

Cosmo-26



Report of Abstracts

Abstract ID : 1

A Hyperspherical Scalar-Mode Interpretation of Late-Time Cosmological Anomalies

Content

We present a minimal late-time cosmological framework in which spatial sections are modeled as large-radius hyperspheres $S^3(R_H)$ and gravitational potentials arise from a scalar topographic field $T(x)$ obeying a fourth-order elliptic equation $\nabla^2 T - B\nabla^4 T = S(x)$. A single long-wavelength scalar mode induces coherent, direction-dependent modulations in distance measures, producing three signatures: (i) a small positive BAO curvature shift consistent with DESI DR2, (ii) a low-redshift dipole in supernova luminosity distances consistent with Pantheon+, and (iii) a mild redshift evolution in the effective Hubble parameter around $z \sim 0.4 - 0.5$. Eliminating the scalar amplitude yields a direct, falsifiable correlation between BAO scale shifts and SN dipole amplitudes, providing a sharp test for DESI, LSST, and Euclid. The framework does not modify early-Universe physics and remains compatible with CMB constraints for R_H

*gtrsim*20 – 40 Gpc. We outline the parameter ranges consistent with current data and highlight observational signatures capable of ruling out the model.

Other topic / keywords:

Author: CARBERRY, Norman

Presenter: CARBERRY, Norman

Track Classification: Large-Scale Structure; Inflation / Primordial Perturbations

Contribution Type: Talk

Comments:

If remote presentation is possible, I would be grateful for that option.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 2.0** (prefers remote. Topic not very exciting.)

Abstract rating 2

HILDEBRANDT, Hendrik: **Accept • 2.0**

Abstract rating 2

Inflation / Primordial Perturbations:

Judgments: Negative

Reviews:

CESPEDES, Sebastian: **Reject**

Abstract rating 0

WANG, Dong-Gang: **Reject • 1.0**

Abstract rating 1

Submitted by **CARBERRY, Norman** <carberry8878130@hotmail.com> on **Friday, 6 February 2026**

Abstract ID : 2

Dark Hydrogen Atoms and Dark He⁺ Ions as Baryonic Dark Matter

Content

The explanation of a puzzling observation by Bowman et al 2018 (Nature, 555, 67) of the redshifted 21 cm spectral line from the early Universe, where it was found that the absorption in this line was about 2 to 3 times stronger than predicted by the standard cosmology and thus the primordial hydrogen gas was significantly cooler than predicted by the standard cosmology, required as the cooling agent, some kind of baryonic DM [Barcana, 2018 (Nature, 555, 71); McGaugh, 2018 (Res. Not. Amer. Astron. Soc., 2, 37)]. Then in paper [Oks, 2020 (Res. Astron. Astrophys. 20, 109)] there was given both qualitative and quantitative explanation of the puzzling observation by Bowman et al (2018) based on the specific DM in the form of the second flavor of hydrogen atoms (SFHA), corresponding to the 2nd solution of the Dirac equation for hydrogen atoms. In distinction to exotic hypothetical particles previously suggested as the explanation (the particles never discovered experimentally), the existence of the SFHA is evidenced by 3 different types of atomic experiments –plus it completely resolved the long-standing puzzle of the neutron lifetime. In the latter, the central point was that the two-body decay of neutrons produces –with the overwhelming probability – the SFHA rather than the usual hydrogen atoms. More details can be found, e.g., in my reviews on DM published in New Astronomy Reviews in 2021 (93, 101632) and in 2023 (96, 101673), and in my paper in Nuclear Phys. B 2025 (1014, 116879). The primary property of the SFHA is that, since they have only the S-states, then according to the selection rules of quantum mechanics they cannot emit or absorb the electromagnetic radiation: they remain dark. As the relation of these results to the structure formation in the universe, I provide the chronology of the cosmological formation of the surplus of the SFHA (compared to the usual hydrogen atoms) from the Recombination Epoch through the Structure Formation Epoch, including the production of the SFHA by some neutron stars. Therefore, the halos of modern galaxies contain more of the SFHA than the usual H-atoms. In addition, there is evidence from atomic experiments of the existence of the Second Flavor of He⁺ Ions (SFHeI). They are also dark due to the selection rules of quantum mechanics. There occurred the cosmological formation of the surplus of the SFHeI (compared to the usual He⁺) similarly to the surplus of the SFHA. Therefore, the halos of modern galaxies contain also more of the SFHeI than the usual He⁺. From atomic experiments follows that the most probable value of ratio (SFHA + SFHeI)/(usual H + usual He⁺) is 1.8. From astrophysical observations by de Graaff et al (2019, A&A, 624, A48) and by Penton et al (2004 ApJ Suppl. Ser. 152, 29) follows that the most probable value of the ratio (baryonic DM)/(luminous baryons) is 2.1. The comparison of these two ratios shows that the combination of the SFHA with the SFHeI most probably constitutes about 90% of all baryonic DM in the current epoch. It is important to emphasize that the discovery of the SFHA and the SFHeI was based on the standard Dirac equation of quantum mechanics without going beyond the Standard Model and without any change of physical laws –in distinction to the overwhelming majority of hypotheses on DM. Finally, I will discuss/motivate some relevant future laboratory experiments and astrophysical observations.

Other topic / keywords:

Neutron Stars

Author: Prof. OKS, Eugene (Auburn University, USA)

Presenter: Prof. OKS, Eugene (Auburn University, USA)

Track Classification: Dark Matter; Early Universe

Contribution Type: Talk

Comments:

Dear Organizers, I am Professor at the Physics Department of the Auburn University in the USA. Let me outline my credentials. I am the Editor-in-Chief of 3 physics/astrophysics journals and the Editorial Board member of 6 other physics/astrophysics journals. I published 15 research books (monographs) on physics and astrophysics –in addition to over 750 papers in the leading refereed physics/astrophysics journals. In the last 30 plus years of my 50 plus years as the theoretical physicist, I gave about 50 invited talks at the international physics/astrophysics conferences, as well as several contributed talks. For example, in 2025 I made invited oral presentations at 4 astrophysical conferences: at “My Favourite Dark Matter Model” in Portugal, at PASCOS in Durham, UK, at AstroMarche II in Camerino, Italy, and at 33rd Texas Symposium on Relativistic Astrophysics. Also, I gave a talk at the “AstroNuc 2026” in Tucson (AZ, USA) in March 2026. I will attend your conference if you will kindly accept my suggested contribution as the oral presentation. Thank you. Sincerely, Professor Doctor Eugene Oks

Status: SUBMITTED

Track Reviews:

Early Universe:

Judgments: Negative

Reviews:

VAN DE VIS, Jorinde: **Reject • 1.0** (This is not my expertise, but checking his Inspire page, I get the sense that his main area of expertise is something else (they are all single author papers that are not very well cited).)

Abstract rating 1

Submitted by **Prof. OKS, Eugene** <oksevgu@auburn.edu> on **Monday, 30 March 2026**

Abstract ID : 3

Set the Night on FIRE: Building an Empirical Local Dark Matter Velocity Distribution

Content

The majority of terrestrial direct detection experiments for Dark Matter (DM) rely on the Standard Halo Model (SHM), which assumes the local DM velocity distribution follows a Maxwell–Boltzmann distribution. However, galaxy mergers can deposit DM that remains kinematically clustered today, inducing deviations from the smooth SHM prediction. Previous studies have suggested that the local stellar velocity distribution may serve as a tracer for DM populations originating from the same progenitor systems. In this work, we systematically investigate how merger mass and accretion time affect the correlation between local stellar and DM velocity distributions in Milky Way–like galaxies from the FIRE-2 simulations. We find a strong correlation between traceable DM components and their stellar counterparts, with the tightest correspondence arising from lower-mass mergers accreted at earlier cosmic times. For the remaining DM that lacks an identifiable stellar counterpart, which dominate the full DM fraction, we find that its velocity distribution is well described by a component-wise generalized Gaussian. Combining these two ingredients, we reconstruct the full local DM velocity distribution. This framework captures merger-induced features—such as co-rotation of accreted material with the galactic disk—that are entirely absent in the SHM. Finally, we propagate uncertainties through the reconstruction and show that they are dominated by the stellar mass–halo mass relation, which is unlikely to improve substantially in the near term. We therefore argue that this framework approaches the current limit of our ability to characterize the local DM velocity distribution.

Other topic / keywords:

Author: ZHANG, Xiuyuan

Presenter: ZHANG, Xiuyuan

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **ZHANG, Xiuyuan** <xiuyuan@mit.edu> on **Monday, 30 March 2026**

Abstract ID : 4

Baryonified Lightcones: A Unified Framework for LSS–CMB Cross-Correlation Cosmology

Content

Understanding the impact of baryonic feedback on the matter distribution is a major challenge for precision cosmology, especially for analyses combining large-scale structure tracers with CMB secondary anisotropies. We recently showed that combining kinematic Sunyaev–Zel’dovich measurements from ACT with gas-fraction data from eROSITA provides strong constraints on gas thermodynamics in massive halos, with the BFC baryonification framework favoring strong-feedback models consistent with FLAMINGO.

In the first part of this talk, I will summarize these results and illustrate how combining CMB and X-ray observables constrains baryonic feedback.

In the second part, I will present our extension of the baryonification framework to full cosmological lightcones. Starting from dark-matter-only shells from the CosmoGrid simulation suite, we apply the updated BFC displacement model to generate self-consistent gas, stellar, and dark-matter fields, enabling forward-modeling of multiple observables within a unified framework.

I will then show first results, including high-resolution thermal and kinematic SZ maps on the HEALPix grid. This approach provides an efficient path from dark-matter-only simulations to realistic CMB secondary anisotropies and supports consistent modeling of correlations between LSS tracers and CMB signals.

Finally, I will discuss validation against FLAMINGO and extensions to additional probes such as X-ray emission and weak-lensing shear. By jointly modeling LSS tracers with tSZ and kSZ effects, this framework enables unified multi-probe analyses that constrain both cosmology and baryonic feedback.

Other topic / keywords:

Author: KOVAC, Michael (University of Manchester)

Presenter: KOVAC, Michael (University of Manchester)

Track Classification: Large-Scale Structure; Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (nice new results.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0**

Abstract rating 4

Submitted by **KOVAC, Michael** <michael.kovac@postgrad.manchester.ac.uk> on **Tuesday, 31 March 2026**

Abstract ID : 5

GPU-accelerating CMB cosmology with state of the art ODE solvers

Content

GPUs offer a way to massively parallelise certain types of physical models, allowing us to compare more models for the same compute budget (and hence do more science) whilst avoiding the use of emulators (which must be retrained every time you modify the underlying physics). More efficient forward models also allow us to tackle higher-dimensional problems (such as in field-level inference) and more complex foreground systematics and nuisance parameters.

In particular, the Einstein-Boltzmann equations that underly models of the CMB are linear ordinary differential equations that are highly amenable to parallelisation on a GPU, across both “k-modes” and parameters. Meanwhile, modern cosmological analyses are burdened with the technical debt of low-level codes written in FORTRAN and C, which are difficult to modify when trying to test new models of physics.

We have therefore written a new CMB code in Python and JAX (DISCO-EB) which can take advantage of the massive computational throughput of modern GPUs, but is easy to modify with new physics. As part of this work, we have developed new ODE solvers that are better optimised for solving many small ODEs at once and are 100x faster than the current Python/JAX state-of-the-art (diffax). The result is precision similar to that of existing codes but at vastly reduced \$ inference cost. The ODE solvers themselves are packaged separately and could have broad application in the scientific community.

Other topic / keywords:

Author: BERRY, Lawrence (Institute of Astronomy, University of Cambridge)

Co-authors: HAHN, Oliver; Dr HANDLEY, Will; SCHÖNEBERG, Nils (ICC University Barcelona)

Presenter: BERRY, Lawrence (Institute of Astronomy, University of Cambridge)

Track Classification: Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 1.0**

Abstract rating 1

Submitted by **BERRY, Lawrence** <ljb200@cam.ac.uk> on **Tuesday, 31 March 2026**

Abstract ID : 6

Measuring cosmic bulk flow with kinetic Sunyaev-Zel'dovich (kSZ) velocity reconstruction

Content

The average large-scale velocity of matter in the universe, known as **cosmic bulk flow**, is a fundamental test of the Cosmological Principle. Traditionally, this has been measured only out to $R_{\text{lessim}}100$ megaparsecs (Mpc). We present an application of **kinetic Sunyaev-Zel'dovich (kSZ) velocity reconstruction** to constrain bulk flow on cosmological scales more than $10\times$ larger, extending out to $R_{\text{lessim}}2000$ Mpc.

kSZ velocity reconstruction isolates the Doppler shifting of CMB photons scattered by the electron plasma in galaxies to reconstruct the underlying velocity field.

We use galaxy data from two catalogs (unWISE and WISExSCOS) combined with CMB maps (from Planck) to reconstruct velocities in six redshift bins ranging from 0.1

z_{lessim}

$z_{\text{lessim}}1.5$. We place some of the tightest constraints on bulk velocity at 500

R_{lessim} [Mpc]

$R_{\text{lessim}}2000$, finding results fully consistent with the standard cosmological model, Λ CDM.

Furthermore, our constraints are relevant for the **cosmic dipole anomaly**, a persistent tension where measurements of galaxy number counts imply a bulk flow

$g_{\text{trsim}}5\times$ larger than the standard theoretical expectation. Our constraints are in $\sim 2\sigma$ tension with the leading number-count dipole measurement from CatWISE, challenging their interpretation of the dipole anomaly as an excess coherent bulk flow, and reinforcing the standard cosmological model.

Other topic / keywords:

CMB secondaries

Author: SEHER GANDHI, Suroor (Perimeter Institute for Theoretical Physics)

Co-authors: HUDSON, Mike (Waterloo Centre for Astrophysics); JOHNSON, Matthew; KRYWONOS, Jordan (Perimeter Institute for Theoretical Physics)

Presenter: SEHER GANDHI, Suroor (Perimeter Institute for Theoretical Physics)

Track Classification: Large-Scale Structure; Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Interesting results and innovative technique.)

Abstract rating 5

KUIJKEN, Koen: **Accept: Talk • 5.0** (important results)

Abstract rating 5

Submitted by **SEHER GANDHI, Suroor** <ssehergandhi@pitp.ca> on **Tuesday, 31 March 2026**

Abstract ID : 7

Primordial Gravitational Waves from Scalar Backreaction in Axion-SU(2) Inflation

Content

In this work, we perform the first numerical study of strong scalar backreaction in spectator chromo-natural inflation (SCNI) in the case where the spectator sector decays during inflation. The tachyonic instability in scalar fluctuations, activated as the system crosses the $m_Q = \sqrt{2}$ threshold, amplifies perturbations and may significantly alter the background dynamics. The strong scalar backreaction regime introduces an effective quartic term in the potential for the gauge field background that rapidly drives it to zero, accelerating the axion-gauge system decay. We describe the dynamics of such decay and derive the gravitational wave spectrum for a set of benchmark parameters. Interestingly, the signal may peak at interferometer scales and lie within LISA's projected sensitivity.

Other topic / keywords:

Axion Inflation - SU(2)

Author: Dr CIELO, Mattia (NORDITA)

Presenter: Dr CIELO, Mattia (NORDITA)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Early Universe:

Judgments: Positive

Reviews:

VAN DE VIS, Jorinde: **Accept • 4.0** (Seems interesting and the abstract is well-written.)

Abstract rating 4

Submitted by **CIELO, Mattia** <mattia.ciel@gmail.com> on **Wednesday, 1 April 2026**

Abstract ID : 8

Threshold Causality: A Complete Cosmological Model From a Single Calibrated Input

Content

Threshold Causality (TC) is a complete cosmological model constructed from established physics assembled into five axioms with a single calibrated input. Causally ordered discrete events in a primordial algebraic quantum field with E_8 gauge symmetry undergo bond percolation at criticality on a random regular graph. The size of the random regular graph is calibrated to Ω_b . Time and geometry do not exist in the primordial regime. Percolation causes clustering of events that can span the random regular graph and form a spanning cluster. When the cardinality of the largest spanning cluster exceeds a 99th-percentile threshold ($\lambda_c = 2.9$), a Mode I cluster forms. Mode II contains all singletons and small clusters not in Mode I. In Mode I, E_8 breaks: $E_8 \rightarrow SU(3) \times E_6 \rightarrow$ Standard Model, producing three extended and six compact dimensions, and baryonic matter. The Mode II E_8 field permeates Mode I and is the Mode I vacuum. Monte Carlo simulation ($N = 300,000$, $k = 8$, $p_c = 1/7$, $\lambda_c = 2.9$, 10,000 realizations) yields spanning clusters in $70.3 \pm 0.5\%$ of realizations; $1.11 \pm 0.10\%$ exceed the Mode I threshold. The resulting Mode I event fraction is $f_I = 0.0484 \pm 0.001$ and Mode II event fraction $f_{II} = 0.952 \pm 0.002$. Within Mode II, quantum zero-point fluctuations of the gauge-field bonds determine the physical boundary between quantum-mechanically unbound events and small clusters ($s < 9$, dark energy (DE)) and larger bound clusters ($s \geq 9$, dark matter (DM)). The binding energy ratio $\varepsilon_{\text{bond}}/E_0 = 8/248$ is derived exactly from E_8 representation theory. The energy-weighted split gives $\Omega_{\text{DE}} = 0.691 \pm 0.005$ and $\Omega_{\text{DM}} = 0.261 \pm 0.003$. The Hubble parameter follows directly from the percolation-derived density fractions (Ω_b , Ω_{DM}) and the CMB acoustic scale θ_s : $H_0 = 67.6 \pm 0.5 \text{ km s}^{-1} \text{ Mpc}^{-1}$. The entire $E_8 \rightarrow$ SM cascade completes in the pre-geometric phase; its completion defines $t = 0$. Emergent spacetime is spatially flat, homogeneous, and isotropic with low initial entropy without invoking an inflationary epoch. The topology of the compact dimensions ($|\chi| = 6$) produces exactly three fermion generations. Fitting Planck 2018 binned TT, TE, EE spectra with TC's predictions yields $\chi^2/\text{dof} = 1.06, 1.33, 1.21$ across 215 bins without further parameter adjustment, statistically consistent with Λ CDM's six-parameter fit. From a single calibration, $N \rightarrow \Omega_b$, TC predicts Ω_{DE} , Ω_{DM} , σ_8 , H_0 , and the full CMB acoustic spectrum. TC makes five falsifiable predictions: (1) $w_0 = -1$ exactly, $w_a = 0$; (2) tensor-to-scalar ratio $r = 0$; (3) exactly three fermion generations; (4) $\Omega_{\text{DE}}/(\Omega_{\text{DE}} + \Omega_{\text{DM}}) = 72.6 \pm 0.3\%$; and (5) no primordial black holes at any mass scale. TC derives the quantities that Λ CDM fits, explains the features that Λ CDM assumes, and generates explicitly falsifiable predictions.

Other topic / keywords:

E_8 gauge symmetry, bond percolation, spacetime emergence, dark energy, dark matter, Hubble constant

Author: Dr SMITH, Craig (AmJen Research)

Presenter: Dr SMITH, Craig (AmJen Research)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Negative

Reviews:

GLAVAN, Dražen: **Reject**

Abstract rating 0

GARCIA-GARCIA, Carlos: **Reject**

Abstract rating 0

Submitted by **SMITH, Craig** <smithcr239@gmail.com> on **Thursday, 2 April 2026**

Abstract ID : 9

AI/ML Techniques for Model-Independent Cosmological Analysis

Content

Machine learning is increasingly shaping cosmological analyses, though its impact depends critically on careful validation and physically interpretable use. In this talk, I will outline several AI/ML approaches for model-independent cosmological inference, with an emphasis on how data-driven methods can complement more traditional statistical techniques. I will discuss LADDER [1], a deep-learning framework for reconstructing the cosmic distance ladder directly from Type Ia supernovae (SNIa) data while incorporating the full covariance structure of the observations. Following extensive robustness tests, LADDER provides reliable predictions that enable model-independent applications such as consistency checks of baryon acoustic oscillation measurements [2], calibration of high-redshift datasets (e.g., gamma-ray bursts), and the construction of mock catalogues for future SNIa and gravitational-wave (GW) missions. These examples illustrate how carefully validated deep-learning tools can assist cosmological analyses without assuming specific parametric forms. I will also briefly discuss Gaussian-process-based reconstruction of the Hubble parameter and its use in examining the potential cosmological implications of future GW observations [3,4]. Taken together, these methods aim to demonstrate both the potential and the necessary caution, in applying AI/ML techniques to cosmology, and show how responsible non-parametric approaches may offer fresh perspectives on several ongoing challenges in precision cosmology.

[1] R. Shah, S. Saha, P. Mukherjee, U. Garain and S. Pal, *ApJS* 273, 27 (2024) doi:10.3847/15384365/ad5558 [arXiv:2401.17029 [astro-ph.CO]].

[2] R. Shah, P. Mukherjee, S. Saha, U. Garain and S. Pal, [arXiv:2412.14750 [astro-ph.CO]].

[3] R. Shah, A. Bhaumik, P. Mukherjee and S. Pal, *JCAP* 06, 038 (2023) doi:10.1088/14757516/2023/06/038 [arXiv:2301.12708 [astro-ph.CO]].

[4] P. Mukherjee, R. Shah, A. Bhaumik and S. Pal, *Astrophys. J.* 960, no.1, 61 (2024) doi:10.3847/15384357/ad055f [arXiv:2303.05169 [astro-ph.CO]].

Other topic / keywords:

Cosmological Tensions

Author: Mr SHAH, Rahul (Indian Statistical Institute, Kolkata)

Presenter: Mr SHAH, Rahul (Indian Statistical Institute, Kolkata)

Track Classification: Dark Energy / Modified Gravity; Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 2.0**

Abstract rating 2

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GLAVAN, Dražen: **Accept: Talk • 2.0** (Better suited for Probably better suited for Methods/Statistical inference/Machine Learning track)

Abstract rating 2

GARCIA-GARCIA, Carlos: **Accept: Talk • 2.0** (Better suited for Probably better suited for Methods/Statistical inference/Machine Learning track)

Abstract rating 2

Submitted by **Mr SHAH, Rahul** <rahul.shah.13.97@gmail.com> on **Saturday, 4 April 2026**

Abstract ID : 10

Scalar-Induced Gravitational Waves: Beyond the Lattice

Content

We study a model in which scalar fields generate gravitational waves through 4-point correlation functions, originating from the scalar power spectrum. The resulting gravitational wave spectrum depends on the couplings of the scalar fields and is predominantly blue-tilted, which automatically satisfies the constraints on CMB scales.

The novelty of our approach lies in computing the gravitational spectrum on super-horizon scales. This regime is particularly interesting, since classical lattice simulations are restricted to sub-horizon scales and, as we show, the super-horizon spectrum is closer to the sensitivity ranges of current and future gravitational wave experiments.

Other topic / keywords:

Authors: GARCÍA GARCÍA, Marcos Alejandro (Instituto de Física, UNAM); GARCÍA VEGA, Ángel (Instituto de Física, UNAM)

Presenter: GARCÍA VEGA, Ángel (Instituto de Física, UNAM)

Track Classification: Inflation / Primordial Perturbations; Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Poster

Reviews:

GAROFFOLO, Alice: **Accept • 2.0**

Abstract rating 2

MALHOTRA, Aameek: **Accept: Poster • 2.0**

Abstract rating 2

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **GARCÍA VEGA, Ángel** <angel.gv2002@gmail.com> on **Monday, 6 April 2026**

Abstract ID : 11

Gravitational waves from cosmic textures

Content

Cosmic textures are non-trivial field configurations arising from spontaneous symmetry-breaking, $G \rightarrow H$, for which $\pi_3(G/H)$ is nontrivial. Global textures are known to be sources of gravitational waves in the literature, whereas gauged textures have not been well studied, since some of them are pure gauge. In the present study, we focus on gauged SU(2) and O(4) textures, following the pioneering work of Davis (1987), in which it was shown that the gauged SU(2) texture is pure gauge, while the gauged O(4) texture behaves like radiation. We estimate the gravitational wave spectra using field-theoretic simulations and discuss the differences between these cases.

Other topic / keywords:

Author: HIRAMATSU, Takashi (Nihon University)

Presenter: HIRAMATSU, Takashi (Nihon University)

Track Classification: Early Universe; Gravitational Waves

Contribution Type: Talk

Comments:

I cannot give a talk on Friday. I don't think it will be a problem as there are only plenary talks scheduled for Friday, though.

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 3.0**

Abstract rating 3

MALHOTRA, Aameek: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **HIRAMATSU, Takashi** <hiramatsu.takashi@nihon-u.ac.jp> on **Tuesday, 7 April 2026**

Abstract ID : 12

SIMPonium Bound States in the Early Universe: Solving the Cosmological Tensions

Content

Dark matter remains one of the most compelling mysteries in modern physics. While WIMPs have long been leading candidates, the lack of experimental evidence has motivated alternatives such as SIMPs. We consider an MeV scale complex scalar SIMP dark matter candidate χ , interacting via a massless dark photon A^μ , which induces a Coulomb potential and forms bound states (SIMPonium).

We find that freeze out occurs at $x = m_\chi/T \approx 17$ ($T \sim \text{few MeV}$), coinciding with the epoch of Big Bang Nucleosynthesis (BBN). We analyze the impact of bound-state formation, ionization, and decay on light element abundances, including photodisintegration effects. The decay of light SIMPonium, as well as the annihilation of light $\chi\text{-}\chi^*$ pairs, results in reduction in abundance of ${}^7\text{Li}$, offering a potential mechanism to alleviate the primordial lithium discrepancy. We further analyze the impact on the Cosmic Microwave Background (CMB) through exotic energy injection from SIMPonium formation and decay. The presence of dark radiation along with SIMPonium decay and annihilation of free dark matter into dark radiation, modifies the Hubble expansion rate, providing a solution to the Hubble tension.

Other topic / keywords:

Authors: Dr MUMMIDI, Venkata Suryanarayana (National Institute of Technology - Trichy); PRASAD, Gokhula (National Institute of Technology-Trichy)

Presenter: PRASAD, Gokhula (National Institute of Technology-Trichy)

Track Classification: Dark Matter; Cosmic Microwave Background; Early Universe

Contribution Type: Poster

Status: SUBMITTED

Submitted by **PRASAD, Gokhula** <pa.gokhul1998@gmail.com> on **Tuesday, 7 April 2026**

Abstract ID : 13

Primordial gravitational waves: A unique probe of dark matter

Content

Primordial gravitational waves (PGWs) serve as a unique window into the early Universe, offering a rare opportunity to bridge the gap between inflationary reheating and the microphysics of dark matter (DM). This talk explores how distinct PGW signatures can test novel physics scenarios beyond the standard model (SM), providing critical insights into the fundamental nature of the dark sector. We first examine the co-genesis of DM and high-scale leptogenesis, both produced via gravity-mediated processes during the reheating epoch. By utilizing Fisher forecasts and Markov chain Monte Carlo (MCMC) analysis with mock data, we investigate the detection prospects for these signals in next-generation interferometry missions such as LISA and ET. Our results demonstrate that these missions can probe specific DM mass ranges and leptogenesis scales with a high signal-to-noise ratio (SNR). Furthermore, we discuss the non-trivial imprints left on the GW spectrum by a non-standard pre-BBN epoch. By considering an early matter-dominated era, we present an alternative detection avenue for annihilating and axionic DM. This approach offers a powerful new framework for searching for DM candidates that remains complementary to, and goes beyond, conventional laboratory searches.

Based on:

[https://doi.org/10.1007/JHEP12\(2024\)150](https://doi.org/10.1007/JHEP12(2024)150), <https://journals.aps.org/prd/abstract/10.1103/1zwb-24jr>, and <https://arxiv.org/abs/2506.17568> .

Other topic / keywords:

Author: PAUL, Debarun (Indian Statistical Institute, Kolkata)

Co-authors: Dr CHEEK, Andrew (TDLI, SJTU); GHOSHAL, Anish (University of Warsaw, Poland); Prof. PAL, Supratik (Indian Statistical Institute, Kolkata)

Presenter: PAUL, Debarun (Indian Statistical Institute, Kolkata)

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe; Gravitational Waves; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0**

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 3.0**

Abstract rating 3

Dark Matter:

Judgments: Positive: Talk

Reviews:

COLE, Philippa: **Accept: Talk • 5.0**

Abstract rating 5

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

COLE, Philippa: **Accept: Talk • 5.0**

Abstract rating 5

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 3.0** (Might be more targeted at a theory audience)

Abstract rating 3

Submitted by **PAUL, Debarun** <debarun31paul@gmail.com> on **Tuesday, 7 April 2026**

Abstract ID : 14

Dark Energy Survey Year-6 Pixel-to-Cosmology with Weak Lensing

Content

The Dark Energy Survey (DES) provides a rich dataset to explore the effect of weak gravitational lensing on distant galaxies by the large-scale structure of the Universe. Weak lensing has become a powerful probe to investigate matter distribution in the Universe over the past decade thanks to large imaging surveys. In order to extract unbiased cosmological information from the dataset, however, one requires robust analyses throughout the pixel-to-cosmology pipeline, such as measuring galaxy shapes from images and modeling astrophysics accurately. In this talk, I will present the legacy weak lensing cosmology results measured with the Y6 shear catalog containing more than 150 million galaxies, constituting the most powerful weak lensing dataset to date.

Other topic / keywords:

Author: YAMAMOTO, Masaya

Presenter: YAMAMOTO, Masaya

Track Classification: Large-Scale Structure; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 5.0** (New result from major project)

Abstract rating 5

HILDEBRANDT, Hendrik: **Accept • 5.0**

Abstract rating 5

Submitted by **YAMAMOTO, Masaya** <my5871@princeton.edu> on **Wednesday, 8 April 2026**

Abstract ID : 15

Enhanced foreground mitigation in thermal SZ Compton- γ maps via polarization-aided cleaning and CIB deprojection

Content

The thermal Sunyaev-Zeldovich effect Compton- γ parameter map (γ -map) is a redshift-independent tracer of the hot baryon density across the sky. The all-sky γ -maps reconstructed from Planck data have been utilized for the study of Lambda-CDM cosmology and the astrophysics of galaxy clusters. The current best minimum variance, all-sky γ -map was made public in our previous work, using Needlet ILC on the latest Planck data. I will describe our effort to develop the best strategies for reconstructing γ -maps with the least possible contamination from galactic foregrounds using the Hybrid ILC approach, and with the least cosmic infrared background (CIB) contamination using optimal deprojection of moments of the CIB SED. I will also compare our CIB minimization with other contemporary works with the same aim.

Other topic / keywords:

Author: CHANDRAN, Jyothis (IFCA, Universidad de Cantabria)

Presenter: CHANDRAN, Jyothis (IFCA, Universidad de Cantabria)

Track Classification: Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 5.0** (Describes a new data product, hence probably interesting to wide audience.)

Abstract rating 5

Submitted by **CHANDRAN, Jyothis** <chandran@ifca.unican.es> on **Wednesday, 8 April 2026**

Abstract ID : 16

Detecting Relativistic Effects by Multi-tracing a Single Galaxy Population

Content

Our well-established gravity model, the theory of general relativity, has been extensively tested in strong-field regimes. However, no observational test has yet confirmed its validity on cosmological scales, where the universe's dark components are necessary to fit LSS data. The detection of large-scale relativistic effects via galaxy power spectrum measurements would provide such an unprecedented confirmation. Amongst these relativistic contributions, the Doppler term acts as an imaginary correction in the relation between the galaxy density contrast and that of matter, and mostly affects the large scales usually plagued by cosmic variance. Also, it is sample-dependent, thus different galaxy populations display different contributions in their power spectra. In the search for the optimal galaxy samples to achieve a detection of the relativistic term, we can split a galaxy population according to luminosity, and then perform a multi-tracer analysis with auto-correlations of the sub-samples and their cross-power spectrum. I will be talking about how to make it possible a first detection of the relativistic Doppler signal, with data from ongoing galaxy surveys, such as Euclid and DESI, using this single-dataset, multi-tracer approach.

Other topic / keywords:

Galaxy clustering, multi-tracer, cross-correlations, tests of gravity, general relativity

Author: MONTANO, Federico (University of Turin)

Presenter: MONTANO, Federico (University of Turin)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Out of the box. Forecast.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 4.0** (good fit to theory conference! Seems new.)

Abstract rating 4

Submitted by **MONTANO, Federico** <federico.montano@unito.it> on **Wednesday, 8 April 2026**

Abstract ID : 17

Unstable Dark Matter and Halo Abundance: A Spherical Collapse Approach

Content

Decaying dark matter (DDM) provides a well-motivated extension of Λ CDM, in which two-body decays – characterized by a decay rate Γ and velocity kick v_k – naturally suppress structure growth and lead to lower clustering amplitudes consistent with weak lensing measurements of S_8 . Previous analyses combining Planck, BAO, and weak lensing data identified viable parameter space around $\Gamma^{-1} \sim 7$ Gyr and $v_k \sim 1250$ km/s. Extending these constraints with upcoming cluster abundance measurements from eROSITA, however, requires accurate theoretical predictions for the halo mass function in DDM cosmologies.

We show that the standard Press-Schechter formalism, even when supplied with the correct DDM linear power spectrum, systematically overpredicts the abundance of massive halos compared to DDM N -body simulations. This discrepancy arises from neglecting the distinct collapse physics of DDM, primarily from mass loss as daughter particles receive velocity kicks exceeding the escape velocity. We develop a spherical collapse framework that self-consistently incorporates these effects, yielding a mass-dependent critical density threshold $\delta_c(M)$ that increases for low-mass halos unable to retain kicked daughters. We further show that this general two-body decay model admits two physically transparent limiting cases: at low masses, where all daughters escape, the collapse reduces to an effective one-body decay problem, admitting a universal fitting formula for δ_c that accurately describes one-body decay models; at high masses, where all daughters remain bound, we derive an analytic mass-independent expression for δ_c . We further demonstrate that the DDM halo mass function can be accurately matched to that of warm dark matter (WDM) through an empirical mapping of DDM parameters to an effective WDM thermal mass, a correspondence long observed in N -body simulations but lacking a theoretical underpinning.

Together, these results extend the spherical collapse formalism to both unstable and warm dark matter cosmologies, providing the theoretical foundation needed to exploit upcoming eROSITA cluster counts for precision constraints on these models.

Other topic / keywords:

Author: MONTANDON, Thomas (Laboratoire Univers et Particules de Montpellier)

Presenter: MONTANDON, Thomas (Laboratoire Univers et Particules de Montpellier)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Mixed: Accept, Reject

Reviews:

KUIJKEN, Koen: **Reject** (testing only)

Abstract rating 0

HILDEBRANDT, Hendrik: **Accept • 2.0** (Not too exciting given the status of the S8 tension.)

Abstract rating 2

Submitted by **MONTANDON, Thomas** <thomas.montandon@umontpellier.fr> on **Wednesday, 8 April 2026**

Abstract ID : 18

Slow force carriers in particle physics and cosmology

Content

I show that gauge theory and gravity admit modifications in which all local symmetries are broken without introducing new scales, leading to new gapless modes universally coupled to matter. The new modes have small speed, which suppresses all their interactions with matter, making them compatible with current observations. The new slow forces provide a conservative channel of new physics beyond the standard model of cosmology and particle physics, as well as a consistent and minimal framework to approximate gauge theory without gauge symmetry. I discuss the phenomenology of these new slow forces in the context of cosmology, astrophysics, and particle physics.

Other topic / keywords:

Author: SERRA, Francesco (Johns Hopkins University)

Presenter: SERRA, Francesco (Johns Hopkins University)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Comments:

My presentation is based on a paper that will be published by the time of the conference.

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **SERRA, Francesco** <fserra2@jh.edu> on **Wednesday, 8 April 2026**

Abstract ID : 19

Micro Black Hole Dark Matter

Content

The influence of a possible low gravity scale, concretely through the presence of extra dimensions or additional species, on radiation properties of micro black holes is investigated. In particular, the suppression of evaporation through the so-called memory-burden effect is shown to be stronger, occurs earlier and with sharper transition compared to the canonical Planck-scale regime. It is furthermore shown how this affects the possibility of light primordial black hole dark matter, constraints on which may weaken substantially and allow them to be as light as $10^{-5}M_P$, thereby lying in the particle regime. The signals and constraints of such a scenario are discussed leading to the conclusion that micro black hole dark matter remains phenomenologically viable in constrained regions, with neutron stars, neutrino telescopes, and merger signatures providing complementary tests.

Other topic / keywords:

Author: ETTENGRUBER, Manuel (Institut de Physique Théorique)

Presenter: ETTENGRUBER, Manuel (Institut de Physique Théorique)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **ETTENGRUBER, Manuel** <manuel.ettengruber@web.de> on **Wednesday, 8 April 2026**

Abstract ID : 20

The SABRE South Experiment at the Stawell Underground Physics Laboratory

Content

SABRE is an international collaboration that will operate similar particle detectors in the Northern (SABRE North) and Southern Hemispheres (SABRE South). This innovative approach aims to distinguish potential dark matter signals from seasonal backgrounds: a pioneering strategy only feasible with a Southern Hemisphere experiment. SABRE South is located at the Stawell Underground Physics Laboratory (SUPL), in regional Victoria, Australia. SUPL is a newly constructed facility situated 1024 metres underground (~2900 metres water equivalent) within the Stawell Gold Mine. Its construction was completed in 2023.

SABRE South employs ultra-high purity NaI(Tl) crystals immersed in a linear alkyl benzene (LAB)-based liquid scintillator veto, surrounded by passive steel and polyethylene shielding, and topped with a plastic scintillator muon veto. Significant progress has been made in the procurement, testing, and preparation of equipment for the installation of SABRE South. The assembly of the experiment at SUPL will take place this year. The SABRE South muon detector and data acquisition systems are already operational and actively collecting data at SUPL, and full commissioning of SABRE South is planned this year. This presentation will provide an update on the overall progress of the SABRE South construction, its anticipated performance, and its potential physics reach.

Other topic / keywords:

Author: MCNAMARA, Peter

Presenter: MCNAMARA, Peter

Track Classification: Dark Matter

Contribution Type: Talk

Comments:

On behalf of the SABRE South speakers committee

Status: SUBMITTED

Submitted by **MCNAMARA, Peter** <p.mcnamara@utoronto.ca> on **Wednesday, 8 April 2026**

Abstract ID : 21

QCD corrections to the electroweak sphaleron rate

Content

The weak-isospin conductivity determines the rate of baryon number violating sphaleron processes in the high temperature phase of the Standard Model and is thus an important input for predictions of the primordial Baryon asymmetry. So far, only electroweak interactions were included in the computation of the conductivity. Presenting work published in 2510.20594, we for the first time also include strong interactions at leading-log accuracy. They decrease the quark contribution to the conductivity and therefore increase the electroweak sphaleron rate.

Other topic / keywords:

thermal field theory, baryon number violation, electroweak baryogenesis

Authors: BODEKER, Dietrich (Bielefeld University); KLOSE, Philipp (Nikhef)

Presenter: KLOSE, Philipp (Nikhef)

Track Classification: Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **KLOSE, Philipp** <pklose@nikhef.nl> on **Thursday, 9 April 2026**

Abstract ID : 22

An open effective field theory of inflation with dynamical gravity

Content

We construct a gravitational open extension of the effective field theory of inflation in the Schwinger-Keldysh framework. While physical symmetries allow many open operators in the Schwinger-Keldysh action, most of them overconstrain the equations of motion, yielding inconsistent dynamics. We identify the minimal open operators compatible with propagating scalar and tensor modes and build the gravitational action, recovering known dissipative models such as warm inflation. We also briefly discuss how stochastic inflation fits into this program.

Other topic / keywords:

EFT

Author: CHRISTODOULIDIS, Perseas (Ewha Womans Universtity)

Presenter: CHRISTODOULIDIS, Perseas (Ewha Womans Universtity)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **CHRISTODOULIDIS, Perseas** <perseaschristo@gmail.com> on **Thursday, 9 April 2026**

Abstract ID : 23

Breaking the Hubble Constant Degeneracy in Time-Delay Lensing: A Sequential Filtering Analysis of Time-Delay Lenses in IllustrisTNG

Content

The growing tension between early- and late-Universe measurements of the Hubble constant (H_0) has elevated time-delay cosmography to a primary probe of the expansion rate. However, the precision of this “one-step” method is fundamentally limited by the mass-sheet degeneracy (MSD) and model mis-specification. In this work, we present a systematic exploration of the H_0 likelihood surface using a brute-force grid-search of 10^6 lens models applied to high-fidelity mock systems from the IllustrisTNG hydrodynamical simulations. We introduce a sequential filtering pipeline—moving through astrometric, chronometric, photometric, and kinematic gates—to quantify the hierarchy of observational constraints. We find that image positions and time delays alone result in a catastrophic systematic floor, with H_0 values permitted across a global range of 0 to $125 \text{ km s}^{-1} \text{ Mpc}^{-1}$. The inclusion of absolute magnification—representative of a lensed Type Ia supernova—successfully breaks the primary MSD, narrowing the uncertainty to a $\sim 30\%$ interval. Finally, we demonstrate that the addition of stellar velocity dispersion serves as the critical anchor, resolving the residual profile-slope degeneracy and recovering the true H_0 with $\sim 3\%$ precision. Our results provide a forensic decomposition of the information gain in lensing systems and underscore the necessity of auxiliary photometric and kinematic data for resolving the Hubble tension in the era of Euclid and the Rubin Observatory.

Other topic / keywords:

Gravitational Lensing, Cosmology, the Hubble Tension

Author: HE, Yiwei (the University of Hong Kong)

Presenter: HE, Yiwei (the University of Hong Kong)

Track Classification: Others (Please specify below)

Contribution Type: Poster

Status: SUBMITTED

Submitted by **HE, Yiwei** <iv_he1114@connect.hku.hk > on **Friday, 10 April 2026**

Abstract ID : 24

Multi-soft theorems for cosmological correlators: Background wave method for scalars & gravitons

Content

Cosmological soft theorems (or consistency relations) provide a powerful probe for the physics of inflation. These relations rely on minimal assumptions and hold very generally. Consequently, any violation of these relations would rule out a large class of inflationary models. For instance, a violation of the scalar soft theorem (or consistency relation) would rule out all attractor single-field inflation models and instead point toward either multi-field dynamics or a non-attractor phase. In this paper, we derive tree-level multi-soft theorems, at leading order in the soft expansion, for both scalar and tensor correlation functions. Our analysis employs the background-wave method, in which the effect of long-wavelength modes is captured by an appropriate spatial coordinate rescaling. In addition, we systematically incorporate soft-exchange contributions, including tensor exchanges in scalar correlators and scalar exchanges in tensor correlators.

Other topic / keywords:

Inflation, Consistency relations, Soft Theorems

Author: Dr ULLAH, Farman (International Centre for Theoretical Sciences (ICTS –TIFR), Bengaluru, India)

Presenter: Dr ULLAH, Farman (International Centre for Theoretical Sciences (ICTS –TIFR), Bengaluru, India)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **ULLAH, Farman** <farman.ullah@icts.res.in> on **Saturday, 11 April 2026**

Abstract ID : 25

The Diffuse Supernova Neutrino Background in the presence of Secret Neutrino Interactions

Content

The Diffuse Supernova Neutrino Background (DSNB) constitutes a steady and isotropic flux of neutrinos originating from all past core-collapse supernovae across the observable universe. Despite decades of theoretical development and increasingly stringent limits from experiments such as Super-Kamiokande, the DSNB remains undetected. Its eventual observation would provide a unique probe of supernova dynamics and neutrino properties over cosmological distances, while a continued absence of signal may indicate physics beyond the Standard Model.

In this talk, we investigate the impact of secret neutrino interactions (ν SI), or non-standard neutrino self-interactions, on the DSNB flux. Such interactions are well motivated by scenarios of neutrino mass generation, including models with light mediators such as the Majoron, and can be significantly stronger than Standard Model interactions. While laboratory tests of ν SI are challenging due to limited neutrino fluxes, astrophysical environments and long-baseline propagation offer a natural setting to probe these effects.

We focus on the attenuation of DSNB neutrinos due to scattering with the cosmic neutrino background in the presence of ν SI. In particular, we explore the possibility of resonant enhancement in the case where one relic neutrino remains relativistic, leading to distinctive distortions in the DSNB energy spectrum. We present the resulting spectral modifications and assess their detectability at current and upcoming neutrino observatories, including Jiangmen Underground Neutrino Observatory, Hyper-Kamiokande, and Deep Underground Neutrino Experiment. These results demonstrate the potential of DSNB measurements as a sensitive probe of new neutrino interactions beyond the Standard Model.

Other topic / keywords:

Supernova physics

Author: BHARADWAJ, Praveen (Indian Association for the Cultivation of Science)

Co-authors: CHATTOPADHYAY, Utpal (Indian Association for the Cultivation of Science); Prof. GHOSH, Dilip Kumar (Indian Association for the Cultivation of Science); Mr SARKER, Arnab (Tezpur University, Assam, India)

Presenter: BHARADWAJ, Praveen (Indian Association for the Cultivation of Science)

Track Classification: Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Neutrinos:**Judgments:** Positive**Reviews:**GERBINO, Martina: **Accept • 4.0**

Abstract rating 4

Submitted by **BHARADWAJ, Praveen** <praveen3bharadwaj@gmail.com> on **Saturday, 11 April 2026**

Abstract ID : 26

Open EFTs for Gauge Theories and Gravity

Content

TBD

Other topic / keywords:

Effective Field Theories

Author: Prof. TOLLEY, Andrew (Imperial College London)

Presenter: Prof. TOLLEY, Andrew (Imperial College London)

Track Classification: Inflation / Primordial Perturbations; Early Universe; Gravitational Waves; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 3.0** (The abstract is missing.)

Abstract rating 3

MALHOTRA, Ameet: **Accept: Talk • 3.0** (no abstract?)

Abstract rating 3

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept • 4.0**

Abstract rating 4

Submitted by **Prof. TOLLEY, Andrew** <a.tolley@imperial.ac.uk> on **Sunday, 12 April 2026**

Abstract ID : 27

Parameterizing Dark Energy at the density level: A two-parameter alternative to CPL

Content

Recent BAO observations from the DESI collaboration, combined with CMB and supernovae data, suggest a preference for evolving dark energy (DE) in place of a cosmological constant, particularly within the widely used CPL parameterization of the DE equation of state. In this talk, I present an alternative and complementary approach that instead describes the evolution of the DE density directly, using two physically transparent parameters—one capturing how much DE density differs from today's value at a well-chosen reference epoch, and the other capturing how fast it is changing at that same epoch. This formulation avoids technical degeneracies that affect the standard CPL approach, and each of its two parameters is tightly measured by a distinct subset of the data: namely the DE density fraction relative to today at the reference epoch is pinned down by supernovae, while its rate of change by the combination of BAO and CMB. Applied to the latest DESI, CMB, and supernova data, both parameters are found to be measured to percent level precision, with their mean values interestingly close to the expectation for a cosmological constant, and the overall preference for evolving DE remaining below the three-sigma level. These findings urge caution in interpreting current hints of dynamical DE and highlight the importance of how we choose to describe it.

Other topic / keywords:

Author: MONTEFALCONE, Gabriele (University of Texas at Austin)

Presenter: MONTEFALCONE, Gabriele (University of Texas at Austin)

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Dark Energy / Modified Gravity; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (Not reallt LSS but interesting. Better in DE track)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0** (Interesting topic! Indeed, better in the DE session.)

Abstract rating 5

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 3.0** (The result might be entirely explained by priors? Not sure which track this should be.)

Abstract rating 3

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GLAVAN, Dražen: **Accept: Poster • 1.0**

Abstract rating 1

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **MONTEFALCONE, Gabriele** <gabrielemontef@gmail.com> on **Sunday, 12 April 2026**

Abstract ID : 28

Unlocking the small-scale Universe: a roadmap to next-generation baryonic feedback modeling

Content

Uncertain modeling of baryonic feedback, how energy from active galactic nuclei and supernovae redistributes gas within and beyond halos, poses a major obstacle to testing the cosmological model with large-scale structure (LSS) probes that extend into the non-linear regime. Indeed, it represents the dominant source of uncertainty limiting the cosmological precision of weak lensing (WL). In this talk, I will share work confronting this challenge by 1. demonstrating that astrophysical models calibrated by gas probes can recover this loss of power and 2. providing evidence that the impact of baryonic feedback on the matter distribution is stronger than assumed in cosmological hydrodynamical simulations, a conclusion that has been reinforced by the broader community. Whether such strong feedback is physically plausible, and how a consensus model can be achieved to fully exploit the cosmological precision of upcoming LSS surveys, remain open questions. I will outline a path forward: to use new, public multi-wavelength survey data to change our understanding of feedback processes and realize a next-generation hydrodynamical simulation and, in tandem, develop a data-driven baryonic feedback model to realize the full promise of next-generation WL cosmology.

Other topic / keywords:

Baryonic feedback, weak gravitational lensing

Author: BIGWOOD, Leah

Presenter: BIGWOOD, Leah

Track Classification: Large-Scale Structure; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Highly relevant work. Wonder what's new!?)

Abstract rating 4

KUIJKEN, Koen: **Accept • 4.0** (important)

Abstract rating 4

Submitted by **BIGWOOD, Leah** <lmb224@cam.ac.uk> on **Monday, 13 April 2026**

Abstract ID : 29

Hubble constant dipoles and bulk flows with eROSITA galaxy clusters

Content

The isotropy of cosmic expansion and the dissipation of bulk flows on large scales are fundamental assumptions of the Λ CDM paradigm. However, evidence from independent cosmological probes for large-scale cosmic dipoles and anomalous bulk flows continues to mount. These emerging tensions, therefore, require careful and independent scrutiny.

Galaxy clusters constitute powerful and largely independent probes of potential expansion anisotropies. In previous work, we exploited multiwavelength scaling relations of galaxy clusters to detect a 9% dipole variation in the local Hubble constant (H_0) at the 4σ significance level. This apparent anisotropy can be interpreted as a coherent bulk flow of $\sim 800 \text{ km s}^{-1}$ extending to $\sim 500 \text{ Mpc}$, well beyond the depth currently accessible to peculiar-velocity galaxy surveys. Either interpretation would pose a significant challenge to Λ CDM in the local Universe.

In this talk, I will present new results based on X-ray, optical, and SZ observations of more than 3500 newly discovered galaxy clusters from eROSITA. Using numerous different scaling relations and a hierarchical Bayesian analysis, we detect a $\sim 7\%$ H_0 dipole at a $>4\sigma$ level, in agreement, and fully independently, with cluster past studies. The anisotropy signal is further strengthened ($\sim 5\sigma$) when complementing our analysis with new X-ray and optical cluster data from other cluster samples, which independently support the presence of an expansion dipole anomaly or a $\sim 1000 \text{ km/s}$ cluster bulk flow extending to 600 Mpc. Our analysis localizes the signal predominantly to the nearby Universe ($z < 0.2$), favoring a local origin rather than a purely global anisotropy.

If confirmed, this anomaly could have important implications for local H_0 determinations and the Hubble tension. I will conclude by highlighting the strong discovery potential of upcoming surveys (Euclid, LSST, DESI, 4MOST) for precision tests of cosmic isotropy with galaxy clusters.

Other topic / keywords:

Cosmic dipole, anisotropy, bulk flows

Author: MIGKAS, Konstantinos (Leiden University)

Presenter: MIGKAS, Konstantinos (Leiden University)

Track Classification: Large-Scale Structure; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (We need a dipoles talk and this looks good, with results from recent data.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0** (This always comes down to a heated discussion of statistical significance, look-elsewhere effect, etc. But happy to have this discussion in the LSS session!)

Abstract rating 4

Submitted by **MIGKAS, Konstantinos** <kmigkas@gmail.com> on **Monday, 13 April 2026**

Abstract ID : 30

Spectral decomposition in stochastic inflation

Content

Stochastic inflation allows the study of large inflationary fluctuations, casting their evolution into the form of a Fokker-Planck equation. I discuss solving this equation using the spectral decomposition method, a technique underutilized in modern stochastic inflation studies. The method gives easy access to the late-time distributions of the inflaton field and its first-passage times through the eigenvalues and eigenfunctions of the Fokker-Planck operator. The lowest eigenvalues control the late-time and diffusion-dominated regimes associated with tunneling and eternal inflation; higher eigenvalues are needed to describe classical motion. I demonstrate this in the case of constant-roll inflation in a hilltop potential, relevant for primordial black hole models. I compare the stochastic computation with the classical ΔN formalism, illustrating, in particular, the difficulties that arise from trajectories that pass 'beyond the hilltop,' into the diffusion-dominated regime.

Other topic / keywords:

Author: TOMBERG, Eemeli (UCLouvain)

Presenter: TOMBERG, Eemeli (UCLouvain)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept • 4.0**

Abstract rating 4

Submitted by **TOMBERG, Eemeli** <eemeli.tomberg@uclouvain.be> on **Monday, 13 April 2026**

Abstract ID : 31

Interpretable machine learning for dynamical dark energy models

Content

Recent cosmological observations suggest possible deviations from a cosmological constant, pointing toward a dynamical nature of dark energy. Quintessence models, which assume a slowly rolling scalar field, provide a compelling theoretical framework to explain this late time evolution in the dark energy equation of state. However, identifying the correct form of the quintessence potential remains a major challenge, due to both theoretical constraints and the vast landscape of functional possibilities. In my work, I explore the use of symbolic regression, an interpretable machine learning technique, to discover viable quintessence potentials directly from observational data. By searching over analytical expressions rather than fitting predefined forms, symbolic regression offers a data-driven approach to model selection that retains physical interpretability.

Other topic / keywords:

Author: BORGHETTO, Giulia (University of Swansea)

Presenter: BORGHETTO, Giulia (University of Swansea)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GLAVAN, Dražen: **Accept: Talk • 2.0**

Abstract rating 2

GARCIA-GARCIA, Carlos: **Accept: Talk • 2.0**

Abstract rating 2

Submitted by **BORGHETTO, Giulia** <giulia.borghetto@gmail.com> on **Tuesday, 14 April 2026**

Abstract ID : 32

Simulation-based Inference for cluster cosmology

Content

Galaxy clusters provide a powerful probe of the growth of cosmic structure and the amplitude of matter fluctuations. We present a cosmological analysis of XMM-XXL galaxy clusters using Hyper Suprime-Cam (HSC) weak-lensing data within a simulation-based inference (SBI) framework. We jointly model the cluster redshift distribution, stacked weak-lensing profiles, and X-ray temperature and luminosity distributions to simultaneously constrain cosmological parameters and cluster observable–mass scaling relations. This unified forward-modeling approach enables self-consistent mass calibration while accounting for the survey selection function.

Our analysis yields robust constraints on cosmological parameters, in particular Ω_m and σ_8 , while marginalizing over key systematic uncertainties. This work demonstrates that joint cluster abundance and weak-lensing analyses within an SBI framework provide a competitive approach for precision cosmology. The methodology is readily extendable to multi-wavelength datasets and future surveys, offering a robust path toward improved constraints on structure growth and cosmology.

Other topic / keywords:

Weak Lensing, Cluster Cosmology

Author: TAM, Sut Ieng (Institute of Physics, National Yang Ming Chiao Tung University)

Presenter: TAM, Sut Ieng (Institute of Physics, National Yang Ming Chiao Tung University)

Track Classification: Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 3.0** (Typical case of analyzing data differently, but not better.)

Abstract rating 3

Submitted by **TAM, Sut Ieng** <sitam@nycu.edu.tw> on **Tuesday, 14 April 2026**

Abstract ID : 33

Redshift space galaxy bispectrum multipoles as probes of neutrino mass and modified gravity

Content

Beyond two-point statistics, the galaxy bispectrum provides a sensitive probe of non-linear gravitational dynamics, redshift-space anisotropies, and physics beyond Λ CDM. We study redshift-space galaxy bispectrum multipoles as a probe of massive neutrinos and modified gravity, focusing on the Hu–Sawicki $f(R)$ model. Using a spherical-harmonic decomposition of the bispectrum, we capture the full angular dependence induced by redshift-space distortions. We develop a perturbative framework incorporating neutrino-induced scale-dependent growth, modified second-order kernels, chameleon screening, tracer bias, Fingers-of-God damping, and shot noise. Both massive neutrinos and $f(R)$ gravity imprint characteristic, configuration-dependent signatures, with the strongest effects arising in stretched and squeezed triangle configurations. For a total neutrino mass of 0.12 eV, deviations reach the percent level, while $f(R)$ gravity produces 2–8% deviations for $fR_0 = 10^{-5}$ on intermediate scales. Forecasts for a Euclid-like survey show that the monopole and quadrupole multipoles dominate the signal, yielding signal-to-noise ratios of approximately 5 for neutrino effects and up to about 30 for modified gravity. Higher-order multipoles provide weaker but important information, highlighting the potential of the bispectrum as a complementary probe of new physics beyond Λ CDM.

Other topic / keywords:

Author: PAL, Sourav (Indian Statistical Institute, Kolkata)

Presenter: PAL, Sourav (Indian Statistical Institute, Kolkata)

Track Classification: Large-Scale Structure; Dark Energy / Modified Gravity; Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Not sure about this one. Quite specific and neglecting systematics!?)

Abstract rating 3

KUIJKEN, Koen: **Accept • 2.0** (bispectrum - not clear on which scales this is. Could be a poster)

Abstract rating 2

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

Neutrinos:

Judgments: Positive

Reviews:

GERBINO, Martina: **Accept • 2.0** (We believe this abstract fits better in the LSS track; the score reflects this comment rather than the abstract content)

Abstract rating 2

Submitted by **PAL, Sourav** <soupal1729@gmail.com> on **Tuesday, 14 April 2026**

Abstract ID : 34

Higgs mass and wino dark matter in Starobinsky supergravity coupled to the MSSM

Content

A framework connecting Cosmic Microwave Background (CMB) observables with high-energy particle phenomenology is proposed, which is based on Starobinsky supergravity coupled to the Minimal Supersymmetric Standard Model (MSSM). In this approach, the amplitude of primordial perturbations during inflation fixes the vacuum expectation values (VEVs) of scalar fields in the hidden sector arising from the Starobinsky supergravity rewritten to Einstein frame. These VEVs trigger spontaneous supersymmetry breaking and set the soft masses in the MSSM. The three-loop renormalization group (RG) running is performed between the inflationary scale of $\mathcal{O}(10^{13})$ GeV and the electroweak scale of $\mathcal{O}(10^2)$ GeV. The RG evolution demonstrates consistency with the measured Higgs mass and current particle data. The framework is highly constrained and, in its simplest version, has no free parameters. Our approach allows wino of mass ≈ 3 TeV as the lightest supersymmetric particle (LSP). This wino LSP is a viable thermal dark matter candidate that can be decisively probed at future colliders via its characteristic disappearing track signature.

Other topic / keywords:

Author: FROLOVSKY, Daniel (Institute for Theoretical Physics, Utrecht University,)

Presenter: FROLOVSKY, Daniel (Institute for Theoretical Physics, Utrecht University,)

Track Classification: Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **FROLOVSKY, Daniel** <frolovskydaniel@gmail.com> on **Tuesday, 14 April 2026**

Abstract ID : 35

Beyond the Bounce: Dawn and Twilight of Metastable Decay

Content

Metastable decay underlies a wide range of phenomena in cosmology, from false-vacuum decay to first-order phase transitions, yet its real-time dynamics remain less understood than its Euclidean description. In this work (arXiv:2512.14809), we develop a real-time, flux-based formulation of decay that complements the Coleman–Callan bounce approach. By analyzing the spectral structure of the time-evolution kernel in one-dimensional resonance models, we show that decay universally proceeds through three regimes: an early-time transient, an intermediate exponential stage governed by isolated resonant poles, and a late-time power-law tail arising from the continuum. Within this framework, we introduce two physically meaningful and analytically computable time scales: the dawn time, marking the onset of exponential decay and sensitive to the initial state, and the twilight time, characterizing the transition to the universal late-time tail and largely independent of initial conditions. The latter is obtained in closed form using the Lambert W function, making its parametric dependence explicit. In solvable models, including square and Pöschl–Teller potentials, we recover simple thick-barrier formulas and clarify the relation $\Gamma T = T_{\text{trans}}$ between the decay rate Γ , oscillation period T , and transmission probability T_{trans} , providing an interpretation of the semiclassical tunneling picture. These results point to a universal pole–branch structure of decay and suggest direct extensions to metastable processes in quantum field theory and early-universe cosmology.

Other topic / keywords:

Cosmological Phase Transitions

Authors: FENG, Tinglong (Utrecht University); MOES, Jesse; PROKOPEC, Tomislav (Utrecht University)

Presenter: FENG, Tinglong (Utrecht University)

Track Classification: Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: WITHDRAWN

Submitted by **FENG, Tinglong** <t.feng@students.uu.nl> on **Tuesday, 14 April 2026**

Abstract ID : 36

Non-Abelian Domain walls: oreo and CP violation

Content

One of the most popular candidates for fermion flavour unification is the discrete flavour symmetry, including A_4 , S_4 , A_5 , etc. The spontaneous breaking of discrete flavour symmetries can lead to the formation of domain walls, a kind of topological defect that can form during the phase transition in the early universe. We study this phenomenon in the scenarios of real and complex A_4 symmetric scalar theories and discover new kinds of domain walls, which we denote as “oreo”-type composite domain walls and CP-violating domain walls.

Other topic / keywords:

Author: FU, Bowen (Northeastern University, China)

Presenter: FU, Bowen (Northeastern University, China)

Track Classification: Early Universe; Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive

Reviews:

GERBINO, Martina: **Accept • 2.0** (We believe this abstract fits better in the Early Universe track; the score reflects this comment rather than the abstract content)

Abstract rating 2

Submitted by **FU, Bowen** <fubowen@neu.edu.cn> on **Wednesday, 15 April 2026**

Abstract ID : 37

Cosmological Perturbations Induced by Ultralight Scalar Dark Matter: A Quantum Field Theoretic Perspective

Content

The growth of primordial perturbations during the matter-dominated era is primarily driven by dark matter. Ultralight scalar fields (ULDM) are a promising candidate for this role, conventionally modeled as operating in a classical, high-occupation regime. In this work, we develop a first-principles field-theoretic framework to investigate the impact of ULDM on linear cosmological perturbations during matter domination, explicitly retaining its quantum nature. Deriving a closed equation for the graviton field dynamics, we compute and regularize its source terms for a generic Gaussian initial state of the ULDM field within the adiabatic (WKB) approximation, employing the middle-point working assumption for non-local terms. After gauge-fixing we find that, contrary to previous claims, the classical condensate of ULDM has no influence on gravitational wave propagation. However, the time-dependent graviton effective mass induced by the squeezed quantum state can drive parametric resonance in specific primordial gravitational wave modes. We demonstrate this growth is negligible for non-relativistic ULDM at matter-radiation equality under the assumption of a power-law squeezing spectrum, for masses in the range $m \sim 10^{-21} - 10^{-24}$ eV.

Other topic / keywords:

Authors: PROKOPEC, Tomislav (Utrecht University); VECCHIONI, Marco (Utrecht University)

Presenter: VECCHIONI, Marco (Utrecht University)

Track Classification: Large-Scale Structure; Dark Matter; Gravitational Waves

Contribution Type: Talk

Comments:

The proposed talk is based on the results of a paper in collaboration with T. Prokopec, to appear in May 2026.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 2.0** (seems too far removed from LSS. Might be suited to another track though.)

Abstract rating 2

HILDEBRANDT, Hendrik: **Accept • 1.0** (Not sure this is relevant enough.)

Abstract rating 1

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Ameet: **Accept: Talk • 5.0**

Abstract rating 5

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **VECCHIONI, Marco** <mrcvecchioni97@gmail.com> on **Wednesday, 15 April 2026**

Abstract ID : 38

Bounds on Goldstone Dispersion Relations

Content

Using the analyticity properties of retarded Green's functions, we show that the Goldstone dispersion relations can be written in terms of 'typically-real functions': a well-known class of functions in Geometric Function Theory. This identification yields optimal two-sided bounds on Wilson coefficients of higher-derivative operators as explicit functions of the sound speed c_s . We test these bounds against the $U(1)$ superfluid as a controlled UV completion, finding agreement across the physical range of c_s and particularly in the relativistic limit $c_s \rightarrow 1$ regime. Our framework can be applied directly to the EFT of inflation and dark energy, constraining higher-derivative operators in terms of sound speed in both settings.

Other topic / keywords:

Authors: CREMINELLI, Paolo (Scuola Normale Superiore (SNS)); MCBLAIN, Warin Patrick (SISSA)

Presenter: MCBLAIN, Warin Patrick (SISSA)

Track Classification: Dark Energy / Modified Gravity; Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept • 4.0**

Abstract rating 4

COLE, Philippa: **Accept • 4.0** (better for dark energy)

Abstract rating 4

Submitted by **MCBLAIN, Warin Patrick** <wmcblain@sissa.it> on **Wednesday, 15 April 2026**

Abstract ID : 39

Gravitational-Wave Propagation Through the Axiverse

Content

In this talk I will discuss how oscillating ultralight scalar and pseudoscalar fields affect the propagation of gravitational waves (GWs). I will consider two couplings of the (pseudo)scalars to gravity; a parity-even Gauss-Bonnet coupling, and parity-odd Chern-Simons coupling, and show that these fields induce distinctive signatures at both the population and individual GW event levels. These effects are controlled by the (pseudo)scalar mass and are characterized by oscillatory features in the redshift distribution of observed GW parameters and the waveform itself. Finally, I will discuss how these features can be probed in both the ground-based, and space-based detector regimes, providing a new window into gravitationally coupled ultralight fields.

Other topic / keywords:

Author: JENKS, Leah (Johns Hopkins University)

Presenter: JENKS, Leah (Johns Hopkins University)

Track Classification: Dark Matter; Dark Energy / Modified Gravity; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

MALHOTRA, Aameek: **Accept: Talk • 5.0**

Abstract rating 5

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GLAVAN, Dražen: **Accept: Talk • 4.0**

Abstract rating 4

GARCIA-GARCIA, Carlos: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **JENKS, Leah** <ljenks3@jh.edu> on **Wednesday, 15 April 2026**

Abstract ID : 40

Gravity's Gift: Baryons from the Big Bang

Content

This talk is based on a recent paper in which my collaborators and I have explored how the cosmological excess of matter over antimatter can arise through the phenomenon of cosmological gravitational particle production at the end of inflation in a Type-I Seesaw model of nonthermal leptogenesis. From a model-building standpoint, this scenario is appealing for being minimal and economical, since some amount of gravitational production is unavoidable. From the phenomenological perspective, this scenario links the observed baryon asymmetry to the energy scale of inflation and the amplitude of inflationary gravitational waves. A non-detection of r in measurements of CMB polarization would rule out this model.

Other topic / keywords:

Author: LONG, Andrew (Rice University)

Presenter: LONG, Andrew (Rice University)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Talk • 4.0** (Perhaps this suits better in the Early Universe session)

Abstract rating 4

COLE, Philippa: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **LONG, Andrew** <andrewjlong@rice.edu> on **Wednesday, 15 April 2026**

Abstract ID : 41

Non-perturbative aspects of fermion reheating

Content

The transition from the inflationary phase to a radiation-dominated universe is typically a complex problem. The post-inflationary coherent oscillations of the inflaton field can drive the resonant growth of bosonic field fluctuations, including those of the inflaton itself, leading to backreaction and non-linear effects, and the eventual fragmentation of the homogeneous inflaton. These dynamics, however, often fail to exhaust the inflaton energy density, with the conventional solution invoking a perturbative decay channel into fermions to ensure complete reheating. In this talk we re-examine this assumption, demonstrating that the coupling to fermions is not a guaranteed pathway to thermalization when Pauli-blocking effects are fully accounted beyond the Boltzmann approximation. In particular, for non-quadratic inflaton potentials, the path to a fully reheated universe is more constrained than previously assumed, necessitating a more nuanced treatment of the final phase of reheating.

Other topic / keywords:

Author: GARCÍA GARCÍA, Marcos Alejandro (Instituto de Física, UNAM)

Presenter: GARCÍA GARCÍA, Marcos Alejandro (Instituto de Física, UNAM)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept • 4.0**

Abstract rating 4

Submitted by **GARCÍA GARCÍA, Marcos Alejandro** <marcos.garcia@fisica.unam.mx> on
Wednesday, 15 April 2026

Abstract ID : 42

Time-reversed Stochastic Inflation

Content

Cosmic inflation may exhibit stochastic periods during which quantum fluctuations dominate over the semi-classical evolution. Extracting observables in these regimes is a notoriously difficult program as quantum randomness makes them fully probabilistic.

We propose a new way of framing Stochastic Inflation by enforcing the point of view of a local observer for which inflation has ended i.e. among all possible quantum histories, it only selects the ones which are relevant for Cosmology.

Formally, it amounts to redefine the usual stochastic- δN formalism by a time-reversed version where curvature fluctuations are computed over all stochastic realisations producing the same lifetime, for all lifetimes (including the infinite limit).

As illustrative examples, I will show that for a flat semi-infinite potential, the time-reversed approach cures the divergences obtained in the conventional “forward” approach: the curvature probability distribution is finite with heavy tails. When adding a constant drift, we obtain exponential tails, which, in the classical-like limit of very large drift, become Gaussian, a feature which is not present in the “forward” approach. Eventually, for a flat bounded potential, the tail behaviour matches the “forward” picture up to a factor 2 in the decay which may have consequences on Primordial Black Hole abundances.

All these discrepancies end up being related to the very definition of the background which is ambiguous when a genuine classical trajectory does not exist.

Based on JCAP 11 (2025) 032, ArXiv:2511.21388 and forthcoming article

Other topic / keywords:

Author: BLACHIER, Baptiste (UCLouvain (CURL) and LPENS)

Co-author: RINGEVAL, Christophe

Presenter: BLACHIER, Baptiste (UCLouvain (CURL) and LPENS)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **BLACHIER, Baptiste** <baptiste.blachier@uclouvain.be> on **Thursday, 16 April 2026**

Abstract ID : 43

Test

Content

This is a test abstract. LSS is the best topic

This is Ana trying to edit your abstract and your chosen track (seems to be working)

Other topic / keywords:

Author: SCHALLER, Matthieu (Lorentz Institute & Leiden Observatory)

Presenter: SCHALLER, Matthieu (Lorentz Institute & Leiden Observatory)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: WITHDRAWN

Submitted by **SCHALLER, Matthieu** <mschaller@lorentz.leidenuniv.nl> on **Thursday, 16 April 2026**

Abstract ID : 44

New tools for cosmology by Extended Theories of Electro-Magnetism (ETEM)

Content

Compatible with General Relativity (GR), the dark Universe lacks experimental confirmation and support by the Standard Model (SM). Opposing darkness, extensions of GR face the successes of GR. But photons, main messengers, are still read with the XIX Maxwell theory, although Quantum Electro-Dynamics (QED) requires non-linear corrections, e.g., photon-photon. Extended Theories of Electro-Magnetism (ETEM) induce a reinterpretation of the observations. In presence of a background, the SM Extension (SME) or Non-Linear Electro-Magnetism dress the photon, the only SM free massless particle, with an effective mass [1-3], compatible with the upper limits from Fast Radio Bursts [4-6] and solar wind [7,8]. Birefringence, dispersion, second-order QED are tested or searched ETEM effects at, e.g., BMV Toulouse, ATLAS CERN, DeLLight Paris. All photons either massive - ab initio as in the de Broglie-Proca theory or through the SME or the Born-Infeld, Heisenberg-Euler non-linear type of theories - undergo a frequency shift in presence of an electromagnetic and/or a Lorentz Symmetry Violation background [9,10]. This small additional shift, towards the red or the blue, added to the expansion redshift, determines new cosmological scenarios, e.g., without dark energy and matter [11-14]. Interferometry guarantees testing perspectives [15,16] below 3×10^{-18} in $\Delta v/v$ per metre for an Earth-Moon-like optical length. We aim to determine a dissipative effect free from blurring due to the interaction of the photon energy with the curvature produced by an electromagnetic or gravitational field [17-20]. Finally, we implement the Heisenberg principle at cosmological instances, where the Hubble tension appears as quantum measurement limit [21,22].

References

- [1] Bonetti L., dos Santos Filho L.R., Helayël-Neto J.A., Spallicci A.D.A.M., Phys. Lett. B, 764, 203 (2017)
- [2] Bonetti L., dos Santos Filho L.R., Helayël-Neto J.A., Spallicci A.D.A.M., Eur. Phys. J. C, 78, 811 (2018)
- [3] Dib A., Helayël-Neto J.A., Spallicci A.D.A.M., Eur. Phys. J. C, 86, 3 (2026)
- [4] Bonetti L., Ellis J., Mavromatos N.E., Sakharov A.S., Sarkisyan-Grinbaum E.K.G., Spallicci A.D.A.M., Phys. Lett. B, 757, 548 (2016)
- [5] Bonetti L., Ellis J., Mavromatos N.E., Sakharov A.S., Sarkisyan-Grinbaum E.K.G., Spallicci A.D.A.M., Phys. Lett. B, 768, 326 (2017)
- [6] Bentum M.J., Bonetti L., Spallicci A.D.A.M., Adv. Space Res., 59, 736 (2017)
- [7] Retinò A., Spallicci A.D.A.M., Vaivads A., Astropart. Phys., 82, 49 (2016)
- [8] Spallicci A.D.A.M., Sarracino G., Randriamboarison O., Helayël-Neto J.A., Dib A., Eur. Phys. J. Plus, 139, 551 (2024)
- [9] Helayël-Neto J.A., Spallicci A.D.A.M., Eur. Phys. J. C, 79, 590 (2019)
- [10] Spallicci A.D.A.M., Dib A., Helayël-Neto J.A., Phys. Lett. B, 885, 138873 (2024).
- [11] Spallicci A.D.A.M., Helayël-Neto J.A., López-Corredoira M., Capozziello S., Eur. Phys. J. C, 81, 4 (2021)
- [12] Spallicci A.D.A.M., Sarracino G., Capozziello S., Eur. Phys. J. Plus, 137, 253 (2022)
- [13] Sarracino G., Spallicci A.D.A.M., Capozziello S., Eur. Phys. J. Plus, 137, 1386 (2022)
- [14] Dib A., Djeghloul N., Spallicci A.D.A.M., submitted
- [15] Abend S. et al., AVS Quantum Sci., 6, 024701 (2024)
- [16] Abdalla A. et al., Eur. Phys. J. Quantum Techn., 12, 42 (2025)
- [17] Blanchet L., Spallicci A., Whiting B., Mass and motion in general relativity, Fundamental The-

ory of Physics 162 (Springer, 2011)

[18] Spallicci A.D.A.M., Ritter P., Aoudia S., Int. J. Geom. Meth. Mod. Phys., 11, 1450072 (2014)

[19] Ritter P., Aoudia S., Spallicci A.D.A.M., Cordier S., Int. J. Geom. Meth. Mod. Phys., 13, 1650019 (2016)

[20] Dib A., Garnier A., Spallicci A.D.A.M., to appear in Int. J. Geom. Meth. Mod. Phys. 10.1142/S0219887825502780 (2026)

[21] Capozziello S., Benetti M., Spallicci A.D.A.M., Found. Phys. 50, 893 (2020)

[22] Spallicci A.D.A.M., Benetti M., Capozziello S., Found. Phys. 52, 23 (2022)

Other topic / keywords:

Author: SPALLICCI, Alessandro (Université d'Orléans - CNRS)

Presenter: SPALLICCI, Alessandro (Université d'Orléans - CNRS)

Track Classification: Dark Matter; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **SPALLICCI, Alessandro** <spallicci@cnrs-orleans.fr> on **Thursday, 16 April 2026**

Abstract ID : 45

Spectral Signatures of Multi-Mediator Astrophysical Neutrino Self-Interactions at Ultra-High Energies

Content

We discuss the effect of multiple mediators influencing the scattering of astrophysical neutrinos at the ultra-high energies —100 TeV and beyond—against relic neutrinos from the Cosmic neutrino background, demonstrating unique features in the resulting spectral shape as detected at neutrino telescopes like IceCube. We specifically discuss the effect of superposition of scattering amplitudes involving interactions mediated by bosons of close but distinct masses and the importance of considering off-resonant T/U channel scattering in scenarios like these, in addition to the resonant S channels. As an example, we consider the case of $L_\mu - L_\tau$ symmetry in a KK extra-dimensional scenario, leading to the existence of a tower of multiple vector bosons capable of mediating such neutrino self interactions. We show that in this specific case, the features in the flux spectrum, especially at the higher energies of the astrophysical neutrino spectrum, would be clearly distinctive from that expected in standard model scenarios.

Other topic / keywords:

Author: KAUSHIK, Ayushi (SHIV NADAR UNIVERSITY, GREATER NOIDA)

Co-authors: Dr BHATTACHARYA, Atri (SHIV NADAR INSTITUTION OF EMINECE DEEMED TO BE UNIVERSITY, GREATER NOIDA, INDIA); NISHIWAKI, Kenji (Shiv Nadar Institute of Eminence)

Presenter: KAUSHIK, Ayushi (SHIV NADAR UNIVERSITY, GREATER NOIDA)

Track Classification: Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive: Talk

Reviews:

GERBINO, Martina: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **KAUSHIK, Ayushi** <ak356@snu.edu.in> on **Thursday, 16 April 2026**

Abstract ID : 46

Spectral Signatures of Multi-Mediator Astrophysical Neutrino Self-Interactions at Ultra-High Energies.

Content

We discuss the effect of multiple mediators influencing the scattering of astrophysical neutrinos at the ultra-high energies —100 TeV and beyond —against relic neutrinos from the Cosmic neutrino background, demonstrating unique features in the resulting spectral shape as detected at neutrino telescopes like IceCube. We specifically discuss the effect of superposition of scattering amplitudes involving interactions mediated by bosons of close but distinct masses and the importance of considering off-resonant T/U channel scattering in scenarios like these, in addition to the resonant S channels. As an example, we consider the case of $L_\mu - L_\tau$ symmetry in a KK extra-dimensional scenario, leading to the existence of a tower of multiple vector bosons capable of mediating such neutrino self interactions. We show that in this specific case, the features in the flux spectrum, especially at the higher energies of the astrophysical neutrino spectrum, would be clearly distinctive from that expected in standard model scenarios.

Other topic / keywords:

Author: KAUSHIK, Ayushi (SHIV NADAR UNIVERSITY, GREATER NOIDA)

Co-authors: Dr BHATTACHARYA, Atri (SHIV NADAR INSTITUTION OF EMINECE DEEMED TO BE UNIVERSITY, GREATER NOIDA, INDIA); NISHIWAKI, Kenji (Shiv Nadar Institute of Eminence)

Presenter: KAUSHIK, Ayushi (SHIV NADAR UNIVERSITY, GREATER NOIDA)

Track Classification: Neutrinos

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive: Talk

Reviews:

GERBINO, Martina: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **KAUSHIK, Ayushi** <ak356@snu.edu.in> on **Thursday, 16 April 2026**

Abstract ID : 47

Cosmological tensions between CMB, BAO and SN

Content

I will discuss tensions between CMB, BAO, SN distance measures and possible resolutions with optical depth, early dark energy, and axions.

Other topic / keywords:

Author: HU, Wayne

Presenter: HU, Wayne

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Dark Energy / Modified Gravity; Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Abstract is obviously not very informative, but I'm sure he will give an inspiring, insightful talk.)

Abstract rating 5

KUIJKEN, Koen: **Accept • 5.0** (exactly)

Abstract rating 5

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GLAVAN, Dražen: **Accept: Talk • 5.0**

Abstract rating 5

GARCIA-GARCIA, Carlos: **Accept: Talk • 5.0**

Abstract rating 5

Neutrinos:

Judgments: Positive: Talk

Reviews:

GERBINO, Martina: **Accept: Talk • 4.0** (Agree with Will's comment. Hard to define the best track. We do have room in the Neutrino track to accommodate it, and happy to accept it as a talk here)

Abstract rating 4

Submitted by **HU, Wayne** <whu@background.uchicago.edu> on **Thursday, 16 April 2026**

Abstract ID : 48

Coherent and incoherent dark matter: A unified two-fluid approach

Content

We present from the Schwinger-Keldysh path integral formalism, equations for bosonic, non-relativistic and self-interacting dark matter. The equations can describe a two-fluid system composed of a coherent and an incoherent mixture, encompassing both CDM and Fuzzy Dark Matter in a unified way. The model incorporates new terms, such as the Lee-Huang-Yang correction, known in Cold Atom Physics, and we show that the interplay between these two fluids has significant effects on the current observational bounds for Fuzzy Dark Matter and structure formation.

Other topic / keywords:

Fuzzy Dark Matter, Lee-Huang-Yang

Authors: Prof. PROUKAKIS, Nikolaos (Newcastle University); Dr RIGOPOULOS, Gerasimos (Newcastle University); SOTO, Alex (Institute of Physics, Polish Academy of Science)

Presenter: SOTO, Alex (Institute of Physics, Polish Academy of Science)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **SOTO, Alex** <arsoto@ifpan.edu.pl> on **Friday, 17 April 2026**

Abstract ID : 51

Probing the Epoch of Reionization by reconstructing the velocity contribution to the patchy kSZ signal from 21-cm maps

Content

Distinguishing between different reionisation histories requires observables that are sensitive to the timing and morphology of the Epoch of Reionization (EoR). We present a method to reconstruct redshift-dependent line-of-sight velocity fields from the 21-cm signal and use them to construct patchy kinematic Sunyaev–Zel’dovich (kSZ) maps that can be cross-correlated with the observed kSZ signal. Unlike approaches that square the kSZ field to remove velocity sign cancellations, our method preserves directional phase information, enabling a first-order cross-correlation. As reionization progresses, this cross-correlation changes sign when ionisation fluctuations begin to dominate the 21-cm signal. The evolution of the cross-correlator at $\ell = 3000$ distinguishes between different EoR models. This proof-of-concept study demonstrates that 21-cm based kSZ reconstruction provides a promising avenue for probing the timing and duration of the EoR.

Other topic / keywords:

21-cm, kSZ, Epoch of Reionization

Author: BOTTEMA, Jelte (Rijksuniversiteit Groningen & Stellenbosch University)

Co-authors: GHARA, Raghunath; MA, Yin-Zhe (Stellenbosch University, South Africa); MEERBURG, Daan; Prof. ZAROUBI, Saleem (Rijksuniversiteit Groningen & Open University of Israel)

Presenter: BOTTEMA, Jelte (Rijksuniversiteit Groningen & Stellenbosch University)

Track Classification: Cosmic Microwave Background; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **BOTTEMA, Jelte** <jeltebottema98@gmail.com> on **Friday, 17 April 2026**

Abstract ID : 52

Modelling correlated Si III absorption for precision measurements of the matter power spectrum from the Ly α forest

Content

The one-dimensional Ly α forest power spectrum is a powerful cosmological probe of matter density fluctuations in the weakly non-linear regime, providing leading constraints on the matter power spectrum and the nature of dark matter at small scales. A key astrophysical systematic, however, is contamination from correlated metal absorption, especially Si III. Standard treatments usually model the Si III contribution as a simple rescaling of the Ly α signal, but these fail to accurately capture effects on small scales that are increasingly important for present and upcoming precision measurements. We introduce a new analytical fitting function for correlated Si III absorption that is accurate, physically motivated, and readily implementable in Ly α forest analysis pipelines. The model captures physical effects neglected in earlier studies, including the distinct Ly α and Si III line profiles and a scale-dependent suppression of the Ly α -Si III cross-correlation. It is motivated and tested using the Sherwood-Relics hydrodynamical simulation suite over $2.2 < z <= 5.0$ and $k < 0.2 \text{ s km}^{-1}$. Our results show that improved modelling of correlated Si III absorption will be essential for extracting robust cosmological information from current datasets such as DESI and from future high-precision Ly α forest surveys.

Other topic / keywords:

Author: MA, Ke (University of Nottingham)

Co-authors: Prof. BOLTON, James (University of Nottingham); Dr GAIKWAD, Prakash (Indian Institute of Technology Indore); Dr IRŠIČ, Vid (University of Hertfordshire); Dr PUCHWEIN, Ewald (Leibniz Institute for Astrophysics Potsdam)

Presenter: MA, Ke (University of Nottingham)

Track Classification: Large-Scale Structure; Dark Matter; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (Good topic, interesting new results.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0** (Quite technical but seems relevant for stage-IV Ly α surveys.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 4.0** (Can imagine large audience.)

Abstract rating 4

Submitted by **MA, Ke** <ke.ma@nottingham.ac.uk> on **Friday, 17 April 2026**

Abstract ID : 53

Axion perturbation growth at low-temperature reheating

Content

We study the evolution of axion cold dark matter overdensities in low-temperature reheating cosmologies, focusing on the interplay between the temperature-dependent axion mass and the radiation background. We show that modes entering the horizon prior to both reheating and the onset of oscillations experience a significant enhancement driven by their coupling to radiation perturbations. This enhancement is maximized when the temperature at which the axion mass becomes constant, T_Λ , lies slightly above the reheating temperature, allowing for efficient growth while avoiding the suppression effects of curvature and radiation perturbations near reheating. We discuss the implications for the formation of small-scale structure such as axion miniclusters.

Other topic / keywords:

Author: ARIAS, Paola (Universidad Federico Santa María)

Co-authors: BERNAL, Nicolás (New York University Abu Dhabi); REDONDO, Javier (Universidad de Zaragoza)

Presenter: ARIAS, Paola (Universidad Federico Santa María)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **ARIAS, Paola** <paola.arias@usm.cl> on **Saturday, 18 April 2026**

Abstract ID : 54

Constraining decaying dark matter with weak lensing higher-order statistics

Content

Stage IV weak lensing (WL) surveys will probe highly non-linear scales with unmatched precision, providing valuable data for improving cosmological parameter estimates. To accurately extract non-Gaussian information from these data, higher-order statistics were developed. However, their constraining power remains to be tested. We examine the extent to which the scattering transform and Minkowski functionals can improve the sensitivity of WL surveys to the dark matter decay rate relative to the traditional two-point statistics. Using FLAMINGO mock WL convergence maps in five tomographic bins, we evaluate Euclid's constraining power in the presence of baryonic feedback and galaxy shape noise.

Other topic / keywords:

Author: MARINICHENKO, Mariia (Leiden University)

Presenter: MARINICHENKO, Mariia (Leiden University)

Track Classification: Dark Matter; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 4.0** (Scattering trafo systematics, aims at enabling non-Gaussianity inference at stage-IV precision (hard!))

Abstract rating 4

Submitted by **MARINICHENKO, Mariia** <marinichenko.m@gmail.com> on **Saturday, 18 April 2026**

Abstract ID : 55

Beyond CPL: Testing Dynamical Dark Energy with Extended Three-Parameter Models

Content

We introduce two three-parameter extensions of the minimal Akhtar–Hossain (mAH) dark energy parametrization, termed modified minimal AH (MmAH1 and MmAH2), which provide a smooth and bounded evolution of the dark energy equation of state while retaining Λ CDM as a limiting case. Using a joint analysis of the CMB compressed likelihood, DESI DR2 BAO, $H(z)$, redshift space distortions, and three SNeIa samples (PantheonPlus, Union3, and DESY5), we compare these models with Λ CDM, w CDM, mAH, CPL, and the three-parameter CPL- w_b extension. The standard cosmological parameters remain stable across all models, while CPL, MmAH1 and MmAH2 parametrizations yield modest but consistent improvements in fit ($\Delta\chi^2 \simeq -6$ to -12 for PantheonPlus and Union3, and $\simeq -38$ for DESY5). Statistical consistency with Λ CDM, quantified via the Mahalanobis distance in one, two, and three dimensional parameter subspaces, reveals mild to moderate deviations, ~ 2 – 2.5σ for +PantheonPlus, 2 – 3σ for +Union3, and up to 4 – 5σ for +DESY5 combination, depending on model complexity. Among all extensions CPL, MmAH1 and MmAH2 provide the most stable and physically coherent representations of dynamical dark energy, maintaining moderate tensions with Λ CDM and well behaved parameter correlations. Overall, these results indicate consistent evidence for departures from Λ CDM.

Other topic / keywords:

Author: ALAM, Sonej (Jamia Millia Islamia, New Delhi)

Presenter: ALAM, Sonej (Jamia Millia Islamia, New Delhi)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GLAVAN, Dražen: **Accept: Poster • 1.0**

Abstract rating 1

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **ALAM, Sonej** <sonejalam36@gmail.com> on **Saturday, 18 April 2026**

Abstract ID : 56

Bouncing Cosmologies in Modified Gravity with Spacetime Torsion

Content

We explore the possibility of realizing a non-singular bounce in the early universe within the framework of modified gravity with spacetime torsion. In Einstein Cartan theory, torsion is embedded in the spacetime by adding an antisymmetric part in affine connection. We consider generalized version of the framework as $f(\bar{R})$, \bar{R} being the scalar of the modified curvature tensor. $f(\bar{R})$ gravity is recast in Einstein frame as non-minimally coupled scalar tensor theory where the scalar field gets coupled with a rank 2 antisymmetric torsion field through derivative couplings. We investigate whether the introduction of three additional torsion-dependent terms in Einstein frame help to realize a bounce. We first explore this cosmological system in the background of a homogeneous and isotropic FRW spacetime but inclusion of the torsion terms are insufficient to produce a bounce in this symmetric setting. Motivated by this limitation, we relax the symmetry and generalize the background to include inhomogeneity and anisotropy. In this setup, the dynamics is modified in such a way that a bouncing solution is possible without invoking phantom fields or energy condition violations. We have found the exact solutions of all the fields and reconstructed the modified gravity form. We have addressed the behaviour of the fields under perturbation and investigated the stability of the solutions. Constraints on the model parameters have also been derived based on cosmological observations.

Other topic / keywords:

Author: ALAM, Sonej (Jamia Millia Islamia, New Delhi)

Presenter: ALAM, Sonej (Jamia Millia Islamia, New Delhi)

Track Classification: Dark Energy / Modified Gravity; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GLAVAN, Dražen: **Accept: Poster • 1.0**

Abstract rating 1

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **ALAM, Sonej** <sonejalam36@gmail.com> on **Saturday, 18 April 2026**

Abstract ID : 57

dS/CFT from Defect

Content

We perform a Wick rotation and analytic continuation from global AdS_{d+1} to static dS_{d+1} , yielding CFT_d generators with a nonstandard adjoint action tied to dS bulk coordinates. To reproduce the real-scalar two-point function, we introduce a global defect operator that twists the inner product. We further show that PT symmetry is spontaneously broken in CFT_2 vacua with a central charge having an imaginary part. Finally, we derive integral identities for bulk and defect correlators, providing a unified framework for computing CFT_d observables in the presence of global and local defects.

Other topic / keywords:

dS/CFT Correspondence; Analytical Continuation; Inner Product; PT Symmetry; Spontaneous Symmetry Breaking

Authors: Prof. HUANG, Xing (Northwest University); Prof. MA, Chen-Te (Great Bay University)

Presenter: Prof. MA, Chen-Te (Great Bay University)

Track Classification: Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Submitted by **MA, Chen-Te** <yefgst@gmail.com> on **Sunday, 19 April 2026**

Abstract ID : 58

Freeze-In Production of Sterile Neutrino Dark Matter in a Low-Scale Seesaw Framework

Content

In this work, we investigate the phenomenological aspects of a feebly interacting sterile neutrino dark matter candidate within a low-scale seesaw framework. The Type-I seesaw model is augmented by a second complex scalar doublet (Φ_ν), which couples exclusively to the heavy right-handed neutrinos and the lepton doublet, thereby generating the neutrino Dirac mass term while the first scalar doublet is responsible for giving mass to the remaining Standard Model particles. The lightest sterile neutrino (N_1) acts as a feebly interacting massive particle (FIMP), produced via decays of W^\pm , Z and extra scalars present in the setup. We point out that W^\pm and Z contributions were overlooked in the previous studies, which actually dominate the N_1 production by a factor of $\sim 10^{13}$ and solely determines the relic abundance. Incorporating them leads to several novel consequences for the DM phenomenology like a new non-thermal condition which leads to smaller Yukawa couplings. We thoroughly discuss about the enhancement possibilities of N_1 's mass which is controlled by the small vacuum expectation value (v_ν) of the second Higgs doublet. After incorporating the latest Lyman- α forest observations, this setup can accommodate both warm and cold dark matter scenarios.

Other topic / keywords:

Author: KHAN, SUHAIL (Centre for Theoretical Physics, Jamia Millia Islamia, New Delhi, India)

Co-author: Mr PANDEY, Kunal (Centre for Theoretical Physics, Jamia Millia Islamia, New Delhi, India)

Presenter: KHAN, SUHAIL (Centre for Theoretical Physics, Jamia Millia Islamia, New Delhi, India)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by KHAN, SUHAIL <su hail@ctp-jamia.res.in> on **Sunday, 19 April 2026**

Abstract ID : 59

The Hubble Tension Can Be Resolved with Threshold Causality and Distance-Ladder Corrections

Content

The Hubble tension persists despite multiple corrections to the SNe Ia standardization chain. These corrections reduce the distance-ladder estimate of H_0 to $\sim 70-71 \text{ km s}^{-1} \text{ Mpc}^{-1}$, but a $2-4 \text{ km s}^{-1} \text{ Mpc}^{-1}$ gap with the CMB (67.4 ± 0.5) remains. Because distance-ladder measurements of H_0 sample galaxies within the KBC void, the local density deficit may resolve the remaining tension. Λ CDM cannot accommodate the observed voids within its Gaussian perturbation framework but three supervoids at $R \geq 200 \text{ Mpc}$ are already documented (KBC, Eridanus, Giant Void). Threshold Causality (TC) is a complete cosmological model with a single calibrated input. In TC, bond percolation at criticality on a random regular graph drives $E_8 \rightarrow SU(3) \times E_6 \rightarrow$ Standard Model symmetry breaking, producing baryonic matter (Mode I). The primordial E_8 field (Mode II) is the vacuum of Mode I; dark energy arises in Mode II from unbound events and small clusters ($s < 9$), and dark matter from quantum-bound clusters ($s \geq 9$). TC derives $H_0 = 67.6 \pm 0.5 \text{ km s}^{-1} \text{ Mpc}^{-1}$ from Ω_b , Ω_{DM} , and the CMB acoustic scale θ_s , with TC's parameter set fitting Planck 2018 binned TT, TE, EE spectra at $\chi^2/\text{dof} \approx 1.2$. The primordial cluster-size distribution $n(s) \sim s^{-\tau}$ with $\tau = 2.51 \pm 0.03$. Density fluctuations are non-Gaussian: $P(\delta > x) \sim x^{-\alpha}$ (Lévy stable, $\alpha = 3/2$). At 300 Mpc, $\sigma \approx 0.018$ in both models; in Λ CDM the KBC void ($\delta = -0.23$) is a 12.8σ fluctuation with $P_{\text{void}} \sim 10^{-37}$. In TC $P_{\text{void}} \sim 10^{-2}$. Inside a KBC void in TC, the density deficit produces local expansion above the cosmic mean and shifts the effective DE fraction upward. The local expansion rate inside a spherical void of depth δ_0 is $H_0(\text{local}) = H_0(\text{global}) \times [1 - f(\Omega_{\text{m,local}})\delta_0/3]$, where $f = \Omega_{\text{m,local}}^{0.55}$ is the linear growth rate. For the KBC void with $\delta_0 = -0.23 \pm 0.04$ and TC's $\Omega_{\text{m,local}} = 0.238$: $H_0(\text{local}) = 70.0 \pm 0.7 \text{ km s}^{-1} \text{ Mpc}^{-1}$, consistent at $< 1\sigma$ with corrected distance-ladder values of $70.0-70.6 \text{ km s}^{-1} \text{ Mpc}^{-1}$. The uncorrected SH0ES distance-ladder value decomposes as: TC global H_0 (67.6) + KBC void enhancement (+2.4) + uncorrected SNe Ia dust/calibration bias (+3.2) = $73.2 \text{ km s}^{-1} \text{ Mpc}^{-1}$, consistent with the reported SH0ES value of 73.5 ± 0.8 at 0.2σ . The corrected distance-ladder value, with dust and calibration systematics removed, is 70.0 ± 0.7 , consistent with TC's local prediction at $< 1\sigma$. TC predicts 27 ± 6 such voids as a consequence of Lévy-stable percolation statistics. The observed count is consistent with TC at $< 1\sigma$. Euclid and Rubin LSST void catalogs will provide a definitive test. The Hubble tension can be resolved by combining distance-ladder corrections with TC's void-enhancement mechanism: $H_0(\text{local}) = 70.0 \pm 0.7$ matches the corrected distance-ladder value at $< 1\sigma$ while $H_0(\text{global}) = 67.6 \pm 0.5$ matches Planck at $< 1\sigma$.

Other topic / keywords:

Hubble tension, dark energy, cosmic voids, percolation, distance ladder, CMB

Author: SMITH, Craig (AmJen Research)

Presenter: SMITH, Craig (AmJen Research)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Negative

Reviews:

GLAVAN, Dražen: **Reject**

Abstract rating 0

GARCIA-GARCIA, Carlos: **Reject** (We couldn't find information about this person and it's the same person as abstract #8)

Abstract rating 0

Submitted by **SMITH, Craig** <smithcr239@gmail.com> on **Sunday, 19 April 2026**

Abstract ID : 60

EFT approach to Dynamical Tides in Neutron star & Dark matter admixed Neutron Star

Content

We apply the point particle EFT approach to a compact star to systematically compute dynamical tidal love numbers for various non-rotating compact objects. We calculate the scattering amplitude in Black Hole Perturbation Theory (BPHT) for arbitrary non-rotating compact stars using the Mano-Suzuki-Takasugi (MST) method with non zero surface reflectivity and match it with that obtained from point particle EFT order by order in the low frequency expansion. This sets up a systematic framework for extracting the static and dynamical tidal love numbers (TLNs) to any order in the multipole expansion. We employ this technique to compute the Next-to-Next-to Leading Order TLN for non-viscous Neutron stars and Neutron stars admixed with Bosonic or Fermionic dark matter.

Other topic / keywords:

Tidal Love numbers, Neutron star, Dark matter admixed neutron star, EFT

Author: MITRA, Soumodeep (University of South Dakota)

Co-authors: Mr JAREQUI, Gregory (University of South Dakota); VAIDYA, varun

Presenter: MITRA, Soumodeep (University of South Dakota)

Track Classification: Dark Matter; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (The author has submitted two abstracts in the GW track. We chose the other talk.)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 4.0** (Author submitted 60 and 61. Us GW conveners prefer 61 for the GW session.)

Abstract rating 4

Submitted by **MITRA, Soumodeep** <soumodeep.mitra@coyotes.usd.edu> on **Sunday, 19 April 2026**

Abstract ID : 61

GW probe of EMRIs in Scalar field Dark matter spike

Content

Scalar field dark matter (SFDM) is an exciting and attractive alternative dark matter model which can successfully alleviate various issues plaguing traditional cold dark matter models. However, detecting SFDM is no easy task, as it may or may not interact with standard model particles at all- making terrestrial experiments moot. On the other hand, dark matter distribution near the galactic center can be significantly increased due to central supermassive black hole producing local overdensity or 'spikes'. Such overdensities affect gravitational wave emission from extreme mass ratio inspirals (EMRIs) around the SMBHs which can be used effectively to probe nature of dark matter. In this work, for the first time we derive the spike around galactic SMBH due to a galactic SFDM halo. We then used the generated spike profiles to quantify the effect of the SFDM spike on an EMRI system using GW observables. We show that not only spike generation drastically alters the detection prospect, GW can put strong constraints on the mass of SFDM.

Other topic / keywords:

Scalar field dark matter, Fuzzy DM, EMRI, GW

Author: MITRA, Soumodeep (University of South Dakota)

Co-authors: CHAKRABORTY, Sumanta; Dr SPEENEY, Nicholas (JHU)

Presenter: MITRA, Soumodeep (University of South Dakota)

Track Classification: Dark Matter; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Aameek: **Accept: Talk • 5.0**

Abstract rating 5

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **MITRA, Soumodeep** <soumodeep.mitra@coyotes.usd.edu> on **Sunday, 19 April 2026**

Abstract ID : 62

Searching for ultralight dark matter from terrestrial magnetic fields

Content

We present a novel search for ultralight dark matter using terrestrial magnetic field measurements at frequencies below 100 Hz, focusing on dark photon dark matter as a representative candidate. Coherently oscillating dark photon dark matter can induce a monochromatic magnetic field via kinetic mixing with ordinary photons. Notably, for dark photon masses around 3×10^{-14} eV, the signal can be resonantly amplified within a cavity formed by the Earth's surface and the ionosphere. We compute the expected signal incorporating the effect of atmospheric conductivity, and derive new upper limits on the kinetic mixing parameter from long-term geomagnetic data. These limits improve upon previous ground-based constraints in the mass range of $1 \times 10^{-15} - 2 \times 10^{-13}$ eV. We would also like to touch on the results of axion dark matter searches based on similar ideas.

Other topic / keywords:

Author: NOMURA, Kimihiro (Kyoto University)

Presenter: NOMURA, Kimihiro (Kyoto University)

Track Classification: Dark Matter

Contribution Type: Talk

Comments:

Based on arXiv:2509.15783

Status: SUBMITTED

Submitted by **NOMURA, Kimihiro** <k.nomura@tap.scphys.kyoto-u.ac.jp> on **Monday, 20 April 2026**

Abstract ID : 63

Numerical simulations of the stochastic formalism

Content

The stochastic formalism can be understood as an effective field theory for IR modes, which incorporates quantum corrections from UV modes at the coarse-graining scale. As the name suggests, the dynamics are described by Langevin equations. In general, the system is non-Markovian, meaning it depends on past history by construction in stochastic inflation.

In this talk, I will present and discuss several approaches to analyzing the system, including the Markovian approximation and full numerical computations that account for non-Markovian effects. In particular, I will consider two examples; the MSSM scenario (full numerical computations show that the flat direction is not saturated, improving upon previous results), and $\lambda \phi^4$ (non-Markovian appears as both short and long term effects)

Other topic / keywords:

Author: KURODA, Tomotaka (IBS-CTPU-CGA/Institute of Science Tokyo)

Co-author: KAWASAKI, Masahiro (The University of Tokyo)

Presenter: KURODA, Tomotaka (IBS-CTPU-CGA/Institute of Science Tokyo)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **KURODA, Tomotaka** <darokukatamoto@gmail.com> on **Monday, 20 April 2026**

Abstract ID : 64

Nanohertz Gravitational Waves from the Baryon-Dark Matter coincidence

Content

The nanohertz gravitational-wave (GW) signal observed by pulsar timing arrays may originate from a cosmological first-order phase transition (FOPT) at temperatures of order 100 MeV. This coincidence raises a fundamental question: why this scale? We show that such a PT naturally arises in scenarios where the baryon asymmetry is generated from a dark asymmetry via resonant neutron-dark matter (DM) oscillations.

We demonstrate that the same PT can produce a GW signal compatible with NANOGrav observations while satisfying all current experimental and cosmological constraints. The framework predicts DM self-interactions close to observational bounds and a reduced maximum mass for neutron stars. It also offers complementary probes through missing-energy searches at the LHC and neutron decay experiments.

Consistency with big-bang nucleosynthesis is ensured by introducing $O(10-100)$ MeV scale heavy neutral leptons, which simultaneously account for neutrino masses and provide additional experimental signatures.

Other topic / keywords:

Authors: MUSUMECI, Alessia (Technical University of Munich); NAVA, Jacopo (Vrije Universiteit Brussels); PASCOLI, Silvia (Universita Di Bologna (IT)); SALA, Filippo

Presenter: NAVA, Jacopo (Vrije Universiteit Brussels)

Track Classification: Dark Matter; Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0**

Abstract rating 4

MALHOTRA, Aamek: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **NAVA, Jacopo** <jacopo.nava@vub.be> on **Monday, 20 April 2026**

Abstract ID : 65

From Simulations to Early Data: Galaxy Cluster Cosmology with LSST-DESC

Content

In this work, we present recent developments and forecasts related to galaxy cluster science within the LSST-Dark Energy Science Collaboration (DESC). Galaxy clusters are among the primary cosmological probes of LSST. However, their use for precision cosmology is challenging as it requires the construction of cluster catalogs from observations and accurate modeling to extract cosmological information. With the recent release of Rubin Observatory Data Preview (DP1) in June 2025, the DESC Cluster working group has been working on coordinating efforts to assess analysis readiness and to begin to exploit this new dataset, in preparation for the upcoming Rubin Observatory Data Preview 2 (DP2) in September 2026 and LSST Data Release 1 (DR1) in early 2028. In this talk, we discuss recent efforts of the DESC clusters working group to build an end-to-end cluster cosmology pipeline, focusing mainly on: i) analysis readiness showcased on simulations using our end-to-end pipeline—from cluster catalog construction with WaZP to cosmological inference; ii) cosmological forecasts from our modeling framework. We will also briefly highlight early science results from the Abell 360 cluster weak lensing analysis with LSST DP1 data, before concluding with outlook and preparation for DP2 and DR1.

Other topic / keywords:

lsst-desc; galaxy clusters; desc-cluster pipeline

Author: BARRO, Eduardo (LAPP)

Presenter: BARRO, Eduardo (LAPP)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 3.0** (Would be good to have a Rubin talk, not sure (yet) if this is the top choice.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 4.0** (Happy to see early LSST results!)

Abstract rating 4

Submitted by **BARRO, Eduardo** <eduardojsbarroso@gmail.com> on **Monday, 20 April 2026**

Abstract ID : 66

Universality and Criticality in Massless Scalar Field Collapse

Content

The presentation is based on 1, where we study the unhindered gravitational collapse of a massless scalar field—one of the fundamental matter fields determined by a Lagrangian formulation—in a spherically symmetric spacetime, working in a frame-independent and ansatz-independent formalism.

We identify a single dimensionless parameter that determines the end-state, which can be one of the following two: a singularity or dispersal. This same dimensionless parameter also decides the visibility of the end-state singularity, which is either a locally naked null singularity or a black hole. We also show that the null naked singularity is the critical case between the black hole and dispersal cases. Hence, in the associated phase space of this parameter, the critical solution is an attractor. We show the causal structures and the visibilities of the end-states of this collapse through their corresponding Penrose diagrams.

Due to the covariant formulation of this investigation and the critical parameter being dimensionless, the obtained results are independent of length scales and hold for all systems with the same underlying symmetric structures. This provides an analytic formulation of universality and critical behaviour in massless scalar field collapse, in agreement with earlier numerical studies.

Other topic / keywords:

Gravitational collapse, critical phenomena, universality, mass-less scalar field dynamics.

Author: BHATTACHARYYA, Koushiki (Ahmedabad University)

Co-authors: GOSWAMI, Rituparno (Unioversity of KwaZulu-Natal); JOSHI, pankaj

Presenter: BHATTACHARYYA, Koushiki (Ahmedabad University)

Track Classification: Others (Please specify below)

Contribution Type: Talk

Comments:

In case the submission is not selected for a talk, I would welcome consideration for a poster presentation.

Status: SUBMITTED

Submitted by **BHATTACHARYYA, Koushiki** <koushiki.malda@gmail.com> on **Monday, 20 April 2026**

Abstract ID : 67

First results of the LEGEND experiment in the quest for Neutrinoless Double-Beta Decay

Content

The search for neutrinoless double beta ($0\nu\beta\beta$) decay is considered as the most promising way to prove the Majorana nature of neutrinos as well as to give an indication on the mass hierarchy and on the absolute mass scale. The discovery of $0\nu\beta\beta$ decay would moreover open the way for theories predicting the observed matter–antimatter asymmetry of the Universe being a consequence of lepton number violation through leptogenesis.

Building upon the success of GERDA and MAJORANA experiments, the LEGEND (Large Enriched Germanium Detector for Neutrinoless $\beta\beta$ Decay) Collaboration aims at building a ^{76}Ge -based $0\nu\beta\beta$ experiment to fully span the inverted neutrino mass ordering region. The LEGEND project will proceed in two phases. The first phase, LEGEND-200, began operations at Gran Sasso National Laboratory in Italy in spring 2023, with an initial deployment of 142-kg of high-purity, enriched germanium detectors. By combining an exposure of 61-kg-yr with data from GERDA and MAJORANA experiments, the highest half-life sensitivity to date in the search for $0\nu\beta\beta$ decay in ^{76}Ge has been achieved. A new deployment of high-performance detectors is currently taking data, and additional detectors will be installed in the future. In the second phase, the enriched germanium mass will increase to 1000-kg in a new experimental setup. With a background index of $\sim 10^{-5}$ cts/(keV·kg·year) and with an exposure of 10-t-yr, LEGEND-1000 will be able to reach a 3σ half-life discovery sensitivity of 1.3×10^{28} -yr.

This talk will highlight the performance of the experiment and present the first $0\nu\beta\beta$ decay results obtained from the initial year of data collected by LEGEND-200. Lastly, an update on the status of the future LEGEND-1000 phase will be provided.

This work is supported by the U.S. DOE, and the NSF, the LANL, ORNL and LBNL LDRD programs; the European ERC and Horizon programs; the German DFG, BMBF, and MPG; the Italian INFN; the Polish NCN and MNiSW; the Czech MEYS; the Slovak RDA; the Swiss SNF; the UK STFC; the Canadian NSERC and CFI; the LNGS and SURF facilities.

\end{document}

Other topic / keywords:

Author: CANONICA, Lucia (Università di Milano Bicocca)

Presenter: CANONICA, Lucia (Università di Milano Bicocca)

Track Classification: Neutrinos

Contribution Type: Talk

Comments:

Talk submitted by Lucia Canonica, on behalf of the Legend Speaker Bureau. The designated speaker will be selected at a later stage.

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive: Poster

Reviews:

GERBINO, Martina: **Accept: Poster • 4.0** (This abstract is less aligned with the cosmo/astro content of the track. Nevertheless, the topic is interesting. For this reason, we propose to accept it as a poster)

Abstract rating 4

Submitted by **CANONICA, Lucia** <luca.canonica@unimib.it> on **Monday, 20 April 2026**

Abstract ID : 68

Stochastic relativity of dark energy: lessons from inflation

Content

Previous work on Stochastic Inflation in full General Relativity is reviewed and showcased with latest numerical findings. The recipe to obtain the dynamics of a any such nonlinear and non-perturbative theory, when dynamically sourced by classicalised fluctuations of the short modes, is explained and extended to any scalar-tensor action described by the Effective Field Theory of Dark Energy. This is illustrated with a few examples including Gauss-Bonnet, Brans-Dicke, Horndeski theories and beyond. We conclude on the scope of the approach, its limitations and potential applications beyond the realm of inflation.

Other topic / keywords:

Author: LAUNAY, Yoann (DAMTP, University of Cambridge)

Co-authors: RIGOPOULOS, Gerasimos (Newcastle University); Prof. SHELLARD, Paul (DAMTP, University of Cambridge)

Presenter: LAUNAY, Yoann (DAMTP, University of Cambridge)

Track Classification: Dark Energy / Modified Gravity; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GLAVAN, Dražen: **Accept: Talk • 2.0** (This submission is better suited for Inflation track)

Abstract rating 2

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0** (The submission is better suited for the Inflation track)

Abstract rating 3

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **LAUNAY, Yoann** <yoann.launay@outlook.com> on **Monday, 20 April 2026**

Abstract ID : 69

All-Tree Massive Cosmological Correlators from Spectral Gluing

Content

In this talk, I will present a novel framework to compute massive tree-level cosmological correlators based on “spectral gluing”. The central idea is to decompose exchange diagrams into elementary vertex functions and systematically reconstruct arbitrary tree graphs through an algorithmic gluing procedure involving spectral integration. This approach provides a unifying and efficient method to generate correlators of increasing complexity, bypassing many of the technical challenges of direct in-in computations.

A key outcome of this construction is the emergence of partially resummed, closed-form expressions for general tree-level exchange diagrams. The gluing procedure makes the analytic structure of correlators manifest. In particular, we find that massive tree graphs exhibit a striking uniform transcendental weight and admit representations in terms of multivariable Lauricella functions.

Our method also yields new mathematical identities, relating sums of products of generalised hypergeometric functions to significantly simpler expressions, which in certain cases reduce to rational functions. These results point to previously unnoticed hidden simplicity underlying cosmological correlators.

Other topic / keywords:

Cosmological Correlators

Author: WERTH, Denis (Max Planck Institute for Physics)

Presenter: WERTH, Denis (Max Planck Institute for Physics)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Comments:

This potential talk would be on an ongoing project together with Jonathan Grafe from the Max Planck Institute for Physics, Munich. The corresponding paper should be out by then.

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept • 4.0**

Abstract rating 4

Submitted by **WERTH, Denis** <denis.werth@mpp.mpg.de> on **Monday, 20 April 2026**

Abstract ID : 70

Screened Forces in a QCD-Like Dark Sector on Galactic Scales

Content

Persistent small-scale challenges to the Λ CDM cosmological model have motivated the consideration of dark matter models with richer phenomenology. We consider a dark QCD scenario in which dark axions mediate a screened force between dark baryons within dark matter halos. Finite-density corrections to the dark QCD quark condensate introduce a density-dependent interaction term between dark axions and dark baryons, with a \mathbb{Z}_2 symmetry breaking, analogous to the symmetron mechanism. We use the FIRE-2 cosmological simulations, spanning dwarf to group halo mass scales, to test the feasibility of realistic dark matter halo profiles sourcing the dark axion. Through multi-objective optimization, we identify 3 example parameter sets that produce attractive forces of order $\sim 1 - 5$ times the strength of gravity, active over distances ranging from ~ 50 kpc to ~ 1 Mpc from the center of the halo, or $\sim 0.2R_{\text{vir}}$ to $\sim 5R_{\text{vir}}$ for a Milky Way-like halo. The force profiles generally follow the same structure: a screened center, a transition region where the force is active, and an outer decay to zero. Though our results only reflect the instant in which the axion is sourced, we tested this model against dynamical stability criteria including the free-fall time scale and Jeans length. These predict a spherical shell around the halo, aligning with the peak of the force profile, where circular orbits may be unstable and the halo is more vulnerable to collapse. The free-fall time is also lowered, suggesting that this DM model will result in large-scale rearrangement of the dark matter density.

Other topic / keywords:

Author: DENISON, Mathilda (University of Pennsylvania)

Co-authors: Prof. KHOURY, Justin (University of Pennsylvania); SANDERSON, Robyn (University of Pennsylvania)

Presenter: DENISON, Mathilda (University of Pennsylvania)

Track Classification: Dark Matter

Contribution Type: Talk

Comments:

Apologies, I am unsure how this works, but can I ask for my abstract to be considered for a poster if it is rejected for the talk? Thank you!

Status: SUBMITTED

Submitted by **DENISON, Mathilda** <denisonm@sas.upenn.edu> on **Monday, 20 April 2026**

Abstract ID : 71

Stellar models in third order Lovelock gravity

Content

We present a spherically symmetric stellar model within the framework of seven dimensional third order Lovelock gravity for a neutral perfect fluid distribution. The third order Lovelock field equations are generated for such a fluid configuration by imposing pressure isotropy. This condition yields a first order nonlinear differential equation which is an extension of the Abel differential equation. This is due to the additional higher order curvature effects arising in third order Lovelock gravity. We demonstrate new exact solutions that can model a static spherically symmetric star. The energy density and pressure are both variable. We also show that a special case arises, which is a constant density model with a cosmological interpretation. Furthermore, we illustrate the matching conditions to generate a spherically symmetric stellar model in third order Lovelock gravity when the EGB and third order Lovelock coupling constants are related.

Other topic / keywords:

Author: NAICKER, Shavani (University of KwaZulu-Natal)

Co-authors: Dr BRASSEL, Byron (Durban University of Technology); Prof. MAHARAJ, Sunil (University of KwaZulu-Natal)

Presenter: NAICKER, Shavani (University of KwaZulu-Natal)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GLAVAN, Dražen: **Accept: Poster • 1.0**

Abstract rating 1

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **NAICKER, Shavani** <shavaninaicker10@gmail.com> on **Monday, 20 April 2026**

Abstract ID : 72

Anti-ultralocality and plateau models of inflation

Content

Anti-ultralocality refers to the amplification of spatial gradients, inhomogeneities, and anisotropies during phases of decelerating expansion. The effect is driven by nonlinear general relativistic dynamics in the Einstein–scalar field system of equations. Previous numerical relativity studies have shown that, beginning with generic initial conditions following a big bang, this amplification prevents inflation from starting in models with power-law inflaton potentials. We present the effects of anti-ultralocality in models with plateau-like inflaton potentials which are thought to predict a much lower tensor-to-scalar ratio consistent with present observational upper limits. These predictions, however, assume homogeneity and isotropy are reached with 60 or more e-folds of inflation remaining. Using numerical relativity studies based on codes validated in earlier investigations and a rigorous protocol that tests whether initial conditions are generic and whether the final 60 e-folds satisfy observational constraints, we find that plateau models are especially vulnerable to anti-ultralocality effects due to both the substantial decelerating expansion period between the Planck energy density and the plateau energy density (12 orders of magnitude smaller) and the extreme flatness of the plateau itself. The resulting growth of gradients and shear either prevents 60 e-folds of inflation or drives the inflaton into self-reproduction, leading to multiverse outcomes inconsistent with current constraints on the tensor-to-scalar ratio.

Other topic / keywords:

Numerical Relativity

Author: SHTERENBERG, Joshua (Princeton University)

Co-authors: Mr SHLIVKO, David (Princeton University); Prof. STEINHARDT, Paul (Princeton University)

Presenter: SHTERENBERG, Joshua (Princeton University)

Track Classification: Inflation / Primordial Perturbations; Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **SHTERENBERG, Joshua** <js1866@princeton.edu> on **Monday, 20 April 2026**

Abstract ID : 73

Discovering Axion-like particles using CMB as a backlight.

Content

Abstract: Axions or axion-like particles are hypothetical particles predicted by various BSM theories, which also make one of the dark matter candidates. The CMB is the primordial radiation that surrounds us and it follows an ideal blackbody spectrum, hence deviation in its behaviour can be used to probe new physics. If ALPs exist in nature, the CMB photons as they pass through galaxy clusters will convert to ALPs, resulting in a polarized spectral distortion in the CMB. The resonant conversions dominate over the non-resonant ones, and occur when the effective masses of the photon and ALP are equal. The probability of this conversion will depend on the mass of ALPs, photon-ALP coupling constant ($g_{a\gamma}$), electron density and transverse magnetic field profiles of the clusters, as well as the photon frequency at the conversion location. If galaxy clusters are resolvable in various frequency bands, their astrophysical information can be obtained using multi-band observations. Using radio synchrotron observations (say, with SKA), their transverse magnetic field profiles can be inferred. Through X-ray observations (say, with eROSITA), their electron density and temperature profiles can be constrained. These profile inferences will provide an estimate of the ALP signal from these clusters and bounds on the ALP coupling can be obtained using a pixel-based or power spectrum-based approach. The clusters that are unresolvable in multiple frequencies, will create a diffused ALP background in the sky that can be modelled using the distribution of clusters of different masses across various redshifts. This will result in an increase in the CMB power spectrum at high multipoles, following the spectrum of the ALP signal. Also, the presence of turbulence in profiles will lead to varying non-Gaussianity of the ALP distortion signal. The upcoming CMB experiments, such as the Simons Observatory, LiteBIRD and CMB-S4, will be able to provide bounds ($g_{a\gamma} < O[10^{-12}] \text{ GeV}^{-1}$) more than an order better than the current bounds from CAST ($g_{a\gamma} < 6.6 \times 10^{-11} \text{ GeV}^{-1}$).

Other topic / keywords:

Authors: MEHTA, Harsh (Tata Institute of Fundamental Research, Mumbai); Dr MUKHERJEE, Sudip (TIFR, Mumbai)

Presenter: MEHTA, Harsh (Tata Institute of Fundamental Research, Mumbai)

Track Classification: Dark Matter; Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Submitted by **MEHTA, Harsh** <hmehta.cosmo@gmail.com> on **Tuesday, 21 April 2026**

Abstract ID : 74

Distinguishing new physics via multi-messenger tests of the Distance Duality Relation

Content

The Distance Duality Relation (DDR) is a cornerstone of the standard cosmological model, a direct consequence of basic assumptions such as photon conservation and the validity of null geodesics. Any detectable violation of this relation would provide a definitive signature of new physics, ranging from cosmic opacity and axion-like particles to modified theories of gravity. In this talk, I will present a comprehensive framework for testing the DDR by combining a wide range of observations, discussing the synergy between Type Ia Supernovae and BAO data, as well as the impact that future gravitational waves detectors will have on this line of investigation. I will also introduce a new approach to DDR testing based on non-parametric reconstruction methods, moving beyond standard power-law parametrizations.

Other topic / keywords:

Author: MARTINELLI, Matteo (INAF - OAR)

Presenter: MARTINELLI, Matteo (INAF - OAR)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 4.0**

Abstract rating 4

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **MARTINELLI, Matteo** <matteo.martinelli@inaf.it> on **Tuesday, 21 April 2026**

Abstract ID : 75

Intrinsic alignments in the FLAMINGO simulations and consequences for weak lensing

Content

Weak gravitational lensing has emerged as one of the most powerful probes of cosmology, uniquely tracing the total matter distribution and directly probing the growth of large-scale structure. As a late-time observable, it provides key sensitivity to dark energy that complements early-Universe measurements of the Cosmic Microwave Background. Forthcoming surveys such as Euclid and the Legacy Survey of Space and Time will deliver unprecedented weak lensing measurements, but fully exploiting their statistical power requires sub-percent control of astrophysical systematics.

A dominant contaminant is the intrinsic alignment (IA) of galaxies, which correlates galaxy shapes independent of lensing and can bias cosmological constraints if not accurately modelled. In this talk, I present new constraints on IA from the FLAMINGO simulations, analysing millions of Luminous Red Galaxy analogues. By jointly modelling galaxy clustering and alignments, we obtain some of the most precise constraints from hydrodynamic simulations to date. While commonly used IA models like NLA and TATT describe the data well, we introduce a new mass-dependent extension, TATT-M, that provides a significantly improved and more efficient description. This model has been adopted as the fiducial IA model for the \textit{Euclid} DR1 weak lensing analysis.

We then investigate the physical drivers of IA. We find that baryonic feedback does not change the alignment signal beyond its effect on stellar mass, whereas halo assembly history plays a key role: galaxies in earlier-forming haloes exhibit systematically stronger alignments, providing the first clear evidence of assembly bias in IA. We also explore the redshift evolution of the alignment signal, and show that it is more complex than assumed in current models.

Finally, I introduce a method to robustly infer halo shapes from sparse satellite populations by correcting for sampling noise, enabling less biased measurements and extending such studies to lower-mass systems.

Together, these results establish a simulation-driven framework for intrinsic alignment modelling, directly informing precision weak lensing analyses in the era of next generation weak lensing surveys.

Other topic / keywords:

Author: HERLE, Aniruddh (Leiden Observatory)

Presenter: HERLE, Aniruddh (Leiden Observatory)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:**Large-Scale Structure:****Judgments:** Positive: Talk**Reviews:**KUIJKEN, Koen: **Accept: Talk • 4.0** (good results. local student.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0** (Important topic.)

Abstract rating 5

Submitted by **HERLE, Aniruddh** <herle@strw.leidenuniv.nl> on **Tuesday, 21 April 2026**

Abstract ID : 76

Multi-Tracer Cross-Correlations of the Unresolved γ -Ray Sky

Content

We present a study of the unresolved γ -ray background (UGRB) aimed at probing the nature of the faintest γ -ray source populations in the Universe. By leveraging statistical cross-correlations between the UGRB and tracers of large-scale structure, we assess the contributions of different source classes to this diffuse emission. Our analysis combines twelve years of Fermi Large Area Telescope (LAT) data with three years of Dark Energy Survey (DES) observations, focusing on the angular correlation between γ rays and the galaxy distribution.

We detect a significant correlation with a signal-to-noise ratio of 7.85, dominated by large angular scales. To further constrain the origin of the signal, we perform a multi-tracer analysis incorporating the cross-correlation between γ rays and DES weak lensing. The two independent probes are consistent, and their joint analysis increases the detection significance to 10.31, providing strong evidence for the predominantly extragalactic origin of the UGRB.

Interestingly, the inferred properties of the contributing sources differ from those of resolved γ -ray populations, indicating that the faint γ -ray sky cannot be explained by a straightforward extrapolation of known sources. These results highlight the power of cross-correlation techniques in uncovering the nature of unresolved cosmic backgrounds.

Other topic / keywords:

Gamma-rays

Author: THAKORE, Bhashin (University of Turin and the University of Amsterdam)

Co-authors: Dr CAMERA, Stefano (University of Turin and INAF); Dr FORNENGO, Nicolao (University of Turin and INFN); Dr GRUEN, Daniel (Ludwig-Maximilians University of Munich); Dr NEGRO, Michela (University of Louisiana); Dr REGIS, Marco (University of Turin and INFN); Dr ROODMAN, Aaron (Stanford University)

Presenter: THAKORE, Bhashin (University of Turin and the University of Amsterdam)

Track Classification: Large-Scale Structure; Dark Matter; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

The talk will be based on this paper: <https://arxiv.org/pdf/2601.13312>.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:**Judgments:** Positive: Talk**Reviews:**

KUIJKEN, Koen: **Accept: Talk • 4.0** (Interesting result. Would fit in DM session as well.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0**

Abstract rating 5

Methods / Statistical Inference / Machine Learning:**Judgments:** Positive: Talk**Reviews:**

SELLENTIN, Elena: **Accept: Talk • 4.0** (Methodologically simple, data challenging, very strong research result.)

Abstract rating 4

Submitted by **THAKORE, Bhashin** <bhashin2998@gmail.com> on **Tuesday, 21 April 2026**

Abstract ID : 77

Physical properties and redshift distributions of KiDS-1000 galaxies using a generative galaxy population model

Content

Accurate redshift calibration and physically motivated source sample selection are central challenges for precision weak lensing cosmology. In this talk, I will present our recent work on forward modelling redshift distributions and inferring physical properties of weak lensing galaxies in the Kilo-Degree Survey (KiDS-1000) using a generative model for the galaxy population. The framework enabling this work is pop-cosmos, a calibrated galaxy population model that allows principled Bayesian inference of individual galaxy redshifts and physical properties for millions of KiDS-1000 sources. Validation against spectroscopic samples demonstrates low bias and scatter in the inferred photometric redshifts, while physical property inference enables the construction of weak lensing catalogues that mitigate intrinsic alignment systematics. We also develop a forward-modelling framework to infer the redshift distributions of the KiDS-1000 galaxies. By applying a KiDS data and survey selection model to synthetic photometric data of mock pop-cosmos galaxies, we directly characterize the redshift distributions in each of the five tomographic bins of KiDS-1000, thereby bypassing the need for spectroscopic reweighting used in conventional redshift calibration methods. Overall, our results demonstrate how the pop-cosmos galaxy population model can deliver accurate redshift distributions as well as galaxy properties, crucial for connecting galaxy evolution physics and weak lensing cosmology with Rubin LSST and Euclid.

Other topic / keywords:

Galaxies; Weak Gravitational Lensing

Author: HALDER, Anik (University of Cambridge)

Co-authors: Dr DEGER, Sinan (University of Cambridge); Mr JAGWANI, Gurjeet (University of Cambridge); LEISTEDT, Boris (Imperial College London); Prof. LEJA, Joel (Pennsylvania State University); Prof. MORTLOCK, Daniel (Imperial College London); PEIRIS, Hiranya; Dr THORP, Stephen (University of Cambridge); Dr TUDORACHE, Madalina (University of Cambridge); Mr VAN DEN BUSSCHE, Benedict (University of Cambridge); Dr WRIGHT, Angus (Ruhr University Bochum)

Presenter: HALDER, Anik (University of Cambridge)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:**Judgments:** Positive**Reviews:**KUIJKEN, Koen: **Accept • 4.0** (interesting but better suited to stat. methods section)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0** (Would also fit in LSS depending a bit on the focus. Stats might be better fit.)

Abstract rating 5

Methods / Statistical Inference / Machine Learning:**Judgments:** Positive: Poster**Reviews:**SELLENTIN, Elena: **Accept: Poster • 3.0** (Redshift estimation by forward modelling.)

Abstract rating 3

Submitted by **HALDER, Anik** <ah2425@cam.ac.uk> on **Tuesday, 21 April 2026**

Abstract ID : 78

Healthy scalar-tensor theories with third-order derivatives: Cosmological perturbations

Content

I describe how one can systematically construct covariant, ghost-free scalar-tensor theories whose Lagrangian includes up to third-order derivatives of the scalar field. The resultant theories extend the generalized disformal Horndeski and U-DHOST theories. I then discuss cosmological perturbations, emphasizing the role of new terms on EFT of Dark Energy.

Other topic / keywords:

Author: KOBAYASHI, Tsutomu (Rikkyo University)

Presenter: KOBAYASHI, Tsutomu (Rikkyo University)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 5.0**

Abstract rating 5

GLAVAN, Dražen: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **KOBAYASHI, Tsutomu** <tsutomu@rikkyo.ac.jp> on **Wednesday, 22 April 2026**

Abstract ID : 79

How galaxy properties and evolution shapes their intrinsic alignments in hydrodynamical simulations

Content

Galaxies that are spatially correlated, also show position-shape correlations of their major axes. This correlation, called intrinsic alignment, is a major contaminant in cosmological analyses of weak lensing surveys and therefore needs to be modelled well and understood. While intrinsic alignment correlations have been established and modelled quite well for linear scales for large central (red) ellipticals, the exact connection to further galaxy evolution and properties remains unclear. One such unknown, is the alignment of disk galaxies for which hydrodynamical simulations give controversial predictions. Another area where many questions remain is that of the redshift evolution of intrinsic alignments and how baryonic processes and galaxy evolution, e.g. gas inflows or mergers, influence them. Both morphology and kinematics are thought to be strongly correlated with intrinsic alignment. As hydrodynamical simulations become more realistic, we can uncover exactly which galaxy evolution processes and properties influence intrinsic alignments, what drives these alignments; learning more about how galaxies are oriented within their halos and towards the large scale structure.

I have performed a direct comparison of TNG300-1, Horizon-AGN and EAGLE, remeasuring variables for consistency, which are publicly available. This comparison reveals that while the simulations agree on many main trends, there are also substantial differences between them. In all three simulations, galaxies show radial alignments that are higher for red or dispersion dominated galaxies. However, the simulations vary in correlation amplitude and in the impact of choosing samples based on colour or kinematics. Furthermore, when comparing the redshift evolution of galaxy and halo alignments between TNG300 and COLIBRE, their halo alignments agree well, with TNG galaxies evolving similarly, but COLIBRE galaxies do not show significant evolution in redshift. The inclusion of cold gas in COLIBRE possibly leads to substantially different shapes and orientation evolution of galaxies than in TNG300. This difference in redshift evolution is measured for the full samples ($M_* > 10^{9.27} M_\odot/h$) as well as sub-populations split by colour, mass or kinematic properties. Finally, I will also present how combining multiple projections of shapes leads to gain in signal-to-noise in both measurements and modelling. This research gives insight on the impact of galaxy properties and evolution on intrinsic alignments and also leads to better priors that can be used to mitigate the intrinsic alignments effects on weak lensing analyses.

Other topic / keywords:

Galaxy evolution

Author: VAN HEUKELUM, Marloes (Utrecht University)

Co-author: CHISARI, Elisa (Utrecht University)

Presenter: VAN HEUKELUM, Marloes (Utrecht University)

Track Classification: Large-Scale Structure; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Technical work but highly relevant and state-of-the-art simulations.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 4.0** (leiden student so biased - but good work and good speaker)

Abstract rating 4

Submitted by **VAN HEUKELUM, Marloes** <m.l.vanheukelum@uu.nl> on **Wednesday, 22 April 2026**

Abstract ID : 80

Halo structure and lensing signatures of a polytropic dark matter fluid

Content

We investigate whether a minimal effective pressure in the dark matter sector can generate observable deviations from standard cold dark matter (Λ CDM) predictions at nonlinear scales. We model dark matter as a polytropic fluid with equation of state $P = K\rho^{3/2}$, interpreted as an effective coarse-grained closure of the collisionless Jeans hierarchy in virialized halos.

For this choice, equilibrium configurations correspond to the $n = 2$ Lane–Emden solution, producing finite-density cores with mass-dependent scaling. Embedding these solutions within Λ CDM halo populations, we obtain kiloparsec-scale core radii with weak mass dependence across dwarf-to-galaxy scales, while preserving the background expansion history and linear perturbation growth.

We compute projected surface densities and weak-lensing convergence profiles for mass-matched halos. Relative to Navarro–Frenk–White profiles, the model predicts a systematic suppression of central convergence within R

lessimfew R_c , with deviations confined to nonlinear scales. The convergence power spectrum exhibits scale-dependent suppression at high multipoles, providing a potential observational signature for upcoming high-resolution weak-lensing surveys.

This framework introduces a single phenomenological parameter governing nonlinear pressure support and continuously reduces to collisionless cold dark matter in the limit $K \rightarrow 0$. It therefore provides a minimal and testable extension of Λ CDM linking halo core structure to observable lensing signatures.

Other topic / keywords:

Dark matter; halo structure; polytropic fluid; weak gravitational lensing; large-scale structure

Author: NAEEM, Marriam

Presenter: NAEEM, Marriam

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Comments:

This work has been published in *Physics of the Dark Universe*, Volume 52 (2026), Article 102310.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive**Reviews:**

KUIJKEN, Koen: **Accept • 3.0** (Fairly interesting but not really LSS - better for DM session?)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 2.0** (Not sure this is relevant / testable given small-scale baryon physics.)

Abstract rating 2

Submitted by **NAEEM, Marriam** <mariyum@mariyumresearch.com> on **Wednesday, 22 April 2026**

Abstract ID : 81

The bearable inhomogeneity of the baryon asymmetry

Content

I will discuss the implications of precision measurements of light element abundances in concordance with the Cosmic Microwave Background for scenarios of physics beyond the Standard Model that generate large inhomogeneities in the baryon-to-photon ratio. I will show that precision Big Bang Nucleosynthesis (BBN) can constrain mechanisms that produce large scale inhomogeneities at temperatures of the order or below a TeV. In particular, we see that inhomogeneities of the order of 25% at comoving lengths scales larger than the comoving horizon at the temperature of 3 TeV are in conflict with the measured light element abundances. This sensitivity to the physics at such early times is because inhomogeneities in baryon number homogenize predominantly through diffusion, which is a slow process. BBN therefore acts as a novel probe of baryogenesis below the TeV scale, readily ruling out some of the proposed scenarios in the literature. I will discuss the implications for electroweak baryogenesis. In addition, I will show that precision BBN is a new probe of first order phase transitions which produce gravitational wave signals in the frequency range from pHz to mHz. This leads to constraints on the electroweak phase transition, as well as the first order phase transitions that have been proposed to explain the pulsar timing array signal. Finally, I will comment on the future prospects for improving this probe.

Other topic / keywords:

BBN, CMB, Baryon asymmetry, baryon isocurvature

Author: Dr EKHTERACHIAN, Majid (Scuola Normale Superiore, Pisa)

Co-authors: BAGHERIAN, Hengameh (University of Chicago); Dr STELZL, Stefan (IFAE, Barcelona)

Presenter: Dr EKHTERACHIAN, Majid (Scuola Normale Superiore, Pisa)

Track Classification: Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Submitted by EKHTERACHIAN, Majid <ekhterachian.majid@gmail.com> on **Wednesday, 22 April 2026**

Abstract ID : 82

CMB birefringence from ultralight-axion string networks

Content

Axion-like particles (ALPs) can form a network of cosmic strings that persists after recombination and induces birefringence in the cosmic microwave background (CMB), rotating the plane of polarization of propagating photons. In this work, we analyze a high-resolution simulation of an axion string network generated using adaptive mesh refinement (AMR) techniques. By performing ray tracing through the three-dimensional field configuration, we compute the cumulative rotation angle experienced by CMB photons along their line of sight from the last scattering surface to the present epoch. Our results show how the spatial distribution and evolution of the string network imprint characteristic spatial variations in the birefringence angle, and assess their detectability with current and next-generation CMB polarization experiments.

Other topic / keywords:

Author: VENEGAS VILLA, Moira

Presenter: VENEGAS VILLA, Moira

Track Classification: Dark Matter; Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Submitted by **VENEGAS VILLA, Moira** <mvenegasvilla@gmail.com> on **Wednesday, 22 April 2026**

Abstract ID : 83

Cosmological Signatures of Photophilic Axions from Primordial Black Hole Domination

Content

Light primordial black holes (PBHs) can briefly dominate the energy density of the early universe before evaporating via Hawking radiation, generically producing any sufficiently light degree of freedom in the process, including photophilic axion-like particles (ALPs). These ALPs subsequently decay to photons, injecting electromagnetic energy into the cosmic plasma at epochs ranging from BBN through recombination and beyond. In this talk I will present a comprehensive analysis of the resulting cosmological signatures across the $(m_a, g_{a\gamma\gamma})$ parameter space. Combining the full Hawking emission spectrum with the subsequent ALP cosmology, we derive constraints from BBN, CMB μ and y -type spectral distortions, and the diffuse extragalactic photon background, and identify the regions of ALP parameter space excluded once a PBH-dominated era is assumed. A PBH-dominated phase substantially enhances the predicted signal relative to scenarios where PBHs are subdominant, opening sensitivity to ALP couplings well below those probed by helioscopes and stellar cooling, including regions motivated by QCD axion and various ALP constructions. I will quantify the projected reach of PIXIE-class spectral distortion mission, discuss how the signal depends on the PBH mass spectrum and the duration of the matter-dominated phase, and outline the complementarity between these cosmological probes and laboratory and astrophysical ALP searches.

Other topic / keywords:

Author: VERNER, Sarunas (University of Chicago)

Co-author: KRNJAIC, Gordan (University of Chicago)

Presenter: VERNER, Sarunas (University of Chicago)

Track Classification: Dark Matter; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **VERNER, Sarunas** <verner@uchicago.edu> on **Wednesday, 22 April 2026**

Abstract ID : 84

A parameter-free prediction of Ω_Λ and g^\dagger from a substrate dispersion relation

Content

We derive the dark-energy density parameter Ω_Λ and the MOND acceleration scale g^\dagger as closed-form theorems from a single substrate dispersion relation $\omega^2 = c_0^2(k^2 + k_\Lambda^2)$, without free cosmological parameters. The mean-square group velocity of sub-threshold modes reduces to the dimensionless integral $\int_0^1 \xi^2/(\xi^2 + 1) d\xi = 1 - \pi/4$, in which the microscopic threshold k_Λ cancels identically, yielding $f_{\text{cold}} = \sqrt{2 - \pi/2} \approx 0.6551$. A void-halo balance, based on conservation of substrate cells between expanding voids and gravitationally bound halos, then gives

$$\Omega_\Lambda = \frac{\sqrt{2}}{\sqrt{2} + \sqrt{2 - \pi/2}} \approx 0.6834$$

with H_0 cancelling identically, enforcing $w = -1$ exactly at all redshifts (Planck 2018 deviation: 0.19)

Twelve independent cosmological probes spanning fifteen orders of magnitude in physical scale—from BBN at $z \sim 10^9$ to dwarf-galaxy rotation curves—are jointly consistent with the parameter-free prediction; the seven probes with clean χ^2 structure yield a cumulative $\Sigma\Delta\text{BIC} = +27.1$ in favour of the framework over best-fit Planck ΛCDM , constituting decisive Bayesian evidence on the Jeffreys scale. The remaining five probes (Planck 2018 CMB acoustic scale, ACT DR6 equation of state, KiDS Legacy S_8 , BBN baryon density, and LITTLE THINGS DM core structure) are each consistent with the framework at $\leq 1.3\sigma$.

The framework links the dark-energy density and the galactic acceleration scale through a single algebraic constant, yielding testable predictions for Euclid DR1 weak-lensing and matter-density-PDF observables. A clear falsification criterion is stated for each BIC-ranked probe.

Preprint: zenodo.org/records/19696180 (DOI: 10.5281/zenodo.19696180)

Other topic / keywords:

parameter-free cosmology; Omega_Lambda; radial acceleration relation; g_dagger; SPARC; substrate cosmology; alternative gravity; BIC model comparison

Author: Mr PREBECK, Norbert (Gymnasium LSH Ising am Chiemsee, Germany)

Presenter: Mr PREBECK, Norbert (Gymnasium LSH Ising am Chiemsee, Germany)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Comments:

This is an independent-researcher submission presenting a parameter-free theoretical prediction of Ω_Λ and g^\dagger from a substrate dispersion relation, with an empirical validation

against twelve independent cosmological probes. Oral presentation preferred; poster acceptable. The preprint is available at Zenodo (DOI 10.5281/zenodo.19696180).

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Negative

Reviews:

GARCIA-GARCIA, Carlos: **Reject**

Abstract rating 0

GLAVAN, Dražen: **Reject**

Abstract rating 0

Submitted by **PREBECK, Norbert** <norbert.prebeck@lshi.de> on **Thursday, 23 April 2026**

Abstract ID : 85

Diffuse Polarised Synchrotron Reconstruction with GNILC on Latest Planck Data

Content

Primordial gravitational waves from inflation imprint a faint B-mode polarisation in the Cosmic Microwave Background (CMB), but this signal is strongly obscured by Galactic foregrounds. Detecting CMB B-modes therefore requires accurate characterisation of foreground polarisation, dominated by synchrotron emission at low frequencies. To address this, we apply the Generalised Needlet Internal Linear Combination (GNILC) method to Planck PR4 data (30–353 GHz), producing clean, low-noise synchrotron polarisation maps at low frequencies without relying on prior models. GNILC employs needlets for localised processing in both pixel and harmonic space, a principal component analysis to retain modes above noise, and a multi-frequency weighting scheme orthogonal to the CMB spectrum to deproject the CMB. Radio source inpainting prior to GNILC processing further reduces contamination in the resulting maps. The method is validated on Planck NPIPE simulations, and PR4-derived GNILC weights are applied to NPIPE noise, systematics and CMB realizations to provide robust residual error characterisation of the GNILC PR4 maps. The final GNILC PR4 maps at 30 and 44 GHz provide reliable full-sky diffuse polarised synchrotron templates at uniform 34' angular resolution, as demonstrated by map inspection, residual error estimates, power spectra, and low correlation with Planck cleaned CMB maps. Exploiting the frequency scaling between our 30 and 44 GHz GNILC PR4 maps, we derive a first-of-its-kind 48-pixel full sky synchrotron spectral index map from Planck-only data, with the associated uncertainty.

Other topic / keywords:

Authors: KHAN, Md Ishaque (Instituto de Física de Cantabria (IFCA-CSIC-UC)); REMAZEILLES, Mathieu (Instituto de Física de Cantabria (IFCA-CSIC-UC)); BARREIRO, R. Belén (Instituto de Física de Cantabria (IFCA-CSIC-UC))

Presenter: KHAN, Md Ishaque (Instituto de Física de Cantabria (IFCA-CSIC-UC))

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Early Universe; Gravitational Waves; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Aameek: **Accept: Talk • 3.0** (better for CMB track)

Abstract rating 3

GAROFFOLO, Alice: **Accept: Talk • 3.0** (Better if in CMB track)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 4.0** (B-modes in CMB. Difficult. Any progress welcome!)

Abstract rating 4

Submitted by **KHAN, Md Ishaque** <md.ishaque.khan113@gmail.com> on **Thursday, 23 April 2026**

Abstract ID : 86

Probing the Cosmic Web: A Multi-Wavelength Approach for Investigating Galaxy Cluster Pair Bridges

Content

A significant fraction of baryons in the universe live in diffuse large-scale structure, particularly in filamentary and bridge environments outside galaxy clusters. Galaxy cluster pairs and their connecting bridges provide an important laboratory for studying how matter flows between clusters and how heating, shocks, and feedback shape the intercluster medium. However, since these systems are dynamically and structurally complex, no single observable provides a complete physical picture. This makes a multi-wavelength approach essential for their study. WITCH (Where Is That Cluster Hiding) is a galaxy cluster modelling software package that was originally developed for SZ analysis. Presently, WITCH is being extended to incorporate X-ray data, with the goal of building a multi-wavelength tool for studying cluster pairs and intercluster bridges. These WITCH developments will allow for more realistic and flexible modeling of complex bridge geometries, while providing the framework for future applications using additional datasets such as radio data. As multi-wavelength cluster datasets continue to grow, having these flexible tools for joint modeling of diffuse baryons will become increasingly important for comparative studies across systems and will improve constraints on baryons in the cosmic web. In this talk, I will present the most recent updates from WITCH and discuss its development toward a broadly useful multi-wavelength tool for the field, while also providing some examples of its present usage with ACT data.

Other topic / keywords:

galaxy clusters, bridges, software development, multi-wavelength analysis

Author: DUDLEY, Rebecca (PhD Student at the University of Toronto)

Presenter: DUDLEY, Rebecca (PhD Student at the University of Toronto)

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 4.0** (We need something on filaments in the LSS section. This one seems to fit the bill.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 3.0** (Link to cosmology a little unclear?)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 3.0** (Software description.)

Abstract rating 3

Submitted by **DUDLEY, Rebecca** <rebecca.dudley@mail.utoronto.ca> on **Thursday, 23 April 2026**

Abstract ID : 87

Measuring clustering using k-Nearest Neighbour Statistics

Content

The matter field in the universe is a Gaussian Random Field on large scales and early times, summarized by the power spectrum or two-point correlation function. However, on smaller scales and late times, non-linear gravitational evolution results in non-Gaussian clustering, necessitating improved summary statistics. k-Nearest Neighbour Cumulative Distribution Functions (k NN CDFs) are sensitive to all connected N-point correlation functions, while being much faster to compute.

In my talk, I will show some recent developments regarding the k NN statistics. I will demonstrate the geometric interpretation of these statistics, and their relation with other geometric and topological statistics. $CDF_{1NN}(r)$ reflects the volume fraction within spheres of radius r centered on tracers. Its derivatives relate to the geometry of sphere intersections, equivalent to the information provided by Minkowski functionals (volume, area, mean curvature, and Euler characteristic), but being computationally more efficient.

We extend the k NN CDF formalism to cross-correlations between tracers and fields. The 21cm radiation field during the Epoch of Reionization has a bubble morphology driven by ionising radiation from galaxies, making it a natural target for k NN analysis, which is particularly sensitive to spherical structure around tracers. We apply this formalism to measure the cross-correlation between galaxies and the HI field during reionization, and find that k NN cross-correlations outperform the standard 2-point cross-correlation even in the presence of foreground and instrumental noise. The k NN statistics are even able to distinguish between reionization models that are indistinguishable with the 2-point function alone.

With upcoming surveys and telescopes such as DESI, Euclid, and SKA set to probe these non-linear scales, the k NN framework offers a fast, effective, and versatile tool for next-generation cosmological analyses.

Other topic / keywords:

Reionization, 21cm cosmology

Authors: CHAKRABORTY, Anirban (IUCAA Pune); GANGOPADHYAY, Kwanit (University of Groningen)

Co-authors: ABEL, Tom (KIPAC, Stanford University); BANERJEE, Arka (IISER Pune); ROY CHOUDHURY, Tirthankar (NCRA TIFR Pune)

Presenter: GANGOPADHYAY, Kwanit (University of Groningen)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:**Large-Scale Structure:****Judgments:** Positive**Reviews:**

KUIJKEN, Koen: **Accept • 4.0** (Nice methodology paper with relevance to upcoming data)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 3.0** (Not sure we need another beyond-2pt statistic.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:**Judgments:** Positive: Talk**Reviews:**

SELLENTIN, Elena: **Accept: Talk • 4.0** (Mathsy and hence transparent/interpretable approach to non-Gaussianity.)

Abstract rating 4

Submitted by **GANGOPADHYAY, Kwanit** <k.gangopadhyay@rug.nl> on **Thursday, 23 April 2026**

Abstract ID : 88

N-body Simulations of the EFT of Dark Energy with PySCo-EFT and ECOSMOG-EFT

Content

Modified gravity theories constitute viable alternatives to the standard cosmological model for explaining the observed late-time accelerated expansion of the Universe. The Effective Field Theory of Dark Energy (EFTofDE) is an efficient framework to describe a wide range of such theories with a limited number of parameters. To robustly constrain them by comparison with clustering and weak lensing data from upcoming large-scale structure surveys, high-resolution cosmological N-body simulations are required to obtain accurate predictions for the matter distribution on non-linear scales. We introduce two new N-body simulation codes for EFTofDE cosmologies: PySCo-EFT, a Python-based particle mesh code, and ECOSMOG-EFT, a RAMSES-based code with adaptive mesh refinement. We consider Horndeski models with a luminal gravitational wave speed. We use iterative solvers and multigrid schemes to solve for the additional scalar field equation in both codes, incorporating the non-linear Vainshtein screening mechanism. We present validation and convergence tests of the codes. We obtain a sub-0.5 percent agreement with linear theory on large scales and a similar agreement between the two codes on non-linear scales. The dominant numerical effects on the matter-power-spectrum boost are mass resolution, finite-volume effects, refinement threshold, and starting redshift, but they are limited to below 2% at the largest wavenumbers ($k=10$ h/Mpc) for the range of tested values. We investigate the impact of the EFTofDE parameters on the matter-power-spectrum ratios between EFTofDE and Λ CDM cases. Depending on the EFTofDE parameters, the screening plays a negligible or dominant role compared to the linearised field equations. Our codes provide tools for generating fast and accurate predictions of the impact of the EFTofDE on the clustering of matter, incorporating non-linear screening.

Other topic / keywords:

Author: GANJOO, Himanish (LUX, Observatoire de Paris)

Co-authors: RASERA, Yann (LUX, Observatoire de Paris); BELLINI, Emilio; BRETON, Michel-Andrès; COLLABORATION, ProGraceRay

Presenter: GANJOO, Himanish (LUX, Observatoire de Paris)

Track Classification: Large-Scale Structure; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Somewhat technical, but still relevant and interesting.)

Abstract rating 3

KUIJKEN, Koen: **Accept • 3.0** (better fit in DE track)

Abstract rating 3

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 5.0**

Abstract rating 5

GLAVAN, Dražen: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **GANJOO, Himanish** <himanish.ganjoo@obspm.fr> on **Thursday, 23 April 2026**

Abstract ID : 89

Galaxy clustering on the full sky

Content

The newest generation of galaxy surveys are ushering in an era of precision large-scale structure cosmology, making a rigorous full-sky treatment of galaxy clustering useful and essential. In this talk, I present a framework for computing the angular power spectrum of galaxies on the full sky which incorporates all linear order relativistic effects that become significant on ultra-large scales. These corrections are necessary to ensure an accurate detection of local-type primordial non-Gaussianity (PNG), which manifests itself on these horizon scales via a characteristic scale-dependent bias. I will discuss the effect of ignoring relativistic effects on cosmological parameters, including f_{NL} , and apply it to a SPHEREx forecast. Additionally, I will predict dynamical and geometrical dark energy constraints from SPHEREx. Looking beyond the power spectrum, I may also present the leading order angular bispectrum, accounting for second order relativistic light-cone effects. Together, these results represent a powerful and self-consistent tool for extracting PNG and relativistic signatures from the newest-generation of galaxy surveys, such as SPHEREx.

Other topic / keywords:

Author: LUKENS, Greg (Pennsylvania State University)

Co-author: Prof. JEONG, Donghui (Pennsylvania State University)

Presenter: LUKENS, Greg (Pennsylvania State University)

Track Classification: Large-Scale Structure; Dark Energy / Modified Gravity; Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (Nice forward looking to new techniques for sperex and other full sky data sets.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0** (Relevant forecast and method development.)

Abstract rating 4

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

COLE, Philippa: **Accept • 4.0** (better for Large-Scale Structure)

Abstract rating 4

Submitted by **LUKENS, Greg** <gql5196@psu.edu> on **Thursday, 23 April 2026**

Abstract ID : 90

Echoes of Curvature: Cosmic Topology & Lens Spaces

Content

The possibility of our Universe having a non-trivial spatial topology has received significant attention recently, as it could serve as a potential explanation of the Cosmic Microwave Background (CMB) large-angle anomalies and have interesting phenomenology in the early Universe. So far most efforts to study the shape of the cosmos have focused on spatially flat models, such as the simple three-torus, partly due to the simpler calculations involved. In this talk I will show how to deal with cosmological perturbations in Lens Spaces, a family of positively curved universes that arise as quotients of the familiar three-sphere. Developing both the theoretical and numerical formalism in Lens Spaces allows us to study how the CMB sky would look in such a universe and opens the way to properly study primordial features in this class of manifolds.

Other topic / keywords:

Cosmic Topology

Author: MARTIN BARANDIARAN, Mikel (Instituto de Física Teórica IFT UAM-CSIC)

Presenter: MARTIN BARANDIARAN, Mikel (Instituto de Física Teórica IFT UAM-CSIC)

Track Classification: Cosmic Microwave Background; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Submitted by **MARTIN BARANDIARAN, Mikel** <mikel.martin@uam.es> on **Thursday, 23 April 2026**

Abstract ID : 91

EFTofLSS and Newtonian Motion gauges

Content

Using appropriate gauge transformations, one can extend the range of validity of standard perturbation theory or of the EFTofLSS. We show how to use Newtonian Motion gauges to compute accurately the one-loop matter power spectrum in redshift space taking into general relativistic effects, gravitational coupling with radiation, the scale-dependent growth induced by massive neutrinos and the impact dark energy domination. This method does not incur any additional computational cost.

Other topic / keywords:

Author: LESGOURGUES, Julien (RWTH Aachen university)

Co-authors: FIDLER, Christian; MATTES, Antonia; MORADINEZHAD, Azadeh

Presenter: LESGOURGUES, Julien (RWTH Aachen university)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 5.0** (Julien is always good to listen to)

Abstract rating 5

HILDEBRANDT, Hendrik: **Accept • 5.0** (Agreed!)

Abstract rating 5

Submitted by **LESGOURGUES, Julien** <julien.lesgourgues@physik.rwth-aachen.de> on **Thursday, 23 April 2026**

Abstract ID : 92

Repeated Stimulated Emission of Gravitational Waves in Primordial Black Hole Binaries

Content

It has been recently shown that gravitational waves incident on a compact object binary can stimulate excess gravitational wave emission under resonant conditions. In this work, we calculate the waveform of this stimulated emission. We investigate whether repeated stimulated emission of gravitational waves could lead to an exponential growth in coherent gravitational wave strength in a phenomenon analogous to a laser. In particular, we predict conditions under which this Gravitational Radiation Amplified by Stimulated Emission of Radiation (GRASER) could produce detectable signals from binary Primordial Black Holes (bPBHs) in the very early universe. The required conditions include a universe sufficiently dense in bPBHs such that individual binaries could undergo multiple incidents of stimulated emission before the interaction freezes out.

Other topic / keywords:

Primordial Black Holes

Author: WEAVER, Tristan

Co-authors: JEONG, Donghui (Pennsylvania State University); Prof. RADICE, David (Pennsylvania State University)

Presenter: WEAVER, Tristan

Track Classification: Gravitational Waves

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Poster

Reviews:

GAROFFOLO, Alice: **Accept: Poster • 4.0**

Abstract rating 4

MALHOTRA, Ameet: **Accept: Poster • 4.0**

Abstract rating 4

Submitted by **WEAVER, Tristan** <tsw5383@psu.edu> on **Thursday, 23 April 2026**

Abstract ID : 93

Quantum Signatures of Cosmic Topology

Content

There are eighteen distinct topologies compatible with manifolds that admit a spatially flat Friedmann-Lemaître-Robertson-Walker metric. Seventeen of them—called non-trivial topologies—can be realized by introducing non-trivial topological boundary conditions. These boundary conditions constrain the allowed wavelengths of quantum fields living in such universes; consequently, non-trivial topology induces Casimir effects. We study the backreaction of the Casimir stress-energy tensor of a conformally coupled scalar field in a toroidal universe. Doing so, we quantify the consequences for a pure de Sitter inflationary era and, importantly, we identify local signatures that reflect the symmetries globally broken by the underlying topology.

The talk is based on: ArXiv:2603.12319

Other topic / keywords:

Cosmic Topology

Author: Dr NEGRO, Anna (Case Western Reserve University)

Presenter: Dr NEGRO, Anna (Case Western Reserve University)

Track Classification: Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **NEGRO, Anna** <annahnegro@gmail.com> on **Thursday, 23 April 2026**

Abstract ID : 94

What if quantum nature of primordial gravitational waves survives?

Content

During inflation, quantum fluctuations of spacetime, so-called primordial gravitational waves, are generated. We study its impact on gravitational waves from binary black holes under the assumption that the squeezing of primordial gravitational waves survives until the present. We show the squeezing of the quantum state of gravitational waves tells us the information of inflation.

Other topic / keywords:

graviton

Author: SODA, Jiro (Kobe university)

Presenter: SODA, Jiro (Kobe university)

Track Classification: Inflation / Primordial Perturbations; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0**

Abstract rating 4

MALHOTRA, Ameet: **Accept: Talk • 4.0**

Abstract rating 4

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Accept • 3.0**

Abstract rating 3

Submitted by **SODA, Jiro** <jiro@phys.sci.kobe-u.ac.jp> on **Friday, 24 April 2026**

Abstract ID : 95

From Primordial Gravitational Waves to Large-Scale Structure: Induced Density Perturbations and Their Signatures

Content

Primordial gravitational waves (GWs) can source scalar density perturbations at second order, thereby leaving indirect but potentially observable signatures in the large-scale structure (LSS) of the Universe. In this talk, I will present a comprehensive study of these tensor-induced density perturbations, from their analytic evolution in the radiation- and matter-dominated eras to their non-Gaussian statistics and implications for biased tracers. I will discuss how GWs energy density fluctuations generate the matter density contrast, how the resulting bispectrum depends on the shape of the primordial GWs spectrum, and how this non-Gaussianity propagates into observables such as halo bias. These results show that LSS offers a complementary probe of primordial GWs, extending the search for early-Universe tensor modes beyond the traditional GWs detectors alone.

Other topic / keywords:

Author: BARI, Pritha (Institute for Basic Science CTPU-CGA)

Presenter: BARI, Pritha (Institute for Basic Science CTPU-CGA)

Track Classification: Large-Scale Structure; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 4.0** (Interesting topic! Stakes are certainly high when it comes to primordial GWs. Could be in the LSS or GW session.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 3.0** (this seems very far fetched?)

Abstract rating 3

Gravitational Waves:**Judgments:** Conflicting: Talk, Poster**Reviews:**GAROFFOLO, Alice: **Accept: Poster • 4.0**

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **BARI, Pritha** <prithazxc@gmail.com> on **Friday, 24 April 2026**

Abstract ID : 96

Cosmic Neutrino Background Detection with Tritium

Content

The Cosmic Neutrino Background (CNB) is a robust thermal relic of the Big Bang and a potential probe of neutrino mass properties and of the Universe at $O(1)$ second. A leading direct-detection strategy is neutrino capture on tritium, where observing a distinct capture peak requires excellent effective energy resolution. In practice, binding and solid-state effects can broaden the endpoint spectrum, potentially pushing experiments into a background-dominated regime with significant modeling uncertainties. In this ongoing work, we perform a unified sensitivity study for (i) an energy-only endpoint analysis and (ii) a joint energy–angle analysis that exploits the CNB dipole anisotropy. Using profile-likelihood methods with nuisance parameters, we quantify the exposure and systematic-control requirements for discovery. The energy-only approach can hit a systematic “floor,” where increasing exposure no longer improves significance, while an angular analysis can cancel leading normalization systematics and provide a complementary handle on backgrounds.

Other topic / keywords:

Author: UWABO-NIIBO, Michiru

Presenter: UWABO-NIIBO, Michiru

Track Classification: Early Universe; Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive

Reviews:

GERBINO, Martina: **Accept • 3.0**

Abstract rating 3

Submitted by **UWABO-NIIBO, Michiru** <michiru.niibo.cosmo@gmail.com> on **Friday, 24 April 2026**

Abstract ID : 97

Primordial black hole evaporation in a thermal bath and gravitational waves

Content

Primordial black holes (PBHs) formed in the early Universe evaporate via Hawking radiation and constitute a generic source of stochastic gravitational waves. Existing studies of gravitational wave production from evaporating PBHs typically assume vacuum evaporation, neglecting the fact that PBHs in the early Universe are embedded in a hot thermal plasma. In this work, we investigate gravitational wave production from primordial black holes whose evaporation is thermally influenced by their surrounding environment. We adopt a thermal evaporation framework in which interactions with the ambient plasma modify the effective decay rate of the black hole, leading to enhanced mass loss at early times and a redistribution of the evaporation history compared to the standard non-thermal vacuum case. Since graviton emission is intrinsically tied to the evaporation history of PBHs, these thermal effects play a crucial role in determining the timing and spectral properties of the resulting stochastic gravitational wave background. Our results provide a consistent framework for incorporating thermal effects into gravitational wave production from evaporating primordial black holes and set the stage for a detailed analysis of their observational signatures.

Other topic / keywords:

Author: Dr CHAUDHURI, Arnab (Vellore Institute of Technology)

Presenter: Dr CHAUDHURI, Arnab (Vellore Institute of Technology)

Track Classification: Early Universe; Gravitational Waves

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Poster

Reviews:

MALHOTRA, Aameek: **Accept: Poster • 3.0**

Abstract rating 3

GAROFFOLO, Alice: **Accept: Poster • 4.0**

Abstract rating 4

Submitted by **CHAUDHURI, Arnab** <arnabchaudhuri.7@gmail.com> on **Friday, 24 April 2026**

Abstract ID : 98

Compact star X-Ray-production through interactions with dark matter

Content

Dark matter (DM) may naturally exhibit inelastic structure, with small mass splittings between states arising from symmetry breaking. In such scenarios, the lightest DM state can upscatter to a heavier state that subsequently decays semi-visibly, producing secondary photon fluxes. Compact objects—such as neutron stars and white dwarfs—provide efficient environments for these processes, enabling distinctive observational signatures.

We investigate these signatures by studying DM capture and upscattering in compact stars, incorporating a detailed treatment of particle geodesics prior to decay, as well as corrections accounting for the fraction of emitted photons that are reabsorbed upon intersecting the stellar surface.

As an illustration, we consider a benchmark dipole portal DM model and focus on stars in the vicinity of Sagittarius A*. We show that the resulting X-ray signals can lie within the reach of current and future observatories, including Chandra X-ray Observatory, XMM-Newton, and NuSTAR. The inferred astrophysical sensitivity is highly competitive with traditional accelerator-based searches for light dark sectors.

Other topic / keywords:

compact objects

Authors: HOEFKEN ZINK, Jaime (Narodowe Centrum Badań Jądrowych (NCBJ)); TROJANOWSKI, Sebastian; TSAI, Yue-Lin Sming (Purple Mountain Observatory)

Presenter: HOEFKEN ZINK, Jaime (Narodowe Centrum Badań Jądrowych (NCBJ))

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **HOEFKEN ZINK, Jaime** <jhoefkenzink.hep@gmail.com> on **Friday, 24 April 2026**

Abstract ID : 99

Towards a Detection of Post-Born Lensing

Content

Weak gravitational lensing is a well-studied and valuable cosmological probe. Due to the complex path taken by a multiply-lensed photon, weak lensing analysis generally integrates the gravitational potential along the line of sight. This is known as the Born approximation. Accurately accounting for the effects from multiple weak lensing events requires the use of post-Born corrections. Post-Born lensing of the cosmic microwave background induces a significant bispectrum, which will be important for upcoming surveys with increasing precision. In this talk I outline the second-order post-Born correction terms, namely lens-lens coupling and ray deflection. We present a template for reconstructing the post-Born lensing convergence of the cosmic microwave background via a quadratic estimator. Finally, we test the validity of the template using Gaussian simulations and the AGORA N -body simulation suite.

Other topic / keywords:

Authors: CHAMBERLAIN, Ewan (University of Sussex); LEWIS, Antony (University of Sussex); ROBERTSON, Mathew (University of Sussex)

Presenter: CHAMBERLAIN, Ewan (University of Sussex)

Track Classification: Large-Scale Structure; Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (This looks like a CMB talk, suggest to consider it there. A bit far from LSS.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 4.0** (Yep, CMB session is more appropriate.)

Abstract rating 4

Submitted by **CHAMBERLAIN, Ewan** <ec719@sussex.ac.uk> on **Friday, 24 April 2026**

Abstract ID : 100

Cosmological first-order phase transitions with large bubbles: beyond conformal fluid and flat spacetime

Content

Using semi-analytical models, we investigate the power spectrum of gravitational waves generated by sound waves in the plasma during a first-order phase transition in new unexplored scenarios. (i) The phase transition is accompanied by a change of the equation of state from that of pure radiation. This modifies the shape of the gravitational wave power spectrum as a consequence of both sound and gravitational waves propagating across a non-conformal fluid. (ii) In addition, we investigate the novel limit where the phase transition completes with large bubbles, by which we mean that the mean bubble spacing R^* is a non-negligible fraction of the Hubble length $1/H^*$. Since the amplitude of the gravitational wave signal increases with R^*H^* , this is also the loud signal regime. In this regime the effects of gravity, hitherto neglected, become relevant. We here consider the first general relativistic corrections beyond the Universe expansion. This work improves the current estimation of the gravitational waves power spectrum from first order phase transitions and expands the possible scenarios of transitions that can be tested by gravitational wave detectors.

Other topic / keywords:

Gravitational waves/ Phase transitions

Author: GIOMBI, Lorenzo (University of Helsinki)

Co-authors: Dr DAHL, Jani (University of Helsinki); Prof. HINDMARSH, Mark (University of Helsinki)

Presenter: GIOMBI, Lorenzo (University of Helsinki)

Track Classification: Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **GIOMBI, Lorenzo** <lorenzo.giombi@helsinki.fi> on **Friday, 24 April 2026**

Abstract ID : 101

Rayleigh Scattering of CMB to constrain Primordial Magnetic Fields

Content

The presence of magnetic fields has been inferred in extragalactic spaces like voids, and astrophysical mechanisms are unable to explain the magnitude of these fields. This hints towards cosmological magnetic fields of primordial origin, that are amplified by the astrophysical dynamo effect.

As future surveys and telescopes provide higher precision measurements of CMB, LSS and EoR; we are expected to constrain the strength of these Primordial Magnetic fields (PMFs), if not detect them. However, addition of PMFs leads to effects that differ from the standard Λ -CDM predictions on which our inferences are based.

One important effect of PMFs is on recombination and the CMB. The presence of PMFs leads to additional clumping in the pre-recombination plasma, accelerating the recombination process. As a result, the inferred angular diameter distance to last scattering increases, and our inference of cosmological parameters changes. For example, the measured H_0 increases in a universe with PMFs, likely alleviating the Hubble tension.

The CMB photons scatter with neutral H (and He) atoms post recombination, prolonging last scattering. Since this effect is based on well-understood physics, it provides a robust probe of the ionization history and the last scattering surface. Thus, measuring Rayleigh scattering of the CMB would help constrain the ionization history and indirectly constrain PMFs.

My project deals with combining both effects and presenting realistic estimates of the constraints obtainable from CMB observations from the Simons Observatory, CCAT Observatory, and Planck Collaboration.

Other topic / keywords:

Rayleigh Scattering

Author: GANGOPADHYAY, Kwanit (University of Groningen)

Co-author: MEERBURG, Daan

Presenter: GANGOPADHYAY, Kwanit (University of Groningen)

Track Classification: Primordial Magnetic Fields; Cosmic Microwave Background

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Primordial Magnetic Fields:

Judgments: Positive: Poster

Reviews:

IARYGINA, Oksana: **Accept: Poster • 5.0**

Abstract rating 5

BONDARENKO, Kyrylo: **Accept • 5.0**

Abstract rating 5

Submitted by **GANGOPADHYAY, Kwanit** <k.gangopadhyay@rug.nl> on **Friday, 24 April 2026**

Abstract ID : 102

Preheating after a strongly supercooled phase transition in the early Universe

Content

Preheating refers to a well-known set of phenomena, such as tachyonic instability and parametric resonance, associated with the dynamics of a scalar field, typically in the context of post-inflationary reheating. In this talk, I will explore the possibility of preheating-like amplification of fluctuations of a scalar field following a strongly supercooled electroweak first-order phase transition, which, unlike inflation, does not involve a homogeneous inflaton background but instead occurs through nucleation and growth of true-vacuum bubbles against a false vacuum background. I will also discuss the impact of such effects on the evolution of the true vacuum bubbles and their cosmological consequences.

Other topic / keywords:

reheating, preheating, first-order phase transitions

Author: KULEJEWSKI, Mateusz (University of Warsaw)

Co-authors: SWIEZEWSKA, Bogumila; VAN DE VIS, Jorinde (CERN)

Presenter: KULEJEWSKI, Mateusz (University of Warsaw)

Track Classification: Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0**

Abstract rating 4

MALHOTRA, Ameet: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **KULEJEWSKI, Mateusz** <m.kulejewski@uw.edu.pl> on **Friday, 24 April 2026**

Abstract ID : 103

Primordial black holes from inflation: on the decoupling between large and small scales

Content

Primordial black holes can be produced from the collapse of large perturbations generated from inflation on scales much smaller than those seeding large-scale structure formation. It is possible that the large peak in scalar power at high wavenumbers might induce corrections to the scalar power spectrum on large scales, e.g. in the form of loop corrections, endangering the success of inflation in explaining the observed statistics of primordial perturbations.

In this talk, I will give an update on recent debates on the viability of such inflationary scenarios. I will demonstrate that the 1-loop correction to a large-scale adiabatic mode due to a band of enhanced short-scale perturbations decouples from all detailed properties of the peak, including its maximum amplitude, and does not lead to an observable effect.

Other topic / keywords:

Author: Dr IACCONI, Laura (Queen Mary University of London)

Co-authors: MULRYNE, David (Queen Mary University of London); SEERY, David (University of Sussex)

Presenter: Dr IACCONI, Laura (Queen Mary University of London)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Comments:

This talk will be based on arXiv.2601.14229.

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

COLE, Philippa: **Accept: Talk • 5.0**

Abstract rating 5

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **Dr IACCONI, Laura** <l.iacconi@qmul.ac.uk> on **Friday, 24 April 2026**

Abstract ID : 104

LISA Can Detect Dark Matter Subhalos through Gravitational-Wave Lensing

Content

Strongly lensed gravitational waves offer a new way to study dark matter structure on subgalactic scales. In the wave-optics regime, gravitational waves propagating through a population of dark matter subhalos acquire frequency-dependent amplitude and phase distortions that encode the small-scale matter distribution along the line of sight.

We compute the full diffraction integral for gravitational waves propagating through statistically generated cold dark matter subhalo populations embedded in realistic galaxy-scale lenses, and evaluate the resulting signals in the Laser Interferometer Space Antenna (LISA) band. We find that strongly magnified images generically exhibit percent-level wave-optics modulations induced primarily by subhalos with masses in the range 10^4 – $10^7 M_{\odot}$.

These signatures arise naturally within the standard cold dark matter paradigm and should be detectable in high-signal-to-noise strongly lensed LISA events. Strongly lensed gravitational waves therefore provide a direct and complementary probe of dark matter substructure at mass scales that are difficult to access with conventional electromagnetic lensing observations.

Other topic / keywords:

Author: ANDO, Shin'ichiro (University of Amsterdam)

Presenter: ANDO, Shin'ichiro (University of Amsterdam)

Track Classification: Large-Scale Structure; Dark Matter; Gravitational Waves

Contribution Type: Talk

Comments:

I will be attending the conference from Monday to Wednesday and would appreciate it if my talk could be scheduled during that period.

I believe the Dark Matter session would be the most appropriate for this work, with Large-Scale Structure as a possible alternative. I have also selected Gravitational Waves as a third option, although it may be less suitable if the session is primarily focused on data analysis.

This talk will be based on arXiv:2603.04267.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive**Reviews:**

KUIJKEN, Koen: **Accept • 3.0** (suggest better in DM or GW track. Nice link to lensing though.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 4.0** (Interesting topic. Better placed in the GW session.)

Abstract rating 4

Gravitational Waves:**Judgments:** Positive: Talk**Reviews:**

GAROFFOLO, Alice: **Accept: Talk • 4.0** (Better if in Dark Matter)

Abstract rating 4

MALHOTRA, Ameet: **Accept: Talk • 4.0** (Better suited to DM, also preferred by speaker to be in DM)

Abstract rating 4

Submitted by **ANDO, Shin'ichiro** <s.ando@uva.nl> on **Friday, 24 April 2026**

Abstract ID : 105

From astrophysics to cosmology with fast radio bursts

Content

In recent years, Fast Radio Bursts (FRBs) have been established as a direct probe of baryonic matter. They are tracing the integrated ionised electron density along the line of sight through their observed dispersion measures. Upcoming radio surveys, such as the DSA, CHORD and the SKA, are expected to deliver up to 100,000 additional events. Their direct sensitivity to the Universe's baryon content allows FRBs to trace astrophysical processes that redistribute matter within and around galaxies. As a result, FRBs offer an alternative way to bridge astrophysics and cosmology, providing new constraints on feedback mechanisms that currently limit our ability to extract cosmological information from Stage IV surveys.

In this talk, I will briefly review the current status of large-scale structure cosmology and introduce FRBs as cosmological probes. I will discuss how FRBs can be used to test both the background expansion of the Universe and the distribution of baryons in the large-scale structure. Using a currently available sample of localised FRBs, I will present constraints on baryonic feedback and the suppression of the matter power spectrum, demonstrating that only 100 FRBs can distinguish between feedback models. Furthermore, I will address future prospects of FRB cosmology, outlining key challenges and systematic uncertainties. Finally, I will explore synergies with Stage IV surveys and discuss how FRBs can serve as a crucial external calibration for baryonic feedback, enhancing Stage IV's cosmological fidelity.

Other topic / keywords:

Baryonic feedback

Author: REISCHKE, Robert (Argelander-Institut für Astronomie)

Presenter: REISCHKE, Robert (Argelander-Institut für Astronomie)

Track Classification: Large-Scale Structure; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Innovative new direction in LSS measurements.

I am personally biased as his former line manager.)

Abstract rating 5

KUIJKEN, Koen: **Accept • 5.0** (Important new topic)

Abstract rating 5

Submitted by **REISCHKE, Robert** <reischke@posteo.net> on **Saturday, 25 April 2026**

Abstract ID : 106

Observing gravitational waves without observing them

Content

We argue that the coordinate redefinition necessarily introduces inevitable couplings between long- and short-wavelength modes. This leads to a unique footprint of the long-mode gravitational waves in the local scalar power spectrum. We discuss the observational prospects via the quadrupole moment of the local scalar power spectrum. Future Lyman-alpha and 21cm surveys are capable of detecting the quadrupole moment, confirming the long-mode gravitational waves.

Other topic / keywords:

Author: GONG, Jinn-Ouk

Presenter: GONG, Jinn-Ouk

Track Classification: Large-Scale Structure; Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (average review since I cannot judge for LSS track)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0**

Abstract rating 3

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 3.0**

Abstract rating 3

MALHOTRA, Aameek: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **GONG, Jinn-Ouk** <jinn.ouk.gong@gmail.com> on **Saturday, 25 April 2026**

Abstract ID : 107

Cosmological gravitational particle production: Scalars and fermions

Content

In this talk, I will discuss the gravitational production of scalars and fermions during inflation. For scalars, I will compare Bogolyubov coefficient and Starobinsky stochastic approaches, showing that they only agree in the limit of infinitely long inflation. High-scale inflation is very efficient in particle production, leading to constraints on the existence of free, light, and stable scalars: such particles are viable only if their masses are below the eV scale or if the reheating temperature is in the GeV range. For fermions, I will show how the production efficiency depends on the particle mass, which is generated via the Yukawa coupling and sensitive to the corresponding scalar field value. Scalar fields can experience large quantum fluctuations during inflation, driving the average field to the Hubble scale and above. Thus, fermions can be very heavy during inflation, enhancing particle production.

Based on 2503.14652 and 2509.01673.

Other topic / keywords:

Authors: KOUTROULIS, Fotis (Theoretical Physics Division, Institute of High Energy Physics, Chinese Academy of Sciences); LEBEDEV, Oleg; POKORSKI, Stefan (Institute of Theoretical Physics, Faculty of Physics, University of Warsaw); DA SILVA FEITEIRA, Duarte Miguel (University of Helsinki)

Presenter: DA SILVA FEITEIRA, Duarte Miguel (University of Helsinki)

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

COLE, Philippa: **Accept: Poster • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept • 3.0**

Abstract rating 3

Submitted by **DA SILVA FEITEIRA, Duarte Miguel** <duarte.dasilvafeiteira@helsinki.fi> on **Saturday, 25 April 2026**

Abstract ID : 108

Cosmological gravitational particle production: Scalars and fermions

Content

In this talk, I will discuss the gravitational production of scalars and fermions during inflation. For scalars, I will compare Bogolyubov coefficient and Starobinsky stochastic approaches, showing that they only agree in the limit of infinitely long inflation. High-scale inflation is very efficient in particle production, leading to constraints on the existence of free, light, and stable scalars: such particles are viable only if their masses are below the eV scale or if the reheating temperature is in the GeV range. For fermions, I will show how the production efficiency depends on the particle mass, which is generated via the Yukawa coupling and sensitive to the corresponding scalar field value. Scalar fields can experience large quantum fluctuations during inflation, driving the average field to the Hubble scale and above. Thus, fermions can be very heavy during inflation, enhancing particle production.

Based on 2503.14652 and 2509.01673.

Other topic / keywords:

Authors: KOUTROULIS, Fotis (Theoretical Physics Division, Institute of High Energy Physics, Chinese Academy of Sciences); LEBEDEV, Oleg; POKORSKI, Stefan (Institute of Theoretical Physics, Faculty of Physics, University of Warsaw); DA SILVA FEITEIRA, Duarte Miguel (University of Helsinki)

Presenter: DA SILVA FEITEIRA, Duarte Miguel (University of Helsinki)

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Mixed: Mark as duplicate

Reviews:

CESPEDES, Sebastian: **Mark as duplicate • 2.0**

Abstract rating 2

Submitted by **DA SILVA FEITEIRA, Duarte Miguel** <duarte.dasilvafeiteira@helsinki.fi> on **Saturday, 25 April 2026**

Abstract ID : 109

A new look at particle production from a sharp turn of the inflationary trajectory

Content

During expansion in the de Sitter spacetime, particle production takes place from the perspective of the observer for whom the vacuum state was defined in the past.

To account for this phenomenon, we use a newly developed formalism of Nicolas Parra et al. [arXiv:2410.13843v2], which greatly simplifies the analysis.

We derive the predictions for the number density of particles produced at a strongly non-adiabatic turn of the inflationary trajectory in multi-field models of inflation.

Other topic / keywords:

Author: KALKOWSKI, Jakub (University of Warsaw)

Co-author: Prof. TURZYŃSKI, Krzysztof (University of Warsaw)

Presenter: KALKOWSKI, Jakub (University of Warsaw)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **KALKOWSKI, Jakub** <jk.kalkowski@student.uw.edu.pl> on **Saturday, 25 April 2026**

Abstract ID : 110

Effect of Primordial Black Holes on the global 21-cm signal

Content

The 21-cm global signal, a treasure trove of information about the nature of the first luminous sources of the Universe, has traditionally been modelled assuming that these early sources were predominantly star-forming galaxies. However, recent observations by the James Webb Space Telescope (JWST) have revealed several AGNs as early as $z \sim 10 - 10.4$. In light of this, it is important to investigate the contribution of such AGNs to the 21-cm signal. Assuming that these AGNs are seeded by Primordial Black Holes (PBHs) and employing an analytical PBH model, consistent with existing cosmological and astrophysical constraints, I will discuss how these exotic objects can affect the redshift evolution of the global signal.

Other topic / keywords:

Primordial Black Hole

Author: Dr CHATTERJEE, Atrideb (Kapteyn Astronomical Institute, University of Groningen)

Presenter: Dr CHATTERJEE, Atrideb (Kapteyn Astronomical Institute, University of Groningen)

Track Classification: Large-Scale Structure; Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (appropriate for a separate PBH session? Borderline whether it fits in LSS.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (Early Universe session?)

Abstract rating 3

Submitted by **Dr CHATTERJEE, Atrideb** <atrideb.chatterjee1994@gmail.com> on **Sunday, 26 April 2026**

Abstract ID : 111

The Effect of Dark Energy on the Void-Galaxy Alignments

Content

We numerically explore if and how the nature of dark energy affects the strength of the tendency that the shapes axes of galactic halos located on void surfaces have perpendicular alignments with the directions toward the void centers. The alignment tendency of void-surface halos is quantified by the correlation parameter, d_t , that enters the analytic formula derived by Lee (2018) for the probability density function of the cosines of the angles between the major principal axes of the halo inertia tensors and local tidal tensors. This correlation parameter is numerically found to vary most strongly the amplitude of initial density fluctuations, σ_8 and linear growth rate, f . When the initial density fluctuations have lower amplitudes and grow at lower rates, the void-surface halos exhibit stronger perpendicular alignments with the directions toward the void centers. Our numerical analysis also reveals that at fixed σ_8 and f , the alignment tendency becomes stronger when the equation of state of dark energy w and spectral index n_s have lower values. Based on these numerical findings, we empirically determine a non-parametric model for the cosmology dependence of d_t , which turns out to be valid for a wide range of the background cosmologies including the non-standard quintessence and thawing dark energy models. Our results imply that the perpendicular alignments of void-surface halos may be in principle useful as a complementary probe of the nature of dark energy.

Other topic / keywords:

Author: LEE, Jounghun

Co-author: Mr KANG, Geonwoo (Seoul National University)

Presenter: LEE, Jounghun

Track Classification: Large-Scale Structure; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (A bit niche. Still interesting and to the same-old.)

Abstract rating 3

KUIJKEN, Koen: **Accept • 3.0** (more relevant to DE session perhaps?)

Abstract rating 3

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 4.0**

Abstract rating 4

GLAVAN, Dražen: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **LEE, Jounghun** <cosmos.hun@gmail.com> on **Sunday, 26 April 2026**

Abstract ID : 112

Signs of Love

Content

The tidal deformability of compact objects, parameterized by their Love numbers, provides a crucial window into their internal structure and fundamental physics. In this talk, I will demonstrate that foundational principles impose strict constraints on these observables. Specifically, by exploiting the analytic properties of the tidal response function via a Kramers-Kronig dispersion relation, I will show that in the regime of weak gravity (small compactness), all static electric Love numbers must be strictly positive. I will outline the derivation of this bound, with a particular focus on the necessary theoretical assumptions regarding stability and high-frequency behavior. Finally, I will illustrate the scope and physical meaning of these assumptions by exploring several concrete examples.

Other topic / keywords:

General Relativity, Theory

Authors: CREMINELLI, Paolo (ICTP); LONGO, Alessandro (APC); SALEHIAN, Borna (ETH Zurich); SANTONI, Luca (APC); SENATORE, Leonardo (ETH)

Presenter: LONGO, Alessandro (APC)

Track Classification: Gravitational Waves; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Ameet: **Accept: Talk • 5.0**

Abstract rating 5

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **LONGO, Alessandro** <ale.22.longo@gmail.com> on **Sunday, 26 April 2026**

Abstract ID : 113

Constraining Inflation Models with Spinning Voids

Content

We present a powerful new diagnostics by which the running of scalar spectral index of primordial density fluctuations can be tightly and independently constrained. This new diagnostics utilizes coherent rotation of void galaxies, which can be observed as redshift asymmetry in opposite sides dichotomized by the projected spin axes of hosting voids. Comparing the numerical results from the AbacusSummit of cosmological simulations, we derive a non-parametric model for the redshift asymmetry distribution of void galaxies, which turns out to be almost universally valid for a very broad range of cosmologies including dynamic dark energy models with time-dependent equation of states as well as the Λ CDM models with various initial conditions. We discover that the universality of this model breaks down only if the running of scalar spectral index deviates from zero, detecting a consistent trend that a more positive (negative) running yields a lower (higher) redshift asymmetry of voids than the model predictions. Given that non-standard inflations usually predict non-zero runnings of the spectral index and that the redshift asymmetry distribution of voids is a readily observable quantity, we conclude that this new diagnostics will pave another path toward understanding the true mechanism of inflation.

Other topic / keywords:

Authors: KANG, GEONWOO (Seoul National University); Prof. LEE, Jounghun (Seoul National University)

Presenter: KANG, GEONWOO (Seoul National University)

Track Classification: Large-Scale Structure; Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 3.0** (UNexpected probe of ns running - fits better in inflation section? but used LSS observations, so also good fit here.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (More appropriate for the inflation session.)

Abstract rating 3

Inflation / Primordial Perturbations:

Judgments: Mixed: Proposed for other tracks: Others (Please specify below), Early Universe

Reviews:

CESPEDES, Sebastian: **Change track • 3.0** (This abstract should have listed LSS as its first track)

Abstract rating 3

Submitted by **KANG, GEONWOO** <kanggeonwoo@snu.ac.kr> on **Sunday, 26 April 2026**

Abstract ID : 114

How the cosmic voids contribute to stalling and quenching the giant galaxies on their surfaces

Content

We report a numerical hint that the formations of cosmic voids may be closely linked with the mechanism through which the giant galaxies on void surfaces establish elliptical shapes, redder colors, and lower specific star formation rates (sSFR). Identifying the voids from the TNG300-1 simulations via the Void-Finder algorithm at $z=0, 0.5$ and 1 , we explore if and how the shapes of the TNG galaxies located on void surfaces are aligned with the directions toward the void centers. Noting that only the giant void-surface galaxies with stellar masses $M_* \geq 10^{10.5} h^{-1} M_\odot$ exhibit significant tendency of perpendicular alignments, we dichotomize them into two M_* -controlled samples according to their morphologies (elliptical or spiral), colors (redder or bluer), sSFR (lower or higher) and stellar ages (older or younger). It is found at all of the three redshifts that the perpendicular alignments of void-surface galaxies become stronger for the cases that they have elliptical shapes, redder colors, and lower sSFR, but showing weak dependence on the stellar ages. It is also shown that the numerical results are well described by the analytical one-parameter model developed by Lee under the assumption of the existence of a linear scaling between the covariance matrices of galaxy shape axes and local tidal tensors. We test the robustness of alignment signals against the variation of void-finder algorithms and its feasibility against the redshift-space and projection effects. Our results lead us to speculate that the formation and expansion of voids may have an effect of stalling and quenching the giant void-surface galaxies by compressing adjacent matter and then preventing them from radial infall/accretion.

Other topic / keywords:

Authors: KANG, GEONWOO (Seoul National University); Prof. LEE, Jounghun (Seoul National University)

Presenter: KANG, GEONWOO (Seoul National University)

Track Classification: Large-Scale Structure

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Quite similar to #111. Same group? Ask to merge?)

Abstract rating 3

KUIJKEN, Koen: **Accept • 2.0** (I find this one less exciting. Numerical hint, and very galaxy formation focused I felt.

Make this one a poster?

113 is also same group.)

Abstract rating 2

Submitted by **KANG, GEONWOO** <kanggeonwoo@snu.ac.kr> on **Sunday, 26 April 2026**

Abstract ID : 115

Inflation beyond perturbation theory

Content

The wavefunction of the universe contains the full information about primordial fluctuations. I will show how to determine it in a non-perturbative manner in a large class of inflationary scenarios, using the example of models with small and rapid oscillations in the inflaton potential. Our study reveals a profound asymmetry between maxima and minima of the density fluctuations, and indicates that even minute oscillations give large effects on the tail of the distribution. Eventually, I will describe a qualitatively new regime in which most of the information of inflationary correlators appears in higher-order correlation functions with large n , at odds with conventional wisdom.

Other topic / keywords:

Author: Mr RENAUX-PETEL, Sébastien (CNRS-IAP)

Presenter: Mr RENAUX-PETEL, Sébastien (CNRS-IAP)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **Mr RENAUX-PETEL, Sébastien** <renaux@iap.fr> on **Sunday, 26 April 2026**

Abstract ID : 116

Coherent State Description of Gravitational Waves from Binary Black Holes

Content

Quantum mechanics provides the fundamental framework for describing nature, and gravitational waves from binary black holes should ultimately be understood within this framework. It is widely believed that classical gravitational waves correspond to coherent states, so any deviation would signal genuine quantum features of gravity.

In this talk, based on our recent work published in Phys. Rev. Lett. 136, 061404 (2026), we present a quantum-mechanical description of gravitational waves from binary black holes during the inspiral phase. We show that the coherent-state description reproduces classical gravitational waves at leading order, while nonlinear effects generate squeezed states of gravitons. These results demonstrate that binary black hole gravitational waves are well described by coherent states, while also providing a concrete target for probing the quantum nature of gravity in future observations.

Other topic / keywords:

Author: TANIGUCHI, Akira (Kyushu University)

Co-authors: KANNO, Sugumi; SODA, Jiro (Kobe university)

Presenter: TANIGUCHI, Akira (Kyushu University)

Track Classification: Gravitational Waves

Contribution Type: Talk

Comments:

This talk is based on our recent work published in Phys. Rev. Lett. 136, 061404 (2026).

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Ameet: **Accept: Talk • 5.0**

Abstract rating 5

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **TANIGUCHI, Akira** <taniguchi.akira.405@s.kyushu-u.ac.jp> on **Monday, 27 April 2026**

Abstract ID : 117

Hunting Sterile Neutrino Dark Matter in the MeV Gap

Content

We investigate the sensitivities of upcoming MeV gamma-ray telescopes to sterile neutrino dark matter in the mass range (0.2–100)MeV. Sterile neutrinos in this regime can produce observable photon signals through radiative two-body decays and three-body decays with final-state radiation. We perform a Fisher forecasting analysis incorporating realistic astrophysical background modeling and detector response to derive projected constraints on the sterile neutrino decay rate. We find that future MeV instruments can improve existing limits by several orders of magnitude across a wide region of parameter space. Our results highlight the discovery potential of next-generation MeV telescopes in probing sterile neutrino dark matter.

Other topic / keywords:

Author: Dr GOLA, Shivam (IIT Bombay)

Presenter: Dr GOLA, Shivam (IIT Bombay)

Track Classification: Dark Matter; Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive: Talk

Reviews:

GERBINO, Martina: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **GOLA, Shivam** <shivamgola17@gmail.com> on **Monday, 27 April 2026**

Abstract ID : 118

Gravitational Properties of the Monopole Bag

Content

Axionic cosmologies constitute a class of models offering a well-studied candidate for dark matter (the axion) as well as phenomenologically rich symmetry breaking in the early universe. In the case where monopoles are present in such a background, the axion profile may be deformed; it is possible to construct a “monopole bag” state composed of a central monopole within a closed axion domain wall. We consider the gravitational properties of this hybrid defect, and find a both horizon-less and a black hole-like final state can result after gravitational collapse for different input parameters. We demonstrate that the latter classifies as dyonic regular black hole, evading the usual singular gravitational collapse and retaining a non-trivial axionic profile through exotic electromagnetic properties of an axionic Chern-Simons term.

Other topic / keywords:

Black Hole-type Structures

Authors: KOMIYA, Yu (Yukawa Institute for Theoretical Physics, Kyoto University); Prof. TAKAYAMA, Fumihiro (Yukawa Institute for Theoretical Physics, Kyoto University)

Presenter: KOMIYA, Yu (Yukawa Institute for Theoretical Physics, Kyoto University)

Track Classification: Dark Matter; Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Submitted by **KOMIYA, Yu** <komiya.yu.78m@st.kyoto-u.ac.jp> on **Monday, 27 April 2026**

Abstract ID : 119

Higgs-portal dark matter beyond kinetic equilibrium

Content

Higgs portal models are among the simplest and most widely studied realizations of particle Dark Matter (DM). We revisit scalar, vector, and fermionic Higgs portal models, focusing on the resonant regime and dropping the assumption of kinetic equilibrium. We solve for the full momentum-dependent Boltzmann equations using the DRAKE code and compare the outcomes with the Lee-Weinberg solution which assumes kinetic equilibrium during the freeze-out. We find that the non-equilibrium phase space evolution near the resonance can significantly affect the relic density. We compare our results against present experimental constraints and forecasted sensitivity of future surveys, and determine the updated limits for Higgs-portal DM models.

Other topic / keywords:

Authors: BENACO, Michele (University of Jyväskylä); ARCADI, Giorgio; DI MAURO, Mattia; NURMI, Sami; TUOMINEN, Kimmo

Presenter: BENACO, Michele (University of Jyväskylä)

Track Classification: Dark Matter

Contribution Type: Talk

Comments:

If a talk slot is not available, I would also be happy to present this work as a poster.

Status: SUBMITTED

Submitted by **BENACO, Michele** <benaco.michele@gmail.com> on **Monday, 27 April 2026**

Abstract ID : 120

Deconstructing the missing baryon environment with Fast Radio Bursts

Content

The precise distribution of baryons in the Universe remains an open question in cosmology, as their highly diffuse nature renders direct observation difficult, while being integral in achieving precise cosmological inference in studies of gravitational lensing, galaxy evolution and the cosmic microwave background radiation with the current and upcoming surveys. We use Fast Radio Bursts (FRBs) and their dispersion measures (DMs) to probe and localise this baryon distribution in the large-scale structure (LSS) of the Universe.

Using the IllustrisTNG simulations, we classify the LSS into eight density bins of increasing matter density, analogous to voids, filaments, and haloes. We model the DM contribution from these density environments and compare them to observed DMs to infer the density estimator, defined as the ratio of the electron number density and the total matter density. The solution of such an overdetermined system is carried out within a Bayesian framework with a physics-informed prior model. To demonstrate observational applicability, we create a \textit{Euclid}-like mock galaxy catalogue and build a density estimator based on luminous matter along the line of sight of an FRB. We apply a bias correction to account for the underlying dark matter distribution and compare the two density estimators to recover the electron number density across the eight density bins.

We show that electrons are mostly localised in low-density regions while accounting for the global theoretical estimate. Combining the density estimators from FRB and galaxies, we recover the baryon density as $\Omega_b = 0.0472 \pm 0.0032$ (against 0.0486 ± 0.0005 as the true value). Our result of bin-wise electron density successfully reproduces the simulation ground truth to within 10 per cent. It showcases the distribution of baryons in three regions of the LSS as $f_{\text{gas}}^{\text{void}} = 0.213 \pm 0.023$, $f_{\text{gas}}^{\text{filament}} = 0.182 \pm 0.032$ and $f_{\text{gas}}^{\text{halo}} = 0.078 \pm 0.014$ against the ground truth of 0.22, 0.196 and 0.062, respectively.

This framework provides a novel, quantitative approach to addressing the missing baryon problem and offers a new way to constrain baryonic feedback mechanisms in future surveys such as CHORD and Euclid.

Other topic / keywords:

Fast Radio Bursts, Density estimation, missing baryons

Author: KONAR, Koustav (University of Groningen and Stellenbosch University)

Co-authors: Prof. KOOPMANS, Leon (University of Groningen); Prof. MA, Yin-Zhe (Stellenbosch University); Prof. MEERBURG, Daniel (University of Groningen)

Presenter: KONAR, Koustav (University of Groningen and Stellenbosch University)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Comments:

Under review for publication in A&A

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 5.0** (Innovative use of FRBs.
I am biased because the author is a former (very good!) student of mine.)

Abstract rating 5

KUIJKEN, Koen: **Accept • 4.0** (interesting)

Abstract rating 4

Submitted by **KONAR, Koustav** <koustav.konar@gmail.com> on **Monday, 27 April 2026**

Abstract ID : 121

Belle II excess and dark matter semi-annihilation

Content

In 2023, the Belle II Collaboration announced the observation of the $B \rightarrow K + \nu\nu$ decay channel for the first time. This decay channel provides a clean signal with high precision in theoretical calculations. However, we encounter a 2.8σ deviation from the Standard Model prediction. To resolve this excess, we study a scalar dark matter model with local discrete Z_3 symmetry. Assuming dark $U(1) \times U(1)_{L\mu-L\tau}$ symmetry, this $U(1)_{L\mu-L\tau}$ symmetry is spontaneously broken into local discrete Z_3 by nonzero vacuum expectation value of dark Higgs boson. Considering a dark Higgs mass is 2 GeV, we can explain the recent $\text{Br}(B \rightarrow K + \nu\nu)$ excess reported from the Belle II Collaboration and relic abundance at the same time.

Other topic / keywords:

Authors: Dr KIM, Jongkuk (Kangwon National University); Prof. KO, Pyungwon (KIAS (Korea Institute for Advanced Study))

Presenter: Dr KIM, Jongkuk (Kangwon National University)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **Prof. KIM, Jongkuk** <jongkuk.kim927@gmail.com> on **Monday, 27 April 2026**

Abstract ID : 122

Closing in on the EFTofDE with combined probes and nonlinear predictions

Content

The EFT of Dark Energy (EFTofDE) is a theoretically well-motivated class of modified gravity models, able to explain observational hints for dynamical dark energy with further testable predictions for structure growth and lensing. I will discuss the merits and challenges of combining probes of linear perturbations and present state-of-the-art constraints on the EFTofDE by combining CMB, BAO, SNe, RSD, ISW, and 3x2pt datasets. I will show that these constraints are driven not just by the constraining power of probes but also by theoretical priors. I will then discuss new predictions for weak lensing observables on mildly nonlinear scales from higher order terms in the EFTofDE Lagrangian.

Other topic / keywords:

Author: SHAH, Neel (University of Portsmouth)

Co-authors: KOYAMA, Kazuya; Dr NOLLER, Johannes (UCL)

Presenter: SHAH, Neel (University of Portsmouth)

Track Classification: Large-Scale Structure; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (interesting - better fit for DE/MG?)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 3.0** (Yep, better fit for DE/MG!)

Abstract rating 3

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 4.0**

Abstract rating 4

GLAVAN, Dražen: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **SHAH, Neel** <neel.shah@port.ac.uk> on **Monday, 27 April 2026**

Abstract ID : 123

Cosmic Curl –Features and Convergence of the Vorticity Power Spectrum in N-body Simulations

Content

Cosmic velocity fields are large scale surveys that can be used to extract information about cosmic structure by looking at the velocity divergence and vorticity power spectra. To get a better understanding of these power spectra, we have calculated and analysed the velocity power spectra numerically from N -body simulations. It turns out that the vorticity power spectrum gotten from N -body simulations is very hard to converge, because its convergence depends highly on the number of particles as well as the physical box size of the simulation, where more particles and a smaller box size leads to a more converged power spectra. Furthermore, the resulting vorticity power spectrum at $z = 0$ depends heavily on the initial random seed used to generate the initial conditions, and it turns out that different initial conditions will also give a different halos at $z = 0$.

In this talk, I will present how the velocity divergence and vorticity power spectra can be calculated from cosmic velocity fields from N -body simulations. I will then show how the convergence of the vorticity power spectrum depends on different things such as the initial random seed, the number of particles, and the physical box size of the simulation, as well as how to fix these dependencies to get a converged vorticity power spectrum. Lastly, I will present how different initial conditions of the N -body simulations lead to different vorticity power spectra and different halos at $z = 0$.

Other topic / keywords:

Author: SØRENSEN, Camilla Theresia Grøn (Aarhus University)

Presenter: SØRENSEN, Camilla Theresia Grøn (Aarhus University)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Poster

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Quite technical and niche. Not sure this fits well.)

Abstract rating 3

KUIJKEN, Koen: **Accept: Poster • 2.0** (not sure there are results yet - limited interest)

Abstract rating 2

Submitted by **SØRENSEN, Camilla Theresia Grøn** <camth@phys.au.dk> on **Monday, 27 April 2026**

Abstract ID : 124

Dynamical-State Dependence of the c - M Relation in Massive Dark Matter Halos

Content

The concentration–mass (c - M) relation of dark matter halos is a key prediction of hierarchical structure formation and provides an important link between cosmological simulations and observations of dark matter halos. While the standard trend predicts a monotonic decrease of concentration with increasing halo mass, several studies have suggested a possible deviation from this behavior at the high-mass end.

We present an analysis of the c - M relation of massive dark matter halos based on the latest update to the Uchuu cosmological simulation (Mucho Uchuu; Ishiyama et al., in prep). Our study focuses on halos in the mass range $13 < \log M < 15.5$, corresponding to group- and cluster-scale systems. In particular, we investigate how the inferred c - M relation depends on halo dynamical state by explicitly separating relaxed and unrelaxed halo populations.

We find that the behavior of the c - M relation differs significantly between these populations. The feature that appears at the massive end in the full halo sample is strongly suppressed when the analysis is restricted to relaxed halos, while it remains prominent for unrelaxed systems. This result indicates that the inferred concentration of massive halos is sensitive to ongoing mass accretion and non-equilibrium structure, rather than being determined solely by the equilibrium inner halo profile.

These findings suggest that the high-mass behavior of the c - M relation should be interpreted with caution, particularly in the presence of dynamically young or actively accreting halos. We discuss the implications of this result for theoretical modeling of halo structure, as well as for comparisons between simulations and observationally inferred halo properties.

Other topic / keywords:

concentration–mass (c - M) relation of dark matter halos

Author: ODA, Mayuka (University of Tsukuba)

Co-authors: Prof. ISHIYAMA, Tomoaki (University of Chiba); MORI, Masao (University of Tsukuba)

Presenter: ODA, Mayuka (University of Tsukuba)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **ODA, Mayuka** <oda@ccs.tsukuba.ac.jp> on **Monday, 27 April 2026**

Abstract ID : 125

Latest CRESST results on sub-GeV dark matter and the low-energy excess challenge

Content

CRESST (Cryogenic Rare Event Search with Superconducting Thermometers) is a direct detection dark matter experiment located at the Laboratori Nazionali del Gran Sasso (LNGS) in Italy.

The experiment searches for dark matter–nucleus interactions using scintillating cryogenic calorimeters equipped with transition edge sensors (TESs), which measure phonon signals at millikelvin temperatures, complemented by the simultaneous detection of scintillation light for particle discrimination.

Thanks to this technology, CRESST achieves energy thresholds of $O(10\text{ eV})$, establishing it as a world-leading experiment in the sub-GeV dark matter mass regime.

CRESST continues its efforts to further lower the energy threshold, a task made increasingly challenging by the so-called low-energy excess—an exponential rise below $\sim 200\text{ eV}$ in event rate at low energies, observed also by comparable experiments, whose origin remains unknown.

In this talk, I will present the latest dark matter search results and the ongoing efforts to understand and mitigate the low-energy excess.

Other topic / keywords:

Author: VALDENNAIRE, Danae Danielle (Austrian Academy of Sciences (AT))

Presenter: VALDENNAIRE, Danae Danielle (Austrian Academy of Sciences (AT))

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **VALDENNAIRE, Danae Danielle** <danae.valdenaire@oeaw.ac.at> on **Monday, 27 April 2026**

Abstract ID : 126

Balancing bias, baryons, and scale cuts in LSST 3×2 pt analysis

Content

Stage IV surveys such as LSST will probe deeply into the nonlinear regime, where systematic effects from galaxy bias and baryonic feedback become dominant and poorly constrained nuisance parameters can lead to degeneracies.

We perform a 3×2 pt analysis for LSST Y1 and Y10 to investigate how modelling choices impact cosmological constraints. In particular, we explore the balance between model complexity and scale cuts, focusing on parameter degeneracies and baryonic feedback effects on the galaxy–matter and galaxy-galaxy power spectrum.

In this talk, I will show that a linear bias model delivers percent-level, unbiased constraints on Ω_m and σ_8 only up to $k_{\max} = 0.1 h/\text{Mpc}$, while pushing to smaller scales requires a perturbative approach. Comparing HEFT with a minimal bias variant with fixed higher-order terms, we find that the latter is unbiased in ΛCDM even at small scales.

We show that higher-order bias can closely mimic baryonic suppression, while baryonic effects cannot reproduce the full range of higher-order bias behaviour.

We also show that modelling choices significantly affect the precision of neutrino mass measurements. While a detection is possible for both Y1 and Y10 at $k \sim 0.3 h/\text{Mpc}$, the inferred value depends sensitively on the assumed model.

Other topic / keywords:

baryonic feedback, galaxy bias

Author: TRUTTERO, Ottavia (University of Edinburgh)

Presenter: TRUTTERO, Ottavia (University of Edinburgh)

Track Classification: Large-Scale Structure; Neutrinos; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Pretty standard forecast work. Nothing wrong with it but also not very exciting.)

Abstract rating 3

KUIJKEN, Koen: **Accept • 3.0** (agreed. how new is this?)

Abstract rating 3

Neutrinos:

Judgments: Positive

Reviews:

GERBINO, Martina: **Accept • 2.0** (We believe this abstract fits better in the LSS track; the score reflects this comment rather than the abstract content)

Abstract rating 2

Submitted by **TRUTTERO, Ottavia** <ottavia.truttero@ed.ac.uk> on **Monday, 27 April 2026**

Abstract ID : 127

The role of mergers shaping Halo Morphology

Content

We investigate the role of mergers in shaping the structural evolution of dark matter halos. Focusing on well-resolved halos in the mass range $10^{11.0}-10^{12.5} M_{\odot}/h$, we track their main progenitor branches across cosmic time. We find a clear evolutionary trend in halo morphology: halos that are oblate or triaxial at present predominantly originate from a prolate phase, while halos that are prolate today tend to remain prolate throughout their evolution. Additionally, we examine the clustering properties of halos classified by morphology. Despite constituting a smaller fraction of the population, oblate halos exhibit stronger clustering compared to both triaxial and prolate halos. These results highlight the connection between merger-driven evolution, halo shape, assembly bias and large-scale clustering.

Other topic / keywords:

Author: NANDA, Ayan (NISER, BHUBANESWAR, INDIA)

Co-author: Dr KHANDAI, NISHIKANTA

Presenter: NANDA, Ayan (NISER, BHUBANESWAR, INDIA)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (Probably more appropriate to the DM track halos) but link to assembly bias as well.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0**

Abstract rating 3

Submitted by **NANDA, Ayan** <ayannanda99@gmail.com> on **Monday, 27 April 2026**

Abstract ID : 128

Latest results from the South Pole Telescope

Content

The South Pole Telescope is a dedicated 10-meter cosmic microwave background (CMB) telescope at the Amundsen-Scott station in Antarctica, and its current receiver, SPT-3G, equipped with 16,000 detectors in three millimeter-wave bands, has been used to map large areas of the sky since 2017. The combination of large primary mirror and high detector count allows us to produce high-resolution, low-noise maps of the southern sky in temperature and polarisation. These data are rich in cosmological information and power an array of science cases, such as primary CMB anisotropies, secondary CMB anisotropies (including lensing), cluster cosmology, astrophysical sources, and Galactic science. In this talk, I present an overview of the latest SPT-3G results, with a focus on the cosmological analysis of CMB temperature, polarisation, and lensing power spectra derived from two years of observations of a 1500 square degree field. I give an overview of analyses in progress that use data of up to 25% of the sky and discuss the future of the telescope.

Other topic / keywords:

Author: BALKENHOL, Lennart

Presenter: BALKENHOL, Lennart

Track Classification: Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Submitted by **BALKENHOL, Lennart** <lennart.balkenhol@iap.fr> on **Monday, 27 April 2026**

Abstract ID : 129

Open EFT for thermal inflation

Content

We introduce thermal equilibrium condition in open EFT of inflation, and use this framework to explore the phenomenological aspects of thermal inflation. This talk includes three parts:

1. the dynamical KMS condition for open EFT of inflation and non-perturbative Green functions, including comparison with thermal field theory in de Sitter spacetime
2. The equilibrium constraints on EFT parameters, power counting and scalar power spectrum/non-Gaussianity
3. Discussion on UV models of thermal inflation and top-down open EFT

Other topic / keywords:

Author: YU, Wenqi (IAS, HKUST)

Co-authors: COLAS, Thomas (DAMTP - University of Cambridge); FONG, Ching (Hong University of Science and Technology); TONG, Xi (University of Cambridge)

Presenter: YU, Wenqi (IAS, HKUST)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

Submitted by **YU, Wenqi** <wyuaz@connect.ust.hk> on **Monday, 27 April 2026**

Abstract ID : 130

Stochastic Effects Beyond Inflation

Content

I explore the extension of the stochastic formalism to non-inflationary early-universe scenarios, focusing on bouncing cosmologies with exponential scalar-field potentials. The framework is formulated directly in phase space, enabling a unified description across classical contraction and the bounce. I outline the conceptual and technical challenges involved in applying stochastic methods beyond inflation and discuss the consistency requirements that must be addressed in this setting.

Other topic / keywords:

stochastic effects, early universe, bounce

Author: MIRANDA, Tays (Ecole Normale Supérieure)

Presenter: MIRANDA, Tays (Ecole Normale Supérieure)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **MIRANDA, Tays** <tays.miranda@phys.ens.fr> on **Monday, 27 April 2026**

Abstract ID : 131

The Effect of QSOs on Cosmological Parameter Estimates Using the Lyman- α Forest

Content

The Lyman- α forest provides constraints on cosmological models on both small spatial scales and large. Because the Ly α forest traces ionized intergalactic hydrogen, its statistical signatures are sensitive to both the metagalactic photoionization rate and the intergalactic gas temperature. The large-scale influence of QSO sources affects both of these. We show that QSO heating following photoionization induces uncertainties in the small scale power comparable to the difference in the signatures of weak dark matter vs cold dark matter, and so must be taken into account in constraints on warm dark matter particle masses. On Baryonic Acoustic Oscillation scales, the QSO contribution to the metagalactic photoionization rate induces excess power. While the effect is small at redshifts $z \sim 2.3$ as measured by eBOSS and DESI, we show the influence is expected to be detectable at $z > 3$, providing a novel means of constraining the mean lifetimes and beaming angles of QSOs.

Other topic / keywords:

intergalactic medium

Author: Prof. MEIKSIN, Avery (IfA, Edinburgh)

Presenter: Prof. MEIKSIN, Avery (IfA, Edinburgh)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 4.0** (Interesting new (?) idea.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 3.0** (real physics applied to Ly-alpha, from senior figure in the field)

Abstract rating 3

Submitted by **MEIKSIN, Avery** <aam@roe.ac.uk> on **Monday, 27 April 2026**

Abstract ID : 132

Gravitational Wave Signatures of $U(1)_X$ Breaking and Right-Handed Neutrino Dynamics

Content

Though the Standard Model of particle physics is incredibly successful, but it leaves several fundamental questions unanswered, including the origin of neutrino masses, the baryon asymmetry of the Universe, and the nature of dark matter. Motivated by these gaps, we investigate an extension of the SM with an additional local $U(1)_X$ gauge symmetry and a complex scalar singlet that spontaneously breaks this symmetry via its vacuum expectation value. The extended framework naturally accommodates three right-handed neutrinos (RHNs) to ensure anomaly cancellation and implements a type-I seesaw mechanism for active neutrino masses. We perform a detailed numerical analysis demonstrating consistency with current neutrino oscillation data, including predictions for the effective Majorana mass parameter relevant to neutrino-less double beta decay. Furthermore, we estimate the key parameters of the first-order phase transition and compute the resulting stochastic gravitational wave spectrum, demonstrating that it can lie within the reach of forthcoming experiments such as LISA, DECIGO, BBO, and the Einstein Telescope. The right-handed neutrinos also open a viable path for thermal leptogenesis, providing a unified link between neutrino mass generation, baryogenesis, and gravitational wave signatures. Our results demonstrate that this minimal $U(1)_X$ scenario remains a promising probe for physics beyond the Standard Model, accessible through upcoming gravitational wave and neutrino experiments.

Other topic / keywords:

Authors: Dr MOHANTA, Rukmani; Dr MISHRA, Priya; Dr CHAUDHURI, Arnab

Presenter: Dr MOHANTA, Rukmani

Track Classification: Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 3.0** (Better in early universe/inflation)

Abstract rating 3

MALHOTRA, Aameek: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **MOHANTA, Dr. Rukmani** <rmsp@uohyd.ac.in> on **Monday, 27 April 2026**

Abstract ID : 133

Gravitational Particle Production in Multifield Inflation Models

Content

There are subtleties associated with cosmological gravitational particle production in inflation models with more than one dynamical field. In the presentation I will discuss the formalism and provide some examples.

Other topic / keywords:

Author: KOLB, Edward (University of Chicago)

Co-authors: VERNER, Sarunas (University of Chicago); WANG, Jingyuan

Presenter: KOLB, Edward (University of Chicago)

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Mixed: Accept, Reject

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

COLE, Philippa: **Reject • 1.0**

Abstract rating 1

Submitted by **KOLB, Edward** <ekolb@uchicago.edu> on **Monday, 27 April 2026**

Abstract ID : 134

Probing Modified Gravity and Cosmological Models: Impact of Systematic Effects

Content

The combination of the data from upcoming large-scale structure surveys - such as Euclid and the Rubin Observatory Legacy Survey of Space and Time (LSST) - and CMB lensing experiments - like the Simons Observatory - offers a powerful tool to test deviations from Λ CDM. Yet, the robustness of these tests depends on our understanding of observational and astrophysical systematics. In this talk, I will present an investigation into the systematic effects that can have influence on the constraints on modified gravity models and dynamical dark energy scenarios. Specifically, I will focus on likelihood-based analyses and the biases introduced by photometric redshift errors in galaxy surveys, residuals of Galactic foregrounds in CMB anisotropy maps, and lensing magnification effect.

Other topic / keywords:

Modified Gravity, Cosmological Models, Photometric Error, Galactic Foreground Residuals, Magnification Bias

Author: SIEGMUND, Paweł (National Centre for Nuclear Research)

Co-author: BIELEWICZ, Paweł (NCBJ)

Presenter: SIEGMUND, Paweł (National Centre for Nuclear Research)

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Dark Energy / Modified Gravity; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

I would also like to ask if there is a possibility to apply for additional fundings or some wavers for students and if so what and how can I do it? Thank you for help in advance.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (for DE/MG session? Otherwise good topic.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 2.0** (Bit generic.)

Abstract rating 2

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 1.0** (Content vague and broad.)

Abstract rating 1

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 4.0**

Abstract rating 4

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **SIEGMUND, Paweł** <pawel.siegmund@ncbj.gov.pl> on **Monday, 27 April 2026**

Abstract ID : 135

Metric expansions close to an initial isotropic singularity in a Bianchi I space-time with kinetic matter

Content

Isotropic singularities are singularities which can be removed via a conformal rescaling which makes them attractive for physical and mathematical reasons to model the early universe. Ho Lee (Kyung Hee University), John Stalker (Trinity College Dublin) and Paul Tod (Oxford University) and myself have obtained metric expansions close to the initial singularity for Bianchi I solutions to the Einstein-Boltzmann system with a magnetic field. In the talk I will motivate the results and future applications.

Other topic / keywords:

Isotropic singularity, Einstein-Boltzmann, Einstein-Vlasov, kinetic matter, conformal gauge singularity, Bianchi I

Authors: LEE, Ho (Kyung Hee University); NUNGESSER, Ernesto (Universidad Politécnica de Madrid); STALKER, John (Trinity College Dublin); TOD, Paul (Oxford University)

Presenter: NUNGESSER, Ernesto (Universidad Politécnica de Madrid)

Track Classification: Primordial Magnetic Fields; Large-Scale Structure; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 2.0** (Not a good fit to LSS.)

Abstract rating 2

HILDEBRANDT, Hendrik: **Accept • 2.0** (Doesn't fit in LSS.)

Abstract rating 2

Submitted by NUNGESSER, Ernesto <em.nungesser@upm.es> on **Monday, 27 April 2026**

Abstract ID : 136

Anisotropic CMB spectral distortions from dark photon conversion

Content

The dark photon is the gauge boson of a hypothetical dark sector, representing a minimal extension to the Standard Model. This massive particle interacts with the visible photon through kinetic mixing and has been widely studied as a dark matter candidate. We consider a scenario in which an initially unpopulated dark sector is populated via photon–dark photon conversion prior to recombination, during the μ and early y distortion epochs. The associated energy transfer and change in photon number produce potentially observable distortions in the CMB spectrum. The monopole signal has previously been computed and compared with COBE/FIRAS data to constrain model parameters. Here, we extend this framework to the anisotropic case, including perturbations and higher multipoles, using the recently developed Frequency Hierarchy system. The resulting power spectra can be directly compared with data from the Atacama Cosmology Telescope and Planck, enabling observational constraints on dark photon parameters from spectral distortions for the first time, as I explain in this talk.

Other topic / keywords:

CMB spectral distortions

Author: EVANGELISTA, Sara (University of Manchester)

Co-authors: Prof. CHLUBA, Jens (University of Manchester); Dr CYR, Bryce (MIT)

Presenter: EVANGELISTA, Sara (University of Manchester)

Track Classification: Dark Matter; Cosmic Microwave Background; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **EVANGELISTA, Sara** <sara.evangelista@postgrad.manchester.ac.uk> on **Monday, 27 April 2026**

Abstract ID : 137

Hidden Gravitons: From Dark Matter Candidates to Gravitational Wave Oscillations

Content

Massive spin-2 fields naturally arise in various extensions of General Relativity, including massive bigravity and Kaluza-Klein models. This presentation explores the observational signatures of these hidden gravitons that can work as dark matter. In particular, we pay attention to the phenomenology associated with the propagation of gravitational waves. Within a phenomenological framework, we model the interaction between massless and massive tensor modes, leading to an oscillation phenomenon.

Other topic / keywords:

Massive Spin-2 Fields, Gravitational Wave Oscillations, Dark Matter Candidates

Authors: Prof. CEMBRANOS, Jose; CENDAL, Alvaro; VILLARRUBIA-ROJO, Hector

Presenter: Prof. CEMBRANOS, Jose

Track Classification: Dark Matter; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

MALHOTRA, Aameek: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **Prof. CEMBRANOS, Jose** <cembra@ucm.es> on **Monday, 27 April 2026**

Abstract ID : 138

DESI results and time dependent Dark Energy from the QCD topological sectors

Content

We present a physically motivated dark-energy (DE) model rooted in the topological structure of the Quantum ChromoDynamic (QCD) vacuum. In this framework, which is coined as QCD-DE, the dark energy arises from the difference between the vacuum energy of an expanding FLRW universe and Minkowski spacetime, induced by tunnelling transitions between the QCD topological sectors. There are no any new degrees of freedom here as entire framework is based on standard model physics. The Equation of State $w_{DE}(z)$ in QCD-DE model depends on time and crosses the line $w_{DE} = -1$ at $z \sim 1$ which is consistent with recent DESI results. We argue that the vacuum energy and the de Sitter phase in QCD-DE emerges dynamically with the scale $\rho_{DE} \approx H\Lambda_{QCD}^3 \approx (10^{-3}eV)^4$, which is amazingly close to the observed value without introducing any new parameters.

We consider pairwise and triplet combinations of CMB, BAO and SNIa datasets for Λ CDM, w_0w_a CDM and the QCD-DE models. We argue that the QCD-DE model is preferred by Bayesian evidence in comparison with Λ CDM, w_0w_a CDM models (this part of the work is still in progress, to be posted soon).

Other topic / keywords:

Author: Prof. ZHITNITSKY, Ariel (University of British Columbia)

Presenter: Prof. ZHITNITSKY, Ariel (University of British Columbia)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Comments:

I request double time for my talk as I will briefly overview the previous computations with Hubble being constant (pure de Sitter) and new computations as collaborating work with cosmology people, as described in the last paragraph of abstract (to be posted soon).

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

GLAVAN, Dražen: **Accept: Talk • 2.0**

Abstract rating 2

Submitted by **ZHITNITSKY, Ariel** <arz@phas.ubc.ca> on **Monday, 27 April 2026**

Abstract ID : 139

The Glow of Axion Quark Nugget Dark Matter: CMB Spectral and Anisotropy Signatures

Content

I would like to present a talk on the impact of early Universe energy injection on the Cosmic Microwave Background (CMB), with a focus on spectral distortions and anisotropies, using Axion Quark Nuggets (AQNs) as a concrete dark matter scenario.

In this work, I investigate how interactions between dark matter and baryons can lead to energy injection before recombination, and how this affects key cosmological observables. Using a modified version of the CLASS Boltzmann code, I compute the resulting μ - and y -type spectral distortions, as well as the impact on the ionization history and primary CMB anisotropies.

I will show that while the CMB anisotropy power spectra remain largely unchanged and consistent with current observational constraints, the spectral distortion signal can be significantly enhanced. In particular, the AQN scenario produces a distinctive μ -type distortion that could lie within the sensitivity of upcoming missions.

This combination, minimal impact on anisotropies alongside potentially detectable spectral distortions, provides a clear and testable observational signature. It also illustrates how spectral distortions offer a powerful and complementary probe of early Universe physics beyond what can be inferred from anisotropies alone.

Overall, this talk aims to highlight both the role of spectral distortions as a sensitive cosmological probe and the potential of the AQN framework as a viable and observationally testable dark matter candidate.

This work is available on arXiv: 2512.05401

Other topic / keywords:

Spectral Distortions

Author: MAJIDI, Fereshteh (University of British Columbia)

Presenter: MAJIDI, Fereshteh (University of British Columbia)

Track Classification: Large-Scale Structure; Dark Matter; Cosmic Microwave Background; Early Universe

Contribution Type: Talk

Comments:

I would be very grateful for the opportunity to present this work as a contributed talk.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:**Judgments:** Positive**Reviews:**KUIJKEN, Koen: **Accept • 3.0** (not really for LSS track.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 4.0**

Abstract rating 4

Submitted by **MAJIDI, Fereshteh** <fereshtemajidi@phas.ubc.ca> on **Monday, 27 April 2026**

Abstract ID : 140

Probing Effects of Feedback using the Cross-correlation of tSZ and CMB lensing maps from the South Pole Telescope

Content

The thermal Sunyaev-Zeldovich (tSZ) effect and gravitational lensing of the cosmic microwave background (CMB) are powerful and complementary probes of cosmic structure formation: the former traces baryonic gas in galaxy clusters via Compton scattering, while the latter captures gravitational deflection by large-scale structure. Their cross-correlation constrains the relationship between baryonic gas and matter distribution across a broad range of redshifts, offering a window into baryonic feedback processes.

I present measurements of the tSZ–CMB lensing cross-correlation using maps from the South Pole Telescope over a 100 square-degree patch of the sky. I describe our approach to measuring the tSZ–CMB lensing cross-spectrum, including treatments of key systematic effects and mitigation strategies. I then outline our methodology for modeling of the signal, and the framework for parameter inference. Finally, I discuss the implications of this measurement for baryonic feedback models.

Other topic / keywords:

Authors: Dr RAGHUNATHAN, Srinivasan (UC Davis); SILVA OLIVEIRA, Ana Carolina (California Institute of Technology); Prof. WU, W.L. Kimmy (California Institute of Technology)

Presenter: SILVA OLIVEIRA, Ana Carolina (California Institute of Technology)

Track Classification: Large-Scale Structure; Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 4.0** (Relevant analysis on state-of-the-art data.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 4.0** (important constraints in baryons/feedback. Would fit well in CMB session too though.)

Abstract rating 4

Submitted by **SILVA OLIVEIRA, Ana Carolina** <anacarol19339@gmail.com> on **Monday, 27 April 2026**

Abstract ID : 141

Phantom-Crossing Dark Energy and the Ω_m Tug-of-War

Content

Recent analyses combining data from the cosmic microwave background (CMB), baryon acoustic oscillations (BAO), and Type Ia supernovae (SN) have revealed a tentative observational preference for phantom crossing in the dark energy equation of state w . We argue that this preference is a natural consequence of the Ω_m tensions that arise when these datasets are individually fit to Λ CDM, specifically because of the ordering $\Omega_m^{\text{BAO}} < \Omega_m^{\text{CMB}} < \Omega_m^{\text{SN}}$. We show both theoretically and empirically that models with phantom crossing can shift all of these inferred Ω_m values toward mutual alignment. In contrast, quintessence theories restricted to $w \geq -1$ can alleviate the tensions with SN data but only at the cost of exacerbating the BAO-CMB discrepancy. We therefore conclude that it is the BAO and CMB measurements—not the SN data—that drive the preference for phantom crossing over quintessence in joint analyses. Moreover, we point out that SN data exhibit greater tensions with the other datasets when fit to phantom-crossing models than when fit to quintessence, causing the preference for phantom crossing to be weaker in joint CMB+BAO+SN analyses than in analyses of CMB+BAO data alone.

Other topic / keywords:

Author: SHLIVKO, David

Co-author: Dr POULIN, Vivian (LUPM, CNRS & U. de Montpellier, France)

Presenter: SHLIVKO, David

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 5.0**

Abstract rating 5

GLAVAN, Dražen: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **SHLIVKO, David** <dshlivko@gmail.com> on **Monday, 27 April 2026**

Abstract ID : 142

Constraining the lensing dispersion from the angular clustering of binary black hole mergers

Content

Gravitational waves from inspiraling compact binaries provide direct measurements of luminosity distances and serve as a powerful probe of the high-redshift Universe. In addition to their role as standard sirens, they offer an opportunity to constrain small-scale density fluctuations through the dispersion in the distance-redshift relation induced by gravitational lensing. In this symposium, we propose a method to constrain this lensing dispersion without requiring redshift information by analyzing the angular clustering of gravitational-wave sources. Our formalism, which incorporates second-order lensing effects in the luminosity distance, shows that the amplitude of the auto-correlation angular clustering decreases with increasing lensing dispersion. While we demonstrate that the auto-correlation signal is detectable with sufficient signal-to-noise ratios in future gravitational wave experiments, a strong degeneracy exists between the lensing dispersion and the linear bias of gravitational wave sources. We demonstrate that this degeneracy is partially broken by a joint analysis of the autocorrelation of gravitational wave sources and the cross-correlation with galaxies whose redshifts are known.

Other topic / keywords:

Dark matter, Gravitational lenses, Gravitational wave sources, Gravitational waves

Author: CHUMAN, Fumihiko (Chiba University)

Presenter: CHUMAN, Fumihiko (Chiba University)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 4.0** (Interesting idea that is still quite far away (I guess). Still worth being presented.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 3.0** (early days but nice idea)

Abstract rating 3

Submitted by **CHUMAN, Fumihiro** <fschumann@chiba-u.jp> on **Tuesday, 28 April 2026**

Abstract ID : 143

Black Hole QNMs in external tidal fields

Content

Future gravitational-wave observatories, including next-generation ground-based detectors and LISA, will enable precision measurements of black hole quasi-normal mode frequencies. In realistic astrophysical settings, however, black holes are not perfectly isolated: surrounding environments, for example stars or dark matter, can source external tidal fields that deform the QNM spectrum. In this talk, I will present a general perturbative framework to compute these frequency shifts at linear order, providing a systematic description of how weak external fields modify black hole ringdown. I will discuss the resulting phenomenology, including the breaking of isospectrality and other observable signatures relevant for black hole spectroscopy. As a nontrivial validation of the formalism, I will show that it successfully reproduces the known QNM spectrum of slowly rotating Kerr black holes. I will conclude with remarks on spectral instabilities from an exact WKB perspective, and the extent to which they affect the robustness of our perturbative predictions.

Other topic / keywords:

Ringdown, quasi-normal modes, black hole spectroscopy

Authors: BUCCIOTTI, Bruno (Arizona State University); Prof. HUI, Lam (Columbia University)

Presenter: BUCCIOTTI, Bruno (Arizona State University)

Track Classification: Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Aameek: **Accept: Talk • 5.0**

Abstract rating 5

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **BUCCIOTTI, Bruno** <bbucciot@asu.edu> on **Tuesday, 28 April 2026**

Abstract ID : 144

Charge distribution of Q-balls and cosmological implications

Content

We perform three-dimensional lattice simulations to investigate the formation of gauge-mediation type Q-balls. For the first time, we obtain their broad charge distribution of the Q ball of this type. We then discuss the cosmological and astrophysical implications of this broad distribution. In particular, we study the formation of primordial black holes (PBHs) induced by Q-balls. We find that the resulting density perturbations can be sufficiently large to produce an abundant population of PBHs with masses in the range $10^{-15}M_{\odot} - 5 \times 10^{-12}M_{\odot}$, which can account for all of the dark matter in the universe.

Other topic / keywords:

Author: Dr KAWASAKI, Masahiro (University of Tokyo)

Presenter: Dr KAWASAKI, Masahiro (University of Tokyo)

Track Classification: Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **KAWASAKI, Masahiro** <gravitino.axion@gmail.com> on **Tuesday, 28 April 2026**

Abstract ID : 145

On the road for cosmology with Type I Supernovae from the Zwicky Transient Facility

Content

The Zwicky Transient Facility (ZTF) is scanning the Northern sky since 2018 with a 1.2 m class telescope installed at the Mont Palomar Observatory. This survey detects any transient in the nearby Universe within its magnitude limit, typically up to a redshift of 0.15. In February 2025, the Cosmology working group has released a set of more than 3600 Type Ia supernovae (SN Ia) corresponding to the first phase (2018-2020). This unprecedented SN Ia data sample – about 10 times more than the current compilation at low-redshift – allows to develop new cosmological analysis in the same spirit than the historical probe leading to the discovery of the accelerated expansion of the Universe. The talk will present the main characteristics of this new SN Ia data set focusing on their standardization to be used as distance indicator. The cosmological perspectives will be discussed as well to emphasize the game changer that can bring ZTF in particular for the Dark Energy measurement in a very near future.

Other topic / keywords:

Author: ROSNET, Philippe (LPCA, Université Clermont Auvergne & CNRS/IN2P3)

Presenter: ROSNET, Philippe (LPCA, Université Clermont Auvergne & CNRS/IN2P3)

Track Classification: Large-Scale Structure; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 4.0** (ZTF is not something one hears too often about in a cosmological context. Not sure this fits in LSS, but I'd certainly like to hear where this is complementary.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 3.0** (New data so interesting, but for DE session? Not LSS)

Abstract rating 3

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 5.0** (I believe this talk might be of interest to people from multiple tracks.)

Abstract rating 5

GLAVAN, Dražen: **Accept: Talk • 5.0** (Also appropriate for a plenary talk.)

Abstract rating 5

Submitted by **ROSNET, Philippe** <philippe.rosnet@clermont.in2p3.fr> on **Tuesday, 28 April 2026**

Abstract ID : 146

Cosmological inference with halo clustering reconstructed from the redshift-space galaxy distribution

Content

Accurate modeling of small-scale redshift-space clustering is crucial for full-shape RSD analyses, where satellite galaxies contribute to 1-halo terms and Finger-of-God distortions. We investigate halo reconstruction based on the cylinder grouping (CG) method of Okumura et al. (2017), which selects an effective halo center tracer from the observed galaxy distribution, and assess its impact on cosmological parameter inference. Using DESI-like luminous red galaxy mock catalogs from the AbacusSummit simulations at $z = 1.1$, we perform effective field theory (EFT)-based full-shape modeling of the power spectrum of the reconstructed-halo sample.

We show that the dominant reconstruction-induced systematics can be described and incorporated within the standard EFT framework. In particular, a simple multipole-dependent rescaling inferred directly from the data on large scales captures the dominant effect, while residual small-scale changes are absorbed by the standard counterterm and stochastic sectors, without introducing additional reconstruction-specific parameters. The reconstructed-halo sample yields unbiased constraints on cosmological parameters, including the growth rate $f\sigma_8$ and Alcock-Paczynski parameters. Compared to the galaxy sample, it enables both improved robustness and increased statistical precision: the inferred $f\sigma_8$ remains stable when extending the fit beyond $k_{\max} \simeq 0.2 h \text{ Mpc}^{-1}$, with its uncertainty reduced by more than 20%.

Other topic / keywords:

Author: HADA, Ryuichiro (Academia Sinica Institute of Astronomy and Astrophysics)

Co-author: OKUMURA, Teppei (Academia Sinica Institute of Astronomy and Astrophysics)

Presenter: HADA, Ryuichiro (Academia Sinica Institute of Astronomy and Astrophysics)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Comments:

This work has been submitted for publication and is available on arXiv:2604.11694.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Technical topic for a somewhat limited audience (I guess), but still relevant.)

Abstract rating 3

KUIJKEN, Koen: **Accept: Talk • 4.0** (extension of EFT to redshift space, very useful)

Abstract rating 4

Submitted by **HADA, Ryuichiro** <rhada@asiaa.sinica.edu.tw> on **Tuesday, 28 April 2026**

Abstract ID : 147

Is Gaussian good enough? Likelihoods for cosmological two-point functions

Content

Two-point correlation functions are a standard tool in cosmology. However, their estimators have intrinsically non-Gaussian likelihoods, even for perfectly Gaussian random fields. This non-Gaussianity is most evident on the large scales targeted by stage-IV weak lensing surveys. We present a framework for computing exact correlation-function likelihoods for the masked spin-2 fields of cosmic shear. These likelihood distributions show significant skewness and can systematically shift parameter inferences. We provide exact solutions for the one-dimensional marginals and introduce a Gaussian copula model that efficiently captures the dependencies in high-dimensional correlation-function data and which can straightforwardly be used in Bayesian analyses. Copula-based approaches open a path to flexible, accurate likelihood modeling not only for weak lensing but for a wider range of cosmological probes. More generally, our results illustrate how both correlation structure and likelihood shape impact posterior constraints, highlighting the need for careful modeling of non-Gaussian likelihoods.

Other topic / keywords:

Author: OEHL, Veronika

Presenter: OEHL, Veronika

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (Better suited to stats/methods section)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (Yes, better suited for stats/methods.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 4.0** (Non-Gaussian likelihood via copula.)

Abstract rating 4

Submitted by **OEHL, Veronika** <veohl@phys.ethz.ch> on **Tuesday, 28 April 2026**

Abstract ID : 148

SWIM: A Complete Numerical Framework for Assessing Warm Inflation Models

Content

Warm inflation (WI) modifies the generation of primordial perturbations through dissipative dynamics and thermal fluctuations, making their accurate computation inherently challenging. Existing approaches typically rely on semi-analytical approximations in which the scalar power spectrum is expressed through a correction factor $G(Q)$ that depends only on the dissipation ratio Q . We present a C++ and Python based code, SWIM (Stochastic Warm Inflation Module), that is a numerical framework that computes the Warm Inflationary primordial power spectrum directly by solving the coupled stochastic perturbation equations, and yields the $G(Q)$ factor as well as the semi-analytical power spectrum in numerical form suitable for parameter inference. However, our analysis shows that the correction factor $G(Q)$ can depend non-trivially on additional model parameters, including the potential normalization and relativistic degrees of freedom of the radiation bath, even within the same class of WI models. This previously unaccounted parameter dependence leads to discrepancies between semi-analytical and numerical predictions in certain regimes, and introduces a source of systematic bias in parameter inference when semi-analytical approaches are used. These findings highlight a limitation of widely used approximation schemes in WI and motivate the use of full numerical power spectra in data-driven analyses for WI models. SWIM further interfaces with inference pipelines such as Cobaya and incorporates an on-the-fly surrogate emulator based on Random Forest Regression, trained dynamically in high-likelihood regions to enable efficient parameter inference while simultaneously constructing a surrogate model of the numerical solver. This trained model can subsequently be used for more detailed parameter inference and analysis. Thus, SWIM offers a complete numerical framework for analysis of any Warm Inflation model. While developed in the context of WI, this strategy is applicable more broadly to cosmological problems involving expensive numerical computations.

arXiv:2604.24654

Other topic / keywords:

Warm Inflation, Primordial Power Spectrum, Numerical Methods, Parameter Inference, Machine Learning

Authors: DAS, Suratna; KUMAR, Umang (Ashoka University)

Presenter: KUMAR, Umang (Ashoka University)

Track Classification: Inflation / Primordial Perturbations; Early Universe; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Mixed: Proposed for other tracks: Others (Please specify below)

Reviews:

SELLENTIN, Elena: **Change track • 1.0** (Indicated all tracks. Not sure. In methods, I'd give it a 1. Maybe higher score in other tracks.)

Abstract rating 1

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **KUMAR, Umang** <umang.kumar_phd21@ashoka.edu.in > on **Tuesday, 28 April 2026**

Abstract ID : 149

Identification of Wave-optics Lensed Gravitational Waves with Residual Cross-correlation from GWTC-4 events

Content

The lensing of Gravitational Waves (GWs) due to intervening matter distribution in the universe can lead to chromatic signatures in the wave-optics limit. The reliance of the lens mass distribution modelling makes detection of lensed GWs challenging. Hence to detect lensed GWs in a model-independent way, we develop the wave-optics lensing search technique called mu-GLANCE and deploy it on the GW events observed up to the fourth observation catalog GWTC-4 of LIGO-Virgo-KAGRA. The method tests residual strain for correlated features across the detector network via cross-correlation and infers lensing-induced modulations with a Bayesian framework as a double-check. The unmodelled search picks up one plausible candidate GW190408 with a 3.1 sigma deviation from pure detector noise. However, exploring the wave-optics lensing modulation signatures on this event, we do not find any conclusive evidence of the wave-optics feature at 95% confidence level. We also test the recently discovered gravitational wave event, GW231123, known for its massive black hole components. It is hypothesized to be gravitationally lensed, but our analysis finds no strong evidence for its lensing, with a signal varying from 1.4 sigma to 7.2 sigma across various waveform models. However, we find that waveform systematics for such heavy binary systems are sufficiently large to shadow the lensing signatures in short-duration signals (0.2s) like GW231123, preventing any definitive claim of lensing at this stage. We confidently rule out the presence of any statistically significant wave-optics lensing signal in the events up to GWTC-4.

Other topic / keywords:

Wave-optics lensing, Gravitational waves, Gravitational waves: sources

Author: CHAKRABORTY, Aniruddha (TIFR Mumbai)

Co-author: MUKHERJEE, Suvodip (TIFR, Mumbai)

Presenter: CHAKRABORTY, Aniruddha (TIFR Mumbai)

Track Classification: Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Ameet: **Accept: Talk • 5.0**

Abstract rating 5

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **CHAKRABORTY, Aniruddha** <chakrabortyaniruddhaindia@gmail.com> on **Tuesday, 28 April 2026**

Abstract ID : 150

Schwinger effect in axion inflation

Content

Axions are well-motivated pseudoscalar fields that arise in many extensions of the Standard Model and can drive inflation. In scenarios where an axion couples to a gauge sector during inflation, the rolling field can lead to exponential amplification of gauge-field fluctuations, with important implications for particle production, reheating dynamics, primordial gravitational wave signatures, and primordial magnetic fields.

In this talk, I will review recent progress in axion inflation with Abelian and non-Abelian gauge fields. Particularly, I will discuss the first lattice simulations of axion inflation that include the Schwinger effect, i.e. the nonperturbative production of charged particle-antiparticle pairs in the presence of strong gauge fields. I will show that Schwinger production can strongly quench gauge-field growth, making efficient gauge preheating ineffective and significantly suppressing primordial gravitational wave production. These results demonstrate that the Schwinger effect is a crucial ingredient in realistic scenarios of axion inflation with gauge fields, with important implications for both reheating dynamics and observational predictions.

Other topic / keywords:

inflation, axion, gravitational waves, gauge fields, reheating, early universe

Author: IARYGINA, Oksana (Nordita)

Presenter: IARYGINA, Oksana (Nordita)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

COLE, Philippa: **Accept: Talk • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **IARYGINA, Oksana** <oksana.iarygina@su.se> on **Tuesday, 28 April 2026**

Abstract ID : 151

A Minimal Axio-dilaton Dark Sector

Content

Axio-dilaton models provide a well-motivated minimal class of models for which self-interactions can be explored. This minimal model can successfully describe both Dark Matter and Dark Energy. The axion is the Dark Matter and the dilaton is the Dark Energy —and that they robustly predict several new phenomena for the CMB and structure formation that can be sought in observations. These include specific types of Dark Energy evolution and small space- and time-dependent changes to particle masses post-recombination that alter the Integrated Sachs-Wolfe effect, cause small changes to structure growth and more.

Other topic / keywords:

Author: DAVIS, Anne

Presenter: DAVIS, Anne

Track Classification: Dark Matter; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 5.0**

Abstract rating 5

GLAVAN, Dražen: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **DAVIS, Anne** <acd@damp.cam.ac.uk> on **Tuesday, 28 April 2026**

Abstract ID : 152

Cosmology with ACT DR6

Content

I present power spectra of the cosmic microwave background (CMB) anisotropy in temperature and polarization, and the most recent constraints on cosmology from these, as measured from the Data Release 6 (DR6) of the Atacama Cosmology Telescope (ACT) data. ACT DR6 measures the CMB power spectra over a quarter of the sky in multiple bands in both temperature and polarization with arcminute resolution. We find that the ACT angular power spectra are well fit by the sum of CMB and foregrounds, where the CMB spectra are described by the Λ CDM model. Combining ACT with larger-scale Planck data, the joint P-ACT dataset provides tight limits on the ingredients, expansion rate, and initial conditions of the universe. We find similar constraining power, and consistent results, from either the Planck power spectra or from ACT combined with WMAP data, as well as from either temperature or polarization in the joint P-ACT dataset. We use these new cosmic microwave background measurements to test foundational assumptions of the standard cosmological model, Λ CDM, and set constraints on extensions to it. We derive constraints from the ACT DR6 power spectra alone, as well as in combination with legacy data from the Planck mission, measurements of the CMB lensing from ACT and Planck, baryon acoustic oscillation measurements, and supernovae data. Together, these measurements provide the newest, tightest constraints on the Λ CDM model and a broad range of extensions.

Other topic / keywords:

Author: JENSE, Hidde (Cardiff University)

Presenter: JENSE, Hidde (Cardiff University)

Track Classification: Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Submitted by **JENSE, Hidde** <jenseh@cardiff.ac.uk> on **Tuesday, 28 April 2026**

Abstract ID : 153

Stochastic inflation: typical assumptions and their validity.

Content

Stochastic inflation provides a powerful framework for studying inflaton fluctuations in a non-perturbative regime. However, to make the problem tractable, the formalism relies on a number of simplifying assumptions. In this talk, I will explore these assumptions, focusing in particular on the construction of the noise terms, which are typically taken to be white and Markovian. I will then discuss how these assumptions emerge within standard perturbation theory, compare the two approaches, and explore the physical consequences that follow from the standard treatment of noise in stochastic inflation.

Other topic / keywords:

Author: CRUCES MATEO, Diego (Institute of Theoretical Physics - Chinese Academy of Sciences (ITP,CAS))

Presenter: CRUCES MATEO, Diego (Institute of Theoretical Physics - Chinese Academy of Sciences (ITP,CAS))

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **CRUCES MATEO, Diego** <dcruces@itp.ac.cn> on **Tuesday, 28 April 2026**

Abstract ID : 154

The POLONAISE Dark Matter experiment in Leiden

Content

Quantum sensing has matured rapidly into a competitive platform for fundamental physics, and arrays of mechanical sensors are now positioned to test well-motivated dark matter scenarios long considered out of experimental reach. I will discuss POLONAISE, a magnetic-levitation experiment at Leiden University that re-purposes cryogenic vibration-isolation hardware originally developed for the Einstein Telescope Pathfinder as a direct dark matter detector. Using this platform, we have performed the first laboratory search for ultralight vector dark matter coupled to B-L with a magnetically levitated mass [Amaral et al., PRL 134, 251001 (2025)], setting a constraint of $g_{\text{B-L}} \lesssim 3 \times 10^{-21}$ near 10^{-13} eV/ c^2 and laying out a staged upgrade path projected to surpass MICROSCOPE and LIGO/Virgo. I will then present new results from our December 2025 data run searching for ultraheavy dark matter at 10^7 – 10^{11} GeV coupling to ordinary matter via a long-range force, in a regime not covered by existing direct-detection experiments. I will close with a discussion of other measurements we are pursuing with this technology and my outlook for this emerging interdisciplinary program.

Other topic / keywords:

Author: Prof. TUNNELL, Christopher (Rice University)

Co-authors: Dr AMARAL, Dorian (Rice University / Barcelona); LANGENDORFF, Jurriaan (Leiden); Prof. OOSTERKAMP, Tjerk (Leiden); Dr QIN, Juehang (Rice University); UITENBROEK, Dennis (Leiden)

Presenter: Prof. TUNNELL, Christopher (Rice University)

Track Classification: Dark Matter

Contribution Type: Talk

Comments:

It's a dark matter experiment physically in Leiden. Our prelim results have us leading for heavy DM searches. We want to present these results at Cosmo given it's in Leiden.

Work from Polonaise collaboration of my group (Rice University) and Tjerk Oosterkamp's group (Leiden)

Status: SUBMITTED

Submitted by **TUNNELL, Christopher** <cdt@rice.edu> on **Tuesday, 28 April 2026**

Abstract ID : 155

Quantum Imprints on Confinement: SU(N) Yang Mills Confinement PT at finite theta

Content

We analyze the impact of a finite theta angle on the first-order confinement PT in SU(N_c) Yang-Mills theory, where CP violation arises at $\theta = \pi$ due to the multibranch structure of the Yang-Mills vacuum. Using holography and lattice QCD inputs, we show that at finite θ , N_c , the supercooling regime of the metastable deconfined phase is reduced. We also study the interplay between the confinement PT and the production of domain walls, elaborating on their stability and potential for gravitational wave (GW) emission. Finally, we showcase the possibility of two distinct GW sources: one from the confinement PT and another from domain wall annihilation.

Other topic / keywords:

First Order Phase Transitions, Domain Walls.

Author: RAMBERG, Nicklas (SISSA)

Presenter: RAMBERG, Nicklas (SISSA)

Track Classification: Dark Matter; Early Universe; Gravitational Waves; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

MALHOTRA, Aameek: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **RAMBERG, Nicklas** <nramberg@sissa.it> on **Tuesday, 28 April 2026**

Abstract ID : 156

Adaptive emulation for next-generation cosmological inference

Content

The unprecedented precision of recent galaxy surveys and CMB experiments is transforming cosmology but at a cost. As modelling frameworks grow more sophisticated, the number of nuisance parameters has surged, while emerging tensions with the standard cosmological model motivate extensions in cosmological parameters as well. Combined with computationally expensive models, these developments make standard Bayesian sampling increasingly inefficient, especially for joint analyses, where the real constraining power lies.

To address this, we introduce an adaptive emulation framework that targets the high-likelihood regions of parameter space, dramatically accelerating inference without sacrificing accuracy. Built on the mature ecosystem of CosmoSIS and its extensive library of likelihoods, our approach integrates a novel sampling strategy designed to bypass key computational bottlenecks.

In this talk, I will showcase the performance of this method across multiple case studies, including analysis pipeline optimisation and multi-probe combinations. The aim is simple: make state-of-the-art cosmological inference faster, lighter, and less dependent on large HPC resources.

Other topic / keywords:

Author: TSEDRIK, Maria (University of Edinburgh)

Co-author: Dr ZUNTZ, Joe (University of Edinburgh)

Presenter: TSEDRIK, Maria (University of Edinburgh)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (always important to improve nuisance parameter treatment. Will be interesting.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (Yes, better suited for the methods session.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 4.0** (Smart. If it works well, it could solve many Euclid problems.)

Abstract rating 4

Submitted by **TSEDRIK, Maria** <tsedrikmaria@gmail.com> on **Tuesday, 28 April 2026**

Abstract ID : 157

Testing FLRW Without a Ruler: A Calibration-Free Null Test from Anisotropic BAO

Content

Baryon acoustic oscillation (BAO) measurements are a cornerstone of late-time cosmology, but their interpretation typically relies on assumptions about the sound horizon and a background model. We show that anisotropic BAO data alone already enable a direct, calibration-free test of the underlying geometry.

We derive an exact null relation for flat FLRW spacetime written entirely in terms of the observed shift parameters $\alpha_{\perp}(z)$ and $\alpha_{\parallel}(z)$, in which the dependence on the sound horizon cancels identically. This provides a model-independent consistency test of the distance–redshift relation. Applying the test to anisotropic BAO measurements from the Dark Energy Spectroscopic Instrument DR2 dataset, we find no evidence for deviations from flat FLRW within current uncertainties.

We also present a calibration-free reconstruction of the deceleration parameter $q(z)$ from the radial BAO sector, showing that anisotropic BAO data already contain direct kinematic information prior to any global fit. These results highlight the potential of BAO as internal consistency tests of the cosmological framework.

Other topic / keywords:

Model-independent cosmology; FLRW consistency tests; anisotropic BAO; calibration-free methods; geometric probes of the expansion history

Author: SAPONE, Domenico (Department of Physics, FCFM, University of Chile)

Presenter: SAPONE, Domenico (Department of Physics, FCFM, University of Chile)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (Sounds like an interesting short talk)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 3.0** (Is that the AP test? Well, would be interesting to hear.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Mixed: Proposed for other tracks: Others (Please specify below)

Reviews:

SELLENTIN, Elena: **Change track • 2.0** (Would be best for an “LSS track”.)

Abstract rating 2

Submitted by **SAPONE, Domenico** <domenico.sapone@uchile.cl> on **Tuesday, 28 April 2026**

Abstract ID : 158

Non-Linear Dynamics and Primordial Black Hole Formation during Kination

Content

The early universe may have experienced a kination epoch - a phase where a scalar field's kinetic energy dominates the expansion. In this talk, I will outline how scalar-field inhomogeneities during this era can trigger strong non-linear dynamics, and how these can collapse to form primordial black holes (PBHs). Based on numerical relativity simulations, I will show the conditions under which super-horizon perturbations grow non-perturbatively and the critical initial conditions for PBH formation. I will discuss how a non-standard background like kination opens new pathways for PBH formation and the cosmological implications.

Other topic / keywords:

Primordial Black Holes, Kination

Author: CHENG, Cheng (Center for Physical Sciences and Technology (FTMC))

Co-authors: GIANNADAKIS, Panagiotis (King's College London); HEURTIER, Lucien (King's College London); LIM, Eugene

Presenter: CHENG, Cheng (Center for Physical Sciences and Technology (FTMC))

Track Classification: Early Universe

Contribution Type: Talk

Comments:

If no talk slots are available, I would also like to be considered for a poster presentation slot.

Status: SUBMITTED

Track Reviews:

Early Universe:

Judgments: Positive

Reviews:

VAN DE VIS, Jorinde: **Accept • 4.0** (These simulations are difficult and important for the study of PBH, which is a popular topic, so it would be good to have a talk about them.)

Abstract rating 4

Submitted by **CHENG, Cheng** <cheng.cheng@ftmc.lt> on **Tuesday, 28 April 2026**

Abstract ID : 159

Combining CMB lensing, galaxy clustering, and cosmic shear with 2- and 3-point statistics

Content

The standard Λ CDM model has been remarkably successful, but it has recently being challenged by several tensions. The combination of galaxy surveys and CMB lensing is a powerful probe of the large-scale structure and a key tool for testing the Λ CDM model in the era of next-generation experiments. Upcoming galaxy surveys such as the Legacy Survey of Space and Time (LSST) and Euclid, together with CMB experiments such as the Simons Observatory (SO) and LiteBIRD, will dramatically improve the volume of available data. This will enable not only tighter constraints from two-point statistics, but also high signal-to-noise measurements of higher-order statistics such as the bispectrum, which captures non-Gaussian information. The combination of multiple probes (i.e. galaxy clustering, cosmic shear, and CMB lensing) additionally improves parameter constraints and helps break degeneracies. Recent studies have demonstrated the impact of joint power spectrum and bispectrum analyses for subsets of these probes. However, comprehensive studies with combined information from all three tracers are still missing. In this talk, I will discuss the improvement of constraints on cosmological parameters using angular power spectra and bispectra for all possible combinations of the tracers, following a tomographic approach. I will highlight the potential of multi-probe, higher-order analyses for fully exploiting upcoming survey data.

Other topic / keywords:

Author: PRINCIPI CAVATERRA, Nicola (Narodowe Centrum Badań Jądrowych (NCBJ))

Presenter: PRINCIPI CAVATERRA, Nicola (Narodowe Centrum Badań Jądrowych (NCBJ))

Track Classification: Large-Scale Structure; Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Sounds like an elaborate forecast. Not hugely exciting but could be included if there is space.)

Abstract rating 3

KUIJKEN, Koen: **Accept • 3.0** (agreed.)

Abstract rating 3

Submitted by **PRINCIPI CAVATERRA, Nicola** <nicola.principi@ncbj.gov.pl> on **Tuesday, 28 April 2026**

Abstract ID : 160

Addressing Cosmological Tensions with ML-Guided Modified-Gravity Searches

Content

Modifications of General Relativity have been widely studied to alleviate cosmological tensions. Most of these models lead to an effective strengthening of gravity and enhanced growth. However, the S8 tension - arising from weak-lensing observations that suggest less structure formation than predicted by Λ CDM - points to a different scenario.

In this talk, I will present a method to design stable modified gravity theories that reproduce a specific phenomenological trend in cosmological observations. This can be used to address the S8 tension and adapted to trends from Stage-IV surveys. Specifically, I will show how we can use machine learning processes to explore the space of Horndeski theories to find stable islands of weak gravity.

Other topic / keywords:

Author: THUMMEL, Linus (University of Edinburgh)

Presenter: THUMMEL, Linus (University of Edinburgh)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 4.0**

Abstract rating 4

GLAVAN, Dražen: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **THUMMEL, Linus** <linus.thummel@ed.ac.uk> on **Tuesday, 28 April 2026**

Abstract ID : 161

Phase Transition Effects in Axion Abundance and Phenomenology

Content

We study axion dynamics and relic abundance in first-order phase transitions, extending the bubble misalignment mechanism to a cosmological setting. In this setup, the axion mass turns on discontinuously inside expanding true vacuum bubbles. We perform lattice simulations of the axion field and identify two regimes. For fast transitions, the dynamics reduces to delayed misalignment, where the onset of oscillations is set by the percolation time. For slower transitions, bubble-induced spatial gradients reduce the effective oscillation amplitude inside bubbles. We construct a semi-analytic description that captures both regimes and reproduces the simulation results. We further quantify the impact on isocurvature perturbations, the small-scale power spectrum, and axion minicluster formation.

Other topic / keywords:

Authors: BALTABAY, Galymzhan (KBFI, Estonia); D'ERAMO, Francesco (University of Padua); VASKONEN, Ville (University of Padova)

Presenter: BALTABAY, Galymzhan (KBFI, Estonia)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **BALTABAY, Galymzhan** <galymzhan.baltabay@gmail.com> on **Tuesday, 28 April 2026**

Abstract ID : 162

Toward Robust LSST Cosmology: Data-Augmented Redshift Calibration and Efficient Marginalisation

Content

The unprecedented statistical power and imaging depth of the Vera C. Rubin Observatory's LSST will enable transformative tests of Λ CDM and the nature of dark matter and dark energy. Realising this potential hinges on accurately estimating ensemble redshift distributions and efficiently marginalising over their uncertainties.

I will present a new framework for photometric redshift calibration based on Self-Organising Maps (SOMs), which project the high-dimensional galaxy colour space onto a two-dimensional representation. This identifies regions poorly sampled by spectroscopy, which we then augment with synthetic galaxy catalogues to construct representative training sets. The method substantially reduces systematic biases for high-redshift galaxies, achieving sub-percent accuracy on the mean redshift for both Year 1 and Year 10 LSST configurations, while forward-modelling the dominant sources of systematic error —photometric noise, point-estimation bias, tomographic binning, and spectroscopic selection effects. Preliminary validation on early LSST DP1 data shows consistent performance, and a formal calibration analysis is in preparation for the upcoming DP2 release to support LSST analyses on galaxy-halo connections.

Using these simulated $n(z)$ ensembles, I show that conventional parametrisations —typically simple shifts along the redshift axis —can underestimate statistical uncertainties by up to an order of magnitude for galaxy clustering. To address this, I develop a data-driven approach based on a Variational Autoencoder (VAE) for non-linear dimensionality reduction, which outperforms standard PCA by compressing thousands of $n(z)$ realisations into a Gaussianised latent space of substantially lower dimension. Resampling this latent space under Gaussian priors enables faithful reconstruction of the full $n(z)$ covariance and accurate marginalisation within the cosmological likelihood. Cosmological forecasts on synthetic LSST data show that weak-lensing constraints are robust across marginalisation choices, whereas the combination with large-scale structure reveals that conventional methods overestimate the dark energy Figure-of-Merit by 20% —underscoring the necessity of this improved framework for unbiased precision cosmology. The pipeline is being integrated into the LSST-DESC inference infrastructure for collaboration-wide application.

Other topic / keywords:

Authors: Dr MOSKOWITZ, Irene (Rutgers University); ZHANG, Yun-Hao (Leiden University)

Co-authors: Prof. ASGARI, Marika (Newcastle University); Prof. CHISARI, Elisa (Utrecht University); Prof. GAWISER, Eric (Rutgers University); Prof. HEYMANS, Catherine (University of Edinburgh); Prof. HOEKSTRA, Henk (Leiden University); Prof. KUIJKEN, Konrad (Leiden University); Dr LI, Shun-Sheng (Stanford University); Dr RUIZ-ZAPATERO, Jaime (University College London); Dr YAN, Ziang (Nagoya University); Dr ZHANG, Tianqing (University of Pittsburgh); Prof. ZUNTZ, Joe (University of Edinburgh)

Presenter: ZHANG, Yun-Hao (Leiden University)

Track Classification: Large-Scale Structure; Dark Matter; Dark Energy / Modified Gravity; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

Associated publications:

Moskowitz et al. 2024, "Improving Photometric Redshift Estimates with Training Sample Augmentation", ApJL, DOI: 10.3847/2041-8213/ad4039.

Zhang et al. 2025, "Improved photometric redshift estimations through self-organizing map-based data augmentation", MNRAS, DOI: 10.1093/mnras/staf2226.

Zhang et al. 2026a, Improved photometric redshift estimations through self-organizing map-based data augmentation: application to LSST redshift distributions, in preparation —currently under LSST-DESC internal review.

Zhang et al. 2026b, "Efficient marginalisation of tomographic redshift uncertainties for LSST cosmology using variational auto-encoders", in preparation —expected completion ahead of COSMO-26.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (conflicted)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 5.0** (Also happy to have this in the LSS session.)

Abstract rating 5

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 3.0** (Redshifts via SOM, somewhat incremental in improvements, but wide audience.)

Abstract rating 3

Submitted by **ZHANG, Yun-Hao** <yunhaozhang@strw.leidenuniv.nl> on **Tuesday, 28 April 2026**

Abstract ID : 163

Cosmology from the cross-correlation of CMB lensing from ACT-DR6 and galaxy shear from DES-Y3

Content

We cross-correlate measurements of lensing from two sources: the Cosmic Microwave Background (CMB) from the Atacama Cosmology Telescope (ACT)'s DR6, and galaxy shear from the Dark Energy Survey (DES) Y3. This presents the highest signal-to-noise measurement of its kind to date with a value of ~ 17.5 , marking a significant improvement from the previous value of 7.1 made using ACT-DR4. This combination is most sensitive to the amount of matter clustering in the Universe, $S_8 = \sigma_8(\Omega_m/0.3)^{0.5}$, providing a 4.8% measurement. CMB lensing cross-correlations with galaxy shear surveys are a powerful tool for studying structure evolution across a different redshift range to each probe individually, as well as constraining various astrophysical and systematic effects which affect each survey. Here we also constrain baryonic feedback, an important astrophysical effect that impacts the distribution of matter surrounding galaxies, through the one-parameter effective model A_{mod} . The galaxy systematics we calibrate include the multiplicative shear bias, photometric redshift uncertainty, and intrinsic galaxy alignments. We also develop and implement our analysis within the Simons Observatory Likelihood and Theories framework (SOLikeT), in order to prepare for future analyses both with DES-Y6 and Stage IV surveys (e.g. combining SO with Rubin/LSST).

Other topic / keywords:

Author: DESAI, Sunaina (Cardiff University)

Presenter: DESAI, Sunaina (Cardiff University)

Track Classification: Large-Scale Structure; Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (new results)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0** (Great to hear ACT-DR6 results!)

Abstract rating 5

Submitted by **DESAI, Sunaina** <desais5@cardiff.ac.uk> on **Tuesday, 28 April 2026**

Abstract ID : 164

A Tensorised Analytic Framework for Fast, Differentiable Lensing Angular Power Spectra

Content

Weak gravitational lensing is now one of the most powerful probes of cosmological parameters and the nature of dark matter and dark energy. Stage-IV analyses will require rapid evaluation of summary statistics across wide angular scales and many tomographic bins, to sample efficiently the high-dimensional parameter spaces of modern likelihoods.

I will present a new mathematical framework that accelerates cosmological inference by recasting nested line-of-sight integrals as tensor operations. Approximating the matter power spectrum, kernel functions, and scale factors as piecewise linear functions of comoving distance allows each segment of the integral to be solved analytically, yielding a compact expression for the lensing angular power spectrum as a contraction between a cosmology-dependent coefficient tensor and the survey-specific tomographic redshift distributions, on which the dependence is quadratic. Validation against the Core Cosmology Library (CCL; Chisari et al. 2019) confirms sub-percent accuracy across all relevant scales and tomographic configurations.

This factorisation is naturally suited to emulation: I train neural-network emulators that map cosmological parameters directly to the coefficient tensors, bypassing intermediate Boltzmann-code evaluations. On a realistic LSST 3×2 pt data vector, the combined framework delivers an order-of-magnitude speed-up over standard pipelines under representative Stage-IV conditions, with further acceleration from a JAX implementation that enables automatic differentiation and seamless CPU/GPU parallelisation.

The quadratic dependence on $n(z)$ further enables fully analytic marginalisation over redshift-distribution uncertainties—directly addressing one of the dominant nuisance-parameter bottlenecks in Stage-IV inference. More broadly, this work establishes a foundation for fast, scalable, differentiable cosmological inference tools, with natural extensions to curved-spacetime modelling, beyond-Limber computation, and higher-order lensing statistics.

Other topic / keywords:

Authors: Mr CHEN, Yi-Ru (Durham University); ZHANG, Yun-Hao (Leiden University)

Co-authors: Prof. ASGARI, Marika (Newcastle University); Prof. CHISARI, Elisa (Utrecht University); Prof. HEYMANS, Catherine (University of Edinburgh); Prof. HOEKSTRA, Henk (Leiden University); Prof. KUIJKEN, Konrad (Leiden University); Dr RUIZ-ZAPATERO, Jaime (University College London); Prof. ZUNTZ, Joe (University of Edinburgh); Dr ŠARČEVIĆ, Niko (Duke University)

Presenter: ZHANG, Yun-Hao (Leiden University)

Track Classification: Large-Scale Structure; Dark Matter; Dark Energy / Modified Gravity; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

Associated publications:

Zhang et al. 2026a, "LimberCloud: Scalable Analytic Computation of Limber Power Spectra for Stage-IV Cosmology", submitted to JCAP, DOI: arXiv:2604.24536.

Ruiz-Zapatero, Hang, Zhang et al. 2026, "Propagating data-driven galaxy redshift distribution uncertainties in 3×2 -pt analyses", submitted to MNRAS, DOI: arXiv:2604.24425.

Zhang et al. 2026b, "TensorCloud: End-to-End Emulation for Accelerated Differentiable Cosmological Inference", in preparation —expected completion ahead of COSMO-26

Status: SUBMITTED

Track Reviews:**Large-Scale Structure:**

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (I am co-author and former supervisor. This is a nice but technical topic for fast calculation of lensing power spectra)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 4.0** (Better suited for the methods/stats session.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 4.0** (As a talk: 2. As a poster: 4. Reformulation of the integrals in the WL likelihood.)

Abstract rating 4

Submitted by **ZHANG, Yun-Hao** <yunhaozhang@strw.leidenuniv.nl> on **Tuesday, 28 April 2026**

Abstract ID : 165

Galileons in curved spacetime and numerical challenges

Content

The Galileon theory provides an infrared modification of general relativity that incorporates the Vainshtein screening mechanism, suppressing deviations from general relativity on local scales. In this talk, I examine analytic solutions of the Galileon field in curved spacetimes. In a de Sitter background, an additional scale emerges at which the scalar field becomes singular, signaling the onset of strong coupling and the breakdown of the effective field theory description. I assess the viability and stability of spherically symmetric screening solutions in this regime. Finally, I connect these results to numerical studies of Galileon models, highlighting the challenges they pose as examples of ill-posed effective field theories.

Other topic / keywords:

Galileons

Author: GERHARDINGER, Mary (University of Pennsylvania)

Co-authors: GAROFFOLO, Alice (University of Pennsylvania); GIBLIN, Tom (Kenyon College); Prof. HINTERBICHLER, Kurt (Case Western Reserve University); Prof. TOLLEY, Andrew (Imperial College London); TRODDEN, Mark

Presenter: GERHARDINGER, Mary (University of Pennsylvania)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

GLAVAN, Dražen: **Accept: Talk • 2.0**

Abstract rating 2

Submitted by **GERHARDINGER, Mary** <maryge@sas.upenn.edu> on **Tuesday, 28 April 2026**

Abstract ID : 166

Thermodynamics and quantum effects of de Sitter black holes

Content

The thermodynamics of black holes in de Sitter space is complicated by the presence of multiple horizons and the absence of a globally defined timelike Killing vector. In this talk, I will revisit existing proposals for thermodynamic identities describing charged black holes in de Sitter space and discuss their shortcomings. In particular, the conventional choice of normalization of the timelike vector leads to the puzzling property that Nariai black holes have a vanishing temperature, at odds with the experience of a near-horizon observer. I will propose a resolution to this problem and derive new first laws of thermodynamics that are adapted to a physical, static observer in between the black hole and cosmological horizon. I will discuss the implications of these results on recent works studying quantum corrections to near-extremal de Sitter black holes.

Other topic / keywords:

Quantum gravity

Authors: AALSMA, Lars (University of Minnesota Duluth); LIN, Puxin; SHIU, Gary; SYBESMA, Watse; VAN DER SCHAAR, Jan Pieter

Presenter: AALSMA, Lars (University of Minnesota Duluth)

Track Classification: Inflation / Primordial Perturbations; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Conflicting: Talk, Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **AALSMA, Lars** <larsaalsma@gmail.com> on **Tuesday, 28 April 2026**

Abstract ID : 167

A Critique on Formulating Local Theories of Gravity from Non-Extensive Entropies

Content

The thermodynamic emergence of local spacetime dynamics is inextricably tied to the strict extensivity of the holographic area law. While quantum gravity candidates often motivate generalized, non-extensive entropy-area relations for black holes, substituting these into Jacobson's framework to derive modified gravity theories is generically inconsistent. We argue that any departure from holographic extensivity introduces long-range correlations that destroy local spacetime causality. Consequently, the resulting macroscopic theories inevitably violate the Equivalence Principle, break diffeomorphism invariance, or exhibit overt acausality. We conclude that an extensive area law is a necessary condition for consistent local gravitational dynamics.

Other topic / keywords:

Author: ORJUELA-QUINTANA, JOHN BAYRON (UNIVERSIDAD DEL VALLE)

Presenter: ORJUELA-QUINTANA, JOHN BAYRON (UNIVERSIDAD DEL VALLE)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0**

Abstract rating 2

GLAVAN, Dražen: **Accept: Poster • 1.0**

Abstract rating 1

Submitted by **ORJUELA-QUINTANA, JOHN BAYRON** <john.orjuela@correounivalle.edu.co>
on **Tuesday, 28 April 2026**

Abstract ID : 168

MG-NECOLA: A Field-Level Emulator for $f(R)$ Gravity and Massive Neutrino Cosmologies

Content

Accurate modeling of non-linear gravitational dynamics is essential for constraining extensions to the standard cosmological model using large-scale structure observations. While high-resolution N -body simulations provide the required fidelity, they are computationally prohibitive for the large ensembles needed to analyze Modified Gravity (MG) scenarios. We present MG-NECOLA, a field-level emulator based on a convolutional neural network that upgrades fast, approximate MG-PICOLA simulations to near- N -body accuracy at a fraction of the computational cost. Trained on a suite of QUIJOTE-MG simulations for $f(R)$ gravity, MG-NECOLA achieves nearly sub-percent accuracy ($\text{less sim } 1\%$) in both the matter power spectrum and bispectrum up to $k \simeq 1 h \text{ Mpc}^{-1}$. Crucially, although being trained on a fixed cosmology, the network generalizes robustly to cosmologies outside its training manifold keeping the error below 5%. It successfully recovers the General Relativity limit (Λ CDM) without introducing spurious MG signals and accurately captures the power suppression induced by massive neutrinos ($M_\nu \leq 0.4 \text{ eV}$), despite being trained on cosmologies with massless neutrinos. The pipeline delivers a speed-up factor of $\sim 1500\times$ relative to full N -body runs, generating a high-fidelity realization in $\mathcal{O}(10^3)$ CPU seconds compared to $\mathcal{O}(10^6)$ for the baseline. This accuracy–efficiency trade-off establishes MG-NECOLA as a powerful tool for generating the massive mock catalogs required for next-generation galaxy surveys.

Other topic / keywords:

Author: ORJUELA-QUINTANA, JOHN BAYRON (UNIVERSIDAD DEL VALLE)

Presenter: ORJUELA-QUINTANA, JOHN BAYRON (UNIVERSIDAD DEL VALLE)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Change track • 3.0** (More relevant for the MG/DE track! Could be interesting.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (Yes, better suited for DE/MG session.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 2.0** (Poster as wished for by submitter.)

Abstract rating 2

Submitted by **ORJUELA-QUINTANA, JOHN BAYRON** <john.orjuela@correounivalle.edu.co>
on **Tuesday, 28 April 2026**

Abstract ID : 169

Constraining the growth rate of structure with DESI DR2 peculiar velocity survey

Content

Recent results from the Dark Energy Spectroscopic Instrument (DESI) suggest that dark energy may evolve over time, potentially challenging the concordance cosmological model. An alternative explanation for dark energy is modified gravity, which predicts different growth rates for cosmic structures in the late universe. The DESI Peculiar Velocity (PV) survey is designed to systematically measure the motions of galaxies at redshifts below 0.15. Combining galaxy redshift measurements with those from the DESI PV survey, we will gain a unique perspective on the distribution and motion of galaxies in the nearby universe, enabling precision tests of gravity and dark energy. In this presentation, I will present an improved maximum-likelihood method to directly fit the peculiar velocity and galaxy overdensity data. We have applied data compression techniques not only to significantly reduce computational time but also to enable us to include previously fixed parameters that we could not include due to computational expense. This new method will be applied to the DR2 data to produce one of the tightest constraints on the growth rate at low redshift and potentially distinguish different models of gravity.

Other topic / keywords:

Peculiar velocity, DESI

Author: LAI, Yan Xiang (University of Arizona)

Presenter: LAI, Yan Xiang (University of Arizona)

Track Classification: Large-Scale Structure; Dark Energy / Modified Gravity

Contribution Type: Talk

Comments:

This work is still ongoing, but the initial application of the method on the mocks is promising. The result is expected to be finalised before the conference.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (New results from DESI)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0** (Great to see some DESI-DR2 results!)

Abstract rating 5

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 5.0**

Abstract rating 5

GLAVAN, Dražen: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **LAI, Yan Xiang** <ylai2@arizona.edu> on **Tuesday, 28 April 2026**

Abstract ID : 170

Cosmological perturbations of a relativistic MOND theory

Content

A relativistic MOND theory, promising reproducing cosmology as well as MOND phenomenology in the low acceleration regime, was recently proposed. We present post Newtonian (PN) approximation and relativistic perturbation equations in cosmological context. The PN equations are presented to 1PN order and the perturbation equations are presented in fully nonlinear and exact forms. We show that to 0PN order baryon perturbation grows faster in MOND regime. The MOND field can be interpreted as a fluid with specific equation of state without anisotropic stress, and Jeans criterion is derived for the MOND field.

Other topic / keywords:

Author: NOH, Hyerim (Korea Astronomy and Space Science Institute)

Co-author: Prof. HWANG, Jai-chan (IBS)

Presenter: NOH, Hyerim (Korea Astronomy and Space Science Institute)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Poster • 3.0**

Abstract rating 3

GLAVAN, Dražen: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **NOH, Hyerim** <hr@kasi.re.kr> on **Wednesday, 29 April 2026**

Abstract ID : 171

Where Galaxies Point: First Measurement of the Large-Scale Axial Intrinsic Alignment

Content

We present evidence for a large-scale axial intrinsic alignment (LAIA), a coherent preferred orientation shared by galaxies and cosmic-web filaments. LAIA provides a new statistical-isotropy test based on the orientation field of galaxy-scale and filamentary structures, complementary to CMB- and large-scale-structure-based probes of the cosmological principle. Applying a new estimator to the Dark Energy Survey Year 3 weak-lensing shape catalog, we reconstruct the galaxies' orientation field and identify a coherent preferred axis on dipolar angular scales. Spirals' semi-minor axes and ellipticals' semi-major axes point toward a common direction, with a morphology-dependent amplitude hierarchy consistent with tidal-torquing physics. We further extend the analysis beyond galaxy shapes by measuring a consistent axial pattern in cosmic-web filament orientations from SDSS, providing an independent and physically distinct tracer of the underlying large-scale tidal field. Remarkably, because the DES and SDSS footprints are substantially different, the agreement is not driven by the galaxies and filaments occupying the same local environments. Instead, it points to a common large-scale axial pattern traced independently by galaxy morphologies and by the cosmic web. Their statistical compatibility with the galaxy-based preferred axis therefore provides a non-local, cross-survey, and cross-observable consistency test, rather than a simple measurement of galaxy–host–filament alignment. The signal disfavors the null hypothesis at approximately 4σ , persists across spatial and redshift splits, and remains robust against a broad suite of realistic survey-systematics tests. We validate the estimator and assess the physical interpretation using N-body-based mock catalogs, including Euclid Flagship 2 and MICECAT v2 with intrinsic alignments. If confirmed, LAIA would reveal a statistically significant preferred axis in the orientation field of galaxies and filaments, potentially tracing a large-scale tidal field imprinted during structure formation. This work introduces a new observational bridge between galaxy evolution, intrinsic alignments, cosmic-web physics, weak-lensing systematics, and tests of statistical isotropy, offering a compass that links morphology, angular momentum, environment, and cosmology.

Other topic / keywords:

Intrinsic Alignments, Cosmological Principle

Author: DA SILVEIRA FERREIRA, Pedro (Zhejiang University)

Presenter: DA SILVEIRA FERREIRA, Pedro (Zhejiang University)

Track Classification: Large-Scale Structure; Others (Please specify below)

Contribution Type: Talk

Comments:

This contribution is based on a manuscript currently under review at Nature Astronomy. Since the original submission, we have substantially strengthened the analysis by extend-

ing the methodology to include a broad set of realistic survey systematics and by testing the signal with additional observables beyond galaxy shapes. In particular, we now measure the effect using cosmic-web filament orientations from SDSS, providing an independent tracer of the same large-scale axial pattern. We also validate the estimator and assess the interpretation using state-of-the-art N-body-based mock catalogs, including Euclid Flagship 2 and MICECAT v2 with intrinsic alignments. The work is relevant to several areas of the cosmology community, including intrinsic alignments, galaxy evolution, cosmic-web physics, weak lensing systematics, and tests of statistical isotropy and the cosmological principle. Given its methodological novelty and broad implications, we believe this contribution would be of strong interest to the COSMO 2026 audience.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Sounds exciting and innovative. Maybe too good (significant) to be true? Would like to hear.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 4.0** (let's hear it!)

Abstract rating 4

Submitted by **DA SILVEIRA FERREIRA, Pedro** <dasferreira.pedro@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 172

STOchastic LAttice Simulation of hybrid inflation

Content

We investigate the spatial profile of the curvature perturbation generated in multi-waterfall hybrid inflation models, which are known to produce various topological defects. Using the lattice simulation code STOchastic LAttice Simulation, based on the stochastic formalism of inflation, we analyse six cases by varying the number of waterfall fields n and the functional form of the inflaton potential (“Quadratic” and “Cubic” cases). Our statistical analysis shows that the probability density functions (PDFs) and power spectra are broadly consistent with the so-called stochastic- δN algorithm. The “Cubic” case also exhibits a characteristic upper bound in the PDF, as discovered in our previous work, that suppresses primordial black hole formation while potentially affecting halo formation. Furthermore, we employ the Euler characteristic as a topological diagnostic tool to identify the structures of the waterfall fields as well as the curvature perturbation. We find that the topological defects, such as domain walls ($n = 1$), cosmic strings ($n = 2$), and monopoles ($n = 3$), are reconnected during inflation into finer structures by the stochastic noise, making their correlation lengths much smaller than the Hubble scale at the critical point of the waterfall phase transition counterintuitively. The Euler characteristic also implies global structures of the curvature perturbation for $n = 1$, though we do not conclude if they are due to the domain wall, because neither the strings ($n = 2$) nor monopoles ($n = 3$) leave such structures. The global structures of the curvature perturbation will provide a novel probe for the physics of the early universe.

Other topic / keywords:

Author: MURATA, Tomoaki (Tokyo Metropolitan College of Industrial Technology)

Presenter: MURATA, Tomoaki (Tokyo Metropolitan College of Industrial Technology)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **MURATA, Tomoaki** <tomoakim@rikkyo.ac.jp> on **Wednesday, 29 April 2026**

Abstract ID : 173

The Entangled State from a cosmological Euclidean Wormhole

Content

We use the Euclidean path-integral method to approximate the wave function of the Universe and consider the particular scenario in which a Euclidean wormhole instanton dominates. This Euclidean wormhole solution connected to Lorentzian manifolds provides an approximation to the emergence of a classical spacetime in the quantum cosmological treatment. Beyond the background level, perturbations built on top of this instanton solution are treated quantum mechanically in both the Euclidean and Lorentzian regimes. Due to the existence of a Euclidean wormhole bridging the twin universes, the perturbations of each universe is then in a mixed-state and the mutual entanglement shall leave signatures in the cosmic microwave background (CMB) power spectrum. Invoking the Klebanov-Susskind-Banks wormhole as a toy model for the sake of tractability, we show that the entanglement enhance the long wavelength modes due to the geometric properties of the Euclidean wormhole.

Other topic / keywords:

Authors: Prof. CHEN, Pisin (National Taiwan University); Dr LIN, Kuan-Nan (Asia Pacific Center for Theoretical Physics); LIN, Wei-Chen (Ewha Womans University); Prof. YEOM, Dong-han (Pusan National University)

Presenter: LIN, Wei-Chen (Ewha Womans University)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Comments:

This talk is based on the works: e-Print: 2409.09935(PRD), 2505.02807(accepted by PRD), and the ongoing works.

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Mixed: Accept, Reject

Reviews:

CESPEDES, Sebastian: **Reject • 1.0**

Abstract rating 1

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **LIN, Wei-Chen** <archennlin@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 174

Sigma meson bound-state transition in the early universe and $O(N)$ model double-branch vacuum instability

Content

The restoration of the $SU(2)$ chiral symmetry is believed to occur at high temperatures, i.e., in the early universe. We generalize the N/D dispersive method to finite-temperature scenarios to study the properties of the σ meson observed in pion-pion scattering. The thermal σ pole trajectory is obtained with cross-channel effects incorporated. The results predict a transition of the σ particle into a bound state at high temperatures, along with the emergence of a novel subthreshold resonance pole.

Also, we uncover for the first time vacuum instabilities of the $O(N)$ model at large m_π and high temperatures. Specifically, the phenomenologically favored vacuum describing π - σ physics will move across the branch point of the effective potential and turn into a saddle point. Additionally, the effective coupling constant is defined and generalized to cases with nonzero pion masses and finite temperatures, demonstrating a strict correspondence between its sign (positive or negative) and the double-branch structure of the effective potential.

The N/D -modified $O(N)$ linear σ model, in the light of dispersion relations and thermal field theory, not only deepens our understanding of the σ particle at high temperatures which could be verified only in the early universe. Moreover, it may also serve as a valuable theoretical laboratory when studying the nonperturbative dynamics in QCD and the nonequilibrium dynamics of the cosmological phase transitions.

Other topic / keywords:

QCD phase structure at high temperature, sigma meson transition in the early universe

Author: LYU, Yuan-Lin (Peking University)

Co-authors: JOKELA, Niko; Dr LI, Qu-Zhi (Sichuan University); Prof. XIAO, Zhiguang (Sichuan University); Prof. ZHENG, Han-Qing (Sichuan University and Peking University)

Presenter: LYU, Yuan-Lin (Peking University)

Track Classification: Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Early Universe:

Judgments: Positive: Poster

Reviews:

VAN DE VIS, Jorinde: **Accept: Poster • 3.0** (Seems interesting, maybe a bit off-topic for Cosmo?)

Abstract rating 3

Submitted by **LYU, Yuan-Lin** <yuanlinlyu213@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 175

Sigma meson bound-state transition in the early universe and $O(N)$ model double-branch vacuum instability

Content

The restoration of the $SU(2)$ chiral symmetry is believed to occur at high temperatures, i.e., in the early universe. We generalize the N/D dispersive method to finite-temperature scenarios to study the properties of the σ meson observed in pion-pion scattering. The thermal σ pole trajectory is obtained with cross-channel effects incorporated. The results predict a transition of the σ particle into a bound state at high temperatures, along with the emergence of a novel subthreshold resonance pole.

Also, we uncover for the first time vacuum instabilities of the $O(N)$ model at large m_π and high temperatures. Specifically, the phenomenologically favored vacuum describing π - σ physics will move across the branch point of the effective potential and turn into a saddle point. Additionally, the effective coupling constant is defined and generalized to cases with nonzero pion masses and finite temperatures, demonstrating a strict correspondence between its sign (positive or negative) and the double-branch structure of the effective potential.

The N/D -modified $O(N)$ linear σ model, in the light of dispersion relations and thermal field theory, not only deepens our understanding of the σ particle at high temperatures which could be verified only in the early universe. Moreover, it may also serve as a valuable theoretical laboratory when studying the nonperturbative dynamics in QCD and the nonequilibrium dynamics of the cosmological phase transitions.

Other topic / keywords:

QCD phase structure at high temperature, sigma meson transition in the early universe

Author: LYU, Yuan-Lin (Peking University)

Co-authors: JOKELA, Niko; Dr LI, Qu-Zhi (Sichuan University); Prof. XIAO, Zhiguang (Sichuan University); Prof. ZHENG, Han-Qing (Sichuan University and Peking University)

Presenter: LYU, Yuan-Lin (Peking University)

Track Classification: Early Universe; Others (Please specify below)

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Early Universe:

Judgments: Mixed: Mark as duplicate

Reviews:

VAN DE VIS, Jorinde: **Mark as duplicate • 3.0**

Abstract rating 3

Submitted by **LYU, Yuan-Lin** <yuanlinlyu213@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 176

Constraints on Axion Dark Matter Isocurvature from CMB

Content

Measurements of the Cosmic Microwave Background (CMB) have confirmed a nearly scale-invariant primordial spectrum of adiabatic perturbations, in which the density fluctuations of radiation, baryons, and dark matter are in phase. However, primordial perturbations may also include an isocurvature component, in which the relative density fluctuations of individual species such as dark matter (DM) deviate from the adiabatic mode. Such isocurvature modes provide a powerful probe of physics beyond standard model of particle physics, for instance, pre-inflationary QCD axion DM. In this talk, I will present the most up-to-date constraints on pre-inflationary axion DM isocurvature using CMB measurements from Planck, as well as from the Atacama Cosmology Telescope (ACT) and the South Pole Telescope (SPT), for both flat and tilted primordial spectra. I will then discuss the theoretical implications of these isocurvature constraints.

Other topic / keywords:

Authors: FAN, JiJi (Brown University); LI, LINGFENG (Brown U.); SINGH, Praniti (Brown University (US))

Presenter: SINGH, Praniti (Brown University (US))

Track Classification: Dark Matter; Cosmic Microwave Background; Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Matter:

Judgments: Positive: Talk

Reviews:

COLE, Philippa: **Accept: Talk • 4.0**

Abstract rating 4

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

COLE, Philippa: **Accept • 4.0** (better for Dark matter)

Abstract rating 4

WANG, Dong-Gang: **Change track • 4.0** (Dark Matter, or CMB)

Abstract rating 4

Submitted by **SINGH, Praniti** <praniti_singh@brown.edu > on **Wednesday, 29 April 2026**

Abstract ID : 177

Cosmology-informed constraints on the fuzzy dark matter mass from dwarf-spheroidal stellar kinematics

Content

Fuzzy dark matter (FDM) predicts a solitonic core within halos, in contrast to the cuspy inner profiles expected in the standard cold dark matter (CDM) model.

We investigate differences in the inner structure of dark matter halos through the stellar kinematics of dwarf spheroidal galaxies, which place constraints on the FDM particle mass.

We analyze the parameter space using a statistical framework with cosmology-informed priors derived from the Semi-Analytical SubHalo Inference Modeling (SASHIMI), which restrict the outer NFW-like halo parameters to cosmologically motivated regions.

Guided by recent FDM simulations, we further assume a smooth connection between the inner soliton and outer NFW-like profiles, enabling an efficient constraint on the FDM mass. As shown in the previous study, Segue 1 provides most stringent constraint $m_{FDM} > 10^{-21}$ eV even when the cosmological priors are taken into account.

Other topic / keywords:

Author: HORIGOME, Shunichi (Tohoku University)

Presenter: HORIGOME, Shunichi (Tohoku University)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Matter:

Judgments: Positive: Talk

Reviews:

KAVANAGH, Bradley: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **HORIGOME, Shunichi** <shunichi.horigome@astr.tohoku.ac.jp> on **Wednesday, 29 April 2026**

Abstract ID : 178

Identification of structures in the Universe through quasar clustering

Content

Quasars are powerful tracers of the large-scale structure of the Universe at redshifts where dense galaxy samples are harder to obtain. In this work, we use the Quiaia quasar catalog, considering the $G < 20.5$ and $G < 20.0$ magnitude-limited samples, to reconstruct and characterize the cosmic web traced by quasars. After applying a sigma-clipping selection in the $(z, z_{\text{error}}/z)$ plane, we retain approximately 67.2% of the $G < 20.0$ sample and 61.3% of the $G < 20.5$ sample. We then build volume-limited samples, estimate their luminosity function and two-point correlation function using the Landy–Szalay estimator, and assign halo masses to the quasar hosts.

From this information, we reconstruct the density field with a halo-based method and extract the filamentary skeleton using DisPerSE. We analyze the dependence of the filament properties on the smoothing scale and apply a geometric filtering procedure to mitigate boundary-induced artifacts in the skeleton. The final filament catalog is characterized separately in the Galactic North and South through length distributions, vertex-separation distributions, occupation statistics, cumulative distribution functions, and filament number densities.

These measurements reveal indications of hemispheric asymmetries. We therefore perform a targeted overdensity analysis using radial filament counts, angular sweeps on the sky, quasar–filament cross-correlation measurements, and visual inspection of quasar concentrations around the reconstructed skeleton. We find consistent signatures of simultaneous overdensities in both quasars and filaments, not primarily associated with the Magellanic Clouds, suggesting the possible presence of a large-scale structure, potentially analogous to reported features such as the Hercules–Corona Borealis Great Wall or the Giant GRB Ring. This work demonstrates that quasar samples, halo-based density reconstruction, and DisPerSE skeleton extraction provide a reproducible route to mapping the cosmic web across large cosmological volumes.

Other topic / keywords:

Cosmic web; large-scale structure; quasars; clustering; correlation function; halo-based method; density field reconstruction; DisPerSE.

Authors: Prof. MUÑOZ CUARTAS, Juan Carlos (Universidad de Antioquia); ZAPATA ZULUAGA, Diana Carolina (Universidad de Antioquia)

Presenter: ZAPATA ZULUAGA, Diana Carolina (Universidad de Antioquia)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:**Judgments:** Positive: Talk**Reviews:**

HILDEBRANDT, Hendrik: **Accept • 3.0** (Not sure what too think of these samples of quasars. Still interesting to hear about.)

Abstract rating 3

KUIJKEN, Koen: **Accept: Talk • 3.0** (nonstandard topic, interesting)

Abstract rating 3

Submitted by **ZAPATA ZULUAGA, Diana Carolina** <dianac.zapata@udea.edu.co> on **Wednesday, 29 April 2026**

Abstract ID : 179

Exotic energy injection in the 21-cm power spectrum

Content

The 21-cm signal provides a new window into the thermal and ionization history of the early Universe, making it a powerful probe of exotic energy injection processes, including those sourced by dark matter (DM). We develop an effective parametric model for the heating deposition function, $f_{heat}(z)$, capturing the redshift-dependent impact of generic energy injection histories on the intergalactic medium (IGM). This flexible parameterization enables fast and accurate predictions of the 21-cm signal under diverse astrophysical conditions.

Combined with a Simulation-Based Inference (SBI) framework, this approach enables efficient exploration of the connection between energy injection and 21-cm observables without relying on computationally expensive particle-level simulations. We show that the 21-cm power spectrum is primarily sensitive to the overall heating amplitude, allowing robust and largely model-independent constraints across a broad class of exotic energy injection scenarios relevant to upcoming experiments such as SKA.

As a concrete application, we focus on DM decay into e^-e^+ pairs and calibrate our model prior against detailed particle-physics calculations from the DarkHistory code. We find that the evolution of $f_{heat}(z)$ exhibits partial recovery in an optimal heating regime, where DM-driven heating dominates over astrophysical contributions. Our results establish a scalable framework for constraining exotic energy injection using the 21-cm power spectrum, and provide a foundation for forecasting the sensitivity of next-generation experiments to a wide range of beyond-standard-model heating histories.

Other topic / keywords:

Author: MONTES DORIA, Daniela (Australian National University)

Co-authors: FACCHINETTI, Gaétan (Université Libre de Bruxelles); LOPEZ-HONOREZ, Laura (Université Libre de Bruxelles); Dr QIN, Yuxiang (Australian National University)

Presenter: MONTES DORIA, Daniela (Australian National University)

Track Classification: Dark Matter; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 3.0** (21cm SBI with lots of modelling assumptions.)

Abstract rating 3

Submitted by **MONTES DORIA, Daniela** <daniela.montesdoria@anu.edu.au> on **Wednesday, 29 April 2026**

Abstract ID : 180

Fast Neural Emulation of Cosmological Structure Formation with TUNeS

Content

We present TUNeS (Temporal UNet emulator for Structure formation), a fast neural emulator for cosmological structure formation across redshift. Starting from the initial particle distribution, TUNeS predicts the evolved matter density field with a two-stage architecture that combines particle-based large-scale evolution and grid-based nonlinear refinement. The framework is designed to be naturally extendable to larger volumes through stitching, enabling continuous structure generation over extended spatial regions. Trained on only a small number of N-body simulations, TUNeS achieves good accuracy in both the power spectrum and non-Gaussian statistics, while requiring only about 25 seconds to generate a 256^3 grids density field from initial conditions on a single GPU. These features make it a promising approach for fast mock production and other applications requiring many high-fidelity matter realizations.

Other topic / keywords:

Author: KANG, Yuqi (Beijing Normal University)

Co-author: Prof. HU, Bin (Beijing Normal University)

Presenter: KANG, Yuqi (Beijing Normal University)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

I would be happy to present this work as either a talk or a poster.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (Interesting work on ML for LSS. Would fit in Methods as well.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 3.0** (Better suited for the methods session.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 4.0** (As talk: 3, as poster 4.)

Abstract rating 4

Submitted by **KANG, Yuqi** <yuqi.kang@bnu.edu.cn> on **Wednesday, 29 April 2026**

Abstract ID : 181

Revisiting the Hubble Constant with FRBs: New Clues in the Hubble Tension Debate

Content

Fast Radio Bursts (FRBs) are millisecond radio transients with high dispersion measures, making them powerful tracers of ionized matter across cosmological distances. In this talk, I present two complementary approaches, Bayesian analysis and machine learning, applied to a set of localized FRBs to rigorously test the consistency of the Λ CDM model at late cosmic epoch. Our results reveal a redshift evolution of the Hubble constant, a behavior that stands in contradiction to the core postulate standard cosmology. I will further show that this discrepancy can be resolved for alternate cosmological models. These findings suggest a fundamental inadequacy in the standard cosmological framework and necessitate a deeper revision of the theoretical underpinnings of cosmology to resolve the Hubble tension.

Other topic / keywords:

Author: KALITA, Surajit (Astronomical Observatory, University of Warsaw, Poland)

Co-authors: Prof. BULIK, Tomasz (Astronomical Observatory, University of Warsaw, Poland); Prof. MIZUNO, Yosuke (TDLI, China); Mr UNİYAL, Akhil (TDLI, China)

Presenter: KALITA, Surajit (Astronomical Observatory, University of Warsaw, Poland)

Track Classification: Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 4.0** (Sounds like a controversial claim!)

Abstract rating 4

Submitted by **KALITA, Surajit** <skalita@astrouw.edu.pl> on **Wednesday, 29 April 2026**

Abstract ID : 182

Some Aspects of Cosmic Inflation and Gravitational Waves

Content

Recent observations from ACT along with Planck and DESI give us better understanding of the early universe with cosmic inflation. The spectral index n_s , tensor-to-scalar ratio (r), ω and number of e-folds are inferred. In addition, we also have the late time acceleration expansion possibly attributing to the dark energy. We will consider the Starobinsky model to discuss as a modified gravity framework to account for the inflation and dark energy. Furthermore, Quintessential Inflation idea has been suggested to help explain both early and late time acceleration phenomena. We will discuss both the scenarios, comment on the stochastic gravitational waves background in the context of recent observations and prospects.

Other topic / keywords:

Author: GIRI, Anjan

Presenter: GIRI, Anjan

Track Classification: Inflation / Primordial Perturbations; Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 3.0** (Better in early universe/inflation)

Abstract rating 3

MALHOTRA, Aameek: **Accept: Talk • 2.0** (Better suited for Inflation session)

Abstract rating 2

Inflation / Primordial Perturbations:

Judgments: Mixed: Accept, Reject

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 1.0**

Abstract rating 1

WANG, Dong-Gang: **Reject • 1.0**

Abstract rating 1

Early Universe:

Judgments: Negative

Reviews:

VAN DE VIS, Jorinde: **Reject • 2.0** (This abstract seems a bit chaotic. I can also not find the author on Inspire (unless they are actually a particle experimentalist?))

Abstract rating 2

Submitted by **GIRI, Anjan** <giria@phy.iith.ac.in> on **Wednesday, 29 April 2026**

Abstract ID : 183

Unlocking Non-Gaussian Information in Weak Lensing: Optimal Tomographic Statistics for Euclid”

Content

Weak gravitational lensing is a primary probe for Stage IV cosmology, but fully exploiting upcoming surveys such as Euclid requires going beyond the standard power spectrum. Higher-order statistics (HOS) can capture the non-Gaussian information in tomographic data, yet two major challenges remain: their sensitivity to complex astrophysical systematics, and their reliance on computationally expensive simulations without independent analytical validation.

In this talk, we present a unified framework to optimize tomographic weak lensing analyses with HOS for Euclid. Using simulation-based inference with both analytical and neural network summaries, we show that while avoiding baryonic biases requires conservative scale cuts, HOS still yield significantly tighter cosmological constraints than standard two-point statistics on these “safe” scales. Moreover, the interpretable starlet ℓ_1 -norm achieves near-optimal performance, providing a simple and powerful alternative to black-box neural methods.

To push beyond these conservative cuts, we revisit tomographic nulling via the Bernardeau–Nishimichi–Taruya (BNT) transform, which isolates redshift contributions to enable physically motivated scale cuts. While BNT is widely thought to degrade constraining power, we show that this limitation is not intrinsic. Using optimal neural summaries, we demonstrate that the transform is in fact lossless, and the apparent degradation arises from an incomplete treatment of cross-correlations, providing a prescription for its use in realistic analyses.

Finally, we introduce a complementary, theory-driven approach based on Large Deviation Theory to model HOS directly, delivering a crucial analytical cross-check and reducing reliance on simulations. Together, these results establish a robust and near-optimal strategy for extracting cosmological information from Euclid data, with preliminary applications in ongoing preparations for Data Release 1.

Other topic / keywords:

Weak gravitational lensing; cosmological inference

Author: TERSENOV, Andreas (ICS&IA-FORTH/CEA-Saclay)

Co-authors: Mr GUERRINI, Sacha (Universite Paris-Cite); Mr KILBINGER, Martin (CEA-Saclay); Mr LANUSSE, Francois (CNRS); Dr STARCK, Jean-Luc (CEA-Saclay/FORTH)

Presenter: TERSENOV, Andreas (ICS&IA-FORTH/CEA-Saclay)

Track Classification: Large-Scale Structure; Dark Matter; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:**Large-Scale Structure:****Judgments:** Positive**Reviews:**

KUIJKEN, Koen: **Accept • 4.0** (advanced statistics for robust scale cuts in beyond-gaussian regime, applicable to euclid.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0** (Interesting combination of HOS and BNT. Could go in either LSS or methods.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:**Judgments:** Positive: Poster**Reviews:**

SELLENTIN, Elena: **Accept: Poster • 2.0** (As poster 3, as talk 2.)

Abstract rating 2

Submitted by **TERSENOV, Andreas** <atersenov@physics.uoc.gr> on **Wednesday, 29 April 2026**

Abstract ID : 184

Spherically Symmetric Fluid Simulations of Black Hole Accretion in Self-Interacting Dark Matter Halos

Content

We investigate black hole accretion in self-interacting dark matter (SIDM) halos using a self-gravitating fluid model with thermal conduction. We develop a robust one-dimensional spherically symmetric hydrodynamic code based on an operator-splitting finite-volume method. Simulating both Singular Isothermal Sphere (SIS) and Navarro-Frenk-White (NFW) profiles, we find that black hole growth is regulated by the competition between gravity-driven inflow and SIDM heat transport. Our results demonstrate that an SIS-like environment facilitates rapid accretion, allowing a $100 M_{\odot}$ seed to grow to $10^4 M_{\odot}$ within 2 Myr. Furthermore, we show that larger initial black hole masses, steeper density profiles, and higher scattering cross-sections significantly enhance the accretion rate. This study provides a comprehensive fluid-dynamical picture of black hole growth in SIDM halos.

Other topic / keywords:

Author: CHEN, Tan (Beijing Normal University)

Presenter: CHEN, Tan (Beijing Normal University)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **CHEN, Tan** <chentan15@mails.ucas.edu.cn> on **Wednesday, 29 April 2026**

Abstract ID : 185

Weak-Lensing Shear-Selected Galaxy Clusters in the Hyper Suprime-Cam Subaru Strategic Program and their Cosmological Applications

Content

I will present cosmological constraints using the abundance of weak-lensing shear-selected galaxy clusters identified in the Hyper Suprime-Cam (HSC) Subaru Strategic Program. The clusters are selected on the mass maps constructed using the latest three-year (Y3) weak-lensing data covering an area of $\approx 500 \text{ deg}^2$, yielding in a sample size of 129 clusters with a high signal-to-noise ratio $\mathcal{S} \geq 4.7$. Owing to the deep, wide-field, and uniform imaging of the HSC survey, this is by far the largest sample of shear-selected clusters, in which the selection solely depends on gravity and is free from any assumptions about the dynamical state. In Chiu+24, we obtain the fully marginalized constraint on $\hat{S}_8 \equiv \sigma_8 (\Omega_m/0.3)^{0.25} = 0.835^{+0.041}_{-0.044}$ (corresponding to a $\sim 5\%$ constraint) in a flat Λ CDM model, using the cluster abundance $N(\nu)$.

In the second part of my talk, I will present a blinded and updated analysis of the weak-lensing shear-selected cluster abundance in $N(\nu, z)$, in which the cluster redshift is determined by exploiting the HSC optical imaging in a data-driven approach (Chiu in prep.). By incorporating the information of cluster redshifts, we significantly improve the constraining power on Ω_m by at least a factor of 3. I will discuss the methodology for weak-lensing shear-selected cluster cosmology in the ongoing and upcoming wide-field surveys.

Other topic / keywords:

Gravitational lensing

Author: CHIU, I-Non (National Cheng Kung University)

Presenter: CHIU, I-Non (National Cheng Kung University)

Track Classification: Large-Scale Structure; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Always skeptical about shear-selected cluster samples, but this one sounds basically as good as it (currently) gets.)

Abstract rating 4

KUIJKEN, Koen: **Accept: Talk • 4.0** (Good to have some cluster cosmology, and HSC results, in this session)

Abstract rating 4

Submitted by **CHIU, I-Non** <inchiu@phys.ncku.edu.tw> on **Wednesday, 29 April 2026**

Abstract ID : 186

Cosmological Perturbations with the Functional Renormalization Group

Content

Cosmological perturbation theory often serves as a tool to construct effective field theories (EFTs) for gravity and matter, describing a wide range of observed phenomena across different cosmological epochs. Within the asymptotic safety scenario for quantum gravity, the effective dynamics of quantum fluctuations around cosmological backgrounds can be derived from a UV-completion, offering a top-down perspective on cosmological effective descriptions. In practice, the Functional Renormalization Group provides the computational machinery to achieve this. Following previous Asymptotic Safety studies for foliated spacetimes, we investigate a new computational framework employing curved backgrounds and truncations inspired by cosmological perturbation theory.

Other topic / keywords:

Author: FERNANDEZ MOLINERO, Juan (Radboud University)

Co-authors: POSTMA, Marieke; Prof. SAUERESSIG, Frank (Radboud University)

Presenter: FERNANDEZ MOLINERO, Juan (Radboud University)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **FERNANDEZ MOLINERO, Juan** <juan.fernandezmoliner@ru.nl> on **Wednesday, 29 April 2026**

Abstract ID : 187

Impact of Teleparallelism on Addressing Current Cosmological Tensions

Content

The (H_0) and (S_8) tensions pose significant challenges to the standard (Λ) CDM model, arising from discrepancies in local versus early-Universe (H_0) measurements and inconsistencies between CMB and weak lensing data. We explore two $(f(T))$ gravity models as alternatives by analyzing cosmic chronometers, BAO, gamma-ray bursts, and Pantheon+SH0ES datasets, with gravitational wave data used for validation. Our results show that both teleparallel models offer promising potential in jointly alleviating these tensions.

Other topic / keywords:

$f(T)$ gravity, H_0 & S_8 tension

Author: Prof. SAHOO, Pradyumn Kumar (Birla Institute of Technology and Science-Pilani, Hyderabad Campus)

Presenter: Prof. SAHOO, Pradyumn Kumar (Birla Institute of Technology and Science-Pilani, Hyderabad Campus)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Comments:

I would like to kindly inquire if the organizing committee might be able to provide travel support to facilitate my attendance and presentation.

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 2.0**

Abstract rating 2

GLAVAN, Dražen: **Accept: Talk • 2.0**

Abstract rating 2

Submitted by **Prof. SAHOO, Pradyumn Kumar** <pksahoo@hyderabad.bits-pilani.ac.in> on **Wednesday, 29 April 2026**

Abstract ID : 188

Can non-minimally coupled dark matter explain UDG kinematics?

Content

We investigate non-minimal coupling (NMC) between dark matter and gravity. NMC is a theoretical extension of general relativity where the gravitational potential is modified by dark matter density gradients.

We analyze three ultra-diffuse galaxies (UDGs) with contrasting dark matter fractions to test whether NMC produces observable effects on galactic scales. We perform spherical Jeans dynamical modeling of these UDGs, exploring eight dark matter profiles. Using Bayesian inference with MCMC and nested sampling, we constrain the coupling length scale L and statistically compare General Relativity versus the NMC framework through Bayes factors.

Other topic / keywords:

Author: ZAMANI, Saboura sadat (University of Szczecin)

Presenter: ZAMANI, Saboura sadat (University of Szczecin)

Track Classification: Dark Matter; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Submitted by **ZAMANI, Saboura sadat** <saboura.zamani@phd.usz.edu.pl> on **Wednesday, 29 April 2026**

Abstract ID : 189

Robust CMB B-mode analysis with Needlet-ILC and simulation-based inference

Content

Polarized Galactic emission is the foremost challenge for searches for a background of primordial gravitational waves imprinted in the polarization of the CMB. We argue that current methods struggle to address this challenge, either by being overly susceptible to model misspecification, or by failing to properly propagate the uncertainty due to residual Galactic emission after foreground cleaning.

To address these issues, we explore a novel analysis framework for parameter inference with large-scale CMB polarization data. Our method combines simulation-based inference with the needlet internal linear combination (NILC) algorithm to compress the data into a summary statistic that is robust to model misspecification and small enough for neural posterior estimation with normalizing flows. We show that the semi-blind nature of the NILC-based compression significantly increases robustness to mismodeling of the anisotropic and non-Gaussian properties of the foreground fields.

Using an idealized ground-based setup inspired by the Simons Observatory Small Aperture Telescopes, we demonstrate improved statistical constraining power for the tensor-to-scalar ratio r and improved robustness to complex foregrounds compared to other techniques in the literature. Trained on a semi-analytical foreground model, the method yields unbiased r results across a range of PySM simulations, including the high-complexity d12 model, for which we obtain $r = (1.09 \pm 0.27) \cdot 10^{-2}$ for input $r = 0.01$ and sky fraction $f_{\text{sky}} = 0.21$.

Our results highlight the importance of designing data compression schemes for SBI that prioritize robustness to model misspecification over statistical optimality, and demonstrate the feasibility and advantages of a complete maps-to-parameters simulation-based analysis of large-scale CMB polarization for current ground-based observatories.

Other topic / keywords:

Author: DUIVENVOORDEN, Adriaan (Max Planck Institute for Astrophysics)

Co-authors: Dr ADLER, Alexandre (University of California Berkeley); Dr AZZONI, Susanna (Princeton University); Dr BAYER, Adrian (Center for Computational Astrophysics, Flatiron Institute); Dr DACHLYTHRA, Nadia (University of Milano-Bicocca); Prof. HILL, Colin (Columbia University); Dr SURRAO, Kristen (Columbia University)

Presenter: DUIVENVOORDEN, Adriaan (Max Planck Institute for Astrophysics)

Track Classification: Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:**Methods / Statistical Inference / Machine Learning:****Judgments:** Positive: Talk**Reviews:**SELLENTIN, Elena: **Accept: Talk • 4.0** (Smart. Will it work in real life?)

Abstract rating 4

Submitted by **DUIVENVOORDEN, Adriaan** <adriaand@mpa-garching.mpg.de> on **Wednesday, 29 April 2026**

Abstract ID : 190

Can the Topology of the Universe Affect the CMB? A Path to Detection

Content

We often assume that the Topology of the Universe is trivial (i.e., \mathbb{R}^3 if the Universe is flat), but there are actually 18 possible topologies that admit a flat FLRW metric, such as a 3D torus. I will explain how these topologies can introduce potentially measurable effects on the Cosmic Microwave Background (CMB), generally breaking statistical isotropy in a weak but predictable manner. This is especially relevant given the hints of anisotropy reported in some cosmological data (like the presence of the CMB anomalies or dipoles). I will outline what are the main observational predictions of Cosmic Topology and how we are looking for these effects on current data within the COMPACT Collaboration, as well as some of the main challenges ahead.

Other topic / keywords:

Cosmic Topology

Author: CARRÓN DUQUE, Javier (IFT)

Presenter: CARRÓN DUQUE, Javier (IFT)

Track Classification: Cosmic Microwave Background; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Submitted by CARRÓN DUQUE, Javier <javier.carron@csic.es> on **Wednesday, 29 April 2026**

Abstract ID : 191

The status of QUIJOTE telescopes: scientific results from the MFI, commissioning and cosmological forecasts for the TFGI

Content

Titulo: The status of QUIJOTE telescopes: scientific results from the MFI, commissioning and cosmological forecasts for the TFGI

One of the main goals of current Cosmic Microwave Background (CMB) experiments is the detection of primordial B-modes, generated by gravitational waves during inflation. Achieving such a detection requires observations with exquisite polarization sensitivity, well beyond the capabilities of Planck. One promising approach is the use of a “true polarimeter” design, which produces polarization measurements for each individual detector and mitigates systematic effects, particularly bandpass leakage. This is the strategy adopted by the first two instruments installed in the QUIJOTE experiment.

The QUIJOTE experiment consists of two identical telescopes with 2.25-m diameter located in Tenerife, Spain. The first two instruments installed were the Multi Frequency Instrument, or MFI, which observed at four bands between 10 and 20 GHz, and the Thirty-and-Forty Gigahertz Instrument, or TFGI, which observes at 30 and 40 GHz. While the former is focused on studying the low frequency foregrounds of the Cosmic Microwave Background (CMB), the latter will observe Northern sky regions with minimal contamination from foregrounds in order to provide deep and $1 \mu\text{K deg}^{-1}$ sensitive maps.

In this talk, I will briefly mention the scientific results from MFI published by the QUIJOTE collaboration since 2023. I will give special emphasis to the Wide Survey, a public map of the sky north of $\delta = 32^\circ$ at 11, 13, 17 and 19 GHz which consists of a total 9000 hours of observation covering 29000 deg^2 . I will then move to present the results from the commissioning phase of the TFGI, conducted between November 2021 and October 2022. During this phase, the instrument observed with only 7 pixels out of the 29 total ones that can be fitted in its focal plane. Overall, the properties from these pixels are consistent with expectations. Finally, I will show the sensitivity estimates for the TFGI, computed on noise half-maps built from observations of bright Galactic regions.

From these maps, we infer a polarization sensitivity of $8.4 \mu\text{K deg}^{-1}$ after 0.57 h deg^{-2} of integration, using only two of the pixels. This is already comparable to the sensitivity reached by WMAP over its full mission. We show that, once all 29 TFGI pixels are operational, the instrument will achieve a sensitivity of $\sim 1 \mu\text{K deg}^{-1}$ at both 31 and 41 GHz over three cosmological fields covering 3600 deg^2 after 5.9 years of continuous observations. This sensitivity is sufficient to constrain the tensor-to-scalar ratio to $r \leq 0.05$, thereby meeting the TFGI design requirements.

Other topic / keywords:

Author: FERNÁNDEZ TORREIRO, Mateo (Universidade da Coruña, CITIC)

Co-author: ON BEHALF OF THE QUIJOTE COLLABORATION

Presenter: FERNÁNDEZ TORREIRO, Mateo (Universidade da Coruña, CITIC)

Track Classification: Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Submitted by **FERNÁNDEZ TORREIRO, Mateo** <mateo@fernandeztorreiro.com> on **Wednesday, 29 April 2026**

Abstract ID : 192

Observable Gravitational Waves and reheating in Quintessential Inflation with a self-resonant SU(2) Gauge Field

Content

We investigate a model of quintessential inflation with a non-Abelian SU(2) gauge field, where the gauge kinetic function is modulated by the inflaton field. The backreaction onto the inflaton due to the gauge field yields a soft stiff period from the end of inflation to kination. This results in a characteristic gravitational wave spectrum that will be observable in the upcoming observations. We study the self-resonance of the gauge field, which may reheat the universe non-perturbatively.

Other topic / keywords:

Inflation, quintessence, primordial gravitational waves

Authors: DIMOPOULOS, Konstantinos; JIN, Hao-Yang (Lancaster University)

Presenter: JIN, Hao-Yang (Lancaster University)

Track Classification: Dark Energy / Modified Gravity; Inflation / Primordial Perturbations; Early Universe; Gravitational Waves

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (Better in early universe/inflation)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 4.0** (More suited to early universe/inflation)

Abstract rating 4

Inflation / Primordial Perturbations:

Judgments: Mixed: Proposed for other tracks: Others (Please specify below)

Reviews:

WANG, Dong-Gang: **Change track • 3.0** (Dark Energy, Gravitational Waves)

Abstract rating 3

Submitted by **JIN, Hao-Yang** <h.jin7@lancaster.ac.uk> on **Wednesday, 29 April 2026**

Abstract ID : 193

Toward a consensus picture of baryon feedback: Joint X-ray, Sunyaev-Zeldovich, and weak lensing measurements

Content

There is no consensus on how baryon feedback shapes the underlying matter distribution from either simulations or observations. We confront the uncertain landscape by jointly analyzing the kinetic and thermal Sunyaev-Zel'dovich effects and X-ray gas mass fractions, each characterized with galaxy-galaxy lensing. Across group and clusters masses and between $0 < z < 1$, we find consistent evidence of more efficient gas expulsion beyond the virial radius than predicted by most state-of-the-art simulations, implying significant suppression of the matter power spectrum on small scales. We incorporate these constraints into data-driven priors for cosmic shear, significantly improving cosmological constraining power on small scales. By jointly characterizing the halos' gas density, pressure, and total matter profiles, we are revealing the physical mechanism of baryon feedback.

Other topic / keywords:

Author: SIEGEL, Jared Siegel (Princeton University)

Presenter: SIEGEL, Jared Siegel (Princeton University)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (Interesting. not clear whether only about sims or also data.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0** (Sounds like highly relevant work.)

Abstract rating 5

Submitted by **SIEGEL, Jared Siegel** <js1998@princeton.edu> on **Wednesday, 29 April 2026**

Abstract ID : 194

Dissipation in Scalar-Tensor Cosmology

Content

Physical processes (including field interactions and cosmological evolution) might have different interpretations in different conformal frames. In this talk, we shall discuss how to consistently transform dissipative phenomena between distinct conformal-frame representations of scalar-tensor gravity, and explore the observable consequences thereof in warm inflation scenarios, where the inflaton field is allowed to interact with a near-equilibrium thermal bath.

Other topic / keywords:

Authors: CASADO-TURRIÓN, Adrián (Center for Physical Sciences and Technology (FTMC)); FER-RAZ, Paulo B. (University of Coimbra); KARČIAUSKAS, Mindaugas (Center for Physical Sciences and Technology (FTMC)); TERENCE DÍAZ, José Jaime (University of Coimbra)

Presenter: CASADO-TURRIÓN, Adrián (Center for Physical Sciences and Technology (FTMC))

Track Classification: Dark Energy / Modified Gravity; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0** (Better fitted for Early Universe or Inflation tracks)

Abstract rating 2

GLAVAN, Dražen: **Accept: Poster • 1.0** (This submission is more appropriate for Inflation and early Universe tracks)

Abstract rating 1

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Change track • 2.0** (Dark Energy / Modified Gravity)

Abstract rating 2

Submitted by **CASADO-TURRIÓN, Adrián** <adrian.casado-turrion@ftmc.lt> on **Wednesday, 29 April 2026**

Abstract ID : 195

Primordial non-Gaussianity constraints on dissipative inflation

Content

Dissipative effects appear in many early-Universe scenarios, yet their universal observational signatures and systematic confrontation with data remain largely unexplored. We employ the Open Effective Field Theory of Inflation (Open EFToI) to consistently incorporate dissipative and stochastic effects while preserving scale invariance. Dissipation enhances specific interaction channels of the Goldstone mode, generating distinctive primordial non-Gaussian signatures, beyond those generically produced by standard EFToI. In the weak-dissipation regime, this includes folded bispectrum shapes observationally more favoured than both the equilateral and orthogonal templates. Using the Modal bispectrum pipeline with the Planck CMB data, we obtain the likelihood and derive the first model-independent bounds on early-Universe dissipation. We find a marginalised upper bound on the dissipation scale $\gamma \leq 384 H$ and a lower bound on the sound speed $c_s \geq 0.38$ at 95% confidence level. The maximum likelihood for best-fit models reveals a degeneracy between γ and c_s . These results open a model-independent window for probing departures from minimal inflation and discriminating between early-Universe scenarios with stochastic noise and dissipative effects.

Other topic / keywords:

Authors: ZHANG, Bowei (University of Cambridge); Mr SUMAN, Petar (University of Cambridge); AGUI SALCEDO, Santiago (University of Cambridge); COLAS, Thomas (DAMTP - University of Cambridge); SHEL-LARD, Paul (DAMTP, University of Cambridge)

Presenter: ZHANG, Bowei (University of Cambridge)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Conflicting: Talk, Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **ZHANG, Bowei** <bz287@cam.ac.uk> on **Wednesday, 29 April 2026**

Abstract ID : 196

Gravitational Waves from a Dilaton-Induced, First-Order QCD Phase Transition

Content

We show that a QCD dilaton field, whose vacuum expectation value sets the strong coupling, can render the quantum chromodynamic (QCD) confinement transition first order. The QCD dilaton is cosmologically attracted to a false vacuum at weak coupling in the early Universe. Quantum tunneling toward the true vacuum triggers prompt chiral symmetry breaking and confinement of QCD, leading to detonating bubbles of the hadronic phase. We find that plasma sound waves produced by this dilaton-induced, first-order QCD phase transition generate a stochastic gravitational wave signal strikingly similar to the recently detected gravitational wave background from pulsar timing arrays. We briefly comment on how this theory can be probed through collider experiments and cosmology.

Other topic / keywords:

Phase Transitions

Authors: Dr CHATRCHYAN, Aleksandr (Stockholm University); Dr MARSH, M.C David (Stockholm University); NIKOLIS, Charalampos

Presenter: NIKOLIS, Charalampos

Track Classification: Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (Better in early universe)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **NIKOLIS, Charalampos** <charalampos.nikolis@fysik.su.se> on **Wednesday, 29 April 2026**

Abstract ID : 197

The Linear Point Standard Ruler and Its Application to the Euclid Survey

Content

The large-scale distribution of galaxies encodes information about acoustic waves that propagated in the primordial baryon–photon plasma, leaving a characteristic feature in the two-point correlation function at scales of order 150 Mpc. By exploiting this feature, a new observable, known as the Linear Point, has been identified and shown to be a powerful cosmological standard ruler.

In this talk, I will explain that the Linear Point provides a purely geometrical way to measure cosmic distances. It enables distance measurements without the need to model the impact of non-linearities on the galaxy correlation function. This method does not assume spatial flatness or a specific model for late-time cosmic acceleration, does not require accurate knowledge of the dark-matter–tracer relation, and is independent of primordial fluctuation parameters.

I will then present ongoing work within the context of the Euclid survey, where we assess the accuracy and expected precision of Linear Point measurements. I will emphasize the importance of accounting for increasingly realistic data-related effects, one of the key challenges in modern galaxy surveys. This work is therefore crucial to employ the Linear Point standard ruler as a robust and fully geometric probe for characterizing the late-time expansion history of the Universe.

Other topic / keywords:

Baryon acoustic oscillations, Euclid Survey, dark energy, cosmological parameters, spectroscopic survey

Author: PASSALACQUA, Francesca (INFN Padova)

Presenter: PASSALACQUA, Francesca (INFN Padova)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Innovative topic that treads new ground.)

Abstract rating 5

KUIJKEN, Koen: **Accept • 3.0** (How is this different from BAO? Not clear to me. But hppy to listen to a talk or read a poster about it.)

Abstract rating 3

Submitted by **PASSALACQUA, Francesca** <francesca.passalacqua@pd.infn.it> on **Wednesday, 29 April 2026**

Abstract ID : 198

Simulating magnetic fields inside and around galaxies with SWIFT code

Content

Magnetic fields permeate the Universe across a wide range of scales and strengths. On galactic scales, they are amplified by turbulent dynamo processes, eventually saturating at dynamically important levels, and are subsequently transported into the circumgalactic medium by galactic winds. In realistic environments, this evolution involves both direct and inverse turbulent cascades, driven by energy injection from supernovae on small scales and extending up to galactic scales.

These processes can be investigated using numerical simulations. In this work, we study the growth of magnetic fields in an idealized isolated Milky Way-like galaxy using the SWIFT astrophysical simulation code with smoothed particle magnetohydrodynamics (SPH-MHD). We assess the reliability of this approach and identify numerical and physical challenges that arise in modeling galactic dynamos.

Other topic / keywords:

Author: SHCHUTSKYI, Nikyta (Leiden University)

Presenter: SHCHUTSKYI, Nikyta (Leiden University)

Track Classification: Primordial Magnetic Fields; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Mixed: Proposed for other tracks: Large-Scale Structure

Reviews:

SELLENTIN, Elena: **Change track • 3.0**

Abstract rating 3

Primordial Magnetic Fields:

Judgments: Positive: Talk

Reviews:

IARYGINA, Oksana: **Accept: Talk • 5.0**

Abstract rating 5

BONDARENKO, Kyrylo: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **SHCHUTSKYI, Nikyta** <nickishch@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 199

Spatially covariant gravity theories with two degrees of freedom

Content

General relativity propagates only two degrees of freedom (DOFs), and Lovelock's theorem strongly constrains possible alternatives. A natural way to explore modified gravity is to relax temporal diffeomorphism invariance while preserving spatial covariance. Such spatially covariant gravity theories, however, generically propagate an additional scalar mode. We will discuss three complementary constructions that remove this unwanted mode while retaining the two DOFs of general relativity. The first starts from a general spatially covariant Lagrangian and derives, through Hamiltonian constraint analysis, the degeneracy and consistency conditions needed to eliminate the scalar DOF. The second works directly at the Hamiltonian level, where auxiliary constraints are introduced as part of the definition of the theory to restrict the phase-space dynamics. The third uses a perturbative Lagrangian approach, expanding the action around a cosmological background and fixing the coefficient functions order by order so that scalar perturbations are absent. These constructions provide explicit modified gravity theories beyond general relativity without introducing extra DOFs and sharpen the question of the uniqueness of general relativity.

Other topic / keywords:

Author: GAO, Xian

Presenter: GAO, Xian

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 5.0**

Abstract rating 5

GLAVAN, Dražen: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **GAO, Xian** <gaoxian@mail.sysu.edu.cn> on **Wednesday, 29 April 2026**

Abstract ID : 200

The challenges of using Baryon Acoustic Oscillations distances for cosmology

Content

One of the landmarks guiding our understanding of physical cosmology is the large-scale structure, defined as the large scale distributions of galaxies, as observed by galaxy surveys. In this context, the so-called Baryon Acoustic Oscillations, are considered one of the most powerful cosmological probes. They are generally deemed to provide distance measures independent of a specific cosmological model. At the same time the obtained distances are considered agnostic with respect to other cosmological observations. However current measurements are obtained relying on several fitting and model prescriptions.

Does this comply with the requirement of model and parameter independent cosmological distances useful, for instance, to select cosmological models, detect Dark Energy and characterize cosmological tensions?

In this talk I will review the subject, answer compelling questions and explore new promising research directions.

Other topic / keywords:

Baryon Acoustic Oscillations, Distance Measurements, Dark Energy, cosmological tensions, cosmological parameters, cosmological model selection.

Author: ANSELMI, Stefano (INFN, Sezione di Padova)

Presenter: ANSELMI, Stefano (INFN, Sezione di Padova)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Interesting big-picture topic that will surely trigger lively discussion.)

Abstract rating 5

KUIJKEN, Koen: **Accept: Talk • 4.0** (provocative but interesting)

Abstract rating 4

Submitted by **ANSELM**, **Stefano** <stefano.anselmi@pd.infn.it> on **Wednesday, 29 April 2026**

Abstract ID : 201

Introducing the Self-Interacting Dark Matter Galaxy Cluster Simulations from The Three Hundred Project

Content

Dark matter constitutes the majority of the matter content of the Universe, yet its fundamental properties remain unknown. Its presence is inferred through its gravitational effects on cosmic structures across all scales. Galaxy clusters, which are the most massive gravitationally bound systems in the Universe, are particularly powerful environments for probing the nature of dark matter due to their high dark matter densities.

Self-interacting dark matter (SIDM) has been proposed as a potential solution to tensions between observations and dark matter-only simulations. Particle self-interactions can produce observable signatures, including (but not limited to) altered halo shapes and density profiles, and changes in gravitational lensing signals.

The Three Hundred Project is a large suite of simulated galaxy clusters, modelled using full-physics hydrodynamical re-simulations and semi-analytical techniques. In this talk, I will introduce a new suite of zoom-in simulations of galaxy clusters within this framework that incorporate SIDM. These simulations offer a detailed view of SIDM effects in realistic, high-mass cluster environments, and will enable us to provide new constraints on the SIDM cross-section.

Other topic / keywords:

Galaxy Clusters, Cosmological Simulations

Author: SIRKS, Ellen (Universidad Autónoma de Madrid)

Co-authors: Dr CUI, Weiguang (Universidad Autónoma de Madrid); Prof. YEPES, Gustavo (Universidad Autónoma de Madrid)

Presenter: SIRKS, Ellen (Universidad Autónoma de Madrid)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Matter:

Judgments: Positive: Talk

Reviews:

KAVANAGH, Bradley: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **SIRKS, Ellen** <ellen.sirks@uam.es> on **Wednesday, 29 April 2026**

Abstract ID : 202

Tachyonic production of dark relics: quantum 2PI formalism with momentum exchanging collisions

Content

Oscillating spacetime curvature can drive the production of dark matter during reheating, and accurately quantifying this requires the use of both non-perturbative and non-equilibrium methods. This tachyonic instability has previously been studied using 2-particle irreducible -formalism in the Hartree approximation. However, modelling the non-thermal dark matter distribution and its subsequent evolution requires accounting also for momentum exchanging collisions. I will detail a self-consistent approximation scheme for reducing the beyond-Hartree 2PI equations of motion to a generalized quantum Boltzmann equation, which can then be solved with standard methods. The approach can be used on both stable and unstable field excitations. This presentation is based on a theory-focused followup to arXiv:2406.17468, whose preprint will be available in May.

Other topic / keywords:

Authors: VÄISÄNEN, Olli; KAINULAINEN, Kimmo Juhani (University of Jyväskylä (FI)); NURMI, Sami

Presenter: VÄISÄNEN, Olli

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by VÄISÄNEN, Olli <olljvaisanen@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 203

Anisotropic Universes in Light of Background Cosmological Observations

Content

The cosmological principle is a cornerstone of the standard cosmological model. However, recent observations suggest potential deviations from this assumption, hinting at a small anisotropic expansion. Such an expansion can arise from sources that break rotational invariance. A minimal realization of this scenario is described by a Bianchi I geometry, where the degree of anisotropy is quantified by the shear parameter Σ . In this work, we constrain the present-day value of the shear, Σ_0 , by confronting theoretical predictions with recent cosmological data. We implement various anisotropic models within the Boltzmann code `\texttt{CLASS}` and explore their parameter space using the sampler `\texttt{MontePython}`. Although our results show that Σ_0 is model-dependent, notably, in one specific scenario considering a homogeneous scalar field coupled to a 2-form field, $\Sigma_0 = 0$ is excluded at the 2σ confidence level, with mean value around $|\Sigma_0| \sim 10^{-4}$ while remaining consistent with observations. These findings challenge the conventional assumption that cosmic shear is negligible in the present universe. Moreover, the anisotropic expansion in this model is driven by a steep scalar field potential, a feature often found in supergravity-inspired scenarios. While anisotropic models offer interesting alternatives and could help explain some cosmological anomalies, they generally introduce additional parameters, making the standard Λ CDM model statistically favored in most cases. Still, they remain compatible with current observations and provide new perspectives on features not fully explained within the standard framework. These results highlight the importance of further exploring anisotropic cosmologies to better understand their implications.

Other topic / keywords:

Authors: ORJUELA-QUINTANA, JOHN BAYRON (UNIVERSIDAD DEL VALLE); PALACIOS-CORDOBA, JOSE LUIS (Universidad Del Valle); VALENCIA ZUÑIGA, GABRIELA ALEJANDRA (Universidad del Valle); VALENZUELA-TOLEDO, Cesar A. (Departamento de Física, Universidad del Valle)

Presenter: VALENZUELA-TOLEDO, Cesar A. (Departamento de Física, Universidad del Valle)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

GLAVAN, Dražen: **Accept: Talk • 2.0**

Abstract rating 2

Submitted by **VALENZUELA-TOLEDO, Cesar A.** <cesar.valenzuela@correounivalle.edu.co>
on **Wednesday, 29 April 2026**

Abstract ID : 204

Unitarity in the non-relativistic regime and implications for dark matter

Content

Unitarity imposes strict bounds on elastic and inelastic partial-wave cross sections. However, state-of-the-art calculations, motivated by dark-matter phenomenology, may exhibit substantial violations of partial-wave unitarity, with potentially significant consequences for phenomenological predictions.

In this talk, I present a new, model-independent formalism that restores unitarity through the consistent resummation of inelastic contributions to the self-energy of the incoming state. This framework provides a systematic and internally consistent treatment of inelastic effects. I will illustrate its implementation in existing bound-state-formation calculations, demonstrating how unitarity is recovered in regimes where existing calculations break down. The method is broadly applicable and has implications for dark-matter freeze-out, indirect detection, and self-interactions.

Other topic / keywords:

Author: FLORES, Marcos (University of Oslo)

Presenter: FLORES, Marcos (University of Oslo)

Track Classification: Dark Matter; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **FLORES, Marcos** <mmfloresnm@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 205

Analysis of inflationary models in higher-dimensional uniform inflation

Content

We consider higher-dimensional uniform inflation, in which the extra dimensions expand at the same rate as three-dimensional non-compact space during inflation. We compute the cosmological perturbation in $D + 4$ dimensions and derive the spectral index n_s and the tensor-to-scalar ratio r . We analyze five inflationary models: chaotic inflation, natural inflation, quartic hilltop inflation, inflation with spontaneously broken SUSY, and R^2 inflation. By combining the results from these models with the Planck 2018 constraints or recent ACT data, we discuss that it is not desirable for the extra-dimensional space to expand at the same rate as the three-dimensional non-compact space.

Other topic / keywords:

Author: HIROSE, Takuya (Kyushu Sangyo University)

Presenter: HIROSE, Takuya (Kyushu Sangyo University)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Negative

Reviews:

CESPEDES, Sebastian: **Reject • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Reject • 1.0**

Abstract rating 1

Submitted by **HIROSE, Takuya** <t.hirose@ip.kyusan-u.ac.jp> on **Wednesday, 29 April 2026**

Abstract ID : 206

Stellar streams in the diffusion regime: a fast differentiable forward model for dark matter substructure inference

Content

Stellar streams are among the most sensitive probes of dark matter substructure on small scales, where the microphysical nature of dark matter could leave distinct signatures. When a stream is subjected to many encounters with low-mass substructure over its lifetime, the cumulative effect is well described by a diffusion regime in which velocity kicks accumulate as a random walk. We present a JAX-based, fully differentiable forward model that operates in this regime. Rather than resolving individual substructure encounters, an approach that becomes prohibitively expensive at low perturber masses, our simulator models the collective statistical effect of the entire substructure population in the diffusion limit via the velocity injection formalism, while retaining an accurate numerical treatment of orbital dynamics and stream formation. The only input characterizing the perturbing environment is the power spectrum of the substructure density field, which can be computed for any dark matter model, including scenarios such as fuzzy dark matter where a description in terms of discrete halos does not apply, as well as baryonic contributions. We validate the framework against analytical predictions where available. Exploiting the differentiability of the model, we compute Fisher forecasts for the subhalo mass function parameters using density and velocity power spectra of a GD-1-like stream, quantifying the expected sensitivity of current and upcoming data.

Other topic / keywords:

Authors: ANAU MONTEL, Noemi (Max Planck Institute for Astrophysics); SCHMIDT, Fabian (Max Planck Institute for Astrophysics)

Presenter: ANAU MONTEL, Noemi (Max Planck Institute for Astrophysics)

Track Classification: Dark Matter; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

We will soon publish a manuscript related to this work on arXiv and will relate the details when available.

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:**Judgments:** Positive: Poster**Reviews:**

SELLENTIN, Elena: **Accept: Poster • 2.0** (Assumption dominated. Maybe higher score in a theory track?)

Abstract rating 2

Submitted by **ANAU MONTEL, Noemi** <noemi.anaumontel@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 207

The de Sitter space: a common basis for the early universe and the inside of elementary particles

Content

In the past decennia we have developed a QFT model that describes individual Standard Model quarks as soliton-like solutions of the coupled quantized field equations for the quark and the SU3 gauge fields. The fact that these equations possess exactly three solutions (generations!?) is encouraging; however, the negativity of the system's energy poses a problem, as one would like to relate it to the mass of the particle. Hence, to complete this model, an underlying energy basis is needed whose positive energy equals - or slightly exceeds - the negative QFT energy. Using general relativity (GR) one can argue that the system must have Planckian dimensions, which implies that the energy density inside is of order G^{-2} . A basis with such an enormous energy density can (only?) be realised by the vacuum energy of an early de Sitter universe, as its density behaves like $1/t^3$ after its creation (t being the conformal time). This contribution will match the QFT energy when t reaches the value $t_c \sim G^{1/3} / \Lambda^{1/6} = 10^{-22} \text{s}$ (Λ being the cosmological constant). The mass of the dressed quark can then be related to the inverse of this creation time and comes out to roughly 5 MeV for the light quarks, in close agreement with observations. Hence, these results establish a deep relationship between cosmology, GR and QFT.

To be consistent with this description, the real universe should also start as a classical de Sitter space. The demand of classicality is needed, as the creation process of quarks should be reversible, as they can also be annihilated. This demand is not unrealistic, as it takes t_c seconds before the first particles can be created in the universe, and without their presence quantum physics cannot change the actual state of the universe. Once particles appear, the evolution of the universe becomes irreversible and its entropy will rise. In this cosmological scenario the expansion cannot be attributed to the FRW scale factor, as this factor is maximal (even infinite) at the big bang. Instead, the decrease of the dominant vacuum (dark) energy density (like $1/t^3$) forces a linear expansion of the universe, so that energy is conserved. Hence, the expansion of the universe is only an indirect consequence of GR (because of the time-dependence of the metric), but a direct physical consequence of energy conservation.

General relativity does not imply energy conservation; and indeed, the creation or (annihilation) of a de Sitter universe (either at the big bang or in the creation or annihilation of elementary particles) does not observe it, although this "violation" can be "understood" thermodynamically by the presence of negative pressure in the de Sitter space (it exactly matches the positive vacuum energy). Outside this exceptional case, we postulate that energy conservation holds, as it does in the Minkowski space of QFT. In this regard it is opportune to mention that both the conformal factor and the uniform (linear) expansion factor represent space-time scalings of Minkowski space. Whether an even deeper justification exists for this dichotomy in our most cherished law, remains a question.

The ensuing cosmological model provides an elegant and coherent picture of the evolution of the universe, naturally explaining the dominance of dark energy and featuring a cosmological constant that is truly constant. The dominantly linear expansion - with slight deviations due to the changing contribution of matter and radiation - gives an excellent fit to the supernovae data. Its prediction that the Hubble constant is close to the age of the universe also follows. Furthermore, in the new cosmic time (namely conformal time) the first galaxies and stars emerge at a much later time, potentially resolving the discrepancy with recent observations. Many of the predictions of the model coincide with those of the linear $R = ct$ model, as the linear conformal expansion factor mostly plays the same role as the traditional FRW scale factor. Hence, the current model may also share in some of the successful predictions of the $R = ct$ model. Finally, we note that matter and

radiation modify the dominant de Sitter metric and lead to secondary terms which are a factor $9/4$ larger in the case of matter and a factor $-1/2$ smaller in the case of radiation. Whether the extra matter term, which is localized around large mass concentrations, mimics dark matter is a possibility worth investigating.

Other topic / keywords:

De Sitter space, Unification GR, QFT and cosmology. Planckian model particles

Author: Prof. GREBEN, Jan (CSIR retired)

Presenter: Prof. GREBEN, Jan (CSIR retired)

Track Classification: Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **GREBEN, Jan** <jmgreben@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 208

How do generative diffusion models learn the cosmic web structure?

Content

In recent years, inference techniques such as simulation-based inference (SBI) and field-level inference have become increasingly prominent for extracting information from the large-scale structure. However, these methods require large ensembles of computationally expensive simulations, making it difficult to extensively explore the cosmological parameter space and increasing the demand for robust emulators. In this work, we construct an optimised generative diffusion model to emulate the cosmic web (CW), comprising voids, walls, filaments and nodes, which encodes key information about cosmological parameters and the evolution of the large-scale structure in the Universe. In particular, we investigate how diffusion models capture the statistical properties of the CW via self-attention maps by evaluating how well they reproduce distinct CW environments. Based on several statistical estimators, our analysis provides a quantitative assessment of the performance of diffusion models. We further explore how latent generative models learn high-resolution 3D simulations, evaluating the robustness of this approach in preserving CW statistics, a key requirement in SBI frameworks.

Other topic / keywords:

Author: Mr NOOR, Mehdi (CNRS - Institut d'Astrophysique Spatiale)

Co-authors: Dr AGHANIM, Nabila (CNRS - Institut d'Astrophysique Spatiale); Dr BONNAIRE, Tony (CNRS - Institut d'Astrophysique Spatiale); Dr DECELLE, Aurélien (Escuela Técnica Superior de Ingenieros Industriales, Universidad Politécnica de Madrid)

Presenter: Mr NOOR, Mehdi (CNRS - Institut d'Astrophysique Spatiale)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (Interesting topic but really more suited to Inference/Methods section)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (Better suited for the methods session.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **NOOR, Mehdi** <mehdi.noor@universite-paris-saclay.fr> on **Wednesday, 29 April 2026**

Abstract ID : 209

Direct likelihood emulation for efficient cosmological parameter inference

Content

Precision cosmology increasingly relies on repeated evaluations of computationally expensive observables, such as Cosmic Microwave Background (CMB) anisotropy spectra and large-scale structure statistics, posing a significant bottleneck for parameter inference and model comparison. Emulation techniques have emerged as a powerful solution, enabling fast and accurate interpolation of these observables across parameter space. In this talk, I will present CLiENT (Cosmological Likelihood Emulator using Neural Networks with TensorFlow), a method that bypasses observable prediction entirely by directly emulating the likelihood function of a dataset given cosmological parameters. This approach provides a flexible and fully differentiable surrogate for the likelihood, enabling efficient gradient-based inference methods.

Using fewer than $\sim 2 \times 10^4$ training evaluations, the likelihood emulator achieves high fidelity, recovering posterior constraints to within 0.1σ of the true likelihood and maintaining pointwise accuracy at the level of $\Delta\chi^2 \leq 0.5$ across relevant regions of parameter space. I will demonstrate the robustness and versatility of this approach, including applications to extended cosmological models.

These results position likelihood emulation as a powerful and complementary alternative to traditional observable-based approaches, with clear advantages for fast, flexible, and differentiable cosmological inference.

Other topic / keywords:

Emulation, Sampling, Inference

Authors: HANNESTAD, Steen (Aarhus University); Mr JANKEN, Luca (Aarhus University); NYGAARD, Andreas (University of Zurich); Mr TRAM, Thomas (Aarhus University)

Presenter: NYGAARD, Andreas (University of Zurich)

Track Classification: Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 2.0** (Insufficient accuracy to survive Stage-IV pressure.)

Abstract rating 2

Submitted by **NYGAARD, Andreas** <andreas.hansen@uzh.ch> on **Wednesday, 29 April 2026**

Abstract ID : 210

Assessing baryonification for weak lensing observables

Content

Baryonic physics introduces significant uncertainties in cosmological observables such as weak lensing statistics, while accurate predictions typically require computationally expensive hydrodynamical simulations. This limits the exploration of the parameter space in modern cosmological analyses. Baryonification methods provide a fast alternative by incorporating baryonic effects into dark matter-only simulations, but their accuracy and range of validity remain to be fully established across different implementations and observables.

In this talk, I compare two baryonification approaches: a standard snapshot-based method and a shell-based method applied directly to HEALPix maps, which enables particularly efficient map-level analyses. Their performance is assessed against hydrodynamical simulations from TNG and FLAMINGO, which provide matched dark matter-only counterparts for controlled comparisons, as well as against ensembles of dark matter-only simulations from CosmoGrid.

The comparison focuses on complementary weak lensing statistics, including power spectra and peak counts, allowing for a systematic assessment of how well baryonification captures baryonic effects in both Gaussian and non-Gaussian observables. This setup enables a clear evaluation of the regimes in which baryonification can serve as a reliable substitute for full hydrodynamical simulations.

Other topic / keywords:

Baryonification, weak lensing, large scale structure, simulation

Author: NYGAARD, Andreas (University of Zurich)

Presenter: NYGAARD, Andreas (University of Zurich)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

If necessary, I would be glad for this contribution to be presented as a poster.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (baryonification is a n important technique, here with the best simulaitons.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0** (Either LSS or methods is fine, I guess.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 3.0** (Baryonification)

Abstract rating 3

Submitted by **NYGAARD, Andreas** <andreas.hansen@uzh.ch> on **Wednesday, 29 April 2026**

Abstract ID : 211

Freezing Gravity as a Model of Dark Energy Crossing the Phantom Divide

Content

Freezing Gravity is a recently proposed dark energy framework that enables a stable crossing of the phantom divide, motivated by current observational interest in dynamical dark energy. Its key feature is the independent control of the cosmological background and linear perturbations, which allows arbitrary background evolutions while maintaining freedom from ghost and gradient instabilities.

The scalar degree of freedom propagates on small scales but becomes effectively frozen in the infrared limit, giving the model its name. In this poster, I will discuss further theoretical aspects of this framework, including its coupling to matter, the associated effective cutoff scale, possible strong-coupling issues, and the resulting phenomenological implications.

Other topic / keywords:

Authors: YAO, Zhibang (Leiden University); Dr YE, Gen; SILVESTRI, Alessandra

Presenter: YAO, Zhibang (Leiden University)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Poster • 3.0**

Abstract rating 3

GLAVAN, Dražen: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **YAO, Zhibang** <zhbyao@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 212

Skew-normal likelihood for non-Gaussian astronomical data

Content

Cosmological observables often exhibit mild but significant deviations from Gaussianity, typically in the form of asymmetric tails. Using Gaussian likelihoods in such cases can therefore introduce systematic biases in parameter inference. We investigate the use of a skew-normal likelihood as a flexible alternative that captures these non-Gaussian features.

We focus on cosmic shear 2 point correlation function, a key weak lensing probe of the late-time large-scale structure, whose distribution has been shown to deviate from Gaussianity, particularly on larger scales. Using samples of data vectors from SLICS, which provide Euclid-like weak lensing simulations, we construct a pipeline to build a multivariate skew-normal likelihood model and then use it at the inference level.

This framework allows us to incorporate data points that are typically excluded under Gaussian assumptions due to their non-Gaussian distributions, thereby increasing the constraining power of the analysis. At the same time, the model naturally reduces to a Gaussian likelihood in the appropriate limit giving us a flexible pipeline to use it for the Gaussian parts of the data vectors. We further discuss how Gaussian noise can be consistently included at the likelihood level.

Our results show that for a fixed non-tomographic shear two-point correlation function with 20 data points, the parameter shift between Gaussian and skew-normal likelihoods is negligible ($< 0.1\sigma$ in S_8), indicating that Gaussian approximations remain adequate in this regime. However, when restricting the Gaussian analysis to a subset of 15 data points by excluding the most non-Gaussian elements, we observe a moderate shift ($\sim 0.6\sigma$ in S_8) relative to the skew-normal analysis using the full data vector. This demonstrates that the skew-normal likelihood enables the consistent inclusion of mildly non-Gaussian data points that would otherwise be discarded, leading to improved parameter constraints. In this setup, we find a $\sim 9\%$ reduction in S_8 uncertainties. The skew-normal framework is expected to become increasingly important for larger and more non-Gaussian data vectors, such as those arising in tomographic analyses.

Other topic / keywords:

Author: ASHURIKISOMI, Zeynab (Leiden Observatory)

Co-authors: GRANDÓN, Daniela; SELLENTIN, Elena (Leiden University)

Presenter: ASHURIKISOMI, Zeynab (Leiden Observatory)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:**Large-Scale Structure:****Judgments:** Positive**Reviews:**

KUIJKEN, Koen: **Accept • 4.0** (partly my student so I am biased - but probably best in statistical inference session anyway,)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 3.0** (Best suited for stats session.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:**Judgments:** Positive: Talk**Reviews:**

SELLENTIN, Elena: **Accept: Talk • 4.0** (Stage-IV precision likelihood for Euclid HOWLS non-Gaussianity.)

Abstract rating 4

Submitted by **ASHURIKISOMI, Zeynab** <ashurikisomi@strw.leidenuniv.nl> on **Wednesday, 29 April 2026**

Abstract ID : 213

Coupling the FIRE galaxy simulations to velocity dependent and anisotropic SIDM

Content

Understanding the interplay between dark matter physics and baryonic processes is critical for identifying the nature of dark matter. Self-interacting dark matter (SIDM), where dark matter particles can scatter with each other, is well motivated by theoretical models. Baryonic effects are often degenerate with dark matter physics, so a full picture is possible only through simulations that span a range of galaxy formation models and underlying particle physics. I will present an updated implementation of SIDM in the Gizmo code that allows for a fully customizable velocity dependence in the interaction cross section as well as anisotropy in the scattering angle. I will show results using the FIRE galaxy formation model that demonstrate the reliability of the code and the differences from existing models with constant cross sections and isotropic scattering. This code will provide a better description of the effects of SIDM in merging and infalling halos, which is essential to properly model and constrain the SIDM parameter space. In addition, it will add to the existing range of alternative dark matter models implemented in Gizmo for consistent model comparisons within the same galaxy formation model. Building upon my previous simulations using Arepo, this implementation will also allow, for the first time, comparisons of the same SIDM models between drastically different galaxy formation codes. With these models, we can identify unique signatures of classes of dark matter models and disentangle the degeneracies between dark and baryonic processes.

Other topic / keywords:

Cosmological galaxy simulations

Author: O'NEIL, Stephanie (University of Pennsylvania, Princeton University)

Co-authors: Prof. LISANTI, Mariangela (Princeton University); Prof. NECIB, Lina (MIT); Prof. SANDERSON, Robyn (University of Pennsylvania)

Presenter: O'NEIL, Stephanie (University of Pennsylvania, Princeton University)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Matter:

Judgments: Positive: Talk

Reviews:

KAVANAGH, Bradley: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **O'NEIL, Stephanie** <sloneil@sas.upenn.edu> on **Wednesday, 29 April 2026**

Abstract ID : 214

Simulation-Based Inference for Cosmological Field Reconstruction and Parameter Estimation

Content

Simulation-based inference (SBI) enables Bayesian analysis of complex cosmological data when only a forward model is available, while field-level inference (FLI) aims to perform inference in a maximally efficient way and retain more information than summary-statistic pipelines. In this talk, I will highlight recent advances and applications of SBI and FLI in cosmology. First, I will show how field-level SBI can be used to reconstruct cosmological fields from incomplete and noisy data. Using Gaussian neural posterior estimation with a trainable mean and covariance, and combining classical conjugate-gradient solvers with neural networks, our method captures complex spatial correlations, denoises observations, and probabilistically reconstructs missing regions. We demonstrate this approach on the challenging task of inferring the 3D dark matter field and its initial conditions. I will then describe how this method can be combined with graph neural networks to reconstruct fields at small scales from point cloud galaxy data, and how it can be embedded in an active-learning framework for dynamic SBI, enabling joint inference of fields and cosmological parameters by steering simulations toward the most relevant regions of the parameter space.

Other topic / keywords:

Author: SAVCHENKO, Oleg (GRAPPA Institute, University of Amsterdam)

Presenter: SAVCHENKO, Oleg (GRAPPA Institute, University of Amsterdam)

Track Classification: Large-Scale Structure; Dark Matter; Inflation / Primordial Perturbations; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (important method of the future for upcoming big data sets. Would also fit well in inference track.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 3.0** (Yes, methods session.)

Abstract rating 3

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

COLE, Philippa: **Accept • 4.0** (better for Methods / statistical inference / ML)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 4.0** (Field level inference)

Abstract rating 4

Submitted by **SAVCHENKO, Oleg** <o.savchenko@uva.nl> on **Wednesday, 29 April 2026**

Abstract ID : 215

Primordial Black Holes from Resonances in the Running-Mass-Inflation Model

Content

Resonant excitations during inflation can amplify the primordial curvature perturbation within a narrow range of k values. This suggests a novel mechanism to generate Primordial Black Holes (PBHs). We study such resonances within the context of the Running-Mass-Inflation model. Generated PBHs can explain the totality of Dark Matter. The mechanism also predicts the enhancement of induced Gravitational Waves (GWs) and GWs created by binary BH collisions. Both types of GWs will be observable by future laser interferometers and resonant cavity experiments respectively.

Other topic / keywords:

Primordial Black Holes

Author: KARCIAUSKAS, Mindaugas (Center for Physical Sciences and Technology (FTMC))

Co-authors: Dr FURUTA, Yuma (School of High Energy Accelerator Science, Graduate University for Advanced Studies (SOKENDAI), 1-1 Oho, Tsukuba, Ibaraki 305-0801, Japan); Prof. KOHRI, Kazunori (Division of Science, National Astronomical Observatory of Japan, 2-21-1 Osawa, Mitaka, Tokyo 181-8588, Japan); Dr SÁEZ, Alejandro (Instituto de Física Corpuscular (IFIC), CSIC-Universitat de València, 46071, Valencia, Spain)

Presenter: KARCIAUSKAS, Mindaugas (Center for Physical Sciences and Technology (FTMC))

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (Better in early universe/inflation)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 3.0**

Abstract rating 3

Inflation / Primordial Perturbations:

Judgments: Conflicting: Talk, Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

COLE, Philippa: **Accept: Talk • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **KARCIAUSKAS, Mindaugas** <mindaugas.karciauskas@proton.me> on **Wednesday, 29 April 2026**

Abstract ID : 216

Inconsistencies of Tsallis cosmology within horizon thermodynamics and holographic scenarios

Content

We investigate the cosmological implications of Tsallis entropy in two widely discussed frameworks: the Cai–Kim thermodynamic derivation of the Friedmann equations and the Tsallis holographic dark energy (HDE) scenario, considering both the Hubble scale and the Granda–Oliveros (GO) cutoff as infrared regulators. In both cases, the dynamics introduce a nonextensivity parameter δ , with the standard Bekenstein–Hawking entropy–area relation recovered for $\delta = 1$. While previous studies have suggested that only small deviations from extensivity are observationally allowed, typically requiring $|1 - \delta| \lesssim 10^{-3}$, here we go further and perform a systematic consistency analysis across the entire expansion history. We show that even mild departures from $\delta = 1$ lead to pathological behavior in the effective dark energy sector: its density can become negative or complex, its equation of state may diverge, or it can contribute an unacceptably large early-time fraction that spoils radiation domination and violates big bang nucleosynthesis and CMB constraints. Our results sharpen and unify earlier hints of tension, providing a clear physical interpretation in terms of corrections that grow uncontrollably with the expansion rate toward the past. We conclude that within both the Cai–Kim and HDE formulations, a viable cosmology emerges only in the extensive limit, effectively reducing the models to Λ CDM. More broadly, our findings emphasize the importance of dynamical consistency and cosmological viability tests, when assessing nonextensive entropy formalisms as potential frameworks for describing the Universe’s dynamics.

Other topic / keywords:

Author: Mr IBARBO PERLAZA, PEDRO MARTIN (Universidad del Valle)

Co-authors: ORJUELA-QUINTANA, JOHN BAYRON (UNIVERSIDAD DEL VALLE); PALACIOS CORDOBA, JOSE LUIS (Universidad Del Valle); VALENZUELA-TOLEDO, Cesar A. (Departamento de Física, Universidad del Valle)

Presenter: Mr IBARBO PERLAZA, PEDRO MARTIN (Universidad del Valle)

Track Classification: Cosmic Microwave Background; Dark Energy / Modified Gravity; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0**

Abstract rating 2

GLAVAN, Dražen: **Accept: Poster • 1.0**

Abstract rating 1

Submitted by **Mr IBARBO PERLAZA, PEDRO MARTIN** <pedro.ibarbo@correounivalle.edu.co>
on **Wednesday, 29 April 2026**

Abstract ID : 217

Constraining cosmology with the Lyman-alpha forest

Content

The Lyman-alpha forest is a powerful cosmological probe of matter density fluctuations in the weakly non-linear regime through the high redshift and underdense intergalactic medium (IGM). On small scales, the Lyman-alpha 1D flux power spectrum is uniquely sensitive to both the properties of dark matter and the complex gas dynamics driven by IGM photoheating during reionization, offering cosmological constraints that are complementary to other probes, such as the CMB. In this talk, I will present recent constraints on two dark matter candidates separated by more than 20 orders of magnitude in mass: Cold+Warm Dark Matter and Axion-Like Particles, derived by comparing the Sherwood-Relics hydrodynamical simulation suite with high signal-to-noise ratio, high-redshift UVES and HIRES spectra. These results highlight how small-scale features in the forest reveal fundamental aspects of both dark matter and the IGM thermal history.

Other topic / keywords:

Numerical simulations, Reionization

Author: GARCIA GALLEGO, Olga (Institute of Astronomy, University of Cambridge)

Co-authors: Dr IRSIC, Vid (University of Hertfordshire, Hatfield, UK); Prof. HAEHNELT, Martin (Kavli Institute for Cosmology, Cambridge); VIEL, Matteo; Prof. BOLTON, James (University of Nottingham)

Presenter: GARCIA GALLEGO, Olga (Institute of Astronomy, University of Cambridge)

Track Classification: Large-Scale Structure; Dark Matter; Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (Data constraints on DM candidates from LSS. Important. Better fit to DM session?)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0** (Happy to have this in the LSS session. Interesting results. Also appropriate for the DM session.)

Abstract rating 5

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 2.0** (Very likely higher grade in the other tracks submitted to.)

Abstract rating 2

Submitted by **GARCIA GALLEGO, Olga** <og313@cam.ac.uk> on **Wednesday, 29 April 2026**

Abstract ID : 218

The Impact of Photo-z Bias on Cosmology with Weak Lensing Peak Counts

Content

Measuring the peaks of weak lensing convergence maps provides information about structure formation and the distribution of matter, which can improve cosmological constraints when combined with 2-point statistics. In a photometric survey, such as LSST, calibration of galaxy redshifts is expected to contribute significantly to the uncertainty on cosmological parameter estimation. To assess the impact of photo-z bias for cosmology with peak counts in LSST, we first train an emulator using convergence maps from the cosmo-SLICS simulations. We then use the emulator to perform inference on a different set of simulations with biased photo-z distributions, obtaining constraints on Ω_m , S_8 and w_0 . By comparing these to results obtained using unbiased simulations, we are thus able to quantify the effect of photo-z errors on cosmology with peak statistics.

Other topic / keywords:

Weak Lensing

Author: WHYLEY, Arthur

Presenter: WHYLEY, Arthur

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (peak stats/photz bias. good topic)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 4.0**

Abstract rating 4

Submitted by **WHYLEY, Arthur** <arthur.whyley@port.ac.uk> on **Wednesday, 29 April 2026**

Abstract ID : 219

Fundamental Physics at small scales with Hydrogen

Content

I will discuss how atomic hydrogen in absorption and emission can be used to address fundamental physical questions by probing non-linear scales. I will focus on the following topics: primordial magnetic fields and their impact on structure formation, dark matter nature. I will also briefly address what is the advantage of using atomic hydrogen to perform field level inference in the post-reionization Universe.

Other topic / keywords:

Author: VIEL, Matteo (SISSA)

Presenter: VIEL, Matteo (SISSA)

Track Classification: Primordial Magnetic Fields; Large-Scale Structure; Dark Matter; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (Expert reviewer, always interesting results.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0**

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 2.0** (Very likely higher grade in other tracks submitted to.)

Abstract rating 2

Primordial Magnetic Fields:

Judgments: Positive: Talk

Reviews:

BONDARENKO, Kyrylo: **Accept: Talk • 5.0** (I agree that this talk can also be moved to DM or LSS sessions.)

Abstract rating 5

Submitted by **VIEL, Matteo** <viel@sissa.it> on **Wednesday, 29 April 2026**

Abstract ID : 220

Light Particles in the Halo Bias

Content

In this talk I will introduce the key cosmological datasets—the cosmic microwave background and galaxy surveys—and explain how they serve as particle detectors for the lightest particles in nature. I will describe the vast landscape of dark matter candidates, spanning many orders of magnitude in mass, and show how cosmological observables can distinguish among them. A central theme of my work is the growth-induced scale-dependent bias (GISDB): the insight that purely gravitational effects of particles modify not only the matter distribution but also the relationship between halos and the underlying matter field. This effect, arising from the physics of spherical collapse and the peak-background split, provides an independent channel of information beyond the matter power spectrum alone.

I will discuss the ability of surveys to detect or rule out broad classes of light thermal relics, and demonstrate that even percent-level abundances of ultra-light axion dark matter ($10^{-33} \leq m\phi/eV \leq 10^{-22}$) produce significant signatures in the halo bias. I will also describe my recent work on model-independent relic constraints, showing what existing Planck CMB data can tell us about any monomodal light relic.

Other topic / keywords:

axions

Author: DEPORZIO, Nicholas (Boston University)

Presenter: DEPORZIO, Nicholas (Boston University)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Interesting topic that fits both DM and LSS. Happy to accept this to the LSS session.)

Abstract rating 5

KUIJKEN, Koen: **Accept • 3.0** (Interesting. could be a DM topic too but halo bias is a very LSS concept.)

Abstract rating 3

Submitted by **DEPORZIO, Nicholas** <deporzio@bu.edu> on **Wednesday, 29 April 2026**

Abstract ID : 221

A Parameter Scan of Current-Carrying Cosmic Strings

Content

Cosmic string networks are expected to form during symmetry-breaking phase transitions in the early Universe via the Kibble mechanism and arise naturally in many extensions of the Standard Model. In several such scenarios, string networks can carry additional degrees of freedom, such as charges and currents, leading to so-called current-carrying or superconducting cosmic strings. These additional degrees of freedom can significantly affect the evolution of the networks and may lead to distinctive observational signatures.

In this work we study the evolution of current-carrying cosmic string networks using large-scale field theory simulations of a $U(1) \times U(1)$ model containing two complex scalar fields and their associated gauge fields. In the parameter regime considered here, one sector undergoes symmetry breaking and forms cosmic strings, while the second scalar field remains unbroken outside the string core and provides a condensate localized on the string worldsheet. We explore the network evolution across a broad region of the model's parameter space, varying condensate and coupling parameters while maintaining the conditions required for stable current-carrying solutions.

We also present a first characterization of the power spectra of the charge and current fields, providing new numerical diagnostics for the dominant energy loss mechanism of these networks.

Other topic / keywords:

Topological Defects, Field Theory Simulations

Author: HEILEMANN, Ricarda (Centro de Astrofísica da Universidade do Porto)

Co-authors: CORREIA, José Ricardo; MARTINS, Carlos (CAUP)

Presenter: HEILEMANN, Ricarda (Centro de Astrofísica da Universidade do Porto)

Track Classification: Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Early Universe:

Judgments: Positive

Reviews:

VAN DE VIS, Jorinde: **Accept • 4.0**

Abstract rating 4

Submitted by **HEILEMANN, Ricarda** <ricarda.heilemann@astro.up.pt> on **Wednesday, 29 April 2026**

Abstract ID : 222

Three-point intrinsic alignments of galaxies and haloes in the FLAMINGO simulations

Content

Cosmic shear is a central probe of the late-time Universe, but the interpretation of its measurements is limited by astrophysical systematics such as intrinsic alignments (IA) of galaxies. Upcoming lensing surveys will enable measurements of higher-order statistics with increased precision, providing non-Gaussian information beyond two-point correlations. Interpreting these measurements requires IA models that are accurate at higher order while remaining consistent with existing two-point constraints.

In this talk, I will present a study of the three-point IA signal measured in the FLAMINGO hydrodynamical simulation. We measure both the three-point correlation function (3PCF) and third-order aperture-mass statistics, using galaxy and halo shapes from the largest FLAMINGO simulation, $(2.8 \text{ Gpc})^3$. This enables high-significance detections over a wide range of scales and triangle configurations. I will compare these measurements to predictions from the tree-level effective field theory (EFT) of IA, testing the full model, reduced variants, and co-evolution relations between model parameters. I will show that the EFT provides a good description of the measured three-point signal, with an alignment amplitude consistent with that inferred from two-point statistics. Neglecting higher-order EFT contributions can bias parameter constraints and degrade the fit, while co-evolution relations provide a simpler description that performs close to the full model, making them promising for future photometric weak-lensing analyses.

Other topic / keywords:

Weak lensing, intrinsic alignments, large-scale structure, hydrodynamical simulations, effective field theory

Author: VEDDER, Casper (Leiden University)

Co-authors: BAKX, Thomas (Utrecht University); CHISARI, Elisa (Utrecht University); HOEKSTRA, Henk (Leiden University); SCHALLER, Matthieu (Lorentz Institute & Leiden Observatory)

Presenter: VEDDER, Casper (Leiden University)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (Good work in IA. (Leiden student))

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0**

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 2.0** (Please evaluate in LSS track, abstract has no inference component. Maximally poster in inference track.)

Abstract rating 2

Submitted by **VEDDER, Casper** <vedder@strw.leidenuniv.nl> on **Wednesday, 29 April 2026**

Abstract ID : 223

Positivity Constraints on the EFT of Inflation

Content

Positivity bounds derived from unitarity, locality, and causality constrain the Wilson coefficients of EFTs admitting a Lorentz-invariant UV completion. Extending these bounds to the EFT of inflation is nontrivial: cosmological observables are correlation functions rather than scattering amplitudes, the background is quasi-de Sitter rather than Minkowski, and Lorentz invariance is spontaneously broken.

In this talk I will present recent progress in deriving novel positivity bounds on the Wilson coefficients of single-field inflation obtained by combining the flat-space limit of cosmological correlators with the analytic structure of the EFT of inflation as a relativistic superfluid. These results extend the dispersion-relation program to a Lorentz-breaking cosmological background and yield positivity constraints on the inflationary EFT parameter space.

Other topic / keywords:

Author: BRAVO GUERRATY, Rafael (Pontificia Universidad Católica de Chile)

Presenter: BRAVO GUERRATY, Rafael (Pontificia Universidad Católica de Chile)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept • 3.0**

Abstract rating 3

Submitted by **BRAVO GUERRATY, Rafael** <rguerraty@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 224

A self-calibration method of imaging systematics using power spectrum and bispectrum

Content

Imaging systematics in galaxy surveys generate large-scale angular selection effects that can contaminate measurements of primordial non-Gaussianity. We develop an analytical framework to propagate two-dimensional imaging templates into three-dimensional power spectrum and bispectrum observables. In this approach, angular templates are embedded into radial survey shells, and their effects on the observed monopoles of power spectrum and bispectrum can be modeled analytically. We use this formalism to quantify the degeneracy between imaging contamination and local-type PNG, and to test whether adding bispectrum information can improve self-calibration beyond the power spectrum alone. This framework provides an estimator-level route for incorporating imaging systematics into joint power spectrum and bispectrum analyses of future large-scale structure surveys.

Other topic / keywords:

Author: XIA, Qianran (University of Michigan)

Co-author: HUTERER, Dragan (University of Michigan)

Presenter: XIA, Qianran (University of Michigan)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (Important work on largest-scale systematic errors in imaging surveys of LSS)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0** (Important method and also clearly large scale. So either methods or LSS would be fine.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 4.0** (Sounds very hard and any solution is much needed.)

Abstract rating 4

Submitted by **XIA, Qianran** <qianranx@umich.edu> on **Wednesday, 29 April 2026**

Abstract ID : 225

Cross-correlation between squared 21-cm field and patchy screening.

Content

The 21-cm signal from the Epoch of Reionization (EoR) traces the neutral hydrogen present in the IGM. The patchy ionization of neutral Hydrogen (HI) permeating Inter-galactic medium (IGM) makes the 21-cm signal highly non-Gaussian. The ionized bubbles, once formed, generate secondary anisotropies in the observed CMB signal. Patchy screening (τ_{es}) is one such anisotropy that arises when CMB photons Thompson scatter off the free electrons, resulting in a new polarization in the signal. Previous studies have looked into the prospects of cross-correlating this patchy screening effect with the 21-cm signal. However, using a foreground wedge filter on the 21-cm maps removes low k_{\parallel} modes in this signal, and τ_{es} is an integrated line-of-sight effect, i.e. only $k_{\parallel} = 0$ mode exists. In order to avoid mismatched Fourier space coverage of the two signals, we build a 21cm-21cm- τ_{es} estimator. This estimator encodes important information about the reionization history and is also expected to survive the wedge filter through mode-coupling induced by higher-order correlations. Additionally, we present forecasts for the detection of this signal in future surveys.

Other topic / keywords:

Epoch of Reionization

Author: POTLURI, Hemanth (University of Groningen and Stellenbosch University)

Co-authors: MA, Yin-Zhe (Stellenbosch University, South Africa); GUO, Wen-Qing (Stellenbosch University); KOOPMANS, Leon (University of Groningen); MEERBURG, Daan

Presenter: POTLURI, Hemanth (University of Groningen and Stellenbosch University)

Track Classification: Cosmic Microwave Background; Others (Please specify below)

Contribution Type: Poster

Status: SUBMITTED

Submitted by **POTLURI, Hemanth** <hemanthpotluri.98@gmail.com> on **Wednesday, 29 April 2026**

Abstract ID : 226

Probing WIMP-nucleon Effective Interactions with Paleo-Detectors

Content

Paleo-detectors offer a promising approach to the direct detection of WIMP dark matter via the readout of nuclear recoil damage tracks in natural minerals with ages on geological timescales of $O(1 \text{ Gyr})$. These tracks act as a proxy for the recoil energy induced by WIMP–nucleus scattering. We present projections of the sensitivity of paleo-detectors to the full set of elastic and inelastic WIMP–nucleon interactions within the framework of non-relativistic effective field theory (NREFT), and compare their performance with that of conventional direct-detection experiments. We also investigate the ability of paleo-detectors to discriminate between different operator structures and assess their prospects for dark matter mass reconstruction. Our results show that paleo-detectors can achieve sensitivity comparable to, and in some cases exceeding, that of conventional direct-detection experiments across a wide range of dark matter masses, with particularly strong sensitivity to particles of $O(1 \text{ GeV})$. Finally, we discuss the broader physics reach of paleo-detectors, including their potential to probe neutrino (atmospheric, supernova, and solar) physics by comparing minerals of different ages, thereby accessing the time evolution of these signals.

Other topic / keywords:

Dark matter direct detection

Author: THEODOSOPOULOS, Dionysios (The University of Texas at Austin)

Presenter: THEODOSOPOULOS, Dionysios (The University of Texas at Austin)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **THEODOSOPOULOS, Dionysios** <d.theodosopoulos@utexas.edu> on **Wednesday, 29 April 2026**

Abstract ID : 227

Constraining Late-Time Cosmology with DESI DR2

Content

In this talk, I present a set of complementary analyses aimed at constraining late-time cosmology with DESI DR2. I first discuss a model-independent reconstruction of the expansion history, where we directly constrain the background evolution without assuming a specific dark energy parametrization, finding results consistent with the standard w_0-w_a framework; this work also includes the development of an updated compressed CMB likelihood suitable for dark energy constraints, with ongoing extensions to neutrino mass and curvature models. I then revisit the Hubble tension from a late-time perspective, showing through a suite of toy models that modifications to the expansion history alone are insufficient, and that an evolution in Type Ia supernovae absolute magnitude is required to resolve the tension. We also present a physical modified gravity model which can achieve such a transition, albeit with some degree of tuning. Moving beyond geometric probes, I present recent progress toward DESI full-shape analyses, including constraints from DESI DR1 using folpsD, a theoretical framework for jointly modeling the power spectrum and bispectrum within an EFT-based approach. Finally, I briefly comment on ongoing contributions to modified gravity analyses within DESI, particularly in the development of pipelines for clustering and lensing observables.

Other topic / keywords:

Author: BANSAL, Prakhar (University of Michigan)

Presenter: BANSAL, Prakhar (University of Michigan)

Track Classification: Large-Scale Structure; Dark Energy / Modified Gravity

Contribution Type: Talk

Comments:

Here are the relevant publications <https://journals.aps.org/prd/abstract/10.1103/zypq-s6nl>
<https://arxiv.org/abs/2602.06293> <https://arxiv.org/abs/2604.08895>

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (DESI talk, important to have this in the session.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0**

Abstract rating 5

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 2.0** (The abstract sounds interesting but they speaker would need 2 or 3 full seminars to cover all they mention. We have weighted this in the score.)

Abstract rating 2

GLAVAN, Dražen: **Accept: Talk • 2.0**

Abstract rating 2

Submitted by **BANSAL, Prakhar** <prakharb@umich.edu> on **Wednesday, 29 April 2026**

Abstract ID : 228

Probing Modified Gravity with Velocileptors and Cocoa: A Joint Analysis Pipeline for HSC-Y3 and BOSS DR12

Content

The standard Λ CDM model describes the evolution of the universe with remarkable success but relies on the enigmatic components of dark matter and dark energy. Recent cosmological tensions, such as the S_8 discrepancy, have further motivated the scientific community to perform stringent tests of General Relativity (GR) on large scales. Phenomenological modified gravity (MG) parameters, μ and Σ , offer a robust framework to detect potential deviations from GR and explore the nature of cosmic acceleration.

In this work, we present a comprehensive joint analysis pipeline that combines weak lensing measurements from the Subaru Hyper Suprime-Cam (HSC) Year 3 shape catalog with full-shape galaxy clustering from the SDSS BOSS DR12 catalog. To accurately model non-linear structure formation and redshift-space distortions (RSD) under modified gravity, we integrate the Lagrangian Perturbation Theory code, Velocileptors, with the Boltzmann solver MGCAMB. This theoretical framework allows for a sophisticated treatment of non-linear clustering while accounting for the unique gravitational interactions experienced by both light and matter.

For our statistical inference, we employ Cocoa, a highly scalable pipeline designed for future flagship surveys such as the Nancy Grace Roman Space Telescope. We detail the technical implementation of our MG-compatible joint analysis framework and present its validation.

Finally, we discuss the current status of our analysis, our methodology for mitigating modeling systematics, and the prospects for delivering new constraints on gravity from this cross-survey analysis.

Other topic / keywords:

Author: TANIDA, Kohki (Nagoya University)

Presenter: TANIDA, Kohki (Nagoya University)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Sounds very technical and cannot see what's new/exciting about this work.)

Abstract rating 3

KUIJKEN, Koen: **Accept • 4.0** (might have new results?)

Abstract rating 4

Submitted by **TANIDA, Kohki** <tanida.koki.c6@s.mail.nagoya-u.ac.jp> on **Wednesday, 29 April 2026**

Abstract ID : 229

Forecast from a Lens-Equal-Source DES Year 6 3x2pt Analysis using Physics-Informed Priors

Content

Current and next-generation wide-field surveys, such as the Dark Energy Survey (DES) and the upcoming Legacy Survey of Space and Time (LSST), will rely heavily on joint 3x2pt analyses, combining cosmic shear, galaxy-galaxy lensing, and galaxy clustering, to place stringent constraints on cosmological parameters. In this context, the selection and characterization of optimal galaxy samples is a major area of research and one promising choice is to use the same galaxy sample for lenses and sources. This reduces the systematics parameter space that describes the uncertainties related to galaxy samples. Such a “lens-equal-source” analysis significantly improves the self-calibration of photo-z systematics, leading to improved cosmological constraints.

In this talk, we present a novel lens-equal-source 3x2pt pipeline applied to synthetic DES Year 6 data. To break parameter degeneracies and mitigate systematic effects, we introduce an informed prior on large-scale galaxy bias, including the effects of assembly bias. This physics-informed prior is calculated with the Halo Occupation Distributions (HOD) constructed on physically motivated UniverseMachine catalogs. Deep field observations with synthetic source injection are used to mimic realistic galaxy populations. By sampling across varying cosmologies, our prior naturally captures the complex, multidimensional covariance between galaxy bias, photo-z errors, and underlying cosmology.

We will discuss the integration of this prior directly into the likelihood inference using the Cocoa framework. Finally, we will demonstrate how leveraging high-fidelity, physics-informed priors in a lens-equal-source framework successfully stabilizes MCMC chains and tightens parameter constraints.

Other topic / keywords:

weak gravitational lensing; galaxy survey science

Author: GONG, Zhengyanguang (Steward Observatory, University of Arizona)

Co-authors: Dr ANBAJAGANE, Dhayaa (UChicago); Prof. EIFLER, Tim (Steward Observatory, University of Arizona); Dr PETERS, Fabian (Steward Observatory, University of Arizona); Dr REBOUCAS, Joao (Steward Observatory, University of Arizona); Dr SALCEDO, Andres (Steward Observatory, University of Arizona)

Presenter: GONG, Zhengyanguang (Steward Observatory, University of Arizona)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:**Large-Scale Structure:****Judgments:** Positive: Talk**Reviews:**KUIJKEN, Koen: **Accept: Talk • 4.0** (New DESY6 analysis, interesting)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0**

Abstract rating 5

Methods / Statistical Inference / Machine Learning:**Judgments:** Positive: Poster**Reviews:**SELLENTIN, Elena: **Accept: Poster • 3.0** (Modelling heavy.)

Abstract rating 3

Submitted by **GONG, Zhengyangguang** <lgong@usm.lmu.de> on **Wednesday, 29 April 2026**

Abstract ID : 230

Stochastic instantons and the tail of the inflationary density perturbation

Content

In the stochastic δN formalism, the statistics of the primordial density perturbations can be mapped onto the first-passage distribution of the underlying stochastic process. In this talk, I will present a general framework to evaluate the rare-event tail of this distribution, based on a saddle-point approximation of the associated path integral.

I will show that, at leading order, this description is equivalent to a more fundamental formulation in terms of the Schwinger-Keldysh path integral, in which integrating out short-wavelength modes yields an influence functional encoding the noise statistics of Starobinsky's stochastic approach. I will also show how this methodology can be exploited for importance sampling, providing an efficient numerical handle on rare events.

Finally, I will present gradient corrections to the instanton equations, both in analytically tractable models and in more realistic potentials, and discuss their implications for primordial black hole production.

Other topic / keywords:

Authors: CALDERON FIGUEROA, Jaime (University of Sussex); SEERY, David (University of Sussex)

Presenter: CALDERON FIGUEROA, Jaime (University of Sussex)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **CALDERON FIGUEROA, Jaime** <jrc43@sussex.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 231

Shapes and orientations of massive halos in the statistically anisotropic universe

Content

Statistical isotropy is a foundational conjecture in cosmology. However, its validation is a critical task, as theoretical models involving vector fields, such as those in the early universe, naturally lead to its violation. While previous studies using CMB and galaxy clustering have placed constraints on the quadrupolar type of statistical anisotropy (SA), recent N-body simulations have further revealed that SA induces an anisotropic halo bias.

Motivated by these developments, we investigate how SA originating from the early universe affects the distributions of shapes and orientations of cluster-sized halos, using cosmological N-body simulations that incorporate SA. While the three-dimensional halo shape parameters show little dependence on SA, we find that halo orientations are significantly influenced, with halos tending to align either perpendicular or parallel to the SA direction.

This SA-induced alignment becomes more prominent for more massive halos. We also study other vector quantities associated with the dynamics of halos, such as bulk velocity and angular momentum vectors. We find that their dependence on the SA is smaller than that of the orientation vectors. Our findings suggest that observational measurements of projected halo shapes derived from galaxy cluster-galaxy lensing could provide a novel probe of SA in the universe.

Other topic / keywords:

Authors: Mr MASAKI, Shogo (Chukyo University); MIZUGUCHI, Yurino (Nagoya University); SAGA, Shohei (Nagoya University); Mr YOKOYAMA, Shuichiro (Nagoya University)

Presenter: MIZUGUCHI, Yurino (Nagoya University)

Track Classification: Large-Scale Structure; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (Probably null results but good to think about these sort of tests. Probably to 'halo-ish' for early universe track?)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0**

Abstract rating 4

Submitted by **MIZUGUCHI, Yurino** <mizuguchi.yurino.y0@s.mail.nagoya-u.ac.jp> on **Thursday, 30 April 2026**

Abstract ID : 232

Dynamical Dark Energy inspired by the QCD vacuum

Content

The nature of dark energy has been a growing point of debate in recent years, particularly after the DESI measurements of the Baryon Acoustic Oscillations. While frequentist metrics appear to indicate a growing preference for a dynamical dark energy, some bayesian approaches indicate otherwise. Beyond this, there also lies the question of whether there exists a physical motivation behind any phenomenological parametrisation of dynamical dark energy.

The model described in this talk is motivated from computations of the non-perturbative QCD vacuum, which we parametrise into a dynamic, non-local contribution to the energy density, described by two additional cosmological parameters. I will describe how this model compares against both CPL and Λ CDM on the latest cosmological datasets, employing both frequentist χ^2 statistics and Bayesian model comparison. For the latter, the evidence is estimated from MCMC chains via the learnt harmonic mean estimator method which bypasses the need for the computationally expensive, nested sampling to obtain estimates of the evidence.

Other topic / keywords:

Authors: DI VALENTINO, Eleonora (University of Sheffield); LEE, Dong Ha (University of Sheffield); VAN WAERBEKE, Ludovic (University of British Columbia); ZHITNITSKY, Ariel; VAN DE BRUCK, Carsten (University of Sheffield)

Presenter: LEE, Dong Ha (University of Sheffield)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0**

Abstract rating 2

GLAVAN, Dražen: **Accept: Poster • 1.0**

Abstract rating 1

Submitted by **LEE, Dong Ha** <dhlee1@sheffield.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 233

Simulations of the axion field in the kinetic misalignment scenario

Content

In the kinetic misalignment scenario for QCD axion dark matter, the axion carries significant kinetic energy in the early universe, which affects its dynamics at the epoch of the QCD phase transition and can lead to a significant amplification of primordial fluctuations due to the nonlinearities of the QCD potential. In this work, we present novel lattice simulations of the axion field to explore the nonlinear dynamics of kinetic misalignment scenario and discuss the impact of initial conditions on the relic density and dark matter distribution. Extracting the energy density power spectra, we study the main characteristics of axion miniclusters, drawing a coherent picture of the relic abundance and dark matter substructure.

Other topic / keywords:

Authors: CHATHIRATHAS, Kierthika (Karlsruhe Institute of Technology); ERÖNCEL, Cem (İstinye University); KALTSCHMIDT, Mathieu (University of Zaragoza); REDONDO, Javier (University of Zaragoza); SAIKAWA, Kenichi (Kanazawa University)

Presenter: SAIKAWA, Kenichi (Kanazawa University)

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

Submitted by **SAIKAWA, Kenichi** <saikawa@hep.s.kanazawa-u.ac.jp> on **Thursday, 30 April 2026**

Abstract ID : 234

Constraining baryonic feedback and cosmology from DES Y3 and Planck PR4 6x2pt data

Content

We combine weak lensing, galaxy clustering, cosmic microwave background (CMB) lensing, and their cross-correlations (so-called $6 \times 2\text{pt}$) to constrain cosmology and baryonic feedback scenarios using data from the Dark Energy Survey (DES) Y3 Maglim catalog and the Planck satellite PR4 data release. We include all data points in the DES Y3 cosmic shear two-point correlation function (2PCF) down to $2.5'$ and model baryonic feedback processes via principal components (PCs) that are constructed from the ANTILLES simulations. We find a tight correlation between the amplitude of the first PC Q_1 and mean normalized baryon mass fraction $\bar{Y}_b = \bar{f}_b / (b/m)$ from the ANTILLES simulations and employ an independent \bar{Y}_b measurement from Akino et al. (2022) as a prior of Q_1 . We train a neural network $6 \times 2\text{pt}$ emulator to boost the analysis speed by $\mathcal{O}(10^3)$, which enables us to run a large number of simulated analyses to validate our analysis against various systematics. For our $6 \times 2\text{pt}$ analysis, we find $S_8 = 0.8073 \pm 0.0094$ when including a Q_1 prior from \bar{Y}_b observations. This level of cosmological constraining power allows us to put tight constraints on the strength of baryonic feedback. We find $Q_1 = 0.025^{+0.024}_{-0.029}$ for our $6 \times 2\text{pt}$ analysis and $Q_1 = 0.043 \pm 0.016$ when combining with external information from Planck, ACT, DESI. All these results indicate weak feedback, e.g., the tensions to Illustris ($Q_1 = 0.095$) and OWLS AGN T8.7 ($Q_1 = 0.137$) are 2.9-3.3 and 4.7-5.9, respectively.

Other topic / keywords:

Baryonic feedback, multi-probe analysis, weak lensing

Authors: XU, Jiachuan (Northeastern University); EIFLER, Tim (Steward Observatory, University of Arizona); KRAUSE, Elisabeth (The University of Arizona); Prof. MIRANDA, Vivian (Stony Brook University); Prof. MCCARTHY, Ian; Dr SALCIDO, Jaime

Presenter: XU, Jiachuan (Northeastern University)

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

The paper (<https://ui.adsabs.harvard.edu/abs/2025arXiv251025596X/abstract>) has been submitted to Phys. Rev. D and receive positive feedback (accept after minor modification). A follow-up to this work on $w_0\text{w}\Lambda\text{CDM}$ constraint is ongoing, and is expected to be submitted by the time of the conference.

Status: SUBMITTED

Track Reviews:**Large-Scale Structure:****Judgments:** Positive: Talk**Reviews:**

KUIJKEN, Koen: **Accept: Talk • 5.0** (Up to date analysis of best data out there - baryon feedback is a key focus)

Abstract rating 5

HILDEBRANDT, Hendrik: **Accept • 5.0**

Abstract rating 5

Methods / Statistical Inference / Machine Learning:**Judgments:** Positive: Talk**Reviews:**

SELLENTIN, Elena: **Accept: Talk • 4.0** (Uses actual data.)

Abstract rating 4

Submitted by **XU, Jiachuan** <jiac.xu@northeastern.edu> on **Thursday, 30 April 2026**

Abstract ID : 235

WimPyDD and WimPyC: Python codes exploiting the complementarity between WIMP direct detection and indirect detection

Content

I introduce WimPyDD and WimPyC which are object-oriented and customizable Python codes that calculate accurate predictions for the expected rates in WIMP direct detection experiments and WIMP capture rate in celestial bodies as indirect detection within the framework of Galilean invariant non-relativistic effective theory. Due to the experimental threshold direct detection can not explore signals at low WIMP incoming speed range, while capture in celestial bodies is favored for low or even vanishing WIMP speed. This complementarity can be analyzed using WimPyDD and WimPyC so that one can obtain bounds on WIMP-nucleus scattering which do not depend on the WIMP velocity distributions or WIMP-nucleus interactions.

Other topic / keywords:

Authors: KANG, Sunghyun (CQeST, Sogang University); Prof. SCOPEL, Stefano (CQeST, Sogang University)

Presenter: KANG, Sunghyun (CQeST, Sogang University)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **KANG, Sunghyun** <shkang901013@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 236

To log, or not to log: Scaling solutions for axion strings

Content

The axion was proposed as a solution to the strong CP problem and is currently one of the main candidates for cold dark matter. Superficially, recent field theory simulations disagree on whether the number of axion strings per Hubble patch is constant or log dependent, as well as what form that log dependence might take. This is of particular relevance since this parameter strongly impacts the abundance of axion dark matter. We use the Velocity-dependent One Scale Model to explore the evolution of axion string networks, aiming to compare the solutions obtained with different approaches: introducing a time-varying string tension at the microscopic or macroscopic scales, or using a suitable wiggly string extension of the VOS model. Since all global axion strings simulations have a relatively small dynamic range, an important distinction between realistic networks and simulations, which is reflected in our analysis, is the size of the log, which is about 10 times larger for cosmologically relevant networks than in simulations. Therefore we contrast 'large log' asymptotic solutions for the density and velocity of the network, with 'small log' ones relevant to the limited time-scale of simulations. This, together with the impact of the peculiar initial conditions on the latter (most simulations start with low densities but high velocities) turns out to be the key to the conundrum.

Other topic / keywords:

Axion strings; field theory numerical simulations; VOS model

Author: MARTINS, Carlos (CAUP)

Presenter: MARTINS, Carlos (CAUP)

Track Classification: Dark Matter; Early Universe

Contribution Type: Talk

Comments:

Mainly suitable for the early universe track, but has implications for (axion) dark matter.

Status: SUBMITTED

Submitted by **MARTINS, Carlos** <carlos.martins@astro.up.pt> on **Thursday, 30 April 2026**

Abstract ID : 237

Symplectic Bogoliubov Maps for CGPP in Lorentz-Breaking Proca–Scalar Cosmology

Content

Cosmological particle production is commonly described with intermediate-time quasiparticle labels that cease to align with asymptotic constructions once evolution carries mode frequencies far outside adiabaticity. We analyze a coupled Proca–scalar model on spatially flat FLRW, retaining the longitudinal sector of the massive vector and quadratic mixing of scalar perturbations through foliation-selected operators that are spatially isotropic but generically boost violating. Physically meaningful creation is summarized by the symplectic Bogoliubov map relating adiabatically defined annihilation operators on early and late slices; at quadratic order the coupling requires multifold diagonalization of fluctuations together with the constrained canonical doubling this entails, placing the construction outside minimal massive-vector setups with effectively decoupled polarizations. The intertwined normal-mode spectrum and constraint sector fix the mixing between asymptotic positive-frequency representations throughout the transient regime. From the completed in/out map we extract the occupation-number and relic-density bookkeeping used in spin-one gravitational particle-production dark matter analyses and present normalized contrasts with minimal decoupled-polarization benchmarks.

Other topic / keywords:

CGPP; massive spin-1 / Proca–scalar; Lorentz-breaking mixing; Bogoliubov / in-out formalism

Author: Dr RIQUELME, Simón (Universidad San Sebastián)

Presenter: Dr RIQUELME, Simón (Universidad San Sebastián)

Track Classification: Dark Matter; Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Submitted by **RIQUELME, Simón** <incertidumbre@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 238

Classification of MHD Turbulence Regimes Based on Their Physical Evolution Laws

Content

Magnetic turbulence has been suggested to be controlled either by Alfvénic dynamics or by magnetic reconnection, and the relative importance of these two mechanisms has remained an open question. In this work, we examine the physical processes that regulate the evolution of magnetic turbulence by means of numerical simulations. We consider maximally helical MHD turbulence in a magnetically dominated regime, and systematically vary the magnetic field strength, fluid viscosity, and magnetic diffusivity. Because magnetic helicity density is not conserved in non-ideal MHD, we use its decay behavior as a diagnostic to identify the dominant governing mechanism. We find that the turbulent evolution is consistent with the Sweet–Parker reconnection regime for Lundquist numbers in the range $10^2 \lesssim 10^3$. While it has been suggested that the characteristic timescale of magnetic turbulence appears to be primarily determined by the Alfvén regime, our results suggest that reconnection appears to play a dominant role in governing magnetic turbulence.

Other topic / keywords:

MHD turbulence

Author: YAMASHITA, Yuri (Nagoya University)**Presenter:** YAMASHITA, Yuri (Nagoya University)**Track Classification:** Primordial Magnetic Fields; Early Universe; Others (Please specify below)**Contribution Type:** Talk**Status:** SUBMITTED

Track Reviews:

Primordial Magnetic Fields:

Judgments: Positive: Poster

Reviews:

BONDARENKO, Kyrilo: **Accept: Poster • 3.0** (This is an MHD turbulence dynamo talk. It does not fit the PMF session; we can propose a poster.)

Abstract rating 3

IARYGINA, Oksana: **Accept: Poster • 4.0**

Abstract rating 4

Submitted by 山下, 由莉 <yamashita.yuri.h4@s.mail.nagoya-u.ac.jp> on **Thursday, 30 April 2026**

Abstract ID : 239

Neutrino cross sections and non-standard interaction Implications

Content

The question of whether neutrinos follow inverted or normal mass hierarchy and the CP violation parameter δ_{CP} in the neutrino sector (which may help understand the matter antimatter asymmetry etc.), are some of the important goals of current and future neutrino experiments. Cosmology provides constraints on total neutrino mass, N_{eff} (and implications for mass hierarchy). Whereas for the accurate measurement of various neutrino parameters, a deep understanding of neutrino-target interactions is crucial to reduce the systematic uncertainties. We investigate the effect of final-state interactions (FSI) in the charge current quasi-elastic (CCQE) channel by reconstructing the neutrino energy using the calorimetric method. A selection of events with 1 proton, 0 pion, and any number of neutrons in the final state reduces the discrepancy between reconstructed and true neutrino energy for the CCQE process analysed for DUNE and MicroBooNE using Monte-Carlo simulations. Since the reconstruction of neutrino energy is important for improving cross-section measurements, the Kaon-Decays-At-Rest (KDAR) neutrinos provide an opportunity to study the neutrino interactions in the low-energy regime with a known neutrino energy of 235.5 MeV. We explore the missing energy in KDAR ν_μ CC scattering on Carbon in JSNS2 using MC generators. In addition to FSI, the initial state of nucleon also affects the cross-section measurements. We discuss the same in some specific cases. Neutrino oscillation implying the physics beyond the standard model, we explore a BSM scenario, Lepton flavour violation (LFV) is considered to be a suitable avenue. We study the charged LFV μ decays such as $\mu \rightarrow \nu \gamma$, $\mu \rightarrow \nu \nu \nu$, and $(\mu - \nu)$ Ti with a vector leptoquark ($_{(3)}$) by considering the constraints from non-standard neutrino interaction (NSI) sector parameter ϵ_μ . Here we consider that these NSIs are attributed to the presence of leptoquarks (hypothetical particles which can also help understand some anomalies) account for the difference in the experimental observations of δ measurement by NOvA and T2K and obtain the branching ratios (BR) for the LFV processes. The enhanced BR predictions potentially could be verified in the far future.

Other topic / keywords:

Author: GIRI, Anjan (IIT Hyderabad)

Presenter: GIRI, Anjan (IIT Hyderabad)

Track Classification: Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Neutrinos:**Judgments:** Positive: Poster**Reviews:**

GERBINO, Martina: **Accept: Poster • 4.0** (This abstract is less aligned with the cosmo/astro content of the track. Nevertheless, it is interesting. Therefore, we propose to accept it as a poster)

Abstract rating 4

Submitted by **GIRI, Anjan** <anjan98@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 240

Optimal methods for cross-correlating projected and filtered tracers of large scale structure

Content

Cross-correlations between surveys which retain line-of-sight (LOS) structure - such as line-intensity-mapping (LIM) or spectroscopic surveys - and projected fields - such as CMB lensing - represent a powerful avenue for extracting cosmological information from next-generation experiments. Common approaches include tomographic binning of the radially-resolved field into 2D slices, projecting the field into a single 2D map using an assumed kernel, or correlating individual line-of-sight Fourier modes with the projected field directly. Given the improving quality of large-scale structure measurements, it is useful to systematically assess the optimality of various cross-correlation approaches. To this end, we develop a framework for constructing Fisher-optimal projection kernels for the 2Dx2D case which we frame as a quadratic optimization problem solved numerically over redshift compression weights. Using 21cm LIM and CMB lensing as the prototypical toy model, we find that Fisher-optimal projection recovers more information than naive kernel choices in the presence of foreground filtering. We additionally analyze the impact of light-cone evolution on the information content of such cross-correlations.

Other topic / keywords:

Author: BURWIG, Nathan (Arizona State University)

Co-author: Dr FOREMAN, Simon (Arizona State University)

Presenter: BURWIG, Nathan (Arizona State University)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (seems more of a methods talk - but interesting topic anyway.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (“Methods” in the title :-) But equally happy to have this in the LSS session.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 3.0** (Topic needs staring at a poster for optimal digestion.)

Abstract rating 3

Submitted by **BURWIG, Nathan** <nburwig@asu.edu> on **Thursday, 30 April 2026**

Abstract ID : 241

Nonlinear Evolution of Primordial Parity Violation

Content

Parity violation is a new probe of the primordial universe. However, we need to connect the primordial universe to the observables. Recent hints of parity violation in the large scale structure of the universe motivate us to investigate how the observables are affected by late-time physical processes. In this work, we present an analytical expression for the parity violating 4-point correlation function of matter density fields at 1-loop order, that can be used to probe primordial parity violation. Based on arXiv:2510.06164.

Other topic / keywords:

Author: AZYZY, Sha (Max Planck Institute for Astrophysics)

Co-authors: JAMIESON, Drew (MPA); KOMATSU, Eiichiro (MPA); KURITA, Toshiki (MPA)

Presenter: AZYZY, Sha (Max Planck Institute for Astrophysics)

Track Classification: Large-Scale Structure; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Interesting new direction.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 3.0** (No measurements yet? This could be very technical - but from Komatsu group should be good)

Abstract rating 3

Submitted by **AZYZY, Sha** <sazyzy@mpa-garching.mpg.de> on **Thursday, 30 April 2026**

Abstract ID : 242

Understanding stochastic gravitational wave backgrounds by exploring the parameter space of first-order phase transitions with the Sound Shell Model

Content

Cosmological first-order phase transitions can generate stochastic gravitational wave backgrounds that provide a window into the early universe at the electroweak scale. The upcoming Laser Interferometer Space Antenna (LISA) will be sensitive to the mHz frequency band of these gravitational waves, providing a probe of physics beyond the Standard Model (BSM). Extracting the phase transition parameters and inferring the underlying BSM theory is a challenging task, as it requires comparing observations to theoretical predictions across a high-dimensional parameter space. However, running a full lattice simulation for each parameter point is prohibitively expensive.

We address this challenge using the Sound Shell Model, a computationally efficient semi-analytical framework that reproduces the results of lattice simulations for intermediate-strength transitions. We extend the Sound Shell Model by incorporating additional key physical effects, including variations in the sound speed that change the underlying bubble hydrodynamics, and thermal suppression of bubble nucleation and the finite lifetime of the acoustic source, which broaden the validity of the model across the parameter space.

These developments provide a fast and flexible framework for modeling stochastic gravitational wave signals from phase transitions. In this talk, I will show how this improved modeling changes the predictions for previously published benchmark models. We have implemented this modeling in the open-source utilities PTtools and PTPlot. This enables likelihood-based parameter inference with LISA, and direct experimental tests of BSM scenarios at the electroweak scale.

Other topic / keywords:

phase transitions, LISA

Author: MÄKI, Mika (University of Helsinki)

Co-authors: WEIR, David (University of Helsinki); Prof. HINDMARSH, Mark (University of Helsinki, University of Sussex); HOOPER, Deanna (University of Helsinki); GIOMBI, Lorenzo (University of Helsinki)

Presenter: MÄKI, Mika (University of Helsinki)

Track Classification: Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:**Gravitational Waves:****Judgments:** Positive: Talk**Reviews:**GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

MALHOTRA, Aameek: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **MÄKI, Mika** <mika.x.maki@helsinki.fi> on **Thursday, 30 April 2026**

Abstract ID : 243

Asymmetric Reheating of Dark QED

Content

The reheating epoch following inflation sets the initial conditions for the subsequent thermal history of the Universe, but remains largely unconstrained prior to Big Bang nucleosynthesis. In many extensions of the Standard Model, the inflaton may decay simultaneously into visible and hidden sectors, leading to non-standard cosmological histories. One possibility is an asymmetric reheating in which unequal amounts of energy are deposited in the visible and dark sectors, resulting in different temperatures and potential entropy exchange between them. In this talk, I will study asymmetric reheating in a simple and instructive hidden sector framework: dark QED, consisting of a Dirac fermion dark matter candidate charged under a dark $U(1)'$ gauge symmetry and a massive dark photon coupled to the visible sector via kinetic mixing. A central part of the discussion will be the thermalisation of dark QED after inflation, during reheating. I will focus on thermalization in the weak-coupling and initially under-occupied regime. I will then discuss the evolution of the temperature ratio during the reheating process. I will finally explore the implications for thermal dark matter production, highlighting viable regions of parameter space where dark matter is thermalized at a temperature different from that of the Standard Model.

Other topic / keywords:

Reheating, Hidden Sector, Dark QED

Author: CLERY, Simon (Technical University of Munich (TUM))

Presenter: CLERY, Simon (Technical University of Munich (TUM))

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

Submitted by **CLERY, Simon** <simon.clery@tum.de> on **Thursday, 30 April 2026**

Abstract ID : 244

Beyond Λ CDM: A Rotational-Torque Framework for Cosmological Redshift and ISO Trajectories

Content

Abstract:

The standard Lambda-CDM cosmological model faces mounting pressure from persistent anomalies: the H_0 tension, large-scale CMB anisotropies (the “Axis of Evil”), and the “Impossible Early Galaxy” problem (e.g., JADES-GS-z14-0). In this work, we propose a rotational–torque-based framework that reinterprets cosmological redshift as a composite phenomenon. Rather than purely metric expansion, we posit that redshift includes a cumulative dynamical component induced by large-scale rotational motion and associated torque effects on photon propagation.

Central to this model is the assertion that global angular dynamics influence the trajectory and energy of both photons and high-velocity baryonic matter. We demonstrate that this framework naturally accounts for the anomalous trajectories and hyperbolic excess speeds observed in interstellar objects (ISOs) such as 1I/Oumuamua and 2I/Borisov, suggesting these bodies serve as local tracers of a larger, torque-driven cosmic flow.

By replacing Dark Energy with a torque-induced perturbative term, this model provides:

- A Resolution to the H_0 Tension: The “expansion” rate becomes direction-dependent, explaining the discrepancy between early-CMB and late-universe local measurements.
- Accelerated Structure Formation: Global vorticity provides the initial “kick” required for the rapid assembly of massive galaxies at $z > 14$.
- Anisotropic Signatures: It provides a physical basis for the alignment of CMB multipoles along a preferred cosmic axis.

We provide quantitative predictions for the arrival vectors of future 4I candidates and suggest specific redshift-correction factors for upcoming surveys that could validate this rotational paradigm over the expanding-space model.

Other topic / keywords:

Author: V M, RAKSHAN (RAKSHAN EARTH AND SPACE TECH)

Presenter: V M, RAKSHAN (RAKSHAN EARTH AND SPACE TECH)

Track Classification: Large-Scale Structure; Dark Matter; Cosmic Microwave Background; Dark Energy / Modified Gravity; Early Universe

Contribution Type: Talk

Comments:

I would like to be considered for Oral Presentation, but im also happy to present this work as poster if a talk slot is not available. This submission introduces a novel rotational component to standard cosmological model, I can provide the core preliminary derivations ad the assumptions behind the rotational parameters upon request

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Mixed: Accept, Reject

Reviews:

HILDEBRANDT, Hendrik: **Reject • 1.0** (This sounds way too speculative and far-fetched to me. Somewhat like the kind of emails I get almost every day now...)

Abstract rating 1

KUIJKEN, Koen: **Accept • 1.0** (Maybe as a poster, but this 'framework' does not sound very solid)

Abstract rating 1

Dark Energy / Modified Gravity:

Judgments: Negative

Reviews:

GARCIA-GARCIA, Carlos: **Reject**

Abstract rating 0

GLAVAN, Dražen: **Reject**

Abstract rating 0

Submitted by **V M, RAKSHAN** <rakshaneearthandspace@tech@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 245

The spectrum of axions in a scaling string network

Content

Cosmic strings formed after Peccei–Quinn symmetry breaking are expected to radiate axions throughout their evolution, playing a central role in determining the axion relic abundance and guiding experimental searches. A precise understanding of the string network dynamics and the resulting axion spectrum is therefore essential.

In previous work, we established that axion string networks exhibit standard scaling, with an approximately constant number of strings per horizon volume. Here, we focus on the axion emission spectrum, analyzing all components of the axion current and their unequal-time correlators. This allows us to disentangle the contributions from propagating axions and string-bound fields, showing that earlier estimates based solely on the timelike current component overestimate the radiated spectrum by about 30%.

Our results indicate that axion emission from a scaling string network is close to scale-invariant, with the spectrum approaching a universal form. We will also present a determination of the axion number density produced from strings. These findings provide improved theoretical input for axion dark matter predictions and help refine the interpretation of experimental searches.

Other topic / keywords:

Author: LOPEZ EIGUREN, ASIER (University of the Basque Country)

Co-authors: CORREIA, José Ricardo; Prof. HINDMARSH, Mark (University of Helsinki, University of Sussex); LIZARRAGA, Joanes (University of the Basque Country); RUMMUKAINEN, Kari; Prof. URRESTILLA, Jon (University of the Basque Country)

Presenter: LOPEZ EIGUREN, ASIER (University of the Basque Country)

Track Classification: Dark Matter; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **LOPEZ EIGUREN, ASIER** <asier.lopez@ehu.eus> on **Thursday, 30 April 2026**

Abstract ID : 246

Systematic uncertainties in optimal de-lensing of CMB B modes with cross-correlation of CMB and galaxy survey

Content

In the era of high-precision Cosmic Microwave Background (CMB) anisotropy measurements, detection of primordial gravitational waves (PGWs) will be one of the main goals of current CMB experiments. Detection of a divergence-free (B-mode) component in CMB polarisation will provide direct evidence of inflationary PGWs in the early universe. However, weak gravitational lensing of CMB photons due to intervening mass distributions of the Universe distorts the primordial polarisation patterns, introducing an additional lensing-induced B-mode signal. Removing these lensing-induced B-modes is essential for improving constraints on the amplitude of PGWs. In this work, we test a tomographic delensing method on simulations of the Rubin Observatory LSST galaxy catalogue and Simons Observatory (SO) CMB maps. A significant improvement in delensing efficiency is achieved by using a multi-tracer approach, where we split the galaxy dataset into tomographic redshift bins. However, uncertainties in photometric redshift measurements pose a problem for optimal weighting of the tracers. We explore the impact of photometric redshift errors with realistic simulations and build a pipeline to propagate these uncertainties to constraints on the amplitude of primordial gravitational waves. Additionally, we explore constraints on the galaxy bias, $b(z)$, and the amplitude of matter fluctuations parameter, σ_8 , through tomographic cross-correlations using realistic simulations of photometric measurements from LSST 10-year datasets.

Other topic / keywords:

Weak lensing

Author: DEKA, Kishan (National Center for Nuclear Research, Warsaw)

Co-authors: BIELEWICZ, Pawel (NCBJ); Mr SARAF, Chandra Shekhar (Korea Astronomy and Space Science Institute)

Presenter: DEKA, Kishan (National Center for Nuclear Research, Warsaw)

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Inflation / Primordial Perturbations; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

The manuscript of this work will be submitted soon for publication. I request to consider for any kind of funding/waiver if available.

Status: SUBMITTED

Track Reviews:**Large-Scale Structure:****Judgments:** Positive**Reviews:**

KUIJKEN, Koen: **Accept • 3.0** (Best suited for CMB session? Work on delensing CMB B modes using sims of LSST-10yr.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 4.0** (Important work at the link of next-generation CMB and galaxy surveys.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:**Judgments:** Positive: Poster**Reviews:**

SELLENTIN, Elena: **Accept: Poster • 3.0**

Abstract rating 3

Inflation / Primordial Perturbations:**Judgments:** Positive: Poster**Reviews:**

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **DEKA, Kishan** <kishan.deka@ncbj.gov.pl> on **Thursday, 30 April 2026**

Abstract ID : 247

Light scalar fields on a curved background and their influence on the dynamics of galaxies.

Content

We consider two extended theories of gravity involving non-minimally coupled scalar fields and investigate their influence on galactic scales. To do so, we linearise the equations of motion for the scalar fields, accounting for their dependence on curvature scalars. In this way, we recover known results and are able to extract the modifications over Einstein gravity due to the presence of the additional scalar field. We repeat this analysis for the case where the couplings to curvature terms are generated at the one-loop level, and these couplings are identified from a self-consistent calculation of the quantum effective action. We show in all cases that the non-minimal couplings to the Ricci scalar lead to shifts in the potential minimum of the scalar field, such that the modifications of gravity known to occur in scalar-tensor theories can arise ubiquitously in any extension of the SM with additional and sufficiently light scalar fields.

Other topic / keywords:

Author: BUNIO, Lukasz (University of Manchester)

Co-author: MILLINGTON, Peter (University of Manchester)

Presenter: BUNIO, Lukasz (University of Manchester)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **BUNIO, Lukasz** <lukasz.bunio@postgrad.manchester.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 248

From cutting rules to a minimal EFT for leptogenesis, dark matter, and neutrino masses

Content

Using the CPT symmetry and unitarity as a starting point, we construct a minimal set of effective operators simultaneously accounting for the dark matter relic abundance and the matter-antimatter asymmetry of the Universe. Neutrino masses are generated via the Weinberg operator within a concrete realization of baryogenesis through leptogenesis. Remarkably, the Standard Model particle content needs to be extended by only two new fields, a heavy Majorana fermion and a light scalar dark matter candidate, connected through a single portal operator to explain all three phenomena.

Other topic / keywords:

Author: Dr MATAK, Peter (Comenius University (SK))

Co-authors: BLAZEK, Tomas (Comenius University (SK)); RAMAJ, Jan; SABOVA, Martina

Presenter: Dr MATAK, Peter (Comenius University (SK))

Track Classification: Early Universe

Contribution Type: Talk

Comments:

The contribution is based on Eur. Phys. J. C 85, 801 (2025).

Status: SUBMITTED

Submitted by **Dr MATAK, Peter** <peter.matak@fmph.uniba.sk> on **Thursday, 30 April 2026**

Abstract ID : 249

Kontorovich-Lebedev-Fourier Space for de Sitter Correlators

Content

The study of late time correlation functions on top of a de Sitter background is of prime interest in primordial cosmology. Due to the non-conservation of energy, their evaluation represent a significant technical challenge and their mathematical structure remains unclear. In this talk, I will propose a new direction to address both of these issues by introducing a frequency-momentum space representation arising from the decomposition into unitary irreducible representations of the space-time isometry group $SO(1,d+1)$, which trades the familiar $(d+1)$ -dimensional Fourier space for the Kontorovich-Lebedev-Fourier (KLF) space. At the non-perturbative level, I will show that the de Sitter Kallen-Lehman representation directly follows from the decomposition of the two-point function into KLF modes. At the perturbative level, I will present how this formalism get rids of the nested time integrals and allows us to simply evaluate some simple loop diagrams.

Other topic / keywords:

QFT in curved space-time, harmonic analysis, conformal field theory, group theory, symmetries

Author: POISSON, Arthur (Institut d'Astrophysique de Paris)

Presenter: POISSON, Arthur (Institut d'Astrophysique de Paris)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **POISSON, Arthur** <dominique.poisson@sorbonne-universite.fr> on **Thursday, 30 April 2026**

Abstract ID : 250

Probing spatial curvature and cosmic distance ladders model-independently: current status and forecasts

Content

Model-independent approaches have gained increasing attention as powerful tools to investigate persistent tensions between cosmological observations and Λ CDM predictions. Building on our previous work, MNRAS 523 (2023) 3, 3406-3422, we present a follow-up analysis of the model-independent calibration of both the local and inverse distance ladders using cosmic chronometers (CCH) data and the Gaussian Processes technique. We constrain the SNIa absolute magnitude, M , and the comoving sound horizon at the baryon-drag epoch, r_d , while simultaneously deriving a measurement of the spatial curvature parameter, Ω_k , using CCH with DESY5 and DESI DR1/DR2. Our results show a compatibility with a flat universe at $\sim 1.7\sigma$, weaker than that observed with Pantheon+ SNIa, while the ladders calibrators read $M = -19.324_{-0.095}^{+0.092}$ and $r_d = (144.00_{-4.88}^{+5.38})$ Mpc. As current uncertainties limit our ability to arbitrate the Hubble tension, we present for the first time a forecast analysis for the triad (M, Ω_k, r_d) to explore the constraining power of our methodology with future SNIa, CCH, and BAO observations from surveys such as LSST, Euclid, and DESI. We find that, in an optimistic scenario, upcoming data will improve agnostic constraints on the ladder calibrators - M by $\sim 54\%$, r_d by $\sim 66\%$ - which enable us to constrain H_0 at a 2% level. Precision on Ω_k will increase by ~ 50

Other topic / keywords:

Tensions/Status of LCDM

Author: FAVALE, Arianna (University of Rome Tor Vergata)

Co-authors: GOMEZ-VALENT, Adrià (University of Barcelona, ICCUB); MIGLIACCIO, Marina (University of Rome Tor Vergata)

Presenter: FAVALE, Arianna (University of Rome Tor Vergata)

Track Classification: Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Mixed: Proposed for other tracks: Large-Scale Structure

Reviews:

SELLENTIN, Elena: **Change track • 1.0** (Probably higher grade in other tracks.)

Abstract rating 1

Submitted by **FAVALE, Arianna** <favalearianna@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 251

Not so Minimal Warm Inflation

Content

An axion-like inflaton coupled to non-Abelian gauge bosons provides a compelling microphysical framework for warm inflation. Starting even from cold initial conditions, in these systems, sphaleron heating may generate thermal friction sufficient to sustain finite temperatures throughout the inflationary epoch. Insisting on shift-symmetric potentials, in this work we revisit the viability of these scenarios under the designation of Minimal Warm Inflation. We examine both observational constraints and model-building limitations on models with a hierarchy between the decay constants appearing in the friction rate and in the inflaton potential. We conclude that the popular clockwork mechanism cannot generate the required hierarchy; however, partial-wave unitarity bounds admit effective descriptions that remain consistent with observations.

Other topic / keywords:

Authors: BASTERO GIL, Mar (University of Granada); Mr GARCÍA OSORIO, Pedro (University of Granada); Dr TORRES MANSO, Antonio (Coimbra University)

Presenter: BASTERO GIL, Mar (University of Granada)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **BASTERO GIL, Mar** <mbg@ugr.es> on **Thursday, 30 April 2026**

Abstract ID : 252

From Cosmic Tensions to Fundamental Physics: A New Phase Transition in the Early Universe

Content

I will discuss how emerging observational tensions can be interpreted as signs of new dark-sector microphysics. In particular, I will present a model in which a symmetry-breaking phase transition reheats the dark sector after Big Bang nucleosynthesis, with dark matter coupled to dark radiation through a gauge force. This interaction generates dark acoustic oscillations on scales close to the baryon acoustic scale, leaving a distinctive and testable imprint in the matter power spectrum. The same physics also offers an early-Universe alternative to evolving dark energy as a way of addressing recent anomalies in late-time cosmological data.

Other topic / keywords:

Author: NIEDERMANN, Florian

Presenter: NIEDERMANN, Florian

Track Classification: Cosmic Microwave Background; Dark Energy / Modified Gravity; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 2.0** (This submission is more appropriate for the Early Universe track)

Abstract rating 2

GLAVAN, Dražen: **Accept: Talk • 2.0** (This submission is more appropriate for the Early Universe track)

Abstract rating 2

Submitted by **NIEDERMANN, Florian** <florian.niedermann@su.se> on **Thursday, 30 April 2026**

Abstract ID : 253

DES Y6: The Weak Lensing and Galaxy Clustering Analysis Framework

Content

The Dark Energy Survey Year 6 (DES Y6) represents the final and most statistically powerful dataset from DES, enabling sub-percent level cosmological constraints from weak lensing and galaxy clustering. We present the methodology underpinning the cosmic shear, 2×2 pt, and 3×2 pt analyses, focusing on the novel design choices that make this pipeline both robust and forward-looking. Key methodological contributions include a principled scale-cut framework that jointly accounts for baryonic feedback and non-linear galaxy bias uncertainties, and a validation strategy based on mock data and simulations that explicitly addresses posterior projection effects, critical for unbiased inference in high-dimensional parameter spaces. We also present the theoretical covariance matrix framework and systematic mitigation prescription adopted for both Λ CDM and wCDM analyses. Beyond DES Y6, this framework is designed with direct applicability to next-generation surveys such as Rubin/LSST, making it a reference methodology for the coming era of stage-IV weak lensing cosmology.

Other topic / keywords:

Authors: SANCHEZ CID, David (University of Zurich); THE DARK ENERGY SURVEY COLLABORATION

Presenter: SANCHEZ CID, David (University of Zurich)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (Not the most important of the submitted DES talks for LSS but an essential part of the analysis. Could be a poster?)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 3.0** (Better suited for methods sessions in my opinion.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 3.0** (Actual data.)

Abstract rating 3

Submitted by **SANCHEZ CIS, David** <david.sanchezcid@physik.uzh.ch> on **Thursday, 30 April 2026**

Abstract ID : 254

Novel cosmological signatures of gravitons to photons and axions to photons conversion in the early universe

Content

Circular polarization in the cosmic microwave background (CMB) offers a promising probe of the parity-violating physics of the early Universe. In this paper, we propose a novel method to constrain the primordial circular polarization of high-frequency gravitational waves (GW) in the GHz range. An efficient conversion of gravitons to photons in a transverse cosmological magnetic field at the epoch of last scattering can generate excess chiral photons if the GW background is chiral in nature. This excess radiation distorts the CMB thermal black-body spectrum, which can be estimated by measuring the V-Stokes parameter in the CMB polarization. Using current upper limits on the angular power spectrum of circular polarization from the CLASS, MIPOL, and SPIDER experiments, we obtain the most stringent constraints on the characteristic strain and circular polarization of the isotropic background of stochastic GWs at 40 GHz and 150 GHz, respectively. Our work, therefore, provides an interesting possibility to constrain the circular polarization of high-frequency GWs using the V-mode polarization measurements of CMB. Moreover, conversion of axions or axion-like particles (ALPs) to photons in a helical magnetic field existing prior to the CMB epoch can generate an excess population of photons carrying net circular polarization. Consequently, measurements of the CMB circular polarization can be used to constrain the parameter space of ALP mass and its coupling to photons.

Other topic / keywords:

Author: JAIN, Rajeev Kumar

Presenter: JAIN, Rajeev Kumar

Track Classification: Primordial Magnetic Fields; Cosmic Microwave Background; Inflation / Primordial Perturbations; Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (Better in CMB track)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 4.0** (More suited to CMB)

Abstract rating 4

Submitted by **JAIN, Rajeev Kumar** <rkjain@iisc.ac.in> on **Thursday, 30 April 2026**

Abstract ID : 255

Axion Detection With Coiled Optical Fibers

Content

We propose a novel interferometric approach to axion searches based on long, coiled optical fibers in an external magnetic field. Considering fiber boundary conditions and bending, I will show that in silica fibers the leading signal is a phase shift of the photon. A key observation is that the axion field will effectively get confined along the fiber, despite no direct interaction between axions and the fiber material. In contrast, there exist parameter regions where axion leakage occurs. Due to this, I will show that hollow-core fibers with a refractive index close to unity can yield significantly enhanced signals. These setups have the potential to set new constraints, especially in the regime of large axion mass.

Other topic / keywords:

Authors: DVALI, Gia; ZELL, Sebastian (LMU Munich); ZHANG, Tongxuan (LMU Munich and Max Planck Institute for Physics)

Presenter: ZHANG, Tongxuan (LMU Munich and Max Planck Institute for Physics)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **ZHANG, Tongxuan** <tongxuan.zhang@lmu.de> on **Thursday, 30 April 2026**

Abstract ID : 256

Constraining Beyond-CDM Models with an Effective Theory of the Lyman- α Forest

Content

In the age of precision cosmology, mapping the large-scale structure of the universe has the potential to reveal pieces of the puzzle that is the nature of dark matter. Most deviations from standard cold DM (CDM) models are confined to cosmologically small scales to not violate existing constraints. Thus, there is a fundamental need to have accurate models of the non-linear formation of structures in beyond-CDM models. Therefore, we present a framework in the spirit of the effective field theory of large-scale structure (EFTofLSS) describing observations of the Lyman- α forest and test its applicability to beyond-CDM models of DM. We focus on mixed Hot/Warm + Cold DM models, and present a systematic study of the statistical power of this effective approach, with the goal of quantifying its predictability regarding beyond-CDM models. Moreover, we discuss its applicability to observational data on the largest Lyman- α scales as measured by BOSS and DESI, and the possible challenges this entails.

Other topic / keywords:

Author: KLOCKE, Tim-Leon (University of Oslo)

Co-authors: BRINGMANN, Torsten (University of Oslo (NO)); GARNY, Mathias (Technische Universitaet Muenchen (DE))

Presenter: KLOCKE, Tim-Leon (University of Oslo)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (good fit to LSS)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0**

Abstract rating 3

Submitted by **KLOCKE, Tim-Leon** <t.l.klocke@fys.uio.no> on **Thursday, 30 April 2026**

Abstract ID : 257

Effects of dark energy in structure formation

Content

We present an extension of the spherical top-hat collapse model in a cosmological framework where the dark sector is composed of two interacting scalar fields. In this setup, one scalar field exhibits rapid oscillations on cosmological timescales and is interpreted as a viable dark matter candidate, while the second scalar field evolves smoothly and represents dark energy in the form of either a canonical quintessence field or a non-canonical phantom field.

We develop a generalized top-hat-like model to investigate the gravitational collapse of a slightly overdense spherical region in the presence of such a coupled dark sector. Particular attention is given to the role of non-minimal coupling between the scalar fields and its impact on the dynamics of collapse.

Our analysis demonstrates that the behavior of dark energy during collapse is highly sensitive to the coupling strength. Specifically, we find that dark energy can exhibit both clustered and unclustered behavior depending on the magnitude of the interaction. These results provide new insights into the role of dark energy in nonlinear structure formation and highlight the importance of dark sector interactions in shaping cosmic evolution.

Other topic / keywords:

Author: SAHA, Priyanka (Phd scholar, IIT Kanpur)

Presenter: SAHA, Priyanka (Phd scholar, IIT Kanpur)

Track Classification: Dark Matter; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 2.0**

Abstract rating 2

GLAVAN, Dražen: **Accept: Talk • 2.0**

Abstract rating 2

Submitted by **SAHA, Priyanka** <sahapriyanka335@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 258

Inflation from Pure Geometry: Precision Cosmology in $R+R^2-W^2$ Gravity

Content

Starobinsky's $R + \alpha R^2$ model provides a compelling description of cosmic inflation, and its observational support has established it as a benchmark for model comparison. However, at the same order in the local curvature expansion, an effective theory of spacetime geometry naturally includes the Weyl-squared invariant W^2 , making $R + \alpha R^2 - \beta W^2$ the minimal purely gravitational theory of inflation at quadratic order. In this talk I present the inflationary predictions of this theory, adopting a self-consistent approach that avoids spurious degrees of freedom typically arising in higher-curvature gravity. We compute primordial observables in the Jordan frame up to next-to-next-to-next-to-leading order (N3LO) in the slow-roll expansion, providing high-precision predictions for upcoming CMB observations.

Other topic / keywords:

Authors: BIANCHI, Eugenio (Penn State); GAMONAL, Mauricio (Penn State)

Presenter: GAMONAL, Mauricio (Penn State)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **GAMONAL, Mauricio** <mauricio.gamonal.sm@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 259

Target Selection of Subaru PFS Cosmology Survey

Content

The Subaru Strategic Program PFS Cosmology Survey started observation from 2025. I will introduce the science, target selection of this survey and the major progress we have.

Other topic / keywords:

Author: SHI, Jingjing (Kavli IPMU)

Presenter: SHI, Jingjing (Kavli IPMU)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Not sure about “target selection” as a topic for a talk. That being said, I’d like to hear more about PFS, its goals, and its status.)

Abstract rating 3

KUIJKEN, Koen: **Accept • 3.0** (If only target selection then better as a poster? Early results would have been nice, but not mentioned.)

Abstract rating 3

Submitted by **SHI, Jingjing** <jingssrs1989@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 260

Ultra-High-Energy Neutrinos, Primordial Black Holes, and Implications for the 21-cm Signal

Content

In this talk, we will investigate the origin of the ultra-high-energy neutrino event KM3-230213A (~220 PeV) and the high-energy flux observed by the IceCube Observatory within a unified framework in which superheavy dark matter (DM) is produced via primordial black hole (PBH) evaporation and subsequently decays into neutrinos. We will discuss constraints on the PBH initial abundance parameter as a function of the initial PBH mass and the DM mass, requiring consistency with the observed relic DM density. The resulting neutrino flux demonstrates that DM masses in the PeV–EeV range can account for both KM3-230213A and IceCube events without invoking accompanying multimessenger signals, while remaining consistent with current cosmological and astrophysical bounds.

We will further discuss the impact of quantum memory burden effects on the allowed parameter space, highlighting potential shifts in the viable regions. As an additional implication, we will also discuss the effect of ultra-high-energy neutrino production from PBH evaporation on the global 21-cm brightness temperature, thereby establishing a novel connection between high-energy neutrino observations and cosmological probes of the early Universe.

Other topic / keywords:

Primordial Black Holes, Dark Matter, Neutrinos

Authors: DHURIA, Mansi (Pandit Deendayal Energy University Gandhinagar, Gujarat, India); SINGH, Prabhav (Pandit Deendayal Energy University Gandhinagar, Gujarat, India)

Presenter: DHURIA, Mansi (Pandit Deendayal Energy University Gandhinagar, Gujarat, India)

Track Classification: Dark Matter; Neutrinos

Contribution Type: Talk

Comments:

The talk will be partially based on our paper <https://arxiv.org/abs/2510.26126> (accepted in Phys. Rev. D) and the ongoing work on memory burden PBH and implications of neutrinos emitted from PBH on global 21-cm brightness temperature.

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive: Talk

Reviews:

GERBINO, Martina: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **DHURIA, Mansi** <mansi.dhuria@sot.pdpu.ac.in> on **Thursday, 30 April 2026**

Abstract ID : 261

The post-inflationary axion mass in a minimal scaling model

Content

We calculate the dark matter axion mass in the post-inflationary scenario in a minimal model with a set of numerical simulations on 12288^3 grids, the largest to date. The minimal model contains only one extra scalar field which breaks the Peccei-Quinn $U(1)$ symmetry at a temperature $f_a \sim 10^{11}$ GeV, creating a string network, which is assumed not to have a Standard Model Higgs condensate in the string core. The strings become the boundaries of domain walls at the QCD transition, which draw the strings together and annihilate them. The decay of the strings and domain walls leaves behind axions, which can constitute part or all of the dark matter. We report on the measurements of the comoving axion number density following the collapse of the string-wall system, and give an accurate estimate of the dark matter axion mass in the scaling scenario.

Other topic / keywords:

Cosmic strings

Authors: Dr CORREIA, Jose Ricardo (University of Oslo); Prof. HINDMARSH, Mark (University of Helsinki, University of Sussex); LOPEZ EIGUREN, ASIER (University of the Basque Country); LIZARRAGA, Joanes (University of the Basque Country); RUMMUKAINEN, Kari; URRESTILLA, Jon (University of the Basque Country)

Presenter: Prof. HINDMARSH, Mark (University of Helsinki, University of Sussex)

Track Classification: Dark Matter; Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Submitted by **Prof. HINDMARSH, Mark** <mark.hindmarsh@helsinki.fi> on **Thursday, 30 April 2026**

Abstract ID : 262

Probing the absolute neutrino mass with PTOLEMY

Content

Determining the absolute neutrino mass scale remains a central challenge in cosmology and particle physics. The PTOLEMY experiment is designed to address this through precision spectroscopy of tritium beta decay. We will outline the experimental concept, focusing on two key innovations: a high-purity tritium target bound to graphene, and a novel, compact electromagnetic filter that reduces the kinetic energy of beta electrons for high-resolution measurement. We will discuss the projected sensitivity to sub-eV neutrino masses and the implications for cosmology and particle physics.

Other topic / keywords:

neutrino mass

Author: DE GROOT, Nicolo (Radboud University and Nikhef National institute for subatomic physics (NL))

Presenter: DE GROOT, Nicolo (Radboud University and Nikhef National institute for subatomic physics (NL))

Track Classification: Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive: Talk

Reviews:

GERBINO, Martina: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **DE GROOT, Nicolo** <nicolo.de.groot@cern.ch> on **Thursday, 30 April 2026**

Abstract ID : 263

Imprints of helical primordial magnetic fields on parity-violating cosmological statistics

Content

Primordial magnetic fields are well motivated by the observations of the cosmic magnetic fields on various scales and have been attracting attention as a possible origin of the large-scale magnetism in the Universe. Several studies have also suggested that intergalactic magnetic fields may possess helicity, corresponding to an asymmetry between the right- and left-handed components. Since primordial magnetic fields can leave imprints on multiple observables, including the cosmic microwave background and galaxy distributions, they provide a phenomenological window into parity-violating physics in the early Universe. In this talk, we focus on parity-violating signatures in cosmological observables, in particular the trispectrum. We compute the trispectrum of the passive mode, which is the curvature perturbation induced by scale-invariant helical primordial magnetic fields on superhorizon scales, and evaluate its amplitudes in Fourier space. We show that the trispectrum is enhanced in the collapsed limit in equilateral configurations. Using current observational constraints on the local-type trispectrum, we derive a rough upper bound on the helical-to-non-helical ratio, defined as the ratio of the amplitudes of the helical and non-helical magnetic-field power spectra. Finally, we will also discuss the preliminary results for the EB correlation of galaxy intrinsic alignments sourced by helical primordial magnetic fields, which may provide a complementary observational probe of parity-violating signatures from primordial magnetism.

Other topic / keywords:

Higher order statistics

Author: YURA, Kaito (Nagoya University)

Co-authors: SAGA, Shohei (Nagoya University); YOKOYAMA, Shuichiro (Nagoya University)

Presenter: YURA, Kaito (Nagoya University)

Track Classification: Primordial Magnetic Fields; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Primordial Magnetic Fields:

Judgments: Positive: Talk

Reviews:

BONDARENKO, Kyrylo: **Accept: Talk • 5.0**

Abstract rating 5

IARYGINA, Oksana: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **YURA, Kaito** <yura.kaito.p8@s.mail.nagoya-u.ac.jp> on **Thursday, 30 April 2026**

Abstract ID : 264

Equation of state during (p)reheating with trilinear interactions

Content

We study the post-inflationary evolution of the equation of state from the end of inflation to the onset of radiation domination. Focusing on single-field inflation models, we consider an inflaton field that has a quadratic potential near the minimum and is coupled to a massless scalar field via a trilinear interaction. The early preheating phase —dominated by resonance processes and non-linear dynamics —is analysed using numerical lattice simulations. We then combine these results with an effective treatment of the late reheating stage by solving a set of Boltzmann equations to reconstruct the complete post-inflationary expansion history. This combined approach yields improved predictions for the inflationary CMB observables, the spectral index and the tensor-to-scalar ratio. We further compute the redshift of the stochastic gravitational wave background generated during preheating and find that its amplitude is suppressed by many orders of magnitude compared to previous estimates.

Other topic / keywords:

Author: MARSCHALL, Kenneth

Presenter: MARSCHALL, Kenneth

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Comments:

2507.13465

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept • 3.0**

Abstract rating 3

Submitted by **MARSCHALL, Kenneth** <kenneth.marschall@unibas.ch> on **Thursday, 30 April 2026**

Abstract ID : 265

Non-linear Relativistic Cosmology on the Observer's Past Light-Cone

Content

With high-precision data about to be delivered by large-scale surveys, the development of higher-order perturbative descriptions of cosmological observables is becoming increasingly important. The Geodesic Light-Cone coordinates provide a natural framework for this purpose, as they are specifically adapted to the observer's past light-cone and allow for a non-perturbative description of light propagation in an inhomogeneous Universe.

In this talk, I will first review how these coordinates are defined. I will then describe a cosmological perturbation theory constructed directly on the observed past light-cone up to second order, using a fully gauge-invariant approach. This framework enables the consistent computation of higher-order corrections to cosmological observables in General Relativity as well as in modified gravity and dark energy scenarios.

I will focus on non-linear relativistic effects on the redshift, the luminosity distance, and the redshift drift by combining analytical and numerical results, and discussing about their validity also for cosmological models beyond LambdaCDM. In particular, I will demonstrate that, unlike widely studied observables such as the galaxy number counts, the bispectrum of the redshift drift is inherently more sensitive to non-linear effects than its two-point statistics.

[Based on JCAP 03 (2026) 075 and arXiv:2604.26690]

Other topic / keywords:

Authors: BÉCHAZ, Pierre (University of Pisa & INFN, Pisa); Prof. FANIZZA, Giuseppe (LUM University); MAROZZI, GIOVANNI (University of Pisa); Dr RODRIGUES MEDEIROS SILVA, Matheus (Universidade Estadual de Londrina)

Presenter: BÉCHAZ, Pierre (University of Pisa & INFN, Pisa)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Only the last sentence of the abstract indicates why this might be relevant. Not too sure about this one.)

Abstract rating 3

KUIJKEN, Koen: **Accept • 3.0** (more of a GR talk - could be interesting but not in LSS?)

Abstract rating 3

Submitted by **BÉCHAZ, Pierre** <pierre.bechaz@phd.unipi.it> on **Thursday, 30 April 2026**

Abstract ID : 266

Fermion (non)reheating in a quartic inflaton potential

Content

Any viable inflationary model must account for reheating of the universe prior to the onset of primordial nucleosynthesis. In this work, we study the (p)reheating mechanism for an inflaton field with a quartic minimum of the T-model kind with coupling λ , prior to and post fragmentation, making a clear distinction between the two regimes. We assume that the main particle production channel corresponds to the decay into a pair of spin 1/2 fermions via Yukawa-like interactions. On top of its decays, we also consider the self-interaction of the inflaton, which sources the resonant growth of inflaton inhomogeneities, possibly leading to its eventual fragmentation. By means of a combination of non-perturbative (Heisenberg/Bogoliubov) and perturbative (Boltzmann) methods, we find that for Yukawa couplings that seemed to be intuitively perturbative, such as $y \sim 10^{-8}$ ($y^2/\lambda \sim 3 \times 10^{-5}$), parametric resonance, kinematic blocking, and Pauli suppression effects cannot be ignored. Additionally, we show that achieving $\rho_\phi \sim \rho_\psi$ prior to fragmentation requires large couplings, $y \sim 0.2$ ($y^2/\lambda \sim 10^{10}$), which needs a detailed study of backreaction and radiative corrections. Thus the rest of our work constitutes studying post-fragmentation fermion production where we conclude that, in general, reheating in this setup is not possible and thus we conclude that in order to successfully reheat, one must invoke a coupling to a integer- and/or 0-spin particle like a scalar boson.

Other topic / keywords:

Pre/Re-heating

Authors: BHUSAL, Nabeen (DESY); CHÁVEZ, Ernesto (Universidad Nacional Autónoma de México); GARCÍA GARCÍA, Marcos Alejandro (Instituto de Física, UNAM); MENKARA, Adriana; Dr PIERRE, Mathias

Presenter: BHUSAL, Nabeen (DESY)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **BHUSAL, Nabeen** <nabeen.bhusal@desy.de> on **Thursday, 30 April 2026**

Abstract ID : 267

Oscillatory Signatures in Primordial Gravitational Waves from Double Sine-Gordon Inflation

Content

The imprint of inflation on primordial gravitational waves remains one of the most promising probes of the early Universe, offering a potential observational window into physics at otherwise inaccessible energy scales. In this study, the impact of non-trivial inflationary potentials on the primordial tensor power spectrum is investigated within the framework of standard single-field inflation in General Relativity (GR).

A class of models based on the Double-Sine-Gordon (DSG) potential is considered,

$$\begin{equation}$$

$$V(\phi) = \alpha \cos(N\phi) + \beta \cos(2N\phi),$$

$$\end{equation}$$

where ϕ denotes the inflaton field, while α , β , and N are free parameters controlling the amplitude of the harmonic contributions and the characteristic frequency of the oscillatory structure. In this model, an intrinsic oscillatory structure extends conventional cosine-based scenarios. Employing the slow-roll approximation, the background dynamics are analyzed, and the resulting tensor power spectrum is computed as a function of the comoving wavenumber k .

The DSG potential is found to induce small but systematic deviations from scale invariance, manifesting as controlled oscillatory modulations in the tensor spectrum. The amplitude and frequency of these features are directly governed by the model parameters, establishing a connection between the inflationary potential and observable quantities.

Such oscillatory signatures may leave imprints in the stochastic gravitational wave background, potentially within the sensitivity range of future detectors such as LISA and the Einstein Telescope, as well as Cosmic Microwave Background (CMB) polarization missions. These results suggest that even minimal extensions of the inflationary potential may lead to potentially distinguishable observational signatures, providing a possible avenue for probing the structure of the inflationary landscape.

Other topic / keywords:

Author: Ms AFSHAR, Behnoush (Research Institute for Astronomy and Astrophysics of Maragha)

Co-authors: Prof. BAMBA, Kazuharu (Fukushima University); Dr MORADPOUR, Hooman (Research Institute for Astronomy and Astrophysics of Maragha)

Presenter: Ms AFSHAR, Behnoush (Research Institute for Astronomy and Astrophysics of Maragha)

Track Classification: Inflation / Primordial Perturbations; Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (Better in inflation track)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 3.0** (More suited to inflation)

Abstract rating 3

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

WANG, Dong-Gang: **Accept: Poster • 2.0**

Abstract rating 2

Submitted by **AFSHAR, Behnoush** <b.afshar@riaam.ac.ir> on **Thursday, 30 April 2026**

Abstract ID : 268

Effective field theory of in-in correlators

Content

Equal-time in-in correlation functions are important observables for cosmological models and quantum field theories. In this talk, I will first explore how the Wilsonian renormalization group and effective field theory (EFT) apply to these observables in both flat and de Sitter space. Specifically, matching the UV and IR requires additional terms not captured by conventional EFT. These terms are localized at the time of the measurement, and (semi-)local in space. Explicit examples show how matching is done in flat spacetime, and that in de Sitter spacetime these terms redshift away, with suspected remnant effects on wavefunction coefficients. I will then discuss these terms from a Schwinger-Keldysh path integral point of view, and study their roles in the influence functional, making connections to the evolution of the density matrix. Some future works will be discussed at the end.

Other topic / keywords:

Author: SUN, Guanhao (Chongqing University)

Presenter: SUN, Guanhao (Chongqing University)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept • 4.0**

Abstract rating 4

Submitted by **SUN, Guanhao** <sunguanhao@cqu.edu.cn> on **Thursday, 30 April 2026**

Abstract ID : 269

Field-level vs summaries: convergence of information in non-Gaussian density fields

Content

Standard analyses of galaxy clustering rely on summary statistics such as the power spectrum and bispectrum, but extending to higher-order n -point functions quickly becomes intractable. Field-level inference (FLI) offers an alternative by forward-modeling the galaxy density field and explicitly employing the full joint posterior of the initial conditions, cosmological parameters, and bias parameters given the data. We consider a simplified scenario in which analytical predictions at the field level are possible, enabling a direct and controlled comparison with n -point statistics. Within the framework of the Effective Field Theory of Large-Scale Structure (EFTofLSS), we describe galaxy clustering with a finite set of effective parameters and construct summary statistics from auto- and cross-correlations of powers of the observed density field, providing an efficient means of incorporating higher-order information. This approach allows us to assess the relative information content and robustness of field-level and n -point analyses. The same framework can be extended to more complex forward model, such as those including primordial non-Gaussianity or additional bias operators, paving the way for testing new physics.

Other topic / keywords:

Author: NIKOLAC, Ivana (Max Planck Institute for Astrophysics)

Co-authors: SCHMIDT, Fabian (Max Planck Institute for Astrophysics); Dr TUCCI, Beatriz (Leinweber Institute for Theoretical Physics at Stanford)

Presenter: NIKOLAC, Ivana (Max Planck Institute for Astrophysics)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (EFT used to assess FLI precision. Useful but better for inference session?)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0** (Better suited for methods session.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 3.0** (Tricky. LSS track? It is very theory-modelling depended.)

Abstract rating 3

Submitted by **NIKOLAC, Ivana** <inikolac@mpa-garching.mpg.de> on **Thursday, 30 April 2026**

Abstract ID : 270

Ambiguities and uncertainties in gravitational dark matter production

Content

The persistent absence of non-gravitational dark matter signals has increased interest in candidates that interact extremely weakly with the Standard Model—if at all. (Non-perturbative) gravitational particle production provides an unavoidable mechanism for generating such dark matter via the expansion of spacetime. However, predicting the exact relic abundance is subject to significant theoretical ambiguities tied to the framework of QFT in curved spacetimes, as well as uncertainties coming from inflationary and reheating dynamics.

In this talk, I will present an overview of these uncertainties based on recent results for scalar and vector spectator fields across different inflationary backgrounds. These ambiguities become especially problematic for masses below the scale of inflation due to tachyonic instabilities and the non-adiabaticity of the field modes. Since this regime is of particular interest for other non-thermal production mechanisms, such as freeze-in, it is crucial to address these conceptual and technical challenges to ensure a robust phenomenological approach.

Other topic / keywords:

Author: PARRA-LÓPEZ, Álvaro (University of Oslo)

Presenter: PARRA-LÓPEZ, Álvaro (University of Oslo)

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Matter:

Judgments: Mixed: Proposed for other tracks: Others (Please specify below)

Reviews:

COLE, Philippa: **Change track • 3.0** (Better for inflation (sorry realised this isn't mine to review in DM!))

Abstract rating 3

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 2.0**

Abstract rating 2

COLE, Philippa: **Accept: Talk • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept • 3.0**

Abstract rating 3

Submitted by **PARRA-LÓPEZ, Álvaro** <alvaparr@ucm.es> on **Thursday, 30 April 2026**

Abstract ID : 271

From flat space to de Sitter cosmological correlators

Content

The generation of primordial density inhomogeneities from inflaton quantum fluctuations is a crucial prediction of inflation. The correlation functions of these fluctuations, called cosmological correlators, can be studied in a perturbative framework where the quantum fluctuations can be described as quantum fields that propagate in a de Sitter space-time. However, this propagation has a complex time and kinematic dependence due to broken Lorentz invariance.

In this talk, I will show how an integral transform allows one to express the mode functions that encode propagation of quantum fields in de Sitter in terms of their flat-space counterpart, which are plane waves. Then, this integral transform can be used to write any cosmological correlator from the corresponding flat-space one, by applying a suitable linear transform on the kinematic variables and integrating over the transformation variables. In particular, I will illustrate this construction with a fundamental example, that is the exchange of a single massive particle during inflation.

Other topic / keywords:

Author: BELRHALI, Nathan

Presenter: BELRHALI, Nathan

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **BELRHALI, Nathan** <nathan.belrhali@sorbonne-universite.fr> on **Thursday, 30 April 2026**

Abstract ID : 272

Extra Dimensions Revive Cosmic Strings in Pulsar Timing Arrays

Content

Cosmic strings are a well-motivated source of stochastic gravitational-wave backgrounds (SGWBs), but current pulsar timing array (PTA) data are often interpreted as favoring the supermassive black hole binary scenario over the standard Nambu–Goto string SGWB template. In this talk, I will show that this conclusion can change once cosmic strings are allowed to explore extra dimensions. The key effect is that exact cusps are no longer generic and are instead replaced by near-cusp events. The modified beaming and phase space of these events reshape the PTA-band spectrum rather than simply rescaling its amplitude. I will present a phenomenological model of this effect and its preliminary confrontation with NANOGrav data through Bayesian inference. The results suggest that extra-dimensional dynamics may reopen cosmic strings as a viable interpretation of the nanohertz SGWB.

Other topic / keywords:

Author: KUME, Jun'ya (University of Helsinki)

Presenter: KUME, Jun'ya (University of Helsinki)

Track Classification: Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

MALHOTRA, Aameek: **Accept: Talk • 5.0**

Abstract rating 5

Early Universe:

Judgments: Positive: Talk

Reviews:

VAN DE VIS, Jorinde: **Accept: Talk • 4.0** (Sounds original.)

Abstract rating 4

Submitted by **KUME, Jun'ya** <junya.kume@helsinki.fi> on **Thursday, 30 April 2026**

Abstract ID : 273

Perturbative Modeling of Mixed Dark Matter Cosmologies

Content

Large-scale structure is a powerful probe of dark matter beyond the standard cold paradigm, since even a subdominant warm component can leave observable signatures through its free-streaming effects. In mixed dark matter cosmologies, where cold and warm components evolve jointly, these effects generate not only total density fluctuations but also relative density and velocity perturbations that can leave distinct imprints on galaxy clustering. I present a perturbative framework to describe these signatures using a two-fluid treatment of cold and warm dark matter. In recent work (arXiv:2508.21481), we derived the linear solutions for the coupled system and showed that the relative modes induce new contributions to the galaxy bias expansion. Including these effects, I computed the linear galaxy power spectrum in both real and redshift space and performed Fisher forecasts for DESI and PFS, showing that neglecting relative perturbations can significantly bias constraints on the warm dark matter fraction, particularly for light warm relics. I will then present ongoing work, now nearing completion, that extends this framework beyond linear order by incorporating the nonlinear evolution of mixed dark matter perturbations together with the associated relative-mode bias contributions. This yields a more accurate and systematically improvable description of galaxy clustering across a wider range of scales and strengthens the interpretation of upcoming survey data in searches for non-standard dark matter.

Other topic / keywords:

Authors: CELIK, Safak (Max Planck Institute for Astrophysics); SCHMIDT, Fabian (Max Planck Institute for Astrophysics)

Presenter: CELIK, Safak (Max Planck Institute for Astrophysics)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Interesting and relevant work.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 4.0** (good - advanced treatment of complex DM effects on LSS)

Abstract rating 4

Submitted by **CELIK, Safak** <scelik@mpa-garching.mpg.de> on **Thursday, 30 April 2026**

Abstract ID : 274

Enhancement of axion-density power spectrum via QCD phase transition

Content

We present an enhancement of axion density power spectrum during the QCD phase transition. The axion-radiation coupling together with the self-interaction leads to an enhancement of the power spectrum on horizon scales during the phase transition. We evaluate the axion density power spectrum at the end of the QCD phase transition and show a pronounced enhancement for the hilltop initial conditions.

Other topic / keywords:

Author: HWANG, Jai-chan (IBS)

Presenter: HWANG, Jai-chan (IBS)

Track Classification: Dark Matter; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **HWANG, Jai-chan** <jchan@knu.ac.kr> on **Thursday, 30 April 2026**

Abstract ID : 275

Dark sector models with a vanishing speed of sound

Content

We develop a field theory description of the dark sector, constructed under the requirement of having a vanishing fluid sound speed so as not to spoil cosmic structure formation. The form of the field theory naturally arises in transverse diffeomorphism invariant scenarios, in which case the dark sector is unified into a single scalar field. After a systematic model selection, we classify the resulting families into adiabatic and non-adiabatic fluids. We find that, in general, the adiabatic families exactly reproduce the Λ CDM dark sector, while the non-adiabatic families admit the interpretation of an interacting dark matter and vacuum energy.

Other topic / keywords:

Authors: JARAMILLO-GARRIDO, Darío (Universidad Complutense de Madrid and IPARCOS-UCM); Dr MAROTO, Antonio L. (Universidad Complutense de Madrid and IPARCOS-UCM); Dr MARTÍN-MORUNO, Prado (Universidad Complutense de Madrid and IPARCOS-UCM); Dr DE CRUZ PÉREZ, Javier (Universidad de Granada)

Presenter: JARAMILLO-GARRIDO, Darío (Universidad Complutense de Madrid and IPARCOS-UCM)

Track Classification: Dark Matter; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 4.0**

Abstract rating 4

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **JARAMILLO-GARRIDO, Darío** <djaramil@ucm.es> on **Thursday, 30 April 2026**

Abstract ID : 276

A framework for efficient map-based simulations to mitigate instrumental systematics for CMB surveys

Content

The current and future observations of the CMB are expected to reach unprecedented sensitivity to place stringent constraints on both cosmological parameters and fundamental physics. The ground-based Simons Observatory Large Aperture Telescope started observations last year, and will provide the most sensitive small-scale CMB measurements. A tight control over instrumental systematics is critical, through the assessment of their impact as well as their mitigation.

In this talk, we propose a new generalized framework to efficiently simulate systematics at the map level, along with the Python package `smarties` optimized to handle high resolution simulations. As a first application, we demonstrate that our results are in agreement with significantly more numerically expensive end-to-end simulations for a set of beam-related systematics. The ability to efficiently produce large ensembles of such simulations will allow for more robust cosmological parameter estimation from the power spectra of the CMB and gravitational lensing potential.

Other topic / keywords:

Author: MORSHED, Magdy (INFN Ferrara)

Co-authors: ADLER, Alexandre (University of California Berkeley); DUIVENVOORDEN, Adriaan (Max Planck Institute for Astrophysics); Dr FABBIAN, Giulio (IAS)

Presenter: MORSHED, Magdy (INFN Ferrara)

Track Classification: Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 3.0** (If heavy on Simons, then expected to be very insightful. Otherwise a bit stale.)

Abstract rating 3

Submitted by **MORSHED, Magdy** <magdy.morshed.fr@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 277

Test4

Content

zaaa

Other topic / keywords:

Author: SCHALLER, Matthieu (Lorentz Institute & Leiden Observatory)

Presenter: SCHALLER, Matthieu (Lorentz Institute & Leiden Observatory)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Poster

Status: WITHDRAWN

Submitted by **SCHALLER, Matthieu** <mschaller@lorentz.leidenuniv.nl> on **Thursday, 30 April 2026**

Abstract ID : 278

Cosmological analysis of cosmic shear and galaxy clustering with the KiDS survey

Content

Weak gravitational lensing has emerged as a competitive cosmological probe, and it is often combined with galaxy clustering to provide constraints on the matter density and matter fluctuations of the Universe. In this talk, I will present the cosmological analysis of data from the Kilo Degree Survey (KiDS), where we combine statistical measurements from galaxy shapes and galaxy positions using the latest, full-survey data release. Building on the published cosmic shear cosmological results, I will focus on details of the galaxy position sample selection. In particular, I will present the magnitude-limited KiDS Bright sample, but also introduce the methodology for measuring galaxy clustering using the full-depth, cosmic shear sample. In addition, I will present methodological advances such as supplementing the data with stellar mass function measurements and using the halo model for modelling observables, as well as including spectroscopic data in a standard 3x2 analysis, increasing cosmological information and robustness through self-calibration.

Other topic / keywords:

weak gravitational lensing, galaxy clustering, galaxy surveys

Author: GEORGIU, Christos (IFAE)

Presenter: GEORGIU, Christos (IFAE)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Highly relevant results from KiDS. I am biased though as I am one of the KiDS weak lensing coordinators.)

Abstract rating 5

KUIJKEN, Koen: **Accept: Talk • 5.0** (I agree, and am also biased! But a KiDS overview talk is objectively relevant here I think.)

Abstract rating 5

Submitted by **GEORGIU, Christos** <chr.p.georgiou@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 279

Exploring primordial signatures in Large-Scale Structure with GENGARS

Content

Primordial non-Gaussianity (PNG) provides a unique window into the nature of inflation, and large-scale structure (LSS) surveys offer a promising route to sharpen its constraints. While local PNG leaves a characteristic imprint on large-scale 2-point clustering statistics, many well-motivated non-local PNG models mainly induce higher-order correlations, making their signatures more difficult to model and detect. Cosmological simulations are therefore essential to connect primordial physics with late-time observables in the nonlinear Universe.

I will present GENGARS, a framework to generate non-Gaussian initial conditions for N-body simulations from arbitrary separable primordial bispectra. I will outline the main idea behind the method, emphasizing how the kernel choice controls the variance and accuracy of the generated correlation functions, and describe the prescription adopted in GENGARS to make the calculation computationally feasible while preserving the target primordial bispectrum. I will then discuss how this pipeline can be applied beyond standard templates, including oscillatory feature models, to assess how primordial correlations propagate into late-time matter and halo statistics. Finally, I will briefly comment on how this framework can provide a basis for future field-level and simulation-based inference applications.

Other topic / keywords:

Author: FONDI, Emanuele (Institut d'Astrophysique de Paris)

Presenter: FONDI, Emanuele (Institut d'Astrophysique de Paris)

Track Classification: Large-Scale Structure; Inflation / Primordial Perturbations; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

Based on arXiv:2508.01855

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (Looks like a very useful tool.)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0** (Better suited for methods session.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 1.0** (Grade only for inference track.)

Abstract rating 1

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Talk • 4.0** (better fit for LSS)

Abstract rating 4

Submitted by FONDI, Emanuele <emanuelefondi9@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 280

Measuring magnetic fields at cosmological distances with gravitational lensing

Content

Magnetic fields drive galaxy evolution by shaping the interstellar medium and regulating star formation. However, their origins and cosmic history remain obscure. To understand the evolution of magnetic fields from initial seed fields to well-ordered systems, resolving the spatial structure of these fields across cosmic time is essential. Although achievable in local galaxies, this task becomes increasingly difficult at high redshift due to limited angular resolution and faint emission levels.

Strong gravitational lensing provides a unique opportunity to extend our knowledge of magnetic fields to high redshift. Recently, we have developed a new pixellated Bayesian framework that enables us to constrain magnetic fields in both lensing and source galaxies. By combining this technique with high-resolution data from ALMA, we have uncovered a kiloparsec-scale spiral magnetic field in a gravitationally lensed starburst galaxy at redshift 2.6, demonstrating that resolved magnetic field topologies can now be recovered well into the early Universe. In this talk, I will discuss how we apply this approach to probe the topology of magnetic fields in galaxies at cosmological distances, as well as the observational limits and requirements for a systematic survey of magnetic fields across cosmic time.

Other topic / keywords:

Author: DE ROO, Willem (Max Planck Institute for Astrophysics)

Co-authors: MCKEAN, John (University of Groningen / University of Pretoria); NDIRITU, Simon (Max Planck Institute for Astrophysics); PAKMOR, Ruediger (Max Planck Institute for Astrophysics); Dr POWELL, Devon (Max Planck Institute for Astrophysics); Dr VEGETTI, Simona (Max Planck Institute for Astrophysics)

Presenter: DE ROO, Willem (Max Planck Institute for Astrophysics)

Track Classification: Primordial Magnetic Fields

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Primordial Magnetic Fields:

Judgments: Positive: Talk

Reviews:

BONDARENKO, Kyrylo: **Accept: Talk • 5.0** (This is not a PMF topic, strictly speaking, but one cannot really separate PMF from observations at a later time. I would recommend extending the PMF session to cover large-scale MF in the late-time Universe.)

Abstract rating 5

IARYGINA, Oksana: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **DE ROO, Willem** <roo@mpa-garching.mpg.de> on **Thursday, 30 April 2026**

Abstract ID : 281

Lattice Simulations of Multifield Inflation

Content

The inflationary period in the early universe provides a widely accepted mechanism for generating primordial perturbations. While some single-field models successfully reproduce current observations, multifield models can lead to distinct observational signatures on scales much smaller than those probed by the cosmic microwave background. Multifield models of inflation introduce richer dynamics, including nonlinear evolution where standard perturbative methods break down. In this work, we extend existing numerical techniques to a general multifield setup. We explore the waterfall regime near the end of hybrid inflation, where tachyonic instabilities lead to fast, nonlinear growth of field fluctuations. Using lattice simulations, we follow the evolution of the coupled fields through this regime and compute the resulting curvature perturbations. These results demonstrate the importance of accurately describing multifield dynamics in nonlinear regimes. In particular, they highlight how nonlinear effects during the final stages of inflation can affect curvature perturbations and potentially leave observational signatures.

Other topic / keywords:

Multifield inflation, lattice simulations

Author: JANSSEN, Lena (University of Groningen)

Presenter: JANSSEN, Lena (University of Groningen)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept • 3.0**

Abstract rating 3

Submitted by **JANSSEN, Lena** <l.janssen@rug.nl> on **Thursday, 30 April 2026**

Abstract ID : 282

Large Primordial Fluctuations: Stochastic vs. Classical δN approaches

Content

The classical evolution of fields during a period of accelerated expansion in the very early universe ("inflation") can establish an idealised homogeneous and isotropic cosmology. However, quantum fluctuations inevitably generate inhomogeneities and anisotropies on all observable scales and beyond. The δN formalism provides a powerful framework to describe the nonlinear curvature perturbation in terms of fluctuations in the duration of inflation, N . In its standard implementation, δN is calculated using the classical trajectory to find the number of e-folds of inflation from a given field value to the end of inflation. In contrast, the stochastic δN formalism incorporates quantum fluctuations as stochastic noise along the trajectory, enabling a non-perturbative treatment of inflationary dynamics that can be crucial for rare, large fluctuations. In this work, we compare the classical and stochastic approaches to study the statistics of large curvature perturbations when coarse-grained at a given length scale. This is particularly relevant for calculations of primordial black hole formation. Using the numerical code PyFPT, we compute the distribution of curvature perturbations from slow-roll inflation driven by a quadratic potential, and perform a detailed comparison with the classical δN formalism, identifying regimes where quantum diffusion significantly impacts the probability distribution of large fluctuations.

Other topic / keywords:

Primordial Black Holes, Stochastic Inflation

Author: BHARGAVA, Parth (ICG, Portsmouth)

Co-authors: Dr ASSADULLAHI, Hooshyar (School of Mathematics and Physics, University of Portsmouth); KOYAMA, Kazuya; VENNIN, Vincent (LPENS Paris); WANDS, David

Presenter: BHARGAVA, Parth (ICG, Portsmouth)

Track Classification: Inflation / Primordial Perturbations; Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Conflicting: Talk, Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **BHARGAVA, Parth** <parth.bhargava@port.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 283

Localized Detection of Baryon Acoustic Oscillation Shells in DESI DR1

Content

I present results from a new local approach to detecting and characterizing Baryon Acoustic Oscillations (BAO) in the large-scale distribution of matter. The possibility of observing individual BAO structures in configuration space was long speculative until the Ho'oleilana candidate (Tully et al. 2023), discovered in the Cosmicflows-4 dataset, revealed a single shell-like over-density with BAO-scale radius. That discovery raised the question of whether such features are reproducible cosmological signatures or rare fluctuations, and highlighted the need for systematic searches in much larger and deeper surveys. Our work addresses this question by exploiting the unprecedented statistical power of modern datasets to confirm the standard BAO shell and to identify individual instances with high confidence.

We apply a spherical wavelet transform (Arnalte-Mur et al. 2012) to galaxy redshift catalogs, convolving them with shell-shaped filters anchored on cluster centers identified in the DESI Legacy Surveys optical cluster catalog with combined spec- and photo- z (Wen & Han 2024), and tracing surrounding structure with spectroscopic redshifts from DESI DR1. Our analysis focuses on the best-observed regions of DR1 and on the luminous red galaxy samples LRG1 ($0.4 < z < 0.6$) and LRG2 ($0.6 < z < 0.8$), using of order 100,000 clusters as anchors for potential BAO centers. Extensive tests against dedicated mock and randomized catalogs, constructed to reproduce the observational properties of both cluster and galaxy samples while excluding BAO physics, enable us to detect the ensemble BAO shell signal in configuration space with significance greater than 5σ . Building on this validation, we assemble a catalog of individual BAO candidates, each with local significances exceeding 5σ . The resulting sample comprises roughly one thousand large-scale shell-like structures, with about five hundred candidates in each redshift bin, and statistical strength comparable to or greater than Ho'oleilana, demonstrating that localized BAO features are a reproducible aspect of the cosmic density field rather than isolated curiosities.

Rather than replacing the traditional two-point correlation function (2PCF), our method provides a complementary, object-based description of BAO. While the 2PCF yields a volume-averaged acoustic scale, the wavelet approach delivers localized measurements of centers, radii, and radial profiles, enabling direct studies of environmental dependence, anisotropies, and redshift evolution. This localized characterization opens new possibilities for cosmological inference, including consistency tests, independent probes of $H(z)$ and H_0 from stacked and individual BAO detections, tests of large-scale homogeneity and isotropy, and improved control of systematics associated with spatial averaging.

In this talk, I will present the methodology, representative detections of both stacked and individual BAO shells, the statistical validation framework, and the implications of localized BAO measurements for future large-scale structure analyses with DESI, Euclid, 4MOST, and related surveys.

Other topic / keywords:

Author: OLEX, Edward (Universidad Autónoma de Madrid (Spain))

Co-authors: EINASTO, Maret (Tartu Observatory, University of Tartu); Prof. KNEBE, Alexander (Universidad Autónoma de Madrid); Prof. LIBESKIND, Noam (Leibniz-Institute for Astrophysics Potsdam); Prof. TEMPEL, Elmo (Tartu Observatory, University of Tartu)

Presenter: OLEX, Edward (Universidad Autónoma de Madrid (Spain))

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Highly innovative approach. Want to hear more!)

Abstract rating 5

KUIJKEN, Koen: **Accept: Talk • 4.0** (I heard about this before, it would fit in well as a nice contrast to standard analysis methods.)

Abstract rating 4

Submitted by **OLEX, Edward** <edward.olex@uam.es> on **Thursday, 30 April 2026**

Abstract ID : 284

Geometric Z' : Dark Matter, and Black Hole Probes

Content

In this talk, I will discuss a purely geometric vector field arising in metric-Palatini gravity and its interpretation as a possible fifth force. When metric-Palatini gravity is extended by the antisymmetric part of the affine Ricci tensor together with a matter sector involving the affine connection, the theory dynamically reduces to general relativity together with a massive vector field of geometric origin. This field, identified as the geometric couples universally to fermions while remaining decoupled from scalars and vector bosons as a consequence of its geometric origin. I will discuss how the geometric Z' can serve as a viable dark matter candidate and examine its implications for black hole formation. The talk will highlight how the geometric Z' provides a common framework for fifth force, dark matter, and black hole physics.

Other topic / keywords:

geometric Z' , fifth force, dark matter, black hole

Author: PULIÇE, Beyhan (Istinye University)

Presenter: PULIÇE, Beyhan (Istinye University)

Track Classification: Dark Matter; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0** (This submission is better suited for DM track)

Abstract rating 2

GLAVAN, Dražen: **Accept: Poster • 1.0** (This submission is better suited for DM track)

Abstract rating 1

Submitted by **PULIÇE, Beyhan** <beyhan.pulice@istinye.edu.tr> on **Thursday, 30 April 2026**

Abstract ID : 285

Gravitational Waves from Cosmic Strings with Backreaction

Content

Cosmic strings are one-dimensional topological defects, which are formed during symmetry-breaking phase transitions with a non-simply connected vacuum manifold. If they exist, they are expected to generate gravitational waves, which we might be able to detect with future gravitational wave observatories such as LISA or Einstein Telescope. In particular, local features on the strings, such as kinks and cusps, would produce distinctive gravitational waveforms.

The evolution of these strings can be approximately modelled using Nambu-Goto dynamics, which can then be used to calculate the gravitational wave signals they emit. In previous such calculations the effect of the gravitational backreaction of the string onto itself was neglected. However, since the gravitational self-force is particularly important for kinks and cusps we would expect it to especially affect the gravitational waves produced by these features.

By modelling how simple cosmic string loops evolve under the effect of their own gravity we find that the gravitational backreaction suppresses the formation of cusps. This subsequently leads to a high-frequency cut-off in the gravitational wave signal they produce, which has important implications for detecting such signals with future observatories.

Other topic / keywords:

Author: GERBLICH, Lasse (University of Cambridge)

Presenter: GERBLICH, Lasse (University of Cambridge)

Track Classification: Early Universe; Gravitational Waves

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Poster

Reviews:

MALHOTRA, Aameek: **Accept: Poster • 4.0**

Abstract rating 4

GAROFFOLO, Alice: **Accept: Poster • 4.0**

Abstract rating 4

Submitted by **GERBLICH, Lasse** <lg708@cam.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 286

Intrinsic Galaxy Shapes as a Novel Probe of Cosmology: Primordial Parity Violation with Intrinsic Alignments

Content

Intrinsic alignment (IA), the large-scale correlation of intrinsic galaxy and halo shapes, is recognized not only as a major systematic in weak-lensing analyses but also as a cosmological signal in its own right. Because IA is sensitive to the gravitational tidal field and its higher-order statistics, it provides information complementary to standard late-time observables and may open a new window onto early-Universe physics. In this talk, I will present our recent analytical and numerical results on primordial parity violation in IA, combining predictions from an effective field theory for IA with measurements from N-body simulations. We show that primordial parity violation can leave distinctive signatures in the IA power spectrum. In particular, for a parity-odd trispectrum of curvature perturbations enhanced in the collapsed limit, we find a characteristic large-scale enhancement of the parity-odd component of the IA power spectrum, namely the EB power spectrum. I will then present Fisher forecasts to constrain the amplitude of such parity-violating primordial signals using current and upcoming galaxy survey data. Finally, I will discuss ongoing methodological developments for measuring and analyzing the parity-odd IA power spectrum in observational data.

Other topic / keywords:

Author: KURITA, Toshiki (Max Planck Institute for Astrophysics)

Presenter: KURITA, Toshiki (Max Planck Institute for Astrophysics)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Interesting but not sure how relevant. A bit niche...)

Abstract rating 3

KUIJKEN, Koen: **Accept • 4.0** (Nice to see IA as a physics probe and not just nuisance. Early days though...)

Abstract rating 4

Submitted by **KURITA, Toshiki** <toshiki.kurita0@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 287

Measuring scalar tensor dynamics in the early universe

Content

Current searches for non-Gaussianity are mostly limited to higher-order correction functions of scalar perturbations. In the meantime, primordial B-mode detection is one of the main goals of next-generation CMB experiments. Bispectra involving B-modes, i.e., $\langle TTB \rangle$, $\langle EEB \rangle$, and $\langle TEB \rangle$ are of great importance for two reasons:

First, tensor perturbations source B modes while scalars do not, searching for bispectra involving B modes could put stronger constraints on tensor non-Gaussianity, which is predicted in a number of compelling theoretical models, i.e., inflation models involving axion-gauge field interactions, primordial magnetic field as a mechanism to generate tensor non-Gaussianity.

Second, current constraints on primordial tensor perturbations from T and E modes are limited by cosmic variance and B-mode observations are not yet cosmic-variance limited. Therefore, including future B-mode data from upcoming CMB experiments will improve our constraints on bispectra involving primordial tensor perturbations.

In this talk we describe a generalization of the Komatsu-Spergel-Wandelt(KSW) bispectrum estimator which shares its statistical properties with the existing KSW Estimator and maintains the favorable numerical scaling with angular resolution. We apply this estimator to SO and advanced SO data and present a set of preliminary constraints on f_{NL} for bispectra involving tensor perturbation, i.e., $\langle \zeta\zeta h \rangle$, $\langle \zeta hh \rangle$, $\langle hhh \rangle$.

Other topic / keywords:

Authors: DING, Keyi; DUIVENVOORDEN, Adriaan (Max Planck Institute for Astrophysics); MEERBURG, Daan

Presenter: DING, Keyi

Track Classification: Primordial Magnetic Fields; Cosmic Microwave Background; Inflation / Primordial Perturbations; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 1.0** (Old method, new CMB data: Please review in CMB.)

Abstract rating 1

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept • 4.0** (better fit for CMB)

Abstract rating 4

Submitted by **DING, Keyi** <keyiding24@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 288

Multi-messenger Cosmology with gravitational waves and NewAthena

Content

The connection between gravitational wave (GW) sources, short gamma-ray bursts and their X-ray afterglows in GW170817 is a cornerstone for multi-messenger cosmology, allowing for an independent measurement of the cosmic expansion.

Gravitational wave signals alone cannot constrain the Hubble constant, H_0 , due to intrinsic degeneracies between redshift and the masses of the merging objects, and between luminosity distance and system's inclination angle relative to the observer. Electromagnetic counterparts of GW signals break these degeneracies by providing direct redshift measurements and constraints on the binary's inclination.

☒ In this presentation, I will discuss how NewAthena will play a central role in the next decade of multi-messenger astrophysics. ☒ The high-resolution offered by X-IFU will provide access to X-ray lines at the distances targeted by the third-generation gravitational waves detectors. These highly resolved spectra will deliver the missing redshift information. Meanwhile, WFI's high sensitivity is well suited to observe faint GW afterglows over long timescales, thus constraining the inclination angle of binary systems.

In synergy with next-generation interferometers such as the Einstein Telescope and Cosmic Explorer, NewAthena will deliver cosmological measurements that are competitive with traditional probes, further highlighting the central role of neutron stars in multi-messenger cosmology and astronomy.

Other topic / keywords:

Multi-Messenger Cosmology

Author: PASSALEVA, Niccolò (Sapienza University of Rome)

Presenter: PASSALEVA, Niccolò (Sapienza University of Rome)

Track Classification: Gravitational Waves; Others (Please specify below)

Contribution Type: Talk

Comments:

I would like to give a talk but if there is no space I would like to move to a poster

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

MALHOTRA, Aameek: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **PASSALEVA, Niccolò** <niccolo.passaleva@uniroma1.it> on **Thursday, 30 April 2026**

Abstract ID : 289

One-point matter PDFs beyond TopHat filters

Content

We study one-point probability distribution function (PDF) for averaged matter densities over spherical cells as a non-perturbative probe of the large-scale structure. The PDF is analytically modelled using a path integral framework. It contains a leading order contribution controlled by the spherically symmetric gravitational collapse dynamics, as well as higher order contributions coming from aspherical fluctuations. We investigate the sensitivity of the PDF to the shape of the window function by considering a family of radial window functions interpolating between the top-hat and Gaussian filters in coordinate space. We find that the sensitivity is rather mild suggesting that the PDF is robust against the precise choice of the filter. The results are compared to N-body simulations.

Other topic / keywords:

Authors: KAYSSI, Alexander (McMaster University); Dr SIBIRYAKOV, Sergey (McMaster U. & Perimeter Inst.); CHUDAYKIN, Anton (Institute for Nuclear Research)

Presenter: KAYSSI, Alexander (McMaster University)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

HILDEBRANDT, Hendrik: **Accept • 3.0** (Not clear what this really adds to LSS analyses. Still nothing wrong with it.)

Abstract rating 3

KUIJKEN, Koen: **Accept • 3.0** (combination with other probes would be more interesting)

Abstract rating 3

Submitted by **KAYSSI, Alexander** <kayssia@mcmaster.ca> on **Thursday, 30 April 2026**

Abstract ID : 290

Cosmological Constraints on Novel Tsallis Holographic Dark Energy within Rastall Theory

Content

In Rastall theory, the cosmological implications of new Tsallis holographic dark energy combined with the Rastall correction to General Relativity are investigated. A comprehensive data set—including Dark Energy Spectroscopic Instrument Baryon Acoustic Oscillations (Data Release 2), PantheonPlus Type Ia Supernovae, Hubble parameter measurements, and Big Bang Nucleosynthesis—is used to constrain model parameters via Markov Chain Monte Carlo analysis. Results indicate that this framework reproduces the present dark energy density parameter in agreement with the Lambda Cold Dark Matter model, while predictions for the Hubble parameter at intermediate redshifts show improved consistency with observations compared to the standard model. New Tsallis holographic dark energy alone cannot achieve this agreement. Dynamical stability analysis demonstrates a stable de Sitter fate for the Universe. The study also reinforces theoretical and observational bounds on the Rastall parameter and highlights the model's testable departures from standard cosmology, providing a viable candidate for dynamical dark energy.

Other topic / keywords:

Author: Ms AFSHAR, Behnoush (Research Institute for Astronomy and Astrophysics of Maragha)

Co-authors: Dr SADEGHNEZHAD, Neda (Research Institute for Astronomy and Astrophysics of Maragha); Dr JALALZADEH, Raheleh (Research Institute for Astronomy and Astrophysics of Maragha); DAVARI DOLATABADI, Zahra (Korea Institute for Advanced Study)

Presenter: Ms AFSHAR, Behnoush (Research Institute for Astronomy and Astrophysics of Maragha)

Track Classification: Dark Energy / Modified Gravity

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0**

Abstract rating 2

GLAVAN, Dražen: **Accept: Poster • 1.0**

Abstract rating 1

Submitted by **AFSHAR, Behnoush** <b.afshar@riaam.ac.ir> on **Thursday, 30 April 2026**

Abstract ID : 291

Evaporating black holes: how the burden of their memory stabilizes them

Content

The memory burden effect describes how an object's stored information resists its own decay. This mechanism is especially pronounced in saturons - systems that saturate unitarity bounds on entropy - with black holes providing the prime example. I will show how memory burden can halt Hawking evaporation and dynamically stabilize black holes against complete decay. Crucially, this phenomenon is not exclusive to gravity: it arises naturally in generic quantum many-body systems and renormalizable field theories, underscoring its broader theoretical relevance. I will then discuss the phenomenological consequences, focusing on potential signatures in the early Universe and today. In particular, memory-stabilized black holes can produce distinctive high-energy cosmic-ray signals and leave characteristic imprints on the CMB, offering correlated cosmological and astrophysical probes of this peculiar form of dark matter.

Other topic / keywords:

Author: ZANTEDESCHI, Michael

Presenter: ZANTEDESCHI, Michael

Track Classification: Dark Matter; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **ZANTEDESCHI, Michael** <michael.zantedeschi1@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 292

Lukewarm inflation, primordial black holes, gravitational waves and the GUT scale QCD axion

Content

In this talk we present “Lukewarm Inflation”, a concrete particle physics model with parametrically low reheating temperatures that can naturally generate a parametrically large, broad, nearly-flat enhancement of the primordial curvature power spectrum. In the case of reheating temperatures $T_R \sim 5$ TeV, this simultaneously produces planet-mass primordial black holes and scalar-induced gravitational waves consistent with the nanohertz frequency range, possibly within reach of present and future pulsar timing arrays (PTAs). Furthermore, for T_R lesssim 1 GeV, the late-stage inflationary epoch efficiently dilutes primordial relics, opening a viable window for the QCD axion with a GUT-scale decay constant and $\theta_i \sim 1$ to account for part or all of the observed dark matter abundance.

Other topic / keywords:

Authors: FERRAZ, Paulo B. (University of Coimbra); MANSO, António (Jozef Stefan Institut); ROSA, Joao (University of Coimbra)

Presenter: MANSO, António (Jozef Stefan Institut)

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe; Gravitational Waves

Contribution Type: Talk

Comments:

Soon to be submitted on the arXiv

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (Better in early universe/ inflation track)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 4.0** (more suitable for early universe/inflation)

Abstract rating 4

Inflation / Primordial Perturbations:

Judgments: Conflicting: Talk, Poster

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

COLE, Philippa: **Accept: Talk • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **MANSO, António** <antonio.manso@ijs.si> on **Thursday, 30 April 2026**

Abstract ID : 293

Probing Inflationary and Reheating Signatures of the Double-Sine-Gordon Potential in General Relativity and Rastall Gravity

Content

Cosmic inflation is one of the most successful frameworks for addressing the fundamental problems of the standard Big Bang model, including the horizon, flatness, and magnetic monopole problems. Among various inflationary scenarios, solitonic potentials, due to their topological features and dynamical stability, have attracted considerable attention in cosmological studies. This study investigates the Double-Sine-Gordon (DSG) potential,

$$\begin{equation}$$

$$V(\phi) = \alpha \cos(N\phi) + \beta \cos(2N\phi),$$

$$\end{equation}$$

where ϕ denotes the inflaton field, while α , β , and N are free parameters controlling the amplitude, relative contribution of each harmonic term, and the frequency of the oscillatory structure, respectively. The model is studied within two different gravitational frameworks: General Relativity (GR) and Rastall gravity, the latter being a representative of geometry-matter non-minimal coupling theories.

In both frameworks, the inflationary models based on the DSG potential are consistent with the Planck Collaboration 2018 data combined with BK18 and BAO observations, and satisfy the theoretical requirements imposed by the Trans-Planckian Censorship Conjecture (TCC). However, differences emerge between the two approaches. The analysis of the inflationary dynamics reveals differences in the parameter space and the range of viable number of e-folds between the two gravitational frameworks, while remaining consistent with observational constraints.

The reheating phase in both models is well described, yielding a positive reheating number of e-folds (N_{reh}) and a final reheating temperature (T_{reh}) ranging from 10^{-2} GeV to 10^{16} GeV. Additionally, the analysis constrains the free parameters of the DSG potential, including N , α , and β , as well as the Rastall parameter, identifying viable regions of parameter space consistent with both observational and theoretical bounds.

This comparison highlights that while the DSG potential provides a viable inflationary model within GR, its implementation in Rastall gravity exhibits enhanced theoretical consistency and broader compatibility with observational constraints, making it a promising candidate for modeling the early Universe.

Other topic / keywords:

Author: Ms AFSHAR, Behnoush (Research Institute for Astronomy and Astrophysics of Maragha)

Co-authors: Prof. BAMBA, Kazuharu (Fukushima University); Dr MORADPOUR, Hooman (Research Institute for Astronomy and Astrophysics of Maragha)

Presenter: Ms AFSHAR, Behnoush (Research Institute for Astronomy and Astrophysics of Maragha)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Negative

Reviews:

CESPEDES, Sebastian: **Reject • 1.0**

Abstract rating 1

WANG, Dong-Gang: **Merge • 2.0**

Abstract rating 2

Submitted by **AFSHAR, Behnoush** <b.afshar@riaam.ac.ir> on **Thursday, 30 April 2026**

Abstract ID : 294

"CoDE-4: A Phenomenological Framework for Cross-Epoch Cosmological Consistency"

Content

CoDE-4 (Cosmic Dynamical Expansion Framework v1.0)

Cross-Epoch Consistent Resolution of the H_0 Tension with Coupled Expansion–Growth Dynamics

Model Status and Scope

CoDE-4 is a phenomenological cosmology framework designed to test whether modest early-time expansion modifications combined with scale-dependent structure-growth coupling can reconcile the Hubble-parameter discrepancy while preserving observational consistency from recombination to late-time large-scale structure.

The present release represents a validated baseline implementation rather than a finalized cosmological theory. As with all precision cosmology frameworks, parameters are expected to evolve as constraints improve from next-generation surveys.

Planned updates will incorporate:

- Euclid large-scale structure mapping
- Roman Space Telescope supernova distances
- DESI final BAO catalogues
- CMB-S4 acoustic constraints
- JWST high-redshift galaxy statistics

All revisions will be version-tracked and released through the public repository.

☒

Observational Alignment (v1.0 Validation Suite)

CoDE-4 demonstrates simultaneous agreement with 14 independent observational regimes:

Early-Universe Geometry

- ✓ Planck acoustic scale θ^*
- ✓ First acoustic peak position ℓ_1
- ✓ CMB shift parameter R
- ✓ damping-tail expansion consistency
- ✓ Big-Bang nucleosynthesis expansion rate
- ✓ matter–radiation equality redshift

☒

Expansion History

- ✓ BAO distance scale $D_V(z)$
- ✓ Pantheon Type-Ia supernova luminosity distances
- ✓ comoving distance to recombination
- ✓ sound-horizon calibration

☒

Structure Formation

- ✓ redshift-space distortion growth $f\sigma_8(z)$
- ✓ growth index γ evolution
- ✓ Integrated Sachs–Wolfe potential decay
- ✓ matter power-spectrum turnover scale
- ✓ weak-lensing clustering parameter S_8

☒

Early Galaxy Formation

- ✓ improved high-redshift structure timing consistent with JADES-GS-z14-0 formation constraints

☒

Expansion-Rate Tension Resolution

The framework reduces the early- vs late-Universe Hubble discrepancy from $4.89\sigma \rightarrow 0.17\sigma$

with

$$H_0 = 72.86 \text{ km s}^{-1} \text{ Mpc}^{-1}$$

while preserving CMB acoustic geometry.

☒

Methodological Contribution

Unlike early-dark-energy scenarios that modify only the background equation of state, CoDE-4 introduces a dual-mechanism structure:

- (1) early-time expansion modification (ϵ -coupling)
- (2) scale-dependent perturbation-growth enhancement (β -coupling)

This combined approach allows the expansion history and structure-formation timeline to adjust simultaneously without degrading recombination-era observables.

The numerical framework integrates:

- modified Friedmann evolution with early-time coupling terms
- second-order perturbation growth solver with effective gravity scaling
- cross-epoch validation spanning recombination \rightarrow BAO \rightarrow weak lensing \rightarrow structure growth

☒

Model Philosophy

CoDE-4 is designed as an adaptive phenomenological framework rather than a fixed parameter solution. As observational constraints improve, parameters will be iteratively refined with fully reproducible releases.

All implementations are open-source and publicly version-tracked.

Peer validation is invited.

☒

Scientific Motivation

The $\approx 5\sigma$ discrepancy between early-Universe (Planck CMB) and late-Universe (SH0ES) determinations of H_0 represents one of the primary tensions in precision cosmology.

CoDE-4 demonstrates that modest early-time expansion modifications, when jointly constrained across recombination geometry, expansion history, and structure growth observables, can reconcile this discrepancy without degrading agreement with established datasets.

Methodology:

The framework integrates: (1) self-consistent Friedmann integration with early-time coupling terms, (2) coupled perturbation growth solver with modified effective gravity, (3) comprehensive cross-epoch validation suite spanning CMB geometry \rightarrow structure formation \rightarrow weak lensing.

Code & Reproducibility

MIT-licensed implementation available at:

<https://github.com/siddharthatresearch-afk>

Includes:

- full solver pipeline
- validation suite
- observational consistency tests
- reproducible parameter configuration

Other topic / keywords:

H_0 Tension and Beyond- Λ CDM Solutions

Author: SATHISH KUMAR, Siddharth (Independent Researcher)

Presenter: SATHISH KUMAR, Siddharth (Independent Researcher)

Track Classification: Large-Scale Structure; Dark Matter; Cosmic Microwave Background; Dark Energy / Modified Gravity; Early Universe; Others (Please specify below)

Contribution Type: Poster

Comments:

This submission presents results from the CoDE-4 cosmological framework, an independently developed numerical solver designed to address current expansion–structure tensions while preserving early- and late-time observational consistency. The model simultaneously reproduces CMB acoustic geometry, BAO distances, Pantheon supernova constraints, equality redshift, and structure-growth observables ($f\sigma_8$ and γ), while reducing the H_0 discrepancy from 4.9σ to 0.17σ .

Particular emphasis is placed on maintaining cross-epoch consistency: early-universe expansion (BBN), recombination geometry (θ^* and ℓ_1), and late-time potential decay (ISW) remain aligned with observational expectations despite modifications to the expansion history. The framework also explores implications for early structure formation motivated by recent JWST detections.

I welcome technical feedback and discussion regarding parameter degeneracies, growth evolution, and observational extensions of the model.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Mixed: Accept, Reject

Reviews:

HILDEBRANDT, Hendrik: **Reject** (This looks very AI-generated to me. Similar to many emails I get these days.)

Abstract rating 0

KUIJKEN, Koen: **Accept: Poster • 3.0** (This looks like a contribution that is better discussed over a poster.)

Abstract rating 3

Dark Energy / Modified Gravity:

Judgments: Negative

Reviews:

GARCIA-GARCIA, Carlos: **Reject** (I haven't been able to identify the person. The github user and repo that they cite is 2 weeks old, which seems a red flag.)

Abstract rating 0

GLAVAN, Dražen: **Reject**

Abstract rating 0

Submitted by **SATHISH KUMAR, Siddharth** <s.siddharth2023@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 295

The path to realistic SIMP dark matter

Content

Strongly interacting dark sectors with pseudo–Nambu–Goldstone bosons provide a compelling and versatile framework for sub-GeV dark matter. While the original SIMP paradigm emphasizes number-changing $3 \rightarrow 2$ processes as the primary mechanism for setting the relic abundance, the phenomenology of pionic dark matter is significantly richer. Depending on the mass spectrum and interaction strengths, the relic density may instead be governed by $2 \rightarrow 2$ annihilations (WIMP-like regime), semi-annihilation channels involving vector mesons, as well as higher-order processes such as $\pi\pi\pi \rightarrow \rho$. A comprehensive description therefore requires a framework that consistently incorporates pion dynamics, vector resonances, anomalous interactions, and portal couplings.

We study QCD-like dark sectors in which the dark matter candidates are pions stabilized by unbroken dark flavor symmetries. The low-energy effective theory is formulated within the Hidden Local Symmetry (HLS) approach. The resulting HLS Lagrangian, augmented by the gauged Wess–Zumino–Witten term, is constructed in a representation-independent way and applies to complex, real, and pseudo-real fermion theories.

As a minimal benchmark, we consider the pseudo-real symmetry-breaking pattern $SU(2N_f)/Sp(2N_f)$ with $N_f = 2$. We incorporate lattice results for $Sp(N_c = 4)$ to obtain realistic relations between m_π/f_π and m_ρ/m_π .

A dark photon portal is included to ensure thermal contact with the visible sector and to evaluate its impact on the relic abundance and the stability of dark matter within the HLS framework.

Other topic / keywords:

Authors: BRINGMANN, Torsten (University of Oslo (NO)); KOLESOVA, Helena (University of Stavanger); KRICHEVSKIY, Daniil (University of Stavanger); MELKILD, Halvor (University of Oslo); POMPER, Joachim (University of Piza)

Presenter: KRICHEVSKIY, Daniil (University of Stavanger)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **KRICHEVSKIY, Daniil** <daniil.krichevskiy@uis.no> on **Thursday, 30 April 2026**

Abstract ID : 296

Staying focused: In-flight monitoring of the Euclid space telescope

Content

One of the Euclid survey's primary cosmological probes is weak gravitational lensing: the apparent coherent distortion of galaxies caused by their light passing through gravitational potentials along the line of sight. Obtaining precise and accurate galaxy shapes is therefore crucial for unbiased cosmological inference. The leading source of systematic error in these measurements is the point-spread function (PSF), which can introduce spurious correlations if not modelled accurately.

During survey operations, the main driver of PSF variability is the defocus wavefront error, which affects the PSF size and consequently the apparent roundness of galaxies. We present a fast, purely empirical method to estimate the defocus wavefront error using a simple linear relation between defocus and the lateral displacement of diffraction spikes in bright stars.

This approach enables us to trace the remarkably stable evolution of the Euclid telescope across its full survey timeline. Our defocus estimator provides a tight per-exposure prior for PSF modelling and is generalisable to other diffraction-limited telescopes.

Other topic / keywords:

Instrumentation

Author: NEUMANN, Dennis (Leiden Observatory)

Presenter: NEUMANN, Dennis (Leiden Observatory)

Track Classification: Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 2.0** (Hard to imagine this topic at Cosmo; LE3 in Euclid is ideal audience.)

Abstract rating 2

Submitted by **NEUMANN, Dennis** <dneumann@strw.leidenuniv.nl> on **Thursday, 30 April 2026**

Abstract ID : 297

Improved cosmological constraints on axion-lepton interactions

Content

We investigate lepton-flavour-conserving (LFC) and lepton-flavour-violating (LFV) axion-lepton couplings using cosmological data, addressing the specific mass ranges where the standard ΔN_{eff} approximation fails. We implement a full phase-space treatment of thermal axion production and incorporate finite axion mass effects to test these couplings against Planck 2018 CMB and DESI DR2 BAO measurements. Our analysis significantly strengthens previous cosmological bounds in the mass range 0.1 eV

lessim m_a

*lessim*1 keV. For $m_a \sim 10$ eV, cosmological limits on LFC electron and muon couplings, as well as LFV μ - e couplings, improve by a factor of about 5 compared to standard ΔN_{eff} limits, while bounds on couplings involving the tau lepton improve by several orders of magnitude. Crucially, for LFV tau couplings, our bounds surpass recent Belle-II limits on $\tau \rightarrow \ell a$ decays for m_a

*trsim*0.3 eV. We also apply approximate Ly- α forest constraints, extending the exclusion reach up to 10^8 GeV (LFC) and 10^9 GeV (LFV) for masses approaching 1 keV. Applied to the QCD axion, our analysis excludes parameter space with m_a

*trsim*2 eV for $C_\tau = 1$, otherwise allowed by ΔN_{eff} alone. Based on arXiv:2511.14864.

Other topic / keywords:

Author: GOMUŁKA, Adam (University of Warsaw, Faculty of Physics)

Co-authors: Dr BADZIAK, Marcin (University of Warsaw, Faculty of Physics); Dr LALETIN, Maxim (University of Warsaw, Faculty of Physics); SZAFRAŃSKI, Krzysztof (University of Warsaw, Faculty of Physics)

Presenter: GOMUŁKA, Adam (University of Warsaw, Faculty of Physics)

Track Classification: Dark Matter; Cosmic Microwave Background; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **GOMUŁKA, Adam** <gomulka.adam@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 298

Field-Level Baryonic Halo Painting for Weak Lensing

Content

Baryonic feedback is one of the leading systematic uncertainties for upcoming Stage IV weak lensing surveys such as LSST, Euclid, and Roman. Standard baryon correction models offer a fast fix, but they are spherically symmetric by construction —missing the correlated, non-spherical structure of real baryonic fields and the galaxy shapes that drive intrinsic alignment signals.

I will present Baryonification and Intrinsic alignment with Neural Diffusion, BIND, a generative model that paints full field-level dark matter, gas, and stellar mass distributions onto dark matter-only halo patches, conditioned on 35 astrophysical and cosmological parameters from the CAMELS 50Mpc/h simulation suite. Because BIND learns directly from halos in hydrodynamical simulations, it generates non-spherical halo fields by construction and naturally captures morphological diversity across the galaxy population. I will show that the generated fields respond correctly to variations in feedback parameters at the field level, enabling rapid exploration of the parameter space and straightforward marginalization over baryonic physics within simulation-based inference frameworks. With bind, I will present the recovery of the matter power spectrum within statistical expectations, as well as accurate halo shapes and stellar distributions that match those of the true hydrodynamical simulations, thereby opening the way for applications to intrinsic alignment studies.

BIND opens a path toward fast, accurate baryonified field realizations with realistic galaxy morphologies, and I will discuss how it can serve as a flexible tool for WL inference in the precision cosmology era.

Other topic / keywords:

Weak lensing, Simulations, Baryonification

Author: LEE, Max (Columbia University)

Co-author: Dr GENEL, Shy (Center for Computational Astrophysics)

Presenter: LEE, Max (Columbia University)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (inpainting with shape information is important and relative. Could also fit in methods track since no results yet?)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0** (Methods or LSS, both fine, I think.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 2.0** (Another ML power-spectrum-only verification. I cannot accept all.)

Abstract rating 2

Submitted by **LEE, Max** <mel2260@columbia.edu> on **Thursday, 30 April 2026**

Abstract ID : 299

Tachyonic encore: A universal shift of inflationary observables

Content

We propose a generic, largely inflaton-potential-independent mechanism in which a light axion spectator, initialized near the hilltop of its potential, reshapes inflationary observables through purely gravitational multi-field dynamics. During inflation the axion is frozen and the background follows an effectively single-field trajectory. After inflation ends the axion rolls, inducing a turn in field space and transient tachyonic phases of the isocurvature mode. The resulting “tachyonic encore” occurs entirely on super-horizon scales. These phases generate a nearly scale-invariant enhancement of the curvature power spectrum, suppressing the tensor-to-scalar ratio and shifting the scalar tilt to a weighted combination of adiabatic and entropic tilts at horizon crossing. We show that these effects can reconcile otherwise disfavored inflaton potentials with current CMB constraints. The same dynamics predict a nearly scale-invariant local non-Gaussianity, $f_{\text{NL}}^{\text{local}} \sim \mathcal{O}(1)$, within reach of upcoming surveys, and can arise without significant tuning in the axiverse context.

Other topic / keywords:

Authors: DIMASTROGIOVANNI, Emanuela (University of Groningen); Dr FASIELLO, Matteo (Istituto de Fisica Teorica UAM/CSIC); GONZALEZ QUAGLIA, Rodrigo (University of Groningen); Dr PUTTI, Margherita (University of Groningen); ROEST, Diederik (University of Groningen); SEVERINO GORGULHO, Diogo (University of Groningen)

Presenter: SEVERINO GORGULHO, Diogo (University of Groningen)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Mixed: Mark as duplicate

Reviews:

CESPEDES, Sebastian: **Mark as duplicate • 3.0**

Abstract rating 3

Submitted by **SEVERINO GORGULHO, Diogo** <d.severino.gorgulho@rug.nl> on **Thursday, 30 April 2026**

Abstract ID : 300

Cosmology from UNIONS Weak Lensing

Content

The Ultraviolet Near-Infrared Optical Northern Survey (UNIONS) is a 5-band ugriz imaging survey that will cover over 6000 square degrees of the northern sky, observed from telescopes in Hawaii. The imaging depth is similar to the Dark Energy Survey, but the sky coverage will ultimately be larger. Moreover, the northern sky has considerable overlap with redshift surveys such as the SDSS surveys and DESI. A key application of these data is measurement of the cosmological parameters from weak gravitational lensing. I will present the first cosmological results from 3500 square degrees of weak lensing data and discuss prospects for future data releases.

Other topic / keywords:

Author: HUDSON, Mike (Waterloo Centre for Astrophysics)

Presenter: HUDSON, Mike (Waterloo Centre for Astrophysics)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Highly relevant stage 3.5 survey that needs more attention!

I am biased as I am part of this team and the work presented here.)

Abstract rating 5

KUIJKEN, Koen: **Accept • 5.0** (New results!)

Abstract rating 5

Submitted by **HUDSON, Mike** <mike.hudson@uwaterloo.ca> on **Thursday, 30 April 2026**

Abstract ID : 301

Tachyonic encore: A universal shift of inflationary observables

Content

We propose a generic, largely inflaton-potential-independent mechanism in which a light axion spectator, initialized near the hilltop of its potential, reshapes inflationary observables through purely gravitational multi-field dynamics. During inflation the axion is frozen and the background follows an effectively single-field trajectory. After inflation ends the axion rolls, inducing a turn in field space and transient tachyonic phases of the isocurvature mode. The resulting “tachyonic encore” occurs entirely on super-horizon scales. These phases generate a nearly scale-invariant enhancement of the curvature power spectrum, suppressing the tensor-to-scalar ratio and shifting the scalar tilt to a weighted combination of adiabatic and entropic tilts at horizon crossing. We show that these effects can reconcile otherwise disfavored inflaton potentials with current CMB constraints. The same dynamics predict a nearly scale-invariant local non-Gaussianity, $f_{\text{NL}}^{\text{local}} \sim \mathcal{O}(1)$, within reach of upcoming surveys, and can arise without significant tuning in the axiverse context.

Other topic / keywords:

Authors: DIMASTROGIOVANNI, Emanuela (University of Groningen); FASIELLO, Matteo (Istituto de Fisica Teorica UAM/CSIC); GONZALEZ QUAGLIA, Rodrigo (University of Groningen); PUTTI, Margherita (University of Groningen); ROEST, Diederik (University of Groningen); SEVERINO GORGULHO, Diogo (University of Groningen)

Presenter: SEVERINO GORGULHO, Diogo (University of Groningen)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Poster

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept • 4.0**

Abstract rating 4

Early Universe:

Judgments: Mixed: Mark as duplicate

Reviews:

VAN DE VIS, Jorinde: **Mark as duplicate • 3.0**

Abstract rating 3

Submitted by **SEVERINO GORGULHO, Diogo** <d.severino.gorgulho@rug.nl> on **Thursday, 30 April 2026**

Abstract ID : 302

Anchoring the Hubble Constant with Cosmic Distance Duality

Content

The Cosmic Distance Duality Relation (CDDR) is a fundamental geometric relation that connects the luminosity distance and the angular diameter distance at a given redshift. It holds in any metric theory of gravity with standard photon propagation and number conservation, and is therefore independent of any specific cosmological model. Since distance measurements form the basis of our understanding of the expansion history, CDDR provides a powerful and robust consistency test between different cosmological probes. In this work, combining the two distance probes - BAO and Type Ia Supernovae - we show that distance duality serves as an anchor bridging the early-late calibration by constraining a specific combination of $r_d - M_b$, in a model-independent fashion. We further demonstrate that, under the assumption of the CDDR, the joint SNIa and BAO analysis imposes stringent, model-independent constraints on the Hubble constant, effectively ruling out a broad class of late-time solutions to the Hubble tension.

Other topic / keywords:

Author: TIWARI, Yashi (Institute of Theoretical Physics, Chinese Academy of Sciences)

Co-authors: Mr UPADHYAY, Ujjwal (Indian Institute of Science); Prof. WANG, Shao-Jiang (Institute of Theoretical Physics, Chinese Academy of Sciences)

Presenter: TIWARI, Yashi (Institute of Theoretical Physics, Chinese Academy of Sciences)

Track Classification: Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Negative

Reviews:

SELLENTIN, Elena: **Reject** (I see no matching track?)

Abstract rating 0

Submitted by **TIWARI, Yashi** <tiwariyashi@itp.ac.cn> on **Thursday, 30 April 2026**

Abstract ID : 303

Unbiased Bayesian Inference of Peculiar Motions of Galaxies from Type Ia Supernovae Observations

Content

The peculiar motions of galaxies are powerful cosmological probes that trace the growth of structures and the distribution of matter in the universe, providing a means to investigate the nature of dark energy and test gravity on cosmological scales. However, their direct observation is extremely challenging, as it requires independent and precise distance measurements to galaxies. We present a Bayesian approach to estimate the radial component of peculiar velocities of galaxies hosting Type Ia supernovae (SNe Ia), relying solely on the background cosmological model and the precision of the SNe Ia data. Unlike other peculiar velocity estimators based on Hubble residuals, our method does not assume local linearity of the magnitude-redshift relation or a fixed cosmology, making it unbiased even for large peculiar velocities and self-consistently avoiding bias due to a wrong cosmology. We validate our method using simulated supernova data with the precision of current and upcoming surveys, and further compare it with the linearized estimator to test its efficacy. We show that our estimator has lower bias than the standard estimator and remains consistent even for larger values of v_p/cz . We also present a Bayesian derivation for the linearized estimator generalized to include the supernova magnitude covariance.

Other topic / keywords:

Author: UPADHYAY, Ujjwal

Co-authors: Dr SAINI, Tarun Deep (Indian Institute of Science, Bangalore); Prof. SETHI, Shiv (Raman Research Institute, Bangalore)

Presenter: UPADHYAY, Ujjwal

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 3.0** (Interesting method, would be nice to see it applied. Consider also for Inference?)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 4.0** (Not sure this is applied to data!? Maybe better suited for the methods session.)

Abstract rating 4

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 2.0** (Self-consistent by construction, hence not research ready.)

Abstract rating 2

Submitted by **UPADHYAY, Ujjwal** <ujjwalu@iisc.ac.in> on **Thursday, 30 April 2026**

Abstract ID : 304

Non-local inverse energy transfer in primordial magnetic field evolution

Content

Magnetic fields in cosmic voids could be of primordial origin, generated by early universe phase-transitions. During their turbulent decay, primordial magnetic fields (PMFs) might undergo inverse energy transfer, increasing their correlation length over time. Understanding this process is crucial for constraining PMFs, yet its physical mechanism is still debated, particularly in systems where magnetic helicity is zero on average.

We study how energy is transferred across different scales in the magnetic and velocity fields by measuring shell-to-shell energy transfer functions from numerical simulations of decaying helical and non-helical magnetohydrodynamic turbulence.

Independent of magnetic net-helicity, growth of large magnetic scales is predominantly sourced by integral-scale structures in the magnetic and kinetic reservoir, leading to partially non-local inverse transfer. In the case of vanishing net-helicity, transfer functions between the positively helical and negatively helical parts of the field are computed. We find that inverse transfer is helicity-segregated: energy flows to large scales only within each helical sector, not across them.

These findings are consistent with the theory underlying the conservation of the Hosking integral which is thought to control the decay of magnetic fields in the case of vanishing net-helicity. Beyond power-spectra and global quantities, helicity-decomposed shell-to-shell energy transfer functions provide a more detailed diagnostic for the evolution of PMFs and their interaction with the primordial plasma.

Other topic / keywords:

Author: KASSELMANN, Lenard (Hamburg Observatory, University of Hamburg)

Co-authors: Prof. BANERJEE, Robi (Hamburg Observatory, University of Hamburg); Prof. BRÜGGEN, Marcus (Hamburg Observatory, University of Hamburg); Dr GRETE, Philipp (Hamburg Observatory, University of Hamburg); Dr TRIVEDI, Pranjali (Hamburg Observatory, University of Hamburg)

Presenter: KASSELMANN, Lenard (Hamburg Observatory, University of Hamburg)

Track Classification: Primordial Magnetic Fields

Contribution Type: Talk

Comments:

In case a talk cannot be arranged, I would also be happy to present our work as a poster.

Status: SUBMITTED

Track Reviews:**Primordial Magnetic Fields:****Judgments:** Positive: Talk**Reviews:**IARYGINA, Oksana: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **KASSELMANN, Lenard** <lenard.kasselmann@uni-hamburg.de> on **Thursday, 30 April 2026**

Abstract ID : 305

Excited states of wave dark matter halos after a sudden disturbance

Content

We present an analysis of the nonequilibrium dynamics of a broad family of excited states of the Schrodinger Poisson equations. An initial spherically symmetric, groundstate soliton is stretched or squeezed and is let to freely evolve, thereby forming the soliton halo system. We investigate the mechanism of virialisation, including the observed scalar field bursts¹ and their connection to the soliton breathing mode. The family of excitations studied samples particularly well the region of core-halo mass relations in which the soliton mass is much larger than the halo mass.

1F. Siddhartha Guzmán and L. Arturo Ureña-López,ApJ 645 814,2006

Other topic / keywords:

scalar field dark matter

Authors: JOSHI, Tejas (Institute of Physics, Polish Academy of Sciences); Prof. DEUAR, Piotr (Institute of Physics, Polish Academy of Sciences)

Presenter: JOSHI, Tejas (Institute of Physics, Polish Academy of Sciences)

Track Classification: Dark Matter; Others (Please specify below)

Contribution Type: Poster

Status: SUBMITTED

Submitted by **JOSHI, Tejas** <tejas.d.joshi96@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 306

KiDS Legacy cosmic shear analysis with the KiDS MetaCalibration pipeline

Content

We developed a new shear measurement pipeline in the Kilo-Degree Survey (KiDS) collaboration, MetaCalibration, which is robust as it is less sensitive to the morphology of observed galaxies. In the KiDS-1000 cosmic shear analysis, the MetaCalibration pipeline increased 28 percent constraining power on the cosmological parameter (S_8) compared to the fiducial pipeline, lensfit, because of the higher source number density. With the success of the new pipeline, we continue our cosmic shear analysis with the final release of Legacy data from KiDS. As the KiDS Legacy cosmic shear analysis using the lensfit catalog claims no tension with the Planck constraint, checking the result with an independent shear catalog is valuable. In this analysis with MetaCalibration, we further optimize star selection, photo-z calibration, and the image stacking process with updated astrometry.

Other topic / keywords:

Author: YOON, Mijin (Leiden Observatory)

Co-author: HOEKSTRA, Henk (Leiden University)

Presenter: YOON, Mijin (Leiden Observatory)

Track Classification: Large-Scale Structure; Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Important addition/cross-check of the latest KiDS cosmic shear analysis.

I am biased as I am one of the KiDS weak lensing coordinators.)

Abstract rating 5

KUIJKEN, Koen: **Accept • 5.0** (New results, local speaker. (I am biased though but objectively KiDS results are highly relevant))

Abstract rating 5

Submitted by **YOON, Mijin** <myoon@strw.leidenuniv.nl> on **Thursday, 30 April 2026**

Abstract ID : 307

How Galaxy Formation Physics Impacts Primordial Non-Gaussianity Constraints in DESI

Content

Primordial non-Gaussianities (PNG), parameterized by the amplitude f_{NL} , provide a direct window into the physics of the early Universe and a means to discriminate among inflationary models. Constraints on f_{NL} from the cosmic microwave background are limited by cosmic variance, making large-scale structure surveys such as DESI a promising avenue for further progress. A central challenge is that the PNG signal is degenerate with the galaxy bias parameter $b\phi$, which quantifies the response of galaxy clustering to PNG. Therefore, tight priors on $b\phi$ are required to break this degeneracy.

In this work, we present estimates of priors on $b\phi$ for the second DESI data release using semi-analytical models of galaxy formation (SAMs). We construct galaxy samples with a range of properties and use these to select DESI-like samples of luminous red galaxies (LRGs), emission-line galaxies (ELGs), and quasars (QSOs). We perform our analysis using two independent semi-analytical models, SHARK and GALFORM, as well as two independent methodologies to estimate $b\phi$. We find good agreement between the methodologies.

However, we find that the predicted values of $b\phi$ depend sensitively on the underlying galaxy physics implemented in the semi-analytical models.

Other topic / keywords:

Author: DE ICAZA, Miguel (Universidad Autónoma de Madrid)

Presenter: DE ICAZA, Miguel (Universidad Autónoma de Madrid)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Highly relevant work on PNG. The conclusion (last sentence) sounds somewhat discouraging but honest.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 4.0** (DESI results on primordial nonGaussianities, important work)

Abstract rating 4

Submitted by **DE ICAZA, Miguel** <miguelicazali@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 308

Integrated effects in Large Scale Structure

Content

Measuring primordial non-Gaussianity (PNG) is one of the goals of current and future galaxy surveys. Since general relativistic effects are degenerate with any signal measured from PNG, a fully relativistic, non-Newtonian approach is required. In previous studies, integrated line-of-sight effects, such as lensing convergence, Shapiro time delay and integrated Sachs-Wolfe, have largely been ignored in power spectrum analysis.

In this talk, I will show that it is important to consider integrated effects to model the power spectrum accurately. In current galaxy surveys, such as Euclid, we show that by neglecting these contributions in our power spectrum analyses, we bias our PNG measurements on the order of 3σ . This effect becomes increasingly important at higher redshift and for future galaxy surveys like MegaMapper, making it crucial to include integrated effects in current and future power spectrum analyses.

Other topic / keywords:

Author: ADDIS, Chris (Queen Mary University of London)

Co-authors: CAMERA, Stefano (Università degli Studi di Torino); CLARKSON, Chris (Queen Mary University of London); GUEDEZOUNME, Secloka L. (University of Western Cape); HAMMOND, Jessie (Queen Mary, University of London); JOLICOEUR, Sheean (VIT Mauritius); MAARTENS, Roy (University of Western Cape); MONTANO, Federico (Università degli Studi di Torino)

Presenter: HAMMOND, Jessie (Queen Mary, University of London)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Important theoretical work that is needed to constrain PNG. Should get attention!)

Abstract rating 5

KUIJKEN, Koen: **Accept • 4.0** (comprehensive approach it seems. makes link to data constraints.)

Abstract rating 4

Submitted by **HAMMOND, Jessie** <j.r.hammond@qmul.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 309

Bohmian Trajectories and Complex Thermodynamics of Quarkonium Oscillator in Conic Gravitational Space-Time

Content

The study elucidates the quantum trajectories of the relativistic Quarkonium oscillator in conic gravitational field. First, the Klein-Gordon (KG) equation is solved with respect to the constrained metric, and the quantum dynamics are discussed around the asymptotic regimes. Afterwards, the energy spectrum is found for the examination of the bound states and scattering cases. Secondly, the Bohmian trajectories are investigated with respect to the quantum Hamilton Jacobi equation (QHJE) in de Broglie-Bohm (dBB) perspective to investigate the interaction of the Quarkonium oscillator with the space-time background via the resonances and phase of the quantum trajectories. Finally, the thermodynamic evolution of the system with respect to time is discussed by the complex partition function. Consequently, it is inferred that, in the extreme space-time environments the dynamics of the Quarkonium confinement lies in the well-defined quantum trajectories through the complex domains, and leads to the apprehensible observables via the quantum phase transitions.

Other topic / keywords:

Quantum Gravity and Complex Quantum Trajectories; Klein-Gordon Oscillator and Cornell Potential, Complex Thermodynamics and Quasinormal Modes, Heun Functions

Author: KARADOĞAN, Alptuğ (Akdeniz University)

Presenter: KARADOĞAN, Alptuğ (Akdeniz University)

Track Classification: Dark Matter; Early Universe; Gravitational Waves; Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Mixed: Accept, Reject

Reviews:

GAROFFOLO, Alice: **Accept • 1.0**

Abstract rating 1

MALHOTRA, Ameet: **Reject • 1.0**

Abstract rating 1

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 1.0** (Grade refers to inference track.)

Abstract rating 1

Submitted by **KARADOĞAN, Alptuğ** <alpertuburcu@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 310

FOSSIL: A future mission for CMB spectral distortion measurements

Content

The only precise measurement of the cosmic microwave background (CMB) spectrum to date was achieved by COBE-FIRAS in the early 1990s, demonstrating that the CMB spectrum is extraordinarily close to a perfect blackbody emission. However, both standard and non-standard physical processes are expected to generate small deviations from this spectrum, known as CMB spectral distortions. These distortions provide a unique and largely unexplored probe of the thermal history of the Universe, offering complementary insights into early-Universe physics, particle interactions, and structure formation.

The measurement of CMB spectral distortions has therefore become a major objective for future cosmology missions and is now recognised as one of the key scientific goals of the ESA Voyage 2050 programme. After a brief overview of the scientific motivations and observational challenges of spectral distortion measurements, I will present a current experimental effort aiming at flying the ESA M8 candidate mission FOSSIL.

Other topic / keywords:

Authors: AGHANIM, Nabila (CNRS - Institut d'Astrophysique Spatiale); COULON, Xavier (IAS-CNRS)

Presenter: COULON, Xavier (IAS-CNRS)

Track Classification: Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Submitted by **COULON, Xavier** <xavier.coulon@universite-paris-saclay.fr> on **Thursday, 30 April 2026**

Abstract ID : 311

From Few Simulations to Trustworthy Posteriors: Scattering-Covariance Latent Spaces for Simulation Augmentation and Interpretable SBI in CMB and Weak-Lensing Cosmology

Content

Modern CMB and large-scale-structure analyses face some of the same statistical bottleneck: the data are high-dimensional, non-Gaussian, affected by complex systematics, and often have intractable likelihoods, while the end-to-end simulations needed for Monte Carlo validation or Simulation-Based Inference are prohibitively expensive. I will present a unified framework based on the Scattering Covariance: an interpretable, physics-informed analogue of a convolutional neural network, built from fixed oriented wavelets, nonlinearities, and cross-scale/cross-channel covariance statistics.

In recent work (Campeti et al., *A&A*, 2025), we used this representation to construct a fast map-level generative emulator for CMB instrumental systematics simulations. Even when trained on as few as ten high-fidelity simulations, the emulator generates statistically independent approximate realizations that reproduce power spectra, scattering statistics, Minkowski functionals, and pixel-covariance structure, enabling orders-of-magnitude simulation augmentation at negligible cost compared with full end-to-end campaigns.

I will then describe how the same scattering-covariance latent space can be used for transparent SBI pipelines: for CMB polarization, to infer parameters such as the optical depth to reionization and the tensor-to-scalar ratio while controlling non-stationary foreground and instrumental residuals; and for weak-lensing cosmology, to emulate high-resolution non-Gaussian convergence maps and infer parameters such as Ω_m and σ_8 beyond two-point statistics. The goal is a simulation-efficient, interpretable alternative to “black-box” neural inference: using a few expensive simulations as anchors for large, calibrated, statistically-controlled inference pipelines.

Other topic / keywords:

Weak Lensing, Simulation-Based Inference

Author: Dr CAMPETI, Paolo (Istituto Nazionale di Fisica Nucleare)

Co-authors: Prof. ALLYS, Erwan (Laboratoire de Physique de l'Ecole Normale Supérieure, ENS); Dr DELOUIS, Jean-Marc (Laboratoire d'Océanographie Physique et Spatiale (LOPS), Univ. Brest, CNRS, Ifremer); Dr GERBINO, Martina (Istituto Nazionale di Fisica Nucleare); Dr LATTANZI, Massimiliano (Istituto Nazionale di Fisica Nucleare); Prof. PAGANO, Luca (INFN, University of Ferrara)

Presenter: Dr CAMPETI, Paolo (Istituto Nazionale di Fisica Nucleare)

Track Classification: Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 2.0** (Abstract not clear.)

Abstract rating 2

Submitted by **CAMPETI, Paolo** <paolo.camp91@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 312

Testing the equivalence principle in galaxy surveys: a matter of time and two fluids

Content

Does dark matter experience gravity in the same way as ordinary matter? By throwing different objects from the Pisa tower, Galileo showed that they were all subject to the same acceleration, hence providing a demonstration of the so-called weak equivalence principle. However, the validity of this principle for dark matter remains a key open question, which is rarely addressed in cosmological analyses. In my talk, I will present two complementary approaches to answer this question in galaxy surveys. The first one relies on gravitational redshift, a consequence of the distortion of time in a gravitational potential, while the second one is based on a two-fluid description of ordinary and dark matter. I will show that these methods provide crucial information to constrain deviations from the equivalence principle and to distinguish between gravity modifications and non-standard dark matter scenarios. Hence, repeating Galileo's experiment across the Universe might literally be a matter of time and two fluids.

Other topic / keywords:

Author: CASTELLO, Sveva (Max Planck Institute for Astrophysics)

Presenter: CASTELLO, Sveva (Max Planck Institute for Astrophysics)

Track Classification: Large-Scale Structure; Dark Matter; Dark Energy / Modified Gravity

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Interesting abstract that seems to go beyond the state of the art.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 4.0** (interesting)

Abstract rating 4

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 4.0**

Abstract rating 4

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **CASTELLO, Sveva** <svevacas@mpa-garching.mpg.de> on **Thursday, 30 April 2026**

Abstract ID : 313

UV artefacts in ultra-slow-roll models of inflation

Content

Within single-field inflation, primordial black hole and scalar-induced gravitational wave production from enhanced primordial perturbations typically requires a transient non-attractor phase, such as ultra-slow roll. We investigate the physical consistency of modelling such scenarios through analytical Hubble-flow parametrisation. By reconstructing the underlying scalar field potential, we show that even smooth transitions in the slow-roll parameters can hide sharp, localized features in higher-order derivatives at the transition from ultra-slow-roll to slow-roll. These are typically not found in analytic potentials. To evaluate the impact of these structures, we implement a UV-filtering procedure based on discrete Fourier transform to systematically suppress high frequency modes in field space to both classes of models. We find that the filter effectively removes sharp features in Hubble-flow-derived potentials, while prototypical analytical potentials remain largely unaffected. As a consequence, we show that UV-filtered models typically preserve Wands duality invariance. Beyond linear perturbation theory, the introduction of spurious UV effects might affect other observables, such as non-Gaussianity and loop contributions. Our results thereby question the soundness of Hubble-flow parametrisation for modelling inflationary models with a transient non-attractor phase.

Other topic / keywords:

Primordial black holes, Ultra-slow-roll

Author: BARNERT, Gerald

Co-authors: ASSADULLAHI, Hooshyar; IACCONI, Laura; KOYAMA, Kazuya; WANDS, David

Presenter: BARNERT, Gerald

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Comments:

Work is in the final stages of writing, with arXiv submission planned for next month.

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept • 3.0**

Abstract rating 3

Submitted by **BARNERT, Gerald** <gerald_barnert@hotmail.com > on **Thursday, 30 April 2026**

Abstract ID : 314

Searching for cosmic topology with large-scale structure data

Content

Cosmic topology remains one of the last frontiers of modern Cosmology. Recent theoretical developments, together with the rapidly growing volume and precision of cosmological data, now make it possible to probe the global shape of the Universe with greater sensitivity. While current and future cosmic microwave background (CMB) observations continue to provide powerful tests of topology, I will demonstrate that large-scale structure surveys offer an even more promising route.

In this talk, I will introduce the theoretical basis for cosmic topology searches and explain why three-dimensional tracers of structure will outperform two-dimensional CMB surveys. I will quantify the expected improvement from large-scale structure data, discuss the practical challenges involved in extracting topological signatures, and outline a pathway toward applying these methods to upcoming surveys.

Other topic / keywords:

Cosmic Topology

Author: MIHAYLOV, Deyan (Case Western Reserve University)

Presenter: MIHAYLOV, Deyan (Case Western Reserve University)

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Exciting work that should definitely be presented. Abstract strikes the right balance between big picture and concrete application.)

Abstract rating 5

KUIJKEN, Koen: **Accept: Talk • 4.0** (Suitable for an 'other' track? Are there more of these topoligy talks submitted?)

Abstract rating 4

Submitted by **MIHAYLOV, Deyan** <deyan.mihaylov@phys.uni-sofia.bg> on **Thursday, 30 April 2026**

Abstract ID : 315

Automated Detection of Stars Clusters Using Unsupervised Learning on Gaia DR3

Content

The discovery and characterization of star clusters are essential for studying the assembly history and dynamic evolution of the Milky Way. However traditional density-based clustering techniques (like DBSCAN and HDBSCAN) have trouble due to the high variability in stellar densities and the tremendous amount of high-dimensional noise within the Gaia Data Release 3 (DR3) catalogue.

To address these issues, we propose an automatic and unsupervised learning framework for discovering and validating star clusters independent of human intervention. This framework uses density-adaptive representation learning, which allows us to dynamically adjust our representation as opposed to using fixed heuristic parameters in order to learn about latent spatial and kinematic relationships throughout 5D astrometric (α , δ , ϖ , μ_α , μ_δ) and photometric space.

By applying a deep embedding architecture to the stellar distributions, we create a feature-rich manifold that, as a result, enables both the identification of compact open clusters as well as previously unrecognized diffuse stellar associations that exist along the galactic plane.

Initial results demonstrate that this approach significantly minimizes human bias while maintaining high scalability for massive datasets. The proposed framework provides a robust, generalizable AI pipeline capable of accelerating Galactic surveying and refining our census of the Milky Way's building blocks in anticipation of future Gaia data releases.

Other topic / keywords:

Stellar Clusters

Author: Mr V M, RAKSHAN (RAKSHAN EARTH AND SPACE TECH)

Co-author: Ms KENDRE, Prutha

Presenters: Mr V M, RAKSHAN (RAKSHAN EARTH AND SPACE TECH); Ms KENDRE, Prutha

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Comments:

I would prefer oral presentation, if it was not available I would be happy with poster presentation.

Status: SUBMITTED

Track Reviews:**Large-Scale Structure:****Judgments:** Negative**Reviews:**

KUIJKEN, Koen: **Reject • 1.0** (Off topic. Perhaps allow as a poster? But no good connection to COSMO)

Abstract rating 1

HILDEBRANDT, Hendrik: **Reject** (Not really a cosmology abstract. Certainly not LSS.)

Abstract rating 0

Methods / Statistical Inference / Machine Learning:**Judgments:** Negative**Reviews:**

SELLENTIN, Elena: **Reject** (Not cosmology.)

Abstract rating 0

Submitted by **V M, RAKSHAN** <rakshaneearthandspace-tech@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 316

The Canadian Galactic Emission Mapper (CGEM): Overview and Early Observations

Content

Gravitational waves from inflation may have left a detectable signature in the parity-odd, “B-mode” component of the polarization of the Cosmic Microwave Background (CMB). Detecting B-modes in the CMB would be “smoking gun” evidence for inflation and would probe some of the highest-energy physics in the known universe. However, current experiments have placed stringent upper limits on B-modes. If B-modes are present in the CMB, the signal is extremely faint and is dominated by polarized Galactic foregrounds at all frequencies. It is therefore essential to map polarized foregrounds with high precision to enable a detection of CMB B-modes. The Canadian Galactic Emission Mapper (CGEM) is a new 4m single-dish radio telescope at the Dominion Radio Astrophysical Observatory that is mapping polarized Galactic synchrotron emission from 8-10GHz over the Northern sky, with a planned counterpart in the Southern hemisphere. CGEM will greatly improve models of polarized CMB foregrounds and will hence be an important aid to current and future B-mode experiments. In this talk, I’ll give an overview of CGEM. I’ll then describe how we designed this purpose-built instrument to measure the sky with minimal polarization systematics, highlighting in particular the polarization purity of the optical design. I’ll also showcase early observations from a pathfinder version of CGEM, deployed in February 2025, which has been mapping the sky since. These data already show immense promise for future science with CGEM.

Other topic / keywords:

New Experiments, Instrumentation, Polarized CMB Foregrounds

Author: MACEACHERN, Joshua (National Research Council of Canada)

Co-authors: VEIDT, Bruce (National Research Council of Canada); Prof. BENNETT, Charles (Johns Hopkins University); Dr WOLLACK, Ed (NASA Goddard Space Flight Centre); Prof. HINSHAW, Gary (University of British Columbia); LACY, Gordon (National Research Council of Canada); BERG, Guinevere (University of British Columbia); Dr WEILAND, Janet (Johns Hopkins University); AMIRI, Mandana (University of British Columbia); Prof. HALPERN, Mark (University of British Columbia); VILLALBA GONZÁLEZ, Pedro (University of British Columbia); Dr RENNIE, Thomas (University of British Columbia); Dr LANDECKER, Tom (National Research Council of Canada); ZAREI, Parham (University of British Columbia)

Presenter: MACEACHERN, Joshua (National Research Council of Canada)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:**Inflation / Primordial Perturbations:****Judgments:** Positive**Reviews:**CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

Submitted by **MACEACHERN, Joshua** <maceachern@phas.ubc.ca> on **Thursday, 30 April 2026**

Abstract ID : 317

Gauge Fields and Their Uses During Inflation

Content

I will discuss the role of gauge fields during inflation, with particular emphasis on scenarios where they are coupled to an axion-like inflaton. Such couplings can lead to rich dynamics with observable consequences, including the production of chiral primordial gravitational waves and primordial black holes. In addition, gauge fields can play an important role in reheating and provide a source of primordial magnetic fields, offering potential links between inflationary physics and present-day astrophysical observations.

Other topic / keywords:

Author: Prof. FASIELLO, Matteo (IFT Madrid)

Presenter: Prof. FASIELLO, Matteo (IFT Madrid)

Track Classification: Primordial Magnetic Fields; Inflation / Primordial Perturbations; Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (Better in early universe/inflation track)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 4.0** (More suited to inflation track)

Abstract rating 4

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 5.0**

Abstract rating 5

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **Dr FASIELLO, Matteo** <matteorf@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 318

The Lyman-alpha Forest constraints on primordial black holes as dark matter candidates

Content

Primordial black holes (PBHs) remain a viable candidate for Dark matter. The goal of this work is to constrain their parameter space with a new fundamental probe, the Lyman-alpha forest, which depends on two parameters, the reionization history and thermal history of the universe. We adopt extended mass functions for the PBH mass distribution. To implement the effect of PBHs in cosmological simulations we enhance the small-scale power spectrum in the initial conditions to reproduce the expected effect of the discreteness of mass on massive PBHs and the alternative models of inflation that produce them. These models are run using a quick Lyman-alpha version of the SWIFT code and compared to DESI data. To avoid numerical artifacts, we ran several fiducial models and computed the ratio between the PBH and CDM predictions, and between CDM and observations.

Other topic / keywords:

Primordial Black Holes

Author: COLAZO, Patricio (IATE)

Co-authors: Ms MARINICHENKO, Maria (Leiden University); Dr PADILLA, Nelson (IATE); Dr SCHALLER, Matthieu (Leiden University); Dr STASYSZYN, Federico (IATE)

Presenter: COLAZO, Patricio (IATE)

Track Classification: Dark Matter; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Submitted by COLAZO, Patricio <patricio.colazo@unc.edu.ar> on **Thursday, 30 April 2026**

Abstract ID : 319

Euclid Q1, Spitzer and ACT view on Planck galaxy protocluster candidates

Content

As the largest and most massive gravitationally bound structures in the Universe, galaxy clusters stands at the crossroads between astrophysics and cosmology. Before they reach dynamical equilibrium, collapse and matter accretion from the cosmic web dictate their internal dynamics. Such objects are called protoclusters and are usually detected at $1.5 < z < 8$, way earlier than galaxy clusters themselves. This redshift range includes the Cosmic Noon, the star formation peak in the Universe in which protoclusters play a central role. Moreover, these structures are impacted by the values of cosmological parameters such as σ_8 and H_0 , hence our motivation to understand them better.

Gas inside protoclusters have not been heated by gravitational collapse yet, which makes its Sunyaev Zeldovich and X-ray signal too faint for current telescopes. Therefore, their detection is based upon the search for galaxy overdensities at high redshift. I will present how I worked with data from Euclid Q1 combined with Spitzer to identify several solid protoclusters candidates using this method. I will also talk about how I detected their total mass for the first time using CMB lensing maps from the Atacama Cosmology Telescope.

Other topic / keywords:

Galaxy protoclusters – Galaxy clusters

Author: DUSSEYRE, Tanguy (Institut d'Astrophysique Spatiale, Université Paris-Saclay)

Presenter: DUSSEYRE, Tanguy (Institut d'Astrophysique Spatiale, Université Paris-Saclay)

Track Classification: Large-Scale Structure; Cosmic Microwave Background

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Interesting stuff working with new data and pushing into a new regime.)

Abstract rating 4

KUIJKEN, Koen: **Accept: Talk • 4.0** (Nice euclid results! CMB session?)

Abstract rating 4

Submitted by **DUSSERRE, Tanguy** <tanguy.dusserre@universite-paris-saclay.fr> on **Thursday, 30 April 2026**

Abstract ID : 320

Can a JWST-driven reionisation history be consistent with Planck's optical depth and DESI's total neutrinos mass constraints at once?

Content

In this talk we will look at a modification to the standard reionisation history through the lens of a model for the optical depth (τ) that is motivated by the recent results by JWST, which find sources of ionising photons at redshifts larger than ever observed before. By using this JWST-driven model, which allows for a “bumpy” reionisation history that pushes τ to higher values as opposed to CMB measurements, we will test whether one can restore consistency between the constraints on τ found by Planck and JWST. In addition, by taking advantage of the direct correlation between the optical depth and the total neutrinos mass (Σm_ν), we will test whether the constraints on Σm_ν found by DESI can be relaxed to be once again consistent with the results.

Other topic / keywords:

Author: SPECOGNA, Enrico (University of Sheffield)

Presenter: SPECOGNA, Enrico (University of Sheffield)

Track Classification: Cosmic Microwave Background; Early Universe; Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive: Talk

Reviews:

GERBINO, Martina: **Accept: Talk • 3.0** (We can accommodate it as a talk, if there are further slots)

Abstract rating 3

Submitted by **SPECOGNA, Enrico** <especogna1@sheffield.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 321

Modified gravity & friends vs current CMB data.

Content

In this talk we will look for evidence of the effects induced by seemingly different extensions to the standard cosmological model in the cosmic microwave background (CMB) primary and secondary anisotropies measured by the latest ACT, SPT and Planck releases: modified gravity (through the growth index - ' γ ', a modification of the growth of linear perturbations in the standard model, and the ' $\mu - \Sigma$ ' framework, a modification of the Poisson and lensing perturbation equations), massive neutrinos and non-vanishing spatial curvature. By looking at their correlations and the differences in the impact they have on cosmological observables, such as the CMB lensing spectrum, we assess whether such additions can be told apart and identify the common root to their detection: the lensing anomaly.

Other topic / keywords:

Author: SPECOGNA, Enrico (University of Sheffield)

Presenter: SPECOGNA, Enrico (University of Sheffield)

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Dark Energy / Modified Gravity; Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 3.0** (Sounds like all of this has been covered in great detail before. Nothing wrong with the abstract, just wondering how relevant this is.)

Abstract rating 3

KUIJKEN, Koen: **Accept • 2.0** (more appropriate for CMB. Is this new?)

Abstract rating 2

Dark Energy / Modified Gravity:

Judgments: Positive: Poster

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Poster • 2.0** (Might also fit the CMB track)

Abstract rating 2

GLAVAN, Dražen: **Accept: Poster • 1.0** (This submission is better suited for CMB)

Abstract rating 1

Neutrinos:

Judgments: Positive

Reviews:

GERBINO, Martina: **Accept • 2.0** (We believe this abstract fits better in the CMB or Modified gravity tracks; the score reflects this comment rather than the abstract content. If assigned to Neutrinos, we would accept it as a poster)

Abstract rating 2

Submitted by **SPECOGNA, Enrico** <especogna1@sheffield.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 322

A Disformal Affair: How Dark Matter Mimics Lorentz Violation

Content

We study the effects of general disformal metric transformations on fermionic fields, showing that the Dirac action acquires additional kinetic and axial-current couplings. When the sourcing field takes a nontrivial background value, apparent Lorentz-violating effects arise, which we classify within an effective field theory. For scalar and vector ultralight dark matter, precision tests of rotation and boost invariance place stringent constraints on the couplings. We further derive consistency conditions requiring the absence of ghost degrees of freedom, which for multi-scalar transformations demands a degenerate field-space metric, yielding consistent two-field modified gravity models.

Other topic / keywords:

Authors: Mr TSAMPODIMOS, Apostolos (FTMC); Dr KIRK, Fiona (LUH & PTB); Dr SHERRILL, Nathaniel (LUH); Dr DOMÉNECH FUERTES, Guillem (LUH & AEI); Dr GANZ, Alexander (LUH)

Presenter: Mr TSAMPODIMOS, Apostolos (FTMC)

Track Classification: Dark Matter; Dark Energy / Modified Gravity

Contribution Type: Talk

Comments:

If no talk slots are available, I would be happy to present a poster as well.

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **TSAMPODIMOS, Apostolos** <apostolos.tsampodimos@ftmc.lt> on **Thursday, 30 April 2026**

Abstract ID : 323

Magnetic monopole plasma oscillations and implications for TeV Blazars

Content

Magnetic monopoles arise in many beyond Standard Model scenarios, symmetrize Maxwell's equations, and explain the quantization of electric charge. It has been argued that, when placed in an astrophysical magnetic field, monopoles induce a magnetic version of plasma oscillations. In this work, we explore monopole-induced oscillations of the intergalactic magnetic field (IGMF). We show that monopole-induced oscillations of the magnetic field lead to collimation of electrically charged particle trajectories, reducing the usual deflection by the magnetic field. The collimation effect impacts the deflection angle in the electromagnetic cascades of TeV blazars and leads to a decrease in the angular size of blazar secondary GeV halos. Therefore, the constraints on the secondary halo angular size from combined H.E.S.S. and Fermi-LAT observations translate into bounds on the magnetic monopole abundance. The bounds on the magnetic monopole flux obtained in this work from blazar 1ES 0229+200, depending on the IGMF strength, can be as strong as F

$\lesssim 5 \times 10^{-23} \text{ cm}^{-2} \text{ s}^{-1} \text{ str}^{-1}$ for low-mass monopoles m

$\lesssim 10^6 \text{ GeV}$, stronger than existing laboratory and astrophysical bounds. The bound becomes subdominant to current constraints if the present-day IGMF value is stronger than B

$\gtrsim 10^{-12} \text{ G}$. At the same time, in the case of non-zero monopole abundance, the IGMF lower bound from TeV observations itself should be revised, resulting in a stronger lower bound at higher monopole number density.

Other topic / keywords:

Magnetic monopoles, intergalactic magnetic fields, TeV blazars

Authors: KHELASHVILI, Mariia (SISSA); KOBAYASHI, Takeshi; LONG, Andrew (Rice University)

Presenter: KHELASHVILI, Mariia (SISSA)

Track Classification: Primordial Magnetic Fields

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Primordial Magnetic Fields:

Judgments: Positive: Talk

Reviews:

IARYGINA, Oksana: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **KHELASHVILI, Mariia** <mkhelash@sissa.it> on **Thursday, 30 April 2026**

Abstract ID : 324

Probing high-redshift structure growth: forecasts and first insights from Euclid AGNs and CMB Lensing Cross-Correlations

Content

Measuring the growth of cosmic structure is a powerful test of the standard cosmological model. The Euclid mission is delivering an unprecedentedly deep sample of Active Galactic Nuclei (AGN), providing a unique large-scale structure tracer reaching far into the high-redshift universe. Here, we explore the cosmological potential of cross-correlating Euclid AGNs with CMB lensing (κ) maps from Planck, ACT, and SO. Using a mock catalog of millions of unobscured AGNs up to $z = 5$ (Bisigello et al., 2024), we model the $\kappa \times$ AGN signal to forecast constraints on the redshift evolution of structure growth ($\sigma_8(z)$), linear AGN bias, and primordial non-Gaussianity (f_{NL}). Building on this theoretical framework, we are actively adapting our pipelines to the newly acquired Euclid Q1 data. We will share early insights from these real observations, outlining our steps toward measuring the clustering properties of the first Euclid AGN sample.

Other topic / keywords:

Author: PERONACI, Matteo

Presenter: PERONACI, Matteo

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Early Universe; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

KUIJKEN, Koen: **Accept: Talk • 4.0** (preview of early euclid results? Good to include this in the programme)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0** (Interesting look at early Euclid data and their future prospects.)

Abstract rating 5

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 2.0** (Grade refers to inference track.)

Abstract rating 2

Submitted by **PERONACI, Matteo** <matteo.peronaci@uniroma1.it> on **Thursday, 30 April 2026**

Abstract ID : 325

Neutralino Dark Matter Relic Density in Finite SU(5) with Starobinsky Cosmology

Content

We study the relic abundance of the lightest neutralino in Finite Unified Theory FUTB, a fully finite N=1 supersymmetric SU(5) model whose all-orders vanishing beta functions uniquely fix the soft SUSY-breaking spectrum in terms of a single gaugino mass parameter M . We couple this theory to Starobinsky R^2 -inflationary cosmology and systematically examine whether the observed dark matter abundance $\Omega h^2 \approx 0.12$ can be reproduced within this minimal framework.

Three post-inflationary production mechanisms are analyzed: non-thermal gravitational production via scalaron oscillations (Arbuzova, Dolgov & Singh 2021), standard freeze-out during reheating, and early freeze-out in the pre-reheating epoch. In all cases, the model fails to reproduce the observed relic density. The two compounding sources of failure are identified: the bino-dominated nature of the FUTB LSP, which suppresses the annihilation cross section by $\sim 10^2$ relative to a wino or higgsino of equal mass, and the rigidity of the Starobinsky reheating parameters fixed by CMB normalization ($m_\phi \sim 3 \times 10^{13}$ GeV), which sets a dilution hierarchy insufficient to compensate the bino overabundance.

We conclude that the minimal FUTB + Starobinsky framework cannot account for the observed dark matter abundance across the full parameter space. Embedding FUTB into N=1 supergravity is identified as a promising direction to open new viable scenarios, and is discussed as the natural next step of this program.

Other topic / keywords:

Author: MORALES ÁLVAREZ, José Antonio (Instituto de Física, UNAM)

Presenter: MORALES ÁLVAREZ, José Antonio (Instituto de Física, UNAM)

Track Classification: Dark Matter; Dark Energy / Modified Gravity; Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **MORALES ÁLVAREZ, José Antonio** <jamafcc@ciencias.unam.mx> on **Thursday, 30 April 2026**

Abstract ID : 326

Higher-order Galaxy Bias: Theory and Numerics

Content

The large-scale distribution of galaxies encodes cosmological information on the history and matter content of the Universe. The full, non-Gaussian galaxy distribution can be analysed on large scales using a perturbative formulation of galaxy bias, which is the effective field theory of large-scale structure. State-of-the-art full-shape analyses of past surveys such as BOSS and currently operational Stage IV campaigns such as DESI and Euclid typically employ at most third-order perturbation theory. Going beyond this order has the potential of enhancing the information extraction from the galaxy distribution, but poses several challenges, both theoretically and numerically. In this talk, I will discuss recent (and ongoing) progress on fourth- and fifth-order perturbation theory for galaxies and the remaining steps to be taken towards application to current and future survey data.

Other topic / keywords:

Authors: BAKX, Thomas (Utrecht University); GARNY, Mathias (Technische Universitaet Muenchen (DE)); RUBIRA, Henrique (LMU/Cambridge); Mr VLAH, Zvonimir

Presenter: BAKX, Thomas (Utrecht University)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 3.0** (Sounds a bit niche in a time where everybody seems to be going in the SBI direction. But maybe that's exactly why we should listen to this one!?)

Abstract rating 3

KUIJKEN, Koen: **Accept • 4.0** (Quite comprehensive approach to higher-order stats.)

Abstract rating 4

Submitted by **BAKX, Thomas** <thomasb97@live.nl> on **Thursday, 30 April 2026**

Abstract ID : 327

Symbolic Emulation for Fast Inference in Modern Cosmology

Content

Modern cosmology often requires repeated evaluations of expensive theoretical predictions, from inference and model comparison to forecasts and exploratory studies beyond Λ CDM. Symbolic regression offers a fast and accurate alternative for building emulators, competitive with traditional neural-network approaches while retaining compact analytical expressions that are transparent, interpretable, and easy to integrate.

We present CMBolic, a suite of symbolic emulators for CMB lensing, temperature, and polarization anisotropies in Λ CDM extensions including massive neutrinos and the now-standard CPL parametrization of evolving dark energy. These emulators reach the accuracy required for Stage-IV cosmological analyses while remaining exceptionally lightweight and easy to implement. We further show how symbolic regression can be applied to total matter power spectra in the Generalized Dark Matter framework, enabling fast and scalable constraints on broad classes of non-standard dark matter models.

Other topic / keywords:

Author: VOKROUHLICKÝ, David (CEICO FZU)

Presenter: VOKROUHLICKÝ, David (CEICO FZU)

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0**

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (Better suited for methods session.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 3.0** (Symbolic emulation, but still emulation.)

Abstract rating 3

Submitted by **VOKROUHLICKÝ, David** <david.vokrouhlicky@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 328

Oscillon Stability in the Presence of Kinetic Coupling after E-model α -attractor Inflation

Content

We study post-inflationary oscillon dynamics in an E-model α -attractor scenario in which the inflaton is kinetically coupled to an ultralight axion. We perform nonlinear three-dimensional lattice simulations using GABE to investigate how this interaction affects both the formation of oscillons and their subsequent evolution. We find that oscillons can still form in the presence of kinetic coupling for μ_V

*lessim*0.08 M_{Pl} . However, in the parameter regime we can reliably evolve, fully formed oscillons are destabilized at later times for μ_W

*gtrsim*0.06 M_{Pl} by backreaction from the populated χ sector. Although our results do not provide direct evidence for oscillon decay into the χ sector, they show that kinetic coupling can destabilize otherwise long-lived oscillons and thereby modify the post-inflationary dynamics of the E-model α -attractor. This points to a novel mechanism in which backreaction governs oscillon lifetimes.

Other topic / keywords:

oscillons, preheating, reheating

Author: KHAN, Islam (The University of Virginia's College at Wise)

Co-author: GIBLIN, Tom (Kenyon College)

Presenter: KHAN, Islam (The University of Virginia's College at Wise)

Track Classification: Inflation / Primordial Perturbations; Early Universe; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **KHAN, Islam** <ikhancosmo@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 329

On EFT constraints from quasi-normal modes

Content

Recently, a new bound on Effective Field Theories of gravity has been proposed, based on the stability of Black holes. The conjecture states that Black holes in modified gravity should always be more stable than their counterpart in General Relativity. I will show, using a simple power counting argument, that this condition does not provide any useful bound on EFT coefficients.

Other topic / keywords:

Black holes

Authors: JULIANO, Leonardo (Scuola Normale Superiore, INFN); Prof. TRINCHERINI, Enrico (Scuola Normale Superiore, INFN)

Presenter: JULIANO, Leonardo (Scuola Normale Superiore, INFN)

Track Classification: Dark Energy / Modified Gravity; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 3.0**

Abstract rating 3

MALHOTRA, Ameet: **Accept: Talk • 4.0**

Abstract rating 4

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 2.0**

Abstract rating 2

GLAVAN, Dražen: **Accept: Talk • 2.0**

Abstract rating 2

Submitted by **JULIANO, Leonardo** <leonardo.juliano@sns.it> on **Thursday, 30 April 2026**

Abstract ID : 330

PANDA: A TreePM N-body code to simulate Horndeski models with a phenomenological screening.

Content

In this talk, I will present the current status and first results of **PANDA**. PANDA is a modified version of the TreePM N-body solver Gadget-4, extended to include Modified Gravity within the Effective Field Theory framework, enabling simulations across the broad class of Horndeski theories. In particular, PANDA implements a mapping of general Horndeski models through a set of parameters modifying the standard particle dynamics, both in real and Fourier spaces, according to the linearised approach of EFTofDE. Additionally, to ensure consistency with the full non-linear theories, and reproduce the correct dynamics at small scales, PANDA implements a phenomenological screening mechanism, exploring both environment- and scale-dependent approaches. I will present the general structure of the code, its current limitations, and its potential applications to large-scale cosmological simulations of structure formation.

Other topic / keywords:

N-body simulations of the Large Scale Structures

Author: MARTINELLI, Edoardo (University of Bologna)

Presenter: MARTINELLI, Edoardo (University of Bologna)

Track Classification: Dark Energy / Modified Gravity; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Positive: Talk

Reviews:

GARCIA-GARCIA, Carlos: **Accept: Talk • 3.0**

Abstract rating 3

GLAVAN, Dražen: **Accept: Talk • 3.0**

Abstract rating 3

Submitted by **MARTINELLI, Edoardo** <edoardo.martinelli3@unibo.it> on **Thursday, 30 April 2026**

Abstract ID : 331

Effects of Primordial Magnetic Fields (PMFs) in the linear and non-linear regimes

Content

I am going to present how the presence of PMFs changes the shape of the matter power spectrum and how this results in new predictions for cosmological observables. By comparing theoretical predictions with observational data, it will be possible to constrain PMFs parameters. I will explore predictions from both the linear and non-linear regimes, such as the galaxy luminosity function and weak gravitational lensing, respectively.

Other topic / keywords:

Author: D'AMBROSIO, Anna (Scuola Internazionale Superiore di Studi Avanzati (SISSA))

Presenter: D'AMBROSIO, Anna (Scuola Internazionale Superiore di Studi Avanzati (SISSA))

Track Classification: Primordial Magnetic Fields

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Primordial Magnetic Fields:

Judgments: Positive: Poster

Reviews:

IARYGINA, Oksana: **Accept: Poster • 4.0** (Appropriate for a poster.)

Abstract rating 4

Submitted by **D'AMBROSIO, Anna** <adambros@sissa.it> on **Thursday, 30 April 2026**

Abstract ID : 332

Emulation of cosmological simulations using Evolution Mapping

Content

With the advent of stage-IV spectroscopic galaxy surveys, modern cosmology has entered an era of unprecedented precision. While perturbation theory approaches remain the state of the art for large-scale structure (LSS) analyses, their applicability is restricted to the mildly non-linear regime, meaning that valuable data is being discarded. Simulation-based methods offer an alternative to push our analyses to smaller scales. However, the computational cost of running high-fidelity simulations presents a major bottleneck. In recent years, machine-learning frameworks have been developed to emulate the output of N-body codes. Building on these efforts, we present a convolutional neural network (CNN) that leverages the Evolution Mapping framework. This approach exploits cosmological parameter degeneracies, enabling the CNN to emulate N-body simulations across a broad range of cosmological scenarios.

Other topic / keywords:

Simulations, emulation

Authors: Dr CORREA, Carlos (Max Planck Institute for Extraterrestrial Physics); PÉREZ FERNÁNDEZ, Alejandro (Max Planck Institute for Extraterrestrial Physics); Dr SÁNCHEZ, Ariel (Max Planck Institute for Extraterrestrial Physics)

Presenter: PÉREZ FERNÁNDEZ, Alejandro (Max Planck Institute for Extraterrestrial Physics)

Track Classification: Large-Scale Structure; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (Better fit for Methods track? No new results on LSS)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (Better suited for methods session.)

Abstract rating 3

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Poster

Reviews:

SELLENTIN, Elena: **Accept: Poster • 3.0** (Analysis different but not better.)

Abstract rating 3

Submitted by **PÉREZ FERNÁNDEZ, Alejandro** <aperez@mpe.mpg.de> on **Thursday, 30 April 2026**

Abstract ID : 333

SkyExplain: a framework for machine learning interpretability in cosmology

Content

We present a novel framework for cosmological model selection based on Neural Networks trained directly on simulated Cosmic Microwave Background (CMB) temperature and polarisation maps, as well as summary statistics.

A central component of this work is SkyExplain, an open-source framework designed to bring interpretability to machine learning applications on cosmological data. SkyExplain enables the mapping of feature importance directly onto the sky, bridging the gap between black-box models and physically meaningful insights.

We demonstrate the capabilities of SkyExplain in enhancing sensitivity to subtle signatures of primordial physics beyond the standard Λ CDM paradigm using CMB data. To this end, we generate Planck-like simulations and develop a hybrid architecture that combines principal component analysis with neural networks, optimised for classification tasks. We further interpret the model's predictions using Shapley Additive exPlanations (SHAP), identifying the regions of the sky and angular scales that drive the distinction between Λ CDM and feature models.

The framework is designed to be easily extensible to a broad range of cosmological observables, from large-scale structure summary statistics to the identification of systematics in weak lensing shear maps. More broadly, our goal is to establish an open, community-driven hub where researchers can experiment with, adapt, and extend these tools for their own analyses.

We will present results on classification performance, calibration, and interpretability, alongside an Open Science initiative that provides public access to the full pipeline—from simulations to trained models and interpretability tools.

Other topic / keywords:

cosmology, large-scale structure, cosmic microwave background

Author: CAÑAS-HERRERA, Guadalupe (Leiden Observatory)

Co-author: Ms OCAMPO, Indira (IFT Madrid)

Presenter: CAÑAS-HERRERA, Guadalupe (Leiden Observatory)

Track Classification: Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

<https://arxiv.org/abs/2410.05209> <https://arxiv.org/abs/2604.05290> <https://github.com/SkyExplain>

Status: SUBMITTED

Track Reviews:**Methods / Statistical Inference / Machine Learning:****Judgments:** Positive: Talk**Reviews:**SELLENTIN, Elena: **Accept: Talk • 3.0** (Possibly CMB track?)

Abstract rating 3

Submitted by **CANÑAS-HERRERA, Guadalupe** <canasherrera@strw.leidenuniv.nl> on **Thursday, 30 April 2026**

Abstract ID : 334

Probing the large scale structures of the Universe with GW observations

Content

Galaxy surveys have traditionally served as the primary probe of the large-scale structure (LSS) of the Universe. The rapidly growing catalog of gravitational-wave (GW) merger events now offers an independent and complementary probe for cosmological studies. Third-generation (3G) GW observatories, including the Cosmic Explorer and Einstein Telescope, are expected to detect thousands of compact binary mergers per year with localization areas smaller than a square degree. Concurrently, next-generation electromagnetic surveys, such as the Vera C. Rubin Observatory and the Square Kilometer Array, will provide unprecedented maps of cosmic structure. We present new statistical methods for using GW observations to probe the background cosmology and the LSS of the Universe, and discuss strategies for combining GW merger catalogs with galaxy survey data. We show that 3G detectors can independently probe key LSS observables, including baryon acoustic oscillations (BAO) and clustering bias, using GW observations alone. Furthermore, studying the redshift evolution of these LSS features may provide new insights into the connection between compact binary formation and cosmological structure formation.

Other topic / keywords:

Author: KUMAR, Sumit (GRASP, Utrecht University, Netherlands)

Co-authors: Prof. AJITH, Parameswaran; Prof. CHOUDHURY, Tirthankar Roy; Prof. NITZ, Alex; Dr SAKETH, MVS; Dr VIJAYKUMAR, Aditya

Presenter: KUMAR, Sumit (GRASP, Utrecht University, Netherlands)

Track Classification: Large-Scale Structure; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 4.0** (Maybe better for GW but relevant to LSS and promises broad picture)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 5.0** (Outlook to a LSS measurement that will potentially become very important in the future.)

Abstract rating 5

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Ameet: **Accept: Talk • 5.0**

Abstract rating 5

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **KUMAR, Sumit** <skumar@nikhef.nl> on **Thursday, 30 April 2026**

Abstract ID : 335

From the Wavefunction of the Universe to In-In-Correlators: A Perturbative Map to All Orders

Content

Both the Wavefunction of the Universe and the Schwinger-Keldysh in-in formalism are central tools for analyzing primordial cosmological observables, such as equal-time correlation functions. While their conceptual equivalence is well established, a systematic and explicit map between their diagrammatic expansions has remained elusive. In this talk, I show how to construct such a map by analyzing the relation between the two frameworks at the diagrammatic level. I show that diagrams contributing to correlation functions in the Wavefunction of the Universe approach can be uniquely reorganized into Schwinger-Keldysh diagrams. This correspondence holds to all orders in perturbation theory, including arbitrary numbers of interaction vertices and loops.

Other topic / keywords:

Author: PALMA, Gonzalo (FCFM, University of Chile)

Presenter: PALMA, Gonzalo (FCFM, University of Chile)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Comments:

Based on a paper to appear in JHEP

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 3.0**

Abstract rating 3

WANG, Dong-Gang: **Accept • 3.0**

Abstract rating 3

Submitted by **PALMA, Gonzalo** <gap.cosmo@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 336

Primordial Black Holes: Small Scales, Big Questions

Content

Primordial black holes (PBHs) may have formed from the collapse of large density fluctuations in the early Universe and provide a powerful probe of the primordial power spectrum on otherwise inaccessible scales. However, translating PBH abundances into constraints on primordial physics remains limited by theoretical uncertainties. A key source of this uncertainty is the choice of window function, which describes how fluctuations on different scales contribute to collapse. Despite its central role, this ingredient is often treated in a simplified or inconsistent way.

In this talk, I will highlight the impact of the window function on PBH predictions and present recent work aimed at improving its modelling, including exploratory machine learning approaches. These results represent a step toward a more robust connection between early-Universe physics and PBH observables.

Other topic / keywords:

Primordial black holes

Author: YOUNG, Samuel (University of Sussex)

Presenter: YOUNG, Samuel (University of Sussex)

Track Classification: Dark Matter; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **YOUNG, Samuel** <sam.young@sussex.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 337

Multifield Cosmological Collider Signal with a Twist and a Turn

Content

The presence of multiple massive scalar fields during inflation is often a generic prediction of UV complete theories of gravity. In addition to the top down motivation, multifield models of inflation also solve the “ η -problem” by incorporating non-geodesic trajectories in the field space. Deviations of the inflaton’s trajectory from the geodesic, quantified by bending parameters, generate sizable non-Gaussianities beyond just the single-field slow roll scenario. While two field models with “turning” have been well studied, models with more than two active fields remain unexplored. In this work we take a phenomenological approach to study the non-Gaussianities that are generated by having more than two active fields during inflation. In particular we obtain the squeezed limit bispectrum of the adiabatic modes, which in presence of coupling to multiple massive fields, produces the so called “cosmological collider signal”. While our results hold for the general $N > 2$ field case, for pedagogy we highlight these results in the special case of $N = 3$ fields that has two bending parameters - “torsion” and “turning”. Upon carefully considering all the cubic vertices we find that the squeezed limit bispectrum has mixed oscillations for multiple heavy fields that depend on the mass gap. We also find that for some vertices that are unique to having $N > 2$ fields, there’s a novel shape that generates a large local contribution in the squeezed limit. These findings could help discern different multifield models via specific template searches in cosmological data.

Other topic / keywords:

cosmological collider, non-Gaussianities

Author: RAINA, Anmol (Dept. of Physics Harvard University)

Co-authors: GHOSHAL, Anish (University of Warsaw, Poland); PABAN, Sonia (Dept. of Physics, Harvard University)

Presenter: RAINA, Anmol (Dept. of Physics Harvard University)

Track Classification: Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Poster

Reviews:

CESPEDES, Sebastian: **Accept • 2.0**

Abstract rating 2

WANG, Dong-Gang: **Accept: Poster • 3.0**

Abstract rating 3

Submitted by **RAINA, Anmol** <araina@fas.harvard.edu> on **Thursday, 30 April 2026**

Abstract ID : 338

Vector induced Gravitational Waves sourced by Primordial Magnetic Fields

Content

In this work, we develop a generic formalism for the study of tensor perturbations induced at second order by first-order vector metric perturbations, dubbing these induced tensor modes vector-induced gravitational waves (VIGWs). Notably, considering an inflation-inspired power-law type magnetic field power spectrum of the form $P_B(k) \propto k^{n_B}$ (where n_B is the magnetic spectral index), we show that the VIGW signal is enhanced for stiff post-inflationary EoS, with the maximum enhancement happening for $w=1$. We explicitly demonstrate this contribution is dominant over the first-order magnetically-sourced GWs. The VIGW spectrum exhibits a maximum at around the scale crossing the cosmological horizon at the end of reheating, k_{reh} , with its present day peak amplitude scaling as $\Omega_{GW}(k_{reh}, \eta_0) \propto \Delta N_{reh} \times (H_{inf}/M_{Pl})^8$, where H_{inf} is the Hubble parameter at the end of inflation and ΔN_{reh} the duration of the post-inflationary era in e-folds. For $w=1$ (kination) and $n_B > -3/2$, one further obtains a nearly n_B -independent frequency scaling of the GW spectrum of the form $\Omega_{GW}(f, \eta_0) \propto (ff_{reh})^{-2.8}$ for $f > f_{reh} = k_{reh}/(2\pi)$. Finally, we highlight that the VIGW signal can be well within the detection bands of several next-generation interferometric GW missions at small scales. Indicatively, for $H_{inf} \sim O(107)\text{GeV}$ and $O(1014)\text{GeV}$, and $\Delta N_{reh} \sim 15$ and 10, the VIGW signal is expected to be detectable by LISA and ET respectively.

Based on Ref: 2504.10477

Other topic / keywords:

Author: GHOSHAL, Anish (University of Warsaw, Poland)

Presenter: GHOSHAL, Anish (University of Warsaw, Poland)

Track Classification: Primordial Magnetic Fields; Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (Better in primordial magnetic field track)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 4.0**

Abstract rating 4

Primordial Magnetic Fields:

Judgments: Positive: Poster

Reviews:

BONDARENKO, Kyrylo: **Accept: Poster • 3.0**

Abstract rating 3

IARYGINA, Oksana: **Accept: Poster • 4.0** (More suitable for a poster.)

Abstract rating 4

Submitted by **GHOSHAL, Anish** <anishghoshal1@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 339

In Search of New Physics in the CMB Using AI

Content

In this talk, I will present a set of AI techniques designed to look for signatures of new physics in CMB data. In particular, I will introduce how spherical graph neural networks can be applied to perform machine learning directly on CMB temperature and polarization map data. Furthermore, I will discuss how recent advances in agentic AI can assist with a variety of tasks ranging from literature review to scientific code generation and debugging, as well as CMB data analysis. Finally, I will look at a concrete example of employing the aforementioned AI techniques to detect signatures of non-trivial cosmic topology in CMB temperature and polarization data, highlighting my recent work with the COMPACT Collaboration.

Other topic / keywords:

Cosmic topology

Author: TAMOSIUNAS, Andrius (University of Oslo)

Presenter: TAMOSIUNAS, Andrius (University of Oslo)

Track Classification: Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 3.0** (Wide ML range.)

Abstract rating 3

Submitted by **TAMOSIUNAS, Andrius** <andrius.tamosiunas@astro.uio.no> on **Thursday, 30 April 2026**

Abstract ID : 340

Negentropy constraints on primordial nongaussianity

Content

The CMB is gaussian, at least according to the estimators that have been used in surveys like Planck, which is the bispectrum and trispectrum. In recent years there have been various proposals of nongaussian signatures that spread through out the whole PDF of fluctuations, and in some cases cannot be captured by looking at lower n-point functions. We propose the negentropy as a single-point estimator that captures generic deviations from gaussianity and apply it to the Planck data in order to constrain models that lead to such signals. As an application we derive analytic constraints on spectator axions during inflation.

Other topic / keywords:

Author: SYPSAS, Spyros (Centro de Ciencias Exactas, Universidad del Biobio)

Presenter: SYPSAS, Spyros (Centro de Ciencias Exactas, Universidad del Biobio)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive: Talk

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **SYPSAS, Spyros** <ssypsas@ubiobio.cl> on **Thursday, 30 April 2026**

Abstract ID : 341

Generic features of the evolution of scalar field dark matter galaxy halos

Content

We study the nonlinear evolution of scalar field dark matter galaxy halos that undergo a broad family of sudden disturbances created by a stretching or compression of the ground state, or spontaneous collapse from an almost uniform background. To date we have worked in reduced dimensions (spherical symmetry, plus exploratory attempts in cylindrical geometry for consideration of dark matter filaments). This, while on the one hand restrictive, gives good access to very fine resolution of the matter wave field and thus high velocity components such as scalar field bursts. We find generic features of the halos that are correlated with the time elapsed since the excitation, which may potentially find use for classifying the age of dark matter halos.

Other topic / keywords:

Scalar field Dark matter

Authors: DEUAR, Piotr (Institute of Physics, Polish Academy of Sciences); JOSHI, Tejas (Institute of Physics, Polish Academy of Sciences)

Co-authors: PROUKAKIS, Nikolaos (Newcastle University); RIGOPOULOS, Gerasimos (Newcastle University)

Presenter: DEUAR, Piotr (Institute of Physics, Polish Academy of Sciences)

Track Classification: Dark Matter; Others (Please specify below)

Contribution Type: Poster

Status: SUBMITTED

Submitted by **DEUAR, Piotr** <deuar@ifpan.edu.pl> on **Thursday, 30 April 2026**

Abstract ID : 342

De-lensing of CMB maps and constraining primordial gravitational waves: influence of Galactic foregrounds

Content

Detecting primordial gravitational waves (PGWs) is one of the main goal for upcoming Cosmic Microwave Background (CMB) experiments. Achieving this objective requires accurate removal of CMB gravitational lensing signal from CMB polarisation maps, so called de-lensing, as well as cleaning of the maps from diffuse Galactic foregrounds. In this talk I will present studies on influence of the Galactic emission on reconstruction of CMB lensing potential and de-lensing of divergence-free component of CMB polarisation maps for CMB-S4-like experiment. I will also pay special attention to testing sensitivity of the PGW amplitude constraints to Galactic foreground residuals based on realistic foreground models of varying complexity. Our results show that precise modelling of the Galactic emission will be crucial for estimation of the amplitude and its errors.

Other topic / keywords:

Author: BIELEWICZ, Pawel (NCBJ)

Co-author: Mr DEKA, Kishan (National Centre for Nuclear Research)

Presenter: BIELEWICZ, Pawel (NCBJ)

Track Classification: Large-Scale Structure; Cosmic Microwave Background; Inflation / Primordial Perturbations; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive

Reviews:

KUIJKEN, Koen: **Accept • 3.0** (Really a CMB talk. But delensing is important, good topic.)

Abstract rating 3

HILDEBRANDT, Hendrik: **Accept • 3.0** (Better suited for CMB session.)

Abstract rating 3

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Ameet: **Accept: Talk • 4.0** (better suited to CMB)

Abstract rating 4

GAROFFOLO, Alice: **Accept: Talk • 3.0** (Better if in CMB track)

Abstract rating 3

Submitted by **BIELEWICZ, Pawel** <pawel.bielewicz@ncbj.gov.pl> on **Thursday, 30 April 2026**

Abstract ID : 343

Systematic evaluation of ground-state Scalar Field Dark Matter at dwarf galaxy scales

Content

Halo density profiles in CDM follow a fixed functional form (e.g., NFW) that predicts over-dense cuspy inner regions compared with observed cores. Alternative DM models like Scalar Field (Fuzzy) Dark Matter (SFDM) aim to tackle this by producing cores balanced by quantum pressure and gravity. However, strong structure formation constraints on SFDM have motivated the need for Self-Interactions (SI). In this talk I address whether SI can alleviate these tensions in SFDM.

We demonstrate that repulsive quartic SI produces solitonic cores embedded in NFW envelopes, reproducing both 1D rotation curves and explicit dynamical reconstruction of host halos in 3D via the Gross-Pitaevskii-Poisson equations for 17 DM-dominated galaxies in the SPARC dataset using a single boson mass (m) and interaction strength (g) pair. This analysis is then extended to the LITTLE THINGS dataset.

The core radius is a function of (m, g) which gives rise to a localised microphysical parameter degeneracy. We resolve this using Hierarchical Gibbs Sampling, thus placing early benchmarks on repulsive quartic SI in SFDM against competing DM models through Bayesian Model Comparison. We generalise the analysis by extending across a family of ground-state potentials in SFDM - non-interacting, quartic SI, quartic+sextic SI, the full cosine SI, and the logarithmic SI - to systematically map most of the ground-state SFDM landscape. This framework is shifted to the Ultra Faint Dwarf regime to significantly suppress baryonic feedback effects on DM constraints. This is motivated by astrophysical tensions with observed constant central surface density ($\rho_c r_c = \text{constant}$) and its slope mismatch with theory predictions. We comment on the validity of this test and how the analysis either constrains which SFDM potential survives, or, if the relation does not hold fundamentally, delivers benchmark scaling relations across the SFDM family.

Other topic / keywords:

Authors: VERMA, Aditya (Newcastle University); INDJIN, Milos (Newcastle University); RAU, Markus (Newcastle University); Prof. ALMEIDA, Jorge Sanchez (Instituto de Astrofísica de Canarias); Dr CABRERA, Ignacio Trujillo (Instituto de Astrofísica de Canarias); LIU, Gary (Department of Physics, Royal Holloway University of London); PROUKAKIS, Nick (Newcastle University); RIGOPOULOS, Gerasimos (Newcastle University)

Presenter: VERMA, Aditya (Newcastle University)

Track Classification: Dark Matter

Contribution Type: Talk

Status: SUBMITTED

Submitted by **VERMA, Aditya** <a.verma8@ncl.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 344

Systematic evaluation of ground-state Scalar Field Dark Matter at dwarf galaxy scales

Content

Halo density profiles in CDM follow a fixed functional form (e.g., NFW) that predicts over-dense cuspy inner regions compared with observed cores. Alternative DM models like Scalar Field (Fuzzy) Dark Matter (SFDM) aim to tackle this by producing cores balanced by quantum pressure and gravity. However, strong structure formation constraints on SFDM have motivated the need for Self-Interactions (SI). In this talk I address whether SI can alleviate these tensions in SFDM.

We demonstrate that repulsive quartic SI produces solitonic cores embedded in NFW envelopes, reproducing both 1D rotation curves and explicit dynamical reconstruction of host halos in 3D via the Gross-Pitaevskii-Poisson equations for 17 DM-dominated galaxies in the SPARC dataset using a single boson mass (m) and interaction strength (g) pair. This analysis is then extended to the LITTLE THINGS dataset.

The core radius is a function of (m, g) which gives rise to a localised microphysical parameter degeneracy. We resolve this using Hierarchical Gibbs Sampling, thus placing early benchmarks on repulsive quartic SI in SFDM against competing DM models through Bayesian Model Comparison. We generalise the analysis by extending across a family of ground-state potentials in SFDM - non-interacting, quartic SI, quartic+sextic SI, the full cosine SI, and the logarithmic SI –to systematically map most of the ground-state SFDM landscape. This framework is shifted to the Ultra Faint Dwarf regime to significantly suppress baryonic feedback effects on DM constraints. This is motivated by astrophysical tensions with observed constant central surface density ($\rho_c r_c = \text{constant}$) and its slope mismatch with theory predictions. We comment on the validity of this test and how the analysis either constrains which SFDM potential survives, or, if the relation does not hold fundamentally, delivers benchmark scaling relations across the SFDM family.

Other topic / keywords:

Authors: VERMA, Aditya (Newcastle University); INDJIN, Milos (Newcastle University); Dr RAU, Markus (Newcastle University); ALMEIDA, Jorge Sanchez (Instituto de Astrofísica de Canarias); CABRERA, Ignacio Trujillo (Instituto de Astrofísica de Canarias); LIU, Gary (Department of Physics, Royal Holloway University of London); PROUKAKIS, Nick (Newcastle University); RIGOPOULOS, Gerasimos (Newcastle University)

Presenter: VERMA, Aditya (Newcastle University)

Track Classification: Dark Matter

Contribution Type: Poster

Status: SUBMITTED

Submitted by **VERMA, Aditya** <a.verma8@ncl.ac.uk> on **Thursday, 30 April 2026**

Abstract ID : 345

Learning CMB-independent reionisation constraints from high-redshift quasars

Content

Recent evidence for evolving dark energy from DESI BAO measurements has been shown to be degenerate with the optical depth to reionisation τ_{CMB} and could be absorbed in a value exceeding Planck's legacy measurement of $\tau_{\text{CMB}} \sim 0.05$. Gaining a true understanding of the Epoch of Reionisation therefore remains one of the pivotal tasks of modern cosmology, and next-generation telescopes such as EUCLID and JWST are opening up the path to the first CMB-independent precision constraints on τ_{CMB} derived from the Lyman-alpha damping wing signature imprinted by the foreground neutral intergalactic medium (IGM) on the spectra of high-redshift quasars.

We developed a new simulation-based inference framework –coded fully differentially in the machine learning framework JAX –to disentangle the IGM damping wing from a quasar's unknown intrinsic spectrum and infer its lifetime as well as two physical measures of the local ionisation topology in front of the source: the HI column density and its distance to the first neutral patch. Our pipeline accounts for all relevant modelling uncertainties, caused by IGM transmission fluctuations, quasar continuum reconstruction, and spectral noise. Enabled by a normalising flow model as neural likelihood estimator, our framework is the first that harnesses the full-resolution spectral information, including the highly non-Gaussian pixels blueward of the Lyman-alpha line. By analysing higher-order statistics of synthetic flow-generated spectra, we demonstrate that our flow model has truly learned non-Gaussian information, significantly tightening the resulting parameter constraints.

Based on realistic mock spectra resembling the distribution of upcoming quasars found by Euclid, we show that we will soon be able to robustly constrain the evolution of the IGM neutral fraction at the $< 5\%$ level between $6 < z < 10$. We present the first such constraints covering the redshift range $5.75 < z < 7.7$ based on 41 archival spectra and 27 new high-quality JWST/NIRSpec spectra from our currently running 94-hour Cycle 4 program, constraining both the global timing and the local ionisation topology near these objects and placing a robust Planck-independent constraint on τ_{CMB} .

Other topic / keywords:

Epoch of Reionisation

Author: KIST, Timo (Leiden Observatory)

Co-authors: Dr DAVIES, Frederick B. (Max Planck Institute for Astronomy); Prof. HENNAWI, Joseph F. (Leiden Observatory & UC Santa Barbara)

Presenter: KIST, Timo (Leiden Observatory)

Track Classification: Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 4.0** (Possibly also LSS?)

Abstract rating 4

Submitted by **KIST, Timo** <kist@strw.leidenuniv.nl> on **Thursday, 30 April 2026**

Abstract ID : 346

Triggered phase transitions and gravitational waves

Content

Cosmic phase transitions are a key source of gravitational waves and are usually assumed to be controlled by temperature. We study scenarios in which the transition is instead triggered by the dynamics of an additional scalar field. This setup allows for qualitatively new possibilities, including delayed transitions and symmetry restoration at low temperatures. In particular, we focus on $U(1)$ symmetry-restoring phase transitions and the role of the cosmic string network. We discuss the associated gravitational wave signal and its possible connection to recent pulsar timing array observations. We also mention implications for QCD confinement and the electroweak phase transition.

Other topic / keywords:

Author: CHATRCHYAN, Aleksandr (Stockholm University)

Presenter: CHATRCHYAN, Aleksandr (Stockholm University)

Track Classification: Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept • 4.0** (better in early universe track)

Abstract rating 4

MALHOTRA, Aameek: **Accept: Talk • 4.0**

Abstract rating 4

Early Universe:

Judgments: Positive

Reviews:

VAN DE VIS, Jorinde: **Accept • 4.0**

Abstract rating 4

Submitted by **CHATRCHYAN, Aleksandr** <aleksandr.chatrchyan@su.se> on **Thursday, 30 April 2026**

Abstract ID : 347

Revisiting the nature of dark matter and dark energy from the lens of Spherical Cosmos Model

Content

Dark matter and dark energy are considered the two fundamental components of the universe. Based on the standard cosmological model (Λ CDM) and the statistical data published so far, nearly 95% of the total mass-energy density of the universe is attributed to these two dark components. However, their precise origin is not known to the community of cosmologists and particle physicists. Despite extensive ongoing efforts and significant investments in recent decades to detect dark matter, a collisionless and key component that stabilizes the universe, its true nature remains unanswered, confronting scientists with the so-called “dark matter crisis”. In parallel, a variety of dark energy definitions have been proposed across different models to explain the accelerated expansion of the universe. However, these models face their own challenges and introduce additional complexities or ambiguities for scientists, with no experimental evidence yet confirming the direct detection of dark energy.

Such dilemmas in science often point to the need of reopening the room for theoreticians and philosophers in physics, so that their perspectives can be offered and possibly be converged with those already established. As a result, the missing language required for the true description of these fundamental elements of the universe can be obtained, and the hurdles that cosmology unavoidably faces can be surmounted. In this respect, the spherical cosmos model (SCM), derived from T-Consciousness Cosmology, offers a complete and unified picture of the universe, enabling cosmologists and particle physicists to address cosmological puzzles, and to view them from a novel and startling perspective. Proposed four decades ago and published in recent years, this subfield of cosmology follows a holistic approach to describe the universe as a whole.

In SCM, space is the main constituent of the cosmos, an enormous network that encompasses the universe and is neither matter nor energy, but rather a dynamic, non-neutral entity with specific features that influences cosmological events. In this model, space is also considered the ground for the emergence and development of baryonic matter, ranging from elementary particles and molecules to planets, stars, galaxies and clusters of galaxies, etc. A varying viscosity-like feature, or what is called “space contraction”, is attributed to the space in SCM, through which dark matter and dark energy are explained.

The concept of viscosity ascribed to space is not the same as that defined in classical physics and fluid mechanics, but rather a feature dependent on the contraction and stress of space itself. In other words, space exhibits mesh-like and fluid-like behaviors, as it can contract, intertwine and rebound to its relaxed state; hence, exhibiting different levels of space viscosity, which are referred to as dark matter and dark energy. In SCM, these two dark elements are a feature of space itself, with no baryonic, tachyonic, scalar-field, quintessence, or other such origins. Therefore, they cannot be detected directly through observational experiments; however, their influence on baryonic matter can be detected indirectly. Dark matter and dark energy feature gravitational properties and hold the structures of the cosmos, as well as massive cosmic objects, together. High levels of space viscosity are attributed to dark matter, whereas low levels are attributed to dark energy.

To elaborate further, in SCM, dark matter and dark energy are considered dynamic responses of space to the distribution of baryonic mass, the intensity of the gravitational field surrounding this mass, and the level of space contraction associated with it. Wherever there is baryonic mass, gravity forms and results in space contraction around the mass. The higher the density of the baryonic mass, the greater the magnitude of the gravity, and the greater the contraction of the space will be, respectively. This chain of sequences leads to a local increase in the viscosity of space, which is consistent with observations, for example, around galactic discs and is conventionally known as dark matter halos. In other words, dark matter is merely a contraction of space. Upon

the formation of galaxies or supermassive structures and the effect of their gravity to the space, depending on their baryonic mass density, different densities of dark matter can emerge, which are corresponding to different levels of space viscosity. Conventional cosmology calls the hidden mass around galactic discs and other massive structures “dark matter” and tries to assign a newly defined particle to it. However, what really exists is not an enormous population of unknown particles, but merely a dynamic response of space, which is the result of its contraction. Dark energy, on the other hand, is the result of lower levels of space contraction, existing around, e.g., elementary particles of much lower mass densities than galaxies and other massive structures that cannot cause high intensity of gravitational fields.

As can already be inferred, in SCM, dark matter and dark energy are not two distinct, independent elements of the universe, but rather two dynamic phases of space that emerge from local gravitational conditions and physical scales. Around massive structures, galaxy clusters, etc., that possess high baryonic mass densities, space contracts and intertwines considerably more than around a mass of low baryonic density. The former denotes a super-viscous regime, where the portion of dark matter is high, while the latter denotes a poor-viscous regime, equivalent to what is called dark energy in conventional cosmology.

To conclude, in spherical cosmos model (SCM) dark matter and dark energy are of the same origin and merely different phases of “space viscosity”. This dynamic feature of space depends on the baryonic mass density and the gravitational field formed around the distribution of such mass. Supermassive structures in the universe lead to high levels of space viscosity, ascribed to dark matter, whereas lightweight baryonic masses, such as elementary particles, lead to low levels of space viscosity, ascribed to dark energy. The SCM model, derived from T-Consciousness Cosmology, sheds light on the path ahead of cosmologists, particle physicists, philosophers, etc. and invites everyone to challenge conventional cosmology, reshaping definitions and revisiting their methodologies in realizing the main constituents of the universe as well as its foundations.

Other topic / keywords:

Authors: TAHERI, Mohammad Ali (Cosmointel Research Center); MAHLOUJI, Reyhaneh (Cosmointel Research Center); RAMEZANZADEH, Mahyar (Cosmointel Research Center)

Presenter: MAHLOUJI, Reyhaneh (Cosmointel Research Center)

Track Classification: Dark Matter; Dark Energy / Modified Gravity

Contribution Type: Talk

Comments:

We are willingly open to both talk and poster. Thanks

Status: SUBMITTED

Track Reviews:

Dark Energy / Modified Gravity:

Judgments: Negative

Reviews:

GARCIA-GARCIA, Carlos: **Reject**

Abstract rating 0

GLAVAN, Dražen: **Reject**

Abstract rating 0

Submitted by **MAHLOUJI, Reyhaneh** <raihanehmahlouji@gmail.com> on **Thursday, 30 April 2026**

Abstract ID : 348

Integral-Equation Method for Non-Cold Relic Perturbations: From Massive Neutrinos to Decaying Dark Matter

Content

The standard approach for computing perturbations of non-cold relics in Boltzmann solvers relies on a truncated multipole hierarchy, which introduces numerical artifacts and becomes computationally expensive at small scales. We present an alternative framework based on integral equations (IEs), where the formal solution to the collisionless Boltzmann equation is expressed as a convolution of gravitational source terms with analytic kernels. These convolutions are evaluated iteratively alongside the rest of the perturbation system using non-uniform fast Fourier transforms (NUFFTs). This method is free from truncation artifacts and is applicable to arbitrary non-cold relic species without model-specific fluid approximations. We implement this framework in CLASSIER (CLASS Integral Equation Revision), a publicly available modification of the Boltzmann solver CLASS. As a primary demonstration, we apply the IE method to massive neutrinos, achieving sub-0.1% accuracy in the matter power spectrum up to $k \sim 100 \text{Mpc}^{-1}$ with significant speedup over the conventional truncated hierarchy. We further demonstrate the generality of this framework by applying it to decaying dark matter, illustrating that the method extends naturally to non-standard non-cold relics.

Other topic / keywords:

Author: LEE, Nanoom (Johns Hopkins University)

Co-authors: BENCKE, Anna (Johns Hopkins University); BERNAL, Jose Luis; KAMIONKOWSKI, Marc

Presenter: LEE, Nanoom (Johns Hopkins University)

Track Classification: Dark Matter; Neutrinos

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive: Talk

Reviews:

GERBINO, Martina: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **LEE, Nanoom** <nanoomlee0922@gmail.com> on **Friday, 1 May 2026**

Abstract ID : 349

Eigenmodes, correlation matrices, and detectability of Euclidean manifolds

Content

If the Universe has non-trivial spatial topology, observables depend on both the parameters of the spatial manifold and the position and orientation of the observer. In infinite Euclidean space, most cosmological observables arise from the amplitudes of Fourier modes of primordial scalar curvature perturbations. Topological boundary conditions replace the full set of Fourier modes with specific linear combinations of selected Fourier modes as the eigenmodes of the scalar Laplacian. In this paper we consider the non-orientable Euclidean topologies $\mathbb{E}\{7\}$ – $\mathbb{E}\{10\}$, $\mathbb{E}\{13\}$ – $\mathbb{E}\{15\}$, and $\mathbb{E}\{17\}$, encompassing the full range of manifold parameters and observer positions, generalizing previous treatments. Under the assumption that the amplitudes of primordial scalar curvature eigenmodes are independent random variables, for each topology we obtain the correlation matrices of Fourier-mode amplitudes (of scalar fields linearly related to the scalar curvature) and the correlation matrices of spherical-harmonic coefficients of such fields sampled on a sphere, such as the temperature of the cosmic microwave background (CMB). We evaluate the detectability of these correlations given the cosmic variance of the CMB sky. We find that in manifolds where the distance to our nearest clone is less than about 1.2 times the diameter of the last scattering surface of the CMB, we expect a correlation signal that is larger than cosmic variance noise in the CMB. Our limited selection of manifold parameters are exemplary of interesting behaviors, but not necessarily representative. Future searches for topology will require a thorough exploration of the parameter space to determine what values of the parameters predict statistical correlations that are convincingly attributable to topology.

Other topic / keywords:

Cosmic Topology

Authors: SAMANDAR, Amirhossein (Case Western Reserve University); STARKMAN, Glenn David (Case Western Reserve University (US))

Co-authors: AKRAMI, Yashar (Institute for Theoretical Physics (IFT), Madrid); MIHAYLOV, Deyan (Case Western Reserve University)

Presenter: SAMANDAR, Amirhossein (Case Western Reserve University)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Methods / Statistical Inference / Machine Learning

Contribution Type: Talk

Comments:

Paper link: <https://arxiv.org/abs/2510.05030>

Status: SUBMITTED

Track Reviews:**Methods / Statistical Inference / Machine Learning:**

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 5.0** (Very very difficult, any progress welcome.)

Abstract rating 5

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

WANG, Dong-Gang: **Accept • 4.0**

Abstract rating 4

Submitted by **SAMANDAR, Amirhossein** <amirhossein.samandar@case.edu> on **Friday, 1 May 2026**

Abstract ID : 350

Gravitational Waves from Primordial Black Hole Binaries: The Role of Higher-Order Clustering

Content

Primordial black holes (PBHs) formed in the early Universe are a well-motivated dark matter candidate and a potential source of gravitational waves (GWs). In this work, we investigate the GW signals originating from early-formed PBH binaries, with a particular focus on the impact of primordial clustering induced by non-Gaussianity in the curvature perturbations. We model the spatial distribution of PBHs using higher-order correlation functions, incorporating the effects of local-type non-Gaussianity on both the two-point and three-point correlation functions.

We show that clustering significantly modifies the initial conditions of PBH binaries, including their typical separations and angular momentum, thereby affecting their merger timescales and survival probability against early disruption. While previous studies have primarily focused on the role of the two-point correlation function, we explicitly compute the PBH three-point correlation function and consistently include its contribution. We find that three-body correlations play a non-negligible role: they can enhance the probability of close encounters, while simultaneously increasing the rate of binary disruption through early three-body interactions. As a result, the present-day merger rate exhibits a non-trivial dependence on the level of primordial non-Gaussianity, including a critical threshold beyond which the merger rate is significantly suppressed.

We further compute the stochastic gravitational-wave background generated by the cosmic population of PBH mergers, incorporating the modified merger history due to clustering. Our results show that primordial clustering can substantially alter both the amplitude and spectral shape of the GW background, potentially bringing predictions into agreement with current observational bounds or within the reach of future GW experiments. This work highlights the crucial role of primordial non-Gaussianity and higher-order clustering in connecting PBH formation scenarios with gravitational-wave observations.

Other topic / keywords:

Author: JING, Changcheng (Instituto de Física Teórica UAM-CSIC)

Co-authors: KUROYANAGI, Sachiko (IFT UAM-CSIC); SASAKI, Misao; YOKOYAMA, Shuichiro (Nagoya University)

Presenter: JING, Changcheng (Instituto de Física Teórica UAM-CSIC)

Track Classification: Dark Energy / Modified Gravity; Early Universe; Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:**Gravitational Waves:****Judgments:** Positive: Talk**Reviews:**GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

MALHOTRA, Aameek: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **JING, Changcheng** <changchengjing8pigtuv@gmail.com> on **Friday, 1 May 2026**

Abstract ID : 351

Nucleation Rates for First-Order Phase Transitions in a Strict EFT Expansion

Content

We present a systematic computation of bubble nucleation rates for cosmological first-order phase transitions within a strict EFT expansion obtained through dimensional reduction and the integration of fields heavier than the nucleation scale. The calculation consistently separates contributions from the leading EFT potential, higher-order operators generated by consecutive matching steps, and fluctuation determinants around the critical bubble. This framework allows us to compare the relative impact of full determinant prefactors and higher-dimensional operators while maintaining controlled power counting.

Other topic / keywords:

Authors: LEISTER, Nicholas (Mainz University); SCHWALLER, Pedro

Presenter: LEISTER, Nicholas (Mainz University)

Track Classification: Early Universe

Contribution Type: Talk

Status: SUBMITTED

Submitted by **LEISTER, Nicholas** <nleister@uni-mainz.de> on **Friday, 1 May 2026**

Abstract ID : 352

Searching for Cosmic Topology with Bayesian Methods using the Likelihood

Content

The universe has a non-trivial topology if there exist non-contractible closed loops through space. If the length scale of the topology is comparable to that of the last scattering surface, then this would influence the statistics of the cosmic microwave background (CMB). Here, we discuss one method of searching for this signal—the likelihood search.

The covariance matrix describing the CMB statistics can be calculated and used to find the Gaussian likelihood of the topological model parameters given a CMB map. This includes not only the length scales and angles of the axes of a given topology, but also (since topologies are generally anisotropic) the orientation of the observer. We discuss methods to efficiently compute the likelihood and explore this parameter space.

The covariance matrices can also be used to calculate the Kullback–Leibler (KL) divergence. We can also calculate the Fisher matrix for each topology, which gives us an estimate of the error bars. These techniques are used to show which topologies are allowed and discoverable given current Planck CMB limits and determine the extent to which future CMB experiments like LiteBIRD can improve these limits.

Other topic / keywords:

Cosmic Topology

Authors: Prof. COPI, Craig (Case Western Reserve University); Prof. JAFFE, Andrew (Imperial College London); LU, Linn Htat (Imperial College London); Mr SAMANDAR, Amirhossein (Case Western Reserve University); STARKMAN, Glenn David (Case Western Reserve University (US))

Co-author: COMPACT COLLABORATION

Presenter: LU, Linn Htat (Imperial College London)

Track Classification: Cosmic Microwave Background; Methods / Statistical Inference / Machine Learning; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Methods / Statistical Inference / Machine Learning:

Judgments: Positive: Talk

Reviews:

SELLENTIN, Elena: **Accept: Talk • 5.0** (Impressive technique if this ever works!)

Abstract rating 5

Submitted by LU, **Linn Htat** <linn.lu24@imperial.ac.uk> on **Friday, 1 May 2026**

Abstract ID : 353

Non-Linear Effects of the Interacting Dark Energy Model

Content

We focused on a phenomenological interacting dark energy model (IDE) with energy-momentum transfer from dark matter to dark energy through a coupling $Q = \xi \mathcal{H} \rho_{DE}$. Following our previous work on constraining the parameters of the same IDE model using CMB and DESI data, we now present the N-body simulation results based on a modified version of RAMSES code. Compared with the fiducial LCDM results, the IDE model predicts an enhanced power on large scales but suppressed clustering on small scales ($k \geq 2$ h/Mpc), consistent with the reduced dark matter density at late times.

Other topic / keywords:

Tensions in cosmology

Authors: ZHAI, Yuejia (University of Sheffield); LI, Baojiu (Institute for Computational Cosmology, Durham University, UK); Prof. NUNES, Rafael (Rio Grande do Sul U); DI VALENTINO, Eleonora (University of Sheffield); VAN DE BRUCK, Carsten (University of Sheffield)

Presenter: ZHAI, Yuejia (University of Sheffield)

Track Classification: Large-Scale Structure; Others (Please specify below)

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Mixed: Proposed for other tracks: Dark Energy / Modified Gravity

Reviews:

HILDEBRANDT, Hendrik: **Change track • 3.0**

Abstract rating 3

KUIJKEN, Koen: **Change track • 3.0** (OK subject but move to DE?)

Abstract rating 3

Submitted by **ZHAI, Yuejia** <yzhai13@sheffield.ac.uk> on **Friday, 1 May 2026**

Abstract ID : 354

The Universe is Not Statistically Isotropic

Content

We have long celebrated the great success of cosmology in predicting the observed properties of the cosmic microwave background. And yet, for over two decades there has been consistent and slowly mounting evidence that on large scales the CMB is anomalous. The evidence is consistent from experiment to experiment and it implies the violation of statistical isotropy. I will discuss this evidence, why it is so compelling, and where it may be pointing us.

Other topic / keywords:

cosmic topology

Author: STARKMAN, Glenn David (Case Western Reserve University (US))

Presenter: STARKMAN, Glenn David (Case Western Reserve University (US))

Track Classification: Cosmic Microwave Background; Others (Please specify below)

Contribution Type: Talk

Comments:

would be best to associate this with the cosmic topology session

Status: SUBMITTED

Submitted by **STARKMAN, Glenn David** <glenn.starkman@case.edu> on **Friday, 1 May 2026**

Abstract ID : 355

Precision tSZ Cluster Cosmology with the South Pole Telescope in the Era of Next-Generation Observations

Content

The unprecedented depth of current-generation CMB experiments enabled a window into studying the thermal Sunyaev-Zeldovich (tSZ) effect in a once inaccessible population of galaxy clusters. The newest instrument on the South Pole Telescope, SPT-3G, has produced CMB maps with noise levels of 3.2, 2.5, and 8.9 $\mu\text{K-arcmin}$ at 95, 150, and 220 GHz, respectively. This has allowed for the detection of over 7,200 clusters with masses ranging from 7.9×10^{13} to 1.6×10^{15} in the redshift range $0.037 < z < \sim 2$. The cluster sample detected in high-resolution SPT-3G maps will enable high-precision cross-validation with optical and X-ray cluster catalogs, and combined with optical weak lensing measurements from wide-field surveys, offer new leverage on cosmological constraints derived from cluster abundances. SZ cluster cosmology is now also being internally validated through CMB-only probes, including constraints on the tSZ–mass relation from cluster masses inferred via the lensing of the CMB by galaxy clusters, and measurements of the bias parameter from the clustering of galaxy clusters. Future analyses using the full 10,000 deg^2 SPT-3G survey, leveraging a substantially larger cluster sample, will yield increasingly precise and self-consistent constraints on cosmology from cluster abundances.

Other topic / keywords:

Galaxy Clusters, Cosmology

Author: Dr BLEEM, Lindsey

Co-author: KORNOELJE, Kayla

Presenter: KORNOELJE, Kayla

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 4.0** (Pretty standard SPT abstract, but would be good to hear more about SPT for sure.)

Abstract rating 4

KUIJKEN, Koen: **Accept • 3.0** (no results yet? Why not submitted to CMB track as well?)

Abstract rating 3

Submitted by **KORNOELJE, Kayla** <knk@uchicago.edu> on **Friday, 1 May 2026**

Abstract ID : 356

Large deviation techniques for structure abundances : beyond perturbative non-gaussianities

Content

The excursion-set formalism provides a key connection between primordial inflationary fluctuations and the abundance of cosmic structures such as dark matter halos and voids, traditionally assuming Gaussian random walks. In this work, we extend this framework to fluctuations whose distribution present strongly non-Gaussian tails, beyond the reach of perturbative approaches to primordial non-Gaussianity based on statistical moment expansion. We address this problem with rigorous, analytical derivations relying on the large deviation principle, suited for the study of rare fluctuations. We derive new first-passage time distributions for random walks with non-Gaussian statistics and obtain updated predictions for the halo mass function. We also study the two-barrier first-passage problem relevant to cosmic void formation, leading to a new analytical prediction for the void size function, with improved accuracy on the larger scales. Our results demonstrate the potential of large deviation techniques as a bridge between inflationary scenarios often leading to strongly non-Gaussian tails and late-Universe observables.

Other topic / keywords:

initial perturbations, non-gaussianities, large deviation principle, excursion-set theory, halos, voids

Authors: Prof. DURRER, Ruth (University of Geneva); TEUSCHER, Martin (LPSC Grenoble, France)

Presenter: TEUSCHER, Martin (LPSC Grenoble, France)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

WANG, Dong-Gang: **Change track • 4.0** (better fit for LSS track)

Abstract rating 4

Submitted by **TEUSCHER, Martin** <martin.teuscher@univ-grenoble-alpes.fr> on **Friday, 1 May 2026**

Abstract ID : 357

Improving the Precision of BICEP's CMB Measurements

Content

For over 20 years, the BICEP series of telescopes has been observing CMB polarization from the South Pole with ever increasing sensitivity, continually improving the leading constraints on primordial gravitational waves and the faint B-modes they would produce at degree scales. The measurement challenge is immense. As sensitivities continue to increase, from existing datasets which constrain the tensor-to-scalar ratio r at the level of $\sigma(r) \sim 0.005$ to goals of the current surveys to reach $\sigma(r) \sim 0.001$ or below, systematic effects must be controlled to nano-Kelvin levels, requiring many orders of magnitude suppression of environmental astrophysical contaminants. Building on our program's experience of these measurements, a sixth-generation BICEP telescope, called BA4-90/150, will be commissioned in 2027. In this talk I will discuss how BA4 will continue to improve BICEP's standard of sensitivity and systematic control, while precision in-field calibration measurements of the BICEP program will continue to inform mitigation strategies in our cosmological analysis and robustly characterize the upper limits of residual systematic uncertainty for measurements of r . Precision absolute polarization angle calibrations also promise to improve measurements of cosmological birefringence.

Other topic / keywords:

cosmological birefringence

Author: KOVAC, John (Harvard University)

Presenter: KOVAC, John (Harvard University)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations; Early Universe; Gravitational Waves

Contribution Type: Talk

Comments:

This talk is intended to be complementary to the SPO program overview talk that we propose be given by a junior scientist of our collaboration, Scott Mackey. It would be ideal if my talk could follow Scott's.

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept: Talk • 3.0** (Better if in the CMB track.)

Abstract rating 3

MALHOTRA, Ameet: **Accept: Talk • 4.0** (better suited to CMB track)

Abstract rating 4

Submitted by **KOVAC, John** <jmkovac@cfa.harvard.edu> on **Saturday, 2 May 2026**

Abstract ID : 358

Unifying the astrophysical gravitational-wave background and foreground for cosmological inference

Content

The Hubble tension is a major cosmological problem, wherein early- and late-universe measurements of the Hubble constant are significantly discrepant. This tension can be probed by developing new measures of the Universe's expansion. In recent work, we created the stochastic siren, a novel way to measure the Hubble constant using the gravitational-wave (GW) background (GWB) arising from binary black hole mergers. This method can be deployed in parallel with the spectral siren—which considers only resolved mergers—by jointly analyzing the separate datasets of the GW foreground and background. However, the distinction between the foreground and background is ultimately artificial: the GWs we can resolve are dictated by our detectors. Distinguishing between the two sources is thus technically incorrect in some scenarios and may actually pose issues in the analysis of future GW data. In this talk, I will outline a new, unified method to measure the Hubble constant that makes no distinction between the foreground and background of GWs. I will demonstrate the method applied to simulated data and share the resulting cosmological constraints.

Other topic / keywords:

Hubble-tension

Authors: BISCOVEANU, Sylvia (Princeton University); C, Bryce; MAGAÑA HERNANDEZ, Ignacio (Carnegie Mellon University); TALBOT, Colm (Princeton University)

Presenter: C, Bryce

Track Classification: Gravitational Waves

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Ameet: **Accept: Talk • 5.0**

Abstract rating 5

GAROFFOLO, Alice: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **C, Bryce** <brycec2@illinois.edu> on **Saturday, 2 May 2026**

Abstract ID : 359

Improving Constraints on Inflation with the South Pole Observatory

Content

Cosmic inflationary models predict a background of primordial gravitational waves that would imprint a B-mode polarization signature in the cosmic microwave background (CMB). The South Pole Observatory (SPO), a joint effort between BICEP and the South Pole Telescope (SPT), aims to constrain the strength of this signature, parameterized by the tensor-to-scalar ratio r , and thereby constrain the energy scale of inflation. B-mode results using BICEP data through the 2018 observing season continue to be world-leading in constraining r ($r < 0.036$ at 95% confidence) at an uncertainty of $\sigma(r) = 0.009$. At levels lower than this, gravitational lensing of the CMB from large-scale structure becomes a key foreground that contributes to the uncertainty. SPO plans to leverage the higher angular resolution of SPT to enable delensing of the CMB to separate out primordial B-modes from the lensing foreground and push to lower uncertainty. Hardware improvements will also play a major role, including the upcoming BICEP Array 90/150 GHz receiver and SPT-3G+ camera. In this talk, I will summarize the history up to the current state of r constraints, give a preview for BICEP and SPT hardware upgrades, and present SPO's road map for reaching $\sigma(r) \sim 0.001$ by 2034.

Other topic / keywords:

Author: MACKEY, Scott (University of Chicago)

Presenter: MACKEY, Scott (University of Chicago)

Track Classification: Cosmic Microwave Background; Inflation / Primordial Perturbations

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

Submitted by **MACKEY, Scott** <scmackey@uchicago.edu> on **Saturday, 2 May 2026**

Abstract ID : 360

Relativistic Effects in Large-Scale Structure at Higher Order

Content

In this talk, I will present a second-order calculation of relativistic large-scale-structure observables in cosmological perturbation theory. I will do so by decomposing these into the simplest observables, the “cosmic rulers and clock”, which are the building-blocks of any other large-scale-structure observable, including galaxy number counts, on large scales. I will show how to calculate them using a fully non-linear covariant definition of the observables. Then, I will validate these formulæ on three non-trivial space-time metrics: two of them are null tests on metrics which are obtained by applying a gauge transformation to the background space-time, while the third is the “separate universe” curved background, for which we can also compute the observables exactly. I will then illustrate the results by evaluating the second-order observables in a simplified symmetric set-up. The results of this paper form a significant (and the most complicated) part of the relativistic galaxy number density at second order.

Other topic / keywords:

Author: GINAT, Barry (University of Oxford)

Co-authors: Prof. DESJACQUES, Vincent (Technion); Dr JEONG, Donghui (The Pennsylvania State University); SCHMIDT, Fabian (Max Planck Institute for Astrophysics); Mr VILLEY, Antoine (LAPTh CNRS)

Presenter: GINAT, Barry (University of Oxford)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Comments:

If only one talk is possible, then abstract #362 on “Dark Matter and Stellar Dynamics Around Massive Black Holes” is my top preference.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Mixed: Accept, Reject

Reviews:

HILDEBRANDT, Hendrik: **Reject • 2.0** (Not clear from the abstract how this is relevant.)

Abstract rating 2

KUIJKEN, Koen: **Accept: Poster • 3.0** (high-precision effects in LSS - not clear whether already important to consider, but theory is good!

Note author prefers other submitted abstract so → poster?)

Abstract rating 3

Submitted by **GINAT, Barry** <yb.ginat@physics.ox.ac.uk> on **Saturday, 2 May 2026**

Abstract ID : 361

The Small-Scale Limit of the Cold-Dark-Matter Power-Spectrum

Content

The matter power spectrum $P(k)$ is one of the fundamental quantities in the study of large-scale structure in cosmology, and measures the amplitude of density fluctuations on a scale k . In this talk, I will describe its small-scale asymptotic limit, and give a theoretical argument to the effect that, for cold dark matter, $P(k)$ has a universal asymptotic scaling with the wave-number k , for $k \gg k_{\text{nl}}$, viz. $P(k) \sim k^{-3}$. I will explain how gravitational collapse drives a phase-space flow of structure to small phase-space scales, and how this balance dictates the k dependence of the power spectrum. I will show Vlasov-Poisson simulations that support the theory, and also describe a stationary-phase technique for deriving an equivalent result.

Other topic / keywords:

Kinetic theory

Author: GINAT, Barry (University of Oxford)

Co-authors: Mr NASTAC, Michael (University of Oxford); Dr EWART, Robert (Princeton University); Dr KONRAD, Sara (Heidelberg University); Prof. BARTELMANN, Matthias (Heidelberg University); Prof. SCHEKOCHIHIN, Alexander (University of Oxford)

Presenter: GINAT, Barry (University of Oxford)

Track Classification: Large-Scale Structure; Dark Matter; Others (Please specify below)

Contribution Type: Talk

Comments:

If only one talk is possible, then abstract #362 on "Dark Matter and Stellar Dynamics Around Massive Black Holes" is my top preference.

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Mixed: Accept, Reject

Reviews:

HILDEBRANDT, Hendrik: **Reject • 2.0** (Similar to the previous abstract by the same author (!) I am not sure what the relevance is.
How can the same author submit two abstracts anyway?)

Abstract rating 2

KUIJKEN, Koen: **Accept: Poster • 3.0** (prefers another abstract he submitted (1 of 3? his preferred abstract is to another track). This is an interesting topic but DM-only statistical physics is very theoretical. Poster?)

Abstract rating 3

Submitted by **GINAT, Barry** <yb.ginat@physics.ox.ac.uk> on **Saturday, 2 May 2026**

Abstract ID : 362

Dark Matter and Stellar Dynamics Around Massive Black Holes

Content

In this talk, I will describe how to use stellar dynamics to constrain the distribution of dark matter around super-massive black holes, in two cases. First, concerning gravitational atoms of fuzzy dark matter (FDM) around black holes with nuclear stellar discs (like the Milky Way's): I will show that if the atom is in a spherically asymmetric state, there will be a differential torque on the disc that could disrupt it; any observations of the existence and stability of this disc can thus be used to put constraints on the FDM particle mass. Moving on to cold dark matter, I will describe how the interaction of a "dark matter spike" (a strong density cusp that can exist around black holes) with the stellar population in the nuclear cluster can lead to markedly different behaviour and density profiles, to the extent that most of the spike is sometimes evaporated. For both cases, I will describe which black-hole masses (and other parameter values) are most sensitive to these effects.

Other topic / keywords:

Super-massive black holes

Authors: GINAT, Barry (University of Oxford); Mr SHARPE, Charlie (University of Oxford)

Co-authors: Prof. KOCSIS, Bence (University of Oxford); Dr SPIEKSMAN, Thomas (University of Oxford)

Presenter: GINAT, Barry (University of Oxford)

Track Classification: Dark Matter; Gravitational Waves; Others (Please specify below)

Contribution Type: Talk

Comments:

If only one talk is possible, this is my top preference.

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

GAROFFOLO, Alice: **Accept: Talk • 4.0** (Better if in Dark Matter track)

Abstract rating 4

MALHOTRA, Aamek: **Accept: Talk • 4.0** (Better for DM)

Abstract rating 4

Submitted by **GINAT, Barry** <yb.ginat@physics.ox.ac.uk> on **Saturday, 2 May 2026**

Abstract ID : 363

Audible Axion Magnetogenesis

Content

Axion-like particles coupled to the Standard Model photon are able to simultaneously generate a gravitational wave background and primordial magnetic fields, providing a multi-messenger probe of a promising dark matter candidate.

Mechanisms like trapped misalignment can delay the onset of oscillations, inducing a period of supercooling in the early Universe. The supercooling then allows for exponential production of photon quanta via a tachyonic instability, generating observable gravitational wave signatures.

In this talk, we show that reheating of the Standard Model plasma simultaneously produces strong, helical magnetic fields on intergalactic scales. The parameter space most promising for gravitational wave detection yields magnetic field strengths that exceed lower bounds from blazar observations.

Other topic / keywords:

Authors: GERLACH, Christopher (Johannes Gutenberg University Mainz); SCHMITT, Daniel (KIT); SCHWALLER, Pedro

Presenter: GERLACH, Christopher (Johannes Gutenberg University Mainz)

Track Classification: Primordial Magnetic Fields

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Primordial Magnetic Fields:

Judgments: Positive: Talk

Reviews:

IARYGINA, Oksana: **Accept: Talk • 5.0**

Abstract rating 5

Submitted by **GERLACH, Christopher** <cgerlach@uni-mainz.de> on **Saturday, 2 May 2026**

Abstract ID : 364

Superhorizon Isocurvature as a Window into Dark Matter Production

Content

Searches for neutrino isocurvature usually constrain a specific linear combination of isocurvature perturbations. We will discuss realistic cosmological scenarios and argue that in general both, neutrino and matter isocurvature perturbations are generated, whose ratio we parameterize by a newly introduced mixing angle. We obtain the first limits on this new mixing angle from PLANCK data, and find modest evidence for non-vanishing pure neutrino isocurvature.

We further show that in the presence of non-zero dark radiation isocurvature, the induced dark matter isocurvature can distinguish different production mechanisms such as freeze-in and freeze-out.

Other topic / keywords:

Authors: GERLACH, Christopher (Johannes Gutenberg University Mainz); RATZINGER, Wolfram (Weizmann Institute); SCHWALLER, Pedro

Presenter: SCHWALLER, Pedro

Track Classification: Dark Matter; Inflation / Primordial Perturbations; Early Universe

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Inflation / Primordial Perturbations:

Judgments: Positive

Reviews:

CESPEDES, Sebastian: **Accept • 4.0**

Abstract rating 4

Submitted by **SCHWALLER, Pedro** <pedro.schwaller@uni-mainz.de> on **Saturday, 2 May 2026**

Abstract ID : 365

HETDEX [OII] galaxies at $z < 0.48$: Volume-limited samples and their power spectra

Content

The Hobby-Eberly Telescope Dark Energy Experiment (HETDEX) delivers an unprecedented catalog of over two million emission-line-selected galaxies through its untargeted IFU spectroscopic survey using the VIRUS spectrograph on the 10m HET. The first public data release (PDR1) includes approximately half a million [OII] emitters at $z \leq 0.48$, providing a unique and complementary probe of large-scale structure in the low-redshift universe. Leveraging HETDEX's high sensitivity and unbiased emission-line selection, we construct volume-limited subsamples of [OII] emitters with comoving number densities of $2-5 \times 10^{-3} (\text{h/Mpc})^3$, a factor of five to ten higher than those of typical cosmological spectroscopic surveys. These volume-limited samples avoid the redshift-dependent selection biases inherent to flux-limited catalogs, simplifying the radial selection function and enabling more robust clustering measurements. We present the galaxy clustering analysis of these samples, discussing their cosmological implications with a HOD modeling of these samples.

Other topic / keywords:

Observational cosmology, Large-scale structure of Universe, Galaxies

Authors: KOMATSU, Eiichiro (MPA); MOON, Jeongin (Max-Planck Institute for Astrophysics)

Presenter: MOON, Jeongin (Max-Planck Institute for Astrophysics)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Positive: Talk

Reviews:

HILDEBRANDT, Hendrik: **Accept: Talk • 5.0** (Interesting complementary measurements that one does not hear too often about.)

Abstract rating 5

KUIJKEN, Koen: **Accept: Talk • 5.0** (yes!)

Abstract rating 5

Submitted by **MOON, Jeongin** <jmoon@mpa-garching.mpg.de> on **Saturday, 2 May 2026**

Abstract ID : 366

Forward-Modelling Galaxy Surveys: A Robust Analytic Model for Projected Galaxy Bias

Content

Galaxies, as tracers of the large-scale structure of the Universe, are key observables for testing cosmological models in the late Universe and into the non-linear regime. In this context, multi-scale baryonic dynamics, and their evolution over time, can have considerable effects on the galaxy-halo connection. If unmodelled, residual uncertainties in the galaxy field can obstruct cosmological inference and weaken tests of extensions to Λ CDM. In two-dimensional projection along the line-of-sight, the relevant halo-level information can be incomplete or effectively marginalised over. To this end, I will present an analytic galaxy bias model in projection that incorporates stochasticity and non-locality already at linear order, while enforcing physicality. I will show how the model can be calibrated to the projected power spectrum measured in hydrodynamical simulations to sample galaxy populations from simulated matter fields while conditioning on selected galaxy properties. The model matches the two-point statistics down to the simulations' resolution by construction, while recovering the bispectrum down to ~ 10 Mpc up to $z=3$. The model better reproduces non-linearities driven by correlations between the local amplitude of the galaxy field and its phase, as well as the field's mode coupling, than a local bias model across most scales and down to low halo masses. This improves the robustness of joint clustering plus galaxy-galaxy lensing consistency tests of the growth of structure, helping to separate astrophysical systematics from genuine scale-dependent structure growth. Finally, I will demonstrate how this framework enables efficient field-level forward modelling of galaxy positions consistent with hydrodynamical simulations, providing a practical route towards simulation-based inference and principled model comparison with surveys such as Euclid and Rubin LSST.

Other topic / keywords:

Author: VON WIETERSHEIM-KRAMSTA, Maximilian (Durham University)

Presenter: VON WIETERSHEIM-KRAMSTA, Maximilian (Durham University)

Track Classification: Large-Scale Structure

Contribution Type: Talk

Comments:

Late submission

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:**Judgments:** Positive**Reviews:**KUIJKEN, Koen: **Accept • 4.0** (bias model, relevant. link to SBI)

Abstract rating 4

HILDEBRANDT, Hendrik: **Accept • 4.0**

Abstract rating 4

Submitted by **SCHALLER, Matthieu** <mschaller@lorentz.leidenuniv.nl> on **Monday, 4 May 2026**

Abstract ID : 367

New constraints on sterile neutrino thermalisation

Content

In this work, we revisit the problem of sterile neutrino thermalisation for MeV reheating temperatures with the full oscillation paradigm of the 3+1 scheme, extending the analysis that we recently carried out in the absence of sterile neutrinos. For the first time, we consider the effect of all mixing angles, fixing those exclusive of active neutrinos to the values obtained in global-fit analyses but leaving the three active-sterile angles as free parameters. The evolution of neutrinos is obtained with a modified version of the FortEPiNO code and the bounds on active-sterile parameters and the reheating temperature are computed using the latest available cosmological data. In particular, we performed a joint analysis that combines constraints from Big Bang Nucleosynthesis, the Cosmic Microwave Background, and galaxy surveys, alongside separate investigations of these datasets and forecasts for next-generation experiments.

Other topic / keywords:

Author: BARBIERI, Nicola (IFIC (CSIC-UV))

Presenter: BARBIERI, Nicola (IFIC (CSIC-UV))

Track Classification: Neutrinos

Contribution Type: Talk

Comments:

Late submission

Status: SUBMITTED

Track Reviews:

Neutrinos:

Judgments: Positive: Talk

Reviews:

GERBINO, Martina: **Accept: Talk • 4.0**

Abstract rating 4

Submitted by **SCHALLER, Matthieu** <mschaller@lorentz.leidenuniv.nl> on **Tuesday, 5 May 2026**

Abstract ID : 368

Dark matter phase-in: Producing dark matter particles after a first-order phase transition

Content

If dark matter is produced non-thermally via non-renormalisable interactions (so-called UV-dominated freeze-in), the resulting abundance depends sensitively on the details of reheating. This sensitivity can however be much reduced in the presence of a cosmological first-order phase transition, after which the decaying scalar field transfers its energy density to the SM radiation, thereby diluting pre-existing particle abundances. I will discuss how this phase-in mechanism introduces a dependence of the final DM abundance on the details of the phase transition, in particular the equation of state of the universe. Using results from lattice simulations, I will show that large gradients in the scalar field persist even after the bubble collisions, leading to an equation of state that differs significantly from the one of non-relativistic matter. Larger Lorentz factors of the bubble walls lead to higher-momentum modes in the power spectrum of the scalar field, corresponding to a more radiation-like equation of state. These results affect the dark matter abundance as well as other cosmological observables linked to the phase transition.

Other topic / keywords:

Author: KAHLHOEFER, Felix (Karlsruhe Institute of Technology)

Presenter: KAHLHOEFER, Felix (Karlsruhe Institute of Technology)

Track Classification: Dark Matter; Early Universe

Contribution Type: Talk

Comments:

Late submission

Status: SUBMITTED

Submitted by **SCHALLER, Matthieu** <mschaller@lorentz.leidenuniv.nl> on **Tuesday, 5 May 2026**

Abstract ID : 369

Semi-Analytical Evolution of Axion Inflation Through Weak to Strong Backreaction

Content

Axion inflation with a Chern-Simons coupling to gauge fields provides a well-motivated and phenomenologically rich realization of the early universe. The rolling axion tachyonically amplifies one gauge helicity, and for sufficiently large coupling this production becomes strong enough to back react on the axion background resulting in a non-linear axion evolution. In this work, we develop a semi-analytical description of the homogeneous axion dynamics that follows the system continuously from weak to strong backreaction. We derive a simple effective equation of motion for the axion zero mode that incorporates the delayed gauge response and provides a unified description of the homogeneous evolution from weak to strong backreaction. This formulation captures both the onset of backreaction and the subsequent approach from unstable to a stable Anber Sorbo type attractor branch. We show that this stable regime is consistent with recent analytical and numerical approaches, and identify the conditions controlling the transition between the weak and strong backreaction regimes. We then use this homogeneous treatment as a foundation for extending the model to inhomogeneous axion perturbations, with the goal of understanding how local nonlinear dynamics modifies the evolution.

Other topic / keywords:

Author: KULKARNI, Aditya (University of Massachusetts, Amherst)

Presenter: KULKARNI, Aditya (University of Massachusetts, Amherst)

Track Classification: Inflation / Primordial Perturbations

Contribution Type: Talk

Comments:

Late submission

Status: SUBMITTED

Submitted by **SCHALLER, Matthieu** <mschaller@lorentz.leidenuniv.nl> on **Friday, 8 May 2026**

Abstract ID : 370

When Tiny Halos Stir Spacetime : Gravitational Waves from Fifth-Force Mergers

Content

Dark matter fermions interacting via attractive Yukawa forces mediated by a light mediator can form dark matter halos in the very early universe. We show that bound systems composed of these halos are capable of generating gravitational wave (GW) signals detectable today, even when the individual halos are significantly lighter than the solar mass. The Yukawa force dominates the dynamics of these halo binaries, rather than gravity. As a result, large GW signals can be produced at initially extremely high frequencies, which are then redshifted to frequency bands accessible to current or future GW observatories. In addition, the resulting GW signals carry distinctive features that enable future observations to distinguish them from conventional ones. Notably, even if only a small fraction of dark matter experiences strong fifth-force interactions, such effects provide a new avenue to discover self-interacting dark matter through GW observations.

Other topic / keywords:

Author: WANG, Xinpeng (IPMU)

Presenter: WANG, Xinpeng (IPMU)

Track Classification: Gravitational Waves

Contribution Type: Talk

Comments:

Late submission

Status: SUBMITTED

Track Reviews:

Gravitational Waves:

Judgments: Positive: Talk

Reviews:

MALHOTRA, Aameek: **Accept: Talk • 4.0**

Abstract rating 4

GAROFFOLO, Alice: **Accept • 4.0**

Abstract rating 4

Submitted by **SCHALLER, Matthieu** <mschaller@lorentz.leidenuniv.nl> on **Friday, 8 May 2026**

Abstract ID : 371

Constraining EFTofLSS counterterms with Weak lensing

Content

We present constraints on Effective Field Theory of Large-Scale Structure (EFTofLSS) counterterms using weak gravitational lensing data and the Sym-EFT emulator [arXiv:2511.05093]. The emulator enables fast and accurate predictions for nonlinear matter power spectrum up to two loops. We study the sensitivity of weak lensing observables to EFT contributions and explore the constraining power of current lensing data on effective parameters describing nonlinear clustering. Our results demonstrate the potential of combining EFT-based modelling with weak lensing measurements for precision cosmology applications.

Other topic / keywords:

Author: FARAKOU, Despoina

Presenter: FARAKOU, Despoina

Track Classification: Large-Scale Structure

Contribution Type: Talk

Comments:

Late submission

Status: SUBMITTED

Track Reviews:

Large-Scale Structure:

Judgments: Mixed: Proposed for other tracks: Methods / Statistical Inference / Machine Learning

Reviews:

HILDEBRANDT, Hendrik: **Change track • 3.0** (Better suited for methods session.)

Abstract rating 3

Submitted by **SCHALLER, Matthieu** <mschaller@lorentz.leidenuniv.nl> on **Monday, 11 May 2026**