4th EuCAPT Annual Symposium

Report of Contributions

https://indico.cern.ch/e/1335106

Contribution ID: **5** Type: **early universe cosmology**

Backreaction of axion-SU(2) dynamics during inflation

Wednesday, 15 May 2024 11:54 (5 minutes)

Nowadays, the search for primordial gravitational waves is mainly focused on the parity-odd polarization pattern in the CMB - the B-modes. A correct interpretation of B-mode measurements strongly relies on understanding their production mechanism. One intriguing scenario is gravitational waves generation by gauge fields. The tachyonic amplification of the gauge fields modes during inflation leads to significant backreaction on the background dynamics. In this talk, I will discuss how the backreaction on axion-SU(2) dynamics during inflation leads to a new dynamical attractor solution for the axion field and the vacuum expectation value of the gauge field. These findings are of particular interest to the phenomenology of axion-SU(2) inflation, redefining parts of the viable parameter space. The backreaction effects lead to characteristic oscillatory features in the primordial gravitational wave background that are potentially detectable with upcoming gravitational wave detectors.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: IARYGINA, Oksana (Nordita)

Co-authors: BRANDENBURG, Axel (Nordita); SFAKIANAKIS, Evangelos; Dr SHARMA, Ramkishor (Nordita)

Presenter: IARYGINA, Oksana (Nordita)

Session Classification: Early Universe

Contribution ID: **6** Type: **dark matter**

X-rays constraints on sub-GeV Dark Matter

Wednesday, 15 May 2024 16:17 (5 minutes)

We present updated constraints on 'light' Dark Matter (DM) particles with masses between 1 MeV and 5 GeV. In this range, we can expect DM-produced pairs to upscatter low-energy ambient photons in the Milky Way via the Inverse Compton process, and produce a flux of X-rays that can be probed by a range of space observatories. Using diffuse X-ray data from XMM-Newton and realistic cosmic-ray transport parameters, we compute the strongest constraints to date on annihilating and decaying DM for 1 MeV < $m_{\rm DM}$ < 5 GeV

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: KOECHLER, Jordan (LPTHE - Sorbonne Université (France))

Presenter: KOECHLER, Jordan (LPTHE - Sorbonne Université (France))

Session Classification: Dark Matter

Contribution ID: **7** Type: **poster**

Probing interacting dark sector models with future weak lensing-informed galaxy cluster abundance constraints from SPT-3G and CMB-S4

We forecast the sensitivity of ongoing and future galaxy cluster abundance measurements to detect deviations from the cold dark matter (CDM) paradigm. Concretely, we consider a class of dark sector models that feature an interaction between dark matter and a dark radiation species (IDM-DR). This setup can be naturally realized by a non-Abelian gauge symmetry and has the potential to explain S_8 tensions arising within ΛCDM.
We create mock catalogs of the ongoing SPT-3G as well as the future CMB-S4 surveys of galaxy clusters selected via the thermal Sunyaev-Zeldovich effect (tSZE). Both datasets are complemented with cluster mass calibration from next-generation weak gravitational lensing data (ngWL) like those expected from the Euclid mission and the Vera C. Rubin Observatory. We consider an IDM-DR scenario with parameters chosen to be in agreement with Planck 2018 data and that also leads to a low value of S_8 as indicated by some local structure formation analyses.
Accounting for systematic and stochastic uncertainties in the mass determination and the cluster tSZE selection, we find that both SPT-3G×ngWL and CMB-S4×ngWL cluster data will be able to discriminate this IDM-DR model from ΛCDM, and thus test whether dark matter - dark radiation interactions are responsible for lowering S_8. Assuming IDM-DR, we forecast that the temperature of the dark radiation can be determined to about 40% (10%) with SPT-3G×ngWL (CMB-S4×ngWL), considering 68% credibility, while S_8 can be recovered with percent-level accuracy. Furthermore, we show that IDM-DR can be discriminated from massive neutrinos, and that cluster counts will be able to constrain the dark radiation temperature to be below ~ 10

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: MAZOUN, Asmaa

Co-authors: Dr RUBIRA, Henrique (TUM); Prof. MOHR, Joseph (LMU); Dr GARNY, Mathias (TUM); Dr BOCQUET, Sebastian (LMU); Mrs VOGT, Sophie (LMU)

Presenter: MAZOUN, Asmaa

Session Classification: Reception and Poster Session

Contribution ID: **8** Type: **poster**

Shedding light on the Δm^2_{21} tension with supernova neutrinos

One long-standing tension in the determination of neutrino parameters is the mismatched value of the solar mass square difference, Δm^2_{21}, measured by different experiments: the reactor antineutrino experiment KamLAND finds a best fit larger than the one obtained with solar neutrino data. Even if the current tension is mild ($\sim 1.5\sigma$), it is timely to explore if independent measurements could help in either closing or reassessing this issue. In this regard, we explore how a future supernova burst in our galaxy could be used to determine Δm^2_{21} at the future Hyper-Kamiokande detector, and how this could contribute to the current situation. We study Earth matter effects for different models of supernova neutrino spectra and supernova orientations. We find that, if supernova neutrino data prefers the KamLAND best fit for Δm^2_{21}, an uncertainty similar to the current KamLAND one could be achieved. On the contrary, if it prefers the solar neutrino data best fit, the current tension with KamLAND results could grow to a significance larger than 5σ. Furthermore, supernova neutrinos could significantly contribute to reducing the uncertainty on $\sin^2\theta_{12}$.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: MENA, Olga; HAJJAR MUÑOZ, Rasmi Enrique (IFIC (CSIC-UV)); Dr PALOMARES-RUIZ, SERGIO (IFIC (CSIC - UV))

Presenter: HAJJAR MUÑOZ, Rasmi Enrique (IFIC (CSIC-UV))

Session Classification: Reception and Poster Session

Contribution ID: **12** Type: **dark matter**

Riding the dark matter wave: Novel limits on general dark photons from LISA Pathfinder

Wednesday, 15 May 2024 16:24 (5 minutes)

I will point out the possibility to perform a parametrically improved search for gauged baryon (B) and baryon minus lepton ($B-L$) Dark Photon Dark Matter (DPDM) using auxiliary channel data from LISA Pathfinder. In particular I will show how to use the measurement of the differential movement between the test masses (TMs) and the space craft (SC) which is nearly as sensitive as the tracking between the two TMs. TMs and SC are made from different materials and therefore have different charge-to-mass ratios for both $B-L$ and B. Thus, the surrounding DPDM field induces a relative acceleration of nearly constant frequency. For the case of $B-L$, I will demonstrate that LISA Pathfinder can constrain previously unexplored parameter space, providing the world leading limits in the mass range $4 \cdot 10^{-19}$ eV $\leq m \leq 3 \cdot 10^{-17}$ eV. This limit can easily be recast also for dark photons that arise from gauging other global symmetries of the SM.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: FRERICK, Jonas

Co-authors: KAHLHOEFER, Felix (Karlsruhe Institute of Technology); JAECKEL, Joerg (ITP Heidelberg); SCHMIDT-HOBERG, Kai Ronald (Deutsches Elektronen-Synchrotron (DE))

Presenter: FRERICK, Jonas

Session Classification: Dark Matter

Contribution ID: **13** Type: **poster**

Poster: Bubble-Wall Velocity from Hydrodynamical Simulations

Terminal velocity reached by bubble walls in first-order phase transitions is an important parameter determining both primordial gravitational wave spectrum and the production of baryon asymmetry in models of electroweak baryogenesis. We developed a numerical code to study the real-time evolution of expanding bubbles and investigate how their walls reach stationary states. Our results agree with profiles obtained within the so-called bag model with very good accuracy; however, not all such solutions are stable and realized in dynamical systems. Depending on the exact shape of the potential there is always a range of wall velocities where no steady-state solutions exist. This behavior in deflagrations was explained by hydrodynamical obstruction where solutions that would heat the plasma outside the wall above the critical temperature and cause local symmetry restoration are forbidden. For even more affected hybrid solutions causes are less straightforward. In addition, we show that in local thermal equilibrium, stationary states are reached only in narrow range of parameters and runaways are generic scenarios due to early-stages evolution of the bubble-wall.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: ZYCH, Mateusz (University of Warsaw)

Co-authors: Dr LEWICKI, Marek (University of Warsaw); KRAJEWSKI, Tomasz (University of Warsaw)

Presenter: ZYCH, Mateusz (University of Warsaw)

Session Classification: Reception and Poster Session

Contribution ID: **14** Type: **gravitational waves**

Timekeepers of the Universe: The recent gravitational wave observation and Primordial black holes

Thursday, 16 May 2024 11:47 (5 minutes)

Primordial black holes (PBHs) are currently in the spotlight as they may solve several open questions in astrophysics and cosmology.
We describe an exact formalism for the computation of the abundance of PBHs in the presence of local non-gaussianity (NG).
Then, we describe the phenomenological relevance of our results for the connection between the abundance of PBHs and the
stochastic gravitational wave (GW) background related to their formation. As NGs modify the amplitude of perturbations necessary to produce a given PBHs abundance, modelling these effects is crucial to connect the PBH scenario to its signatures at current and future GWs experiments such as the recent data release by PTA collaborations

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary author: IOVINO, Antonio Junior (Università di Roma "La Sapienza")

Co-authors: URBANO, Alfredo; Mrs FRANCIOLINI, Gabriele; VEERMÄE, Hardi (National Institute of Chemical Physics and Biophysics (EE)); Dr VASKONEN, Ville

Presenter: IOVINO, Antonio Junior (Università di Roma "La Sapienza")

Session Classification: Gravitational Waves

Contribution ID: **18** Type: **late universe**

A model-independent test of gravity from the Weyl potential evolution

Tuesday, 14 May 2024 11:47 (5 minutes)

To test the vast number of modified gravity models, a systematic and comprehensive approach is necessary when analysing the data from cosmological surveys. The novel observable \hat{J}, capturing the evolution of the combined gravitational potential Ψ + Φ, provides a powerful and model-independent test of gravity. Recently, we have performed the first measurement of this observable from Dark Energy Survey data (C. Bonvin, I. Tutusaus & N. Grimm, arXiv:2312.06434), combining galaxy-galaxy lensing and galaxy clustering data. Interestingly, we find a tension with the prediction of the standard cosmological model, reaching 3.1 sigma at z=0.48. In my lightning talk, I will present this novel observable and demonstrate its remarkable capacity to test gravity in a model-independent manner.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: GRIMM, Nastassia; Dr TUTUSAUS, Isaac; Dr BONVIN, Camille

Presenter: GRIMM, Nastassia

Session Classification: Late Universe

Contribution ID: **19** Type: **poster**

Imprints of dark stars in the 21-cm signal

A strongly self-interacting component of dark matter can lead to formation of compact objects. These objects (dark stars) can in principle be detected by emission of gravitational waves from coalescence with black holes or other neutron stars or via gravitational lensing. However, in the case where dark matter admits annihilations, these compact dark matter made objects can have significant impact on the cosmic reionization and the 21-cm signal. We demonstrate that even if dark matter has suppressed annihilations, dark stars could inject a substantial amount of photons that would interact with the intergalactic medium. For dark matter parameters compatible with current observational constraints, dark stars could modify the observed reionization signal in a considerable way.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: BETANCOURT KAMENETSKAIA, Boris (Technical University of Munich)

Co-authors: Dr IBARRA, Alejandro (Technical University of Munich); Dr KOUVARIS, Chris (National Technical University of Athens)

Presenter: BETANCOURT KAMENETSKAIA, Boris (Technical University of Munich)

Session Classification: Reception and Poster Session

Contribution ID: **20** Type: **particle astrophysics**

Fast particle acceleration in 3D hybrid simulations of quasi-perpendicular shocks

Tuesday, 14 May 2024 16:50 (5 minutes)

Understanding the conditions conducive to particle acceleration at collisionless, non-relativistic shocks is important for the origin of cosmic rays. We use hybrid (kinetic ions—fluid electrons) kinetic simulations to investigate particle acceleration and magnetic field amplification at non-relativistic, weakly magnetized, quasi-perpendicular shocks. So far, no self-consistent kinetic simulation has reported non-thermal tails at quasi-perpendicular shocks. Unlike 2D simulations, 3D runs show that protons develop a non-thermal tail spontaneously (i.e., from the thermal bath and without pre-existing magnetic turbulence). They are rapidly accelerated via shock drift acceleration up to a maximum energy determined by their escape upstream. We discuss the implications of our results for the phenomenology of heliospheric shocks, supernova remnants and radio supernovae.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary author: ORUSA, Luca (Princeton University)

Co-author: Prof. CAPRIOLI, Damiano (University of Chicago)

Presenter: ORUSA, Luca (Princeton University)

Session Classification: Particle Astrophysics

Contribution ID: **21** Type: **poster**

Poster: Primordial Non-Gaussianity in Spectral Distortions and PBH constraints

Distortions of μ-type in the frequency spectrum of CMB photons are bounded by FIRAS observations. Since peaks in the primordial scalar power spectrum at small scales can enhance them, FIRAS data can be used to set limits on the Primordial Black Hole (PBH) abundance. However, such peaks usually come together with some non-Gaussian statistics in the primordial curvature spectrum which is usually neglected when deriving bounds on PBH abundance. This caveat has often been invoked to discard such bounds. After studying and comparing various approximation schemes to compute μ-distorsions with good accuracy, we show how to deal with non-Gaussianity of the local type, either for a perturbative case or a full χ^2 distribution. Finally, we show that bounds on PBH abundance derived from FIRAS bounds on μ-distorsions are robust against the assumption of non-gaussian statistics. This talk will be based on two articles in collaboration with C. Byrnes and J. Lesgourgues that will be published before this symposium.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: SHARMA, Devanshu

Co-authors: BYRNES, Christian (University of Sussex (GB)); LESGOURGUES, Julien (TTK, RWTH Aachen University)

Presenter: SHARMA, Devanshu

Session Classification: Reception and Poster Session

Contribution ID: **23** Type: **poster**

Poster: Leptogenesis in the superweak extension of the standard model

In this contribution we investigate the viability of leptogenesis in the superweak extension of the standard model. We focus on the parameter space of the model with relatively light sterile neutrinos with masses comparable to the electroweak scale and a new singlet scalar that is heavier than the Higgs boson. We present a comprehensible analysis of leptogenesis within the model with interaction rates and the evolution of the vacuum expectation values of the scalar sector evaluated at finite temperature.
Based on yet unpublished results and *JHEP* **04** (2023) 096.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: SELLER, Károly (ELTE Eötvös Loránd University)

Presenter: SELLER, Károly (ELTE Eötvös Loránd University)

Session Classification: Reception and Poster Session

Contribution ID: **26** Type: **particle astrophysics**

Status of Direct Determination of Solar Neutrino Fluxes after Borexino

Tuesday, 14 May 2024 16:15 (5 minutes)

We determine the solar neutrino fluxes from the global analysis of the most up-to-date terrestrial and solar neutrino data including the final results of the three phases of Borexino. The analysis are performed in the framework of three-neutrino mixing with and without accounting for the solar luminosity constraint. We discuss the independence of the results on the input from the Gallium experiments. The determined fluxes are then compared with the predictions provided by the latest Standard Solar Models. We quantify the dependence of the model comparison with the assumptions about the normalization of the solar neutrino fluxes produced in the CNO-cycle as well as on the particular set of fluxes employed for the model testing.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary author: PINHEIRO, Joao Paulo (Universitat de Barcelona)

Presenter: PINHEIRO, Joao Paulo (Universitat de Barcelona)

Session Classification: Particle Astrophysics

Contribution ID: **27** Type: **poster**

Poster: Non-linear analysis of primordial perturbations

The non-Gaussian tail of the PDF of primordial scalar perturbations is a key element to determine the abundance of primordial black holes. These primordial non-Gaussianities arise, at least partly, from the non-linear, super-horizon dynamics of inflationary perturbations. Such non-linearities have been computed by combining classical non-linear techniques (the δN formalism) with the stochastic formalism of inflation. In our work, we reconsider the underlying assumptions and implications of this calculation using both numerical and analytical methods, assessing the validity of several approximations commonly used in the literature.

Based on work currently in progress with Guillermo Ballesteros, Thomas Konstandin, Mathias Pierre and Julian Rey.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: PEREZ RODRIGUEZ, Alejandro (Universidad Autonoma de Madrid); BALLESTEROS, Guillermo (IFT UAM-CSIC); REY IDLER, Julian Leonardo (CERN); PIERRE, Mathias; KONSTANDIN, Thomas

Presenter: PEREZ RODRIGUEZ, Alejandro (Universidad Autonoma de Madrid)

Session Classification: Reception and Poster Session

Contribution ID: **28** Type: **particle astrophysics**

New bounds on monopole abundance from cosmic magnetic fields

Tuesday, 14 May 2024 16:43 (5 minutes)

Magnetic monopoles are intriguing hypothetical particles and inevitable predictions of Theories of Grand Unification. They are produced during phase transitions in the early universe, but mechanisms like the Schwinger effect in strong magnetic fields could also contribute to the monopole number density. I will show how from the detection of intergalactic magnetic fields we can infer additional bounds on the magnetic monopole flux, and how even well-established limits, such as Parker bounds and limits from terrestrial experiments, are affected by the acceleration in cosmic magnetic fields. I will also discuss the implications of these bounds for minicharged monopoles and magnetic black holes as dark matter candidates.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: PERRI, Daniele (SISSA Trieste, Trieste)

Presenter: PERRI, Daniele (SISSA Trieste, Trieste)

Session Classification: Particle Astrophysics

Contribution ID: **30** Type: **dark matter**

Global Fits of sub-GeV Dark Matter

Wednesday, 15 May 2024 16:31 (5 minutes)

Sub-GeV dark matter (DM) has been gaining significant interest in recent years, since it can account for the thermal relic abundance while evading nuclear recoil direct detection constraints. However, sub-GeV DM is still subject to a number of constraints from laboratory experiments, and from astrophysical and cosmological observations. In this work, we compare these observations with the predictions of two sub-GeV DM models (Dirac fermion and scalar DM) within frequentist and Bayesian global analyses using the Global And Modular BSM Inference Tool (GAMBIT). We infer the regions in parameter space preferred by current data, and compare with projections of near-future experiments.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: GRAY, Taylor (Chalmers University of Technology)

Presenter: GRAY, Taylor (Chalmers University of Technology)

Session Classification: Dark Matter

Contribution ID: **32** Type: **poster**

Poster: Insights into the highest natural scale

We apply the criterion of finite naturalness to the limiting case of a generic heavy sector decoupled from the standard model. The sole and inevitable exception is represented by gravitational interactions. We demonstrate how gravity can couple the Higgs to the heavy scale well before the three-loop diagrams mediated by the top quark discussed in previous literature. As an application, we illustrate how the criterion of finite naturalness disfavors large-field inflationary models with super-Planckian field excursions.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: URBANO, Alfredo; DEL GROSSO, Loris (La Sapienza University of Rome); CATINARI, Pier Giuseppe (Sapienza)

Presenter: CATINARI, Pier Giuseppe (Sapienza)

Session Classification: Reception and Poster Session

Contribution ID: **33** Type: **poster**

Poster: Scalar perturbations from inflation in the presence of gauge fields

Different models of inflationary magnetogenesis have been receiving a lot of attention in the literature for the last two decades providing a possible explanation for the large-scale magnetic fields in voids, seeds for the astrophysical magnetic fields and having relation to baryogenesis, dark matter production, cosmological Schwinger effect etc. However, the presence of gauge fields during inflation may strongly alter the inflaton evolution, the universe expansion, and, consequently, the spectral properties of primordial perturbations generated at that time. The latter issue is extremely important as primordial perturbations later give rise to the CMB anisotropies and the large-scale structure of the universe and, thus, are strongly constrained by the observations. Although, the impact of gauge fields on primordial spectra has been studied in the literature earlier, the full and self-consistent treatment of this problem taking into account both inflaton and metric perturbations is still missing. In our work, we develop a general framework which allows one to compute the scalar power spectrum and bispectrum in a single-field inflationary model in the presence of an Abelian gauge field with kinetic and axial couplings to the inflaton which may cause a strong backreaction on the background evolution. We then apply this formalism to the model of axion inflation in the absence of backreaction and show that our results are consistent with earlier studies. Further, we plan to determine the scalar power spectrum in the regime of strong backreaction.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: Prof. DURRER, Ruth (Geneva University); Mr VON ECKARDSTEIN, Richard (University of Münster); Dr GARG, Deepen (Geneva University); SCHMITZ, Kai (Westfaelische Wilhelms-Universitaet Muenster (DE)); Dr SOBOL, Oleksandr (University of Münster); Prof. VILCHINSKII, Stanislav (Taras Shevchenko National University of Kyiv (UA))

Presenter: Dr SOBOL, Oleksandr (University of Münster)

Session Classification: Reception and Poster Session

Contribution ID: **35** Type: **poster**

A special property of natural polynomials for Schwarzschild black holes

We present a special property of natural polynomials related to the overtone label of quasi-normal modes for Schwarzschild black holes. The natural polynomials for the radial Teukolsky equation have been the subject of recent work involving quasinormal modes of Kerr black holes. These polynomials, which can be constructed using Gram-Schmidt orthogonalization, are a basis for the ringdown strain of gravitational wave signals from black hole mergers. We derive a three-term recurrence relation which allows us to shift overtone peaks using algebraically special frequencies, and to provide insight into the physical significance of the overtone index.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: GUREVICH, Michelle (King's College London)

Co-author: Dr LONDON, Lionel (KCL)

Presenter: GUREVICH, Michelle (King's College London)

Session Classification: Reception and Poster Session

Contribution ID: **36** Type: **gravitational waves**

Probes of reheating after non-Abelian axion-like inflation

Thursday, 16 May 2024 12:22 (5 minutes)

We consider a model, where a single inflaton interacts as an axion with Yang-Mills gauge bosons. As these rapidly thermalize, the friction felt by the inflaton field is increased, leading to a self-amplifying process. The corresponding gravitational wave spectrum is enhanced by thermal contributions at large confinement scales of the Yang-Mills sector, which heats up to high temperatures, yet below the critical value.
On the other hand, the gauge bosons of the thermal bath may represent part of a dark sector. Assuming a feeble coupling to the visible sector, the stable component of the dark sector satisfies the bounds on the relic abundance, if its confinement scale takes values far below those relevant to the gravitational wave signal so that the dark sector is in a deconfined phase at the end of inflation. The reheating of the Standard Model is most efficiently actuated by dark glueballs after the confinement phase transition. The latter might represent an additional source of gravitational waves.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: KOLESOVA, Helena (University of Stavanger); LAINE, Mikko Sakari (Universitaet Bern (CH)); KLOSE, Philipp (Bielefeld University); PROCACCI, Simona (University of Geneva (CH)); Dr BIONDINI, Simone (University of Basel)

Presenter: PROCACCI, Simona (University of Geneva (CH))

Session Classification: Gravitational Waves

Contribution ID: **41** Type: **early universe cosmology**

One-loop power spectrum in ultra slow-roll inflation and implications for primordial black hole dark matter

Wednesday, 15 May 2024 11:47 (5 minutes)

A possible way to generate primordial black holes as candidates for the entirety of dark matter is a large power spectrum of inflationary curvature fluctuations. Recently, questions have been raised regarding the validity of perturbation theory in this context. We compute the one-loop power spectrum in ultra-slow roll inflation, including all relevant interactions for such analysis, along with counterterms that absorb the ultraviolet divergences. We compare the one-loop and tree-level contributions to the power spectrum, finding that perturbation theory remains valid in realistic ultra-slow roll models.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: BALLESTEROS, Guillermo (IFT UAM-CSIC); GAMBIN EGEA, Jesus (Instituto de Fisica Teorica, UAM - CSIC)

Presenter: GAMBIN EGEA, Jesus (Instituto de Fisica Teorica, UAM - CSIC)

Session Classification: Early Universe

Contribution ID: **44** Type: **poster**

Impact of adiabatic fluctuations on axion minicluster formation

Axions and axion-like particles (ALPs) have gained attention as potential dark matter candidates, leading to extensive research into their detection and characterization. Energy density fluctuations in the ALP field can result in the formation of axion miniclusters (AMC), gravitationally bound configurations with implications for dark matter structure. While widely accepted in the post-inflationary Peccei-Quinn symmetry-breaking scenario, uncertainties persist regarding the pre-inflationary phase, where large initial field fluctuations may extend beyond the horizon due to inflation. We investigate the influence of adiabatic fluctuations in the primordial plasma on ALP density perturbations, revealing their significant impact on large scales and emphasizing their crucial role in AMC formation during the pre-inflationary era. This prompts questions about the reliability of using AMC detection alone to distinguish between pre- and post-inflationary axion origins.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: Dr AYAD, Ahmed (Bielefeld University)

Presenter: Dr AYAD, Ahmed (Bielefeld University)

Session Classification: Reception and Poster Session

Contribution ID: **45** Type: **early universe cosmology**

Hot Leptogenesis: A naturalness-motivated solution to baryon asymmetry

Wednesday, 15 May 2024 12:15 (5 minutes)

In standard leptogenesis models, the baryon asymmetry is initially produced as a lepton asymmetry via the out of equilibrium decays of the lightest right handed neutrino (RHN).

There are however constraints on the RHN mass that are in tension; the naturalness constraint on the Higgs mass from RHN loop corrections, i.e. the Vissani bound, puts a limit on the RHN mass which is lower than is generally required for leptogenesis to produce a sufficient baryon asymmetry (the Davidson-Ibarra bound).

Increasing the temperature of the RHN sector, known as a 'hot leptogenesis' model, allows for a boosting of the baryon asymmetry produced, allowing for both bounds to be reconciled.

Following on from the work of Bernal and Fong on hot leptogenesis from thermal dark matter, we give a comprehensive treatment of hot leptogenesis more generally; exploring the evolution of both sectors, the parameter space of the models, as well as possible UV origins for the initially thermally disconnected SM bath and the hot RHN sector.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: BHATNAGAR, Ansh (IPPP, Durham University)

Co-authors: Dr CROON, Djuna (IPPP Durham); TURNER, JESSICA; BAKER, Michael James (University of Melbourne (AU))

Presenter: BHATNAGAR, Ansh (IPPP, Durham University)

Session Classification: Early Universe

Contribution ID: **46** Type: **poster**

Eternal Freeze-Out from Bound State Effects

My talk will show how the presence of highly excited bound states changes the common assumption of Freeze-Out taking place at $T \approx M/25$. Instead of a decoupling at finite-time, particle densities deplete continuously until additional physical effects occur, e.g. phase transitions or lifetime constraints. We have applied our framework to a t-channel mediator model yielding $\mathcal{O}(1)$ corrections to the DM relic abundace.

arXiv:2308.01336, Phys.Rev.D

Publication Abstract:
We explore the impact of highly excited bound states on the evolution of number densities of new physics particles, specifically dark matter, in the early Universe. Focusing on dipole transitions within perturbative, unbroken gauge theories, we develop an efficient method for including around a million bound state formation and bound-to-bound transition processes. This enables us to examine partial-wave unitarity and accurately describe the freeze-out dynamics down to very low temperatures. In the non-Abelian case, we find that highly excited states can prevent the particles from freezing out, supporting a continuous depletion in the regime consistent with perturbativity and unitarity. We apply our formalism to a simplified dark matter model featuring a colored and electrically charged t-channel mediator. Our focus is on the regime of superWIMP production which is commonly characterized by a mediator freeze-out followed by its late decay into dark matter. In contrast, we find that excited states render mediator depletion efficient all the way until its decay, introducing a dependence of the dark matter density on the mediator lifetime as a novel feature. The impact of bound states on the viable dark matter mass can amount to an order of magnitude, relaxing constraints from Lyman-α observations.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: HEISIG, Jan (RWTH Aachen University); GARNY, Mathias (TUM); LEDERER, Stefan; BINDER, Tobias

Co-author: URBAN, Kai (Technical University Munich)

Presenter: LEDERER, Stefan

Session Classification: Reception and Poster Session

Contribution ID: **47** Type: **poster**

A dark solution to ANITA-IV events

We explore the interactions of dark fermions with the SM that could explain ANITA-IV events through a DIS with nucleons and a decay of a massive dark fermion produced from the interaction. We show the best fit regions to the results such that the model also fits IceCube non-observation.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: GRANELLI, Alessandro (University of Bologna and INFN); HOEFKEN ZINK, Jaime; PASCOLI, Silvia (Universita e INFN, Bologna (IT))

Presenter: HOEFKEN ZINK, Jaime

Session Classification: Reception and Poster Session

Contribution ID: **48** Type: **late universe**

The full-sky Spherical Fourier-Bessel power spectrum in general relativity

Tuesday, 14 May 2024 12:22 (5 minutes)

We present a full methodology for analyzing galaxy clustering on the lightcone with the 2-point correlation in the Spherical Fourier-Bessel (SFB) formalism. SFB is a natural choice to account for all wide-angle and relativistic (GR) effects, allowing to efficiently extract information from large volume galaxy surveys.
We extend previous studies using SFB by including all projection and GR effects, developing an efficient numerical implementation that avoids the use of the Limber approximation and includes multi-bins correlations and a full non-diagonal covariance.
We investigate the impact of neglecting GR corrections in cosmological parameter constraints, focusing on Primordial Non-Gaussianity and bias parameters.
We also present a novel prescription for multi-bin correlations that allow to significantly boost the detectability of GR effects, opening a new window on general relativity testing.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Primary author: SEMENZATO, Federico (University of Padova)

Presenter: SEMENZATO, Federico (University of Padova)

Session Classification: Late Universe

Contribution ID: **49** Type: **poster**

Magnetic monopoles in effective extensions of the SU(2) Georgi-Glashow model

We discuss a class of effective extensions of the SU(2) Georgi–Glashow model and discuss its Bogomol'nyi–Prasad–Sommerfield (BPS) limit. We identify a specific subclass of these models that admit analytical solutions of the monopole type. We present some concrete examples and find that the resulting monopoles tend to have their energy concentrated not in their center, but rather in a spherical shell around it.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: BENEŠ, Petr (Czech Technical University in Prague (CZ)); BLASCHKE, Filip (Czech Technical University in Prague (CZ))

Presenter: BENEŠ, Petr (Czech Technical University in Prague (CZ))

Session Classification: Reception and Poster Session

Contribution ID: **50** Type: **gravitational waves**

High Frequency Gravitational Wave Bounds from Galactic Neutron Stars

Thursday, 16 May 2024 11:54 (5 minutes)

High-Frequency Gravitational Waves (HFGWs) constitute a unique window on the early Universe as well as exotic astrophysical objects. If the current gravitational wave experiments are more dedicated to the low frequency regime, the graviton conversion into photons in a strong magnetic field constitutes a powerful tool to probe HFGWs. In this paper, we show that neutron stars, due to their extreme magnetic field, are a perfect laboratory to study the conversion of HFGWs into photons. Using realistic models for the galactic neutron star population, we calculate for the first time the expected photon flux induced by the conversion of an isotropic stochastic gravitational wave background in the magnetosphere of the ensemble of neutron stars present in the Milky Way. We compare this photon flux to the observed one from several telescopes and derive upper limits on the stochastic gravitational wave background in the frequency range 10^8 Hz - 10^{25} Hz. We find our limits to be competitive in the frequency range 10^8 Hz - 10^{15} Hz.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: DANDOY, Virgile (ULB)

Presenter: DANDOY, Virgile (ULB)

Session Classification: Gravitational Waves

Contribution ID: **53** Type: **late universe**

The Hitchhiker's Guide to the Galaxy (peculiar velocities)

Tuesday, 14 May 2024 12:08 (5 minutes)

In this talk, we will review what peculiar velocities are and how they can help us in better understanding both our local universe, its cosmological components and also studying relativistic effects. In particular, we will focus on the information we can extrapolate from the Pantheon+SH0ES and CosmicFlow4 datasets.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary author: SORRENTI, Francesco (University of Geneva)

Presenter: SORRENTI, Francesco (University of Geneva)

Session Classification: Late Universe

Contribution ID: **55** Type: **poster**

Poster: ALP leptogenesis

We propose a novel non-thermal realisation for leptogenesis that relies on the out-of-equilibrium decay of an axion-like particle (ALP) into right-handed Majorana neutrinos (RHN) in the Early Universe, and that it opens the parameter space of successful leptogenesis down to TeV-scale RHNs, with values of $f_a > 10^{11}$ GeV and $m_a > 10^4$ GeV for the ALP decay constant and mass.
We also explore the region where the ALP induces a matter-dominated phase and, finally, provide a viable suspersymmetric realisation of ALP leptogenesis which solves the cosmological gravitino problem.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: CATALDI, Martina (University of Hamburg)

Co-authors: MARIOTTI, Alberto (Vrije Universiteit Brussel); SALA, Filippo; VANVLASSELAER, Miguel (VUB); PASCOLI, Silvia (Universita e INFN, Bologna (IT))

Presenter: CATALDI, Martina (University of Hamburg)

Session Classification: Reception and Poster Session

Contribution ID: **56** Type: **particle astrophysics**

Constraints on the Cosmic Neutrino Background from NGC1068

Tuesday, 14 May 2024 16:35 (5 minutes)

We investigate IceCube's ability to constrain the neutrino relic abundance using events from the recently identified neutrino source NGC1068. Since these neutrinos have large energies $gtrsim$ 1 TeV and have propagated through large distances, they make a great probe for overabundances of the cosmic neutrino background.

The propagation of neutrinos from NGC1068 was simulated by solving a transport equation, which takes into account the SM neutrino-neutrino interactions. The final fluxes produced are then analysed using publicly released IceCube data. Our preliminary results indicate that IceCube is able to improve the current bounds on a relic neutrino overabundance by 3 orders of magnitude compared to current experimental bounds, i.e. to less than ˜ $10^9 \mathrm{cm}^{-3}$ at the 2σ confidence level.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: FRANKLIN, Jack

Co-authors: MARTINEZ SOLER, Ivan (Durham University and IPPP); TURNER, Jessica; PEREZ--GONZALEZ, Yuber F (IPPP, Durham University)

Presenter: FRANKLIN, Jack

Session Classification: Particle Astrophysics

Contribution ID: **57** Type: **early universe cosmology**

Black holes and gravitational waves from slow phase transitions

Wednesday, 15 May 2024 12:08 (5 minutes)

Slow first-order phase transitions generate large inhomogeneities that can lead to the formation of primordial black holes (PBHs). We show that the gravitational wave (GW) spectrum then consists of a primary component sourced by bubble collisions and a secondary one induced by large perturbations. The latter gives the dominant peak if $\beta/H_0 < 10$, impacting, in particular, the interpretation of the recent PTA data. The GW signal associated with a particular PBH population is stronger than in typical scenarios because of a negative non-Gaussianity of the perturbations and it has a distinguishable shape with two peaks.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: Dr LEWICKI, Marek (University of Warsaw); TOCZEK, Piotr (University of Warsaw); Dr VASKONEN, Ville

Presenter: TOCZEK, Piotr (University of Warsaw)

Session Classification: Early Universe

Contribution ID: **60** Type: **dark matter**

Burst Signals from Axion String Travelling Wave Collisions

Wednesday, 15 May 2024 16:38 (5 minutes)

Axion strings are a type of topological defect that arise in particle physics models with a spontaneously broken global U(1) symmetry. They are predicted to radiate massless dark matter axions, massive particles and gravitational waves. If we are to detect axion dark matter, either directly or indirectly via gravitational waves, understanding the magnitude and spectrum of this radiation is crucial. In this talk, I will summarise my most recent work (arXiv:2312.07701) which models axion string radiation using adaptive mesh refinement simulations. We investigate colliding travelling wave configurations with a Gaussian profile and the dependence of the radiation on parameters such as the amplitude of the Gaussian and the radius of curvature of the string relative to the string width.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary author: DREW, Amelia

Co-authors: Prof. SHELLARD, Paul; Mr KINOWSKI, Tomasz

Presenter: DREW, Amelia

Session Classification: Dark Matter

Contribution ID: **61** Type: **dark matter**

EFT approach to sterile neutrino dark matter

Wednesday, 15 May 2024 16:52 (5 minutes)

Sterile neutrinos represent a minimal and well motivated extension of the Standard Model (SM). For masses at the keV scale, their mixing to the active neutrinos offers a minimal explanation of the dark matter (DM) density. The very same mixing inevitably leads to radiative photon emission and the non-observation of such peaked X-ray lines virtually rules out this minimal sterile neutrino DM hypothesis.
However, in this talk I will point out that in the context of the SM effective field theory with (light) sterile neutrino (nuSMEFT), higher dimensional operators can produce sterile neutrino DM in a broad range of parameter space. In particular, even in the zero mixing limit the DM density can be explained. On the other hand, nuSMEFT interactions also open the large mixing parameter space. This is because some nuSMEFT operators induce photon dipoles, which can cause destructive interference effects in the X-ray emission. I will further discuss the testability prospect of the nuSMEFT operators and show their correlations to the parameter space of the DM production.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary authors: SANDNER, Stefan (IFIC); SANDNER, Stefan

Presenter: SANDNER, Stefan (IFIC)

Session Classification: Dark Matter

Contribution ID: **62** Type: **early universe cosmology**

Scale-invariant inflation

Wednesday, 15 May 2024 12:01 (5 minutes)

Fundamental scale invariance has been proposed as a new theoretical principle beyond renormalizability. Besides its highly predictive power, a scale-invariant formulation of gravity could provide a natural explanation for the long-standing hierarchy problem and interesting applications in cosmology.
We present a globally scale-invariant model of quadratic gravity and study its solutions in a spatially flat Robertson-Walker metric. The system admits a dynamical flow from an unstable to a stable fixed point, where scale symmetry gets spontaneously broken, and a mass scale —the Planck mass —is classically generated. This trajectory is compatible with an arbitrarily long stage of inflation which is investigated both at the classical level and at first order in perturbation theory. We outline some of the most recent result obtained within the framework of scale-invariant inflation.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: CECCHINI, Chiara (University of Trento, TIFPA-INFN); Mrs DE ANGELIS, Mariaveronica (University of Sheffield); RINALDI, Massimiliano (University of Trento); VAGNOZZI, Sunny; GIARE, William (University of Sheffield)

Presenter: CECCHINI, Chiara (University of Trento, TIFPA-INFN)

Session Classification: Early Universe

Contribution ID: **63** Type: **poster**

Exploring the Implications of Non-Standard Cosmology on Ultra-Light Dark Matter Candidates

Weakly interacting massive particles (WIMPs) are by far the most extensively studied class of CDM as the correct dark matter abundance is easily reproduced with cross sections around the weak scale. They have been extensively searched for by many experiments (direct and indirect detection, and colliders) with no success. The null results reported thus far motivate us to explore alternative candidates. In this lightning talk, we delve into the examination of an ultra-light dark matter candidate within the context of Axion-Like Particles (ALPs) in a non-standard cosmological framework. We focus on elucidating how it influences phenomena such as thermalization, since in general, ultralight DM cannot thermalize with SM to avoid jeopardizing BBN predictions. In this talk we focus on the mechanism of kinetic misalignment, where the ALPs assume a non-zero initial velocity. Through numerical analysis, we elucidate the intricate interplay between the proposed cosmology and the behaviour of ultra-light dark matter, shedding light on potential deviations from standard cosmology predictions.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: OLIVEIRA, Vinícius (Universidade de Aveiro); MORAIS, António (Univerisdade de Aveiro)

Presenter: OLIVEIRA, Vinícius (Universidade de Aveiro)

Session Classification: Reception and Poster Session

Contribution ID: **65** Type: **poster**

Cosmological phase transitions in a dimensionally-reduced vector dark matter model

Faced with the lack of observational evidence supporting the existence of new physics at the electroweak scale, alongside overwhelming experimental evidence that hints at the need for the exploration of new phenomena, such as neutrino masses/mixing or dark matter, new approaches to beyond the Standard Model (SM) phenomenology become imperative. Gravitational waves stemming from first-order phase transitions serve as an unparalleled gateway to new physics, offering insights beyond the scope of the Standard Model (SM). In this talk, we explore potential gravitational signatures originating from a non-abelian vector dark matter framework, where interactions with the visible sector are mediated via a dark vector-like fermion and examine its impact on the phase transition, contrasting it with a scenario involving a pure scalar-vector theory.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: PINO GONÇALVES, João Pedro (University of Aveiro)

Co-authors: Prof. BELYAEV, Alexander (University of Southampton & Rutherford Appleton Laboratory); MORAIS, António (University of Aveiro); BERTENSTAM, Mårten (Lund University); PASECHNIK, Roman (Lund university)

Presenter: PINO GONÇALVES, João Pedro (University of Aveiro)

Session Classification: Reception and Poster Session

Contribution ID: **67** Type: **poster**

Poster: A nonperturbative test of nucleation calculations for strong phase transitions

In the minimal Standard Model (SM) the Electroweak Phase Transition is a crossover, but in many beyond the SM theories the possibility for a first order transition has sustained interest. Strong first order phase transitions could produce gravitational waves that might be detectable by the Laser Interferometer Space Antenna (LISA). Improving the accuracy of predictions of the nucleation rate for strong phase transitions is crucial - if we are to make reliable estimates of the gravitational wave power spectrum from first order phase transitions. There are also proposals for analogue experiments that will test bubble nucleation in the lab; good understanding of the underlying field theory nucleation process is key to interpreting the results of these experiments.

Previously, these nucleation rates have generally been calculated perturbatively, but those calculations depend on the semiclassical picture of the bubble and its fluctuations, and different orders of perturbative calculation yield very different results. In this poster, I will give you an update on results of our lattice calculations of the nucleation rate. We focused on a real scalar theory with a tree-level potential barrier and performed nonperturbative simulations to determine the nucleation rate. To overcome challenges with applying the lattice method of computing the nucleation rate to our model, we use a shifted order parameter. Our results show that higher orders in perturbation theory are necessary, and we expect our findings to allow calibration of the systematic uncertainty in perturbative results.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: KORMU, Anna

Co-authors: WEIR, David (University of Helsinki); Dr GOULD, Oliver (University of Nottingham)

Presenter: KORMU, Anna

Session Classification: Reception and Poster Session

Contribution ID: **68** Type: **poster**

Poster: Composite Inflation

We investigate the possibility that inflation originates from a composite field theory, in terms of an effective chiral Lagrangian involving a dilaton and pions. It is possible to find a successful hybrid inflation occurring via the dilaton as the inflaton and the pions as waterfall fields. Compositeness consistency strongly constrain the model such as the composite scale and the inflation scale are fully calculable.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: DEANDREA, Aldo (Centre National de la Recherche Scientifique (FR)); CHEONG, Dhong Yeon (Yonsei University (KR)); CACCIAPAGLIA, Giacomo (Centre National de la Recherche Scientifique (FR)); Prof. PARK, Seong Chan (Yonsei University); ISNARD, Wanda (IP2I Lyon)

Presenter: ISNARD, Wanda (IP2I Lyon)

Session Classification: Reception and Poster Session

Contribution ID: **70** Type: **particle astrophysics**

Stochastic modelling of cosmic ray sources sped up

Tuesday, 14 May 2024 16:29 (5 minutes)

Cosmic rays can be probed via direct detection at the Earth's position or indirectly through diffuse emissions of gamma-rays and neutrinos produced by the interaction of cosmic rays with the interstellar medium in other parts of the Galaxy. It is commonly assumed in the modelling of galactic cosmic rays that the source density is smooth and steady. However, supernova remnants, the likely sources of cosmic rays, have a point-like and burst-like nature. This renders our predictions very sensitive to the precise positions and times of the sources. Yet observationally, those parameters are not accessible such that the source modelling must be done probabilistically. The computation of contributions to the total cosmic ray flux from individual sources is inherently parallelisable and suitable for the use of GPUs to speed up simulations. We demonstrate how these simulations can be used to constrain the energy dependence of escape from the cosmic ray accelerators and to study the energy-dependent morphology of the diffuse emission sky, relevant for observations with LHAASO, Tibet AS-gamma, IceCube and the upcoming SWGO.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary authors: STALL, Anton (Institute for Theoretical Particle Physics and Cosmology (TTK), RWTH Aachen University); Mr LOO, Chun Khai (Institute for Theoretical Particle Physics and Cosmology (TTK), RWTH Aachen University); Mr KAISER, Leonard (1. Physikalisches Institut, University of Cologne); MERTSCH, Philipp (RWTH Aachen University)

Presenter: STALL, Anton (Institute for Theoretical Particle Physics and Cosmology (TTK), RWTH Aachen University)

Session Classification: Particle Astrophysics

Contribution ID: **74** Type: **late universe**

Modified Gravity vs Dark Interactions: Settling the Dispute through the Distortion of Time

Tuesday, 14 May 2024 12:15 (5 minutes)

Combining measurements of the growth rate of cosmic structures with gravitational lensing is considered as the optimal way to test for deviations from General Relativity on cosmological scales. In my talk, I will demonstrate that this standard method suffers from an important limitation, since models of dark matter with additional interactions can lead to exactly the same signatures as modified gravity in these two observables. Luckily, I will show that the coming generation of large-scale structure surveys, like the Square Kilometer Array, will allow us to break this degeneracy through measurements of the distortion of time.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: CASTELLO, Sveva (University of Geneva)

Presenter: CASTELLO, Sveva (University of Geneva)

Session Classification: Late Universe

Contribution ID: **75** Type: **poster**

Center-of-mass recoil effects for thermal dark matter pairs in the early universe

For a quantitative investigation on the time evolution of heavy thermal dark matter at and after thermal freeze-out, near-threshold processes need to be taken into account which have a large impact on the observed dark matter relic abundance. We study the recoil effect of heavy dark matter pairs in a thermal bath and compute the thermal rates of dark matter fermion-antifermion pairs in the laboratory frame within the framework of potential non-relativistic effective field theories at finite temperature. For the considered hierarchy of energy scales, we highlight the effect of the recoil corrections to the thermal rates and relic density.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary authors: VAIRO, Antonio (TU Munich); Mr QERIMI, Gramos (Technical University of Munich (TUM)); BRAMBILLA, Nora; Dr BIONDINI, Simone (University of Basel)

Presenter: Mr QERIMI, Gramos (Technical University of Munich (TUM))

Session Classification: Reception and Poster Session

Contribution ID: **76** Type: **late universe**

Cosmology from ACT DR6 lensing cross-correlated with DES Y3 galaxies

Tuesday, 14 May 2024 11:54 (5 minutes)

In this work we present our pipeline for a joint analysis at the angular power spectrum level between measurements of galaxy positions from Dark Energy Survey Years 3 data release (DES Y3) and CMB lensing from the Atacama Cosmology Telescope Year 6 data release (ACT DR6) on a common area of around $4000\ \mathrm{deg}^2$. We show preliminary results, including several null-tests and inference on realistic mocks to achieve few percent level constraints on the amplitude of matter fluctuations. In a future work we will combine this measurement in a joint analysis with DES Y3 cosmic shear data, setting the stage for next generation cross-correlation analyses.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary author: DARWISH, Omar (University of Geneva)

Presenter: DARWISH, Omar (University of Geneva)

Session Classification: Late Universe

Contribution ID: **78** Type: **gravitational waves**

Signatures of ultralight bosons in the orbital eccentricity of binary black holes

Thursday, 16 May 2024 12:01 (5 minutes)

It is well known that clouds of ultralight particles surrounding black holes produced by the superradiant instability can experience Landau-Zehner transitions if the black hole is part of a binary system.
We study the effect of orbital eccentricity, backreaction of the cloud onto it and observational possibilities with future gravitational-wave detectors like the Laser Interferometer Space Antenna, as well as the planned deciHertz gravitational-wave observatories. For black hole binaries with chirp masses below $10\,M_\odot$, such effects would provide strong evidence for the existence of a new particle of mass between $10^{-13} - 10^{-11}\,\mathrm{eV}$.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: BOSKOVIC, Mateja (SISSA); KOSCHNITZKE, Matthias (University of Hamburg/DESY); PORTO, Rafael (DESY)

Presenter: KOSCHNITZKE, Matthias (University of Hamburg/DESY)

Session Classification: Gravitational Waves

Contribution ID: **80** Type: **gravitational waves**

Colour breaking in the early universe: a minimal leptoquark model

Thursday, 16 May 2024 12:08 (5 minutes)

The electroweak phase transition is a promising explanation for the origin of baryon asymmetry in the universe, a core problem in cosmology and particle physics.
An extension of the Standard Model is necessary to generate a strong first-order phase transition. Besides representing a target for several future-generation colliders, such Beyond the Standard Model (BSM) theories can generate - through a thermal phase transition - gravitational waves (GWs) potentially detectable by future space-based detectors, such as LISA 1, DECIGO, and BBO.

As a result, the interplay between BSM phenomenology and GWs is among the most active areas in the field of high-energy physics. Of particular interest are leptoquark (LQ) models, offering an alternative to conventional seesaw scenarios for the generation of Majorana neutrino masses at TeV scale. The presence of LQs can induce first order phase transitions with a temporary colour-breaking phase in the early universe.
With this poster, I intend to present results from the analysis of a minimal leptoquark model. In a dimensionally reduced effective theory approach 3, the model presents strong first order transitions, producing - in some scenarios - gravitational waves detectable by LISA. To our knowledge, these results provide the first evidence for the potential detection of color-breaking features in the above mentioned detectors.

The poster will be organized in 3 sections:

1. Introduction of the leptoquark model introduction and its features
2. Sketch of the pipeline implemented, and the adopted tools: (a) Computation of an effective potential with Dralgo 3. (b) Derivation of the phase structure and phase transition parameters by means of CosmoTransitions. (c) Derivation of the GW parameters with a dedicated python routine.
3. Illustration of the results (a) comparison of GW spectral peaks with detector sensitivities. (b) Interpretation of the various vacuum expectation value (vev) configurations identified in the two phases (c) correlation between collider observables.

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1 Amaro-Seoane, P., Audley, H., Babak, S., Baker, J., Barausse, E., Bender, P., ... & Zweifel, P. (2017). *Laser interferometer space antenna.* arXiv preprint arXiv:1702.00786.

2 Felipe F. Freitas, João Gonçalves, António P. Morais, Roman Pasechnik, Werner Porod. *On interplay between flavour anomalies and neutrino properties.* Phys.Rev.D 108 (2023) 11, 115002.

3 Andreas Ekstedt, Philipp Schicho, Tuomas V.I. Tenkanen. *DRalgo: A package for effective field theory approach for thermal phase transitions.*Comput.Phys.Commun. 288 (2023) 108725.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: EKSTEDT, Andreas; MORAIS, António (University of Aveiro); RATHSMAN, Johan (Lund University); FINETTI, Marco (Aveiro University); BERTENSTAM, Mårten (Lund University); PASECHNIK, Roman (Lund university)

Presenter: FINETTI, Marco (Aveiro University)

Session Classification: Gravitational Waves

Contribution ID: **81** Type: **poster**

Poster: Characterization of the strong backreaction regime in axion inflation

In this talk, I will address the issue of the strong backreaction regime in the abelian axion inflation scenario, extending results from 2303.17436 and ongoing work. I will do a revision of the mild and strong backreaction regimes, during and at the end of inflation, and also show how they can be distinguished in terms of dynamics and lengthening of the inflationary period, as well as, the helical imbalance. I will also highlight the ultraviolet sensitivity of the model in the case of larger couplings and the challenges it presents for the accurate capture of the dynamics.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: URIO, Ander (University of the Basque Country)

Co-authors: FIGUEROA, Daniel G. (Univ. of Valencia and CSIC (ES)); LIZARRAGA, Joanes (University of the Basque Country); URRESTILLA, Jon (University of the Basque Country)

Presenter: URIO, Ander (University of the Basque Country)

Session Classification: Reception and Poster Session

Contribution ID: **82** Type: **poster**

Poster: EFT for supercooled phase transitions in the early Universe

We analyze the role of higher-order thermal corrections for supercooled phase transition, and to what extent they can be computed using dimensionally reduced effective field theory (3D EFT). This framework requires high-temperature (HT) expansion to be valid, which seems challenging due to the presence of supercooling. We show how to reliably use the HT expansion in dimensionally reduced theory for the calculation of bubble nucleation rate, and apply it to a classically scale-invariant model
These corrections affect the predictions significantly e.g. transition temperature and scale. We compare new results to the ones obtained using the most common scheme based on the so-called daisy resummation.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: SWIEZEWSKA, Bogumila (University of Warsaw); VAN DE VIS, Jorinde; Mr KIERKLA, Maciej; Dr TENKANEN, Tuomas V. I. (University of Helsinki)

Presenter: Mr KIERKLA, Maciej

Session Classification: Reception and Poster Session

Contribution ID: **83** Type: **poster**

Solar heavy neutrinos

Heavy neutrinos with masses in the MeV range could in principle simultaneously explain the light neutrino masses via the seesaw mechanism and the origin of baryonic matter in the universe through leptogenesis. Their properties are severely constrained by cosmological considerations, in particular primordial nucleosynthesis. Since these constraints rely on assumptions about the cosmic history, independent experimental tests are highly desirable. We show that the strongest constraints for masses below 15 MeV at present time can be obtained from the non-observation of an enhanced high energy electron flux in the interplanetary medium, originating from the decay of heavy neutrinos produced in nuclear reactions in the sun. We estimate this constraint with data from the Solar Orbiter.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: HEISIG, Jan; DREWES, Marco; WEBER, Valentin

Presenter: WEBER, Valentin

Session Classification: Reception and Poster Session

Contribution ID: **84** Type: **poster**

Black Hole Quadratic Quasi-Normal Modes

We study the quadratic quasi-normal modes of a Schwarzschild black hole, i.e. those perturbations that originate from the coupling of two (linear) quasi-normal modes.
Assuming the amplitude of the two linear modes is known, we compute the amplitude of the resulting quadratic mode for a wide range of possible angular momenta. Finally, we reconstruct the waveform in radiation gauge.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: KUNTZ, Adrien (Scuola Normale Superiore, Pisa); BUCCIOTTI, Bruno (Scuola Normale Superiore di Pisa); TRINCHERINI, Enrico

Presenter: BUCCIOTTI, Bruno (Scuola Normale Superiore di Pisa)

Session Classification: Reception and Poster Session

Contribution ID: **85** Type: **poster**

Gravitational particle creation as a mechanism for vector dark matter production

Gravitational particle production of spectator fields due to the expansion universe during the inflationary and reheating phases of the early universe is of particular interest in the context of dark matter, since it allows to constrain the properties of the dark candidate
by comparing the density of particles produced with the observed dark matter abundance. In such processes, tachyonic instabilities arise as a consequence of the coupling to the curvature, greatly enhancing mode production. We consider a massive vector field that is coupled to the curvature scalar and the Ricci tensor only, and study its gravitational
production through inflation and reheating. We show how the mechanism is more efficient than in the case of a non-minimally coupled scalar field, giving rise to larger abundances. Moreover, we analyze the importance of the coupling to the Ricci tensor, which increases tachyonic nstabilities in the system, and constrain the mass of the dark particle and the values of the coupling constants by comparing the corresponding abundance with observations

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: CEMBRANOS, Jose A. R. (Universidad Complutense de Madrid); Dr SÁNCHEZ-VELÁZQUEZ, José Manuel (IFT UAM-CSIC); Prof. GARAY, Luis J. (Complutense University of Madrid and IPARCOS); PARRA-LÓPEZ, Álvaro (IPARCOS-UCM (Complutense University of Madrid))

Presenter: PARRA-LÓPEZ, Álvaro (IPARCOS-UCM (Complutense University of Madrid))

Session Classification: Reception and Poster Session

Contribution ID: **86** Type: **poster**

Poster: Impact of theoretical uncertainties on model parameter reconstruction from gravitational wave signals sourced by cosmological phase transitions

Different thermal resummation techniques impact the gravitational wave (GW) spectra from cosmological first-order phase transitions predicted in a given particle physics model. To investigate this effect, we perform large-scale parameter scans of the electroweak phase transition (EWPT) in the dynamical real-singlet extension of the Standard Model (SM) using three different perturbative approximations of the effective potential. While predictions of the GW amplitudes from the common, four-dimensional (4D) Daisy-resummed potentials are unreliable compared to state-of-the-art dimensionally reduced (3D) potentials, I will demonstrate that the overall detectable parameter spaces are robust up to a few percent in uncertainty. Regarding the reconstruction of the model parameters given a GW signal, I will illustrate that theoretical uncertainties however remain dominant over the experimental ones when using 4D standard techniques. Three-dimensional thermal effective theory, on the other hand, is accurate already at one-loop order, therefore providing the most promising route towards robust predictions.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: SCHMITT, Daniel (Goethe University, Frankfurt); SAGUNSKI, Laura; MERCHAND MEDINA, Marco Antonio; Dr LEWICKI, Marek (University of Warsaw); SCHICHO, Philipp (Goethe University Frankfurt)

Presenter: SCHMITT, Daniel (Goethe University, Frankfurt)

Session Classification: Reception and Poster Session

Contribution ID: **87** Type: **early universe cosmology**

CMB spectral distortions from dark sector anisotropies

Wednesday, 15 May 2024 12:22 (5 minutes)

We introduce a novel approach to investigate sectors solely gravitationally coupled, characterized by significant anisotropies. These anisotropies undergo damping through gravitational interactions with the baryon-photon fluid, inducing heating in the process. The resultant injected heat leads to observable distortions in the cosmic microwave background spectrum. We provide analytic estimates for the magnitude of these distortions and outline a method to calculate them from first principles. The application of these methods extends to anisotropies arising from a domain wall/cosmic string network, a first-order phase transition, or scalar field dynamics. Our findings indicate that this method holds the potential to explore substantial regions of previously unconstrained parameter space, serving as a valuable complement to upcoming searches for gravitational waves originating from such dark sectors

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary authors: RAMBERG, Nicklas (Johannes gutenberg universität Mainz); SCHWALLER, Pedro; RATZINGER, Wolfram (Weizmann Institute)

Presenter: RAMBERG, Nicklas (Johannes gutenberg universität Mainz)

Session Classification: Early Universe

Contribution ID: **89** Type: **gravitational waves**

Analytic derivation of gravitational wave spectrum from expanding string loop on domain wall

Thursday, 16 May 2024 12:15 (5 minutes)

It is well known that spontaneous breaking of discrete symmetries produce topological objects called domain walls, which must decay in order not to dominate the energy density of the universe. One of the possible decay scenarios is nucleating holes bounded by cosmic strings on the walls. Once they are nucleated, the holes expand faster and faster by eating the energy of the domain walls and may radiate stochastic gravitational waves with significant energy fraction. This resembles cases of bubble collisions in cosmological 1st-order phase transition. We derive an analytic expression for the GW spectrum radiated from these string loops expanding on the walls. Remarkablly, the spectrum is found to be flat in high-frequency region, in contrast to usual bubble collisions. We also discuss the implication to the NANOGrav signal and future GW observatories.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: Dr HAMADA, Yu (DESY)

Co-author: Dr NAKANO, Wakutaka (KEK)

Presenter: Dr HAMADA, Yu (DESY)

Session Classification: Gravitational Waves

Contribution ID: **90** Type: **late universe**

Probing the LCDM Universe with 21cm intensity mapping surveys

Tuesday, 14 May 2024 12:01 (5 minutes)

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Primary author: BERTI, Maria (UniGE)

Presenter: BERTI, Maria (UniGE)

Session Classification: Late Universe

Contribution ID: **91** Type: **dark matter**

Dynamical contraints on PBH clusters

Wednesday, 15 May 2024 16:45 (5 minutes)

In the high mass range, primordial black holes are constrained by the observed velocity dispersion of the Galactic disk, as they are expected to heat up stars through two-body encounters. These constraints have been obtained assuming that the PBHs are smoothly distributed in the DM halo. However, PBHs are expected to form bound structures under the effect of gravity; furthermore, it has been argued that they are likely to be already born in clusters. In this work, we investigate how the heating of the galactic disk constrains the abundance of PBHs when clustering is taken into account.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: SCARCELLA, Francesca (Laboratoire Univers et Particules de Montpellier (LUPM)); LAVALLE, Julien (LUPM (CNRS / Univ. Montpellier))

Presenter: SCARCELLA, Francesca (Laboratoire Univers et Particules de Montpellier (LUPM))

Session Classification: Dark Matter

Contribution ID: **92** Type: **poster**

Magnetisation of radio relics and implications for dark matter searches

Shock waves driven by merger events can continuously source self-generated magnetic fields at the periphery of galaxy clusters. Diffuse non-thermal emission and polarization measurements from radio relics indicate a magnetisation of the intracluster medium due to merger shocks in addition to particle acceleration at the shock site. I will outline the growth and saturation of such magnetic fields, describe how they can explain the long-standing discrepancy between radio and X-ray observations of these objects, and make the case for a novel astrophysical search strategy for light dark matter species.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: GHOSH, Oindrila (Stockholm University & the Oskar Klein Centre)

Presenter: GHOSH, Oindrila (Stockholm University & the Oskar Klein Centre)

Session Classification: Reception and Poster Session

Contribution ID: **96** Type: **not specified**

EuCAPT community

Tuesday, 14 May 2024 17:00 (1 hour)

Presenters: MARSH, David; PASCOLI, Silvia (Universita e INFN, Bologna (IT))

Session Classification: EuCAPT community

Contribution ID: **105** Type: **poster**

Poster: A model-independent test of gravity from the Weyl potential evolution

To test the vast number of modified gravity models, a systematic and comprehensive approach is necessary when analysing the data from cosmological surveys. The novel observable \hat{J}, capturing the evolution of the combined gravitational potential Ψ + Φ, provides a powerful and model-independent test of gravity. Recently, we have performed the first measurement of this observable from Dark Energy Survey data (C. Bonvin, I. Tutusaus & N. Grimm, arXiv:2312.06434), combining galaxy-galaxy lensing and galaxy clustering data. Interestingly, we find a tension with the prediction of the standard cosmological model, reaching 3.1 sigma at z=0.48. In my lightning talk, I will present this novel observable and demonstrate its remarkable capacity to test gravity in a model-independent manner.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: GRIMM, Nastassia; Dr TUTUSAUS, Isaac; Dr BONVIN, Camille

Presenter: GRIMM, Nastassia

Session Classification: Reception and Poster Session

Contribution ID: **106** Type: **poster**

Poster: Disentangling Modified Gravity from Dark Interactions through the Distortion of Time

Combining measurements of the growth rate of cosmic structures with gravitational lensing is considered as the optimal way to test for deviations from General Relativity on cosmological scales. In my talk, I will demonstrate that this standard method suffers from an important limitation, since models of dark matter with additional interactions can lead to exactly the same signatures as modified gravity in these two observables. Luckily, I will show that the coming generation of large-scale structure surveys, like the Square Kilometer Array, will allow us to break this degeneracy through measurements of the distortion of time.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: CASTELLO, Sveva (University of Geneva)

Presenter: CASTELLO, Sveva (University of Geneva)

Session Classification: Reception and Poster Session

Contribution ID: **109** Type: **poster**

Poster: One-loop power spectrum in ultra slow-roll inflation and implications for primordial black hole dark matter

A possible way to generate primordial black holes as candidates for the entirety of dark matter is a large power spectrum of inflationary curvature fluctuations. Recently, questions have been raised regarding the validity of perturbation theory in this context. We compute the one-loop power spectrum in ultra-slow roll inflation, including all relevant interactions for such analysis, along with counterterms that absorb the ultraviolet divergences. We compare the one-loop and tree-level contributions to the power spectrum, finding that perturbation theory remains valid in realistic ultra-slow roll models.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: BALLESTEROS, Guillermo (IFT UAM-CSIC); GAMBIN EGEA, Jesus (Instituto de Fisica Teorica, UAM - CSIC)

Presenter: GAMBIN EGEA, Jesus (Instituto de Fisica Teorica, UAM - CSIC)

Session Classification: Reception and Poster Session

Contribution ID: **111** Type: **poster**

Poster: Scale-invariant inflation

Fundamental scale invariance has been proposed as a new theoretical principle beyond renormalizability. Besides its highly predictive power, a scale-invariant formulation of gravity could provide a natural explanation for the long-standing hierarchy problem and interesting applications in cosmology.
We present a globally scale-invariant model of quadratic gravity and study its solutions in a spatially flat Robertson-Walker metric. The system admits a dynamical flow from an unstable to a stable fixed point, where scale symmetry gets spontaneously broken, and a mass scale —the Planck mass —is classically generated. This trajectory is compatible with an arbitrarily long stage of inflation which is investigated both at the classical level and at first order in perturbation theory. We outline some of the most recent result obtained within the framework of scale-invariant inflation.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: CECCHINI, Chiara (University of Trento, TIFPA-INFN); Mrs DE ANGELIS, Mariaveronica (University of Sheffield); RINALDI, Massimiliano (University of Trento); VAGNOZZI, Sunny; GIARE, William (University of Sheffield)

Presenter: CECCHINI, Chiara (University of Trento, TIFPA-INFN)

Session Classification: Reception and Poster Session

Contribution ID: **112** Type: **poster**

Poster: Black holes and gravitational waves from slow phase transitions

Slow first-order phase transitions generate large inhomogeneities that can lead to the formation of primordial black holes (PBHs). We show that the gravitational wave (GW) spectrum then consists of a primary component sourced by bubble collisions and a secondary one induced by large perturbations. The latter gives the dominant peak if $\beta/H_0 < 10$, impacting, in particular, the interpretation of the recent PTA data. The GW signal associated with a particular PBH population is stronger than in typical scenarios because of a negative non-Gaussianity of the perturbations and it has a distinguishable shape with two peaks.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: Dr LEWICKI, Marek (University of Warsaw); TOCZEK, Piotr (University of Warsaw); Dr VASKONEN, Ville

Presenter: TOCZEK, Piotr (University of Warsaw)

Session Classification: Reception and Poster Session

Contribution ID: **113** Type: **poster**

Poster: Hot Leptogenesis: A naturalness-motivated solution to baryon asymmetry

In standard leptogenesis models, the baryon asymmetry is initially produced as a lepton asymmetry via the out of equilibrium decays of the lightest right handed neutrino (RHN).

There are however constraints on the RHN mass that are in tension; the naturalness constraint on the Higgs mass from RHN loop corrections, i.e. the Vissani bound, puts a limit on the RHN mass which is lower than is generally required for leptogenesis to produce a sufficient baryon asymmetry (the Davidson-Ibarra bound).

Increasing the temperature of the RHN sector, known as a 'hot leptogenesis' model, allows for a boosting of the baryon asymmetry produced, allowing for both bounds to be reconciled.

Following on from the work of Bernal and Fong on hot leptogenesis from thermal dark matter, we give a comprehensive treatment of hot leptogenesis more generally; exploring the evolution of both sectors, the parameter space of the models, as well as possible UV origins for the initially thermally disconnected SM bath and the hot RHN sector.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: BHATNAGAR, Ansh (IPPP, Durham University)

Co-authors: Dr CROON, Djuna (IPPP Durham); TURNER, JESSICA; BAKER, Michael James (University of Melbourne (AU))

Presenter: BHATNAGAR, Ansh (IPPP, Durham University)

Session Classification: Reception and Poster Session

Contribution ID: **116** Type: **poster**

Poster: New bounds on monopole abundance from cosmic magnetic fields

Magnetic monopoles are intriguing hypothetical particles and inevitable predictions of Theories of Grand Unification. They are produced during phase transitions in the early universe, but mechanisms like the Schwinger effect in strong magnetic fields could also contribute to the monopole number density. I will show how from the detection of intergalactic magnetic fields we can infer additional bounds on the magnetic monopole flux, and how even well-established limits, such as Parker bounds and limits from terrestrial experiments, are affected by the acceleration in cosmic magnetic fields. I will also discuss the implications of these bounds for minicharged monopoles and magnetic black holes as dark matter candidates.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: PERRI, Daniele (SISSA Trieste, Trieste)

Presenter: PERRI, Daniele (SISSA Trieste, Trieste)

Session Classification: Reception and Poster Session

Contribution ID: **118** Type: **poster**

Poster: Constraints on the Cosmic Neutrino Background from NGC1068

We investigate IceCube's ability to constrain the neutrino relic abundance using events from the recently identified neutrino source NGC1068. Since these neutrinos have large energies $gtrsim$ 1 TeV and have propagated through large distances, they make a great probe for overabundances of the cosmic neutrino background.

The propagation of neutrinos from NGC1068 was simulated by solving a transport equation, which takes into account the SM neutrino-neutrino interactions. The final fluxes produced are then analysed using publicly released IceCube data. Our preliminary results indicate that IceCube is able to improve the current bounds on a relic neutrino overabundance by 3 orders of magnitude compared to current experimental bounds, i.e. to less than ˜ $10^9 \mathrm{cm}^{-3}$ at the 2σ confidence level.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: FRANKLIN, Jack

Co-authors: MARTINEZ SOLER, Ivan (Durham University and IPPP); TURNER, Jessica; PEREZ--GONZALEZ, Yuber F (IPPP, Durham University)

Presenter: FRANKLIN, Jack

Session Classification: Reception and Poster Session

Contribution ID: **119** Type: **poster**

Poster: X-rays constraints on sub-GeV Dark Matter

We present updated constraints on 'light' Dark Matter (DM) particles with masses between 1 MeV and 5 GeV. In this range, we can expect DM-produced pairs to upscatter low-energy ambient photons in the Milky Way via the Inverse Compton process, and produce a flux of X-rays that can be probed by a range of space observatories. Using diffuse X-ray data from XMM-Newton and realistic cosmic-ray transport parameters, we compute the strongest constraints to date on annihilating and decaying DM for 1 MeV < $m_{\rm DM}$ < 5 GeV

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: KOECHLER, Jordan (LPTHE - Sorbonne Université (France))

Presenter: KOECHLER, Jordan (LPTHE - Sorbonne Université (France))

Session Classification: Reception and Poster Session

Contribution ID: **120** Type: **poster**

Poster: Riding the dark matter wave: Novel limits on general dark photons from LISA Pathfinder

I will point out the possibility to perform a parametrically improved search for gauged baryon (B) and baryon minus lepton ($B-L$) Dark Photon Dark Matter (DPDM) using auxiliary channel data from LISA Pathfinder. In particular I will show how to use the measurement of the differential movement between the test masses (TMs) and the space craft (SC) which is nearly as sensitive as the tracking between the two TMs. TMs and SC are made from different materials and therefore have different charge-to-mass ratios for both $B-L$ and B. Thus, the surrounding DPDM field induces a relative acceleration of nearly constant frequency. For the case of $B-L$, I will demonstrate that LISA Pathfinder can constrain previously unexplored parameter space, providing the world leading limits in the mass range $4 \cdot 10^{-19}$ eV $\leq m \leq 3 \cdot 10^{-17}$ eV. This limit can easily be recast also for dark photons that arise from gauging other global symmetries of the SM.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: FRERICK, Jonas

Co-authors: KAHLHOEFER, Felix (Karlsruhe Institute of Technology); JAECKEL, Joerg (ITP Heidelberg); SCHMIDT-HOBERG, Kai Ronald (Deutsches Elektronen-Synchrotron (DE))

Presenter: FRERICK, Jonas

Session Classification: Reception and Poster Session

Contribution ID: **121** Type: **poster**

Poster: Spin-1 Thermal Targets for Dark Matter Searches at Fixed Target Experiments

Sub-GeV dark matter (DM) has been gaining significant interest in recent years, since it can account for the thermal relic abundance while evading nuclear recoil direct detection constraints. Such light DM must carry a larger energy to be probed, either directly or through missing energy/momentum, making beam dump and fixed target experiments ideal for this mass range. Here, we extend the previous literature, which mainly focuses on the predicted experimental signals of scalar and fermionic DM, by considering simplified DM models in which the Standard Model is extended by one vector DM candidate along with one spin-1 mediator. In this analysis, we identify the parameters consistent with the observed relic abundance, calculate the relevant constraints from existing experiments and measurements, and predict the sensitivity of future experiments such as the upcoming LDMX. We find that spin-1 DM is testable by future experiments, and for certain spin-1 models, will be the first DM models probed by LDMX.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: GRAY, Taylor (Chalmers University of Technology)

Presenter: GRAY, Taylor (Chalmers University of Technology)

Session Classification: Reception and Poster Session

Contribution ID: **122** Type: **poster**

The role of radiative feedback of CMB constraints on PBHs with DM halos

The abundance of primordial black holes is constrained by observations of the Cosmic Microwave Background (CMB): these compact objects would accrete matter and emit high-energy photons, altering the statistical properties of the CMB. The presence of dense dark matter mini-halos around the PBHs has been used to further tighten the bounds, as these would boost the accretion rates. In this poster, I discuss how radiative feedback affects CMB constraints. In particular, I argue that the local increase in temperature around PBHs can prevent dark matter mini-halos from strongly enhancing the accretion process, in some cases significantly weakening previously derived constraints.

Based on https://arxiv.org/abs/2403.18895, in collaboration with D. Agius, R. Essig, D. Gaggero, G.Suczewski, M. Valli.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: SCARCELLA, Francesca (Laboratoire Univers et Particules de Montpellier (LUPM))

Presenter: SCARCELLA, Francesca (Laboratoire Univers et Particules de Montpellier (LUPM))

Session Classification: Reception and Poster Session

Contribution ID: **123** Type: **poster**

Poster: High Frequency Gravitational Wave Bounds from Galactic Neutron Stars

High-Frequency Gravitational Waves (HFGWs) constitute a unique window on the early Universe as well as exotic astrophysical objects. If the current gravitational wave experiments are more dedicated to the low frequency regime, the graviton conversion into photons in a strong magnetic field constitutes a powerful tool to probe HFGWs. In this paper, we show that neutron stars, due to their extreme magnetic field, are a perfect laboratory to study the conversion of HFGWs into photons. Using realistic models for the galactic neutron star population, we calculate for the first time the expected photon flux induced by the conversion of an isotropic stochastic gravitational wave background in the magnetosphere of the ensemble of neutron stars present in the Milky Way. We compare this photon flux to the observed one from several telescopes and derive upper limits on the stochastic gravitational wave background in the frequency range 10^8 Hz - 10^{25} Hz. We find our limits to be competitive in the frequency range 10^8 Hz - 10^{15} Hz.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: DANDOY, Virgile (ULB)

Presenter: DANDOY, Virgile (ULB)

Session Classification: Reception and Poster Session

Contribution ID: **124** Type: **poster**

Poster: Signatures of ultralight bosons in the orbital eccentricity of binary black holes

It is well known that clouds of ultralight particles surrounding black holes produced by the superradiant instability can experience Landau-Zehner transitions if the black hole is part of a binary system.
We study the effect of orbital eccentricity, backreaction of the cloud onto it and observational possibilities with future gravitational-wave detectors like the Laser Interferometer Space Antenna, as well as the planned deciHertz gravitational-wave observatories. For black hole binaries with chirp masses below $10\,M_\odot$, such effects would provide strong evidence for the existence of a new particle of mass between $10^{-13} - 10^{-11}\,\mathrm{eV}$.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: BOSKOVIC, Mateja (SISSA); KOSCHNITZKE, Matthias (University of Hamburg/DESY); PORTO, Rafael (DESY)

Presenter: KOSCHNITZKE, Matthias (University of Hamburg/DESY)

Session Classification: Reception and Poster Session

Contribution ID: **125** Type: **poster**

Poster: Colour breaking in the early universe: a minimal leptoquark model

The electroweak phase transition is a promising explanation for the origin of baryon asymmetry in the universe, a core problem in cosmology and particle physics.
An extension of the Standard Model is necessary to generate a strong first-order phase transition. Besides representing a target for several future-generation colliders, such Beyond the Standard Model (BSM) theories can generate - through a thermal phase transition - gravitational waves (GWs) potentially detectable by future space-based detectors, such as LISA 1, DECIGO, and BBO.

As a result, the interplay between BSM phenomenology and GWs is among the most active areas in the field of high-energy physics. Of particular interest are leptoquark (LQ) models, offering an alternative to conventional seesaw scenarios for the generation of Majorana neutrino masses at TeV scale. The presence of LQs can induce first order phase transitions with a temporary colour-breaking phase in the early universe.
With this poster, I intend to present results from the analysis of a minimal leptoquark model. In a dimensionally reduced effective theory approach 3, the model presents strong first order transitions, producing - in some scenarios - gravitational waves detectable by LISA. To our knowledge, these results provide the first evidence for the potential detection of color-breaking features in the above mentioned detectors.

The poster will be organized in 3 sections:

1. Introduction of the leptoquark model introduction and its features
2. Sketch of the pipeline implemented, and the adopted tools: (a) Computation of an effective potential with Dralgo 3. (b) Derivation of the phase structure and phase transition parameters by means of CosmoTransitions. (c) Derivation of the GW parameters with a dedicated python routine.
3. Illustration of the results (a) comparison of GW spectral peaks with detector sensitivities. (b) Interpretation of the various vacuum expectation value (vev) configurations identified in the two phases (c) correlation between collider observables.

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1 Amaro-Seoane, P., Audley, H., Babak, S., Baker, J., Barausse, E., Bender, P., ... & Zweifel, P. (2017). *Laser interferometer space antenna.* arXiv preprint arXiv:1702.00786.

2 Felipe F. Freitas, João Gonçalves, António P. Morais, Roman Pasechnik, Werner Porod. *On interplay between flavour anomalies and neutrino properties.* Phys.Rev.D 108 (2023) 11, 115002.

3 Andreas Ekstedt, Philipp Schicho, Tuomas V.I. Tenkanen. *DRalgo: A package for effective field theory approach for thermal phase transitions.*Comput.Phys.Commun. 288 (2023) 108725.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: EKSTEDT, Andreas; MORAIS, António (University of Aveiro); RATHSMAN, Johan (Lund University); FINETTI, Marco (Aveiro University); BERTENSTAM, Mårten (Lund University); PASECHNIK, Roman (Lund university)

Presenter: FINETTI, Marco (Aveiro University)

Session Classification: Reception and Poster Session

Contribution ID: **126** Type: **poster**

Poster: Analytic derivation of gravitational wave spectrum from expanding string loop on domain wall

It is well known that spontaneous breaking of discrete symmetries produce topological objects called domain walls, which must decay in order not to dominate the energy density of the universe. One of the possible decay scenarios is nucleating holes bounded by cosmic strings on the walls. Once they are nucleated, the holes expand faster and faster by eating the energy of the domain walls and may radiate stochastic gravitational waves with significant energy fraction. This resembles cases of bubble collisions in cosmological 1st-order phase transition. We derive an analytic expression for the GW spectrum radiated from these string loops expanding on the walls. Remarkablly, the spectrum is found to be flat in high-frequency region, in contrast to usual bubble collisions. We also discuss the implication to the NANOGrav signal and future GW observatories.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: Dr HAMADA, Yu (DESY)

Co-author: Dr NAKANO, Wakutaka (KEK)

Presenter: Dr HAMADA, Yu (DESY)

Session Classification: Reception and Poster Session

Contribution ID: **127** Type: **poster**

Poster: Probes of reheating after non-Abelian axion-like inflation

We consider a model, where a single inflaton interacts as an axion with Yang-Mills gauge bosons. As these rapidly thermalize, the friction felt by the inflaton field is increased, leading to a self-amplifying process. The corresponding gravitational wave spectrum is enhanced by thermal contributions at large confinement scales of the Yang-Mills sector, which heats up to high temperatures, yet below the critical value.
On the other hand, the gauge bosons of the thermal bath may represent part of a dark sector. Assuming a feeble coupling to the visible sector, the stable component of the dark sector satisfies the bounds on the relic abundance, if its confinement scale takes values far below those relevant to the gravitational wave signal so that the dark sector is in a deconfined phase at the end of inflation. The reheating of the Standard Model is most efficiently actuated by dark glueballs after the confinement phase transition. The latter might represent an additional source of gravitational waves.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary authors: KOLESOVA, Helena (University of Stavanger); LAINE, Mikko Sakari (Universitaet Bern (CH)); KLOSE, Philipp (Bielefeld University); PROCACCI, Simona (University of Geneva (CH)); Dr BIONDINI, Simone (University of Basel)

Presenter: PROCACCI, Simona (University of Geneva (CH))

Session Classification: Reception and Poster Session

Contribution ID: **128** Type: **not specified**

TBD

DESI, Galaxy Clustering

Contribution ID: **129** Type: **late universe**

Galaxy clustering in the era of Stage IV surveys

Tuesday, 14 May 2024 09:30 (30 minutes)

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Presenter: MUELLER, Eva-Maria

Session Classification: Late Universe

Contribution ID: **130** Type: **late universe**

Line intensity mapping and the physics of cosmic reionization

Tuesday, 14 May 2024 10:00 (30 minutes)

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Presenter: Dr PADMANABHAN, Hamsa (U. Geneva)

Session Classification: Late Universe

Contribution ID: **132** Type: **late universe**

Lensing of the Cosmic Microwave Background , synergies with galaxy surveys and AOB

Tuesday, 14 May 2024 11:15 (30 minutes)

Presenter: Dr FABBIAN, Giulio (U. Cardiff)

Session Classification: Late Universe

Contribution ID: **133** Type: **particle astrophysics**

Supernova 1987 neutrinos: status and prospects

Tuesday, 14 May 2024 14:00 (30 minutes)

Presenter: FIORILLO, Damiano (Niels Bohr International Academy, Niels Bohr Institute,4 University of Copenhagen, 2100 Copenhagen, Denmark)

Session Classification: Particle Astrophysics

Contribution ID: **134** Type: **not specified**

Cosmic-ray propagation

Tuesday, 14 May 2024 14:30 (30 minutes)

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Presenter: RECCHIA, Sarah (INAF)

Session Classification: Particle Astrophysics

Contribution ID: **135** Type: **not specified**

High-energy emissions from AGN and starburst galaxies

Tuesday, 14 May 2024 15:00 (30 minutes)

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Presenter: PERETTI, Enrico (CNRS)

Session Classification: Particle Astrophysics

Contribution ID: **136** Type: **early universe cosmology**

Baryogenesis & Leptogenesis

Wednesday, 15 May 2024 09:30 (30 minutes)

Presenter: KLARIC, Juraj (Universiteit van Amsterdam, Nikhef)

Session Classification: Early Universe

Contribution ID: **137** Type: **not specified**

Gravitational Waves from Phase Transitions

Thursday, 16 May 2024 10:00 (30 minutes)

Presenter: SWIEZEWSKA, Bogumila (University of Warsaw)

Session Classification: Gravitational Waves

Contribution ID: **138** Type: **not specified**

Particle creation dynamics during inflation and reheating

Wednesday, 15 May 2024 11:15 (30 minutes)

Presenter: PIERRE, Mathias

Session Classification: Early Universe

Contribution ID: **139** Type: **not specified**

Line Intensity Mapping for new physics

Wednesday, 15 May 2024 14:00 (30 minutes)

Presenter: Dr BERNAL, Jose Luis (Institute of Physics of Cantabria, Spain)

Session Classification: Dark Matter

Contribution ID: **140** Type: **not specified**

21 cm and CMB as dark matter probes

Wednesday, 15 May 2024 14:30 (30 minutes)

Presenter: FACCHINETTI, Gaëtan

Session Classification: Dark Matter

Contribution ID: **141** Type: **not specified**

The dark shines - Highlights of gamma-ray searches for dark matter

Wednesday, 15 May 2024 15:45 (30 minutes)

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Presenter: ECKNER, Christopher (University of Nova Gorica)

Session Classification: Dark Matter

Contribution ID: **142** Type: **not specified**

Implications of gravitational waves detection for stellar astrophysics

Thursday, 16 May 2024 09:30 (30 minutes)

Presenter: KOROL, Valeriya (Max Planck Institute for Astrophysics)

Session Classification: Gravitational Waves

Contribution ID: **143** Type: **not specified**

Cold-atom analogues of vacuum decay

Wednesday, 15 May 2024 10:00 (30 minutes)

Presenter: Dr JENKINS, Alexander (University College London)

Session Classification: Early Universe

Contribution ID: **144** Type: **gravitational waves**

Topological defects during cosmological phase transitions

Thursday, 16 May 2024 11:15 (30 minutes)

Presenter: Dr BLASI, Simone (DESY)

Session Classification: Gravitational Waves

Contribution ID: **145** Type: **particle astrophysics**

White dwarf cooling through neutrinos and L_mu - L_tau

Tuesday, 14 May 2024 16:22 (5 minutes)

Hot white dwarfs lose energy mainly in the form of neutrinos through plasmon decay from the inner part of the star. BSM physics can have visible contributions to the cooling of these compact objects. The aim of this study is to show how hot white dwarf cooling could be altered by a dark photon from the L_mu - L_tau model and explore these effects from ultra-light to heavy intermediators. This leads to very interesting constraints to this BSM model.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Primary author: HOEFKEN ZINK, Jaime

Presenter: HOEFKEN ZINK, Jaime

Session Classification: Particle Astrophysics

Contribution ID: **146** Type: **poster**

Looking for a blue tilted power spectrum in the dark ages

We investigate how the primordial power spectrum on small scales could be constrained using 21cm line intensity mapping in the dark ages. The focus is on models that imprint an increase of the matter spectrum at large angular multipoles.
We study a few specific models, including early matter domination, primordial black holes and vector dark matter, and then parameterize small scale features in a model-independent way.
Moreover, we explore the possibility of using the primordial power spectrum to search for signatures of the quantum to classical transition in the early Universe.
We present forecasts for measurements with the SKAO and a few possible future instruments, both Earth and Moon based.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Primary author: DE KRUIJF, Jessie (University of Padova)

Presenter: DE KRUIJF, Jessie (University of Padova)

Session Classification: Reception and Poster Session

Contribution ID: **148** Type: **not specified**

Welcome

Tuesday, 14 May 2024 09:20 (10 minutes)

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

Presenters: PASCOLI, Silvia (Universita e INFN, Bologna (IT)); PASCOLI, Silvia (Universita e INFN, Bologna (IT))

Session Classification: Welcome

Contribution ID: **149** Type: **not specified**

EuCAPT updates and outlook

Thursday, 16 May 2024 14:00 (30 minutes)

Presenter: MARSH, David

Session Classification: EuCAPT updates and outlook