Tensions in Cosmology 2023

Report of Contributions

https://indico.cern.ch/e/1315931

Contribution ID: **1** Type: **not specified**

The challenges of ΛCDM and the physics transition approaches

Thursday, September 7, 2023 9:00 AM (1 hour)

I first review the three main classes of observational challenges to the standard cosmological model (ΛCDM) the Hubble tension, the growth of perturbations tension and the cosmic dipoles. I then focus on essence of the Hubble tension and describe the assumptions involved in its existence. I also classify the models that have been proposed for its resolution in three broad classes Early time models that change the sound horizon scale, late time models that deform the Hubble expansion history H(z) and ultralate time models that change the physics of the late time distance calibrators (SnIa, Cepheids, TRGB etc). I show that in each one of these classes the most succesful representative models involve some kind of abrupt event (transition) that may occur either at early times before recombination (z>1100, eg new early dark energy) or at late times (z˜1, eg sign switching cosmological constant) or at ultralate times (z<0.01 eg gravitational transition that changes the physics of SnIa). The potential of each class to resolve the other two challenges will be briefly discussed. Finally, I focus on the ultralate late class of models and discuss observational hints for their predicted signals and possible theoretical models that may support them.

Presenter: PERIVOLAROPOULOS, Leandros (Ioannina U.)

Contribution ID: **2** Type: **not specified**

Quasars as high-redshift standard candles

Thursday, September 7, 2023 10:00 AM (1 hour)

The non-linear X-ray to UV luminosity relation in quasars can be used to derive their distances, and to build a Hubble diagram up to z˜7 which shows a strong tension with the standard LCDM model. I will present a series of observational results strongly supporting the redshift stability of the relation and its intrinsic precision. In particular, I will show that (1) the slope of the relation does not evolve with redshift, (2) the spectral properties of the quasars in our sample are the same at all redshifts, (3) the dispersion of the relation becomes much smaller if precise spectroscopic flux measurements are used, (4) the Hubble diagram of quasars and that of supernovae are in full agreement in the common redshift range, (5) the residual intrinsic dispersion is fully explained by quasar variability and disk inclination effects. I conclude that the X-ray to UV non-linear relation is due to a universal, redshift-independent physical process, and provides reliable distance measurements.

Presenter: Prof. RISALITI, Guido (University of Florence)

Contribution ID: **3** Type: **not specified**

Almost extensivity of Barrow entropy as favoured by the full dynamical and geometrical set of cosmological data

Thursday, September 7, 2023 11:30 AM (30 minutes)

I will briefly introduce into the problem of nonextensive entropies (Bekenstein, Tsallis, Barrow, Renyi, Sharma-Mittal) and their applications to black holes and, in particular, to cosmology. Then, I will concentrate onto the Barrow entropy (strongly related to Tsallis entropy) and show how the full set of most updated dynamical and geometrical data in cosmology points towards an extensive Gibbs-like entropic behaviour of it. In fact, the data limits Barrow entropy parameter to $\Delta > 0.86$ which is close to the maximum threshold of $\Delta = 1$ where the fractal dimension of the area-horizon becomes almost or just the volume and the intensivity is recovered. Finally, I will comment on the possible (slight resolution) of the cosmological tensions by Barrow entropy. Literature 1. M.P. Dabrowski and V. Salzano, Geometrical observational bounds on a fractal horizon holographic dark energy, Physical Review D 102, 064047 (2020). 2. T. Denkiewicz, V. Salzano, M.P. Dabrowski, Barrow nearly extensive Gibbs-like entropy favoured by the full dynamical and geometrical data set in cosmology, arXiv 2303.11680.

Presenter: Prof. DABROWSKI, Mariusz P. (University of Szczecin)

Contribution ID: **4** Type: **not specified**

Addressing the cosmological tensions within a Majoron model.

Saturday, September 9, 2023 4:00 PM (30 minutes)

Presenter: Prof. DI BARI, Pasquale (University of Southampton)

Contribution ID: **5** Type: **not specified**

Update on the use of Artificial Neural Networks in cosmology

Thursday, September 7, 2023 12:30 PM (30 minutes)

"Nonparametric reconstructions of cosmological parameters from observational data sets are usually associated with Gaussian processes (GP). It is known though, that GPs are plagued with overfitting issues and they introduce some statistical bias through the selection of the kernel. The last few years, with the advent of Machine Learning, artificial neural networks are being used in cosmology for the reconstruction of parameters in a model independent way, both from the physical and from the statistical point of view. In this talk, I will present the use of ANNs in cosmology and I will show how we expanded an existing neural network, to include non-Gaussian data points, as well as data sets with covariance matrices. I will also apply our algorithm in scalar-tensor models and I will present the stricter bounds we found on their arbitrary functions, compared to Gaussian processes."

Presenter: Dr DIALEKTOPOULOS, Konstantinos (Transilvania University of Brasov)

Contribution ID: **8** Type: **not specified**

High-Scale Supersymmetry from Inflection-Point Sgoldstino Inflation

Thursday, September 7, 2023 4:30 PM (30 minutes)

We propose a modification of no-scale supergravity models which incorporates sgoldstino stabilization and supersymmetry (SUSY) breaking with a tunable cosmological constant by introducing a Kahler potential which yields a kinetic pole of order one. The resulting scalar potential may develop an inflection point close to which an inflationary period can be realized for subplanckian field values consistently with the observational data. For central value of the spectral index ns, the necessary tuning is of the order of 10ˆ-6, the tensor-to-scalar ratio is tiny whereas the running of ns is around -3x10ˆ-3. Our proposal is compatible with high-scale SUSY and the results of LHC on the Higgs boson mass.

Primary author: Dr PALLIS, Constantinos (AUTH)

Presenter: Dr PALLIS, Constantinos (AUTH)

Contribution ID: **9** Type: **not specified**

Disentangling tensions from systematics with CLONES (Constrained Local & Nesting Environment Simulations)

Thursday, September 7, 2023 5:30 PM (30 minutes)

To understand dark matter and energy, large cosmological surveys are designed to reach a few percent precision. To be fully exploited, this large quantity of data needs to be analyzed in light of cosmological simulations. Preliminary analyses brought out tensions between the standard cosmological model and observations. Reaching a 1% precision, systematics of the same order of magnitude, due to our cosmic environment, survey specificities and tool properties, may rise out. Analyses would benefit from being fueled with a new type of cosmological simulations built to reproduce our cosmic environment. Such simulations, that I named CLONES (Constrained LOcal & Nesting Environment Simulations), could provide a robust methodological framework to minimize these systematic errors. I will introduce the CLONES giving a few study examples. CLONES are a promising tool to increase our capacity to evade biases in future survey analyses in order to disentangle systematics from real tensions.

Presenter: Prof. SORCE, Jenny (CNRS (CRIStAL, IAS))

Contribution ID: **10** Type: **not specified**

Signatures of no-scale supergravity in Nanograv and beyond

Thursday, September 7, 2023 6:00 PM (30 minutes)

In this talk I am going to present our recent work where we derive for the first time a three-peaked GW signal associated to no-scale Supergravity within the frequency ranges of nHz, Hz and kHz, with the former being in excellent agreement with NANOGrav/PTA GW data. We concentrate on the primordial gravitational wave (GW) spectrum induced due to second-order gravitational interactions by inflationary curvature perturbations as well as by isocurvature energy density perturbations of primordial black holes (PBHs) which are produced naturally within the framework of no-scale Supergravity. In particular, we work within Wess-Zumino type no-scale Supergravity and its naturally realised inflection-point inflationary potentials, which can give rise to the formation of microscopic PBHs which trigger an early matter-dominated era (eMD) and evaporate before Big Bang Nucleosythesis (BBN). Remarkably, we obtain an abundant production of gravitational waves at three different frequency ranges: 1) a resonantly amplified GW signal in the nHz frequency range induced by enhanced inflationary adiabatic perturbations and in strong agreement with NANOGrav/PTA data 2) a GW spectrum peaked at the Hz frequency range induced by isocurvature PBH fluctuations 3) a GW signal induced by the enhanced primordial curvature power spectrum around the characteristic PBH scale, being within the kHz frequency range and potentially detectable by electromagnetic GW detectors. The simultaneous detection of all three nHz, Hz and kHz GW peaks can constitute a clear indication in favor of no-scale Supergravity.

Presenter: Dr TZEREFOS, Charalampos (University of Athens)

Contribution ID: **11** Type: **not specified**

NANOGrav spectral index γ=3 from melting domain walls

Thursday, September 7, 2023 6:30 PM (30 minutes)

I will discuss cosmic domain walls with the tension which red-shifts with the expansion of the Universe. These melting domain walls emit gravitational waves (GW) with the low-frequency spectral shape corresponding to the spectral index favoured by the recent NANOGrav 15 yrs data. I will discuss a concrete high-energy physics scenario, which leads to such a melting domain wall network in the early Universe. The scenario involves a feebly coupled scalar field, which can serve as a promising dark matter candidate. We identify parameters of the model matching the GW characteristics observed in the NANOGrav data. The dark matter mass is pushed to the ultra-light range, which is accessible through planned observations thanks to the effects of superradiance of rotating black holes.

Presenter: Prof. BABICHEV, Eugeny (IJCLab, Orsay)

Contribution ID: **12** Type: **not specified**

Landscape, swampland and extra dimensions

Friday, September 8, 2023 9:00 AM (1 hour)

I will argue on the possibility that the smallness of some physical parameters signals a universe at a large distance corner in the string landscape of vacua. Such parameters can be the scales of dark energy and supersymmetry breaking, which should then be tied to a large 'dark' dimension at the micron scale. I will discuss the theoretical framework and some of its main physical implications.

Presenter: Prof. ANTONIADIS, Ignatios (LPTHE-Paris)

Contribution ID: **14** Type: **not specified**

On the Robustness of the Constancy of the Supernova Absolute Magnitude Non-parametric Reconstruction & Bayesian approaches

Friday, September 8, 2023 10:00 AM (1 hour)

In this work, we test the robustness of the constancy of the Supernova absolute magnitude MB using Non-parametric Reconstruction Techniques (NRT). We isolate the luminosity distance parameter dL(z) from the Baryon Acoustic Oscillations (BAO) data set and cancel the expansion part from the observed distance modulus dL(z). Consequently, the degeneracy between the absolute magnitude and the Hubble constant H0, is replaced by a degeneracy between MB and the sound horizon at drag epoch rd. When imposing the rd value, this yields the MB(z)=MB+Î´MB(z) value from NRT. We perform the respective reconstructions using the model independent Artificial Neural Network (ANN) technique and Gaussian processes (GP) regression. For the ANN we infer MB=19.22Â±0.20, and for the GP we get MB=19.25Â±0.39 as a mean for the full distribution when using the sound horizon from late time measurements. These estimations provide a 1ï¿½ possibility of a nuisance parameter presence Î´MB(z) at higher redshifts. We also tested different known nuisance models with the Markov Chain Monte Carlo (MCMC) technique which showed a strong preference for the constant model, but it was not possible not single out a best fit nuisance model.

Presenter: Prof. STAICOVA, Denitsa (INRNE)

Contribution ID: **15** Type: **not specified**

Primordial black holes, first order phase transitions, and superradiance

Friday, September 8, 2023 12:00 PM (30 minutes)

One of the main tensions in cosmology is that of the identity of dark matter. Primordial black holes (PBHs) are a longstanding candidate that has garnered a tremendous amount of attention and re-examination in recent years due to possible connections with gravitational wave signatures and regions of parameter space where they can form all of the dark matter, while well-studied WIMP candidates continue to not be found at direct detection experiments. I will discuss my current work regarding PBHs and their interplay with the phenomenon of superradiance, which provides an avenue for exploration of beyond the Standard Model physics through the production of new light particles around a rotating black hole, Hawking radiation, and gravitational waves. I will also address PBH formation mechanisms at the end of first order phase transitions, and their connections to early universe cosmology and possible observations at current and future gravitational wave observatories.

Presenter: Prof. DENT, James (Sam Houston State University)

Contribution ID: **16** Type: **not specified**

The more things change

Saturday, September 9, 2023 6:00 PM (30 minutes)

In this talk, I will present a possible way to alleviate tensions in cosmology through relaxing some of the widely-held assumptions in cosmology: the constancy of fundamental parameters, large-scale isotropy, and perfect-fluid cosmic media.

Presenter: Prof. ABEBE, Amare (Centre for Space Research, North-West University)

Contribution ID: **17** Type: **not specified**

Fractional Cosmology with conformal and nonminimal couplings a possible resolution to H0 tension?

Saturday, September 9, 2023 4:30 PM (30 minutes)

Various studies, such as references 2207.00878 [gr-qc], 2304.14465 [gr-qc], and 2304.14465 [gr-qc], have explored the potential of Fractional Cosmology to address the H0 tension. They have analyzed the Equation of State's value attained from the Supernova H0 and Planck's value for z<1.5 and have reported a trend of H0 that aligns with these values. However, there is still a discrepancy between the two values in the range 1.5<z<2.5, indicating that the H0 tension has not been entirely resolved. To expand on this theory, we may assume the Einstein-Hilbert action and a scalar field Ï to create a nonminimal coupling theory with the coupling Î¾RÏ^2 of gravity and the scalar field. Î¾ is the coupling constant, and the simplest and most natural case is minimal coupling where Î¾=0. Another viable option is Î¾=1/6, known as conformal coupling because the action is unchanged under conformal transformations of the metric. Any value of Î¾â 0 is nonminimal coupling. A fractional version of the conformal and nonminimal coupling theory employs fractional calculus to modify the standard derivative equations and alter the Friedmann and Klein-Gordon equations. The Î¼ fractional parameter and the age of the Universe t0 affect the evolution of cosmic species densities. This new approach to cosmology modifies the Friedmann equations and allows for late cosmic acceleration without a dark energy component. Fractional cosmology could be a significant breakthrough in solving longstanding cosmology problems, including the H0 tension.

Presenter: Prof. LEON TORRES, Genly (Universidad Catolica del Norte)

Contribution ID: **19** Type: **not specified**

Dark Energy from topology change at the foam level

Friday, September 8, 2023 12:30 PM (30 minutes)

We investigate the invariability of the Gauss-Bonnet action term in 4D in the case where gravitational instatons appear in the quantum foam level. The key hypotheses of Euclidean Quantum Gravity, that produce instaton solutions of distinct topology, are encapsulated effectively into the quantum field fluctuations. Therefore, under the Effective Topological Variation Conjecture (ETVC) the variation of the Gauss-Bonnet term need not be zero and in the semiclassical approach yields a novel effective dark energy sector of topological origin. The effective cosmological constant
$protect\Lambda_{eff}$ is interpreted as the density of wormholes thus exhibiting a dynamical nature. We examine the case of Nariai instatons and Euclidean Wormholes leading to arbitrary sign of dark energy. The theoretical values of Λ_{eff} support our models candidacy for explaining the late time acceleration.

Presenter: Dr TSILIOUKAS, Stylianos (Thessaly U.)

Contribution ID: **20** Type: **not specified**

Reconstructing the Dark Energy

Friday, September 8, 2023 11:30 AM (30 minutes)

In this talk, I will review my research on using the "reconstruction" method to study Dark Energy. I'll discuss different types of reconstructions, how they work, and the results I've obtained. My focus is on model-independent reconstructions of the equation of state and density parameter of Dark Energy. The findings suggest oscillatory behavior and a possible transition from positive to negative energy density, deviating from the standard LCDM model.

Presenter: Dr ESCAMILLA TORRES, Luis Adrian (ICF, UNAM)

Contribution ID: **21** Type: **not specified**

Alleviating both H0 and σ8 tensions through Tsallis entropy

Thursday, September 7, 2023 4:00 PM (30 minutes)

We investigate the cosmological applications of Tsallis entropy and we analyze them in the light of both H0 and σ8 tensions. We obtain the modified Friedmann equations, which contain new extra terms that constitute an effective dark energy sector depending on the new Tsallis exponent δ, that quantifies the departure from standard entropy. For particular δ choices we investigate the effect of the additional terms on the expansion rate of the universe, which appears to be negligible at high redshifts, however at low redshifts the Hubble parameter acquires increased values in a controlled way. The mechanism behind this behavior is the fact that the effective dark-energy equation-of-state parameter exhibits phantom behavior, which implies faster expansion, which is one of the sufficient conditions that are capable of alleviating the H0 tension. Additionally, for the same parameter choice we obtain an increased friction term and an effective Newton's constant smaller than the usual one, and thus the σ8 tension is also solved.

Presenter: Dr PETRONIKOLOU, Maria (National Observatory of Athens, NTUA)

Contribution ID: **22** Type: **not specified**

Viscous Modified Ghost Scalar Field Dark Energy Models with Varying G

Monday, September 11, 2023 6:30 PM (30 minutes)

We intend to study QCD-modified scalar field models of dark energy, in the presence of both interaction and viscosity, with varying gravitational constant G. The equation of the state parameter of the interacting viscous QCD-modified ghost dark energy (MGDE) and the deceleration parameter of the universe, is derived. Furthermore, we establish the correspondence between the interacting viscous QCD-MGDE and scalar field models of the dark energy which includes quintessence, tachyon, k-essence, and dilaton energy density. This is done in the framework of a non-flat FRW universe. Hence we are able to establish a correspondence and reconstruct the potential $V(\phi)$ and dynamics ϕ of the scalar field models according to the evolution of viscous QCD-MGDE.

Presenter: Prof. DHANKAR, Praveen Kumar (G. H. Raisoni College of Engineering, Nagpur, India)

Contribution ID: **23** Type: **not specified**

Opening

Thursday, September 7, 2023 8:45 AM (15 minutes)

Primary author: Prof. SARIDAKIS, Emmanuel (National Observatory of Athens)

Co-author: Prof. DI VALENTINO, Eleonora (University of Sheffield)

Presenters: Prof. DI VALENTINO, Eleonora (University of Sheffield); Prof. SARIDAKIS, Emmanuel (National Observatory of Athens)

Contribution ID: **24** Type: **not specified**

The Astrophysics of the Cosmic Distance Scale

Saturday, September 9, 2023 9:00 AM (1 hour)

TBA

Presenter: Prof. BEATON, Rachael (Space Telescope Science Institute Baltimore, Maryland, US)

Contribution ID: **25** Type: **not specified**

Two out of Three Ain't Bad A SH0ES Two Rung Distance Ladder

Saturday, September 9, 2023 10:00 AM (1 hour)

In light of the Hubble tension, it is important to test the individual components of the distance ladder. For this purpose, we report a measurement of the Hubble constant from 35 extragalactic Cepheid hosts measured by the SH0ES team, using their distances and redshifts at cz â⊠¤ 3300 km s-1, instead of any more distant SNe Ia, to measure the Hubble flow. The Cepheid distances are calibrated geometrically in the Milky Way, NGC 4258, and the Large Magellanic Cloud. Peculiar velocities are a significant source of systematic uncertainty at z ˜ 0.01, and we present a formalism for both mitigating and quantifying their effects, making use of external reconstructions of the density and velocity fields in the nearby universe. Accounting for all systematic uncertainties, we find H0 = 72.9 (+2.4/-2.2) as a fiducial result, at 2.4ï⊠ tension with Planck. While SNe Ia are essential for a precise measurement of H0, unknown systematics in these supernovae are unlikely to be the source of the Hubble tension.

Presenter: Prof. KENWORTHY, W DArcy (Oskar Klein Center, Stockholm University)

Contribution ID: **26** Type: **not specified**

Simultaneous alleviation of major cosmological tensions through Λ

ms$CDMcosmology$

Saturday, September 9, 2023 11:30 AM (1 hour)

In this talk, we will first give a brief introduction to the $\Lambda_{\rm s}$CDM model, which explores the recent conjecture suggesting a rapid transition of the universe from anti-de Sitter vacua to de Sitter vacua, viz., the cosmological constant switches sign from negative to positive at redshift $z_\dagger \sim 1.7$, inspired by the graduated dark energy (gDE). And then, we will present the results of its comprehensive observational analysis showing that, predicting $z_\dagger \approx 1.7$, $\Lambda_{\rm s}$CDM simultaneously addresses the major cosmological tensions of the standard ΛCDM model, viz., the H_0, M_B, and S_8 tensions, along with some other less significant tensions such as the BAO Ly-α discrepancy. We will conclude with a theoretical discussion on the possible physical mechanisms from which this scenario may be realized and their implications for our current understanding of the universe.

Presenter: Prof. AKARSU, Ozgur (Istanbul Technical University)

Contribution ID: **29** Type: **not specified**

Exorcizing the ghosts in higher-derivative gravity

Sunday, September 10, 2023 4:00 PM (30 minutes)

Higher-derivative theories of gravity are advocated to be power-counting renormalizable. As such, they might play a role in the possible UV completion of gravity. At the same time, some of these theories suffer from the presence of ghosts – unphysical degrees of freedom that at the classical level lead to instability, while upon quantization, they cause violation of unitarity. In this talk, I will present boundary conditions that remove such pathological modes, studying them on the examples of Conformal and Einstein-Weyl gravity, and discuss the consequences for these theories once the boundary conditions are implemented.

Presenter: Dr HELL, Anamaria (LMU Munich)

Contribution ID: **31** Type: **not specified**

Shape of CMB lensing in early dark energy cosmology

Thursday, September 7, 2023 12:00 PM (30 minutes)

Recently, the cosmological tensions, H_0 and S_8 in particular, have inspired modification of both the pre and post recombination physics simultaneously. Early dark energy is a promising solution of the H_0 tension known to be compatible with CMB. However, the compatibility of early dark energy, as well as general early resolutions, with CMB is no longer obvious if the late Universe is also modified. Aside from cosmological parameters, the main channel through which late Universe physics affects CMB observable is gravitational lensing. Using a new Gaussian Process function sampling method, we obtained the early Universe (CMB) only constraints on the full shape of the lensing potential, without relying on observation data of the late Universe. It is found that CMB prefers a lensing potential shape that is ΛCDM-like in $80 < L < 400$ but with enhanced amplitude beyond this range. The obtained shape constraints can serve as a CMB-compatibility guideline for both late and early Universe model building that modifies the lensing potential.

Presenter: Dr YE, Gen (Leiden University)

Contribution ID: **32** Type: **not specified**

Cosmological implication of f(T) gravity models through phase space analysis

Saturday, September 9, 2023 5:30 PM (30 minutes)

We have performed the dynamical system analysis of f(T) gravity cosmological models at both background and perturbation levels. We have presented three models pertaining to three distinct functional forms of f(T). The first form is that of the logarithmic form of the torsion scalar T, the second one is in the power law form, and the third one is the combination of the first two forms. For all these three forms of f(T), we have derived the corresponding cosmological parameters in terms of the dynamical variables. Subsequently, the critical points are obtained and the condition(s) of its existence has been derived. Critical points of each model have been analysed individually and the corresponding cosmology are derived. The stability behaviour of these critical points are discussed from the behaviour of the eigenvalues and the phase portraits. At least one stable node has been obtained in each of these models. Further from the evolution plots of the cosmological parameters, the accelerating behaviour of the cosmological models are also verified

Presenter: Dr DUCHANIYA, Lokesh Kumar (BITS Pilani Hyderabad Campus India)

Contribution ID: **33** Type: **not specified**

A possible scheme to alleviate the small-scale tension encountered by fuzzy dark matter

Monday, September 11, 2023 5:30 PM (30 minutes)

Fuzzy dark matter (FDM) with mass around 10^{-22} eV is believed to be a more hopeful DM candidate compared to cold dark matter (CDM). Because FDM can solve the small-scale problems for CDM, thanks to its wave nature due to the very light mass. These problems arise from the incorrect prediction for the structure growth. For example, CDM predicts a cusp at the center of DM halo, while recent observations show a preference for core in DM halo profile. While FDM, which can be realized by axion-like-particles, has successfully explain these problems, by suppressing the structure growth at small scale. This is achieved by its wave nature (or we call "quantum pressure") countering the collapse of DM halos. More recently, however, small-scale observations at high redshifts, such as Lyman-alpha, begin to challenge FDM in return. That is, the FDM which can solve the CDM crisis, predicts too much suppression at small scale, and so appears a closing window of its parameter space. In this talk, I will show our result on alleviating or even solving such tension in a new theory. We focus on the redshift difference between these observations, and propose a scheme of DM scalar field with differently-evolving sound speed. Under the frame of DBI theory, we have showed that it is possible to change the behavior of the quantum pressure term, therefore change the process of structure growth. I will present some examples in this talk, while more possibilities remain to be explored.

Presenter: Dr LU, Shiyun (University of Science and Technology of China)

Contribution ID: **35** Type: **not specified**

The Ups and Downs of Early Dark Energy

Sunday, September 10, 2023 9:00 AM (1 hour)

Early Dark Energy (EDE), an additional component of dark energy active in the decade of redshift before recombination, has emerged as one of the most effective models at resolving the Hubble tension. By reducing the size of the sound horizon'that calibrates CMB and BAO observations, it is able to fit a variety of datasets including the variety of high-H0 measurements, and may shed light upon the yet-unknown nature of dark energy, and even inflation. Yet, it is clear that EDE cannot bethe end of the story'at least in its current form, as it brings up a number of theoretical and observational issues. In this talk, I will review the current status of EDE models and present some new developments, highlighting both the successes and challenges that EDE is facing, and draw implications of what we have learned about EDE towards establishing a new "concordance cosmology".

Presenter: Prof. POULIN, Vivian (Montpellier U.)

Contribution ID: **36** Type: **not specified**

Seven hints that early-time new physics alone is not sufficient to solve the Hubble tension

Sunday, September 10, 2023 10:00 AM (1 hour)

It appears by now established that solving the Hubble tension requires new physics operating at early times, i.e. prior to recombination. But is that really the end of the story? Based on Miller's law (which states that the number of objects the average person can hold in working memory is about seven), I will present seven independent hints pointing towards the fact that the Hubble tension requires more than just early-time new physics, and will discuss my personal thoughts about what the most promising scenarios might be moving forward (also keeping in mind the potential tension in S8).

Presenter: Prof. VAGNOZZI, Sunny (Trento U.)

Contribution ID: **37** Type: **not specified**

Scalar field emulator via anisotropically deformed vacuum energy

Sunday, September 10, 2023 11:30 AM (30 minutes)

In this talk, we introduce a generalization of the usual vacuum energy via preserving zero inertial mass density. In return for zero inertial mass density, vacuum energy yields a particular form of anisotropic pressure. This â□□ansiotropicallly deformed vacuum energy' couples to the shear scalar in a unique way, such that they together emulate the canonical scalar field with an arbitrary potential. This opens up a new avenue by reconsidering cosmologies based on canonical scalar fields, along with a bonus that the kinetic term of the scalar field is replaced by an observable, the shear scalar. There has been recent suggestions to address Hubble tension by reanalyzing the cosmological data by breaking down of the RW framework, e.g., allowing anisotropic expansion in the late universe and at the end of this talk, we will show that via deformed vacuum energy, it is possible to generate anisotropies at cosmological scales in the late universe, which in turn can pave the way for considering such approaches to address some of the cosmological discrepancies. In collaboration with Ã□. Akarsu, A. A .Sen and J. A. Vazquez,

Presenter: Prof. KATIRCI, Nihan (Dogus University)

Contribution ID: **38** Type: **not specified**

Probing H0 isotropy and bulk flows with eROSITA and galaxy cluster scaling relations

Sunday, September 10, 2023 12:00 PM (30 minutes)

The expansion isotropy of the Universe and the dissipation of bulk flows at >200 Mpc scales is a crucial assumption of LCDM. Any significant, observational deviation from this consensus can strongly challenge the standard cosmological model. Multiwavelength scaling relations of galaxy clusters are an excellent and powerful tool to scrutinize both the Hubble constant (H0) isotropy and the existence of bulk flows at large scales. This becomes feasible by studying the directionality of scaling relations between cluster properties that do or do not depend on cosmological assumptions. Using 540 X-ray clusters at z<0.4, we robustly detected a 9% H0 anisotropy at a 5.4 sigma level. Alternatively, this anomaly can be attributed to a 900 km/s cluster bulk flow extending up to 500 Mpc. Both scenarios are in strong tension with LCDM and have clear implications to the Hubble tension. Interestingly, the 1st eROSITA cluster catalog independently confirms this cosmic anisotropy within z<0.2. Further confirmation comes from using new X-ray cluster measurements, forming much more precise scaling relations than before, boosting the detection of a large bulk flow out to ˜600 Mpc to 6 sigma. Finally, the use of the hydrodynamical, LCDM FLAMINGO simulations confirms the rarity of our findings.

Presenter: Prof. MIGKAS, Konstantinos (Leiden University)

Contribution ID: **39** Type: **not specified**

The multipolar structure of the local universe

Sunday, September 10, 2023 12:30 PM (30 minutes)

The three-dimensional expansion rate fluctuation field is an unbiased Gaussian observable that measures deviations from the linearity and isotropy of the redshift-distance relationship in an optimal, robust, and model-independent way (Kalbouneh, Marinoni, Bel 2023). We show how to perform a spherical harmonic analysis of this observable and determine the multipole structure of the Hubble expansion rate in the local universe, as traced by samples of galaxies Cosmicflows-4 and, independently, of SNIa (Pantheon+). With this analysis, we update and extend the scope of the conclusions we have previously drawn from the analysis of smaller samples (Cosmicflows-3 and Pantheon). We also show how to subtract multipole fluctuations from the data and extract an optimal value of the Hubble constant. We then compare this value with that found by traditional analyses and discuss the implications for cosmology.

Presenter: Dr KALBOUNEH, Basheer (Aix-Marseille university/ CPT)

Contribution ID: **41** Type: **not specified**

From the Hubble tension to the Harrison-Zeldovich spectrum

Sunday, September 10, 2023 4:30 PM (30 minutes)

An exact scale-invariant Harrison-Zeldovich spectrum, i.e. $n_s = 1$, has been ruled out at 8.4σ level according to Planck results. However, the situation changes when we consider the Hubble tension. Extra energy injection in early cosmology (e.g. Early Dark Energy), which is a class of promising solutions of the Hubble tension, seems to call for the return of $n_s = 1$. Using recent observational data, we show strong evidence for $n_s = 1$ if the Hubble tension is resolved in this way. Furthermore, we show how these solutions can affect the observation constraints on the r-n_s plane, bringing unforeseen impacts to the inflation model.

Presenter: Dr JIANG, Jun-Qian (University of Chinese Academy of Sciences)

Contribution ID: **43** Type: **not specified**

Static and radiative cylindrically symmetric spacetimes

Tuesday, September 12, 2023 4:30 PM (30 minutes)

A simple setup for discussing both mathematical and physical aspects of spacetimes with extended sources, like cosmic strings or cosmic filaments of galaxies and dark matter extending across hundreds of millions of light years is provided by cylindrical symmetry. Investigating cylindrically symmetric configurations is also a suitable precursor to the study of axial symmetry. Unlike in the spherically symmetric case, the cylindrically symmetric vacuum is not unique. The Einstein–Rosen cylindrically symmetric vacuum solutions in GR include wavelike behaviours, allowing for both standing wave and approximate progressive wave solutions, discovered analytically in the very early days of general relativity by Einstein and Rosen. Both solitonic waves and impulsive wave solutions were also identified in this class. The canonical quantization of cylindrically symmetric gravitational waves by Kuchar was the earliest example of the midisuperspace approach. A cylindrically symmetric, static background on which the ylindrical gravitational waves propagate, could be the Levi-Civita spacetime, the static limit of the Einstein–Rosen class. Although well studied earlier in a variety of coordinates, certain aspects of the Levi-Civita spacetime concerning its physical and geometrical interpretation were not well clarified. In order to do so, we suitably defined the Komar mass density of its infinite axis source to explore it as a metric parameter. Among the advantages we enlist that it eliminates double coverages of the parameter space, vanishes in flat spacetime and when small, it corresponds to the mass density of an infinite string. As expected, the Newtonian gravitational force is attractive and it increases monotonically with positive Komar mass densities, asymptoting to the inverse of the proper distance in the radial direction. The tidal force between nearby geodesics (gravity in the Einsteinian sense) however has a maximum, after which it decreases asymptotically to zero with increasing Komar mass density. Hence, from a physical point of view the Komar mass density of the Levi-Civita spacetime encompasses both Newtonian gravity and acceleration effects. Its increase eventually drags the field lines parallel, transforming Newtonian gravity through the equivalence principle into a pure acceleration field and the Levi-Civita spacetime into a flat Rindler-like spacetime. In a geometric picture the increase of the Komar mass density deforms the planar sections of the spacetime into ever deepening funnels, eventually degenerating into cylindrical topology in an appropriately chosen embedding. The Einstein-Rosen vacuum waves propagating on this background have been generalised both to be sourced by radiation in the geometrical optics limit and to Brans-Dicke vacuum. Preliminary results on further generalisations will also be reported.

Presenter: ÁRPÁD GERGELY, László (University of Szeged)

Contribution ID: **45** Type: **not specified**

Rethinking Recombination Primordial magnetic fields, small-scale inhomogeneities, and their implications for the Hubble tension

Sunday, September 10, 2023 6:00 PM (30 minutes)

One of the ways to resolve the Hubble tension is to modify the recombination history of the universe. An intriguing proposal to realize this invokes primordial magnetic fields (PMFs) to stir up the plasma on small scales. A clumpy baryon density field recombines faster than a homogenous one, which would push the surface of last scattering to earlier times and increase the inferred distance to it, as well as the value of the Hubble constant H0. Previous work on this mechanism has treated the recombination problem in a simplified manner, by taking the fluctuations induced by PMFs for granted and modifying existing codes that solve recombination in a homogenous universe in an ad-hoc manner to estimate the average recombination rate. In reality, recombination involves photons in the Lyman-alpha resonance and the Lyman-continuum. On the small scales at which PMFs introduce baryon clumping, the nonlocal transport of these photons becomes important. Our preliminary results utilizing a linearized framework which accounts for the non-local radiative transport indicate that PMFs are not effective in sourcing significant growth rates in the baryon density field across many length scales. Furthermore, on the smallest scales, modified silk and neutrino diffusion damping in the presence of PMFs inhibit the seeding and growth of inhomogeneities. Our studies are ongoing to determine whether there is still a range of length scales for which PMFs that respect PLANCK18 constraints can source inhomogeneities. We plan to present results demonstrating that a naive treatment of recombination in an inhomogeneous plasma with PMFs can reproduce substantial clumping across many length scales. However, when the full radiative transport is accounted for, it suppresses growth across a wide range of scales. We will also present our continuing work in determining the diffusion damping scale in the presence of PMFs. Not only is this the first work to date that provides a detailed treatment of the evolution of PMF-induced small scale inhomogeneities, but the general framework we have developed is useful for any future proposals to modify the recombination history on small scales.

Presenter: Dr SCHIFF, Jonathan (University of California Santa Barbara)

Contribution ID: **46** Type: **not specified**

Cosmic Microwave Background Polarization Measurements and Cosmological Data Tensions

Monday, September 11, 2023 10:00 AM (1 hour)

Recent advancements in CMB measurements have offered a detailed window into the cosmos. However, this progress has also led to tensions between the outcomes of various cosmological observations, challenging the coherence of our current cosmological model. This talk delves into the implications of CMB polarization measurements on large angular scales, which appear to significantly amplify the level of existing tensions. This raises the pivotal question: does this signify new physics or stem from systematic errors?

Presenter: Prof. MELCHIORRI, Alessandro (Universitα di Roma â La Sapienzaâ)

Contribution ID: **47** Type: **not specified**

Cosmology from the smallest scales

Monday, September 11, 2023 11:30 AM (1 hour)

Recent tensions and anomalies have motivated the need to explore novel theoretical possibilities beyond the standard cosmological model. In this talk, I will argue that small-scale CMB observations can play a crucial role in the study of several physical mechanisms, potentially revealing unique signatures of new physics that would be difficult to detect on larger angular scales. I will provide and discuss three different examples of emerging hints of new physics from the smallest scales that involve the three pillars of the cosmological model: Inflation, Dark Matter, and Dark Energy. These hints differ both in their interpretations and implications and include models featuring interactions in the dark sector of the theory, able to reconcile (part of) the cosmological tensions.

Presenter: Prof. GIARE, William (University of Sheffield)

Contribution ID: **48** Type: **not specified**

A Model of Dark Matter and Energy

Monday, September 11, 2023 12:30 PM (30 minutes)

TBA

Presenter: Prof. FRAMPTON, Paul (UniSalento)

Contribution ID: **49** Type: **not specified**

The Hubble parameter of the Local Distance Ladder from dynamical dark energy with no free parameters

Tuesday, September 12, 2023 9:00 AM (1 hour)

The H_0-tension problem challenges our conventional application of general relativity to cosmology, otherwise well-described by FRLW universes in terms a Hubble parameter $H(z)$ and a deceleration parameter $q(z)$. A finite dark energy density is expected from the Sitter temperature associated with the de Sitter background scale of acceleration $a_{dS} = cH$, where c is the velocity of light. Normalizing the propagator by the total phase of the Hubble horizon, this predicts a dynamical dark energy $\Lambda = g(1-q)H^2$, where $g = 1-\xi\alpha < 1$ refers to a gravitational coupling constant modified on the order of the fine-structure constant α. Preserving the astronomical age of the Universe and the BAO, we infer $\xi = 0.49\pm 0.1$. Specifically, $\xi = 1/2$ predicts $H_0 = (73.37\pm 0.54)$km/s/Mpc (van Putten, 2021, PLB, 823, 136737) consistent with $H_0 = (73.30 \pm 1.04)$km/s/Mpc of the Local Distance Ladder (Riess et al. 2022, ApJ, 934, L7).

Presenter: Prof. VAN PUTTEN, Maurice (Sejong U. Korea)

Contribution ID: **50** Type: **not specified**

Galaxy evolution, observational biases and cosmological tensions

Tuesday, September 12, 2023 10:00 AM (1 hour)

Galaxies are known to be good but biased tracers of the underlying dark matter field. This bias is mostly driven by the history of hierarchical clustering and galaxy/halo assembly history but is also affected by factors regulating galaxy evolution, usually environment dependent. Moreover, it is easily blurred by observational biases unavoidably present in the data. Thus, the relations between galaxy physical properties and the underlying dark cosmic web are not easy to model. At the same time, all cosmological tests are necessarily based on baryonic tracers. Thus, using galaxies for tests of cosmological models relies on our understanding of the relations between a galaxy, its DM halo, large-scale environment, their co-evolution, and observational biases in the data we use. In my talk, I will show some recent results from our group illustrating nontrivial dependencies between galaxy evolution and their environment, and pointing to the prospects - and pitfalls - with the new soon-arriving data from near-future large surveys.

Presenter: Prof. POLLO, Agnieszka (National Centre for Nuclear Research & Jagiellonian University)

Contribution ID: **51** Type: **not specified**

Interacting scalar field models-observational data

TBA

Presenter: Prof. PATIL, Trupti

Contribution ID: **52** Type: **not specified**

Generating primordial fluctuations from modified teleparallel gravity

Monday, September 11, 2023 4:00 PM (30 minutes)

In the context of modified teleparallel gravity, we study the generation of primordial density fluctuations. It is well known that generic modifications of teleparallel gravity are not invariant under six-parameter local Lorentz transformations. In order to restore the local Lorentz symmetry, we have incorporated six additional degrees of freedom in the form of Goldstone modes of the symmetry breaking through a Lorentz rotation of the tetrad field. After integrating out all the auxiliary modes, we obtain a second order action for the scalar and tensor propagating modes and their power spectrum generated during inflation. It is found that an explicit mass term emerges in the second order action for curvature perturbation, describing the imprints of local Lorentz violation at first-order of slow-roll.

Presenter: Prof. OTALORA, Giovanni (University of Tarapaca)

Contribution ID: **53** Type: **not specified**

Resolution of cosmological tensions using Unparticles

Tuesday, September 12, 2023 12:00 PM (30 minutes)

Addressing the discrepancy between the late and early time measurements of the Hubble parameter, H_0, and the so-called S_8 parameter has been a challenge in precision cosmology. Several models are present to address these tensions, but very few of them can do so simultaneously. In the past, we have suggested Banks-Zaks/Unparticles as an emergent Dark Energy model and claimed that it can ameliorate the Hubble tension. In this work, we test this claim and perform a likelihood analysis of the model and its parameters are given current data and compare it to ΛCDM. The model offers a possible resolution of Hubble tension and softens the Large Scale Structure (LSS) tension without employing a scalar field or modifying the gravitational sector. Our analysis shows a higher value of $H_0 \sim 70 - 73$ km/sec/Mpc and a slightly lower value of S_8 for various combinations of data sets. Consideration of Planck CMB data combined with the Pantheon sample and SH0ES priors lowers the H_0 and S_8 tension to 0.96σ and 0.94σ respectively with best-fit $\Delta\chi^2 \approx -10$ restoring cosmological concordance. Significant improvement in the likelihood persists for other combinations of data sets as well. Evidence for the model is given by inferring one of its parameters to be $x_0 \simeq -4.36$.

Presenter: Prof. BEN-DAYAN, Ido (Ariel U.)

Contribution ID: **55** Type: **not specified**

Tackling the tensions of cosmology with a negative dark energy density

Tuesday, September 12, 2023 12:30 PM (30 minutes)

In this talk, relying on the fact that the comoving angular diameter distance to last scattering, $D_M(z_*)$, is strictly constrained almost model-independently, I will present how a dark energy (DE) density that attains negative values in the past can alleviate the H_0 tension along with the S_8, and Ly-α discrepancies. Observational studies suggest that matching the mean value of the Ly-α data requires a negative DE density, and to keep $D_M(z_*)$ unaltered compared to that of ΛCDM, this is naturally accompanied by a higher H_0 value. Of course, a negative DE density should transit to the positive regime to drive the present-day acceleration of the universe, and for a continuous density function, this requires that the DE density vanishes at a certain time. This vanishing point is accompanied with a singularity in the equation of state parameter of the DE, I will discuss why such a singularity is necessary, and how a negative energy density is not problematic from the point of view of fundamental physics. Finally, imposing that $D_M(z_*)$ is constant amongst different models, along with an identical pre-recombination and present-day universe, requires that any modifications to the Hubble radius of ΛCDM should be described in terms of \textit{ admissible wavelets}. The oscillatory behaviour of wavelets provides a natural way to fit a multitude of BAO data, and through their characteristics, I will discuss how the bumps found in the Hubble function and the DE density in their observational reconstructions may be fake.

Presenter: Dr OZULKER, Emre (Istanbul Technical University)

Contribution ID: **56** Type: **not specified**

Observational cosmology in higher-order F(R,G) Gravity

Monday, September 11, 2023 6:00 PM (30 minutes)

The current study offers a thorough analysis of a dark energy cosmological model in $\mathcal{F}(\mathcal{R},\mathcal{G})$ gravity, where $\mathcal{R}$ and $\mathcal{G}$ denote Ricci scalar and Gauss-Bonnet invariant respectively. In order to solve Einstein field equations, we use the parametrized Hubble parameter in terms of the scale factor. We constrain the model parameters using the Hubble (Hz) dataset of 77 points, $Pantheon$ dataset of 1048 points, and the joint dataset ($Hz + Pantheon$). The evaluated best-fit values of the model parameters are in close agreement with recent observations. The Deceleration parameter transits from decelerating state to an accelerating state in late times. The EoS parameter converges to the quintessence region of the dark energy, which is responsible for the accelerated expansion of the universe in late times. Moreover, we examine the energy conditions that are satisfied except for the strong energy condition, which is unavoidable in the context of modified gravity. Finally, we incorporate the information regarding cosmic observations to execute the statefinder diagnostic and the scalar field.

Presenter: Dr BALHARA, Harshna (Netaji Subhas University of Technology)

Contribution ID: **57** Type: **not specified**

The distribution and morphologies of Fornax Cluster dwarf galaxies suggest they lack dark matter

Tuesday, September 12, 2023 4:00 PM (30 minutes)

Due to their low surface brightness, dwarf galaxies are particularly susceptible to tidal forces. The expected degree of disturbance depends on the assumed gravity law and whether they have a dominant dark halo. This makes dwarf galaxies useful for testing different gravity models. In this project, we use the Fornax Deep Survey (FDS) dwarf galaxy catalogue to compare the properties of dwarf galaxies in the Fornax Cluster with those predicted by the Lambda cold dark matter (\LambdaCDM) standard model of cosmology and Milgromian dynamics (MOND). We construct a test particle simulation of the Fornax system. We then use the MCMC method to fit this to the FDS distribution of tidal susceptibility \eta (half-mass radius divided by theoretical tidal radius), the fraction of dwarfs that visually appear disturbed as a function of \eta, and the distribution of projected separation from the cluster centre. This allows us to constrain the \eta value at which dwarfs should get destroyed by tides. Accounting for an r-band surface brightness limit of 27.8 magnitudes per square arcsec, the required stability threshold is \eta destruction = 0.25+0.07-0.03 in \LambdaCDM and 1.88+0.85-0.53 in MOND. The \LambdaCDM value is in tension with previous N -body dwarf galaxy simulations, which indicate that \eta destruction is about 1. Our MOND N-body simulations indicate that \eta destruction= 1.70 \pm 0.30, which agrees well with our MCMC analysis of the FDS. We therefore conclude that the observed deformations of dwarf galaxies in the Fornax Cluster and the lack of low surface brightness dwarfs towards its centre are incompatible with \LambdaCDM expectations but well consistent with MOND. Monthly Notices of the Royal Astronomical Society, Volume 515, Issue 2, September 2022, Pages 2981, 3013, https //doi.org/10.1093/mnras/stac1765

Presenter: Dr ASENCIO, Elena (University of Bonn)

Contribution ID: **58** Type: **not specified**

Quasar f(T) cosmologies

Sunday, September 10, 2023 5:30 PM (30 minutes)

To explore a possible deviation from standard cosmologies that can explain the current discrepancy on the current Hubble value, in this talk we consider adding to the current local observables new calibrated Quasars datasets using ultraviolet, x-ray and optical plane techniques. While these can be identified as part of the high-redshift standard candels objects, the main characteristics of these are based on fluxes distributions calibrated up to z˜7. Our results can be an initial start for more serious treatments in the quasars physics from ultraviolet, x-ray and optical plane techniques behind the local observations as cosmological probes to relax the cosmological tensions problems.

Presenter: Prof. ESCAMILLA RIVERA, Celia (Instituto de Ciencias Nucleares UNAM)

Contribution ID: **60** Type: **not specified**

Cosmological tensions and strong coupling issue in the f(T) gravity

Tuesday, September 12, 2023 11:30 AM (30 minutes)

By incorporating torsional gravity into the effective field theory (EFT)perspective, the model offers a unified and By Incorporating torsional gravity into the EFT perspective offers a unified and consistent framework to fit observations solving the two tensions. Both the H0 and ÏŽ8 tensions can simultaneously be alleviated within torsional gravity by the EFT approach. Further, we investigate the scalar perturbations and the possible strong coupling issues of f(T) around a cosmological background. We apply the EFT framework by considering both linear and second-order perturbations for f(T) theory. We find that no new scalar mode is present in both linear and second-order perturbations in f(T) gravity, which suggests a strong coupling problem. However, based on the ratio of cubic to quadratic Lagrangians, we provide a simple estimation of the strong coupling scale, a result which shows that the strong coupling problem can be avoided at least for some modes. In conclusion, perturbation behaviors that at first appear problematic may not inevitably lead to a strong coupling problem, as long as the relevant scale is comparable with the cutoff scale M of the applicability of the theory.

Presenter: Dr HU, Yu-Min (University of Science and Technology of China)

Contribution ID: **62** Type: **not specified**

Domain Walls and Hubble constant Tension

Monday, September 11, 2023 4:30 PM (30 minutes)

We present the idea that replacing the cosmological constant Λ in the ΛCDM by a distribution of walls with very low tension compared to what one would expect from the "new physics"could help for the tension in the Hubble constant fit in this Standard Cosmological Model. Using parameters from our, since long, model for dark matter as macroscopic pearls, we can get a promising order of magnitude for the correction to the Hubble constant. Our model is on the borderline to fail by predicting too much extra fluctuations as function of direction in the cosmological microwave background radiation,
but imagining the bubbles in the voids to have come from more a bit smaller "big bubbles"may help.

Presenter: Prof. NIELSEN, Holger (Glasgow U.)

Contribution ID: **63** Type: **not specified**

A (DOUBLE) TAKE ON THE γL INDEX

Sunday, September 10, 2023 6:30 PM (30 minutes)

The search for a solution to the tensions in the Standard Model in the shape of a single, all-describing model is both extremely needed and extremely hard to carry out. This is partly because we lack the knowledge of some of the fundamental aspects that a new theory should include in order to match our observations of the universe. Even in the case of the ΛCDM model itself, which we take as our most general description of the universe at large scales, it is not clear what components such as Λ and CDM (!) are supposed to be consisting of.
As an alternative, we can consider phenomenological extensions or modifications to the standard theory, which aim at detecting a deviation from the standard framework rather than explaining their fundamental nature.
I will be presenting the results of an analysis carried on the growth index - 'γ L ', a highly precise parametrisation that modifies the growth of linear, sub-horizon matter perturbations in the Standard Model, but not its expansion history. Through the lens of a variety of CMB datasets, we have studied how the ad-hoc inclusion of the fixed parameter γ L behaves when confronted with the problematic H 0 and S 8 tensions, while also searching for the presence of deviations from its ΛCDM value: γ L ≈ 0.55.

Presenter: Dr SPECOGNA, Enrico (University of Sheffield)

Contribution ID: **64** Type: **not specified**

Renormalization group approaches to Quantum Gravity and Tensions in Modern Cosmology

Saturday, September 9, 2023 12:30 PM (30 minutes)

Asymptotic Safety is a promising framework towards the understanding, in a non-perturbative way, of Quantum Gravity. It treats the Newtons constant G_N and the cosmological constant Λ as running coupling of an effective action. At the phenomenological point of view the values of G_n and Λ depend on the energy density of the system under consideration. This fact has interesting astrophysical and cosmological consequences. The present work discusses the effects on the distance measurements from SNIa light curves and on the strong and weak gravitational lensing measurements.

Presenter: Prof. ZARIKAS, Vasilios (Thessaly U.)

Contribution ID: **65** Type: **not specified**

Alleviating H0 tension in f(G) gravity

Tuesday, September 12, 2023 5:00 PM (30 minutes)

We show how we can alleviate the H0 tension in the framework of f(G) gravity. In particular, we obtain the Friedmann equations and we show that we obtain extra terms of geometrical origin that constitute an effective dark energy sector. Then we show that due to the increased friction terms, one can obtain an increase in H0 at late times. The reason behind the tension alleviation is the fact that the effective dark-energy equation-of-state parameter lies in the phantom regime, which is known to be one of the mechanism that can lead to an increased H0.

Presenter: Dr SKORDA, Marianthi (National Observatory of Athens)