Cosmology wH0rksH0p

Report of Contributions

https://indico.cern.ch/e/1409324

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

From dark SU(N) to H0 and back again

Monday 18 November 2024 09:00 (1 hour)

Presenter: GARNY, Mathias (Technische Universitaet Muenchen (DE))

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

Type Ia supernova standardisation: taboo systematics in the local Hubble constant measurement

Monday 18 November 2024 10:20 (1 hour)

My talk will focus on unresolved problems in the current models of type Ia supernova standardisation and how they bias the Hubble constant determination. I will show that the supernova standardisation model employed in the SH0ES measurement leaves unaccounted for residuals in the calibration data (supernovae observed in host galaxies of Cepheids). These residuals can be traced back to the model's assumption that intrinsic and extrinsic (extinction in supernova host galaxies) supernova properties are identical in the calibration galaxies and in the Hubble flow. This, however, cannot be reconciled with a naturally expected bias resulting from selecting highly star forming and dust-rich calibration galaxies for observations of Cepheids. I will show that the selection problem requires a more sophisticated modelling of type Ia supernovae in which we account for supernova subpopulations related to their host galaxy environments. I will discuss results from a newly developed hierarchical Bayesian modelling type Ia supernovae and its impact on the Hubble constant determination. I will demonstrate that the new approach lowers the best fit Hubble constant to 70 km/s/Mpc, reducing the Hubble tension by a factor of 2, primarily due to stronger extinction in the calibration galaxies than in the Hubble flow – the property which turns out to be the main cause of apparent residuals in the original modelling from SH0ES.

Presenter: WOJTAK, Radosław

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

On the implications of the cosmic calibration tension beyond H0 and the synergy between early- and late-time new physics

Monday 18 November 2024 14:00 (1 hour)

The cosmic calibration tension is a > 5σ discrepancy between the cosmological distance ladder built from baryonic acoustic oscillations calibrated by the Planck/ΛCDM sound horizon and Type Ia supernovae calibrated with the SH0ES absolute magnitude. In this talk, I will emphasize the consequences of this tension beyond the value of the Hubble constant, and the implications for physics beyond ΛCDM. First, I will show that the SH0ES calibration implies (in addition to a higher value of H0) a larger physical matter density, a larger clustering amplitude S8, as well as a lower age of the universe. Second, I will talk about the role of early- and late-time new physics in resolving all these discrepancies.

Presenter: SIMON, Théo

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

Decaying dark matter and emulating CMB codes

Monday 18 November 2024 15:20 (1 hour)

In the last few years, advances in artificial neural networks has allowed fast and accurate emulation of cosmic microwave background (CMB) observables and, to a lesser degree, large-scale structure observables. The potential speed-up of this approach is significant: the execution time of a CMB code such as CLASS is of the order 10 core-seconds, while the output of the neural network is of the order 0.1 core-seconds. However, building the neural network in the first place for a new model may erode the benefits entirely. In this talk I will discuss the framework CONNECT that we have developed exemplified using decaying dark matter models. I will also discuss profile likelihoods as a tool for discovering volume effects in Bayesian posteriors.

Presenter: Dr TRAM, Thomas

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

Coffee

Contribution ID: **6** Type: **not specified**

Discussion session I / Systematics or new models

Monday 18 November 2024 11:20 (40 minutes)

What is the status/systematics of the distance ladder independent measurements?

How should we interpret the new results from Wendy Freedman et al. (CCHP)?

HNEDE: Other dark radiation models (step model, decaying DM->DR, interacting DM-DR) Signatures in LSS that can discriminate? Status w.r.t. H0 tensions?

Session Classification: Short discussion session / Systematics or new models

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

Beyond decay: late-time conversion of dark matter to invisible radiation

Tuesday 19 November 2024 09:00 (1 hour)

In the cosmological concordance model, dark matter is assumed to be cold, non-interacting and covariantly conserved. An interesting possibility to consider is a violation of the third assumption in this simple picture, namely the conversion of a small fraction of dark matter to an invisible form of radiation.

So far, surprisingly little attention has been given to this option without theoretical bias towards a specific scenario like decaying dark matter. Here I will discuss how cosmic microwave and large-scale structure observations can probe dark matter conversion in a model-independent way, thus putting a conservative bound on how much dark matter could have disappeared at any point during the cosmological evolution. For late conversion times, but still before the onset of structure formation, such a 'disappearance' of a few percent of dark matter would even mitigate some of the well-known tensions between these datasets.

There is a variety of more concrete scenarios that can be mapped to this general idea, such as decaying dark matter or merging primordial black holes. In the second part of the talk, I will discuss yet another concrete particle physics realization, featuring a second era of dark matter annihilation after thermal freeze-out. As a bonus, this model naturally allows for velocity-dependent dark matter self-interactions strong enough to affect structure formation at dwarf galaxy scales in potentially observable ways.

Presenter: BRINGMANN, Torsten (University of Oslo (NO))

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

TBA

Presenter: BRINGMANN, Torsten (University of Oslo (NO))

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

Probing the intergalactic magnetic field through gamma-ray ob- servations

Tuesday 19 November 2024 15:20 (1 hour)

Magnetic fields in galaxies and galaxy clusters are believed to be the result of the amplification of seed fields during structure formation. However, the origin of this intergalactic magnetic field (IGMF) remains unknown. Observations of high-energy gamma rays from distant sources offer an in-direct probe of the IGMF. Gamma-rays interact with the extragalactic background light to produce electron-positron pairs, which can subsequently initiate electromagnetic cascades whose gamma-ray signature depends on the IGMF. The absence of the cascade signal has been used to place lower
bounds on the IGMF. In this overview, I will introduce the method of how to search for this cascade emission using spectral, spatial, and timing information of the signal, and review recent results and highlights. I will also discuss sources of uncertainties regarding predictions of the cascade and provide an outlook for the potential of future gamma-ray observations, in particular with the upcoming Cherenkov Telescope Array

Presenter: MEYER, Manuel

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

TBA

Tuesday 19 November 2024 14:00 (1 hour)

Presenter: FRANDSEN, Mads

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

The EFTofLSS: going forward

Wednesday 20 November 2024 09:00 (1 hour)

Presenter: D'AMICO, Guido (Universita degli Studi di Parma (IT))

Contribution ID: **13** Type: **not specified**

The Renormalization group of Large Scale Structure

Wednesday 20 November 2024 10:20 (1 hour)

Presenter: RUBIRA, Henrique

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

The Hubble Tension as the Signature of a New Phase of Dark Energy

Wednesday 20 November 2024 14:00 (1 hour)

In my talk, will argue that the Hubble tension might be the signature of new physics in the early Universe. First, I will describe the conditions new physics has to satisfy to stand a chance of addressing the Hubble tension without compromising the fit of the CMB. Secondly, I will argue that this new physics could be related to a new phase of dark energy that decays in a first-order phase transition before the CMB forms. In particular, I will consider the model of Cold New Early Dark Energy and highlight the central role of an ultralight scalar field that triggers the phase transition and contributes a small fraction of fuzzy dark matter.

Presenter: NIEDERMANN, Florian (Nordita)

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

New early dark energy and its equation of state

Wednesday 20 November 2024 15:20 (1 hour)

Cold New Early Dark Energy (NEDE) addresses the Hubble tension using a triggered vacuum phase transition in the dark sector. In this work we constrain the phenomenological fluid model properties of NEDE using recent datasets. We allow the equation of state parameter, characterizing the post-phase transition fluid, to evolve in time. We discuss simple physical scenarios where such a time-dependence can arise.

Presenter: CHATRCHYAN, Aleksandr