Mainz-Frankfurt CosmoCoffee

Report of Contributions

https://indico.global/e/6713

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

Welcome

Friday 26 November 2021 14:00 (15 minutes)

Presenter: SAGUNSKI, Laura

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

Nicklas Ramberg (Mainz), ”QCD Axion Kinetic Misalignment Observational Aspects”

Friday 26 November 2021 17:30 (30 minutes)

When the spontaneous breaking of the Peccei-Quinn (PQ) symmetry occurred, the resulting angular direction of the PQ field, i.e.\ the axion could have possessed an initial non-zero velocity arising from additional terms that explicitly break the PQ symmetry. I elaborate further on the outcome of the “kinetic misalignment” framework, assuming that axions form the entirety of the dark matter abundance. The scenario of interest in this talk regards QCD axions where the PQ-symmetry breaking occurs in the post-inflationary universe. I study how the kinetic misalignment framework alters the onset of coherent field oscillations and show how this scenario impacts the formation of axion miniclusters, and I discuss how this scenario alters the usage of axion miniclusters/stars in microlensing events along with tidal stripping.

Presenter: RAMBERG, Nicklas

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

Stephan Wystub (Frankfurt), ”Constraining exotic compact stars composed of bosonic and fermionic dark matter with gravitational wave events”

Friday 26 November 2021 16:00 (30 minutes)

We investigate neutron star-black hole (NS-BH) merger candidates as a test for compact exotic objects. Using the events GW190814, GW200105 and GW200115 measured by the LIGO-Virgo collabration, which represent a broad profile of the masses in the NS mass spectrum, we demonstrate the constraining power for the parameter spaces of compact stars consisting of dark matter for future measurements.

Presenter: WYSTUB, Stephan

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

Niklas Becker (Frankfurt), ”Intermediate Mass Ratio Inspirals in Dark Matter Spikes”

Friday 26 November 2021 17:00 (30 minutes)

To test the particle nature of dark matter, its influence on the inspiral of stellar mass black holes onto intermediate mass black holes (IMBHs) can be studied. If the IMBH forms an adiabatic dark matter spike around it, the smaller black hole will gravitationally interact with and accrete the dark matter particles. Thus, the dark matter spike can be studied and mapped out with the gravitational wave signal that will be observable by LISA.

Presenter: BECKER, Niklas

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

Wolfram Ratzinger (Mainz), ”Axion fragmentation on the Lattice”

Friday 26 November 2021 15:30 (30 minutes)

Recently scenarios in which an initially homogeneous field rolls over an oscillatory potential have been popularized by variations of the relaxion mechanism as well as the kinetic misalignment scenario for ALPs. These systems possess an instability that leads to the kinetic energy in the homogeneous field getting transferred to exponentially enhanced fluctuations. I will present a detailed numerical study of this process and speculate on the interesting possibility that bubbles where the field settels in different minima of the potential might arise. When the fluctuations start to dominate, the energy density becomes inhomogeneous and one therefore expects that GWs are emitted. I will show however that the ALPs contribution to DM necessarily over-closes the universe if a signal detectable by pulsar timing arrays or laser interferometers would be emitted.

Presenter: RATZINGER, Wolfram (Johannes Gutenberg Universität Mainz)

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

Kai Schmitz (CERN), "Pulsar hints for nanohertz gravitational waves?"

Friday 26 November 2021 14:15 (45 minutes)

All major pulsar timing array (PTA) collaborations—NANOGrav, Parkes PTA, and EPTA—are now seeing indications of a new stochastic process in their latest data sets. If confirmed in the future, this new signal may turn out to be the first glimpse of a stochastic gravitational-wave background at nanohertz frequencies. In this talk, I will review how PTAs search for gravitational waves, discuss the properties of the newly detected signal, and highlight various possible interpretations. First, I will point out that, if the signal is of astrophysical origin, it is expected to arise from the mergers of supermassive black-hole binaries, in which case it would promise to contain invaluable information on galaxy and black-hole evolution. Then, I will turn to the possibility of a cosmological origin and present a range of exotic particle physics processes in the early Universe that may be responsible for the signal, including cosmic strings, phase transitions, and axion-like fields. In this case, PTA observations would allow us to probe the cosmology of the early Universe and particle physics at extremely high energies. Finally, I will conclude with a brief outlook on the future of the field, which is set to see some amazing progress in the coming years.

Presenter: SCHMITZ, Kai (CERN)