VI SWEDISH—UKRAINIAN SEMINAR in THEORETICAL PHYSICS

March 11, 2024

Mixed on-line/off-line regime*

Programe**

10.00–10.05 – Opening

10.05–10.45 – **Ariel Goobar** (Oskar Klein Centre for Cosmoparticle Physics, Stockholm University, Sweden) **“Unraveling the Dark: the Case for Dynamic Dark Energy: a supernova focused perspective”**

10.45–11.25 – **Yuriy Shtanov** (BITP of the NAS of Ukraine, Kyiv, Ukraine) **"Dark matter as a manifestation of gravity"**

11.25–11.40 – Coffee break

11.40–12.20 – **Vyatcheslav Mukhanov** (Arnold Sommerfeld Center for Theoretical Physics, Munich, Germany) **"Modern Cosmology: facts, myths and misconceptions"**

12.20–13.00 – **Anton Rudakovsky** (BITP of the NAS of Ukraine, Kyiv, Ukraine) **“Testing Fuzzy Dark Matter with Disc Galaxy Dynamics: A Challenge to Current Models”**

*** Join Zoom Meeting**

https://indico.fysik.su.se/event/9115/

****EE Time, CE Time is one hour earlier**

Unraveling the Dark: the Case for Dynamic Dark Energy: a supernova focused perspective

Ariel Goobar

The Oskar Klein Centre for Cosmoparticle Physics,

Physics Department of Stockholm University, Sweden

A quarter of a century has passed since the discovery of the accelerated expansion of the Universe, which led to the establishment of the concordance Lambda-CDM model of cosmology. However, recent findings suggest intriguing challenges to this model. New evidence points to potential deviations from a cosmological constant (Λ), emerging from the combination of first-year galaxy clustering data from the Dark Energy Spectroscopic Instrument (DESI), Planck satellite cosmic microwave background observations, and several of the largest Type Ia supernova (SNIa) compilations. Notably, these potentially groundbreaking results are influenced by the use of highly inhomogeneous SNIa datasets, some of which include observations dating back several decades. In this talk, I will discuss the complexities of these findings and explore future directions for addressing these challenges in cosmological research.

Dark matter as a manifestation of gravity

Yuriy Shtanov

BITP of the NAS of Ukraine, Kyiv, Ukraine

The scalaron in metric f(R) gravity can be a dark-matter candidate if its mass lies in the range between around 4.4 meV and 1.2 MeV. The scalaron manifests itself as an almost sterile cold dark matter, and its possible observational verifications would consist in measuring specific Yukawa gravitational forces on submillimeter spatial scales or detecting gamma-ray radiation produced by the scalaron decays. We will discuss initial conditions for the scalaron in the early universe and the role played by the electroweak crossover and conformal anomaly in the formation of these initial conditions.

Modern Cosmology: facts, myths and misconceptions

Vyatcheslav Mukhanov

Arnold Sommerfeld Center for Theoretical Physics, Munich, Germany

I will discuss the recent progress in cosmology, concentrating on the robust theoretical predictions made back to 80th and their confirmation in the Cosmic Microwave Background fluctuations measurements. The misconceptions in the current literature and non-plausible speculations based on noncritical approach to the theory will also be discussed.

Testing Fuzzy Dark Matter with Disc Galaxy Dynamics: A Challenge to Current Models

Anton Rudakovsky

BITP of the NAS of Ukraine, Kyiv, Ukraine

The popular fuzzy (ultra-light) dark matter models predict the peculiar shape of density distribution in galaxies: specific dense core with the transition to the outer halo. Moreover, fuzzy dark matter predicts scaling relations between the dark matter particle mass and density parameters. We use a Bayesian framework and several dark matter halo models to analyse the stellar kinematics of disc galaxies. We find that most of the galaxies in our sample prefer the fuzzy dark matter model over standard NFW and Burkert dark matter profiles. While this seems like a success for fuzzy dark matter, we also find that the credible intervals for fuzzy DM particle mass for many galaxies are in tension, e.g., with constraints from studies of dwarf satellites of the Milky Way.