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University of Miami, Physics Department Colloquium

Date: Wednesday, Apr 24, 2024
Time: 4:00 pm – 5:00 pm
Location: Wilder Auditorium – Rm 112, Knight Physics Building

Galaxy Clusters as a Probe of Cosmology and Large-Scale Structure Formation in the Light of SRG/eROSITA

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Abstract

Galaxy clusters, representing the peaks in the cosmic density field, serve as an independent and powerful tool for investigating the evolution of cosmic structures and advancing our understanding of cosmology. The strategic identification of these clusters through multi-wavelength surveys is essential for scrutinizing gravitational theory, general relativity, and cosmological models. A significant milestone was achieved with the successful launch of eROSITA in July 2019. This German-built eROSITA X-ray telescope, on board the Russian-German Spectrum-RG (SRG) mission, operates within the 0.2-8 keV range and has produced the largest ICM-detected catalogs of galaxy clusters and groups through its All-Sky Surveys. The first eROSITA all-sky survey, with over 10,000 confirmed clusters, is pivotal in refining cosmological parameters. Combined with the data from optical surveys like DESI Legacy, DES, HSC, and KIDS, these parameters are constrained at a percent level through the evolution of the cluster mass function. In this talk, I will outline the constraints on fundamental cosmological parameters, neutrino masses, and general relativity derived from the first eROSITA All-Sky Survey. Notably, this survey represents a significant leap forward, exhibiting a 5-9 times improvement compared to previous cluster surveys. I will present eROSITA's significant detection of warm baryons within cosmic filaments identified by optical surveys and in groups and the implications for our understanding of AGN feedback. I will summarize the value-added products made available to the cluster science community by the eROSITA consortium's data release.

Biography

Dr. Esra Bulbul is the lead scientist for eROSITA cluster science and cosmology. She holds a group leader position at the Max Planck Institute for Extraterrestrial Physics. She received her Ph.D. in physics from the NASA Marshall Space Flight Center. She has held a staff scientist position at the Center for Astrophysics | Harvard & Smithsonian (CfA) and postdoctoral fellowships at CfA, MIT, and NASA Goddard Space Flight Center prior to her arrival at MPE. Dr. Bulbul's research interests are focused on understanding the growth of structure and the fundamental physics of the universe, including the nature of dark matter and dark energy, by utilizing observations of clusters of galaxies detected in large area multi-wavelength surveys. Dr. Bulbul was recently awarded the European Research Council's Consolidator Grant in 2020 for the project "DarkQuest: Shedding Light on the Nature of Dark Matter and Dark Energy with Multi-wavelength All-Sky Surveys". The ERC Consolidator Grants are awarded to outstanding researchers in Europe with a significant track record and have a success rate of ~10%.