भारतीय खगोलभौतिकी संस्थान

INDIAN INSTITUTE OF ASTROPHYSICS

कोरमंगला **Koramangala,** बेंगलूरु **Bengaluru – 560034.**

स्नातक अध्ययन मंडल Board of Graduate Studies.

STUDENT SEMINAR
(Part of Comprehensive Examination)

Speaker: Ms. Kanan Vijay Virkar

Title: Primordial Physics Signatures in 21 cm Signal.

सार Abstract

21 cm signal from the cosmic dawn and epoch of reionization (EoR) encodes information about the primordial universe and physical processes that took place during this period, such as formation of the first stars and ionizing sources, the rate of clustering of matter to form galaxies and subsequent structures. Using the 21cmFAST simulation code we probe the signatures of primordial physics on the 21 cm signal through the morphological statistics, namely, Minkowski functionals (MFs). Compared to the traditional power spectrum these statistics contain additional information since they contain information of higher order correlations. In particular, we study the signatures of a phase of particle production during inflation on the 21 cm signal, referred to as "bump model" of inflation as it results in a bump like feature in the primordial power spectrum. We find that MFs can discriminate between the bump inflation models parameterized by the amplitude and location of the bump in power spectrum through the EoR 21 cm signal compared to the fiducial model - power law form of inflation. We also determine the degeneracy between inflation models and different EoR models by their effects on MFs. We find that Minkowski Functionals are highly sensitive to both – the parameters of bump model and EoR parameters (ionizing efficiency, virial temperature and softband X-ray luminosity per unit SFR). We quantify the changes in shapes of MFs and find that at different redshifts, different bump models are distinguishable from EoR models. In future we plan to use these findings to constrain inflationary particle production models. Further this method has potential to constrain a wider class of inflationary models.

मंगलवार Tuesday 16, सितम्बर September 2025

Venue: प्रेक्षागृह Auditorium

Time: 11:00 AM

सभी का स्वागत है All are welcome.