भारतीय खगोलभौतिकी संस्थान
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कोरमंगला **Koramangala,** बेंगलूरु **Bengaluru – 560034.**

स्नातक अध्ययन मंडल Board of Graduate Studies.

STUDENT SEMINAR
(Part of Comprehensive Examination)

Speaker: Arav Bhaskaran Jayaprasad

Title: Models of constrained violent relaxation to quasi-stationary states of halos.

सार Abstract

Collisionless self-gravitating systems, such as galaxies and dark matter halos, undergo violent relaxation during their formation. The potential oscillations that drive this relaxation damp after a few dynamical times, leading to an incompletely relaxed quasi-stationary state (QSS) that slowly evolves on relaxation time scales (Lynden-Bell, 1967). Simulations of dissipationless collapse from cold initial conditions have shown that violently relaxed QSSs have several quasi-universal properties, which might explain the ubiquitous properties of elliptical galaxies. We introduce a class of anisotropic spherical distribution functions (DFs) that depend on energy, E, pericenter r_p, and a free parameter ξ_s, which modulates the region of violent relaxation. A DF of these quantities that features a cutoff in pericenter, $\Phi(r_p)$, chosen to be of the Fermi-Dirac form generalizes the model of Mangalam et al 1999 and leads to QSS configurations. Based on the dynamical constraints of incomplete and confined relaxation (Tremaine 1987), we discuss two variants of DFs of this type that suppress orbits with high radial periods with a factor proportional to the radial frequency. These models possess several properties, such as density, surface density, velocity anisotropy, and differential energy distribution, that match well with dissipationless cold collapse simulations. We also discuss the stability analysis of these systems and possible ways of extending the models to the axisymmetric case. The problem of constructing self-consistent three-integral axisymmetric models and possible ways of tackling this problem are also discussed.

शुक्रवार Friday 21, फरवरी February 2025

Venue: प्रेक्षागृह Auditorium

Time: 11:30 AM

सभी का स्वागत है All are welcome