



भारतीय ताराभौतिकी संस्थान
INDIAN INSTITUTE OF ASTROPHYSICS
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स्नातक अध्ययन मंडल **Board of Graduate Studies.**

STUDENT SEMINAR
(Part of Comprehensive Examination)

Speaker: Mr. Abishek Balakrishnan

शीर्षक Title: Scenarios for Supermassive Black Hole Seed Formation

सार Abstract

Supermassive Black Holes (SMBH) are now believed to be at the centre of all massive galaxies due to various observations of Quasars over the years, which puts a constraint of $\sim 10^9 M_{\odot}$ at $z \sim 6$ on these objects. However, how the seeds for these SMBH's are formed at high redshifts, remains an open question.

In this work, we plan to investigate the formation of these seeds through the runaway collapse of a dense stellar system and provide a comprehensive semi-analytical model in accordance with the observed values. We start with the formation of the dense stellar system itself through a spherical collapse model which gives a rotationally supported baryonic structure that can fragment and allow star formation, giving a dense stellar system. We follow the evolution of this system through various stellar dynamical processes towards its ultimate collapse, wherein a small region within the contracting core of the system becomes so dense that the general relativistic instability kicks in and the whole region collapses dynamically to give a massive BH. The evolution of the system is studied by doing a Fokker-Plank analysis through numerical integration. It is shown how this collapse proceeds with the appropriate timescale for the collapse and an estimate for the mass of the Black hole so formed, is also provided.

Further we show how this seed BH can grow through stellar capture of the remaining stars. The timescales of the formation and the growth of the seed BH with respect to the observed SMBH redshifts and masses are also addressed.

मंगलवार Tuesday 24, सितम्बर September 2024

Time: 10:00 AM

Venue: प्रेक्षागृह Auditorium

सभी का स्वागत है All are welcome.