भारतीय ताराभौतिकी संस्थान
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स्नातक अध्ययन मंडल Board of Graduate Studies.

STUDENT SEMINAR

(Part of Comprehensive Examination)

Speaker: Ms. Ayushi Chhipa

शीर्षक Title: X-ray/radio variability in AGNs and the Fundamental Plane of Black Hole Activit.

सार Abstract

Active Galactic Nuclei (AGN) are characterized as compact, highly luminous, and variable regions at the centers of galaxies, emitting radiation across all electromagnetic wavebands. The X-ray emission in AGNs is supposed to originate mainly from the regions near the Supermassive Black hole (SMBH), Corona and the inner-accretion disk. On the other hand, radio emission is believed to predominantly originate from synchrotron radiation produced by relativistic electrons in the jets/outflows from the AGN core. Several studies have revealed empirical correlations observed between X-ray and radio emissions from the core of AGNs. The" Fundamental Plane of Black Hole activity" defines a correlation between X-ray, and radio luminosities of accreting systems and the mass of the accreting black hole (BH) for all kinds of BH accreting systems. This resulting correlation is thought to arise from the disk-jet connection in AGNs. Our goal is to study the empirical correlations between X-ray and radio emissions in AGNs, primarily the fundamental plane, by probing the relation between the X-ray and radio variability in AGNs. For this, we have identified a" golden sample" of 12 AGNs that have, (i) multi-epoch X-ray data available from the XMM-Newton and Chandra telescopes exhibiting long-term variability, (ii) optical spectral information available from the Sloan Digital Sky Survey (SDSS) for the BH mass estimation, (iii) quasi-simultaneous observations in the 5 GHz frequency range from the VLA to their corresponding X-ray observations. Additionally, the point sources in this sample have flat spectral indices indicative of core radio emission. We are currently analyzing this data to examine the fundamental plane correlation's response to X-ray and radio variability.

From this sample, SDSSJ1539+3954 (redshift, z∼1.935), identified as a radio-quiet weak line quasar and a previously X-ray weak source, exhibited an exceptional X-ray variability phenomenon in 2019 and 2020 in a study conducted by Ni et al., 2020 and 2022. Specifically, its X-ray flux increased by more than 20 times from 2013 to 2019, followed by a nine-fold drop in 2020. The source remained undetected in its further X-ray observations. To obtain insights on radio properties of the source and possible connection between its X-ray and radio emissions, we have conducted a radio study of the source in the frequency range 340 MHz to 10 GHz using uGMRT bands - 3,4,5 (in 2020, 2022 and 2024) and jVLA bands - S,C,X (in 2022). The observations were conducted following the X-ray brightening and other follow-up X-ray observations of the source. The source was not detected in the archival data obtained from the VLA-FIRST survey at 1.4 GHz. Our observations reveal the detection of a point-like radio source with the spectral index of ≈ -0.6 in the frequency range 350 MHz to 1.4 GHz and ≈ -1.09 in 3 GHz to 10 GHz. In my talk, I will be discussing about results obtained from the radio and X-ray study of the quasar and various mechanisms driving the radio emission in this radio-quiet quasar with a possibility of predominant radio emission from a young radio source.

सोमवार Monday 7, अक्तूबर October 2024

Time: 2:30 PM

Venue: प्रेक्षागृह Auditorium

सभी का स्वागत है All are welcome.