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. Anjali K A

Title: Resolving BAL Quasar Outflows: Outflow Cloud Properties Using Voigt Profile Fitting of Si IV and C IV Absorption Lines

सार Abstract

Active Galactic Nuclei (AGN) are among the brightest sources in the Universe, shining across the entire electromagnetic spectrum. They are powered by matter falling onto supermassive black holes (SMBHs) and often drive strong outflows. A special class of AGN, known as Broad Absorption Line (BAL) quasars, make up about 10–20% of all quasars. These objects show broad, blueshifted absorption features in high-ionization lines such as C IV 1548, 1550 and Si IV 1393, 1402. While these features provide direct evidence of outflows, their large widths and blending make them difficult to study in detail. A small fraction of BAL quasars show resolved Si IV absorption with distinct narrow components. Such systems offer a unique opportunity to probe the internal structure of outflowing clouds and to constrain parameters such as covering fraction, optical depth, column density, and velocity dispersion. In this study, quasars with BAL signatures were selected from the DR16Q catalog. An automated procedure was developed to identify sources with resolved Si IV absorption features. Using the VoigtFit package, multiple Voigt components were fitted simultaneously to Si IV and C IV absorption lines, yielding measurements of column density, Doppler parameter, and velocity offset for individual components. Unlike most previous work that examines global BAL variability, this analysis focuses on variability at the level of individual absorption components. This component-level approach enables a more detailed characterization of the internal substructure of BAL outflows, revealing how column density, optical depth, and kinematics vary within a single outflow system, and provides direct inputs for photoionization modeling of individual kinematic components. When extended to multi-epoch data or additional ionic species, the method allows variability to be assessed in terms of changes in ionization state, column density, or covering fraction, without relying on global or ensemble-averaged absorption properties. This result provides new insights into the small-scale structure and physical conditions of BAL quasar outflows.

मंगलवार Tuesday 29, सितम्बर September 2026

Venue: प्रेक्षागृह Auditorium

Time: 11:30 AM

सभी का स्वागत है All are welcome.