DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY KANPUR

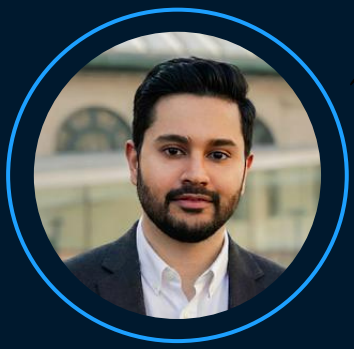
PHYSICS COLLOQUIUM

FAST RADIO BURSTS: FROM A MILLISECOND MYSTERY TO A PRECISION TOOL FOR EXPLORING THE UNIVERSE

ABSTRACT

Fast Radio Bursts (FRBs) are among the most extreme signals ever observed from deep space: flashes of radio waves lasting only a few milliseconds, yet bright enough to be detected across billions of light years. In that fleeting moment, an FRB can outshine entire galaxies at radio wavelengths, pointing to extraordinarily compact sources operating under physical conditions far beyond anything achievable on Earth. In this colloquium, I will present FRBs as both a compelling cosmic mystery and a powerful new opportunity for physics and astronomy. I will first explain why FRBs are uniquely valuable probes of the Universe: their highly coherent radio pulses propagate through ionized matter in and around galaxies and across the cosmic web, allowing us to map otherwise invisible material—including during epochs when the Universe was young and galaxies were still forming—and to place new constraints on cosmic magnetic fields and turbulent plasma over vast distances. I will then turn to the unresolved question of what produces these bursts. While growing evidence points toward highly magnetized neutron stars, the strongest magnets known in nature, the remarkable diversity in FRB behavior, repetition, and environments suggests that their origins may reveal previously unexplored pathways in stellar evolution and compact-object formation. I will discuss how recent progress in precisely localizing FRBs to their host galaxies, including contributions from my own work, is beginning to connect these signals to their physical origins. I will conclude by explaining why the next 5–10 years are poised to become a golden age for FRB research

SPEAKER



Dr. Mohit Bhardwaj
SPASE, IIT Kanpur

VENUE

FB 382 (Amal Kumar Raychaudhuri Seminar Room)

January 09(Friday), 2026

17:15 PM(Tea starts from - 17:00 PM)

ALL ARE CORDIALLY INVITED