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ICTS Astrophysics & Relativity Seminar

Title : Testing General Relativity with Gravitational Waves: Higher-Mode Amplitudes and Fast Bayesian Inference

Speaker : Ish Mohan Gupta (Northwestern University)

Date : Monday , 05 October 2026

Time : 11:30 AM (IST)

Abstract : Gravitational-wave observations provide a unique probe of general relativity (GR) in the strong-field regime. I will present the subdominant-mode amplitude (SMA) test, that searches for deviations from GR by independently varying the amplitudes of higher-order modes in binary black-hole signals while keeping the dominant quadrupole fixed. I will discuss its validation against Gaussian noise and waveform systematics due to incorrectly modeling spin-precession and not accounting for orbital eccentricity, as well as its response to simulated non-GR amplitude and phase modifications. Applied to recent observations, the test yields stringent constraints on higher-mode amplitudes, including the strongest constraint to date on the (4,4)-mode amplitude deviation. Finally, I will discuss how relative binning can accelerate Bayesian parameterized tests of GR by factors of $O(10)$ -- $O(100)$, making systematic studies increasingly tractable for current and next-generation gravitational-wave detectors.

Venue : Feynman Lecture Hall

Zoom Meeting: <https://icts-res-in.zoom.us/j/96781493797?pwd=r9GD7NnmEWMDFNt0Mq5fhaQpxmNXjo.1>

Meeting ID: 967 8149 3797

Passcode: 67199 Z7