ICTS Astrophysics & Relativity Seminar

Title : Probing gravity using black hole ringdown

Speaker : Pratik Wagle (Max Planck Institute for Gravitational Physics, Germany)

Date : Monday, 18 August 2025

Time : 2:00 PM (IST)

Abstract : The detection of gravitational waves from compact binary mergers by the LIGO/Virgo collaboration has opened new avenues for testing relativistic gravity in the strong, dynamical, and nonlinear regimes. With the advent of future ground- and space-based gravitational wave detectors, we are poised to extract further insights into astrophysical events and investigate the implications for Einstein's theory of relativity in contexts where gravitational fields are both strong and dynamical. In this presentation, I will discuss recent advancements in the study of gravitational perturbations related to gravitational wave ringdown. I will highlight the necessity for these investigations and outline prospective research directions. Central to my discussion will be a novel approach that enables us to derive a "modified Teukolsky equation", a set of linear, decoupled differential equations that characterize the dynamical perturbations of non-Kerr black holes through the radiative Newman-Penrose scalars Ψ0 and Ψ4. This foundational work facilitates the examination of gravitational waves emitted during the ringdown phase of black hole coalescence within modified gravity frameworks applicable to black holes of any spin. Additionally, I will discuss the application of this approach in the context of a quadratic theory of gravity, where the metric and scalar fields exhibit non-minimal coupling, and calculate the quasinormal mode frequencies. I will conclude by discussing the prospects for detecting modifications to gravitational wave ringdown signatures in future observations, thereby enhancing our understanding of gravity beyond general relativity.

Venue : Amal Kumar Raychaudhuri Meeting Room
Zoom Link: https://icts-res-in.zoom.us/j/97929152213?pwd=QT2uHqLfJTJpMCMjMNuhZHuRU1a1KJ.1
Meeting ID: 979 2915 2213
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