ICTS Astrophysics & Relativity Seminar

Title : Tidal Response of relativistic Compact Objects via Gravitational Raman scattering

Speaker : Venkata Sai Saketh Muddu (Max Planck Institute, Germany)

Date : Thursday, 06 March 2025

Time : 3:30 PM (IST)

Abstract : Identifying the nature of compact objects in binary mergers is a key challenge in gravitational-wave astronomy, with implications for nuclear physics, exotic compact objects, and quantum gravity. During inspiral, finite-size effects, such as tidal deformations, imprint characteristic signatures on the gravitational waveform. A central question is how to model these effects in relativistic compact objects within binaries. I will present an effective worldline framework where compact objects are treated perturbatively about the point-particle limit, where tidal effects are captured by attaching multipole moment degrees of freedom that respond to external fields through a tidal response. In GR, this response can be partially constrained by black hole perturbation theory, specifically by studying the scattering of gravitational waves off the compact object. This process, analogous to Raman scattering in optics, encodes information about the object's internal structure through its tidal response. As an application, I will demonstrate how horizon fluxes in BHs, governing mass and angular momentum dissipation, can be understood as tidal heating and computed to 4PN in this approach.

Venue : Feynman Lecture Hall
Zoom Link: https://icts-res-in.zoom.us/j/96237704598?pwd=lbXa86kDlOcxaobkM5Tu9cRRYRbGbn.1
Meeting ID: 962 3770 4598
Passcode: 202030