

## **ICTS Astrophysical Relativity Seminar**

- Title** : Systematic bias on the inspiral-merger-ringdown consistency test due to neglect of orbital eccentricity
- Speaker** : Sajad Bhat (Chennai Mathematical Institute)
- Date** : Wednesday, 17<sup>th</sup> August, 2022
- Time** : 03:00 pm (IST)
- Abstract** : The inspiral-merger-ringdown (IMR) consistency test checks the consistency of the final mass and final spin of a binary black hole merger remnant, independently inferred via the inspiral and merger-ringdown parts of the waveform. As binaries are expected to be nearly circularized when entering the frequency band of ground-based detectors, tests of general relativity (GR) currently employ quasi-circular waveforms. We quantify the effect of residual orbital eccentricity on the IMR consistency test. We find that eccentricity causes a significant systematic bias in the inferred final mass and spin of the remnant black hole at an orbital eccentricity (defined at 10Hz) of  $e_0 \gtrsim 0.1$  in the LIGO band (for a total binary mass in the range  $65 - 200 M_\odot$ ). For binary black holes observed by Cosmic Explorer (CE), the systematic bias becomes significant for  $e_0 \gtrsim 0.015$  (for  $200 - 600 M_\odot$  systems). This eccentricity-induced bias on the final mass and spin leads to an apparent inconsistency in the IMR consistency test, manifesting as a false violation of GR. Hence, eccentric corrections to waveform models are important for constructing a robust test of GR, especially for 3rd-generation (3G) detectors.
- Venue** : **Online:** Please click on the below link to join the seminar  
<https://icts-res-in.zoom.us/j/81533329666?pwd=VGILUUNtc3RTSU5ob3RqaXdXcFJpZz09>  
Meeting ID: 815 3332 9666  
Passcode: 171722