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ICTS Astrophysics and Relativity Seminar

Title : Defining eccentricity for gravitational wave astronomy

Speaker : Md Arif Shaikh (Department of Physics and Astronomy Seoul National University, Seoul, Korea)

Date : Thursday, 01 December 2022

Time : 03:00 pm (IST)

Abstract : Eccentric Compact Binary Coalescences are significant scientific targets for current and future Gravitational Wave observatories. To detect and analyze eccentric events, there is an increasing effort to build eccentric waveform models using various frameworks. Different models chose different internal parameterisations of eccentricity in the absence of a unique natural definition of eccentricity in general relativity, resulting in different values of eccentricity inferred from parameter estimation using these waveform models. In this paper, we present a standard definition of eccentricity based solely on waveform quantities; thus, this definition is model-independent and gauge-independent. In the Newtonian limit, our definition also approaches the correct Newtonian definition of eccentricity. We present gw_eccentricity, a Python implementation of our definition that employs a variety of methods. We show the robustness of our implementation on waveforms ranging from quasicircular to highly eccentric systems. Our method can be used in a post-processing step on posterior samples for any waveform model, putting all models on equal footing and providing eccentricity estimates that can be directly compared with astrophysical predictions. The current study focuses on aligned-spin binaries with no orbital precession. Extensions to precessing binaries are discussed.

Venue : Please click on the below link to join the meeting

https://icts-res-in.zoom.us/j/81528964288?pwd=SEVqTWtTUmFNZkhCanB3ZWxGTDFHQT09

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