

Deciphering Gravitational Wave Observations

Wednesday 9 April 2025 09:00 (1 hour)

Gravitational Waves emitted by colliding black holes were detected for the first time by LIGO in 2015. The subsequent observation of merging neutron stars in 2017, and its electromagnetic counterpart signal, attracted the attention of the astronomy community worldwide. Over two hundred gravitational wave signals have been observed to date by the LIGO-Virgo-KAGRA network, with several new observations per week.

The properties of a binary system, such as the masses and spins of each black hole, the system's orientation and location, are all encoded in different, subtle ways into the emitted gravitational waveform. In this talk, I will present an intuitive explanation of how the observed waveform can be used to extract the physical parameters of the system. I will focus on less commonly observed phenomena, such as higher gravitational wave multipoles, spin-induced orbital precession and binary eccentricity. I will discuss how these features can be observed and the new insights they provide on the properties of the system and the formation and evolution of individual binaries and populations.

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