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"ENIGMA"- An aligned-spin eccentric IMR waveform model for compact binary mergers

The network of LIGO-Virgo detectors has detected nearly 100 compact binary mergers in their three observing runs, among which most of the merger events are from quasicircular orbits. Though binaries tend to circularize when they enter the LIGO band, binaries formed via dynamical interactions in dense stellar clusters or through Kozai-Lidov processes can have large residual eccentricities. As the effect of eccentricity is substantial in waveform, neglecting it results in a low signal-to-noise (SNR) ratio while detecting a likely eccentric candidate. Also, orbital eccentricity is the cleanest feature to know about binary formation channels. On the other hand, spins of individual compact objects are one of the most important physical effects that significantly modify the shape of the waveform. As the sensitivities of current ground-based detectors are upgraded, there is an urgent need for an eccentric spinning waveform model. In this talk, we present ENIGMA, an eccentric, aligned-spin, time-domain, inspiral-merger-ringdown (IMR) waveform model for compact binary mergers that include higher gravitational-wave harmonics. ENIGMA incorporates the latest spinning eccentric information available in the literature to date. This model can help us understand the astrophysical origins of spinning eccentric binaries by inferring the orbital parameters of detected events in the upcoming observing runs of gravitational wave detectors.

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