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A new multipolar waveform model for eccentric, spin-aligned binary black holes within the effective-one-body formalism

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The detection of orbital eccentricity in gravitational waves (GWs) will provide us with unique and valuable information about the astrophysical origin and evolution of compact binary systems. In recent years, the expectations for observing eccentricity signatures in GWs have increased due to the continuous improvement of GW detectors and data-analysis techniques. For this purpose, eccentric waveform models are being improved since they will play a fundamental role in the characterization of eccentric GW signals. Here, we present SEOBNRv5EHM, a new time-domain inspiral-merger-ringdown multipolar waveform model for eccentric binary black holes (BBHs) with aligned spins. This model is developed within the effective-one-body (EOB) formalism and has been successfully validated against eccentric numerical-relativity (NR) simulations. Its accuracy, robustness, and speed are suitable for data analysis and astrophysical applications, such as searches for eccentric GWs, parameter estimation of the signals, waveform systematic tests, and BBH population studies. Finally, we also discuss a possible generalization to eccentric, spin-precessing BBHs, which is required for a complete understanding of binary formation channels.

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