Surrogate Models for gravitational waves from large-mass-ratio black hole binaries SCOTT FIELD, GAURAV KHANNA, NUR RIFAT, Univ of Mass - Dartmouth, VIJAY VARMA, Caltech — Gravitational wave signals from compact astrophysical sources such as those observed by LIGO and Virgo require a high-accuracy waveform model for the analysis of the recorded signal. Current inspiral-merger-ringdown (IMR) models are calibrated only up to moderate mass ratios, thereby limiting their applicability to signals from high-mass ratio binary systems. We describe reduced-order surrogate models for gravitational waveforms including several harmonic modes and with mass-ratios varying from 3 to 10,000 thus vastly expanding the parameter range beyond the current surrogate IMR models. This surrogate model is trained on waveform data generated by point-particle black hole perturbation theory (ppBHPT) both for large mass-ratio and comparable mass-ratio binaries. We observe that the gravitational waveforms generated through a simple application of ppBHPT to the comparable mass-ratio cases agree remarkably (and surprisingly) well with those from full numerical relativity after a rescaling of the ppBHPT's total mass parameter. These results will enable data analysis studies in the high-mass ratio regime, including potential intermediate mass-ratio signals from LIGO/Virgo and extreme-mass ratio events of interest to the future space-based observatory LISA.

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