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High mass-ratio binary black hole simulations in numerical relativity MATTHEW GIESLER, Cornell, MARK SCHEEL, Caltech, VIJAY VARMA, Cornell, SAUL TEUKOLSKY, Caltech/Cornell — We present high accuracy, fully nonlinear, numerical simulations of binary black holes up to a mass ratio of $q = 30$. Using improved methods, we extend the capabilities of the numerical relativity code, SpEC, to simulate binary black holes with mass ratios beyond its previous limit of $q = 10$. Such systems are potential sources for current gravitational wave detectors (i.e. LIGO) and are expected to be even more promising for future space-based detectors (e.g. LISA). The binaries are evolved through a minimum of 14 orbits, providing a sufficient number of gravitational wave cycles to compare with predictions from approximate models. We present comparisons of our numerical waveforms with self-force predictions, the most promising perturbative scheme for extreme mass ratio inspirals. Additionally, we compare our waveforms with effective-one-body (EOB) approximants, which model the full waveform and are presumed to be valid at any mass ratio.

Matthew Giesler
Cornell University

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