General Relativity and Quantum Cosmology

Intermediate Mass Ratio Black Hole Binaries: Numerical Relativity meets Perturbation Theory

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We study black-hole binaries in the intermediate-mass-ratio regime $0.01 < q < 0.1$ with a new technique that makes use of nonlinear numerical trajectories and efficient perturbative evolutions to compute waveforms at large radii for the leading and nonleading modes. As a proof-of-concept, we compute waveforms for $q = 1/10$. We discuss applications of these techniques for LIGO/VIRGO data analysis and the possibility that our technique can be extended to produce accurate waveform templates from a modest number of fully-nonlinear numerical simulations.

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