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Gravitational Waveforms in the Early Inspiral of Binary Black Hole Systems KEVIN BARKETT, California Institute of Technology, PRAYUSH KUMAR, Canadian Institute for Theoretical Astrophysics, SWETHA BHAGWAT, DUNCAN BROWN, Syracuse University, MARK SCHEEL, BELA SZILAGYI, California Institute of Technology, SIMULATING EXTREME SPACETIMES COLLABORATION — The inspiral, merger and ringdown of compact object binaries are important targets for gravitational wave detection by aLIGO. Detection and parameter estimation will require long, accurate waveforms for comparison. There are a number of analytical models for generating gravitational waveforms for these systems, but the only way to ensure their consistency and correctness is by comparing with numerical relativity simulations that cover many inspiral orbits. We've simulated a number of binary black hole systems with mass ratio 7 and a moderate, aligned spin on the larger black hole. We have attached these numerical waveforms to analytical waveform models to generate long hybrid gravitational waveforms that span the entire aLIGO frequency band. We analyze the robustness of these hybrid waveforms and measure the faithfulness of different hybrids with each other to obtain an estimate on how long future numerical simulations need to be in order to ensure that waveforms are accurate enough for use by aLIGO.

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