

Advances and Challenges in Waveform Modeling for Gravitational-Wave Observations

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In the last fifteen years, crucial interactions between analytical and numerical relativists working on the two-body problem in General Relativity have led to highly-accurate waveform models for binary black holes and neutron stars. Those models are routinely employed in LIGO and Virgo observations and inference studies to extract unique astrophysical and cosmological information upon detection, and carry out unprecedented tests of General Relativity. After reviewing the key ideas underlying the synergistic work, I will discuss the state-of-the-art of waveform models, and point out the need of further improving their accuracy, as we approach the era of precision gravitational-wave astrophysics with future facilities on the ground and in space.