Contribution ID: **74** Type: **not specified**

Enhancing the SEOBNRv5 effective-one-body waveform model with second-order gravitational self-force fluxes

Wednesday 5 July 2023 09:00 (20 minutes)

We leverage recent breakthrough calculations using second-order gravitational self-force (2GSF) theory to improve both the gravitational-mode amplitudes and radiation-reaction force in effective-one-body~(EOB) waveform models. We achieve this by introducing new calibration parameters in the SEOBNRv5HM mode amplitudes, and matching them to the newly available 2GSF energy-flux multipolar data for quasicircular nonspinning binary black holes. We find that this significantly improves the SEOBNRv5HM energy flux, when compared to numerical-relativity (NR) simulations of binary black holes with mass ratios between 1:1 and 1:20. Moreover, we find that, once the conservative part of the SEOBNRv5 dynamics is calibrated, the SEOBNRv5HM waveform model with 2GSF information reproduces the binding energy of NR simulations more accurately, providing a powerful check of the consistency and naturalness of the EOB approach. While we only include nonspinning 2GSF information, the more accurate binding energy and energy flux carry over to the SEOBNRv5 waveform models for spinning binary black holes. Thus, our results improve the latest generation of SEOBNR waveform models (i.e., SEOBNRv5), which has been recently completed for use in the upcoming fourth observing (O4) run of the LIGO-Virgo-KAGRA Collaboration.

Presenter: POMPILI, Lorenzo (Max Planck Institute for Gravitational Physics (AEI Potsdam))

Session Classification: Wednesday Morning