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Fast and Reliable Gravitational Waveform Model for Binary Neutron Star Coalescences

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Efficient gravitational waveform models enable us to analyze gravitational wave signals and extract information about the source properties of the compact binary involved in the merger. In this talk, we discuss the improvements made to the NRTidal model, a state-of-the-art model used to describe the tidal interactions between the components of binary neutron stars. The updates include a new closed-form expression calibrated to a suite of numerical relativity simulations including high-mass ratio systems and a variety of equations of state. The model also considers dynamical tidal effects and post-Newtonian mass-ratio dependence of the calibration parameters. It has been implemented in LALsuite by attaching it to existing binary black hole waveform models. The validity of the model is tested on a larger parameter space by comparing it with numerical-relativity waveforms and other tidal models. We show how the model performs when analyzing previously detected gravitational-wave signals and how it can be used to place constraints on the equation of state of supranuclear-dense matter. Finally, we discuss the outlook and future directions of the model.

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