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Numerical relativistic simulations of neutron star binaries and the nuclear equations of state.[1] ATUL KEDIA, GRANT MATHEWS, IN-SAENG SUH, University of Notre Dame, HEE IL KIM, Sogang University — With the recent observations of gravitational wave signals from binary neutron star mergers, relativistic hydrodynamics has become testable by numerical simulations. Numerous simulations currently exist exploring parameters of binaries such as the mass ratio, distance, spins, and the equations of state (EOSs) of the constituent neutron stars. Many different numerical approaches exist such as the BSSN or BSSNOK formalisms, and the conformally flat approximation that can solve the Einstein equation efficiently. In this work we will be doing full GR three-dimensional hydrodynamics simulation by first constructing initial data using Lorene followed by simulating the merger with Einstein Toolkit. The goal is to study binary neutron stars described by various EOSs and their effects on the observed GW waveform as the merger happens. We also perform tests on the EOSs using the Rotating neutrons star code to check their validity under modern standards of mass limits.

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