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Dynamical Simulations of Binary Neutron Star Mergers[1] TANMAYEE GUPTE, JOSHUA FABER, GRACE FIACCO, Rochester Institute of Technology, TRUNG HA, University of Rochester, THEORETICAL AND COMPUTATIONAL ASTROPHYSICS NETWORK COLLABORATION — The recent detection of gravitational waves (GW) from a system of binary neutron stars (BNS) in coincidence with electromagnetic observations has launched a new era of multi-messenger astrophysics. As a result, BNS mergers are one of the main targets for GW interferometer detectors on earth. A particularly interesting challenge is to constraint the equation of state (EOS) of the nuclear matter inside the neutron star core, which is still theoretically unknown. In order to do parameter estimation and detect additional GW signals, we need to compare the observed signals to theoretical GW templates, which depend on different characteristics like total mass, EOS, mass ratio, etc. Limited work has been previously done with simulating unequal-mass BNS because of numerical difficulties. We have modified the LORENE code to advance our ability to construct unequal-mass BNS initial data, and used them to initiate dynamical evolutions of BNS mergers performed using the Einstein Toolkit. Here we discuss our analysis of the dynamics of the merger for varying mass ratios and different EOSs represented as piecewise. We will focus on the relationship between the BNS mass ratio, EOS and the ejected mass from corresponding merger.

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Tanmayee Gupte
Rochester Institute of Technology

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