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Dynamical Simulations of Binary Neutron Star Mergers¹ TAN-
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Technology, TRUNG HA, University of Rochester, THEORETICAL AND COM-
PUTATIONAL 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 theoret-
cal 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 ra-
tios 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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