Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Realistic Binary Neutron Star Mergers and their Magnetosphere[1]

MARIA BABIUC HAMILTON, Marshall University — The GW170817 event was the first detection of a binary neutron star (BNS) merger in both gravitational waves and light, thus receiving worldwide attention. Recently, a second gravitational wave detection from a heavier BNS was announced: GW190425. In this work we model the equation of state (EOS) of neutron stars and to understand how the magnetic field is amplified during the BNS evolution. We construct initial data with the LORENE code and choose three EOS, constrained by the GW170817 and GW190425 events. We simulate each event with the Einstein Toolkit, considering first the same EOS for the binary, then allowing different EOS for individual stars. We add dipolar magnetic fields, modeling the magnetospheres with the general relativistic force-free electrodynamics code GiRaFFE. We monitor the mass density, the gravitational waves, and for the simulations with magnetic field, the electromagnetic Poynting luminosity. We quantify the relationship between the chosen equations of state, the gravitational wave signal, and the collimation of the electromagnetic field. If the merger produces a black hole, we look for the incipience of jets. Our work will help with understanding matter at high density, and highly energetic sources of both gravitational and electromagnetic radiation.

[1]This work is partially supported by the NSF EPSCoR Grant OIA-1458952 to the state of West Virginia.

Maria Babiuc Hamilton
Marshall University

Date submitted: 08 Jan 2020 Electronic form version 1.4