Abstract Submitted
for the TSF19 Meeting of
The American Physical Society

Kilonova Emissions – Particle-In-Cell Simulations of Mildly Relativistic Outflows. MOHIRA RASSEL, Los Alamos National Laboratory — Collisionless shocks are ubiquitous in astrophysical plasmas, and are observed to be the sites of very high energy particles (which then radiate photons over a wide range of energies). A long-standing, unsolved problems in high energy astrophysics how magnetic fields are generated in these shocks, and how these fields relate to the process of particle acceleration. Particle-in-cell codes are ideally suited to address this question and previous work has looked at cases of magnetic field generation and particle acceleration in both highly relativistic and non-relativistic shocks. The aim of this project is to examine shock development, magnetic field generation and particle acceleration in the case of *mildly* relativistic shocks, which are expected when the tidal ejecta of neutron star mergers shocks with the external medium. Using LANL's VPIC (vector particle-in-cell), we have run simulations of such mildly-relativistic, collisionless, (initially unmagnetized) plasmas and compute the resultant magnetic fields and particle energy spectra. We show the effects of varying plasma conditions, as well as explore the validity of using different and often unrealistic proton to electron mass ratios in VPIC. Our results have implications for observing late-time electromagnetic counterparts to gravitational wave detections of neutron star mergers.

Mohira Rassel
Los Alamos National Laboratory

Date submitted: 30 Sep 2019 Electronic form version 1.4