Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Lanthanide Database of Abundances for Neutron Star Mergers
PRANAV NALAMWAR[1], Michigan State Univ — Kilonovae are optical transients associated with neutron star mergers (NSMs) and are powered by the radioactive decay of heavy elements created by the rapid neutron capture process(r-process). It is important to note that the blue and red emission component from the kilonovae, along with their timescales, are greatly dependent on the abundance of the lanthanides and their various charge states in the merger material. To analyze these mergers and their abundances, we study the event through an Atomic Physics lense. We study how varying atomic data inputs, such as ionization energies, affect the total abundance of these unique elements. We use elemental abundances calculated by Skynet, a nuclear reaction network code, and uncover how distinct isotopes evolve over time due to variables such as temperature and electron fraction. We then use these calculated elemental abundances, the Saha Equation, and NIST ionization data to predict the ionization state populations of lanthanides on timescales similar to the expected time of the kilonova peak. We will report on our most recent results, and how a multi-element merger material should evolve over time. This work is supported by Michigan State University, the Honors College of MSU, and the Joint Institute of Nuclear Astrophysics.

[1]I did conduct my work under my research advisors Dr. Jaideep Singh and Dr. Luke Roberts, but we do not have a team name nor is there anyone else working on the project.

Pranav Nalamwar
Michigan State Univ

Date submitted: 12 Jan 2020 Electronic form version 1.4