Abstract Submitted
for the DNP20 Meeting of
The American Physical Society

Gamma rays from neutron star mergers: a unique signature of r process XILU WANG, NICOLE VASSH, University of Notre Dame, MATTHEW MUMPOWER, Los Alamos National Laboratory, TREVOR SPROUSE, REBECCA SURMAN, University of Notre Dame, RAMONA VOGT, Lawrence Livermore National Laboratory, JORGEN RANDRUP, Lawrence Berkeley National Laboratory, N3AS COLLABORATION, FIRE COLLABORATION — Neutron star mergers (NSMs) are one site for rapid neutron capture (r process) nucleosynthesis, which are verified by the multi-messenger observations of the event GW170817. The optical and infrared signals from the event indicated lanthanide production from a NSM. NSM could also emit gamma rays from the heavy isotopes synthesized through the r process in the neutron-rich ejecta. The gamma ray signal may provide a unique probe of the NSM environment as well insight into the nature of the r process. We simulate the gamma-ray light curves and spectra from a NSM event with different astrophysical and nuclear conditions and find that the NSM gamma ray signals encode the ejecta properties and r process features like neutron richness and heavy isotope yields. We also test the detectability of nearby NSMs by making comparisons to the sensitivity limit of the next generation gamma ray detector AMEGO.

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Date submitted: 25 Jun 2020 Electronic form version 1.4