

The Nuclear Physics Uncertainty on Kilonova Heating Rates and the Role of Fission

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The detection of an electromagnetic counterpart to GW170817[1] suggests that r-process elements are produced in neutron star mergers. This electromagnetic counterpart has been modeled as a kilonova, which is a light curve thought to be powered mainly from the radioactive decay of heavy elements formed. We investigate uncertainties in the nuclear physics inputs to kilonova calculations, finding that the uncertainty in the total nuclear heating rate is a factor of a few. We examine in particular the role of fission in this heating, and find that while much of the total nuclear heating is driven by beta decay, fission has an important role to play. We identify the nuclei which make the largest contribution to the heating through fission, and we also investigate the population of beta decaying nuclei by way of fission daughter products.

References

- [1] B. P. Abbott *et al.* [LIGO Scientific and Virgo Collaborations], *Phys. Rev. Lett.* **119**, no. 16, 161101 (2017)