Fission properties relevant for GW170817

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The recent observation of gravitational waves and electromagnetic counterpart to GW170817 [1] has provided fresh impetus to understand the formation of the heaviest elements on the periodic table. The merging of two neutron stars offers a potentially robust site for the neutron-rich nucleosynthesis of these elements in the rapid neutron capture process (r process). However, many challenging problems remain in both the astrophysical modeling of merger events and the nuclear physics inputs. Among the nuclear physics needs for the r process, fission properties may be particularly important. The dynamical ejecta of mergers is expected to be so neutron-rich that the resulting r process produces nuclei above the predicted $N = 184$ shell closure and terminates via fission. We focus our discourse on recent nuclear model developments in the description of fission apart of the Fission In R-process Elements (FIRE) collaboration. We discuss new calculations of neutron-induced and β-delayed fission properties using FRDM2012. We present new microscopic fission yields predicted from FRLDM. We report on the relevance of these calculations to nucleosynthetic yields, the impact on reheating of the ejecta in addition to the influence on kilonova observations.

References

[1] B. P. Abbott *et al.*, PRL 119 161101 (2017).