Realistic Reaction Evaluations for Fission Products Off Stability

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Nuclear applications such nonproliferation, post-detonation forensics, spent-fuel assay, reactor burnup and design, as well as astrophysics, rely on the accurate description of the neutron interaction with unstable fission products. However, current cross-section descriptions of these nuclei are either non-existent or based on simplified assumptions, leading to unquantified impacts on predicted cross-sections. In this work we will discuss a newly funded project aiming to address these issues through predictive modelling, leveraging machine-learning methods, with an experimental component to help constrain model parameters. We will discuss details of the approach as well as project status and plans. We will present preliminary results, focusing on the most produced nuclei off stability in the fission process of 235U. In particular, we will discuss coupled-channels mechanisms with different models for nuclear deformation. When completed, assuming the methods are well-established, the project should be able to provide realistic evaluated files for the whole isotopic chain of all off-stability fission products of 235U, 239Pu, and 252Cf. The evaluated files will be submitted to ENDF/B for consideration in the future ENDF/B-IX release.

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Authors: VOINOV, Alexander (Ohio University); SHARMA, Aman (LLNL); BROWN, David (Brookhaven National Laboratory); CHIMANSKI, Emanuel (BNL); NOBRE, Gustavo (Brookhaven National Laboratory); WENDT, Kyle (Lawrence Livermore National Laboratory); LIU, Shusen (LLNL)

Presenter: NOBRE, Gustavo (Brookhaven National Laboratory)

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