Testing the Extended SRM against the ^{238}U(^{3}He,^{4}He)^{237}U* surrogate probabilities

O. Bouland
CEA, DES, IRESNE, DER, SPRC, Physics Studies Laboratory, Cadarache, F-13108 Saint-Paul-lez-Durance, France

B. Jurado and P. Marini
Univ. Bordeaux, CNRS, CENBG, UMR 5797, F-33170 Gradignan, France

Since its introduction, the so-called surrogate-reaction method (SRM) has motivated the development and improvement of theories in connection to direct reactions. A recent paper [1] has shown that the assimilation of experimental probabilities in the neutron cross section evaluation process can still be better estimated using tools resulting from the efforts made over the two last decades. In particular, this paper has put forward a new prescription, named after the SRM as extended SRM (ESRM), to convert, with reasonable confidence, measured direct-reaction induced probabilities to pseudo experimental neutron-induced cross sections. Applied to the ^{174}Yb(^{3}He,pγ)^{176}Lu* transfer reaction, the ESRM has demonstrated much more precision than the standard use of the historical SRM to make that conversion. Beyond 'direct' analysis of direct-reaction induced probabilities using the right modeling as developed in Ref. [2], it is worth to try converting the measured probabilities in pseudo experimental neutron-induced cross sections for neutron reactor data applications. In the present talk, we demonstrate that the ESRM is also suitable for fissile isotopes. The ESRM formula will be applied to gamma-emission and fission probabilities measured in the ^{238}U(^{3}He,^{4}He)^{237}U* reaction, transforming them into neutron-incident (n+^{236}U) data. Figure 1, extracted from Ref. [3], shows the disagreement commonly observed between decay probabilities recovered using the Weisskopf-Ewing limit of the SRM from neutron-incident evaluated cross sections and, the actually measured probabilities.

---

[1] O. Bouland and G. Noguère, Phys. Rev. C **102**, 054608 (2020).
[2] O. Bouland, Phys. Rev. C **100**, 064611 (2019).
[3] B. Jurado, P. Marini *et al.* , EPJ Web Conf. 146, 11006 (2017).

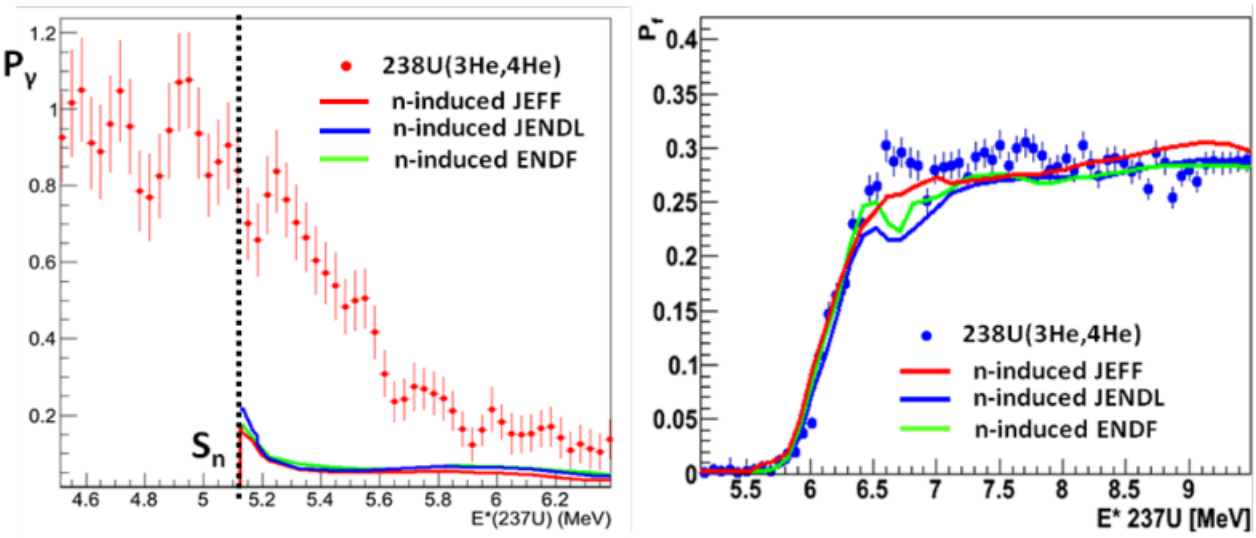

FIG. 1: Gamma-decay (left) and fission (right) probabilities measured according to the ^{238}U(^{3}He,^{4}He)^{237}U* reaction [3] as a function of the excitation energy for the ^{237}U compound system compared to the corresponding SRM-transformed neutron-induced decay probabilities obtained from several neutron cross section evaluations. The vertical dotted line in the left panel represents the neutron separation energy S_n of ^{237}U.