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Determining cross sections for neutron capture reactions involving isomeric states

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Neutron capture reactions play an important role in nuclear physics and other fields that seek to understand physical processes in which neutrons react with their environment. In particular, knowledge of capture cross sections is crucial for nuclear astrophysics applications. Many required capture cross sections are unknown and extremely difficult to determine experimentally, as their measurement involves colliding neutrons with short-lived or highly-radioactive targets. The presence of isomers in the target or intermediate nuclei involved further complicate the situation. The surrogate reaction method [1], an indirect approach, has been demonstrated to provide meaningful constraints for neutron capture cross sections [2,3]. I will present an extension of the work published in Ref. [2] to determine cross sections for multiple reaction pathways that involve isomeric states in the target and/or final nucleus.

References:

- [1] Escher et al, RMP 84, 353 (2012)
- [2] Escher et al, PRL 121, 052501 (2018)
- [3] Ratkiewicz et al, PRL 122, 052502 (2019)

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Primary author: ESCHER, Jutta (Lawrence Livermore National Laboratory)

Presenter: ESCHER, Jutta (Lawrence Livermore National Laboratory)

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