Contribution ID: **13** Type: **Poster**

Toward 238U(n, γ) cross sections from measured γ-strength function and nuclear level density with SFγNCS

A neutron capture by a nucleus results in a compound nucleus that quickly desexcites while emitting γ-rays if its excitation energy is less than a few MeV. This process, known as a radiative capture, occurs in many stellar nucleosynthesis. The reaction cross sections can be measured precisely for stable nuclei or nuclei close to the valley of stability but this becomes challenging for more exotic nuclei [1]. Nuclear reaction models based on stable nuclei struggle to provide reliable predictions for these exotic nuclei. Some progress has been made by looking at microscopic ingredients that are experimentally accessible: the nuclear level density and the γ strength function. These describe the γ-ray cascade and the structure of the nucleus at high excitation energies. Measuring them allows us to improve the precision of evaluated radiative capture cross sections of unstable nuclei.
A detection system SFγNCS (γ Strength function for Neutron Capture Simulations) [2] has recently been developed to measure these ingredients of the radiative decay. In SFγNCS experiments, aimed nuclei are populated in direct kinematics by (d, p) transfer reactions close to the neutron radiative captures of interest. From the light ejectiles detected in a ΔE-E silicon telescope,the excitation energy Ex is identified. The γ-rays emitted throughout the cascade are measured with an array of 60 NaI detectors with an excellent efficiency. Following the Oslo method, the [Eγ ,Ex] measured matrix is analysed to extract the [Eγ , Ex] primary matrix, i.e. the first-generation γ-rays in the cascade which are described by the γ-strength function and nuclear level density. A benchmark experiment of SFγNCS will be reported here. The γ-strength function and nuclear level density of 239U were recently measured [2]. Furthermore, a new evaluation of the 238U(n, γ) cross sections will be discussed.

References

[1] S. N. Liddick *et al.*, *Phys. Rev. L* **116** (2016).
[2] O. Roig *et al.*, *Nucl. Inst. Methods A* **1073** (2025).

Authors: FOUGERES, Chloe (CEA/DIF); Dr ROIG, Olivier (CEA/DIF); Ms POTTIER, Mathilde (CEA/DIF); GAUDEFROY, Laurent (CEA-France); Dr MÉOT, Vincent (CEA/DIF); Dr EBRAN, Adeline (CEA/DIF)

Presenter: FOUGERES, Chloe (CEA/DIF)

Session Classification: Poster session

Track Classification: Nuclear Astrophysics