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Study of fission products characteristic with the LOHENGRIN spectrometer

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Fission yields are one of the most used observables to describe the fission process. They are also mandatory for nuclear fuel cycle studies or nuclear reactor calculations. A collaboration between CEA, LPSC, and ILL has been working since 2010 on the LOHENGRIN spectrometer in order to better control the possible experimental biases and systematic uncertainties.
Different setups allow us to study some characteristics of fission products. In this talk, we will highlight the recent results obtained using γ spectroscopy. For instance, a new procedure has been developed in order to measure independent fission yields for shielded isotopes. For such isotopes, due to their low cumulated yield, their γ signals are very low in comparison to the γ−ray background at the measurement position. Therefore, the ions were collected by implantation of the mass-separated beam into Al foil placed inside a vacuum chamber. This foil was then removed and transferred to a low γ-ray background setup located at LPSC. The procedure is then repeated for different LOHENGRIN settings. The low γ-ray background setup features a considerably improved signal-to-background ratio compared to more conventional measurements in the online regime.
Fission product characteristics can be studied with the LOHENGRIN spectrometer such as their angular momentum. Usually, fission product angular momentum is studied through prompt γ emission or isomeric ratio measurement. The later observable is interesting because it preserves the initial angular momentum information resulting from the fission process just after the prompt particle emission. Recently experimental campaigns achieved at the ILL showed the kinetic energy dependence of isomeric ratios for numerous nuclei for 235U(nth,f) and 241Pu(nth,f) reactions. A Bayesian assessment of the angular momentum distribution is proposed according to calculations performed with the FIFRELIN code. The similar angular momentum distributions found for both reactions are interpreted with angular momentum generation models.

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