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Isomeric yield ratio measurements in the alpha-particle induced fission of Thorium at 32 MeV

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The mechanism generating fission fragments'large angular momenta is still a heavily discussed question in nuclear physics. Since they are not directly measurable, experimentally accessible observables are used to derive the angular momenta using nuclear model codes. One of these observables is the ratio between the yields of spin isomers produced in a fission reaction, the so-called isomeric yield ratio. The isomeric yield ratio is also relevant to test nuclear models and in technological applications, since, *e.g.*, the fraction of nuclei in the excited state may affect the decay heat of spent fission fuel.

For these reasons, the isomeric yield ratio of fifteen fission products in the high mass region was measured for Th(α,f) at 32 MeV. The α-induced fission of Th was chosen in order to investigate the impact of the initial spin of the compound system on the yield ratio and eventually the corresponding angular momenta. To do so, the newly measured isomeric yield ratios can be compared with data from different fissioning systems, such as ^{233}U and ^{235}U, where, in principle, compound nuclei similar to those of Th(α,f) are formed.

The measurements were performed at the University of Jyväskylä using the phase-imaging ion-cyclotron-resonance (PI-ICR) technique at the IGISOL-4 facility. Through PI-ICR, isomers are separated with a high mass resolving power, allowing *e.g.* to resolve the ^{129}Sn isomeric pair, with an energy difference corresponding to 35.1 keV. The separated ions are then projected onto a position sensitive detector. The images produced are then analyzed to calculate the number of ions measured for each state. The measured ratios are then corrected to account for the MCP efficiency and the decay and feeding effects from eventual precursors in the beam, as the time from extraction to measurement can be comparable to their half-lives.
The analysis procedure and results of the measurement campaign will be presented.

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