Contribution ID: **84** Type: **not specified**

Shape isomerism in uranium isotopes

Thursday, 12 March 2026 10:35 (25 minutes)

The unexpected observation of a metastable spontaneously fissioning state
in 242Am put in question the common knowledge of the fission barrier. The inability of the available fission models back then to explain the observed decay mode, based on a single-humped barrier, led to the consideration of shell effects modulating the liquid-drop energy as a function of deformation. In 1967, Strutinsky achieved a breakthrough by incorporating shell effects into the calculation of the nuclear energy at large nucleus deformations. As a result, the modulation of the energy surface leads to an additional local, so-called super-deformed, minimum, at a deformation corresponding to an aspect ratio of about 2:1, when approximating nuclear shapes as spheroids.

In the forthcoming decade systematic investigation led to the discovery of about 30 shape isomers in nuclei with Z > 93, except for 236,238U and 237Np. In the latter case, the exceptionally low population probability of the shape isomer promoted the idea that an internal transition to the normal ground-state takes the main strengths of the decay. This decay branch had indeed been observed in 236U and 238U. In the meantime, the so-called γ back-decay has been confirmed for 236U, whereas this decay mode has been put into doubt for 238U after several further experiment campaigns.

At the JRC Geel attempts have been made to search for shape isomers in odd uranium isotopes, for which half-life predictions ranges from ns until hundreds of ms. While a shape isomer had been discovered for 235U with a reasonable population probability, a recent measurement campaign hints to the existence of a shape isomer in 237U with a probability comparable with that in 237Np.

The present situation around shape isomers will be discussed and possible future efforts presented.

Type of contribution

Invited Speaker

Primary author: OBERSTEDT, Stephan (European Commission)

Presenter: OBERSTEDT, Stephan (European Commission)

Session Classification: session 12 (Chair: A. Setaro)