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Properties of the ^{236m}U Fission Isomer

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We report on measurements of delayed γ decay and delayed fission of the shape isomer ^{236m}U , as well as a search for isomeric decay in ^{233}Th , performed with the Heidelberg–Darmstadt Crystal Ball spectrometer. For ^{236m}U , the data demonstrate that delayed γ decay and delayed fission constitute two competing decay modes of the same isomeric state. This conclusion is supported by the identical half-lives observed for both decay channels, the same excitation energy of the isomer, equal missing energy in the prompt energy balance, and consistent prompt energy spectra populating the second minimum. The excitation energy of the isomeric ground state in the second minimum is determined to be 2814 ± 33 keV. The γ back-decay proceeds via multi-step cascades involving known 1^- states of normally deformed ^{236m}U while a direct single-step γ transition is excluded within the experimental sensitivity. In contrast, no evidence for isomeric γ decay was found in ^{233}Th . An upper limit of $< 10^{-6}$ is established for the branching ratio populating a potential shape isomer in the second minimum relative to the first minimum. These results place stringent constraints on the existence and population probability of a second minimum in ^{233}Th and provide valuable benchmarks for theoretical models of shape isomerism in actinide nuclei.

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