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Fast-timing@nu-Ball2 fission campaign: new results for the neutron-rich isotopes $^{134,136}\text{Te}$

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Neutron-rich nuclei far away from the valley of stability contribute decisively to our understanding of nuclear characteristics. At the IJCLab in Orsay, a variety of nuclei were produced in a fast-neutron-induced fission reaction $^{238}\text{U}(n,f)$ as part of the nu-Ball2 fission campaign in 2022. The measurement was performed with the nu-Ball2 spectrometer, a hybrid γ -spectrometer equipped with HPGe and LaBr₃(Ce) detectors, which provide excellent energy and timing resolution, respectively. In comparison to the first fission campaign in 2018, nu-Ball1, several improvements on the spectrometer and the beamline were made. An important gain was the tripling of the LaBr₃(Ce) efficiency (from 0.7% to 2.1%). Together with the factor of 10 increased beam intensity, this led into almost two orders of magnitude more of HPGe-LaBr₃(Ce)-LaBr₃(Ce) coincidences. The excellent time resolution of the LaBr₃(Ce) detectors allows lifetime measurements in the ps-regime using the fast-timing technique. The nu-Ball2 LaBr₃(Ce) data was properly time-walk calibrated, which allowed the application of the more precise centroid-shift method instead of the convolution and slope methods used for nu-Ball1 data analysis [1]. The fast-timing analysis procedure was benchmarked by re-evaluating known lifetimes of low-lying excited states in $^{134,136}\text{Te}$. The new results for $^{134,136}\text{Te}$ will be presented, compared with literature and theory, and discussed. While for most of the lifetimes only an improvement of the error bar was achieved, the newly determined lifetime of the 6^+ state in ^{136}Te disagrees with the previous result. Currently, none of the presented theoretical calculations can consistently reproduce the new set of experimental B(E2) strengths for the low-lying $6^+ \rightarrow 4^+$, $4^+ \rightarrow 2^+$ and $2^+ \rightarrow 0^+$ yrast transitions in ^{136}Te .

[1] G. Häfner et al., Phys. Rev. C 103 (2021) 034317

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Regular Abstract

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