Contribution ID: **88** Type: **not specified**

Approaching the dominance of electron-capture delayed fission in 234Bk and 230Am

Thursday, 12 March 2026 18:05 (25 minutes)

The first identification of the exotic decay process of Electron-Capture Delayed Fission (ECDF) of the very neutron-deficient isotope 234$Bk was performed, and improved ECDF properties for its alpha-decay product 230Am were obtained at the gas-filled recoil separator SHANS2. The isotope 234Bk was produced in the fusion-evaporation reaction 40Ar+197Au->237Bk*->234Bk+3n.
By using the method of temporal and position correlations, different decay channels of 234Bk and 230Am isotopes were investigated and a wealth of new experimental information was obtained.
The highest ECDF probabilities, P(ECDF)(234Bk)=0.55(15) and P(ECDF)(230Am)=0.35(11), among all beta- or EC-delayed fission cases known so far are reported, showing the tendency of approaching the expected saturation towards P(ECDF)=1. The comparison of the P(ECDF) systematics with two theoretical fission models shows significant discrepancies in respect of corresponding fission barrier values. Meanwhile, the analysis of the ECDF probabilities in the heavy actinides and lead region suggests the similar ECDF mechanism in both cases. The need for a theoretical framework that can provide realistic beta-delayed fission probabilities for astrophysical predictions is strongly underlined.

*on behalf of the York-IMP(Lanzhou)... collaboration

Type of contribution

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Session Classification: session 14 (Chair: S. Siem)