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Angular distribution measurements of fission fragment gamma rays

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In nuclear fission, a heavy nucleus normally splits into two fission fragments. Fragments are typically created with about $6-7 \hbar$ of angular momentum on average [1]. The fragment spin directions relative to the fission axis are not well understood, with the only available data from 1976 by A. Wolf and E. Cheifetz [2]. The angular distributions of γ rays give with respect to the fission axis give us experimental information about spin directions. In this work, we present measurements of the angular distributions of discrete γ rays in fission fragments from spontaneous fission of ^{252}Cf . The data were taken at Argonne National Laboratory with the Gammasphere spectrometer. The set up combined a twin Frisch-gridded ionization chamber, which gives fission fragment mass, kinetic energy and directions, together with the Compton-suppressed high-purity germanium (HPGe) detector array Gammasphere that provides high-granularity, high-resolution γ -ray energy measurements [3]. Around $2.5 \cdot 10^9$ fission events were recorded over 180 h of experiment. This set-up allows accurate measurements of gamma ray angular distributions with respect to the fission axis.

References

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