Angular Distribution of Prompt Fission γ-Rays

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A more detailed analysis was carried out of the previously obtained experimental data on the measurement of angular correlations of prompt γ-rays emitted by fragments of ^{235}U fission induced by monochromatic polarized neutrons with the energy of 60 meV. Experimental measurements were carried out at the POLI facility of the FRM II reactor (Garching, Germany). The work was published in the journal Romanian Reports in Physics [1].

In our previous studies, using the angular distribution of prompt gamma-rays from binary fission, we studied the effect of rotation of the fission axis, the so-called ROT effect. This effect is expressed in the shift of the anisotropic angular distribution of γ-quanta emitted by excited fission fragments by some small angle δθ relative to the fission axis when the neutron beam polarization direction is reversed. Results on the ROT effect have been published in [2]. As a result of processing these data, in parallel, results were obtained on the angular distribution of gamma quanta relative to the fission axis, which are also of scientific value.

The paper describes a technique for determining the efficiency of gamma radiation detectors by analysis of all possible combinations of angles between the sectors of the fragment detector and all gamma detectors. Such an operation is analogous to rotating a clip of eight detectors and measuring the number of γ-quanta of each detector at the same angle per unit time. As a result, the gamma-ray emission angular anisotropy coefficient relative to the fission axis was $A = 0.1570 \pm 0.0053$, which is in good agreement with the results obtained by other authors for thermal neutrons.

1. G. Ahmadov, D. Berikov, Yu. Kopatch, Angular distribution of prompt fission γ-rays // Romanian Reports in Physics, 75(1), (2023), 202.
2. D. Berikov, G. Ahmadov, Yu. Kopatch, A. Gagarski et. al., Effect of rotation in the gamma-ray emission from 60 meV polarized neutron-induced fission of the ^{235}U isotope // Phys. Rev. C, 104(2), (2021), 024607.