Exploring Long-Lived Shape Isomers in Photofission Fragments Using a Novel Ion-Guide TOF-E Spectrometer at the MT-25 Microtron Electron Beam

In 1962, at the Flerov Laboratory of Nuclear Reactions (FLNR), JINR, spontaneously fission shape isomers in actinides were discovered. The physics of the phenomenon is due to the fact that the fission barrier has a complex two-humped structure. The isomeric level is localized in the second potential well of the barrier and, with some probability, from this state the nucleus spontaneously fissions. The existence of local minima on the surface of the potential energy of a nucleus in a multidimensional deformation space has been shown in a large number of theoretical works for a wide range of nuclei, in addition to actinides. *At the same time, there are no calculations that predict the isomeric state at the top of the fission barrier for the nuclei lighter than actinides*. A nucleus in this state can be called a fission isomer by analogy with fission isomers in actinides.

The fission isomers among the fragments of binary fission of low excited heavy nuclei were observed for the first time also in FLNR some years ago. The project aims to study fission isomers in fragments from photofission.

Possible tasks for the student practice.

- 1. Mastering the heavy ions angular distribution measurement technique using TIMEPIX-3 pixel detectors with space resolution 55 um.
- 2. Processing of the experimental data demonstrated the break-up of the shape-isomers in the solid-state foils: linear energy calibration of the spectrometer.
- 3. Processing of the experimental data demonstrated the break-up of the shape-isomers in the solid-state foils: linear time calibration of the spectrometer.