Nuclear isomers in heaviest nuclei

Stanislav Antalic

antalic@fmph.uniba.sk

Recent developments of experimental techniques suited for alpha, gamma and conversion electron spectroscopy now allow to study nuclear structure in the region of trans-fermium nuclei. This opened the door to investigate nuclear structure under extreme conditions of heaviest nuclei like are elements with a proton number above 100.

Special importance has the study of nuclear isomers. Experiments aimed to investigate nuclear isomers provide important information on the nuclear structure of heaviest elements and are are stringent tests for the quality of nuclear models. One can obtain e.g. information on nucleon pairing, single particle levels, deformation changes or one can study properties of levels and collective excitations not observable in in-beam measurements.
Very important is the connection of nuclear isomers with the stability of super-heavy nuclei.

This kind of experiments is part of the long-term program aimed at the study of heaviest nuclei performed at the velocity filter SHIP at GSI in Darmstadt. In combination with the UNILAC accelerator is SHIP an extremely sensitive tool for the identification and investigation of isomeric states with very low production cross-section.

Most interesting examples are studies of K-isomers, which in are a special kind of spin-traps whose existence depends not only on the spin value but also on its orientation. In particular in this contribution the results from the studies of multi-quasi-particle isomeric states in 253No and 255Lr performed at SHIP will be presented in detail. These two nuclei are the first odd-mass isotopes in the trans-fermium region for which high K-isomers were observed. Additionally, also the recent results on the single particle level systematics for the N = 149, 151 and 153 isotones will be presented.