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Study of deformed structure in ^{254}Es by Coulomb excitation

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Exploring the new elements toward the high end of the nuclear chart is one of the most interesting topics in nuclear physics. The key ingredient to stabilize nucleus in this region is a nuclear shell structure and Z=114, 120, N=184 [1-4] are predicted to be new magic numbers. However, the access to such nuclei and study of their shell structure is limited by the very low cross sections. To investigate and understand the shell structure there, we are focusing on the nuclei in the A~250 heavy mass region including ^{254}Es. By studying the excited states, spin and parity, and deformation, we will be able to access the single-particle orbitals relevant to new shell structure at Z=114, 120, N=184 in the super-heavy mass region.

In A~250 nuclei, experimentally observed rotational bands indicate the existence of deformed structure in this region, however the studies of deformation, such as determination of quadrupole moment, are not performed well. To understand single-particle structure, it is important to determine the size of ground state deformation systematically.

To study nuclear deformation in the A~250 region, we have performed Coulomb excitation experiments to determine the deformation of low-lying states of ^{254}Es. The experiment was performed at the JAEA-Tokai Tandem accelerator using a 240-MeV ^{58}Ni beam irradiating a ^{254}Es target. Particle-gamma coincidence measurements were conducted using segmented CD-silicon detectors placed backward and forward from the target and an array of Ge and $LaBr_3$ detectors. From the gamma-ray spectrum analysis, a rotational band structure in ^{254}Es was observed. In the presentation, recent experimental results will be discussed.

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