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Gamma-ray spectroscopy of the heaviest nuclei at the JAEA-Tokai Tandem laboratory, using ^{249}Cf and ^{254}Es targets

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The spectroscopy of heavy nuclei near the N=152 and N=162 deformed shell gaps provides precious information to improve current predictions of long-lived super-heavy elements in the Island of Stability. Due to deformation, in fact, substates of spherical orbits in the island of stability can be found near the Fermi level in these lighter systems. At the JAEA-Tokai Tandem accelerator, the first in-beam γ-ray spectroscopy of ^{252}Fm (Z=100, N=152) was attempted. ^{252}Fm was produced via the multi-nucleon transfer reaction ^{249}Cf(^{12}C,^{9}Be) respectively at 75 and 77 MeV. The target radioactivity was nearly 150 kBq. The target chamber was surrounded by a new particle-gamma detection setup, comprising an array of Silicon detectors to detect and identify the light reaction ejectiles, and a mixed array of four Germanium and four $LaBr_3$(Ce) detectors, with an absolute photopeak efficiency of nearly 30% at 150 keV. γ-ray transitions from ^{252}Fm were discriminated by the coincident detection of ^{9}Be. The analysis revealed candidate peaks for ^{252}Fm E2 transitions in ground-state rotational band. The implications of this measurement and future plans using a ^{254}Es target will be presented.

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