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# Experimental half-lives of states in the $^{105}$Cd $11/2^-$ intruder band

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## Abstract

Half-lives of $^{105}$Cd excited nuclear states from the $11/2^-$ intruder band were measured for the first time by using the Bucharest Plunger device [1] during a July 2023 experiment performed at the 9 MV IFIN - ”Horia Hulubei” Tandem accelerator. In this experiment $^{12}$C beam was accelerated to 50 MeV and impinged on a 1 mg/cm$^2$-thick $^{96}$Mo target. The recoils were then implanted in the plunger 5 g/cm$^2$-thick Au stopper. The target-to-stopper distance varied from 13 $\mu$m to 120 $\mu$m and the $\gamma$-rays emitted from the recoils were detected by the RoSphere $\gamma$-ray array, comprising 20 Compton-suppressed HPGe detectors and 5 $LaBr_3$:Ce detectors. The HPGe detectors were placed in four rings at +35°, +70° (forward) and -35°, -70° (backward) angles with respect to the beam direction.

The signals were processed by digital electronics and the events were constructed offline from coincidences between at least two HPGe detectors. For each distance, the data were sorted in symmetric two-dimensional (E$\gamma$, E$\gamma$) matrices for forward and backward angles, respectively. Energy spectra were obtained from shifted feeding transitions and then the half-lives were obtained from the shifted and unshifted components of transitions de-exciting the state of interest. The new data were then analyzed with the NAPATAU program [2]. In particular, the half-lives of $15/2^-_1$ and $19/2^-_1$ states in $^{105}$Cd were obtained from the energy spectrum gated on the shifted feeding transition with an energy of 786 keV and 855 keV, respectively. Our preliminary analysis show that the half-lives of the $15/2^-_1$ and $19/2^-_1$ states are 24 ps and 5 ps, respectively.

The new data will be discussed within the rigid triaxial rotor plus particle model framework that was previously used for several nuclei of the A=100-120 mass region [3–5].

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