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Gamma and Fast-Timing spectroscopy in the ^{128}Cd$\rightarrow$^{128}In$\rightarrow$^{128}Sn β-decay chain

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The isotopic chains close to the nuclei number Z=50 have motivated extensive experimental and theoretical efforts during the last decades. Their structure provide an excellent ground to study shell-evolution along the chain and to investigate the interplay between single-particle and collective degrees of freedom. The systematic study of excited structure of nuclei in the double magic ^{132}Sn region, and specifically the measurement of excited-state lifetimes, provides key observables to get a deeper insight on nuclear structure.

A new experimental camping was carried out at the ISOLDE facility to study the β-decay of neutron-rich cadmium isotopes. High intensity Cd (Z=48) beams were produced after the fission of a thick UC_x target, selectively ionized by the ISOLDE Resonance Ionization Laser Ion Source (RILIS) and separated in mass using the General Purpose Separator (GPS) ISOLDE mass separator. A temperature-controlled quartz transfer line was used to ensure purity of the cadmiun beams.

In this contribution results derived for the A=128 isobaric chain will be discussed [3-5]. Our experiment exploited the excellent spectroscopic capabilities provided by the ISOLDE Decay Station (IDS). The fast-timing configuration was employed, which includes 6 highly efficient clover-type HPGe detectors, altogether with two $LaBr_3$(Ce) and three ultrafast β-plastic detectors arranged in a close geometry. This configuration is well suited to measure lifetimes of excited states down to the 10 ps via ultra-fast timing methods [1,2].

The excited structure of ^{128}In was populated via the β-decay of the ^{128}Cd 0^+ ground state. In the case of ^{128}Sn, the excited levels were selectively fed only by the β-decay of the precursor ^{128}In $(3)^+$ ground state, excluding the contribution of others β-decaying states due to selection rules imposed by the parent ^{128}Cd 0^+ state. In this contribution, we will inform on the the expanded level-schemes for both ^{128}In and ^{128}Sn. Additionally, we will report on the first direct measurements lifetimes below the nanosecond range in both nucleus. A discussion will be provided on the derived $B(XL)$ transition rates are discussed, and particularly on the lifetime of the first 4^+ stat in ^{128}Sn and the derived $B(E2; 4^+ \rightarrow 2^+)$.

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