Results on the β decay of ^{60}Ge and ^{62}Ge measured at RIBF

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The investigation of the structure of nuclei close to the limits of stability is a topic of paramount importance in modern nuclear physics. The $T_z = -2$, ^{60}Ge nucleus is a semi-magic, $N = 28$ isotone whose decay is almost unknown. An exotic feature seen in other $T_z = -2$ nuclei[1,2] is the competition between the γ de-excitation and the (isospin-forbidden) proton emission from the $T = 2$ isobaric analog state populated by β decay in the daughter nucleus. Little was known about the decay of the $T_z = -1$, ^{62}Ge nucleus. In other $T_z = -1$ nuclei a suppression of isoscalar γ transitions between $J^\pi = 1^+$, $T = 0$ states (Warburton and Weneser *quasi-rule*[3,4]) has been observed.[5]

Heavy proton-rich nuclei can be produced with unprecedented statistics at the Radioactive Isotope Beam Factory (RIBF) of the RIKEN Nishina Center. In the NP1112-RIBF82 experiment, 1.5×10^4 ^{60}Ge and 2.1×10^6 ^{62}Ge ions were recorded. They were produced by fragmenting a ^{78}Kr primary beam (345 MeV/nucleon and intensity up to 250 particle nA) on a Be target. The fragments were selected and identified by the BigRIPS separator by means of the $B\rho$-ΔE-ToF method. They were then implanted in the WAS3ABi setup, consisting of three 1-mm-thick double-sided Si strip detectors of a 6×4 cm^2 area. The EURICA array, arranged in 12 clusters containing 7 high-purity Ge crystals each, was used for γ detection.

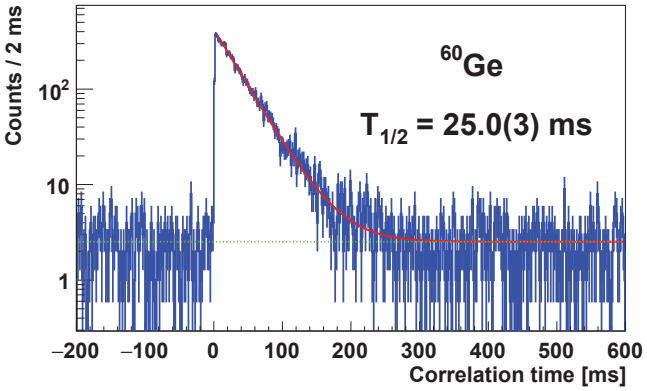

Fig. 1. Time correlations between ^{60}Ge implants in WAS3ABi and subsequent β-delayed protons ($E_p > 1$ MeV) detected in the same pixel of WAS3ABi.

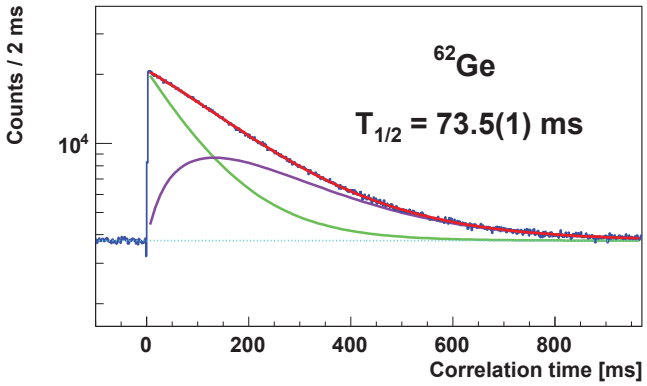

Fig. 2. Time correlations between implanted ^{62}Ge ions and β decays in the same or adjacent pixel of WAS3ABi.

For ^{60}Ge, the first experimental information on both the β-delayed proton and γ emissions has been extracted. By gating on the β-delayed proton emission, a half-life value of 25.0(3) ms has been obtained for ^{60}Ge (Fig. 1). For ^{62}Ge, new information on the β-delayed γ emission has been obtained, indicating the persistence of the *quasi-rule*.[3,4] A half-life value of 73.5(1) ms has been extracted for ^{62}Ge (Fig. 2). The precision on both ^{60}Ge and ^{62}Ge half-lives has been improved in comparison with values in the literature.

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