

γ rays identified in the decay chain of ^{64}Se measured with EURICA

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In a separate contribution to this Accel. Prog. Rep.¹⁾ we have presented the preliminary results for the β delayed proton spectrum of ^{64}As decay and its $T_{1/2}$. This was needed in order to fully understand the decay chain following the decay of ^{64}Se (see Fig. 1 in the separate contribution). Here we present some γ spectra that will help us to determine the complete decay chain. All of the data for the two contributions come from an experiment performed at RIKEN using the fragmentation of a 345 MeV/nucleon ^{78}Kr beam with typical intensity of 200 pA on a Be target. The fragments were separated in flight using the BigRIPS separator and implanted in three WAS3ABi double-sided Si strip detectors. The implantation setup was surrounded by the EUROBALL-RIKEN Cluster Array (EURICA).²⁾ It consisted of 12 Euroball IV type HPGe cluster detectors, each consisting of seven tapered, hexagonal HPGe crystals at a nominal distance of 22 cm from the center. We have analysed the γ spectra in prompt coincidence with β signals happening in WAS3ABi in correlation with the implantation signals happening in the same pixel with the conditions set on ^{64}Se ($T_{1/2} = 22.5$ ms), ^{64}As ($T_{1/2} = 63.4$ ms), and ^{63}Ge ($T_{1/2} = 153.3$ ms). The corresponding γ spectra in “addback” mode (considering the full cluster as a single detector) are shown in Fig. 1. In green are the gamma lines which appear in the spectrum with the condition on ^{64}Se implantation and not on the other two. Consequently they are identified as γ rays associated with the beta decay of ^{64}Se . Similarly, the lines marked in pink appear with the condition on ^{64}Se (as daughter activity) and ^{64}As and disappear when the condition is set on ^{63}Ge ,

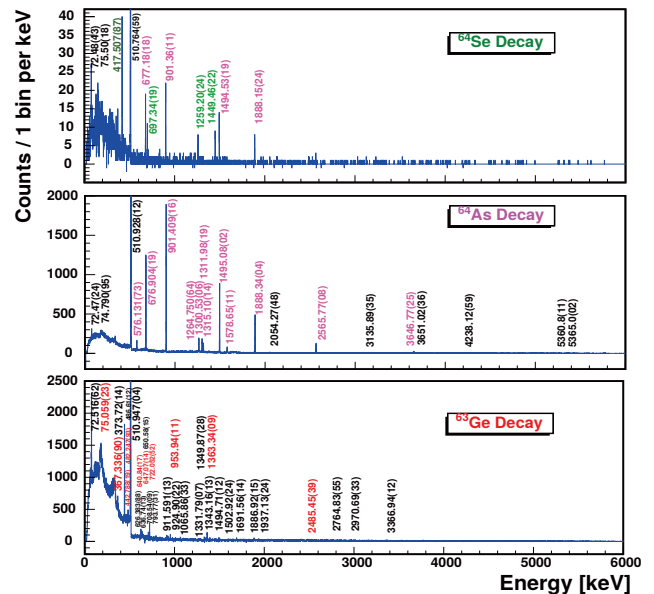


Fig. 1. Spectra showing the γ rays measured with the Ge array EURICA in correlation with implantation signal happening in WAS3ABi with conditions on ^{64}Se , ^{64}As , and ^{63}Ge implanted ions (see text).

and are consequently associated with the β decay of ^{64}As . Finally the γ rays associated with the decay of ^{63}Ge are marked in red. Other possible activities in the decay chain have longer half-lives. No β delayed γ radiation was observed in any of the three cases prior to this work. The corresponding level schemes are in preparation.

References

- 1) P. Aguilera *et al.*, in this report.
- 2) P.-A. Söderström *et al.*, Nucl. Instrum. Methods Phys. Res. B **317**, 649–652 (2013).

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