Beta-delayed proton emission in the decay of ^{71}Kr

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We present preliminary results of our study of β-delayed proton emission detected in the β-decay of ^{71}Kr. These results were obtained in the framework of the experiment NP1112-RIBF93. In our experiment a 40 particle nA ^{78}Kr primary beam provided by RI Beam Factory (RIBF) impinged on a 5-mm thick Be target to produce 9.8 million ^{71}Kr implants—after optimization to separate ^{71}Kr secondary beams—in the WAS3ABi active stopper.[1] The WAS3ABi detector was surrounded by the EURICA γ-ray spectrometer.[2]

Beta-delayed protons were distinguished from β-particles in the same way as in our earlier work on ^{70}Kr, using an energy threshold of 1400 keV measured in WAS3ABi,[3] resulting in the deposited energy spectrum shown in Fig. 1. The number of protons was divided by the number of implants in order to calculate the β-delayed proton emission probability $\varepsilon_p = 2.49(10)\%$ in agreement with the value of $\varepsilon_p^{lit} = 3.1(4)\%$ found in the literature.[4] In our analysis the dead time of the detector system was also accounted for, while a 100% detection efficiency was assumed for single protons.

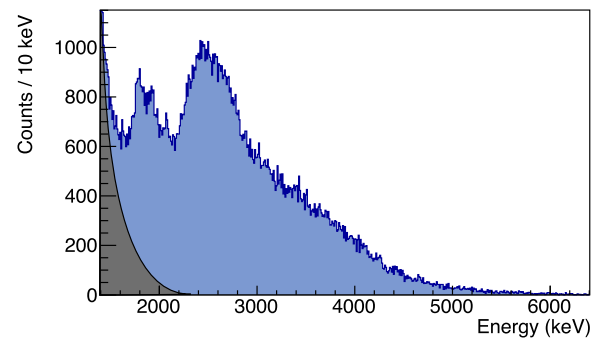A half-life value of $T_{1/2} = 94.1(4)$ ms was derived

Fig. 1. Intensity distribution as a function of the deposited energy of the β-delayed proton events in the DSSSD. The high energy tail of β-particles was extrapolated by an exponential function, shown in grey.

from the time correlations between protons and implants using an exponential fit shown in Fig. 2, in agreement with the results obtained from implant-β time correlations ($T_{1/2} = 94.5(2)$ ms) and from the decay curve of β-delayed γ-transitions in the daughter nucleus ($T_{1/2} = 95.5(24)$ ms).
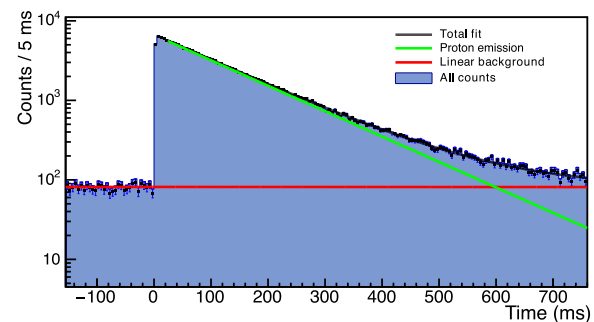

Fig. 2. Time correlations between β-delayed proton events and ^{71}Kr implants. The total fit represents an exponential function plus a linear background.

The theoretical interpretation of the experimental data is ongoing.

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