

Isospin symmetry studies beyond the $f_{7/2}$ shell: study of the beta decay of $^{70,71}\text{Kr}$

A. Algora,^{*1} A. Morales,^{*1} B. Rubio,^{*1} J. Agramunt,^{*1} V. Guadilla,^{*1} A. Montaner-Piza,^{*1} S. Orrigo,^{*1} G. de Angelis,^{*2} D. Napoli,^{*2} F. Reccquia,^{*3} S. Lenzi,^{*3} A. Boso,^{*3} S. Nishimura,^{*4} G. Kiss,^{*4} P. Vi,^{*4} J. Wu,^{*4} P.-A. Söderström,^{*4} T. Sumikama,^{*4} H. Suzuki,^{*4} H. Takeda,^{*4} D.S. Ahn,^{*4} H. Baba,^{*4} P. Doornebal,^{*4} N. Fukuda,^{*4} N. Inabe,^{*4} T. Isobe,^{*4} T. Kubo,^{*4} S. Kubono,^{*4} Y. Shimizu,^{*4} C. Sidong,^{*4} B. Blank,^{*5} P. Ascher,^{*5} M. Gerbaux,^{*5} T. Goigoux,^{*5} J. Giovinazzo,^{*5} S. Grévy,^{*5} T. Kurtukian Nieto,^{*5} C. Magron,^{*5} W. Gelletly,^{*6} Zs. Dombrádi,^{*7} Y. Fujita,^{*8} M. Tanaka,^{*8} P. Aguilera,^{*9} F. Molina,^{*9} J. Eberth,^{*10} F. Diel,^{*10} D. Lubos,^{*11} C. Borcea,^{*12} A. Petrovici,^{*12} E. Ganioglu,^{*13} D. Nishimura,^{*14} H. Oikawa,^{*14} Y. Takei,^{*14} S. Yagi,^{*14} W. Korten,^{*15} G. de France,^{*16} and P. Davies^{*17}

Nuclei in the vicinity of the $N=Z$ line around $Z=36-38$ have been the subject of numerous theoretical and experimental investigations to answer questions about deformation, shape coexistence, shape transitions, np pairing and isospin symmetry. This region is characterized by drastic shape changes depending on the competition in energy between prolate and oblate shapes, which is determined by the occupation of particular single particle orbits. This makes it the ideal playground for our investigations.

The main goal of this experiment was to study isospin related features of the structure of $^{70,71}\text{Kr}$. One objective of the experiment is the investigation of the isomeric decay of ^{71}Kr , which could answer questions related to isospin symmetry breaking effects in the $^{71}\text{Br}/^{71}\text{Kr}$ system. The second goal was the study of the beta decay of $^{70,71}\text{Kr}$, which may provide information of relevance to our understanding of $T=0$ np pairing in $N=Z$ nuclei, shape coexistence, isospin symmetry, astrophysics and nuclear structure.

In this report we present some preliminary results from the experiment. A high intensity ^{78}Kr beam provided by the RIKEN Nishina Center Accelerator Complex impinging on a Be target was used to produce the nuclides of interest in fragmentation. In the experiment the EURICA gamma-ray array surrounded the implantation detector WAS3ABI into which the fragments of interest were implanted. The fragments were identified using the BigRIPS separator employing the ΔZ -ToF- $B\rho$ method. Figure 1 shows an identifica-

tion plot of the fragments using this technique for the ^{70}Kr setting. Several gamma transitions emitted from states populated in the beta decay of $^{70,71}\text{Kr}$ have been observed for the first time. Figure 2 shows the preliminary analysis of the beta decay half-life of ^{70}Kr based on coincidences with two of the newly identified gamma transitions. The value obtained is in agreement with the results from Ref. 1. The determination of beta decay half-lives in this region is of relevance for a better understanding of the rp -process (Ref. 2). The analysis of the experimental data on the $^{70,71}\text{Kr}$ decays and the decay of the ^{71}Kr isomer decay is in progress.

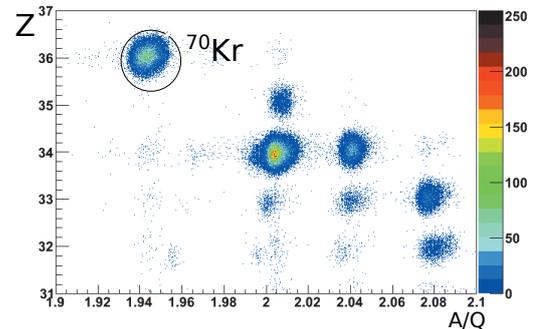


Fig. 1. Identification plot for the isotopes produced in ^{78}Kr fragmentation for the ^{70}Kr setting.

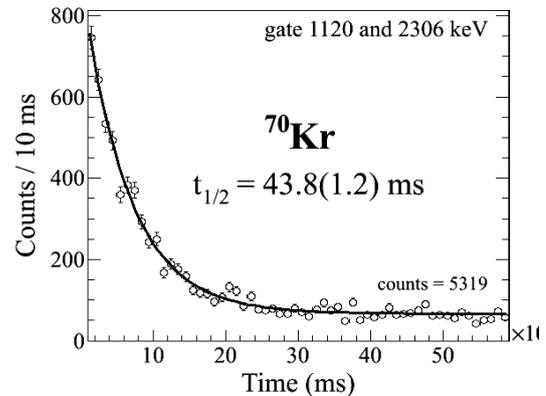


Fig. 2. Preliminary half-life for the beta decay of ^{70}Kr .

*1 IFIC, CSIC-Univ. Valencia
 *2 INFN-Legnaro
 *3 INFN-Padova
 *4 RIKEN Nishina Center
 *5 CEN Bordeaux-Gradignan
 *6 Surrey University
 *7 MTA ATOMKI
 *8 Osaka University
 *9 CCHEN-Chile
 *10 Universität zu Köln
 *11 Technische Universität München
 *12 IFIN-HH, Bucarest
 *13 University of Istanbul
 *14 Tokyo Uni. Sci.
 *15 CEA-France
 *16 GANIL-France
 *17 York University

References

- 1) A.M. Rogers et al., Nuclear Data Sheets 120, 41 (2014).
- 2) R.K. Wallace and S.E. Woosley, Astro. J. Supp. Ser. 45, 389 (1981).