$T_Z = -1$ and $T_Z = -2$ β-decay studies using ^{78}Kr fragmented beams at BigRIPS, part I

B. Rubio,[*1] J. Agramunt,[*1] A. Algora,[*1] V. Guadilla,[*1] A. Montaner-Piza,[*1] A. I. Morales,[*1] S. E. A. Orrigo,[*1] J. Chiba,[*2] D. Nichimura,[*2] H. Oikawa,[*2] Y. Takei,[*2] S. Yagi,[*2] B. Blank,[*3] P. Ascher,[*3] M. Gerbaux,[*3] T. Goigoux,[*3] J. Giovinazzo,[*3] S. Grévy,[*3] T. Kurtukian Nieto,[*3] C. Magron,[*3] P. Aguilera,[*4] F. Molina,[*4] D. S. Ahn,[*5] P. Doornenbal,[*5] N. Fukuda,[*5] N. Inabe,[*5] G. Kiss,[*5] T. Kubo,[*5] S. Kubono,[*5] S. Nishimura,[*5] Y. Shimizu,[*5] C. Sidong,[*5] P. A. Söderström,[*5] T. Sumikama,[*5] H. Suzuki,[*5] H. Takeda,[*5] P. Vi,[*5] J. Wu,[*5] Y. Fujita,[*6] M. Tanaka,[*6] W. Gelletly,[*1,*7] F. Diel,[*8] D. Lubos,[*9] G. de Angelis,[*10] D. Napoli,[*10] C. Borcea,[*11] A. Boso,[*12] R. B. Cakirli,[*13] E. Ganioglu,[*13] G. de France,[*14] and S. Go[*15]

The study of the beta decay of proton-rich nuclei is interesting for a number of reasons; we can have access to states in the daughter nucleus populated by Fermi (the Isobaric Analogue State, IAS) as well as Gamow-Teller transitions and in some cases the IAS is fragmented (see for instance[1)] and[2)]); it can also happen that the process goes via the exotic beta-delayed gamma-proton decay, a phenomenon that is the result of a combined effect of the forbidden proton decay of the IAS and the fact that some of the states populated after γ-decay are proton-unbound. Furthermore, spin-isospin excitations can be studied by beta-decay and charge exchange reactions in mirror nuclei, shedding light on mirror symmetry, hence we can compare our results on the beta decay of proton-rich nuclei with the results of charge exchange experiments when appropriate targets for the mirror nuclei are available[3)].

Accordingly we have performed experiments at GSI and GANIL to study $T_Z = -1$[4)] and $T_Z = -2$[1)] nuclei respectively where it became clear that the study of heavier, more exotic systems, demands beam intensities available only at the RIKEN Nishina Center.

The experiment was carried out using the fragmentation of a 345 MeV·A ^{78}Kr beam with unprecedented intensity (up to 300 particle nA) on a Be target. The fragments were separated in flight using the BigRIPS separator[5)] and implanted in three 1mm thick WAS3ABi[6)] double-sided Si strip detectors (DSSSD) with each of them having an active area of 60 × 40 mm^2 segmented into 60 vertical by 40 horizontal strips. The implantation setup was surrounded by the EUROBALL-RIKEN Cluster Array (EURICA)[7)] consisting of 12 HPGe CLUSTER-detectors of Euroball type. Two different settings of BigRIPS were used in this experiment, the first was optimised for the production of ^{58}Zn, ^{60}Ge, ^{62}Ge and ^{64}Se nuclei and overlapped with the experiment planned for the search of new isotopes and two-proton emitters, see the contribution by B. Blank et al. to this volume, and the second for ^{66}Se. Putting conditions on the ToF and ΔE signals of the ions we have produced the identification plot shown in Figure 1 for the first setting. The Y-axis represents the Z of the implanted ion and the X-axis the A/Q. Preliminary results of the analysis are presented in the second contribution to this progress report.

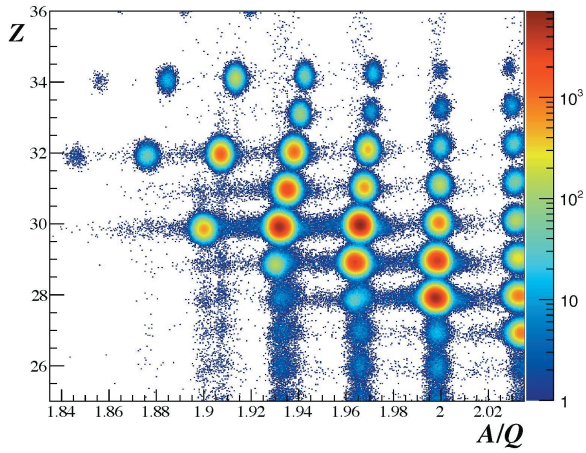

Fig. 1. Particle Identification Plot for isotopes at the first BigRIPS setting, see text.

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

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