SHAPE COEXISTENCE IN KRYPTON ISOTOPES STUDIED THROUGH COULOMB EXCITATION OF RADIOACTIVE KRYPTON BEAMS

E. Clément,[a] A. Görgen,[a] W. Korten,[a] E. Bouchez,[a] A. Chatillon,[a] Y. Le Coz,[a] Ch. Theisen,[a] J. N. Wilson,[a] C. Andreoiu,[b] F. Becker,[c] P. Butler,[b] J. M. Cassandjian,[d] W. Catford,[e] T. Czosnyka,[f] G. de France,[d] J. Gerl,[c] R.-D. Herzberg,[b] J. Iwanicki,[f] D. Jenkins,[g] G. Jones,[b] G. Sletten,[h] C. Timis,[e] R. Wadsworth,[g] M. Zielinska,[f]

[a] *DAPNIA/SPhN, CEA Saclay, F-91191 Gif-sur-Yvette, France*

[b] *Dept. of Physics, University of Liverpool, Liverpool L69 7ZE, UK*

[c] *GSI, D-64291 Darmstadt, Germany*

[d] *GANIL, F-14076 Caen cedex, France*

[e] *Dept. of Physics, University of Surrey, Guildford GU2 7XH, UK*

[f] *Heavy Ion Laboratory, Warsaw University, PL-02097 Warsaw, Poland*

[g] *Dept. of Physics, University of York, Heslington, York YO1 5DD, UK*

[h] *The Niels Bohr Institute, Blegdamsvej 17, DK-2100 Copenhagen Ø, Denmark*

In the Se and Kr nuclei near the N=Z line states of large prolate and oblate deformation are predicted within a very small energy range. This coexistence of shapes is caused by the competition of shell gaps in the single-particle level scheme. The deformed shell model predicts the N=Z nuclei ^{68}Se and ^{72}Kr to be rare cases with an oblate ground state and a low-lying state of prolate configuration. A reversed situation is predicted for the heavier isotopes. Experimental support for this scenario comes from low-lying 0^+ states that have recently been observed in ^{72}Kr and ^{74}Kr using conversion-electron spectroscopy after fragmentation reactions at GANIL [1]. The results suggest a strong mixing of the two 0^+ states in ^{74}Kr and an oblate ground state with the known prolate band built on the new shape isomer in ^{72}Kr.

The proposed scenario is conclusive, but in general only based on indirect observables. In order to directly measure the shapes of the involved configurations, a series of experiments has been performed at GANIL to study the light Kr isotopes using Coulomb excitation of radioactive beams. In the first two experiments beams of ^{76}Kr and ^{74}Kr were produced by fragmentation of a 70 MeV/u ^{78}Kr beam on a carbon target. The fragmentation products were extracted using the ISOL technique and re-accelerated in the CIME cyclotron of the SPIRAL facility to energies just below the Coulomb barrier. Gamma rays following the Coulomb excitation on Pb and Ti targets were detected in the Exogam array, while scattered beam and target particles were detected in a segmented annular Si detector. High-quality spectra were obtained for various scattering angles in both cases. Matrix elements, including diagonal elements, have been extracted from the measured excitation probabilities using the code GOSIA and the results will be presented. While the yield is currently too low to perform such a measurement with re-accelerated ^{72}Kr, a measurement is feasible at intermediate energies where low yields can be compensated by thick targets. This experiment, in which the ^{72}Kr fragments will be separated in flight in the LISE spectrometer, is scheduled for May 2004, and first results will be discussed.

[1] E. Bouchez *et al.*, Phys. Rev. Lett. **90**, 082502 (2003)