

Deformation near the proton drip-line in the light rare-earth nuclei produced with the SPIRAL ^{76}Kr radioactive beam and studied with EXOGAM + DIAMANT + VAMOS

B. Rossé¹, M. Meyer¹, N. Redon¹, Ch. Schmitt¹, O. Stézowski¹, D. Guinet¹, Ph. Loutesse¹, K. Bennaceur¹, J. Meyer¹, P.J. Nolan², A.J. Boston², R. Cooper², M. Dimmock², S. Gros², B. McGuirk², E.S. Paul², M. Petri², H. Scraggs², G. Turk², G. De France³, S. Bhattachasyya³, G. Mukherjee³, M. Rejmund³, H. Savajols³, J.N. Scheurer⁴, A. Astier⁵, I. Deloncle⁵, M.G. Porquet⁵, A. Prévost⁵, B.M. Nyakó⁶, J. Gál⁶, J. Molnár⁶, J. Timár⁶, L. Zolnai⁶, K. Juhasz⁷, R. Wadsworth⁸, P. Joshi⁸, G. La Rana⁹, R. Moro⁹, M. Trotta⁹, E. Vardaci⁹, G. Hackman¹⁰, G. Ball¹⁰

¹IPN Lyon, IN2P3-CNRS, Université Lyon-1, F-69622 Villeurbanne Cedex, France

²Oliver Lodge Laboratory, University of Liverpool, P.O. Box 147, Liverpool L69 7ZE, U.K.

³GANIL, B.P. 55027, F-14076 Caen Cedex, France

⁴CEN Bordeaux-Gradignan, Le Haut Vigneau, F-33170 Gradignan, France

⁵CSNSM Orsay, IN2P3-CNRS, Bât. 104, F-91405 Orsay Campus, France

⁶Institute of Nuclear Research, H-4001 Debrecen, Hungary

⁷Institute of Mathematics and Informatics, Univ. Debrecen, H-4001 Debrecen, Hungary

⁸Department of Physics, University of York, Heslington, York YO1 5DD, U.K.

⁹Dipartimento di Scienze Fisiche dell'Università and INFN, Via Cintia, 80126 Napoli, Italy

¹⁰TRIUMF, 4004 Wesbrook Mall, Vancouver, BC, V6T 2A3, Canada

The structure of the very neutron-deficient rare-earth nuclei near the proton drip-line has been investigated in the first experiment with the EXOGAM gamma array coupled to the DIAMANT light charged particle detector and the wide angular and momentum acceptance VAMOS spectrometer using radioactive beam ^{76}Kr delivered by the SPIRAL facility at GANIL.

Microscopic Hartree-Fock-Bogolioubov calculations using Sly4 effective force have been performed in order to determine the proton drip-line position and the deformation of the neighbouring even-even Nd, Sm and Gd isotopes. The predictions of these calculations concerning the island of large ground state deformation in these nuclei will be presented.

Very proton-rich Pr, Nd and Pm isotopes have been populated at rather high spin by the fusion-evaporation reaction with a SPIRAL radioactive beam of ^{76}Kr ($T_{1/2} = 14.8\text{h}$) at 328 MeV bombarding ^{58}Ni target. For this experiment, the γ -array composed by 11 EXOGAM Ge segmented clover detectors was coupled to the DIAMANT detector system in order to measure the charged-particle evaporation residues and to the VAMOS spectrometer to determine the recoil nuclei.

During this experiment, the performances of the coupling of EXOGAM, DIAMANT and VAMOS have been demonstrated for the first time with fusion-evaporation reaction induced by a radioactive beam and this constitutes an excellent device to remove the background due to the radioactivity of the beam. The first results of this experiment will be reported.