International Nuclear Physics Conference INPC2013: 2-7 June 2013, Firenze, Italy

Investigation of high K states in ^{252}No and the new focal plane detector for S^3.

Barbara Sulignano[1]

[1] *CEA Saclay/DSM/Irfu/SPhN, Orme des Merisiers-91191 Gif/Yvette cedex, France*

Contact email: barbara.sulignano@cea.fr

In the last decades exhaustive investigations have been performed on the decay of deformed nuclei in the transfermium region around N=152 and Z=102, where enhanced stability is observed. Nuclei in this region are produced with cross sections ranging from nb to μb, high enough for detailed decay studies. Moreover, this region is characterized by the presence of K isomerism which may enhance the stability of such nuclei against α-decay and spontaneous fission (e.g. ^{270}Ds [1]). This phenomenon is explained by the presence of a high single-particle level density with high angular momentum just below and above the deformed shell gaps predicted at Z=102 and N= 152.

The investigation of the Nobelium region (Z=102), thus, delivers data in a region close to the domain of superheavy nuclei, where our knowledge of single-particle spectra and of pairing correlations is particularly limited. This will provide information relevant for the next shell closure which is expected to be at Z=114, 120, or 126 and N=184 for spherical superheavy elements ([2] and reference therein).

In this contribution I will first report on the successful discovery of an isomeric state in ^{252}No [3] and the recent results of the investigation of the rotational band built upon this isomeric state [4] performed at the Accelerator Laboratory of the University of Jyväkylä using the RITU gas-filled spectrometer and the JUROGAM array spectrometer. The last experiment helped assigning the structure of the isomer on the basis of purely experimental data and disentangle between different theoretical interpretations. New triaxial self-consistent Hartree-Fock-Bogoliubov calculations using the D1S force and breaking time-reversal as well as z-signature symmetries have been performed showing a good agreement with present measurements. I will then give an overview of K isomeric states found in N=150 and N=152 isotones nuclei; this comparison will provide important information and feeds self-consistent theories.

Finally, I will briefly describe the new focal plane detection set-up SIRIUS that will be built in the framework of Spiral 2 coupled with the high-intensity stable beams of the superconducting linear accelerator of GANIL and combined with the new Super Separator Spectrometer S^3. The Sirius spectrometer, which has been designed for identification of fusion evaporation residue through decay tagging, will provide important information on nuclear deformation, single particle properties, and resistance against fission under rotation. Such studies will univocally provide information concerning the location of deformed proton and neutron shell gaps, along with the ordering of single-particle levels. The ordering of the single-particle orbitals will provide a possibility to test the shell model for extreme nuclear deformations and will help us better understand the structure of the SHE close to the island of stability.

[1] S. Hofmann *et al.*, Eur.Phys.J.A **10**, 5 (2001).

[2] A Sobiczewski and K. Pomorski, Prog. Part. Nucl. Phys. **58**, 292 (2007).

[3] B. Sulignano *et al.*, Eur. Phys. A **33**, 327-331 (2007).

[4] B. Sulignano *et al.*, Physical Review C **86**, 044318 (2012).