SHELL-STRUCTURE AND PAIRING INTERACTION IN SUPERHEAVY NUCLEI: ROTATIONAL PROPERTIES OF THE Z=104 NUCLEUS ^{256}Rf

P.T. Greenlees[1], J. Rubert[2], J. Piot[2], B.J.P. Gall[2], Z. Asfari[2], L.L. Andersson[3], M. Asai[4], D.M. Cox[3], F. Dechery[5], O. Dorvaux[2], T. Grahn[1], K. Hauschild[6], G. Henning[6], A. Herzan[1], R.-D. Herzberg[3], F.P. Heßberger[8], U. Jakobsson[1], P. Jones[1], R. Julin[1], S. Juutinen[1], S. Ketelhut[1], T.-L. Khoo[7], M. Leino[1], J. Ljungvall[6], A. Lopez-Martens[6], R. Lozeva[2], P. Nieminen[1], J. Pakarinen[9], P. Papadakis[3], E. Parr[3], P. Peura[1], P. Rahkila[1], S. Rinta-Antila[1], P. Ruotsalainen[1], M. Sandzelius[1], J. Sarn[1], C. Scholey[1], D. Seweryniak[7], J. Sorri[1], B. Sulignano[5], Ch. Theisen[5], J. Uusitalo[1], M. Venhart[10].

[1] *Department of Physics, University of Jyväskylä, FIN-40014 Jyväskylä, Finland*
[2] *Institut Pluridisciplinaire Hubert Curien, F-67037 Strasbourg, France*
[3] *Department of Physics, University of Liverpool, Liverpool, L69 7ZE, U.K.*
[4] *Advanced Science Research Center, Japan Atomic Energy Agency, Tokai, Japan*
[5] *CEA Saclay, IRFU/Service de Physique Nucléaire, F-91191 Gif-sur-Yvette, France*
[6] *CSNSM, IN2P3-CNRS, F-91405 Orsay Campus, France*
[7] *Argonne National Laboratory, Argonne, IL 60439, USA*
[8] *GSI, Planckstr. 1, 64291 Darmstadt, Germany*
[9] *CERN-ISOLDE, Building 26, 1-013, CH-1211 Geneva 23, Switzerland*
[10] *Institute of Physics, Slovak Academy of Sciences, SK-84511 Bratislava, Slovakia*

The rotational band structure of the Z=104 nucleus ^{256}Rf has been observed up to a tentative spin of 20$\hbar$ using state-of-the-art γ-ray spectroscopic techniques at the University of Jyväskylä, Finland. This represents the first such measurement in a superheavy nucleus whose stability is entirely derived from the shell-correction energy. The observed rotational properties are compared to those of neighbouring nuclei and it is shown that the kinematic and dynamic moments of inertia are sensitive to the underlying single-particle shell structure and the specific location of high-j orbitals. The moments of inertia therefore provide a sensitive test of shell structure and pairing in superheavy nuclei which is essential to ensure the validity of contemporary nuclear models in this mass region. The data obtained show that there is no deformed shell gap at Z=104, which is predicted in a number of current self-consistent mean-field models.

Details of the experiment carried out and the in-beam and decay spectroscopic data obtained will be presented. Perspectives for future studies of this type will also be discussed.