SEARCH FOR MIXED-SYMMETRY STATES IN THE VICINITY OF THE DOUBLY-MAGIC NUCLEUS ^{208}Pb

R. Stegmann[1], D. Kocheva[2], G. Rainovski[2], N. Pietralla[1], J. Jolie[3], C. Stahl[1], C. Stoyanov[4], C. Bauer[1], A. Blazhev[3], M. Carpenter[5], L. Cortes[1], A. Dewald[3], C. Fransen[3], K. A. Gladnishki[2], A. Hennig[3], R. V. F. Janssens[5], V. Karayonchev[3], M. Lettmann[1], O. Möller[1], T. Möller[1], C. Müller-Gatermann[3], P. Petkov[6], M. Reese[1], M. Scheck[6], D. Tarpanov[4], M. Trichkova[2], P. Van Isacker[7], V. Werner[1], W. Witt[1], S. Zhu[5]

[1] Institut für Kernphysik, Technische Universität Darmstadt, Darmstadt, Germany
[2] Faculty of Physics, University of Sofia St. Kliment Ohridski, Sofia, Bulgaria
[3] Institut für Kernphysik, Universität zu Köln, Cologne, Germany
[4] Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences, Sofia, Bulgaria
[5] Argonne National Laboratory, Argonne, IL, USA
[6] School of Engineering, University of the West of Scotland, Paisley PA1 2BE, UK
[7] Grand Accélérateur National d'Ions Lourds, CEA/DSM-CNRS/IN2P3, BP 55027, F-14076 Caen Cedex 5, France

In the framework of the Interacting Boson Model proton-neutron mixed-symmetric states represent a class of low-energy excitations of isovector character. The basic mixed-symmetric state of weakly collective vibrational nuclei is the one-quadrupole-phonon $2^+_{1,ms}$ state, which is strongly correlated with the fully-symmetric 2^+_1 state. These states are identified in the mass region $A \approx 90$ as well as recently in the mass region $A \approx 130$. However in the vicinity of the heaviest stable doubly-magic nucleus ^{208}Pb no such states have been identified up to now.
An important feature of MSSs is that their properties are strongly affected by the shell structure. The isovector character of MSSs is best manifested when the one-phonon states have wave functions with balanced neutron and proton components. Such situation can be expected for vibrational nuclei having simple valence shell configurations such as 2 proton particle (holes) – 2 neutron particle (holes). However such nuclei which can be studied experimentally by conventional methods are not so many. In the mass region $A \approx 130$, i.e. the mass region around doubly-magic ^{132}Sn, all such nuclei are radioactive. The situation around doubly-magic ^{208}Pb is a bit different. Here ^{202,204}Hg and ^{212}Po are experimentally accessible. Because of this projectile Coulomb-excitation experiments to investigate ^{202,204}Hg

as well as an α-transfer experiment to investigate ^{212}Po have been conducted. Evidence for the identification of MSSs in these nuclei will be presented and discussed in the framework of the quasi-particle phonon model (QPM).