Relativistic Mean Field Theory in Rotating Frame: Single-particle Properties at Superdeformation

A. V. Afanasjev [a] and P. Ring

Department of Theoretical Physics, Aristotle University of Thessaloniki

[a] Nuclear Research Center, Latvian Academy of Sciences, LV-2169, Salaspils, Miera str.31, Latvia

Single-particle properties at superdeformation are investigated within the Cranked Relativistic Mean Field (CRMF) theory on the example of superdeformed rotational bands observed in the $A \sim 140 - 150$ mass region. Applying the effective alignment approach it is shown that CRMF theory provides a reasonable description of the alignment properties of the single-particle orbitals. The agreement with experiment is good in most of the cases. This suggests that many features of the observed superdeformed bands can be well understood in terms of an almost undisturbed single-particle motion. The stability of the results with respect to the parameterizations used in Relativistic Mean Field (RMF) theory is also investigated, employing some frequently used non-linear effective forces. It turns out, with the exception of the single-particle ordering in superdeformed minimum, that the dependence of the calculated observables on the parameterization is rather small.

Nucl. Phys. **A**, in print

Excitation Energy of Superdeformed Bands in Relativistic Mean Field Theory

G. A. Lalazissis [a] and P. Ring

[a] Department of Theoretical Physics, Aristotle University of Thessaloniki, Greece

Constrained Relativistic Mean Field (RMF) calculations have been carried out to estimate excitation energies relative to the ground state for superdeformed bands in the mass regions $A \sim 190$ and $A \sim 150$. It is shown that RMF theory is able to successfully reproduce the recently measured superdeformed minima in Hg and Pb nuclei.

Phys. Lett. **B**, in print