GIANT MONOPOLE RESONANCE IN SPHERICAL AND DEFORMED NUCLEI

Jan Kvasil, Institute for Particle and Nuclear Physics, Charles University, Prague, Czech Republic

J. Kvasil[1], V.O. Nesterenko[2], A. Repko[1], D. Bozik[1], W. Kleinig[2], P.-G. Reinhard[3],

1 Institute for Particle and Nuclear Physics, Faculty of Math. and Phys., Charles University in Prague, Prague,Czech Republic
2 Laboratory of Theoretical Physics, Joint Institute for Nuclear Research, Dubna, Russia
3 Institut fur Theoretische Physik II, Universitat Erlangen, Germany

During the last decade an increasing interest in the isoscalar E0 resonance (giant monopole resonance - GMR) can be observed from theoretical (see e.g. [1,2,3] and citations therein) and experimental (e.g. [4,5,6]) point of view. This is caused by the fact that the isoscalar GMR is a good tool to investigate the behaviour of nuclear matter, especially its incompressibility. Various approximations in the energy-density functionals framework with using interactions with nuclear incompressibility modulus KNM ~ 230 MeV have shown good agreement with GMR centroids in spherical nuclei. However in the present time there are experimental data on GMR also for deformed nuclei: TAMU data [4,5] for deformed Sm and Mo isotopes or RCNP data [6] for Sm isotopes. Moreover, the energy E0 strength distributions for deformed nuclei have not been theoretically interpreted. Both experiments (TAMU and RCNP) give a little bit different E0 strength distributions for spherical and especially for deformed nuclei in spite of the fact that GMR centroids are not so different.

In the present study we analyze the energy isoscalar E0 strength distributions (not only GMR centroids) in isotope chain of 144-154Sm and some other nuclei going from spherical to deformed nuclei in the framework of the self-consistent RPA + modified BCS approach (see e.g. [7]) using different Skyrme forces. The deformation effects on GMR (double-peak structure) is demonstrated and the role of the coupling of monopole and quadrupole modes in deformed nuclei are shown as well. Theoretical E0 strength functions are compared with experimental values taken from both TAMU [4,5] and RCNP [6] (α,α') experiments. The question of the simultaneous theoretical interpretation (with the same energy functional parametrization) of the GMR experimental data of nuclei from Sm/Pb and Sn regions is also discussed.

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