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Contribution of tensor forces to formation of Gamow-Teller Resonance and its overtone in closed-shell parent nuclei

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A mean-field and interaction in the particle-hole (p-h) channel are the input quantities for any RPA-based approach to describing Gamow-Teller Resonance and its overtone –Isovector Giant Spin-Monopole Resonance in the $\beta^{(-)}$ -channel (GTR and IVGSMR$^{(-)}$) , respectively). The recent example of such an approach is given in Ref. [1], where main properties of mentioned resonances in ^{208}Bi are described within the continuum-RPA-based semimicroscopic p-h dispersive optical model. A realistic partially self-consistent phenomenological mean field and Landau-Migdal p-h interaction have been used in this study. Provided that dimensionless strength g' of the spin-isospin part of the mentioned interaction is adjusted to reproduce in calculations of the GT strength function the observable GTR energy, the calculated IVGSMR$^{(-)}$) energy is found to be less (on about 3 MeV) than respective experimental value. In the present study, we attempt to resolve this puzzle by taking into account tensor forces, which lead to mixing 1^+ spin-monopole and spin-quadrupole excitations. In applying to describing GT strength distribution, tensor forces have been considered in Ref. [2]. Mentioned mixing takes place due to both the spin-orbit term in a mean field (so-called nonsymmetric or non-diagonal approximation in RPA-based approaches employing central forces [3]) and non-central (tensor) forces. Using the mentioned
continuum-RPA-based analysis of Ref. [1] as a starting point, we resolved the above-described puzzle related to evaluation of the IVGSMR$^{(-)}$) energy by taking tensor forces into account. As expected, the strength parameter of the spin-isospin part of non-central forces g'_T is found to be less than the Landau-Migdal parameter g'.
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