Pairing correlations and isospin mixing within the 'Highly Truncated Diagonalization Approach'

Julien Le Bloas*[1], Ludovic Bonneau[2], Philippe Quentin[3], Johann Bartel[4], and Daniel D. Strottman[5]

[1]CEN Bordeaux-Gradignan (CENBG) – CNRS/IN2P3 - UBxI – France
[2]CEN Bordeaux-Gradignan (CENBG) – CNRS/IN2P3 - UBxI – France
[3]CEN Bordeaux-Gradignan (CENBG) – CNRS/IN2P3 - UBxI – France
[4]Laboratoire de Spectrométrie de Masse BioOrganique, Département des Sciences Analytiques, Institut Pluridisciplinaire Hubert Curien, Strasbourg, France (LSMBO-DSA-IPHC) – CNRS UMR 7178, Université de Strasbourg, université de Strasbourg – France
[5]Los Alamos National Laboratory (LANL) – États-Unis

Résumé

One a the most striking aspects of the structure of atomic nuclei is the very small violation of the isospin invariance even for heavy nuclei where the Coulomb force is expected to act in a non-perturbative manner. There are phenomena where a specific knowledge of the isospin impurity is needed such as forbidden E1 transitions or superallowed 0+ -> 0+ nuclear beta decays in the context of the test of the Conserved-Vector-Current hypothesis of the weak interaction through ft-value mesurements. Within the framework of the Highly Truncated Diagonalization microscopic Approach (HTDA), dedicated to the description of correlations beyond the mean field and conserving explicitly the particle number, we have studied the role played by pairing correlations in the breaking mechanisms of this symmetry in the ground state of well deformed even-even N=Z nuclei. A sensitivity study of the isospin mixing, as a function of the strength of the residual interaction describing the pairing correlations in HTDA (calculated in both T=0 and T=1 channels), has been carried out and an interpretation of the mechanims at work has emerged in terms of an accurate approximation of the isospin distribution developped in this work. This study has pointed out the complexity of a good treatment of the isospin symmetry, in the description of the breaking sources as well as in the reduction of model biases. In particular, we have shown that, in order to avoid spurious isospin symmetry breaking, it is necessary to treat exactly the Coulomb interaction. We have also paid attention to the construction of the many-body basis. Results for 4 different nuclei will be presented. A general conclusion concerning the mechanisms of the isospin-symmetry breaking will be discussed.

*Intervenant