The structure of isobaric excitations in N=Z nuclei *

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The isobaric excitations provide invaluable information on the pairing component of effective nuclear forces in $N \sim Z$ nuclei. The aim of this paper (see Ref. [1] for details) is to discuss the necessary extensions to the mean-field approximation in order to account in a consistent manner for (**i**) the Wigner energy, (**ii**) the T=1 and T=2 states in even-even (e-e) N=Z nuclei as well as (**iii**) T=0 and T=1 states in odd-odd (o-o) N=Z nuclei. We argue that this goal can be achieved when the model includes simultanously isoscalar and isovector pairing correlations and takes into account [at least approximately] number- and isospin projection. The latter is realized within the simple cranking approximation which provides a deeper understanding of the underlying physics through a number of analogies to well known high-spin phenomena. Furthermore, we show that within such a framework also the standard BCS treatment of nuclear pairing does not longer apply. The necessary modifications are schematically drawn in Fig. 1 [left part] and can be summarized as follows: (**i**) The T=2 states in e-e nuclei and T=1 in o-o nuclei are obtained by iso-cranking the vacuum state [false vacuum for the case of o-o nucleus] so that $T_x = \sqrt{T(T+1)}$; (**ii**) The T=1 states in e-e nuclei require two-quasiparticle (2qp) excitations and subsequent iso-cranking; (**iii**) The T=0 states in o-o nuclei [or more generally the minimal isospin states T=$|N-Z|/2$ in o-o nuclei] are 2qp states. The numerical estimates of the excitation energies of T=2 and T=1 states in e-e N=Z nuclei and the difference between excitation energies of T=1 and T=0 states in o-o N=Z nuclei are shown in Fig. 1 [right panel]. The agreement between theory and experiment is indeed excellent. For further details concerning these calculations we refere reader to Ref. [1].

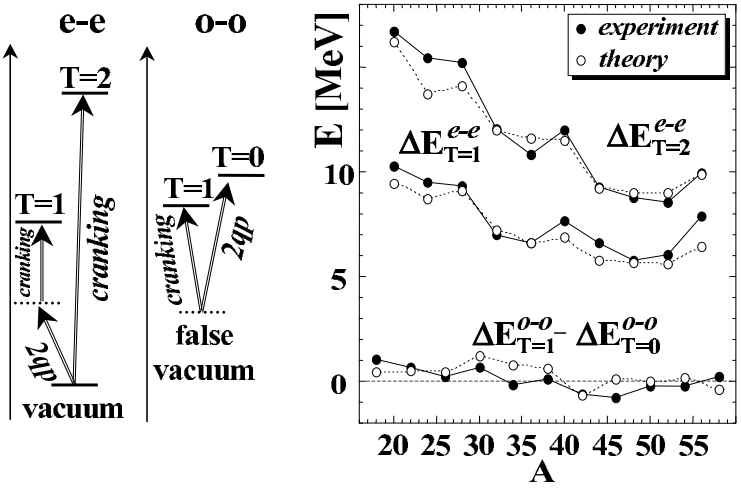

FIG. 1. Schematic illustration of the calculation scheme [left] applied to compute excitation energies of T=0,1, and 2 isobaric excitations in N=Z nuclei [right].

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