

The superfluid particle-number projection rule

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Recently, a superfluid quasicluster - vibration model (QCVM) for odd nuclei has been developed¹⁾, the illustrative applications are performed and the main features are discussed. The quasicluster consists of number - projected one plus three quasiparticles, which is equivalent to a zero - plus - one - broken - pair state. QCVM enables one to make a systematic study of sequences of isotopes or isotones with 1,3,5,.. valence-shell particles.

In QCVM we have arrived at the following number-projection rule: Consider a state which has as the leading - order component a one-quasiparticle state of hole type, i.e. below the Fermi level (or particle type, i.e. above the Fermi level). The particle-number projection produces sizeable alternation of the effective coupling if the corresponding three - quasiparticle states of the three - hole type (three - particle type) are available, which are connected to the leading one - quasiparticle component by the large matrix element of Y_2 .

If this number-projection rule is not satisfied, i.e. if the three-quasiparticle states of the corresponding type are absent, the effect of particle-number projection on the reduction of the effective coupling is smaller.

Therefore, by including the particle-number projection in QCVM, the states for which the number-projection rule is not satisfied are shifted down with respect to states which do satisfy the rule.

1) K.Allaart, P.Hofstra and V.Paar, Nucl.Phys. A336 (1981)384

2) A.von Egmond, P.Hofstra, E.Boeker, K.Allaart and V.Paar, Z.Phys. A300 (1981)323