box 3 (I)

Two-nucleon spectroscopic amplitudes associated with pairing vibrational modes in closed shell systems

App. 2C

The solution of the pairing Hamiltonian

$$H = H_{sp} + H_p ,$$

where

$$H_{sp} = \sum_\nu \varepsilon_\nu a^\dagger_\nu a_\nu$$

and

$$H_p = -G P^\dagger P ,$$

with

$$P^\dagger = \sum_{\nu>0} a^\dagger_\nu a^\dagger_{\bar\nu} ,$$

in the Harmonic approximation (RPA) leads to pair addition (a) / pair removal (r) two-particle, two-hole correlated mode, the associated creation and annihilation operators being

$$\Gamma^\dagger_a(n) = \sum_k X^a_n(k)\, \Gamma^\dagger_k + \sum_i Y^a_n(i)\, \Gamma_i$$

and

$$\Gamma^\dagger_r(n) = \sum_i X^r_n(i)\, \Gamma^\dagger_i + \sum_k Y^r_n(k)\, \Gamma_k ,$$

with

$$\sum X^2 - \sum Y^2 = 1$$

and

$$\Gamma^\dagger_k = a^\dagger_k a^\dagger_{\bar k} , \qquad (\varepsilon_k > \varepsilon_F),$$

$$\Gamma^\dagger_i = a^\dagger_{\bar i} a_i . \qquad (\varepsilon_k \le \varepsilon_F).$$

The relations

$$[H, \Gamma^\dagger_a(n)] = \hbar W_n \Gamma^\dagger_a(n)$$

(and