

Structure of the Phonon Vacuum State

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The action of the long-range residual force on the the expectation value of observables in the nuclear ground-states is evaluated by finding optimal values for the coefficients of the canonical transformation which connects the phonon vacuum state with the (quasi-)particle ground-state. After estimating the improvements over the predictions of the independent particle approximation we compare the ground-state wave functions obtained using the presented approach with those obtained using the conventional random phase approximation (RPA) and its extended version. The problem with overbinding of the nuclear ground state calculated using the RPA is shown to be removed if one sticks to the prescriptions of the present approach. The reason being that the latter conforms to the original variational formulation. Calculations are performed within the two-level Lipkin in which we present results for the binding energies and particle occupation numbers. Finally we discuss the possibility of adapting the presented developments to global studies of nuclear properties.