COLLECTIVE STATES IN ^{158}Dy

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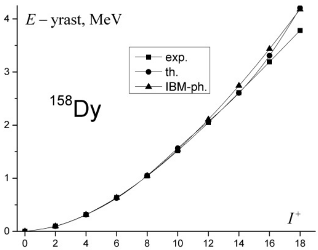
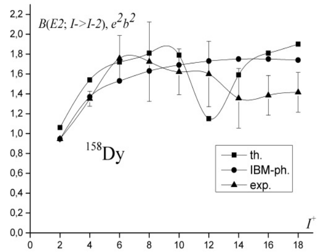
Properties of collective states in ^{158}Dy were studied in the same way as in this book for ^{156}Dy. Since the phenomenological analysis within the IBM1 does not define a unique region of values for parameters of the IBM1 Hamiltonian, especially when beta band states are ignored, so an attempt was made to find those values of the parameters which fall within the region of the values obtained from the microscopic calculation. This allows the states of the ground-state and gamma bands to be reproduced. If the IBM1 Hamiltonian has the form

$$H_{\mathrm{IBM}} = \varepsilon_{\mathrm{d}} d^{+} \cdot d + \left(k_1 d^{+} \cdot d^{+} ss + k_2 (d^{+} d^{+})^{(2)} \cdot ds + \mathrm{H.c.} \right) + 1/2 \sum\nolimits_L C_L (d^{+} d^{+})^{(\mathrm{L})} \cdot (dd)^{(\mathrm{L})}$$

the microscopic values of the parameters ε_{d}, k_1, k_2, C_0, C_2, C_4 at the total number of bosons $\Omega = 26$ turn out to be –1.107, –0.0728, 0.0119, 0.205, 0.086, and 0.1530. The phenomenological parameters at the same total number of bosons are –1.133, –0.0566, 0.0065, 0.183, 0.043, and 0.055 respectively. The respective energies of the ground state with respect to the bosonless state are –21 and –30 MeV. The coherent state energy minimum occurs at the deformation parameter $\beta \approx 0.28$. If smaller values of the quadrupole particle–hole forces are used (no more than 10%), the deformation parameter remains unchanged while the depth of the well decreases down to 10 MeV, but it is only in the first case given above that the absolute values of $B(E2)$ are correctly reproduced without introduction of effective charges.





The figures show the energies of the yrast band and the values of $B(E2)$ *inside it.*

A noticeable difference between the theoretical and the experimental energy of the 18^+ state may already indicate that there is already influence of four-quasiparticle states.

In the nucleus under consideration, as in ^{156}Dy, a strongly noncollecitve 8^+ state with the energy of 2.528 MeV is observed. Experimental observation of these states in ^{156,158}Dy is due to the presence of high-spin (9^+) isomers in ^{156,158}Ho and their decay to the levels of the dysprosium daughter nucleus. For states 9^+ in ^{156,158}Ho the only observed channel of decay are β^+-process on 8^+ states in ^{156,158}Dy. This is the result of high degree of forbiddenness on multipolarity for γ-transitions inside ^{156,158}Dy isotopes [1].

1. V.G.Kalinnikov *et al.* // Int. Conf. on Nucl. Phys. «Nucleus-2018». Abstracts.