

Is there any evidence for the interacting boson model (IBM)?

V. Paar and S. Brant, Prirodoslovno-matematički fakultet,  
University of Zagreb and "Rudjer Bošković" Institute,  
Zagreb, Yugoslavia

H. Kraljević, Prirodoslovno-matematički fakultet, University  
of Zagreb, Zagreb, Yugoslavia

It is often considered that the IBM<sup>1)</sup> with s- and d-bosons contains a basically new physics and as such leads to limiting symmetries (SU(3)-rotational, SU(5)-vibrational, etc.). However, the quadrupole phonons also lead to SU(6) symmetry by enforced closure of the algebra of two-quasi-particle pair algebra<sup>2)</sup>, or by the approximate mapping of the matrix elements in the selected fermion space onto the phonon space.

We point out that the IBM SU(6) model is equivalent to the quadrupole-phonon SU(6) model (hereafter referred to as TQM), with the simple relations between the parameters. If the SU(6) Hamiltonians  $H_{\text{IBM}}$  and  $H_{\text{TQM}}$  are treated phenomenologically, i.e. by fitting or freely choosing parameters, then the IBM and TQM give exactly the same results. All results of numerical fitting, the limiting symmetries (SU(3), SU(5), O(5),...), the vibration-rotation transition etc., are the same in both models. Therefore, it is not justified to treat any of these features as evidence for the s- and d-bosons of the IBM. In fact, the IBM and TQM are related to two representations of the SU(6) group, i.e. the Schwinger and Holstein-Primakoff representations<sup>3)</sup>, respectively, leading to the equivalence

$$d_2^+ \leftrightarrow b_2^+ , \quad s^+ \leftrightarrow (N_{\text{max}} - N)^{1/2} .$$

The explicit nature of the transformation between the generators is under investigation.

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2) D. Janssen, R.V. Jolos and F. Döna, Nucl. Phys.  
A224 (1974) 93.

3) G. Baird and L.C. Biedenharn, J. Math.Phys. 4 (1963) 1449.