High Spin Physics 2001, Warsaw, February 6-10, 2001

Abstract No: 018
Submitted on: 14 Nov 2000, 14:42 GMT
Title: **Is the collective IBM space exhausted only by the valence shell?**
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During last two decades the Interacting Boson Model (IBM) serves as one of the most useful tools for analysis properties of nuclear collective states [1]. The feature of IBM is the finite number of bosons Ω which is adopted to be equal to the half of the valence particle or hole number ($\Omega_{\mathrm{canonical}}$). Such statement is based on the assumption that IBM bosons are formed only by valence shell nucleons. The most sensible function of Ω is B(E2) along the ground state band. In accordance with these probabilities increase with spin I up to a maximum value at I Ω and then decrease. In many nuclei experiments confirm this prediction. However there are data (e.g. ^{100}Mo [2], ^{128}Xe [3]) showing that the growth of B(E2) is not stopped after I$\sim$ $\Omega_{\mathrm{canonical}}$.

Moreover the decrease of B(E2) frequently occurs at those energies and spins in the band-crossing region that causes decreasing B(E2) independently of Ω. The theoretical description of this phenomenon requires the detail consideration of different mechanisms for mixing the collective and high-spin two quasiparticle bands, that was implemented for ^{126}Ba [4], ^{120}Xe [5] and ^{118}Te [6]. The analysis of B(E2) values in these nuclei indicates that the description of experiments demands increasing Ω by comparison with $\Omega_{\mathrm{canonical}}$. Such values of Ω are evidence that the nuclear quadrupole collectivity is created by not only valence shell nucleons. It can be conditioned firstly by the action of the residual interacting leading to the appearance of two quasiparticle components from adjacent shells in the microscopical structure of the quadrupole boson and secondly by the decrease of energy gaps between shells which can be aroused by the impact of the presence of many quadrupole bosons (effective deformation).

References

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Preferred presentation of the contribution: in the oral session.