Nuclear Seminar

BAND STRUCTURES OF NUCLEI NEAR N, Z = 82 SHELL CLOSURES

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The nuclei near the Z = 82 and N = 82 shell closures in A ~ 190 and A ~ 130 mass regions, respectively, are crucial laboratories to observe interesting nuclear structure phenomena and to test a variety of nuclear models. Because of the proximity of the spherical shell closures, the angular momenta are mostly generated in these nuclei by particle-hole excitations. The valence protons and the neutrons in these mass regions occupy the high-j orbitals with competing prolate and oblate driving effects. This competition results into triaxiality and shape co-existence in such nuclei. The bands structures arise due to the chiral symmetry breaking in triaxial nuclei have been reported in Cs and other nuclei in A ~ 130 region. The shape co-existence is a well known phenomenon for the nuclei in the Pb region in which the magnetic rotational band structures, arises due to shears mechanism for near spherical nuclei, have also been observed. However, as one approaches the shell closures from the mid-shell the minimum in the potential energy surfaces change from a deformed shape to γ-soft ones. The γ-softness in nuclei destroys the chirality condition and hence, the structure of a band corresponding to a particular configuration is expected to evolve from chiral to magnetic rotation in an isotopic or isotonic chain. We have performed a systematic study on the band structure based on $\pi h_{11/2} \otimes \nu h_{11/2}$ configuration in the Cs nuclei to investigate such transition. We have also studied the high spin spectroscopy of Tl and Bi nuclei in A ~ 190 region with proton numbers just below and above the Z = 82 shell closures, respectively to study the effect of intruder levels on the shape of these nuclei. The gamma ray spectroscopy of the above nuclei was performed in several experiments using the Indian National Gamma Array (INGA) with Clover HPGe detectors. The interesting results obtained in these works will be discussed.

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