Onset of deformation in trans-lead nuclei around A = 190

G. Mukherjee

Variable Energy Cyclotron Centre, 1/AF Bidhan Nagar, Kolkata 700064, India

The nuclei near A ~ 190 in the Pb (Z = 82) region are known for rich variety of structural phenomena and interesting shape properties. Clear experimental evidence of coexistence of three different shapes spherical, oblate and prolate, observed in ^{186}Pb has opened up a renewed research interest, both theoretically and experimentally, in this region. There were several spectroscopic investigation to study the shapes and single particle level structures in the nuclei below Z = 82 shell closer. However, there were only a few above it. The spectroscopy of trans-lead region is interesting in several ways. The Bismuth nuclei (Z=83) are of particular interest as they show a variety of structures from spherical to superdeformed shapes as one goes down in neutron number from N=126 shell closer to midshell (around N = 110). The ground state of all odd-A Bi nuclei are $9/2^-$, depicting the spherical $h_{9/2}$ orbital above the shell closer. The Nilsson diagram in this region shows that both the $[505]9/2^-$ and intruder $[606]13/2^+$ orbitals have strong shape driving effect towards oblate shape. However, the intruder $[660]1/2^+$ proton orbital has a strong shape driving effect towards prolate shape. The competing nature of these orbitals are reflected in the calculated total routhian surfaces (TRS) which shows minima at different parts in the β–γ plane indicating different shapes for different isotopes and at different rotational frequencies. These calculations indicate that an onset of deformed shape at neutron number N = 112 for Bi isotopes with a profound minimum in the TRS at oblate deformation. However, the experimental evidence of onset of deformation observed only at neutron number N = 110. Our new result on ^{195}Bi showed the evidence of deformation sets in at N = 112 in conformity with the calculations. The results of the calculations and the experiment will be discussed.