BAND STRUCTURES IN Ce ISOTOPES

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Nuclei around N $\leq$82 shell closure offer a good possibility to investigate the shape evolution induced by the intruder configurations while going from lower spin to higher spin regime. As both the proton and neutron numbers for these nuclei are lying in the Z or N ~ 50-82 sub-shell space, the high-j $h_{11/2}$ intruder orbital has been very important in depicting a variety of shapes and structures in these nuclei, for example, chirality, magnetic rotation and shape coexistence. The experimentally observed signature splitting in the N = 75, 77 nuclei, according to Cranked Shell Model calculations [1, 2], imply intermediate values of γ in the collective regime $-60^o < \gamma < 0^o$. The recent observation of Magnetic Rotation (MR) band [3] has revealed that the total angular momentum can be generated almost entirely by re-coupling of proton and neutron spin vectors of a few particles and holes in a high-j orbital. These bands are characterized by the observation of cascades of strongly enhanced magnetic dipole (M1) transitions, following a rotation-like I(I+1) pattern, despite of very low deformation and are explained as arising due to "shears mechanism". The oblate magnetic rotation bands, developed on a multi-quasiparticle configuration, have been observed in nuclei around A ~130 [4]. Recently in ^{134}Ce (N=76) and ^{136}Ce (N=78), a number of dipole bands have been interpreted as MR bands [5, 6]. In this presentation, the experimental results obtained for ^{137,138}Ce nuclei, studied using Indian National Gamma Array (INGA) will be narrated with some emphasis on the observed magnetic rotation band in ^{138}Ce [7]. The results would be discussed in the light of experimental signatures, semi-classical analyses [8] and Tilted Axis Cranking (TAC) calculations. A review of similar band structures observed in this mass region will also be attempted in the framework of semi-classical prescription.

Reference:

1. B. D. Kern et al., Phys. Rev. C36, 1514 (1987).
2. R. Wyss et al., Phys. Lett. B215, 211 (1988).
3. H. Hubel, Prog. Part. Nucl. Phys. 54, 1 (2005).
4. D.B. Fossan, et al., Nucl. Phys. A 520, 241c (1990).
5. S. Lakshmi, et al., Phys. Rev. C 69 , 014319 (2004).
6. S. Lakshmi, et al., Phys. Rev. C 66, 041303 (2002).
7. T. Bhattacharjee et al., Communicated to NPA.
8. R.M. Clark and A.O. Macchiavelli, Ann. Rev. Nucl. Part. Sci. 50 (2000).