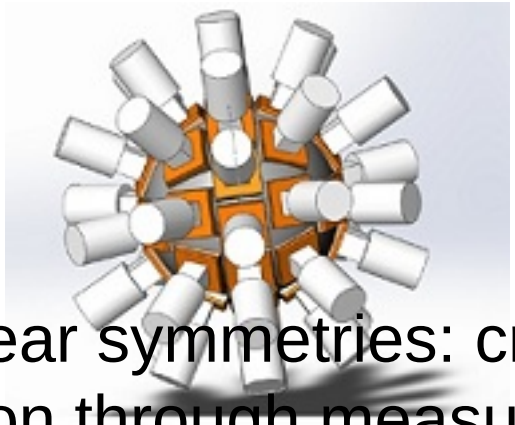
Frontiers in Gamma Ray Spectroscopy FIG18

Contribution ID : 65



Nuclear symmetries: critical observation through measurement of short lifetimes

Monday 12 Mar 2018 at 15:00 (00h30')

Content :

Nuclei at high angular momentum states exhibit various symmetries. The underlying physics which describe these symmetries are often model dependent. Therefore, it is difficult to find a unique set of experimental observables. Originally, Chiral symmetry was recognized by two nearly degenerate bands. A stringent test of Chirality now is the observation of a regular pattern of reduced transition probabilities- identical B(E2) values for the two Chiral bands and alternating sequence of B(M1), between low and high values, for intra-band as well as inter-band transitions [1]. While 128Cs showed the expected behavior, 132La deviated significantly [2]. We have performed an experiment at IUAC (New Delhi) using reaction 116Cd(19F, 5n)130La to measure B(E2) and B(M1) for the two bands which were already qualified as Chiral partners on the basis of near degeneracy. Short lifetimes (in ps) have been measured using Doppler shift attenuation method (DSAM). Our results on the reduced transition probability will finally decide if 130La qualifies for the Chiral symmetry or not. If not, the question will still remain to find an alternative explanation- possibly a different kind of symmetry. Many early studies were devoted to finding different nuclear shapes e.g. axial (prolate or oblate) and triaxial. With the observation of signature splitting and signature inversion, it was possible to assign different shapes at low and high spins. Whenever there remained ambiguity in explanation, measurement of lifetimes was required. Earlier, we proposed a change in the axis of rotation for the doubly odd 126I at inversion point [3]. However, after we performed lineshape analysis using DSAM, a different picture has emerged. A detailed discussion will be presented.

[1] I. Hamamoto, Int. J. Mod. Phys. E 20, 373 (2011).
[2] E. Grodner et al., Phys. Rev. Lett. 97, 172501 (2006).
[3] Bhushan Kanagalekar et al., Phys. Rev. C 88, 054306 (2013).

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Session classification : --not yet classified--

Track classification : --not yet classified--

Type : Invited Talk