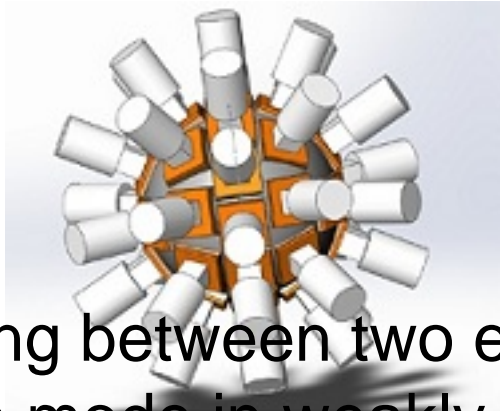


Frontiers in Gamma Ray Spectroscopy

FIG18

Contribution ID : 50



Coupling between two extreme excitation mode in weakly deformed ^{142}Eu

Content :

Spectroscopic investigation of weakly deformed nuclei in mass $A \sim 140$ region has generated considerable interest as they exhibit varieties of excitation mechanisms at higher excitation energy. The multi-particle configuration along with its small deformation plays an important role at higher excitation energy resulting in several novel phenomena, like shears mechanism, octupole correlation, chiral symmetry breaking etc. Among these magnetic rotation (MR) is a well known phenomena for generating angular momentum in weakly deformed nuclei manifested in a regular sequence of rotational-like bands consisting of stretched dipole transitions (M1). On the other hand breaking of reflection symmetry results octupole moment is also an important feature. The interaction between the orbitals of near the Fermi surface which differ by three units of angular momenta, leading to a sequence of interleaved states of opposite parity. Typically, this situation occurs when Fermi level is found between intruder sub-shell (l, j) and normal parity sub-shell $(l - 3, j - 3)$ [1]. The dynamical correlation between this sub-shell resulted in enhanced E1 transitions between the sequences of interleaved states of negative and positive parity. For weakly deformed nuclei in $A \sim 140$ region protons can be easily excited to the $h_{11/2}$ orbital across the $Z = 64$ sub-shell closure. The interaction between $d_{5/2}$ and $h_{11/2}$ orbitals of the proton sector near the Fermi surface may leads the band of interleaved states of negative and positive parity connected by E1 transitions. Also, due to the presence of particles and holes in high j orbitals MR band can also be observed. This opens up the possibility of observing two extreme mode of excitation in the vicinity of $Z = 64$ sub-shell closure. In order to investigate these possibilities ^{142}Eu is populated through the reaction $^{31}\text{P}(^{116}\text{Cd}, 5n)$ at $E_{\text{lab}} = 148\text{-MeV}$ at TIFR, Mumbai with INGA as a detection system.

In ^{142}Eu a negative parity dipole band starting from 13^- to 21^- connected to the positive parity dipole band by three E1 transition reported earlier [2]. In the reported work, more connecting E1 transitions and cross over E2 transitions are placed. Along with the transition strength $(B(M1), B(E1)$ and $B(E2))$ are evaluated from the lifetime measurement of the states of the negative parity dipole band. $B(M1)$ value shows decreasing nature with spin characteristics of MR band. The large $B(E1)$ value of the connecting transition and the ratio

B(E1)/B(E2) values may be understood as a result of octupole correlation. This observation also leads to the unique observation of coupling between two extreme mode of generation of angular momentum i.e. shears mechanism and octupole correlation in a single nuclei.

References:

[1] P.A. Butler, W. Nazarewicz, Rev. Mod. Phys. 68, 349 (1996).

[2] M. Piiparinen et al., Nucl. Phys. A 605, 191 - 268 (1996).

Primary authors : Mr. ALI, Sajad (Saha Institute of Nuclear Physics, HBNI, Kolkata 700064, India) ; Dr. RAJBANSHI, Subhendu (Dum Dum Motijheel College, Kolkata 700074, India) ; Prof. GOSWAMI, Asimananda (Saha Institute of Nuclear Physics, HBNI, Kolkata 700064, India)

Co-authors : Ms. RAY, Prithwijita (Saha Institute of Nuclear Physics, HBNI, Kolkata 700064, India) ; Dr. PAI, Haridas (Saha Institute of Nuclear Physics, HBNI, Kolkata 700064, India) ; Dr. RAUT, Rajarshi (UGC-DAE-Consortium for Scientific Research, Kolkata 700098, India) ; Dr. BISOI, Abhijit (Indian Institute of Engineering Science and Technology, Howrah 711103, India) ; Prof. CHATTOPADHYAY, Sukalyan (Saha Institute of Nuclear Physics, HBNI, Kolkata 700064, India) ; Dr. NAG, Somnath (National Institute of Technology, Raipur 492010, India) ; Prof. PALIT, Rudrajyoti (Tata Institute of Fundamental Research, Mumbai 400005, India) ; Dr. SAHA, Sudipta (GSI Helmholtzzentrum fr Schwerionenforschung, Darmstadt, Hesse, Germany) ; Dr. SETHI, Jasmine (Department of Chemistry and Biochemistry, University of Maryland, United States) ; Prof. GANGOPADHYAY, Gautam (Department of Physics, University of Calcutta, Kolkata 700009, India) ; Dr. BHATTACHARYYA, Sarmishtha (Variable Energy Cyclotron Center, Kolkata 700064, India) ; Dr. MUKHERJEE, Gopal (Variable Energy Cyclotron Center, Kolkata 700064, India) ; Dr. BHATTACHARJEE, Tumpa (Variable Energy Cyclotron Center, Kolkata 700064, India) ; Prof. SINGH, Ajay Kumar (Indian Institute of Technology, Kharagpur 721302, India) ; Prof. TRIVEDI, Tarakeshwar (Guru Ghasidas Vishayavidyalaya, Bilaspur 495009, India) ; Prof. SAHA SARKAR, Maitreyee (Saha Institute of Nuclear Physics, HBNI, Kolkata 700064, India)

Presenter : Mr. ALI, Sajad (Saha Institute of Nuclear Physics, HBNI, Kolkata 700064, India)

Session classification : --not yet classified--

Track classification : --not yet classified--

Type : Poster