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Observation of a long regular band structure at high spin in 89Zr

The high spin states of an atomic nucleus provides understanding of it's shape, dynamics and interaction between the constituent nucleons. The high spin states of a nucleus near the shell closure provide unique test bench for studying the excitations of valance shell nucleons.
Among some of the very interesting phenomena that have been observed in different doubly magic nuclei is the evolution of collectivity at high
spin [1]. Nuclei around 90Zr having Z=40 shell gap and N = 50 major shell closure are perfect testing ground to probe such emergent phenomena. Recently, the high spin states of 89Zr was populated with 13C(80Se,5n) reaction using 13C beam at 50 and 60 MeV from TIFR-BARC pelletron facility [2,3]. The gamma-rays decaying from the residual nuclei were detected using the Indian National Gamma Array (INGA) spectrometer with 18 Compton suppressed clover HPGe detectors [4].
The 89Zr levelscheme has been extended up to 49/2 hbar and a
regular dipole band has been observed. The spin and parity of the
levels have been assigned using DCO and polarisation method. The lifetimes of some of the states have also been measured. The cranked Nilsson Strutinsky model has been used to describe the observed rotational bands. The calculation suggests that the the band structure
is originated from the longest axis rotation of the triaxially deformed nucleus.

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