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Coupling of single proton configurations to collective core excitations in ¹⁶²Yb: the nucleus ¹⁶¹Tm

Over the past two decades there has been controversy as to whether deformed nuclei are subject to quadrupole vibrations (γ and β), particularly the β vibrations. Pertaining the gamma(K=2⁺) vibrations, experimental evidence has been more or less consistent, confirming they indeed exist. On the other hand the situation remains elusive for the β vibrations which are characterized by the first low lying 0+ excited state. The current study seeks to get more insight on the microscopic nature of the aforementioned by studying the nucleus 161 Tm, which was populate using the ¹⁵²Sm(¹⁴N,5n)¹⁶¹Tm reaction with the aid of the AFRODITE array at iThemba LABS. A level scheme was built for ¹⁶¹Tm by examining multiple gates using coincidence spectra. Transitions were confirmed with DCO (Direct Correlations for Oriented states) and/or polarization anisotropy measurements where applicable. Alignments and band crossings have been used to meaningfully describe the quantum behavior of the collective structures observed in this work. In addition systematic comparisons have also been used to further understand the structural behavior of band structures observed in the level scheme. Furthermore experimental B(M1)/B(E2) values for bands involving the [505]11/2⁻ orbital and other observed strong coupled bands were obtained to confirm quasi-particle configurations.

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