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A finite number of regular rotational bands in the superdeformed well of ^{143}Eu

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Abstract

The number of excited superdeformed bands in ^{143}Eu is measured by use of the Fluctuation Analysis Method. Between 10 and 40 rotational bands, displaying typical rotational energy correlations over two consecutive transitions, are populated within a rather narrow range in transition energy, $E_\gamma \approx 1300$–1500 keV. These numbers are close to the values found for normally deformed nuclei and agree with microscopic cranking + band mixing calculations for the specific superdeformed nucleus, which predict the onset of rotational damping to occur at the excitation energy $U_0 = 1.3$–1.6 MeV above the yrast line.

Although discrete spectroscopy is very powerful for studying nuclear rotational motion at low excitation energy, it fails in the region of higher level density where the rotational transition strength becomes fragmented due to the residual interaction, corresponding to a damping of the rotational motion [1]. This implies very complex sequences of levels, connected by weak γ-lines which cannot be resolved, even with the improved spatial resolution obtained from higher fold γ-coincidences (measured γ multiplicity). Therefore a statistical method was developed recently to extract more general information about the level structure in the quasi-continuum region. From the analysis of the fluctuation of counts in specific sections of the $E_{\gamma_1} \times E_{\gamma_2}$ coincidence spectra using the *Fluctuation Analysis Method* (FAM) [2–4], quantitative estimates of the number of rotational bands participating in the decay process can be obtained, both for the

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