INVESTIGATION OF LIFETIMES IN QUADRUPOLE BANDS OF ^{142}Gd

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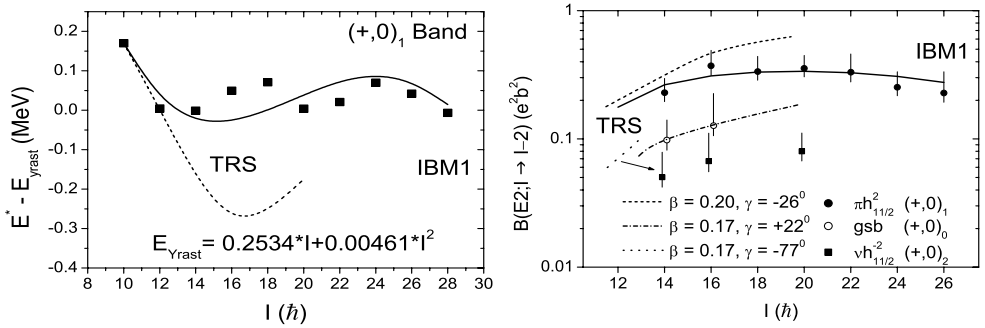
The nuclei around ^{142}Gd have been investigated because they lie in the transition region between nuclei of highly and superdeformed shapes. One of the major open problems is to establish the transition between these two regions. In the nuclei $^{142-144}$Gd long quadrupole bands are strongly populated which show two band crossings each [1-3], which may result from the breakup of $h_{9/2}$ and $i_{13/2}$ neutron pairs, respectively. TRS calculations suggest that for the long stretched E2 cascades in $^{142-144}$Gd the nuclear shape will move at high spins into a well-deformed, triaxial minimum ($\beta_2 = 0.25$, $\gamma = 26.5°$). This may imply that the quadrupole bands in these nuclei become at high spins of similar nature as the highly deformed bands in the $A < 142$ nuclei. To check this prediction reduced transition probabilities $B(E2)$ have to be determined from lifetime measurements for this band.

To study lifetimes in ^{142}Gd we have carried out a DSAM experiment with EUROBALL IV at IReS Strasbourg using the ^{114}Sn(^{32}S,2pxn) reaction at a beam energy of 160 MeV. The initial recoil velocity is $v/c = 2.2\%$. To extract lifetimes the data have been sorted into several γ-γ-γ-matrices for which the γ-ray energies from any detector were stored into the first two axes and the energies from detectors of a certain detector ring in the third axis of the respective matrix. The DSAM line shape analysis was hence carried out in doubly-gated coincidence spectra. Lifetimes have been determined for members of three E2 bands in ^{142}Gd based on the ground state and the 10^+ isomers of $(\pi h_{11/2})^2$ and $(\nu h_{11/2})^{-2}$ configurations, respectively [1]. The deduced B(E2) values are compared in the figure with calculations in the framework of the TRS and IBM1 models. The latter calculations for the $(+,0)_1$ band of $(\pi h_{11/2})^2$ configuration are based on a 10^+ core, taking into account the effective charge as parameter and using $N = 12$ as effective number of bosons. The good agreement indicates a collective excitation of 2qp nature up to 26^+.



This work was partly supported by the BMBF, Germany under the WTZ contract RUS 99/191 and the EU under the contracts no. ERBFMRXCT970123 and HPRI-CT-1999-00078EU. The support of the colleagues from the EUROBALL collaboration is acknowledged.

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