HIGHLY DEFORMED ROTATIONAL BANDS IN ^{65}ZN

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High spin states of ^{65}Zn were populated using the ^{40}Ca(^{29}Si, 4p) reaction at a beam energy of 130 MeV. The experiment was performed at the LBL 88" cyclotron using the Gammasphere in conjunction with the Microball. Three highly deformed rotational bands were established in ^{65}Zn, see the figure below. Although all three bands are seen clearly in coincidence with the known[7] low spin transitions in ^{65}Zn, the connecting transitions themselves have not been established. Coincidence spectra indicate, however, that all three bands feed the low spin levels around spin 12- 16 $\hbar$. Our backed target (2.49 mg/cm^2 ^{181}Ta backing) also allowed a measurement of mean lifetimes for the more strongly populated bands, *i.e.* band 1 and 2. Using the centroid shift method, average transition quadrupole moments were determined to be $Q_t = 2.6 \pm 0.4$ eb and $Q_t = 2.1 \pm 0.3$ eb for band 1 and band 2, respectively. This corresponds to a quadrupole deformation of $\beta_2 \approx 0.43$ and $\beta_2 \approx 0.35$, respectively. Different deformations of the two bands are also reflected in their different $J^{(2)}$ moments of inertia. The average $J^{(2)}$ of band 1 is about 25% larger than that of band 2. This difference is a strong indication of the different particle-hole configurations associated with the two bands. Self-consistent Hartree-Fock calculations[8] show that band 1 most likely occupies two $g_{9/2}$ intruder protons and leaves two $f_{7/2}$ proton holes, both having the effect of driving the nuclear shape toward a larger deformation. In contrast, band 2 occupies only one $g_{9/2}$ proton and leaves only one $f_{7/2}$ proton hole. Consequently, the deformation of band 2 is smaller than that of band 1. The B(M1)/B(E2) ratios for band 2 and 3 are currently being analyzed, the outcome of which will further help our understanding of the configurations of the three bands.

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[8]J. Dobaczewski and W. Satula, private communications.

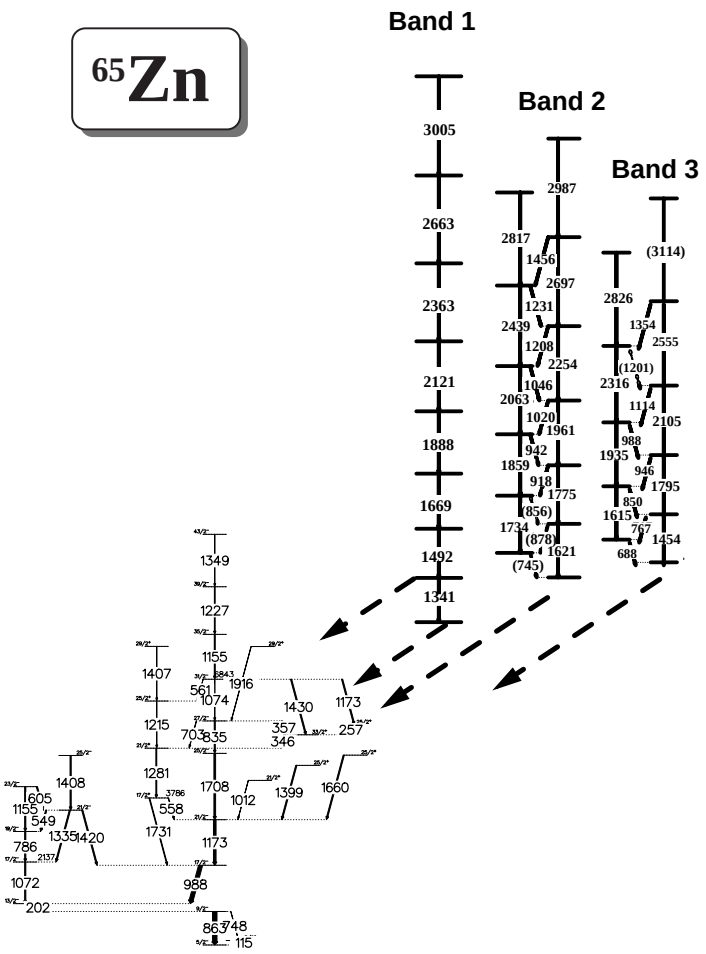

Figure 1: Three highly deformed rotational bands observed in ^{65}Zn. The dashed arrows show their approximate feeding routes to the low-spin, normally deformed states.