LEVEL STRUCTURE OF $^{91}_{41}Nb_{50}$ AT HIGH SPINS: SIGNATURE OF DEVIATION FROM SPHERICAL BEHAVIOUR?*

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Magnetic rotation is a well established mode of nuclear excitation [1]. The titled axis cranking(TAC) model predicts magnetic rotation in several regions which are characterized by nuclei of low deformation in the vicinity of shell closures. One such favorable configuration in the $A \sim 80$ region is $[\pi(fp)\ \pi g_{9/2}^2 \nu g_{9/2}^{-1}]$. This configuration can occur via the excitation of a $\nu(g_{9/2})$ neutron across the $N = 50$ core in the N $\sim$ 50 nuclei. Hence, the high spins states in and around the neutron $N = 50$ shell closure might be excellent candidates to look for magnetic rotation. The $^{31}P(^{63}Cu, 3p)$ reaction at an incident beam energy of 125 MeV was used to populate the high spin states in the semi-magic nucleus $^{91}_{41}Nb_{50}$. In-beam γ-ray coincidences were measured using an array of 8 Clover detectors. More than 40 new γ-transitions have been identified and placed in the decay scheme, using γ-γ-γ coincidence information, along with angular correlation and linear polarization data.

The partial level scheme is illustrated in figure 1. The observation of magnetic dipole sequences labeled as B4 and B5 is the focus of this presentation. The shell model predicts these states to be dominated by the excitation of $\nu(g_{9/2})$ across the $N = 50$ shell closure. These transitions do indicate asymmetrical line shapes, a feature not present in B1 & B2 sequences. Observation of a weak cross-over E2 transition (1250-keV) belonging to sequence B5 helped us obtain a value of $B(M1)/B(E2)$ as $\sim 50(\mu_N/eb)^2$, which is indicative of the enhanced magnetic strength. As seen from the second figure, the sequences B4 and B5 show an increase in frequency with spin, a property of rotational states. Using large basis shell model calculation the levels of the sequences B4 and B5 were estimated. Plot of spin against the predicted frequency is shown in the inset. As seen from these plots, one can understand that the pattern of the experimental frequency clearly deviates from that of the shell model prediction. The experimental and preliminary theoretical characteristics for these sequences are suggestive for a pair of magnetic rotational band. This would be the first observation of magnetic rotation in the N$\sim$50 nuclei, a new region to exhibit this phenomenon.

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[1] S Frauendorf, Rev. Modern Phys. **73**, 463 (2001).