Collective *versus* single-particle excitation in ^{86}Nb

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Recent investigations [1-5] have revealed the prominent role played by the $\pi g_{9/2} \otimes \nu g_{9/2}$ structure in the yrast states of odd-odd $A \approx 80$ nuclei. Lifetime measurements [1-4] have demonstrated highly collective rotational bands, but an observed reversal of signature splitting has been interpreted [6] as arising from competition between quasiparticle recoupling and rotation. A careful study of the details of the reversal in signature splitting should provide valuable information on the neutron-proton residual interaction, especially if the effect can be tracked over a range of nuclei.

This investigation of ^{86}Nb was initiated to fill a gap in information on odd-odd $A \approx 80$ nuclei above mid-shell in proton number and to use the power of GAMMASPHERE plus the MICROBALL to provide a much more thorough investigation of one odd-odd nucleus. Two decay sequences of relatively low-spin states were previously observed [7] in ^{86}Nb. In the present experiment, high-spin states were populated in ^{86}Nb using the ^{58}Ni(^{32}S,3pn) reaction at 135 MeV. Cascades of three or more γ rays were detected with the early implementation of GAMMASPHERE (36 detectors) and the evaporated charged particles were detected in the 96-element MICROBALL for channel selection.

A preliminary analysis of part of the triples γ coincidence data has allowed one band to be extended to at least the (21^+) state. The behavior of this band is quite similar to that of bands in other odd-odd nuclei which have been identified as based on a predominantly $\pi g_{9/2} \otimes \nu g_{9/2}$ configuration. A reversal of the phase of the signature splitting is seen between the (10^+) and (11^+) states and the branching ratios suggest large alternations in the $B(M1)$ strengths. In contrast to these similarities with neighboring nuclei, another band, with tentatively positive parity, has been observed which has no obvious analogy in nearby nuclei. Depending on the exact spin assignments, which will be determined from the DCO ratios, the new band may become yrast at higher spins and remove decay strength from the previously described band.

A presumably negative-parity decay sequence has been observed up to the (25^-) level. Unlike the bands in neighboring odd-odd nuclei, the level spacings do not take on a rotation-like spacing until a spin of about $13\hbar$. This appears to be another example of the competition between collective and single-particle excitations. The signature splitting is also larger than in nearby nuclei. A complete analysis including the charged-particle data is in progress.

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