

Abstract Submitted  
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**Coupling between bosonic and fermionic degrees of freedom in**

**$^{93}\text{Nb}$** <sup>1</sup> J.N. ORCE, University of Kentucky, J.D. HOLT, Stony Brook, A. LINNEMANN, Universität zu Köln, C.J. MCKAY, University of Kentucky, et al. — Excited states in  $^{93}\text{Nb}$  can be regarded as resulting from the weak coupling of a  $\pi 1g_{9/2}$  proton to a  $^{92}_{40}\text{Zr}$  core, and a  $\pi 2p_{1/2}^{-1}$  proton-hole to a  $^{94}_{42}\text{Mo}$  core. These couplings result in two independent and unmixed one-phonon structures of opposite parity. The lack of mixing provides a good opportunity for a comprehensive analysis of the low-spin structure in this odd-mass nuclide.  $^{93}\text{Nb}$  has been studied using the  $^{93}\text{Nb}(n,n'\gamma)$  reaction with neutron energies from 1.5 to 3 MeV, the  $^{93}\text{Nb}(\gamma,\gamma')$  reaction with a bremsstrahlung end-point energy of 2.75 MeV, and  $^{94}\text{Zr}(p,2n\gamma\gamma)^{93}\text{Nb}$  reaction at bombarding energies ranging from 11.5 to 19 MeV. Excitation functions, lifetimes, and branching ratios were measured, and multipolarities and spin assignments were determined. The results from these experiments will be presented in this DNP meeting, including the proposed mixed-symmetry states at 1779.7 and 1840.6 keV, respectively, associated with the  $\pi 2p_{1/2}^{-1} \otimes (2_{1,\text{MS}}^{+}, ^{94}\text{Mo})$  coupling. These assignments are derived from the observed  $M1$  and  $E2$  transition strengths to the  $2p_{1/2}^{-1}$  symmetric one-phonon states, energy systematics, spins and parities, and comparison with shell model calculations.

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