

Abstract Submitted  
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**Nonadiabatic Coupling in the  $3^3\Pi$  and  $4^3\Pi$  State of NaK<sup>1</sup>** R.D. MILES, L. MORGUS, J.P. HUENNEKENS, A.P. HICKMAN, Lehigh University — The excited  $3^3\Pi$  and  $4^3\Pi$  electronic states of the NaK molecule exhibit an avoided crossing, leading to anomalous behavior of many features of the ro-vibrational energy levels belonging to each state. We have carried out a joint experimental and theoretical investigation of these states. Experimentally, the hyperfine structure of numerous ro-vibrational levels has been determined using the Doppler-free, perturbation-facilitated optical-optical double resonance (PFOODR) technique. Striking patterns in the data provide a sensitive probe of the electronic wave function in the various regions of the double well  $3^3\Pi$  potential. Companion *ab initio* electronic structure calculations have provided adiabatic and diabatic potential curves that account for the avoided crossing. The nonadiabatic coupling between the  $3^3\Pi$  and  $4^3\Pi$  states can be exactly formulated in terms of the diabatic potential curves. Using the *ab initio* diabatic potential curves as a starting point, we used a nonlinear fitting routine to adjust the potential curves to fit the observed structure. The perturbations between the  $3^3\Pi$  and  $4^3\Pi$  states have been accurately reproduced.

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