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State-selective detection of ultracold KRb molecules in near-dissociation vibrational levels D. WANG, E.E. EYLER, P.L. GOULD, W.C. STWALLEY, Physics Department, University of Connecticut — Using resonance-enhanced one-color two-photon ionization, we have detected ultracold polar KRb molecules with vibrational selectivity. The KRb molecules are produced by photoassociation (PA) followed by radiative decay to either $X\ ^1\Sigma^+$ ground state or the metastable triplet $a\ ^3\Sigma^+$ state[1]. The distribution of final states can be modified by selecting different PA resonances, which radiate to various near-dissociation vibrational levels in the X and a states, following the Franck-Condon principle. We have obtained long range bound-bound excitation spectra of these molecules, which also provide the first spectroscopic data on the (4) $^1\Sigma^+$ shelf state, the (4) $^3\Sigma^+$ state and the (3) $^3\Pi$ state. Analysis of our spectra shows vibrational spacings in these excited states in good agreement with those calculated from *ab initio* potential curves. We acknowledge support from NSF.
[1] D. Wang et al., Phys. Rev. Lett., 93, 243005(2004).

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