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Energy structure and dynamics of the $B"\overline{B}^1\Sigma_u^+$ and $D^1\Pi_u^+$state of molecular hydrogen near the third dissociations limit[1] ELIZABETH MCCORMACK, Bryn Mawr College, ROBERT EKEY, University of Mary Washington, JOE CROMAN, AARON MARKS, Bryn Mawr College — Two-color, resonantly-enhanced, multiphoton ionization spectroscopy is used to probe highly excited vibrational levels of the $B"\overline{B}^1\Sigma_u^+$ and $D^1\Pi_u^+$states of molecular hydrogen near the n=3 dissociation limit. Transitions are observed via two-photon excitation of the $E, F^1\Sigma_g^+, v' = 6, J'$ state from the ground state. Both molecular and atomic ion production are detected as a function of wavelength by using a time-of-flight mass spectrometer. Term energies of multiple rovibrational levels the $B"\overline{B}^1\Sigma_u^+$ and $D^1\Pi_u^+$ states and lifetimes of the J = 1-4, v= 12, 13 and 14 levels of the $D^1\Pi_u^+$state are reported. The trend of lifetime with vibration is strongly suggestive of a new dissociation channel opening up for the high vibrational levels. Recent theoretical calculations of the rotational interaction of the $D^1\Pi_u^+$ state with the 6 lowest $^1\Sigma_u^+$ states of H_2 are invoked to explain the dynamics of these highly excited vibrational levels.

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