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The structure and dynamics of the $B"\overline{B}^1\Sigma_u^+$ *ungerade* double-well state in H_2. A. MARKS, R. C. EKEY JR., E. F. MCCORMACK, Bryn Mawr College — Due to their symmetry and average internuclear separation, the *ungerade* double-well states in H_2 have been difficult to observe. In the work presented here, double resonance spectroscopy via the$EF^1\Sigma_g^+, v'_{EF} = 6$ state has been used to probe highly excited rovibrational levels of the double-well $B"\overline{B}^1\Sigma_u^+$state of H_2. Many transitions to levels located above the double-well barrier have been observed for the first time by detecting both molecular and atomic ion production as a function of energy by using a time-of-flight mass spectrometer. While significant perturbations are observed in the energy region at and above the barrier, assignments to levels with either dominant outer-well or inner-well characteristics can still be made according to the relative vibrational spacing and the observed rotational structures. Of note, is the observation of a subset of transitions with remarkably large linewidths corresponding to extremely rapid decay. The variation of linewidth observed as a function of well character and total angular momentum suggests autoionization as the primary decay mode for these levels. The results of our investigation of the transition energies and widths along with their possible assignments will be presented.

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