Observations of the high vibrational levels of the $B''B^1\Sigma_u^+$ state of $\text{H}_2$ ROBERT EKEY, University of Mount Union, ALEXANDER CHARTRAND, Bryn Mawr College, WENQI DUAN, University of Iowa, ELIZABETH MCCORMACK, Bryn Mawr College — Double-resonance laser spectroscopy via the $EF^1\Sigma_g^+, v' = 6, J' = 0 \rightarrow 2$ state was used to probe the high vibrational levels of the $B''B^1\Sigma_u^+$ state of molecular hydrogen. Resonantly-enhanced multiphoton ionization spectra were recorded by detecting ion production as a function of energy using a time of flight mass spectrometer. New measurements of energies for the $v = 51 – 66$ levels for the $B''B^1\Sigma_u^+$ state are reported, which, taken with previous results, span the $v = 46 – 69$ vibrational levels. Results for energy levels are compared to theoretical calculations [L. Wolniewicz, T. Orlikowski, and G. Staszewska, J. Mol. Spec. 238, 118 (2006)]. The average difference between the 84 measured energies and calculated energies is $-3.8 \text{ cm}^{-1}$ with a standard deviation of $5.3 \text{ cm}^{-1}$. This level of agreement showcases the success of the theoretical calculations in accounting for the strong rovibronic mixing of the $^1\Sigma_u^+$ and $^1\Pi_u^+$ states.