Abstract Submitted
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Toward a determination of the proton-to-electron mass ratio from a Lamb-dip measurement of HD S.-M. HU, L.-G. TAO, A.-W. LIU, Y. R. SUN, J. WANG, Univ of Sci Tech of China, J. KOMASA, Adam Mickiewicz University, K. PACHUCKI, University of Warsaw — Precision spectroscopy of the hydrogen molecule is a test ground of quantum electrodynamics (QED), and may serve for determination of fundamental constants. Using a comb-locked cavity ring-down spectrometer, for the first time, we observed the Lamb-dip spectrum of the R(1) line in the overtone of HD. The line position was determined to be 217 105 182.79(9) MHz ($\delta\nu/\nu = 4\times10^{-10}$), which is the most accurate rovibrational transition ever measured in the ground electronic state of molecular hydrogen. Moreover, from calculations including QED effects up to the order $m_e\alpha^6$, we obtained predictions for this R(1) line as well as for the HD dissociation energy, which are less accurate but signaling the importance of the complete treatment of nonadiabatic effects. Provided that the theoretical calculation reaches the same accuracy, the present measurement will lead to a determination of the proton-to-electron mass ratio with a precision of 1.3 parts per billion.

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