THz SPECTROSCOPY OF H_2D^+

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The pure rotational transition frequencies of H_2D^+, $2_{12} \leftarrow 1_{11}, 2_{02} \leftarrow 1_{01}, 2_{11} \leftarrow 1_{10}$, and $3_{13} \leftarrow 2_{12}$, have been measured in the laboratory precisely by using a tunable far-infrared spectrometer. Among them, the $2_{12} \leftarrow 1_{11}$ line was recently detected in space toward Sgr B2 by Cernicharo *et al.*[a]. Their identification was made based on a calculated line frequency estimated from the spectroscopic data of Amano and Hirao[b]. It has been found that our measured frequency of this line, 2363242.82(69) MHz, is lower by about 20 MHz than the estimated value. All the available THz lines and known millimeter- and submillimeter-wave lines together with the combination differences derived from the infrared transitions are fitted to the Watson effective Hamiltonian. A set of improved molecular constants are obtained.

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[a] J.Cernicharo, E. Polehampton, and J.R. Goicoechea. *Astrophys. J.*, **657**, L21-L24 (2007).
[b] T. Amano and T. Hirao, *J. Mol. Spectrosc.*, **233**, 7-14 (2005).