HIGH-ACCURACY SPECTROSCOPY OF H_2 ROVIBRATIONAL TRANSITIONS IN THE (1-0) AND (2-0) BANDS NEAR 2.0 AND 1.2 μm

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Accurate transition frequencies of six lines of the (2-0) vibrational band of H_2 are reported near 1.2 μm, namely Q1-Q4, S0, and S1, as well as the S2 transition of the (1-0) vibrational band near 2.03 μm. These weak electric-quadrupole transitions were measured at room temperature by comb-referenced cavity ring-down spectroscopy. Accurate transition frequencies were determined by applying a multi-spectrum fit procedure with various profile models including speed-dependent collisional broadening and shifting phenomena.

The obtained values are the first H_2 (2-0) transition frequencies referenced to an absolute frequency standard. As a result, a 1σ-accuracy better than 100 kHz was achieved for the Q1, S0, and S1 transition frequencies, improving by three orders of magnitude the accuracy of previous measurements. The measured frequencies and intensities are compared to the most recent calculated values.