ACCURATE COMB-ASSISTED CAVITY RING DOWN SPECTROSCOPY OF MOLECULAR HYDROGEN

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Because molecular hydrogen is the simplest molecule, it is considered as the best candidate for a direct comparison of experiment against high level ab initio calculations, both in terms of transition frequencies and line strength. Unfortunately, this apparent simplicity is not only spoiled by the weakness of the transition, but also by its surprisingly complex line profile that hampers accurate parameters to be straightforwardly derived. To address that problem, we have recorded with unprecedented sensitivity pure H_2 Q(1) 2-0 and D_2 S(2) 2-0 transitions around 1.24 and 1.59 μm, respectively, down to a pressure of 100 Pa. A limit of detection of about 2×10^{-12} $\mathrm{cm}^{-1}$was achieved with the two accurate comb-referenced cavity ring down spectrometers used. Effective parameters were determined for different line profiles (NGP, SDNGP, HTP), allowing line reproduction down to the noise level. The zero pressure parameters will be presented and discussed.