

# Probing the proton-electron mass ratio through Doppler-free two-photon spectroscopy of HD<sup>+</sup>

Wednesday, 15 January 2020 09:00 (30 minutes)

We have performed Doppler-free two-photon spectroscopy of cold, trapped HD<sup>+</sup> ions to measure a ro-vibrational transition frequency with a relative uncertainty of a few parts-per-trillion. Using highly precise *ab-initio* calculations [1], these measurements allow –for the first time –to determine the proton-electron mass ratio,  $\mu$ , from molecular spectroscopy with a precision competitive with that of state-of-the-art Penning trap mass measurements [2, 3]. Hence, our method provides both a new value of  $\mu$  and a cross check of existing methods. In addition, our results provide an indication of the values of the proton radius and Rydberg constant, and may even serve as a probe of physics beyond the Standard Model.

[1] V.I. Korobov, J.-Ph. Karr, L. Hilico, Phys. Rev. Lett. **118**, 233001 (2017).

[2] F. Heiße *et al.* Phys. Rev. Lett. **119**, 033001 (2017).

[3] S. Sturm *et al.* Nature **506**, 467 (2014).

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