Abstract Submitted
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Atomic mass ratios of light ions by simultaneous cyclotron frequency measurement of two ions in a coupled magnetron orbit[1] EDMUND MYERS, DAVID FINK, JAMES MCAULEY, Florida State University — In the early 2000s, the MIT Penning trap group implemented a technique for measuring atomic mass ratios by simultaneous measurement of the cyclotron frequency of two ions in a coupled magnetron orbit [1]. Applying this technique to ion pairs of m/q near 30 they achieved a fractional precision of 7×10^{-12}, still the highest precision attained for a mass ratio. With future aims of an improved mass comparison of tritium to helium-3 [2], and of the antiproton to proton, and the immediate goal of an improved value for m_d/m_p, we are re-developing this method using H_2^+ and D^+. (We have recently determined this mass ratio to 2×10^{-11} using simultaneously trapped ions, but by measuring the cyclotron frequencies alternately using large and small cyclotron orbits [3]). However, the coupled magnetron orbit entails additional systematics due to increased ion-ion interaction, and because the ions are now displaced from the center of the Penning trap. Compared to $m/q = 30$, some systematics are reduced, while others are increased. [1] S. Rainville, J. K. Thompson, and D. E. Pritchard, Science 303, 334 (2004). [2] E. G. Myers, et al., Phys. Rev. Lett. 114, 013003 (2015). [3] D. Fink and E. G. Myers, Phys. Rev. Lett. 124, 013001 (2020).

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