

Abstract Submitted  
for the DAMOP20 Meeting of  
The American Physical Society

**Two-photon vibrational transitions in  $O_2^+$**  BORAN KUZHAN, ANNIKA LUNSTAD, JAMES LOGAN, ADDISON HARTMAN, DAVID HANNEKE, Amherst College — Vibrational overtones in the  $O_2^+$  molecule are electric-dipole forbidden and thus intrinsically narrow and immune from some systematic shifts.[1] They could serve as reference frequencies for optical clocks or as probes of new physics such as time-variation of fundamental constants. We report on our attempts to drive these transitions with two photons from a nanosecond pulsed laser. Our goal is to reduce the measurement uncertainty in the vibrational frequency by several orders of magnitude. In addition to an overview of our experiment, we present recent upgrades that reduce the temperature of our molecular beam and increase our signal.

1. R. Carollo, A. Frenett, D. Hanneke, *Atoms* v.7, 1 (2018)

This work is supported by the NSF (RUI PHY-1806223).

David Hanneke  
Amherst College

Date submitted: 30 Jan 2020

Electronic form version 1.4