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Toward Measurements With Sympathetically Cooled State-Selected Molecular Ions RYAN A. CAROLLO, DAVID A. LANE, ALEXANDER FRENETT, DAVID HANNEKE, Amherst College — Deeply bound diatomic molecular ions are of interest for a variety of studies, such as precision measurements, quantum control of rotational states, or quantum memory. We are particularly interested in homonuclear systems, which show promise at suppressing certain systematic effects. We present an apparatus capable of controllably leaking O_2, ionizing and sympathetically cooling trapped O_2^+, and performing state-selective photoionization. We report on progress toward initial measurements with oxygen, and discuss a proposed precision measurement of the time variation of the proton-to-electron mass ratio using trapped O_2^+.

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