

Abstract Submitted  
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**Molecular Spectroscopy by Coherent Motion Detection** YEN-WEI LIN, BRIAN ODOM, Department of Physics and Astronomy, Northwestern University, Evanston, IL 60208 — We are currently constructing an experiment to perform spectroscopy on single trapped molecular ions. A silicon monoxide molecular ion ( $\text{SiO}^+$ ) will be co-trapped with a barium ion in a linear Paul trap. The barium ion is laser-cooled and sympathetically cools the molecular ion; rotational cooling of  $\text{SiO}^+$  will be accomplished by P-branch optical pumping on the B-X electronic transition. The spectroscopy result of the molecular ion is mapped to the barium ion through a state-dependent coherent motional state excitation. We are particularly interested in probing rotational (microwave) or vibrational (infrared) transitions sensitive to a time-varying electron-to-proton mass ratio.

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