

Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Towards Fluorescence Imaging of single SiO+¹ PATRICK STOLLENWERK, YEN-WEI LIN, BRIAN ODOM, Northwestern University — Working to generalize the techniques of atomic ion trapping to molecules, it is clear that the ability to image molecules is a fundamental requisite for such a goal. In our lab, we are interested in precision spectroscopy of SiO+ for measuring time-varying fundamental constants. We have been developing techniques for coherent control of trapped SiO+. We load the trap via laser ablation and subsequent 2+1 REMPI of SiO, and then optically pump SiO+ into its ground rotational state by driving the B: Σ \leftarrow X: Σ band, which has nearly diagonal vibrational overlap. We use a broadband light source to drive multiple rotational cooling transitions simultaneously and avoid rotational heating transitions by using pulse-shaping to modify its spectrum. We probe the ground state of SiO+ using laser-induced fluorescence. With vibrational repumping, excitation of single SiO+ within the B-X (00) band produces 10^3 fluorescence photons over 1 ms, though there are uncertainties due to relaxation through the low-lying A: Π state. These photons are projected onto an EMCCD, forming images of single SiO+. We will then study coherent control of SiO+'s rotation and perform precision spectroscopy with ultracold SiO+ by fluorescence imaging.

¹This research is supported by NSF.

Yen-Wei Lin
Northwestern University

Date submitted: 30 Jan 2015

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