

Abstract Submitted  
for the DAMOP15 Meeting of  
The American Physical Society

**Ultrafast Pulse Sequencing for Fast Projective Measurements of Atomic Hyperfine Qubits** MICHAEL IP, ANTHONY RANSFORD, WESLEY CAMPBELL, UCLA — Projective readout of quantum information stored in atomic hyperfine structure typically uses state-dependent CW laser-induced fluorescence. This method requires an often sophisticated imaging system to spatially filter out the background CW laser light. We present an alternative approach that instead uses simple pulse sequences from a mode-locked laser to affect the same state-dependent excitations in less than 1 ns. The resulting atomic fluorescence occurs in the dark, allowing the placement of non-imaging detectors right next to the atom to improve the qubit state detection efficiency and speed. We also discuss methods of Doppler cooling with mode-locked lasers for trapped ions, where the creation of the necessary UV light is often difficult with CW lasers.

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Date submitted: 30 Jan 2015

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