

Abstract Submitted
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Nondestructive fluorescence detection of hyperfine states of Rb using an EMCCD camera¹ MINHONG KWON, MATTHEW EBERT, CHRISTOPHER YOUNG, THAD WALKER, MARK SAFFMAN, Univ of Wisconsin, Madison — We demonstrate a method to non-destructively differentiate two hyperfine ground states of trapped neutral ⁸⁷Rb atoms, with an EMCCD camera. The semi-closed cycling transition limits the number of photons that atoms can scatter before their internal state changes. We utilize circularly polarized probe light and strictly controlled quantization axis to fully close the transition. This enables us to collect sufficient photons for a measurement while preserving the internal state. In our proof of principle experiments up to five trap sites are interrogated in parallel. A few ms of readout time and scalability of the method allow significant speed ups in quantum information experiments with neutral atoms. We also report progress toward Rydberg-mediated gate experiments using ensembles.

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