Abstract Submitted
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**Fast, accurate, nondestructive quantum state detection of a single trapped neutral atom**[1] MARGARET E. SHEA, JAMES A. JOSEPH, PAUL M. BAKER, JUNGSANG KIM, Duke University, DANIEL J. GAUTHIER, The Ohio State University — In recent years, single neutral atom traps have emerged as a promising platform for the study of fundamental physics and quantum information protocols. Many of these applications can benefit greatly from fast, accurate, nondestructive quantum state detection. Here, we report our progress on achieving nondestructive quantum state detection in a single-atom trap constructed with an in-vacuum lens and off-the-shelf components. Through careful choice of the detection beam frequency and power, we have demonstrated a nondestructive state detection scheme with >96% fidelity over 200 $\mu s$ of integration time. To the best of our knowledge, this is faster than other reported results and of comparable fidelity. Furthermore, we report our investigations into the limiting features of this process. Our observations can be understood using a rate equation model.

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