Abstract Submitted
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Exploring the range of motion of atom traps formed in the diffraction pattern behind a pinhole for quantum computing[1] IAN POWELL, TAYLOR SHANNON, SANJAY KHATRI, GLEN GILLEN, KATHARINA GILLEN-CHRISTANDL, California Polytechnic State University, San Luis Obispo — To solve the scalability issue of neutral atom quantum computing, we have investigated the diffraction pattern formed behind an array of pinholes as a possible two-dimensional quantum memory system [1]. Exploiting polarization dependence and varying the incident laser angle may facilitate two-qubit gates by bringing pairs of atoms together and apart controllably [2]. We have both experimentally and computationally explored the limits of the incident laser angle for the traps to remain viable for quantum computing. We will present a quantitative comparison of our computations and direct measurements of the diffraction pattern for a large range of incident angles. We will also discuss our progress towards constructing an experimental setup for transferring atoms from our magneto-optical trap (MOT) to the pinhole traps, including projection of our traps into the MOT cloud (proposed in [3]) and an imaging system to characterize the atom traps.

[1] G. D. Gillen, et al., Phys. Rev. A 73, 013409 (2006).
[2] K. Gillen-Christandl and B. D. Copsey, Phys. Rev. A 83, 023408 (2011).
[3] K. Gillen-Christandl and G. D. Gillen, Phys. Rev. A 82, 063420 (2010).

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