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Progress Towards Experimental Realization of Polarization Dependent Optical Dipole Traps in the Diffraction Pattern of a Pinhole¹ GRANT RAYNER, BERT COPSEY, ANDREW FERDINAND, DANI MAY, JEN-NIFER RUSHING, GLEN D. GILLEN, KATHARINA GILLEN-CHRISTANDL, California Polytechnic State University, San Luis Obispo — We work towards solving the scalability problem of neutral atom quantum computing by trapping atoms in two dimensional arrays of light-polarization dependent dipole traps formed in the diffraction pattern immediately behind an array of pinholes. Our simulations show that adequate traps result from modest laser powers [1]. Adjusting the angle of the trap laser, we can controllably manipulate the location of the traps. By exploiting the polarization dependence of the trapping potential, traps can be brought together and apart [2]. This scheme constitutes a scalable addressable system that facilitates two qubit gates. We will present progress towards experimentally verifying our previous computations.

[1] G. D. Gillen, et al., Phys. Rev. A 73, 013409 (2006)

[2] K. Gillen-Christandl and B. D. Copsey, Phys. Rev. A 83, (in production) (2011)

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