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Investigation of the polarization dependence of optical dipole traps for quantum computing BERT DAVID COPSEY, KATHARINA GILLEN-CHRISTANDL, California Polytechnic State University, San Luis Obispo — In an effort to find ways to create scalable arrays of neutral atoms that allow bringing atoms together and apart for 2-qubit gate operations, we are exploring the dependence of different dipole trap and optical lattice geometries on the trap light polarization. Several dark spot optical lattice and dipole trap geometries that have sufficiently low scattering rates for laser detunings comparable to the (ground state) hyperfine splitting have been proposed [1, 2]. To fully explore the polarization dependence of these traps, we explicitly calculate the full expression for the optical dipole potential for this case, based on the expression given in [3]. We will present our progress towards identifying trap geometries with different light polarizations that might be used to bring atoms together and apart for two-qubit gates. 1. Phys. Rev. A 70 032302 (2004), 2. Phys. Rev. A 73 013409 (2006), 3. Phys. Rev. A 57(3) 1972 (1998).

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