Abstract Submitted
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1D array of dark spot traps formed by counter-propagating nested Gaussian laser beams for trapping and moving atomic qubits KATHARINA GILLEN-CHRISTANDL, California Polytechnic State University, San Luis Obispo, TRAVIS D. FRAZER, JILA, University of Colorado, Boulder — The standing wave of two identical counter-propagating Gaussian laser beams constitutes a 1D array of bright spots that can serve as traps for single neutral atoms for quantum information operations [1]. Detuning the frequency of one of the beams causes the array to start moving, effectively forming a conveyor belt for the qubits [1]. Using a pair of nested Gaussian laser beams with different beam waists, however, forms a standing wave with a 1D array of dark spot traps confined in all dimensions [2]. We have computationally explored the trap properties and limitations of this configuration and, trading off trap depth and frequencies with the number of traps and trap photon scattering rates, we determined the laser powers and beam waists needed for useful 1D arrays of dark spot traps for trapping and transporting atomic qubits in neutral atom quantum computing platforms. [1] D. Schrader et al., Appl. Phys. B 73, 819 (2001); [2] P. Zemánek, C.J. Foot, Opt. Comm. 146, 119 (1998).

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