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Neutral atom quantum computing architecture based on 1D and 2D optical lattices on a chip KATHARINA CHRISTANDL, RAJANI AYACHITULA, MICHAEL CHMUTOV, GREGORY P. LAFYATIS, Department of Physics, The Ohio State University, SEUNG-CHEOL LEE, JIN-FA LEE, Department of Electrical Engineering, The Ohio State University — We present results of our investigation of neutral atom quantum computing architectures using 1D and 2D optical lattices on a chip. Previously, we have shown that lattices can be created above an optical waveguide by destructively interfering different, co-propagating waveguide modes of blue-detuned laser light [1]. The optical lattice nodes are suitable for tightly trapping single atoms, which can in turn serve as individually addressable qubits in a quantum memory. We are studying details of these systems including the polarization of the light around optical lattice nodes and the resulting Zeeman substate-dependence of the trapped-atom dynamics. We also explore the possibilities of moving traps within a lattice, entangling pairs of trapped atoms, and, ultimately, realizing one- and two-qubit gates. 1. Phys. Rev. A 70 032302 (2004).

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