Abstract Submitted
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Sub-wavelength optical trapping and manipulation using far-field optics JEFF THOMPSON, TOBIAS TIECKE, Harvard University Department of Physics, ALEXEY GORSHKOV, LIANG JIANG, Caltech Institute for Quantum Information, MIKHAIL LUKIN, Harvard University Department of Physics — Coherent optical fields provide a powerful tool for trapping and manipulating quantum systems like atoms, ions and electron and nuclear spins in solid state systems. Diffraction sets a fundamental limit on the size of a beam focus, which appears to prohibit optical trapping or high-fidelity addressing of individual, identical atoms separated by a distance of order λ or less. In this poster, we will present several methods for trapping and manipulating atoms with sub-wavelength spatial resolution. In principle, these techniques allow spatial resolutions approaching a few nanometers, using only far-field optics. Sub-wavelength optical dipole traps have several potential applications. The high curvature of the nonlinear traps may help to trap atoms near surfaces, e.g., in the evanescent field of an optical waveguide or micro-cavity. Also, pairs or clusters of atoms may be trapped near each other to execute high-fidelity fast quantum logic gates or mesoscopic quantum simulation.

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