Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

A Quantum Plasmonic Circuit for Cold Atoms MICHAEL GULLANS, Harvard University, DARRICK CHANG, California Institute of Technology, JOHANNES FEIST, TOBIAS TIECKE, JEFF THOMPSON, Harvard University, IGNACIO CIRAC, Max-Planck-Institut fur Quantenoptik, PETER ZOLLER, Institute for Quantum Optics and Quantum Information of the Austrian Academy of Sciences, MIKHAIL LUKIN, Harvard University — We propose a new architecture for quantum simulation with atoms using a two dimensional lattice of plasmonic nanoparticles to both trap the atoms and mediate interactions between them. This proposal combines existing technologies from ultracold atoms and plasmonics to exploit the unique coherence properties of atoms and the strong light-matter interaction and subwavelength confinement provided by plasmonic systems. We first show that this system allows to increase the energy scales of Hubbard models by two orders of magnitude compared to optical lattices. We then show how this system can realize a dissipative quantum simulator to prepare a wide range of many-body entangled states.

Michael Gullans
Harvard University

Date submitted: 11 Nov 2011 Electronic form version 1.4