Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Robust tomography of microwave resonator arrays for quantum simulation with light AMAN LACHAPELLE, JOHN C OWENS, RUICHAO MA, JONATHAN SIMON, DAVID SCHUSTER, Univ of Chicago — We are interested in using a bottom-up approach to create topologically non-trivial states of light via Hamiltonian engineering in coupled microwave cavities. Characterization and reduction of disorder is paramount to realizing and studying idealized many-body Hamiltonians. Our tight-binding lattices are made of arrays of evanescently coupled three-dimensional microwave resonators. From the spectroscopic response measured at specific lattice sites, we develop methods to fully map out the underlying tight-binding Hamiltonian, including onsite energies, nearest-neighbor couplings and the local dissipation on all sites. We show that for a 1D system, one reflection measurement off of the site at the end of the chain is sufficient, while for 2D only measurements along one edge of the system is sufficient for complete tomography of the lattice Hamiltonian. The transmission between neighboring sites also reveals the phase of the tunnel coupling, thereby allow direct measurement of the flux in lattices with time-reversal breaking synthetic gauge fields. These methods can be readily applied to many other physical systems for the characterization of quantum processes or the validation of quantum simulators.

Aman LaChapelle
Univ of Chicago

Date submitted: 23 Nov 2015 Electronic form version 1.4