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Topological states of light in coupled microwave cavities CLAI OWENS, AMAN LACHAPELLE, RUICHAO MA, BRENDAN SAXBERG, JON SIMON, DAVID SCHUSTER, University of Chicago — We present a unique photonic platform to explore quantum many-body phenomena in coupled cavity arrays. We create tight binding lattices with arrays of evanescently coupled three-dimensional coaxial microwave cavities. Topologically non-trivial band structures are engineered by utilizing the chiral coupling of the cavity modes to ferrite spheres in a magnetic field. Using screws made of different dielectric material, we can control every lattice site frequency, loss, and coupling strength to its neighbors. We then can probe each lattice site and measure the band structure, the Chern number of the bands, and time-resolved dynamics of pulses we inject at a particular site. These lattices can be cooled to superconducting temperatures to realize low disorder, long-coherence, topological tight binding models that are compatible with effective onsite photon-photon interactions by coupling lattice sites to superconducting qubits. This will allow us to explore the interplay between topology and coherent interaction in these artificial strongly-correlated photonic quantum materials.

John Owens
University of Chicago

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