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Electromagnetically Induced Flux Lattices for 2D Photon Gases JOHANNES OTTERBACH, Physics Department, Harvard University, JONATHAN SIMON, James Franck Institute, University of Chicago — The intense interest in topological states of matter has triggered an outpouring of effort to develop artificial gauge fields for ultracold atomic gases, where access to extraordinary control provides a promising route to the creation of synthetic materials on-demand. However, engineering *scalable* magnetic fields for neutral particles has proven difficult, resulting in either low flux densities or small system sizes. A new, scalable approach to creation of high flux densities for neutral atoms employs a so-called "optical flux lattice," which is a spinor lattice of berry-phase vortices [1]. Here we discuss an extension of this idea to photonic systems: using a coherently driven atomic ensemble, we modify the optical response of a near-degenerate cavity to mimick an effective optical flux lattice for photonic polarization states. This enables us to engineer photonic Bloch-bands with non-zero Chern number, giving rise to chiral edge-modes in the presence of an additional potential. The single particle bulk- and edge-dispersion relations may be directly probed in cavity transmission. Combined with interactions, the proposed hybrid system presents an ideal tool to study strongly correlated photon states.

[1] N. R. Cooper, Phys. Rev. Lett. 106, 175301 (2011).

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