Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Topological photonics: an observation of Landau levels for optical photons[1] NATHAN SCHINE, ALBERT RYOU, ARIEL SOMMER, JONATHAN SIMON, Univ of Chicago — We present the first experimental realization of a bulk magnetic field for optical photons. By using a non-planar ring resonator, we induce an image rotation on each round trip through the resonator. This results in a Coriolis/Lorentz force and a centrifugal anticonfining force, the latter of which is cancelled by mirror curvature. Using a digital micromirror device to control both amplitude and phase, we inject arbitrary optical modes into our resonator. Spatial- and energy- resolved spectroscopy tracks photonic eigenstates as residual trapping is reduced, and we observe photonic Landau levels as the eigenstates become degenerate. We show that there is a conical geometry of the resulting manifold for photon dynamics and present a measurement of the local density of states that is consistent with Landau levels on a cone. While our work already demonstrates an integer quantum Hall material composed of photons, we have ensured compatibility with strong photon-photon interactions, which will allow quantum optical studies of entanglement and correlation in manybody systems including fractional quantum Hall fluids.

[1]This work was supported by DOE, DARPA, and AFOSR.

Nathan Schine
Univ of Chicago

Date submitted: 04 Nov 2015 Electronic form version 1.4