Topological states in photonic systems MOHAMMAD HAFEZI, SUNIL MITTAL, PRABIN ADHIKARI, JINGYUN FAN, ALAN MIGDALL, JACOB TAYLOR, Joint Quantum Institute, UMD/NIST — Topological features – global properties which are not discernible locally – emerge in systems from magnets to fractional quantum Hall systems. The best known examples are quantum Hall effects, where insensitivity to local properties manifests itself as conductance through edge states that is insensitive to defects and disorder. In this talk, I demonstrate how similar physics can be observed for photons; specifically, how various quantum Hall Hamiltonians can be simulated with linear optical elements. I report the first observation of topological photonic edge state using silicon-on-insulator technology. Furthermore, I discuss the prospect of measuring integer topological invariants, the addition of optical non-linearity and the possibility of implementing fractional quantum Hall states of photons, in both optical and circuit-QED systems.

Mohammad Hafezi
Univ of Maryland-College Park

Date submitted: 15 Nov 2013   Electronic form version 1.4