Abstract Submitted
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Photonic Topological Quantum Materials Engineering[1] NATHAN SCHINE, JIA NINGYUAN, ALEXANDROS GEORGAKOPOULOS, ALBERT RYOU, CLAIRE BAUM, LOGAN W. CLARK, ARIEL SOMMER, JONATHAN SIMON, University of Chicago — Interacting quantum materials with nontrivial topology possess a multitude of fascinating properties and behaviors, many of which have never been observed experimentally. Engineered synthetic material systems with made-to-order properties have established themselves as ideal platforms, not just to study analogue solid state materials, but moreover to explore new manifestations of the interplay between topology and interactions. We describe one such system, wherein a resonator traps photons and introduces a synthetic gauge field, while hybridization with Rydberg atoms introduces strong single photon interactions. This realizes a fractional quantum Hall hamiltonian for bosons, but with the additional ability to place the system in curved space. Additional state manipulation techniques with radio-frequency photons offer control over interaction strength and form, while strong modulated AC Stark shifts provide temporal control over particle dispersion and dynamical evolution. We present and characterize these tools separately and then describe ongoing work combining these capabilities to enable new studies of interacting topological materials.

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