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Time Reversal Symmetry Breaking Microwave Resonators JOHN C OWENS, AMAN LACHAPELLE, TAEKWAN YOON, RUICHAO MA, DAVID SCHUSTER, JONATHAN SIMON, University of Chicago — In this talk we present our work towards realizing high Q, superconducting circulators to be employed in topological circuit QED lattices. These circulators generate gauge fields that produce protected edge states. We couple magnon excitations in spheres of the ferrite Yttrium Iron Garnet (YIG) to microwave cavity fields in order to break the degeneracy between modes that precess with different handedness. The YIG sphere only couples strongly (1GHz) to cavity modes that precess with the same handedness. We tune the YIG sphere into resonance with degenerate cavity modes to shift only the frequency of the modes with the same handedness, leaving the uncoupled mode at its original frequency. Since this mode is dark to the YIG excitation, its quality factor is dependent only on the characteristics of the cavity. We make the cavities out of the Type II superconductor Niobium Titanium so that we achieve high quality factors while also tolerating the large magnetic fields acting on the YIG spheres within the cavities. These cavities can be evanescently coupled to create topologically nontrivial lattices. Photon-photon interactions can then be added via couplings to qubits to create fractional quantum hall states for microwave photons.

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