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Time- and Site- Resolved Dynamics in a Circuit Topological Insulator NINGYUAN JIA, CLAI OWENS, ARIEL SOMMER, DAVID SCHUSTER, JONATHAN SIMON, Univ of Chicago — With the discovery of the quantum Hall effect and topological insulators there has been an outpouring of ideas to harness topologically knotted band-structures in the design of state-of-the art, disorder-insensitive materials. Here we demonstrate the first simultaneous site- and time-resolved measurements of a time reversal invariant topological insulator, realized in a novel RF circuit topology. In this meta-material, we induce global topology in the band structure via local braiding in a capacitor-inductor network. We observe a gapped density of states consistent with a modified Hofstadter spectrum at a flux per plaquette of $\phi = \pi/2$. In-situ probes reveal spatial localization within the bulk energy-gaps, as well as de-localized edge states. Time-resolved dynamics demonstrate a splitting of localized excitations into spin-resolved edge-modes. The RF circuit paradigm is naturally compatible widely proposed non-local coupling schemes, allowing us to implement a Mobius topological insulator inaccessible to conventional materials. Combining local braiding in an RF circuit with circuit-QED techniques, provides a direct path to topologically ordered quantum phases of matter.

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