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Synthetic Quantum Matter in Superconducting Circuits

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Superconducting circuits have recently emerged as a leading platform for quantum computation, satisfying the challenges of controllability, long coherence, and strong interactions. Here we apply the same toolbox to the exploration of strongly correlated quantum materials made of microwave photons, and investigate the emerging quantum phases and quantum dynamics in both coherent and driven-dissipative settings. I will talk about recent work where we experimentally demonstrated a new approach for preparing photonic many-body states in superconducting circuits using engineered dissipation. In a separate experiment, we realized a topological lattice for microwave photons and observe the dynamics of protected edge states. I will briefly introduce the directions we are currently pursuing in my new lab.