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Realization of Gapped Flat Band Models in Circuit QED[1] MATTIAS FITZPATRICK, ALICIA KOLLAR, ANDREW HOUCK, Princeton University — After close to two decades of research and development, superconducting circuits have emerged as a rich platform for both quantum computation and quantum simulation. In this talk, we will explore a novel lattice, called the heptagon-pentagon-kagome (HPK) lattice, created by interspersing pentagons and heptagons in a standard kagome lattice. The HPK lattice is incompatible with other quantum simulators, but readily achievable in circuit QED. In contrast to the well-known kagome lattice, it exhibits a dispersion-less flat band which is gapped from the rest of the spectrum. Because this flat band is spectrally isolated and dispersion-less, interactions are the dominant energy scale, enabling the study of strongly correlated, many-body photon states. We will explore the theoretical origin of this gapped flat band and show experimental results where we introduce effective photon-photon interactions via classical non-linearity using high kinetic-inductance materials such as NbTiN.

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