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Coupled Qubit-Cavity Arrays: Evolution of resonance with hopping FELIX NISSEN, University of Cambridge, JONATHAN KEELING, Scottish Universities Physics Alliance, University of St Andrews — Recent experiments on the light-matter interaction in superconducting qubits have sparked interest in the prospect of studying collective behaviour of coupled qubit-cavity arrays. Any such behaviour will necessarily be non-equilibrium, as the photon loss present in real cavities must be compensated by pumping. We study an array of coupled qubit-cavity systems, with the simplest pumping scheme, using a coherent field. Such pumping might be thought to destroy any interesting physics by imposing coherence on the system. Yet we show that the emerging phenomena are remarkably rich, focussing on the evolution from the antiresonance feature known in the Jaynes-Cummings model [1] as one increases hopping strength between the coupled cavities. We study both the coherent field (as can be measured by homodyne detection) and the fluorescence spectrum, comparing numerical simulations to analytic approximations valid in the limits of large and small hopping. The steady state coherent field depends non-monotonically on the hopping strength, as a crossover occurs from polariton blockade physics at small hopping to semiclassical behaviour at large hopping.

[1] Bishop et al., Nat. Phys. 5, 105 - 109 (2009)

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