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Strongly correlated photons from single quantum dots in polarization degenerate micropillar cavities[1] J. A. FREY, UC Santa Barbara, H. SNIJDERS, Leiden University, J. NORMAN, E. C. LANGMAN, UC Santa Barbara, M. P. BAKKER, Leiden University, A. GOSSARD, J. E. BOWERS, UC Santa Barbara, M. P. VAN EXTER, W. LOFFLER, Leiden University, D. BOUWMEESTER, UC Santa Barbara, Leiden University — A self-assembled quantum dot embedded in an oxide tapered microcavity forms a compact and robust cavity quantum electrodynamics (CQED) system for applications in quantum information science, such as, single and entangled photon sources, quantum repeaters, and photonic quantum gates. In a polarization degenerate microcavity, a quantum dot can couple to both polarizations of a cavity mode. This enables polarization-based filtering of photons that interacted with the quantum dot. We show that this enables transforming coherent laser light into a stream of strongly correlated photons with a record high $g^2(0)$ in the solid state [1]. Further, by comparison to numerical simulations, we obtain first indication of Jaynes-Cummings physics in the weak-coupling regime of CQED. Polarization degeneracy is complicated by inherent imperfections in the fabrication of the micropillar cavities by residual ellipticity and strain. The splitting of the polarized modes must be fine-tuned in some way, usually involving tuning of birefringence through strain. As a convenient alternative we show first results on electro-optic tuning through a Schottky gate over one of the cavity mirrors. [1] Nat. Commun. 7, 12578 (2016).

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