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Tuning the Photon Statistics of a Strongly Coupled Nanophotonic System[1] C DORY, K A FISCHER, K MÜLLER, K G LAGOUDAKIS, T SARMIENTO, A RUNDQUIST, J L ZHANG, Y KELAITA, N V SAPRA, J VUČKOVIĆ, E. L. Ginzton Laboratory, Stanford University, Stanford, California 94305, USA — Strongly coupled quantum-dot-photonic-crystal cavity systems provide a nonlinear ladder of hybridized light-matter states, which are a promising platform for non-classical light generation. The transmission of light through such systems enables light generation with tunable photon counting statistics. By detuning the frequencies of quantum emitter and cavity, we can tune the transmission of light to strongly enhance either single- or two-photon emission processes. However, these nanophotonic systems show a strongly dissipative nature and classical light obscures any quantum character of the emission. In this work, we utilize a self-homodyne interference technique combined with frequency-filtering to overcome this obstacle. This allows us to generate emission with a strong two-photon component in the multi-photon regime, where we measure a second-order coherence value of $g^{(2)}[0] = 1.490 \pm 0.034$. We propose rate equation models that capture the dominant processes of emission both in the single- and multi-photon regimes and support them by quantum-optical simulations that fully capture the frequency filtering of emission from our solid-state system. Finally, we simulate a third-order coherence value of $g^{(3)}[0] = 0.872 \pm 0.021$.

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