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Single-photon nonlinearity of a semiconductor quantum dot in a cavity FRANK BELLO, DANIELE SANVITTO, FABRICE LAUSSY, PAOLO GUIMARAES, DAVID WHITTAKER, MAURICE SKOLNICK, A. TAHRAOUI, P.W. FRY, M. HOPKINSON, University of Sheffield — A single atom in a cavity is the model system of cavity quantum electrodynamics (CQED).In the weak coupling regime, where losses exceed the interaction energy between atoms and the cavity mode, irreversible decay of the excitations occurs. Strong coupling, which corresponds to the reversible exchange of energy between the atom and the mode opens up a much wider range of CQED phenomena. We present evidence depicting non-linear effects for a quantum dot embedded within a semiconducting micropillar cavity. Emission spectra show transitions from the strong to weak coupling regime between the n=2 and n=1 photon states. Transforming from a system with weak coupling and low pumping to one with higher pumping, lessens the conditions needed for strong coupling due to the increased number of photons inside the cavity. Good agreement with theoretical calculations using the Jaynes-Cummings ladder model is also shown, along with corresponding transition rates.

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