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Two-Photon Blockade in an Atom-Driven Cavity QED System CHRISTOPH HAMSEN, KARL NICOLAS TOLAZZI, TATJANA WILK, GERHARD REMPE, Max Planck Institute of Quantum Optics — The n-photon blockade is a dynamical quantum-nonlinear effect in which the absorption of n photons blocks the absorption of the $(n+1)$th photon. This effect can occur in driven systems with an anharmonic ladder of energy eigenstates, e.g. a single atom strongly-coupled to a high finesse optical resonator. While single-photon blockade has been demonstrated in such a system before [1], we now report on the first observation of two-photon blockade [2]. As a signature, we show a three-photon antibunching with simultaneous two-photon bunching observed in the light emitted from the cavity. The effect occurs for atom driving, not cavity driving. While the two-level atom can only add photons stepwise one-by-one, the bosonic enhancement for cavity driving increases the transition strengths towards higher manifolds which reduces the inherent nonlinearity of the system. We consider these results as a significant step towards multi-photon quantum nonlinear optics.
[1] Birnbaum et al., Nature 436,87 (2016)
[2] Hamsen et al., arXiv 1608.01571 (2016)

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