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Strong Interaction Between Light and a Single Trapped Atom Without a Cavity[1] MENG KHOON TEY, CQT/Physics Dept, Nat. Univ. Singapore, ZILONG CHEN, IMRE / ASTAR, SYED ALJUNID, BRENDA CHNG, GLEB MASLENNIKOV, CHRISTIAN KURTSIEFER, CQT/Physics Dept, Nat. Univ. Singapore — We measured the extinction of a focused light beam by a single 87Rb atom localized in an optical dipole trap and found a value of 9.7% for a focused Gaussian beam resonantly interacting with an atomic two-level system. Various models describing interaction of an atom with a focused light field are compared to explain our experimental result. Our experiment suggests that a strong coupling may be achieved without cavity assistance. This opens new perspectives for an efficient quantum state transfer of a photonic qubit into an atom. Furthermore, the strong effecitive nonlinerity of the atom may be used to efficiently implement a phase gate between two photons.

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Christian Kurtsiefer
Centre for Quantum technologies/ Physics Dept, Nat. Univ. Singapore

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