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A Quantum Electrodynamics Kondo Circuit with Orbital and Spin Entanglement MARCO SCHIRO, CNRS IPhT CEA Saclay, GUANG-WEI DENG, Key Laboratory of Quantum Information, University of Science and Technology of China, LOIC HENRIET, Centre de Physique Theorique, Ecole polytechnique, CNRS, Universite Paris-Saclay, F-91128 Palaiseau, France, DA WEI, SHU-XIAO LI, HAI-OU LI, GANG CAO, MING XIAO, GUANG-CAN GUO, Key Laboratory of Quantum Information, KARYN LE HUR, Centre de Physique Theorique, Ecole polytechnique, CNRS, GUO-PING GUO, Key Laboratory of Quantum Information — Recent progress in nanotechnology allows to engineer hybrid mesoscopic devices comprising on chip an artificial atom or quantum dot, capacitively coupled to a microwave (superconducting) resonator and to biased metallic leads. Here, we build such a prototype system where the artificial atom is a graphene double quantum dot (DQD) to probe non-equilibrium aspects of strongly-entangled many body states between light and matter at the nanoscale. Controlling the coupling of the photon field and the charge states of the DQD, we measure the microwave reflection spectrum of the resonator. When the DQD is at the charge degeneracy points, experimental results are consistent with a Kondo impurity model entangling charge, spin and orbital degrees of freedom with the quantum fluctuations of the cavity photon. The light coming out from the resonator reveals the formation of the Kondo or Abrikosov-Suhl resonance at low temperatures. We also explore other routes to investigate nonlinear transport by increasing the microwave power, the bias and gate voltages.

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