

Strong Interaction Between a Single Artificial Atom and Propagating Microwave Photons

Io-Chun Hoi^a, C.M. Wilson^a, Göran Johansson^a, Tauno Palomaki^a, Borja Peropadre^b, and Per Delsing^a

^aDepartment of Microtechnology and Nanoscience (MC2), Chalmers University of Technology, Gothenburg, Sweden

^bInstituto de Física Fundamental Serrano, CSIC, Madrid, Spain

We have experimentally investigated a single superconducting three-level artificial atom strongly coupled to a superconducting one dimensional open transmission line. We have observed strong coupling between the artificial atom and propagating microwave photons, revealed by the high degree of scattering of an incident microwave field¹. By exploiting the phenomenon of electromagnetically induced transparency (EIT), we can route a single photon signal² from an input port to either of two output ports with an on-off ratio of approximately 90%. The switching time of the router is shown to be a few nanoseconds, consistent with theoretical expectations and the device parameters. Besides the router, we also observed some fundamental phenomena of the single atom, such as strong nonlinearity, anomalous dispersion and the Mollow triplet.

¹O. Astafiev, A. M. Zagoskin, A. A. Abdumalikov, Y. A. Pashkin, T. Yamamoto, K. Inomata, Y. Nakamura, and J. S. Tsai, *Science* **327**, 840 (2010).

²Io-Chun Hoi, C.M. Wilson, Göran Johansson, Tauno Palomaki, Borja Peropadre and Per Delsing, arXiv:1103.1782v1(2011).