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Giant Cross Kerr Effect via a Superconducting Artificial Atom I.-C. HOI, C.M. WILSON, G. JOHANSSON, T. PALOMAKI, Department of Microtechnology and Nanoscience (MC2), Chalmers University of Technology, Sweden, T.M. STACE, B. FAN, Centre for Engineered Quantum Systems, School of Physical Sciences, University of Queensland, Australia, A. FRISK KOCKUM, L. TORN-BERG, P. DELSING, Department of Microtechnology and Nanoscience (MC2), Chalmers University of Technology, Sweden — We investigate the effective interaction between two microwave fields, mediated by a superconducting artificial atom (transmon qubit) which is strongly coupled to a coplanar transmission line. The interaction between the fields and atom realizes an effective cross Kerr coupling. Using this, we demonstrate average Kerr phase shifts of up to 25 degrees per photon with both coherent microwave fields at the single-photon level. Our results provide an important step towards quantum gates with propagating photons in the microwave regime.

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