Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Splitting individual Cooper pairs and single photon detection in superconducting aluminium MEGAN EDWARDS, NICHOLAS LAMBERT, ADAM ESMAIL, ANDREW FERGUSON, University of Cambridge, BRENDON LOVETT, University of St. Andrews, FELIX POLLOCK, University of Oxford, UNIVERSITY OF CAMBRIDGE TEAM, UNIVERSITY OF OXFORD/ UNIVERSITY OF ST. ANDREWS TEAM[1] — Using superconducting aluminum quantum dots, we demonstrate the splitting of individual Cooper pairs using microwave light [1]. Within our nanoscale devices, the competition at low temperatures between the charging energy, superconducting gap and Josephson energy enables single Cooper pairs to be split and reformed. The delivery of constituent quasi-particles to separate quantum dots has facilitated measurements of both splitting and recombination. The devices are probed by radio-frequency reflectometry, a technique sensitive to the 'quantum capacitance' of the device band structure [2]. We intentionally induce splitting via the application of a microwave field, indicating a system able to detect individual photons of microwave light [1]. To controllably separate a Cooper pair into two quasi-particles may have important implications for quantum information processing; future experiments will investigate the coupling of a double quantum dot to a microwave resonator for single photon detection [3], with applications to circuit quantum electrodynamics.

[1] N. J. Lambert *et al.*, Phys. Rev. B., 90, 140503(R), 2014
[2] T. Duty *et al.*, Phys. Rev. Lett., 95, 206807, 2005
[3] M. Göppl *et al.*, J. Appl. Phys., 104, 113904, 2008

[1]Valuable contributions to this work have been made by a joint team from the Universities of Oxford and St. Andrews.

Megan Edwards
University of Cambridge

Date submitted: 14 Nov 2014 Electronic form version 1.4