Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

High-efficiency Cooper pair splitting demonstrated by two-particle conductance resonance and positive noise cross-correlation YUVAL RONEN, ANINDYA DAS, MOTY HEIBLUM, DIANA MAHALU, ANDREY KRETININ, HADAS SHTRIKMAN, Weizmann Institute of Science, MOTY HEIBLUM LAB TEAM — Entanglement is at the heart of the Einstein-Podolsky-Rosen paradox, where the non-locality is a necessary ingredient. Cooper pairs in superconductors can be split adiabatically, thus forming entangled electrons. Here, we fabricate such an electron splitter by contacting an aluminum superconductor strip at the centre of a suspended InAs nanowire. The nanowire is terminated at both ends with two normal metallic drains. Dividing each half of the nanowire by a gate-induced Coulomb blockaded quantum dot strongly impeds the flow of Cooper pairs due to the large charging energy, while still permitting passage of single electrons. We provide conclusive evidence of extremely high efficiency Cooper pair splitting via observing positive two-particle correlations of the conductance and the shot noise of the split electrons in the two opposite drains of the nanowire. Moreover, the actual charge of the injected quasiparticles is verified by shot noise measurements.

Yuval Ronen
Weizmann Institute of Science

Date submitted: 11 Nov 2012 Electronic form version 1.4