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Positive Noise Cross Correlation in a Copper Pair Splitter. ANINDYA DAS, YUVAL RONEN, MOTY HEIBLUM, HADAS SHTRIKMAN, DIANA MAHALU, Weizmann Institute of Science, MOTY'S GROUP TEAM — Entanglement is in heart of the Einstein-Podolsky-Rosen (EPR) paradox, in which non-locality is a fundamental property. Up to date spin entanglement of electrons had not been demonstrated. Here, we provide direct evidence of such entanglement by measuring: non-local positive current correlation and positive cross correlation among current fluctuations, both of separated electrons born by a Cooper-pair-beam-splitter. The realization of the splitter is provided by injecting current from an Al superconductor contact into two, single channel, pure InAs nanowires - each intercepted by a Coulomb blockaded quantum dot (QD). The QDs impedes strongly the flow of Cooper pairs allowing easy single electron transport. The passage of electron in one wire enables the simultaneous passage of the other in the neighboring wire. The splitting efficiency of the Cooper pairs (relative to Cooper pairs actual current) was found to be $\sim 40\%$. The positive cross-correlations in the currents and their fluctuations (shot noise) are fully consistent with entangled electrons produced by the beam splitter.

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