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Observation of two-particle Aharonov-Bohm interference IZHAR NEDER, NISSIM OFEK, YUNCHUL CHUNG, Braun Center for Submicron Research, Department of Condensed Matter Physics, Weizmann Institute of Science, Rehovot 76100, Israel, MOTY HEIBLUM, Department of Physics, Pusan National University, Busan 609-735, Korea, DIANA MAHALU, VLADIMIR UMANSKY, Braun Center for Submicron Research, Department of Condensed Matter Physics, Weizmann Institute of Science, Rehovot 76100, Israel — *Nature* **448**, 333-337 (19 July 2007) We report the first observation of quantum interference between two independent & non-interacting electrons in a unique interferometer proposed by Yurke et. al. [1] & Samuelsson et. al. [2]. The interference fringes were observed only in the joint probability of electrons arrival at two different drains; hence being the quantum analogue to the Hanbury Brown & Twiss (HBT) experiment with classical waves [3]. This, sought after, counter intuitive effect, is a direct result of the quantum exchange statistics of identical quantum particles. Our observation is a signature of orbital entanglement between two independent electrons, even though they never interacted with each other. [1] B. Yurke & D. Stoler, Phys. Rev. A46, 2229-2234 (1992) [2] P. Samuelsson, E. V. Sukhorukov & M. Buttiker, Phys. Rev. Lett. 92, 02685 (2004). [3] R. Hanbury Brown & R. Q. Twiss, Phil. Mag. 45, 663-682 (1954).

Izhar Neder
Braun Center for Submicron Research, Department of Condensed
Matter Physics, Weizmann Institute of Science,
Rehovot 76100, Israel

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