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Observation of replica dispersions in interacting 1D wires[1]
CHRISTOPHER FORD, YIQING JIN, MARIA MORENO, WOOI LIAT TAN, ANKITA ANIRBAN, JON GRIFFITHS, IAN FARRER, DAVID RITCHIE, University of Cambridge, ANNE ANTHORE, Universite Paris Diderot, OLEKSANDR TSYPLYATYEV, ANDREW SCHOFIELD, University of Birmingham — At low excitation energies, a system of interacting one-dimensional (1D) electrons can be described theoretically as a Tomonaga-Luttinger liquid. However, it is only in the last few years that theoreticians have developed models of the behaviour at energies comparable to the Fermi energy, predicting 'replicas' of the dispersion relation offset by multiples of the Fermi wave-vector. We measure momentum-resolved tunnelling of electrons between 1D wires formed within a GaAs heterostructure and a 2D electron gas used as a spectrometer and have previously found well-resolved spin-charge separation at low energy with appreciable interaction strength. Now we have detected structure resembling a replica, which dies away quite rapidly at high momentum, in line with the most recent theory. We have fabricated arrays of wires with lengths between 1 and 20μm, after developing a reliable technique to make thousands of 'air-bridges' on each device. The replica seems strongest in the short wires, again as predicted by the theory. [Moreno *et al., Nat. Commun.* **7**, 12784 (2016); Tsyplyatyev *et al., Phys. Rev. Lett.* **114**, 19640 (2015); Tsyplyatyev *et al., Phys. Rev. B*, **93**, 075147 (2016).]

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