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Scanning Gate Microscopy of Single-Walled Carbon Nanotubes
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The one dimensional nature of single-walled carbon nanotubes (SWCNTs) causes their low energy properties to be described by Luttinger liquid theory. Using low-temperature scanning probe microscopy and electrical transport measurements, we have investigated the electronic properties of SWCNTs. Individual SWCNTs were contacted with Pd electrodes and located using atomic force microscopy. The AFM operating at 300 mK was used to probe the SWCNTs using scanning gate microscopy. Differential conductance as a function of source-drain bias voltage and gate voltage showed Coulomb diamond patterns. Using a voltage on the AFM tip, we are able to probe the spatial dependence of the conductance. The ability to perform simultaneous electrical transport and scanning probe microscopy measurements allows us to test theoretical predictions about Luttinger liquids including spin-charge separation.

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