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Scanning probe microscopy of spin-charge separation IDDO USSISHKIN, LEONID I. GLAZMAN, William I. Fine Theoretical Physics Institute, University of Minnesota — In one-dimensional systems, interaction between electrons modify the nature of the state, as described by Luttinger liquid theory. Spin and charge propagate independently with different velocities. We consider the possibility of probing this spin-charge separation with a scanning probe microscopy technique. Specifically, we consider an experimental setup in which the scanning tip is used to create a local potential that scatters electrons, without tunneling from tip to sample. We analyze the effect of this auxiliary scatterer on the conductance of a semi-infinite one-dimensional system. We find that the differential conductance for tunneling into the end of the quantum wire reflects the separation of the elementary excitations into spin and charge modes for realistic interaction strength. The separation is revealed as a specific moire pattern in the dependence of the differential conductance on bias and on the position of the scatterer (induced by the scanning tip). This pattern is associated with the difference between the velocities of the spin and charge modes.

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