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Variable-range cotunneling and non-Ohmic transport in a chain of one-dimensional quantum dots MICHAEL M. FOGLER, University of California San Diego, SERGEY V. MALININ, Wayne State University, THOMAS NATTERMANN, Universitat zu Koln — A 1D wire with a finite density of strong random impurities is modeled as a chain of weakly coupled quantum dots. The resistance of such a system is shown to exhibit a rich dependence on bias voltage V and temperature T due to the interplay of Coulomb blockade, Luttinger-liquid, and disorder effects. At low T and V electrons propagate through the wire by means of thermal activation and a multiple cotunneling. In this regime the resistance is limited by the "breaks": randomly occurring clusters of dots with a special length distribution pattern that inhibits the transport no matter how the activation and tunneling are combined. As T or V increases, the breaks become shorter and less resistive. The resistance can exhibit a (stretched) exponential and a quasi power-law dependence on T and V depending on the position at the T-V diagram. Unlike the case of a single impurity the effect of T and eV is not symmetric. The Ohmic resistance of a macroscopic wire is always dictated by breaks not single impurities. Our results imply that the power-laws reported in several recent transport measurements of one-dimensional systems may reflect not only intrinsic Luttinger parameters but also impurity distribution statistics.

Michael Fogler
UCSD

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