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Elementary charge-transfer processes in mesoscopic conductors MIHAJLO VANEVIC, Georgia Institute of Technology, YULI NAZAROV, Delft University of Technology, The Netherlands, WOLFGANG BELZIG, Universität Konstanz, Germany — We determine charge-transfer statistics in a quantum conductor driven by a time-dependent voltage and identify the elementary transport processes. At zero temperature unidirectional and bidirectional single-charge transfers occur. The unidirectional processes involve electrons injected from the source terminal due to excess dc bias voltage. The bidirectional processes involve electron-hole pairs created by time-dependent voltage bias. This interpretation is further supported by the charge- transfer statistics in a multiterminal beam-splitter geometry in which injected electrons and holes can be partitioned into different outgoing terminals. The probabilities of elementary processes can be probed by noise measurements: the unidirectional processes set the dc noise level, while bidirectional ones give rise to the excess noise. For ac voltage drive, the noise oscillates with increasing the driving amplitude. The decomposition of the noise into the contributions of elementary processes reveals the origin of these oscillations: the number of electron-hole pairs generated per cycle increases with increasing the amplitude. The charge- transfer statistics at finite temperature can be interpreted in terms of multiple-charge transfers with probabilities which depend on energy and temperature.

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