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Realization of a time-controlled subnanosecond single electron source for ballistic qubits

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Abstract

We report on the realization of a single electron source similar to single photon sources in optics providing an important brick for the implementation of flying quantum bits in ballistic conductors. On-demand single electron injection is obtained using a quantum dot connected to the conductor via a tunnel barrier of variable transmission (quantum point contact). Electron emission is triggered by a sudden change of the dot potential which brings a single energy level above the Fermi energy in the conductor. A single charge is emitted on an average time ranging from 100 ps to 10 ns ultimately determined by the barrier transparency and the dot charging energy.

Keywords: Single electron source; ac current quantization; Nanosecond; Ballistic conductors

PACS classification codes: 73.23.−b; 73.23.Hk; 73.43.Cd

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