Abstract Submitted
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Direct observation of single-electron tunneling oscillations JONAS BYLANDER, TIM DUTY, PER DELSING, Dept. MC2, Chalmers University of Technology, Sweden — We report real time detection of time correlated single-electron tunneling oscillations in a series array of small tunnel junctions[1]. Here the current, I, is made up of a lattice of charge solitons moving throughout the array by time correlated tunneling with frequency $f = I/e$, where e is the electron charge. This phenomenon is analogous to the a.c. Josephson effect, but not fully dual since the oscillations are not coherent. To detect the single electrons, we have integrated the array with an RF-SET and injected the full charge into the SET island. In this fundamentally new way we have measured extremely small currents[2], ranging from 5 fA to 1 pA by counting single electrons. Our results suggest that very good accuracy can be achieved in the future. Since current is related to frequency by a natural constant only, the measurement is self calibrated and does not suffer from offset or drift; it also opens a possibility to realize the quantum metrological triangle.

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