I(V) characteristics of one-dimensional tunnel junction arrangements

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Within the framework of a semiclassical model, an analytical approach is presented to determine Coulomb blockade and single electron tunneling (SET) phenomena for arbitrary tunnel junctions coupled in series. The Coulomb gap in the I(V) curves is obtained as a simple function of the capacitances in the series, and a "recipe" for the determination of particular voltages, at which steps occur, is given. The magnitude of the differential conductivity at the current onset is calculated. The results are useful for a qualitative and quantitative analysis of experimental I(V) curves and are compared with Monte Carlo simulations and experimental data.