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In mesoscopic physics, a Coulomb blockade, named after Charles-Augustin de Coulomb's electrical force, is the decrease in electrical conductance at small bias voltages of a small

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electronic device comprising at least one low-capacitance tunnel junction. Because of the CB, the conductance of a device may not be constant at low bias voltages, but disappear for biases under a certain threshold, i.e. no current flows. Coulomb blockade can be observed by making a device very small, like a quantum dot

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## **Coulomb blockade - Wikipedia**

The field of single charge tunneling comprises of phenomena where the tunneling of a microscopic charge, usually carried by an electron or a Cooper pair, leads to macroscopically observable effects. The first conference entirely devoted to this new field was the NATO Advanced Study

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Institute on Single Charge Tunneling held in Les Hauches ...

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charge tunneling, a phenomenon whereby the tunneling of a microscopic charge, usually carried by an electron or a Cooper pair, leads to macroscopically observable effects.

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Single Charge Tunneling: Coulomb Blockade Phenomena In Nanostructures. M. H. Devoret, H. Grabert (auth.), Hermann Grabert, Michel H. Devoret (eds.) The field of single charge tunneling comprises of phenomena where the tunneling of a

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microscopic charge, usually carried by an electron or a Cooper pair, leads to macroscopically observable effects. The first conference entirely devoted to this new field was the NATO Advanced Study Institute on Single Charge Tunneling held in Les Hauches ...

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tunneling, coulomb  
blockade phenomena  
in nanostructures.

Edited by H. Grabert  
and M. H. Devoret,  
NATO Adv. Sci. Inst.

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These observations indicate that the results are intrinsic to transport through the SiNWs, and moreover, are consistent with Coulomb blockade (CB) phenomena resulting from single charge tunnelling through a single quantum structure (e.g. the

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SiNW) with discrete energy levels [44,45 ]. Sign in to download full-size image Figure 5.9.

## **Coulomb Blockade - an overview | ScienceDirect Topics**

The field of single charge tunneling comprises of phenomena where the tunneling of a microscopic charge, usually carried by an electron or a Cooper pair, leads to macro



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scopically observable effects. The first conference entirely devoted to this new field was the NATO Advanced Study Institute on Single Charge Tunneling held in Les Hauches, France, March 5-15, 1991.

## **Single Charge Tunneling | SpringerLink**

referred to as Coulomb blockade. For the

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energy consideration presented in this section it was important that the charge on the capacitor is well defined and continuous even on the scale of an elementary charge. Only a junction charge less than  $e/2$  together with the fact that tunneling always changes this charge by  $e$  gave rise to the possibility of a

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## **Charge Tunneling Rates in Ultrasmall Junctions**

As a result of the blockade, coherent oscillations of the voltage can arise even in the absence of Josephson coupling, e.g., for single-electron tunneling (SET) between normal metal electrodes. The most significant features of these "SET" oscillations and their coexistence with Bloch oscillations

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Coulomb  
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in Josephson junctions are studied in detail.

## Phenomena In Nanostructures Coulomb blockade of single-electron tunneling, and ...

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Single charge tunneling : Coulomb blockade phenomena in nanostructures.

[Hermann Grabert;  
Michel H Devoret;  
North Atlantic Treaty Organization. Scientific Affairs Division.;]

## Single charge

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## **Coulomb tunneling : Coulomb blockade**

### **phenomena in ...**

In order to transfer a single electron through the DBTJ, the electron must overcome the Coulomb charging energy  $E_c = e^2 / C_\Sigma$ , where  $C_\Sigma = \sum C_i$ . If the charging energy  $E_c$  is much larger than the thermal energy  $kBT$ , the tunneling of an electron is blocked for bias voltages smaller than  $U_c = e / C_\Sigma$ .

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a NATO Advanced  
Study Institute on  
Single Charge  
Tunneling, held March  
5-15, 1991, in Les  
Houches, France"--Title  
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## **Single charge tunneling: Coulomb blockade phenomena in ...**

As we will discuss, the single-electron charging energy can cause a "Coulomb blockade" of the Aharonov-Bohm effect in a quantum dot.<sup>30,31</sup> The magnetoconductance oscillations are suppressed when  $e^2/C$  becomes comparable to the Landau level

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Coulomb separation  $\hbar\omega_c$  (with  $\omega_c = eB/m$ ). However, the periodic oscillations as a function of gate voltage remain.

## **Coulomb-Blockade Oscillations in Semiconductor Nanostructures**

While Coulomb-Blockade devices have shown promise as qubit systems or qubit state detectors, large scale integration of



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Coulomb

these devices is severely hampered due to the low-frequency charge offset ( $Q_0$ ) drift in time. We note that an extrapolation of the  $1/f$  noise to lower frequencies cannot account for the large ( $\delta Q_0 \sim 1 e$ ) changes.

## **CHARGE OFFSET NOISE IN COULOMB-BLOCKADE DEVICES**

A single-electron transistor (SET) is a sensitive electronic

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device based on the Coulomb blockade effect. In this device the electrons flow through a tunnel junction between source/drain to a quantum dot (conductive island).

## **Single-electron transistor - Wikipedia**

article 'Operation of bistable phase-locked single-electron tunneling logic

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Coulomb elements' by T. Ohshima and R. Kiehl, 80 (2), 1996, p. 912-923). The principle is to use Coulomb oscillations of a single current biased tunnel junction. These oscillations can lock to a pump in a bistable fashion. The input signal determines to which phase

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transistor (SET) and  
semiconductor  
quantum dot (QD) are  
Coulomb blockade (CB)  
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