Desain parallel single electron transistor (SET) untuk mengontrol perpindahan elektron pada dua buah quantum dot (QD) dengan software simon 2.0 = Design of parallel single electron transistor (SET) to control an electron movement in two quantum dots (QDS) with simon 2.0 software

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Abstrak

Divais SET dapat digunakan untuk banyak aplikasi seperti single electron switching, single photon detector, single electron detector, quantum bit memory, dll. Untuk aplikasi seperti quantum bit memory, diperlukan dua buah quantum dot (QD) yang disusun secara paralel. Pada thesis ini, dua buah SET yang disusun secara paralel disimulasikan dengan software SIMON 2.0 untuk mendapatkan parameter-parameter yang diperlukan guna mengontrol perpindahan elektron antar QD. Dari hasil simulasi, didapatkan bahwa dua buah SET yang disusun secara paralel bertindak sebagai dua buah SET yang independen pada saat junction capacitance antar QD bernilai di atas 5×10–18 F. Perpindahan elektron antar QD terjadi apabila terdapat perbedaan potensial pada dua QD yang melebihi suatu nilai minimum. Nilai minimum tersebut dipengaruhi oleh resistansi dan kapasitansi junction capacitance. Semakin besar resistansi, nilai minimum perbedaan potensial yang diperlukan akan semakin membesar sedangkan apabila kapasitansi semakin besar, nilai minimum perbedaan potensial yang diperlukan akan semakin mengecil.

.....SET devices can be used in many applications, such as single electron switching, single photon detector, single electron detector, quantum bit memory, etc. For applications such as quantum bit memory, two quantum dots (QDs) in parallel position are required. In this thesis, two SETs in parallel configuration are simulated with SIMON 2.0 software in order to obtain parameters which are needed to control the interdot electron movement. From the results of the simulation, it is obtained that two SETs in parallel configuration will act as two independent SETs when the interdot junction capacitance is above 5×10–18 F. The interdot electron movement occurs when a potential difference exist between the two QDs. The same potential difference must surpass the required minimum value which is influenced by the interdot resistance and capacitance. The bigger the resistance, the required minimum value of potential difference will be increased while the bigger the capacitance, the required minimum value of potential difference will be decreased.