Correlated coherent oscillations in coupled semiconductor charge qubits
- Development of multi-functional quantum information processing devices using semiconductor nano-structures -

NTT

Motivation

An electron spin or charge confined in a semiconductor quantum dot can be used as a quantum bit (qubit). We aim at developing multi-functional quantum information devices based on semiconductor nano-structures.

Originality

Two-qubit operation can be performed by controlling the correlation between two qubits. We have demonstrated two-qubit operations such as controlled rotation (CROT) and SWAP operation by applying high-frequency voltage pulses to the qubit.

Impact

Using this multi-functional quantum information device, we are trying to demonstrate more sophisticated operation such as creation of quantum entanglement state. This kind of device is expected to be one of the important components in the future quantum computer.
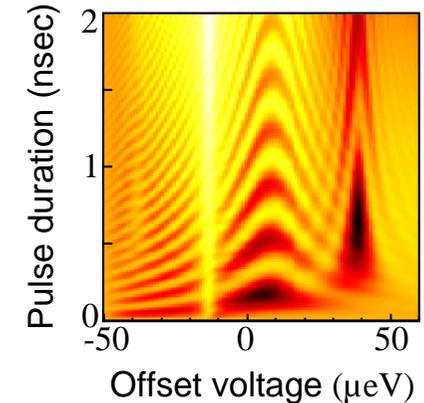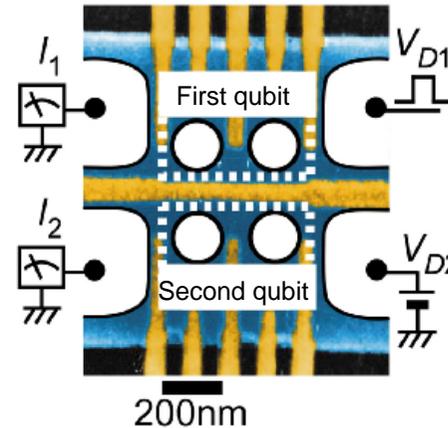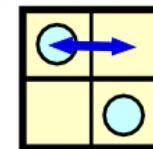

Multi-functional quantum information processing device fabricated by using GaAs/AlGaAs heterostructure (upper left), Simulation of correlated coherent oscillations (upper right)
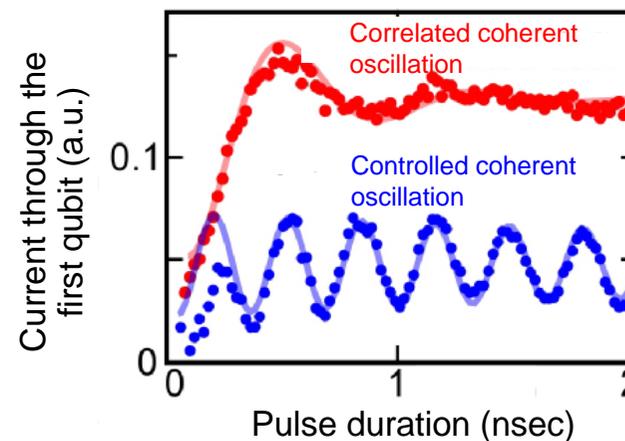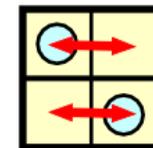
Controlled (blue) and correlated (red) coherent oscillation.