Abstract Submitted
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High-Frequency Electron Pumps used as an Entangler[1] S. J. WRIGHT, Cavendish Lab, Cambridge, GODFREY GUMBS, Hunter College/CUNY, MICHAEL PEPPER, M. D. BLUMENTHAL, Cavendish Lab, Cambridge, DANHONG HUANG, USAF Research Lab — We calculate the exchange interaction of two interacting electrons that are captured in the quantum dot (QD) formed by the DC electric potential applied to a pair of gates. A giga hertz AC pulse is applied to one of the gates to pump electrons from below the Fermi level. We shall discuss the mechanism for capturing and ejecting electrons from the quantum dot and the characteristics of the pumped current as a function of the DC voltage. A simple model for the observed temperature dependence of the pumped current will be presented. The measured current shows plateaus at Nef, where $N = 1, 2, \cdots$, e is the magnitude of the electron charge and f is the frequency of the pulse. The QD capturing the electrons is modeled by a harmonic confining potential. We calculate the spin singlet and spin triplet energies which then determine the exchange interaction J for $N = 2$. As the QD moves from just above the Fermi level to a height when the electrons are ejected, the confinement is strong just after the capture but the size of the QD continues to increase. When the size of the QD is increased, we show that the energy of the spin singlet and spin triplet state gets larger over a range of values for the size of the QD. We will present calculated results for the energies of entangled electrons and possible related experiments.

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