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Correlation effects with low electron density along a potential barrier in quantum point contacts[1] KARAN ARYANPOUR, JONG HAN, Department of Physics, SUNY at Buffalo — We study correlated electrons effect in the conductance through Quantum Point Contacts (QPC). Conductance of a QPC is quantized in steps of $G_0 = 2e^2/h$ (e the charge of an electron and h Planck's constant). Experiments also reveal an additional shoulder near $0.7G_0$ referred to as the *0.7 Anomaly*. Evidence supporting spin 1/2 magnetic moment formation in the conductance channel has motivated scenarios such as the Kondo effect. We intend to address whether or not the 0.7 anomaly is a many-body effect associated with the formation of a spin 1/2 magnetic moment in the conductance channel. We employ the Quantum Monte Carlo (QMC) technique for electrons on a 1-D QPC lattice with an adiabatic potential barrier. The QPC lattice includes the Hubbard lattice in the QPC region and two leads modeled by semi-infinite chains and we calculate the conductance along the chain using the Kubo formula. The physics is determined by the competition between the many-body interaction and the small kinetic energy at the top of the potential barrier. Due to the singular nature of the density of states at low electron density along with the spatial inhomogeneity, the many-body effects are expected to differ from conventional wide-band limit physics.

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