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Steady State Charge Transport in Quantum Dots: Nonequilibrium Green's Function (NEGF) vs. Single Electron Analysis

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Abstract : In this paper, we present a quantum transport study of a quantum dot in steady state in the presence of static gate potential. We consider a quantum dot coupled to the two metallic leads. The quantum dot under study is modeled through Anderson Impurity Model (AIM) with hopping parameter modulated through voltage drop between leads and the central dot region. Based on the Landauer's formula derived from Nonequilibrium Green's Function and Single Electron Theory, the essential ingredients of transport properties are revealed. We show that the results out of two approaches closely agree with each other. We demonstrate that Landauer current response derived from single electron approach converges with non-zero interaction through gate potential whereas Landauer current response derived from Nonequilibrium Green's Function (NEGF) hits a pole.

Keywords : Anderson impurity model (AIM), nonequilibrium Green's function (NEGF), Landauer's formula, single electron analysis
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