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Enhancement of shot noise due to the fluctuation of Coulomb interaction DUO LI, LEI ZHANG, FUMING XU, JIAN WANG, Department of Physics, The University of Hong Kong, DEPARTMENT OF PHYSICS AND THE CENTER OF THEORETICAL AND COMPUTATIONAL PHYSICS TEAM — We have developed a theoretical formalism to investigate the contribution of fluctuation of Coulomb interaction to the shot noise based on Keldysh non-equilibrium Green's function method. We have applied our theory to study the behavior of dc shot noise of atomic junctions using the method of nonequilibrium Green's function combined with the density functional theory (NEGF-DFT). In particular, for atomic carbon wire consisting 4 carbon atoms in contact with two Al(100) electrodes, first principles calculation within NEGF-DFT formalism shows a negative differential resistance (NDR) region in I-V curve at finite bias due to the effective band bottom of the Al lead. We have calculated the shot noise spectrum using the conventional gauge invariant transport theory with Coulomb interaction considered explicitly on the Hartree level along with exchange and correlation effect. Although the Fano factor is enhanced from 0.6 to 0.8 in the NDR region, the expected super-Poissonian behavior in the NDR region is not observed. When the fluctuation of Coulomb interaction is included in the shot noise, our numerical results show that the Fano factor is greater than one in the NDR region indicating a super-Poissonian behavior.

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