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Title:Impact of induced bandgaps on sub-Poissonian shot noise in graphene armchair-edge nanoribbons
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Abstract:The impact of the bandgap induced by transversal constriction on the sub-Poissonian properties of graphene armchair-edge nanoribbons (GANRs) has been investigated in a theoretical perspective. For a typical GANR with a bandgap, the minimal conductivity at the Dirac point becomes more suppressed than that of the gapless case 4 e²/ π h, and the Fano factor becomes more enhanced than the originally predicted value 1/3. The amplitudes of conductivity suppression and Fano factor enhancement will grow large as the nanoribbon width decreases. And the variance of Fano factor is qualitatively consistent with the reported experimental data. The carriers of GANRs with gaps behave like counterparticles in a semiconductor, and the transition from the sub-Poissonian to a Poissonian process takes place gradually with the reduction of the nanoribbon width. For the low aspect ratio (the sample width over its length) limit, the shot noise property at the Dirac point is no longer sensitive to the boundary edges. For the high limit, it requires a larger aspect ratio for the minimal conductivity and maximal Fano factor to achieve stationary values than that of the gapless case. © 2012 American Institute of Physics.
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