TIME-DEPENDENT BALLISTIC TRANSPORT IN METALLIC GRAPHENE NANORIBBONS

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We theoretically investigate the time-dependent ballistic transport in metallic graphene nanoribbons of width W after the sudden switching of a bias voltage. The potential drop is linear across a central part of length L where the current is calculated. During the early transient time the current does not grow linearly in time but remarkably reaches a *temporary plateau* [1]. Such behavior allows us to define a *transient conductivity*, the value of which coincides with the minimal conductivity of two-dimensional graphene. At time L/v_F (v_F being the Fermi velocity) a cross-over takes place: the current changes abruptly and saturates at its final steady state value (second plateau). We show that the two plateaus develop with damped oscillations of totally different nature and demonstrate that the occurrence of the first plateau is independent of the boundary conditions. The transition from quasi-1D to bulk behavior ($W \to \infty$) is also analyzed.

References

[1] E. Perfetto, G. Stefanucci, and M. Cini, Phys. Rev. B, 82 (2010) 035446.