Hydrodynamic electron flow in graphene

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Abstract

Viscous electron flowing in graphene exhibits exotic signatures such as superballistic conduction. Twisting the geometry of the device is a must to observe hydrodynamic effects, and so, we have built different samples with different geometries, like nanoconstrictions, crenellated channels, Tesla valves and some others, designed to enhance hydrodynamic effects. We will show their electrical response as function of tempe-rature, carrier density and external magnetic field, finding for some of them scaling laws which help us discuss the different transport regimes. We support our findings with detailed simulations of the Boltzmann transport equation and have found an enhanced superballistic effect with a non-monotonic behaviour with the magnetic field. Our simulations provide the explanation for our experimental results contributing to a better under-standing of hydrodynamic transport and super-ballistic conduction.

References

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Figures

Figure 1: Optical images of two of our typical devices: **a)** Crenellated channel with a nano-constriction. **b)** Tesla valve geometry.