Ideal Sharvin contact in a multimode regime shows the conductance G≈GSharvin=g0kFW/π (with g0 the conductance quantum, kF the Fermi momentum, and W the contact width) accompanied by strongly suppressed shot noise quantified by small Fano factor F≈0. For ballistic graphene away from the charge-neutrality point, sub-Sharvin transport occurs, characterized by suppressed conductance G≈(π/4)GSharvin and enhanced shot noise F≈1/8. All these results can be derived from a basic and highly idealised model of quantum scattering, involving assumptions of infinite height and a perfectly rectangular shape of the potential barrier in the sample.

We have relaxed these assumptions and carried out analysis of scattering on smoothened barrier of finite height. We find that, tuning the barrier shape, one can modify the asymmetry between electron- and hole-doped systems. For electronic dopings, the system crosses from the Sharvin to sub-Sharvin transport regime as the potential becomes closer to the rectangular shape. In contrast, for hole dopings, the conductivity is strongly suppressed when the barrier is parabolic and slowly converges to sub-Sharvin value as the potential evolves towards a rectangular shape. In such a case, the Sharvin transport regime is inaccessible, shot noise is generically enhanced (with much slower convergence to F≈1/8) compared to the electron-doped case, and aperiodic oscillations of both G and F are prominent due to the formation of quasibound states.