

Negative correlation between charge carrier density and mobility fluctuations in graphene

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By carrying out simultaneous longitudinal and Hall measurements in graphene, we find that the 1/f noise for the charge carrier density is negatively correlated to that of mobility, with a governing behavior that differs significantly from the relation between their mean values. The correlation in the noise data can be quantitatively explained by a single parameter theory whose underlying physics is the trapping and de-trapping of the fluctuating charge carriers by the oppositely charged Coulomb scattering centers. This can alter the effective density of long-range scattering centers in a transient manner, with the consequent fluctuating effect on the mobility.