

Abstract Submitted
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Negative correlation between charge carrier density and mobility fluctuations in graphene¹ JIE PAN, Graduate Student, Physics Department, Hong Kong University of Science and Technology, JIANMING LU, Postdoctoral, Physics Department, Hong Kong University of Science and Technology, PING SHENG, Professor, Physics Department, Hong Kong University of Science and Technology, INSTITUTE OF PHYSICS AND DEPARTMENT OF ELECTROPHYSICS, NATIONAL CHIAO TUNG UNIVERSITY, TAIWAN COLLABORATION — 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. The longitudinal noise turns out to be dominated by the remaining component of the mobility fluctuations, and display no correlation to the Hall noise. Due to the negative correlation between charge carrier density and mobility fluctuations, the normalized PSD is smaller than that of the Hall noise.

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