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Thermal broadening effects on unstable plasmons in extrinsic graphene with injected carriers[1] BEN YU-KUANG HU, The University of Akron, ANTTI-PEKKA JAUHO, Danmarks Tekniske Universitet and Aalto University — We study theoretically the charge density collective oscillations (plasmons) of an extrinsic (*i.e.*, doped) graphene system into which charge carriers (either electrons or holes) are injected. When the injected carriers are sharply peaked so that the distribution function of the injected carriers can be well approximated by $f_{\text{inject}}(\mathbf{p}) = \mathbf{n}\delta(\mathbf{p} - \mathbf{p_0})$, some of the plasmons in the system become unstable, in the sense that the amplitudes of these plasmons grow exponentially in time (at least initially, in the linear-response regime). This effect is analogous to the two-stream instability that is seen in classical plasma systems. As with the classical plasma system, thermal broadening of the injected carriers tends to suppress the instability. We report a theoretical study of the effect of the thermal broadening of the injected carriers on the plasmon instability in graphene, and we delineate the parameters where the thermal effects completely suppress the instability.

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Ben Yu-Kuang Hu
The University of Akron

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