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Loss mechanisms in graphene plasmonics[1]

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"Dirac" plasmons are self-sustained carrier density oscillations that occur in a doped graphene sheet. These collective modes have recently attracted enormous experimental and theoretical interest for their potential use in plasmonics [1]. In this talk I will discuss the two most important figures of merit of "graphene plasmonics," namely the ratio between the Dirac plasmon wavelength and the illumination wavelength, and the Dirac plasmon damping rate. I will emphasize the subtle difference between plasmon lifetime and Drude transport scattering time. I will then present a theoretical framework that enables fully microscopic calculations of Dirac plasmon damping rates due to electron-electron [2], electron-impurity [3], and electron-phonon [4] collisions. Finally, I will conclude by discussing how our theoretical predictions compare with recent accurate measurements [5] in high-quality graphene sheets encapsulated in boron nitride.

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