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Proximity Resonance and Localized Surface Plasmons BO LIU, ERIC HELLER, Department of Physics, Harvard University — The collective excitation of conduction electrons in subwavelength nanostructures is known as Localized Surface Plasmon(LSP)[1]. Such plasmon modes has been intensively studied using noble nanoparticles . More recently, the possibility of building terahertz metamaterials supporting such LSP modes has been explored in graphene microribbons and microdisks. Unlike Surface Plasmon Polaritons(SPPs) at metal-insulator interface, LSP can be directly excited by light illumination and holds promise for applications in ultrasensitive biosensing, nano-optical tweezers and improved photovoltaic devices. In this paper, we consider the interaction of two LSPs in the weak coupling regime and show how an effect similar to the proximity resonance in the quantum scattering theory[**?**] gives rise to an asymmetric(quadrupole) mode with increased damping rate. The existence of this asymmetric mode relies on a small phase retardation between the two LSPs. This phase retardation, though small, is key to both increased damping rate for the asymmetric mode and reduced damping rate for the symmetric mode. When this small phase retardation is removed by changing the polarization of the exciting light,we show that the asymmetric mode can not be excited and the symmetric mode shows increased damping.

Bo Liu
Department of Physics, Harvard University

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