MESOSCOPIC ELECTRODYNAMICS OF METALS AND 2D MATERIALS

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Plasmonic phenomena in metals are commonly explored within the framework of classical electrodynamics and semiclassical models for the interactions of light with free-electron matter. The more detailed understanding of mesoscopic electrodynamics at metal surfaces is, however, becoming increasingly important for both fundamental developments in quantum plasmonics [1] and potential applications in emerging light-based quantum technologies [2]. While this intuitively calls for a full quantum description of plasmon-enhanced light-matter interactions, recent discoveries suggest how classical electrodynamics may still suffice if appropriately dressed by quantum-corrected mesoscopic boundary conditions — surface-response formalism [3, 4, 5, 6].

The plenary will address three cases, where mesoscopic electrodynamic effects matter: plasmon-emitter interactions [7], electronic surface states in crystalline materials [8], and plasmon-polariton interactions in graphene-on-metal structures [9]. Finally, prospects for probing electrodynamics of correlated electron materials are discussed [10].

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