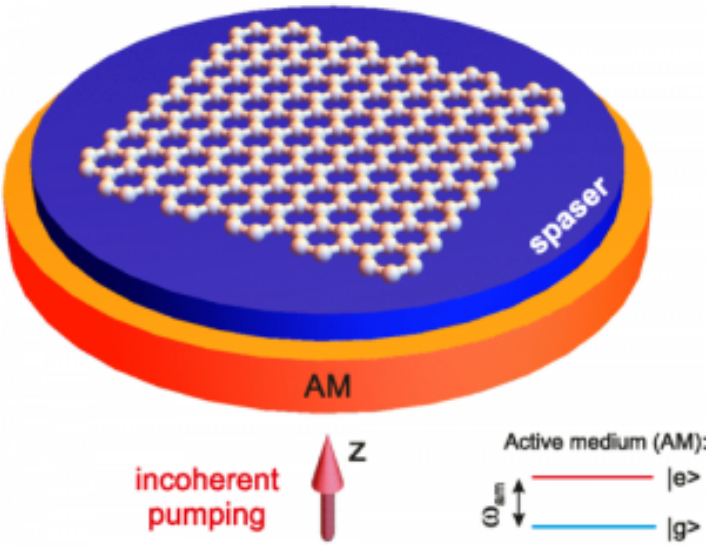
Self-consistent description of graphene quantum amplifier



The development of active and passive plasmonic devices is challenging due to the high level of dissipation in *normal* metals. One possible solution to this problem is using *alternative* materials. Graphene is a good candidate for plasmonics in the near-infrared region. In this paper, we develop a quantum theory of a graphene plasmon generator. Lozovic et al. account for quantum correlations and dissipation effects, thus they are able to describe such regimes of a quantum plasmonic amplifier as a surface plasmon emitting diode and a surface plasmon amplifier using stimulated radiation emission. Switching between these generation types is possible *in situ* with a variance of the graphene Fermi level. They provide explicit expressions for dissipation and interaction constants through material parameters, and they identify the generation spectrum and the second-order correlation function, which predicts the laser statistics.

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