

Magnetoplasmons driven by skyrmions in a graphene-magnet heterostructure

Dirac plasmons in graphene are collective excitations of massless Dirac fermions. Graphene plasmons can be tuned by an external magnetic field, resulting in so-called graphene magnetoplasmons^[1].

Chiral magnets host topological excitations known as skyrmions^[2]. Skyrmions can be considered as a local magnetic moment floating in a “ferromagnetic sea”^[3], which can serve as a source of magnetic field for any adjacent material.

In this project, we will consider a chiral magnet as a substrate for the graphene layer. In this structure, graphene magnetoplasmons will be affected by the local magnetic field induced by skyrmions. We will examine the physical properties of magnetoplasmons driven by skyrmions in a graphene-magnet heterostructure and exemplify how this heterostructure can be designed to bear advanced plasmonic characteristics.

[1] Physical Review B, 2021, 103(8): 085405.

[2] Physical Review Letters, 2021, 126(11): 117205.

[3] Physical Review B, 2016, 94(6): 064513.