

Abstract Submitted
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Epsilon-near-zero behavior from plasmonic Dirac point: Theory and realization using two-dimensional materials MARIOS MATTHEAKIS, Harvard University, CONSTANTINOS VALAGIANNOPOULOS, Nazarbayev University, EFTHIMIOS KAXIRAS, Harvard University — The electromagnetic response of a two-dimensional metal embedded in a periodic array of a dielectric host can give rise to a plasmonic Dirac point that emulates Epsilon-Near-Zero (ENZ) behavior. This theoretical result is extremely sensitive to structural features like periodicity of the dielectric medium and thickness imperfections. We propose that such a device can actually be realized by using graphene as the 2D metal and materials like the layered semiconducting transition-metal dichalcogenides or hexagonal boron nitride as the dielectric host. We propose a systematic approach, in terms of design characteristics, for constructing metamaterials with linear, elliptical and hyperbolic dispersion relations which produce ENZ behavior, normal or negative diffraction.

Marios Mattheakis
Harvard University

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