Seminario de Estudiantes 2017-B

Invita a la conferencia

NONLOCAL DIELECTRIC RESPONSE OF A HIGH-TEMPERATURE SUPERCONDUCTOR SLAB

Presenta

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RESUMEN

Layered high-temperature superconductors can be used to construct negative refractive index metamaterials. Such kind of metamaterials have unusual optical properties due to their negative refraction, which allows us to control light propagation. This property is of interest for cloaking devices and superlens development. In fact, a layered high-temperature superconductor slab exhibits negative refraction in the THz frequency range. In this work, we theoretically studied the nonlocal dielectric response of a high-temperature superconductor slab in the frequency range where the superconducting slab has negative refractive index. The nonlocality of the inherently-anisotropic layered superconductor comes from the wave vector dependence of its permittivity tensor. As a result of the spatially-dispersive (nonlocal) dielectric response of the superconductor slab, additional electromagnetic modes are generated in the p-polarization geometry. The calculated p-polarization THz spectra show very narrow resonances associated with the quantization of the wave vectors of long-wavelength electromagnetic modes, having negative dispersion, and short-wavelength additional (nonlocal) modes of positive dispersion, in the frequency interval just above the characteristic Josephson plasma frequency of the superconductor. The frequency positions of the resonances are determined by both slab thickness and the angle of incidence. We have found that the quantized electromagnetic modes are quasi-longitudinal because of the strong anisotropy in the nonlocal dielectric response of the high-temperature superconductor.

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