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Can deep sub-wavelength cavities induce Amperean superconductivity in a 2D material?

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Amperean superconductivity is an exotic phenomenon stemming from attractive effective electron-electron interactions (EEEIs) mediated by a transverse gauge field. Originally introduced in the context of quantum spin liquids and high-Tc superconductors, Amperean superconductivity has been recently proposed to occur at temperatures on the order of 1-20 K in two-dimensional, parabolic-band, electron gases embedded inside deep sub-wavelength optical cavities. In this talk, I first generalize the microscopic theory of cavity-induced Amperean superconductivity to the case of graphene and then argue that this superconducting state cannot be achieved in the deep sub-wavelength regime. In the latter regime, indeed, a cavity induces only EEEIs between density fluctuations rather than the current-current interactions which are responsible for Amperean pairing.

Abstract category

Other

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