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Optical properties of massive anisotropic tilted Dirac systems MIGUEL MOJARRO RAMIREZ, Ohio University — We explore the effect of valley-contrasting gaps in the optical response of two-dimensional anisotropic tilted Dirac systems. The energy bands present an indirect gap in each valley with a reduced magnitude with respect to the nominal gap of the untilted system. Thus, a new possibility opens for the position of the Fermi level (an indirect zone) and for the momentum space available for allowed transitions. We study the spectrum of interband transitions through the joint density of states, which displays a set of van Hove singularities depending on the Fermi energy. This same quantity determines the prominent structure of the optical conductivity tensor. The longitudinal conductivity illustrates the strong anisotropy of the optical response. The breaking of valley symmetry leads to a finite Hall response and associated optical properties. The anomalous and valley Hall conductivities present graphene-like behavior, with characteristic modifications due to the indirect zones. We also calculate the spectra of optical opacity and polarization rotation, which can reach magnitudes of tenths of radians in some cases. The spectral features of the calculated response properties suggest optical ways to determine the formation of different gaps in such class of Dirac systems.

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