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Spin and charge optical conductivities in spin-orbit coupled systems JESUS A. MAYTORENA, CCMC-UNAM, Ensenada B.C., Mexico, CATALINA LOPEZ-BASTIDAS, CCMC-UNAM, FRANCISCO MIRELES, CCMC-UNAM, Ensenada B.C., Mexico — Spin-orbit interaction (SOI) in systems lacking inversion symmetry is a phenomenon with great potential in the development of spintronic-based devices. Since the celebrated proposal by Datta and Das, of a spin-FET relying on the tunability of the Rashba SOI strength through electrical gating, there has been a remarkable attention in the search for new ways of manipulating electron spins without employing ferromagnetic materials and/or external magnetic fields. In this work we study the frequency dependent spin- and charge-conductivity tensors of a two-dimensional electron gas (2DEG) with both Rashba and Dresselhaus spin-orbit interaction. We show that the spectral behavior of the spin and charge response due to the angular anisotropy of the spin-splitting energy induced by the interplay between the Rashba and Dresselhaus couplings is much richer. The new spectral structures open the possibility for control of the optical response by applying an external bias and/or by adjusting the light frequency. In addition, we show that the relative strength of the spin-orbit coupling parameters can be obtained through optical probing.

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