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Nonanalytic behavior of the spin susceptibility in interacting two dimensional electron gases in the presence of spin-orbit interaction ROBERT ZAK, University of Basel, DMITRII MASLOV, University of Florida, DANIEL LOSS, University of Basel — The issue of nonanalytic corrections due to electron-electron interactions to the electron spin susceptibility is investigated in the presence of spin-orbit interaction. We consider a two-dimensional interacting electron gas at finite temperature for two orientations of an external magnetic field: perpendicular and parallel to the plane of the gas (notably, for the perpendicular magnetic field we neglect orbital effects). At second order in the electron-electron interaction we predict strong anisotropy in the spin susceptibility: in the limit of strong spin orbit-coupling, $|\alpha| \gg T$, we show that the leading term in α is nonanalytic and scales linearly with $|\alpha|$ with a prefactor depending on the direction of the magnetic field; furthermore, the correction to this behavior is linear in T for the in-plane magnetic field but cubic in temperature, i.e., it scales as T^3/α^2, for the out-the-plane magnetic field; in the opposite limit of a small spin-orbit coupling, $|\alpha| \ll T$, the leading linear-in-T term does not depend on the direction of the field, however, it receives a correction proportional to α^2/T with a prefactor depending again on the field orientation. An extension to higher order in the Coulomb interaction shows that the $|\alpha|$-nonanaliticity is renormalized by terms logarithmic in temperature and for sufficiently low temperatures the $|\alpha|/\ln^2 T$ behavior is found.

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