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D'yakonov-Perel' spin relaxation in the interacting electron gas in doped semiconductors[1] MATTHEW MOWER, GIOVANNI VIGNALE, University of Missouri — D'yakonov-Perel' spin relaxation is an effect arising from spin precession in spin-orbit split bands, limited by various collision mechanisms. The effect is of fundamental importance to spintronics as it controls spin polarization decay times in semiconductors. We extend previous theoretical calculations of D'yakonov-Perel' spin relaxation based on electron-(electron, impurity, hole, phonon) collisions with a careful analysis of the scattering time due to electron-electron collisions in spin-orbit split bands from a fully microscopic approach under typical low temperature III-V semiconductor conditions for 1, 2, or 3 degrees of freedom. In particular, we make use of the classic Abrikosov-Khalatnikov Fermi liquid approach in the scattering time calculation. Electron-electron scattering times and spin relaxation times are compared to previous work, as well as applied to a recent experimental study on spin polarized electron diffusion in GaAs quantum wells.

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