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Optically Injected Charge and Spin Density Patterns in Quantum Wells[1] JOHN SIPE, RASHAD ABRAROV, EUGENE SHERMAN, Department of Physics and Institute of Optical Sciences, University of Toronto — We investigate the charge and spin dynamics following optical injection of currents in quantum wells taking into account momentum relaxation, electron-hole drag and the long-range Coulomb forces. Our numerical approach uses expansion of the investigated quantities in the Hermite-Gaussian basis. We find that on time scale of the order of one picosecond the carrier and current densities demonstrate complex patterns even when the effects of the spatially nonuniform forces are expected to be weak. This behavior can lead to a difference between results on the dynamics of carriers traced by different experiments; the charge displacements seen in the THz radiation and optical pump-probe experiments can be sufficiently different. The resulting spin density patterns arising due to the spin-dependent electron-hole skew scattering are calculated and analyzed in terms of the spin-orbit coupling, Coulomb forces, and the carrier momentum relaxation effects.

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