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Ultrafast hole-spin dynamics in bulk GaAs HANS CHRISTIAN SCHNEIDER, MICHAEL KRAUSS, Physics Dept., Kaiserslautern University — This talk presents theoretical results on hole-spin dynamics in bulk GaAs after optical excitation. The coupled dynamics of spin and orbital angular momentum is determined by solving dynamical Boltzmann equations for carrier-carrier scattering, which include the effect of spin-orbit coupling on the level of a 4-band Luttinger Hamiltonian. Hole-spin relaxation takes place in two stages. In the first regime, on a timescale of a few hundred femtoseconds, pure momentum scattering dominates the dynamics and the anisotropic contributions to the orbital angular momentum, which are created by the optical excitation, are evened out. In the second regime, on a timescale of a few picoseconds, energy relaxation dominates. The hole-spin dynamics can be approximated by a different relaxation time for each of the two regimes. The fast spin relaxation-time in the first regime is in agreement with experimental results for heavy-hole spin relaxation.

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