Department of Electrical and Computer Engineering
University of Rochester, Rochester, NY
Masters Plan A Thesis Defense

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Spin Relaxation in III-V Semiconductor Quantum Wells

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Spin relaxation is probably the most important parameter when information is encoded in the spin degree of freedom. Using a spin-dependent k• p method, we first review the literature on the effects of spin-orbit coupling on the band structure of semiconductors. Calculated results at the vicinity of the zone center (Γ-point) are shown for several semiconductors. Then we review the case of derive a cubic wavevector tern in the effective Hamiltonian of conduction electrons (so-called Dresselhaus term). This term leads to splitting of spin-up and spin-down states and can be viewed as an intrinsic magnetic field that causes spin relaxation via the Dyakonov-Perel mechanism. The author then presents his contribution to elucidation of experimental results in spin light-emitting-diodes structures with an active region made of a single InGaAs quantum well. Temperature dependence of spin relaxation in these structures is discussed in detail.