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Bias-Dependent Electron Spin Lifetimes in n-Type GaAs and the Role of Donor Impact Ionization M. FURIS, University of Vermont, Burlington, Vermont, D.L. SMITH, S.A. CROOKER, Los Alamos National Laboratory, Los Alamos, NM, J.L. RENO, Sandia National Laboratories, Albuquerque, New Mexico — We present a study of electron spin lifetimes τ_s in n-type GaAs as a function of applied lateral electrical bias [1]. Using the magneto- optical Kerr effect, τ_s is obtained from Hanle depolarization measurements on n-GaAs epilayers doped near the metal-insulation transition ($n_e \sim 0.4-5.0$ x 10^{16} cm^{-3}) . Below 10 K, we observe that applied electric fields larger than 10 V/cm result in a large and sudden decrease of τ_s. This collapse results from impact ionization of the cold donor-bound electrons into free electron states that are subject to Dyakonov-Perel spin relaxation. The effect is less dramatic at higher temperatures and at higher doping concentrations above the metal- insulator transition, where most electrons are delocalized even in the absence of an applied electrical bias. The collapse of τ_s is shown to strongly influence lateral spin transport in the impact ionization regime. [1] M. Furis, D. L. Smith, S. A. Crooker, and J. L. Reno, Appl. Phys. Lett. **89**, 102102 (2006)

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