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Ultrafast Relaxation Dynamics of a High Density Electron-Hole Plasma in High Magnetic Fields[1] JINHO LEE, DAVE H. REITZE, Physics Dept. University of Florida, JUNICHIRO KONO, Dept. of Electrical and Computer Engineering, Rice University, ALEXEY BELYANIN, Physics Dept., Texas A&M University, GLENN SOLOMON, NIST, STEVE MCGILL, NHMFL — We study the inter-Landau level relaxation dynamics of a dense electron-hole plasma in high magnetic fields (up to 31 T). Intense 150 fs pump pulses create carrier densities approaching $10^{13}/\mathrm{cm}^2$ in $In_{0.2}Ga_{0.8}As/GaAs$ multiple quantum wells. Relaxation dynamics are probed as a function of Landau level (LL) and magnetic field using time-resolved transient absorption (TRTA) and time-resolved photoluminescence (TRPL), which provide complementary information about the relaxation processes. Manifestly non-exponential decays of the TRTA signals are observed at high fields (above 15 T). TRPL emissions measured in the plane of the wells reveal the presence of multiple emission bursts from the LLs at high magnetic fields, suggesting a complicated relaxation process mediated by the field whereby carriers get trapped in a specific LL, emit PL though recombination, and then 'reload' as the carriers relax down to the previously occupied LLs.

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