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Carrier Dynamics in Narrow Gap Ferromagnetic Semiconductors[1] D. SAHA, X. PAN, G.D. SANDERS, C.J. STANTON, University of Florida, M. BHOWMICK, T. MERRITT, G.A. KHODAPARAST, Virginia Tech, C. FEESER, B.W. WESSELS, Northwestern University, S. MCGILL, NHMFL — Narrow gap ferromagnetic semiconductors are promising materials for spin photonic and spin transport devices because of their small effective masses, small energy gap, and high carrier mobility. We use time resolved differential transmission (TRDT) experiments to study carrier dynamics in ferromagnetic InMnAs and InMnSb. Electronic structure for InMnAs and InMnSb is calculated using an 8-band Pidgeon-Brown model generalized to include the effects of an external magnetic field. Our model includes the effects of the ferromagnetic Mn ions and their coupling to electrons and holes with or without an external magnetic field. Optical transitions are calculated from Fermi's Golden rule and interband transitions at a given pump or probe laser energy are identified. This allows us to understand a sign change seen in the TRDT. Our results show that 1) Phase-Space Filling, 2) Band Gap Renormalization and 3) Free Carrier Absorption all contribute to the TRDT and that the relative importance of these effects depends on the laser probe energy.

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Gary Sanders
University of Florida

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