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Interband Relaxation Dynamics of Photo-Excited Carriers in InSb Quantum Wells[1] GITI A. KHODAPARAST, M. BHOWMICK, R.N. KINI, K. NONTAPOT, M. FRAZIER, Virginia Tech, T.D. MISHIMA, M.B. SANTOS, University of Oklahoma — As the switching rates in electronic and optoelectronic devices are pushed to higher frequencies, it is important to understand carrier dynamic phenomena in semiconductors on femtosecond time- scales. Here we present carrier dynamics, using several pump/probe schemes, in doped and undoped InSb quantum wells (QWs) with $Al_xIn_{1-x}Sb$ barrier layers. In one scheme, the carriers were created by NIR pulses fixed at 800 nm, above the band gap of $Al_xIn_{1-x}Sb$ and InSb, and probed by MIR pulses, tuned in the vicinity of several interband transitions. We observed that the carriers were captured in the QWs in a time scale of $\sim$ 800 fs and not fully relaxed in a time scale longer than 20 ps. Electrons that are sufficiently energetic have the possibility to scatter between the X, L, and Γ valleys in the conduction band, resulting in more complex dynamics. We probed the influence of the initial distribution function by employing a degenerate pump/probe scheme close to several interband transitions. We will discuss several mechanisms describing the observed dynamics, important for developing long-wavelength optoelectronic devices.

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