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Probe-probe Method for Measuring the Dephasing Time in Saturable Absorbing Materials,*
D.J. ERSKINE, A.F. BELLO, H.B. RADOUSKY, S.N. FOCHS and M.D. PERRY, Lawrence Livermore National Laboratory,--For a saturable absorbing material being measured in transmission by a pair of subpicosecond optical pulses the dephasing time T_θ can be thought of as the time it takes for the material to "forget" the polarization of the first pulse. T_θ can be longer or shorter than the saturable absorption relaxation time T_R, which governs the decay of level population irrespective of polarization interaction. In semiconductors T_θ is generally less than T_R, and is a function of the momentum and energy scattering rate for carriers. We introduce a general technique for measuring T_θ/T_R by comparing the height of transmission correlation peaks obtained by cross and parallel polarization configurations in probe-probe[1] experiments. We have measured T_θ/T_R in GaAs to be approximately 0.3. The technique can be applied to a general saturable absorber. The advantage of the technique is that the measurement can be obtained even when T_R and T_θ are shorter than the laser pulse width.

[1]A.J. Taylor, D.J. Erskine and C.L. Tang, J. Opt. Soc. Am. B 2, 663 (1985).

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