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Title:Ultrafast field-resolved semiconductor spectroscopy utilizing quantum interference control of currents
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Abstract:We implement a versatile concept to time-resolve optical nonlinearities of semiconductors in amplitude and phase. A probe pulse transmitted through the optically pumped sample is superimposed with first subharmonic spectral components derived from the same laser source. This effective ω/2ω pulse pair induces a coherently controlled current in a time-integrating semiconductor detector. Current interferograms obtained by scanning the ω/2ω time delay then reveal the electric field of the 2ω part as well as its pump-induced modifications. As a paradigm we analyze the excitonic optical nonlinearity of a CdTe thin film at frequencies around 385 THz. We then move on to resolve the pump-induced amplitude-and phase-distortions of a probe pulse related to two-photon absorption and cross-phase modulation in ZnSe. © 2012 Optical Society of America.
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Main heading:Optical pumping
Controlled terms:Electric fields - Nonlinear optics - Optically pumped lasers - Phase modulation - Probes - Semiconductor detectors - Two photon processes
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