245
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Title:Method for high resolution and wideband spectroscopy in the terahertz and far-infrared region
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Abstract:Asynchronous electro-optic sampling (A-EOS) using two mode-locked lasers with slightly different pulse repetition rates has significantly advanced high-speed time-domain terahertz (THz) spectroscopy on several practical fronts. However, A-EOS also holds strong potential as a precision frequency measurement technique. By carefully considering A-EOS in the frequency domain as a pair of femtosecond frequency combs with a detuned comb spacing, we show there exists a unique one-to-one mapping between a THz frequency comb and the resulting radio frequency comb of the A-EOS signal. With reasonable frequency comb spacing (0.1 to 1 GHz) and detuning frequencies (1 to 50 kHz) of the combs' repetition rates, interrogation bandwidths of >10 THz centered between 10 to 100 THz (300 to 3000 cm⁻¹) are possible. Furthermore, we calculate the effect of nonuniform spectral phase of the sampling pulse train and wave-vector mismatch within a ZnTe sampling crystal on the expected heterodyne beat signal. © 2012 Optical Society of America.
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