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Single-shot time-resolved THz spectroscopy using non-collinear electro-optic imaging ZHENYOU WANG, FUHAI SU, FRANK A. HEGMANN, Department of Physics, University of Alberta, ULTRAFAST SPECTROSCOPY LAB TEAM — We demonstrate a technique for rapid substance identification via single-shot, coherent THz imaging using non-collinear electro-optic sampling. A THz probe pulse generated in ZnTe is transmitted through the sample then focused on a (110) ZnTe detection crystal. An 800nm, 100fs optical pulse employed as a sampling beam passes through the ZnTe detection crystal at an angle of 7° relative to the THz beam.[1] The THz field induced birefringence is resolved as a variation of the intensity of the sampling pulse transmitted through a crossed polarizer. The modified sampling beam spot is imaged using a CCD camera. Because of the non-collinear geometry, the spatial overlap between the THz field and the optical pulse depends on the temporal position within the THz waveform. Consequently, we obtain high-resolution 2D images of the THz waveform without scanning the relative path length. The resolution of the absorption spectra extracted from wet paper and lactose using the single-shot imaging approach is comparable to the resolution obtained through conventional scanning lock-in measurements. Possible applications for substance detection are discussed.

[1]T. Yasuda et al., Opt. Commun. 267, 128 (2006)

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