

265. Title: Single-shot spatiotemporal measurements of ultrashort THz waveforms using temporal electric-field cross correlation

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Abstract: A new single-shot technique based on linear spectral interferometry between a temporally short reader pulse and a temporally long probe pulse is demonstrated for measuring the spatiotemporal phase and amplitude of an optical probe for use as an ultrafast diagnostic. The probe spatiotemporal field information is recovered, with a resolution set by the duration of the reader pulse, by applying a single Fourier transform operation to the interferogram image, without need of any reference data. The technique was used in conjunction with electro-optic sampling to measure waveforms of coherent, ultrashort THz pulses emitted by electron bunches from a laser-plasma accelerator with sub-50 fs resolution. The presence of strong spatiotemporal coupling in the THz waveforms and of complex temporal electron-bunch structure was determined.