Abstract Submitted
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A Nano-Tip THz Field-Probe[1] SACHIN SHARMA, R. R. JONES, Univ of Virginia — We introduce a new technique for non-invasive THz field characterization using high-energy electron field-emission from tungsten nano-tips. The scheme exploits the large electric field enhancement in the vicinity of nano-tip to enable the measurement of electric-field transients with sub-micron spatial and sub-picosecond temporal resolution. The technique employs an intense single-cycle THz "source" pulse to create a sub-picosecond burst of keV electrons from a nano-tip with a radius of ˜100 nm [1]. A second "signal" pulse is also incident on the tip. The signal field modulates the net instantaneous local field, resulting in a proportional change in the electron yield and maximum energy. We have used two, near single-cycle THz pulses, produced via optical rectification of 100 fs 800 nm laser pulses in $LiNbO_3$, to demonstrate the method. We vary the time-delay between the two THz pulses, and raster scan the location of the nano-tip within the focused signal beam in vacuum, while measuring the emitted electrons with a MCP detector. Changes in the time-dependent waveform of the signal field throughout its focus, including the Gouy phase-shift, are readily observed. [1] S. Li and R.R. Jones, Nature Comm. **7**, 13405 (2016).

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