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High field terahertz response of materials DAN DARANCIANG, Department of Chemistry, Stanford University, JOHN GOODFELLOW, Department of Materials Science, Stanford University, ALAN FISHER, Linac Coherent Light Source, SLAC National Accelerator Laboratory, AARON LINDENBERG, Department of Materials Science, Stanford University — We report on studies of the response of materials to intense ultrashort electromagnetic fields at terahertz frequencies. These are generated through coherent transition radiation using femtosecond electron bunches at the Linac Coherent Light Source and correspond to single-cycle pulses with electric field amplitudes ¿ 20 MV/cm with a frequency centered at 10 THz. Large amplitude nonlinear responses are observed in a range of semiconductor materials associated with field-induced ionization processes, and we show how these processes can be used to carry out nonlinear autocorrelation measurements of the pulse shape. We also discuss recent results probing the response of ferroelectric materials at high fields coupled with ultrafast x-ray probes enabling measurement of their atomic-scale response on sub-picosecond time-scales.

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