ADVANCEMENTS IN PHOTOMIXING AND PHOTCONDUCTIVE SWITCHING FOR THZ SPECTROSCOPY

E.R. BROWN, *Physical Domains, LLC, P.O. Box 1574, La Canada, CA 91012*; JOSEPH R. DEMERS, *EMCORE Corp., 2015 W. Chestnut St., Alhambra, CA 91803*.

Ultrafast photoconductive devices have been an important breakthrough in THz technology during the past two decades. Photoconductive switches have become the workhorse in moderate-resolution time-domain systems, and photomixers have been widely implemented in high-resolution spectrometers of various types. The primary photoconductive material has been low-temperature-grown GaAs. More recently, this has been eclipsed by ErAs-GaAs: a nanocomposite consisting of ErAs nanoparticles embedded in a GaAs matrix. ErAs-GaAs has produced very useful THz output power levels when pumped by low-cost lasers operating around 780 nm. Semiconducting DFB lasers have produced cw photomixer output levels between roughly 10 and 1 microwatt between 0.1 and 1.0 THz, respectively. Frequency-doubled fiber mode-locked lasers having an average output power of 20 mW have produced average THz output powers approaching 1 mW and peak power exceeding 1 W. This photomixer performance has been utilized in the first commercial THz photomixing spectrometer manufactured by EMCORE Corp., which has already been demonstrated on a variety of interesting materials including polar vapors, solid explosives, polysaccharides, nucleic acids, and non-centrosymmetric crystals. Results from each of these types will be presented along with resolution and acquisition-time performance metrics for the latest photomixing system.