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III-V Semiconductor Diodes and the Terahertz Technology Gap
THOMAS CROWE, Virginia Diodes, Inc. — The terahertz frequency band, spanning from roughly 100 GHz through 10 THz, is often sited as the most scientifically rich, yet unexplored region of the electromagnetic spectrum. Scientific applications include radio astronomy, chemical spectroscopy, plasma diagnostics, compact range radar, atmospheric remote sensing and electron paramagnetic resonance studies of organic molecules. Recently, many groups have developed rudimentary imaging systems for this frequency band, either for basic scientific investigations or defense and security scanners. However, the inherent difficulty of creating sources of terahertz power that are sufficiently powerful, tunable, reliable and robust is a primary difficulty. Researchers in the field generally speak of the terahertz technology gap, which spans the transition from classical electronics to quantum photonics. This talk will consider the nature of the terahertz technology gap and the technological transition from electronics to photonics. Efforts to develop useful sources and receivers of terahertz energy based on III-V semiconductor diodes will be discussed. Also, important recent results, including the development of all-solid-state sources and receivers for the 0.1 – 3 THz frequency range will be presented. Finally, the fundamental limitations of this technology will be considered.

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