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New THz Photoconductive Sources Driven at 1550-nm

Dr. E.R. Brown

Departments of Physics and Electrical Engineering
Wright State University

Sponsors: W/NoVa Chapters of MTT-S

Date: Thursday, October 23, 2014

Time: 5:30 Reception, Dinner (Optional) 6:00 pm, Lecture 7:00

Place: Mitre Building 2

Directions: Google Maps

Free parking.

All IEEE members and guests are welcome to attend.

Cost: Lecture and reception free, optional Dinner $10

Please RSVP (Dinner only) to Roger Kaul, 301-394-4775 r.kaul@ieee.org

Abstract:

Perhaps the biggest breakthrough in the THz field during the past 20 years has been the advent of ultrafast semiconductor materials having ultrafast (< 1 ps) electron-hole recombination time and therefore the ability to generate useful levels of THz radiation by laser-excited switching and photomixing. The leading material for this advancement has been low-temperature-grown (LT) GaAs, and the laser technology has been Ti:sapphire mode-locked lasers (for switching) or GaAs-based single-frequency diode lasers (for photomixing), both emitting between 750 and 800 nm. The photonductive mechanism is generally ultrafast intrinsic photoconductivity. This seminar will summarize recent work by our group to develop GaAs-based THz sources driven at 1550-nm where laser sources are much more affordable and easy to integrate into systems large because of devices and components from the 1550-nm fiber-optic telecommunications industry. The mechanism for THz generation in GaAs at 1550-nm is attributed to ultrafast extrinsic photoconductivity. The understanding of this mechanism requires several topics in solid-state physics, including electron transport in metallic-dopant impurity bands, strong sub-band gap radiative absorption by such impurities, strong electron capture cross sections to produce ultrafast lifetime, and of course THz qualification by fabrication and characterization of real devices embedded in planar antennas.

Speaker:

Dr. Elliott Brown is a professor in Physics and Electrical Engineering at Wright State University where he holds the Ohio Research Scholars

Endowed Chair in THz Sensors Physics. He is conducting research and teaching courses in THz technology, solid-state physics and devices, antenna theory and technology, and electromagnetic fields and waves. His THz research encompasses several topics including ultrafast GaAs and InGaAs photoconductive sources, THz interaction with soft tissue and biomaterials, THz resonant signatures from DNA and related biomolecules, THz sensor and imager design and simulation, GaN tunneling and hot electron devices, and ultra-low-noise THz rectifiers. Prior to WSU Dr. Brown was a Professor of Electrical and Computer Engineering at the University of California, (Santa Barbara and Los Angeles campuses), and prior to that was a Program Manager at DARPA in the Electronics Technology Office, Arlington, VA. He received a Ph.D. in Applied Physics from the California Institute of Technology in 1985, and did his post-doctoral work at Lincoln Laboratory, Massachusetts Institute of Technology. Dr. Brown is a Fellow of the IEEE (since 2000) and a Fellow of the American Physical Society (since 2007). In 1998 he received an Award for Outstanding Achievement from the U.S. Office of the Secretary of Defense.