Electrical + Computer Engineering

ECE Final PhD Defense

Electrical Engineering

Christopher W. Berry

Plasmonic Photoconductors for Higher Performance Terahertz Radiation Sources

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1:30 PM – 3:30 PM • 1200 EECS

Chair: Mona Jarrahi

Abstract: Although terahertz waves are well-suited for a variety of imaging and sensing applications, practical development of technologies appropriate for these applications has been hindered by the performance of existing terahertz radiation sources. To address the performance limitations of existing terahertz radiation sources, a novel photoconductive terahertz source architecture is developed which incorporates a plasmonic contact electrode configuration to circumvent the inherent tradeoff between high quantum-efficiency and ultrafast operation of conventional designs.

In this talk, the physical mechanism that leads to the significant quantum-efficiency enhancement in plasmonic photoconductive terahertz sources is described. The details of the design, fabrication, and experimental characterization of a variety of photoconductive terahertz sources based on plasmonic contact electrodes are presented. It is experimentally shown that incorporation of the plasmonic electrodes can boost the output power and optical-to-terahertz conversion efficiency by up to a factor of 50. Based on the presented plasmonic photoconductive terahertz source architecture, terahertz radiation powers up to 2 mW are demonstrated. Finally, it is shown that the use of plasmonic electrodes in photoconductive terahertz sources could eliminate the need for short-carrier lifetime semiconductors that are necessary in conventional photoconductive terahertz sources, enabling a new generation of photoconductive terahertz sources with unique functionalities.

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The public is invited to attend