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Ultrafast Optical Response of Graphene/$LaAlO_3$/$SrTiO_3$ Nanostructures[1] LU CHEN, GIRIRAJ JNAWALI, MENGCHEN HUANG, JEN-FENG HSU, FENG BI, University of Pittsburgh, HYUNGWOO LEE, SANGWOO RYU, CHANG-BEOM EOM, University of Wisconsin-Madison, BRIAN D'URSO, PATRICK IRVIN, JEREMY LEVY, University of Pittsburgh — The exceptional electronic and optical properties of graphene make it promising for tunable plasmonic device applications in the terahertz regime. Plasmons can be induced in graphene by femtosecond laser excitation and its resonance frequency can be tuned over a broad terahertz range by varying the graphene pattern size or gate voltage.[2] Recently, generation, and detection of broadband terahertz (around 10 THz) radiation from 10-nm-scale $LaAlO_3$/$SrTiO_3$ nanostructures created by conductive atomic force microscope (c-AFM) lithography has been demonstrated.[3] This unprecedented control of THz radiation at 10 nm length scales creates a pathway toward hybrid THz functionality in graphene/$LaAlO_3$/$SrTiO_3$ nanostructures. We will discuss efforts to probe graphene plasmonics and its tunability by using this nanoscale THz spectrometer.

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[2]L. Ju, *et al.*, Nature Nanotech. **6**, 630 (2011)
[3]Y. Ma, *et al.*, Nano Lett. **13**, 2884 (2013)

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