**Plasmonic antennas for advanced terahertz imaging and sensing**

**Mona Jarrahi**
Professor of Electrical and Computer Engineering, University of California Los Angeles
66-147E Engineering IV, 420 Westwood Plaza, Los Angeles, CA 90095
Phone: (310) 206-1371, Fax: (310) 825-8282, Email: mjarrahi@ee.ucla.edu
URL: http://www.seas.ucla.edu/~mjarrahi/

**Abstract:**
Although unique potentials of terahertz waves for chemical identification, material characterization, biological sensing, and medical imaging have been recognized for quite a while, the relatively poor performance, higher costs, and bulky nature of current terahertz systems continue to impede their deployment in field settings. In this talk, I will describe some of our recent results on developing fundamentally new terahertz electronic/optoelectronic components and imaging/spectrometry architectures to mitigate performance limitations of existing terahertz systems. In specific, I will introduce new designs of high-performance photoconductive terahertz sources that utilize plasmonic antennas to offer terahertz radiation at record-high power levels of several milliwatts – demonstrating more than three orders of magnitude increase compared to the state of the art. I will describe that the unique capabilities of these plasmonic antennas can be further extended to develop terahertz detectors and heterodyne spectrometers with single-photon detection sensitivities over a broad terahertz bandwidth at room temperatures, which has not been possible through existing technologies. To achieve this significant performance improvement, plasmonic antennas and device architectures are optimized for operation at telecommunication wavelengths, where very high power, narrow linewidth, wavelength tunable, compact and cost-effective optical sources are commercially available. Therefore, our results pave the way to compact and low-cost terahertz sources, detectors, and spectrometers that could offer numerous opportunities for e.g., medical imaging and diagnostics, atmospheric sensing, pharmaceutical quality control, and security screening systems. And finally, I will briefly highlight our research activities on development of new types of high-performance terahertz passive components (e.g., modulators, tunable filters, and beam deflectors) based on novel reconfigurable meta-films.

**Biography:**
Mona Jarrahi received her B.S. degree in Electrical Engineering from Sharif University of Technology in 2000 and her M.S. and Ph.D. degrees in Electrical Engineering from Stanford University in 2003 and 2007. She served as a Postdoctoral Scholar at the University of California Berkeley from 2007 to 2008. After serving as an Assistant Professor at the University of Michigan Ann Arbor, she joined the University of California Los Angeles in 2013 where she is currently a Professor of Electrical Engineering and the Director of the Terahertz Electronics Laboratory. Prof. Jarrahi has made significant contributions to the development of ultrafast electronic and optoelectronic devices and integrated systems for terahertz, infrared, and millimeter-wave sensing, imaging, computing, and communication systems by utilizing novel materials, nanostructures, and quantum well structures as well as innovative plasmonic and optical concepts. The outcomes of her research have appeared in 150 publications and 120 keynote/plenary/invited talks and have received a significant amount of attention from scientific news outlets including Huffington Post, Popular Mechanics, EE Times, IEEE Spectrum, Optics & Photonics News Magazine, Laser Focus world, and Photonics Spectra Magazine. Her scientific achievements have been recognized by several international and national prestigious awards including the Presidential Early Career Award for Scientists and Engineers (PECASE); Friedrich Wilhelm Bessel Research Award from Alexander von Humboldt Foundation; Moore Inventor Fellowship from the Gordon and Betty Moore Foundation; Kavli Fellowship by the USA National Academy of Sciences (NAS), Grainger Foundation Frontiers of Engineering Award from the USA National Academy of Engineering (NAE); Breakthrough Award from Popular Mechanics Magazine; Research Award from Okawa Foundation; Early Career Award in Nanotechnology from the IEEE Nanotechnology Council; Outstanding Young Engineer Award from the IEEE Microwave Theory and Techniques Society; Booker Fellowship from the USA National Committee of the International Union of Radio Science; Lot Shafai Mid-Career Distinguished Achievement Award from the IEEE Antennas and Propagation Society; Early Career Award from the USA National Science Foundation (NSF); Young Investigator Awards from the USA Office of Naval Research (ONR), the Army Research Office (ARO), and the Defense Advanced Research Projects Agency (DARPA); the Elizabeth C. Crosby Research Award from the University of Michigan; Distinguished Alumni Award from Sharif University of Technology; and best-paper awards at the International Microwave Symposium, International Symposium on Antennas and Propagation, and International Conference on Infrared, Millimeter, and Terahertz Waves. Prof. Jarrahi is actively involved in several professional societies and has been on program committees of several conferences from IEEE, OSA, and SPIE societies. She is a Fellow of OSA and SPIE societies and a senior member of IEEE. She serves as a member of the Terahertz Technology and Applications Committee of IEEE Microwave Theory and Techniques, an editorial board member of Journal of Infrared, Millimeter and Terahertz Waves, a Distinguished Lecturer of IEEE Microwave Theory and Techniques Society, a Traveling Lecturer of OSA, and a Visiting Lecturer of SPIE. In addition, she serves as a panelist and reviewer for the USA National Science Foundation (NSF), National Institutes of Health (NIH), and Department of Energy (DOE).