**Plasmonic Terahertz Optoelectronics**

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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 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 nanoantennas to offer record-high optical-to-terahertz conversion efficiencies – 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 nanoantennas can be further extended to develop terahertz detectors and heterodyne spectrometers with quantum-level detection sensitivities over a broad terahertz bandwidth at room temperatures, which has not been possible through existing technologies. I will also present a terahertz time-domain imaging system based on a plasmonic photoconductive terahertz focal-plane array, which provides ultrafast-time-resolved and frequency-resolved amplitude and phase information of the imaged object with an imaging speed that exceeds 16 fps. The rich information provided by the terahertz focal-plane array allows super-resolving both shape and depth information of imaged objects with a lateral/depth resolution as small as 60/10 um and an effective number of pixels exceeding 1-kilo-pixels. These 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, spectrometers, and imaging systems that could offer numerous opportunities for e.g., medical imaging and diagnostics, atmospheric sensing, pharmaceutical quality control, and security screening systems.

**Short Bio:**

Mona Jarrahi received her Ph.D. degree in Electrical Engineering from Stanford University in 2007. She is currently a Professor and Northrop Grumman Endowed Chair in Electrical and Computer Engineering Department at UCLA 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 and millimeter-wave sensing, imaging, computing, and communication systems by utilizing novel materials, nanostructures, and quantum structures as well as innovative plasmonic and optical concepts. The outcomes of her research have appeared in more than 300 publications and 270 invited talks and her scientific achievements have been recognized by several prestigious awards including the Presidential Early Career Award for Scientists and Engineers; Friedrich Wilhelm Bessel Research Award from Alexander von Humboldt Foundation; Moore Inventor Fellowship from the Gordon and Betty Moore Foundation; A F Harvey Engineering Research Prize from the Institution of Engineering and Technology (IET); Kavli Fellowship by the USA National Academy of Sciences, Grainger Foundation Frontiers of Engineering Award from the USA National Academy of Engineering; and Breakthrough Award from Popular Mechanics Magazine. Prof. Jarrahi is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE), Optical Society (OPTICA), International Society for Optics and Photonics (SPIE), American Physical Sosiety (APS), and Institute of Physics (IoP).