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Manipulating optical beams with metasurfaces

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Abstract

Metasurfaces composed of an array of engineered sub-wavelength-sized scatters placed on a surface can impart a point-by-point phase change on an incident beam. These new types of composite surface are called meta-surfaces and have the ability to perform passive and actively tunable beam steering and beam manipulation. The scatters within the array can be waveguide apertures, chevron shaped, or other types of scatters and can be designed to operate in the visible, infrared or microwave spectral regions. Our talk will focus on the theory of meta-surfaces as applied to beam steering, and a method of implementation that allows for active tuning of a beam in the THz spectral range and microwave spectral ranges. In the THz spectral range, a patterned optical pulse (800nm wavelength light) is used to define metal-like regions on the surface of a semiconductor that serve as scatters for an incident THz beam. The 800nm optical pattern can be controlled via a spatial light modulator under computer control. In the microwave, nested double loop structures with tunable capacitors can be used to control the beam steering angles.

Biography

David Crouse received a BS in Honors Physics from Purdue University and a Ph.D. in Electrical Engineering at Cornell University in 2002. He is an associate professor in the Department of Electrical Engineering at The City University of New York, Director of the Center for Advanced Technology in Photonics Applications, Director of the Center for Metamaterials (an NSF Industry/University Cooperative Research Center), and founder and Senior Technical Advisor of Phoebus Optoelectronics LLC. His research interests include fundamental and applied research on plasmonics crystals, metamaterials and nanotechnology and he has published over 50 papers and conference proceedings on the topics.