Fabrication of Inch-Scale Meta-Optical Devices with Subwavelength Antennas

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Abstract: Metasurfaces are artificially engineered surfaces composed of subwavelength-sized antennas. They hold the potential to revolutionize optics by replacing traditional, bulky refractive optics with ultra-thin, flat alternatives. However, the fabrication of large-scale metasurface optics remains challenging due to time-consuming and expensive processes like electron beam lithography and high-aspect-ratio etching. These challenges often limit metasurface fabrication to the micrometer scale, significantly constraining their use in practical scenarios that require millimeter- or larger-scale optical components, such as camera lenses, augmented or virtual reality displays, and beam steerers. In this presentation, we introduce methods to fabricate inch-scale meta-optical devices like beam deflectors, visible meta-deflectors, and broadband achromatic meta-correctors using electron beam lithography. Our approach offers a pathway for efficient prototyping and testing of large-scale meta-optics, effectively bridging the gap between micro/nanoscale and macroscopic optics.