

OSSC Online Webinar, June 9, 2021, 7:00pm PDT

“Versatile Diffractive Flat Optics”

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Abstract

Traditional refractive lenses are bulky owing to their curvature. Flat diffractive lenses can overcome this difficulty, but traditional diffractive optics have limited reach, primarily due to chromaticity. Recently, we have shown that by treating the “imaging” phenomenon as simply information transfer from the object to the image plane, the spatial distribution of the phase in the focal plane can be an arbitrary function.

Using this concept, we have shown that allowing the phase in the image plane of a flat lens to be a free parameter enables imaging properties of unprecedented versatility in flat, multilevel diffractive lenses (MDLs).

Our research group has demonstrated binary multi-level diffraction lenses in three high performance categories: super-achromatic lenses in three wavelength regions (8-12 μ m, 0.45-1 μ m, 1.5-150 μ m), high NA of 0.9 of at 0.85 μ m, and extreme depth of focus (5mm to 1200mm).

We believe that our inverse-designed flat MDLs, which can be manufactured using low-cost imprinting techniques, could prove widely applicable—especially where weight and restricted form factor are important considerations, as in aerospace and airborne imaging as well as augmented and virtual reality displays.

About Our Speaker

Rajesh Menon (<http://lons.utah.edu/>) combines his expertise in nanofabrication, computation and optical engineering to impact several fields including inverse-designed photonics, flat lenses and unconventional imaging. His research has produced over 120 peer-reviewed publications, 40 patents, and 4 spin-off companies.

His lab has graduated 9 PhD students, 3 of whom are women. Rajesh is a Fellow of the OSA, and Senior Member of the IEEE and the SPIE. Among his other honors are a NASA Early Stage Innovations Award, NSF CAREER Award and the International Commission for Optics (ICO) Prize.

Rajesh currently directs the Laboratory for Optical Nanotechnologies at the University of Utah, where he is a tenured Associate Professor. He received S.M. and Ph.D. degrees from MIT. He serves and has served on the Program Committees of the IEEE Photonics Conference, EIPBN, OSA Imaging Systems and Applied Optics Congress, CLEO (Complex media and metamaterials), among many others.