

Molding light propagation with phase discontinuities

Dipartimento di Fisica,
Università degli Studi di Trento
CNSC - Istituto Italiano di Tecnologia (IIT)
SEAS, Harvard University

sukosin@gmail.com

Conventional optical components rely on gradual phase shifts accumulated during light propagation to shape light beams. New degrees of freedom are attained by introducing abrupt phase changes over the scale of the wavelength. A two-dimensional array of optical resonators with spatially varying phase response and subwavelength separation can imprint such phase discontinuities on propagating light as it traverses the interface between two media. Anomalous reflection and refraction phenomena are observed in this regime in optically thin arrays of metallic antennas on silicon with a linear phase variation along the interface, in excellent agreement with generalized laws derived from Fermat's principle. Phase discontinuities provide great flexibility in the design of light beams as illustrated by the generation of optical vortices, lenses and axicons using planar designer metallic interfaces.

References

- [1] N. Yu et al., *Science* 334, 333, 2011 (featured on cover),
- [2] P. Genevet et al., *Appl. Phys. Lett.* 100, 13101, 2012 (featured on cover),
- [3] F. Aieta et al., *NanoLetters* 12, 1702, 2012,
- [4] R. Blanchard et al., *Phys. Rev. B* 85, 155457, 2012,
- [5] F. Aieta et al., *NanoLetters* 12, 4932, 2012.