

Vectorial Holography

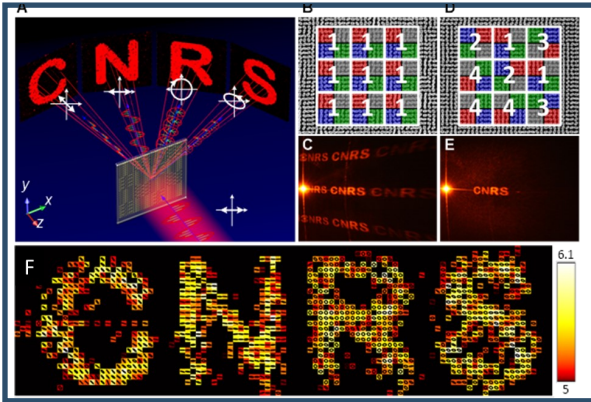


Fig : (A) Schematic of the polarization-reconstructed and multi-directional meta-hologram. (B, D) SEM image of the fabricated meta-hologram with uniformly and randomly distributed sub-pixels. (C, E) Photograph of the holographic image with a series of ghost images and unique image respectively. (F) Intensity values (arbitrary units), together with the corresponding local state of polarization. The reconstructed vectorial far-field of the metasurface have been obtained using ptychographic measurements.

Metasurfaces enable wavefront shaping with arbitrary output polarization

Polarization reconstruction, which is based on the superposition of two orthogonal polarization bases, has been widely used in optical science. Circular polarization (CP), respectively linear polarization (LP), can be generated based on the superposition of two orthogonal LP, respectively CP.

However, full-polarization-reconstruction cannot be obtained based on such phase-only difference between two orthogonal bases and its application to arbitrary wavefront control have not been realized. Here, we demonstrate a full-polarization-

reconstructed metasurface that can produce arbitrary polarization for wavefront shaping based on a given LP incidence light. The approach relies on pixelated metasurfaces, in which each pixel acts as a deflector able to encode both the polarization and the holographic phase information, resulting in a holographic image in a specific angle with arbitrary polarization. The experimental demonstrations, based on the metasurface Jones matrices extraction, are supported by state-of-the-art vectorial ptychography for full electromagnetic field characterization.

Breakthroughs

A multidirectional meta-hologram is able to multiplex the polarization channels in different directions.

Perspectives

Vectorial holograms that address different polarization channels have been integrated into a shared aperture to display several arbitrary polarized images, leading to promising new applications in vector beam generation, full color display and augmented/virtual reality imaging.

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