Highlights

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Broadband and chiral binary dielectric meta-holograms

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We show how basic holographic principles can be revisited to implement new capabilities of wavefront molding with planar sub-wavelength dielectric optical elements. Our holographic devices are transmissive, broadband, and phase distortion–free from the near-infrared (NIR) range to the visible range, with high polarization sensitivity allowing for a wide range of functionalities depending on the design. The basic element of our holograms is an "effective aperture" designed to diffract light with high efficiency across a broad range of wavelengths into the (±1) diffraction order; thus, it is functionally equivalent to a broad- band blazed grating. The phase profile of our meta-holograms is then generated by displacing the effective apertures with respect to each other in such a way as to create the desired interference pattern. The latter is the detour phase concept, which is the basis of binary holograms. A complex computer-generated hologram representing the logo of the International Year of Light (IYL) has been imaged with high efficiency (up to 75%) in the NIR range. Polarization-selective holograms have been widely investigated (20–22); here, we have demonstrated a chiral holographic plate that creates different images depending on the handedness of the incident light.

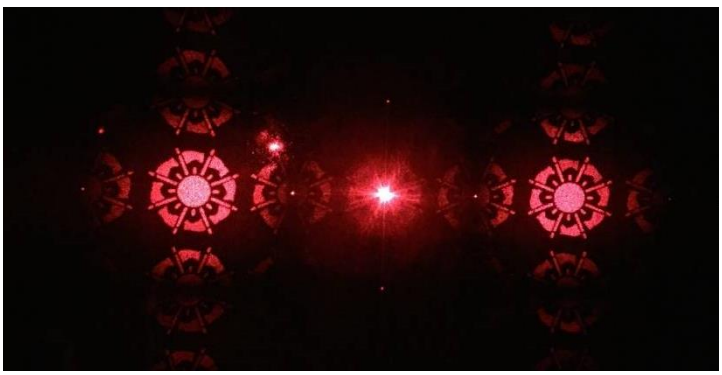

Figure 1. Images generated by the hologram in the visible range. These images were captured by a color charge-coupled device camera