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Ultra-Thin Color Phase Hologram with Metasurfaces

A new plasmonic antenna technology enables high-capacity data storage and multicolor holographic imaging by simultaneously encoding both color and phase information of light.

With the advancements of metasurfaces, holography has evolved from the reproduction of 3D images to data storage. Monochromatic phase holograms were developed with encoded wavelength, using binary amplitude modulation; however, these holograms have a maximum storage capacity due to the diffraction limit. Binary color holograms were then introduced to increase maximum capacity beyond the diffraction limit, yet the color holograms can only encode binary data corresponding to the existence or absence of the nanoantenna, not the phase information.

Researchers at Purdue University have developed an array of plasmonic antennas that simultaneously encode both wavelength and phase information of light. In order to encode both wavelength and phase information, another degree of freedom beyond the existence or absence of antennas was needed. This new technology uses antenna lengths to encode color, while the antenna's orientating (angle) encodes phase information. This technology is useful in encoding data at a storage capacity exceeding the diffraction limit and can be used for multicolor holographic imaging by composing three images of red, green, and blue. In addition, this device could prove useful in other areas where data is stored using holography such as security scanning, credit cards, and personal identification cards.

Advantages:

-Encodes both wavelength and phase information

Potential Applications:

-Holographic color imaging

-Data storage

Technology ID

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Category

Semiconductors/Devices & Components
Materials Science & Nanotechnology/Nanomaterials & Nanostructures
Computing/Photonic & Optical Computing Technologies

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