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Superresolution Imaging Using a 3D Nanolens Made Up of Bulk Nanowires Metamaterials[1] BERNARD DIDIER FREDERIC CASSE, WENTAO LU, YONGJIAN HUANG, EVIN GULTEPE, LATIKA MENON, SRINIVAS SRIDHAR, Northeastern University — We report superresolution imaging of large objects, having sub-λ features, over significant distances ($>> \lambda$, wavelength) with a resolution well below the diffraction limit in optics, using a metallic nanolens. The metallic nanolens is composed of high aspect ratio gold nanowires embedded in disordered porous alumina template matrix. This composite medium possesses strongly anisotropic optical properties with negative permittivity in the nanowire axis direction, which enables negative refraction, and transports both far-field and near-field components with minimal distortions and with very lowattenuations. The long-distance image transport mechanism is not based on resonances of materials parameters and thus the subwavelength imaging occurs with low loss (Figure-of-merit (FOM) = $Re(n)/Im(n) \sim 12$ (much higher than existing metamaterials)) and in a broad spectral range. This nanolens not only exhibits superior optical properties over existing metamaterials-based lenses, but can also be manufactured in large scale (mm size), thereby offering significant potential for applications in optical storage devices, nanolithography and biomedical imaging.

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