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Optical Hyperlens: Far-field imaging beyond the diffraction limit
ZUBIN JACOB, LEONID ALEKSEYEV, EVGENII NARIMANOV, Princeton University — We propose an approach to far-field optical imaging beyond the diffraction limit. The proposed system allows image magnification, is robust with respect to material losses and can be fabricated by adapting existing metamaterial technologies in a cylindrical geometry. This device relies on recently proposed strongly anisotropic metamaterials that feature opposite signs of the two permittivity tensor components, $\varepsilon_{\perp}$ and $\varepsilon_{||}$ [1-2]. Such metamaterials have been theoretically shown to support propagating waves with very large wavenumbers (in ordinary dielectrics, such high-$k$modes undergo evanescent decay) [3]. This unusual property arises from the *hyperbolic* functional form of the dispersion relation for such metamaterials, and is the key feature enabling subwavelength resolution of our proposed device. It is for this reason that we call our imaging device *the hyperlens*. [1] V. A. Podolskiy, and E. E. Narimanov, "Strongly anisotropic waveguide as a nonmagnetic left-handed system," Phys. Rev. B **71**, 201101 (2005). [2] V. A. Podolskiy, L. Alekseyev, and E. E. Narimanov, "Strongly anisotropic media: the THz perspectives of left-handed materials", J. Mod. Opt. **52**(16) 2343 (2005). [3] A. A. Govyadinov and V. A. Podolskiy, "Meta-material photonic funnels for sub-diffraction light compression and propagation," Phys. Rev. B **73**(15), 155108 (2006).

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