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Focusing light with subwavelength aperture due to surface plasma

K.R. CHEN, Physics Dept. and Plasma and Space Science Center, National Cheng Kung University, Taiwan — Diffraction limits any optical system; in fact, it affects all wave fields. As a reminiscent of Heisenberg uncertainly principle for quantum mechanics, diffraction limit restricts the minimum value of the product of divergent angle and width of light beam and sets the achievable smallest spot size of a focused light at the order of wavelength. We study an innovative approach and the physical mechanism using surface plasma to focus propagating light to a width below the scale of wavelength and are investigating the possibility to break the diffraction limit and its implications in fundamental physics. This process is simulated with finite-difference time domain (FDTD) method; the dispersive material such as silver film is modeled by auxiliary difference equation (ADE) method with Drude poles and thus the phasor polarization current is calculated. Such a focused light may be useful to imaging, sensing, lithograph, optical storage, photonic circuit, and many other applications.

K.R. Chen
National Cheng Kung University, Taiwan

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