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Beam shaping based on intermediate zone diffraction of a micro-aperture

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Keywords

aperture, diffraction, beam shaping

Abstract

We analyze optical diffraction of a micro-aperture (slit or hole) in a metal screen in the intermediate zone and report its application for beam focusing and collimating in micro-optics. Both finite-difference time-domain simulations and Rayleigh–Sommerfeld diffraction formula were applied to calculate the intermediate-zone diffraction patterns. It is shown that, by controlling the aperture size, the focal length and depth can be adjusted in a very wide range, from subwavelength to tens of wavelengths, while the focal width maintains in an order of wavelength.