Abstracts

Millimeter-Wave Fresnel-Zone Plate Lens and Antenna (Dec. 1995, Part II [T-MTT])

H.D. Hristov and M.H.A.J. Herben. "Millimeter-Wave Fresnel-Zone Plate Lens and Antenna (Dec. 1995, Part II [T-MTT])." 1995 Transactions on Microwave Theory and Techniques 43.12 (Dec. 1995, Part II [T-MTT] (1995 Symposium Issue)): 2778-2784.

A new variety of millimeter-wave Fresnel-zone plate lens with enhanced focusing quality is described. Each full-wave zone of the lens is divided into four quarter-wave subzones, which are covered by dielectric rings having equal thickness but different permittivities. More practical equations are derived for the radii of the zones, and for the thickness of the lens by taking into account the angle of incidence of the electromagnetic wave. A Fresnel-zone plate antenna (FZPA) consisting of a quarter-wave lens and a scalar feed is developed and analysed theoretically. Equations for the aperture field and far field are derived using multiple ray tracing through dielectric plates and vectorial Kirchhoff diffraction theory, respectively. It is demonstrated that the proposed transmissive-type FZPA has an aperture efficiency of more than 50% in the 60 GHz frequency band. This computed efficiency agree with the measured overall efficiency reported by other researchers for an X-band quarter-wave reflector-type FZPA.

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