Abstracts

Design and characterization of single- and multiple-beam mm-wave circularly polarized substrate lens antennas for wireless communications

X. Wu, G.V. Eleftheriades and T.E. van Deventer-Perkins. "Design and characterization of single- and multiple-beam mm-wave circularly polarized substrate lens antennas for wireless communications." 2001 Transactions on Microwave Theory and Techniques 49.3 (Mar. 2001 [T-MTT]): 431-441.

Single- and multiple-beam circularly polarized ellipsoidal substrate lenses suitable for millimeter-wave wireless communications have been designed, implemented, and experimentally characterized at 30 GHz. The lenses are made out of low-cost low-permittivity Rexolite material. The single-beam lens achieves a directivity of 25.9 dB, a front-to-back ratio of 30 dB, and an axial ratio of 0.5 dB is maintained within the main lobe. The measured impedance bandwidth is 12.5% within a SWR/spl les/1.8:1. The single-beam antenna is well suited for broad-band wireless point-to-point links. On the other hand, the multiple-beam lens launches 31 beams with a minimum 3-dB overlapping level among adjacent beams. The coverage of the lens antenna system has been optimized through the utilization of a hexagonal patch arrangement leading to a scan coverage of 45.4/spl deg/ with a maximum loss in directivity of 1.8 dB due to multiple reflections. The multiple-beam lens antenna is suitable for indoor point-to-multipoint wireless communications such as a broad-band local area network or as a switched beam smart antenna. During the proposed design process, some fundamental issues pertaining to substrate lens antennas are discussed and clarified. This includes the depolarization properties of the lenses, the effect of multiple internal reflections on the far-field patterns and the directivity, the nature of the far-field patterns, the estimation of the lens system F/B ratio, and the off-axis characteristics of ellipsoidal lenses.

❑ Return to main document.