Abstracts

Effect of internal reflections on the radiation properties and input admittance of integrated lens antennas

M.J.M. van der Vorst, P.J.I. de Maagt and M.H.A.J. Herben. "Effect of internal reflections on the radiation properties and input admittance of integrated lens antennas." 1999 Transactions on Microwave Theory and Techniques 47.9 (Sep. 1999, Part I [T-MTT]): 1696-1704.

This paper begins with the modeling of the reflected waves within integrated lens antennas, which consist of a dielectric lens on which a planar antenna is mounted. It is demonstrated that if the relative dielectric constant of the lens is small (/spl epsi//sub r//spl les/4), the single- and double-reflected waves are sufficient to analyze the effect of the internal reflections. For small angles around boresight, these unwanted reflected fields mainly affect the cross-polar far-field pattern, while for large observation angles, both the co-polar and cross-polar patterns are significantly disturbed. It appears that by neglecting the internally reflected field contributions, the beam efficiency may be overestimated more than 10%. In this paper, two types of matching layers are analyzed in order to reduce these unwanted reflections. It is demonstrated that the radiation performances of the integrated lens antennas with optimum-thickness and quarter-wavelength matching layer are almost equal. Even for low dielectric-constant lenses, the beam efficiency can be increased by over 10%. Finally, it is demonstrated that the internal reflections may also have a strong effect on the antenna admittance, which can only be reduced partly by the use of a matching layer.

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