Abstracts

Double-Slot Antennas on Extended Hemispherical and Elliptical Silicon Dielectric Lenses

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In this paper, the far-field patterns and Gaussian-beam coupling efficiencies are investigated for a double-slot antenna placed on hemispherical lenses with varying extension lengths. The radiation patterns of a double-slot antenna on a silicon dielectric lens are computed using ray-tracing inside the dielectric lens and electric and magnetic field integration on the spherical dielectric surface. The measured radiation patterns at 246 GHz and Gaussian-beam coupling efficiencies show good agreement with theory. The theoretical results are presented in extension length/radius and radius/lambda and therefore result in universal design curves for silicon lenses of different diameters and at different frequencies. The theoretical and experimental results indicate that for single units, there exists a wide range of extension lengths (ext. length/radius = 0.32 to 0.35) which result in high Gaussian-coupling efficiencies (50-60%) to moderately high f#'s. These Gaussian-coupling efficiencies can be increased to 80-90% with the use of a lambda/sub m//4 matching-cap layer. For imaging array applications with high packing densities, an extension length/radius = 0.38 to 0.39 (depending on frequency) will result in peak directivity and a corresponding Gaussian-coupling efficiency 15-20% lower than for single units.

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