

Fundamental Superstrate Effects on Printed Circuit Antenna Efficiency

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Printed circuit antennas integrated on typically used substrates such as quartz, GaAs or Si exhibit low radiation efficiency due to surface wave effects in the substrate (e.g., a GaAs substrate yields on optimum radiation efficiency of $\epsilon_r / \epsilon_r + 1 \approx 28\%$). It is demonstrated in this paper that $\epsilon_r / \epsilon_r + 1 = 100\%$ is feasible with practical materials either by using a magnetic superstrata layer or by integrating the antennas on the lower side of a dielectric superstrata (such as GaAs), while in this case, the substrate is merely a supporting layer with lower dielectric constant. The effect of the composite layer is to eliminate surface waves, provided the layer thicknesses are chosen properly.

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