Corrugated Patch Antennas On Plastic Substrates

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This work investigates the use of corrugated dielectric substrates in order to reduce the length of rectangular patch antennas. Using this new type of design, reductions of antenna length by 50% at a frequency of 2.0 GHz are possible. Decreasing the size of antennas is motivated by the need to incorporate small form factor antennas into handheld devices. Several techniques have been previously demonstrated to reduce the size of the patch antenna, including: modifying the patch antenna shape (J. George and K.G. Nair, *Elect Lett.*, *32*, 508-509, 1996) use of high permittivity substrates, and the use of shorting posts. We present a new type of patch antenna where the radiating metallic surface is deposited on a corrugated dielectric substrate, which reduces the effective phase velocity of the propagating wave. Our fabrication approach is based on using PDMS (Polydimethylsiloxane- a moldable thermoplastic with a dielectric constant of 2.75) as the substrate material and sputtered copper metallization for the ground plane and radiator material. The corrugated antenna geometry is shown in Figure 1, where the length L of the baseline patch antenna is 4.65 cm. The reduced antenna has four periods, each with length of 0.58 cm., for an overall length of 2.4 cm. To verify its performance, far-field radiation patterns and input return loss are simulated and compared to the classical rectangular patch antenna. As shown in Figure 2, the return loss and radiation patterns degrade only marginally at up to a 50% reduction in length. The corrugated antenna also shows a bandwidth increase of x2 over the reference structure. The results suggest that non-planar substrates and antenna structures may offer new design opportunities for low-cost compact devices.

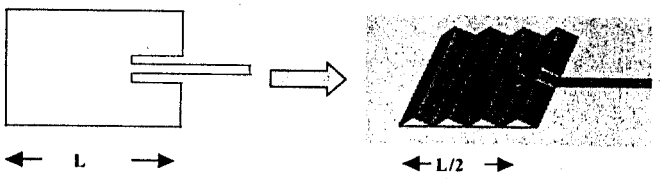
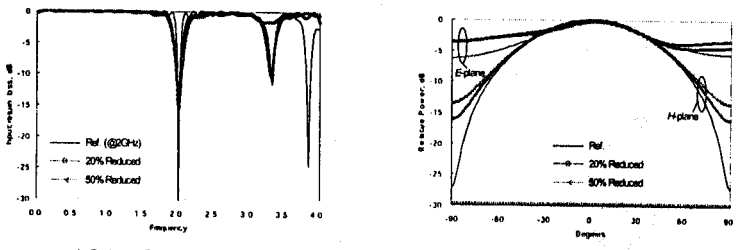


Fig.1 Proposed Antenna



(a) Input Return Loss (b) Radiation Patterns

Fig. 2 Simulated Effects of Corrugated Antenna