PLANAR L-STRIP FED BROADBAND MICROSTRIP ANTENNA

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ABSTRACT: *A broadband rectangular microstrip antenna utilizing an electromagnetically coupled L-strip feed is presented. Experimental study shows a 2:1 VSWR bandwidth of ≈ 10% and excellent cross-polarization performance with a radiation coverage almost as same as that of the rectangular microstrip antenna fed by conventional methods. The variation of bandwidth for different feed param-*

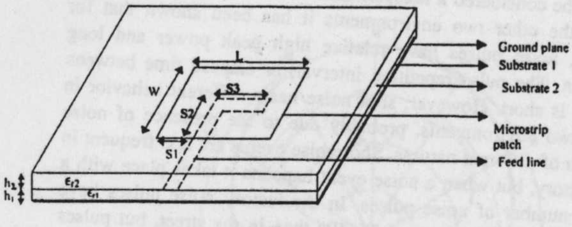

Figure 1 Geometry of the proposed planar L-strip fed antenna

eters is also studied. The proposed antenna is suitable for broadband communications. © 2002 Wiley Periodicals, Inc. Microwave Opt Technol Lett 34: 115–117, 2002; Published online in Wiley InterScience (www.interscience.wiley.com). DOI 10.1002/mop.10390

Key words: *microstrip antenna; bandwidth enhancement; L-strip feed; electromagnetic coupling*

1. INTRODUCTION

A microstrip antenna, by virtue of its planar and compact nature, is the ideal choice for modern wireless communication systems. But the narrow impedance bandwidth is a major drawback of these antennas. Bandwidth enhancement is of great concern among microstrip antenna designers. Various techniques, such as use of thick substrates, addition of parasitic patches, loading with dielectric resonators, et cetera have been suggested in the literature [1,2] for bandwidth enhancement. The L-shaped probe has been applied successfully to various microstrip antenna designs [3] for improving the bandwidth. This Letter proposes the use of a planar L-strip feed for a rectangular patch antenna with less feed complexity.

2. ANTENNA GEOMETRY

The geometry of the proposed antenna is shown in Figure 1. Rectangular patch antenna of dimension L × W is etched on a substrate of thickness h_2 and permittivity ε_{r2}. The patch is electromagnetically fed by the L-shaped 50Ω microstrip feed fabricated on a substrate of thickness h_1 = 1.6 mm and permittivity ε_{r1} = 4.28.

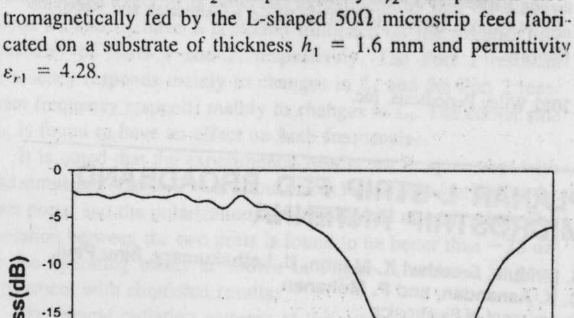

Figure 2 Variation of return loss with frequency. $h_1 = h_2$ = 1.6 mm, $\varepsilon_{r1} = \varepsilon_{r2}$ = 4.28, L = 20 mm, W = 40 mm, S_1 = 8 mm, S_2 = 6 mm, and S_3 = 25 mm

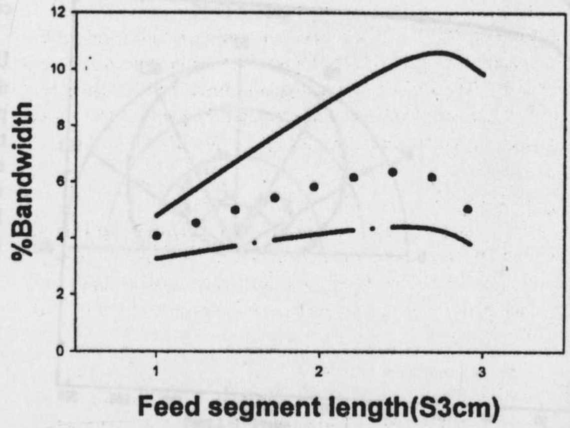

Figure 3 Variation of percent bandwidth with feed segment lengths for different substrates (ε_{r1} = 4.28, h_1 = 1.6 mm). Dot-dash line—ε_{r2} = 2.2, h_2 = 1.1 mm; solid line—ε_{r2} = 4.28, h_2 = 1.6 mm; dotted line—ε_{r2} = 10.2, h_2 = 0.6 mm

3. EXPERIMENTAL RESULTS

A rectangular patch antenna with L = 40 mm and W = 20 mm is fabricated on a substrate with ε_{r2} = 4.28, h_2 = 1.6 mm. The parameters of the L-strip feed are optimized to obtain maximum percentage bandwidth. The variation of the return loss of the above antenna with the optimum feed parameters S_1 = 8 mm, S_2 = 6 mm and S_3 = 25 mm is shown in Figure 2. The antenna operates in the 3.03–3.38-GHz band giving a 2:1 VSWR bandwidth of ~ 10% with a center frequency of 3.3 GHz. The experiment is repeated for

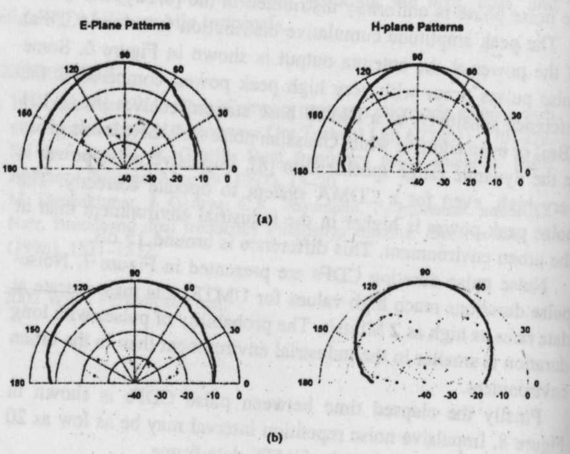

Figure 4 Radiation patterns of the proposed antenna at different frequencies in the operating band $h_1 = h_2$ = 1.6 mm, $\varepsilon_{r1} = \varepsilon_{r2}$ = 4.28, L = 20 mm, W = 40 mm, S_1 = 8 mm, S_2 = 6 mm, and S_3 = 25 mm. (a) 3.03 GHz, (b) 3.3 GHz, and (c) 3.38 GHz

antennas resonating at the same frequency, fabricated on different substrates. Variation in the percentage bandwidth with feed segment length (S_3) is shown in Figure 3.

Radiation patterns of the antenna at the operating band edges and midband frequencies for the above feed parameters are shown in Figure 4. The HPBW of the antenna in the E and H planes are 92° and 66°, respectively, at the resonant frequency. The cross polarization of the antenna is better than −30 dB.

4. CONCLUSIONS

A microstrip antenna with an electromagnetically coupled L-strip feed giving large bandwidth is presented. The remarkable feature of the proposed antenna is its compact structure to achieve enhanced bandwidth. The feeding technique is very simple compared to the other methods.

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