MICROSTRIP ANTENNA WITH SLOTS FOR UWB COMUNICATIONS

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ABSTRACT

Microstrip patch antennas with slots are a promising candidate for ultra-wideband (UWB) radio communication that has created interest in the subject of UWB antennas. Many designs for UWB antennas have been proposed. In the present work, a microstrip patch antenna with tapered slots at the patch center has been used to provide a return loss of about -9 dB for a frequency range from 4 to 7 GHz.

Key Words: Multi-Band Antenna, Patch Antenna , Paper Thin Antenna , Slot Antennas, Ultra-Wide Band Antenna

I. INTRODUCTION

The use of printed circuit technology has brought about a rapid growth in the development of antennas, having patches of conducting materials etched on one side of a dielectric substrate the other side being a metal ground plane . As the resulting printed circuit board is very thin (about 1mm thick).The microstrip patch antennas are also known as paper-thin antennas [1,2,3]. The simplest configuration of a microstrip antenna is shown in Fig.1.

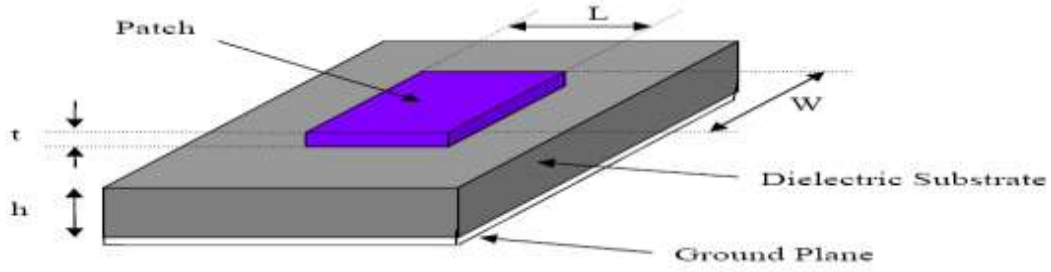

Figure 1 : Microstrip Antenna Configuration

The popularity of such antennas arises from the fact that the structure is plannar in configuration and enjoys all the advantages of the printed circuit technology. The feed lines and matching networks are fabricated simultaneously with the antenna structure. The solid state components can also be added directly on the microstrip antenna board. Hence such antennas are compatible with modular designs.These antennas meet the prime requirements, i.e. small size, low weight etc. and hence are easy to manufacture on a mass scale.These antennas do not disturb aerodynamic flow or disrupt the mechanical structure [4,5] linear and circular polarisations are possible. Dual –frequency antennas

can be constructed. These antennas are replacing old and bulky ones on aerospace vehicles e.g. on satellites , missiles, rockets, aircrafts etc [6,7].

The main limitations are :

- Narrow bandwidth (a few percent)
- Practical limitation on maximum gain (-20dB)
- Radiate in to a half plane
- Poor end fire radiation
- Low power handling capability
- Possibility of excitation of surface waves.

Various shapes of patches used in practice are shown in Fig.2. The choice depends on the required type of polarisation of the radiated field viz., linear, circular or elliptical polarisation.

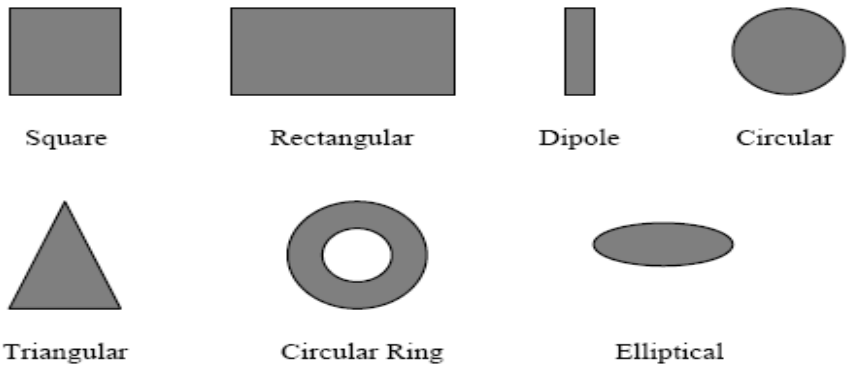

Figure 2. Various Microstrip Antenna Patches used

II. ANTENNA DESIGN

Here in this configuration,we propose a microstrip patch antenna with tapered slots at the patch center. Smooth transition in the slot shape is an important factor in minimizing resonance and hence increasing bandwidth [8,9.10]. The tapered slots are etched on a patch of size 40mm x20 mm. The substrate has a dielectric constant of 4.4 and thickness h= 0.0254 cm . The combined length and maximum width of the slot are 34 mm and 3mm respectively and the fed point is placed at the patch center.

III. SIMULATION RESULTS

The antenna maintains a a return loss of about -9 dB for a frequency range from 4 to 7 GHz as shown in fig. 3. The antenna exhibits near linear phase characteristics. The shape of skots , thickness, lengthand width of patch determine the bandwidth of antenna.

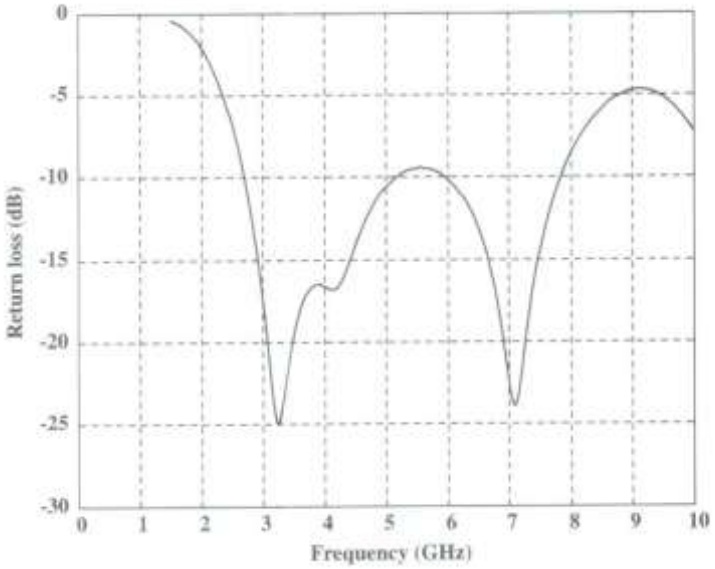

Figure 3: Measured Return Loss of Antenna

IV. CONCLUSION

A new UWB microstrip patch antenna with tapered slots at the patch center is presented in this paper. The simulation results show that the antenna maintains a a return loss of about -9 dB for a frequency range from 4 to 7 GHz with a sharp roll off at the notch band to reduce interference from existing indoor radio frequency.

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