Triple Frequency Operated Microstrip Patch Antenna for Communication in Multibands

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***Abstract*— In order to operate a microstrip antenna at various frequencies and to improve other parameters of microstip antenna various designs configurations are performed. For this purpose IE3D software has been taken for experimental study. Planer designs are mostly preferred for these structures, due to their advantages of small size, low manufacturing cost and conformabilty.Microstrip patch antenna of 20X20 mm size is designed on a FR4 substrate of thickness 1.59mm and relative permittivity of 4.4.This layer consists of several grills of same dimensions. Triple Frequency operation is obtained with stable pattern characterization, such as gain and polarization within its bandwidth. Impedance matching is also observed for this case. Details of the measured and simulated results are presented and discussed in this paper**.

***IndexTerms*—** Bandwidth**.** Impedance, Grills, Microstrip Antenna, ,,

I. INTRODUCTION

Rapid changes are taking place in mobile and wireless communication devices. These communication devices are becoming an imperative need of our daily lives. With time and requirements, these device are becoming smaller in size and hence antenna required for transmit and receive signals are becoming smaller and lightweight while maintaining high gain characteristics. Several efforts are reported in recent times to achieve compact antennas with improved performance. Parasitic elements may be applied to miniaturize geometrical structures.

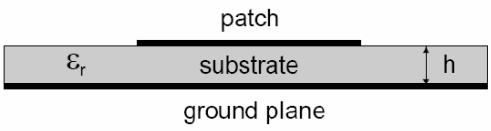

Fig 1: Microstrip patch antenna

In this paper, a compact rectangular mirostrip antenna is designed on glass epoxy FR-4 substrate and analyzed through IE3D simulation Software by considering free space conditions.Different radiation parameters are analyzed and results are presented systematically.The obtained simulated results suggests that proposed compact size antenna with improved performance may be proved suitable for modern communication system. A single layer microstrip patch antenna is designed as shown in fig.This antenna is designed on a glass epoxy FR-4 substrate(ε_r=4.4,tanδ=0.025,substrate thickness h=1.59 mm).The simulation analysis of this antenna is carried out by applying IE3D simulation software.The antenna is fed through proximity feed.The patch has a dimension of 20x20mm.

This patch may be of any conducting material like gold or copper. Microstrip patch antenna radiate because of fringing field between patch edge and the ground plat, This antenna mostly used in wireless application where low profile antennas are required. Because of several other advantages ,this antenna has its various applications in the fields like mobile communication, space communication etc. A microstrip antenna is a resonant style radiator so one of its dimensions must be taken in consideration of surrounding environment.

II. Antenna Design

A. Rectangular Microstrip Antenna

A single layer rectangular patch antenna with dimension 20mmX20mm on a dielectric substrate is considered first. This antenna is designed on a glass epoxy FR-4 substrate (ε_r=4.4,tanδ=0.025,substrate thickness h=1.59 mm).Further simulation is carried out by using IE3D simulation software .The lower patch has dimensions L1=20 mm and W1=20mm.

Fig 2: Microstrip Patch Antenna

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B. Grilled Rectangular Patch Antenna

To achieve improved performance, grill formation has been done on this layer as shown in figure3.

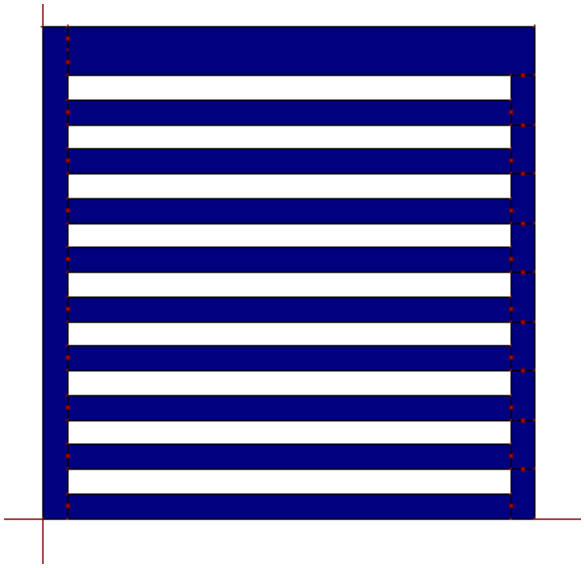

Fig 3: Grilled Microstrip antenna

Both the microstrip antenna are designed on a glass epoxy FR-4 substrate through air gap of thickness 1mm. The return loss of antenna is well below 10dB, which suggests bandwidth of approx 5 %.

III. Results & Discussions

The proposed antenna has been simulated using IE3D software .The physical parameters of all antenna are the same but the resonant frequency varies as the feed point changes.

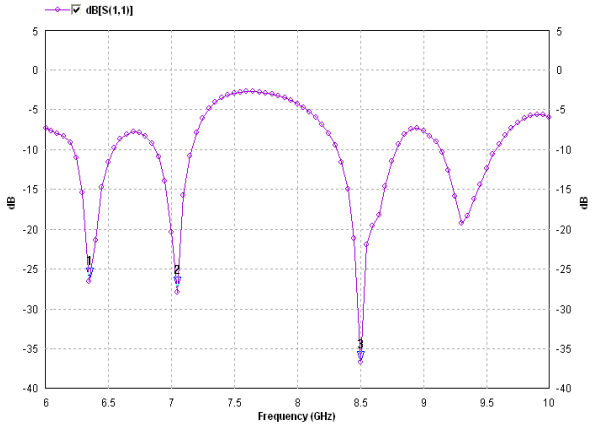

Fig 4: S-Parameter Measurement

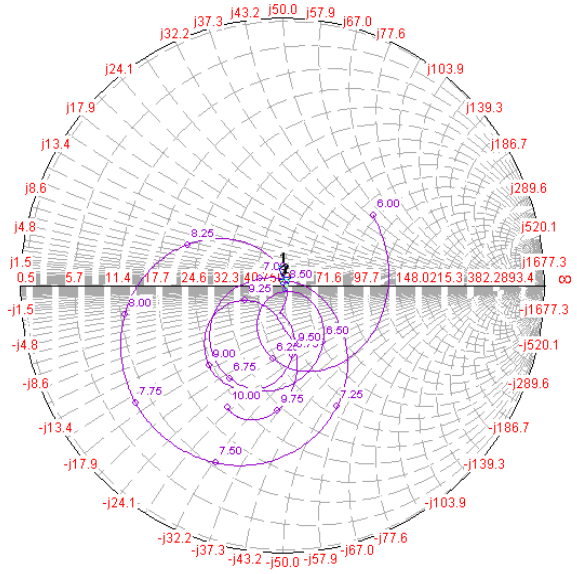

Fig 5: Impedance Matching Measurement

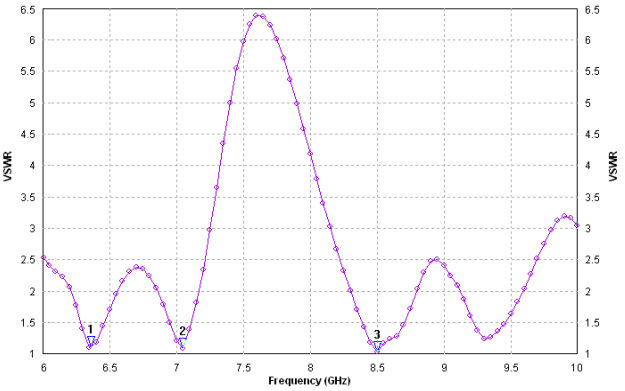

Fig 6:VSWR Measurement

IV. CONCLUSION

This paper presents the performance of microstrip patch antenna. The simulation results show the triple frequency operation of this structure. Results obtained shows that single patch gives bandwidth of 3%,3% and 5% at various operating frequencies .The direction of maximum radiation is normal to patch geometry and radiation patterns are symmetrical in nature.

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