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Study and design of Hexagonal patch antenna for UWB system

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Abstract-Since the release by the Federal Communications Commission (FCC) of a bandwidth of 7.5GHz (from 3.1GHz to 10.6GHz) for ultra wideband (UWB) wireless communications, UWB is rapidly advancing as a high data rate wireless communication technology. As is the case in conventional wireless communication systems, an antenna also plays a very crucial role in UWB systems. The suitable UWB patch antenna design must be capable of operating over a range of ultra wide bandwidth as allocated by the FCC. At the same time, satisfactory radiation properties over the entire frequency range are also necessary. The requirement of the UWB antenna is a good time domain and frequency domain performance, i.e. a good impulse response with minimal distortion.

This paper focuses on UWB antenna design and analysis. Studies have been undertaken covering the areas of UWB basics and reliability of antenna. Extensive investigations were also carried out on two different types of UWB antennas.

The type of antenna studied in this thesis is hexagonal patch antenna. Based on the understanding of hexagonal patch, two more compact versions featuring low-profile and compatibility to printed circuit board are proposed and studied. Both of them are printed hexagonal path antenna, one fed by a micro-strip line, while the other fed by a co-planar waveguide (CPW).

The second type of UWB antenna is hexagonal slot antenna, which can also be fed by either micro-strip line or CPW.

The performances and characteristics of UWB disc monopole and hexagonal slot antenna are investigated in both frequency domain and time domain. The design parameters for achieving optimal operation of the antennas are also analyzed extensively in order to understand the antenna operations.

1. INTRODUCTION

In now day's the wireless system playing very important role in human life. Most of the electrical and electronics equipment around are using the wireless system. An antenna is the most basic element of the wireless system. Antenna is an electrical device which transmits the electromagnetic waves into the space by converting the electric power given at the input into the radio waves and at the receiver side the antenna intercepts these radio waves and converts them back into the electrical power. The antenna is used in so many system such as remote controlled television, cellular phones, satellite communications, spacecraft, radars, wireless phones and wireless computer networks. Day by day new wireless devices are introducing which increasing1 demands of compact antennas. Day by day increase in the satellite communication the use of antennas in the aircraft and spacecraft has also increased the demands a very low profile antenna that can provide a reliable communication to the users.

A microstrip is defined as the antenna who offers low profile and light weight. It is a wide beam narrow band antenna can be manufactured easily by the printed circuit technology such as a metallic layers in a particular shape is bonded on a dielectric substrate which forms a radiating element and another continuous metallic layer on the other side of substrate as ground plane not only the basic shapes any continuous shape can be used as the radiating patch. Instead of using dielectric substrate some of the microstrip antennas use dielectric spacers . Microstrip antennas are usefull, low profile antenna and mechanical rugged and can be easily mounted on any planar and nonplanar surfaces in the printed form. The size of microstrip antenna is related to the wavelength of operation generally $\lambda/2$. The applications of microstrip antennas are above the microwave frequency because below these frequency the use of microstrip antenna doesn't make a sense because of the size of antenna. At frequencies lower than

microwave, microstrip patches don't make sense because of the sizes required. The microstrip antenna is used in so many sectors like commercial sectors due to its low cost and easy to implement on pcb benefit by advanced printed circuit technology and for the reliable communication. Due to the development and ongoing research in the area of microstrip antenna it is expected that in future after some time most of the conventional antenna will be replaced by microstrip antenna.

1.1 Antenna design and perfomance

A hexagonal patch antenna with sides 6 and a 50Ω microstrip feed line are printed on the same side of the dielectric substrate (in this experiment, the FR4substrate of thickness 1.55mm and relative permittivity 4.6 was used. The width of the microstrip feed line is fixed at W=2.5mm to achive 50Ω impedance .On the other side of the substrate, the conducting ground plane with a length of L=20mm only covers the section of the microstrip feed line .

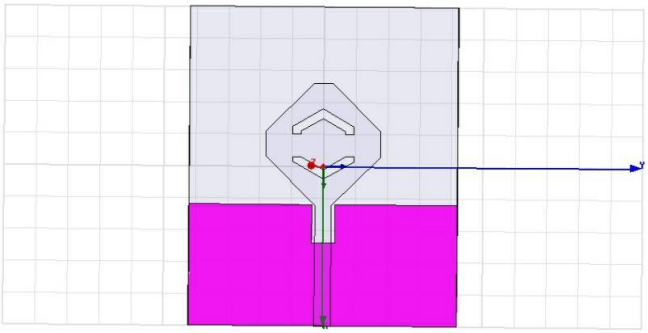

Fig -1 Geometry of printed hexagonal patch antenna.

1.2 Antenna charateristics

For hexagonal patch antenna , the ground plane serves as impedance matching circuit. It tunes the input impedance matching and hence the 10 dB return loss bandwidth by changing feed gap.

2. The result of the simulation and measured values.

The simulation are perform using the HFSS software which give the plot of the resonant frequency and the bandwidth

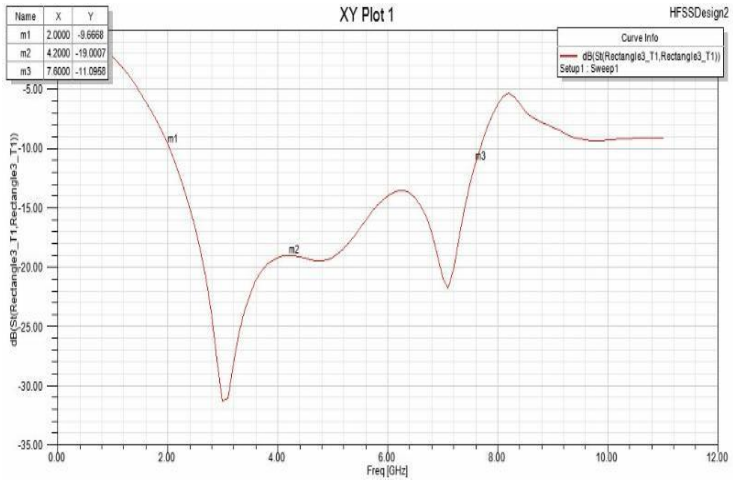

Fig.2 Simulated return loss curve

Fig2. Shows the simulation result of the hexagonal patch antenna with the slot in which the measured 10dB return loss bandwidthis from 2.3GHz to 7GHz,while the simulated from 2GHz to 6.8 GHz.The measurement confirms the UWB characteristics of the proposed antenna.

2.1 Antenna radiation pattern and gain.

The radiation pattern have been calculated and also measured for the designed antenna .The simulated normalized radiation pattern at 2,2.5,3.8 and 6.8GHz are plotted in fig.2

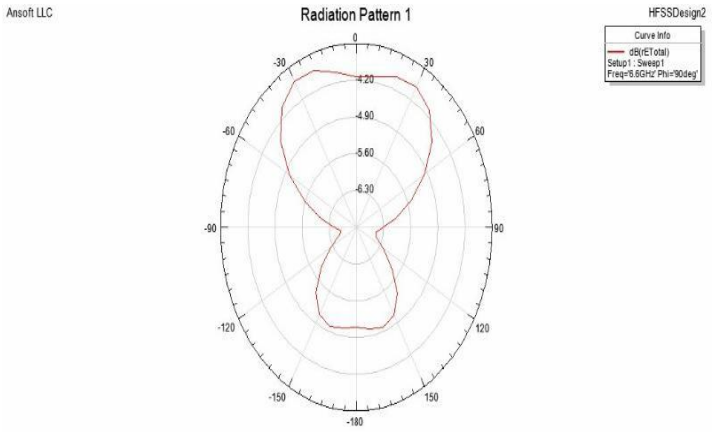

Fig -3: Radiation pattern of the antenna

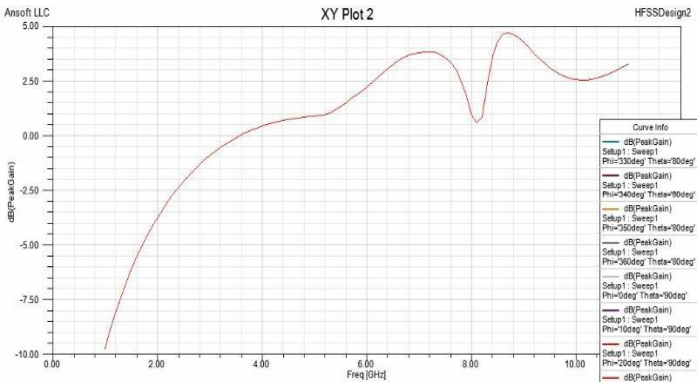

Fig -4: Gain of the antenna

Fig4. Shows the gain of the hexagonal antenna in the different directions in E-plane.It shows the maximum gain occur at the direction of ϴ=90◦ when frequency is no more than 4GHz.

3. CONCLUSIONS

The printed hexagonal patch antenna feed by microstrip line is investigated in this paper.It has been experimented that the performance of the antenna in terms of its frequency its mostly dependent on feed gap.

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REFERENCES

[1] Nasser Ojaroudi*, Mohammad Ojaroudi, and Yaser Ebazadeh "UWB/Omni-Directional Microstrip Monopole Antenna for Microwave Imaging Applications ".Progress In Electromagnetics Research C, Vol. 47, 139- 146, 2014.

[2] A.Kasinathan, Dr.V.Jayaraj,M.Pachiyaannan," E-Shape Microstrip Patch Antenna Design for Wireless Applications" IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 1 Issue 3, May 2014.

[3] Darshana R. Suryawanshi, Prof. Bharati A. Singh,A Compact Rectangular Monopole Antenna with Enhanced Bandwidth, IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), Volume 9, Issue 2, Ver. VII (Mar - Apr. 2014), PP 54-57.

[4] : Reza Jafarlou, Changiz Ghobadi, Javad Nourinia "Design, Simulation, and Fabrication of an Ultra-Wideband Monopole Antenna for Use in Circular Cylindrical Microwave Imaging Systems "Australian Journal of Basic and Applied Sciences, 7(2): 674-680, 2013 ISSN 19918178.

[5] Ramna1,Amandeep Singh Sappal," Design Of Rectangular Microstrip Patch Antenna Using Particle Swarm Optimization" International Journal of Advanced Research in Computer and Communication Engineerin Vol. 2, Issue 7, July 2013