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CIRCULAR PATCH MICROSTRIP ANTENNA USING STUB

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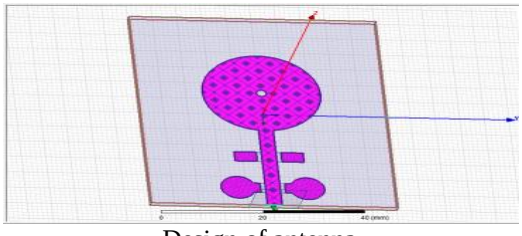
Abstract: ***Micro-strip Antenna has become very popular day by day the because of its analysis and fabrications. This paper contains design Linear Polarization & circular Patch microstrip patch antenna with feed line connector using dual stub. The antenna is mainly used for received signal transmitted from an unmanned aircraft, and can be used in various applications in communication systems such as satellite communication and military applications. A microstrip feed line patch antenna is designed for 3.6GHz & 6.5GHz center frequency have successfully been built. the half power beam width (HPBW) come out 60 with VSWR lower than 1.5, and return losses equal to -28.9dB & -30.6dB at center frequency. Next the results of microstrip feed line patch antenna is designed by using HFSS (High Frequency Simulation Software) Finally, the results obtained from the simulations are demonstrated.***
Keywords: Circular polarization, Dielectric resonator Antenna (DRA), Gain, Micro-strip antenna (MSA), Radiation pattern.

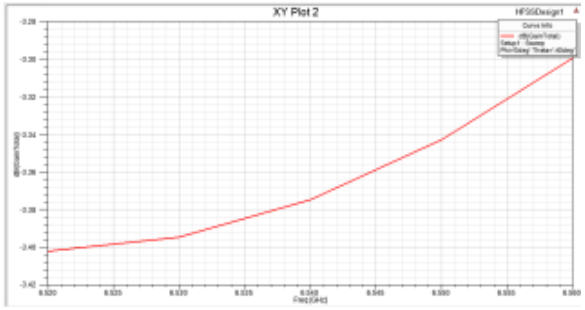
I. INTRODUCTION

Usually, requirement is improve the design of these Microstrip Antennas (MSA) demands by using small size, light weight, low profile, low cost and sometimes the easy fabrication & integration with microwave integrated circuits (MICs). To fulfill these requirements, the planar microstrip antennas (MSA)[1] are considered. HFSS-15' and 'CST microwave studio 2011' which has finite element method electromagnetic simulator used for results and approximation. The transmitting antenna is used for radiate e.m. waves into free space. The power is supplied by a feeder which is a transmission line or waveguide having that is characteristic impedance. We can say an antenna is a kind of transducer which convert electrical energy into radiating energy at transmitter end and convert electromagnetic waves into electrical energy at Receiver end. It is aslo used for receiving radiating signal from free space and convert into electrical energy at receiving end . There are many types of antennas used in various applications such as radar, communication application and military application [1, 2]. Patch antennas are becoming increasingly popular for microwave application as they are small and easily simulation. In microstrip patch antenna substrate exist between the patch and Ground. Patch and Ground are perfect conductor and substrate is non-conducting material. The excitation can be by means of micro-strip transmission line. Many feeding techniques and polarization types have been publish in [3]. This paper covers the results from the design of a circular Patch antenna, and results comes from the design with simple patch and patch with stub. A novel method to develop broadband microstrip (patch) antennas using substrates containing explain in [4]. In addition, it is also proposed that the behavior of the photonic crystals will lead to a decrease the radiation in side lobes which improve in radiation pattern front-to-back ratio and antenna efficiency. Circular patch antennas with micro-strip line and probe feeds antenna using two stub which operate at 3.6 GHz &6.5GHz frequency. In this paper a design of a microstrip patch antenna with probe feed line has been presented which gives a satisfied gain scattering parameter. It is supposed that the presented antenna will operate at resonant frequency of 3.6GHz & 6.5 with a band of 400MHz. Three essential parameters for design of microstrip Patch Antenna are; First, the resonant frequency (fo) of the antenna must be selected appropriately. The frequency range is used from (2-9) GHz.. The resonant frequency selected for this design is 3.6GHz & 6.5GHz with band width 400MHz. Second, the dielectric material of the substrate (εr) selected for this design is Fr4-(epoxy) which has a dielectric constant of 4.55 and loss tangent equal to 0.0009. The dielectric constant of the substrate material is an important design parameter. Low dielectric constant is used in the prototype design because it gives better efficiency and higher bandwidth, and lower quality factor Q. The value of dielectric constant inversely proportional to the fringing field & radiated power at the patch periphery. The proposed design has patch size dependes on dielectric constant. So to decrease patch size we use higher value of dielectric constant. Therefore, substrates with dielectric constant 4.55 can be preferred in the proposed dual band antenna. A small value of loss tangent is always preferable in order to reduce dielectric loss. Fr4-(epoxy) is good in this regard. The small loss tangent was neglected in the simulation. Substrate widhts is also an important design parameter. Thick substrate increases the fringing field at the patch periphery i.e by using low value of dielectric constant increases the radiated power which decrease Q and and increase bandwidth. Third, the height of dielectric substrate (h) of the microstrip patch antenna with feed line to be used in C-band range frequencies. Hence, the height of dielectric substrate using in this design of antenna is h= 1.57mm.

II. LAYOUT OF ANTENNA

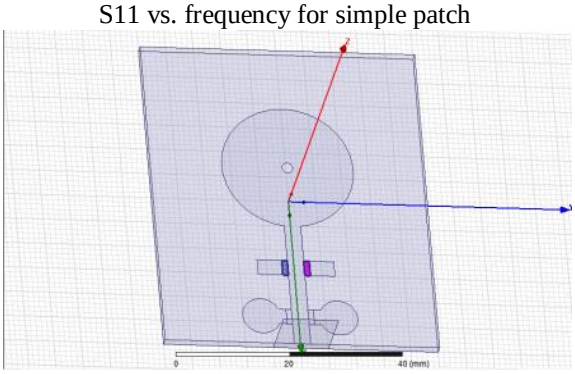


Design of antenna

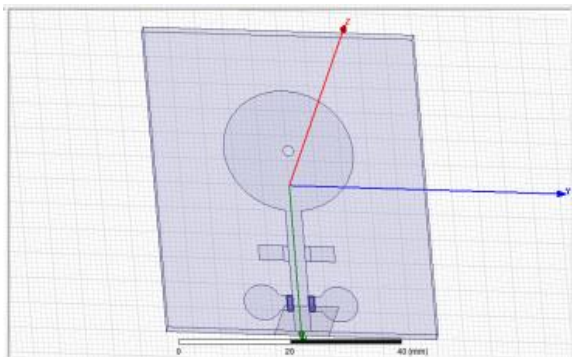


Gain for simple Patch

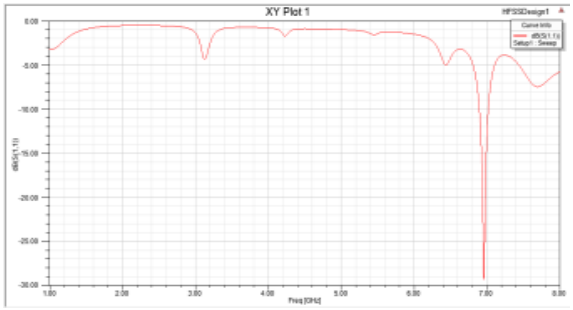
S11 vs. frequency for simple patch



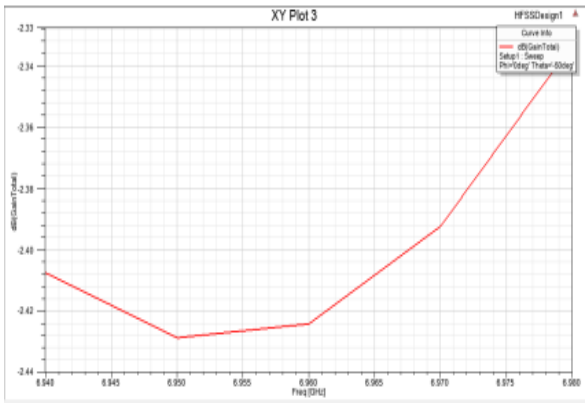
Patch with d1 ON



Patch with d2 ON

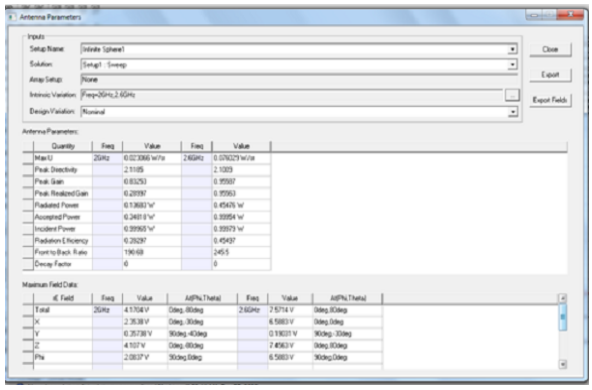


S11 vs freq d3 and d4

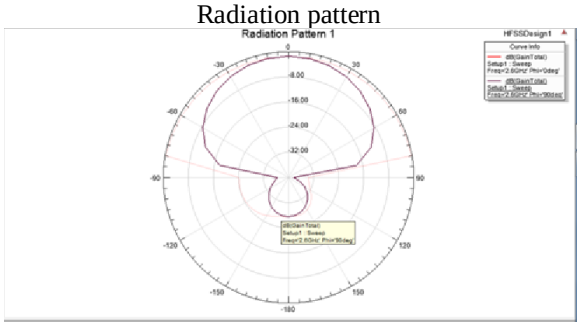


Gain for d3 and d4

Parameter:



Radiation pattern



III. CONCLUSION

The design of circular patch antenna for circular polarization has been completed using HFSS software. The simulation gave results good enough to satisfy our requirements after than embedded it on hardware to use it practically wherever needed. The investigation has been limited mostly to theoretical studies and simulations due to lack of fabrication facilities. Detailed experimental studies can be taken up at a later stage to fabricate the antenna. Before going for fabrication we can optimize the parameters of antenna using one of the soft computing techniques known as Particle Swarm Optimization (PSO).

Future Work

The simulation results are good enough to justify fabrication of the proposed antennas on hardware to check the actual radiation performance. The investigation has been limited to theoretical studies and simulations due to lack of testing facilities at 3.6 GHz & 6.5 frequency. In order to enhance the

gain and other radiation performances of the antennas, additional directors/reflectors can be added accordingly. Using thicker substrates for those applications where the weight of the antenna is not an issue could improve the performance of the proposed designs.

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