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Circularly Polarized Antenna Design AT 5.8GHZ

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ABSTRACT

The microstrip antenna has been the most innovative area in the antenna engineering. This paper focuses on the development of circular polarized rectangular patch antennas that functions at 5.8 GHZ. The feed type used is coaxial feed. The developed antenna can be used for microwave wireless power transmission system, working at 5.8 GHZ, aimed at enabling the drones to be charged in flight. The proposed antenna's performance is analyzed using Ansoft-HFSS 13.0 simulation software.

KEYWORDS:

INTRODUCTION

Microstrip patch antennas because of their light weight, compact and cost effective,they have been widely used. The conducting material such as copper or gold is used for the patch. The Basic microstrip patch antenna shows the radiating patch present on top side of a dielectric substrate and the ground plane present at the bottom. On the dielectric substrate the feed linesand the radiating patch are usually photo etched.Foreasy fabrication and spurious radiation the coaxial feed technique is chosen.

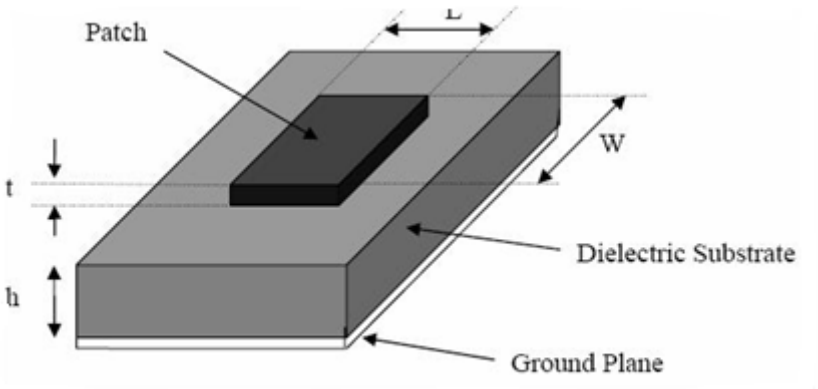

Fig. 1: Basic microstrip patch antenna

Design of circular polarization antenna:

Initially an antenna with coaxial feedis designed to operate at 5.8GHZ. To obtain circular polarization there are two different ways.

1. Dual feed circular polarization
2. Single feed circular polarization

The single feed method is chosen, since it is compact in structure, simple, easy to manufacture and the use of a polarizer is also eliminated in the second method.

To the ground plane, the outer conductor of the coaxial cable is connected, and the center conductor is extended up to the patch antenna. To control the input impedance,the position of the feed can be changed.

If the height *h* gets large, an inductance is introduced into the feed with the coaxial feed and the probe will also radiate, leading to the radiation in undesirable directions.

Basic antenna operating at 5.8GHz:

Theantenna in the Fig.2 was designed with linear polarization. The antenna was designed to coaxial feed so that the rectifier circuit could be added at the back of the antenna. The simulated square patch antenna produced a return loss of 11 dB.

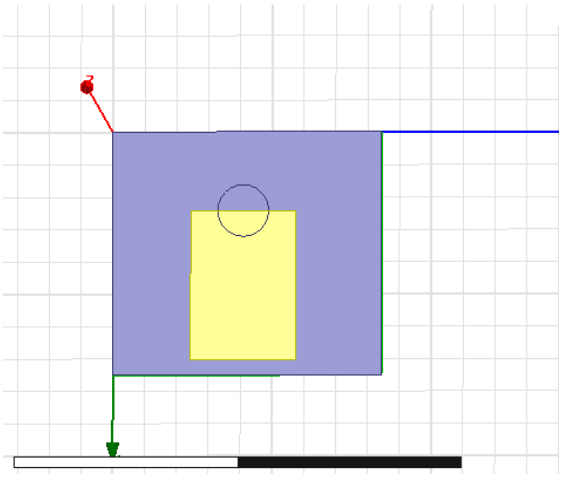

Fig. 2: Top view of the antenna

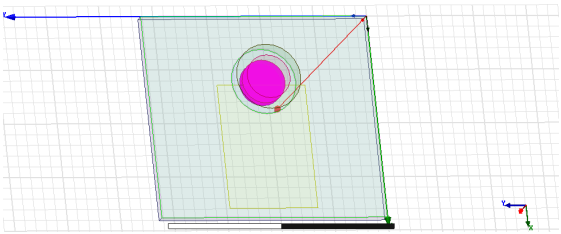

Fig. 3: Coaxial feed of the antenna

The above figure shows the coaxial feed at the bottom of the ground. The inner conductor and the outer conductor are shown clearly.

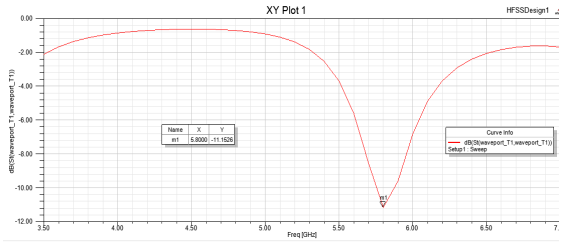

Fig. 4: Return loss of the antenna

The Fig.4 shows the return loss of -11 dB obtained for linearly polarized antenna.

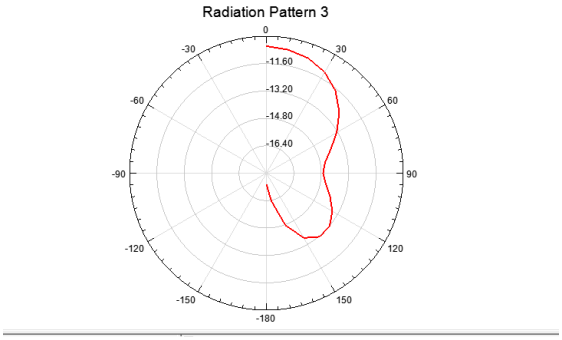

Fig. 5: Radiation pattern of the antenna

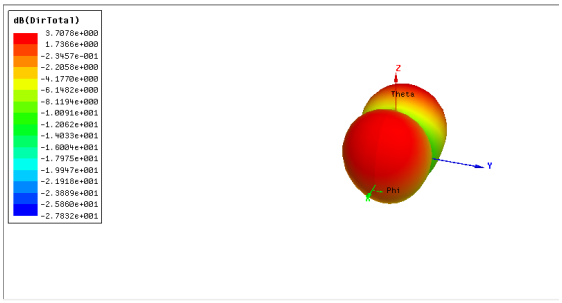

Fig. 6: Directivity of the antenna

Circular polarization:

To the single fed microstrip antenna, perturbation segment is introduced to achieve circular polarization.Here the circular polarization is obtained by embedding cross slot in the radiating patch.By using the perturbation segments the field is split into two orthogonal modes with 90^{o} phase shift and equal magnitude, excitation of two degenerating modes is made with equal amplitude and 90^{o} difference. The Ansoft-HFSS designedcircularly polarized antenna with the return loss and directivitygiven below.

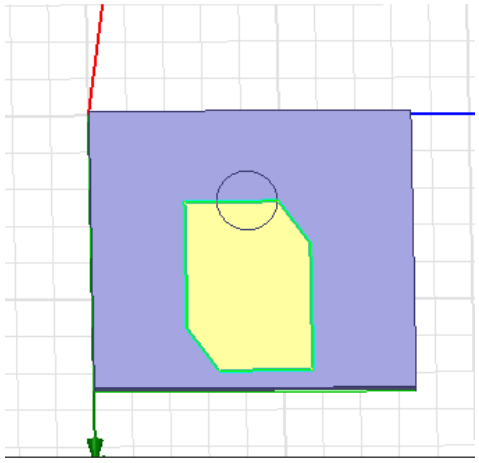

Fig. 7: Circular polarization antenna

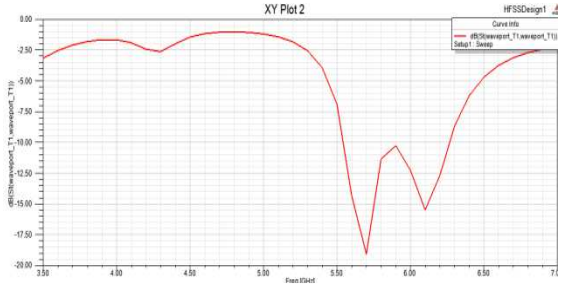

Fig. 8: Return loss of CP receiver antenna

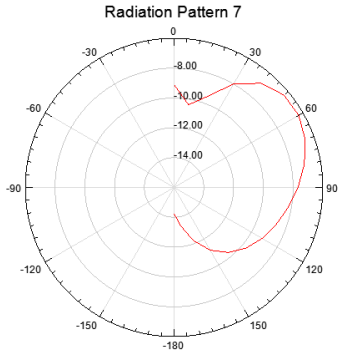

Fig. 9: Radiation pattern of the CP receiver antenna

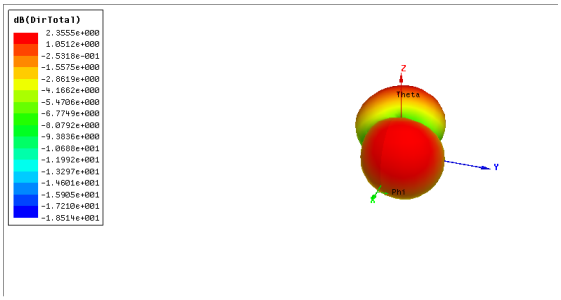

Fig. 10: Directivity of CP receiver antenna

Fig. 11: Gain of CP receiver antenna

Conclusion:

A square patch circularly polarized microstrip antenna has been designed. The antenna performance has been analyzed using Ansoft HFSS software. The return loss of -10.5dB has been achieved and the antenna operates in a narrow band. The designed antenna can be used in radiolocation, mobile, amateur-satellite service and non-ISM band applications.

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