DESIGN AND SIMULATION OF MODIFIED SWASTIKA SHAPED MICRO- STRIP PATCH ANTENNA USING HFSS FOR MULTIBAND APPLICATIONS

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ABSTRACT:
The main objective of this paper is to design and simulate H & swastika shaped micro strip patch antenna for multiband applications. It has Omni directional and stable radiation pattern. Here micro strip antenna can be simulated by using ANSOFT HFSS software. Parameters such as return loss, VSWR and radiation pattern are taken. Micro strip antenna becomes very popular day to day because of easy analysis and fabrication, low cost, light weight. Micro-strip antennas offer low cost design for many wireless application systems. During design different feeding techniques with different antenna shapes are used. By increasing the substrate thickness and decreasing the permittivity of substrate the percentage of bandwidth is increased. HFSS software is used for simulation and design of micro strip antenna where its version is 13.0. HFSS means High Frequency Structure Simulator launched by the ANSOFT. Micro-strip antennas are used for WLAN, Wi-MAX & RADAR, mobile communications, satellite applications and microwave applications. The proposed antenna has Return loss -25db and frequency ranges 2.36 to 2.38GHz and 7.8 to 8.85GHz.

KEYWORDS: *Frequency, Bandwidth, VSWR, Radiation pattern, return loss.*

I. INTRODUCTION

Previously single band antennas were implemented for single wireless application. But later antennas suitable for multiband applications came into existence. Multiband includes dual, triple, quad and pentad bands etc. Multiband antenna means an antenna operating at more than one frequency. By using multiband antenna we can use same antenna for multiple applications.

MIMO (Multiple Input Multiple Output) systems are developed by employing multiple numbers of antennas at both the transmitter side and receiver side without any additional usage of the transmitting power. Generally MIMO systems are employed to increase the throughput, i.e., to increase the data transferring rate between the communicating device.

MIMO systems are intended to acquire higher data rates in wireless communications by employing multiple numbers of antennas at both transmitter side and receiver side .Employing antenna arrays at both transmitter and receiver side build ups a Multiple Input Multiple Output System. In general the antennas in an array are termed as elements. In MIMO systems, one of the major factor to be considered is mutual coupling between the adjacent elements. Mutual coupling can be defined as the electromagnetic energy transfer between adjacent radiating elements. i.e., whenever two conducting elements are placed side by side, there will be a energy transfer between them which results in loss of radiating power**.**

The Multiple-input multiple-output (MIMO) systems are today regarded as one of the most promising research areas of wireless communications. In MIMO (commonly pronounced my-moh or me-moh), is the use of multiple antennas at both the transmitter and receiver to improve communication performance. It is one of several forms of smart antenna technology. It transmits two or more data bits in same channel at same time using multi antennas at transmitter and receiver. It enables the increase of data rates by transmission of several independent multiplexed data streams on the different transmit antennas. It can enable robust communications, especially in challenging environments for radio propagation, by sending instead redundant information over the multiple antennas. Multiple data streams enable higher data speeds, while with redundancy under less radio-friendly conditions, if one signal is disrupted by interference, the receiver can recover all data from the other. It achieves this by higher spectral efficiency (more bits per second per hertz of bandwidth) and link reliability or diversity (reduced fading).It enables us to make use of variety of signal paths. The increase in spectral efficiency offered by MIMO systems is based on the utilization of space (or antenna) diversity at both the transmitter and the receiver.

A basic MIMO system is as shown in the fig1

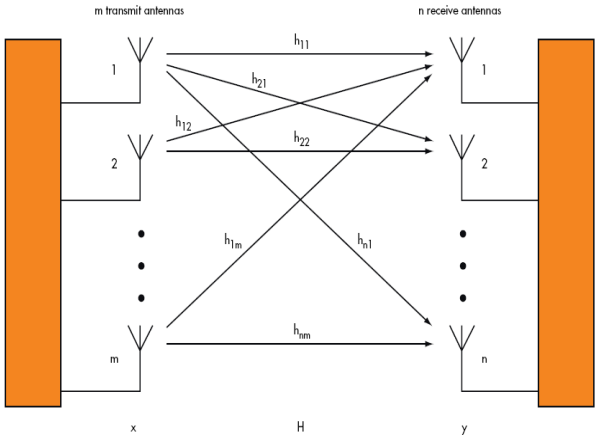

Fig1: A MIMO systems consisting of m transmitting antennas and n receiving antennas.

II. Antenna Design

In the present wireless communications, the patch antennas are fabricated with various designs and shapes. the most widely studied antennas are E shaped patch antennas, H shaped patch antennas, U slotted patch antennas etc., among all this antennas H shaped patch antenna is proved to be better one in terms of return loss and frequency. In the present paper a swastika shaped patch antenna is designed and results indicate that return loss and frequency is better compare to H shape patch antenna.

The design is developed on Rogers RT duroid 5880 substrate with relative permittivity 2.2, dielectric loss tangent 0.0009, impedance bandwidth 35%

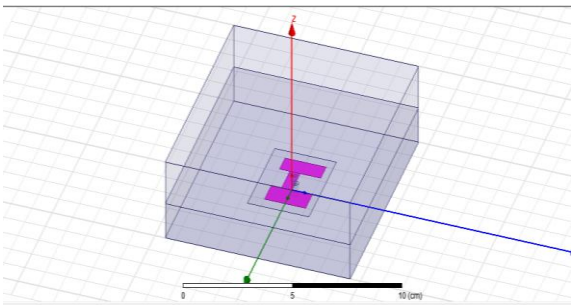

Fig2: H-Shape single band coaxial feed patch Antenna

Here H shape patch antenna is designed with coaxial feeding technique as shown in above fig2.

Return loss=S11

$$VSWR=\frac{1+|S11|}{1-|S11|}$$

Bandwidth = upper frequency - lower frequency

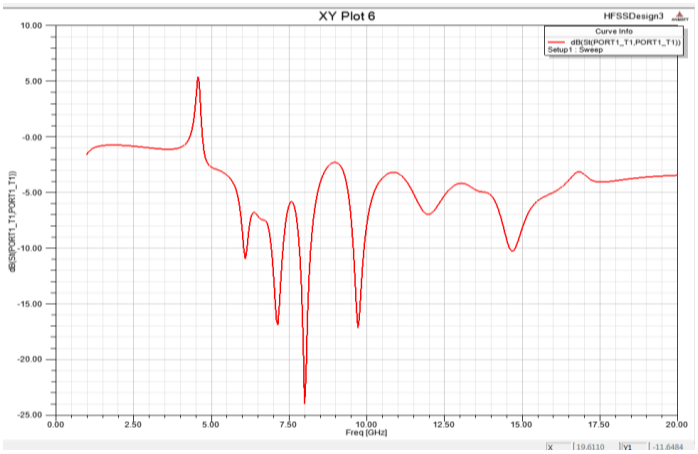

Fig3. Rectangular plot (H-Shape)

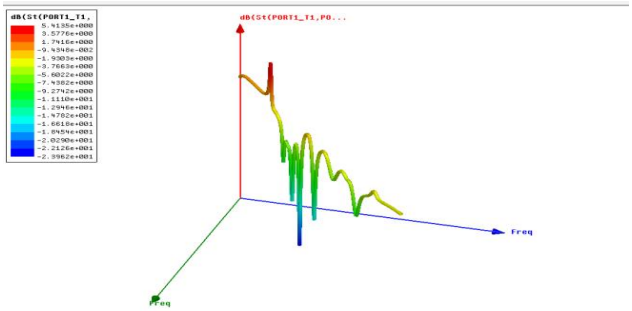

Fig4: 3D Rectangular plot (H-Shape)

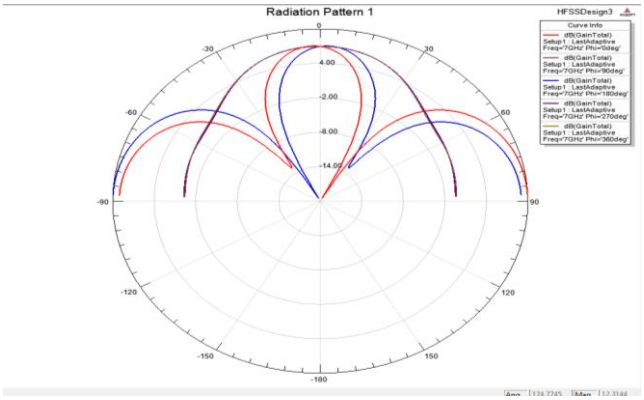

Fig5: Radiation pattern (H-Shape)

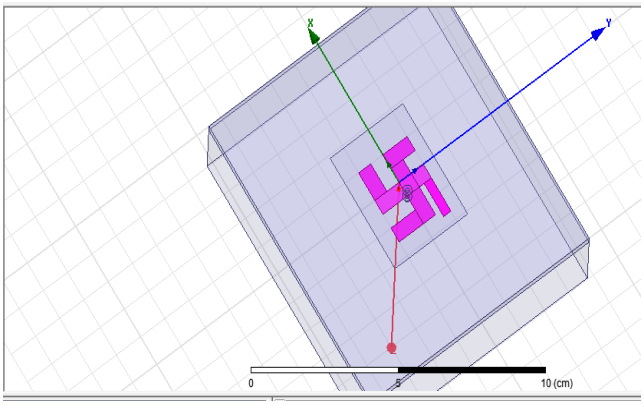

Fig6: Dual band Swastika coaxial feed patch Antenna

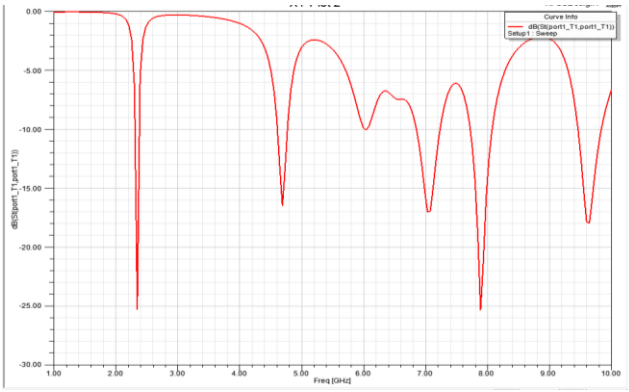

Fig7: Rectangular plot (Swastika)

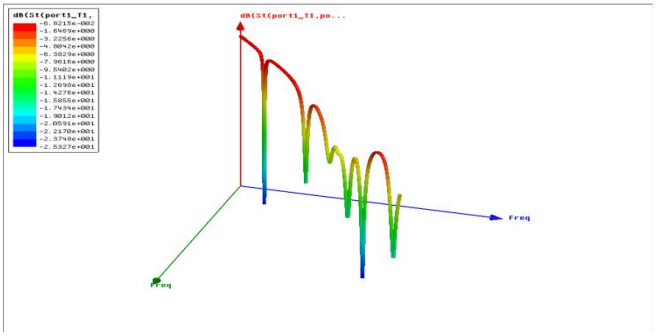

Fig8: 3D Rectangular plot (Swastika)

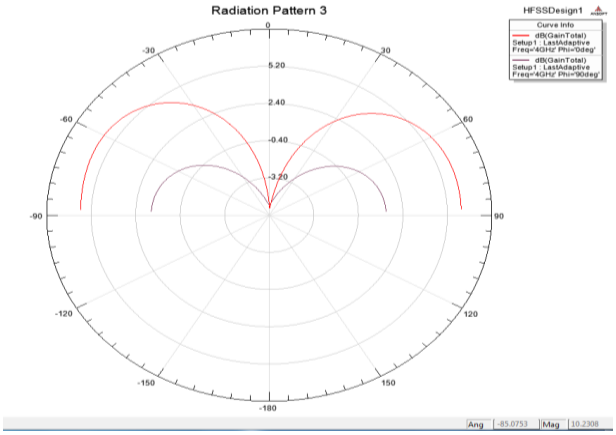

Fig9: Radiation pattern (swastika)

The term Radiation pattern refers to the directional (angular) dependence of the strength of radio waves from the antenna or other source.

Radiation patterns are almost Omni-directional which allows us to use this antenna for mobile applications.

Comparison of Different Patch Antennas

S.NO	PARAMETER	H SHAPE	SWASTIKA
1.	FREQUENCY RANGES (GHz)	7.7-8.2GHZ	2.36-2.38GHZ 7.8-8.85GHZ
2.	RETURN LOSS (dB)	-24	-25
3.	VSWR	1.08	1.08
4.	FEEDING	COAXIAL	COAXIAL
5.	BANDWIDTH(GHZ)	0.5	0.2 0.25
6.	APPLICATION	RADAR SATELLITE	MIMO WEATHER FORECASTING RADAR SATELLITE

III. CONCLUSION:

In this paper we have design a H-shape and swastika shaped dual band patch antenna with coaxial feed which is suitable for multiband applications .Finally we calculated Return loss -25db and frequency ranges 2.36-2.38GHZ and 7.8-8.85GHZ.

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