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Microstrip patch Antenna modification using Double Split Ring Resonator

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ABSTRACT- The aim of this paper is to analyze the difference in different parameters of antenna while double split ring resonator. Antenna is firstly loaded with Complementary Split Ring Resonator (CSRR) and then with S-shaped slot in microstrip feed line. In this Complementary Split Ring Resonator slot and S-shaped slot are used to produce band notched characteristics for WiMAX band (3.30-3.60 GHz) and WLAN band (5.10-5.80 GHz) respectively. The downlink frequency band (7.25 – 7.75 GHz) of X-band for satellite communication is notched using Symmetrical Split Ring Resonator Pair (SSRRPP)as electromagnetic coupling element near microstrip feed line which produces band stop characteristics. The different plots show evidence of difference in parameters while using resonator and feed lines.

Keywords-VSWR, Band Notched Antenna, SSRRPP Loaded Antenna, CSRR Loaded Antenna, Feed Miniaturized Antenna, UWB Antenna.

I. INTRODUCTION

Antenna has a very important play in any wireless communication systems. Antennas enable wireless communications between two or more stations by directing signals toward the stations by means of radiating or receiving radio waves[1]. Present day wireless communication systems shows increased affinity towards antennas with multiband operations. Though the designs of single antenna with multiband characteristics are difficult to implement, there is an upbeat in trend for design of such multiband antennas[2]. Ultra-Wide Band (UWB) from 3.10-10.60 GHz as unlicensed band for commercial use and has attracted interest of scholars from academics and industries for future applications[6].The.need.of.wireless.communicatio n such as Wi-Maxhas grown very rapidly today[8]. Wireless system expected to be low profile which needs smaller dimension because of its characteristic to be mobile. Microstrip patch antenna is one of the best choices for wireless system. As the patch antenna possesses many advantages such as low profile, light weight, small volume.

A. Unlicensed Frequency Band

Unlicensed frequency band covers ISM band such as5GHz band. It is provided that sharing of radio resources is feasible, available radio resources are used more frequently and at more location which may lead to better accuracy [5].The 5GHz unlicensed frequency band covers the radio spectrum between 5.15GHz and 5.825GHz.

B. Wi-Max

WiMAX can be shortly described as: "a telecommunications technology aimed at providing wireless data over long distances in a variety of ways, from point-to point links to full mobile cellular type access. It is based on the IEEE 802.16 standard [4] .

The goal of WiMAX is to provide high-speed Internet access in a coverage range several kilometers in radius. In theory, WiMAX provides for speeds around 70 Mbps with a range of 50 kilometers. The WiMAX standard has the advantage of allowing wireless connections between a base transceiver station (BTS) and thousands of subscribers without requiring that they be in a direct line of sight (LOS) with that station[11]. At the heart of WiMAX technology is the base transceiver station, a central antenna which communicates with subscribers' antennas**.** The proposed structures are to beaten the above issue of the range pass channel of the narrow spectrum framework.UWB channels give high information speeds, bringing about low obstruction, low hardware cost, impedance opposition and superior on multi-course channels. The significant thing is to plan a range pass filter in UWB to give low inclusion misfortune, steady gathering postponement and furthermore to decrease the obstruction signal by dismissing different flag outside the UWB range.

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II. ANTENNA DESIGN

- **Proposed Antenna 1 – At 180^0 degree**

In this proposed antenna there are two complimentary split ring resonator in inner patch of the antenna. Both resonator are aligned at 180 degree to each other as shown in figure given below.

Fig-1 Antenna at 180^0

- **Proposed Antenna 2 – At 0 degree**

In this proposed antenna there are two complimentary split ring resonators in inner patch of the antenna. Both resonator are aligned at 0degree to each other as shown in figure given below.

Fig-2 Antenna at 0^0

- **Proposed Antenna3– At 90 degree-clockwise**

In this proposed antenna there are two complimentary split ring resonator in inner patch of the antenna. Both resonator are aligned at 90 degree-clockwise to each other as shown in figure given below

Fig-3 Antenna at90^0 clockwise

- **Proposed Antenna4–At 270 degree-clockwise**

In this proposed antenna there are two complimentary split ring resonator in inner patch of the antenna. Both resonator are aligned at 270 degree-clockwise to each other as shown in figure given below

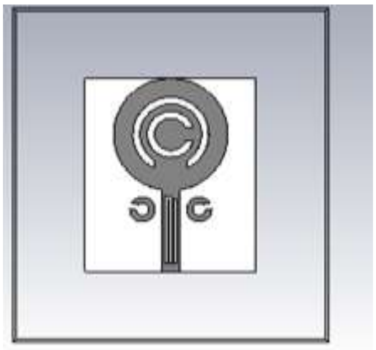

Fig-4 Antenna at90^0 clockwise

III. ANALYSIS.OF.GENERAL ANTENNA DIMENSIONS

By using CST STUDIO SUITE 2014 we have design a antenna with double CSRR and simulated the antenna structure. The FR-4 substrate (thickness = 0.16 cm, dielectric constant r = 4.4 and loss tangent = 0.02) is utilized to make this model. This antenna uses a 50 ohm microstrip power line that features highlights and line width s 2.8 mm. We have added a one CSRR with the dimension given below in table and studied different parameters like VSWR,Gain , Directivity with each patch in the antenna or by adding different patches in antenna and differences generated by adding patches in previous antenna.

We have Studied VSWR of antenna by adding Double CSRR at different alignments with each other. There can be many alignments possible. We have taken four basic alignments and simulated and studied

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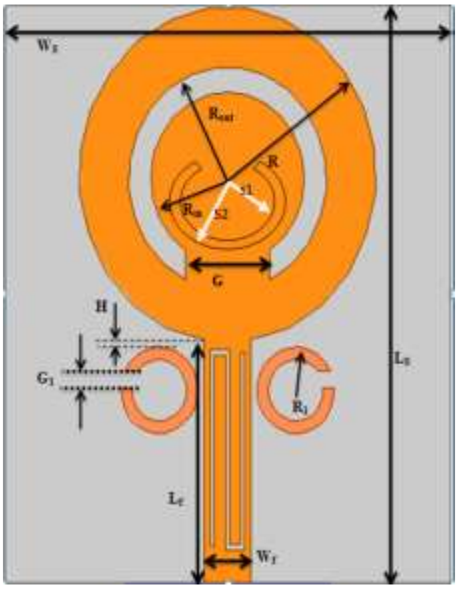

Fig5- Proposed DSCRR

IV. VSWR RESULTS OF DOUBLE SPLIT RING RESONATOR

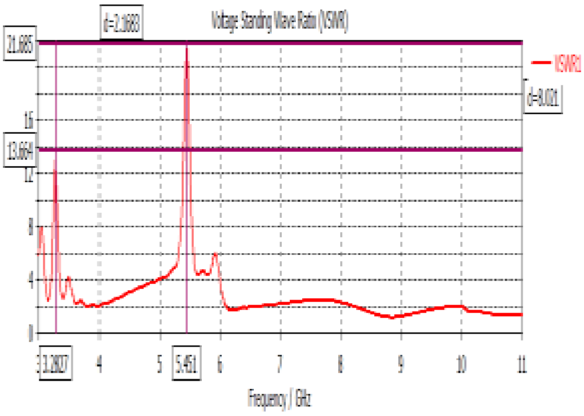

Fig.6.VSWR of Antenna proposed 1-At 180^0

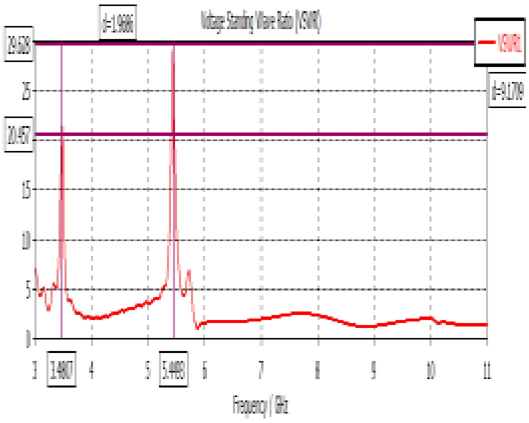

Fig-7 VSWR of Antenna proposed 2-At 0^0

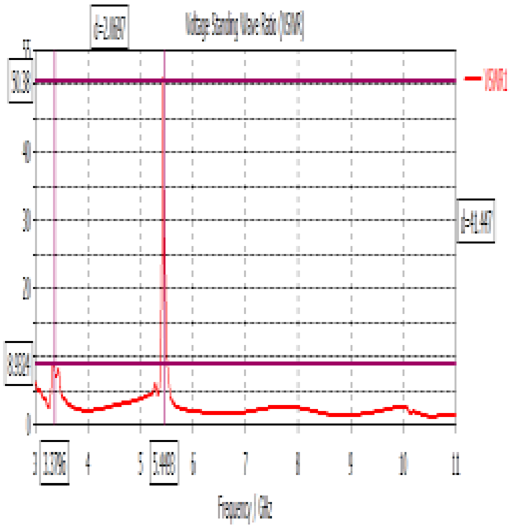

Fig-8 VSWR of Antenna proposed 3-At 90 ^{0}clockwise

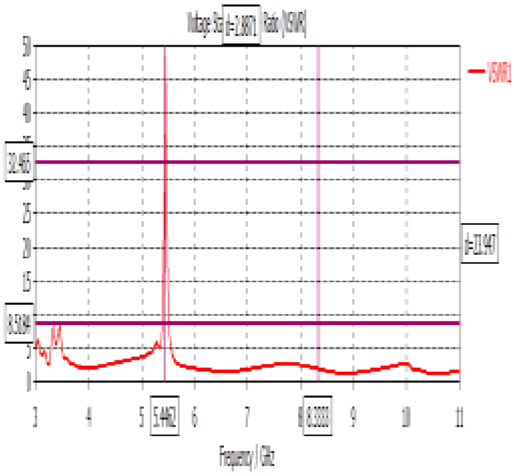

Fig-9 VSWR of Antenna proposed 8-At 270^0 clockwise

V. RESULT AND COMPARISON

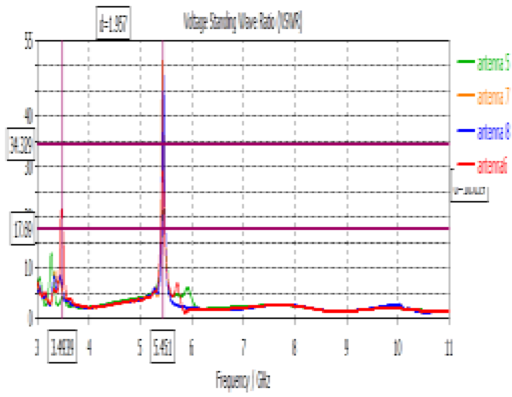

Fig-10 The diagrammatical representation of the study

Tab.1. Comparison of VSWR of DCSRR

S. no	Proposed Antenna Rotated At different angle	Operating frequency(F IN GHZ)	VSWR
1	Antenna 5 rotated at 180^0	3.28	12.9
		5.45	21.52
2	Antenna 6 rotated at 0^0	3.48	20.45
		5.45	29.63
3	Antenna 7 rotated at 90^0	3.3	8.9
		5.44	50.38
4	Antenna 8 rotated at 270^0	3.3	8.9
		5.44	54.3

VI. CONCLUSION

The patch antenna has been tried effectively. The outcomes were acquired and dissected. The attributes of the patch antenna were found and afterward talked about all through the examination where the outcomes were broke down. When increasing or expanding the antenna frequency, it is sometimes indispensable to change the antenna parameter. All goals were accomplished and the goal was accomplished. The dual band antenna has been studied. Observations have been made on several parameters such as gain, radiation pattern and VSWR in both cases. From the results, it has been observed that the parameters that influence the antenna are the relative permittivity of the dielectric material under the patch, the width (Wf) of the microstrip line, the slot position in the patch and the plane of ground (in case of the dual spectrum), and the length and width of the patch.

In the various antennas that we have studied in our research, we have placed circular patches which can be replaced by square patches too and thus we can study different parameters such as VSWR, gain etc. For better approach we can also make combinations of circular and square patch embedded in a single antenna.

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