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Analysis of Reconfigurable Microstrip Patch antenna

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***Abstract*— In this paper, micro strip patch and slot antenna are describe. We similarly show about the reconfigurable antenna and their types like frequency, polarization, radiation pattern and gain. The antenna is capable of the frequency exchanging at ten different frequency between 3.4698 GHz and 6.0878 GHz. There are design and simulate the microstrip antenna, 1X2 array patch antenna and the 1X2 array patch antenna with PIN Diodes. The outcomes are accomplished distinctive frequencies, gain, bandwidth, directivity.**

***Index Terms* – Microstrip Patch Antenna, Micro Strip slot antenna, Reconfigurable Frequency, RF PIN Diode.**

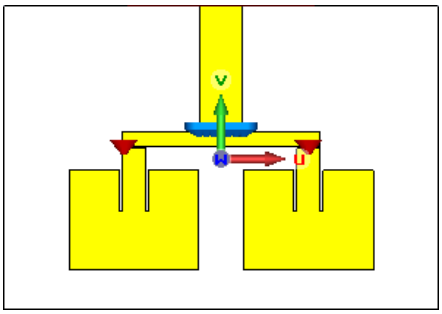
I. INTRODUCTION

As the next generation of wireless communication, systems should support multi-mode and multi-band applications, the number of antenna elements increases in these procedure. Reconfigurable Antennas (RA) contain latest acknowledged best deal in wireless communication, satellite communication and mobile communication [1][8]. The commitment of increase bandwidth, gain performance, control etc can be achieved by RA [1][3]. The basic working law of this reconfigurable antenna is achieved by switching the status of an RF switch are performed by ON or OFF mode which then affects the current allocation of the antenna. Switching components for example PIN diode, Varactor diodes, MEMs switches, and optoelectronic switches be usually use to set frequency reconfigurable antenna [3]. Microstrip patch Antenna has been used in wireless communication. It have features compact size and easy to fabricate use with multiband antenna operation [2][3][5].

The antenna consists of micro strip patch and slot antenna. Micro strip patch antenna has been consisting of ground plane with dielectric substrate. This is sequence leads to troubles related to intrusion in the site, cost, and no difficulty of maintenance, reliability and increased weight. In this paper, antenna is consisting of microstrip patch antenna and slot antenna where slot antenna in the ground plane connected through microstrip feed line. The antenna is capable to reconfigure at ten unique frequencies between 3.4698 to 6.0878 GHz using two PIN diode placed in the slot. Details of the proposed design are described. The simulated and measured results are presented, and the performances of the antenna are investigated.

II. DESIGN AND METHODOLOGY

In this division, planned antenna is designed. Figure 1 show that geometry of proposed antenna.
The antenna is designed on an FR4 substrate with dielectric constant is 4.3 and the height of dielectric substrate is 1.6 mm. The thickness of patch antenna is 0.035 mm. The patch size is 20X26 mm2. The length of inset feed is 12.6 mm and width is 4.75-mm. Slot antenna, which is connected two patch antenna with two PIN Diodes. So this geometry is called 1X2 array antenna. Slot with ground plane is attached two patch antenna with width 19.875 mm and length is between 2.4 to 5.3 mm for using bypass capacitors which value is 0.25 PF. Two PIN diodes have been connected in slot. PIN diode that is operated as a switch. The first switch is placed on slot at the left side that distance is -19.5 mm. Second switch which places middle of the slot at a distance of 17.5 mm. The equivalent diodes formation is shown in Table I. When all diodes are ON then the antenna resonant up to three different frequencies, which is properly grounded. When all diodes are OFF then the patch act as feeding to the slot and the antenna resonant up to three different frequencies, which is shown in Table I. PIN diodes 1SV128 is used as the switch in simulation and measurements. Computer.



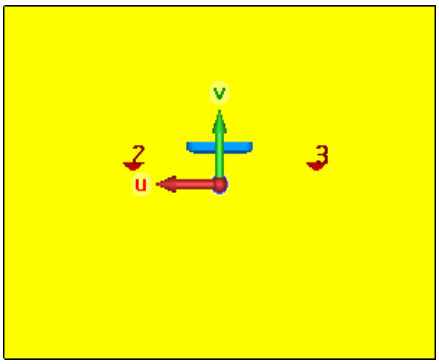


Fig. 1 Different view of 1X2 array antenna with PIN Diodes (1) Front view (2) Back view

III. RESULTS

The planned 1X2 array antenna is simulated in CST software that is shown in Fig. 1. The corresponding return loss results are shown in Fig. 2 S-Parameter v/s Frequency of antenna have been shown below graph. The simulated results are less than -10 dB at all frequency bands. Table I shows that all the results of antenna when PIN diodes different state.

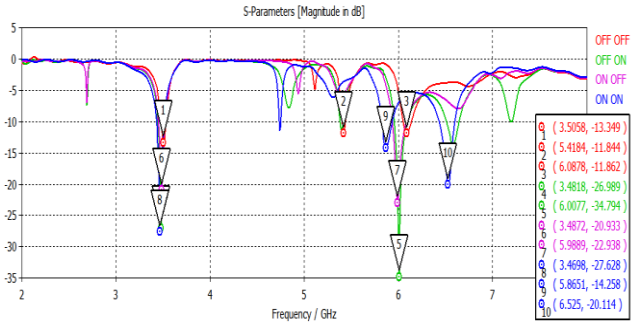


Fig. 2 S-Parameter v/s Frequency of antenna

The simulated results of return loss are shown good at different frequency. The planned antenna is capable reconfigure up to ten different frequencies bands.

3. One Diode in OFF and Second in ON Condition

From the simulation, the gain results are shown in figures at

1. Two Diodes In ON Condition

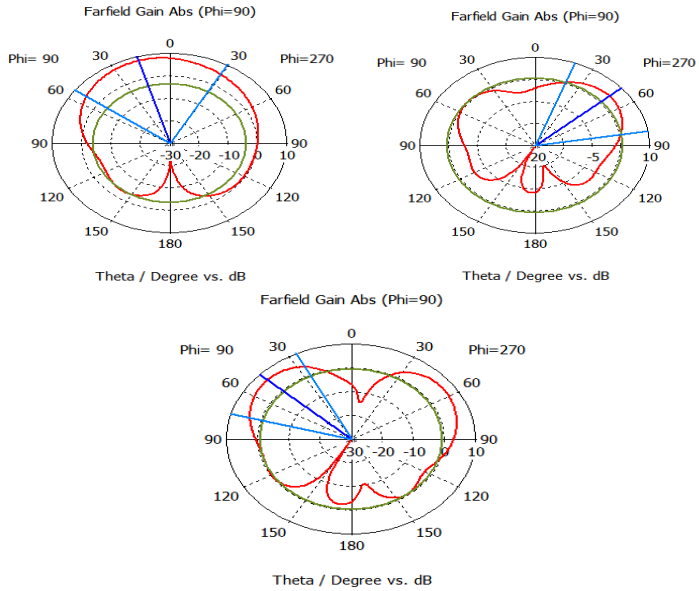


Fig. 3 Simulated result of gain when diodes are ON

different mode of diodes. Fig. 3 shows the result of gain when diode is ON and another Figure are different mode of diode shown below.

2. One Diode in ON and Second in OFF Condition

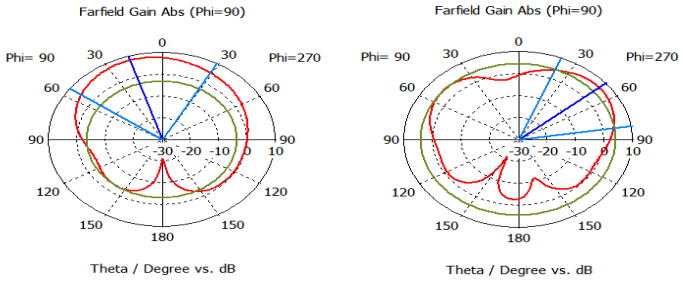


Fig. 4 Simulated result of gain when diodes are ON and OFF

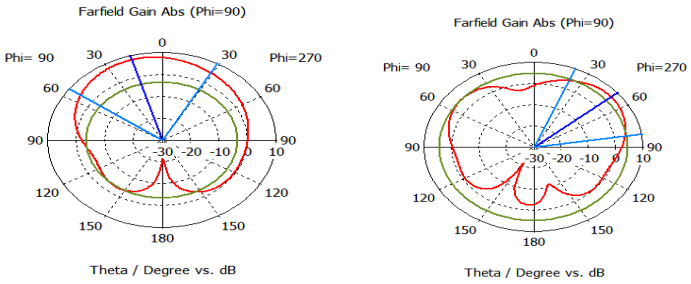


Fig.5 Simulated result of gain when diodes are OFF and ON

4. Two Diodes In OFF Condition

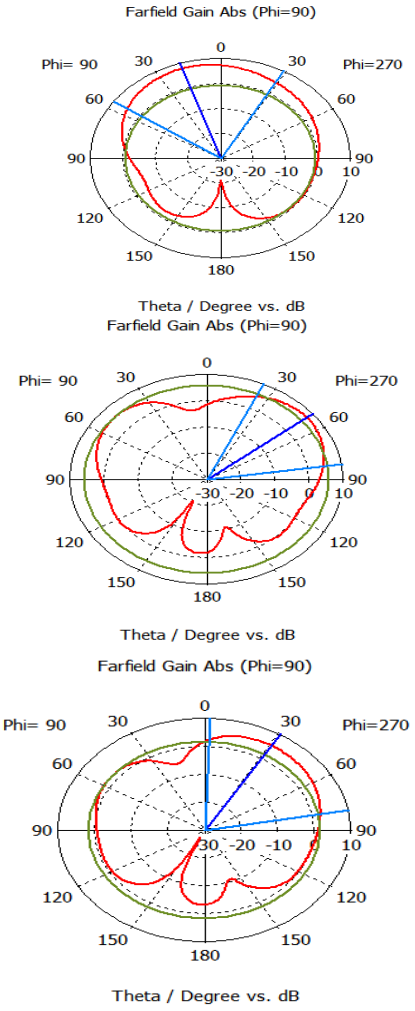


Fig.6 Simulated result of gain when diodes are OFF and ON

Table 1 Simulated resonant frequency and other results

Diodes Configuration		Frequencies(GHz)	Gain(G) in dB	Directivity (D) in dBi	Efficiency(E) in %	BW in %
D1	D2					
ON	ON	F1=3.4698 F2=5.8651 F3=6.525	8.0 5.7 6.6	8.1 6.1 7.1	98.76 93.44 92.96	2.37 1.94 2.53
ON	OFF	F4=3.4872 F5=5.9889	7.9 6.7	8.1 7.4	97.53 90.54	1.96 2.42
OFF	ON	F6=3.4818 F7=6.0077	7.9 6.7	8.1 7.5	97.53 89.33	2.02 2.2
OFF	OFF	F8=3.5058 F9=5.4184 F10=6.0878	7.7 5.2 7.5	8.1 5.5 7.9	95.06 94.55 94.94	1.38 0.6 1.53

IV. CONCLUSION

The aim of this thesis was to design a solid microstrip patch antenna, for increase gain using 1X2 array patch antenna for use in Wimax application. Also, there are achieved different frequencies using 1X2 array patch antenna PIN Diodes. Radiation pattern plots have been obtained for the desired antenna orientation. We have proposed a gain antenna based on simple patch antenna for Wimax applications. So, there are using simple patch achieved gain 5.3 dB and directivity 6.6dBi and using array method gain is 7.3dB and directivity is 8.3dBi. There are also conclude to use 1X2 array antenna with pin diodes and achieved different frequency, gain is 8.0 dB.

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