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Reconfigurable Antenna Design for Dual Band to Operate in UWB Applications

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Abstract ***Reconfigurable antennas wires are equipped for working in various groups by recurrence re-configurability or polarization re-configurability. A recurrence reconfigurable fix reception apparatus with two rectangular metallic rings is utilized by changing the transmitting surface of antenna. The switches are presented at the focal point of the essential fix. This antenna can work in 1.8 GHz, 2.2 GHz and 2.7GHz recurrence groups, when the switches are turned ON and OFF. The emanating surface zone increments when the switches are turned ON and thus change the working recurrence of antenna. The switches are displayed for equal circuit of PIN diodes. In this paper the radio wire can work from 1.8GHz to 2.7 GHz. The antenna is created and reproduced in HFSS Software.***

Keywords: Multi Band, Ultra Wide Band, Micro strip patch antenna.

I. INTRODUCTION

The re-configurability is an extra capacity that the miniaturized scale strip fix radio wire can be intended to work at various frequencies or wide band of frequencies. Reconfigurable recieving wire gives various functionalities to clients to associating with various types of administrations now and again [2]. A reconfigurable reception apparatus has tunable qualities like working recurrence, radiation design, polarization, impedance data transfer capacity or mix of these. The mean to structure a reconfigurable recieving wire is to change these attributes autonomously [2]. Reconfiguration in radio wire can be accomplished by redistributing the present and changing the compelling emanating surface. In recen structures, the compelling gap of recieving wire by utilizing switches like MEMS (small scale electromechanical frameworks), varactor diodes or basic PIN diodes. They are generally inclined to nonlinearity impacts, misfortunes and so forth., yet at the same time they are prominently utilized as they are anything but difficult to incorporate [3-7]. Among these, MEMS have high exchanging pace and minimal plan however are increasingly costly, Pin diode is progressively famous decision.

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Recurrence reconfigurable reception apparatus is the one that can bounce between various recurrence groups i.e., it very well may be constant or exchanged; consistent recurrence reconfigurable radio wire changes to various working frequencies easily as opposed to hops as in exchanged reconfigurable recieving wires [8-10].

A Yagi Uda framed repeat reconfigurable radio wire for multimode remote applications was shown in [11]. PIN diodes were used to change the electrical length of the fix recieving wire that realized change in resounding repeat. A reconfigurable space dipole recieving wire presented in [12] can be reconfigured for single-band, twofold band and triple-band errands. PIN diodes are used to control stream of current and from now on the working frequencies of radio wire. Gathering device proposed in [13] can be reconfigured to six particular frequencies using PIN diodes as switches.

Reconfigurable gathering contraptions reinforce more than one remote standard, decline disturbance sway, improve system expansion and security, give grow model and extra essentialness [3]. Planning them in circuits limit the volume need just as reduce the cost especially for some propelled remote specific contraptions and observation systems. Little scale strip radio wires can be supported through systems like, Inset feed, pin feed, hole coupling and closeness coupling. Inset feed on account of perfect impedance planning, more increment and straightforwardness of production has advantage over other supporting methodologies [8].

This paper depicts structure and geometry of recieving wire in Section II, re-enactment results are delineated in segment III lastly the paper is closed area IV individually.

II. DESIGN ASPECT

The design of the antenna is developed by using the basic equations of patch antenna as shown below.

$$w = \frac{c}{2f_o\sqrt{\frac{(\epsilon_r+1)}{2}}} \quad \ldots\ldots\ldots (1)$$

By putting fo=2.4 GHz and ϵr=2.4, the width of the Patch is Wp=47.5mm. For ascertaining length following recipe from [6] was utilized

$$L = L_{eff} - 2\Delta L \quad \ldots\ldots (2)$$

Where Leff is effective length and can be determined by utilizing following equation [6],

$$L_{eff} = \frac{c}{2f_o\sqrt{\epsilon_{reff}}} \quad \ldots\ldots\ldots\ldots (3)$$

effective length can be bigger than the real length of reception apparatus in light of the fact that electrical field isn't constrained to emanating patch limit however it grows and causes radiation, this augmentation is called bordering field. these bordering fields make the successful length, additionally called as electrical length, more noteworthy than the physical length. ϵreff is the powerful dielectric consistent and can be determined as,

$$\epsilon_{reff} = \frac{\epsilon_r+1}{2} + \frac{\epsilon_r-1}{2}\left[1 + 12\frac{h}{w}\right]^{\frac{1}{2}} \quad \ldots\ldots (4)$$

Where h is stature of substrate and ϵr is dielectric consistent of material utilized. After calculating Leff, real physical length of focus metallic fix was found as Lp=39mm.

The planned radio wire utilizes PIN Diodes to switch between frequencies. As legitimately they are not utilized, they are demonstrated as proportionate circuits supplanted by metallic strip, as appeared in figures 1 and 2. The Table 1 gives the rundown of the structure

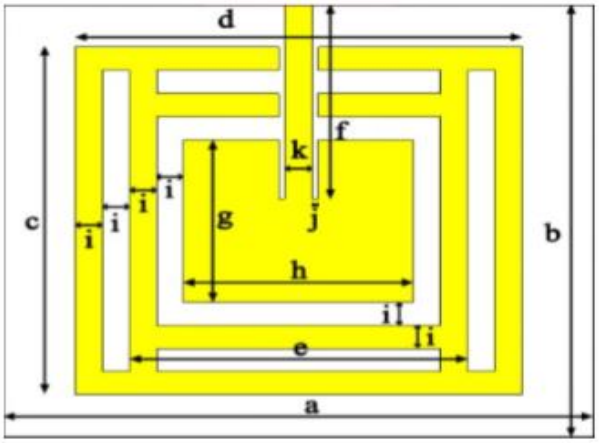

Fig. 1. Antenna topology with switches in OFF state

Table1. Length of Different Parameters of Antenna

Parameter	Length(mm)	Parameter	Length(mm)
a	122	g	39
b	104	h	47.5
c	83.8	i	5.6
d	92.3	j	1.25
e	69.9	k	5.6
f	33.4	t	1.58

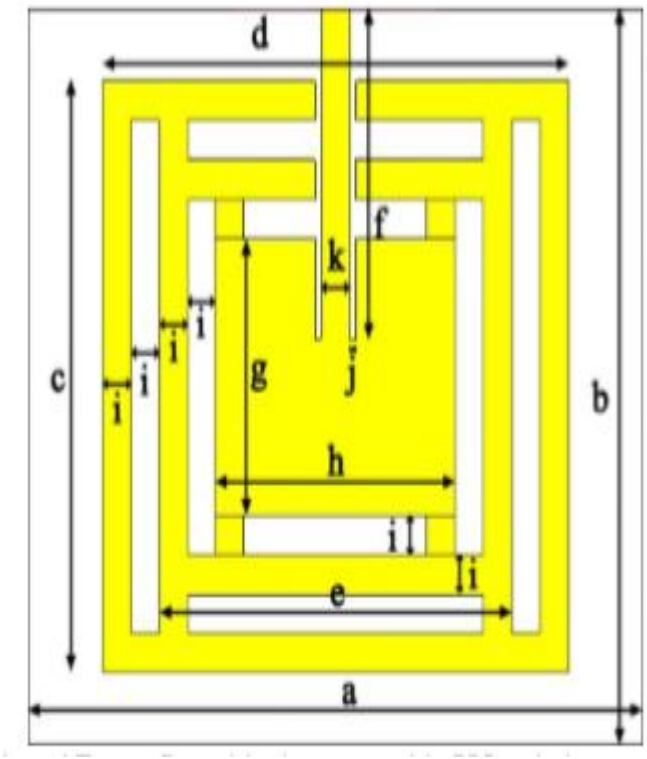

Fig. 2. Designed Reconfigurable antenna with ON Switches

The antenna is developed in Ansys High Frequency Structure Simulator and the results obtained are discussed in section III.

III. SIMULATION RESULTS

The designed reconfigurable antenna is simulated in Ansys HFSS Tool for both ON and OFF Conditions of Switches. The Patch is fed by Inset Feed.

A. With OFF Condition

The antenna operated with switches turned OFF yields the VSWR of 1.1163 at 1.81GHz which is at acceptable level as shown in figure3.

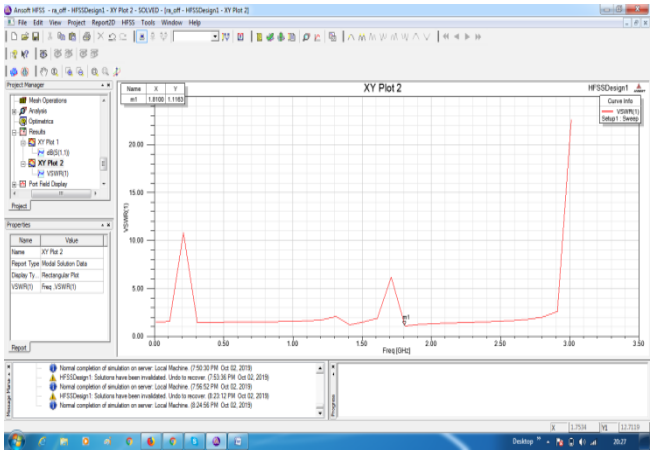

Fig. 3. VSWR of antenna with switches in OFF Condition

The Return Loss was found to be -26.2dB at 1.81 GHz as shown in figure 4.

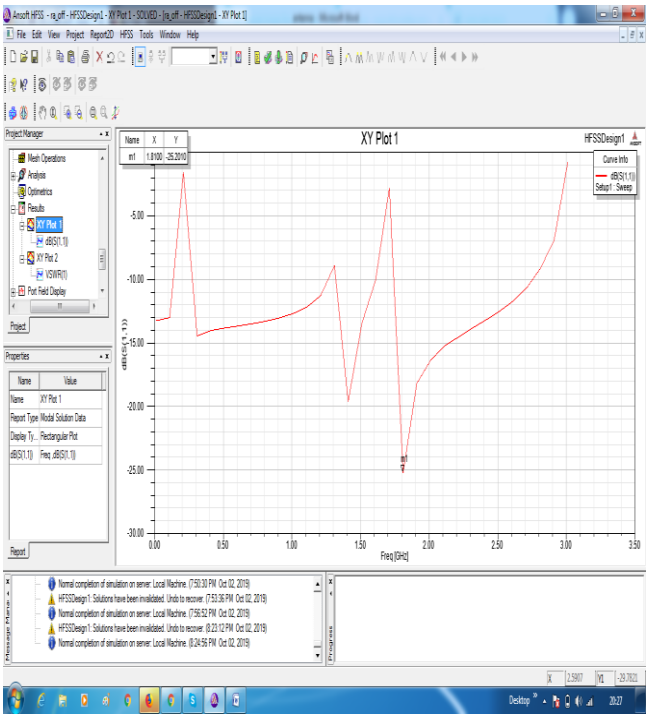

Fig.4. Return Loss of antenna with Switches in OFF Condition

The Radiation pattern is as shown in Figure 5.

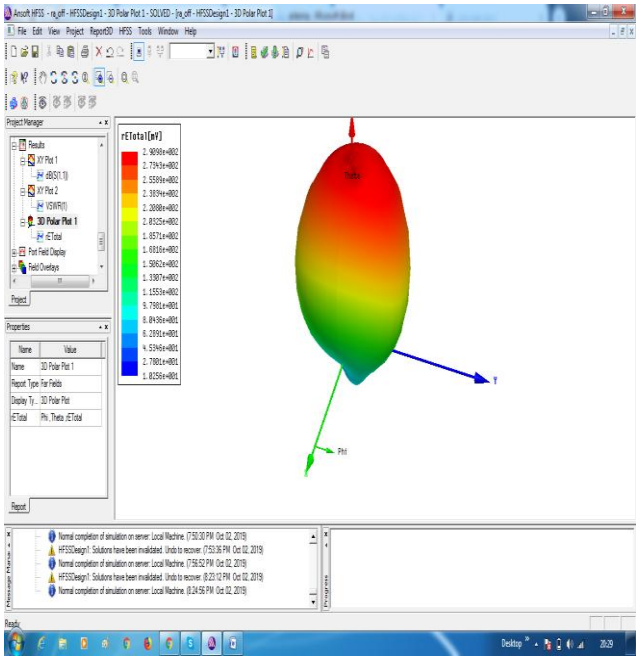

Fig. 5. Radiation pattern of antenna with Switches in OFF Condition

B. With ON Condition

The Return Loss of the designed antenna with switches in ON condition is shown in figure 6 which has at frequency of 1.81GHz as -18.57dB and at 2.21GHz as -14.39dB.

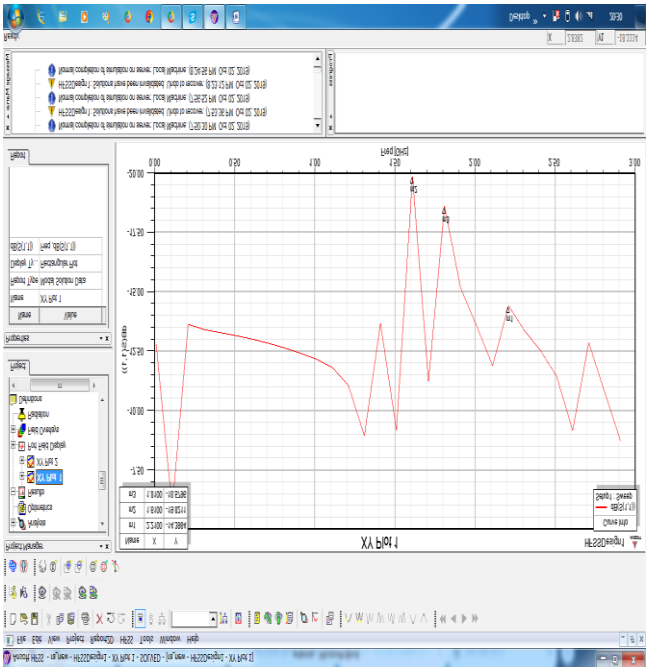

Fig. 6. Return Loss of antenna with Switches in ON Condition

The VSWR of the designed antenna is as shown in figure 7 gives at a frequency of 1.81GHz as 1.267, at 2.21GHz as 1.4709 and at 2.71GHz as 1.5892.

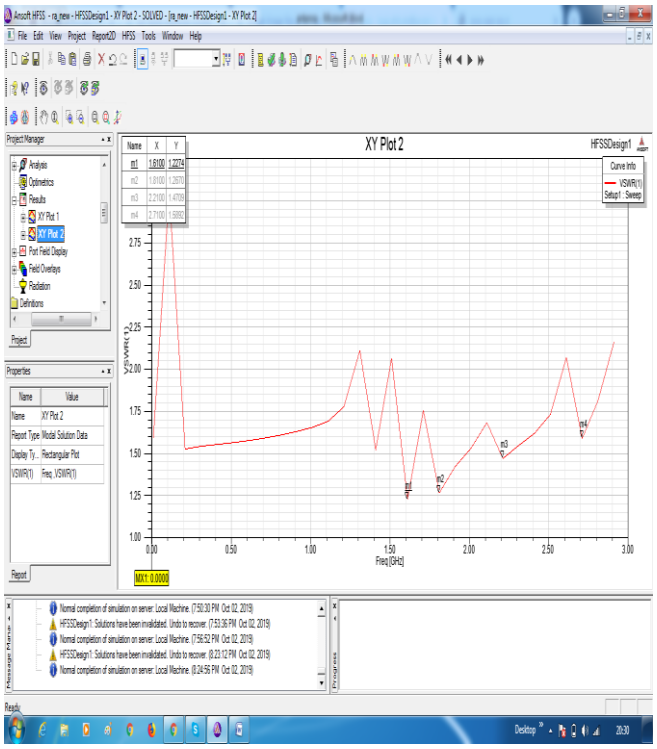

Fig. 7. VSWR of antenna with Switches in ON Condition

The Radiation pattern is directional as shown in figure 8 for the designed antenna with switches in ON Condition.

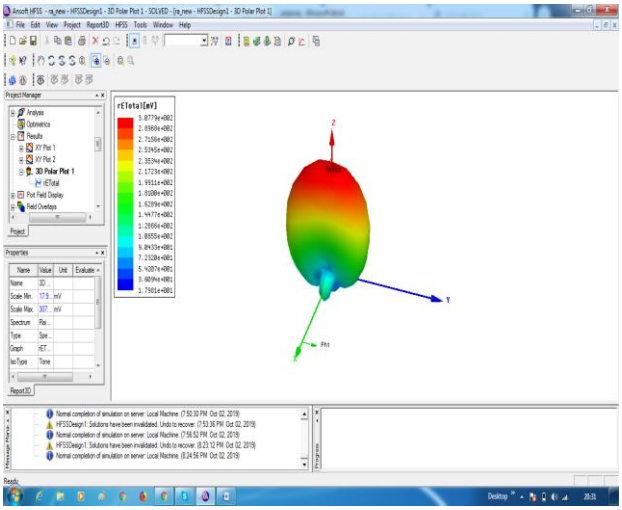

Fig.8. Radiation Pattern of antenna with Switches in ON Condition

IV. CONCLUSION

In this paper, the rectangular patch with concentric rectangular rings connected with switches are designed and simulated in Ansys HFSS Tool. The switches used are PIN Diodes which yield switching in frequencies between 1.8GHz, 2.21GHz and 2.71GHz due to variation in the effective radiating aperture of the antenna. The efficiency of the antenna can be further enhanced by using novel Electromagnetic Bandgap structures as a ground plane. The proposed antenna can be used in Wi-Fi and GSM applications

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