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BEAM CONTROLLER ANTENNA FOR WI-FI APPLICATION

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Abstract - Design of an antenna that able to radiated the farfield pattern by using PIN diode as a switch and capacitor as a filter. This antenna is design by using Computer Simulation Technology Microwave Studio (CST MWS) Software with the frequency of Wi- Fi 2.45 GHz and diameter of the antenna 20cm X 20cm it able to switch direction of the signalling of the antenna by using a switch with four different angle. The material of the antenna is using FR-4 and SMA connector with 50 Ohm.

Keyword —Directivity, Microstrip antenna array, Wi-Fi.

I. Introduction

Beam control antenna able to control the beam of the radiation pattern this to allow greater gain to increase the performances and reduce unwanted source. Beam control antenna is like directional antenna such as Yagi-Uda antenna that able to concentrate to a single direction with better gain and to reduse energy that waste in different area. [1] [3] Material that been used as a substrate is FR-4 that generic specification FR-4 refer to a specific fore-retardant level rather than to a specific laminate chemistry. [4]

II. Antenna Design

This method of allow the specific radiation pattern by four different angle the four the antenna is control by PIN diode as act as a switch. There are total of four PIN diode and eight Capacitor. Each diode need two capacitor as a filter to prevent the DC current go thru the antenna. Each angle it able to radiate of 90 degree if one of the diode is activate by using 5 Volt DC current. This antenna is design by using FR-4 dielectric substrate with the thickness of 0.16mm and the thickness of the cooper is 0.035mm. The function of the PIN diode is act as a switch and it allow the AC current pass thru then the DC current is activate. The capacitor acts as DC high pass filter. When high frequency sinusoidal components pass through this circuit, the capacitive reactance πfc define two of the parameters. [2]

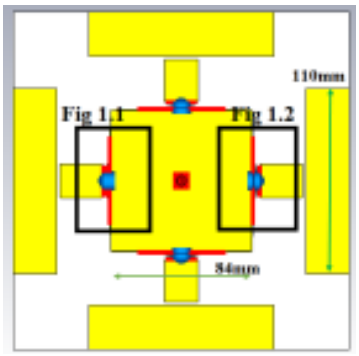

Fig 1.0 Back View of the Antenna

From the Figure 1.0 the simulation of this antenna design is the back view. The middle part with a red square is SMA connector with 50 Ohm connect the antenna main section and the ground of the antenna. The middle part of this antenna is the diameter of 84mm x 84mm is the antenna ground as it connected to the outer layer of the SMA connector. In figure

1.1 is the PIN diode is connected between the ground and small patch of the antenna meanwhile at Figure 1.2 is show that the connection between the ground of the antenna and the small patch is did not connect.

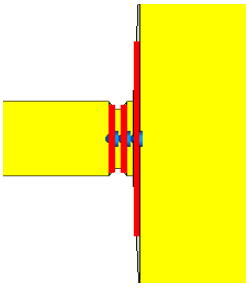

Fig 1.1 Design with PIN Diode

From Figure 1.1 is the zoom out from figure 1.0 and the middle three blue triangle is represent as capacitor and

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diode. The middle triangle is PIN diode act as switch while the other blue triangle is act as capacitor filter. When DC current is present it will active the PIN diode and it will drain the AC signal from the antenna to other site and both capacitor will prevent the DC current to flow to the both site of the antenna.

Fig 1.2 Design without PIN Diode

From figure above figure 1.2 is zoom out from figure 1.0 and it only show two blue triangle in the middle is represent capacitor and it did not show any PIN diode present. It show that during simulation the diode id not active and the current from the antenna unable to flow or pass thru the other site of the antenna and it unable to generate the farfield on the other site.

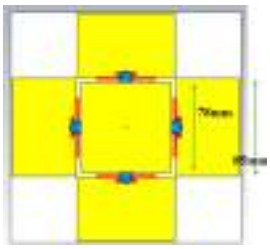


Figure 1.3 Front View of the Antenna

The above Figure is show that the front view of the antenna and the middle patch is simulate as 2.45 GHz frequency with the diameter 78mm x 78mm while the outside four patch is for generate signal to the farfield as below of this antenna have diode and capacitor for switching the antenna direction.

Result and Discussion

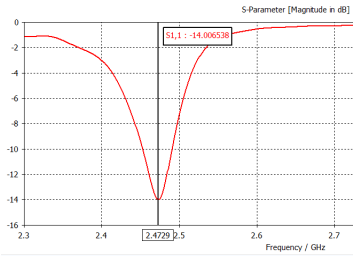
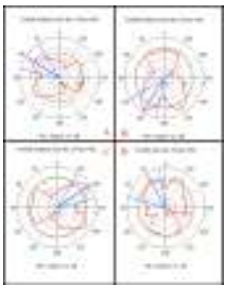


Figure 2.0 S11 parameter

Figure 2.0 shows the frequency drop at 2.47 GHz and the S11 Magnitude at -14.00 and after simulation with (even the diode in different position) and without diode the frequency and the S11 is remain at same frequency and S11. The desire frequency drop is at below -10 while the frequency 2.57 GHz is under ISM band and in the range of Wi-Fi 2.4 GHz to 2.5 GHz. [5]



diode turn on the right side and the signal will generate to the left side Figure 2.1 (A) it same go to Figure 2.1 (B) when the diode turn on the top position of the antenna the farfield pattern will generate opposite direction. This is because the diode is controlling the ground of the antenna.

Conclusion

By using diode and capasitor in an antenna it able to radiate farfield signal and by using Computer Simulation Technology Microwave Studio (CST MWS) Software it able to simulate the antenna to get the desire frequency, farifield and gain. This antenna using FR-4 subtract with the dimension of 20cm x 20cm it suitable to use for Wi-Fi application as the frequency drop at 2.47 GHz. that there are four different farfield as it represent that four different location of the diode when the diode turn on the farfield will generate as above .It also show that the farfield is different angle as the diode turn on in different location.

Acknowledgment

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