DESIGN OF A MULTI-PURPOSE PLANAR ANTENNA

R. Vignesh Ram[1], O. P. Saravana Priyan[2]
[1,2] Department of Electronics and Communication, Thiagarajar College of Engineering
Thiruparankundram, INDIA

ABSTRACT:

In this study, we have designed a multi-purpose planar antenna for DCS, WiBro ,and ISM. The proposed antenna was designed as an open-loop antenna that was transformed from a monopole antenna structure. The capacitance of the multi-purpose antenna was increased by the coupling of open gap. This antenna has many advantages such as smaller size , lower cost , more light weight , and higher gain than existing antennas . The resonance frequency and bandwidth can be adjusted by change of the gap and the height of the open loop antenna. The bandwidth of the designed antenna is satisfied with DCS, WiBro, bluetooth, wireless LAN and ISM bands. The frequency range is 1.745-1.891GHz (1.807GHz) and 2.469-2.750GHz (2.573GHZ).This antenna was used in WLAN and Mobile application.

1. Introduction:

Of the many factors that determine the quality of wireless communications, the characteristics of the antenna is one of the most important factors. Recently, the type of antenna widely used for mobile communications is the patch antenna or helical and monopole antenna. patch antennas antenna are widely used for antenna elements because they can be manufactured easily [2]. However, their bandwidth is narrow and the size of the patch is λ/2 of the resonance frequency wavelength. So the size of the antenna has a problem at a low frequency band. Such problems can be resolved by using substrate materials , advancing the manufacturing technology and varying design method [1]. Nowadays the rapid development of mobile communication needs a multi-resonance antenna satisfied not only existing service bands but the new developed frequency bands. Therefore, this study was proposed an open-loop antenna structure and designed a wide antenna that is generated multi resonance at DCS, WiBro, Bluetooth, wireless LAN and ISM bands. In this paper, I proposed a new structure of antenna using microstrip line.

2. Antenna structure:

The geometry of multi-purpose antenna is illustrated in fig.The structure of the antenna is designed an open –loop antenna that was transformed a monopole antenna structure.In general the parasitic element that is generated waveguide feed line and radiation patch affects matching. In this study, we fixed S=2.3[mm] and among L1,L2,L3,length of L2 was the most influenced by antenna characteristics.Therefore length of L2 was changed from 12[mm] to 24[mm].

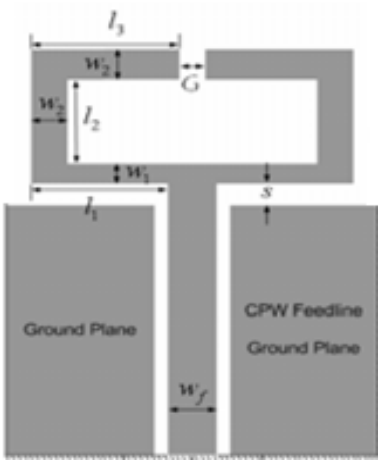

Fig. 1. The geometry of printed a multi-purpose planar antenna

3. Fabrication and measurement:

The antenna was printed on an FR-4 substrate of thickness h=1.6[mm] and relative permittivity 4.6 and loss tangent 0.002.Table shows the parameter values of the multi-purpose planar antenna.

3.1 Parameter of multi-purpose planar antenna:

parameter	Value[mm]	Parameter	Value[mm]
L1	18.5	W1	4
L2	22.5	W2	6
L3	20	W3	6
G	0.8	H	1.6

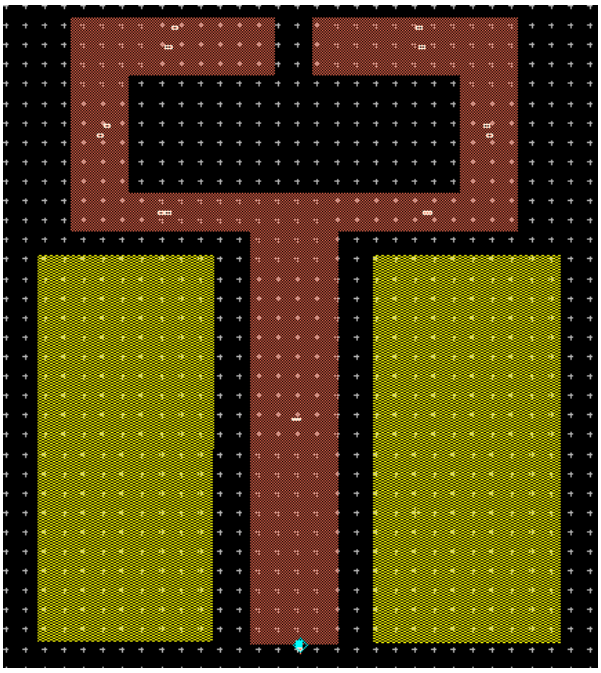

Fig. 2. The simulated structure of printed multi-purpose planar antenna

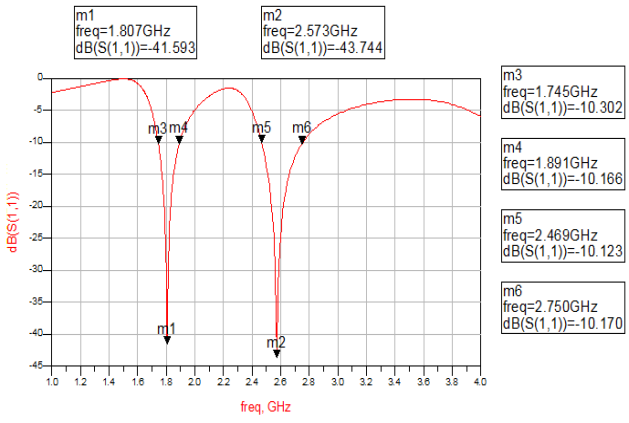

Fig-3 simulation and measurement of return loss

Fig2 shows the simulated planar antenna using advanced design .In this design I use microstrip line and FR-4 substrate. Among L1,L2,L3,length of L2 was the most influenced by antenna characteristics in terms of return loss [3]. The length L2 varies from 12[mm] to 22.5[mm] . Instead of using bottom ground plane in this design used parallel ground plane. The measured return loss values proposed antenna were -41.593dB at 1.807GHz ,-43.744dB at 2.573GHz.

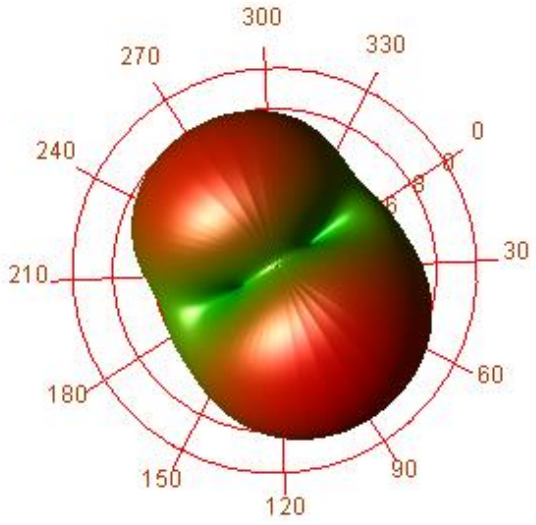

Fig 4. Measured radiation patterns for the proposed antenna at 1.807GHz

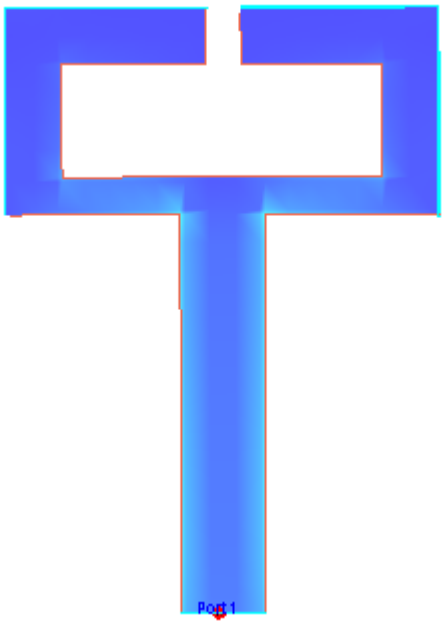

Fig 5. Measured current distribution for the proposed antenna at 1.807GHz

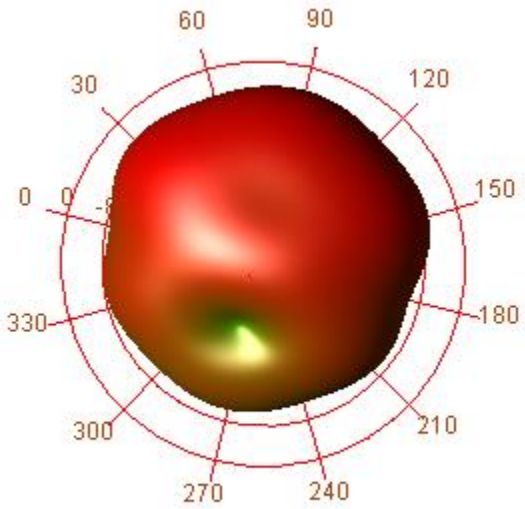

Fig 6. Measured radiation patterns for the proposed antenna at 2.573GHz

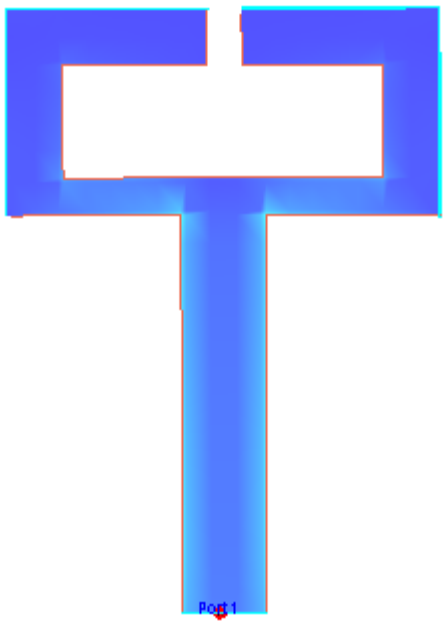

Fig 7. Measured current distribution for the proposed antenna at 2.573GHz

Figure4.6, shows the radiation pattern of the multi-purpose planar antenna and Figure5,7 shows the current distribution of the planar antenna that were simulated by ADS software. So the proposed antenna can be effectively used for mobile communication system or base station. We can know it has a good transmission regardless of location and it can be solved the directional problem.

4. Results and Discussions

1) 1.807GHz application

1. Digital Cellular Service
2. GSM
3. PHS

2)2.573GHz application

1. WLAN and UWB applications
2. WiBro
3. ISM.
4. Bluetooth

This study was designed a multi-purpose planar antenna. The capacitance of the multi-purpose antenna was increased by coupling of open loop. The frequency ranges is 1.745-1.891GHz(1.807GHz) and 2.469-2.750GHz (2.573GHz). So the proposed antenna can be effectively used for WLAN,UWB and mobile communication system (or) base station application. I can know it has a good transmission regardless of location and it can be solved the directional problem. Therefore, this study was found that this antenna can be used at DCS, WiBro, Bluetooth, wireless LAN , GSM-1800, and ISM bands.

REFERENCES

[1] W. Menzel and W. Grabherr,"A microstrip patch-antenna with coplanar feed line," *IEEE MicrowaveWave lett.*, vol. 1, pp. 340-342, Nov. 1991.

[2] Kai Fong Lee, Wei Chen, "Advanced in Microstrip and Printed Antennas", Wiley Interscience, pp71-109, 1997.

[3] David M.pozar,"microwave & RF design of wireless systems," john wiley & sons, 1998.