Linear-Directional Microstrip Planar Antenna for C-Band Mobile Application

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ABSTRACT
A simple configuration omnidirectional microstrip planar antenna with agile features of frequency is paper is presented. The prototype design has the rectangular shaped radiating patch, which has four orthogonal slots. Where substrate dielectric constant value is 4.3, FR4-material for suppression of electric lines, Antenna is excited by the proximity feeding strip. Aim of paper to design a antenna reducing the size and to achieve symmetric broadside omnidirectional radiation pattern. The proposed antenna provides a solution for size reduction of the radiating patch while maintaining good broadside radiation pattern. Obtained results illustrate that the proposed radiating element is very effective in reducing the Antenna size. Good results of ReturnLoss-S11, gain, VSWR and radiation pattern can be achieved. The letter shows the novel smaller size proximity coupled single band for the application of C-Band microstrip antenna for 7.8 GHz frequency.

Keywords
Microstrip antenna, single and, proximity coupled, Gain, impedance.

1. INTRODUCTION
Microstrip Antenna was first invented by the Bob Munson in 1972, where Deschamps has also presented earlier little work on it which is in back to 1953, after 1970's it is started very popular. Small sizes Design for microstrip antenna are frequently used nowadays for wireless communication, due to the miniaturization of electronic equipment devices. Nowadays researcher's interest has increased in reduced size of antenna, for recent technology requirement. Antenna is largely in microwave frequency and above. We can see there are many techniques for designing of antenna element like-rectangular, Triangular, circular, EBG, Shorting Pins or Diodes, Meandered antenna, slotted Patch and Defected Ground Plane etc.

For reducing of Antenna appropriate substrate should be employed, and desired frequency radiation pattern in particular frequency should be achieved. Designing of such reduced sized antenna element, lot of analysis and parameterization needs to be performed for required results by the simulation process. These antennas shows great flexibility having low profile quality can also be conformed, easy to fabricate by means of photolithography and etching. Exciting of antenna method is very easy coaxial, microstrip line, aperture feeding or proximity feeding. microstrip antennas are easy to use in an array or incorporate with other microstrip circuit elements

Drawbacks of microstrip antennas are always confronted these having narrow bandwidths, low gains and efficiency may be lower than with other antennas. Always have low bandwidth, low bandwidth Bandwidths of a few percent are typical. Bandwidth is roughly proportional to the substrate thickness and inversely proportional to the substrate permittivity but can be improved by a variety of techniques. Efficiency is limited due to the losses in antenna by surface-wave, conductor and dielectric losses. If thicker substrate is used surface wave losses becomes more severe so air or foam is used. Mostly used in the field of satellite communications, microwave communications, cell phone antenna and GPS antenna. .In this paper antenna is matched with 50 ohm impedance network through proxy feed technique; the antenna has gain of about 4.6 dB and bandwidth of 439 MHz at the 7.87 GHz frequency in C-Band spectrum. The antenna structure, the design topologies, the preliminary simulations and the simulated result are given in the following sections respectively, for achieving the resonating frequency for the proposed antenna.

2. PROPOSED ANTENNA DESIGN
Antenna has following main components patch, proxy feed ground, and port. Figure1 shows the overview of proposed antenna. The antenna is in rectangular shape and size, slotted patch is etched above top of FR4 substrate material with permittivity value 4.3, patch radiates the electromagnetic field.

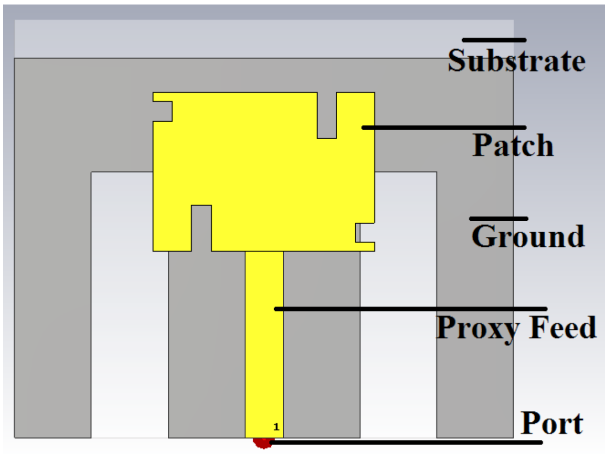

Fig 1: Structure of designed antenna

The bottom the ground plane is placed which slotted at the middle the model is consists the proxy feeding network is buried inside the substrate material, and in the port given between the proxy feed and ground. The antenna design consists of patch, substrate, ground, proxy feed and port figure1.1 shows the prototype schematic diagram of microstrip antenna. Patch is made up of perfect electric conductor metal on excitation electric energy is radiated. Patch is placed above the substrate slab of FR4, patch has the slot, which is etched from it. Size of the patch width is 11.51mm and the length is 8.36mm where four slots are made up by etching process they parameterized in u1,u2,v1 and v2 all are in mm. The patch is the main part of this antenna which constructed by the annealed copper having perfect electric conducting lossy metal characteristics having value of 5.8+007 s/m, heat capacity of 0.39 kj/k/kg.

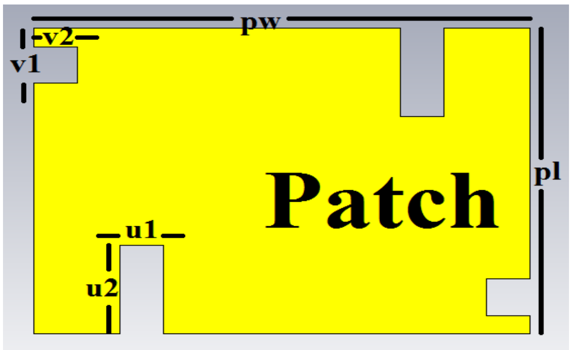

Fig 2: Structure of designed patch

These values are achieved through the optimization process by many simulations. As mentioned earlier the substrate value decides the power losses to surface waves, dielectric constant for the grounded substrate for where feed line is engraved is 4.3 which FR4 material.FR4 material is easily available in the market with different thickness. For this design substrate length(sl) and width(sw) are 26mm and 22mm respectively and the thickness is of 1.6mm.

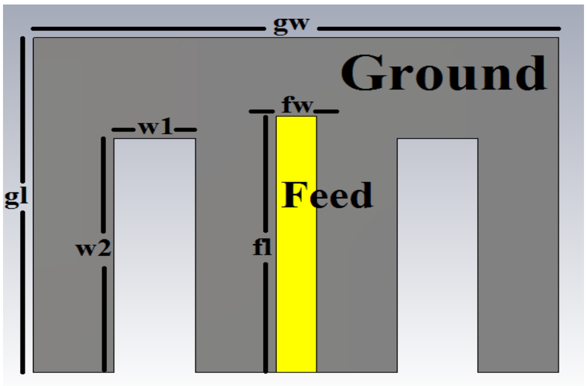

Fig 3: Structure of designed antenna's Feed and Ground.

Ground is also made from the perfect electric conductor material which placed below the substrate slab 26*20 and the slots are etched from it having values in w1 and w2.

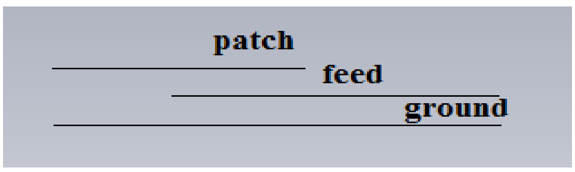

Fig 4: Side view of the designed antenna

Cross sectional view of microstrip antenna design view, Feed is placed just below the patch structure on after 50 ohm impedance matching.

Table 1. Parameters used to design the proposed antenna

Parameters		Dimensions in mm
Substrate Length	sl	22
Substrate Width	sw	26
Substrate Height	sh	1.6
Ground Length	gl	20
Ground Width	gw	26
Patch Length	pl	11.51
Patch Width	pw	8.36
Length of Feed	fl	15.3
Feed Width	fw	2
Patch Slot Width	u1,v2	1,1
Patch Slot Length	u2,v1	2.42,1
Ground Slot Width	w1	14
Ground Slot Length	w2	4
Port		Discrete

The feed is excited the current travels through it and electromagnetic wave radiates which is excites the patch above it. Applied proxy feed provides better bandwidth and gain. The length and width of are fl and fw the feed is also made up of perfect electric conductor.The prototype design has stimulated by using software CST microwave studio 2015. All the results of the software are achieved by simulation and approximation for the designs. Dimensions are shown below and VSWR E-fields and 3D-pattern results are described in following section.

3. SIMULATED RESULTS

The designed antenna is simulated in the CST software for the result analysis. The return loss and VSWR obtained are illustrated in figure 5 and figure 6 respectively. The resonant frequency is 8.042GHz with the S11 parameter of value 38.241dB. The E-field pattern is shown in figure 7 for this antenna. It shows good radiation pattern for the high frequency distant communications. The 3-D pattern of the same frequency is illustrated through the figure 8. The gain and directivity is 4,54dB and 4.6 dB respectively The other parameters are shown in table 2 with their units.

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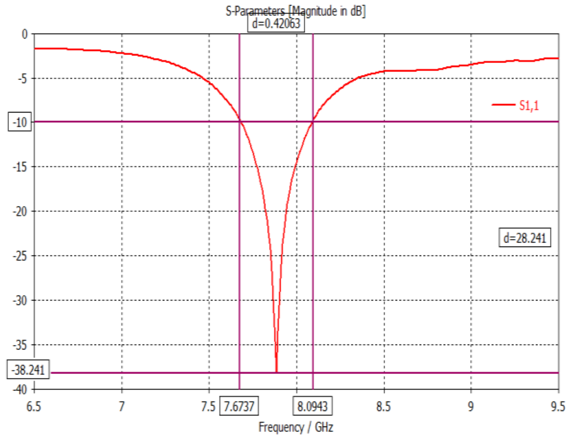

Fig 5: Return Loss S11 of the proposed antenna

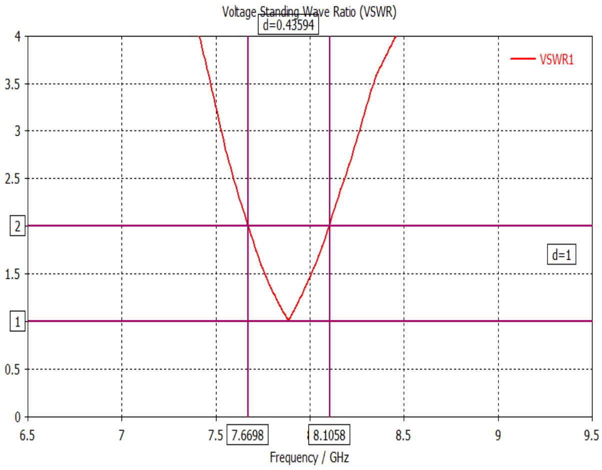

Fig 6: VSWR of the proposed antenna

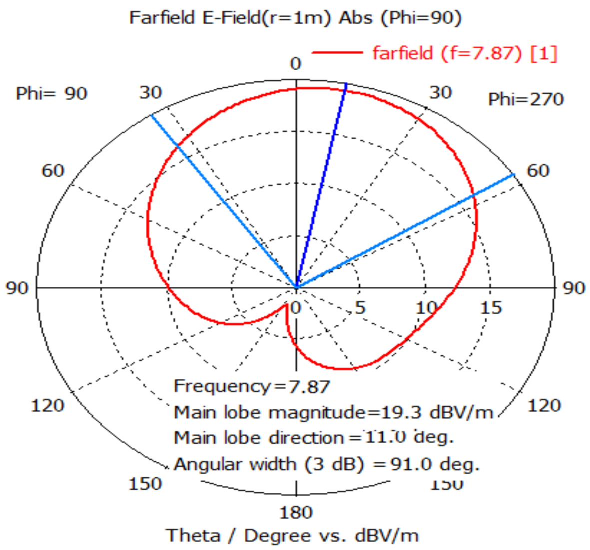

Fig 7: E-Field patternof the proposed antenna

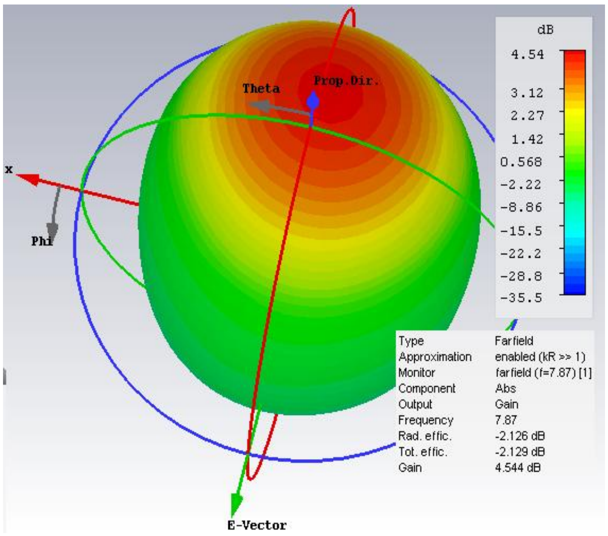

Fig 8: 3-D Pattern of the proposed antenna

Table 2 Single Element parameters

Parameter	Single Element
Bandwidth	434 MHz
Gain	4.54 dB
Directivity	4.6 dB
Return Loss	-38 dB
Radiation Efficiency	-2.126 dB

4. CONCLUSION

Monopoles planar Antenna attached to reduced sized ground planes which areoptimized. The simulated result shows antenna is capable for the WLAN bands at 3.49 GHz in C-band for 7.67-8 GHz frequency range. In the whole operating frequency, the monopole can provide linear directional 3-D radiation pattern vertical to the plane. Having relatively low profile, the compact planar Antenna have great potential use in mobile communication systems. The antenna has been analyzed using a Finite Integral Method, where the results are achieved by CST Microwave simulator 2015. It is hopeful proposed antenna has good features like simple, compact size, and the degrees of freedom of its design, will make it an attractive choice for the Wideband antenna[10] designers.

5. ACKNOWLEDGMENTS

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