International Journal of Research in Engineering, Science and Management
Volume-2, Issue-3, March-2019
www.ijresm.com | ISSN (Online): 2581-5792

Patched Antenna with radiators for 5G Applications

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***Abstract*: Antenna design is the most important part of any communication advancement. This project presents a new way to implement four by four MIMO antennae in a mobile terminal. By carefully choosing the position of the input feed and shorting pin on one dielectric radiator, the proposal design can provide us with decoupled and uncorrelated antenna ports. This antenna is resonant at 12 GHz covering 5G frequency band. The superiority of proposal antenna is obtained by measurement. Measured S-parameter, total efficiency, velocity SWR and envelope correlations between each port demonstrate that this dual band antenna is simple and effective for any LTE advanced enable system.**

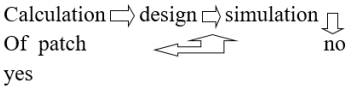
***Keywords*: Patched Antenna, 5G Applications**

1. Introduction

Over the past decade there has been a steady and rapid growth in the communication industry which resulted in the requirement of better efficient antenna. The conventional antenna has been replaced with millimeter wave frequency antenna, an antenna is used a transmitting or a receiving system. For radiation and reception of electromagnetic waves. Microstrip antenna have gained enormous popularity now-a-days because of its huge advantage like high gain, high directivity, massive connectivity, small size & low loss. Even though it has these advantages, its major disadvantage is the narrow band. As the size of the antenna is half of wavelength the bandwidth degrades further. In the recent past to overcome this disadvantage we have started the use of the MIMO structure. Various designs have been proposed for the 5g apps. A micro strip patch antenna with a radiator can work more efficiently with greater gain.

2. Antenna structure

For the designing of desired antenna, we need to use the ANSOFT-HSS software. This allows electromagnetic simulation we need to first calculate the parameter of the required patch antenna.



A. Fabrication

In our antenna design we are using two types of patch antennae mounted on a dielectric patch. A Z shaped antenna and a L shaped antenna are used, here the L shaped antenna acts as input transmitting feed. It is also a lumped input.

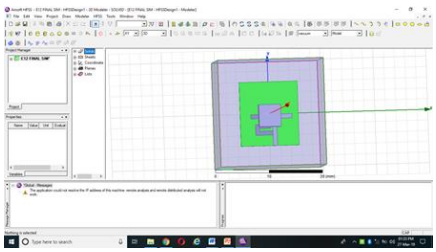


Fig. 1. Fabrication

These antennae are made of copper and are mounted on duroid substrate. This entire patch is kept in free space (vaccum)for efficient transmission despite human contact. The imput feed is about 3.5 GHz. This forms a dual band antenna. The output frequency of this antenna is expected as around 25-32 GHz. The S parameter to be far below -10 db making it advantage to produce greater gain and directivity.

3. Simulated result

A. Gain plot

The gain plot determines the efficiency of antenna. Our proposed dual band patch antenna has achieved high gain of 12 db which is thrice of conventional antenna gain i.e. 3db. The below figure represents the gain plot in an infinite sphere (360 deg)

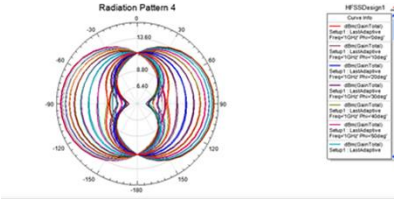


Fig. 2. Gain plot

B. Radiation Pattern

The radiation pattern of this antenna is represented in below figure an omnidirectional favourable pattern is achieved by the proposed antenna.

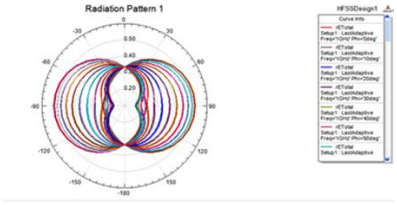


Fig. 3. Radiation pattern

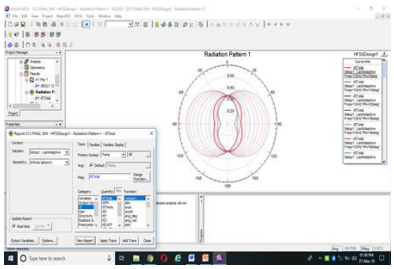


Fig. 4. Angle 10 deg pattern

C. S- parameter

S- parameter are obtained as antenna return loss. The value of -10 db is usually considered excellent but for 5g applications it is inadequate. Our proposed antenna had dual band for 5g wireless communication with resonation at 12 GHz and return loss of -17 db and covering a band of 25-32 GHz. The below fig shows the S- parameter of proposed antenna.

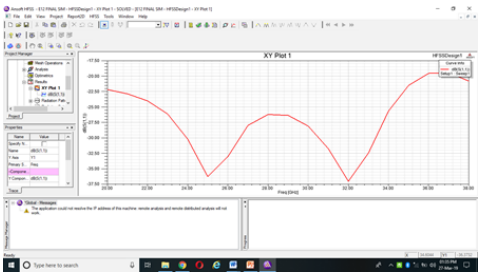


Fig. 5. S- parameter

D. VSWR

The voltage standing wave ratio of antenna should not be more then 2.5 db and it should be 1 db ideally. The vswr value achieved in resonant frequency of 25-32 GHz is 1.18 to 1.25 db which is below 2.5 and is acceptable in wireless applications.

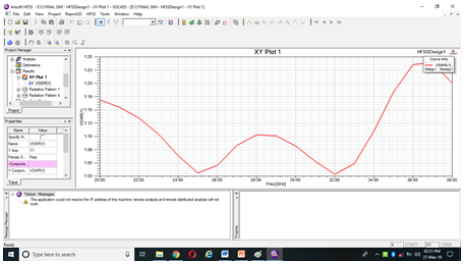


Fig. 6. VSWR

4. Conclusion

In this project, a dual band patch antenna with radiator has been proposed for 5G applications. The proposed antenna resonates at 25 GHz with return loss of -17.0 db and can be used for 5g devices. It shows efficient radiation pattern and a great gain of 12 db. It has great directivity and VSWR is in acceptable range.

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