# Multi-Band Inverted 6 – Shaped Micro Strip Patch Antenna for 5G Applications

**Venkata Ramanaiah G, Mounika Neelam, D Srikanth**

***Abstract*: In the paper, Multi transmission capacity Inverted 6-formed fix radio wire utilizing FR4 substrate featured and upgraded to get the best outcomes utilizing HFSS (High Frequency Structure Simulator) programming. Present generation the 004Dicro strip fix reception apparatuses are used in tremendous applications for its positive highlights like light weight, less volume measurements, and less creation cost. The smaller scale strip fix radio wire piece was delineated as far as group of velocity, gain, reflection coefficient, VSWR, and principle pattern obtained in the maximum direction***

***Index Terms*: Wireless LAN, 4G, 5G, Long-Term Evolution, WiMAX**

## I. INTRODUCTION

The reputation of cellular communication systems has dramatically increased over the last decade and the marketplace demand maintains to boom. In near future the celluar communication need to improve in the features of QOS (Quality of service) and execution. Besides, new technologies wireless communication will not be there without antenna [1]. In this concern, the antenna design configurations need to be advance to have the new requisitions for the benefit of the society. Microstripped patching antennas are used broadly on account of their feature points, like light weight, less dimensions, low manufacturing cost and ability of doubling and tripling frequency bandwidths. The construction of directional micro-strip antenna for wireless applications is extremely demanding on high access. The most important feature of a micro-strip antenna is its narrow band width [7][8]. To eradicate these characteristic inhibitions of confined impedance and axial ratio (AR), capacity of the transmission rate of data, many systems had designed, and created for the improvement of micro-strip antennas bandwidth. [9][10]. Multiple shapes and design structures had designed by analysts around the globe. Moreover the clients are increasing as of the analysis of communication world because of that a wide range deficiency in existing in the society. Upcoming systems of the wireless communication, like 5G and previous generations will undoubtedly use the frequencies of millimeter to micrometer frequencies which was prescribed in the International Teleconference Union. There is a needful to design such micro-strip antenna system for the immediate access of web-services and remote communication for more than 6GHz. Our proposed Micro-strip antenna is basic in configuration, minimal in measuring dimensions and vibrates in more than 6GHz bandwidths. With expanding conservativeness of electronic construction, there is necessity of installing at least any two narrowband constructions together. It is hard to achievethe micro sized strip antenna that is used at the different layers of frequencies. The High Frequency Structure Simulator is availed for the construction of our proposed micro-strip antenna.

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## II. LITERATURE SURVEY

The cellular mobile technology as drastically increased from zero G to 4G in a very short time. The analog voice was utilized in the 1st generation of the cellular technology. The figure below explains in details aboutthe fast emerging changes in the technology from past decades from 2G, 3G, and 4G technologies. Different generational techniques like frequency reuse, line switching, circuit switching packet switching modulation etc., are different techniques used for the emergent of these generations of cellular mobile communications.

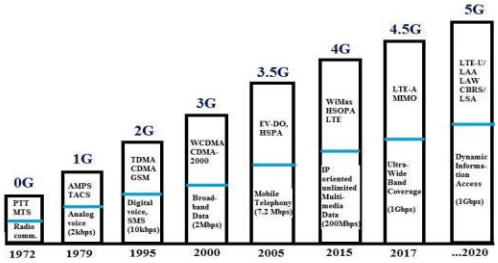


***Fig.1. Overview of generations in mobile wireless communication.***

To access all these features we have to use high speed data rate for the applications. In present day scenario the mobile technology has become vital important in our daily life. In good olden days the main aimis for the mobile cellular technology is calling the subscriber or texting the short messages but these days the usage of the mobiles had increased drastically for many applications like navigation, online shopping, trading, ticket bookings, services, home deliveries etc. Till date 4G technology satisfied the amount of transmitting of data in almost all the developed and developing countries which is a mandatory requirement for the access of the applications. But this 4G also has few challenges like poor coverage, connectivity, crisis of the frequency spectrum etc.,[5-6].



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To meet the necessities of the present applications of free access to any requirement of the mobile subscribers the 5G would be helpful to overcome the restriction and confinements in the features of good network coverage, black hole regions, connectivity and spectrum crisis. 5G fifth generation technology has many updated features which would satisfy the necessary conditions of the present requirements of the mobile technology by providing lower latency, highest data, best reliability, more connectivity and improved security. Recently some authors published their work on 5G antennas[10-12].The micro-strip antennas of 5G mostly uses millimeter wave frequencies[13].We are proposing a design of 28GHz inset fed elliptical micro strip patch antenna which is designed using HFSS software for 5G antenna. This paper is generated as takes after: Section III portrays the design plan, features and geometrical dimensions of micro-strip patch antenna. Area IV demonstrates the outcomes clarifying reception apparatus parameters like losses of the return signals, Voltage stand wave (VSW) ratio and Gain with determinations and lastly Section V is conclusion.

## III. DESIGN

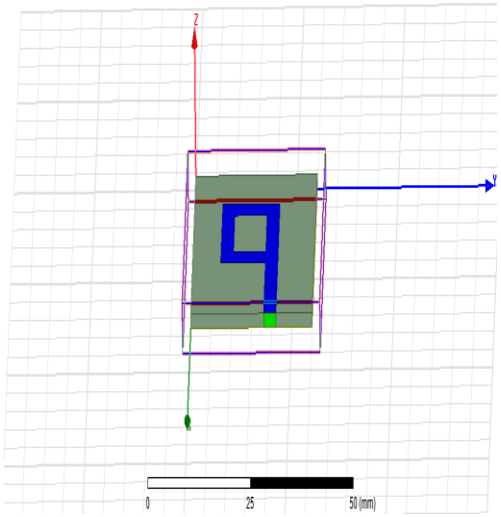


**Fig. 2: The present design antenna**

Our design demonstrates the micro-strip patch antenna is 6-shaped antenna with FR4 substrate. The FR4 was used because for the lowest cost easy availability.

The size of antenna is 30×38 $mm^2$ with height of 1.6 mm. Table 1 has parameters of present antenna

Table I:Parameters of present antenna

| Element | Type of material | Parameter | Dimension(mm) |
|---|---|---|---|
| Substrate | FR4 | $L_{sub}$ | 38 |
| | | $W_{sub}$ | 30 |
| | | $H_{sub}$ | 1.6 |
| Ground plane | pec | $L_9$ | 6 |
| | | $W_9$ | 30 |
| | | $T_9$ | 0.035 |
| Patch | pec | $L_{p1}$ | 3 |
| | | $L_{p2}$ | 10 |
| | | $L_{p3}$ | 3 |
| | | $L_{p4}$ | 5.4 |
| | | $L_{p5}$ | 3.06 |
| | | T | 0.035 |
| Feed Line | pec | $W_f$ | 3.06 |
| | | $L_f$ | 13 |
| | | T | 0.035 |

Our design is very vastly utilized. The output explains that the proposed configuration is a multiband type antenna covering low Wi-Fi band which remains for "wireless communication fidelity".

The frequencies which occurred in this design are 2.7 GHz, 22.2 GHz, 24.7GHz, 10.6 GHz, and 17.7 GHz.

## IV. RESULTS

HFSS software is utilized for the present design of our proposed micro-strip antenna with the required dimensions. The antenna's performances are evaluated as far as data transmission with impedance matching, gain and Voltage standing wave ratio. The required radiating frequency of our antenna is achieved by two parameters of the micro-strip antenna like losses of the reflected signals and VSWR. On the chance of loss of return signals an antenna for a required particular frequency is more than - 10 dB which explains that whatever influence encouraged to antenna is rejected. In this way, for a clear radiating antenna, return loss have to be not equal to -10 dB and VSWR < 2. yet another foremost parameter for the antenna is the reap which relies on the directivity of the designed micro-strip antenna. Actually that the acquirer of the antenna is precisely varies with the directivity, the antennaefficiency and additionally its directional capabilities. In the antenna design thedirectivity depends on the radiation antenna intensity and it is alongside these lines controlled just by way of the pattern.

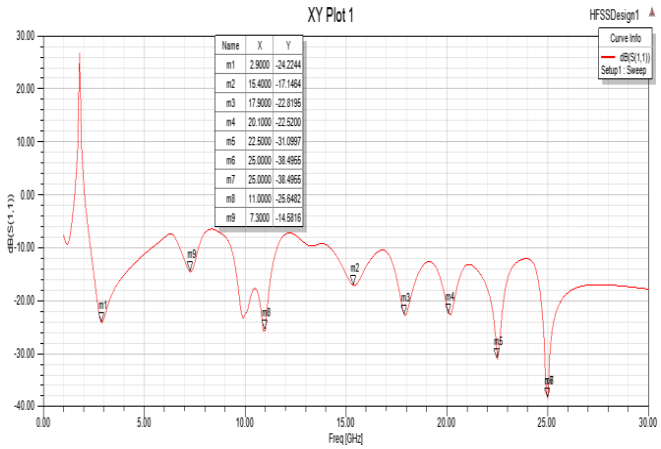


**Fig. 3. Antenna Simulated Loss**

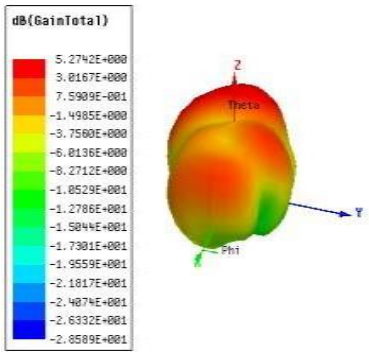


**Fig. 4. Antenna's gain at 15.4Ghz**

Gain of the micro-strip antenna always depend on the particular design parameters like radiation coefficient and directivity. The radiation coefficient will depend on the materials were used for development, efficiency of the dielectric and efficiency of the radiations.

The gain of our design (5.2742dB dB, fig-3a) is quite reasonable for mobile phones.

$G_T$=5.2742dB; $D_T$=7.1029 dB

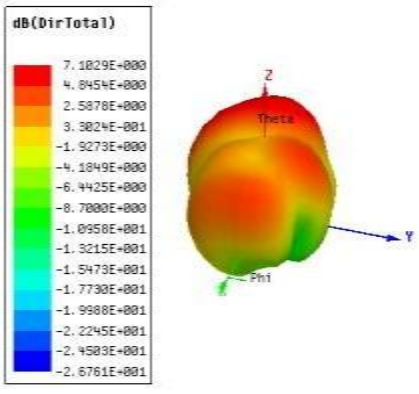


**Fig. 5. Directivity at 15.4Ghz**

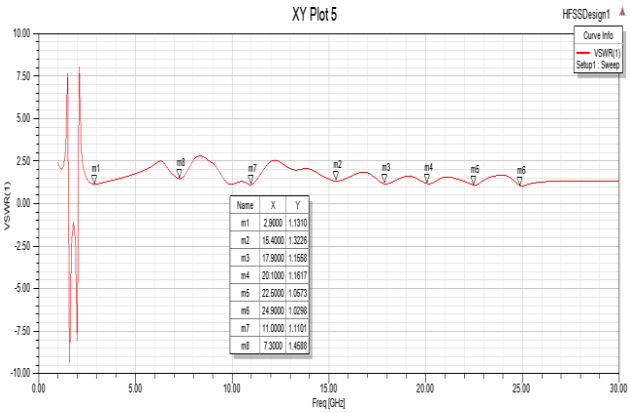


**Fig. 6. The antenna's VSWR coefficient**

VSWR must be maintained in between 1 and 2 for the required bandwidth of frequency in which our antenna is operating. It is clear and evident that the proposed antenna is efficient as shown in the fig4. Moreover one can observe the difference between both simulations in low frequencies is issue which still needs to be validated experimentally.

## V. CONCLUSION

The proposed micro-strip antenna access for the inclusion of various groups of frequency ranges including lower and upper bands of Wi-Fi groups, WiMAX etc. Even though the structure is difficult to manufacture but easy to utilize over a large range of the frequencies. Due to the large ranges offrequency operation and smaller zone involved, the proposed present antenna is apt for being installed in the diverse convenient gadgets in various applications. Later on our scope of future changes, we will take a parasitic structure or a variety of the ponder antenna to upgrade its features (gain, directivity) for wireless applications

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