

Printed Antenna Design and Simulation for 5G using HFSS

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ABSTRACT

With expanding number of users, the demand for better technology also increases. The fifth Generation 5G technology would be one of the best technologies to meet the need of increased capacity demand, massive connectivity better speed by using the large amount of spectrum in the millimeter wave band, with 5G it is expected to get 80-100 Mbps speed. The need for 5G technology, methodology designing of antenna and various simulations is offered. The micro strip patch antenna is used here in 5G technology is relatively inexpensive to manufacture and design because of its simple physical geometry. Micro strip Patch Antenna shows multi-band characteristics and has a compact structure and hence has emerged as a promising candidate for handheld devices the proposed idea is implemented by using HFSS software which is used for antenna designing.

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Keywords: 4G, 5G, UHD, IP, GSM

I. Introduction

The early communication systems supported only analog voice and now provide wide range of different applications to large number of users. First origination mobile system supported voice only. Within previous minor years, we have seen continuous development of mobile telecommunications by the birth of 2G bands, 3G and 4G bands wireless networks respectively. Digital networking procedures as if modulation techniques, Frequency reuse, Packet switching and physical layer

simulation etc. have appeared in this change. With the expanding appeal of smart devices, nowadays IP based networks has grown into an essential Resultant, new multimedia applications for mobile users. Open Market is overwhelm with these applications and has opened up new deals for mobile user and service providers. The forthcoming of mobile communications is likely to be very distinct to that which we are used to today. While interest for portable broadband will drastically increase day by day, largely consumed by UHD video and better screens, we are already seeing the developing impact of the human capabilities of technology as the stuff around us become ever more linked. The approaching 5th generation network is certain to output a constant Gbps data speed experience across a wide range of user scenarios. 5G is more just a new wireless transmission technology called radio technology. It is a gate opener to new communication capabilities and used cases, many of that are still unknown to us. For the bandwidth aspects, here millimeter wave mobile communications approach is developed and a micro-strip receiver has implemented for the 5G cellular network/device. Respecting the 4G and 5G network bands, its focus is approaching smooth combination of cellular networks such as GSM and 3G, WLAN and Bluetooth. Micro-strip patch receiver (MPAs) has beautiful and boundless features due to its low profile, small size, and lightweight, low cost as well as to the fact these are very simple to construct, suited to planer and non-laner surfaces. However, their future use in definite systems is finite of their almost narrow bandwidth. For generating

the excessive-frequency mm-wave electric signals, the usage of traditional electronics turns into less financially appealing; consequently, there is an excessive concern to at once generate mm-wave alerts within the optical domain. For that reason in these paintings, the photonic technology, variation and circulation of 60 GHz thickness band signals to be applied in 5G that have been recommended and established already. Basically, a photonics founded totally mm-wave is a laser beam together with two or extra coherent longitudinal modes with frequency spacing same to the wanted mm-wave. As the longitudinal method beat with each dissimilar in the photodiode, the definite electrical mm-wave can be achieved.

II. Problem Definition

The fundamental intention of this thesis is to style a micro-strip patch antenna for milli meter wave mobile communication at 38GHz frequency by exploitation the fundamental micro-strip conductor methodology and line calculation analyze from HFSS computer code. In projected style excited in its basic mode contains a most radial asymmetry within the direction perpendicular to the patch (broadside) and is 8.4316 db. during this style, input reflection coefficients or the S11 parameter for the antenna is -42 decibel at resonant frequency a pair of.8 GHz. the height Gain 8.211 decibel and therefore the most -10dB information measure of 0.0565GHz are achieved in simulation of S11 parameter for center frequency a pair of.8 GHz. Another vital parameter of AN antenna is that the

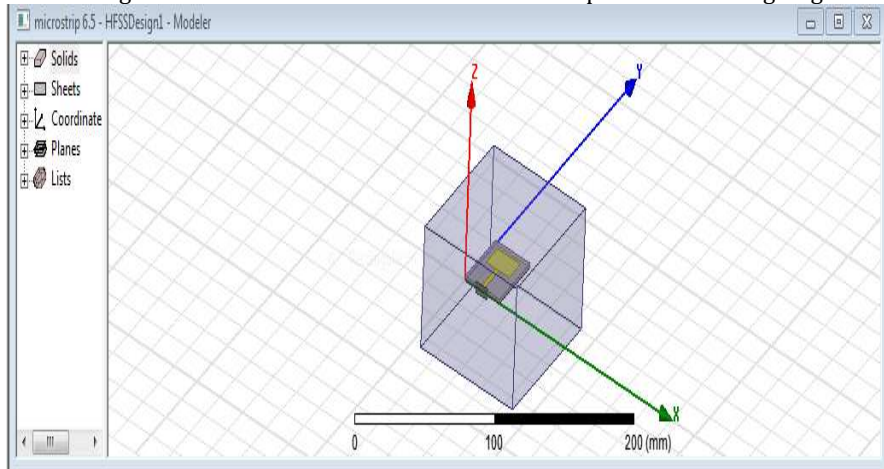
information measure it covers. Most of the time solely resistance or come loss information measure is given. However, it's vital to comprehend that many different definitions of information measure exist: radial asymmetry Bandwidth, polarization information measure and potency bandwidth. radial asymmetry and potency are usually combined to achieve information measure

III. Methodology

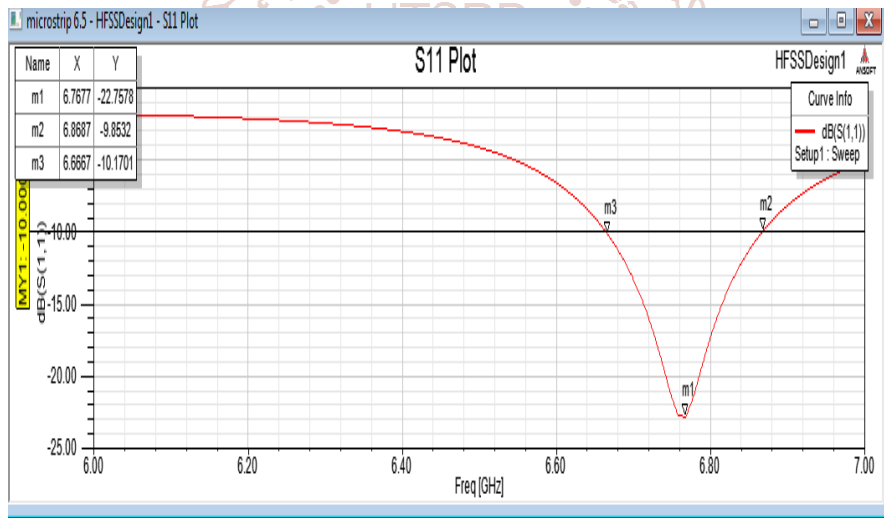
IV. Results

The results obtained after using the HFSS software. The HFSS is an efficient platform for designing micro strip Patch Antenna.

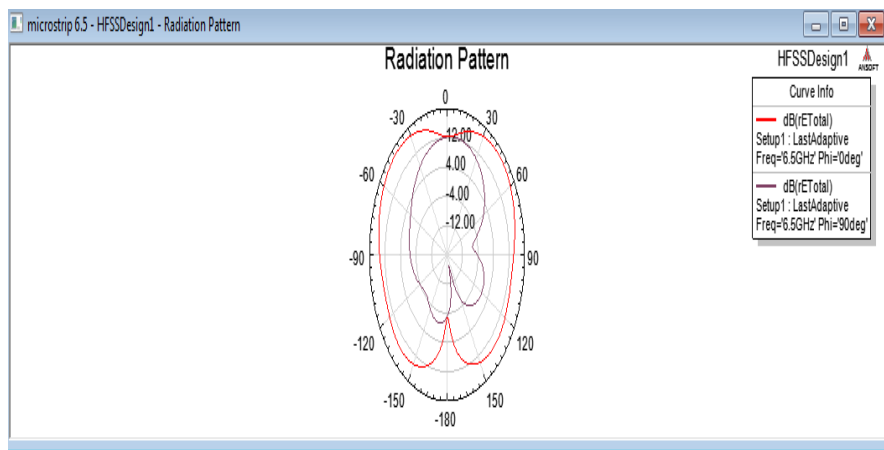
The methodology involves the use of theoretical analysis and the system simulation. For the simulation approach, the event simulator HFSS package tool needs to be used to investigate the number of parameters. The HFSS software package is used to design a Micro-strip Patch Antenna and the parameters investigated are Return Loss, Radiation Pattern, The Gain, VSWR, Impedance, Directivity etc.



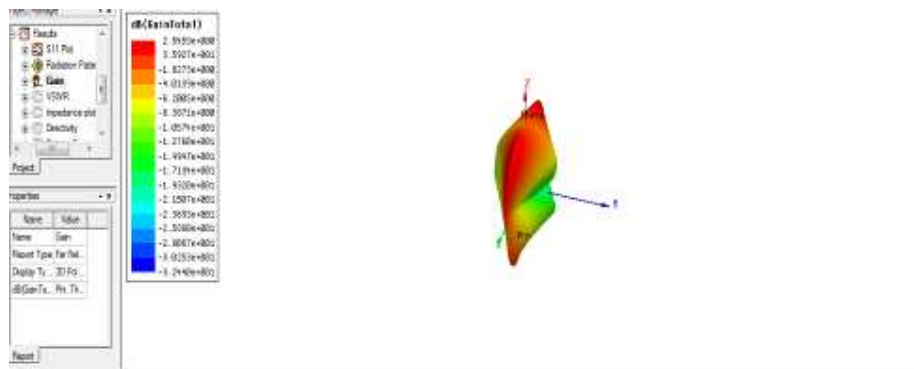
Designed micro strip Patch Antenna using HFSS.



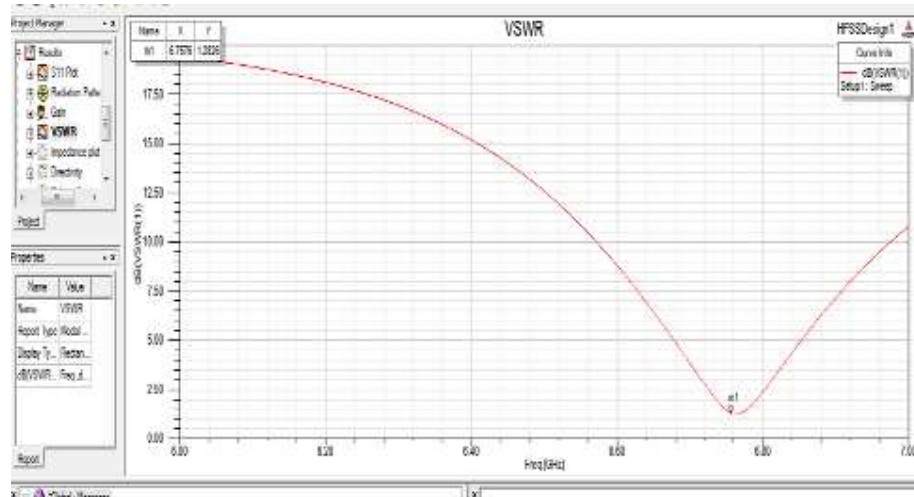
Return Loss Plot



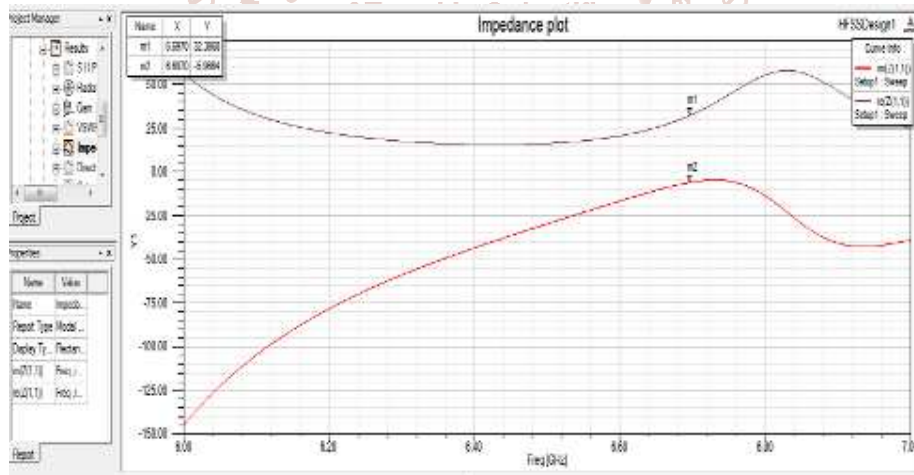
Radiation Pattern



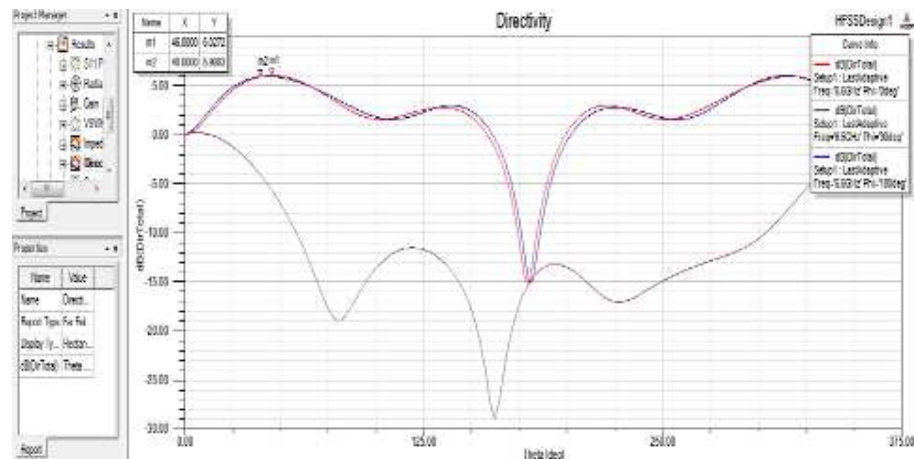
The Gain Plot



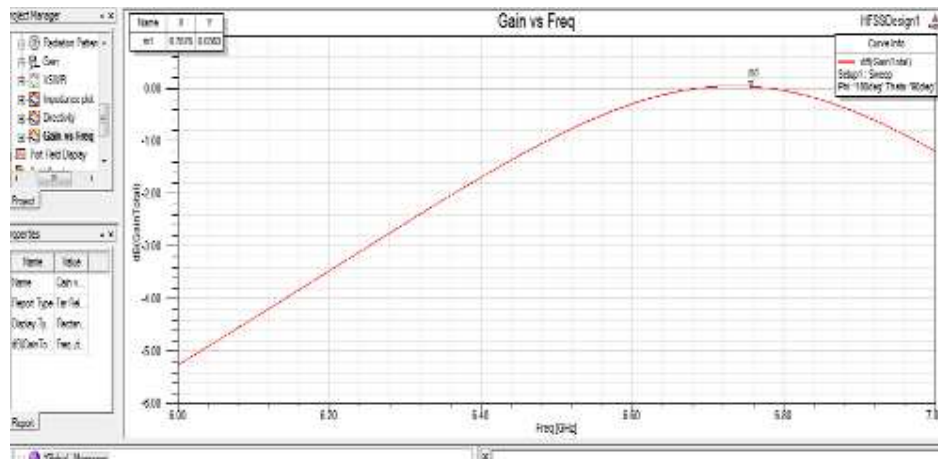
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Impedance Plot



Directivity Graph



Gain vs. Frequency Graph

Results

PARAMETERS	VALUES
Return Loss	-23 db
Resonance Frequency	6.76GHz
Bandwidth	200 MHz
Highest Radiation Intensity	2.63 db
Directivity	5.87 db
VSWR	1.28 db

Comparison between my base paper and my work

PARAMETERS	Reported design at F=2.8 GHz	Proposed design at F=6.5 GHz
Return Loss	-42dB	-23 db
Resonance Frequency	2.76 GHz	6.76GHz
Bandwidth	0.0565 GHz	200 MHz
Highest Radiation Intensity	2.63 db	2.63 db
Directivity	8.48dB	5.87 db
VSWR	Not obtained	1.28 db

V. Conclusion:

The paper explains the micro-strip patch antenna fundamentals and HFSS software. The paper explains in details the steps needed to develop a complete simulation of micro-strip patch antenna using the popular HFSS software. The results are given with parameter values and the comparison between parameters of bases paper and our proposed work.

References

- [1]. BrajlataChauhan, Sandip Vijay, S. C. Gupta, "Millimetre-Wave Mobile Communications Micro strip Antenna for 5G - A Future Antenna", International Journal of Computer Applications Volume 99- No.19, August 2014.
- [2]. Theodore S. Rappaport, Shu Sun, RimmaMayzus, Hang Zhao, YanivAzar, "Millimetre Wave Mobile Communications for 5G Cellular", IEEE Access. Vol. 1, 2013.
- [3]. M. Samimi, K. Wang, Y. Azar, G. N. Wong, R. Mayzus, H. Zhao, J. K. Schulz, S. Sun, F. Gutierrez, and T.S. Rapp port, "28 GHz angle of arrival and angle of departure analysis for outdoor cellular communications using steerable-beam antennas in New York City", in Proc. IEEE Veh. Technol. Conf., Jun. 2013.
- [4]. M. Cudak, A. Ghosh, T. Kovarik, R. Ratasuk, T. Thomas, F. Vook, and P. Moorut, "Moving towards mmwave-based beyond-4G (B-4G) Technology", in Proc. IEEE Veh. Technol. Soc. Conf., 2013.
- [5]. Singh, Sapana, Pratap Singh, "Key Concepts and Network Architecture for 5G Mobile Technology.", International Journal of Scientific Research Engineering & Technology,1.5,2012.
- [6]. H. Zhao, R. Mayzus, S. Sun, M. Samimi, J. K. Schulz, Y. Azar, K. Wang, G. N. Wong, F. Gutierrez, Jr., and S. T. Rapp port, "28 GHz millimetre wave cellular communication measurements for reflection and penetration loss in and around buildings in New York City", in Proc. IEEE Int. Conf. Comm., Jun. 2013.
- [7]. N. Murdock, E. Ben-Dor, Y. Qiao, J. I. Tamir, and T. S. Rapp port, "A 38 GHz cellular outage study for an urban campus environment", in Proc. IEEE Wireless Commun. Netw. Conf., Apr. 2012.
- [8]. S. Rajagopal, S. Abu-Surra, Z. Pi, and F. Khan, "Antenna array design for multi-Gbps mmwave mobile broadband communication", in Proc. IEEE Global Telecommun. Conf., Dec. 2011.
- [9]. G. Nair, "Single-feed Dual-frequency Dual-polarized Slotted Square micro strip Antenna", *Microw. Opt. Technol. Lett.*, 25, pp. 395-397, June 20, 2000.
- [10]. W.F. Richards, Y.T. Lo, and D.D. Harrison, "An Improved Theory Formicro strip Antennas and Applications", *IEEE Trans. antennas Propagat.* 29, pp. 38-46, Jan. 1981.

- [11]. W.F. William F. Richards, "micro strip Antennas", in Antenna Handbook, Y. T. Lo and S.W. Lee, Eds. NewYork: Van Nostrand Reinhold, 1993.
- [12]. L. Alatan, M. I. Aksun, K. Leblebicioglu, and M. T. Birand, "Use of Computationally Efficient Method of Moments in the Optimization of Printed Antennas", *IEEE Trans. Antennas Propagate.*, 47, pp. 725-732, Apr. 1999.
- [13]. D. H. Shaubert, F. G. Garrar, A. Sindoris, and S. T. Hayes, "microstrip antennas with Frequency Agility and Polarization Diversity", *IEEE Trans. Antennas Propagate.*, 29, pp. 118-123, Jan. 1981.
- [14]. W. F. Richards and Y. T. Lo, "Theoretical and Experimental Investigation of a micro strip Radiator with Multiple Lumped Linear Loads", *Electromagn*, 3(3-4), pp. 371-385, July-Dec. 1983.
- [15]. S. C. Pan and K.L. Wand, "Dual Frequency Triangular micro strip Antenna with Shorting Pin", *IEEE Trans. Antennas Propagate*, 45, pp. 1889-1891, Dec. 1997.
- [16]. Ms. Varsharani Mokall, Prof S. R. Gagare, Dr. R. P. Labade "Analysis of Micro strip patch Antenna Using Coaxial feed and Micro strip line feed for Wireless Application", *IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)* Volume 12, Issue 3, Ver. III (May - June 2017), PP 36-41 www.iosrjournals.org
- [17]. Deal W., N. Kaneda, J. Sor, Y. Qian, and T. Itoh, "A New Quasiyagi Antenna for Planar Active Antenna Arrays", *IEEE*.

