International Journal of Trend in Scientific Research and Development (IJTSRD)
International Open Access Journal | www.ijtsrd.com
ISSN No: 2456 - 6470 | Volume - 2 | Issue – 6 | Sep – Oct 2018

Future Antenna for 5G Mobile Communications

Nazia Hameed[1], Dr. Vipin Gupta[2]
[1]M.Tech Scholar, [2]Principal
[1]Department of Electronics & Communication Engineering
SSCET Badhani, Pathankot, Punjab, India

ABSTRACT
The smart phone users are growing day by day because of the dynamic and user friendly interactive applications. The internet is the base for smart phone users and presently we have 4G technology and expecting 5G in coming years. As for analysis the 5G mobile technology greatly increases communication capacity in large amount of spectrum in the millimeter wave bands. The paper describes the basic fundamentals of the antenna used for the coming 5G technology. This paper describes millimeter wave antenna design for future 5G wireless system. The paper review objectives of millimeter wave antenna for 5G.

Keywords: *5G, Millimeter wave antenna, Micro strip.*

INTRODUCTION
The early communication systems supported only analogy voice and now provide wide range of different applications to large number of users. First generation of mobile system supported voice only. Within last few years we have seen gradual development of mobile communications by birth of 2G, 3G and 4G wireless networks respectively. Digital networking communication techniques like Modulations, Cellular frequency reuse, Packet switching and physical layer simulation etc. have resulted in this change. With the increasing demand of smart devices, now a day's IP based networks has become a necessity. Resultant, new multimedia applications for mobile users .Market is flooded with these applications and has open up new ventures for mobile user and service providers. The future of mobile communications is likely to be very different to that which we are used to today. While demand for mobile broadband will continue to increase, largely driven by ultra-high definition video and better screens, we are already seeing the growing impact of the human possibilities of technology as the things around us become ever more connected. The upcoming 5th generation cellular network ("5G") is anticipated to exhibit a uniform Gbps data throughput experience across a vast range of user scenarios. 5G is more than just a new wireless radio technology. It is a door opener to new communications possibilities and use cases, many of which are still unknown. Enabled by 5G, a programmable world will transform our lives, economy and society. Data throughput will be enhanced by more than a hundred fold. Mobile and wireless communication networks (GSM, 2G, 2.5G, and 3G) have made tremendous growth in the last fifteen years. The multimedia application for cellular system are limited to carrier frequency spectrum between 700MHz & 2.6Ghz.The global spectrum bandwidth allocation for all the cellular networks does not exceed 780MHz where each Service provider has approximately 200 MHz across all of the different cellular bands of the available spectrum. For the bandwidth aspects, here millimetre wave mobile communications technique is introduced and a micro-strip antenna has developed for 5G cellular network/device. The millimeter wave antenna must be compact in size to fit into hand held devices.

5G TECHNOLOGY
Till now 5G standards are not available. So researches have started to put the base for the technology that will provide these standards. This technology mostly consists of wireless access systems, frequency utilization, power consumption, antenna and propagation.

A. 5G SPECTRUM
There is an enormous expanse in millimeter wave spectrum specifically 28 GHZ and beyond that is overlooked till now.FCC proposed new rules for

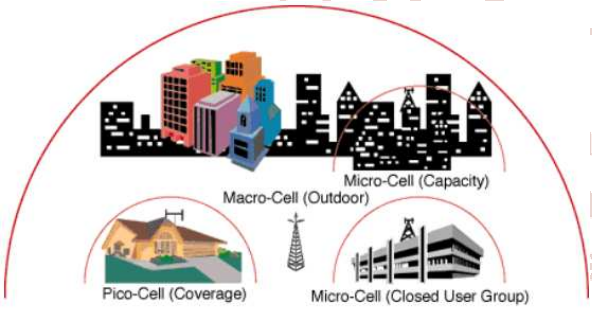
wireless broadband frequencies of 28GHz, 37GHz, 39GHz and 64-7GHz bands. Researches are targeting these frequencies for 5G.

B. 5G OBJECTIVES

The goal of 5G will be on better coverage and low cost. The important target will be on capacity with high speed and high information rates.

CELLULAR SYSTEMS-THE PRESENT

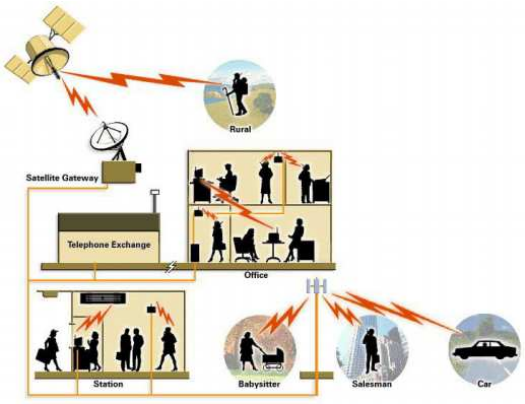
Further improvements and advances in technology led to the PCS (Personal Communication Services) in 1995. One example of a PCS system is the DCS-1900 which uses the 1850-1990 MHz band and is in use today. This system is based on TDMA and has 200-kHz channel spacing and eight time slots. The system also provides services like paging, caller ID, and e-mail. In a PCS system, the cells are further divided into macro cells, microcells and picocells to facilitate better coverage as shown in the following Figure.



PCS Cell structure

VISION FOR THE FUTURE

According to the Cellular Telecommunications Industry Association (CTIA), today there exist more than 60 million wireless customers. This figure is hard to imagine considering the fact that cellular service was invented about 50 years ago. Over the last 25 years, the wireless market has grown steadily from a $3 billion market to a $30 billion market in terms of annual revenues.



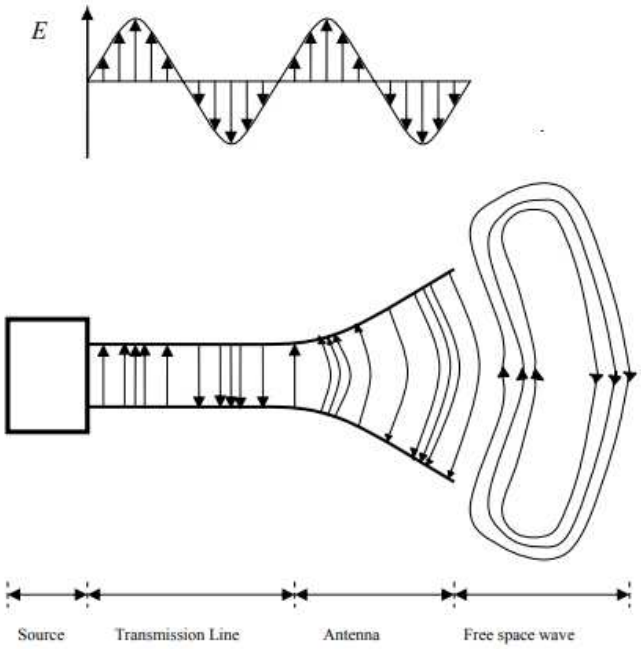
The future vision

The figure above shows the vision of the future. An integrated terrestrial/satellite multimedia system is envisioned. Global personal communication is to be supported via satellites using the satellite gateways to connect to the fixed ground network. Underground cable, optical fibers or fixed radio links would be used to link the gateways to the fixed networks. The fixed networks would be connected to cellular base stations providing radio links to mobile handsets or hand set units on vehicles. Indoor base stations located in offices and public places such as bus and rail stations, airports and shops would also be connected to the fixed network. In areas which cannot be provided coverage by terrestrial base stations or fixed networks, satellites would be used to connect to the personal handsets. Hence, in the future, the handsets would be such that they would support multimedia which is an integration of voice, data and video signals. Thus, the user would have access to a very wide range of services such as telephone, fax, electronic mail, World Wide Web, video conferencing, remote shopping and emergency services. In the present world cordless, indoor and other types of cellular phones are available for different applications

HOW AN ANTENNA RADIATES

In order to know how an antenna radiates, let us first consider how radiation occurs. A conducting wire radiates mainly because of time-varying current or an acceleration (or deceleration) of charge. If there is no motion of charges in a wire, no radiation takes place, since no flow of current occurs. Radiation will not occur even if charges are moving with uniform velocity along a straight wire. However, charges moving with uniform velocity along a curved or bent wire will produce radiation. If the charge is oscillating with time, then radiation occurs even along a straight wire as explained by Balanis.

The radiation from an antenna can be explained with the help of Figure 3.1 which shows a voltage source connected to a two conductor transmission line. When a sinusoidal voltage is applied across the transmission line, an electric field is created which is sinusoidal in nature and these results in the creation of electric lines of force which are tangential to the electric field. The magnitude of the electric field is indicated by the bunching of the electric lines of force. The free electrons on the conductors are forcibly displaced by the electric lines of force and the movement of these charges causes the flow of current which in turn leads to the creation of a magnetic field.



Radiation from an antenna

Due to the time varying electric and magnetic fields, electromagnetic waves are created and these travel between the conductors. As these waves approach open space, free space waves are formed by connecting the open ends of the electric lines. Since the sinusoidal source continuously creates the electric disturbance, electromagnetic waves are created continuously and these travel through the transmission line, through the antenna and are radiated into the free space. Inside the transmission line and the antenna, the electromagnetic waves are sustained due to the charges, but as soon as they enter the free space, they form closed loops and are radiated.

CONCLUSION

The 5G is the coming popular mobile technology and antenna architecture is the prime concern. In this paper describes the basic fundamentals of antenna designing for 5G mobile communications. In my research, I am going to present the motivation for future antenna for 5G mobile communications, methodology, and in future present a variety of simulation results. The paper focused on millimeter wave antenna for 5G technology.

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. T. S. Rappaport, F. Gutierrez, E. Ben-Dor, J. N. Murdock, Y. Qiao, and J. I. Tamir, “Broadband millimetre wave propagation measurements and models using adaptive beam antennas for outdoor urban cellular communications” ,IEEE Trans. Antennas Propag., vol. 61, no. 4, Apr. 2013.
4. M. Samimi, K. Wang, Y. Azar, G. N. Wong, R. Mayzus, H. Zhao, J. K. Schulz, S. Sun, F. Gutierrez, and T.S. Rappaport, “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.
5. 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.
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. Rappaport, ``28 GHz millimetre wave cellular communication measurements for re_ection and penetration loss in and around buildings in New York City", in Proc. IEEE Int. Conf. Commun., Jun. 2013.
7. J. N. Murdock, E. Ben-Dor, Y. Qiao, J. I. Tamir, and T. S. Rappaport „„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 formulti-Gbpsmmwave mobile broadband communication", in Proc. IEEE Global Telecommun. Conf., Dec. 2011.
9. G. Nair, “Single-feed Dual-frequency Dual-polarizedSlotted Square Microstrip Antenna”, *Microw. Opt. Technol. Lett.*, 25, pp. 395-397, June 20, 2000.
10. W.F. Richards, Y.T. Lo, and D.D. Harrison, “An ImprovedTheory Formicrostrip Antennas and Applications”, *IEEETrans. 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. New York: Van No strand Reinhold, 1993.

12. L. Alatan, M.I. Aksun, K. Leblebicioglu, and M.T. Birand, "Useof 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, "Microstripantennas 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. B.F. Wang and Y.T. Lo, "Micro strip Antennas for Dual frequency Operation", *IEEE Trans. Antennas Propagate*.32, pp. 938-943, Sept. 1984, 137-145, Mar. 1979.
17. Deal W., N. Kaneda, J. Sor, Y. Qian, and T. Itoh, "A New Quasiyagi Antenna for Planar Active Antenna Arrays", *IEEE*.
18. Transactions on Microwave Theory and Techniques, 48(6), 910-918, Jun. 2000.
19. Wang H., D. Fang, L. Wang, and Y. Guo, "A Modi edtshaped Probe-fed Circularly Polarized Micro strip Patch Antenna", *Microwave Conference*, 2008.Asia-Pacific, 1-4, Dec. 2008.