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The advanced generation mobile broadband technology for wireless communication system and its applications

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Abstract

Wireless Mobile communication is developing very rapidly with passage of time. The high speed mobile approach to new technologies are being introduced to facilitate the mobile users from the technology. The past technologies are replaced by new ones and needs are growing for the new technologies to be developed. 5G is based on the requirements of high speed mobile wireless access service. It is also called Next future generation the mobile communication. Now mobile is not only a device used for talking but it's more or less a portable computer that can serve different purposes. The introduction of advanced generation has widened the scope of mobile communication. The 4G mobile phone technology promises faster communication Speeds (100 Mbps to 1 Gbps), capacity and diverse usage formats. These formats would provide richer content and support for other public networks such as optical fibre and wireless local area networks. Antenna techniques play an important role in increasing the spectral efficiency. Advanced multiple antenna solutions help the emerging advanced cellular technologies. *There are many ways in which antennas can be used smartly. This improves the overall performance of mobile communications system and their applications.*

Keywords: 4G, 3G, Antenna, MIMO Antenna, WiMAX Technology, 4G broadband wireless access (BWA), 2G, 5G, Mobile communication

1. Introduction

The Fundamentals of Wireless Communicational system mainly includes the research on basic aspects of wireless communication along with the techniques to explore the utility of it in modern communication era^[1-2]. The use of wireless communication systems is increasing very rapidly now a days^[3-4]. Basically the most prominent limitation of wireless communication is multi path fading due to which the capacity of the system is decreasing and the error rate is increasing^[5-6]. The stuff presented in the book elaborates the way in which how the fading can be exploited as an advantage to improve the system performance by means of various diversity techniques. The concept of Time diversity, Frequency diversity and Antenna diversity i.e. MIMO would be the most innovative approach in the modern wireless systems to improve the capacity with the highest superior quality^[7-8]. To implement the diversity algorithms into the wireless systems.

The next generation system will be able to provide a comprehensive IP Solution where voice, data and streamed multimedia can be given to users at Anytime, anywhere" basis, and at higher data rates than present generations^[9-10]. There are certain objectives that are projected for 5G. It is used to describe the next step in wireless communications.

2. Next generation Application for MIMO Antenna

Modern day communication systems present a challenge for communication engineers & scientist. Fourth generation (4G) technology, such as World Wide Interoperability for Microwave Access (WiMax) and Long Term Evolution (LTE), provide higher data rates in mobile services. 4G technology relies greatly on Multiple-Input-Multiple-Output (MIMO) systems, rather than classical Single-Input-Single-Output (SISO) systems. MIMO systems employ multiple antennas at both the transmitter and Receiver. Higher data rates can be achieved by employing MIMO systems. The basic principle beyond MIMO antenna design is

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to reduce the correlation between the received signals among the antenna ports and maximizes channel capacity. This can be achieved by employing diversity techniques for networks and other decoupling techniques are useful for the defined parameter that defines the correlation between signals is the mutual coupling. The mutual coupling mainly depends on the distance between the elements of the MIMO system. Increasing this distance can reduce the mutual coupling between the elements. However, this distance is limited due to the small area in which the antennas are placed, for example in a mobile handset. The MIMO Antenna Configuration applications of a three port MIMO antenna. To improve the ports isolation, a decoupling network was designed by using the same substrate material as shown in Fig. 1. The decoupling network consists of two elements having similar dimensions. The dimensions of the network can be optimized to achieve the desired pass band frequency. The separation between the elements can be changed to improve the MIMO antenna ports isolation and its Analysis of the forth generation 4G communication systems in general and various parameters are able to achieved within the range of standard values of communication systems. *There are many ways in which antennas can be used smartly. This improves of performance of mobile communications system. the overall performance of mobile depends upon various parameters.*

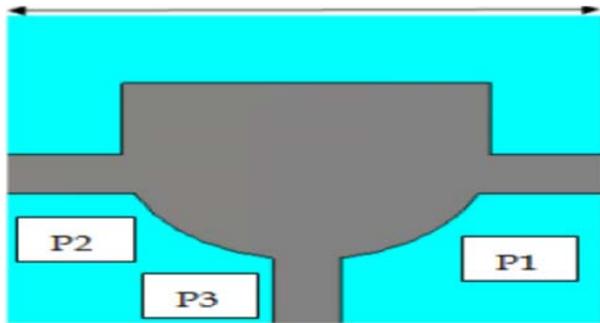


Fig 1(a): Multiple-Input-Multiple-Output (MIMO -Three port antenna configuration for Fourth generation (4G) technology.

3. Wi-Max wireless communication applications

WiMAX Technology In regards to what WiMAX was created for, WiMAX is a wireless digital communications system, also known as IEEE 802.16, that is intended for wireless "metropolitan area networks". In addition to WiMAX's usage in Metropolitan areas, WiMAX can provide broadband wireless access (BWA) up to 30 miles (50km) for fixed stations, and 3-10miles (5-15km) for mobile stations. In regards to the issue of backward compatibility with 3G networks for WiMAX has many other benefits and advantages regarding its 4G based technology. The primary advantages of the Wi-MAX standard are to enable the adoption of advanced radio features in a uniform fashion and reduce costs for all of the radios made by companies. WiMAX for 4G purpose as part of the 4G umbrella of wireless technologies along with 4G LTE As for 4G technology and its performance for uploads and download speeds, is Lighting fast abbreviation for Wireless Broadband. *Wi-Max Technology for wireless communication applications would be the most innovative approach in the modern wireless systems to improve the capacity with the highest superior quality.*

4. Development of wireless communication systems

5G is being developed to accommodate the quality of service (QoS) and rate, requirements set by forthcoming applications like wireless broadband access, Multimedia Messaging Service, video chat, mobile TV, HD TV content, Digital Video Broadcasting (DVB), minimal service like Voice and data, and other streaming services for "anytime-anywhere". The 5G working group has defined the following as objectives of the 5G wireless Communication standard with so many new and exciting possibilities as discussed, we wanted to know what were the most innovations ideas and advancements in recent years as seen by experts in the research and engineering community. We prepared a simple survey to identify the top few innovations and advancements in wireless communications & MIMO would be the most innovative approach in the modern wireless systems to improve the capacity with the highest superior quality of wireless Communications system.

4. A. Comparison between 3 G & 4G

3G

1. 3rd generation of mobile telecommunications technology also called Tri-Band 3G.
2. It is the successor to 2G technology.
3. It has various release versions like 3.5G, 3.75G.
4. The technologies under it are CDMA 2000, UMTS, EDGE, 1XRTT, EVDO.
5. It based on high capacity broadband data.
6. It has data bandwidth of 2Mbps.
7. It has bandwidth of 5-10 Mbps.
8. The spectral efficiency ranges from 1-5 Mhz.
9. Costly in implementation.
10. The data throughput is up to 3.1Mbps.
11. It has a peak upload rate of 5 Mbps.
12. The peak download rate is 100 Mbps.
13. It supports packet switching.
14. Its network architecture is wide area cell based.
15. It uses turbo codes for error correction.
16. It has frequency band of 1.8-2.5 GHz.
17. It provides video access to the user.
18. No virtual presence.
19. It provides digital navigation.

4. A. Comparison between 3 G & 4G

4G

1. 4G is the fourth generation that evolved in late 1990 and early 00s.
2. It is based on wireless communication which is IP based.
3. It supports data band width in Mbps.
4. Multiple carrier aggregation.
5. Advanced MIMO technology.
6. Extremely dense and small cells.
7. Peak speed up to 150 Mbps.
8. High security.
9. Very fast in connecting.

5. Conclusion

The next generation mobile phone telecommunications concept and architecture has been proposed. There are many complex and interdependent moving parts that must work together before a standard definition of next generation is solidified. The benefits to service providers and end users drive the adoption of 4G services that, in turn, lead to the demand for even more advanced services. The realization of the advance generation minimizes the distance between

wireless and wire line services, a challenging endeavor. Currently; the ongoing work is on the modules that shall provide the best QoS and lowest cost. As research is going on still some doubt and confusions still therein 4G, the increased competition and new applications will be the way for this next Generation in wireless systems.

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Short-Biography



Anand Mohan is working as a Junior Research Fellowship (J.R.F) P.G Dept. of physics C.M.Sc College Darbhanga, Bihar, Graduate from Lalit Narayan Mithila University (LNMU) Physics, (Hons). He received the Post Graduate in

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- The IAENG Society of Information System Engineering, Hong Kong.
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