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## IMPLEMENTATION OF MIMO FOR 4G AND 5G APPLICATIONS

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### ABSTRACT

-The 5G wireless technology is the advanced features of 4G. The 5G technology is better in speed, frequency band, switching design basis and forward correction in comparison to 4G technology. The 5G Technology provides the higher coverage area and higher network density to all the devices. The 5G network provides ten thousand times data traffic compared to 4G and data downloading more than 1000 times compared to 4G. Massive MIMO is the wireless data networks which have the significant gain, and offers the more users at high data rates and provide the better reliability. The BER performance of the 5G is reduced and improve the performance of 5G MIMO.

### I. INTRODUCTION

Massive MIMO is used for the use of large excess of service of antenna over active terminals and time division duplex operation. MIMO is also known as very Large MIMO. Approximately equal number of service antenna and frequency division multiplexing is a technology which is originally visualized by the MIMO. MIMO are the latest 5G wireless research. For next-generation wireless data networks, it promises significant gains that offer the ability to accommodate more users at higher data rates with better reliability while consuming less power. MIMO offers big advantage over conventionally point to point MIMO. The latest technology in wireless communication used the MIMO (Multiple Input Multiple Output) in Orthogonal Frequency division Multiplexing. This technology employed in 4G/5G wireless Standard such as Long term evolution. These advanced technologies are contemplated to support data rates in excess of 1 Gbps from beginning to end MIMO/OFDM/Massive MIMO and thus given the authority for high rate applications in wireless systems such as broadcast/multicast video, HDTV on demand, high speed internet access, interactive gaming amongst others. This is operate and control the direction of wireless telecommunication designers and researchers to focus in large amount of the research and development of MIMO/ OFDM/ Massive MIMO based wireless networks which have proven to be the top wireless technologies for 4G/5G cellular networks.

### II. THE POTENTIAL OF MASSIVE MIMO

The MIMO make greater in data rate size, because it can use the additional amount of antennas, It can more capable of thinking data streams can be sent out and the more terminals can be served simultaneously. The MIMO have more efficiency, because the base stations emit its energy in more than one direction, where the terminal located. It can contrive not to meet and reduced the interference from the stations. Massive MIMO have 10 times or more than others and it can use the additional energy efficiency in order of 100 times. The fundamental principle that makes the dramatic increase by using the large numbers of In In Antennas, The base station can emitted all the wave fronts collectively by the antennas add up constructively at the locations of the intended terminals, but destructively (randomly) everywhere. Each antenna can transmit signals from one place to other place with very small peak –to average ratio or even constant envelope at a very modest penalty in terms of increased total radiated power. Such (near-constant) envelope signaling make easier to the use of extremely cheap and power-efficient RF amplifiers.

### III. 4G TECHNOLOGY

In the year 2009 the technology of 4g was proposed to ITU. They basically proposes two ideas:

- a) LTE Advanced standardized by the 3GPP.
- b) 802.16m standardized by the IEEE (i.e. WiMAX)

The different features of 4G and 5G like mobile multimedia, applications. These features are used anytime, anywhere

It is used as a part of entertainment and also used for the knowledge. It give the high speed data rate for uploading and downloading speed of 400 mbps and 1GB up to for the users. It can used to download anything in few minutes. In this technology packet switching is used instead of circuit switching network. Comprehensive isolations will be taken from this technology where voice and data and multimedia can be given to a user on an “Any time Anywhere”. It provide high mobile and TV resolution. Its bandwidth is almost about 100 MHz It is a combination of Wi-Fi And Wimax. WiMAX: Wireless Mobile Access, the standard designed to provide 30 to 40 mbps with 1Gbits/s update for fixed station.

#### IV. 5G TECHNOLOGY

The 5G Technology is the wireless technology with the wide space coverage and packet switched network. The 5G have the Ultra high Bandwidth which is one thousand times higher wireless ability in comparison to the 4 G network.

The 5 G network have zero latency and ultra high knowledge Rate and it have high energy efficiency and provide more security to the data.

##### 4G and 5G difference

- a) The LTE-based 4G networks are going to moved with one side rapid deployment, 5G networks analyze the other research papers and pilot projects.
- b) Wireless networks till 4G mostly focused on the accessible of raw bandwidth, while 5G is aiming on the condition the group of users connected to lay grounds for fast and recover quickly access to the internet users. They are on the top of skyscraper or down under a subway station. LTE standard is combined a variant called machine type communication for the traffic. The 5G technologies are designed to support multiple type communication.
- c) The 5G technology is a monolithic network and the combination of 2G, 3G, LTE, Wi-Fi etc. The 5G is made to support various applications. A comparative study of 4G and 5G will support the large number of users.

For example, 5G give the ultra high speed to the users for HD video streaming and also provide the low data rate speed for sensors network.

##### Merits and demerits of 5G

**Merits:** The 5G network provide the high speed, and have maximum amount that something can contain, low cost per bit. It can provide the high data rate for uploading and downloading speed up to 1Gbps.

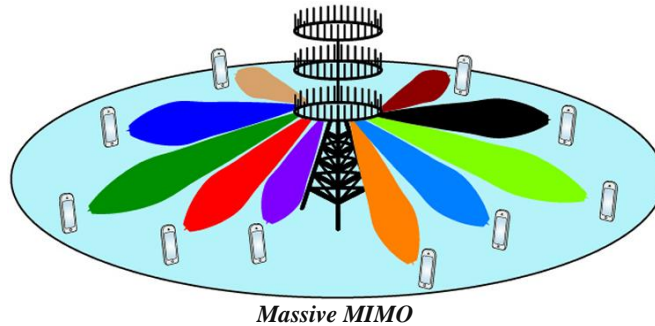
The network provide the services to the users and less traffic and high resolution for the mobile phones

##### Application of 4G & 5G

- **E-commerce-** It can help in online payment and courier system integrated in one site.
- Business work in office by mobile phones.
- Private life - various useful things are to be downloaded by search engine.
- Vehicle- It can helpful in transportation and give the information and controlling of the vehicle.
- Education and Entertainment- it is also helpful in Smart classes-learning, online gaming.
- Public places- The 4G and 5G network provide the guidelines for certain places like showroom, police security.

V. MASSIVE MIMO

MIMO stands for Multiple-input multiple-output. MIMO contained the multiple technologies and MIMO absolutely needed to be done by this single principle, the wireless network can provide the network for transmitting and receiving the data over the same radio channel.



The Massive MIMO system consist the high numbers of antennas and Standard MIMO networks are use two or four antennas. The 5G network used the high frequency (mm wave) signal in 5G. The high frequency defines the size of single antenna is very small and the aperture will be very small .

We need the large number of transmission antenna for the high frequency transmission at the receiver side. This is the important technology in which we can used a large array antenna.

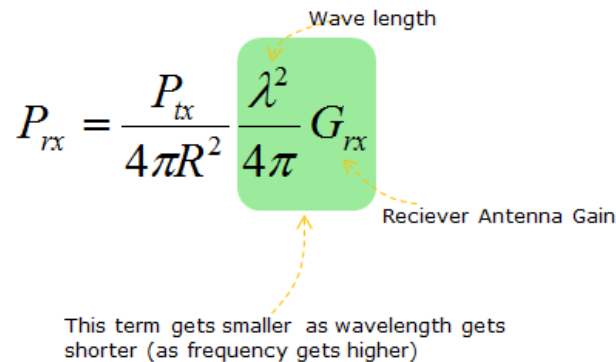
When the data is transmitted through the antenna from transmitter to the receiver with the distance of R which is given by –

$$P_{rx} = \frac{P_{tx}}{4\pi R^2}$$

Distance between Tx and Rx Antenna

This equation does not contained about the frequency and gain of the receiver antenna. The received power is proportional to the square of the wavelength. The received signal is affected by the frequency or receiver gain .In this , the antenna gain does not changes, the frequency gets increased by 2 times (thismean that the wavelength gets shorten by 2 times), the recieved power gets decreased by 4 times.

$$P_{rx} = \frac{P_{tx}}{4\pi R^2} \frac{\lambda^2}{4\pi} G_{rx}$$



This term gets smaller as wavelength gets shorter (as frequency gets higher)

In the of 5G technology we can use the higher frequency for the transmission of the signal. The received power will be lower than the communication system.

Now, how we can overcome the drastic received power reduction at high frequency. We can get the maximum power at the receiver by setting the parameters are-

- Increase P<sub>tx</sub> (Transmitter Power)
- Decrease the distance between the transmitter and receiver antennas.
- Increase wavelength (use low frequency)
- increase receiver antenna gain
- Increase transmitter antenna gain

## VI. RESULT AND DISCUSSION

- Massive MIMO can be assembled with economical low power Consumption.
- Massive MIMO can increase the capacity 10 times more than the others and improve the radiated energy efficiency in order of 100 times.
- Massive MIMO can reduce the latency on the air interface (due to robustness).
- Massive MIMO is easier to understand the multiple-access layer.
- Massive MIMO make greater robustness both to planned interference and intentional jamming.

## VII. FUTURE WORK

The 5G discovers the application in the field of medical ,transfer prescription ,other network for all the purpose .The Massive MIMO can used the millimeter wave frequency and wireless access and give the multiple applications .Cognitive radio technology are also known as the smart radio which used the same spectrum to be used by different radio technology.

## VIII. CONCLUSION

The technology offers the advantages of increasing the energy efficiency, spectral efficiency robustness and the reliability .This paper show the large potential of massive MIMO system enabling for the future beyond the 4G cellular systems. It can be done with low cost of hardware is used in the base station including with the use of mobile unit side. In 5G technology we can achieved the wider bandwidth by increasing the operating frequency millimeter range which handle the higher data rate . This give the result of fast transmission higher path loss between the transmitter and the receiver .So antennas need to provide the higher gain to reach a longer distance.The process of developing the design and performance of mobile antenna ,which containing as a part of the whole being considered those just mentioned, the ideal internet of things which include the new technology.

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