

# Review On 5G Wireless Technology

Sagarkumar Patel<sup>1</sup>, Harshad Purohit<sup>2</sup>, Shivam Shah<sup>3</sup>

Department of Electronics & Communication C.S.P.I.T, Charusat University, Changa, Gujarat, India

## ABSTRACT

5<sup>th</sup> generation wireless technology is give us dynamic speed and much more efficiency. It would create massive improvements in wireless technology's word. The need of 5G technology increases day by day with no. of problems like plethora users, high speed, receiver complexity etc.. Nowadays 4G is going on but as a user and devices are going to increase day by day then in future there is a lot of traffic in 4G spectrum. Moreover, at that time we need a new technology, which is 5G. There is some cellular or telecommunication industries which has already implemented in some countries like united states, south korea, sweden, turkey, japan, china etc..This technology is still in progress under expert. So many wireless researchers and academicians are going to work for this technology enhancement.

**Keywords:** 5<sup>th</sup> generation wireless technology, Networking, Massive MIMO, Spectrum, Full Duplex, Millimeter waves, Beam forming

## I. INTRODUCTION

Every new wireless technology gives faster speed and more functionality. 1<sup>st</sup> generation wireless technology for first cell phone. 2<sup>nd</sup> generation wireless technology gives text first time. 3<sup>rd</sup> generation wireless technology gives online platform and 4<sup>th</sup> generation technology which is nowadays every one using is deliver speed

1st generation wireless network introduced around 1980's up to 1990. This network give voice only cellular calls with speed up to 2.4 Kbps. AMPS,NMT,TACS this is all those technologies which used in this network. in 1st generation analog band width used. First time any network able to make calls .

1st generation network is first wireless network. There is also some drawback of this network. There is no room for spectrum enhancement. Also privacy is less in 1st generation network. capacity of calling is also less in 1st generation network.[1]

2nd generation wireless technology is GSM based. Difference between 1G and 2G is analog signal used in 1G where digital signal used in 2G.This technology introduced around 1991. TDMA,CDMA technology which is used in 2G. 2G gives speed around 64 Kbps. Quality of sound is increased in 2nd generation network and also noise is reduced. First time SMS (short message service ) and Email is established by 2nd generation network. There is also drawback of 2nd generation network. In this network signal easily dropped. 2G is based on digital signals and this digital signals are so weak so there for some time signal not reach up to tower. This generation network has low data handling capability.[1]

3rd generation technology introduces around 2000. WCDAMA/CDMA is technology which is used in 3G. Maximum speed of 3G is around 21.6 Mbps. In this network quality of digital voice signal is increased.

3rd generation is use large band width. In this network first time able to do video conferencing also this network support TV to internet. There is also some drawback of 3rd generation network. Main drawback is cost because establishing of 3rd generation is so high. its require more band width. For proper connection more number of tower is required so initial cost of 3rd generation wireless network is so high. [2]

4th generation wireless network is packed switched wireless system with wide area coverage and high efficiency . 4G is more cost effective and high speed network. its provide speed around 20Mbps. Frequency band is used 2 to 8 GHz, this is the main advantage of 4th generation wireless network high speed. This network has low cost per bit and good spectral efficiency. 4th generation of wireless network provide high quality of service and high security. There is also some drawback of this network. Battery consumption while using 4G is so high. this network is hard to implement. Signal dropped so many times because it has high frequency. It need complicated hardware and very expensive to implement. it also required more number of towers.[2]

But as more user come online 4G reach up to its limit in future and that's why need of 5G occurs. It will be able to handle thousand time more traffic compare to today's network and able to give speed ten times more. It will able to give more functionality and revaluation in some fields like virtual reality, automation driving, internet of things, online robotic surgery many more. Right now five brand new technologies immerging as a foundation of 5G.

## II. MILLIMETER WAVES

All wireless electronic communication devices use specific frequency band, which is called spectrum. Typically it's up to 6GHz but nowadays this frequency spectrum get more crowded because day

by day number of user and devices are increase so high. Carrier going to send a large amount of data on same range of frequency spectrum.[3] System going to provide slow service and more drooped connection. The solution is open some new range of frequency and here millimeter waves comes into picture. Range of millimeter waves is up to 300 GHz. This section on spectrum is never been used before. If this new range of spectrum will be, open that mean more number of bandwidth foe more number of users.[4] However, there is one main drawback of millimeter waves. These waves cannot travel through walls or any other obstacles. These waves easily observe by weather. Therefore, for solution need of small cells occurs.



Figure 1. Connection loses

## III. SMALL CELL

Today wireless network travel large high power cell tower to broadcast signal, over long distance. Where, millimeter waves not able to traveling through obstacles, which means if devices are behind the any obstacles they lose signal. Small cell networks solve that problem. Using thousands of small tower mini base station. These small cell mini base stations are much closer together then traditional tower. So small cell able to transmit signal around the obstacles. This is specially use in cities.[5] As user moves around the obstacles this device, get automatically switched from one nearest small cell to another nearest small cell.

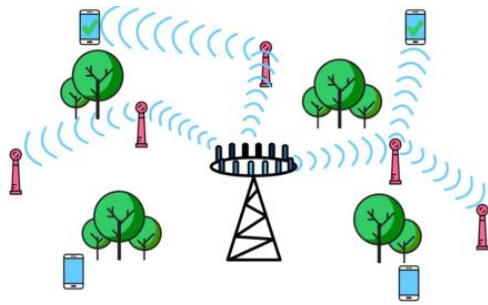


Figure 2. Small cells

#### IV. MASSIVE MIMO

MIMO stand for multiple inputs multiple outputs. Today's cellular base stations have dozen port of antenna for handling cellular traffic. Where MIMO base station can support 100 ports of antennas.[6] This can improve today's network capacity by factor of 22 or more. MIMO comes with its own drawback. MIMO antennas able to transmit information in all direction at ones and this entire signal get a serious interface which brings a new technology Beamforming.

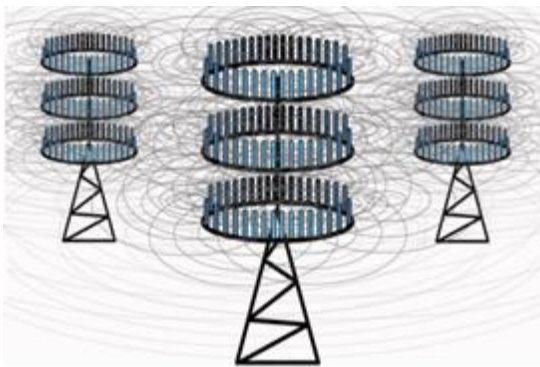


Figure 3. Signal interface of MIMO

#### V. BEAMFORMING

The Beamforming is like a traffic signal in system. Its broadcasting signal in every direction it would allow to base station to send focused stream data to specific user. This precision prevention system is more efficient. That mean station can handle more incoming and outgoing data at once. Process of this system is as follows. Supposed two or more devices are in city around the obstacles and make call.[7] So

first massive MIMO collect that data and send to specific user with specific data sending algorithm that means Beamforming through which direction of data is where user want to send it which brings new technology full duplex communication.

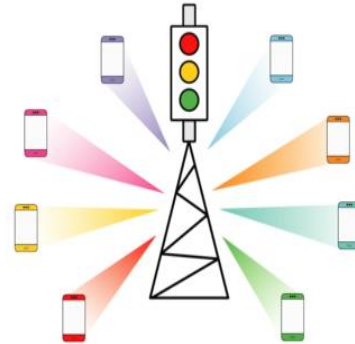


Figure 4 Beamforming

#### VI. FULL DUPLEX

In one scenario data can either transmit or either receives. This is call half duplex communication like walky-talky. Today's cellular base stations have same that problem. This is because of reciprocity principle. If you transmit data on radio frequency then it travel forward or backward on same frequency. So two devices are send data at a same time so error occurs because of reciprocity principle.[8] For solution researchers use silicon transistor to create high speed switches. This silicon transistor allows two user to transmit data at ones.

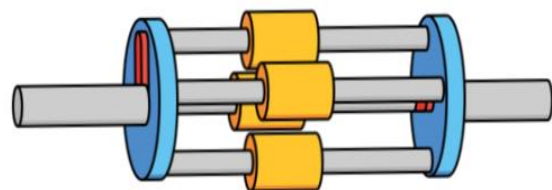


Figure 4. Silicon transistor

#### VII. CONCLUSION

5th generation technology going to revaluation in wireless technology. Experts are still working on this five technology. Millimeter waves, small cell, massive mimo, Beamforming, full duplex this all

technologies are still in progress. It would also include some new technologies. All of this system work together it would be a challenge. If expert figure it out then 5G services could arrive in next five years.

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