

6 G: an extended genre of 5G Mobile Communication Network

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ABSTRACT: Mobile communication systems have evolved over multiple generations from 2G to 5G approximately every ten years. The new generation is looking for the ever-increasing human-machine interaction based upon technology. 6G, the next-generation mobile networking brings the combination of quantum processors enabled Artificial Intelligence to Mobile Communication systems by using Terahertz technology. As of now, the cellular notion has been the most important constituent of mobile and wireless communication networks. In the terahertz band spectrum, atto-cells and zepto-cells have been used to increase the capacity of the system covering a small area enabling cell densification, a reality. Weigh up with 5G, 6G has the advantages of ultra-high transmission rate, bigger connection capability, having wider frequency band, and stronger anti-interference capability. It is applicable in the areas of Virtual Reality, Super-Ultra High Definition Video, and Teleportation. Your 3D Avatar image can be produced by the technique of 6G and thus holographic image can attend the meeting virtually. This paper reviews the technical aspect of 6G and lists out the advantages and limitations of 6D technology. The real-time applications of 6D like 3D intercoms and distributed Artificial Intelligence enable us to change the world in a high-tech mode in the future. 6G system is an amalgamation of intelligent, deep, ubiquitous as well as holographic connectivity. Even if the 5G era has not fully arrived, we can expect the deployment of 6G in.

KEYWORDS: Artificial Intelligence, Beam forming, terahertz communication, Wireless network, 6G

I. INTRODUCTION

Unlike the existing communication contraction which is restricted by network paradigms and technology, 6G will explore new communication mechanisms spanning new horizons. As a result, the 6G will be compatible with new and hitherto unheard-of protocols,

and architecture that would support existing and future scenarios and technology [1]. Following the flagship line-up set afloat by the University of Oulu, Finland, several Institutions and Organizations have started to explore fluctuating controversy in 6G communication networks. 6G will open a way for several applications rather than in 4G and 5G through ultra-high reliable ultra-low latency. It is observed that even though 5G communication systems have given to widespread data usage, it is still not enough for many IoT devices to various types of data and real-time. 6G presents us with the facility to launch jam-packed exposure of the air-space-sea-land to form a network ecosystem as it integrates a holographic and ubiquitous multidimensional network [2-3].

5G technology is integrated with more advanced technology to fulfill the needs of man-machine interaction and developed 6G. Some good services proposed for the 6G include AI, the inclusion of Visible Light Communication and Terahertz communication, Holographic Communication, and 3D coverage framework [4].

Japan has most recently launched its 6G project for both Samsung and LG. Even though the scenarios of 5G were elucidated initially as eMBB (enhanced Mobile Broadband), the mMTC (massive Machine Type Communications) and URLLC (Ultra-Reliable Low Latency Communications) were sidelined. At present, a refresh frequency of 60Hz with 2K+ pixels is supported by devices in the market. S-UHD must have a display resolution of 15,360 horizontal pixels by 8,640 vertical pixels, thereby providing a total of 132.7 megapixels per frame. Network architecture is determined in such a way that the connected devices should interact locally upon the availability of different sensors [5-6, 22]. Teleportation users will increase to their maximum in 2030 and would become a mobile reality with the help of a specially designed helmet with a light projection over the crystal [6-8]. Nokia BellLab has

already begun the research work on 6G to make it commercially available by 2030.

A Deep Neural Network scheme is used in 6G signals. Artificial Intelligence bright up for the inclusion of Deep Learning technology and deep sensing tactile internet as well as deep mind or telepathy will not be a problem with the advancement of 6G [9].

II. TECHNOLOGIES

Different types of technologies can be band together and integrated and an autonomous and intelligent vehicle will be on the road without compromising the safety aspect of the passenger. By installing more antennas will enable in time of sight conditions, 6G vision can be achieved [10-12].

A. Beam forming

Beam forming makes imparting information fast and more directional by eliminating interference as well as energy consumption. It is mainly used for reducing the intrusion of signals which may happen in multiple user environments in network data transmission. In the traffic-signaling system, beamforming recalls the well-run avenue for data transmission for a particular user [7]. The multiple-input and multiple-output (MIMO) techniques make a high transmission rate with higher efficiency [8]. Beamforming results faster data transmission with high reliability [20-21].

B. Terahertz communication

Width of 0.3 -10THz, the unused and unexplored band of the electromagnetic spectrum [Figure1] is significant for the Terahertz communication.

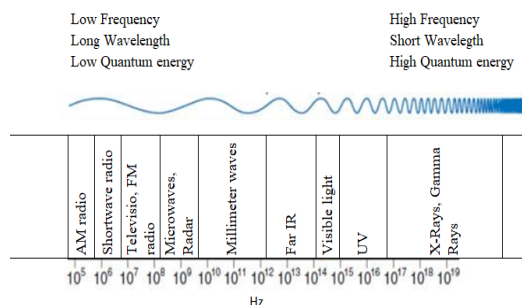


Fig. 1 Electromagnetic Spectrum of terahertz and millimeter waves [13]

Cell densification is a part to enhance the capacity of a system as seen macro cells being contemplated by microcells, then picocells, and eventually femtocells, covering short ranges. With the introduction of 6G, atto cells and zepto cells have been introduced [9]. The applications of THz

communication include wireless cognition in robotic control, drone fleet control and autonomous vehicles and the course of action of sensing especially in health monitoring systems, air quality detection and gesture detection, imaging in a body scan, high-definition video resolution radar and communication in data centers and intra-device communication [11-13, 23-24]. 6G uses millimeter wave, THz frequency band for data transmission.

C. Ultra Mobile Broadband (UMBB)

It moulds the refinement felt by the customer or device such as a headset or watch or any other handheld device.

The high data transmission rate enables viewers to download a full video of a film on Netflix within a second. 3D construction of a real object or a person is ably drive away virtually to another location by just captured by a 360 camera and with the help of VR glass. The teleporting technique does not require any movement of an object. Although teleporting is possible by 5G, quality was poor and 6G makes it a reality. The idea of superimposing things into reality by way of Augmented Reality is also within the bounds of possibility [25].

D. Enhanced Ultra Reliable Low Latency Communication (eURLLC)

It is necessary to maintain confidentiality in many cases where people have to communicate in a guaranteed transmission. Driverless vehicles should keep the safety of the passengers and goods to enable efficient transportation. 6G provides ultra-reliable, ultra-low latency, multiple path communication. Autonomous robots should conserve accuracy to move in an industry field with the aid of 6G [14,26].

E. Ambient Internet

To fulfill the goal of autonomous vehicles, many kinds of information from various devices have to be incorporated. Before applying AI, data need to be collected fast with the use of the internet. The AI agents collect the sensors which will present in every object such as cars, speakers, cameras, screens, etc and further make decisions depending upon the data such as what you need most at each moment [7,15,27].

F. Holographic Call

A hologram of a member of a meeting will appear in front of you without having a recording studio [16]. The holographic techniques such as Augmented Reality and Virtual Reality became easy with the advent of 6G. Users can talk with a full-sized hologram of another person during a video call which will make a revolution in business as well as a medical field. The ubiquitous characteristic of 6G enables internet connection

everywhere in sea, air, ground, or space at any time [17-18].

G. Quantum Computing

Quantum bits (Qubits) are the basic element in the process of quantum computing. It can take the value 0 or 1 or both simultaneously.

2n unique binary patterns can be represented for n qubits. Intel, IBM, and Google have cloud-based quantum networks and processors [19-20].

QC-assisted Data Learning will bring intelligence in 6G.

III. DIFFERENCE BETWEEN 5G AND 6G

Table 1. Difference between 5G and 6G

Sl No	Definition	5G	6G
1	Frequency band	GHz	THz
2	Latency	1 ms	0.1 ms
3	Wave usage	Used millimeter waves	Uses sub-millimeter waves
4	Type of devices	Smart phones, drones and sensors	CRAS, Sensors & DLT devices, XR and BCI equipment and Smart implants
5	Traffic Proportions	10 Mbps/m ²	1 to 10 Gbps/m ²
6	Peak data rate	0.01 Tbps	1 Tbps
7	Experienced data rate	0.1-0.5 Gbps	10 Gbps
8	Connectivity density	10 ² devices/ 100m ²	10 ³ devices/ 100m ²

IV. ADVANTAGES

1. A large amount of data transmission in a selected area with much lower latency and a mind-blowing speed of 1Tbps would be possible with 6G mechanism.
2. 6G will be a hybrid ubiquitous network that would incorporate all advanced coexisting technologies.
3. Quantum communication and cryptography are expected to be deployed in 6G
4. As terra bits are available, they can carry colossal amounts of data.
5. 6G enables integration of our brain to the computer and science fiction could become science fact.
6. Medical surgery and many more activities are possible remotely by eliminating space and time barriers after the evolution of 6G technology in the medical sector which will be a boom in the Health care sector [20-24].

V. LIMITATIONS

1. Collision with obstacles may occur as the signals with higher frequency and there may fail to keep energy too.
2. They are easily blocked by a building or trees.
3. Small cell stations are additionally required between base stations and users to operate 6G.
4. The wavelength of the light used for communication in Visible Light Communication (VLC) is 390-700nm. As VLC is partly used for the 6G communication, line of sight is required for the data communication and obstacles will interrupt proper communication [19-23,27].

VI. CONCLUSION

5G is still being deployed around the world and 6G is undergoing research. 6G will provide a significant data rate over 5G. It will be amazing when new products and services are

happening using 6G technology features and improved bandwidth. This survey will open an insight to further research. We can expect the 6G network which can sense the environment, people, and object in the coming era.

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