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# A Review Paper on 5G Wireless Technology

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**Abstract**— The in-depth exploration in the era of fifth generation (5G) wireless network technology is a sign of technical revolution to joint up with the demands and requirements for very fast speed communication and applications which are based on Internet of Thing (IoT) as well. IoT devices and the mobile phone technology supports the 5G technology to invent with distinct facilities like the smart city, smart building and many more that will need an antenna with 5th Generation technology, with reduced latency, minimum path loss and steady pattern of radiation. This paper provides a deep study of various characteristics of all the wireless generations with their salient characteristics along with 5G technology.

**Keywords**—5G technology, Internet of Thing (IoT), latency, low path loss, radiation pattern Introduction.

## 1. INTRODUCTION

The entire world has witnessed a number of developments in the field of Communication. In the last few years, drastic development of wireless services and technologies has contributed a lot in forming our economic system and society. The world has turned towards digitized format, from services that are using voice only applications to wireless broadband connectivity, from second Generation to fourth Generation and even after this also [1]. New development in technology not only supports but also extends the limits of easy to use policies giving authorization to a number of users and uses. It is correct in view of fifth Generation technologies which permits larger bands of spectrum for quality purposes than many previous wireless generations.

The next offered main phase of mobile phone telecommunication standards in the Fifth Generation wireless network technology are beyond the present Fourth Generation/IMT Advanced standards. Along with a number of improvements 5G planning carries The speed of Internet connectivity is very fast as compared to current 4G.

The Fifth Generation smartphone mixed media networks of internet can be entirely communicated wirelessly without any major constraints that creates a complete real world wirelessly known as World Wide Wireless Web (WWW). It is based on 4G technologies.

## 2. THE EVOLUTION OF GENERATIONS FROM 0 TO 5<sup>TH</sup> GENERATION

**0G WIRELESS SYSTEM:** In the late of year 1940, the first ever radio telephone service came into picture. It was created for communicating between the callers in four wheelers to the land-line connected telephone network.

During the year 1960's, the new technology called Improved Mobile Telephone Service (IMTS) which was a system started by Bell Systems brought some of the changes like Direct Dialing and a large bandwidth. In the late 1960's and early 1970's, IMTS was the main technology on which the very first analog systems were based upon.[2]

**1G WIRELESS SYSTEM:** These system uses networks analogy signals. A very high frequency which is near to approximately 150 MHz was used for voice modulation.

Analog cell phones of 1st generation which are having a speed limited up to 2.4 kbps, allow the callers to initiate voice calls in one country. The salient features of 1G standard are:

- \* Advanced Mobile Phone System referred as AMPS

- \* Nordic Mobile Telephone referred as NMT [2].

**2G WIRELESS SYSTEM:** These wireless systems are commercially launched on the standards of GSM (1991). 30 to 200 KHz is the bandwidth used by 2G Wireless system. 2G networks allows for a lot more penetration intensity. E.g. GPRS, CDMA[2].

It also provides the facility of SMS (Short Message Service).

**3G WIRELESS SYSTEM:** These type of wireless system makes use of technology of Code Division Multiple Access and Time Division Multiple Access. In computer networking and mobile devices area 3G came into the use (WCDMA, WLAN and Bluetooth) (cell phone and GPS) in 2005. In terms of spectral efficiency, 3G technology is far better than 2G technology. Transmission speed is from 125 kbps to 2 Mbps. Packet switching is the main technology through which Data is sent. The main feature of 3G Wireless systems is very high clarity in Voice calls and Access to Global Roaming[2].

**4G WIRELESS SYSTEM:** These type of wireless systems should be able to provide a smooth worldwide roaming with 4G Mobile Phones. 4G provides both the cellular and multimedia services everywhere in the world. Nowadays with 4G, the mobile TV provider redirects or gives the facility of TV channel directly and completely to the subscriber's phone where it can be watched. One of the main features of 4G Technology is Video on demand on the subscriber's phone. Video conferencing facility allows subscribers to watch and communicate with each other. Using telecommunication, one can also have medical advice. Salient features like Mobile ultra-broadband (gigabit speed) access and also good multi-carrier transmission [2] is also available in 4G wireless systems.

4G provides few same features as Third Generation along with some important applications like Multi-Media Newspapers, enables users to watch T.V programs with good visually and clarity and send Data with a lot more high speed than the other previous generations [3]

**5G WIRELESS SYSTEM:** Huge consortiums of much more significant worldwide telecommunication are progressing to create universal values across Fifth generation wireless network technology. Despite a lot of these standards don't get hardened, experts of this field yet anticipate it to be more suited with Fourth Generation and third Generation. With the increase in growth of demand of the users and callers exponentially, Fourth Generation wireless technology can be easily substituted with Fifth Generation technology with a new advanced access technology named as Beam Division Multiple Access i.e. BDMA and or Filter Bank multi carrier abbreviated as FBMC multiple access. By considering the matter of the base station which is having communication with the mobile stations, there lies the main concept behind BDMA technique. An orthogonal beam is given to each and every mobile station and by using Beam Division Multiple Access technique one can divide that antenna beam according to locations of the mobile stations for openhanded multiple accesses to the mobile stations, that will definitely increase the competency of the 5G system and thus this is observed as the important and main process of BDMA communication.

Few of the reasons to turn in the direction of 5G wireless systems are based on the present scenarios. The hindrances that are not looked upon in 4G technology can be tackled by 5G cellular networks perfectly. These are

- 1: Higher capacity
- 2: Larger data rate
- 3: Lowered cost
- 4: Consistent Quality

- 5: End to End latency has been lowered,
- 6: connectivity to the massive device,

### 3. SALIENT FEATURES OF 5G

- 5G wireless technology offers the increased resolution for intense mobile phone on daily basis and gives user's good and better connectivity to Internet.
- Billing limits in advance are provided by 5G technology that is why this technology will be more successful in the modern era.
- 5G technology provides mobile phone users, mobile records easily available for better printing tasks.
- 5G wireless technology allows for huge volume data spread in Gigabits.
- More accurate and reliable results are obtained by the information that is provided from the data transfer by 5G technology.
- Applying technology named as remote control one can get an easy and comfortable 5G access in less time.
- Virtual and particular wireless network is also supported by 5G technology
- 5G Technology provides a faster upload and data download speed as compared to previous generations.
- The 5G wireless technology provides a better internet connectivity all around the world.
- Wireless technology of 5G network is authentic and high speed [4].

### 4. 5G MERITS AND DEMERITS

#### 4.1 Merits of 5G Technology

There are a number of merits of 5G technology as listed below

- Excessive resolution and two direction huge bandwidth [8].
- 5G wireless network Technology has the ability to collect all wireless networks on a single platform.
- 5G Technology is highly efficient than other counterpart technologies.
- 5G wireless network will ease the subscriber supervision methods for the faster activity.
- This technology will offer a vast broadcasting data in the units of Gigabit that will help 60,000 plus connections.
- Compatible with the earlier wireless generations.
- 5G network is highly sound to provide support to heterogeneous resources (including private network) technologically.
- Possible to offer constant, uninterrupted, and continuous internet connectivity worldwide [9].
- 5G technology very well supports Artificial Intelligence applications [10].

#### 4.2 5G Demerits

Though, 5G wireless network technology is explored and its concepts are there to resolve the existing radio frequency based transmission issues and major hardships of cell phone world, still due to some of the security reasons and need of technological enhancement in majority of the geographical regions, it has underlying demerits

- The research on viability of 5G Technology is currently ongoing.
- The internet accessing speed of 5G wireless network technology is still difficult to attain in nearby future, due to the inefficient technological network support worldwide.
- A large number of the earlier used devices will be inefficient to 5G technology, hence, each one of them will be required to be exchanged with newer versions.
- Huge amount of cost is required to develop infrastructure needs.
- 5G wireless network technology needs to address the issues related to security and data privacy.

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