5G Myths, Realities and Opportunities

WEBINAR REPORT

By Barrack Otieno

KICTANet

May 2020

Contents

Executive Summary

The fifth-generation (5G) wireless technology promises higher connection speeds, lower latencies and the capacity to carry large numbers of connections simultaneously. It will result in tremendous increase in data speeds and change how people interact with the Internet inspiring innovation and new services.

Leveraging 5G will require a change in mindsets. Organizations and people that will embrace the change sooner will gain a competitive advantage over those that will not.

Introduction

5G has become a global buzzword that has elicited mixed emotions within global economic and socio economic spheres. The onset of the Covid-19 pandemic did not make it easier for this nascent technology. Many myths have arisen linking the novel virus to the new technology. It is for this reason that the Kenya ICT Action Network (KICTANet) In partnership with Huawei, organized a Webinar on 4th May 2020, to debunk some of the myths that have arisen around the yet to be understood technology.

The Webinar was moderated by Mr. Ali Hussein the CEO of Kipochi and Chairman of the Kenya Fintech Association. Featured panelists included Mr. John Walubengo, Lecturer Multimedia University, Mr. Adam Lane, Deputy CEO Huawei Sub-Saharan Africa, Mr. Musa Bello, Innovation Manager Huawei Southern Africa, Mrs Ann Kinyanjui, Acting Manager Frequency planning, Communication Authority of Kenya and Engineer Daniel Obam, a Spectrum expert.

188 participants registered for the Webinar which was also streamed on the KICTAnet Youtube Channel. At the end of the Webinar the total number of users was 220, unique viewers 114 and concurrent views 85.

Historical Developments of the Global System for Mobile Communications By John Walubengo

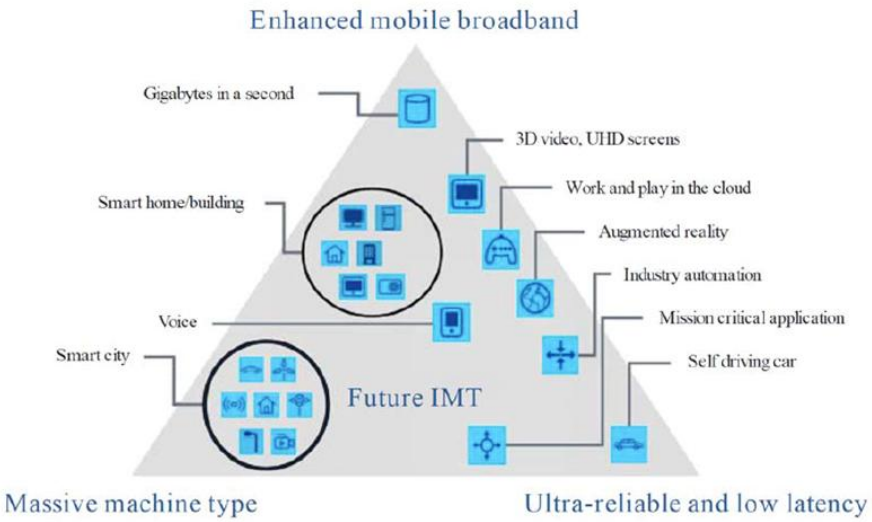
Walubengo commenced his presentation by explaining that the Global System for Mobile Communications (GSM) is a standard developed by the European Telecommunications Standard Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets.

He then took participants through the evolution of the Global System for mobile communication from the first generation (1G) to the fifth generation (5G). The presentation focused on the main characteristics of the fourth generation (4G) and fifth generation (5G) GSM networks as per analysis conducted by the International Telecommunications Union (ITU) Academy in 2019. Some of the characteristics are shown the table below: .

Table 3.1. IMT-2020 (5G) vs. IMT-Advanced (4G) ITU requirements

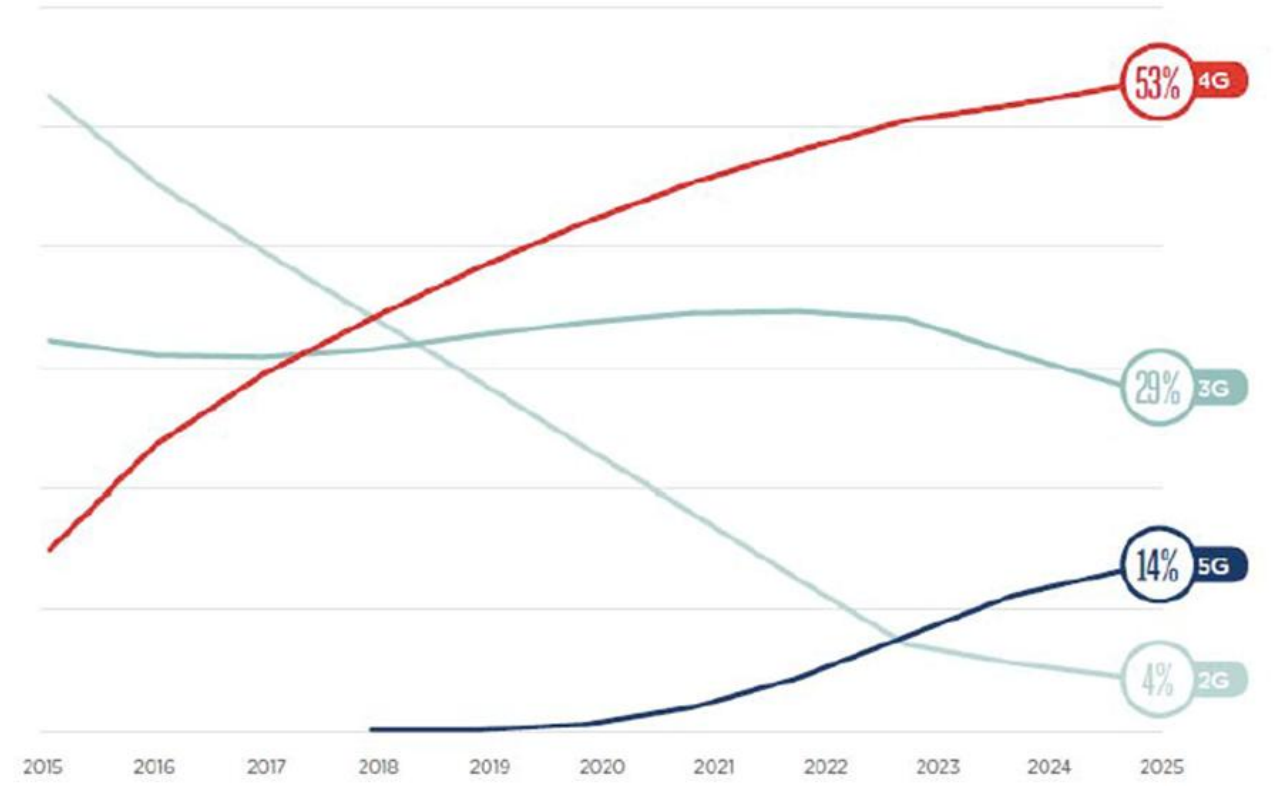
	IMT-Advanced	IMT-2020
Minimum peak bitrate	Downlink: 1 Gbit/s Uplink: 0.05 Gbit/s	Downlink: 20 Gbit/s Uplink: 10 Gbit/s
Bitrate experienced by individual mobile device	10 Mbit/s	100 Mbit/s
Peak spectral efficiency	Downlink: 15 bit/s/Hz Uplink: 6.75 bit/s/Hz	Downlink: 30 bit/s/Hz Uplink: 15 bit/s/Hz
Mobility	350 km/h	500 km/h
User plane latency	10 msec	1 msec
Connection density	100 thousand devices per square kilometer	1 million devices per square kilometer
Traffic capacity	0.1 Mbit/s/sq. m.	10 Mbit/s/sq. m. in hot spots
Frequency bandwidth	Up to 20 MHz/carrier (up to 100 MHz aggregated)	Up to 1 GHz (single or multiple frequency carriers)

5G use cases based on studies conducted by the International Telecommunications Union Academy in 2019 were also discussed. The use cases are captured in the triangle below:



In conclusion, Mr Walubengo noted that according to the Global System for Mobile Communications Association which represents the interests of mobile operators worldwide, and unites more than 750 operators with almost 400 companies in the broader mobile ecosystem, the number of 2G connections by 2025 will be 4%, 5G 14%, 3G 29% and 4G 53%. The

networks will continue to exist due to the unique business models surrounding each type of network as per the illustration below:



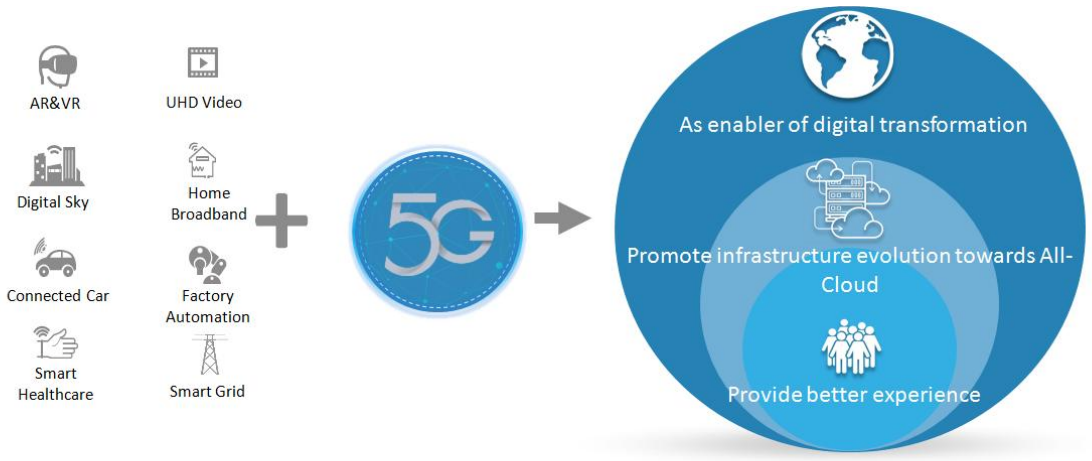
: 1.25 Number of connections per mobile generation (prediction 2018 to 2025)

5G use cases by Adam Lane and Dr. Mussa Bello HUAWEI

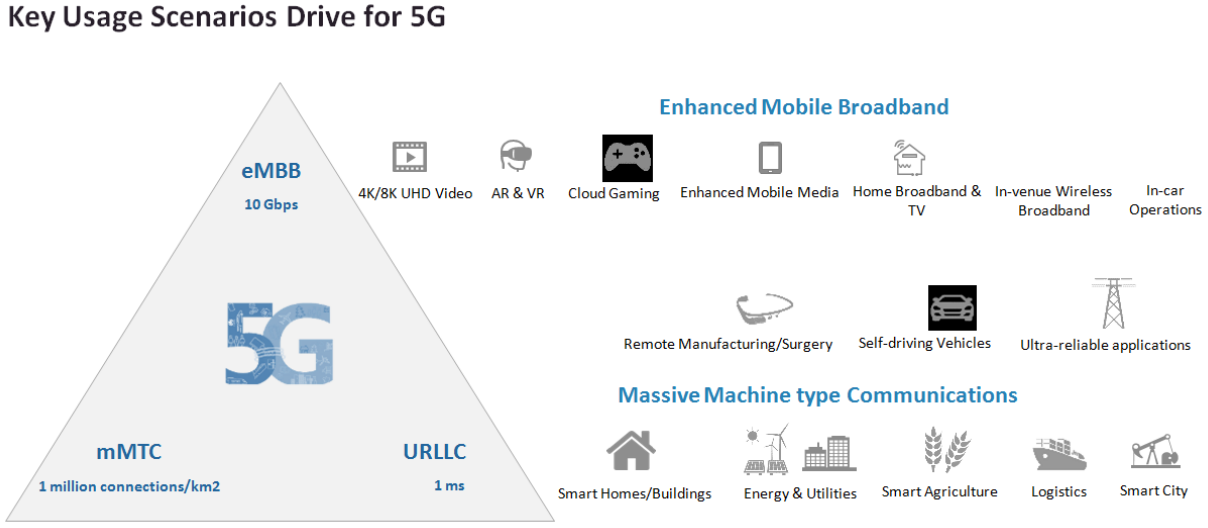
In his opening remarks Mr. Adam Lane noted that Huawei has become a global leader in 5G due to significant investment in Research and Development. Research on 5G has been ongoing since 2009. 2012 saw the launch of the first 5G prototype. Huawei has invested in twelve 5G research centers, more than 300 top 5G scientists and 8000 employees in research and development. So far, Huawei has awarded 91 commercial 5G contracts and shipped over 700,000 5G massive multiple-input and multiple output (MIMO) Active Antenna Units (AAU's). He noted that many countries had gone ahead to develop 5G strategies and policies. He gave examples of global economic super powers whose 5G strategies had been endorsed by the top political leadership which resulted in speeding up of spectrum release as well as provision of supportive policies.

The role of 5G in enabling Digital Economies was also highlighted with emphasis on 5G as an enabler of digital transformation as well as 5G's role in promoting infrastructure evolution towards cloud based services, and better experiences for Internet users.

Mobile networks and the Internet of Things (IoT) will be two major driving forces for the future development of mobile communications and will provide broad prospects for 5G to build a better digital society as illustrated below.



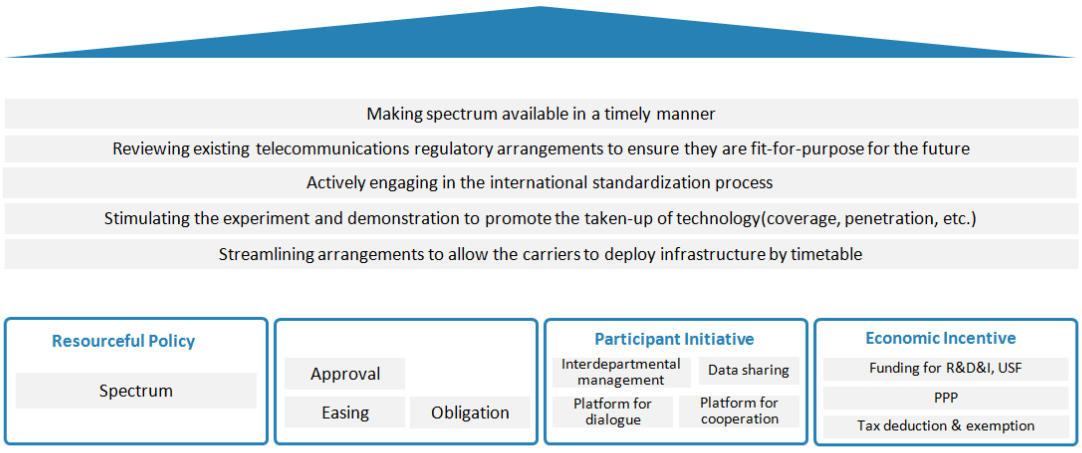
Key usage scenarios for 5G were also shared which included enhanced mobile broadband that would support home broadband and television, enhanced mobile media, ultra reliable low latency communications that supports industrial automation, and self driving vehicles. Others are massive machine type communications that support smart homes/buildings, logistics and smart cities. 5G will go beyond facilitating communication among human beings and will enable intelligent internet of things in the future. The image below depicts key usage scenarios as outlined above.



Other use cases include the use of 5G to fight the COVID-19 pandemic by improving the efficiency of diagnosis and treatment in China through remote medicine, remote prevention and control, remote diagnosis and treatment and improved medical efficiency with technology.

5G based fixed wireless access for providing gigabit broadband to homes as an alternative to fibre optic cable was also discussed. 5G enabled streaming of famous attractions and 5G enabled factory automation were included in the discussion as possible use cases.

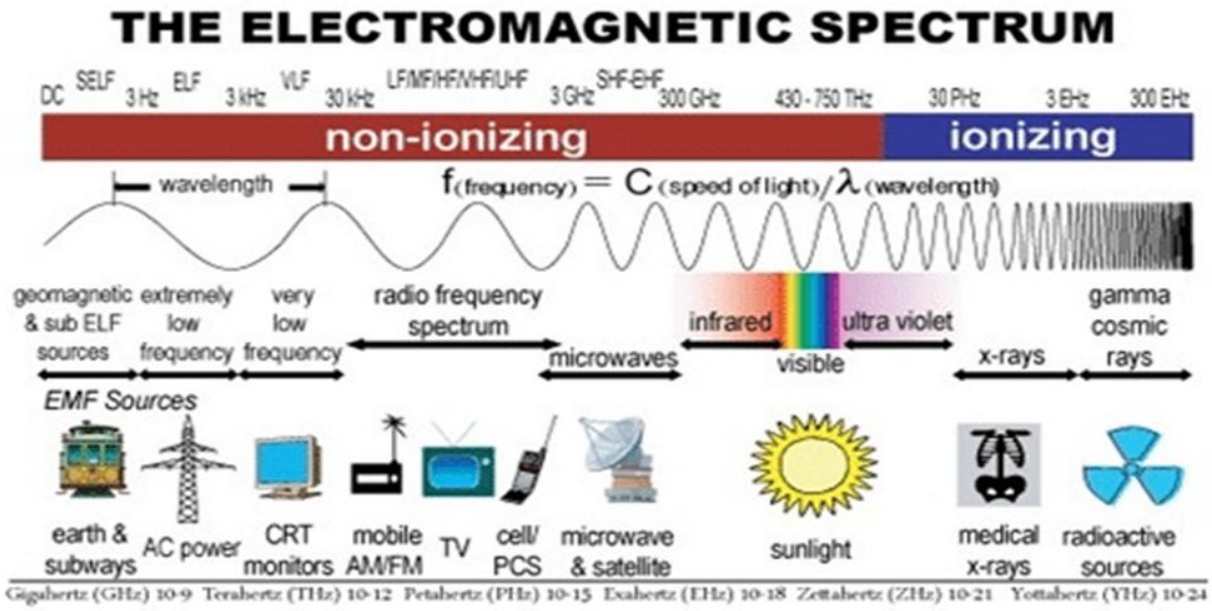
In conclusion, a proposed roadmap to 5G was presented outlining the role of various stakeholders.



5G Myths and Realities by Engineer Daniel Obam, Radio Communication Expert

Engineer Daniel Obam stated that as with previous cellular technologies, 5G networks rely on signals carried by radio waves which are part of the electromagnetic spectrum - transmitted between an antennae or mast and mobile phones. Participants were informed that 5G uses higher frequency waves than earlier mobile networks, allowing more devices to have access to the Internet at the same time and at faster speeds.

Unlike previous GSM generations, 5G waves travel shorter distances through urban spaces. As such, 5G networks require more transmitter masts than previous generations positioned closer to ground level. The figure below illustrates the position of mobile technologies within the electromagnetic spectrum.



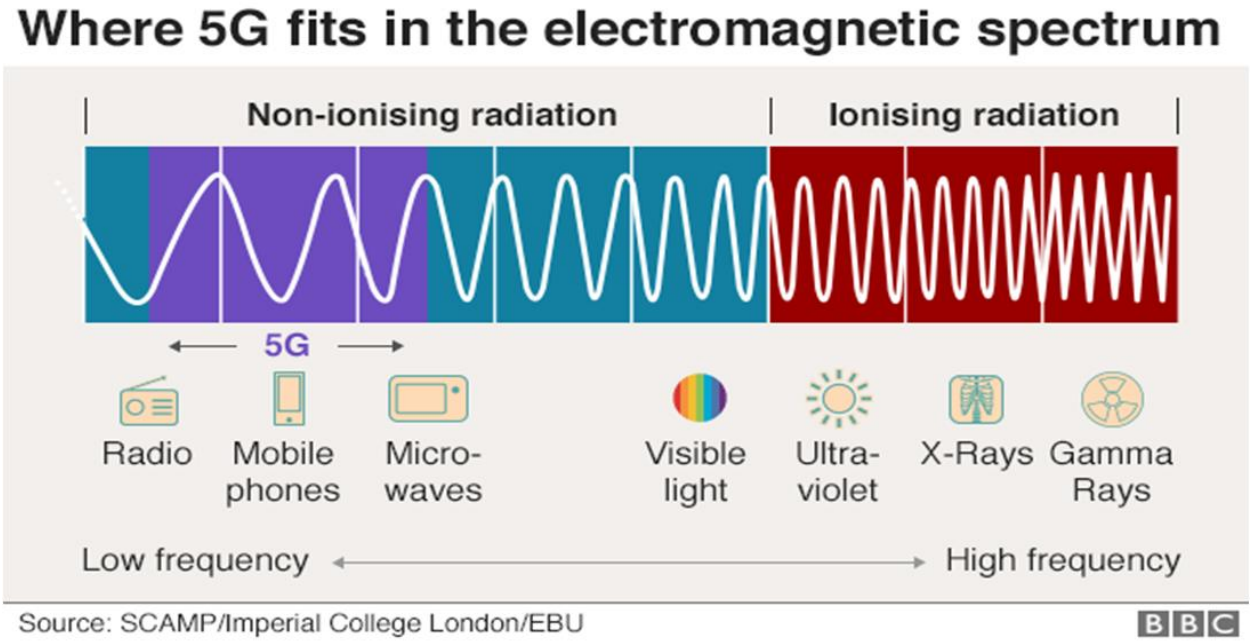
Engineer Obam noted that availability of information about spectrum as well as support to stakeholders is improving as a greater number of devices become commercially available.

The Global Mobile Suppliers Association April 2020 report notes:

- 70 % of all announced 5G devices are identified as supporting sub-6GHz spectrum bands;
- 29.3% are understood to support mmWave spectrum; and
- Just 22.6% of all announced devices are known to support both mmWave and sub-6 GHz spectrum bands.

The 5G device ecosystem is expected to grow quickly and more than 35 additional devices are expected to be availed by the end of June 2020.

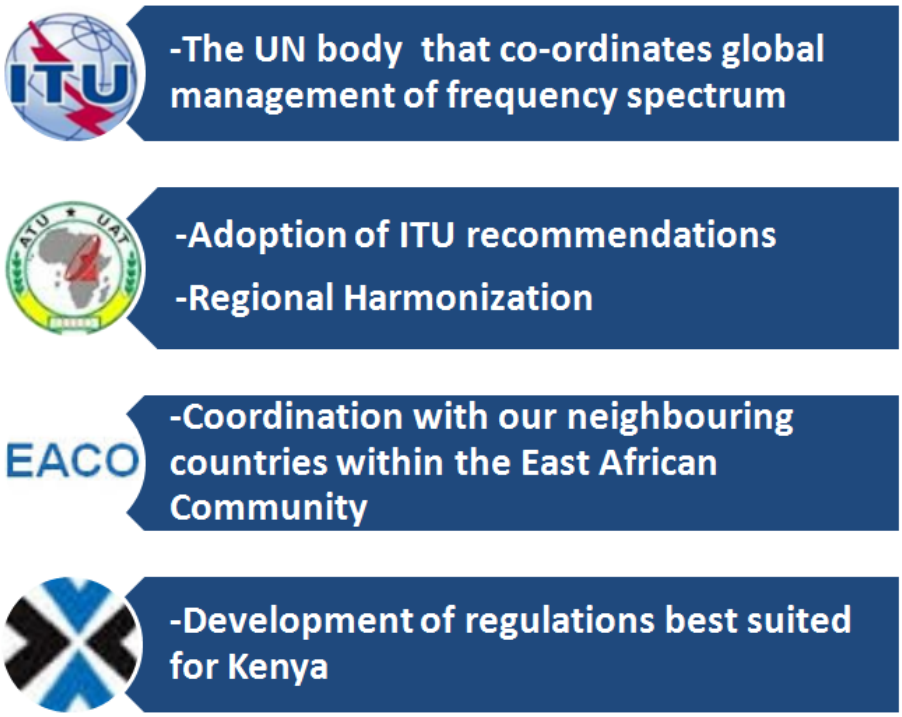
With respect to myths related to 5G and health, Engineer Obam noted that in 2014, the World Health Organization (WHO) issued a statement that no adverse health effects have been established as being caused by mobile phone use which utilises the electromagnetic spectrum. However, WHO together with the International Agency for Research on Cancer (IARC) have classified all radio frequency radiation (of which mobile phones are part of) as possibly carcinogenic. This does not compare to alcoholic drinks and processed meat which have stronger evidence. Engineer Obam dismissed conspiracy theories that suggested that 5G can suppress the immune system thus resulting in COVID-19. He pointed out that the radio waves are at the lower end of the electro-magnetic spectrum and are less powerful than even visible light as illustrated in the figure below.



Radio waves cannot damage cells - unlike radiation at the higher frequency end of the spectrum which includes medical x-rays and Gamma rays. In his final remarks Engineer Obam observed that there was need for more studies and conclusive proof on the potential health effects of mobile networks in general and 5G networks in particular.

Regulatory Perspectives by Anne Kinyanjui Communications Authority

The role of the Communications Authority (CA) in the development of 5G was outlined by Anne Kinyanjui. She noted that the International Telecommunications Union (ITU) set the agenda for 5G studies during the World Radio Communication Conference 2015 (WRC -15). The studies indicated that the frequency range between 24.25 GHz and 86 GHz would be considered for 5G services. The process used in setting the 5G agenda is outlined below:



Other aspects of the studies included:

- Reviewing the technical and operating characteristics;
- The deployment scenarios; and
- The time frame in which the spectrum would be needed.

The Communications Authority participated in the 5G studies through the National Preparatory Committee that included relevant stakeholders. The proposals were then harmonized at a sub regional level through the East Africa Communication organization (EACO) and at a continental level through the Africa Telecommunications Union (ATU). This position was then presented to the World Radio Communication Conference 2019 (WRC-19).

In conclusion, Anne noted that the Communication Authority is working on mechanisms for release of 5G frequencies which include:

- Licensing methodologies,

- Amount of bandwidth to be offered to operators,

- Frequency spectrum pricing mechanisms, and
- Type approval of devices.