Journal of The Gujarat Research Society

ISSN: 0374-8588
Volume 21 Issue 8, August 2019

SIXTH GENERATION (6G) WIRELESS COMMUNICATION: A COMPREHENSIVE REVIEW

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Abstract

The standardisation activates of communications of the fifth (5) generation are clearly over and worldwide rollout has begun. Industrial as well as the academic synergies have begun to conceptualise the next generation of wireless communication systems (such as, sixth generation, (6G)) to preserve the competitive advantage of wireless networks, aimed at laying the groundwork for stratifying the communication needs of the 2030s. This review article highlights the most promising lines of research from the latest literature on common directions for the 6G project in support of this vision. Its core contribution includes exploring 6G communications' crucial problems and key potential features, including: vision and key features; (ii) threats and possible solutions; and lastly (iii) research activities. In relation to the motivation of their different sub-domains to achieve a specific, concrete, and succinct conclusion, these contentious research topics were thoroughly explored. This review article would also make a huge contribution to expand new horizons for future research directions.

Keywords: *Fifth Generation, Internet of Things (IoT), Sixth Generation, Wireless Network, Wireless Communication System.*

I. INTRODUCTION

Due to the rapid technical advances in recent decades and symmetry strategies for the Internet of Things, wireless networking networks are the Eureka equivalents of our time. Five (5) generations of mobile wireless cellular communications networks exist to date, with the fifth generation (5G) wireless network being the newest generation [1]. Since 1980, a generation of wireless cellular communication has appeared about every 10 years, including the first generation of analog FM cellular systems in 1981, the second generation in 1992, the third

generation (3G) in 2001, and the fourth generation (4G) in 2011 (often referred to as the long-term evolution [LTE])[1], [2].

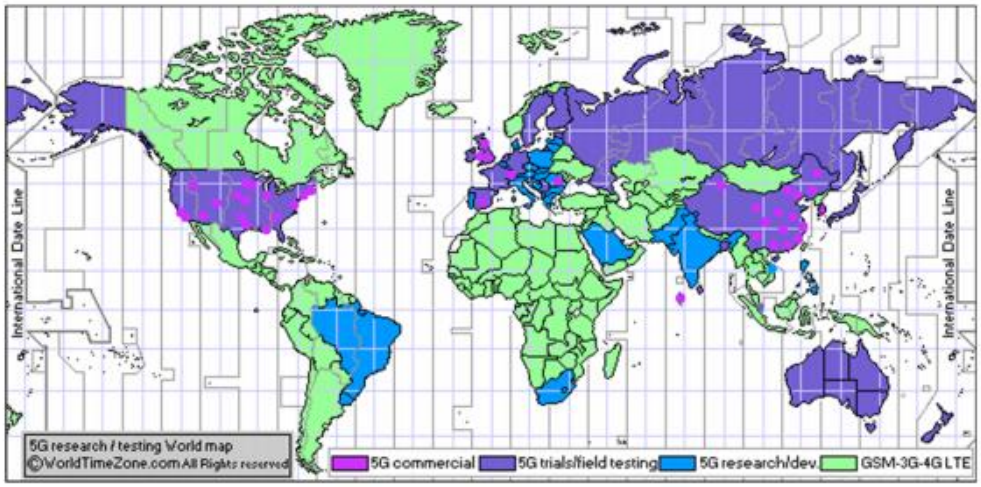

Fig. 1: Illustrates the 5G commercial network world coverage map.

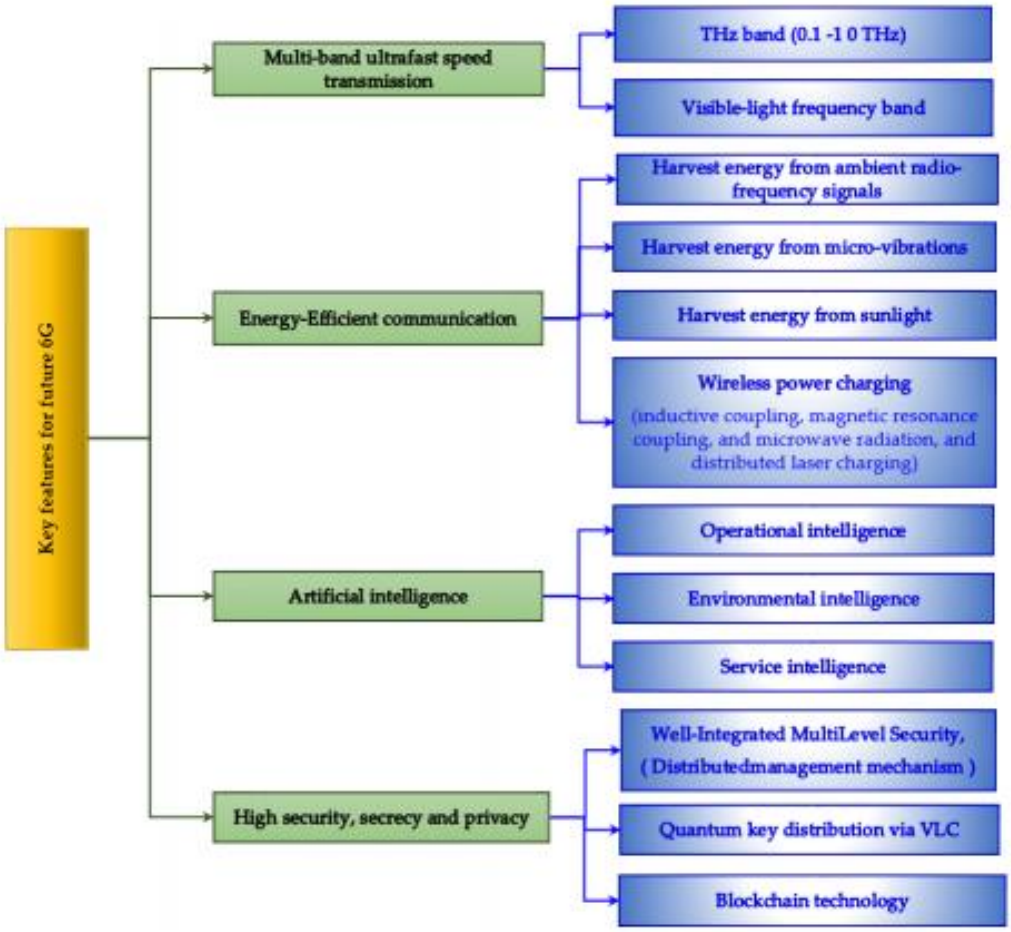

Fig. 2: Illustrates the key features for the future Six (6) Generation.

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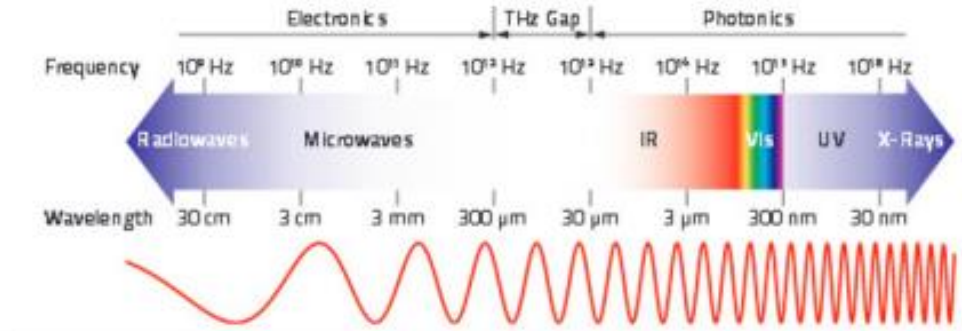

Frequency (THz)	Wavelength (µm)	Propagation mechanism	Attenuation effects	Supported link distances (m)	Approximate Bandwidth (THz)
0.3-3	1000-100	LOS, Reflection	Free Space Loss	< 10	Up to 0.3
3-30	100-10		Molecular Absorption High H_2O Peaks	< 1	> 1

Fig. 3: Illustrates the electromagnetic spectrum and wavelength of terahertz and millimetre waves [3].

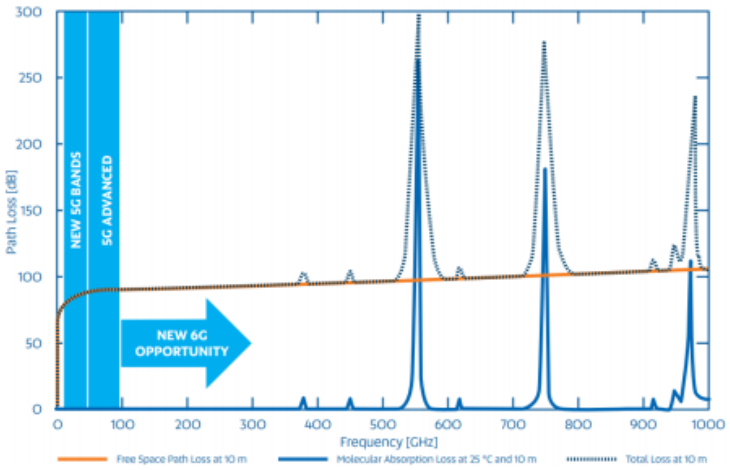

Fig. 4: Illustrates the major effect of the free space loss as well as the water vapor absorption at a distance of 10m [3].

Figure 1 shows the 5G commercial network world coverage map. Figure 2 shows the key features for the future Six (6) Generation. Figure 3 shows the electromagnetic spectrum and wavelength of terahertz and millimetre waves. Figure 4 shows the major effect of the free space loss as well as the water vapour absorption at a distance of 10m [4].

II. LITERATURE REVIEW

Research on 6G Wireless Communications: Vision and Future Techniques was carried out by Yang et al. Wireless data traffic has increased dramatically with the rapid growth of smart terminals and evolving new technologies (e.g., real-time and interactive services), and existing

cellular networks (even the upcoming 5G) do not fully meet the increasingly growing technological requirements. The sixth generation (6G) mobile network is expected to adopt a high technical level for new spectrum and energy efficient transmission strategies to address the challenges ahead. We outline the possible requirements in this article and provide an overview of the latest research on the promising techniques that have recently attracted considerable interest, evolving to 6G. Moreover, we outline a range of key technological problems as well as the possible solutions associated with 6G, including physical-layer transmission methods, network architectures, security approaches, and testbed innovations[5].

III. DISCUSSION AND CONCLUSION

Industrial and academic synergies have started to conceptualize the next generation of wireless communication systems (6G) during the worldwide introduction of 5 G networks to overcome the coming complexities of the dramatic rise in wireless data traffic. 6G technology, apart from the launch of a group of new services, enables bitrates of up to TBPS with a latency of less than 1 millisecond. This research began by highlighting a vision and main characteristics aimed at promoting future 6G in the following dimensions: energy efficiency; intelligence; spectral efficiency; protection, confidentiality, and privacy; affordability; and customization. We then presented the many potential problems associated with 6G technology and the possible strategies for encouraging the future of 6G. Finally, this work ends with international research activities aimed at building a vision for 6G in the future.

IV. REFERENCES

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