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WRC-15 5G Spectrum

DIGITALEUROPE recommendations for spectrum above 6 GHz

Luigi Ardito

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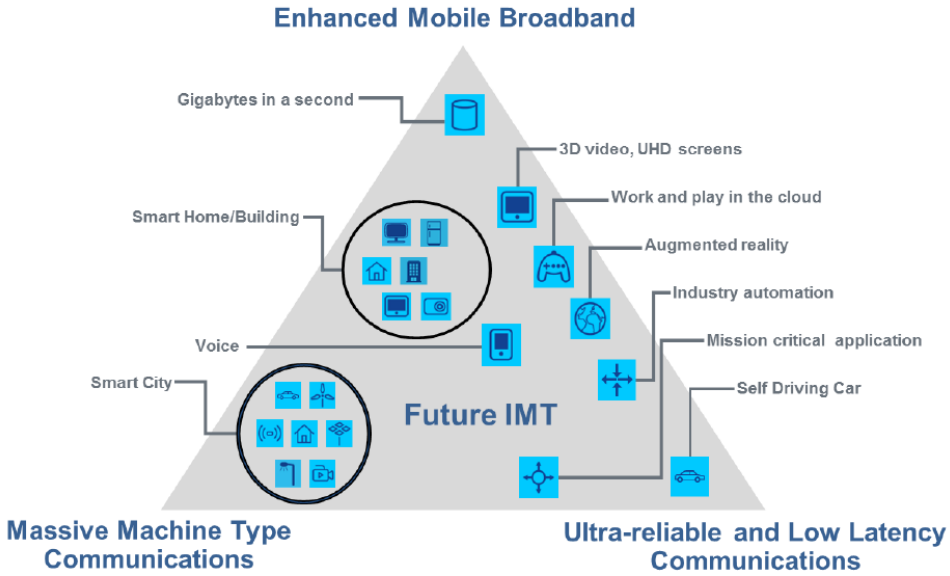
14, Rue de la Science, 1040 – Brussels [Belgium]
T: +32 2 609 53 10 F: +32 2 431 04 89
www.digitaleurope.org - info@digitaleurope.org

5G Vision and Usage Scenarios

5G will enable new services, connect new industries and empower new user experiences in networks with lower cost of deployment and operation, with a more consistent user experience, higher capacity and better energy efficiency



· **High data rates and capacity** will be provided, with target data rates of 10 Gbps or more in order to meet increasing requirements on quality and bit rates (e.g. for high resolution video streaming and augmented reality) and to satisfy the requirements of more cloud based services of all types: financial, entertainment, educational and many others.

· **Massive increase of connectivity** capabilities will serve the increasing number of connected devices (Internet of Things), due to e.g. machine-type communication and sensors (roads, railways, safety systems).

· **Substantial reduction of latency**, to the order of 1 ms or less will enable new latency-critical applications e.g. for traffic safety, critical infrastructure protection, gaming or emerging industrial internet applications.

· **Energy-efficient systems and devices** will reduce power consumption and enable ultra-long battery life.

· **Lower network deployment and operational costs** will drive affordable services.

5G Spectrum Requirements

- **Traditional cellular frequency bands (< 6 GHz) will remain important for mobile services, but will not provide sufficient bandwidth for all 5G applications.**
  - necessary to have access to a range of frequency bands > 6 GHz (coverage in urban/suburban areas, outdoor-to-indoor coverage)
  - different bands (below and above 6 GHz) may be used in conjunction for different deployment scenarios to provide very high bit rates and total throughput as well as guaranteed QoS/coverage.
- **Harmonized and contiguous spectrum of sufficient bandwidth to deliver 5G services and to simplify implementation**
  - Contiguous channel bandwidths of about 1 GHz for peak bit rates of 10 Gbps or more as well as frequency bands of lower bandwidth, possibly in the order of 100 MHz, but with better coverage and lower complexity for equipment
  - Carrier aggregation, also with spectrum below 6 GHz, to increase available bandwidth at the cost of increased complexity.
- **Sufficient backhaul spectrum must be available to handle the increasing data rates and total traffic.**

5G Spectrum Requirements above 6 GHz

- **Spectrum < 20 GHz**
  - Propagation characteristics facilitate better area coverage with relatively simple antenna.
  - Generally speaking, the potential bandwidth available in these frequencies may be limited for some 5G capabilities, especially for the possibility to deliver extremely high data rate services although bands of several hundred MHz in this range will be of relevance to 5G deployments
  - Complementing spectrum below 6 GHz with bands between 6 and 20 GHz allows for incremental steps.
- **Spectrum between around 20 GHz to around 40 – 45 GHz**
  - More challenging propagation characteristics but these may be overcome by using more complex antenna array technologies.
  - Potential bands with very wide contiguous bandwidth suitable for the delivery of very high data rates.
  - Complex antenna arrays can realistically be implemented in the limited space in handheld devices and component and sub-system technology is available to efficiently and cost-effectively deliver services in an outdoor mobile environment.
- **Spectrum above around 45 GHz and up to the 70 GHz**
  - A key driver is the possibility for very wide frequency ranges (several GHz) that can support extremely high giga-bit services especially delivering high user quality of experience more suited to hot spot areas, in particular for indoor scenarios.
  - Application of advanced antenna technology.

Regional Common Proposals Towards WRC-15

Regional Groups	Bands identified in Regional Common Proposals		
	Below 20 GHz	20 – 30 GHz	Above 30 GHz
CEPT		24.5 - 27.5 GHz	31.8 - 33.4 GHz, 40.5 - 43.5 GHz, 45.5 - 48.9 GHz, 66 - 71 GHz, 71 - 76 GHz, 81 - 86 GHz.
APT		25.25 - 25.5 GHz	31.8 - 33.4 GHz, 39 - 47 GHz, 47.2 - 50.2 GHz, 50.4 - 52.6 GHz, 66 - 76 GHz, 81 - 86 GHz.
CITEL	10-10.45 GHz[3]	23.15 - 23.6 GHz 24.25 - 27.5 GHz 27.5 - 29.5 GHz	31.8 - 33 GHz, 37 - 40.5 GHz, 45.5 - 47 GHz, 47.2 - 50.2 GHz, 50.4 - 52.6 GHz, 59.3 - 76 GHz
ASMG		-	Bands above 31 GHz
RCC		25.5 - 27.5GHz	31.8 - 33.4GHz, 39.5 - 40.5GHz, 40.5 - 41.5GHz, 45.5 - 47.5GHz, 48.5 - 50.2GHz, 50.4 - 52.6GHz, 66 - 71GHz, 71 - 76GHz, 81 - 86GHz.

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Conclusions and Recommendations

- **Good support for an A.I. for IMT spectrum > 6 GHz toward WRC-19 with sufficient alternatives proposed > 30 GHz.**
- **Studies in a range of frequency bands are needed to satisfy the diverse range of 5G applications and usage scenarios.**
  - Spectrum bands in ranges <20 GHz will be important as well as those between 20 and 30 GHz, between 30 and 45 GHz and > 45 GHz.
  - **Bands < 20 GHz are under-represented in the WRC-15 AI10 proposals - Further frequency bands/ ranges < 20 GHz should be studied under the expected agenda item**
  - Studies are also needed to investigate sharing opportunities of other systems with 5G systems.
- **CEPT should not take a vocal position against proposals from other Regions to include the 27.5 – 29.5 GHz band and continues to remain neutral on other bands/ranges below 30 GHz proposed for future studies.**
  - Opportunity for implementation harmonization provided by the bands 24.25/24.5 – 27.5 GHz and 27.5 – 29.5 GHz and thus both of these bands should be kept on the list for this study item.
- **Spectrum requirements for backhaul should also be considered to assure a good functioning of the overall 5G systems.**

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Conclusions and Recommendations

DIGITALEUROPE recommends European institutions and administrations to consider:

- **Making available spectrum for 5G deployment by 2020.**
- **Developing a detailed investigation of spectrum within CEPT for spectrum above 6GHz covering all the existing Radio Services, their use and future needs and trends, in order to better understand the spectrum opportunities for 5G systems.**
- **Supporting harmonization of spectrum allocations, in order to enable economy-of-scale advantages for development of 5G systems.**
- **Consider flexible spectrum management capabilities, ranging from exclusive use of spectrum to license-shared access and license-exempt of the frequencies to enable the 5G use cases and business models.**

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