Towards a harmonious future – addressing the 5G spectrum challenge

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One of the closely watched topics at WRC-15 is the agenda items for the next WRC and in particular identifying spectrum allocations above 6 GHz for mobile broadband services. If the experience from recent years is anything to go by, the search for new mobile spectrum is likely to be contentious. With the specifications for the new generation of mobile technology (5G) to be finalised by 2020, this is a crucial issue that will need to be resolved over the next two to three years. In this Insight we briefly discuss three key questions that need to be addressed in tackling the 5G spectrum challenge.

Proposed bands for 5G at WRC-15

GHz	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Europe		24.5–27.5	31.8–33.4	40.5–43.5, 45.5–48.9		66–71	71–76	81–86
Asia Pacific		25.25–25.5	31.8–33.4	39–47, 47.2–50.2	50.4–52.6	66–76		81–86
Americas	10–10.45	23.15–23.6, 24.5–27.5, 27.5–29.5	31.8–33, 37–40.5	45.5–47, 47.2–50.2	50.4–52.6	59.3–76		
Russia/CIS		25.5–27.5	31.8–33.4	39.5–40.5, 40.5–41.5, 45.5–47.5, 48.5–50.2	50.4–52.6	66–71	71–76	81–86
Arab states			31–<90					

Note: There is no common position from ATU but two multi-country proposals from Africa have been submitted

WRC-15 and bands for 5G

One of the important topics at the World Radiocommunication Conference 2015 (WRC-15) is the agenda items for the next WRC and in particular identifying spectrum allocations above 6 GHz for mobile broadband services. Next generation mobile broadband services (5G) are likely to need to make use of frequencies both below and above 6 GHz, although the main focus so far has been on the latter. Channel bandwidths of at least 100 MHz and ideally 500 MHz to 1 GHz are required to support the 5G networks and deliver data rates of more than 10Gbps.

Concerns have been raised that a more coordinated and focussed approach would be needed to ensure efficient study processes and more desirable outcomes. Industry stakeholders would be keen to avoid a repeat of the rather scattergun approach and acrimonious discussions surrounding agenda item 1.1 (additional bands below 6 GHz for mobile) of WRC-15.

The common positions of the various ITU regions presented at WRC-15 as illustrated above suggest plenty of work lies ahead in identifying common bands and harmonised technical conditions for 5G. Aside 66-71 GHz and 71-76 GHz, there are only slivers in the 31.8-33 GHz, 45.5-47 GHz and 48.5-48.9 GHz bands which are common across all five regions. At the same time, a number of countries (notably US, China, Korea, Japan, Brazil and India) have also drawn up their own list of bands. Factor in the industry trials in various bands and the picture gets even more complicated.

The benefits of spectrum harmonisation are well recognised – common standards, international roaming, minimising interference and economies of scale, which lowers costs of equipment and handsets and drives adoption. Yet with 5G comes increased complexity in radio frequency components, network deployment and interference issues. The timetable is short – the ITU has a 2020 timetable for the finalisation of 5G capabilities,

specifications and frequency arrangements. The discussion at WRC-15 is expected to produce a list of around 10 sets of bands for further study.

To address the implications of 5G for spectrum management and harmonisation, three high level questions need to be considered.

1. What are the features of 5G uses and deployments?

Three high level use cases for 5G – enhanced mobile broadband including pervasive video, massive machine type communications or Internet of Things, ultra-reliable and low latency communications – have been widely discussed. Each of these is likely to have different features and requirements which means the suitability of the frequency bands will also vary depending on their propagation and technical characteristics. The likely applications, technical requirements and regulations across vertical industries will also differ.[1]

Wider bandwidths and the move to denser, small-cell networks will also create new challenges in the provision of backhaul capacity. At the same time, potential sharing opportunities may also exist given mobile operators themselves are the dominant users of fixed links in high frequency bands.

2. What is the nature and extent of incumbent uses and how to share?

Spectrum sharing is emerging as a central theme in the future of spectrum management. This of course is easier said than done and involves understanding the characteristics of incumbent use, determination of sharing criteria and mitigation techniques to ensure adequate protection for existing services.

Many of the new bands proposed overlap with existing applications used by various sectors including mobile, satellite, defence, space research and broadcasting sectors. While sharing might prove challenging in some cases, technology synergies such as similar radio frequency (RF) components may make the introduction of 5G simpler in other cases. Potential bands for sharing, the nature of sharing and the costs and benefits of doing so will need to be carefully assessed.

3. What is the appropriate spectrum management regime?

5G is not just about bands above 6 GHz; existing and new mobile bands below 6 GHz will be important, for coverage and to allow a smooth migration from LTE to 5G. However unlike the traditional approach of long term exclusive licensing in the mobile sector, spectrum management of 5G is likely to require a mix of approaches including exclusive licences, sharing arrangements (geographic- or time-based), dynamic database access and licence-exempt use, depending on the frequency band and the type of use. Wi-Fi, which already plays an important role in supporting mobile traffic growth, is also likely to be part of the mix, with spectrum around 60 GHz already globally available and technology standards in place.

As with previous generations of mobile technology, spectrum harmonisation will be key to the development of 5G. However a good 5G spectrum allocation outcome won't just be driven by the identification of bands. A clear focus on the mode of use and sharing models that could be applied is also essential.

[1] See for example https://ec.europa.eu/digital-agenda/en/news/2nd-5g-verticals-workshop-5g-serving-vertical-industries