

5G will include millimetre wave radio, but work is needed to decide spectrum scope for further study

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The term ‘5G’ is now well established – not just as the next generational step for the wireless industry after 4G, but also as an emerging vision of virtualised, software-defined, next-generation wireless networks that connect many more people, devices and things at even greater speeds and quality of connection, over much wider areas. The detailed implementation of this vision is as yet undefined, but details of what might be included are starting to emerge.

The GSMA and the 5G PPP have recently published visions for 5G

The GSMA refers to two definitions of 5G.¹ The first is a service-led view of 5G as a consolidation of 2G/3G/4G cellular and Wi-Fi with some emerging wireless technology innovations to provide far greater coverage and reliability. This is an ‘evolutionary’ view of what 5G might be. The second definition is of 5G as a step change in terms of increased data speed, a significant reduction in latency and an improvement in other quality metrics (for example, reliability and availability). This suggests a ‘revolutionary’ change in network technologies, architecture and spectrum requirements – albeit with a requirement that a new 5G interface should work seamlessly with existing 3G/4G-based networks, which will continue to operate in parallel.

The European Commission-sponsored 5G Infrastructure Public Private Partnership (5G PPP) presents a vision that embodies both of the GSMA definitions.² More specifically, the 5G PPP vision sets out 5G as embracing a wide range of capabilities spanning mission-critical services and highly responsive connectivity for the sorts of embedded devices that will emerge through the Internet of Things, and predicts that 5G will represent a substantial step change in the user experience for consumer-based wireless broadband in terms of speed, quality, reliability and continuity.

The target date for implementing 5G was widely thought to be 2020. However, it is becoming clearer from recent publications that this timeline might be ambitious. For example, the 5G PPP indicates that 2020 is ‘too early for European operators to commit to network roll-out’. It suggests a timeframe of 2020–2025 instead, possibly reflecting the growing acknowledgement that 4G has a considerable amount of life left.

Delegates at WRC-15 will need to set the agenda for 5G spectrum discussions at WRC-19

In terms of the spectrum needed to support 5G, discussions on the identification of suitable bands are likely to take place during the ITU World Radio Conference in 2019 (WRC-19). However, delegates will need to agree the scope of this future agenda item during WRC-15 – when additional spectrum below 6GHz for 4G networks will also be discussed. This is required in order to focus the necessary studies that will take place once WRC-15 has concluded, leading up to the discussions at WRC-19.

¹ GSMA (London, UK, 2014) *GSMA publishes new report outlining 5g future*. Available at www.gsma.com/newsroom/press-release/gsma-publishes-new-report-outlining-5g-future/.

² 5G PPP (Heidelberg, Germany, 2015) *The 5G Infrastructure Public Private Partnership: the next generation of communication networks and services*. Available at <http://5g-ppp.eu/wp-content/uploads/2015/02/5G-Vision-Brochure-v1.pdf>.

There is a growing recognition that millimetre wave radio will be part of the 5G solution. This is good for high-speed, line-of-sight communication – potentially using very densely deployed infrastructure involving many small cells. Current wide-area mobile networks are not designed to operate in millimetre-wave bands, but millimetre-wave products are poised to become mass-market in the next few years through Wi-Gig, which is the new IEEE Wi-Fi standard that uses the 60GHz band.

The ITU uses the term ‘millimetre wave’ to refer to frequencies in the extremely high frequency (EHF) range from 30GHz to 300GHz. However, various publicly reported 5G technology trials are being conducted in bands below this, in the ITU super high frequency (SHF) range, between 3GHz and 30GHz. For example, Samsung is conducting trials using 28GHz spectrum and Ericsson is using the 15GHz band. SHF bands are potentially attractive because many are already designated for commercial use and hence some components of the technologies and antennas needed for 5G already exist.

The FCC in the USA and Ofcom in the UK have published initial calls for input to the WRC-19 agenda item on the frequency scope for 5G. The FCC focused on a selection of bands from 24GHz and above as being potential candidate bands for further consideration for 5G. Ofcom took a broader view and looked at spectrum from 6GHz, but has focused on possible options within frequency bands where a primary mobile allocation already exists.

Some will argue that starting with bands that already include a mobile allocation (which Ofcom has done) might foreclose debate on other potentially suitable candidate frequencies, whereas others will consider that this approach has merit. The contrasting approaches taken by the FCC and Ofcom in terms of the lower bound of the frequencies to consider is also likely to attract a range of different views. Ultimately, the wireless industry and worldwide regulators need to work towards a common view on the scope of frequency study for 5G in time for WRC-15, which takes place in November 2015.

The 5G debate requires further consensus. Stakeholders need to build on the key discussion points that are now emerging – as described above. These are summarised in Figure 1.

Figure 1: Key discussion points on 5G [Source: Analysys Mason, 2015]

| Criteria | Consensus process |
|------------------|---|
| Vision/use cases | Clarity on the new use cases and the technology features to support these, together with the relationship (and seamless working with) existing 3G/4G networks |
| Timeframe | 2020 or 2020–2025 |
| Frequency scope | 3–30GHz or 30–300GHz |

Analysys Mason has conducted world-leading research into 2G, 3G and 4G networks and continues to be at the forefront of technology and spectrum consulting with 5G.

For further insight into what 5G might mean in terms of services, business models, technologies and spectrum, please contact Janette Stewart, Principal, at janette.stewart@analysismason.com.