Multi-company response to the UK preparations for the World Radiocommunication Conference 2023 (WRC-23) – Agenda Item 1.2: 6425 – 7125 MHz

BT, Vodafone, Virgin Media O2, 3 UK, Ericsson, Nokia, Huawei

The companies listed above welcome the opportunity to provide their feedback to the Ofcom consultation on the UK preparations for the World Radiocommunication Conference 2023 (WRC-23). This response complements the individual responses by the Companies to the Ofcom consultation.

The response herein focuses on the 6425-7125 MHz band ("the upper 6 GHz band" hereafter) which is in the scope of Agenda Item 1.2 of the WRC-23 and which represents the only possible additional mid-band spectrum opportunity to meet the 2 GHz average mid-bands spectrum demand estimated by the GSMA study [1] towards 2030. This study considers typical city-wide macro-cellular deployments, as well as both indoor and outdoor small cells in the mid-bands, complemented by offloading to mmWaves. The alternative approach considered if this amount of spectrum is not made available to increase capacity would be extreme network densification well beyond today's already dense grid of city-wide base stations. This approach is not realistic due to technical challenges (interference management), practical restrictions (lack or difficulties of obtaining new adequate sites) as well as economic feasibility and would have unacceptable implications on network costs and energy consumption.

5G is a key pillar of digital transformation providing expected reliable performance (e.g. high capacity, low latency, wide-area connectivity) to citizens, enterprises, and industries. It is therefore important to ensure mobile networks can evolve their capability and contribute to UK's digital transformation, by allocating the additional mid-band spectrum capacity needed to keep up with increasing traffic demand from users. The upper 6 GHz band will be critical to secure the future expansion and quality of 5G services.

There has been significant debate about whether the upper 6 GHz band should be made available for licensed mobile, or licence-exempt use, with differing views expressed across different constituencies: this has been portrayed as being dividing lines established along mobile (licensed) versus fixed broadband (licence-exempt in-home) use. In this context we would highlight that the network operator contributors to this response provide the majority of the UK's fixed broadband connections (and associated routers), so have developed a balanced, customer-centric view of preferred outcomes against a backdrop of considering the needs of both fixed and mobile service customers. We acknowledge that the provision of additional licence-exempt spectrum recently made available in the lower 6 GHz for example for use by Wi-Fi would bring benefits. However, considering this recent spectrum expansion for licence-exempt use, and noting that spectrum is a finite resource, we consider that the social and economic benefits of licensed mobile use of the upper 6 GHz band are overwhelming.

Additional mid-band spectrum for mobile will not only help the UK to improve connectivity but will add significant economic value. A study by GSMA Intelligence [2] estimates that 5G will generate $960 billion in gross domestic product (GDP) in 2030 on a global basis, given the availability of an adequate amount of mid-bands spectrum (2 GHz as per GSMA's estimation), with $610 billion of this being a result of deployments in mid-bands and representing almost 65% of the overall socio-economic value generated by 5G. However, up to 40% of the

expected benefits of mid-bands 5G could be lost if no additional mid-bands spectrum is assigned to mobile services. Focusing on 6 GHz, GSMA Intelligence has also conducted a cost-benefit analysis comparing allocations in the band 5925-6425 MHz and 6425-7125 MHz for licensed or licence-exempt use [3]. The study concludes that the greatest economic benefit would be achieved by allocating the full 6 GHz band (5925-7125 MHz) for licensed mobile, however this is not an option for the UK. The study also concludes that allocating the full 6 GHz for licence-exempt use would not be the most beneficial option in any of the considered scenarios, whereas allocating the upper 6 GHz band (6425-7125 MHz) for licensed mobile use – when the lower 6 GHz band (5945-6425 MHz) is allocated for licence-exempt use – would drive the greatest socio-economic benefits even with extremely high-speed fixed broadband availability[1];

The UK has already allocated the lower 500 MHz of the 6 GHz band to licence-exempt use by WAS/RLAN (e.g. Wi-Fi and NR-U), adding to the existing 2.4 GHz and 5 GHz spectrum. Additionally, the use of the large available bandwidth within 57-71 GHz will complement and address extreme capacity-hungry WAS/RLAN use cases. All this spectrum guarantees users can make the most of their current and future fixed broadband gigabit connectivity.

Studies of sharing between IMT and existing services in the upper 6 GHz band are on-going in ITU WP 5D. At this point, the vast majority of contributions submitted to ITU-R by administrations and industry have concluded[2] that macro-cellular IMT (5G NR) deployments can coexist with the Fixed Satellite Service (FSS) uplink[3]. Importantly, a recent study by Euroconsult [4] on the usage of the "Extended C-band" (3400-3700 / 6425-6725 MHz), "Planned C-band" (4500-4800/6725-7025 MHz) and 7025-7075 MHz in Region 1 concluded that the usage of the Extended and Planned C-band for satellite systems in Europe is limited, with little rationale for the replacement of satellites. Furthermore, by 2030, around 70% of the satellites currently deployed in ITU Region 1 in the Extended and Planned C-band are expected to end operation.

Studies have further indicated that co-existence with FSS downlink[4] and the Fixed Service (FS) is also feasible at a national level through coordination and/or geographic separation on a case-by-case basis. Notably, the individual licensing associated with IMT networks is always preferred for co-existence with the FS for two reasons: it allows coordination as the regulator knows the position of the fixed links, and it also greatly enhances the ability of administrations to identify potential sources of interference and to take mitigating action in line with licence conditions. We note that even when technical conditions are developed for licence-exempt use with the protection of the FS in mind, licence-exempt devices cannot be controlled, which may impact the investment in new FS sites.

[1] For example, where there is high fibre/cable broadband adoption and very high fixed broadband speeds of 10 Gbit/s to all fibre/cable users.

[2] In line with the well-recognized need to exploit the scarce spectrum resources through more intensive sharing of spectrum, such studies are based on realistic assumptions on some key parameters including a) the realistic geographic density of IMT base stations, b) the clutter loss model applicable to 6 GHz macro deployment scenario and propagation environment, c) IMT base station active antenna systems (AAS) directing wanted signal towards desired directions (away from the incumbents), and d) realistic incumbent receiver antenna characteristics.

[3] Cameroon et al (5D/782, 996, 1231, 1299); Japan (5D/1021, 1082, 1303); France (5D/1042, 1138); China (5D/874, 1069); Senegal (5D/1323); Mali et al (5D/1224); Russian Federation (5D/1089, 1244, 1238); UAE et al (5D/1148, 1285); Ericsson (5D/1032, 1127, 1250); Reliance Jio et al (5D/1215); Huawei (5D/1322); Nokia (5D/1146, 1278). The contributions are available at https://www.itu.int/md/R19-WP5D-C/en

[4] Simulations presented at WP 5D show separation distances in the order of 13-15 km between FSS earth stations and IMT base stations for both long and short term protection criteria (5D/1017, Ericsson).

Ofcom is right in pointing out that Agenda Item 1.2 considers IMT identification of the ranges 6425-7025 in Region 1 and 7025-7125 MHz globally. However, due to the importance of mid-bands and the scarcity of spectrum available in this range, most countries outside Region 1 are following with interest the development of coexistence studies towards WRC-23. As such, most countries across the world are awaiting the decision on the upper 6 GHz at WRC-23 and will follow this accordingly, thereby enhancing the economies of scale.

This international interest is driving the rapid consolidation of the equipment ecosystem. 3GPP has concluded the technical specifications of 5G NR base stations and user equipment for licensed use of 6425-7125 MHz (3GPP band n104) [5], defining the band plan, system parameters including channel bandwidth, transmitter and receiver characteristics, as well as other technical requirements. Commercial 5G NR products in the 6 GHz band – both for the radio access network and user equipment – will be available to deploy in the 6 to 12 months following initial assignments to mobile use [6]. The band would be important to meet projected demand in the 2025-2030 timeframe.

Considering the above, we strongly recommend that the UK supports IMT identification of the upper 6 GHz band at WRC-23 and that Ofcom consequently licenses the band for wide-area deployment of mobile networks in a timely manner, to cope with the demand growth.

Further information on the importance and feasibility of 6 GHz for wide-area mobile networks can be found in the whitepaper “6 GHz opportunity: licensed spectrum for mobile networks”, which is downloadable here. Other studies and reports are also available at: www.6ghzopportunity.com.

References

[1] “Estimating the mid-band spectrum needs in the 2025-2030 time frame; Global Outlook; A report by Coleago Consulting Ltd” (July 2021), GSMA report.

[2] “The socio-economic benefits of mid-band 5G services” (June 2022), GSMA report.

[3] “The socioeconomic benefits of the 6 GHz band; Considering licensed and unlicensed options” (January 2022), GSMA Intelligence report.

[4] “The use of Extended C-band, Planned C-band and the 7025-7075 MHz band for satellite service” (June 2022), Euroconsult report.

[5] 3GPP TS 38.104 V17.6.0 (2022-06) “3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Base Station (BS) radio transmission and reception (Release 17)”.

[6] “The 6 GHz IMT Ecosystem” (August 2022), GSMA report.

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