Hewlett Packard Enterprise

Response to the Public Consultation on the ‘Draft RSPG Opinion on ITU-R World Radiocommunication Conference 2023’ issued by the Radio Spectrum Policy Group

12th August 2022

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Introduction

Hewlett Packard Enterprise (HPE) is grateful for the opportunity to respond to the public consultation on the 'Draft RSPG *Opinion on ITU-R World Radiocommunication Conference 2023'* issued by the Radio Spectrum Policy Group (RSPG) on the 8th June 2022.

HPE is a global technology leader focused on developing intelligent solutions that allow customers to capture, analyze and act upon data seamlessly from edge to cloud. Its Aruba Networks division is a leader in Enterprise Network and Mobility Solutions and the world's second largest provider of Enterprise Class Wireless Access Points. HPE's Communications Technology Group (CTG) is a market leader in mobile communications, providing core network technology and services for 4G and 5G networks addressing the needs of Communications Service Providers (CSPs).

HPE has led society's digital transformation since the very beginning, as one of the founders of Silicon Valley in 1939. Present in Europe for over fifty years, the company works with European businesses and organisations to capture, analyse, and act upon data to accelerate business growth and modernise public administrations. HPE is deeply vested in the EU's ambitious digital and green transformations, from SMEs to the public sector, underpinned by strong privacy rules, targeted R&I investment, support for science, and a multistakeholder approach that sustains Europe's openness to innovation and responds to market needs.

HPE is present in all European countries, operating eight innovation centres in the region, and manufacturing liquid cooled supercomputers and servers for data driven organizations in Kutna Hora, Czech Republic. HPE Europe employs one third of HPE's global workforce of more than 60,000 employees.

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HPE comments to the RSPG's Public Consultation

General

HPE acknowledges the importance of the RSPG's role to advise the European Commission (EC) on a common EU position to be negotiated by Member States on behalf of the EU at the World Radiocommunication Conference 2023 (WRC-23).

We fully support the notion that the common EU position should enable an outcome of the WRC-23 negotiations that will yield the maximum benefits for EU citizens, businesses, and societies overall.

HPE position on WRC-23 Agenda Items

In our response, we will focus on two agenda items, Agenda Item (AI) 1.2, and here specifically on the possible identification of the bands 6425-7025 MHz (ITU Region 1) and 7025-7125 MHz (globally) for International Mobile Telecommunications (IMT), and AI 10, "… *items for inclusion in the agenda for the next WRC, and items for the preliminary agenda of future conferences*".

1. Agenda Item 1.2 (6425-7125 MHz)

At WRC-19, Europe took the position that an identification of the 6425-7025 MHz and 7025-7125 MHz bands for IMT was not needed as sufficient spectrum had already been made available or identified for IMT to fulfil the performance objectives defined for IMT-2020.

This view was and still is shared by HPE. Since WRC-19 there have been no new developments or revelations that would justify an identification of an additional 700 MHz of mid-band spectrum for IMT. We would like to express our deep concerns that an IMT identification of the 6425-7125 MHz frequency range (the 'upper 6 GHz band') would not yield any benefits for Europe but on the contrary seriously jeopardize the widespread adoption of gigabit connectivity which is at the very heart of Europe's Digital Decade initiative and constitutes the foundation of Europe's future competitiveness and prosperity.

As manufacturer of 5G core network components, HPE acknowledges that a sufficient amount of spectrum must be made available to enable IMT 5G to operate as envisaged. We do believe, however, that the amount of spectrum that has been identified for IMT 5G in Europe is sufficient and that the upper 6 GHz band will be used much more effectively if it is made available for licence-exempt use by Wireless Access Systems including Radio Local Area Networks (WAS/RLAN), for reasons we will detail below.

We therefore call upon the RSPG to propose 'No Change' to be the common EU position on AI 1.2 as far as it concerns the bands 6425-7025 MHz and 7025-7125 MHz.

Global situation of the 6 GHz band

The 6 GHz band (5925-7125 MHz) has been allocated to licence-exempt services in many countries around the world, including in ITU Region 1 (Figure 1). Countries representing more than 40% of the global gross domestic product (GDP) have opened or propose opening the full 6 GHz band for licence-exempt use[1].

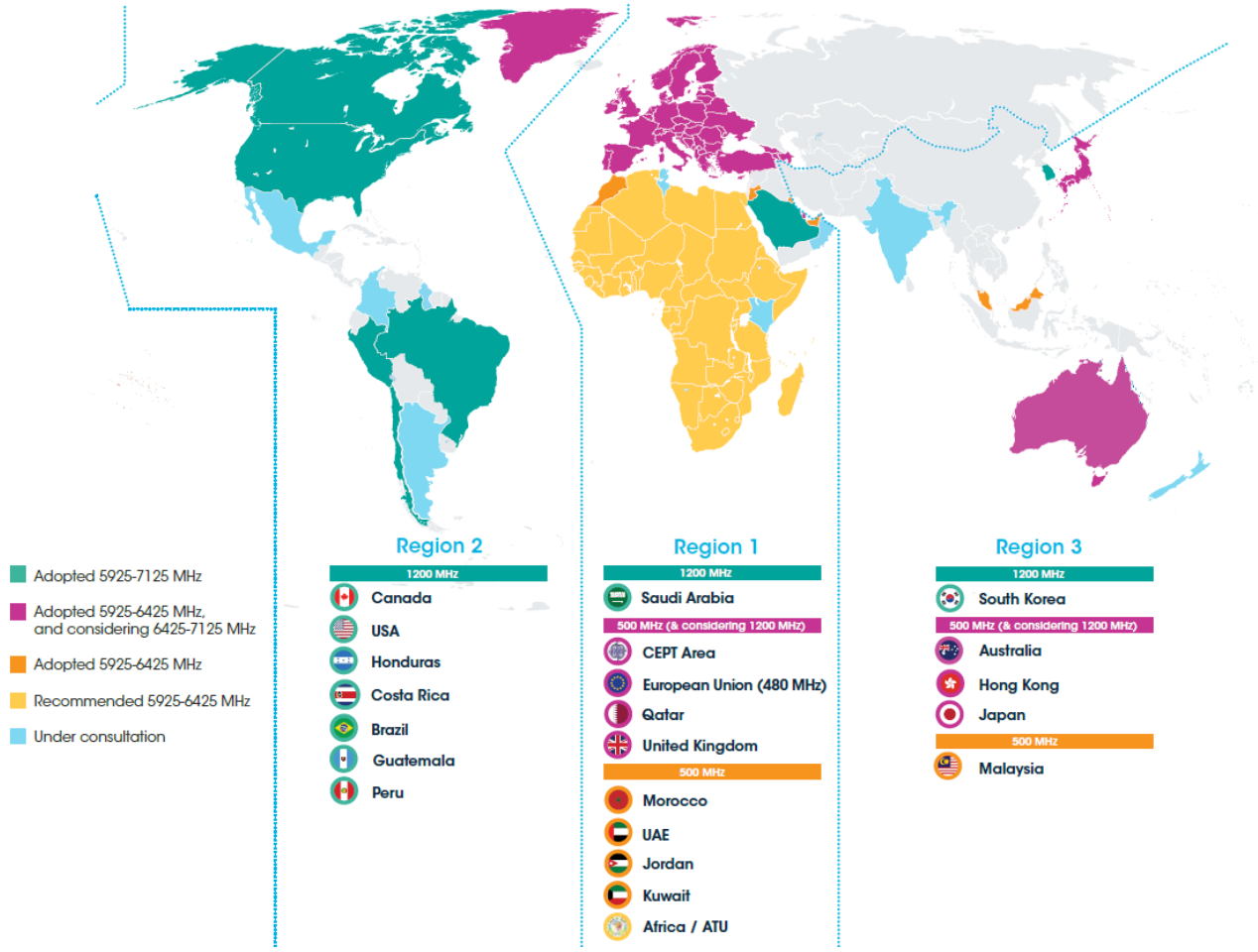


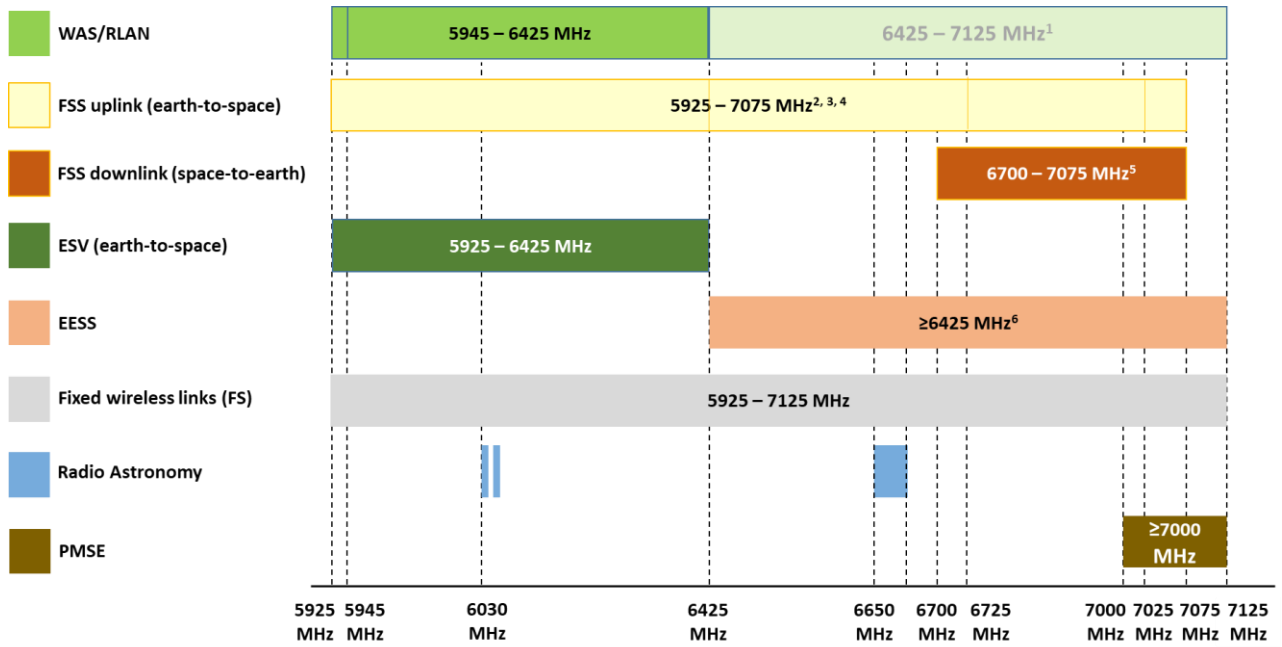
Figure 1: Global authorizations of licence-exempt use of the 6 GHz band

Global harmonization of the 5925-7125 MHz band for licence-exempt use is underway. As an IMT identification of the 6425-7025 MHz band will be discussed for Region 1 only, a harmonisation of that band for IMT use is not going to happen. An IMT identification of the 6425-7125 MHz band, or parts of it in Europe would result in market fragmentation, increase cost of WAS/RLAN equipment, and disadvantage European businesses.

[1] Dynamic Spectrum Alliance: *License Exempt: - Why the full 1200 MHz and why now?*; http://dynamicspectrumalliance.org/wp-content/uploads/2021/08/6GHz-License-Exempt-Band-Why-1200-MHz-and-Why-Now.pdf

Current use of the 5925-7125 MHz band in the EU and the CEPT area

In the CEPT area, the 6425-7125 MHz band is allocated to and used by various incumbent systems (Figure 2). The incumbent situation in this band is very similar to that in the lower 6 GHz band (5925/5945 MHz – 6425 MHz) which has been opened for licence-exempt use by WAS/RLAN. It is expected that WAS/RLAN would be able to share the upper 6 GHz band with incumbents under the same or very similar conditions as in the lower 6 GHz band.



1 The original scope of the EC Mandate on 6 GHz WAS/RLAN was to study the 5925-7125 MHz band. In some Region 1 countries outside CEPT, licence-exempt use of the 6425-7125 MHz band has been authorized.
2 The band 6425-6725 MHz is allocated to the FSS (Earth-to-space) globally and is not subject to a Plan in the Radio Regulations, i.e. is not covered by the provisions in Appendix 30B.
3 The use of the band 6725-7025 MHz by the FSS (Earth-to-space) shall be in accordance with the provisions of Appendix 30B (see FN 5.441).
4 The band 7025-7075 MHz is allocated to the FSS (Earth-to-space) globally and is not subject to a Plan in the Radio Regulations, i.e. is not covered by the provisions in Appendix 30B.
5 The space-to-Earth allocation to the FSS in the band 6700-7075 MHz is limited to feeder links for non-geostationary satellite systems of the mobile-satellite service (see FN 5.458B).
6 No allocation in the RR but subject to footnote 5.458.

Figure 2: Systems operating in the 5925-7125 MHz band (CEPT area)

The lower 6 GHz band (5945-6425 MHz; UK: 5925-6425 MHz) has been made available for licence-exempt use by Low Power Indoor (LPI) and Very Low Power (VLP) WAS/RLAN systems.

In Article 3, Commission Implementing Decision (EU) 2021/1067 stipulates that “when introducing new applications into the 5 945-6 425MHz frequency band or into adjacent frequency bands after the entry into force of this Decision, Member States shall not adopt technical and operational conditions applicable to any new application that unduly restrict the continued use of WAS/RLAN in the 5 945-6 425MHz frequency band …”.

Any consideration to introduce IMT into the 6425-7125 MHz band would hence require in-depth studies to ensure the operation of licence-exempt networks in the 5945-6425 MHz band is not unduly restricted.

Considering the case of VLP WAS/RLAN devices operating outdoors, a guard band above 6425 MHz would very likely be required to avoid undue operational restrictions which would contradict the objective of using scarce spectrum more efficiently and further reduce the economic feasibility of an IMT deployment in that band.

EU Member States wishing to authorize licence-exempt usage of the upper 6 GHz band nonetheless would be forced to delay deployment until cross-border interference issues are solved.

Relevance of the 6 GHz band for Europe's Digital Decade

The 2030 digital targets formulated by the European Commission[2] state that by 2030, all households in the EU should have gigabit connectivity and all populated areas should be covered by 5G networks.

Across the EU, the buildout of FTTH which is a pre-requisite of ubiquituous gigabit connectivity is progressing. If by 2030 all households will have access to a 1 Gbit/s connection this means that in reality, 1 Gbit/s is the minimum bit rate that will be available. In other words, many European households will have access to connections even faster than 1 Gbit/s. As a matter of fact, 10 Gbits/s and even 25 Gbits/s are available to residential customers in some European countries today[3].

In recent years, Internet connection speeds have increased beyond the "historical" growth rate of 1.5x per year, and for 2030 it is expected that maximum speeds in excess of 50 Gbits/s will be offered to consumers (Figure 3).

Cable networks based on DOCSIS 4.0 technology which is expected to be introduced around 2024, will provide data rates of up to 10 Gbits/s downstream and 6 Gbits/s upstream[4].

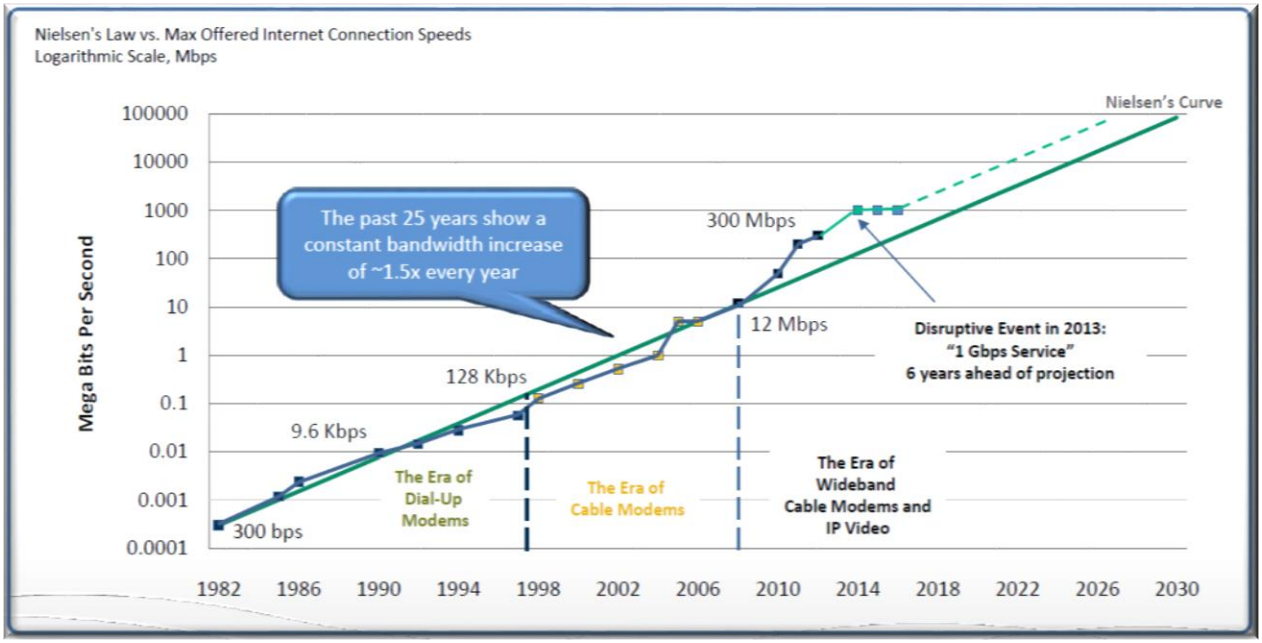


Figure 3: Evolution of internet connection speeds (Source: IEEE[5])

A very important aspect which is frequently overlooked when the provisioning of broadband is discussed is how households (which account for the bulk of internet traffic) actually connect to the Internet (Figure 4).

[2] https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en
[3] https://www.pctipp.ch/news/telekommunikation/init7-lanciert-internet-speed-25-gbit-sekunde-2665925.html
[4] https://www.vodafone-institut.de/wp-content/uploads/2021/08/Evolution-von-HFC-Netzen-Kurzstudie-Goldmedia-Vodafone-Institut.pdf
[5] IEEE: *More bandwidth, please*; http://atlanta.chapters.comsoc.org/files/2018/02/MoreBandwidthPlease-Slides.pdf

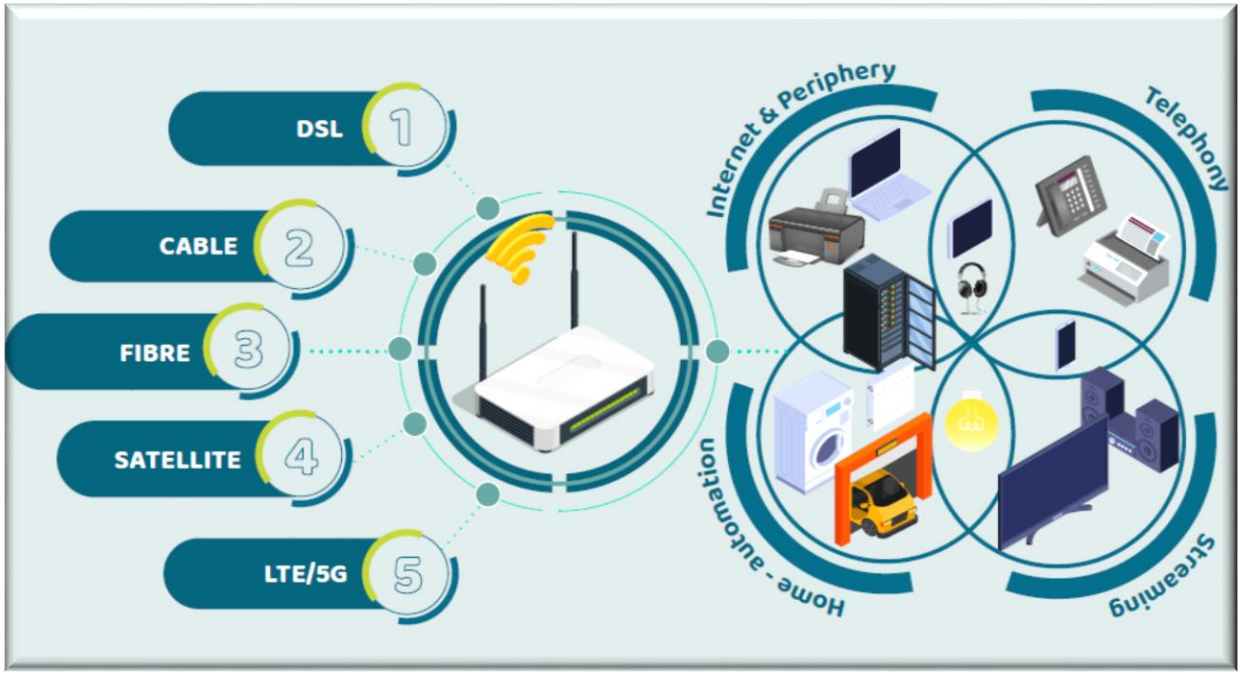


Figure 4: How users connect to the Internet (Source: DSA[6])

While there are many different ways to deliver broadband Internet to the doorstep, the technology of choice for extending broadband connectivity to the user who typically is located indoors, is Wi-Fi. The Wi-Fi Alliance estimates that in 2022, the global installed base of Wi-Fi will reach 18 billion devices, and according to studies conducted by ASSIA[7], more than 90% of network traffic is transported over Wi-Fi.

With the proliferation of gigabit fibre and cable access networks, performance of the indoor network is increasingly becoming a bottleneck. During the ANGA COM 2022 congress in May 2022, Vodafone Germany stated that of their 20 million fixed network customers in Germany, 1.3 million subscribe to Vodafone's gigabit service. The latter, however, cannot exploit this bit rate because of limitations of the in-home infrastructure[8].

At the FTTH Conference Europe in May 2022[9], delivery of gigabit speeds to the end user was a major topic, too. Presenters from all industry segments agreed that 6 GHz Wi-Fi was the solution to the local connecticity bottleneck problem.

For network operators, the availability of an adequately performant indoor infrastructure is of vital economic importance. Take-up of very high-bit rate offers depends on the availability of these speeds indoors. Even if users do not actually exploit gigabit speeds at all times, they want to have them available because that is what they pay for. There is a considerable risk that the enormous investments made in the giganit fibre build-out throughout Europe will largely be lost if users do not experience tangible benefits.

With Wi-Fi 6E, the technology to provision wireless gigabit local connectivity exists today, and Wi-Fi 7 and future Wi-Fi generations will improve performance even further, particularly in high-density environments such as densely populated urban areas. A necessary pre-requisite is, of course, the availability of a sufficient amount of licence-exempt spectrum, i.e., the full 6 GHz band.

In contrast, 5G coverage as envisaged in Europe's Digital Decade ('5G everywhere') can be achieved with the spectrum that has already been identified for 5G.

For the reasons stated above, it is essential that Europe does not support an IMT identification of the 6425-7125 MHz band at WRC-23 but swiftly moves forward with opening that band for licence-exempt use.

[6] http://dynamicspectrumalliance.org/wp-content/uploads/2022/06/DSA-WhitePaper-How-do-Europeans-connect-to-the-Internet.pdf
[7] ASSIA: *Wi-Fi and Broadband Data; June 2021*
[8] ANGA COM 2022: *Digitalgipfel – Netze, Dienste, Konnektivität;* 10th May 2022
[9] https://ftthconference.eu/

Options for the future use of the 6425-7125 MHz band

Several options for the future use of the upper 6 GHz band are currently being discussed.

Option 1: Licence-exempt use

As outlined above, the 6425-7125 MHz band has been opened for licence-exempt use by numerous countries in all regions of the world, and a thriving and diverse ecosystem of licence-exempt equipment able to operate in this band already exists. Hence, opening this band for licence-exempt use also in Europe is a viable option.

In response to demands by several European administrations, ECC decided in 2021 to study the conditions for coexistence between licence-exempt WAS/RLAN and incumbents operating in this band. These studies are currently undertaken by ECC PT SE45. Given the almost identical incumbent situations in the lower and upper 6 GHz bands, it is generally expected that LPI and VLP WAS/RLAN can coexist with incumbents in the upper 6 GHz band under the same or very similar conditions.

Furthermore, an authorization of licence-exempt use of the band would observe the guiding principle of technology neutrality as any compliant wireless technology, be it Wi-Fi, 5G NR-U or other would be allowed to operate in that band.

Undisputedly, Wi-Fi is the most successful and widely deployed licence-exempt WAS/RLAN technology by far, not at last because of its capability to use the available spectrum very effectively. Consumers, businesses and public institutions are and will be relying on Wi-Fi technology for providing local connectivity, and Wi-Fi 6/6E and Wi-Fi 7 have been designed to cope with the enormous amounts of data and the increased QoS requirements the next years will bring about. However, to fully exploit the capabilities of Wi-Fi 6E and future Wi-Fi generations (Wi-Fi 7, Wi-Fi 8, and beyond), Wi-Fi needs 1200 MHz of contiguous spectrum in the 6 GHz band.

New applications, or enhancements of existing applications such as AR/VR/XR, cloud gaming, and 8K video streaming will require high to very high data rates and low latencies (Figure 5) which can best be achieved by using the 160 MHz and 320 MHz-wide wide channels supported by Wi-Fi 6E and Wi-Fi 7, resp. AR/VR/XR applications will not be limited to entertainment applications and the consumer segment but be important productivity-enhancing tools in education, health care, research, maintenance, manufacturing, logistics, retail, and other enterprise sectors.

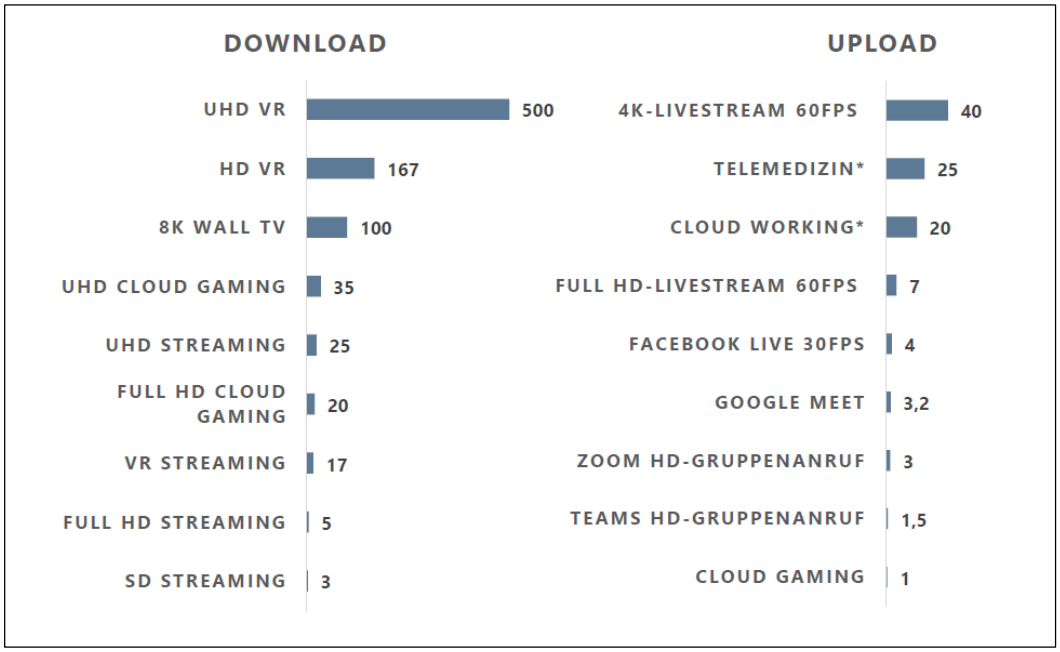


Figure 5: Bandwidth requirements of selected applications, in Mbits/s (Source: Goldmedia/Vodafone[10])

With only 480 MHz of spectrum available in Europe, only three non-overlapping 160 MHz channels, and only a single 320 MHz channel could be realised (see Figure 6). This would be particularly problematic in high-density environments such as dense urban areas, educational facilities (schools, universities), large public venues, and manufacturing and logistics sites. In high-density and/or high-QoS environments, at least seven non-overlapping channels are typically required. With 480 MHz of available spectrum, this condition can be fulfilled for 20 MHz and 40 MHz channels only, severely limiting the attainable capacity.

[10] https://www.vodafone-institut.de/wp-content/uploads/2021/08/Evolution-von-HFC-Netzen-Kurzstudie-Goldmedia-Vodafone-Institut.pdf

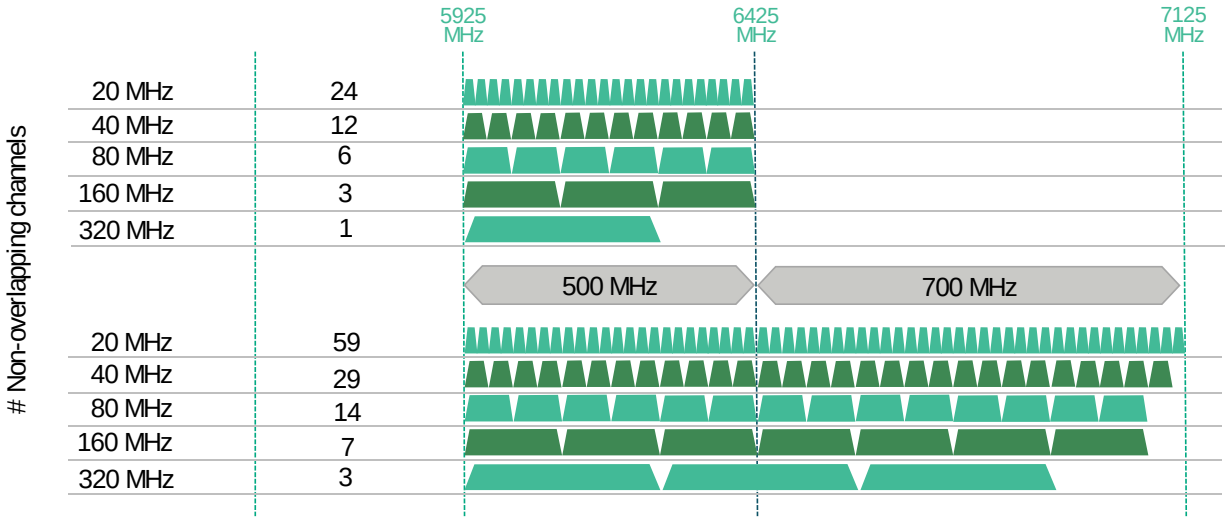


Figure 6: Available WAS/RLAN channels in the lower 6 GHz band[11] and in the full 6 GHz band

Having a large number of non-overlapping channels available allows enterprises to segment and prioritize different classes of traffic and provide QoS levels according to application needs. A prominent example of the benefits that Wi-Fi 6E utilizing the full 1200 MHz of the 6 GHz band can provide for education is the recent network upgrade by the University of Michigan (UMich)[12]. The state-of-the-art network which was provided by HPE comprises over 15,000 Wi-Fi 6E access points (APs) which support a multitude of applications including teaching, research, campus communication, and administration. By deploying a highly flexible and high-QoS Wi-Fi 6E network, UMich was able not only to considerably enhance service quality but to generate significant savings as less hardware equipment (mostly switches) is needed which in turn means less electronic waste, less power consumption and less heat generated.

WAS/RLAN/Wi-Fi is ubiquitously used by businesses of all sizes to increase efficiency and productivity. Within a few years from its introduction, “Wi-Fi evolved from a “nice-to-have” to a critical investment for businesses of all kinds. Businesses that offer WiFi access to visitors are seeing higher sales and customer satisfaction, while WiFi at the business drives employee productivity and collaboration”[13].

Regulators must understand that in case the upper 6 GHz band should not be opened for licence-exempt use in Europe, there is no alternative band available. As WAS/RLAN/Wi-Fi is predominantly used to provide broadband indoor connectivity, the required levels of coverage and performance can only be realized in mid-band spectrum.

Option 2: Licensed use (IMT)

The second option is to make the upper 6 GHz band available for IMT. Unlike WAS/RLAN, IMT was not designed to share spectrum and requires licensed, i.e., exclusive access to spectrum.

In response to WRC-23 AI 1.2, conditions for coexistence between IMT and incumbent services in the 6425-7125 MHz band are being studied by ECC PT1 and ITU-R WP5D. For Fixed Satellite Services (FSS), studies come to opposing results, depending on the assumptions taken. Those studies that find that IMT coexistence with FSS is possible assume very low overall IMT base station (BS) densities and BS/antenna locations below rooftop and apply unverified clutter loss models.

The calculated low BS densities result from the assumption that 6 GHz IMT would be deployed in dense urban and, to a lesser extent, suburban areas only. Rural areas would not be served[14]. Hence, there is a considerable risk that an IMT identification of the upper 6 GHz band could further deepen the rural-urban digital divide.

Coexistence with Fixed Services (FS) and Radio Astronomy Services (RAS) has not been extensively studied so far. Those studies that did, found that for IMT to coexist with FS, large separation distances in the range of more than 60 kilometres between IMT BS and FS receiver would be required[15].

If the upper 6 GHz band was to be made available to IMT, regulatory restrictions reflecting the coexistence conditions identified during the studies would have to be imposed on 6 GHz IMT deployments which would likely render the business case for outdoor macro-cell deployment unfeasible.

[11] Generalized depiction. In the EU and CEPT area, only 480 MHz of spectrum are available for WAS/RLAN in the lower 6 GHz band.
[12] https://edtechmagazine.com/higher/article/2022/04/how-university-michigan-upgraded-next-generation-wi-fi-access-points
[13] https://business.comcast.com/community/browse-all/details/the-business-benefits-of-wifi
[14] *Mid-band Spectrum Review for WRC-23. A joint presentation by Ericsson, Huawei and Nokia, 13/7/2022*
[15] Germany: Sharing study for WRC-23 Agenda Item1.2 onIMT/FS in 6425-7125 MHz, 07 June 2022 (R19-WP5D-C-1273!!MSW-E.docx).

Certain administrations supporting an IMT identification argue that use of the upper 6 GHz band by FSS and FS will either be phased out or, in the case of FS, can be coordinated on a national basis. In the case of EESS (Copernicus) they argue that its operational frequencies can be moved to a range above 7125 MHz. In our view, this is an acknowledgement of the fact that IMT cannot share spectrum with incumbents in the upper 6 GHz band which means that until the band was cleared which might take five to ten years, the band would be underutilized. This, once again, would constitute a highly ineffiect use of valuable mid-band spectrum.

What would IMT in the upper 6 GHz band be used for?

IMT proponents claim that to fulfil the key performance objectives defined for IMT-2020, an additional 2 GHz of mid-band spectrum would be required for 5G. It shall be noted that in the European Union, the 5G pioneer bands were identified and found to be sufficient for fulfilling the IMT-2020 performance objectives. This was in 2016[16], but even today, these bands are not fully uitilized. Until now, only 64% of the 700 MHz band and 75% of the 3.6 GHz band have been assigned. For the 26 GHz band, the situation is even worse as its assignment rate is below 30%[17]. In the 700 MHz and 3.6 GHz bands, the number of 5G base stations stands at below 5% of the number of corresponding 4G base stations[17]. These figures demonstrate that there is considerable headroom for utilizing the spectrum that has already been identified for IMT 5G.

As mentioned above, the upper 6 GHz band is supposed for IMT to provide additional capacity in urban and suburban areas. As various studies show, even in dense urban areas mobile traffic peaks occur only in very few locations, and only during short periods of time during the day. Figure 7 shows the spatial distribution of cellular traffic for Shanghai[18], a city with one of the highest mobile densities globally. The charts show the amount of cellular traffic at different times of the day.

It can be seen that even at the busiest times (top right and bottom left), the areas where peak demand occurs are small (they represent approximately 9% of the urban area). Information published by Ofcom UK on mobile use in the cities of London and Edinburgh confirms this observation[19]. Should peak demand exceed the current capacity of the cellular network, this can be addressed by densification of mobile networks using already assigned mobile spectrum. Reserving 700 MHz of mid-band spectrum on European or even national scale for a use which is very limited both in terms of space and time would be highly inefficient even without considering the typical use of mobile broadband which we will address later in this document.

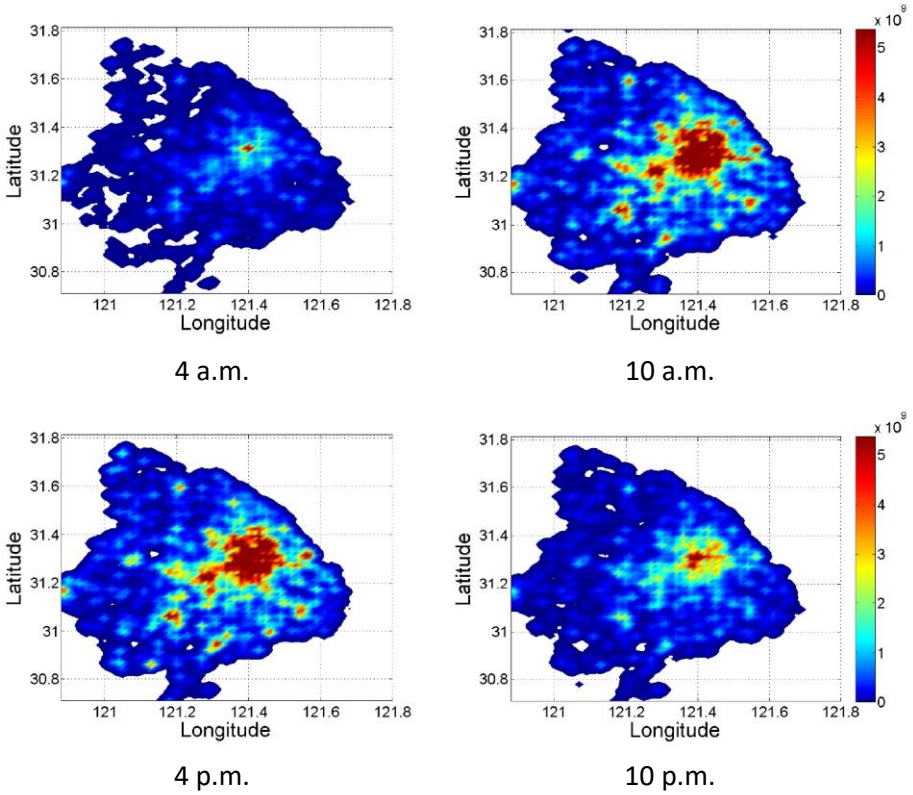


Figure 7: Mobile traffic patterns observed in Shanghai[18]

[16] http://www.gsmhistory.com/short-history-of-the-5g-pioneer-bands/
[17] https://5gobservatory.eu/observatory-overview/eu-scoreboard/
[18] Source: *Understanding Mobile Traffic Patterns of Large Scale Cellular Towers in Urban Environment*; IEEE/ACM TRANSACTIONS ON NETWORKING, VOL. 25, NO. 2, APRIL 2017
[19] Ofcom *Connected Nations 2021 – UK Report*; Ofcom *Connected Nations 2020, Scotland Report*

As urban and suburban areas will be supplied with gigabit fibre access, there is a need for adequate gigabit wireless indoor connectivity which can best be satisfied by WAS/RLANs. Providing satisfactory indoor coverage from outdoor IMT base stations is not feasible, neither technically nor economically. Building entry loss can exceed 50 dB, resulting in unpredictable indoor signal quality and increased power consumption. Due to the availability of fibre and/or coax cable, the need for fixed wireless access (FWA), which is the dominant use case for IMT 5G today, will be very low in these areas. FWA is used to provide internet connectivity in areas where fixed broadband access (cable, fibre, DSL) is not available, i.e., mostly remote rural areas which are not targeted by 6 GHz IMT. Furthermore, the 26 GHz band which is already available for IMT 5G is perfectly suited for FWA as it provides high capacity over distances of up to one kilometer[20].

IMT usage in the upper 6 GHz band would be mostly to provide mobile broadband connectivity outdoors. As people spend more than 90% or their time indoors (tendency increasing) and more than 90% of data traffic is generated and consumed indoors, the required capacity, and hence spectrum demand for 6 GHz IMT would be very limited. This is also demonstrated by the fact that in Europe more than 90% of data traffic is transported over fixed networks, and less than 10% over cellular networks[21]. In countries such as Germany and the UK, the share of mobile data traffic is even lower and has remained below 3% for the past 10 years[22].

5G connectivity is mostly found in Smartphones (65% of 5G devices), followed by FWA equipment (20%), and others (15%)[23]. Outdoors, smartphones are predominantly used for email, texting, web searches and accessing social media[24], services and applications that do not require very high bit rates or very low latencies and that are typically used for short durations. Productive activities account for only a very small portion of mobile device usage[25]. Although social media may bring benefits to individuals, communities and businesses, its ultimate effect in building digital societies or economies is very limited.

In 5G IMT networks, the most frequently used high-speed application is speed tests[26]. The alleged need for more IMT spectrum is in stark contrast with the current demand for 5G which has prompted the mobile industry to launch a public call to identlify new and innovative 5G use cases[27]

An IMT identification of the upper 6 GHz band also entails a serious risk of increasing the estrangement between urban and rural regions. Even though an IMT identification of the upper 6 GHz band would deliver very little, if any real benefit to the urban populations, it could create a perception of discrimination in the rural population.

The case of enterprise applications has hardly been addressed by 6 GHz IMT proponents. While Wi-Fi 6E and Wi-Fi 7 are able to support the stringent QoS requirements of most enterprise applications, there may be use cases that could benefit from licensed spectrum. For those cases, dedicated locally licensed spectrum for local/private 5G IMT networks can be assigned in other bands such as the 3.8-4.2 GHz band. Nationwide allocations of a large amount of licensed spectrum are unnecessary.

Another future use of the upper 6 GHz band that has been promoted by certain administrations is for IMT 6G. HPE is of the view that 6G has not even been defined at this stage and that assuming that 6G will equal IMT-2030 is premature. The RSPG should make clear that for 6G the principle of technology neutrality should be observed.

Option 3: Shared use by IMT and licence-exempt technologies

Recently, it has been contemplated whether IMT and licence-exempt WAS/RLAN technologies such as Wi-Fi could share the upper 6 GHz band if they were confined to different geographical domains, i.e., high-power IMT would operate outdoors while LPI WAS/RLAN would operate indoors. Building entry loss (BEL) would provide sufficient signal attenuation to prevent mutual harmful interference to occur. Notwithstanding that, at least to our knowledge, coexistence studies between IMT and WAS/RLAN have never been conducted, this sharing scenario is not feasible for a number of reasons.

While WAS/RLANs are designed to share spectrum and employ a number of mechanisms and ‘politeness protocols’ for that purpose, IMT is not. The inability of IMT to share spectrum with WAS/RLAN was repeatedly highlighted by members of the IMT industry. To allow co-channel operation of IMT and WAS/RLAN, there would either have to be sufficiently large separation distances to guarantee that harmful interference will not occur, or the IMT channel access mechanism would have to be fundamentally re-designed. As building entry loss can vary between a few dB and more than 50 dB, separation distances would have to be calculated for the worst-case scenario which precludes an efficient use of spectrum.

The areas in which 6 GHz IMT would be deployed, i.e., dense urban and, to a lesser extent suburban areas are those that also feature the highest RLAN densities. In most of these areas large separation distances cannot be realised.

[20] Nokia: *The emerging opportunity for 5G mmWave Fixed Wireless Access*; Technology White Paper..
[21] https://www.statista.com/statistics/1180156/fixed-mobile-data-usage-gigabytes/
[22] Data consumption per connection. Germany: *Tätigkeitsbericht Telekommunikation 2020/2021 der Bundesnetzagentur*; UK: *Ofcom Communications Reports* 2011 to 2021
[23] GSA GAMBoD database, July 2022 (www.gsa.com)
[24] https://www.marketingcharts.com/digital/mobile-phone-118519
[25] https://www.livingstonepartners.com/de/insights/apps-oder-mobile-browsing-eine-frage-die-den-marketingerfolg-bei-millennials-wesentlich-beeinflusst/
[26] Handelsblatt: Enttäuschung 5G – Warum der neue Standard Kunden noch wenig bringt; https://www.handelsblatt.com/technik/it-internet/telekommunikation-enttaeuschung-5g-warum-der-neue-standard-kunden-noch-wenig-bringt/27895166.html
[27] *GSMA issues call for innovative 5G use cases*; https://telecoms.com/516784/gsma-issues-call-for-innovative-5g-use-cases/

Furthermore, it would not be possible to control IMT user equipment (UE) and prevent it from connecting to an outdoor BS while being indoors. Indoors, UE transmit power would be increased to compensate for building entry loss, exacerbating interference to WAS/RLAN. Consequently, only stationary outdoor IMT UE could be allowed in that band.

Outdoor operation of VLP WAS/RLAN would not be possible in the upper 6 GHz band.

Some administrations brought up the question whether frequency coordination between IMT and WAS/RLAN would provide a way to enable operation in the same geographical location but in different sub-bands, either manually, in the form of a light licensing approach, or in an automated manner by means of a central database. IMT BS locations and frequencies as well as LPI WAS/RLAN locations would be stored in a database that would have to be queried by WAS/RLAN devices which would then avoid the IMT frequencies. The feasibility of these proposals has been refuted repeatedly.

As pointed out above, 6 GHz IMT is intended to be deployed in dense urban hotspot areas to provide additional capacity. In these same areas, however, the full 1200 MHz of bandwidth will be needed for WAS/RLAN. In less dense areas where 6 GHz IMT would not be deployed, or only sparsely, more capacity would be available for WAS/RLAN than in denser areas. If there was a real need for additional IMT capacity in these very small dense urban hotspot areas, these could be addressed by utilizing the available 26 GHz band.

A database system would be technically complex and hence costly and put a disproportionally high burden on WAS/RLAN devices, resulting in higher product cost for all users, including those residing in countries that have no intention to have IMT and WAS/RLAN share the upper 6 GHz band. The development of database management standards would likely take years and, considering the strict European data protection rules, might not be implementable after all.

For the reasons mentioned above, HPE is of the opinion that trying to make IMT and WAS/RLAN share the upper 6 GHz band will in the best case render one of the systems unusable and in the worst case, result in significant performance penalties for both systems which will make the economic case unfeasible for either system. The consequences for Europe would be regulatory fragmentation, reduced indoor connectivity capacity, and an inefficient use of spectrum which would result in Europe falling way behind other regions.

Comparison of IMT and licence-exempt technologies

Unlike IMT, WAS/RLAN is not a technology but comprises a family of technologies such as Wi-Fi and 5G NR-U that can share licence-exempt spectrum and coexist with incumbents.

The global IMT ecosystem is dominated by three large equipment manufacturers supplying a slightly larger group of mobile network operators. The Wi-Fi ecosystem, in contrast, comprises thousands of companies from chip makers to equipment manufacturers to service and content providers.

While Wi-Fi has been covering many different use cases for years, IMT 5G until today is covering a very limited number of use cases such as accessing social media.

Wi-Fi has become indispensable for for businesses and professional users of all sorts, greatly enhancing efficiency and productivity. The main usage of IMT, in contrast, is for entertainment and social media.

Wi-Fi connectivity is an essential feature of a huge variety of equipment, from washing machines, fridges, light bulbs and other smarthome IoT devices to audio/video/TV equipment to laptop and desktop computers, tablets, and smartphones to game consoles, access points and routers, to industrial controls, robots, tools, and medical systems. IMT is mostly used in smartphones and FWA equipment.

IMT in the upper 6 GHz band would only be deployed in dense urban and suburban areas while WAS/RLAN would be available to users ubiquitously.

The cost of licensing the necessary intellectual property for cellular 5G alone is 3x that of a Wi-Fi chipset, and the entire 5G cellular modem cost is 50x the cost of a Wi-Fi chipset[28]. Support for a cellular connection can add as much as US$130 to the retail price of a tablet device[28].

Between 2003 and 2021, no new spectrum had been made available for licence-exempt use. During this time, internet traffic increased by a factor of 1500[29], and the number of Wi-Fi devices grew from 50 million to 13 billion[30].

Following WRC-19, 1368 MHz of low- and mid-band spectrum had been identified for IMT in ITU Region 1 while 538.5 MHz were available for licence-exempt use. Of this 538.5 MHz, only 100 MHz (5150-5250 MHz) were available for WAS/RLAN without restrictions (e.g., DFS).

Following the ECC and EC Decisions in 2020 and 2021, resp. to make the 5945-6425 MHz available for licence exempt use, a total of 1018.5 MHz is now available for WAS/RLAN in Europe.

[28] Source: https://policyimpactpartners.com/blogs/realising-the-full-potential-of-6-ghz-spectrum/
[29] https://blogs.cisco.com/sp/the-history-and-future-of-internet-traffic; Cisco VNI 2018
[30] Wi-Fi Alliance / ABI Research

Wi-Fi accounts for only 43% of the combined allocated spectrum but carries 90% of the traffic (Figure 8). In Germany, for instance, Wi-Fi (operating exclusively in the 2.4 GHz and 5 GHz bands during 2021), delivered approximately 167 GB per Hz of allocated spectrum, compared to 5.2 GB per Hz for mobile networks.

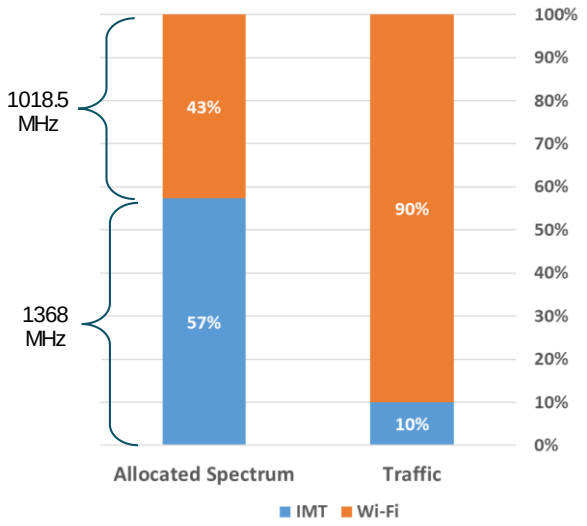


Figure 8: Wi-Fi and IMT spectrum allocations and transported data traffic.

A summary of the comparison between IMT and WAS/RLAN is shown in Table 1 below.

Characteristic	IMT	WAS/RLAN
Technology neutrality	✗	✓
Ubiquitous coverage	✗	✓
Technology & product cost	✗	✓
Diverse 6 GHz ecosystem in place	✗	✓
Economic benefits can be realized immediately	✗	✓
High-capacity low-latency indoor coverage	✗	✓
Ease of extending gigabit fiber performance inside buildings / homes	✗	✓
Suitability for providing free broadband connectivity in public places	✗	✓
Large installed base	✗	✓
Strongly improve business and employee productivity	✗	✓
Unrestricted capability to share spectrum with incumbents	✗	✓
Spectrum utilization [bits transferred per Hz of assigned spectrum)	✗	✓
Wide range of use cases served today	✗	✓
Spectrum already assigned in all three world regions	✗	✓
Potential for global harmonization	✗	✓

Table 1: Comparison of IMT and WAS/RLAN characteristics related to AI 1.2

Consequences of an IMT identification of the 6425-7125 MHz band

Under the ITU Radio Regulations, there already is a mobile allocation for the 6425-7125 MHz band in Region 1. It is up to each country to determine which bands it wishes to make available for IMT, depending on its national requirements. An IMT identification is not required.

In principle, an IMT identification of a band does not preclude the use of this band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. However, an IMT identification sends a strong signal to administrations and industry that the band is to be used for mobile, and once IMT base stations and terminals are deployed it becomes almost impossible to remove the identification[31]. Furthermore, an IMT identification establishes an expectation that IMT is to be protected against interference which in case of the 6425-7125 MHz band could contradict the provisions of Article 3 of Commission Implementing Decision (EU) 2021/1067. Considering the complete absence of a 6 GHz IMT ecosystem, the slow take-up of 5G IMT in already identified bands, and the lenghty process from identification to allocation to implementation, an IMT identification would block the upper 6 GHz band for years and severely restrict administrations' abilities to make other choices for the usage of that band.

Retaining the status quo, i.e., a mobile allocation of the 6425-7125 MHz band without an IMT identification will provide maximum flexibility and freedom of choice for administrations. Hence, the RSPG should adopt and propose 'No Change' as European position on AI 1.2 as far as it concerns the 6425-7025 MHz and 7025-7125 MHz bands.

2. Agenda Item 1.10

HPE concurs that the agenda for WRC-27 which will be decided on at WRC-23 should be in line with current and future EU policies, and specifically with a view on the next generations of communication technologies such as 6G.

HPE is of the opinion that 6G should be a network of networks and not tied to a particular technology such as IMT. 6G could comprise licence-exempt technologies such as Wi-Fi 7, Wi-Fi 8, and beyond which will, in countries that opened the full 6 GHz band, be deployed in the upper 6 GHz band. The RSPG should therefore reject proposals to establish an agenda item for WRC-27 to study the upper 6 GHz band for 6G.

[31] Mohamed El-Moghazi, Jason Whalley: *IMT Spectrum Identification: An obstacle for 5G Deployments?* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3426808

Summary and Conclusion

Licence-exempt technologies such as Wi-Fi are essential for realizing the objectices of Europe's Digital Decade.

The technology exists to make gigabit connectivity available to people and businesses where they need it, i.e., indoors. All that is required is a regulatory decision to open the 6425-7125 MHz band for licence-exempt use.

There are no compelling arguments that would justify an identification of an additional 700 MHz of mid-band spectrum for IMT. Over the past ten years, the share of traffic transferred over mobile networks has remained constantly low at below 10% of total traffic in most European countries.

Deciding for an IMT identification of the upper 6 GHz band or for 'No Change' is not a choice between two technologies (i.e., IMT or Wi-Fi), as frequently asserted but between technology lock-in (i.e., IMT) and technology neutrality which fosters innovation, reduces cost, and provides users with flexibility and freedom of choice.

An IMT identification of the upper 6 GHz band would mean that IMT might be introduced into the band at some point in time which likely would be many years away, if ever. As this would most probably not be done by all countries, fragmentation and cross-border issues would be the result.

A decision to support an IMT identification of the upper 6 GHz band is likely to have serious consequences for the adoption of gigabit fibre services in Europe and result in a large part of the investment in fibre infrastructure being wasted. Furthermore, the shortage of licence-exempt spectrum and resulting lack of adequate local area connectivity would seriously jeopardize the future competitiveness and prosperity of Europe.

Furthermore, it would create a real risk of decoupling Europe from some of its major allies in the Americas and Asia and support the case of Europe's systemic competitors and global challengers who strongly support an IMT identification.

By defending a common EU position of 'No Change', the EU can adopt and globally promote the existing harmonised conditions for spectrum use in the upper 6 GHz band. Global harmonisation of the upper 6 GHz band will yield significant benefits for the availability of affordable and high-quality equipment, interoperability of services, and more efficient usage of spectrum in the EU single market.

At the same time, a 'No Change' position leaves all options open and provides administrations with complete freedom of choice concerning the future use of the upper 6 GHz band.

For these reasons, HPE urges the RSPG to adopt and propose 'No Change' as the European common position on AI 1.2 as far as it is related to the 6425-7025 MHz and 7025-7125 MHz bands.

HPE contact information

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