

DIGITALEUROPE

Whitepaper on 5925-6425 MHz (6 GHz) Wireless Access Systems /
Radio Local Area Network (WAS/RLAN)

February 2018

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1. Executive Summary

With the continuing and growing demand for data, by users and businesses, there is a need to address the lack of available spectrum for Wireless Access Systems/Radio Local Area Network (WAS/RLAN) technologies for use in Wi-Fi and other networks. In order to meet this demand and the higher capacity needs on WAS/RLAN network traffic, additional license exempt spectrum must be made available.

In this whitepaper, DIGITALEUROPE examines the regulatory framework currently in place for WAS/RLAN spectrum. We identify a lack of progress at the international level and are concerned that WRC-19 will be unable to identify new spectrum suitable for WAS/RLAN. In that context, we support European efforts to identify and make available adequate spectrum.

DIGITALEUROPE considers that the 5925-6425 MHz frequency range offers significant potential to meet the aforementioned license exempt spectrum need. We suggest the MOBILE allocation in Region 1 for the 5925-6700 MHz range could form the basis for WAS/RLAN deployment in 5925-6425 MHz. We also support amending the European Common Allocation Table to reflect this.

We make several suggestions for studies, in order to examine and determine the availability of location and operation conditions, mitigation techniques for coexistence and sharing with incumbent users, compatibility and sharing conditions. We note the complexity of the ecosystem regarding 5925-6425/6725 MHz and the need to align this further.

On the EU level, DIGITALEUROPE welcomes the Commission “Mandate to CEPT to study feasibility and identify harmonised technical conditions for Wireless Access Systems including Radio Local Area Networks in the 5925-6425 MHz band for the provision of wireless broadband services”.

We support the Commission here also with the overall policy objective to ensure effective and efficient spectrum use, with the principle of service and technology neutrality, including the need to ensure sufficient spectrum resources are made available on a harmonised basis. For the 5925-6425 MHz frequency range in particular, and noting the potential for significant harmonisation, we recommend the development of regulatory strategies to make this available and advise here a license exempt approach for WAS/RLAN.

2. Introduction

Over the last two decades, Wireless Access Systems/Radio Local Area Network (WAS/RLAN) technologies, such as Wi-Fi, have met user needs for ever-growing demand for data. WAS/RLANs have evolved from emerging technology to an essential component of telecommunications infrastructure. Users rely on WAS/RLAN as the primary means for internet access since Wi-Fi hotspot deployment prevalent, widely-used, affordable and offers performance that is well suited for current and emerging applications. Whether in the home, office, or outdoors, untethered internet access via WAS/RLAN is essential for the European citizens.

User demand for data continues to grow at an exponential rate with IP traffic projected to increase nearly threefold in the next five years, with a majority of that traffic delivered over WAS/RLAN networks. Currently, over 60% of mobile traffic is offloaded in hot-spot, workplace and domestic locations to WAS/RLAN with that number

projected to increase over the next years. This is supported by two analyses that wireless data traffic is projected to continue to grow dramatically during the 2018-2025 timeframe¹.

New and high growth application areas such as 4k/8k HD video for entertainment, machine vision and robotics, Augmented Reality/Virtual Reality (AR/VR), gaming and low latency industrial applications, combined with the significant increase of the number of Mobile Broadband devices in homes, schools, businesses and public spaces, will further contribute to the traffic growth in WAS/RLAN networks.

At the same time, the amount of license exempt spectrum available has not kept pace with the extraordinary growth and adoption of WAS/RLAN. Recognizing that WAS/RLAN functionality is dependent on the availability of adequate license exempt spectrum, it is no surprise that the projected continued growth in WAS/RLAN use requires additional new available license exempt spectrum.

The issue of a significant shortfall in license exempt spectrum needed for WAS/RLAN is not new and has been under consideration in Europe and worldwide for number of years.

In 2013 the European Commission(EC) submitted a Mandate² to CEPT to study and identify harmonised compatibility and sharing conditions for WAS/RLAN in the 5 GHz extension bands 5350-5470 MHz and 5725-5925 MHz. CEPT Report 64³ (dated November 2016) in response to the EC Mandate concludes that considering the results of the studies performed under tasks of the EC Mandate it is *not* possible to specify any appropriate mitigation techniques and/or operational compatibility and sharing conditions that would allow WAS/RLANs to be operated in the bands 5350-5470 MHz and 5725-5925 MHz while ensuring relevant protection of incumbent services in these bands.

The issue of additional spectrum for WAS/RLAN was also considered by the World Radiocommunication Conference 2015 (WRC-15) and is again on the agenda for the upcoming conference in 2019 (WRC-19, Agenda Item 1.16)⁴. This Agenda Item is limited to 5150-5925 MHz but so far, it seems unlikely it will deliver the additional new spectrum required for future WAS/RLAN traffic which is estimated to be in the region of 500 MHz - 1 GHz⁵ more spectrum than currently available.

Recently (December 2017) the European Commission (EC) Mandate⁶ to CEPT was approved: “Mandate to CEPT to study feasibility and identify harmonised technical conditions for Wireless Access Systems including Radio Local Area Networks in the 5925-6425 MHz band for the provision of wireless broadband services”.

The “Purpose” of the EC 6 GHz Mandate is –

The objective of the Mandate is to study feasibility and identify harmonised technical conditions for a sustainable and efficient use on a coexistence basis of the 5925-6425 MHz band for wireless access systems including radio local area networks (WAS/RLANs). Based on the results of the compatibility and coexistence studies covering the 5925-6425 MHz band to be carried out under this Mandate, the relevant harmonised technical conditions should enable the coexistence with other systems in this and adjacent frequency bands. (Source: RSCOM17-53rev1)

¹ See: <http://www.cisco.com/c/en/us/solutions/service-provider/visual-networking-index-vni/index.html?stickynav=1> and <https://fon.com/pr-mobile-data-traffic-will-offloaded/>

² http://ec.europa.eu/newsroom/dae/document.cfm?action=display&doc_id=7467

³ <http://www.erodocdb.dk/Docs/doc98/official/Word/CEPTREPO64.DOCX>

⁴ <http://www.itu.int/en/ITU-R/study-groups/rcpm/Pages/wrc-19-studies.aspx>

⁵ https://www.wi-fi.org/downloads-registered-guest/Wi-Fi%2BSpectrum%2BNeeds%2BStudy_0.pdf/33364

⁶ RSCOM17-53rev1

In light of ample evidence that expected growth in WAS/RLAN use and deployment will exhaust available license exempt spectrum capacity in the near future and additional license exempt spectrum access is required. This DIGITALEUROPE whitepaper provides information and recommendations to the European Union Policymakers to facilitate action towards resolving the looming WAS/RLAN spectrum crunch; making access to new spectrum for WAS/RLAN a priority.

3. Objective of this DIGITALEUROPE Whitepaper

The continued market expansion of WAS/RLANs, plus the additional throughput needs of new wireless applications, are placing demand that cannot be sustained at optimal service quality on the existing license exempt spectrum available for WAS/RLAN thus creating the momentum and justification to secure access to additional new general authorization spectrum. As already mentioned it seems unlikely that WRC-19 will deliver the additional new spectrum required for future WAS/RLAN traffic which is estimated to be in the region of 500 MHz - 1 GHz. It can be expected that if not addressed, the projected spectrum shortfall will result in significant degradation of WAS/RLAN quality services delivered to the European citizens and will impair countries' abilities to deliver on the Digital Single Market (DSM)⁷ which is the second highest priority of the Juncker Commission.

DIGITALEUROPE has developed this whitepaper to raise awareness on the need to provide a suitable regulatory framework enabling access to additional license exempt spectrum for WAS/RLANs in particular highlighting the importance of the 5925-6425 MHz frequency range.

In order to achieve access to sufficient spectrum to meet the ever increasing WAS/RLAN demands, in particular noting that the need for spectrum is acute in high density urban areas where people and devices are permanently connected, DIGITALEUROPE has developed some recommendations related to the 5925-6425 MHz frequency range for consideration with the aim of helping market growth of license-exempt WAS/RLANs devices.

4. WAS/RLAN Spectrum Needs

According to the Wi-Fi Alliance (WFA)⁸ projections the increasing number of Wi-Fi devices combined with growing demand for Wi-Fi connectivity will exceed the existing available Wi-Fi spectrum capacity in the near future. The "Wi-Fi Spectrum Needs Study" indicates that by 2020, Wi-Fi networks around the world will need access to significantly more mid-band spectrum than is currently available in the 5 GHz range to satisfy expected growth in Wi-Fi data traffic.

The WFA "Wi-Fi Spectrum Needs Study" undertook a comprehensive analysis to determine the number of channels required to support Wi-Fi traffic by taking into consideration existing and future Wi-Fi device capabilities and deployment needs for business, residential and public locations. The study evaluates two demand scenarios: "expected traffic growth" and "potential unexpected increase that may come from novel applications".

The WFA "Wi-Fi Spectrum Needs Study" findings include -

⁷ https://ec.europa.eu/commission/priorities/digital-single-market_en

⁸ https://www.wi-fi.org/downloads-registered-guest/Wi-Fi%2BSpectrum%2BNeeds%2BStudy_0.pdf/33364

- The ever growing number and diversity of Wi-Fi devices along with increased connection speeds and data traffic volumes will exceed the capacity of spectrum currently available in the 5 GHz band by 2020;
- Between 500 MHz and 1 GHz of additional spectrum in various world regions may be needed to support expected growth in Wi-Fi by 2020;
- If demand for Wi-Fi exceeds expected growth, then between 1.3 GHz and 1.8 GHz more spectrum may be required by 2025; and
- Wi-Fi spectrum needs to be sufficiently contiguous to support 160 MHz wide channels, which are required to support a growing number of bandwidth-intensive applications and to allow maximum Wi-Fi benefits to be attained.

People use Wi-Fi to connect with one another, to learn, to work, and even to manage a range of autonomous smart devices. The exponential increase in reliance on Wi-Fi warrants additional spectrum allocation to meet Wi-Fi users’ needs for years to come.

WFA Spectrum Needs study predictions for the new spectrum required per region are as shown below:

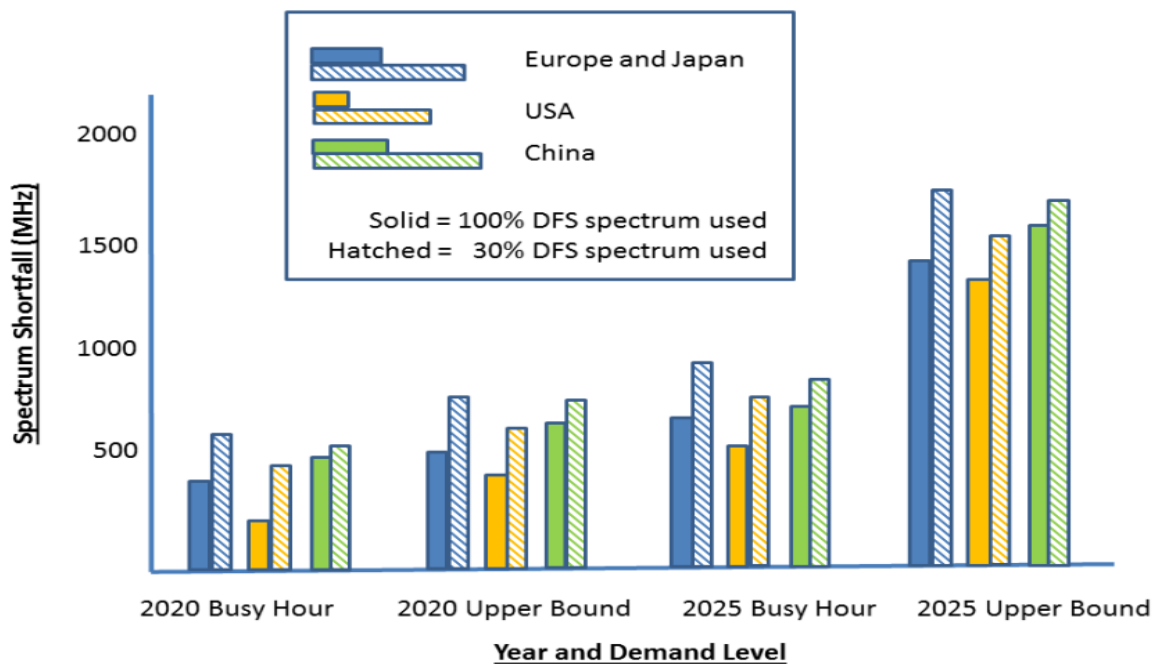


Figure 1: Illustration of the spectrum shortfall per region, by year and demand level⁹

The amount of new spectrum required varies by geographical region. It is important that new contiguous spectrum is made available since such spectrum needs to be assigned with sufficient contiguity that wide channels of 160 MHz, or perhaps even wider in future, can be constructed with ease. To do otherwise would be to risk restricting the growth of WAS/RLAN and the economic benefits with which it is widely associated and which was first enabled by forward-thinking spectrum regulation. Such a need for contiguity presents a significant further challenge to those with responsibility for spectrum allocation.

⁹ ‘Dynamic Frequency Selection’ (‘DFS’) Spectrum – see: <https://www.wi-fi.org/knowledge-center/faq/what-is-dynamic-frequency-selection-dfs>

Another spectrum needs effort performed by Qualcomm¹⁰, conducted a top down, engineering driven analysis to identify the amount of wireless spectrum required to achieve sustained 1 Gbps throughput, under various networking topologies in dense residential and enterprise deployment scenarios. The analysis shows that in dense environments that primarily rely on Wireless Local Area Networking (WLAN) networking and for some of the configurations considered in the analysis, a total amount of approximately 1280 MHz of spectrum is required centred. This amount of required spectrum is significantly higher than the amount of 5 GHz spectrum that is currently available for unlicensed usage today.

Currently, only 450 MHz of heavily constrained license exempt spectrum is available in Europe. With 450 MHz available spectrum, the sustained throughput would be capped at around 400 Mbps at the most, under the idealized '802.11ax generation technology only' assumptions in the dense deployment scenarios underlying the study. This analysis evidences that to enable future WLAN applications such as AR/VR and several of the envisioned usage scenarios, regulators should plan for around 1280 MHz of unlicensed spectrum.

It is important to recognize the consistency of the two studies' conclusions even though entirely different methodologies and models were applied. The goal of turning Europe into a Gigabit society by 2025, depends on the ability to fully deploy the next generation WAS/RLAN capabilities which can only be realised with adequate license exempt spectrum access.

DIGITALEUROPE considers that the 5925-6425 MHz frequency range offers significant potential to assist meeting the spectrum needs identified by the WFA; "between 500 MHz and 1 GHz of additional spectrum in various world regions may be needed to support expected growth in RLAN by 2020".

5. World Radiocommunication Conference 2019 (WRC-19)

The World Radiocommunication Conference 2019 (WRC-19) Agenda Item considering additional spectrum for WAS/RLAN is Agenda Item 1.16¹¹ which states:

to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands between 5150 MHz and 5925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with Resolution 239 (WRC-15)

At a global level WRC-19 Agenda Item 1.16 is the responsibility of ITU-R WP5A¹² (Land mobile service excluding IMT; amateur and amateur-satellite service) while at a European / CEPT regional level the responsible organisation is ECC PTD¹³ (WRC-19 agenda items 1.1, 1.11, 1.12, 1.16, 9.1.5, and 9.1.6) reporting ultimately to ECC CPG¹⁴ (Conference Preparatory Group) which will, were possible, prepare European positions for ITU World Radiocommunication Conferences (WRCs) and Radiocommunication Assemblies (RAs).

ITU-R WP5A has the responsibility to perform the studies requested under ITU-R Resolution 238 in preparation for the WRC-19. This activity is supplemented by regional activities developing the technical studies between the anticipated WAS/RLAN systems and the incumbent services.

¹⁰ <https://www.qualcomm.com/documents/quantification-5-ghz-unlicensed-band-spectrum-needs>

¹¹ <http://www.itu.int/en/ITU-R/study-groups/rcpm/Pages/wrc-19-studies.aspx>

¹² <http://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5a/Pages/default.aspx>

¹³ <https://cept.org/ecc/groups/ecc/cpg/cpg-pt-d/page/terms-of-reference/>

¹⁴ <https://cept.org/ecc/groups/ecc/cpg/page/terms-of-reference/>

Regrettably, in 2016 CEPT Report 64¹⁵ concluded that “it is not possible to specify any appropriate mitigation techniques and/or operational compatibility and sharing conditions that would allow WAS/RLANs to be operated in the bands 5350-5470 MHz and 5725-5925 MHz while ensuring relevant protection of incumbent services in these bands”. The incumbent services are frequency band/range dependent and include a number of space borne and terrestrial applications. The study work continues at a pace and within Europe the Conference Preparatory Group (CPG) is developing technical studies relevant to the European situation.

DIGITALEUROPE is concerned that the WRC-19 will be unable to identify any new spectrum suitable for WAS/RLAN which is worrying considering the ever increasing growth in traffic.

DIGITALEUROPE supports European efforts (outside of the WRC-19 process) to identify suitable frequency range(s) that could be utilised to meet this demand in Europe, and we consider the 5925-6425 MHz frequency range the most promising in terms of coverage, incumbent compatibility and sufficient contiguous wide channels.

6. ITU Radio Regulations Table of Frequency Allocations

The ITU (Region 1) frequency allocation 5925-6700 MHz is allocated to FIXED, FIXED SATELLITE (EARTH-TO-SPACE) and MOBILE. See Table 1 below:

Frequency band	Allocations
5925 MHz - 6700 MHz (5.149) (5.440) (5.458)	FIXED-SATELLITE (EARTH-TO-SPACE) (5.457A) (5.457B) MOBILE (5.457C) FIXED (5.457)

Table 1: 5925-6700 MHz ITU (Region 1) Allocation

DIGITALEUROPE suggests the MOBILE allocation in Region 1 for the 5925-6700 MHz could form the basis for WAS/RLAN deployment in Europe within the 5925-6425 MHz frequency range.

7. European Common Allocation Table

The European Common Allocation Table (ECA Table) in ERC Report 25¹⁶, and the ECO Frequency Information System (EFIS), confirms that CEPT / Europe has not implemented the ITU (Region 1) MOBILE allocation for 5925-6700 MHz.

The ECA Table for 5925-6425 MHz includes a primary allocation to the Fixed Service, the Fixed-Satellite Service (Earth-to-Space) and the Earth Exploration-Satellite (passive) Service. See table 2.

According to the ECA Table, radio applications in this band include Satellite Earth Stations on board Vessels, Fixed Satellite Service Earth Stations, Fixed Service systems (point-to-point), Passive Sensors (satellite), Radiodetermination and UWB. See Table 2:

¹⁵ <http://spectrum.welter.fr/international/cept/cept-reports/cept-report-064-5-GHz-WAS-RLAN.pdf>

¹⁶ ERC Report 25 European Common Allocation: <http://www.efis.dk/sitecontent.jsp?sitecontent=ecatble>

5925 MHz - 6700 MHz (5.149) (5.440) (5.458)

FIXED
FIXED-SATELLITE (EARTH-TO-SPACE)
Earth Exploration-Satellite (passive)

-
Fixed
ESV
UWB applications
Radiodetermination applications
FSS Earth stations
Passive sensors (satellite)

Table 2: 5925-6425 MHz European Common Allocations Table (ECA Table)

The lack of a MOBILE allocation at a European level is a regulatory impediment to the implementation of WAS/RLANs in 5925-6425 MHz frequency range.

DIGITALEUROPE suggests that the European Common Allocation Table (ECA Table) should be amended to reflect the ITU-R Region 1 MOBILE allocation which could then be implemented at a European level to enable access to 5925-6425 MHz frequency range for WAS/RLAN.

8. Coexistence with Incumbents

Coexistence between WAS/RLANs and potential interference to incumbent systems are always areas of concern that need to be addressed appropriately before new spectrum designations and allocations can be implemented.

As can be established from the European Common Allocations Table (ECA Table) for the 5925-6425 MHz frequency range the existing primary allocations are to the:

- Fixed Service
- Fixed-Satellite Service (Earth-to-Space)
- Earth Exploration-Satellite (passive) Service

According to the same ECA Table applications in this band include:

- Satellite Earth Stations on board Vessels (within the sub-band 5925-6425 MHz)
- Fixed Satellite Service Earth Stations
- Fixed Service systems (point-to-point)
- Passive Sensors (satellite)
- Radiodetermination
- Ultra-Wide Band (UWB)

It is further noted that for the fixed service systems, it is not just the number of links in operation that matters, but the potentially very high cost to replace them with e.g. in alternative frequency bands or indeed with fibre. In addition, it should be noted that the 6GHz FS band is in Europe divided in two sub-bands: Lower 6 (5925-6425 MHz) and Upper 6 (6425-7125 MHz).

The scope of the European Communications Commission (ECC) Work Item¹⁷ is to “Study the technical feasibility of the introduction of low power wireless access systems (including RLAN) in the band 5925-6425 MHz under a non-protected basis and ensuring certainty of continued operation, development and protection of existing services (FS, FSS) taking into account RR 5.440 and 5.458”.

¹⁷ ECC Work Programme Database, SE45_01, <http://eccwp.cept.org/>

The “Tasks” of the European Commission Mandate¹⁸ is to:

- (1) **Task 1** – Assessment and study of compatibility and coexistence scenarios in the band 5925-6425 MHz
- (2) **Task 2** – Development of harmonised technical conditions

DIGITALEUROPE suggests that a CEPT survey should be undertaken to determine the availability of location and operating conditions of existing Fixed Service stations in the 5925-6425 MHz frequency band since this will assist in the coexistence studies.

9. Interference Mitigation Techniques

Critical to incumbent protection are interference mitigation techniques used to access the spectrum. This may be variations on tested and proven methods, used as is or in combination, or this may be entirely new methods. Some examples are listed below -

- **Transmit Power Control (TPC):** reduce transmit power when full power is not needed to prevent harmful interference to incumbents
- **Geolocation Database Approach:** use of location data to prevent harmful interference to incumbents by avoiding co-channel operation
- **Antenna Characteristics:** reduction of skyward transmissions to reduce aggregate interference by access points and other fixed stations
- **Leveraging Indoor Propagation:** using wall attenuation to mitigate interference from indoor WAS/RLAN deployments into (outdoor) incumbent users
- **Massive MIMO (antenna techniques):** could be a very useful interference mitigation technique for outdoor deployments
- **Listen Before Talk (LBT):** to find a free radio channel by sensing radio environment before transmission
- **Power Density:** More available spectrum will allow the usage of wider channels resulting in a lower power density and as such reduce the potential of interfering with incumbents

These are likely a non-exclusive list and other interference mitigation techniques may well emerge.

DIGITALEUROPE suggests that a combination of various mitigation techniques could be considered to enable sharing the 5925-6425 MHz frequency range with incumbent users.

DIGITALEUROPE assumes that the development of compatibility and sharing conditions for RLAN in the 5925-6425 MHz should be less problematic than in the previously proposed extension bands at 5 GHz (5350-5470 MHz and 5725-5925 MHz) mainly in regard to a different composition of the incumbent use of the band.

¹⁸ RSCOM17-53rev1

10. European 5925-6425 MHz Standards and Regulatory Ecosystem

DIGITALEUROPE notes that there is a rather unique standards and regulatory ecosystem in Europe that needs to be considered when advocating for access to the 5925-6425 MHz frequency range.

Within ETSI, a System Reference Document (SRDoc)¹⁹ is being developed “Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) in the band 5 925 MHz to 6 725 MHz”. The scope is:

The System Reference Document provides information on the intended applications, the technical parameters, mitigation techniques, the relation to the existing spectrum regulation and additional new radio spectrum requirements for Wireless access systems including radio local area networks (WAS/RLANs). The SRDoc contains information to support the CEPT activities resulting from Work Item FM_52 (covering the band 5 925 MHz to 6 425 MHz). In addition, this SRDoc contains a request for considering additional frequencies up to 6 725 MHz. The document includes the necessary information to support the co-operation between ETSI and the Electronic Communications Committee (ECC) of the European Conference of Post and Telecommunications Administrations (CEPT).

The ETSI SRDoc has a different frequency range which is being considered, 5925-**6725** MHz, where the EC Mandate and also the work ongoing within CEPT is focussed on 5925-**6425** MHz. There is a lot of history associated with these different ranges but suffice to acknowledge from a European perspective the focus of the coexistence analysis and regulatory development is clearly, today, on the 5925-6425 MHz frequency range.

The European 5925-6425 MHz Standards and Regulatory ecosystem is as detailed in the Figure 2:

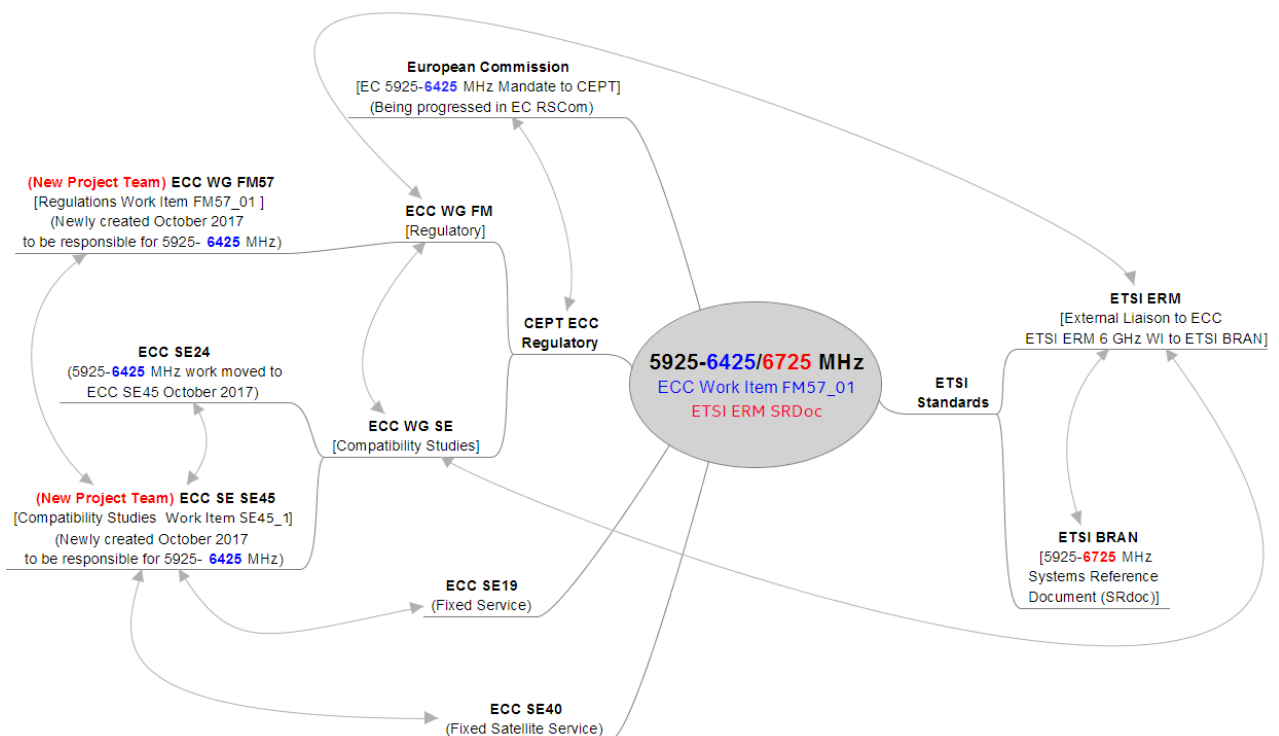


Figure 2: Illustration of European 5925-6425 / 6725 MHz Standards and Regulatory Ecosystem

¹⁹ ETSI SRDoc reference ETSI TR 103 524.

DIGITALEUROPE is aware that 3GPP has started a new Study Item led by RAN aiming at investigating the ongoing regulatory work on 6 GHz band in different regions. Noting that the European regulatory initiatives are focused on investigating unlicensed operation of WAS/RLAN in 5.925-6.425 and that the activities in the U.S. on identifying additional spectrum for both licensed and unlicensed operations in the 5.925-6.425 GHz and 6.425-7.125 GHz frequency ranges, the 3GPP study will cover the regulations for the entire 5.925-7.125 GHz frequency range. 3GPP will consider the results of such studies for the definition of a new band/bands for potential LTE and NR operations if and when spectrum in this frequency range becomes available.

DIGITALEUROPE notes the complexity of the 5925-6425/6725 MHz Standards and Regulatory Ecosystem and recommends that consideration is given when setting meetings to ensure maximum Industry participation and to avoid, where possible, overlaps with other important meetings.

11. European Commission 5925-6425 MHz (6 GHz) Mandate to CEPT

The European Commission Radio Spectrum Committee (RSCoM) has approved a EC Mandate²⁰ to CEPT titled “Mandate to CEPT to study feasibility and identify harmonised technical conditions for Wireless Access Systems including Radio Local Area Networks in the 5925-6425 MHz band for the provision of wireless broadband services”.

As detailed in Section 1, the “Purpose” of the EC 6 GHz Mandate is:

The objective of the Mandate is to study feasibility and identify harmonised technical conditions for a sustainable and efficient use on a coexistence basis of the 5925-6425 MHz band for wireless access systems including radio local area networks (WAS/RLANs). Based on the results of the compatibility and coexistence studies covering the 5925-6425 MHz band to be carried out under this Mandate, the relevant harmonised technical conditions should enable the coexistence with other systems in this and adjacent frequency bands. (Source: RSCoM17-53rev1)

The “Background” is:

Regarding the frequency band 5925-6425 MHz, the European Table of frequency allocations and applications in the frequency range 8.3 kHz to 3 000 GHz (ERC Report 25 (ECA Table))²¹ includes primary allocations to the Fixed Service and to the Fixed-Satellite Service (Earth-to-space). According to the ECA Table, radio applications in this band include Satellite Earth Stations on board Vessels, Fixed Satellite Service Earth Stations, Fixed Service systems (point-to-point), Passive Sensors (satellite), SRD (Radiodetermination) and UWB applications. The band 5925-6425 MHz is allocated by ITU Radio Regulations (RR) to the Mobile service on a primary basis.

The frequency band 5925-6425 MHz is used by medium/high capacity, long distance fixed terrestrial links (point-to-point) for backhauling of mobile broadband networks²². Some Member States have also authorised urban rail systems (such as CBTC) in parts of this band. The band 5925-6425 MHz is also part of the so-called “standard C band”.

A considerable amount of WAS/RLAN devices currently in use are operated in the 2.4 GHz band (2400-2483.5 MHz) where, based on the Commission Implementing Decision (EU) 2017/1483 amending Decision 2006/771/EC on short-range devices, 83.5 MHz of spectrum is available for such usage on a non-exclusive, non-interference and nonprotected basis to a large number of RLANS and non-specific short-range devices.

²⁰ RSCoM17-53rev1

²¹ ERC Report 25 <http://www.erodocdb.dk/Docs/doc98/official/pdf/ERCREP025.PDF>

²² ERC Recommendation 14-01 “Radio-frequency channel arrangements for high capacity analogue and digital radio-relay systems operating in the band 5925 to 6425 MHz” ERC REC 1401

Commission Decision 2007/90/EC amending Decision 2005/513/EC harmonises the use of radio spectrum in the 5 GHz band (5150-5350 MHz and 5470-5725 MHz) for wireless access systems including radio local area networks (WAS/RLANs). The use of the 5 GHz band for the operation of WAS/RLAN systems is subject to general authorisation only (Commission Recommendation 2003/203/EC)²³. Currently 455 MHz of harmonised spectrum is available on a non-exclusive, non-interference and non-protected basis.

The existing regulatory framework for WAS/RLAN systems using the 2.4 GHz and 5 GHz bands has led to a rapid take-up of WAS/RLAN usage which is based on the availability in the internal market of a nearly-globally harmonised spectrum resource that fosters large economies of scale for equipment manufacturers. The low spectrum access barrier has led to a large-scale deployment of interoperable WAS/RLAN-capable devices and access points. In addition to the private use of WAS/RLANs, wireless broadband access through publicly accessible WAS/RLAN access points is now recognised as important connectivity infrastructure that is largely complementary to mobile internet services provided by mobile network operators.

Moreover, large-scale public networks for WAS/RLAN are today a significant driver of 5 GHz band use, especially where outdoor coverage is being provided. This type of WAS/RLAN usage is nevertheless not always compliant with the national authorisation framework and is an ongoing source of interference e.g. to meteorological radars without resolution.

Making available additional spectrum resources on a coexistence basis without refarming existing usage would provide additional socioeconomic benefits under the condition that spectrum coexistence with incumbent services is feasible and robust. In this context, harmonised standards being developed by ETSI should ensure operational conditions for WAS/RLANs in order to enable the coexistence with other systems in the 5925-6425 MHz band and in the adjacent bands.

In order to identify additional spectrum resources for WAS/RLAN on a shared basis, the Commission submitted a Mandate⁴ to CEPT in 2013 to study and identify harmonised compatibility and sharing conditions for WAS/RLANs in the “5 GHz extension bands” 5350-5470 MHz and 5725-5925 MHz.

CEPT Report 645²⁴ of November 2016 concluded that considering the results of the studies, it is not currently possible to specify any appropriate mitigation techniques and/or operational compatibility and sharing conditions that would allow WAS/RLANs to be operated in the 5350-5470 MHz and 5725-5925 MHz while ensuring relevant protection of incumbent services in these bands. However, studies are ongoing into mitigation techniques in these bands, and in addition, the studies done in CEPT Report 57 and 64 are being updated by further work that is currently taking place under the WRC-19 Agenda Item 1.16.

The outcome of the Mandate submitted to CEPT in 2013 does not allow the Commission to proceed with a harmonisation measure on WAS/RLANs in the bands 5350-5470 MHz and 5725-5925 MHz. However, there is an interest²⁵ to explore new opportunities for making available additional spectrum in the 5925-6425 MHz band for WAS/RLANs while protecting other radio services / applications currently using the 5925-6425 MHz band.

Relevant coexistence solutions for possible usage of the band 5925-6425 MHz by WAS/RLAN systems still need to be identified, defined and developed. They may imply operational developments enabling the implementation of a coexistence framework. An innovative coexistence solution increases the complexity and needs time before the practical implementation, in particular due to the need to validate and to implement solutions.

The “Justification” is:

²³ EC Rec 2003/203/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:078:0012:0013:EN:PDF>

²⁴ <http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP064.PDF>

²⁵ ETSI ERM is developing a System Reference document (SRDoc) TR 103 524 on Wireless access systems including radio local area networks (WAS/RLANs) in the band 5925 MHz to 6725 MHz

Pursuant to Article 4(2) of the Radio Spectrum Decision²⁶, the Commission may issue mandates to the CEPT for the development of technical implementing measures with a view to ensuring harmonised conditions for the availability and efficient use of radio spectrum necessary for the functioning of the internal market. Such mandates shall set the tasks to be performed and their timetable.

Pursuant to Article 6 of the Radio Spectrum Policy Programme (RSPP)²⁷, the Commission shall, in cooperation with Member States, assess the justification and feasibility of extending the allocations of spectrum for wireless access systems, including radio local area networks operating under general authorisations regime. In addition, Article 3(c) of the RSPP requires Member States, in cooperation with the Commission, to take all steps necessary to ensure that sufficient spectrum for coverage and capacity purposes is available for achieving the target for all citizens to have access to broadband speeds of not less than 30 Mbps by 2020. In order to meet future broadband connectivity needs, the Commission proposes that by 2025 all schools, transport hubs and main providers of public services as well as digitally intensive enterprises should have access to internet connections with download/upload speeds of 1 Gigabit of data per second²⁸. In addition, all European households, rural or urban, should have access to networks offering a download speed of at least 100 Mbps, which can be upgraded to 1 Gigabit.

In view of the above broadband connectivity objectives as part of the Digital Single Market Strategy and Digital Agenda for Europe and considering the steadily increasing amount of data traffic delivered through fixed broadband networks, the Commission considers WAS/RLAN frequency bands as part of the solutions for the provision of internet-based services. It is therefore necessary to ensure that sufficient spectrum resources are made available on a harmonised basis to support a long-term future for new generations of WAS/RLAN technologies that will provide increasing data capacity and speed.

Recent studies carried out by WAS/RLAN industry point to the ever growing number and diversity of devices for WAS/RLAN along with increased connection speeds and data traffic volumes will exceed the capacity of spectrum currently available in the 5 GHz band by 2020. Between 500 MHz and 1 GHz of additional spectrum in various world regions may be needed to support expected growth in WAS/RLAN usage by 2020. Additional spectrum identified for WAS/RLAN should support wide channels which are required for a growing number of applications which need a large bandwidth to achieve Gigabit speeds.

The Commission focuses on the 5925-6425 MHz band as a promising alternative to 5 GHz where spectrum currently available for WAS/RLAN cannot be extended given the outcome of the previous Mandate (2013).

However, such an opportunity can only be realised if appropriate coexistence conditions between WAS/RLAN and radio applications in the band 5925-6425 MHz are identified and able to provide confidence to all spectrum users. It will therefore be necessary to carry out the appropriate technical studies and identify suitable compatibility and coexistence conditions to fully safeguard the operation of all radio services / applications currently using the band 5925-6425 MHz as well as the bands adjacent to this band.

CEPT should work in cooperation with ETSI and take into account international harmonisation, as appropriate, in order that any opportunities for even greater economies of scale for manufacturers of WAS/RLAN equipment can be realised.

The “Task Order” is:

The objective of this Mandate is to (1) study regulatory and technical feasibility of the introduction of WAS/RLANs in the band 5925-6425 MHz, including an assessment of coexistence scenarios for WAS/RLANs to operate on a coexistence basis to (2) develop harmonised compatibility and coexistence conditions and propose relevant harmonised technical conditions for WAS/RLAN usage subject only to general authorisations, if technically feasible.

²⁶ Decision 676/2002/EC 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community

²⁷ Decision 243/2012/EU of 14 March 2012

²⁸ (COM(2016) 587) Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society

The CEPT is thereby mandated to carry out the following tasks:

Task 1 – Assessment and study of compatibility and coexistence scenarios in the band 5925-6425 MHz

To study and assess compatibility and coexistence scenarios for WAS/RLANs in the 5925-6425 MHz band and identify relevant parameters and coexistence conditions to be implemented in the regulatory framework in order to enable coexistence between existing usages and WAS/RLAN systems without constraining incumbent uses in various Member States in and adjacent to the band 5925-6425 MHz including at the outer EU border.

For each compatibility/coexistence scenario, the risk of interference, the deployment assumptions of all applications, the geographical extent of usage and consequential restrictions in WAS/RLAN deployment should be identified as well as requirements for implementing such scenarios, e.g. in terms of harmonised technical parameters or in terms of other regulatory and operational aspects which support the implementation of a coexistence framework.

Task 2 – Development of harmonised technical conditions

Taking into account the results of task 1, for the band 5925-6425 MHz develop appropriate mitigation techniques and/or operational compatibility/coexistence conditions. In the light of experience, these conditions should in particular identify the harmonised technical parameters that would be needed to ensure in the internal market consistent harmonised conditions for WAS/RLANs operating on a coexistence basis, if technically feasible. This should be developed in close cooperation with ETSI which is working on harmonised standards which include operational coexistence conditions for WAS/RLANs with other systems in the band and in adjacent bands.

It is assumed in this Mandate that WAS/RLANs could operate on the basis of a general authorisation only. With a view to achieving a scope for worldwide harmonisation of additional spectrum for WAS/RLAN that would strengthen the economies of scale for manufacturers of RLAN equipment and thereby benefit all end-users, the work carried out under this task should take into account developments in other ITU Regions, e.g. through the organisation of a workshop.

In the work carried out under the Mandate, the overall policy objectives of the RSPP, such as effective and efficient spectrum use and the support for specific Union policies shall be given utmost consideration. In implementing this Mandate, the CEPT shall, whenever relevant, take utmost account of EU law applicable and support the principles of service and technological neutrality, non-discrimination and proportionality insofar as technically possible.

CEPT is also requested to collaborate actively with all concerned stakeholders, as for instance, (i) the European Telecommunications Standardisation Institute (ETSI), which develops relevant voluntary harmonised standards for the presumption of conformity under Directive 2014/53/EU and (ii) the Coordination of the Notified Bodies under the same Directive (REDCA), which ensures a harmonised approach in the certification of equipment when manufacturers do not use harmonised standards.

From the EC Mandate that CEPT should provide deliverables according to the following schedule:

Delivery Date	Deliverable	Subject
Nov-18	Interim Report from CEPT to the Commission	Description of work undertaken and interim results of task (1)
Mar-19	Final Draft Report A10 from CEPT to the Commission	Draft results under task (1)
Mar-20	Final Report A from CEPT to the Commission taking into account the outcome of the public consultation Final Draft Report B10 from CEPT to the Commission	Final results under task (1) Draft results under task (2)
Jul-20	Final Report B from CEPT to the Commission taking into account the outcome of the public consultation	Final results under task (2)

DIGITALEUROPE has concerns that the delivery date for Report A and Report B is 2020 which is after the WRC-19 and doesn't seem to take into account the urgency of securing access to additional new spectrum for WAS/RLAN (noting that two WRCs are likely not to have delivered any new spectrum plus there is the risk at WRC-19 for yet another new Agenda Item being agreed).

Article 3(c) of the Radio Spectrum Policy Programme (RSPP)²⁹ requires Member States, in cooperation with the European Commission, to take all steps necessary to ensure that sufficient spectrum for coverage and capacity purposes is available for achieving the target for all citizens to have access to broadband speeds of not less than 30 Mbps by 2020. In order to meet future broadband connectivity needs, the European Commission proposes that by 2025 all schools, transport hubs and main providers of public services as well as digitally intensive enterprises should have access to internet connections with download/upload speeds of 1 Gigabit of data per second.

In addition, all European households, rural or urban, should have access to networks offering a download speed of at least 100 Mbps, which can be upgraded to 1 Gigabit. In view of the above broadband connectivity objectives as part of the Digital Single Market Strategy and Digital Agenda for Europe and considering the steadily increasing amount of data traffic delivered through fixed broadband networks, the European Commission considers WAS/RLAN frequency bands as essential spectrum resource for the provision of internet-based services.

DIGITALEUROPE applauds the European Commission "Mandate to CEPT to study feasibility and identify harmonised technical conditions for Wireless Access Systems including Radio Local Area Networks in the 5925-6425 MHz band for the provision of wireless broadband services". Noting that it is not possible for the European Commission to proceed further with harmonisation measures on RLAN in the bands 5350-5470 MHz and 5725-5925 MHz, DIGITALEUROPE believes it is vital to pursue a potential way forward by examining the possibilities of making available additional spectrum in the 6 GHz band (5925-6425 MHz) for WAS/RLAN on a shared basis.

DIGITALEUROPE supports the European Commission overall policy objective to ensure effective and efficient spectrum use and support the principles of service and technological neutrality, non-discrimination and proportionality insofar as technically possible.

DIGITALEUROPE supports the European Commission vision that it is necessary to ensure that sufficient spectrum resources are available on a harmonised basis to support a long-term future for new generations of WAS/RLAN technologies that will provide increasing data capacity and speed.

12. Product Availability

Harmonisation Aspects: A key aspect for WAS/RLAN industry is to achieve global and regional harmonisation, so as to enable economy-of-scale advantages. Enabling global and regional scale provides confidence to operators, vendors and businesses to invest at an early stage in the development of new WAS/RLAN deployments and the creation of the new ecosystem. This helps develop a competitive market with a wide range of products and services with the benefit to all, including consumers and a nation's productivity and competitiveness. From a

²⁹ Decision 243/2012/EU of 14 March 2012, OJ L 81 of 21.3.2012

regulatory perspective, such harmonization also helps agencies in charge of market surveillance by creating a common platform for product compliance that is understood uniformly by all market players.

Equipment Availability: A broad range of WAS/RLAN products will become available in 5925-6425 MHz frequency range in line with market demand. Chipset suppliers are committed to supporting the 5925-6425 MHz frequency range and started already the development of chipsets for this new frequency range. In broad terms, Regulators should develop strategies for making available the 5925-6425 MHz frequency range. Commercial readiness of WAS/RLAN equipment for the 5925-6425 MHz frequency range is expected in 2018 targeting broader commercialisation from 2019.

Noting the potential for significant harmonisation of the 5925-6425 MHz frequency range, and the availability of WAS/RLAN product in a timely manner, DIGITALEUROPE recommends Regulators should develop strategies for making available the 5925-6425 MHz frequency range.

13. License-Exempt use of 5925-6425 MHz

DIGITALEUROPE prefers Regulators take a license-exempt approach for the 5925-6425 MHz frequency range in a similar manner to the existing 5 GHz WAS/RLAN frequency ranges.

A common approach employed by European countries may greatly influence rapid deployment of WAS/RLAN deployment in the 5725-6425 MHz frequency range throughout Europe.

DIGITALEUROPE recommends that a license-exempt approach is adopted to make the 5925-6425 MHz frequency band available for WAS/RLAN.

14. Regulatory Considerations

DIGITALEUROPE suggests that while there are no international regulatory impediments at an ITU (Region 1) level, due to the already existing MOBILE allocation, there is a constraint at a European level since this MOBILE allocation for 5925-6700 MHz has not been implemented within the European Common Allocation ECA table. This lack of a MOBILE allocation at a European level is introducing regulatory impediments to the implementation of WAS/RLANs in 5925-6425 MHz frequency range.

Based on the current limitations in the regulations DIGITALEUROPE suggests the following proposed regulations should be considered for implementation enabling WAS/RLANs access to the 5925-6425 MHz frequency range:

1. European Common Allocation implement Radio Regulations Region 1 MOBILE Allocation
2. ECC Decision “harmonised use of the 6 GHz frequency bands for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs)”
3. EC Decision “harmonised use of radio spectrum in the 6 GHz frequency band for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs)”

Designating an uninterrupted block of spectrum in the 5925-6425 MHz frequency range for WAS/RLANs would result in up to 500 MHz of newly available spectrum, and may also result in an increase of the number of channels with wider channel bandwidth, therefore ensuring that sufficient spectrum capacity for private and public RLAN deployments will be available throughout Europe.

DIGITALEUROPE believes that these proposed regulatory amendments are necessary for WAS/RLANs license exempt technologies to access the 5925-6425 MHz frequency range under the least restrictive regulations conditions. Benefits of these changes include higher spectrum efficiency and fairer approaches to spectrum access/utilization.

15. Observations, Conclusions and Recommendations

This DIGITALEUROPE whitepaper presents justification on the need for additional new license exempt spectrum for Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) in the 5925-6425 MHz frequency range to support future growth. In Europe, to meet the WAS/RLAN spectrum shortfall, between 500 MHz and 1 GHz of additional spectrum may be needed to support expected growth in RLAN by 2020.

DIGITALEUROPE's Observations, Conclusions and Recommendations are:

- DIGITALEUROPE considers that the 5925-6425 MHz frequency range offers significant potential to assist meeting the spectrum needs identified by the WFA; “between 500 MHz and 1 GHz of additional spectrum in various world regions may be needed to support expected growth in RLAN by 2020” and “if demand for RLAN exceeds expected growth, then between 1.3 GHz and 1.8 GHz more spectrum may be required by 2025”.
- DIGITALEUROPE is concerned that the WRC-19 will be unable to identify any new spectrum suitable for WAS/RLAN which is worrying considering the ever increasing growth in traffic.
- DIGITALEUROPE supports European efforts (outside of the WRC-19 process) to identify suitable frequency range(s) that could be utilised to meet this demand in Europe, and we consider the 5925-6425 MHz frequency range the most promising in terms of coverage, incumbent compatibility and sufficient contiguous wide channels.
- DIGITALEUROPE suggests the MOBILE allocation in Region 1 for the 5925-6700 MHz could form the basis for WAS/RLAN deployment in Europe within the 5925-6425 MHz frequency range.
- DIGITALEUROPE suggests that the European Common Allocation Table (ECA Table) should be amended to reflect the ITU-R Region 1 MOBILE allocation which could then be implemented at a European level to enable access to 5925-6425 MHz frequency range for WAS/RLAN.
- DIGITALEUROPE suggests that a CEPT survey should be undertaken to determine the availability of location and operating conditions of existing Fixed Service stations in the 5925-6425 MHz frequency band since this will assist in the coexistence studies.
- DIGITALEUROPE suggests that a combination of various mitigation techniques could be considered to enable sharing the 5925-6425 MHz frequency range with incumbent users.
- DIGITALEUROPE assumes that the development of compatibility and sharing conditions for RLAN in the 5925-6425 MHz should be less problematic than in the previously proposed extension bands at 5 GHz (5350-5470 MHz and 5725-5925 MHz) mainly in regard to a different composition of the incumbent use of the band.
- DIGITALEUROPE notes the complexity of the 5925-6425/6725 MHz Standards and Regulatory Ecosystem and recommends that consideration is given when setting meetings to ensure maximum Industry participation and to avoid, where possible, overlaps with other important meetings.

- DIGITALEUROPE applauds the European Commission “Mandate to CEPT to study feasibility and identify harmonised technical conditions for Wireless Access Systems including Radio Local Area Networks in the 5925-6425 MHz band for the provision of wireless broadband services”. Noting that it is not possible for the European Commission to proceed further with harmonisation measures on RLAN in the bands 5350-5470 MHz and 5725-5925 MHz, DIGITALEUROPE believes it is vital to pursue a potential way forward by examining the possibilities of making available additional spectrum in the 6 GHz band (5925-6425 MHz) for WAS/RLAN on a shared basis.
- DIGITALEUROPE supports the European Commission overall policy objective to ensure effective and efficient spectrum use and support the principles of service and technological neutrality, non-discrimination and proportionality insofar as technically possible.
- DIGITALEUROPE supports the European Commission vision that it is necessary to ensure that sufficient spectrum resources are available on a harmonised basis to support a long-term future for new generations of WAS/RLAN technologies that will provide increasing data capacity and speed.
- Noting the potential for significant harmonisation of the 5925-6425 MHz frequency range, and the availability of WAS/RLAN product in a timely manner, DIGITALEUROPE recommends Regulators should develop strategies for making available the 5925-6425 MHz frequency range.
- DIGITALEUROPE recommends that a license exempt approach is adopted to make the 5925-6425 MHz frequency band available for WAS/RLAN.
- DIGITALEUROPE believes that these proposed regulatory amendments are necessary for WAS/RLANs license exempt technologies to access the 5925-6425 MHz frequency range under the least restrictive regulations conditions. Benefits of these changes include higher spectrum efficiency and fairer approaches to spectrum access/utilization.

16. List of Acronyms and Abbreviations

AR / VR - Augmented Reality / Virtual Reality

CEPT - European Conference of Postal and Telecommunications (Administrations)

CPG - Conference Preparatory Group

DFS - Dynamic Frequency Selection

DL - Down Link

ECA Table - European Common Allocations Table

EC - European Commission

ECO - European Communications Office

ECC - Electronics Communications Committee

ETSI - European Telecommunications Standards Institute

FCC - Federal Communications Commission

IMT - International Mobile Telecommunications

ITU-R - International Telecommunications Union - Radiocommunication Sector

LBT - Listen Before Talk

MIMO - Multiple Input Multiple Output

RLAN - Radio Local Area Network

RSCoM - Radio Spectrum Committee

RSPP - Radio Spectrum Policy Programme

SRDoc - System Reference Document

TCP - Transmit Power Control

UWB - Ultra Wide Band

WAS - Wireless Access Systems

WFA - Wi-Fi Alliance

WLAN - Wireless Local Area Networking

WRC-15 - World Radiocommunication Conference 2015

WRC-19 - World Radiocommunication Conference 2019

ABOUT DIGITALEUROPE

DIGITALEUROPE represents the digital technology industry in Europe. Our members include some of the world's largest IT, telecoms and consumer electronics companies and national associations from every part of Europe. DIGITALEUROPE wants European businesses and citizens to benefit fully from digital technologies and for Europe to grow, attract and sustain the world's best digital technology companies. DIGITALEUROPE ensures industry participation in the development and implementation of EU policies.

DIGITALEUROPE's members include in total 25,000 ICT Companies in Europe represented by 60 corporate members and 37 national trade associations from across Europe. Our website provides further information on our recent news and activities: <http://www.digitaleurope.org>

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National Trade Associations

Austria: IOÖ	France: AFNUM, Syntec Numérique, Tech in France	Romania: ANIS, APDE TIC
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Belgium: AGORIA	Greece: SEPE	Slovenia: GZS
Bulgaria: BAIT	Hungary: IVSZ	Spain: AMETIC
Croatia: Croatian Chamber of Economy	Ireland: TECHNOLOGY IRELAND	Sweden: Foreningen Teknikföretagen i Sverige, IT&Telekomföretagen
Cyprus: CITEA	Italy: Anitec-Assinform	Switzerland: SWICO
Denmark: DI Digital, IT-BRANCHEN	Lithuania: INFOBALT	Turkey: Digital Turkey Platform, ECID
Estonia: ITL	Netherlands: Nederland ICT, FIAR	Ukraine: IT UKRAINE
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