CEPT ECC
Electronic Communications Committee

CEPT Report 087

Report from CEPT to the European Commission in response to the Mandate to review the limit of out-of-band (OOB) Emissions below 5935 MHz applicable to Very Low Power (VLP) WAS/RLAN devices

approved on 08 November 2024

0 EXECUTIVE SUMMARY

This CEPT Report addresses the response to the Mandate from the European Commission to CEPT to review the limit of out-of-band (OOB) emissions below 5935 MHz applicable to Very Low Power (VLP) WAS/RLAN devices (see ANNEX 1). In this Report, Communication Based Train Control (CBTC) refers to Urban Rail Intelligent Transport Systems (ITS).

As part of the work in response to Task 1, ECC Report 355 [1] on measurement-based compatibility studies assessing interference from Very Low Power (VLP) Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) operating in 5945-6425 MHz to Communication Based Train Control (CBTC) systems operating in 5915-5935 MHz has been developed. It contains the results of technical assessment with respect to the OOB emission limit below 5935 MHz for VLP WAS/RLAN devices operating in the 6 GHz band.

Based on the results of the different studies, CEPT proposes to European Commission to relax the OOB emission levels for VLP WAS/RLAN below 5935 MHz to -37 dBm/MHz, given that VLP devices shall first attempt to select a frequency block above 6105 MHz when initiating a communication session. Alternatively, where no such mechanism is implemented, then a maximum mean *e.i.r.p.* density for out-of-band emissions of -45 dBm/MHz below 5935 MHz applies.

VLP devices using the frequency band below 6105 MHz are assumed to use a Transmit Power Control (TPC) mechanism in line with the revised ECC Decision (20)01.

In response to Task 2 of the EC Mandate, the proposed amendments on the regulatory framework of Commission Implementing Decision (EU) 2021/1067 for VLP WAS/RLAN devices [6] are provided in Section 4. An additional proposed modification is provided for Low Power Indoor (LPI) WAS/RLAN devices installed in train and aircraft.

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LIST OF ABBREVIATIONS

Abbreviation	Explanation
ANFR	Agence Nationale des Fréquences (National Frequency Agency (France))
AP	Access Point
ATC	Automatic Train Control
BNetzA	Bundesnetzagentur (Federal Network Agency, Germany)
CBTC	Communication-based Train Control
CEPT	European Conference of Postal and Telecommunications Administrations
DSSS	Direct-Sequence Spread Spectrum
EC	European Commission
ECC	Electronic Communications Committee
e.i.r.p.	Effective isotropic radiated power
ETSI	European Telecommunications Standards Institute
EU	European Union
IEEE	Institute of Electrical and Electronics Engineers
I/N	Interference to noise ratio
ITS	Intelligent Transport Systems
JRC	Joint Research Centre of the European Commission
MP	Urban metro type
NB	Narrowband
OOB	Out-of-band
RER	Réseau Express Régional
RLAN	Radio Local Area Network
SINR	Signal to interference plus noise ratio
TPC	Transmit Power Control
TU	Train Unit
VLP	Very Low Power
WAS	Wireless Access System

1 INTRODUCTION

This CEPT Report addresses the response to EC Mandate to review the limit of out-of-band (OOB) emissions below 5935 MHz applicable to Very Low Power (VLP) WAS/RLAN devices (see ANNEX 1).

In 2020, CEPT approved ECC Decision (20)01 [3] on the harmonised use of the frequency band 5945 - 6425 MHz for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN). At the time, CEPT Report 73 [4] and CEPT Report 75 [5] were developed in response to the EC 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 [9].

Based on the outcomes provided by CEPT in those CEPT Reports, the European Commission set out Commission Implementing Decision (EU) 2021/1067 of 17 June 2021 on the harmonised use of radio spectrum in the 5945-6425 MHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLAN) [6].

Communication-based Train Control (CBTC) is operating in the 5915-5935 MHz band as safety-related Urban Rail Intelligent Transport Systems (ITS). Its regulatory framework is set out in ECC Decision (08)01 [7] on the Harmonised use of the Safety-Related Intelligent Transport Systems (ITS) in the 5875-5935 MHz frequency band, and in the Commission Implementing Decision (EU)2020/1426 of 7 October 2020 on the harmonised use of radio spectrum in the 5875-5935 MHz frequency band for safety-related applications of intelligence transport systems (ITS) and repealing Decision 2008/671/EC [8].

ECC Report 302 [2] studied the in-band and adjacent bands coexistence scenarios between WAS/RLAN and the incumbent usages in the frequency band 5925-6425 MHz. In the particular case of CBTC, it contains technical studies performed to assess the compatibility between WAS/RLAN operating in 5925-6425 MHz and CBTC operating below 5935 MHz.

In ECC Decision (20)01 as published in November 2020, a value of -45 dBm/MHz OOB limit below 5935 MHz for VLP WAS/RLAN was agreed for the protection of the CBTC operating in the 5915-5935 MHz band as well as to allow VLP WAS/RLAN initial market to take up. This OOB emission limit should be valid until 31 December 2024 and be re-examined with regard to an opportunity to relax it based on the real IEEE and Direct-Sequence Spread Spectrum (DSSS) Urban Rail interference situation. In absence of the justified evidence, a value of -37 dBm/MHz, for the OOB emission limit below 5935 MHz, will be adopted from 1 January 2025.

As a consequence of the EC Mandate to review the limit of OOB emissions below 5935 MHz applicable to VLP WAS/RLAN devices , CEPT performed complementary studies, based on field measurements, contained in ECC Report 355 [1] on requirements and possible mitigation techniques for protection of Urban Rail ITS and to investigate interference scenarios from VLP WAS/RLANs in the 5945 - 6425 MHz band to Urban Rail ITS operating in the 5915-5935 MHz band.

An additional topic was analysed regarding the Low Power Indoor (LPI) devices and its installation in train and aircraft. WAS/RLAN systems for broadband connection onboard trains and aircrafts typically use distributed antenna systems to provide good and evenly spread coverage in the passenger carriage, thus a note with the clarification on the use of distributed antenna system in these use cases is added in the proposed update of the regulatory framework.

This CEPT Report presents the outcome of the CEPT work for the review of the regulatory framework on the harmonised use of the frequency band 5945-6425 MHz for WAS/RLAN.

2 BACKGROUND

2.1 WAS/RLAN OPERATING IN THE 5945-6425 MHZ BAND

ECC Decision (20)01 [3] harmonises the use of the frequency band 5945-6425 MHz for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) at CEPT level.

At European Union level, the regulatory framework of this application in the 5945-6425 MHz band is set out in Commission Implementing Decision (EU)2021/1067 of 17 June 2021 [6]. WAS/RLAN devices operate under a general authorisation regime (see CEPT Report 75 [5]) and WAS/RLAN devices cannot be coordinated or mitigated once they are on the market.

Very low Power (VLP) WAS/RLAN are portable devices with maximum mean effective isotropic radiated power (*e.i.r.p.*) of 25 mW that may operate both indoor and outdoor. The VLP WAS/RLAN outdoor use is intended to cover short range applications for small area direct communications. VLP WAS/RLAN shall comply with the harmonised technical conditions listed in Table 2 of Annex A1.2 of ECC Decision (20)01, within CEPT, and in Table 2 of Annex of Commission Implementing Decision (EU)2021/1067 of 17 June 2021, within the European Union.

WAS/RLAN contribute to achieving the objectives of EU's gigabit society and, as consumer products, benefit from EU's single market.

2.2 URBAN RAIL ITS USING CBTC OPERATING IN THE 5915-5935 MHZ BAND

CBTC is a wireless Automatic Train Control (ATC) application used along urban or suburban railway lines. Due to the short headway of trains, an emergency brake of a single train due to interference will affect operation of the whole line.

ECC Decision (08)01 [7] harmonises the use of Safety-Related Intelligent Transport Systems (ITS) in the 5875-5935 MHz frequency band, where Urban Rail ITS operates in the band 5915-5935 MHz under the conditions specified in *DECIDES 4* of that ECC Decision.

At European Union level, the regulatory framework of ITS applications operating in 5875-5935 MHz band is set out in Commission Implementing Decision (EU) 2020/1426 of 7 October 2020 [8] .Urban Rail ITS using CBTC operates in 5915-5935 MHz band under the conditions specified in Article 3 of this Commission Implementing Decision.

CBTC contributes to achieving EU's objectives for sustainable and reliable public transports. CBTC is characterised by long-term investments and life cycle.

3 SUMMARY OF TECHNICAL ASSESSMENT

The content of this section is the Executive summary of ECC Report 355 on measurement-based compatibility studies assessing interference from Very Low Power (VLP) Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) operating in 5945-6425 MHz to Communication Based Train Control (CBTC) systems operating in 5915-5935 MHz.

“ECC Report 302 and CEPT Report 75 studied the coexistence between Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) operating above 5945 MHz and Communication Based Train Control (CBTC) operating below 5935 MHz. ECC Decision (20)01 harmonises the use of WAS/RLAN in the 5945-6425 MHz band, including Very Low Power (VLP) portable use, with maximum mean[1] 25 mW *e.i.r.p.*, that may operate both indoor and outdoor. VLP WAS/RLAN devices are in the scope of this Report.

ECC Decision (20)01 as published in November 2020 mentioned that "It should be noted that the -45 dBm/MHz OOB limit below 5935 MHz for VLP would allow VLP initial market to take up. CEPT also agreed that this OOB limit should be valid in time only until 31 December 2024 and be re-examined with regard to an opportunity to relax it based on the real IEEE and DSSS Urban Rail interference situation. In absence of the justified evidence, a value of -37 dBm/MHz, for the OOB limit below 5935 MHz, will be adopted from 1 January 2025." ECC Decision is expected to be amended in due course.

This Report gathers findings of laboratory and field measurement campaigns as well as additional studies with the aim of re-examining the OOB emission limit below 5935 MHz for VLP WAS/RLAN devices operating in the 6 GHz band. The measurement campaigns were conducted thanks to the help of the French administration ANFR, the German administration BNetzA, the JRC, and CBTC and WAS/RLAN industry stakeholders.

These measurement campaigns provided new technical elements relevant for interference to a single CBTC link. The studies in the Report first analyse single link interference scenarios. Then based on these analyses, the Report provides probabilistic assessments of the overall risk of interference to the CBTC system. No measurement was performed on the overall resilience of the system to interference.

This Report considered the following four scenarios:

- Scenario 1: impact of a VLP WAS/RLAN operated on a platform to CBTC Access Point (AP);
- Scenario 2: impact of a VLP WAS/RLAN operated on a platform to CBTC Train Unit (TU);
- Scenario 3: impact of a VLP WAS/RLAN operated onboard a train to CBTC TU;
- Scenario 4: impact of a VLP WAS/RLAN operated onboard a train to CBTC AP.

Studies conducted in this Report include:

- Coupling loss approach: VLP OOB emissions potential impact on CBTC through an I/N analysis;
- Coupling loss approach: VLP OOB emissions potential impact on CBTC through an SINR analysis;
- Coupling loss approach: VLP in-band and OOB emissions potential impact on CBTC through a protection ratio analysis;
- Statistical assessments of the overall risk of interference to the CBTC system.

From these studies, it was observed that the critical scenario for the studied RER train is Scenario 2 (VLP on platform vs CBTC TU), while the critical scenario for the studied metro types[2] (labelled as MP14, MP89, and MP05) is Scenario 3 (VLP onboard vs CBTC TU).

3.1 RESULTS OF COUPLING LOSS STUDIES

Some studies demonstrated that VLP with OOB emission levels at both -37 dBm/MHz and -45 dBm/MHz can lead, for some scenarios, to degradation of performance of a single CBTC radio link. The risk of interference is shown to be increased by relaxing the OOB emissions from -45 dBm/MHz to -37 dBm/MHz.

[1] The "mean *e.i.r.p.*" refers to the *e.i.r.p.* during the transmission burst, which corresponds to the highest power, if power control is implemented.
[2] For the definition of RER trains and metro trains refer to ECC Report 355, section 2.4.2

Some other studies demonstrated that with both OOB emission levels there is no degradation of performance of a single CBTC radio link, except for one studied metro type (MP14), lacking a margin of less than 1 dB due to its lower measured coupling loss[3].

The different results mainly come from the variation in the assumptions used for the noise floor, the minimum CBTC signal level, the modulation and the body loss. It was also observed that the coupling loss between the passenger cabin and the CBTC TU can vary significantly between trains. Therefore, the variation in the coupling loss has a significant impact on the coexistence between VLP WAS/RLAN and CBTC.

3.2 RESULTS OF STATISTICAL STUDIES

Noting that an emergency brake is automatically triggered if a train is not able to receive and successfully demodulate the movement authority message for a period of typically 2.5 s, statistical studies were conducted.

A first statistical analysis further analysed the MP14 case and showed that the likelihood of interference is low.

A second statistical analysis on the impact from a VLP WAS/RLAN on platform to a CBTC TU showed that the risk of single link interference is increased from 2.5% to 43% of trains entering a platform when relaxing OOB emissions from -45 dBm/MHz to -37 dBm/MHz, and could be mitigated by transmit power control. It is expected some interference would affect the useful link of a TU, therefore the CBTC system would be affected, although still able to cope in most cases (nominal mode). The system would become more exposed in case of double failures, and in those very rare but critical events, there could be instances of partial or total loss of CBTC communication. A sensitivity analysis showed that with a minimum CBTC signal level of -77 dBm/MHz over the platforms there is no interference with the OOB emissions of -37 dBm/MHz.

A third statistical analysis on the impact from a VLP WAS/RLAN onboard to a CBTC TU showed that the number of interference events per 24 hours (lasting more than 1 second) is low for OOB emissions at -45 dBm/MHz, but substantially increased with OOB emissions relaxed to -37 dBm/MHz (70-fold increase). The study also showed that VLP with OOB emissions at -37 dBm/MHz are unlikely to produce harmful interference to CBTC under the following conditions:

- A VLP would select lower channels below 6105 MHz only if the spectrum access mechanism has failed with the upper channels. When channels below 6105 MHz are used, the channel selection would be reassessed approximately every 100 seconds, for example;
- Transmit Power Control (TPC) would be able to reduce the total power from VLP maximum transmit power P_{max} down to at least P_{max} – 6 dB.

Some possible mitigation techniques on both VLP WAS/RLAN and CBTC and their possible implications are described in section 8.

It has to be noted that the one CBTC receiver with 10 MHz bandwidth measured (Annex 5) responds heterogeneously to changes of OOB emission levels and WAS/RLAN bandwidths. The laboratory measurements did not highlight a CBTC receiver selectivity issue. The measurements of characteristics of this receiver were conducted specifically for the purpose of this study and are not meant to be used or referenced outside the scope of this Report."

[3] Metro MP14 exhibits a 44.2 dB coupling loss while metros MP89 and MP05 exhibit 50.1 dB and 54.2 dB, respectively

4 RECOMMENDED REGULATORY FRAMEWORK

In order to take into account the results of the different studies, it is recommended to update and adopt the regulatory framework in accordance to the revised ECC Decision (20)01 as follows. CEPT concludes that these proposed amendments, which are a variation of some of the results of the technical studies, ensure the protection of incumbent users.

Add a new recital:

> "that VLP devices using the frequency band below 6105 MHz use a Transmit Power Control (TPC) mechanism or adhere to a maximum mean *e.i.r.p.* density for out-of-band emissions of -45 dBm/MHz below 5935 MHz;"

Update the technical Annex:

Table 1: Update to the regulatory framework for Low Power Indoor (LPI) WAS/RLAN devices

Parameter	Technical conditions
Permissible operation	Restricted to indoor use only (including trains where metal coated windows (note 1) are fitted and aircraft) Outdoor use (including in road vehicles) is not permitted.
Category of device	An LPI access point or bridge that is supplied power from a wired connection, has an integrated antenna (note 3) and is not battery powered. An LPI client device is a device that is connected to an LPI access point or another LPI client device and may or may not be battery powered.
Frequency band	5945-6425 MHz
Channel access and occupation rules	An adequate spectrum sharing mechanism shall be implemented.
Maximum mean *e.i.r.p.* for in-band emissions (note 2)	23 dBm
Maximum mean *e.i.r.p.* density for in-band emissions (note 2)	10 dBm/MHz
Maximum mean *e.i.r.p.* density for out-of-band emissions below 5935 MHz (note 2)	-22 dBm/MHz

Note 1: Or similar structures made of material with comparable attenuation characteristics.

Note 2: The "mean *e.i.r.p.*" refers to the *e.i.r.p.* during the transmission burst, which corresponds to the highest power, if power control is implemented.

Note 3: Or a distributed antenna system installed inside a train or an aircraft.

Table 2: Update to the regulatory framework for Very Low Power (VLP) WAS/RLAN devices

Parameter	Technical conditions
Permissible operation	Indoors and outdoors. Use on Unmanned Aircraft Systems (UAS) is not permitted.
Category of device	The VLP device is a portable device
Frequency band	5945-6425 MHz
Maximum mean *e.i.r.p.* for in-band emissions (note 1)	14 dBm
Maximum mean *e.i.r.p.* density for in-band emissions (note 1)	1 dBm/MHz
Narrowband usage maximum mean *e.i.r.p.* density for in-band emissions (note 1) (note 2)	10 dBm/MHz
Maximum mean *e.i.r.p.* density for out-of-band emissions below 5935 MHz (note 1)	~~-45~~ -37 dBm/MHz ~~until 31 December 2024 (note 3)~~ (note 3)

Note 1: The mean *e.i.r.p.* refers to the *e.i.r.p.* during the transmission burst which corresponds to the highest power, if power control is implemented.

Note 2: Narrowband (NB) devices are devices that operate in channel bandwidths below 20 MHz. NB devices also require a frequency hopping mechanism based on at least 15 hop channels to operate at a value of in-band power spectral density (PSD) above 1 dBm/MHz.

~~Note 3: The appropriateness of this limit shall be subject to review by 31 December 2024. In the absence of justified evidence, a value of -37 dBm/MHz shall apply from 1 January 2025.~~

Note 3: VLP devices shall first attempt to select a frequency block above 6105 MHz when initiating a communication session. Alternatively, where no such mechanism is implemented, then a maximum mean *e.i.r.p.* density for out-of-band emissions of -45 dBm/MHz below 5935 MHz applies.

Techniques to access spectrum and mitigate interference that provide an appropriate level of performance to comply with the essential requirements of Directive 2014/53/EU shall be used. Where relevant techniques are described in harmonised standards or parts thereof the references of which have been published in the *Official Journal of the European Union* in accordance with Directive 2014/53/EU, performance at least equivalent to the performance level associated with those techniques shall be ensured.

These harmonised technical conditions would have to be applied in the corresponding ETSI harmonised standard to be developed for adoption under Directive 2014/53/EU [10].

5 CONCLUSIONS

This CEPT Report addresses the response to the Mandate from the European Commission to CEPT to review the limit of out-of-band (OOB) emissions below 5935 MHz applicable to Very Low Power (VLP) WAS/RLAN devices (see ANNEX 1). In this Report, Communication Based Train Control (CBTC) refers to Urban Rail Intelligent Transport Systems (ITS).

As part of the work in response to Task 1, ECC Report 355 [1] on measurement-based compatibility studies assessing interference from Very Low Power (VLP) Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) operating in 5945-6425 MHz to Communication Based Train Control (CBTC) systems operating in 5915-5935 MHz has been developed. It contains the results of technical assessment with respect to the OOB emission limit below 5935 MHz for VLP WAS/RLAN devices operating in the 6 GHz band.

Based on the results of the different studies, CEPT proposes to European Commission to relax the OOB emission levels for VLP WAS/RLAN below 5935 MHz to -37 dBm/MHz, given that VLP devices shall first attempt to select a frequency block above 6105 MHz when initiating a communication session. Alternatively, where no such mechanism is implemented, then a maximum mean *e.i.r.p.* density for out-of-band emissions of -45 dBm/MHz below 5935 MHz applies.

VLP devices using the frequency band below 6105 MHz are assumed to use a Transmit Power Control (TPC) mechanism in line with the revised ECC Decision (20)01.

In response to Task 2 of the EC Mandate, the proposed amendments on the regulatory framework of Commission Implementing Decision (EU) 2021/1067 for VLP WAS/RLAN devices [6] are provided in Section 4. An additional proposed modification is provided for Low Power Indoor (LPI) WAS/RLAN devices installed in train and aircraft.

ANNEX 1: CEPT MANDATE

Ref. Ares(2021)2664990 - 21/04/2021



EUROPEAN COMMISSION

DIRECTORATE-GENERAL FOR COMMUNICATIONS NETWORKS, CONTENT AND TECHNOLOGY

The Director-General

Brussels,

DG CONNECT/B4

MANDATE TO CEPT
TO REVIEW THE LIMIT OF OUT-OF-BAND (OOB) EMISSIONS BELOW 5935 MHZ APPLICABLE TO VERY LOW POWER (VLP) WAS/RLAN DEVICES

1. PURPOSE

The objective of the mandate is to review and identify the limit of maximum mean e.i.r.p. density of out-of-band emissions below 5935 MHz applicable to very low power (VLP) WAS/RLANs in the 5945-6425 MHz from 1 January 2025 onwards.

2. BACKGROUND

On 20 November 2020, the CEPT published the Report B (CEPT Report 75) entitled '*Harmonised technical parameters for WAS/RLANs operating on a coexistence basis with appropriate mitigation techniques and/or operational compatibility/coexistence conditions, operating on the basis of a general authorisation*'[1] in response to the Commission mandate 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. Harmonised conditions for the availability and efficient use of the frequency band 5945-6425 MHz for wireless access systems including radio local area networks (WAS/RLANs) have been developed on the basis of this report. Regarding the maximum mean e.i.r.p. density limits of VLP WAS/RLAN out-of-band emissions below 5935 MHz, they will be subject to review by the end of 2024 at the latest.

Following the adoption of CEPT Report 75, CEPT launched a review of the maximum mean e.i.r.p. density limits of VLP WAS/RLAN out-of-band emissions below 5935 MHz based on field measurements and the study of protection requirements for urban rail ITS from adjacent bands usage including interference scenarios. This gives an opportunity to review, as appropriate, the RLAN VLP OOB emission limit below 5935 MHz with regard to the possibility to relax the limit.

[1] https://docdb.cept.org/download/aefb853d-8780/CEPT%20Report%2075.pdf

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In the absence of justified evidence, a value of -37 dBm/MHz will be adopted from 1 January 2025.

3. JUSTIFICATION

Pursuant to Article 4(2) of the Radio Spectrum Decision, the Commission may issue mandates to the CEPT for the development and amendment 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.

The maximum mean e.i.r.p. density limits of VLP WAS/RLAN out-of-band emissions below 5935 MHz will be subject to review by the end of 2024 at the latest on the basis of CEPT response to this Commission mandate.

4. TASKS AND SCHEDULE

The CEPT is tasked

1. To study requirements and possible mitigation techniques for protection of urban rail ITS and to investigate interference scenarios, based on field measurements, from very low power (VLP) WAS/RLANs in the 5945-6425 MHz band to urban rail ITS operating in the 5915-5935 MHz band, in accordance with Decision (EU) 2020/1426.

2. Based on the results of task 1, to review and identify the limit of the maximum mean e.i.r.p. density of the out-of-band emissions below 5935 MHz of very low power (VLP) WAS/RLAN devices. The identified limit must protect urban rail ITS operating in the 5915-5935 MHz band in accordance with Decision (EU) 2020/1426 and will be adopted from 1 January 2025, taking into account that in the absence of justified evidence, a value of -37 dBm/MHz will apply.

The CEPT should provide deliverables according to the following schedule:

Delivery date	**Deliverable**	**Subject**
February 2024	Draft Report from CEPT to the Commission	Draft final results of task 1 and 2
June 2024	Final Report from CEPT to the Commission taking into account the outcome of the public consultation	Final results of task 1 and 2

The Commission, with the assistance of the Radio Spectrum Committee and pursuant to the Radio Spectrum Decision, may consider applying the results of this mandate in the EU, pursuant to Article 4 of the Radio Spectrum Decision.

Electronically signed on 19/04/2021 11:15 (UTC+02) in accordance with article 11 of Commission Decision C(2020) 4482

ANNEX 2: LIST OF REFERENCES

[1] ECC Report 355: “Measurement-based compatibility studies assessing interference from Very Low Power (VLP) Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) operating in 5945-6425 MHz to Communication Based Train Control (CBTC) systems operating in 5915-5935 MHz”, approved May 2024

[2] ECC Report 302: "Sharing and compatibility studies related to Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) in the frequency band 5925-6425 MHz”, approved May 2019

[3] ECC Decision (20)01: “on the Harmonised use of the frequency band 5945-6425 MHz for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN)”, approved November 2020

[4] CEPT Report 073: “Report from CEPT to the European Commission in response to the Mandate 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). Report A: Assessment and study of compatibility and coexistence scenarios for WAS/RLAN in the band 5925-6425 MHz”, approved March 2020

[5] CEPT Report 075: “Report from CEPT to the European Commission in response to the Mandate 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).Report B: Harmonised technical parameters for WAS/RLAN operating on a coexistence basis with appropriate mitigation techniques and/or operational compatibility/coexistence conditions, operating on the basis of a general authorisation”, approved November 2020

[6] Decision (EU) 2021/1067: “Commission Implementing Decision (EU) 2021/1067 of 17 June 2021 on the harmonised use of radio spectrum in the 5945-6425 MHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLANs)”

[7] ECC Decision (08)01: “on the Harmonised use of the Safety- Related Intelligent Transport Systems (ITS) in the 5875-5935 MHz frequency band”, approved March 2008, latest amendment November 2022

[8] Decision (EU) 2020/1426: Commission Implementing Decision (EU) 2020/1426 of 7 October 2020 on the harmonised use of radio spectrum in the 5875-5935 MHz frequency band for safety-related applications of intelligence transport systems (ITS) and repealing Decision 2008/671/EC

[9] 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

[10] Directive 2014/53/EU: “Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC”