



ECC Recommendation (15)04

Guidance for the implementation of a sharing framework
between MFCN and PMSE within 2300-2400 MHz

Approved 3 July 2015

INTRODUCTION

ECC/DEC/(14)02 [1] was developed with the purpose of providing harmonised technical and regulatory conditions for mobile/fixed communications networks (MFCN), including broadband wireless systems (BWS) in the frequency band 2300-2400 MHz. It includes the least restrictive technical conditions (LRTC), taking into account the existing standardisation framework and activities at worldwide level, and an appropriate frequency arrangement.

ECC/DEC/(14)02 describes the various incumbent usages across CEPT in the band 2300-2400 MHz and also recognises that administrations, wishing to introduce MFCN in the band, and maintain the long term incumbent use of the band in their territory, should develop an appropriate sharing framework.

Licensed Shared Access (LSA), as defined by RSPG in [2] and further described in ECC Report 205 [3], is the recognised approach at the CEPT level for administrations wishing to introduce MFCN while maintaining the current incumbent use, and is therefore hereby recommended as an appropriate basis for a sharing framework between the incumbent Programme Making and Special Events applications (PMSE) and MFCN in the band 2300-2400 MHz.

Technical conditions and details of implementation of the LSA sharing framework should be defined at the national level solely reflecting the national sharing scenarios, which depend strictly upon the type and extent of incumbent use to be protected.

PMSE video links, as described in Table 1, is the most common usage in the band 2300-2400 MHz across CEPT and their technical characteristics are similar from one country to another. As a result, this Recommendation is intended to provide common guidance to administrations for implementing a sharing framework between MFCN and PMSE within 2300-2400 MHz.

As described in ECC Report 172 [4], incumbent PMSE applications (SAP/SAB video links) can coexist with mobile broadband services at the same time through the use of either geographic separation if co-frequency operation is expected or a combination of separation distance and frequency separation if co-located operation is anticipated.

On this basis, CEPT Report 56 [5] identifies two general sharing options, which are considered in this Recommendation as follows:

- **Option A:** The first option is to allow the use of PMSE in a number of blocks or in the whole band while making available this same spectrum for MFCN in accordance with the defined LSA framework;
- **Option B:** The other option is to preserve a number of blocks for the operation of PMSE video-links. The relevant blocks (and possibly the adjacent ones as well) will not be available for the additional user.

This Recommendation is providing guidelines for the implementation of a sharing framework between PMSE and MFCN in the 2300-2400 MHz band based on option A as described above.

Details of the implementation may be impacted by the authorisation scheme applying to the incumbent use, which varies through CEPT countries, e.g. due to limited information of the precise time and locations of the use of PMSE video in all or parts of the band.

It has to be noted that this Recommendation focusses on PMSE (i.e. for commercial use). In some CEPT countries, the band 2300-2400 MHz is heavily used for governmental video links, for which the guidelines described in ANNEX 1: of this Recommendation can also be applied, possibly leading to operational conditions different from PMSE.

Standardisation activities on LSA will facilitate the availability and interoperability of technical solutions for implementation of LSA, allowing the national implementations to be specific depending on the national conditions and incumbent usage of the band. The assessment of a feasible implementation solution for LSA may require field experimentations.

ECC RECOMMENDATION OF 3 JULY 2015 ON GUIDANCE FOR THE IMPLEMENTATION OF A SHARING FRAMEWORK BETWEEN MFCN AND PMSE WITHIN 2300-2400 MHz

“The European Conference of Postal and Telecommunications Administrations,

considering

- a) that ECC/DEC/(14)02 [1] provides the harmonised technical and regulatory conditions for mobile/fixed communications networks (MFCN) operating in the band 2300-2400 MHz;
- b) that some Administrations expressed their intention to introduce MFCN in the 2300-2400 MHz band under Licensed Shared Access (LSA), as defined by RSPG in [2] and as further described in ECC Report 205 [3], on a shared basis with the incumbent systems/services;
- c) that MFCN for the purpose of this Recommendation includes IMT and other communications networks in the mobile and fixed services;
- d) that ECC/REC/(14)04 [6] provides guidance on cross-border coordination for MFCN and between MFCN and other systems in the frequency band 2300-2400 MHz;
- e) that in some CEPT countries the band 2300-2400 MHz is used for various systems/services, which may use the full band;
- f) that PMSE video link for professional use is the most common incumbent use across CEPT and their technical characteristics are similar from one country to another;
- g) that the PMSE use of the band 2300-2400 MHz is by nature limited to certain times and/or to specific geographical locations, although operating PMSE sites can be at any place at any time;
- h) that, in some CEPT countries, the band 2300-2400 MHz is used for governmental video links, which may lead to sharing operational conditions different from PMSE commercial use;
- i) that ETSI provides Technical Specification TS 103 154 on system requirements for operation of Mobile Broadband Systems in the 2300-2400 MHz band under Licensed Shared Access [10];

recommends

1. that, administrations wishing to introduce MFCN in the band, and maintain the long term use of PMSE in the band 2300-2400 MHz in their territory implementing Licensed Shared Access (LSA), should implement an appropriate sharing framework which is developed following the guidelines and examples contained in Annex 1.

Note:

Please check the Office documentation database <http://www.ecodocdb.dk> for the up to date position on the implementation of this and other ECC Recommendations.

ANNEX 1: GUIDELINES FOR THE IMPLEMENTATION OF A SHARING FRAMEWORK BETWEEN MFCN AND PMSE WITHIN 2300-2400 MHz

As described in ECC Report 205 [3], the implementation of LSA relies on the concept of a sharing framework that is under the responsibility of the Administration/National Regulatory Authority (NRA). Its development requires the involvement of all relevant stakeholders. A common understanding on the sharing conditions between the incumbent licensee(s) and the prospective MFCN (LSA) licensee is required in order to assign the band or parts of it for MFCN by the Administration/NRA. This may require that, when reviewing the regulatory framework for PMSE, administrations should consider appropriate conditions which facilitate the introduction of an LSA usage.

The sharing framework is a set of sharing rules or sharing conditions that will materialise the change, if any, in the spectrum rights of the incumbent(s) and define the spectrum, with corresponding technical and operational conditions, that can be made available for additional usage under LSA.

This Annex complements the regulatory process described in ECC Report 205 by recommending a step-by-step procedure as shown in Figure 1 to implement an appropriate sharing framework to allow for sharing and coexistence between PMSE (incumbent) and MFCN. It focusses on the definition of the sharing framework in the context of LSA.

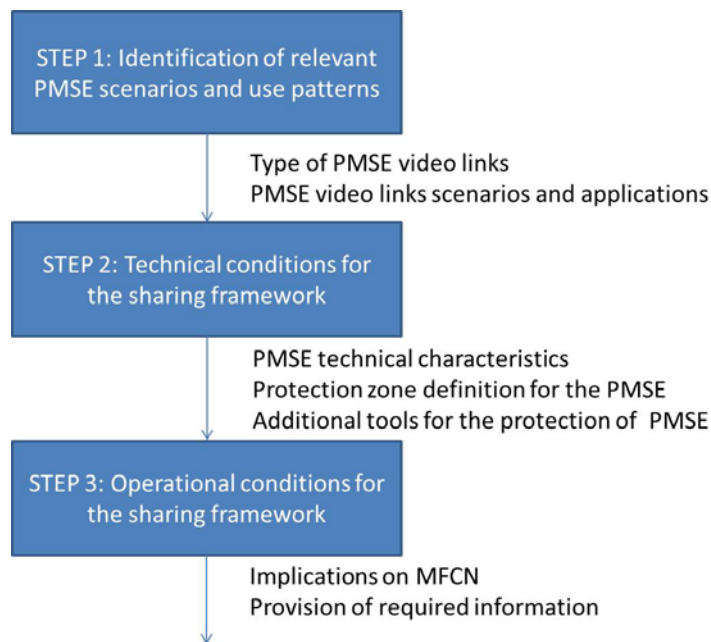


Figure 1: Step-by-step approach

The applications of PMSE and the wireless broadband systems (MFCN) are usually deployed in the same geographical area, most likely in areas with a high population density.

It should be noted that, depending upon the national cases, PMSE video links may be allowed to use the full frequency range identified or only parts of it.

The case of airborne use of PMSE may require large separation distances, reaching over national borders (see ECC REC/(14)04 [6] for guidance on cross-border coordination in the 2300-2400 MHz band).

In this Recommendation, only interference from MFCN into PMSE is considered. In the case of PMSE possibly interfering with MFCN, additional constraints are not expected on PMSE deployment. Appropriate measures for handling those parts of the MFCN networks which might be affected by the incumbents' operations can be defined in the sharing framework or determined by the MFCN operator.

A1.1 STEP 1: IDENTIFICATION OF RELEVANT PMSE SCENARIOS AND USE PATTERNS

In the first step, the extent of the PMSE use should be determined at the national level. This will help the administration to assess the applicability of the sharing and define the PMSE protection requirements. The amount and type of PMSE usage in the band is one of the elements which will allow:

- the administration to decide nationally on the applicability of the LSA on a frequency and geographical basis;
- the administration and the prospective LSA licensee to evaluate the amount of spectrum available for sharing.

The information on the PMSE usage may be gathered by the Administrations e.g. through questionnaires addressed to the relevant national stakeholders. An example of questionnaire addressing the PMSE usage pattern is provided in ANNEX 2..

A1.1.1 Type of PMSE video links

The categories of PMSE video links to be considered in sharing and compatibility studies are given in Table 1 (see also [7]). PMSE for the purpose of this Recommendation is understood as PMSE video links including cordless/radio cameras. The main type of PMSE applications used in the 2300-2400 MHz band is related to temporary video links (portable, mobile with some allowance for airborne use) and cordless cameras.

Table 1: Categories of PMSE video links in regular use

Type of link	Definition
Radio camera (line-of-sight)	Handheld or otherwise mounted camera with integrated or Clip-on transmitter, power pack and antenna for carrying broadcast-quality video together with sound signals over short-ranges line-of-sight
Radio camera (non-line-of-sight)	Handheld or otherwise mounted camera with integrated or Clip-on transmitter, power pack and antenna for carrying broadcast-quality video together with sound signals over short-ranges non-line-of-sight
Miniature camera/link	Very small transmitter and miniature camera for specialist action shots, e.g. helmet cam, UAV, etc. Can be body worn or covert mounted/installed
Portable video link	Small transmitter, for deployment over greater ranges, typically up to 2 km
Mobile air-to-ground video link	Video transmission system employing radio transmitter and receivers mounted on helicopters, airships or other aircraft.(includes repeaters and relays)
Mobile vehicular video link (including ground-to-air)	Video transmission system employing radio transmitter mounted in/on motorcycles, racing motorbikes, pedal cycles, cars, racing cars or boats. One or both link terminals may be used while moving

A1.1.2 PMSE video links scenarios and applications

The PMSE scenarios together with typical applications and link types are given in Table 2. The PMSE scenarios have implications also on the MFCN operational conditions. This aspect will be discussed in the step 3 described in A1.3.

Table 2: PMSE video links scenarios and applications

PMSE scenarios	Typical applications	Type of PMSE link
Frequent or permanent use, specific location	TV studio, theatre, stadium	Cordless cameras / Portable
Temporary use, specific location	Special events (e.g. Cycling races, Marathons, Formula One)	Cordless cameras / Portable / Mobile / Airborne
Temporary use anywhere, anytime, unplanned	TV news, governmental use	Cordless cameras / Portable / Airborne

A1.2 STEP 2: TECHNICAL CONDITIONS FOR THE SHARING FRAMEWORK

A1.2.1 Step 2.1: PMSE technical characteristics

Based on the information on PMSE gathered in step 1, administrations should identify the relevant PMSE technical characteristics to be used in the process of determining the protection criteria for the PMSE.

The PMSE technical characteristics may be defined according to the typical values given in ECC Report 219 [7] or they can be defined based on the national usage by the Administration (see Table 3).

Table 3: Typical characteristics for PMSE video links

Type of Link	P_{MAI} (dBm) (Note 1)	P_{fr} (dB) (Note 2)	Rx antenna gain @ height agl (Note 3)
			ECC Report 219 (Note 4, Note 5)
Radio Camera Line-of-Sight	-107	0	3-13dBi @ 2-60m
Radio Camera Non-Line-of-Sight	-107	0	3-13dBi @ 2-60m
Miniature Link	-107	0	3-13dBi @ 2-60m
Portable Link	-107	0	9-17dBi @ 2-60m
Air to ground Link	-107	0	17-24dBi @ 2-60m
Mobile vehicular Link (including ground-to-air)	-107	0	10-13dBi @ 2-60m 4-9dBi @ 150m-6km (airborne)
Note 1: P_{MAI} (dBm): Maximum allowable interference power at the PMSE receiver in an 8 MHz occupied bandwidth. Note 2: P_{fr} (dB): cable and feeder loss at receiver. Note 3: a.g.l - above ground level. Note 4: Typical and maximum values are provided. Note 5: Value agreed at a national level may be considered.			

Regarding the PMSE protection criteria P_{MAI} , administrations may agree to choose alternative values. However, since the protection criteria of the PMSE has an effect on the availability of spectrum and therefore on the feasibility of LSA, this information is assumed to remain stable throughout the sharing arrangement.

A1.2.2 Step 2.2: Protection zone definition for the PMSE

The general approach for the PMSE protection is based on the determination of protection zone.

Protection Zone is defined as a geographical area within which PMSE video link receivers will not be subject to harmful interference caused by MFCN transmissions (covering both MFCN Base Stations (BS) and User Equipment (UEs)).

However, since UEs operate under the control of a network, the protection of PMSE video links is mainly addressed by controlling the MFCN BS.

A protection zone is characterized by its geographical area and the maximum field strength level (see below) defined for the protection of the PMSE video link. A protection zone is normally applicable for a defined frequency range and time period.

For the protection of unidirectional PMSE video link, there is only a need to protect the PMSE receiver.

A definition of a greater size zone by administrations for the protection of a PMSE receiver might be considered for different reasons, for example for verification measures or to include a margin to the protection.

The definition of the zone can also cover different cases:

- to have several PMSE receivers in the same zone (for example for Formula 1 races);
- to take into account the mobility of a PMSE receiver;
- to take into account the location uncertainty of the PMSE receiver.

It is up to administrations to define these zones depending upon the national situations.

In some cases, e.g. for the protection of mobile PMSE receivers, the protection zone can move over time depending upon the location of the PMSE receiver.

Within the protection zone, the electromagnetic field strength level (E_{CC} in the co-channel case or E_{AC} for the adjacent channel case) emitted by a MFCN network (covering both BS and UEs) should not exceed a defined value in $\text{dB}\mu\text{V}/\text{m}$ at a defined PMSE video link receiver in a defined PMSE bandwidth (here 8 MHz) at antenna height above ground level.

In accordance with Recommendation ITU-R P.525 [8], the allowable electromagnetic field strength to be received can be calculated following the scheme below. It is to be noted that for simplification, the free space propagation loss has been assumed. It is expected that multipath propagation loss is taken into account by the MFCN system, in those cases where this can be taken as possible higher interference into the PMSE receiver.

$$E_{CC} = 77.21 + P_{MAI} + 20_{\log} f_{PMSE} - G_{RX} \left[\text{dB} \frac{\mu\text{V}}{\text{m}} \right] \quad (1)$$

where:

- P_{MAI} = maximum allowable interference power in the PMSE bandwidth with $P_{MAI} = P_N + \frac{I}{N}$ [dBm] (2)
- P_N = minimum noise floor with $P_N = -174 + 10_{\log} B_{PMSE} [\text{Hz}] + F$ [dBm] (3)
- F = receiver noise figure; here: typical values available in ECC Report 219;
- B_{PMSE} = bandwidth here: 8 MHz;
- I/N = interference to noise ratio here: administrations may choose to use - 6 dB (or ECC Report 219 [7]);
- f_{PMSE} = centre frequency of the used PMSE receiver channel;
- G_{RX} = PMSE receiver antenna gain here: 0dB for isotropic antennas.

The assumption on the field strength (1) is to be considered as co-channel situation (E_{CC}), when (4) applies, while for an adjacent channel situation (E_{AC}), when (5) applies the MFCN Adjacent Channel Interference Ratio is to be added to (1) leading to (6).

$$|(f_{PMSE} - f_{MFCN})| \leq \frac{(B_{PMSE} + B_{MFCN})}{2} \quad (4)$$

$$\frac{B_{PMSE} + B_{MFCN}}{2} < |(f_{PMSE} - f_{MFCN})| \leq \frac{3(B_{PMSE} + B_{MFCN})}{2} \quad (5)$$

$$E_{AC} = 77.21 + P_{MAI} + 20 \log f_{PMSE} - G_{RX} + L_{ACIR} \left[dB \frac{\mu V}{m} \right] \quad (6)$$

where:

- B_{PMSE} / B_{MFCN} = occupied bandwidths of the PMSE receiver and the MFCN transmitter;
- f_{PMSE} / f_{MFCN} = centre frequencies of the PMSE receiver channel and the MFCN transmitter channel;
- L_{ACIR} = Adjacent Channel Interference Ratio, ratio of the total power transmitted from a source to the total interference power affecting a victim receiver, resulting from both transmitter (L_{ACLR} = MFCN Adjacent Channel Leakage Ratio, ACLR) and receiver (L_{ACS} = PMSE Adjacent Channel Selectivity, ACS) imperfections).

$$L_{ACIR} = \frac{1}{\frac{1}{L_{ACLR}} + \frac{1}{L_{ACS}}}$$

For the MFCN ACLR, example value is 45dB as suggested by Table 6.6.4.4-1 ETSI TS 137 104 v12.5.0 for E-UTRA [9]. For the PMSE ACS, example value is provided in ECC Report 219 [7].

A1.2.3 Step 2.3: Additional tools for the protection of PMSE

In addition to the approach described under step 2.2, Administrations may want, in some cases, to introduce additional requirements for the protection of PMSE. Two possible options are described as follows:

Exclusion Zone is defined as a geographical area within which MFCN operator is not allowed to have active transmissions on frequencies that interfere with the PMSE video link channel. An exclusion zone is normally applicable for a defined time period.

More stringent protection requirement: This may be stipulated by the need to create more certainty on the protection of the PMSE receivers at the given location (e.g. due to problem to provide location information of the PSME receiver) or to create a stable zone to allow use of more than one PMSE receiver in a given area. This requirement is to be added to the threshold derived from consideration on step 2.2.

The needed distance (D) and/or additional margin (L_{MARGIN}) can be calculated as follows:

$$P_{MAI} + L_{Margin} = P_{TX} - L_0 \iff D = 10^{\frac{P_{TX} - 32.4 - P_{MAI} - L_{Margin} - 20 \log f}{20}} \text{ [km]} \quad (7)$$

where:

- P_{MAI} = maximum allowable interference power [dBm]
- L_{Margin} = additional margin for PMSE protection [dB]
- P_{TX} = transmitter output power [dBm]
- L_0 [dB] = free space propagation loss with $L_0 = 32.4 + 20 \log f + 20 \log D$ (8)
- D = distance between PMSE receiver and MFCN transmitter [km]
- f = frequency in MHz here: centre frequency of the used PMSE receiver channel.

A1.3 STEP 3: OPERATIONAL CONDITIONS FOR THE SHARING FRAMEWORK

The MFCN will need mechanisms to ensure that it fulfills the protection of the PMSE video links. Operational conditions for the MFCN are highly dependent on the considered PMSE scenario as shown in Table 4.

Table 4: PMSE scenarios and their implications on the protection zone and MFCN network

PMSE scenarios	Typical applications	Possible Implications on the protection zone	Implications on the MFCN network
Frequent or permanent use, specific location	TV studio	Permanent protection zone	Network planning according to the requirement
	Theatre, stadium	Permanent protection zone	Network planning according to the requirement
		Dynamic protection zone, protection zone and its possible dimensions known well in advance	Dynamic adjustment of radio network, pre-defined configurations possible, adequate time for network planning
Temporary use, specific location, (limited mobility possible in pre-defined area)	Special events (e.g. Cycling races, Marathons, Formula One),	Dynamic protection zone, protection zone and its possible dimensions known well in advance	Dynamic adjustment of radio network, pre-defined configurations possible, adequate time for network planning
Temporary use, anywhere, anytime, unplanned, mobility possible	TV news, governmental use	Dynamic protection zone, protection zone needed with a short notice, location may vary due to mobility	Dynamic adjustment of radio network, short response time, mobility support

A1.3.1 Implications on MFCN

The operation of a PMSE video-link at a given position or on the move is to be protected from the interference arising from the BS and UE of the MFCN network. In order to guarantee the protection zone around the PMSE video link receiver, the MFCN operator is required to perform interference calculations and dynamically adjust its radio network at the needed position(s) in the frequency block affecting the operation of the PMSE video link accordingly.

This is done by closing down or restricting the transmission power of the BSs in the vicinity of the PMSE receiver to fulfil the protection criteria. The latter may allow MFCN BSs with lower transmission power (small cells) to continue their transmission even when the macro BSs would need to be turned off. The network should operate related interfaces accepting information by the incumbent(s) on the position of the cordless camera(s). For example databases or ad-hoc information on the PMSE video link receiver positions could be considered.

The implications on the protection zone and MFCN network depend on the considered PMSE application as shown in Table 4.

For PMSE applications such as special events, theatre or stadium, the PMSE usage is tied to a certain location. The need for protection zone as well as possible mobility is known by the MFCN well beforehand. This allows the MFCN adequate time for network planning as well as use of pre-defined network configurations.

In the case of applications such as TV news or governmental use, the need for protection zone may come with short notice and therefore the MFCN needs to be able to make the interference estimation and network adjustment in a fast pace. Additionally, mechanisms such as tracking may be needed to support the mobility of the PMSE video link. It has to be taken into account that in some cases, the information regarding the locations in support of tracking may be treated as confidential – see also A1.4.

The need for dynamic adjustment of the MFCN network is foreseen to require additional spectrum management layer on top of the existing MFCN network infrastructure. The MFCN needs to calculate the interference caused to the PMSE video link in order to define appropriate areas for turning off or restricting the power of its BSs. The Administrations may set limits to the maximum time that it can take for the MFCN to make this calculation and create the appropriate protection.

Appropriate solutions implementing the above operational conditions are developed in ETSI as part of its activities on the standardisation of the LSA system requirements, architecture and interfaces. In particular, ETSI has approved TS 103 154 v 1.1.1 on the System requirements for operation of Mobile Broadband Systems in the 2300-2400 MHz band under Licensed Shared Access (LSA) [10].

On this basis, implementations have been developed or are under development, which fulfil the requirements set out in this Recommendation. An example of an LSA implementation, where the MFCN is deploying fully commercial LTE equipment and the LSA System –comprising of LSA Repository and LSA Controller – is implemented on top of the existing MFCN network infrastructure, is given in CEPT Report 56 [5] (Section 4.3 and Annex 2 of that Report).

A1.3.2 Provision of required information

The information required by the MFCN for the protection of the PMSE video link can be categorized into information which can be provided only once during the sharing framework and into information that is needed when a new protection zone is required.

The values for the maximum field strength are defined in the beginning of the sharing framework. The values may vary between different PMSE video link types, service providers etc. However they should remain stable throughout the LSA sharing arrangement and may be made available in a database.

For administrations considering the dynamic protection of PMSE receivers, some information needs to be transmitted by the PMSE user upon each of its requests for a new protection zone. This kind of information includes at minimum the location and frequency of the PMSE receiver to be protected and the type of the PMSE link and may also include further information relevant for the process.

A secure means is needed so that the PMSE user provides dynamic information on a scheduled protection zone beforehand. This could be done e.g. via mobile phone or a web browser.

Automatic or on-demand tracking of the PMSE video link could be used for gathering the information in the case of immediate need for the protection zone. It would also aid in supporting the mobility of the PMSE receiver.

A1.4 ADDITIONAL CONSIDERATIONS

Additional actions should be taken into account and performed to apply the full LSA mechanism outside of the defined sharing framework. In particular, there is a need to

- incentivise the incumbent(s) to provide access to the spectrum resource;
- reach common understanding on the use of the available resource;
- consider the protection of information/data: in order to implement a full operational sharing between the partners, both sides, the incumbent(s) and the additional user(s), need to provide information. Some of these require a certain level of confidentiality, which is to be provided by appropriate means e.g. by the implementation of a confidentiality layer in the used data bases. This could be dynamic location information and protection thresholds. Confidentiality might be required for any information to be restricted e.g. on use cases and times, traffic volumes, etc. Access to this information is to be limited to the purpose of the sharing only.

ANNEX 2: EXAMPLE OF QUESTIONNAIRE TO GATHER INFORMATION ON PMSE USAGE PATTERN

Introduction

This questionnaire is provided as example to Administrations to understand and quantify the existing video PMSE use in the 2300-2400 MHz band including all types of video links and all types of use. It has been defined in order for the administration to draw video PMSE pattern usage i.e. type of use, frequency, space and time.

Definition

Type of Link / Type of Use	Definition
Cordless cameras	Handheld or otherwise mounted camera with integrated transmitter, power pack and antenna for carrying broadcast-quality video together with sound signals over short-ranges (<500m)
Portable video link	Handheld camera with separate body-worn transmitter, power pack and antenna for carrying broadcast-quality video together with sound signals over short-ranges (<2000m)
Mobile vehicular video link	Video transmission system employing radio transmitter mounted in/on motorcycles, pedal cycles, and cars, racing cars or boats. One or both link terminals may be used while moving
Airborne video link	Video transmission system employing radio transmitter and receivers mounted on helicopters, airships or other aircraft (includes repeaters and relays)

I) Details information on your Organization [whom responded to the questionnaires]

Organization/Company	Name of the Organization
Address	Number and Street Name
	Post Code
	City
	Select Your Country (dropdown)
Contact Name	Full Name
Contact Phone Number	
Contact Email	

II) Questionnaire A: cordless cameras and portable video links

A.1.	Please indicate if you use the 2300-2400 MHz band for cordless cameras or portable video links within your organization?	[Yes/No]
<i>[If you answered yes to the previous question, please answer the next questions]</i>		
A.2.	What is the typical number of frequencies you simultaneously use for cordless cameras or portable video links in the 2300-2400 MHz band?	[Your Answer]
A.3.	What is your typical use of cordless cameras or portable video links in the 2300-2400 MHz band?	
<i>[Please select one or multiple use from the following list]</i>		
A.3.1.a	<u>Permanent use at defined locations</u> (TV studios, theaters, stadium, ...)	[Yes/No]
<i>[If you answered yes to A.3.1.a, please answer the next question]</i>		
A.3.1.b	What is the typical occurrence of using cordless cameras or portable video links in the 2300-2400 MHz band for permanent use at defined locations?	<i>[Please choose one of the following choices] Every day several times a day/ Every day once a day/ Up to 5 times a week/ Up to 5 times a month/ Several times a year</i>
A.3.2.a	<u>Temporary use at predefined location and time</u> (Formula1, cycling race, marathon, ...)	[Yes/No]
<i>[If you answered yes to A.3.2.a, please answer the next question]</i>		
A.3.2.b	What is the typical occurrence of using cordless cameras or portable video links in the 2300-2400 MHz band for temporary use at predefined location and time?	<i>[Please choose one of the following choices: Every day several times a day/ Every day once a day/ Up to 5 times a week/ Up to 5 times a month/ Several times a year]</i>
A.3.3.a	<u>Short term events with uncertainty of locations and time</u> (TV news, ...)	[Yes/No]
<i>[If you answered yes to A.3.3.a, please answer the next question]</i>		
A.3.3.b	What is the typical occurrence of using cordless cameras or portable video links in the 2300-2400 MHz band for Short term events with uncertainty of locations and time?	<i>[Please choose one of the following choices: Every day several times a day/ Every day once a day/ Up to 5 times a week/ Up to 5 times a month/ Several times a year]</i>
A.3.4.a	<u>Other</u> <i>[please describe other use]</i>	[Yes/No]
<i>[If you answered yes to A.3.4.a, please answer the next question]</i>		
A.3.4.b	What is the typical occurrence of using cordless cameras or portable video links in the 2300-2400 MHz band for other use	<i>[Please choose one of the following choices: Every day several times a day/ Every day once a day/ Up to 5 times a week/ Up to 5 times a month/ Several times a year]</i>
A.4.	Do you encounter problems in finding enough frequencies for cordless cameras or portable video links in the 2300-2400 MHz band? If yes: What is the nature of the problems?	[Your Answer]
A.5.	Do you use Cordless HD-Cameras in the 2300-2400 MHz band with bandwidth exceeding 8MHz? If yes: What is the required bandwidth?	[Your Answer]
A.6.	All the questions above suppose that only digital links are used. Is this correct, or do you still use analogue video links or analogue wireless cameras?	[Your Answer]

III) Questionnaire B: mobile vehicular video links

B.1.	Please indicate if you use the 2300-2400 MHz band for mobile vehicular video links within your organization?	[Yes/No]
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[If you answered yes to the previous question, please answer the next questions]

B.2.	What is the typical number of frequencies you simultaneously use for mobile vehicular video links in the 2300-2400 MHz band?	[Your Answer]
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B.3.	What is the typical occurrence of using mobile vehicular video links in the 2300-2400 MHz band?	<i>[Please choose one of the following choices] Every day several times a day/ Every day once a day/ Up to 5 times a week/ Up to 5 times a month/ Several times a year</i>
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B.4.	Do you encounter problems in finding enough frequencies for mobile vehicular video links in the 2300-2400 MHz band? If yes: What is the nature of the problems?	[Your Answer]
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B.5.	Do you use mobile HD-Cameras in the 2300-2400 MHz band with bandwidth exceeding 8MHz? If : What is the required bandwidth?	[Your Answer]
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B.6.	All the questions above suppose that only digital links are used. Is this correct, or do you still use analogue video links or analogue wireless cameras?	[Your Answer]
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IV) Questionnaire C: airborne video links

C.1.	Please indicate if you use the 2300-2400 MHz band for airborne video links within your organization?	[Yes/No]
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[If you answered yes to the previous question, please answer the next questions]

C.2.	What is the typical number of frequencies you simultaneously use for airborne video links in the 2300-2400 MHz band?	[Your Answer]
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C.3.	What is the typical occurrence of using airborne video links in the 2300-2400 MHz band?	<i>[Please choose one of the following choices] Every day several times a day/ Every day once a day/ Up to 5 times a week/ Up to 5 times a month/ Several times a year</i>
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C.4.	Do you encounter problems in finding enough frequencies for airborne video links in the 2300-2400 MHz band? If yes: What is the nature of the problems?	[Your Answer]
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C.5.	Do you use airborne HD-Cameras in the 2300-2400 MHz band with bandwidth exceeding 8MHz? If yes: What is the required bandwidth?	[Your Answer]
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C.6.	All the questions above suppose that only digital links are used. Is this correct, or do you still use analogue video links or analogue wireless cameras?	[Your Answer]
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ANNEX 3: LIST OF REFERENCES

This annex contains the list of relevant reference documents.

- [1] ECC Decision(14)02: Harmonised technical and regulatory conditions for the use of the band 2300-2400 MHz for Mobile/Fixed Communications Networks (MFCN)
- [2] RSPG Opinion on Licensed Shared Access, November 2013, https://circabc.europa.eu/sd/d/3958ecef-c25e-4e4f-8e3b-469d1db6bc07/RSPG13-538_RSPG-Opinion-on-LSA%20.pdf
- [3] ECC Report 205: Licensed Shared Access (LSA)
- [4] ECC Report 172: Broadband Wireless Systems Usage in 2300-2400 MHz
- [5] CEPT Report 56: Report B1 in response to the EC Mandate on the 2.3-2.4 GHz band - Technological and regulatory options facilitating sharing between Wireless broadband applications (WBB) and the relevant incumbent services/applications in the 2.3 GHz band
- [6] ECC Recommendation (14)04 on Cross-border coordination for MFCN and between MFCN and other systems in the frequency band 2300-2400 MHz
- [7] ECC Report 219: Characteristics of PMSE digital video links to be used in compatibility and sharing studies
- [8] Recommendation ITU-R P:525: Calculation of free-space attenuation
- [9] ETSI TS 137 104 v12.5.0: Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception (3GPP TS 37.104 version 12.5.0 Release 12)
- [10] ETSI TS 103 154: System requirements for operation of Mobile Broadband Systems in the 2 300 MHz-2 400 MHz band under Licensed Shared Access (LSA).