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COMMISSION IMPLEMENTING DECISION (EU) 2021/1730

of 28 September 2021

on the harmonised use of the paired frequency bands 874,4-880,0 MHz and 919,4-925,0 MHz and of the unpaired frequency band 1 900-1 910 MHz for Railway Mobile Radio

(notified under document C(2021) 6862)

(Text with EEA relevance)

(OJ L 346, 30.9.2021, p. 1)

Amended by:

		Official Journal		
		No	page	date
►**M1**	Commission Implementing Decision (EU) 2026/291 of 9 February 2026	L 291	1	11.2.2026

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COMMISSION IMPLEMENTING DECISION (EU) 2021/1730

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(Text with EEA relevance)

Article 1

This Decision establishes the harmonised conditions for the availability and efficient use of radio spectrum for the Railway Mobile Radio (RMR) in the bands 874,4-880,0 MHz, 919,4-925,0 MHz and 1 900-1 910 MHz.

Article 2

For the purposes of this Decision, the following definitions shall apply:

(a) ‘RMR terminal’ is an item of mobile radio equipment under the control of the RMR network;

(b) ‘cab-radio’ means a RMR terminal installed on board the train capable of supporting voice and data applications;

(c) ‘equivalent isotropically radiated power (‘e.i.r.p.’)’ means the product of the power supplied to the antenna and the absolute or isotropic gain in a given direction relative to an isotropic antenna.

Article 3

1. By 1 January 2022, Member States shall designate and make available on a non-exclusive basis the paired frequency bands 874,4-880,0 MHz and 919,4-925,0 MHz for Railway Mobile Radio, in accordance with the technical conditions set out in the Annex.

2. At the latest by 1 January 2025, based on national demand, Member States shall designate and make available on a non-exclusive basis the unpaired frequency band 1 900-1 910 MHz for Railway Mobile Radio, in accordance with the technical conditions set out in the Annex.

3. Member States shall ensure that networks using the frequency bands referred to in paragraph 1 give appropriate protection to systems in adjacent bands.

4. Member States where no rail services are provided at the date of 1 January 2022 shall only apply paragraph 1 as soon as a rail line is planned to be activated.

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Article 4

Member States shall report to the Commission on the implementation of this Decision by 1 January 2025.

Member States shall monitor the use by RMR of the frequency bands subject to this Decision and report their findings, including any impacts on interoperability related to spectrum issues, to the Commission upon request or at their own initiative to allow a timely review of this Decision, where needed.

Article 5

This Decision is addressed to the Member States.

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ANNEX

PART A

TECHNICAL CONDITIONS FOR GSM-R IN 874,4-880,0 MHZ and 919,4-925,0 MHZ BANDS

For GSM-R, the following parameters apply:

GSM-R Downlink centre frequency f_{DL} = 921 MHz + n × 0,2 MHz ([1]) where

$$\{n \in \mathbb{Z} \mid -7 \leq n \leq 19\}$$

GSM-R Uplink centre frequency $f_{UL} = f_{DL} - 45$ MHz

GSM-R channel bandwidth is 200 kHz

Table 1

In-block requirements for GSM-R Base Stations in 919.4-921 MHz uncoordinated deployment

GSM-R channel bandwidth	Maximum EIRP
200 kHz	= 70,5 dBm + (f_{DL} – 921) × 40/3 dB

f_{DL} is the centre frequency in MHz

There is no EIRP restriction on GSM-R Base Stations transmitting in the 921-925 MHz frequency band. Formula applicable to $f_{DL} \leq 921$ MHz. To allow higher EIRP the implementation of a coordination procedure or other mitigation measures must be applied.

PART B

TECHNICAL CONDITIONS FOR A SINGLE WIDEBAND RAILWAY MOBILE RADIO (RMR) CARRIER IN 874,4-880,0 MHZ and 919,4-925,0 MHZ BANDS

Technical conditions for RMR Base Stations using wideband technologies

The technical conditions defined in this section are in the form of a block-edge mask (BEM) applicable to wideband RMR Base Stations. The technical conditions defined in this section are valid for a single RMR carrier using wideband technologies. The BEM is developed on the basis that detailed coordination and cooperation agreements would not be required to be in place prior to network deployment. To allow multiple carriers or higher EIRP for RMR Base Stations than stated in the harmonised technical conditions, the implementation of a coordination procedure or other mitigation measures must be applied. Base Stations using active antenna systems are prohibited.

For radio access technologies other than GSM-R, the following parameters apply:

— The lower edge of the lowest Resource Block shall be ≥ 919,6 MHz

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Table 2

General in-block requirement – not mandatory

RMR channel bandwidth	Maximum EIRP
For any channel bandwidth	The following value may be used in case an upper bound is desired: = Min {65 dBm/channel, Maximum EIRP specific to the channel bandwidth}

Table 3

Specific in-block requirements for 5,6 MHz and 5 MHz channels mandatory for uncoordinated deployment

RMR channel bandwidth	Maximum EIRP
5,6 MHz	= 62 dBm/5,6 MHz
5 MHz	= 64,5 dBm/5 MHz + (f_{DL} – 922,1) × 40/3 dB (Note 1)

f_{DL} is the centre frequency in MHz.

NB-IoT in-band operation mode without power boost is allowed. NB-IoT guard-band operation mode and in-band operation mode with power boost are not allowed.

Note 1: The calculation has been based on 25 Resource Blocks. The formula equally applies to 20 Resource Blocks.

Table 4

Specific in-block requirements for frequency channels of 3 MHz, and smaller than or equal to 200 kHz, which are mandatory for uncoordinated deployment

RMR channel bandwidth	Maximum EIRP
3 MHz	= 61 dBm/3 MHz + (f_{DL} – 921,4) × 40/3 dB (Note 1)
200 kHz (Note 2)	= 70,5 dBm/200 kHz + (f_{DL} – 921) × 40/3 dB (Note 3)

f_{DL} is the centre frequency in MHz.

Note 1: Formula applicable to $f_{DL} \leq 922,5$ MHz. No specific EIRP restriction above 922,5 MHz. The calculation is based on 15 Resource Blocks. It equally applies to 12 Resource Blocks.

Note 2: Applicable to narrowband technologies.

Note 3: Formula applicable to $f_{DL} \leq 921,0$ MHz. No specific EIRP restriction above 921 MHz.

Table 5

Out-of-band requirements

MHz from block edge (919.4-925 MHz)	EIRP limit
$0 \leq \Delta f < 0.2$	32,5 dBm/200 kHz

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MHz from block edge (919.4-925 MHz)	EIRP limit
$0,2 \leq \Delta f < 1$	14 dBm/800 kHz
$1 \leq \Delta f < 10$	5 dBm/MHz

On a case-by-case basis, at a national level, higher out-of-band limits may be applied.

Table 6

Baseline requirement

Frequency range	EIRP limit
880-915 MHz	-49 dBm/5 MHz

This requirement prevails over out-of-band requirements.

Technical conditions for RMR cab-radio using wideband technologies

For radio access technologies other than GSM-R, the following parameters apply:

Maximum output power: higher than 23 dBm and up to 31 dBm;

ACLR ([2]): 37 dB minimum;

Uplink power control is mandatory and shall be activated.

Technical conditions for RMR terminals, other than cab-radios, using wideband technologies

For radio access technologies other than GSM-R, the following parameters apply:

Maximum output power: 23 dBm;

ACLR: 30 dB minimum;

Uplink power control is mandatory and shall be activated.

Technical conditions for RMR receivers using wideband technologies

The band can be accessed if techniques to access spectrum and mitigate interference that provide an appropriate level of receiver performance to comply with the essential requirements of Directive 2014/53/EU of the European Parliament and of the Council ([3]) are 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.

Table 7

Requirements on wideband RMR Base Station receiver characteristics

Parameter	Value
Level of the wanted signal	RefSens + 3 dB

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Parameter	Value
Maximum interfering signal in 870-874,4 MHz (Note 1)	-34 dBm

The antenna connector of the radio module is the reference point. The reference sensitivity (RefSens) is the minimum mean power received at the antenna connector at which a specified minimum performance shall be met.

These requirements cover both blocking and third-order intermodulation.

Note 1: A bandwidth of 200 kHz for the interfering signal is assumed.

Table 8

Requirements for wideband RMR cab-radio receiver characteristics ([4])

Parameter	Value
Level of the wanted signal	RefSens + 3 dB
Maximum interfering signal in 880-918,9 MHz (Note 1)	-26 dBm
Maximum continuous wave interfering signal in 925,6-927 MHz	-13 dBm
Maximum continuous wave interfering signal in 927-960 MHz	-10 dBm
Maximum 5 MHz LTE interfering signal (lowest carrier at 927,6 MHz)	-13 dBm

The antenna connector of the radio module is the reference point. The reference sensitivity (RefSens) is the minimum mean power received at the antenna connector at which a specified minimum performance shall be met.

These requirements cover both blocking and third-order intermodulation.

Note 1: A bandwidth of 400 kHz for the RFID interfering signal is assumed.

PART C

TECHNICAL CONDITIONS FOR WIDEBAND RMR IN 1 900-1 910 MHZ (TDD) BAND

Technical conditions for RMR Base Stations using wideband technologies

The technical conditions defined in this section are in the form of a block-edge mask (BEM) applicable to wideband RMR BS. The BEM is developed on the basis that detailed coordination and cooperation agreements would not be required to be in place prior to network deployment. Base Stations with active antenna systems are prohibited.

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The following parameters apply:

Table 9

General in-block requirement mandatory for uncoordinated deployment

RMR channel bandwidth	Maximum EIRP
10 MHz	= 65 dBm/10 MHz (Note 1)

Note 1: Member States may allow a higher EIRP level, subject to national coordination or other mitigation measures.

Table 10

Baseline requirement

Frequency range	EIRP limit
1 920 -1 980 MHz	-43 dBm/5 MHz

Technical conditions for RMR cab-radio using wideband technologies

The following parameters apply:

Maximum output power: 31 dBm;

ACLR: 37 dB minimum;

Unwanted output power in 1 920-1 980 MHz:

— 25 dBm/MHz maximum in 1 920-1 925 MHz,

— 30 dBm/MHz maximum in 1 925-1 980 MHz;

Uplink power control is mandatory and shall be activated.

Technical conditions for RMR terminals, other than cab-radios, using wideband technologies

The following parameters apply:

Maximum output power: 23 dBm;

ACLR: 30 dB minimum;

Uplink power control is mandatory and shall be activated.

Technical conditions for RMR receivers using wideband technologies

The band can be accessed if techniques to access spectrum and mitigate interference that provide an appropriate level of receiver performance to comply with the essential requirements of Directive 2014/53/EU are 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.

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Table 11

Requirements on wideband RMR Base Stations receiver characteristics

Parameter	Value
Level of the wanted signal	RefSens + 3 dB
Maximum 5 MHz LTE interfering signal in 1 805 -1 880 MHz	-20 dBm
The antenna connector of the Base Station receiver is the reference point. The reference sensitivity (RefSens) is the minimum mean power received at the antenna connector at which a specified minimum performance shall be met. These requirements cover both blocking and third-order intermodulation.	

Table 12

Requirements for wideband RMR cab-radio receiver characteristics ([4])

Parameter	Value
Level of the wanted signal	RefSens + 3 dB
Maximum 5 MHz LTE interfering signal in 1 805 -1 880 MHz	-13 dBm
Maximum 5 MHz LTE interfering signal in 1 920 -1 980 MHz	-39 dBm
The antenna connector of the Base Station receiver is the reference point. The reference sensitivity (RefSens) is the minimum mean power received at the antenna connector at which a specified minimum performance shall be met. These requirements cover both blocking and third-order intermodulation.	

([1]) GSM-R channel raster of 200 kHz.

([2]) ACLR: Adjacent Channel Leakage power Ratio.

([3]) 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 (OJ L 153, 22.5.2014, p. 62).

([4]) Requirements for RMR terminal receiver other than cab-radio are not covered in this table