RADIO SPECTRUM MANAGEMENT

Re-planning the 1710–2300 MHz Band – Decisions

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Version History

Version	Date of effect	Description	Authorised by
0.1	23/10/2020	Initial recommendation of the band plan and engineering rules	
1.0	05/11/2020	Approved	Len Starling

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Re-planning the 1710–2300 MHz Band – Decisions

1 Introduction

This document follows a public consultation on planning of the 1710–2300 MHz band. After analysis of the submissions, RSM has determined a new band plan for the 1710–2300 MHz frequency range. The new band plan includes those parts of the band known as the 1800 MHz duplex gap, the unpaired 2200 MHz band, the paired 2200 MHz and the paired 2100 MHz band extension. This document also specifies the technical requirements for each band.

2 Background

Existing management rights (MR) in the 1700-2300 MHz band expire on 31 March 2021. In May 2018, RSM decided not to renew a number of existing management rights in these bands as it was determined that they were being under-utilised. The expiry of existing rights is an opportunity to reallocate the blocks in a way that maximises their use in the future[1].

In February 2020, RSM published a public consultation on re-planning 1700-2300 MHz. The spectrum blocks in the consultation scope are:

- 1785-1805 MHz (1800 MHz Duplex gap)
- 2010-2025 MHz (Unpaired 2000 MHz band)
- 1980-2010 MHz and 2170-2200 MHz (Paired 2100 MHz band expansion)
- 2025-2110 MHz and 2200-2300 MHz (Paired 2200 MHz band)

[1] The parts of this band in use for cellular mobile services (the “1800 MHz” and “2100 MHz” bands) were subject to a separate process. Renewal offers have been made to the mobile network operators who are currently using these bands to provide 3G and 4G services.

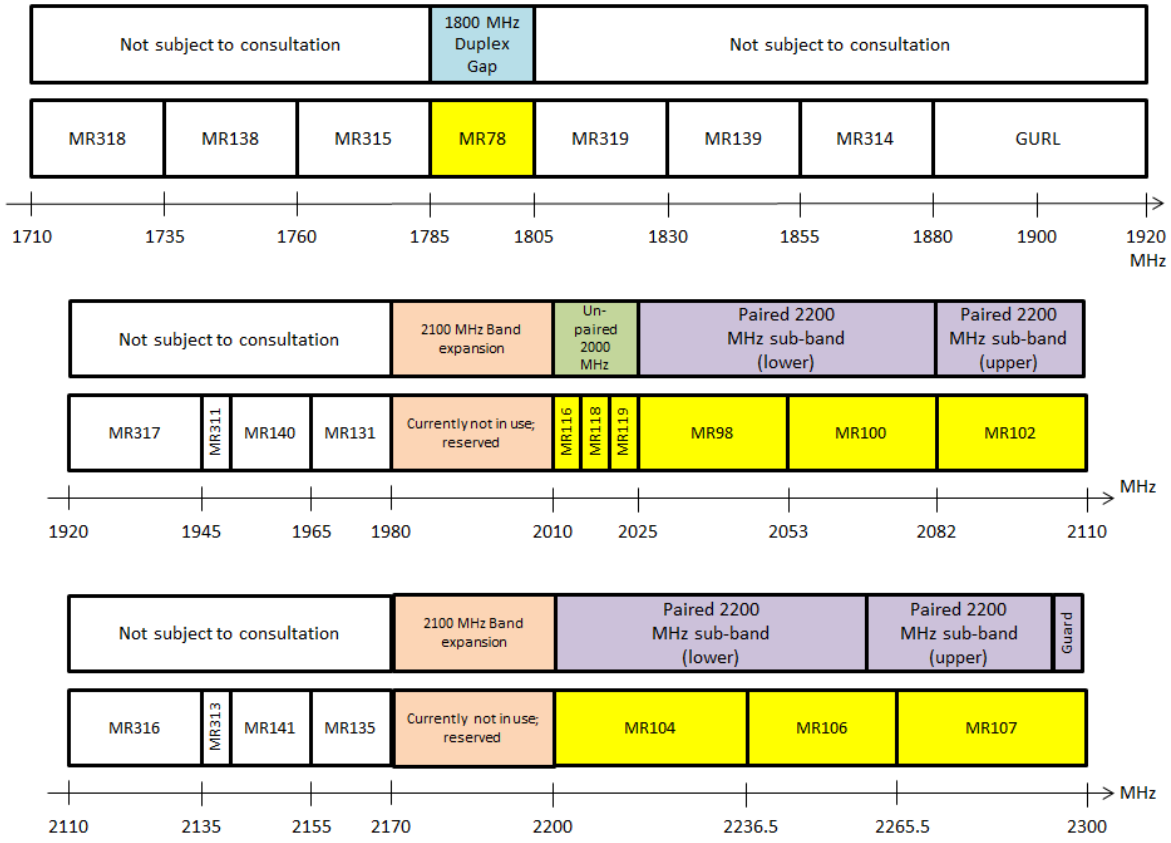


Figure 1 The sub-bands inside the consultation scope

In the consultation paper we proposed the following usage of the sub-bands:

- Repurpose the 1800 MHz Duplex Gap for use by wireless microphones.
- Postpone a decision on the use of the unpaired 2000 MHz band until there is clarity on international harmonisation of the band.
- Seek views on potential uses for two indicative channel paired blocks for the Paired 2100 MHz band expansion for short-term licences.
- Repurpose the lower portion of the Paired 2200 MHz band for fixed links under an administrative radio licensing regime based on the channel raster arrangements in Recommendation ITU-R F.1098-1.
- Reserve the upper portion of the Paired 2200 MHz band exclusively for space operation use.

We received twenty-eight submissions, from telecommunication, space, Programme Making and Special Events (PMSE) industries, and government agencies. After reviewing all the submissions, RSM has now determined the future band plan including the policy and technical requirements.

The decisions described in this document will take effect from 1 April 2021, once the existing management rights expire.

3 Planning Decisions

3.1 1785–1805 MHz (1800 MHz Duplex Gap)

The proposal to use the 1800 MHz duplex gap to accommodate radio microphones was welcomed by all submissions. Industry also recommended that RSM define technical requirements based on the analysis in ECC Report 191.

RSM has decided to update the General User Radio Licence (GURL) for short range devices (SRD) with licence conditions derived from CEPT Report 50. The details of the updated licence are in Annex 1: 1785–1805 MHz General User Radio Licence for Wireless Microphone and Audio transmission .

The equipment used for radio microphones within the frequency band will need to comply with ETSI standard EN 300 422-1 V2.1.2. RSM mandates this standard in the Radiocommunications Regulations (Radio Standards) Notice 2020.

3.2 2010–2025 MHz (Unpaired 2000 MHz Band)

In the consultation document we proposed postponing a decision on the use of the unpaired 2000 MHz band until there is clarity on international harmonisation of the band.

One space-industry submission recommended that short-term licensed trials be conducted for Mobile Satellite Services (MSS), as envisioned by Agenda 1.18 for the World Radiocommunication Conference in 2023 (WRC-23).

Submissions from the PMSE industry noted that Region 1 has harmonised the band for PMSE.

Other submitters were either silent on this question or agreed that the decision should be postponed.

Given the absence of substantive proposals, RSM has decided to postpone a decision on the band 2010–2025 MHz until there is clarity on international harmonised usage.

In the interim, RSM will consider short-term licences for testing or for special events, on a case-by-case basis.

3.3 2025–2110 MHz/2200–2290 MHz (Paired 2200 MHz Band)

The proposal to allocate 2025–2081.5 MHz and 2200–2256.5 MHz for fixed services was welcomed by the land mobile sector and by mobile network operators. However, there were concerns from the space industry about allocating the lower part of the band exclusively to fixed services. The reasons were:

- the bands are allocated by the ITU to fixed, space research (SR), space operation (SO) and Earth exploration-satellite (EES) services on a primary basis
- satellites and satellite ground stations require the flexibility to utilise the entire frequency band due to international spectrum harmonisation of satellite communications
- the growing demand for Telemetry, Tracking and Control (TT&C) spectrum from the space industry

- the risks inherent in reprogramming transceiver frequencies when the satellite is operating in space.

There was also interest from some submitters in using the band for PMSE and for other applications. In such cases, RSM will consider dispensations for short-term licences on a case-by-case basis.

After considering the submissions, RSM has determined the band plan and the technical conditions as follows.

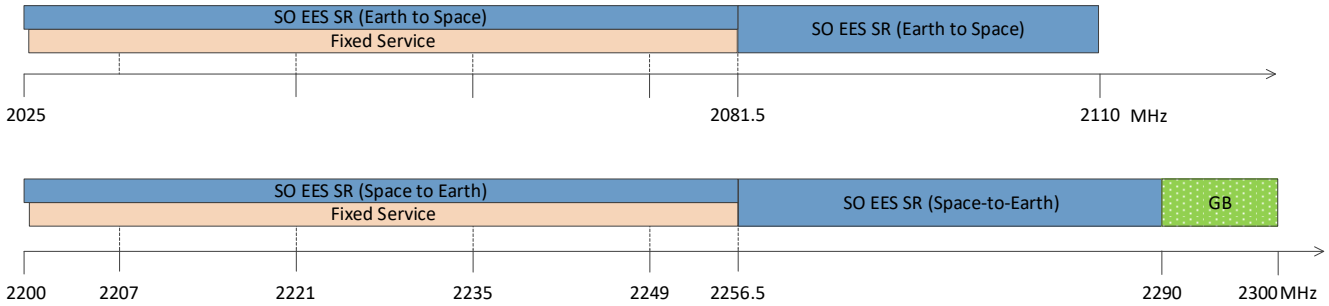
3.3.1 Band plan

RSM proposes to make the lower portion of the paired 2200 MHz band (2025-2081.5 MHz and 2200-2256.5 MHz) available for shared use between space (SO, EES, SR) and fixed services.

The band allocated to fixed services will be used for both new applications and for migrating existing licences from the 'L' and 'LL' (1427-1518 MHz) band.

2081.5–2110 MHz (Earth-to-space) and 2256.5–2290 MHz (space-to-Earth) are allocated to SO, EES and SR exclusively to support:

- the growing demand for spectrum from the space industry
- the protection of the data relay satellite (DRS) network[2]



2025 – 2081.5 MHz and 2200 – 2256.5 MHz is on a sharing use between terrestrial and non-terrestrial service
2081.5 – 2110 MHz and 2256.5 – 2290 MHz is exclusivity allocated to non-terrestrial service

Figure 2 2025 – 2110 / 2200 -2290 MHz band plan

Most submissions agreed that 2290–2300 MHz should be reserved as a guard band to achieve compatibility with the adjacent management right above 2300 MHz. One submission suggested following the ITU allocation of this band for space research and deep space communication. Considering the rare use of this band in New Zealand, RSM has decided to retain the guard band. RSM will consider dispensations for special licences in this guard band on a case-by-case basis.

3.3.2 Space Operation, Earth Exploration-Satellite and Space Research

The 2025–2110 and 2200–2290 MHz bands largely support TT&C satellite subsystems, including communications with satellite Earth stations (SES). There is no standardised channel plan but generally each link uses a channel size from 25 kHz to 1 MHz.

[2] ITU-R F.1247-4 explains that the higher part of the 2200–2290 MHz band is more susceptible to interference. This is because most DRS spacecraft currently operate in the upper part of the band, while a few operate in the middle part, with at least one in the lower part.

Earth station receive-protection zone

Several submissions from the space industry proposed that a protection area for their satellite Earth station sites be defined. Considering that:

1. satellite receivers operate with a very low signal-to-noise ratio (SNR)
2. there are already a few satellite or space operation sites serving multiple satellite licences
3. the space industry contribute an important part to regional economic development

RSM has decided to define three protection zones (Warkworth Earth Station, Awarua Earth Station and Mahia Peninsula) allocated for SR, EES and SO with parameters as follows.

1. Each protection zone is centred on a point location, as shown in Table 1 below
2. Each protection zone has a radius of 2 km from that point location
3. The protection frequency range is 2200–2290 MHz
4. To avoid desensitisation of the satellite station receivers, permissible interference from terrestrial services within the protection area shall be less than -154 dBW/MHz[3].

Table 1 SO EES and SR protection zone

Location Name	Geo-reference (NZGD2000)	Protection area radius (km)
Warkworth Earth Station	-36.43235 174.66834	2
Awarua Earth Station	-46.52864 168.37913	2
Mahia Peninsula	-39.24054 177.87585	2

Approved persons must undertake an interference analysis for any new applications deployed within 100km of the protection zone. This is based on the minimum coordination distance calculation from the International Radio Regulations, Appendix 7[4].

Technical requirements for satellite Earth station transmitters

For satellite Earth station transmitters operating in 2025–2110MHz, the antenna radiation pattern should comply with Recommendation ITU-R S.465.

For Earth stations tracking Non-Geostationary Satellite Orbit (NGSO), the minimum antenna elevation should be greater than 10 degrees.

The above two requirements aim to limit the terrestrial radiation area from a satellite Earth station transmitter. By reducing the radiation area, spectrum sharing between space and terrestrial services can be more efficient.

3.3.3 Fixed Services

The 2.1 GHz fixed service band will be used for point-to-point and point-to-multipoint digital-only systems. A total of 2 x 56.5 MHz spectrum is sufficient to accommodate the migration of fixed links from the fixed ‘L’ and ‘LL’ bands in the frequency range 1427–1524 MHz.

[3] The permissible interference power and calculation parameters is derived from ITU Radio Regulation 2020 Appendix 7 Table 8b “Parameters required for the determination of coordination distance for a receiving earth station”.

[4] Appendix 7 addresses the determination of the coordination area around a transmitting or receiving earth station that is sharing spectrum with terrestrial services.

Channel plan

The submissions welcomed RSM's proposed channel plan, although one recommended that RSM add a narrow channel more suitable for L band migration. RSM has decided to plan the channels based on the ITU-R F.1098-1 Recommendation. Supported channel sizes are 1.75, 3.5 and 7 MHz with a transmitter-receiver duplex spacing of 175 MHz. The frequencies of individual channels will be derived as follows:

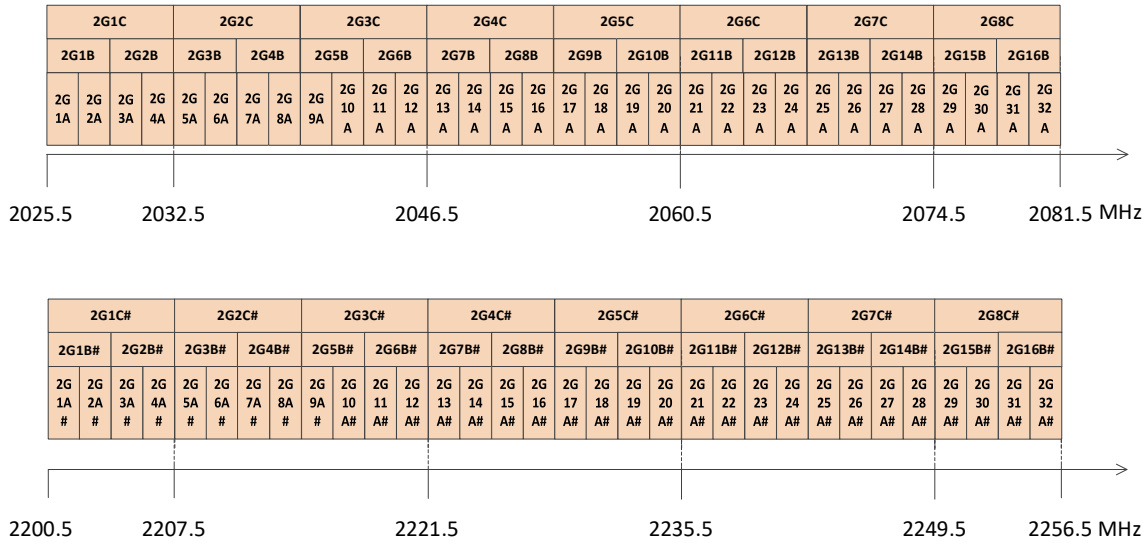
Lower half of the band: $f_n = f_0 - 133 + 7n$

Upper half of the band: $f_n = f_0 + 42 + 7n$

where: n = 1, 2, 3, 4, 5, 6, 7 or 8.

f_0 being the centre frequency of the band, which equals 2 155 MHz
f_n being the centre frequency of one channel in the lower half of this band (MHz)
f_n' being the centre frequency of one channel in the upper half of this band (MHz)

Channel arrangements with carrier spacing of 3.5 and 1.75 MHz are possible by means of channel subdivision. Figure 3 shows the complete channel plan:



56 MHz x2 with 175 MHz Duplex

- 8 Channels of 7 MHz
- 16 Channels of 3.5 MHz
- 32 Channels of 1.75 MHz

Figure 3 2.1 GHz fixed service channel plan of 1.75, 3.5 and 7 MHz

Technical requirements

Considering that 2025 –2110 and 2200–2290 MHz are primarily used by SR, SO and EES, the following technical conditions are required for deploying fixed services in this band. These technical requirements are from ITU Recommendation ITU-R F.1247-4.

- Point-to-point fixed service stations operating in the band 2200–2290 MHz must avoid radiating at an e.i.r.p. spectral density greater than +8 dB(W/MHz) towards geostationary DRS locations, as specified in Recommendation ITU-R SA.1275.

- Automatic Transmit Power Control (ATPC) such that the mean power is a minimum of 10 dB below the maximum transmitter power.

Besides the technical requirement above, RSM mandates EN 302 217-2-2 V2.2.1 as the radio standard for fixed services operating under 2.1 GHz band.

3.4 1980–2010/2170–2200 MHz (paired 2100 MHz band extension)

Submissions from both the IMT and the satellite industries showed interest in the paired 2100 MHz band extension. One party expressed an interest in using the band for direct air-to-ground networks. These networks can be used in conjunction with mobile satellite services to provide in-flight connectivity.

A submission from mobile network operators (MNO) recommended waiting to see if the paired 2100 MHz band extension is going to be used more widely as an IMT band.

A few submissions from the space industry recommended the band could also be planned for mobile satellite service (MSS) or a hybrid approach. The hybrid approach uses MSS with an ancillary terrestrial component (ATC), also known as the complementary ground component (CGC). The approach can encompass a broad range of services such as IoT, public safety, etc.

Considering the range of uses suggested from the submissions, RSM has decided to reserve the band for short-term trial opportunities, pending a later decision about long term allocation. As the frequencies are immediately adjacent to the 3GPP band 3 and a satellite Earth station receiving band, any long-term allocation would require an engineering assessment to ensure technical compatibility with incumbent licences and to meet the protection zone requirements defined in above section.

Annex 1: 1785–1805 MHz General User Radio Licence for Wireless Microphone and Audio transmission

Licence Name: General User Radio Licence for Short Range Devices (GURL-SRDs).
Licence: Any person may transmit radio waves using Short Range Devices (SRDs), also known as Restricted Radiation Devices (RRDs), Low Interference Potential Devices (LIPDs), or Spread Spectrum Devices (SSDs), in accordance with the applicable terms, conditions and restrictions of this notice.
Licence number: 266324
Spectrum -

Low (MHz)	High (MHz)	Reference Frequency (MHz)	Maximum Power dBW e.i.r.p.	Remarks
1785.000	1805.000	1795.000	-17	Special condition 24 and 29
1785.000	1805.000	1795.000	-13	Special condition 24 and 29

24. Use is limited to the purpose known as wireless microphones, in-ear monitors, or wireless audio transmitters.
29. Emission of the transmitter needs to comply with below block edge mask (BEM). Maximum e.i.r.p. of -17 dBW per channel for handheld unit and -13 dBW per channel for body worn unit. The spectrum will be available from 1 April 2021.

	Frequency Range	**Handheld unit (e.i.r.p.)**
Out-of-block	< 1785 MHz	-17 dBm/200 kHz
Restricted frequency range	1785-1785.2 MHz	4 dBm/200 kHz
	1785.2-1803.6 MHz	13 dBm/channel
	1803.6-1804.8 MHz	10 dBm/200 kHz, with a limit of 13dBm/channel
Restricted frequency range	1804.8-1805 MHz	-14 dBm/200 kHz
Out-of-block	> 1805 MHz	-37 dBm/200 kHz
	Frequency Range	**Body worn unit (e.i.r.p.)**
Out-of-block	< 1785 MHz	-17 dBm/200 kHz
	1785-1804.8 MHz	17 dBm/channel
Restricted frequency range	1804.8-1805 MHz	0 dBm/200 kHz
Out-of-block	> 1805 MHz	-23 dBm/200 kHz

References

[1] ECC Report 191: “Adjacent band compatibility between MFCN and PMSE audio applications in the 1785-1805 MHz frequency range”.

[2] CEPT Report 50: Report A from CEPT to the European Commission in response to the Mandate “On technical conditions regarding spectrum harmonisation options for wireless radio microphones and cordless video-cameras (PMSE equipment)” Technical conditions for the use of the bands 821-832 MHz and 1785-1805 MHz for wireless radio microphones in the EU.

[3] ITU-R Recommendation F.1098-1, “Radio-frequency channel arrangements for fixed wireless systems in the 1900-2300 MHz band”.

[4] ITU-R Recommendation F.1247-4 “Technical and operational characteristics of systems in the fixed service to facilitate sharing with the space research, space operation and Earth exploration-satellite services operating in the bands 2025-2110 MHz and 2200-2290 MHz”.

[5] ITU-R Recommendation SA.1275 “Orbital locations of data relay satellites to be protected from the emissions of fixed service systems operating in the band 2200-2290 MHz”.

[6] ITU-R Recommendation S.465-6 “Reference radiation pattern of Earth station antennas in the fixed-satellite service for use in coordination and interference assessment in the frequency range from 2 to 31 GHz”.

[7] EN302 217-2-2 Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 2-2: Digital systems operating in frequency bands where frequency co-ordination is applied; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive.