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Implementation of the 1.9 GHz band planning outcomes

Consultation paper

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Executive summary

In November 2023, we released our ‘Replanning of the 1880–1920 MHz’ outcomes paper, setting out the planning decisions for the future of the 1880–1920 MHz band.[1] Following multiple rounds of consultation, we settled on the following arrangements for the 1.9 GHz band:

- Maintaining short-range wireless broad band (SR WBB) use under Australia-wide class-licensing arrangements across the 1880–1900 MHz frequency range. Also updating these arrangements to ensure support for ‘future DECT’ (digital enhanced cordless telecommunications – indoor and outdoor applications).
- Introducing apparatus-licensed arrangements for indoor-only SR WBB (‘future DECT’) applications in metropolitan areas in the 1900–1920 MHz frequency range.
- Maintaining local area wireless broadband (LA WBB) and point-to-point (PTP) access arrangements across the 1900–1920 MHz frequency range in regional and remote areas. We will consider the need for restrictions on new licences near defined rail corridors. We will also assess whether existing licences will be affected by arrangements developed to support the introduction of rail mobile radio (RMR) services.
- Preserving options for RMR services in the 1900–1910 MHz segment for new uses and applications.

We are now seeking comment on the implementation of these planning decisions, including the development of technical planning, detailed licensing, allocation and pricing considerations.

[1] Past papers dealing with the 1.9 GHz band are available on our website.

Issue/s for comment

We invite comments on the issues set out in this paper:

1. (a) Should we adopt the enhanced selectivity requirements in ETSI TS 103 807 for coordination of Future Railway Mobile Communications Services (FRMCS) with 2 GHz band base station receivers?
    (b) What would be the impact to 2 GHz band spectrum and public telecommunications service (PTS) licensees if ETSI TS 103 807 was adopted in Australia?
    (c) Do existing 2 GHz band base station receivers already meet the enhanced selectivity in ETSI TS 103 807?
2. Do stakeholders agree that the frequency separation between FRMCS receivers and 1800 MHz spectrum and PTS-licensed transmitters is sufficient to support coexistence without the need for defined coordination requirements?
3. Are there any comments on the proposed draft RALI MS51?
4. Are there any comments on the proposed licensing options and taxes for FRMCS?
5. Are there any comments on the proposed changes to the cellular mobile class licence?
6. Are there any comments on the proposed amendments to RALI FX19?
7. Are there any comments on the proposed licensing option and taxes for SR WBB services?
8. Are there any comments on the proposed amendments to RALI FX3?

We also welcome feedback from stakeholders on any of the other issues and proposals raised in this consultation.

Introduction

This paper seeks feedback on proposed new arrangements to support the introduction of Future Rail Mobile Communications Services (FRMCS) and SR WBB services in the 1.9 GHz band. These proposals build on previous rounds of consultation on the future use of the 1.9 GHz band (discussed further below).

FRMCS is an evolving technology that is being developed by the Conference of European Postal and Telecommunications (CEPT) for the specialised requirements of rail services. FRMCS is being developed to operate in the 1900–1910 MHz band and is based on the 3GPP Rel. 17 standard. FRMCS is being adopted primarily in Europe and is supported by the Australasian Railway Association (ARA) as the preferred technology for RMR.

The proposed SR WBB arrangements are intended to support a broad range of wireless applications, such as cordless telephony, wireless microphone systems and internet of things applications, in various settings including industrial, residential, educational and commercial. We understand that Digital Enhanced Cordless Telecommunications (DECT) standard – including newer generations of the DECT standard – is currently the sole technology likely to be used to provide SR WBB services in the band.[2]

Background

We released the *Exploring future use of the 1.9 GHz band* discussion paper in November 2021. This paper identified domestic and international considerations for the future use of the 1880–1920 MHz band (the 1.9 GHz band) and explored views on possible changes in planning arrangements for the band. Following the discussion paper, we released the *Replanning of the 1880–1920 MHz band* options paper in November 2022 and the *Replanning of the 1880–1920 MHz band* outcomes paper in November 2023.

Outcomes of previous consultation

The outcomes paper outlines the process, considerations and decisions for the replanning of the 1.9 GHz band and identified the following key planning decisions:

- Maintain SR WBB use under Australia-wide class licensing arrangements across the 1880–1900 MHz frequency range and update these arrangements to ensure support for ‘future DECT’ (indoor and outdoor applications).
- Introduce apparatus licensed arrangements for indoor-only SR WBB (‘future DECT’) applications in metropolitan areas in the 1900–1920 MHz frequency range.
- Maintain local area (LA) WBB and point-to-point (PTP) access arrangements across the 1900–1920 MHz frequency range in regional and remote areas, noting that we will consider the need for restrictions on new licences near defined rail corridors and also assess whether existing licences will be impacted by arrangements developed to support the introduction of RMR.
- Preserve options for RMR services in the 1900–1910 MHz segment of the band for new uses and applications. This will allow rail operators to plan for and deploy RMR to support their operations along defined rail corridors, while permitting ongoing LA WBB and PTP use in other areas

[2] Newer generations of the DECT standard include: DECT evolution and DECT-2020 new radio (NR).

In June 2024, we issued the Radiocommunications (Cordless Communications Devices) Class Licence 2024 (the CCD class licence), which includes the provisions for DECT NR in the 1880–1900 MHz frequency range.

Purpose

The purpose of this paper is to seek comment on the proposed implementation of FRMCS in the 1900 – 1910 MHz band and SR WBB services in the 1900 – 1920 MHz band. These proposed arrangements aim to support the deployment of FRMCS and SR WBB services and provide measures to manage coexistence with other services operating in, and adjacent to, the 1.9 GHz band.

The majority of the proposed arrangements discussed in this paper are planned to be implemented via a new Radiocommunications Assignment and Licensing Instruction (RALI), referred to as RALI MS51 in this paper, and an update to the existing RALI FX19. Drafts of these RALIs are included in the key documents section of this consultation's web page, and should be read in conjunction with this paper.

We are also proposing changes to the Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2024 (the cellular mobile class licence) and Radiocommunications (Transmitter Licence Tax) Determination 2025 (the tax determination).

The implementation of arrangements for FRMCS and SR WBB services will conclude our replanning work in the 1.9 GHz band.

FRMCS is widely considered the replacement technology for existing Global System for Mobile Communications – Railway (GSM-R) networks that are currently operated in the 1800 MHz band in some cities. There is a relationship between the proposals in this paper and the expiry of 1800 MHz band spectrum licences that are currently held by rail licensees. However, issues related to the expiring spectrum licence process and the long-term use of the 1800 MHz band for rail services are outside the scope of this consultation process.

Next steps

Subject to feedback to this public consultation, we aim to publish RALI MS51 and amend RALI FX19 and vary the cellular mobile class licence and the tax determination.

Technical analysis

In this section, we provide an analysis of how FRMCS and SR WBB services would be able to coexist with other spectrum users. In assessing the implementation for these services, analysis was undertaken to determine the sharing criteria between FRMCS and other services (both co-channel and adjacent channel, as required). This technical analysis uses the following published documents as reference material:

- ERC 314, Co-existence between Future Railway Mobile Communication System (FRMCS) in the frequency range 1900–1920 MHz and other applications in adjacent bands.
- ERC 318, Compatibility between RMR and MFCN in the 900 MHz range, the 1900–1920 MHz band and the 2290–2300 MHz band.
- ETSI TR 103 149, System Reference document (SRdoc); DECT operating in the 1900–1920 MHz band.
- ETSI TR 103 459, Rail Telecommunications (RT); Future Rail Mobile Communication System (FRMCS); Study on system architecture.
- ETSI TR 103 554-2, Rail Telecommunications (RT); Next Generation Communication System; Radio performance simulations and evaluations in rail environment; Part 2: New Radio (NR).
- ETSI TR 103 865, Rail Telecommunications (RT); Future Railway Mobile Communication System (FRMCS); Radio performance aspects.

Where the above documents have not addressed a specific Australian coexistence scenario, we have conducted our own analysis using the system parameters provided in the Appendices to this paper. FRMCS, SR WBB (DECT), fixed link and BWA parameters are provided in Appendix A, B, C and D respectively.

The following sections contain summaries of the interference considerations between FRMCS and the different services.

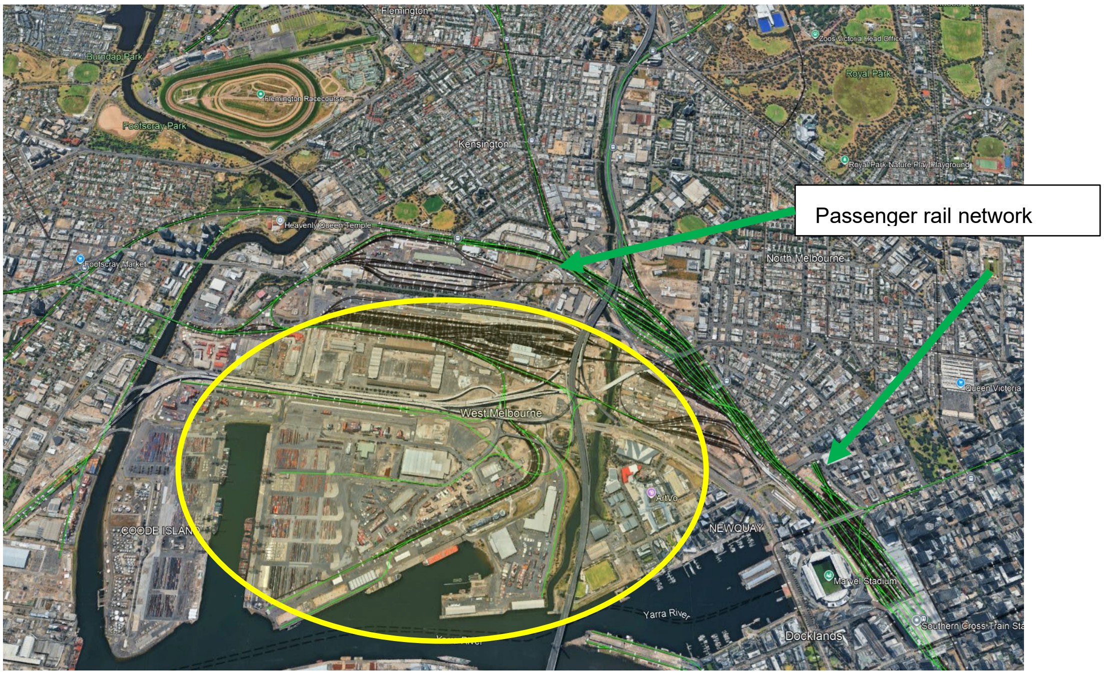
Coexistence between different FRMCS networks

We propose that licences to operate a 1.9 GHz band FRMCS network be available to any rail operator (include operators of passenger, freight and mining rail networks). However, given there is only 10 MHz of spectrum available for 1.9 GHz band FRMCS services, there is an interference risk between disparate FRMCS networks when deployed in the same areas.

While it is generally expected that there will only be a single rail operator per railway line, there are some scenarios where several operators could be in close proximity. Figures 1 and 2 illustrate some possible example scenarios.

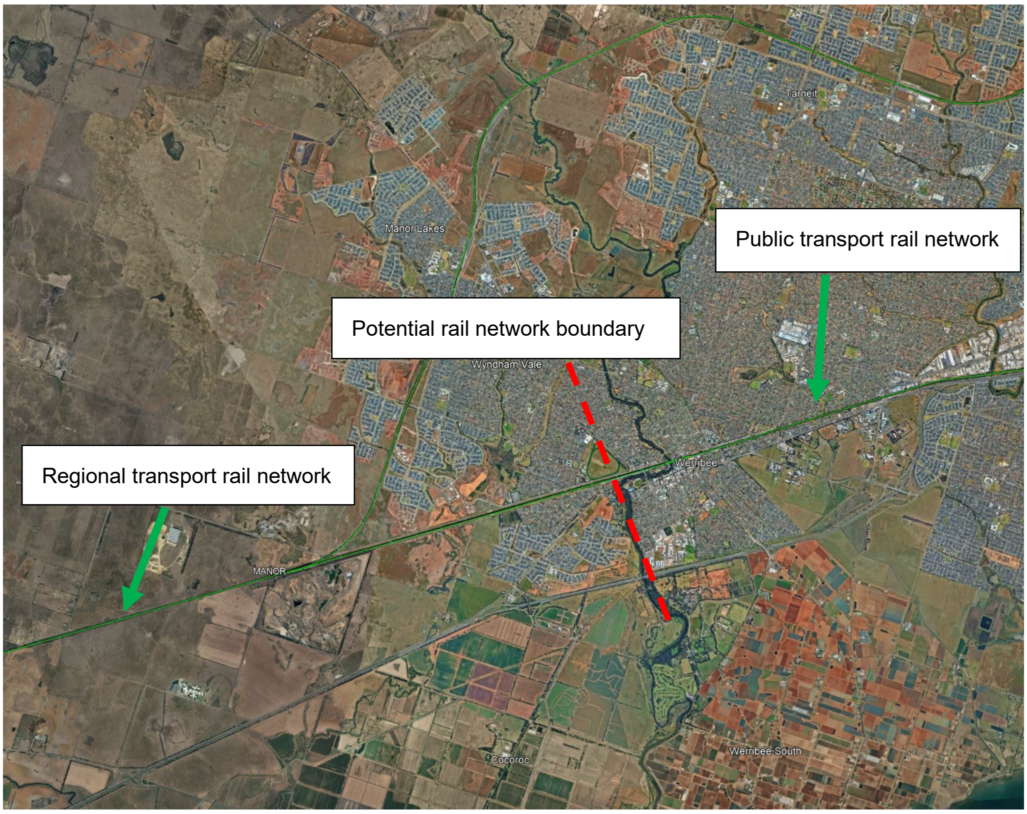
The first scenario in Figure 1 illustrates a passenger rail network in close proximity to the Melbourne docks where freight rail services would be operating.

Figure 1: Example of passenger and freight rail operations in close proximity



The second example in Figure 2 shows a scenario where there is a boundary between different operators on the same railway line. In this example, a regional train operator may own the FRMCS network until the railway line crosses over into the metropolitan rail network. A similar scenario may be where a railway line crosses a state boundary.

Figure 2: Example of a boundary between 2 rail operators on the same railway line



While there is a risk of interference between FRMCS networks in the absence of a coordinated approach, that risk is considered low in the short to medium-term as we expect that initial FRMCS deployments will be limited to passenger rail networks in major capital cities. An industry coordinated approach is therefore preferred as it could lead to more efficient use of the band (as opposed to prescribing defined arrangements for coexistence between different FRMCS networks).

We propose that licence applications for FRMCS operation will generally have the endorsement of the Australasian Railway Association (ARA) – this is similar to the approach used to manage rail industry spectrum in the 400 MHz band.[3] It will make it more likely that only rail operators gain access to the proposed FRMCS spectrum arrangements and would be assisted by an industry-agreed limit on different FRMCS operators within a geographical area.

While we do not propose to define any specific coordination requirements, in cases where the rail industry supports multiple co-area FRMCS networks, interference mitigation can be achieved by having regard to relevant specifications in ETSI TR 103 865, such as the FRMCS operating characteristics, deployment planning and frame synchronisation.

Coexistence between FRMCS and fixed links (point-to-point)

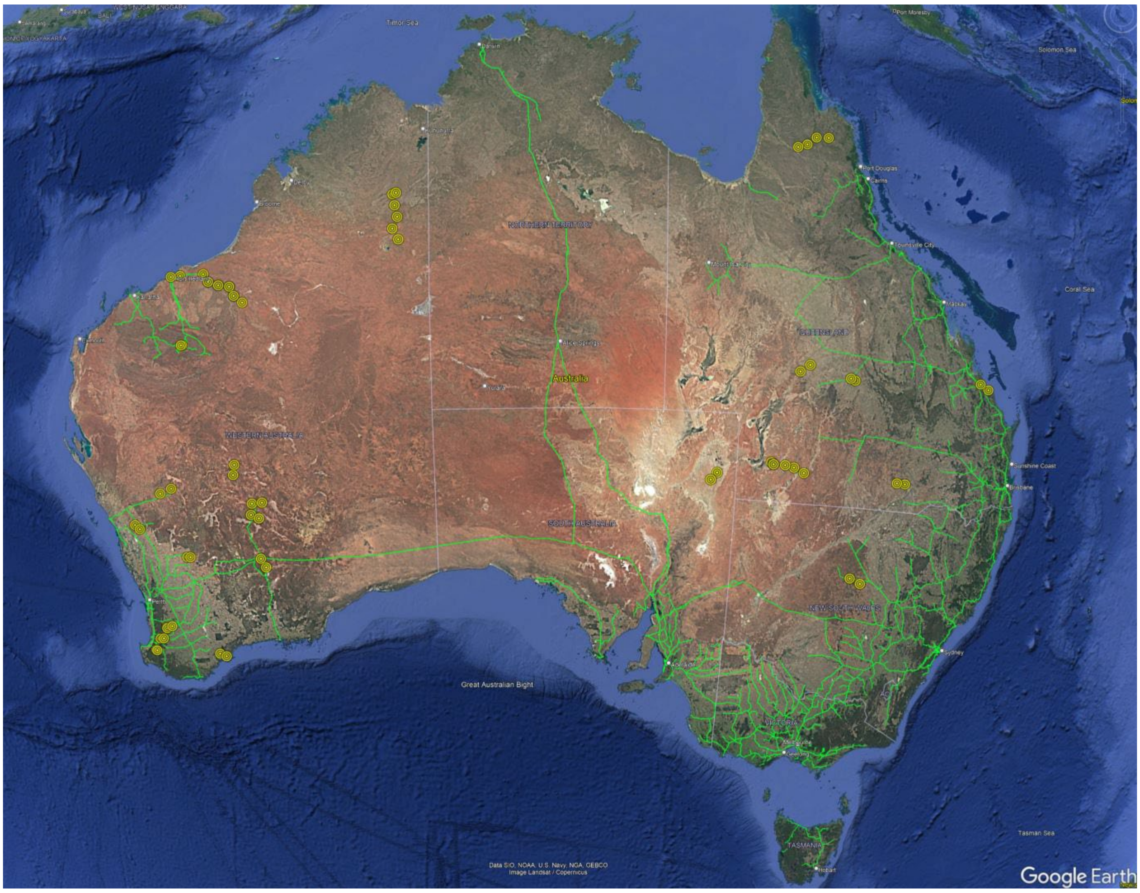
As of 1 August 2025, there are 33 fixed links (33 transmitters, 33 receivers) whose licensed bandwidth overlaps the 1900–1910 MHz frequency range. There are:

- 14 fixed links with centre frequency within 1900–1910 MHz
- 2 fixed links with centre frequency below 1900 MHz
- 17 fixed links with centre frequency above 1910 MHz.

These fixed links are located in regional and remote Australia, as illustrated in Figure 3.

[3] See FAP7 Assigning rail industry spectrum in the 400 MHz band.

Figure 3: Location of existing fixed link stations (yellow)



Fixed links are currently able to be deployed in regional and remote areas without restriction, including proximate and co/adjacent channel to railway lines, which may impact the operation of FRMCS networks.

Fixed link interference into FRMCS

We modelled the interference from a fixed link transmitter into an FRMCS receiver, assuming the worst-case scenario of a fixed link transmitter with the maximum[4] equivalent isotropic radiated power (EIRP) directed towards a co-channel FRMCS bast station. Three different antenna heights were used for the fixed link transmitter: 200 m, 400 m and 800 m to model potential differences in terrain heights. The FRMCS base station receiver protection criteria are provided in Appendix A and the antenna height is assumed to be 30 m. The International Telecommunication Union (ITU) recommendations ITU-R P.525 and ITU-R P.526 were applied for the propagation modelling. Table 1 provides the calculated separation distances that would be necessary to avoid unacceptable interference into a co-channel FRMCS base station receiver.

[4] Using details of current fixed links from the Radiocommunications Register of Licences (RRL).

Table 1: Required separation distance between fixed link transmitters and FRMCS base station receivers operating co-channel

Fixed links				
		Tx antenna height(m)		
		200	400	800
	Path loss required (dB)	Distance based on ITU-R p.526 (km)		
MAX EIRP (28.99 dBW/MHz)	180	105.5	128	160
MIN EIRP (18.06 dBW/MHz)	169.1	96.5	119	151

Table 2 contains the results of the same calculations for adjacent channel operation. Since adjacent channel distances are significantly smaller than for co-channel, the calculated separation distances do not differ by antenna height as they are all within line-of-sight.

Table 2: Required separation distance between fixed link transmitters and FRMCS base station receivers operating adjacent channel

Fixed links		
	Path loss required (dB)	Distance based on ITU-R p.525 (km)
MAX EIRP (28.99 dBW/MHz)	122	15.7
MIN EIRP (18.06 dBW/MHz)	111.1	4.5

FRMCS interference into fixed links

We modelled the interference risk from a FRMCS transmitter to a fixed link receiver, also assuming a worst-case interference scenario. For the fixed link receivers modelled, each receiver's interference threshold was determined using parameters registered on the RRL. Based on the transmitter power, path length, transmit and receive antenna gains, protection ratio and relevant correction factors, see Appendix C, the lowest interference threshold is approximately -139 dBW/MHz for co channel and -109 dBW/MHz. With the maximum FRMCS base station EIRP of 65 dBm/10 MHz (25 dBW/MHz), this equates to a path loss requirement of 164 dB co-channel and 134 dB adjacent channel.

For the co-channel scenario, as this is less than the path loss requirement for the fixed link transmitter to a FRMCS receiver discussed in the previous section (see Table 1), the coordination requirements for that scenario will ensure the appropriate protection for a fixed link receiver.

For the adjacent channel, the required path loss for a FRMCS transmitter to fixed link receiver (134 dB) is greater than the path loss required for a fixed link transmitter to a FRMCS receiver (122 dB, see Table 2). Based on free space loss (as line-of-sight could occur to fixed link receivers sited on a hill greater than 100 m), this equates to a required separation distance of 60 km.

Conclusion

Based on a worse-case scenario, a fixed link would require a minimum separation distance of 160 km co-channel and 60 km adjacent channel with a FRMCS base station to ensure co-existence without coordination. Within this distance, any new fixed link service will need to be coordinated with the FRMCS network to ensure coexistence. This proposal is discussed further in the Implementation section of this paper.

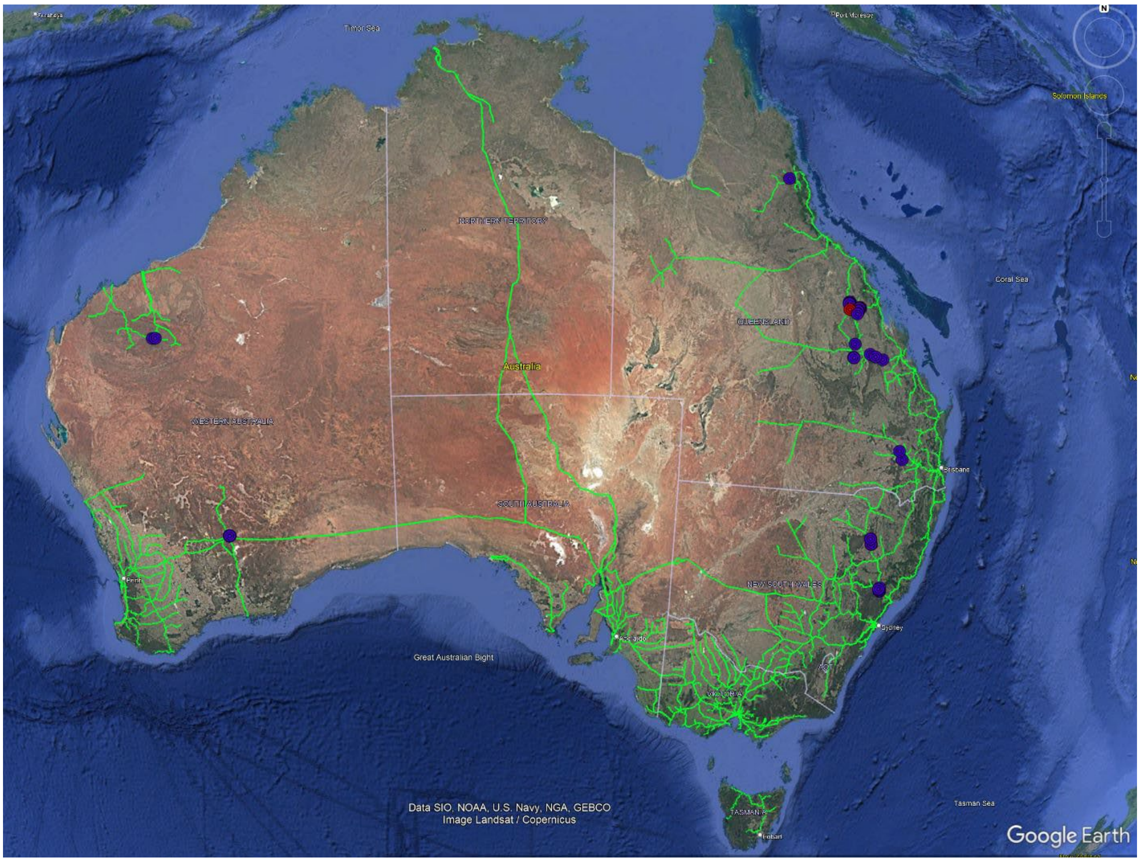
FRMCS and broadband wireless access (BWA)

As of 1 August 2025, there are:

- 35 BWA base stations Australia-wide in the range 1900–1910 MHz (co-channel with the FRMCS allocation)
- 9 BWA base stations Australia-wide in the range 1910–1920 MHz (adjacent channel with the FRMCS allocation).

These BWA base stations are located in regional and remote Australia, as illustrated in Figure 4 (co-channel in blue and adjacent channel in red).

Figure 4: Location of existing BWA stations (co-channel blue, adjacent channel red)



BWA services are currently able to be deployed in regional and remote areas without restriction with regards to railway lines. This means they could be deployed in close proximity to railway lines both co-channel and adjacent channel which may impact the operation of FRMCS networks.

BWA interference into FRMCS

We modelled the interference risk from a BWA base station transmitter into a FRMCS base station receiver, assuming a worst-case scenario of the BWA transmitter with the maximum[5] EIRP directed towards an FRMCS base station. Three different heights were used for the BWA antenna: 200 m, 400 m and 800 m, to model potential differences in terrain heights.

[5] Using current BWA station details from the RRL.

The assumed FRMCS base station receiver protection criteria as provided in Appendix A and the antenna height above ground was assumed to be 30 m. ITU recommendations ITU-R P.525 and ITU-R P.526 were applied for the propagation modelling.

Table 3 contains the calculated distance required to avoid unacceptable interference from a BWA transmitter into a co-channel FRMCS base station receiver.

Table 3: Required separation distance between BWA transmitters and FRMCS base station receivers operating co-channel

Fixed links				
		Tx antenna height(m)		
		200	400	800
	Path loss required (dB)	Distance based on ITU-R p.526 (km)		
MAX EIRP (26.6 dBW/MHz)	177.7	104	126	158.5
MIN EIRP (3.01 dBW/MHz)	154	84	106.5	138.5

Table 4 contains the calculated distances required to avoid unacceptable interference from a BWA base station transmitter into an adjacent-channel FRMCS base station receiver.

Since adjacent channel distances are significantly smaller than for co-channel, the calculated separation distances do not differ by antenna height as they are all within line-of-sight.

Table 4: Separation distance between BWA transmitters and FRMCS base station receivers operating adjacent channel

Fixed links		
	Path loss required (dB)	Distance based on ITU-R p.525 (km)
MAX EIRP (26.6 dBW/MHz)	119.7	12.09
MIN EIRP (3.01 dBW/MHz)	96	0.79

FRMCS interference into BWA

We analysed the interference risk from an FRMCS transmitter into a BWA receiver, also assuming a worst-case scenario. BWA receiver protection requirements are provided in Appendix D and are 2 dB more stringent than the protection requirements for FRMCS receivers. However, as the maximum BWA transmitter EIRP (66.7 dBm/10 MHz) is greater than the maximum FRMCS transmitter EIRP (65 dBm/10MHz), the interference scenario is equivalent to that of the BWA transmitter interfering with the FRMCS receiver. So, the proposed protection measures for FRMCS receivers will also ensure that BWA receivers do not receive unacceptable interference.

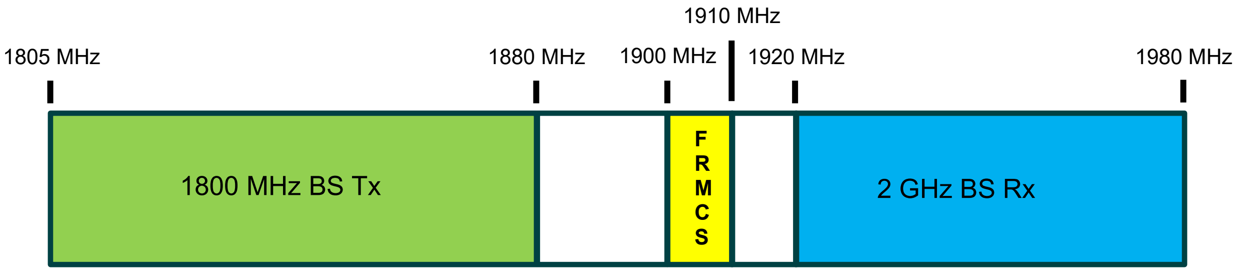
Conclusion

Based on a worse-case coexistence scenario, a BWA base station would require a minimum separation distance of 160 km for co-channel operation and 15 km for adjacent channel operation from an FRMCS network to ensure co-existence without coordination. Within this distance, any proposed new BWA service will need to be coordinated with the FRMCS network to ensure coexistence. This proposal is discussed further in the implementation section of this paper.

FRMCS and spectrum licence/PTS

Spectrum-licensed and public telecommunications service (PTS) licensed devices operate in the adjacent 1800 MHz (1805–1880 MHz) and 2 GHz bands (1920–1980 MHz).[6] These licences typically authorise the use of devices for public and private wireless broadband networks (i.e. 4G/5G-based technologies). 1800MHz/2GHz band services operate as frequency division duplexing (FDD) services on paired spectrum allocations, with the lower pair being used for base station transmit and the upper pair for base station receive. This means that frequency pairs adjacent to the 1.9 GHz band, 1805–1880 MHz and 1920–1980MHz, are used for 1800 MHz base station transmitters and 2 GHz base station receivers respectively – see Figure 5.

Figure 5: Band arrangements for 1800 MHz and 2 GHz band spectrum-licensed and PTS services



The potential interference between 1800MHz/2GHz band spectrum licence and PTS services and FRMCS services operating in the range 1900 MHz–1910 MHz was considered in:

- ECC Report 314 'Co-existence between Future Railway Mobile Communication System (FRMCS) in the frequency range 1900–1920 MHz and other applications in adjacent bands'
- ECC Report 318 'Compatibility between RMR and MFCN in the 900 MHz range, the 1900–1920 MHz band and the 2290–2300 MHz band'.

Additionally, Ofcom (the United Kingdom spectrum regulator) released a consultation paper in March 2025, 'Future authorisation of the 1900–1920 MHz band'. We have referred to these papers to help inform our analysis of these scenarios.

FRMCS interference into 2 GHz band base station receivers

The notional receiver performance requirements for 2 GHz base stations are provided in the Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers – 2 GHz Band) 2023 (the RAG Rx). The RAG Rx provides parameters to access out-of-band interference scenarios (i.e. adjacent channel selectivity (ACS) and blocking requirements) as well as a maximum tolerable interference limit of -108 dBm/5 MHz (at the receiver input) and a notional antenna gain of 18 dBi (inclusive of losses).

In-band interference

Based on a combination of the out-of-band emission limit of -40 dBm/10 MHz we propose to place on FRMCS services (in line with ECC Reports and the Ofcom consultation paper) and an assumed 2 GHz base station antenna gain of 18 dBi, the required separation distance (for path loss attenuation of 83 dB) will be 180 m. Being a small separation distance, we expect

[6] Spectrum licences have been generally issued in metro and regional areas, and PTS apparatus licensed are available in other areas.

that coexistence will be achieved via the out-of-band interference mitigations (discussed below).

Out-of-band interference

The RAG Rx provides both ACS and blocking requirements, which vary depending on the receiver channel bandwidth and frequency offset – these are replicated in Table 5. For receiver channels less than 20 MHz wide, only the blocking requirement will be applicable, given the frequency separation from the FRMCS band will generally be greater than 5 MHz. For channels of 20 MHz or greater, the ACS value would be applicable if the receiver channel overlaps the range 1920-1930 MHz (i.e. it would be less than or equal to 20 MHz from the FRMCS band).

We have applied the ACS requirements for a 20 MHz channel from Table 5 in our analysis, as this represents the worse-case coexistence scenario. Assuming a minimum wanted level of -89 dBm/20 MHz, the maximum unwanted limit would be -52 dBm (-89 dBm + 37 dB).[7]

Table 5: ACS and blocking requirements from the RAG Rx

Receiver occupied bandwidth	Frequency offsets from the upper and lower frequency limit of the receiver	Minimum relative adjacent channel selectivity (dB)	Minimum blocking requirement (dB)
< 20 MHz	≤ 5 MHz	44 dB	-
	> 5 MHz	-	53
≥ 20 MHz	≤ 20 MHz	37 dB	-
	> 20 MHz	-	46

The modelling presented in the ECC Reports and the Ofcom consultation paper is representative of the expected deployment scenario in Australia. In that analysis, out of the different interference mechanisms (i.e. receiver sensitivity, blocking and ACS), the dominant interference mechanism was determined to be ACS – this was also reflected in our own analysis. However, the ACS value used in ECC Report 318 was 71.24 dB (for emissions in the range 1905–1910 MHz), which equates to an unwanted signal level of -30 dBm/10 MHz (assuming the sensitivity level of -101.5 dBm in Report 318). As detailed in CEPT Report 39, the ACS value of 71.24 dB was derived from measurements provided by a manufacturer. ETSI TS 103 807[8] also mandates an enhanced selectivity requirement on 2 GHz band base stations and sets the tolerable unwanted emission level of -30 dBm/10 MHz.

Table 6 contains the calculated separation distances between an FRMCS base station transmitter and 2 GHz band base station receivers, and includes the following combinations of input parameters and assumptions:

- FRMCS radiated power of either 65 dBm/10 MHz or 40 dBm/10 MHz.

[7] The assumed wanted level of -89 dBm is based on 3GPP TS 36.104, where the wanted level = receiver sensitivity + 6 dB, and the receiver sensitivity for 20 MHz channels is approximately -95 dBm.

[8] *Mobile Standards Group (MSG); IMT Cellular Networks Base Stations (BS) Additional Regulatory Requirements*

- With and without antenna discrimination (where discrimination is assumed to provide an additional 8 dB attenuation).[9]
- An ACS requirement of either -52 dBm or -30 dBm, taken from the RAG Rx and ETSI TS 103 807 (enhanced selectivity) respectively.

In all cases, an antenna gain of 18 dBi has been assumed. The purpose of this analysis was to compare the coexistence environment based on the RAG Rx requirements with the enhanced selectivity model set out in ETSI TS 103 807.

Table 6: Separation distance between FRMCS transmitters and 2GHz base station receivers using different mitigation factors

Required separation distance between FRMCS and 2 GHz base station		
	Path loss required (dB)	Distance based on ITU-R p.525 (km)
Based on 2 GHz RAG Rx notional receiver		
EIRP (65 dBm/10 MHz)	135	69.86
with 8 dB antenna discrimination	127	27.81
EIRP (40 dBm/10 MHz)	110	3.93
with 8 dB antenna discrimination	102	1.56
Based on ECC Report 318 using ETSI TS 103 807 enhanced selectivity		
EIRP (65 dBm/10 MHz)	113	5.55
with 8 dB antenna discrimination	105	2.21
EIRP (40 dBm/10 MHz)	88	0.31
with 8 dB antenna discrimination	80	0.12

Based on the above analysis, we are of the view that coexistence between FRMCS base stations and 2 GHz band base stations would be achievable via a coordinated approach. However, successful coordination may be challenging if the ACS value specified in the RAG Rx is used, and may require more compromises from FRMCS operators (such as reducing transmit powers, which may impact cell coverage).

Adopting the enhanced selectivity requirement specified in ETSI TS 103 807 may significantly improve coexistence between these two services. While the enhanced selectivity in ETSI TS 103 807 differs from the baseline requirements in 3GPP standards (on which the RAG Rx parameters have been based), equipment that complies with ETSI TS 103 807 may be readily available, noting the widespread use of ETSI TS 103 807 in Europe, and that the standard itself seems to be based on the measured performance of receivers.

We seek input on whether we should adopt the enhanced selectivity requirements in TS 103 807, and what impact this may have on 2 GHz band licensees. Subject to this feedback, we will consider if and how any enhanced selectivity should be implemented in a subsequent consultation process.

[9] ECC Report 318 proposed an 8 dB mitigation factor could be used due to horizontal discrimination between services

Question 1

(a) Should we adopt the enhanced selectivity requirements in ETSI TS 103 807 for coordination of FRMCS with 2 GHz band base station receivers?

(b) What would be the impact to 2 GHz band spectrum and PTS licensees if ETSI TS 103 807 was adopted in Australia?

(c) Do existing 2 GHz band base station receivers already meet the enhanced selectivity in ETSI TS 103 807?

We note the findings in ECC Report 318 that mobile FRMCS transmitters should be limited to a maximum total radiated power of 31 dBm/10MHz, and that power control needs to be implemented for cab-radios to manage coexistence with 2 GHz services. We agree with these findings and propose to adopt these requirements, as discussed in the Implementation section of this paper.

1800 MHz base station transmitter interference into FRMCS receivers

As a minimum, 1800 MHz mobile services operate at a frequency separation greater than the second adjacent channel of potential FRMCS receivers. The potential interference from 1800 MHz band PTS and spectrum licensed services to FRMCS receivers was considered in the ECC Report 314, but no additional mitigations were identified, and no interference concerns were raised in the Ofcom paper.

We expect that the frequency separation between the 2 services will be sufficient to mitigate any potential for unacceptable interference, so we do not propose to establish any coordination criteria to address this scenario.

Question 2

Do stakeholders agree that the frequency separation between FRMCS receivers and 1800 MHz spectrum and PTS-licensed transmitters is sufficient to support coexistence without the need for defined coordination requirements?

Conclusion

Based on the above analyses, an FRMCS base station transmitter would require a minimum separation distance of 70 km from a 2 GHz base station receiver to ensure co-existence without coordination. Within this distance, any new FRMCS base station will need to be coordinated with existing 2 GHz band spectrum licence and PTS base station receivers to ensure FRMCS base station transmitters do not cause unacceptable interference. However, this coordination distance may be significantly reduced, subject to further consideration of the adoption of the enhanced filtering characteristics.

SR WBB & DECT

SR WBB/DECT in the range 1880–1900 MHz

DECT services currently operate in the adjacent frequency range 1880–1900 MHz under the CCD class licence. ECC Report 314 contains an analysis of the interference risk into FRMCS from adjacent band services, including DECT services in the adjacent 1880–1900 MHz range. The report finds that the calculated minimum separation distances are sufficiently low in the adjacent band case that coordination is not required, so we do not propose to prescribe any coordination requirements for FRMCS services.

SR WBB/DECT in the range 1900–1920 MHz

As detailed in the outcomes paper, new SR WBB arrangements will be introduced into the frequency range 1900–1920 MHz in metropolitan areas. As these will be co-frequency with FRMCS, it was decided that these SR WBB services will be limited to indoor only operation and authorised under apparatus licences to help mitigate potential interference. While a range of technologies were previously considered, it was concluded that DECT technology will be the predominate SR WBB technology operated in the band.

Interference between co-channel apparatus-licensed indoor SR WBB (DECT) services and FRMCS equipment may occur when SR WBB and FRMCS systems are in close proximity, and coexistence studies have been undertaken to assess this risk. ECC Report 314 provides separation distances for adjacent channel scenarios. Although the report focuses on adjacent channel interference, similar free-space path loss calculations can be applied to co-channel cases. Calculated free-space separation distances are shown in Table 7, based on system parameters and calculations detailed in Appendix B. The model includes a building penetration loss value of 20 dB, taken from ECC Report 314 to account for the indoor-only conditions of the service.

Table 7: Free space path loss separation distances between co-channel services

Scenario	Interferer → Victim	Free space distance with 20 dB (ECC 314) building loss	Extended Hata model
		(km)	(km)
A	FRMCS BS Tx → SR WBB Rx	0.354	0.065 (Urban environment) 0.099 (Suburban Environment)
B	SR WBB Tx → FRMCS Rx	14	0.35 (Urban environment) 0.78 (Suburban environment)

Based on free-space path loss, separation distances required to meet interference thresholds – when SR WBB is considered the interferer – can extend up to 14 km. Even when accounting for environmental clutter using models such as Hata, the required separation distance may still be approximately 800 m. This suggests that, without further coordination, SR WBB interference into FRMCS base stations is possible.

Given the potential for interference to FRMCS services, and noting the decision in the outcomes paper for the 1900–1910 MHz range to be primarily allocated for rail applications along rail corridors, we propose to implement a distance-based coordination zone to protect FRMCS operations, while facilitating co-channel apparatus-licensed SR WBB deployments.

This would require proposed SR WBB services within 14 km of defined railway lines to be coordinated with a notional FRMCS base station at all locations along the defined railway line. This will preserve the utility of the band for rail services, while enabling co-channel SR WBB services.

As indicated in Table 7, FRMCS base stations would be more susceptible to interference than SR WBB services, so any coordination undertaken to protect FRMCS receivers would also protect SR WBB services from interference in the opposite direction. In addition, the expected SR WBB technology, DECT, incorporates a Dynamic Channel Assignment algorithm, which enables the system to switch to alternative channels when interference exceeds a threshold. This will both aid coexistence between other SR WBB systems and mitigate interference from FRMCS systems if it occurs. SR WBB systems will have access to a broader range of channels, including in the 1880–1900 MHz class-licensed range, reducing susceptibility to interference from FRMCS base stations.

Existing arrangements for BWA services only permit their deployment in regional and remote areas. In addition, as indicated in the outcomes paper, ongoing arrangements for fixed links will also be limited to regional and remote areas. We propose to implement this limitation via an update to RALI FX3. Given SR WBB services are proposed to be limited to metropolitan areas, the likelihood that these services will be in close proximity is low. As such, we do not propose any coordination requirements between SR WBB services and fixed links and BWA services.

Implementation

We propose to implement arrangements for FRMCS services in the 1900–1910 MHz frequency range and indoor SR WBB services in the range 1900–1920 MHz via:

- A new FRMCS RALI, RALI MS51) to provide the required coordination criteria for FRMCS in the 1900–1910 MHz range. We are of the view that a new RALI is the most appropriate way to introduce FRMCS arrangements, as opposed to amending an existing RALI.
- Amending RALI FX 19, to include the required coordination criteria for indoor SR WBB services.
- Updating RALI FX3 to limit new fixed links to regional and remotes areas, as per the outcomes paper.
- Updates to the Radiocommunications (Transmitter Licence Tax) Determination 2025 (the tax determination) and the Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2024 (cellular mobile class licence), as discussed further in this paper. The draft Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence Variation 2026 (No. 1) is available in the key documents box on this consultation's web page.

In previous consultations, we indicated that RALI MS33 may require amending to reflect the implementation of FRMCS and SR WBB services, however we no longer consider that necessary. We will monitor the implementation of these services and will consider if changes to RALI MS33 is required in the future.

RALI MS51

The proposed RALI MS51 will contain the criteria for coordinating FRMCS and other services in and adjacent to the 1900–1910 MHz band, as applicable, with the exemption of SR WBB (which are proposed to be included in RALI FX19. A draft of RALI MS51 is available in the key documents section of this consultation's web page. The proposed coordination criteria are based on the analysis provided in the Technical analysis section of this paper.

Inter-FRMCS coexistence

As described in the Technical analysis section, there is potential for an FRMCS network to interfere with another FRMCS network. However, the potential for this to occur is expected to be low in the short-to-medium term, given the likelihood that only passenger rail services in major cities will be interested in deploying 1.9 GHz band FRMCS in that time frame, so only a single FRMCS operator will operate in a given geographic area.

Our preference is that inter-FRMCS coexistence is managed via a 'sector-coordinated' approach, where we would prefer to issue a licence for FRMCS operation where the application has the endorsement of the ARA. This will make it more likely that approved rail operators are the entities using the FRMCS allocation for rail services, and may affect the number of operators within a given area. Any potential inter-FRMCS interference issues would usually then be resolved by the rail sector (potentially making use of provisions in 3PGG standards to help FRMCS operators coordinate their networks to mitigate potential interference). Under this approach a new FRMCS operator could discuss their plans with existing FRMCS operators in the area prior to seeking the ARA's endorsement and applying for a licence. A similar approach is currently in operation for access to rail spectrum in the 400 MHz band.[10]

Given the proposed 'sector-coordinated' approach, we do not propose to include any requirement for inter-FRMCS coordination in the draft RALI MS51. We also proposed to generally include the following special condition on all licences authorising FRMCS base stations:

> **Special condition [YYY]:** 'No interference shall be caused to, and no protection from interference shall be afforded from, stations operated under a PTS licence in the 1900–1910 MHz frequency range.

In addition, to ensure that these arrangements are only used to provide rail-related services, the following special condition is proposed to generally be included on licences authorising FRMCS base stations in the 1900–1910 MHz frequency band:

> **Special condition [XXX]:** 'The licence only authorises the operation of radiocommunications devices for the purpose of the provision of rail safety and control communications.

Coordination of fixed links and BWA services with FRMCS receivers

FRMCS network deployments will differ from those of commercial mobile networks, as they will be constrained to rail corridors. FRMCS stations that service these railway lines also need to be afforded a high level of protection as they provide a critical service. For these reasons, we propose the following coordination measures:

- Coordination with railway lines – new fixed link and BWA services will be required to coordinate to a notional FRMCS receiver at any point along an operational railway line. This will allow FRMCS operators the flexibility to design and expand their networks as needed. Railway lines to be coordinated against can be obtained from the Digital Atlas Australia:
    - https://digital.atlas.gov.au/datasets/digitalatlas::railway-lines/about
- FRMCS base stations are to be located within 100 m of the railway line being served – to maximise the railway line coverage, FRMCS base stations will be required to be placed in close proximity to relevant railway lines. This will ensure that FRMCS base stations are used for their intended purpose and that the prescribed coordination measures are effective in protecting FRMCS base stations.
- Coordination zone – the purpose of the coordination zone is to ensure that fixed link and BWA services do not cause unacceptable interference to FRMCS receivers while providing a high level of certainty to railway operators to plan and deploy services. It is not an exclusion zone and we expect that fixed link and BWA services will be able to operate within the zone in practice (subject to successful coordination).
- The coordination zone for the different services are:
    - Fixed link co-channel – 160 km from railway lines
    - Fixed link adjacent channel – 60 km from railway lines
    - BWA co-channel – 160 km from railway lines
    - BWA adjacent channel – 15 km from railway lines

[10] See FAP7 Assigning rail industry spectrum in the 400 MHz band.

- The following **special condition [YYY]** will generally be attached to all new point-to-point and point-to-multipoint licences issued in the range 1900–1920 MHz frequency band for stations that are located within a coordination zone:

  Special Condition [YYY]: No interference shall be caused to, and no protection from interference shall be afforded from, stations operated under a PTS licence in the 1900–1910 MHz frequency range.

Interference from FRMCS transmitters

New fixed link or BWA receivers (i.e. licensed on or after the date RALI MS51 is first made, notionally set at 1 January 2026 in the draft RALI) can be deployed within a coordination zone, but should consider the potential for interference from FRMCS. The procedures set out in RALI MS51 can be used to make such assessments. To enshrine priority status for FRMCS receivers, the following special condition [YYY] will be attached to all new point-to-point and point-to-multipoint licences issued in the range 1900–1920 MHz for stations that are located within a coordination zone:

> **Special Condition [YYY]:** 'No interference shall be caused to, and no protection from interference shall be afforded from, stations operated under a PTS licence in the 1900–1910 MHz frequency range.

As discussed in the 'FRMCS interference into 2 GHz band base station receivers' section of this paper, coordination will be needed to ensure coexistence between FRMCS base station transmitters and 2 GHz and PTS and spectrum licensed base station receivers. Within 70 km from any existing 2 GHz base station, FRMCS base stations will be expected to meet the following criterion:

- FRMCS transmitters' emissions in the frequency range 1900–1910 MHz does not exceed the following levels at the input connector of the receiver:[11]
  - -43 dBm/5 MHz for receivers with an occupied bandwidth < 20 MHz
  - -52 dBm/20 MHz for receivers with an occupied bandwidth ≥ 20 MHz.

These limits are based on the notional receiver performance levels set out in the RAG Rx. In particular, we have incorporated the adjacent channel selectivity and receive blocking criteria with the assumed receiver sensitivity levels of -96 dBm for bandwidths < 20 MHz and -89 dBm for bandwidths ≥ 20 MHz.[12]

Grandfathering of existing services

While FRMCS along rail corridors will have primary status in the 1900–1910 MHz frequency band, existing fixed link and BWA services (i.e. licensed before the date RALI MS51 is first made, notionally set at 1 January 2026 in the draft RALI) will require protection from new FRMCS transmitters. In addition, new FRMCS receivers will need to assess the potential unwanted emissions received from these existing services. We propose that new FRMCS services coordinate with existing services within the respective coordination zone detailed in the 'Coordination of fixed links and BWA services with FRMCS receivers' section of this paper. Applicable protection requirements for fixed links and BWA services are detailed in RALI MS51 and RALI FX19 respectively.

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[11] Antenna gain will need to be included to determine the level at the antenna.

[12] These receiver sensitivity values are based on the wanted levels in 3GPP TS 38.104 that use a refence sensitivity + 6 dB. In 38.104, the reference sensitivity levels are approximately -102 dBm for BW<20 MHz and -95 dBm for BW ≥ 20 MHz.

Existing fixed links and BWA services operating in coordination zones are proposed to be grandfathered for a minimum of 7 years, to 1 January 2033. A review of the grandfathering arrangements will be conducted closer to that date.

Question 3
Are there any comments on the proposed draft RALI MS51?

Proposed licensing options and taxes for FRMCS

We propose that FRMCS base stations be authorised under telecommunications service (PTS) licences, specifically the public mobile telecommunications services (PMTS) Class B licence type, and mobile FRMCS stations be authorised via the Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2024 (cellular mobile class licence). This is a similar approach to that used for both public and private wireless broadband services in the adjacent 1800 MHz and 2 GHz bands.

The Radiocommunications (Transmitter Licence Tax) Determination 2025 (the tax determination) sets tax rates for transmitter licences, including the PMTS Class B licence type. The tax determination provides tax rates for PMTS Class B licences on a frequency band basis in Part 9 of Schedule 1, although that part does not currently include PMTS Class B licences that authorise the operation of transmitters in the 1.9 GHz band.[13]

Consistent with other frequency bands where PMTS Class B licences are used, we propose to set a tax rate for 1900 MHz PMTS Class B licences on a $/MHz/population basis. Under this model, the population of each HCIS level 2 block in which stations are located is used to calculate the annual licence tax. The intent is for one tax rate to cover all base stations operated under that licence that are located within the applicable level 2 HCIS block(s).

We are of the view that the base rates for the 1.9 GHz band should be within the bounds of the existing base rates for the adjacent 1800 MHz and 2.1 GHz bands, which is $0.01/MHz/pop and $0.06/MHz/pop respectively. However, as noted in the tax determination, the base rate for PMTS Class B licences have been developed on the basis that it only apples to one of the paired frequency segments (i.e. the transmit segment). For example, for a PMTS Class B licence in the 1800 MHz band that is authorised to use 10 MHz paired (20 MHz total), the tax is calculated by multiplying the $0.01/MHz/pop price by population and by 10 MHz.

Given that the 1.9 GHz band is unpaired, the equivalent benchmark range would therefore be: $0.005/MHz/pop when compared with the existing 1800 MHz band price, to $0.03/MHz/pop when compared with the existing 2 GHz band price. This means that half the tax rate of paired PMTS Class B licences would be applied to unpaired PMTS Class B licences, translating to an equivalent transmitter licence tax for the same bandwidth. This is consistent with the pricing principle that users of similar spectrum should generally face the same price.

Taking into account the expected demand for access to the 1.9 GHz band, we are of the initial view that a rate equivalent to the 1800 MHz band rate would be appropriate. That is, our initial proposal is to set the base rate for 1.9 GHz band PMTS Class B licences at

[13] Where tax rates for a specific licence are not specified in the tax determination, Part 1 of Schedule 1 of the tax determination sets the tax rate.

$0.005/MHz/pop. Given that it is an unpaired band, we propose that the methodology to calculate the annual tax would be:

- the bandwidth of the spectrum access, multiplied by
- the base rate of $0.005, multiplied by
- the population of the HCIS level 2 block(s) within which stations are authorised by the licence.

Example annual tax rates are shown in Table 8. The example HCIS level 2 blocks are based on the HCIS blocks that contain existing stations registered under 1800 MHz band spectrum licences held by state rail entities, given that these 1800 MHz band stations are currently used to provide GSM-R based services for rail communications.

Table 8: Example annual taxes for 1900 MHz PTS licences

Level 2 HCIS blocks	Population	Example annual apparatus licence tax (assuming a 10 MHz bandwidth)
KX3K, KX3O, KX3L, KX3P, LX1I, LX1M, LX4A, LX1N, LX4B, LX4C	4,676,611	$233,830.55
MV9E, MV9J, MV9K, MV9F, MV9O, MV9L, MV9P, MW3D, MW3H, MW3L, NV4O, NV7B, NV7C, NV7F, NV7I, NV7M, NW1A	5,449,062	$272,453.10
NT8H, NT8L, NT9E	1,302,765	$65,138.25
BV1K, BV1L, BV1P, BV2M, BV2M, BV4C, BV4D, BV4H, BV4K, BV4L, BV5A	2,024,378	$101,218.90

We note that the above considerations and examples are limited to setting tax rates for FRMCS use of the 1.9 GHz band and is not intended to reflect positions related to the expiring spectrum licence process.

Question 4
Are there any comments on the proposed licensing options and taxes for FRMCS?

Proposed changes to the cellular mobile class licence

As detailed in the Technical Analysis section of this paper, we proposed to include limitations on FRMCS mobile stations (in particular high-power cab radios) to support coexistence with adjacent band services. To implement these arrangements, we proposed to amend the cellular mobile class licence to include the following provisions:

- A person must not operate a radiocommunications device in the 1900–1910 MHz frequency band if the device exceeds a total radiated power of 31 dBm/10MHz.
- A person must not operate a radiocommunications device in the 1900–1910 MHz frequency band unless the person uses transmit power control on the device ,where *transmit power control* means a function that changes the power at which a radiocommunications transmitter operates, to maintain a particular level of reception quality.

Question 5
Are there any comments on the proposed changes to the cellular mobile class licence?

Proposed updates to RALI FX19

As detailed in the introduction section or this paper, and in the outcomes paper, we proposed that SR WBB services are authorised under an apparatus licence and are limited to indoors-only.

We propose to introduce the SR WBB arrangements, which are summarised in the following sections, via an amendment to RALI FX19. No changes are proposed to the existing arrangements in RALI FX19 for BWA services, other than to correct outdated and redundant information and to make editorial improvements.

Licensing conditions and coordination

As detailed in the Technical Analysis section of this paper, it is proposed that new SR WBB services will be on a coordinated basis with FRMCS. To preserve the 1900–1910 MHz range for FRMCS, we propose that new SR WBB stations within 14 km of a defined railway line will be required to coordinate with a notional FRMCS base station located at all locations along the defined railway line (using the FRMCS parameters and protection criteria in the draft RALI MS51).[14]

In addition, it is proposed that licences authorising the operation of SR WBB services will generally include the following conditions:

- stations must not exceed an EIRP limit of 30 dBm
- indoors-only operation
- no interference, no protection (NINP).

As detailed in the Technical analysis section of this paper, as the proposed arrangements do not permit SR WBB to be operated in the same areas as fixed links and BWA services, we do not propose to include requirements for coordination between these services in RALI FX19.

Question 6
Are there any comments on the proposed amendments to RALI FX19?

Proposed licensing options and taxes for SR WBB services

The ACMA applies a system of apparatus licence types to standardise licence conditions, and taxation and cost-recovery charge amounts, across different categories of radiocommunications. Most licence types include associated licence options tailored to specific use-cases, with taxes and charges varying accordingly. To support the deployment of SR WBB services, it is important that the licensing framework is fit for purpose – both in terms of pricing and operating conditions.

We propose that SR WBB services be authorised under the fixed licence (land mobile system) subtype of the fixed licence type, which can be used to authorise both base stations and mobile stations. The tax determination sets a $/kHz base rate for different frequency ranges and areas. Table 9 provides example annual tax rates that would apply for land mobile services in the 1.9 GHz band, assuming channel bandwidths of 1.728 MHz and

[14] Rationale for the proposed 1km coordination distance for coordination is provided in the 'DECT 1900 – 1920 MHz' section.

6.912 MHz. As SR WBB services are proposed to be limited to a maximum EIRP of 30 dBm, the examples in Table 9 include the micro power (EIRP ≤ 1.7 watts) discount of 95%.

Table 9: Example annual tax rates for land mobile systems in the range 960–2690 MHz

	High density	Medium density	Low density	Remote density
Existing base rate ($/kHz)[15]	48.7297	22.5216	11.1227	5.5385
Example annual tax for 1.728 MHz channel	$4,210.25	$1,945.87	$961.00	$478.53
Example annual tax for 6.912 MHz channel	$16,840.98	$7,783.46	$3,844.00	$1,914.11

As is evident in Table 9, given the channel bandwidth of DECT technology, annual taxes could be viewed as being disproportionate to the certainty of access, given the proposed NINP condition. Consequently, the example annual taxes in Table 9 could act to discourage the take-up of licences, given that SR WBB services can already be operated tax-free in the adjacent 1880–1900 MHz band under the CCD class licence.

We propose to amend the tax determination to apply the minimum annual tax rate for land mobile systems in the range 1900–1920 MHz with an EIRP of equal to or less than 30 dBm. The current minimum annual tax rate is $42.88[16]. This annual tax reflects the low interference potential from indoor SR WBB services and the proposed NINP basis of operation.

Question 7

Are there any comments on the proposed licensing option and taxes for SR WBB services?

Proposed update to RALI FX3

As detailed in the outcomes paper, fixed links in the 1900–1920 MHz frequency range will be limited to regional and remote areas only. To give effect to this arrangement, we propose to update RALI FX3 to specify that apparatus licences for new fixed links in 1900–1920 MHz are not generally issued in the areas described in Table 10. These are the same areas where licenses for BWA services are generally not issued under RALI FX19.

Table 10: Areas not available for fixed links in the frequency range 1900–1920 MHz

Adelaide
IW3J, IW3K, IW3L, IW3N, IW3O, IW3P, IW6B, IW6C, IW6D, IW6F, IW6G, IW6H, IW3E5, IW3E6, IW3E8, IW3E9, IW3F4, IW3F5, IW3F6, IW3F7, IW3F8, IW3F9, IW3G4, IW3G5, IW3G6, IW3G7, IW3G8, IW3G9, IW3H4, IW3H5, IW3H6, IW3H7, IW3H8, IW3H9, IW3I2, IW3I3, IW3I5, IW3I6, IW3I8, IW3I9, IW3M2, IW3M3, IW3M5, IW3M6, IW3M8, IW3M9, IW6A2, IW6A3, IW6A5, IW6A6, IW6A8, IW6A9, IW6E2, IW6E3, IW6E5, IW6E6, IW6E8, IW6E9, JW1E4, JW1E7, JW1I1, JW1I4, JW1I7, JW1M1, JW1M4

[15] From table 3 in the Radiocommunications (Transmitter Licence Tax) Determination 2025 - Federal Register of Legislation.
[16] the ACMA is consulting on increasing the minimum: 2.69 GHz to 5 GHz band pricing review and proposed annual adjustments to apparatus licence tax rates | ACMA

Brisbane
NT9, NT5G, NT5H, NT5K, NT5L, NT5O, NT5P, NT6E, NT6F, NT6G, NT6H, NT6I, NT6J, NT6K, NT6L, NT6M, NT6N, NT6O, NT6P, NT8C, NT8D, NT8G, NT8H, NT8K, NT8L, NT8O, NT8P, NU3A, NU3B, NU3C, NU3D, NU3F, NU3G, NU3H, NT5C4, NT5C5, NT5C6, NT5C7, NT5C8, NT5C9, NT5D4, NT5D5, NT5D6, NT5D7, NT5D8, NT5D9, NT6A4, NT6A5, NT6A6, NT6A7, NT6A8, NT6A9, NT6B4, NT6B5, NT6B6, NT6B7, NT6B8, NT6B9, NT6C4, NT6C5, NT6C6, NT6C7, NT6C8, NT6C9, NT6D4, NT6D5, NT6D6, NT6D7, NT6D8, NT6D9, NU2C1, NU2C2, NU2C3, NU2D1, NU2D2, NU2D3, NU2D5, NU2D6, NU2D8, NU2D9, NU2H2, NU2H3, NU3E1, NU3E2, NU3E3, NU3E5, NU3E6, NU3E8, NU3E9, NU3I2, NU3I3, NU3J1, NU3J2, NU3J3, NU3K1, NU3K2, NU3K3, NU3L1, NU3L2, NU3L3
Canberra
MW4D, MW4H, MW4L, MW5A, MW5B, MW5E, MW5F, MW5I, MW5J, MW1P4, MW1P5, MW1P6, MW1P7, MW1P8, MW1P9, MW2M4, MW2M5, MW2M6, MW2M7, MW2M8, MW2M9, MW2N4, MW2N5, MW2N6, MW2N7, MW2N8, MW2N9, MW4P1, MW4P2, MW4P3, MW5M1, MW5M2, MW5M3, MW5N1, MW5N2, MW5N3
Darwin
GO7C, GO7D, GO7G, GO7H, GO7K, GO7L, GO8A, GO8E, GO8I
Hobart
LY8L, LY8P, LY9I, LY9J, LY9K, LY9L, LY9M, LY9N, LY9O, LY9P, LZ2D, LZ2H, LZ3A, LZ3B, LZ3C, LZ3D, LZ3E, LZ3F, LZ3G, LZ3H, LY8H4, LY8H5, LY8H6, LY8H7, LY8H8, LY8H9, LY9E4, LY9E5, LY9E6, LY9E7, LY9E8, LY9E9, LY9F4, LY9F5, LY9F6, LY9F7, LY9F8, LY9F9, LY9G4, LY9G5, LY9G6, LY9G7, LY9G8, LY9G9, LY9H4, LY9H5, LY9H6, LY9H7, LY9H8, LY9H9, LZ2L1, LZ2L2, LZ2L3, LZ3I1, LZ3I2, LZ3I3, LZ3J1, LZ3J2, LZ3J3, LZ3K1, LZ3K2, LZ3K3, LZ3L1, LZ3L2, LZ3L3
Melbourne
KX3J, KX3K, KX3L, KX3N, KX3O, KX3P, KX6B, KX6C, KX6D, KX6F, KX6G, KX6H, KX6J, KX6K, KX6L, LX1I, LX1M, LX1N, LX1O, LX4A, LX4B, LX4C, LX4E, LX4I, KX3F7, KX3F8, KX3F9, KX3G7, KX3G8, KX3G9, KX3H4, KX3H5, KX3H6, KX3H7, KX3H8, KX3H9, KX3M6, KX3M8, KX3M9, KX6A2, KX6A3, KX6A5, KX6A6, KX6A8, KX6A9, KX6E2, KX6E3, KX6E5, KX6E6, KX6E8, KX6E9, KX6I2, KX6I3, KX6I5, KX6I6, KX6I8, KX6I9, LX1E4, LX1E7, LX1E8, LX1E9, LX1J1, LX1J4, LX1J5, LX1J6, LX1J7, LX1J8, LX1J9, LX1K4, LX1K7, LX4F1, LX4F2, LX4F4, LX4F5, LX4F7, LX4F8, LX4J1, LX4J2, LX4J4, LX4J5, LX4J7, LX4J8
Perth
BV1I, BV1J, BV1K, BV1L, BV1M, BV1N, BV1O, BV1P, BV2I, BV2J, BV2M, BV2N, BV4A, BV4B, BV4C, BV4D, BV4E, BV4F, BV4G, BV4H, BV4I, BV4J, BV4K, BV4L, BV5A, BV5B, BV5E, BV5F, BV5I, BV5J, BV1E7, BV1E8, BV1E9, BV1F7, BV1F8, BV1F9, BV1G7, BV1G8, BV1G9, BV1H7, BV1H8, BV1H9, BV2E7, BV2E8, BV2E9, BV2F7, BV2F8, BV2F9, BV4M1, BV4M2, BV4M3, BV4N1, BV4N2, BV4N3, BV4O1, BV4O2, BV4O3, BV4P1, BV4P2, BV4P3, BV5M1, BV5M2, BV5M3, BV5N1, BV5N2, BV5N3

Sydney
NW1, MV9I, MV9J, MV9K, MV9L, MV9M, MV9N, MV9O, MV9P, MW3C, MW3D, MW3G, MW3H, MW3K, MW3L, MW3O, MW3P, NV4N, NV4O, NV4P, NV5M, NV5N, NV5O, NV5P, NV7B, NV7C, NV7D, NV7E, NV7F, NV7G, NV7H, NV7I, NV7J, NV7K, NV7L, NV7M, NV7N, NV7O, NV7P, MV9D6, MV9D9, MV9E4, MV9E5, MV9E6, MV9E7, MV9E8, MV9E9, MV9F4, MV9F5, MV9F6, MV9F7, MV9F8, MV9F9, MV9G4, MV9G5, MV9G6, MV9G7, MV9G8, MV9G9, MV9H3, MV9H4, MV9H5, MV9H6, MV9H7, MV9H8, MV9H9, MW3B2, MW3B3, MW3B5, MW3B6, MW3B8, MW3B9, MW3F2, MW3F3, MW3F5, MW3F6, MW3F8, MW3F9, MW3J2, MW3J3, NV4I5, NV4I6, NV4I8, NV4I9, NV4J4, NV4J5, NV4J6, NV4J7, NV4J8, NV4J9, NV4K4, NV4K5, NV4K6, NV4K7, NV4K8, NV4K9, NV4L4, NV4L5, NV4L6, NV4L7, NV4L8, NV4L9, NV4M2, NV4M3, NV4M5, NV4M6, NV4M8, NV4M9, NV5I4, NV5I5, NV5I6, NV5I7, NV5I8, NV5I9, NV5J4, NV5J5, NV5J6, NV5J7, NV5J8, NV5J9, NV5K4, NV5K5, NV5K6, NV5K7, NV5K8, NV5K9, NV5L4, NV5L5, NV5L6, NV5L7, NV5L8, NV5L9, NV7A2, NV7A3, NV7A4, NV7A5, NV7A6, NV7A7, NV7A8, NV7A9

Question 8

Are there any comments on the proposed amendments to RALI FX3?

Invitation to comment

Making a submission

We invite comments on the issues set out in this consultation paper.

- Online submissions can be made by uploading a document. Submissions in PDF, Microsoft Word or Rich Text Format are preferred.
- Submissions by post can be sent to:

  The Manager
  Wireless Broadband Section
  Australian Communications and Media Authority
  PO Box 78
  Belconnen ACT 2616

The closing date for submissions is **COB, Friday 27 February 2026**.

Consultation enquiries can be emailed to freqplan@acma.gov.au.

Publication of submissions

We publish submissions on our website, including personal information (such as names and contact details), except for information that you have claimed (and we have accepted) is confidential.

Confidential information will not be published or otherwise released unless required or authorised by law.

Privacy

View information about our policy on the publication of submissions, including collection of personal information during consultation and how we handle that information.

Information on the *Privacy Act 1988*, how to access or correct personal information, how to make a privacy complaint and how we will deal with any complaints, is available in our privacy policy.

Appendix A: FRMCS system model

FRMCS system parameters are based on the values provided in ETSI TS 103 793, ‘Rail Telecommunications (RT); Future Railway Mobile Communication System (FRMCS); Radio Characteristics’.

Deployment model and general equipment characteristics

Tables A1 and A2 show deployment model parameter values for base stations and remote stations respectively. These values are informed by typical FRMCS parameter values.

Table A1: FRMCS base station deployment parameters

Base station parameter	Deployment model value	Unit
Maximum in band EIRP	65	dBm/10 MHz
Tx Bandwidth	10	MHz
Antenna height	30	m
Antenna gain	18	dBi
Cable loss	4	dBi
Adaptive transmit power control	enabled	—
Maximum out of band EIRP: 1920–1980 MHz	-40	dBm/10 MHz

Table A2: FRMCS mobile station deployment parameters

Mobile station parameter	Deployment model value	Unit
Cab radio		
Maximum in band total radiated power	31	dBm/10 MHz
Tx Bandwidth	10	MHz
Antenna height	5	m
Adaptive transmit power control	enabled	—
Maximum out of band EIRP: 1920–1925 MHz	-25	dBm/10 MHz
Maximum out of band EIRP: 1925–1980 MHz	-30	dBm/10 MHz
Maximum out of band EIRP: 1880–1920 MHz	-2	dBm/10 MHz
Railway mobile radio terminal		
Maximum in band EIRP	23	dBm/10 MHz

Emission masks

In addition to the criteria specified in Table A1, emission characteristics must conform to the 3GPP TS 38.104 standard for the n101 band, paying particular attention to co-existence requirements.

Emission protection of FRMCS from a non-FRMCS transmitter

Table A3 contains protection criteria for FRMCS receivers from interfering non-FRMCS transmitters. The requirements in Table A3 are to be met at the input of the FRMCS receiver.

Table A3: FRMCS protection criteria from non-FRMCS transmitters.

Frequency offset	Protection criteria Digital interferer Tx into digital victim Rx
Co-channel	–100 (dBm per 5 MHz channel) –97 (dBm per 10 MHz channel)
1st adjacent channel	–42 (dBm per 5 MHz channel) –39 (dBm per 10 MHz channel)
2nd adjacent channel	—

Appendix B: SR WBB parameters and coexistence calculations

This appendix provides the assumed parameters for SR WBB services and the calculations used to analyse the interference risk between FRMCS and SR WBB services. Given our expectation that DECT technologies will be used (with a dynamically assigned channel with the frequency range 1900–1920 MHz), only co-channel scenarios have been considered.

SR WBB parameters are contained in Table B1 (based on ETSI TS 103 636-1) with FRMCS base station parameters contained in Table B2 (based on ETSI TS 103 793). As SR WBB will be limited to indoor-only operation, a building entry loss value of 20 dB has been included in this analysis, as per ECC Report 314.

Table B1: Notional SR WBB parameters

DECT parameter	Value	Units
Maximum EIRP (ACMA)	30	dBm
Centre frequency	1905	MHz
Channel bandwidth	1.728, 3.456, 6.912	MHz
RX sensitivity	-65	dBm
Protection criterion	C/(N+I) = 21	dB
Antenna height	1.5	m
Antenna gains	0	dBi

Table B2: FRMCS base station deployment parameters

FRMCS BS parameter	Value	Units
Centre frequency	1905	MHz
Channel bandwidth	10	MHz
Maximum in band EIRP	65	dBm/10 MHz
Antenna height	30	m
Antenna gain	18	dBi
Cable loss	4	dBi
Protection criterion	-97	dBm/10 MHz

Table B3: Coexistence scenarios considered

Scenario	Interferer → Victim
A	FRMCS base station transmitter → SR WBB receiver
B	SR WBB transmitter → FRMCS base station receiver

Scenario A calculations – FRMCS base station transmitter → SR WBB receiver

$$Path\ loss\ (PL) = PTx - (Rx\ sensitivty + Protection\ ratio)$$

$$PL = 65\ dBm - 20 - (-65\ dBm + 21\ dB)$$

$$Required\ Pathloss = 89$$

Distance required (free space propagation):

$$PL = 20log_{10}(d) + 20log_{10}(f) + 32.44$$

$$89 = 20log_{10}(d) + 20log_{10}(1905) + 20 + 32.44 + 0$$

$$d = 0.354\ km$$

Scenario B calculations – SR WBB transmitter → FRMCS base station receiver

$$Path\ loss\ (PL) = PTx - building\ entry\ loss - (protection\ criterion + Rx\ antenna\ gain - cable\ loss\ )$$

$$PL = 30\ dBm - 20\ dB - (-97\ dBm\ -\ 18dBi - 4dBi)$$

$$PL =\ 121\ dB$$

Distance required (free space propagation):

$$125\ dB =\ 20log_{10}(d) + 20log_{10}(1905) + 32.44$$

$$d =\ 14\ km$$

Appendix C: Fixed link parameters

Table C1 contains a summary of existing fixed links with overlapping bandwidth in the 1900–1910 MHz frequency range, correct as at 1 August 2025. Using the parameters recorded on the RRL, we calculated the required level of protection at the receiver using free space path loss, taking into account path length (calculated using related receiver coordinates), received power (incorporating the antenna gain of the receiver) and the protection ratio (using a co-channel value of 60 dB and applying the relevant correction factor for path length).

Table C1: Site specific data for PTP receivers

Site name	Link Tx EIRP	path length	Link Rx power	PR	Calculated LOP
	(dBW/MHz)	(km)	(dBW/MHz)	(dB)	(dBW/MHz)
Telstra Radio Terminal 7 km NW of PINIDARY WATERHOLE	26.65	46.36	-70.33	56.00	-126.33
Telstra Radio Terminal WANERIE	18.06	26.17	-75.56	48.00	-123.56
Telstra Site Daylerking QUINDANNING	23.76	3.82	-57.44	43.00	-100.44
Telstra DRCS Repeater Sylvana Hill LEINSTER	19.92	40.78	-76.41	54.00	-130.41
Telstra Site Power Station MUJA	25.32	15.84	-68.43	38.00	-106.43
Telstra Radio Terminal FIVE MILE CREEK	18.49	49.15	-80.59	56.00	-136.59
Telstra DRCS Site Warramboo Hill Mm1 MT MAGNET	19.72	54.51	-79.33	57.00	-136.33
Telstra Site Packard 42km South of LEONORA	19.86	36.13	-75.62	52.00	-127.62
Telstra Radio Terminal GREGORY RANGE	21.09	47.56	-75.11	56.00	-131.11
BHP Site F9 Ch21b PORT HEDLAND	27.04	42.56	-75.10	55.00	-130.10
Telstra Radio Terminal via HALLS CREEK	19.72	49.46	-78.48	56.00	-134.48
Telstra Radio Terminal Minara Hill via LAVERTON	21.13	42.96	-74.05	55.00	-129.05
Telstra Radio Terminal STRATHLEVEN	26.77	42.90	-68.19	55.00	-123.19
Telstra Quongup Radio Terminal Chuddich Rd NANNUP	25.52	4.80	-57.66	34.00	-91.66
Telstra Radio Terminal FERDINAND	19.72	51.19	-78.78	57.00	-135.78

Site name	Link Tx EIRP	path length	Link Rx power	PR	Calculated LOP
	(dBW/MHz)	(km)	(dBW/MHz)	(dB)	(dBW/MHz)
Terminal Mining Area C NEWMAN	28.99	5.99	-52.62	34.00	-86.62
Telstra Radio Terminal BLACK	19.72	14.64	-67.91	40.00	-107.91
Telstra Radio Terminal 13 km E of BOOLBA	21.52	36.03	-72.13	52.00	-124.13
Telstra Radio Terminal STONEHENGE	23.30	49.46	-73.11	56.00	-129.11
Telstra Radio Terminal FIVE MILE CREEK	19.92	48.66	-77.94	56.00	-133.94
Telstra Radio Terminal Nockatunga 9 km SW of RICHIES WELL	27.65	12.11	-56.67	34.00	-90.67
Telstra Radio Terminal MAURICE HILL	21.42	43.49	-73.96	56.00	-129.96
Telstra Exchange GAIRDNER	19.72	29.65	-74.04	50.00	-124.04
Telstra Radio Terminal GREGORY RANGE	19.92	43.96	-77.06	56.00	-133.06
Telstra Radio Terminal FAIRVIEW	24.97	52.92	-73.62	57.00	-130.62
WMC Microwave Site John Hill KAMBALDA	24.17	40.00	-73.07	55.00	-128.07
Telstra Radio Terminal Nockatunga 9 km SW of RICHIES WELL	26.65	47.91	-70.55	56.00	-126.55
Prime link site NARDOO	16.39	50.73	-82.63	56.00	-138.63
Santos Site 37 km SW of Moomba DARALINGIE	23.39	36.90	-77.71	52.00	-129.71
Telstra Exchange 21 Clematis St BLACKALL	19.72	19.38	-70.34	48.00	-118.34
Radio Terminal Nimingarra SHAY GAP	18.49	40.21	-78.85	54.00	-132.85
Telstra Exchange cnr Dreghorn & Ryan Rds MERKANOOKA	22.48	27.70	-75.93	48.00	-123.93
Telstra Exchange Doig Road BILOCUPPING	26.80	14.27	-65.91	38.00	-103.91

Appendix D: BWA system model

Deployment model and general equipment characteristics

Tables D1 and D2 show deployment model parameter values for BWA base stations and remote stations respectively.

Table D1: BWA base station deployment parameters

Base station parameter	Range	Deployment model value	Unit
Transmitter power	4–20	20	W
Feeder loss	2	2	dB
Antenna gain	11–19	19	dBi
F/B	0–30	28	dB
EIRP	45–60	60	dBm
Rx bandwidth	5	5	MHz
Rx noise floor	-100 to -102	-102	dBm/5MHz
Antenna height	Variable	30	m
Maximum cell radius	10–30	15	Km
Adaptive transmit power control	Not specified	enabled	--

Table D2: BWA remote station deployment parameters

Remote station parameter	Range	Deployment model value	Unit
Transmitter power	0.25–1	0.25	W
Feeder loss	0	0	dB
Antenna gain	0–18	14	dBi
F/B	0–25	25	dB
XPD	20–24	17	dB
EIRP	24–48	38	dBm
Rx bandwidth	3.5–10	5	MHz
Rx noise floor	-100 to -102	-102	dBm/5MHz
Antenna height	1.5–6	6	m

Emission masks

Emission characteristics must conform to the 3GPP TS 38.104 standard for the n39 band, paying particular attention to co-existence requirements.

Emission protection criteria for BWA receivers in the 1900–1920 MHz band

Table D3 contains protection criteria for BWA receivers from interfering a FRMCS transmitter. The requirements in Table D3 are to be met at the input of the BWA receiver.

Table D3: BWA protection criteria from FRMCS transmitters.

Frequency offset	Protection criteria Digital interferer Tx into digital victim Rx
Co-channel	-102 (dBm per 5 MHz channel) -99 (dBm per 10 MHz channel)
1st adjacent channel	—