Proposed updates to RALIs LM08,
FX16 and FX22

Consultation paper

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# Issue/s for comment

We welcome your feedback on any of the issues raised in this paper. In particular, views on the proposed arrangements and guidance regarding coordination between apparatus-licensed services in the frequency range 804–809 MHz and 700 MHz spectrum-licensed services.

# Introduction

In November 2015, we concluded our review of the 803–960 MHz band with
the release of [*The ACMA’s long-term strategy for the 803–960 MHz band*](https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.acma.gov.au%2Fsites%2Fdefault%2Ffiles%2F2019-12%2FThe%2520ACMAs%2520long-term%2520strategy%2520for%2520the%2520803960%2520MHz%2520band_decision%2520paper.docx&wdOrigin=BROWSELINK) (the
long-term strategy paper). This paper outlined an incremental re-configuration of the
803–960 MHz band to ensure the public benefit derived from the use of the band would be maximised. This included the shifting of apparatus-licensed trunked land mobile systems (TLMS) and fixed services to the lower part of the 803 MHz band over 5 milestone dates.

We are now proposing to implement changes to planning arrangements to support the final stage of the long-term strategy. In particular, we want to:

Remove arrangements in Radiocommunications Assignment and Licensing Instruction (RALI) LM08 which apply to the legacy TLMS frequency segments
(820–825/865–870 MHz).

Suppress the [document SP 4/93](#_Document_SP_4/93) that contains coordination procedures for services in the 857–861 MHz band, which has now become redundant.

These proposed changes were foreshadowed in the long-term strategy paper.

In addition, we are seeking comment from interested stakeholders on the proposed inclusion of revised protection criteria and guidance in RALIs LM08, FX16 and FX22. This will aid coordination between 800 MHz band apparatus-licensed services and spectrum-licensed services operating below 803 MHz. We propose that the revised protection criteria would only apply for new (licensed after specific dates) apparatus-licensed systems in the 804–809 MHz band (proposed changes would not apply to existing apparatus-licensed systems). These proposed additions are in response to feedback that coordination may be difficult in some situations due to the reduced frequency separation between these services.

Details of all proposed changes is contained in the following sections.

The proposed changes will not affect the milestone dates detailed in the long-term strategy paper.

# Proposed updates to RALIs

This section outlines the changes proposed to be made to RALIs LM08, FX16 and FX22. Marked-up versions of these draft RALIs are also available in Attachments A-C.

## RALI LM08

RALI LM08 contains frequency assignment and coordination criteria for land mobile services operating in the VHF, 400 MHz and
800 MHz bands. We intend to make the following consequential changes to RALI LM08 to support the final milestone of the 803–960 MHz band review:

Amending the frequency limits for the 800 MHz TLMS in Annex A (Table A1) from 806–870 MHz to 806–854 MHz.

Removing Table B4.2, renaming Table B4.2a as Table B4.2 (which will put into effect the removal of the allocation at 820–825/865–870 MHz) and changing channel numbers from 201–440 to 1–240.

Removing Table B4.1, renaming Table B4.1a as Table B4.1 and changing channel numbers from 201–440 to 1–240.

Changing channel numbers from 201–320 to 1–120 in Tables B5.1 and B5.2

In addition, changes are proposed to Annex E to:

Reference the updated coexistence arrangements with adjacent-band spectrum-licensed services contained in the applicable advisory guidelines.[[1]](#footnote-2)

Provide additional criteria and guidance to aid coordination between TLMS and 700 MHz spectrum-licensed services (these arrangements are discussed further in the [Coordination with 700 MHz spectrum-licensed transmitters](#_Coordination_with_700) section).

A marked-up version of these proposed changes is contained in Attachment A.

## RALIs FX16 and FX22

RALIs FX16[[2]](#footnote-3) and FX22[[3]](#footnote-4) contain frequency assignment and coordination criteria for 800 MHz band point-to-multipoint (PMP) and point-to-point (PTP) services respectively.[[4]](#footnote-5) We intend to make to minor, factual updates to these RALIs to reference the updated coexistence arrangements with adjacent-band spectrum-licensed services contained in the applicable advisory guidelines.1 We also want to provide additional criteria and guidance to aid coordination with 700 MHz spectrum-licensed services (these arrangements are discussed further in the [Coordination with 700 MHz spectrum licensed transmitters](#_Coordination_with_700) section).

Marked-up versions of proposed changes to RALIs FX16 and FX22 are contained in Attachments B and C respectively.

## Document SP 4/93

Document SP 4/93 contains the coordination procedure for apparatus-licensed services in the 857–861 MHz band. This band is subject to the [Radiocommunications (Spectrum Re-allocation – 850/900 MHz Band) Declaration 2020](https://www.legislation.gov.au/Series/F2020L01407), which re-allocates this band for spectrum licensing within the designated area. In addition, [RALI MS40 – Frequency plan for services in the 800 MHz band](https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.acma.gov.au%2Fsites%2Fdefault%2Ffiles%2F2020-07%2FRALI%2520MS%252040.docx&wdOrigin=BROWSELINK) prohibits new PTP and cordless telephone service assignments in this frequency range from 1 July 2023. It outlines that existing services must vacate the band by 30 June 2024. Accordingly, the coordination procedure set out in SP 4/93 has become redundant and the document is proposed to be suppressed.

# Coordination with 700 MHz spectrum-licensed transmitters

A key outcome of the 803–960 MHz band review was the progressive clearance
of apparatus licensed services from the 850 MHz ‘expansion’ band
(809–825/854–870 MHz) to allow this spectrum to be repurposed for mobile broadband services. The 814–824/859–869 MHz band has since been reallocated for spectrum licensing, and licences were assigned [via auction in late-2021](https://www.acma.gov.au/spectrum-allocation-and-auction-summary-850900-mhz-band-2021).[[5]](#footnote-6)

A consequence of this band clearance work was to reallocate new spectrum for apparatus-licensed PTP, PMP and land mobile services in the 804–806/849–851 MHz frequency range. This resulted in a smaller frequency separation from the base-transmit segment of the 700 MHz spectrum-licensed band below 803 MHz, compared to the legacy frequency allocations for these apparatus-licensed services. The new frequency arrangements are depicted in Figure 1 for reference.

New frequency arrangements around the 803 MHz boundary (paired frequency segments not shown)

804 MHz

803 MHz

809 MHz

806 MHz

805.5 MHz

TLMS

(base receive

Spectrum licensed (base transmit)

Guard band

Two-frequency point-to-point

Two-frequency point-to-multipoint (base transmit)

The primary potential interference path is between spectrum-licensed base station transmitters and apparatus-licensed base receivers. Coordination with existing services, based on this interference path, is required:

1. prior to registering a new spectrum licensed transmitter (as detailed in the applicable 700 MHz band RAGs)
2. prior to the assignment of a new or transitioning (from a legacy frequency segment) apparatus licensed service.

Feedback from AMTA,[[6]](#footnote-7) Optus and Telstra to the [consultation 36/2022](https://www.acma.gov.au/consultations/2022-11/proposal-remake-instruments-700-mhz-1800-mhz-25-ghz-and-25-ghz-mid-band-gap-spectrum-licensed-bands-consultation-362022) (Proposal to remake instruments for the 700 MHz, 1800 MHz, 2.5 GHz and 2.5 GHz mid-band gap spectrum-licensed bands) has suggested that coordination of services across the
803 MHz boundary will require significant geographic separation in some circumstances. The ACMA has also received similar informal feedback from accredited persons. There have also been some requests for more explicit instructions about the methodology to be used when coordinating services across the 803 MHz boundary.

Assuming notional parameters sourced from the applicable RALIs and the unwanted emission limits applicable to 700 MHz spectrum licensees, Table 1 provides examples of the required separation distance between a spectrum licensed transmitter and different types of apparatus licensed receivers.

Example of notional separation distances

|  |  |
| --- | --- |
| Parameter | Scenario |
| TLMS Base Station receiver | PMP master station receiver | PTP receiver |
| Receiver antenna type | Omni | Omni | Parabolic dish or yagi-array |
| Receiver antenna gain | 6 dBi | 8.2 dBi | 22 dBi @ 0°9 dBi @ 30°0.5 dBi @ >45° |
| Usable sensitivity[[7]](#footnote-8) | -119 dBm | -119 dBm | N/A |
| Protection requirement | C/I= 5 dB | C/I=10 dB | C/I = 50 dB(co-channel for BW>25 kHz) |
| Maximum Interference Signal Level @Rx | -124 dBm | -129 dBm |  N/A |
| Unwanted transmitter emissions within passband of Rx(spectrum licence condition)[[8]](#footnote-9) | -6 dBm/MHz EIRP | 15 dBm/MHz EIRP(Likely to be lower based on the -6 dBm/MHz limit in 806–813 MHz) | 15 dBm/MHz EIRP(Likely to be lower based on the ‑6 dBm/MHz limit in 806–813 MHz) |
| Propagation model | Free space loss + 10 dB | Free space loss + 10 dB | Free space loss  |
| Calculated minimum separation distance | 2.3 km | 60 km(5.4 km assuming an unwanted emission limit of -6 dBm/MHz) | For 45 km link:* 63.5 km @ 0°
* 14 km @ 30°
* 5.3 km @ >45°

(assuming an unwanted emission limit of -6 dBm/MHz:* 5.7 km @ 0°
* 1.3 km @ 30°
* 500 m @ >45°)
 |

As is evident in Table 1, the level of unwanted emissions from the spectrum-licensed transmitter falling within the passband of the receiver is a key factor in determining the required separation distance (and these will often dominate any receiver-blocking requirements in the coordination process). Spectrum licensees are currently subject
to stricter unwanted emission levels at frequencies in the range 806–813 MHz
(-6 dBm/MHz), which aids coexistence with TLMS. The need to comply with the
806–813 MHz limit will most likely result in actual emissions being significantly less than the 15 dBm/MHz limit in the adjacent fixed service segment (804–806 MHz). The impact on separation distances assuming unwanted emissions at -6 dBm/MHz instead of 15 dBm/MHz is significant, as shown in Table 1 for PMP and PTP receivers.

The unwanted emission limits are specified as a core condition on spectrum
licences and cannot be changed without the licensee agreement (section 72 of the *Radiocommunications Act 1992*). However, spectrum licensees can operate with reduced levels of unwanted emissions if they choose to, and in practice, actual emissions from a transmitter are likely to be lower than the maximum limit on
the licence.

As detailed in the [draft Five-year spectrum outlook 2023–28](https://www.acma.gov.au/node/4124), we commenced a review of the 700 MHz band spectrum licence technical framework in Q1 2023, considering potential changes to core conditions. Any potential changes to the unwanted emission limits in the 803–809 MHz frequency range as a result of this review would impact the example separation distances calculated in Table 1. As per our standard practices, we would publicly consult before deciding on any changes.

## Proposed new protection criteria

Using a revised protection criteria (i.e., higher receiver sensitivity and/or lower protection ratio) will reduce the notional separation distances shown in Table 1.
A revised protection criteria can be voluntary (e.g., the apparatus licensee may decide to accept a higher level of interference), or it can be a mandatory requirement specified in the applicable RALI.

We are of the view that providing a revised protection criteria through both voluntary and mandated means provides a balanced solution to aid coexistence between TLMS/PMP/PTP receivers and spectrum-licensed transmitters. A modest relaxation of the protection criteria for TLMS, PMP and PTP services in LM08, FX16 and FX22 respectively is therefore proposed.

These revised criteria are proposed to only be used when coordinating with 700 MHz band spectrum licensed transmitters and is only to apply to apparatus licences
issued after either:

the release date of the updated RALIs FX16 and FX22 for PMP and PTP, (and only for PTP links with a bandwidth greater than 100 kHz, discussed further below)

1 July 2024 for TLMS.

These dates are chosen to provide time for the remainder of existing TLMS licences to transition to the new segment (noting that the majority of PMP and PTP services have already completed the transition) and to ensure existing receivers are not impacted if the licensee does not voluntarily consent to a higher level of interference. It also reflects the reality that there isn’t significant growth in narrowband 800 MHz services beyond those services that needed to transition to the new arrangements, so limiting the application of the revised limits to new assignments isn’t expected to constrain prospective use too heavily. The proposed revised criteria are detailed in the
following sections.

### Revised TLMS criteria

The current protection criteria in RALI LM08 are intended to support a broad range of TLMS technologies, including both analogue and digital systems. In addition, the usable sensitivity level in RALI LM08 is based on the level of man-made noise typically encountered in city centres. The revised TLMS criteria are proposed to only apply for systems licensed from 1 July 2023, so no change is proposed to the protection criteria of existing systems.

The proposed revised TLMS criteria for new assignments are based on equipment characteristics for digital systems and consider an adjustment of the receiver sensitivity and protection ratio, based on the receiver performance requirements in [ETSI EN 300 113 V2.2.1 (2016-12)](https://www.etsi.org/deliver/etsi_en/300100_300199/300113/02.02.01_60/en_300113v020201p.pdf).[[9]](#footnote-10)

Table 2 summarises the required receiver sensitivity and co-channel protection radio values from ETSI EN 300 113 V2.2.1 applicable to land mobile base receivers operating in the 800 MHz band.

Summary of technical requirements for 800 MHz band land mobile base receivers from ETSI EN 300 113 V2.2.1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Channel BW**  | **Data rate**  | **Sensitivity**  | **Protection ratio[[10]](#footnote-11)** | **Maximum interference signal level @Rx** |
|  12,5 kHz    | 9.6 kbit/s or less  | -110 dBm  | 12 dB | -122 dBm |
| More than 9.6 kbits to 16 kbit/s  | -105 dBm  | 17 dB | -122 dBm |
| More than 16 kbits to 38.4 kbit/s  | -98 dBm  | 24 dB | -122 dBm |
| Greater than 38.4 kbit/s  | -93 dBm  | 29 dB | -122 dBm |
|  20 kHz and 25 kHz   | 9.6 kbit/s or less  | -110 dBm  | 8 dB | -118 dBm |
| More than 9.6 kbit/s to 38.4 kbit/s  | -105 dBm  | 12 dB | -117 dBm |
| More than 38.4 kbits to 76.8 kbit/s  | -98 dBm  | 19 dB | -117 dBm |
| Greater than 76.8 kbit/s  | -93 dBm  | 24 dB | -117 dBm |

We propose that the revised TLMS criteria be based on a sensitivity level of -110 dBm with an 8 dB protection ratio. This is based on the lowest receiver sensitivity for a channel bandwidth of 25 kHz from Table 2. A 25 kHz bandwidth is used given that 99% of the current users of TLMS services use a 25 kHz bandwidth.

The proposed revised criteria will result in a 6 dB increase in permitted interference at the receiver, being -118 dBm compared to the existing -124 dBm.[[11]](#footnote-12) This in-turn will allow for smaller separation distances between TLMS base recievers and 700 MHz spectrum-licensed transmitters. Using the values in Table 1, the proposed revised criteria reduces the notional separation distance from 2.3 km to 1.2 km.

The increased receiver sensitivity level of -110 dBm (up from the existing level of -119 dBm) may result in a smaller service area for TLMS systems.

Table 3 shows the calculated service area radii for high and low-powered TLMS systems, using the above notional mobile station parameters and the modified Hata propagation model from RALI LM08. For the high-powered TLMS model, Table 3 calculations include base station antenna heights of 200 m (from RALI LM08) and 30 m (considered typical for currently licensed TLMS systems).

Comparison of calculated TLMS service area radii

|  |  |
| --- | --- |
|  | **Calculated service area radius** |
|  | Current usable sensitivity -119 dBm with PR=5 dB / maximum interference signal level -124 dBm  | Proposed receiver sensitivity -110 dBm with PR=8 dB / maximum interference signal level -118 dBm |
| TLMS high-powered**[[12]](#footnote-13)** | 71 km for base station antenna height = 200 m32.8 km for base station antenna height = 30 m | 50.7 km for base station antenna height = 200 m20.7 km for base station antenna height = 30 m |
| TLMS low-powered[[13]](#footnote-14) | 5.3 km | 2.9 km |

For the high-powered TLMS example, when using a 200 m base station antenna height, the calculated service area radii exceed the notional 40 km service area radius from RALI LM08 for both the current and proposed sensitivity levels. This indicates that the proposed sensitivity level is reasonable and remains consistent with the service model in RALI LM08. For the 30 m antenna height scenario, although the calculated service area radius is reduced for the proposed receiver sensitivity level, it indicates that a reasonably large service area can still be achieved for the affected prospective new assignments. Therefore, the proposed sensitivity level is not expected to have a significant impact on the viability of future high-powered TLMS deployments.

For the low-power example, a service area radius of 2.9 km exceeds the notional
low-power model service area radius of 2 km in LM08, so the impact of the proposed sensitivity level on low-powered TLMS would be considered reasonable and consistent with the model.

### Revised PMP criteria

The proposed revised PMP criteria considers an adjustment of the receiver sensitivity and protection ratio, based on the receiver performance requirement set out in
[ETSI EN 302 561 V2.1.1 (2016-03)](https://www.etsi.org/deliver/etsi_en/302500_302599/302561/02.01.01_60/en_302561v020101p.pdf), as opposed to the usable sensitivity level in
RALI FX16, which is based on the level of man-made noise typically encountered in city centres.[[14]](#footnote-15) Table 4 summarises the required receiver sensitivity and co-channel protection radio values from ETSI EN 302 561 V2.1.1 (2016-03) applicable to PMP base receivers operating in the 800 MHz band.

Summary of technical requirements for 800 MHz band PMP receivers from ETSI EN 302 561 V2.1.1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Channel BW**  | **Data rate**  | **Sensitivity**  | **Protection ratio** | **Maximum interference signal level @Rx** |
|  25 kHz    | 38.4 kbit/s or less  | -111 dBm  | 12 dB | -123 dBm |
| 38.5 kbits to 76.8 kbit/s  | -104 dBm  | 19 dB | -123 dBm |
| Greater than 76.8 kbit/s  | -99 dBm | 24 dB | -123 dBm |

We propose that the revised PMP criteria be based on a receiver sensitivity of
-111 dBm with a 12 dB protection ratio, based on the lowest sensitivity requirement in
Table 4. This would result in a 6 dB increase in permitted interference at the receiver,
-123 dBm instead of -129 dBm.[[15]](#footnote-16) Using the values in Table 1, the proposed revised criteria would reduce the notional separation distance as follows:

60 km would be reduced to 30 km, for an unwanted emission level of 15 dBm/MHz

5.4 km would be reduced to 2.7 km, for an unwanted emission level of
-6 dBm/MHz.

The reduced receiver sensitivity level of -111 dBm (from the existing level of
-119 dBm) may result in a smaller service area for PMP systems.

Table 5 shows calculated service area radii for PMP systems, assuming the proposed receiver sensitivity of -111 dBm and using the notional remote station parameters in RALI FX16 and the smooth earth propagation model. The calculated service area radii for both high and lower-powered PMP systems will exceed the service areas radii permitted in FX16 of 30 km and 2 km respectively. As such, the impact of the proposed receiver sensitivity level on PMP system coverage is considered minor consistent with the service models in RALI FX16.

Example PMP service area radii using the proposed receiver sensitivity level of -111 dBm

|  |  |  |
| --- | --- | --- |
|  | **Calculated service area radius** | **Max service area radius permitted by FX16[[16]](#footnote-17)** |
| PMP high-powered**[[17]](#footnote-18)** | 48.2 km | 30 km  |
| PMP low-powered[[18]](#footnote-19) | 28.9 km | 2 km |

### Revised PTP Protection criteria

The proposed revised PTP criteria has been derived by re-calculating the required protection based on the calculated fade margin as a function of the PTP link length.

The method adopted in deriving protection ratios in RALI FX3 has been used to determine the proposed revised protection ratios, which uses a calculated fade margin over the wanted path of the link.[[19]](#footnote-20) In this methodology, fade margin is calculated using the following equation.

Where:

|  |  |
| --- | --- |
| f | Frequency (GHz) |
| d | Distance between the fixed link transmitter and its associated receiver (km) |
| p | Percentage of time link is unavailable due to fading (The minimum value of fade margin can be calculated from the requirement for link availability, typically 99.99% of the time – i.e., 0.01%) |
| K | 10-6.5 x PL1.5 for climate and terrain effects (overland paths not in mountainous regions) |
| PL | Percentage of time that the average refractivity gradient in the lowest 100 m of the atmosphere is less than or equal to -100 N units/km |
|  | Path inclination in milliradians (assumed to be zero)  |

|  |  |
| --- | --- |
| he | Transmit antenna height above sea level |
| hr | Receiver antenna height above sea level |

The maximum allowable interference (Iall) is calculated using the below equation.

|  |  |
| --- | --- |
| k | Boltzmann’s constant (J/k) |
| T | Absolute temperature in Kelvin (assumed 300 degrees Kelvin or 27 Celsius) |
| B | Fixed link receiver bandwidth (Hz) |
| NF | Noise figure (dB) |
| I/N | Interference to noise ratio (dB) |

Using the calculated fade margin and maximum allowable interference from equations 1 and 2, the revised protection ratio (PR) can be calculated using the below equation.

|  |  |
| --- | --- |
| Tmx  | receiver threshold level for specified S/N and BER (1x10-3) in dBm per channel BW |

 ….. (3)

Table 6 below shows the input parameter values used in the equations and relevant references.

Input parameters and assumption values

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Input values** | **Reference** |
| Band / frequency (GHz) | 0.8 |   |
| Band width | 50 kHz / 200 kHz | Assumed. Aligns with example links in [ITU-R F.758-5 Table 4](https://www.itu.int/dms_pubrec/itu-r/rec/f/R-REC-F.758-5-201203-S%21%21PDF-E.pdf) |
| Link availability (%) | 99.99 | Used in the FX3 methodology |
| PL | 5, 10 & 20 | Refer to Annex A to [Appendix 1 of RALI FX3](https://www.acma.gov.au/sites/default/files/2019-11/RALI%20FX03%20-%20Appendix%201%20-%20Annex%20A%20pdf.pdf) |
| NF (dB) | 5 | [Rep. ITU-R F.2108 Table 2](https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-F.2108-2007-PDF-E.pdf) |
| I/N (dB) | -6 | For 30 MHz to 3 GHz as recommended in the [ITU-R F.758-5 Table 4](https://www.itu.int/dms_pubrec/itu-r/rec/f/R-REC-F.758-5-201203-S%21%21PDF-E.pdf)  |
| Rx input level for 1 × 10–3 BER (Tmx in dBm) | For BW = 50 kHz-93 (7-FSK/64 kbit/s)-105 (4 QAM/64 kbit/s)-100 (16 QAM/128 kbit/s) | [Rep. ITU-R F.2108 Table 2](https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-F.2108-2007-PDF-E.pdf) |
| For BW = 200 kHz-87(7-FSK/256 kbit/s)-99 (4 QAM/256 kbit/s)-94 (16 QAM/512 kbit/s) |

RALI FX22 currently provides separate protection ratios for 2-frequency PTP links, depending on bandwidth. For links with a bandwidth of ≤100 kHz (termed ‘narrowband’ in this paper), a co-channel protection of 30 dB is required, for links > 100 kHz (termed ‘wideband’ in this paper), the co-channel protection ratio is 50 dB.[[20]](#footnote-21)

Figure 2 shows the calculated protection ratios for narrowband links (≤100 kHz), using the above methodology and assuming the 4-QAM modulation technique with a capacity of 64 kbit/s (Tmx = -105 dBm/50 kHz), which results in the lowest protection ratios of the different modulation techniques in Table 6.

The protection ratios calculated for all climatic variable PL values are above 30 dB for path lengths greater than 20 km (the minimum path length for 2-frequency links in FX22 is 20 km), so based on these assumptions used, there is no scope to provide a reduced level of protection. We are not inclined to increase the protection ratios above 30 dB, given narrowband links are currently coexisting successfully with this level of protection. As such, we do not propose including a revised protection ratio for narrowband PTP links.

Protection Ratio (PR) for narrow band links (<100 kHz)

PL=20: 4-QAM / 64 kbits/s

PL=10: 4-QAM / 64 kbits/s

PL=5: 4-QAM / 64 kbits/s

Figure 3 shows the calculated protection ratios for PTP links with bandwidths greater than 100 kHz, including all three modulation techniques from Table 6 and assuming a PL of 10. The lowest protection ratio is for a modulation technique of 4-QAM/256 kbit/s, whereas the highest protection ratio is given by 7-FSK/256 kbit/s.

We propose that the revised protection ratio be based on the protection requirements for a 16-QAM link, which will also afford adequate protection for PTP links with modulation technique of 4-QAM. However, this protection ratio is less than the calculated ratios for 7-FSK. Given both 7-FSK and 4-QAM provide the same data capacity of 256 kbit/s, we think it is not necessary to base the revised protection ratios on the protection requirements for a 7-FSK link. While new 7-FSK links would still be permitted in the band, they would need to accept a lower level of protection than may be required (for coordination with 700 MHz spectrum licensed transmitters).

800 MHz band wideband fixed link protection ratio (PR) for different modulation techniques with PL=10

PL=10: 16-QAM / 512 kbits/s

PL=10: 4-QAM / 256 kbits/s

PL=10: 7-FSK / 256 kbits/s

The proposed revised protection ratios are shown in Figure 4. Although the calculated protection ratios in Figure 3 are higher than the 50 dB currently provided in RALI FX22 for longer link lengths, we are not proposing to increase the revised protection ratio beyond 50 dB, given that this level of protection has been suitable for PTP links in the band for many years. In addition, we propose a constant protection ratio for link lengths less than 10 km due to the absence of fading at these distances. While
RALI FX22 does not permit link lengths less than 20 km, it is proposed to include revised protection ratios below this distance for cases where the ACMA has granted an exemption for shorter links.

Proposed revised wideband (≥ 100 kHz) PTP link protection ratios for different PL values.

PL=20

PL=10

PL=5

FX22 currently provides an adjusted protection criteria for PTP links with a low wanted level (see Table 7 in FX22). Table 7 below provides a similar adjustment for the revised protection ratios shown in Figure 4. The arrangements in Table 7 constitute the proposed revised PTP protection criteria, to be applied for coordination between a 700 MHz spectrum licensed transmitter and a PTP receiver that:

Is licensed after the release date of the updated RALI FX22.

Has a bandwidth greater than or equal to 100 kHz.

Coordination in all other cases would use the protection ratios already specified in RALI FX22.

Revised protection ratios, including adjustment for links with a low wanted level (where PR is the applicable revised protection ratio from Figure 4)

|  |  |
| --- | --- |
| Wanted level (WL) | Revised co-channel protection ratio (dB) |
| WL ≥ -72 dBm | PR in Figure 4 |
| -72 dBm > WL ≥ -92 dBm | = max (30, PR-(-72 – WL)), for PR ≥ 30= max (28, PR-(-72 - WL) for PR < 30 |
| WL < -92 dBm | = 30, for PR ≥ 30 |

## Proposed additional guidance

The ACMA notes that there still may be situations where a proposed spectrum-licensed transmitter or apparatus-licensed receiver cannot be successfully coordinated with an existing service on the other side of the 803 MHz boundary. For these situations, we propose to include additional guidance in LM08,[[21]](#footnote-22) FX16[[22]](#footnote-23) and FX22[[23]](#footnote-24) detailing additional measures that can be considered by the Accredited Person and/or licensees. This guidance focusses on:

Using actual, rather than notional (i.e., measured or taken from datasheets), parameters in coordination assessments, and/or conducting on-site investigation of the interference environment.

Considering whether a higher level of interference can be voluntarily accepted
(e.g., protection down to the receiver sensitivity level may not be required for systems where mobile/remote stations all operate in close proximity to the base station, or for short PTP links where the impact of fading on the wanted path is less). This may be particularly relevant when a proposed apparatus-licensed service is attempting to coordinate with an existing spectrum-licensed transmitter.

Considering whether additional filtering can be incorporated on the spectrum-licensed transmitter to reduce unwanted emissions in the apparatus licence frequency segment. This would be particularly relevant when a proposed spectrum-licensed transmitter is attempting to coordinate with an existing apparatus-licensed receiver.

Encouragement to negotiate with affected licensees to identify actual parameters being used and to potentially find mutually agreeable solutions.

Where an apparatus licensee chooses to accept a higher level of interference, it is proposed that the below advisory note is included on their licence to ensure that existing licensees are not negatively impacted. For example, if future modifications are made to an existing spectrum licensed transmitter, from which the apparatus licensee has accepted a higher level of interference, the spectrum licensee will only need to
re-coordinate to the level accepted by the apparatus licensee (not to the level in the applicable RALI).

For PMP and land mobile systems:

*‘The licensee agrees to accept a level of interference which is [xx] dB higher than the level provided by [the applicable RALI], with respect to a transmitter operated under device registration number(s) [yyyyyy]. [where ‘xx’ is the amount in which the receiver fails the coordination criteria in the applicable RALI]’*

For PP systems:

*‘The licensee agrees to accept a wanted to unwanted ratio which is [xx] dB lower than the level provided by RALI FX22, with respect to a transmitter operated under device registration number(s) [yyyyyy]. [where ‘xx’ is the amount in which the receiver fails the coordination criteria in RALI FX22]’*

We also propose to provide more detail on a methodology which can be used to undertake coordination. For PTP services, this methodology entails comparison of
the unwanted emissions falling within the receiver’s passband with the applicable
co-channel protection ratio.

For TLMS and PMP services, this methodology entails using the prescribed protection ratio and receiver sensitivity levels (either the values currently in the applicable RALIs or the revised criteria detailed above, as applicable) and the unwanted emissions falling with in the receiver’s passband. Receiver blocking of TLMS should also be checked, using the existing blocking criteria in LM08 and the in-band power of the spectrum licensed transmitter.

We also propose to clarify that coordination with spectrum licensed receivers operating in the 703–748 MHz range and above 890 MHz is not required as the frequency separation is considered sufficient to enable coexistence (based on the notional receiver specifications contained in the relevant advisory guidelines).

# Invitation to comment

## Making a submission

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

[Online submissions](https://www.acma.gov.au/have-your-say) 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

Spectrum Planning Section

Australian Communications and Media Authority

PO Box 78

Belconnen ACT 2616

The closing date for submissions is **COB,** **Friday 17 November 2023**.

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](https://www.acma.gov.au/publication-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](https://www.acma.gov.au/privacy-policy).

1. These arrangements are contained in the [Radiocommunications Advisory Guidelines (Managing Interference from Transmitters – 700 MHz band) 2023](https://www.legislation.gov.au/Series/F2023L00248), and [Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters – 850/900 MHz Band) 2021](https://www.legislation.gov.au/Series/F2021L01148). [↑](#footnote-ref-2)
2. Frequency assignment requirements for the point-to-multipoint service in the VHF high, 400 MHz and
800 MHz bands. [↑](#footnote-ref-3)
3. Frequency assignment requirements for the fixed service in the 800 MHz band. [↑](#footnote-ref-4)
4. RALI FX 16 also includes provision for point-to-multipoint services in the VHF and 400 MHz bands. [↑](#footnote-ref-5)
5. 850 MHz spectrum licences will commence 1 July 2024. [↑](#footnote-ref-6)
6. Australian Mobile Telecommunications Association. [↑](#footnote-ref-7)
7. This are the usable sensitivity levels assumed by the service model in RALIs LM08 and FX16 based on
the noise levels in built-up areas and taking into consideration man-made noise. [↑](#footnote-ref-8)
8. Assumes main-beam coupling without any consideration of antenna tilt. [↑](#footnote-ref-9)
9. ETSI EN 300 113 V2.2.1 is one of the standards used in the development of RALI LM08. [↑](#footnote-ref-10)
10. Protection ratio is termed‘co-channel rejection ratio’in ETSI EN 300 113 V2.2.1. [↑](#footnote-ref-11)
11. The current maximum interference level of -124 dBm is for a sensitivity of -119 dBm and protection ratio of 5 dB, from LM08. [↑](#footnote-ref-12)
12. Assumes TLMS antenna height of 1.5 m for the mobile station and a mobile statin EIRP of 41 W. [↑](#footnote-ref-13)
13. Assumes TLMS antenna heights of 10 m for the base station and 1.5 m for the mobile station. Mobile station EIRP = 41 W. [↑](#footnote-ref-14)
14. ETSI EN 302 561 V2.1.1 is one of the standards used in the development of RALI FX16. [↑](#footnote-ref-15)
15. The current max interference level of -129 dBm is for a sensitivity of -119 dBm and protection ratio of 10 dB, from FX16. [↑](#footnote-ref-16)
16. The service area in RALI FX16. [↑](#footnote-ref-17)
17. Assumes PMP antenna heights of 30 m for the master station and 5 m for the remote station. Remote station EIRP = 20 W. [↑](#footnote-ref-18)
18. Assumes PMP antenna heights of 10 m for the master station and 3 m for the remote station. Remote station EIRP = 8.3 W. [↑](#footnote-ref-19)
19. The methodology used to derive the protection ratios in RALI FX3 is [detailed here](https://www.acma.gov.au/sites/default/files/2019-11/RALI%20FX03%20Protection%20Ratios%20Assumptions%20and%20Methodology.pdf). [↑](#footnote-ref-20)
20. These quoted values do not include the adjustments provided in Tables 6 and 7 of FX22 when the wanted level is low. [↑](#footnote-ref-21)
21. See section E3 of Annex E of the draft RALI LM08 at Attachment A. [↑](#footnote-ref-22)
22. See section 5.6 of the draft RALI FX16 at Attachment B. [↑](#footnote-ref-23)
23. See section 3.2 of the draft RALI FX22 at Attachment C. [↑](#footnote-ref-24)