Development of the 850 MHz expansion and 900 MHz spectrum licencing technical frameworks

Technical Liaison Group Consultation Paper

Version 1.1

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# Version Control

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| --- | --- |
| **Version** | **Comments** |
| Version 1.0 | Initial release |
| Version 1.1 | Timeline updated (deadline for initial input extended to 5 Feb |

# Introduction

The Australian Communications and Media Authority (the ACMA) commenced a review of arrangements in the 803–960 MHz frequency band (the review) in May 2011, with the release of the discussion paper *The 900 MHz band—Exploring new opportunities* *(*[*Exploring new opportunities*](https://www.acma.gov.au/803-960-mhz-overview)). This was followed in 2012 with a second paper entitled, *The 803–960 MHz band: options for future change* ([*Future options*](https://www.acma.gov.au/803-960-mhz-overview)).

The *Future options* paper sought comment on a range of specific band planning proposals, including options for:

* re-farming the so-called ‘850 MHz expansion’ band[[1]](#footnote-2) for additional mobile broadband services,
* replanning the 900 MHz digital cellular mobile telephone band into 5 MHz blocks (or multiples thereof),
* facilitating the introduction of new and emerging low interference potential technologies; and ,
* overall band planning arrangements to implement these measures.

The ACMA formalised these considerations in the decision paper [*The ACMA’s long-term strategy for the 803-960 MHz Band*](https://www.acma.gov.au/sites/default/files/2019-12/The%20ACMAs%20long-term%20strategy%20for%20the%20803960%20MHz%20band_decision%20paper.docx)*.* The key outcomes of this paper included:

* The identification of 2 x 15 MHz of spectrum from the 850 MHz expansion band (809-824/845-869 MHz) that is optimised for mobile broadband.
* The declaration of the ACMA’s intent to reconfigure the 900 MHz band (890–915/935–960 MHz) to support future LTE applications.
* The potential implementation of a 1 MHz downshift of the existing 850 MHz band (currently 825-845/870-890 MHz, proposed to ultimately move to 824-844/869-889 MHz).
* The potential deployment of a national Public Safety Mobile Broadband (PSMB) capability within the 850 MHz expansion band.

Considerations around how to reconfigure the 900 MHz band have been the subject of subsequent consultations and the PSMB issue has since been managed by the Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) in consultation with relevant state and territory government agencies.

Most relevantly, the Minister for Communications recently [announced](https://minister.infrastructure.gov.au/fletcher/media-release/2021-will-be-year-5g) that the 850 MHz expansion and 900 MHz bands would be reallocated for spectrum licensing, which triggers the development of technical frameworks to be considered, initially, by this Technical Liaison Group (TLG). The Minister’s announcement also placed an emphasis on facilitating 5G technologies with the expectation that sub-1 GHz spectrum licence holdings will, over time, be re-farmed to enable the evolution to those technologies. This means that parameters specified by 5G standards (i.e. the 3GPP ’38 series’) should also be accommodated by the frameworks informed by this TLG.

**Terminology**

It is necessary to make some terminology distinctions up front, as changes over time have led to some inconsistencies. What will be discussed in this TLG under the name ‘850 MHz band’ comprises the existing spectrum licensed band of 825-845/870-890 MHz that was originally described as the ‘800 MHz band’. Indeed the technical frameworks that underpin licences in this band are still known as the [800 MHz technical frameworks](https://www.acma.gov.au/800-mhz-technical-framework). However following the clearance of 803-820 MHz as part of the digital dividend and the reorganisation of the 803-890 MHz band (as set out in the decision paper), the term ‘800 MHz band’ now refers to a broader range of frequencies (as described in the [800 MHz band plan (RALI MS 40)](https://www.acma.gov.au/publications/2019-11/rules/rali-ms-40-800-mhz-band-plan)).

Use of the term ‘850 MHz band’ for the range 825-845/870-890 MHz aligns with more contemporary parlance – following allocation of the 850 MHz expansion band, the full (expanded) 850 MHz band will comprise of:

* 809-845 (844 post-downshift) MHz, and
* 854-890 (889 post-downshift) MHz.

For the purposes of this TLG the term ‘850 MHz band’ will be used but please keep in mind that the purpose of this TLG is to inform to update the existing 800 MHz technical frameworks, which are one and the same.

**The Technical Framework**

The ACMA develops a technical framework for every band subject to spectrum licensing. Each framework is a collection of technical and regulatory conditions applicable to the use of radiocommunications devices in the spectrum-licensed band. The purpose of the technical framework is to define the technical conditions and constraints under which a device may be deployed and operated within the specified geographic area and frequency band of the licence.

The technical framework defines the spectrum licence asset and its relationship to other spectrum users. In doing so the framework provides arrangements to manage interference and provide legal certainty about licensee rights.

The objectives of technical frameworks are to:

minimise the negotiation necessary between licensees; and,

maximise flexibility for the deployment of services; and,

maximise the efficiency with which the spectrum is used.

The technical framework of the spectrum licence is developed by the ACMA to fulfil its requirements under the Radiocommunications Act 1992 (the Act). The framework is developed by the ACMA in consultation with industry through the TLG.

This initial paper provides information on the various aspects of the technical framework. We are asking for comment on the proposed parameters for the following basic items of the technical framework:

the reference technologies; and,

the standard trading unit and minimum contiguous bandwidth (MCB); and,

the out-of-area emission limit; and,

the out-of-band emission limits, and

relevant adjacent system characteristics and protection requirements.

The out-of-area (in band) and out-of-band emission limits, together with the frequency and geographic boundaries, make up the core conditions of the spectrum licence as defined in Section 66 of *the Act*. This discussion paper examines each of these items of the framework, considering the specifications of the reference technologies, the arrangements in place overseas, and proposed arrangements to be put in place in Australia. An outline of the reasoning leading to selection of the proposed values for each item is provided.

Given the commonality between both the technologies used and physical characteristics of adjacent and near-adjacent spectrum licenced bands, it is intended that some aspects of the technical frameworks will essentially carry over from relevant existing frameworks (e.g. 800 MHz band). These aspects include device boundary criteria (DBC) and associated levels of protection (LOPs) and propagation models for making DBC assessments.

As with all TLG papers, this is a discussion paper only and the views and suggestions of the members of the TLG are sought as to the relevance and suitability of the proposed values. It is also intended to be a ‘living’ document that evolves with input from the TLG membership, so the first iteration of this paper can be considered as a starting point.

**TLG Outcomes**

There are two key bodies of work that will be informed by outcomes of the TLG process:

* Development of the 850 MHz expansion technical framework, by:
* Reviewing the 2012 850 MHz[[2]](#footnote-3) technical framework, which comprises of:
* the [s.145(4) determination](https://www.acma.gov.au/800-mhz-technical-framework) on unacceptable levels of interference,
* the [Radiocommunications Advisory Guidelines (Managing interference from Spectrum Licensed Transmitters)](http://www.comlaw.gov.au/Details/F2012L01775) (the ‘RAG tx’), and
* the [Radiocommunications Advisory Guidelines (Managing interference from Spectrum Licensed Transmitters)](http://www.comlaw.gov.au/Details/F2012L01774) (the ‘RAG rx’)
* the [*Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012*](https://www.legislation.gov.au/Details/F2018C00564) (the Trading Rules determination)

to incorporate the 850 MHz expansion band within their scope;

* Developing the licence conditions for the 850 MHz expansion band;
* Development of a new 900 MHz band technical framework (ie. developing licence conditions, and a new s.145(4) determination, RAG tx and RAG rx). This will also include adding the 900 MHz band to the Trading Rules determination.

## Scope

This TLG paper will propose initial arrangements for the 850MHz expansion band and the reconfiguration of the 900 MHz band. Allocation of spectrum for PSMB and effecting the 850 MHz band downshift are not within the scope of this TLG process, however arrangements for those frequency segments will be included in the frameworks developed in this TLG. In other words, should the government allocate a segment of the 850 MHz expansion band for PSMB, PSMB network operations will be subject to the same provisions and conditions as operators in other segments of the band.

The 2 x 1 MHz that is proposed for the 850 MHz downshift is within the scope of this TLG. This means that the in-band frequency ranges within scope of the TLG are:

* 809 MHz to 825 MHz (base rx);
* 854 MHz to 870 MHz (base tx);
* 890 MHz to 915 MHz (base rx); and
* 935 MHz to 960 MHz (base tx).

Regarding the 1 MHz downshift, this will occur no later than the expiry date of the current 850 MHz spectrum licences in 2028 (or earlier if agreement can be obtained from incumbent licence holders). The work of this TLG assumes that that downshift is *not* in place – technical frameworks can be updated later to take account of the downshift when it occurs.

Device boundary criteria (DBC) for service deployments will be considered within this TLG, which are relevant to managing interference across geographic boundaries. however any consideration of geographic spectrum lot configurations is not within the scope of this TLG.

Lastly, the device and emission characteristics that are proposed for consideration in developing these frameworks have, with some exceptions, been based on the 3GPP ’38 series’ standards that specify 5G new radio (NR) systems and devices. While technical frameworks developed to support spectrum licensing are deliberately technology-flexible, they are generally optimised for the most evolved technologies available at the time of their writing. Parameters are also necessarily tempered if/where necessary to enable coexistence with incumbent services – while 3GPP standards are instructive they do not always translate directly into parameters for entry into technical frameworks.

It may be some time until 5G technologies are deployed in the frequency bands being considered by this TLG, however optimising the frameworks in this way will enable a smooth transition to these technologies at the appropriate time, and is not expected to constrain previous generation (eg, 3G, 4G) technology deployments in the interceding period.

## Timeline

The ACMA is working towards allocating the 850 MHz expansion band and 900 MHz band in Q4 2021.

1. TLG anticipated process timeline

| Key steps | Proposed Date |
| --- | --- |
| TLG process:  Initial release of TLG paper  Deadline for submissions/comments on initial TLG paper  Revision to TLG paper and recirculation  Deadline for submissions/comments on revised TLG paper  Second (final) revision to TLG paper and recirculation | 17 Dec 2020  5 Feb 2021[[3]](#footnote-4)  12 Feb 2021  12 Mar 2021  26 Mar 2021 |
| Public consultation on the draft updates to the following technical framework instruments (the consultation will also include a draft 850 MHz ‘expansion’ band & 900 MHz marketing plan):  Draft spectrum licence; and,  Draft *Radiocommunications (Unacceptable Levels of Interference) Determination;* and,  Draft *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters);* and  Draft *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers);* and,  Draft update to *Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012;* and  Draft updates to relevant RALIs | April 2021 |

## Legal Review

Currently there are no draft instruments. Initial drafts (when released) may not have undergone any legal review and are therefore indicative only and may be subject to change.

Under the current timeline, draft instruments will be provided for comment in April 2021.

# Proposed technical frameworks & subsequent parameters

A technical framework consists of three interlocking regulatory elements provided for under the Act:

The conditions specified on the spectrum licence—in particular, the core conditions that define the spectrum space (both frequency and geographical area) and the level of emissions permitted inside and across the frequency boundaries of the licence (section 66 of the Act).

A determination of unacceptable interference for the purpose of device registration in each band (section 145 of the Act). This defines permissible levels of emissions across geographical licence boundaries and can also define various deployment constraints.

Radiocommunications advisory guidelines (RAG) that provide assistance and advice for coordination with stations in other services when and where required (section 262 of the Act). This includes detailing interference management criteria with incumbent apparatus and other spectrum licences.

A more comprehensive explanation of spectrum licence technical frameworks is provided in the document [*Know your obligations—Spectrum licensees*](http://www.acma.gov.au/theACMA/Library/Industry-library/Spectrum/know-your-obligationshelp-for-spectrum-licensees). As described above, the outcomes of this TLG will inform the development of a new technical framework for the 900 MHz band and an update of the existing 850 MHz framework to incorporate the 850 MHz expansion band spectrum.

This section of the paper considers the development of each of these components along with the standard trading unit and minimum contiguous bandwidth.

## Conditions on spectrum licences

Each spectrum licence includes both core conditions and statutory conditions specified under relevant sections of the Act. The Act also provides that other specific conditions may be included by the ACMA.

**Core conditions**—required under section 66, these conditions define the spectrum space within which the licensee is authorised to operate radiocommunications devices under the licence, and the maximum permitted level of radio emissions inside and outside the band. These conditions are included in all spectrum licences.

**Statutory conditions**—required under sections 67 to 69A, these conditions include information about payment of charges, use by third parties, residency, registration of transmitters and devices exempt from registration. These conditions are included in all spectrum licences.

**Other conditions**—conditions placed on licences under section 71 generally provide for the efficient management of the spectrum and administration of the Act. These conditions may vary from one band or licence to another.

The core conditions of a spectrum licence form the fundamental building blocks for operation of a spectrum-licensed device, and for managing interference with adjacent frequency bands and geographic areas. Section 66 of the Act states spectrum licences must specify the following core conditions:

the part or parts of the spectrum in which operation of radiocommunications devices is authorised under the licence (frequency range of operation)

the maximum permitted level of radio emission, in parts of the spectrum outside the frequency range specified on the licence, that may be caused by operation of radiocommunications devices under the licence (outside-the-band emission)

the area within which operation of radiocommunications devices is authorised under the licence (geographic area of operation)

the maximum permitted level of radio emission that may be caused by the operation of radiocommunications devices under the licence (outside-the-area emission).

When developing conditions on the spectrum licence it is proposed to use those on the 700 MHz and 800 MHz spectrum licences as a starting point.

## Standard Trading Unit and Minimum Contiguous Bandwidth

A spectrum licence may be traded in whole, or in part, by geographic area or frequency or both. Under section 88 of the Act, the ACMA may determine the rules that apply to trades under spectrum licensing. These rules are contained in the [*Radiocommunications (Trading Rules for Spectrum Licences) Determination 2012*](https://www.legislation.gov.au/Details/F2015C00469)(trading determination).

The trading determination specifies the smallest parcel of spectrum space that can be traded (the standard trading unit) and the minimum contiguous holding of spectrum space required by a licensee after the completion of a trade. This minimum holding is a combination of frequency and geographic requirements. Where:

the frequency requirement is equal to the minimum contiguous bandwidth (MCB),

the geographical requirement is equal to the geographical component of the standard trading unit (STU).

The minimum quotas of frequency and area that can be traded are defined by the STU. The definition of a STU is contained in the trading determination.

The STU that applies to the 850 MHz expansion and 900 MHz band (and every other spectrum licence band) is defined as a parcel of spectrum space that consists of:

a geographic area equal to a Level 1 HCIS cell of the 2012 Australian Spectrum Map Grid (ASMG)[[4]](#footnote-5)– approximately a 9×9 kilometre in size

a frequency band where the lower and upper frequency limits of each segment are integers when described in Hertz

This means the frequency component of the STU is defined as 1 Hz for both bands and all other spectrum licence bands. This provides licensees with flexibility in the quantum of spectrum that may be traded, subject to the value of the MCB. The minimum area is referenced to the ASMG mapped consistently in five-minute increments by latitude and longitude.

**There is no proposed change to the STU.**

The current MCB for the 825–845/870–890 MHz band is 1 MHz, however it is proposed to change this to 5 MHz. This means that any trades in this band must not result in a licensee holding a contiguous bandwidth less than 5 MHz in any area. Noting the *Channelling arrangements* discussion below, the same MCB is proposed for adoption in both the 850 MHz expansion and the 900 MHz band.

**Is a 5 MHz MCB appropriate for both the 850 MHz expansion and 900 MHz spectrum licence bands?**

## Technical settings

### Relevance of existing frameworks

Unlike a ‘greenfield’ spectrum allocation and deployment, pre-existing deployments in both the 850 MHz and 900 MHz bands mean that some existing parameters will not need to be derived. Moreover, in the case of the 850 MHz expansion band, many of the characteristics will necessarily be aligned with those of the existing 850 MHz band.

For example, device emission limits, levels of protection (LOP, to inform device boundary criteria) and system models used to determine those characteristics can be informed by those encapsulated in existing frameworks. Accordingly, unlike previous TLG papers, system models and derivations of LOPs have been omitted from this paper. This does not mean that proposed technical settings carried over from relevant existing frameworks are ‘locked in’ – the TLG can inform whether those settings remain relevant or suggest amendments if necessary (noting that the ACMA will consider views from existing 850 MHz spectrum licensees on any proposed changes which would affect their licences). If no change is needed, the values and calculations set out in schedules to the current 850 MHz technical framework will remain in force.

Furthermore, given the commonality of technologies and characteristics between both the 850 MHz and 900 MHz bands, it is expected that many of the elements developed for the (update to the) 850 MHz frameworks will translate across to the new 900 MHz band frameworks.

### Reference technologies

The proposed reference technologies that will be specifically considered in the development of the framework are:

1. Reference Technologies

| Technology Identification | Technology Mix | Duplexing Methodology | Service Model(s) | Applicable standards and reports |
| --- | --- | --- | --- | --- |
| UMTS (UTRA) | Current | Two frequency (FDD) | Fixed and mobile | ITU-R Report M.2039-2, 3GPP TS 25.101, 3GPP TS 25.104, 3GPP TS 24.942, ECC Report 82, ECC Report 96 |
| LTE  (E-UTRA) | Current | Two frequency (FDD) | Fixed and mobile | ITU-R Report M.2039-2, 3GPP TS 36.101, 3GPP TS 36.104, 3GPP TS 36.942 |
| 5G NR | Current | Two frequency (FDD) | Fixed and mobile | ITU-R Recommendation M.2101, 3GPP TS 38.101, 3GPP TS 38.104 |

This does not exclude other technologies from being used under the framework; rather, it is proposed that the framework will be developed with specific reference to these technologies. As there has been little interest in the use of TDD systems in these bands in Australia, only FDD technologies are being considered. The proposed framework will be optimised to support FDD in line with band arrangements developed by the AWG for FDD.

**Are the reference technologies appropriately representative of expected spectrum use cases?**

## Channelling arrangements

The 900 MHz band has long been a cornerstone in the delivery of cellular communications services in Australia, first through the deployment of the 2G Global System for Mobile (GSM) and now 3G Universal Mobile Telecommunications System (UMTS) and 4G Long Term Evolution (LTE) technologies. LTE can operate using a range of different channel sizes, being: 1.4, 3, 5, 10, 15, and 20 MHz, however LTE is more spectrally efficient in channels of 5 MHz or multiples thereof.

Increases in channel size (in 5 MHz increments) up to a 20 MHz channel increases throughput but results in only incremental gains to spectral efficiency. While LTE can operate using channels smaller than 5 MHz, this is generally avoided as efficiency suffers and the level of throughput adds little to the overall capacity of a network. Therefore, bands for 3G and 4G technologies are predominately planned based on a minimum block size of 5 MHz.

The 850 MHz expansion band will consist of 3 paired channels of 5 MHz on both the upper and lower limit (Figure 1), given that it is expected that most end-use stakeholders will be using FDD technologies. The potential for licensees to re-farm holdings to enable future (5G) NR deployments is preserved by using a baseline of 5 MHz blocks.

Proposed channelling arrangements for the 850 MHz expansion band

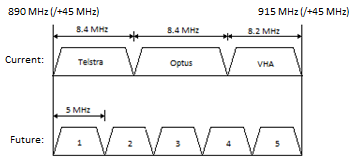
Diagram

Description automatically generated

If an allocation is made for PSMB in the 850 MHz expansion, it is anticipated that it will be limited to channel 1. Whether PSMB is ultimately allocated to the 850 MHz is a decision for government – however is it anticipated that this capability will be LTE-based technology, allowing for a single unified technical framework to be developed across all band segments.

The 900 MHz band is intended to have the following channel arrangements within the base receive segment (Figure 2). The 900 MHz band (890–915/935–960 MHz) is currently apparatus licensed to Telstra, Optus, and Vodafone Hutchison Australia (VHA) in 8.4 and 8.2 MHz blocks. Figure 2 shows the lower (base-receive) part of this band, with the current licensing arrangements shown at the top of the diagram.

Current and proposed channelling arrangements for 900 MHz band



These details are provided for information only – no comment is requested.

## Emission Limits

### *In-band emission limit*

The value proposed for the in band (otherwise referred to as out-of-area) emission limit is based on the maximum in-block limit identified in the European arrangements with an additional factor of 5 dB added to cover future technological developments that may occur over the period of the licence.

**The proposed in band/out-of-area limit is 47dBm EIRP per 30 kHz for licenses in the 850 MHz expansion and 900 MHz bands. Is this appropriate?**

**Noting that 38 series standards express device power in terms of conducted power per transmitter, is it still appropriate to refer to EIRP for maximum in band power or should conducted power be used instead?**

*Unwanted emissions limit*

Another core condition of the licence sets the unwanted emission limits outside the band. These limits control emissions outside the frequency boundary of the licence. Unwanted emissions may affect licensees in adjacent holdings as well as spectrum uses outside the spectrum licensed band. Unwanted emissions consist of out-of-band emissions (OOBEs) and spurious emissions.

OOBEs are unwanted emissions immediately outside the allocated bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions.

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

Note that prescribed OOBE and spurious limits would apply to all devices operating under a spectrum licence in the 850 MHz expansion and 900 MHz bands. Devices which are exempt from registration (e.g. mobile handsets) are not exempt from the core conditions of the licence under which they operate.

Given the contiguity with the upper-adjacent 850 MHz band, the proposed out-of-band limits will apply to both the 850 MHz and 850 MHz expansion bands as a whole. So the out of band limits proposed are based on band filter edges at 809/845 MHz segment paired with 854-890 MHz segment (to be later adjusted to upper edges of 844 and 889 MHz once the 1 MHz downshift of the 850 MHz band is brought into effect).

For both the expanded 850 MHz band and 900 MHz band, it is considered that the current 850 MHz OOBE and spurious limits (described in sections 6 through 12 of Schedule 2 – Core Conditions on the [current 850 MHz licence](https://web.acma.gov.au/rrl/licence_image.extract_pdf?pLICENCE_NO=9263429)) remain relevant. So for these purposes, it is proposed that the OOBE and spurious limits contained in the existing 850 MHz licence be retained but with amended frequency limits to include both the expanded 850 MHz band (i.e. outside the 809, 845, 854 and 890 MHz boundaries) and 900 MHz band. In other words, it is proposed that:

the current OOBE limits described in Table 3 of the current 850 MHz licence for (outside and offset from) the existing 825 and 845 MHz boundaries will apply to the 809, 845, 890\* and 915 MHz boundaries;

the current OOBE limits described in Table 4 of the current 850 MHz licence for outside the existing 870 and 890 MHz boundaries and offset from 870 MHz, will apply to outside 854 – 890 MHz and 935 – 960 MHz and offset from 854 and 935 MHz;

the current OOBE limits described in Table 5 of the current 850 MHz licence for outside the existing 870 and 890 MHz boundaries and offset from 890 MHz, will apply to outside 854 – 890 MHz and 935 – 960 MHz and offset from 890\* and 960 MHz;

the current OOBE limits described in Table 6 of the current 850 MHz licence will apply outside all frequencies (base receive *and* base transmit segments) licensed to a given operator, offset from the lower and upper edges of those segment; and

the current spurious OOBE limits described in Tables 7 and 8 of the current 850 MHz licence will apply outside 809-845, 854-915 and 935-960 MHz for transmitters and receivers respectively.

\* TLG members may wish to further examine the suitability of these limits at the 890 MHz boundary, given both the 850 MHz and 900 MHz bands are within scope of the TLG.

***Proposed out-of-band emission limits:***

**Are the existing spurious and non-spurious out-of-band emission limits as prescribed in the current 850 MHz spectrum licence appropriate for the 900 MHz and expanded 850 MHz bands?**

**What additional constraints might be necessary at the 890 MHz boundary to ensure coexistence between the 850 and 900 MHz bands?**

**Other conditions of the licence**

It is proposed that spectrum licences would be subject to most (if not all) of the existing conditions on the current 800 MHz and 700 MHz spectrum licences that are also relevant to the 850 MHz expansion and 900 MHz band.

It is also proposed to include a licence condition to protect incumbent services during the reallocation period. Proposed protection requirements are further discussed in the *Radiocommunications advisory guidelines (RAGs)* section.

**Do stakeholders have any concerns about the proposed ‘other’ conditions?**

**Are there any additional ‘other’ conditions that stakeholders wish to include?**

## Unacceptable levels of interference (s.145 determination)

Spectrum licensees are required to register a radiocommunications transmitter in the Register of Radiocommunications Licences before they may be operated under the licence. The only exception to this is if there is a condition on licences that exempts certain types of transmitter.

Subsection 145(1) of the Act gives the ACMA the power to refuse to register a radiocommunications transmitter if it is satisfied that the operation of the transmitter could cause an unacceptable level of interference to the operation of other radiocommunications devices. Under subsection 145(4) of the Act, the ACMA can make a determination (referred to as a section 145 determination) that sets out what is considered unacceptable levels of interference for each spectrum-licensed band.

A section 145 determination sets out the circumstances in which devices are deemed to cause unacceptable levels of interference. These circumstances typically include:

if the levels of emissions from a device at the geographical boundary of a licence exceed a defined level; or

if the operation of the transmitter will cause a breach of a core condition of the licence; or

if the deployment of the device is outside any deployment constraints defined for the band.

It is proposed that, as a result of the TLG, the current 850 MHz s.145 determination will be updated, and a new s.145 determination will be made for the 900 MHz band.

Under normal circumstances, a TLG will consider relevant elements of the device boundary criteria (DBC) to be reflected in the s.145 determination. This usually includes definitions and/or calculations of system models, propagation models and device levels of protection (LOP) that underpin the DBC.

Once again, given the pre-existence of the 850 MHz frameworks, it is proposed that those existing frameworks be referred to as a starting point for these considerations (for both the 900 MHz and 850 MHz expansion bands), rather than seeking to develop a new suite of metrics. We expect these to be updated somewhat through the TLG process but reiterate that the amendment of any values associated with conditions on existing 850 MHz band licences will need to be agreed by existing 850 MHz licensees. Based on recent TLG experience, some aspects of the s.145 determination that we may consider updating include:

updating to 3 second digital elevation model (DEM);

excluding propagation paths that lie outside the ASMG and/or territorial sea boundaries from needing to comply with DBC; and

revision of DBC calculation resolution (from 500m down to 100m); and

revision of the definition of a transmitter from the current definition in section 9(e).

**Which aspects of the current 850 MHz s.145 determination require revision and what might appropriate revised values be?**

Regarding the LOP, it is generally a compromise between the level of emissions over the geographic boundary of the licence and the anticipated protection requirements of receivers. The LOP must be met at or within the geographic boundary of the licence following the device boundary criterion methodology of the section 145 determination.

For the purposes of these frameworks and given the interrelationships between the 850 MHz existing and expansion bands, it is considered that the existing 850 MHz LOP is a useful starting point for both the 850 MHz expansion and 900 MHz band frameworks. These are:

– 111 dBm/MHz for base-transmit frequencies, and

– 115 dBm/MHz for base-receive frequencies.

These LOPs were previously determined based on a 1dB desensitisation of UE in the 850 MHz band. The existing 850 MHz frameworks can be referred to for calculation of these values – it is understood that these values are now considered somewhat conservative and more flexibility has since been preferred in subsequent sub-1 GHz technical frameworks, so the TLG is being asked to provide input on what an appropriate LOP across both the 900 MHz and 850 MHz expansion bands is, based on learned experience in other comparable bands.

**What is the appropriate level of protection for the 850 MHz and 900 MHz bands?**

## Radiocommunications advisory guidelines (RAGs)

**Amendments to 850 MHz RAGs**

Further guidance on interference management with other licensed services is provided in Radiocommunications Advisory Guidelines (RAGs) made under section 262 of the Act. RAGs can refer to any aspect of radiocommunications or radio emissions.

Generally, RAGs include provisions to help assess the possible interference between spectrum-licensed devices and services operating under spectrum, apparatus, or class licences. Potentially affected services are identified in the RAGs to enable licensees to assess and mitigate the risk of interference between these services.

It is important to note that where a case of interference arises between a spectrum-licensed device and another licensed device, the ACMA will refer to the provisions of the RAGs in resolving the matter. In general, affected licensees also can negotiate their own arrangements to manage interference. Such arrangements will be considered when resolving any interference disputes.

The following 850 MHz RAGs will need to be updated as a result of this TLG:

[*Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters - 800 MHz Band) 2012*](http://www.comlaw.gov.au/Details/F2012L01775) (the RAG tx), and

[*Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers - 800 MHz Band) 2012*](http://www.comlaw.gov.au/Details/F2012L01774)(the RAG rx).

These updates are expected to be relatively minor given the adjacent services in the band will be relatively minor, given the adjacent band services will remain the same (only the lower frequency edge will change from 825/870 MHz to 809/854 MHz):

Trunked land mobile services (TLMS) will remain lower-adjacent to both the base-transmit and base-receive segments of the expanded 850 MHz band;

Single-frequency links (including sound outside broadcast) will remain upper-adjacent to the base-receive segment of the expanded 850 MHz band; and

The 900 MHz band wireless broadband will be upper-adjacent to the base-transmit segment of the expanded 850 MHz band.

Apart from the latter point, which will itself be considered within the scope of this TLG, it is proposed that the existing coexistence arrangements (including protection requirements) between these services and 850 MHz spectrum-licensed services will not be amended. This includes incorporating the coexistence arrangements from Appendix E of RALI FX22 into the RAG rx.

Instructions for management of in-band interference will continue to refer to the DBC and associated arrangements set out in the s.145 determination.

**Is there a need to revisit established adjacent-band protection requirements for the (expanded) 850 MHz band, noting adjacent services will not change?**

Separately, one unique aspect of the 850 MHz expansion band is that it will be allocated partially encumbered – existing operators will transition out of the band by mid-2024 in accordance with the [*The ACMA’s long-term strategy for the 803-960 MHz Band*](https://www.acma.gov.au/sites/default/files/2019-12/The%20ACMAs%20long-term%20strategy%20for%20the%20803960%20MHz%20band_decision%20paper.docx). To enable temporary coexistence with these services, it is proposed that a simple note will be added to the RAG tx and rx that refers to relevant RALIs (most likely limited to RALI LM 08 for existing TLMS) for the services concerned, so that they can essentially be ‘worked around’ until they have transitioned out. Given the temporary nature of this overlap, we do not see any need to revise coexistence provisions.

However, it may be prudent to place a note in RAGs to take account of registered locations of (in particular) TLMS base stations that will be transitioning from 820-825/865-870 MHz to 806-809/851-584 MHz for coordination purposes. The reason for this is that existing TLMS services should be afforded first-in-time status for coordination purposes and should not be disadvantaged by a decision to allocate the 850 MHz expansion band spectrum encumbered and earlier than originally forecast. It is further proposed that these arrangements are incorporated as a condition on the licence.

**Development of 900 MHz RAGs**

A new RAG tx and RAG rx will be required for the 900 MHz band. The formats of these will closely follow those of the 850 MHz RAGs that are update in this TLG. Existing arrangements to enable coexistence between 900 MHz apparatus licenced PMTS services and adjacent band services will be instructive in informing the contents of these guidelines. These services include:

Lower-adjacent 850 MHz wireless broadband services (also within scope of this TLG);

Devices authorised under the Low Interference Potential Devices (LIPD) Class Licence; and

Aeronautical services operating above 960 MHz (predominantly distance measuring equipment (DME)).

As per usual practice, instructions for management of in-band interference will refer to the DBC and associated arrangements set out in the s.145 determination.

**Is there any need to revisit existing coexistence arrangements between (currently apparatus-licensed) 900 MHz wireless broadband services and adjacent band services?**

**Mobile Communications on board Aircraft (MCA)**

The current 850 MHz RAG tx contains provisions for operating mobile communications systems aboard aircraft (MCA). These services are normally operated under PMTS class C licences, however when operating in spectrum-licenced areas/frequencies must be operated under the spectrum licence (either directly or via 3rd party, depending on the operating entity). The provisions set out in the RAG refer to the conditions for PMTS class C operation set out in the PTS LCD. The intent is to retain these provisions in updates to the 850 MHz frameworks (and extend their applicability across the expanded band) and to reproduce them in new 900 MHz frameworks.

**Do the existing provisions in place for the operation of mobile communications devices on board aircraft under spectrum licences (3rd party or otherwise) continue to be appropriate?**

1. ‘850 MHz expansion’ band refers to the harmonised International Mobile Telecommunications (IMT) frequencies that are frequency lower adjacent to the existing 850 MHz band and standardised by 3GPP for 3G and 4G technologies (under the band numbers 26 and 27). As its name suggests, it is a downwards expansion of the 850 MHz band. [↑](#footnote-ref-2)
2. Existing 850 MHz band frameworks were made under the name ‘800 MHz band’ [↑](#footnote-ref-3)
3. Ordinarily one month is provided for comment, however additional time has been added to accommodate the holiday period. [↑](#footnote-ref-4)
4. Available at: <http://www.acma.gov.au/webwr/_assets/main/lib410188/australian_spectrum_map_grid_28feb2012.docx> [↑](#footnote-ref-5)