**Outcomes of the Technical Liaison Group (TLG)**

The ACMA advertised the formation of a 3.6 GHz band TLG on the 8th of March 2018. This is the same day the Minister for Commination’s announced he had re-allocated the 3.6 GHz for the issue of spectrum licences.

Membership to the TLG consisted of representatives from existing 3.4 GHz spectrum licensees, prospective 3.6 GHz band spectrum licensees, incumbent apparatus licences (including WISPs), adjacent band apparatus licensees (such as Defence and the satellite industry), equipment manufacturers and accredited persons. Appendix A provides the full list.

This attachment contains a summary of the outcomes of the TLG for each of the individual components of the technical framework. Where appropriate the distinction between Option 1 and Option 2 frameworks are made.

Please note that that unless otherwise stated a reference to the 3.4 GHz band includes the 3425-3492.5 MHz and 3542.5-3575 MHz frequency ranges.

## Standard Trading Unit (STU) and Minimum Contiguous Bandwidth (MCB)

The following was proposed:

* STU: no change (Frequency component = 1 Hz, Area component: HCIS level 1)
* MCB: 10 MHz

## Conditions on the spectrum licence

In the event **Option 2** is adopted:

* all conditions proposed will apply to licences issued in the 3575-3700 MHz frequency range;
* only those conditions that all existing 3.4 GHz band spectrum licensees agree two will be adopted for licences in the in the 3425-3492.5 MHz and 3542.5-3575 MHz frequency range.

In-band emission limit:

* A total radiated power (TRP) of 48 dBm/5 MHz per cell/sector.

Unwanted emission limits for registered transmitters:

The unwanted emission limits proposed assume either a negotiated outcome or synchronised operation to manage interference when it occurs.

It is also noted that adjacent band spectrum licensees are free to negotiate alternative unwanted emission levels within their respective spectrum licence space.

**Note 1**: foffset is the frequency offset from the upper or lower frequency limits of the licence. The closest -3dB point of the measurement bandwidth to the upper or lower frequency limits of the licence is placed at foffset**.**

1. Transmitter unwanted emission limits within the 3380-3720 MHz frequency band – registered non-AAS devices. For registered AAS devices an additional 9 dB is added to the TRP values.

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| --- | --- | --- |
| **Frequency Range (foffset)Note 1** | **Total Radiated Power (dBm) per cell/sector** | **Measurement Bandwidth** |
| 0 kHz ≤ foffset ≤ 5 MHz | -7 – (7/5).foffset(MHz) | 100 kHz |
| 5 MHz≤ foffset ≤ 10 MHz | -14 | 100 kHz |
| foffset ≥ 10 MHz | -15 | 1 MHz |

1. Transmitter unwanted emission limits outside the 3380-3740 MHz frequency band – registered devices. For registered AAS devices an additional 9 dB is added to the TRP values.

|  |  |  |
| --- | --- | --- |
| **Frequency Range (f)** | **Total Radiated Power (dBm) per cell/sector** | **Measurement Bandwidth** |
| 9 kHz ≤ f ≤ 150 kHz | -27 | 1 kHz |
| 150 kHz ≤ f ≤ 30 MHz | -27 | 10 kHz |
| 30 MHz ≤ f ≤ 1 GHz | -27 | 100 kHz |
| 1 GHz ≤ f ≤ 3.1 GHz | -21 | 1 MHz |
| 3.1 GHz ≤ f ≤ 3.38 GHz | -47 | 1 MHz |
| 3.74 GHz ≤ f ≤ 19 GHz | -21 | 1 MHz |

1. Receiver unwanted emission limits outside the 3360-3740 MHz frequency band – registered devices.

|  |  |  |
| --- | --- | --- |
| **Frequency Range (f)** | **Total Radiated Power (dBm) per cell/sector** | **Measurement Bandwidth** |
| 30 MHz ≤ f ≤ 1 GHz | -57 | 100 kHz |
| 1 GHz ≤ f ≤ 19 GHz | -47 | 1 MHz |

Unwanted emission limits for transmitters exempt from registration:

It is proposed that the following kinds of radiocommunications transmitters be exempt from registration:

* a transmitter that operates in the 3.4 GHz band with a total radiated power of less than or equal to 28 dBm per occupied bandwidth

In addition to this a condition will be placed on the licence stating that devices exempt from registration must not cause harmful interference (such a condition is already on current 3.4 GHz band spectrum licences)

The proposed unwanted emission limits proposed follow:

1. Transmitter unwanted emission limits in the 3295-3805 MHz frequency band – devices exempt from registration.

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| --- | --- | --- |
| **Frequency Range (foffset)Note 1** | **Total Radiated Power (dBm) per device** | **Measurement Bandwidth** |
| 0 kHz ≤ foffset ≤ 1 MHz | -15 | 30 kHz |
| 1 MHz≤ foffset ≤ 5 MHz | -10 | 1 MHz |
| 5 MHz≤ foffset ≤ 100 MHz | -13 | 1 MHz |
| foffset ≥ 100 MHz | -25 | 1 MHz |

1. Transmitter unwanted emission limits outside the 3295-3805 MHz frequency band – devices exempt from registration.

|  |  |  |
| --- | --- | --- |
| **Frequency Range**  **(f)** | **Total Radiated Power (dBm) per device** | **Measurement Bandwidth** |
| 9 kHz ≤ f ≤ 150 kHz | -36 | 1 kHz |
| 150 kHz ≤ f ≤ 30 MHz | -36 | 10 kHz |
| 30 MHz ≤ f ≤ 1 GHz | -36 | 100 kHz |
| 1 GHz ≤ f ≤ 19 GHz | -30 | 1 MHz |

1. Receiver unwanted emission limits outside the 3295-3805 MHz frequency band – devices exempt from registration

|  |  |  |
| --- | --- | --- |
| **Frequency Range**  **(f)** | **Radiated Mean Power (dBm EIRP)** | **Measurement Bandwidth** |
| 30 MHz ≤ f ≤ 1 GHz | -57 | 100 kHz |
| 1 GHz ≤ f ≤ 19 GHz | -47 | 1 MHz |

All other conditions on the licence:

* Update the definition of the 3.4 GHz band to include the 3.6 GHz band
* Include a synchronisation requirement as a fall back measure to manage cross-border and adjacent channel interference
* If **Option 2** is adopted there will also be a condition that will require a stricter out-of-band emission limits below the 3575 MHz frequency band if need to manage interference
* Include a condition to take reasonable measures to manage interference caused by spurious emissions
* Update the devices exempt from registration as indicated previously
* Include a condition to protect incumbent 3.6 GHz band licensees
* Include a condition to protect the east and west coast earth station protection zones.
* Include a condition not to cause interference to earth stations operated by Lockheed Martin near Uralla
* Maintain all other conditions currently on 3.4 GHz band spectrum licences

The proposed new conditions for **Option 1** are shown below:

**Synchronisation Requirement**

1. If:
2. interference occurs from a radiocommunications device:
   * 1. operated under this licence; and
     2. operated under another 3.4 GHz band spectrum licence (the ***other licence***);
3. the level of interference exceeds the compatibility requirement defined in *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 3.4 GHz Band) 2015*;
4. that interference is not the result of operation of a radiocommunications device in a manner that does not comply with the conditions of the relevant licence;
5. either the licensee or the holder (or authorised third party) of the other licence wishes to resolve the interference; and
6. no agreement can be reached on how to manage this interference;

then the licensee is required to synchronise the operation of their radiocommunication device with that on the other licence. This includes:

1. aligning the timing of uplink and downlink emissions with frame structure type 2, configuration 2 as specified in 3GPP TS 36.211; and
2. employing configuration 6 for the special sub-frame.

*Note:* Other frame structures can be implemented provided emissions in the downlink and uplink (or alternatively no emissions at all) only occur during the same periods as specified in clauses 12(f) and (g).

**Definition**

1. ***managing interference*** includes but is not limited to:

1. investigating the possible causes of the interference;
2. taking all steps reasonably necessary to resolve disputes about interference;
3. taking steps (or requiring persons authorised to operate radiocommunications devices under this licence to take steps) reasonably likely to reduce interference to acceptable levels; and
4. negotiating with other persons to reduce interference to acceptable levels.

**Managing interference caused by spurious emissions**

2. If:

(a) interference occurs between a radiocommunications device:

(i) operated under this licence; and

(ii) operated under another licence (the ***other licence***);

and the interference is due to spurious emissions at frequencies below 3100 MHz and above 3740 MHz from a radiocommunications device operating under this licence; and

(b) that interference is not the result of operation of a radiocommunications device in a manner that does not comply with the conditions of the relevant licence; and

(c) either the licensee or the holder (or authorised third party) of the other licence wishes to resolve the interference;

the licensee must ***manage interference*** with:

(d) the holder of the other licence; or

(e) if a site manager is responsible for managing interference at that location, that site manager.

**Exemption from registration requirements**

1. The following kinds of radiocommunications transmitters are exempt from the registration requirement in Statutory Condition 3:

(a) a transmitter that operates in the 3.4 GHz band with a total radiated power of less than or equal to 28 dBm per occupied bandwidth

**Managing interference with Uralla Earth station facility**

1. The licensee must protect Earth stations operated within HCIS identifier NU7K4 to the levels specified in RALI[ESPZ]

**Coordination with Earth station protection zones**

1. Before seeking to register a radiocommunications transmitter, the licensee must follow the procedures set out in *RALI[ESPZ]* for the protection of the defined Earth station protection zones.

**Managing interference to incumbent apparatus licences**

1. The licensee must protect any apparatus licences operating in a re-allocation zone in the 3575-3700 MHz band in accordance with the criteria specified in the Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 3.4 GHz Band) 2015 until the end of the re-allocation period.

For **Option 2** all the same conditions apply except the synchronisation requirements is amended as follows:

**Synchronisation Requirement**

1. If:
2. interference occurs from a radiocommunications device:
   * 1. operated under this licence; and
     2. operated under another 3.4 GHz band spectrum licence (the ***other licence***);
3. the level of interference exceeds the compatibility requirement defined in *Radiocommunications Advisory Guidelines (Managing Interference to Spectrum Licensed Receivers — 3.4 GHz Band) 2015*;
4. that interference is not the result of operation of a radiocommunications device in a manner that does not comply with the conditions of the relevant licence;
5. either the licensee or the holder (or authorised third party) of the other licence wishes to resolve the interference; and
6. no agreement can be reached on how to manage this interference;

then the licensee must manage the interference as follows:

1. if the other licence has the same synchronization requirement as specified on this licence, the licensee is required to synchronise the operation of their radiocommunication device with that on the other licence. This includes:
2. aligning the timing of uplink and downlink emissions with frame structure type 2, configuration 2 as specified in 3GPP TS 36.211; and
3. employing configuration 6 for the special sub-frame.

*Note:* Other frame structures can be implemented provided emissions in the downlink and uplink (or alternatively no emissions at all) only occur during the same periods as specified in clauses 12(f) and (g).

1. if the other licence does not contain the same synchronization requirement as specified on this licence, the licensee is required to reduce the level of out-of-band emissions from the radiocommunications transmitters operated under their licence that is causing the interference to the levels defined in Schedule 3 if it would facilitate compatibility with registered radiocommunications receivers operating under the other licence. This is irrespective of which radiocommunications device was registered first-in-time. Licensees are responsible for bearing the costs of changes to their own system. In the event that reducing out-of-band emissions does not facilitate compatibility between services, the radiocommunications device registered first-in-time has priority.

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

Update current 3.4 GHz s.145 determination as follows:

* Update the definition of the 3.4 GHz band to include the 3.6 GHz band
* Make the following changes to the device boundary criteria:
  + Change the level of protection from -111 dBm/MHz to -98 dBm/MHz;
  + Increase the resolution of calculations from 500m increments to 250m increments.
* Exempt spectrum licensees from having to meet the device boundary criteria around the areas excised for consideration as earth station protection zones and the earth station facility operating at Uralla;
* Include a note guiding AP’s on how to treat systems with beam-forming capabilities.

## Radiocommunications Advisory Guidelines

Interference from spectrum licence transmitters (RAG Tx):

Update current 3.4 GHz RAG Tx as follows:

* Section 1.4(1) - Include 3.6 GHz band definition.
* Sections 2.3 & 3.1 – indicate fixed links operate ‘in and adjacent to the 3.4 GHz band’.
* Section 4.2 – adoption of the FCC defined FSS RF filter mask.
* Section 4.3 – update to include co-channel coordination with Fixed Satellite Service (FSS) earth stations as well as a requirement to notify affected earth station licensees of any new systems to ensure they have suitable RF filters installed.
* New section 4.4 – additional protection criteria for incumbent FSS earth stations operating in the 3600-3700 MH band;
* Part 6 – extension of operating frequency range for radiolocation services.
* Section 7.1(1) – update frequency range to encompass 3400-3700 MHz frequency band.
* A new section providing guidance on how to manage interference with the east and west coast ESPZ.
* A new section dealing with how to coordinate with the earth station facility operated by Lockheed Martin near Uralla (NSW).

**Option 1**

* Section 5.2(1) – Removal of additional emission mask requirement for spectrum licences.
* Section 5.2(2) – Clarification on responsibility to bear costs Note: this also requires an update to RALI FX19 to manage interference to P-MP apparatus licences.

**Option 2**

* Section 5.2(1) – Clarification that the additional emission mask requirement for spectrum licences only applies when coordinating with P-MP and PTS apparatus licences in the 3400-3542.5 MHz frequency range.
* Section 5.2(2) – Clarification on responsibility to bear costs Note: this also requires an update to RALI FX19 to manage interference to P-MP apparatus licences.

New or updated RALIs incorporated by reference into the RAG Tx:

* RALI FX19: Updates to define interference management requirements from devices deployed under a spectrum licence with apparatus licence P-MP service operating in the 3.6 GHz band; and
* RALI[ESPZ]: Proposed new RALI managing interference to ESPZs an earth stations operating at the Lockheed Martin facility near Uralla, NSW.

Interference to spectrum licence receivers (Rag Rx):

Update current 3.4 GHz RAG Rx as follows:

* Section 1.4(1) - Include 3.6 GHz into the frequency ranges covered by the RAG Rx. Also include a definition of unwanted emissions.
* Replace ‘out-of-band emission’ with ‘unwanted emission’ throughout out the document.
* Section 3.1(2) & (5) – Update clauses to include how in-band interference from apparatus licences is managed in the 3575-3700 MHz band.
* Section 3.1(4) – additional text pointing spectrum licensees to new section 3.2(4) for additional guidance on managing interference from radiolocation services.
* New section 3.2(4) – Providing advice and guidance on managing interference from radiolocation services.

**Option 1**

* Section 5.1(3) – removal of reference to Schedule 3 and inclusion of text regarding the synchronisation requirement.
* Amendment to the adjacent channel selectivity and blocking requirements of the notional receiver to account for wider channel systems.
* Schedule 3 – Deletion of this section and relevant text within the RAG Rx. If a synchronisation fall back requirement is proposed to be adopted this schedule is no longer required.

**Option 2**

* Section 5.1(3) – amend to provide guidance on how to manage interference between licences with and without a synchronisation condition.
* Amendment to the adjacent channel selectivity and blocking requirements of the notional receiver to account for wider channel systems.
* Schedule 3 – Define an additional out-of-band emission limit for both non-ASS and ASS that match ECC coexistence levels. Have the stricter limits apply at 10 MHz offsets from the licence edge.