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Australian Communications and Media Authority

Registration of radiocommunications devices under spectrum licences

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1. Introduction

This information paper provides licensees and accredited persons (APs) with advice on the device registration options that are available under spectrum licences.

In accordance with section 69 of the *Radiocommunications Act 1992* (the Radiocommunications Act), it is a condition of all spectrum licences that transmitters must be registered in the Register of Radiocommunications Licences (RRL) before they may be operated under the licence.

The Radiocommunications (subsection 145 (3) Certificates) Determination 2012 (IIC determination), made under subsection 145(3) of the Radiocommunications Act, provides the regulatory framework for the issue of an interference impact certificate (IIC) during the registration process for transmitters under spectrum licences.[1] Registration can occur via:

- the subsection 145(4) determination
- the implementation of guard space
- agreement.

This paper explains the options available under each method identified above.

The subsection 145(4) determination for a particular band sets out what is an unacceptable level of interference caused by a radiocommunications transmitter operating under a spectrum licence (see section 3.1 for more information).[2]

If a transmitter meets all requirements in the subsection 145(4) determination for a particular band, then the transmitter is able to be registered with an IIC. In cases where the requirements of the subsection 145 (4) determination cannot be achieved, a transmitter may be able to be registered using guard space or an agreement.

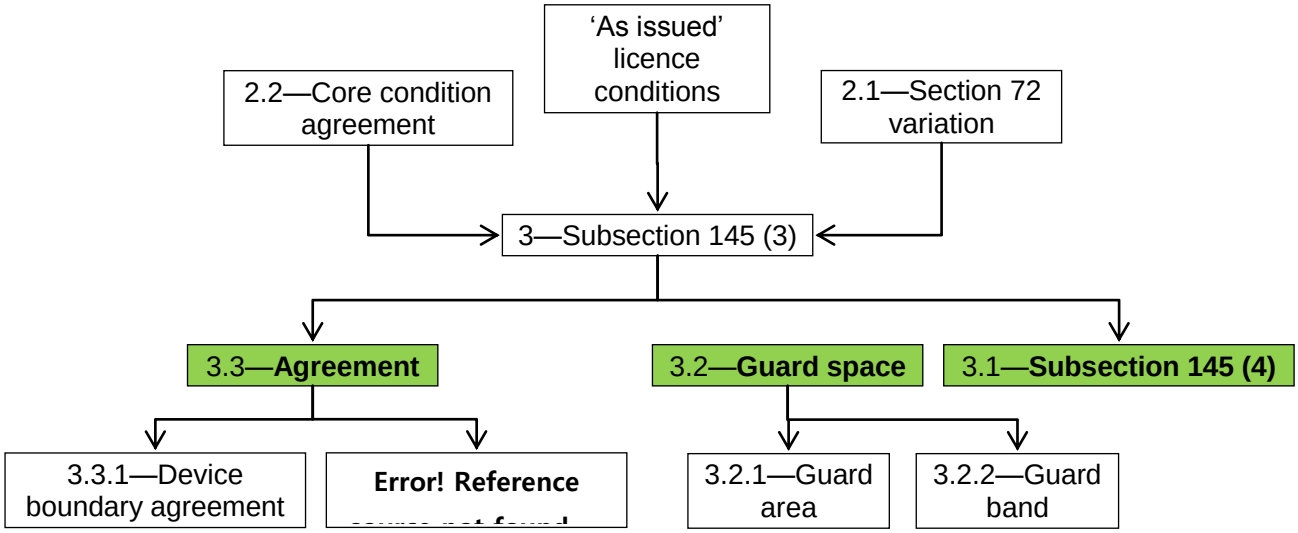
The use of core condition agreements, and the option to vary a spectrum licence with agreement prior to the registration process, are also explored.

Error! Reference source not found. shows the hierarchical registration structure available to licensees and the sections of this paper in which each is explored.

[1] Section 10 of the Radiocommunications (Register of Radiocommunications Licences) Determination 1997 requires that certain details be included in the RRL for each transmitter to be operated under a spectrum licence. This includes the client number for the AP who issued the IIC for the device.

[2] A list of determinations made under section 145 of the Radiocommunications Act is available on the ACMA website. Consolidated, current versions of these instruments are available at www.comlaw.gov.au.

Figure 1 Transmitter registration options under spectrum licensing



Typically, the registration of receivers under spectrum licensing is not mandatory; however, it is encouraged. Registered receivers will receive protection from out-of-band emissions on a first-in-time coordination basis. Receivers that are not registered will not be afforded protection.

2. Core conditions

Section 66 of the Radiocommunications Act states spectrum licences must include the following core conditions:

(a) a condition specifying the part or parts of the spectrum in which operation of radiocommunications devices is authorised under the licence—frequency range of operation
(b) a condition specifying the maximum permitted level of radio emission, in parts of the spectrum outside such a part, that may be caused by operation of radiocommunications devices under the licence—out-of-band emission
(c) a condition specifying the area within which operation of radiocommunications devices is authorised under the licence—geographic area of operation
(d) a condition specifying the maximum permitted level of radio emission, outside the area, that may be caused by the operation of radiocommunications devices under the licence—out-of-area emission).

Core conditions form the fundamental building blocks of the spectrum licence, detailing the maximum operational parameters licensees are able to utilise when deploying devices within their spectrum space.

The core conditions specified on a spectrum licence are determined in the relevant schedules to the marketing plan for the band. For example, different core conditions relating to emission levels may apply at different frequency boundaries of a spectrum licence.

The core conditions of the spectrum licence are determined by the ACMA through consultation with industry stakeholders via a technical liaison group (TLG) formed typically after the spectrum is designated or declared for spectrum licensing by the Minister for Broadband, Communications and the Digital Economy or prior to re-issue or re-allocation. A TLG not only provides advice for development of the core conditions of the licence, but also what is deemed to be unacceptable interference under subsection 145(4) of the Radiocommunications Act, and for the creation of advisory guidelines under section 262 of the Act.

Core conditions can only be varied by agreement through one of the following mechanisms:

- by agreement from affected licensees to vary the spectrum licence under section 72 of the Radiocommunications Act—refer to section 2.1
- by agreement between adjacent area or frequency licensees to exceed specific core conditions at a common boundary relating to out-of-band emission limits and out-of-area emission limits—refer to section 2.2.

Licensees issued a spectrum licence under section 62 of the Radiocommunications Act, must meet all conditions applicable to their spectrum licences when registering devices. It is the responsibility of the licensee, and APs acting on behalf of the licensee, to ensure that this occurs when devices are registered.

2.1 Variation with agreement

Section 72 of the Radiocommunications Act allows the ACMA to vary a spectrum licence, with the written agreement of the licensee, by including further conditions, or revoking or varying the existing core conditions of the licence.

Core conditions of spectrum licences (like all aspects of spectrum licensing technical frameworks) are developed in consultation with industry. Consequently, the ACMA

expects that the resulting technical framework will be sufficient for the lifetime of the spectrum licence and not require revision once licences are issued.

The ACMA would generally not agree to vary the core conditions for just one licensee in a particular band release because of the burden that consultation for such a change would place on industry (as well as the resource impact on the ACMA). The ACMA may take into account the *Principles for spectrum management*[3], a total welfare standard[4] and consultation with affected licensees before any changes are made. These help to guide the ACMA's decision within its existing legislative responsibilities and government policy settings, and to assess the impact that the variation may have on the public interest.

2.2 Core condition agreement

A core condition agreement enables adjacent spectrum licensees to come to a mutual agreement to authorise, by varying a core condition, the operation of devices whose emissions overlap the boundary between, and are entirely contained within, the spectrum licences. A core condition agreement may span multiple licences and licensees.

Once a core condition agreement is in place the usual process for issuing an IIC is followed (refer to **Error! Reference source not found.**). Licensees are required to adhere to the terms of the agreement.

By issuing an IIC for the registration of a transmitter that is subject to a core condition agreement, an AP certifies that there is a valid core condition agreement in place and that the proposed deployment of the transmitter meets this agreement. As a result, an IIC can be provided to the ACMA.

[3] Available from the ACMA website.

[4] Available from the ACMA website.

3. Interference impact certificates

The IIC determination, made under section 266A of the Radiocommunications Act, sets out the conditions that apply to the issuing of a certificate under subsection 145(3) of the Act for the operation of a device under a spectrum licence. Specifically, the determination sets out the conditions that apply to an AP issuing an IIC for the registration of transmitters under a spectrum licence.

The general criteria for registering transmitters in a spectrum licence space is through an assessment of the likely adherence of the device to the technical conditions defined in the relevant subsection 145(4) determination (see 3.1).

In cases where part(s) of the subsection 145(4) determination are unable to be met by the transmitter, an AP has two available choices for the registration of the transmitter—registration via guard space or registration via agreement.

The purpose of this section is to outline the three options available for registration of transmitters under spectrum licences including how they apply. They are:

- subsection 145 (4) determination of unacceptable interference
- guard space
- agreement.

The registration of receivers is not covered under subsection 145(3) of the Radiocommunications Act because the issuing of a certificate under subsection 145(3) applies only to transmitters. Nevertheless, the registration of receivers is encouraged for interference management purposes as detailed in section 4.

3.1 Determination of unacceptable levels of interference

The ACMA may determine, by written instrument, what are unacceptable levels of interference for the purpose of section 145 of the Radiocommunications Act. Typically, for each spectrum-licensed frequency band the ACMA makes a determination under subsection 145(4) of the Radiocommunications Act (subsection 145(4) determination).[5]

The subsection 145(4) determination sets out what is an unacceptable level of interference for the purposes of the ACMA refusing to include details of the transmitter on the Register of Radiocommunications Licences. This is intended to provide a clear and legally robust definition of transmitter characteristics for the relevant spectrum licensed band and inform adjacent licensees of the level of in-band power that can be radiated across the spectrum licence boundary.

The subsection 145(4) determination includes the following:

- calculation of the device boundary
- description of the relevant deployment constraints
- details of registration exempt requirements and device registration procedures

[5] A list of determinations made under section 145 of the Radiocommunications Act is available on the ACMA website. Consolidated, current versions of these instruments are available at www.comlaw.gov.au.

> details of possible breaches of the core conditions of the licence.

Where the provisions of the relevant subsection 145(4) determination are met, a transmitter may be registered with the issuing of an IIC under subsection 145(3) of the Radiocommunications Act.

3.2 Guard space

Guard space allows licensees to utilise the 'space' within their licence (in both the geographic and frequency sense) to operate devices that do not meet the requirements of the subsection 145(4) determination for a band. Guard space agreements do not override the core conditions specified in a spectrum licence.

When sufficient guard space cannot be maintained within the spectrum space of a licence, a device can only be registered via agreement with all affected licensees.

The application of guard space for the purposes of device registration under spectrum licences should be in accordance with the objectives of the technical framework established for the relevant band release.

3.2.1 Guard area

Additional geographic separation from the licence boundary can help to reduce unwanted emissions from a transmitter across a common boundary to acceptable levels. Identification of the necessary guard area may be required before a device is operated outside the limits of the spectrum licence deployment constraints and device boundary criterion. The size of the guard area depends on factors such as the effective antenna height of the transmitter, radiated power of the transmitter, the terrain features near the device and the propagation model employed.[6]

3.2.2 Guard band

Additional frequency separation can help to reduce unwanted emissions from a transmitter across a common boundary to acceptable levels.

While technically a transmitter can be registered in a guard band, sufficient frequency space within a spectrum licence needs to be available for a guard band to be used to manage interference.

A guard band can be used as a method to register devices outside the deployment constraints specified in the subsection 145(4) determination. However, for the purposes of registering with guard space, a guard band will exist within the frequencies authorised on the spectrum licence.

3.3 Agreement

3.3.1 Device boundary agreement

The device boundary criterion and the calculation procedures typically contained in a subsection 145(4) determination are used to reduce emission levels across the geographic boundaries of the spectrum licence. To calculate the device boundary, the distance from the transmitter is calculated where the received signal level drops below an acceptable level (the level of protection) in adjacent geographical areas.

If the device boundary falls outside the geographic area of the relevant spectrum licence, the ACMA will generally refuse to register the device.

[6] An appropriate propagation model that reflects the deployment and resulting interference scenario should be applied when determining a guard area.

A device boundary agreement allows adjacent area licensees to agree to permit additional emissions over their mutual geographic boundary. This can allow devices to operate at higher powers closer to a shared licence boundary than would otherwise be permitted.

Licensees may come to any form of agreement (whether to permit all interference, set a specific set-back from the boundary or received power level as examples) as long as the agreement does not allow interference to be caused beyond the geographic boundaries of the licences subject to the agreement.

Scaling parameter
Some subsection 145(4) determinations include a scaling parameter applied to the path loss model to vary the location of the device boundary. This process varies a single parameter in the calculation of the device boundary criterion and is equivalent to creating a new virtual boundary.

For those spectrum licences where a scaling parameter is not included in the relevant subsection 145(4) determination, the use of a scaling parameter as a form of agreement between licensees is not necessarily precluded.

Note that there could be different scaling parameters used for licensees in different adjacent areas.

The registration process using a device boundary agreement
When registering a device that is subject to a device boundary agreement, the IIC determination requires that APs certify that they are satisfied that consent in writing has been given by all licensees who, in the opinion of the APs, may be affected. The ACMA does not require a copy of the agreement.

Once the AP is satisfied that a device boundary agreement exists, the AP ensures that the device registration under the device boundary agreement does not exceed the conditions of the agreement and issues an IIC.

3.3.2 Deployment constraint agreement

Deployment constraints refer to a range of possible restrictions placed on the use of transmitters in a spectrum licence space. They include emission limits, antenna beamwidths and effective antenna heights, and are defined in the relevant subsection 145(4) determination. Deployment constraints are used to:

- provide balanced spectrum utility for transmitters and receivers, particularly in spectrum optimised for FDD technologies (that is, maintaining site sense)
- manage in-band and out-of-band interference.

Transmitters that do not comply with the deployment constraints could cause unacceptable interference within the meaning of section 145 of the Radiocommunications Act because the levels of emission could be greater than that intended. In such cases, the transmitter can only be registered if the AP is satisfied there is sufficient guard space (refer to section 3.2) or if an agreement is reached between all affected licensees.

An agreement between all affected licensees would allow the licensee to deploy transmitters outside the deployment constraints of the licence.

The registration process using a deployment constraint agreement
When registering a device that is subject to a deployment constraint agreement, the IIC determination requires that an AP certify that he or she is satisfied that consent in

writing has been given by all licensees who, in the opinion of the AP, may be affected. The ACMA does not require a copy of the agreement.

Once the AP is satisfied that a deployment constraint agreement exists, the AP ensures that the transmitter registration under the deployment constraint agreement does not exceed the conditions of the agreement and issues an IIC.

4. Receivers

Typically, the registration of receivers under spectrum licensing is not mandatory; however, for the purposes of applying procedures for the protection of receivers from interference from adjacent licensees, spectrum licensees are encouraged to register receivers. These procedures are outlined in radiocommunications advisory guidelines in each spectrum-licensed band under section 262 of the Radiocommunications Act.[7]

Licensees are advised that registered receivers will receive protection from out-of-band emissions as specified in the relevant radiocommunications advisory guidelines on a first-in-time coordination basis. Receivers that are not registered will not be afforded protection.

Receiver spurious emission limits are typically a core condition of the licence. Registered receivers are required to meet these limits which are specified on the spectrum licence.

[7] A list of these guidelines is available on the ACMA website. Current versions of all such instruments can be accessed from www.comlaw.gov.au.

5. Effect of spectrum trading

5.1 Trading spectrum licences

All or a part of a spectrum licence can be traded—as provided for by sections 85–88 of the Radiocommunications Act. Agreements between licensees for the sharing of spectrum can only continue to apply while the size and the shape of the spectrum space owned by the licensees, as well as ownership of the relevant spectrum, remains the same. Where trading of licences takes place and new boundaries are formed, or alternatively, when ownership of a licence changes due to trading or licence expiry and re-issue, new written agreements will need to be negotiated. This negotiation can occur at any time, that is, before or after the trade, so that there is no loss of flexibility to licensees.

When trading results in the division of spectrum space covered by a single licence, the ACMA generally requires all devices to be re-registered. This is because a check is required to ensure that any transmitters that are to continue operating do not breach the core conditions at any new frequency boundaries created, that their device boundaries remain within the geographic area of the resulting licence(s) and, where applicable, that necessary guard space is maintained. In addition, if devices do not comply with the deployment constraints, appropriate guard space should be maintained either by new agreements or within the new licence.

6. Registration procedure

The ACMA offers APs two methods of submitting device registrations; electronically via the accredited person online service[8], or using the ACMA radiofrequency spectrum forms available on the ACMA website.[9] This section briefly details information and procedural requirements for the registration of transmitters and receivers under spectrum licences.

The ACMA has prepared (at Annex A) a procedural flowchart for the registration of transmitters and receivers under spectrum licences. This provides licensees and APs with a source for determining what registration options are available to them.

Additional information on site details and required accuracies for the registration of devices under spectrum licences are available in the ACMA business operating procedure, *Radiocommunications site data requirements,* available on the ACMA website.[10]

For a complete list of details required for inclusion on the RRL please refer to the Radiocommunications (Register of Radiocommunications Licences) Determination 1997.[11]

6.1 Transmitters

Transmitters can be registered individually or as part of a group depending on whether they meet the requirements for group registration in the subsection 145(4) determination for the band.

Details on the information requirements for transmitters include:

- emission information—upper and lower frequency, emission designator, occupied bandwidth
- horizontal radiated power pattern
- antenna information
- site details
- site manager and contact details.

[8] The accredited person online service is available at http://web.acma.gov.au/apservices/index.jsp.

[9] ACMA forms available at: www.acma.gov.au/WEB/STANDARD/pc=ACMA_FORMS_SPECTRUM.

[10] Available at: www.acma.gov.au/WEB/STANDARD/pc=PC_495.

[11] Available at: www.comlaw.gov.au/Details/F2007B00310.

6.2 Receivers

Receivers can be registered individually or as part of a group depending on whether they meet the requirements for group registration in the subsection 145(4) determination for the band.

Details on the information requirements for receivers include:

- antenna information
- site details
- site manager and contact details.

When registering a receiver, an AP ensures that the details provided to the ACMA are correct.

7. Glossary

device boundary criterion	the value of the mathematical expression that must be satisfied to ensure the device boundary is contained within the spectrum licence geographic area, as typically calculated in the relevant subsection 145(4) determination.
deployment constraints	emission limits, effective antenna heights, antenna beamwidths or other specified criteria in the relevant subsection 145(4) determination, that apply to the deployment of transmitters in a specific frequency band.
geographic area	for a spectrum licence, the area within which operation of a radiocommunications device is authorised under the licence.
guard area	additional geographic separation from the licence boundary within the geographic area of the spectrum licence.
guard band	additional frequency separation within the frequency band of the spectrum licence.
guard space	isolation achieved by means of: (a) guard area (b) guard band (c) a combination of the above to ensure that a radiocommunications transmitter operated under a spectrum licence does not radiate significant levels of emission outside the spectrum space of that licence.
interference impact certificate (IIC)	a certificate issued under subsection 145 (3) of the Radiocommunications Act.
IIC determination	the Radiocommunications (subsection 145(3) Certificates) Determination 2012.
in-band	(a) for a transmitter or receiver operated under a spectrum licence, the frequencies within the frequency band to which the licence relates (b) for a transmitter or receiver operating under an apparatus licence, the frequencies between the lower frequency limit and the upper frequency limit of its spectrum access.

out-of-band	(a) for a spectrum licensed transmitter or receiver, the frequencies outside the frequency band of the spectrum licence. (b) for a transmitter or receiver operated under an apparatus licence, the frequencies outside the frequency limit of the spectrum access of the apparatus licence.
subsection 145(4) determination	for a device operating under a spectrum licence, the determination under subsection 145 (4) of the Radiocommunications Act for the part of the spectrum where the device operates.
spectrum space	a three-dimensional space consisting of a frequency band and a geographic area.

The following terms are defined in the *Radiocommunications Act 1992* and have the meanings given to them by that Act:

- ACMA
- core condition
- frequency band
- interference
- spectrum licence
- transmitter

8. Annex A—Registration decision diagram

Figure 2 Registration decision diagram under spectrum licences