Authorising Devices under Australian Spectrum Licences

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Preamble

Australian spectrum licences utilise a method of spectrum right design known as Space-Centric Management (S-CM). S-CM establishes explicit transmit rights with embedded receiver protection in relation to **all** interference mechanisms. The rights create a precise level of guardspace isolation for each interference mechanism, maintaining minimum distance, frequency and time separation for a transmitter's emission levels, between the antenna and the geographic, frequency and time boundaries of the space of a spectrum licence. Spectrum licensees use the technical detail of the rights to determine:

- whether their transmitters may be authorised; and
- whether their receivers have sufficient protection from transmitters operated under adjacent spectrum licences.

Legislation has shaped the 'look' of S-CM in Australia. This paper describes some aspects of the practical management of Australian spectrum licences and helps illustrate the concept of S-CM as it appears in a working legislative regime.

1.0 Introduction

Spectrum licences in Australia offer the necessary flexibility to authorise the operation of any type of standard or non-standard wireless device as long as the spectrum space (geographic area and frequency band) is sufficiently large to allow the device to comply with the related transmit rights.

For new services the transmit rights are primary. Receiver protection is provided only to the extent that the transmitters of adjacent spectrum licences must all operate in accordance with the transmit rights[1]. While the transmit rights are designed to provide equitable spectrum access as well as protect the receivers of adjacent spectrum licensees to a degree, all licensees are ultimately responsible for self-managing interference to their new receivers caused not only by their own transmitters but also by transmitters in adjacent spectrum licences.

The details of the transmit rights together with a centralised device database allow neighbouring licensees to accurately estimate the levels of both linear and non-linear interference they can expect. Irrespective of whether primary spectrum access rights are transmit rights (radiated power at each antenna), as in Australia (and recently Mauritius[2]), or ambiguous transmit/receive rights (aggregate field strength levels throughout spectrum spaces) as currently promoted in the UK, spectrum access rights in general cannot function efficiently without a central device database. Furthermore, once such a database has been implemented, it is simple to demonstrate that transmit rights based on radiated power at each antenna provide the most efficient solution for conferring authentic legal rights on industry for flexible spectrum access.

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[1] Legacy services licensed before the issue of an overlay spectrum licence are treated differently. They are provided with explicit receive protection which may override the explicit transmit rights. Incumbent legacy services are only provided with explicit protection during a short 're-allocation period'.

[2] See "The Authority is of the view that formulating out-of-band emission in terms of field strength at a distance from the transmitter may be impractical due to measurement and prediction uncertainties. The views of the Authority are shared by Whittaker (2007). Another way of formulating the out-of-band emission in the frequency band of an adjacent DCS1800 licensee is in terms of power radiated at the antenna." Information & Communication Technologies Authority, Consultation Ref: ICTA/01/08, CONSULTATION PAPER ON THE OPENING OF THE 1785 – 1805 MHz BAND FOR BROADBAND WIRELESS ACCESS, 29 September 2008.

2.0 Explicit Transmit Rights with Implicit Receive Protection

In Australia, transmit rights are set out as *Unacceptable Levels of Interference*, also referred to as a *section 145 Determination* (s.145), made in relation to each spectrum auction. The transmit rights specify:

- maximum in-band emission levels in relation to the geographic area boundary of the licence: a device boundary criterion;
- maximum out-of-band emission levels in relation to the upper and lower edges of the frequency band of the licence; and
- in the case of bands optimised for base station receivers, transmitter deployment constraints.

Additional transmit rights are contained in *Advisory Guidelines* and involve management of non-linear out-of-band interference such as receiver intermodulation. They are maximum emission levels in relation to previously authorised transmitters and receivers, irrespective of whether they are legacy or new spectrum licensed services, operating outside the frequency boundaries of the spectrum licence.

Where required, *Advisory Guidelines* also provide further coordination rules for managing interference to incumbent or nearby legacy services.

Links between the various elements of S-CM and ACMA legal instruments for the 800 MHz band are provided as an example in Attachment A.

3.0 The Register

When transmitters have a significant likelihood of causing interference they are authorised to operate only after they have been registered in ACMA's *Register of Radiocommunications Licences (RRL)*. After ACMA receives a letter from a spectrum licensee authorising an ACMA-accredited person to register devices under its licences, details for each station together with a certificate are sent to ACMA by the accredited person for registration in the *RRL*. The certificate helps to maintain the legal and technical integrity of the database, providing ACMA with a level of confidence that each transmitter complies with the conditions of the spectrum licence under which it is to be authorised to operate. The central device database serves a multitude of important legal and technical purposes.

Certification is distributed between **two** separate responsibilities in relation to licence conditions which have **two** separate natures:

- **certain nature:** conditions contained in a legal Determination for the purpose of clarity and certainty - covers compliance with particular explicit transmit rights required for certificate issue; and
- **uncertain nature:** conditions contained in legal Guidelines, which means there is an element of risk-management (the accredited person selects the most appropriate propagation model) - covers compliance with any

remaining explicit transmit rights not included in the Determination *e.g.* non-linear interference, and any explicit **receive** protection for specific legacy incumbent/primary services – the responsibility is related to the level of success at keeping reported interference below a specified rate.

While the process of certificate issue is clearly defined in the Determination, certificates should only be issued if the accredited person has also performed an assessment of the Guidelines and the device is found to be compliant.

Different audit criteria are applied to the two responsibilities. ACMA may withdraw accreditation for either one incorrectly issued certificate or an unusually high rate of occurrence of actual interference[3]. Liability in relation to managing all interference mechanisms in all situations for both new and legacy services is distributed between these two requirements. Contractual arrangements between the licensee and accredited person must also deal with the related liability[4]. ACMA requires accredited persons to be covered by professional indemnity insurance against loss or damage for up to $2 million before issuing a certificate and with a run-off period of 5 years.

4.0 Methods of Certification

In general there are three ways an accredited person may issue a certificate:

1. **Interference Impact Certificate (IIC)** – transmitter complies with the transmit rights of the s.145 in relation to a single spectrum licence;
2. **Internal Guard Space** – method of working around any transmitter deployment constraints of the s.145 in accordance with Advisory Guidelines[5]; and
3. **External Guard Space** – method of working around insufficient spectrum space by aggregating a number of adjacent licences via spectrum-sharing agreement(s).

The device boundary, out-of-band limits and transmitter deployment constraints are not mandatory. Certification method 3 can be used by licensees to apply their own criteria, but only at shared internal geographic and frequency boundaries.

While it is a rare occurrence, a transmitter may also be registered without a certificate through negotiation with ACMA when any necessary spectrum

[3] See ACMA Radiocommunications (Accreditation — Prescribed Certificates) Principles 2003

[4] For a more detailed examination of the liability issues see "Legal Analysis of ACA Proposals for Reform of Device Registration Procedures under Spectrum Licensing", Ian Coe, Bailey Dixon Lawyers and Consultants 2005, available at www.futurepace.com.au

[5] Transmitter operation must achieve the levels of isolation for emissions transmitted between spectrum spaces to the same extent as provided by the s.145.

space falls outside all issued spectrum licences. This is the only occasion when ACMA needs to be brought into the device authorisation process.

The registration of receivers is not mandatory but is sometimes advisable in situations where there is a high likelihood of non-linear out-of-band interference, because the related transmit right for an adjacent spectrum licensee can be restricted by any pre-registered receivers *i.e.* non-linear out-of-band interference is settled according to a first-in-time policy.

5.0 The Purpose of Registration

Devices not exempted from registration, must be registered in the *RRL* in order to authorise their operation. Registering devices in the *RRL* creates a reliable database of certified device information. The *RRL* makes interference self-management practical and accurate and thus helps to secure optimal use of the spectrum. The *RRL* provides harmonised spectrum access for all licensees, whether new entrants or established operators as well as legal transparency, primarily for the avoidance of interference disputes altogether, but if necessary for interference settlement[6]. The *RRL*:

- allows all device details to be readily available for all licensees in a standard format rather than requiring licensees to obtain possibly unreliable and partial information via a multiplicity of proprietary data formats through one-on-one negotiation with spectrum-adjacent competitors;
- establishes the fact of device certification, and records the accredited person who issued the certificate together with the method of certification used, including for example, whether all licensees affected by the emissions of the device have agreed to a spectrum sharing agreement;
- establishes a concise standard set of parameters to describe the operating characteristics of transmitters and receivers, consistent with the design and operation of the spectrum licence conditions and the needs of all licensees;
- provides the basis of a framework for the efficient management of non-linear out-of-band interference, including a transparent first-in-time status for each device, rather than an inefficient process involving notional parameters and possibly unreliable first-in-time information obtained from competitors after an interference event;

[6] See also ACMA website: "By registering their devices on the ACMA's public register of licences, licensees are recording the fact that their devices are set up to operate within their licence conditions. It ensures that other licensees in the band can coordinate their devices to minimise interference potential and it also allows ACMA to undertake efficient interference investigation and resolution in response to interference complaints. The effect of certified registration in a public data base (the Radiocommunications Licence Register) is to create an unambiguous chain of legal liability for management of out-of-band interference at the frequency boundaries of a spectrum licence."

- allows industry to easily automate its coordination processes, assisting licensees in making accurate assessments of necessary receiver protection in relation to all interference mechanisms;
- in the case of spectrum sharing agreements, supports adjacent spectrum licensees in applying proprietary device coordination rules across shared spectrum boundaries;
- is a point of reference for the settlement of interference disputes for both licensees and the regulator including interference to incumbent or nearby legacy services;
- supports enforcement through desk audits of certification and licence compliance by ACMA;
- facilitates open and transparent assessments of spectrum utility/value before an auction or subsequent trading; and
- provides for implementation of dynamic spectrum access using cognitive radio via a geo-location/database or pilot channel technique[7].

6.0 Equipment Types

Australian spectrum licensing manages spectrum space directly, without any dependence on mandated equipment standards. Each type of equipment is assessed in relation to the transmit rights and the amount of spectrum space available. While certain equipment might conform to an international standard it does not necessarily mean that it can be authorised to operate under a particular spectrum licence. Conversely, non-standard equipment may be authorised to operate as long as the necessary spectrum space is available[8].

The certification process involves specific information about each station, for example, the location, antenna height and antenna type. General equipment performance information is also required for:

- non-spurious emission levels;
- spurious emission levels;
- transient emission levels; and
- other transmitter information.

In most cases, the general performance information must be specially measured because it is not usually contained in the documentation associated with an

[7] In the case of dynamic access of TV White Space, the FCC has said full details of all incumbent providers will be in a database and any device wanting to use the white space must first access the database over the Internet. While the commission already has an equipment type registration database, it will need to be substantially modified to handle the new requirements.

[8] ***iBurst*** mobile wireless broadband technology, arguably the first truly mobile broadband technology to go into commercial service when it was launched in Sydney Australia, utilised adaptive utilised adaptive array antenna and spatial division multiple access technologies and was authorised by Futurepace to operate under Australian spectrum licences in 2004, nearly 4 years before it became the international standard IEEE 802.20.

equipment standard. The information must be obtained for worst case operation. In addition, its measurement error (including manufacturing tolerance) must be obtained at a level of confidence not less than 95 percent that true performance of a registered device remains within the measured value plus or minus the measurement error. There are standard statistical methods for obtaining the overall measurement error from a number of error sources.

Any station which uses equipment whose performance is outside the measured performance and error is deemed to be a new *equipment type* requiring a different set of performance information. Different equipment types sometimes result from use of different external transmitter filters. When base receivers are to be registered, or high power mobile transmitters are to be operated, general performance information is required for the registration of representative terminal equipment.

6.1 Non-spurious Emission

Non-spurious emission means emission related to transmitter modulation products, transmitter broadband noise and switching transients. Non-spurious emission levels are obtained as the worst case maximum power spectral density (PSD) of the emission. PSD is measured as true mean power in a specified rectangular (or noise) bandwidth. True mean power means:

(a) if an unmodulated carrier is present - the mean power measured while the unmodulated carrier is present; and
(b) if an unmodulated carrier is not present - the mean power measured while transmitted information is present.

While the PSD is certified under spectrum licence conditions at only a few frequency offsets, full characterisation of the PSD is usually obtained because under Australian spectrum licensing the carrier could be at any frequency. A point about every 6 dB change of the PSD is sufficient, provided linear interpolation within the measurement error quoted is applicable.

Importantly, the PSD is measured in relation to a single antenna and therefore, multiple transmitters connected to a single antenna or antenna array require special consideration.

The worst case operational conditions for measurement of the maximum PSD should consider the following:

(a) range (minimum and maximum carrier frequencies to be utilised and registered) as well as carrier multiplicity (if applicable) and their frequency separation for a single transmitter; and
(b) composite contributions of PSDs from any other transmitters that are also connected to the same antenna or antenna array; and
(c) levels referenced to the transmitter antenna port (if applicable, incorporating the effect of any external transmit filtering); and

(d) range of occupied bandwidths possible; and
(e) minimum transmitter power back-off to be used; and
(f) type of modulation information as well as modulation order in relation to worst case spectral re-growth; and
(g) broadband transmitter noise (using a notch filter or other nulling method for the carrier in order to increase the dynamic range of the measuring instrument); and
(h) measured up to 10 MHz outside the occupied bandwidth; and
(i) measured within a noise (or rectangular) bandwidth of 30kHz; and
(j) for environmental and voltage source extremes anticipated.

Special test procedures are necessary for non-spurious signals from high power non-regenerative RF repeaters (also referred to as on-frequency repeaters) having either channel-selective or band-selective bandwidths, which take account of all the types of modulated signal(s) and at all the carrier frequencies that in practice, will be radiated near the repeater. Test frequencies should include any signals from transmitters authorised under frequency-adjacent spectrum licences.

Authorisation of wide band multi-operator repeaters may require formal spectrum-sharing agreements between the relevant operators, involving a number of spectrum licences. If authorisation of simultaneous multi-carrier operation is required, measurement of the PSD must include simultaneous input of all carriers to ensure intermodulation and cross-modulation effects are correctly taken into account.

In addition:

- the input levels must be increased by at least 10 dB above that required for maximum transmitter output; and
- the PSD of the transmitter must, for worst case broadband noise assessment, also take into account either the power radiated when no input signal is present or the minimum input signal necessary to un-mute the receiver, whichever is applicable.

6.2 Spurious Emission

Spurious emission means emission not related to transmitter modulation products, transmitter broadband noise and switching transients. Maximum spurious signal level is measured as mean power referenced to the antenna port, if applicable, incorporating the effects of any external filtering.

Measurement must take account of:
(a) spurious emissions at the transmitter output (usually first and second harmonics); and
(b) spurious emissions that can exist by virtue of passive intermodulation in a feeder/combiner/antenna including situations where a transmitter operates with multiple carriers or multiple transmitters coupled to one antenna.

Any emissions at frequencies within the frequency band of a spectrum licence under which a transmitter is to be authorised to operate do not come within the definition of spurious emission.

When receivers are registered, the maximum spurious signal levels at the receive antenna port must also be obtained.

6.3 Transient Emission

Transient signals can spread radiated power over a very large bandwidth. Peak limits for transient out-of-band emissions manage interference from:
- carrier frequency instability; and
- short transmit rise and fall times, for example, GSM services[9].

Transient out-of-band emission can occur in digital synthesis through phase truncation and the jitter of irregular waveform periods, in addition to signal clipping and non-linearities of the transmitter power amplifier.

Transient emission must be measured in terms of transient peak power which:
(a) means the average power measured within a specified bandwidth during one radio frequency cycle at the crest of the signal envelope, *i.e.* the power created as a consequence of fast changes in the signal level; and
(b) does not mean the peak envelope power of the transmitted signal.

In checking equipment against the peak power limit of a spectrum licence the transient power must be measured under worst case conditions at a specified offset from the occupied bandwidth of a transmitter.

Worst case operational conditions when measuring transient emissions are related to:
(a) shortest transmitter turn-on and turn-off times to be used; and
(b) range of carrier frequencies to be used; and
(c) minimum Tx power backoff (if applicable); and
(d) measuring at the transmitter antenna port if applicable incorporating the effect of any external filtering.

[9] See ETSI Standard ETS 300 577, section *"4.2.2 Spectrum due to switching transients"*, August 1996 (GSM 05.05)

Peak power measurements are made using a brick-wall filter *e.g.* a 300 kHz brick-wall filter would have 60 dB loss at 350 kHz, and detected using a spectrum analyser set on zero span.

6.4 Other Transmitter Information

Besides general information about non-spurious, spurious and transient emission levels for an equipment type, other performance information is necessary for the certification process.

The maximum error for the carrier frequency is required when checking worst case out-of-band emission levels against the licence conditions because a frequency shift towards an edge of the frequency band of a licence can affect the levels of out-of-band emission significantly.

The minimum width of the worst case occupied bandwidth for 99% for one carrier is required for registration purposes, and means the minimum width of a frequency band having fixed upper and lower limits that is necessary to contain not less than 99% of the true mean power of the transmitter's emission at any time. A common mistake is to use the notional value in the ITU emission designator, for example, 5 MHz when the actual value is 4.60 MHz. In this case the registered emission designator would be 4M60W7WEC rather than 5M00W7WEC.

The maximum total transmitter power per carrier (dBm) for the measured PSD is required to calculate the device boundary[10]. The value must be corrected for measurement error and manufacturing tolerance. Since the maximum power relates to a particular worst case PSD, registration does not authorise use of any higher transmitter powers.

7.0 Supply, Assessment and Submission of Device Details

Once general equipment performance information for an equipment type has been obtained, each deployed station belonging to that type can then be assessed against the spectrum licence conditions to decide whether a certificate may be issued.

[10] See ACMA website for further information about calculating the device boundary: "This involves establishing the distance, along radials from the transmitter that is required for the emission level to drop below a level that is likely to cause interference to receivers in adjacent geographic areas. The distance along each radial is based on a mathematical propagation model. The device boundary method takes account of the terrain loss by adjusting the antenna height of a device according to its height above average terrain, called its effective antenna height." ACMA publishes a "Spectrum Licensing CD-ROM" which includes a digital elevation model for Australia (RadDEM), the Spectrum Map Grid and a program plus source code for calculating tables of effective antenna heights for any location in Australia.

In some cases, licence conditions on the ACMA website (the licence image) may not be complete owing to ACMA web document template limitations, for example, out-of-band emission limits are sometimes not fully represented. For this reason it is better to obtain licence conditions from the relevant Marketing Plan unless the licensee advises that licence conditions have been subsequently amended.

Contractual arrangements between the spectrum licensee and accredited person should consider the accuracy of station deployment information, as well as accuracy of the general performance information supplied by the client to the accredited person. The client should warrant the accuracy of all the data it supplies. When drafting agreements, the s.145 provides acceptable accuracies for data such as effective antenna height and location coordinates as well as parameters associated with a number of transmitters being registered as a group.

Definitions for some data items have been designed to provide a high level of technical and legal clarity to not only remove ambiguity but also ensure interference is accurately managed. Three good examples are the definitions for "*antenna height*", "*indoor*" and "*Radiated Power Pattern*".

Antenna height means vertical height in metres of the phase centre of a fixed transmitter's antenna measured with an error less than 5 parts in 100 and relative to the point:

(i) located on the line of intersection between the external surface of the structure supporting the antenna and the surface of the ground or sea; and
(ii) having the lowest elevation on that line.

Indoor, for a fixed transmitter, means a transmitter having an antenna:

(i) located within an enclosed space; and
(ii) with its phase centre at least 5 metres from the external surface of the part of the enclosed space which its half-power beamwidth illuminates.

Because the radiated power envelope (RPE) of an antenna, that is, the antenna's isotropic gain in all directions, can be difficult to obtain or is not always publicly available, certain antennas being proprietary, the *Radiated Power Pattern* (*RPP*) is designed to provide coordination data in a simplified format as well as reduce the regulatory burden on licensees. The composite *RPP* parameter incorporates the following information:

- the antenna RPE at an azimuth resolution commensurate with the requirements of the device boundary criterion;
- the worst case PSD of the transmitter;
- the feeder loss;
- adjustment to account for the measurement errors for each of the above parameters; and

- adjustment for any error allowance provided in the licence conditions.

Web applications can be created to assist licensees (often in practice, engineers working for the licensee and who are located throughout Australia) in compiling specific station data, submitting each station for assessment and viewing subsequent registration information. Such web applications can provide pre-assessment validation checks of the station data in batch files that are obtained by simple extraction from a licensee's wireless network design software and uploaded via the web. Queries and warnings can be issued concerning the validity of data items, which the client then amends online. Additional functionality can include searching for existing, or requesting new ACMA site IDs and antenna IDs. When a record in a batch file is free of queries it can be submitted for assessment by an accredited person after which, the device might be registered, varied or de-registered, as requested, or a post-assessment query issued. Post-assessment queries usually result from a significant failure of the device to satisfy licence conditions, for example, the device boundary is outside the geographic area of a spectrum licence or radiated emission limits outside the frequency band of the licence are not satisfied.

The accredited person submits device details for registration, variation or de-registration to ACMA via specially formatted transaction files, called *message files*, prescribed in a document "*Message Protocol for External Device Registration*" prepared by Errol Martin and Bill Watson, 30 October 1998 and available from ACMA. The certificate is ACMA form R070 (January 2008) which is signed and faxed to ACMA when the message files are emailed.

Attachment A - Example of Links between S-CM and ACMA Legal Instruments

To obtain the original 800 MHz Marketing Plan documents go to www.acma.gov.au :

- Home of ACMA > Radiofrequency spectrum > Spectrum licensing auctions and trading > Past auction results > Previous Applicant Information Packages > (800 MHz) Personal Communications Service

Spectrum licence conditions built upon S-CM specify a complete set of explicit transmit rights in relation to **all** Interference Categories (IC). The rights are established as functions of device separation from the boundaries of a licensed spectrum space:

IC A. (*Geographic* Boundary) in-band interference: same-band adjacent-area;

IC B. (*Frequency* Boundary) in-band interference: same-area adjacent-frequency;

IC C. (*Frequency* Boundary/Non-linear) out-of-band interference: same-area adjacent-frequency; and

IC D. in the case of non-exclusive spectrum access, (*Time* Boundary) in-band interference: same-band same-area.

Under space-centric management the explicit transmit rights for new services consist of conditions for power **radiated at an antenna.** This is not a power threshold at a boundary, but power radiated **at** each antenna (or antenna array).

The receiver is not ignored. Receiver protection is embedded within the explicit transmit rights when they are designed by the regulator. Licensees then decide the ultimate level of protection they require when making fully independent cost-benefit trade-offs with equipment design. In the case of new services (but not legacy services), a legal definition of Unacceptable Levels of Interference (*harmful interference-Tx*) is created which is precise and practical for enforcement because tests for interference can be specified in terms of easily measurable transmit quantities. Spectrum licensees use the limits of power radiated **at** antennas to aid design of their receivers to achieve whatever level of protection they desire. The regulator is no longer responsible for ensuring that a particular level of protection/degradation occurs.

S-CM provides **all** the necessary practical technical benchmarks, upon which licensees can design their different systems to ensure guaranteed access to spectrum and to manage interference from devices operated by adjacent spectrum licensees:

- IC A (*Geographic* Boundary) – *device boundary*: benchmarks for in-band radiated power related to the management of out-of-area emissions;
- IC B (*Frequency* Boundary) – *antenna EIRP spectrum mask*: benchmarks for out-of-band radiated emission related to the management of *e.g.* "near-far", transient and spurious interference;
- IC C (*Frequency* Boundary/Non-linear) – *model coordination procedure*: radiated benchmarks related to the management of non-linear out-of-band interference, with the necessary technical and legal certainty provided by reference to a central device database; and
- in the case of non-exclusive spectrum, IC D (*Time* Boundary) – *dynamic spectrum access*: benchmarks for radiated power related to time-sharing of the same spectrum space.

The main technical document (upon which devices are authorised to operate) is Attachment 8 (S.145 Determination for Unacceptable Levels of Interference)

But to get the **latest** Attachment 8 document go to the consolidations:

- Home > For licensees & industry: Licensing & regulation > Legislation, codes & standards > Consolidations > Radiocommunications Act 1992 – Part 4

See "Radiocommunications (Unacceptable Levels of Interference - 800 MHz Band) Determination 2000" which contains:

- the 'device boundary' for management of IC A – see SCHEDULE 2
- reference to 'antenna EIRP spectrum mask' for management of IC B – see Section 7(2)
- reference to 'model coordination procedure' for management of IC C – see NOTE 3 on Page 2
- rights pertaining to IC D are specified when the spectrum space is not exclusive. Note that spectrum can also be shared in the sense that out-of-band and out-of-area emissions fall outside the frequency and area dimensions of a spectrum licence. For some interference scenarios, time-related limits are used as benchmarks for radiated power in otherwise 'exclusive' spectrum, for example, see SCHEDULE 2 clause 2(2)

Importantly, note that the Section 7(2) (b) outside the "geographic area of the licence" does not completely set emission levels outside the area in practice. The **existence** of this clause is related to a mandatory requirement for a particular 'core licence condition' in the Radiocommunications Act 1992, however, the main **purpose** of the condition is to establish a maximum in-band

emission level to provide an upper bound to the extent of IC C. In practice, the device boundary does all the work with regard to managing out-of-area emission levels.

The ‘antenna EIRP spectrum mask’ is contained in the ‘core conditions’ of the licence (see Attachment 4 SCHEDULE 8 (*i.e.* the Attachment 4 of the ‘original Marketing Plan’ web page). There are out-of-band emission limits for non-spurious, spurious and transient emissions.

Only those devices, which have high likelihood of interference, are registered. See Attachment 4 of the Marketing Plan, SCHEDULE 6, LICENCE SCHEDULE 3, Section 4, for exemptions to device registration requirements.

Attachment 13 (note that the file name is actually ‘14’) contains the ‘model coordination procedure’.

Attachments 10 and 11 (file names 11 and 12) are compatibility criteria for the management of legacy services.