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| Technical Liaison Group  Discussion Paper #2 Review of the 800MHz Technical FrameworkS145 Radiocommunications Determination on Unacceptable Levels of Interference including the Device Boundary Methodology and the Level of Protection. |
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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Canberra**  Purple Building  Benjamin Offices  Chan Street  Belconnen ACT  PO Box 78  Belconnen ACT 2616  T +61 2 6219 5555  F +61 2 6219 5353 | **Melbourne**  Level 44  Melbourne Central Tower  360 Elizabeth Street Melbourne VIC  PO Box 13112  Law Courts  Melbourne VIC 8010  T +61 3 9963 6800  F +61 3 9963 6899 | **Sydney**  Level 5  The Bay Centre  65 Pirrama Road  Pyrmont NSW  PO Box Q500  Queen Victoria Building  NSW 1230  T +61 2 9334 7700  1800 226 667  F +61 2 9334 7799 |  |  | |
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# Introduction

Spectrum licences in the 825-845 / 870-890 MHz (800MHz) band are due to reach their expiry on 17th June 2013. In order to prepare for potential re-issue of spectrum licences in the band a review of the 800MHz technical framework conditions is being conducted to meet the objectives:

* To ensure technology flexibility so that a range of modern technologies can be used in the band, with a particular focus on International Mobile Telecommunications (IMT) technologies.
* Provide conditions that enable continued usage of existing network technologies in the band.
* Provide interference management within the 800MHz band and in adjacent bands.
* To address deficiencies that have come to light during the previous licence period.

This paper explains proposed changes to the registration requirements set out in the:

**Radiocommunications (Unacceptable Levels of Interference – 800MHz Band) Determination 1998 (in accordance with RA S145)** - consisting of requirements for the registration of spectrum licensed devices through a device boundary criteria calculated around the location of the transmitter. The device boundary criterion is used to ensure that devices operating under a spectrum licence are contained within the boundary of the spectrum licence and to avoid co-frequency interference to receivers in an adjacent area.

The paper covers such aspects as;

* System models and methodology for device registration.
* Levels of protection for adjacent receivers.
* Propagation used in the device boundary criterion.
* Definition of the exemption limits for device registrations in the upper and lower bands.
* Definition of the limits for unacceptable levels of interference for mobile stations in the lower band.
* The Road and Towns Mobile Listing.

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| **Technical Framework Element** | **Proposed Changes** |
| S145 Radiocommunications (Unacceptable Levels of Interference) Determination 1998 | Change in the method for construction of the Device Boundary through use of averaging of terrain heights of nine cells local to a point on a radial.  Increase in the resolution of the DBC through use of 360 radials and segment length of 500m.  Change to the Level of Protection for registration in the upper band to -111dBm/1MHz (or -126dBm/30kHz).  Change to the Level of Protection for registration in the lower band to -115dBm/1MHz (or -130dBm/30kHz).  New propagation modelling via the ERC68 Modified Hata method is to apply to registration of devices in both the upper and lower bands.  Removal of use of the Scaling Parameter in the formal S145 Device Boundary calculation.  A decrease in the registration exemption limit to 30dBm/1MHz (or 15dBm/30kHz) so as ensure that higher powered macro and micro stations are still required to be registered and lower powered devices, including mobiles and indoor devices operating below this limit, are not required to be registered.  A decrease in the maximum EIRP that applies to mobile stations operating in the lower band to 30dBm/1MHz (or 15dBm/30kHz).  Removal of the method of registration via the Towns Mobile Listing and the Roads Mobile Listing. |

Table 1.

# Technologies

The development of revised technical framework conditions has been based on those technologies considered to be likely candidates for licensing and deployment in the 800MHz band. These technologies include:

|  |  |
| --- | --- |
| Technology | Reference Specifications |
| LTE and LTE-Advanced (E-UTRA) | 36.104, 36.101, 36.106, 36.942, 25.814, ITU-R M.1580, ITU-R M.1581. |
| WCDMA, HSDPA/HSUPA, HSPA, HSPA Evolution (UTRA) | 25.104, 25.101, 25.106, 25.201, 36.942, ITU-R Rec M.1580, ITU-R Rec M.1581. |
| CDMA2000, CDMA Multi-Carrier, CDMA HRPD | ITU-R Rep M.2039, ITU-R Rec M.1580, ITU-R Rec M.1581. 3GPP2 specifications. |

Table 2.

The main characteristics for each of the technology types listed here are described in the 800MHz Technical Liaison Group Discussion Paper #1 as released on the TLG share-point site. These characteristics have been used in the derivation of revised conditions in the 800MHz Spectrum Licensing Technical Framework.

# The S145 Radiocommunications Determination

## Device Boundary

The S145 Radiocommunications (Unacceptable Levels of Interference – 800MHz) Determination provides a method through which interference is managed between devices operating on a co-frequency basis in adjacent spectrum-licensed areas in the 800MHz band. In this document the method for calculation of the Device Boundary around a transmitting device is described. It is the final Device Boundary polygon and its mapping to whole cells of the Australian Spectrum Map Grid (ASMG) that must then be contained within a spectrum licensee’s geographic area to be deemed not to cause unacceptable interference into an adjacent area. Successful construction and location of a Device Boundary plot for any particular device then enables registration of the devices whereby its details are submitted to the Register of Radiocommunications Licences (RRL).

The overall method for construction of the Device Boundary consists of evaluation of the boundary criterion for each segment along a radial emanating out from the centre location coordinates of the transmitting device.

The number of radials is then evenly spaced surrounding the device ranging from 0 degrees through 360 degrees. The existing DBC is comprised of 72 radials, one every 5 degrees, each of which is divided up into m segments where m ranges from 1 to 30.

The DBC evaluation determines the endpoint of a radial when the Radiated Power (RP) less the Maximum Power (MP) at some distance on the radial passes through zero or becomes negative. The functions are as follows:

where:

and

HRP is the horizontally radiated power for each bearing Фn measured with an error of ±E, and

MP is the Maximum Power being a function of hem(Фn) and dm(Фn)

where:

hem(Фn) is the effective antenna height of the transmitter measured in metres for segment m (m being any integer from 1 to 30) for each bearing Фn; and

dm(Фn) is the distance 5 minutes with reference to the Australian National Spheroid, calculated for segment m and measured in kilometres with an error of less than ±0.5km for each bearing Фn.

The maximum power (MP) may also be described as the propagation loss (Lb) over the path plus the level of protection (LOP) for the receiver, such that the evaluation of the radial endpoint is determined from the following equation.

In computing the Maximum Power the effective antenna height of the transmitter must be determined at each particular point on a radial. In the existing method this requires taking an average of the heights of the local terrain which surround a particular point on the radial by determining the number of Digital Elevation Model (DEM) cells contained within the sector/segment area. The heights of those cells whose areas are more than 50% contained within the sector/segment area are then included in the average.

Because of the complexities of this method involving areas with curved and radial boundaries, it is proposed to change the averaging process to a method based on averaging of terrain heights from nine local cells of the DEM. This corresponds to taking an average of the heights of the single cell corresponding to the particular point on a radial and those of the surrounding eight DEM cells. The DEM is comprised of cells of nine second resolution throughout the whole of Australia.

The new method will apply to the 800MHz band and to each of the other spectrum-licensed bands where the Device Boundary is used to register devices. For a full description of the new method please refer to the paper entitled “TLG Reference Paper - Proposed New Device Boundary Criterion Methodology; Radiocommunications (Unacceptable Levels of Interference) Determinations”, which is available on the TLG Sharepoint site.

It is further proposed to increase the density of radials from 72 to 360; such that resolution of the Device Boundary calculation is improved. The segment length is also to be changed to a uniform 500m to avoid the difficulties of converting between coordinate points for segments and radial distances.

**It is proposed that in construction of the Device Boundary:**

**A new method be used for determining the effective antenna height of the transmitter based on terrain heights of nine DEM cells local to a point on the device boundary radial.**

**The number of radials be increased from 72 to 360 to provide greater resolution to the Device Boundary.**

**The distance between segments over a radial be changed to 500m increments.**

## Adoption of a New Geodetic Datum and Digital Elevation Model

For future radiocommunications licensing activities ACMA plans to transition from the Australian Geodetic Datum 1966 (ADG66) to the Geodetic Datum of Australia 1994 (GDA94) as the basis of coordinate referencing. The GDA94 datum is an earth-centred datum which is compatible with satellite-based navigation systems and major international geographic systems, including the World Geodetic System 1984 (WGS84). The transition to GDA94 will also align radiocommunications licensing within Australia with spatial data published by the Commonwealth and state mapping and surveying agencies.

For spectrum licensing, the implementation of this transition comprises of the following main features.

* A change from AGD66 to GDA94 as the coordinate reference for device registrations held in the Register of Radiocommunications Licences. Existing registrations in the RLL will have their coordinates converted to GDA94 basis.
* Amendments to the Australian Spectrum Map Grid (ASMG) including extension for 5 minute cells across the whole of the ASMG and adoption of a hierarchical identification scheme for individual cells.
* A change in the digital elevation model used for spectrum licensing from the existing *RadDEM* to the *GEODATA 9 Second Digital Elevation Model Version 3 (DEM9S)* to be made available by Geoscience Australia.

Full details of the impact of datum transition and ACMA’s plans are contained in the TLG reference paper *“Adoption of GDA94 for Spectrum Licensing”* available on the Sharepoint site.

**It is proposed:**

**That radiocommunications licensing activities including spectrum licensing transition to use of the GDA94 datum and the GEODATA 9 Second Digital Elevation Model Version 3 (DEM9S).**

## System Model

The system model for use of radio systems in the 800MHz band assumes use of Frequency Duplex Division (FDD) systems only, where the upper and lower band segments (mid band gap) are separated by 25MHz of spectrum.

The current scenario in the band is base transmission on the downlink occurring in the 870-890MHz segment and mobile transmission on the uplink occurring in the 825-845MHz segment. This is the most typical scenario for deployment of radio systems in the band and as such this is not to be changed in the revised technical framework. Note also that there is no provision for use of Time Division Duplex (TDD) technologies within the band with this model.

Transmitters operating in the 800MHz band must be registered in either the upper or lower segment when they are not considered to fall within the definition of transmitters exempt from registration. In this first scenario, this requires registration and evaluation of the device boundary criterion for base transmitters in the upper segment. In the second scenario, this requires registration and evaluation of the device boundary criterion for fixed transmitters in the lower segment; which are likely to include fixed outdoor stations and repeaters operating up to the height constraint of 10m.

Technology characteristics and parameters for the system models in the upper and lower band are described in the first 800MHz TLG paper.

## Registration of a Transmitter in the Upper Band (870-890MHz)

The system model includes a base station transmitter located at height of 30m above local terrain with a maximum radiated output power of 56dBm/5MHz in accordance with typical specifications for modern IMT technologies which use an output of 43dBm/5MHz in combination with an 18dBi antenna less 5dB of losses. It is expected that the radiated output for most macro base station installations will not exceed this level. The system model also assumes a mobile handset receiver located at a height of 1.5m above local terrain. This results in a high site to low site propagation scenario between the base station and the mobile station.

In this scenario the objective is to maintain downlink coverage from base station to mobile station whilst ensuring that there is sufficient geographical separation to protect mobile stations operating in adjacent spectrum licence areas. The required separation distance for the protection of adjacent mobile stations will determine the distance that the registered transmitter is set back from the licence boundary.

Only the downlink coverage radius is relevant in this case in determining cell size because the uplink coverage (which may differ) is completed in the lower band segment. The downlink coverage is dependent on the data rate and the modulation and coding scheme applied on an adaptive basis over the radio channel. Taking these factors into account, typical coverage radii on the downlink for IMT technologies ranges from 1km to 5km when using Modified Hata urban propagation and from 2km to 9km when using Modified Hata suburban propagation. From these ranges a nominal coverage radius of 5km is selected.

The diagram below depicts this situation for cellular deployment near the spectrum licence geographic area boundary.

SystemModelDiagram.wmf

Figure 1: 800MHz System Model: Registration of a base transmitter in the 870-890MHz band.

## Benchmark Level of Protection in the Upper Band (870-890MHz)

The level of protection is the maximum level of interference seen in the receiver and it is the basis of protection for station operating in the adjacent spectrum licence area. The existing LOP at - 131dBm/30kHz is based on older cellular technologies (D-AMPS) with different characteristics and protection requirement to those of modern IMT technologies which currently operate in the band and are expected to do so into the future.

It is proposed that a new LOP be set so as to provide sufficient protection from co-frequency interference in adjacent area mobile receivers, whilst reducing the buffer zone that exists between cell coverage and the geographic boundary – thus enabling base stations to be deployed nearer to the boundary to improve coverage in this area.

The new LOP is based on a 1dB de-sensitisation (M) of a mobile handset receiver, calculated using the equation;

where;

Where k is Boltzmann’s constant at 1.38e-23J/K, T is the receiver temperature at 290K, BW is the receiver bandwidth at 5MHz and NF is the noise figure at 9dB. These values are drawn from the characteristics stated in the preceding TLG Discussion Paper #1.

Using these equations the new LOP is calculated as - 111dBm/1MHz (or - 126dBm/30kHz), which is a maximum interference level of 6dB below the noise floor of the receiver. This represents a reduction in the protection afforded receivers in an adjacent area by some 5dB thus removing conservatism and allowing licensees to deploy devices nearer to the boundary.

As depicted in the System Model diagram for the upper band, using this LOP a registered station is set back from the licence geographic boundary by some 9km using the ERC68 Modified Hata (Urban) propagation model. This is the distance required for the signal strength in the mobile to reduce to the - 111dBm/1MHz level and thus mobiles on the boundary are protected to this level.

Then assuming reciprocal deployment of base station in an adjacent area with essentially the same coverage area, and again set back by at least 9km from the boundary, the actual level of interference seen in adjacent mobile receivers will be somewhat less than this stated LOP.

Using this updated system model and the new level of protection the re-use distance between adjacent systems becomes 18km, a significant reduction from the 33.7km of the previous system model.

**It is proposed:**

**That a new Level of Protection at the spectrum licence boundary be set at - 111dBm/1MHz for calculation of the Device Boundary Criterion when registering transmitter devices in the 870-890MHz band.**

## Registration of a Transmitter in the Lower Band (825-845MHz)

The situation may arise where a licensee wishes to operate a fixed station in the lower band that has a radiated output power above the EIRP exemption limits of the framework. This situation is most likely to apply to repeater stations or higher powered outdoor femto-cells which make a connecting uplink to the base receiver.

Fixed transmitting devices in this band are likely to use some type of directional antenna and hence there is increased system gain over the path. They may also be deployed up to a height of 10m (the height constraint in 825-845MHz of the framework) and so there is also lesser propagation loss over the path. These factors contribute to an increased coverage radius and an increased set back distance from the boundary for a lower band transmitter in comparison to an upper band transmitter.

The system model includes a repeater transmitter station operating at a height of 10m with a maximum radiated output power of 30dBm/5MHz inclusive of an antenna gain of 18dBi less 5dB of losses. For the receiver station the model assumes a base receiver at a height of 30m above local terrain. The mode of propagation is low site to high site.

The cell size for the system is dependent only on the uplink coverage radius because the downlink coverage occurs in the upper band. For IMT technologies the uplink coverage radii ranges from 6km to 21km when using Modified Hata – Urban propagation and from 10km to 39km when using Modified Hata – Suburban propagation. A cell radius of 21km is selected as nominal coverage. The lower band system model is depicted in the diagram below.

SystemModelDiagram_V1.wmf

Figure 2: 800MHz System model: Registration of a transmitter in the 825-845MHz band.

## Benchmark Level of Protection in the Lower Band (825-845MHz)

A new level of protection is devised for the purposes of protecting base station receivers operating in the adjacent spectrum licence area. It is based on the same concepts as that used in the upper band, specifically, a maximum de-sensitisation of the base receiver by 1dB. This results in a maximum interference level of -115dBm/1MHz (or - 130dBm/30kHz).

Then, for a fixed transmitter operating at maximum height of 10m and with use of the new LOP the site back distance from the geographic boundary is 40km, again using the ERC68 Modified Hata (Urban) propagation model. It can be expected that transmitters positioned at lesser heights and using lesser radiated power would result in reduced separation distances. Where there is a base station transmitter operating on the other side of the boundary deployed at the minimum separation of 9km, the reuse distance becomes 49km.

**It is proposed:**

**That a new Level of Protection at the spectrum licence boundary be set at - 115dBm/1MHz for calculation of the Device Boundary Criterion when registering transmitter devices in the 825-845MHz band.**

## Propagation Modelling in the Device Boundary Criterion

The propagation model used previously in Device Boundary calculations for the 800MHz band was based on the Okumura field strength curves derived for the VHF and UHF bands from measurements in the 1960’s. Since this time these curves have been converted to path attenuation curves by Hata and then modified a number of times for extension to increased distance and greater frequency ranges.

It is proposed to replace the existing propagation modelling used in the 800MHz Upper Band and Lower Band with the more modern Modified Hata (Urban) propagation as specified in ERC Report 068. This version has been extended to distances of up to 100km and it enables modelling for greater mobile antenna heights. The use of ERC68 Modified Hata also avoids the discontinuities that are seen in propagation of the S145 calculations of the existing 800MHz technical framework; these discontinuities appear at 15.7km in the upper band and 11.2km in the lower band.

In applying ERC68 Hata to the upper band, the effective antenna height He includes both the structure height and the local terrain height. The mobile receive is at a height of 1.5m.

The propagation loss is calculated via the equation below.

Where

Where the Maximum Power (MP) function in the upper band is determined simply by adding the level of protection to this propagation loss.

In the Lower Band, the effective antenna height He again includes both the structure height of the transmitter and the local terrain height. The receiver height is 30m corresponding to an adjacent base station receiver.

Where

Then the Maximum Power (MP) function in the lower band is calculated by adding the level of protection to the propagation loss.

The level of protection at -115dBm/1MHz applies within the base receiver station, so that inclusion of a typical antenna gain (18dBi) and line losses (5dB) results in a effective level of protection of -128dBm/1MHz not to be exceeded at the input to the receiving antenna.

Licensees may apply alternate propagation in either of the upper or lower bands where such methods are considered to more accurately reflect the local path conditions. In particular, licensees may consider the propagation methods of ITU-R Recommendation P1546 which deals with cases of low-site to high-site and high-site to high-site path scenarios which may arise in the lower band. Converting the raw field strength data from this recommendation to propagation loss, adjusting for frequency and receive antenna height then enables characteristic equations (based on logarithmic distance and height dependencies) and corresponding coefficients to be derived through data regression analysis.

The plots below display the comparison between ERC68 Modified Hata (urban areas) and the existing propagation algorithm of the 800MHz technical framework. In the upper band the curves are almost identical resulting to no effective change to device boundary calculations. In the lower band the Modified Hata calculation more accurately accounts for receiver height at 30m resulting in less loss over the interference path of the order of 30dB.

**It is proposed:**

**That ERC68 Modified Hata (Urban Area) replace the existing propagation modelling used in the 800MHz upper and lower bands.**

Figure 3. Comparison of ERC68 Modified Hata (Urban areas) and the existing propagation applied in the 800MHz technical framework for the upper band.

Figure 4. Comparison of ERC68 Modified Hata (Urban areas) and the existing propagation applied in the 800MHz technical framework for the lower band.

## Use of Scaling Parameters

Previously the 800MHz Technical Framework has included the ability to vary the device boundary through use of scaling parameters. These scaling parameters were used to adjust the device boundary such that a licensee may register a transmitter through the S145 calculation method nearer to the licence boundary than would be the case if such scaling factors were not used. The scaling parameter should be derived through iterative assessment of interference potential into receivers in an adjacent spectrum licensed area where there is agreement between the licensees on the increased level of interference seen in receivers over the geographical licence boundary. Maximum scaling parameters previously had values up to 18.8 in the lower band and 14.3 in the upper band.

In the revised spectrum licensing technical framework in the 800MHz band, it is now possible to register a device the fails the S145 device boundary registration through either the application of guard space or through an agreement reached between licensees. In each of these cases, the accredited assigner must issue an Interference Impact Certificate (IIC) verifying that the device does not cause unacceptable levels of interference. In the latter case, an agreement between licensees may include negotiations on the maximum levels of interference seen in adjacent receivers caused by the registered device or on the value of a scaling parameter in order to assess increased levels of interference over the boundary. Registration through agreement would then follow as a matter of course.

On this basis it is proposed to remove the use of the scaling parameter in the formal device boundary calculation. Where there is normal usage of the S145 device boundary calculations to register a device, this effectively sets the scaling parameter to zero. Licensees may use the scaling parameter as a tool for assessing potential interference to adjacent receivers in negotiations between adjacent licensees.

A full explanation of registration via guard space or agreement is to be provided in the new ACMA Policy Paper entitled *“Registration of Devices using Guard Space or Agreement, 2011”*.

**It is proposed:**

**To remove usage of the Scaling Parameter as a formal method for adjusting the S145 Device Boundary calculation. Licensees may use the scaling parameter as a tool in negotiating proximity of a registered device to a neighbouring boundary and thus levels of interference into adjacent area spectrum licensed receivers.**

# Registration Exemption Limits for Transmitter Stations

Conditions of the existing 800MHz technical framework include a radiated power limit below which mobile stations are exempt from the requirement to register. The existing requirement is that transmitter stations in the 825-845MHz band, including mobile handsets and fixed indoor transmitters, that operate with a radiated EIRP of less than 38dBm/30kHz (or 53dBm/1MHz) are not required to be registered in the Register of Radiocommunications Licences (RRL).

It is anticipated that within mobile communications bands in the future there is likely to be an increased usage of low powered devices for servicing small coverage areas. Therefore is it important that there be flexibility in the technical framework for the unhindered deployment of these devices but sufficient controls in place to ensure interference management for the higher powered devices.

It is considered that the existing limit is currently set too high for the types of wideband macro-cell, micro-cell and repeater stations that are expected to be deployed in the 800MHz band. Interference controls and the process of registration should apply to these types of stations. Therefore it is proposed that a new exemption limit be set at 30dBm/1MHz (or 15dBm/30kHz) applicable to both the 800MHz Upper Band and the Lower Band.

The types of stations which would typically be exempt from registration on the basis that they operate below the new exemption limit include:

* Mobile devices including user handsets and mobile computing USB devices.
* Femto-cells.
* Pico-cells.
* Pico-cells and lower powered base stations deployed on aircraft, cell-phone radio frequency management unit (CRFMU) or network control unit (NCU) transmitters deployed on aircraft.
* Low powered repeater stations and Smart repeater stations.
* Groups of transmitters operating with an EIRP or below the exemption limit.
* Mobile devices operating in the 825-845MHz band whilst at sea and only communicating with a receiver at sea.

The types of stations which would typically be expected to operate above the exemption limit and would thus be required to be registered:

* High powered base stations.
* Macro and micro base stations.
* Outdoor repeater stations operating at an EIRP above the exemption limit.
* Groups of transmitters which operate at an EIRP above the exemption limit.

In addition, all registered transmitting devices must of course adhere to the existing Out-of-Area condition in the technical framework which sets the maximum EIRP level at 59dBm/30kHz – this level is to remain in place in both the upper and lower bands. Operation of a transmitter above this level is considered a breach of the core condition.

In the lower band currently the maximum EIRP level permitted for mobile stations is 46dBm/30kHz (or 61dBm/1MHz) – levels above which are deemed to cause unacceptable interference. It is proposed to reduce this level to 30dBm/1MHz (or 15dBm/30kHz) so as to align with the new registration exemption limit. The intention here is that mobile stations below the exemption limit will not be required to be registered and those above will be deemed to cause unacceptable interference. It is anticipated that this level is sufficient to allow all mobile station types to operate.

A height restriction for registered transmitters will be maintained in the lower band at 10m. Transmitters deployed above this level will be deemed to cause unacceptable interference.

**It is proposed:**

**That the EIRP limit for the exemption of registration of a transmitter device be reduced to 30dBm/1MHz (or 15dBm/30kHz).**

**Mobile transmitters be restricted to a maximum EIRP limit of 30dBm/1MHz (or 15dBm/30kHz) within the 825-845MHz band.**

**Mobile transmitters that have a radiated power above this limit are deemed to cause unacceptable interference.**

# Device Registration using the Roads and Towns Mobile Listing

Previously under the 800MHz Spectrum Licensing Technical Framework use of the Roads and Towns Mobile listings provided a means through which mobile transmitters within the proximity of a town of the Towns Mobile List or on a road of the Roads Mobile List were not required to be registered. This review of the framework found that this method for registration of devices using the Roads and Towns Mobile Listing was problematic due to:

* Additional complexities in the registration of devices.
* Differences in the way in which individual carriers registered devices.
* Difficulties in understanding the purpose of the Roads and Towns Mobile Listing.
* No further value added to the registration of devices and the technical framework through use of the Roads and Towns Mobile Listing.

It is also planned that mobile devices with radiated power below the exemption limits will not be required to be registered regardless of their location or proximity to certain towns and roads.

On this basis, it is proposed that under the revised spectrum licensing technical framework for the 800MHz band, registration via the method of the Roads and Towns Mobile Listing will not apply. Each individual device is to be registered as a singular transmitter or receiver, or as part of a group of transmitters or a group of receivers through the main existing methods of the S145 Determination. Devices that have been registered using the Roads and Towns Mobile Listing method in the past may be retained in the RRL and there is no requirement to ‘re-register’ each device recorded in this way individually. Accordingly, those references to use of the Roads and Towns Mobile Listing are to be removed from the technical framework documentation.

**S145 Determination (Unacceptable Levels of Interference – 800MHz Band) Determination 1998.**

Much of the guidance and instruction on the registration of devices through the Roads and Towns Mobile Listing is contained within the S145 Determination document, the following sections of which are updated as follows.

**General:**

Each reference throughout the document to the “ACA” to be replaced with reference to the “ACMA”.

**Interpretation:**

In the interpretation section the definitions of the:

*Roads Mobile List* is to be removed,

*Towns Mobile List* is to be removed.

**Unacceptable Level of Interference:**

In the Unacceptable Level of Interference section

The clause 5(a) referring to:

“(a) a mobile transmitters that operates:

1. outside the limits of a town that is on the towns mobile list; or
2. on a road that is not on the roads mobile list;”

is to be removed from the document.

**Schedule 1 - Centre location and effective radius of a transmitter:**

The text in Note 2 is to be updated as replaced with the following:

*A mobile transmitter ~~operating outside the limits of a town that is on the towns mobile list or on a road that is not on the roads mobile list, or~~ that only transmits at sea and only communicates with a mobile receiver at sea, does not need a centre location or effective radius because the ACA does not intend to require these mobile transmitters to be registered – see s.69(2) of the Act and the registration conditions of spectrum licences.*

The section regarding the centre location and effective radius of a transmitter setting out operation in a town and on a major road, is to be removed. This text is as follows:

“3. Centre location and effective radius of a mobile transmitter operating on land.

1. Operating in a town. For a mobile transmitter operating within the limits of a town specified in the towns mobile list, *lc* and *re* are taken to be those specified in the towns mobile list for that town.
2. Operating on a major road. For a mobile transmitter that is operating on a section of major road, the centre location and effective radius of the mobile transmitter is the centre location and effective radius specified in the roads mobile list for that section of road. A section of road that is part of the road intersected by 2 lines drawn:
3. Starting from each of the 2 sets of coordinates in the roads mobile list…..
4. Along the shortest distance from each set of coordinates…..
5. Along the latitude or longitude of the coordinate…..

A transmitter is taken to be on a road if it is within one kilometre of any part of the road.”

**Schedule 2 – Part 1 – Device Boundary of a Transmitter or a Group of Transmitters**

The note in this section is to be updated and replaced with the following text:

*Note: It is not necessary to calculate a device boundary for mobile transmitters that operate ~~outside the limits of a town on the towns mobile list, on a road that is not on the roads mobile list;~~ or at sea, as these will not be registered – see Radiocommunications (Register of Spectrum Licences) Determination 1996, copies of which are available from the ACMA.*

The clause (4.) is to be removed:

“4. In the case of a group of transmitters some of which operate in a town that is on the towns mobile list……

……in the town or on the major road.”

**It is proposed:**

**That the method for registration of radiocommunications devices through use of the Roads and Towns Mobile Listing should not be applied under a renewed 800MHz spectrum licensing technical framework.**

**The S145 Determination for the 800MHz band is to be modified as described above.**

# Questions for Technical Liaison Group Participants

Technical Liaison Group participants are requested to provide general comments on the recommended modifications to the S145 Radiocommunications (Unacceptable Level of Interference) Determination. In particular, stakeholders are invited to submit comment on the following:

* Do stakeholders concur with changes to the method of calculating the S145 Device Boundary criterion through the use of height averaging over nine local cells of the DEM? Any reasoning regarding retention for the older method should also be submitted.
* Do stakeholders concur with the transition to the GDA94 geodetic datum and the GEODATA (DEM9S) digital elevation model. Stakeholders are invited to submit preliminary comments noting that ACMA intends to conduct a public consultation at some time in the future.
* Do stakeholders concur with changes to the propagation modelling and the level of protection for adjacent receivers designed firstly for greater accuracy in determining path loss of greater efficiency in spectral though allowing registration nearer to the boundary.
* Do stakeholders concur with the reduction in exemption limits for registration of devices?
* Do stakeholders concur with the proposals for use of Mobile Communications On-Board Aircraft systems under spectrum licences?
* Do stakeholders concur with the removal of the method of registration via the Towns Mobile Listing and the Roads Mobile Listing?

***Comment Period***

Technical Liaison Group participants are requested to submit comments and suggestions to the 800MHz TLG SharePoint discussion pages prior to the closure of the comment period on 4th November 2011.

# References

**800MHz Technical Framework Documents:**

1. *Radiocommunications Spectrum Marketing Plan (800MHz and 1.8GHz Bands) 1998.* Office of Legislative Drafting and Publishing, Attorney-General’s Department, October 2005.

**3GPP Specifications:**

1. 3GPP TS 25.104 V8.0.0, *Technical Specification Group Radio Access Network; Base Station (BS) radio transmission and reception (FDD) (Release 8)*, September 2009.
2. 3GPP TS 25.101 V8.0.0, *Technical Specification Group Radio Access Network; User Equipment (UE) radio transmission and reception (FDD) (Release 8)*, September 2009.
3. 3GPP TS 25.201 V10.0.0, *Technical Specification Group Radio Access Network; Physical Layer; General Description (Release 10)*, March 2011.
4. 3GPP TR 25.814 V.7.1.0, *Technical Specification Group Radio Access Network; Physical Layer Aspects for Evolved Universal Terrestrial Radio Access (UTRA) (Release 7)*, September 2006.
5. 3GPP TS 36.104 V9.2.0, *Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (FDD) (Release 9)*, December 2009.
6. 3GPP TS 36.101 V9.2.0, *Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (FDD) (Release 9)*, December 2009.
7. 3GPP TS 36.942 V9.0.1, *LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Frequency (RF) system scenarios (Release 9)*, April 2010.
8. 3GPP TS 45.005 V9.3.0. Technical Specifications Group GSM/EDGE Radio Access Network; Radio Transmission and Reception (Release 9), May 2010.

**3GPP2 Specifications:**

1. 3GPP3 C.20010-C Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations, Release C, February 2006.
2. 3GPP2 C.S0011-C Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations, Release C, Version 2.0, February 2006.
3. 3GPP2 C.S0057-D Band Class Specification for cdma2000 Spread Spectrum Systems, Revision D, September 2009.
4. 3GPP2 C.S0002-E Physical Layer Standard for cdma2000 Spread Spectrum Systems, Revision E, September 2009.

**ITU-R Recommendations:**

1. ITU-R Recommendation M.1580-3. *Generic Unwanted Emission Characteristics of Base Stations Using the Terrestrial Radio Interfaces of IMT-2000.* Working Party 5D, International Telecommunications Union, June 2009.
2. ITU-Recommendation SM.329-10. Unwanted Emissions in the Spurious Domain. International Telecommunications Union, 2003.
3. ITU-R Report M.2039. *Characteristics of Terrestrial IMT-2000 Systems for Frequency Sharing/Interference Analysis.* International Telecommunications Unions, 2004.
4. ITU-R Recommendation M.1036-3. *Frequency Arrangements for the Implementation of the terrestrial component of International Mobile Telecommunications-2000 (IMT-2000) in the bands 806-960MHz, 1710-2025MHz, 2110-2200MHz and 2500-2690MHz.* International Telecommunications Union, 2007.
5. ITU-R Recommendation P1546-4. *Method for point-to-area predictions for terrestrial services in the frequency range 30MHz to 3000MHz.* International Telecommunications Union, 2009.

# Appendix A: Propagation using ERC-68 Modified Hata for Urban Areas

The propagation modelling applied to the device boundary criterion calculation is that defined in European Radiocommunications Commission Report 068 “*Monte-Carlo Simulation Methodology for the use in Sharing and Compatibility Studies between Different Radio Services or Systems”*, CEPT 2002.

Calculation of Median Path Loss:

Lb = median path loss in dB.

f = frequency in MHz.

Hm = min (h1, h2) mobile station height in m.

Hb = max (h1, h2) base station height in m.

d = distance in km, less than 100km.

Case 1: d ≤ 0.04km

Case 2: d ≤ 0.1km.

Sub-case: 150MHz < f ≤ 1500MHz for urban areas.