Technical Framework Development

2.5 GHz Spectrum Licence Band

TLG-Discussion Paper No. 1
Design Requirements for the Technical Framework
Reference Technologies / Standard Trading Units / Core Condition

Document Release Information

Version	Date of Release	Remarks
1	18/08/2011	Initial Release
2	07/09/2011	Updated - MCB increased, Glossary added
3	11/10/2011	Final

1 Background

The technical framework of a Spectrum Licence consists of the following 3 interlocking components:

- The Marketing or Conversion Plan including the Draft Licence;
- The Section 145 Determination of Unacceptable Interference; and
- The Section 262 Advisory Guidelines.

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

The objectives of technical frameworks are to:

- minimise the negotiation necessary between licensees;
- maximise flexibility for the deployment of services; and to
- maximise the efficiency with which the spectrum is used.

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

The International Telecommunications Union Radiocommunications sector (ITU-R) has identified the band 2500-2690 MHz as being suitable to support terrestrial International Mobile Telecommunications-2000 (IMT-2000) services. ITU-R Recommendation M.1036-3[1] proposes frequency arrangements for this service in the band. The European Community (EC) Electronic Communications Committee (ECC) decided[2] in 2005 to introduce arrangements to support this use of the band. A number of countries have also put in place regulatory arrangements based on the frequency arrangement C1 set out in ITU-R M.1036-3[3].

[1] ITU-R Rec M.1036-3 Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications-2000 (IMT-2000) in the bands 806-960 MHz, 1710-2025 MHz, 2110-2200 MHz and 2500-2690 MHz
[2] ECC/DEC/(05)05
[3] Denmark, Finland, Hong Kong, France, Germany, New Zealand

Frequency arrangement C1 of ITU-R M.1036-3 supports both Frequency Division Duplex (FDD) systems using two frequency channels with 120 MHz split and single frequency Time Division Duplex (TDD) systems located in the 50 MHz centre gap between the FDD uplink and down link blocks. A number of overseas countries have however introduced additional flexibility by allowing for the use of TDD at the top of the band and the top of the lower block of FDD segments[4].

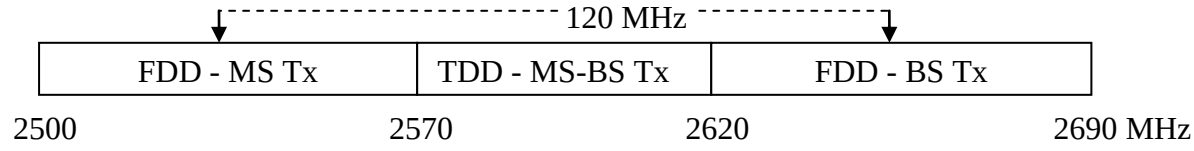

Figure 1 - ITU-R M.1036-3 Frequency arrangement C1

The ACMA 2.5 GHz Band Review[5] identified a preferred outcome from the review of the band and this was supported by responses to the discussion paper that the existing Electronic News Gathering (ENG) services in the band should be given access to the central TDD band 2570-2620 MHz and the rest of the band in Australia should be made available to support Wireless Access Services (WAS) including IMT-2000 services. To facilitate this support for WAS in the rest of the band the ACMA seeks to develop a spectrum licence technical framework for the 2 x 70 MHz FDD portion of the band with the assistance of this TLG.

2 Introduction

This discussion paper looks at the following items[6];

- the reference technologies;
- the standard trading unit, and minimum contiguous bandwidth;
- the out-of-area emission limit; and
- the out-of-band emission limits.

The last two items, together with the frequency and geographic boundaries, make up the core conditions of the spectrum licence as defined in Section 66 of *the Act*. This discussion paper examines each of these four items of the framework, looking at arrangements in place overseas and the proposed arrangements in Australia to support WAS while being mindful of the need to enable ENG services in the band 2570-2620 MHz across Australia. An outline of the reasoning leading to selection of proposed limits for the technical framework is provided.

This is a discussion paper and the views and suggestions of the members of the technical liaison group are sought as to the relevance and suitability of the proposed values.

[4] Netherlands, United Kingdom
[5] Review of the 2.5 GHz band and long-term arrangements for ENG, ACMA January 2010.
[6] A second paper will look at system and propagation modelling leading to the development of the determination of unacceptable interference. A third paper will look at the interference protection to and from systems operating in adjacent spectrum.

3 Reference Technologies

There are five proposed reference technologies[7] that will be specifically considered in the development of the framework. They are:

ENG	Single frequency	See ITU-R F.1777
UMTS (UTRA)	Two frequency (FDD)	Fixed and mobile
LTE (E-UTRA)	Two frequency (FDD)	Fixed and mobile
TD-SCDMA	Single frequency (TDD)	Fixed and mobile
WiMAX	Single frequency (TDD)	Fixed and mobile

This does not exclude other technologies from being used under the framework. Rather, it is proposed that the framework will be developed with specific reference to these five technologies. These technologies include both FDD and TDD systems however due to the configuration of the band and in line with international harmonisation of arrangements the proposed framework will primarily support FDD. The use of the ENG characteristics in ITU-R F.1777 is primarily for the purposes of interference and compatibility studies.

4 Standard Trading Unit and Minimum Contiguous Bandwidth

Previously spectrum licence technical frameworks were based on use of a Standard Trading Unit (STU) that defined the minimum unit for the trading of spectrum under spectrum licensing. The size of the STU was defined in terms of both geographic area and frequency bandwidth. The geographic area was defined using the ACMA's Spectrum Map Grid that was referenced to the Australian Geocentric Datum AGD66. See Figure 2 below.

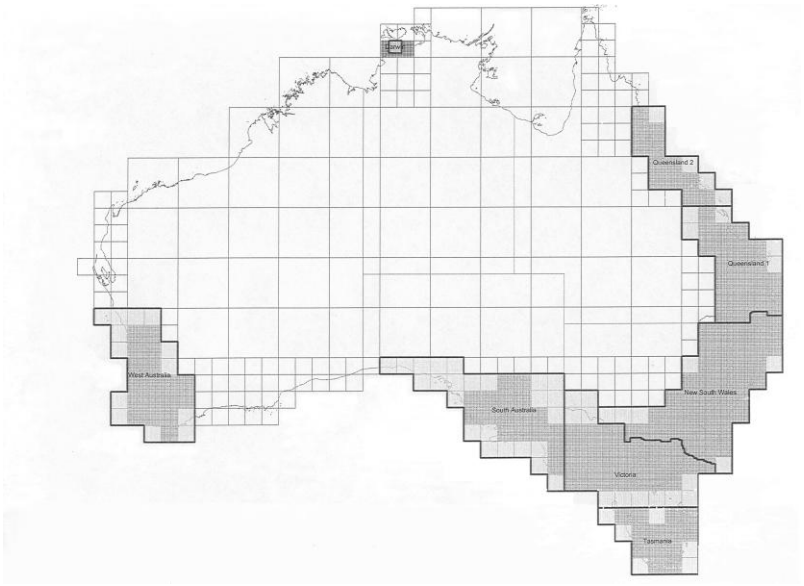

Figure 2 – The Old Spectrum Map Grid

The ACMA in its ongoing review of spectrum license technical frameworks[8] has decided to move away from specifying an STU in each band to increase flexibility and better facilitate secondary trading particularly in remote and regional areas. As part of this move the ACMA

[7] Specifications and/or values used in relation to these technologies are set out in the 2nd TLG paper.
[8] Spectrum Licensing review paper reference.

has decided to adopt a uniform 5 minutes of arc map grid and using coordinates specified using the current Australian datum used for mapping and surveying.

The ACMA is currently in the process of updating its systems to make use of the Geocentric Datum of Australia GDA94 across its entire radiocommunications database. This new datum provides better alignment with the coordinates generated by the GPS system among other advantages. The change of datum however leads to a non uniform translation of points along a line so altering the shape and areas within the grid. The spectrum licence areas in other spectrum licence bands will be translated to ensure they are as similar as practical to the existing areas. For more information see Attachment A.

The ACMA does not intend to include the area of the Mid-western Radio Quiet Zone in the area designated by the Minister of Communication and the Digital Economy for spectrum licensing in the 2.5 GHz band. This area, defined as being within 70 km of the point latitude 26^{o} 42' 15" S longitude 116^{o} 39' 32" E, is located in central Western Australia. The 2.5 GHz spectrum licence technical framework is likely to include additional coordination requirements for the registration of transmitters under spectrum licenses adjacent to this area.

The bandwidths specified for STUs in previous spectrum licence frameworks were typically chosen to be the bandwidth necessary to support one radiocommunications channel using the most likely technology to operate in the band. In the case of the 2.5 GHz band, the range of possible bandwidths extends from 1.25 MHz to 5 MHz with a number of technologies designed optimally to operate in a 5 MHz block. For instance the narrow band TD-SCDMA technology has been designed to support 3 channels within a 5 MHz block.

Under the new spectrum licence arrangements the ACMA is adopting a minimum tradable bandwidth of 1 Hz for all new spectrum licenses to maximise trading flexibility.

The minimum contiguous bandwidth (MCB) requirement of previous frameworks has been maintained to minimise spectrum fragmentation. However additional flexibility has been added by making the limit a recommended value. The ACMA may upon request consider allowing a licensee to hold an amount less than the stated MCB for the band where there are special circumstances.

Previous MCBs have been chosen based on both system technical requirements and marketing goals. From a technical perspective, the MCB should support system coverage of the licence area. For example, sufficient aggregated bandwidth needs to be provided to give a licensee enough bandwidth to support a practical or viable system.

4.1 International Arrangements

Internationally arrangements across Europe and Asia have identified spectrum to support both FDD and TDD systems with frequency arrangements conforming to arrangement C1 of ITU-R Recommendation M.1036. Additional spectrum has in a number of cases been identified where TDD systems might be used beyond that within the 50 MHz mid-band gap. To allow both FDD and TDD systems in the same geographic area there will be a bandwidth (guard band) and filter cost to be absorbed between uncoordinated / mobile system users.

The European Commission decision of 13 June 2008[9] identified a minimum block size of 5 MHz and the use of a Block Edge Mask (BEM)[10]. The bandwidth (block size) chosen in Europe was designed to support the operation of the UMTS services. Elsewhere, Japan has identified 10 MHz blocks for the TDD licenses it granted during 2008 in the band.

4.2 Australian spectrum licence arrangements

The geographic areas of the auction lots will be constructed from units in the ACMA's new spectrum map grid specified in coordinates referenced to GDA94. The frequency limits of the auction lots will be constructed with bandwidths that will be equal to or greater than the recommended MCB.

4.3 Proposed Recommended Minimum Contiguous Bandwidth

The choice of an appropriate recommended MCB has been made after careful consideration of the reference technologies, the need to harmonise with international arrangements and the recognised demand for high speed data services. The proposed minimum contiguous bandwidth takes into account the growing demand for high speed services. The recommended MCB is arguably large enough to viably support variants of all the proposed reference WAS technologies.

The proposed recommended minimum contiguous bandwidth (MCB) for the technical framework of the 2.5 GHz Spectrum Licence bands is 10 MHz.

The proposed recommended MCB bandwidth of 10 MHz is larger than that in 2 GHz spectrum licence bands, five that in the 3.4 GHz bands (2.5 MHz) and nearly three times greater than that in the 2.3 GHz band (3.5 MHz). The bandwidth accommodates all current high speed wireless access system and has been used overseas. The flexibility of the new spectrum licence framework arrangements (minimising the STU bandwidth and adding flexibility to the MCB) mean that there is no reason to have a smaller value in this band.

It is intended to pair the frequencies of the upper and lower band segments so as to support FDD two frequency systems as this best fits the expected use in areas with the highest density of radiocommunications services. The inherently greater isolation available between FDD base station transmitters and receivers reduces the risk of near-far[11] interference and minimises the risk of receiver intermodulation and transmitter out-of-band emission interference. This maximises the spectrum available at auction by reducing the need for additional guard bands or restricted use bands between licensees.

This pairing does not however preclude the possible use of TDD systems and it will still be necessary to consider the potential issues caused by the use of TDD systems in, as well as adjacent to, the bands 2500-2570 MHz and 2620-2690 MHz. This does however have a potential cost in terms of spectrum efficiency and the complexity of the technical framework

[9] 2008/477/EC on harmonisation of the 2500-2690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the community.
[10] BEM were derived in CEPT Report19 and ECC Report131 TLG members are urged to read these reports.
[11] Near-far interference is interference caused to the reception of signal from a distant transmitter when located in close proximity to a transmitter operating on a different frequency.

of the licence within the bands 2500-2570 MHz and 2620-2690 MHz. Where possible, the impact on FDD services will be minimised.

TDD systems typically require additional guard bands and/or guard space requirements over that required for FDD systems to protect against high site to high site interference between the base stations of different licensees where there is no agreement or synchronisation. In a strict two band FDD arrangement the mid band gap is effectively a shared guard band between FDD licensees. In mobile FDD systems the guard bands and guard space are only required to protect against high site to low site interference where there is typically greater path loss.

5 Out-of-Area Emission Limit (a licence core condition)

Emissions that fall outside the geographic area of a spectrum licence are limited by a core condition of the licence. The form of this condition (found in the sample licence in the marketing plan) places an overall cap on the horizontally radiated power anywhere in the area of the license and thus towards adjacent licenses.

The limit expressed this way directly affects the risk of receiver overload and the levels of site generated intermodulation products that may cause interference to receivers in close proximity. The limit is expressed as a per unit bandwidth value to ensure flexibility between different bandwidth systems. However this gross value is typically unsuitable for coordination between co-frequency systems in adjacent areas.

Another part of the technical framework that helps to control the level of emissions across the geographic boundary between co-frequency areas is found in the Determination of Unacceptable Interference made under Section 145 of *the Act*. The development of this determination will be discussed in the next TLG paper. The Out-of-Area Emission Limit in the licence is generally chosen to encompass transmitter powers likely to be implemented while allowing for likely technology developments.

5.1 Overseas limits (European BEM)

The BEM model in EC decision 2008/477/EC adopted maximum in-block e.i.r.p limits of 61 dBm/5MHz for FDD and TDD base stations, 25 dBm/5MHz for restricted block stations [12] and 35dBm/5MHz for terminal stations. There is also a provision in the decision for member states to increase the base station maximum in-block limit to 68 dBm/5MHz for specific deployments in low population areas provided the risk of terminal station blocking is not significantly increased e.g. through restrictions on base station location or other constraints.

These limits determined in CEPT Report 19 are based on least restrictive technical conditions developed to support the Urban Macro-cell model (see Figure 3) in the band using current cellular equipment technology. The figure of 68 dBm/5MHz allows for larger rural cells although user terminal device limitations will typically limit cell size. In rural areas base stations are likely to have greater antenna height and physical separation from user terminal units than in urban areas that will minimise the risk of receiver blocking.

[12] The restricted block referred to is a 5 MHz guard block between high power FDD and TDD services. The block provides a guard band which together with appropriate filtering minimises interference between the two systems. This block may be used by low power or indoor stations on a no interference no protection basis.

This figure is a suitable starting point for consideration of the likely maximum horizontally radiated true mean power to feed into an Australian spectrum licence out-of-area emission limit. There is no need to specify levels for terminal or restricted block devices in this part of the Australian spectrum licence technical framework as arrangements covering low power devices including mobiles and other user terminal equipment will be covered in other papers.

This European figure can be converted to the form of out-of-area emission limit used in Australian spectrum licences i.e. a horizontally radiated maximum true mean power by adjusting for bandwidth and incorporating antenna down tilt.

68 dBm/5MHz - 22 dB (BW 5 MHz to 30 kHz) – 3 dB (down tilt) = 43 dBm EIRP/30kHz

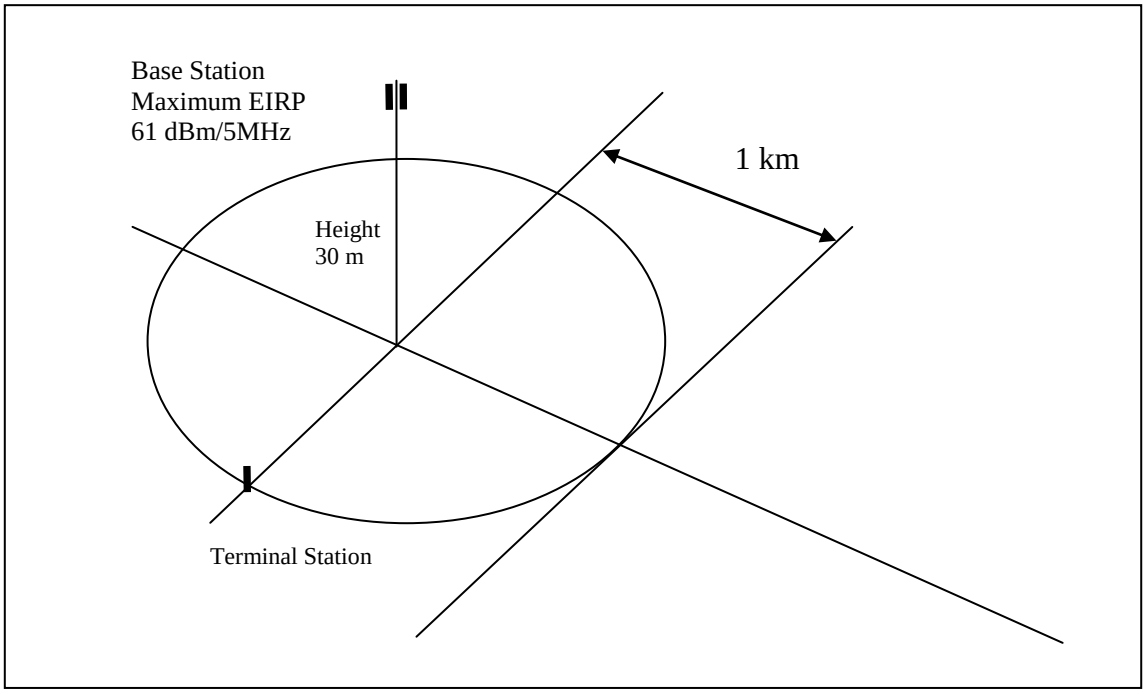

Figure 3 – Urban Macro-cell Model

5.2 Proposed Out-of-Area Emission Limit

The figure for the Out-of-Area Emission limit is based on the maximum in-block limit identified in the European arrangements with an additional factor of 2 dB added to cover future technological development over the period of the licence.

The proposed out-of-area limit is a horizontally radiated power of 45 dBm EIRP per 30 kHz for spectrum licences in the 2.5 GHz band.

This limit is equal to that for TDD services in the 2 GHz spectrum licence framework although less than that for FDD services (55 dBm EIRP/ 30 kHz). It is also less than that for 3.4 GHz (52 dBm/ 30 kHz) spectrum licences. While it could be argued that the figure should be increased slightly over the 2 GHz licence FDD values because of higher frequency dependant propagation losses, the 2 GHz licence FDD value incorporates a significant margin for technological change (>10 dB) that has proved unnecessary.

This margin has been found in practice not to be required. The highest power base station in the 2 GHz band has a maximum EIRP of 42.2 dBm/ 30 kHz and this does not take into account antenna down tilt. A higher limit is not needed because the per unit bandwidth limit accommodates the technological change towards broader bandwidth systems and coverage is typically limited by user uplink path.

The greater data rate capacity has proved to be more important than coverage as the number of cell sites have increased. The proposed value also better reflects harmonised values used overseas and helps protect TDD and 'TDD like' ENG services operating in the mid-band gap from receiver blocking.

The use of the much higher value in the 2.3 GHz band (60 dBm/ 30 kHz) was necessary to accommodate the then existing high power analogue MDS services in that band lead to a framework with a larger site interference self management zone for licensees amongst other interference mitigation requirements to manage adjacent channel issues.

6 Out-of-Band Emission Limits (a licence core condition)

Out-of-band emission limits are another core condition of the licence. These limits control emissions affecting licensees in adjacent holdings across the frequency boundaries of the licence. These limits also include requirements for both non-spurious unwanted emissions and spurious emissions.

Non-spurious unwanted emissions are modulation-generated noise or intermodulation products caused by the transmission of information, or broadband noise generated by the transmitter. Spurious emissions are emissions including intermodulation products, harmonics and frequency conversion products not associated with the transmission of information by the transmitter.

6.1 Overseas Limits

The BEM model in EC decision 2008/477/EC adopts out-of-block levels for unrestricted base station blocks and restricted blocks as developed in CEPT Report 19. ECC Report 131[13] later developed out-of-block masks for terminal stations operating in different parts of the band and this information was used to update CEPT Report 19. The out-of-block masks and baseline limits developed in both reports apply to both FDD and TDD systems. These limits are built upon the adjacent band compatibility studies in ECC Report 45[14].

[13] ECC Report 131Derivation of a Block Edge Mask (BEM) for terminal stations in the 2.6 GHz band (2500-2690 MHz) Dublin 2009

[14] ECC Report 45 "Sharing and Adjacent Band Compatibility between UMTS/IMT-2000 in the band 2500-2690 MHz and Other Services" Granada, February 2004

The baseline level for emissions from base station transmitters is -45 dBm/MHz. This figure applies FDD uplink band and the mid band gap up to the 5 MHz shoulder of the FDD downlink band. The baseline level for restricted block transmitters beyond the shoulders of the mask is -22 dBm/MHz. The baseline level for terminal station transmitters beyond the shoulders of the mask is a limit of -19 dBm/MHz. The differences in these three figures primarily reflect the differences in interference risk due to transmitter antenna location and height. (See updated version of CEPT Report 19 Annex IV Tables A4.1 through 7)

The shoulders of the European unrestricted base station block mask fall on the 5 MHz blocks adjacent either side of the licence band at a level of +4 dBm/MHz. Close to the block or licence boundary (within 1 MHz) narrowband emission requirements specified in a 30 kHz bandwidth apply. The narrowband requirements for base station transmitters are +3 dBm/30kHz for 0 to 200 kHz offset before falling off at a rate of 15 dB/MHz out to 1 MHz.

The shoulders of the block mask for transmitters in the restricted block falling on the 5 MHz blocks either side of the licence band at a level of -18 dBm/MHz. The narrowband requirements for the restricted block emissions are -19 dBm/30kHz for 0 to 200 kHz before falling off at a rate of 15 dB/MHz out to 1 MHz.

The shoulders of terminal station masks vary between CEPT Report 19 and ECC Report 131. The first 5 MHz block on either side of the licence has a maximum level of +1.6 dBm/5MHz and the next block either side of the licensed band a level of -10 dBm/5MHz in ECC Report 131. CEPT Report 19 is more specific in determining common narrowband levels. The narrowband requirements for terminal stations are -15 dBm/30kHz for 0 to 1 MHz offset to account for peak to average changes and -10 dBm/MHz from 1 MHz to 5 MHz and -13 dBm/MHz for offsets of 5 to 6 MHz and -19 dBm/MHz elsewhere in the band.

	Base	Restricted	Terminal
In-Band	+61 dBm/5MHz	+25 dBm/5MHz	+35 dBm/5MHz
0 – 200 kHz	+3 dBm/30kHz	-19 dBm/30kHz	-15 dBm/30kHz
200 kHz – 1 MHz	+3 – 15 * (Δf + 0.2) dBm/30kHz	-19 - 15 * (Δf + 0.2) dBm/30kHz	-15 dBm/30kHz
1 – 5 MHz	+4 dBm/MHz	-18 dBm/MHz	-10 dBm/MHz
5 – 6 MHz			-13 dBm/MHz
Baseline			
FDD uplink band	-45 dBm/MHz	-22 dBm/MHz	-19 dBm/MHz
TDD band less guard band	-45 dBm/MHz	-22 dBm/MHz	-19 dBm/MHz
FDD downlink band	+4 dBm/MHz	-22 dBm/MHz	-19 dBm/MHz

Figure 4 – European BEM emission limits

6.2 Proposed Out-of-Band Emission Limits

The proposed out-of-band emission limits have been derived from the CEPT Report 19 BEM models. Spectrum use in and adjacent to the 2.5 GHz band is remarkably similar in all three ITU-R regions and is one of the reasons for international harmonisation of the band for WAS. The compatibility studies of ECC Report 45 are applicable to the Australian environment. The proposed limits are based on the unrestricted base station requirements in the upper band and for the terminal station in the lower band from the latest version of CEPT Report 19 and are suitable for both FDD and TDD use in those bands.

The proposed out-of-band emission limits differentiate between the FDD up link and the FDD down link frequency bands rather than by the type of device used. The narrowband emission limits close to the frequency boundary of the licence in the FDD down link band are comparable with those for TDD services in the Australian 2 GHz spectrum licence (+4 dBm EIRP per 30 kHz) and therefore provide the necessary technology flexibility to support TDD use. The out-of-band emission limits of the FDD uplink band will impact on TDD use of that band unless a future TDD licensee purchases sufficient guard band.

Australian equivalents to the restricted blocks (guard bands) of the European model will initially only be located at either end within the 50 MHz of the mid-band gap to be used by ENG services and licensed to ENG licensees. To operate TDD systems outside the mid-band gap eg within the bands 2500-2570 MHz and 2620-2690 MHz in the future, under this proposed Australian spectrum licence framework it will be necessary for TDD system operators to acquire sufficient spectrum to protect existing licensees and themselves. eg To acquire sufficient spectrum to provide internal guard band / restricted block within the licence.

To make future TDD use possible the +4 dBm/MHz EIRP shoulder in the FDD down link segment will be restricted to the 5 MHz either side of the licence. This makes the out-of-band filter requirements for all licensees the same and does away with the need for floating restricted blocks or guard bands within the FDD down link segment making more spectrum available.

The additional spectrum required by a TDD licensee will be minimised where the TDD licensee purchases spectrum at the edges of the sub-bands. Deployment constraints will be developed in later TLG discussion papers in order to provide the necessary guard space within the licence area to protect co-frequency TDD licensees. Previous Australian spectrum licences a step mask rather than a slope mask and this is proposed limits in these limits.

The tight baseline levels of the European BEM models in and outside the 2.5 GHz bands have been implemented in the proposed limits. These baseline levels are significantly lower than in many of the current spectrum licence frameworks. For example in the 2 GHz licence the level beyond an offset of 5 MHz is -30 dBm/30kHz.

The proposed limits on non-spurious out-of-band emissions from a transmitter operated under a 2.5 GHz band spectrum licence for the core conditions of the licence are:

For transmitters operating in the lower band (2500-2570 MHz) the radiated maximum true mean power limits for out-of-band emissions in the bands within the following offsets from the upper and lower limits of the licence are:

(i) for an offset of 0 MHz to an offset of 1 MHz - a radiated maximum true mean power of -15 dBm/30kHz;
(ii) for an offset of 1 MHz to an offset of 5 MHz - a radiated maximum true mean power of -10 dBm/MHz;
(iii) for an offset of 5 MHz to an offset of 6 MHz within the band 2494-2575 MHz - a radiated maximum true mean power of -13 dBm/MHz; and
(iv) for an offset of 6 MHz or greater within the band 2490-2700 MHz - a radiated maximum true mean power of -19 dBm/MHz.

Continued over

For transmitters operating in the upper band (2620-2690 MHz) the radiated maximum true mean power limits for out-of-band emissions in the bands within the following offsets from the upper and lower limits of the licence are:

(i) for an offset of 0 MHz to an offset of 1 MHz - a radiated maximum true mean power of +3 dBm/30kHz;

(ii) for an offset of 1 MHz to an offset of 5 MHz - a radiated maximum true mean power of +4 dBm/MHz; and

(iii) for an offset of 5 MHz or greater within the band 2490-2800 MHz - a radiated maximum true mean power of -45 dBm/MHz.

Equipment manufactures[15] responding to the proposals in CEPT Report 19 indicated that the -45 dBm/MHz level would be difficult to achieve within 5 to 10 MHz of the base station. However these levels appear to have since been met overseas and are necessary to support both the in-band and out-of-band services. Concerns regarding risk of introducing an additional failure point in the additional filtering are however balanced by the greater interference protection provided by the filtering. The Figures 5 and 6 below show the proposed out-of-band emission limits for the spectrum licence.

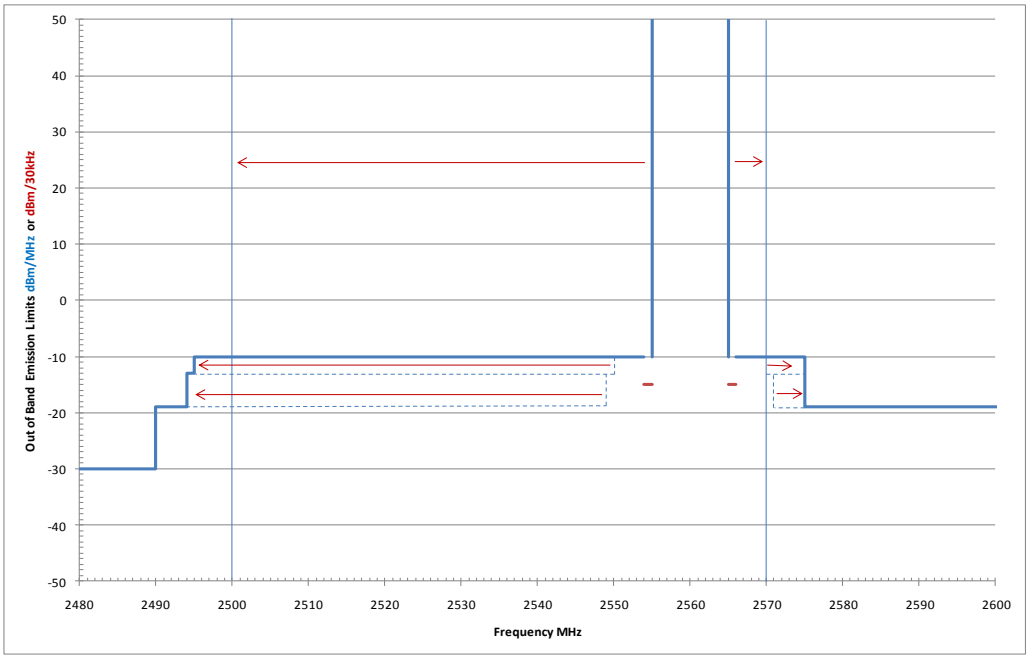

Figure 5 – Licence Out-of-Band Emission Limits - Lower Band

[15] Nokia, Ericson Annex VI CEPT Report 19.

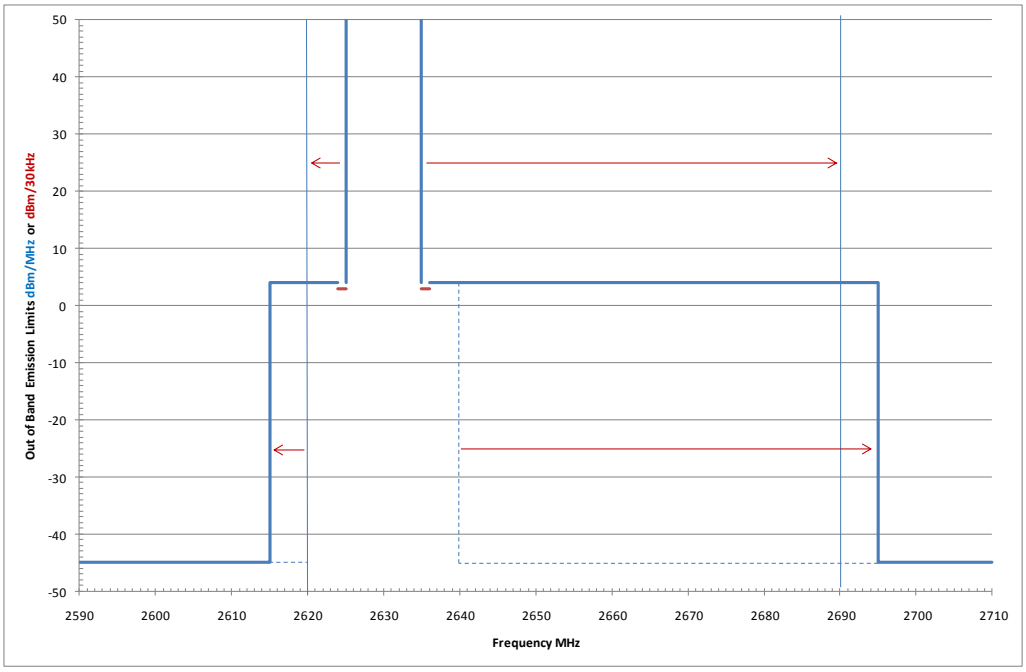

Figure 6 – Licence Out-of-Band Emission Limits – Upper Band

6.3 Proposed Out-of-Band Spurious emission limits

The proposed limits for spurious emissions have been based on arrangements and limits found in CEPT/ERC/REC 74-01, ITU-R SM329 and the ITU-R Radio Regulations Appendix 3. The limits are applicable outside the band 2490-2700 MHz.

The proposed limits on radiated out-of-band spurious emissions from transmitters operated under a 2.5 GHz band spectrum licence for the core conditions of the licence are:

(i) within the band 9 kHz to 150 kHz - a radiated maximum mean power of -36 dBm per 1 kHz EIRP;

(ii) within the band 150 kHz to 30 MHz - a radiated maximum mean power of -36 dBm per 10 kHz EIRP;

(iii) within the band 30 MHz to 1 GHz - a radiated maximum mean power of -36 dBm per 100 kHz EIRP;

(iv) within the band 1 GHz to 2.49 GHz - a radiated maximum mean power of -30 dBm per 1 MHz EIRP;

(v) within the band 2.7 GHz to 2.8 GHz – a radiated maximum mean power of -45 dBm per 1 MHz EIRP; and

(vi) within the band 2.8 GHz to 12.5 GHz – a radiated maximum mean power of -30 dBm per 1 MHz EIRP.

The proposed limits on radiated out-of-band spurious emissions from receivers operated under a 2.5 GHz band spectrum licence for the core conditions of the licence are:

(i) within the band 30 MHz to 1 GHz - a radiated maximum mean power of -57 dBm per 100 kHz EIRP; and

(ii) within the band 1 GHz to 12.5 GHz - a radiated maximum mean power of -47 dBm per 1 MHz EIRP.

The proposed limits are comparable with limits set out in the 2 GHz and 3.4 GHz spectrum licences. The diplexer filtering necessary to manage out-of-band unwanted emissions as well as antenna gain roll off mean that typically the radiated spurious emission levels will be met without additional filtering. The emission levels are based on the less demanding of the limits for fixed services and for mobile services specified in CEPT/ERC/REC 74-01.

6.4 Other Emission Limits

The maximum level of emissions outside the band of the licence for a particular transmitter registered under the spectrum licence could be constrained to levels below the proposed limits by the need to coordinate with existing services operating in adjacent spectrum.

For example, when coordinating a proposed transmitter at a site near radio astronomy facilities at Parkes and Narrabri, ENG collection stations, radar facilities at major airports and weather radar sites. Coordination requirements for stations operated under the 2.5 GHz band spectrum licences with stations operated under other licences are outlined in the Radiocommunications Advisory Guidelines for the 2.5 GHz band, another part of the technical framework to be discussed in a latter TLG discussion paper.

7 Comment Period

The comment period for this release of the discussion paper closes 10 October 2011. Comment and proposals for changes to this first discussion paper should be made on the 2.5 GHz Spectrum Licence TLG SharePoint site.

Glossary

AGD66 – Australian Geocentric Datum 1966

BEM – Block Edge Mask [See CEPT Report 19]

BS – Base Station(s)

CEPT – Conference European of Postal and Telecommunications

DVBT – Digital Video Broadcasting Terrestrial

E - East

EC – European Community

ECC – EC Electronic Communications Committee

ENG – Electronic News Gathering [includes television outside broadcasting and program making]

FDD – Frequency Division Duplex

GDA94 – Geocentric Datum of Australia 1994

GPS – Geographic Positioning System

IMT-2000 – International Mobile Telecommunications-2000 [A group of wireless technologies identified for mobile communications]

ITU-R – International Telecommunications Union Radiocommunications Sector

LTE – Long Term Evolution [A WAS technology]

MCB – Minimum Contiguous Bandwidth

MS - Mobile Station(s) [See also UE]

S – South

STU – Standard Trading Unit

TDD – Time Division Duplex

TD-SCDMA – Time Division Synchronous Code Division Multiple Access

TS - Terminal Station [Communicates with a BS typically lower power fixed or nomadic]

TLG – Technical Liaison Group

UE – User Equipment [Includes MS and other Terminal Equipment]

UMTS – Universal Mobile Telecommunications System

UTRA – Universal Terrestrial Radio Access

WAS – Wireless Access Services [Wireless links providing connection to the digital broadband network]

WiMAX – Worldwide interoperability for Microwave Access [A WAS technology]