Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 1800 MHz Band) 2012

Radiocommunications Act 1992

The AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY makes these Advisory Guidelines under section 262 of the *Radiocommunications Act 1992*.

Dated *26 September* 2012

Chris Chapman
[signed]
Member

Brendan Byrne
[signed]
~~Member~~/General Manager

Australian Communications and Media Authority

1 Name of Advisory Guidelines

These guidelines are the *Radiocommunications Advisory Guidelines (Managing Interference from Spectrum Licensed Transmitters — 1800 MHz Band) 2012*.

2 Commencement

These guidelines commence on 18 June 2013.

Note All legislative instruments and compilations are registered on the Federal Register of Legislative Instruments kept under the *Legislative Instruments Act 2003*. See http://www.frli.gov.au.

3 Revocation

The *Radiocommunications Advisory Guidelines (Protection of Apparatus-licensed and Class-licensed Receivers – 1800 MHz Band) 1999* are revoked.

4 Purpose of these guidelines

(1) The purpose of these guidelines is to manage interference to apparatus licensed or class licensed radiocommunications receivers operating in or adjacent to the 1800 MHz band:
   (a) outside the spectrum licensed bands; or
   (b) outside the spectrum licensed areas.

(2) The ACMA will take these guidelines into account in determining whether a spectrum licensed radiocommunications transmitter is causing interference to an apparatus licensed or class-licensed radiocommunications receiver operating in any of the circumstances set out in these guidelines. These guidelines do not prevent a licensee negotiating other protection requirements with another licensee.

5 Interpretation

(1) In these guidelines, unless the contrary intention appears:

3GPP TS 45.005 means the technical specification "3GPP TS 45.005 Version 9.3.0 (2010-05), 3rd Generation Partnership Project, Technical Specification Group GSM/EDGE Radio Access Network, Radio Transmission and Reception (Release 9)" published by the 3rd Generation Partnership Project in May 2010, as in force from time to time.

Note: This 3GPP specification can be accessed through the 3GPP website.

1800 MHz band means the frequency bands:

(a) 1710 MHz – 1785 MHz (the ***1800 MHz Lower band***); and

(b) 1805 MHz – 1880 MHz (the ***1800 MHz Upper band***).

Act means the *Radiocommunications Act 1992.*

ARSP means the *Australian Radiofrequency Spectrum Plan 2009* as in force from time to time.

in-band means:

(a) for a radiocommunications transmitter or radiocommunications receiver operated under a spectrum licence, the frequencies within the frequency band in which operation of those radiocommunications devices is authorised under the licence; and

(b) for a radiocommunications transmitter or radiocommunications receiver operating under an apparatus licence, the frequencies within the lower frequency limit and the upper frequency limit specified in the licence.

ITU means the International Telecommunication Union.

ITU-R means the ITU Radiocommunications sector.

ITU-R Recommendation means a Recommendation made by the ITU-R as in force from time to time.

Note ITU-R Recommendations are available from the ITU website: http://www.itu.int.

out-of-band means:

(a) for a radiocommunications transmitter or radiocommunications receiver operated under a spectrum licence, the frequencies outside the frequency band in which operation of those radiocommunications devices is authorised under the licence; and

(b) for a radiocommunications transmitter or radiocommunications receiver operating under an apparatus licence, the frequencies outside the lower frequency limit and upper frequency limit specified in the licence.

RALI FX 3 means the Radiocommunications Assignment and Licensing Instruction No. FX 3, Microwave Fixed Services Frequency Coordination, published by the ACMA, as in force from time to time.

Note Copies of RALI FX 3 are available from the ACMA website.

RALI MS 31 means the Radiocommunications Assignment and Licensing Instruction No. MS 31, Notification Zones for Apparatus Licensed Services Around Radio Astronomy Facilities, published by the ACMA, as in force from time to time.

Note Copies of RALI MS 31 are available from the ACMA website.

RALI MS 34 means the Radiocommunications Assignment and Licensing Instruction No. MS 34 published by the ACMA, as in force from time to time.

Note Copies of RALI MS 34 are available from the ACMA website.

section 145 Determination means the *Radiocommunications (Unacceptable Levels of Interference – 1800 MHz Band) Determination 2012.*

(2) Unless the contrary intention appears, terms used in these guidelines that are defined in the section 145 Determination have the same meaning as in that determination.

Note The following terms that are used in these guidelines are defined in the section 145 Determination:

- EIRP
- fixed receiver
- fixed transmitter
- geographic area
- mobile transmitter
- Radio Regulations.

(3) Unless the contrary intention appears, terms and expressions used in these guidelines that are defined in the *Radiocommunications (Interpretation) Determination 2000* have the meanings given to them by that determination.

Note 1 The following terms that are used in these guidelines are defined in the *Radiocommunications (Interpretation) Determination 2000*:

- land station
- mobile station
- PMTS Class B
- PMTS Class C
- PTS
- PTS licence
- public mobile telecommunications service
- station

Note 2 A number of terms used in these guidelines are defined in the Act and, unless the contrary intention appears, have the meaning given to them by the Act. These include:

- ACMA
- apparatus licence
- class licence
- core condition
- frequency band
- interference
- radiocommunications receiver
- radiocommunications transmitter
- Register
- spectrum licence

Part 1 Background

The 1800 MHz band has been allocated for spectrum licensing in capital cities (1710-1785 MHz paired with 1805-1880 MHz) and regional areas (1710-1725 MHz paired with 1805-1820 MHz). Radiocommunications receivers of apparatus licensed and class licensed services operate in and adjacent to these frequency bands. These receivers may suffer interference from unwanted emissions and blocking, caused by a radiocommunications transmitter operating under a spectrum licence in the 1800 MHz band.

Unwanted emissions are by-products of a radiocommunications transmitter's emissions and include broadband noise, harmonics, intermodulation products, transient signals and other spurious signals. Blocking occurs when a high level off-tune signal overloads a radiocommunications receiver's front-end and causes a degradation in the quality of the wanted output signal. Intermodulation products can be generated in-band in the input stages of receivers in the presence of two or more high level signals at the receiver input.

These guidelines have been made for the management of these types of interference to licensed radiocommunications receivers operating in the following circumstances:

- Point-to-point fixed services operating in and adjacent to the 1800 MHz spectrum licensed bands (Part 2 of these guidelines);
- Meteorological-satellite services operating in the band below 1710 MHz, adjacent to the 1800 MHz spectrum licensed bands (Part 3 of these guidelines);
- Cordless communications devices authorised by a class licence and operating in the 1880–1900 MHz band (Part 4 of these guidelines); and
- Public Telecommunications Services (PTS) operating in the 1800 MHz band outside areas designated for spectrum licensing (Part 6 of these guidelines).

These guidelines also provide advice regarding:

- the protection of radio-astronomy services operating in the 1250-1780 MHz band on an opportunistic basis (Part 5 of these guidelines);
- the deployment of mobile communications on-board aircraft within the radiofrequency spectrum designated for spectrum licensing (Part 7 of these guidelines); and
- the co-existence arrangements between Public Mobile Telecommunications Service (PMTS) networks and railway networks using Global System for Mobile Communications - Railway (GSM-R) technologies, operating under 1800 MHz spectrum licences (Part 8 of these guidelines).

As radio waves propagate in different ways because of factors such as frequency, terrain, atmospheric conditions and topography, there are a number of ways to predict path loss. The ITU-R Recommendation P.1144 "*Guide to the application of the propagation methods of Radiocommunications Study Group 3*" provides a guide on

the application of various propagation methods developed internationally by the ITU-R. It advises users on the most appropriate methods for particular applications as well as the limits, required input information, and output for each of these methods. It is recommended that the most recent version of propagation models defined by the ITU-R should be considered when modelling propagation in the 1800 MHz band.

Note The use of other published propagation models applicable to the 1800 MHz band may also be suitable.

Part 2 Point-to-point fixed service receivers

2.1 Background

(1) Point-to-point fixed services in the 1800 MHz band are licensed in accordance with the frequency assignment criteria detailed in RALI FX 3. RALI FX 3 provides details about channel plans for individual microwave bands and guidance on interference criteria and frequency coordination between microwave links to achieve certain performance objectives. It provides assignment criteria for each frequency band and specifies protection ratios. The criteria are usually based on internationally accepted ITU-R Recommendations.

(2) RALI FX 3 is subject to continuing review in consultation with industry, to incorporate improved assignment techniques and changing technology requirements. Particular account is taken of changes in ITU-R Recommendations and standards made by other bodies. As revisions seek to improve spectrum access opportunities, without undue detriment to current licensees, users of RALI FX 3 are urged to consult the current version when planning systems, to increase spectrum productivity.

2.2 Point-to-point receiver categories

(1) For the purpose of these guidelines on managing interference caused by radiocommunications transmitters operating under spectrum licences, radiocommunications receivers of a fixed service operating in the 1800 MHz band are taken to belong to one of the following categories:

(a) ***Category (1)*** - a receiver operating under an apparatus licence where that licence was issued before 18 June 2013; or

(b) ***Category (2)*** - a receiver operating under an apparatus licence where that licence was issued on or after 18 June 2013.

2.3 Protection requirements

(1) The protection requirements for fixed services operating in the 1800 MHz band are specified in RALI FX 3. In planning for the operation of radiocommunications transmitters under a spectrum licence, spectrum licensees are to provide a level of out-of-band and in-band protection from those transmitters as would be provided from apparatus licensed fixed service transmitters whose frequencies are assigned in accordance with RALI FX 3.

(2) For the categories of fixed service radiocommunications receivers listed in section 2.2:

(a) Category (1) receivers are to be provided with out-of-band and in-band protection from interference according to RALI FX 3; and

(b) Category (2) receivers:

(i) are to be provided with out-of-band protection from interference according to RALI FX 3 caused by frequency adjacent radiocommunications transmitters operated under a spectrum licence that were registered in the Register after the date of issue of the apparatus licence under which the receiver operates; and

(ii) are required to accept levels of in-band emissions from a radiocommunications transmitter operated under a spectrum licence, if the radiocommunications transmitter is operated in accordance with the conditions of the spectrum licence it operates under and the section 145 Determination.

Part 3 Meteorological-satellite service (space-to-Earth)

3.1 Background

(1) The Meteorological-satellite (Met-Sat) service operates in the band below 1710 MHz and adjacent to the 1800 MHz spectrum licensed band.

(2) Met-Sat Earth stations use this band for the reception of data to assist in meteorological forecasting and other scientific purposes. The service uses both geo-stationary (GSO) and non geo-stationary (NGSO) satellite transmitters. The bands 1698–1710 MHz are typically utilised for NGSO purposes, with GSO operating below 1698 MHz (see ITU-R Recommendation SA.1745 *Use of the band 1 668.4 1 710 MHz by the meteorological aids service and meteorological-satellite service (space-to-Earth)*). Apparatus licensed Earth stations of this service require protection from spectrum licensed services in the 1800 MHz band.

(3) Out-of-band emissions from both fixed and mobile radiocommunications transmitters operated under an 1800 MHz band spectrum licence have the potential to cause interference to Met-Sat radiocommunications receivers. The potential for interference is also likely to be increased for technologies that utilise wide band emissions. Spectrum licensees should note that the protection requirements set out below apply to interference from all radiocommunications transmitters operated under their licence, including mobile transmitters.

3.2 Protection requirements

(1) The protection requirements for Met-Sat service Earth station radiocommunications receivers operating in the band below 1710 MHz are set out in the following ITU-R Recommendations:

(a) ITU-R Recommendation SA.1026-4: *Interference Criteria for Space-to-Earth Data Transmission Systems Operating in the Earth Exploration-Satellite and Meteorological-Satellite Services Using Satellites in Low-Earth Orbit*; and

(b) ITU-R Recommendation SA.1160-2: *Interference Criteria for Data Dissemination and Direct Data Readout Systems in the Earth Exploration-Satellite and Meteorological-Satellite Services Using Satellites in the Geostationary Orbit*.

3.3 Additional information on Meteorological-satellite service protection

(1) The following ITU-R Recommendations provide information on the prediction of appropriate coordination distances, propagation models, threshold coordination levels, and Earth station receiver and antenna

characteristics, that may assist in assessing compliance with interference criteria:

(a) ITU-R Recommendation SA.1027-4: *Sharing and Coordination Criteria for Space-to-Earth Data Transmission Systems Operating in the Earth Exploration -Satellite and Meteorological-Satellite Services Using Satellites in Low-Earth Orbit*;
(b) ITU-R Recommendation SA.1161-1: *Sharing and Coordination Criteria for Data Dissemination and Direct Data Readout Systems in the Earth Exploration-Satellite and Meteorological-Satellite Services Using Satellites in the Geostationary Orbit*; and
(c) ITU-R Recommendation SA.1158-3: *Sharing of the 1675-1710 MHz Band Between the Meteorological-Satellite Service (Space-to-Earth) and the Mobile Satellite Service (Earth-to-Space).*

(2) In addition to subsection (1), the following advice provides further guidance which may assist in assessing compliance with interference criteria:

(a) The main source of interference will be from a mobile transmitter operating in the 1800 MHz Lower band caused by either in-band or out-of-band emissions. The probability of interference depends not only on physical proximity to an Earth station, but also network configuration and operation, such as the mobile station EIRP level which will depend on cell size and location of the mobile transmitter relative to the base station;
(b) Liaison is encouraged between spectrum licensees and Met-Sat Earth station operators to determine additional details about specific sites which may assist in coordination. These details include:
    (i) Type of Met-Sat service (e.g. recoded data playback or direct data readout) and type of satellite orbit, GSO or NGSO;
    (ii) Met-Sat Earth station antenna azimuth and elevation, or minimum elevation angle;
    (iii) Radiocommunications receiver radiofrequency (RF) and intermediate frequency (IF) bandwidth and response (including additional filtering that may be installed); and
    (iv) Met-Sat Earth station antenna height and gain (if not available in the Register);
(c) In the event that a Met-Sat antenna radiation pattern is unavailable, ITU-R Recommendation SA.465: *Reference radiation pattern for earth station antennas in the fixed-satellite service for use in coordination and interference assessment in the frequency range 2 to 31 GHz*, may be used for coordination. Although Met-Sat Earth stations are outside the frequency range covered by this ITU-R Recommendation, the derived antenna patterns are still suitable;
(d) Coordination is performed on a first-in-time basis, therefore the operator of any new or relocated Met-Sat Earth station will need to

assess the interference potential from existing spectrum licensed services (both fixed transmitters and mobile transmitters); and

(e) Local terrain and clutter may also be taken into account.

(3) Additional information can also be found in Appendix 7 of the Radio Regulations for the determination of the coordination area around an Earth station in the frequency bands between 100 MHz and 105 GHz.

Note At the date of making these guidelines, Appendix 7 of the Radio Regulations made provision for determining the coordination area around an Earth station in the frequency bands between 100 MHz and 105 GHz.

Part 4 Cordless communications devices

4.1 Background

(1) Cordless communications devices authorised by the *Radiocommunications (Cordless Communications Devices) Class Licence 2001* operate in the frequency band 1880–1990 MHz. This band is adjacent to the 1800 MHz spectrum licensed band. Technologies which may operate in the band (as at the time these guidelines commence) are those complying with the following Digital Enhanced Cordless Telecommunications (DECT) and Japanese Personal Handyphone Service (PHS) standards:

(a) *Radiocommunications (Digital Cordless Communications Devices – DECT Devices) Standard 2007* (the DECT standard); and

(b) *Radiocommunications (Digital Cordless Communications Devices – PHS Devices) Standard 2007* (the PHS standard).

The DECT standard supports operation over the entire 1880–1900 MHz band, whilst the PHS standard restricts operation to 1895-1900 MHz.

(2) Typical applications for these devices include domestic and business telephones, as well as wireless Private Automatic Branch Exchange (PABX).

(3) European studies in the Electronic Communications Committee (ECC) Reports 96 and 146, and the European Conference of Postal and Telecommunications Administrations (CEPT) Report 41 show that no guard band is required for International Mobile Telecommunications (IMT) technologies operating below and directly adjacent to the 1880-1900 MHz band (below the 1880 MHz frequency boundary) to co-exist with DECT services operating in the band 1880-1900 MHz. This is due to the ability of DECT services to dynamically select channels located further away from the 1800 MHz frequency boundary in order to avoid interference. In order to facilitate equitable spectrum access for DECT services and services operated under a spectrum licence, a limit on the allowable radiated power of spectrum licensed devices in the 1877.5-1880 MHz segment of the 1800 MHz Upper band has been imposed. This limit is specified in paragraph 9 (g) of the section 145 Determination.

4.2 Protection requirements

Provided that a spectrum licensee complies with the in-band emission limits specified in the section 145 Determination and with all relevant core conditions of the spectrum licence, then unacceptable interference is taken not to be caused to any cordless communications device, for the purposes of these guidelines.

Part 5 Radio Astronomy Service Receivers

5.1 Background

(1) Radio Astronomy Service (RAS) radiocommunications receivers conduct passive observations in the frequency bands 1250-1780 MHz, 2200-2550 MHz, 4350-6700 MHz, 8000-9200 MHz and 16-26 GHz as indicated by Australian footnote AUS87 in the ARSP. Footnote AS87 is defined in Part 3 of the ARSP.

(2) Due to the highly sensitive nature of RAS radiocommunications receivers, spectrum licensees are requested to have regard to RAS receivers operating on frequencies in and adjacent to the 1800 MHz spectrum licensed band. A number of RAS facilities operate in bands subject to footnote AUS87 as specified in the ARSP.

(3) Footnote AUS87 indicates that there are facilities operated by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the University of Tasmania.

Note When considering Radio Astronomy sites contained in footnote AUS87, the most current version of the ARSP (available on Comlaw – www.comlaw.gov.au) should be consulted.

5.2 Protection Requirements

(1) Licensees are requested to have regard to RAS radiocommunications receivers operating on frequencies in the 1800 MHz spectrum licensed band covered by footnote AUS87 in the ARSP. Specifically this includes RAS receivers operating in the frequency range 1250-1780 MHz.

(2) While these facilities operate on a fortuitous reception basis, the ACMA encourages the direct liaison of spectrum licensees with the RAS station operators particularly during the system planning phase of new systems to minimise the potential interference impact on these stations. To this end spectrum licensees planning new registered fixed transmitters in the band are requested to follow the notification arrangements in RALI MS 31.

Note RALI MS 31 is subject to continuous review in consultation with industry. As a result users of RALI MS 31 are urged to consult the current version when planning systems. The current version of RALI MS 31 can be accessed on the ACMA website: www.acma.gov.au.

Part 6 Public Telecommunications Service

6.1 Background

(1) Public Telecommunications Services (PTS) operate in spectrum in and adjacent to areas subject to spectrum licensing in the 1800 MHz band. PTS is a service that consists of one or more base stations that are operated for the purposes of supplying a public mobile telecommunications service (PMTS). Mobile stations that communicate with PTS land stations are authorised by the *Radiocommunications (Cellular Mobile Telecommunications Devices) Class Licence 2002.*

(2) Two types of PTS licences are available in the 1800 MHz band:

(a) PMTS Class B – which authorises the use of terrestrial systems; and

(b) PMTS Class C – which authorises the use of systems onboard aircraft.

(3) The PMTS Class B licences in the 1800 MHz band are issued in accordance with the frequency assignment criteria in RALI MS 34. This RALI provides details about channel plans and guidance on interference criteria and frequency coordination procedures.

(4) RALI MS 34 is subject to continuing review in consultation with industry, to incorporate improved assignment techniques and changing technology requirements. Particular account is taken of changes in ITU-R recommendations and standards made by other bodies. As revisions seek to improve spectrum access opportunities, without undue detriment to current licensees, users of RALI MS 34 are urged to consult the current version when planning systems, to increase spectrum productivity.

(5) For the purposes of these guidelines on managing interference caused by radiocommunications transmitters operating under spectrum licences, radiocommunications receivers operating under a PMTS Class B licence in the 1800 MHz band are taken to be divided into two types:

(a) land station radiocommunications receivers – land station radiocommunications receivers operate in the 1710-1785 MHz band outside those areas subject to spectrum licensing in the 1800 MHz band; and

(b) mobile station radiocommunications receivers – mobile station radiocommunications receivers operate in the 1805-1880 MHz band outside those areas subject to spectrum licensing in the 1800 MHz band.

6.2 Protection Requirements

(1) The protection requirements for radiocommunications receivers operating under a PMTS Class B licence are specified in RALI MS 34. In planning for the operation of radiocommunications transmitters under a spectrum

licence, radiocommunications receivers operating under a PMTS Class B licence are to be provided with the protection from interference outlined in subsections (2) and (3).

Land station radiocommunications receivers

(2) Land station radiocommunications receivers:

(a) are to be provided with out-of-band protection from interference according to RALI MS 34, from spectrum licensed radiocommunications transmitters:

(i) operating in the 1800 MHz Lower band whose effective antenna height for any increment 1, $he_1(\phi_n)$, is greater than 10 metres;

(ii) that were registered in the Register after the date of issue of the apparatus licence under which the receiver operates; and

(iii) are operated in accordance with all conditions of the licence and the section 145 Determination;

(b) are required to accept levels of out-of-band interference from radiocommunications transmitters operating in the 1800 MHz Lower band whose effective antenna height for each increment 1, $he_1(\phi_n)$, is less than or equal to 10 metres and are operated in accordance with all conditions of the spectrum licence and the section 145 Determination; and

(c) are required to accept levels of in-band emissions from a radiocommunications device operated under a spectrum licence, if the device is operated in accordance with all conditions of the licence and the section 145 Determination.

Note Effective antenna height is defined in the section 145 Determination.

Mobile station radiocommunications receivers

(3) The ACMA will not regard interference from a spectrum licensed radiocommunications transmitter to a mobile station radiocommunications receiver operating in the 1800 MHz band as unacceptable if the transmitter is operated in accordance with all conditions of the licence and the section 145 Determination.

(4) PMTS Class C licences will be afforded the same protection from radiocommunications transmitters operating under a spectrum licence as they are afforded from other apparatus licensed services. As a result, radiocommunications receivers associated with a PMTS Class C licence are required to accept levels of in-band and out-of-band emissions from a transmitter operated under a spectrum licence, if the transmitter is operated in accordance with all conditions of the licence and the section 145 Determination.

Part 7 Use of Mobile Communications systems on-board Aircraft (MCA)

7.1 Background

(1) Systems are available which enable the deployment of mobile communications on-board aircraft (MCA). MCA systems are comprised of two main transmitting components:

(a) the base station (BTS) radiocommunications transmitter which is typically a low powered pico-cell connected to a leaky cable antenna system run through the passenger cabin of the aircraft; and

(b) the system controller being either a CRFMU (Cell-phone Radio Frequency Management Unit) or NCU (Network Control Unit), which transmits a broadband noise signal in mobile communications bands designed to mask reception of terrestrial mobile networks within the aircraft. The transmission of this signal is designed to control mobile terminals on-board the aircraft such that they cannot connect to the terrestrial network, may only connect to the on-board BTS and only operate at low power.

(2) It is recommended that operators of MCA systems in spectrum licensed bands adhere to the conditions of the PMTS Class C licence set out in the *Radiocommunications Licence Conditions (PTS Licence) Determination 1997*. The PMTS Class C licence authorises the operation of MCA in apparatus-licensed bands. These conditions were developed in consultation with industry and consideration of international deployments of similar systems.

(3) It should be noted that the recommendation in subsection (2) is intended to help make deployment of PTS on-board aircraft simpler by having consistent licence conditions as developed through consultation with industry. This recommendation does not obligate a spectrum licensee to issue a third party authorisation under section 68 of the Act which contains the conditions referred to in subsection (2). If a spectrum licensee requires different technical conditions to be attached to a third party authorisation, the spectrum licensee is free to do so.

7.2 Recommended MCA Technical Conditions

(1) The recommended MCA technical conditions below are a subset of the licence conditions relevant to the 1800 MHz band for PMTS Class C apparatus licences:

(a) ***Frequencies of Operation:*** Operation of the CRFMU/NCU unit and the BTS unit should be within the upper and lower frequency limits of the spectrum licence(s) under which it is authorised to operate.

(b) ***Height Restriction:*** The licensee should not operate a station below a height of 5000m above ground level.

(c) ***Emission Limits:*** Emissions from the CRFMU within the 1800 MHz Upper band should not exceed -20 dBm, measured within a 30 kHz bandwidth, at any point outside the aircraft.

Emissions from the BTS should not exceed -12 dBm, measured within a 30 kHz bandwidth, at any point outside the aircraft.

Mobile stations connected to the BTS should be controlled to operate at a power control level of 15 (nominal output power 0 dBm), as specified for Digital Cellular Systems operating in the 1800 MHz band (DCS1800) in Part 4.1.1 of specification 3GPP TS 45.005.

(d) ***Out-of-Band Emission Limits:*** Out-of-band emission power levels of the CRFMU in a frequency band should be attenuated, relative to the maximum power level of the CRFMU in the 1800 MHz Upper band by a minimum attenuation of 6 dB, 25 dB and 45 dB at offsets greater than 6 MHz, 18.75 MHz and 50 MHz respectively from the operating range.

(e) ***Antenna:*** Only radiating cable type antennas should be used with the BTS and CRFMU to transmit and receive signals to and from the onboard mobile devices. At a range of 2m, this antenna should have a coupling loss of at least 69dB within the 1800 MHz Upper band.

7.3 Additional Recommended MCA Conditions

(1) It is further recommended that operators of MCA systems in spectrum licensed bands adhere to those conditions regarding:

(a) the operation of an MCA system whilst an aircraft is on the ground;

(b) the compliance of an MCA system installation with the *Civil Aviation Safety Regulations (1998)*;

as specified for PMTS Class C licences in the *Radiocommunications Licence Conditions (PTS Licence) Determination 1997*.

(2) It is noted that the use of an MCA system is dependent on certified installation on a particular aircraft type to verify that the MCA system does not cause interference to aircraft avionics followed by approval by the national aviation safety authority.

Part 8 Co-existence arrangements for Global System for Mobile Communications - Railway (GSM-R) networks

8.1 Background

(1) Global System for Mobile Communications - Railway (GSM-R) is based on the standard GSM platform, however its use and deployment configurations vary to some degree from that of a Public Mobile Telecommunications Service (PMTS) network. These variations include an increase in the minimum quality of service and reliability, and the introduction of vehicle mobile stations which may have an increased EIRP (up to 39 dBm/200kHz) and increased notional antenna height (typically 4 metres).

(2) These differences between GSM-R and PMTS networks may give rise to additional co-existence considerations when services are in close physical proximity. There are several European studies produced by the Electronic Communications Committee (ECC) and the European Conference of Postal and Telecommunications Administration (CEPT), which detail co-existence between GSM-R and PMTS networks. These studies are:

(a) ECC Report 96: Compatibility between UMTS 900/1800 and systems operating in adjacent bands;
(b) ECC Report 146: Compatibility between GSM MCBTS and other services (TRR, RSBN/PRMG, HC-SDMA, GSM-R, DME, MIDS, DECT) operating in the 900 and 1800 MHz frequency bands;
(c) ECC Report 162: Practical mechanism to improve the compatibility between GSM-R and public mobile networks and guidance on practical coordination; and
(d) CEPT Report 41: Compatibility between LTE and WiMAX operating within the bands 880-915 MHz / 925-960 MHz and 1710-1785 MHz / 1805-1880 MHz (900/1800 MHz bands) and systems operating in adjacent bands.

Note 1 These studies are available from the European Communications Office website at: www.erodocdb.dk.

Note 2 Whilst these studies are conducted at 900 MHz, the results are applicable for services operating in the 1800 MHz band.

8.2 Co-existence recommentations

(1) It is recommended that all spectrum licensees, when planning and deploying their networks, take note of the co-existence issues that may arise due to GSM-R services, typically GSM-R vehicle mobile stations, that may operate in the 1800 MHz band. It is also recommended that affected licensees seek to

coordinate between themselves to help manage and resolve interference that may arise to or from GSM-R mobile stations.

(2) Licensees should also be aware of the following matters which may impact on co-existence between GSM-R and PMTS networks:

(a) Co-existence between GSM-R and PMTS networks has been studied in several European reports as detailed in subsection 8.1 (2). These reports conclude that in general a 200 kHz guard band is sufficient for co-existence. However, in some cases additional coordination may be needed;

(b) Some GSM-R operators may choose to implement a two GSM channel guard band (400 kHz) at the frequency boundary with another spectrum licensee to obtain more isolation from frequency adjacent services;

(c) Coordination with mobile stations may be difficult due to their mobility, however GSM-R services typically operate in close proximity to railway infrastructure;

(d) Potential interference paths are in both directions, for example, to and from GSM-R vehicle mobile stations; and

(e) ECC Report 162 describes a range of coordination mechanisms that may be used to address co-existence between GSM-R and PMTS networks.