



Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 1999

as amended

made under section 145 of the

Radiocommunications Act 1992

This compilation was prepared on 16 November 2005 taking into account amendments up to *Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Amendment Determination 2002 (No. 1)*

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1 Title [see Note 1]

This determination is called the *Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 1999*.

2 Commencement

This determination commences on 3 November 1999.

3 Purpose

This determination sets out what is an unacceptable level of interference caused by a transmitter operating under a spectrum licence issued in the 1800 MHz band, so as to ensure that high levels of emission from transmitters operated under a licence are kept within the geographic area and frequency band of the licence, and that special account is taken of the increase in emission levels caused by placing transmitters at high sites.

Note 1 The ACA may refuse to register a transmitter if the operation of the transmitter could cause an unacceptable level of interference to the operation of other radiocommunications devices — see section 145 of the Act.

Note 2 The ACA has issued written advisory guidelines under section 262 of the Act about compatibility requirements in relation to the assignment of transmitters operated under apparatus licences and the operation of transmitters under spectrum licences. The ACA will take these guidelines into account during the settlement of interference disputes. Each case will be assessed on its merits. The guidelines do not prevent a licensee negotiating other compatibility requirements with another licensee. The guidelines are:

- *Radiocommunications Advisory Guidelines (Protection of Apparatus-licensed and Class-licensed Receivers — 1800 MHz Band) 1999*;
- *Radiocommunications Advisory Guidelines (Protection of Mobile Base Receivers — 1800 MHz Lower Band) 1998*;
- *Radiocommunications Advisory Guidelines (Managing Interference from Apparatus-licensed and Class-licensed Transmitters — 1800 MHz Band) 1999*;

Copies are available from the ACA.

4 Interpretation

- (1) In this determination, unless the contrary intention appears:

Act means the *Radiocommunications Act 1992*.

Australian National Spheroid means the Australian National Spheroid as used with the Australian Geodetic Datum 1984 and published in the *Gazette* on 6 October 1966.

area of high mobile use means an area described in Schedule 4.

cell means a square with a side measured in degrees by reference to the Australian National Spheroid.

centre location, in relation to a transmitter, means the centre location of the transmitter calculated in accordance with Schedule 1.

device boundary, in relation to a transmitter or a group of transmitters operated under a spectrum licence, means the device boundary established in accordance with Part 1 of Schedule 2.

device boundary criterion (1800 MHz) means the value of the mathematical expression calculated in accordance with Part 2 of Schedule 2.

device boundary scaling parameter means a parameter used in the calculation of the device boundary criterion (1800 MHz).

effective antenna height means the effective height of an antenna calculated in accordance with Schedule 3.

effective occupied bandwidth, in relation to a transmitter, means the minimum width of a frequency band having fixed upper and lower limits that is necessary to contain 99% of the true mean power of the transmitter's emission at any time.

effective radius, in relation to a transmitter, means the value in kilometres of the effective radius for the transmitter, calculated in accordance with Schedule 1.

emission centre frequency, in relation to a transmitter, means the frequency midway between the lower and upper frequency limits of the transmitter's effective occupied bandwidth.

emission designator has the meaning given by clause 8.

error means the measurement uncertainty relating to the measured value of a parameter required to achieve a 95 percent level of confidence that the true value of the parameter is within the range:

- (a) measured value minus the measurement uncertainty; to
- (b) measured value plus the measurement uncertainty.

fixed receiver means a radiocommunications receiver located at a fixed point on land or sea and not established for use while in motion.

fixed transmitter means a radiocommunications transmitter located at a fixed point on land or sea and not established for use while in motion.

geographic area, in relation to a spectrum licence, means the area within which operation of a radiocommunications device is authorised under the licence.

group of receivers has the meaning given by clause 6.

group of transmitters has the meaning given by clause 5.

horizontally radiated power, in relation to a radiocommunications device, means the radiated maximum true mean power, within the frequency band of the licence authorising the operation of the device, summed over all polarisations and measured in units of dBm EIRP in a direction referenced from, and in the horizontal plane containing, the phase centre of the antenna used with the device.

in-band, in relation to a transmitter operated under a spectrum licence, means the frequencies within the frequency band of the spectrum to which the licence relates.

indoor, in relation to a fixed transmitter, means the phase centre of the antenna used with the fixed transmitter being located within, and at least 5 metres from the external surface of, an enclosed space.

maximum true mean power means the true mean power measured in a 30 kHz rectangular bandwidth that is located within a specified frequency band such that the true mean power is the maximum of true mean powers produced.

Note The power within a 30 kHz rectangular bandwidth is normally established by taking measurements using either an adjacent channel power meter or a spectrum analyser. The accuracy of measuring equipment, measurement procedure and any corrections to measurements necessary to take account of practical filter shape factors would normally be in accordance with good engineering practice.

mean power means the average power measured during an interval of time that is at least ten times the period of the lowest modulation frequency.

mobile transmitter means a radiocommunications transmitter established for use while in motion or during halts at unspecified points on land or sea.

outdoor, in relation to a fixed transmitter, means a fixed transmitter that is not an indoor fixed transmitter.

publish includes publish electronically.

RadDEM means the digital elevation model developed by the ACA for radiocommunications purposes that contains modelled terrain height information for Australia in cells of a size of 9 seconds of arc, published by the ACA, copies of which are available from the ACA.

spectrum map grid means the map grid developed by the ACA for Australia, showing cells the sides of which measure 3 degrees of arc, 1 degree of arc or 5 minutes of arc, published by the ACA, copies of which are available from the ACA.

towns mobile list means the list giving the names of towns, latitude and longitude of the centre location and the effective radius for each town, published by the ACA, copies of which are available from the ACA.

true mean power means:

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

1800 MHz band means the following frequency bands:

- (a) 1710 MHz – 1785 MHz;
- (b) 1805 MHz – 1880 MHz.

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

ACA	frequency band
interference	spectrum licence
transmitter.	

- (2) In this determination, the range of numbers that identifies a frequency band includes the higher, but not the lower, number.

5 Group of transmitters

- (1) For the purpose of this determination, two or more fixed transmitters are a group of transmitters if:
 - (a) they have the same:
 - (i) emission centre frequency; and
 - (ii) emission designator; and
 - (b) each has an antenna of the same type, model and manufacturer; and
 - (c) they are operated for the purpose of communicating with the same receiver or group of receivers; and
 - (d) they have the same identification number assigned by the ACA to the antenna used with each transmitter.
- (2) A transmitter may belong to more than one group of transmitters.

6 Group of receivers

- (1) For the purpose of this determination, two or more fixed receivers are a group of receivers if:
 - (a) each has an antenna of the same type, model and manufacturer; and
 - (b) they are operated for the purpose of communicating with the same transmitter or group of transmitters; and
 - (c) they have the same identification number assigned by the ACA to the antenna used with each receiver.
- (2) A receiver may belong to more than one group of receivers.

7 Unacceptable level of interference

- (1) This clause sets out what are unacceptable levels of interference for the purposes of section 145 of the Act.

Note Under section 145 of the Act, the ACA may refuse to register a transmitter if the operation of the transmitter could cause an unacceptable level of interference to the operation of other radiocommunications devices.

- (2) A level of interference caused by a transmitter operated under a spectrum licence issued for the 1800 MHz band is unacceptable if the operation results in a breach of a core condition of the licence relating to the maximum permitted level of radio emission from the transmitter:
 - (a) outside the parts of the spectrum the use of which is authorised by the licence; or
 - (b) outside the geographic area of the licence.

Note Subsection 66 (1) of the Act deals with core conditions relating to maximum permitted levels of radio emissions.

- (3) A level of interference caused by a transmitter operated under a spectrum licence issued for the 1800 MHz band is unacceptable if any part of the device boundary of the transmitter lies outside the geographic area of the licence.

- (4) If a device boundary of a fixed transmitter cannot be calculated in accordance with Schedule 2, the transmitter is taken to cause unacceptable interference.
- (5) A fixed transmitter that operates in the bands 1877.5 – 1880 MHz with a horizontally radiated power greater than 24.5 dBm per 30 kHz is taken to cause unacceptable interference.

Note Emission levels in this band are limited to manage unacceptable interference to cordless telecommunications services in the 1880 – 1900 MHz bands.

- (6) A mobile transmitter that operates in the 1800 MHz band with a horizontally radiated power greater than 24.5 dBm per 30 kHz is taken to cause unacceptable interference.
- (7) A transmitter that:
 - (a) has an effective antenna height for any segment 1, $he_1(\phi_n)$ greater than 10 metres; and
 - (b) operates in the band 1710 MHz to 1785 MHz; and
 - (c) operates within an area of high mobile use described in Schedule 4; is taken to cause unacceptable interference.
- (8) In spite of subclause (3), a mobile transmitter that operates in the 1800 MHz band with a horizontally radiated power always less than or equal to 24.5 dBm EIRP per 30 kHz is taken not to cause unacceptable interference.

Note The ACA does not intend to require the registration of mobile transmitters — see subsection 69 (2) of the Act and the registration conditions of spectrum licences.

- (9) In spite of subclause (3), a fixed transmitter:
 - (a) with an effective antenna height for each segment 1, $he_1(\phi_n)$ less than or equal to 20 metres; and
 - (b) operating in the band:
 - (i) 1805 – 1880 MHz in any location; or
 - (ii) 1710 – 1785 MHz outside areas of high mobile use;
 is taken not to cause unacceptable interference.

8 Emission designator

- (1) In this determination, a reference to an emission designator, in relation to a transmitter, is a reference to the designation of the transmitter's emission worked out in accordance with Appendix S1 of the Radio Regulations published by the International Telecommunication Union as in force on the day on which this determination commences.
- (2) For the purpose of working out the designation of the transmitter's emission, the references in Appendix S1 to necessary bandwidth for a given class of emission are taken to be references to the effective occupied bandwidth of the transmitter.

9 Revocation

- (1) The *Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 1998* is revoked.

Schedules

Schedule 1 Centre location and effective radius of a transmitter

(clause 4 (1))

Note A model for the locations of a group of transmitters (the effective location) is the circumference of the circle defined by the centre location and the effective radius.

1. The centre location of a transmitter is the centre of a circle l_c with an effective radius r_e . This Schedule sets out the l_c and r_e of particular transmitters.

2. **Centre location and effective radius of a fixed transmitter**

For a fixed transmitter, l_c is the location (by latitude and longitude) of the phase centre of the transmitter's antenna and r_e is zero.

3. **Centre location and effective radius of a group of fixed transmitters operating on land and not covered in paragraph 4**

For a group of fixed transmitters operating within the limits of a town specified in the towns mobile list, l_c and r_e are taken to be those specified in the towns mobile list for that town.

4. **Centre location and effective radius of a group of fixed transmitters located near a central point**

For a group of fixed transmitters:

- (a) supported by the same structure; and
- (b) having the phase centre of each transmitter's antenna located within 10 metres of the same central point;

l_c is the central point and r_e is zero.

Schedule 2

(clause 4 (1))

Part 1 Device boundary of a transmitter or a group of transmitters

Note It is not necessary to calculate a device boundary for mobile transmitters as the ACA does not intend to require these to be registered — see subsection 69 (2) of the Act and the registration conditions of spectrum licences.

1. The device boundary of a transmitter is established as follows:

Step 1: Calculate the device boundary criterion (1800 MHz) for each increment (m·5) minutes in distance by reference to the Australian National Spheroid, where m is any integer beginning 1 to 30, along each of 144 radials. All increments m = 1, begin at the common central point of the radials. The common central point is the centre location of the transmitter. The 144 radials have bearings taken clockwise and given by the sequence $\phi_0, \phi_1, \phi_2, \dots, \phi_{142}, \phi_{143}, (\phi_n)$ according to the sequence rule $\phi_n = ((n \cdot 5/2) + 5/4)$ degrees referenced to true north.

Note In the expression ‘m·5’, and similar expressions, the symbol ‘·’ represents the operation of multiplication.

Step 2: Calculate an end point for each radial as the point corresponding to the sum of :

- (a) the distance in kilometres along the radial equal to the length corresponding to the number of 5 minute increments from the centre location of the transmitter that corresponds to the calculated value of the device boundary criterion (1800 MHz) being zero or negative when either all the previous values calculated for that radial are positive, or the number of the increment is equal to 1; and
- (b) the effective radius of the centre location.

Note 1 The value of m for each increment is the same as the value of m for the segment referred to in paragraph 2 (c) of Schedule 3.

Note 2 The actual distance in kilometres for a 5 minute increment in distance varies according to the direction and location of the radial by reference to the Australian National Spheroid. Distances measured in minutes are accepted usage in mapping.

Step 3: Identify the location of each end point by reference to the spectrum map grid.

Step 4: Connect the end point of each radial consecutively to draw a polygon in relation to the spectrum map grid cells.

Step 5: Aggregate the spectrum map grid cells that either fall within or are intersected by the polygon. The boundary of this aggregated area is the device boundary of the transmitter.

2. (1) For a group of transmitters:
 - (a) the device boundary of the group is to be calculated as if for a single transmitter; and
 - (b) when calculating the device boundary criterion (1800 MHz), for each transmitter in the group the horizontally radiated power is calculated in accordance with subclauses (2) and (3).
- (2) If no two transmitters in the group transmit simultaneously for more than 5% of the time in any one hour period, the horizontally radiated power is taken:
 - (a) to be equal for each bearing ϕ_n ; and
 - (b) to have a value that is greater than or equal to the horizontally radiated power, in any direction, of any transmitter in the group.
- (3) If subclause (2) does not apply, the horizontally radiated power is taken:
 - (a) to be equal for each bearing ϕ_n ; and
 - (b) to have a value that is greater than or equal to the horizontally radiated power, in any direction, of any transmitter in the group, but never less than 51.5 dBm EIRP per 30 kHz.

Part 2 Device boundary criterion (1800 MHz)

The device boundary criterion (1800 MHz) is the value of the mathematical expression:

$$RP - MP$$

where:

RP is the Radiated Power, being:

$$HRP + E - 0.8,$$

where:

HRP is the horizontally radiated power for each bearing ϕ_n measured with an error of $\pm E$ dB;

MP is the Maximum Power, calculated as set out below, being a function of $he_m(\phi_n)$ and $d_m(\phi_n)$,

where:

$he_m(\phi_n)$ 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 ϕ_n ; and

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

$MP(he_m(\phi_n), d_m(\phi_n))$ measured in units of dB is as described as 'MP' below.

In calculating MP, for simplification let:

$$d_m(\phi_n) = d; \text{ and}$$

$$he_m(\phi_n) = he.$$

If $he < 1.5$, then $he = 1.5$; and

if $he > 1,600$ then $he = 1,600$.

For $0 < d \leq 20.2$

$$MP = 34.6 \cdot \log_{10}(d + S) - 20.4 \cdot \log_{10}(he) + 43$$

For $d > 20.2$

$$MP = 58.9 \cdot \log_{10}(d + S) + 0.038 \cdot he - 2.8 \cdot (he)^{1/2} - 6.9$$

where:

S = Device Boundary Scaling Parameter; and

$$= 4.8$$

Schedule 3 Effective antenna height

(clause 4 (1))

1. The effective height of an antenna is determined in accordance with its transmitter, as set out in this Schedule.

Note The ACA publishes software tools that may be used to calculate tables of effective antenna heights for any location in Australia.

2. **Effective antenna height of an outdoor fixed transmitter** (see Diagram 1 below)

If:

- (a) hg is the vertical height in metres of the phase centre of the fixed transmitter's antenna measured with an error of less than 5 parts in 100 and relative to the point:
 - (i) located on the line of intersection between the external surface of the structure supporting the antenna and the surface of the ground or sea; and
 - (ii) having the lowest elevation on that line; and
- (b) hs is the sum of:
 - (i) the elevation attribute of the RadDEM cell containing the location of the phase centre of a fixed transmitter's antenna; and
 - (ii) hg ; and
- (c) $hag_m(\phi_n)$ is average ground height, as described below, for each of the segments 'm' of a sector of 2.5 degrees arc centred along each of the bearings ϕ_n , calculated by taking the average of the elevation attributes for all of the cells that have either half (with an error of less than 1 part in 64) or more than half their area within each segment 'm'; and
- (d) each sector is divided into 30 segments 'm' (as illustrated in Diagram 2 below) with:
 - (i) any two consecutively numbered segments 1 to 30 being contiguous; and
 - (ii) each segment being a 5 minute increment in radial distance; and
 - (iii) segment 1 beginning at the centre location;

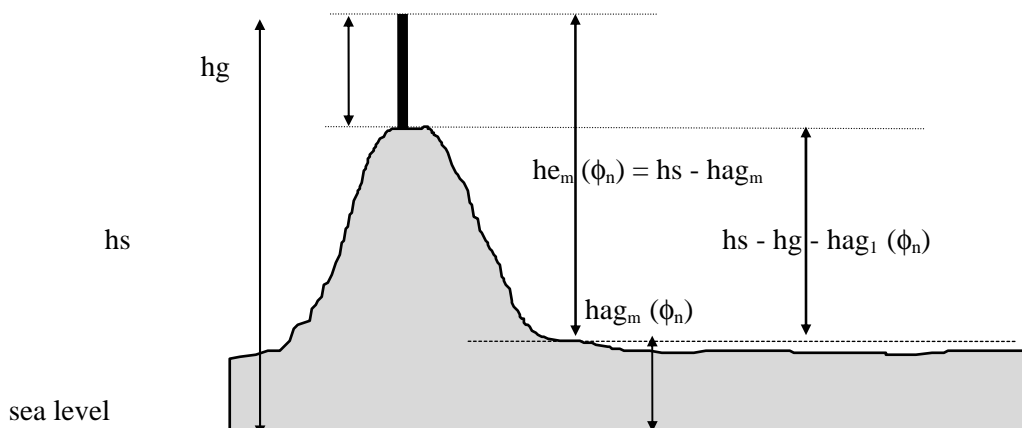
then for an outdoor fixed transmitter operating in the 1800 MHz band the effective antenna height:

- (e) for segment 1, $he_1(\phi_n)$, is hg for that centre location except when $(hs - hg - hag_1(\phi_n))$ is > 48 in which case $he_1(\phi_n)$ is $(hs - hag_1(\phi_n))$ for that centre location; and
- (f) for segments 2 to 30, $he_m(\phi_n)$ where m is any integer in the range 2 to 30, is $(hs - hag_m(\phi_n))$ for that centre location except when $(hs - hag_m(\phi_n))$ is $< hg$, in which case $he_m(\phi_n)$ is hg for that centre location.

Note 1 A RadDEM cell is represented as raster data such that the western and southerly boundary of the cell is part of the cell but the northerly and easterly boundary is part of the adjacent cells. This is an important consideration when a location falls on a cell boundary.

Note 2 A RadDEM cell is considered to be half within a sector/segment with an error of less than 1 part in 64 when the centre locations of 32 sub-cells that compose the cell are within the sector/segment.

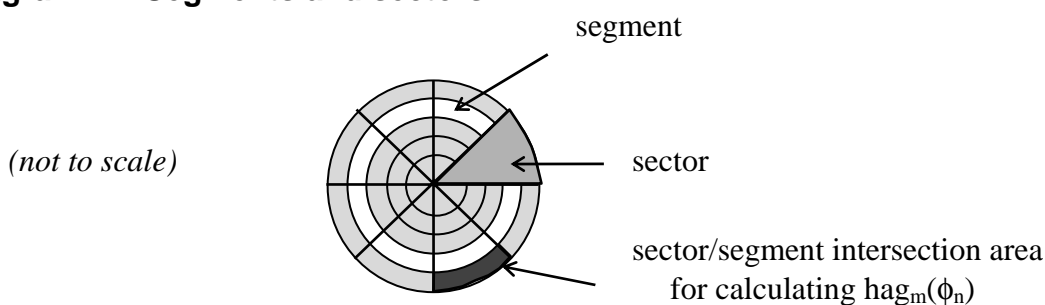
Diagram 1 Calculating effective antenna height



- hg: antenna height
- hs: antenna height above sea level
- $hag_m(\phi_n)$: average ground height above sea level in segment 'm' of sector 'n'
- $he_m(\phi_n)$: effective antenna height for segment 'm' of sector 'n'

Note for this case $hs - hg - hag_1(\phi_n) > 0$

Diagram 2 Segments and sectors



3. Effective antenna height of an indoor fixed transmitter

The effective antenna height of an indoor fixed transmitter for any segment 'm' = 1 to 30 and any bearing (ϕ_n), $he_m(\phi_n)$ is hg metres, where hg is the smallest distance, measured vertically, between the phase centre of the transmitter's antenna and any surface in the building where the transmitter is located and on which mobile transmitters are supported.

4. Effective antenna height of a group of fixed transmitters

For a group of fixed transmitters where the antenna height above ground of the highest transmitter (hg_{max}), calculated in accordance with clause 2 (a), is equal to or less than 20 metres, the effective antenna height of the group $he_m(\phi_n)$, is hg_{max} for any segment 'm' = 1 to 30, and any bearing (ϕ_n).

However, if a fixed transmitter in the group transmits for more than 5% of the time in any 1 hour period, each transmitter in the group is to be treated as if it were a single fixed transmitter and the effective antenna height of each fixed transmitter is to be worked out as for a single fixed transmitter.

5. Effective antenna height of a group of fixed transmitters located near a central point

For a group of fixed transmitters:

- (a) all supported by the one structure; and
- (b) having the phase centre of each transmitter's antenna located within 10 metres of the same central point;

the effective antenna height of the group is calculated as if it is a single fixed transmitter located at the central point and with a hg , calculated in accordance with clause 2 (a), equal to that calculated for the antenna with the largest hg .

Schedule 4 Areas of high mobile use

(clause 7 (7))

Description of Area: An area of high mobile use is the area of land described in a table below, bounded by a line starting at the intersection of the first map grid co-ordinates listed in the table in relation to the area and then bounded by a line passing sequentially through the intersections of each set of co-ordinates shown in the table to the point of commencement.

Adelaide

° ' " East	° ' " South
138 05 0	34 20 0
139 05 0	34 20 0
139 05 0	34 55 0

° ' " East	° ' " South
139 00 0	34 55 0
139 00 0	35 30 0
138 05 0	35 30 0

° ' " East	° ' " South
138 05 0	34 20 0

Brisbane

° ' " East	° ' " South
152 30 0	26 50 0
154 00 0	26 50 0
154 00 0	28 35 0

° ' " East	° ' " South
153 05 0	28 35 0
153 05 0	28 20 0
152 50 0	28 20 0

° ' " East	° ' " South
152 50 0	28 05 0
152 30 0	28 05 0
152 30 0	26 50 0

Canberra

° ' " East	° ' " South
148 55 0	35 35 0
148 55 0	35 05 0
149 20 0	35 05 0

° ' " East	° ' " South
149 20 0	35 35 0
148 55 0	35 35 0

Melbourne

° ' " East	° ' " South
144 45 0	37 20 0
145 05 0	37 20 0
145 05 0	37 25 0
145 15 0	37 25 0
145 15 0	37 30 0
145 20 0	37 30 0
145 20 0	37 35 0

° ' " East	° ' " South
145 35 0	37 35 0
145 35 0	37 45 0
145 45 0	37 45 0
145 45 0	38 15 0
145 25 0	38 15 0
145 25 0	38 45 0
144 05 0	38 45 0

° ' " East	° ' " South
144 05 0	37 55 0
144 10 0	37 55 0
144 10 0	37 50 0
144 15 0	37 50 0
144 15 0	37 25 0
144 45 0	37 25 0
144 45 0	37 20 0

Perth

° ' " East	° ' " South
115 00 0	31 25 0
116 30 0	31 25 0

° ' " East	° ' " South
116 30 0	32 50 0
115 00 0	32 50 0

° ' " East	° ' " South
115 00 0	31 25 0

Sydney

° ' " East	° ' " South
151 05 0	32 35 0
153 00 0	32 35 0
153 00 0	33 00 0
152 00 0	33 00 0
152 00 0	34 50 0

° ' " East	° ' " South
150 30 0	34 50 0
150 30 0	34 35 0
150 20 0	34 35 0
150 20 0	34 00 0
150 00 0	34 00 0

° ' " East	° ' " South
150 00 0	33 20 0
150 55 0	33 20 0
150 55 0	33 05 0
151 05 0	33 05 0
151 05 0	32 35 0

Table of Instruments

Notes to the *Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 1999*

Note 1

The *Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 1999* (in force under section 145 of the *Radiocommunications Act 1992*) as shown in this compilation is amended as indicated in the Tables below.

Table of Instruments

Title	Date made	Date of commencement	Application, saving or transitional provisions
<i>Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 1999</i>	3 Nov 1999	3 Nov 1999	
<i>Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Determination 1999 Amendment 1999 (No. 1)</i>	25 Nov 1999	25 Nov 1999	—
<i>Radiocommunications (Unacceptable Levels of Interference — 1800 MHz Band) Amendment Determination 2002 (No. 1)</i>	28 Nov 2002	28 Nov 2002	—

Table of Amendments

Table of Amendments

ad. = added or inserted am. = amended rep. = repealed rs. = repealed and substituted

Provision affected	How affected
Note 1 to c. 3.....	am. 2002 No. 1
Note 2 to c. 3.....	am. 2002 No. 1
C. 7	am. 1999 No. 1
Note to c. 7 (1)	am. 2002 No. 1
Note to c. 7 (2)	am. 2002 No. 1
Note to c. 7 (8)	am. 2002 No. 1
C. 8 (first occurring).....	am. 2002 No. 1
C. 8 (second occurring) Renumbered c. 9	2002 No. 1
Note to c. 8 (second occurring)	am. 2002 No. 1
Schedule 2	
Schedule 2.....	am. 2002 No. 1
Schedule 3	
Schedule 3.....	am. 2002 No. 1
Schedule 4	
Schedule 4.....	am. 2002 No. 1
