Commonwealth of Australia

Radiocommunications Act 1992

Radiocommunications (Unacceptable Levels of Interference - 800 MHz Band) Determination 2000

THE AUSTRALIAN COMMUNICATIONS AUTHORITY determines the following unacceptable levels of interference under section 145 of the *Radiocommunications Act 1992*.

Dated 12 December 2000.

A J Shaw
Chair

R Horton
Deputy Chair

Australian Communications Authority

CONTENTS

Title

1. This determination is called the *Radiocommunications (Unacceptable Levels of Interference - 800 MHz Band)* Determination 2000.

Commencement

2. This determination commences on 12 December 2000.

Purpose

3. This determination sets out what is an unacceptable level of interference caused by a transmitter operating under a spectrum licence issued in the 800 MHz band. The determination ensures that high levels of emission from transmitters operated under a licence are kept within the geographic area and frequency band of the licence in a manner providing protection to receivers of certain deployment. Special account is taken of the increase in received levels of emission when transmitters are located at high sites.

[NOTES: 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 s.145 of the Act.

2. The ACA may register a transmitter whose operation could cause an unacceptable level of interference to the operation of other radiocommunications devices, when guard space, provided either within a single licence or within a number of shared licences, is used to achieve the levels of isolation for emissions transmitted between spectrum spaces to the same extent as provided by this determination. The ACA has issued written advisory guidelines under s.262 of the Act about the registration and operation of transmitters that could cause an unacceptable level of interference to the operation of other radiocommunications devices. The guidelines are:

- *Radiocommunications Advisory Guidelines (Registration of Devices under Spectrum Licences without an Interference Impact Certificate) 1998*.

3. The ACA has issued written advisory guidelines under s.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 Receivers - 800 MHz Band) 1998;*
- *Radiocommunications Advisory Guidelines (Protection of Molonglo Observatory Synthesis Telescope) 1998;*
- *Radiocommunications Advisory Guidelines (Managing Interference from Apparatus-licensed Transmitters - 800 MHz Band) 1998.*

Copies are available from the ACA.]

Interpretation

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

Act means the *Radiocommunications Act 1992*.

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

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 (800 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 (800 MHz).

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

effective occupied bandwidth, for a transmitter, means the frequency band between the lower and upper frequency limits of the transmitter's effective occupied bandwidth.

effective radius, for a centre location, means the value in kilometres of the effective radius for the centre location, calculated in accordance with Schedule 1.

emission centre frequency, for 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 section 8.

error means the uncertainty, relating to the measured value of a parameter, that results in a 95% level of confidence that the true value of the parameter is within the range:

(a) measured value minus the uncertainty; to

(b) measured value plus the uncertainty.

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

fixed transmitter means a 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 device is authorised under the licence.

group of receivers has the meaning given by section 6.

group of transmitters has the meaning given by section 5.

horizontally radiated power, for a radiocommunications device, means the product of

(a) the maximum true mean power, within the frequency band of the licence authorising the operation of the device, measured in units of dBm EIRP per 30 kHz at the antenna connector; and

(b) the antenna gain relative to an isotropic antenna in a specified direction reference from, and in the horizontal plane containing, the phase centre of the antenna used with the device.

in-band, means:

(a) for a transmitter operated under a spectrum licence, the frequencies within the frequency band to which the licence relates; and

(b) for a receiver operating within the space of a spectrum licence, the frequencies within the frequency band to which the licence relates; and

(c) for a transmitter or receiver operating under an apparatus licence, the frequencies within the lower frequency limit and the upper frequency limit of its spectrum access.

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

(a) located within an enclosed space; and

(b) with its phase centre at least 5 metres from the external surface of the part of the enclosed space which its half-power beamwidth illuminates.

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 10 times the period of the lowest modulation frequency.

mobile transmitter means a 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.

roads mobile list means the list giving the names of major roads, latitude and longitude of the centre location, the effective radius and 2 sets of co-ordinates from which sections of the roads may be identified, 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.

800 MHz band means the following frequency bands:

(a) 825 MHz - 845MHz (the ***800 MHz Lower band***);

(b) 870 MHz - 890 MHz (the ***800 MHz Upper band***).

[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:

core condition	interference
frequency band	spectrum licence
ACA	transmitter.]

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

Group of transmitters

5.(1) For the purpose of this determination, two or more transmitters are a group of transmitters if an effective antenna height can be calculated for the group, and:

(a) they have the same:

(i) emission centre frequency; and

(ii) emission designator; and

(b) they are operated for the purpose of:

(i) if operated on land - communicating with the same receiver or same group of receivers on land or at sea; or

(ii) if operated at sea - communicating with the same fixed receiver on land or at sea; and

(c) 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.

Group of receivers

6.(1) For the purpose of this determination, two or more receivers are a group of receivers if an effective antenna height can be calculated for the group, and:

(a) they have the same identification number assigned by the ACA to the antenna used with each receiver; and

(b) they are operated for the purpose of:

(i) if operated on land - communicating with the same transmitter or same group of transmitters on land or at sea; or

(ii) if operated at sea - communicating with the same fixed transmitter on land or at sea.

(2) A receiver may belong to more than one group of receivers.

Unacceptable level of interference

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

[NOTE: Under section 145, 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 800 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: Section 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 800 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 transmitter cannot be calculated in accordance with Schedule 2, the transmitter is taken to cause unacceptable interference.

(5) In spite of subsection (3), a transmitter that operates in any of the following circumstances is taken not to cause unacceptable interference while it is operating in those circumstances:

(a) a mobile transmitter that operates:

(i) outside the limits of a town that is on the towns mobile list; or

(ii) on a road that is not on the roads mobile list;

(b) the following transmitters:

(i) a mobile transmitter that operates; or

(ii) an indoor fixed transmitter that operates; or

(iii) a group of mobile transmitters all of which operate;

in the 800 MHz Lower band with a horizontally radiated power always less than or equal to 38 dBm EIRP per 30 kHz;

(c) a mobile transmitter that only transmits at sea and only communicates with a mobile receiver at sea.

[NOTE: The ACA does not intend to require these mobile transmitters to be registered- see s.69(2) of the Act and the registration conditions of spectrum licences.]

(6) A transmitter with an effective antenna height for any segment 1, $he_1(\phi_n)$ greater than 10 metres and operating in the 800 MHz Lower band is taken to cause unacceptable interference.

(7) A mobile transmitter that operates in the 800 MHz band with a horizontally radiated power greater than 46 dBm EIRP per 30 kHz is taken to cause unacceptable interference.

(8) In spite of subsection (3), a fixed transmitter with an effective antenna height for each segment 1, $he_1(\phi_n)$ less than or equal to 5 metres operating in the 800 MHz Upper band is taken not to cause unacceptable interference.

Emission designator

8. (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 Article 4 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 Article 4 to necessary bandwidth for a given class of emission are taken to be references to the effective occupied bandwidth of the transmitter.

Revocation

9. (1) The *Radiocommunications (Unacceptable Levels of Interference - 800 MHz Band) Determination 1998* is revoked.

SCHEDULES

SCHEDULE 1

Section 4(1)

Centre location and effective radius of a transmitter

1. Centre location and effective radius of a transmitter

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.

[NOTES: 1. A model for the location of a group of transmitters (the effective location) is the circumference of the circle defined by the centre location and the effective radius.

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

2. Centre location and effective radius of a fixed transmitter

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

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

(a) Operating in a town. For a mobile transmitter 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.

(b) Operating on a major road. For a mobile transmitter that is operating on a section of a major road, the centre location and effective radius of the mobile transmitter is the centre location and effective radius specified in the roads mobile list for that section of road. A section of road is that part of the road intersected by 2 lines drawn:

(i) starting from each of the 2 sets of coordinates in the roads mobile list from which sections of the road may be identified; and

(ii) along the shortest distance from each set of coordinates to the road; and

(iii) along the latitude or longitude of the coordinate.

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

4. Centre location and effective radius of a mobile transmitter operating at sea

For a mobile transmitter operating only at sea and communicating with a fixed receiver, l_c is the location (by latitude and longitude) of the phase centre of the fixed receiver's antenna and r_e is 28 km.

5. Centre location and effective radius of a group of fixed transmitters not covered in paragraph 8

The centre location and effective radius of a group of fixed transmitters is to be worked out as if the group were a single mobile transmitter.

6. Centre location and effective radius of a group of mobile transmitters operating on land

The centre location and effective radius of a group of mobile transmitters operating on land is to be worked out as if the group were a single mobile transmitter operating on land.

7. Centre location and effective radius of a group of mobile transmitters operating at sea

The centre location and effective radius of a group of mobile transmitters operating at sea and communicating with the same fixed receiver is to be worked out as if the group were a single mobile transmitter operating at sea and communicating only with a fixed receiver.

8. 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

Section 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 section 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 (800 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 72 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 72 radials have bearings taken clockwise and given by the sequence ϕ_0, ϕ_1, ϕ_2,... ϕ_{69}, ϕ_{70}, ϕ_{71} (ϕ_n) according to the sequence rule $\phi_n = ((n \cdot 5) + {}^5/_2)$ 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 (800 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.

[NOTES: 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.

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 (800 MHz), for each transmitter in the group the horizontally radiated power is calculated in accordance with subsections (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 subsection (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 50 dBm EIRP per 30 kHz.

3. If there is more than one centre location for a mobile transmitter, a device boundary is to be calculated for each centre location.

4. In the case of a group of transmitters, some of which operate in a town that is on the towns mobile list and some of which operate on a section of major road that is on the roads mobile list, a device boundary is to be calculated for each number of transmitters that operates in the town or on the major road.

5. In the case of a transmitter that operates at sea and communicates with more than one fixed receiver, a device boundary is calculated for each fixed receiver.

PART 2

Device boundary criterion (800 MHz)

The device boundary criterion (800 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 ±E dB;

MP is the Maximum Power, 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·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, for transmitters operating in the 800 MHz Lower band, is as described as 'MP Lower band' in Schedule 4.

$MP(he_m(\phi_n), d_m(\phi_n))$ measured in units of dB, for transmitters operating in the 800 MHz Upper band, is as described as 'MP Upper band' in Schedule 5.

[NOTE: For an explanation of segment m, see Schedule 3, section 2(c).]

SCHEDULE 3

Section 4(1)

Effective Antenna Height

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 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 either of two adjacent sectors of 2.5 degrees of arc that overlay the 5 degree sector; and

(d) each 5 degree 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:

(e) for an outdoor fixed transmitter operating in the 800 MHz Upper band, the effective antenna height:
  (i) for segment 1, $he_1(\phi_n)$, is *hg* for that centre location except when $(hs - hg - hag_1(\phi_n))$ is > 0 in which case $he_1(\phi_n)$ is $(hs - hag_1(\phi_n))$ for that centre location; and
  (ii) 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; and

(f) for an outdoor fixed transmitter operating in the 800 MHz Lower band the effective antenna height:

(i) 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

(ii) 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:

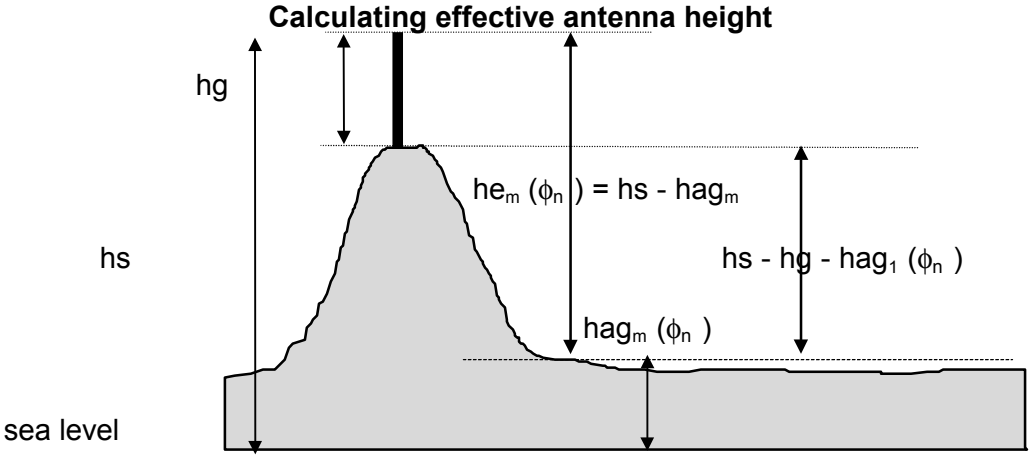
(A) $(hs - hag_m(\phi_n))$ is > 10 in which case $he_m(\phi_n)$ is 10 for that centre location; and

(B) $(hs - hag_m(\phi_n))$ is < 1.5 in which case $he_m(\phi_n)$ is 1.5 for that centre location.

[NOTES: 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.

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 64 sub-cells that compose the cell are within the sector/segment.]

Diagram 1



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'

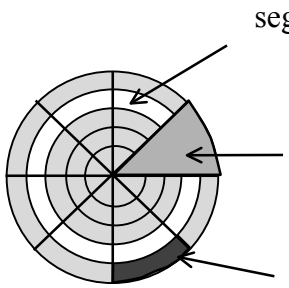
$he_m(\phi_n)$: effective antenna height for segment 'm' of sector 'n'

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

Diagram 2

Segments and sectors

(not to scale)



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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 mobile transmitter

The effective antenna height of a mobile transmitter for any segment "m" =1 to 30 and any bearing (ϕ_n), $he_m(\phi_n)$ is *hg* metres, where *hg* is greater than the height of the phase centre of the transmitter's antenna above any three points of contact between the transmitter's mobile support and:

(a) if the transmitter is an indoor transmitter - any physical surface; and

(b) in any other case - the surface of the earth or sea.

5. Effective antenna height of a group of mobile transmitters

For a group of mobile transmitters:

(a) the group is to be treated as if the highest antenna in the group is part of a single mobile transmitter; and

(b) the effective antenna height of the group is the height of that highest antenna.

6. 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 section 2(a), is equal to or less than 10 metres:

(a) the group of transmitters is to be treated as if it is a single mobile transmitter; and

(b) 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 section 2(a), equal to that calculated for the antenna with the largest *hg*.

SCHEDULE 4

Schedule 2

MP Lower Band

For the purpose of calculating the Device boundary criterion in Schedule 2, the propagation loss for the 800 MHz band (MP Lower band) is calculated as set out below.

For simplification let:

$d_m(\phi_n) = d$; and
$he_m(\phi_n) = he$. .

If $he < 1.5$, then $he = 1.5$; and
if $he > 1{,}600$ then $he = 1{,}600$.

For $0 < d \leq 11.2$

$$MP = 36.8 \cdot \log_{10}(d + S) - 3.2 \cdot (\log_{10}(11.8 \cdot he))^2 - 24$$

For $d > 11.2$

$$MP = 58 \cdot \log_{10}(d + S) - 3.2 \cdot (\log_{10}(11.8 \cdot he))^2 - 55.3$$

where:

S = Device Boundary Scaling Parameter; and
= 18.8

SCHEDULE 5

Schedule 2

MP Upper Band

For the purpose of calculating the Device boundary criterion in Schedule 2, the propagation loss for the 800 MHz band (MP Upper band) is calculated as set out below.

For simplification let:

$d_m(\phi_n) = d$; and
$he_m(\phi_n) = he$.

If $he < 1.5$, then $he = 1.5$; and
if $he > 1{,}600$ then $he = 1{,}600$.

For $0 < d \leq 15.7$

$$MP = 36.8 \cdot \log_{10}(d + S) - 20.4 \cdot \log_{10}(he) + 24.1$$

For $d > 15.7$

$$MP = 58 \cdot \log_{10}(d + S) + 0.037 \cdot he - 2.77 \cdot (he)^{1/2} - 23.2$$

where:

S = Device Boundary Scaling Parameter; and
= 14.3