

Radiocommunications (Unacceptable Levels of Interference — 26 GHz Band) Determination 2020

The Australian Communications and Media Authority makes the following determination under subsection 145(4) of the *Radiocommunications Act 1992*.

Dated:

Member

Member/General Manager

Australian Communications and Media Authority

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# 1 Name

This is the *Radiocommunications (Unacceptable Levels of Interference — 26 GHz Band) Determination 2020*.

# 2 Commencement

This instrument commences at the start of the day after the day it is registered on the Federal Register of Legislation.

Note: The Federal Register of Legislation may be accessed free of charge at [www.legislation.gov.au](http://www.legislation.gov.au).

# 3 Authority

This instrument is made under subsection 145(4) of the *Radiocommunications Act 1992*.

# 4 Definitions

(1) In this instrument:

***26 GHz band*** means the part of the spectrum from 25.1 GHz to 27.5 GHz.

***Act*** means the *Radiocommunications Act 1992*.

***active antenna system*** means a base station antenna system where the amplitude and/or phase between antenna elements is continually adjusted, resulting in an antenna pattern that varies in response to short term changes in the radio environment.

***ASMG*** means the *Australian Spectrum Map Grid 2012*, published by the ACMA on its website at [www.acma.gov.au](http://www.acma.gov.au).

Note: The ASMG can be accessed for free on the ACMA’s website: [www.acma.gov.au](http://www.acma.gov.au).

***centre frequency***, in relation to a radiocommunications transmitter, means the frequency midway between the lower and upper frequency limits of the transmitter’s occupied bandwidth.

***DEM-3S*** means the dataset “Geoscience Australia, 3 second SRTM Digital Elevation Model (DEM) v01”, containing modelled terrain height information for Australia, published by Geoscience Australia.

Note: Copies of DEM-3S can be obtained free of charge from the Geoscience Australia website: [www.ga.gov.au](http://www.ga.gov.au).

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

***device boundary criterion***, in relation to a radiocommunications transmitter or a group of radiocommunications transmitters operated under a spectrum licence,means the value of the mathematical expression calculated in accordance with Part 2 of Schedule 2 to this instrument.

***EIRP***, in relation to a radiocommunications device, means the Equivalent Isotropically Radiated Power of the device.

***emission designator*** means the designation of a radiocommunications transmitter’s emission, determined in accordance with section 6.

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

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

***Geocentric Datum of Australia 2020*** means the coordinate reference system designated as the “Geocentric Datum of Australia (GDA2020)” as published by Geoscience Australia.

Note: More information on GDA2020 can be obtained free of charge from the Geoscience Australia website: [www.ga.gov.au](http://www.ga.gov.au).

***geographic area***, for a spectrum licence, means the area within which the operation of a radiocommunications device is authorised under the licence.

***group of radiocommunications receivers*** has the meaning given by section 8.

***group of radiocommunications transmitters*** has the meaning given by section 7.

***HCIS identifier*** means an identifier used to describe a geographical area in the HCIS.

***hierarchical cell identification scheme*** or ***HCIS*** means the cell grouping hierarchy scheme used to describe areas in the ASMG.

***horizontally radiated power***,for a radiocommunications device, means the sum of:

(a) the maximum true mean power, in dBm per specified rectangular bandwidth, at the antenna connector that is located within the frequency band of the spectrum licence authorising the operation of the radiocommunications device; and

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

***ITU*** means the International Telecommunication Union.

***ITU-R*** means the International Telecommunication Union Radiocommunication Sector.

***location***, in relation to a radiocommunications transmitter or group of radiocommunications transmitters, means the location of the transmitter or group of transmitters, as the case may be, calculated in accordance with Schedule 1 to this instrument.

***maximum true mean power*** means the true mean power measured in a specified, 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 the specified rectangular bandwidth is normally established by taking measurements using either an adjacent channel power meter or a spectrum analyser. Estimation of the accuracy of the measuring equipment, measurement protocol and any adjustments made to measurements to take account of practical filter shape factors should be in accordance with good engineering practices.

***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.

***occupied bandwidth***, in relation to a radiocommunications transmitter, means the width of a frequency band having upper and lower limits that are necessary to contain 99% of the true mean power of the transmitter’s emission at any time.

***Radio Regulations*** means the document:

(a) titled ‘Radio Regulations’ as existing from time to time; and

(b) published by the ITU.

Note 1: The Radio Regulations published by the ITU are not regulations made by the Governor‑General under the Act.

Note 2: Copies of the Radio Regulations can be obtained for free from the ITU website: www.itu.int.

***Recommendation ITU-R P.526-15*** means the ITU-R Recommendation “P.526-15 Propagation by diffraction” published by the ITU.

Note: Copies of Recommendation ITU-R P.526-15 can be obtained for free from the ITU website: [www.itu.int](http://www.itu.int).

***Recommendation ITU-R P.2108-0*** means the ITU-R Recommendation “P.2108-0 Prediction of clutter loss” published by the ITU.

Note: Copies of Recommendation ITU-R P.2108-0 can be obtained for free from the ITU website: [www.itu.int](http://www.itu.int).

***total radiated power***, in relation to a radiocommunications transmitter, means the integral of the power transmitted in different directions over the entire radiation sphere. It is measured considering the combination of all radiating elements on an antenna panel or individual device.

***true mean power*** means:

1. if an unmodulated carrier is present – the mean power measured while the unmodulated carrier is present; and
2. if an unmodulated carrier is not present – the mean power measured while transmitted information is present.

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

Note: A number of other expressions used in this instrument are defined in the Act, including the following:

(a) ACMA;

(b) core condition;

(c) frequency band;

(d) interference;

(e) radiocommunications device;

(f) radiocommunications receiver;

(g) radiocommunications transmitter;

(h) radio emission;

(i) Register;

(j) spectrum licence.

# 5 References to other instruments

In this instrument, unless the contrary intention appears:

(a) a reference to any other legislative instrument is a reference to that other legislative instrument as in force from time to time; and

(b) a reference to any other kind of instrument or writing is a reference to that other instrument or writing as in force or existing from time to time.

Note 1: For references to Commonwealth Acts, see section 10 of the *Acts Interpretation Act 1901*; and see also subsection 13(1) of the *Legislation Act 2003* for the application of the *Acts Interpretation Act 1901* to legislative instruments.

Note 2: All Commonwealth Acts and legislative instruments are registered on the Federal Register of Legislation.

Note 3: See section 314A of the Act.

# 6 Emission designator

(1) For the purpose of this instrument, the designation of a radiocommunications transmitter’s emission (***emission designator***) is determined using the methods specified in the Radio Regulations.

(2) For the purpose of determining the emission designator of a radiocommunications transmitter using the methods specified in the Radio Regulations, references in the Radio Regulations to “necessary bandwidth” for a given class of emission are taken to be references to the occupied bandwidth of the transmitter.

Note: At the date of making this instrument, Appendix 1 of the Radio Regulations sets out the method to be used for determining the designation of a radiocommunications transmitter’s emission.

# 7 Group of radiocommunications transmitters

(1) For the purpose of this instrument, subject to subsection (2), two or more fixed transmitters are a ***group of radiocommunications transmitters*** if:

(a) each transmitter has the same centre frequency and emission designator;

(b) each transmitter is operated for the purpose of communicating with the same radiocommunications receiver or group of radiocommunications receivers;

(c) each transmitter has an antenna of the same type, model and manufacturer;

(d) the antenna used with each fixed transmitter is located on the same structure and within 20 metres of the phase centre of all antennas within the group of radiocommunications transmitters; and

(e) the identification number assigned by the ACMA to the antenna used with each radiocommunications transmitter is the same.

Note: The *Radiocommunications (Register of Radiocommunications Licences) Determination 2017* sets out the information that must be included about each radiocommunications device operated under a spectrum licence.

(2) A radiocommunication transmitter must not belong to more than one group of radiocommunications transmitters.

Note: If a radiocommunications transmitter is capable of belonging to more than one group of radiocommunications transmitters, the spectrum licensee or authorised third party may nominate which group the transmitter belongs to.

# 8 Group of radiocommunications receivers

(1) For the purpose of this instrument, and subject to subsection (2), two or more fixed receivers are a ***group of radiocommunications receivers*** if:

(a) each receiver is operated for the purpose of receiving communication from the same radiocommunications transmitter or group of radiocommunications transmitters;

(b) each receiver has an antenna of the same type, model and manufacturer;

(c) the antenna used with each fixed receiver is located on the same structure and within 20 metres of the phase centre of all antennas within the group of radiocommunications receivers; and

(d) the identification number assigned by the ACMA to the antenna used with each radiocommunications receiver is the same.

Note: The *Radiocommunications (Register of Radiocommunications Licences) Determination 2017* sets out the information that must be included about each radiocommunications device operated under a spectrum licence.

(2) A radiocommunication receiver must not belong to more than one group of radiocommunications receivers.

Note: If a radiocommunications receiver is capable of belonging to more than one group of radiocommunications receivers, the spectrum licensee or authorised third party may nominate which group the receiver belongs to.

# 9 Unacceptable level of interference

(1) For the purpose of subsection 145(4) of the Act, a level of interference caused by a radiocommunications transmitter operated under a spectrum licence issued for the 26 GHz band is unacceptable if:

(a) the operation of the transmitter in the 26 GHz band results in a breach of a core condition of the licence relating to the maximum permitted level of radio emission from the transmitter:

(i) outside the parts of the spectrum the use of which is authorised under the licence; or

(ii) outside the geographic area of the licence; or

(b) subject to subsections (2), (3) and (4), any part of the device boundary of the transmitter lies outside of the geographic area of the licence; or

(c) the device boundary of the transmitter cannot be calculated in accordance with Part 1 of Schedule 2 to this instrument.

(2) A level of interference mentioned in paragraph (1)(b) is not unacceptable in relation to a part of the device boundary that:

(a) lies outside the boundary of the ASMG; and

(b) is connected to a radial that:

(i) is mentioned in Part 1 of Schedule 2 to this instrument; and

(ii) does not cross the geographic area of another spectrum licence in the 26 GHz band.

(3) A level of interference mentioned in paragraph (1)(b) is not unacceptable in relation to a part of the device boundary that:

(a) lies outside the geographic area of the licence;

(b) lies inside the HCIS with the HCIS identifier MW4H6; and

(c) is connected to a radial that:

(i) is mentioned in Part 1 of Schedule 2 to this instrument; and

(ii) does not cross the geographic area of another spectrum licence in the 26 GHz band.

(4) A level of interference mentioned in paragraph (1)(b) is not unacceptable in relation to a part of the device boundary that:

(a) lies outside the geographic area of the licence;

(b) is connected to a radial that:

(i) is mentioned in Part 1 of Schedule 2; and

(ii) does not cross over the land outside the geographic area of the licence that is permanently above the Australian territorial sea baseline as defined by Geoscience Australia.

Note 1: The definitions referred to in paragraph (4)(b)(ii) can be accessed for free at Geoscience Australia’s website ([www.ga.gov.au](http://www.ga.gov.au)).

Note 2: Some radiocommunications transmitters are exempt from the requirement to be registered in the Register under their 26 GHz band spectrum licence – see subsection 69(2) of the Act. These transmitters are not required to meet the device boundary criteria specified in this Determination.

# 10 Accuracy

Unless otherwise specified, the value of a parameter in Schedules 2 and 3 to this instrument must be estimated with a level of confidence not less than 95 percent that the true value of the parameter will always remain below the requirement specified in this instrument.

# Schedule 1 Location of a transmitter

(subsection 4(1))

1. The location of a radiocommunications transmitter, (*lt*, *Lt*) is the location (by latitude and longitude with reference to the Geocentric Datum of Australia 2020) of the phase centre of the radiocommunications transmitter’s antenna.

2. The location of a group of radiocommunications transmitters, (*lt*, *Lt*) is the location (by latitude and longitude with reference to the Geocentric Datum of Australia 2020) of the centre point between the phase centre of each radiocommunications transmitter antenna within the group.

3. In determining the location of a radiocommunications transmitter, or a group of radiocommunications transmitters, the measurement error should be less than 10 metres.

Note 1: The ACMA issues site identifiers for established radiocommunications locations available in the Register.

Note 2: The ACMA provides advice to assist licensees in determining the location and measurement error of a transmitter site in the document Business Operating Procedure (BOP) – Radiocommunications site data requirements, available on the ACMA’s website: [www.acma.gov.au](http://www.acma.gov.au).

# Schedule 2 Device boundaries and device boundary criteria

(subsection 4(1) paragraph 9(1)(c), subparagraphs 9(2)(b)(i), 9(3)(c)(i), 9(4)(b)(i) and section 10)

Part 1 Device boundary of a transmitter

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

Step 1: Calculate the device boundary criterion at each *m*×100 metre increment along each of the *n*-degree radials, where:

(a) ***m*** is each of the integers from 2 through 300; and

(b) ***n*** is each of the integer degrees from 0 (true north) through 359.

Step 2: For each radial, find the latitude and longitude of the first point on the radial, moving away from the location of the transmitter (that is, with the lowest value of *m*) where either:

(a) the device boundary criterion, RP-MP, is less than or equal to 0; or

(b) *m* is equal to 530.

This point is the ***end point*** of the radial.

Step 3: The end point of each radial is the ***device boundary*** of the radiocommunications transmitter connected to that radial.

Note: RP-MP (the device boundary criterion) is calculated under Part 2 of this Schedule.

2. For a group of radiocommunications transmitters the ***device boundary*** is calculated as if for a single radiocommunications transmitter. However, the radiated power (***RP***) for a group of radiocommunications transmitters is taken:

(a) to be equal for each bearing *σn*; and

(b) to have a value that is equal to the maximum horizontally radiated power, in any direction, of any of the radiocommunications transmitters in the group.

Note: σ*n* is the bearing of the *nth*-degree radial for the group of radiocommunications transmitters.

Part 2 Device boundary criterion

1. The device boundary criterion is the value of the mathematical expression:

RP – MP

where:

|  |  |  |
| --- | --- | --- |
| ***MP*** | : | is *PL*(*lmn,Lmn*) *+ LOP – Gr*; |
| ***RP*** | : | is the horizontally radiated power, measured in dBm EIRP per MHz, for each bearing, *σn*; |
| Note: |  | For a device with an active antenna system, the RP at bearing σn is defined as the sum of the gain of the antenna towards the horizontal plane and towards azimuth σn (dB) and the total radiated power (dBm). This allowance is based on the assumption that beam pointing angles and/or power can be controlled dynamically to ensure RP is not exceeded. |
| ***LOP*** | : | is the level of protection. For radiocommunications transmitters that incorporate active antenna system (AAS), the ***LOP*** is -102 dBm per MHz. For radiocommunications transmitters without AAS, the ***LOP*** is –110 dBm per MHz; |
| ***Gr*** | : | is the nominal radiocommunications receiver antenna gain including feeder loss set to 0 dBi; |
| ***PL(lmn,Lmn)*** | : | is the propagation loss (dB) (calculated under Part 3 of this Schedule) of the *mth* increment on the *nth* radial. |

Part 3 Calculation of propagation loss

1. Subject to this Part 3, the ***propagation loss*** (or ***PL(lmn,Lmn)***), for a radiocommunications transmitter, of the *mth* increment on the *nth* radial is calculated using:

(a) for a transmitter connected to an antenna which is located greater than 6 metres above ground level – the method and parameters defined in section 4.5.2 of Recommendation ITU-R P.526-15;

(b) for a transmitter connected to an antenna which is located at or below 6 metres above ground level – the method and parameters defined in section 4.5.2 of Recommendation ITU-R P.526-15 and in section 3.2 of Recommendation ITU-R P.2108-0.

2. In implementing the method in section 4.5.2 of Recommendation ITU-R P.526-15:

(a) the height of the nominal receiver is 5 metres above ground level;

(b) the height of the transmitter above ground level is determined in accordance with Part 1 of Schedule 3 to this instrument; and

(c) the height of a profile point is determined in accordance with Part 2 of Schedule 3 to this instrument.

3. In implementing the method in section 4.5.2 of Recommendation ITU-R P.526-15:

(a) the path profile is developed by sampling the DEM-3S at 100 metre increments along each radial; and

(b) at each increment along the path profile, the procedure for calculating the average ground height described in Part 2 of Schedule 3 to this instrument is used.

4. In implementing the method in section 3.2 of Recommendation ITU-R P.2108-0:

(a) the percentage of locations is set at 0.0001% and the correction is applied at only one end of the path;

(b) if the loss calculated using the method in section 3.2 of Recommendation ITU-R P.2108-0 is less than 0 dB, the calculated loss value is replaced with 0 dB.

# Schedule 3 Antenna height and average ground height

(section 10, item 2 of Part 3 of Schedule 2)

Part 1 Antenna height of a transmitter

1. The ***antenna height*** of a fixed transmitter is the vertical height in metres of the phase centre of the transmitters’s antenna, measured with an error of less than 5 parts in 100 and relative to the point:

(a) 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

(b) having the lowest elevation on that line.

2. For a group of radiocommunications transmitters, the ***antenna height*** for the group is the greatest of the heights of each individual transmitter in the group, calculated in accordance with this Part.

Part 2 Average ground height

1. The ***average ground height*** at the *mth*increment on the *nth* radial is calculated as follows:

Step 1: Determine the associated latitude and longitude of the *mth* increment on the *nth* radial, ***(lmn, Lmn)***, as calculated in Part 3 of this Schedule.

Step 2: Identify the DEM-3S cell represented by (*lmn, Lmn*).

Note: See item 2 below for identifying the DEM-3S cell in a particular case.

Step 3: Bound the identified DEM-3S cell with the 8 adjacent DEM-3S cells in a 3 x3 matrix and obtain each DEM-3S cell height attribute (as shown in Diagram 1).

Step 4: Determine the average value of the 9 DEM-3S cell heights for each cell in the the 3 x 3 matrix.

**Diagram 1 Calculating average ground height**

m=100 m

m=200 m

σn=n.10

2. If (*lmn, Lmn*) has a modulus of zero when divided by 0.000833333, then the corresponding DEM-3S cell, for the purposes Step 2 in item 1, is the adjacent DEM-3S cell with the minimum height.

Note: Additional information for the case where (*lmn, Lmn*) corresponds to a DEM-3S cell boundary is provided in the document titled ‘*Digital Elevation Model Interpretation*’,available for free on the ACMA website: [www.acma.gov.au](http://www.acma.gov.au).

Part 3 Vincenty’s Direct Formulae

Note: This implementation of Vincenty’s Direct Formulae uses the parameters from the GRS80 ellipsoid as referenced by the Geocentric Datum of Australia 2020.

1. In calculating (*lmn, Lmn*):

|  |  |  |
| --- | --- | --- |
| *lt* |  | is the latitude of the fixed transmitter (decimal radians) |
| *Lt* |  | is the longitude of the fixed transmitter (decimal radians) |
| *α* |  | is the azimuth angle (decimal radians) |
| *d* |  | is the separation distance to required point (m×250 metres) |
| *a* |  | is the semi-major axis with value 6378137 metres |
| *fl* |  | is the flattening of the value 1/298.25722210 |
| *b* |  | is the semi-minor axis of (*a×(1-fl)*) |

2. Using an initial value , iterate the following three equations until the change in is less than 10-12.

3. Then:

Note: Use the four-quadrant inverse tangent, *atan2*.

Note: Use the four-quadrant inverse tangent, *atan2*.