

- ANSI IEEE C95.1-1991, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
- Council recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC) and respective national regulations.
- *Directive 2004/40/EC of the European Parliament and of the Council of 29 April 2004 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (18th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC).*
- US FCC limits for the general population. See the FCC web site at <http://www.fcc.gov>, and the policies, guidelines, and requirements in Part 1 of Title 47 of the Code of Federal Regulations, as well as the guidelines and suggestions for evaluating compliance in FCC OET Bulletin 65.
- Health Canada limits for the general population. See the Health Canada web site at [http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/99ehd-dhm237/limits-limités\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/99ehd-dhm237/limits-limités_e.html) and Safety Code 6.
- EN 50383:2002 to 2010 Basic standard for the calculation and measurement of electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunication systems (110 MHz - 40 GHz).
- BS EN 50385:2002 Product standard to demonstrate the compliances of radio base stations and fixed terminal stations for wireless telecommunication systems with the basic restrictions or the reference levels related to human exposure to radio frequency electromagnetic fields (110 MHz – 40 GHz) – general public.
- ICNIRP (International Commission on Non-Ionizing Radiation Protection) guidelines for the general public. See the ICNIRP web site at <http://www.icnirp.de/> and Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields.

## Power density exposure limit

Install the radios for the PTP 550 family of PTP wireless solutions so as to provide and maintain the minimum separation distances from all persons.

The applicable power density exposure limit for RF energy between 4900 MHz and 6050 MHz is **10 W/m<sup>2</sup>**.

## Calculation of power density

The following calculation is based on the ANSI IEEE C95.1-1991 method, as that provides a worst case analysis. Details of the assessment to EN50383:2002 can be provided, if required.

Peak power density in the far field of a radio frequency point source is calculated as follows:

$$S = \frac{P \cdot G}{4\pi d^2}$$

**Where:**

S

P

G

d

**Is:**

power density in W/m<sup>2</sup>

maximum average transmit power capability of the radio, in W

total Tx gain as a factor, converted from dB

distance from point source, in m

Rearranging terms to solve for distance yields:

$$d = \sqrt{\frac{P \cdot G}{4\pi \cdot S}}$$

## Calculated distances

**Table 38** shows calculated minimum separation distances, recommended distances and resulting margins for each frequency band and antenna combination. These are conservative distances that include compliance margins. At these and greater separation distances, the power density from the RF field is below generally accepted limits for the general population.

## Calcul des distances pour la conformité aux limites de radiation radiofréquence

La **Table 39** indique les distances minimales de séparation calculées, les distances recommandées et les marges de sécurité qui en découlent pour chaque bande de fréquence et chaque antenne. Ces distances comprennent les marges de sécurité recommandées par les régulateurs. À ces distance et des distance supérieures, la densité de puissance du champ de radiofréquence est inférieur aux limites généralement admises pour la population.

**Table 38** Minimum safe distances - FCC

Band	Channel Size	Antenna	P (W) (*1)	G (*2)	S (W/m <sup>2</sup> ) (*3)	D (m) (*4)
5.1 GHz	20 MHz	On-board (2.0 dBi)	0.519	2	10	0.08
		Dish (22.0 dBi)	0.102	158	10	0.36
	80 MHz	On-board (2.0 dBi)	0.079	2	10	0.03
		Dish (22.0 dBi)	0.005	158	10	0.08
5.8 GHz	20 MHz	On-board (2.0 dBi)	0.495	2	10	0.08
		Dish (22.0 dBi)	0.020	158	10	0.16
	80 MHz	On-board (2.0 dBi)	0.153	2	10	0.04
		Dish (22.0 dBi)	0.008	158	10	0.10

(\*1) P: maximum average transmit power capability of the radio including cable loss (Watt)

*capacité de puissance d'émission moyenne maximale de la radio comprenant la perte dans les câbles de connexion (W)*

(\*2) G: total transmit gain as a factor, converted from dB

*gain total d'émission, converti à partir de la valeur en dB*

(\*3) S: power density (W/m<sup>2</sup>)

*densité de puissance (W/m<sup>2</sup>)*

(\*4) d: minimum distance from point source (meters)

*distance minimale de source ponctuelle (en mètres)*

**Table 39** Minimum safe distances - ISEDC

Band	Channel Size	Antenna	P (W) (*1)	G (*2)	S (W/m <sup>2</sup> ) (*3)	D (m) (*4)	S @ 20 cm (W/m <sup>2</sup> ) (*5)
5.8 GHz	20 MHz	On-board (2.0 dBi)	0.495	2	9.69	0.08	1.56
		Dish (22.0 dBi)	0.020	158	9.69	0.16	0.48
	80 MHz	On-board (2.0 dBi)	0.153	2	9.69	0.04	6.29
		Dish (22.0 dBi)	0.008	158	9.69	0.10	2.60

(\*1) P: maximum average transmit power capability of the radio including cable loss (Watt)

*capacité de puissance d'émission moyenne maximale de la radio comprenant la perte dans les câbles de connexion (W)*

(\*2) G: total transmit gain as a factor, converted from dB

*gain total d'émission, converti à partir de la valeur en dB*

(\*3) S: power density (W/m<sup>2</sup>)

*densité de puissance (W/m<sup>2</sup>)*

(\*4) d: minimum distance from point source (meters)

*distance minimale de source ponctuelle (en mètres)*

(\*5) S @ 20 cm: power density (W/m<sup>2</sup>) at 20 cm

*densité de puissance (W/m<sup>2</sup>), 20 cm*

**Note**

Gain of antenna in dBi =  $10 \cdot \log(G)$ .

The regulations require that the power used for the calculations is the maximum power in the transmit burst subject to allowance for source-based time-averaging.

At 5.4 GHz and EU 5.8 GHz, the products are generally limited to a fixed EIRP which can be achieved with the Integrated Antenna. The calculations above assume that the maximum EIRP allowed by the regulations is being transmitted.

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**Note**

If there are no EIRP limits in the country of deployment, use the distance calculations for FCC 5.8 GHz for all frequency bands.

At FCC 5.8 GHz, for antennas between 0.6m (2ft) and 1.8m (6ft), alter the distance proportionally to the antenna gain.

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**Remarque**

Gain de l'antenne en dBi =  $10 \cdot \log(G)$ .

Les règlements exigent que la puissance utilisée pour les calculs soit la puissance maximale de la rafale de transmission soumis à une réduction pour prendre en compte le rapport cyclique pour les signaux modulés dans le temps.

Pour une opération dans la CEE dans les bandes 5,4 GHz et 5,8 GHz, les produits sont généralement limités à une PIRE qui peut être atteinte avec l'antenne intégrée. Les calculs ci-dessus supposent que la PIRE maximale autorisée par la réglementation est atteinte.

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**Remarque**

Si aucune limite de PIRE existe pour le pays de déploiement, utilisez les calculs de distance pour FCC 5,8 GHz pour toutes les bandes de fréquence.

Pour la band FCC 5,8 GHz et les antennes entre 0,6 m (2 pieds) et 1,8 m (6 pieds), modifier la distance proportionnellement au gain de l'antenne.

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