Exposure Evaluation

hd33™ 450-700-800-900

Quad-Band Medium Power Remote Unit

FCCID: HCOHD334PSABCH20A

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RF Exposure Evaluation

According to FCC Part 1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. More information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation".

All maximum Conducted Output Power + Max Antenna Gain (dBi) shown below is less than the 37dBm ERP limit. In real deployment, there will be distribution loss due to cable and splitter combiners between the output of device and antenna to ensure radiated power is under 37dBm ERP limit.

Band 1: 450 MHz

In the Frequency Range of 300 to 1500 MHz, the maximum power density limit for the occupational/controlled exposures is f/300 mW/cm^2 for an average time of 6 minutes.

In the Frequency Range of 300 to 1500 MHz, the maximum power density limit for the general population/uncontrolled exposures is f/1500 mW/cm^2 for an average time of 30 minutes.

The antenna connected to the product is specific to the deployment. The worst case scenario occurs when using a very high gain outdoor/indoor antenna. However a typical indoor antenna is shown in the following example:

The highest expected output power is 35 dBm at 511.9875MHz. For an output level of 35 dBm with an indoor antenna gain of 3 dBi, the EIRP is 38 dBm.

The maximum power density safe exposure level for general population/uncontrolled exposure of 30 minutes for the frequency of 511.9875 MHz is 0.341 mW/cm^2.

Conducted Output Power (dBm)	Max Antenna Gain (dBi)	Max EIRP (mW)	Power Density Limit Allowed (mW/cm^2)	Safe Distance (cm)
35	3	6310	0.341	39

RF Exposure Evaluation Distance Calculation

$$d = \sqrt{(EIRP/4\pi S)}$$

Where:

d = Distance to the center of radiation of the antenna (cm) for the allowable Power Density

S = Allowable Power Density Limit (mW/cm^2)

EIRP = Equivalent isotropically radiated power (mW) = $10^{[\text{TX Power (dBm) + Ant Gain (dBi)}/10]}$

As shown above, the minimum safe distance where the MPE limit is reached is 39 cm from the unit with a 3 dBi antenna and no distribution loss.

If the antenna will be positioned closer to end users than 39cm, then the installer must calculate the safe distance for a given installation using the formulas provided.

Band 2: 700 MHz

In the Frequency Range of 300 to 1500 MHz, the maximum power density limit for the occupational/controlled exposures is f/300 mW/cm^2 for an average time of 6 minutes.

In the Frequency Range of 300 to 1500 MHz, the maximum power density limit for the general population/uncontrolled exposures is f/1500 mW/cm^2 for an average time of 30 minutes.

The antenna connected to the product is specific to the deployment. The worst case scenario occurs when using a very high gain outdoor/indoor antenna. However a typical indoor antenna is shown in the following example:

The highest expected output power is 35.1 dBm at 772MHz. For an output level of 35.1 dBm with an indoor antenna gain of 2.5 dBi, the EIRP is 37.6 dBm.

The maximum power density safe exposure level for general population/uncontrolled exposure of 30 minutes for the frequency of 772 MHz is 0.515 mW/cm^2.

Conducted Output Power (dBm)	Max Antenna Gain (dBi)	Max EIRP (mW)	Power Density Limit Allowed (mW/cm^2)	Safe Distance (cm)
35.1	2.5	5754	0.515	30

RF Exposure Evaluation Distance Calculation

$$d = \sqrt{(EIRP/4\pi S)}$$

Where:
d = Distance to the center of radiation of the antenna (cm) for the allowable Power Density
S = Allowable Power Density Limit (mW/cm^2)
EIRP = Equivalent isotropically radiated power (mW) = $10^{[\text{TX Power (dBm) + Ant Gain (dBi)}/10]}$

As shown above, the minimum safe distance where the MPE limit is reached is 30 cm from the unit with a 2.5 dBi antenna and no distribution loss.

If the antenna will be positioned closer to end users than 30 cm, then the installer must calculate the safe distance for a given installation using the formulas provided.

Band 3: 800 MHz

In the Frequency Range of 300 to 1500 MHz, the maximum power density limit for the occupational/controlled exposures is f/300 mW/cm^2 for an average time of 6 minutes.

In the Frequency Range of 300 to 1500 MHz, the maximum power density limit for the general population/uncontrolled exposures is f/1500 mW/cm^2 for an average time of 30 minutes.

The antenna connected to the product is specific to the deployment. The worst case scenario occurs when using a very high gain outdoor/indoor antenna. However a typical indoor antenna is shown in the following example:

The highest expected output power is 35.5 dBm at 860.9875MHz. For an output level of 35.5 dBm with an indoor antenna gain of 3.5 dBi, the EIRP is 39 dBm.

The maximum power density safe exposure level for general population/uncontrolled exposure of 30 minutes for the frequency of 860.9875 MHz is 0.574 mW/cm^2.

Conducted Output Power (dBm)	Max Antenna Gain (dBi)	Max EIRP (mW)	Power Density Limit Allowed (mW/cm^2)	Safe Distance (cm)
35.5	3.5	7943	0.574	34

RF Exposure Evaluation Distance Calculation

$$d = \sqrt{(EIRP/4\pi S)}$$

Where:

d = Distance to the center of radiation of the antenna (cm) for the allowable Power Density

S = Allowable Power Density Limit (mW/cm^2)

EIRP = Equivalent isotropically radiated power (mW) = $10^{\text{[TX Power (dBm) + Ant Gain (dBi)/10]}}$

As shown above, the minimum safe distance where the MPE limit is reached is 34 cm from the unit with a 3.5 dBi antenna and no distribution loss.

If the antenna will be positioned closer to end users than 34 cm, then the installer must calculate the safe distance for a given installation using the formulas provided.

Band 4: 900 MHz

In the Frequency Range of 300 to 1500 MHz, the maximum power density limit for the occupational/controlled exposures is f/300 mW/cm^2 for an average time of 6 minutes.

In the Frequency Range of 300 to 1500 MHz, the maximum power density limit for the general population/uncontrolled exposures is f/1500 mW/cm^2 for an average time of 30 minutes.

The antenna connected to the product is specific to the deployment. The worst case scenario occurs when using a very high gain indoor/outdoor antenna. However a typical indoor antenna is shown in the following example:

The highest expected output power is 34.8 dBm at 935.0125MHz. For an output level of 34.8 dBm with an indoor antenna gain of 3.5 dBi, the EIRP is 38.3 dBm.

The maximum power density safe exposure level for general population/uncontrolled exposure of 30 minutes for the frequency of 935.0125 MHz is 0.623 mW/cm^2.

Conducted Output Power (dBm)	Max Antenna Gain (dBi)	Max EIRP (mW)	Power Density Limit Allowed (mW/cm²)	Safe Distance (cm)
34.8	3.5	6761	0.623	30

RF Exposure Evaluation Distance Calculation

$$d = \sqrt{(EIRP/4\pi S)}$$

Where:

d = Distance to the center of radiation of the antenna (cm) for the allowable Power Density

S = Allowable Power Density Limit (mW/cm^2)

EIRP = Equivalent isotropically radiated power (mW) = $10^{[\text{TX Power (dBm) + Ant Gain (dBi)}/10]}$

As shown above, the minimum safe distance where the MPE limit is reached is 30 cm from the unit with a 3.5 dBi antenna and no distribution loss.

If the antenna will be positioned closer to end users than 30 cm, then the installer must calculate the safe distance for a given installation using the formulas provided.