



APPENDIX I RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

EUT Specification

EUT	Wireless Service Platform
Frequency band (Operating)	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Others
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure ($S = 5\text{mW}/\text{cm}^2$) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ($S=1\text{mW}/\text{cm}^2$)
Antenna diversity	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input checked="" type="checkbox"/> Tx/Rx diversity
Max. output power	For MIMO IEEE 802.11b mode: 18.86 dBm (76.9 mW) IEEE 802.11g mode: 22.77 dBm (189.2 mW) IEEE 802.11n HT 20 MHz mode Channel mode: 22.18 dBm (165.2 mW) IEEE 802.11n HT 40 MHz mode: 23.67 dBm (232.6 mW) For Single IEEE 802.11n HT 20 MHz mode Channel mode: 22.02 dBm (159.22 mW) IEEE 802.11n HT 40 MHz mode: 21.72 dBm (148.59 mW)
Antenna gain (Max)	2dBi (Numeric gain: 1.58) MIMO : $2\text{dBi} + 10 \log (2) = 5.01 \text{ dBi}$ (Numeric gain: 3.16)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

Remark:

The maximum output power is 23.67dBm (232.6mW) at 2442MHz (with 3.16numeric antenna gain.)

TEST RESULTS

No non-compliance noted.

MPE EVALUATION

No non-compliance noted.



Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where $E =$ Field strength in Volts / meter

$P =$ Power in Watts

$G =$ Numeric antenna gain

$d =$ Distance in meters

$S =$ Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

$$P (mW) = P (W) / 1000 \text{ and}$$

$$d (cm) = d(m) / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where $d =$ Distance in cm

$P =$ Power in mW

$G =$ Numeric antenna gain

$S =$ Power density in mW / cm²

Maximum Permissible Exposure

Substituting the MPE safe distance using $d = 20$ cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where $P =$ Power in mW

$G =$ Numeric antenna gain

$S =$ Power density in mW / cm²



IEEE 802.11b mode:

EUT output power = 76.9mW

Numeric Antenna gain = 1.58

→ Power density = 0.024179 mW / cm²

IEEE 802.11g mode:

EUT output power = 189.2 mW

Numeric Antenna gain = 1.58

→ Power density = 0.059488 mW / cm²

For Mimo

IEEE 802.11n HT 20 MHz mode Channel mode:

EUT output power = 165.2 mW

Numeric Antenna gain = 3.16

→ Power density = 0.103884mW / cm²

IEEE 802.11n HT 40 MHz mode:

EUT output power = 232.6 mW

Numeric Antenna gain = 3.16

→ Power density = 0.146268 mW / cm²

For Single

IEEE 802.11n HT 20 MHz mode Channel mode:

EUT output power = 159.22 mW

Numeric Antenna gain = 3.16

→ Power density = 0.10012mW / cm²

IEEE 802.11n HT 40 MHz mode:

EUT output power = 148.59 mW

Numeric Antenna gain = 3.16

→ Power density = 0.093439 mW / cm²

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.)