



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	Wifi Module
Model	WDF710Q
Frequency band (Operating)	<input checked="" type="checkbox"/> 802.11b/g, 802.11n HT20 : 2412MHz ~ 2462MHz <input checked="" type="checkbox"/> 802.11n HT40 : 2422MHz ~ 2452MHz <input checked="" type="checkbox"/> 802.11a/802.11n HT20 : 5150MHz ~ 5250MHz, 5250MHz ~ 5350MHz, 5470MHz ~ 5725MHz, 5725MHz ~ 5850MHz <input checked="" type="checkbox"/> 802.11n HT40 : 5190MHz ~ 5230MHz, 5270MHz ~ 5310MHz, 5510MHz ~ 5590MHz, 5670MHz ~ 5795MHz <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 = 5mW/cm ²) <input checked="" type="checkbox"/> General Population / Uncontrolled exposure
Antenna Specification	Metal Inverted F Antenna, Gain: 3.2 dBi @ 2.4GHz Band, (Numeric gain : 2.09) Gain: 1.9 dBi @ 5GHz Band, (Numeric gain : 1.55)
Average output power	802.11b : 17.77 dBm(59.841mW) 802.11g : 17.97 dBm(62.661mW) 802.11n HT20 : 17.72 dBm(59.156mW) 802.11n HT40 : 17.81 dBm(60.395mW) 802.11a : 16.57 dBm(45.394mW) 802.11n HT20 : 14.46 dBm(27.925mW) 802.11n HT40 : 14.38 dBm(27.416mW)
Tune up limit	802.11b : 18 dBm ± 2.5 dB 802.11g : 15.5 dBm ± 2.5 dB 802.11n HT20 / HT40 : 18 dBm ± 2.5 dB 802.11a / 802.11n HT20 / HT40 : 15 dBm ± 2.5 dB
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A



Remark:

The maximum output power is 17.97dBm (62.661 mW) at 2437 MHz (with 2.09 numeric antenna gain.)



TEST RESULTS

No non-compliance noted.

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{377}$

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:

$$S = \frac{30 \times P \times G}{377d^2}$$

Changing to units of mW and cm, using:

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

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

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:

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

Where $P =$ Power in mW

$G =$ Numeric antenna gain

$S =$ Power density in mW / cm²

IEEE 802.11b:

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW / cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
6	2437.0	59.841	112.202	2.09	20	0.0249	0.0467	1.0

IEEE 802.11g:

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW / cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
6	2437.0	62.661	112.202	2.09	20	0.0261	0.0467	1.0

IEEE 802.11n HT20:

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW / cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
6	2437.0	59.156	112.202	2.09	20	0.0246	0.0467	1.0

IEEE 802.11n HT40:

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW / cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
6	2437.0	60.395	112.202	2.09	20	0.0251	0.0467	1.0

IEEE 802.11a:

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW / cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
36	5180.0	45.394	56.234	1.55	20	0.0140	0.0173	1.0



IEEE 802.11n HT20:

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW / cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
140	5700.0	27.925	56.234	1.55	20	0.0086	0.0173	1.0

IEEE 802.11n HT40:

Ch.	Frequency (MHz)	P (mW)		Gain (num.)	D (cm)	Power density in mW / cm ²		Limit (mW/cm ²)
		Measured	Tune-up limit			Measured	Reported	
102	5510.0	27.416	56.234	1.55	20	0.0085	0.0173	1.0