RADIO FREQUENCY EXPOSURE

LIMIT

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 15.247(b)(4) and 1.1307(b)(1) of this chapter.

EUT Specification

EUT	802.11 b/g Mini-PCI Card
	WLAN: 2.412GHz ~ 2.462GHz
Frequency band	WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz
(Operating)	WLAN: 5.745GHz ~ 5825GHz
	Others _2.405GHz ~ 2.477GHz
	Portable (<20cm separation)
Device category	Mobile (>20cm separation)
	Others
	Occupational/Controlled exposure ($S = 5mW/cm^2$)
Exposure classification	General Population/Uncontrolled exposure
	$(S=1mW/cm^2)$
	Single antenna
	Multiple antennas
Antenna diversity	Tx diversity
	Rx diversity
	Tx/Rx diversity
Max. output power	16.12dBm (40.93mW)
Antenna gain (Max)	1.50 dBi (Numeric gain:1.41)
Evaluation applied	MPE Evaluation
	SAR Evaluation
Note:	

1. The maximum output power is <u>16.12 dBm (40.93mW)</u> at <u>2412MHz</u> (with <u>1.41 numeric</u> <u>antenna gain</u>.)

2. For mobile or fixed location transmitters, no SAR consideration applied. The minimum separation generally be used is at least 20 cm, even if the calculations indicate that the MPE distance would be lesser.

TEST RESULT

No non-compliance noted.



Calculation

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

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:

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

Changing to units of mW and cm, using:

$$P(mW) = P(W) / 1000 and$$

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

Yields

$$d = 100 \times \sqrt{\frac{30 \times (P/1000) \times G}{3770 \times S}} = 0.282 \times \sqrt{\frac{P \times G}{S}}$$

Where $d = distance$ in cm
 $P = Power$ in mW
 $G = Numeric$ antenna gain
 $S = Power$ Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

$$P(mW) = 10^{(Bm)}/10$$
 and

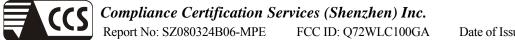
$$G(numeric) = 10 \wedge (G(dBi) / 10)$$

Yields

$$d = 0.282 \times \frac{10^{(P+G)/20}}{\sqrt{20}}$$

Equation 1

Where d = MPE safe distance in cm



P = Power in dBm G = Antenna Gain in dBi $S = Power Density Limit in mW / cm^2$

Maximum Permissible Exposure (2.4 GHz Band)

S = Maximum power density (mW/cm²)

- P = Power input to the antenna (mW) = 40.93
- G = Numeric power gain of the antenna = 1.41

R = Distance to the center of the radiation of the antenna (20cm = limit for MPE) = 0.02^{2}

The maximum permissible exposure (MPE) for the general population is 1.00 mW/cm².

 $(40.93 * 1.41) / (4\pi * 0.02^2) = 0.0115 \text{ mW/cm}^2$

The power density at 20cm does not exceed the 1 mW/cm^2 limit. Therefore, the exposure condition is compliant with FCC rules.