



7.7 APPENDIX I RADIO FREQUENCY EXPOSURE

LIMIT

EUT Specification

EUT	Air-Lock WK-8800 Network Stabilizer Module Booster
Frequency band (Operating)	<input 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 checked="" type="checkbox"/> Others: WCDMA Band V Uplink: 826.4 ~ 846.6 MHz WCDMA Band V Downlink: 871.4 ~ 891.6 MHz AMPS / CDMA / TDMA: Uplink: 824 – 849MHz Downlink: 869 – 894MHz
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 (S=1mW/cm ²)
Antenna diversity	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Max. output power Mode: WCDMA	WCDMA Band V Uplink: 826.4 ~ 846.6 MHz: 28.51 dBm / 709.57mW WCDMA Band V Downlink: 871.4 ~ 891.6 MHz: 12.91 dBm / 19.54mW
Max. output power Mode: AMPS	Uplink: -8.72 dBm / 0.13 mW Downlink: 25.28 dBm / 337.29 mW
Max. output power Mode: CDMA	Uplink: 0.53 dBm / 1.13 mW Downlink: 31.26 dBm / 1336.60 mW
Max. output power Mode: TDMA	Uplink: -2.12 dBm / 0.61 mW Downlink: 28.98 dBm / 790.68 mW
Antenna gain (Max)	15 dBi (Numeric gain: 31.62)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A
Test Specification:	ANSI / IEEE Std.C95.1-1999, H46_2/99_237E: 199
Remark:	<i>The maximum output power is 28.51 dBm (709.57mW) (with 31.62 numeric antenna gain.)</i>

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:

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

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

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

EUT output power = 1336.60mW

Numeric Antenna gain = 31.62

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

\Rightarrow Power density = 8.4104 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.)



EUT	Air-Lock WK-8800 Network Stabilizer Module Booster
Frequency band (Operating)	<input 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 checked="" type="checkbox"/> Others: WCDMA Band II Uplink: 1852.4 ~ 1907.6 MHz WCDMA Band II Downlink: 1932.4 ~ 1987.6 MHz AMPS / CDMA / TDMA: Uplink: 1850 – 1910MHz Downlink: 1930 – 1990MHz
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 (S=1mW/cm ²)
Antenna diversity	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Max. output power Mode: WCDMA	WCDMA Band II Uplink: 1852.4 ~ 1907.6 MHz: 28.34 dBm / 682.33mW WCDMA Band II Downlink: 1932.4 ~ 1987.6 MHz: 14.46 dBm / 27.92mW
Max. output power Mode: AMPS	Uplink: -8.23 dBm / 0.15 mW Downlink: 24.87 dBm / 306.9 mW
Max. output power Mode: CDMA	Uplink: 0.84 dBm / 1.21 mW Downlink: 15.04 dBm / 31.92 mW
Max. output power Mode: TDMA	Uplink: -2.59 dBm / 0.55 mW Downlink: 28.36 dBm / 685.49 mW
Antenna gain (Max)	15 dBi (Numeric gain: 31.62)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A
Test Specification:	ANSI / IEEE Std.C95.1-1999, H46_2/99_237E: 199

Remark:

The maximum output power is 28.34 dBm (682.33mW) (with 31.62 numeric 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:

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

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

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

EUT output power = 685.49mW

Numeric Antenna gain = 31.62

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

\Rightarrow Power density = 4.3134 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.)