7.7 APPENDIX I
RADIO FREQUENCY EXPOSURE

LIMIT

EUT Specification

EUT	Air-Lock WK-9900 Network Stabilizer Module Booster
Frequency band (Operating)	☐ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5.825GHz ☒ Others: WCDMA Band V Uplink: 826.4 ~ 846.6 MHz WCDMA Band V Downlink: 871.4 ~ 891.6 MHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)
Antenna diversity	☒ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Max. output power Mode: WCDMA	WCDMA Band V Uplink: 826.4 ~ 846.6 MHz: 29.58 dBm / 907.82mW WCDMA Band V Downlink: 871.4 ~ 891.6 MHz: 13.06 dBm / 20.23mW
Max. output power Mode: AMPS	Uplink: -6.81 dBm / 000.2 W Downlink: 25.03 dBm / 318.4 W
Max. output power Mode: CDMA	Uplink: 1.22 dBm / 1.3 W Downlink: 31.88 dBm / 1541.7 W
Max. output power Mode: TDMA	Uplink: -4.17 dBm / 0.4 W Downlink: 28.89 dBm / 774.5 W
Antenna gain (Max)	15 dBi (Numeric gain: 31.62)
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation ☐ N/A
Test Specification:	ANSI / IEEE Std.C95.1-1999, H46_2/99_237E: 199
Remark: *The maximum output power is 31.88 dBm (1541.7mW) (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:

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

Changing to units of mW and cm, using:

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

d (cm) = d(m) / 100

Yields

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

Where *d = Distance in cm*
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

Maximum Permissible Exposure

EUT output power = 1541.7mW

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 / cm^2

→ Power density = 9.70096mW / cm^2

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.)

EUT	Air-Lock WK-9900 Network Stabilizer Module Booster
Frequency band (Operating)	☐ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5.825GHz ☒ Others: WCDMA Band II Uplink: 1852.4 ~ 1907.6 MHz WCDMA Band II Downlink: 1932.4 ~ 1987.6 MHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)
Antenna diversity	☒ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Max. output power Mode: WCDMA	WCDMA Band II Uplink: 1852.4 ~ 1907.6 MHz: 28.53 dBm / 712.85mW WCDMA Band II Downlink: 1932.4 ~ 1987.6 MHz: 15.33 dBm / 34.12mW
Max. output power Mode: AMPS	Uplink: -10.23 dBm / 0.1 W Downlink: 23.26 dBm / 211.8 W
Max. output power Mode: CDMA	Uplink: -1.16 dBm / 0.8 W Downlink: 14.90 dBm / 30.9 W
Max. output power Mode: TDMA	Uplink: -4.58 dBm / 0.3 W Downlink: 27.91 dBm / 618.0 W
Antenna gain (Max)	15 dBi (Numeric gain: 31.62)
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation ☐ N/A
Test Specification:	ANSI / IEEE Std.C95.1-1999, H46_2/99_237E: 199
Remark: *The maximum output power is 28.53 dBm (712.85mW) (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:

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

Changing to units of mW and cm, using:

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

d (cm) = d(m) / 100

Yields

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

Where *d = Distance in cm*
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

Maximum Permissible Exposure

EUT output power = 712.85mW

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 / cm^2

→ Power density = 4.4855 mW / cm^2

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.)