



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	Data Collection Computer
Model	CV31A
Frequency band (Operating)	☒ Bluetooth 2.1 + EDR / 4.0: 2402 ~ 2480 MHz 802.11b/g/n HT20: 2.412GHz ~ 2.462GHz 802.11n HT40: 2.422GHz ~ 2.452GHz 802.11a: 5150 ~ 5250MHz / 5725 ~ 5850MHz 802.11 HT20: 5150 ~ 5250MHz / 5725 ~ 5850MHz 802.11 HT40: 5150 ~ 5250MHz / 5725 ~ 5850MHz 802.11AC HT80: 5170 ~ 5330 MHz / 5490 ~ 5815 MHz ☐ Others
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure ($S = 5\text{mW/cm}^2$) ☒ General Population/Uncontrolled exposure ($S=1\text{mW/cm}^2$)
Antenna Specification	5GHz: Antenna Gain : 5.00 dBi (Numeric gain 3.16) 2.4GHz: Antenna Gain : 3.00 dBi (Numeric gain 2.00)
Maximum Average output power	IEEE 802.11b Mode: 18.73 dBm (74.645 mW) IEEE 802.11g Mode: 14.55 dBm (28.510 mW) IEEE 802.11n HT 20 Mode 14.45 dBm (27.861 mW) IEEE 802.11a Mode: 14.41 dBm (27.606 mW) IEEE 802.11n HT20 Mode 14.38 dBm (27.416 mW)
Maximum Tune up Power	Bluetooth Mode : 9.00 dBm (7.943 mW) IEEE 802.11b Mode: 20.00 dBm (100.000 mW) IEEE 802.11g Mode: 20.00 dBm (100.000 mW) IEEE 802.11n HT 20 Mode 20.00 dBm (100.000 mW) IEEE 802.11a Mode: 16.00 dBm (39.811 mW) IEEE 802.11n HT20 Mode 16.00 dBm (39.811 mW)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A



Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	2014/05/24	Initial Issue	ALL	Angel Cheng



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:

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

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

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

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

Bluetooth mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
0	2402	7.943	2	20	0.0032	1

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
1	2412	100	2	20	0.0398	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
1	2412	100	2	20	0.0398	1

IEEE 802.11n HT20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
1	2412	100	2	20	0.0398	1

IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
140	5700	39.811	3.16	20	0.0250	1

IEEE 802.11a HT20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm ²	Limit (mW/cm2)
140	5700	39.811	3.16	20	0.0250	1