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	Panel PC
Model	VM-521
Frequency band (Operating)	☒ Bluetooth 3.0 + EDR / 4.0: 2402 MHz ~ 2480 MHz 802.11b/g/gn HT20: 2412 MHz ~ 2462 MHz 802.11gn HT40: 2422 MHz ~ 2452 MHz 802.11a, 802.11ac VHT20/VHT40/VHT80: 5150 MHz ~ 5250 MHz 5250 MHz ~ 5350 MHz 5500 MHz ~ 5700 MHz 5725 MHz ~ 5850 MHz ☐ Others
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 Specification	Dipole Antenna × 2 (External), 5GHz: Antenna 1(Chain A), Antenna Gain 5.50 dBi (Numeric gain: 3.55) 5GHz: Antenna 2(Chain B), Antenna Gain 5.50 dBm (Numeric gain: 3.55) 2.4GHz: Antenna 1(Chain A), Antenna Gain 5.00 dBi (Numeric gain: 3.16) 2.4GHz: Antenna 2(Chain B), Antenna Gain 5.00 dBm (Numeric gain: 3.16) PIFA Antenna × 2 (Internal), 5GHz: Antenna 1(Chain A), Antenna Gain 4.73 dBi (Numeric gain: 2.97) 5GHz: Antenna 2(Chain B), Antenna Gain 5.39 dBm (Numeric gain: 3.46) 2.4GHz: Antenna 1(Chain A), Antenna Gain 3.17 dBi (Numeric gain: 2.07) 2.4GHz: Antenna 2(Chain B), Antenna Gain 3.21 dBm (Numeric gain: 2.09)

Maximum output power	2.4G Bluetooth 3.0 Mode : 6.71 dBm (4.688 mW) Bluetooth 4.0 Mode : 6.09 dBm (4.064 mW) IEEE 802.11b Mode: 19.11 dBm (81.470 mW) IEEE 802.11g Mode: 20.40 dBm (109.648 mW) IEEE 802.11gn HT 20 Mode: 23.18 dBm (207.970 mW) IEEE 802.11gn HT 40 Mode: 22.47 dBm (176.604 mW) 5G UNII Band 1 IEEE 802.11a Mode: 15.00 dBm (31.623 mW) IEEE 802.11ac VHT20 Mode: 16.91 dBm (49.091 mW) IEEE 802.11ac VHT40 Mode: 16.65 dBm (46.238 mW) IEEE 802.11ac VHT80 Mode: 11.80 dBm (15.136 mW) 5G UNII Band 2A IEEE 802.11a Mode: 15.22 dBm (33.266 mW) IEEE 802.11ac VHT20 Mode: 17.40 dBm (54.954 mW) IEEE 802.11ac VHT40 Mode: 17.38 dBm (54.702 mW) IEEE 802.11ac VHT80 Mode: 13.48 dBm (22.284 mW) 5G UNII Band 2C IEEE 802.11a Mode: 15.34 dBm (34.198 mW) IEEE 802.11ac VHT20 Mode: 17.06 dBm (50.816 mW) IEEE 802.11ac VHT40 Mode: 17.02 dBm (50.350 mW) IEEE 802.11ac VHT80 Mode: 12.32 dBm (17.061 mW) 5G UNII Band 3 IEEE 802.11a Mode: 15.08 dBm (32.211 mW) IEEE 802.11ac VHT20 Mode: 16.94 dBm (49.431 mW) IEEE 802.11ac VHT40 Mode: 17.11 dBm (51.404 mW) IEEE 802.11ac VHT80 Mode: 17.24 dBm (52.966 mW)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	2014/12/05	Initial Issue	ALL	Michelle Chiu

TEST RESULTS

No non-compliance noted.

Calculation

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

   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 / 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 / cm^2

2.4G

Bluetooth 3.0 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
2402 ~ 2480	4.688	3.16	20	0.0029	1

Bluetooth 4.0 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
2402 ~ 2480	4.064	3.16	20	0.0026	1

IEEE 802.11b mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
2412 ~ 2462	81.470	3.16	20	0.0512	1

IEEE 802.11g mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
2412 ~ 2462	109.648	3.16	20	0.0690	1

IEEE 802.11gn HT20 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
2412 ~ 2462	207.970	3.16	20	0.1308	1

IEEE 802.11gn HT40 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
2422 ~ 2452	176.604	3.16	20	0.1111	1

5G UNII Band 1

IEEE 802.11a mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5180 ~ 5240	31.623	3.55	20	0.0223	1

IEEE 802.11ac VHT20 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5180 ~ 5240	49.091	3.55	20	0.0347	1

IEEE 802.11ac VHT40 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5190 ~ 5230	46.238	3.55	20	0.0327	1

IEEE 802.11ac VHT80 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5210	15.136	3.55	20	0.0107	1

5G UNII Band 2A

IEEE 802.11a mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5260 ~ 5320	33.266	3.55	20	0.0235	1

IEEE 802.11ac VHT20 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5260 ~ 5320	54.954	3.55	20	0.0388	1

IEEE 802.11ac VHT40 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5270 ~ 5310	54.702	3.55	20	0.0386	1

IEEE 802.11ac VHT80 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5290	22.284	3.55	20	0.0157	1

5G UNII Band 2C

IEEE 802.11a mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5500 ~ 5700	34.198	3.55	20	0.0242	1

IEEE 802.11ac VHT20 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5500 ~ 5700	50.816	3.55	20	0.0359	1

IEEE 802.11ac VHT40 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5510 ~ 5670	50.35	3.55	20	0.0356	1

IEEE 802.11ac VHT80 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5530	17.061	3.55	20	0.0121	1

5G UNII Band 3

IEEE 802.11a mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5475 ~ 5825	32.211	3.55	20	0.0228	1

IEEE 802.11ac VHT20 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5475 ~ 5825	49.431	3.55	20	0.0349	1

IEEE 802.11ac VHT40 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5755 ~ 5795	51.404	3.55	20	0.0363	1

IEEE 802.11ac VHT80 mode:

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
5775	52.966	3.55	20	0.0374	1

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