Radio Exposure Evaluation Report

FCC ID	:	**TVE-3518T01236**
Equipment	:	**Secured Wireless Access Point**
Brand Name	:	**FORTINET**
Model Name	:	**FortiAP 231Gxxxxxx, FORTIAP-231Gxxxxxx, FAP-231Gxxxxxx, FortiAP 233Gxxxxxx, FORTIAP-233Gxxxxxx, FAP-233Gxxxxxx, (where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only)**
Applicant	:	**Fortinet, Inc.** **899 Kifer Road, Sunnyvale, CA 94086, USA**
Manufacturer	:	**Fortinet, Inc.** **899 Kifer Road, Sunnyvale, CA 94086, USA**
Standard	:	**47 CFR FCC Part 2 Subpart J, section 2.1091**

The product was received on Jun. 29, 2022, and testing was started from Aug. 08, 2022 and completed on Nov. 15, 2022. We, SPORTON INTERNATIONAL INC. Hsinhua Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR FCC Part 2 Subpart J, section 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Hsinhua Laboratory, the test report shall not be reproduced except in full.

Approved by: Jackson Tsai

SPORTON INTERNATIONAL INC. Hsinhua Laboratory
No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FA262434	01	Initial issue of report	Nov. 29, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
None

Reviewed by: Ben Tseng

Report Producer: Jenny Yang

1 General Description

1.1 Information

1.1.1 EUT General Information

RF General Information			
Evaluation Mode	**Frequency Range (MHz)**	**Operating Frequency (MHz)**	**Modulation Type**
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5725-5850	5180-5240 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
6GHz WLAN	5925-7125	5955-7115	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Bluetooth	2400-2483.5	2402-2480	LE: DSSS (GFSK)
ZigBee	2400-2483.5	2405-2480	DSSS (O-QPSK)

1.1.2 Antenna Information

FAP-231G

Ant.	Brand	Model Name	Antenna Type	Connector	Support
1	SENAO	5718A0675300	PIFA	I-Pex	2.4G+5G
2	SENAO	5718A0677300	PIFA	I-Pex	2.4G+5G
3	SENAO	5718A0678300	PIFA	I-Pex	2.4G+5G+6G
4	SENAO	5718A0676300	PIFA	I-Pex	2.4G+5G+6G
5	SENAO	5718A0679300	PIFA	I-Pex	BT & Zigbee

Ant.	Port	Gain (dBi)				Remark	
		2.4G	5G	6G	BT & Zigbee		
1	1	4.5	5.3	-	-	Radio 1 2.4G 2*2 & Radio2 5G 2*2	Radio 2 5G Low Band+ Radio 3 5G High Band 2*2
2	2	4.3	5.3	-	-		
3	1	4.3	5.2	5.3	-	Radio 3 2.4G/5G/6G 2*2	
4	2	4.4	5.3	5.2	-		
5	1	-	-	-	5.1	-	

FAP-233G

Ant.	Brand	Model Name	Antenna Type	Connector	Support
1	AWAN	7102A0560000	Dipole	Reverse SMA	2.4G+5G
2	AWAN	7102A0560000	Dipole	Reverse SMA	2.4G+5G
3	AWAN	7102A0561000	Dipole	I-Pex	2.4G+5G+6G
4	AWAN	7102A0562000	Dipole	I-Pex	2.4G+5G+6G
5	SENAO	5718A0679300	PIFA	I-Pex	BT & Zigbee

Ant.	Port	Gain (dBi)				Remark	
		2.4G	5G	6G	BT & Zigbee		
1	1	4.94	4.58	-	-	Radio 1 2.4G 2*2 & Radio2 5G 2*2	Radio 2 5G Low Band+ Radio 3 5G High Band 2*2
2	2	5.24	4.98	-	-		
3	1	4.53	4.62	4.77	-	Radio 3 2.4G/5G/6G 2*2	
4	2	4.27	4.23	4.37	-		
5	1	-	-	-	5.1	-	

Note 1: The EUT has five antennas.

For 2.4GHz function:

For IEEE 802.11 b/g/n/VHT/ax mode (2TX/2RX)

Ant. 1 (port 1) and Ant. 2 (port 2) could transmit/receive simultaneously.

Ant. 3 (port 1) and Ant. 4 (port 2) could transmit/receive simultaneously.

For BT function:

For IEEE 802.15.1 Bluetooth mode (1TX/1RX)

Only Ant.5 (port 1) can be used as transmitting/receiving.

For 5GHz function:

For IEEE 802.11 a/n/ac/ax mode (2TX/2RX)

Ant. 1 (port 1) and Ant. 2 (port 2) could transmit/receive simultaneously.

Ant. 3 (port 1) and Ant. 4 (port 2) could transmit/receive simultaneously.

For 6GHz function:

For IEEE 802.11 a/n/ac/ax mode (2TX/2RX)

Ant. 3 (port 1) and Ant. 4 (port 2) could transmit/receive simultaneously.

1.1.3 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Model Name	Description
FortiAP 231Gxxxxxx, FORTIAP-231Gxxxxxx, FAP-231Gxxxxxx, (where “x” can be used as “A-Z”, or “0-9”, or “-“, or blank for software changes or marketing purposes only)	FAP-231G indicates that it comes with internal antennas and FAP-233G indicates that the access point comes with external antennas.Series models serve different marketing purpose.
FortiAP 233Gxxxxxx, FORTIAP-233Gxxxxxx, FAP-233Gxxxxxx, (where “x” can be used as “A-Z”, or “0-9”, or “-“, or blank for software changes or marketing purposes only)	

1.1.4 Accessories

Accessories				
Bracket ceiling mount 1	Brand Name	DRAGONJET CORPORTION	Model Name	CLIP CEILING 9/16 LFP
Bracket ceiling mount 2	Brand Name	DRAGONJET CORPORTION	Model Name	CLIP CEILING 15/16 LFP

Reminder: Regarding to more detail and other information, please refer to user manual.

1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 2 Subpart J, section 2.1091
- KDB 447498 D04 Interim General RF Exposure Guidance v01

The following reference test guidance is not within the scope of accreditation of TAF.

- 47 CFR Part 1.1307
- 47 CFR Part 1.1310

1.3 Testing Location

Test Lab.：Sporton International Inc. Hsinhua Laboratory			
☒	Hsinhua	**ADD:** No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)	
	(TAF: 3785**)**	**TEL:** 886-3-327-3456	**FAX:** 886-3-327-0973
		Test site Designation No. TW3785 with FCC.	
☐	Wen 33rd.St.	**ADD:** No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)	
	(TAF: 3785**)**	**TEL:** 886-3-318-0787	**FAX:** 886-3-318-0287
		Test site Designation No. TW0008 with FCC.	

2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f²)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	F/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f²)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	F/1500	30
1500-100,000	-	-	1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

Multiple Transmitters Condition
Co-location as simultaneously transmitting (co-transmitting) and the evaluation shall be consider that simultaneous transmissions from co-located devices the individual transmitters are evaluated separately. After sum of the individual value (basic restriction / reference level) are measured/calculated also have to under basic restriction / reference level.
Co-transmitting mode: 1. Radio 1:2.4G + Radio 2:5G + Radio 3:2.4G + Bluetooth 2. Radio 1:2.4G + Radio 2:5G + Radio 3:5G + Bluetooth 3. Radio 1:2.4G + Radio 2:5G + Radio 3:6G + Bluetooth 4. Radio 1:2.4G + Radio 2:5G + Radio 3:2.4G + Zigbee 5. Radio 1:2.4G + Radio 2:5G + Radio 3:5G + Zigbee 6. Radio 1:2.4G + Radio 2:5G + Radio 3:6G + Zigbee 7. Radio 1:2.4G + (Radio 2:5G(Low Band) + Radio 3:5G(High Band)) + Bluetooth 8. Radio 1:2.4G + (Radio 2:5G(Low Band) + Radio 3:5G(High Band)) + Zigbee

2.2 RF Exposure Exempt Measurement

Option	Refer Std.	Exemption Exposure Thresholds (TL)
A	§1.1307(b)(3)(i)(A)	Available maximum time-averaged power is no more than 1 mW
B	§1.1307(b)(3)(i)(B)	$\mathrm{P}th(mW) = \begin{cases} ERP_{20cm}(d/20cm)^x \rightarrow d \le 20cm \\ ERP_{20cm} \rightarrow 20cm < d \le 40cm \end{cases}$ $x = -\log_{10}\left(\frac{60}{ERP_{20cm}\sqrt{f}}\right)$ and f is in GHz $\begin{cases} ERP_{20cm} : 0.3GHz \le f < 1.5GHz \rightarrow 2040\ f\,(mW) \\ ERP_{20cm} : 1.5GHz \le f \le 6GHz \rightarrow 3060\,(mW) \end{cases}$
C	§1.1307(b)(3)(i)(C)	$\begin{cases} 0.3 \sim 1.34MHz \rightarrow ERP(\mathrm{W}) = 1920\,R^2 \\ 1.34 \sim 30MHz \rightarrow ERP(\mathrm{W}) = 3450\,R^2 / f^2 \\ 30 \sim 300MHz \rightarrow ERP(\mathrm{W}) = 3.83R^2 \\ 300 \sim 1500MHz \rightarrow ERP(\mathrm{W}) = 0.0128\,R^2 f \\ 1500 \sim 100000\ MHz \rightarrow ERP(\mathrm{W}) = 19.2R^2 \end{cases}$ f is in MHz; R is in m; $\mathrm{R} > \lambda/2\pi$

2.3 Multiple RF Sources Exposure

Refer Std.	Exemption Exposure Thresholds (TL)
§1.1307(b)(3)(ii)(A)	The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required)
§1.1307(b)(3)(ii)(B)	$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{ExposureLimit_k} \leq 1$ a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for P , including existing exempt transmitters and those being added. b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added. c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters. P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive). $P_{th,i}$ = the exemption threshold power (P_{th}) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i. ERP_j = the ERP of fixed, mobile, or portable RF source j. $ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π according to the applicable formula of paragraph §1.1307 (b)(3)(i)(C) of this section. $Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure. $Evaluated\ Limit_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from § 1.1310 of this chapter.

2.4 MPE Calculation Method

The MPE was calculated at 49 cm to show compliance with the power density limit.
The following formula was used to calculate the Power Density:

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

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

2.5 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

< FAP-231G >
WLAN 2.4G
Non-Beamforming_Radio1

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	4.50	26.45	30.95	0.50	851.35	49	0.04628	1.00000	C	4609.920	0.18468
2.4G;D1D	4.50	26.58	31.08	0.50	877.22	49	0.04769	1.00000	C	4609.920	0.19029

Non-Beamforming_Radio3

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	4.40	23.84	28.24	0.50	456.15	49	0.02480	1.00000	C	4609.920	0.09895
2.4G;D1D	4.40	24.66	29.06	0.50	550.95	49	0.02995	1.00000	C	4609.920	0.11951

Beamforming_Radio1

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	7.41	23.00	30.41	0.50	751.81	49	0.04087	1.00000	C	4609.920	0.16309

Beamforming_Radio3

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm2)	S Limit (mW/cm2)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	7.36	21.33	28.69	0.50	505.95	49	0.02750	1.00000	C	4609.920	0.10975

WLAN 5G
Non-Beamforming_Radio2

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	5.30	25.13	30.43	0.50	755.28	49	0.04106	1.00000	C	4609.920	0.16384
5.8G;D1D	5.30	25.12	30.42	0.50	753.55	49	0.04096	1.00000	C	4609.920	0.16346

Non-Beamforming_Radio2(Low Band)+Radio3(High Band)

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	5.30	25.14	30.44	0.50	757.02	49	0.04115	1.00000	C	4609.920	0.16422
5.8G;D1D	5.30	25.17	30.47	0.50	762.27	49	0.04144	1.00000	C	4609.920	0.16535

Non-Beamforming_Radio3

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	5.30	24.29	29.59	0.50	622.46	49	0.03384	1.00000	C	4609.920	0.13503
5.8G;D1D	5.30	26.36	31.66	0.50	1002.56	49	0.05450	1.00000	C	4609.920	0.21748

Beamforming_Radio2

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	8.31	24.94	33.25	0.50	1445.81	49	0.07860	1.00000	C	4609.920	0.31363
5.8G;D1D	8.31	24.97	33.28	0.50	1455.83	49	0.07914	1.00000	C	4609.920	0.31580

Beamforming_Radio2(Low Band)+Radio3(High Band)

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	8.31	24.83	33.14	0.50	1409.65	49	0.07663	1.00000	C	4609.920	0.30579
5.8G;D1D	8.26	25.04	33.30	0.50	1462.55	49	0.07951	1.00000	C	4609.920	0.31726

Beamforming_Radio3

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	8.26	24.17	32.43	0.50	1197.04	49	0.06507	1.00000	C	4609.920	0.25967
5.8G;D1D	8.26	25.44	33.70	0.50	1603.65	49	0.08718	1.00000	C	4609.920	0.34787

WLAN 6G
Non-Beamforming

Mode	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
6.2G;D1D	23.95	0.50	169.87	49	0.00923	1.00000	C	4609.920	0.03685
6.4G;D1D	23.11	0.50	139.99	49	0.00761	1.00000	C	4609.920	0.03037
6.7G;D1D	23.48	0.50	152.44	49	0.00829	1.00000	C	4609.920	0.03307
7.0G;D1D	23.47	0.50	152.09	49	0.00827	1.00000	C	4609.920	0.03299

Beamforming

Mode	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
6.2G;D1D	24.88	0.50	210.43	49	0.01144	1.00000	C	4609.920	0.04565
6.4G;D1D	25.34	0.50	233.94	49	0.01272	1.00000	C	4609.920	0.05075
6.7G;D1D	25.62	0.50	249.52	49	0.01356	1.00000	C	4609.920	0.05413
7.0G;D1D	24.21	0.50	180.35	49	0.00980	1.00000	C	4609.920	0.03912

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WLAN 2.4G
Non-Beamforming_Radio1

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	5.24	25.78	31.02	0.50	865.19	49	0.04703	1.00000	C	4609.920	0.18768
2.4G;D1D	5.24	25.41	30.65	0.50	794.53	49	0.04319	1.00000	C	4609.920	0.17235

Non-Beamforming_Radio3

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	4.53	24.21	28.74	0.50	511.81	49	0.02782	1.00000	C	4609.920	0.11102
2.4G;D1D	4.53	24.37	28.90	0.50	531.02	49	0.02887	1.00000	C	4609.920	0.11519

Beamforming_Radio1

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	8.10	24.93	33.03	0.50	1374.39	49	0.07471	1.00000	C	4609.920	0.29814

Beamforming_Radio3

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	7.41	24.32	31.73	0.50	1018.85	49	0.05539	1.00000	C	4609.920	0.22101

WLAN 5G
Non-Beamforming_Radio2

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	4.98	24.73	29.71	0.50	639.90	49	0.03479	1.00000	C	4609.920	0.13881
5.8G;D1D	4.98	24.70	29.68	0.50	635.49	49	0.03455	1.00000	C	4609.920	0.13785

Non-Beamforming_Radio2(Low Band)+Radio3(High Band)

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	4.98	24.64	29.62	0.50	626.77	49	0.03407	1.00000	C	4609.920	0.13596
5.8G;D1D	4.62	25.45	30.07	0.50	695.20	49	0.03779	1.00000	C	4609.920	0.15081

Non-Beamforming_Radio3

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	4.62	24.55	29.17	0.50	565.08	49	0.03072	1.00000	C	4609.920	0.12258
5.8G;D1D	4.62	26.01	30.63	0.50	790.88	49	0.04299	1.00000	C	4609.920	0.17156

Beamforming_Radio2

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	7.79	24.43	32.22	0.50	1140.54	49	0.06200	1.00000	C	4609.920	0.24741
5.8G;D1D	7.79	24.59	32.38	0.50	1183.34	49	0.06433	1.00000	C	4609.920	0.25669

Beamforming_Radio2(Low Band)+Radio3(High Band)

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	7.79	24.50	32.29	0.50	1159.07	49	0.06301	1.00000	C	4609.920	0.25143
5.8G;D1D	7.44	25.32	32.76	0.50	1291.55	49	0.07021	1.00000	C	4609.920	0.28017

Beamforming_Radio3

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	7.44	24.41	31.85	0.50	1047.39	49	0.05694	1.00000	C	4609.920	0.22720
5.8G;D1D	7.44	25.89	33.33	0.50	1472.69	49	0.08006	1.00000	C	4609.920	0.31946

WLAN 6G
Non-Beamforming

Mode	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
6.2G;D1D	23.88	0.50	167.15	49	0.00909	1.00000	C	4609.920	0.03626
6.4G;D1D	23.37	0.50	148.63	49	0.00808	1.00000	C	4609.920	0.03224
6.7G;D1D	23.00	0.50	136.49	49	0.00742	1.00000	C	4609.920	0.02961
7.0G;D1D	23.41	0.50	150.01	49	0.00815	1.00000	C	4609.920	0.03254

Beamforming

Mode	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
6.2G;D1D	23.92	0.50	168.70	49	0.00917	1.00000	C	4609.920	0.03659
6.4G;D1D	24.67	0.50	200.50	49	0.01090	1.00000	C	4609.920	0.04349
6.7G;D1D	23.67	0.50	159.26	49	0.00866	1.00000	C	4609.920	0.03455
7.0G;D1D	23.86	0.50	166.38	49	0.00904	1.00000	C	4609.920	0.03609

Bluetooth LE

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;BT-LE	5.10	9.86	14.96	0.50	21.43	49	0.00117	1.00000	C	4609.920	0.00465

Zigbee

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	5.10	9.78	14.88	0.50	21.04	49	0.00114	1.00000	C	4609.920	0.00456

Note 1: Option A, B and C refer as clause 2.2
Note 2: For option B, Pth(mW) convert to TL ERP(mW); For option C, ERP(W) convert to TL ERP(mW)
Note 3: TL Ratio=Tune-up ERP(mW)/TL ERP(mW)

Simultaneous Transmission Analysis Mode:

1. Radio 1:2.4G + Radio 2:5G + Radio 3:2.4G + Bluetooth

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	8.10	24.93	33.03	0.50	1374.39	49	0.07471	1.00000	C	4609.920	0.29814
5.8G;D1D	8.31	24.97	33.28	0.50	1455.83	49	0.07914	1.00000	C	4609.920	0.31580
2.4G;D1D	7.41	24.32	31.73	0.50	1018.85	49	0.05539	1.00000	C	4609.920	0.22101
2.4G;BT-LE	5.10	9.86	14.96	0.50	21.43	49	0.00117	1.00000	C	4609.920	0.00465
Sum Ratio	0.83960										
Ratio Limit	1.00000										

2. Radio 1:2.4G + Radio 2:5G + Radio 3:5G + Bluetooth

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	8.10	24.93	33.03	0.50	1374.39	49	0.07471	1.00000	C	4609.920	0.29814
5.8G;D1D	8.31	24.97	33.28	0.50	1455.83	49	0.07914	1.00000	C	4609.920	0.31580
5.8G;D1D	8.26	25.44	33.70	0.50	1603.65	49	0.08718	1.00000	C	4609.920	0.34787
2.4G;BT-LE	5.10	9.86	14.96	0.50	21.43	49	0.00117	1.00000	C	4609.920	0.00465
Sum Ratio	0.96646										
Ratio Limit	1.00000										

3. Radio 1:2.4G + Radio 2:5G + Radio 3:6G + Bluetooth

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	8.10	24.93	33.03	0.50	1374.39	49	0.07471	1.00000	C	4609.920	0.29814
5.8G;D1D	8.31	24.97	33.28	0.50	1455.83	49	0.07914	1.00000	C	4609.920	0.31580
6.7G;D1D	-	-	25.62	0.50	249.52	49	0.01356	1.00000	C	4609.920	0.05413
2.4G;BT-LE	5.10	9.86	14.96	0.50	21.43	49	0.00117	1.00000	C	4609.920	0.00465
Sum Ratio	0.67272										
Ratio Limit	1.00000										

4. Radio 1:2.4G + Radio 2:5G + Radio 3:2.4G + Zigbee

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	8.10	24.93	33.03	0.50	1374.39	49	0.07471	1.00000	C	4609.920	0.29814
5.8G;D1D	8.31	24.97	33.28	0.50	1455.83	49	0.07914	1.00000	C	4609.920	0.31580
2.4G;D1D	7.41	24.32	31.73	0.50	1018.85	49	0.05539	1.00000	C	4609.920	0.22101
2.4G;G1D	5.10	9.78	14.88	0.50	21.04	49	0.00114	1.00000	C	4609.920	0.00456
Sum Ratio	0.83952										
Ratio Limit	1.00000										

5. Radio 1:2.4G + Radio 2:5G + Radio 3:5G + Zigbee

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	8.10	24.93	33.03	0.50	1374.39	49	0.07471	1.00000	C	4609.920	0.29814
5.8G;D1D	8.31	24.97	33.28	0.50	1455.83	49	0.07914	1.00000	C	4609.920	0.31580
5.8G;D1D	8.26	25.44	33.70	0.50	1603.65	49	0.08718	1.00000	C	4609.920	0.34787
2.4G;G1D	5.10	9.78	14.88	0.50	21.04	49	0.00114	1.00000	C	4609.920	0.00456
Sum Ratio	0.96638										
Ratio Limit	1.00000										

6. Radio 1:2.4G + Radio 2:5G + Radio 3:6G + Zigbee

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	8.10	24.93	33.03	0.50	1374.39	49	0.07471	1.00000	C	4609.920	0.29814
5.8G;D1D	8.31	24.97	33.28	0.50	1455.83	49	0.07914	1.00000	C	4609.920	0.31580
6.7G;D1D	-	-	25.62	0.50	249.52	49	0.01356	1.00000	C	4609.920	0.05413
2.4G;G1D	5.10	9.78	14.88	0.50	21.04	49	0.00114	1.00000	C	4609.920	0.00456
Sum Ratio	0.67263										
Ratio Limit	1.00000										

7. Radio 1:2.4G + (Radio 2:5G(Low Band) + Radio 3:5G(High Band)) + Bluetooth

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	8.10	24.93	33.03	0.50	1374.39	49	0.07471	1.00000	C	4609.920	0.29814
5.8G;D1D	8.26	25.04	33.30	0.50	1462.55	49	0.07951	1.00000	C	4609.920	0.31726
2.4G;BT-LE	5.10	9.86	14.96	0.50	21.43	49	0.00117	1.00000	C	4609.920	0.00465
Sum Ratio	0.62005										
Ratio Limit	1.00000										

8. Radio 1:2.4G + (Radio 2:5G(Low Band) + Radio 3:5G(High Band)) + Zigbee

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	S (mW/cm²)	S Limit (mW/cm²)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	8.10	24.93	33.03	0.50	1374.39	49	0.07471	1.00000	C	4609.920	0.29814
5.8G;D1D	8.26	25.04	33.30	0.50	1462.55	49	0.07951	1.00000	C	4609.920	0.31726
2.4G;G1D	5.10	9.78	14.88	0.50	21.04	49	0.00114	1.00000	C	4609.920	0.00456
Sum Ratio	0.61996										
Ratio Limit	1.00000										

Note 1: Option A, B and C refer as clause 2.2
Note 2: For option B, Pth(mW) convert to TL ERP(mW); For option C, ERP(W) convert to TL ERP(mW)
Note 3: TL Ratio=Tune-up ERP(mW)/TL ERP(mW)
Note 4: Refer as clause 2.3 Multiple RF Sources Exposure. Please follow below option and sum TL ration table.

Option	Sum TL Ratio_B	Option	Sum TL Ratio_C	Option	Sum TL Ratio_E
B	$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}}$	C	$\sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}}$	E	$\sum_{k=1}^{c} \frac{Evaluated_k}{ExposureLimit_k}$

Note: The above antenna gain was declared by manufacturer.

———THE END———