

# Radio Exposure Evaluation Report

**FCC ID** : TVE-240609  
**Equipment** : Secured Network Extension Device  
**Brand Name** : FORTINET  
**Model Name** : FortiExtenderRugged 511Gxxxxxxxxxx,  
FORTIEXTENDERRUGGED-511Gxxxxxxxxxx,  
FER-511Gxxxxxxxxxx  
(where "x" can be used as "A-Z", or "0-9", or "-", or  
blank for software changes or marketing purposes only)  
**Applicant** : Fortinet, Inc.  
909 Kifer Road, Sunnyvale, CA 94086, USA  
**Manufacturer** : Fortinet, Inc.  
909 Kifer Road, Sunnyvale, CA 94086, USA  
**Standard** : 47 CFR FCC Part 2 Subpart J, section 2.1091

The product was received on Apr. 02, 2024, and testing was started from Apr. 22, 2024 and completed on Jul. 08, 2024. 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   |
|------------|---------|-------------------------|---------------|
| FA390701   | 01      | Initial issue of report | Apr. 21, 2025 |
|            |         |                         |               |
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## 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:** Barry Hsiao

**Report Producer:** Julie Tseng

# 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)<br>802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)<br>VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)<br>802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) |
| 5GHz WLAN              | 5150-5250<br>5250-5350<br>5470-5725<br>5725-5850 | 5180-5240<br>5260-5320<br>5500-5720<br>5745-5825 | 802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)<br>802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)<br>802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)                                 |
| Bluetooth              | 2400-2483.5                                      | 2402-2480                                        | LE: DSSS (GFSK)                                                                                                                                                                                |

### WWAN

| Evaluation Mode | Operating Band | Freq. (MHz) | Modulation Type            |
|-----------------|----------------|-------------|----------------------------|
| 3G              | WCDMA Band II  | 1850 - 1910 | QPSK, 16QAM, 64QAM, 256QAM |
|                 | WCDMA Band IV  | 1710 - 1755 |                            |
|                 | WCDMA Band V   | 824 - 849   |                            |
| LTE             | LTE Band 2     | 1850 - 1910 |                            |
|                 | LTE Band 4     | 1710 - 1755 |                            |
|                 | LTE Band 5     | 824 - 849   |                            |
|                 | LTE Band 7     | 2500 - 2570 |                            |
|                 | LTE Band 12    | 699 - 716   |                            |
|                 | LTE Band 13    | 777 - 787   |                            |
|                 | LTE Band 14    | 788 - 798   |                            |
|                 | LTE Band 17    | 704 - 716   |                            |
|                 | LTE Band 25    | 1850 - 1915 |                            |
|                 | LTE Band 26    | 814 - 849   |                            |
|                 | LTE Band 30    | 2305 - 2315 |                            |



|       |             |                            |  |
|-------|-------------|----------------------------|--|
|       | LTE Band 38 | 2570 - 2620                |  |
|       | LTE Band 41 | 2496 - 2690                |  |
|       | LTE Band 42 | 3450 - 3550<br>3550 - 3600 |  |
|       | LTE Band 43 | 3600 - 3700                |  |
|       | LTE Band 48 | 3550 - 3700                |  |
|       | LTE Band 66 | 1710 - 1780                |  |
|       | LTE Band 71 | 663 - 698                  |  |
| 5G NR | 5G Band n2  | 1850 - 1910                |  |
|       | 5G Band n5  | 824- 849                   |  |
|       | 5G Band n7  | 2500 - 2570                |  |
|       | 5G Band n12 | 699 - 716                  |  |
|       | 5G Band n13 | 777 - 787                  |  |
|       | 5G Band n14 | 788 - 798                  |  |
|       | 5G Band n25 | 1850 - 1915                |  |
|       | 5G Band n26 | 814 - 849                  |  |
|       | 5G Band n30 | 2305 - 2315                |  |
|       | 5G Band n38 | 2570 - 2620                |  |
|       | 5G Band n41 | 2496 - 2690                |  |
|       | 5G Band n48 | 3550 - 3700                |  |
|       | 5G Band n66 | 1710 - 1780                |  |
|       | 5G Band n71 | 663 - 698                  |  |
|       | 5G Band n77 | 3450 - 3980                |  |
|       | 5G Band n78 | 3450 - 3800                |  |

### 1.1.2 Antenna Information

| Ant. | Port | Brand                            | Model Name   | Antenna Type | Connector | Support |
|------|------|----------------------------------|--------------|--------------|-----------|---------|
| 0    | 1    | ADVANCED WIRELESS & ANTENNA Inc. | A8L8Y-200001 | Monopole     | I-PEX     | WWAN    |
| 1    | 2    | ADVANCED WIRELESS & ANTENNA Inc. | A8L8Y-200001 | Monopole     | I-PEX     | WWAN    |
| 2    | 3    | ADVANCED WIRELESS & ANTENNA Inc. | A8L8Y-200000 | Monopole     | I-PEX     | WWAN    |
| 3    | 4    | ADVANCED WIRELESS & ANTENNA Inc. | A8L8M-200000 | Monopole     | I-PEX     | WWAN    |
| 4    | 1    | ADVANCED WIRELESS & ANTENNA Inc. | A8L8Y-200000 | PIFA         | I-PEX     | GPS     |
| 5    | 1    | ADVANCED WIRELESS & ANTENNA Inc. | A8L8P-200000 | Dipole       | I-PEX     | 2.4G+5G |
| 6    | 2    | ADVANCED WIRELESS & ANTENNA Inc. | A8L8M-200000 | Dipole       | I-PEX     | 2.4G+5G |
| 7    | 1    | ADVANCED WIRELESS & ANTENNA Inc. | A8L8P-200000 | Dipole       | I-PEX     | BT      |

Note : Antenna 1~4 Gain See note 2.

| Ant. | Port | Gain (dBi) |      |      |      | Remark                    |
|------|------|------------|------|------|------|---------------------------|
|      |      | 2.4G       | 5G   | BT   | GPS  |                           |
| 4    | 1    | -          | -    | -    | 3.79 | GPS                       |
| 5    | 1    | 4.84       | 4.34 | -    | -    | Radio1_5G&<br>Radio2_2.4G |
| 6    | 2    | 5.25       | 4.94 | -    | -    |                           |
| 7    | 1    | -          | -    | 4.93 | -    | BT                        |

Note 1: Directional gain information

|               | Maximum Output Power                                                                                                                                | Power Spectral Density                                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>Non-BF</b> | Directional gain = Max.gain + array gain.<br>For power measurements on IEEE 802.11 devices<br>Array Gain = 0 dB (i.e., no array gain) for N ANT ≤ 4 | $DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{IS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ |
| <b>BF</b>     | $DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{IS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$                | $DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{IS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$ |

**For 2.4GHz function:**

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

Ant. 5(port 1) and Ant. 6(port 2) could transmit/receive simultaneously.

**For 5GHz function:**

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

Ant. 5(port 1) and Ant. 6(port 2) could transmit/receive simultaneously.

**For Bluetooth function:**

For Bluetooth mode (1TX/1RX)

Only Ant.7 can be used as transmitting/receiving.

Note 2:

| Operating Band                                    | Freq. (MHz)                | Antenna Gain |      |      |      |
|---------------------------------------------------|----------------------------|--------------|------|------|------|
|                                                   |                            | ANT0         | ANT1 | ANT2 | ANT3 |
| <input checked="" type="checkbox"/> WCDMA Band II | 1850 - 1910                | 3.10         | 3.39 | 3.05 | 4.55 |
| <input checked="" type="checkbox"/> WCDMA Band IV | 1710 - 1755                | 3.74         | 4.51 | 3.28 | 5.17 |
| <input checked="" type="checkbox"/> WCDMA Band V  | 824 - 849                  | 3.13         | -    | 2.38 | -    |
| <input checked="" type="checkbox"/> LTE Band 2    | 1850 - 1910                | 3.10         | 3.39 | 3.05 | 4.55 |
| <input checked="" type="checkbox"/> LTE Band 4    | 1710 - 1755                | 3.74         | 4.51 | 3.28 | 5.17 |
| <input checked="" type="checkbox"/> LTE Band 5    | 824 - 849                  | 3.13         | -    | 2.38 | -    |
| <input checked="" type="checkbox"/> LTE Band 7    | 2500 - 2570                | 3.60         | 3.11 | 3.70 | 3.46 |
| <input checked="" type="checkbox"/> LTE Band 12   | 699 - 716                  | 3.08         | -    | 2.46 | -    |
| <input checked="" type="checkbox"/> LTE Band 13   | 777 - 787                  | 2.89         | -    | 2.33 | -    |
| <input checked="" type="checkbox"/> LTE Band 14   | 788 - 798                  | 3.01         | -    | 2.32 | -    |
| <input checked="" type="checkbox"/> LTE Band 17   | 704 - 716                  | 3.08         | -    | 2.46 | -    |
| <input checked="" type="checkbox"/> LTE Band 25   | 1850 - 1915                | 3.10         | 3.39 | 3.05 | 4.55 |
| <input checked="" type="checkbox"/> LTE Band 26   | 814 - 849                  | 3.13         | -    | 2.38 | -    |
| <input checked="" type="checkbox"/> LTE Band 30   | 2305 - 2315                | 0.87         | 0.86 | 0.86 | 0.91 |
| <input checked="" type="checkbox"/> LTE Band 38   | 2570 - 2620                | 2.96         | 3.03 | 3.46 | 3.42 |
| <input checked="" type="checkbox"/> LTE Band 41   | 2496 - 2690                | 3.63         | 3.67 | 3.70 | 3.65 |
| <input checked="" type="checkbox"/> LTE Band 42   | 3450 - 3550<br>3550 - 3600 | 0.40         | 0.22 | 0.41 | 0.46 |
| <input checked="" type="checkbox"/> LTE Band 43   | 3600 - 3700                | 0.42         | 0.36 | 0.47 | 0.43 |
| <input checked="" type="checkbox"/> LTE Band 48   | 3550 - 3700                | 0.42         | 0.36 | 0.47 | 0.43 |
| <input checked="" type="checkbox"/> LTE Band 66   | 1710 - 1780                | 3.74         | 4.51 | 3.28 | 5.17 |
| <input checked="" type="checkbox"/> LTE Band 71   | 663 - 698                  | 2.89         | -    | 2.79 | -    |
| <input checked="" type="checkbox"/> 5G Band n2    | 1850 - 1910                | 3.10         | 3.39 | 3.05 | 4.55 |
| <input checked="" type="checkbox"/> 5G Band n5    | 824- 849                   | 3.13         | -    | 2.38 | -    |
| <input checked="" type="checkbox"/> 5G Band n7    | 2500 - 2570                | 3.60         | 3.11 | 3.70 | 3.46 |
| <input checked="" type="checkbox"/> 5G Band n12   | 699 - 716                  | 3.08         | -    | 2.46 | -    |
| <input checked="" type="checkbox"/> 5G Band n13   | 777 - 787                  | 2.89         | -    | 2.33 | -    |





|                                                 |             |      |      |      |      |
|-------------------------------------------------|-------------|------|------|------|------|
| <input checked="" type="checkbox"/> 5G Band n14 | 788 - 798   | 3.01 | -    | 2.32 | -    |
| <input checked="" type="checkbox"/> 5G Band n25 | 1850 - 1915 | 3.10 | 3.39 | 3.05 | 4.55 |
| <input checked="" type="checkbox"/> 5G Band n26 | 814 - 849   | 3.13 | -    | 2.38 | -    |
| <input checked="" type="checkbox"/> 5G Band n30 | 2305 - 2315 | 0.87 | 0.86 | 0.86 | 0.91 |
| <input checked="" type="checkbox"/> 5G Band n38 | 2570 - 2620 | 2.96 | 3.03 | 3.46 | 3.42 |
| <input checked="" type="checkbox"/> 5G Band n41 | 2496 - 2690 | 3.63 | 3.67 | 3.70 | 3.65 |
| <input checked="" type="checkbox"/> 5G Band n48 | 3550 - 3700 | 0.42 | 0.36 | 0.47 | 0.43 |
| <input checked="" type="checkbox"/> 5G Band n66 | 1710 - 1780 | 3.74 | 4.51 | 3.28 | 5.17 |
| <input checked="" type="checkbox"/> 5G Band n71 | 663 - 698   | 2.89 | -    | 2.79 | -    |
| <input checked="" type="checkbox"/> 5G Band n77 | 3450 - 3980 | 0.42 | 0.40 | 0.47 | 0.46 |
| <input checked="" type="checkbox"/> 5G Band n78 | 3450 - 3800 | 0.42 | 0.40 | 0.47 | 0.46 |

### 1.1.3 Table for Multiple Listing

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

| Brand Name | Model Name                                                                                                                                                                                                          | Description                                                                                                 |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| FORTINET   | FortiExtenderRugged 511Gxxxxxxxxx,<br>FORTIEXTENDERRUGGED-511Gxxxxxxxxx,<br>FER-511Gxxxxxxxxx<br>(where "x" can be used as "A-Z", or "0-9", or "-",<br>or blank for software changes or marketing<br>purposes only) | All the models are identical, the<br>difference model for difference brand<br>served as marketing strategy. |

From the above models, model: FER-511G was selected as representative model for the test and its data was recorded in this report.

### 1.1.4 Accessories

| Accessories |            |                |            |              |
|-------------|------------|----------------|------------|--------------|
| Pole clamp  | Brand Name | JIN GIAN DA FA | Model Name | 6513A0083000 |

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 |                             |                                                                                         |                     |
|-----------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------|---------------------|
| <input checked="" type="checkbox"/>                       | Hsinhua<br>(TAF: 3785)      | ADD: No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)          |                     |
|                                                           |                             | TEL: 886-3-327-3456                                                                     | FAX: 886-3-327-0973 |
| Test site Designation No. TW3785 with FCC.                |                             |                                                                                         |                     |
| <input type="checkbox"/>                                  | Wen 33rd.St.<br>(TAF: 3785) | ADD: No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) |                     |
|                                                           |                             | 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/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | (100)*                                   | 6                                                                |
| 3.0-30                | 1842 / f                          | 4.89 / f                          | (900 / f <sup>2</sup> )*                 | 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/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-1.34              | 614                               | 1.63                              | (100)*                                   | 30                                                               |
| 1.34-30               | 824/f                             | 2.19/f                            | (180/f <sup>2</sup> )*                   | 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: Radio1\_2.4G+Radio2\_5G+Bluetooth+WWAN

## 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) | $P_{th}(mW) = \begin{cases} ERP_{20cm} (d / 20cm)^x \rightarrow d \leq 20cm \\ ERP_{20cm} \rightarrow 20cm < d \leq 40cm \end{cases}$ $x = -\log_{10} \left( \frac{60}{ERP_{20cm} \sqrt{f}} \right) \text{ and } f \text{ is in GHz}$ $\begin{cases} ERP_{20cm} : 0.3GHz \leq f < 1.5GHz \rightarrow 2040 f (mW) \\ ERP_{20cm} : 1.5GHz \leq f \leq 6GHz \rightarrow 3060 (mW) \end{cases}$ |
| C      | §1.1307(b)(3)(i)(C) | $\begin{cases} 0.3 \sim 1.34MHz \rightarrow ERP(W) = 1920R^2 \\ 1.34 \sim 30MHz \rightarrow ERP(W) = 3450R^2 / f^2 \\ 30 \sim 300MHz \rightarrow ERP(W) = 3.83R^2 \\ 300 \sim 1500MHz \rightarrow ERP(W) = 0.0128R^2 f \\ 1500 \sim 100000MHz \rightarrow ERP(W) = 19.2R^2 \end{cases}$ $f \text{ is in MHz; } R \text{ is in m; } R > \lambda / 2\pi$                                      |

## 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) | $\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{ExposureLimit_k} \leq 1$ <p>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.</p> <p>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.</p> <p>c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.</p> <p><math>P_i</math> = 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> <p><math>P_{th,i}</math> = the exemption threshold power ( <math>P_{th}</math> ) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.</p> <p><math>ERP_j</math> = the ERP of fixed, mobile, or portable RF source j.</p> <p><math>ERP_{th,j}</math> = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least <math>\lambda/2\pi</math> according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.</p> <p><math>Evaluated_k</math> = 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.</p> <p><math>Evaluated Limit_k</math> = 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.</p> |

## 2.4 MPE Calculation Method

The MPE was calculated at 20 cm to show compliance with the power density limit.  
The following formula was used to calculate the Power Density:

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

**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

### 2.4G Non-Beamforming

| Mode     | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up ERP (mW) | Distance (cm) | Option | TL ERP (mW) | TL Ratio |
|----------|----------|-------------|------------|----------------|------------------|---------------|--------|-------------|----------|
| 2.4G;G1D | 5.25     | 21.87       | 27.12      | 0.50           | 352.371          | 20            | B      | 3060.0      | 0.1152   |
| 2.4G;D1D | 5.25     | 21.60       | 26.85      | 0.50           | 331.131          | 20            | B      | 3060.0      | 0.1083   |

### 5G Non-Beamforming

| Mode     | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up ERP (mW) | Distance (cm) | Option | TL ERP (mW) | TL Ratio |
|----------|----------|-------------|------------|----------------|------------------|---------------|--------|-------------|----------|
| 5.2G;D1D | 4.94     | 21.98       | 26.92      | 0.50           | 336.512          | 20            | B      | 3060.0      | 0.1100   |
| 5.3G;D1D | 4.94     | 21.46       | 26.40      | 0.50           | 298.538          | 20            | B      | 3060.0      | 0.0976   |
| 5.6G;D1D | 4.94     | 22.64       | 27.58      | 0.50           | 391.742          | 20            | B      | 3060.0      | 0.1281   |
| 5.8G;D1D | 4.94     | 22.01       | 26.95      | 0.50           | 338.844          | 20            | B      | 3060.0      | 0.1108   |

### 2.4G Beamforming

| Mode     | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up ERP (mW) | Distance (cm) | Option | TL ERP (mW) | TL Ratio |
|----------|----------|-------------|------------|----------------|------------------|---------------|--------|-------------|----------|
| 2.4G;D1D | 8.06     | 21.12       | 29.18      | 0.50           | 566.239          | 20            | B      | 3060.0      | 0.1851   |

### 5G Beamforming

| Mode     | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up ERP (mW) | Distance (cm) | Option | TL ERP (mW) | TL Ratio |
|----------|----------|-------------|------------|----------------|------------------|---------------|--------|-------------|----------|
| 5.2G;D1D | 7.66     | 21.86       | 29.52      | 0.50           | 612.350          | 20            | B      | 3060.0      | 0.2002   |
| 5.3G;D1D | 7.66     | 21.32       | 28.98      | 0.50           | 540.754          | 20            | B      | 3060.0      | 0.1768   |
| 5.6G;D1D | 7.66     | 21.61       | 29.27      | 0.50           | 578.096          | 20            | B      | 3060.0      | 0.1890   |
| 5.8G;D1D | 7.66     | 21.73       | 29.39      | 0.50           | 594.292          | 20            | B      | 3060.0      | 0.1943   |

### Bluetooth

| Mode       | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up ERP (mW) | Distance (cm) | Option | TL ERP (mW) | TL Ratio |
|------------|----------|-------------|------------|----------------|------------------|---------------|--------|-------------|----------|
| 2.4G;BT-LE | 4.93     | 5.04        | 9.97       | 0.50           | 6.792            | 20            | B      | 3060.0      | 0.0022   |

### UMTS

| Mode          | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up ERP (mW) | Distance (cm) | Option | TL ERP (mW) | TL Ratio |
|---------------|----------|-------------|------------|----------------|------------------|---------------|--------|-------------|----------|
| WCDMA Band II | 4.55     | 24.50       | 29.05      | 0.50           | 549.68           | 20            | B      | 3060.000    | 0.17963  |
| WCDMA Band IV | 5.17     | 24.50       | 29.67      | 0.50           | 634.03           | 20            | B      | 3060.000    | 0.20720  |
| WCDMA Band V  | 3.13     | 24.50       | 27.63      | 0.50           | 396.38           | 20            | B      | 1680.960    | 0.23580  |

**LTE**

| Mode        | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up ERP (mW) | Distance (cm) | Option | TL ERP (mW) | TL Ratio |
|-------------|----------|-------------|------------|----------------|------------------|---------------|--------|-------------|----------|
| LTE Band 2  | 4.55     | 24.00       | 28.55      | 0.50           | 489.90           | 20            | B      | 3060.000    | 0.16010  |
| LTE Band 4  | 5.17     | 24.00       | 29.17      | 0.50           | 565.08           | 20            | B      | 3060.000    | 0.18467  |
| LTE Band 5  | 3.13     | 24.00       | 27.13      | 0.50           | 353.27           | 20            | B      | 1680.960    | 0.21016  |
| LTE Band 7  | 3.70     | 24.00       | 27.70      | 0.50           | 402.82           | 20            | B      | 3060.000    | 0.13164  |
| LTE Band 12 | 3.08     | 24.00       | 27.08      | 0.50           | 349.23           | 20            | B      | 1425.960    | 0.24491  |
| LTE Band 13 | 2.89     | 24.00       | 26.89      | 0.50           | 334.28           | 20            | B      | 1585.080    | 0.21089  |
| LTE Band 14 | 3.01     | 24.00       | 27.01      | 0.50           | 343.64           | 20            | B      | 1607.520    | 0.21377  |
| LTE Band 17 | 3.08     | 24.00       | 27.08      | 0.50           | 349.23           | 20            | B      | 1436.160    | 0.24317  |
| LTE Band 25 | 4.55     | 24.00       | 28.55      | 0.50           | 489.90           | 20            | B      | 3060.000    | 0.16010  |
| LTE Band 26 | 3.13     | 24.00       | 27.13      | 0.50           | 353.27           | 20            | B      | 1660.560    | 0.21274  |
| LTE Band 30 | 0.91     | 23.00       | 23.91      | 0.50           | 168.31           | 20            | B      | 3060.000    | 0.05500  |
| LTE Band 38 | 3.46     | 24.00       | 27.46      | 0.50           | 381.16           | 20            | B      | 3060.000    | 0.12456  |
| LTE Band 41 | 3.70     | 26.50       | 30.20      | 0.50           | 716.32           | 20            | B      | 3060.000    | 0.23409  |
| LTE Band 42 | 0.46     | 22.50       | 22.96      | 0.50           | 135.24           | 20            | B      | 3060.000    | 0.04420  |
| LTE Band 43 | 0.47     | 22.50       | 22.97      | 0.50           | 135.55           | 20            | B      | 3060.000    | 0.04430  |
| LTE Band 48 | 0.47     | 22.50       | 22.97      | 0.50           | 135.55           | 20            | B      | 3060.000    | 0.04430  |
| LTE Band 66 | 5.17     | 24.00       | 29.17      | 0.50           | 565.08           | 20            | B      | 3060.000    | 0.18467  |
| LTE Band 71 | 2.89     | 24.00       | 26.89      | 0.50           | 334.28           | 20            | B      | 1352.520    | 0.24715  |

**5G NR**

| Mode         | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up ERP (mW) | Distance (cm) | Option | TL ERP (mW) | TL Ratio |
|--------------|----------|-------------|------------|----------------|------------------|---------------|--------|-------------|----------|
| NR n2        | 4.55     | 24.50       | 29.05      | 0.50           | 549.68           | 20            | B      | 3060.000    | 0.17963  |
| NR n5        | 3.13     | 24.50       | 27.63      | 0.50           | 396.38           | 20            | B      | 1680.960    | 0.23580  |
| NR n7        | 3.70     | 24.50       | 28.20      | 0.50           | 451.97           | 20            | B      | 3060.000    | 0.14770  |
| NR n12       | 3.08     | 24.00       | 27.08      | 0.50           | 349.23           | 20            | B      | 1425.960    | 0.24491  |
| NR n13       | 2.89     | 24.00       | 26.89      | 0.50           | 334.28           | 20            | B      | 1585.080    | 0.21089  |
| NR n14       | 3.01     | 24.00       | 27.01      | 0.50           | 343.64           | 20            | B      | 1607.520    | 0.21377  |
| NR n25       | 4.55     | 24.50       | 29.05      | 0.50           | 549.68           | 20            | B      | 3060.000    | 0.17963  |
| NR n26       | 3.13     | 24.00       | 27.13      | 0.50           | 353.27           | 20            | B      | 1660.560    | 0.21274  |
| NR n30       | 0.91     | 23.00       | 23.91      | 0.50           | 168.31           | 20            | B      | 3060.000    | 0.05500  |
| NR n38       | 3.46     | 25.00       | 28.46      | 0.50           | 479.85           | 20            | B      | 3060.000    | 0.15682  |
| NR n41       | 3.70     | 27.50       | 31.20      | 0.50           | 901.80           | 20            | B      | 3060.000    | 0.29471  |
| NR n41 PC1.5 | 3.70     | 29.00       | 32.70      | 0.50           | 1273.83          | 20            | B      | 3060.000    | 0.41628  |
| NR n48       | 0.47     | 22.50       | 22.97      | 0.50           | 135.55           | 20            | B      | 3060.000    | 0.04430  |
| NR n66       | 5.17     | 24.50       | 29.67      | 0.50           | 634.03           | 20            | B      | 3060.000    | 0.20720  |
| NR n71       | 2.89     | 24.50       | 27.39      | 0.50           | 375.07           | 20            | B      | 1352.520    | 0.27731  |
| NR n77       | 0.47     | 27.50       | 27.97      | 0.50           | 428.66           | 20            | B      | 3060.000    | 0.14008  |
| NR n77 PC1.5 | 0.47     | 29.00       | 29.47      | 0.50           | 605.49           | 20            | B      | 3060.000    | 0.19787  |
| NR n78       | 0.47     | 27.50       | 27.97      | 0.50           | 428.66           | 20            | B      | 3060.000    | 0.14008  |
| NR n78 PC1.5 | 0.47     | 29.00       | 29.47      | 0.50           | 605.49           | 20            | B      | 3060.000    | 0.19787  |

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: Radio1\_2.4G+Radio2\_5G+Bluetooth+WWAN

| Mode         | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up ERP (mW) | Distance (cm) | Option | TL ERP (mW) | TL Ratio |
|--------------|----------|-------------|------------|----------------|------------------|---------------|--------|-------------|----------|
| 2.4G;D1D     | 8.06     | 21.12       | 29.18      | 0.50           | 566.38           | 20            | B      | 3060.000    | 0.18509  |
| 5.2G;D1D     | 7.66     | 21.86       | 29.52      | 0.50           | 612.51           | 20            | B      | 3060.000    | 0.20017  |
| 2.4G;BT-LE   | 4.93     | 5.04        | 9.97       | 0.50           | 6.79             | 20            | B      | 3060.000    | 0.00222  |
| NR n41 PC1.5 | 3.70     | 29.00       | 32.70      | 0.50           | 1273.83          | 20            | B      | 3060.000    | 0.41628  |
| Sum Ratio    | 0.80376  |             |            |                |                  |               |        |             |          |
| 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—