

# RF Exposure Evaluation Report

APPLICANT : Veea Inc.  
EQUIPMENT : Wireless Edge Server  
BRAND NAME : VeeaHub  
MODEL NAME : VHC25-5G  
FCC ID : 2ARXK-VHC25-5G  
STANDARD : 47 CFR Part 2.1091  
FCC KDB 447498 D01 v06

The product evaluation date was started from Sep. 14, 2024 and completed on Sep. 14, 2024. We, Sporton International Inc. (Shenzhen), would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.



Approved by: Si Zhang

**Sporton International Inc. (Shenzhen)**

**1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055**  
**People's Republic of China**



## **Table of Contents**

|                                                                                |           |
|--------------------------------------------------------------------------------|-----------|
| <b>1. ADMINISTRATION DATA .....</b>                                            | <b>4</b>  |
| 1.1. Testing Laboratory .....                                                  | 4         |
| <b>2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) .....</b>                      | <b>5</b>  |
| <b>3. MAXIMUM RF AVERAGE OUTPUT TUNE UP POWER AMONG PRODUCTION UNITS .....</b> | <b>7</b>  |
| <b>4. RF EXPOSURE EXEMPTION .....</b>                                          | <b>12</b> |
| <b>5. RF EXPOSURE EXEMPTION .....</b>                                          | <b>13</b> |
| 5.1. Standalone Power Density Calculation .....                                | 13        |
| 5.2. Simultaneous Transmission with SAR-based Test Exemption .....             | 15        |



**Revision History**

| REPORT NO. | VERSION | DESCRIPTION              | ISSUED DATE   |
|------------|---------|--------------------------|---------------|
| FA452231   | Rev. 01 | Initial issue of report. | Sep. 16, 2024 |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |
|            |         |                          |               |



## **1. Administration Data**

### **1.1. Testing Laboratory**

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

| Testing Laboratory |                                                                                                                                                                            |                  |                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|
| Test Firm          | Sporton International Inc. (Shenzhen)                                                                                                                                      |                  |                  |
| Test Site Location | 1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055<br>People's Republic of China<br>TEL: +86-755-86379589<br>FAX: +86-755-86379595 |                  |                  |
| Test Site No.      | Sporton Site No.                                                                                                                                                           | Sporton Site No. | Sporton Site No. |
|                    | SAR01-SZ                                                                                                                                                                   | SAR01-SZ         | SAR01-SZ         |

| Applicant    |                                                  |
|--------------|--------------------------------------------------|
| Company Name | Veea Inc.                                        |
| Address      | 164 E 83rd Street, NEW YORK, United States 10028 |

| Manufacturer |                                                  |
|--------------|--------------------------------------------------|
| Company Name | Veea Inc.                                        |
| Address      | 164 E 83rd Street, NEW YORK, United States 10028 |



## 2. Description of Equipment Under Test (EUT)

| Product Feature & Specification         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT Type                                | Wireless Edge Server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Brand Name                              | Veeahub                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Model Name                              | VHC25-5G                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| FCC ID                                  | 2ARXK-VHC25-5G                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Wireless Technology and Frequency Range | WCDMA Band II: 1850 MHz ~ 1910 MHz<br>WCDMA Band IV: 1710 MHz ~ 1755 MHz<br>WCDMA Band V: 824 MHz ~ 849 MHz<br>LTE Band 2 : 1850 MHz ~ 1910 MHz<br>LTE Band 4 : 1710 MHz ~ 1755 MHz<br>LTE Band 5 : 824 MHz ~ 849 MHz<br>LTE Band 7: 2500 MHz ~ 2570 MHz<br>LTE Band 12 : 699 MHz ~ 716 MHz<br>LTE Band 13 : 777 MHz ~ 787 MHz<br>LTE Band 14: 788 MHz ~ 798 MHz<br>LTE Band 17: 704 MHz ~ 716 MHz<br>LTE Band 25 : 1850 MHz ~ 1915 MHz<br>LTE Band 26 : 814 MHz ~ 849 MHz<br>LTE Band 30 : 2305 MHz ~ 2315 MHz<br>LTE Band 38: 2570 MHz ~ 2620 MHz<br>LTE Band 41: 2496 MHz ~ 2690 MHz<br>LTE Band 42: 3450 MHz ~ 3550 MHz<br>LTE Band 48: 3550 MHz ~ 3700 MHz<br>LTE Band 66 : 1710 MHz ~ 1780 MHz<br>LTE Band 71: 663 MHz ~ 698 MHz<br>5G NR n2 : 1850 MHz ~ 1910 MHz<br>5G NR n5 : 824 MHz ~ 849 MHz<br>5G NR n7 : 2500 MHz ~ 2570 MHz<br>5G NR n12 : 699 MHz ~ 716 MHz<br>5G NR n13 : 777 MHz ~ 787 MHz<br>5G NR n14 : 788 MHz ~ 798 MHz<br>5G NR n25 : 1850 MHz ~ 1915 MHz<br>5G NR n26 : 814 MHz ~ 849 MHz<br>5G NR n30 : 2305 MHz ~ 2315 MHz<br>5G NR n38 : 2570 MHz ~ 2620 MHz<br>5G NR n41 : 2496 MHz ~ 2690 MHz<br>5G NR n48 : 3550 MHz ~ 3700 MHz<br>5G NR n66 : 1710 MHz ~ 1780 MHz<br>5G NR n70 : 1695 MHz ~ 1710 MHz<br>5G NR n71 : 663 MHz ~ 698 MHz<br>5G NR n77 : 3450 MHz ~ 3550 MHz; 3700 MHz ~ 3980 MHz;<br>5G NR n78 : 3450 MHz ~ 3550 MHz; 3700 MHz ~ 3800 MHz;<br>WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz<br>WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz<br>WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz<br>ZigBee: 2405 MHz ~ 2480 MHz |
| Mode                                    | RMC 12.2Kbps<br>HSDPA<br>HSUPA<br>DC-HSDPA<br>HSPA+(16QAM uplink is not supported)<br>LTE: QPSK, 16QAM, 64QAM, 256QAM<br>5G NR : CP-OFDM / DFT-s-OFDM, PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM<br>WLAN 2.4GHz 802.11b/g<br>WLAN 2.4GHz 802.11n HT20/HT40<br>WLAN 2.4GHz 802.11ac VHT20/VHT40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |



|              |                                                                                                                                                                                                          |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | WLAN 2.4GHz 802.11ax HE20/HE40<br>WLAN 5GHz 802.11a<br>WLAN 5GHz 802.11n HT20/HT40<br>WLAN 5GHz 802.11ac VHT20/VHT40/VHT80<br>WLAN 5GHz 802.11ax HE20/HE40/HE80<br>Bluetooth BR/EDR/LE<br>ZigBee: O-QPSK |
| Antenna Type | WWAN: PIFA Antenna<br>WLAN/Bluetooth/ ZigBee: PIFA Antenna                                                                                                                                               |
| HW Version   | 1.0                                                                                                                                                                                                      |
| SW Version   | 2.33.1-0.mfg.alpha.4.0.7                                                                                                                                                                                 |
| EUT Stage    | Identical Prototype                                                                                                                                                                                      |

### Remark:

- The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
- 5G NR n2/5/7/12/13/14/25/26/30/38/41/48/66/70/71/77/78 supports SA mode and NSA mode.
- The intra-band/inter-band ULCA, UL MIMO and EN-DC mode combination could be referred to the product spec.
- This device supports intra-band ULCA, due to intra-band ULCA and non-CA power is same, so non-CA MPE analysis can represent ULCA SAR-Based Exemption analysis.
- This device supports HPUE mode for LTE Band 38/41/42/43 and 5G NR n38/40/41/77/78 with class 2, so HPUE mode has been performed to do MPE analysis.
- The device supports HPUE (power class 2) under SISO mode and HPUE (power class 1.5) under UL MIMO mode for 5G NR n41/n77/n78, so HPUE (power class 1.5) has been performed MPE calculation.
- 5G NR n38/n41/n48/n77/n78 support SISO/MIMO mode, only MIMO tune up power was chosen to perform MPE calculation conservatively for MIMO power is higher.
- Chose the maximum RF output tune up power and the maximum antenna gain of all antennas among same frequency WLAN bands to perform MPE calculation conservatively.
- WLAN 2.4GHz/WLAN 5GHz all support SISO and MIMO mode, MIMO tune up power was chosen to perform MPE calculation conservatively.
- The device supports Tx Beamforming mode for WLAN 2.4GHz 802.11 n/ac/ax and WLAN 5GHz (UNII-1/UNII-3) 802.11 n/ac/ax.
- For WLAN CDD & Tx Beamforming mode, the MPE calculation performed separately.

### Comments and Explanations:

- The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.
- The maximum RF output tune up power, antenna gain also the safe distance used for evaluate RF exposure were declared by manufacturer.

### Antenna Gain:

| WLAN             | Maximum Antenna Gain (dBi) |       |       |       |             |
|------------------|----------------------------|-------|-------|-------|-------------|
|                  | Ant.1                      | Ant.2 | Ant.3 | Ant.4 | Beamforming |
| WLAN 2.4GHz      | /                          | 2.2   | /     | 1.8   | 5.01        |
| WLAN 5.2GHz      | 3.6                        | /     | 3.5   | /     | 6.56        |
| WLAN 5.3GHz      | 3.5                        | /     | 3.5   | /     | /           |
| WLAN 5.5GHz      | /                          | 3.2   | /     | 2.7   | /           |
| WLAN 5.8GHz      | /                          | 3.3   | /     | 3.4   | 6.36        |
| Bluetooth BR/EDR | 2.3                        | /     | /     | /     | /           |
| Bluetooth LE     | /                          | /     | 1.9   | /     | /           |
| ZigBee           | /                          | /     | 1.9   | /     | /           |

### 3. Maximum RF average output tune up power among production units

#### <WCDMA>

| Mode  |         | Maximum Average power(dBm) |
|-------|---------|----------------------------|
| WCDMA | Band II | 25.00                      |
|       | Band IV | 25.00                      |
|       | Band V  | 25.00                      |

#### <LTE>

| Mode |              | Maximum Average power(dBm) |
|------|--------------|----------------------------|
| LTE  | Band 2       | 25.00                      |
|      | Band 4       | 25.00                      |
|      | Band 5       | 25.00                      |
|      | Band 7       | 25.00                      |
|      | Band 12      | 25.00                      |
|      | Band 13      | 25.00                      |
|      | Band 14      | 25.00                      |
|      | Band 17      | 25.00                      |
|      | Band 25      | 25.00                      |
|      | Band 26      | 25.00                      |
|      | Band 30      | 19.50                      |
|      | Band 38      | 25.00                      |
|      | Band 38 HPUE | 28.00                      |
|      | Band 41      | 25.00                      |
|      | Band 41 HPUE | 28.00                      |
|      | Band 42      | 25.00                      |
|      | Band 42 HPUE | 26.00                      |
|      | Band 48      | 19.50                      |
|      | Band 66      | 25.00                      |
|      | Band 71      | 25.00                      |

**<5GNR>**

| Mode |          | Maximum Average power(dBm) |
|------|----------|----------------------------|
| 5GNR | n2       | 25.00                      |
|      | n5       | 25.00                      |
|      | n7       | 25.00                      |
|      | n12      | 25.00                      |
|      | n13      | 25.00                      |
|      | n14      | 25.00                      |
|      | n25      | 25.00                      |
|      | n26      | 25.00                      |
|      | n30      | 19.50                      |
|      | n38      | 25.00                      |
|      | n38 HPUE | 28.00                      |
|      | n41      | 25.00                      |
|      | n41 HPUE | 28.00                      |
|      | n66      | 25.00                      |
|      | n70      | 25.00                      |
|      | n71      | 25.00                      |
|      | n77      | 25.00                      |
|      | n77 HPUE | 26.00                      |
|      | n78      | 25.00                      |
|      | n78 HPUE | 26.00                      |

| Mode |           | Maximum Average power(dBm) |
|------|-----------|----------------------------|
| 5GNR | n48 Ant 0 | 19.77                      |
|      | n48 Ant 2 | 20.00                      |

**<5GNR MIMO>**

| Mode |     | Maximum Average power(dBm) |
|------|-----|----------------------------|
| 5GNR | n38 | 30.00                      |
|      | n41 | 30.00                      |
|      | n48 | 19.77                      |
|      | n77 | 26.00                      |
|      | n78 | 26.00                      |

Note: WWAN support SISO/MIMO mode, only MIMO tune up power was chosen to perform MPE calculation conservatively for MIMO power is higher.

## < Bluetooth >

| Mode             | Maximum Average Power (dBm) |
|------------------|-----------------------------|
|                  | Ant.1                       |
| Bluetooth BR/EDR | 8.00                        |
| Mode             | Ant.3                       |
|                  | 16.00                       |
| Bluetooth LE     | 16.00                       |

## < ZigBee >

| Mode   |        | Maximum Average power(dBm) |
|--------|--------|----------------------------|
|        |        | Ant.3                      |
| 2.4GHz | ZigBee | 16.0                       |

## < For CDD/MIMO Mode >

### < 2.4GHz WLAN >

| Mode   |                | Maximum Average Power (dBm) |
|--------|----------------|-----------------------------|
|        |                | Ant.2+4                     |
| 2.4GHz | 802.11b        | 24.00                       |
|        | 802.11g        | 24.00                       |
|        | 802.11n-HT20   | 23.00                       |
|        | 802.11n-HT40   | 23.00                       |
|        | 802.11ac-VHT20 | 23.00                       |
|        | 802.11ac-VHT40 | 23.00                       |
|        | 802.11ax-HE20  | 23.00                       |
|        | 802.11ax-HE40  | 23.00                       |

### < 5GHz WLAN >

| Mode   |                | Maximum Average Power (dBm) |
|--------|----------------|-----------------------------|
|        |                | Ant.1+3                     |
| 5.2GHz | 802.11a        | 23.00                       |
|        | 802.11n-HT20   | 23.00                       |
|        | 802.11n-HT40   | 23.00                       |
|        | 802.11ac-VHT20 | 23.00                       |
|        | 802.11ac-VHT40 | 23.00                       |
|        | 802.11ac-VHT80 | 23.00                       |
|        | 802.11ax-HE20  | 23.00                       |
|        | 802.11ax-HE40  | 23.00                       |
|        | 802.11ax-HE80  | 23.00                       |
| 5.3GHz | 802.11a        | 22.00                       |
|        | 802.11n-HT20   | 23.00                       |
|        | 802.11n-HT40   | 23.00                       |
|        | 802.11ac-VHT20 | 23.00                       |
|        | 802.11ac-VHT40 | 23.00                       |
|        | 802.11ac-VHT80 | 22.00                       |
|        | 802.11ax-HE20  | 23.00                       |
|        | 802.11ax-HE40  | 23.00                       |
|        | 802.11ax-HE80  | 22.00                       |



| Mode   |                | Maximum Average Power (dBm) |
|--------|----------------|-----------------------------|
|        |                | Ant.2+4                     |
| 5.5GHz | 802.11a        | 23.00                       |
|        | 802.11n-HT20   | 23.00                       |
|        | 802.11n-HT40   | 23.00                       |
|        | 802.11ac-VHT20 | 23.00                       |
|        | 802.11ac-VHT40 | 23.00                       |
|        | 802.11ac-VHT80 | 23.00                       |
|        | 802.11ax-HE20  | 23.00                       |
|        | 802.11ax-HE40  | 23.00                       |
|        | 802.11ax-HE80  | 23.00                       |
| 5.8GHz | 802.11a        | 23.00                       |
|        | 802.11n-HT20   | 23.00                       |
|        | 802.11n-HT40   | 23.00                       |
|        | 802.11ac-VHT20 | 23.00                       |
|        | 802.11ac-VHT40 | 23.00                       |
|        | 802.11ac-VHT80 | 23.00                       |
|        | 802.11ax-HE20  | 23.00                       |
|        | 802.11ax-HE40  | 23.00                       |
|        | 802.11ax-HE80  | 23.00                       |

Note: WLAN2.4GHz /WLAN5GHz all support SISO/MIMO mode, MIMO tune up power was chosen to perform MPE calculation conservatively for MIMO power is higher.

**<For Tx Beamforming Mode>****<2.4GHz WLAN >**

| Mode   |                | Maximum Average Power (dBm) |
|--------|----------------|-----------------------------|
|        |                | Ant.2+4                     |
| 2.4GHz | 802.11n-HT20   | 20.00                       |
|        | 802.11n-HT40   | 20.00                       |
|        | 802.11ac-VHT20 | 20.00                       |
|        | 802.11ac-VHT40 | 20.00                       |
|        | 802.11ax-HE20  | 20.00                       |
|        | 802.11ax-HE40  | 20.00                       |

**<5GHz WLAN >**

| Mode   |                | Maximum Average Power (dBm) |
|--------|----------------|-----------------------------|
|        |                | Ant.1+3                     |
| 5.2GHz | 802.11n-HT20   | 23.00                       |
|        | 802.11n-HT40   | 23.00                       |
|        | 802.11ac-VHT20 | 23.00                       |
|        | 802.11ac-VHT40 | 23.00                       |
|        | 802.11ac-VHT80 | 23.00                       |
|        | 802.11ax-HE20  | 23.00                       |
|        | 802.11ax-HE40  | 23.00                       |
|        | 802.11ax-HE80  | 23.00                       |

| Mode   |                | Maximum Average Power (dBm) |
|--------|----------------|-----------------------------|
|        |                | Ant.2+4                     |
| 5.8GHz | 802.11n-HT20   | 23.00                       |
|        | 802.11n-HT40   | 23.00                       |
|        | 802.11ac-VHT20 | 23.00                       |
|        | 802.11ac-VHT40 | 23.00                       |
|        | 802.11ac-VHT80 | 23.00                       |
|        | 802.11ax-HE20  | 23.00                       |
|        | 802.11ax-HE40  | 23.00                       |
|        | 802.11ax-HE80  | 23.00                       |

Note: The device supports TX Beamforming mode for WLAN 2.4GHz 802.11 n/ac/ax and WLAN 5GHz (UNII-1/UNII-3) 802.11 n/ac/ax.

#### 4. RF Exposure Exemption

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

| Frequency range (MHz)                                          | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|----------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| <b>(A) Limits for Occupational/Controlled Exposures</b>        |                               |                               |                                     |                          |
| 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>(B) Limits for General Population/Uncontrolled Exposure</b> |                               |                               |                                     |                          |
| 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                       |

The MPE was calculated at 29 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



## 5. RF Exposure Exemption

### 5.1. Standalone Power Density Calculation

| Band             | Frequency (MHz) | Maximum Power (dBm) | MPE evaluation distance (cm) | FCC ERP/EIRP Limit (W) | Power Density for Max Gain to meet FCC ERP/EIRP and MPE limit (mW/cm <sup>2</sup> ) | Power Density for Max gain allowed (mW/cm <sup>2</sup> ) | FCC MPE Limit (mW)/cm <sup>2</sup> | FCC MPE Result / FCC MPE Limit Ratio | Ant Gain to meet FCC MPE limit (dBi) | Ant Gain to meet FCC ERP/EIRP limit (dBi) | Max Gain to meet FCC ERP/EIRP and MPE limit (dBi) | Max Gain to consider same Frequency with LTE or EN-DC /ULCA Active | Max gain allowed (dBi) |
|------------------|-----------------|---------------------|------------------------------|------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------|------------------------|
| WCDMA Band 2     | 1850.0          | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.189                                                    | 1.000                              | 0.189                                | 15.2                                 | 8.0                                       | 8.0                                               | 8.0                                                                | 8.0                    |
| WCDMA Band 4     | 1710.0          | 25.00               | 29.00                        | 1.000                  | 0.095                                                                               | 0.095                                                    | 1.000                              | 0.095                                | 15.2                                 | 5.0                                       | 5.0                                               | 5.0                                                                | 5.0                    |
| WCDMA Band 5     | 824.0           | 25.00               | 29.00                        | 7.000                  | 0.545                                                                               | 0.189                                                    | 0.549                              | 0.344                                | 12.6                                 | 13.4                                      | 12.6                                              | 8.0                                                                | 8.0                    |
| LTE Band 2       | 1850.0          | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.189                                                    | 1.000                              | 0.189                                | 15.2                                 | 8.0                                       | 8.0                                               | 8.0                                                                | 8.0                    |
| LTE Band 4       | 1710.0          | 25.00               | 29.00                        | 1.000                  | 0.095                                                                               | 0.095                                                    | 1.000                              | 0.095                                | 15.2                                 | 5.0                                       | 5.0                                               | 5.0                                                                | 5.0                    |
| LTE Band 5       | 824.0           | 25.00               | 29.00                        | 7.000                  | 0.545                                                                               | 0.189                                                    | 0.549                              | 0.344                                | 12.6                                 | 13.4                                      | 12.6                                              | 8.0                                                                | 8.0                    |
| LTE Band 7       | 2500.0          | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.060                                                    | 1.000                              | 0.060                                | 15.2                                 | 8.0                                       | 8.0                                               | 3.0                                                                | 3.0                    |
| LTE Band 12      | 699.0           | 25.00               | 29.00                        | 3.000                  | 0.279                                                                               | 0.168                                                    | 0.466                              | 0.361                                | 11.9                                 | 9.7                                       | 9.7                                               | 7.5                                                                | 7.5                    |
| LTE Band 13      | 777.0           | 25.00               | 29.00                        | 3.000                  | 0.279                                                                               | 0.168                                                    | 0.518                              | 0.325                                | 12.3                                 | 9.7                                       | 9.7                                               | 7.5                                                                | 7.5                    |
| LTE Band 14      | 788.0           | 25.00               | 29.00                        | 3.000                  | 0.279                                                                               | 0.168                                                    | 0.525                              | 0.320                                | 12.4                                 | 9.7                                       | 9.7                                               | 7.5                                                                | 7.5                    |
| LTE Band 17      | 704.0           | 25.00               | 29.00                        | 3.000                  | 0.279                                                                               | 0.168                                                    | 0.469                              | 0.359                                | 11.9                                 | 9.7                                       | 9.7                                               | 7.5                                                                | 7.5                    |
| LTE Band 25      | 1850.0          | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.189                                                    | 1.000                              | 0.189                                | 15.2                                 | 8.0                                       | 8.0                                               | 8.0                                                                | 8.0                    |
| LTE Band 26      | 814.0           | 25.00               | 29.00                        | 7.000                  | 0.532                                                                               | 0.189                                                    | 0.543                              | 0.348                                | 12.5                                 | 13.4                                      | 12.5                                              | 8.0                                                                | 8.0                    |
| LTE Band 30      | 2305.0          | 19.50               | 29.00                        | 0.250                  | 0.023                                                                               | 0.023                                                    | 1.000                              | 0.023                                | 20.7                                 | 4.4                                       | 4.4                                               | 4.4                                                                | 4.4                    |
| LTE Band 38      | 2570.0          | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.060                                                    | 1.000                              | 0.060                                | 15.2                                 | 8.0                                       | 8.0                                               | 3.0                                                                | 3.0                    |
| LTE Band 38-HPUE | 2570.0          | 28.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.119                                                    | 1.000                              | 0.119                                | 12.2                                 | 5.0                                       | 5.0                                               | 3.0                                                                | 3.0                    |
| LTE Band 41      | 2496.0          | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.060                                                    | 1.000                              | 0.060                                | 15.2                                 | 8.0                                       | 8.0                                               | 3.0                                                                | 3.0                    |
| LTE Band 41-HPUE | 2496.0          | 28.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.189                                                    | 1.000                              | 0.189                                | 12.2                                 | 5.0                                       | 5.0                                               | 5.0                                                                | 5.0                    |
| LTE Band 42      | 3450.0          | 25.00               | 29.00                        | 1.000                  | 0.095                                                                               | 0.095                                                    | 1.000                              | 0.095                                | 15.2                                 | 5.0                                       | 5.0                                               | 5.0                                                                | 5.0                    |
| LTE Band 42-HPUE | 3450.0          | 26.00               | 29.00                        | 1.000                  | 0.095                                                                               | 0.095                                                    | 1.000                              | 0.095                                | 14.2                                 | 4.0                                       | 4.0                                               | 4.0                                                                | 4.0                    |
| LTE Band 48      | 3550.0          | 19.50               | 29.00                        | 0.200                  | 0.019                                                                               | 0.019                                                    | 1.000                              | 0.019                                | 20.7                                 | 3.5                                       | 3.5                                               | 3.5                                                                | 3.5                    |
| LTE Band 66      | 1710.0          | 25.00               | 29.00                        | 1.000                  | 0.095                                                                               | 0.095                                                    | 1.000                              | 0.095                                | 15.2                                 | 5.0                                       | 5.0                                               | 5.0                                                                | 5.0                    |
| LTE Band 71      | 663.0           | 25.00               | 29.00                        | 3.000                  | 0.279                                                                               | 0.150                                                    | 0.442                              | 0.339                                | 11.6                                 | 9.7                                       | 9.7                                               | 7.0                                                                | 7.0                    |
| 5G NR n2         | 1850.0          | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.189                                                    | 1.000                              | 0.189                                | 15.2                                 | 8.0                                       | 8.0                                               | 8.0                                                                | 8.0                    |
| 5G NR n5         | 824.0           | 25.00               | 29.00                        | 7.000                  | 0.545                                                                               | 0.168                                                    | 0.549                              | 0.306                                | 12.6                                 | 13.4                                      | 12.6                                              | 7.5                                                                | 7.5                    |
| 5G NR n7         | 2500.0          | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.189                                                    | 1.000                              | 0.189                                | 15.2                                 | 8.0                                       | 8.0                                               | 8.0                                                                | 8.0                    |
| 5G NR n12        | 699             | 25.00               | 29.00                        | 3.000                  | 0.279                                                                               | 0.168                                                    | 0.466                              | 0.361                                | 11.9                                 | 9.7                                       | 9.7                                               | 7.5                                                                | 7.5                    |
| 5G NR n13        | 777             | 25.00               | 29.00                        | 3.000                  | 0.279                                                                               | 0.168                                                    | 0.518                              | 0.325                                | 12.3                                 | 9.7                                       | 9.7                                               | 7.5                                                                | 7.5                    |
| 5G NR n14        | 788.0           | 25.00               | 29.00                        | 3.000                  | 0.279                                                                               | 0.168                                                    | 0.525                              | 0.320                                | 12.4                                 | 9.7                                       | 9.7                                               | 7.5                                                                | 7.5                    |
| 5G NR n25        | 1850.0          | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.189                                                    | 1.000                              | 0.189                                | 15.2                                 | 8.0                                       | 8.0                                               | 8.0                                                                | 8.0                    |
| 5G NR n26        | 814.0           | 25.00               | 29.00                        | 7.000                  | 0.532                                                                               | 0.189                                                    | 0.543                              | 0.348                                | 12.5                                 | 13.4                                      | 12.5                                              | 8.0                                                                | 8.0                    |
| 5G NR n30        | 2305.0          | 19.50               | 29.00                        | 0.250                  | 0.023                                                                               | 0.023                                                    | 1.000                              | 0.023                                | 20.7                                 | 4.4                                       | 4.4                                               | 4.4                                                                | 4.4                    |
| 5G NR n38        | 3570.00         | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.060                                                    | 1.000                              | 0.060                                | 15.2                                 | 8.0                                       | 8.0                                               | 3.0                                                                | 3.0                    |
| 5G NR n38-HPUE   | 3570.00         | 28.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.119                                                    | 1.000                              | 0.119                                | 12.2                                 | 5.0                                       | 5.0                                               | 3.0                                                                | 3.0                    |
| 5G NR n38-MIMO   | 3570.00         | 30.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.189                                                    | 1.000                              | 0.189                                | 10.2                                 | 3.0                                       | 3.0                                               | 3.0                                                                | 3.0                    |
| 5G NR n41        | 2496.00         | 25.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.060                                                    | 1.000                              | 0.060                                | 15.2                                 | 8.0                                       | 8.0                                               | 3.0                                                                | 3.0                    |
| 5G NR n41-HPUE   | 2496.00         | 28.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.119                                                    | 1.000                              | 0.119                                | 12.2                                 | 5.0                                       | 5.0                                               | 3.0                                                                | 3.0                    |
| 5G NR n41-MIMO   | 2496.00         | 30.00               | 29.00                        | 2.000                  | 0.189                                                                               | 0.189                                                    | 1.000                              | 0.189                                | 10.2                                 | 3.0                                       | 3.0                                               | 3.0                                                                | 3.0                    |
| 5G NR n48 Ant0   | 3550.0          | 19.77               | 29.00                        | 0.200                  | 0.019                                                                               | 0.019                                                    | 1.000                              | 0.019                                | 20.4                                 | 3.24                                      | 3.24                                              | 3.24                                                               | 3.24                   |
| 5G NR n48 Ant2   | 3550.0          | 20.00               | 29.00                        | 0.200                  | 0.019                                                                               | 0.019                                                    | 1.000                              | 0.019                                | 20.2                                 | 3.00                                      | 3.00                                              | 3.00                                                               | 3.00                   |
| 5G NR n48 MIMO   | 3550.0          | 19.77               | 29.00                        | 0.200                  | 0.019                                                                               | 0.019                                                    | 1.000                              | 0.019                                | 20.4                                 | 3.24                                      | 3.24                                              | 3.24                                                               | 3.24                   |
| 5G NR n66        | 1710.0          | 25.00               | 29.00                        | 1.000                  | 0.095                                                                               | 0.095                                                    | 1.000                              | 0.095                                | 15.2                                 | 5.0                                       | 5.0                                               | 5.0                                                                | 5.0                    |
| 5G NR n70        | 1695.0          | 25.00               | 29.00                        | 1.000                  | 0.095                                                                               | 0.095                                                    | 1.000                              | 0.095                                | 15.2                                 | 5.0                                       | 5.0                                               | 5.0                                                                | 5.0                    |
| 5G NR n71        | 663.0           | 25.00               | 29.00                        | 3.000                  | 0.279                                                                               | 0.150                                                    | 0.442                              | 0.339                                | 11.6                                 | 9.7                                       | 9.7                                               | 7.0                                                                | 7.0                    |
| 5G NR n77        | 3450.0          | 25.00               | 29.00                        | 1.000                  | 0.095                                                                               | 0.095                                                    | 1.000                              | 0.095                                | 15.2                                 | 5.0                                       | 5.0                                               | 5.0                                                                | 5.0                    |



## RF Exposure Evaluation Report

Report No. : FA452231

|                |        |       |       |       |       |       |       |       |      |     |     |     |     |
|----------------|--------|-------|-------|-------|-------|-------|-------|-------|------|-----|-----|-----|-----|
| 5G NR n77-HPUE | 3450.0 | 26.00 | 29.00 | 1.000 | 0.095 | 0.095 | 1.000 | 0.095 | 14.2 | 4.0 | 4.0 | 4.0 | 4.0 |
| 5G NR n77-MIMO | 3450.0 | 26.00 | 29.00 | 1.000 | 0.095 | 0.095 | 1.000 | 0.095 | 14.2 | 4.0 | 4.0 | 4.0 | 4.0 |
| 5G NR n78      | 3450.0 | 25.00 | 29.00 | 1.000 | 0.095 | 0.095 | 1.000 | 0.095 | 15.2 | 5.0 | 5.0 | 5.0 | 5.0 |
| 5G NR n78-HPUE | 3450.0 | 26.00 | 29.00 | 1.000 | 0.095 | 0.095 | 1.000 | 0.095 | 14.2 | 4.0 | 4.0 | 4.0 | 4.0 |
| 5G NR n78-MIMO | 3450.0 | 26.00 | 29.00 | 1.000 | 0.095 | 0.095 | 1.000 | 0.095 | 14.2 | 4.0 | 4.0 | 4.0 | 4.0 |

### <For CDD/MIMO Mode>

| Band             | Frequency (MHz) | Antenna Gain (dBi) | Maximum Power (dBm) | Maximum EIRP (dBm) | Average EIRP (mW) | Power Density at 29cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Power Density / Limit |
|------------------|-----------------|--------------------|---------------------|--------------------|-------------------|---------------------------------------------|-----------------------------|-----------------------|
| 2.4GHz WLAN      | 2412.0          | 2.20               | 24.00               | 26.200             | 416.869           | 0.039                                       | 1.000                       | <b>0.039</b>          |
| 5.2GHz WLAN      | 5180.0          | 3.60               | 23.00               | 26.600             | 457.088           | 0.043                                       | 1.000                       | 0.043                 |
| 5.3GHz WLAN      | 5260.0          | 3.50               | 23.00               | 26.500             | 446.684           | 0.042                                       | 1.000                       | 0.042                 |
| 5.5GHz WLAN      | 5500.0          | 3.20               | 23.00               | 26.200             | 416.869           | 0.039                                       | 1.000                       | 0.039                 |
| 5.8GHz WLAN      | 5745.0          | 3.40               | 23.00               | 26.400             | 436.516           | 0.041                                       | 1.000                       | 0.041                 |
| Bluetooth BR/EDR | 2402.0          | 2.30               | 8.00                | 10.300             | 10.715            | 0.001                                       | 1.000                       | <b>0.001</b>          |
| Bluetooth LE     | 2402.0          | 1.90               | 16.00               | 17.900             | 61.660            | 0.006                                       | 1.000                       | <b>0.006</b>          |
| ZigBee           | 2405.0          | 1.90               | 16.00               | 17.900             | 61.660            | 0.006                                       | 1.000                       | 0.006                 |

### <For Beamforming mode>

| Band        | Frequency (MHz) | Antenna Gain (dBi) | Maximum Power (dBm) | Maximum EIRP (dBm) | Average EIRP (mW) | Power Density at 29cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Power Density / Limit |
|-------------|-----------------|--------------------|---------------------|--------------------|-------------------|---------------------------------------------|-----------------------------|-----------------------|
| 2.4GHz WLAN | 2412.0          | 5.01               | 20.00               | 25.010             | 316.957           | 0.030                                       | 1.000                       | 0.030                 |
| 5.2GHz WLAN | 5180.0          | 6.56               | 23.00               | 29.560             | 903.649           | 0.086                                       | 1.000                       | <b>0.086</b>          |
| 5.8GHz WLAN | 5745.0          | 6.36               | 23.00               | 29.360             | 862.979           | 0.082                                       | 1.000                       | <b>0.082</b>          |

#### Note:

1. For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
2. WLAN2.4GHz and WLAN5GHz chose the higher SISO gain as MIMO gain to perform MPE calculation.
3. The gain calculation method of WLAN beamforming mode is referenced to KDB 662911.
4. Chose the maximum RF output tune up power and the maximum antenna gain of all antennas among same frequency WLAN band to perform MPE calculation conservatively.

## 5.2. Simultaneous Transmission with SAR-based Test Exemption

| Maximum WWAN Power Density / Limit | WLAN 2.4GHz Power Density / Limit | WLAN 5GHz Low Band Power Density / Limit | WLAN 5GHz High Band Power Density / Limit | Bluetooth Power Density / Limit | ZigBee or BLE Power Density / Limit | $\Sigma$ (Power Density / Limit) of WWAN+WLAN2.4GHz + WLAN 5GHz Low Band + WLAN5GHz High Band + Bluetooth BR/EDR+ Bluetooth LE/ZigBee |
|------------------------------------|-----------------------------------|------------------------------------------|-------------------------------------------|---------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 0.361                              | 0.039                             | 0.086                                    | 0.082                                     | 0.001                           | 0.006                               | 0.575                                                                                                                                 |

### <LTE inter-band ULCA >

| LTE Power Density / Limit | LTE Power Density / Limit | WLAN 2.4GHz Power Density / Limit | WLAN 5GHz Low Band Power Density / Limit | WLAN 5GHz High Band Power Density / Limit | Bluetooth Power Density / Limit | ZigBee or BLE Power Density / Limit | $\Sigma$ (Power Density / Limit) of LTE + LTE +WLAN2.4GHz + WLAN 5GHz Low Band + WLAN5GHz High Band + Bluetooth BR/EDR+ Bluetooth LE/ZigBee |
|---------------------------|---------------------------|-----------------------------------|------------------------------------------|-------------------------------------------|---------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 0.361                     | 0.361                     | 0.039                             | 0.086                                    | 0.082                                     | 0.001                           | 0.006                               | 0.936                                                                                                                                       |

### <EN-DC>

| LTE Power Density / Limit | 5G NR Power Density / Limit | WLAN 2.4GHz Power Density / Limit | WLAN 5GHz Low Band Power Density / Limit | WLAN 5GHz High Band Power Density / Limit | Bluetooth Power Density / Limit | ZigBee or BLE Power Density / Limit | $\Sigma$ (Power Density / Limit) of LTE +5G NR +WLAN2.4GHz + WLAN 5GHz Low Band + WLAN5GHz High Band + Bluetooth BR/EDR+ Bluetooth LE/ZigBee |
|---------------------------|-----------------------------|-----------------------------------|------------------------------------------|-------------------------------------------|---------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 0.361                     | 0.361                       | 0.039                             | 0.086                                    | 0.082                                     | 0.001                           | 0.006                               | 0.936                                                                                                                                        |

#### Note:

1. According to the EUT characteristic, WLAN 2.4GHz and WLAN5GHz/Bluetooth/Bluetooth BLE/ZigBee can transmit simultaneously, and Bluetooth BLE and ZigBee cannot transmit simultaneously
2. According to the EUT characteristic, Bluetooth BR/EDR and WLAN5GHz/BLE/ZigBee can transmit simultaneously.
3. According to the EUT characteristic, WLAN 5GHz Low Band and WLAN5GHz High Band can transmit simultaneously.
4. Always chose the worst evaluation value of Bluetooth BLE and ZigBee to do analysis.
5. For colocation analysis, choose the highest (power density/limit) among WLAN 2.4GHz/5GHz MIMO mode and Beamforming mode respectively.
6.  $\Sigma$ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN/Inter-band ULCA/EN-DC + WLAN 2.4GHz + WLAN 5GHz Low Band + WLAN5GHz High Band + Bluetooth BR/EDR+ Bluetooth LE/ZigBee.
7. Considering all transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1.

## Conclusion:

According to 47 CFR §2.1091, the equipment at least **29 cm** to show compliance with the power density limit, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

-----THE END-----