



# FCC RF Test Report

**APPLICANT** : Thundercomm Technology Co., Ltd  
**EQUIPMENT** : Cellular Module  
**BRAND NAME** : TurboX  
**MODEL NAME** : CM6125  
**FCC ID** : 2AOHHTURBOXCM6125  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DSS) Spread Spectrum Transmitter  
**TEST DATE(S)** : Sep. 30, 2022 ~ Oct. 31, 2022

We, Sporton International Inc. (Shenzhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in 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. (Shenzhen), the test report shall not be reproduced except in full.

Jason Jia

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Approved by: Jason Jia



**Sporton International Inc. (ShenZhen)**

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**People's Republic of China**



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## REVISION HISTORY

| REPORT NO.   | VERSION | DESCRIPTION             | ISSUED DATE   |
|--------------|---------|-------------------------|---------------|
| FR232517-01A | Rev. 01 | Initial issue of report | Nov. 17, 2022 |
|              |         |                         |               |
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## SUMMARY OF TEST RESULT

| Report Section | FCC Rule           | Description                                        | Limit                 | Result | Remark                             |
|----------------|--------------------|----------------------------------------------------|-----------------------|--------|------------------------------------|
| 3.1            | 15.247(d)          | Radiated Band Edges and Radiated Spurious Emission | 15.209(a) & 15.247(d) | Pass   | Under limit 9.99 dB at 4804.00 MHz |
| 3.2            | 15.207             | AC Conducted Emission                              | 15.207(a)             | Pass   | Under limit 9.40 dB at 0.51 MHz    |
| 3.3            | 15.203 & 15.247(b) | Antenna Requirement                                | 15.203 & 15.247(b)    | Pass   | -                                  |

**Note:** This is a variant report. The change note could be referred to the Class II Permissive Change letter which is exhibit separately. The cellular module remains the same as the original module, only the antenna is different, so the conducted power is reused from the original report. Based on the similarity between current and previous project, only the related cases of two new antennas were tested and shown in this report, all the other test results are referred to the original report FR232517A.

### 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:

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.



# 1 General Description

## 1.1 Applicant

Thundercomm Technology Co., Ltd

No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122

## 1.2 Manufacturer

Thundercomm Technology Co., Ltd

No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122

## 1.3 Product Feature of Equipment Under Test

| Product Feature |                                                                                                                                         |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Equipment       | Cellular Module                                                                                                                         |
| Brand Name      | TurboX                                                                                                                                  |
| Model Name      | CM6125                                                                                                                                  |
| IMEI Code       | Conducted: 869835050001758/869835050002558<br>Conduction: 869835050002210/869835050003010<br>Radiation: 869835050002210/869835050003010 |
| FCC ID          | 2AOHHTURBOXCM6125                                                                                                                       |
| HW Version      | V03                                                                                                                                     |
| SW Version      | Turbox-CM6125_xx.xx_la1.0.V.userdebug.20220509.0843                                                                                     |
| EUT Stage       | Identical Prototype                                                                                                                     |

## 1.4 Product Specification of Equipment Under Test

| Standards-related Product Specification |                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Tx/Rx Frequency Range                   | 2402 MHz ~ 2480 MHz                                                                                                                        |
| Number of Channels                      | 79                                                                                                                                         |
| Carrier Frequency of Each Channel       | 2402+n*1 MHz; n=0~78                                                                                                                       |
| Maximum Output Power to Antenna         | Bluetooth BR(1Mbps) : 12.63 dBm (0.0183 W)<br>Bluetooth EDR (2Mbps) : 11.69 dBm (0.0148 W)<br>Bluetooth EDR (3Mbps) : 11.95 dBm (0.0157 W) |
| Antenna Type / Gain                     | <Ant.1>: Dipole Antenna with gain 2.90 dBi<br><Ant.2>: PIFA Antenna with gain 3.50 dBi                                                     |
| Type of Modulation                      | Bluetooth BR (1Mbps) : GFSK<br>Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK<br>Bluetooth EDR (3Mbps) : 8-DPSK                                    |

Remark: The conducted power refer to the original report FR232507A.

## 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.6 Testing Location

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

|                           |                                                                                                                                                                         |                            |                                       |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------|
| <b>Test Firm</b>          | Sporton International Inc. (Shenzhen)                                                                                                                                   |                            |                                       |
| <b>Test Site Location</b> | 1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China<br>TEL: +86-755-86379589<br>FAX: +86-755-86379595 |                            |                                       |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>                                                                                                                                                 | <b>FCC Designation No.</b> | <b>FCC Test Firm Registration No.</b> |
|                           | CO01-SZ                                                                                                                                                                 | CN1256                     | 421272                                |

|                           |                                                                                                                                                                                           |                            |                                       |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------|
| <b>Test Firm</b>          | Sporton International Inc. (Shenzhen)                                                                                                                                                     |                            |                                       |
| <b>Test Site Location</b> | 101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City Guangdong Province China 518103<br>TEL: +86-755-33202398 |                            |                                       |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>                                                                                                                                                                   | <b>FCC Designation No.</b> | <b>FCC Test Firm Registration No.</b> |
|                           | 03CH03-SZ                                                                                                                                                                                 | CN1256                     | 421272                                |

## 1.7 Test Software

| Item | Site      | Manufacturer | Name | Version     |
|------|-----------|--------------|------|-------------|
| 1.   | 03CH03-SZ | AUDIX        | E3   | 6.2009-8-24 |
| 2.   | CO01-SZ   | AUDIX        | E3   | 6.120613b   |

## 1.8 Applicable Standards

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

- ♦ 47 CFR Part 15 Subpart C §15.247
- ♦ FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ♦ ANSI C63.10-2013

### Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



## 2 Test Configuration of Equipment Under Test

### 2.1 Carrier Frequency Channel

| Frequency Band  | Channel | Freq.<br>(MHz) | Channel | Freq.<br>(MHz) | Channel | Freq.<br>(MHz) |
|-----------------|---------|----------------|---------|----------------|---------|----------------|
| 2400-2483.5 MHz | 0       | 2402           | 27      | 2429           | 54      | 2456           |
|                 | 1       | 2403           | 28      | 2430           | 55      | 2457           |
|                 | 2       | 2404           | 29      | 2431           | 56      | 2458           |
|                 | 3       | 2405           | 30      | 2432           | 57      | 2459           |
|                 | 4       | 2406           | 31      | 2433           | 58      | 2460           |
|                 | 5       | 2407           | 32      | 2434           | 59      | 2461           |
|                 | 6       | 2408           | 33      | 2435           | 60      | 2462           |
|                 | 7       | 2409           | 34      | 2436           | 61      | 2463           |
|                 | 8       | 2410           | 35      | 2437           | 62      | 2464           |
|                 | 9       | 2411           | 36      | 2438           | 63      | 2465           |
|                 | 10      | 2412           | 37      | 2439           | 64      | 2466           |
|                 | 11      | 2413           | 38      | 2440           | 65      | 2467           |
|                 | 12      | 2414           | 39      | 2441           | 66      | 2468           |
|                 | 13      | 2415           | 40      | 2442           | 67      | 2469           |
|                 | 14      | 2416           | 41      | 2443           | 68      | 2470           |
|                 | 15      | 2417           | 42      | 2444           | 69      | 2471           |
|                 | 16      | 2418           | 43      | 2445           | 70      | 2472           |
|                 | 17      | 2419           | 44      | 2446           | 71      | 2473           |
|                 | 18      | 2420           | 45      | 2447           | 72      | 2474           |
|                 | 19      | 2421           | 46      | 2448           | 73      | 2475           |
|                 | 20      | 2422           | 47      | 2449           | 74      | 2476           |
|                 | 21      | 2423           | 48      | 2450           | 75      | 2477           |
|                 | 22      | 2424           | 49      | 2451           | 76      | 2478           |
|                 | 23      | 2425           | 50      | 2452           | 77      | 2479           |
|                 | 24      | 2426           | 51      | 2453           | 78      | 2480           |
|                 | 25      | 2427           | 52      | 2454           | -       | -              |
|                 | 26      | 2428           | 53      | 2455           | -       | -              |

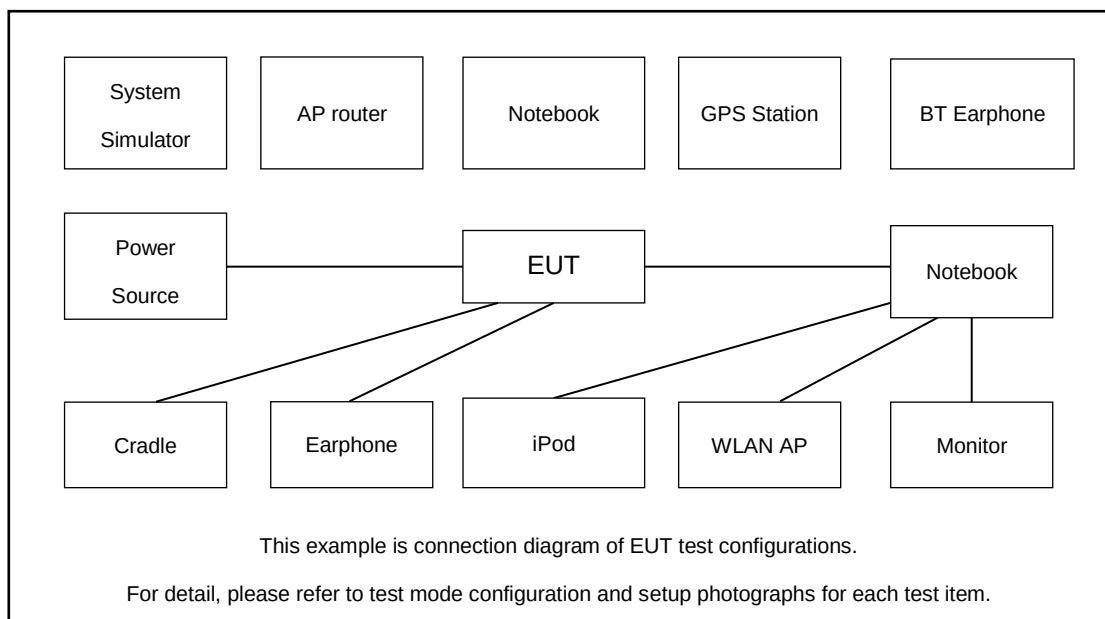
## 2.2 Test Mode

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

| Summary table of Test Cases                                                                                                                                                                                                             |                                                                                                                                                                      |                                       |                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------|
| Test Item                                                                                                                                                                                                                               | Data Rate / Modulation                                                                                                                                               |                                       |                               |
|                                                                                                                                                                                                                                         | Bluetooth BR 1Mbps<br>GFSK                                                                                                                                           | Bluetooth EDR 2Mbps<br>$\pi/4$ -DQPSK | Bluetooth EDR 3Mbps<br>8-DPSK |
| Radiated<br>Test Cases                                                                                                                                                                                                                  | Bluetooth BR 1Mbps GFSK                                                                                                                                              |                                       |                               |
|                                                                                                                                                                                                                                         | Ant. 1/ Ant. 2                                                                                                                                                       |                                       |                               |
|                                                                                                                                                                                                                                         | Mode 1: CH00_2402 MHz<br>Mode 2: CH39_2441 MHz<br>Mode 3: CH78_2480 MHz                                                                                              |                                       |                               |
| AC<br>Conducted<br>Emission                                                                                                                                                                                                             | Mode 1 : WCDMA Band V Idle + Bluetooth Link + WLAN Link(2.4G) + Adapter + Ant. 1<br>Mode 2 : WCDMA Band V Idle + Bluetooth Link + WLAN Link(2.4G) + Adapter + Ant. 2 |                                       |                               |
| Remark:                                                                                                                                                                                                                                 |                                                                                                                                                                      |                                       |                               |
| 1. For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and no other significantly frequencies found in conducted spurious emission. |                                                                                                                                                                      |                                       |                               |
| 2. For Radiated Test Cases, The tests were performed with Adapter.                                                                                                                                                                      |                                                                                                                                                                      |                                       |                               |

## 2.3 Connection Diagram of Test System



## 2.4 Support Unit used in test configuration and system

| Item | Equipment          | Trade Name | Model Name | FCC ID      | Data Cable | Power Cord                                                 |
|------|--------------------|------------|------------|-------------|------------|------------------------------------------------------------|
| 1.   | Base Station       | Anritsu    | MT8820C    | N/A         | N/A        | Unshielded, 1.8m                                           |
| 2.   | BT Base Station    | R&S        | CBT        | N/A         | N/A        | Unshielded, 1.8 m                                          |
| 3.   | WLAN AP            | Dlink      | DIR-820L   | KA2IR820LA1 | N/A        | Unshielded, 1.8m                                           |
| 4.   | Notebook           | Lenovo     | E540       | FCC DoC     | N/A        | AC I/P:<br>Unshielded, 1.2 m<br>DC O/P:<br>Shielded, 1.8 m |
| 5.   | Bluetooth Earphone | Samsung    | EO-MG900   | PYAHS-107W  | N/A        | N/A                                                        |
| 6.   | Test Jig           | N/A        | N/A        | N/A         | N/A        | N/A                                                        |
| 7.   | Antenna 1          | N/A        | N/A        | N/A         | N/A        | N/A                                                        |
| 8.   | Antenna 2          | N/A        | N/A        | N/A         | N/A        | N/A                                                        |
| 9.   | WWAN Antenna       | N/A        | N/A        | N/A         | N/A        | N/A                                                        |
| 10.  | Adapter            | N/A        | N/A        | N/A         | N/A        | N/A                                                        |

## 2.5 EUT Operation Test Setup

For Bluetooth function, the engineering test program was provided and enabled to make EUT connect with Bluetooth base station to continuous transmit.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

### 3 Test Result

#### 3.1 Radiated Band Edges and Spurious Emission Measurement

##### 3.1.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

| Frequency<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(meters) |
|--------------------|--------------------------------------|----------------------------------|
| 0.009 – 0.490      | 2400/F(kHz)                          | 300                              |
| 0.490 – 1.705      | 24000/F(kHz)                         | 30                               |
| 1.705 – 30.0       | 30                                   | 30                               |
| 30 – 88            | 100                                  | 3                                |
| 88 – 216           | 150                                  | 3                                |
| 216 - 960          | 200                                  | 3                                |
| Above 960          | 500                                  | 3                                |

##### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

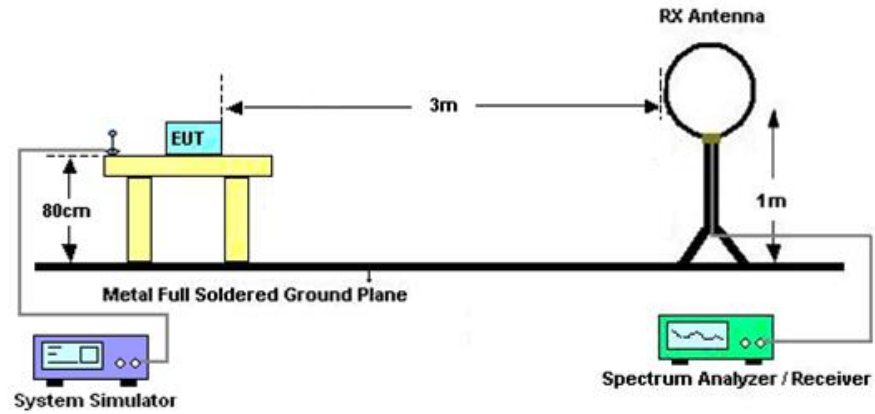
### 3.1.3 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
1. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
2. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1$  GHz, RBW=1MHz for  $f > 1$ GHz ; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
  - (3) For average measurement: use duty cycle correction factor method per 15.35(c).  
Duty cycle = On time/100 milliseconds  
On time =  $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$   
Where  $N_1$  is number of type 1 pulses,  $L_1$  is length of type 1 pulses, etc.  
Average Emission Level = Peak Emission Level +  $20 * \log(\text{Duty cycle})$
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

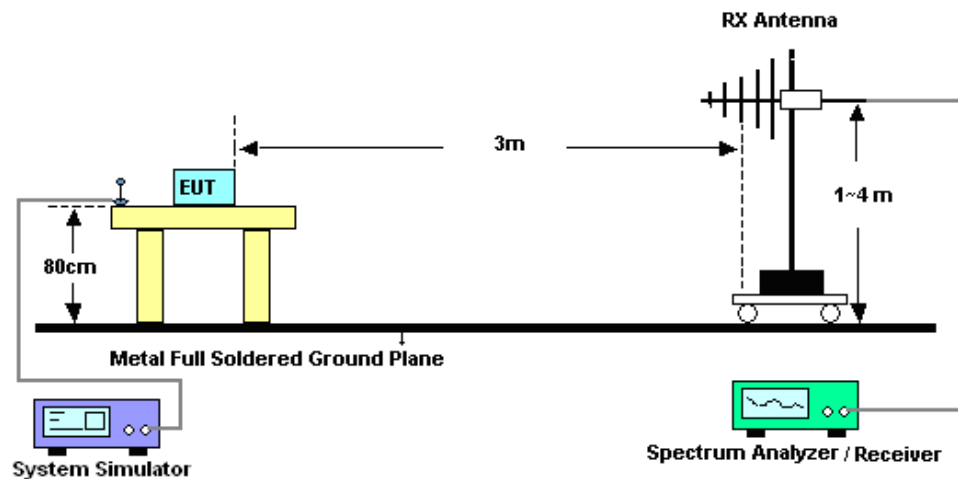
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from  $20 \log(\text{dwell time}/100\text{ms})$ . This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

### 3.1.4 Test Setup

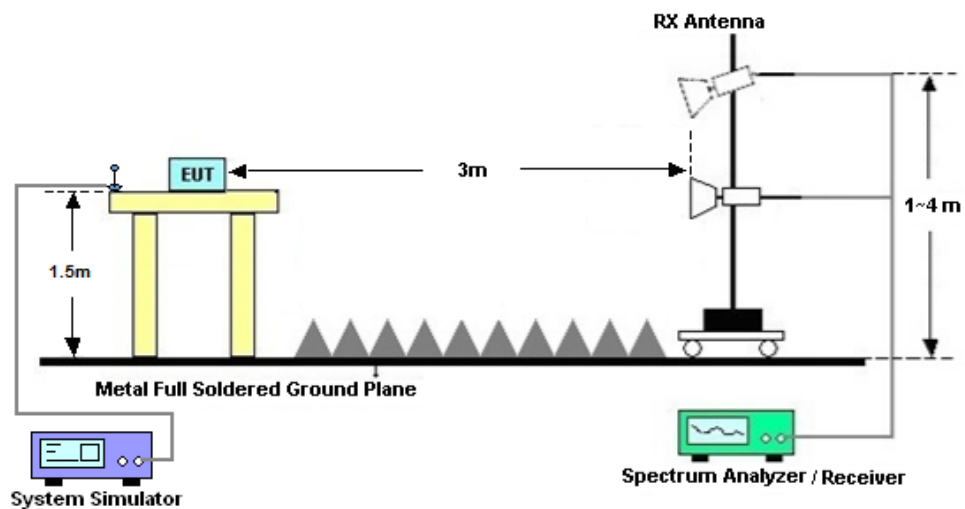
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





### **3.1.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)**

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### **3.1.6 Test Result of Radiated Spurious at Band Edges**

Please refer to Appendix B.

### **3.1.7 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)**

Please refer to Appendix B.

### **3.1.8 Duty cycle correction factor for average measurement**

Please refer to Appendix C.

## 3.2 AC Conducted Emission Measurement

### 3.2.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

| Frequency of emission (MHz) | Conducted limit (dB $\mu$ V) |           |
|-----------------------------|------------------------------|-----------|
|                             | Quasi-peak                   | Average   |
| 0.15-0.5                    | 66 to 56*                    | 56 to 46* |
| 0.5-5                       | 56                           | 46        |
| 5-30                        | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

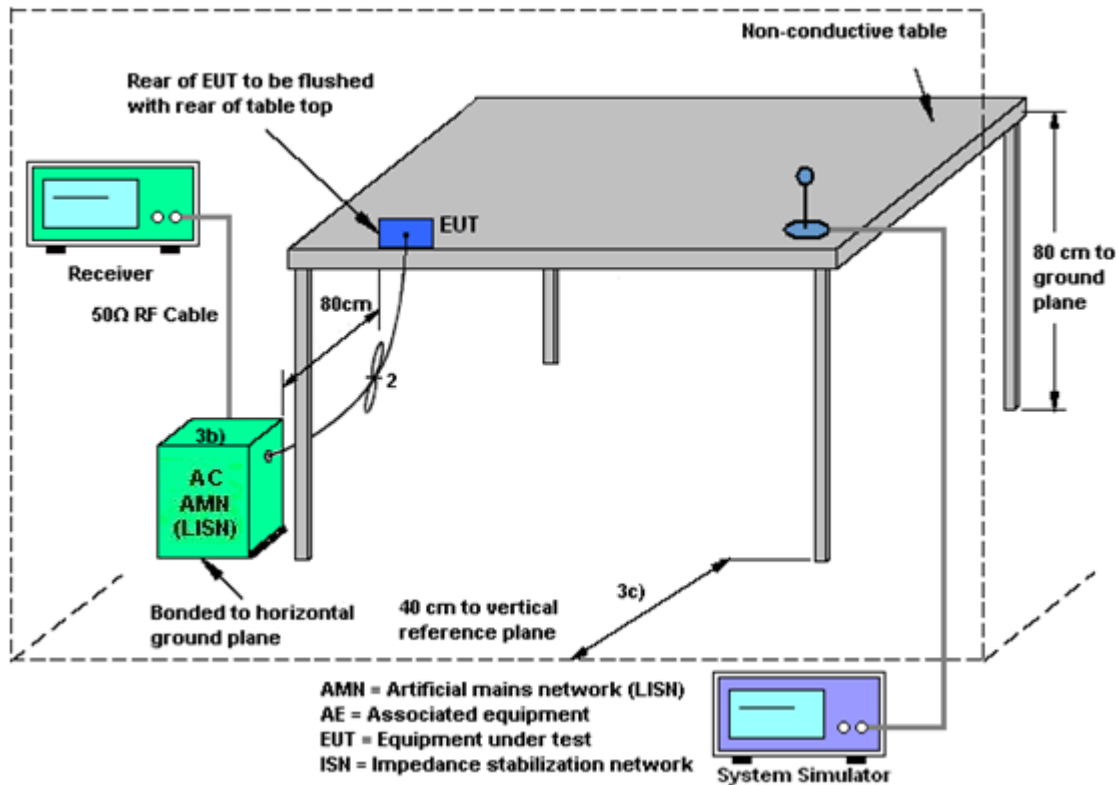
### 3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.2.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

### 3.2.4 Test Setup



### 3.2.5 Test Result of AC Conducted Emission

Please refer to Appendix A.



### **3.3 Antenna Requirements**

#### **3.3.1 Standard Applicable**

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

#### **3.3.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

#### **3.3.3 Antenna Gain**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

| Instrument                           | Manufacturer         | Model No.                | Serial No.   | Characteristics | Calibration Date | Test Date                       | Due Date      | Remark                   |
|--------------------------------------|----------------------|--------------------------|--------------|-----------------|------------------|---------------------------------|---------------|--------------------------|
| EMI Test Receiver&SA                 | KEYSIGHT             | N9038A                   | MY54450083   | 20Hz~8.4GHz     | Apr. 06, 2022    | Oct. 14, 2022~<br>Oct. 31, 2022 | Apr. 05, 2023 | Radiation<br>(03CH03-SZ) |
| EXA Spectrum Analyzer                | KEYSIGHT             | N9010A                   | MY55150246   | 10Hz~44GHz;     | Apr. 06, 2022    | Oct. 14, 2022~<br>Oct. 31, 2022 | Apr. 05, 2023 | Radiation<br>(03CH03-SZ) |
| Loop Antenna                         | R&S                  | HFH2-Z2                  | 100354       | 9kHz~30MHz      | Jul. 28, 2022    | Oct. 14, 2022~<br>Oct. 31, 2022 | Jul. 27, 2024 | Radiation<br>(03CH03-SZ) |
| Bilog Antenna                        | TeseQ                | CBL6112D                 | 35408        | 30MHz~2GHz      | Aug. 09, 2022    | Oct. 14, 2022~<br>Oct. 31, 2022 | Aug. 08, 2023 | Radiation<br>(03CH03-SZ) |
| Double Ridge Horn Antenna            | SCHWARZBECK          | BBHA9120D                | 9120D-1355   | 1GHz~18GHz      | Apr. 08, 2022    | Oct. 14, 2022~<br>Oct. 31, 2022 | Apr. 07, 2023 | Radiation<br>(03CH03-SZ) |
| HF Amplifier                         | MITEQ                | TTA1840-35-HG            | 1871923      | 18GHz~40GHz     | Oct. 22, 2021    | Oct. 14, 2022~<br>Oct. 31, 2022 | Oct. 21, 2022 | Radiation<br>(03CH03-SZ) |
| HF Amplifier                         | MITEQ                | TTA1840-35-HG            | 1871923      | 18GHz~40GHz     | Oct. 21, 2022    |                                 | Oct. 20, 2023 | Radiation<br>(03CH03-SZ) |
| SHF-EHF Horn                         | com-power            | AH-840                   | 101071       | 18Ghz~40GHz     | Apr. 10, 2022    | Oct. 14, 2022~<br>Oct. 31, 2022 | Apr. 09, 2023 | Radiation<br>(03CH03-SZ) |
| Amplifier                            | Burgeon              | BPA-530                  | 102211       | 0.01Hz~3000MHz  | Oct. 22, 2021    | Oct. 14, 2022~<br>Oct. 31, 2022 | Oct. 21, 2022 | Radiation<br>(03CH03-SZ) |
| Amplifier                            | Burgeon              | BPA-530                  | 102211       | 0.01Hz~3000MHz  | Oct. 21, 2022    |                                 | Oct. 20, 2023 | Radiation<br>(03CH03-SZ) |
| HF Amplifier                         | MITEQ                | AMF-7D-00101800-30-10P-R | 1943528      | 1GHz~18GHz      | Oct. 22, 2021    | Oct. 14, 2022~<br>Oct. 31, 2022 | Oct. 21, 2022 | Radiation<br>(03CH03-SZ) |
| HF Amplifier                         | MITEQ                | AMF-7D-00101800-30-10P-R | 1943528      | 1GHz~18GHz      | Oct. 21, 2022    |                                 | Oct. 20, 2023 | Radiation<br>(03CH03-SZ) |
| Amplifier                            | Agilent Technologies | 83017A                   | MY39501302   | 500MHz~26.5GHz  | Dec. 27, 2021    | Oct. 14, 2022~<br>Oct. 31, 2022 | Dec. 26, 2022 | Radiation<br>(03CH03-SZ) |
| AC Power Source                      | Chroma               | 61601                    | 616010001985 | N/A             | NCR              | Oct. 14, 2022~<br>Oct. 31, 2022 | NCR           | Radiation<br>(03CH03-SZ) |
| Turn Table                           | EM                   | EM1000                   | N/A          | 0~360 degree    | NCR              | Oct. 14, 2022~<br>Oct. 31, 2022 | NCR           | Radiation<br>(03CH03-SZ) |
| Antenna Mast                         | EM                   | EM1000                   | N/A          | 1 m~4 m         | NCR              | Oct. 14, 2022~<br>Oct. 31, 2022 | NCR           | Radiation<br>(03CH03-SZ) |
| EMI Receiver                         | R&S                  | ESR7                     | 101630       | 9kHz~7GHz;      | Jul. 07, 2022    | Sep. 30, 2022                   | Jul. 06, 2023 | Conduction<br>(CO01-SZ)  |
| AC LISN                              | R&S                  | ENV216                   | 100063       | 9kHz~30MHz      | Sep. 15, 2022    | Sep. 30, 2022                   | Sep. 14, 2023 | Conduction<br>(CO01-SZ)  |
| AC LISN<br>(for auxiliary equipment) | EMCO                 | 3816/2SH                 | 00103892     | 9kHz~30MHz      | Oct. 29, 2021    | Sep. 30, 2022                   | Oct. 28, 2022 | Conduction<br>(CO01-SZ)  |
| AC Power Source                      | Chroma               | 61602                    | 616020000891 | 100Vac~250Vac   | Jul. 07, 2022    | Sep. 30, 2022                   | Jul. 06, 2023 | Conduction<br>(CO01-SZ)  |

NCR: No Calibration Required

## 5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage  $K=2$  to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 2.2dB |
|-------------------------------------------------------------------------|-------|

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 5.0dB |
|-------------------------------------------------------------------------|-------|

### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 4.9dB |
|-------------------------------------------------------------------------|-------|

### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

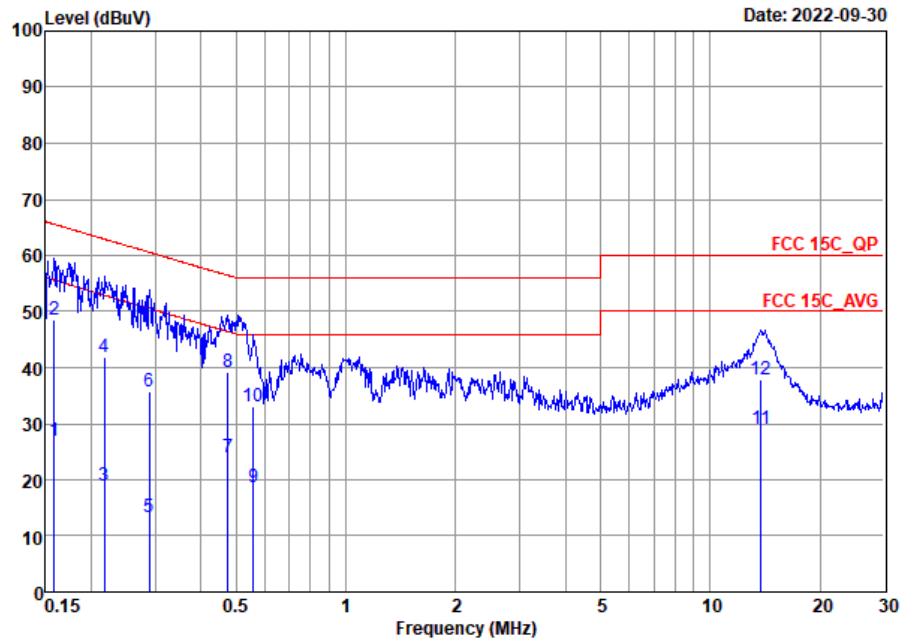
|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 5.0dB |
|-------------------------------------------------------------------------|-------|

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

## Appendix A. AC Conducted Emission Test Results

Mode 1(Ant. 1):

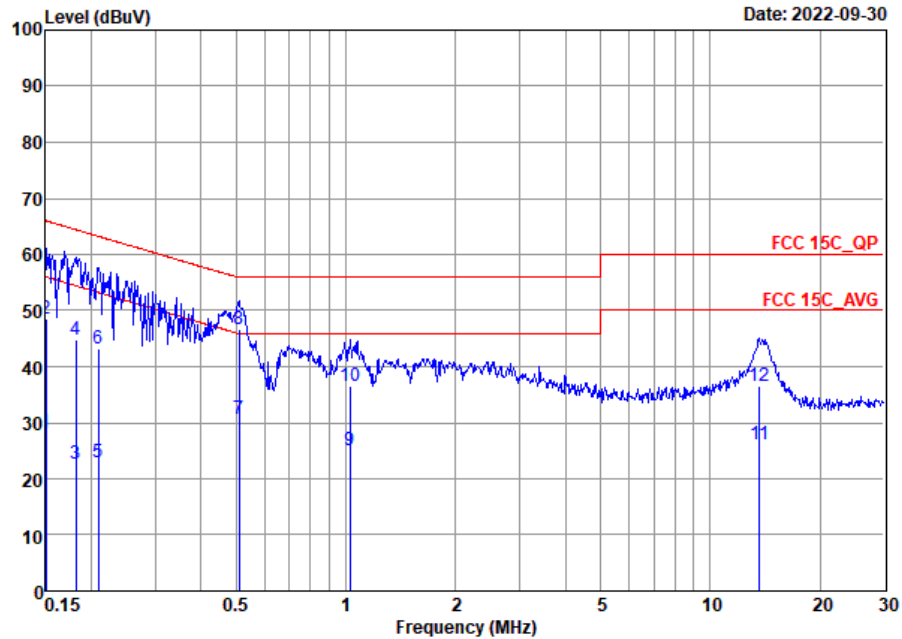
|                        |                                                                                 |                            |         |
|------------------------|---------------------------------------------------------------------------------|----------------------------|---------|
| <b>Test Engineer :</b> | Lily Qiu                                                                        | <b>Temperature :</b>       | 22~25°C |
|                        |                                                                                 | <b>Relative Humidity :</b> | 50~55%  |
| <b>Test Voltage :</b>  | 120Vac / 60Hz                                                                   | <b>Phase :</b>             | Line    |
| <b>Remark :</b>        | All emissions not reported here are more than 10 dB below the prescribed limit. |                            |         |



Site : CO01-SZ  
Condition: FCC 15C\_QP LISN\_20220811\_ L LINE

|     | Freq  | Level | Over   | Limit | Read  | LISN   | Cable |         |
|-----|-------|-------|--------|-------|-------|--------|-------|---------|
|     | MHz   | dBuV  | Limit  | Line  | Level | Factor | Loss  | Remark  |
|     |       |       | dB     | dBuV  | dBuV  | dB     | dB    |         |
| 1   | 0.16  | 26.93 | -28.63 | 55.56 | 6.00  | 10.20  | 10.73 | Average |
| 2 * | 0.16  | 48.43 | -17.13 | 65.56 | 27.50 | 10.20  | 10.73 | QP      |
| 3   | 0.22  | 18.91 | -34.01 | 52.92 | -1.60 | 10.19  | 10.32 | Average |
| 4   | 0.22  | 41.91 | -21.01 | 62.92 | 21.40 | 10.19  | 10.32 | QP      |
| 5   | 0.29  | 13.41 | -37.13 | 50.54 | -7.60 | 10.16  | 10.85 | Average |
| 6   | 0.29  | 35.71 | -24.83 | 60.54 | 14.70 | 10.16  | 10.85 | QP      |
| 7   | 0.47  | 23.98 | -22.47 | 46.45 | 2.09  | 10.12  | 11.77 | Average |
| 8   | 0.47  | 39.28 | -17.17 | 56.45 | 17.39 | 10.12  | 11.77 | QP      |
| 9   | 0.56  | 18.60 | -27.40 | 46.00 | -3.10 | 10.11  | 11.59 | Average |
| 10  | 0.56  | 33.00 | -23.00 | 56.00 | 11.30 | 10.11  | 11.59 | QP      |
| 11  | 13.77 | 29.00 | -21.00 | 50.00 | 8.91  | 9.76   | 10.33 | Average |
| 12  | 13.77 | 37.90 | -22.10 | 60.00 | 17.81 | 9.76   | 10.33 | QP      |

|                        |                                                                                 |                            |         |
|------------------------|---------------------------------------------------------------------------------|----------------------------|---------|
| <b>Test Engineer :</b> | Lily Qiu                                                                        | <b>Temperature :</b>       | 22~25°C |
|                        |                                                                                 | <b>Relative Humidity :</b> | 50~55%  |
| <b>Test Voltage :</b>  | 120Vac / 60Hz                                                                   | <b>Phase :</b>             | Neutral |
| <b>Remark :</b>        | All emissions not reported here are more than 10 dB below the prescribed limit. |                            |         |

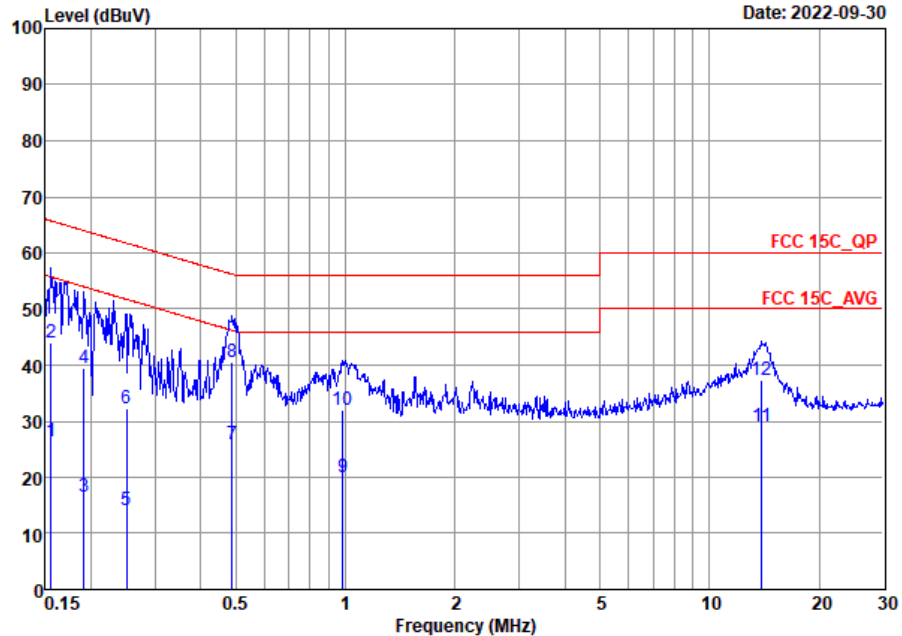


Site : CO01-SZ  
Condition: FCC 15C\_QP LISN\_20220811\_ N NEUTRAL

|     | Freq  | Level | Over   | Limit | Read  | LISN   | Cable |         |
|-----|-------|-------|--------|-------|-------|--------|-------|---------|
|     | MHz   | dBuV  | Limit  | Line  | Level | Factor | Loss  | Remark  |
|     |       |       | dB     | dBuV  | dBuV  | dB     | dB    |         |
| 1   | 0.15  | 28.26 | -27.74 | 56.00 | 7.10  | 10.31  | 10.85 | Average |
| 2   | 0.15  | 48.56 | -17.44 | 66.00 | 27.40 | 10.31  | 10.85 | QP      |
| 3   | 0.18  | 22.59 | -31.83 | 54.42 | 1.90  | 10.30  | 10.39 | Average |
| 4   | 0.18  | 44.69 | -19.73 | 64.42 | 24.00 | 10.30  | 10.39 | QP      |
| 5   | 0.21  | 22.81 | -30.42 | 53.23 | 2.30  | 10.27  | 10.24 | Average |
| 6   | 0.21  | 43.31 | -19.92 | 63.23 | 22.80 | 10.27  | 10.24 | QP      |
| 7   | 0.51  | 30.60 | -15.40 | 46.00 | 8.60  | 10.20  | 11.80 | Average |
| 8 * | 0.51  | 46.60 | -9.40  | 56.00 | 24.60 | 10.20  | 11.80 | QP      |
| 9   | 1.03  | 24.95 | -21.05 | 46.00 | 4.50  | 10.22  | 10.23 | Average |
| 10  | 1.03  | 36.65 | -19.35 | 56.00 | 16.20 | 10.22  | 10.23 | QP      |
| 11  | 13.62 | 26.03 | -23.97 | 50.00 | 5.80  | 9.90   | 10.33 | Average |
| 12  | 13.62 | 36.43 | -23.57 | 60.00 | 16.20 | 9.90   | 10.33 | QP      |

**Mode 2(Ant. 2):**

|                        |                                                                                 |                            |         |
|------------------------|---------------------------------------------------------------------------------|----------------------------|---------|
| <b>Test Engineer :</b> | Lily Qiu                                                                        | <b>Temperature :</b>       | 22~25°C |
|                        |                                                                                 | <b>Relative Humidity :</b> | 50~55%  |
| <b>Test Voltage :</b>  | 120Vac / 60Hz                                                                   | <b>Phase :</b>             | Line    |
| <b>Remark :</b>        | All emissions not reported here are more than 10 dB below the prescribed limit. |                            |         |

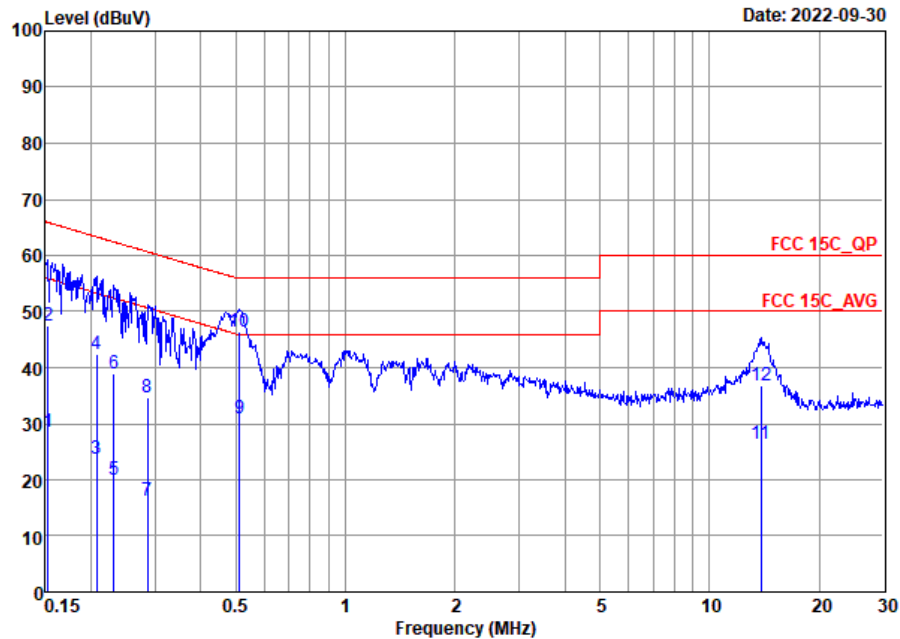


Site : CO01-SZ  
Condition: FCC 15C\_QP LISN\_20220811\_ L LINE

|     | Freq  | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark  |
|-----|-------|-------|------------|------------|------------|-------------|------------|---------|
|     | MHz   | dBuV  | dB         | dBuV       | dBuV       | dB          | dB         |         |
| 1   | 0.16  | 26.27 | -29.42     | 55.69      | 5.30       | 10.20       | 10.77      | Average |
| 2   | 0.16  | 43.87 | -21.82     | 65.69      | 22.90      | 10.20       | 10.77      | QP      |
| 3   | 0.19  | 16.55 | -37.43     | 53.98      | -3.90      | 10.20       | 10.25      | Average |
| 4   | 0.19  | 39.45 | -24.53     | 63.98      | 19.00      | 10.20       | 10.25      | QP      |
| 5   | 0.25  | 14.15 | -37.58     | 51.73      | -6.60      | 10.18       | 10.57      | Average |
| 6   | 0.25  | 32.25 | -29.48     | 61.73      | 11.50      | 10.18       | 10.57      | QP      |
| 7   | 0.49  | 25.93 | -20.26     | 46.19      | 4.00       | 10.12       | 11.81      | Average |
| 8 * | 0.49  | 40.43 | -15.76     | 56.19      | 18.50      | 10.12       | 11.81      | QP      |
| 9   | 0.98  | 19.89 | -26.11     | 46.00      | -0.50      | 10.12       | 10.27      | Average |
| 10  | 0.98  | 31.89 | -24.11     | 56.00      | 11.50      | 10.12       | 10.27      | QP      |
| 11  | 13.91 | 29.19 | -20.81     | 50.00      | 9.10       | 9.76        | 10.33      | Average |
| 12  | 13.91 | 37.29 | -22.71     | 60.00      | 17.20      | 9.76        | 10.33      | QP      |



|                 |                                                                                 |                     |         |
|-----------------|---------------------------------------------------------------------------------|---------------------|---------|
| Test Engineer : | Lily Qiu                                                                        | Temperature :       | 22~25°C |
|                 |                                                                                 | Relative Humidity : | 50~55%  |
| Test Voltage :  | 120Vac / 60Hz                                                                   | Phase :             | Neutral |
| Remark :        | All emissions not reported here are more than 10 dB below the prescribed limit. |                     |         |



Site : CO01-SZ  
Condition: FCC 15C\_QP LISN\_20220811\_ N NEUTRAL

|      | Freq  | Level | Over   | Limit | Read  | LISN   | Cable |         |
|------|-------|-------|--------|-------|-------|--------|-------|---------|
|      | MHz   | dBuV  | Limit  | Line  | Level | Factor | Loss  | Remark  |
|      |       |       | dB     | dBuV  | dBuV  | dB     | dB    |         |
| 1    | 0.15  | 28.42 | -27.45 | 55.87 | 7.30  | 10.31  | 10.81 | Average |
| 2    | 0.15  | 47.42 | -18.45 | 65.87 | 26.30 | 10.31  | 10.81 | QP      |
| 3    | 0.21  | 23.80 | -29.52 | 53.32 | 3.29  | 10.28  | 10.23 | Average |
| 4    | 0.21  | 42.40 | -20.92 | 63.32 | 21.89 | 10.28  | 10.23 | QP      |
| 5    | 0.23  | 19.98 | -32.41 | 52.39 | -0.70 | 10.26  | 10.42 | Average |
| 6    | 0.23  | 38.98 | -23.41 | 62.39 | 18.30 | 10.26  | 10.42 | QP      |
| 7    | 0.29  | 16.15 | -34.48 | 50.63 | -4.90 | 10.22  | 10.83 | Average |
| 8    | 0.29  | 34.65 | -25.98 | 60.63 | 13.60 | 10.22  | 10.83 | QP      |
| 9    | 0.51  | 31.00 | -15.00 | 46.00 | 9.00  | 10.20  | 11.80 | Average |
| 10 * | 0.51  | 46.40 | -9.60  | 56.00 | 24.40 | 10.20  | 11.80 | QP      |
| 11   | 13.84 | 26.43 | -23.57 | 50.00 | 6.21  | 9.89   | 10.33 | Average |
| 12   | 13.84 | 36.83 | -23.17 | 60.00 | 16.61 | 9.89   | 10.33 | QP      |

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)



## Appendix B. Radiated Spurious Emission

For Ant. 1:

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

| BT                     | Note                                                                                        | Frequency | Level      | Margin | Limit<br>Line | Read<br>Level | Antenna<br>Factor | Path<br>Loss | Preamp<br>Factor | Ant<br>Pos | Table<br>Pos | Peak<br>Avg. | Pol.    |
|------------------------|---------------------------------------------------------------------------------------------|-----------|------------|--------|---------------|---------------|-------------------|--------------|------------------|------------|--------------|--------------|---------|
|                        |                                                                                             | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m )    | ( dBμV )      | ( dB/m )          | ( dB )       | ( dB )           | ( cm )     | ( deg )      | ( P/A )      | ( H/V ) |
| BT<br>CH00<br>2402MHz  |                                                                                             | 2366.805  | 45.02      | -28.98 | 74            | 41.68         | 32.15             | 4.87         | 33.68            | 296        | 350          | P            | H       |
|                        |                                                                                             | 2366.805  | 20.23      | -33.77 | 54            | -             | -                 | -            | -                | 296        | 350          | A            | H       |
|                        |                                                                                             | 2402      | 105.63     | -      | -             | 102.14        | 32.25             | 4.9          | 33.66            | 296        | 350          | P            | H       |
|                        | *                                                                                           | 2402      | 80.84      | -      | -             | -             | -                 | -            | -                | 296        | 350          | A            | H       |
|                        |                                                                                             | 2359.875  | 45.92      | -28.08 | 74            | 42.59         | 32.14             | 4.87         | 33.68            | 354        | 253          | P            | V       |
|                        |                                                                                             | 2359.875  | 21.13      | -32.87 | 54            | -             | -                 | -            | -                | 354        | 253          | A            | V       |
|                        |                                                                                             | 2402      | 105.68     | -      | -             | 102.19        | 32.25             | 4.9          | 33.66            | 354        | 253          | P            | V       |
|                        | *                                                                                           | 2402      | 80.89      | -      | -             | -             | -                 | -            | -                | 354        | 253          | A            | V       |
| BT<br>CH 78<br>2480MHz |                                                                                             | 2480      | 106        | -      | -             | 102.22        | 32.45             | 4.95         | 33.62            | 221        | 1            | P            | H       |
|                        | *                                                                                           | 2480      | 81.21      | -      | -             | -             | -                 | -            | -                | 221        | 1            | A            | H       |
|                        |                                                                                             | 2483.96   | 55.71      | -18.29 | 74            | 51.92         | 32.46             | 4.95         | 33.62            | 221        | 1            | P            | H       |
|                        |                                                                                             | 2483.96   | 30.92      | -23.08 | 54            | -             | -                 | -            | -                | 221        | 1            | A            | H       |
|                        |                                                                                             | 2480      | 105.17     | -      | -             | 101.39        | 32.45             | 4.95         | 33.62            | 364        | 302          | P            | V       |
|                        | *                                                                                           | 2480      | 80.38      | -      | -             | -             | -                 | -            | -                | 364        | 302          | A            | V       |
|                        |                                                                                             | 2483.64   | 57.84      | -16.16 | 74            | 54.05         | 32.46             | 4.95         | 33.62            | 364        | 302          | P            | V       |
|                        |                                                                                             | 2483.64   | 33.05      | -20.95 | 54            | -             | -                 | -            | -                | 364        | 302          | A            | V       |
| Remark                 | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |           |            |        |               |               |                   |              |                  |            |              |              |         |



## 2.4GHz 2400~2483.5MHz

## BT (Harmonic @ 3m)

| BT                     | Note                                                                                        | Frequency<br>( MHz ) | Level<br>( dBμV/m ) | Margin<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB/m ) | Path<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Peak<br>Avg.<br>( P/A ) | Pol.<br>( H/V ) |
|------------------------|---------------------------------------------------------------------------------------------|----------------------|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| BT<br>CH 00<br>2402MHz |                                                                                             | 4804                 | 43.99               | -30.01           | 74                          | 54.26                     | 34.68                         | 7.98                   | 52.93                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 4804                 | 19.2                | -34.8            | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | H               |
|                        |                                                                                             | 4804                 | 44.37               | -29.63           | 74                          | 54.64                     | 34.68                         | 7.98                   | 52.93                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 4804                 | 19.58               | -34.42           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | V               |
| BT<br>CH 39<br>2441MHz |                                                                                             | 4882                 | 44.91               | -29.09           | 74                          | 55.1                      | 34.65                         | 8                      | 52.84                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 4882                 | 20.12               | -33.88           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | H               |
|                        |                                                                                             | 7323                 | 46.09               | -27.91           | 74                          | 54.42                     | 36.42                         | 9.36                   | 54.11                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 7323                 | 21.3                | -32.7            | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | H               |
|                        |                                                                                             | 4882                 | 45.25               | -28.75           | 74                          | 55.44                     | 34.65                         | 8                      | 52.84                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 4882                 | 20.46               | -33.54           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | V               |
|                        |                                                                                             | 7323                 | 45.58               | -28.42           | 74                          | 53.91                     | 36.42                         | 9.36                   | 54.11                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 7323                 | 20.79               | -33.21           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | V               |
| BT<br>CH 78<br>2480MHz |                                                                                             | 4960                 | 44.63               | -29.37           | 74                          | 54.73                     | 34.62                         | 8.02                   | 52.74                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 4960                 | 19.84               | -34.16           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | H               |
|                        |                                                                                             | 7440                 | 46.73               | -27.27           | 74                          | 54.72                     | 36.54                         | 9.51                   | 54.04                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 7440                 | 21.94               | -32.06           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | H               |
|                        |                                                                                             | 4960                 | 44.9                | -29.1            | 74                          | 55                        | 34.62                         | 8.02                   | 52.74                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 4960                 | 20.11               | -33.89           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | V               |
|                        |                                                                                             | 7440                 | 46.83               | -27.17           | 74                          | 54.82                     | 36.54                         | 9.51                   | 54.04                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 7440                 | 22.04               | -31.96           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | V               |
| Remark                 | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                      |                     |                  |                             |                           |                               |                        |                            |                      |                         |                         |                 |



## 2.4GHz 2400~2483.5MHz

## BT (LF @ 3m)

| BT                     | Note                                                                                        | Frequency | Level      | Margin | Limit<br>Line | Read<br>Level | Antenna<br>Factor | Path<br>Loss | Preamp<br>Factor | Ant<br>Pos | Table<br>Pos | Peak<br>Avg. | Pol.    |
|------------------------|---------------------------------------------------------------------------------------------|-----------|------------|--------|---------------|---------------|-------------------|--------------|------------------|------------|--------------|--------------|---------|
|                        |                                                                                             | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m )    | ( dBμV )      | ( dB/m )          | ( dB )       | ( dB )           | ( cm )     | ( deg )      | ( P/A )      | ( H/V ) |
| BT<br>CH 78<br>2480MHz |                                                                                             | 30        | 24.32      | -15.68 | 40            | 30.33         | 25.86             | 0.53         | 32.4             | -          | -            | P            | H       |
|                        |                                                                                             | 80.44     | 18.15      | -21.85 | 40            | 36.04         | 13.72             | 0.89         | 32.5             | -          | -            | P            | H       |
|                        |                                                                                             | 293.84    | 22.42      | -23.58 | 46            | 32.57         | 19.78             | 1.78         | 31.71            | -          | -            | P            | H       |
|                        |                                                                                             | 547.98    | 28.68      | -17.32 | 46            | 31.26         | 25.89             | 2.45         | 30.92            | -          | -            | P            | H       |
|                        |                                                                                             | 856.44    | 31.76      | -14.24 | 46            | 31.24         | 28.87             | 3.06         | 31.41            | -          | -            | P            | H       |
|                        |                                                                                             | 989.33    | 34.31      | -19.69 | 54            | 31.81         | 30.33             | 3.29         | 31.12            | -          | -            | P            | H       |
|                        |                                                                                             | 30        | 25.87      | -14.13 | 40            | 31.88         | 25.86             | 0.53         | 32.4             | -          | -            | P            | V       |
|                        |                                                                                             | 66.86     | 21.77      | -18.23 | 40            | 40.95         | 12.4              | 0.82         | 32.4             | -          | -            | P            | V       |
|                        |                                                                                             | 119.24    | 19.3       | -24.2  | 43.5          | 32.66         | 17.72             | 1.12         | 32.2             | -          | -            | P            | V       |
|                        |                                                                                             | 421.88    | 24.14      | -21.86 | 46            | 30.81         | 22.55             | 2.14         | 31.36            | -          | -            | P            | V       |
|                        |                                                                                             | 754.59    | 31.59      | -14.41 | 46            | 31.29         | 28.56             | 2.86         | 31.12            | -          | -            | P            | V       |
|                        |                                                                                             | 949.56    | 33.35      | -12.65 | 46            | 30.48         | 31.14             | 3.23         | 31.5             | -          | -            | P            | V       |
| Remark                 | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |           |            |        |               |               |                   |              |                  |            |              |              |         |



For Ant. 2:

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

| BT                     | Note                                                         | Frequency | Level      | Margin | Limit<br>Line | Read<br>Level | Antenna<br>Factor | Path<br>Loss | Preamp<br>Factor | Ant<br>Pos | Table<br>Pos | Peak<br>Avg. | Pol.    |
|------------------------|--------------------------------------------------------------|-----------|------------|--------|---------------|---------------|-------------------|--------------|------------------|------------|--------------|--------------|---------|
|                        |                                                              | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m )    | ( dBμV )      | ( dB/m )          | ( dB )       | ( dB )           | ( cm )     | ( deg )      | ( P/A )      | ( H/V ) |
| BT<br>CH00<br>2402MHz  |                                                              | 2378.46   | 44.58      | -29.42 | 74            | 41.31         | 32.18             | 4.77         | 33.68            | 331        | 218          | P            | H       |
|                        |                                                              | 2378.46   | 19.79      | -34.21 | 54            | -             | -                 | -            | -                | 331        | 218          | P            | H       |
|                        | *                                                            | 2402      | 93.35      | -      | -             | 89.95         | 32.25             | 4.81         | 33.66            | 331        | 218          | P            | H       |
|                        | *                                                            | 2402      | 68.56      | -      | -             | -             | -                 | -            | -                | 331        | 218          | A            | H       |
|                        |                                                              | 2381.295  | 45.44      | -28.56 | 74            | 42.16         | 32.19             | 4.77         | 33.68            | 400        | 120          | P            | V       |
|                        |                                                              | 2381.295  | 20.65      | -33.35 | 54            | -             | -                 | -            | -                | 400        | 120          | P            | V       |
|                        | *                                                            | 2402      | 95.44      | -      | -             | 92.04         | 32.25             | 4.81         | 33.66            | 400        | 120          | P            | V       |
|                        | *                                                            | 2402      | 70.65      | -      | -             | -             | -                 | -            | -                | 400        | 120          | A            | V       |
| BT<br>CH 78<br>2480MHz | *                                                            | 2480      | 96.51      | -      | -             | 92.76         | 32.45             | 4.92         | 33.62            | 344        | 227          | P            | H       |
|                        | *                                                            | 2480      | 71.72      | -      | -             | -             | -                 | -            | -                | 344        | 227          | P            | H       |
|                        |                                                              | 2483.52   | 51.06      | -22.94 | 74            | 47.3          | 32.46             | 4.92         | 33.62            | 344        | 227          | P            | H       |
|                        |                                                              | 2483.52   | 26.27      | -27.73 | 54            | -             | -                 | -            | -                | 344        | 227          | A            | H       |
|                        | *                                                            | 2480      | 94.64      | -      | -             | 90.89         | 32.45             | 4.92         | 33.62            | 400        | 132          | P            | V       |
|                        | *                                                            | 2480      | 69.85      | -      | -             | -             | -                 | -            | -                | 400        | 132          | P            | V       |
|                        |                                                              | 2483.88   | 48.46      | -25.54 | 74            | 44.7          | 32.46             | 4.92         | 33.62            | 400        | 132          | P            | V       |
|                        |                                                              | 2483.88   | 23.67      | -30.33 | 54            | -             | -                 | -            | -                | 400        | 132          | A            | V       |
| Remark                 | 3. No other spurious found.                                  |           |            |        |               |               |                   |              |                  |            |              |              |         |
|                        | 4. All results are PASS against Peak and Average limit line. |           |            |        |               |               |                   |              |                  |            |              |              |         |



## 2.4GHz 2400~2483.5MHz

## BT (Harmonic @ 3m)

| BT                     | Note                                                                                        | Frequency<br>( MHz ) | Level<br>( dBμV/m ) | Margin<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB/m ) | Path<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Peak<br>Avg.<br>( P/A ) | Pol.<br>( H/V ) |
|------------------------|---------------------------------------------------------------------------------------------|----------------------|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| BT<br>CH 00<br>2402MHz |                                                                                             | 4804                 | 44.01               | -29.99           | 74                          | 54.51                     | 34.68                         | 7.75                   | 52.93                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 4804                 | 19.22               | -34.78           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | H               |
|                        |                                                                                             | 4804                 | 44.01               | -29.99           | 74                          | 54.51                     | 34.68                         | 7.75                   | 52.93                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 4804                 | 44.01               | -9.99            | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | V               |
| BT<br>CH 39<br>2441MHz |                                                                                             | 4882                 | 46.38               | -27.62           | 74                          | 56.79                     | 34.65                         | 7.78                   | 52.84                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 4882                 | 21.59               | -32.41           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | P                       | H               |
|                        |                                                                                             | 7323                 | 44.98               | -29.02           | 74                          | 53.72                     | 36.42                         | 8.95                   | 54.11                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 7323                 | 20.19               | -33.81           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | H               |
|                        |                                                                                             | 4882                 | 45.21               | -28.79           | 74                          | 55.62                     | 34.65                         | 7.78                   | 52.84                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 4882                 | 20.42               | -33.58           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | P                       | V               |
|                        |                                                                                             | 7323                 | 45.37               | -28.63           | 74                          | 54.11                     | 36.42                         | 8.95                   | 54.11                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 7323                 | 20.58               | -33.42           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | V               |
| BT<br>CH 78<br>2480MHz |                                                                                             | 4960                 | 46.62               | -27.38           | 74                          | 56.93                     | 34.62                         | 7.81                   | 52.74                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 4960                 | 21.83               | -32.17           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | P                       | H               |
|                        |                                                                                             | 7440                 | 45.8                | -28.2            | 74                          | 54.11                     | 36.54                         | 9.19                   | 54.04                      | -                    | -                       | P                       | H               |
|                        |                                                                                             | 7440                 | 21.01               | -32.99           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | H               |
|                        |                                                                                             | 4960                 | 45.42               | -28.58           | 74                          | 55.73                     | 34.62                         | 7.81                   | 52.74                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 4960                 | 20.63               | -33.37           | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | P                       | V               |
|                        |                                                                                             | 7440                 | 47.49               | -26.51           | 74                          | 55.8                      | 36.54                         | 9.19                   | 54.04                      | -                    | -                       | P                       | V               |
|                        |                                                                                             | 7440                 | 22.7                | -31.3            | 54                          | -                         | -                             | -                      | -                          | -                    | -                       | A                       | V               |
| Remark                 | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                      |                     |                  |                             |                           |                               |                        |                            |                      |                         |                         |                 |



## Emission below 1GHz

## 2.4GHz BT (LF)

| BT                 | Note                                                                       | Frequency | Level      | Margin | Limit      | Read   | Antenna  | Path   | Preamp | Ant    | Table   | Peak  | Pol.  |
|--------------------|----------------------------------------------------------------------------|-----------|------------|--------|------------|--------|----------|--------|--------|--------|---------|-------|-------|
|                    |                                                                            |           |            |        | Line       | Level  | Factor   | Loss   | Factor | Pos    | Pos     | Avg.  |       |
|                    |                                                                            | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | (dBμV) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| 2.4GHz<br>BT<br>LF |                                                                            | 30        | 24.32      | -15.68 | 40         | 30.33  | 25.86    | 0.53   | 32.4   | -      | -       | P     | H     |
|                    |                                                                            | 80.44     | 18.15      | -21.85 | 40         | 36.04  | 13.72    | 0.89   | 32.5   | -      | -       | P     | H     |
|                    |                                                                            | 293.84    | 22.42      | -23.58 | 46         | 32.57  | 19.78    | 1.78   | 31.71  | -      | -       | P     | H     |
|                    |                                                                            | 547.98    | 28.68      | -17.32 | 46         | 31.26  | 25.89    | 2.45   | 30.92  | -      | -       | P     | H     |
|                    |                                                                            | 856.44    | 31.76      | -14.24 | 46         | 31.24  | 28.87    | 3.06   | 31.41  | -      | -       | P     | H     |
|                    |                                                                            | 989.33    | 34.31      | -19.69 | 54         | 31.81  | 30.33    | 3.29   | 31.12  | -      | -       | P     | H     |
|                    |                                                                            | 30        | 25.87      | -14.13 | 40         | 31.88  | 25.86    | 0.53   | 32.4   | -      | -       | P     | V     |
|                    |                                                                            | 66.86     | 21.77      | -18.23 | 40         | 40.95  | 12.4     | 0.82   | 32.4   | -      | -       | P     | V     |
|                    |                                                                            | 119.24    | 19.3       | -24.2  | 43.5       | 32.66  | 17.72    | 1.12   | 32.2   | -      | -       | P     | V     |
|                    |                                                                            | 421.88    | 24.14      | -21.86 | 46         | 30.81  | 22.55    | 2.14   | 31.36  | -      | -       | P     | V     |
|                    |                                                                            | 754.59    | 31.59      | -14.41 | 46         | 31.29  | 28.56    | 2.86   | 31.12  | -      | -       | P     | V     |
|                    |                                                                            | 949.56    | 33.35      | -12.65 | 46         | 30.48  | 31.14    | 3.23   | 31.5   | -      | -       | P     | V     |
| Remark             | 1. No other spurious found.<br>2. All results are PASS against limit line. |           |            |        |            |        |          |        |        |        |         |       |       |



**Note symbol**

|     |                                                                                                                                                          |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| *   | <b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. |
| !   | Test result is <b>Margin</b> line.                                                                                                                       |
| P/A | <b>Peak</b> or <b>Average</b>                                                                                                                            |
| H/V | <b>Horizontal</b> or <b>Vertical</b>                                                                                                                     |



A calculation example for radiated spurious emission is shown as below:

| BT                     | Note | Frequency | Level      | Margin | Limit      | Read     | Antenna  | Path   | Preamp | Ant    | Table   | Peak    | Pol.    |
|------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|                        |      |           |            |        | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
|                        |      | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| BT<br>CH 00<br>2402MHz |      | 2390      | 55.45      | -18.55 | 74         | 54.51    | 32.22    | 4.58   | 35.86  | 103    | 308     | P       | H       |
|                        |      | 2390      | 43.54      | -10.46 | 54         | 42.6     | 32.22    | 4.58   | 35.86  | 103    | 308     | A       | H       |

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =  
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Margin (dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)  
= 55.45 (dBμV/m)
2. Margin (dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

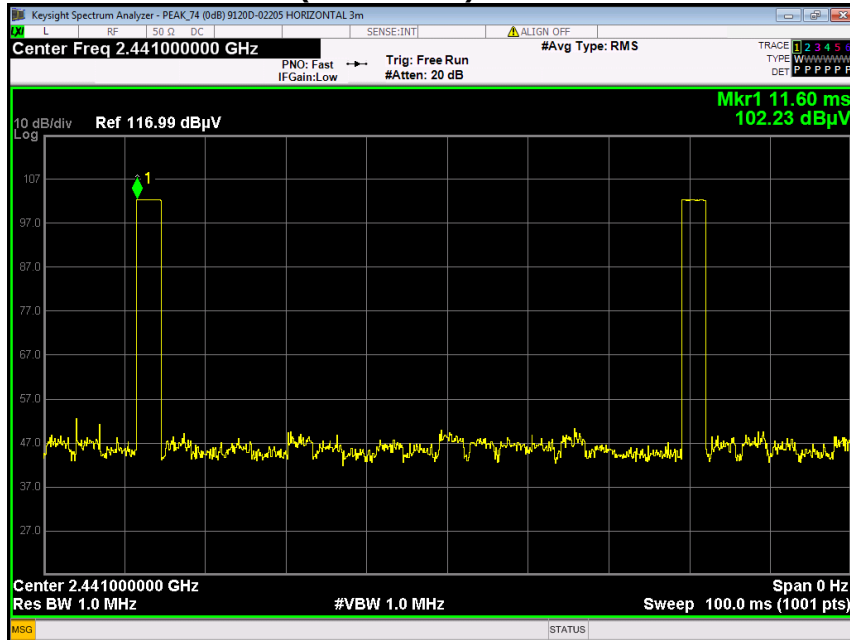
1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)  
= 43.54 (dBμV/m)
2. Margin (dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 43.54(dBμV/m) – 54(dBμV/m)  
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

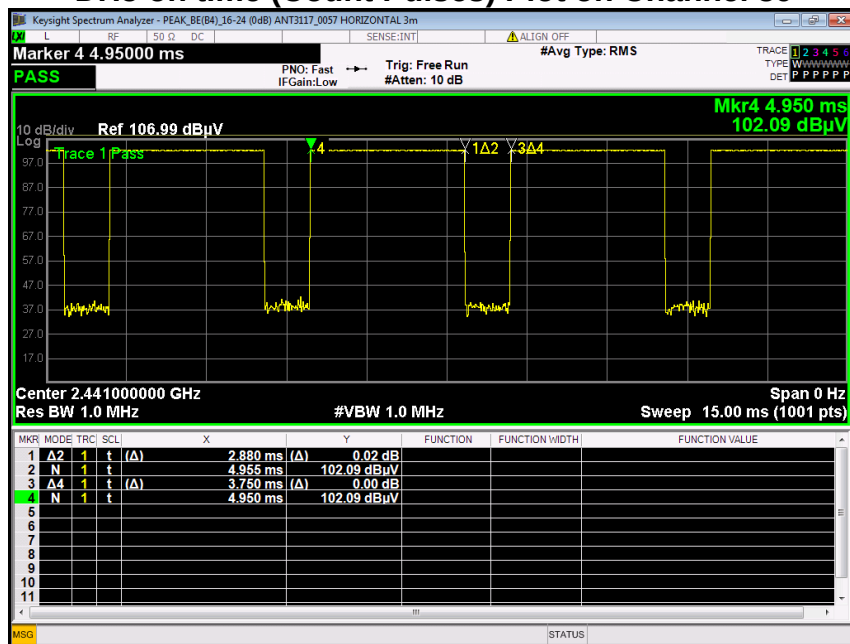
## Appendix C. Duty Cycle Plots

For Ant. 1:

### DH5 on time (One Pulse) Plot on Channel 39



### DH5 on time (Count Pulses) Plot on Channel 39

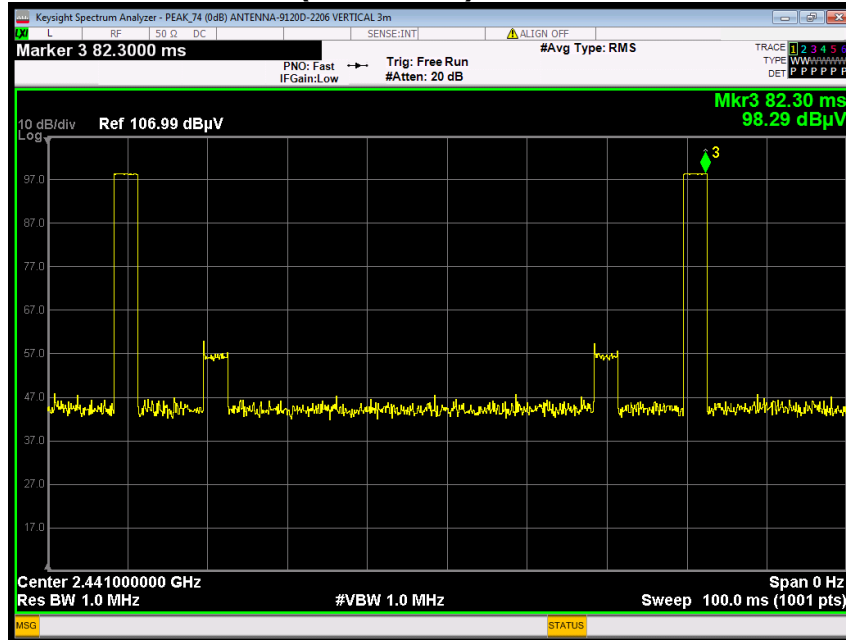


Note:

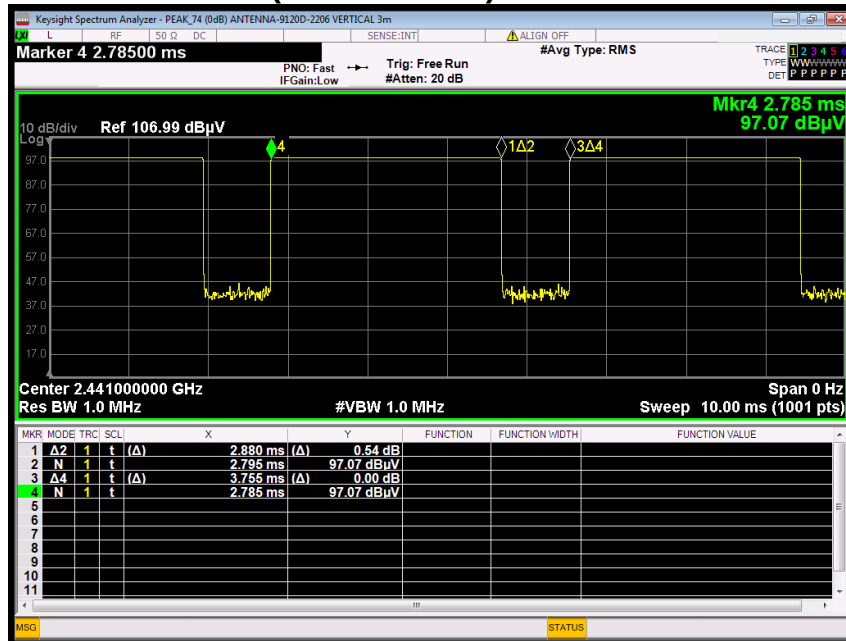
1. Worst case Duty cycle = on time/100 milliseconds =  $2 * 2.88 / 100 = 5.76 \%$
2. Worst case Duty cycle correction factor =  $20 * \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.

For Ant. 2:

### DH5 on time (One Pulse) Plot on Channel 39



### DH5 on time (Count Pulses) Plot on Channel 39



Note:

1. Worst case Duty cycle = on time/100 milliseconds =  $2 * 2.88 / 100 = 5.76 \%$
2. Worst case Duty cycle correction factor =  $20 * \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.