



# FCC RF TEST REPORT

APPLICANT : OnePlus Technology (Shenzhen) Co., Ltd.  
EQUIPMENT : Smart Phone  
BRAND NAME : ONEPLUS  
MODEL NAME : DE2118,DE2117  
FCC ID : 2ABZ2-EF000  
STANDARD : FCC Part 15 Subpart C §15.249  
CLASSIFICATION : (DXX) Low Power Communication Device Transmitter

The product was received on Jan. 05, 2021 and testing was completed on Feb. 27, 2021. We, Sporton International (Shenzhen) Inc., 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 (Shenzhen) Inc., the test report shall not be reproduced except in full.

Reviewed by: Derreck Chen / Supervisor

Approved by: Eric Shih / Manager



**Sporton International (Shenzhen) Inc.**

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



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## REVISION HISTORY

| REPORT NO.   | VERSION | DESCRIPTION             | ISSUED DATE   |
|--------------|---------|-------------------------|---------------|
| FR110513-01E | Rev. 01 | Initial issue of report | Mar. 18, 2021 |
|              |         |                         |               |
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|              |         |                         |               |



## SUMMARY OF THE TEST RESULT

| Applied Standard: FCC Part 15 Subpart C §15.249 |              |   |          |  |
|---|--------------|---|----------|--|
| Part  | FCC Rule     | Description of Test                     | Result   | Remark   |
| 3.1   | 15.207       | AC Power Line Conducted Emissions       | Complies | Under limit<br>9.48 dB at<br>0.400MHz              |
| 3.2   | 2.1049       | 20dB & 99% Occupied Bandwidth           | Complies | -  |
| 3.3   | 15.249(a)    | Field Strength of Fundamental Emissions | Complies | Max level<br>88.41 dB $\mu$ V/m at<br>2480.000 MHz |
| 3.3   | 15.249(a)(d) | Radiated Spurious Emissions             | Complies | Under limit<br>8.40 dB at<br>48.430MHz             |
| 3.4   | 15.203       | Antenna Requirements                    | Complies | -  |

**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 INFORMATION

## 1.1 Applicant

**OnePlus Technology (Shenzhen) Co., Ltd.**

18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen,Guangdong, China.

## 1.2 Manufacturer

**OnePlus Technology (Shenzhen) Co., Ltd.**

18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen,Guangdong, China.

## 1.3 Product Details

For more detailed features description, please refer to the manufacturer's specifications or user's manual.

| Items                   | Description  |
|-------------------------|--------------|
| Modulation              | GFSK         |
| Channel Bandwidth (99%) | 1.001MHz     |
| ANT+ Channel Number     | 79           |
| ANT+ Frequency Range    | 2402-2480MHz |

## 1.4 Modification of EUT

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



### 1.5 Table for Test Modes

Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

| Test Items                              | Mode |
|---|------|
| AC Power Line Conducted Emissions       | CTX  |
| Field Strength of Fundamental Emissions | CTX  |
| Bandwidth                               | CTX  |
| Radiated Emissions                      | CTX  |

Note:

1. CTX=continuously transmitting.
2. The programmed RF utility, "QRCT Tool" installed in the notebook to make the EUT get into the engineering modes to continuously transmit.

### 1.6 Table for Testing Locations

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

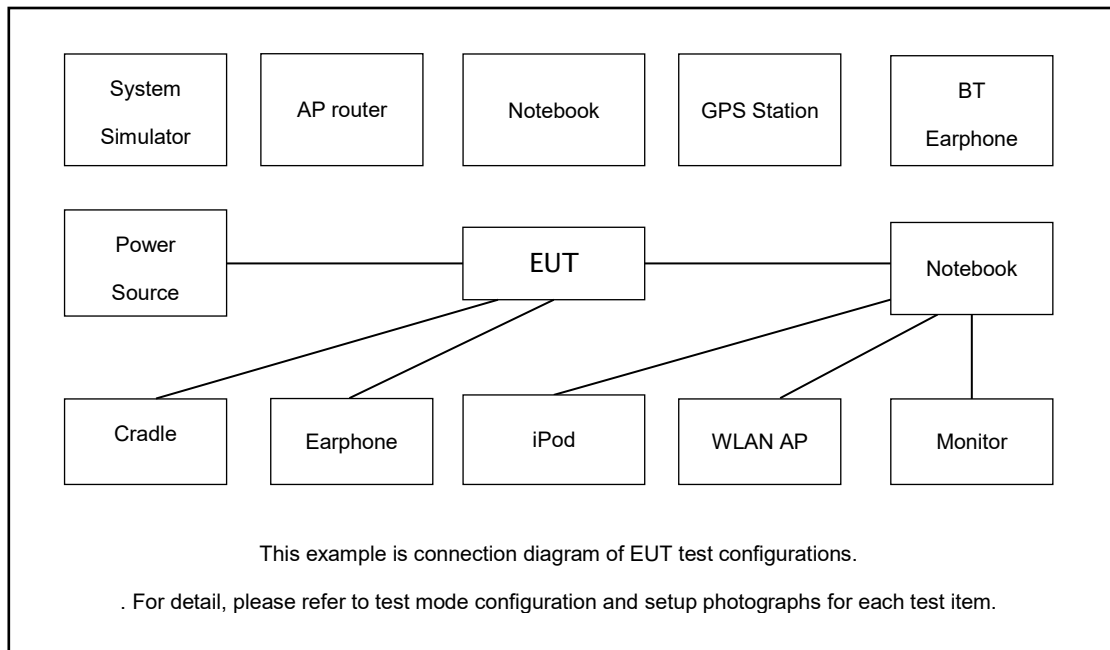
|                           |   |                            |                                       |
|---------------------------|---|----------------------------|---------------------------------------|
| <b>Test Firm</b>          | Sporton International (Shenzhen) Inc.   |                            |                                       |
| <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<br>TH01-SZ  | CN1256                     | 421272                                |

|                           |   |                            |                                       |
|---------------------------|---|----------------------------|---------------------------------------|
| <b>Test Firm</b>          | Sporton International (Shenzhen) Inc.   |                            |                                       |
| <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 Connection Diagram of Test System





## 2. TEST RESULT

### 2.1 AC Power Line Conducted Emissions Measurement

#### 2.1.1 Limit

For a Low-power Radio-frequency device which is designed to be connected to the 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 below limits table.

| Frequency (MHz) | QP Limit (dB $\mu$ V) | AV Limit (dB $\mu$ V) |
|-----------------|-----------------------|-----------------------|
| 0.15~0.5        | 66~56                 | 56~46                 |
| 0.5~5           | 56                    | 46                    |
| 5~30            | 60                    | 50                    |

#### 2.1.2 Measuring Instruments

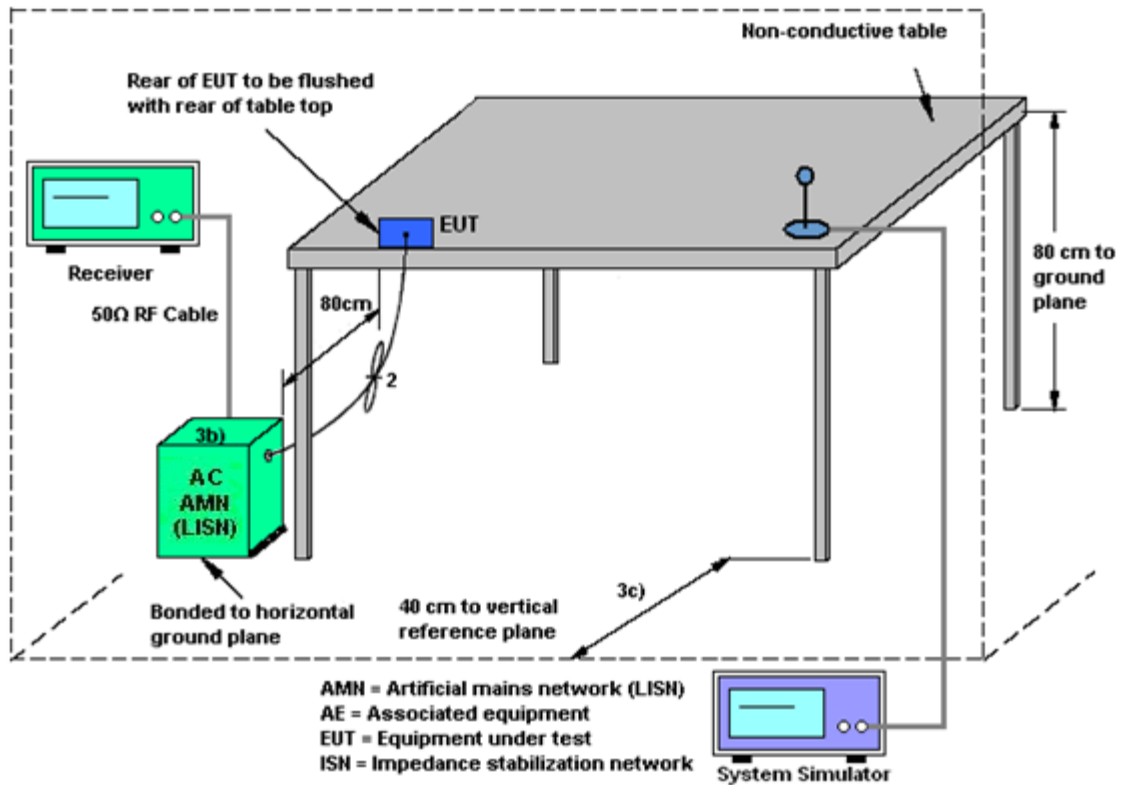
Please refer to section 4 of equipment list in this report.

#### 2.1.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it 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.



### 2.1.4 Test Setup Layout



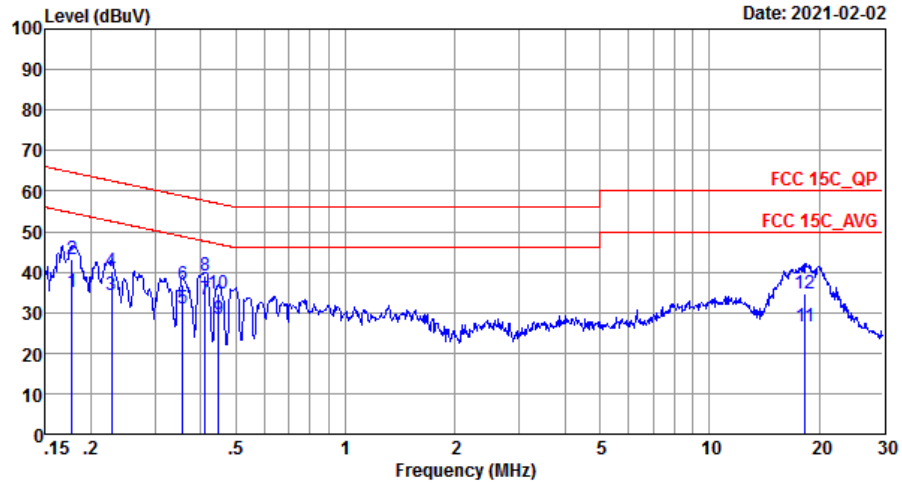
### 2.1.5 EUT Operation during Test

The EUT was placed on the test table and programmed in transmitting function.



2.1.6 Results of AC Power Line Conducted Emissions Measurement

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

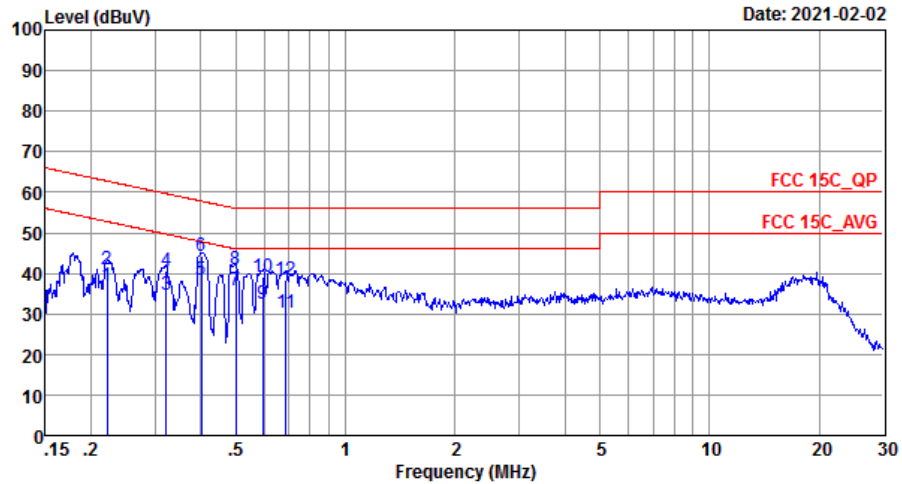


Site : C001-SZ  
 Condition: FCC 15C\_QP LISN\_20200719\_L LINE

|     | Freq  | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark  |
|-----|-------|-------|------------|------------|------------|-------------|------------|---------|
|     | MHz   | dBuV  | dB         | dBuV       | dBuV       | dB          | dB         |         |
| 1   | 0.18  | 35.04 | -19.55     | 54.59      | 25.00      | 0.03        | 10.01      | Average |
| 2   | 0.18  | 43.04 | -21.55     | 64.59      | 33.00      | 0.03        | 10.01      | QP      |
| 3   | 0.23  | 34.34 | -18.18     | 52.52      | 24.30      | 0.03        | 10.01      | Average |
| 4   | 0.23  | 40.14 | -22.38     | 62.52      | 30.10      | 0.03        | 10.01      | QP      |
| 5   | 0.36  | 31.14 | -17.64     | 48.78      | 21.10      | 0.03        | 10.01      | Average |
| 6   | 0.36  | 36.74 | -22.04     | 58.78      | 26.70      | 0.03        | 10.01      | QP      |
| 7 * | 0.41  | 33.35 | -14.24     | 47.59      | 23.30      | 0.03        | 10.02      | Average |
| 8   | 0.41  | 39.25 | -18.34     | 57.59      | 29.20      | 0.03        | 10.02      | QP      |
| 9   | 0.45  | 28.56 | -18.33     | 46.89      | 18.50      | 0.02        | 10.04      | Average |
| 10  | 0.45  | 34.86 | -22.03     | 56.89      | 24.80      | 0.02        | 10.04      | QP      |
| 11  | 18.33 | 26.45 | -23.55     | 50.00      | 15.10      | 1.06        | 10.29      | Average |
| 12  | 18.33 | 34.75 | -25.25     | 60.00      | 23.40      | 1.06        | 10.29      | QP      |



|                 |   |                     |         |
|-----------------|---|---------------------|---------|
| Test Engineer : | Xie YuQiang   | 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 : C001-SZ  
 Condition: FCC 15C\_QP LISN\_20200719\_N NEUTRAL

|     | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark  |
|-----|------|-------|------------|------------|------------|-------------|------------|---------|
|     | MHz  | dBuV  | dB         | dBuV       | dBuV       | dB          | dB         |         |
| 1   | 0.22 | 36.74 | -16.00     | 52.74      | 26.70      | 0.03        | 10.01      | Average |
| 2   | 0.22 | 41.14 | -21.60     | 62.74      | 31.10      | 0.03        | 10.01      | QP      |
| 3   | 0.32 | 34.84 | -14.82     | 49.66      | 24.80      | 0.03        | 10.01      | Average |
| 4   | 0.32 | 40.74 | -18.92     | 59.66      | 30.70      | 0.03        | 10.01      | QP      |
| 5 * | 0.40 | 38.33 | -9.48      | 47.81      | 28.30      | 0.02        | 10.01      | Average |
| 6   | 0.40 | 44.33 | -13.48     | 57.81      | 34.30      | 0.02        | 10.01      | QP      |
| 7   | 0.50 | 35.68 | -10.33     | 46.01      | 25.60      | 0.02        | 10.06      | Average |
| 8   | 0.50 | 41.08 | -14.93     | 56.01      | 31.00      | 0.02        | 10.06      | QP      |
| 9   | 0.59 | 32.58 | -13.42     | 46.00      | 22.49      | 0.02        | 10.07      | Average |
| 10  | 0.59 | 39.28 | -16.72     | 56.00      | 29.19      | 0.02        | 10.07      | QP      |
| 11  | 0.69 | 30.09 | -15.91     | 46.00      | 20.00      | 0.02        | 10.07      | Average |
| 12  | 0.69 | 38.49 | -17.51     | 56.00      | 28.40      | 0.02        | 10.07      | QP      |

## 2.2 20dB and & 99% Occupied Bandwidth

### 2.2.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band.

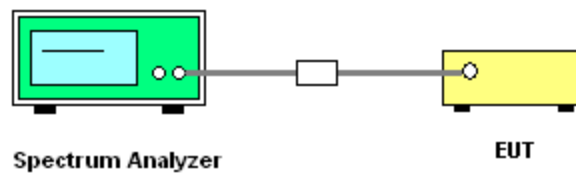
### 2.2.2 Measuring Instruments

Please refer to section 4 of equipment list in this report.

### 2.2.3 Test Procedures

1. The transmitter output port was connected to the spectrum analyzer.
2. Measured the spectrum width with highest power setting.

### 2.2.4 Test Setup Layout



### 2.2.5 Test Deviation

There is no deviation with the original standard.

### 2.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



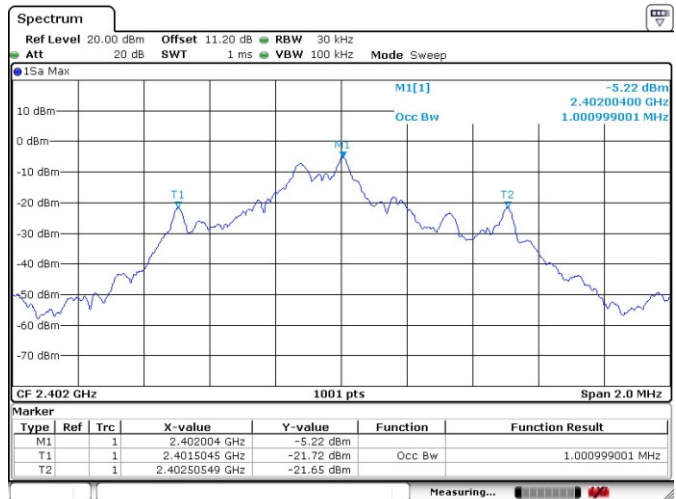
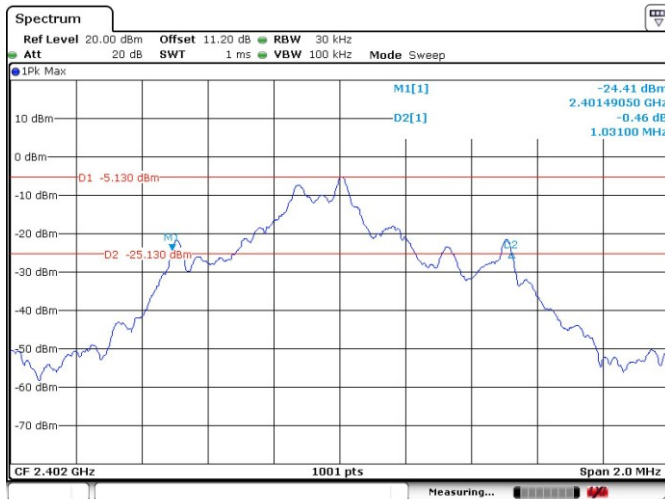
2.2.7 Test Result of 20dB Spectrum Bandwidth

|                 |               |               |         |
|-----------------|---------------|---------------|---------|
| Final Test Date | Jan. 31, 2021 | Test Site No. | TH01-SZ |
| Temperature     | 21~25°C       | Humidity      | 51~54%  |
| Test Engineer   | Zhang Xue Yi  |               |         |

| Frequency | 20dB BW (MHz) | 99% OBW (MHz) |
|-----------|---------------|---------------|
| 2402MHz   | 1.031         | 1.001         |
| 2441MHz   | 1.032         | 0.995         |
| 2480MHz   | 1.033         | 0.997         |

20 dB Bandwidth Plot on 2402MHz

99% Bandwidth Plot on 2402MHz

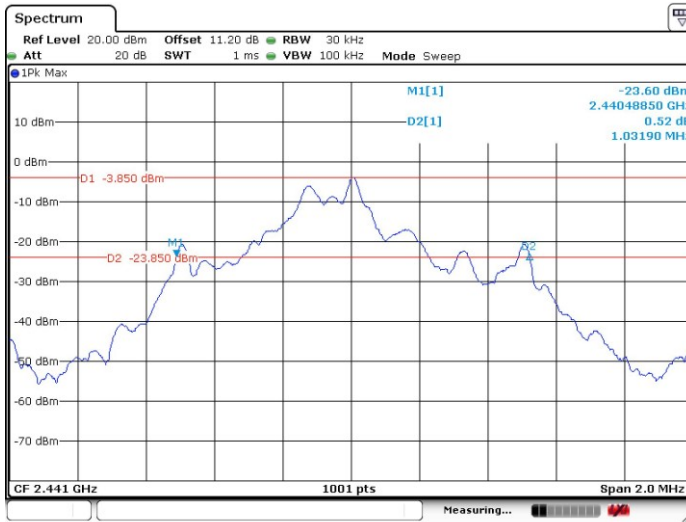


Date: 31.JAN.2021 12:52:54

Date: 31.JAN.2021 12:54:30

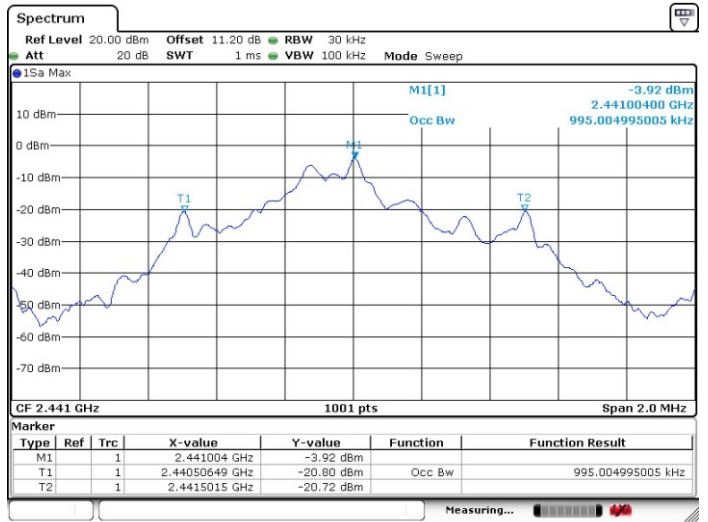


20 dB Bandwidth Plot on 2441MHz



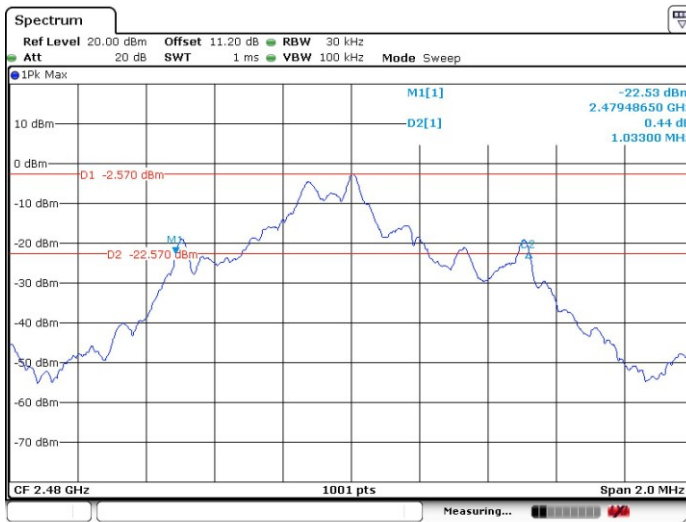
Date: 31.JAN.2021 12:57:56

99% Bandwidth Plot on 2441MHz



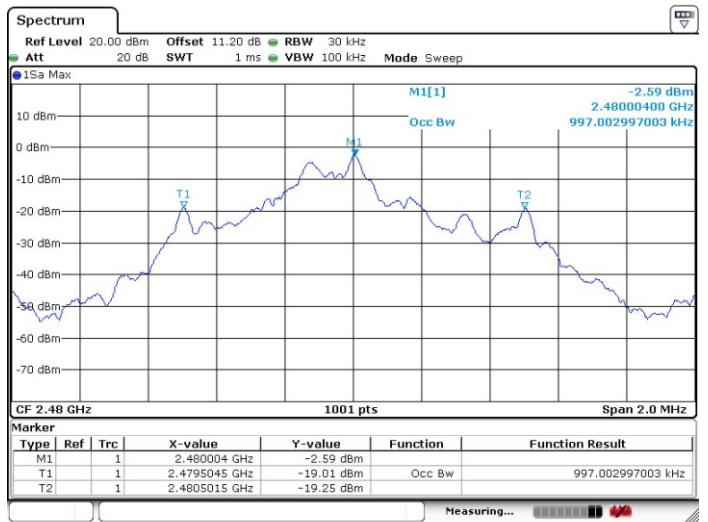
Date: 31.JAN.2021 13:04:22

20 dB Bandwidth Plot on 2480MHz



Date: 31.JAN.2021 13:06:49

99% Bandwidth Plot on 2480MHz



Date: 31.JAN.2021 13:09:45



### 2.3 Field Strength of Fundamental Emissions and Radiated Spurious Emissions

#### 2.3.1 Limit

The field strength measured at 3 meters shall not exceed the limits in the following table:

| Fundamental Frequencies(MHz) | Field Strength(millivolts/m) |           |
|------------------------------|------------------------------|-----------|
|                              | Fundamental                  | Harmonics |
| 902~928                      | 50                           | 0.5       |
| 2400~2483.5                  | 50                           | 0.5       |
| 5725~5875                    | 50                           | 0.5       |

**Note:** The limits shown in the above table are based on measurements using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using a CISPR quasi-peak detector.

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in 15.209 as below, whichever is less stringent.

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (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                             |



### **2.3.2 Measuring Instruments**

Please refer to section 4 of equipment list in this report.

### **2.3.3 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.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. 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.
4. Set to the maximum power setting and enable the EUT transmit continuously.

**Remark:**

1. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
2. For average measurement: use duty cycle correction factor method per 15.35(c).

Duty cycle = On time/100 milliseconds

On time =  $N1*L1+N2*L2+...+Nn-1*LNn-1+Nn*Ln$

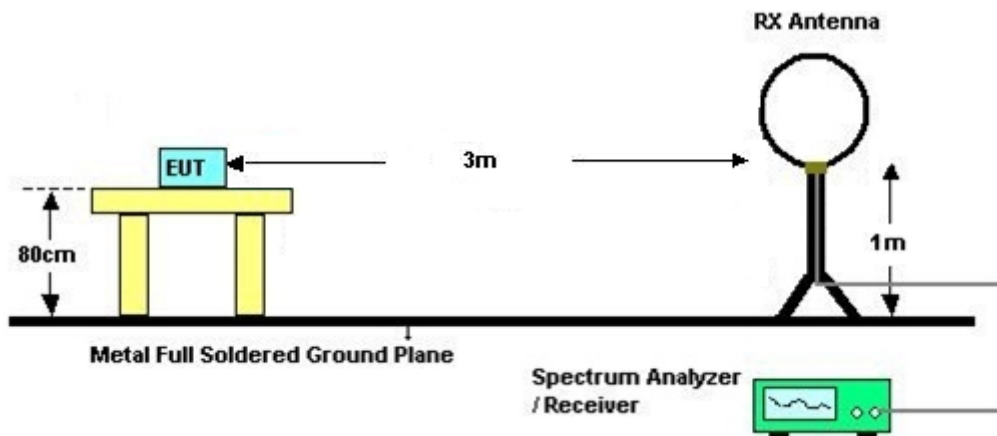
Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.

Average Emission Level = Peak Emission Level + 20\*log(Duty cycle)

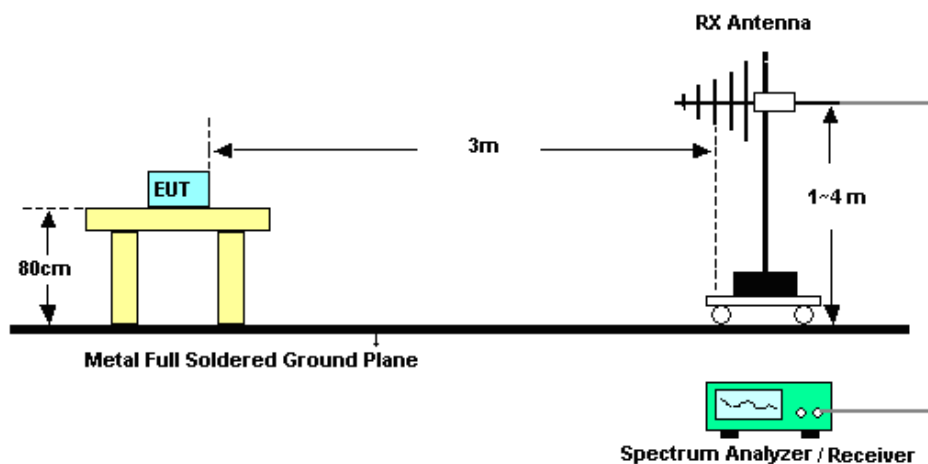


### 2.3.4 Test Setup Layout

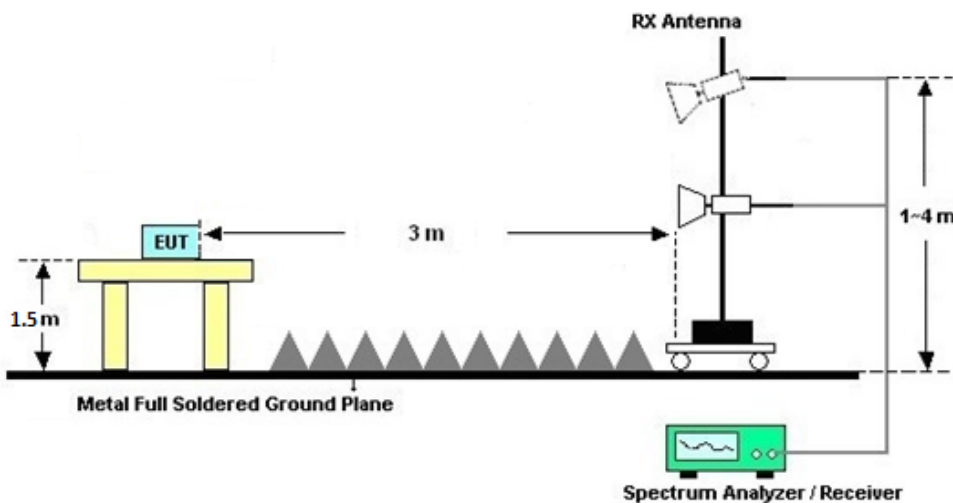
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





### **2.3.5 Test Deviation**

There is no deviation with the original standard.

### **2.3.6 EUT Operation during Test**

The EUT was programmed to be in continuously transmitting mode.

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

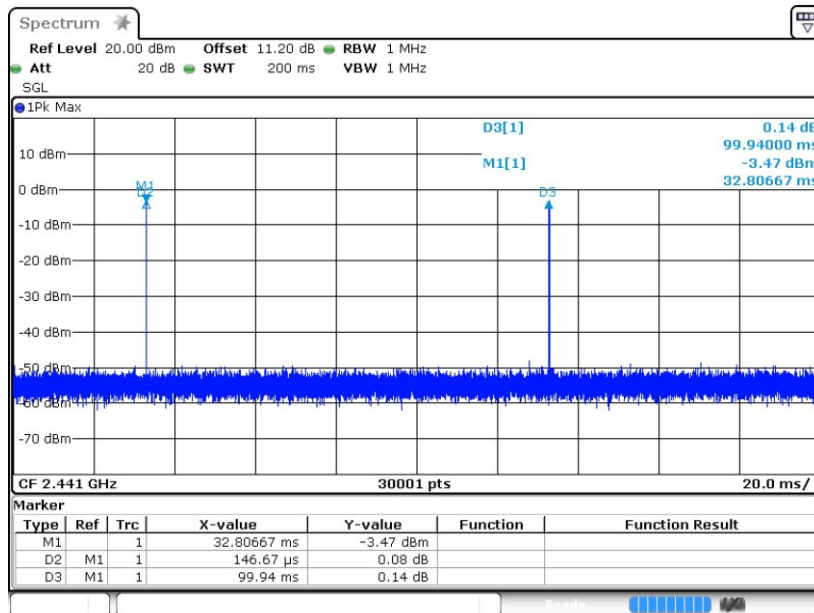
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

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



2.3.8 Duty cycle correction factor for average measurement

On time (One Pulse) Plot on 2441MHz



Note:

1. Worst case Duty cycle = on time/100 milliseconds =  $2 * 0.147 / 100 = 0.29 \%$
2. Worst case Duty cycle correction factor =  $20 * \log(\text{Duty cycle}) = -50.65 \text{ dB}$



2.3.9 Test Result of Field Strength of Fundamental Emissions and Spurious Emissions

2.4GHz 2400~2483.5MHz

ANT+ (Band Edge @ 3m)

| ANT+                     | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Cable  | Preamp | Ant    | Table   | Peak    | Pol.    |
|--------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|                          |      |           |            | Limit  | 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 ) |
| ANT+<br>CH00<br>2402MHz  |      | 2359.455  | 40.85      | -33.15 | 74         | 42.67    | 26.93    | 4.84   | 33.59  | 100    | 0       | P       | H       |
|                          |      | 2359.455  | -9.8       | -63.8  | 54         | -        | -        | -      | -      | 100    | 0       | A       | H       |
|                          | *    | 2402      | 81.55      | -32.45 | 114        | 83.22    | 26.98    | 4.91   | 33.56  | 100    | 0       | P       | H       |
|                          | *    | 2402      | 30.9       | -63.1  | 94         | -        | -        | -      | -      | 100    | 0       | A       | H       |
|                          |      | 2348.22   | 40.64      | -33.36 | 74         | 42.51    | 26.91    | 4.81   | 33.59  | 100    | 360     | P       | V       |
|                          |      | 2348.22   | -10.01     | -64.01 | 54         | -        | -        | -      | -      | 100    | 360     | A       | V       |
|                          | *    | 2402      | 87.65      | -26.35 | 114        | 89.32    | 26.98    | 4.91   | 33.56  | 100    | 360     | P       | V       |
|                          | *    | 2402      | 37         | -57    | 94         | -        | -        | -      | -      | 100    | 360     | A       | V       |
| ANT+<br>CH 41<br>2441MHz |      | 2388.4    | 40.7       | -33.3  | 74         | 42.39    | 26.98    | 4.91   | 33.58  | 100    | 0       | P       | H       |
|                          |      | 2388.4    | -9.95      | -63.95 | 54         | -        | -        | -      | -      | 100    | 0       | A       | H       |
|                          | *    | 2441      | 85.96      | -28.04 | 114        | 87.49    | 27.04    | 4.96   | 33.53  | 266    | 332     | P       | H       |
|                          | *    | 2441      | 35.31      | -58.69 | 94         | -        | -        | -      | -      | 266    | 332     | A       | H       |
|                          |      | 2490.06   | 41.71      | -32.29 | 74         | 43.11    | 27.1     | 5.01   | 33.51  | 136    | 196     | P       | H       |
|                          |      | 2490.06   | -8.94      | -62.94 | 54         | -        | -        | -      | -      | 136    | 196     | A       | H       |
|                          |      | 2385.18   | 43.38      | -30.62 | 74         | 45.12    | 26.96    | 4.88   | 33.58  | 100    | 276     | P       | V       |
|                          |      | 2385.18   | -7.27      | -61.27 | 54         | -        | -        | -      | -      | 100    | 276     | A       | V       |
|                          | *    | 2441      | 85.53      | -28.47 | 114        | 87.06    | 27.04    | 4.96   | 33.53  | 100    | 92      | P       | V       |
|                          | *    | 2441      | 34.88      | -59.12 | 94         | -        | -        | -      | -      | 100    | 92      | A       | V       |
|                          |      | 2489.36   | 43.41      | -30.59 | 74         | 44.81    | 27.1     | 5.01   | 33.51  | 258    | 230     | P       | V       |
|                          |      | 2489.36   | -7.24      | -61.24 | 54         | -        | -        | -      | -      | 258    | 230     | A       | V       |



|                                   |   |         |       |        |     |       |       |      |       |     |     |   |   |
|-----------------------------------|---|---------|-------|--------|-----|-------|-------|------|-------|-----|-----|---|---|
| <b>ANT+<br/>CH 80<br/>2480MHz</b> | *   | 2480    | 83.67 | -30.33 | 114 | 85.11 | 27.08 | 4.99 | 33.51 | 100 | 0   | P | H |
|                                   | *   | 2480    | 33.02 | -60.98 | 94  | -     | -     | -    | -     | 100 | 0   | A | H |
|                                   |   | 2491.84 | 42.28 | -31.72 | 74  | 43.67 | 27.1  | 5.01 | 33.5  | 100 | 360 | P | H |
|                                   |   | 2491.84 | -8.37 | -62.37 | 54  | -     | -     | -    | -     | 100 | 360 | A | H |
|                                   | *   | 2480    | 88.41 | -25.59 | 114 | 89.85 | 27.08 | 4.99 | 33.51 | 100 | 80  | P | V |
|                                   | *   | 2480    | 37.76 | -56.24 | 94  | -     | -     | -    | -     | 100 | 80  | A | V |
|                                   |   | 2489    | 40.85 | -33.15 | 74  | 42.25 | 27.1  | 5.01 | 33.51 | 100 | 360 | P | V |
|                                   |   | 2489    | -9.8  | -63.8  | 54  | -     | -     | -    | -     | 100 | 360 | A | V |
| <b>Remark</b>                     | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |         |       |        |     |       |       |      |       |     |     |   |   |



2.4GHz 2400~2483.5MHz

ANT+ (Harmonic @ 3m)

| ANT+                     | Note  | Frequency | Level      | Over   | Limit | Read     | Antenna  | Cable  | Preamp | Ant    | Table   | Peak    | Pol.    |   |
|--------------------------|---|-----------|------------|--------|-------|----------|----------|--------|--------|--------|---------|---------|---------|---|
|                          |   | ( MHz )   | ( dBμV/m ) | ( dB ) | Limit | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |   |
|                          |   |           |            |        | Line  | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |   |
| ANT+<br>CH 00<br>2402MHz |   | 4804      | 39.87      | -34.13 | 74    | 59.44    | 30.81    | 7.09   | 57.47  | 151    | 219     | P       | H       |   |
|                          |   | 4804      | -10.78     | -64.78 | 54    | -        | -        | -      | -      | 151    | 219     | A       | H       |   |
|                          |   | 4804      | 39.31      | -34.69 | 74    | 58.88    | 30.81    | 7.09   | 57.47  | 151    | 219     | P       | V       |   |
|                          |   | 4804      | -11.34     | -65.34 | 54    | -        | -        | -      | -      | -      | 151     | 219     | A       | V |
| ANT+<br>CH 41<br>2441MHz |   | 4882      | 39.49      | -34.51 | 74    | 58.83    | 30.99    | 7.19   | 57.52  | 159    | 251     | P       | H       |   |
|                          |   | 4882      | -11.16     | -65.16 | 54    | -        | -        | -      | -      | 159    | 251     | A       | H       |   |
|                          |   | 7323      | 45.86      | -28.14 | 74    | 59.68    | 36.31    | 8.8    | 58.93  | 188    | 331     | P       | H       |   |
|                          |   | 7323      | -4.79      | -58.79 | 54    | -        | -        | -      | -      | -      | 188     | 331     | A       | H |
|                          |   | 4882      | 39.96      | -34.04 | 74    | 59.3     | 30.99    | 7.19   | 57.52  | 150    | 258     | P       | V       |   |
|                          |   | 4882      | -10.69     | -64.69 | 54    | -        | -        | -      | -      | -      | 150     | 258     | A       | V |
|                          |   | 7323      | 45.94      | -28.06 | 74    | 59.76    | 36.31    | 8.8    | 58.93  | 152    | 309     | P       | V       |   |
|                          |   | 7323      | -4.71      | -58.71 | 54    | -        | -        | -      | -      | -      | 152     | 309     | A       | V |
| ANT+<br>CH 80<br>2480MHz |   | 4960      | 39.8       | -34.2  | 74    | 58.95    | 31.21    | 7.22   | 57.58  | 118    | 289     | P       | H       |   |
|                          |   | 4960      | -10.85     | -64.85 | 54    | -        | -        | -      | -      | 118    | 289     | A       | H       |   |
|                          |   | 7440      | 46.13      | -27.87 | 74    | 59.44    | 36.72    | 8.95   | 58.98  | 158    | 273     | P       | H       |   |
|                          |   | 7440      | -4.52      | -58.52 | 54    | -        | -        | -      | -      | -      | 158     | 273     | A       | H |
|                          |   | 4960      | 40.21      | -33.79 | 74    | 59.36    | 31.21    | 7.22   | 57.58  | 192    | 213     | P       | V       |   |
|                          |   | 4960      | -10.44     | -64.44 | 54    | -        | -        | -      | -      | -      | 192     | 213     | A       | V |
|                          |   | 7440      | 46.7       | -27.3  | 74    | 60.01    | 36.72    | 8.95   | 58.98  | 114    | 202     | P       | V       |   |
|                          |   | 7440      | -3.95      | -57.95 | 54    | -        | -        | -      | -      | -      | 114     | 202     | 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 ANT+ (LF)

| ANT+                 | Note   | Frequency | Level      | Over   | Limit | Read   | Antenna  | Cable  | Preamp | Ant    | Table   | Peak  | Pol.  |
|----------------------|--|-----------|------------|--------|-------|--------|----------|--------|--------|--------|---------|-------|-------|
|                      |  | ( MHz )   | ( dBμV/m ) | ( dB ) | Limit | Level  | Factor   | Loss   | Factor | Pos    | Pos     | Avg.  |       |
|                      |  |           |            |        | Line  | (dBμV) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| 2.4GHz<br>ANT+<br>LF |  | 49.4      | 23         | -17    | 40    | 35.58  | 20.29    | 2.22   | 35.09  | -      | -       | P     | H     |
|                      |  | 151.25    | 27.19      | -16.31 | 43.5  | 40.43  | 19.3     | 2.56   | 35.1   | 100    | 69      | P     | H     |
|                      |  | 363.68    | 27.65      | -18.35 | 46    | 38.08  | 21.19    | 3.25   | 34.87  | -      | -       | P     | H     |
|                      |  | 492.69    | 27.9       | -18.1  | 46    | 35.45  | 23.7     | 3.45   | 34.7   | -      | -       | P     | H     |
|                      |  | 597.45    | 28.68      | -17.32 | 46    | 33.57  | 25.74    | 3.88   | 34.51  | -      | -       | P     | H     |
|                      |  | 980.6     | 31.59      | -22.41 | 54    | 31.52  | 30.06    | 4.15   | 34.14  | -      | -       | P     | H     |
|                      |  | 48.43     | 31.6       | -8.4   | 40    | 44.2   | 20.28    | 2.2    | 35.08  | 100    | 56      | P     | V     |
|                      |  | 156.1     | 32.79      | -10.71 | 43.5  | 46.02  | 19.3     | 2.57   | 35.1   | -      | -       | P     | V     |
|                      |  | 362.71    | 26.42      | -19.58 | 46    | 36.88  | 21.16    | 3.25   | 34.87  | -      | -       | P     | V     |
|                      |  | 476.2     | 29.94      | -16.06 | 46    | 37.74  | 23.51    | 3.39   | 34.7   | -      | -       | P     | V     |
|                      |  | 554.77    | 33.15      | -12.85 | 46    | 39.2   | 24.87    | 3.67   | 34.59  | -      | -       | P     | V     |
|                      | 934.04   | 31.83     | -14.17     | 46     | 32.27 | 29.66  | 4.13     | 34.23  | -      | -      | P       | V     |       |
| Remark               | 1. No other spurious found.<br>2. All results are PASS against limit line. |           |            |        |       |        |          |        |        |        |         |       |       |



## **2.4 Antenna Requirements**

### **2.4.1 Limit**

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

### **2.4.2 Antenna Connector Construction**

An embedded-in antenna design is used.





### 3. LIST OF MEASURING EQUIPMENT

| Instrument                        | Manufacturer         | Model No.                    | Serial No.       | Characteristics    | Calibration Date | Test Date                       | Due Date      | Remark                |
|-----------------------------------|----------------------|------------------------------|------------------|--------------------|------------------|---------------------------------|---------------|-----------------------|
| Spectrum Analyzer                 | R&S                  | FSV40                        | 101078           | 10Hz~40GHz         | Apr. 17, 2020    | Jan. 27, 2021~<br>Jan. 31, 2021 | Apr. 16, 2021 | Conducted (TH01-SZ)   |
| EMI Test Receiver&SA              | KEYSIGHT             | N9038A                       | MY544500<br>83   | 20Hz~8.4GHz        | Apr. 17, 2020    | Feb. 27, 2021                   | Apr. 16, 2021 | Radiation (03CH03-SZ) |
| EXA Spectrum Analyzer             | KEYSIGHT             | N9010A                       | MY551502<br>46   | 10Hz~44GHz;        | Apr. 17, 2020    | Feb. 27, 2021                   | Apr. 16, 2021 | Radiation (03CH03-SZ) |
| Loop Antenna                      | R&S                  | HFH2-Z2                      | 100354           | 9kHz~30MHz         | Jun. 22, 2020    | Feb. 27, 2021                   | Jun. 21, 2021 | Radiation (03CH03-SZ) |
| Bilog Antenna                     | TeseQ                | CBL6112D                     | 35408            | 30MHz~2GHz         | Jun. 22, 2020    | Feb. 27, 2021                   | Jun. 21, 2021 | Radiation (03CH03-SZ) |
| Double Ridge Horn Antenna         | SCHWARZBECK          | BBHA9120D                    | 9120D-135<br>5   | 1GHz~18GHz         | Apr. 30, 2020    | Feb. 27, 2021                   | Apr. 29, 2021 | Radiation (03CH03-SZ) |
| HF Amplifier                      | MITEQ                | TTA1840-35-HG                | 1871923          | 18GHz~40GHz        | Jul. 21, 2020    | Feb. 27, 2021                   | Jul. 20, 2021 | Radiation (03CH03-SZ) |
| SHF-EHF Horn                      | com-power            | AH-840                       | 101071           | 18GHz~40GHz        | Apr. 23, 2020    | Feb. 27, 2021                   | Apr. 22, 2021 | Radiation (03CH03-SZ) |
| Amplifier                         | Burgeon              | BPA-530                      | 102210           | 0.01Hz<br>~3000MHz | Oct. 17, 2020    | Feb. 27, 2021                   | Oct. 16, 2021 | Radiation (03CH03-SZ) |
| HF Amplifier                      | MITEQ                | AMF-7D-0010<br>1800-30-10P-R | 1943528          | 1GHz~18GHz         | Oct. 17, 2020    | Feb. 27, 2021                   | Oct. 16, 2021 | Radiation (03CH03-SZ) |
| Amplifier                         | Agilent Technologies | 83017A                       | MY395013<br>02   | 500MHz~26.5G<br>Hz | Dec. 25, 2020    | Feb. 27, 2021                   | Dec. 24, 2021 | Radiation (03CH03-SZ) |
| AC Power Source                   | Chroma               | 61601                        | 616010001<br>985 | N/A                | NCR              | Feb. 27, 2021                   | NCR           | Radiation (03CH03-SZ) |
| Turn Table                        | EM                   | EM1000                       | N/A              | 0~360 degree       | NCR              | Feb. 27, 2021                   | NCR           | Radiation (03CH03-SZ) |
| Antenna Mast                      | EM                   | EM1000                       | N/A              | 1 m~4 m            | NCR              | Feb. 27, 2021                   | NCR           | Radiation (03CH03-SZ) |
| EMI Receiver                      | R&S                  | ESR7                         | 101630           | 9kHz~7GHz;         | Dec. 25, 2020    | Feb. 02, 2021                   | Dec. 24, 2021 | Conduction (CO01-SZ)  |
| AC LISN                           | EMCO                 | 3816/2 LISN                  | 00103912         | 9kHz~30MHz         | Dec. 25, 2020    | Feb. 02, 2021                   | Dec. 24, 2021 | Conduction (CO01-SZ)  |
| AC LISN (for auxiliary equipment) | EMCO                 | 3816/2SH                     | 00103892         | 9kHz~30MHz         | Oct. 15, 2020    | Feb. 02, 2021                   | Oct. 14, 2021 | Conduction (CO01-SZ)  |
| AC Power Source                   | Chroma               | 61602                        | 616020000<br>891 | 100Vac~250Vac      | Jul. 21, 2020    | Feb. 02, 2021                   | Jul. 20, 2021 | Conduction (CO01-SZ)  |

**Note:**

1. Test equipment calibration is traceable to the procedure of ISO17025.
2. NCR: No Calibration Required



#### 4. 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 (150kHz ~ 30MHz)**

|   |       |
|---|-------|
| Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y)) | 2.7dB |
|---|-------|

**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 |
|---|-------|