

## TEST REPORT

|           |                                                                                                                                  |
|-----------|----------------------------------------------------------------------------------------------------------------------------------|
| Applicant | Shenzhen Hopewin Electronic Material Co.,Ltd                                                                                     |
| Address   | Room O-P,Floor 4,Block 9C,Baoneng Science Park,Qingxiang Road,QingHu Industrial Estate,Longhua Street ,Longhua District,Shenzhen |

|                                     |                                                                                                                                  |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Manufacturer or Supplier            | Shenzhen Hopewin Electronic Material Co.,Ltd                                                                                     |
| Address                             | Room O-P,Floor 4,Block 9C,Baoneng Science Park,Qingxiang Road,QingHu Industrial Estate,Longhua Street ,Longhua District,Shenzhen |
| Product                             | Gateway                                                                                                                          |
| Brand Name                          | Cloudleaf                                                                                                                        |
| Model                               | GW-1.5-I                                                                                                                         |
| Additional Model & Model Difference | N/A                                                                                                                              |
| Date of tests                       | Nov. 12, 2019 ~ Dec. 09, 2019                                                                                                    |

the tests have been carried out according to the requirements of the following standard:

☒ **FCC Part 15, Subpart C, Section 15.247**

**CONCLUSION: The submitted sample was found to COMPLY with the test requirement**

|                                                                                     |                                                                                                             |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Tested by Breeze Jiang<br>Project Engineer / EMC Department                         | Approved by Glyn He<br>Supervisor / EMC Department                                                          |
|  | <br>Date: Dec. 16, 2019 |

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Test Report No.: RF191119N021-FCC

## TABLE OF CONTENTS

|                                                               |           |
|---------------------------------------------------------------|-----------|
| <b>RELEASE CONTROL RECORD .....</b>                           | <b>4</b>  |
| <b>1 SUMMARY OF TEST RESULTS.....</b>                         | <b>5</b>  |
| 2 MEASUREMENT UNCERTAINTY .....                               | 5         |
| <b>3 GENERAL INFORMATION .....</b>                            | <b>6</b>  |
| 3.1 GENERAL DESCRIPTION OF EUT .....                          | 6         |
| 3.2 DESCRIPTION OF TEST MODES .....                           | 7         |
| 3.2.1. CONFIGURATION OF SYSTEM UNDER TEST .....               | 7         |
| 3.2.2. TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL..... | 7         |
| 3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS .....            | 10        |
| 3.4 DESCRIPTION OF SUPPORT UNITS .....                        | 10        |
| <b>4 TEST TYPES AND RESULTS.....</b>                          | <b>11</b> |
| 4.1 CONDUCTED EMISSION MEASUREMENT .....                      | 11        |
| 4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT .....          | 11        |
| 4.1.2 TEST INSTRUMENTS.....                                   | 11        |
| 4.1.3 TEST PROCEDURES .....                                   | 12        |
| 4.1.4 DEVIATION FROM TEST STANDARD .....                      | 12        |
| 4.1.5 TEST SETUP .....                                        | 12        |
| 4.1.6 EUT OPERATING CONDITIONS .....                          | 13        |
| 4.1.7 TEST RESULTS .....                                      | 14        |
| 4.2 RADIATED EMISSION MEASUREMENT .....                       | 16        |
| 4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT .....           | 16        |
| 4.2.2 TEST INSTRUMENTS.....                                   | 17        |
| 4.2.3 TEST PROCEDURES .....                                   | 18        |
| 4.2.4 DEVIATION FROM TEST STANDARD .....                      | 19        |
| 4.2.5 TEST SETUP .....                                        | 19        |
| 4.2.6 EUT OPERATING CONDITIONS .....                          | 20        |
| 4.2.7 TEST RESULTS .....                                      | 21        |
| 4.3 6DB BANDWIDTH MEASUREMENT .....                           | 26        |
| 4.3.1 LIMITS OF 6DB BANDWIDTH MEASUREMENT .....               | 26        |
| 4.3.2 TEST INSTRUMENTS.....                                   | 26        |
| 4.3.3 TEST PROCEDURE.....                                     | 27        |
| 4.3.4 DEVIATION FROM TEST STANDARD .....                      | 27        |
| 4.3.5 TEST SETUP .....                                        | 28        |
| 4.3.6 EUT OPERATING CONDITIONS .....                          | 28        |
| 4.3.7 TEST RESULTS .....                                      | 29        |



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**Test Report No.: RF191119N021-FCC**

|            |                                                                                               |           |
|------------|-----------------------------------------------------------------------------------------------|-----------|
| <b>4.4</b> | <b>CONDUCTED OUTPUT POWER</b>                                                                 | <b>30</b> |
| 4.4.1      | LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT                                                  | 30        |
| 4.4.2      | TEST SETUP                                                                                    | 30        |
| 4.4.3      | TEST INSTRUMENTS                                                                              | 30        |
| 4.4.4      | TEST PROCEDURES                                                                               | 31        |
| 4.4.5      | DEVIATION FROM TEST STANDARD                                                                  | 31        |
| 4.4.6      | EUT OPERATING CONDITIONS                                                                      | 31        |
| 4.4.7      | TEST RESULTS                                                                                  | 32        |
| 4.4.7.1    | MAXIMUM AVERAGE OUTPUT POWER                                                                  | 32        |
| <b>4.5</b> | <b>POWER SPECTRAL DENSITY MEASUREMENT</b>                                                     | <b>33</b> |
| 4.5.1      | LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT                                                  | 33        |
| 4.5.2      | TEST SETUP                                                                                    | 33        |
| 4.5.3      | TEST INSTRUMENTS                                                                              | 33        |
| 4.5.4      | TEST PROCEDURE                                                                                | 33        |
| 4.5.5      | DEVIATION FROM TEST STANDARD                                                                  | 33        |
| 4.5.6      | EUT OPERATING CONDITION                                                                       | 33        |
| 4.5.7      | TEST RESULTS                                                                                  | 34        |
| <b>4.6</b> | <b>OUT OF BAND EMISSION MEASUREMENT</b>                                                       | <b>35</b> |
| 4.6.1      | LIMITS OF OUT OF BAND EMISSION MEASUREMENT                                                    | 35        |
| 4.6.2      | TEST SETUP                                                                                    | 35        |
| 4.6.3      | TEST INSTRUMENTS                                                                              | 35        |
| 4.6.4      | TEST PROCEDURE                                                                                | 35        |
| 4.6.5      | DEVIATION FROM TEST STANDARD                                                                  | 36        |
| 4.6.6      | EUT OPERATING CONDITION                                                                       | 36        |
| 4.6.7      | TEST RESULTS                                                                                  | 37        |
| <b>5</b>   | <b>PHOTOGRAPHS OF THE TEST CONFIGURATION</b>                                                  | <b>39</b> |
| <b>6</b>   | <b>APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT<br/>BY THE LAB</b> | <b>40</b> |



Test Report No.: RF191119N021-FCC

## RELEASE CONTROL RECORD

| ISSUE NO.        | REASON FOR CHANGE | DATE ISSUED  |
|------------------|-------------------|--------------|
| RF191119N021-FCC | Original release  | Dec.16, 2019 |

## 1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247) |                                  |        |                                |
|-----------------------------------------------------------|----------------------------------|--------|--------------------------------|
| STANDARD SECTION                                          | TEST TYPE AND LIMIT              | RESULT | REMARK                         |
| 15.207                                                    | AC Power Conducted Emission      | PASS   | Meet the requirement of limit. |
| 15.205<br>15.209                                          | Radiated Emission                | PASS   | Meet the requirement of limit. |
| 15.247(d)                                                 | Out of band Emission Measurement | PASS   | Meet the requirement of limit. |
| 15.247(a)(2)                                              | 6dB bandwidth                    | PASS   | Meet the requirement of limit. |
| 15.247(b)                                                 | Conducted Output power           | PASS   | Meet the requirement of limit. |
| 15.247(e)                                                 | Power Spectral Density           | PASS   | Meet the requirement of limit. |
| 15.203                                                    | Antenna Requirement              | PASS   | No antenna connector is used   |

## 2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| MEASUREMENT         | FREQUENCY       | UNCERTAINTY |
|---------------------|-----------------|-------------|
| Conducted emissions | 0.15MHz ~ 30MHz | 2.66 dB     |
| Radiated emissions  | 9KHz ~ 30MHz    | 2.90dB      |
|                     | 30MHz ~ 1GMHz   | 3.47 dB     |
|                     | 1GHz ~ 18GHz    | 4.84 dB     |
|                     | 18GHz ~ 40GHz   | 4.62 dB     |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k = 2$ .

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

|                              |                                                                         |
|------------------------------|-------------------------------------------------------------------------|
| <b>PRODUCT</b>               | Gateway                                                                 |
| <b>BRAND</b>                 | Cloudleaf                                                               |
| <b>MODEL NO.</b>             | GW-1.5-I                                                                |
| <b>ADDITIONAL MODEL</b>      | N/A                                                                     |
| <b>FCC ID</b>                | 2AM29-HBW04                                                             |
| <b>NOMINAL VOLTAGE</b>       | DC 5V from adapter:AC100-240V~50/60Hz<br>DC48V from PoE RJ45 port input |
| <b>MODULATION TECHNOLOGY</b> | DTS                                                                     |
| <b>MODULATION TYPE</b>       | BT-LE GFSK (1, 2Mbps)                                                   |
| <b>OPERATING FREQUENCY</b>   | 2402-2480MHz                                                            |
| <b>AVERAGE OUTPUT POWER</b>  | 0.582mW (Max. Measured)                                                 |
| <b>ANTENNA TYPE</b>          | FPC Antenna, 1.5dBi Gain                                                |
| <b>I/O PORTS</b>             | Refer to user's manual                                                  |
| <b>CABLE SUPPLIED</b>        | USB Line: unshielded detachable 0.3m                                    |

#### NOTES:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 191119N021) for detailed product photo.
4. The adaptor information as below:

|                |                                    |
|----------------|------------------------------------|
| Model name:    | M050200E111                        |
| Input:         | AC100-240V~50/60Hz 0.35A           |
| Output:        | DC5V2A                             |
| Cable support: | DC Line: Shielding, 1.8m, no core. |

### 3.2 DESCRIPTION OF TEST MODES

40 channels are provided for BT-LE(GFSK):

| CHANNEL | FREQ.<br>(MHZ) | CHANNEL | FREQ.<br>(MHZ) | CHANNEL | FREQ.<br>(MHZ) | CHANNEL | FREQ.<br>(MHZ) |
|---------|----------------|---------|----------------|---------|----------------|---------|----------------|
| 0       | 2402           | 10      | 2422           | 20      | 2442           | 30      | 2462           |
| 1       | 2404           | 11      | 2424           | 21      | 2444           | 31      | 2464           |
| 2       | 2406           | 12      | 2426           | 22      | 2446           | 32      | 2466           |
| 3       | 2408           | 13      | 2428           | 23      | 2448           | 33      | 2468           |
| 4       | 2410           | 14      | 2430           | 24      | 2450           | 34      | 2470           |
| 5       | 2412           | 15      | 2432           | 25      | 2452           | 35      | 2472           |
| 6       | 2414           | 16      | 2434           | 26      | 2454           | 36      | 2474           |
| 7       | 2416           | 17      | 2436           | 27      | 2456           | 37      | 2476           |
| 8       | 2418           | 18      | 2438           | 28      | 2458           | 38      | 2478           |
| 9       | 2420           | 19      | 2440           | 29      | 2460           | 39      | 2480           |

#### 3.2.1. CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photographs of the test configuration for reference.

#### 3.2.2. TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports

The worst case was found when positioned on X axis for radiated emission. Following test modes were selected for the final test, and the final worst case is marked in boldface and recorded in the report:

| TX Frequency   | Azimuth/ axis | Antenna ports | Note                                       |
|----------------|---------------|---------------|--------------------------------------------|
| <b>2402MHz</b> | <b>X</b>      | <b>ANT1</b>   | Worst case mode in axis                    |
| 2402MHz        | Y             | ANT1          | -                                          |
| 2402MHz        | Z             | ANT1          | -                                          |
| <b>2402MHz</b> | <b>X</b>      | <b>ANT2</b>   | <b>Worst case mode in axis and ANT por</b> |
| 2402MHz        | X             | ANT3          | -                                          |
| 2402MHz        | X             | ANT4          | -                                          |

| EUT CONFIGURE<br>MODE | APPLICABLE TO |       |     |      | DESCRIPTION        |
|-----------------------|---------------|-------|-----|------|--------------------|
|                       | RE<1G         | RE≥1G | PLC | APCM |                    |
| A                     | √             | √     | X   | √    | DC 5V from adapter |

Where

**RE<1G:** Radiated Emission below 1GHz

**RE≥1G:** Radiated Emission above 1GHz

**PLC:** Power Line Conducted Emission

**APCM:** Antenna Port Conducted Measurement

#### RADIATED EMISSION TEST (BELOW 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channels were selected for the final test as listed below.

| MODE  | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|-------|-------------------|----------------|-----------------------|-----------------|------------------|
| BT-LE | 0 to 39           | 39             | DTS                   | GFSK            | 1 Mbps           |

For the test results, only the worst case was shown in test report.

#### RADIATED EMISSION TEST (ABOVE 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channels were selected for the final test as listed below.

| MODE  | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|-------|-------------------|----------------|-----------------------|-----------------|------------------|
| BT-LE | 0 to 39           | 0, 19, 39      | DTS                   | GFSK            | 1 Mbps           |

#### ANTENNA PORT CONDUCTED MEASUREMENT:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channels were selected for the final test as listed below.

| MODE  | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|-------|-------------------|----------------|-----------------------|-----------------|------------------|
| BT-LE | 0 to 39           | 0, 19, 39      | DTS                   | GFSK            | 1 Mbps           |

#### TEST CONDITION:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | TEST VOLTAGE       | TESTED BY |
|---------------|--------------------------|--------------------|-----------|
| RE<1G         | 22deg. C, 55%RH          | DC 5V from adapter | Tank Tan  |
| RE≥1G         | 22deg. C, 55%RH          | DC 5V from adapter | Tank Tan  |
| PLC           | 22deg. C, 55%RH          | DC 5V from adapter | Rex Yang  |
| APCM          | 22deg. C, 55%RH          | DC 5V from adapter | Rex Yang  |

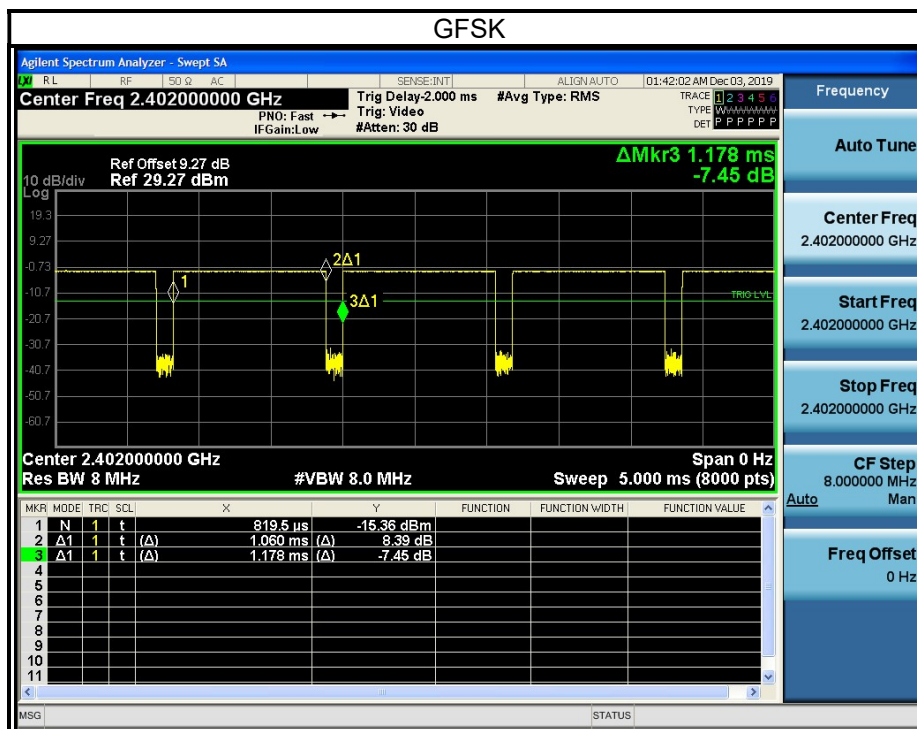
### DUTYCYCLE OF TEST SIGNAL

GFSK:

Duty cycle of test signal is 89.998 %, Duty cycle of test signal is <98%

Duty cycle =  $1.060 / 1.178 = 89.998 \%$ ,

Duty factor =  $10 * \log(1/0.89.998) = 0.458\text{dB}$



### 3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C, Section 15.247**

**558074 D01 15.247 Meas Guidance v05r02**

**ANSI C63.10-2013**

Note: All test items have been performed and recorded as per the above standards.

### 3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an dependent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| NO. | PRODUCT  | BRAND  | MODEL NO. | SERIAL NO. | FCC ID |
|-----|----------|--------|-----------|------------|--------|
| 1   | Notebook | LENOVO | Thinkpad  | KKA9196S   | N/A    |

| NO. | DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|----------------------------------------|
| 1   | N/A                                    |

## 4 TEST TYPES AND RESULTS

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dBμV) |          |
|-----------------------------|------------------------|----------|
|                             | Quasi-peak             | Average  |
| 0.15 ~ 0.5                  | 66 to 56               | 56 to 46 |
| 0.5 ~ 5                     | 56                     | 46       |
| 5 ~ 30                      | 60                     | 50       |

- NOTES:** 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

#### 4.1.2 TEST INSTRUMENTS

| Description & Manufacturer                | Model No.          | Serial No.   | Date of Calibration | Due Date of Calibration |
|-------------------------------------------|--------------------|--------------|---------------------|-------------------------|
| EMI Test Receiver<br>Rohde&Schwarz        | ESCI3              | 101418       | 2019-09-18          | 2020-09-17              |
| Artificial Mains Network<br>Rohde&Schwarz | ENV216             | 3560.6550.15 | 2019-10-18          | 2020-10-17              |
| Test software<br>FARAD                    | EZ EMC<br>V1.1.4.2 | N/A          | N/A                 | N/A                     |
| Hygrothermograph<br>Yuhuaize              | HTC-1              | NA           | 2019-10-18          | 2020-10-17              |
| Digital Multimeter<br>FLUKE               | 15B+               | 43512617WS   | 2019-10-18          | 2020-10-17              |

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.
2. The test was performed in Hwa-Hsing(Dongguan) Testing Co., Ltd.

#### 4.1.3 TEST PROCEDURES

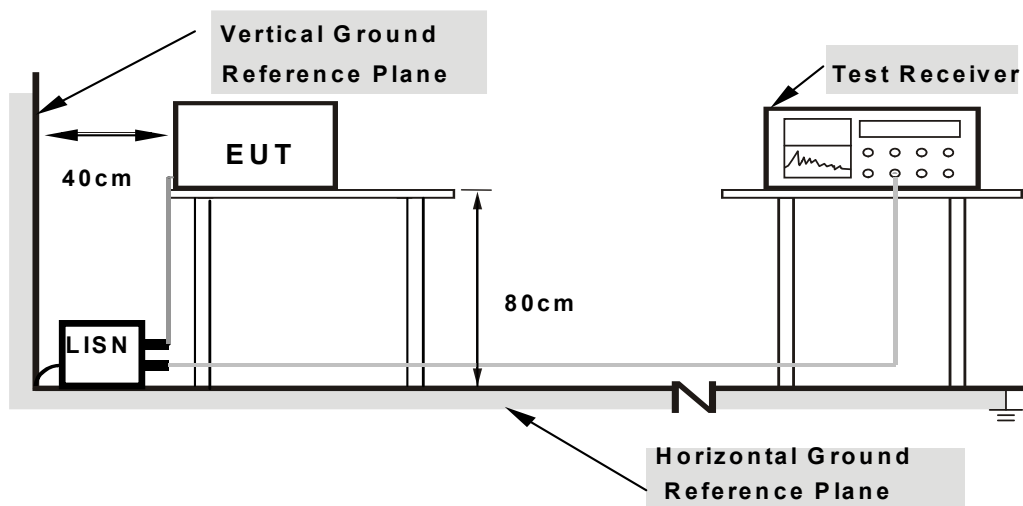
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30MHz was searched. Emission levels under Limit - 20dB was not recorded.

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.1.5 TEST SETUP



**Note: 1.**Support units were connected to second LISN.

**2.**Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).



Test Report No.: RF191119N021-FCC

#### 4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power and connected of all equipment.
- b. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

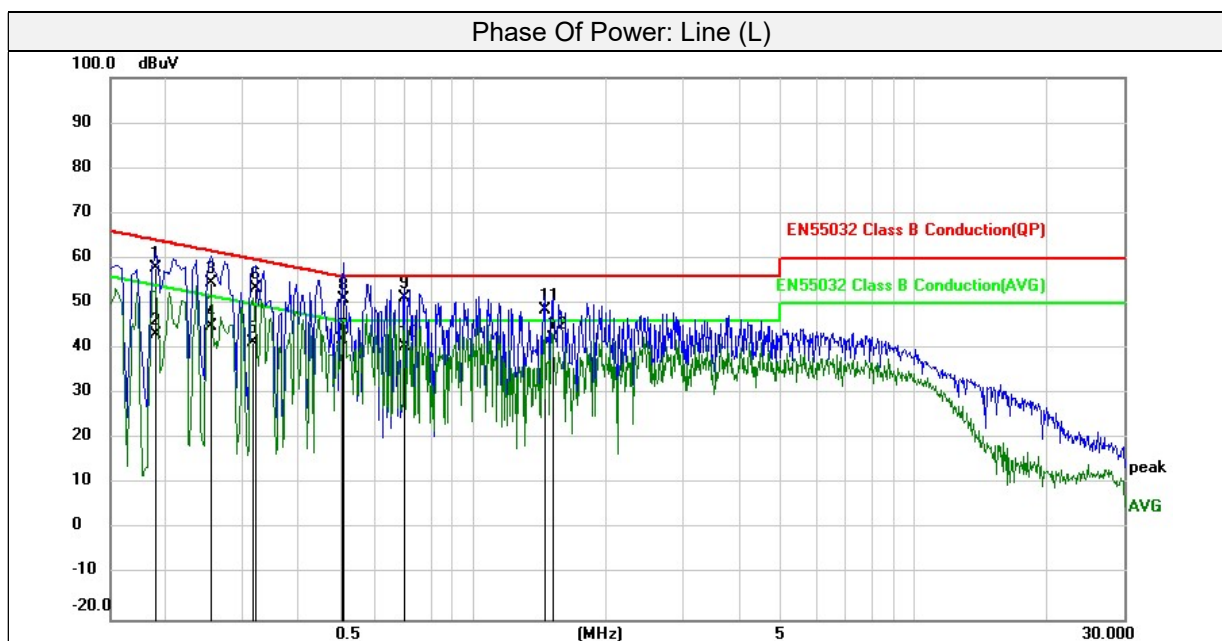


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#### 4.1.7 TEST RESULTS

|                 |                |                                          |                                      |
|-----------------|----------------|------------------------------------------|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
|-----------------|----------------|------------------------------------------|--------------------------------------|



| No | Frequency (MHz) | Reading (dBuV) | Correct Factor dB | Emission Level (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|----|-----------------|----------------|-------------------|-----------------------|--------------|-------------|--------|
| 1  | 0.1905          | 48.14          | 9.69              | 57.83                 | 64.01        | -6.18       | QP     |
| 2  | 0.1905          | 33.34          | 9.69              | 43.03                 | 54.01        | -10.98      | AVG    |
| 3  | 0.2535          | 44.78          | 9.70              | 54.48                 | 61.64        | -7.16       | QP     |
| 4  | 0.2535          | 35.21          | 9.70              | 44.91                 | 51.64        | -6.73       | AVG    |
| 5  | 0.3209          | 43.62          | 9.71              | 53.33                 | 59.68        | -6.35       | QP     |
| 6  | 0.3165          | 31.67          | 9.71              | 41.38                 | 49.80        | -8.42       | AVG    |
| 7  | 0.5100          | 41.19          | 9.72              | 50.91                 | 56.00        | -5.09       | QP     |
| 8  | 0.5055          | 32.31          | 9.72              | 42.03                 | 46.00        | -3.97       | AVG    |
| 9  | 0.6990          | 41.53          | 9.69              | 51.22                 | 56.00        | -4.78       | QP     |
| 10 | 0.6990          | 30.67          | 9.69              | 40.36                 | 46.00        | -5.64       | AVG    |
| 11 | 1.4550          | 38.81          | 9.64              | 48.45                 | 56.00        | -7.55       | QP     |
| 12 | 1.5045          | 32.72          | 9.65              | 42.37                 | 46.00        | -3.63       | AVG    |

#### REMARKS:

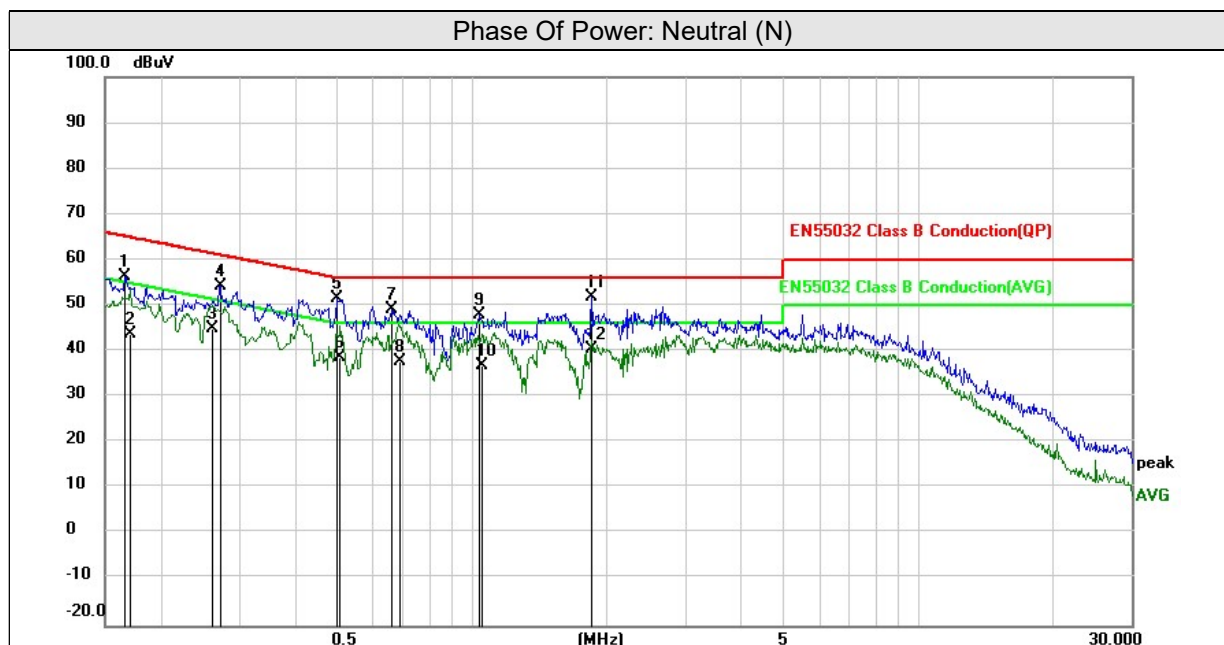
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

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|                 |                |                                          |                                      |
|-----------------|----------------|------------------------------------------|--------------------------------------|
| Frequency Range | 150kHz ~ 30MHz | Detector Function & Resolution bandwidth | Quasi-Peak (QP) / Average (AV), 9kHz |
|-----------------|----------------|------------------------------------------|--------------------------------------|



| No | Frequency (MHz) | Reading (dBuV) | Correct Factor dB | Emission Level (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|----|-----------------|----------------|-------------------|-----------------------|--------------|-------------|--------|
| 1  | 0.1659          | 46.62          | 9.70              | 56.32                 | 65.16        | -8.84       | QP     |
| 2  | 0.1703          | 33.92          | 9.70              | 43.62                 | 54.95        | -11.33      | AVG    |
| 3  | 0.2714          | 44.50          | 9.70              | 54.20                 | 61.07        | -6.87       | QP     |
| 4  | 0.2625          | 35.30          | 9.70              | 45.00                 | 51.35        | -6.35       | AVG    |
| 5  | 0.4967          | 41.75          | 9.72              | 51.47                 | 56.06        | -4.59       | QP     |
| 6  | 0.5055          | 28.94          | 9.72              | 38.66                 | 46.00        | -7.34       | AVG    |
| 7  | 0.6585          | 39.44          | 9.70              | 49.14                 | 56.00        | -6.86       | QP     |
| 8  | 0.6855          | 28.09          | 9.69              | 37.78                 | 46.00        | -8.22       | AVG    |
| 9  | 1.0365          | 38.30          | 9.63              | 47.93                 | 56.00        | -8.07       | QP     |
| 10 | 1.0500          | 27.17          | 9.63              | 36.80                 | 46.00        | -9.20       | AVG    |
| 11 | 1.8510          | 42.25          | 9.66              | 51.91                 | 56.00        | -4.09       | QP     |
| 12 | 1.8510          | 30.69          | 9.66              | 40.35                 | 46.00        | -5.65       | AVG    |

**REMARKS:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

## 4.2 RADIATED EMISSION MEASUREMENT

### 4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

| FREQUENCIES<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                                |

#### NOTES:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

#### 4.2.2 TEST INSTRUMENTS

| Description & Manufacturer                       | Model No.  | Serial No.     | Date of Calibration | Due Date of Calibration |
|--------------------------------------------------|------------|----------------|---------------------|-------------------------|
| EMI Test Receiver<br>Rohde&Schwarz               | ESCI 7     | 100962         | 2019-7-16           | 2020-7-15               |
| Broadband antenna<br>Schwarzbeck                 | VULB 9168  | 00937          | 2019-10-18          | 2020-10-17              |
| 3m Semi-anechoic<br>Chamber<br>MAORUI            | 9m*6m*6m   | NSEMC003       | 2018-10-20          | 2020-10-19              |
| Signal Amplifier<br>Com-power                    | PAM-103    | 18020051       | 2019-10-18          | 2020-10-17              |
| Attenuator<br>Rohde&Schwarz                      | TS2GA-6dB  | 18101101       | N/A                 | N/A                     |
| Test software<br>FARAD                           | FARAD      | EZ_EMCV1.1.4.2 | N/A                 | N/A                     |
| Fixed Attenuator<br>Mini-Circuits                | MDCS18N-10 | MDCS18N-10-01  | 2019-10-18          | 2020-10-17              |
| Loop Antenna                                     | HLA 6121   | 45745          | 2019-10-18          | 2020-10-17              |
| Preamplifier<br>EMCI                             | EMC001340  | 980201         | 2019-10-18          | 2020-10-17              |
| Digital Multimeter<br>FLUKE                      | 15B+       | 43512617WS     | 2019-10-18          | 2020-10-17              |
| Horn Antenna<br>Schwarzbeck                      | BBHA 9170  | 01959          | 2019-10-18          | 2020-10-17              |
| Spectrum Analyzer<br>Rohde&Schwarz               | FSV-40N    | 101783         | 2019-10-18          | 2020-10-17              |
| Broadband Coaxial<br>Preamplifier<br>Schwarzbeck | BBV 9718   | 00025          | 2019-10-18          | 2020-10-17              |
| Horn Antenna<br>Schwarzbeck                      | BBHA 9170  | BBHA9170242    | 2019-05-05          | 2020-05-04              |
| Pre-Amplifier<br>EMCI                            | EMC 184045 | 980102         | 2019-10-18          | 2020-10-17              |
| Spectrum<br>Keysight                             | N9020A     | MY51240612     | 2019-10-18          | 2020-10-17              |
| Antenna Tower<br>MF                              | MFA-440H   | NA             | NA                  | NA                      |
| Turn Table<br>MF                                 | MFT-201SS  | NA             | NA                  | NA                      |
| Antenna Tower&Turn<br>Table Controller<br>MF     | MF-7802    | NA             | NA                  | NA                      |

Note: 3. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.

4. The test was performed in Hwa-Hsing (Dongguan) Testing Co., Ltd.

#### 4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
- g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

#### NOTES:

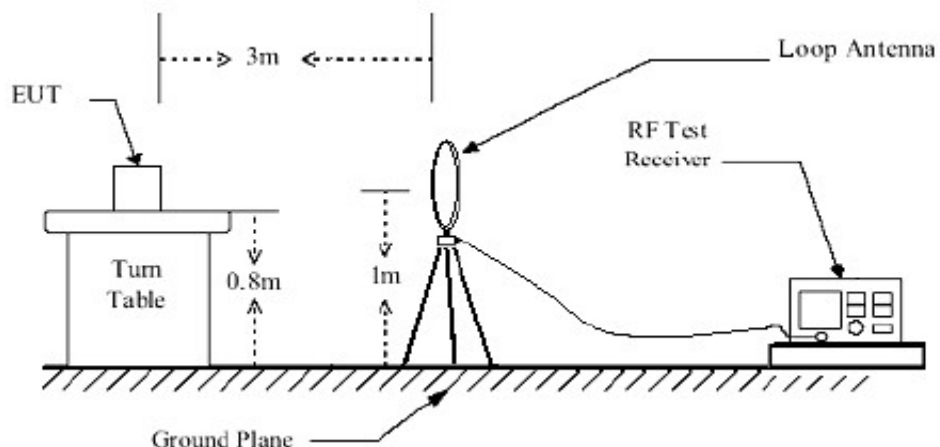
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz(Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

#### 4.2.4 DEVIATION FROM TEST STANDARD

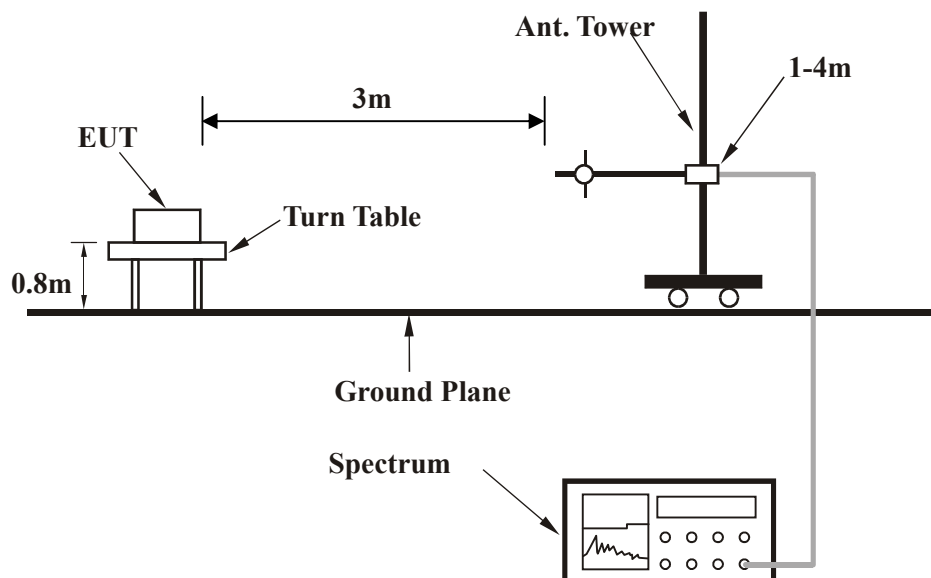
No deviation.

#### 4.2.5 TEST SETUP

##### Below 30MHz test setup

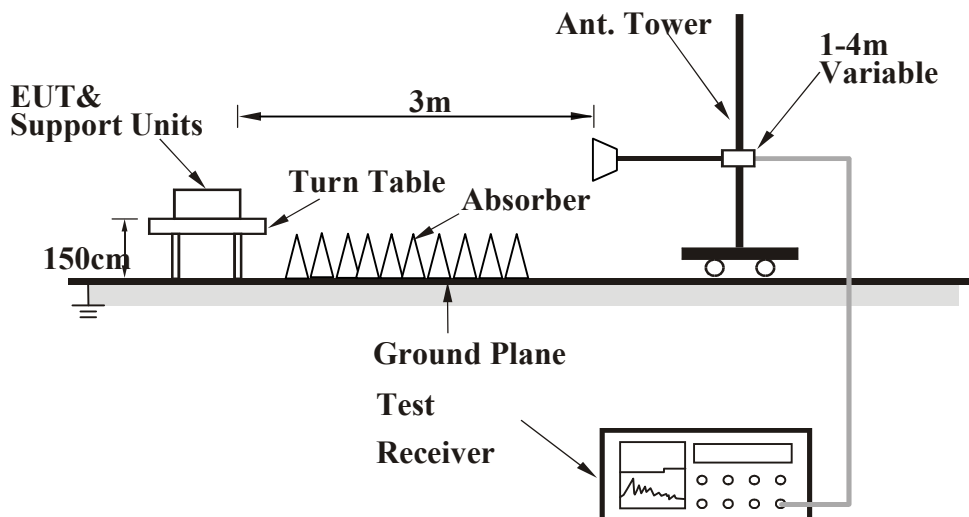


##### Below 1GHz test setup



**Note:** For the actual test configuration, please refer to the attached file (Test Setup Photo).

### Above 1GHz test setup



**Note:** For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.2.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.



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VERITAS**

Test Report No.: RF191119N021-FCC

## 4.2.7 TEST RESULTS

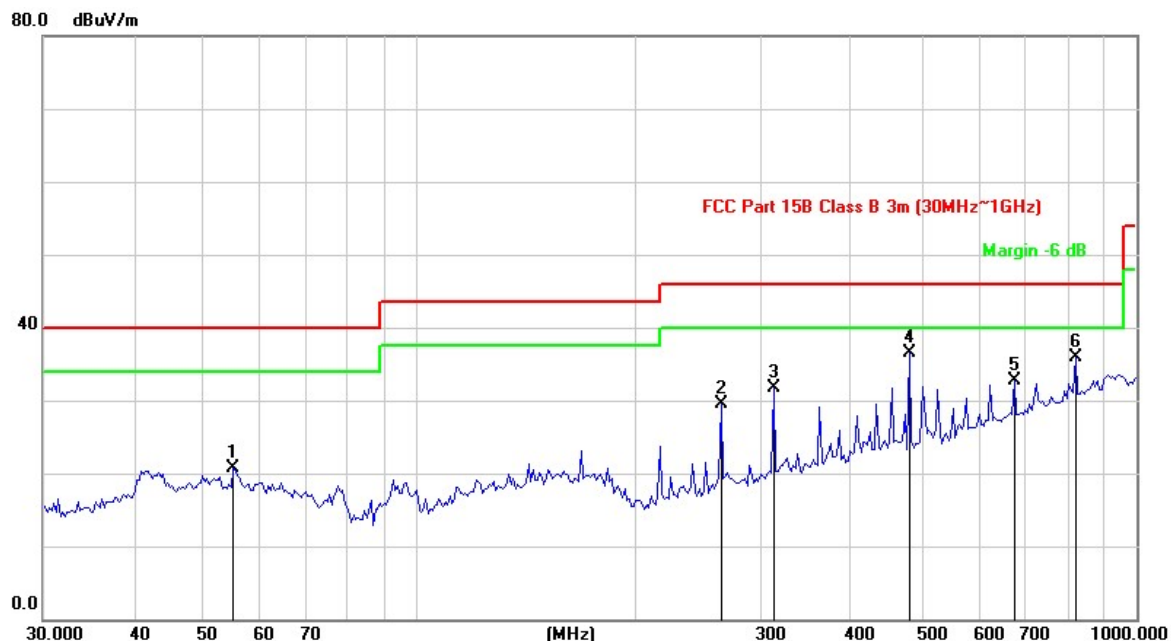
### BELOW 1GHz DATA:

|                        |               |                              |                 |
|------------------------|---------------|------------------------------|-----------------|
| <b>CHANNEL</b>         | TX Channel 39 | <b>DETECTOR<br/>FUNCTION</b> | Quasi-Peak (QP) |
| <b>FREQUENCY RANGE</b> | 9KHz ~ 1GHz   |                              |                 |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                        |                                |                               |                   |                |      |                          |                            |
|-----------------------------------------------------|----------------|------------------------|--------------------------------|-------------------------------|-------------------|----------------|------|--------------------------|----------------------------|
| NO.                                                 | FREQ.<br>(MHz) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | Det. | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) |
| 1                                                   | 55.2207        | 34.97                  | -14.35                         | 20.62                         | 40.00             | -19.38         | QP   | 175                      | 162                        |
| 2                                                   | 263.8190       | 43.40                  | -13.90                         | 29.50                         | 46.00             | -16.50         | QP   | 200                      | 288                        |
| 3                                                   | 312.1794       | 44.29                  | -12.60                         | 31.69                         | 46.00             | -14.31         | QP   | 163                      | 214                        |
| 4                                                   | 482.2156       | 44.71                  | -8.21                          | 36.50                         | 46.00             | -9.50          | QP   | 187                      | 156                        |
| 5                                                   | 675.2080       | 36.20                  | -3.51                          | 32.69                         | 46.00             | -13.31         | QP   | 152                      | 234                        |
| 6                                                   | 821.7103       | 36.12                  | -0.29                          | 35.83                         | 46.00             | -10.17         | QP   | 200                      | 101                        |

### REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.



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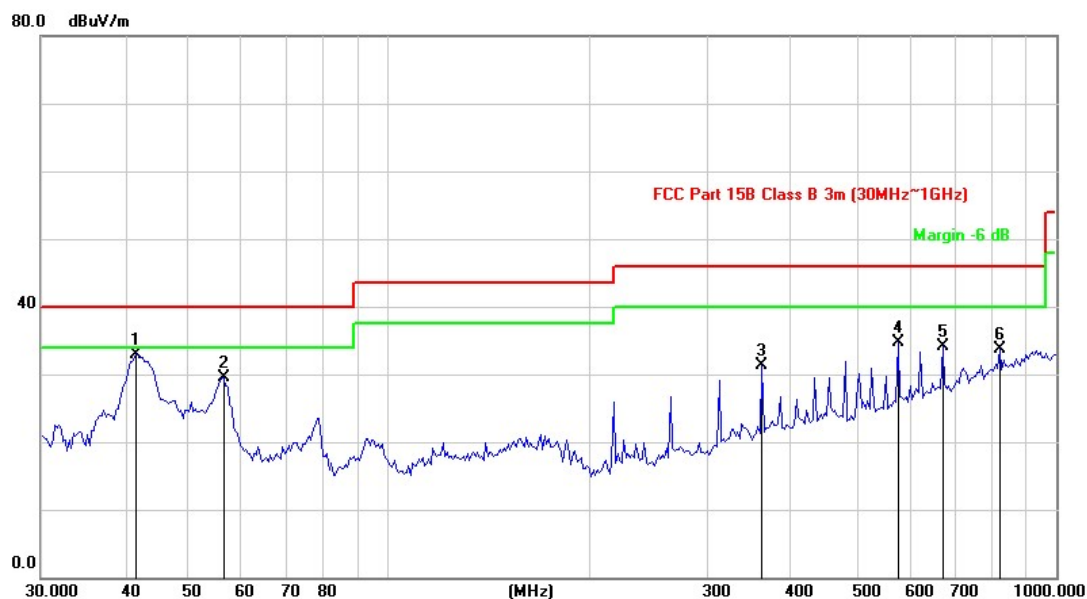
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|                        |               |                          |                 |
|------------------------|---------------|--------------------------|-----------------|
| <b>CHANNEL</b>         | TX Channel 39 | <b>DETECTOR FUNCTION</b> | Quasi-Peak (QP) |
| <b>FREQUENCY RANGE</b> | 9KHz ~ 1GHz   |                          |                 |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |             |                  |                          |                         |                |             |      |                    |                      |
|---------------------------------------------------|-------------|------------------|--------------------------|-------------------------|----------------|-------------|------|--------------------|----------------------|
| NO.                                               | FREQ. (MHz) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | Det. | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) |
| 1                                                 | 41.7129     | 47.99            | -15.07                   | 32.92                   | 40.00          | -7.08       | QP   | 100                | 251                  |
| 2                                                 | 56.3948     | 43.84            | -14.34                   | 29.50                   | 40.00          | -10.50      | QP   | 110                | 274                  |
| 3                                                 | 361.7139    | 42.05            | -10.71                   | 31.34                   | 46.00          | -14.66      | QP   | 100                | 169                  |
| 4                                                 | 578.6699    | 40.32            | -5.66                    | 34.66                   | 46.00          | -11.34      | QP   | 105                | 147                  |
| 5                                                 | 675.2080    | 37.67            | -3.51                    | 34.16                   | 46.00          | -11.84      | QP   | 102                | 101                  |
| 6                                                 | 821.7103    | 34.02            | -0.29                    | 33.73                   | 46.00          | -12.27      | QP   | 124                | 248                  |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.



**ABOVE 1GHz TEST DATA:**

|                        |              |                              |              |
|------------------------|--------------|------------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 0 | <b>DETECTOR<br/>FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 1GHz ~ 25GHz |                              | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                        |                                |                               |                   |                |      |                          |                            |
|-----------------------------------------------------|----------------|------------------------|--------------------------------|-------------------------------|-------------------|----------------|------|--------------------------|----------------------------|
| NO.                                                 | FREQ.<br>(MHz) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | Det. | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) |
| 1                                                   | 2390.000       | 49.70                  | -0.83                          | 48.87                         | 74.00             | -25.13         | peak | 177                      | 284                        |
| 2                                                   | 2390.000       | 19.60                  | -0.83                          | 18.77                         | 54.00             | -35.23         | AVG  | 177                      | 284                        |
| 3*                                                  | 2402.000       | 92.58                  | -0.75                          | 91.83                         |                   |                | peak | 177                      | 284                        |
| 4*                                                  | 2402.000       | 85.48                  | -0.75                          | 84.73                         |                   |                | AVG  | 177                      | 284                        |
| 5                                                   | 4803.441       | 62.96                  | 5.35                           | 68.31                         | 74.00             | -5.69          | peak | 150                      | 279                        |
| 6                                                   | 4803.441       | 32.86                  | 5.35                           | 38.21                         | 54.00             | -15.79         | AVG  | 150                      | 279                        |
| 7                                                   | 7206.000       | 51.55                  | 11.75                          | 63.30                         | 74.00             | -10.70         | peak | 117                      | 236                        |
| 8                                                   | 7206.000       | 21.45                  | 11.75                          | 33.20                         | 54.00             | -20.80         | AVG  | 117                      | 236                        |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                        |                                |                               |                   |                |      |                          |                            |
| NO.                                                 | FREQ.<br>(MHz) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | Det. | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) |
| 1                                                   | 2390.000       | 42.04                  | -0.83                          | 41.21                         | 74.00             | -32.79         | peak | 125                      | 176                        |
| 2                                                   | 2390.000       | 21.94                  | -0.83                          | 21.11                         | 54.00             | -32.89         | AVG  | 125                      | 176                        |
| 3*                                                  | 2402.000       | 93.84                  | -0.75                          | 93.09                         |                   |                | peak | 125                      | 176                        |
| 4*                                                  | 2402.000       | 83.74                  | -0.75                          | 82.99                         |                   |                | AVG  | 125                      | 176                        |
| 5                                                   | 4804.000       | 51.56                  | 5.36                           | 56.92                         | 74.00             | -17.08         | peak | 179                      | 235                        |
| 6                                                   | 4804.000       | 21.46                  | 5.36                           | 26.82                         | 54.00             | -27.18         | AVG  | 179                      | 235                        |
| 7                                                   | 7206.000       | 36.10                  | 11.75                          | 47.85                         | 74.00             | -26.15         | peak | 100                      | 145                        |
| 8                                                   | 7206.000       | 6.00                   | 11.75                          | 17.75                         | 54.00             | -36.25         | AVG  | 100                      | 145                        |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " \* ": Fundamental frequency.

|                        |               |                              |              |
|------------------------|---------------|------------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 19 | <b>DETECTOR<br/>FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 1GHz ~ 25GHz  |                              | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                        |                                |                               |                   |                |      |                          |                            |
|-----------------------------------------------------|----------------|------------------------|--------------------------------|-------------------------------|-------------------|----------------|------|--------------------------|----------------------------|
| NO.                                                 | FREQ.<br>(MHz) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | Det. | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) |
| 1*                                                  | 2440.00        | 93.83                  | -0.64                          | 93.19                         |                   |                | peak | 177                      | 282                        |
| 2*                                                  | 2440.00        | 83.73                  | -0.64                          | 83.09                         |                   |                | AVG  | 177                      | 282                        |
| 3                                                   | 4880.519       | 64.54                  | 6.24                           | 70.78                         | 74.00             | -3.22          | peak | 133                      | 286                        |
| 4                                                   | 4880.519       | 34.44                  | 6.24                           | 40.68                         | 54.00             | -13.32         | AVG  | 133                      | 286                        |
| 5                                                   | 7320.579       | 47.90                  | 12.13                          | 60.03                         | 74.00             | -13.97         | peak | 143                      | 261                        |
| 6                                                   | 7320.579       | 17.80                  | 12.13                          | 29.93                         | 54.00             | -24.07         | AVG  | 143                      | 261                        |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                        |                                |                               |                   |                |      |                          |                            |
| NO.                                                 | FREQ.<br>(MHz) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | Det. | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) |
| 1*                                                  | 2440.00        | 96.91                  | -0.64                          | 96.27                         |                   |                | peak | 126                      | 328                        |
| 2*                                                  | 2440.00        | 89.81                  | -0.64                          | 89.17                         |                   |                | AVG  | 126                      | 328                        |
| 3                                                   | 4880.300       | 53.37                  | 6.24                           | 59.61                         | 74.00             | -14.39         | peak | 100                      | 239                        |
| 4                                                   | 4880.300       | 23.27                  | 6.24                           | 29.51                         | 54.00             | -24.49         | AVG  | 100                      | 239                        |
| 5                                                   | 7319.301       | 47.44                  | 12.13                          | 59.57                         | 74.00             | -14.43         | peak | 100                      | 280                        |
| 6                                                   | 7319.301       | 17.34                  | 12.13                          | 29.47                         | 54.00             | -24.53         | AVG  | 100                      | 280                        |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " \* ": Fundamental frequency.

|                        |               |                              |              |
|------------------------|---------------|------------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 39 | <b>DETECTOR<br/>FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 1GHz ~ 25GHz  |                              | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                        |                                |                               |                   |                |      |                          |                            |
|-----------------------------------------------------|----------------|------------------------|--------------------------------|-------------------------------|-------------------|----------------|------|--------------------------|----------------------------|
| NO.                                                 | FREQ.<br>(MHz) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | Det. | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) |
| 1*                                                  | 2480.000       | 92.84                  | -0.52                          | 92.32                         |                   |                | peak | 185                      | 153                        |
| 2*                                                  | 2480.000       | 79.75                  | -0.52                          | 79.23                         |                   |                | AVG  | 185                      | 153                        |
| 3                                                   | 2483.500       | 60.18                  | -0.51                          | 59.67                         | 74.00             | -14.33         | peak | 185                      | 153                        |
| 4                                                   | 2483.500       | 30.08                  | -0.51                          | 29.57                         | 54.00             | -24.43         | AVG  | 185                      | 153                        |
| 5                                                   | 4960.000       | 56.54                  | 6.09                           | 62.63                         | 74.00             | -11.37         | peak | 114                      | 172                        |
| 6                                                   | 4960.000       | 26.44                  | 6.09                           | 32.53                         | 54.00             | -21.47         | AVG  | 114                      | 172                        |
| 7                                                   | 7440.000       | 47.61                  | 12.53                          | 60.14                         | 74.00             | -13.86         | peak | 156                      | 268                        |
| 8                                                   | 7440.000       | 17.51                  | 12.53                          | 30.04                         | 54.00             | -23.96         | AVG  | 156                      | 268                        |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                        |                                |                               |                   |                |      |                          |                            |
| NO.                                                 | FREQ.<br>(MHz) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | Det. | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) |
| 1*                                                  | 2479.580       | 92.38                  | -0.53                          | 91.85                         |                   |                | peak | 100                      | 279                        |
| 2*                                                  | 2479.580       | 82.28                  | -0.53                          | 81.75                         |                   |                | AVG  | 100                      | 279                        |
| 3                                                   | 2483.500       | 66.93                  | -0.48                          | 66.45                         | 74.00             | -7.55          | peak | 100                      | 279                        |
| 4                                                   | 2483.500       | 36.83                  | -0.48                          | 36.35                         | 54.00             | -17.65         | AVG  | 100                      | 279                        |
| 5                                                   | 4960.400       | 56.11                  | 6.09                           | 62.20                         | 74.00             | -11.80         | peak | 163                      | 275                        |
| 6                                                   | 4960.400       | 26.01                  | 6.09                           | 32.10                         | 54.00             | -21.90         | AVG  | 163                      | 275                        |
| 7                                                   | 7439.301       | 46.80                  | 12.53                          | 59.33                         | 74.00             | -14.67         | peak | 100                      | 279                        |
| 8                                                   | 7439.301       | 16.70                  | 12.53                          | 29.23                         | 54.00             | -24.77         | AVG  | 100                      | 279                        |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " \* ": Fundamental frequency.

## 4.3 6DB BANDWIDTH MEASUREMENT

### 4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

### 4.3.2 TEST INSTRUMENTS

| Description & Manufacturer      | Model No. | Serial No. | Date of Calibration | Due Date of Calibration |
|---------------------------------|-----------|------------|---------------------|-------------------------|
| Spectrum Keysight               | N9020A    | MY51240612 | 2018/10/29          | 2019/10/28              |
| Spectrum Analyzer Rohde&Schwarz | FSV-40N   | 101783     | 2018/12/11          | 2019/12/10              |
| Power Meter10Hz~18GHz Tonscend  | JS0806-2  | 188060126  | 2018-11-10          | 2019-11-09              |
| Signal generator Keysight       | N5182A    | GB40051020 | 2018/10/29          | 2019/10/28              |
| Signal generator Keysight       | N5182A    | MY47420944 | 2018/10/29          | 2019/10/28              |
| Test Software Tonscend          | JS0806-2  | NA         | NA                  | NA                      |
| Hygrothermograph Yuhuaze        | HTC-1     | NA         | 2018/10/30          | 2019/10/29              |

#### NOTES:

1. The test was performed in RF Oven room in Hwa-Hsing(Dongguan) Testing Co., Ltd..
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

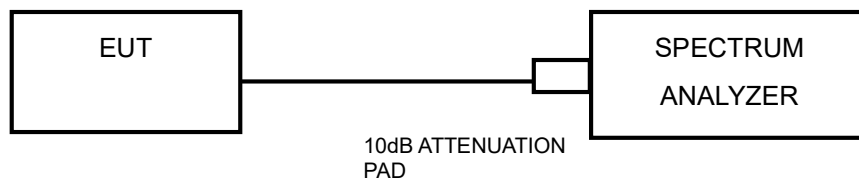
#### 4.3.3 TEST PROCEDURE

- 1) Set RBW = 100 kHz.
- 2).Set the video bandwidth (VBW)  $\geq 3$  RBW.
- 3). Detector = Peak.
- 4).Trace mode = max hold.
- 5).Sweep = auto couple.
- 6).Allow the trace to stabilize.
- 7).Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.3.5 TEST SETUP



#### 4.3.6 EUT OPERATING CONDITIONS

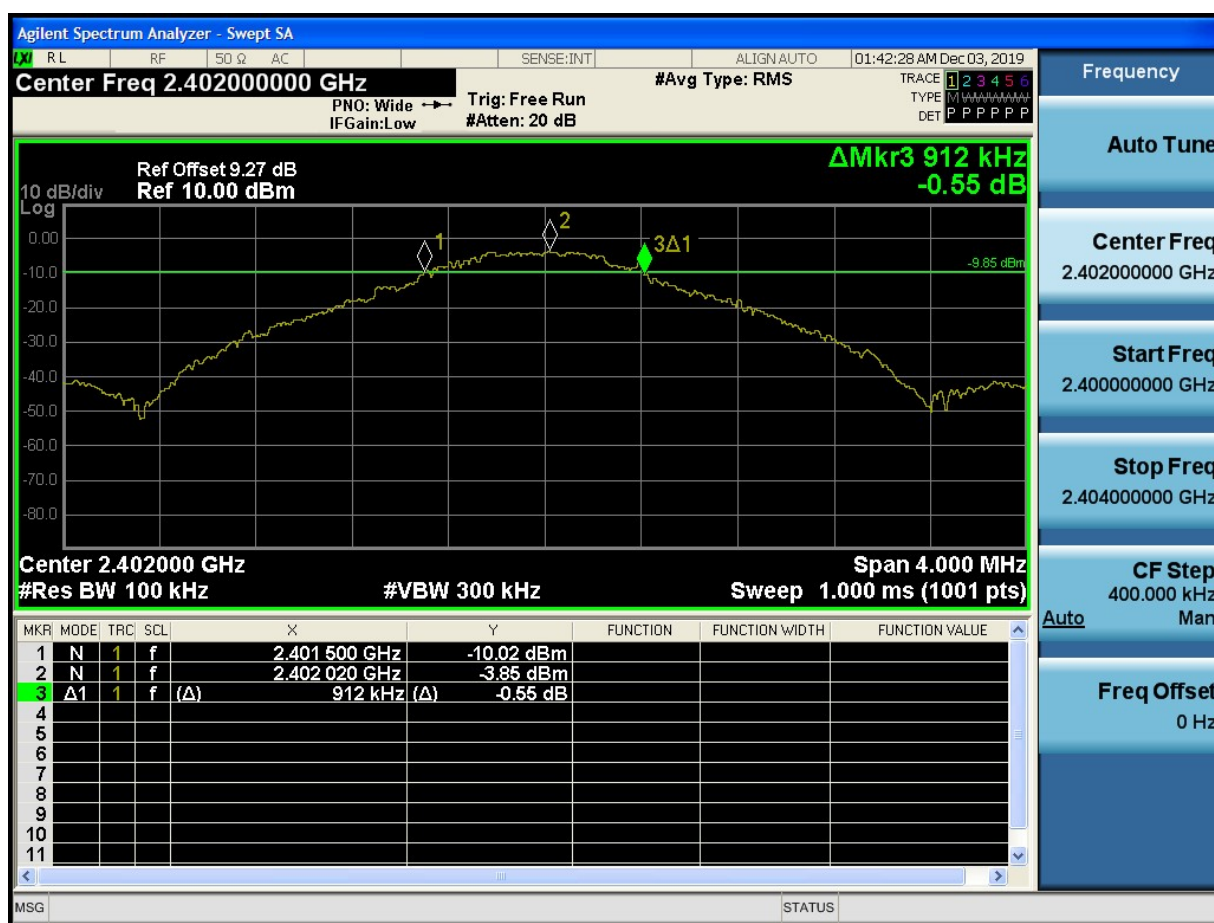
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.3.7 TEST RESULTS

##### BT-LE (GFSK) (1 Mbps)

| CHANNEL | CHANNEL<br>FREQUENCY<br>(MHz) | 6dB<br>BANDWIDTH<br>(MHz) | MINIMUM LIMIT<br>(MHz) | PASS / FAIL |
|---------|-------------------------------|---------------------------|------------------------|-------------|
| 0       | 2402                          | 0.912                     | 0.5                    | PASS        |
| 19      | 2440                          | 0.864                     | 0.5                    | PASS        |
| 39      | 2480                          | 0.824                     | 0.5                    | PASS        |

##### WORSE PLOT

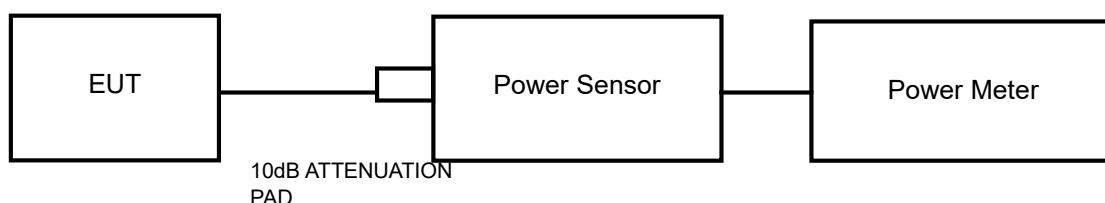


## 4.4 CONDUCTED OUTPUT POWER

### 4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm)

### 4.4.2 TEST SETUP



### 4.4.3 TEST INSTRUMENTS

| Description & Manufacturer      | Model No. | Serial No. | Date of Calibration | Due Date of Calibration |
|---------------------------------|-----------|------------|---------------------|-------------------------|
| Spectrum Keysight               | N9020A    | MY51240612 | 2019/10/18          | 2020/10/17              |
| Spectrum Analyzer Rohde&Schwarz | FSV-40N   | 101783     | 2019/10/18          | 2020/10/17              |
| Power Meter 10Hz~18GHz Tonscend | JS0806-2  | 188060126  | 2019/10/18          | 2020/10/17              |
| Signal generator Keysight       | N5182A    | GB40051020 | 2019/10/18          | 2020/10/17              |
| Signal generator Keysight       | N5182A    | MY47420944 | 2019/10/18          | 2020/10/17              |
| Test Software Tonscend          | JS0806-2  | NA         | NA                  | NA                      |
| Hygrothermograph Yuhuaze        | HTC-1     | NA         | 2019/10/18          | 2020/10/17              |

#### NOTES:

1. The test was performed in RF Oven room in Hwa-Hsing(Dongguan) Testing Co., Ltd..
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

#### 4.4.4 TEST PROCEDURES

A peak sensor was used on the output port of the EUT. A peak power meter was used to read the response of the peak power sensor. Record the peak power level.

#### 4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.4.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.4.7 TEST RESULTS

##### 4.4.7.1 MAXIMUM AVERAGE OUTPUT POWER

###### BT-LE (GFSK) (1 Mbps)

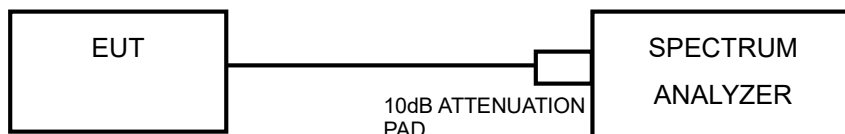
| CHANNEL | CHANNEL<br>FREQUENCY<br>(MHz) | AVG<br>POWER<br>(dBm) | AVG<br>POWER<br>(mW) | AVG<br>POWER LIMIT<br>(W) | PASS/FAIL |
|---------|-------------------------------|-----------------------|----------------------|---------------------------|-----------|
| 0       | 2402                          | -2.35                 | 0.582                | 1                         | PASS      |
| 19      | 2440                          | -2.62                 | 0.547                | 1                         | PASS      |
| 39      | 2480                          | -2.45                 | 0.569                | 1                         | PASS      |

## 4.5 POWER SPECTRAL DENSITY MEASUREMENT

### 4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm/3KHz.

### 4.5.2 TEST SETUP



### 4.5.3 TEST INSTRUMENTS

Refer to section 4.4.3 to get information of above instrument.

### 4.5.4 TEST PROCEDURE

1. Set the span to 1.5 times the DTS bandwidth
2. Set the RBW = 3 kHz, VBW  $\geq 3 \times$  RBW, Detector = peak.
3. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

### 4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

### 4.5.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.5.7 TEST RESULTS

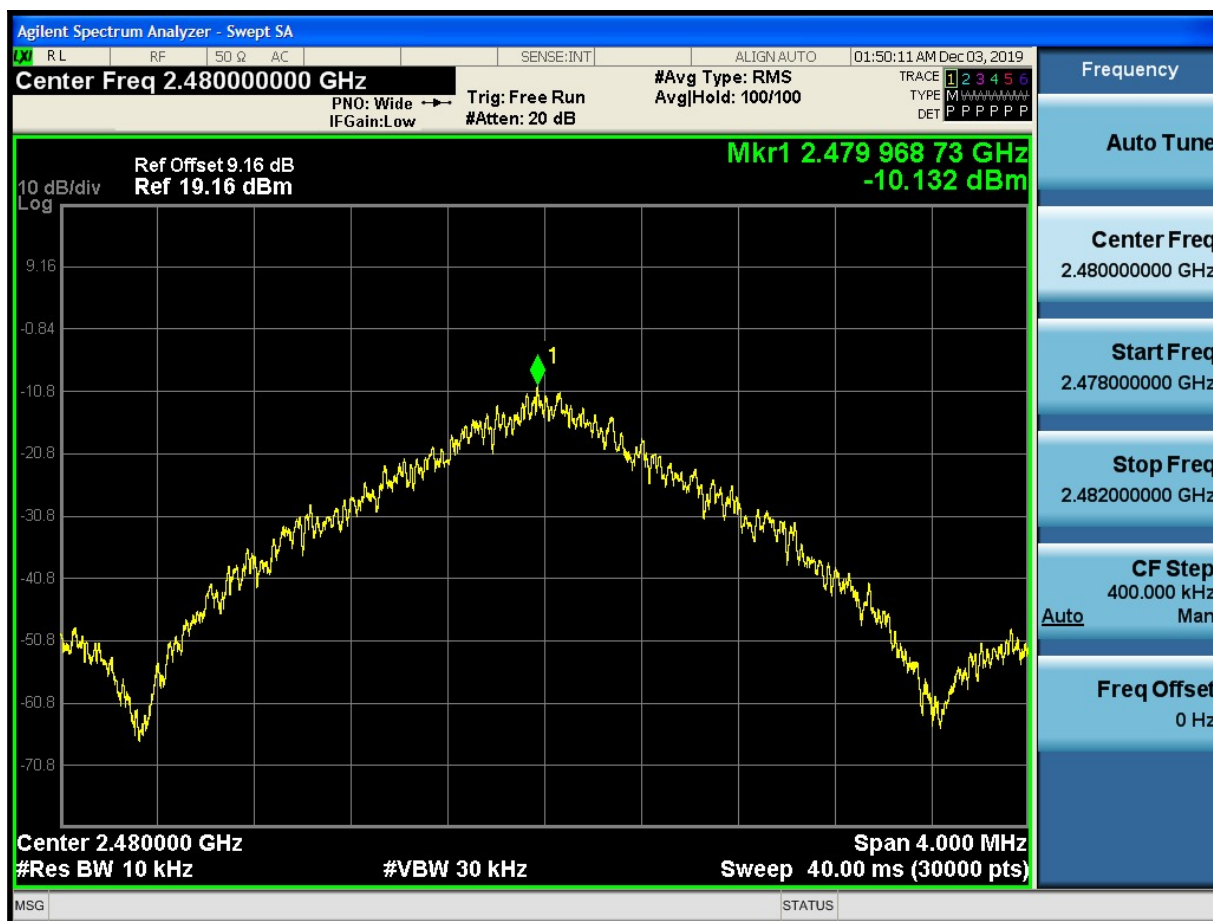
##### BT-LE (GFSK) (1 Mbps)

| Channel | FREQ.<br>(MHz) | PSD<br>(dBm/10kHz) | PSD<br>(dBm/3kHz) | Limit<br>(dBm/3kHz) | PASS<br>/FAIL |
|---------|----------------|--------------------|-------------------|---------------------|---------------|
| 0       | 2402           | -11.099            | -16.33            | 8                   | PASS          |
| 19      | 2440           | -11.300            | -16.53            | 8                   | PASS          |
| 39      | 2480           | -10.132            | -15.36            | 8                   | PASS          |

PSD(dBm/10kHz) conversion PSD(dBm/3kHz) factor= $10 \cdot \log(10/3)=5.22\text{dB}$

PSD(dBm/3kHz)=PSD(dBm/10kHz)+5.22dB

##### WORSE PLOT

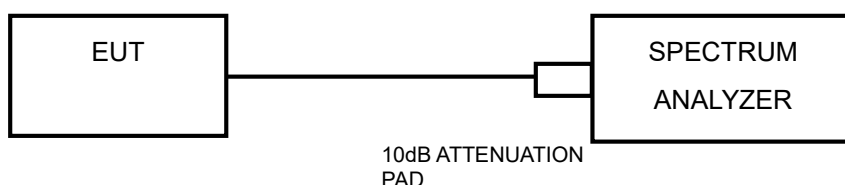


## 4.6 OUT OF BAND EMISSION MEASUREMENT

### 4.6.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

Below  $-30\text{dB}$  of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.6.2 TEST SETUP



### 4.6.3 TEST INSTRUMENTS

Refer to section 4.4.3 to get information of above instrument.

### 4.6.4 TEST PROCEDURE

#### MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

## MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW  $\geq$  300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

### 4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

### 4.6.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



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Test Report No.: RF191119N021-FCC

## 4.6.7 TEST RESULTS

### BT-LE (GFSK) (1 Mbps)

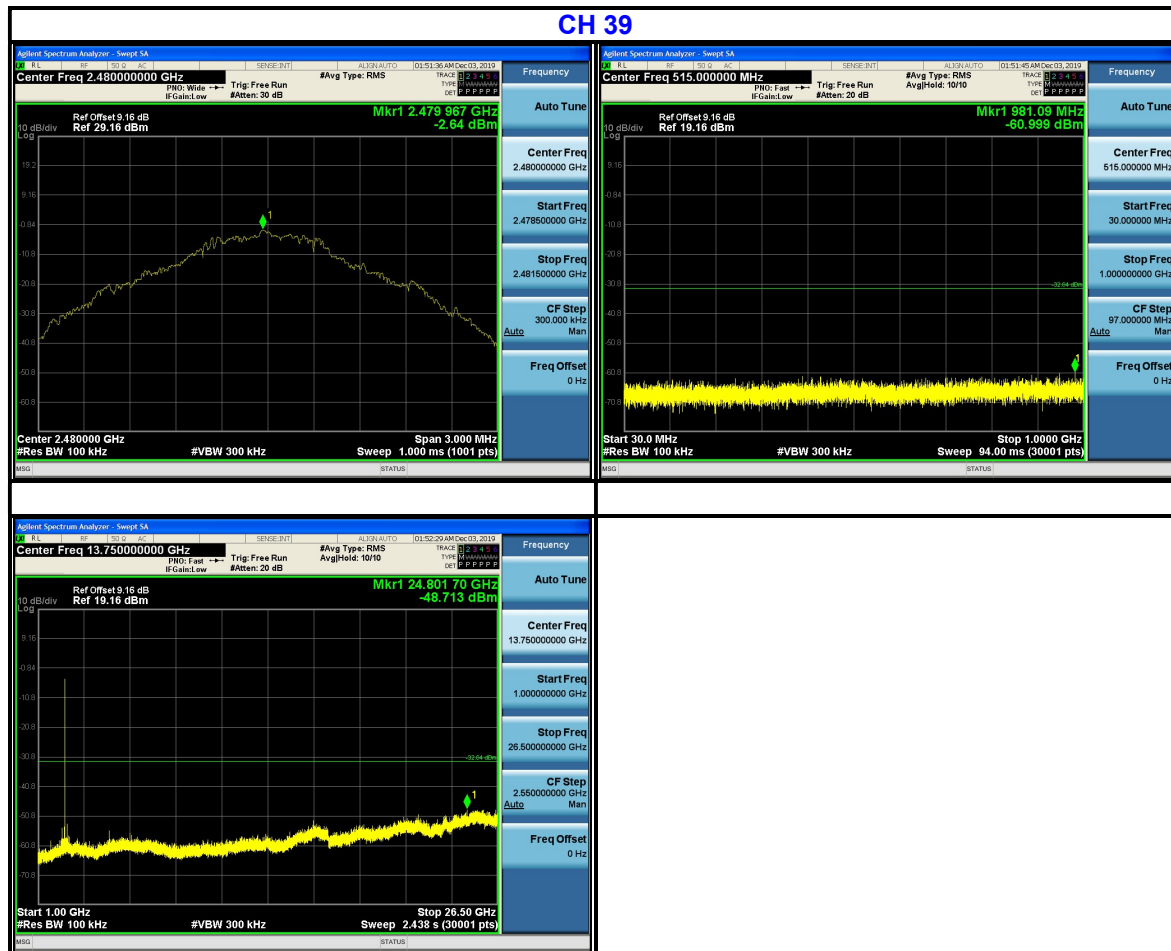


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Dongguan Branch

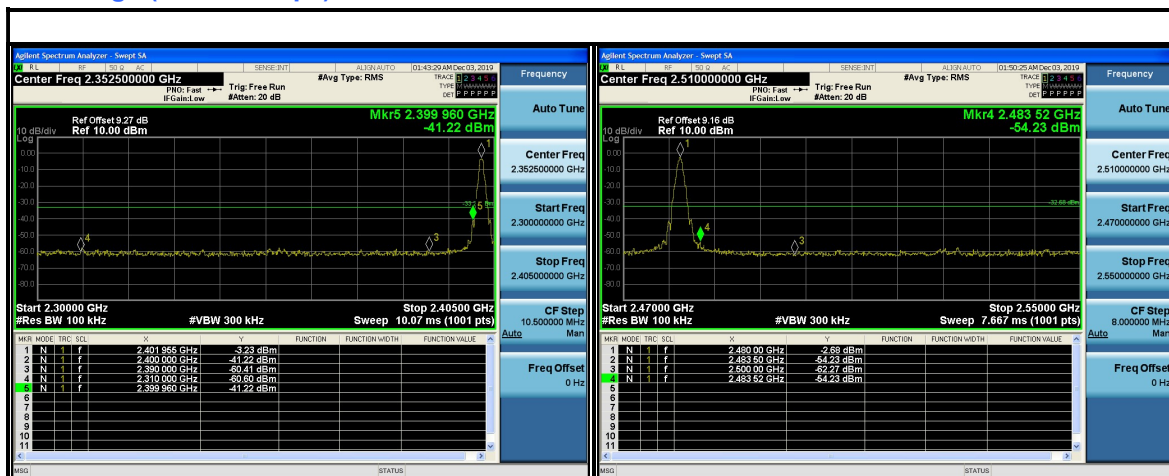
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Fax: +86 769 8593 1080  
Email: [customerservice.dg@cn.bureauveritas.com](mailto:customerservice.dg@cn.bureauveritas.com)

## BT-LE (GFSK) (1 Mbps)



## Band Edge (GFSK 1Mbps):





Test Report No.: RF191119N021-FCC

## 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



Test Report No.: RF191119N021-FCC

## 6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---