



# Shenzhen HTT Technology Co., Ltd.

## FCC PART 15 SUBPART C TEST REPORT

### FCC PART 15.231

Report Reference No.....: HTT202210146F02

FCC ID.....: 2A884-RMRF10TP

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Date of issue.....: Nov.03,2022

Testing Laboratory Name .....: Shenzhen HTT Technology Co.,Ltd.

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District, Shenzhen, Guangdong, China

Applicant's name .....: Nanjing Ningyuan Intelligent Instrument Co., Ltd

Address .....: Building 6, Jima Industrial Park, No. 669 Jiangjun Avenue,  
Jiangning District, Nanjing

Test specification .....

Standard .....: FCC Part 15.231

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Test item description .....: LORA RF module

Trade Mark .....: N/A

Manufacturer .....: Nanjing Ningyuan Intelligent Instrument Co., Ltd

Model/Type reference.....: RM-RF10TP-1278(PI)

Listed Models .....: RM-RF10TP-1278(N), RM-RF10TP-1278(E),  
RM-RF10TP-1278(C)

Ratings .....: DC 5.0V

Modulation .....: Hybrid system

Frequency.....: 433.062866-509.937866MHz

Result.....: PASS

TEST REPORT

Equipment under Test : LORA RF module

Model /Type : RM-RF10TP-1278(PI)

Listed Models : RM-RF10TP-1278(N), RM-RF10TP-1278(E),  
RM-RF10TP-1278(C)

Model Declaration : PCB board, structure and internal of these model(s) are the same,  
So no additional models were tested.

**Applicant** : **Nanjing Ningyuan Intelligent Instrument Co., Ltd**

Address : Building 6, Jima Industrial Park, No. 669 Jiangjun Avenue,  
Jiangning District, Nanjing

**Manufacturer** : **Nanjing Ningyuan Intelligent Instrument Co., Ltd**

Address : Building 6, Jima Industrial Park, No. 669 Jiangjun Avenue,  
Jiangning District, Nanjing

|              |      |
|--------------|------|
| Test Result: | PASS |
|--------------|------|

The test report merely corresponds to the test sample.  
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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## **1 TEST STANDARDS**

The tests were performed according to following standards:

[FCC Rules Part 15.231](#): Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.  
[ANSI C63.10:2013](#) : American National Standard for Testing Unlicensed Wireless Devices

## 2 SUMMARY

### 2.1 General Remarks

|                                |   |             |
|--------------------------------|---|-------------|
| Date of receipt of test sample | : | Oct.28,2022 |
| Testing commenced on           | : | Oct.28,2022 |
| Testing concluded on           | : | Nov.03,2022 |

### 2.2 Product Description

|                       |                                                                      |
|-----------------------|----------------------------------------------------------------------|
| Product Name:         | LORA RF module                                                       |
| Model/Type reference: | RM-RF10TP-1278(PI)                                                   |
| Testing sample ID:    | HTT202210146-1# (Engineer sample),<br>HTT202210146-2#(Normal sample) |
| Power supply:         | DC 5.0V                                                              |
| Modulation:           | Hybrid system                                                        |
| Operation frequency:  | 433.062866-509.937866MHz                                             |
| Channel number:       | 83                                                                   |
| Antenna type:         | External antenna                                                     |
| Antenna gain:         | -0.74dBi                                                             |

### 2.3 Equipment Under Test

#### Power supply system utilised

|                      |   |                                                                   |                                   |
|----------------------|---|-------------------------------------------------------------------|-----------------------------------|
| Power supply voltage | : | <input type="radio"/> 230V / 50 Hz                                | <input type="radio"/> 120V / 60Hz |
|                      |   | <input type="radio"/> 12 V DC                                     | <input type="radio"/> 24 V DC     |
|                      |   | <input checked="" type="radio"/> Other (specified in blank below) |                                   |

DC 5.0V

### 2.4 Short description of the Equipment under Test (EUT)

This is a LORA RF module.

For more details, refer to the user's manual of the EUT.

#### Operation Frequency:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 00      | 433.062866      | 42      | 472437866       |
| 01      | 434000366       | 43      | 473375366       |
| 02      | 434937866       | 44      | 474312866       |
| 03      | 435875366       | 45      | 475250366       |
| 04      | 436812866       | 46      | 476187866       |
| 05      | 437750366       | 47      | 477125366       |
| 06      | 438687866       | 48      | 478062866       |
| 07      | 439625366       | 49      | 479000366       |
| 08      | 440562866       | 50      | 479937866       |
| 09      | 441500366       | 51      | 480875366       |
| 10      | 442437866       | 52      | 481812866       |
| 11      | 443375366       | 53      | 482750366       |
| 12      | 444312866       | 54      | 483687866       |
| 13      | 445250366       | 55      | 484625366       |
| 14      | 446187866       | 56      | 485562866       |

|    |           |    |           |
|----|-----------|----|-----------|
| 15 | 447125366 | 57 | 486500366 |
| 16 | 448062866 | 58 | 487437866 |
| 17 | 449000366 | 59 | 488375366 |
| 18 | 449937866 | 60 | 489312866 |
| 19 | 450875366 | 61 | 490250366 |
| 20 | 451812866 | 62 | 491187866 |
| 21 | 452750366 | 63 | 492125366 |
| 22 | 453687866 | 64 | 493062866 |
| 23 | 454625366 | 65 | 494000366 |
| 24 | 455562866 | 66 | 494937866 |
| 25 | 456500366 | 67 | 495875366 |
| 26 | 457437866 | 68 | 496812866 |
| 27 | 458375366 | 69 | 497750366 |
| 28 | 459312866 | 70 | 498687866 |
| 29 | 460250366 | 71 | 499625366 |
| 30 | 461187866 | 72 | 500562866 |
| 31 | 462125366 | 73 | 501500366 |
| 32 | 463062866 | 74 | 502437866 |
| 33 | 464000366 | 75 | 503375366 |
| 34 | 464937866 | 76 | 504312866 |
| 35 | 465875366 | 77 | 505250366 |
| 36 | 466812866 | 78 | 506187866 |
| 37 | 467750366 | 79 | 507125366 |
| 38 | 468687866 | 80 | 508062866 |
| 39 | 469625366 | 81 | 509000366 |
| 40 | 470562866 | 82 | 509937866 |
| 41 | 471500366 |    |           |

Test frequency:

|              |               |
|--------------|---------------|
| Low channel  | 433.062866MHz |
| Mid channel  | 471.500366MHz |
| High channel | 509.937866MHz |

## 2.5 Block Diagram of Test Setup



## 2.6 Special Accessories

Follow auxiliary equipment(s) test with EUT that provided by the manufacturer or laboratory is listed as follow:

| Description | Manufacturer | Model | Technical Parameters | Certificate | Provided by |
|-------------|--------------|-------|----------------------|-------------|-------------|
| /           | /            | /     | /                    | /           | /           |
| /           | /            | /     | /                    | /           | /           |

## 2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the device filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rules.

## **2.8 Modifications**

No modifications were implemented to meet testing criteria.

### 3 TEST ENVIRONMENT

#### 3.1 Address of the test laboratory

**Shenzhen HTT Technology Co.,Ltd.**

1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road, Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China

#### 3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

**FCC-Registration No.: 779513 Designation Number: CN1319**

Shenzhen HTT Technology Co.,Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

**A2LA-Lab Cert. No.: 6435.01**

Shenzhen HTT Technology Co.,Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

#### 3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Radiated Emission:

|                       |              |
|-----------------------|--------------|
| Temperature:          | 25 ° C       |
|                       |              |
| Humidity:             | 45 %         |
|                       |              |
| Atmospheric pressure: | 950-1050mbar |

Conducted testing:

|                       |              |
|-----------------------|--------------|
| Temperature:          | 25 ° C       |
|                       |              |
| Humidity:             | 44 %         |
|                       |              |
| Atmospheric pressure: | 950-1050mbar |

### 3.4 Summary of measurement results

| FCC and IC Requirements              |                                                 |      |
|--------------------------------------|-------------------------------------------------|------|
| FCC Part 15.207                      | Conducted Emission                              | PASS |
| FCC Part 15.231(a)(2)                | Automatically Deactivate                        | PASS |
| FCC Part 15.231(b)                   | Electric Field Strength of Fundamental Emission | PASS |
| FCC Part 15.205 & 15.209 & 15.231(b) | Electric Field Strength of Spurious Emission    | PASS |
| FCC Part 15.231(c)                   | -20dB bandwidth                                 | PASS |

Remark: The measurement uncertainty is not included in the test result.

### 3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen HTT Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen HTT Technology Co., Ltd. :

| Test                  | Range      | Measurement Uncertainty | Notes |
|-----------------------|------------|-------------------------|-------|
| Radiated Emission     | 30~1000MHz | 4.10 dB                 | (1)   |
| Radiated Emission     | 1~18GHz    | 4.32 dB                 | (1)   |
| Radiated Emission     | 18-40GHz   | 5.54 dB                 | (1)   |
| Conducted Disturbance | 0.15~30MHz | 3.12 dB                 | (1)   |

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

### 3.6 Equipments Used during the Test

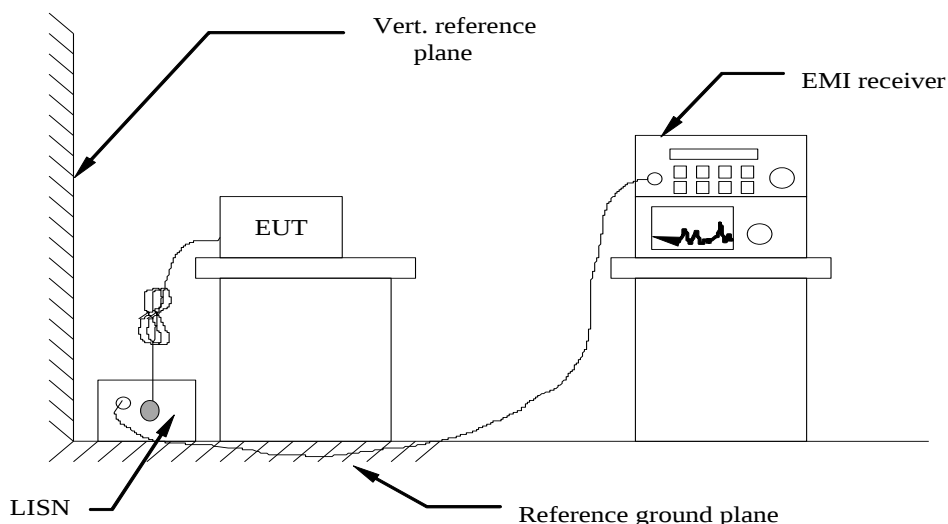
| Item | Test Equipment                   | Manufacturer                        | Model No.          | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
|------|----------------------------------|-------------------------------------|--------------------|---------------|---------------------|-------------------------|
| 1    | 3m Semi- Anechoic Chamber        | Shenzhen C.R.T technology co., LTD  | 9*6*6              | HTT-E028      | Aug. 10 2020        | Aug. 09 2024            |
| 2    | Control Room                     | Shenzhen C.R.T technology co., LTD  | 4.8*3.5*3.0        | HTT-E030      | Aug. 10 2020        | Aug. 09 2024            |
| 3    | EMI Test Receiver                | Rohde&Schwar                        | ESCI7              | HTT-E022      | May 23 2022         | May 22 2023             |
| 4    | Spectrum Analyzer                | Rohde&Schwar                        | FSP                | HTT-E037      | May 23 2022         | May 22 2023             |
| 5    | Coaxial Cable                    | ZDecl                               | ZT26-NJ-NJ-0.6M    | HTT-E018      | May 23 2022         | May 22 2023             |
| 6    | Coaxial Cable                    | ZDecl                               | ZT26-NJ-SMAJ-2M    | HTT-E019      | May 23 2022         | May 22 2023             |
| 7    | Coaxial Cable                    | ZDecl                               | ZT26-NJ-SMAJ-0.6M  | HTT-E020      | May 23 2022         | May 22 2023             |
| 8    | Coaxial Cable                    | ZDecl                               | ZT26-NJ-SMAJ-8.5M  | HTT-E021      | May 23 2022         | May 22 2023             |
| 9    | Composite logarithmic antenna    | Schwarzbeck                         | VULB 9168          | HTT-E017      | May 23 2022         | May 22 2023             |
| 10   | Horn Antenna                     | Schwarzbeck                         | BBHA9120D          | HTT-E016      | May 23 2022         | May 22 2023             |
| 11   | Loop Antenna                     | Zhinan                              | ZN30900C           | HTT-E039      | May 23 2022         | May 22 2023             |
| 12   | Horn Antenna                     | Beijing Hangwei Dayang              | OBH100400          | HTT-E040      | May 23 2022         | May 22 2023             |
| 13   | low frequency Amplifier          | Sonoma Instrument                   | 310                | HTT-E015      | May 23 2022         | May 22 2023             |
| 14   | high-frequency Amplifier         | HP                                  | 8449B              | HTT-E014      | May 23 2022         | May 22 2023             |
| 15   | Variable frequency power supply  | Shenzhen Anbiao Instrument Co., Ltd | ANB-10VA           | HTT-082       | May 23 2022         | May 22 2023             |
| 16   | EMI Test Receiver                | Rohde & Schwarz                     | ESCS30             | HTT-E004      | May 23 2022         | May 22 2023             |
| 17   | Artificial Mains                 | Rohde & Schwarz                     | ESH3-Z5            | HTT-E006      | May 23 2022         | May 22 2023             |
| 18   | Artificial Mains                 | Rohde & Schwarz                     | ENV-216            | HTT-E038      | May 23 2022         | May 22 2023             |
| 19   | Cable Line                       | Robinson                            | Z302S-NJ-BNCJ-1.5M | HTT-E001      | May 23 2022         | May 22 2023             |
| 20   | Attenuator                       | Robinson                            | 6810.17A           | HTT-E007      | May 23 2022         | May 22 2023             |
| 21   | Variable frequency power supply  | Shenzhen Yanghong Electric Co., Ltd | YF-650 (5KVA)      | HTT-E032      | May 23 2022         | May 22 2023             |
| 22   | Control Room                     | Shenzhen C.R.T technology co., LTD  | 8*4*3.5            | HTT-E029      | May 23 2022         | May 22 2023             |
| 23   | DC power supply                  | Agilent                             | E3632A             | HTT-E023      | May 23 2022         | May 22 2023             |
| 24   | EMI Test Receiver                | Agilent                             | N9020A             | HTT-E024      | May 23 2022         | May 22 2023             |
| 25   | Analog signal generator          | Agilent                             | N5181A             | HTT-E025      | May 23 2022         | May 22 2023             |
| 26   | Vector signal generator          | Agilent                             | N5182A             | HTT-E026      | May 23 2022         | May 22 2023             |
| 27   | Power sensor                     | Keysight                            | U2021XA            | HTT-E027      | May 23 2022         | May 22 2023             |
| 28   | Temperature and humidity meter   | Shenzhen Anbiao Instrument Co., Ltd | TH10R              | HTT-074       | May 23 2022         | May 22 2023             |
| 29   | Radiated Emission Test Software  | Farad                               | EZ-EMC             | N/A           | N/A                 | N/A                     |
| 30   | Conducted Emission Test Software | Farad                               | EZ-EMC             | N/A           | N/A                 | N/A                     |
| 31   | RF Test Software                 | panshanrf                           | TST                | N/A           | N/A                 | N/A                     |

Note: The Cal.Interval was one year.

## 4 TEST CONDITIONS AND RESULTS

### 4.1 AC Power Conducted Emission

#### TEST CONFIGURATION



#### TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received DC 12V power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

#### AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

| Frequency range (MHz) | Limit (dBuV) |           |
|-----------------------|--------------|-----------|
|                       | Quasi-peak   | Average   |
| 0.15-0.5              | 66 to 56*    | 56 to 46* |
| 0.5-5                 | 56           | 46        |
| 5-30                  | 60           | 50        |

\* Decreases with the logarithm of the frequency.

## **TEST RESULTS**

Remark:

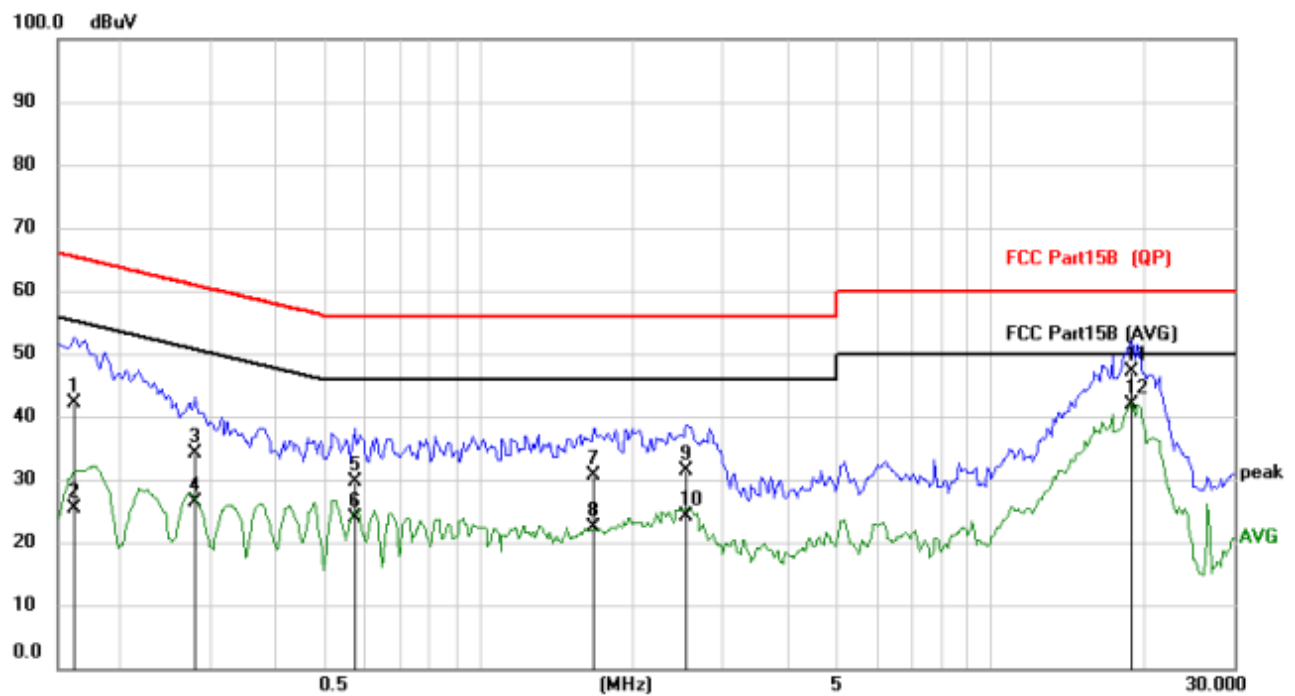
1. Lora was tested at Low, Middle, and High channel; only the worst result of Lora High channel was reported as below:
2. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:

Power supply:

DC 5.0V from PC AC  
120V/60Hz

Polarization

L



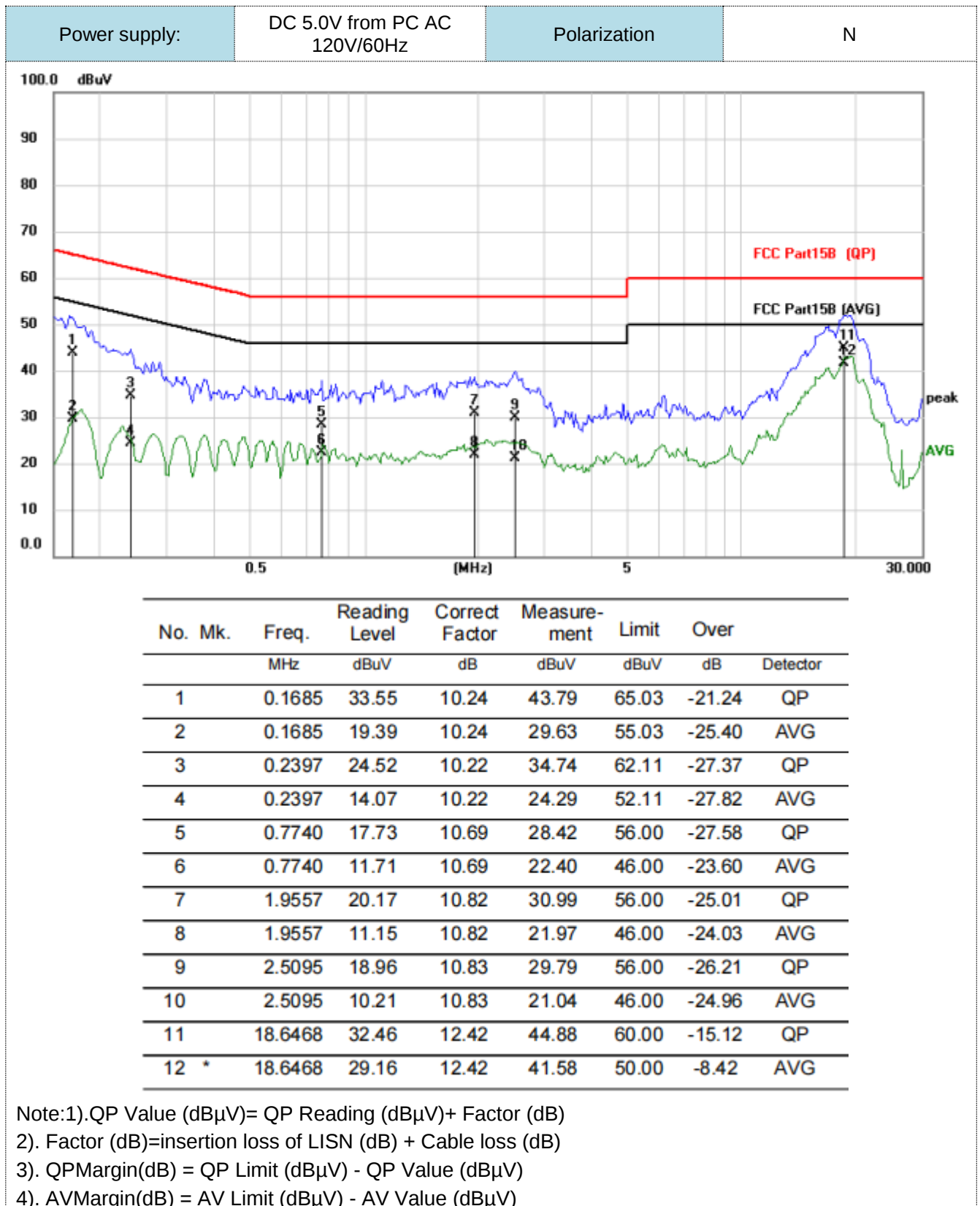
| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBμV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBμV | Limit<br>dBμV | Over<br>dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|
| 1   |     | 0.1617       | 31.70                    | 10.38                   | 42.08                    | 65.38         | -23.30     | QP       |
| 2   |     | 0.1617       | 15.09                    | 10.38                   | 25.47                    | 55.38         | -29.91     | AVG      |
| 3   |     | 0.2787       | 23.68                    | 10.41                   | 34.09                    | 60.85         | -26.76     | QP       |
| 4   |     | 0.2787       | 16.02                    | 10.41                   | 26.43                    | 50.85         | -24.42     | AVG      |
| 5   |     | 0.5712       | 19.15                    | 10.55                   | 29.70                    | 56.00         | -26.30     | QP       |
| 6   |     | 0.5712       | 13.44                    | 10.55                   | 23.99                    | 46.00         | -22.01     | AVG      |
| 7   |     | 1.6788       | 19.90                    | 10.85                   | 30.75                    | 56.00         | -25.25     | QP       |
| 8   |     | 1.6788       | 11.63                    | 10.85                   | 22.48                    | 46.00         | -23.52     | AVG      |
| 9   |     | 2.5485       | 20.45                    | 10.83                   | 31.28                    | 56.00         | -24.72     | QP       |
| 10  |     | 2.5485       | 13.33                    | 10.83                   | 24.16                    | 46.00         | -21.84     | AVG      |
| 11  |     | 18.9080      | 34.88                    | 12.34                   | 47.22                    | 60.00         | -12.78     | QP       |
| 12  | *   | 18.9080      | 29.49                    | 12.34                   | 41.83                    | 50.00         | -8.17      | AVG      |

Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)

2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)

4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)



## 4.2 Radiated Emission

### Limit

For intentional device, according to 15.209(a) the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table.

| Frequency (MHz) | Distance (Meters) | Radiated (dB $\mu$ V/m)                    | Radiated ( $\mu$ V/m) |
|-----------------|-------------------|--------------------------------------------|-----------------------|
| 0.009-0.49      | 3                 | $20\log(2400/F(\text{KHz}))+40\log(300/3)$ | $2400/F(\text{KHz})$  |
| 0.49-1.705      | 3                 | $20\log(24000/F(\text{KHz}))+40\log(30/3)$ | $24000/F(\text{KHz})$ |
| 1.705-30        | 3                 | $20\log(30)+40\log(30/3)$                  | 30                    |
| 30-88           | 3                 | 40.0                                       | 100                   |
| 88-216          | 3                 | 43.5                                       | 150                   |
| 216-960         | 3                 | 46.0                                       | 200                   |
| Above 960       | 3                 | 54.0                                       | 500                   |

In addition to the provisions of 15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

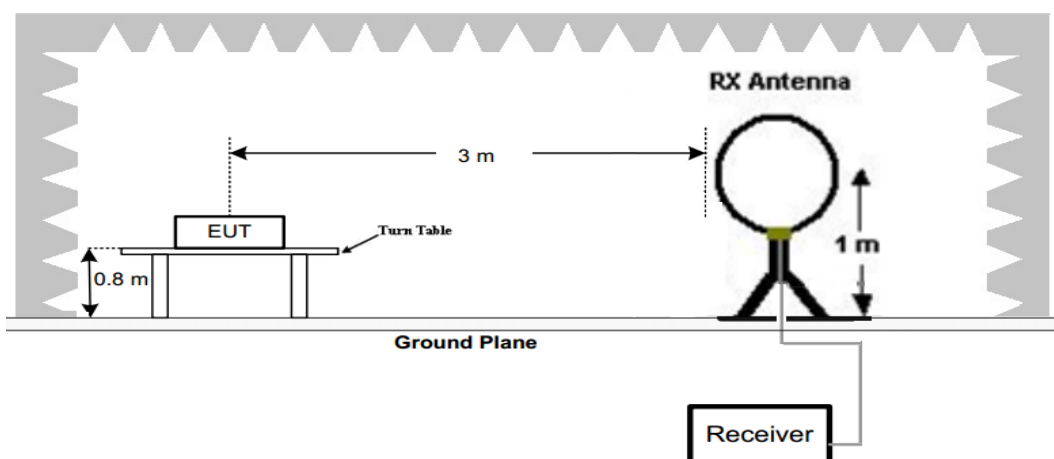
| Funda-<br>mental fre-<br>quency<br>(MHz) | Field strength of funda-<br>mental (microvolts/<br>meter) | Field strength of<br>spurious emissions<br>(microvolts/meter) |
|------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------|
| 40.66–<br>40.70.                         | 2,250 .....                                               | 225                                                           |
| 70–130 .....                             | 1,250 .....                                               | 125                                                           |
| 130–174 ....                             | <sup>1</sup> 1,250 to 3,750 .....                         | <sup>1</sup> 125 to 375                                       |
| 174–260 ....                             | 3,750 .....                                               | 375                                                           |
| 260–470 ....                             | <sup>1</sup> 3,750 to 12,500 .....                        | <sup>1</sup> 375 to 1,250                                     |
| Above 470                                | 12,500 .....                                              | 1,250                                                         |

<sup>1</sup> Linear interpolations.

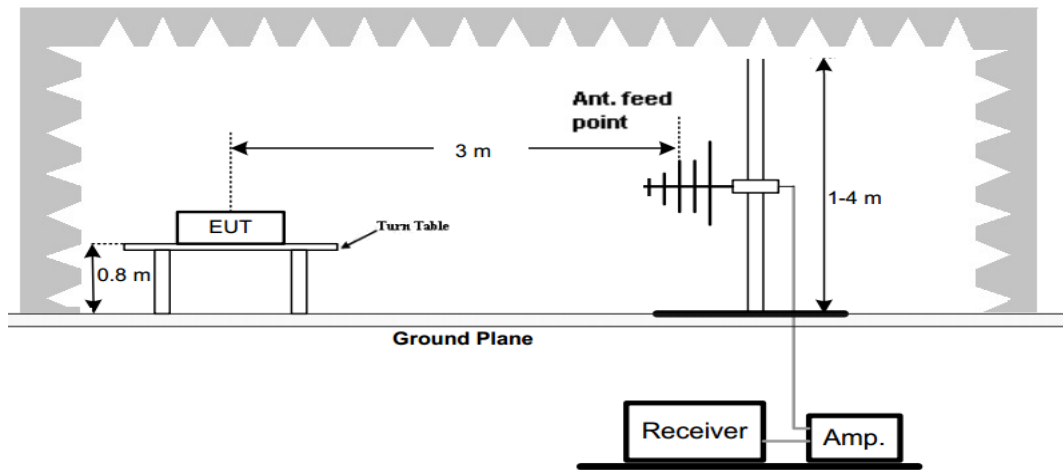
[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 260-470 MHz,  $20*\log(41.6667*433.890-7083.3333)=80.82\text{dB}\mu\text{V/m}$  The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

### TEST CONFIGURATION

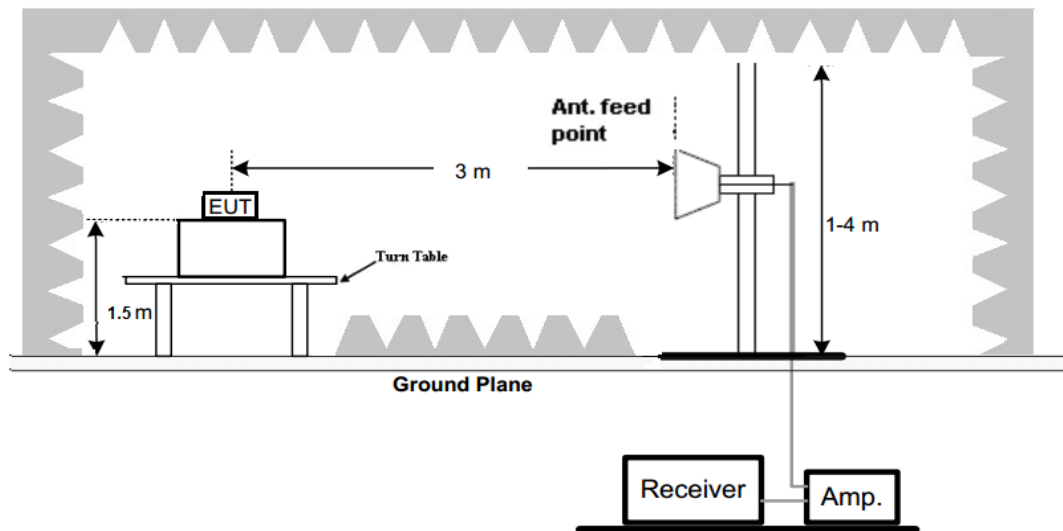
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



### Test Procedure

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

### TEST RESULTS

The emissions from 30MHz to 5GHz are measured peak and average level, below 1 GHz measured QP level, detailed test data please see below. Besides, we tested 3 directions and recorded the worst data.



| Emission Styles | Frequency (MHz) | PK Level (dBuV/m) | AV Factor (dB/m) | AV Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Direction (H/V) |
|-----------------|-----------------|-------------------|------------------|-------------------|----------------|-------------|-----------------|
| Fundamental     | 471.500366      | 85.81             | -8.83            | 76.98             | 81.93          | 4.95        | H               |
| Harmonics       | 943.000732      | 53.94             | -8.83            | 45.11             | 61.93          | 16.82       | H               |
| Harmonics       | 1414.501098     | 51.69             | -8.83            | 42.86             | 54             | 11.14       | H               |
| --              | --              | --                | --               | --                | --             | --          | --              |
| Fundamental     | 471.500366      | 82.39             | -8.83            | 73.56             | 81.93          | 8.37        | V               |
| Harmonics       | 943.000732      | 53.12             | -8.83            | 44.29             | 61.93          | 17.64       | V               |
| Harmonics       | 1414.501098     | 52.34             | -8.83            | 43.51             | 54             | 10.49       | V               |
| --              | --              | --                | --               | --                | --             | --          | --              |

High Channel:

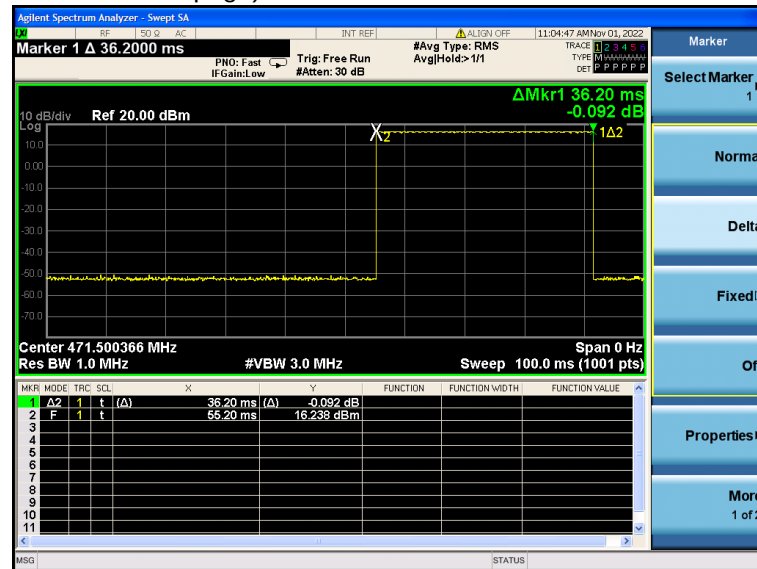
| Emission Styles | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Direction (H/V) |
|-----------------|-----------------|----------------|---------------|----------------|----------------|-------------|----------|-----------------|
| Fundamental     | 509.937866      | 98.34          | -11.87        | 86.47          | 101.94         | 15.47       | PK       | H               |
| Spurious        | 457.321         | 44.07          | -12.39        | 31.68          | 46             | 14.32       | PK       | H               |
| Harmonics       | 1019.875732     | 72.55          | -18.01        | 54.54          | 74             | 19.46       | PK       | H               |
| Harmonics       | 1529.813598     | 46.82          | 5.91          | 52.73          | 74             | 21.27       | PK       | H               |
| --              | --              | --             | --            | --             | --             | --          | --       | --              |
| Fundamental     | 509.937866      | 93.34          | -11.87        | 81.47          | 101.94         | 20.47       | PK       | V               |
| Spurious        | 457.321         | 43.11          | -12.39        | 30.72          | 46             | 15.28       | PK       | V               |
| Harmonics       | 1019.875732     | 70.96          | -18.01        | 52.95          | 74             | 21.05       | PK       | V               |
| Harmonics       | 1529.813598     | 46.60          | 5.91          | 52.51          | 74             | 21.49       | PK       | V               |
| --              | --              | --             | --            | --             | --             | --          | --       | --              |

| Emission Styles | Frequency (MHz) | PK Level (dBuV/m) | AV Factor (dB/m) | AV Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Direction (H/V) |
|-----------------|-----------------|-------------------|------------------|-------------------|----------------|-------------|-----------------|
| Fundamental     | 509.937866      | 86.47             | -8.83            | 77.64             | 81.93          | 4.29        | H               |
| Harmonics       | 1019.875732     | 54.54             | -8.83            | 45.71             | 54             | 8.29        | H               |
| Harmonics       | 1529.813598     | 52.73             | -8.83            | 43.90             | 54             | 10.1        | H               |
| --              | --              | --                | --               | --                | --             | --          | --              |
| Fundamental     | 509.937866      | 81.47             | -8.83            | 72.64             | 81.93          | 9.29        | V               |
| Harmonics       | 1019.875732     | 52.95             | -8.83            | 44.12             | 54             | 9.88        | V               |
| Harmonics       | 1529.813598     | 52.51             | -8.83            | 43.68             | 54             | 10.32       | V               |
| --              | --              | --                | --               | --                | --             | --          | --              |

Note:

1. Level (dBuV/m)= Reading (dBuV)+Factor(dB/m)
2. AV Level (dBuV/m)= PK Level (dBuV/m)+ AV Factor(dB)
3. In a transmit cycle 100ms period found burst 1pcs, the Duty Cycle can calculate as below:
4. Duty Cycle= (36.20)/ 100==0.3620
5. AV Factor=20\*log(Duty Cycle)=20\*log(0.3620)=-8.83

(The plot of Duty Cycle See the follow page)



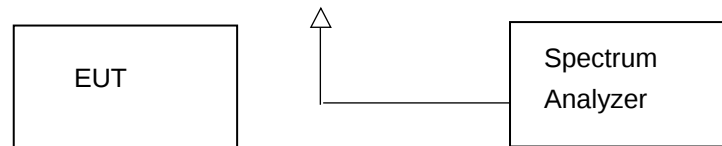
(Transmit cycle 100ms)

### 4.3 20dB Bandwidth

#### Limit

According to 47 CFR 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

#### Test Configuration



#### Test Procedure

The 20dB bandwidth and 99% bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

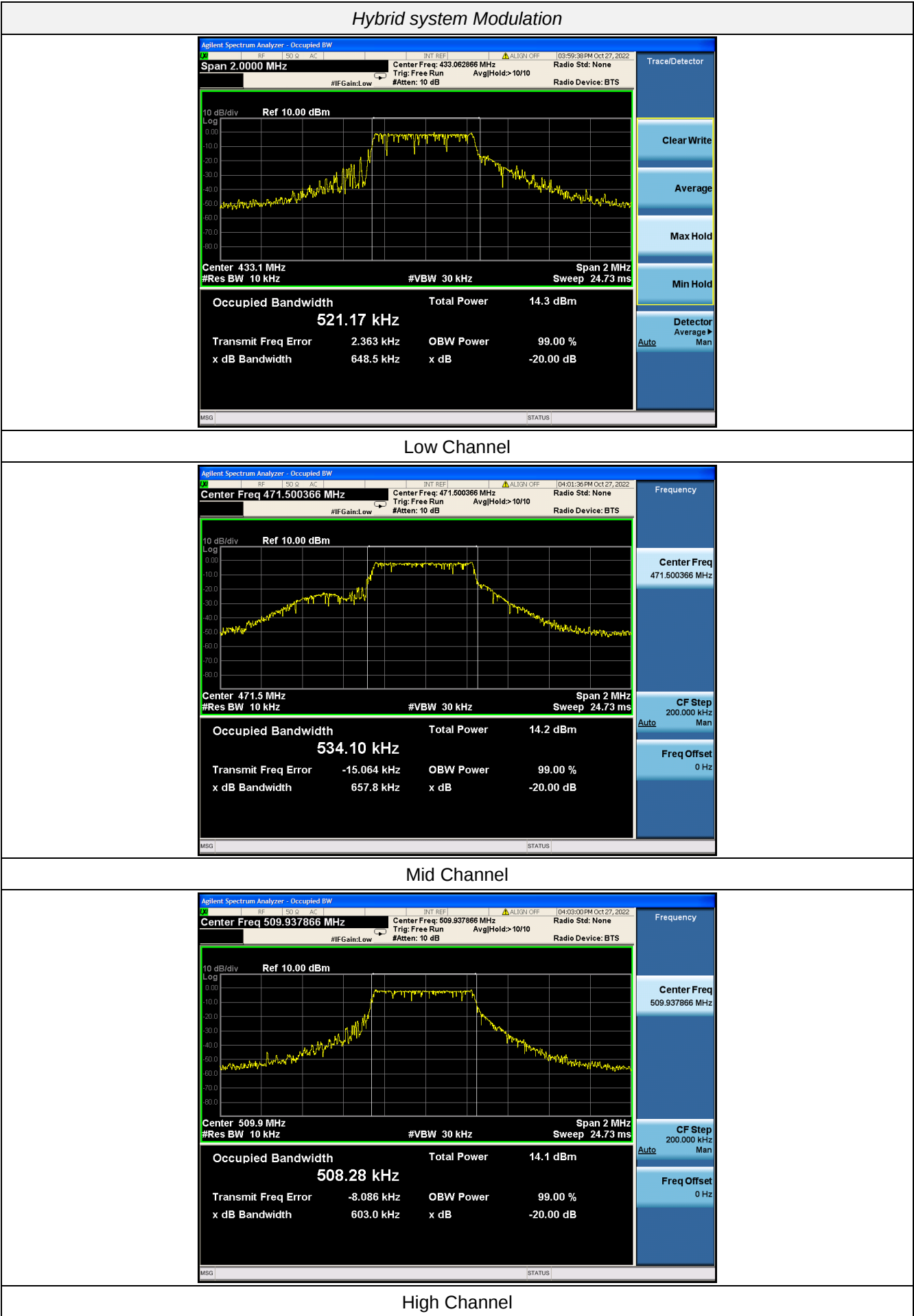
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

The occupied bandwidth (OBW), that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

#### Test Results

| Modulation    | Channel Frequency (MHz) | 99% OBW (KHz) | 20dB bandwidth (KHz) | Limit (MHz)                         | Result |
|---------------|-------------------------|---------------|----------------------|-------------------------------------|--------|
| Hybrid system | 433.062866              | 521.17        | 648.50               | $0.25\% \times 433.062866 = 1.0826$ | Pass   |
|               | 471.500366              | 534.10        | 657.80               | $0.25\% \times 471.500366 = 1.1788$ | Pass   |
|               | 509.937866              | 508.28        | 603.00               | $0.25\% \times 509.937866 = 1.2748$ | Pass   |

Test plot as follows:

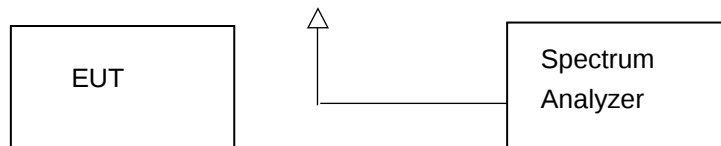


#### 4.4 Deactivation Time

##### Limit

According to FCC §15.231(a)(2), A transmitter activated automatically shall cease transmission within 5 seconds after activation.

##### Test Configuration



##### Test Procedure

1. The EUT was placed on a wooded table which is 0.8m height and close to receiver antenna of spectrum analyzer.
2. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was set to 1 MHz to encompass all significant spectral components during the test. The spectrum analyzer was operated in linear scale and zero span mode after tuning to the transmitter carrier frequency.

##### TEST RESULTS

Note: The transmitter was automatically activated

| Frequency<br>(MHz) | One transmission time<br>(S) | Limit(S) | Result |
|--------------------|------------------------------|----------|--------|
| 433.062866         | 0.0350                       | 5        | Pass   |
| 471.500366         | 0.0350                       | 5        | Pass   |
| 509.937866         | 0.0350                       | 5        | Pass   |

Test plot as follows:



## 4.5 Antenna Requirement

### Standard Applicable

According to FCC Part 15C 15.203

- a) An intentional radiator shall be de-signed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
- b) The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### **Refer to statement below for compliance.**

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. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### Antenna Connected Construction

The antenna used in this product is an Internal Antenna, The directional gains of antenna used for transmitting is -0.74dBi.

Remark:The antenna gain is provided by the customer , if the data provided by the customer is not accurate, Shenzhen HTT Technology Co.,Ltd. does not assume any responsibility.

## **5 Test Setup Photos of the EUT**

Reference to the **appendix I** for details

## **6 Photos of the EUT**

Reference to the **appendix II** for details.

**\*\*\*\*\* End of Report \*\*\*\*\***