

# **FCC TEST REPORT**

## **FCC ID: 2BEDV-E99**

**Product** : Quadcopter  
**Model Name** : E99  
**Brand** : N/A  
**Report No.** : NCT24047537E

Prepared for

**Shantou Ruiou Innovation Technology Co.LTD.**

**Shantou Chenghai District Longdu town, Qianmei village  
residential garden No.36, Shantou, Guangdong, China**

Prepared by

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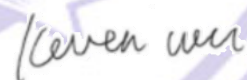
## 1 TEST RESULT CERTIFICATION

Applicant's name : Shantou Ruiou Innovation Technology Co.LTD.  
Address : Shantou Chenghai District Longdu town, Qianmei village  
residential garden No.36, Shantou, Guangdong, China  
Manufacture's name : Shantou Ruiou Innovation Technology Co.LTD.  
Address : Shantou Chenghai District Longdu town, Qianmei village  
residential garden No.36, Shantou, Guangdong, China  
Product name : Quadcopter  
Model name : E99  
Standards : FCC PART 15 C 15.249  
Test procedure : ANSI C63.10:2020  
Date of test : Nov. 20, 2024-Nov. 26, 2024  
Date of Issue : Nov. 27, 2024

This device described above has been tested by NCT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:



Keven Wu / Engineer

Technical Manager:

  
Henry Wang /  


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## 2 Test Summary

| Test Items                                           | Test Requirement  | Result |
|------------------------------------------------------|-------------------|--------|
| Conduct Emission                                     | FCC part 15.207   | N/A    |
| Fundamental & Radiated Spurious Emission Measurement | 15.249(a); 15.209 | PASS   |
| Band edge                                            | 15.249(d); 15.205 | PASS   |
| 20dB Bandwidth                                       | 15.215            | PASS   |
| Antenna Requirement                                  | 15.203            | PASS   |

Remark:

1. "N/A" denotes test is not applicable in this Test Report.

## 2.1 Test Site

### Site Description

EMC Lab. : Accredited by CNAS, 2022-09-27

The certificate is valid until 2028.01.07

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2017)

The Certificate Registration Number is L8251

Designation Number: CN1347

Test Firm Registration Number: 894804

Accredited by A2LA, June 14, 2023

The Certificate Registration Number is 6837.01

Accredited by Industry Canada, November 09, 2018

The Conformity Assessment Body Identifier is CN0150

Company Number: 30806

Name of Firm : Shenzhen NCT Testing Technology Co., Ltd.

Site Location : A101&2F B2, Fuqiao 6th Area, Xintian Community, Fuhai Street, Baoan District, Shenzhen, People's Republic of China

### 3 General Information

#### 3.1 General Description of E.U.T.

|                                                                                                                                                                                                                |   |                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------------------------------|
| Product Name                                                                                                                                                                                                   | : | Quadcopter                   |
| Model Name                                                                                                                                                                                                     | : | E99                          |
| Sample ID                                                                                                                                                                                                      | : | 24047537-001#                |
| Sample(s) Status:                                                                                                                                                                                              | : | Engineer sample              |
| Series Model                                                                                                                                                                                                   | : | N/A                          |
| Model Different.:                                                                                                                                                                                              | : | N/A                          |
| Operating frequency                                                                                                                                                                                            | : | 2420-2460MHz                 |
| Number of Channels                                                                                                                                                                                             | : | 41 channels                  |
| Type of Modulation                                                                                                                                                                                             | : | GFSK                         |
| Antenna installation                                                                                                                                                                                           | : | Internal Antenna             |
| Antenna Gain                                                                                                                                                                                                   | : | 0.17dBi                      |
| Power supply                                                                                                                                                                                                   | : | DC 4.5V(3*1.5V "AA" battery) |
| Hardware Version                                                                                                                                                                                               | : | N/A                          |
| Software Version                                                                                                                                                                                               | : | N/A                          |
| Remark: the Antenna gain is provided by customer from Antenna spec. and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant. |   |                              |

### 3.2 Channel List

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The details of test channels and bandwidth were for RF conductive measurement.

Channel List:

| Channel | Frequency (MHz) | Channel   | Frequency (MHz) | Channel   | Frequency (MHz) |
|---------|-----------------|-----------|-----------------|-----------|-----------------|
| 00      | <b>2420</b>     | 14        | 2434            | 28        | 2448            |
| 01      | 2421            | 15        | 2435            | 29        | 2449            |
| 02      | 2422            | 16        | 2436            | 30        | 2450            |
| 03      | 2423            | 17        | 2437            | 31        | 2451            |
| 04      | 2424            | 18        | 2438            | 32        | 2452            |
| 05      | 2425            | 19        | 2439            | 33        | 2453            |
| 06      | 2426            | <b>20</b> | <b>2440</b>     | 34        | 2454            |
| 07      | 2427            | 21        | 2441            | 35        | 2455            |
| 08      | 2428            | 22        | 2442            | 36        | 2456            |
| 09      | 2429            | 23        | 2443            | 37        | 2457            |
| 10      | 2430            | 24        | 2444            | 38        | 2458            |
| 11      | 2431            | 25        | 2445            | 39        | 2459            |
| 12      | 2432            | 26        | 2446            | <b>40</b> | <b>2460</b>     |
| 13      | 2433            | 27        | 2447            |           |                 |

Note:

1. Test of channel was included the lowest, middle and highest frequency in highest data rate and to perform the test, then record on this report.



### 3.3 Test Setup Configuration

Radiated Emission(30MHz-1GHz)



Radiated Emission(above 1GHz)



Conducted Spurious



### 3.4 Test Mode

|                   |                                                 |
|-------------------|-------------------------------------------------|
| Transmitting mode | Keep the EUT in continuously transmitting mode. |
|-------------------|-------------------------------------------------|

|                   |             |
|-------------------|-------------|
| Test Software     | FCC RF-Test |
| Power level setup | < 0 dBm     |

|              | Channel | Frequency(MHz) |
|--------------|---------|----------------|
| Low Channel  | 00      | 2420           |
| Mid Channel  | 20      | 2440           |
| High Channel | 40      | 2460           |

## 4 Equipment During Test

### 4.1 Equipments List

#### Conducted emission Test Equipment

| Name              | Model No.    | Serial No. | Manufacturer    | Date of Cal. | Due Date  |
|-------------------|--------------|------------|-----------------|--------------|-----------|
| 944 Shielded Room | 944 Room     | /          | EMToni          | 2022/5/31    | 2025/5/30 |
| EMI Test Receiver | ESPI         | 101604     | Rohde & Schwarz | 2024/6/17    | 2025/6/16 |
| LISN              | ENV 216      | 102796     | Rohde & Schwarz | 2024/6/17    | 2025/6/16 |
| LISN              | VN1-13S      | 004023     | CRANAGE         | 2024/6/17    | 2025/6/16 |
| Cable             | RG223-1500MM | NA         | RG              | 2024/6/17    | 2025/6/16 |

#### Radiated emission & Radio Frequency Test Equipment

| Name                                                | Model No.   | Serial No. | Manufacturer    | Date of Cal. | Due Date  |
|-----------------------------------------------------|-------------|------------|-----------------|--------------|-----------|
| 966 Shielded Room                                   | 966 Room    | /          | EMToni          | 2022/5/31    | 2025/5/30 |
| EMI Test Receiver                                   | ESCI        | 101178     | Rohde & Schwarz | 2024/6/17    | 2025/6/16 |
| Amplifier<br>(30MHz-1GHz)                           | BBV 9743 B  | 00374      | SCHNWARZBECK    | 2024/6/17    | 2025/6/16 |
| Bilog Antenna<br>(30MHz-1GHz)                       | VULB9162    | 00473      | SCHNWARZBECK    | 2023/3/19    | 2025/3/18 |
| Horn antenna<br>(1GHz-18GHz)                        | BBHA 9120 D | 02622      | SCHNWARZBECK    | 2023/3/19    | 2025/3/18 |
| Preamplifier<br>(1GHz-18GHz)                        | BBV 9718D   | 0024       | SCHNWARZBECK    | 2024/6/17    | 2025/6/16 |
| Spectrum Analyzer<br>(10Hz-40GHz)                   | FSV 40      | 100952     | Rohde & Schwarz | 2024/6/17    | 2025/6/16 |
| Preamplifier<br>(18GHz-40GHz)                       | BBV 9721    | 0056       | SCHNWARZBECK    | 2024/6/17    | 2025/6/16 |
| Double Ridge Guide<br>Horn Antenna<br>(18GHz-40GHz) | SAS-574     | 588        | A.H.System      | 2023/3/19    | 2025/3/18 |
| Loop Antenna<br>(9KHz-30MHz)                        | FMZB1519B   | 014        | SCHNWARZBECK    | 2024/6/17    | 2025/6/16 |
| Amplifier<br>(9KHz-30MHz)                           | CVP 9222 C  | 00109      | CHNWARZBECK     | 2024/6/17    | 2025/6/16 |

|                             |               |            |         |           |           |
|-----------------------------|---------------|------------|---------|-----------|-----------|
| MXG Signal Analyzer         | N9020A        | MY50510202 | Agilent | 2024/6/17 | 2025/6/16 |
| MXG Vector Signal Generator | N5182A        | MY50140020 | Agilent | 2024/6/17 | 2025/6/16 |
| MXG Analog Signal Generator | N5181A        | MY47420919 | Agilent | 2024/6/17 | 2025/6/16 |
| Power Sensor                | TR1029-2      | 512364     | Techoy  | 2024/6/17 | 2025/6/16 |
| RF Swith                    | TR1029-1      | 512364     | Techoy  | 2024/6/17 | 2025/6/16 |
| Cable                       | DA800-4000MM  | NA         | DA      | 2024/6/17 | 2025/6/16 |
| Cable                       | DA800-11000MM | NA         | DA      | 2024/6/17 | 2025/6/16 |

## Other

| Item | Name                         | Manufacturer | Model  | Software version   |
|------|------------------------------|--------------|--------|--------------------|
| 1    | EMC Conduction Test System   | FALA         | EZ-EMC | Ver.EMC-CON 3A1.1+ |
| 2    | EMC radiation test system    | FALA         | EZ-EMC | Ver.FA-03A2 RE+    |
| 3    | RF test system               | TACHOY       | RFTest | V1.0.0             |
| 4    | RF communication test system | TACHOY       | RFTest | V1.0.0             |

## 4.2 Measurement Uncertainty

| Parameter                                                                                       | Uncertainty              |
|-------------------------------------------------------------------------------------------------|--------------------------|
| RF output power, conducted                                                                      | ±1.0dB                   |
| Power Spectral Density, conducted                                                               | ±2.2dB                   |
| Radio Frequency                                                                                 | ± 1 x 10 <sup>-6</sup>   |
| Bandwidth                                                                                       | ± 1.5 x 10 <sup>-6</sup> |
| Time                                                                                            | ±2%                      |
| Duty Cycle                                                                                      | ±2%                      |
| Temperature                                                                                     | ±1°C                     |
| Humidity                                                                                        | ±5%                      |
| DC and low frequency voltages                                                                   | ±3%                      |
| Conducted Emissions (150kHz~30MHz)                                                              | ±3.64dB                  |
| Radiated Emission(9kHz~30MHz)                                                                   | ±4.51dB                  |
| Radiated Emission(30MHz~1GHz)                                                                   | ±5.03dB                  |
| Radiated Emission(1GHz~25GHz)                                                                   | ±4.74dB                  |
| Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95% |                          |

## 4.3 Description of Support Units

The EUT has been tested as an independent 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.

| Item | Equipment  | Mfr/Brand | Model/Type No. | Series No. | Note |
|------|------------|-----------|----------------|------------|------|
| E-1  | Quadcopter | N/A       | E99            | N/A        | EUT  |
|      |            |           |                |            |      |
|      |            |           |                |            |      |

Note: (1)The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



## 5 Conducted Emission

|                  |                                     |
|------------------|-------------------------------------|
| Test Requirement | : FCC CFR 47 Part 15 Section 15.207 |
| Test Method      | : ANSI C63.10:2020                  |
| Test Result      | : PASS                              |
| Frequency Range  | : 150kHz to 30MHz                   |
| Class/Severity   | : Class B                           |

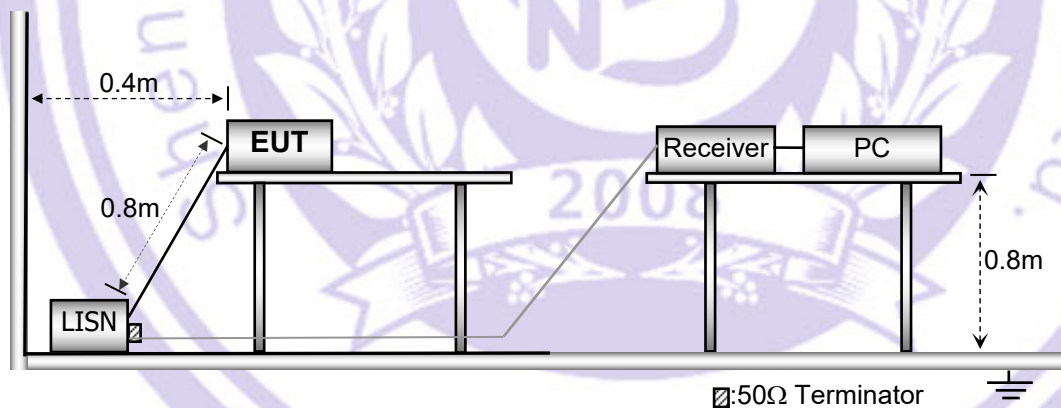
### 5.1 E.U.T. Operation

Operating Environment :

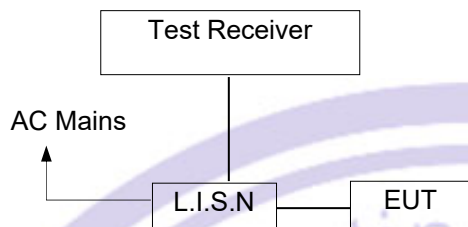
|                      |            |
|----------------------|------------|
| Temperature          | : 25.5 °C  |
| Humidity             | : 51 % RH  |
| Atmospheric Pressure | : 101.2kPa |

### 5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2020.



### 5.3 Test SET-UP (Block Diagram of Configuration)



### 5.4 Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

### 5.5 Conducted Emission Limit

#### Conducted Emission

| Frequency(MHz) | Quasi-peak | Average |
|----------------|------------|---------|
| 0.15-0.5       | 66-56      | 56-46   |
| 0.5-5.0        | 56         | 46      |
| 5.0-30.0       | 60         | 50      |

#### Note:

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.

### 5.6 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

### 5.7 Conducted Emission Test Result

N/A

## 6 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.249,  
Test Method : ANSI C63.10:2020  
Test Result : PASS  
Measurement Distance : 3m  
Limit : See the follow table

| Frequency (MHz) | Field Strength        |              | Field Strength Limit at 3m Measurement Dist |                                       |
|-----------------|-----------------------|--------------|---------------------------------------------|---------------------------------------|
|                 | uV/m                  | Distance (m) | uV/m                                        | dBuV/m                                |
| 0.009 ~ 0.490   | $2400/F(\text{kHz})$  | 300          | $10000 * 2400/F(\text{kHz})$                | $20\log^{(2400/F(\text{kHz}))} + 80$  |
| 0.490 ~ 1.705   | $24000/F(\text{kHz})$ | 30           | $100 * 24000/F(\text{kHz})$                 | $20\log^{(24000/F(\text{kHz}))} + 40$ |
| 1.705 ~ 30      | 30                    | 30           | $100 * 30$                                  | $20\log^{(30)} + 40$                  |
| 30 ~ 88         | 100                   | 3            | 100                                         | $20\log^{(100)}$                      |
| 88 ~ 216        | 150                   | 3            | 150                                         | $20\log^{(150)}$                      |
| 216 ~ 960       | 200                   | 3            | 200                                         | $20\log^{(200)}$                      |
| Above 960       | 500                   | 3            | 500                                         | $20\log^{(500)}$                      |

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental Frequency | Field Strength of Fundamental (millivolts/meter) | Field Strength of Harmonics (microvolts/meter) |
|-----------------------|--------------------------------------------------|------------------------------------------------|
| 902 - 928 MHz         | 50                                               | 500                                            |
| 2400 - 2483.5 MHz     | 50                                               | 500                                            |
| 5725 - 5875 MHz       | 50                                               | 500                                            |
| 24.0 - 24.25 GHz      | 250                                              | 2500                                           |

## LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | Limit (dBuV/m) (at 3M) |         |
|-----------------|------------------------|---------|
|                 | PEAK                   | AVERAGE |
| Above 1000      | 74                     | 54      |

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

**6.1 EUT Operation**

Operating Environment :

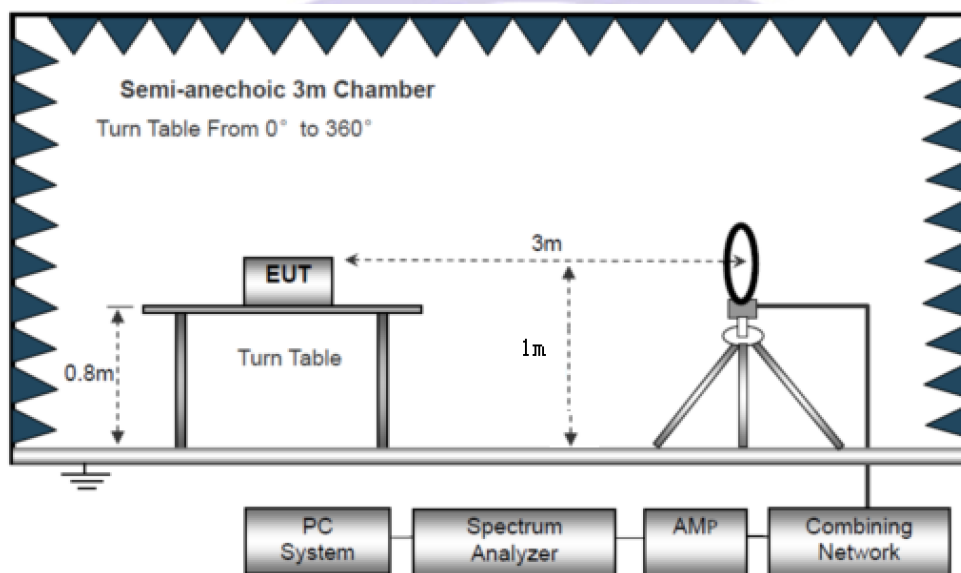
Temperature : 23.5 °C  
Humidity : 51.1 % RH  
Atmospheric Pressure : 101.2kPa



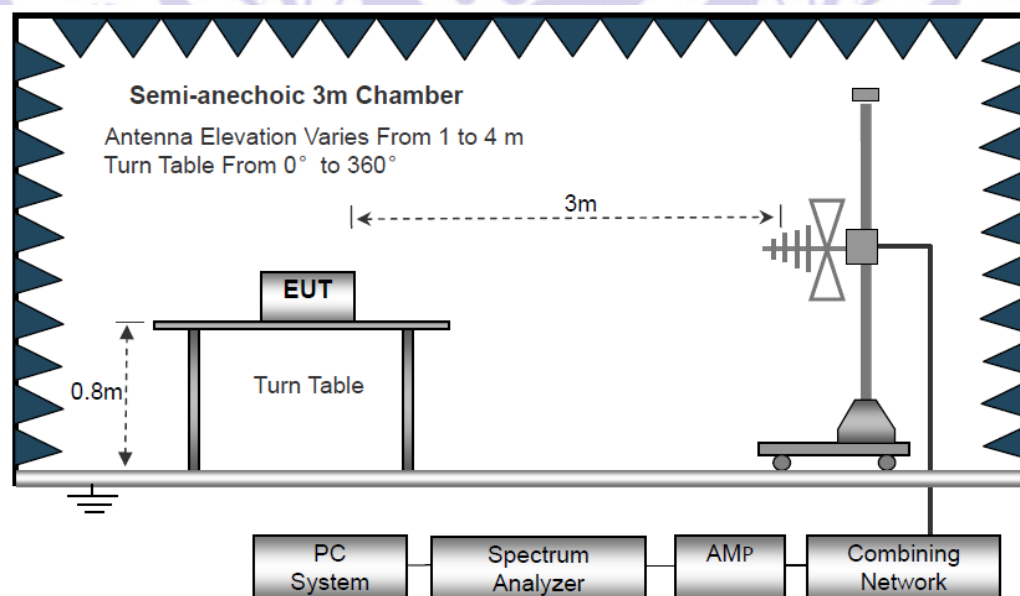
## 6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

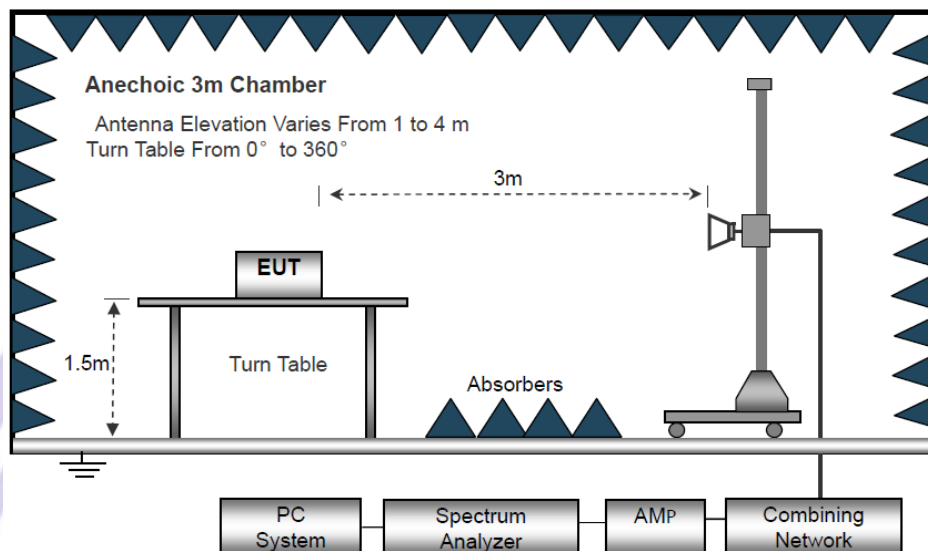
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



## 6.3 Spectrum Analyzer Setup

|                | Frequency    | Detector   | RBW    | VBW    | Remark           |
|----------------|--------------|------------|--------|--------|------------------|
| Receiver Setup | Below 30MHz  | --         | 10kHz  | 10kHz  | --               |
|                | 30MHz ~ 1GHz | Quasi-peak | 120kHz | 300kHz | Quasi-peak Value |
|                | Above 1GHz   | Peak       | 1MHz   | 3MHz   | Peak Value       |
|                |              | RMS        | 1MHz   | 3MHz   | Average Value    |

## 6.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
7. Test Procedure of measurement (For Above 1GHz):
  - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
  - 2) Change the antenna polarization and repeat 1) with vertical polarization.
  - 3) Make a hardcopy of the spectrum.
  - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
  - 5) Change the analyser mode to Clear/ Write and found the cone of emission.
  - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
  - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
  - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
8. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

## 6.5 Summary of Test Results

### Test Frequency: 9KHz-30MHz

| Freq.<br>(MHz) | Ant.Pol.<br>H/V | Emission Level<br>(dBuV/m) | Limit 3m<br>(dBuV/m) | Over<br>(dB) |
|----------------|-----------------|----------------------------|----------------------|--------------|
| --             | --              | --                         | --                   | >20          |

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =  $40\log(\text{Specific distance} / \text{test distance})$  (dB);

Limit line = Specific limits (dBuV) + distance extrapolation factor.

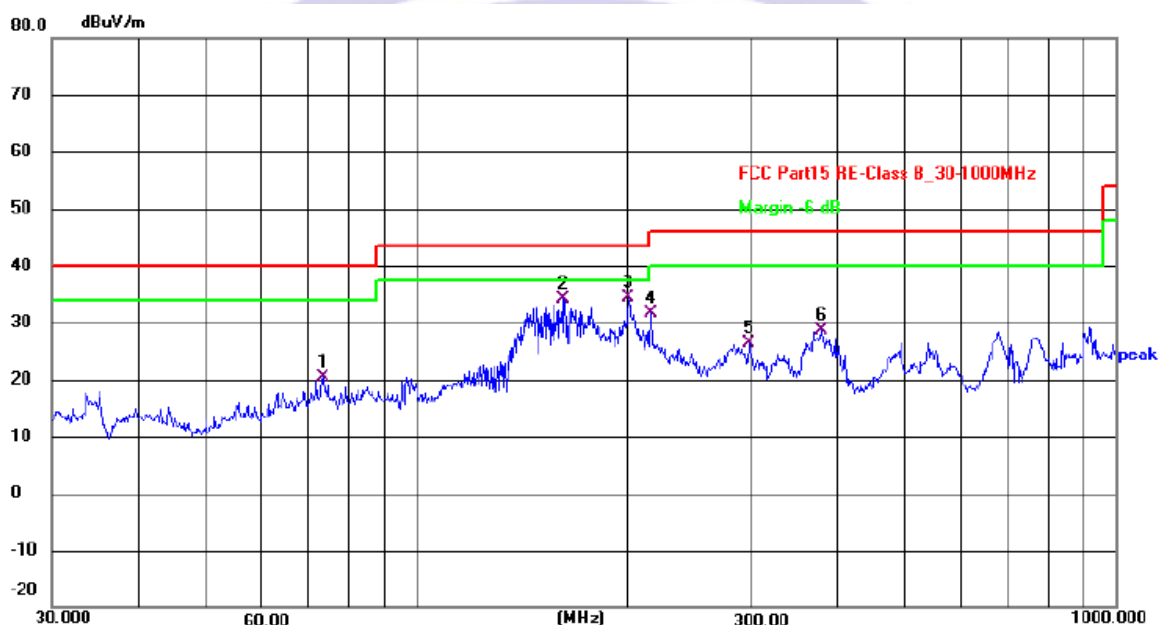
### Test Frequency: 30MHz ~ 1GHz

Pass.

Please refer to the following test plots for the worst test mode (GFSK (CH00: 2420MHz)).



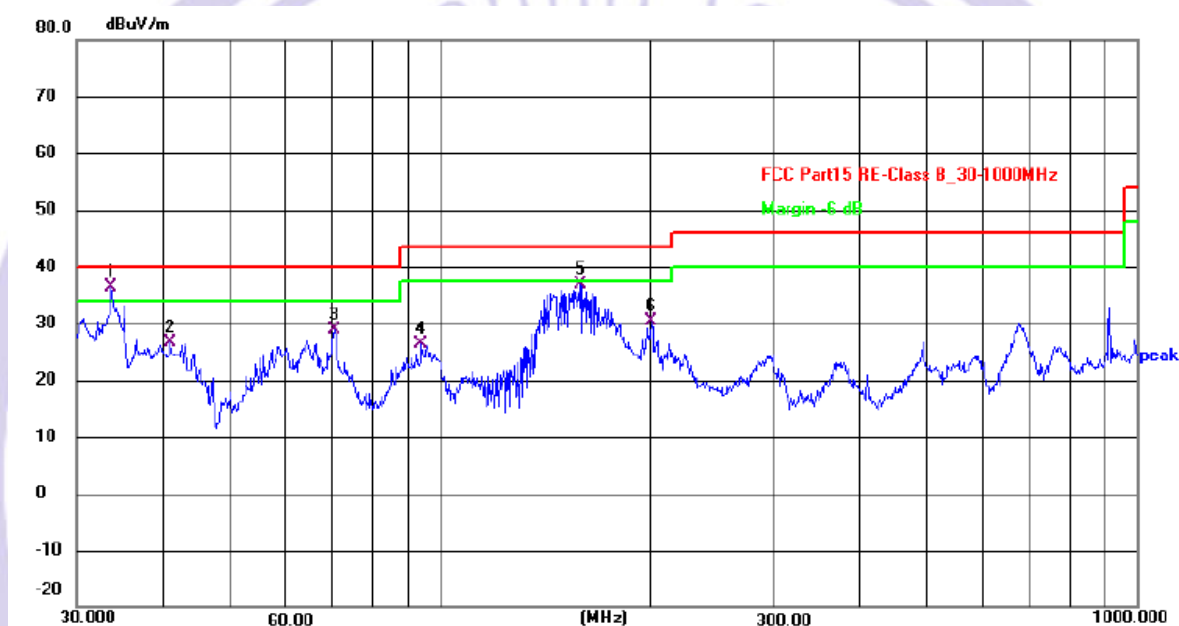
|               |         |                    |            |
|---------------|---------|--------------------|------------|
| Temperature:  | 26°C    | Relative Humidity: | 54%        |
| Pressure:     | 101 kPa | Polarization:      | Horizontal |
| Test Voltage: | DC 4.5V |                    |            |



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1   | 73.3593         | 39.16          | -18.77        | 20.39          | 40.00          | -19.61      | QP       |
| 2   | 161.4742        | 52.74          | -18.61        | 34.13          | 43.50          | -9.37       | QP       |
| 3   | 200.6881        | 50.68          | -16.42        | 34.26          | 43.50          | -9.24       | QP       |
| 4   | 216.0240        | 47.33          | -15.78        | 31.55          | 46.00          | -14.45      | QP       |
| 5   | 298.2681        | 39.78          | -13.44        | 26.34          | 46.00          | -19.66      | QP       |
| 6   | 378.5843        | 40.45          | -11.93        | 28.52          | 46.00          | -17.48      | QP       |

Remark: Emission Level = Reading + Cable Loss + ANT Factor - AMP Factor

|               |         |                    |          |
|---------------|---------|--------------------|----------|
| Temperature:  | 26°C    | Relative Humidity: | 54%      |
| Pressure:     | 101 kPa | Polarization:      | Vertical |
| Test Voltage: | DC 4.5V |                    |          |



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1   | 33.6802         | 52.63          | -16.33        | 36.30          | 40.00          | -3.70       | QP       |
| 2   | 40.9880         | 41.48          | -14.88        | 26.60          | 40.00          | -13.40      | QP       |
| 3   | 70.3365         | 47.11          | -18.17        | 28.94          | 40.00          | -11.06      | QP       |
| 4   | 93.7684         | 43.70          | -17.36        | 26.34          | 43.50          | -17.16      | QP       |
| 5   | 158.6677        | 55.57          | -18.69        | 36.88          | 43.50          | -6.62       | QP       |
| 6   | 200.6880        | 46.76          | -16.42        | 30.34          | 43.50          | -13.16      | QP       |

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

**FIELD STRENGTH CALCULATION**

| Frequency | Emission Level | Limits | Margin | Horizontal / Vertical | Detector Type |
|-----------|----------------|--------|--------|-----------------------|---------------|
| MHz       | dBμV/m         | dBμV/m | dBμV/m |                       |               |
| 2420      | 85.69          | 114    | -28.31 | H                     | PK            |
| 2420      | 73.23          | 94     | -20.77 | H                     | AV            |
| 2420      | 84.58          | 114    | -29.42 | V                     | PK            |
| 2420      | 74.19          | 94     | -19.81 | V                     | AV            |
| 2440      | 83.63          | 114    | -30.37 | H                     | PK            |
| 2440      | 75.26          | 94     | -18.74 | H                     | AV            |
| 2440      | 83.69          | 114    | -30.31 | V                     | PK            |
| 2440      | 75.12          | 94     | -18.88 | V                     | AV            |
| 2460      | 82.28          | 114    | -31.72 | H                     | PK            |
| 2460      | 70.25          | 94     | -23.75 | H                     | AV            |
| 2460      | 81.37          | 114    | -32.63 | V                     | PK            |
| 2460      | 71.15          | 94     | -22.85 | V                     | AV            |

**Test Frequency 1GHz-25GHz:**

| Polar<br>(H/V)      | Frequency<br>(MHz) | Meter<br>Reading<br>(dBuV) | Pre-<br>amplifier<br>(dB) | Cable<br>Loss<br>(dB) | Antenna<br>Factor<br>(dB) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Detector<br>Type |
|---------------------|--------------------|----------------------------|---------------------------|-----------------------|---------------------------|-------------------------------|--------------------|----------------|------------------|
| Low Channel:2420MHz |                    |                            |                           |                       |                           |                               |                    |                |                  |
| V                   | 4840.00            | 53.16                      | 34.12                     | 5.03                  | 32.39                     | 56.46                         | 74.00              | -17.54         | Pk               |
| V                   | 4840.00            | 40.11                      | 34.12                     | 5.03                  | 32.39                     | 43.41                         | 54.00              | -10.59         | AV               |
| V                   | 7260.00            | 49.96                      | 32.54                     | 6.29                  | 35.86                     | 59.57                         | 74.00              | -14.43         | Pk               |
| V                   | 7260.00            | 36.18                      | 32.54                     | 6.29                  | 35.86                     | 45.79                         | 54.00              | -8.21          | AV               |
| V                   | 9680.00            | 43.64                      | 32.98                     | 7.55                  | 38.4                      | 56.61                         | 74.00              | -17.39         | Pk               |
| V                   | 9680.00            | 32.61                      | 32.98                     | 7.55                  | 38.4                      | 45.58                         | 54.00              | -8.42          | AV               |
| V                   | 12100.00           | 42.03                      | 32.09                     | 8.93                  | 39                        | 57.87                         | 74.00              | -16.13         | Pk               |
| V                   | 12100.00           | 30.73                      | 32.09                     | 8.93                  | 39                        | 46.57                         | 54.00              | -7.43          | AV               |
| H                   | 4840.00            | 51.33                      | 34.12                     | 5.03                  | 32.39                     | 54.63                         | 74.00              | -19.37         | Pk               |
| H                   | 4840.00            | 37.61                      | 34.12                     | 5.03                  | 32.39                     | 40.91                         | 54.00              | -13.09         | AV               |
| H                   | 7260.00            | 46.08                      | 32.54                     | 6.29                  | 35.86                     | 55.69                         | 74.00              | -18.31         | Pk               |
| H                   | 7260.00            | 34.13                      | 32.54                     | 6.29                  | 35.86                     | 43.74                         | 54.00              | -10.26         | AV               |
| H                   | 9680.00            | 45.73                      | 32.98                     | 7.55                  | 38.4                      | 58.7                          | 74.00              | -15.30         | Pk               |
| H                   | 9680.00            | 31.2                       | 32.98                     | 7.55                  | 38.4                      | 44.17                         | 54.00              | -9.83          | AV               |
| H                   | 12100.00           | 41.92                      | 32.09                     | 8.93                  | 39                        | 57.76                         | 74.00              | -16.24         | Pk               |
| H                   | 12100.00           | 27.86                      | 32.09                     | 8.93                  | 39                        | 43.7                          | 54.00              | -10.30         | AV               |



| Polar<br>(H/V)         | Frequency<br>(MHz) | Meter<br>Reading<br>(dBuV) | Pre-<br>amplifier<br>(dB) | Cable<br>Loss<br>(dB) | Antenna<br>Factor<br>(dB) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Detector<br>Type |
|------------------------|--------------------|----------------------------|---------------------------|-----------------------|---------------------------|-------------------------------|--------------------|----------------|------------------|
| Middle Channel:2440MHz |                    |                            |                           |                       |                           |                               |                    |                |                  |
| V                      | 4880.00            | 53.68                      | 30.55                     | 5.77                  | 24.66                     | 53.56                         | 74.00              | -20.44         | Pk               |
| V                      | 4880.00            | 42.92                      | 30.55                     | 5.77                  | 24.66                     | 42.8                          | 54.00              | -11.2          | AV               |
| V                      | 7320.00            | 54.4                       | 30.33                     | 6.32                  | 24.55                     | 54.94                         | 74.00              | -19.06         | Pk               |
| V                      | 7320.00            | 43.87                      | 30.33                     | 6.32                  | 24.55                     | 44.41                         | 54.00              | -9.59          | AV               |
| V                      | 9760.00            | 53.98                      | 30.85                     | 7.45                  | 24.69                     | 55.27                         | 74.00              | -18.73         | Pk               |
| V                      | 9760.00            | 44.74                      | 30.85                     | 7.45                  | 24.69                     | 46.03                         | 54.00              | -7.97          | AV               |
| V                      | 12200.00           | 53.01                      | 31.02                     | 8.99                  | 25.57                     | 56.55                         | 74.00              | -17.45         | Pk               |
| V                      | 12200.00           | 43.12                      | 31.02                     | 8.99                  | 25.57                     | 46.66                         | 54.00              | -7.34          | AV               |
| H                      | 4880.00            | 52.96                      | 30.55                     | 5.77                  | 24.66                     | 52.84                         | 74.00              | -21.16         | Pk               |
| H                      | 4880.00            | 42.03                      | 30.55                     | 5.77                  | 24.66                     | 41.91                         | 54.00              | -12.09         | AV               |
| H                      | 7320.00            | 53.26                      | 30.33                     | 6.32                  | 24.55                     | 53.8                          | 74.00              | -20.2          | Pk               |
| H                      | 7320.00            | 41.86                      | 30.33                     | 6.32                  | 24.55                     | 42.4                          | 54.00              | -11.6          | AV               |
| H                      | 9760.00            | 52.66                      | 30.85                     | 7.45                  | 24.69                     | 53.95                         | 74.00              | -20.05         | Pk               |
| H                      | 9760.00            | 42.7                       | 30.85                     | 7.45                  | 24.69                     | 43.99                         | 54.00              | -10.01         | AV               |
| H                      | 12200.00           | 54.19                      | 31.02                     | 8.99                  | 25.57                     | 57.73                         | 74.00              | -16.27         | Pk               |
| H                      | 12200.00           | 41.49                      | 31.02                     | 8.99                  | 25.57                     | 45.03                         | 54.00              | -8.97          | AV               |

| Polar<br>(H/V)       | Frequency<br>(MHz) | Meter<br>Reading<br>(dBuV) | Pre-<br>amplifier<br>(dB) | Cable<br>Loss<br>(dB) | Antenna<br>Factor<br>(dB) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Detector<br>Type |
|----------------------|--------------------|----------------------------|---------------------------|-----------------------|---------------------------|-------------------------------|--------------------|----------------|------------------|
| High Channel:2460MHz |                    |                            |                           |                       |                           |                               |                    |                |                  |
| V                    | 4920.00            | 54.68                      | 30.55                     | 5.77                  | 24.66                     | 54.56                         | 74.00              | -19.44         | Pk               |
| V                    | 4920.00            | 44.06                      | 30.55                     | 5.77                  | 24.66                     | 43.94                         | 54.00              | -10.06         | AV               |
| V                    | 7380.00            | 52.72                      | 30.33                     | 6.32                  | 24.55                     | 53.26                         | 74.00              | -20.74         | Pk               |
| V                    | 7380.00            | 42.96                      | 30.33                     | 6.32                  | 24.55                     | 43.5                          | 54.00              | -10.5          | AV               |
| V                    | 9840.00            | 55.25                      | 30.85                     | 7.45                  | 24.69                     | 56.54                         | 74.00              | -17.46         | Pk               |
| V                    | 9840.00            | 43.16                      | 30.85                     | 7.45                  | 24.69                     | 44.45                         | 54.00              | -9.55          | AV               |
| V                    | 12300.00           | 55.32                      | 31.02                     | 8.99                  | 25.57                     | 58.86                         | 74.00              | -15.14         | Pk               |
| V                    | 12300.00           | 43.21                      | 31.02                     | 8.99                  | 25.57                     | 46.75                         | 54.00              | -7.25          | AV               |
| H                    | 4920.00            | 53.93                      | 30.55                     | 5.77                  | 24.66                     | 53.81                         | 74.00              | -20.19         | Pk               |
| H                    | 4920.00            | 43.91                      | 30.55                     | 5.77                  | 24.66                     | 43.79                         | 54.00              | -10.21         | AV               |
| H                    | 7380.00            | 55.21                      | 30.33                     | 6.32                  | 24.55                     | 55.75                         | 74.00              | -18.25         | Pk               |
| H                    | 7380.00            | 44.17                      | 30.33                     | 6.32                  | 24.55                     | 44.71                         | 54.00              | -9.29          | AV               |
| H                    | 9840.00            | 53.52                      | 30.85                     | 7.45                  | 24.69                     | 54.81                         | 74.00              | -19.19         | Pk               |
| H                    | 9840.00            | 42.5                       | 30.85                     | 7.45                  | 24.69                     | 43.79                         | 54.00              | -10.21         | AV               |
| H                    | 12300.00           | 53.16                      | 31.02                     | 8.99                  | 25.57                     | 56.7                          | 74.00              | -17.3          | Pk               |
| H                    | 12300.00           | 42.82                      | 31.02                     | 8.99                  | 25.57                     | 46.36                         | 54.00              | -7.64          | AV               |

Note: 1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,

Margin= Emission Level - Limit

2. If peak below the average limit, the average emission was no test.

3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

## Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

|                                                                                                                                       | Polar<br>(H/V)        | Frequency<br>(MHz) | Meter<br>Reading<br>(dBuV) | Pre-<br>amplifier<br>(dB) | Cable<br>Loss<br>(dB) | Antenna<br>Factor<br>(dB/m) | Emission<br>level<br>(dBuV/m) | Limit<br>(dBuV<br>/m) | Detec<br>tor<br>Type | Result |
|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------|----------------------------|---------------------------|-----------------------|-----------------------------|-------------------------------|-----------------------|----------------------|--------|
| GFSK                                                                                                                                  | Low Channel: 2420MHz  |                    |                            |                           |                       |                             |                               |                       |                      |        |
|                                                                                                                                       | H                     | 2390.00            | 58.28                      | 35.17                     | 3.48                  | 27.49                       | 54.08                         | 74.00                 | PK                   | PASS   |
|                                                                                                                                       | H                     | 2390.00            | 50.86                      | 35.17                     | 3.48                  | 27.49                       | 46.66                         | 54.00                 | AV                   | PASS   |
|                                                                                                                                       | H                     | 2400.00            | 61.65                      | 35.16                     | 3.49                  | 27.52                       | 57.5                          | 74.00                 | PK                   | PASS   |
|                                                                                                                                       | H                     | 2400.00            | 50.86                      | 35.16                     | 3.49                  | 27.52                       | 46.71                         | 54.00                 | AV                   | PASS   |
|                                                                                                                                       | V                     | 2390.00            | 59.6                       | 35.17                     | 3.48                  | 27.49                       | 55.4                          | 74.00                 | PK                   | PASS   |
|                                                                                                                                       | V                     | 2390.00            | 51.98                      | 35.17                     | 3.48                  | 27.49                       | 47.78                         | 54.00                 | AV                   | PASS   |
|                                                                                                                                       | V                     | 2400.00            | 60.58                      | 35.16                     | 3.49                  | 27.52                       | 56.43                         | 74.00                 | PK                   | PASS   |
|                                                                                                                                       | V                     | 2400.00            | 50.95                      | 35.16                     | 3.49                  | 27.52                       | 46.8                          | 54.00                 | AV                   | PASS   |
|                                                                                                                                       | High Channel: 2460MHz |                    |                            |                           |                       |                             |                               |                       |                      |        |
|                                                                                                                                       | H                     | 2483.50            | 58.48                      | 35.11                     | 3.56                  | 27.75                       | 54.68                         | 74.00                 | PK                   | PASS   |
|                                                                                                                                       | H                     | 2483.50            | 50.58                      | 35.11                     | 3.56                  | 27.75                       | 46.78                         | 54.00                 | AV                   | PASS   |
|                                                                                                                                       | H                     | 2500.00            | 59.82                      | 35.1                      | 3.57                  | 27.8                        | 56.09                         | 74.00                 | PK                   | PASS   |
|                                                                                                                                       | H                     | 2500.00            | 49.87                      | 35.1                      | 3.57                  | 27.8                        | 46.14                         | 54.00                 | AV                   | PASS   |
|                                                                                                                                       | V                     | 2483.50            | 59.12                      | 35.11                     | 3.56                  | 27.75                       | 55.32                         | 74.00                 | PK                   | PASS   |
|                                                                                                                                       | V                     | 2483.50            | 51.45                      | 35.11                     | 3.56                  | 27.75                       | 47.65                         | 54.00                 | AV                   | PASS   |
|                                                                                                                                       | V                     | 2500.00            | 58.52                      | 35.1                      | 3.57                  | 27.8                        | 54.79                         | 74.00                 | PK                   | PASS   |
|                                                                                                                                       | V                     | 2500.00            | 51.34                      | 35.1                      | 3.57                  | 27.8                        | 47.61                         | 54.00                 | AV                   | PASS   |
| Remark:                                                                                                                               |                       |                    |                            |                           |                       |                             |                               |                       |                      |        |
| 1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit                       |                       |                    |                            |                           |                       |                             |                               |                       |                      |        |
| 2. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported. |                       |                    |                            |                           |                       |                             |                               |                       |                      |        |



## 7 20dB Bandwidth Measurement

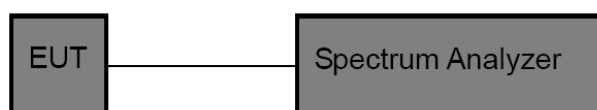
Test Requirement : FCC CFR47 Part 15 Section 15.249

Test Method : ANSI C63.10:2020

Test Limit

| Section | Test Item |
|---------|-----------|
| 15.249  | Bandwidth |

### 7.1 Test Setup



### 7.2 Test Procedure

1. Set RBW = 30 kHz.
2. Set the video bandwidth (VBW)  $\geq$  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 20 dB relative to the maximum level measured in the fundamental emission.

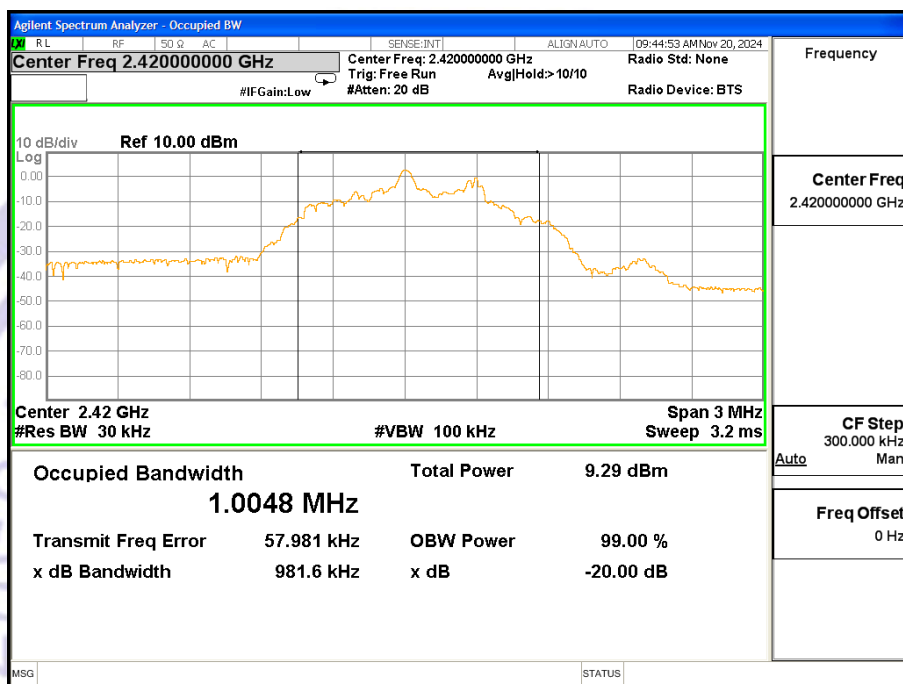
### 7.3 Test Result

| Channel number | Channel frequency (MHz) | -20dB Occupy Bandwidth (MHz) | Limit -20 dB Bandwidth (MHz) | Result |
|----------------|-------------------------|------------------------------|------------------------------|--------|
| 00             | 2402                    | 0.981                        | /                            | Pass   |
| 20             | 2440                    | 1.019                        | /                            | Pass   |
| 40             | 2480                    | 1.050                        | /                            | Pass   |

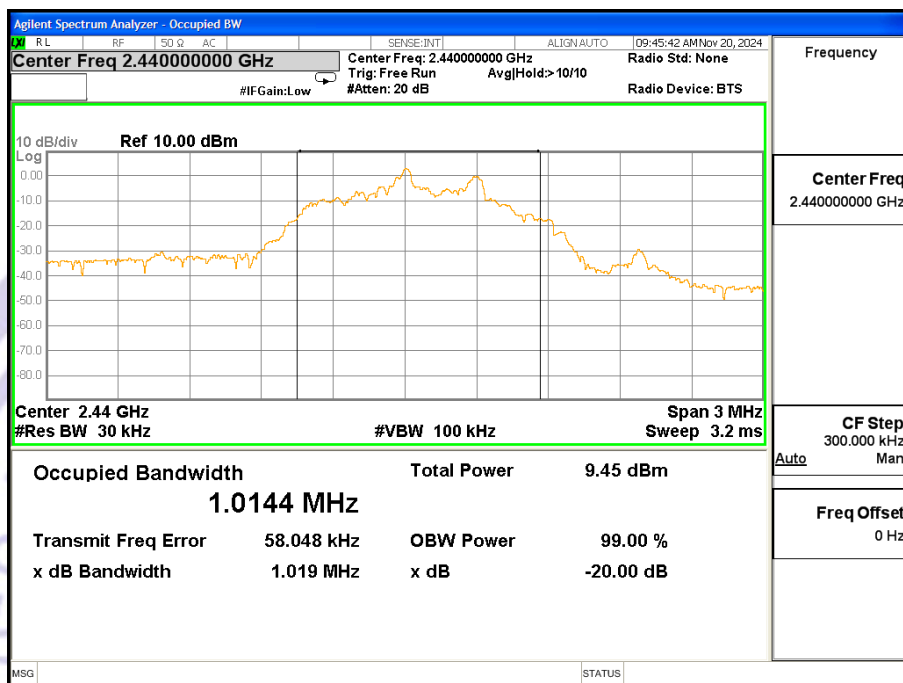


-20dB Occupy Bandwidth

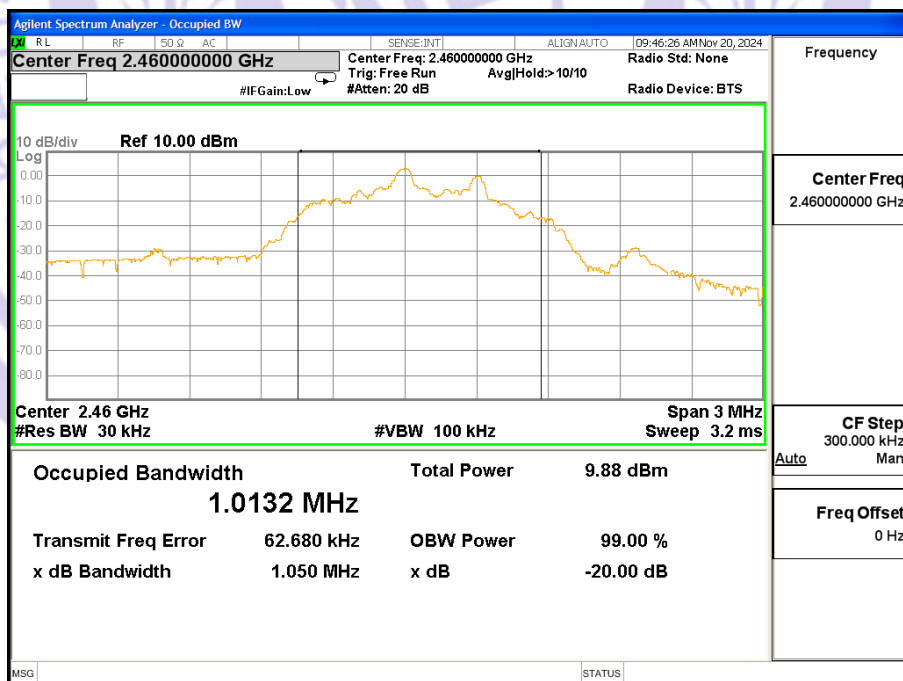
CH00



## CH20



## CH40



## **8 Antenna Application**

### **8.1 Antenna Requirement**

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.

### **8.2 Result**

The antenna is Internal Antenna, the best case gain of the antennas is 0.17dBi, reference to the attachment for details.

## 9 Test Setup Photos and EUT Photos

Please see the attachment for details.

\*\*\*\*\*THE END REPORT\*\*\*\*\*

