



## 1 Cover Page

# RF TEST REPORT

**Application No.:** SHEM2004003221CR  
**FCC ID:** 2APRA220001  
**Applicant:** PAI TECHNOLOGY LIMITED  
**Address of Applicant:** Room H, 18/F, Ning Jin Centre, 7 Cheng Yip Street, Kwun Tong, Kowloon, Hong Kong

**Equipment Under Test (EUT):**  
**EUT Name:** Remote control  
**Model No.:** 220001  
**Standard(s) :** FCC PART 15 Subpart C  
**Date of Receipt:** 2020-04-28  
**Date of Test:** 2020-05-06 to 2020-05-18  
**Date of Issue:** 2020-05-20

|                     |              |
|---------------------|--------------|
| <b>Test Result:</b> | <b>Pass*</b> |
|---------------------|--------------|

\* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan

Parlam Zhan  
E&E Section Manager

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SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.  
Testing Center EMC Lab (Shanghai)

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| Revision Record |             |            |        |
|-----------------|-------------|------------|--------|
| Version         | Description | Date       | Remark |
| 00              | Original    | 2020-05-20 | /      |
|                 |             |            |        |
|                 |             |            |        |

|                             |  |                            |  |  |
|-----------------------------|--|----------------------------|--|--|
| Authorized for issue<br>by: |  |                            |  |  |
|                             |  | Bill Wu                    |  |  |
|                             |  | Bill Wu / Project Engineer |  |  |
|                             |  | Parlam Zhan                |  |  |
|                             |  | Parlam Zhan /Reviewer      |  |  |



## 2 Test Summary

| Test Item                                                                               | Test Requirement                                            | Test method                                       | Result |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------|--------|
| Antenna Requirement                                                                     | FCC Part 15, Subpart C Section 15.203                       | ---                                               | PASS   |
| AC Power Line Conducted Emission                                                        | FCC Part 15, Subpart C Section 15.207                       | ANSI C63.10 (2013) Section 6.2                    | N/A    |
| Field Strength of the Fundamental Signal                                                | FCC Part 15, Subpart C Section 15.249 (a)                   | ANSI C63.10 (2013) Section 6.6                    | PASS   |
| Radiated Spurious Emissions and Band-edge                                               | FCC Part 15, Subpart C Section 15.249 (a) & 15.209 & 15.205 | ANSI C63.10 (2013) Section 6.4 & 6.5 & 6.6 & 6.10 | PASS   |
| 20dB Bandwidth                                                                          | FCC Part 15, Subpart C Section 15.215 (c)                   | ANSI C63.10 (2013) Section 6.9.2                  | PASS   |
| Remark:<br>N/A: Not Applicable. Please refer to Section 6.3 of this report for details. |                                                             |                                                   |        |



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## 4 General Information

### 4.1 Details of E.U.T.

|                    |                                    |
|--------------------|------------------------------------|
| Power supply:      | DC 3V By 2*AA size batteries       |
| Test voltage:      | DC 3V                              |
| Modulation Type    | GFSK                               |
| Number of Channels | 4                                  |
| Antenna Type       | Integral Antenna                   |
| Antenna Gain       | 0 dBi                              |
| Channel List       | 2419MHz, 2434MHz, 2449MHz, 2464MHz |

### 4.2 Description of Support Units

The EUT has been tested independently.

### 4.3 Test Mode

| Test Mode | Description of Test Mode                           |
|-----------|----------------------------------------------------|
| TX mode   | Keep the EUT in transmitting with modulation mode. |



#### 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shanghai Branch

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China.

Tel: +86 21 6191 5666

Fax: +86 21 6191 5678

#### 4.5 Test Facility

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

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **NVLAP (LAB CODE: 201034-0)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

- **FCC (Designation Number: CN5033)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

- **ISED (CAB Identifier: CN0020)**

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- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.



#### 4.6 Measurement Uncertainty

| No. | Item                            | Measurement Uncertainty   |
|-----|---------------------------------|---------------------------|
| 1   | Radio Frequency                 | $\pm 8.4 \times 10^{-8}$  |
| 2   | Timeout                         | $\pm 2s$                  |
| 3   | Duty cycle                      | $\pm 0.37\%$              |
| 4   | Occupied Bandwidth              | $\pm 3\%$                 |
| 5   | RF conducted power              | $\pm 0.6dB$               |
| 6   | RF power density                | $\pm 2.84dB$              |
| 7   | Conducted Spurious emissions    | $\pm 0.75dB$              |
| 8   | RF Radiated power               | $\pm 4.6dB$ (Below 1GHz)  |
|     |                                 | $\pm 4.1dB$ (Above 1GHz)  |
| 9   | Radiated Spurious emission test | $\pm 4.2dB$ (Below 30MHz) |
|     |                                 | $\pm 4.4dB$ (30MHz-1GHz)  |
|     |                                 | $\pm 4.8dB$ (1GHz-18GHz)  |
|     |                                 | $\pm 5.2dB$ (Above 18GHz) |
| 10  | Temperature test                | $\pm 1^{\circ}C$          |
| 11  | Humidity test                   | $\pm 3\%$                 |
| 12  | Supply voltages                 | $\pm 1.5\%$               |
| 13  | Time                            | $\pm 3\%$                 |

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



## 5 Equipments Used during Test

| Equipment                 | Manufacturer | Model No         | Inventory No | Cal Date   | Cal Due Date |
|---------------------------|--------------|------------------|--------------|------------|--------------|
| <b>RF Conducted Test</b>  |              |                  |              |            |              |
| Spectrum Analyzer         | R&S          | FSP-30           | SHEM002-1    | 2019-12-20 | 2020-12-19   |
| Spectrum Analyzer         | Agilent      | N9020A           | SHEM181-1    | 2019-08-13 | 2020-08-12   |
| Signal Generator          | R&S          | SMR20            | SHEM006-1    | 2019-08-13 | 2020-08-12   |
| Signal Generator          | Agilent      | N5182A           | SHEM182-1    | 2019-08-13 | 2020-08-12   |
| Communication Tester      | R&S          | CMW270           | SHEM183-1    | 2019-08-13 | 2020-08-12   |
| Switcher                  | Tonscend     | JS0806           | SHEM184-1    | 2019-08-13 | 2020-08-12   |
| Power Sensor              | Keysight     | U2021XA * 4      | SHEM184-1    | 2019-08-13 | 2020-08-12   |
| Splitter                  | Anritsu      | MA1612A          | SHEM185-1    | /          | /            |
| Coupler                   | e-meca       | 803-S-1          | SHEM186-1    | /          | /            |
| High-low Temp Cabinet     | Suzhou Zhihe | TL-40            | SHEM087-1    | 2017-09-25 | 2020-09-24   |
| AC Power Stabilizer       | APC          | KDF-31020T-V0-F0 | SHEM216-1    | 2019-12-20 | 2020-12-19   |
| DC Power Supply           | MCH          | MCH-303A         | SHEM210-1    | 2019-12-20 | 2020-12-19   |
| Conducted test Cable      | /            | RF01~RF04        | /            | 2019-12-20 | 2020-12-19   |
| <b>RF Radiated Test</b>   |              |                  |              |            |              |
| EMI test Receiver         | R&S          | ESU40            | SHEM051-1    | 2019-12-20 | 2020-12-19   |
| Spectrum Analyzer         | R&S          | FSP-30           | SHEM002-1    | 2019-12-20 | 2020-12-19   |
| Loop Antenna (9kHz-30MHz) | Schwarzbeck  | FMZB1519         | SHEM135-1    | 2019-12-20 | 2020-12-19   |
| Antenna (25MHz-2GHz)      | Schwarzbeck  | VULB9168         | SHEM048-1    | 2019-10-14 | 2021-10-13   |
| Antenna (25MHz-2GHz)      | Schwarzbeck  | VULB9168         | SHEM202-1    | 2019-04-30 | 2021-04-29   |
| Horn Antenna (1-18GHz)    | Schwarzbeck  | HF906            | SHEM009-1    | 2017-10-24 | 2020-10-23   |
| Horn Antenna (1-18GHz)    | Schwarzbeck  | BBHA9120D        | SHEM050-1    | 2019-10-14 | 2021-10-13   |
| Horn Antenna (14-40GHz)   | Schwarzbeck  | BBHA 9170        | SHEM049-1    | 2017-10-31 | 2020-10-30   |
| Pre-amplifier (9KHz-2GHz) | CLAVIIO      | BDLNA-0001       | SHEM164-1    | 2019-08-13 | 2020-08-12   |
| Pre-amplifier (1-18GHz)   | CLAVIIO      | BDLNA-0118       | SHEM050-2    | 2019-08-13 | 2020-08-12   |
| High-amplifier (14-40GHz) | Schwarzbeck  | 10001            | SHEM049-2    | 2019-12-20 | 2020-12-19   |
| Signal Generator          | R&S          | SMR40            | SHEM058-1    | 2019-08-13 | 2020-08-12   |
| Band Filter               | LORCH        | 9BRX-875/X150    | SHEM156-1    | /          | /            |
| Band Filter               | LORCH        | 13BRX-1950/X500  | SHEM083-2    | /          | /            |
| Band Filter               | LORCH        | 5BRX-2400/X200   | SHEM155-1    | /          | /            |
| Band Filter               | LORCH        | 5BRX-5500/X1000  | SHEM157-2    | /          | /            |
| High pass Filter          | Wainwright   | WHK3.0/18G       | SHEM157-1    | /          | /            |
| High pass Filter          | Wainwright   | WHKS1700         | SHEM157-3    | /          | /            |
| Semi/Fully Anechoic       | ST           | 11*6*6M          | SHEM078-2    | 2017-07-22 | 2020-07-21   |
| RE test Cable             | /            | RE01, RE02, RE06 | /            | 2019-12-20 | 2020-12-19   |



## 6 Test Results

### 6.1 E.U.T. test conditions

**Requirements:** 15.31(e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

|                               |                       |               |
|-------------------------------|-----------------------|---------------|
| <b>Operating Environment:</b> | Temperature:          | 20.0 -25.0 °C |
|                               | Humidity:             | 35-75 % RH    |
|                               | Atmospheric Pressure: | 99.2 -102kPa  |

**Test frequencies:** According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

| Frequency range over which device operates | Number of frequencies | Location in the range of operation          |
|--------------------------------------------|-----------------------|---------------------------------------------|
| 1 MHz or less                              | 1                     | Middle                                      |
| 1 to 10 MHz                                | 2                     | 1 near top and 1 near bottom                |
| More than 10 MHz                           | 3                     | 1 near top, 1 near middle and 1 near bottom |

Pursuant to Part 15.31(c) For swept frequency equipment, measurements shall be made with the frequency sweep stopped at those frequencies chosen for the measurements to be reported.

Test frequency is 2419MHz, 2434MHz, 2464MHz



## **6.2 Antenna Requirement**

### **Standard 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

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **EUT Antenna:**

The antenna is integral antenna. The gain of the antenna is less than 0 dBi.

Antenna location: Refer to Appendix (Internal Photos)

### 6.3 Conducted Emissions on Mains Terminals

**Frequency Range:** 150 KHz to 30 MHz

**Class/Severity:** Class B

**Limit:**

| Frequency range<br>MHz | Class B Limits: dB (μV) |          |
|------------------------|-------------------------|----------|
|                        | Quasi-peak              | Average  |
| 0.15 to 0.50           | 66 to 56                | 56 to 46 |
| 0.50 to 5              | 56                      | 46       |
| 5 to 30                | 60                      | 50       |

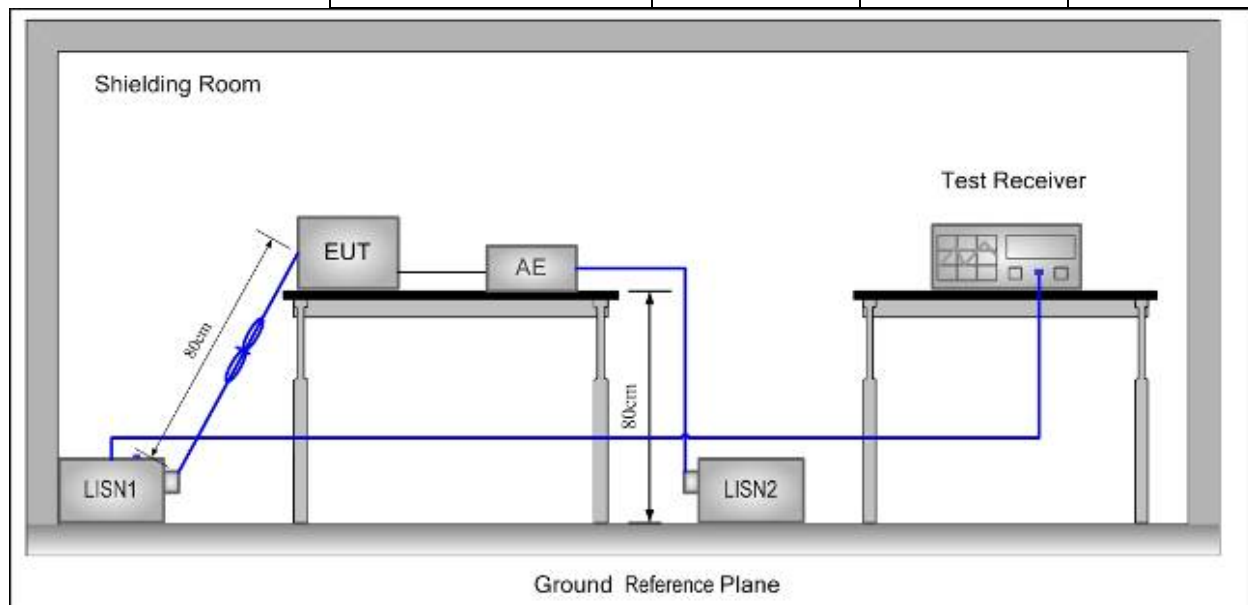
Note1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50MHz.

Note2: The lower limit is applicable at the transition frequency.

**Test site/setup:**

Test instrumentation set-up:

| Frequency Range | Detector   | RBW   | VBW   |
|-----------------|------------|-------|-------|
| 9KHz to 150Hz   | Quasi-peak | 200Hz | 500Hz |
| 150KHz to 30MHz | Quasi-peak | 9kHz  | 30kHz |



#### Test Procedure:

1. The mains terminal disturbance voltage was measured with the EUT in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN, which was bonded to the ground reference plane in the same way as the LISN for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded
3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4



m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance was between the closest points of the LISN and the EUT. The mains lead of EUT excess 0.8m was folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 0.3m and 0.4m. All other units of the EUT and associated equipment were at least 0.8 m from the LISN.

Remark: Pre-scan was performed with peak detected on all ports, Quasi-peak & average measurements were performed at the frequencies at which maximum peak emission level were detected. Please see the attached Quasi-peak and Average test results.

**Test Result:** N/A

Test Data:

Note: This EUT is powered by battery only; therefore the AC Conducted Emission test is not applicable.

## 6.4 Field Strength of the Fundamental Signal

Test Site: Measurement Distance: 3m

Receiver Setup:

| Frequency  | Detector | RBW  | VBW  | Remark  |
|------------|----------|------|------|---------|
| Above 1GHz | Peak     | 1MHz | 3MHz | Peak    |
|            | Peak     | 1MHz | 10Hz | Average |

Limit:

| Frequency       | Limit (dBuV/m) | Remark  |
|-----------------|----------------|---------|
| 2400-2483.5 MHz | 114            | Peak    |
|                 | 94             | Average |

Test Setup:

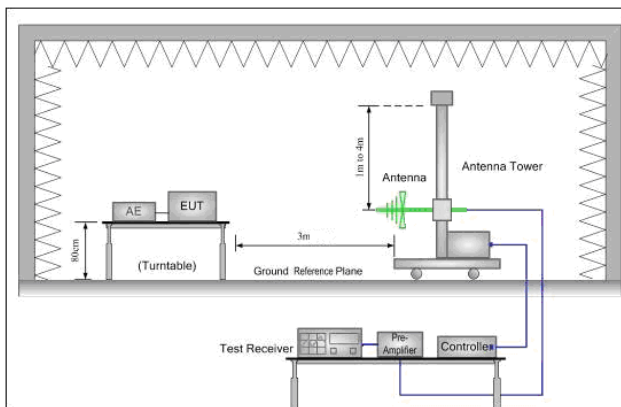


Figure 1. 30MHz to 1GHz

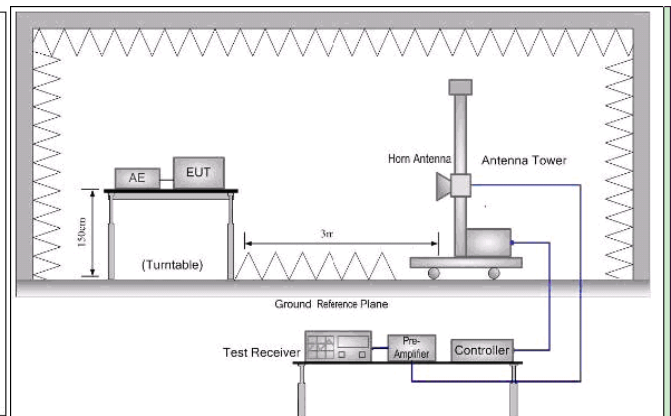


Figure 2. Above 1 GHz

Test Procedure:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- Repeat above procedures until all frequencies measured was complete.

Test Results:

Pass



Measurement Data

Peak value:

| Frequency (MHz) | Read Level (dBUV) | Factor (dB/m) | Level (dBUV/m) | Limit Line (dBUV/m) | Over Limit (dB) | Detector | Polarization |
|-----------------|-------------------|---------------|----------------|---------------------|-----------------|----------|--------------|
| 2419            | 82.89             | -8.31         | 74.58          | 94                  | -19.42          | Peak     | Horizontal   |
|                 | 86.85             | -8.31         | 78.54          | 94                  | -15.46          | Peak     | Vertical     |

| Frequency (MHz) | Read Level (dBUV) | Factor (dB/m) | Level (dBUV/m) | Limit Line (dBUV/m) | Over Limit (dB) | Detector | Polarization |
|-----------------|-------------------|---------------|----------------|---------------------|-----------------|----------|--------------|
| 2434            | 83.65             | -8.22         | 75.43          | 94                  | -18.57          | Peak     | Horizontal   |
|                 | 87.41             | -8.22         | 79.19          | 94                  | -14.81          | Peak     | Vertical     |

| Frequency (MHz) | Read Level (dBUV) | Factor (dB/m) | Level (dBUV/m) | Limit Line (dBUV/m) | Over Limit (dB) | Detector | Polarization |
|-----------------|-------------------|---------------|----------------|---------------------|-----------------|----------|--------------|
| 2464            | 82.32             | -8.14         | 74.18          | 94                  | -19.82          | Peak     | Horizontal   |
|                 | 86.9              | -8.14         | 78.76          | 94                  | -15.24          | Peak     | Vertical     |

Remark:

- 1) The basic equation with a sample calculation is as follows:  $\text{Level} = \text{Read Level} + \text{Factor}$ .  
(The Factor is calculated by adding the Antenna Factor, Cable Loss and Preamp Factor)
- 2) If the Peak value below the Average Limit, the Average test doesn't perform for this submission.

## 6.5 Radiated Spurious Emissions and Band-edge

**Frequency Range:** 9KHz to 25GHz

**Test site/setup:** Measurement Distance: 3m  
Test instrumentation set-up:

| Frequency Range   | Detector   | RBW      | VBW      |
|-------------------|------------|----------|----------|
| 0.009MHz-0.090MHz | Peak       | 10kHz    | 30kHz    |
| 0.009MHz-0.090MHz | Average    | 10kHz    | 30kHz    |
| 0.090MHz-0.110MHz | Quasi-peak | 10kHz    | 30kHz    |
| 0.110MHz-0.490MHz | Peak       | 10kHz    | 30kHz    |
| 0.110MHz-0.490MHz | Average    | 10kHz    | 30kHz    |
| 0.490MHz -30MHz   | Quasi-peak | 10kHz    | 30kHz    |
| 30MHz-1GHz        | Quasi-peak | 100kHz   | 300kHz   |
| Above 1GHz        | Peak       | RBW=1MHz | VBW≥RBW  |
|                   | Average    |          | VBW=10Hz |

Sweep=Auto

**15.209 Limit:**

| Frequency         | Field strength (microvolt/meter) | Limit (dBuV/m) |
|-------------------|----------------------------------|----------------|
| 0.009MHz-0.490MHz | 2400/F(KHz)                      | 128.5 ~ 93.8   |
| 0.490MHz-1.705MHz | 24000/F(KHz)                     | 73.8 ~63.0     |
| 1.705MHz-30MHz    | 30                               | 69.5           |
| 30MHz-88MHz       | 100                              | 40.0           |
| 88MHz-216MHz      | 150                              | 43.5           |
| 216MHz-960MHz     | 200                              | 46.0           |
| 960MHz-1GHz       | 500                              | 54.0           |
| Above 1GHz        | 500                              | 54.0           |

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

**Test Configuration:** Receive antenna scan height 1 m - 4 m. polarization Vertical / Horizontal

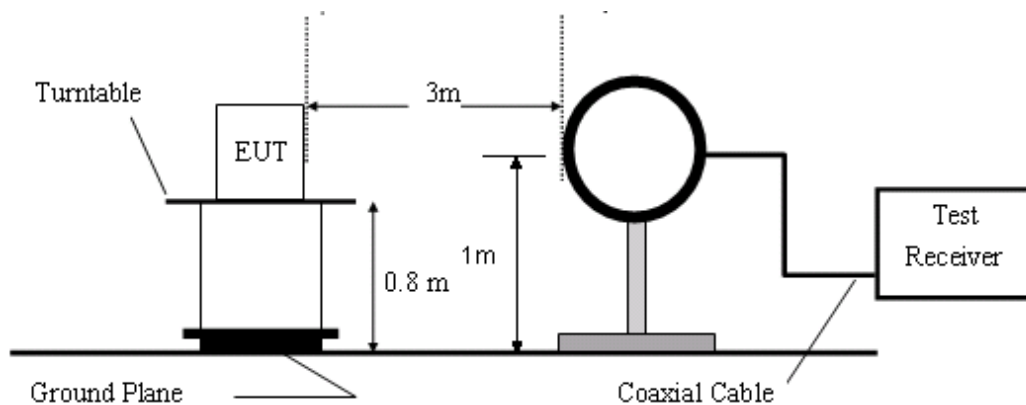


Figure1. Blow 30MHz radiated emissions test configuration

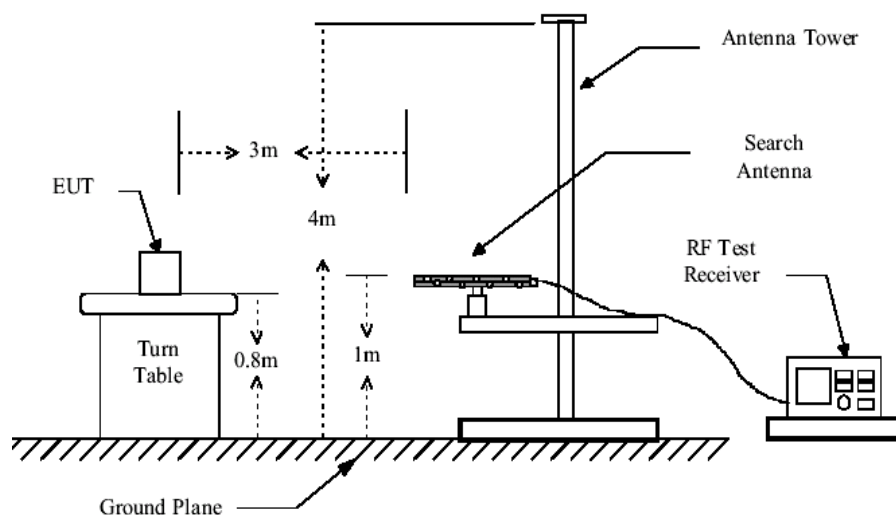


Figure2. 30MHz to 1GHz radiated emissions test configuration

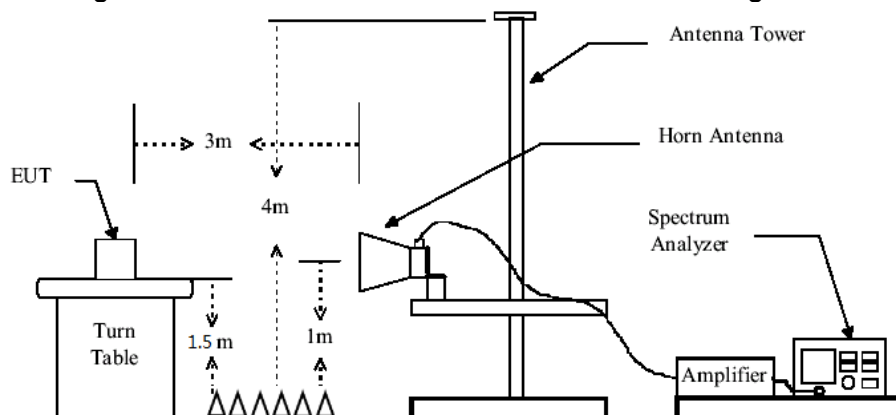


Figure3. Above 1GHz radiated emissions test configuration





**Test Procedure:**

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

**Remark:**

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
- 3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown

**Test Result:**

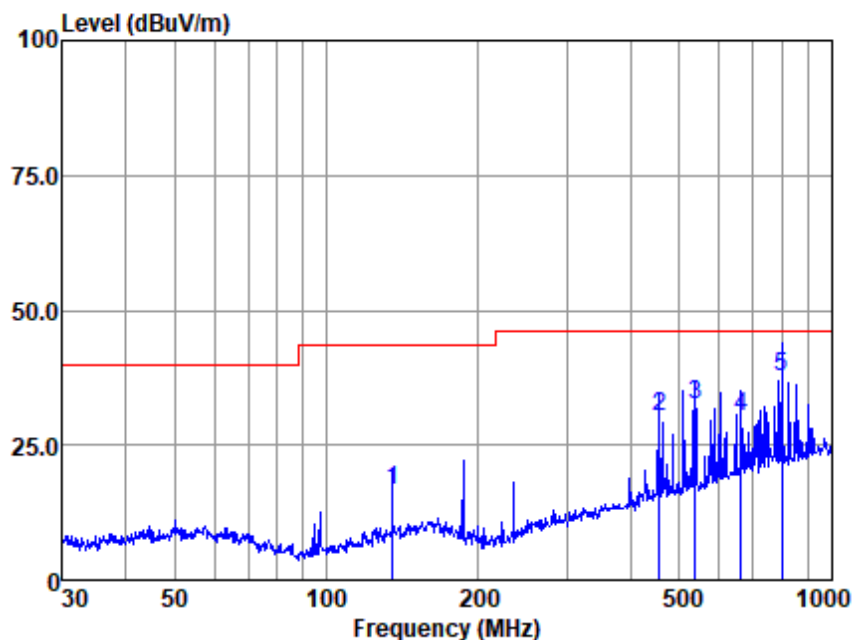
Pass



### 6.5.1 Radiated Spurious Emissions

30MHz-1GHz:

Mode:a; Polarization:Horizontal



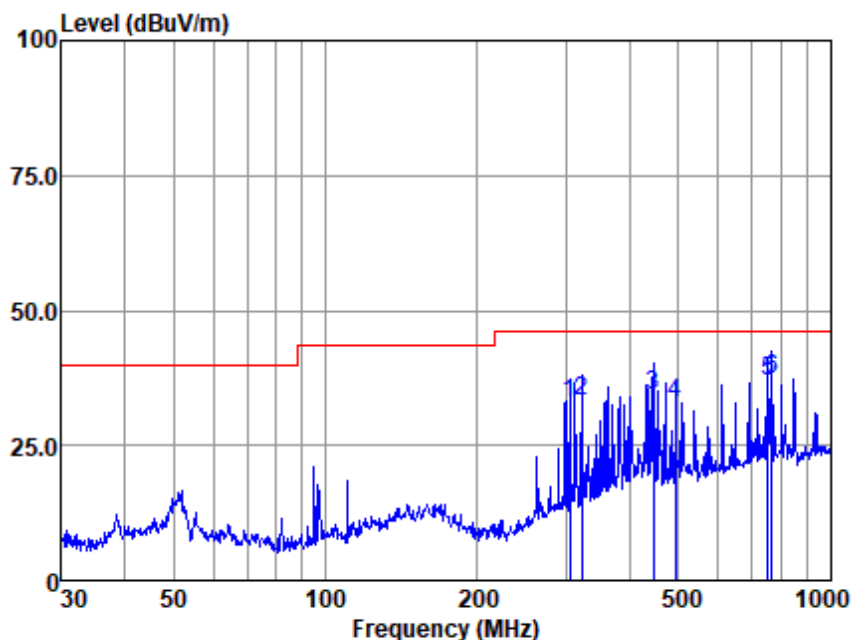
Antenna Polarity :HORIZONTAL  
EUT/Project :3361CR  
Test mode :a

|   | Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
|   | MHz     | dBuV       | dB/m           | dB         | dB            | dBuV/m         | dBuV/m     | dB         |        |
| 1 | 135.032 | 45.22      | 12.17          | 1.61       | 42.25         | 16.75          | 43.50      | -26.75     | QP     |
| 2 | 455.906 | 52.18      | 16.98          | 2.81       | 41.75         | 30.22          | 46.00      | -15.78     | QP     |
| 3 | 537.589 | 53.04      | 18.15          | 3.02       | 41.68         | 32.53          | 46.00      | -13.47     | QP     |
| 4 | 663.473 | 48.14      | 20.44          | 3.39       | 41.73         | 30.24          | 46.00      | -15.76     | QP     |
| 5 | 796.183 | 53.83      | 22.29          | 3.69       | 41.99         | 37.82          | 46.00      | -8.18      | QP     |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Mode:a; Polarization:Vertical



Antenna Polarity :VERTICAL  
EUT/Project :3361CR  
Test mode :a

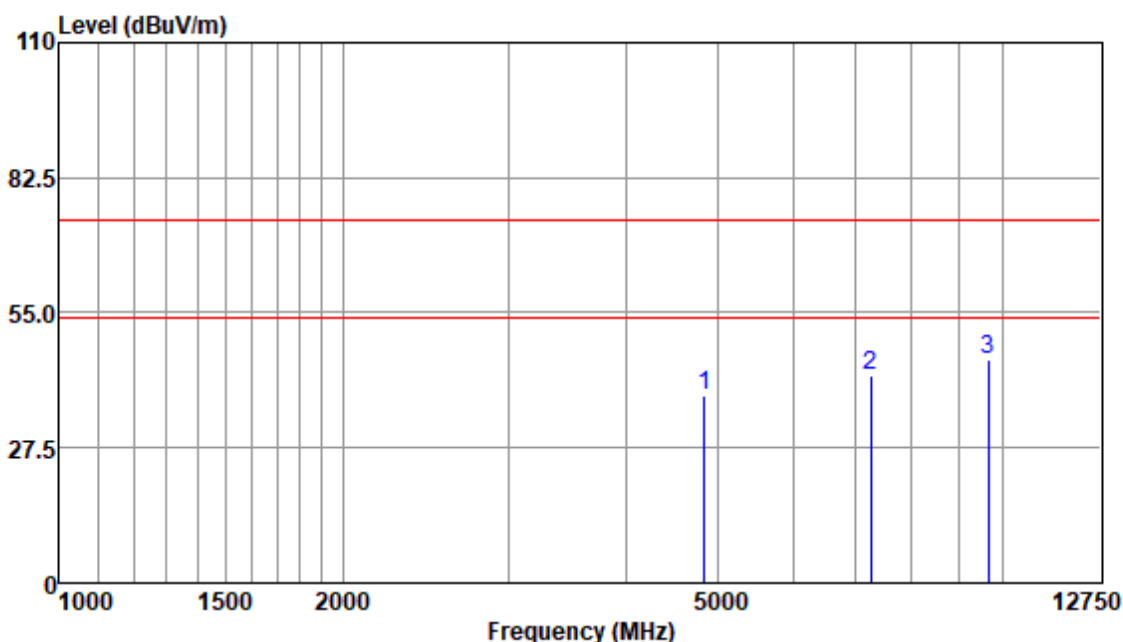
|   | Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
|   | MHz     | dBuV       | dB/m           | dB         | dB            | dBuV/m         | dBuV/m     | dB         |        |
| 1 | 304.610 | 59.11      | 13.43          | 2.40       | 42.09         | 32.85          | 46.00      | -13.15     | QP     |
| 2 | 322.189 | 58.80      | 13.94          | 2.46       | 42.03         | 33.17          | 46.00      | -12.83     | QP     |
| 3 | 446.414 | 56.53      | 16.82          | 2.78       | 41.76         | 34.37          | 46.00      | -11.63     | QP     |
| 4 | 494.199 | 54.03      | 17.59          | 2.88       | 41.70         | 32.80          | 46.00      | -13.20     | QP     |
| 5 | 752.743 | 53.21      | 22.11          | 3.59       | 41.99         | 36.92          | 46.00      | -9.08      | QP     |
| 6 | 766.057 | 53.60      | 22.17          | 3.63       | 41.99         | 37.41          | 46.00      | -8.59      | QP     |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Above 1GHz:

Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



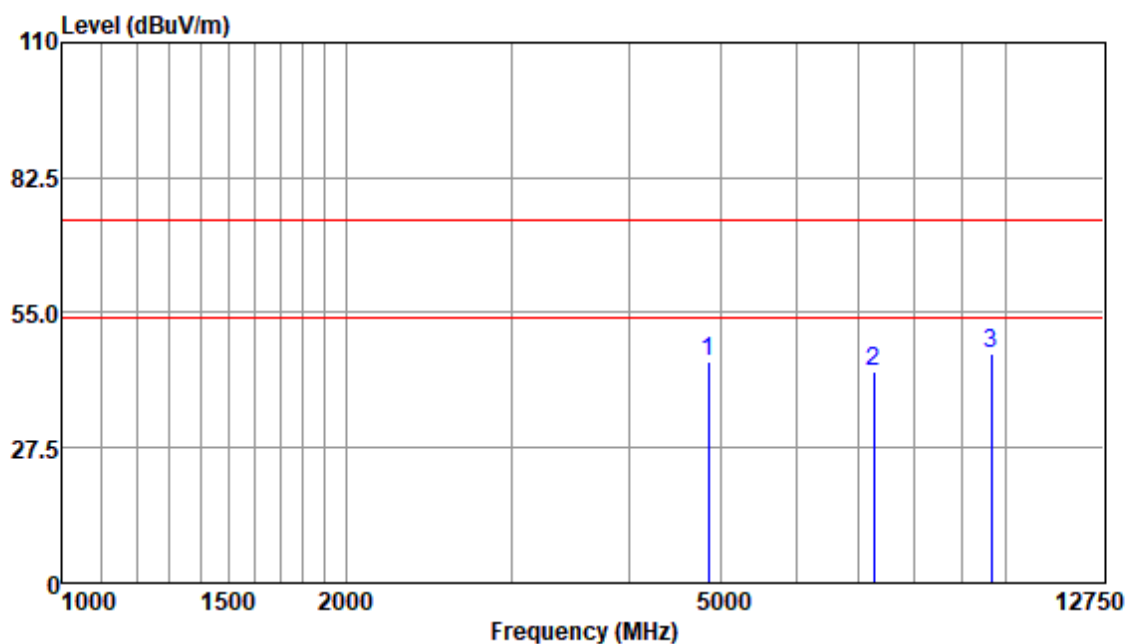
Antenna Polarity :HORIZONTAL

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
| MHz     | dBuv       | dB/m           | dB         | dB            | dBuv/m         | dBuv/m     | dB         |        |
| 4838.00 | 40.85      | 30.95          | 4.89       | 38.74         | 37.95          | 74.00      | -36.05     | Peak   |
| 7257.00 | 40.05      | 33.42          | 5.78       | 37.14         | 42.11          | 74.00      | -31.89     | Peak   |
| 9676.00 | 37.83      | 35.13          | 6.59       | 34.17         | 45.38          | 74.00      | -28.62     | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



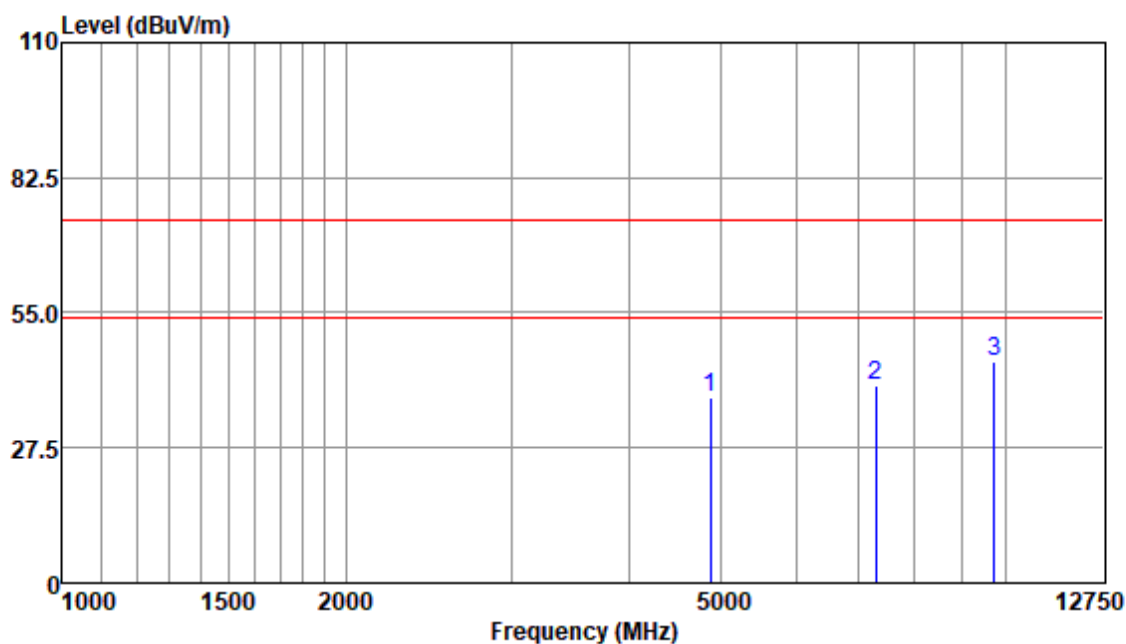
Antenna Polarity :VERTICAL

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
| MHz     | dBuv       | dB/m           | dB         | dB            | dBuv/m         | dBuv/m     | dB         |        |
| 4846.37 | 47.99      | 30.98          | 4.77       | 38.74         | 45.00          | 74.00      | -29.00     | Peak   |
| 7257.00 | 40.96      | 33.42          | 5.78       | 37.14         | 43.02          | 74.00      | -30.98     | Peak   |
| 9676.00 | 39.25      | 35.13          | 6.59       | 34.17         | 46.80          | 74.00      | -27.20     | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle



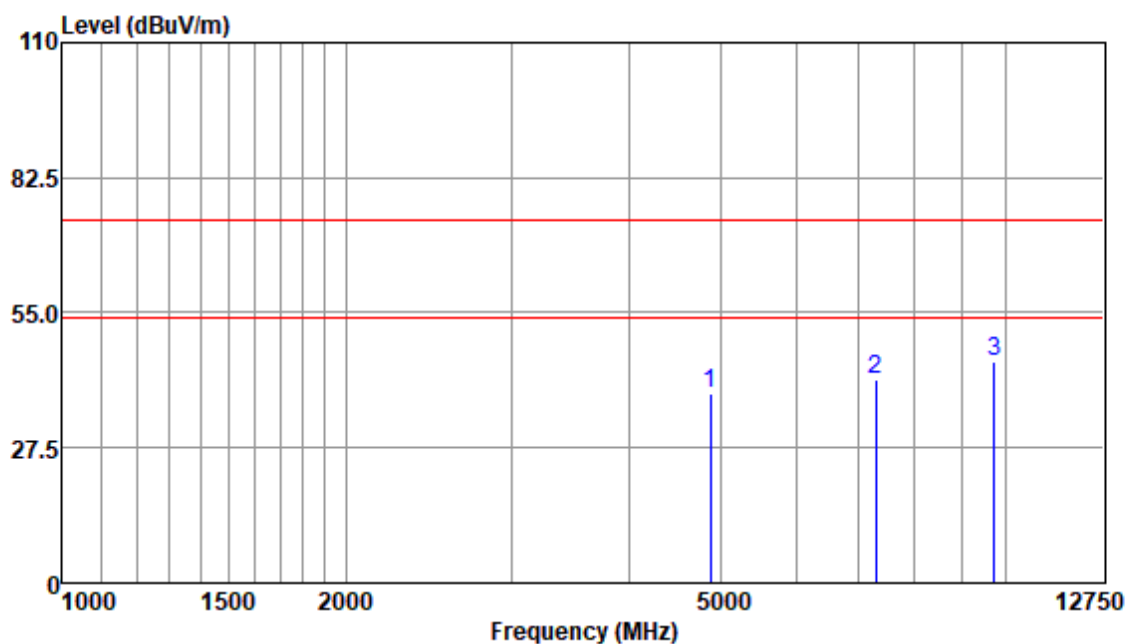
Antenna Polarity :HORIZONTAL

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
| MHz     | dBuv       | dB/m           | dB         | dB            | dBuv/m         | dBuv/m     | dB         |        |
| 4868.00 | 40.63      | 31.06          | 4.65       | 38.78         | 37.56          | 74.00      | -36.44     | Peak   |
| 7302.00 | 38.16      | 33.47          | 5.80       | 37.11         | 40.32          | 74.00      | -33.68     | Peak   |
| 9736.00 | 37.59      | 35.11          | 6.46       | 34.15         | 45.01          | 74.00      | -28.99     | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:middle



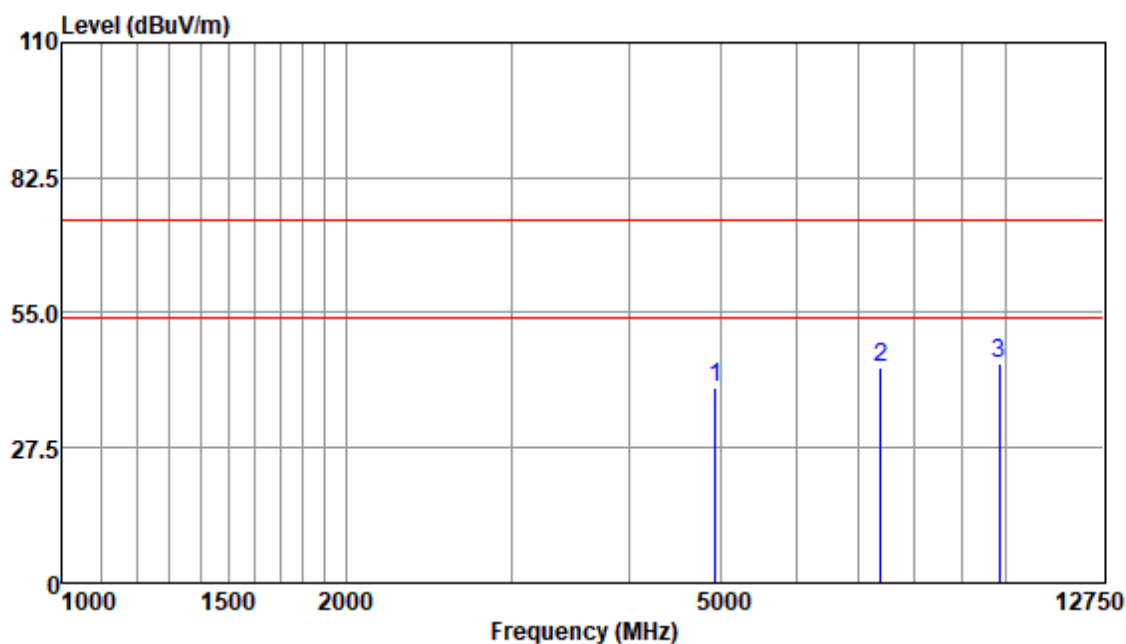
Antenna Polarity :VERTICAL

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
| MHz     | dBuV       | dB/m           | dB         | dB            | dBuV/m         | dBuV/m     | dB         |        |
| 4868.00 | 41.72      | 31.06          | 4.65       | 38.78         | 38.65          | 74.00      | -35.35     | Peak   |
| 7302.00 | 39.34      | 33.47          | 5.80       | 37.11         | 41.50          | 74.00      | -32.50     | Peak   |
| 9736.00 | 37.53      | 35.11          | 6.46       | 34.15         | 44.95          | 74.00      | -29.05     | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Antenna Polarity :HORIZONTAL

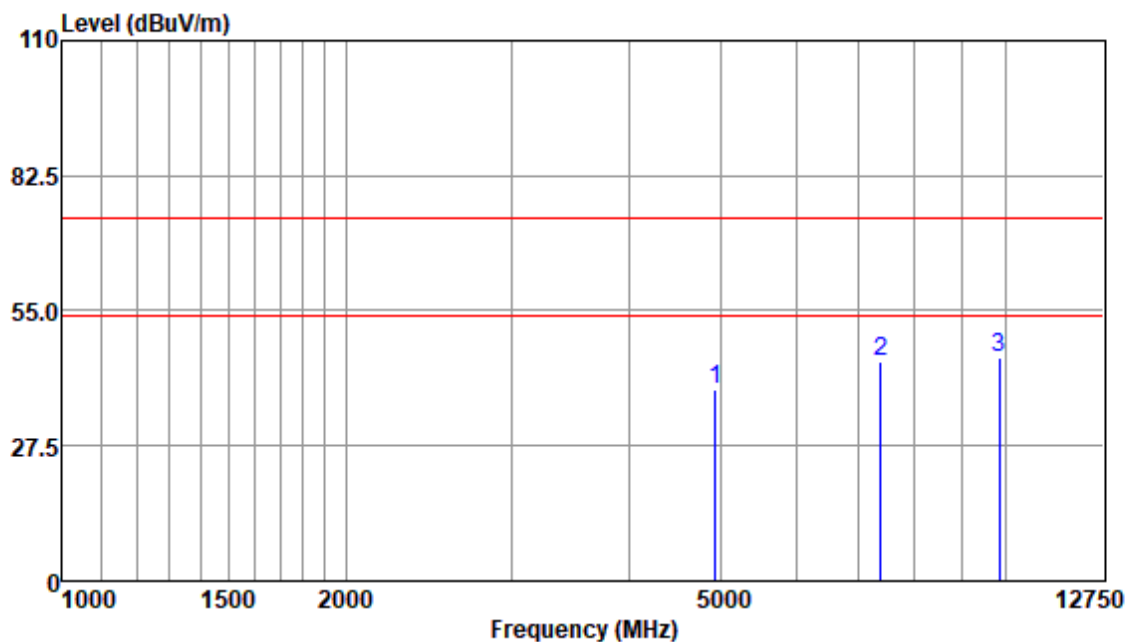
| Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
| MHz     | dBuV       | dB/m           | dB         | dB            | dBuV/m         | dBuV/m     | dB         |        |
| 4928.00 | 43.14      | 31.21          | 4.30       | 38.83         | 39.82          | 74.00      | -34.18     | Peak   |
| 7392.00 | 41.18      | 33.58          | 6.26       | 37.06         | 43.96          | 74.00      | -30.04     | Peak   |
| 9856.00 | 37.10      | 35.06          | 6.53       | 34.13         | 44.56          | 74.00      | -29.44     | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor





Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:High



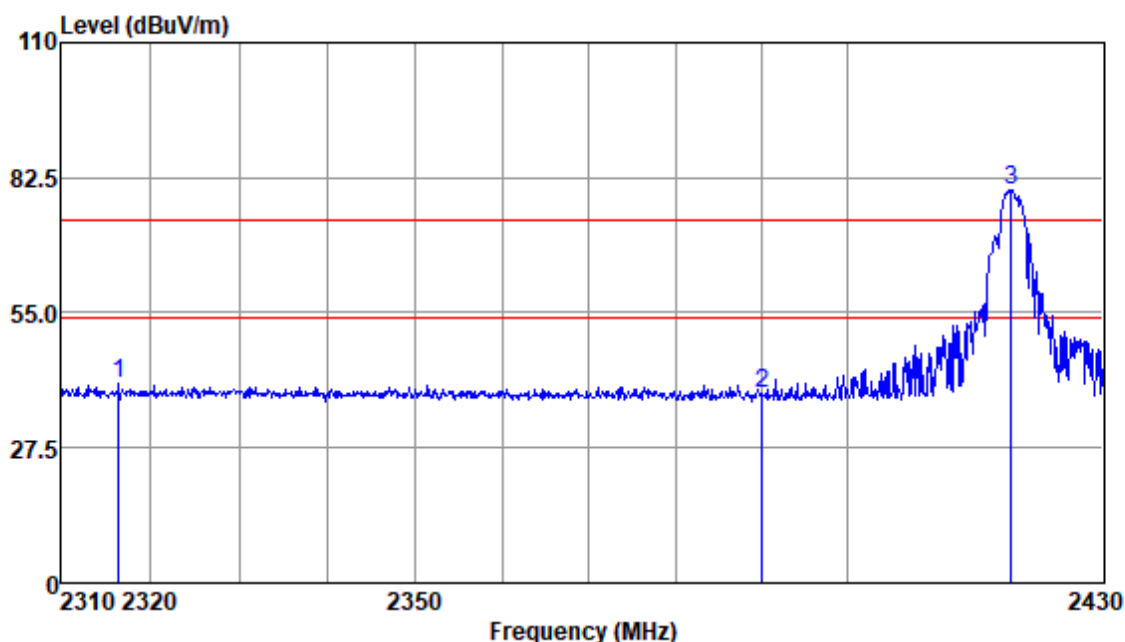
Antenna Polarity :VERTICAL

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
| -----   | -----      | -----          | -----      | -----         | -----          | -----      | -----      | -----  |
| MHz     | dBuV       | dB/m           | dB         | dB            | dBuV/m         | dBuV/m     | dB         |        |
| 4928.00 | 42.44      | 31.21          | 4.30       | 38.83         | 39.12          | 74.00      | -34.88     | Peak   |
| 7392.00 | 41.69      | 33.58          | 6.26       | 37.06         | 44.47          | 74.00      | -29.53     | Peak   |
| 9856.00 | 38.20      | 35.06          | 6.53       | 34.13         | 45.66          | 74.00      | -28.34     | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

## 6.5.2 Radiated Band edge

Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



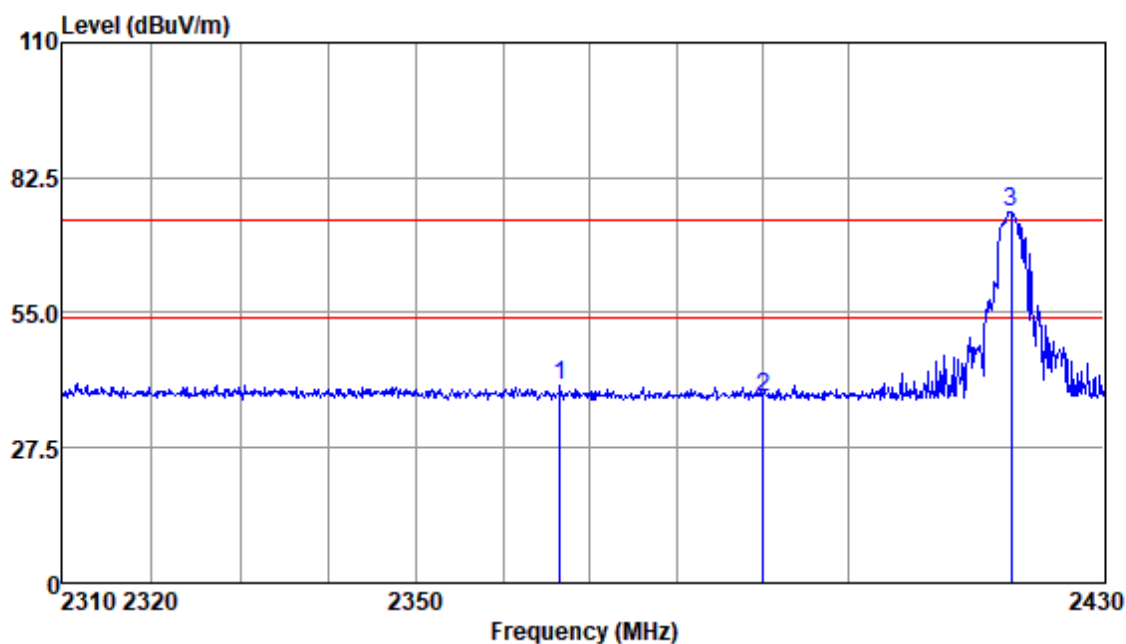
Antenna Polarity :HORIZONTAL

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
| MHz     | dBuV       | dB/m           | dB         | dB            | dBuV/m         | dBuV/m     | dB         |        |
| 2316.44 | 48.86      | 25.93          | 2.99       | 37.36         | 40.42          | 74.00      | -33.58     | Peak   |
| 2390.00 | 46.76      | 26.03          | 3.15       | 37.40         | 38.54          | 74.00      | -35.46     | Peak   |
| 2419.19 | 88.37      | 26.09          | 3.13       | 37.43         | 80.16          | 74.00      | 6.16       | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



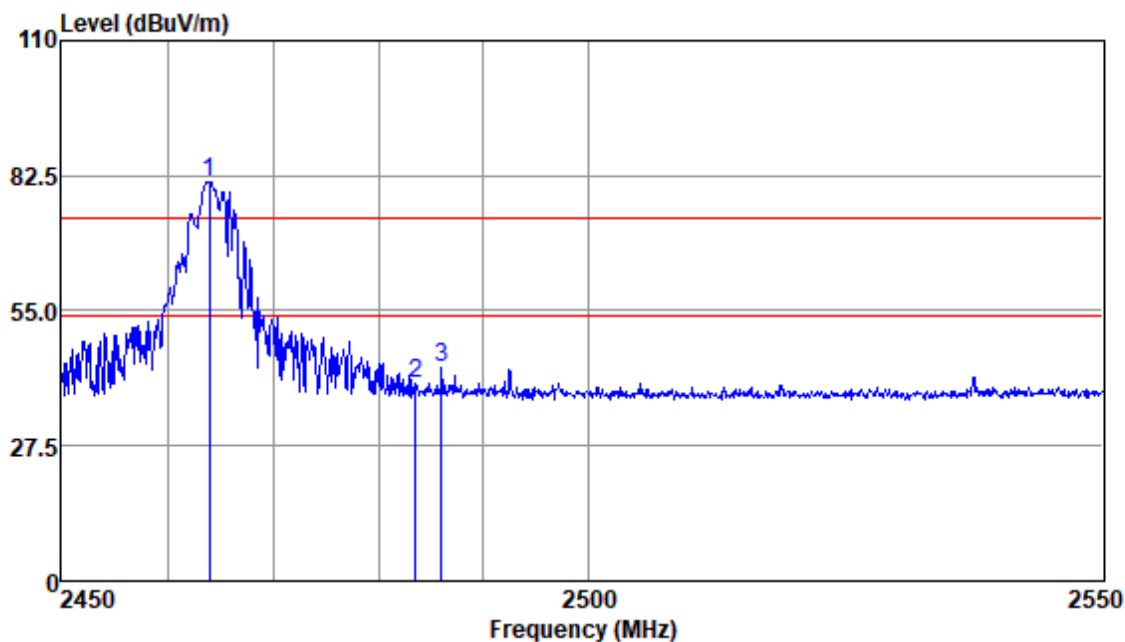
Antenna Polarity :VERTICAL

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamplifier Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------------|----------------|------------|------------|--------|
| MHz     | dBuV       | dB/m           | dB         | dB                  | dBuV/m         | dBuV/m     | dB         |        |
| 2366.60 | 48.50      | 26.00          | 3.17       | 37.38               | 40.29          | 74.00      | -33.71     | Peak   |
| 2390.00 | 46.14      | 26.03          | 3.15       | 37.40               | 37.92          | 74.00      | -36.08     | Peak   |
| 2419.07 | 83.73      | 26.09          | 3.13       | 37.43               | 75.52          | 74.00      | 1.52       | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamplifier Factor



Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



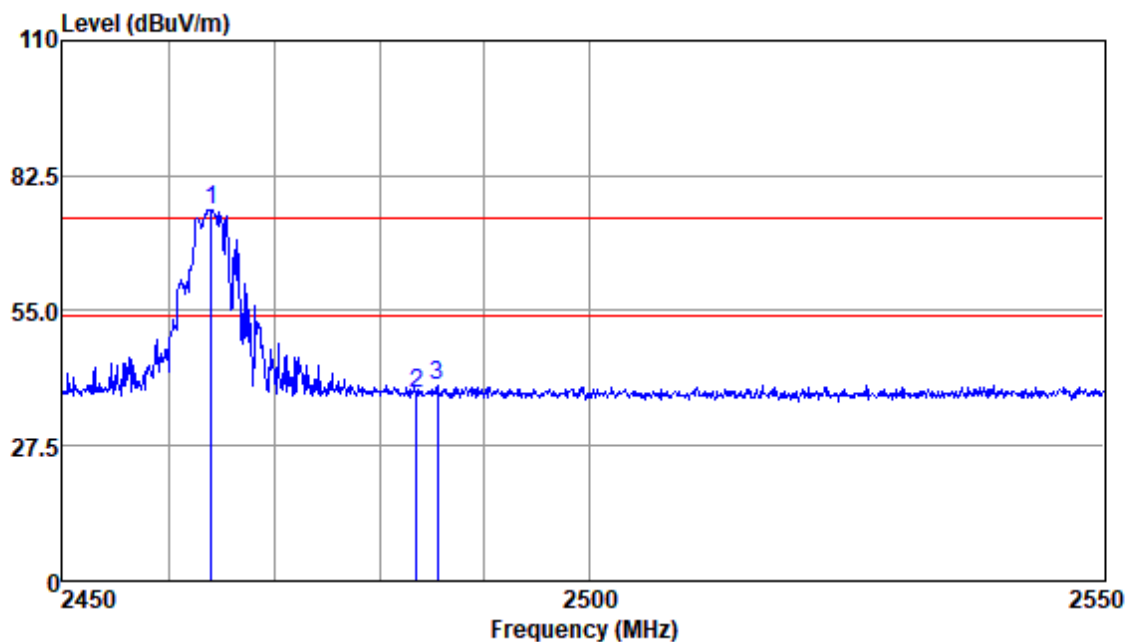
Antenna Polarity :HORIZONTAL

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------|----------------|------------|------------|--------|
| MHz     | dBuV       | dB/m           | dB         | dB            | dBuV/m         | dBuV/m     | dB         |        |
| 2463.96 | 89.44      | 26.15          | 3.13       | 37.53         | 81.19          | 74.00      | 7.19       | Peak   |
| 2483.50 | 48.43      | 26.18          | 3.14       | 37.57         | 40.18          | 74.00      | -33.82     | Peak   |
| 2486.04 | 51.82      | 26.18          | 3.14       | 37.57         | 43.57          | 74.00      | -30.43     | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:High



Antenna Polarity :VERTICAL

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamplifier Factor | Emission Level | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------------|----------------|------------|------------|--------|
| -----   | -----      | -----          | -----      | -----               | -----          | -----      | -----      | -----  |
| MHz     | dBuV       | dB/m           | dB         | dB                  | dBuV/m         | dBuV/m     | dB         |        |
| 2464.06 | 83.91      | 26.15          | 3.13       | 37.53               | 75.66          | 74.00      | 1.66       | Peak   |
| 2483.50 | 46.56      | 26.18          | 3.14       | 37.57               | 38.31          | 74.00      | -35.69     | Peak   |
| 2485.54 | 48.09      | 26.18          | 3.14       | 37.57               | 39.84          | 74.00      | -34.16     | Peak   |

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamplifier Factor



Remark: 1. Test Level = Receiver Reading + Antenna Factor + Cable Loss- Preamplifier Factor

2. No any other emission which falls in restricted bands can be detected and be reported.

3. If the Peak value below the AV Limit, the AV test doesn't perform for this submission.

All frequencies within the "Restricted bands" have been evaluated to compliance. Section 15.205 Restricted bands of operation.

Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                        | MHz                 | MHz             | GHz              |
|----------------------------|---------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423      | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905            | 16.80425 - 16.80475 | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128              | 25.5 - 25.67        | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775          | 37.5 - 38.25        | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775          | 73 - 74.6           | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218              | 74.8 - 75.2         | 1660 - 1710     | 10.5 - 12.7      |
| 6.26775 - 6.26825          | 108 - 121.94        | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225          | 123 - 138           | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294              | 149.9 - 150.05      | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366              | 156.52475 -         | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.52525           | 2655 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 156.7 - 156.9       | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 162.0125 - 167.17   | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 167.72 - 173.2      | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 240 - 285           | 3600 - 4400     | ( <sup>2</sup> ) |
| 13.36 - 13.41              | 322 - 335.4         |                 |                  |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

<sup>2</sup> Above 38.6

## 6.6 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215

Test Method: ANSI C63.10 (2013) Section 6.9

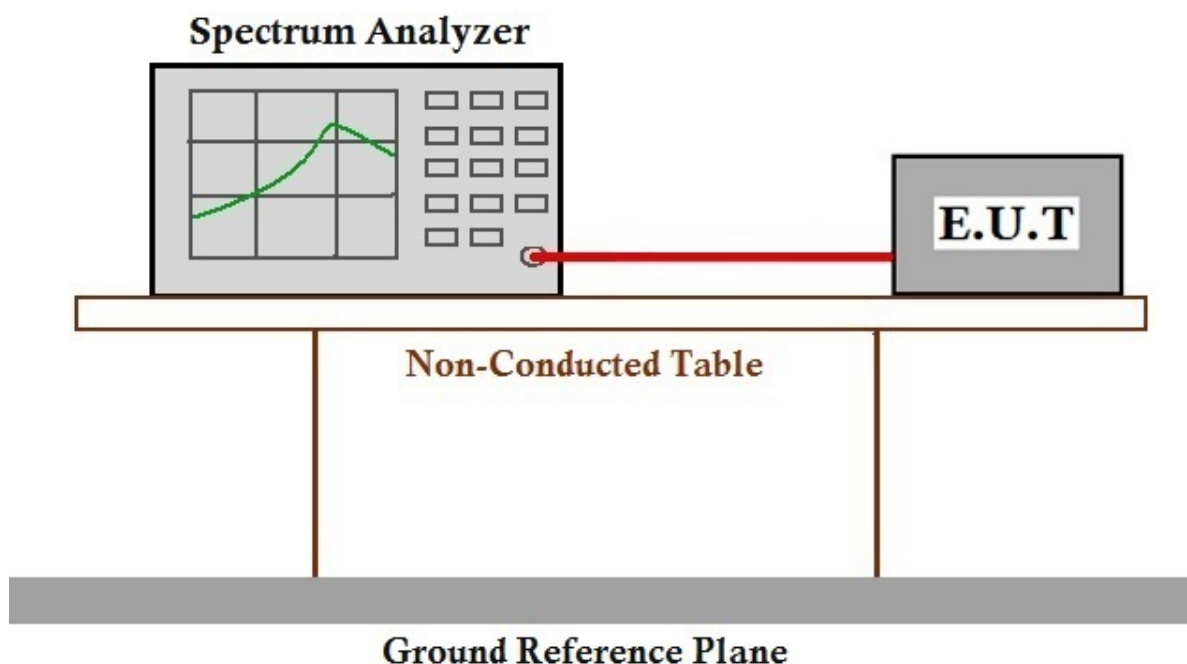
Limit: N/A

### 6.6.1 E.U.T. Operation

#### Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX mode \_Keep the EUT in transmitting with modulation mode.



### 6.6.2 Measurement Procedure and Data

1. Place the EUT on the table and set it in Engineering mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = approximately 1 % to 5 % of the OBW (set 100 kHz), VBW =3\* RBW, Span=10MHz, Sweep=auto
4. Mark the peak frequency and -20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured was complete.

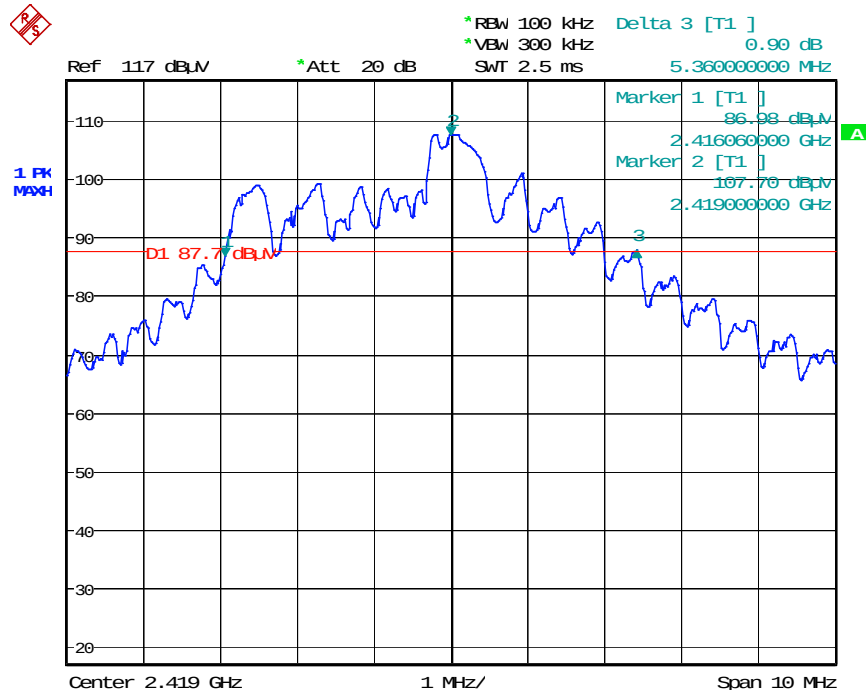
#### Test Data:

| Frequency (MHz) | Bandwidth (MHz) | Result |
|-----------------|-----------------|--------|
| 2419            | 5.36            | PASS   |
| 2434            | 4.50            | PASS   |
| 2464            | 1.48            | PASS   |



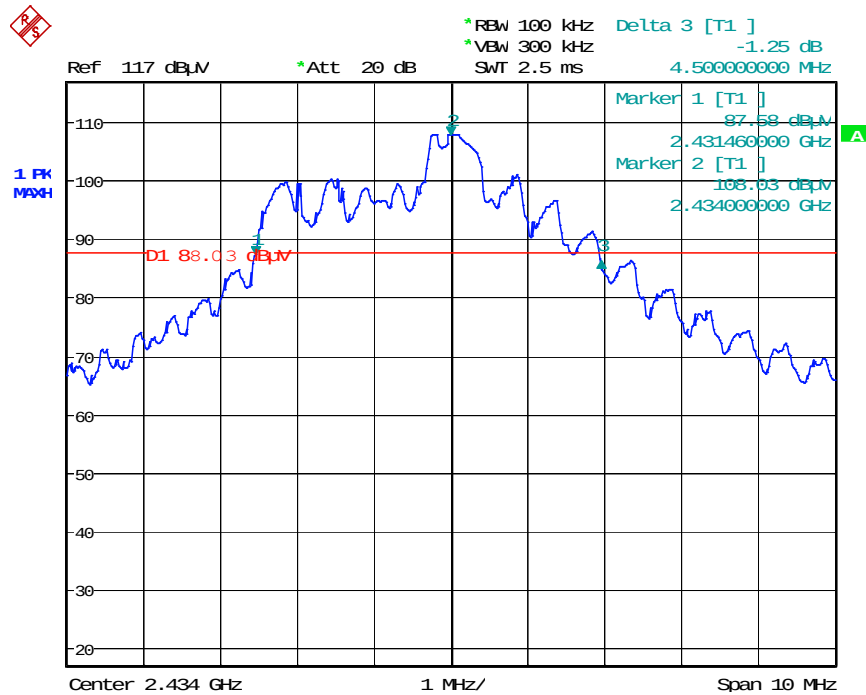
Test plot as follows:

Channel: 2419MHz



Date: 14.MAY.2020 11:10:05

Channel: 2434MHz

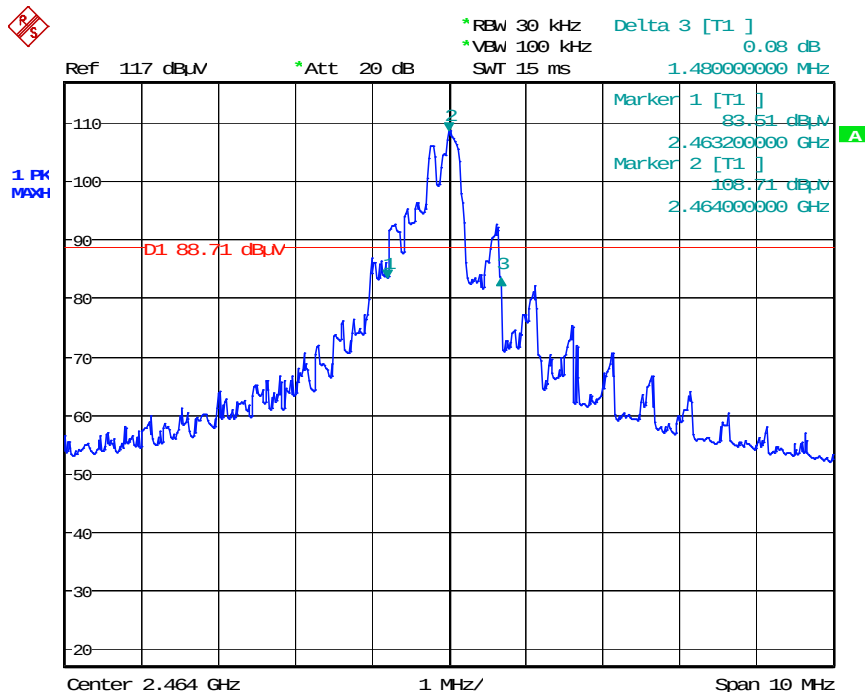


Date: 14.MAY.2020 11:16:02





Channel: 2464MHz



Date: 14.MAY.2020 11:05:14



## **7 Test Setup Photographs**

Refer to the < Test Setup photos-FCC>.

## **8 EUT Constructional Details**

Refer to the < External Photos > & < Internal Photos>.

**--End of the Report--**