



## TEST REPORT

**Application No.:** SHEM2105004880CR  
**FCC ID:** 2AVJ8-RF48  
**IC:** 25804-RF48  
**Applicant:** DewertOkin Technology Group Co., Ltd.  
**Address of Applicant:** Room 247, Floor 6, Jiaying Photovoltaic Science and Innovation Park,  
No.1288, Kanghe Road, Xiuzhou District, Jiaying City, Zhejiang Province,  
China  
**Manufacturer:** DewertOkin Technology Group Co., Ltd.  
**Address of Manufacturer:** Room 247, Floor 6, Jiaying Photovoltaic Science and Innovation Park,  
No.1288, Kanghe Road, Xiuzhou District, Jiaying City, Zhejiang Province,  
China  
**Factory:** DewertOkin Technology Group Co., Ltd.  
**Address of Factory:** No.465, Xinnanyang Road, Wangjiang Development Zone, Xiuzhou  
District, Jiaying City, Zhejiang Province  
**Equipment Under Test (EUT):**  
**EUT Name:** REMOTE CONTROL  
**Model No.:** RF48  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.249  
RSS-210 Issue10, December 2019  
RSS-Gen Issue 5 Amendment 2 (February 2021)  
**Date of Receipt:** 2021-05-21  
**Date of Test:** 2021-05-26 to 2021-06-07  
**Date of Issue:** 2021-06-09

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

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

Parlan Zhan

Parlan Zhan  
Laboratory Manager

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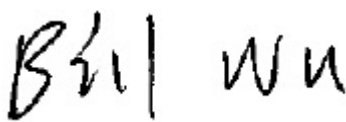
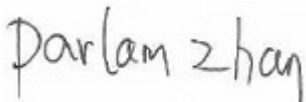
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| Revision Record |             |            |        |
|-----------------|-------------|------------|--------|
| Version         | Description | Date       | Remark |
| 00              | Original    | 2021-06-09 | /      |
|                 |             |            |        |
|                 |             |            |        |

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



## 2 Test Summary

| Radio Spectrum Technical Requirement |                                  |                    |        |        |
|--------------------------------------|----------------------------------|--------------------|--------|--------|
| Item                                 | FCC Requirement                  | IC Requirement     | Method | Result |
| Antenna Requirement                  | 47 CFR Part 15, Subpart C 15.249 | RSS-Gen Clause 6.8 | N/A    | Pass   |

| Radio Spectrum Matter Part                           |                                  |                                                   |                                        |        |
|------------------------------------------------------|----------------------------------|---------------------------------------------------|----------------------------------------|--------|
| Item                                                 | FCC Requirement                  | IC Requirement                                    | Method                                 | Result |
| 20dB Bandwidth                                       | 47 CFR Part 15, Subpart C 15.249 | RSS-Gen Section 6.7                               | ANSI C63.10 (2013) Section 6.9         | Pass   |
| Field Strength of the Fundamental Signal (15.249(a)) | 47 CFR Part 15, Subpart C 15.249 | RSS-210 Issue10 Annex B B.10                      | ANSI C63.10 (2013) Section 6.5&6.6     | Pass   |
| Restricted Band Around Fundamental Frequency         | 47 CFR Part 15, Subpart C 15.249 | RSS-210 Issue10 Annex B B.10& RSS-Gen Section 8.9 | ANSI C63.10 (2013) Section 6.4&6.5&6.6 | Pass   |
| Radiated Emissions                                   | 47 CFR Part 15, Subpart C 15.249 | RSS-210 Issue10 Annex B B.10& RSS-Gen Section 8.9 | ANSI C63.10 (2013) Section 6.4&6.5&6.6 | Pass   |
| 99% Bandwidth                                        | -                                | RSS-Gen Section 6.7                               | ANSI C63.10 Section 6.9.3              | Pass   |



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## 4 General Information

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

|                     |                                     |
|---------------------|-------------------------------------|
| Power supply:       | DC 4.5V by 3*AAA size batteries     |
| Test voltage:       | DC 4.5V                             |
| Modulation Type     | GFSK                                |
| Number of Channels  | 78                                  |
| Operation Frequency | 2403MHz~2480MHz                     |
| Channel Spacing     | 1MHz                                |
| Antenna Type        | PCB Antenna                         |
| Antenna Gain:       | 0dBi (Provided by the manufacturer) |
| S/N:                | RF481MXXXXXXXXXXXXXX                |
| Firmware version:   | V1.0                                |

### 4.2 Description of Support Units

The EUT has been tested as an independent unit.

### 4.3 Measurement Uncertainty

| No. | Item                            | Measurement Uncertainty |
|-----|---------------------------------|-------------------------|
| 1   | Radio Frequency                 | $8.4 \times 10^{-8}$    |
| 2   | Timeout                         | 2s                      |
| 3   | Duty Cycle                      | 0.37%                   |
| 4   | Occupied Bandwidth              | 3%                      |
| 5   | RF Radiated Power               | 5.1dB (Below 1GHz)      |
|     |                                 | 4.9dB (Above 1GHz)      |
| 6   | Radiated Spurious Emission Test | 4.2dB (Below 30MHz)     |
|     |                                 | 4.5dB (30MHz-1GHz)      |
|     |                                 | 5.1dB (1GHz-18GHz)      |
|     |                                 | 5.4dB (Above 18GHz)     |
| 7   | Temperature Test                | 1°C                     |
| 8   | Humidity Test                   | 3%                      |
| 9   | Supply Voltages                 | 1.5%                    |
| 10  | Time                            | 3%                      |

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



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#### 4.4 Test Location

All tests were performed at:

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No tests were sub-contracted.

#### 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.

- **A2LA (Certificate No. 6332.01)**

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- **FCC (Designation Number: CN1301)**

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

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ISED#: 8617A.

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#### 4.6 Deviation from Standards

None

#### 4.7 Abnormalities from Standard Conditions

None



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## 5 Equipment List

| Equipment                 | Manufacturer | Model No                   | Inventory No       | Cal Date   | Cal Due Date |
|---------------------------|--------------|----------------------------|--------------------|------------|--------------|
| <b>RF Conducted Test</b>  |              |                            |                    |            |              |
| Spectrum Analyzer         | R&S          | FSP-30                     | SHEM002-1          | 2020-12-20 | 2021-12-19   |
| Spectrum Analyzer         | Agilent      | N9020A                     | SHEM181-1          | 2020-08-13 | 2021-08-12   |
| Signal Generator          | R&S          | SMR20                      | SHEM006-1          | 2020-08-13 | 2021-08-12   |
| Signal Generator          | Agilent      | N5182A                     | SHEM182-1          | 2020-08-13 | 2021-08-12   |
| Communication Tester      | R&S          | CMW270                     | SHEM183-1          | 2020-08-13 | 2021-08-12   |
| Switcher                  | Tonscend     | JS0806                     | SHEM184-1          | 2020-08-13 | 2021-08-12   |
| Power Sensor              | Keysight     | U2021XA * 4                | SHEM184-1          | 2020-08-13 | 2021-08-12   |
| Splitter                  | Anritsu      | MA1612A                    | SHEM185-1          | /          | /            |
| Coupler                   | e-meca       | 803-S-1                    | SHEM186-1          | /          | /            |
| High-low Temp Cabinet     | Suzhou Zhihe | TL-40                      | SHEM087-1          | 2018-09-25 | 2021-09-24   |
| AC Power Stabilizer       | APC          | KDF-31020T-V0-F0           | SHEM216-1          | 2020-12-20 | 2021-12-19   |
| DC Power Supply           | MCH          | MCH-303A                   | SHEM210-1          | 2020-12-20 | 2021-12-19   |
| Conducted test Cable      | /            | RF01~RF04                  | /                  | 2020-12-20 | 2021-12-19   |
| Test software             | Tonscend     | JS Tonscend BT/WIFI System | Version: 2.6       | /          | /            |
| <b>RF Radiated Test</b>   |              |                            |                    |            |              |
| EMI test Receiver         | R&S          | ESU40                      | SHEM051-1          | 2020-12-20 | 2021-12-19   |
| Spectrum Analyzer         | R&S          | FSP-30                     | SHEM002-1          | 2020-12-20 | 2021-12-19   |
| Loop Antenna (9KHz-30MHz) | Schwarzbeck  | FMZB1519                   | SHEM135-1          | 2020-12-20 | 2021-12-19   |
| Antenna (25MHz-2GHz)      | Schwarzbeck  | VULB9168                   | SHEM048-1          | 2019-10-14 | 2021-10-13   |
| Antenna (25MHz-2GHz)      | Schwarzbeck  | VULB9168                   | SHEM202-1          | 2020-04-30 | 2022-04-29   |
| Horn Antenna (1-18GHz)    | Schwarzbeck  | HF906                      | SHEM009-1          | 2018-10-24 | 2021-10-23   |
| Horn Antenna (1-18GHz)    | Schwarzbeck  | BBHA9120D                  | SHEM050-1          | 2019-10-14 | 2021-10-13   |
| Horn Antenna (14-40GHz)   | Schwarzbeck  | BBHA 9170                  | SHEM049-1          | 2018-10-31 | 2021-10-30   |
| Pre-amplifier (9KHz-2GHz) | CLAVIO       | BDLNA-0001                 | SHEM164-1          | 2020-08-13 | 2021-08-12   |
| Pre-amplifier (1-18GHz)   | CLAVIO       | BDLNA-0118                 | SHEM050-2          | 2020-08-13 | 2021-08-12   |
| High-amplifier (14-40GHz) | Schwarzbeck  | 10001                      | SHEM049-2          | 2020-12-20 | 2021-12-19   |
| Signal Generator          | R&S          | SMR40                      | SHEM058-1          | 2020-08-13 | 2021-08-12   |
| 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          | 2020-05-25 | 2023-05-24   |
| RE test Cable             | /            | RE01, RE02, RE06           | /                  | 2020-12-20 | 2021-12-19   |
| Test software             | ESE          | E3                         | Version: 6.111221a | /          | /            |



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## 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

Limit:

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.

#### 6.1.2 Conclusion

Standard 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.

EUT Antenna:

The antenna is PCB antenna and no consideration of replacement. The best case gain of the antenna is 0dBi.

Antenna location: Refer to Appendix (Internal Photos)





## 7 Radio Spectrum Matter Test Results

### 7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215

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

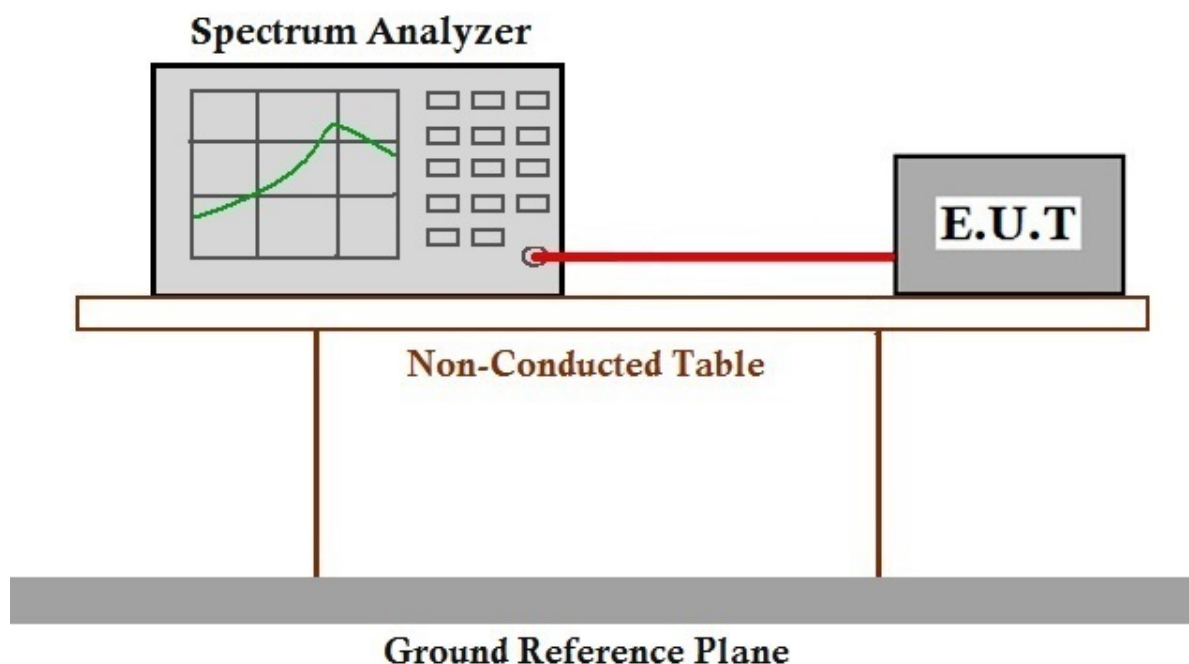
#### 7.1.1 E.U.T. Operation

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.

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Procedure and Data

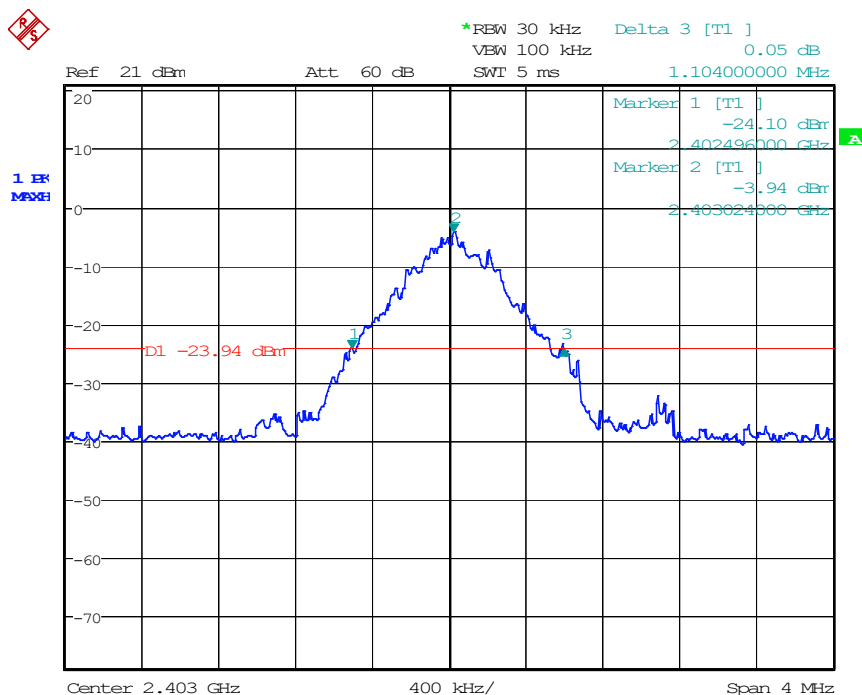
1. Place the EUT on the table and set it in Engineering mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = approximately 1 % to 5 % of the OBW (set 30 kHz), VBW =3\* RBW, Sweep=auto
4. Mark the peak frequency and -20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured was complete.



| Frequency (MHz) | Bandwidth (MHz) | Result |
|-----------------|-----------------|--------|
| 2403            | 1.104           | PASS   |
| 2442            | 1.184           | PASS   |
| 2480            | 1.020           | PASS   |

Test plot as follows:

Channel: 2403MHz



Date: 27.MAY.2021 08:46:31



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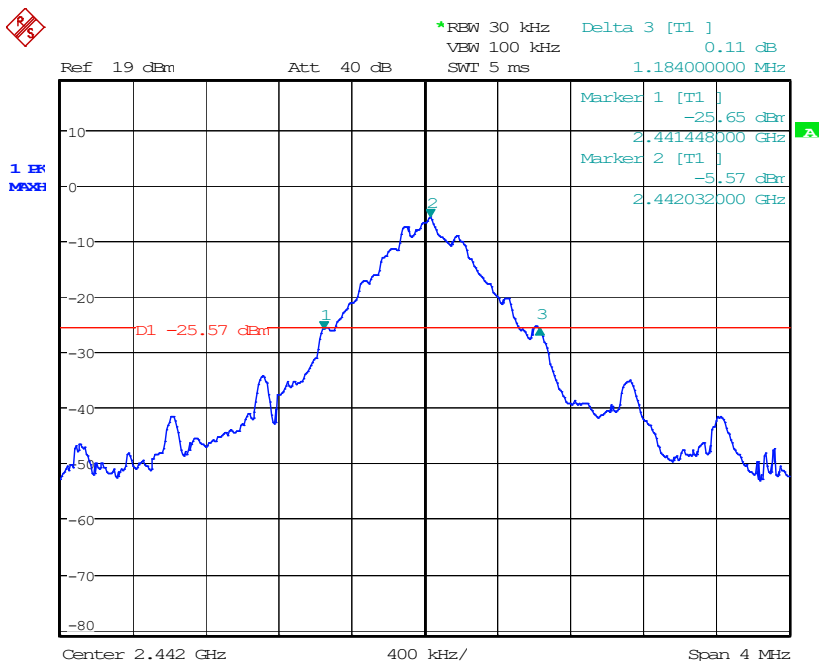
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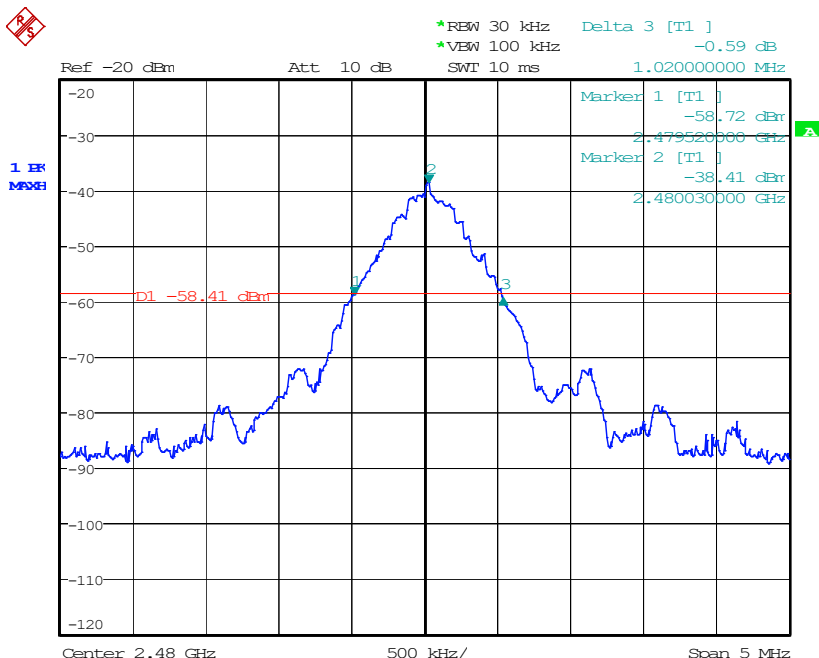
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Channel: 2442MHz



Date: 27.MAY.2021 08:32:06

Channel: 2480MHz



Date: 28.MAY.2021 10:43:46



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## 7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249(a)

Test Method: ANSI C63.10 (2013) Section 6.5&6.6

Test Site: Measurement Distance: 3m

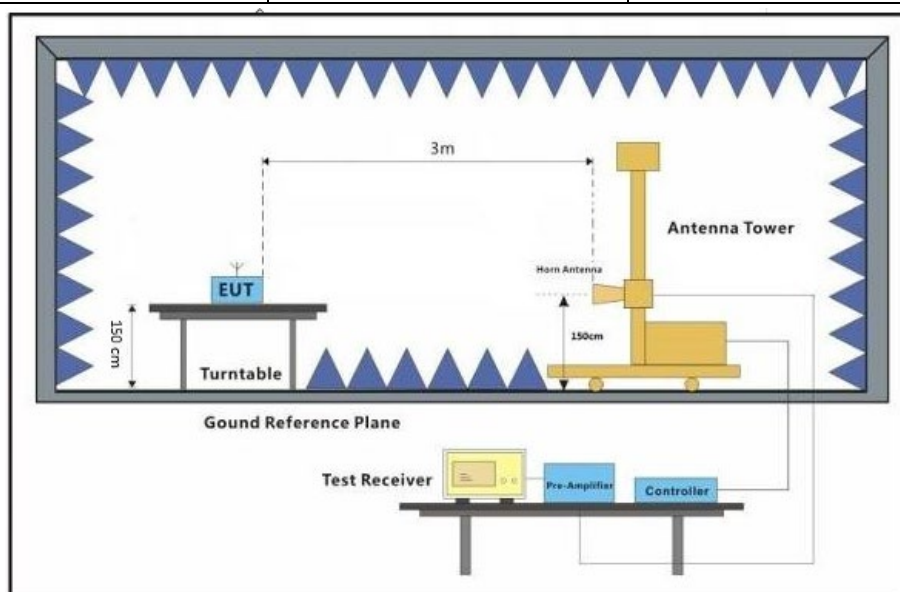
Receiver Setup:

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

Limit:

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

Test Setup:



Test Procedure:

- The EUT was placed on the top of a rotating table 0.8 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.
- 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

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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.

**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 |
|-----------------|-------------------|---------------|----------------|---------------------|-----------------|----------|--------------|
| 2403            | 105.82            | -5.63         | 100.19         | 114                 | -13.81          | Peak     | Horizontal   |
|                 | 98.52             | -5.63         | 92.89          | 94                  | -1.11           | Avg      | Horizontal   |
|                 | 93.29             | -5.63         | 87.66          | 94                  | -6.34           | Peak     | Vertical     |

| Frequency (MHz) | Read Level (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Detector | Polarization |
|-----------------|-------------------|---------------|----------------|---------------------|-----------------|----------|--------------|
| 2442            | 102.64            | -5.61         | 97.03          | 114                 | -16.97          | Peak     | Horizontal   |
|                 | 94.44             | -5.61         | 88.83          | 94                  | -5.17           | Avg      | Horizontal   |
|                 | 92.62             | -5.61         | 87.01          | 94                  | -6.99           | Peak     | Vertical     |

| Frequency (MHz) | Read Level (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Detector | Polarization |
|-----------------|-------------------|---------------|----------------|---------------------|-----------------|----------|--------------|
| 2480            | 98.30             | -5.59         | 92.71          | 94                  | -1.29           | Peak     | Horizontal   |
|                 | 91.41             | -5.59         | 85.82          | 94                  | -8.18           | Peak     | Vertical     |

Remark:

- 1) The basic equation with a sample calculation is as follows: Level = Read Level + 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.



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### 7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6

Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | Measurement distance(meters) |
|----------------|----------------------------------|------------------------------|
| 0.009-0.490    | 2400/F(kHz)                      | 300                          |
| 0.490-1.705    | 24000/F(kHz)                     | 30                           |
| 1.705-30.0     | 30                               | 30                           |
| 30-88          | 100                              | 3                            |
| 88-216         | 150                              | 3                            |
| 216-960        | 200                              | 3                            |
| Above 960      | 500                              | 3                            |

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.

#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

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



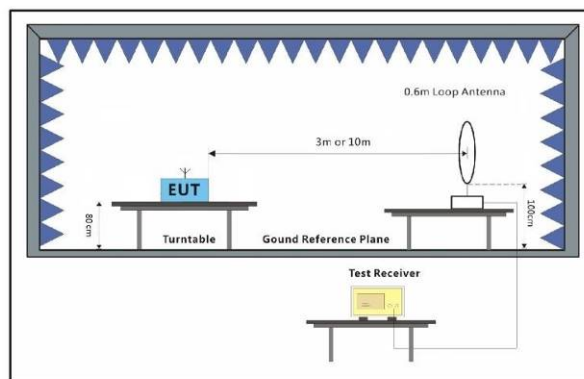
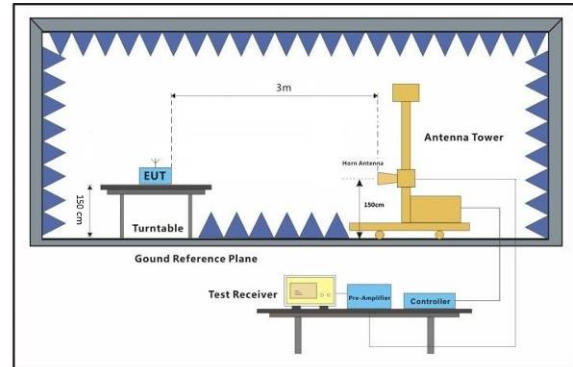
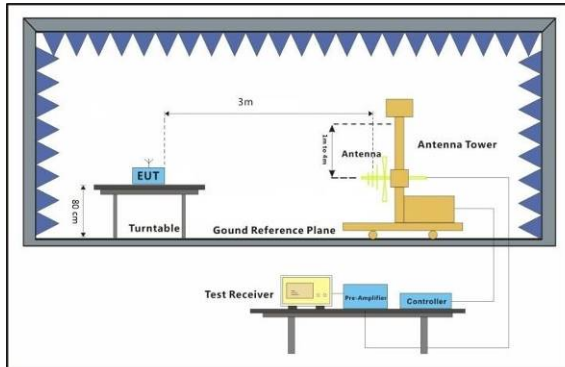
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### 7.3.2 Test Setup Diagram



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### 7.3.3 Measurement Procedure and Data

- 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: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: 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 in the report.



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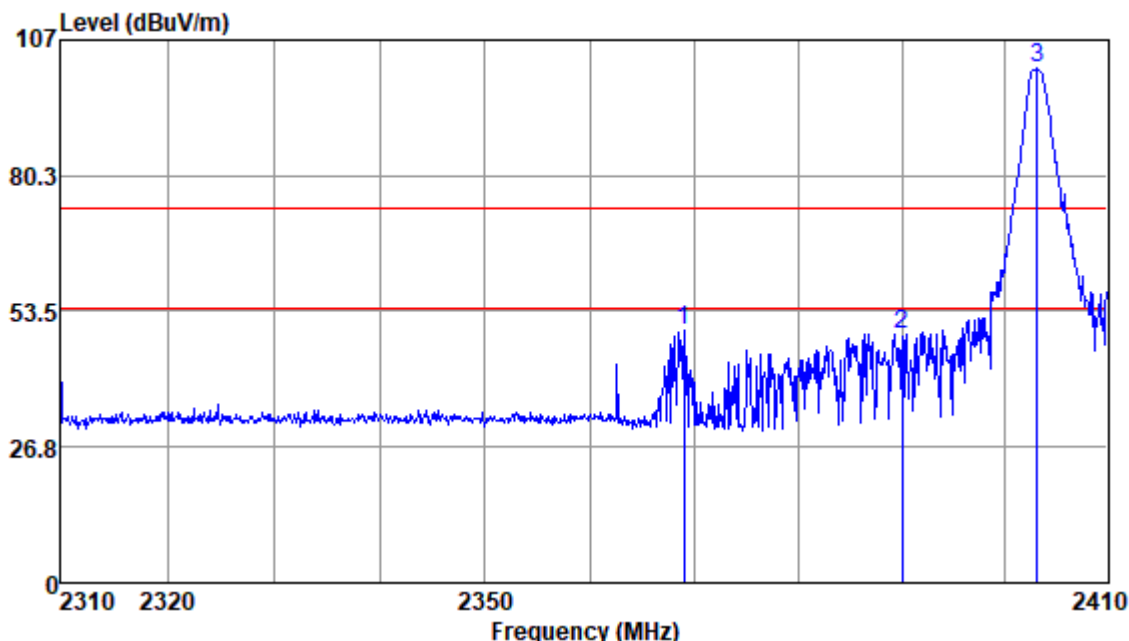
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2403MHz:



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         |        |
| 2368.99 | 55.52      | 28.94          | 2.75       | 37.39         | 49.82          | 74.00      | -24.18     | Peak   |
| 2390.00 | 54.61      | 28.97          | 2.77       | 37.40         | 48.95          | 74.00      | -25.05     | Peak   |
| 2403.17 | 106.93     | 29.01          | 2.79       | 37.43         | 101.30         | 74.00      | 27.30      | Peak   |

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

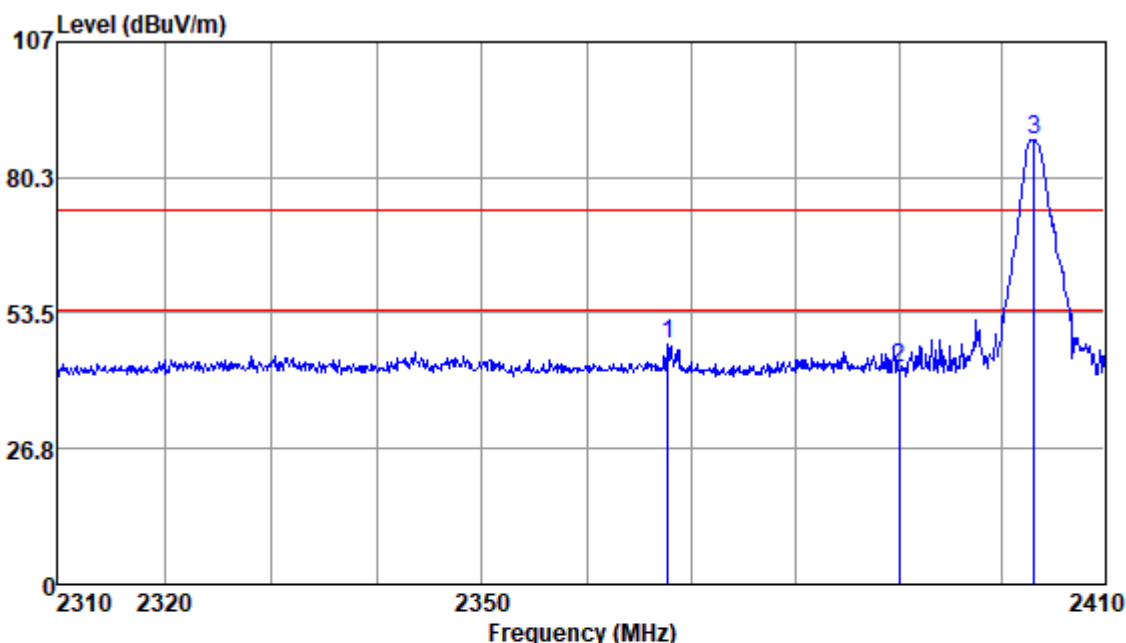


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Antenna Polarity :VERTICAL

| 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         |        |
| 2367.78 | 53.17      | 28.94          | 2.75       | 37.38         | 47.48          | 74.00      | -26.52     | Peak   |
| 2390.00 | 48.23      | 28.97          | 2.77       | 37.40         | 42.57          | 74.00      | -31.43     | Peak   |
| 2403.17 | 93.29      | 29.01          | 2.79       | 37.43         | 87.66          | 74.00      | 13.66      | Peak   |

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

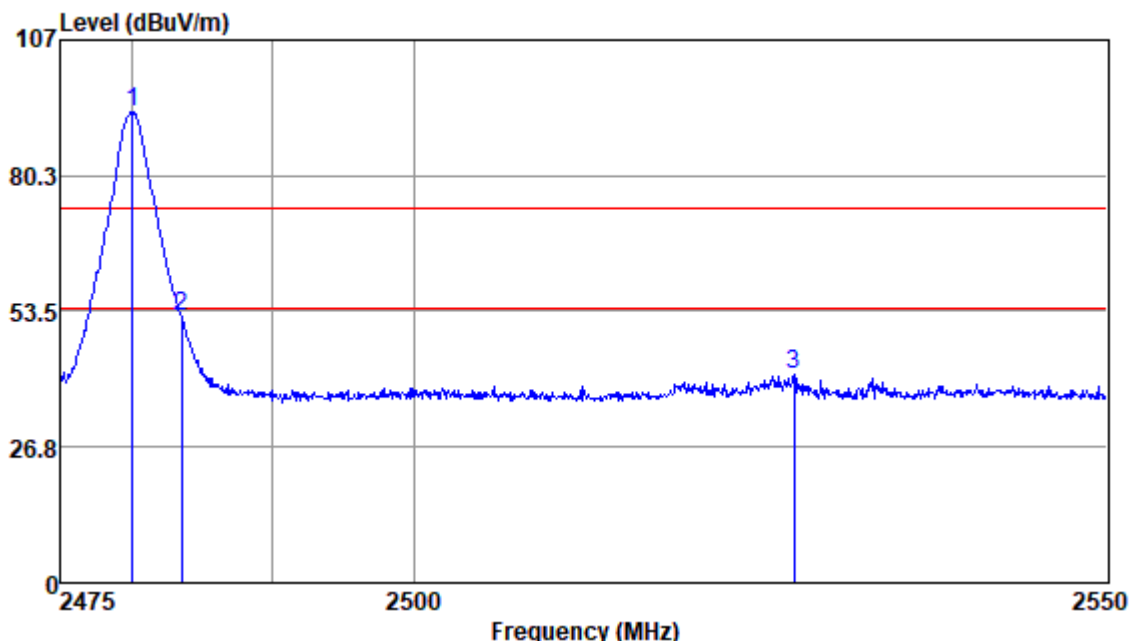


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2480MHz:



Antenna Polarity :HORIZONTAL

| 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         |        |
| 2480.03 | 98.30      | 29.10          | 2.88       | 37.57               | 92.71          | 74.00      | 18.71      | Peak   |
| 2483.51 | 58.23      | 29.11          | 2.88       | 37.57               | 52.65          | 74.00      | -21.35     | Peak   |
| 2527.26 | 46.52      | 29.31          | 2.92       | 37.62               | 41.13          | 74.00      | -32.87     | Peak   |

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

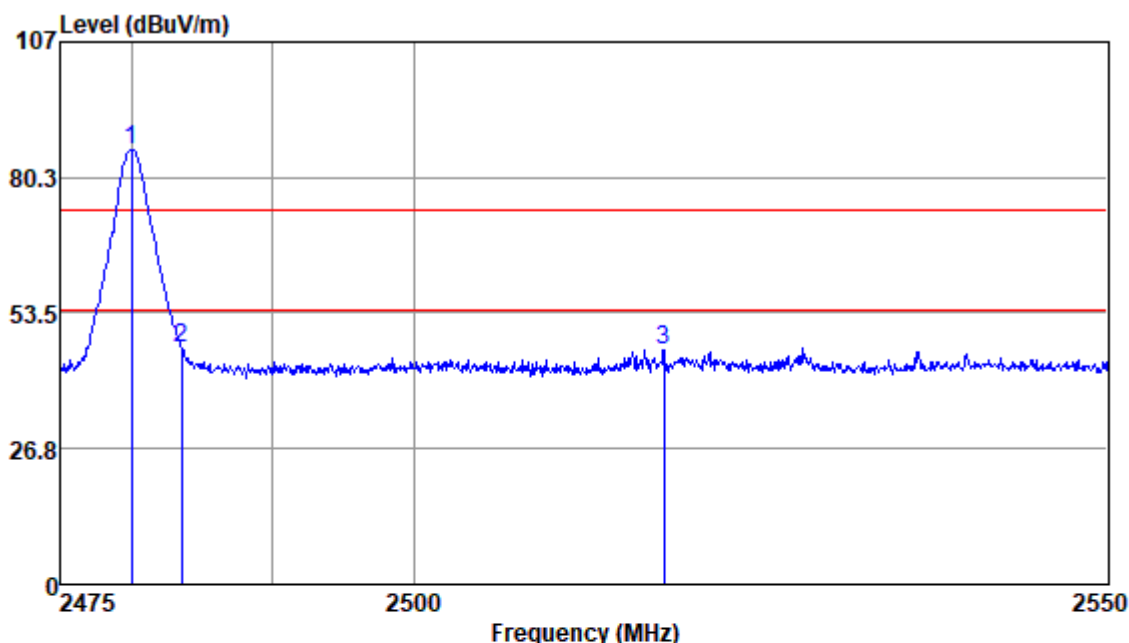


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Antenna Polarity :VERTICAL

| 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         |        |
| 2479.96 | 91.41      | 29.10          | 2.88       | 37.57               | 85.82          | 74.00      | 11.82      | Peak   |
| 2483.51 | 52.32      | 29.11          | 2.88       | 37.57               | 46.74          | 74.00      | -27.26     | Peak   |
| 2517.93 | 51.79      | 29.24          | 2.91       | 37.61               | 46.33          | 74.00      | -27.67     | Peak   |

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



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## 7.4 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 &amp; 15.249 (a),(d)

Test Method: ANSI C63.10 (2013) Section 6.4&amp;6.5&amp;6.6

Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | Measurement distance(meters) |
|----------------|----------------------------------|------------------------------|
| 0.009-0.490    | 2400/F(kHz)                      | 300                          |
| 0.490-1.705    | 24000/F(kHz)                     | 30                           |
| 1.705-30.0     | 30                               | 30                           |
| 30-88          | 100                              | 3                            |
| 88-216         | 150                              | 3                            |
| 216-960        | 200                              | 3                            |
| Above 960      | 500                              | 3                            |

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.

### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

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



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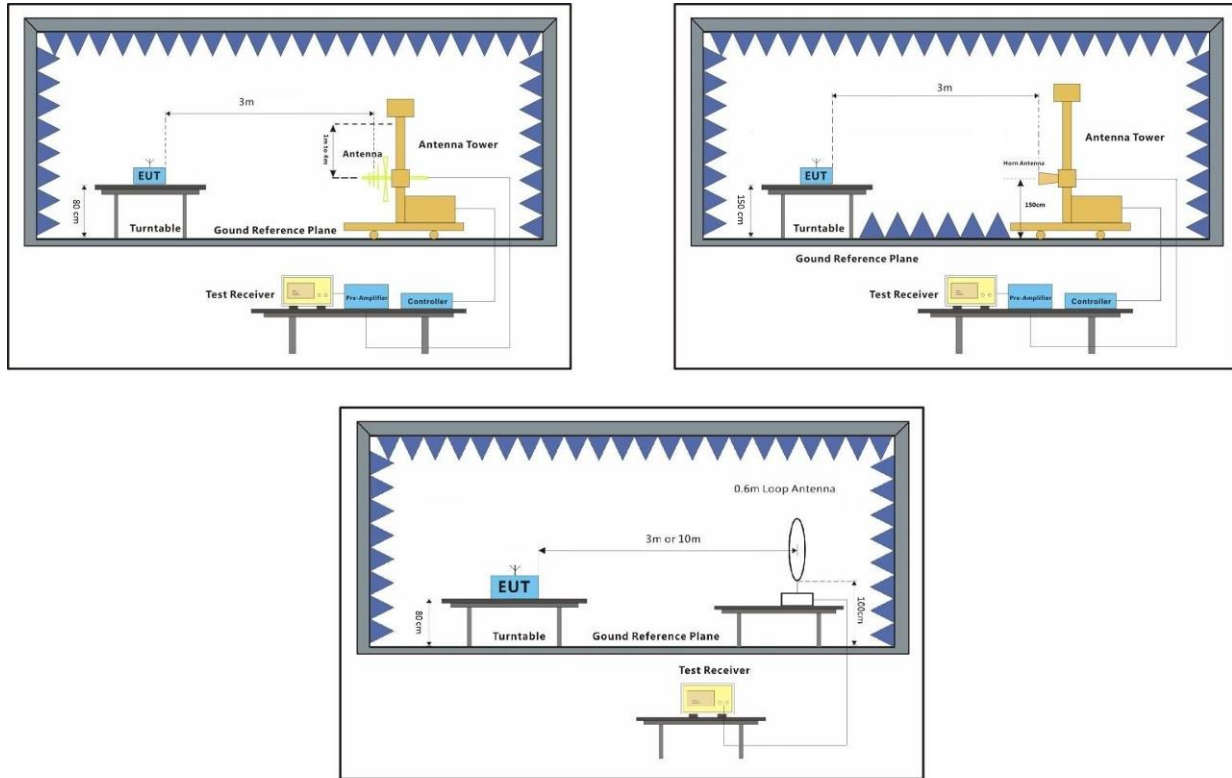
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#### 7.4.2 Test Setup Diagram



#### 7.4.3 Measurement Procedure and Data

- 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



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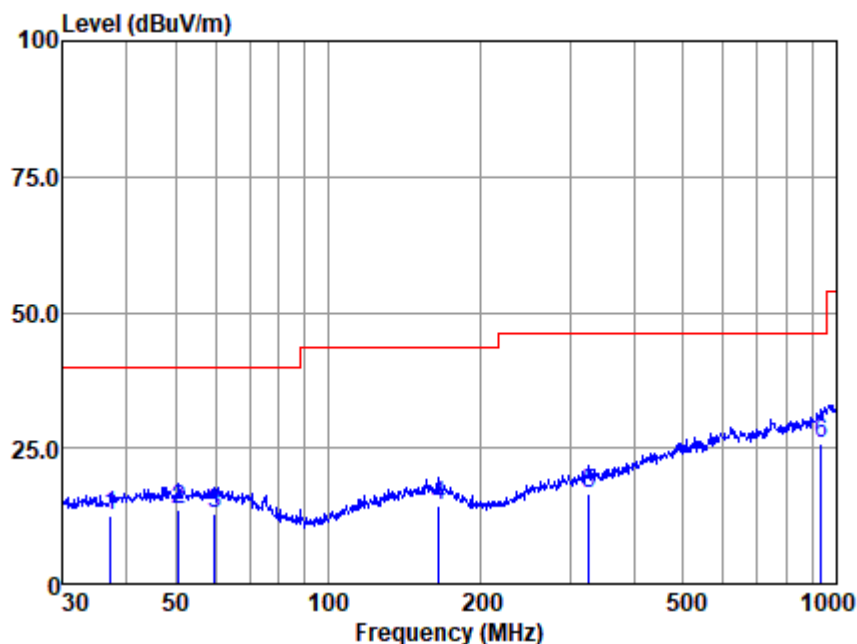
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30MHz-1GHz:

Mode:a; Polarization:Horizontal



Antenna Polarity :HORIZONTAL

EUT/Project :4880CR

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 | 37.285  | 30.95      | 12.78          | 0.84       | 31.93         | 12.64          | 40.00      | -27.36     | QP     |
| 2 | 50.764  | 30.98      | 13.65          | 1.01       | 32.02         | 13.62          | 40.00      | -26.38     | QP     |
| 3 | 59.649  | 30.24      | 13.12          | 1.11       | 31.68         | 12.79          | 40.00      | -27.21     | QP     |
| 4 | 164.908 | 30.68      | 13.00          | 1.96       | 31.25         | 14.39          | 43.50      | -29.11     | QP     |
| 5 | 325.596 | 30.79      | 14.01          | 2.90       | 30.91         | 16.79          | 46.00      | -29.21     | QP     |
| 6 | 935.546 | 29.26      | 23.84          | 4.89       | 32.05         | 25.94          | 46.00      | -20.06     | QP     |

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



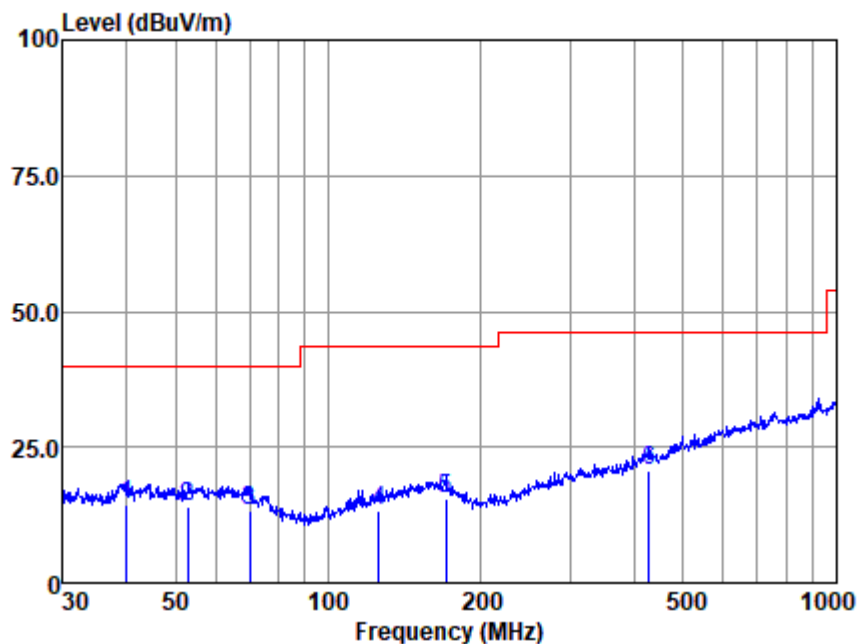
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Mode:a; Polarization:Vertical



Antenna Polarity :VERTICAL

EUT/Project :4880CR

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 | 39.994  | 32.43      | 13.20          | 0.88       | 32.02         | 14.49          | 40.00      | -25.51     | QP     |
| 2 | 52.945  | 31.29      | 13.52          | 1.03       | 31.92         | 13.92          | 40.00      | -26.08     | QP     |
| 3 | 70.090  | 31.32      | 11.70          | 1.22       | 30.91         | 13.33          | 40.00      | -26.67     | QP     |
| 4 | 125.886 | 31.61      | 11.49          | 1.69       | 31.65         | 13.14          | 43.50      | -30.36     | QP     |
| 5 | 170.793 | 32.04      | 12.74          | 2.00       | 31.31         | 15.47          | 43.50      | -28.03     | QP     |
| 6 | 428.019 | 31.39      | 16.38          | 3.22       | 30.35         | 20.64          | 46.00      | -25.36     | QP     |

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



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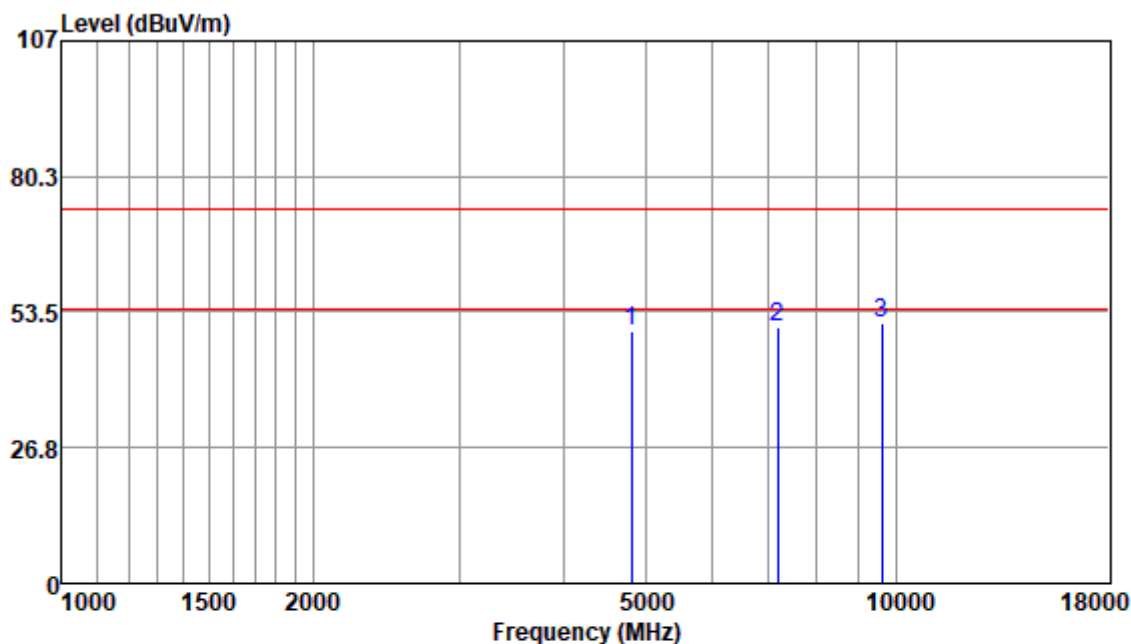
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Above 1GHz:

2403MHz:



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         |        |
| 4806.00 | 50.11      | 33.72          | 4.46       | 38.71         | 49.58          | 74.00      | -24.42     | Peak   |
| 7209.00 | 45.78      | 36.28          | 5.72       | 37.18         | 50.60          | 74.00      | -23.40     | Peak   |
| 9612.00 | 41.45      | 37.70          | 6.53       | 34.18         | 51.50          | 74.00      | -22.50     | Peak   |

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

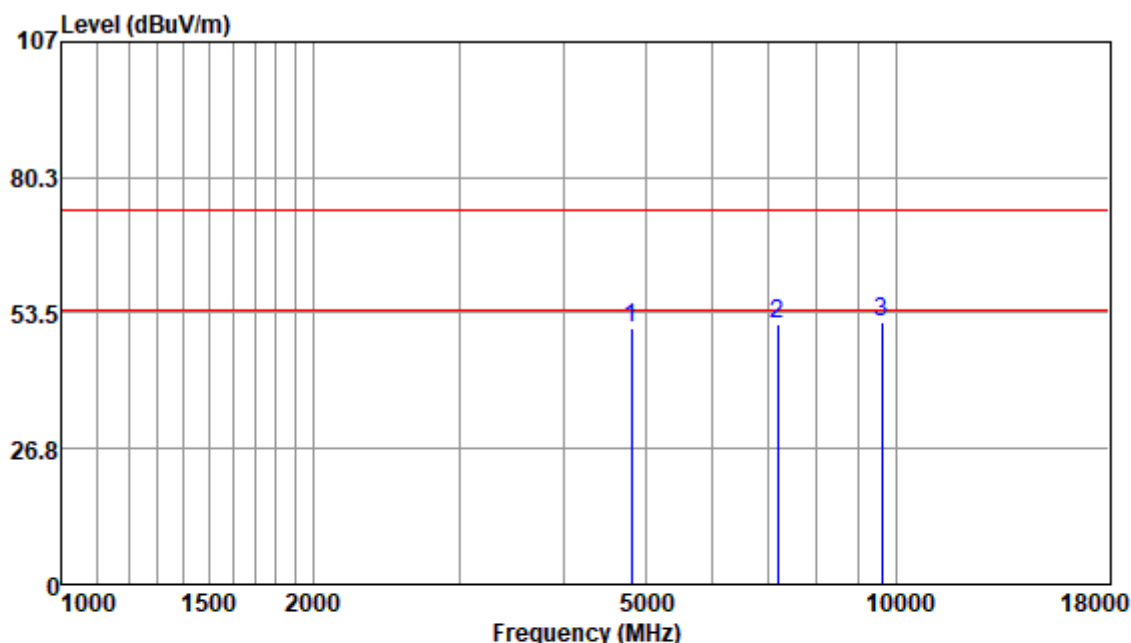


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Antenna Polarity : VERTICAL

| 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         |        |
| 4806.00 | 51.12      | 33.72          | 4.46       | 38.71         | 50.59          | 74.00      | -23.41     | Peak   |
| 7209.00 | 46.42      | 36.28          | 5.72       | 37.18         | 51.24          | 74.00      | -22.76     | Peak   |
| 9612.00 | 41.54      | 37.70          | 6.53       | 34.18         | 51.59          | 74.00      | -22.41     | Peak   |

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



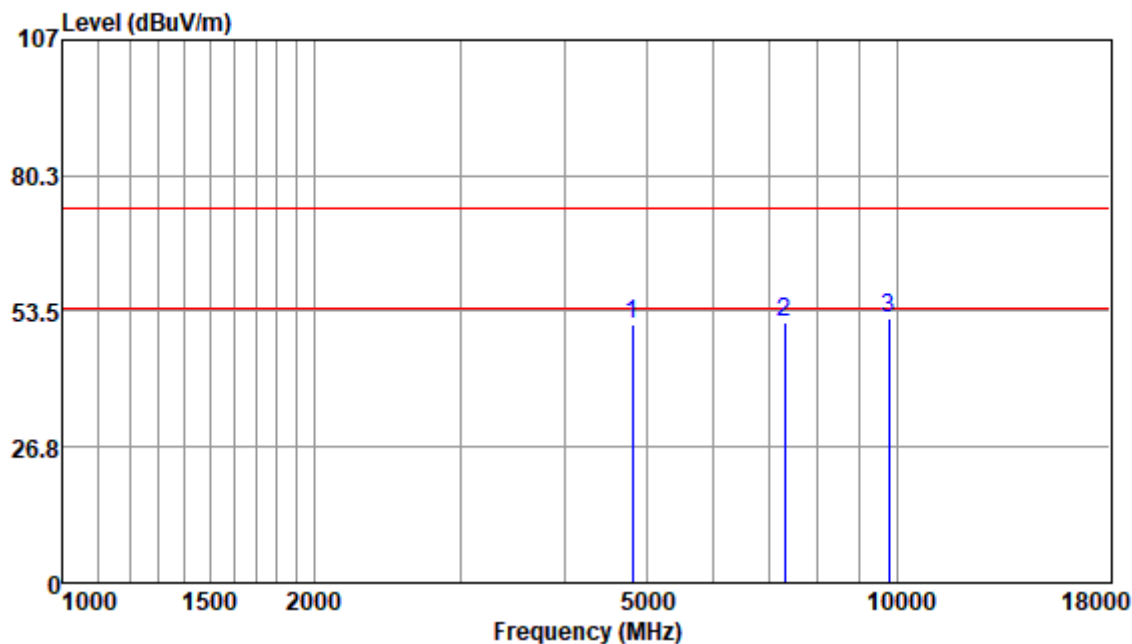
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2442MHz:



Antenna Polarity :HORIZONTAL

| 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         |        |
| 4806.00 | 51.33      | 33.72          | 4.46       | 38.71               | 50.80          | 74.00      | -23.20     | Peak   |
| 7326.00 | 46.18      | 36.47          | 5.85       | 37.10               | 51.40          | 74.00      | -22.60     | Peak   |
| 9768.00 | 42.33      | 37.61          | 6.50       | 34.14               | 52.30          | 74.00      | -21.70     | Peak   |

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



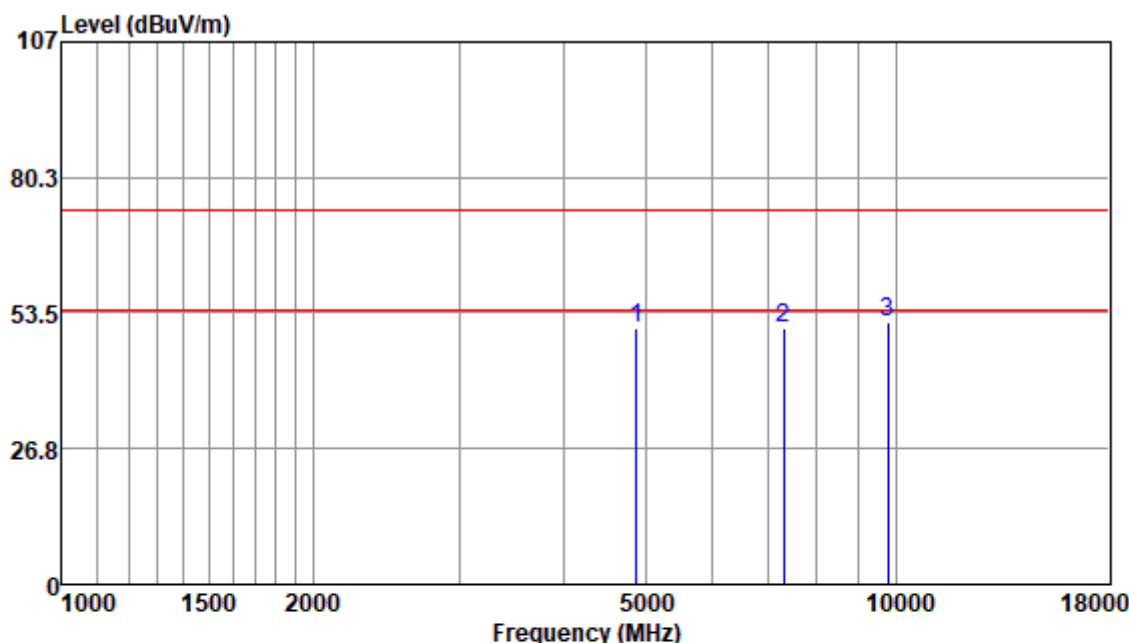
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Antenna Polarity : VERTICAL

| 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         |        |
| 4884.00 | 50.96      | 33.95          | 4.47       | 38.78         | 50.60          | 74.00      | -23.40     | Peak   |
| 7326.00 | 45.28      | 36.47          | 5.85       | 37.10         | 50.50          | 74.00      | -23.50     | Peak   |
| 9768.00 | 41.83      | 37.61          | 6.50       | 34.14         | 51.80          | 74.00      | -22.20     | Peak   |

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



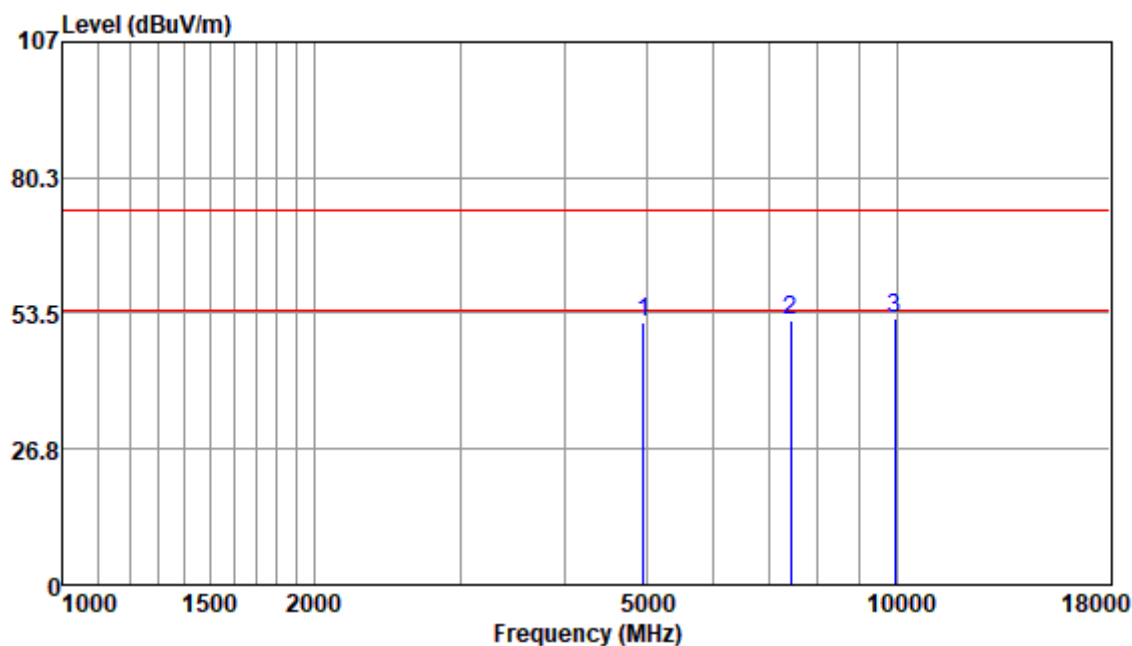
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2480MHz:



Antenna Polarity :HORIZONTAL

| 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         |        |
| 4960.00 | 52.01      | 33.98          | 4.48       | 38.87               | 51.60          | 74.00      | -22.40     | Peak   |
| 7440.00 | 46.86      | 36.40          | 5.97       | 37.03               | 52.20          | 74.00      | -21.80     | Peak   |
| 9920.00 | 42.43      | 37.81          | 6.47       | 34.11               | 52.60          | 74.00      | -21.40     | Peak   |

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

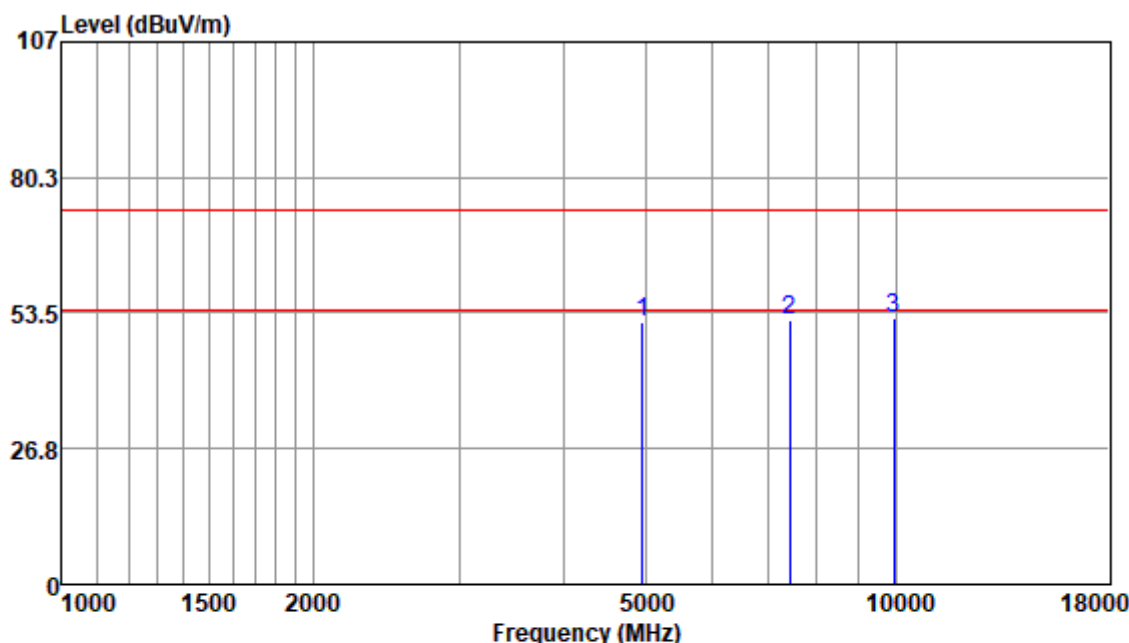


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Antenna Polarity : VERTICAL

| 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         |        |
| 4960.00 | 52.21      | 33.98          | 4.48       | 38.87         | 51.80          | 74.00      | -22.20     | Peak   |
| 7440.00 | 46.86      | 36.40          | 5.97       | 37.03         | 52.20          | 74.00      | -21.80     | Peak   |
| 9920.00 | 42.33      | 37.81          | 6.47       | 34.11         | 52.50          | 74.00      | -21.50     | Peak   |

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



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## 7.5 99% Bandwidth

Test Requirement RSS-Gen Section 6.7  
Test Method: ANSI C63.10 Section 6.9.3

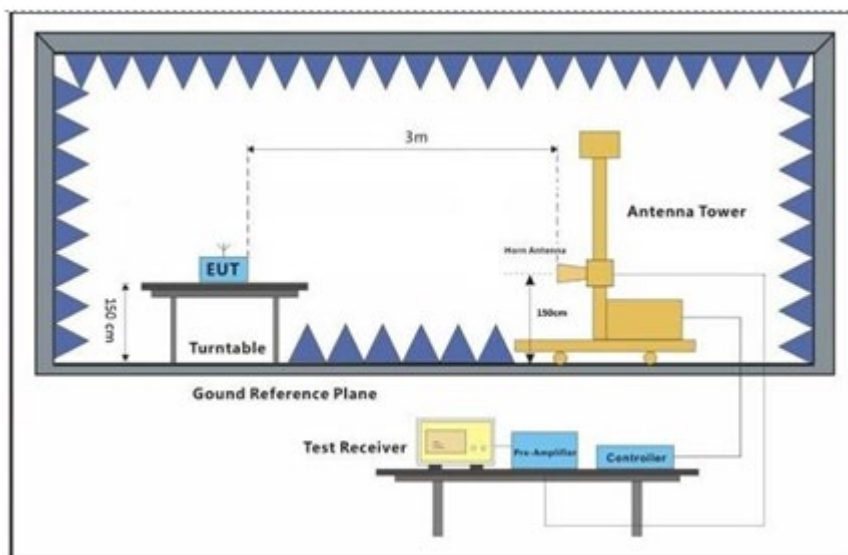
### 7.5.1 E.U.T. Operation

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.

### 7.5.2 Test Setup Diagram



### 7.5.3 Measurement Procedure and Data

- 1.Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centred on the hopping channel;
- 2.Set the spectrum analyzer: RBW = 1% of the span (set 30kHz). VBW >= RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
- 3.Mark the peak frequency and using the 99% OBW function measure the bandwidth.



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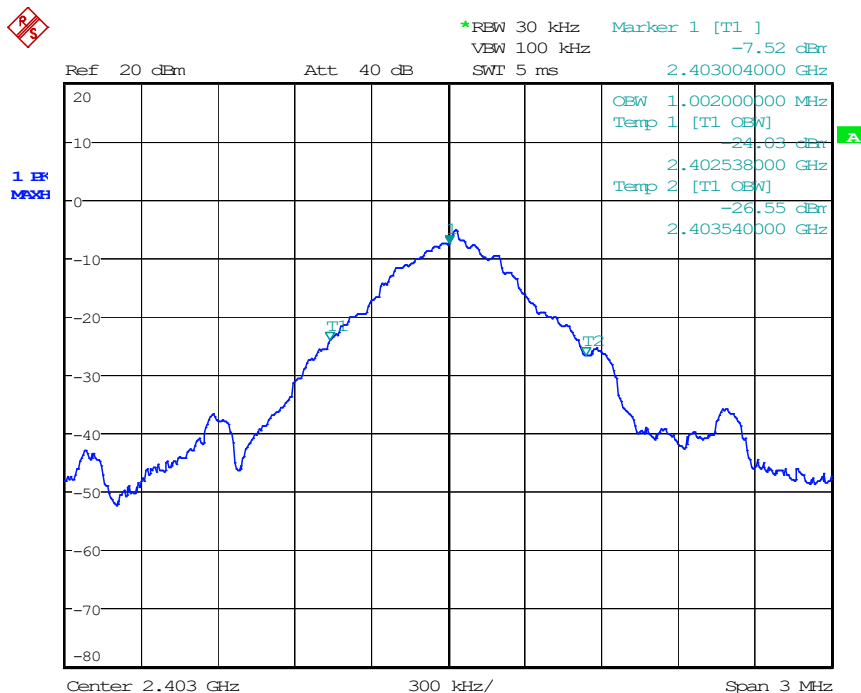
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| Frequency (MHz) | Bandwidth (MHz) | Result |
|-----------------|-----------------|--------|
| 2403            | 1.002           | PASS   |
| 2442            | 1.056           | PASS   |
| 2480            | 1.072           | PASS   |

Test plot as follows:

Channel: 2403MHz



Date: 27.MAY.2021 08:18:14



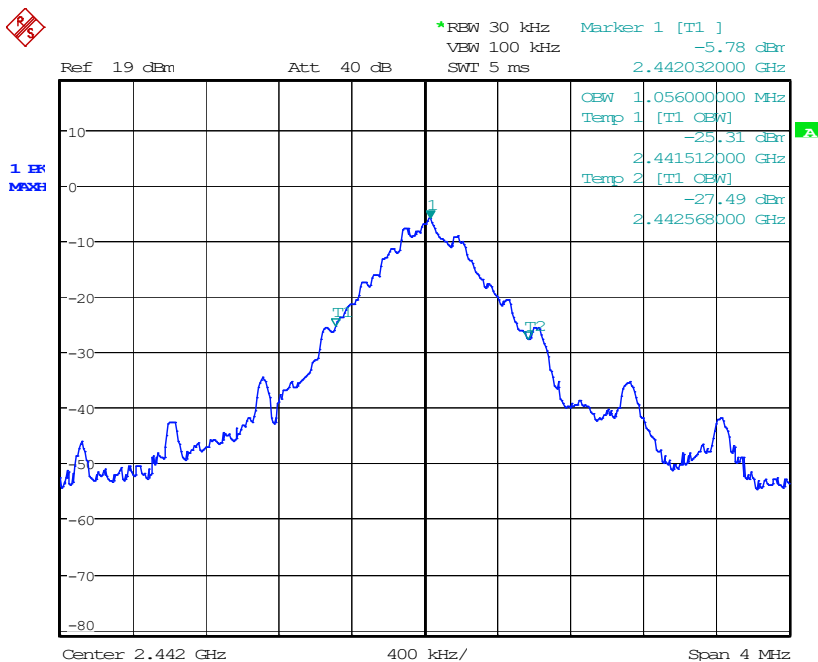
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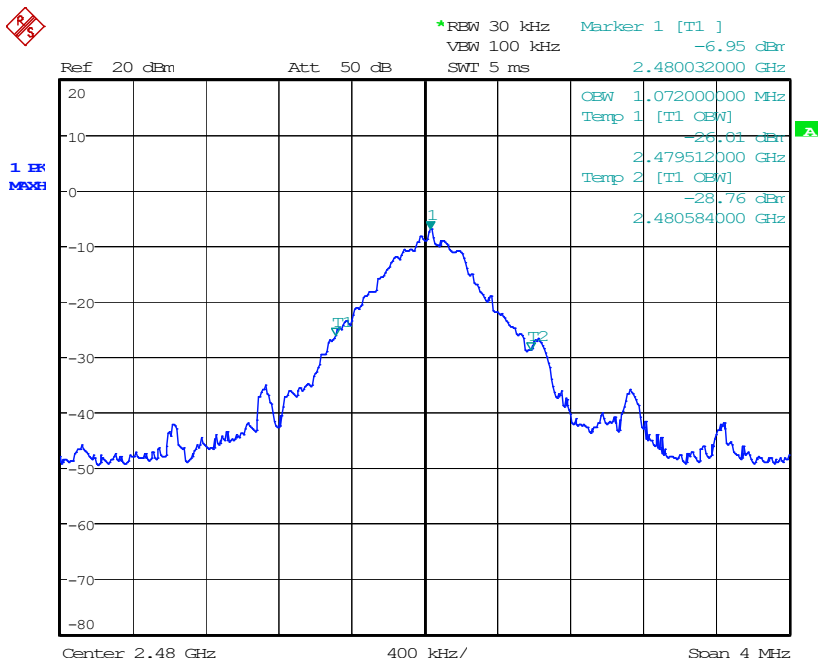
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Channel: 2442MHz



Date: 27.MAY.2021 08:25:03

Channel: 2480MHz



Date: 27.MAY.2021 08:36:16



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## 8 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

## 9 EUT Constructional Details

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

**- End of the Report -**

