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Report No.: GZEM151200667001

Page: 1 of 42

FCC ID: 2AHEYGC293618

## ***TEST REPORT***

The following sample(s) was/were submitted and identified on behalf of the client as:

|                             |   |
|-----------------------------|---|
| <b>Application No.:</b>     | GZEM1512006670HS  |
| <b>Applicant:</b>           | INTELLIGI LLC   |
| <b>FCC ID:</b>              | 2AHEYGC293618   |
| <b>Product Description:</b> | SIPPO SMART HYDRATION   |
| <b>Model No.:</b>           | SIPPO SMART HYDRATION ♣                                       |
| <b>♣</b>                    | Please refer to section 3 of this report for further details. |
| <b>Trade Mark:</b>          | SIPPO   |
| <b>Standards:</b>           | CFR 47 FCC PART 15 Subpart C: 2015 section 15.247             |
| <b>Date of Receipt:</b>     | 2015-01-04  |
| <b>Date of Test:</b>        | 2016-01-28 to 2016-02-01                                      |
| <b>Date of Issue:</b>       | 2016-04-08  |
| <b>Test Result :</b>        | <b>Pass*</b>  |

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above.



Authorized Signature:

**Jerry Chan**  
**Manager**

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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## 2 Version

| Revision Record |         |            |          |                 |
|-----------------|---------|------------|----------|-----------------|
| Version         | Chapter | Date       | Modifier | Remark          |
| 00              |         | 2016-04-08 |          | Original Report |
|                 |         |            |          |                 |
|                 |         |            |          |                 |
|                 |         |            |          |                 |
|                 |         |            |          |                 |

|                          |  |   |                          |
|--------------------------|--|---|--------------------------|
| Authorized for issue by: |  |   |                          |
| Tested By                |  |  | 2016-01-28 to 2016-02-01 |
|                          |  | (Curry Wu) /Project Engineer  | Date                     |
| Prepared By              |  |  | 2016-02-17               |
|                          |  | (Julia Zhu) / Clerk   | Date                     |
| Checked By               |  |  | 2016-02-22               |
|                          |  | (Ricky Liu) /Project Engineer   | Date                     |



### 3 Test Summary

| Test  | Test Requirement  | Test method   | Result |
|---|---|---|--------|
| Antenna Requirement   | FCC PART 15 C<br>section 15.247 (c) and<br>Section 15.203 | FCC PART 15 C<br>section 15.247 (c) and<br>Section 15.203 | PASS   |
| 6 dB Bandwidth  | FCC PART 15 C<br>section 15.247 (a)(2)                    | ANSI C63.10: Clause<br>6.9.1                              | PASS   |
| Maximum Peak Output Power   | FCC PART 15 C<br>section 15.247(b)(3)                     | ANSI C63.10: Clause<br>6.10.2                             | PASS   |
| Peak Power Spectral Density   | FCC PART 15 C<br>section 15.247(e)                        | ANSI C63.10: Clause<br>6.11.2.3                           | PASS   |
| Conducted Spurious Emission   | FCC PART 15 C<br>section 15.209<br>&15.247(d)             | ANSI C63.10: Clause 6.7                                   | PASS   |
| Radiated Spurious Emission  | FCC PART 15 C<br>section 15.209<br>&15.247(d)             | ANSI C63.10: Clause 6.4,<br>6.5 and 6.6                   | PASS   |
| Band Edges Measurement  | FCC PART 15 C<br>section 15.247 (d)<br>&15.205            | ANSI C63.10: Clause<br>6.9.2                              | PASS   |
| <b>Remark1:</b><br>EUT: In this whole report EUT means Equipment Under Test.<br>N/A: not applicable. Refer to the relative section for the details.<br>EUT: In this whole report EUT means Equipment Under Test.<br>Tx: In this whole report Tx (or tx) means Transmitter.<br>Rx: In this whole report Rx (or rx) means Receiver.<br>RF: In this whole report RF means Radio Frequency.<br>ANSI C63.10: the detail version is ANSI C63.10:2009 in the whole report. |   |   |        |
| <b>Model No.: SIPPO SMART HYDRATION</b><br>According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference being the outer colour.  |   |   |        |
| <b>Model No.:</b>   |   | <b>Colour:</b>  |        |
| SIPPO SMART HYDRATION   |   | Ocean Blue  |        |
|   |   | Ultimate Black  |        |
| Therefore only one model <b>SIPPO SMART HYDRATION (Ocean Blue)</b> was tested in this report.   |   |   |        |



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## **5 General Information**

### **5.1 Client Information**

Applicant: INTELLIGI LLC  
Address of Applicant: 16192 COASTAL HIGHWAY LEWES, DELAWARE 19958, USA

### **5.2 General Description of E.U.T.**

Product Description: SIPPO SMART HYDRATION  
Model No.: SIPPO SMART HYDRATION

### **5.3 Details of E.U.T.**

Operating Frequency 2402 MHz to 2480 MHz  
Type of Modulation: GFSK  
DSSS with Adaptive  
Equipment types: (Only one adaptive mode is implemented and could not operate in a non-adaptive mode.)  
Number of Channels 40 Channels  
Channel Separation: 2 MHz  
Duty Cycle: Continuous operation possible for testing purposes  
Antenna Type Integral antenna  
Antenna gain: 0 dBi  
Speciality: Bluetooth 4.0 BLE mode  
Function: A cup with BT function  
Power Supply: Working voltage: DC 3.0V = 1.5V X 2 Size 'AAA' batteries  
Normal Test Voltage: DC 3.0V  
Adapter: N/A  
Power cord: N/A



#### **5.4 Description of Support Units**

Using the special software and development board we can enter the product for engineer mode then we can control the EUT to select the wanted channel for test. The test board and PC are only to configure the engineer mode and not used to final test.

#### **5.5 Deviation from Standards**

Biconical and log periodic antennas were used instead of dipole antennas.

#### **5.6 Abnormalities from Standard Conditions**

None.

#### **5.7 Other Information Requested by the Customer**

None.

#### **5.8 Test Location**

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,  
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,  
Guangzhou, China 510663  
Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

## 5.9 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC (Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

- **Industry Canada (Registration No.: 4620B-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co. Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584, G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



## 6 Equipment List

| RE in Chamber |  |                                   |             |            |              |              |
|---------------|--|-----------------------------------|-------------|------------|--------------|--------------|
| No.           | Test Equipment                             | Manufacturer                      | Model No.   | Serial No. | Cal. date    | Cal.Due date |
|               |  |                                   |             |            | (YYYY-MM-DD) | (YYYY-MM-DD) |
| EMC0525       | Compact Semi-Anechoic Chamber              | ChangZhou ZhongYu                 | N/A         | N/A        | 2014-12-05   | 2016-12-04   |
| EMC0522       | EMI Test Receiver                          | Rohde & Schwarz                   | ESIB26      | 100283     | 2016-02-01   | 2017-01-31   |
| EMC0056       | EMI Test Receiver                          | Rohde & Schwarz                   | ESCI        | 100236     | 2016-02-01   | 2017-01-31   |
| EMC0528       | RI High frequency Cable                    | SGS                               | 20 m        | N/A        | 2014-04-19   | 2016-04-18   |
| EMC2025       | Trilog Broadband Antenna 30-1000MHz        | SCHWARZBECK MESS-ELEKTRONIK       | VULB 9160   | 9160-3372  | 2014-07-14   | 2017-07-13   |
| EMC0524       | Bi-log Type Antenna                        | Schaffner -Chase                  | CBL6112B    | 2966       | 2013-08-31   | 2016-08-30   |
| EMC0519       | Bilog Type Antenna                         | Schaffner -Chase                  | CBL6143     | 5070       | 2014-05-04   | 2017-05-03   |
| EMC2026       | Horn Antenna 1-18GHz                       | SCHWARZBECK MESS-ELEKTRONIK       | BBHA 9120D  | 9120D-841  | 2013-08-31   | 2016-08-31   |
| EMC0521       | 1-26.5 GHz Pre-Amplifier                   | Agilent                           | 8449B       | 3008A01649 | 2016-01-25   | 2017-01-24   |
| EMC2065       | Amplifier                                  | HP                                | 8447F       | N/A        | 2015-07-18   | 2016-07-17   |
| EMC2086       | PRE AMPLIFIER MH648A                       | ANRITSU CORP                      | MH648A      | N/A        | 2015-12-19   | 2016-12-18   |
| EMC2063       | Pre-amplifier 1GHz-26GHz                   | Compliance Direction Systems Lnc. | PAP-1G26-48 | 6279.628   | 2016-01-06   | 2017-01-05   |
| EMC0523       | Active Loop Antenna                        | EMCO                              | 6502        | 42963      | 2014-03-22   | 2016-03-21   |
| EMC2041       | Broad-Band Horn Antenna (14)15-26.5(40)GHz | SCHWARZBECK MESS-ELEKTRONIK       | BBHA 9170   | 9170-375   | 2014-05-26   | 2017-05-25   |
| EMC2079       | High Pass Filter(915MHz)                   | FSY MICROWAVE                     | HM1465-9SS  | 009        | 2016-01-25   | 2017-01-24   |
| EMC2069       | 2.4GHz filter                              | Micro-Tronics                     | BRM 50702   | 149        | 2016-01-25   | 2017-01-24   |
| EMC0530       | 10m Semi-Anechoic Chamber                  | ETS                               | N/A         | N/A        | 2014-05-03   | 2016-05-02   |

| General used equipment |                |              |           |            |              |              |
|------------------------|----------------|--------------|-----------|------------|--------------|--------------|
| No.                    | Test Equipment | Manufacturer | Model No. | Serial No. | Cal. date    | Cal.Due date |
|                        |                |              |           |            | (YYYY-MM-DD) | (YYYY-MM-DD) |
| EMC0006                | DMM            | Fluke        | 73        | 70681569   | 2015-09-17   | 2016-09-16   |
| EMC0007                | DMM            | Fluke        | 73        | 70671122   | 2015-09-17   | 2016-09-16   |





## 7 Test Results

### 7.1 E.U.T. test conditions

**Test Voltage:** DC 3.0V  
**Temperature:** 20.0 -25.0 °C  
**Humidity:** 38-50 % RH  
**Atmospheric Pressure:** 1000 -1010 mbar

**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.  
**15.32:** Power supplies and CPU boards used with personal computers and for which separate authorizations are required to be obtained shall be tested as follows: Testing shall be in accordance with the procedures specified in Section 15.31 of this part.

**Test frequencies and frequency range:** 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:

According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:



**Number of fundamental frequencies to be tested in EUT transmit band**

| Frequency range in which device operates | Number of frequencies | Location in frequency range of operation    |
|--|-----------------------|---|
| 1 MHz or less                            | 1                     | Middle                                      |
| 1 MHz 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 |

**Frequency range of radiated emission measurements**

| Lowest frequency generated in the device | Upper frequency range of measurement  |
|--|---|
| 9 kHz to below 10 GHz                    | 10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower                             |
| At or above 10 GHz to below 30 GHz       | 5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower                             |
| At or above 30 GHz                       | 5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified |

EUT channels and frequencies list:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 0       | 2402            | 27      | 2456            |
| 1       | 2404            | 28      | 2458            |
| 2       | 2406            | 29      | 2460            |
| 3       | 2408            | 30      | 2462            |
| 4       | 2410            | 31      | 2464            |
| 5       | 2412            | 32      | 2466            |
| 6       | 2414            | 33      | 2468            |
| 7       | 2416            | 34      | 2470            |
| 8       | 2418            | 35      | 2472            |
| 9       | 2420            | 36      | 2474            |
| 10      | 2422            | 37      | 2476            |
| 11      | 2424            | 38      | 2478            |
| 12      | 2426            | 39      | 2480            |
| 13      | 2428            | 40      | /               |
| 14      | 2430            | 41      | /               |
| 15      | 2432            | 42      | /               |
| 16      | 2434            | 43      | /               |
| 17      | 2436            | 44      | /               |
| 18      | 2438            | 45      | /               |
| 19      | 2440            | 46      | /               |
| 20      | 2442            | 47      | /               |
| 21      | 2444            | 48      | /               |
| 22      | 2446            | 49      | /               |
| 23      | 2448            | 50      | /               |
| 24      | 2450            | 51      | /               |
| 25      | 2452            | 52      | /               |
| 26      | 2454            | 53      | /               |

Using the special software and development board we can enter the product for engineer mode then we can control the EUT to select the wanted channel for test as above list.

Test frequencies are the lowest channel: 0 channel(2402MHz), middle channel: 20 channel(2442 MHz) and highest channel: 39 channel(2480 MHz)

## 7.2 Antenna Requirement

### Standard requirement

15.203 requirement:

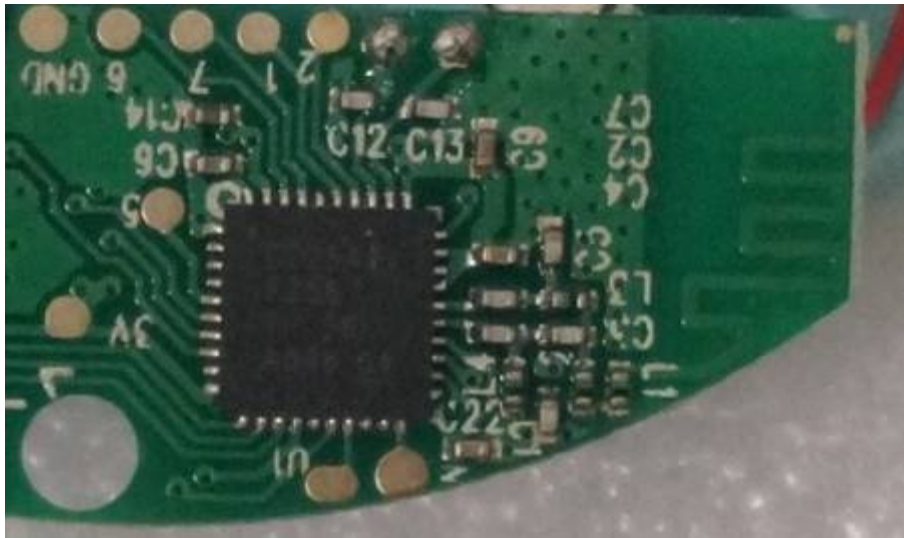
For intentional device. According to 15.203. an intentional radiator shall be designed to Ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz bands that are used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

### EUT Antenna

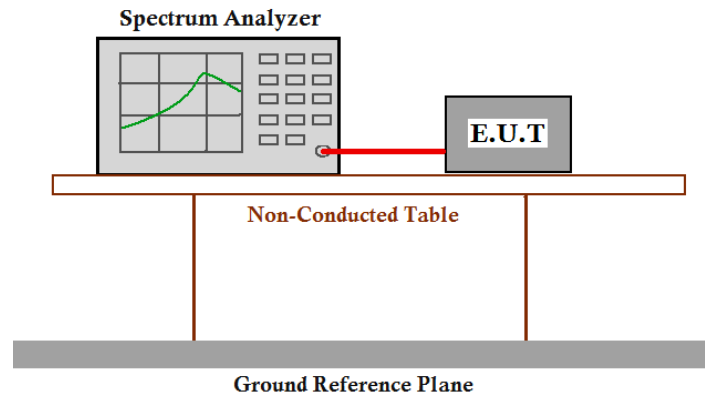
The antenna is PCB Layout antenna and no consideration of replacement. The best case gain of the antenna is 0Bi.



**Test result: The unit does meet the FCC requirements.**

### 7.3 6 dB Bandwidth

|                     |   |
|---------------------|---|
| Test Requirement:   | FCC Part 15 C section 15.247<br><br>(a)(2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz. |
| Test Method:        | ANSI C63.10: Clause 6.9.1   |
| Test Status:        | Enter test mode for the product. Test in Channel lowest (2402MHz), middle (2442MHz) and highest (2480MHz), keep in continuously transmitting status.  |
| Test Configuration: |   |



#### Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable (cable loss =1.2dB) from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW should be approximately 1% to 5% of the OBW, VBW = 3 times of RBW. Span should be between two times and five times the OBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold, Set span to encompass the entire emission bandwidth of the signal.
3. Mark the peak power frequency and -6dB (upper and lower) power frequency.
4. Repeat until all the test status is investigated.
5. Report the worse case.



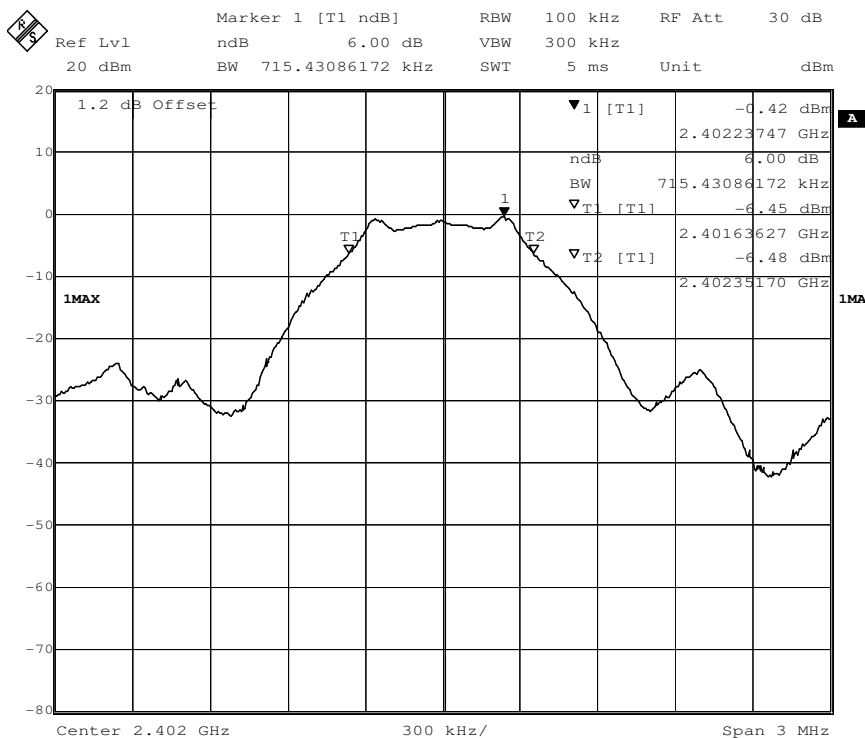
|    |      |      |         |         |      |
|----|------|------|---------|---------|------|
| 0  | 2402 | GFSK | 715.430 | ≥500KHz | Pass |
| 20 | 2442 |      | 697.395 |         | Pass |
| 39 | 2480 |      | 709.419 |         | Pass |

**Test result: The unit does meet the FCC requirements.**

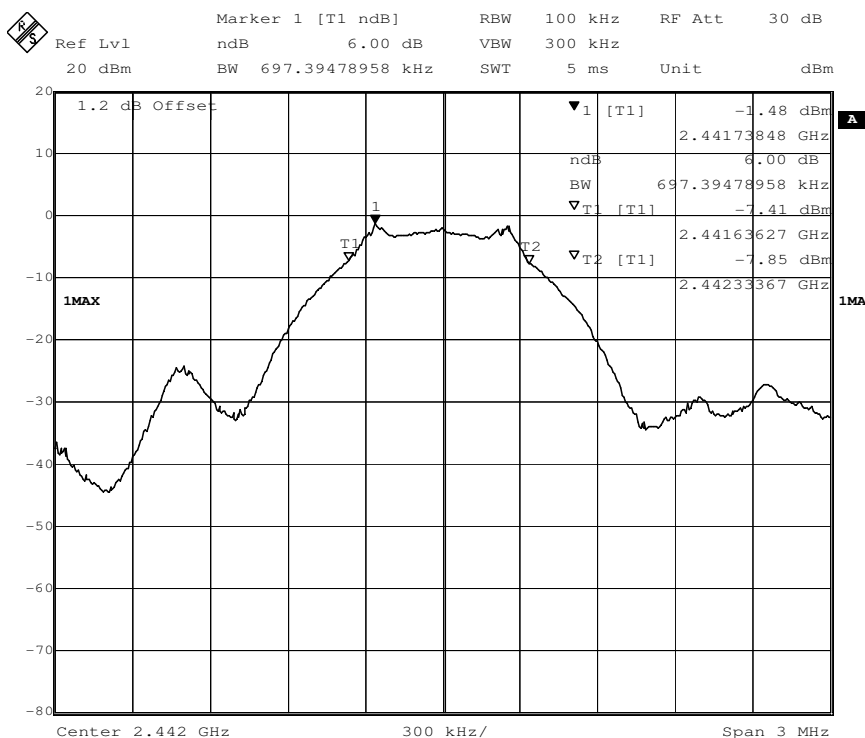


Result plot as follows:

Channel 0:2.402GHz:

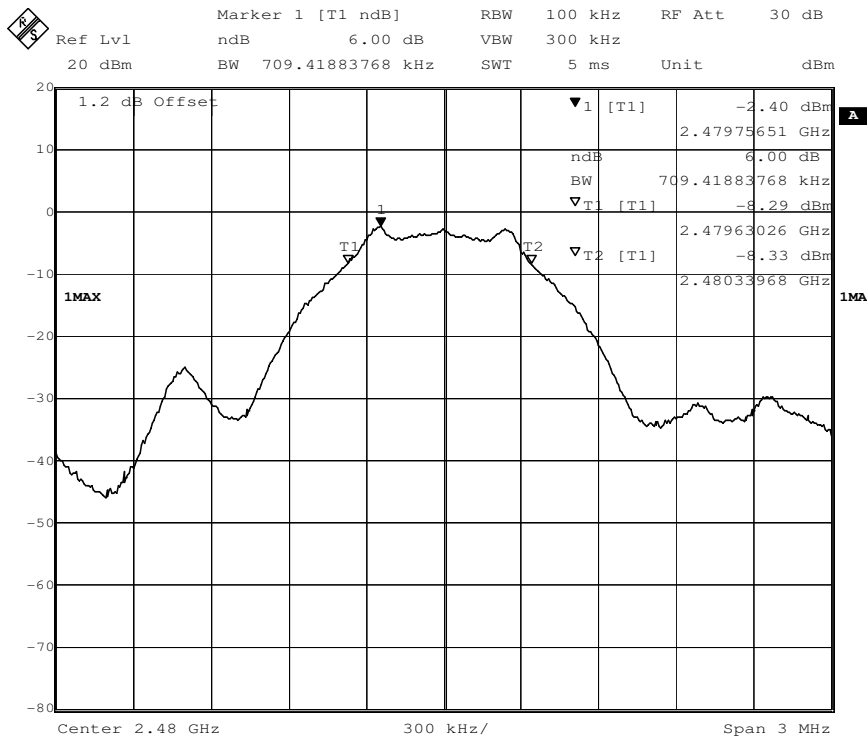


Channel 20:2.442GHz:





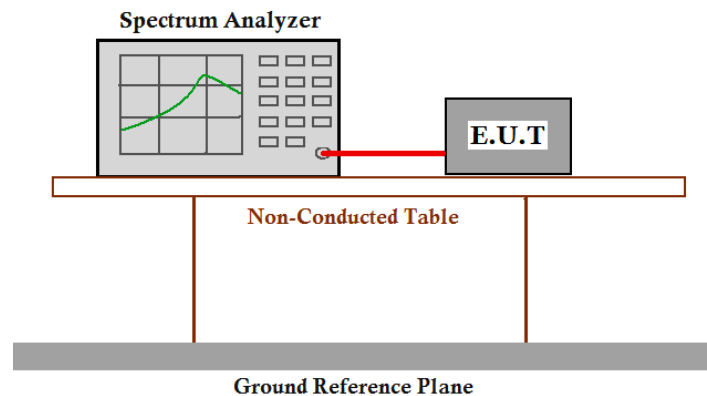
Channel 39:2.480GHz:





## 7.4 Maximum Peak Output Power

|                     |  |
|---------------------|--|
| Test Requirement:   | <p>FCC Part 15 C section 15.247</p> <p>(b)(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.</p> <p>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.</p> |
| Test Method:        | ANSI C63.10: Clause 8.5  |
| Test Status:        | Enter test mode for the product. Test in Channel lowest (2402MHz), middle (2442MHz) and highest (2480MHz), keep in continuously transmitting status.   |
| Test Configuration: |  |





Test Procedure:

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (Cable loss =1.2dB) from the antenna port to the spectrum.
2. Set the RBW $\geq$ DTS bandwidth
3. Set the VBW  $\geq 3 \times$  RBW
4. Set the span  $\geq 3 \times$  RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Use peak marker function to determine the peak amplitude level.
9. Report the worse case.

Test result:

| Channel No. | Frequency<br>(MHz) | Mode | Measured Channel Power<br>(dBm) | Limit     | Result |
|-------------|--------------------|------|---------------------------------|-----------|--------|
| 0           | 2402               | GFSK | -0.01                           | 1W(30dBm) | Pass   |
| 20          | 2442               |      | -0.87                           |           | Pass   |
| 39          | 2480               |      | -1.83                           |           | Pass   |

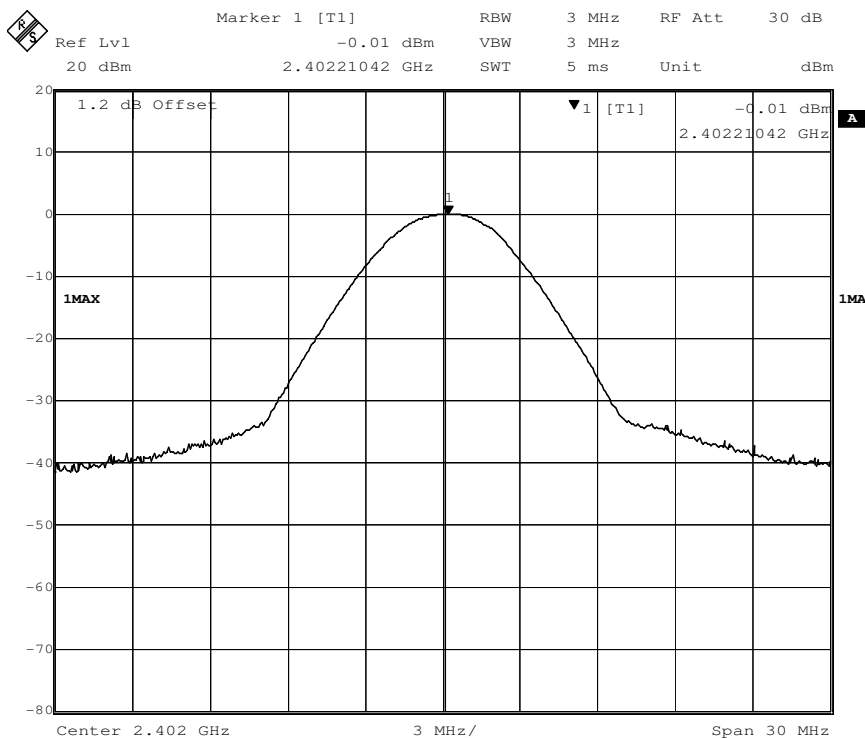
Remark: Level = Read Level + Cable Loss.

The unit does meet the FCC requirements.

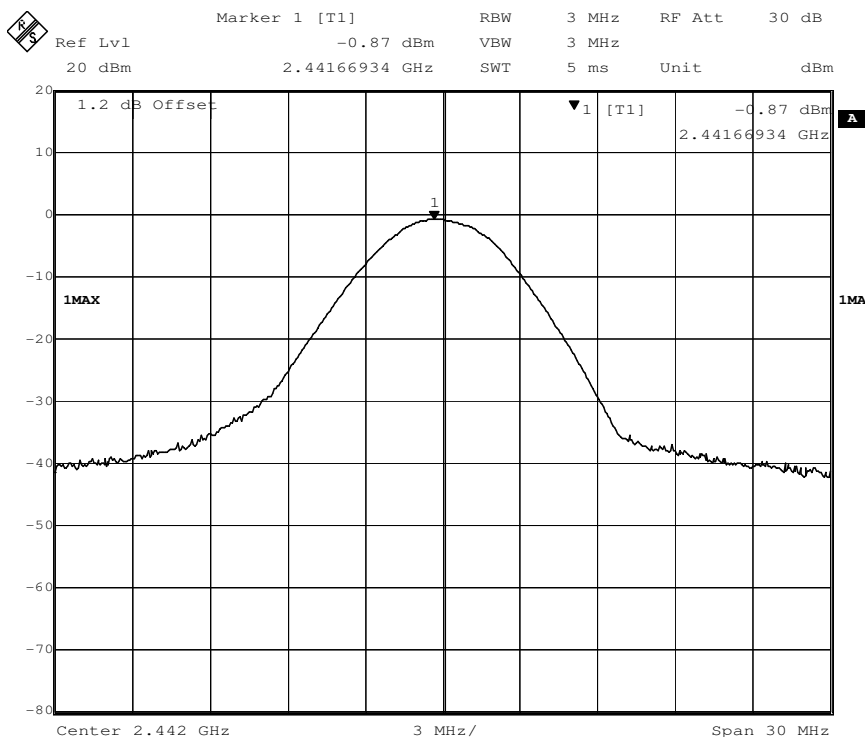


Result plot as follows:

Channel 0:2.402GHz:

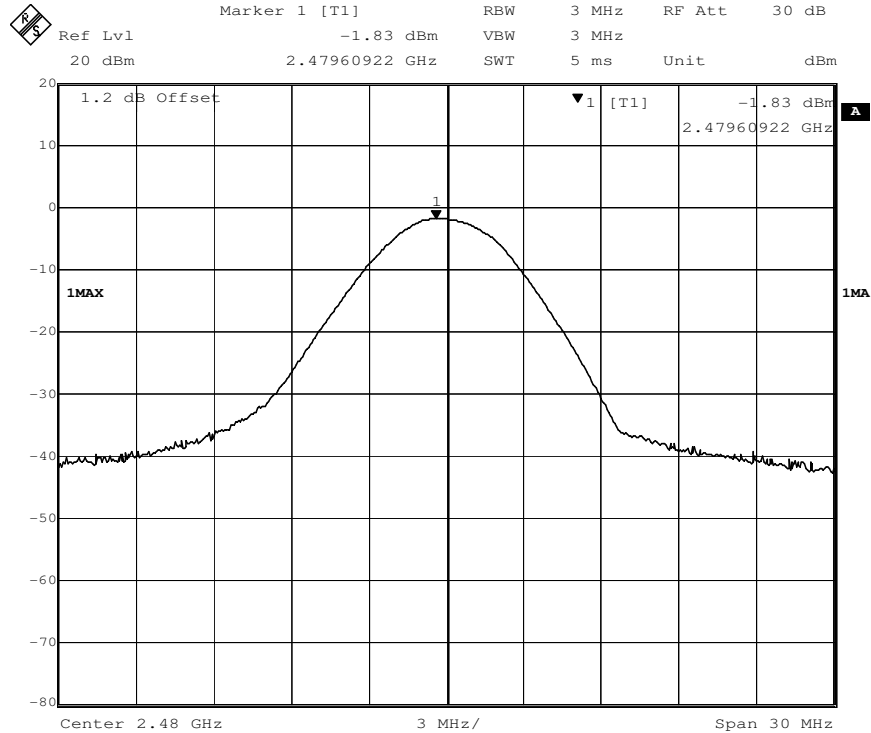


Channel 20:2.442GHz:



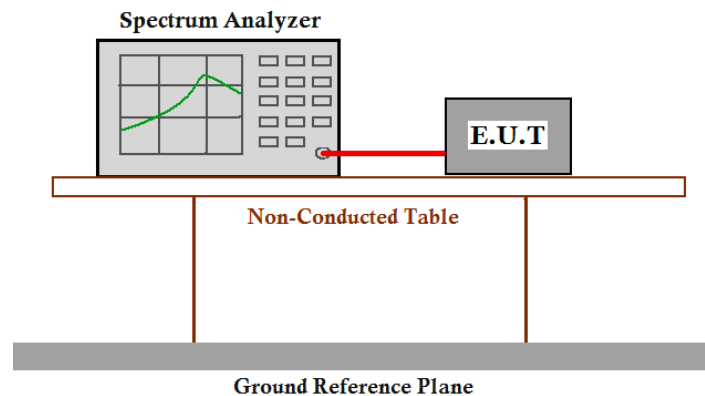


Channel 39:2.480GHz:



## 7.5 Peak Power Spectral Density

|                     |  |
|---------------------|--|
| Test Requirement:   | <p>FCC Part 15 C section 15.247</p> <p>(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.</p> <p>This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.</p> |
| Test Method:        | ANSI C63.10: Clause 6.11.2.3   |
| Test Status:        | Enter test mode for the product. Test in lowest Channel 2402MHz, middle Channel 2442MHz and highest Channel 2480MHz, keep in continuously transmitting status.   |
| Test Configuration: |  |



Test Procedure:



1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable (cable loss =1.2dB) from the antenna port to the spectrum analyzer or power meter.
2. Set the spectrum analyzer:
  - a) Set CENTER FREQUENCY = Frequency from Power Spectral Density Test Matrix (see 6.10.2)
  - b) Set SPAN = 20 MHz (For devices with a nominal 40 MHz BW, 50 MHz span will be needed)
  - c) Set REFERENCE LEVEL = 20 dBm
  - d) Set ATTENUATION = 0 dB (add internal attenuation, if necessary)
  - e) Set SWEEP TIME = Coupled
  - f) Set RBW = 3 kHz
  - g) Set VBW = 10 kHz
  - h) Set DETECTOR = Peak
  - i) Set MKR = Center Frequency
  - j) Set TRACE = CLEAR WRITE

Place the radio in continuous transmit mode. Set the TRACE to MAX HOLD, and after the trace stabilizes, the TRACE to VIEW. Set the marker on the peak of the signal and then adjust the center frequency of the spectrum analyzer to the marker frequency.

After viewing the EUT waveform on the spectrum analyzer, perform the following spectrum analyzer functions to capture the trace:

Set SPAN = 300 kHz

Set SWEEP TIME = 100 s

Set TRACE = MAX HOLD

Set MKR = PEAK SEARCH

3. Measure the Power Spectral Density of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worse case.



| Channel No. | Frequency (MHz) | Mode | Measured Peak Power Spectral Density (dBm/3KHz) | Limit     | Result |
|-------------|-----------------|------|---|-----------|--------|
| 0           | 2402            | GFSK | -11.82  | 8dBm/3KHz | Pass   |
| 20          | 2442            |      | -12.61  |           | Pass   |
| 39          | 2480            |      | -13.44  |           | Pass   |

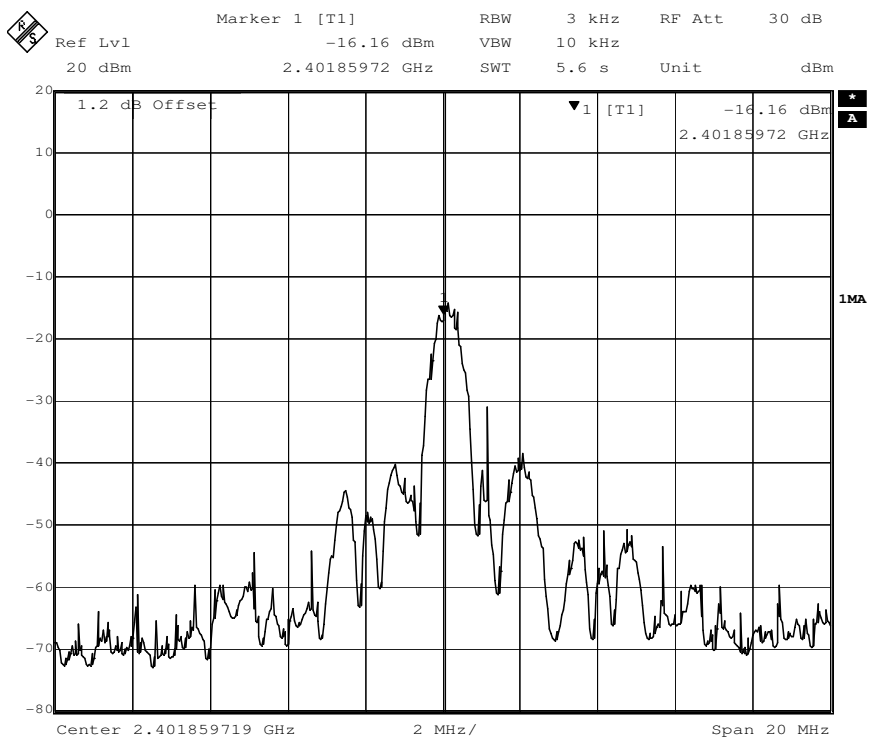
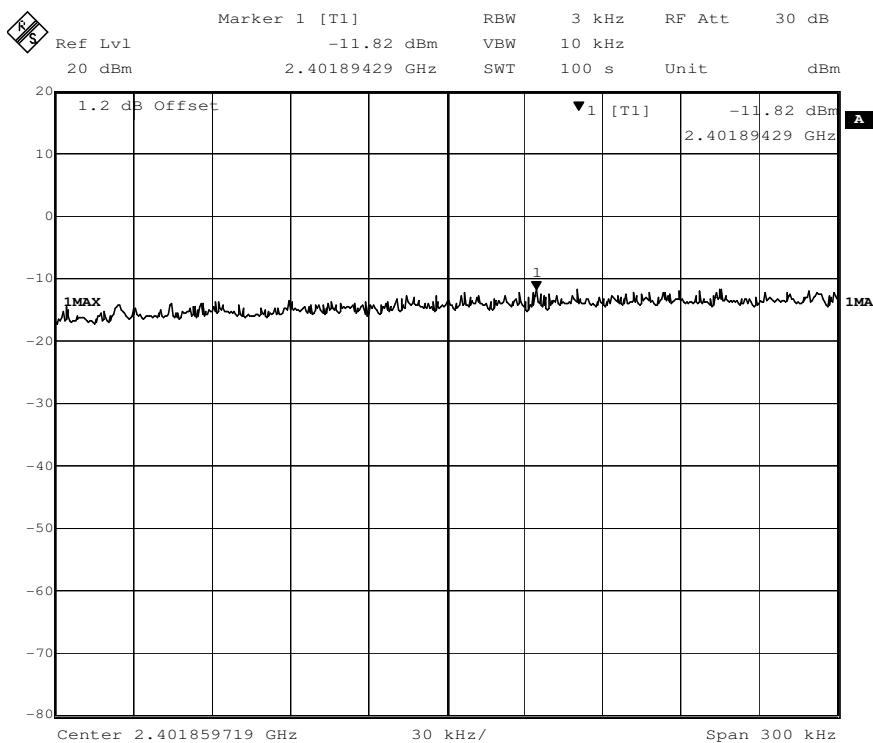
**Test result: Level = Read Level + Cable Loss.**

**The unit does meet the FCC requirements.**



Result plot as follows:

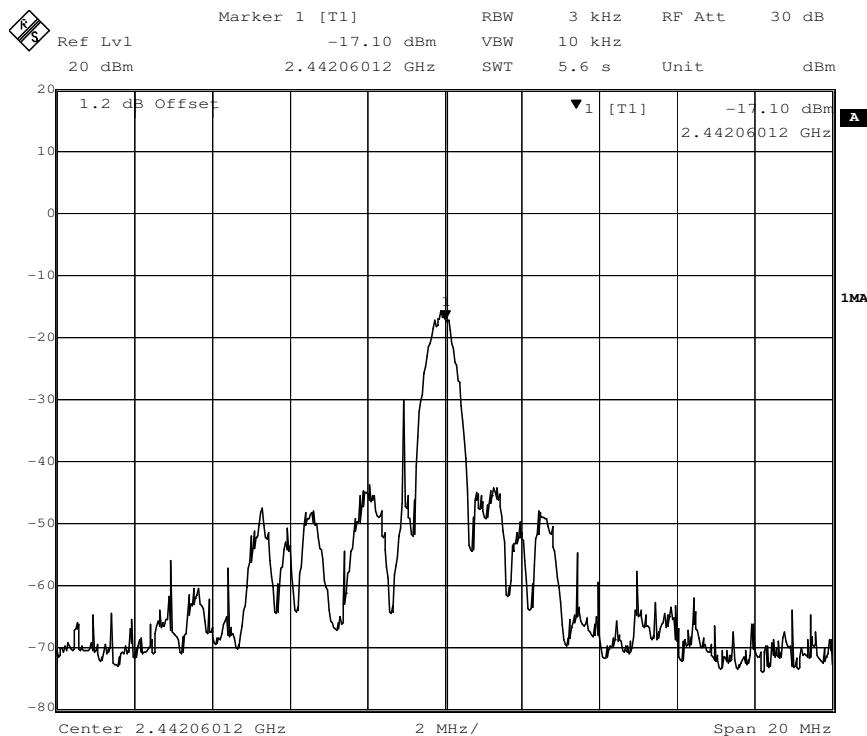
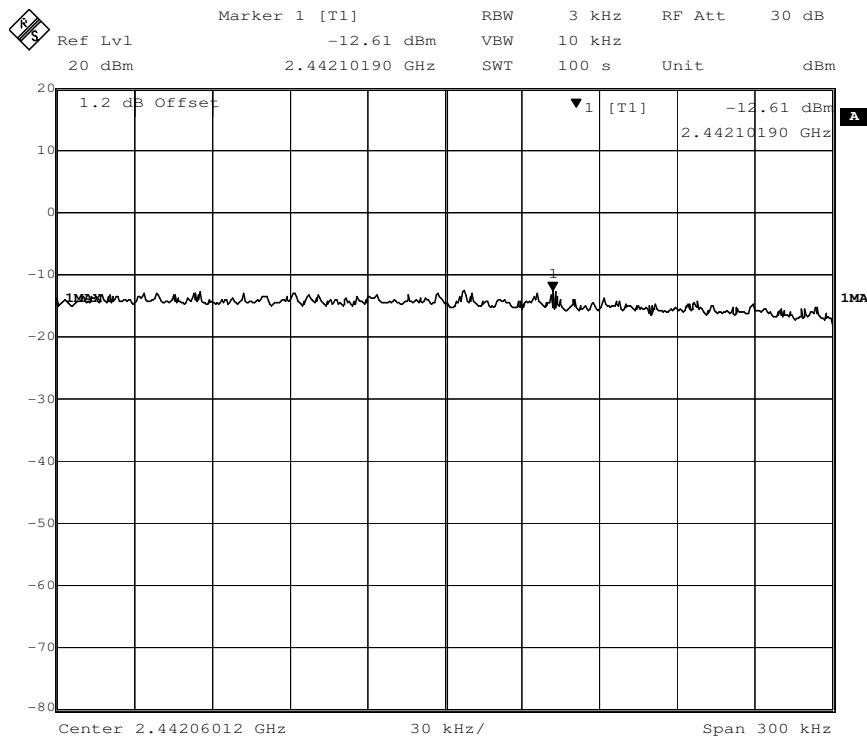
Channel 0:2.402 GHz:





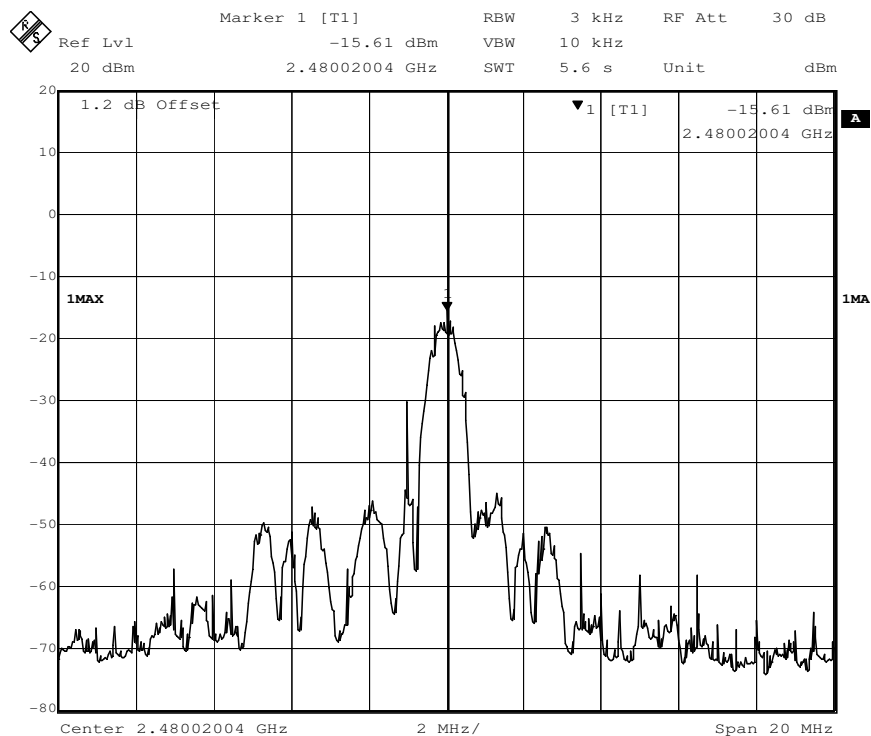
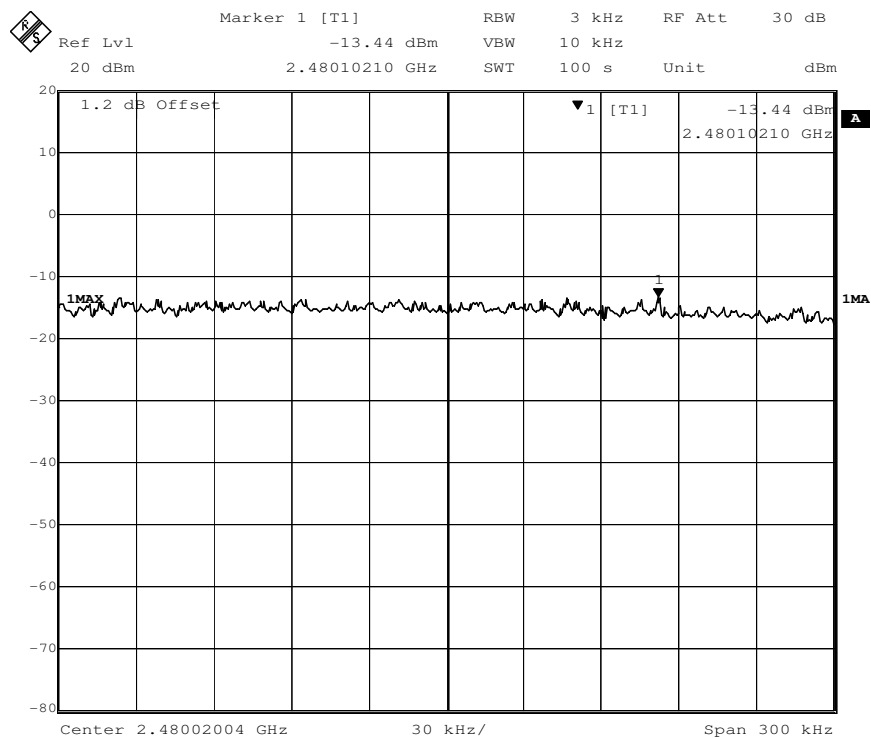


Channel 20:2.442 GHz:





Channel 39:2.480 GHz:



## 7.6 Conducted Spurious Emissions

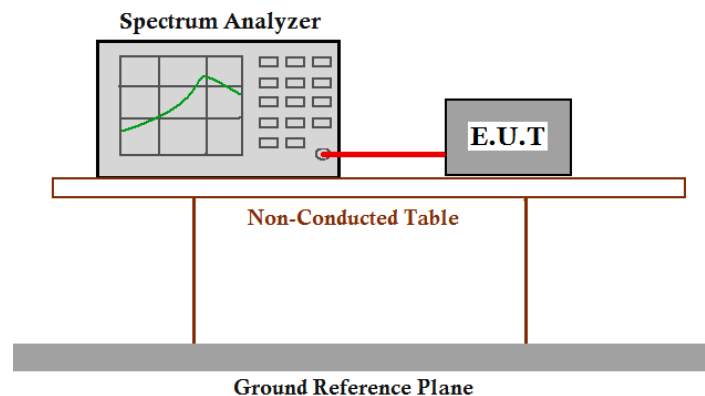
Test Requirement: FCC Part 15 C section 15.247

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Based on either an RF conducted or a radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Method: ANSI C63.10: Clause 6.7

Test Status: Enter test mode for the product. Test in lowest Channel 2402MHz, middle Channel 2442MHz and highest Channel 2480MHz, keep in continuously transmitting status.

Test Configuration:



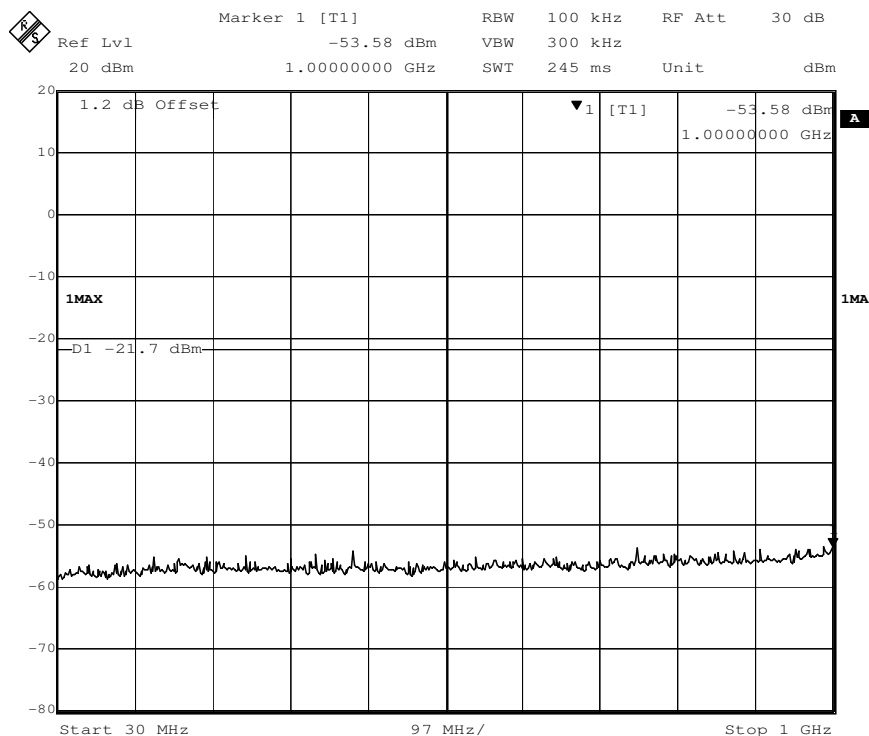
Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter.
2. Set the spectrum analyzer: RBW=100 KHz, VBW = 300KHz. Sweep = auto; Detector Function = Peak. Trace = Max Hold, Scan up through 10th harmonic.
3. Measure the Conducted Spurious Emissions of the test frequency with special test status.
4. Repeat until all the test status is investigated.
5. Report the worse case.

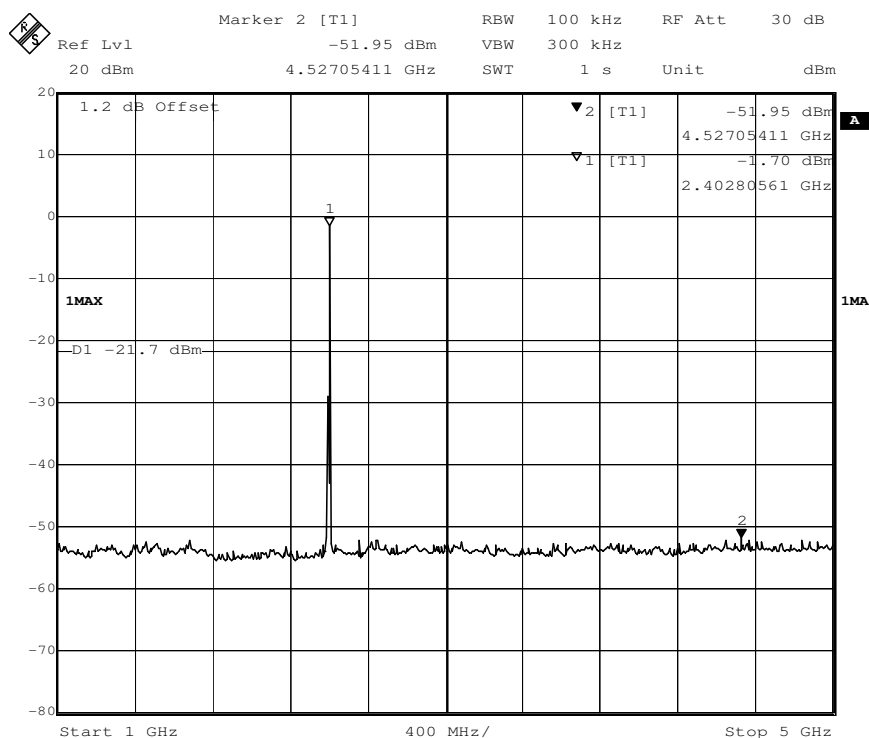
Result plot as follows:

Channel 0: 2.402 GHz

**30 MHz to 1GHz**

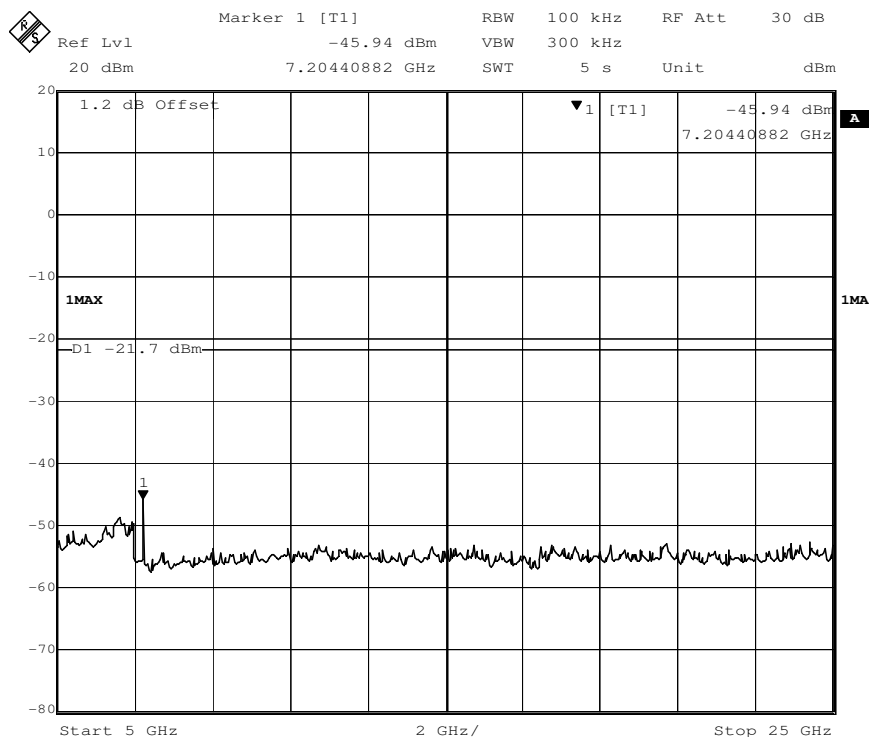


**1GHz to 5GHz**



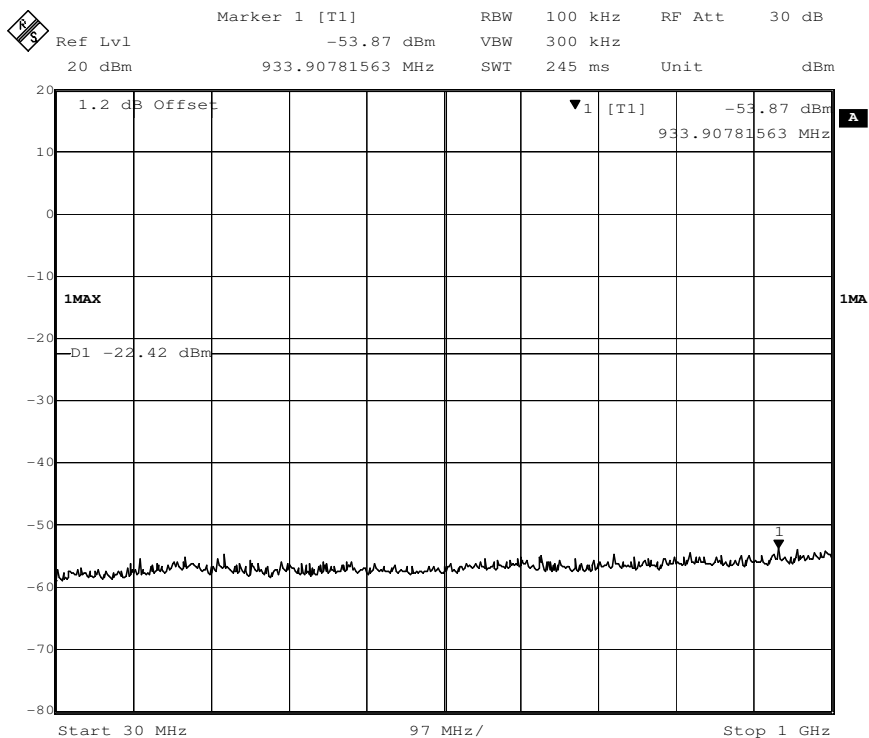


### 5GHz to 25GHz



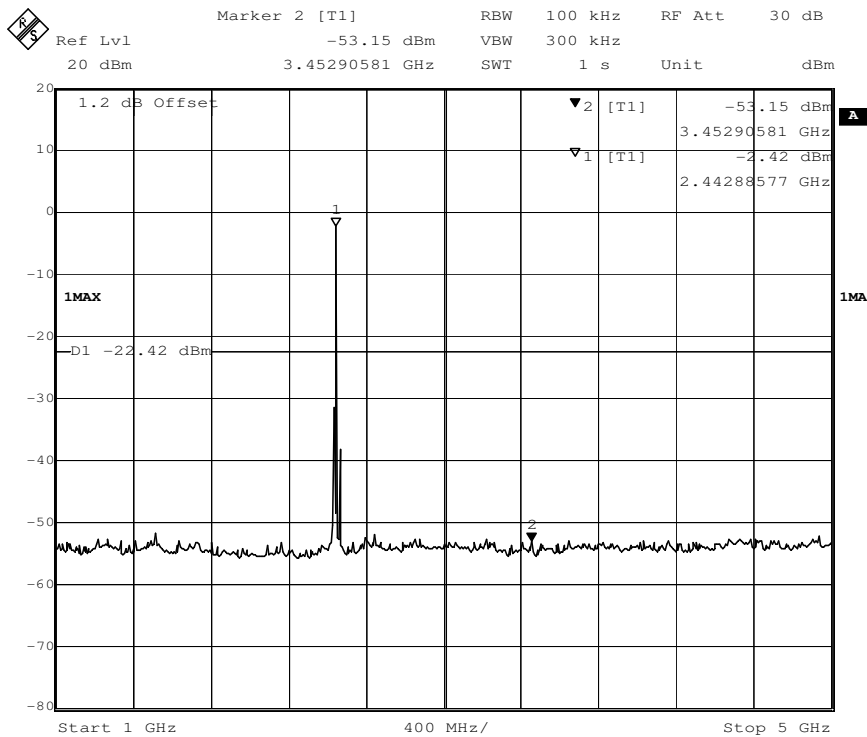
### Channel 20:2.442GHz

### 30 MHz to 1GHz

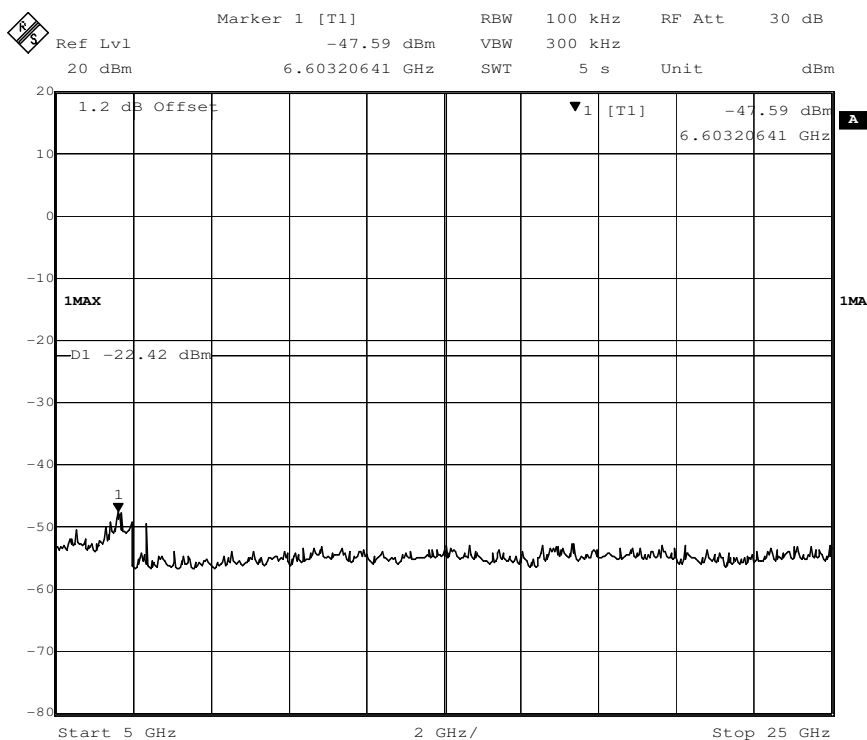




### 1GHz to 5GHz



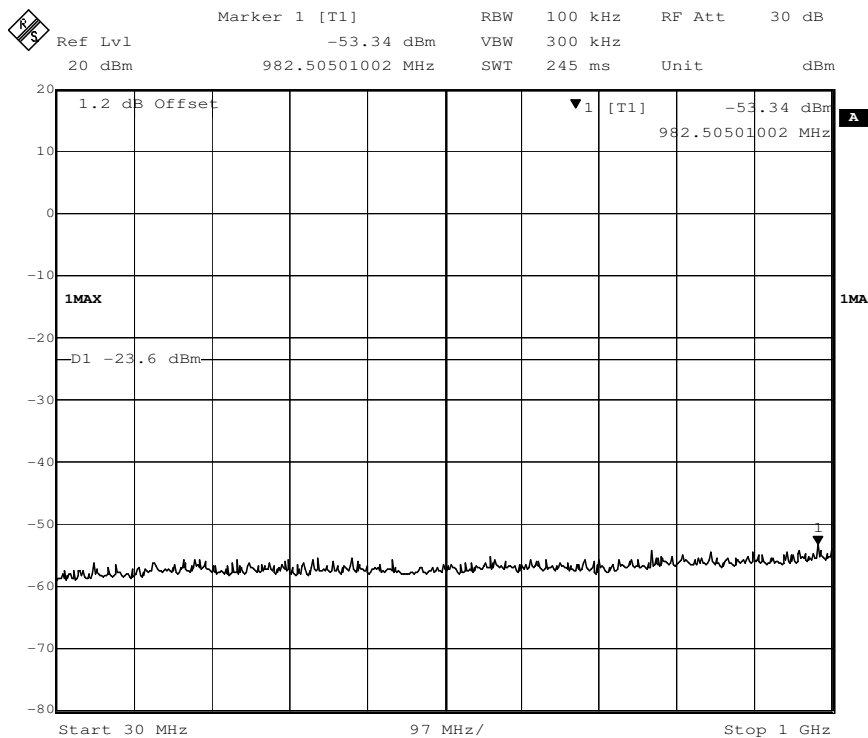
### 5GHz to 25GHz



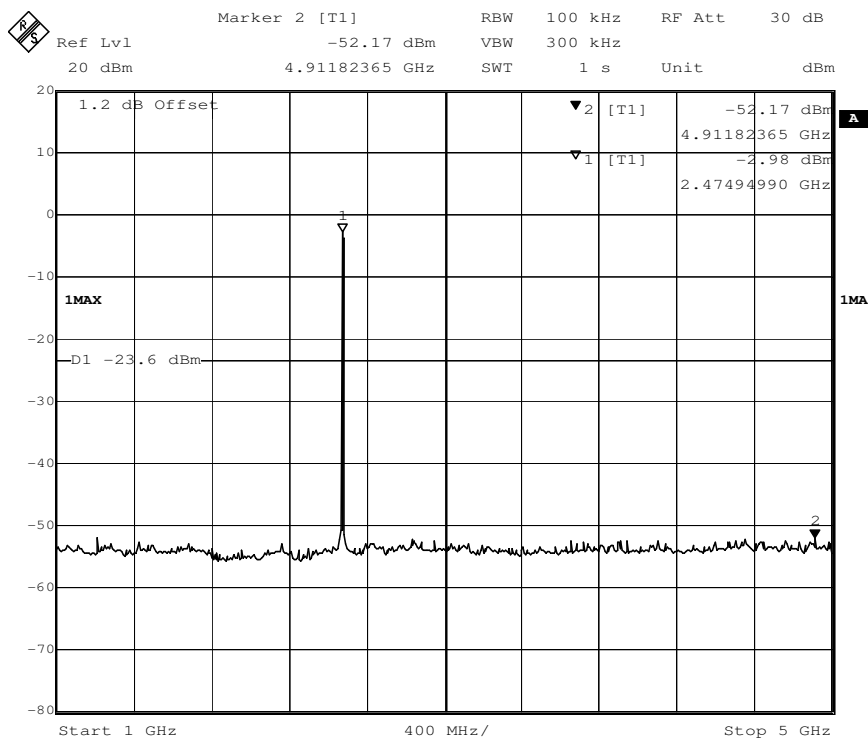


Channel 39:2.480GHz

30 MHz to 1GHz

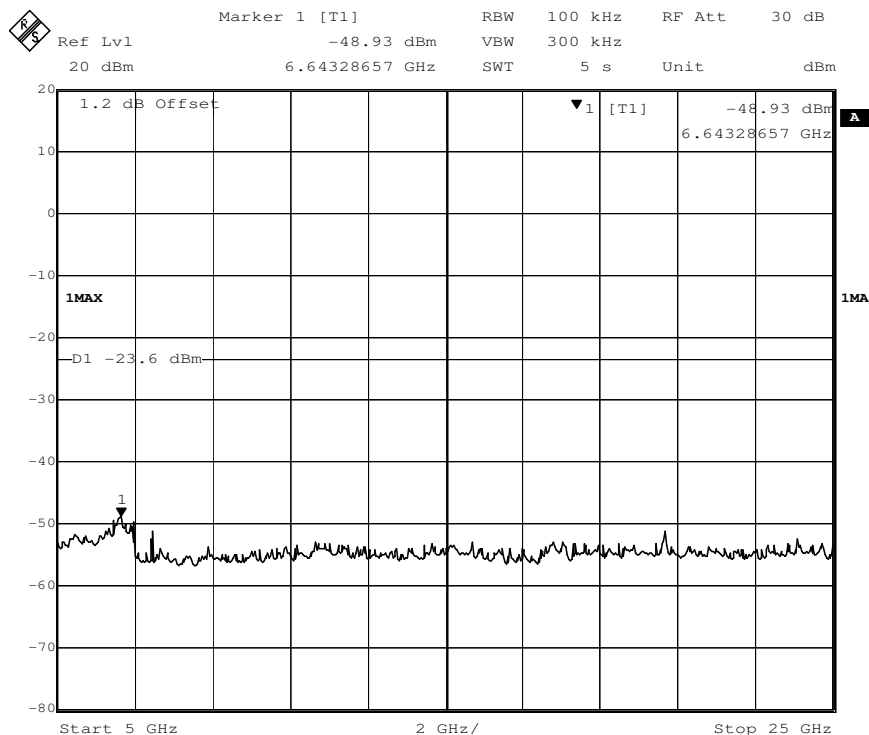


1GHz to 5GHz





5GHz to 25GHz

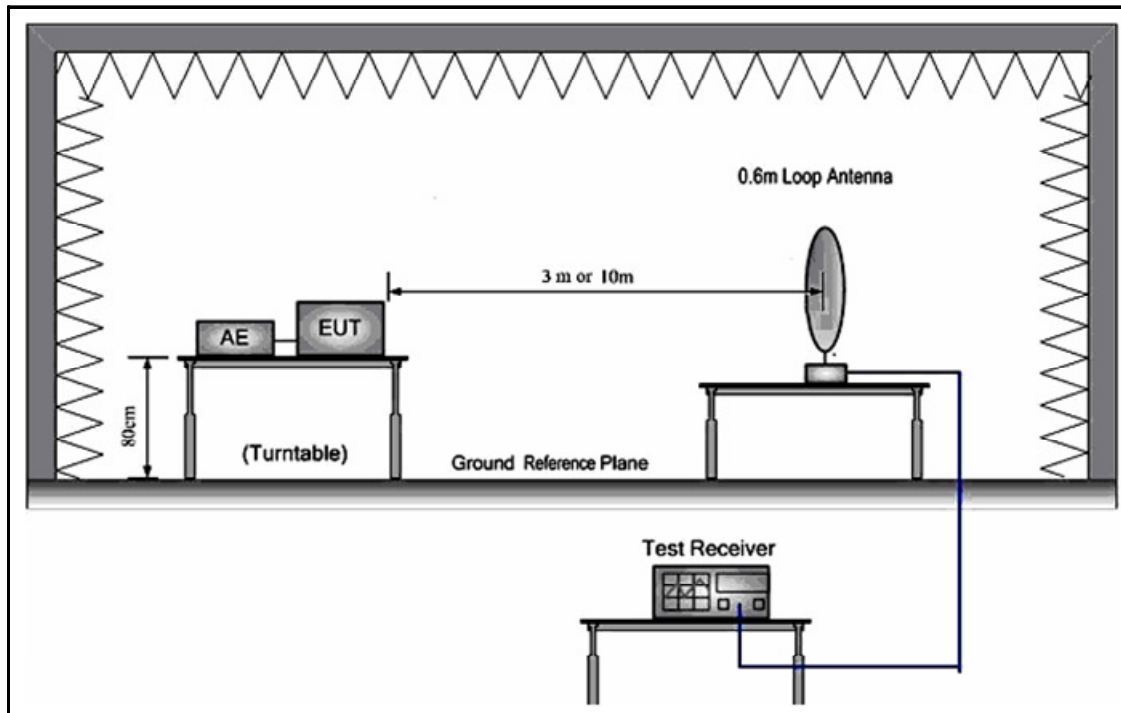




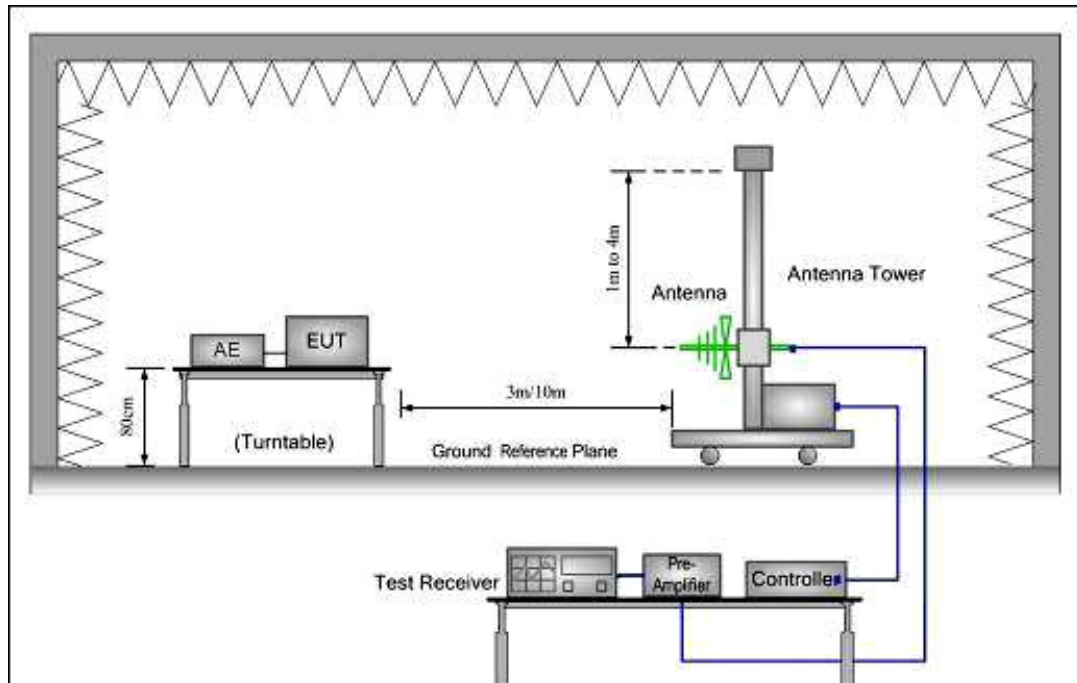
## 7.7 Radiated Emissions which fall in the restricted bands

|                      |  |
|----------------------|--|
| Test Requirement:    | FCC Part 15 C section 15.247<br><br>(d) In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).  |
| Test Method:         | ANSI C63.10: Clause 6.4.4, 6.5.4 and 6.6.4   |
| Test Status:         | Enter test mode for the product. Test in lowest channel 2402 MHz and highest channel 2480 MHz, keep in continuously transmitting status with GFSK modulation. Test the EUT in three-dimension and find the worst case  |
| Test site:           | Measurement Distance: 3m (Semi-Anechoic Chamber)   |
| Limit:               | 40.0 dB $\mu$ V/m between 30MHz & 88MHz;<br>43.5 dB $\mu$ V/m between 88MHz & 216MHz;<br>46.0 dB $\mu$ V/m between 216MHz & 960MHz;<br>54.0 dB $\mu$ V/m above 960MHz.   |
| Detector:            | For PK value:<br>RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz<br>VBW $\geq$ RBW<br>Sweep = auto<br>Detector function = peak<br>Trace = max hold<br>For AV value:<br>RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz<br>VBW = 10Hz<br>Sweep = auto<br>Detector function = peak<br>Trace = max hold |
| Test Frequency Range | 9KHz~26GHz   |
| Test Configuration:  |  |

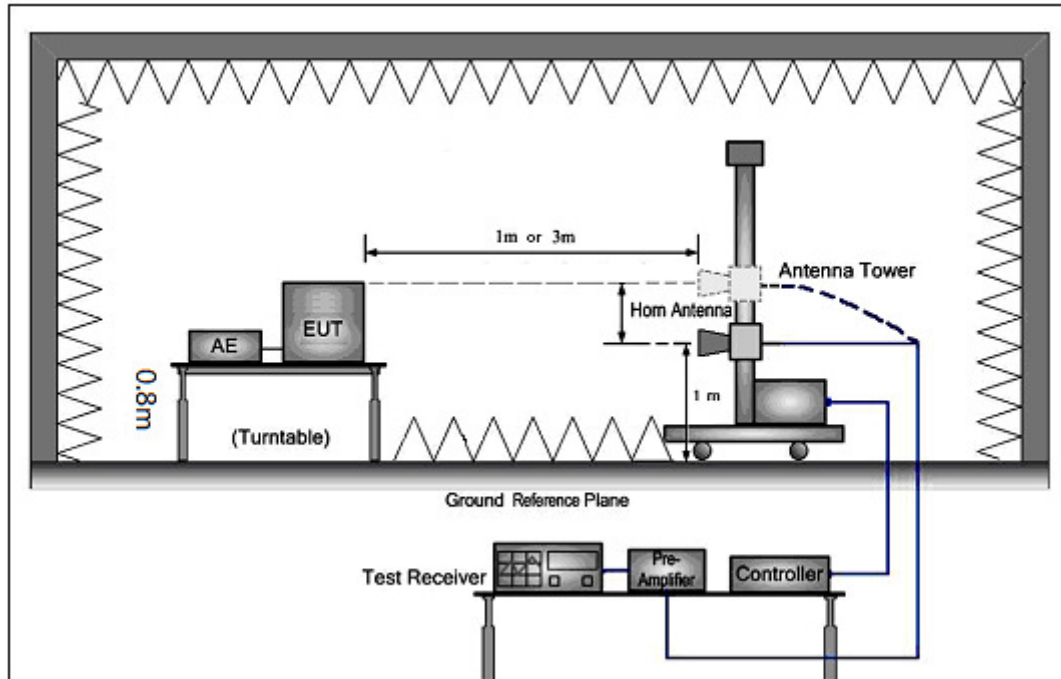
1). 9 KHz to 30 MHz emissions:



2). 30 MHz to 1 GHz emissions:



3). 1 GHz to 40 GHz emissions:





Section 15.205 Restricted bands of operation.

(a) 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     | 10.6 - 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     |               |
| 13.36 - 13.41              | 322 - 335.4         |                 |               |



**Test Result:**

**Test at lowest Channel (2.402 GHz) in transmitting status**

**9 KHz~1000 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement**

The measurements with Loop antenna & Log antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

**Peak Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.000        | 27.93                  | 6.80            | 35.20              | 40.42                | 39.95                   | 74.00          | Vertical             |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 41.15                | 40.43                   | 74.00          | V                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 40.65                | 40.00                   | 74.00          | V                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 40.25                | 39.60                   | 74.00          | V                    |
| 2310.000        | 27.93                  | 6.80            | 35.20              | 40.21                | 39.74                   | 74.00          | Horizontal           |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 41.54                | 40.82                   | 74.00          | H                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 39.74                | 39.09                   | 74.00          | H                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 40.80                | 40.15                   | 74.00          | H                    |

**Average Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.000        | 27.93                  | 6.80            | 35.20              | 32.94                | 32.47                   | 54.00          | Vertical             |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 34.97                | 34.25                   | 54.00          | V                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 33.77                | 33.12                   | 54.00          | V                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 35.14                | 34.49                   | 54.00          | V                    |
| 2310.000        | 27.93                  | 6.80            | 35.20              | 33.56                | 33.09                   | 54.00          | Horizontal           |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 35.25                | 34.53                   | 54.00          | H                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 33.83                | 33.18                   | 54.00          | H                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 35.86                | 35.21                   | 54.00          | H                    |



**Test at middle Channel(2.442 GHz) in transmitting status**

**9 KHz~1000 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement**

The measurements with Loop antenna & Log antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

**Peak Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.000        | 27.93                  | 6.80            | 35.20              | 41.18                | 40.71                   | 74.00          | Vertical             |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 41.28                | 40.56                   | 74.00          | V                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 40.29                | 39.64                   | 74.00          | V                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 39.54                | 38.89                   | 74.00          | V                    |
| 2310.000        | 27.93                  | 6.80            | 35.20              | 39.49                | 39.02                   | 74.00          | Horizontal           |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 42.49                | 41.77                   | 74.00          | H                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 41.12                | 40.47                   | 74.00          | H                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 41.59                | 40.94                   | 74.00          | H                    |

**Average Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.000        | 27.93                  | 6.80            | 35.20              | 31.45                | 30.98                   | 54.00          | Vertical             |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 32.72                | 32.00                   | 54.00          | V                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 31.96                | 31.31                   | 54.00          | V                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 32.51                | 31.86                   | 54.00          | V                    |
| 2310.000        | 27.93                  | 6.80            | 35.20              | 32.85                | 32.38                   | 54.00          | Horizontal           |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 33.85                | 33.13                   | 54.00          | H                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 34.48                | 33.83                   | 54.00          | H                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 33.15                | 32.50                   | 54.00          | H                    |



**Test at highest Channel (2.480 GHz) in transmitting status**

**9 KHz~1000 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement**

The measurements with Loop antenna & Log antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

**Peak Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.000        | 27.93                  | 6.80            | 35.20              | 40.04                | 39.57                   | 74.00          | Vertical             |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 40.63                | 39.91                   | 74.00          | V                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 40.29                | 39.64                   | 74.00          | V                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 41.22                | 40.57                   | 74.00          | V                    |
| 2310.000        | 27.93                  | 6.80            | 35.20              | 41.25                | 40.78                   | 74.00          | Horizontal           |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 40.65                | 39.93                   | 74.00          | H                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 40.80                | 40.15                   | 74.00          | H                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 40.17                | 39.52                   | 74.00          | H                    |

**Average Measurement:**

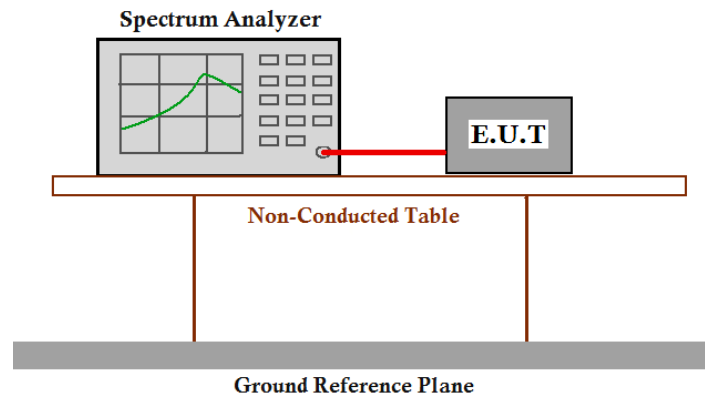
| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.000        | 27.93                  | 6.80            | 35.20              | 31.11                | 30.64                   | 54.00          | Vertical             |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 32.85                | 32.13                   | 54.00          | V                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 33.79                | 33.14                   | 54.00          | V                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 32.98                | 32.33                   | 54.00          | V                    |
| 2310.000        | 27.93                  | 6.80            | 35.20              | 32.24                | 31.77                   | 54.00          | Horizontal           |
| 2390.000        | 27.61                  | 6.87            | 35.20              | 33.42                | 32.70                   | 54.00          | H                    |
| 2483.500        | 27.55                  | 7.07            | 35.27              | 34.55                | 33.90                   | 54.00          | H                    |
| 2500.000        | 27.55                  | 7.10            | 35.30              | 33.07                | 32.42                   | 54.00          | H                    |

Remark: above table only record the worse data of emissions in restricted frequency bands.

**Test result: The unit does meet the FCC requirements.**

## 7.8 Band Edges Requirement

|                     |   |
|---------------------|---|
| Test Requirement:   | FCC Part 15 C section 15.247<br><br>(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Based on either an RF conducted or a radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits. |
| Frequency Band:     | 2400 MHz to 2483.5 MHz  |
| Test Method:        | ANSI C63.10: Clause 6.9.2   |
| Test Status:        | Enter test mode for the product. Test in lowest channel 2402 MHz and highest channel 2480 MHz, keep in continuously transmitting status with GFSK modulation.   |
| Test Configuration: |   |



### Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer or power meter.
2. Set instrument center frequency to the frequency of the emission to be measured (must be within 2MHz of the authorized band edge).
3. Set span to 2MHz,
4. RBW=100kHz,
5. VBW $\geq$ 3 $\times$ RBW
6. Detector=peak
7. Sweep time =auto,
8. Trace mode=max hold.



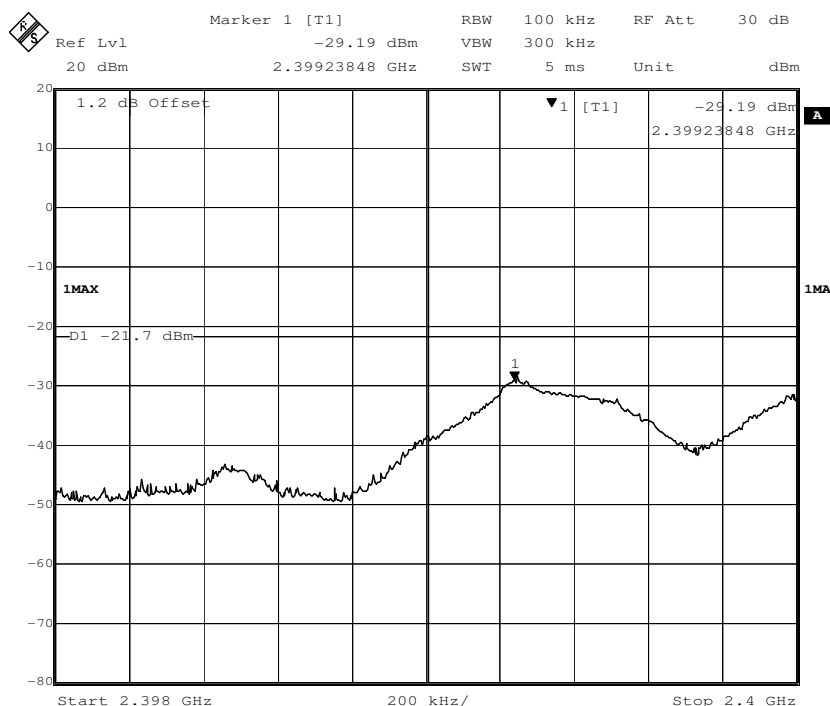
9. Allow sweep to continue until the trace stabilizes(required measurement time may increase for low duty cycle applications)
10. Compute the power by integrating the spectrum over 1MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency( $f_{\text{emission}} \pm 0.5\text{MHz}$ ). If the instrument does not have a band power function, the sum the amplitude levels(in power units) at 100kHz intervals extending across the 1MHz spectrum defined by  $f_{\text{emission}} \pm 0.5\text{MHz}$ .

**Test result with plots as follows:**

Compare with the output power of the lowest frequency, the Lower Edges attenuated more than 20dB  
Compare with the output power of the highest frequency, the Upper Edges attenuated more than 20dB.

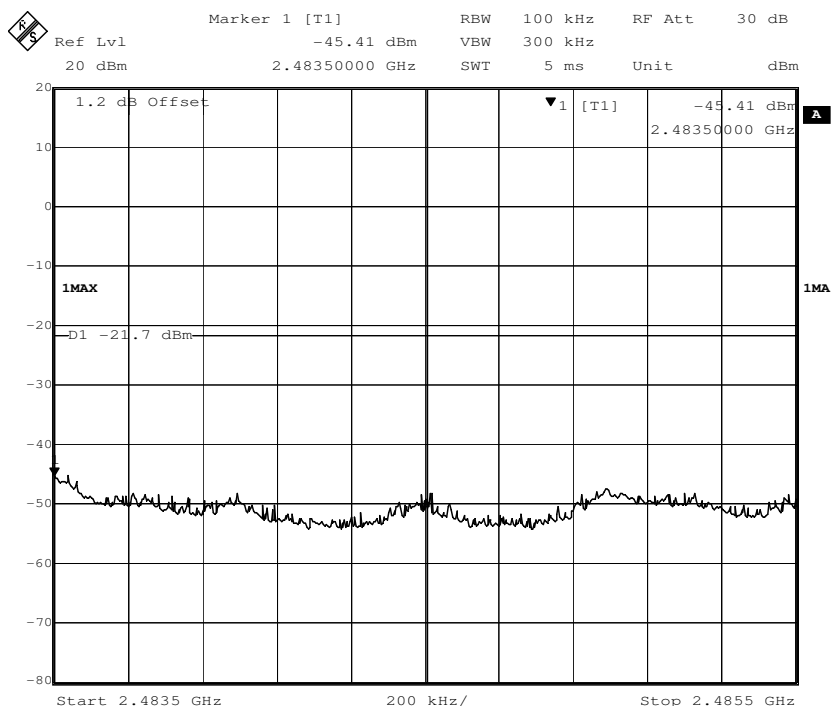
**Result plot as follows:**

Channel 0: 2.402 GHz





Channel 39: 2.480GHz



--End of Report--