



## SGS-CSTC Standards Technical Services Co., Ltd.

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Report No.: GZEM141000557601

Page: 1 of 45

FCC ID: DZO-IQHOME

# TEST REPORT

|                                     |                                                  |
|-------------------------------------|--------------------------------------------------|
| <b>Application No.:</b>             | GZEM1410005576CR                                 |
| <b>Applicant:</b>                   | OSRAM SYLVANIA INC                               |
| <b>Manufacturer:</b>                | Same as the applicant.                           |
| <b>FCC ID:</b>                      | DZO-IQHOME                                       |
| <b>Product Name:</b>                | IQ-H product Zigbee module                       |
| <b>Product Description:</b>         | Zigbee/ IEEE 802.15.4                            |
| <b>Model No.:</b>                   | IQ Home                                          |
| <b>Product Name of Host:</b>        | LIGHTIFY Flex RGBW                               |
| <b>Product Description of Host:</b> | LIGHTIFY Flex RGBW with Zigbee Technology        |
| <b>Model No. of Host:</b>           | 73661                                            |
| <b>Trade Mark:</b>                  | OSRAM                                            |
| <b>Standards:</b>                   | CFR 47 FCC PART 15 SUBPART C:2013 section 15.247 |
| <b>Date of Receipt:</b>             | 2014-10-27                                       |
| <b>Date of Test:</b>                | 2014-10-29 to 2014-11-03                         |
| <b>Date of Issue:</b>               | 2015-01-08                                       |
| <b>Test Result :</b>                | <b>Pass*</b>                                     |

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above. Please refer to section 3 of this report for further detail.

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.

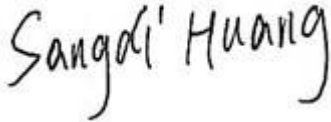
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## 2 Version

| Revision Record |         |            |          |          |
|-----------------|---------|------------|----------|----------|
| Version         | Chapter | Date       | Modifier | Remark   |
| 00              |         | 2015-01-08 |          | Original |
|                 |         |            |          |          |
|                 |         |            |          |          |
|                 |         |            |          |          |
|                 |         |            |          |          |

|                          |                                                                                                                          |                                  |  |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------|--|
| Authorized for issue by: |                                                                                                                          |                                  |  |
| Tested By                | <br>(Sangdi Huang) / Project Engineer | 2014-10-29 to 2014-11-03<br>Date |  |
| Prepared By              | <br>(June Chen) / Clerk               | 2014-11-11<br>Date               |  |
| Checked By               | <br>(Jerry Chan) / Reviewer           | 2014-11-14<br>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                              | N/A    |
| Maximum Peak Output Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FCC PART 15 C<br>section 15.247(b)(3)                     | FCC/KDB-558074 D01<br>v03r01 Clause 9.1.2                 | PASS   |
| Peak Power Spectral Density                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | FCC PART 15 C<br>section 15.247(e)                        | ANSI C63.10: Clause<br>6. 11. 2. 3                        | N/A    |
| Conducted Spurious Emission<br>(30MHz to 25GHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | FCC PART 15 C<br>section 15.209<br>&15.247(d)             | ANSI C63.10: Clause 6.7                                   | PASS   |
| Radiated Spurious Emission<br>30 MHz to 25 GHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 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            | FCC/KDB-558074 D01<br>v03r01 Clause 13.3.1                | PASS   |
| Conducted Emissions at Mains<br>Terminals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FCC PART 15 C<br>section 15.207                           | ANSI C63.10: Clause 6.2                                   | PASS   |
| <b>Remark:</b><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.<br>N/A: not applicable. It means that the change of this class II permissive change and the change does not affect the test result. The result refers to report EESZG09150013 of FCC ID: DZO-IQHOME |                                                           |                                                           |        |



## 4 Contents

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## 5 General Information

### 5.1 Client Information

Applicant: OSRAM SYLVANIA INC  
Address of Applicant: 54 Cherry Hill Dr. DANVERS MA 01923 USA  
Manufacturer: Same as the applicant.  
Address of Manufacturer: Same as the applicant.

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

Product Name: IQ-H product Zigbee module  
Model No.: IQ Home  
Product Name of Host:: LIGHTIFY Flex RGBW  
Model No. of Host: 73661

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

Operating Frequency 2405 MHz to 2480 MHz  
Type of Modulation: BPSK/O-QPSK  
Number of Channels 16 Channels  
Channel Separation: 5 MHz  
Antenna Type Integral  
Antenna gain: 0 dBi  
Function: Zigbee function to transmit and receive signal  
Power Supply: Working voltage: AC 100-240V 50/60Hz 1.0A  
Adapter: Model: GM36-120300-1  
Input: AC 100-240V 50/60Hz 1.0A  
Output: DC 12V 3.0A  
Power cord: 1.2m x 2 wires unscreened power cable



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

The EUT has been tested as an independent unit

#### **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 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 01:2006-10 and Rules of procedure IECEE 02:2006-10, and the relevant IECEE CB-Scheme Operational documents.

## 6 Equipment Used during Test

| 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        | 2013-12-5    | 2014-12-5    |
| EMC0522       | EMI Test Receiver                          | Rohde & Schwarz             | ESIB26     | 100283     | 2014-04-19   | 2015-04-19   |
| EMC0056       | EMI Test Receiver                          | Rohde & Schwarz             | ESCI       | 100236     | 2014-03-03   | 2015-03-03   |
| EMC0528       | RI High frequency Cable                    | SGS                         | 20 m       | N/A        | 2014-05-09   | 2015-05-09   |
| EMC2025       | Trilog Broadband Antenna 30-1000MHz        | SCHWARZBECK MESS-ELEKTRONIK | VULB 9160  | 9160-3372  | 2014-07-14   | 2017-07-14   |
| EMC0524       | Bi-log Type Antenna                        | Schaffner -Chase            | CBL6112B   | 2966       | 2013-08-31   | 2016-08-31   |
| EMC0519       | Bilog Type Antenna                         | Schaffner -Chase            | CBL6143    | 5070       | 2014-05-04   | 2017-05-04   |
| EMC2026       | Horn Antenna 1-18GHz                       | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9120D | 9120D-841  | 2013-08-31   | 2016-08-31   |
| EMC0518       | Horn Antenna                               | Rohde & Schwarz             | HF906      | 100096     | 2012-07-01   | 2015-07-01   |
| EMC0521       | 1-26.5 GHz Pre-Amplifier                   | Agilent                     | 8449B      | 3008A01649 | 2014-03-03   | 2015-03-03   |
| EMC2065       | Amplifier                                  | HP                          | 8447F      | N/A        | 2014-08-25   | 2015-08-25   |
| EMC0075       | 310N Amplifier                             | Sonoma                      | 310N       | 272683     | 2014-03-03   | 2015-03-03   |
| EMC0523       | Active Loop Antenna                        | EMCO                        | 6502       | 42963      | 2014-03-03   | 2016-03-03   |
| EMC2041       | Broad-Band Horn Antenna (14)15-26.5(40)GHz | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9170  | 9170-375   | 2014-05-26   | 2017-05-26   |
| EMC2069       | 2.4GHz filter                              | Micro-Tronics               | BRM 50702  | 149        | 2014-04-19   | 2015-04-19   |
| EMC0530       | 10m Semi-Anechoic Chamber                  | ETS                         | N/A        | N/A        | 2014-05-03   | 2016-05-03   |



| Conducted Emission |                       |                                  |                            |            |              |              |
|--------------------|-----------------------|----------------------------------|----------------------------|------------|--------------|--------------|
| No.                | Test Equipment        | Manufacturer                     | Model No.                  | Serial No. | Cal. date    | Cal.Due date |
|                    |                       |                                  |                            |            | (YYYY-MM-DD) | (YYYY-MM-DD) |
| EMC0306            | Shielding Room        | Zhong Yu                         | 8 x 3 x 3.8 m <sup>3</sup> | N/A        | N/A          | N/A          |
| EMC0118            | Two-line v-netwok     | R&S                              | ENV216                     | 100359     | 2014-03-03   | 2015-03-03   |
| EMC0102            | LISN                  | SCHAFFNER<br>CHASE               | MN2050D/1                  | 1421       | 2014-09-14   | 2015-09-14   |
| EMC0506            | EMI Test Receiver     | Rohde & Schwarz                  | ESCS30                     | 100085     | 2014-03-03   | 2015-03-03   |
| EMC0107            | Coaxial Cable         | SGS                              | 2m                         | N/A        | 2014-07-25   | 2016-07-25   |
| EMC0106            | Voltage Probe         | SGS                              | N/A                        | N/A        | 2014-4-19    | 2015-4-19    |
| EMC0120            | 8 Line ISN            | Fischer Custom<br>Communications | FCC-TLISN-T8-<br>02        | 20550      | 2014-08-30   | 2015-08-30   |
| EMC0121            | 4 Line ISN            | Fischer Custom<br>Communications | FCC-TLISN-T4-<br>02        | 20549      | 2014-08-30   | 2015-08-30   |
| EMC0122            | 2 Line ISN            | Fischer Custom<br>Communications | FCC-TLISN-T2-<br>02        | 20548      | 2014-08-30   | 2015-08-30   |
| EMC2047            | CDN                   | Elektronik-<br>Feinmechanik      | L-801:AF2                  | 2793       | 2011-11-11   | 2014-11-11   |
| EMC2048            | CDN                   | Elektronik-<br>Feinmechanik      | L-801:M2/M3                | 2738       | 2011-11-11   | 2014-11-11   |
| EMC2062            | 6dB Attenuator        | HP                               | 8491A                      | 24487      | 2014-04-19   | 2015-04-19   |
| EMC167             | Conical metal housing | SGS-EMC                          | N/A                        | N/A        | 2014-02-16   | 2016-02-16   |

| 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   | 2014-09-15   | 2015-09-15   |
| EMC0007                | DMM            | Fluke        | 73        | 70671122   | 2014-09-15   | 2015-09-15   |

## 7 Test Results

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

**Test Voltage:** AC 120V, 60 Hz

**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:**

1. Test frequencies are lowest channel: 2405 MHz, middle channel: 2440 MHz and highest channel: 2480 MHz

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 1       | 2405            | 12      | 2460            |
| 2       | 2410            | 13      | 2465            |
| 3       | 2415            | 14      | 2470            |
| 4       | 2420            | 15      | 2475            |
| 5       | 2425            | 16      | 2480            |
| 6       | 2430            | /       | /               |
| 7       | 2435            | /       | /               |
| 8       | 2440            | /       | /               |
| 9       | 2445            | /       | /               |
| 10      | 2450            | /       | /               |
| 11      | 2455            | /       | /               |

## 7.2 Antenna Requirement

### Standard requirement

15.203 requirement:

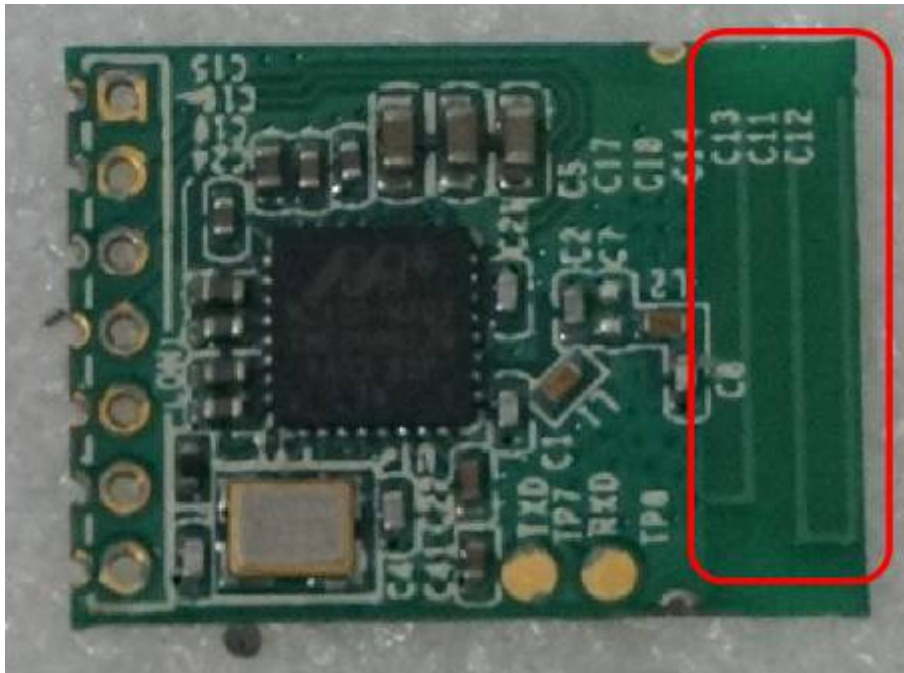
For intentional device. According to 15.203, an intentional radiator shall be designed to Ensure that no antenna other than that furnished by the responsible party shall be used with the device.

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

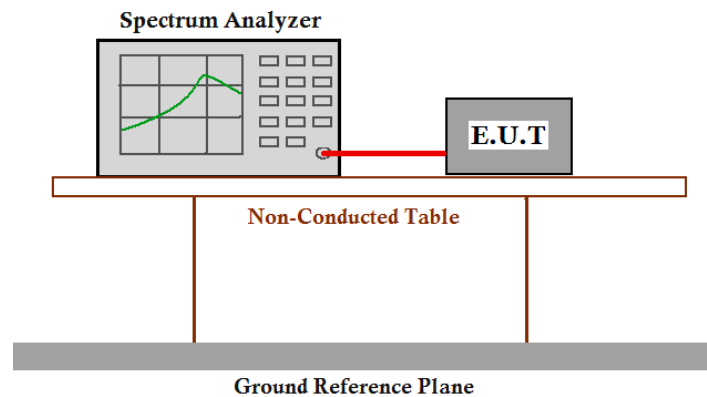
The antenna is an integral and no consideration of replacement. The best case gain of the antenna is 0 dBi.



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

### 7.3 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:        | FCC/KDB-558074 D01 v03r01 9.1.1 RBW $\geq$ DTS bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Test Status:        | <p>Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.</p>                                                                                                                                                                                                                                                                  |
| Test Configuration: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attention attenuation RF cable  
(Cable loss =1.5dB) 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:**

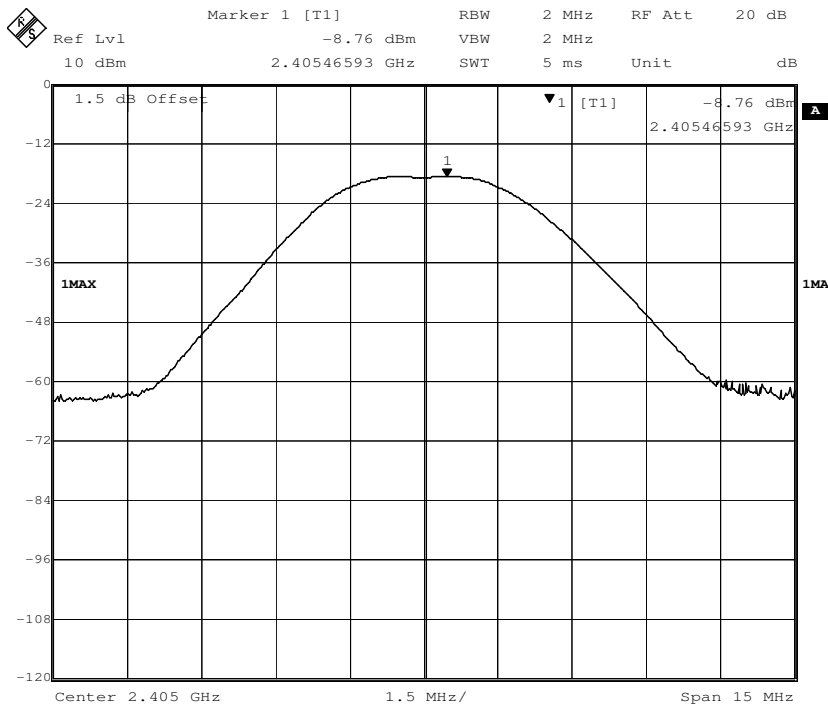
| Channel No. | Frequency<br>(MHz) | Measured Channel Power<br>(dBm) | Limit     | Result |
|-------------|--------------------|---------------------------------|-----------|--------|
| 1           | 2405               | -8.76                           | 1W(30dBm) | Pass   |
| 8           | 2440               | -9.07                           |           | Pass   |
| 16          | 2480               | -10.18                          |           | Pass   |

**Remark: Level = Read Level + Cable Loss.**

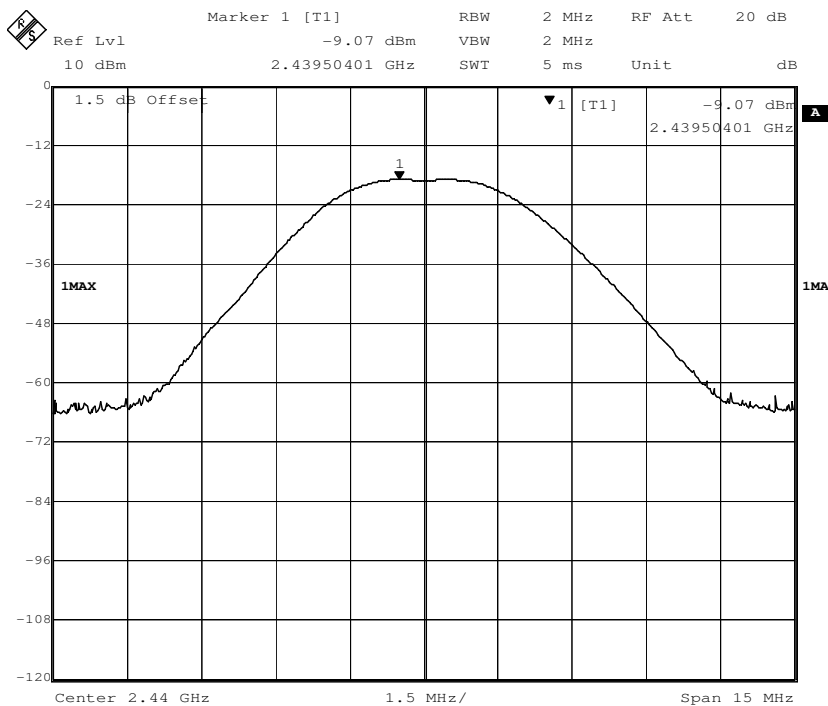
**The unit does meet the FCC requirements.**

## Result plot as follows:

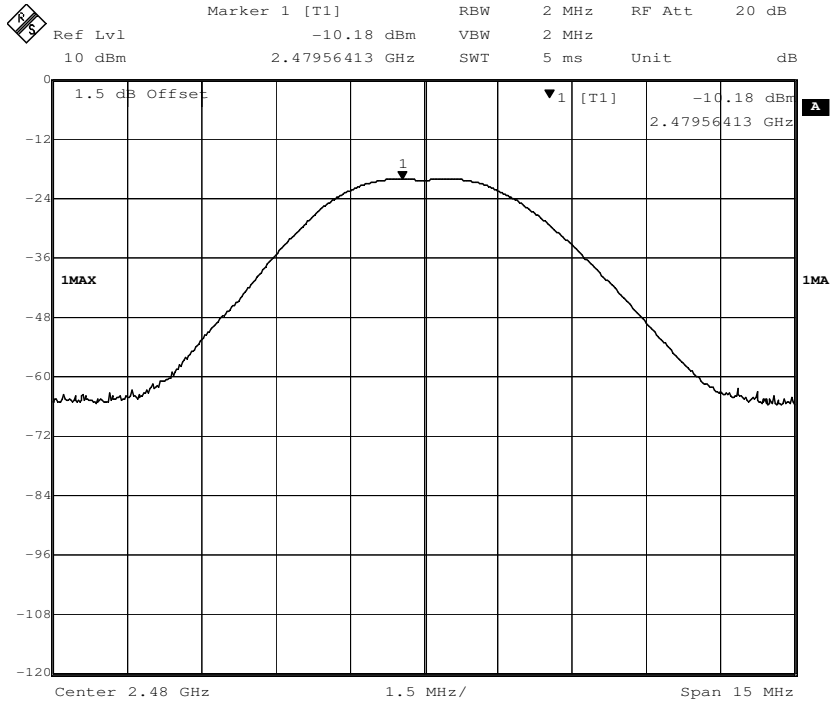
Channel 1: 2.405GHz:



Channel 8: 2.440GHz:



Channel 16: 2.480GHz:



## 7.4 Conducted Spurious Emissions

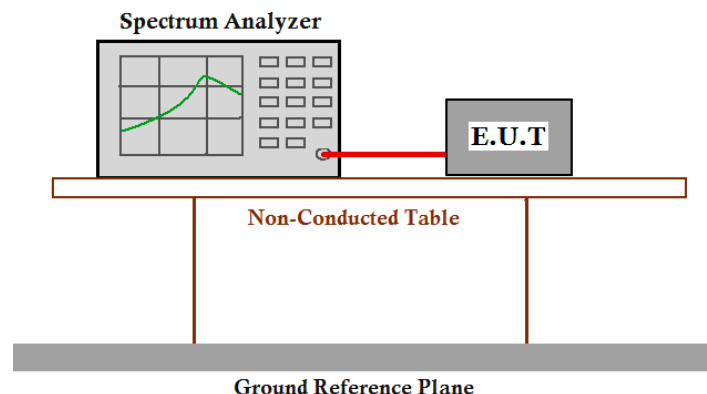
Test Requirement: FCC Part 15 C section 15.247

(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: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Test Configuration:



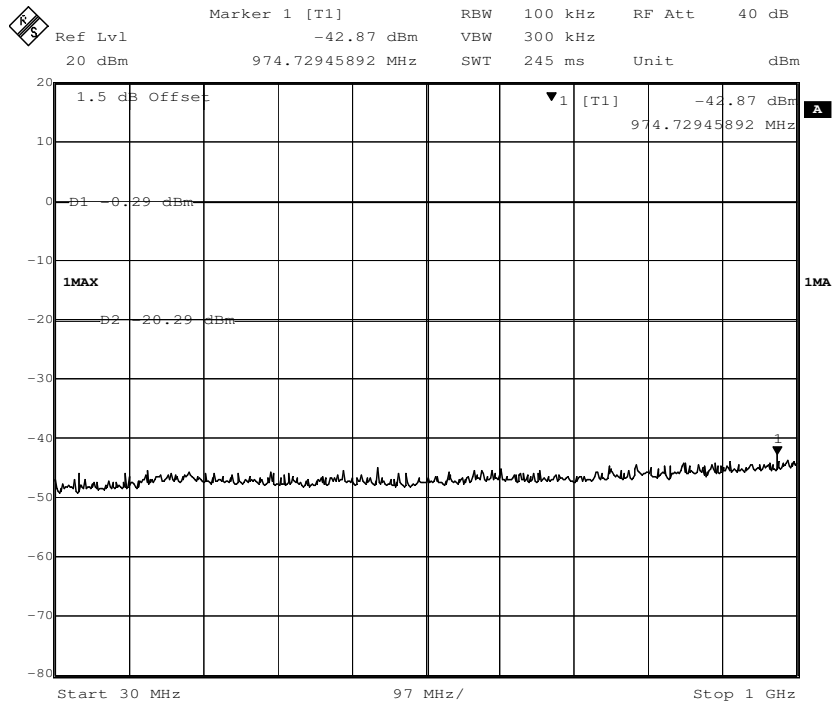
Test Procedure:

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.

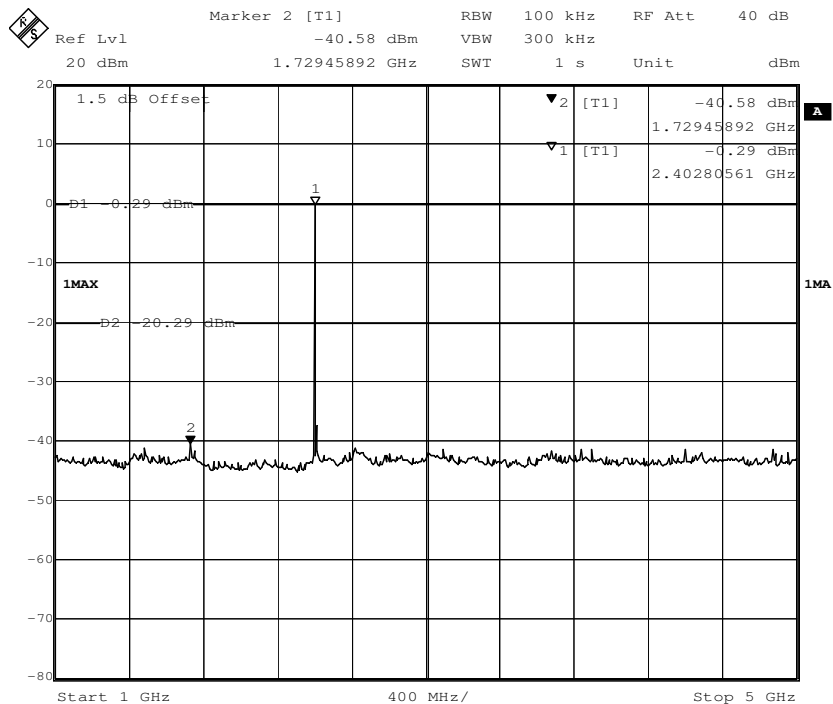
## Result plot as follows:

Channel 1: 2.405GHz:

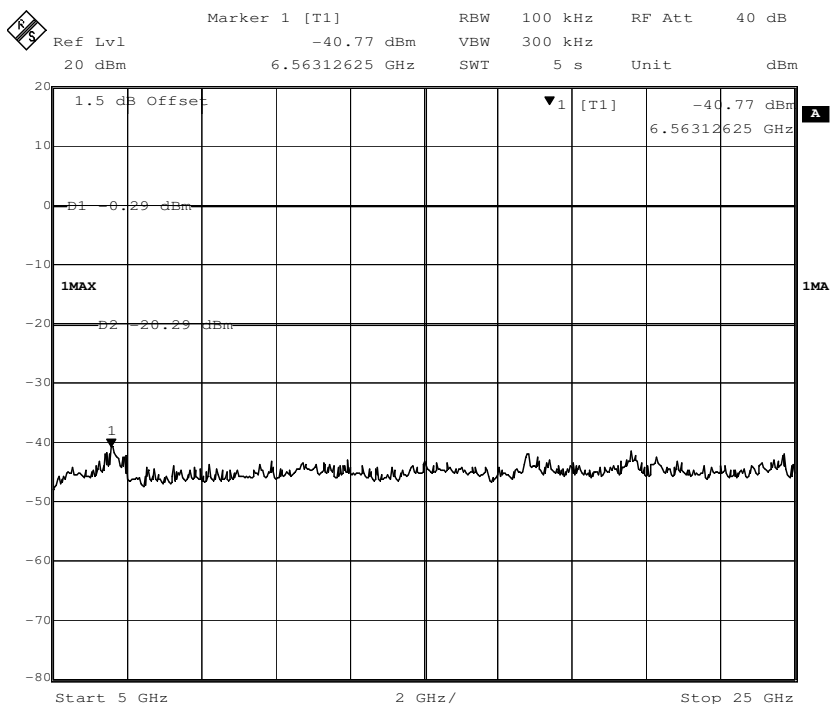
30 MHz to 1 GHz



1 G to 5 GHz

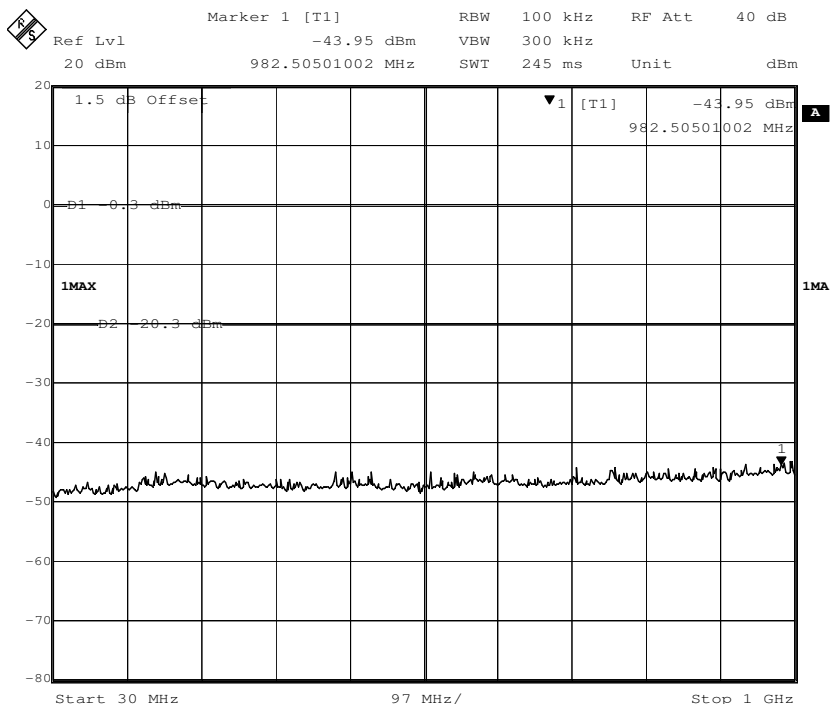


## 5 G to 25 GHz

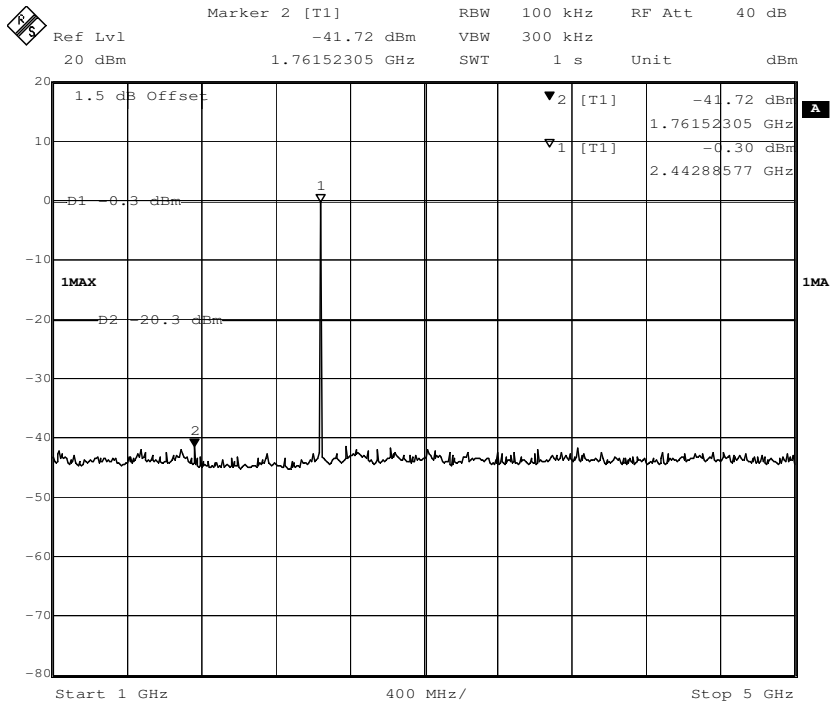


## Channel 8: 2.440GHz:

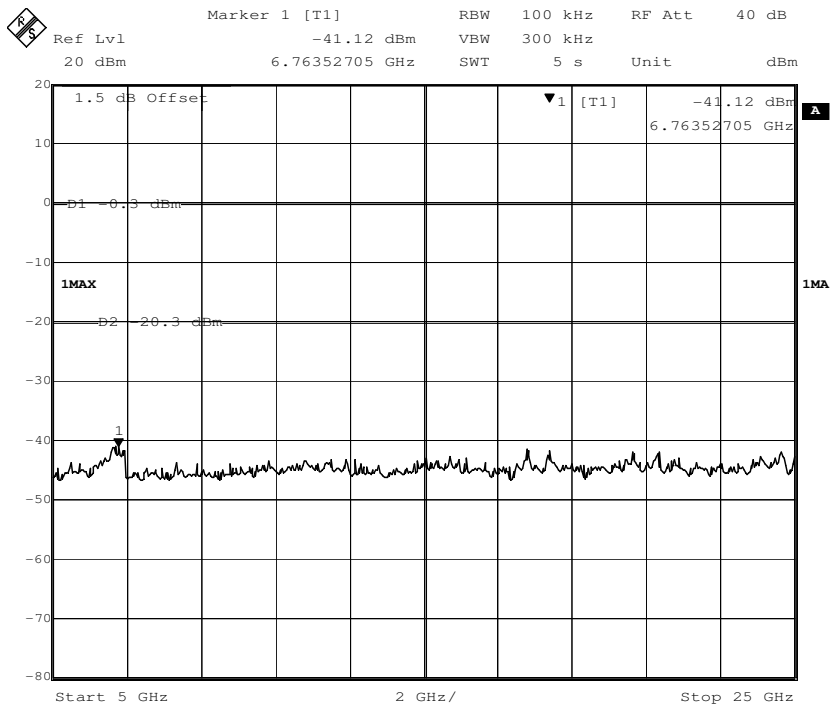
## 30 MHz to 1 GHz



## 1 G to 5 GHz

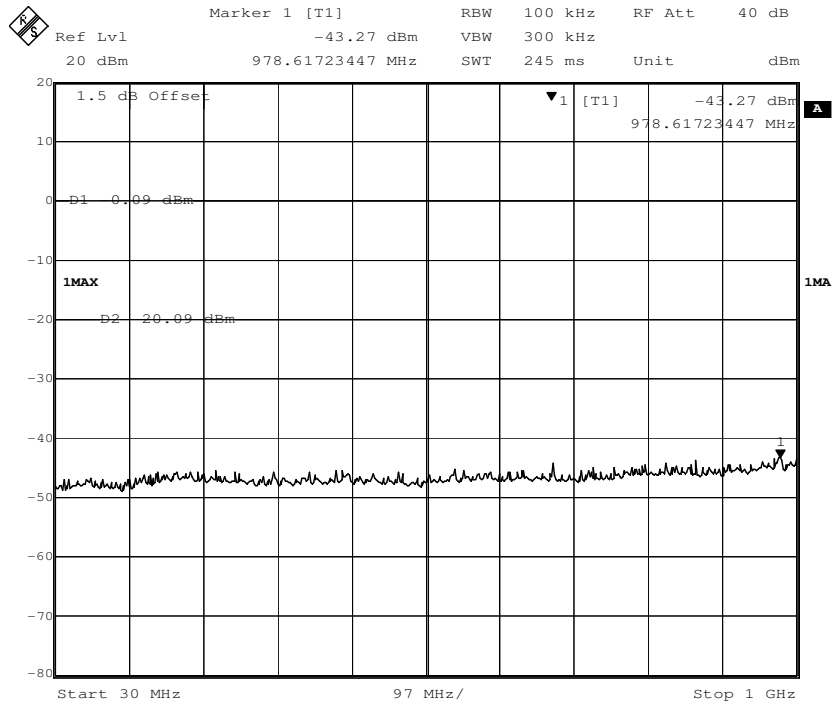


## 5 G to 25 GHz

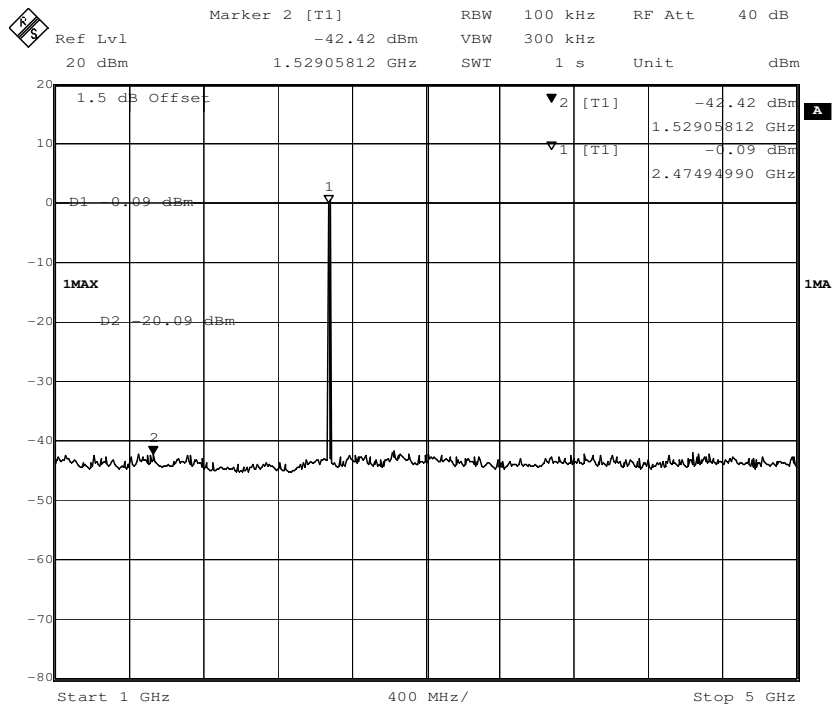


Channel 16:2.480 GHz

30 MHz to 1 GHz

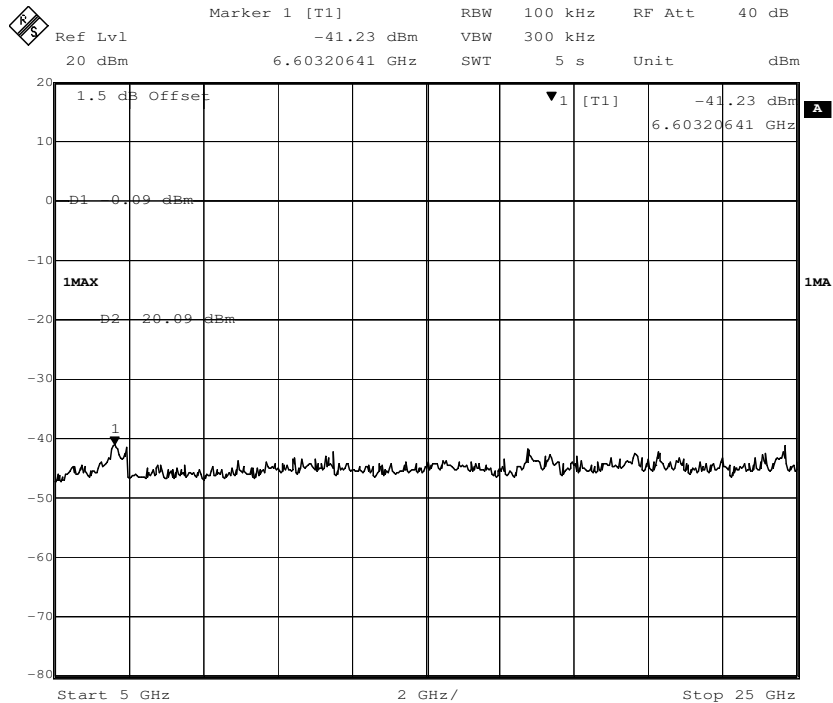


1 G to 5 GHz





5 G to 25 GHz

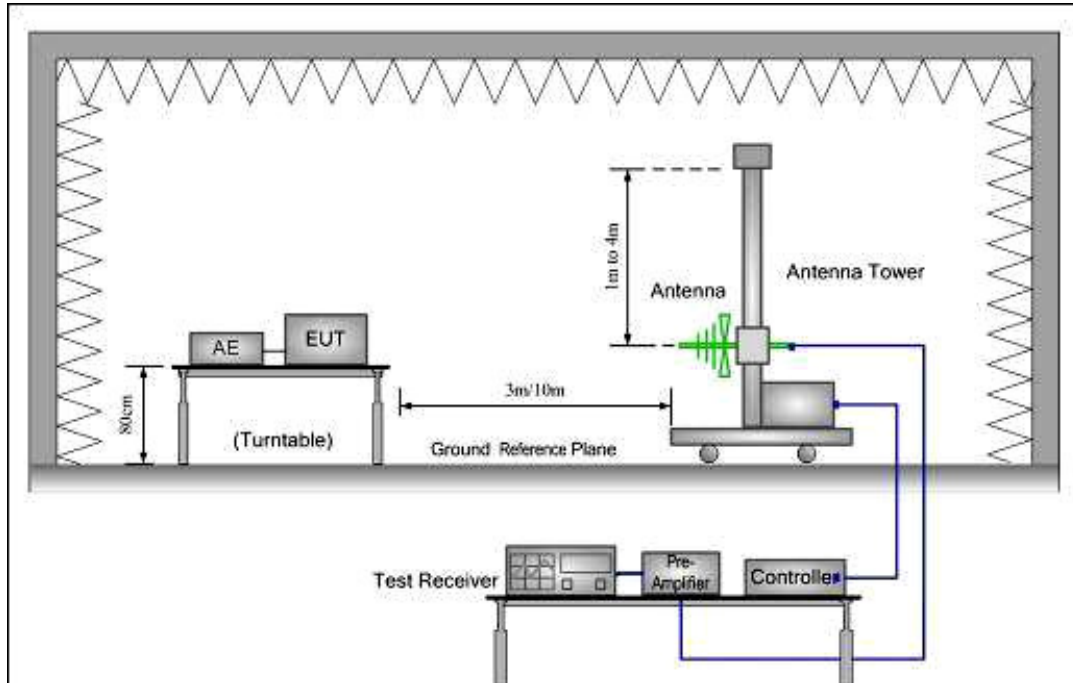


## 7.5 Radiated Spurious Emissions

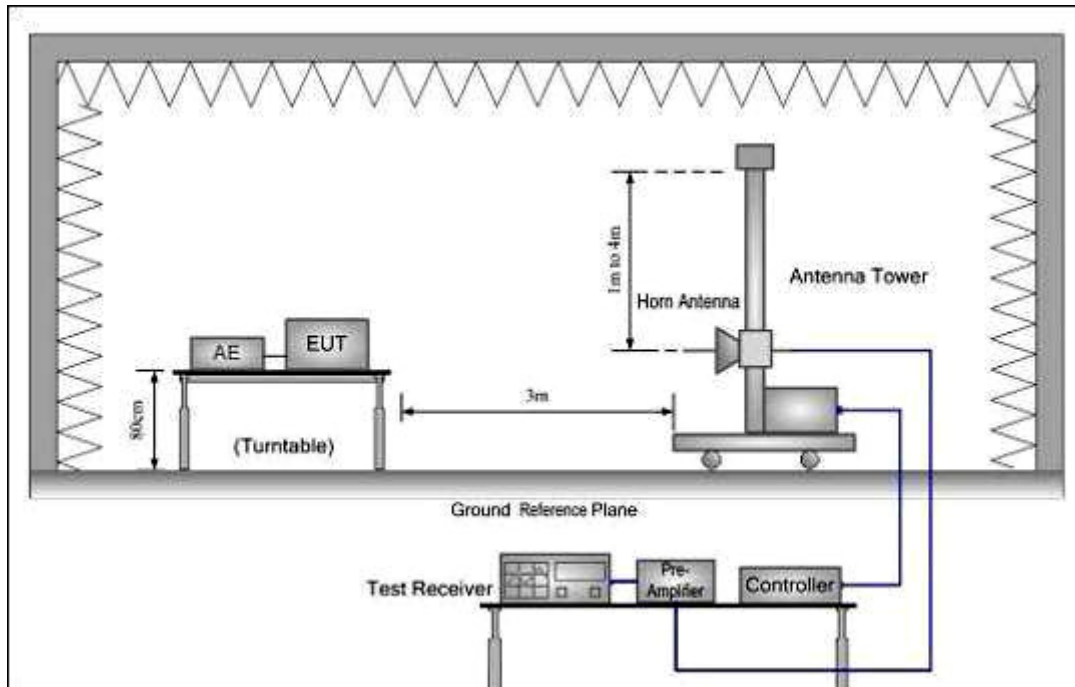
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part 15 C section 15.247<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, and provided the transmitter demonstrates compliance with the peak conducted power limits. |
| Test Method:      | ANSI C63.10: Clause 6.4, 6.5 and 6.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Test Status:      | Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.                                                                                                                                                                                                                                                            |
| 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                                                                                                                                                                                                                          |
| 15.209 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                                                                                                                                                                                                                                                                                                                                                                            |

## Test Configuration:

### 1) 30 MHz to 1 GHz emissions:



### 2) 1 GHz to 40 GHz emissions:



**Test Procedure:**

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2007 was used to perform radiated emission test above 1 GHz.

The receiver was scanned from 30MHz to 25GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. 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. The worst case emissions were reported.

From 30MHz to 1GHz, read the Quasi-Peak field strength of the emissions with receiver QP detector RBW=120KHz.

Above 1GHz, read the Peak field strength and Average field strength.

Read the Peak field strength through RBW=1MHz, VBW=3MHz in spectrum analyzer setting;

Read the Average field strength through RBW=1MHz, VBW=10Hz in spectrum analyzer setting;

While maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the average field strength reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from  $20\log(\text{dwell time}/100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit.

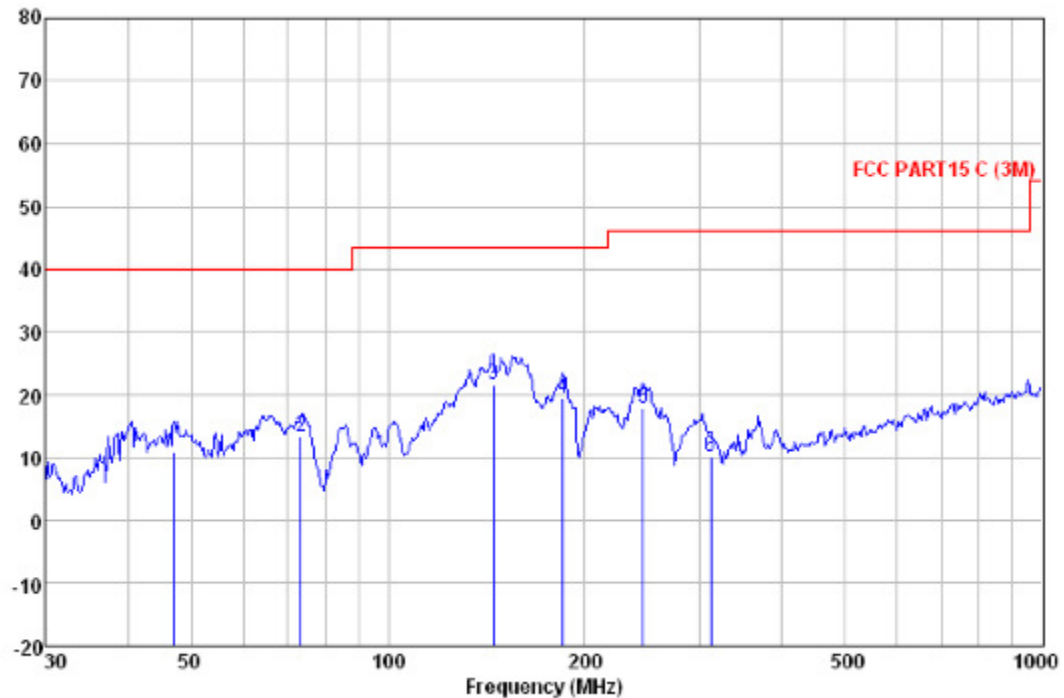
### 7.5.1 Harmonic and other spurious emissions & Band Edge

Test at Channel 1 (2.405 GHz) in transmitting status

## 30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

**Vertical:**

Peak scan

Level (dB $\mu$ V/m)

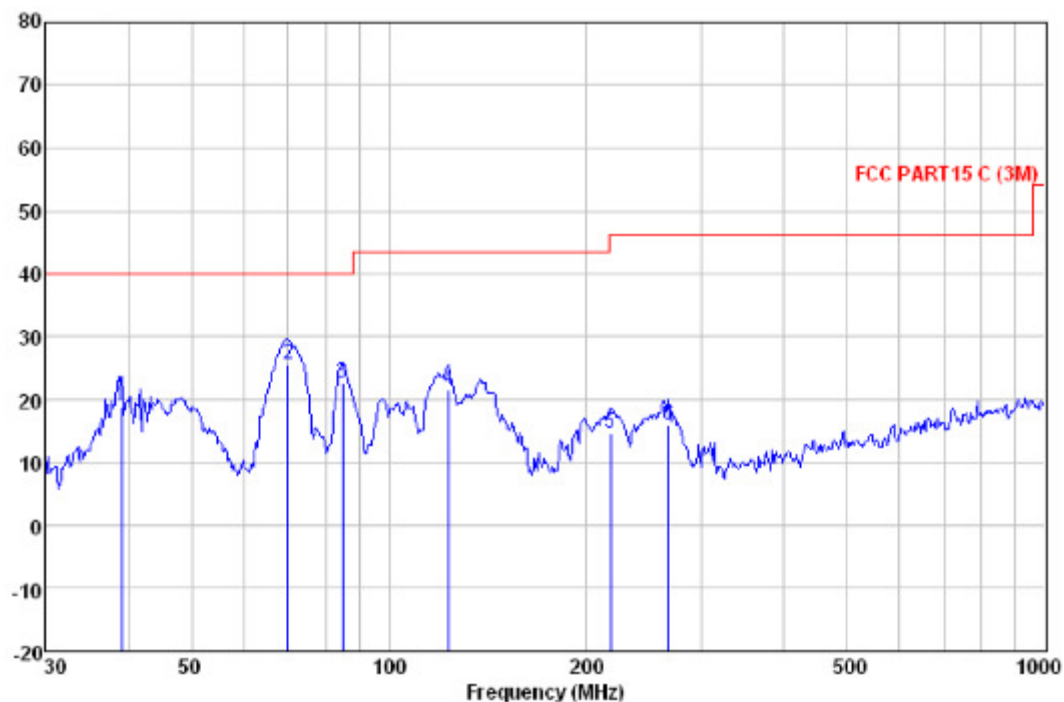
### Quasi-peak measurement

| Freq    | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level  | Limit Line | Over Limit | Remark |
|---------|------------|----------------|------------|---------------|--------|------------|------------|--------|
| MHz     | dBuV       | dB/m           | dB         | dB            | dBuV/m | dBuV/m     | dB         |        |
| 46.995  | 29.12      | 12.68          | 0.00       | 31.00         | 10.80  | 40.00      | -29.20     | QP     |
| 73.617  | 34.14      | 10.18          | 0.00       | 31.00         | 13.32  | 40.00      | -26.68     | QP     |
| 144.842 | 38.90      | 13.63          | 0.00       | 31.06         | 21.47  | 43.50      | -22.03     | QP     |
| 185.138 | 38.82      | 11.65          | 0.00       | 31.09         | 19.38  | 43.50      | -24.12     | QP     |
| 245.090 | 37.21      | 11.81          | 0.00       | 31.05         | 17.97  | 46.00      | -28.03     | QP     |
| 311.087 | 27.73      | 13.46          | 0.00       | 30.99         | 10.20  | 46.00      | -35.80     | QP     |

**Horizontal:**

Peak scan

Level (dBμV/m)



Quasi-peak measurement

| Freq    | ReadAntenna | Cable Preamp | Limit | Over  |        |        |           |
|---------|-------------|--------------|-------|-------|--------|--------|-----------|
| Level   | Factor      | Loss Factor  | Level | Line  | Limit  | Remark |           |
| MHz     | dBμV        | dB/m         | dB    | dB    | dBμV/m | dBμV/m | dB        |
| 39.162  | 37.22       | 12.64        | 0.00  | 31.01 | 18.85  | 40.00  | -21.15 QP |
| 70.090  | 45.57       | 10.99        | 0.00  | 31.00 | 25.56  | 40.00  | -14.44 QP |
| 84.999  | 44.89       | 8.68         | 0.00  | 31.00 | 22.57  | 40.00  | -17.43 QP |
| 123.266 | 40.46       | 12.21        | 0.00  | 31.02 | 21.65  | 43.50  | -21.85 QP |
| 217.544 | 35.01       | 10.73        | 0.00  | 31.08 | 14.66  | 46.00  | -31.34 QP |
| 266.609 | 34.54       | 12.36        | 0.00  | 31.02 | 15.88  | 46.00  | -30.12 QP |

## 1~25 GHz Harmonics &amp; Spurious Emissions. Peak &amp; Average Measurement

**Peak Measurement:**

| Frequency (MHz) | Reading Level (dB $\mu$ V) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Antenna polarization |
|-----------------|----------------------------|------------------------|-----------------|--------------------|-------------------------------|----------------------|----------------------|
| 4810.00         | 48.17                      | 31.53                  | 11.11           | 38.57              | 52.24                         | 74.00                | V                    |
| 7215.00         | 42.45                      | 36.47                  | 12.96           | 38.85              | 53.03                         | 74.00                | V                    |
| 9620.00         | 42.08                      | 38.08                  | 15.16           | 39.71              | 55.61                         | 74.00                | V                    |
| 4810.00         | 50.13                      | 31.53                  | 11.11           | 38.57              | 54.20                         | 74.00                | H                    |
| 7215.00         | 43.03                      | 36.47                  | 12.96           | 38.85              | 53.61                         | 74.00                | H                    |
| 9620.00         | 44.88                      | 38.08                  | 15.16           | 39.71              | 58.41                         | 74.00                | H                    |

**Average Measurement:**

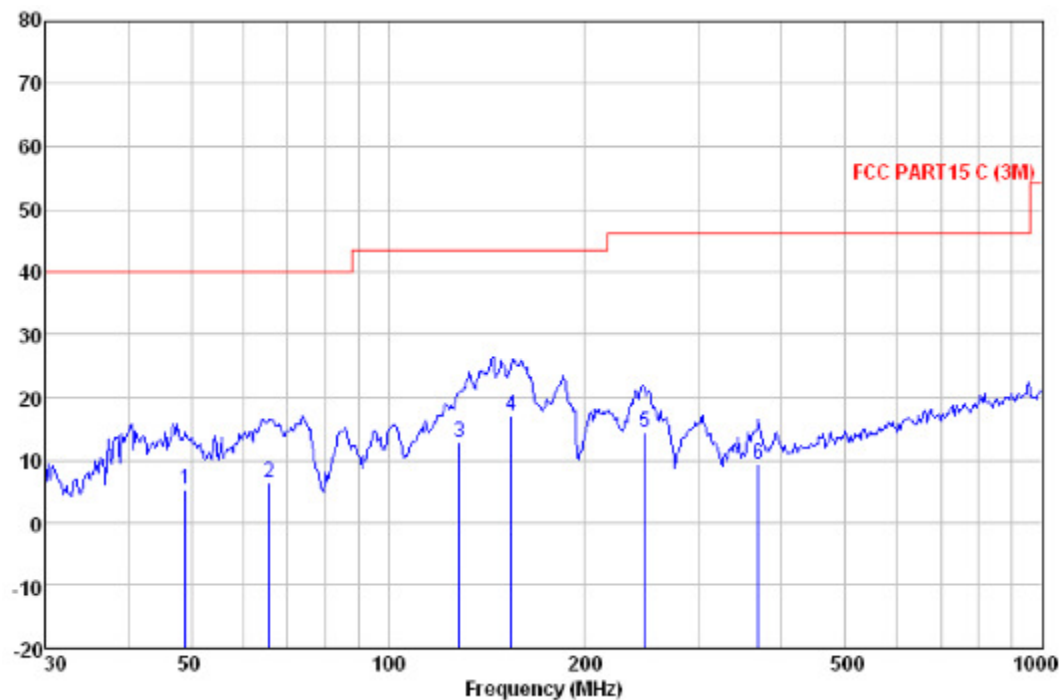
| Frequency (MHz) | Reading Level (dB $\mu$ V) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Antenna polarization |
|-----------------|----------------------------|------------------------|-----------------|--------------------|-------------------------------|----------------------|----------------------|
| 4810.00         | 43.67                      | 31.53                  | 11.11           | 38.57              | 47.74                         | 54.00                | V                    |
| 7215.00         | 37.06                      | 36.47                  | 12.96           | 38.85              | 47.64                         | 54.00                | V                    |
| 9620.00         | 36.30                      | 38.08                  | 15.16           | 39.71              | 49.83                         | 54.00                | V                    |
| 4810.00         | 43.66                      | 31.53                  | 11.11           | 38.57              | 47.73                         | 54.00                | H                    |
| 7215.00         | 39.64                      | 36.47                  | 12.96           | 38.85              | 50.22                         | 54.00                | H                    |
| 9620.00         | 35.84                      | 38.08                  | 15.16           | 39.71              | 49.37                         | 54.00                | H                    |

Test at Channel 8 (2.440 GHz) in transmitting status

## 30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

**Vertical:**

Peak scan

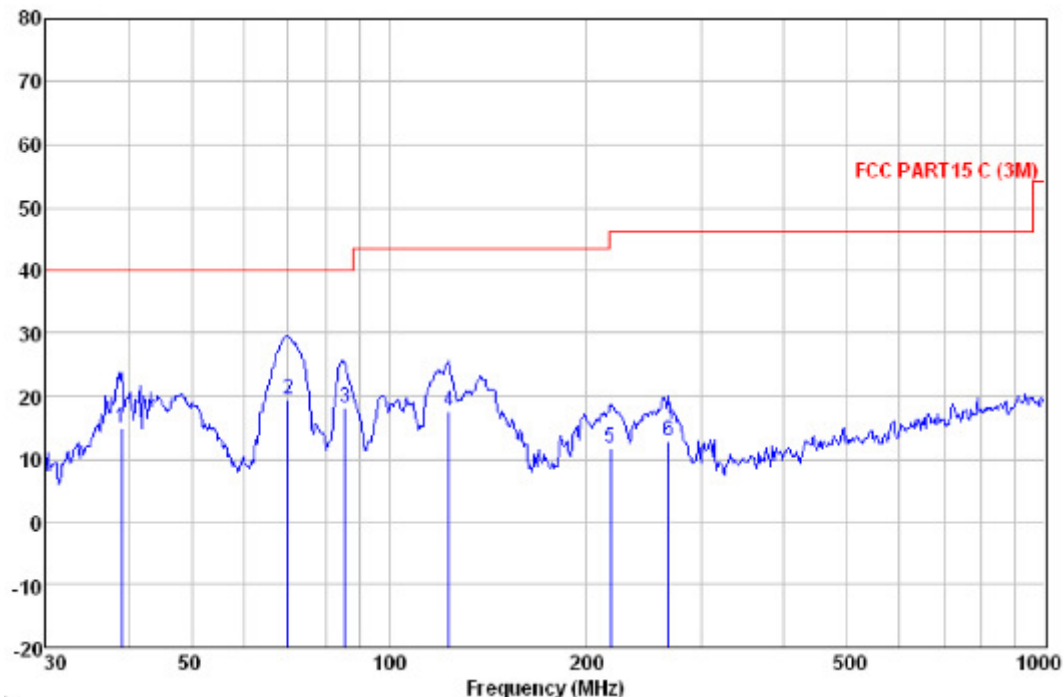
Level (dB $\mu$ V/m)

## Quasi-peak measurement

| Freq    | ReadAntenna<br>Level Factor | Cable Preamp<br>Loss Factor | Level | Limit  | Over<br>Limit | Remark          |
|---------|-----------------------------|-----------------------------|-------|--------|---------------|-----------------|
| MHz     | dBuV                        | dB/m                        | dB    | dBuV/m | dBuV/m        | dB              |
| 49.014  | 23.72                       | 12.59                       | 0.00  | 31.00  | 5.31          | 40.00 -34.69 QP |
| 65.803  | 25.40                       | 12.13                       | 0.00  | 31.00  | 6.53          | 40.00 -33.47 QP |
| 128.563 | 31.37                       | 12.58                       | 0.00  | 31.03  | 12.92         | 43.50 -30.58 QP |
| 154.279 | 34.36                       | 13.89                       | 0.00  | 31.07  | 17.18         | 43.50 -26.32 QP |
| 246.815 | 33.49                       | 11.86                       | 0.00  | 31.04  | 14.31         | 46.00 -31.69 QP |
| 368.112 | 25.78                       | 14.59                       | 0.00  | 30.92  | 9.45          | 46.00 -36.55 QP |

**Horizontal:**

Peak scan

Level (dB $\mu$ V/m)


Quasi-peak measurement

| Freq    | ReadAntenna | Cable | Preamp | Limit | Over   |                 |
|---------|-------------|-------|--------|-------|--------|-----------------|
| Level   | Factor      | Loss  | Factor | Level | Line   | Limit Remark    |
| MHz     | dBuV        | dB/m  | dB     | dB    | dBuV/m | dBuV/m dB       |
| 39.162  | 33.22       | 12.64 | 0.00   | 31.01 | 14.85  | 40.00 -25.15 QP |
| 70.090  | 39.57       | 10.99 | 0.00   | 31.00 | 19.56  | 40.00 -20.44 QP |
| 85.598  | 40.45       | 8.75  | 0.00   | 31.00 | 18.20  | 40.00 -21.80 QP |
| 123.266 | 36.46       | 12.21 | 0.00   | 31.02 | 17.65  | 43.50 -25.85 QP |
| 217.544 | 32.01       | 10.73 | 0.00   | 31.08 | 11.66  | 46.00 -34.34 QP |
| 266.609 | 31.54       | 12.36 | 0.00   | 31.02 | 12.88  | 46.00 -33.12 QP |



## 1~25 GHz Harmonics &amp; Spurious Emissions. Peak &amp; Average Measurement

**Peak Measurement:**

| Frequency (MHz) | Reading Level (dB $\mu$ V) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Antenna polarization |
|-----------------|----------------------------|------------------------|-----------------|--------------------|-------------------------------|----------------------|----------------------|
| 4880.00         | 44.89                      | 31.57                  | 11.24           | 38.56              | 49.14                         | 74.00                | V                    |
| 7320.00         | 42.75                      | 36.50                  | 13.28           | 38.88              | 53.65                         | 74.00                | V                    |
| 9760.00         | 43.99                      | 38.46                  | 15.05           | 39.74              | 57.76                         | 74.00                | V                    |
| 4880.00         | 45.86                      | 31.57                  | 11.24           | 38.56              | 50.11                         | 74.00                | H                    |
| 7320.00         | 44.03                      | 36.50                  | 13.28           | 38.88              | 54.93                         | 74.00                | H                    |
| 9760.00         | 45.40                      | 38.46                  | 15.05           | 39.74              | 59.17                         | 74.00                | H                    |

**Average Measurement:**

| Frequency (MHz) | Reading Level (dB $\mu$ V) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Antenna polarization |
|-----------------|----------------------------|------------------------|-----------------|--------------------|-------------------------------|----------------------|----------------------|
| 4880.00         | 40.60                      | 31.57                  | 11.24           | 38.56              | 44.85                         | 54.00                | V                    |
| 7320.00         | 37.65                      | 36.50                  | 13.28           | 38.88              | 48.55                         | 54.00                | V                    |
| 9760.00         | 35.99                      | 38.46                  | 15.05           | 39.74              | 49.76                         | 54.00                | V                    |
| 4880.00         | 42.63                      | 31.57                  | 11.24           | 38.56              | 46.88                         | 54.00                | H                    |
| 7320.00         | 39.89                      | 36.50                  | 13.28           | 38.88              | 50.79                         | 54.00                | H                    |
| 9760.00         | 35.63                      | 38.46                  | 15.05           | 39.74              | 49.40                         | 54.00                | H                    |

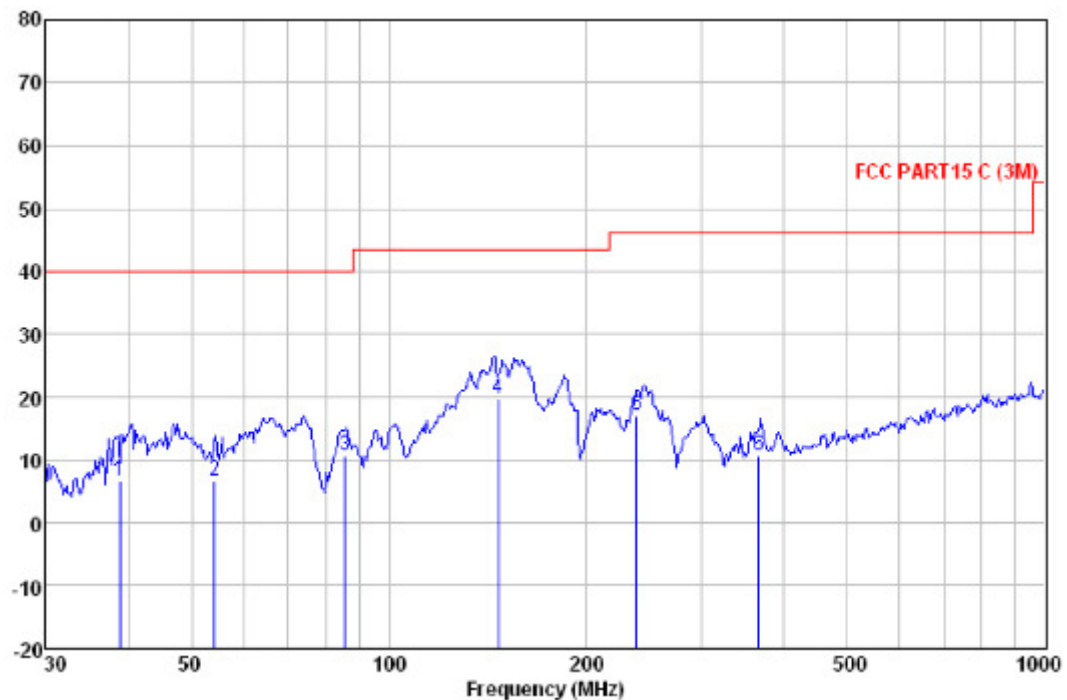
Test at Channel 16 (2.480 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

**Vertical:**

Peak scan

Level (dBμV/m)



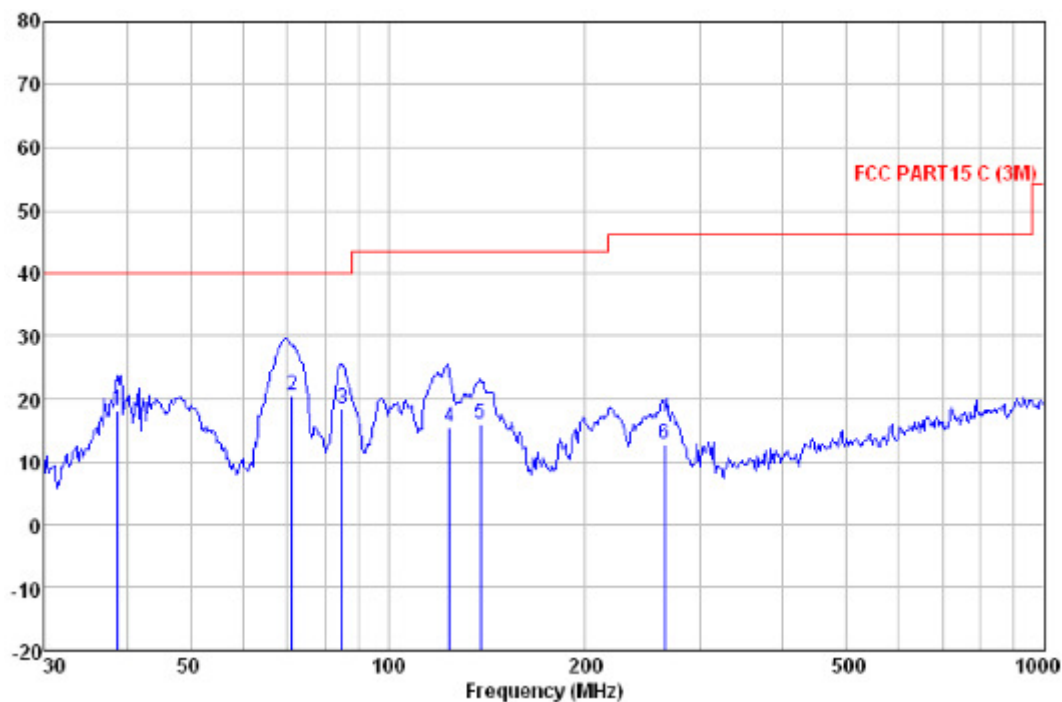
Quasi-peak measurement

|         | ReadAntenna | Cable Preamp |      | Limit  | Over   |        |        |        |
|---------|-------------|--------------|------|--------|--------|--------|--------|--------|
| Freq    | Level       | Factor       | Loss | Factor | Level  | Line   | Limit  | Remark |
| MHz     | dBuV        | dB/m         | dB   | dB     | dBuV/m | dBuV/m | dB     |        |
| 38.888  | 24.93       | 12.63        | 0.00 | 31.01  | 6.55   | 40.00  | -33.45 | QP     |
| 54.261  | 25.32       | 12.42        | 0.00 | 31.00  | 6.74   | 40.00  | -33.26 | QP     |
| 85.598  | 32.91       | 8.75         | 0.00 | 31.00  | 10.66  | 40.00  | -29.34 | QP     |
| 146.888 | 37.03       | 13.75        | 0.00 | 31.06  | 19.72  | 43.50  | -23.78 | QP     |
| 238.310 | 36.54       | 11.67        | 0.00 | 31.05  | 17.16  | 46.00  | -28.84 | QP     |
| 365.539 | 27.16       | 14.50        | 0.00 | 30.93  | 10.73  | 46.00  | -35.27 | QP     |

**Horizontal:**

Peak scan

Level (dBμV/m)



Quasi-peak measurement

| Freq    | ReadAntenna | Cable Preamp | Limit | Over   |        |        |           |
|---------|-------------|--------------|-------|--------|--------|--------|-----------|
| MHz     | Level       | Factor       | Loss  | Factor | Level  | Line   | Limit     |
|         |             |              |       |        |        |        |           |
| MHz     | dBuV        | dB/m         | dB    | dB     | dBuV/m | dBuV/m | dB        |
| 38.752  | 36.47       | 12.61        | 0.00  | 31.01  | 18.07  | 40.00  | -21.93 QP |
| 71.330  | 40.82       | 10.75        | 0.00  | 31.00  | 20.57  | 40.00  | -19.43 QP |
| 85.298  | 40.66       | 8.72         | 0.00  | 31.00  | 18.38  | 40.00  | -21.62 QP |
| 124.133 | 34.15       | 12.29        | 0.00  | 31.02  | 15.42  | 43.50  | -28.08 QP |
| 138.387 | 33.77       | 13.26        | 0.00  | 31.04  | 15.99  | 43.50  | -27.51 QP |
| 263.819 | 31.66       | 12.28        | 0.00  | 31.02  | 12.92  | 46.00  | -33.08 QP |

## 1~25 GHz Harmonics &amp; Spurious Emissions. Peak &amp; Average Measurement

**Peak Measurement:**

| Frequency (MHz) | Reading Level (dBμV) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|----------------------|------------------------|-----------------|--------------------|-------------------------|----------------|----------------------|
| 4960.00         | 48.86                | 31.70                  | 11.39           | 38.56              | 53.39                   | 74.00          | V                    |
| 7440.00         | 43.32                | 36.60                  | 13.60           | 38.91              | 54.61                   | 74.00          | V                    |
| 9920.00         | 43.61                | 38.65                  | 14.92           | 39.78              | 57.40                   | 74.00          | V                    |
| 4960.00         | 47.49                | 31.70                  | 11.39           | 38.56              | 52.02                   | 74.00          | H                    |
| 7440.00         | 43.80                | 36.60                  | 13.60           | 38.91              | 55.09                   | 74.00          | H                    |
| 9920.00         | 44.31                | 38.65                  | 14.92           | 39.78              | 58.10                   | 74.00          | H                    |

**Average Measurement:**

| Frequency (MHz) | Reading Level (dBμV) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|----------------------|------------------------|-----------------|--------------------|-------------------------|----------------|----------------------|
| 4960.00         | 42.00                | 31.70                  | 11.39           | 38.56              | 46.53                   | 54.00          | V                    |
| 7440.00         | 37.73                | 36.60                  | 13.60           | 38.91              | 49.02                   | 54.00          | V                    |
| 9920.00         | 35.66                | 38.65                  | 14.92           | 39.78              | 49.45                   | 54.00          | V                    |
| 4960.00         | 41.31                | 31.70                  | 11.39           | 38.56              | 45.84                   | 54.00          | H                    |
| 7440.00         | 36.10                | 36.60                  | 13.60           | 38.91              | 47.39                   | 54.00          | H                    |
| 9920.00         | 36.49                | 38.65                  | 14.92           | 39.78              | 50.28                   | 54.00          | H                    |

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 Loss – Preamplifier Factor.

As shown in Section, for frequencies above 1000 MHz. the above 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.

No any other emissions level which are attenuated less than 20dB below the limit.

According to 15.31(o), The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this Part.

Hence there no other emissions have been reported.



Band Edges:

Lowest 2405MHz

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 |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2400.0          | 27.58                  | 6.56            | 38.25              | 46.37                | 42.26                   | 74.00          | V                    |
| 2483.5          | 27.55                  | 6.99            | 38.26              | 46.97                | 43.25                   | 74.00          | V                    |
| 2400.0          | 27.58                  | 6.56            | 38.25              | 46.71                | 42.60                   | 74.00          | H                    |
| 2483.5          | 27.55                  | 6.99            | 38.26              | 47.63                | 43.91                   | 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 |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2400.0          | 27.58                  | 6.56            | 38.25              | 42.62                | 38.51                   | 54.00          | V                    |
| 2483.5          | 27.55                  | 6.99            | 38.26              | 42.83                | 39.11                   | 54.00          | V                    |
| 2400.0          | 27.58                  | 6.56            | 38.25              | 42.98                | 38.87                   | 54.00          | H                    |
| 2483.5          | 27.55                  | 6.99            | 38.26              | 43.23                | 39.51                   | 54.00          | H                    |

Highest 2480MHz

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 |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2400.0          | 27.58                  | 6.56            | 38.25              | 45.43                | 41.32                   | 74.00          | V                    |
| 2483.5          | 27.55                  | 6.99            | 38.26              | 47.18                | 43.46                   | 74.00          | V                    |
| 2400.0          | 27.58                  | 6.56            | 38.25              | 45.57                | 41.46                   | 74.00          | H                    |
| 2483.5          | 27.55                  | 6.99            | 38.26              | 45.60                | 41.88                   | 74.00          | H                    |

Average Measurement:

| Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (MHz) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 2400.0          | 27.58           | 6.56            | 38.25           | 42.61           | 38.50           | 54.00           | V               |
| 2483.5          | 27.55           | 6.99            | 38.26           | 43.29           | 39.57           | 54.00           | V               |
| 2400.0          | 27.58           | 6.56            | 38.25           | 41.35           | 37.24           | 54.00           | H               |
| 2483.5          | 27.55           | 6.99            | 38.26           | 40.51           | 36.79           | 54.00           | H               |

Remark:

1). 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 Loss – Preamplifier Factor.

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

## 7.5.2 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, 6.5 and 6.6                                                                                                                                                                                                                                                                                 |
| Test Status:      | Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.                                   |
| 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 |

## 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 Channel 1 (2.405 GHz) in transmitting status

**Peak Measurement:**

| Frequency (MHz) | Reading Level (dBμV) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|----------------------|------------------------|-----------------|--------------------|-------------------------|----------------|----------------------|
| 2310.000        | 57.46                | 27.93                  | 4.74            | 35.09              | 55.04                   | 74.00          | Vertical             |
| 2390.000        | 56.12                | 27.63                  | 4.96            | 35.05              | 53.66                   | 74.00          | V                    |
| 2483.500        | 57.38                | 27.55                  | 4.9             | 34.99              | 54.84                   | 74.00          | V                    |
| 2500.000        | 53.59                | 27.55                  | 5.00            | 34.98              | 51.16                   | 74.00          | V                    |
| 2310.000        | 55.27                | 27.93                  | 4.74            | 35.09              | 52.85                   | 74.00          | Horizontal           |
| 2390.000        | 57.68                | 27.63                  | 4.96            | 35.05              | 55.22                   | 74.00          | H                    |
| 2483.500        | 56.54                | 27.55                  | 4.9             | 34.99              | 54.00                   | 74.00          | H                    |
| 2500.000        | 55.74                | 27.55                  | 5.00            | 34.98              | 53.31                   | 74.00          | H                    |

**Average Measurement:**

| Frequency (MHz) | Reading Level (dBμV) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|----------------------|------------------------|-----------------|--------------------|-------------------------|----------------|----------------------|
| 2310.000        | 47.31                | 27.93                  | 4.74            | 35.09              | 44.89                   | 54.00          | Vertical             |
| 2390.000        | 46.58                | 27.63                  | 4.96            | 35.05              | 44.12                   | 54.00          | V                    |
| 2483.500        | 49.77                | 27.55                  | 4.9             | 34.99              | 47.23                   | 54.00          | V                    |
| 2500.000        | 46.58                | 27.55                  | 5.00            | 34.98              | 44.15                   | 54.00          | V                    |
| 2310.000        | 43.76                | 27.93                  | 4.74            | 35.09              | 41.34                   | 54.00          | Horizontal           |
| 2390.000        | 47.51                | 27.63                  | 4.96            | 35.05              | 45.05                   | 54.00          | H                    |
| 2483.500        | 47.33                | 27.55                  | 4.9             | 34.99              | 44.79                   | 54.00          | H                    |
| 2500.000        | 46.54                | 27.55                  | 5.00            | 34.98              | 44.11                   | 54.00          | H                    |



Test at Channel 8 (2.440 GHz) in transmitting status

**Peak Measurement:**

| Frequency (MHz) | Reading Level (dB $\mu$ V) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Antenna polarization |
|-----------------|----------------------------|------------------------|-----------------|--------------------|-------------------------------|----------------------|----------------------|
| 2310.000        | 54.69                      | 27.93                  | 4.74            | 35.09              | 52.27                         | 74.00                | Vertical             |
| 2390.000        | 55.72                      | 27.63                  | 4.96            | 35.05              | 53.26                         | 74.00                | V                    |
| 2483.500        | 54.28                      | 27.55                  | 4.90            | 34.99              | 51.74                         | 74.00                | V                    |
| 2500.000        | 55.96                      | 27.55                  | 5.00            | 34.98              | 53.53                         | 74.00                | V                    |
| 2310.000        | 54.38                      | 27.93                  | 4.74            | 35.09              | 51.96                         | 74.00                | Horizontal           |
| 2390.000        | 55.75                      | 27.63                  | 4.96            | 35.05              | 53.29                         | 74.00                | H                    |
| 2483.500        | 53.89                      | 27.55                  | 4.90            | 34.99              | 51.35                         | 74.00                | H                    |
| 2500.000        | 54.36                      | 27.55                  | 5.00            | 34.98              | 51.93                         | 74.00                | H                    |

**Average Measurement:**

| Frequency (MHz) | Reading Level (dB $\mu$ V) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Antenna polarization |
|-----------------|----------------------------|------------------------|-----------------|--------------------|-------------------------------|----------------------|----------------------|
| 2310.000        | 44.66                      | 27.93                  | 4.74            | 35.09              | 42.24                         | 54.00                | Vertical             |
| 2390.000        | 46.37                      | 27.63                  | 4.96            | 35.05              | 43.91                         | 54.00                | V                    |
| 2483.500        | 45.29                      | 27.55                  | 4.90            | 34.99              | 42.75                         | 54.00                | V                    |
| 2500.000        | 44.38                      | 27.93                  | 4.74            | 35.09              | 41.96                         | 54.00                | V                    |
| 2310.000        | 42.65                      | 27.93                  | 4.74            | 35.09              | 40.23                         | 54.00                | Horizontal           |
| 2390.000        | 42.74                      | 27.63                  | 4.96            | 35.05              | 40.28                         | 54.00                | H                    |
| 2483.500        | 44.35                      | 27.55                  | 4.90            | 34.99              | 41.81                         | 54.00                | H                    |
| 2500.000        | 45.68                      | 27.93                  | 4.74            | 35.09              | 43.26                         | 54.00                | H                    |

Test at Channel 16 (2.480 GHz) in transmitting status

**Peak Measurement:**

| Frequency (MHz) | Reading Level (dBμV) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|----------------------|------------------------|-----------------|--------------------|-------------------------|----------------|----------------------|
| 2310.000        | 53.12                | 27.93                  | 4.74            | 35.09              | 50.70                   | 74.00          | Vertical             |
| 2390.000        | 54.55                | 27.63                  | 4.96            | 35.05              | 52.09                   | 74.00          | V                    |
| 2483.500        | 53.79                | 27.55                  | 4.90            | 34.99              | 51.25                   | 74.00          | V                    |
| 2500.000        | 54.62                | 27.93                  | 4.74            | 35.09              | 52.20                   | 74.00          | V                    |
| 2310.000        | 53.41                | 27.93                  | 4.74            | 35.09              | 50.99                   | 74.00          | Horizontal           |
| 2390.000        | 53.56                | 27.63                  | 4.96            | 35.05              | 51.10                   | 74.00          | H                    |
| 2483.500        | 52.75                | 27.55                  | 4.90            | 34.99              | 50.21                   | 74.00          | H                    |
| 2500.000        | 52.60                | 27.93                  | 4.74            | 35.09              | 50.18                   | 74.00          | H                    |

**Average Measurement:**

| Frequency (MHz) | Reading Level (dBμV) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|----------------------|------------------------|-----------------|--------------------|-------------------------|----------------|----------------------|
| 2310.000        | 42.43                | 27.93                  | 4.74            | 35.09              | 40.01                   | 54.00          | Vertical             |
| 2390.000        | 43.86                | 27.63                  | 4.96            | 35.05              | 41.40                   | 54.00          | V                    |
| 2483.500        | 45.78                | 27.55                  | 4.90            | 34.99              | 43.24                   | 54.00          | V                    |
| 2500.000        | 46.14                | 27.93                  | 4.74            | 35.09              | 43.72                   | 54.00          | V                    |
| 2310.000        | 45.96                | 27.93                  | 4.74            | 35.09              | 43.54                   | 54.00          | Horizontal           |
| 2390.000        | 46.73                | 27.63                  | 4.96            | 35.05              | 44.27                   | 54.00          | H                    |
| 2483.500        | 45.86                | 27.55                  | 4.90            | 34.99              | 43.32                   | 54.00          | H                    |
| 2500.000        | 44.89                | 27.93                  | 4.74            | 35.09              | 42.47                   | 54.00          | H                    |

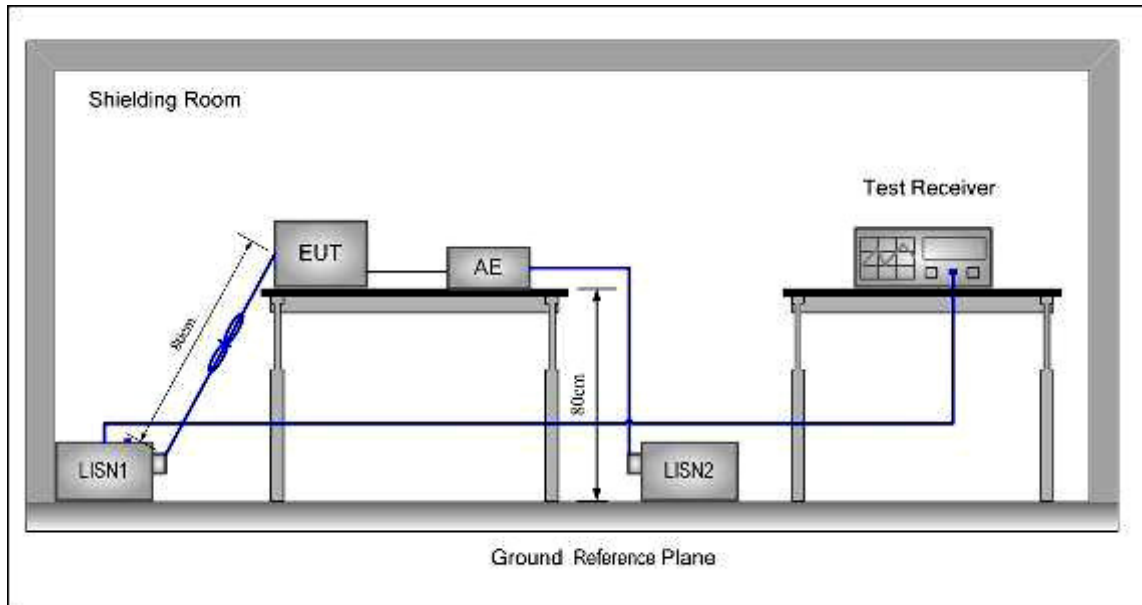
## 7.6 Conducted Emissions at Mains Terminals 150 kHz to 30MHz

**Test Requirement:** FCC Part 15 C section 15.207  
**Test Method:** ANSI C63.10: Clause 6.2  
**Frequency Range:** 150 kHz to 30 MHz  
**Detector:** Peak for pre-scan (9kHz Resolution Bandwidth)  
**Test Limit**

### Limits for conducted disturbance at the mains ports of class B

| Frequency Range<br>(MHz)                                                                                   | Class B Limit (dBuV) |          |
|------------------------------------------------------------------------------------------------------------|----------------------|----------|
|                                                                                                            | Quasi-peak           | Average  |
| 0.15 to 0.50                                                                                               | 66 to 56             | 56 to 46 |
| 0.50 to 5                                                                                                  | 56                   | 46       |
| 5 to 30                                                                                                    | 60                   | 50       |
| NOTE 1 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz. |                      |          |

**EUT Operation:** Test in normal operating mode. 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.  
 Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).  
 Pre-test the EUT in 2405MHz, 2440MHz, and 2480MHz,  
 find worst case in 2405 MHz.

**Test Configuration:**

**Test procedure:**

1. The mains terminal disturbance voltage test was conducted in a shielded room.
2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a  $50\Omega/50\mu\text{H} + 5\Omega$  linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

### 7.6.1 Measurement Data

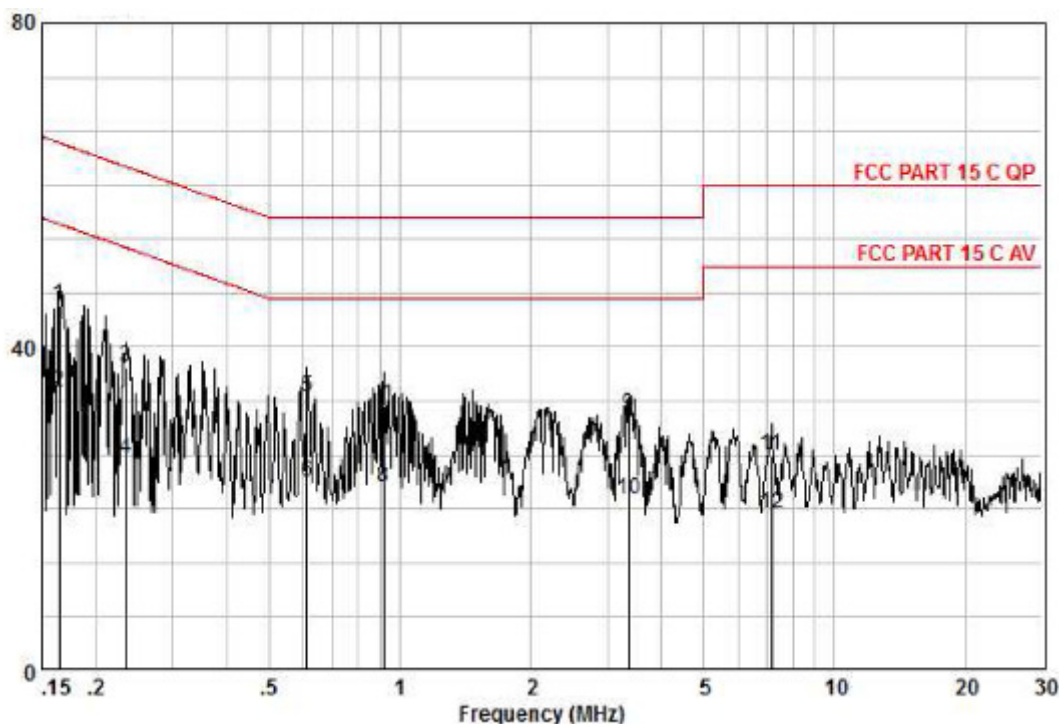
An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected. For EUT the communicating was worst case mode.

**The following Quasi-Peak and Average measurements were performed on the EUT:**

Neutral Line

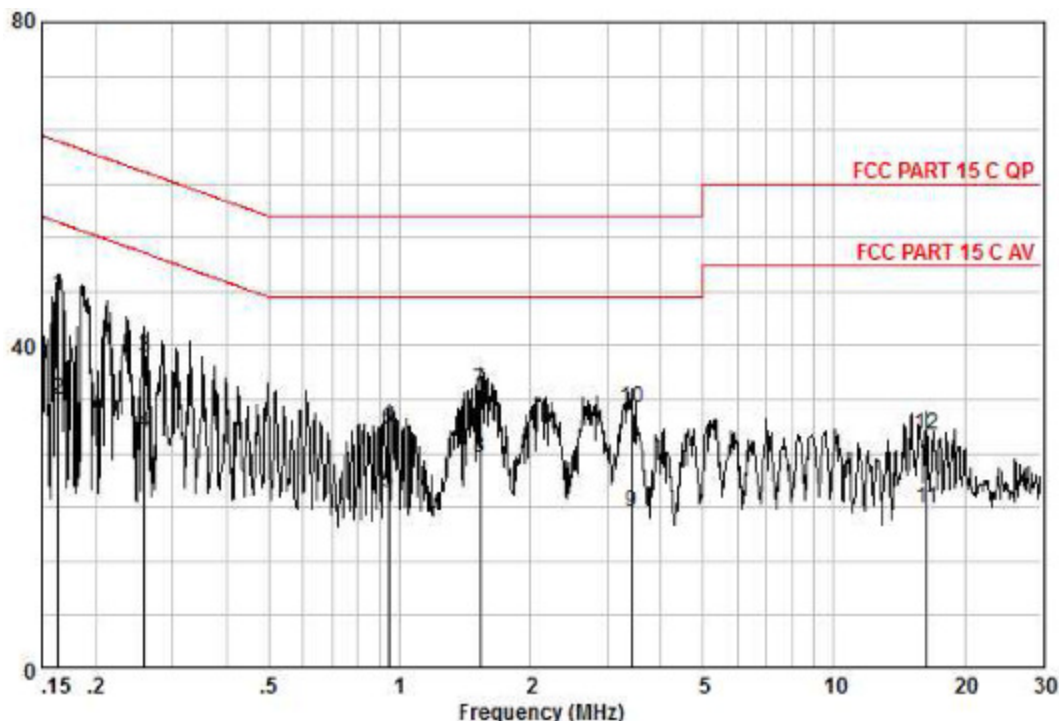
Level(dBμV)



Measure data:

| Freq  | Read  | Cable | LISN   | Level | Limit | Over   | Remark  |
|-------|-------|-------|--------|-------|-------|--------|---------|
| MHz   | dBμV  | Loss  | Factor | dBμV  | dBμV  | Limit  |         |
| 0.164 | 35.26 | 0.10  | 9.66   | 45.02 | 65.25 | -20.24 | QP      |
| 0.164 | 24.68 | 0.10  | 9.66   | 34.44 | 55.25 | -20.82 | AVERAGE |
| 0.234 | 27.74 | 0.08  | 9.66   | 37.48 | 62.30 | -24.83 | QP      |
| 0.234 | 16.45 | 0.08  | 9.66   | 26.19 | 52.30 | -26.12 | AVERAGE |
| 0.611 | 24.06 | 0.03  | 9.67   | 33.76 | 56.00 | -22.24 | QP      |
| 0.611 | 13.57 | 0.03  | 9.67   | 23.27 | 46.00 | -22.73 | AVERAGE |
| 0.918 | 23.10 | 0.00  | 9.67   | 32.78 | 56.00 | -23.22 | QP      |
| 0.918 | 13.08 | 0.00  | 9.67   | 22.76 | 46.00 | -23.24 | AVERAGE |
| 3.364 | 21.66 | 0.16  | 9.70   | 31.52 | 56.00 | -24.48 | QP      |
| 3.364 | 11.39 | 0.16  | 9.70   | 21.25 | 46.00 | -24.75 | AVERAGE |
| 7.175 | 16.62 | 0.26  | 9.74   | 26.62 | 60.00 | -33.38 | QP      |
| 7.175 | 9.45  | 0.26  | 9.74   | 19.45 | 50.00 | -30.55 | AVERAGE |

Live Line

Level(dB  $\mu$  V)


Measure result:

| Freq   | Read Level | Cable Loss | LISN Factor | Level | Limit Line | Over Limit | Remark  |
|--------|------------|------------|-------------|-------|------------|------------|---------|
| MHz    | dBuV       | dB         | dB          | dBuV  | dBuV       | dB         |         |
| 0.163  | 36.54      | 0.10       | 9.60        | 46.24 | 65.30      | -19.06     | QP      |
| 0.163  | 23.68      | 0.10       | 9.60        | 33.38 | 55.30      | -21.92     | AVERAGE |
| 0.259  | 28.84      | 0.07       | 9.62        | 38.53 | 61.47      | -22.94     | QP      |
| 0.259  | 19.51      | 0.07       | 9.62        | 29.20 | 51.47      | -22.27     | AVERAGE |
| 0.943  | 12.08      | 0.00       | 9.70        | 21.78 | 46.00      | -24.22     | AVERAGE |
| 0.943  | 19.88      | 0.00       | 9.70        | 29.58 | 56.00      | -26.42     | QP      |
| 1.535  | 24.78      | 0.06       | 9.70        | 34.54 | 56.00      | -21.46     | QP      |
| 1.535  | 16.51      | 0.06       | 9.70        | 26.27 | 46.00      | -19.73     | AVERAGE |
| 3.417  | 9.45       | 0.16       | 9.70        | 19.31 | 46.00      | -26.69     | AVERAGE |
| 3.417  | 22.48      | 0.16       | 9.70        | 32.34 | 56.00      | -23.66     | QP      |
| 16.398 | 9.39       | 0.37       | 9.99        | 19.76 | 50.00      | -30.24     | AVERAGE |
| 16.398 | 18.70      | 0.37       | 9.99        | 29.07 | 60.00      | -30.93     | QP      |

--End of Report--