# FCC/IC REPORT
## (BLE)

| | |
|---|---|
| **Applicant:** | Lightwave Technology |
| **Address of Applicant:** | 400 Rue Wright, Saint-Laurent, Quebec, Canada, H4N 1M6 |
| **Equipment Under Test (EUT)** | |
| Product Name: | Connected |
| Model No.: | XTX3000 |
| **FCC ID:** | 2ABSL3000 |
| **Canada IC:** | 11732A-LWXTX3000 |
| **Applicable standards:** | FCC CFR Title 47 Part 15 Subpart C Section 15.247<br>RSS-Gen Issue 4, November 2014<br>RSS-247 Issue 2, February 2017 |
| **Date of sample receipt:** | 19 Jan., 2018 |
| **Date of Test:** | 22 Jan., 27 to Feb., 2018 |
| **Date of report issued:** | 27 Feb., 2018 |
| **Test Result:** | PASS * |

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

Authorized Signature:

Bruce Zhang
Laboratory Manager

## 2 Version

| Version No. | Date | Description |
|---|---|---|
| *00* | *27 Feb., 2018* | *Original* |
| | | |
| | | |
| | | |
| | | |

***Tested by:*** YT Yang ***Date:*** *27 Feb., 2018*

***Test Engineer***

***Reviewed by:*** Wimer Zhang ***Date:*** *27 Feb., 2018*

***Project Engineer***

# 3 Contents

# 4 Test Summary

| Test Items | Section | | Result |
|---|---|---|---|
| | FCC | IC | |
| Antenna Requirement | 15.203/15.247 (c) | RSS-GEN Section 8.8 | Pass |
| AC Power Line Conducted Emission | 15.207 | RSS-GEN Section 8.8 | Pass |
| Conducted Peak Output Power | 15.247 (b)(3) | RSS-247 Section 5.4 (d) | Pass |
| 6dB Emission Bandwidth<br>99% Occupied Bandwidth | 15.247 (a)(2) | RSS-247 Section 5.2 (a) | Pass |
| Power Spectral Density | 15.247 (e) | RSS-247 Section 5.2 (b) | Pass |
| Band Edge | 15.247(d) | RSS-GEN ISSUE 4 8.9 8.10<br>RSS-247 Section 5.5 | Pass |
| Conducted and Radiated Spurious Emission | 15.205/15.209 | RSS-GEN ISSUE 4 8.9 8.10<br>RSS-247 Section 5.5 | Pass |
| *Pass: The EUT complies with the essential requirements in the standard.* | | | |

# 5 General Information

## 5.1 Client Information

| | |
|---|---|
| Applicant: | Lightwave Technology |
| Address: | 400 Rue Wright, Saint-Laurent, Quebec, Canada, H4N 1M6 |
| Manufacturer/Factory: | DONGGUAN PORTMAN ELECTRONIC SCIENCE AND TECHNOLOGY CO., LTD |
| Address: | NO.10, LUYI 2 ROAD, TANGXIA TOWN, DONGGUAN CITY, GUANGDONG PROVINCE CHINA |

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

| | |
|---|---|
| Product Name: | Connected |
| Model No.: | XTX3000 |
| Operation Frequency: | 2402-2480 MHz |
| Channel numbers: | 40 |
| Channel separation: | 2 MHz |
| Modulation technology: | GFSK |
| Data speed : | 1Mbps |
| Antenna Type: | Internal Antenna |
| Antenna gain: | 0.5 dBi |
| Power supply: | DC 12V |

**Operation Frequency each of channel**

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

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test. Channel No. 0, 20 & 39 were selected as Lowest, Middle and Highest channel.

## 5.3 Test environment and test mode

| Operating Environment: | |
|---|---|
| Temperature: | 24.0 °C |
| Humidity: | 54 % RH |
| Atmospheric Pressure: | 1010 mbar |
| **Test mode:** | |
| Transmitting mode | Keep the EUT in continuous transmitting with modulation |
| The sample was placed 0.8m (below 1GHz)/1.5m (above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. Duty cycle setting during the transmission is 100% with maximum power setting for all modulations. | |

## 5.4 Description of Support Units

The EUT has been tested as an independent unit.

## 5.5 Measurement Uncertainty

| Parameters | Expanded Uncertainty |
|---|---|
| Conducted Emission (9kHz ~ 30MHz) | 2.14 dB (k=2) |
| Radiated Emission (9kHz ~ 30MHz) | 4.24 dB (k=2) |
| Radiated Emission (30MHz ~ 1000MHz) | 4.35 dB (k=2) |
| Radiated Emission (1GHz ~ 18GHz) | 4.44 dB (k=2) |
| Radiated Emission (18GHz ~ 26.5GHz) | 4.56 dB (k=2) |

## 5.6 Laboratory Facility

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

- **FCC - Registration No.: 727551**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf

## 5.7 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

## 5.8 Test Instruments list

**Radiated Emission:**

| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal. Date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
|---|---|---|---|---|---|---|
| 1 | 3m SAC | SAEMC | 9(L)*6(W)* 6(H) | CCIS0001 | 08-23-2014 | 08-22-2020 |
| 2 | BiConiLog Antenna | SCHWARZBECK | VULB9163 | CCIS0005 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 3 | Horn Antenna | SCHWARZBECK | BBHA9120D | CCIS0006 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 4 | Pre-amplifier (10kHz-1.3GHz) | HP | 8447D | CCIS0003 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 5 | Pre-amplifier (1GHz-18GHz) | Compliance Direction Systems Inc. | PAP-1G18 | CCIS0011 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 6 | Pre-amplifier (18-26GHz) | Rohde & Schwarz | AFS33-18002 650-30-8P-44 | GTS218 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 7 | Horn Antenna | ETS-LINDGREN | 3160 | GTS217 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 8 | Spectrum analyzer 9k-30GHz | Rohde & Schwarz | FSP30 | CCIS0023 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 9 | EMI Test Receiver | Rohde & Schwarz | ESRP7 | CCIS0167 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 10 | Loop antenna | Laplace instrument | RF300 | EMC0701 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 11 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |

**Conducted Emission:**

| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
|---|---|---|---|---|---|---|
| 1 | Shielding Room | ZhongShuo Electron | 11.0(L)x4.0(W)x3.0(H) | CCIS0061 | 07-22-2017 | 07-21-2020 |
| 2 | EMI Test Receiver | Rohde & Schwarz | ESCI | CCIS0002 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 3 | LISN | CHASE | MN2050D | CCIS0074 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 4 | LISN | Rohde & Schwarz | ESH3-Z5 | 8438621/010 | 07-21-2017 | 07-20-2018 |
| 5 | Coaxial Cable | CCIS | N/A | CCIS0086 | 02-25-2017 | 02-24-2018 |
| | | | | | 02-20-2018 | 02-19-2019 |
| 6 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 7 | Power Sensor | D.A.R.E | RPR3006W | 17I00015SNO27 | 11-10-2017 | 11-09-2018 |
| 8 | Power Sensor | D.A.R.E | RPR3006W | 17I00015SNO28 | 11-10-2017 | 11-09-2018 |

# 6 Test results and Measurement Data

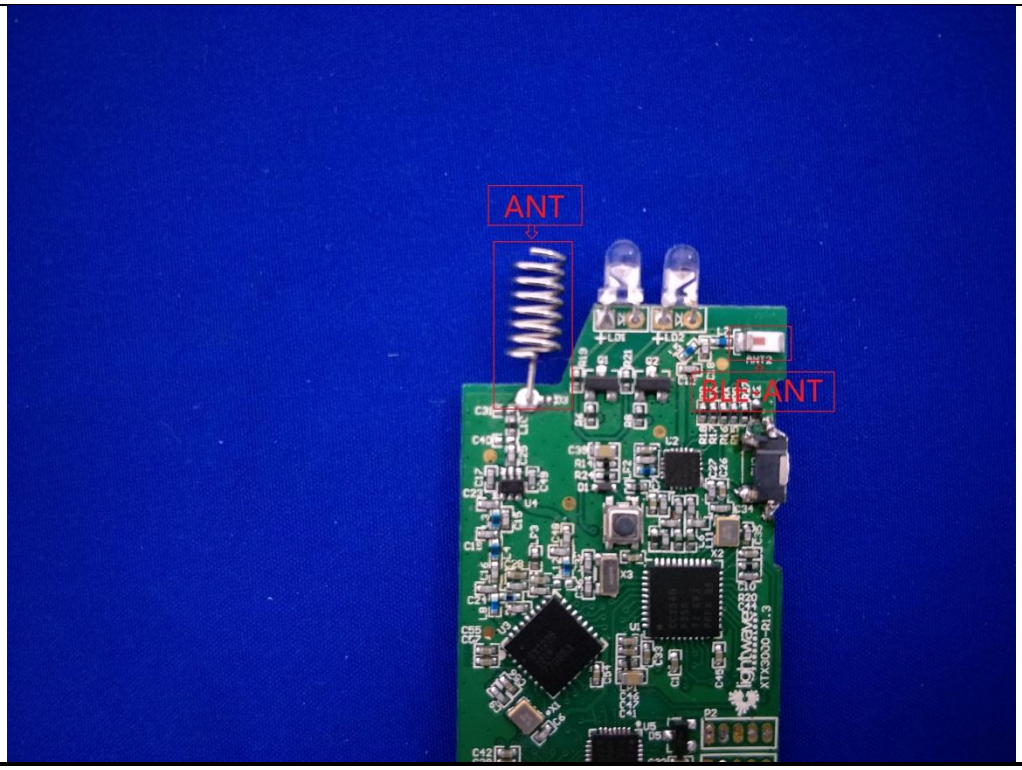
## 6.1 Antenna requirement:

| Standard requirement: | FCC Part 15 C Section 15.203 /247(c) |
|---|---|

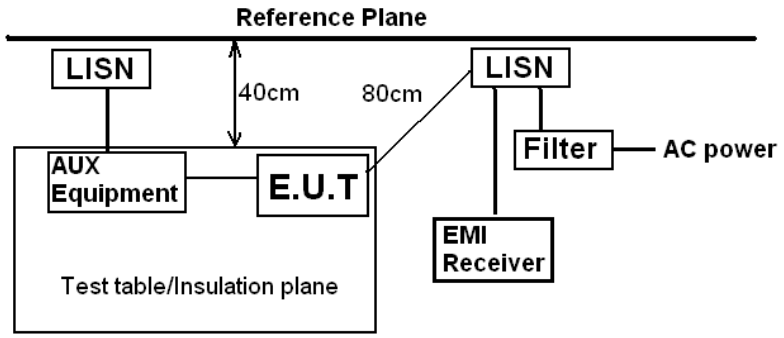
15.203 requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
15.247(c) (1)(i) requirement:
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi 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 6dBi.

| E.U.T Antenna: | |
|---|---|

The BLE antenna is an internal antenna which cannot replace by end-user, the best-case gain of the antenna is 0.5 dBi.



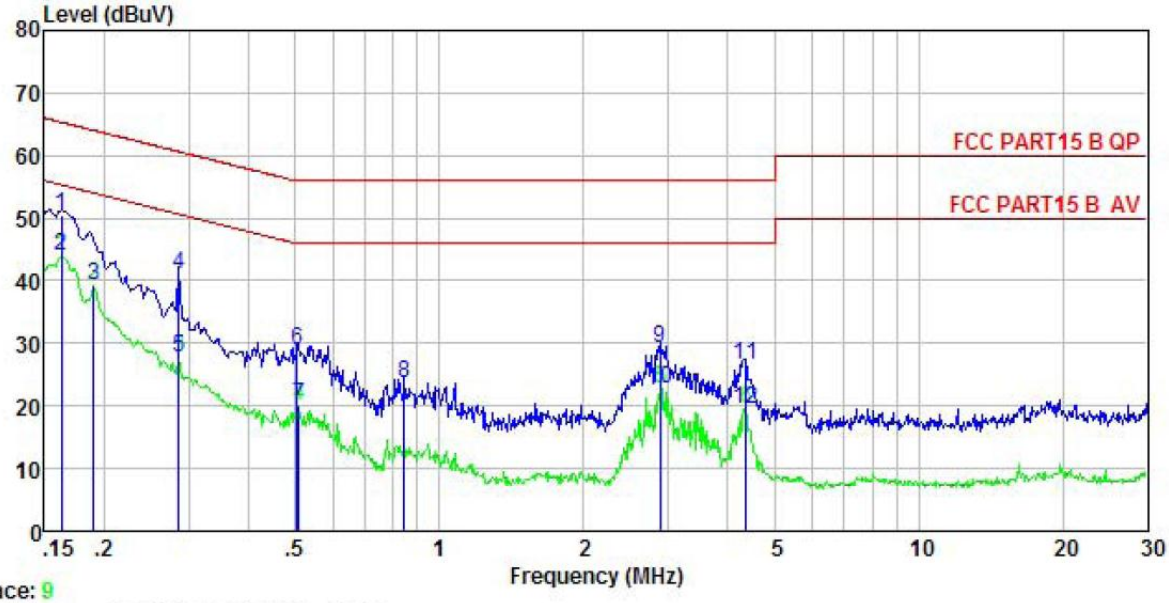
## 6.2 Conducted Emission

<table>
<tr><td>Test Requirement:</td><td colspan="3">FCC Part 15 C Section 15.207<br>RSS-GEN Section 8.8</td></tr>
<tr><td>Test Method:</td><td colspan="3">ANSI C63.10: 2013</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="3">150 kHz to 30 MHz</td></tr>
<tr><td>Class / Severity:</td><td colspan="3">Class B</td></tr>
<tr><td>Receiver setup:</td><td colspan="3">RBW=9kHz, VBW=30kHz</td></tr>
<tr><td rowspan="5">Limit:</td><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
<tr><td colspan="3">* Decreases with the logarithm of the frequency.</td></tr>
<tr><td>Test procedure</td><td colspan="3">1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.), which provides a 50ohm/50uH coupling impedance for the measuring equipment.<br>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).<br>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.</td></tr>
<tr><td>Test setup:</td><td colspan="3"> 

Remark:<br>E.U.T: Equipment Under Test<br>LISN: Line Impedence Stabilization Network<br>Test table height=0.8m</td></tr>
<tr><td>Test Instruments:</td><td colspan="3">Refer to section 5.8 for details</td></tr>
<tr><td>Test mode:</td><td colspan="3">Refer to section 5.3 for details</td></tr>
<tr><td>Test results:</td><td colspan="3">Passed</td></tr>
</table>

**Measurement Data:**

**Neutral:**




Trace: 9

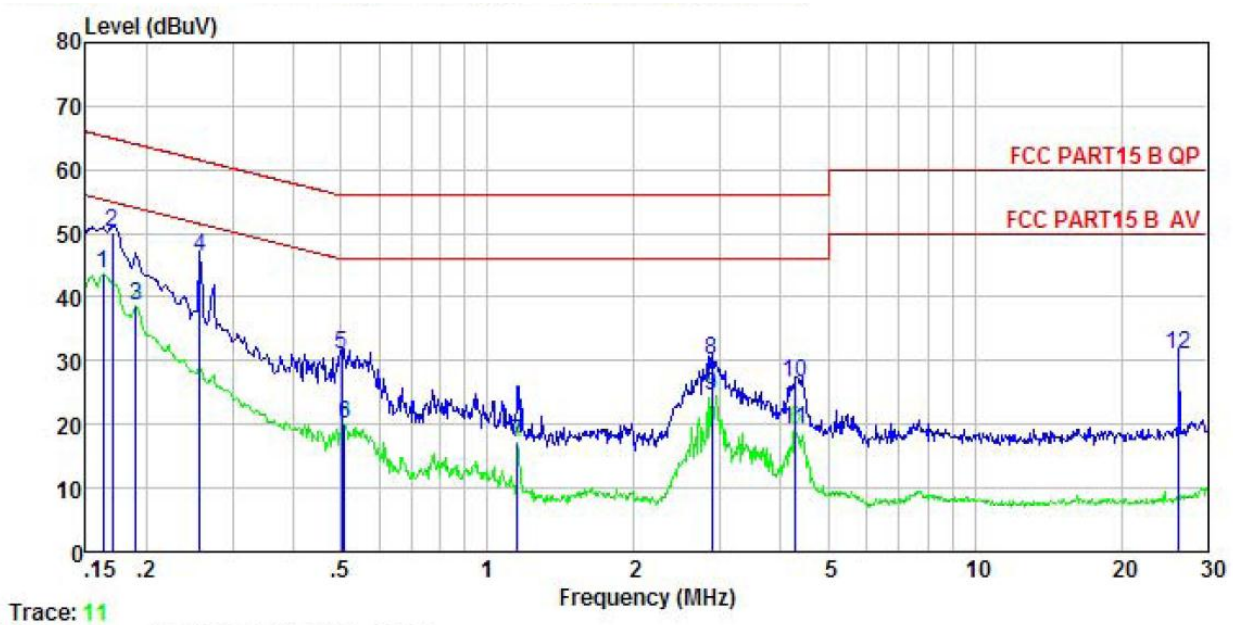
```
Site          : CCIS Shielding Room
Condition     : FCC PART15 B QP LISN(RS) NEUTRAL
EUT           : Connected
Model         : XTX3000
Test Mode     : BLE mode
Power Rating  : DC 12V
Environment   : Temp: 23 .5'C Huni:57%  Atmos:101KPa
Test Engineer: YT
Remark        :
```

| | Freq | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.162 | 38.92 | 0.70 | 10.77 | 50.39 | 65.34 | -14.95 | QP |
| 2 | 0.162 | 32.48 | 0.70 | 10.77 | 43.95 | 55.34 | -11.39 | Average |
| 3 | 0.190 | 27.81 | 0.66 | 10.76 | 39.23 | 54.02 | -14.79 | Average |
| 4 | 0.286 | 29.77 | 0.65 | 10.74 | 41.16 | 60.63 | -19.47 | QP |
| 5 | 0.286 | 16.43 | 0.65 | 10.74 | 27.82 | 50.63 | -22.81 | Average |
| 6 | 0.505 | 17.66 | 0.61 | 10.76 | 29.03 | 56.00 | -26.97 | QP |
| 7 | 0.510 | 8.59 | 0.61 | 10.76 | 19.96 | 46.00 | -26.04 | Average |
| 8 | 0.844 | 12.11 | 0.65 | 10.82 | 23.58 | 56.00 | -32.42 | QP |
| 9 | 2.884 | 17.61 | 0.68 | 10.92 | 29.21 | 56.00 | -26.79 | QP |
| 10 | 2.900 | 11.21 | 0.68 | 10.92 | 22.81 | 46.00 | -23.19 | Average |
| 11 | 4.338 | 14.97 | 0.69 | 10.88 | 26.54 | 56.00 | -29.46 | QP |
| 12 | 4.361 | 7.84 | 0.69 | 10.88 | 19.41 | 46.00 | -26.59 | Average |

*Notes:*

1. *An initial pre-scan was performed on the live and neutral lines with peak detector.*
2. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
3. *Final Level =Receiver Read level + LISN Factor + Cable Loss.*

**Line:**




Trace: 11

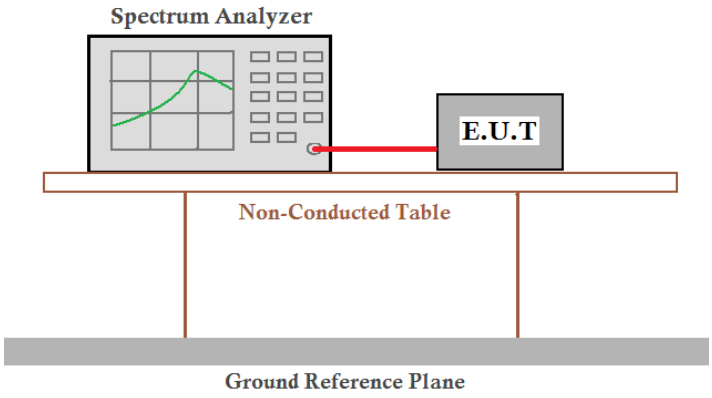
Site : CCIS Shielding Room
Condition : FCC PART15 B QP LISN(RS) LINE
EUT : Connected
Model : XTX3000
Test Mode : BLE mode
Power Rating : DC 12V
Environment : Temp: 23 .5℃ Huni:57% Atmos:101KPa
Test Engineer: YT
Remark :

| | Freq | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.162 | 32.28 | 0.71 | 10.77 | 43.76 | 55.34 | -11.58 | Average |
| 2 | 0.170 | 38.62 | 0.71 | 10.77 | 50.10 | 64.94 | -14.84 | QP |
| 3 | 0.190 | 27.28 | 0.73 | 10.76 | 38.77 | 54.02 | -15.25 | Average |
| 4 | 0.258 | 34.88 | 0.74 | 10.75 | 46.37 | 61.51 | -15.14 | QP |
| 5 | 0.502 | 19.41 | 0.76 | 10.76 | 30.93 | 56.00 | -25.07 | QP |
| 6 | 0.510 | 8.57 | 0.76 | 10.76 | 20.09 | 46.00 | -25.91 | Average |
| 7 | 1.153 | 5.50 | 0.78 | 10.89 | 17.17 | 46.00 | -28.83 | Average |
| 8 | 2.884 | 18.41 | 0.77 | 10.92 | 30.10 | 56.00 | -25.90 | QP |
| 9 | 2.884 | 12.94 | 0.77 | 10.92 | 24.63 | 46.00 | -21.37 | Average |
| 10 | 4.292 | 14.91 | 0.76 | 10.88 | 26.55 | 56.00 | -29.45 | QP |
| 11 | 4.292 | 7.57 | 0.76 | 10.88 | 19.21 | 46.00 | -26.79 | Average |
| 12 | 26.278 | 19.40 | 0.70 | 10.87 | 30.97 | 60.00 | -29.03 | QP |

*Notes:*

1. *An initial pre-scan was performed on the live and neutral lines with peak detector.*
2. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
3. *Final Level =Receiver Read level + LISN Factor + Cable Loss.*

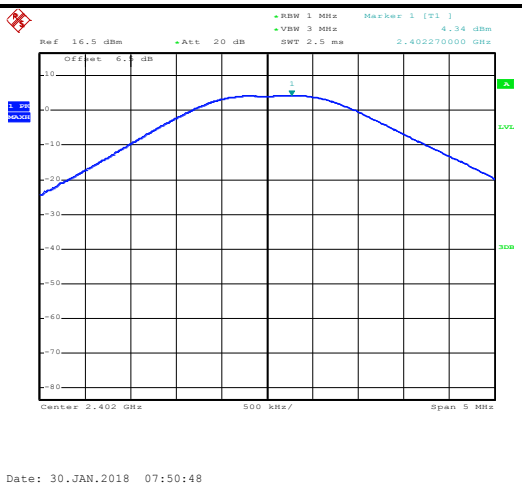
## 6.3 Conducted Output Power

| | |
|---|---|
| Test Requirement: | FCC Part 15 C Section 15.247 (b)(3)<br>RSS-247 section 5.4(d) |
| Test Method: | ANSI C63.10:2013 and KDB558074 |
| Limit: | 30dBm |
| Test setup: |  |
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

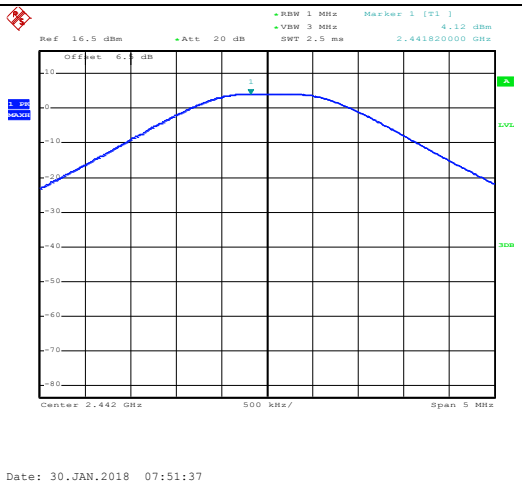
**Measurement Data:**

| Test CH | Peak Conducted Output Power (dBm) | Limit(dBm) | Result |
|---|---|---|---|
| Lowest | 4.34 | 30.00 | Pass |
| Middle | 4.12 | | |
| Highest | 4.11 | | |

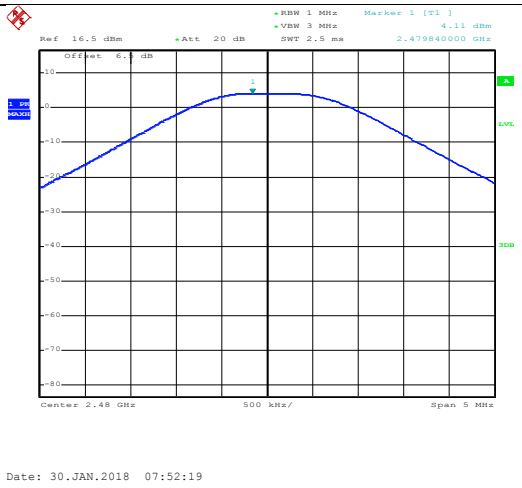
**Test plot as follows:**




Lowest channel

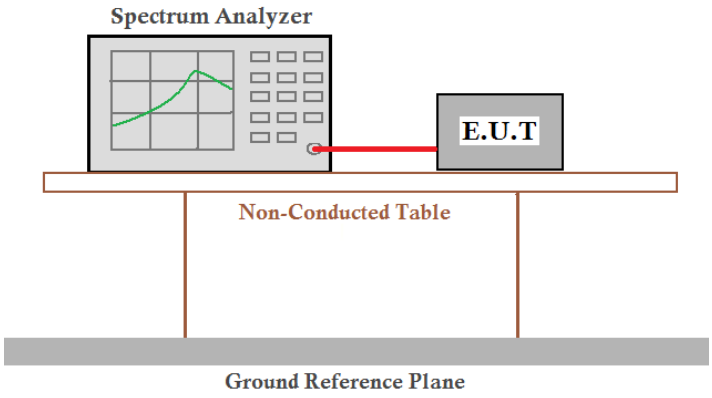



Middle channel




Highest channel

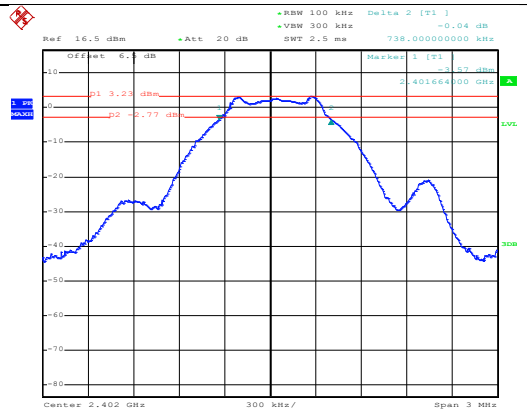
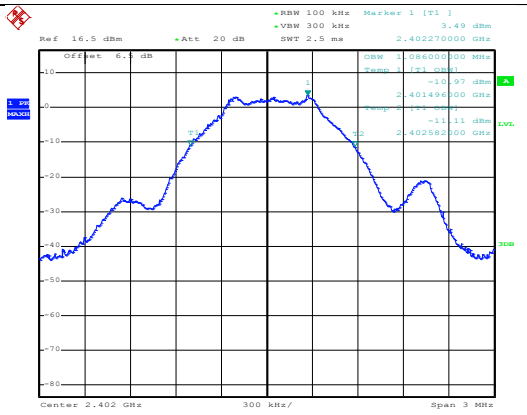
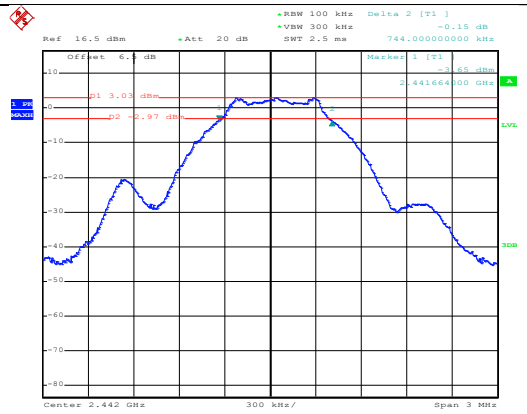
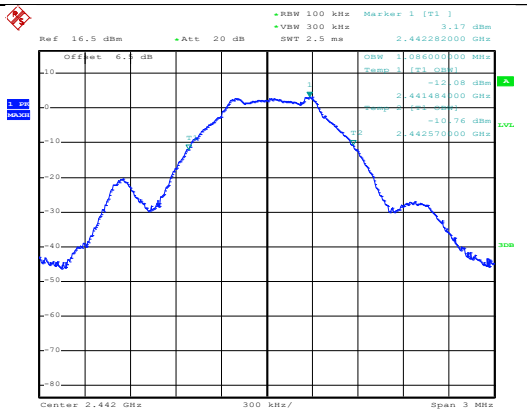
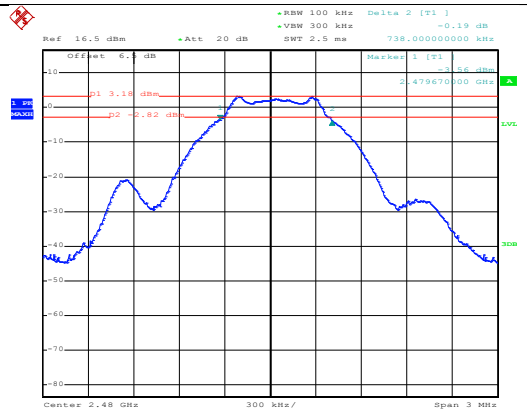
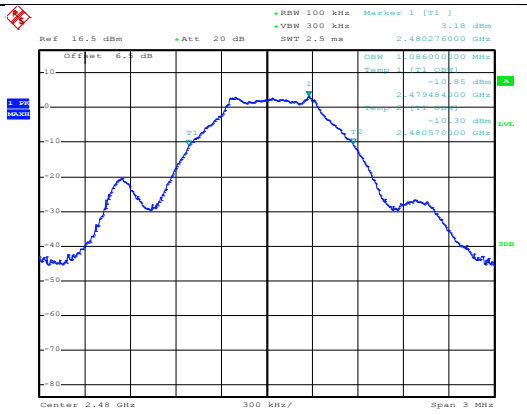
## 6.4 Occupy Bandwidth

| | |
|---|---|
| Test Requirement: | FCC Part 15 C Section 15.247 (a)(2)<br>RSS-247 section 5.2(a) |
| Test Method: | ANSI C63.10:2013 and KDB558074 |
| Limit: | >500kHz |
| Test setup: |  |
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

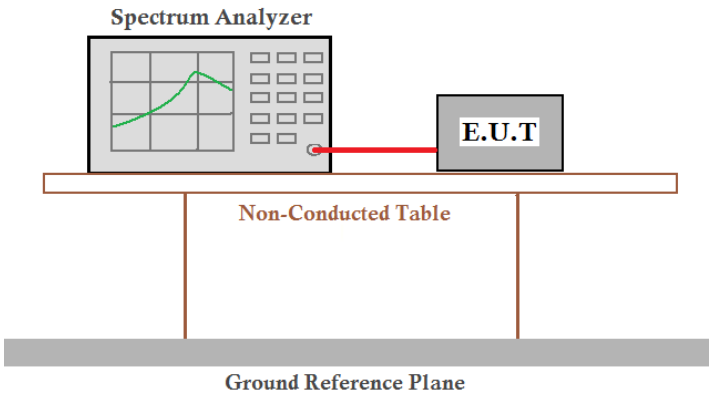
**Measurement Data:**

| Test CH | 6dB Emission Bandwidth (MHz) | Limit(kHz) | Result |
|---|---|---|---|
| Lowest | 0.738 | >500 | Pass |
| Middle | 0.744 | | |
| Highest | 0.738 | | |
| Test CH | 99% Occupy Bandwidth (MHz) | Limit(kHz) | Result |
| Lowest | 1.086 | N/A | N/A |
| Middle | 1.086 | | |
| Highest | 1.086 | | |

**Test plot as follows:**

| 6dB EBW | 99% OBW |
|---|---|
|  |  |
| Lowest channel | Lowest channel |
|  |  |
| Middle channel | Middle channel |
|  |  |
| Highest channel | Highest channel |

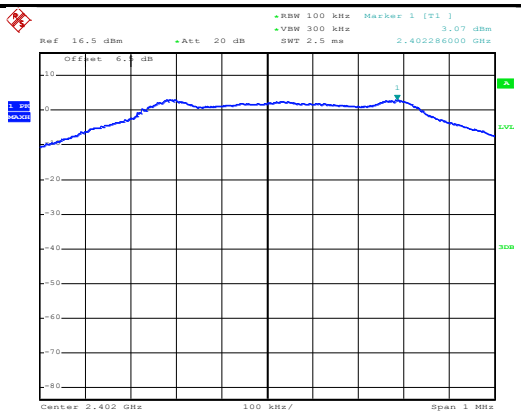
## 6.5 Power Spectral Density

| | |
|---|---|
| Test Requirement: | FCC Part 15 C Section 15.247 (e)<br>RSS-247 section 5.2(b) |
| Test Method: | ANSI C63.10:2013 and KDB558074 |
| Limit: | 8 dBm |
| Test setup: |  |
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

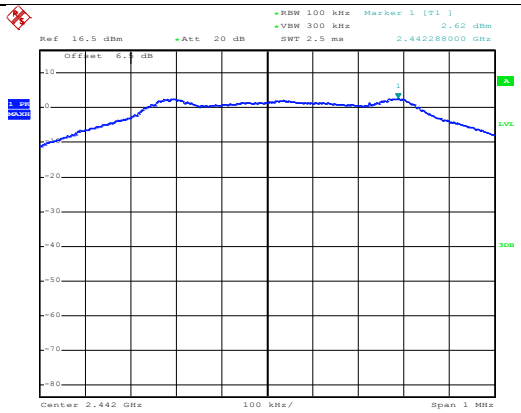
**Measurement Data:**

| Test CH | Power Spectral Density (dBm) | Limit(dBm) | Result |
|---|---|---|---|
| Lowest | 3.07 | 8.00 | Pass |
| Middle | 2.62 | | |
| Highest | 2.44 | | |

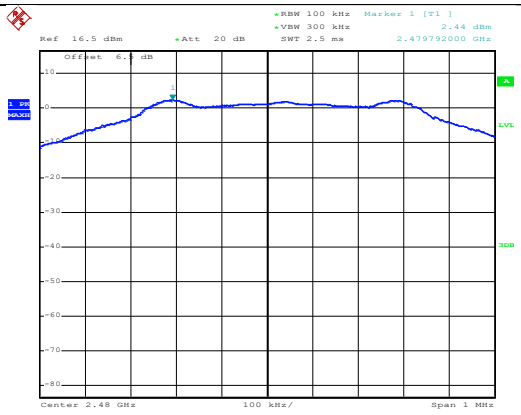
**Test plots as follow:**




Lowest channel



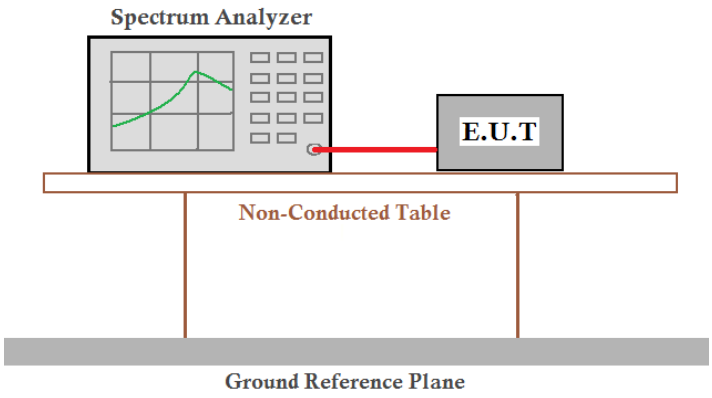

Middle channel



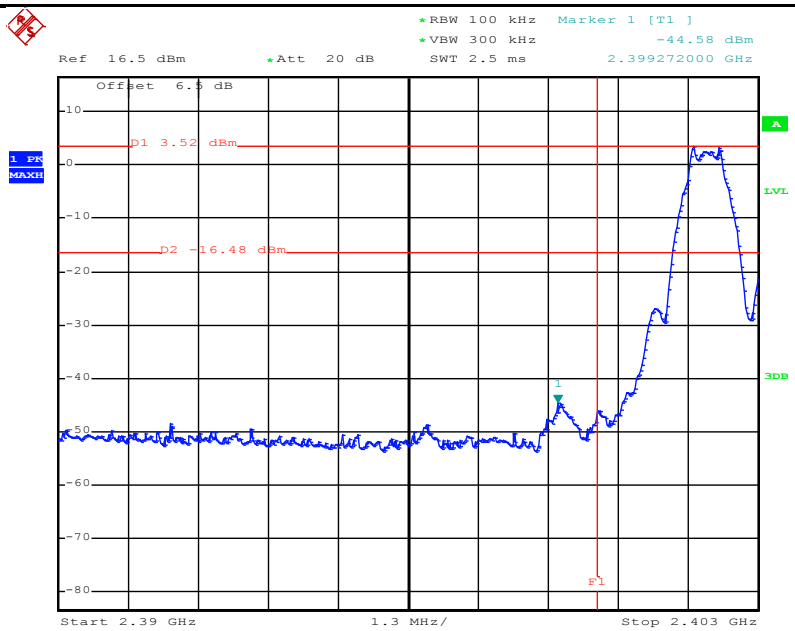

Highest channel

## 6.6 Band Edge

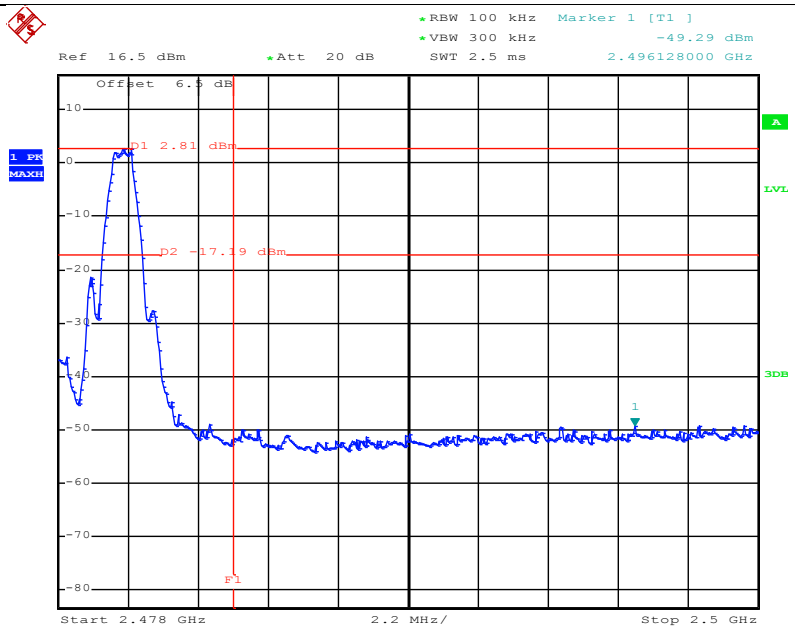
### 6.6.1 Conducted Emission Method

| | |
|---|---|
| Test Requirement: | FCC Part 15 C Section 15.247 (d)<br>RSS-247 section 5.5 |
| Test Method: | ANSI C63.10:2013 and KDB558074 |
| Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. |
| Test setup: |  |
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

**Test plots as follow:**




Lowest channel




Highest channel

### 6.6.2 Radiated Emission Method

| | |
|---|---|
| Test Requirement: | FCC Part 15 C Section 15.209 and 15.205<br>RSS-GEN section 8.9 8.10 |
| Test Method: | ANSI C63.10: 2013 and KDB558074 |
| Test Frequency Range: | 2.3GHz to 2.5GHz |
| Test Distance: | 3m |

Receiver setup:

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| Above 1GHz | Peak | 1MHz | 3MHz | Peak Value |
| | RMS | 1MHz | 3MHz | Average Value |

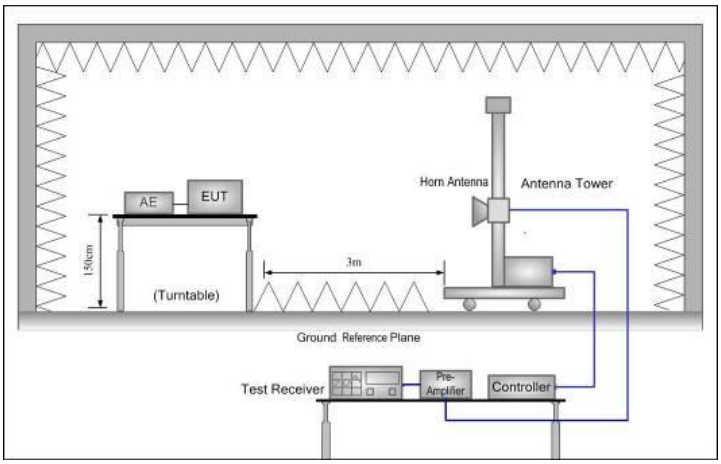
Limit:

| Frequency | Limit (dBuV/m @3m) | Remark |
|---|---|---|
| Above 1GHz | 54.00 | Average Value |
| | 74.00 | Peak Value |

Test Procedure:

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

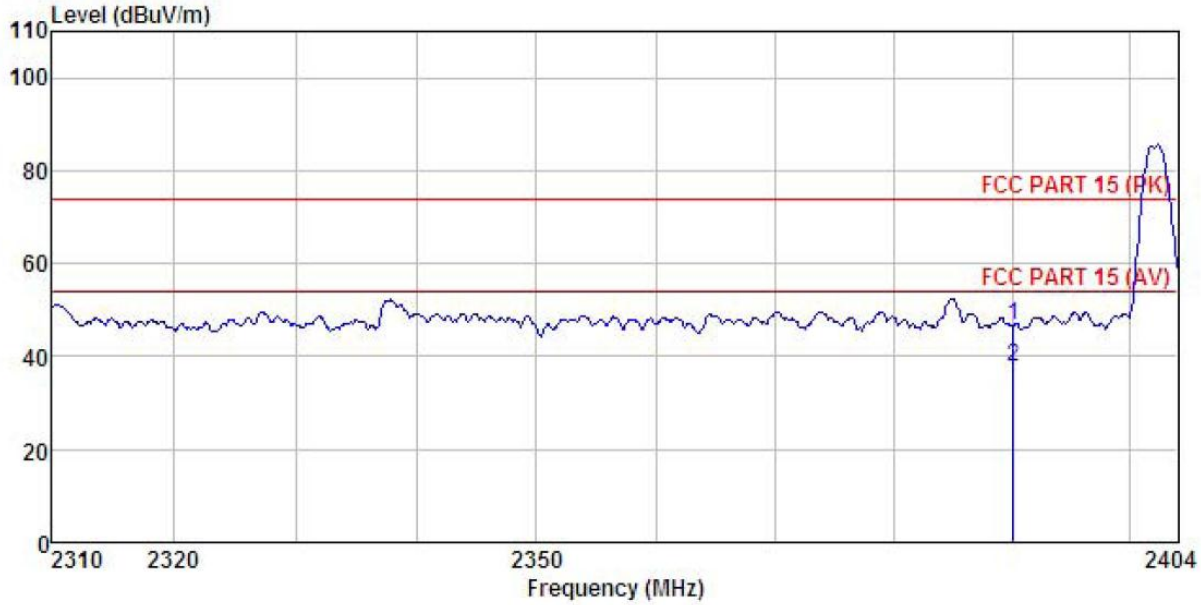
Test setup:




| | |
|---|---|
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

**Test channel: Lowest**

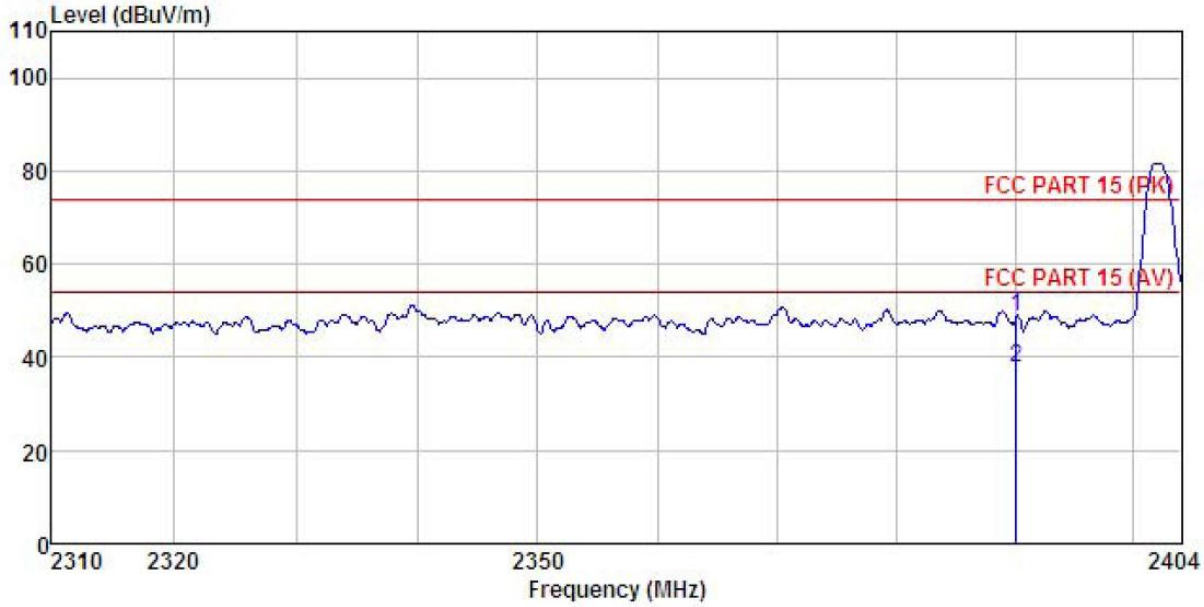
Horizontal:




```
Site          : 3m chamber
Condition     : FCC PART 15 (PK) 3m BBHA9120(1G18G) HORIZONTAL
EUT           : Connected
Model         : XTX3000
Test mode     : BLE-L mode
Power Rating  : DC12V
Environment   : Temp:25.5'C  Huni:55%
Test Engineer: YT
Remark        :
```

| | 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 | |
| 1 | 2390.000 | 16.46 | 25.45 | 4.69 | 0.00 | 46.60 | 74.00 | -27.40 | Peak |
| 2 | 2390.000 | 7.51 | 25.45 | 4.69 | 0.00 | 37.65 | 54.00 | -16.35 | Average |

Vertical:

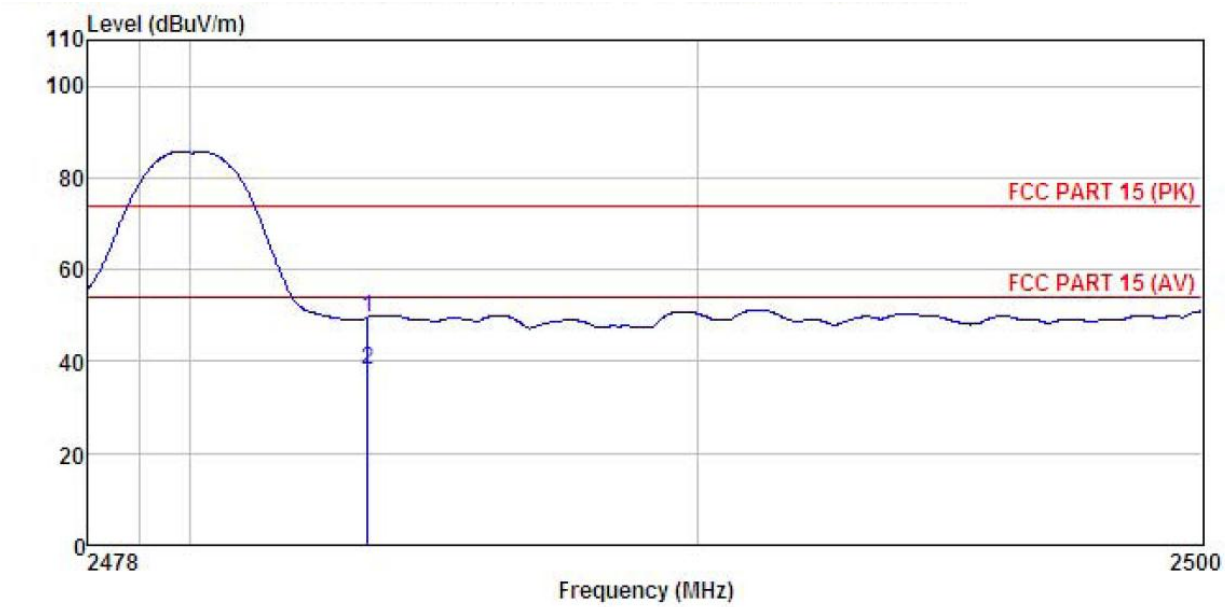



Site : 3m chamber
Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) VERTICAL
EUT : Connected
Model : XTX3000
Test mode : BLE-L mode
Power Rating : DC12V
Environment : Temp:25.5'C Huni:55%
Test Engineer: YT
Remark :

| | Freq | ReadAntenna Level | Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 2390.000 | 18.63 | 25.45 | 4.69 | 0.00 | 48.77 | 74.00 | -25.23 | Peak |
| 2 | 2390.000 | 7.68 | 25.45 | 4.69 | 0.00 | 37.82 | 54.00 | -16.18 | Average |

**Test channel: Highest**

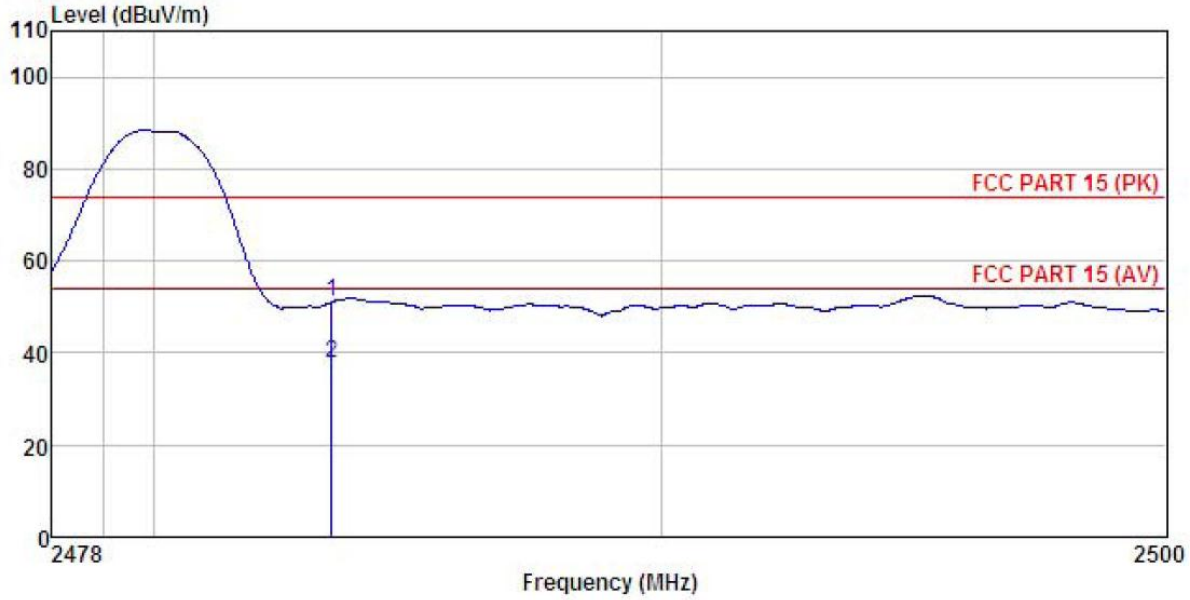
Horizontal:




Site : 3m chamber
Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) HORIZONTAL
EUT : Connected
Model : XTX3000
Test mode : BLE-H mode
Power Rating : DC12V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: YT
Remark :

| | 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 | |
| 1 | 2483.500 | 19.19 | 25.66 | 4.81 | 0.00 | 49.66 | 74.00 | -24.34 | Peak |
| 2 | 2483.500 | 7.68 | 25.66 | 4.81 | 0.00 | 38.15 | 54.00 | -15.85 | Average |

Vertical:

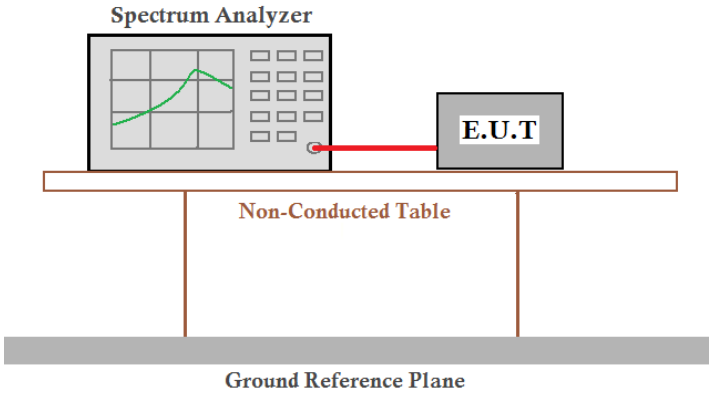



Site : 3m chamber
Condition : FCC PART 15 (PK) 3m BBHA9120(1G18G) VERTICAL
EUT : Connected
Model : XTX3000
Test mode : BLE-H mode
Power Rating : DC12V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: YT
Remark :

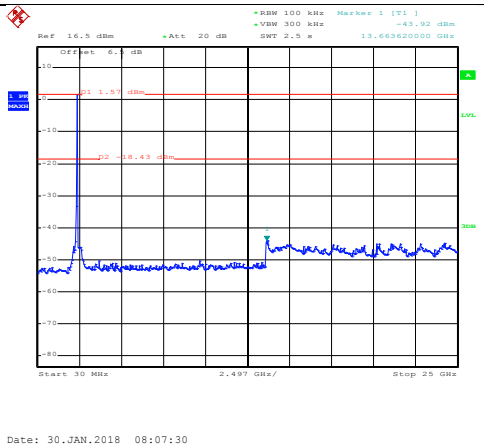
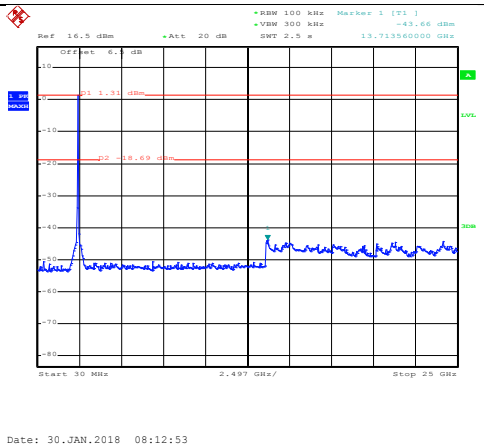
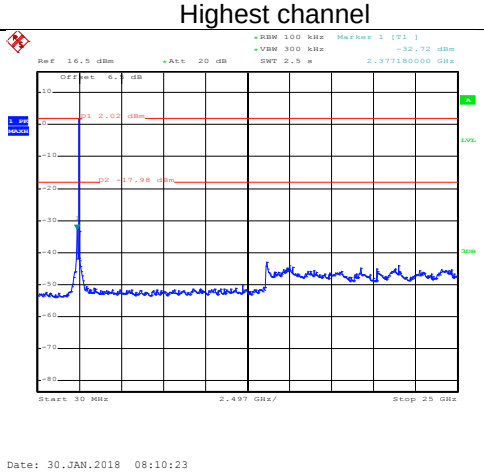
| | Freq | ReadAntenna Level | Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 2483.500 | 20.64 | 25.66 | 4.81 | 0.00 | 51.11 | 74.00 | -22.89 | Peak |
| 2 | 2483.500 | 7.28 | 25.66 | 4.81 | 0.00 | 37.75 | 54.00 | -16.25 | Average |

## 6.7 Spurious Emission

### 6.7.1 Conducted Emission Method

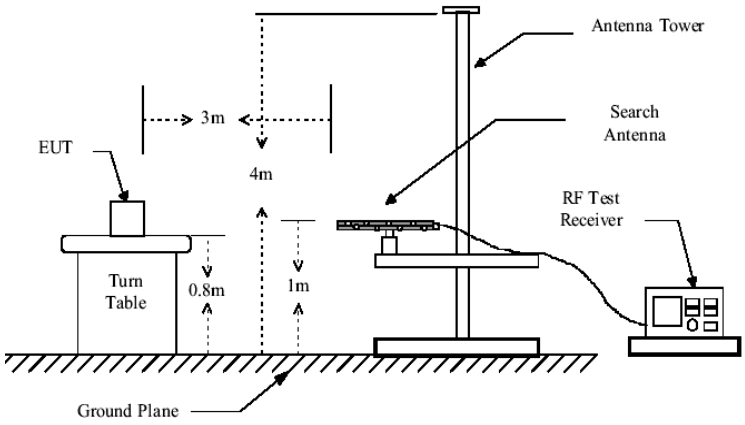
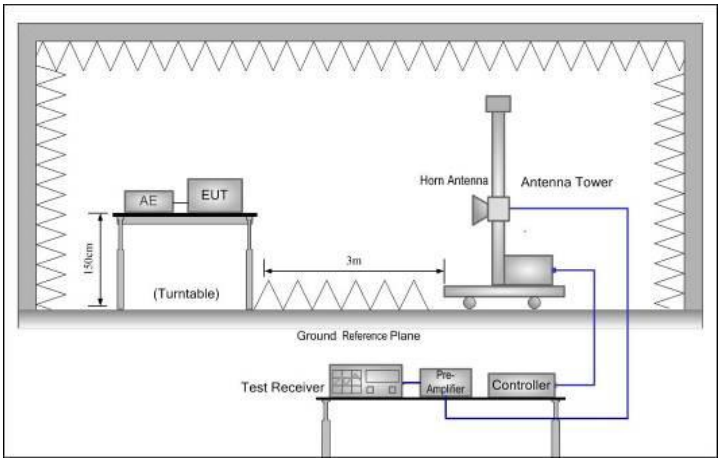
| | |
|---|---|
| Test Requirement: | FCC Part 15 C Section 15.247 (d)<br>RSS-247 section 5.5 |
| Test Method: | ANSI C63.10:2013 and KDB558074 |
| Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that 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. |
| Test setup: |  |
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

**Test plot as follows:**

| |
|---|
| Lowest channel |
|  <br>Date: 30.JAN.2018 08:07:30 |
| 30MHz~25GHz |
| |
| Middle channel |
|  <br>Date: 30.JAN.2018 08:12:53 |
| 30MHz~25GHz |
| |
| Highest channel |
|  <br>Date: 30.JAN.2018 08:10:23 |
| 30MHz~25GHz |

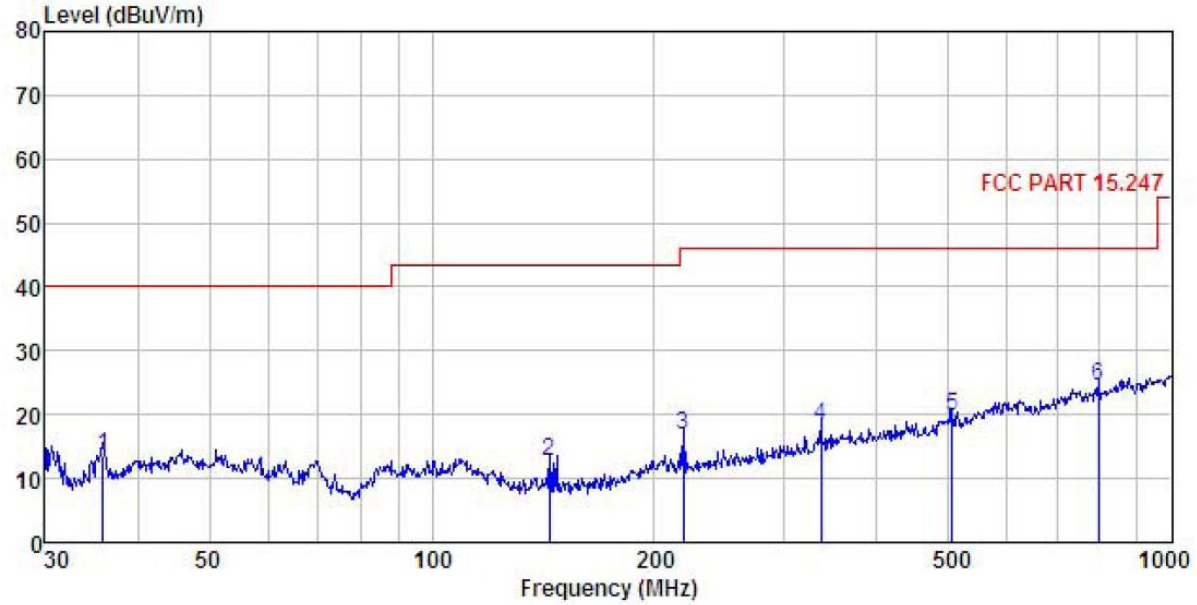
### 6.7.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td colspan="5">FCC Part 15 C Section 15.209 and 15.205<br>RSS-Gen section 8.9 8.10</td></tr>
<tr><td>Test Method:</td><td colspan="5">ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="5">9kHz to 25GHz</td></tr>
<tr><td>Test Distance:</td><td colspan="5">3m</td></tr>
<tr><td rowspan="4">Receiver setup:</td><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>RMS</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr>
<tr><td rowspan="7">Limit:</td><td colspan="2">Frequency</td><td colspan="2">Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td colspan="2">30MHz-88MHz</td><td colspan="2">40.0</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2">88MHz-216MHz</td><td colspan="2">43.5</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2">216MHz-960MHz</td><td colspan="2">46.0</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2">960MHz-1GHz</td><td colspan="2">54.0</td><td>Quasi-peak Value</td></tr>
<tr><td colspan="2" rowspan="2">Above 1GHz</td><td colspan="2">54.0</td><td>Average Value</td></tr>
<tr><td colspan="2">74.0</td><td>Peak Value</td></tr>
<tr><td>Test Procedure:</td><td colspan="5">1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz)/1.5m(above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.<br>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</td></tr>
</table>

| | |
|---|---|
| Test setup: | Below 1GHz<br>  <br><br>Above 1GHz<br>  <br> |
| Test Instruments: | Refer to section 5.8 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |
| Remark: | 1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.<br>2. 9 kHz to 30MHz is too low, so only shows the data of above 30MHz in this report. |

**Below 1GHz:**

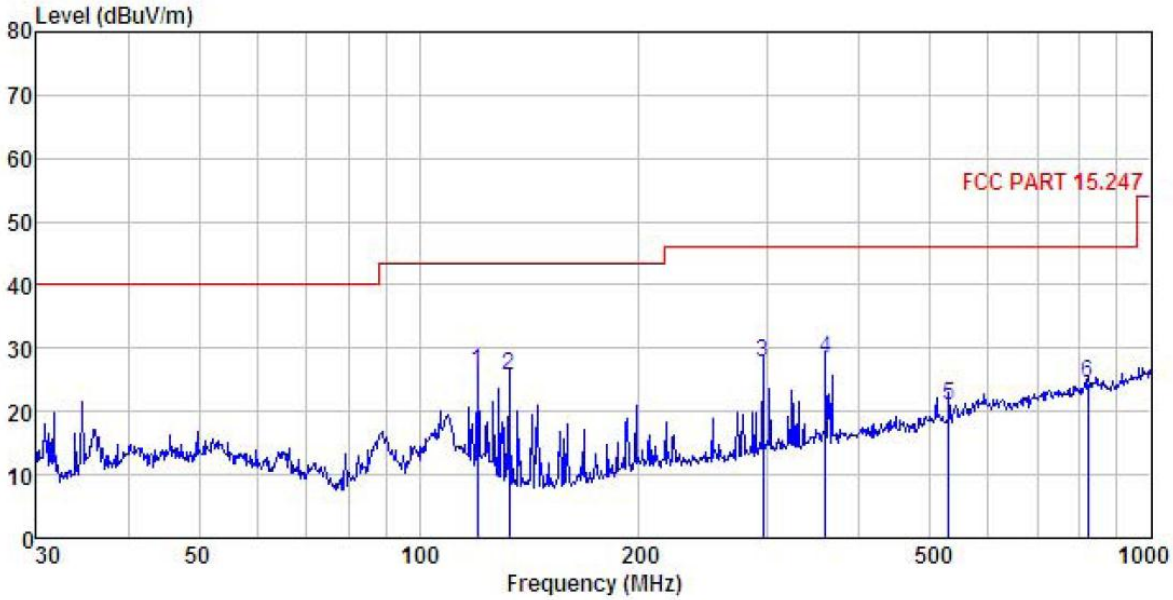
Horizontal:




Site : 3m chamber
Condition : FCC PART 15.247 3m VULB9163(30M2G) HORIZONTAL
EUT : Connected
Model : XTX3000
Test mode : BLE mode
Power Rating : DC12V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: YT
Remark :

| | Freq | ReadAntenna Level | Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 35.875 | 30.59 | 11.90 | 1.07 | 29.94 | 13.62 | 40.00 | -26.38 | QP |
| 2 | 144.335 | 31.18 | 8.38 | 2.45 | 29.25 | 12.76 | 43.50 | -30.74 | QP |
| 3 | 219.075 | 31.48 | 11.30 | 2.85 | 28.71 | 16.92 | 46.00 | -29.08 | QP |
| 4 | 336.035 | 29.73 | 14.10 | 3.05 | 28.53 | 18.35 | 46.00 | -27.65 | QP |
| 5 | 504.706 | 28.39 | 16.70 | 3.65 | 28.97 | 19.77 | 46.00 | -26.23 | QP |
| 6 | 796.183 | 28.76 | 19.52 | 4.35 | 28.22 | 24.41 | 46.00 | -21.59 | QP |

Vertical:




Site : 3m chamber
Condition : FCC PART 15.247 3m VULB9163(30M2G) VERTICAL
EUT : Connected
Model : XTX3000
Test mode : BLE mode
Power Rating : DC12V
Environment : Temp:25.5℃ Huni:55%
Test Engineer: YT
Remark :

| | 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 | |
| 1 | 120.277 | 43.24 | 10.30 | 2.17 | 29.39 | 26.32 | 43.50 | -17.18 | QP |
| 2 | 132.685 | 44.10 | 8.54 | 2.32 | 29.31 | 25.65 | 43.50 | -17.85 | QP |
| 3 | 295.147 | 40.11 | 13.28 | 2.93 | 28.46 | 27.86 | 46.00 | -18.14 | QP |
| 4 | 359.186 | 39.31 | 14.66 | 3.10 | 28.60 | 28.47 | 46.00 | -17.53 | QP |
| 5 | 530.101 | 29.47 | 16.79 | 3.78 | 29.04 | 21.00 | 46.00 | -25.00 | QP |
| 6 | 821.710 | 28.27 | 20.18 | 4.28 | 28.11 | 24.62 | 46.00 | -21.38 | QP |

**Above 1GHz**

| Test channel: | | | Lowest | | Level: | | Peak | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 4804.00 | 49.52 | 30.85 | 6.80 | 41.81 | 45.36 | 74.00 | -28.64 | Vertical |
| 4804.00 | 48.12 | 30.85 | 6.80 | 41.81 | 43.96 | 74.00 | -30.04 | Horizontal |
| Test channel: | | | Lowest | | Level: | | Average | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 4804.00 | 39.62 | 30.85 | 6.80 | 41.81 | 35.46 | 54.00 | -18.54 | Vertical |
| 4804.00 | 38.55 | 30.85 | 6.80 | 41.81 | 34.39 | 54.00 | -19.61 | Horizontal |

| Test channel: | | | Middle | | Level: | | Peak | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 4884.00 | 49.50 | 31.20 | 6.86 | 41.84 | 45.72 | 74.00 | -28.28 | Vertical |
| 4884.00 | 48.71 | 31.20 | 6.86 | 41.84 | 44.93 | 74.00 | -29.07 | Horizontal |
| Test channel: | | | Middle | | Level: | | Average | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 4884.00 | 39.62 | 31.20 | 6.86 | 41.84 | 35.84 | 54.00 | -18.16 | Vertical |
| 4884.00 | 40.12 | 31.20 | 6.86 | 41.84 | 36.34 | 54.00 | -17.66 | Horizontal |

| Test channel: | | | Highest | | Level: | | Peak | |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 4960.00 | 49.62 | 31.63 | 6.91 | 41.87 | 46.29 | 74.00 | -27.71 | Vertical |
| 4960.00 | 48.55 | 31.63 | 6.91 | 41.87 | 45.22 | 74.00 | -28.78 | Horizontal |
| Test channel: | | | Highest | | Level: | | Average | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 4960.00 | 39.62 | 31.63 | 6.91 | 41.87 | 36.29 | 54.00 | -17.71 | Vertical |
| 4960.00 | 37.19 | 31.63 | 6.91 | 41.87 | 33.86 | 54.00 | -20.14 | Horizontal |

*Remark:*

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*