# FCC REPORT

| | |
|---|---|
| **Applicant:** | AwiaTech Corporation |
| **Address of Applicant:** | 11713 Jollyville Road, Austin, Texas 78759, USA |
| **Equipment Under Test (EUT)** | |
| Product Name: | AwiaTech WirelessHART Hardware Module |
| Model No.: | 220 |
| Trade mark: | AwiaWarrior |
| **FCC ID:** | ZCO-220 |
| **Applicable standards:** | FCC CFR Title 47 Part 15 Subpart C Section 15.247:2009 |
| **Date of sample receipt:** | 09 Mar., 2011 |
| **Date of Test:** | 10-17 Mar., 2011 |
| **Date of report issued:** | 17 Mar., 2011 |
| **Test Result :** | PASS * |

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

Authorized Signature:

Robinson Lo
Laboratory Manager

# 2 Contents

Page

# 3 Test Summary

| Test Item | Section in CFR 47 | Result |
|---|---|---|
| Antenna requirement | 15.203/15.247 (c) | PASS |
| AC Power Line Conducted Emission | 15.207 | PASS |
| Conducted Peak Output Power | 15.247 (b)(3) | PASS |
| 6dB Occupied Bandwidth | 15.247 (a)(2) | PASS |
| Power Spectral Density | 15.247 (e) | PASS |
| Band Edge | 15.247(d) | PASS |
| Spurious emissions | 15.205/15.209 | PASS |

*Remark:*

- *Pass: The EUT complies with the essential requirements in the standard.*
- *Fail: The EUT does not comply with the essential requirements in the standard.*
- *Tx: In this whole report Tx (or tx) means Transmitter.*
- *Rx: In this whole report Rx (or rx) means Receiver.*

# 4 General Information

## 4.1 Client Information

| | |
|---|---|
| Applicant: | AwiaTech Corporation |
| Address of Applicant: | 11713 Jollyville Road, Austin, Texas 78759, USA |
| Manufacturer: | AwiaTech Corporation |
| Address of Manufacturer: | 11713 Jollyville Road, Austin, Texas 78759, USA |

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

| | |
|---|---|
| Product Name: | AwiaTech WirelessHART Hardware Module |
| Model No.: | 220 |
| Operation Frequency: | 2405MHz~2480MHz |
| Channel numbers: | 16 |
| Channel separation: | 5MHz |
| Modulation type: | Direct Sequence Spread Spectrum (DSSS) |
| Antenna Type: | Integral |
| Antenna gain: | 2dBi |
| Power supply: | DC 5V (USB port supply) |

| **Operation Frequency each of channel** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1 | 2405MHz | 5 | 2425MHz | 9 | 2445MHz | 13 | 2465MHz |
| 2 | 2410MHz | 6 | 2430MHz | 10 | 2450MHz | 14 | 2470MHz |
| 3 | 2415MHz | 7 | 2435MHz | 11 | 2455MHz | 15 | 2475MHz |
| 4 | 2420MHz | 8 | 2440MHz | 12 | 2460MHz | 16 | 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, and the selected channel see below:

| Channel | Frequency |
|---|---|
| The lowest channel | 2405MHz |
| The middle channel | 2440MHz |
| The Highest channel | 2480MHz |

## 4.3 Test environment and mode

| | |
|---|---|
| **Operating Environment:** | |
| Temperature: | 24.0 °C |
| Humidity: | 52 % RH |
| Atmospheric Pressure: | 1008 mbar |
| **Test mode:** | |
| Transmitting mode | Keep the EUT in transmitting mode with modulation. |

## 4.4 Test Facility

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

● **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fuly described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, July 20, 2010.

● **Industry Canada (IC)**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-1.

## 4.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Address: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China
Tel: 0755-27798480
Fax: 0755-27798960

## 4.6 Other Information Requested by the Customer

None.

## 4.7 Test Instruments list

| Radiated Emission: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Date (dd-mm-yy)** | **Cal.Due date (dd-mm-yy)** |
| 1 | 3m Semi- Anechoic Chamber | ZhongYu Electron | 9.2(L)*6.2(W)* 6.4(H) | GTS201 | Mar. 30 2010 | Mar. 30 2011 |
| 2 | Control Room | ZhongYu Electron | 6.2(L)*2.5(W)* 2.4(H) | GTS202 | N/A | N/A |
| 3 | EMI Test Receiver | Rohde & Schwarz | ESU26 | GTS203 | Sept. 10 2010 | Sept. 10 2011 |
| 4 | BiConiLog Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | GTS204 | Feb. 26 2011 | Feb. 26 2012 |
| 5 | Double -ridged waveguide horn | SCHWARZBECK MESS-ELEKTRONIK | 9120D-829 | GTS205 | June 30 2010 | June 30 2011 |
| 6 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 7 | Coaxial Cable | GTS | N/A | GTS400 | Apr. 01 2010 | Apr. 01 2011 |
| 8 | Coaxial Cable | GTS | N/A | GTS401 | Apr. 01 2010 | Apr. 01 2011 |
| 9 | Coaxial cable | GTS | N/A | GTS402 | Apr. 01 2010 | Apr. 01 2011 |
| 10 | Coaxial Cable | GTS | N/A | GTS407 | Apr. 01 2010 | Apr. 01 2011 |
| 11 | Coaxial Cable | GTS | N/A | GTS408 | Apr. 01 2010 | Apr. 01 2011 |
| 12 | Amplifier(10KHz-5GHz) | Sonnoma Instrument | 305-1052 | GTS210 | Apr. 01 2010 | Apr. 01 2011 |
| 13 | Amplifier(2GHz-20GHz) | HP | 8349B | GTS231 | Apr. 01 2010 | Apr. 01 2011 |
| 14 | Turntable & Antenna Positioner Controller | C&C | CC-C-IF | GTS211 | N/A | N/A |
| 15 | Printer | HP | LaserJet 1007 | GTS212 | N/A | N/A |
| 16 | Color monitor | SUNSPO | SP-14C | GTS213 | N/A | N/A |
| 17 | Color monitor | SUNSPO | SP-14C | GTS214 | N/A | N/A |

| Conducted Emission: | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Date (dd-mm-yy)** | **Cal.Due date (dd-mm-yy)** |
| 1 | Shielding Room | ZhongYu Electron | 7.0(L)x3.0(W)x3.0(H) | GTS206 | Apr. 10 2010 | Apr. 10 2011 |
| 2 | EMI Test Receiver | Rohde & Schwarz | ESCS30 | GTS208 | Sept. 14 2010 | Sept. 14 2011 |
| 3 | 10dB Pulse Limita | Rohde & Schwarz | N/A | GTS209 | Sept. 14 2010 | Sept. 14 2011 |
| 4 | LISN | SCHWARZBECK MESS-ELEKTRONIK | NSLK 8127 | GTS207 | Apr. 14 2010 | Apr. 14 2011 |
| 5 | Coaxial Cable | GTS | N/A | GTS406 | Apr. 01 2010 | Apr. 01 2011 |
| 6 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |

# 5 Test results and Measurement Data

## 5.1 Antenna requirement:

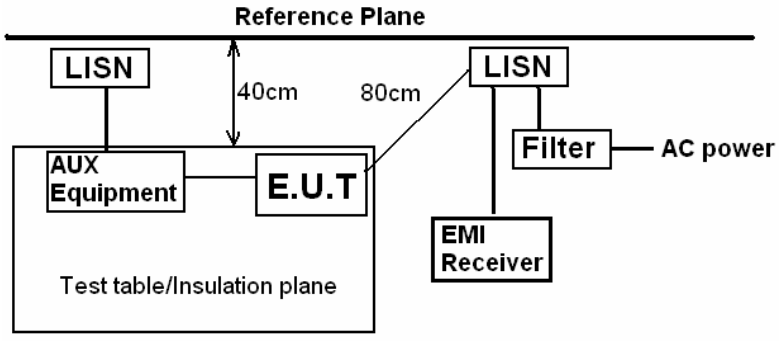
| Standard requirement: | FCC Part15 C Section 15.203 /247(c) |
|---|---|

*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 antenna port is an inverted, unconventional port; the best case gain of the antenna is 2.0dBi.*

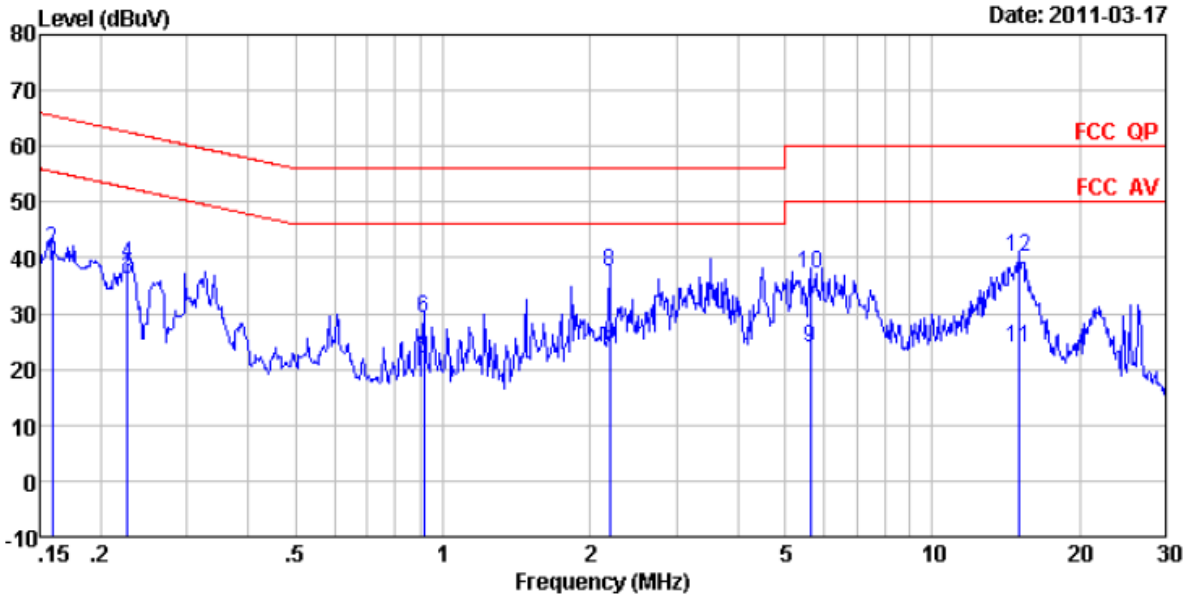
## 5.2 Conducted Emissions

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.207 |
| Test Method: | ANSI C63.4:2003 |
| Test Frequency Range: | 150KHz to 30MHz |
| Class / Severity: | Class B |
| Receiver setup: | RBW=9KHz, VBW=30KHz |
| Limit: | Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average<br>0.15-0.5: 66 to 56* / 56 to 46*<br>0.5-5: 56 / 46<br>5-30: 60 / 50<br>* Decreases with the logarithm of the frequency. |
| Test procedure | The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). The provide a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs). 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: 2003 on conducted measurement. |
| Test setup: |  <br>*Remark:*<br>*E.U.T: Equipment Under Test*<br>*LISN: Line Impedence Stabilization Network*<br>*Test table height=0.8m* |
| Test Instruments: | Refer to section 4.7 for details |
| Test mode: | Refer to section 4.3 for details |
| Test results: | Passed |

**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.

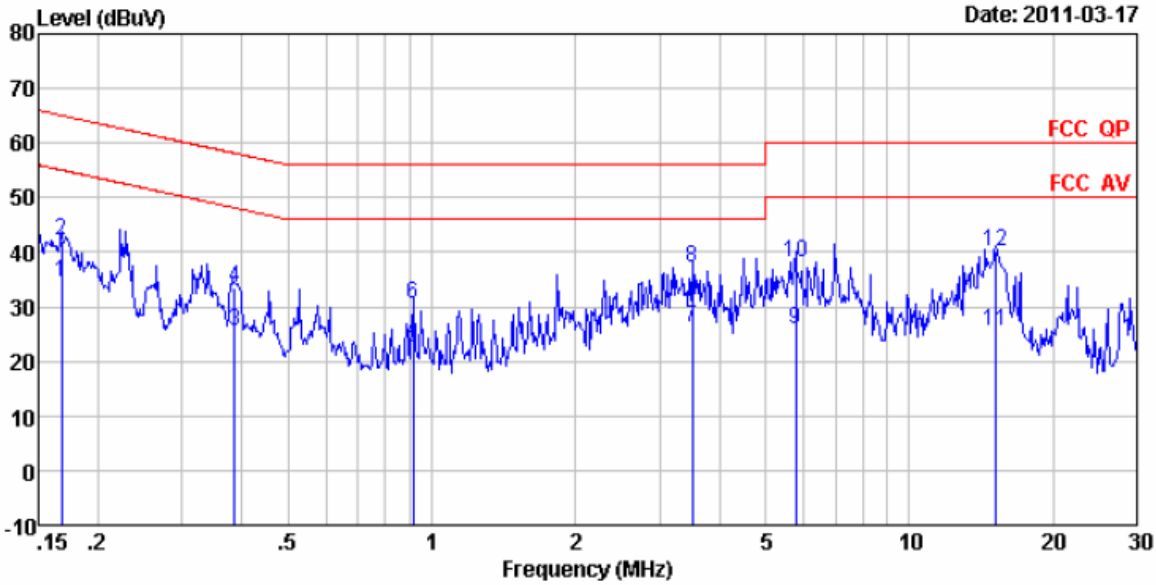
**Live Line:**




Condition : FCC QP LISN(2011) LINE
Job No : 093RF
Test Engineer: Collin

| | Freq | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.159 | 37.61 | 0.68 | 0.10 | 38.39 | 55.52 | -17.13 | Average |
| 2 | 0.159 | 40.81 | 0.68 | 0.10 | 41.59 | 65.52 | -23.93 | QP |
| 3 | 0.227 | 35.41 | 0.64 | 0.10 | 36.15 | 52.57 | -16.42 | Average |
| 4 | 0.227 | 38.11 | 0.64 | 0.10 | 38.85 | 62.57 | -23.72 | QP |
| 5 | 0.914 | 21.21 | 0.49 | 0.10 | 21.80 | 46.00 | -24.20 | Average |
| 6 | 0.914 | 28.45 | 0.49 | 0.10 | 29.04 | 56.00 | -26.96 | QP |
| 7 | 2.190 | 22.43 | 0.39 | 0.10 | 22.92 | 46.00 | -23.08 | Average |
| 8 | 2.190 | 36.84 | 0.39 | 0.10 | 37.33 | 56.00 | -18.67 | QP |
| 9 | 5.623 | 23.51 | 0.29 | 0.11 | 23.91 | 50.00 | -26.09 | Average |
| 10 | 5.623 | 36.85 | 0.29 | 0.11 | 37.25 | 60.00 | -22.75 | QP |
| 11 | 14.986 | 23.52 | 0.18 | 0.20 | 23.90 | 50.00 | -26.10 | Average |
| 12 | 14.986 | 39.66 | 0.18 | 0.20 | 40.04 | 60.00 | -19.96 | QP |

**Neutral Line:**




Condition : FCC QP LISN(2011) NEUTRAL
Job No : 093RF
Test Engineer: Collin

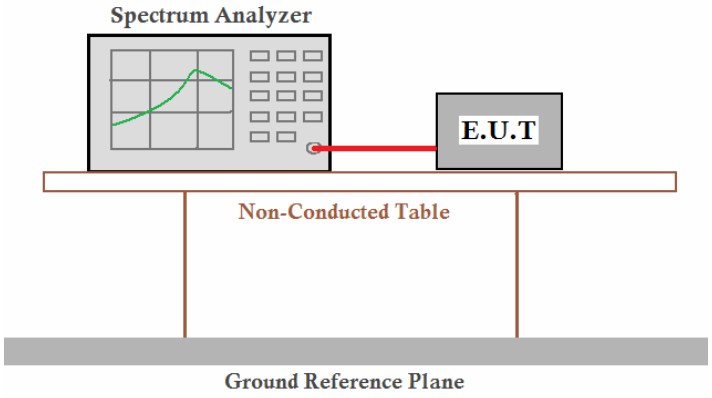
| | Freq | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.168 | 33.71 | 0.68 | 0.10 | 34.49 | 55.08 | -20.59 | Average |
| 2 | 0.168 | 41.51 | 0.68 | 0.10 | 42.29 | 65.08 | -22.79 | QP |
| 3 | 0.387 | 25.01 | 0.58 | 0.10 | 25.69 | 48.12 | -22.43 | Average |
| 4 | 0.387 | 32.91 | 0.58 | 0.10 | 33.59 | 58.12 | -24.53 | QP |
| 5 | 0.914 | 22.01 | 0.49 | 0.10 | 22.60 | 46.00 | -23.40 | Average |
| 6 | 0.914 | 29.93 | 0.49 | 0.10 | 30.52 | 56.00 | -25.48 | QP |
| 7 | 3.509 | 25.64 | 0.34 | 0.10 | 26.08 | 46.00 | -19.92 | Average |
| 8 | 3.509 | 36.74 | 0.34 | 0.10 | 37.18 | 56.00 | -18.82 | QP |
| 9 | 5.774 | 25.32 | 0.28 | 0.11 | 25.71 | 50.00 | -24.29 | Average |
| 10 | 5.774 | 37.82 | 0.28 | 0.11 | 38.21 | 60.00 | -21.79 | QP |
| 11 | 15.146 | 25.02 | 0.18 | 0.20 | 25.40 | 50.00 | -24.60 | Average |
| 12 | 15.146 | 39.74 | 0.18 | 0.20 | 40.12 | 60.00 | -19.88 | QP |

*Notes:*

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

*2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.*

## 5.3 Conducted Peak Output Power

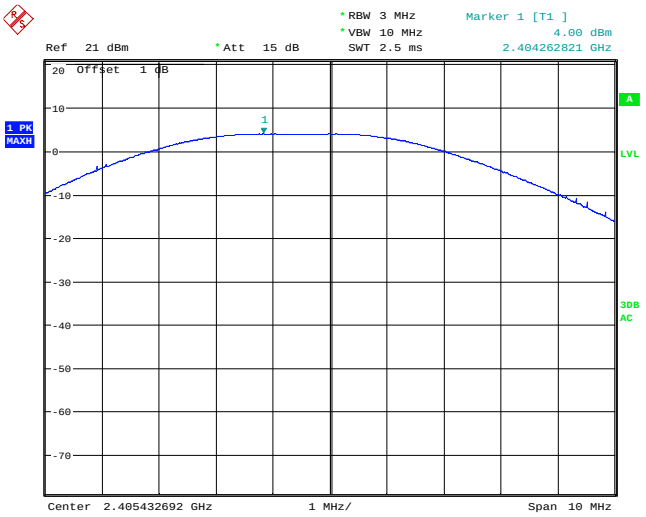
| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (b)(3) |
| Test Method: | ANSI C63.4:2003 and KDB558074 |
| Limit: | 30dBm |
| Test setup: |  <br>*Remark:*<br>*Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.* |
| Test Instruments: | Refer to section 4.7 for details |
| Test mode: | Refer to section 4.3 for details |
| Test results: | Passed |

**Measurement Data**

| Operating mode | | | |
|---|---|---|---|
| Test channel | Peak Output Power (dBm) | Limit (dBm) | Result |
| Lowest | 4.00 | 30.00 | Pass |
| Middle | 3.64 | 30.00 | Pass |
| Highest | 3.30 | 30.00 | Pass |

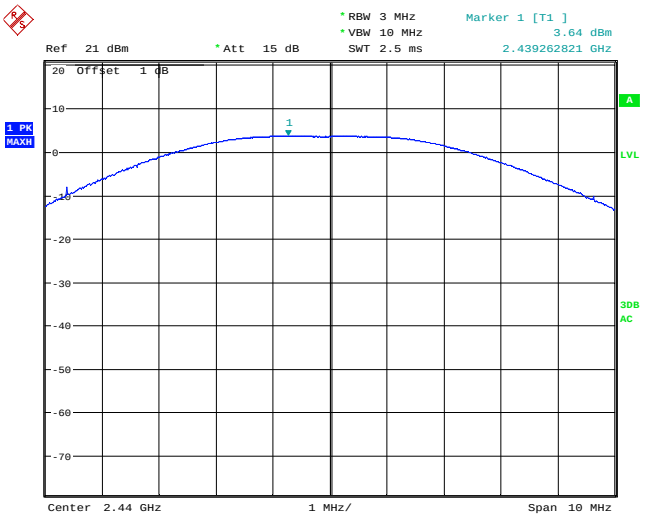
**Test plot as follows:**

| Test channel: | Lowest |
|---|---|



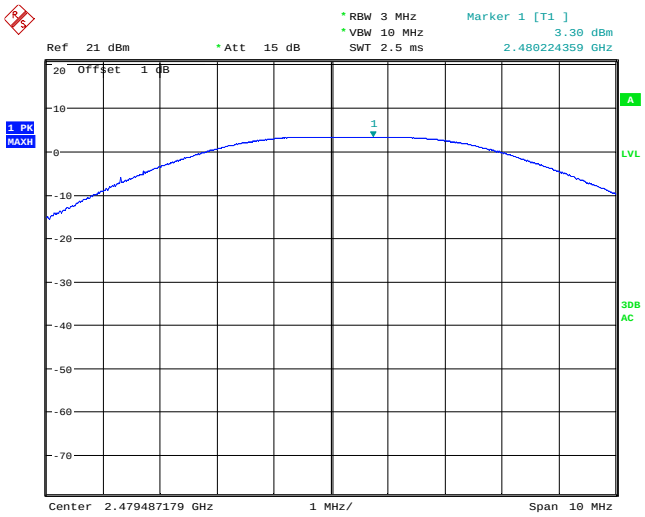

Date: 11.MAR.2011 07:54:14

| Test channel: | Middle |
|---|---|

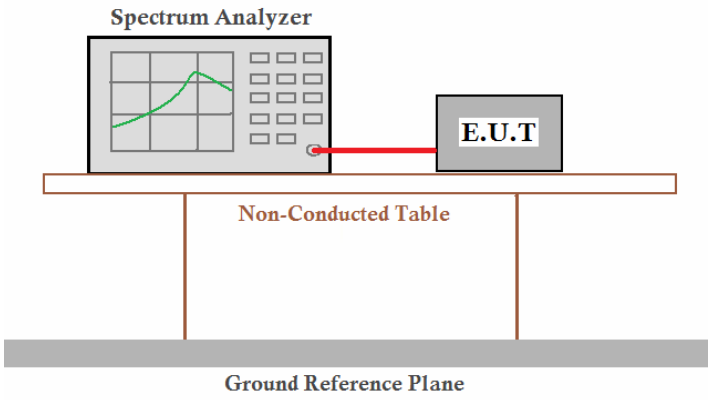



Date: 11.MAR.2011 16:35:03

| Test channel: | Highest |
|---|---|



## 5.4 6dB Occupy Bandwidth

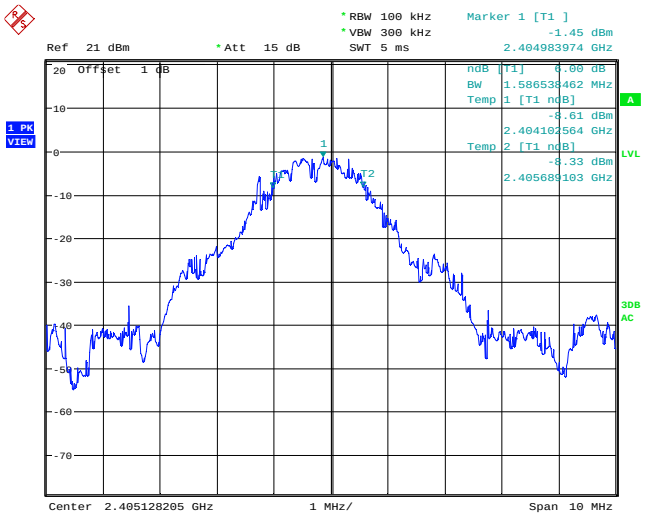
| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(2) |
| Test Method: | ANSI C63.4:2003 and KDB558074 |
| Limit: | >500KHz |
| Test setup: |  |
| Test Instruments: | Refer to section 4.7 for details |
| Test mode: | Refer to section 4.3 for details |
| Test results: | Passed |

**Measurement Data**

| Operating mode | | | |
|---|---|---|---|
| Test channel | 6dB Occupy Bandwidth (MHz) | Limit (KHz) | Result |
| Lowest | 1.5865 | >500 | Pass |
| Middle | 1.5224 | >500 | Pass |
| Highest | 1.5064 | >500 | Pass |

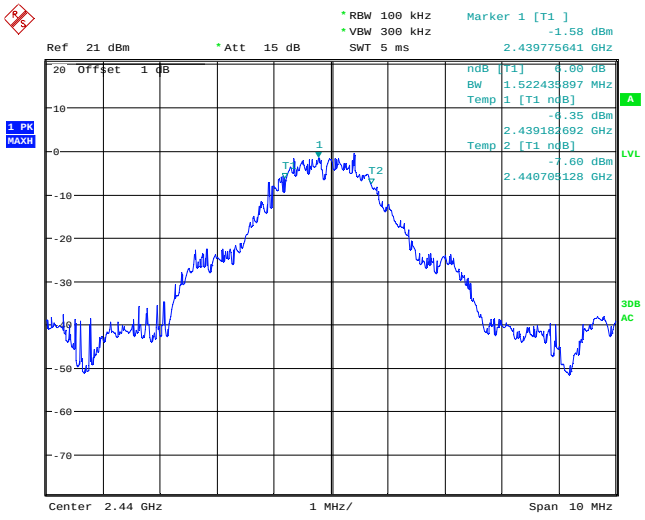
**Test plot as follows:**

| Test channel: | Lowest |
|---|---|



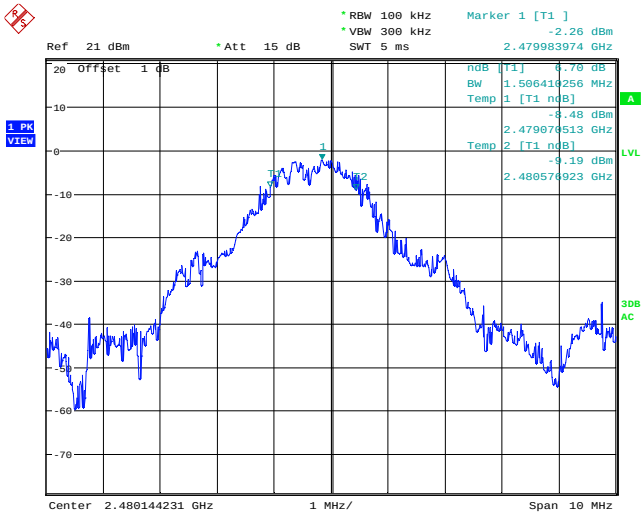

Date: 11.MAR.2011 08:24:51

| Test channel: | Middle |
|---|---|

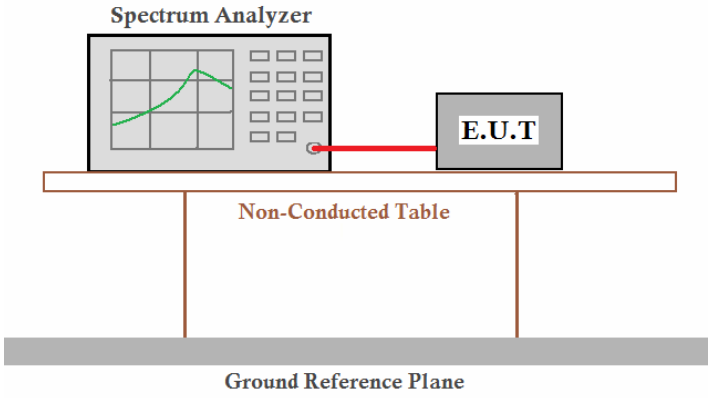



Date: 11.MAR.2011 16:41:26

| Test channel: | Highest |
|---|---|



## 5.5 Power Spectral Density

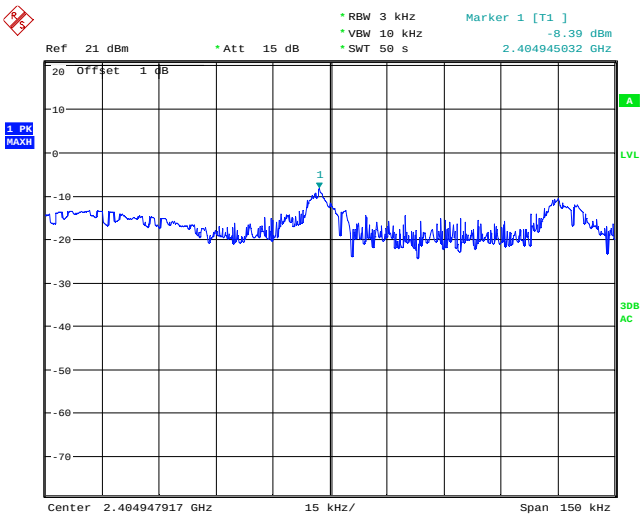
| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (e) |
| Test Method: | ANSI C63.4:2003 and KDB558074 |
| Limit: | 8dBm |
| Test setup: |  <br>*Remark:*<br>*Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.* |
| Test Instruments: | Refer to section 4.7 for details |
| Test mode: | Refer to section 4.3 for details |
| Test results: | Passed |

**Measurement Data**

| Operating mode | | | |
|---|---|---|---|
| Test channel | Power Spectral Density (dBm) | Limit (dBm) | Result |
| Lowest | -8.39 | 8.00 | Pass |
| Middle | -9.33 | 8.00 | Pass |
| Highest | -11.94 | 8.00 | Pass |

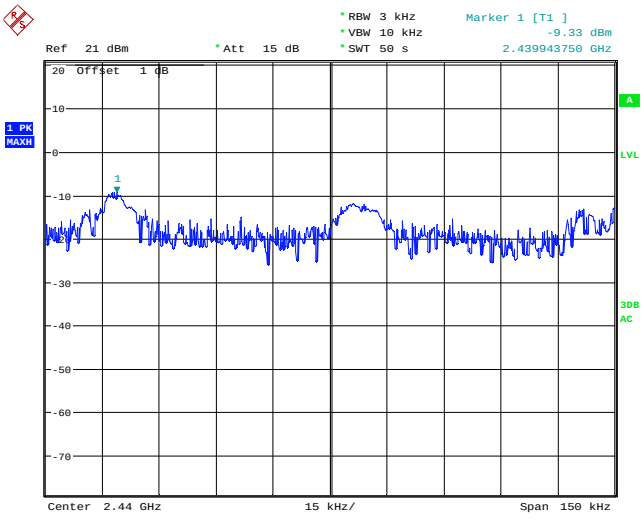
**Test plot as follows:**

| Test channel: | Lowest |
|---|---|



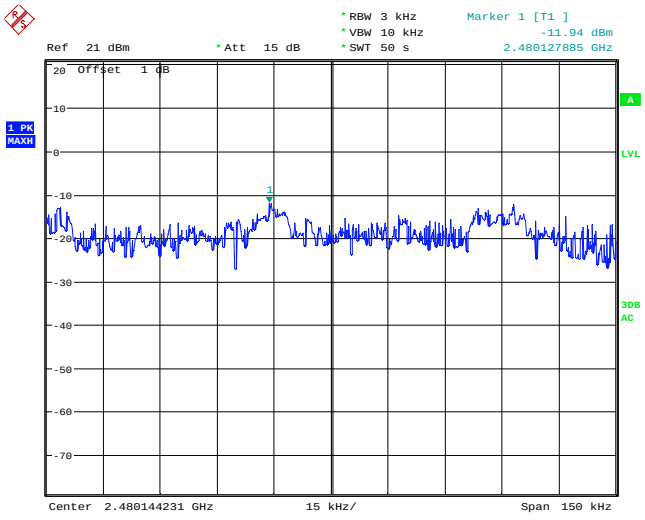

Date: 11.MAR.2011 08:32:35

| Test channel: | Middle |
|---|---|



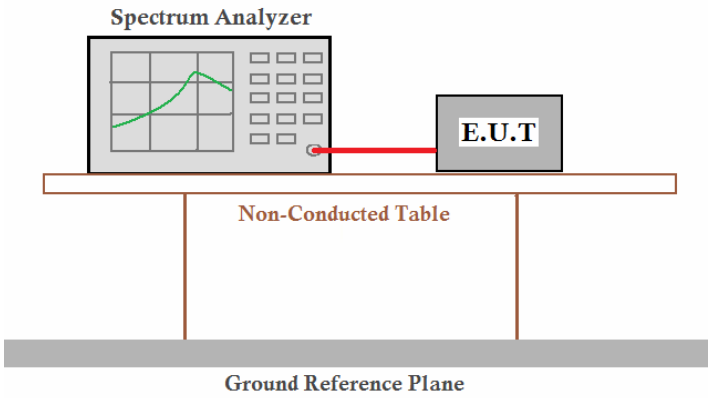

Date: 11.MAR.2011 16:46:36

| Test channel: | Highest |
|---|---|



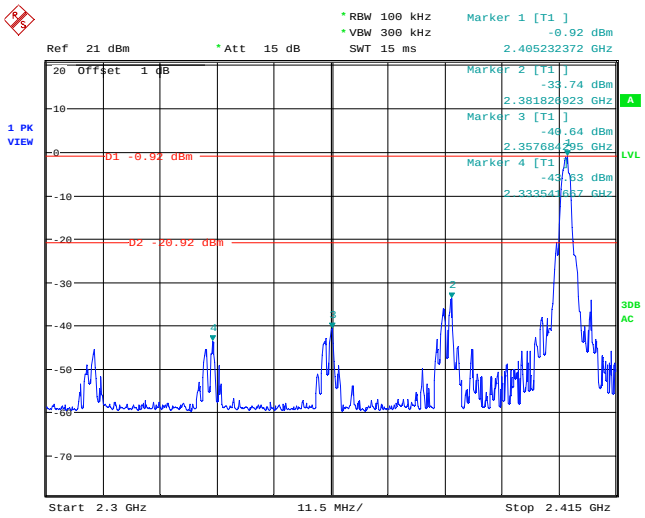
## 5.6 Band Edge

### 5.6.1 Conducted Emission

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (d) |
| Test Method: | ANSI C63.4:2003 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: |  <br>*Remark:*<br>*Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.* |
| Test Instruments: | Refer to section 4.7 for details |
| Test mode: | Refer to section 4.3 for details |
| Test results: | Passed |

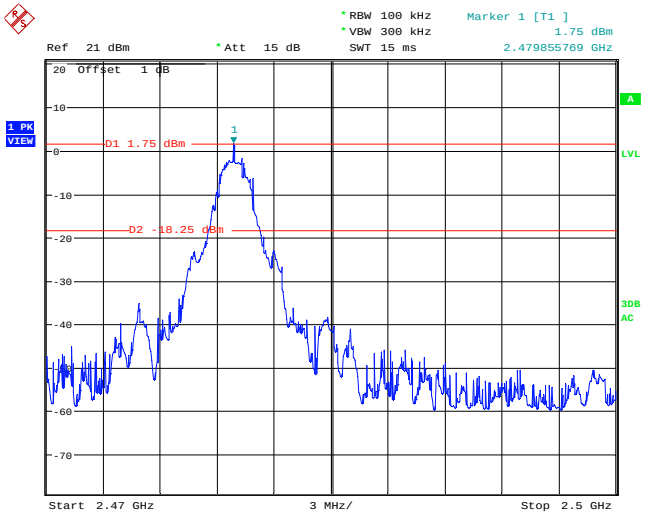
**Test plot as follows:**

| Test mode: | Operating Mode | Test channel: | Lowest |
|---|---|---|---|




Date: 11.MAR.2011 08:06:06

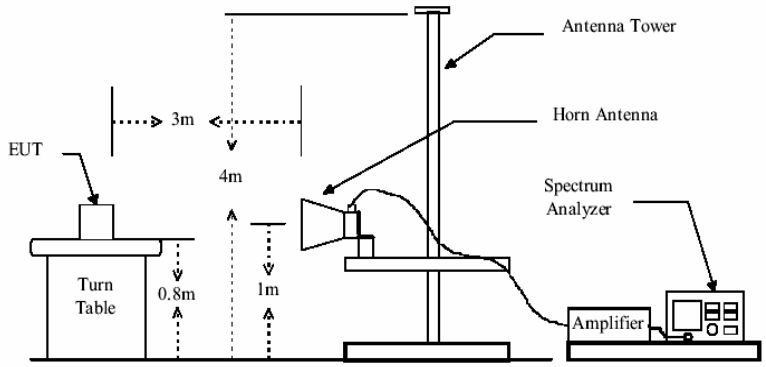
| Test mode: | Operating Mode | Test channel: | Highest |
|---|---|---|---|




Date: 11.MAR.2011 08:36:20

### 5.6.2 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209 and 15.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4: 2003</td></tr>
<tr><td>Test Frequency Range:</td><td>2.3GHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Test Procedure:</td><td>
a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>
b. 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>
c. 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>
d. 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 rotable table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
</td></tr>
</table>

| | |
|---|---|
| Test setup: | Above 1GHz   |
| Test Instruments: | Refer to section 4.7 for details |
| Test mode: | Refer to section 4.3 for details |
| Test results: | Passed |

*Note:*
*The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:*

*Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor*

## Measurement data:

| Test mode: | Transmitting | Test channel: | Lowest | Remark: | 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 |
|---|---|---|---|---|---|---|---|---|
| 2381.30 | 65.62 | 27.59 | 3.33 | 30.10 | 66.44 | 74.00 | -7.56 | Horizontal |
| 2400.00 | 68.59 | 27.58 | 3.37 | 30.10 | 69.44 | 74.00 | -4.56 | Horizontal |
| 2381.30 | 61.08 | 27.59 | 3.33 | 30.10 | 61.90 | 74.00 | -12.10 | Vertical |
| 2400.00 | 64.59 | 27.58 | 3.37 | 30.10 | 65.44 | 74.00 | -8.56 | Vertical |

| Test mode: | Transmitting | Test channel: | Lowest | Remark: | 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 |
|---|---|---|---|---|---|---|---|---|
| 2381.30 | 43.69 | 27.59 | 3.33 | 30.10 | 44.51 | 54.00 | -9.49 | Horizontal |
| 2400.00 | 49.67 | 27.58 | 3.37 | 30.10 | 50.52 | 54.00 | -3.48 | Horizontal |
| 2381.30 | 42.26 | 27.59 | 3.33 | 30.10 | 43.08 | 54.00 | -10.92 | Vertical |
| 2400.00 | 48.06 | 27.58 | 3.37 | 30.10 | 48.91 | 54.00 | -5.09 | Vertical |

| Test mode: | Transmitting | Test channel: | Highest | Remark: | Peak |
|---|---|---|---|---|---|

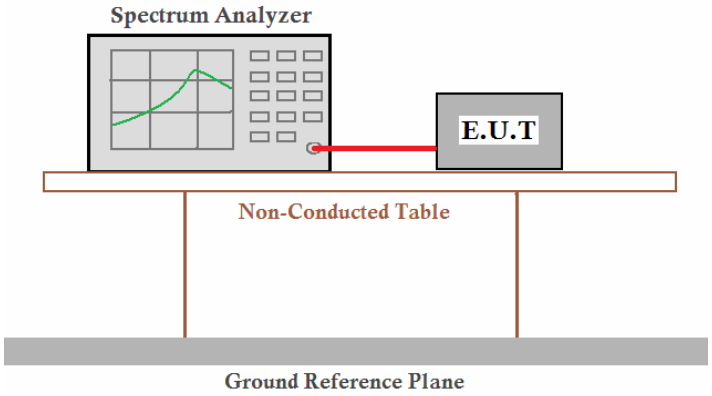
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 2483.50 | 68.21 | 27.53 | 3.49 | 29.93 | 69.30 | 74.00 | -4.70 | Horizontal |
| 2500.00 | 65.97 | 27.55 | 3.52 | 30.70 | 66.34 | 74.00 | -7.66 | Horizontal |
| 2483.50 | 65.68 | 27.53 | 3.49 | 29.93 | 66.77 | 74.00 | -7.23 | Vertical |
| 2500.00 | 59.96 | 27.55 | 3.52 | 30.70 | 60.33 | 74.00 | -13.67 | Vertical |

| Test mode: | Transmitting | Test channel: | Highest | Remark: | 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 |
|---|---|---|---|---|---|---|---|---|
| 2483.50 | 47.13 | 27.53 | 3.49 | 29.93 | 48.22 | 54.00 | -5.78 | Horizontal |
| 2500.00 | 43.27 | 27.55 | 3.52 | 30.70 | 43.64 | 54.00 | -10.36 | Horizontal |
| 2483.50 | 46.09 | 27.53 | 3.49 | 29.93 | 47.18 | 54.00 | -6.82 | Vertical |
| 2500.00 | 42.05 | 27.55 | 3.52 | 30.70 | 42.42 | 54.00 | -11.58 | Vertical |

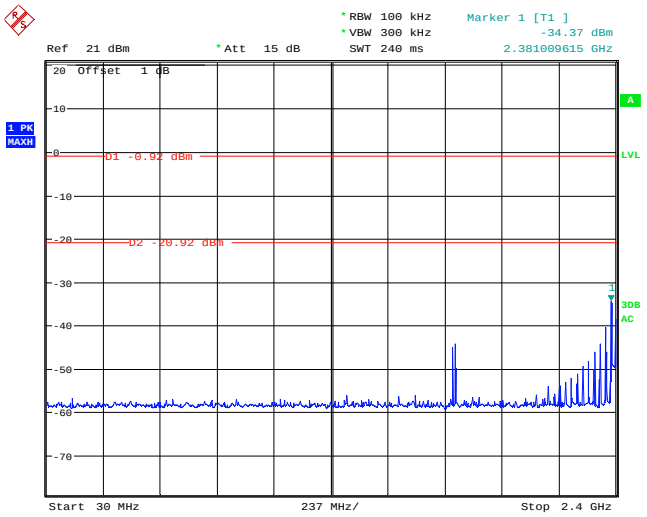
## 5.7 Spurious Emission

### 5.7.1 Conducted Emission

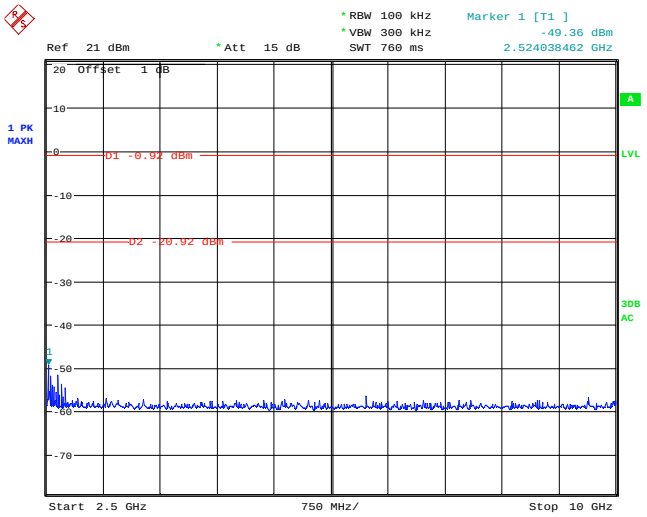
| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (d) |
| Test Method: | ANSI C63.4:2003 and KDB558074 |
| Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional 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: |  <br>*Remark:*<br>*Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.* |
| Test Instruments: | Refer to section 4.7 for details |
| Test mode: | Refer to section 4.3 for details |
| Test results: | Passed |

**Test plot as follows:**

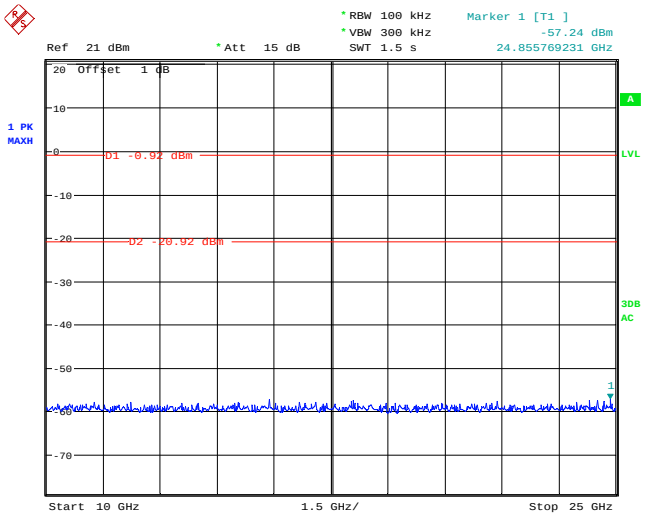
| Test channel: | Lowest |
|---|---|




Date: 11.MAR.2011 08:22:17

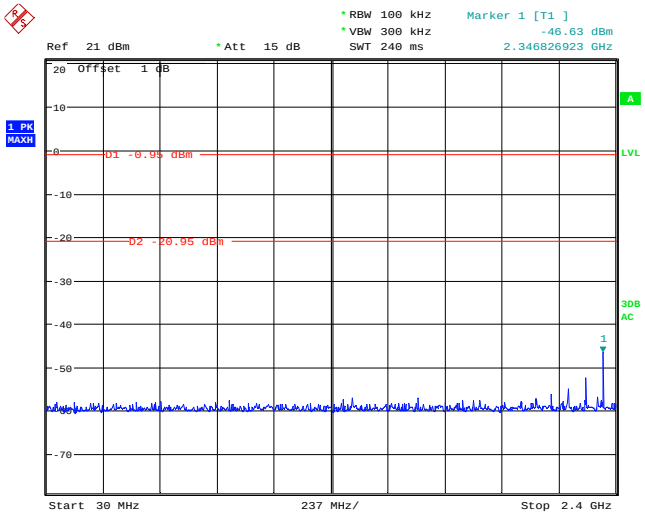



Date: 11.MAR.2011 08:14:51

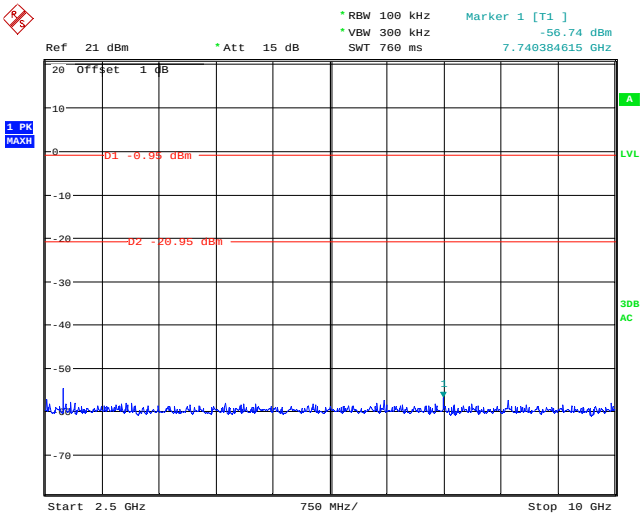



Date: 11.MAR.2011 08:12:26

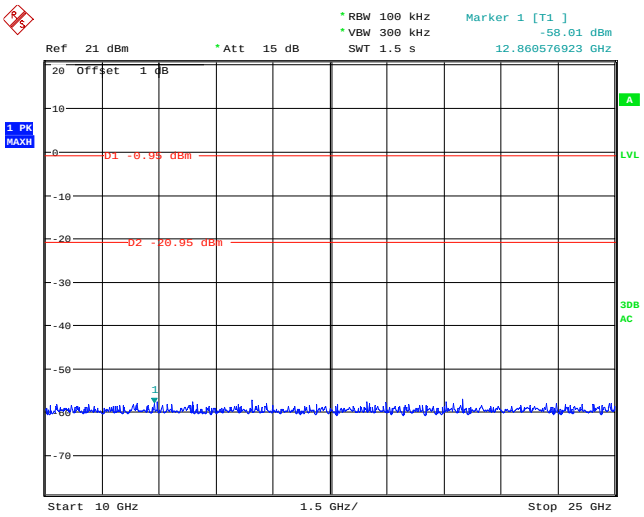
| Test channel: | Middle |
|---|---|




Date: 11.MAR.2011 16:38:26

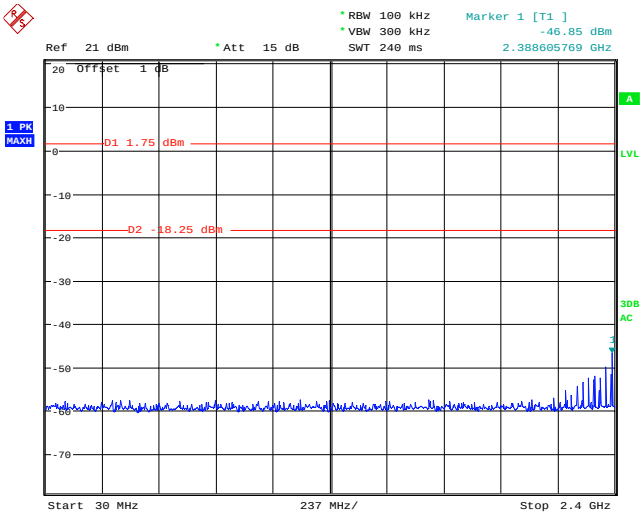



Date: 11.MAR.2011 16:38:47

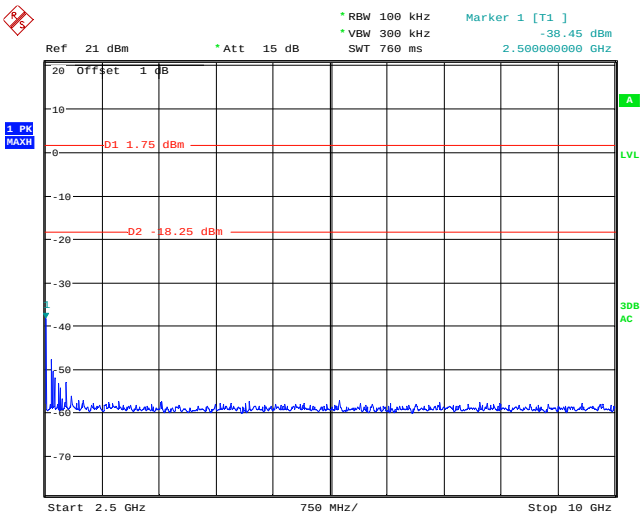



Date: 11.MAR.2011 16:39:09

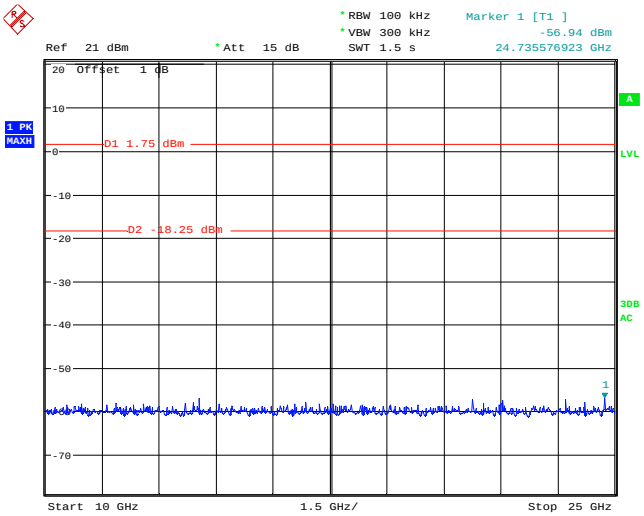
| Test channel: | Highest |
|---|---|




Date: 11.MAR.2011 08:37:13



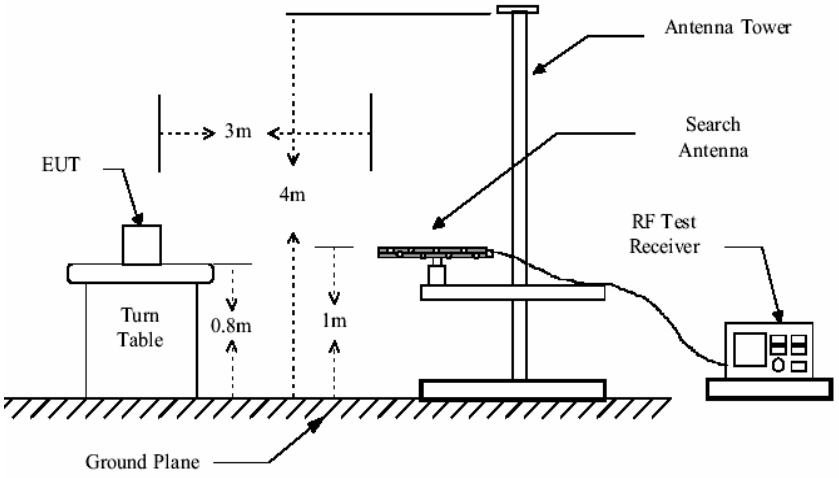
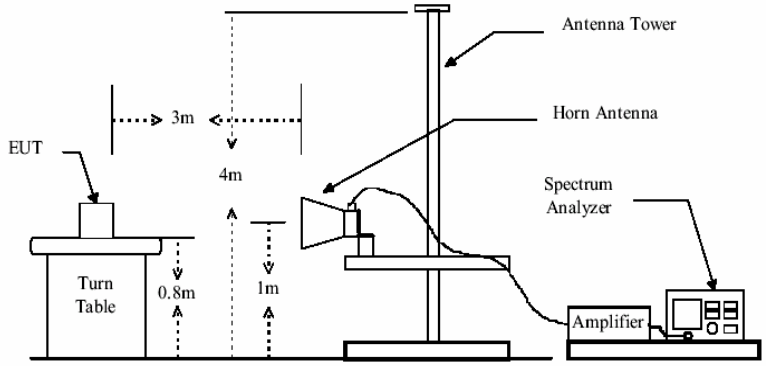

Date: 11.MAR.2011 08:38:26




Date: 11.MAR.2011 08:38:44

## 5.7.2 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209 and 15.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4: 2003</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><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>100KHz</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>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Test Procedure:</td><td>g. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>h. 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>i. 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>j. 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 rotable table was turned from 0 degrees to 360 degrees to find the maximum reading.<br>k. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>l. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</td></tr>
</table>

| | |
|---|---|
| Test setup: | Below 1GHz<br>  <br><br>Above 1GHz<br>  <br> |
| Test Instruments: | Refer to section 4.7 for details |
| Test mode: | Refer to section 4.3 for details |
| Test results: | Passed |

*Note:*
*The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:*

*Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor*

## Radiated emission below 1GHz

| Worst case: | Middle Channel |
|---|---|

| 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 |
|---|---|---|---|---|---|---|---|---|
| 180.02 | 38.44 | 11.63 | 1.68 | 25.62 | 28.72 | 43.50 | -14.78 | Vertical |
| 260.14 | 41.11 | 10.30 | 1.98 | 25.60 | 30.38 | 46.00 | -15.62 | Vertical |
| 312.18 | 40.26 | 12.71 | 2.10 | 25.58 | 33.00 | 46.00 | -13.00 | Vertical |
| 495.93 | 38.32 | 17.56 | 2.39 | 25.55 | 37.15 | 46.00 | -8.85 | Vertical |
| 506.48 | 36.15 | 18.33 | 2.43 | 25.55 | 36.71 | 46.00 | -9.29 | Vertical |
| 755.39 | 30.82 | 23.56 | 3.06 | 25.52 | 38.19 | 46.00 | -7.81 | Vertical |
| 312.18 | 35.73 | 16.22 | 2.10 | 25.58 | 28.47 | 46.00 | -17.53 | Horizontal |
| 497.68 | 39.36 | 21.19 | 2.40 | 25.55 | 37.40 | 46.00 | -8.60 | Horizontal |
| 510.04 | 36.69 | 21.72 | 2.44 | 25.55 | 35.30 | 46.00 | -10.70 | Horizontal |
| 614.21 | 36.46 | 22.16 | 2.73 | 25.54 | 35.81 | 46.00 | -10.19 | Horizontal |
| 729.36 | 34.06 | 21.91 | 3.01 | 25.52 | 33.46 | 46.00 | -12.54 | Horizontal |
| 768.75 | 32.41 | 22.64 | 3.09 | 25.52 | 32.62 | 46.00 | -13.38 | Horizontal |

## Transmitter emission above 1GHz

| Test channel: | Lowest | Remark: | 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 |
|---|---|---|---|---|---|---|---|---|
| 1384.00 | 40.06 | 25.63 | 2.43 | 21.35 | 46.77 | 74.00 | -27.23 | Vertical |
| 4810.00 | 40.25 | 31.79 | 5.34 | 24.07 | 53.31 | 74.00 | -20.69 | Vertical |
| 7215.00 | 33.08 | 36.19 | 6.88 | 26.44 | 49.71 | 74.00 | -24.29 | Vertical |
| 9620.00 | 29.86 | 38.07 | 8.96 | 25.36 | 51.53 | 74.00 | -22.47 | Vertical |
| 12025.00 | 30.45 | 39.05 | 10.35 | 25.15 | 54.70 | 74.00 | -19.30 | Vertical |
| 1384.00 | 42.97 | 25.63 | 2.43 | 21.35 | 49.68 | 74.00 | -24.32 | Horizontal |
| 4810.00 | 42.91 | 31.79 | 5.34 | 24.07 | 55.97 | 74.00 | -18.03 | Horizontal |
| 7215.00 | 34.06 | 36.19 | 6.88 | 26.44 | 50.69 | 74.00 | -23.31 | Horizontal |
| 9620.00 | 30.58 | 38.07 | 8.96 | 25.36 | 52.25 | 74.00 | -21.75 | Horizontal |
| 12025.00 | 31.25 | 39.05 | 10.35 | 25.15 | 55.50 | 74.00 | -18.50 | Horizontal |

| Test channel: | Lowest | Remark: | 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 |
|---|---|---|---|---|---|---|---|---|
| 1384.00 | 29.34 | 25.63 | 2.43 | 21.35 | 36.05 | 54.00 | -17.95 | Vertical |
| 4810.00 | 24.34 | 31.79 | 5.34 | 24.07 | 37.40 | 54.00 | -16.60 | Vertical |
| 7215.00 | 19.98 | 36.19 | 6.88 | 26.44 | 36.61 | 54.00 | -17.39 | Vertical |
| 9620.00 | 15.70 | 38.07 | 8.96 | 25.36 | 37.37 | 54.00 | -16.63 | Vertical |
| 12025.00 | 15.57 | 39.05 | 10.35 | 25.15 | 39.82 | 54.00 | -14.18 | Vertical |
| 1384.00 | 30.59 | 25.63 | 2.43 | 21.35 | 37.30 | 54.00 | -16.70 | Horizontal |
| 4810.00 | 26.13 | 31.79 | 5.34 | 24.07 | 39.19 | 54.00 | -14.81 | Horizontal |
| 7215.00 | 21.95 | 36.19 | 6.88 | 26.44 | 38.58 | 54.00 | -15.42 | Horizontal |
| 9620.00 | 17.85 | 38.07 | 8.96 | 25.36 | 39.52 | 54.00 | -14.48 | Horizontal |
| 12025.00 | 17.90 | 39.05 | 10.35 | 25.15 | 42.15 | 54.00 | -11.85 | Horizontal |

*Remark:*

*The emission levels of above 13GHz are very lower than the limit and not show in test report.*

| Test channel: | Middle | Remark: | 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 |
|---|---|---|---|---|---|---|---|---|
| 1754.00 | 44.36 | 25.09 | 2.61 | 28.59 | 43.47 | 74.00 | -30.53 | Vertical |
| 4880.00 | 42.24 | 31.85 | 5.40 | 24.01 | 55.48 | 74.00 | -18.52 | Vertical |
| 7320.00 | 30.96 | 36.37 | 6.90 | 26.58 | 47.65 | 74.00 | -26.35 | Vertical |
| 9760.00 | 27.25 | 38.13 | 8.98 | 25.34 | 49.02 | 74.00 | -24.98 | Vertical |
| 12200.00 | 28.24 | 38.92 | 10.38 | 25.04 | 52.50 | 74.00 | -21.50 | Vertical |
| 1754.00 | 49.24 | 25.09 | 2.61 | 28.59 | 48.35 | 74.00 | -25.65 | Horizontal |
| 4880.00 | 42.70 | 31.85 | 5.40 | 24.01 | 55.94 | 74.00 | -18.06 | Horizontal |
| 7320.00 | 31.29 | 36.37 | 6.90 | 26.58 | 47.98 | 74.00 | -26.02 | Horizontal |
| 9760.00 | 27.69 | 38.13 | 8.98 | 25.34 | 49.46 | 74.00 | -24.54 | Horizontal |
| 12200.00 | 28.79 | 38.92 | 10.38 | 25.04 | 53.05 | 74.00 | -20.95 | Horizontal |

| Test channel: | Middle | Remark: | 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 |
|---|---|---|---|---|---|---|---|---|
| 1754.00 | 29.60 | 25.09 | 2.61 | 28.59 | 28.71 | 54.00 | -25.29 | Vertical |
| 4880.00 | 24.74 | 31.85 | 5.40 | 24.01 | 37.98 | 54.00 | -16.02 | Vertical |
| 7320.00 | 16.82 | 36.37 | 6.90 | 26.58 | 33.51 | 54.00 | -20.49 | Vertical |
| 9760.00 | 13.96 | 38.13 | 8.98 | 25.34 | 35.73 | 54.00 | -18.27 | Vertical |
| 12200.00 | 15.04 | 38.92 | 10.38 | 25.04 | 39.30 | 54.00 | -14.70 | Vertical |
| 1754.00 | 30.71 | 25.09 | 2.61 | 28.59 | 29.82 | 54.00 | -24.18 | Horizontal |
| 4880.00 | 25.98 | 31.85 | 5.40 | 24.01 | 39.22 | 54.00 | -14.78 | Horizontal |
| 7320.00 | 18.19 | 36.37 | 6.90 | 26.58 | 34.88 | 54.00 | -19.12 | Horizontal |
| 9760.00 | 15.46 | 38.13 | 8.98 | 25.34 | 37.23 | 54.00 | -16.77 | Horizontal |
| 12200.00 | 16.67 | 38.92 | 10.38 | 25.04 | 40.93 | 54.00 | -13.07 | Horizontal |

*Remark:*

*The emission levels of above 13GHz are very lower than the limit and not show in test report.*

| Test channel: | Highest | Remark: | 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 |
|---|---|---|---|---|---|---|---|---|
| 1648.00 | 44.18 | 24.87 | 2.55 | 27.09 | 44.51 | 74.00 | -29.49 | Vertical |
| 4960.00 | 39.58 | 31.89 | 5.46 | 23.96 | 52.97 | 74.00 | -21.03 | Vertical |
| 7440.00 | 31.85 | 36.49 | 6.93 | 26.79 | 48.48 | 74.00 | -25.52 | Vertical |
| 9920.00 | 28.33 | 38.23 | 9.41 | 25.29 | 50.68 | 74.00 | -23.32 | Vertical |
| 12400.00 | 27.85 | 38.82 | 10.48 | 24.82 | 52.33 | 74.00 | -21.67 | Vertical |
| 1648.00 | 49.52 | 24.87 | 2.55 | 27.09 | 49.85 | 74.00 | -24.15 | Horizontal |
| 4960.00 | 44.41 | 31.89 | 5.46 | 23.96 | 57.80 | 74.00 | -16.20 | Horizontal |
| 7440.00 | 34.76 | 36.49 | 6.93 | 26.79 | 51.39 | 74.00 | -22.61 | Horizontal |
| 9920.00 | 32.47 | 38.23 | 9.41 | 25.29 | 54.82 | 74.00 | -19.18 | Horizontal |
| 12400.00 | 31.69 | 38.82 | 10.48 | 24.82 | 56.17 | 74.00 | -17.83 | Horizontal |

| Test channel: | Highest | Remark: | 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 |
|---|---|---|---|---|---|---|---|---|
| 1648.00 | 32.71 | 24.87 | 2.55 | 27.09 | 33.04 | 54.00 | -20.96 | Vertical |
| 4960.00 | 22.21 | 31.89 | 5.46 | 23.96 | 35.60 | 54.00 | -18.40 | Vertical |
| 7440.00 | 18.06 | 36.49 | 6.93 | 26.79 | 34.69 | 54.00 | -19.31 | Vertical |
| 9920.00 | 15.70 | 38.23 | 9.41 | 25.29 | 38.05 | 54.00 | -15.95 | Vertical |
| 12400.00 | 14.08 | 38.82 | 10.48 | 24.82 | 38.56 | 54.00 | -15.44 | Vertical |
| 1648.00 | 33.57 | 24.87 | 2.55 | 27.09 | 33.90 | 54.00 | -20.10 | Horizontal |
| 4960.00 | 23.61 | 31.89 | 5.46 | 23.96 | 37.00 | 54.00 | -17.00 | Horizontal |
| 7440.00 | 19.64 | 36.49 | 6.93 | 26.79 | 36.27 | 54.00 | -17.73 | Horizontal |
| 9920.00 | 17.46 | 38.23 | 9.41 | 25.29 | 39.81 | 54.00 | -14.19 | Horizontal |
| 12400.00 | 14.93 | 38.82 | 10.48 | 24.82 | 39.41 | 54.00 | -14.59 | Horizontal |

*Remark:*

*The emission levels of above 13GHz are very lower than the limit and not show in test report.*