



CONFORMANCE TEST REPORT FOR FCC 47 CFR, Part 15 Subpart C

Report No.: 10-01-MAS-024-04

Client: Sensing Tek Co., Ltd.
Product: Zigbee wireless digital output transmitter
Model: DOZ100
FCC ID: X7W-DOZ100
Manufacturer/supplier: Sensing Tek Co., Ltd.

Date test item received: 2010/01/06

Date test campaign completed: 2010/06/28

Date of issue: 2010/06/29

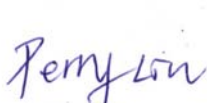


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Total number of pages of this test report: 52 pages

Total number of pages of photos: External photos 3 pages

Internal photos 3 pages

Setup photos 3 pages

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Manufacturer : Sensing Tek Co., Ltd.
Address : 5F, No.19-1 Industry E.4th Rd., Hsinchu Science Park, Hsin-Chu300, Taiwan,
R.O.C.
EUT : Zigbee wireless digital output transmitter
Trade name : Sensing Tek
Model No. : DOZ100
Power Source : 12Vdc
Regulations applied : FCC 47 CFR, Part 15 Subpart C (2008)

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| Table of Contents | Page |
|--|-------------|
| 1 GENERAL INFORMATION..... | 5 |
| 1.1 Product Description..... | 5 |
| 1.2 Characteristics of Device | 5 |
| 1.3 Test Methodology | 5 |
| 1.4 Test Facility..... | 5 |
| 2 PROVISIONS APPLICABLE..... | 6 |
| 2.1 Definition | 6 |
| 2.2 Requirement for Compliance | 7 |
| 2.3 Restricted Bands of Operation | 9 |
| 2.4 Labeling Requirement..... | 9 |
| 2.5 User Information | 10 |
| 3. SYSTEM TEST CONFIGURATION..... | 11 |
| 3.1 Devices for Tested System..... | 11 |
| 4 CONDUCTED EMISSION MEASUREMENT | 12 |
| 4.1 Standard Applicable..... | 12 |
| 4.2 Measurement Procedure..... | 12 |
| 4.3 Conducted Emission Data | 13 |
| 4.4 Result Data Calculation | 15 |
| 4.5 Conducted Measurement Equipment | 15 |
| 5 ANTENNA REQUIREMENT | 16 |
| 5.1 Standard Applicable..... | 16 |
| 5.2 Antenna Construction and Directional Gain..... | 16 |
| 6 EMISSION BANDWIDTH MEASUREMENT | 17 |
| 6.1 Standard Applicable..... | 17 |
| 6.2 Measurement Procedure..... | 17 |
| 6.3 Measurement Equipment | 17 |
| 6.4 Measurement Data | 18 |
| 7 OUTPUT POWER MEASUREMENT | 22 |
| 7.1 Standard Applicable..... | 22 |
| 7.2 Measurement Procedure..... | 22 |
| 7.3 Measurement Equipment | 22 |
| 7.4 Measurement Data | 23 |
| 8 POWER DENSITY MEASUREMENT..... | 24 |

8.1 Standard Applicable 24

8.2 Measurement Procedure..... 24

8.3 Measurement Equipment 24

8.4 Measurement Data 25

9 SPURIOUS EMISSION - RF CONDUCTED MEASUREMENT..... 29

9.1 Standard Applicable 29

9.2 Measurement Procedure..... 29

9.3 Measurement Equipment 29

9.4 Measurement Data 30

10 RADIATED EMISSION MEASUREMENT 45

10.1 Standard Applicable 45

10.2 Measurement Procedure..... 45

10.3 Measuring Instrument 47

10.4 Radiated Emission Data 48

10.5 Field Strength Calculation 52

1 GENERAL INFORMATION

1.1 Product Description

- a) Type of EUT : Zigbee wireless digital output transmitter
 b) Trade Name : Sensing Tek
 c) Model No. : DOZ100
 d) FCC ID : X7W-DOZ100

1.2 Characteristics of Device

The EUT use ZigBee technology for communication. ZigBee is a specification for a suite of high level communication protocols based on the IEEE 802.15.4 standard. ZigBee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking. ZigBee is a low-cost, low-power, wireless mesh networking proprietary standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 11 | 2405 | 19 | 2445 |
| 12 | 2410 | 20 | 2450 |
| 13 | 2415 | 21 | 2455 |
| 14 | 2420 | 22 | 2460 |
| 15 | 2425 | 23 | 2465 |
| 16 | 2430 | 24 | 2470 |
| 17 | 2435 | 25 | 2475 |
| 18 | 2440 | 26 | 2480 |

1.3 Test Methodology

All testing were performed according to the procedures in ANSI C63.4 (2003) and FCC CFR 47 Part 2 and Part 15.

1.4 Test Facility

The semi-anechoic chamber and conducted measurement facility used to collect the radiated and conducted data are located inside the Building at No.8, Lane 29, Wen-ming Road, Lo-shan Tsun, Kweishan Hsiang, Taoyuan, Taiwan, R.O.C.

This site has been accreditation as a FCC filing site.

2 PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:

A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:

A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :

A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business or industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

For unintentional device, according to §15.107(a) Line Conducted Emission Limits is as following:

| Frequency MHz | Quasi Peak dB μ V | Average dB μ V |
|------------------|--------------------------|-----------------------|
| 0.15 - 0.5 | 66-56* | 56-46* |
| 0.5 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

*Decreases with the logarithm of the frequency.

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

(2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency MHz | Distance Meters | Radiated dB μ V/m | Radiated μ V/m |
|------------------|--------------------|--------------------------|-----------------------|
| 30 - 88 | 3 | 40.0 | 100 |
| 88 - 216 | 3 | 43.5 | 150 |
| 216 - 960 | 3 | 46.0 | 200 |
| above 960 | 3 | 54.0 | 500 |

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

(3) Antenna 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.

(4) Bandwidth Requirement

According to 15.247 (a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

(5) Output Power Requirement

For systems using digital modulation , according to 15.247(b), the maximum peak output power of the intentional radiator shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(6) Spurious Emissions Measurement

According to 15.247 (c) , 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. Attenuation below the general limits specified in Section 15.209(a) is not required. 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)).

(7) Power Density Requirement

According to 15.247 (d) , for digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission..

2.3 Restricted Bands of Operation

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 | 4.5-5.25 |
| 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 - 156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2655-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | | | |

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

3. SYSTEM TEST CONFIGURATION

3.1 Devices for Tested System

| Device | Manufacture | Model No. | Cable Description |
|---|-----------------------|---------------|--|
| Zigbee wireless digital output transmitter* | Sensing Tek Co., Ltd. | DOZ100 | ---- |
| Adapter | ---- | SA01-7US12R-A | 1.8m*1 Unshielded Power Line/add a core (Note 2) |

Note:

- 1. Remark “*” means equipment under test.
- 2. core: Brand: CHILISIN / Model: ZLF-110.

4 CONDUCTED EMISSION MEASUREMENT

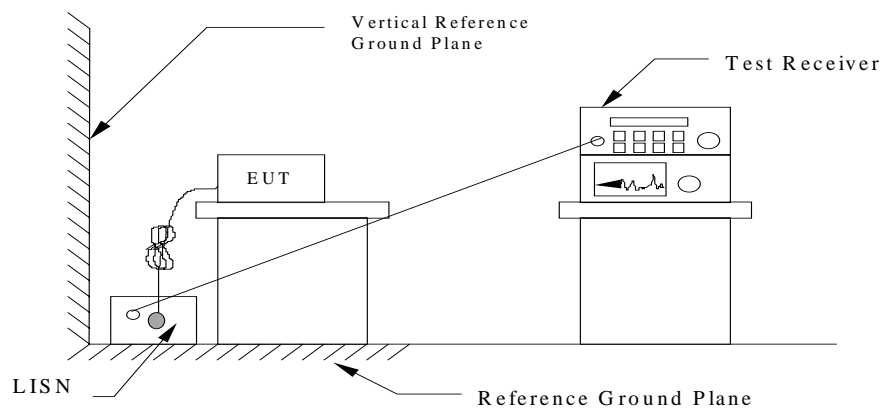
4.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and §15.207(a) respectively. Both Limits are identical specification.

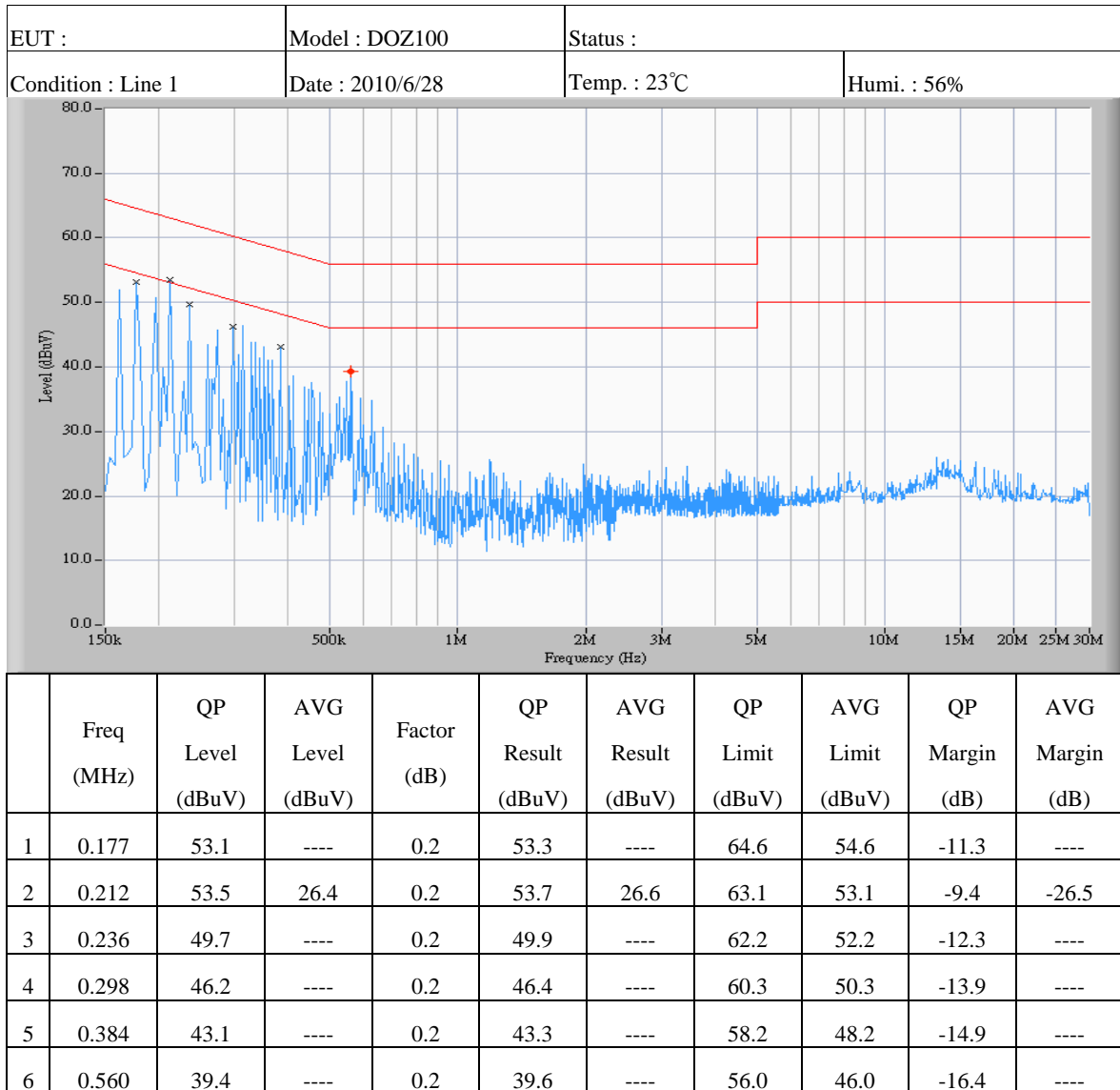
4.2 Measurement Procedure

1. Setup the configuration per figure 1.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then records the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 1 : Conducted emissions measurement configuration

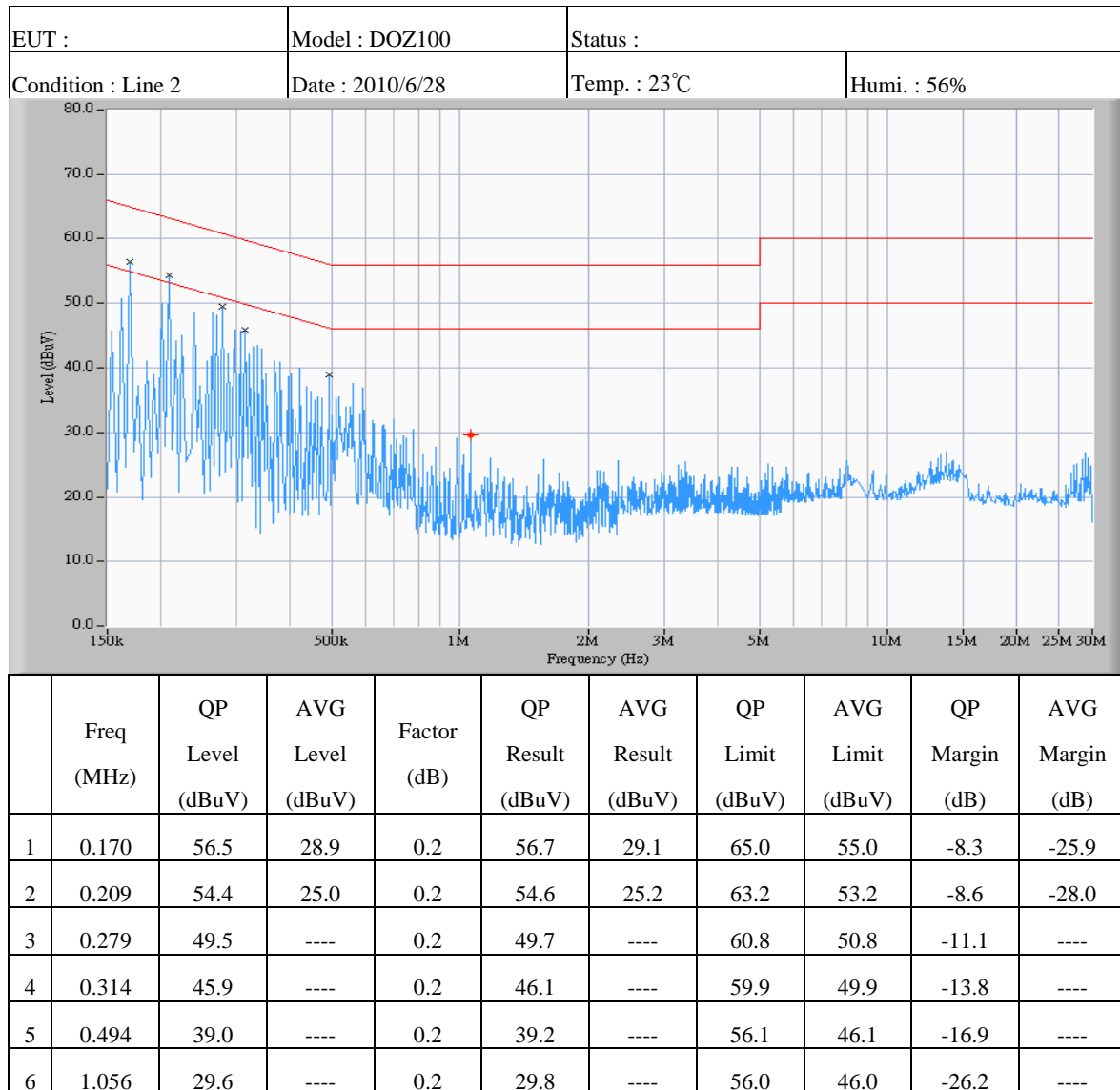


4.3 Conducted Emission Data



Note:

1. Place of measurement: EMC LAB. of the ETC.
2. “***” means the value was too low to be measured.
3. If the data table appeared symbol of “----” means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is $\pm 2.5\text{dB}$.



Note:

1. Place of measurement: EMC LAB. of the ETC.
2. “****” means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is $\pm 2.5\text{dB}$.

4.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

$$\textbf{RESULT} = \textbf{READING} + \textbf{LISN FACTOR (Included Cable Loss)}$$

4.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test.

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|------------------|-------------------|-----------|---------------|
| RF Test Receiver | Rohde and Schwarz | ESCS30 | 08/22/2010 |
| LISN | EMCO | 37100/2M | 03/04/2011 |

5 ANTENNA REQUIREMENT

5.1 Standard Applicable

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. And according to §15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Antenna Construction and Directional Gain

Antenna gain: 5.0 dBi.

Antenna connector: Reverse Polarity SMA.

The directional gain of antenna doesn't greater than 6 dBi, the power won't be reduced.

6 EMISSION BANDWIDTH MEASUREMENT

6.1 Standard Applicable

According to 15.247(a)(2), system using digital modulation techniques, the minimum 6dB bandwidth shall be at least 500 kHz.

6.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Figure 2: Emission bandwidth measurement configuration.



6.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|--------------|-----------|---------------|
| Spectrum Analyzer | Agilent | E4446A | 09/27/2010 |

6.4 Measurement Data

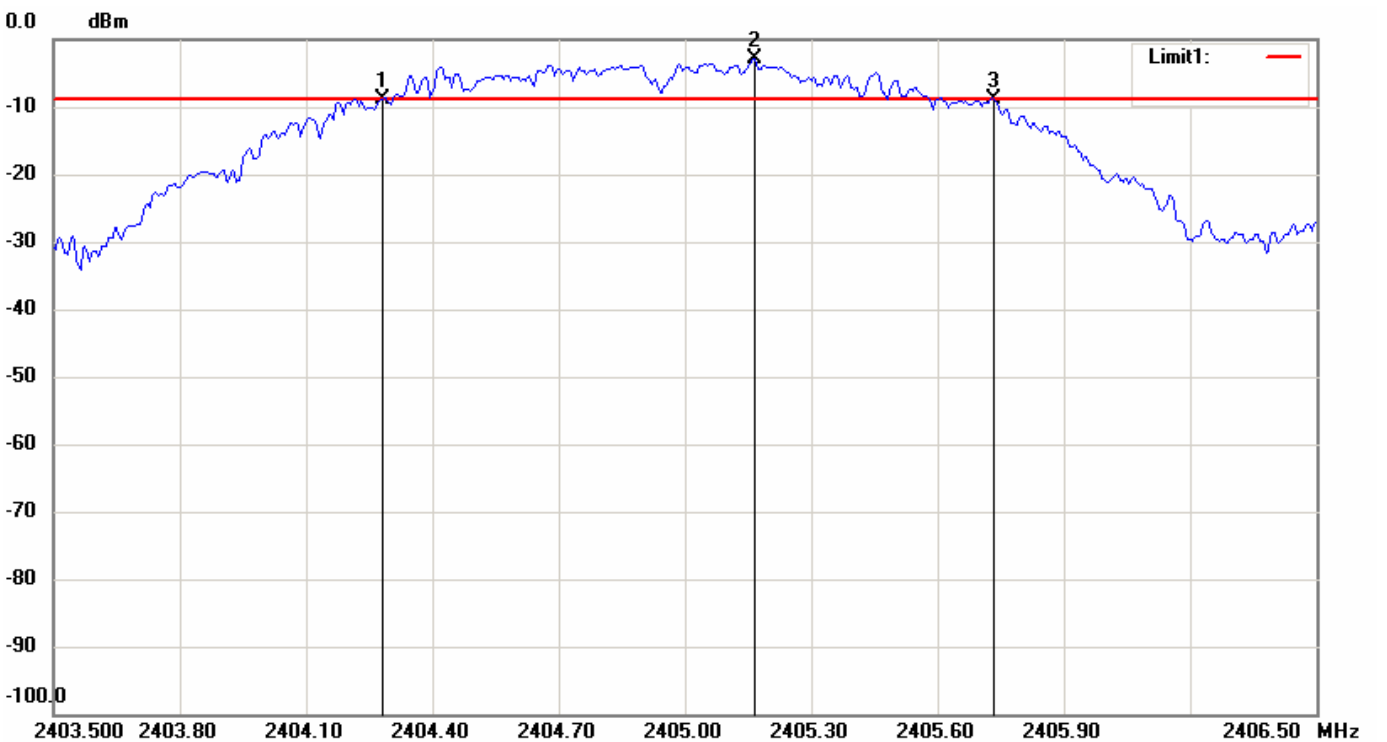
Test Date: Feb. 25, 2010Temperature: 16°CHumidity: 51 %

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | FCC Limit (kHz) | Chart |
|---------|--------------------|------------------------|--------------------|---------|
| 11 | 2405 | 1.455 | 500 | Page 19 |
| 18 | 2440 | 1.515 | 500 | Page 20 |
| 26 | 2480 | 1.575 | 500 | Page 21 |

Note:

1. Please refer to page 19 to page 21 for chart
2. The estimated measurement uncertainty of the result measurement is 8.25×10^{-7} ($1\text{GHz} \leq f \leq 18\text{GHz}$)

File: DO Data: #1 Date: 2010/2/25 Temperature: 16 °C
Time: AM 10:41:48 Humidity: 51 %



Condition: RF Conducted
EUT: Sweep Time: 1ms Att.: 10dB
Model: RBW: 100 KHz VBW: 300 KHz
Test Mode:
Note: L

| No. | Frequency(MHz) | Level(dBm) |
|-----|----------------|------------|
| 1 | 2404.2800 | -8.88 |
| 2 | 2405.1650 | -2.80 |
| 3 | 2405.7350 | -8.91 |

| No. | | △Frequency(MHz) | △Level(dB) |
|-----|---------|-----------------|------------|
| 1 | mk3-mk1 | 1.455 | -0.03 |

File: DO

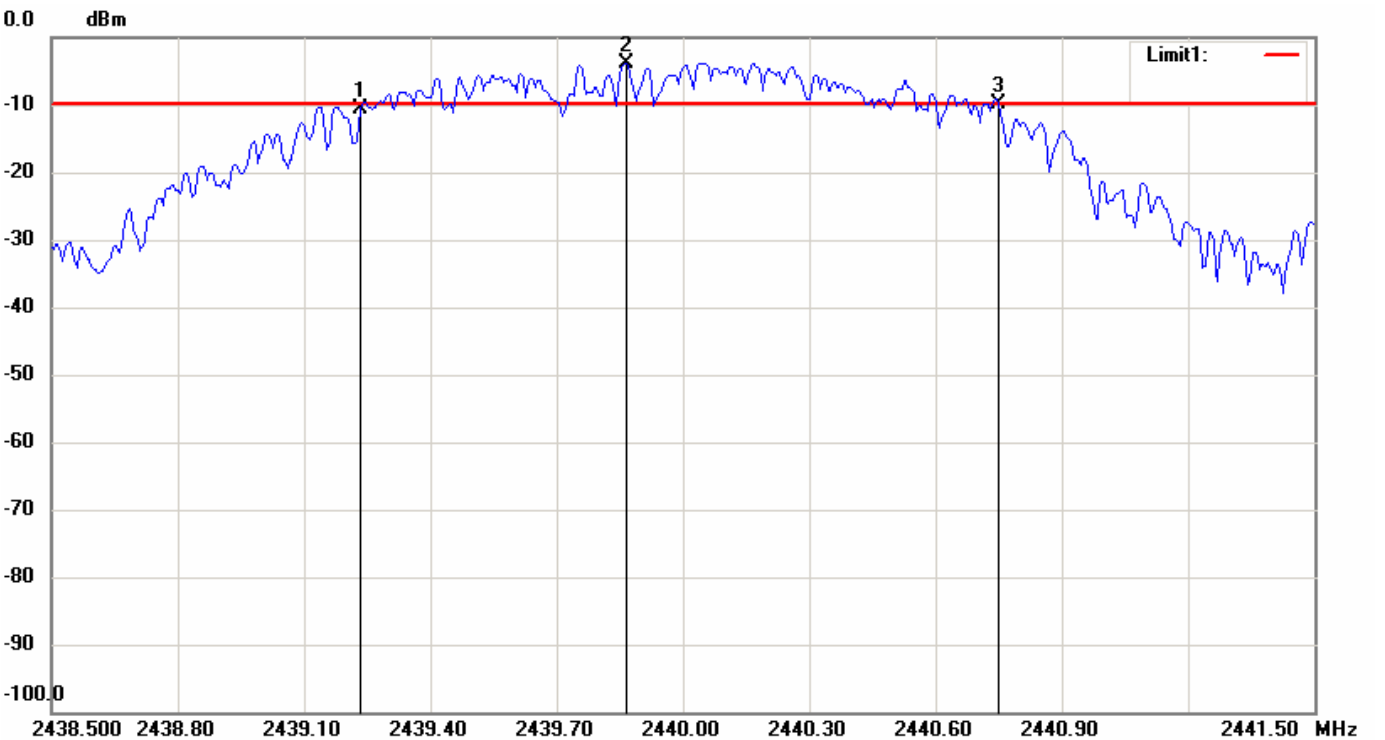
Data: #8

Date: 2010/2/25

Temperature: 16 °C

Time: AM 11:03:19

Humidity: 51 %



Condition:

EUT:

Model:

Test Mode:

Note: M

RF Conducted

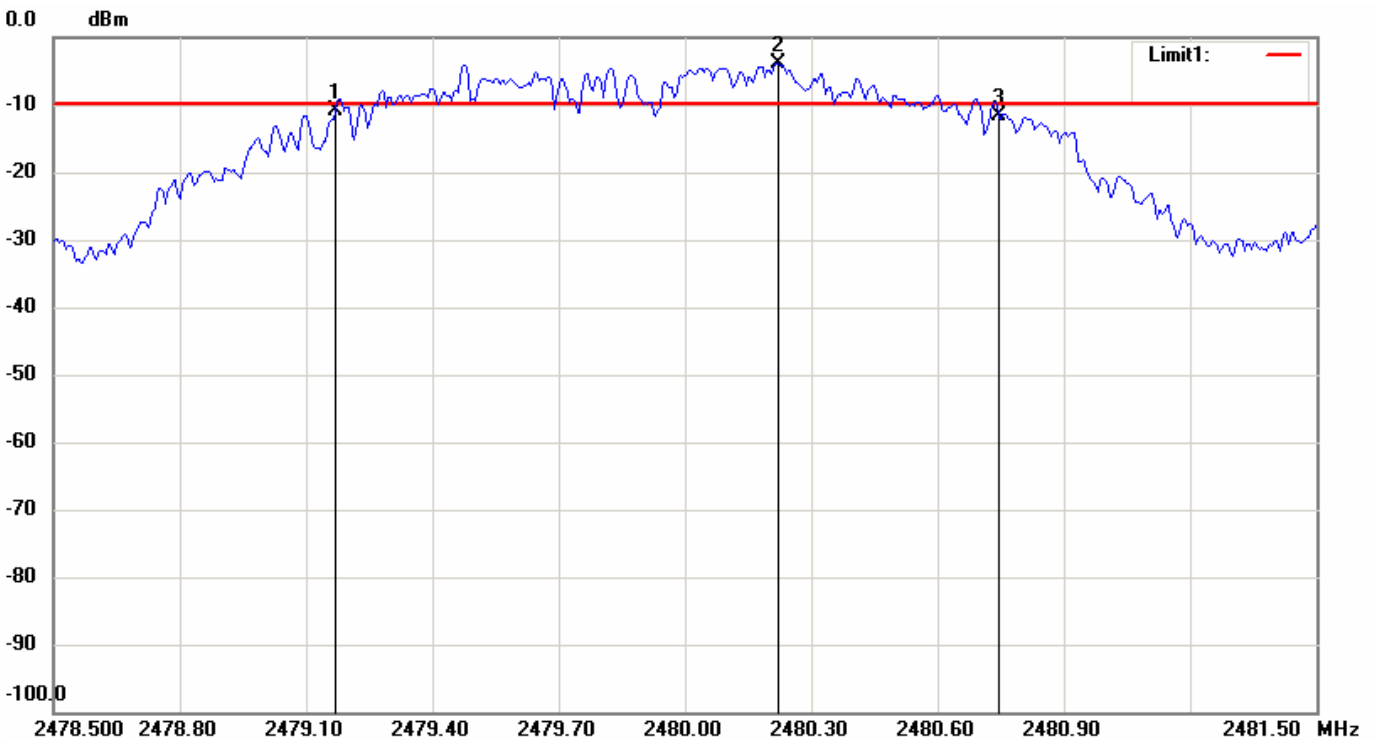
Sweep Time: 1ms Att.: 10dB

RBW: 100 KHz VBW: 300 KHz

| No. | Frequency(MHz) | Level(dBm) |
|-----|----------------|------------|
| 1 | 2439.2350 | -10.71 |
| 2 | 2439.8650 | -3.77 |
| 3 | 2440.7500 | -9.99 |

| No. | | Δ Frequency(MHz) | Δ Level(dB) |
|-----|---------|-------------------------|--------------------|
| 1 | mk3-mk1 | 1.515 | 0.72 |

File: DO Data: #14 Date: 2010/2/25 Temperature: 16 °C
Time: AM 11:16:49 Humidity: 51 %



Condition: RF Conducted
EUT: Sweep Time: 1ms Att.: 10dB
Model: RBW: 100 KHz VBW: 300 KHz
Test Mode:
Note: H

| No. | Frequency(MHz) | Level(dBm) |
|-----|----------------|------------|
| 1 | 2479.1700 | -10.94 |
| 2 | 2480.2200 | -3.80 |
| 3 | 2480.7450 | -11.73 |

| No. | | ΔFrequency(MHz) | ΔLevel(dB) |
|-----|---------|-----------------|------------|
| 1 | mk3-mk1 | 1.575 | -0.79 |

7 OUTPUT POWER MEASUREMENT

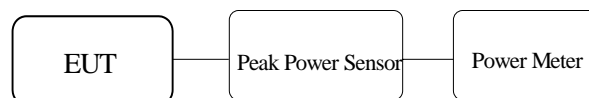
7.1 Standard Applicable

For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 3. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range.
3. Measure the highest value appearing on power meter and record the level to calculate result data.
4. Repeat above procedures until all frequencies measured were complete.

Figure 3: Output power measurement configuration.



7.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|--------------|-----------|---------------|
| Power Meter | Agilent | N1922A | 11/02/2010 |
| Peak Power Sensor | Agilent | N1912A | 11/02/2010 |

7.4 Measurement Data

Test Date: Feb. 25, 2010Temperature: 16°CHumidity: 51 %

| Channel | Frequency (MHz) | Maximum Peak Output Power (dBm) | Maximum Peak Output Power (mW) | FCC Limit (mW) | Chart |
|---------|--------------------|---------------------------------------|--------------------------------------|-------------------|-------|
| 11 | 2405 | 1.01 | 1.262 | 1000 | - |
| 18 | 2440 | 1.17 | 1.309 | 1000 | - |
| 26 | 2480 | 0.87 | 1.222 | 1000 | - |

Note:

The estimated measurement uncertainty of the result measurement is $\pm 1.5\text{dB}$ ($1\text{GHz} \leq f \leq 18\text{GHz}$)

8 POWER DENSITY MEASUREMENT

8.1 Standard Applicable

According to 15.247(d), for direct sequence systems, the transmitted power density averaged over any 1 second interval shall not be greater than 8 dBm in any 3 kHz bandwidth within these bands.

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of spectrum analyzer on highest level appearing on spectral display within a 300 kHz frequency span.
4. Set the spectrum analyzer on a 3 kHz resolution bandwidth and 10 kHz video bandwidth as well as max. hold function, then record the measurement result.
5. Repeat above procedures until all measured frequencies were complete.

8.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|--------------|-----------|---------------|
| Spectrum Analyzer | Agilent | E4446A | 09/27/2010 |

8.4 Measurement Data

Test Date: Feb. 25, 2010Temperature: 16°CHumidity: 51 %

| Channel | Frequency (MHz) | Peak Power Spectral Density (dBm) | FCC Limit (dBm) | Chart |
|---------|--------------------|---|--------------------|---------|
| 11 | 2405 | -16.87 | 8 | Page 26 |
| 18 | 2440 | -12.30 | 8 | Page 27 |
| 26 | 2480 | -13.46 | 8 | Page 28 |

Note:

1. Please refer to page 26 to page 28 for chart
2. The estimated measurement uncertainty of the result measurement is $\pm 1.5\text{dB}$ ($1\text{GHz} \leq f \leq 18\text{GHz}$)

File: DO

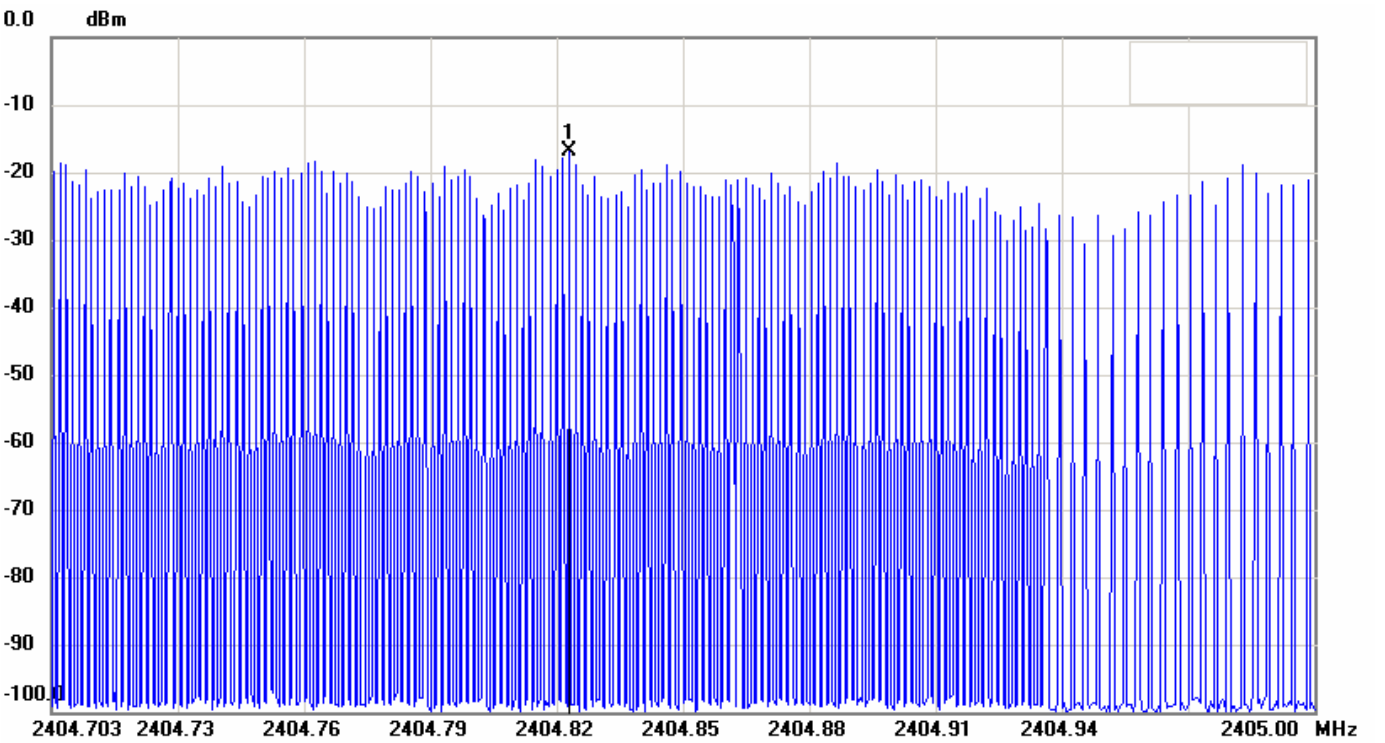
Data: #7

Date: 2010/2/25

Temperature: 16 °C

Time: AM 10:56:44

Humidity: 51 %



Condition:

EUT:

Model:

Test Mode:

Note: L

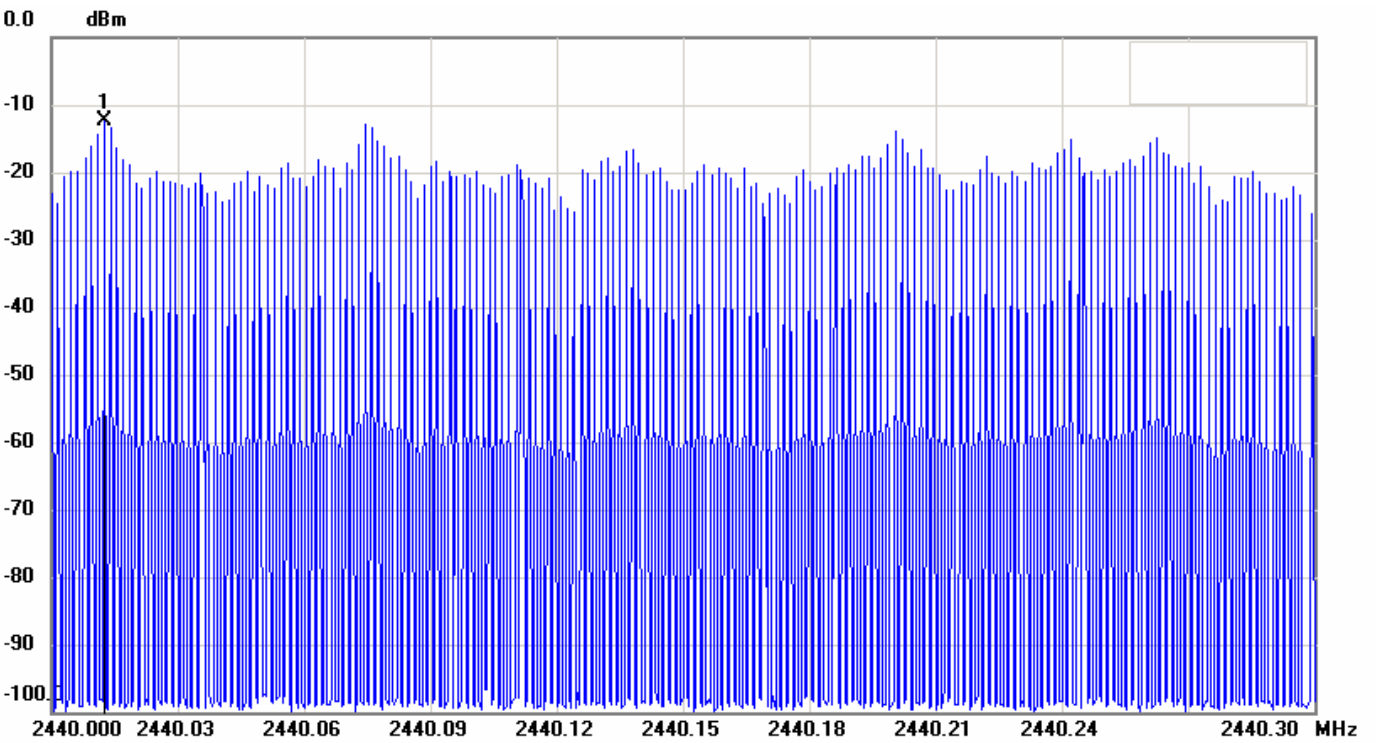
RF Conducted

Sweep Time: 1000ms Att.: 10dB

RBW: 3 KHz VBW: 10 KHz

| No. | Frequency(MHz) | Level(dBm) |
|-----|----------------|------------|
| 1 | 2404.8263 | -16.87 |

File: DO Data: #13 Date: 2010/2/25 Temperature: 16 °C
Time: AM 11:12:27 Humidity: 51 %



Condition: RF Conducted
EUT: Sweep Time: 1000ms Att.: 10dB
Model: RBW: 3 KHz VBW: 10 KHz
Test Mode:
Note: M

| No. | Frequency(MHz) | Level(dBm) |
|-----|----------------|------------|
| 1 | 2440.0125 | -12.30 |

File: DO

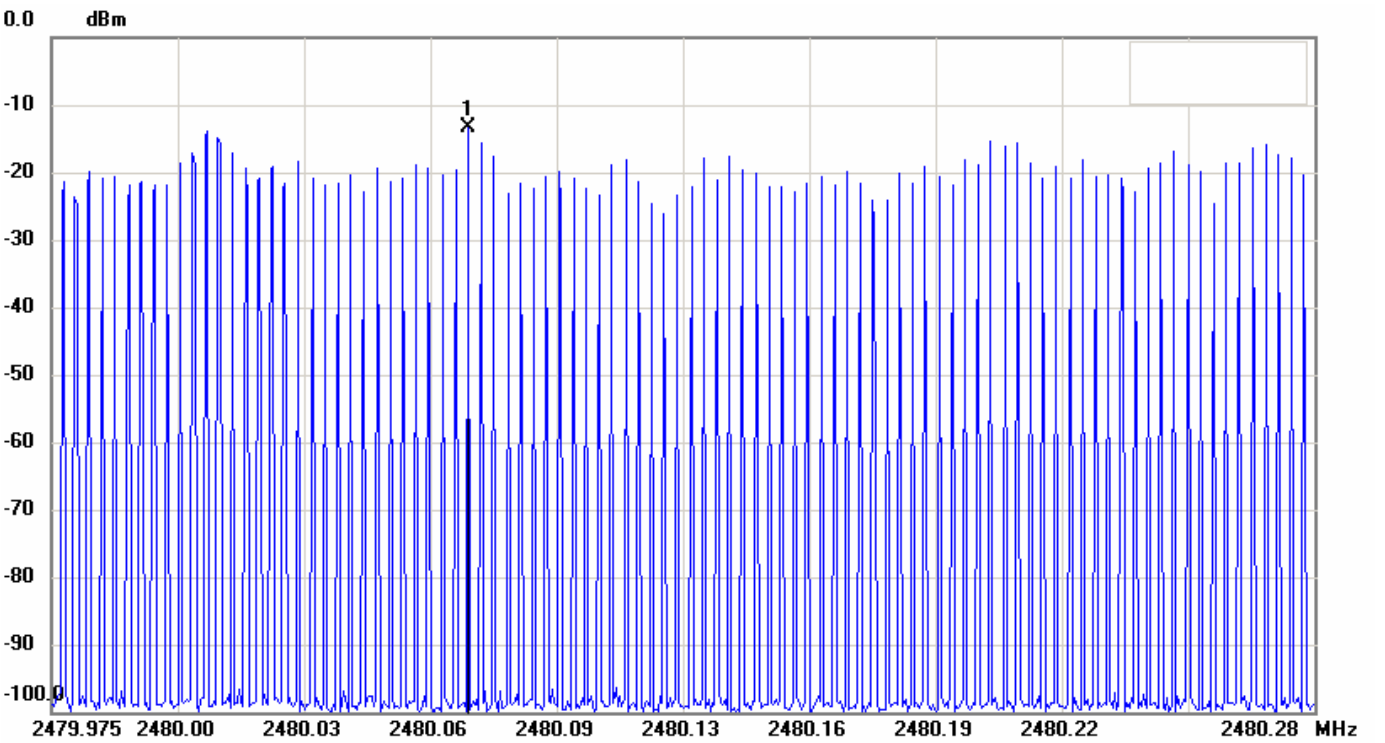
Data: #20

Date: 2010/2/25

Temperature: 16 °C

Time: AM 11:32:22

Humidity: 51 %



Condition:

EUT:

Model:

Test Mode:

Note:

RF Conducted

Sweep Time: 1000ms Att.: 10dB

RBW: 3 KHz VBW: 10 KHz

H

| No. | Frequency(MHz) | Level(dBm) |
|-----|----------------|------------|
| 1 | 2480.0740 | -13.46 |

9 SPURIOUS EMISSION - RF CONDUCTED MEASUREMENT

9.1 Standard Applicable

According to 12.247 (c) , 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. Attenuation below the general limits specified in Section 15.209(a) is not required. 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)).

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

9.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|--------------|-----------|---------------|
| Spectrum Analyzer | Agilent | E4446A | 09/27/2010 |

9.4 Measurement Data

Test Date: Feb. 25, 2010Temperature: 16°CHumidity: 51 %

| Channel | Frequency(MHz) | Chart |
|---------|----------------|---------------------------|
| 11 | 2405 | Page 31, Page 33,34,35,36 |
| 18 | 2440 | Page 37,38,39,40 |
| 26 | 2480 | Page 32 Page 41,42,43,44 |

All out-of –band conducted emissions were more than 20dB below the carrier.

Note: Please refer to page 31 to page 44 for chart

File: DO

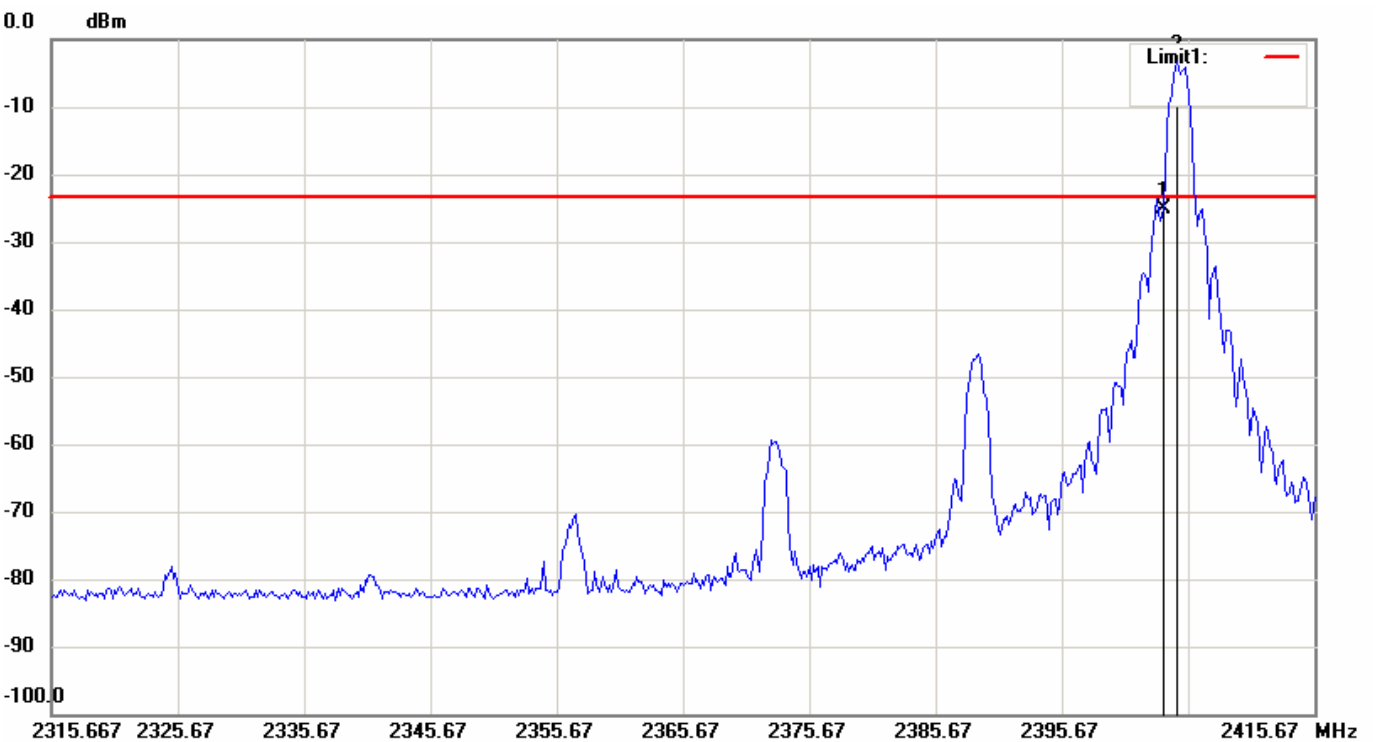
Data: #6

Date: 2010/2/25

Temperature: 16 °C

Time: AM 10:52:53

Humidity: 51 %



Condition: -23.37dBm

RF Conducted

EUT:

Sweep Time: 9.56ms Att.: 10dB

Model:

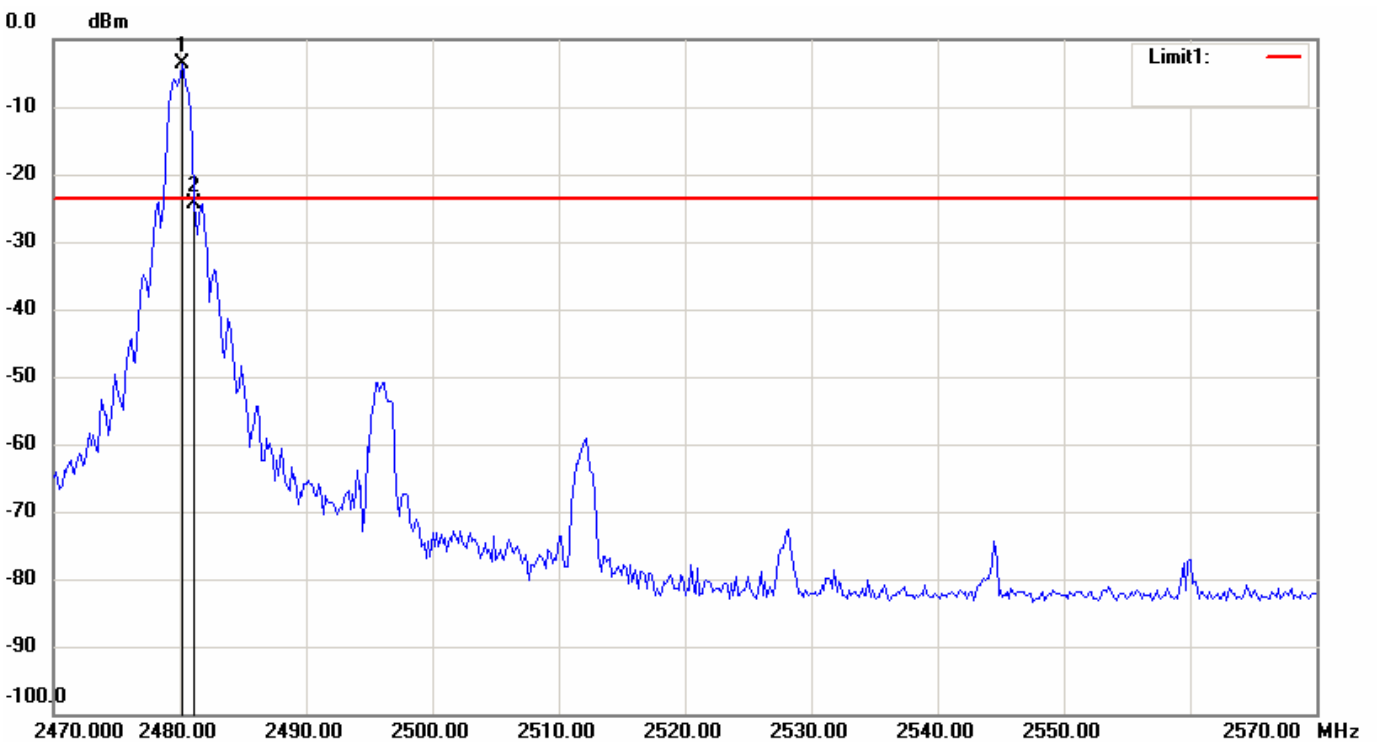
RBW: 100 KHz VBW: 300 KHz

Test Mode:

Note: L

| No. | Frequency(MHz) | Level(dBm) |
|-----|----------------|------------|
| 1 | 2403.6667 | -25.13 |
| 2 | 2404.8332 | -3.37 |

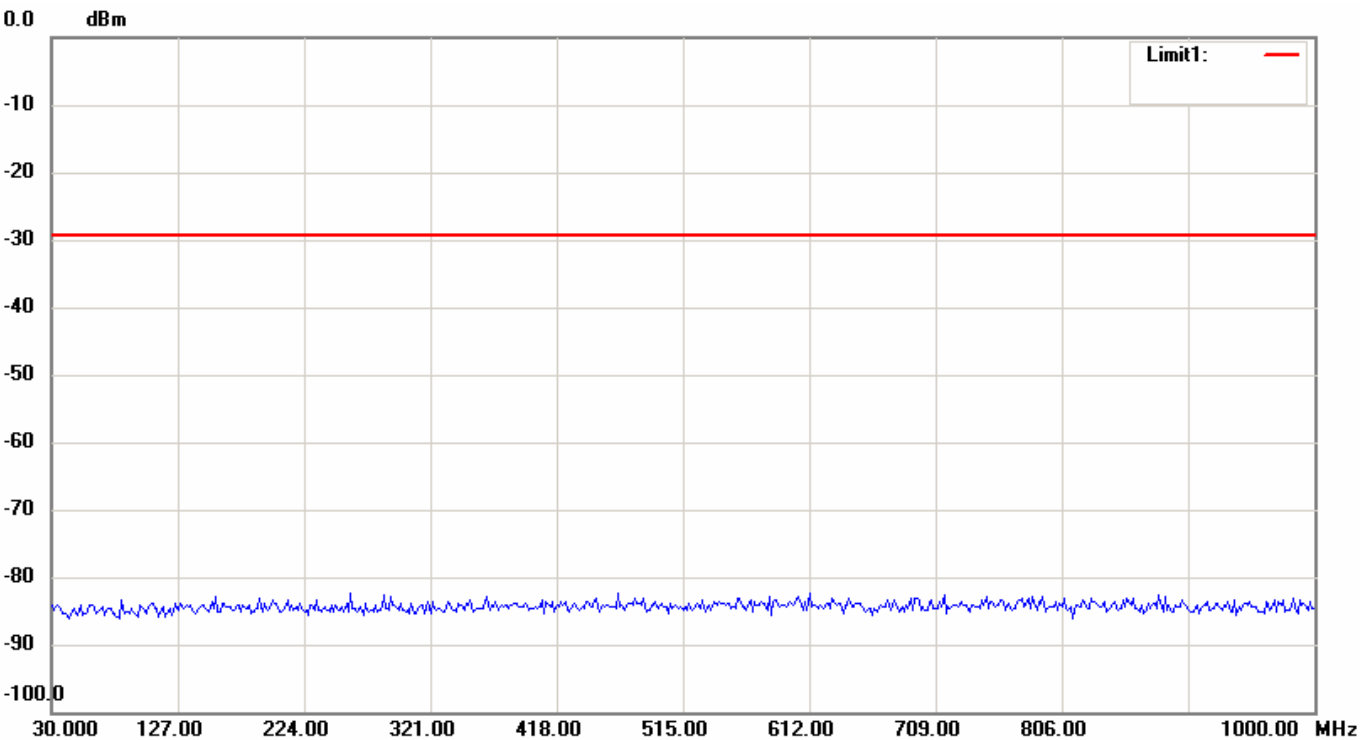
File: DO Data: #19 Date: 2010/2/25 Temperature: 16 °C
Time: AM 11:27:52 Humidity: 51 %



Condition: -23.51dBm RF Conducted
EUT: Sweep Time: 9.56ms Att.: 10dB
Model: RBW: 100 KHz VBW: 300 KHz
Test Mode:
Note: H

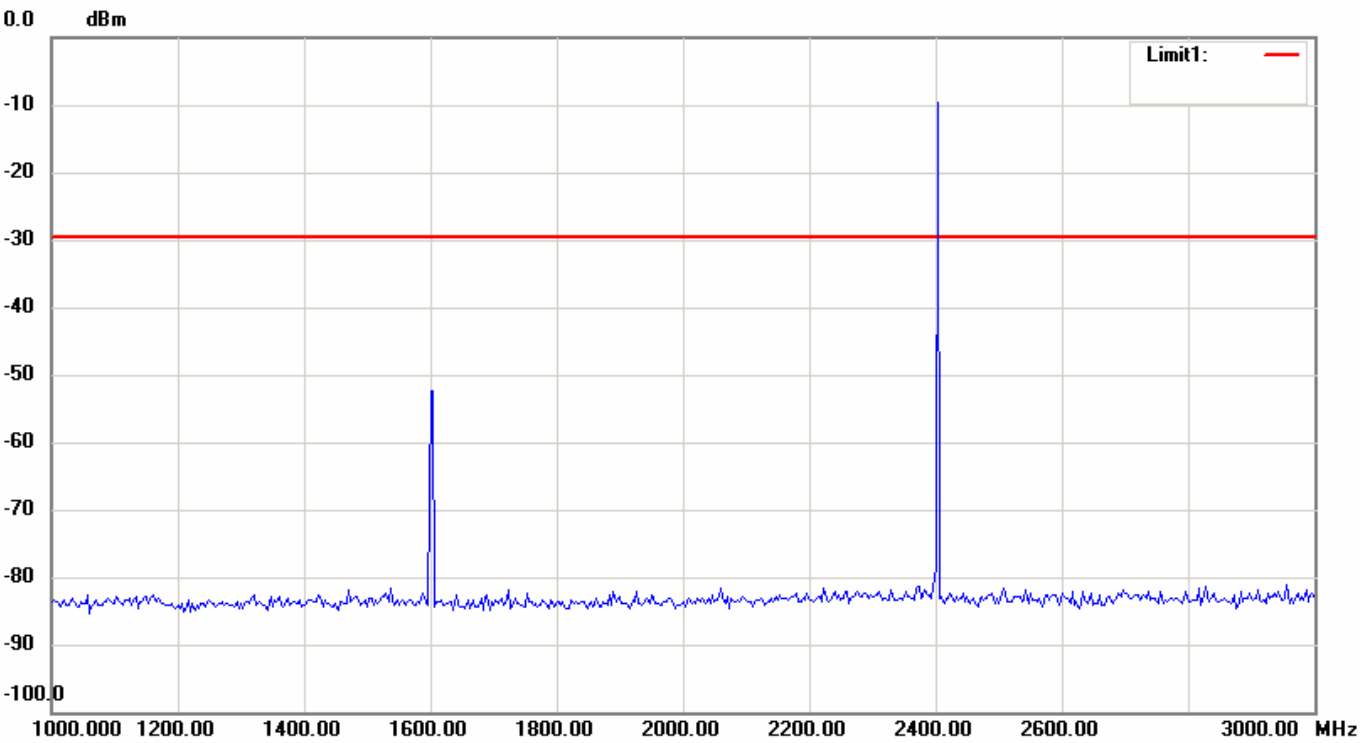
| No. | Frequency(MHz) | Level(dBm) |
|-----|----------------|------------|
| 1 | 2480.1667 | -3.51 |
| 2 | 2481.1667 | -24.46 |

| | | | |
|----------|----------|-------------------|--------------------|
| File: DO | Data: #2 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 10:42:33 | Humidity: 51 % |



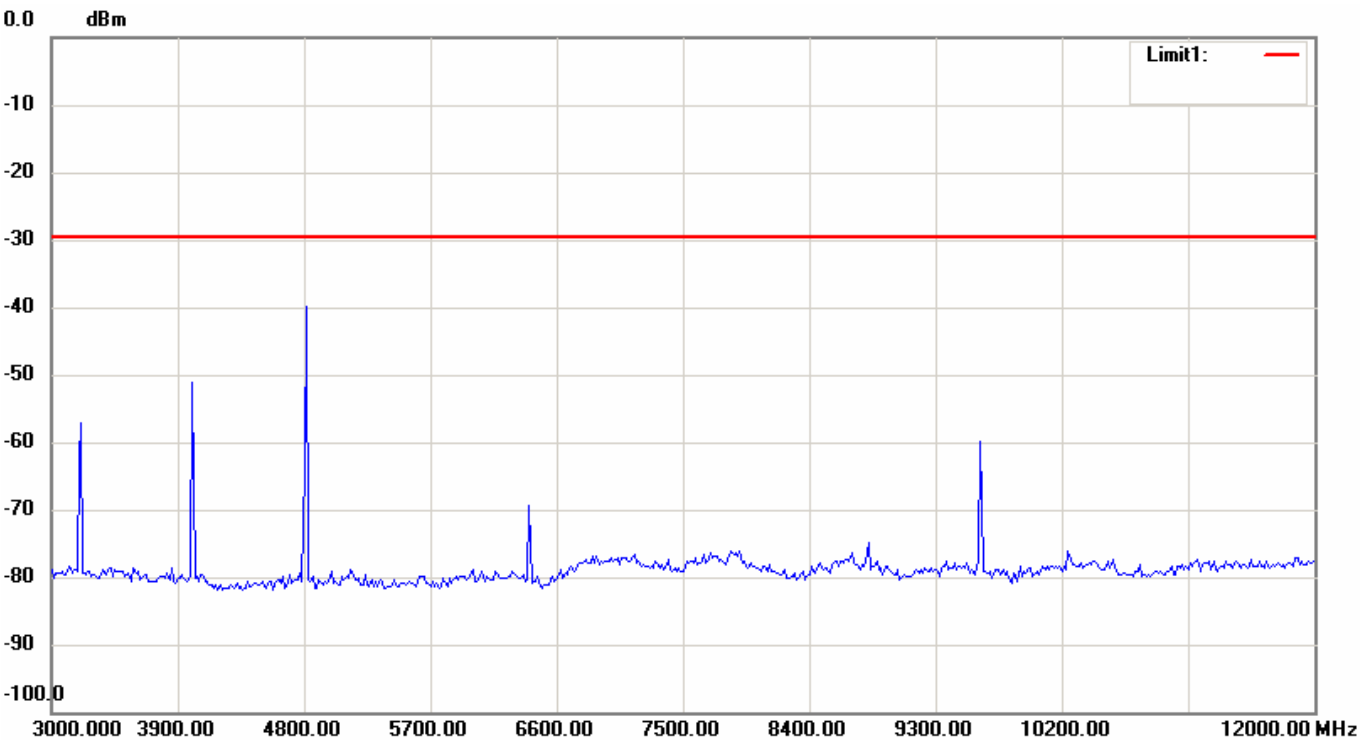
| | | |
|------------|-----------|-------------------------------|
| Condition: | -29.67dBm | RF Conducted |
| EUT: | | Sweep Time: 92.7ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | L | |

| | | | |
|----------|----------|-------------------|--------------------|
| File: DO | Data: #3 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 10:47:07 | Humidity: 51 % |



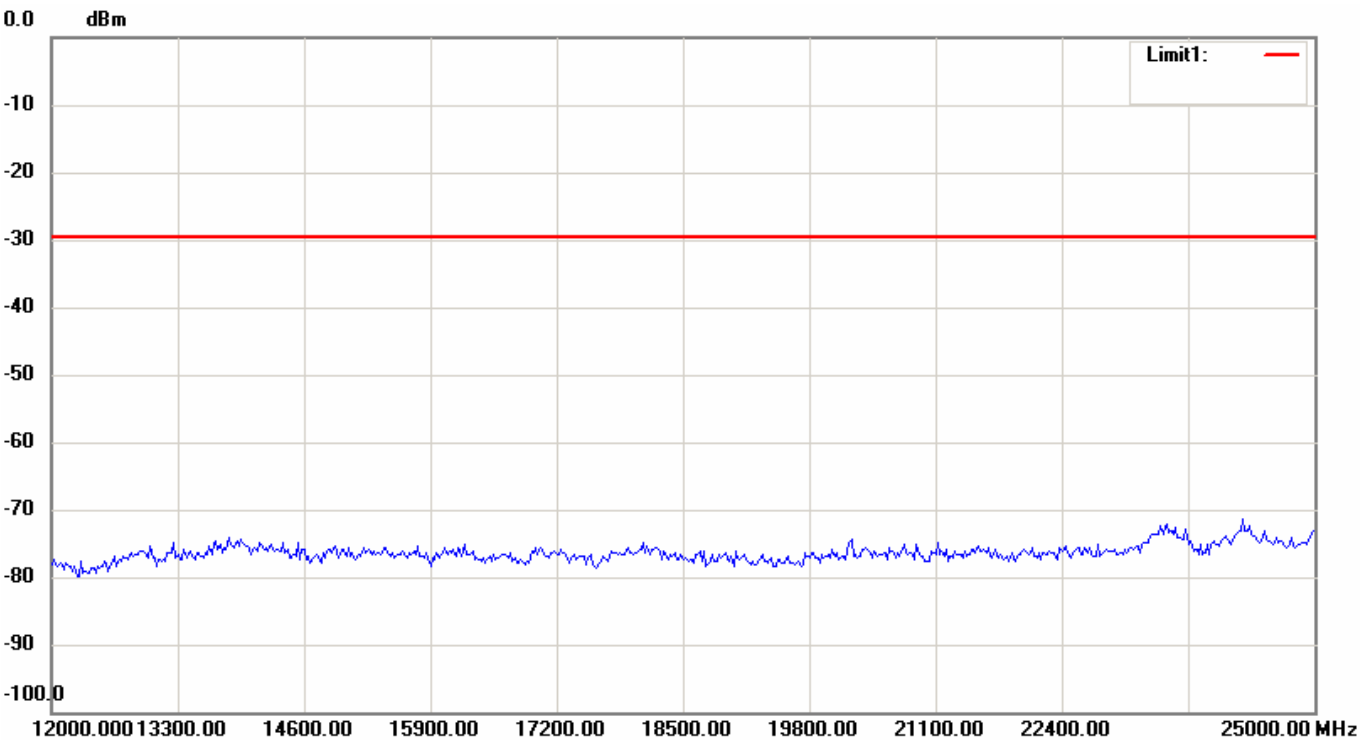
| | | |
|------------|-----------|------------------------------|
| Condition: | -29.67dBm | RF Conducted |
| EUT: | | Sweep Time: 191ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | L | |

| | | | |
|----------|----------|-------------------|--------------------|
| File: DO | Data: #4 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 10:48:58 | Humidity: 51 % |



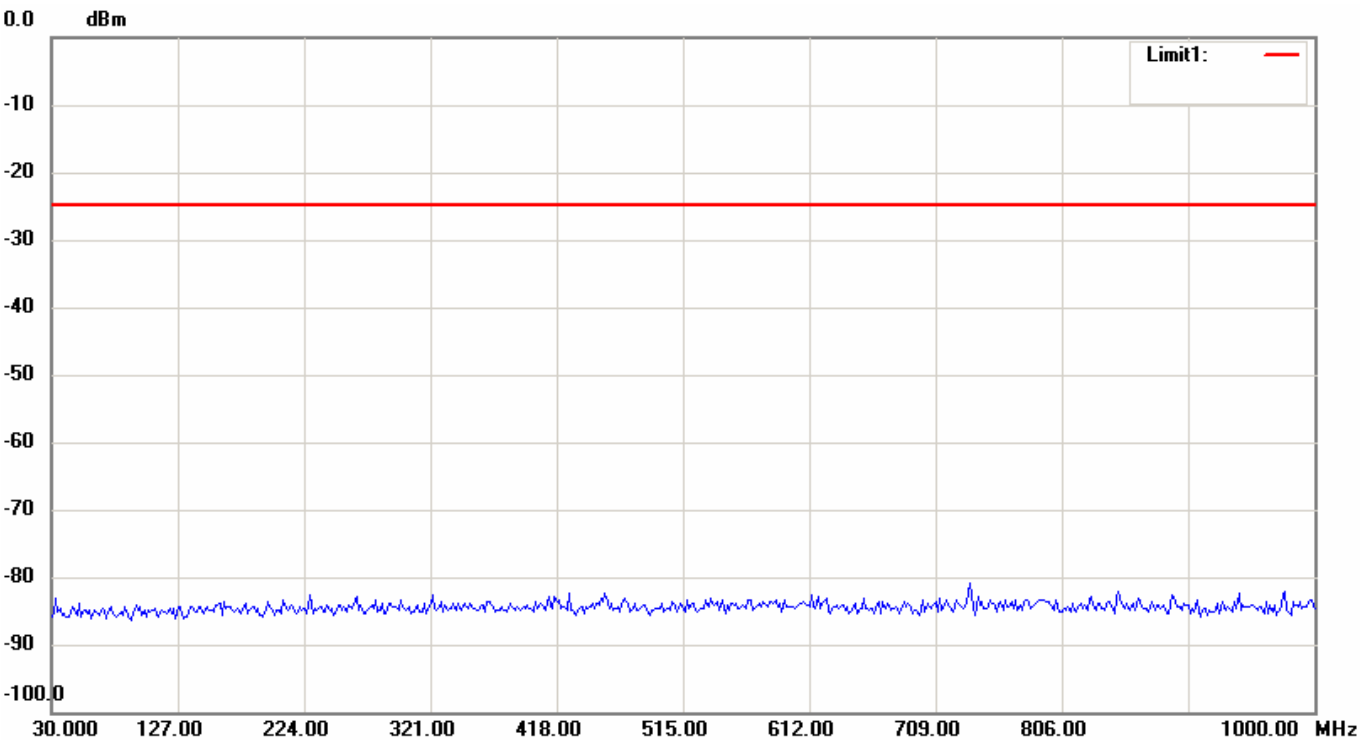
| | | |
|------------|-----------|------------------------------|
| Condition: | -29.67dBm | RF Conducted |
| EUT: | | Sweep Time: 860ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | L | |

| | | | |
|----------|----------|-------------------|--------------------|
| File: DO | Data: #5 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 10:49:30 | Humidity: 51 % |



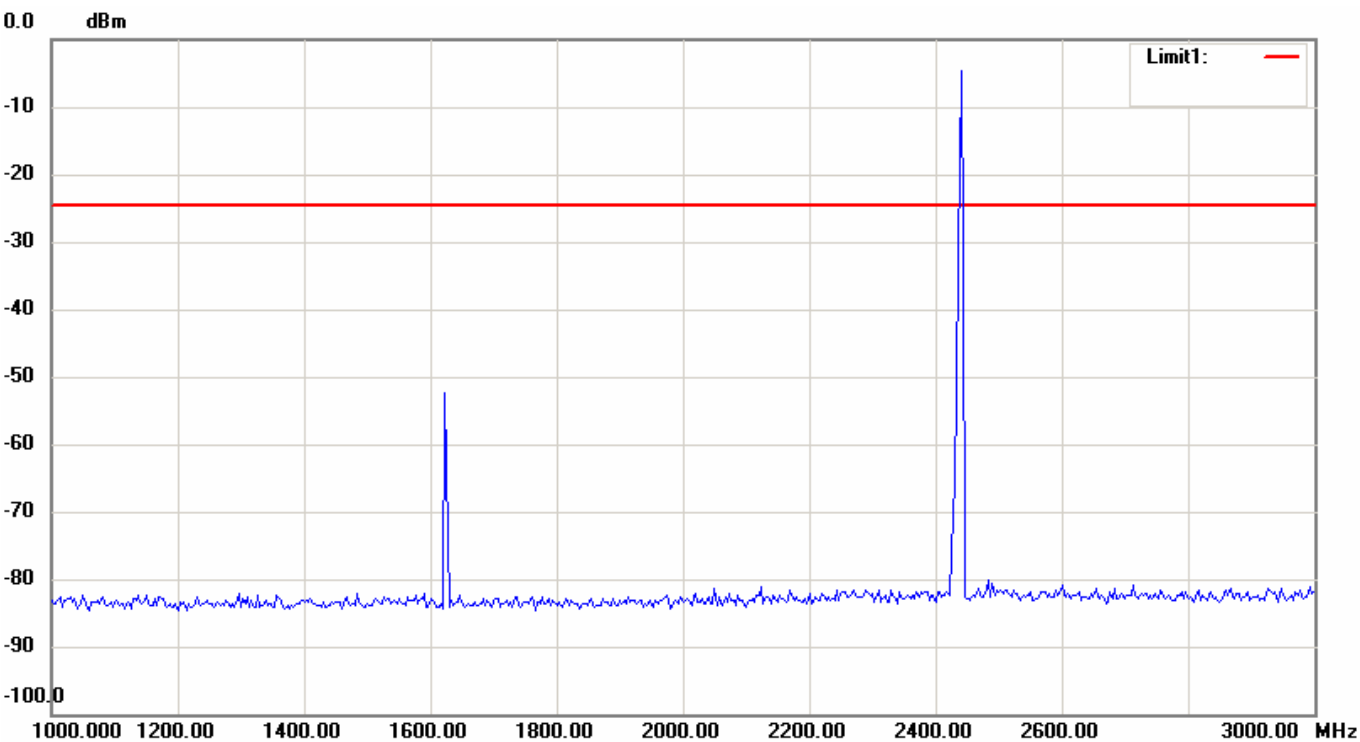
| | | |
|------------|-----------|-------------------------------|
| Condition: | -29.67dBm | RF Conducted |
| EUT: | | Sweep Time: 1242ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | L | |

| | | | |
|----------|----------|-------------------|--------------------|
| File: DO | Data: #9 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 11:04:05 | Humidity: 51 % |



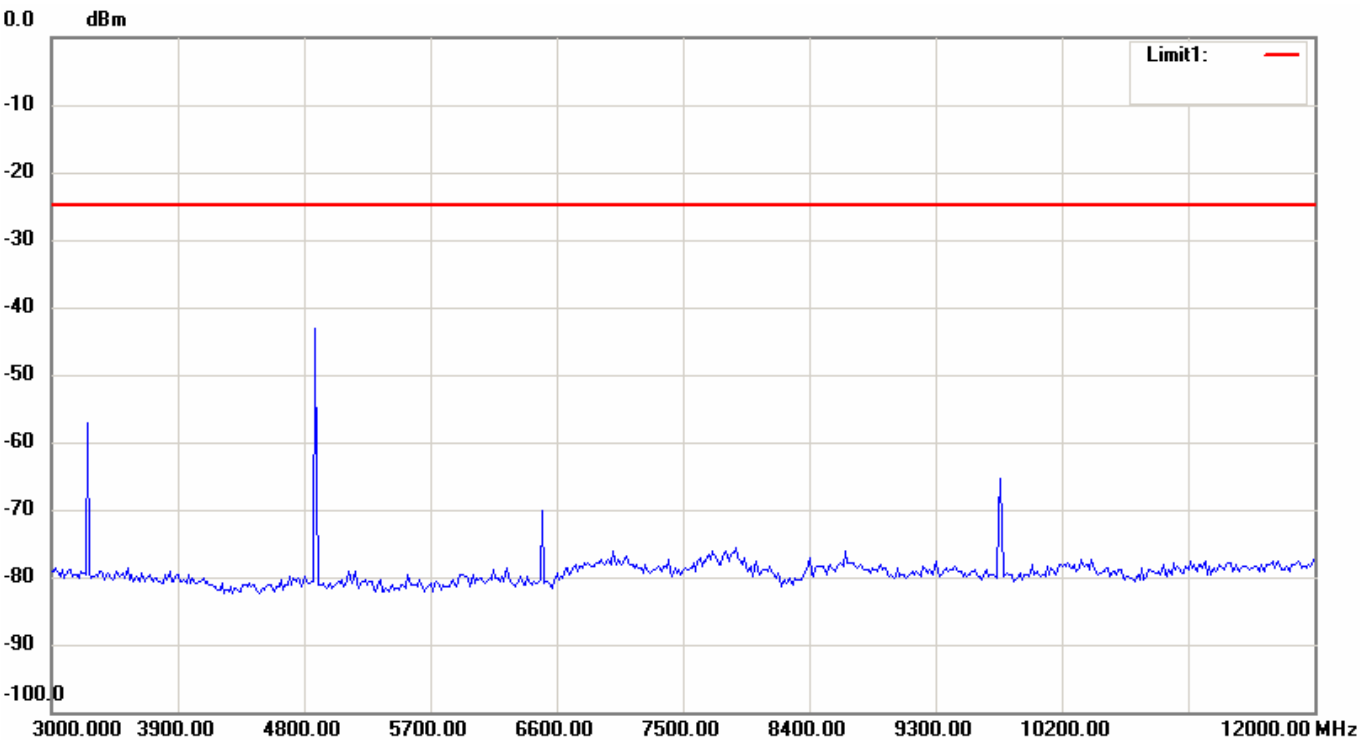
| | | |
|------------|-----------|-------------------------------|
| Condition: | -24.33dBm | RF Conducted |
| EUT: | | Sweep Time: 92.7ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | M | |

| | | | |
|----------|-----------|-------------------|--------------------|
| File: DO | Data: #10 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 11:05:46 | Humidity: 51 % |



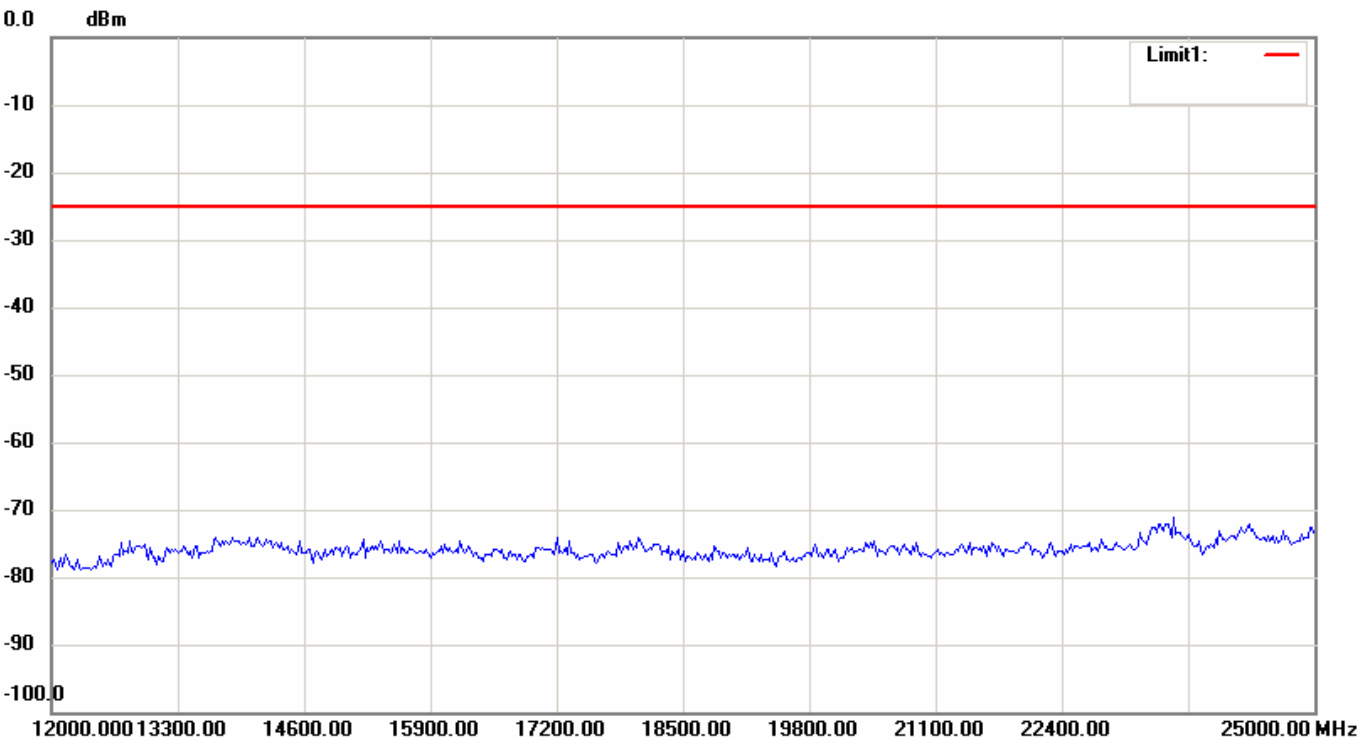
| | | |
|------------|-----------|------------------------------|
| Condition: | -24.33dBm | RF Conducted |
| EUT: | | Sweep Time: 191ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | M | |

| | | | |
|----------|-----------|-------------------|--------------------|
| File: DO | Data: #11 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 11:06:42 | Humidity: 51 % |



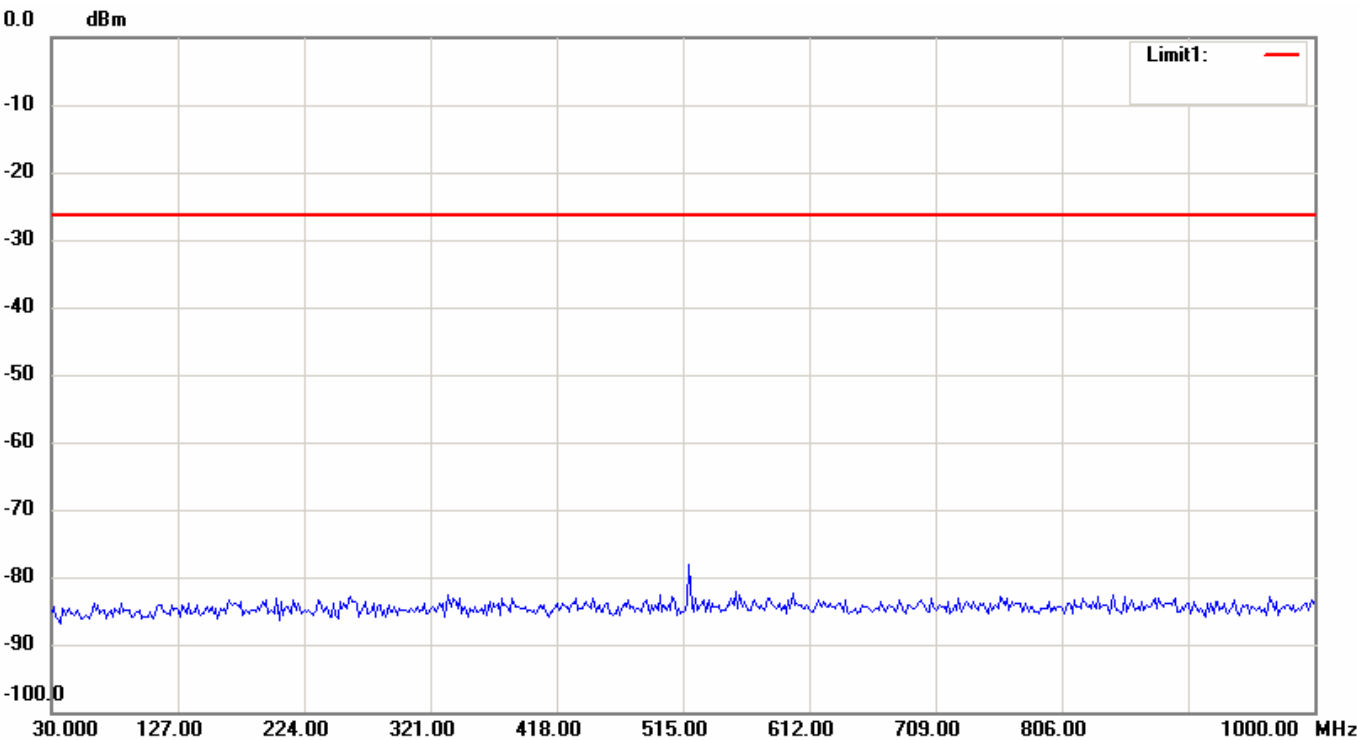
| | | |
|------------|-----------|------------------------------|
| Condition: | -24.33dBm | RF Conducted |
| EUT: | | Sweep Time: 860ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | M | |

| | | | |
|----------|-----------|-------------------|--------------------|
| File: DO | Data: #12 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 11:07:50 | Humidity: 51 % |



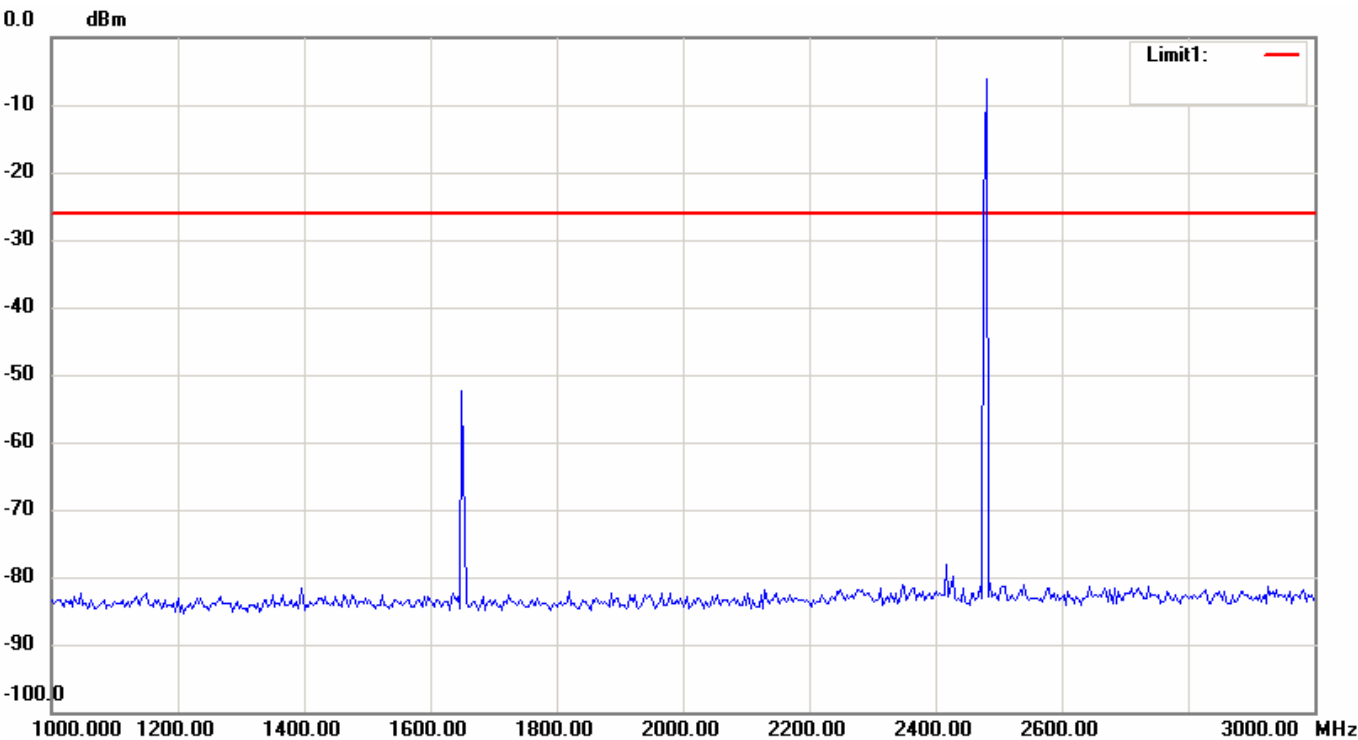
| | | |
|------------|-----------|-------------------------------|
| Condition: | -24.33dBm | RF Conducted |
| EUT: | | Sweep Time: 1242ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | M | |

| | | | |
|----------|-----------|-------------------|--------------------|
| File: DO | Data: #15 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 11:17:26 | Humidity: 51 % |



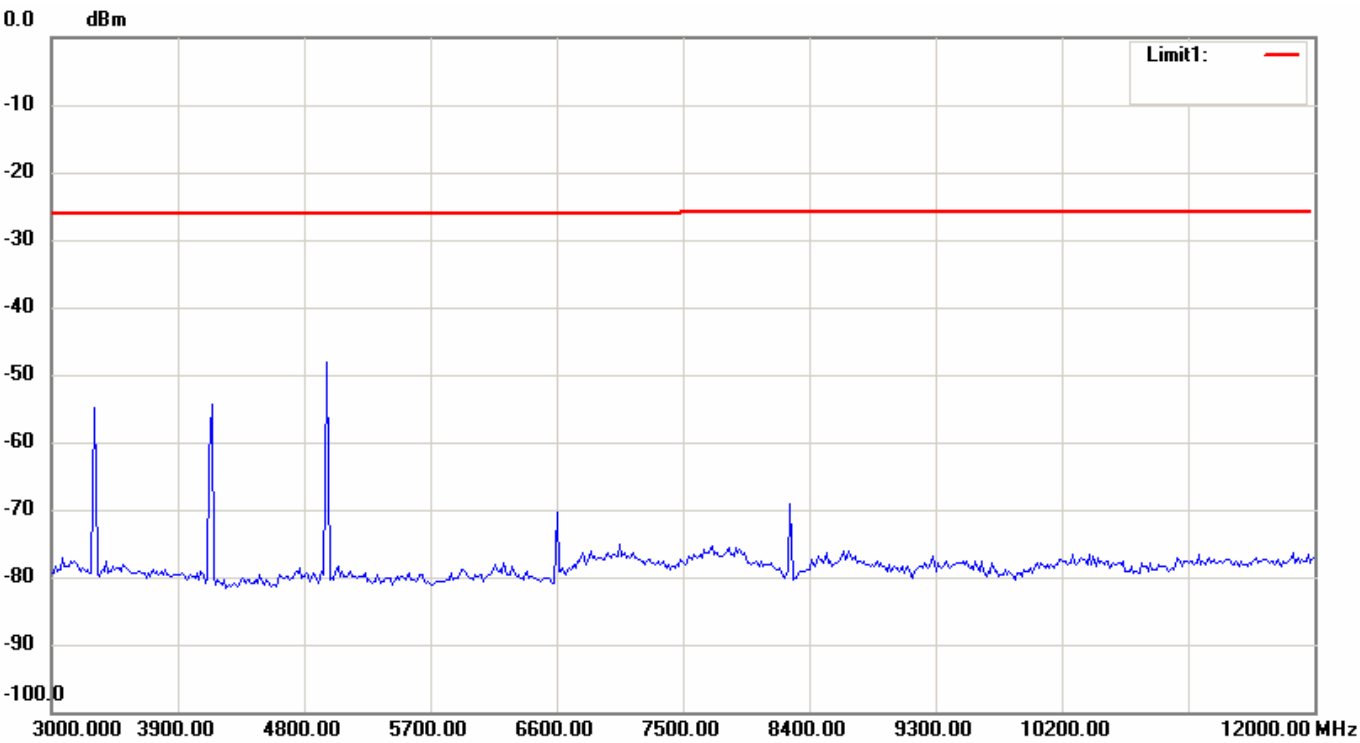
| | | |
|------------|-----------|-------------------------------|
| Condition: | -26.86dBm | RF Conducted |
| EUT: | | Sweep Time: 92.7ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | H | |

| | | | |
|----------|-----------|-------------------|--------------------|
| File: DO | Data: #16 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 11:18:18 | Humidity: 51 % |



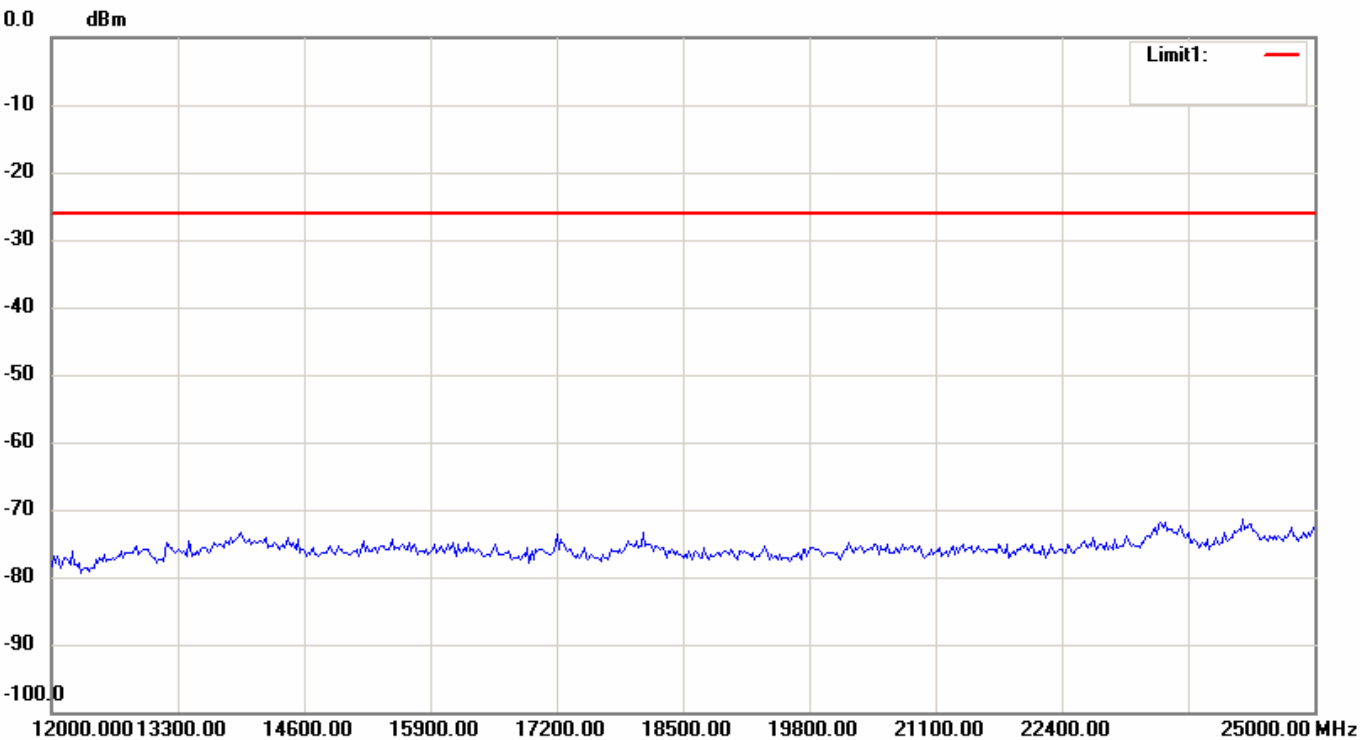
| | | |
|------------|-----------|------------------------------|
| Condition: | -26.86dBm | RF Conducted |
| EUT: | | Sweep Time: 191ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | H | |

| | | | |
|----------|-----------|-------------------|--------------------|
| File: DO | Data: #17 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 11:24:30 | Humidity: 51 % |



| | | |
|------------|-----------|------------------------------|
| Condition: | -26.86dBm | RF Conducted |
| EUT: | | Sweep Time: 860ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | H | |

| | | | |
|----------|-----------|-------------------|--------------------|
| File: DO | Data: #18 | Date: 2010/2/25 | Temperature: 16 °C |
| | | Time: AM 11:25:54 | Humidity: 51 % |



| | | |
|------------|-----------|-------------------------------|
| Condition: | -26.86dBm | RF Conducted |
| EUT: | | Sweep Time: 1242ms Att.: 10dB |
| Model: | | RBW: 100 KHz VBW: 300 KHz |
| Test Mode: | | |
| Note: | H | |

10 RADIATED EMISSION MEASUREMENT

10.1 Standard Applicable

For unintentional radiator, the radiated emission shall comply with §15.109(a).

For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

10.2 Measurement Procedure

A.Preliminary Measurement For Portable Devices.

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT (X and Y axis):

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antennna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. The axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.
4. The position in which the maximum noise occurred was “X axis”. (Please see the test setup photos)

B. Final Measurement

1. Setup the configuration per figure 4 and 5 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, it is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions. For emission frequencies measured above 1 GHz, a pre-scan be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 120 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

Note : A filter was used to avoid pre-amplifier saturated when measure TX operation mode.

5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the datarate, placement of ANT. cables associated with EUT to obtain the worse case and record the result.

Figure 4 : Frequencies measured below 1 GHz configuration

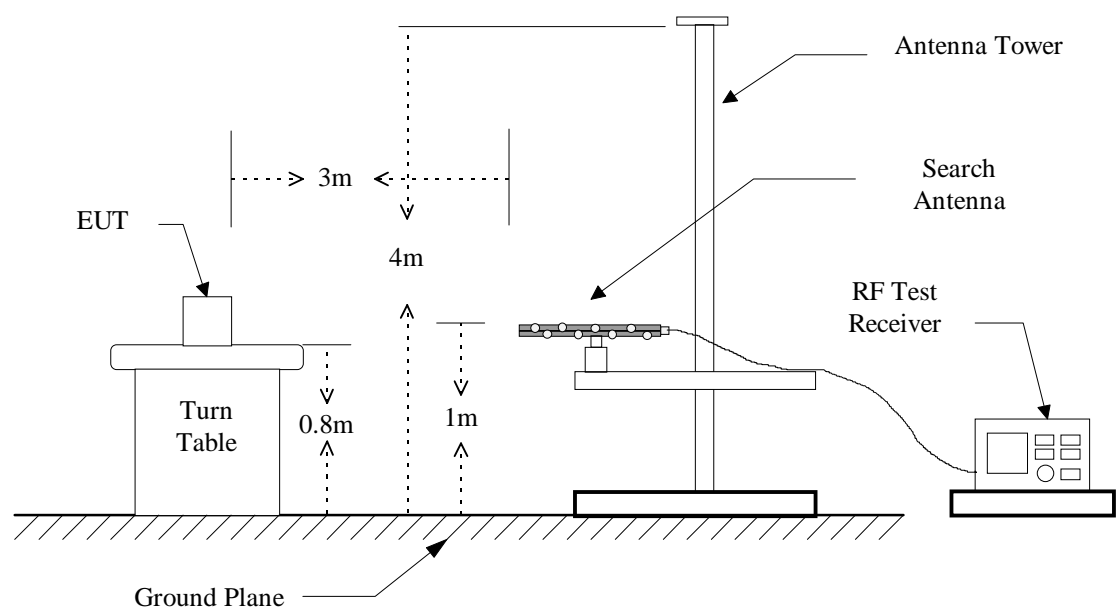
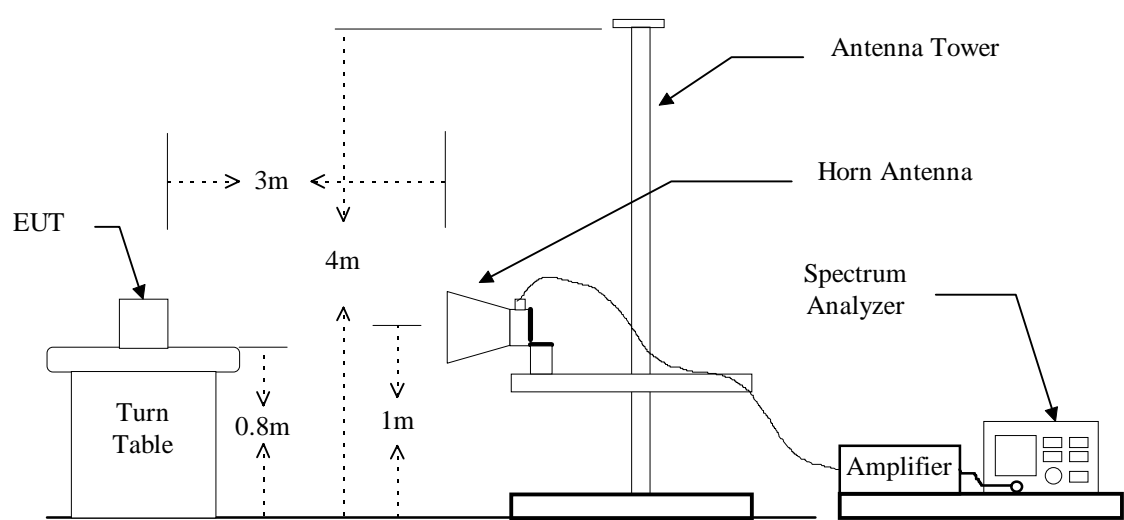


Figure 5 : Frequencies measured above 1 GHz configuration



10.3 Measuring Instrument

The following instrument are used for radiated emissions measurement :

| Equipment | Manufacturer | Model No. | Serial No. | Calibrated until |
|-------------------|--------------|-----------|--------------|------------------|
| EMI Receiver | R&S | ESIB7 | 13054414-001 | 07/19/2010 |
| BiLog Antenna | Schaffner | CBL 6112B | 2927 | 08/18/2010 |
| Horn Antenna | EMCO | 3115 | 9107-3729 | 12/10/2010 |
| PRE-Amplifier | Agilent | 8449B | 3008A01648 | 10/11/2010 |
| Spectrum Analyzer | R&S | FSU46 | 13040904-001 | 11/18/2010 |

Measuring instrument setup in measured frequency band when specified detector function is used :

| Frequency Band (MHz) | Instrument | Function | Resolution Bandwidth | Video Bandwidth |
|----------------------|-------------------|------------|----------------------|-----------------|
| 30 to 1000 | RF Test Receiver | Quasi-Peak | 120 kHz | 300 kHz |
| | Spectrum Analyzer | Peak | 120 kHz | 300 kHz |
| Above 1000 | Spectrum Analyzer | Peak | 1 MHz | 1 MHz |
| | Spectrum Analyzer | Average | 1 MHz | 10 Hz |

10.4 Radiated Emission Data**10.4.1 Harmonic**Operation Mode: TXTest Date: Feb. 04, 2010Temperature: 18°CHumidity: 67 %

a) Channel Low

Fundamental Frequency: 2405 MHz

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m | | Limit @3m | |
|------------------------|----------------|-----|------|------|-----------------------------|------------|------|-----------|------|
| | H | | V | | | (dBuV/m) | | (dBuV/m) | |
| | Peak | Ave | Peak | Ave | | Peak | Ave | Peak | Ave. |
| 4810.000 | --- | --- | 59.3 | 40.0 | -2.52 | 56.8 | 37.5 | 74.0 | 54.0 |
| 12025.000 | --- | --- | --- | --- | 4.41 | --- | --- | 74.0 | 54.0 |
| 14430.000 | --- | --- | --- | --- | 9.05 | --- | --- | 74.0 | 54.0 |
| 19240.000 | --- | --- | --- | --- | -3.66 | --- | --- | 74.0 | 54.0 |

b) Channel Middle

Fundamental Frequency: 2440 MHz

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m | | Limit @3m | |
|------------------------|----------------|-----|------|------|-----------------------------|------------|------|-----------|------|
| | H | | V | | | (dBuV/m) | | (dBuV/m) | |
| | Peak | Ave | Peak | Ave | | Peak | Ave | Peak | Ave. |
| 4880.000 | --- | --- | 59.4 | 33.7 | -2.37 | 57.0 | 31.3 | 74.0 | 54.0 |
| 7320.000 | --- | --- | --- | --- | 0.60 | --- | --- | 74.0 | 54.0 |
| 12200.000 | --- | --- | --- | --- | 4.48 | --- | --- | 74.0 | 54.0 |
| 19520.000 | --- | --- | --- | --- | -4.70 | --- | --- | 74.0 | 54.0 |

c) Channel High

Fundamental Frequency: 2480 MHz

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m | | Limit @3m | |
|------------------------|----------------|-----|------|------|-----------------------------|------------|------|-----------|------|
| | H | | V | | | (dBuV/m) | | (dBuV/m) | |
| | Peak | Ave | Peak | Ave | | Peak | Ave | Peak | Ave. |
| 4960.000 | --- | --- | 59.8 | 36.3 | -2.19 | 57.6 | 34.1 | 74.0 | 54.0 |
| 7440.000 | --- | --- | --- | --- | 0.87 | --- | --- | 74.0 | 54.0 |
| 12400.000 | --- | --- | --- | --- | 4.56 | --- | --- | 74.0 | 54.0 |
| 19840.000 | --- | --- | --- | --- | -4.63 | --- | --- | 74.0 | 54.0 |
| 22320.000 | --- | --- | --- | --- | -3.29 | --- | --- | 74.0 | 54.0 |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.

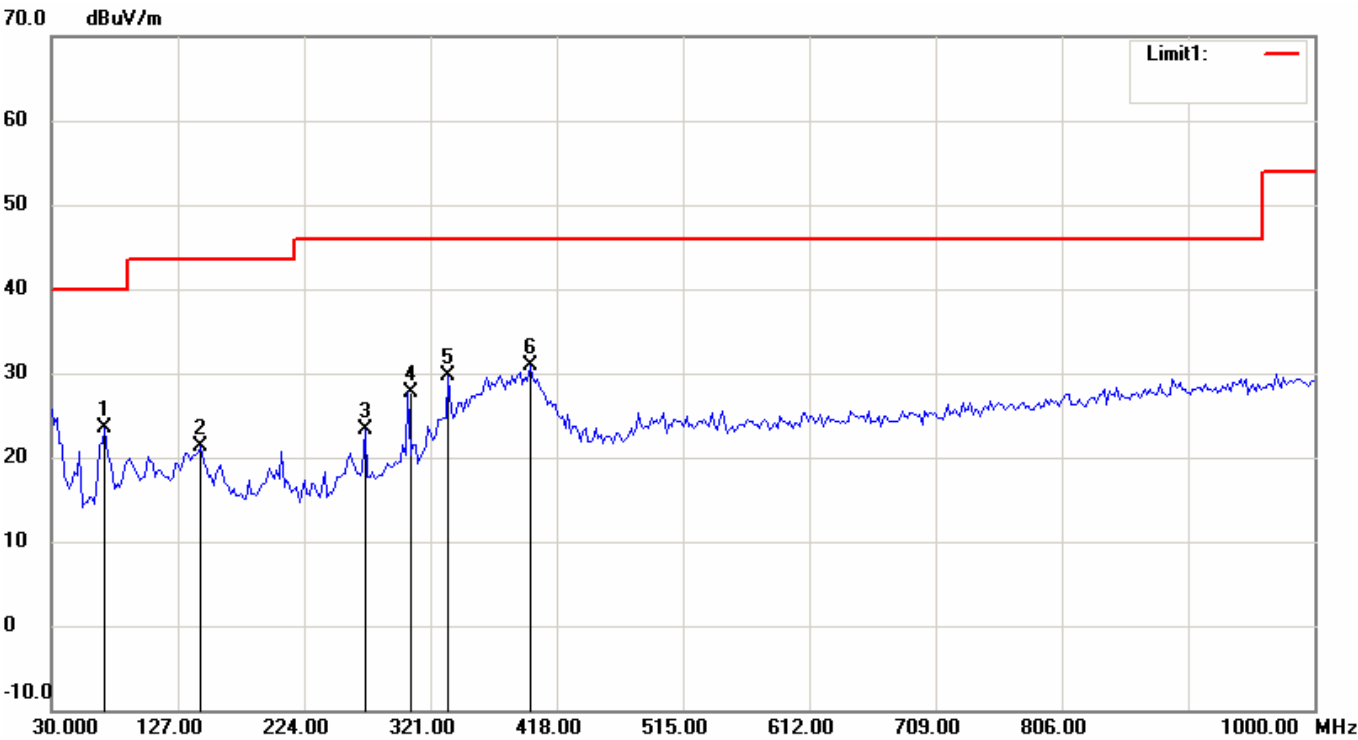
10.4.2 Spurious Emission

10.4.2.1 Emission frequencies below 1 GHz

File: 10-01-MAS-024 Data: #13 Date: 2010/2/4 Temperature: 18 °C

Time PM 01:17:34 Humidity: 67 %

:



Condition: FCC Part15 RE-Class B_30-1000MHz Polarization: Horizontal

EUT: Zigbee wireless digital output transmitter Distance:

Model: DOZ100

Test Mode:

| No. | Frequency | Reading | Detector | Corrected | Result | Limit | Margin |
|-----|-----------|----------|----------|------------|----------|----------|--------|
| | (MHz) | (dBuV/m) | | Factor(dB) | (dBuV/m) | (dBuV/m) | (dB) |
| 1 | 70.8215 | 15.64 | peak | 7.77 | 23.41 | 40.00 | -16.59 |
| 2 | 144.6894 | 8.22 | peak | 13.02 | 21.24 | 43.50 | -22.26 |
| 3 | 271.0421 | 7.77 | peak | 15.47 | 23.24 | 46.00 | -22.76 |
| 4 | 304.0881 | 11.69 | peak | 16.11 | 27.80 | 46.00 | -18.20 |
| 5 | 335.1904 | 12.62 | peak | 17.16 | 29.78 | 46.00 | -16.22 |
| 6 | 397.3947 | 11.92 | peak | 19.03 | 30.95 | 46.00 | -15.05 |

File: 10-01-MAS-024 Data: #14

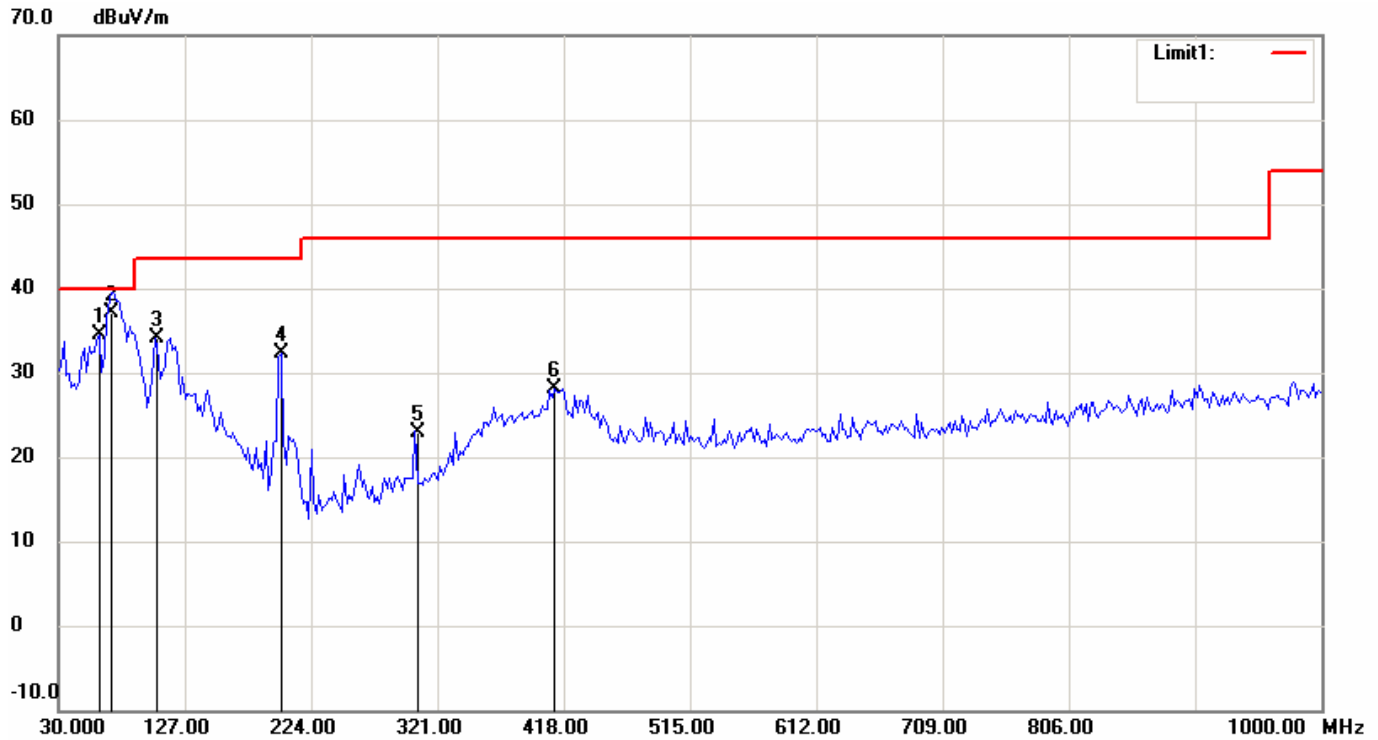
Date: 2010/2/4

Temperature: 18 °C

Time PM 01:20:41

Humidity: 67 %

:



Condition: FCC Part15 RE-Class B_30-1000MHz

Polarization: Vertical

EUT: Zigbee wireless digital output transmitter

Distance:

Model: DOZ100

Test Mode:

| No. | Frequency (MHz) | Reading (dBuV/m) | Detector | Corrected Factor(dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----|--------------------|---------------------|----------|-------------------------|--------------------|-------------------|----------------|
| 1 | 61.1022 | 26.62 | peak | 7.80 | 34.42 | 40.00 | -5.58 |
| 2 | 70.8215 | 29.30 | QP | 7.77 | 37.07 | 40.00 | -2.93 |
| 3 | 103.8676 | 21.28 | peak | 12.80 | 34.08 | 43.50 | -9.42 |
| 4 | 201.0620 | 17.68 | peak | 14.65 | 32.33 | 43.50 | -11.17 |
| 5 | 304.0881 | 6.89 | peak | 16.11 | 23.00 | 46.00 | -23.00 |
| 6 | 411.0020 | 8.82 | peak | 19.26 | 28.08 | 46.00 | -17.92 |

10.4.2.2 Emission frequencies above 1 GHz

10.4.2.2.1 Operation Mode : CH 11, 2405 MHz

| Frequency (MHz) | Reading (dBuV) | | | | Correct Factor (dB/m) | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | |
|------------------------|----------------|-----|------|-----|-----------------------------|------------------------|-----|-----------------------|------|
| | H | | V | | | Peak | AVG | Peak | AVG |
| | Peak | AVG | Peak | AVG | | | | | |
| 1601.280 | 51.3 | --- | --- | --- | -11.60 | 39.7 | --- | 74.0 | 54.0 |
| 1603.250 | --- | --- | 53.4 | --- | -11.59 | 41.8 | --- | 74.0 | 54.0 |
| 3204.620 | --- | --- | 58.8 | --- | -5.83 | 53.0 | --- | 74.0 | 54.0 |

10.4.2.2.2 Operation Mode : CH 18, 2440 MHz

| Frequency (MHz) | Reading (dBuV) | | | | Correct Factor (dB/m) | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | |
|------------------------|----------------|-----|------|-----|-----------------------------|------------------------|-----|-----------------------|------|
| | H | | V | | | Peak | AVG | Peak | AVG |
| | Peak | AVG | Peak | AVG | | | | | |
| 1628.200 | 52.9 | --- | 55.3 | --- | -11.46 | 43.8 | --- | 74.0 | 54.0 |

10.4.2.2.3 Operation Mode : CH 26, 2480 MHz

| Frequency (MHz) | Reading (dBuV) | | | | Correct Factor (dB/m) | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | |
|------------------------|----------------|-----|------|-----|-----------------------------|------------------------|-----|-----------------------|------|
| | H | | V | | | Peak | AVG | Peak | AVG |
| | Peak | AVG | Peak | AVG | | | | | |
| 1652.880 | --- | --- | 56.5 | --- | -11.34 | 45.2 | --- | 74.0 | 54.0 |
| 1655.120 | 54.4 | --- | --- | --- | -11.33 | 43.1 | --- | 74.0 | 54.0 |
| 3304.080 | --- | --- | 54.4 | --- | -5.55 | 48.9 | --- | 74.0 | 54.0 |

Note:

1. Place of Measurement: Measuring site of the ETC.
2. If the data table appeared symbol of "---" means the value was too low to be measured.
3. The estimated measurement uncertainty of the result measurement is
 $\pm 4.6\text{dB}$ ($30\text{MHz} \leq f < 300\text{MHz}$).
 $\pm 4.4\text{dB}$ ($300\text{MHz} \leq f \leq 1000\text{MHz}$).

10.4.3 Radiated Measurement at Bandedge with Fundamental FrequenciesTest Date: Feb. 04, 2010Temperature: 18°CHumidity: 67 %Operation Mode: TX

| Operation Channel | Test Frequency | Reading (dBuV) | | | | Factor (dB) | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | |
|-------------------|----------------|----------------|-------|-------|-------|-------------|---------------------|-------|--------------------|------|
| | | H | | V | | | Peak | Ave | Peak | Ave. |
| | Peak | Ave | Peak | Ave | Corr. | Peak | | | | |
| | (MHz) | | | | | | | | | |
| Low | 2390.000 | 30.63 | 15.64 | 31.56 | 15.67 | 29.8 | 61.36 | 45.47 | 74.0 | 54.0 |
| High | 2483.500 | 34.79 | 16.68 | 33.54 | 16.52 | 29.8 | 64.59 | 46.48 | 74.0 | 54.0 |

Note :

1. Remark “---” means that the emissions level is too low to be measured.
2. The result is the highest value of radiated emission from restrict band of 2310 ~ 2390 MHz and 2483.5 ~ 2500 MHz.

10.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

where

$$\text{Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} + \text{High Pass Filter Loss} - \text{Amplifier Gain}$$