# Test Report

| | |
|---|---|
| Product Name | WHDI Rx board |
| Model No | WV301A |
| FCC ID | PPQ-WV301A |

| | |
|---|---|
| Applicant | LITE-ON TECHNOLOGY CORP. |
| Address | 4F, 90, Chien 1 Road, Chung Ho, Taipei Hsien 235, Taiwan, R.O.C. |

| | |
|---|---|
| Date of Receipt | Sep. 16, 2011 |
| Issued Date | Oct. 14, 2011 |
| Report No. | 119322R-RFUSP32V01 |
| Report Version | V1.0 |

# Test Report Certification

Issued Date: Oct. 14, 2011
Report No.: 119322R-RFUSP32V01

**Accredited by NIST (NVLAP)**

NVLAP Lab Code: 200533-0

| | |
|---|---|
| Product Name | WHDI Rx board |
| Applicant | LITE-ON TECHNOLOGY CORP. |
| Address | 4F, 90, Chien 1 Road, Chung Ho, Taipei Hsien 235, Taiwan, R.O.C. |
| Manufacturer | DONG GUAN G-COM COMPUTER CO., LTD |
| Model No. | WV301A |
| FCC ID. | PPQ-WV301A |
| EUT Rated Voltage | DC 5V |
| EUT Test Voltage | AC 120V/60Hz |
| Trade Name | LITE-ON |
| Applicable Standard | FCC CFR Title 47 Part 15 Subpart E: 2010<br>ANSI C63.4: 2009, KDB-789033<br>NVLAP Lab Code: 200533-0 |
| Test Result | Complied |

The Test Results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : Anita Chou
( Senior Engineering Adm. Specialist / Anita Chou )

Tested By : Henk Huang
( Engineer / Henk Huang )

Approved By :
( Manager / Vincent Lin )

Testing Laboratory
0914

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# 1. GENERAL INFORMATION

## 1.1. EUT Description

| | |
|---|---|
| Product Name | WHDI Rx board |
| Trade Name | LITE-ON |
| FCC ID. | PPQ-WV301A |
| Model No. | WV301A |
| Frequency Range | 20MHz-BW: 5180-5240MHz; 40MHz-BW: 5190-5230MHz |
| Number of Channels | 20MHz-BW: 4; 40MHz-BW: 2 |
| Data Rate | 20MHz mode: 30kbps, 40MHz mode: 60kbps |
| Channel Control | Auto |
| Type of Modulation | OFDM |
| Antenna type | Printed on PCB (PIFA) |
| Antenna Gain | Refer to the table “Antenna List” |
| Power Adapter | MFR: Asian, M/N: WA-15C05R<br>Input: AC 100-240V, 50-60Hz, 0.5A Max.<br>Output: DC 5V, 3A<br>Cable Out: Shielded, 1.5m, with one ferrite core bonded. |

**Antenna List**

| No. | Manufacturer | Part No. | Peak Gain |
|---|---|---|---|
| 1 | LITE-ON | N/A | 2dBi for 5GHz |

Note: The antenna of EUT is conform to FCC 15.203

20MHz Center Working Frequency of Each Channel:

| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|---|---|
| Channel 36: | 5180 MHz | Channel 40: | 5200 MHz | Channel 44: | 5220 MHz | Channel 48: | 5240 MHz |

40MHz Center Working Frequency of Each Channel:

| Channel | Frequency | Channel | Frequency |
|---|---|---|---|
| Channel 38: | 5190 MHz | Channel 46: | 5230 MHz |

Note:

1. This device is a WHDI Rx board with a built-in and 5GHz WLAN transceiver.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart E for Unlicensed National Information Infrastructure devices.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

## 1.2. Operational Description

The EUT is a Full HD Video Wireless Receiver Module with a built-in 5GHz transceiver, together with Full HD Video Wireless Transmitter Module. It has a MISO design of five channel and one slow rate output wireless channel, which generates an upstream channel for data content transmissions.

The data modulation is OFDM, using five antennas to support 1(Transmit) * 5(Receive) technology. The device only provided one transmitting speed 30kbps in 20MHz bandwidth mode and 60kbps in 40MHz bandwidth mode.

Presents the ultimate solution for converting any High Definition (HD) system, including Full HD, into a wireless one. These add-on modules enable wireless A/V applications that fit easily into the living room and eliminate traditional A/V wiring. The perfect HD video and audio quality and the high robustness are unmatched by any other wireless technology and present a true alternative to cable. The WHDI system transmits uncompressed video and audio streams wirelessly and thus simplifies and eliminates system issues, such as: lip-sync, large buffers and other burdens like retransmissions or error propagation.

The device can receive audio and video signal from associate equipment, device will transmit signal to request associate equipment change transmission frequency. The IC AMN2220 WHDI baseband receiver chip is the heart of the WV301A WHDI Receiver module. The AMN2220 interfaces the A/V sink through the WHDI connector and is controlled by the internal MAC uC. The AMN2220 is based on MIMO technology receiving up to five input channels. Five analog-to-digital converters and one digital-to-analog converter are embedded within the chip.

The AMN2220 internal PLL accepts an input clock frequency of 40MHz. The input frequency is multiplied and then used as an internal system clock. The IC AMN3210 is a fully-integrated Zero-IF MIMO receiver specifically designed for WHDI applications using OFDM modulation for single-band 5.15 -5.25GHz and 5.725 - 5.85 GHz. The device consists of:

- Five Complete Downlink Zero-IF Receivers.
- One Uplink Direct Conversion Transmitter.
- Integrated Synthesizer/VCO.
- Internal DC Servo Loops.
- RSSI, RF and Baseband Control Interface.
- Power Management Unit.
- 3-Wire SPI Interface.

To complete the RF front-end solution, the AMN3210 uses external PA, RF Band Pass Filters (BPF), RF BALUNs and a few passive components.

| | |
|---|---|
| Test Mode | Mode 1: Transmit - 20BW<br>Mode 2: Transmit - 40BW |

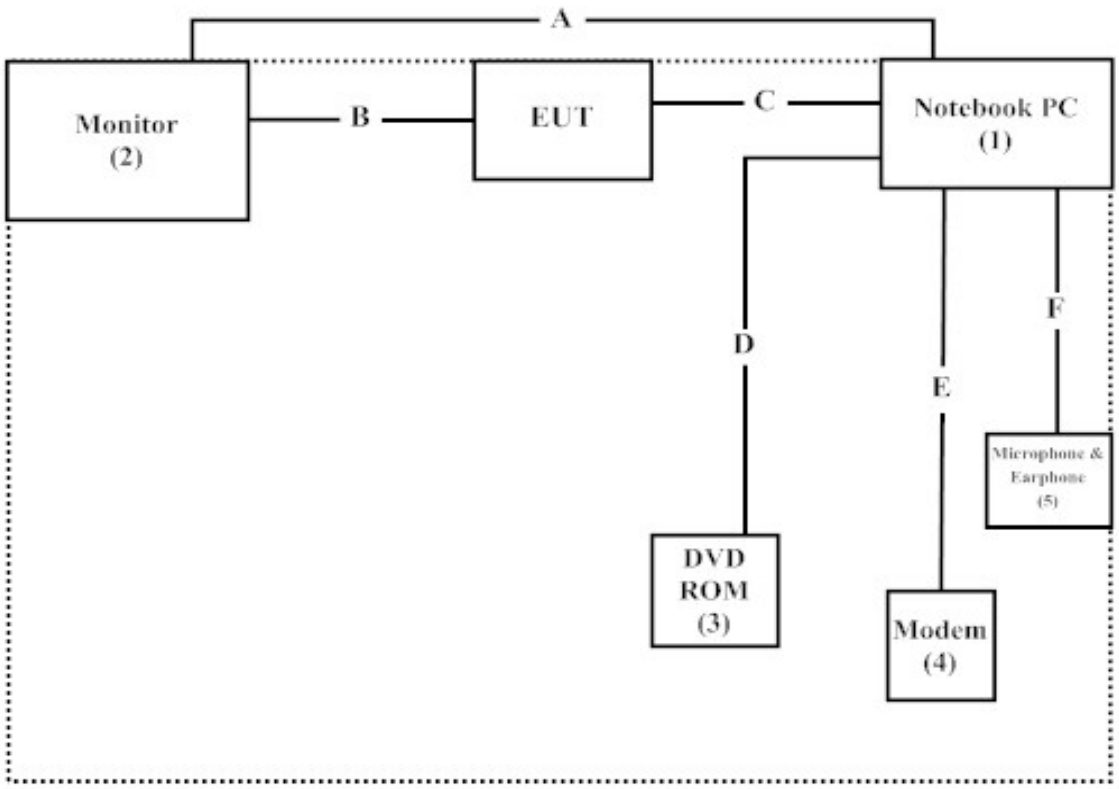
## 1.3. Tested System Datails

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

| Product | | Manufacturer | Model No. | Serial No. | Power Cord |
|---|---|---|---|---|---|
| (1) | Notebook PC | DELL | PPT | N/A | Non-Shielded, 0.8m |
| (2) | Monitor | LG | W2261VT | 907YHZK07373 | Non-Shielded, 1.8m |
| (3) | DVD ROM | DELL | PD01S | 03029 | N/A |
| (4) | Modem | ACEEX | DM-1414 | 0102027550 | Non-Shielded, 1.8m |
| (5) | Microphone & Earphone | Ergotech | ET-E201 | N/A | N/A |

| Signal Cable Type | | Signal cable Description |
|---|---|---|
| A | VGA Cable | Shielded, 1.8m, with two ferrite cores bonded. |
| B | HDMI Cable | Shielded, 1.2m |
| C | USB Cable | Shielded, 1.2m |
| D | DVD ROM Cable | Shielded, 0.6m |
| E | Modem Cable | Non-Shielded, 1.8m |
| F | Microphone & Earphone Cable | Non-Shielded, 1.0m |

## 1.4. Configuration of tested System




## 1.5. EUT Exercise Software

(1) Setup the EUT as shown in Section 1.4

(2) Execute "APPcom" program on the Notebook.

(3) Configure the test mode, the test channel, and the data rate.

(4) Press "OK" to start the continuous Transmit.

(5) Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

| Items | Required (IEC 68-1) | Actual |
|---|---|---|
| Temperature (°C) | 15-35 | 20-35 |
| Humidity (%RH) | 25-75 | 50-65 |
| Barometric pressure (mbar) | 860-1060 | 950-1000 |

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : http://www.quietek.com/tw/ctg/cts/accreditations.htm

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/

Site Description: File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195

Accreditation on NVLAP
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation
Site Address: No.5-22, Ruishukeng Linkou Dist., New Taipei City 24451,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

Testing Laboratory
0914

# 2. Conducted Emission

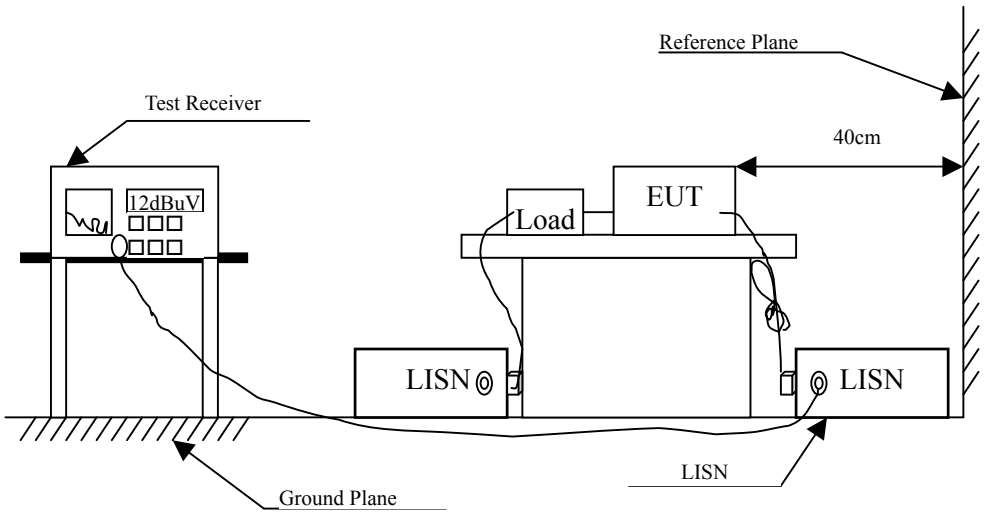
## 2.1. Test Equipment

| | Equipment | Manufacturer | Model No. / Serial No. | Last Cal. | Remark |
|---|---|---|---|---|---|
| X | Test Receiver | R & S | ESCS 30 / 825442/018 | Sep., 2011 | |
| X | Artificial Mains Network | R & S | ENV4200 / 848411/10 | Feb., 2011 | Peripherals |
| X | LISN | R & S | ESH3-Z5 / 825562/002 | Feb., 2011 | EUT |
| | DC LISN | Schwarzbeck | 8226 / 176 | Mar, 2011 | EUT |
| X | Pulse Limiter | R & S | ESH3-Z2 / 357.8810.52 | Feb., 2011 | |
| | No.8 Shielded Room | | | | |

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

## 2.2. Test Setup



## 2.3. Limits

| FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit | | |
|---|---|---|
| Frequency MHz | Limits | |
| | QP | AV |
| 0.15 - 0.50 | 66-56 | 56-46 |
| 0.50-5.0 | 56 | 46 |
| 5.0 - 30 | 60 | 50 |

Remarks : In the above table, the tighter limit applies at the band edges.

## 2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /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: 2009 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2009; tested to DTS test procedure of KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

## 2.5. Uncertainty

± 2.26 dB

## 2.6. Test Result of Conducted Emission

Product : WHDI Rx board
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 2: Transmit - 40BW (5190MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV | dB | dBuV |
| **LINE 1** | | | | | |
| **Quasi-Peak** | | | | | |
| 0.189 | 9.714 | 51.040 | 60.754 | -4.132 | 64.886 |
| 0.263 | 9.667 | 41.220 | 50.887 | -11.884 | 62.771 |
| 0.341 | 9.650 | 38.480 | 48.130 | -12.413 | 60.543 |
| 0.447 | 9.640 | 37.500 | 47.140 | -10.374 | 57.514 |
| 0.736 | 9.636 | 40.200 | 49.836 | -6.164 | 56.000 |
| 15.216 | 9.990 | 32.980 | 42.970 | -17.030 | 60.000 |
| **Average** | | | | | |
| 0.189 | 9.714 | 34.700 | 44.414 | -10.472 | 54.886 |
| 0.263 | 9.667 | 27.050 | 36.717 | -16.054 | 52.771 |
| 0.341 | 9.650 | 26.380 | 36.030 | -14.513 | 50.543 |
| 0.447 | 9.640 | 26.270 | 35.910 | -11.604 | 47.514 |
| 0.736 | 9.636 | 28.930 | 38.566 | -7.434 | 46.000 |
| 15.216 | 9.990 | 24.970 | 34.960 | -15.040 | 50.000 |

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "  " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : WHDI Rx board
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 2: Transmit - 40BW (5190MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV | dB | dBuV |
| **LINE 2** | | | | | |
| **Quasi-Peak** | | | | | |
| 0.185 | 9.727 | 47.360 | 57.088 | -7.912 | 65.000 |
| 0.255 | 9.683 | 41.420 | 51.102 | -11.898 | 63.000 |
| 0.349 | 9.657 | 41.800 | 51.457 | -8.857 | 60.314 |
| 0.455 | 9.641 | 40.540 | 50.181 | -7.105 | 57.286 |
| 0.732 | 9.655 | 41.400 | 51.055 | -4.945 | 56.000 |
| 15.033 | 10.000 | 33.180 | 43.180 | -16.820 | 60.000 |
| **Average** | | | | | |
| 0.185 | 9.727 | 28.350 | 38.078 | -16.922 | 55.000 |
| 0.255 | 9.683 | 26.590 | 36.272 | -16.728 | 53.000 |
| 0.349 | 9.657 | 27.250 | 36.907 | -13.407 | 50.314 |
| 0.455 | 9.641 | 29.620 | 39.261 | -8.025 | 47.286 |
| 0.732 | 9.655 | 33.510 | 43.165 | -2.835 | 46.000 |
| 15.033 | 10.000 | 24.590 | 34.590 | -15.410 | 50.000 |

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " " means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

# 3. Peak Transmit Power

## 3.1. Test Equipment

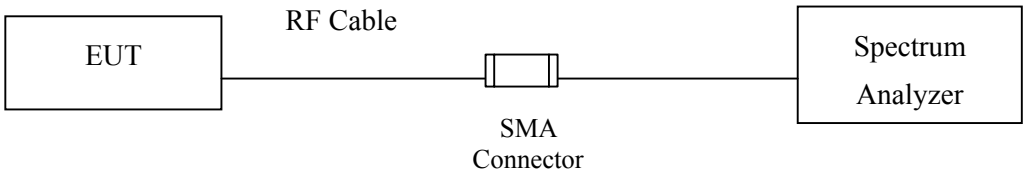
| | Equipment | Manufacturer | Model No./Serial No. | Last Cal. |
|---|---|---|---|---|
| X | Power Meter | Anritsu | ML2495A/6K00003357 | May, 2011 |
| X | Power Sensor | Anritsu | MA2411B/0738448 | Jun, 2011 |
| X | Spectrum Analyzer | Agilent | N9010A / MY48030495 | Apr., 2011 |

Note:

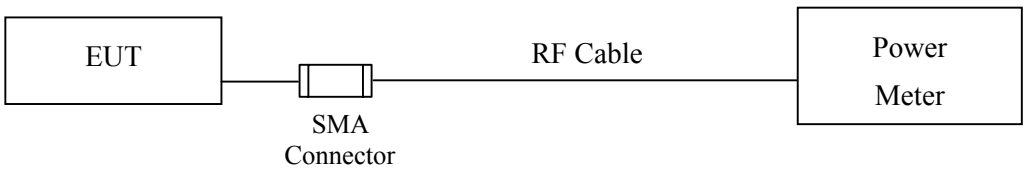
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

## 3.2. Test Setup

**26dBc Occupied Bandwidth**




**Conduction Power Measurement**



## 3.3. Limits

(1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the peak transmit power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

(2) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the peak transmit power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.825 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 1W or 17 dBm + 10log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the peak transmit power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

## 3.4. Test Procedur

As an alternative to KDB-789033, the EUT peak power was measured with a peak power meter employing a video bandwidth greater than 6dB BW of the emission under test. Peak output power was read directly from the meter across all data rates, and across three channels within each sub-band. Special care was used to make sure that the EUT was transmitting in continuous mode. This method exceeds the limitations of KDB-789033, and provides more accurate measurements.

## 3.5. Uncertainty

± 1.27 dB

## 3.6. Test Result of Peak Transmit Power

Product : WHDI Rx board
Test Item : Peak Transmit Power
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW

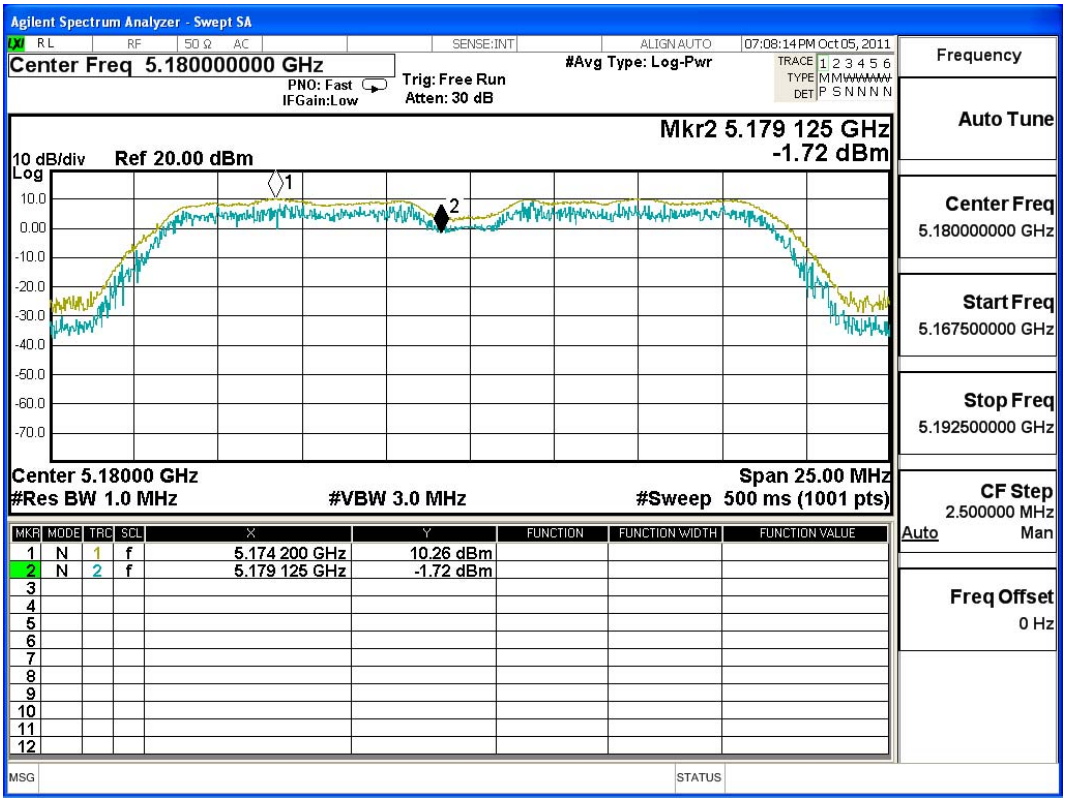
**Peak Transmit Power Measurement:**

| Channel Number | Frequency (MHz) | 26dB Bandwidth (MHz) | Output Power (dBm) | Output Power Limit | |
|---|---|---|---|---|---|
| | | | | (dBm) | dBm+10log(BW) |
| 36 | 5180 | 20.40 | 13.75 | 17 | 17.10 |
| 44 | 5220 | 20.40 | 14.01 | 17 | 17.10 |
| 48 | 5240 | 20.35 | 14.43 | 17 | 17.09 |

Note: Power Output Value =Reading value on peak power meter + cable loss

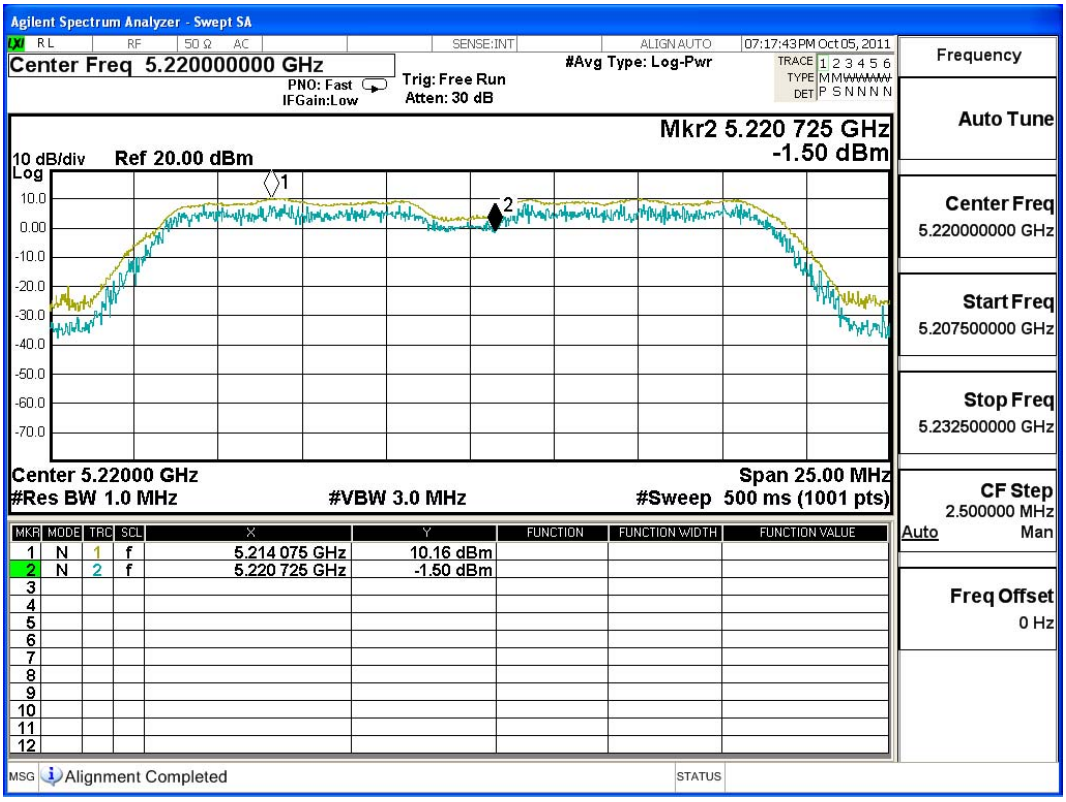
## 26dBc Occupied Bandwidth:

## Channel 36



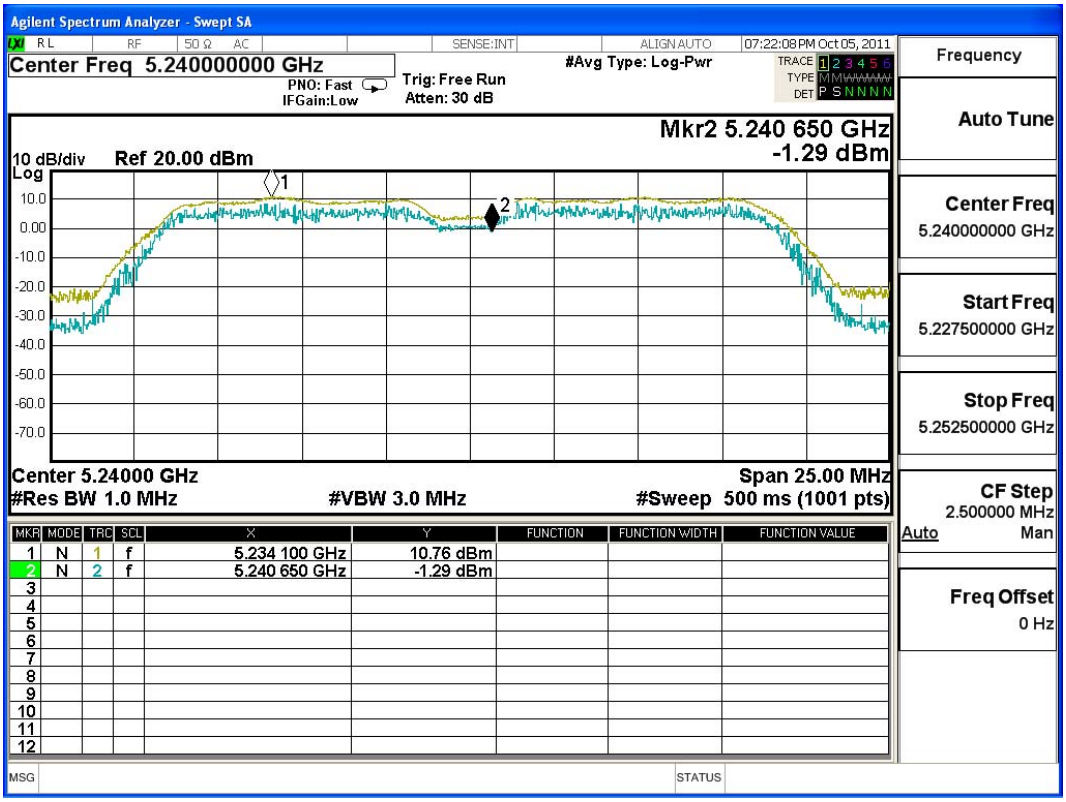

## 26dBc Occupied Bandwidth:

## Channel 44



**26dBc Occupied Bandwidth:**

**Channel 48**



Product : WHDI Rx board
Test Item : Peak Transmit Power
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 40BW

**Peak Transmit Power Measurement:**

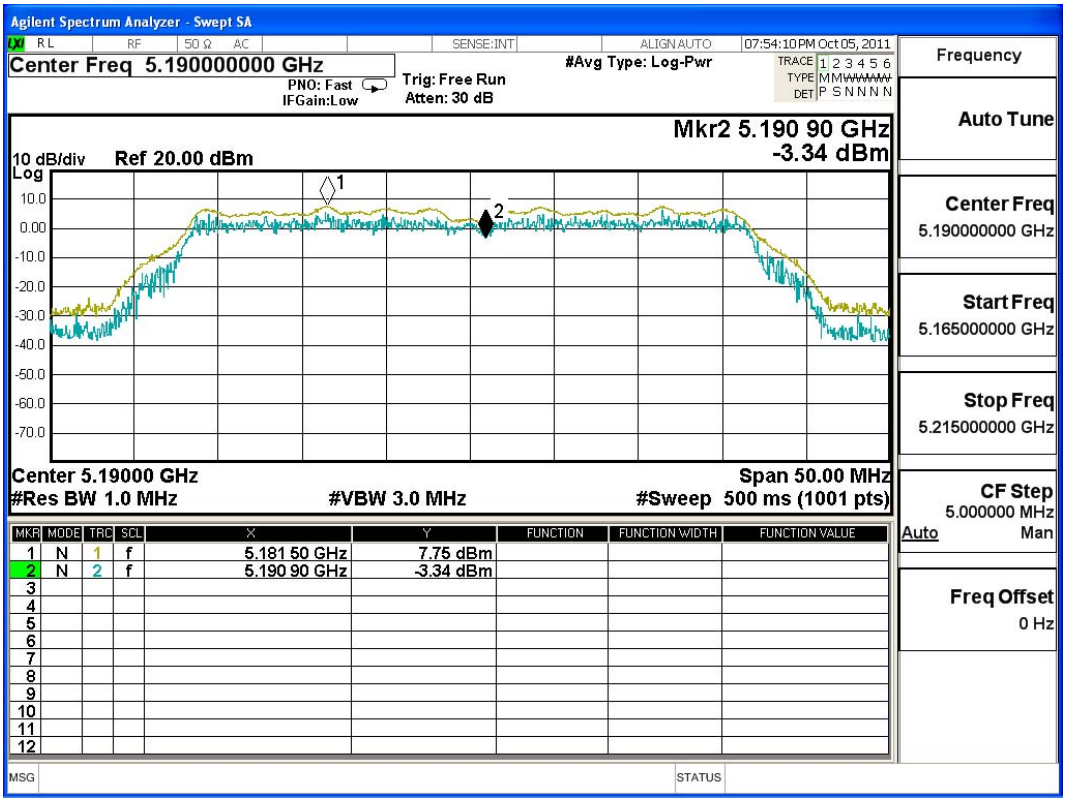
| Channel Number | Frequency (MHz) | 26dB Bandwidth (MHz) | Output Power (dBm) | Output Power Limit | |
|---|---|---|---|---|---|
| | | | | (dBm) | dBm+10log(BW) |
| 38 | 5190 | 39.25 | 14.06 | 17 | 19.94 |
| 46 | 5230 | 39.40 | 14.50 | 17 | 19.95 |

Note:

1. Power Output Value =Reading value on peak power meter + cable loss
2. Output Power (dBm) = 10LOG (Chain A Power (mW)+ Chain B Power (mW)

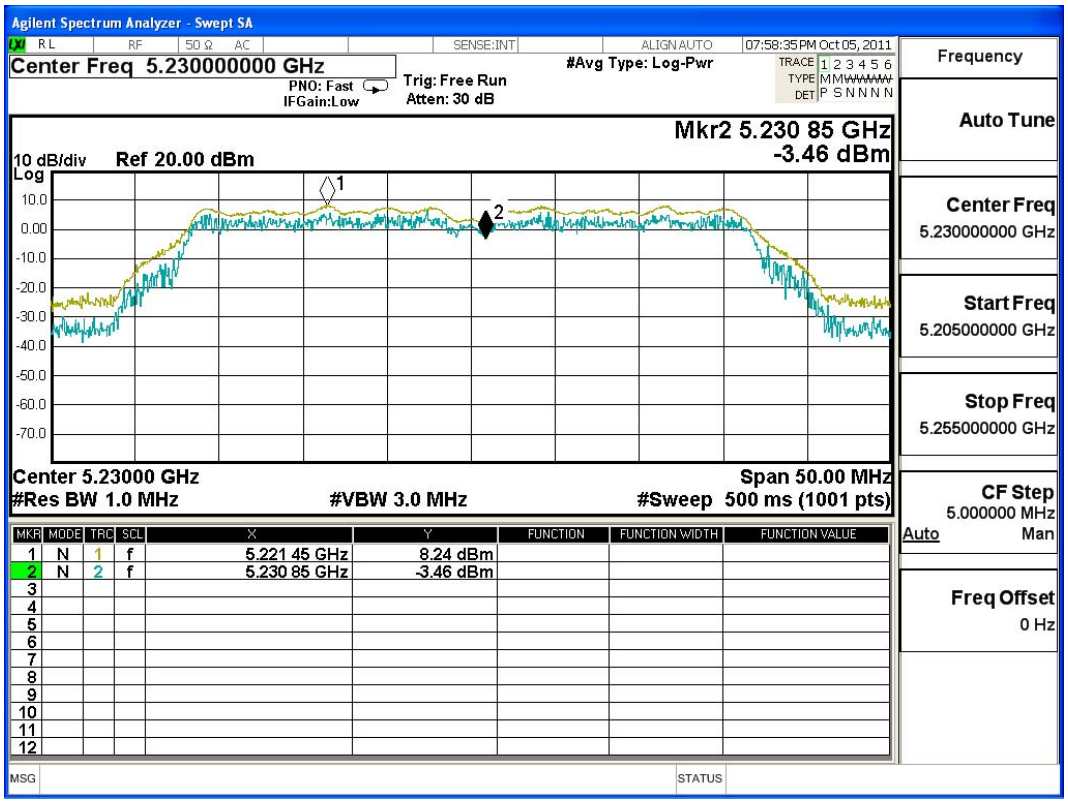
## 26dBc Occupied Bandwidth:

## Channel 38




## 26dBc Occupied Bandwidth:

## Channel 46



# 4. Peak Power Spectral Density

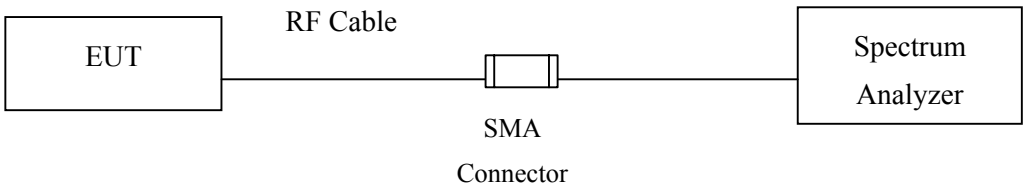
## 4.1. Test Equipment

| | Equipment | Manufacturer | Model No./Serial No. | Last Cal. |
|---|---|---|---|---|
| | Spectrum Analyzer | R&S | FSP40 / 100170 | Jun, 2011 |
| | Spectrum Analyzer | Agilent | E4407B / US39440758 | Jun, 2011 |
| X | Spectrum Analyzer | Agilent | N9010A / MY48030495 | Apr., 2011 |

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

## 4.2. Test Setup




## 4.3. Limits

(4) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antenna of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

(5) For the band 5.25-5.35 GHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antenna of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

(6) For the band 5.725-5.825 GHz, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antenna of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

## 4.4. Test Procedure

The EUT was setup to ANSI C63.4, 2009; tested to DTS test procedure of KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

## 4.5. Uncertainty

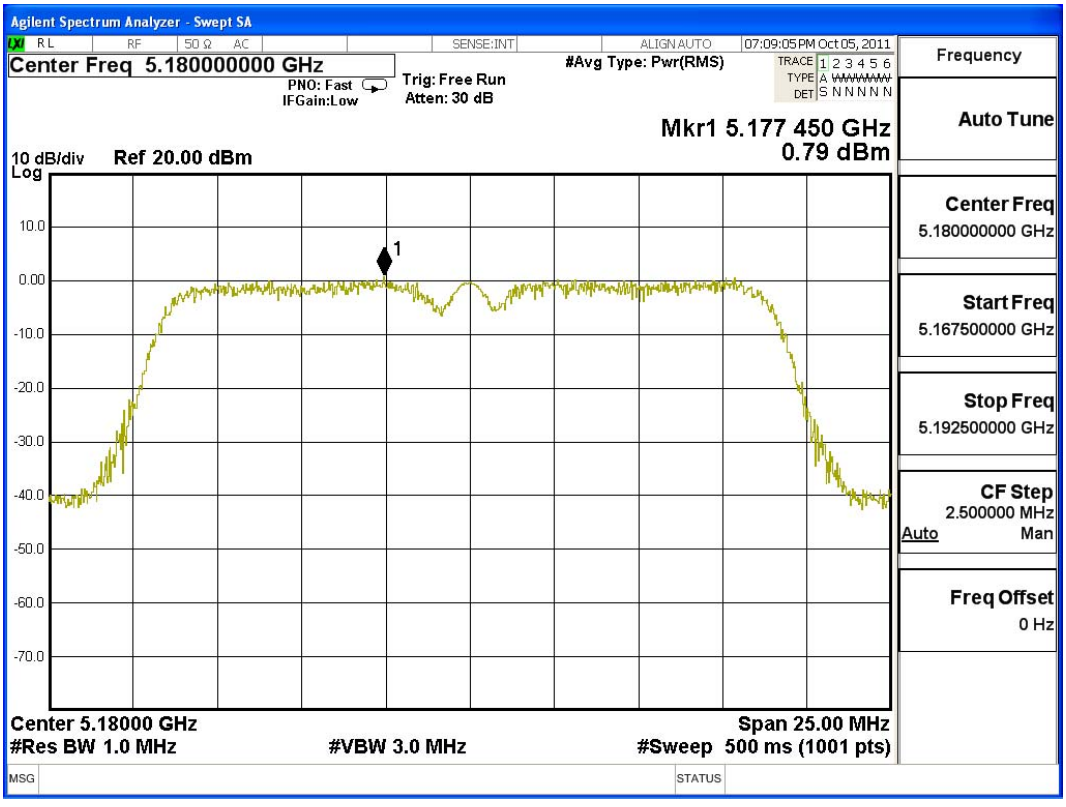
± 1.27 dB

## 4.6. Test Result of Peak Power Spectral Density

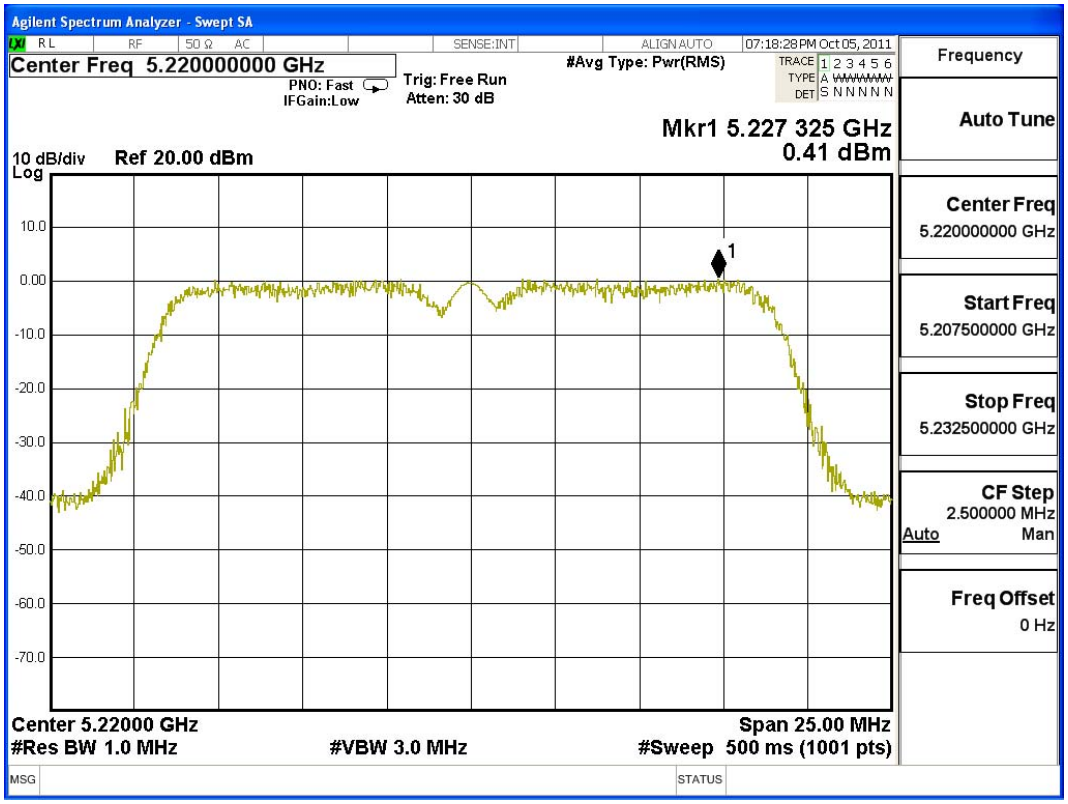
Product : WHDI Rx board
Test Item : Peak Power Spectral Density
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW

| Channel No. | Frequency (MHz) | Measurement Level (dBm) | Required Limit (dBm) | Result |
|---|---|---|---|---|
| 36 | 5180 | 0.790 | <4 | Pass |
| 44 | 5220 | 0.410 | <4 | Pass |
| 48 | 5240 | 1.320 | <4 | Pass |

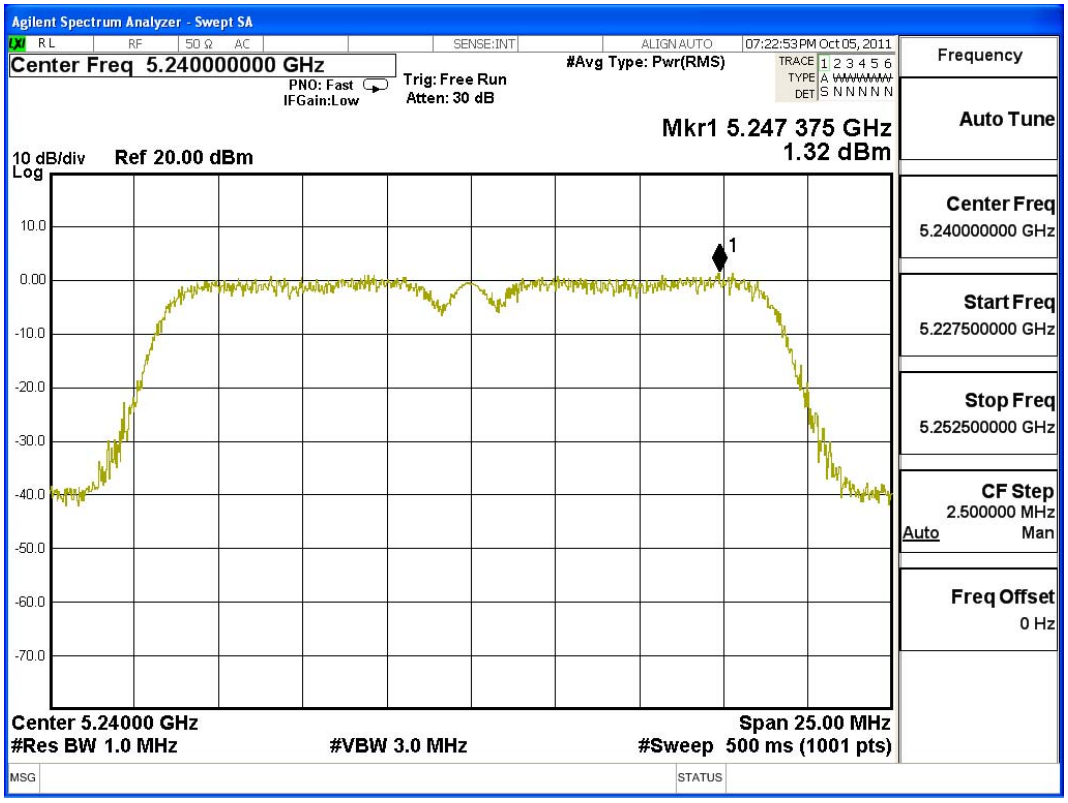
**Channel 36:**



**Channel 44:**



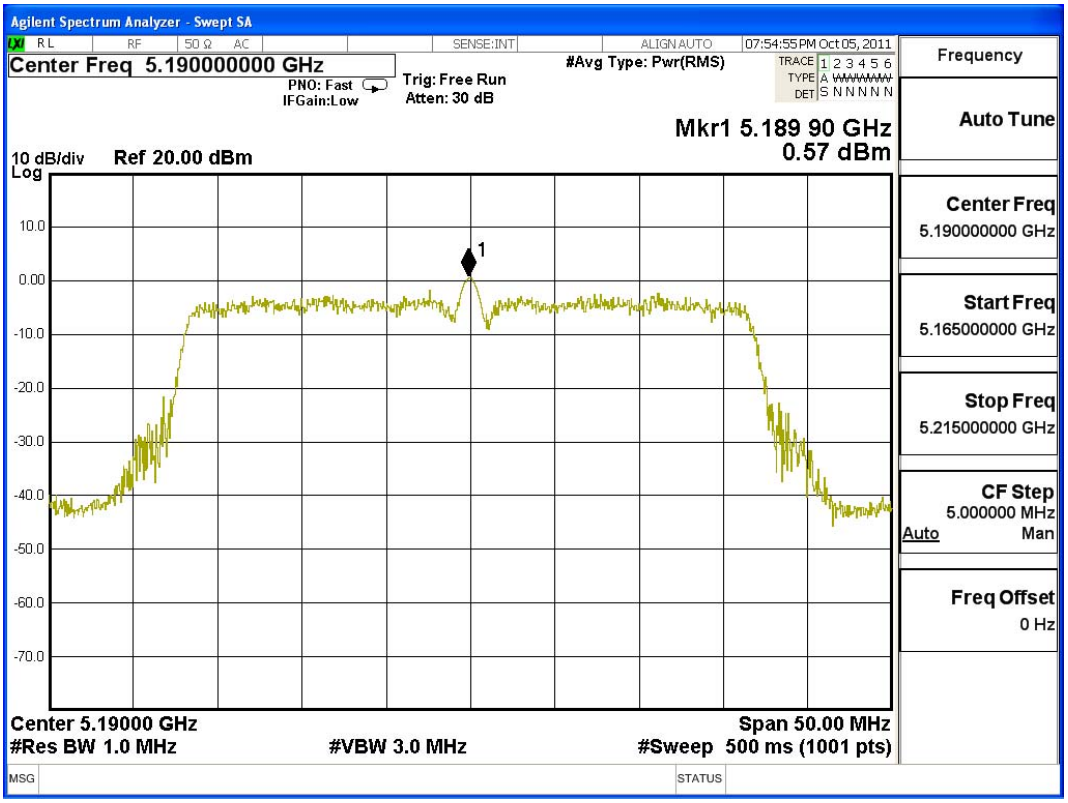

**Channel 48:**



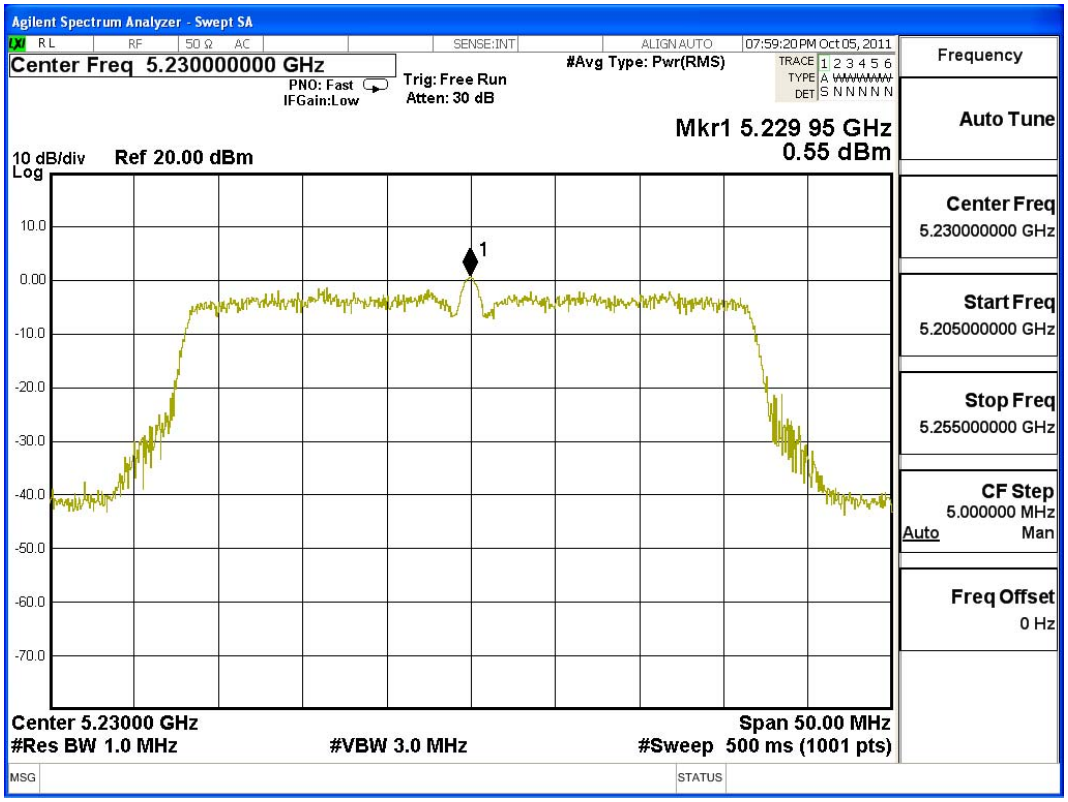
Product : WHDI Rx board
Test Item : Peak Power Spectral Density
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 40BW

| Channel No. | Frequency (MHz) | Measurement Level (dBm) | Required Limit (dBm) | Result |
|---|---|---|---|---|
| 38 | 5190 | 0.570 | <4 | Pass |
| 46 | 5230 | 0.550 | <4 | Pass |

**Channel 38:**



**Channel 46:**


Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
07:59:20 PM Oct 05, 2011
Center Freq 5.230000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
#Avg Type: Pwr(RMS)
TRACE 1 2 3 4 5 6
TYPE A WWWWW
DET S N N N N N
Mkr1 5.229 95 GHz
0.55 dBm
10 dB/div
Log
Ref 20.00 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1
Center 5.23000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 50.00 MHz
#Sweep 500 ms (1001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
5.230000000 GHz
Start Freq
5.205000000 GHz
Stop Freq
5.255000000 GHz
CF Step
5.000000 MHz
Auto
Man
Freq Offset
0 Hz

# 5. Peak Excursion

## 5.1. Test Equipment

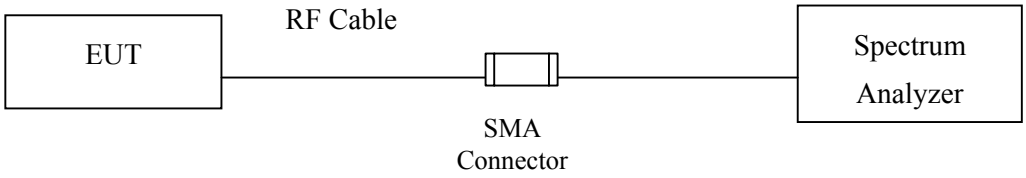
| | Equipment | Manufacturer | Model No./Serial No. | Last Cal. |
|---|---|---|---|---|
| | Spectrum Analyzer | R&S | FSP40 / 100170 | Jun, 2011 |
| | Spectrum Analyzer | Agilent | E4407B / US39440758 | Jun, 2011 |
| X | Spectrum Analyzer | Agilent | N9010A / MY48030495 | Apr., 2011 |

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

## 5.2. Test Setup

**Conduction Power Measurement**




## 5.3. Limits

The ratio of the peak excursion of the modulation envelope (measured suing a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

## 5.4. Test Procedure

The EUT was setup to ANSI C63.4, 2009; tested to DTS test procedure of KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

## 5.5. Uncertainty

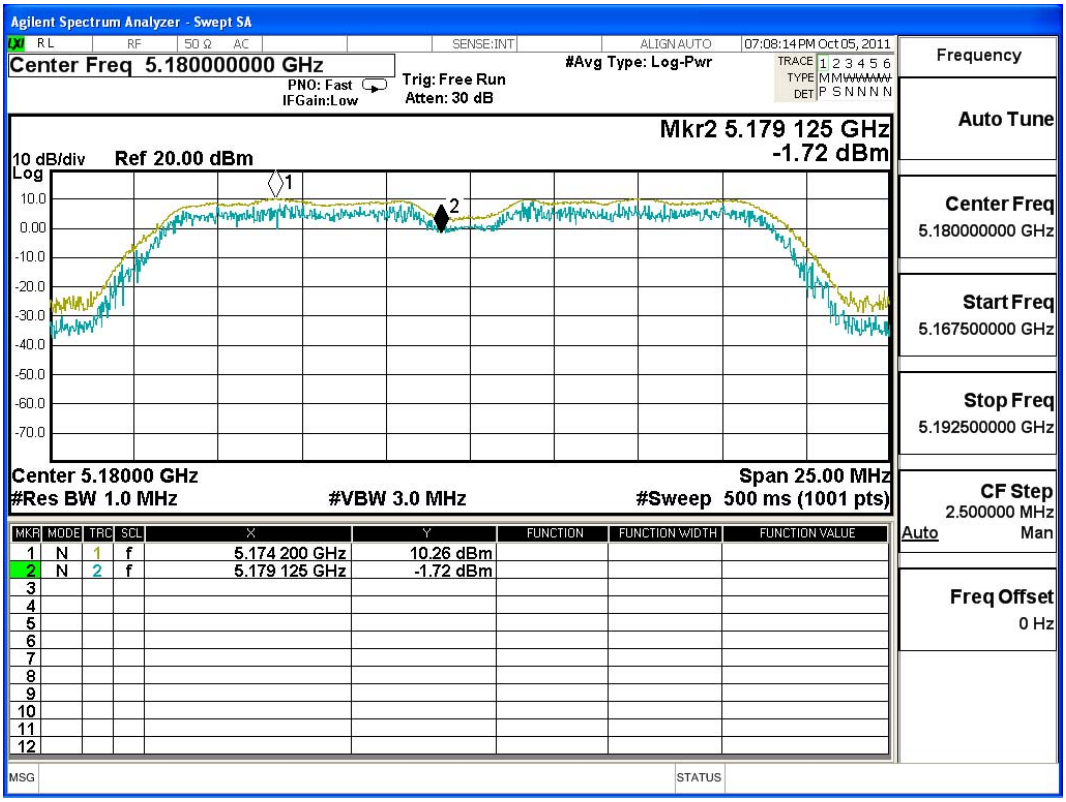
± 1.27 dB

## 5.6. Test Result of Peak Excursion

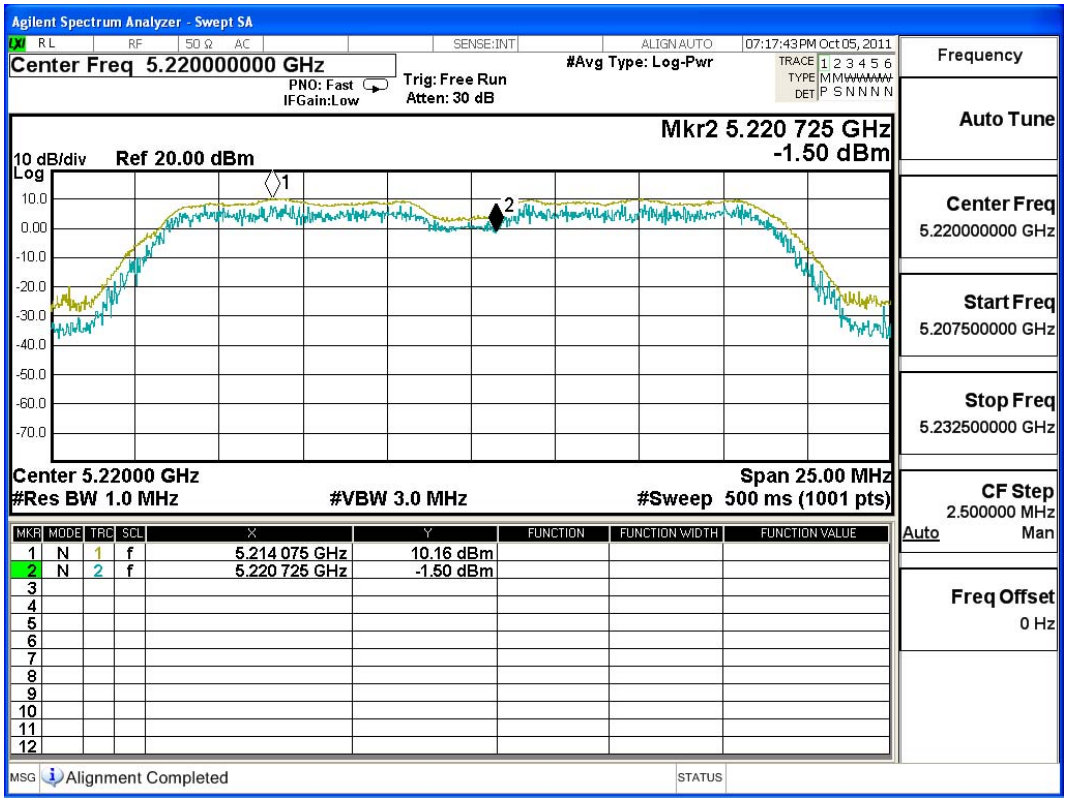
Product : WHDI Rx board
Test Item : Peak Excursion
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW

| Channel No. | Frequency (MHz) | Measurement Level (dB) | Required Limit (dB) | Result |
|---|---|---|---|---|
| 36 | 5180 | 11.980 | <13 | Pass |
| 44 | 5220 | 11.660 | <13 | Pass |
| 48 | 5240 | 12.050 | <13 | Pass |

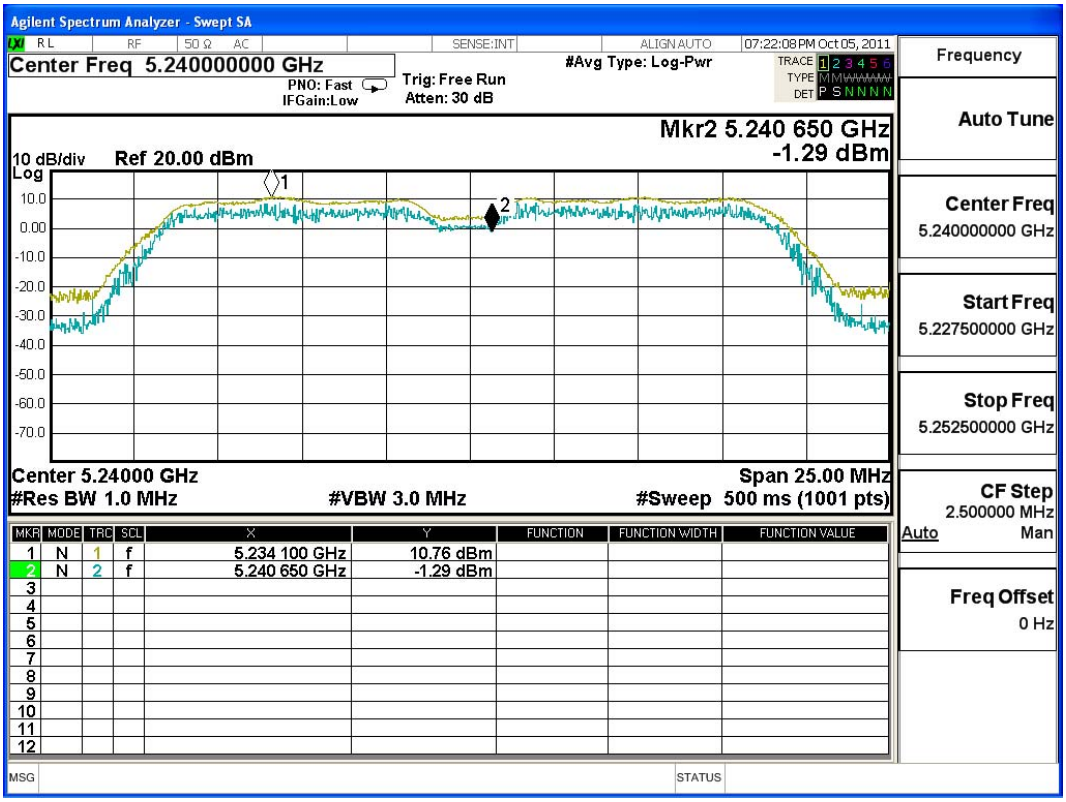
**Channel 36:**



**Channel 44:**



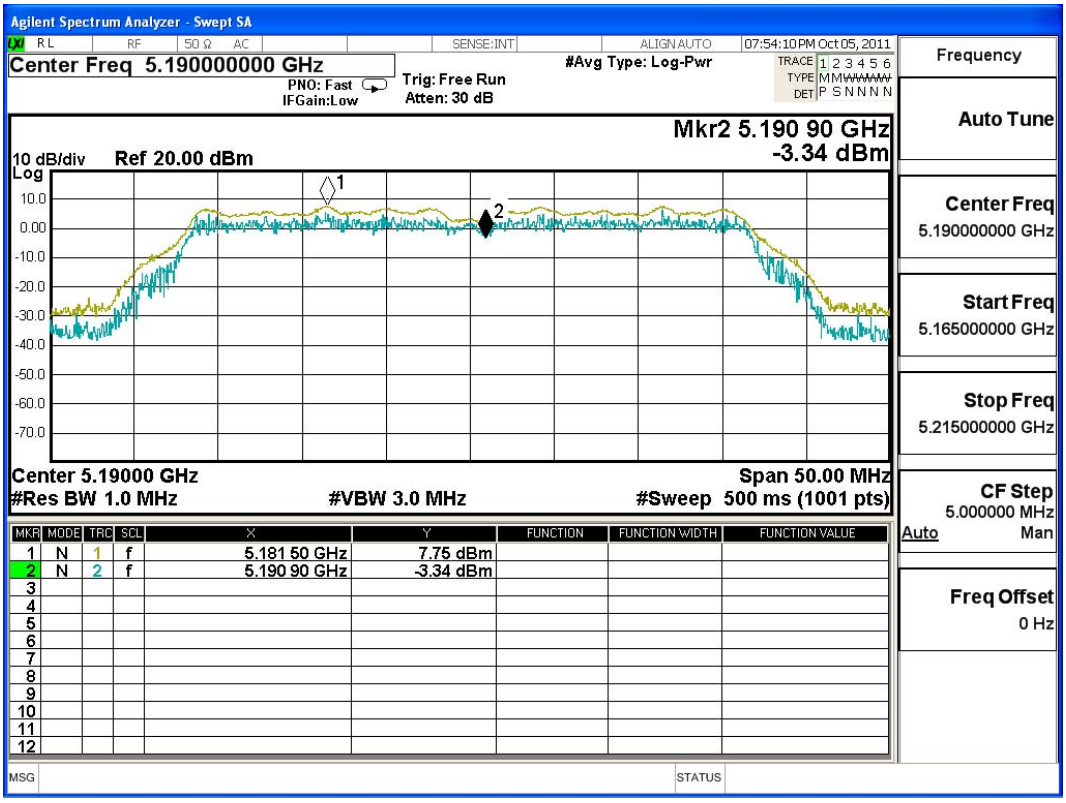

**Channel 48:**



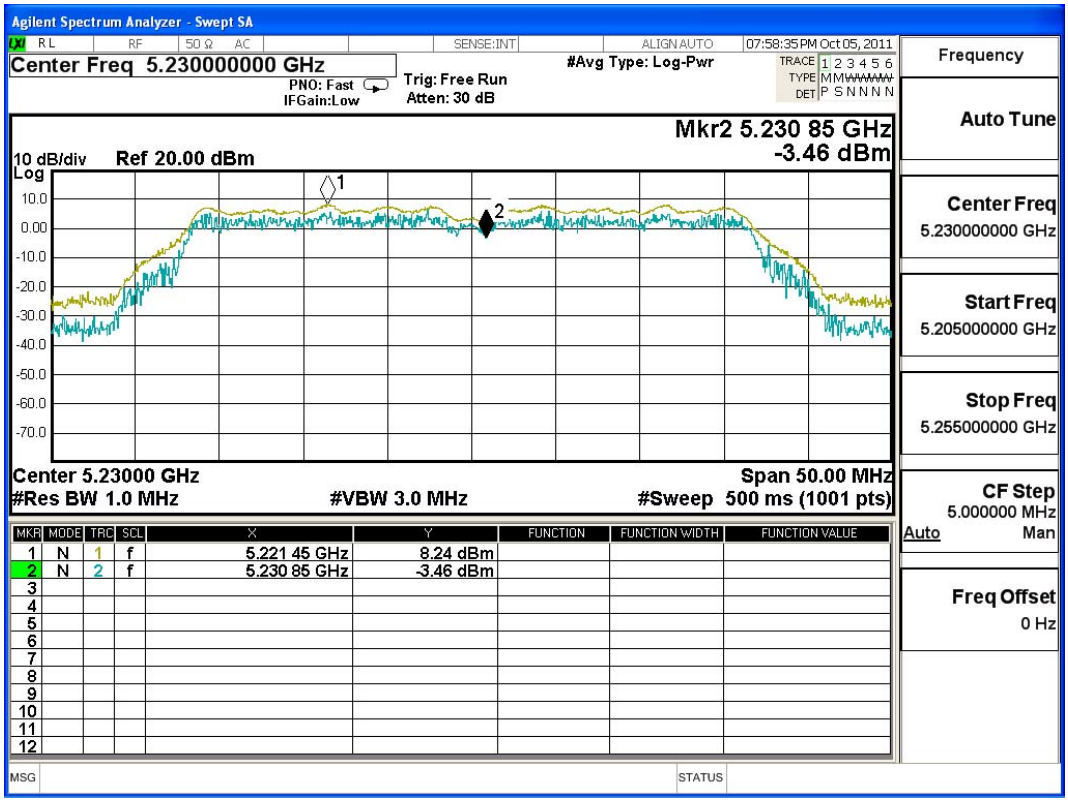
Product : WHDI Rx board
Test Item : Peak Excursion
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 40BW

| Channel No. | Frequency (MHz) | Measurement Level (dB) | Required Limit (dB) | Result |
|---|---|---|---|---|
| 38 | 5190 | 11.090 | <13 | Pass |
| 46 | 5230 | 11.700 | <13 | Pass |

**Channel 38:**



**Channel 46:**


Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
07:58:35 PM Oct 05, 2011
Center Freq 5.230000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
#Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE M M W W W W
DET P S N N N N
Mkr2 5.230 85 GHz
-3.46 dBm
10 dB/div
Log
Ref 20.00 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 5.23000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 50.00 MHz
#Sweep 500 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 5.221 45 GHz 8.24 dBm
2 N 2 f 5.230 85 GHz -3.46 dBm
3
4
5
6
7
8
9
10
11
12
MSG
STATUS
Frequency
Auto Tune
Center Freq
5.230000000 GHz
Start Freq
5.205000000 GHz
Stop Freq
5.255000000 GHz
CF Step
5.000000 MHz
Auto
Man
Freq Offset
0 Hz

# 6. Radiated Emission

## 6.1. Test Equipment

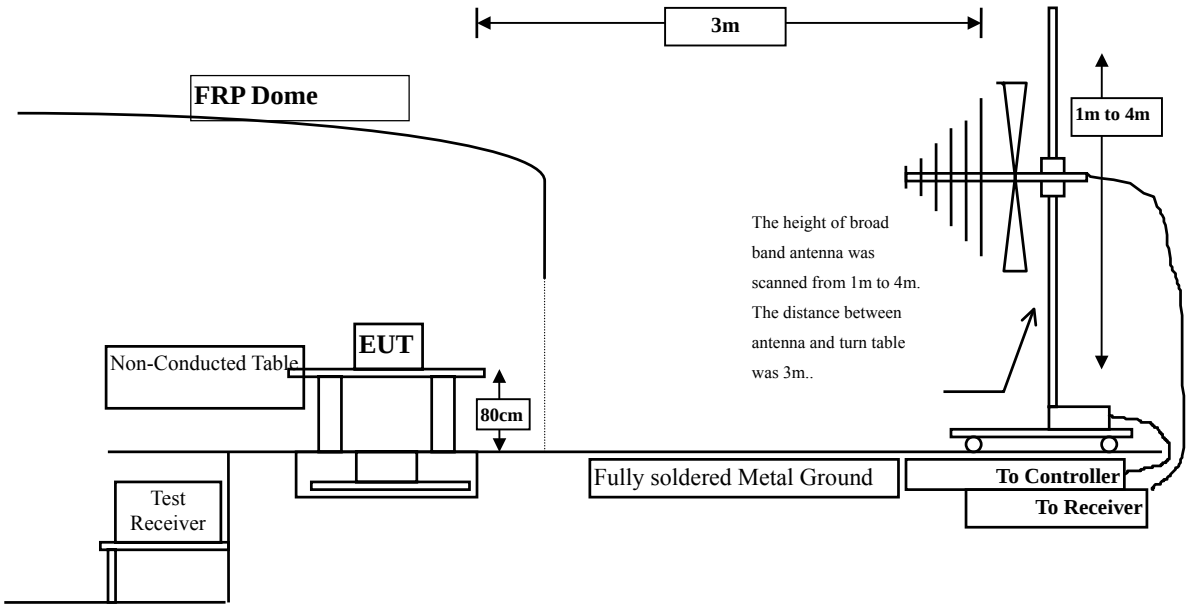
The following test equipments are used during the radiated emission test:

| Test Site | | Equipment | Manufacturer | Model No./Serial No. | Last Cal. |
|---|---|---|---|---|---|
| ☒Site # 3 | X | Bilog Antenna | Schaffner Chase | CBL6112B/2673 | Sep., 2011 |
| | X | Horn Antenna | Schwarzbeck | BBHA9120D/D305 | Sep., 2011 |
| | X | Horn Antenna | Schwarzbeck | BBHA9170/208 | Jul., 2011 |
| | X | Pre-Amplifier | QTK | QTK-AMP-03 / 0003 | May, 2011 |
| | X | Pre-Amplifier | QTK | AP-180C / CHM_0906076 | Sep., 2011 |
| | X | Pre-Amplifier | MITEQ | AMF-4D-180400-45-6P/ 925975 | Mar, 2011 |
| | X | Spectrum Analyzer | Agilent | E4407B / US39440758 | May, 2011 |
| | X | Test Receiver | R & S | ESCS 30/ 825442/018 | Sep., 2011 |
| | X | Coaxial Cable | QuieTek | QTK-CABLE/ CAB5 | Feb., 2011 |
| | X | Controller | QuieTek | QTK-CONTROLLER/ CTRL3 | N/A |
| | X | Coaxial Switch | Anritsu | MP59B/6200265729 | N/A |

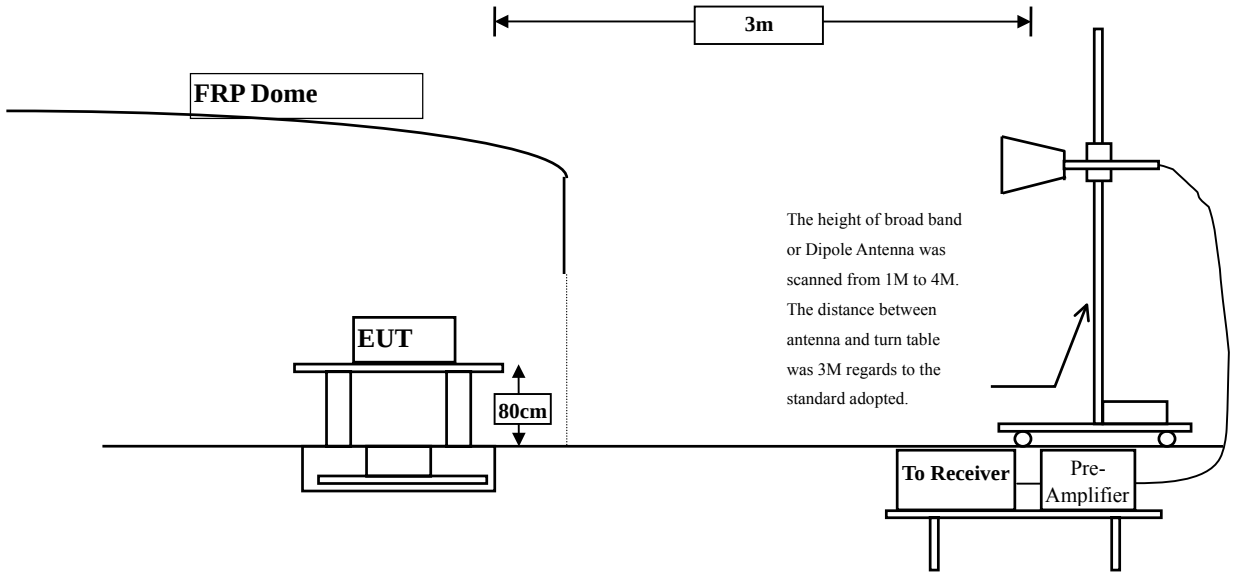
Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

## 6.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz




## 6.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

| FCC Part 15 Subpart C Paragraph 15.209(a) Limits | | |
|---|---|---|
| Frequency MHz | uV/m @3m | dBuV/m@3m |
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

Remarks: E field strength (dBuV/m) = 20 log E field strength (uV/m)

## 6.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested according to KDB-789033 test procedure for compliance to FCC 47CFR 15.407 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range form 30MHz - 10th Harmonic of fundamental was investigated.

## 6.5. Uncertainty

± 3.8 dB below 1GHz

± 3.9 dB above 1GHz

## 6.6. Test Result of Radiated Emission

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW (5180MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 10360.000 | 12.930 | 38.670 | 51.600 | -22.400 | 74.000 |
| 15540.000 | * | * | * | * | 74.000 |
| 20720.000 | * | * | * | * | 74.000 |
| 25900.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10360.000 | * | * | * | * | 54.000 |
| 15540.000 | * | * | * | * | 54.000 |
| 20720.000 | * | * | * | * | 54.000 |
| 25900.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW (5180MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 10360.000 | 13.724 | 41.820 | 55.544 | -18.456 | 74.000 |
| 15540.000 | * | * | * | * | 74.000 |
| 20720.000 | * | * | * | * | 74.000 |
| 25900.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10360.000 | 13.724 | 36.940 | 50.664 | -3.336 | 54.000 |
| 15540.000 | * | * | * | * | 54.000 |
| 20720.000 | * | * | * | * | 54.000 |
| 25900.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW (5220MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 10440.000 | 13.322 | 38.080 | 51.402 | -22.598 | 74.000 |
| 15660.000 | * | * | * | * | 74.000 |
| 20880.000 | * | * | * | * | 74.000 |
| 26100.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10440.000 | * | * | * | * | 54.000 |
| 15660.000 | * | * | * | * | 54.000 |
| 20880.000 | * | * | * | * | 54.000 |
| 26100.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW (5220MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 10440.000 | 14.245 | 41.250 | 55.495 | -18.505 | 74.000 |
| 15660.000 | * | * | * | * | 74.000 |
| 20880.000 | * | * | * | * | 74.000 |
| 26100.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10440.000 | 14.245 | 35.830 | 50.075 | -3.925 | 54.000 |
| 15660.000 | * | * | * | * | 54.000 |
| 20880.000 | * | * | * | * | 54.000 |
| 26100.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW (5240MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 10480.000 | 13.693 | 38.420 | 52.114 | -21.886 | 74.000 |
| 15720.000 | * | * | * | * | 74.000 |
| 20960.000 | * | * | * | * | 74.000 |
| 26200.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10480.000 | * | * | * | * | 54.000 |
| 15720.000 | * | * | * | * | 54.000 |
| 20960.000 | * | * | * | * | 54.000 |
| 26200.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW (5240MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 10480.000 | 14.620 | 41.490 | 56.111 | -17.889 | 74.000 |
| 15720.000 | * | * | * | * | 74.000 |
| 20960.000 | * | * | * | * | 74.000 |
| 26200.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10480.000 | 14.620 | 36.540 | 51.161 | -2.839 | 54.000 |
| 15720.000 | * | * | * | * | 54.000 |
| 20960.000 | * | * | * | * | 54.000 |
| 26200.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 40BW (5190MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 10380.000 | 12.939 | 38.400 | 51.339 | -22.661 | 74.000 |
| 15570.000 | * | * | * | * | 74.000 |
| 20760.000 | * | * | * | * | 74.000 |
| 25950.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10380.000 | * | * | * | * | 54.000 |
| 15570.000 | * | * | * | * | 54.000 |
| 20760.000 | * | * | * | * | 54.000 |
| 25950.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 40BW (5190MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 10380.000 | 13.796 | 42.290 | 56.086 | -17.914 | 74.000 |
| 15570.000 | * | * | * | * | 74.000 |
| 20760.000 | * | * | * | * | 74.000 |
| 25950.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10380.000 | 13.796 | 37.520 | 51.316 | -2.684 | 54.000 |
| 15570.000 | * | * | * | * | 54.000 |
| 20760.000 | * | * | * | * | 54.000 |
| 25950.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 40BW (5230MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Horizontal** | | | | | |
| **Peak Detector:** | | | | | |
| 10460.000 | 13.508 | 37.610 | 51.118 | -22.882 | 74.000 |
| 15690.000 | * | * | * | * | 74.000 |
| 20920.000 | * | * | * | * | 74.000 |
| 26150.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10460.000 | * | * | * | * | 54.000 |
| 15690.000 | * | * | * | * | 54.000 |
| 20920.000 | * | * | * | * | 54.000 |
| 26150.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 40BW (5230MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Vertical** | | | | | |
| **Peak Detector:** | | | | | |
| 10460.000 | 14.433 | 39.210 | 53.643 | -20.357 | 74.000 |
| 15690.000 | * | * | * | * | 74.000 |
| 20920.000 | * | * | * | * | 74.000 |
| 26150.000 | * | * | * | * | 74.000 |
| **Average Detector:** | | | | | |
| 10460.000 | * | * | * | * | 54.000 |
| 15690.000 | * | * | * | * | 54.000 |
| 20920.000 | * | * | * | * | 54.000 |
| 26150.000 | * | * | * | * | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW (5220MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Horizontal** | | | | | |
| **Peak Detector** | | | | | |
| 39.700 | -3.625 | 32.810 | 29.185 | -10.815 | 40.000 |
| 295.780 | -4.747 | 32.378 | 27.631 | -18.369 | 46.000 |
| 445.160 | -0.432 | 35.342 | 34.910 | -11.090 | 46.000 |
| 594.540 | 3.555 | 33.992 | 37.547 | -8.453 | 46.000 |
| 741.980 | 3.892 | 34.222 | 38.114 | -7.886 | 46.000 |
| 891.360 | 6.265 | 35.202 | 41.467 | -4.533 | 46.000 |
| **Vertical** | | | | | |
| **Peak Detector** | | | | | |
| 43.580 | -10.919 | 36.688 | 25.769 | -14.231 | 40.000 |
| 295.780 | -4.687 | 32.878 | 28.191 | -17.809 | 46.000 |
| 445.160 | -6.402 | 41.023 | 34.621 | -11.379 | 46.000 |
| 594.540 | 0.175 | 37.538 | 37.714 | -8.286 | 46.000 |
| 743.920 | 0.718 | 33.543 | 34.261 | -11.739 | 46.000 |
| 891.360 | 0.905 | 36.282 | 37.188 | -8.812 | 46.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : WHDI Rx board
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 40BW (5190MHz)

| Frequency | Correct Factor | Reading Level | Measurement Level | Margin | Limit |
|---|---|---|---|---|---|
| MHz | dB | dBuV | dBuV/m | dB | dBuV/m |
| **Horizontal** | | | | | |
| **Peak Detector** | | | | | |
| 41.640 | -6.175 | 36.640 | 30.466 | -9.534 | 40.000 |
| 295.780 | -4.747 | 31.971 | 27.224 | -18.776 | 46.000 |
| 445.160 | -0.432 | 35.744 | 35.312 | -10.688 | 46.000 |
| 594.540 | 3.555 | 34.738 | 38.294 | -7.706 | 46.000 |
| 743.920 | 3.898 | 33.369 | 37.267 | -8.733 | 46.000 |
| 891.360 | 6.265 | 35.141 | 41.407 | -4.593 | 46.000 |
| **Vertical** | | | | | |
| **Peak Detector** | | | | | |
| 148.340 | -5.406 | 32.657 | 27.252 | -16.248 | 43.500 |
| 295.780 | -4.687 | 31.971 | 27.284 | -18.716 | 46.000 |
| 445.160 | -6.402 | 38.244 | 31.842 | -14.158 | 46.000 |
| 594.540 | 0.175 | 37.038 | 37.214 | -8.786 | 46.000 |
| 743.920 | 0.718 | 33.369 | 34.087 | -11.913 | 46.000 |
| 891.360 | 0.905 | 36.241 | 37.147 | -8.853 | 46.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

# 7. Band Edge

## 7.1. Test Equipment

### RF Conducted Measurement

The following test equipments are used during the band edge tests:

| | Equipment | Manufacturer | Model No./Serial No. | Last Cal. |
|---|---|---|---|---|
| | Spectrum Analyzer | R&S | FSP40 / 100170 | Jun, 2011 |
| | Spectrum Analyzer | Agilent | E4407B / US39440758 | Jun, 2011 |
| X | Spectrum Analyzer | Agilent | N9010A / MY48030495 | Apr., 2011 |

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

### RF Radiated Measurement:

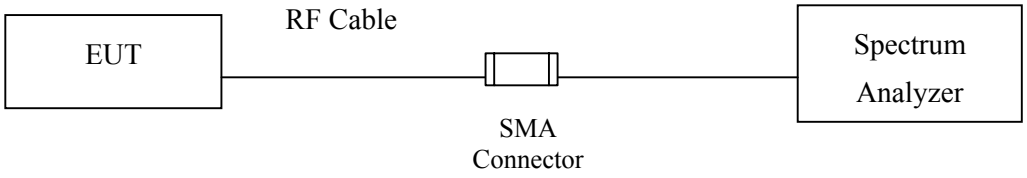
The following test equipments are used during the band edge tests:

| Test Site | | Equipment | Manufacturer | Model No./Serial No. | Last Cal. |
|---|---|---|---|---|---|
| ☒Site # 3 | | Bilog Antenna | Schaffner Chase | CBL6112B/2673 | Sep., 2011 |
| | X | Horn Antenna | Schwarzbeck | BBHA9120D/D305 | Sep., 2011 |
| | | Horn Antenna | Schwarzbeck | BBHA9170/208 | Jul., 2011 |
| | | Pre-Amplifier | QTK | QTK-AMP-03 / 0003 | May, 2011 |
| | X | Pre-Amplifier | QTK | AP-180C / CHM_0906076 | Sep., 2011 |
| | | Pre-Amplifier | MITEQ | AMF-4D-180400-45-6P/ 925975 | Mar, 2011 |
| | X | Spectrum Analyzer | Agilent | E4407B / US39440758 | May, 2011 |
| | | Test Receiver | R & S | ESCS 30/ 825442/018 | Sep., 2011 |
| | X | Coaxial Cable | QuieTek | QTK-CABLE/ CAB5 | Feb., 2011 |
| | X | Controller | QuieTek | QTK-CONTROLLER/ CTRL3 | N/A |
| | X | Coaxial Switch | Anritsu | MP59B/6200265729 | N/A |

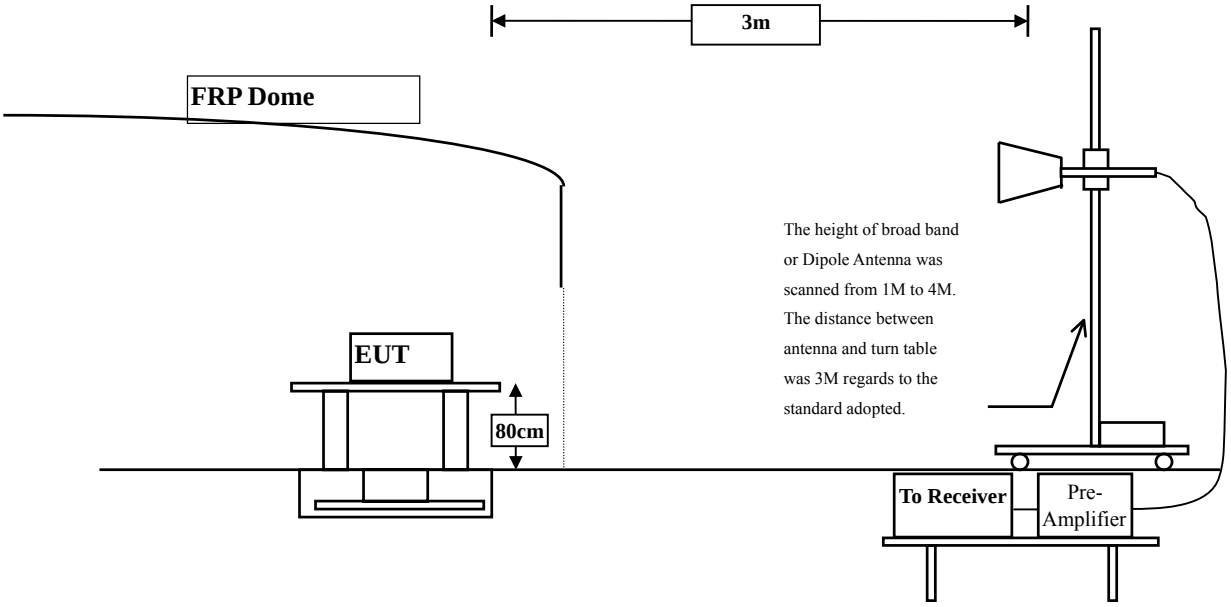
Note: 1. All instruments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

## 7.2. Test Setup

### RF Conducted Measurement




### RF Radiated Measurement:



## 7.3. Limits

The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

Radiated emissions which fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209:

| FCC Part 15 Subpart C Paragraph 15.209 Limits | | |
|---|---|---|
| Frequency MHz | uV/m @3m | dBuV/m@3m |
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

## 7.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2009 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz.

The EUT was setup to ANSI C63.4, 2009; tested to UNII test procedure of KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

## 7.5. Uncertainty

± 3.8 dB below 1GHz

± 3.9 dB above 1GHz

## 7.6. Test Result of Band Edge

Product : WHDI Rx board
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW -Channel 36

Fundamental Filed Strength

| Antenna Pole | Frequency [MHz] | Reading Level [dBuV] | Correction Factor [dB/m] | Emission Level [dBuV/m] | Detector |
|---|---|---|---|---|---|
| Horizontal | 5180 | 34.966 | 65.28 | 100.246 | Peak |
| Horizontal | 5180 | 34.966 | 53.583 | 88.549 | Average |
| Vertical | 5180 | 37.073 | 61.64 | 98.714 | Peak |
| Vertical | 5180 | 37.073 | 49.11 | 86.184 | Average |

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

| Antenna Pole | Test Frequency (MHz) | Fundamental (dBuV/m) | Δ (dB) | Band Edge Field Strength (dBuV/m) | Requiqment Limit (dBuV/m) | Detector |
|---|---|---|---|---|---|---|
| Horizontal | 5148.9 | 100.246 | 38.668 | 61.578 | 74.000 | Peak |
| Horizontal | 5148.2 | 88.549 | 50.259 | 38.29 | 54.000 | Average |
| Vertical | 5148.9 | 98.714 | 38.668 | 60.046 | 74.000 | Peak |
| Vertical | 5148.2 | 86.184 | 50.259 | 35.925 | 54.000 | Average |

Note:

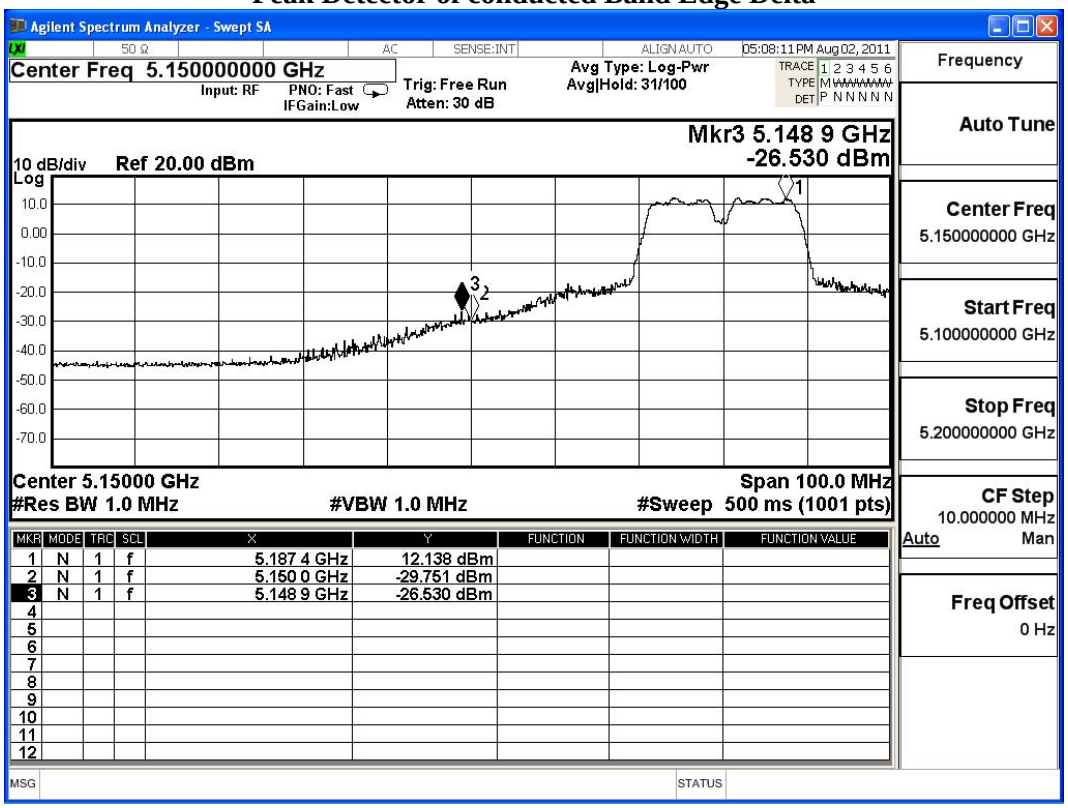
The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

Band Edge field Strength = F - Δ

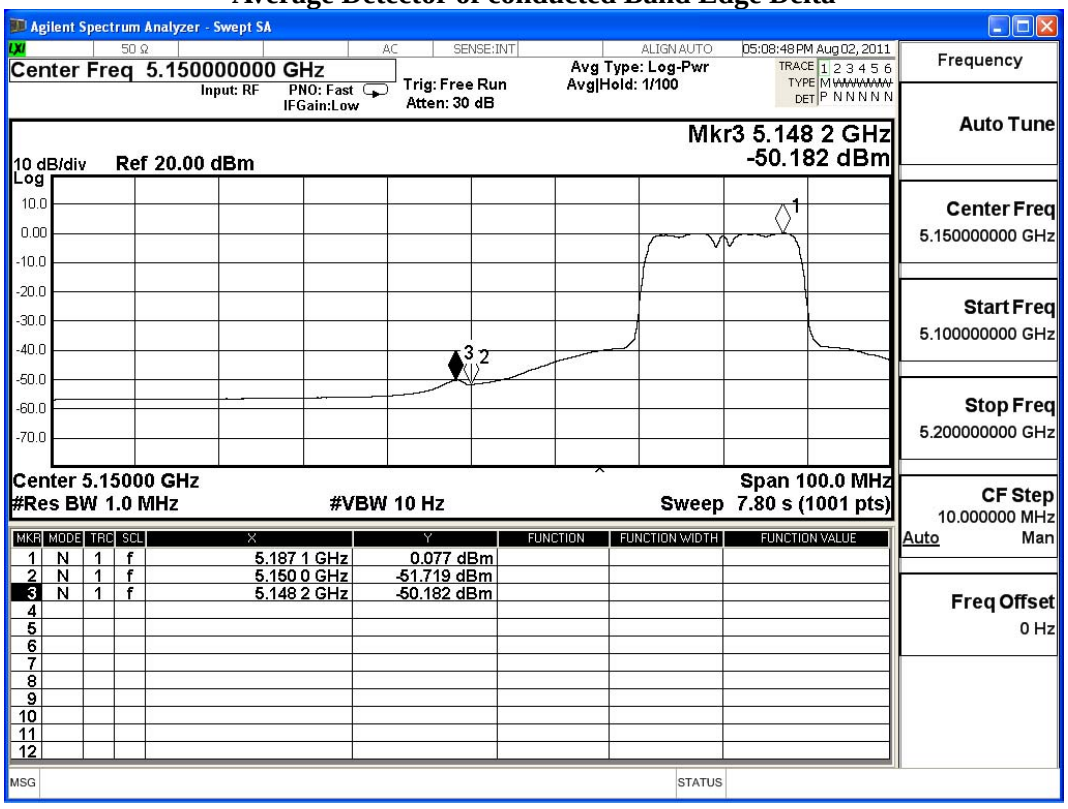
F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

**Peak Detector of conducted Band Edge Delta**



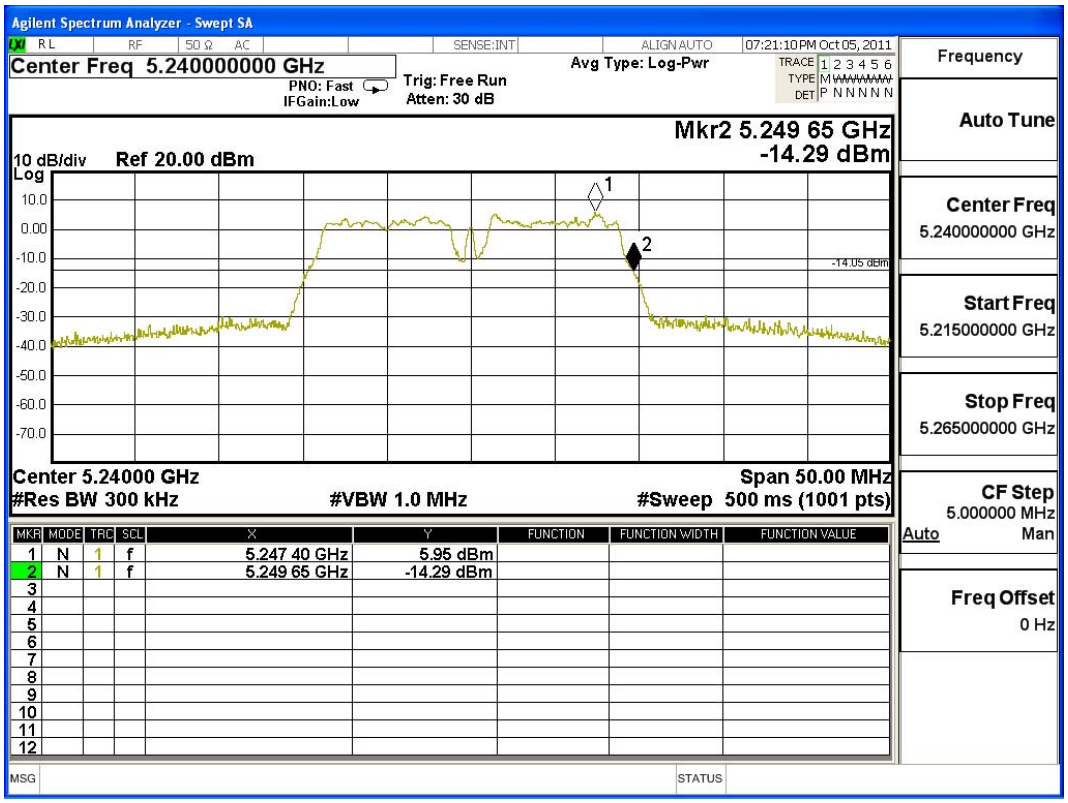

**Average Detector of conducted Band Edge Delta**



Product : WHDI Rx board
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW-Channel 48

| Test Frequency (MHz) | Measurement Level (20dB BW) (MHz) | Limit (MHz) | Result |
|---|---|---|---|
| 5240 | 5249.65 | <5250 | PASS |

NOTE: Accordance with 15.215 requirement.



Product : WHDI Rx board
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 40BW -Channel 38

Fundamental Filed Strength

| Antenna Pole | Frequency [MHz] | Reading Level [dBuV] | Correction Factor [dB/m] | Emission Level [dBuV/m] | Detector |
|---|---|---|---|---|---|
| Horizontal | 5190 | 34.907 | 63.98 | 98.888 | Peak |
| Horizontal | 5190 | 34.907 | 53.37 | 88.278 | Average |
| Vertical | 5190 | 37.077 | 59.53 | 96.608 | Peak |
| Vertical | 5190 | 37.077 | 50.55 | 87.628 | Average |

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=30Hz

Band Edge Test Data

| Antenna Pole | Test Frequency (MHz) | Fundamental (dBuV/m) | Δ (dB) | Band Edge Field Strength (dBuV/m) | Requiqment Limit (dBuV/m) | Detector |
|---|---|---|---|---|---|---|
| Horizontal | 5150 | 98.888 | 36.115 | 62.773 | 74.000 | Peak |
| Horizontal | 5150 | 88.278 | 46.528 | 41.75 | 54.000 | Average |
| Vertical | 5150 | 96.608 | 36.115 | 60.493 | 74.000 | Peak |
| Vertical | 5150 | 87.628 | 46.528 | 41.1 | 54.000 | Average |

Note:

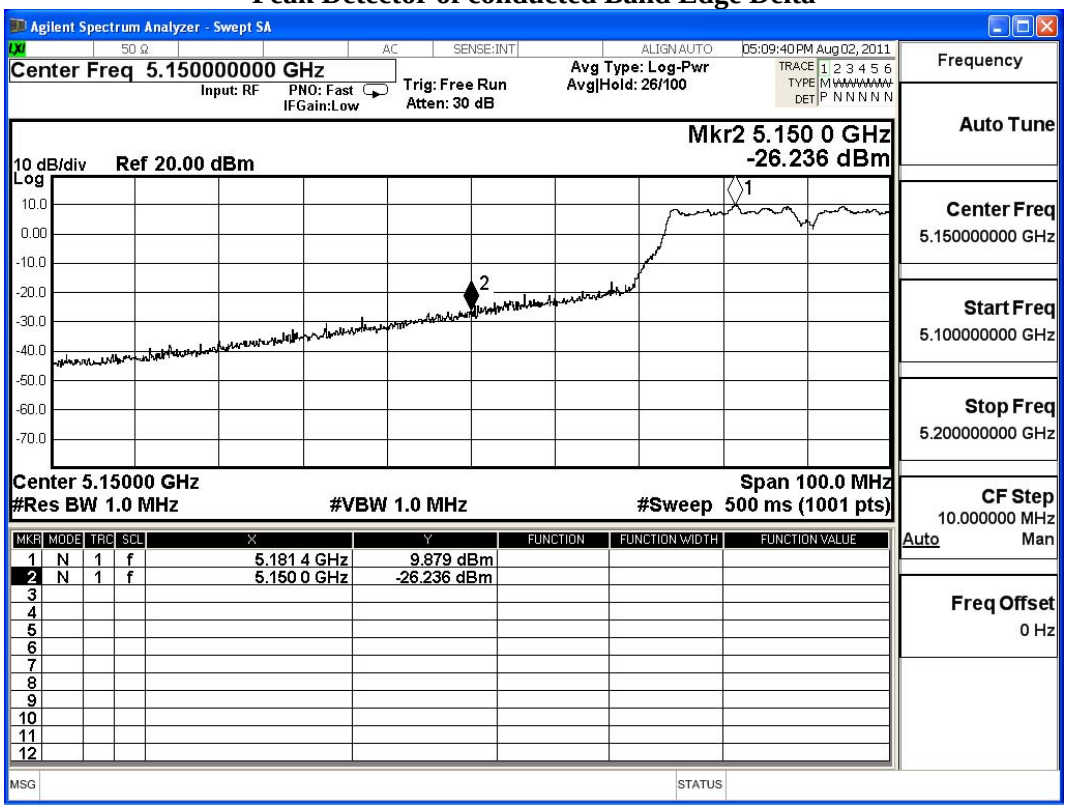
The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

Band Edge field Strength = F - Δ

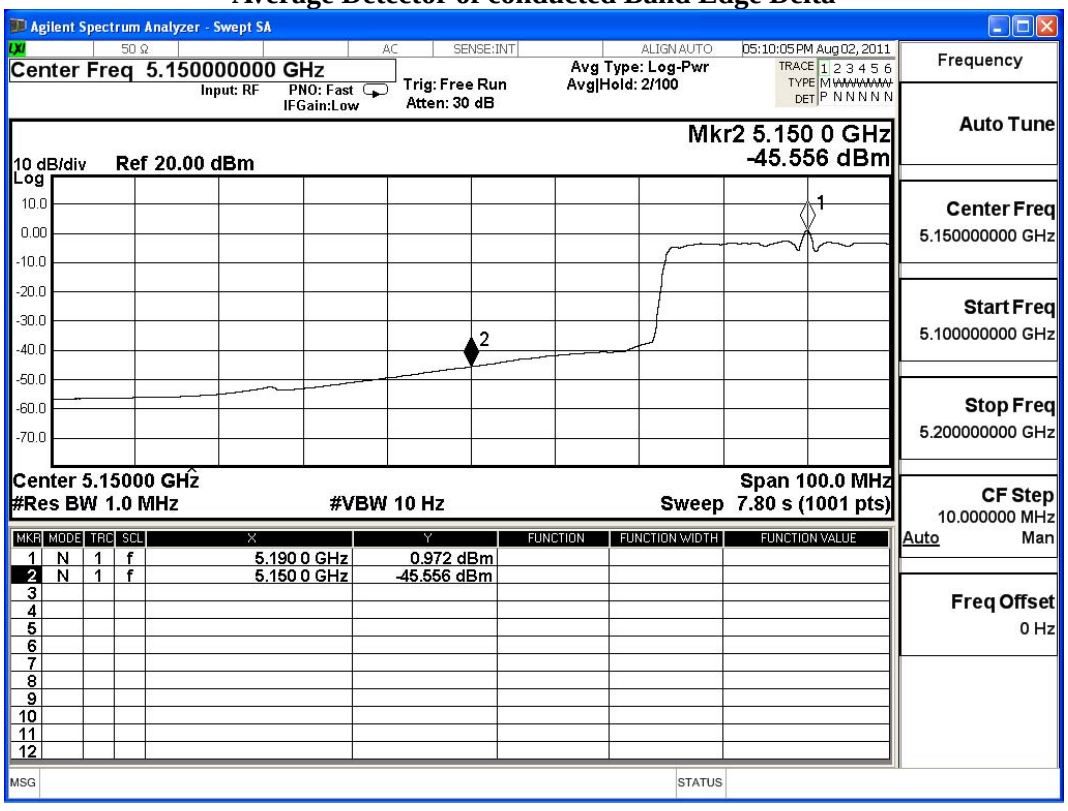
F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

## Peak Detector of conducted Band Edge Delta



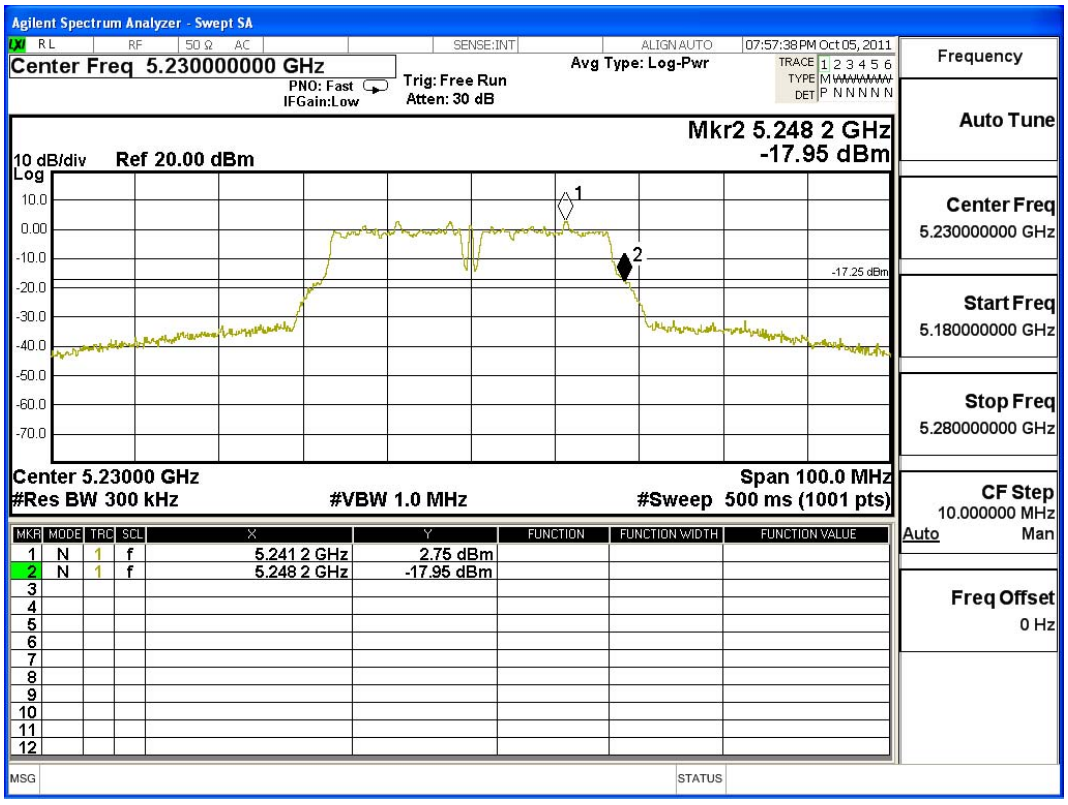

## Average Detector of conducted Band Edge Delta



Product : WHDI Rx board
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 20BW-Channel 48

| Test Frequency (MHz) | Measurement Level (20dB BW) (MHz) | Limit (MHz) | Result |
|---|---|---|---|
| 5230 | 5248.20 | <5250 | PASS |

NOTE: Accordance with 15.215 requirement.



# 8. Frequency Stability

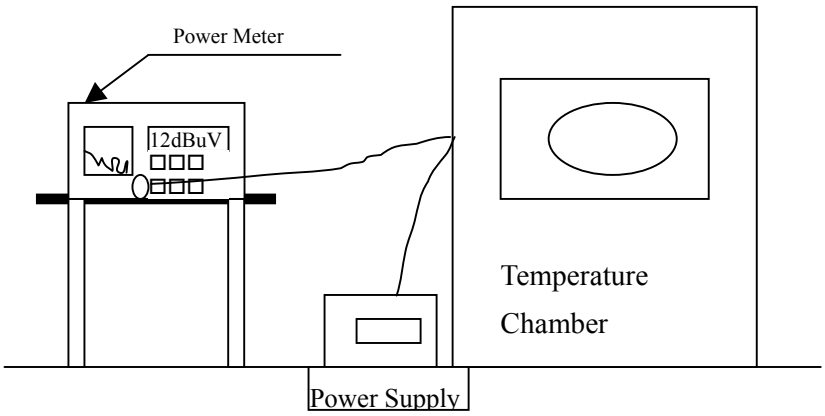
## 8.1. Test Equipment

| | Equipment | Manufacturer | Model No./Serial No. | Last Cal. |
|---|---|---|---|---|
| | Spectrum Analyzer | R&S | FSP40 / 100170 | Jun, 2011 |
| | Spectrum Analyzer | Agilent | E4407B / US39440758 | Jun, 2011 |
| X | Spectrum Analyzer | Agilent | N9010A / MY48030495 | Apr., 2011 |

Note:

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

## 8.2. Test Setup




## 8.3. Limits

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified

## 8.4. Test Procedure

The EUT was setup to ANSI C63.4, 2009; tested to DTS test procedure of KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

## 8.5. Uncertainty

± 150 Hz

## 8.6. Test Result of Frequency Stability

Product : WHDI Rx board
Test Item : Frequency Stability
Test Site : Temperature Chamber
Test Mode : Carrier Wave

| Test Conditions | | Channel | Frequency (MHz) | Frequency (MHz) | △F (MHz) |
|---|---|---|---|---|---|
| Tnom (20) °C | Vnom (110)V | 36 | 5180.0000 | 5180.0011 | -0.0011 |
| | | 38 | 5190.0000 | 5190.0009 | -0.0009 |
| | | 44 | 5220.0000 | 5220.0013 | -0.0013 |
| | | 46 | 5230.0000 | 5230.0009 | -0.0009 |
| | | 48 | 5240.0000 | 5240.0008 | -0.0008 |
| Test Conditions | | Channel | Frequency (MHz) | Frequency (MHz) | △F (MHz) |
| Tmax (50) °C | Vmax (126.5)V | 36 | 5180.0000 | 5180.0012 | -0.0012 |
| | | 38 | 5190.0000 | 5190.0009 | -0.0009 |
| | | 44 | 5220.0000 | 5220.0013 | -0.0013 |
| | | 46 | 5230.0000 | 5230.0010 | -0.0010 |
| | | 48 | 5240.0000 | 5240.0008 | -0.0008 |
| Test Conditions | | Channel | Frequency (MHz) | Frequency (MHz) | △F (MHz) |
| Tmax (50) °C | Vmin (93.5)V | 36 | 5180.0000 | 5180.0012 | -0.0012 |
| | | 38 | 5190.0000 | 5190.0009 | -0.0009 |
| | | 44 | 5220.0000 | 5220.0013 | -0.0013 |
| | | 46 | 5230.0000 | 5230.0010 | -0.0010 |
| | | 48 | 5240.0000 | 5240.0008 | -0.0008 |

| Test Conditions | | Channel | Frequency (MHz) | Frequency (MHz) | △F (MHz) |
|---|---|---|---|---|---|
| Tmin (0) °C | Vmax (126.5)V | 36 | 5180.0000 | 5180.0012 | -0.0012 |
| | | 38 | 5190.0000 | 5190.0010 | -0.0010 |
| | | 44 | 5220.0000 | 5220.0013 | -0.0013 |
| | | 46 | 5230.0000 | 5230.0009 | -0.0009 |
| | | 48 | 5240.0000 | 5240.0008 | -0.0008 |
| Test Conditions | | Channel | Frequency (MHz) | Frequency (MHz) | △F (MHz) |
| Tmin (0) °C | Vmin (93.5)V | 36 | 5180.0000 | 5180.0012 | -0.0012 |
| | | 38 | 5190.0000 | 5190.0010 | -0.0010 |
| | | 44 | 5220.0000 | 5220.0013 | -0.0013 |
| | | 46 | 5230.0000 | 5230.0009 | -0.0009 |
| | | 48 | 5240.0000 | 5240.0008 | -0.0008 |

## 9. EMI Reduction Method During Compliance Testing

No modification was made during testing.

# Attachment 1: EUT Test Photographs

# Attachment 2: EUT Detailed Photographs