**FCC CFR47 PART 15 SUBPART C**
**INDUSTRY CANADA RSS-210 ISSUE 8**

# CERTIFICATION TEST REPORT

**FOR**

**802.11a/b/g/n WLAN + Bluetooth PCI-E Custom Combination Card**

**MODEL NUMBER: BCM94331CD**

**FCC ID: QDS-BRCM1064**
**IC: 4324A-BRCM1064**

**REPORT NUMBER: 12U14227-5, Revision A**

**ISSUE DATE: JUNE 04, 2012**

*Prepared for*
**BROADCOM CORPORATION**
**190 MATHILDA PLACE**
**SUNNYVALE, CA 94086, U.S.A.**

*Prepared by*
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NVLAP LAB CODE 200065-0

## Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| -- | 05/30/12 | Initial Issue | F. Ibrahim |
| A | 06/04/12 | Revised sections 5.2, 7.1 and 7.6 | F. Ibrahim |

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** BROADCOM CORPORATION
190 MATHILDA PLACE
SUNNYVALE, CA 94086, USA

**EUT DESCRIPTION:** 802.11a/b/g/n WLAN + Bluetooth PCI-E Custom Combination Card

**MODEL:** BCM94331CD

**SERIAL NUMBER:** C8Y2104004NDRJVE4 (P508)

**DATE TESTED:** MAY 01 - MAY 9, 2012

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| CFR 47 Part 15 Subpart C | Pass |
| INDUSTRY CANADA RSS-210 Issue 8 Annex 8 | Pass |
| INDUSTRY CANADA RSS-GEN Issue 3 | Pass |

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

FRANK IBRAHIM
EMC SUPERVISOR
UL CCS

Tested By:

DAVID GARCIA
EMC ENGINEER
UL CCS

# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

# 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

## 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

## 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER | UNCERTAINTY |
|---|---|
| Conducted Disturbance, 0.15 to 30 MHz | 3.52 dB |
| Radiated Disturbance, 30 to 1000 MHz | 4.94 dB |

Uncertainty figures are valid to a confidence level of 95%.

# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n WLAN + Bluetooth PCI-E Custom Combination Card.

The radio module is manufactured by Broadcom.

## 5.1. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| 2402 - 2480 | Low Energy BLE | 7.78 | 6.00 |

## 5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an 802.11bgn WLAN and Bluetooth antenna with a maximum gain of 4.8dBi.

**Note:** This antenna was connected during radiated emissions testing. Part number is (604-3215).

## 5.3. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom Bluetooth Version 1.5.2

The test utility software used during testing was Bluetool, ver. 1.5.2.8.

## 5.4. WORST-CASE CONFIGURATION AND MODE

The EUT was tested as an external module installed in a test jig board connected to a host Laptop PC.

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

## 5.5. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Description | Manufacturer | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| Laptop | Lenovo | G560 | CBU4495773 | DoC |
| AC Adapter | Lenovo | ADP-65KH B | 11S36001646ZZ10011FKEZ | DoC |
| Adapter Board | Catalyst | MINI2EXP | JUAN 02 | N/A |
| Adapter Board | Broadcom | BCM94331CSMFG | 1458923 | N/A |

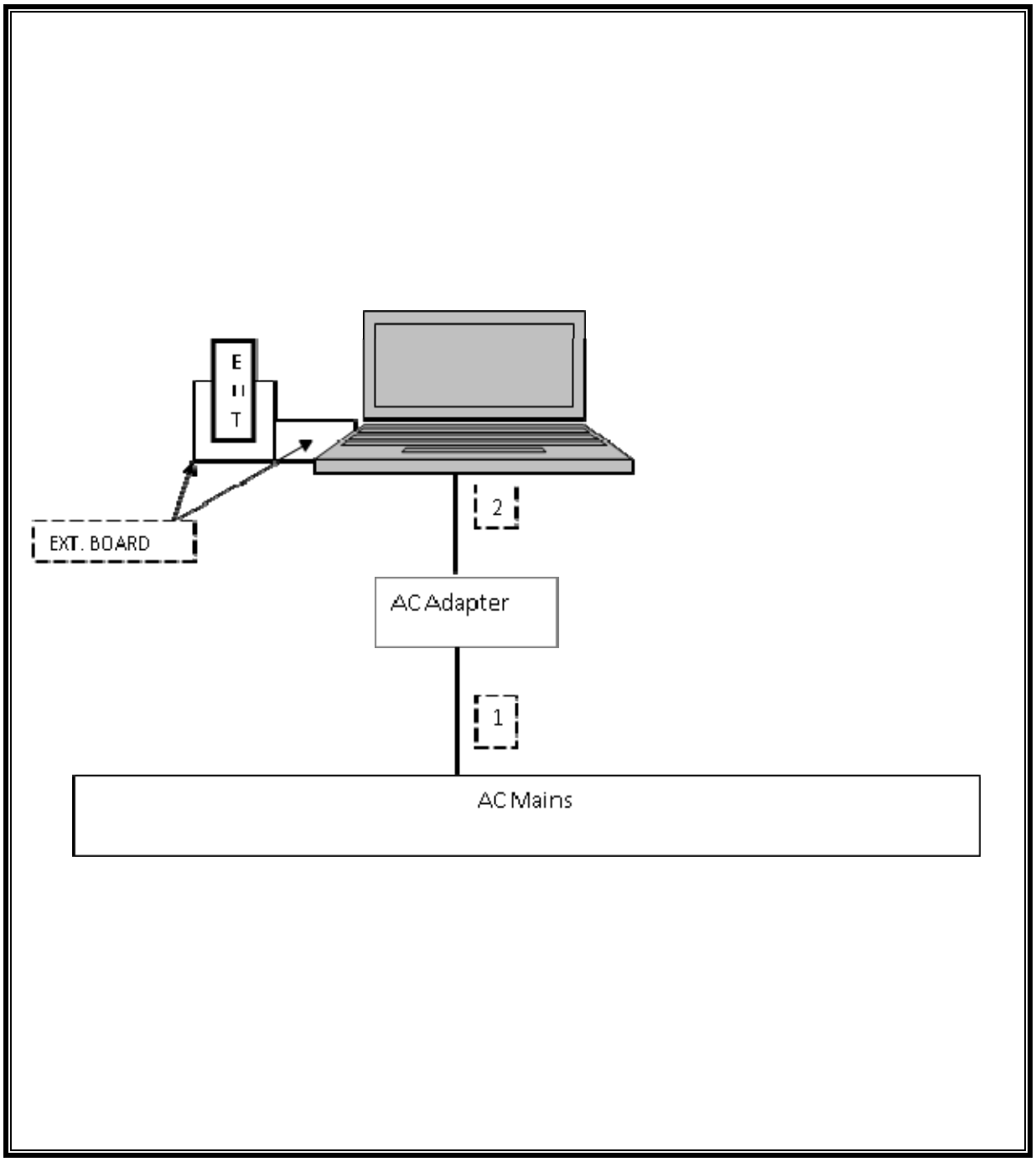
**I/O CABLES**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| Cable No | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1 | AC | 1 | US 115V | Un-Shielded | 1m | NA |
| 2 | DC | 1 | DC | Un-Shielded | 1.8m | Ferrite at laptop's end |

**TEST SETUP**

The EUT is attached to a jig board which is installed in the PCMCI slot of a host laptop computer during the tests. Test software exercised the radio card.

**SETUP DIAGRAM FOR TESTS**



# 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| Test Equipment List | | | | | |
|---|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Asset** | **Cal Date** | **Cal Due** |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01012 | 09/02/11 | 09/02/12 |
| Spectrum Analyzer, 26.5 GHz | Agilent / HP | E4440A | C01176 | 08/04/11 | 08/04/12 |
| EMI Test Receiver, 9 kHz-7 GHz | R & S | ESCI 7 | 1000741 | 07/06/11 | 07/06/12 |
| EMI Test Receiver, 30 MHz | R & S | ESHS 20 | N02396 | 08/19/11 | 08/19/13 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00872 | 09/20/11 | 09/20/12 |
| Antenna, Bilog, 30MHz-1 GHz | Sunol Sciences | JB1 | C01171 | 01/26/12 | 01/26/13 |
| Antenna, Horn, 26.5 GHz | ARA | MWH-1826/B | C00589 | 07/28/11 | 07/28/12 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C00749 | 07/18/11 | 07/18/12 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00558 | 11/11/11 | 11/11/12 |
| LISN, 30 MHz | FCC | 50/250-25-2 | C00626 | 12/13/11 | 12/13/12 |

# 7. ANTENNA PORT TEST RESULTS

## 7.1. 6 dB BANDWIDTH

**LIMITS**

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

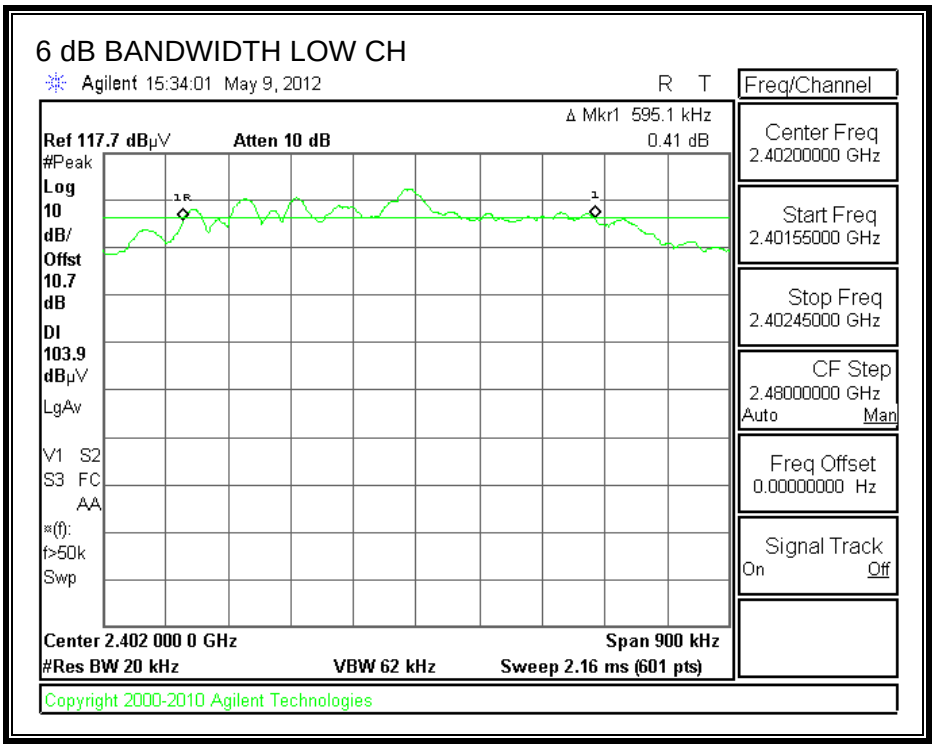
**TEST PROCEDURE**

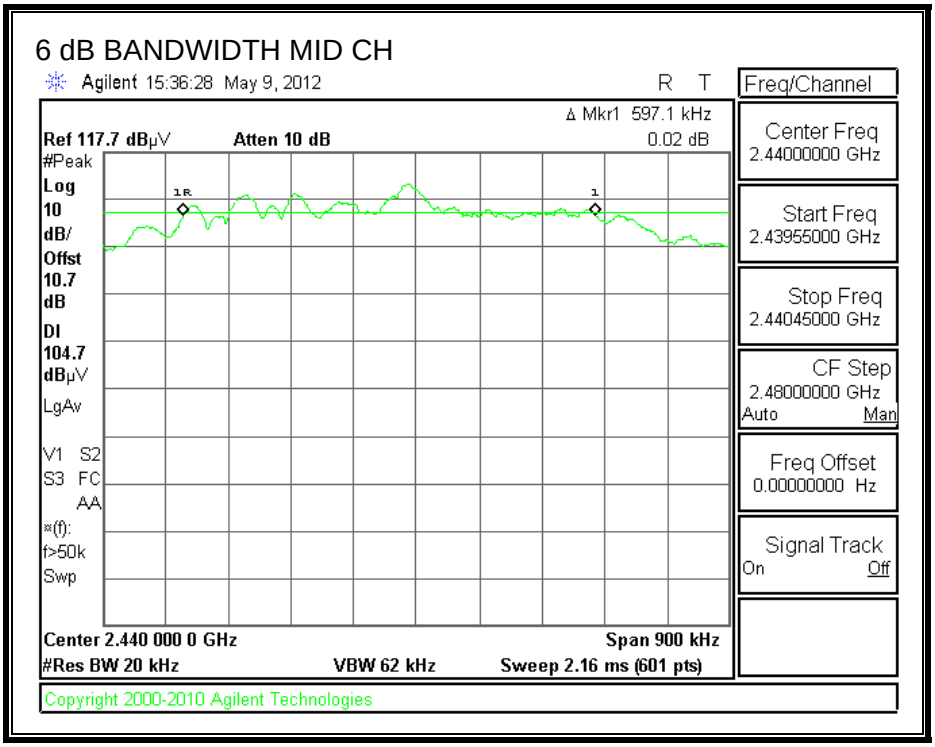
KDB 558074 D01 DTS Measurement Guidance V01 dated 01-18-12.

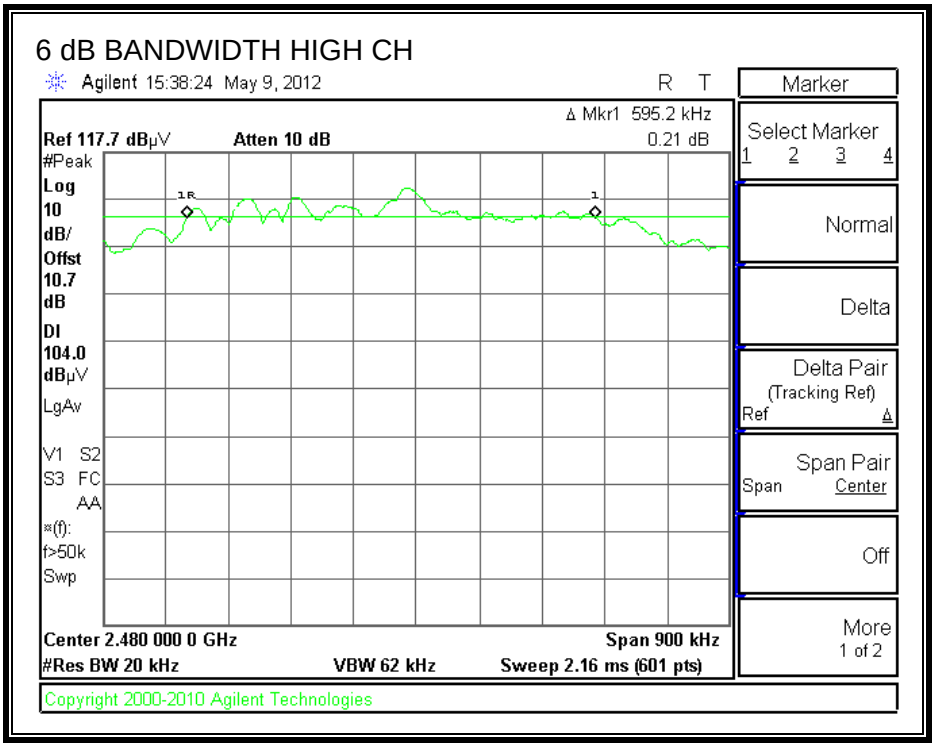
**RESULTS**

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2402 | 0.5951 | 0.5 |
| Middle | 2440 | 0.5971 | 0.5 |
| High | 2480 | 0.5952 | 0.5 |

**6 dB BANDWIDTH**







## 7.2. 99% BANDWIDTH

**LIMITS**

None; for reporting purposes only.

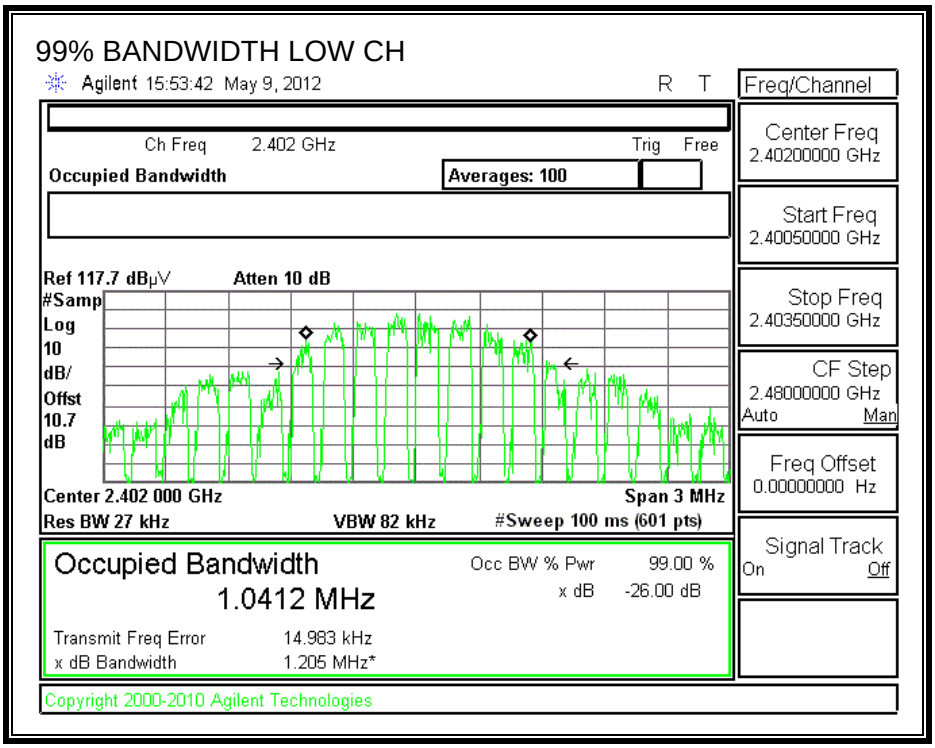
**TEST PROCEDURE**

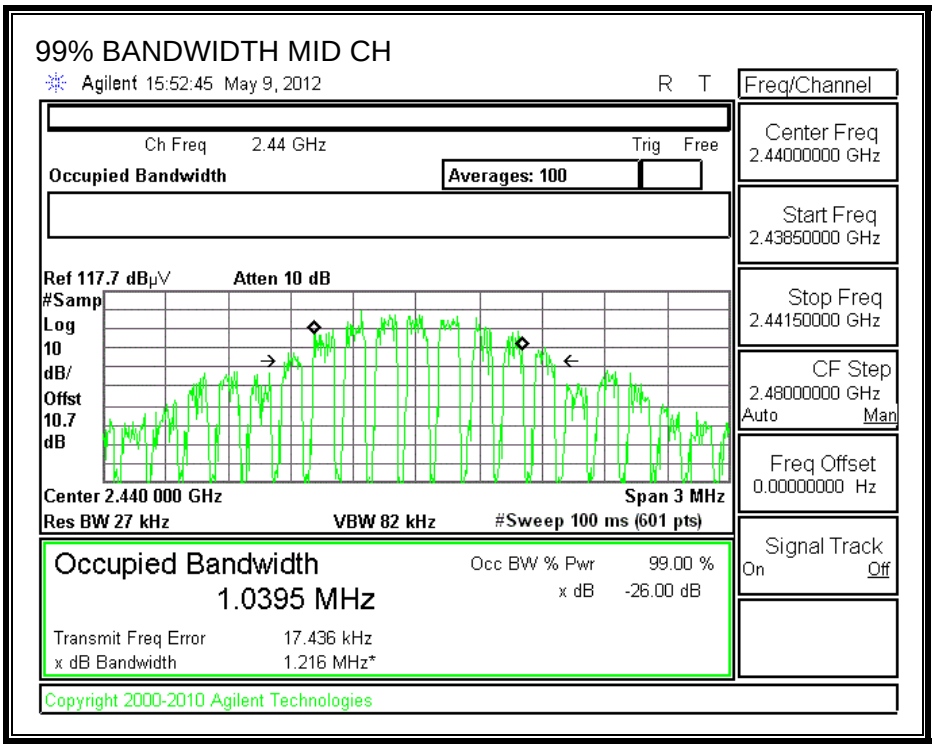
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

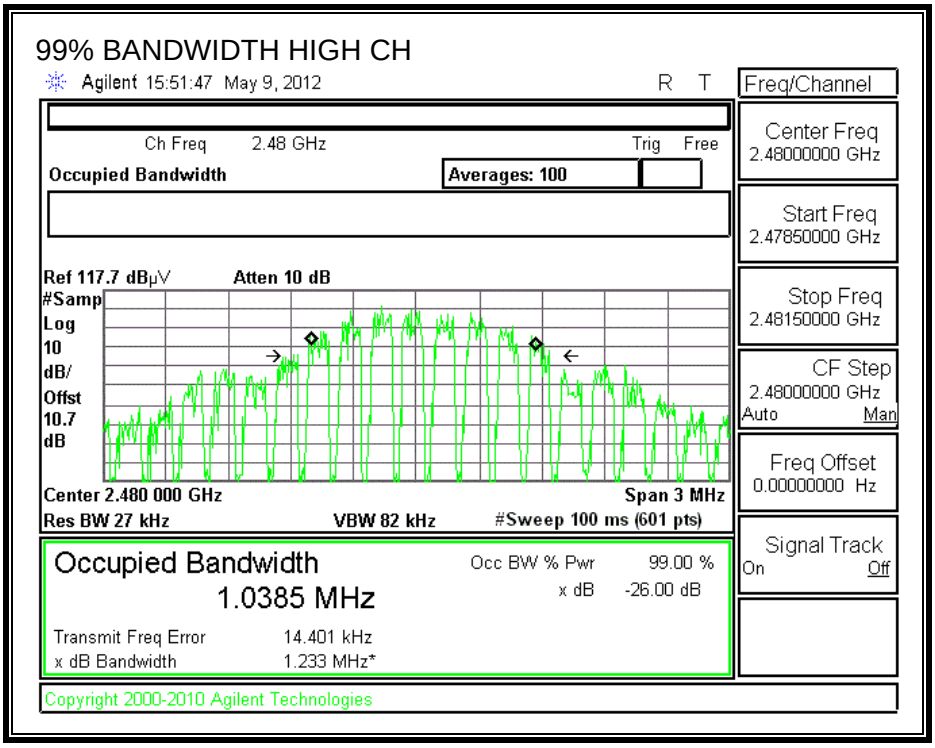
**RESULTS**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2402 | 1.0412 |
| Middle | 2440 | 1.0395 |
| High | 2480 | 1.0385 |

**99% BANDWIDTH**





## 7.3. OUTPUT POWER

**LIMITS**

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

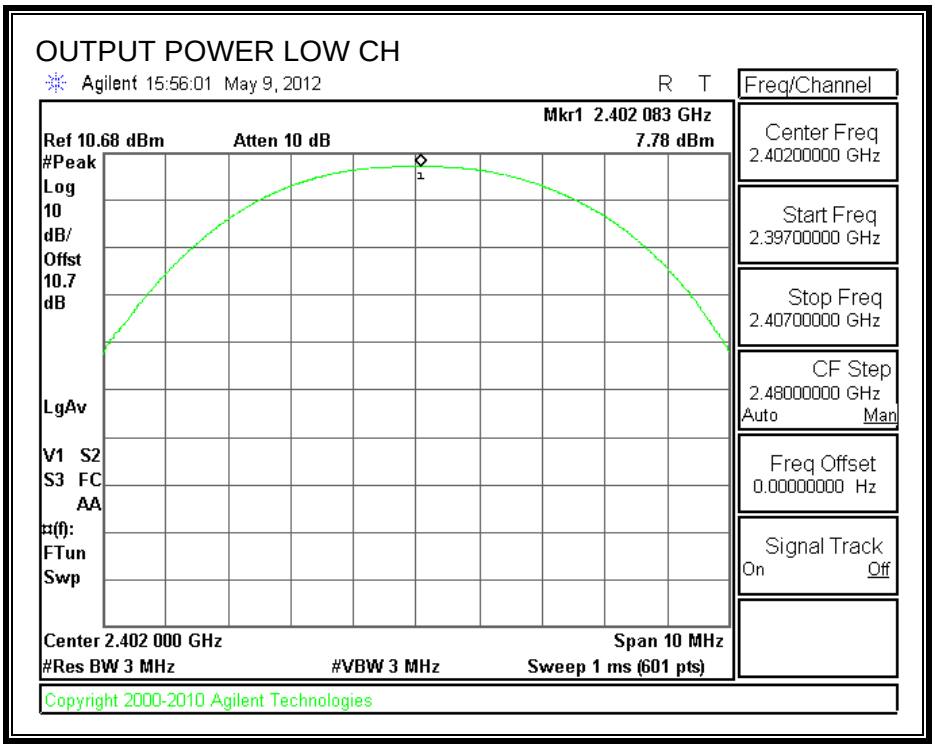
**TEST PROCEDURE**

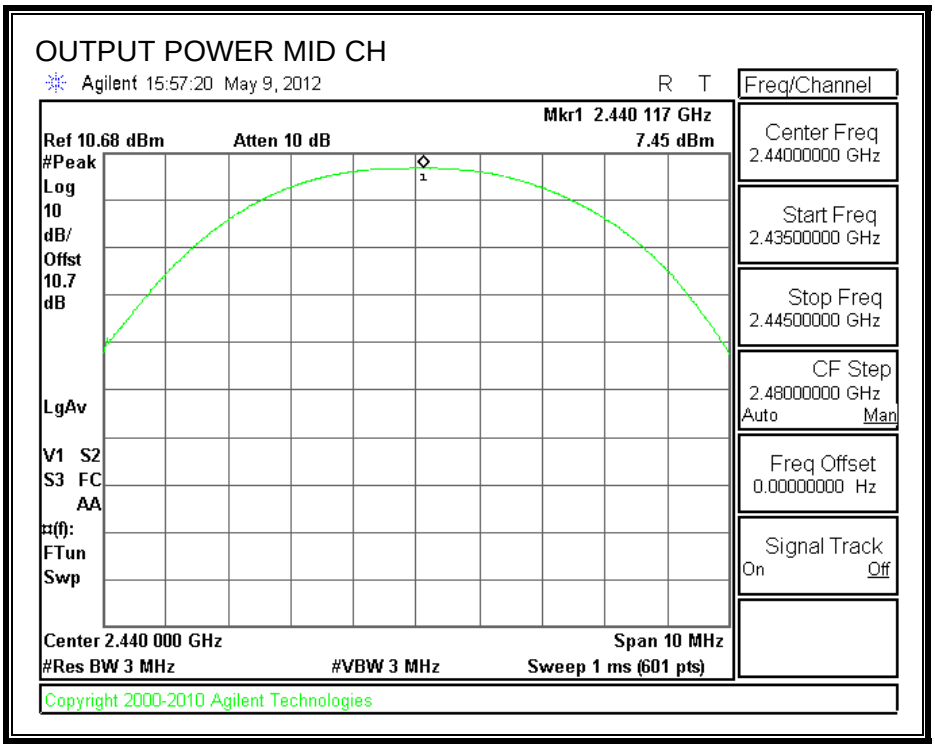
KDB 558074 D01 DTS Measurement Guidance V01 dated 01-18-12.

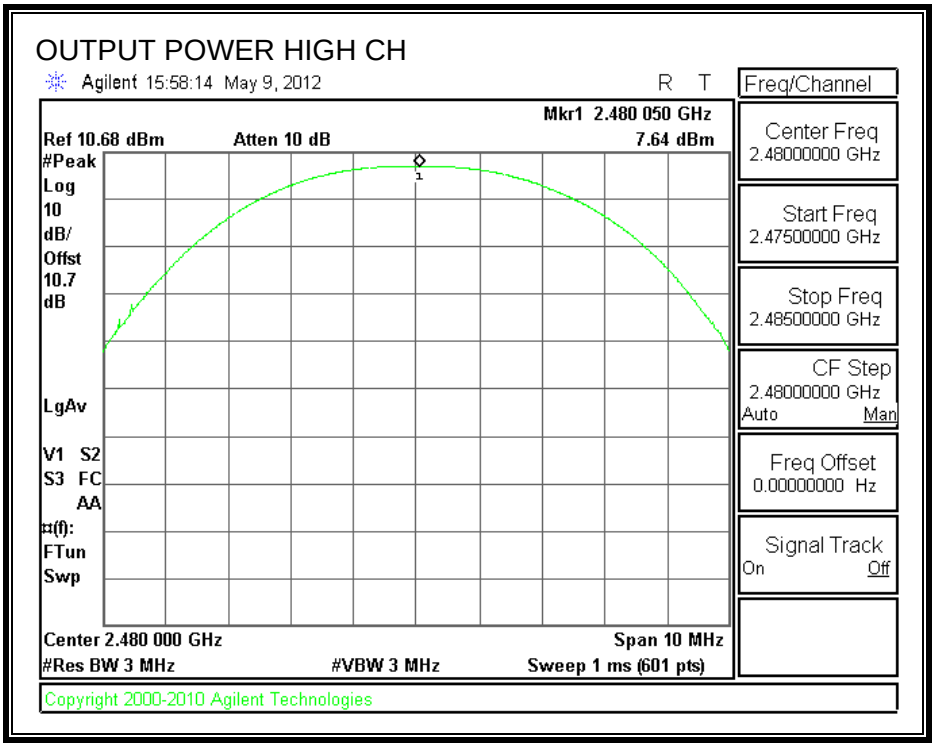
**RESULTS**

| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Attenuator and Cable Offset (dB) | Output Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 2402 | 7.78 | 0 | 7.78 | 30 | -22.22 |
| Middle | 2440 | 7.45 | 0 | 7.45 | 30 | -22.55 |
| High | 2480 | 7.64 | 0 | 7.64 | 30 | -22.36 |

**OUTPUT POWER**





## 7.4. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

**RESULTS**

The cable assembly insertion loss of 10.68 dB (including 10 dB pad and 0.68 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

| Channel | Frequency (MHz) | Power (dBm) |
|---|---|---|
| Low | 2402 | 6.11 |
| Middle | 2440 | 6.83 |
| High | 2480 | 6.94 |

## 7.5. POWER SPECTRAL DENSITY

**LIMITS**

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

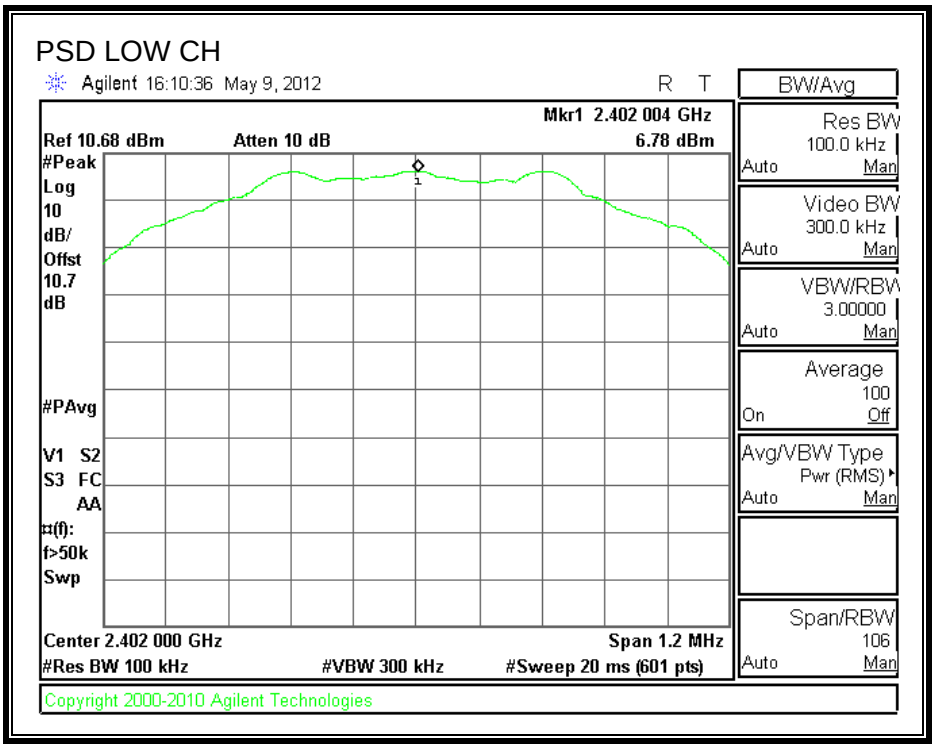
**TEST PROCEDURE**

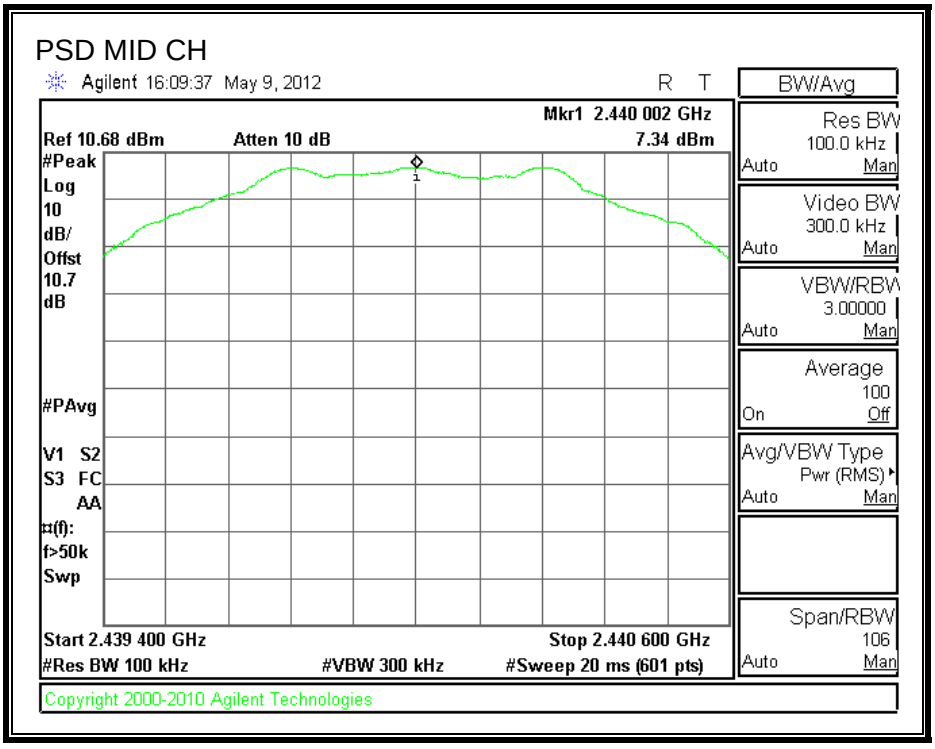
KDB 558074 D01 DTS Measurement Guidance V01 dated 01-18-12.

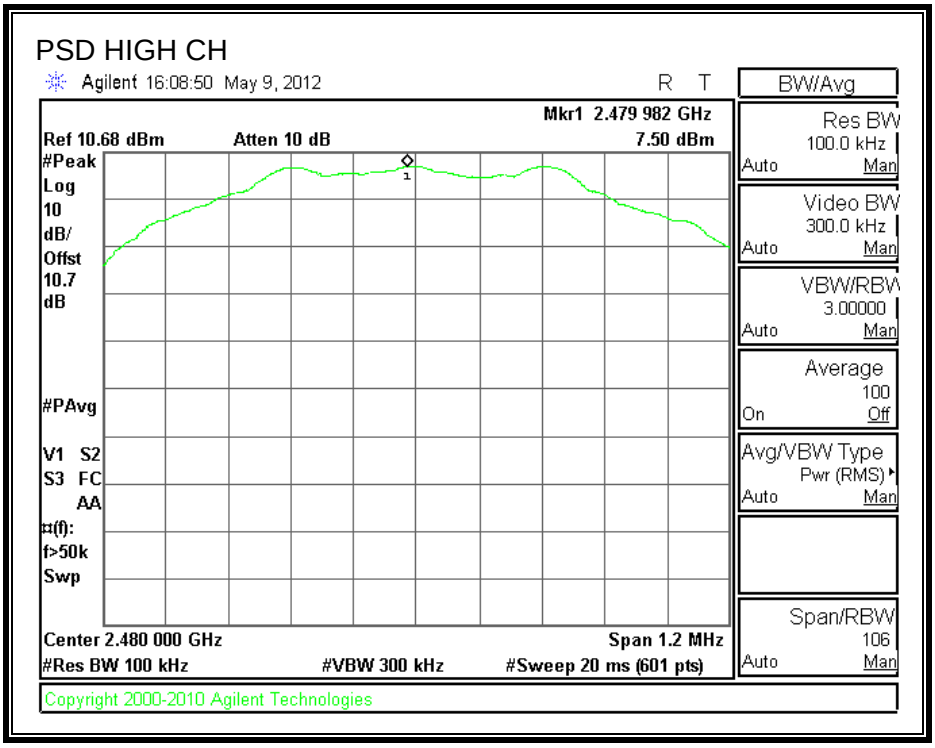
**RESULTS**

| Channel | Frequency (MHz) | PPSD (dBm) | 10 log (3/100 kHz) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| Low | 2402 | 6.78 | -15.2 | 8 | -16.42 |
| Middle | 2440 | 7.34 | -15.2 | 8 | -15.86 |
| High | 2480 | 7.50 | -15.2 | 8 | -15.70 |

**POWER SPECTRAL DENSITY**





## 7.6. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

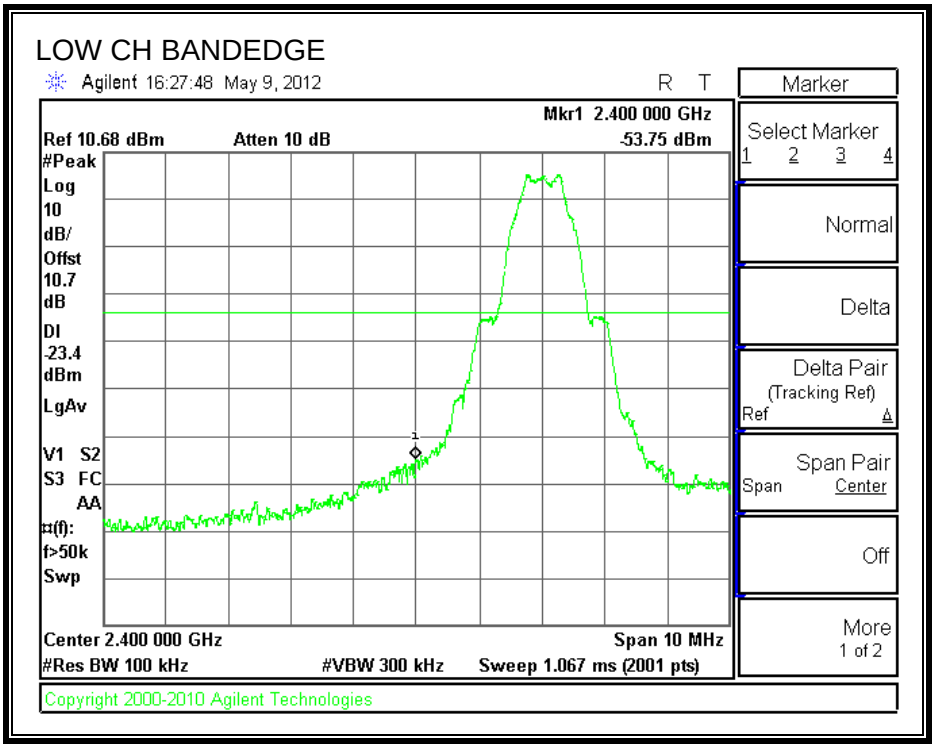
**TEST PROCEDURE**

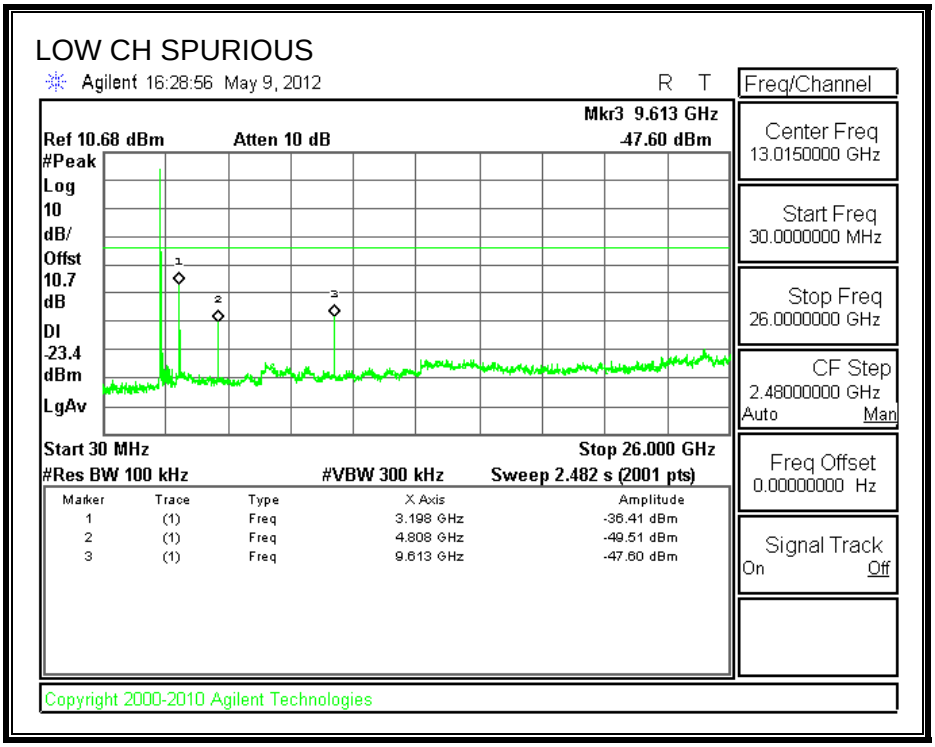
KDB 558074 D01 DTS Measurement Guidance V01 dated 01-18-12.

**Note:** Radiated measurements were made with the device connected to the highest gain antenna of each antenna type, and so conducted measurements were only used to verify compliance with the -20dBc limits for spurious not in restricted bands.

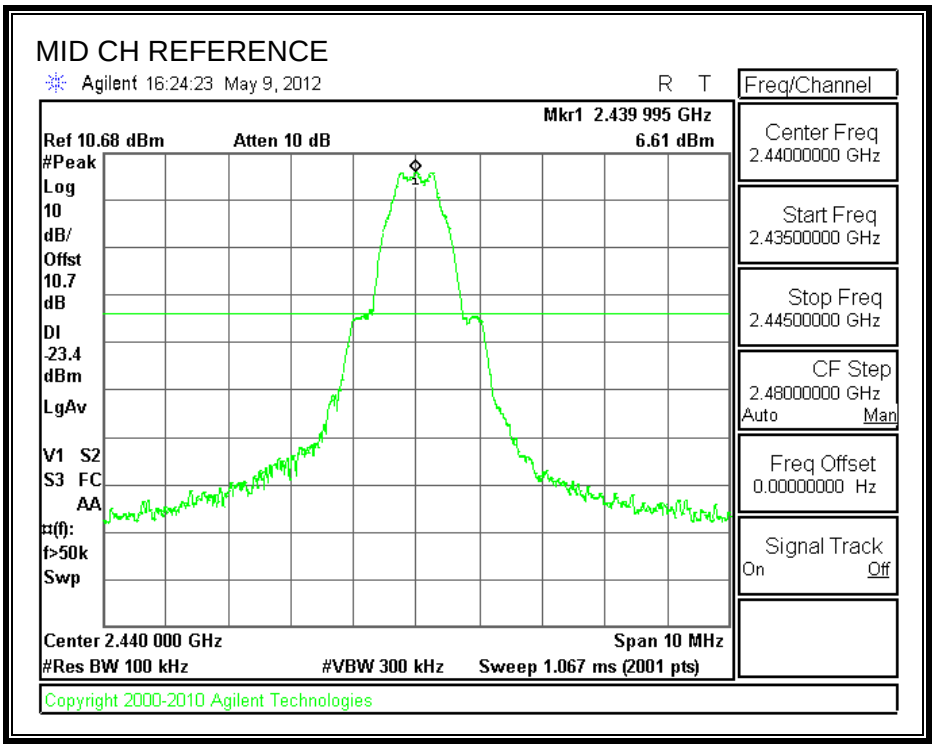
## RESULTS

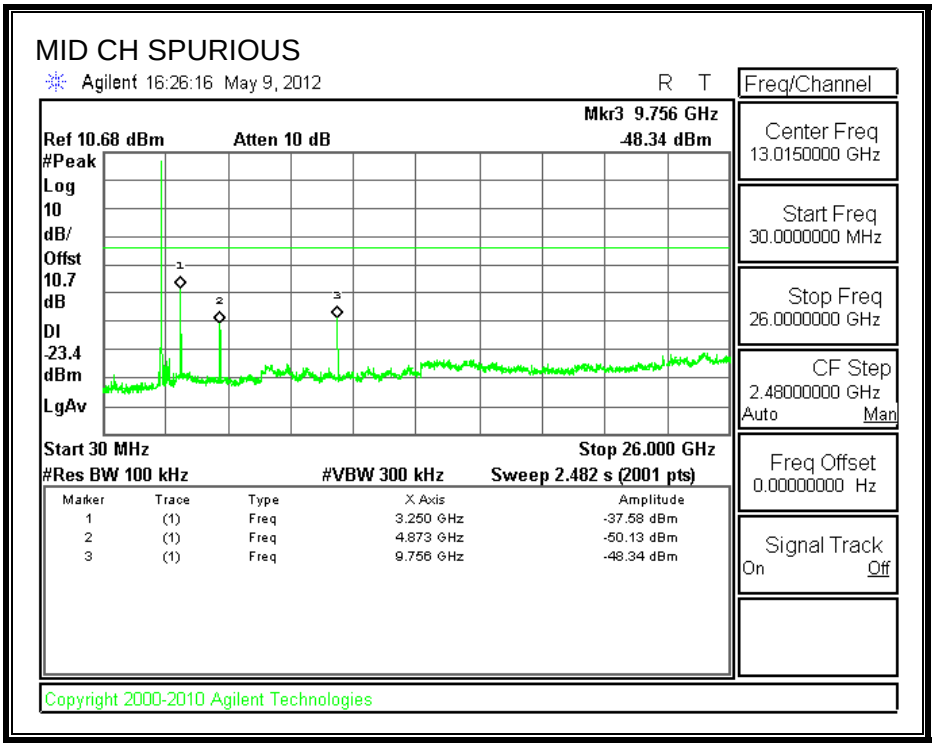
## SPURIOUS EMISSIONS, LOW CHANNEL



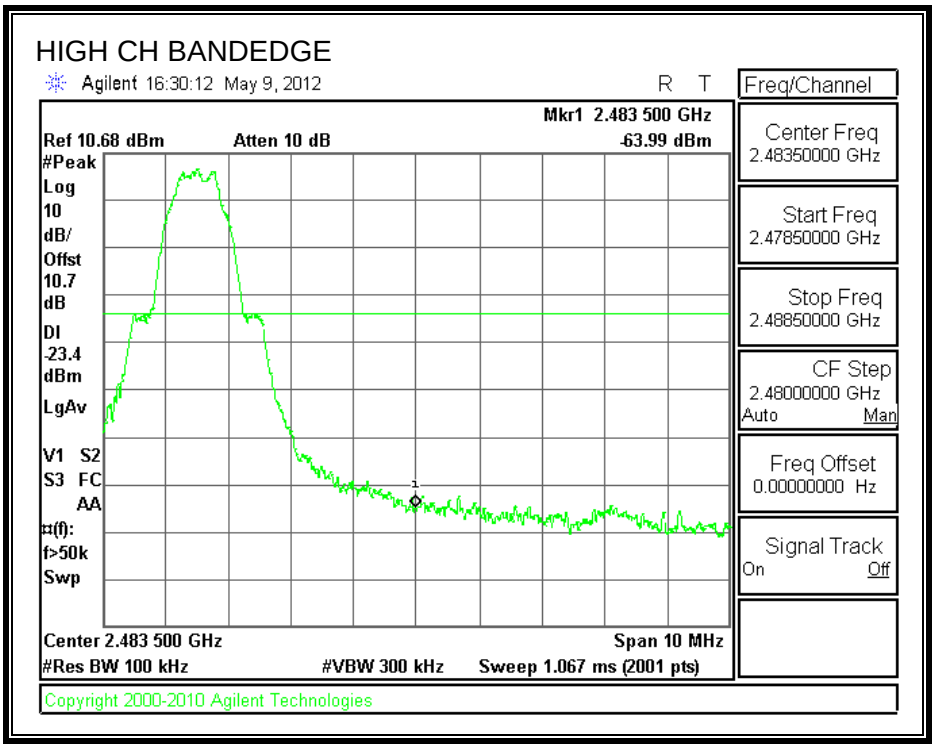


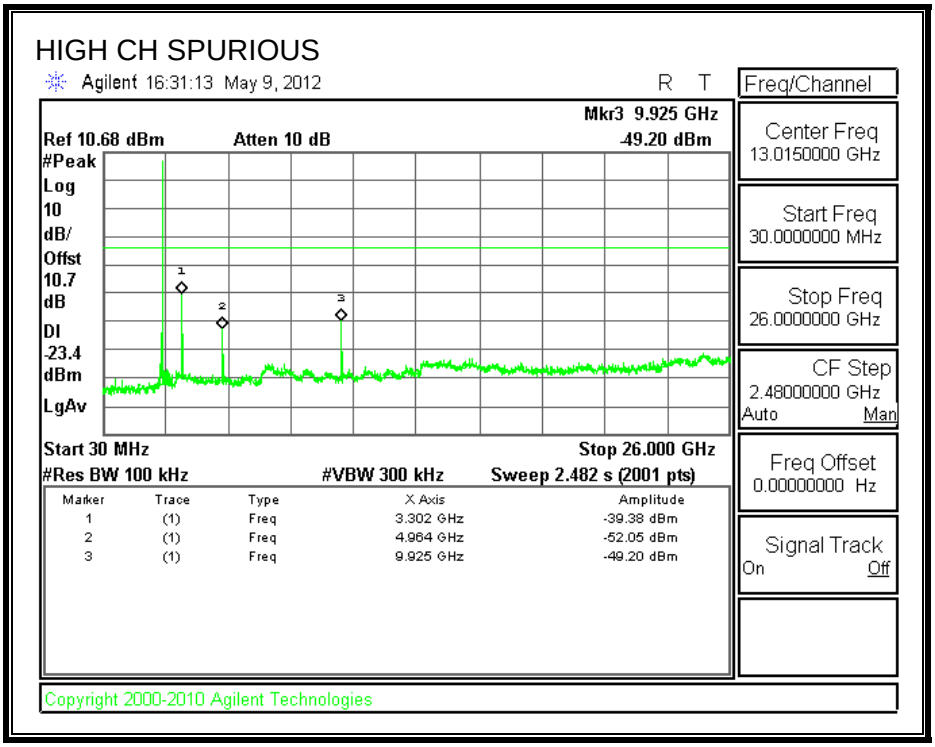
**SPURIOUS EMISSIONS, MID CHANNEL**





**SPURIOUS EMISSIONS, HIGH CHANNEL**





# 8. RADIATED TEST RESULTS

## 8.1. LIMITS AND PROCEDURE

**LIMITS**

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

| Frequency Range (MHz) | Field Strength Limit (uV/m) at 3 m | Field Strength Limit (dBuV/m) at 3 m |
|---|---|---|
| 30 - 88 | 100 | 40 |
| 88 - 216 | 150 | 43.5 |
| 216 - 960 | 200 | 46 |
| Above 960 | 500 | 54 |

**TEST PROCEDURE**

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

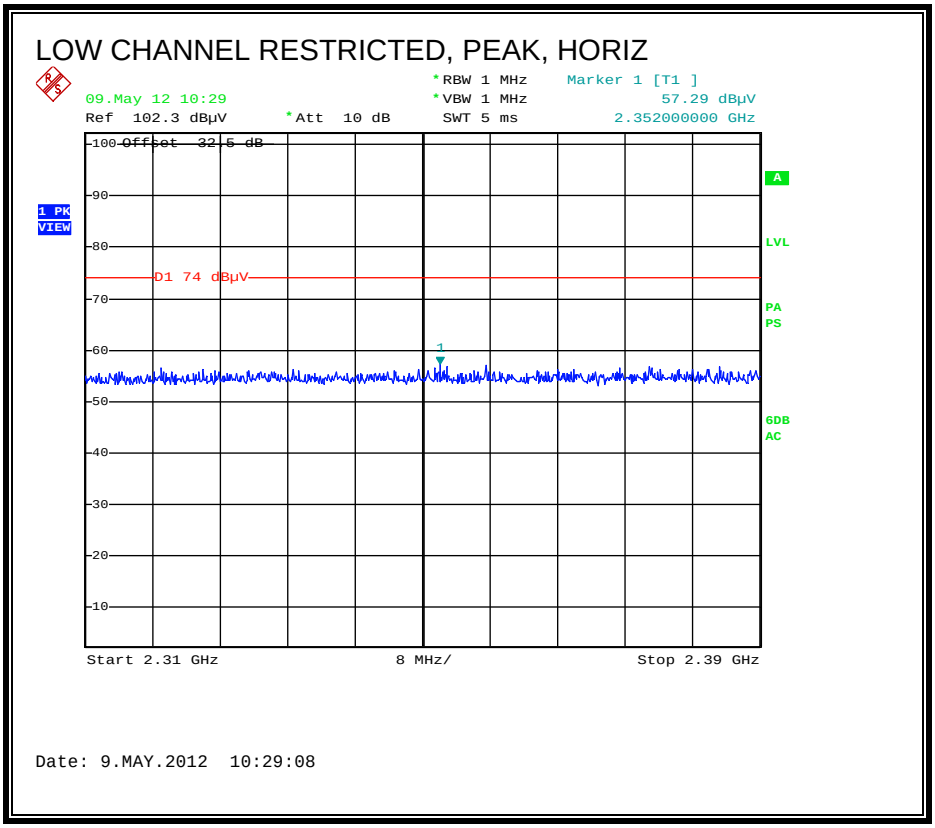
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

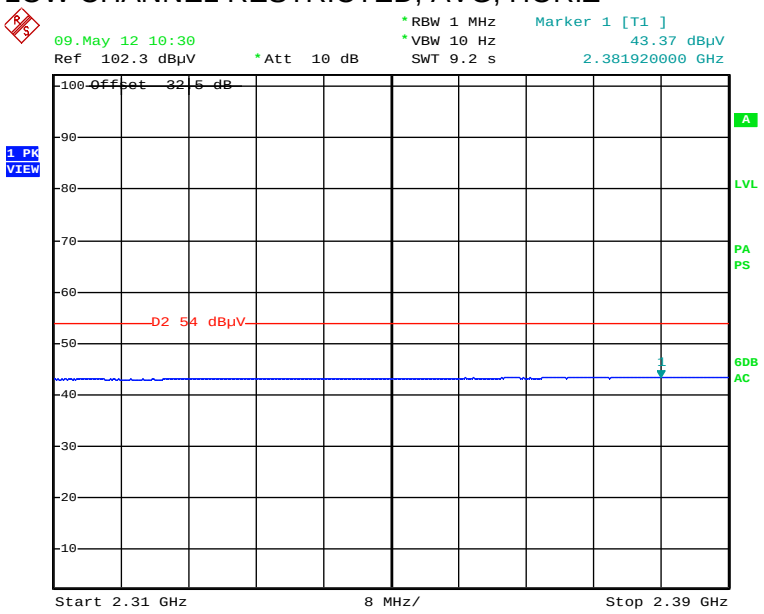
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 8.2. TRANSMITTER ABOVE 1 GHz

**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



LOW CHANNEL RESTRICTED, AVG, HORIZ

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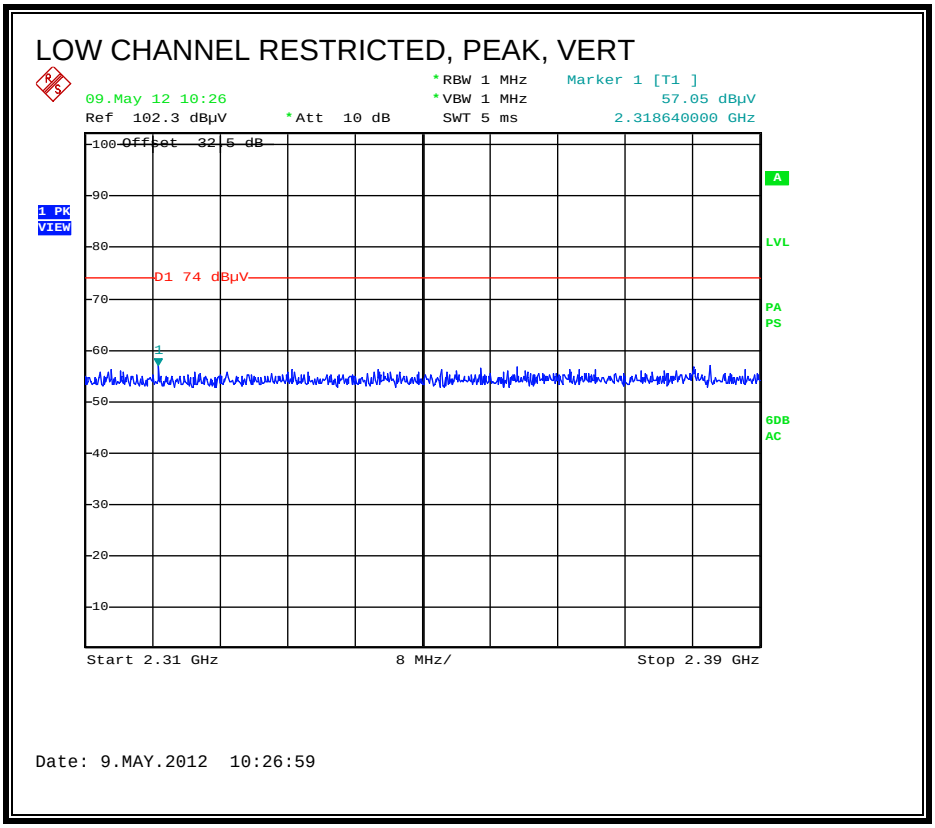
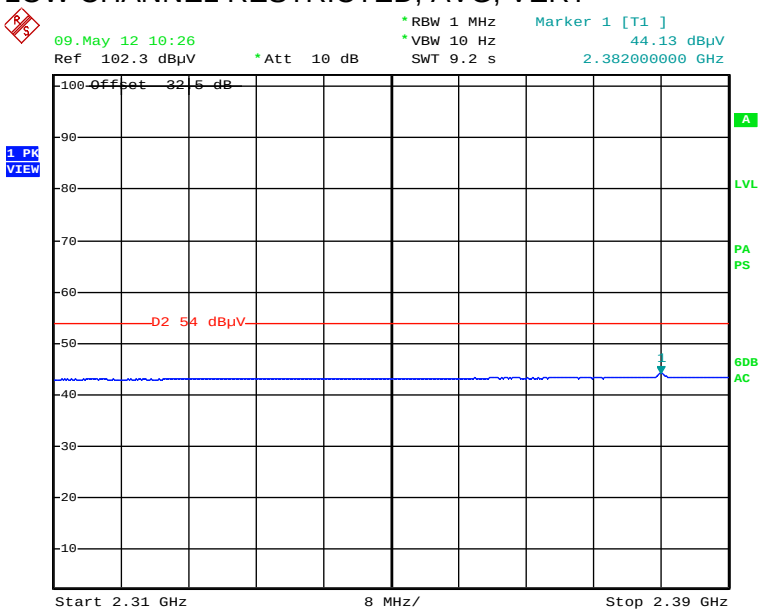
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



LOW CHANNEL RESTRICTED, AVG, VERT

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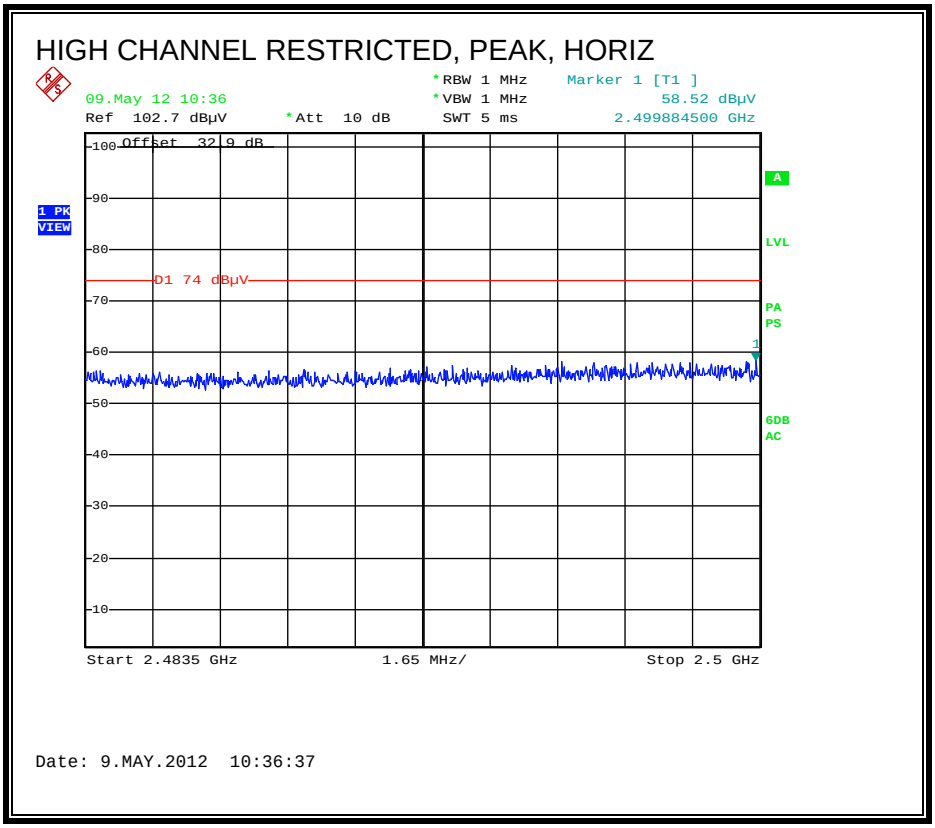
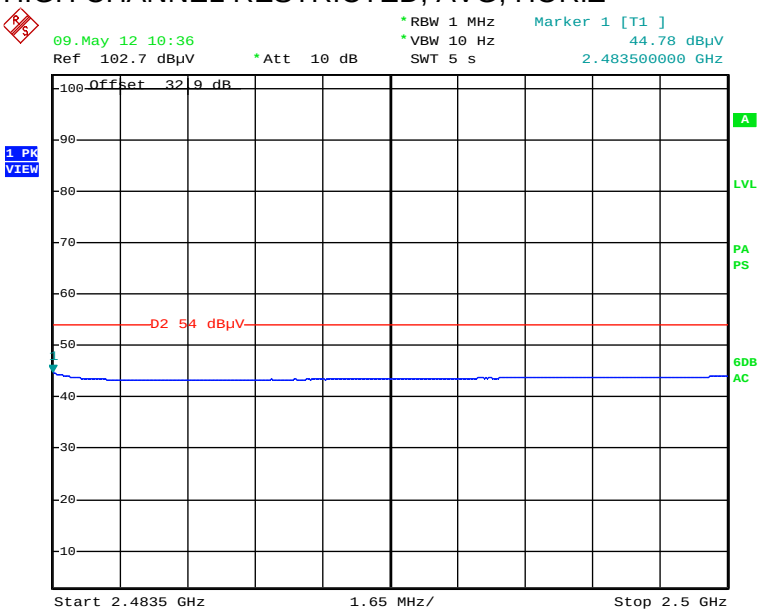
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



HIGH CHANNEL RESTRICTED, AVG, HORIZ

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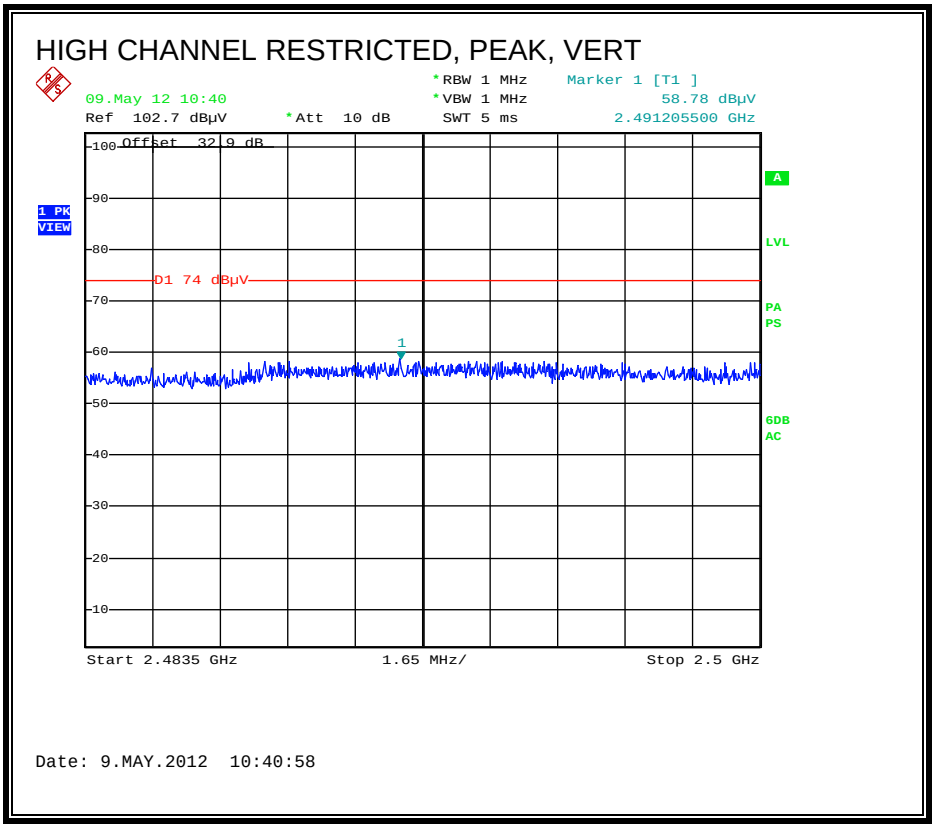
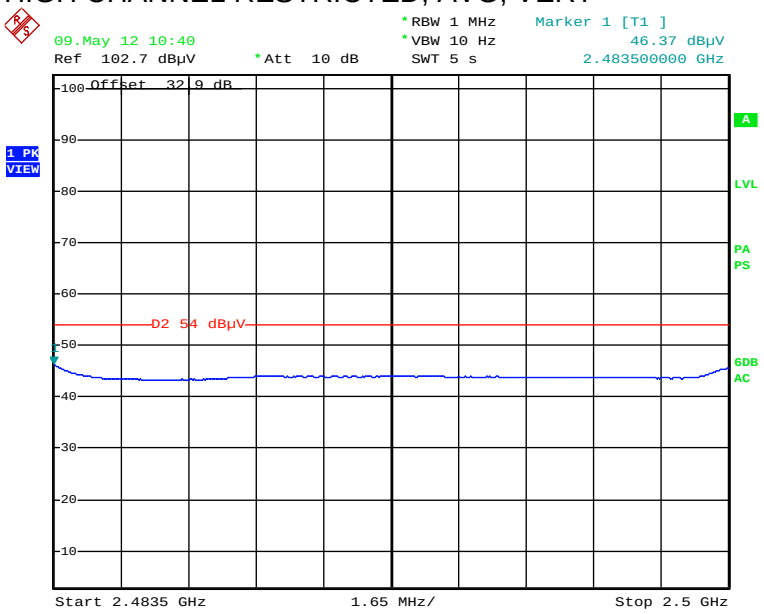
**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



HIGH CHANNEL RESTRICTED, AVG, VERT



## HARMONICS AND SPURIOUS EMISSIONS

**High Frequency Measurement**
**Compliance Certification Services, Fremont 5m Chamber**

**Test Engr:** David Garcia
**Date:** 05/09/12
**Project #:** 12U14227
**Company:** Broadcom
**Test Target:** 15.205
**Mode Oper:** Bluetooth LE

| | | | | | |
|---|---|---|---|---|---|
| f | Measurement Frequency | Amp | Preamp Gain | | Average Field Strength Limit |
| Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | | Peak Field Strength Limit |
| Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | | Margin vs. Average Limit |
| AF | Antenna Factor | Peak | Calculated Peak Field Strength | | Margin vs. Peak Limit |
| CL | Cable Loss | HPF | High Pass Filter | | |

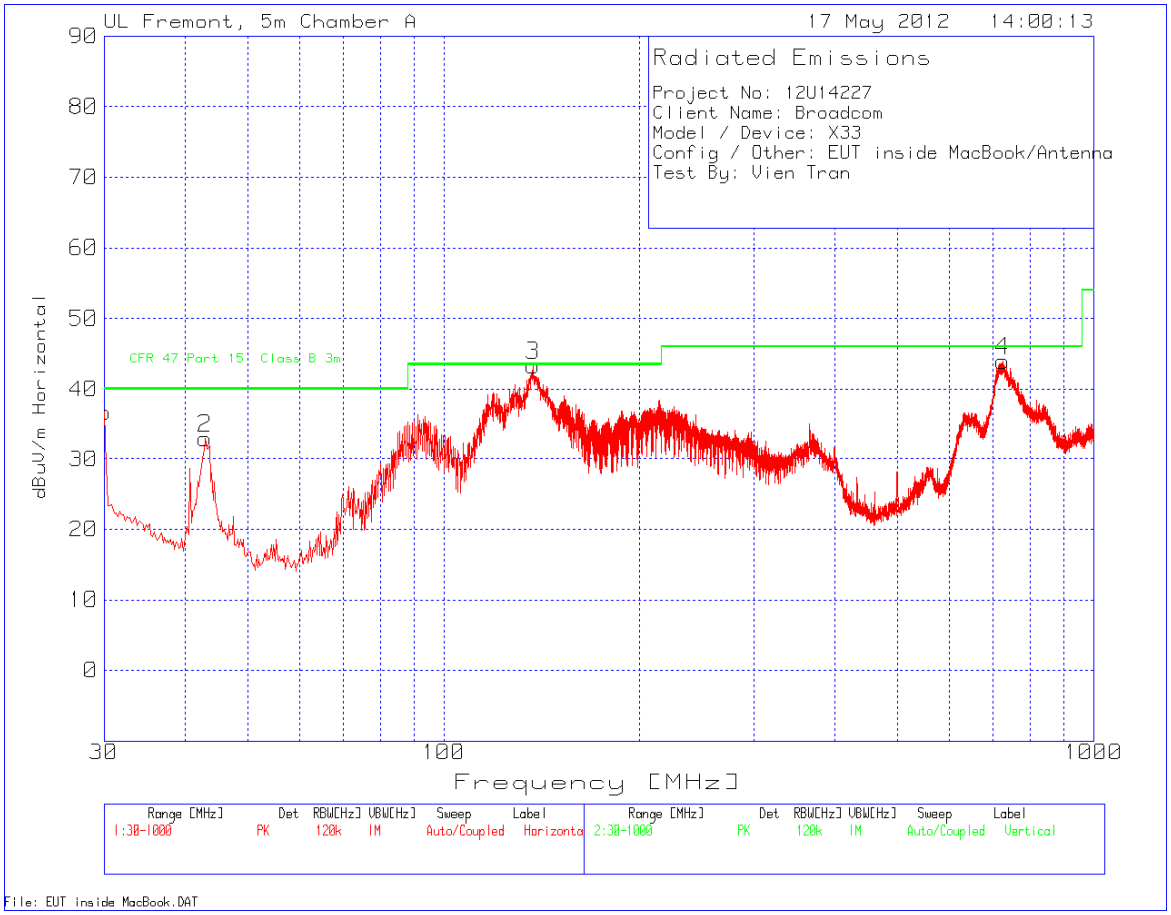
| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low Channel: 2402 MHz** | | | | | | | | | | | | | |
| 4.804 | 3.0 | 38.7 | 33.1 | 6.8 | -34.1 | 0.0 | 0.0 | 44.5 | 74.0 | -29.5 | H | P | |
| 4.804 | 3.0 | 28.1 | 33.1 | 6.8 | -34.1 | 0.0 | 0.0 | 33.9 | 54.0 | -20.1 | H | A | |
| 12.010 | 3.0 | 34.0 | 39.4 | 11.9 | -32.5 | 0.0 | 0.0 | 52.8 | 74.0 | -21.2 | H | P | |
| 12.010 | 3.0 | 21.8 | 39.4 | 11.9 | -32.5 | 0.0 | 0.0 | 40.5 | 54.0 | -13.5 | H | A | |
| 4.804 | 3.0 | 40.7 | 33.1 | 6.8 | -34.1 | 0.0 | 0.0 | 46.5 | 74.0 | -27.5 | V | P | |
| 4.804 | 3.0 | 30.2 | 33.1 | 6.8 | -34.1 | 0.0 | 0.0 | 36.0 | 54.0 | -18.0 | V | A | |
| 12.010 | 3.0 | 33.7 | 39.4 | 11.9 | -32.5 | 0.0 | 0.0 | 52.5 | 74.0 | -21.5 | V | P | |
| 12.010 | 3.0 | 21.7 | 39.4 | 11.9 | -32.5 | 0.0 | 0.0 | 40.5 | 54.0 | -13.5 | V | A | |
| **Mid Channel: 2440 MHz** | | | | | | | | | | | | | |
| 4.880 | 3.0 | 38.2 | 33.2 | 6.8 | -34.0 | 0.0 | 0.0 | 44.2 | 74.0 | -29.8 | H | P | |
| 4.880 | 3.0 | 26.7 | 33.2 | 6.8 | -34.0 | 0.0 | 0.0 | 32.7 | 54.0 | -21.3 | H | A | |
| 7.320 | 3.0 | 35.6 | 36.3 | 9.1 | -33.1 | 0.0 | 0.0 | 47.9 | 74.0 | -26.1 | H | P | |
| 7.320 | 3.0 | 23.3 | 36.3 | 9.1 | -33.1 | 0.0 | 0.0 | 35.6 | 54.0 | -18.4 | H | A | |
| 12.200 | 3.0 | 33.7 | 39.4 | 12.0 | -32.5 | 0.0 | 0.0 | 52.6 | 74.0 | -21.4 | H | P | |
| 12.200 | 3.0 | 21.3 | 39.4 | 12.0 | -32.5 | 0.0 | 0.0 | 40.2 | 54.0 | -13.8 | H | A | |
| 4.880 | 3.0 | 39.9 | 33.2 | 6.8 | -34.0 | 0.0 | 0.0 | 45.9 | 74.0 | -28.1 | V | P | |
| 4.880 | 3.0 | 28.9 | 33.2 | 6.8 | -34.0 | 0.0 | 0.0 | 34.9 | 54.0 | -19.1 | V | A | |
| 7.320 | 3.0 | 35.2 | 36.3 | 9.1 | -33.1 | 0.0 | 0.0 | 47.5 | 74.0 | -26.5 | V | P | |
| 7.320 | 3.0 | 23.3 | 36.3 | 9.1 | -33.1 | 0.0 | 0.0 | 35.6 | 54.0 | -18.4 | V | A | |
| **High Channel: 2480 MHz** | | | | | | | | | | | | | |
| 4.960 | 3.0 | 36.8 | 33.2 | 6.9 | -34.0 | 0.0 | 0.0 | 42.9 | 74.0 | -31.1 | H | P | |
| 4.960 | 3.0 | 24.8 | 33.2 | 6.9 | -34.0 | 0.0 | 0.0 | 30.9 | 54.0 | -23.1 | H | A | |
| 7.440 | 3.0 | 35.7 | 36.5 | 9.1 | -33.0 | 0.0 | 0.0 | 48.2 | 74.0 | -25.8 | H | P | |
| 7.440 | 3.0 | 23.6 | 36.5 | 9.1 | -33.0 | 0.0 | 0.0 | 36.2 | 54.0 | -17.8 | H | A | |
| 4.960 | 3.0 | 38.9 | 33.2 | 6.9 | -34.0 | 0.0 | 0.0 | 45.0 | 74.0 | -29.0 | V | P | |
| 4.960 | 3.0 | 27.7 | 33.2 | 6.9 | -34.0 | 0.0 | 0.0 | 33.8 | 54.0 | -20.2 | V | A | |
| 7.440 | 3.0 | 36.5 | 36.5 | 9.1 | -33.0 | 0.0 | 0.0 | 49.0 | 74.0 | -25.0 | V | P | |
| 7.440 | 3.0 | 23.3 | 36.5 | 9.1 | -33.0 | 0.0 | 0.0 | 35.8 | 54.0 | -18.2 | V | A | |

**Rev. 4.1.2.7**
**Note: No other emissions were detected above the system noise floor.**

## 8.3. WORST-CASE BELOW 1 GHz

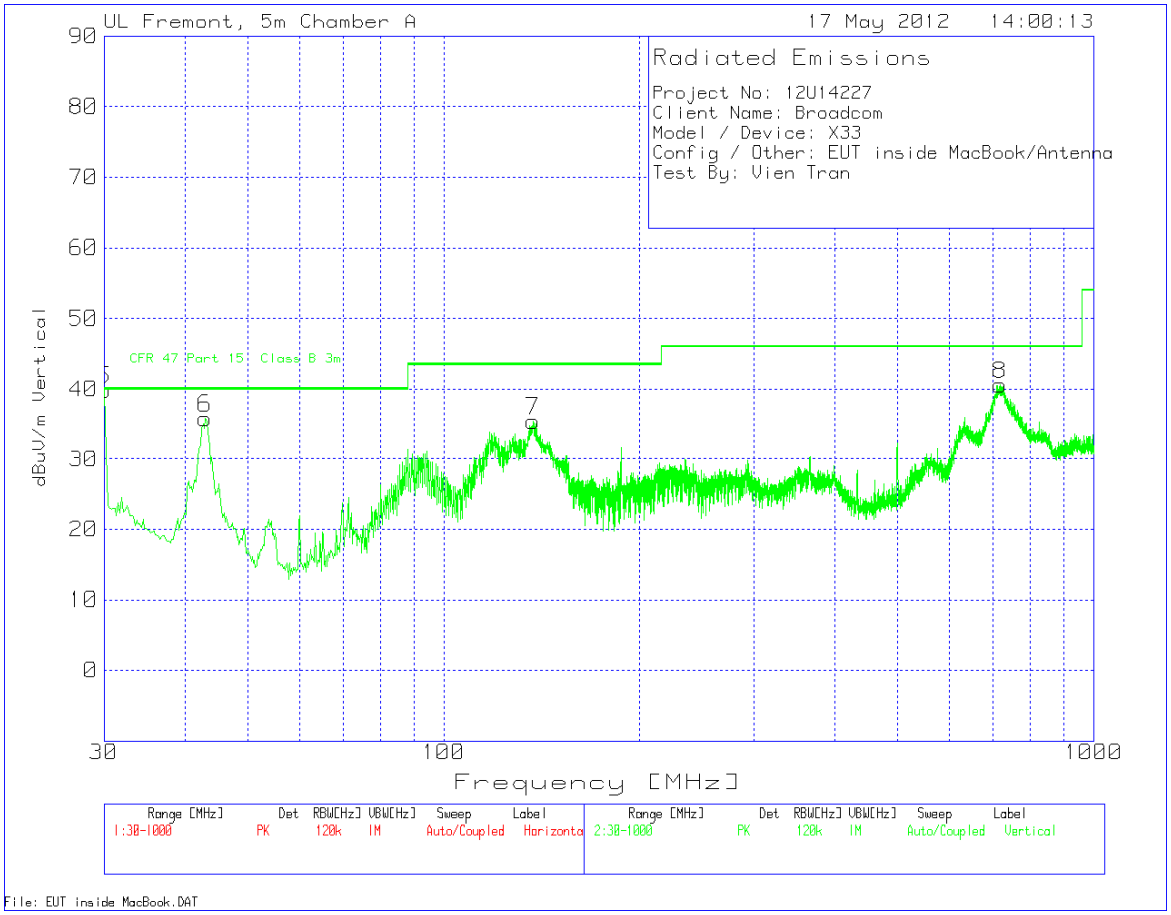
**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)**

HORIZONTAL PLOT



**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**

VERTICAL PLOT



## HORIZONTAL AND VERTICAL DATA

Project No: 12U14227
Client Name: Broadcom
Model / Device: X33
Config / Other: EUT inside MacBook/Antenna
Test By: Vien Tran

Horizontal 30 - 1000MHz

| Test Frequency | Meter Reading | Detector | 1GHz ChmbrA Amplified. TX [dB] | T243 Sunol Bilog.TXT [dB] | dBuV/m | CFR 47 Part 15 Class B 3m | Margin | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 30 | 42.99 | PK | -27.5 | 21.3 | 36.79 | 40.0 | -3.21 | 200 | Horz |
| 42.9876 | 48.53 | PK | -27.4 | 11.9 | 33.03 | 40.0 | -6.97 | 400 | Horz |
| 137.3901 | 57.02 | PK | -26.7 | 13.0 | 43.32 | 43.5 | -0.18 | 200 | Horz |
| 137.3901 | 53.81 | QK | -26.7 | 13.0 | 40.11 | 43.5 | -3.39 | 200 | Horz |
| 725.9033 | 47.02 | PK | -23.3 | 20.2 | 43.92 | 46.0 | -2.08 | 100 | Horz |
| 725.9033 | 45.14 | PK | -23.3 | 20.2 | 42.04 | 46.0 | -3.96 | 100 | Horz |

Vertical 30 - 1000MHz

| Test Frequency | Meter Reading | Detector | 1GHz ChmbrA Amplified. TX [dB] | T243 Sunol Bilog.TXT [dB] | dBuV/m | CFR 47 Part 15 Class B 3m | Margin | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 30 | 46.01 | PK | -27.5 | 21.3 | 39.81 | 40.0 | -0.19 | 400 | Vert |
| 30 | 40.72 | PK | -27.5 | 21.3 | 34.52 | 40.0 | -5.48 | 400 | Vert |
| 42.9876 | 51.35 | PK | -27.4 | 11.9 | 35.85 | 40.0 | -4.15 | 100 | Vert |
| 137.3901 | 49.18 | PK | -26.7 | 13.0 | 35.48 | 43.5 | -8.02 | 200 | Vert |
| 717.3741 | 43.66 | PK | -23.2 | 20.1 | 40.56 | 46.0 | -5.44 | 100 | Vert |

PK - Peak detector
QP - Quasi-Peak detector
Av - Average detector

# 9. AC POWER LINE CONDUCTED EMISSIONS

**LIMITS**

FCC §15.207 (a)

RSS-Gen 7.2.2

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 * | 56 to 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

**TEST PROCEDURE**

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

## RESULTS

## 6 WORST EMISSIONS

Project No:12U14227
Client Name:Broadcom
Model/Device:802.11a/g/n 3x3 MIMO WLAN + BT
Test Volt/Freq:120 Vac / 60Hz
Test By:Vien Tran

**Line-L1 .15 - 30MHz**

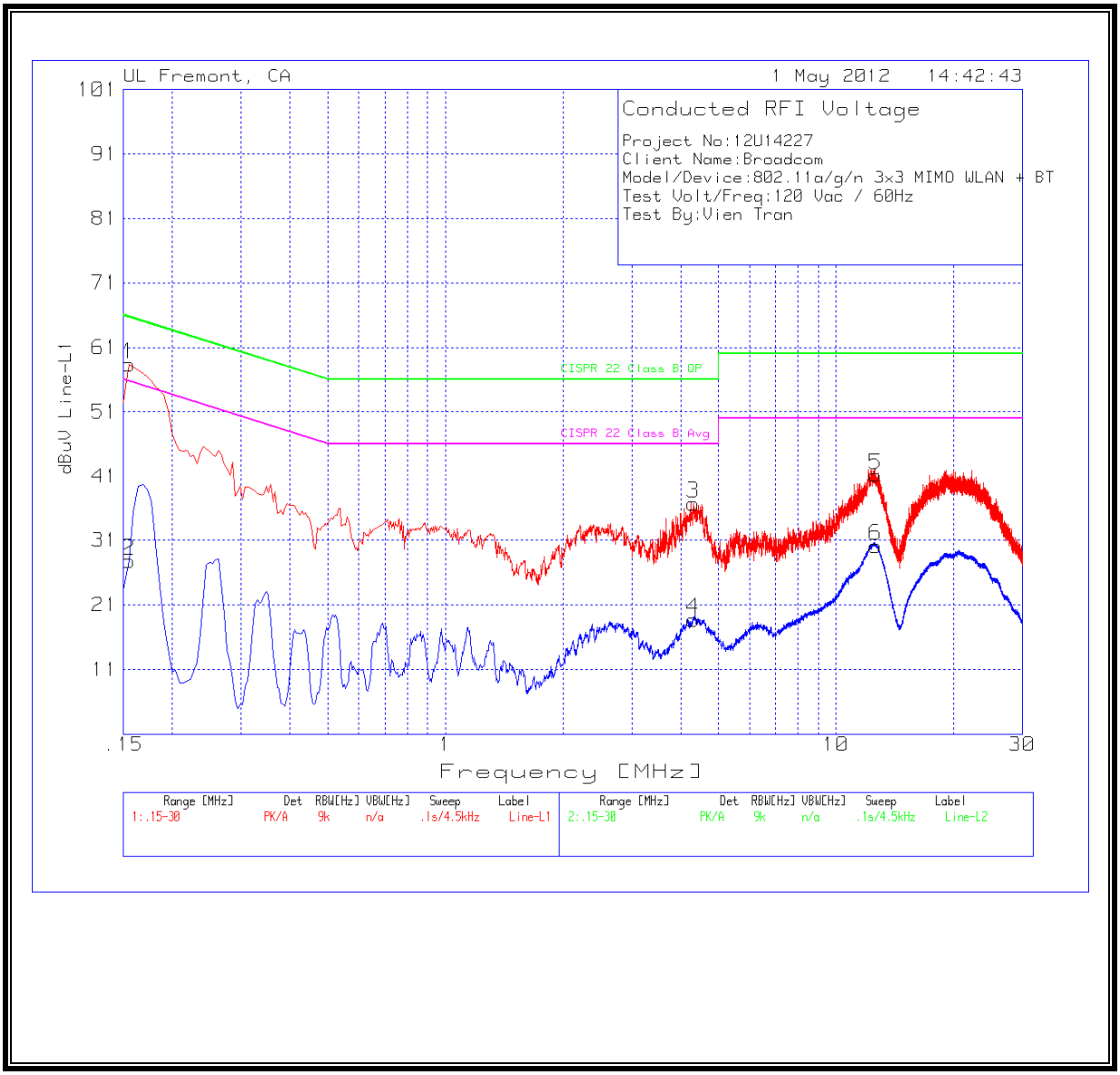
| Test Frequency | Meter Reading | Detector | T24 IL L1.TXT [dB] | LC Cables 1&3.TXT [dB] | dBuV | CISPR 22 Class B QP | Margin | CISPR 22 Class B Avg | Margin |
|---|---|---|---|---|---|---|---|---|---|
| 0.155 | 58.27 | PK | 0.1 | 0.00 | 58.37 | 65.8 | -7.43 | - | - |
| 0.155 | 27.73 | Av | 0.1 | 0.00 | 27.83 | - | - | 55.80 | -27.97 |
| 4.308 | 36.5 | PK | 0.1 | 0.10 | 36.70 | 56 | -19.30 | - | - |
| 4.308 | 18.47 | Av | 0.1 | 0.10 | 18.67 | - | - | 46.00 | -27.33 |
| 12.615 | 40.75 | PK | 0.2 | 0.20 | 41.15 | 60 | -18.85 | - | - |
| 12.615 | 29.67 | Av | 0.2 | 0.20 | 30.07 | - | - | 50.00 | -19.93 |

**Line-L2 .15 - 30MHz**

| Test Frequency | Meter Reading | Detector | T24 IL L1.TXT [dB] | LC Cables 1&3.TXT [dB] | dBuV | CISPR 22 Class B QP | Margin | CISPR 22 Class B Avg | Margin |
|---|---|---|---|---|---|---|---|---|---|
| 0.164 | 54.87 | PK | 0.1 | 0 | 54.97 | 65.3 | -10.33 | - | - |
| 0.164 | 35.78 | Av | 0.1 | 0 | 35.88 | - | - | 55.3 | -19.42 |
| 4.232 | 36.83 | PK | 0.1 | 0.1 | 37.03 | 56 | -18.97 | - | - |
| 4.232 | 19.17 | Av | 0.1 | 0.1 | 19.37 | - | - | 46 | -26.63 |
| 12.539 | 41.39 | PK | 0.2 | 0.2 | 41.79 | 60 | -18.21 | - | - |
| 12.539 | 29.68 | Av | 0.2 | 0.2 | 30.08 | - | - | 50 | -19.92 |

PK - Peak detector
QP - Quasi-Peak detector
Av - Average detector

**LINE 1 RESULTS**



**LINE 2 RESULTS**