



**FCC 47 CFR PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 8**

**CERTIFICATION TEST REPORT**

**FOR**

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

**MODEL NUMBER: BCM943602CS**

**FCC ID: QDS-BRCM1080  
IC: 4324A-BRCM1080**

**REPORT NUMBER: 13U16561-3, Revision A**

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*Prepared for*

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

*Prepared by*

**UL VERIFICATION SERVICES INC.  
47173 BENICIA STREET  
FREMONT, CA 94538, U.S.A.  
TEL: (510) 771-1000  
FAX: (510) 661-0888**



**NVLAP LAB CODE 200065-0**

Revision History

| Rev. | Issue Date | Revisions           | Revised By |
|------|------------|---------------------|------------|
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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** BROADCOM CORPORATION  
190 MATHILDA PLACE  
SUNNYVALE, CA 94086, U.S.A.

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

**MODEL:** BCM943602CS

**SERIAL NUMBER:** P301 SN: 333 (Radiated Sample) and 339 (Conducted Sample)

**DATE TESTED:** March 05 to April 08, 2014

| 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         |

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 Verification Services Inc. By:



FRANK IBRAHIM  
PROGRAM MANAGER  
UL Verification Services Inc.

Tested By:



THANH PHAM  
EMC LAB ENGINEER  
UL Verification Services Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, 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 Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 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/g/n/ac WLAN + Bluetooth PCI-E Custom Combination Card.

The radio module is manufactured by Broadcom.

### 5.2. MAXIMUM OUTPUT POWER-FIXED

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

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|-----------------------|------|--------------------|-------------------|
| 2402 - 2480           | BLE  | 3.003              | 2.00              |

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The EUT utilizes an 802.11a/b/g/n/ac WLAN/BT antenna with a maximum gain of 4.82 dBi for BT.

### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, Ver. 5.6.0.9020.

The test utility software used during testing was Broadcom Bluetooth, Ver.: 1.8.4.7.

### 5.5. WORST-CASE CONFIGURATION AND MODE

EUT is for desktop applications; there is only one orientation for the antenna, the EUT was tested with normal antenna orientation.

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

Chain J1 (WiFi 3) is used for testing BLE.

Based on client's input, there is no colocation among different radios.

## 5.6. DESCRIPTION OF TEST SETUP\_ENTERED

### SUPPORT EQUIPMENT

| Support Equipment List |                  |                |                  |        |
|------------------------|------------------|----------------|------------------|--------|
| Description            | Manufacturer     | Model          | Serial Number    | FCC ID |
| Laptop                 | Dell             | Latitude E6400 | 2477655473       | DoC    |
| AC Adapter             | Dell             | DA90PE3-00     | CN-0WTC00V-48661 | DoC    |
| Catalyst PCIe. Board   | Enterprises Inc. | NA             | NA               | N/A    |
| X29T                   | Broadcom         | BCM94331C5AD   | P300             | N/A    |
| Laptop                 | Dell             | Latitude E6400 | 6MYFMJ1          | DoC    |
| AC Adapter             | Dell             | PA2 /CF745     | CN-0CF745-48661  | DoC    |
| Catalyst PCIe. Board   | Enterprises Inc. | NA             | NA               | N/A    |
| X29T                   | Broadcom         | BCM94331C5AD   | P300             | N/A    |

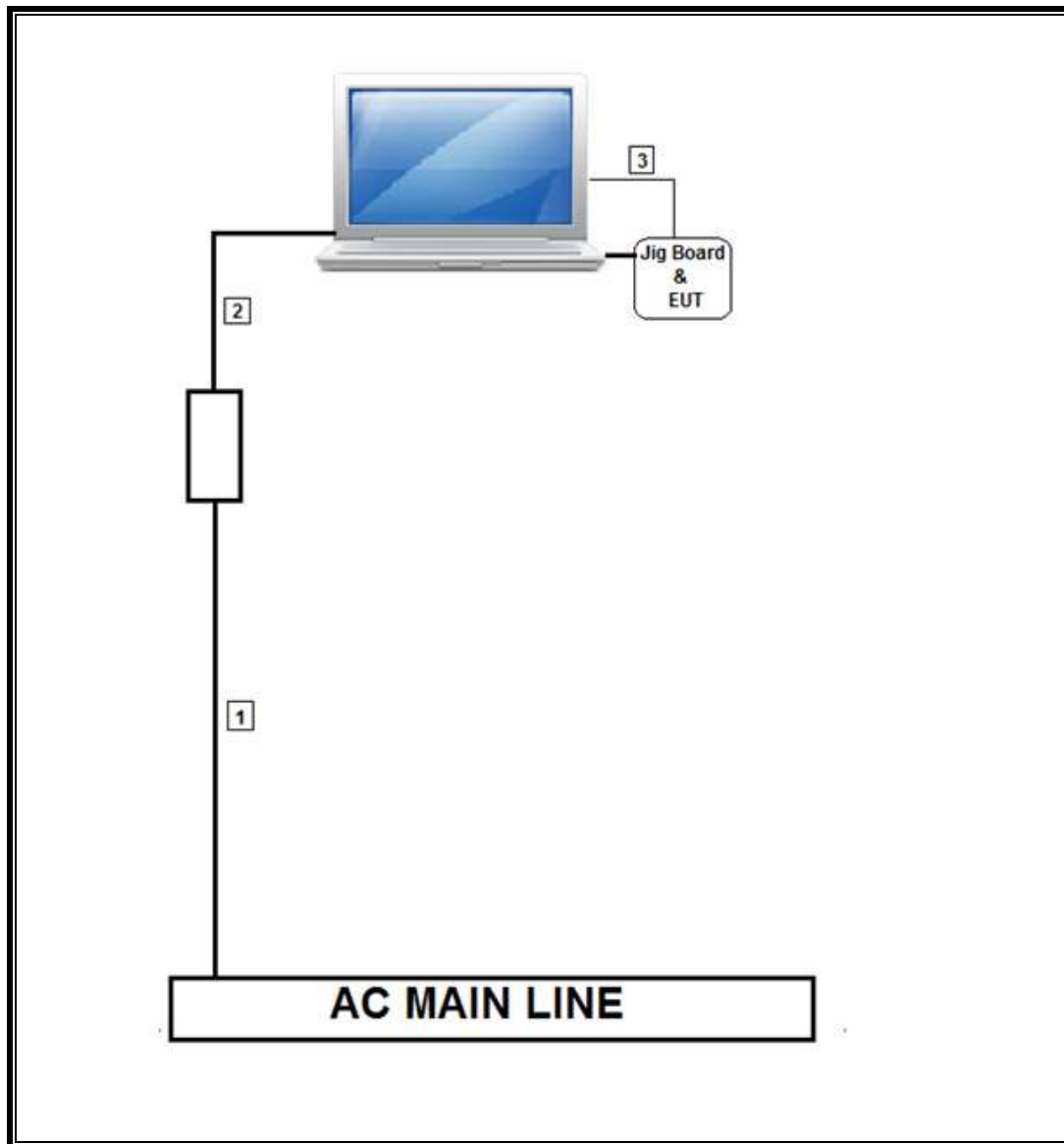
### I/O CABLES

| 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 | 1.0m             | NA      |
| 2              | DC   | 1                    | DC             | Un-Shielded | 0.8m             | NA      |
| 3              | USB  | 1                    | USB            | Un-Shielded | 0.8m             | NA      |

### TEST SETUP

The EUT was tested as an external module that installed on an USB to test JIG board connected to a host Laptop PC via USB cable. 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, 26.5 GHz | Agilent / HP   | E4440A     | C01161 | 05/07/13 | 05/07/14 |
| PXA Signal Analyzer         | Agilent        | N9030A     | T339   | 12/10/13 | 12/10/14 |
| Horn Antenna, 1GHz-18GHz    | ETS Lindgren   | 3117       | T119   | 01/06/14 | 01/06/15 |
| Antenna, Horn, 18 GHz       | EMCO           | 3115       | C01218 | 01/18/14 | 01/18/15 |
| Antenna, Horn, 26.5 GHz     | ARA            | MWH-1826/B | C00980 | 11/14/13 | 11/14/14 |
| Antenna, Bilog, 30MHz-1 GHz | Sunol Sciences | JB1        | C01016 | 08/22/13 | 08/22/14 |
| Preamplifier, 26.5 GHz      | Agilent / HP   | 8449B      | C00749 | 10/19/13 | 10/19/14 |
| Peak Power Meter            | Agilent / HP   | N1921A     | T309   | 12/12/13 | 12/12/14 |
| Preamplifier, 1300 MHz      | Agilent / HP   | 8447D      | C00885 | 01/16/14 | 01/16/15 |
| 5GHz Low Pass Filter        | Micro-Tronics  | LPS17541   | F00219 | 06/26/13 | 06/26/14 |
| 3GHz High Pass Filter       | Micro-Tronics  | HPS17542   | F00222 | 06/26/13 | 06/26/14 |
| 6GHz High Pass Filter       | Micro-Tronics  | HPM17543   | F00224 | 06/26/13 | 06/26/14 |

## 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.

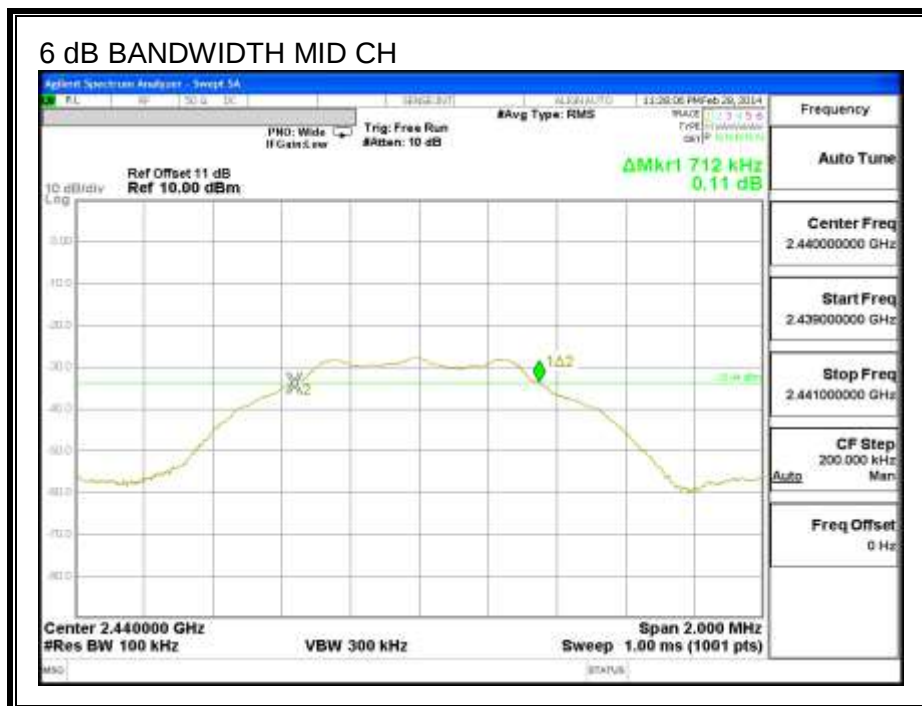
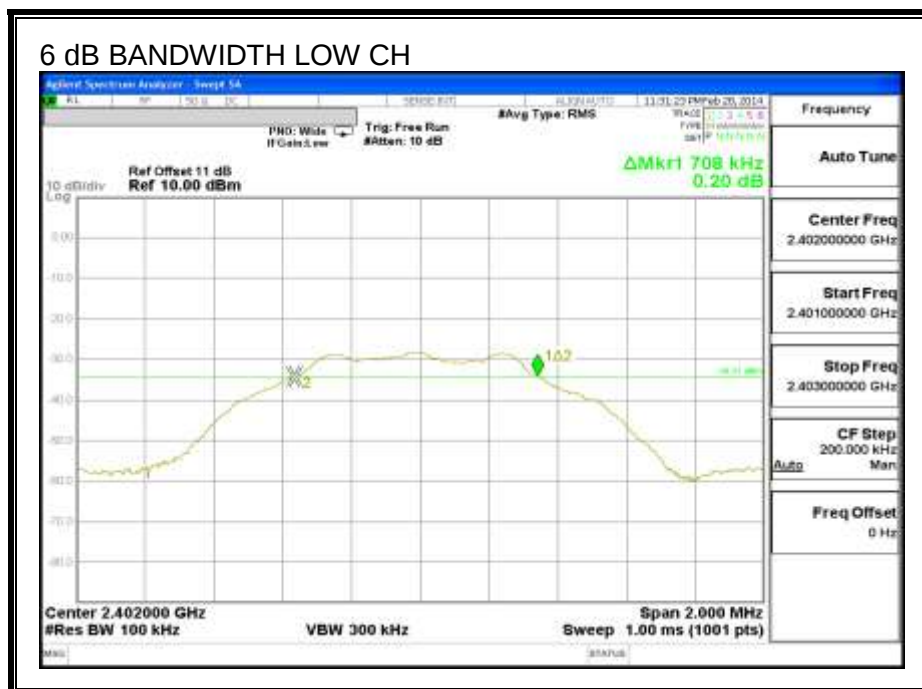
#### TEST PROCEDURE

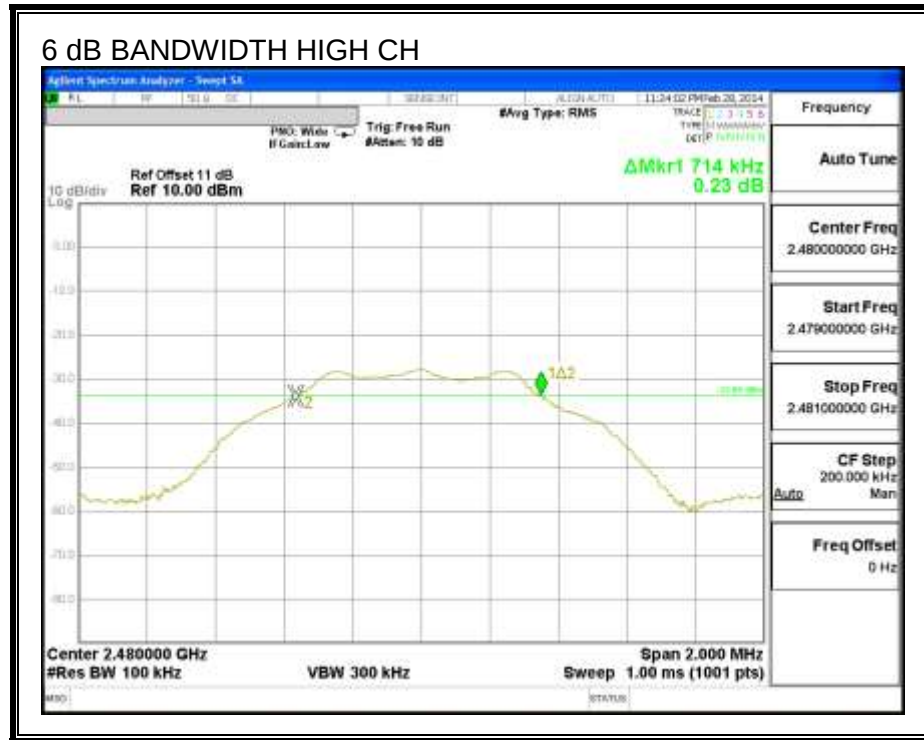
KDB 558074 D01 v03r01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247

#### RESULTS

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2402            | 0.7080               | 0.5                 |
| Middle  | 2440            | 0.7120               | 0.5                 |
| High    | 2480            | 0.7140               | 0.5                 |

## 6 dB BANDWIDTH





## **7.2. 99% BANDWIDTH**

### **LIMITS**

None; for reporting purposes only.

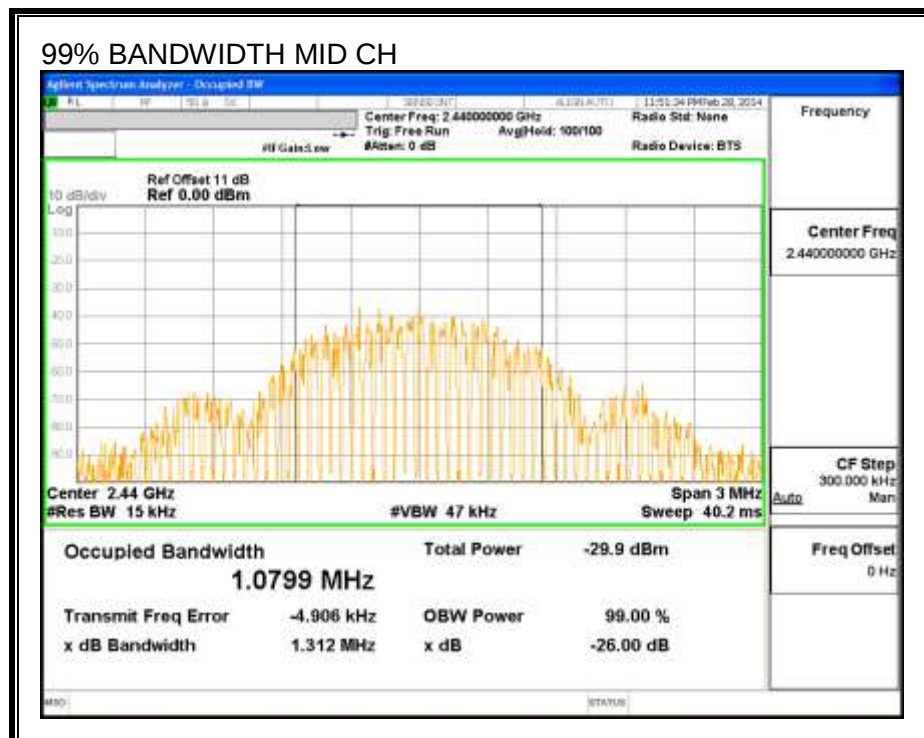
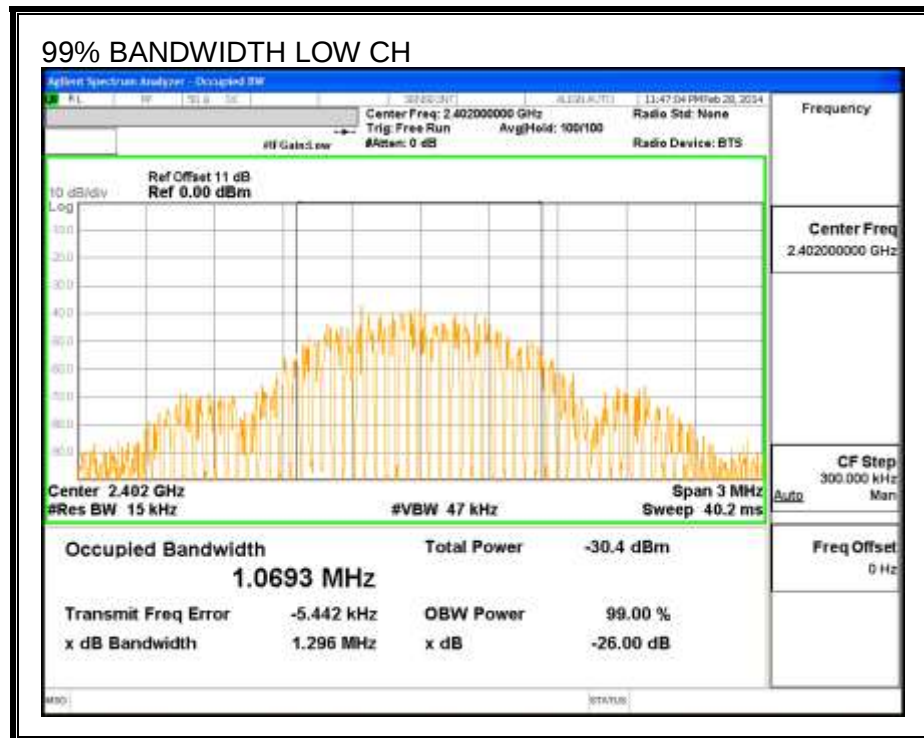
### **TEST PROCEDURE**

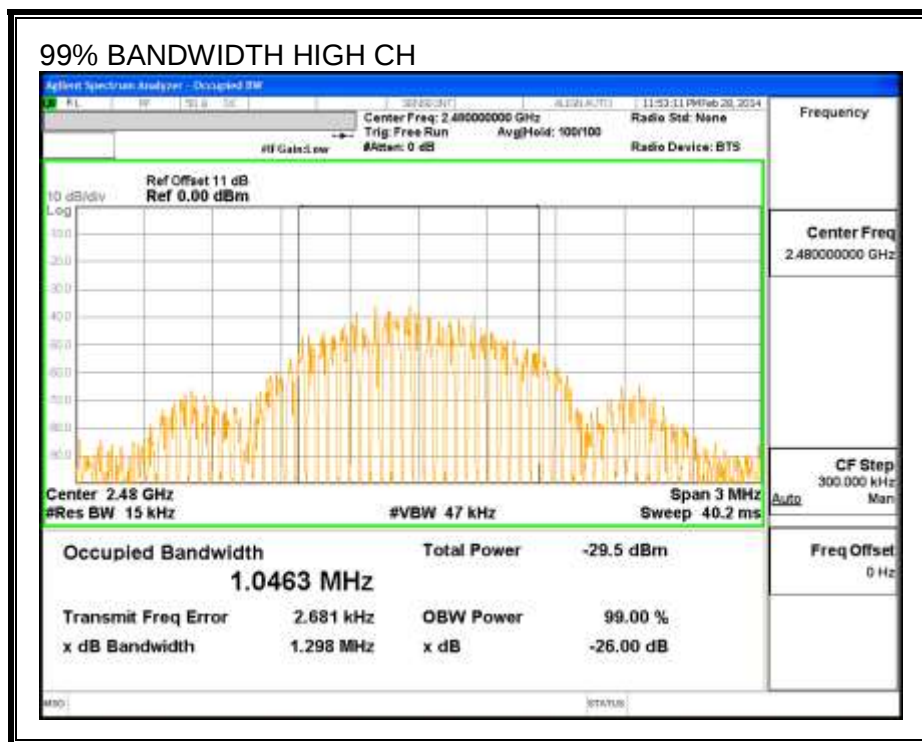
KDB 558074 D01 v03r01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247

### **RESULTS**

| <b>Channel</b> | <b>Frequency<br/>(MHz)</b> | <b>99% Bandwidth<br/>(MHz)</b> |
|----------------|----------------------------|--------------------------------|
| Low            | 2402                       | 1.0693                         |
| Middle         | 2440                       | 1.0799                         |
| High           | 2480                       | 1.0463                         |

**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.

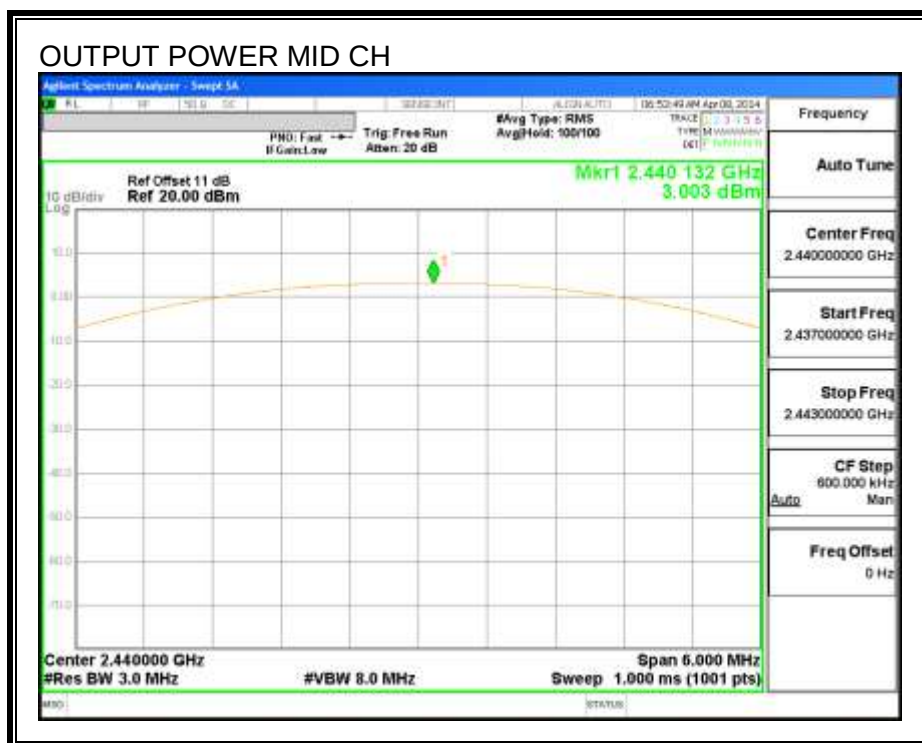
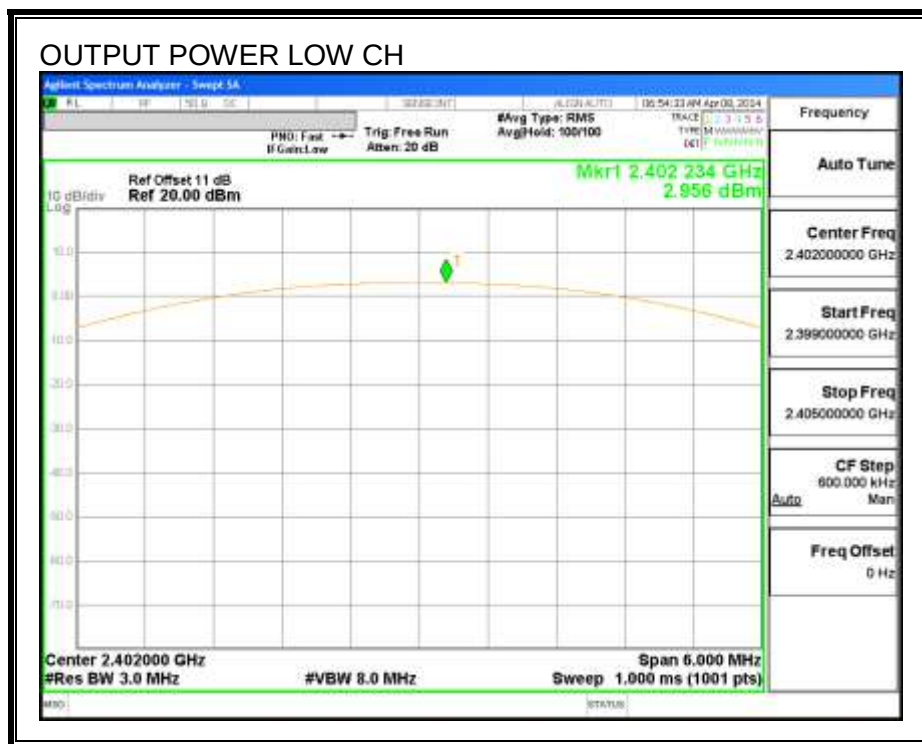
#### TEST PROCEDURE

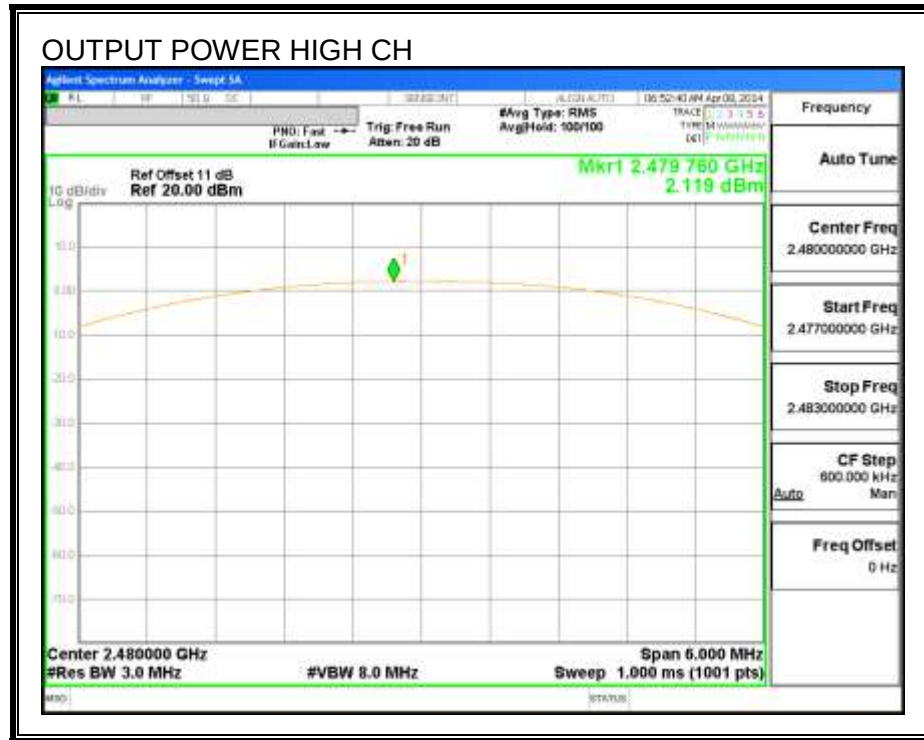
KDB 558074 D01 v03r01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247

#### RESULTS

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2402               | 2.956                          | 30             | -27.044        |
| Middle  | 2440               | 3.003                          | 30             | -26.997        |
| High    | 2480               | 2.119                          | 30             | -27.881        |

## OUTPUT POWER





## 7.4. AVERAGE POWER

### LIMITS

None; for reporting purposes only.

### RESULTS

The cable assembly insertion loss of 10.7 dB was entered as an offset in the power meter to allow for direct reading of power.

| Channel | Frequency (MHz) | AV power (dBm) |
|---------|-----------------|----------------|
| Low     | 2402            | 2.67           |
| Middle  | 2440            | 2.89           |
| High    | 2480            | 1.83           |

## 7.5. POWER SPECTRAL DENSITY

### LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

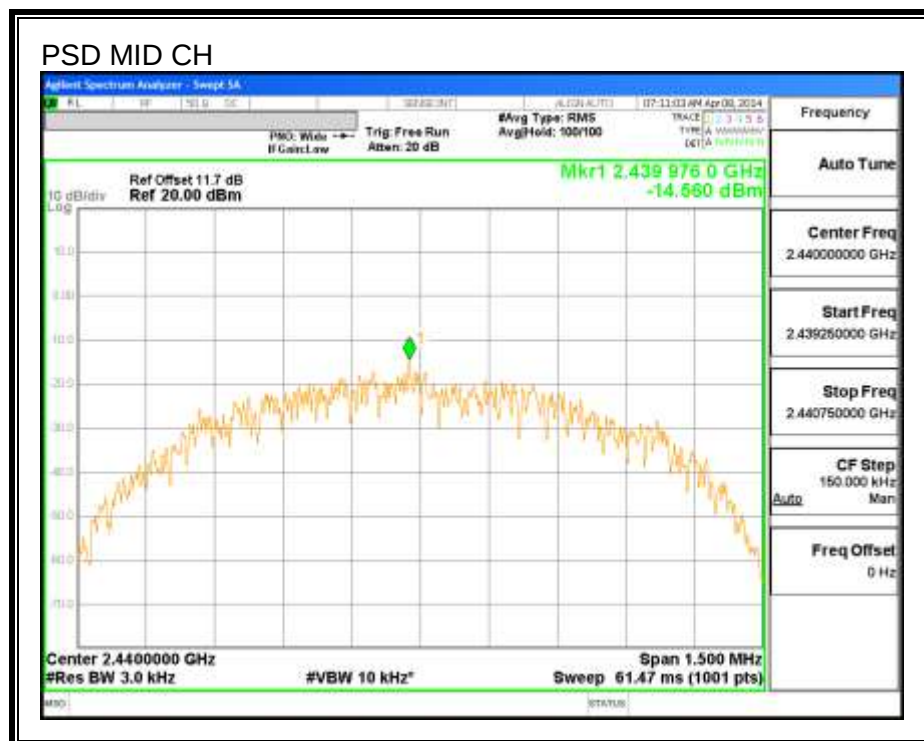
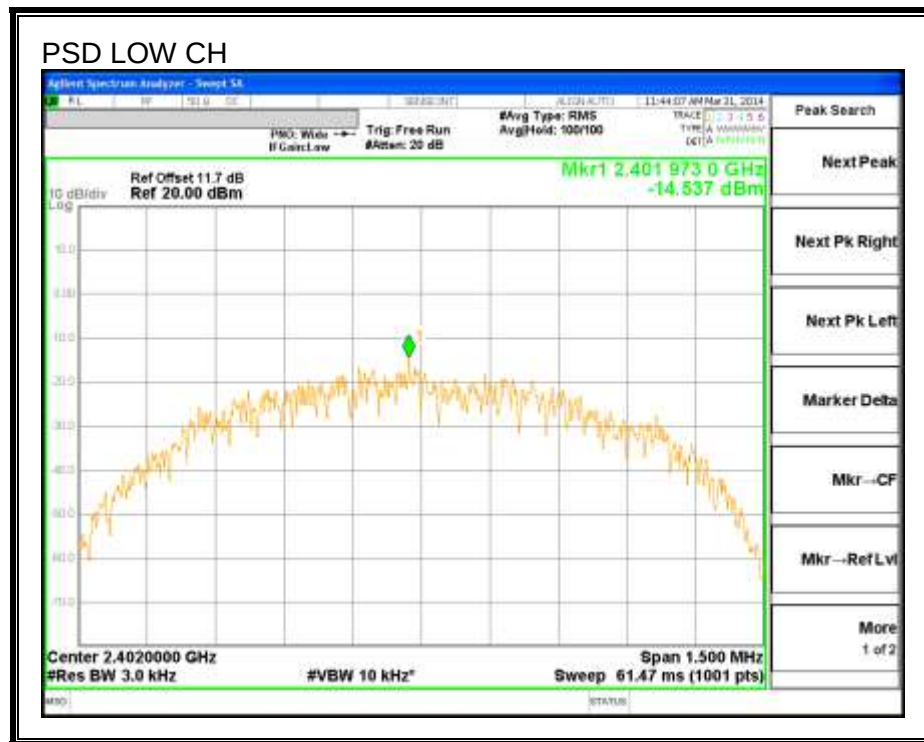
### TEST PROCEDURE

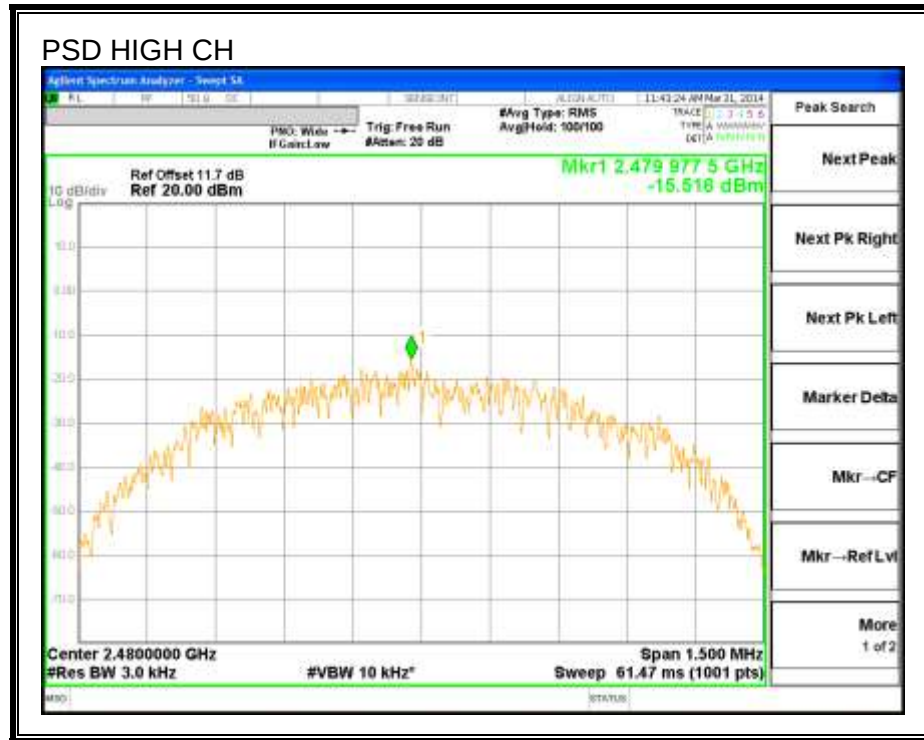
KDB 558074 D01 v03r01 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247

### RESULTS

| Channel | Frequency (MHz) | PSD (dBm) | Limit (dBm) | Margin (dB) |
|---------|-----------------|-----------|-------------|-------------|
| Low     | 2402            | -14.537   | 8           | -22.54      |
| Middle  | 2440            | -14.560   | 8           | -22.56      |
| High    | 2480            | -15.516   | 8           | -23.52      |

**POWER SPECTRAL DENSITY**





## **7.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

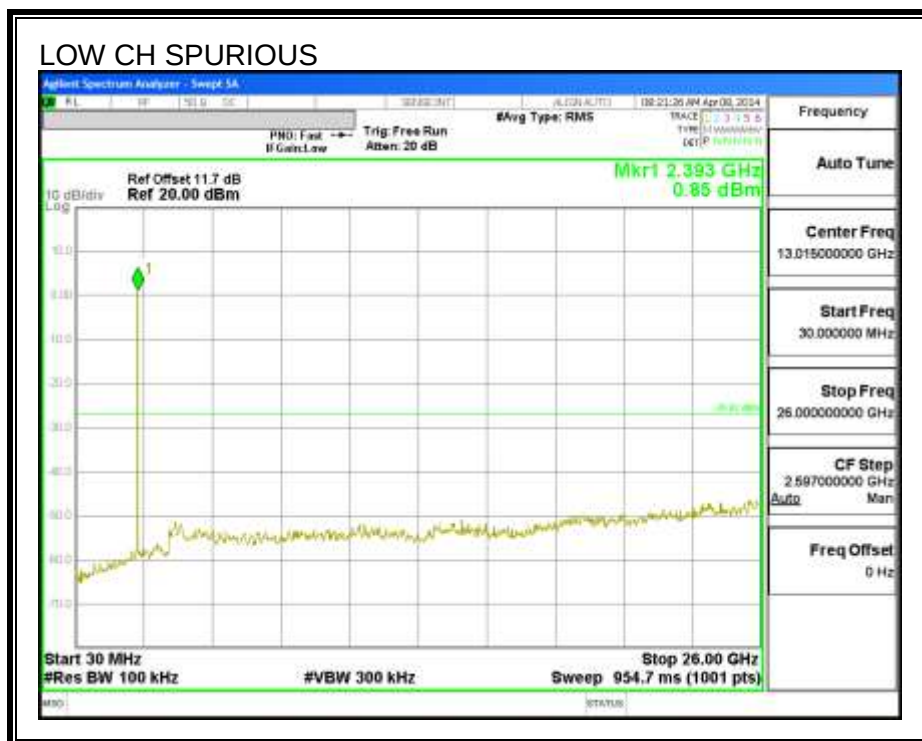
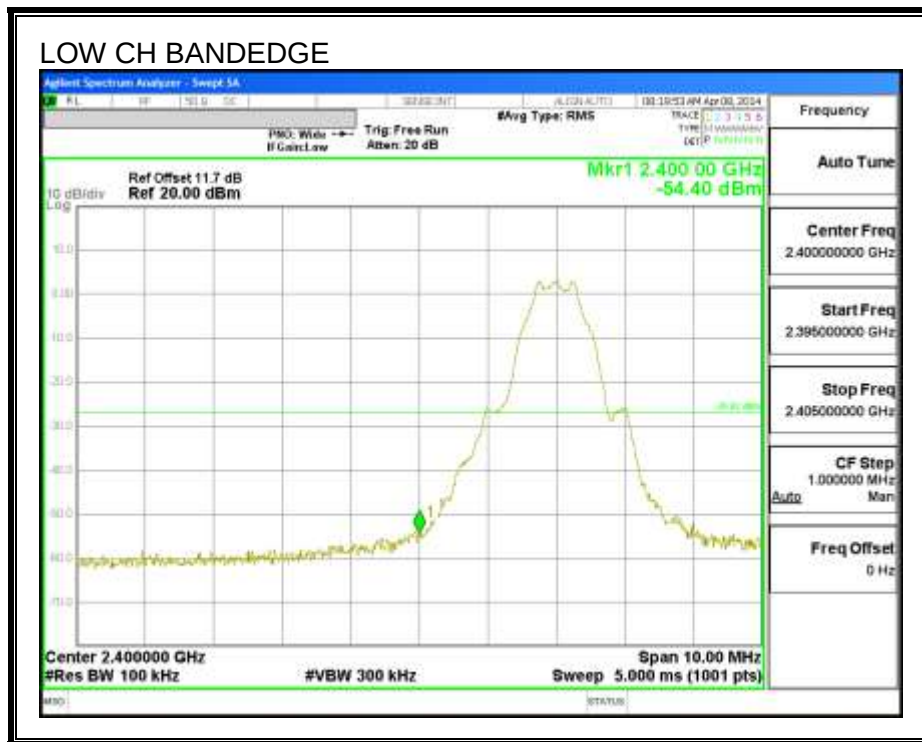
FCC §15.247 (d)

IC RSS-210 A8.5

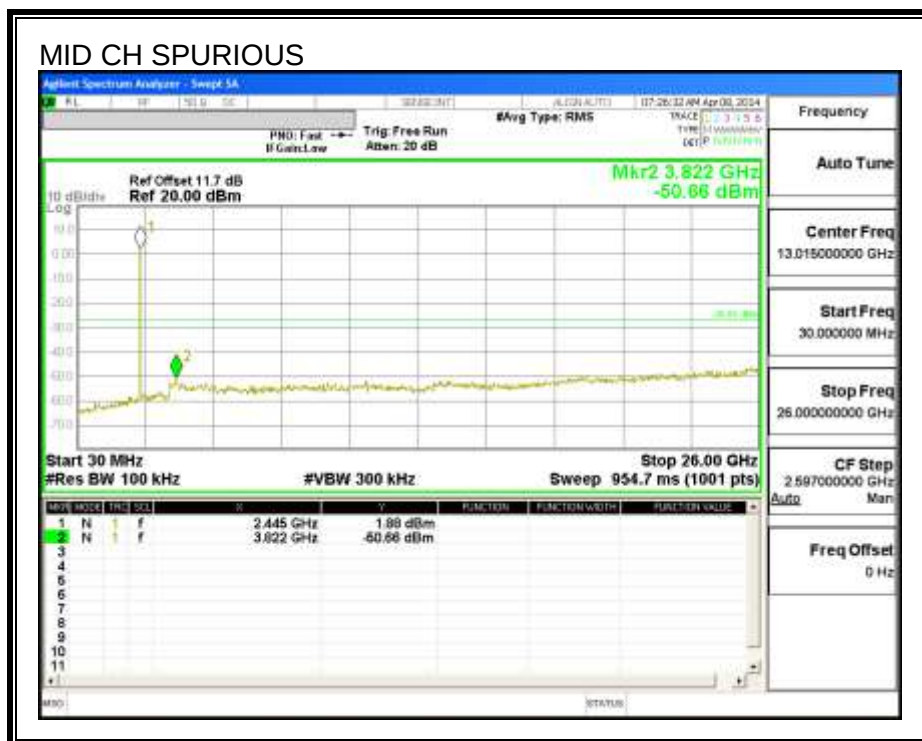
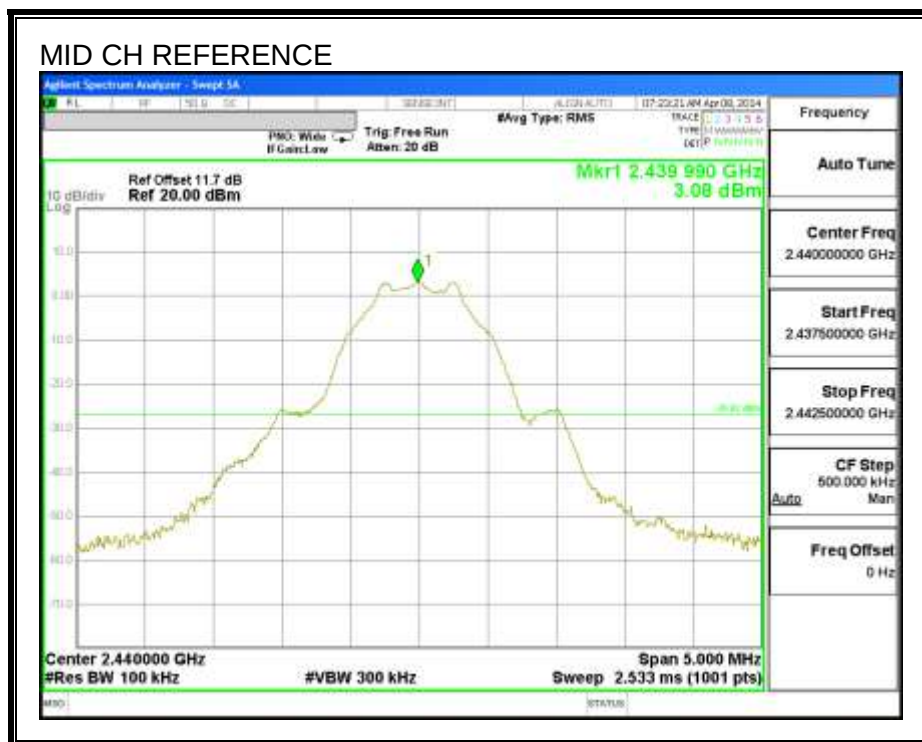
### **TEST PROCEDURE**

KDB 558074 D01 v02 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247".

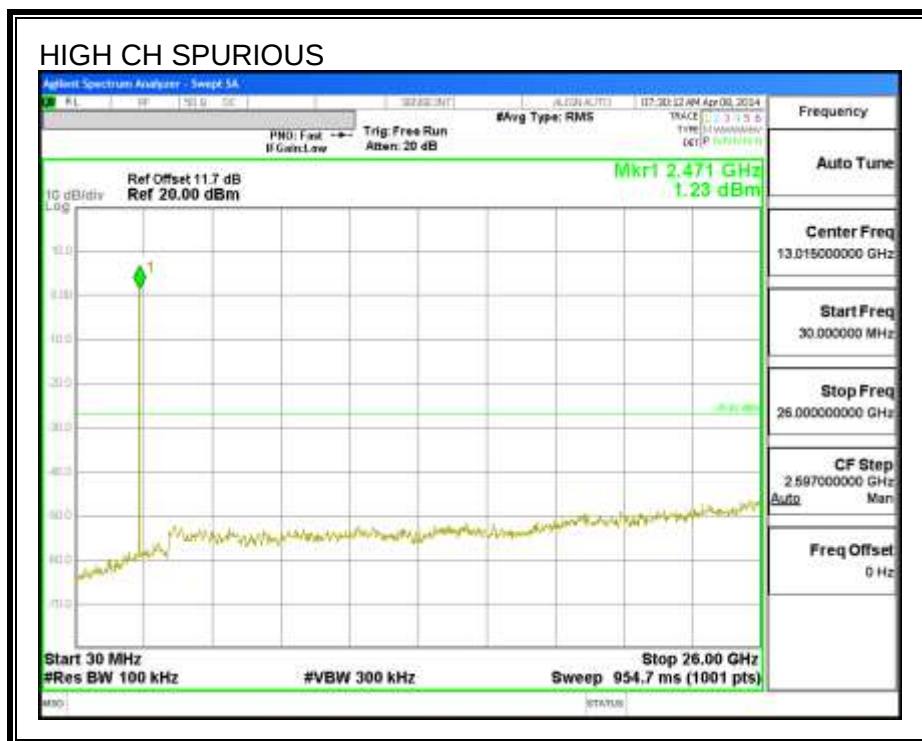
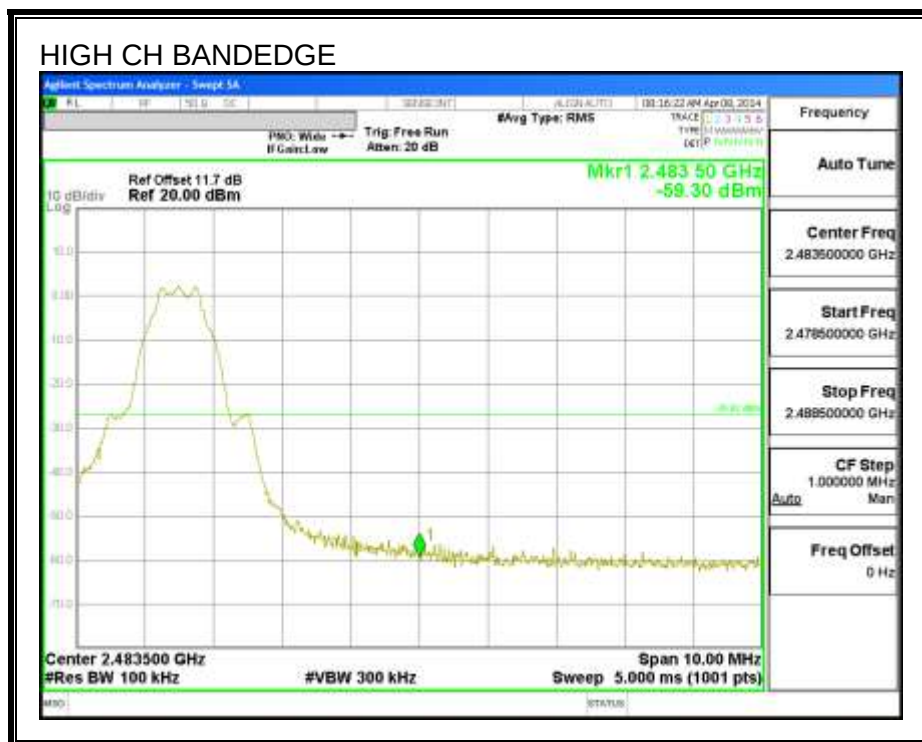
**SPURIOUS EMISSIONS, LOW CHANNEL**



# **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.

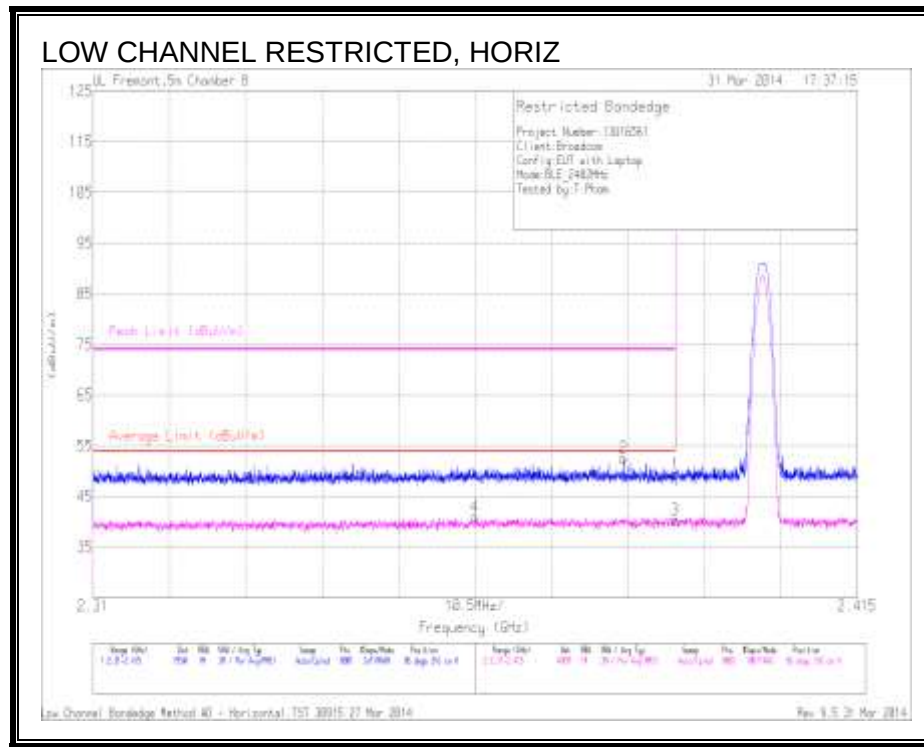
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, video bandwidth is set to 3 MHz, then Peak detection mode is set for peak measurements and Avg detection mode is used for average measurements.

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 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. BLUETOOTH LOW ENERGY MODE IN THE 2.4 GHz BAND

### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



#### Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (dB/m) | Amp/Cbl/ Fitr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 40.25                | PK  | 32.1           | -22.9                  | 49.45                      | -                      | -           | 74                  | -24.55         | 96             | 316         | H        |
| 2      | * 2.383         | 43.39                | PK  | 32.1           | -22.9                  | 52.59                      | -                      | -           | 74                  | -21.41         | 96             | 316         | H        |
| 3      | * 2.39          | 31.21                | RMS | 32.1           | -22.9                  | 40.41                      | 54                     | -13.59      | -                   | -              | 96             | 316         | H        |
| 4      | * 2.362         | 31.92                | RMS | 32             | -22.9                  | 41.02                      | 54                     | -12.98      | -                   | -              | 96             | 316         | H        |

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

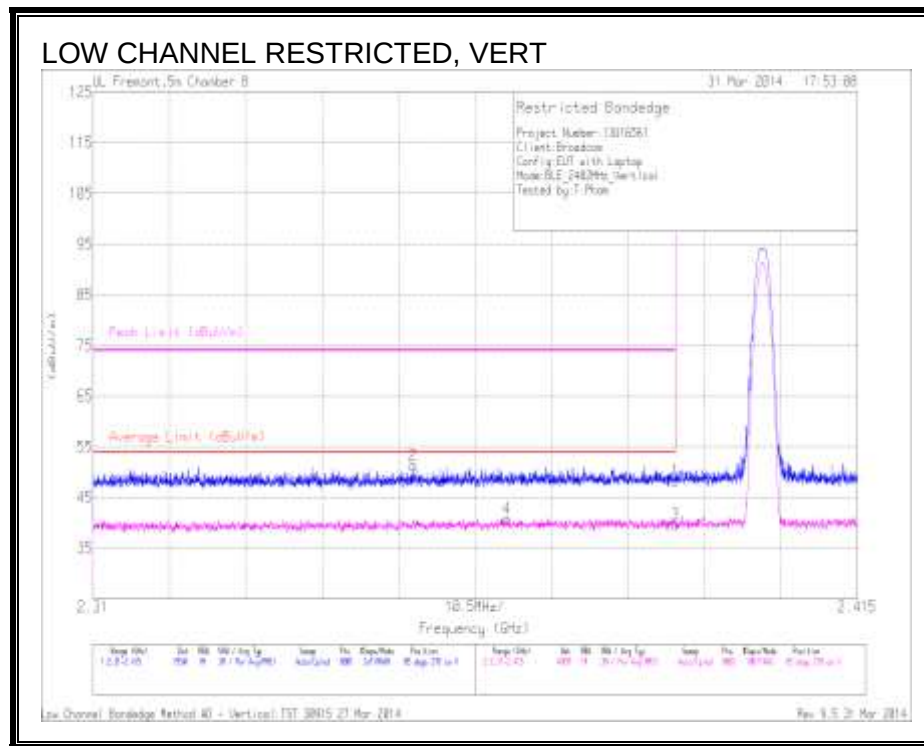
PK - Peak detector

RMS - RMS detection

Low Channel Bandedge Method AD - Horizontal.TST 30915 27 Mar 2014

Rev 9.5 31 Mar 2014

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



Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (dB/m) | Amp/Cbl/ Fitr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 39.06                | PK  | 32.1           | -22.9                  | 48.26                      | -                      | -           | 74                  | -25.74         | 85             | 278         | V        |
| 2      | * 2.354         | 42.42                | PK  | 31.9           | -23                    | 51.32                      | -                      | -           | 74                  | -22.68         | 85             | 278         | V        |
| 3      | * 2.39          | 30.59                | RMS | 32.1           | -22.9                  | 39.79                      | 54                     | -14.21      | -                   | -              | 85             | 278         | V        |
| 4      | * 2.367         | 31.68                | RMS | 32             | -22.8                  | 40.88                      | 54                     | -13.12      | -                   | -              | 85             | 278         | V        |

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

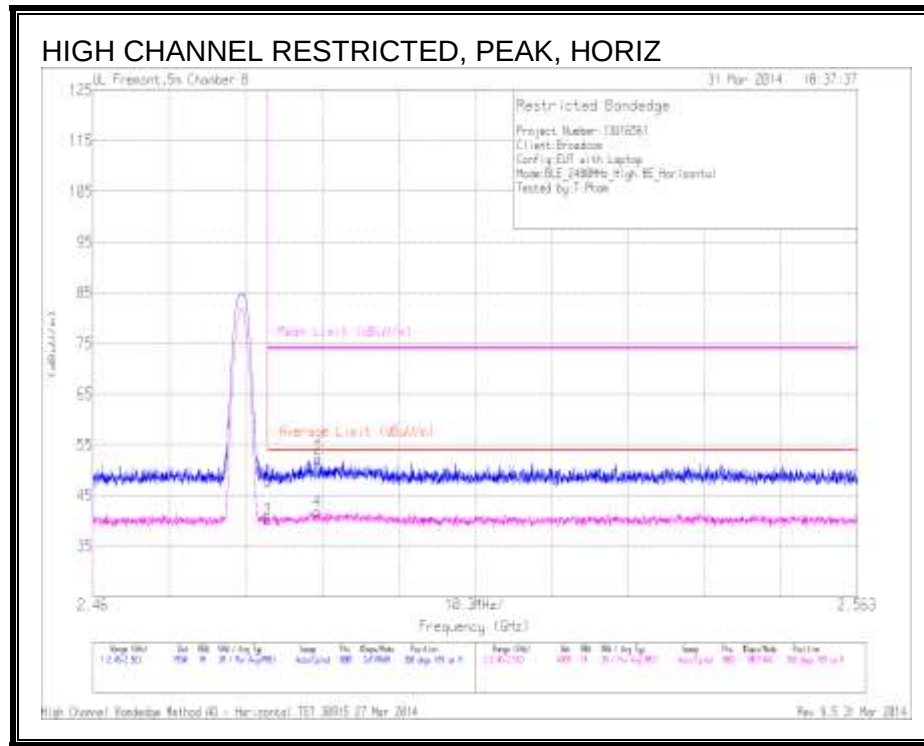
PK - Peak detector

RMS - RMS detection

Low Channel Bandedge Method AD - Vertical.TST 30915 27 Mar 2014

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



**Trace Markers**

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (dB/m) | Amp/Cbl/Filtr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.484         | 38.14                | PK  | 32.4           | -22.6                  | 47.94                      | -                      | -           | 74                  | -26.06         | 360            | 189         | H        |
| 2      | * 2.49          | 42.48                | PK  | 32.4           | -22.6                  | 52.28                      | -                      | -           | 74                  | -21.72         | 360            | 189         | H        |
| 3      | * 2.484         | 30.43                | RMS | 32.4           | -22.6                  | 40.23                      | 54                     | -13.77      | -                   | -              | 360            | 189         | H        |
| 4      | * 2.49          | 32.04                | RMS | 32.4           | -22.6                  | 41.84                      | 54                     | -12.16      | -                   | -              | 360            | 189         | H        |

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

High Channel Bandedge Method AD - Horizontal.TST 30915 27 Mar 2014

Rev 9.5 31 Mar 2014

# HIGH CHANNEL RESTRICTED, VERT

31 Mar 2014 18:30:15

Restricted Bondedge

Project Number: 13012561

Client: Bondedge

Config: EIT with Laptop

Name: BLE\_2480MHz\_High\_SE\_Veritical

Tested by: T. Flom

Power (dBm)

Frequency (GHz)

Peak Limit (dBm/Hz)

Average Limit (dBm/Hz)

| Range (dB) | Set    | Min    | Max    | Avg    | Std    | Peak   | Range (dB) | Set    | Min    | Max    | Avg    | Std    | Peak   | Range (dB) | Set    | Min    | Max    | Avg    | Std    | Peak   |
|------------|--------|--------|--------|--------|--------|--------|------------|--------|--------|--------|--------|--------|--------|------------|--------|--------|--------|--------|--------|--------|
| 120.00     | 120.00 | 120.00 | 120.00 | 120.00 | 120.00 | 120.00 | 120.00     | 120.00 | 120.00 | 120.00 | 120.00 | 120.00 | 120.00 | 120.00     | 120.00 | 120.00 | 120.00 | 120.00 | 120.00 | 120.00 |

High Channel Bondedge Method 65 - Vertical 737 2015 27 Mar 2014

Rev 6.5 31 Mar 2014

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (dB/m) | Amp/Cbl/ Ftrt/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.484         | 39.47                | PK  | 32.4           | -22.6                  | 49.27                      | -                      | -           | 74                  | -24.73         | 304            | 190         | V        |
| 2      | * 2.497         | 41.97                | PK  | 32.4           | -22.7                  | 51.67                      | -                      | -           | 74                  | -22.33         | 304            | 190         | V        |
| 3      | * 2.484         | 30.45                | RMS | 32.4           | -22.6                  | 40.25                      | 54                     | -13.75      | -                   | -              | 304            | 190         | V        |
| 4      | * 2.494         | 32.05                | RMS | 32.4           | -22.7                  | 41.75                      | 54                     | -12.25      | -                   | -              | 304            | 190         | V        |

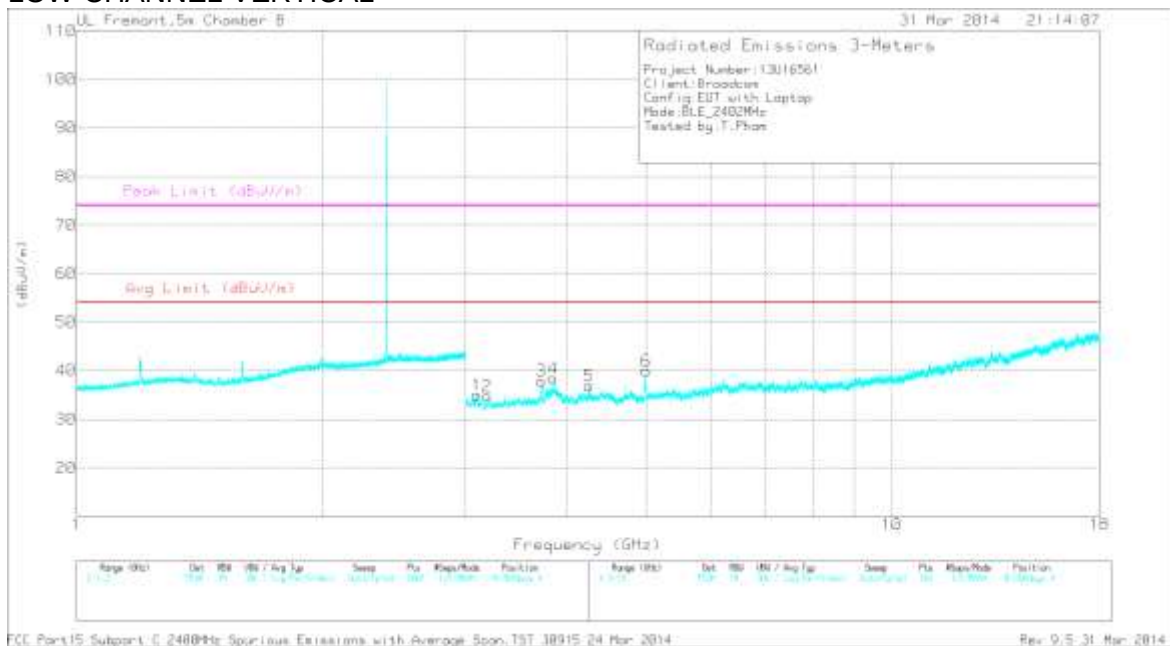
Rev 9.5 31 Mar 2014

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL HORIZONTAL



### LOW CHANNEL VERTICAL



## LOW CHANNEL DATA

### Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AFT345 (dB/m) | Amp/Cbl/Filtr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 7      | * 4.978         | 31.87                | PK  | 34.2          | -29.9                  | 36.17                      | -                  | -           | 74                  | -37.83         | 0-360          | 201         | H        |
| 8      | * 4.255         | 32.72                | PK  | 33.6          | -30.8                  | 35.52                      | -                  | -           | 74                  | -38.48         | 0-360          | 201         | H        |
| 9      | * 3.718         | 33.45                | PK  | 33.4          | -31.3                  | 35.55                      | -                  | -           | 74                  | -38.45         | 0-360          | 201         | H        |
| 10     | * 3.861         | 32.61                | PK  | 33.7          | -30.2                  | 36.11                      | -                  | -           | 74                  | -37.89         | 0-360          | 201         | H        |
| 3      | * 3.718         | 35.83                | PK  | 33.4          | -31.3                  | 37.93                      | -                  | -           | 74                  | -36.07         | 0-360          | 202         | V        |
| 4      | * 3.843         | 34.91                | PK  | 33.7          | -30.2                  | 38.41                      | -                  | -           | 74                  | -35.59         | 0-360          | 202         | V        |
| 5      | * 4.251         | 34.13                | PK  | 33.6          | -30.8                  | 36.93                      | -                  | -           | 74                  | -37.07         | 0-360          | 202         | V        |
| 6      | * 4.997         | 35.16                | PK  | 34.2          | -29.4                  | 39.96                      | -                  | -           | 74                  | -34.04         | 0-360          | 202         | V        |
| 1      | 3.097           | 33.65                | PK  | 32.9          | -31.5                  | 35.05                      | -                  | -           | -                   | -              | 0-360          | 202         | V        |
| 2      | 3.192           | 33.26                | PK  | 32.8          | -31.3                  | 34.76                      | -                  | -           | -                   | -              | 0-360          | 202         | V        |

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

### Radiated Emissions

| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T345 (dB/m) | Amp/Cbl/Filtr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|------|----------------|------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 3.865         | 40.65                | PK2  | 33.7           | -30.2                  | 44.15                      | -                  | -           | 74                  | -29.85         | 242            | 301         | H        |
| * 3.875         | 30.85                | MAV1 | 33.8           | -30.2                  | 34.45                      | 54                 | -19.55      | -                   | -              | 242            | 301         | H        |
| * 4.254         | 42.37                | PK2  | 33.6           | -30.8                  | 45.17                      | -                  | -           | 74                  | -28.83         | 121            | 188         | H        |
| * 4.264         | 30.89                | MAV1 | 33.6           | -30.9                  | 33.59                      | 54                 | -20.41      | -                   | -              | 121            | 188         | H        |
| * 3.729         | 47.73                | PK2  | 33.4           | -31.6                  | 49.53                      | -                  | -           | 74                  | -24.47         | 302            | 239         | V        |
| * 3.727         | 34.56                | MAV1 | 33.4           | -31.5                  | 36.46                      | 54                 | -17.54      | -                   | -              | 302            | 239         | V        |
| * 3.843         | 43.48                | PK2  | 33.7           | -30.2                  | 46.98                      | -                  | -           | 74                  | -27.02         | 302            | 204         | V        |
| * 3.843         | 34.31                | MAV1 | 33.7           | -30.2                  | 37.81                      | 54                 | -16.19      | -                   | -              | 302            | 204         | V        |
| * 4.255         | 43.07                | PK2  | 33.6           | -30.8                  | 45.87                      | -                  | -           | 74                  | -28.13         | 331            | 360         | V        |
| * 4.254         | 31.91                | MAV1 | 33.6           | -30.8                  | 34.71                      | 54                 | -19.29      | -                   | -              | 331            | 360         | V        |

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

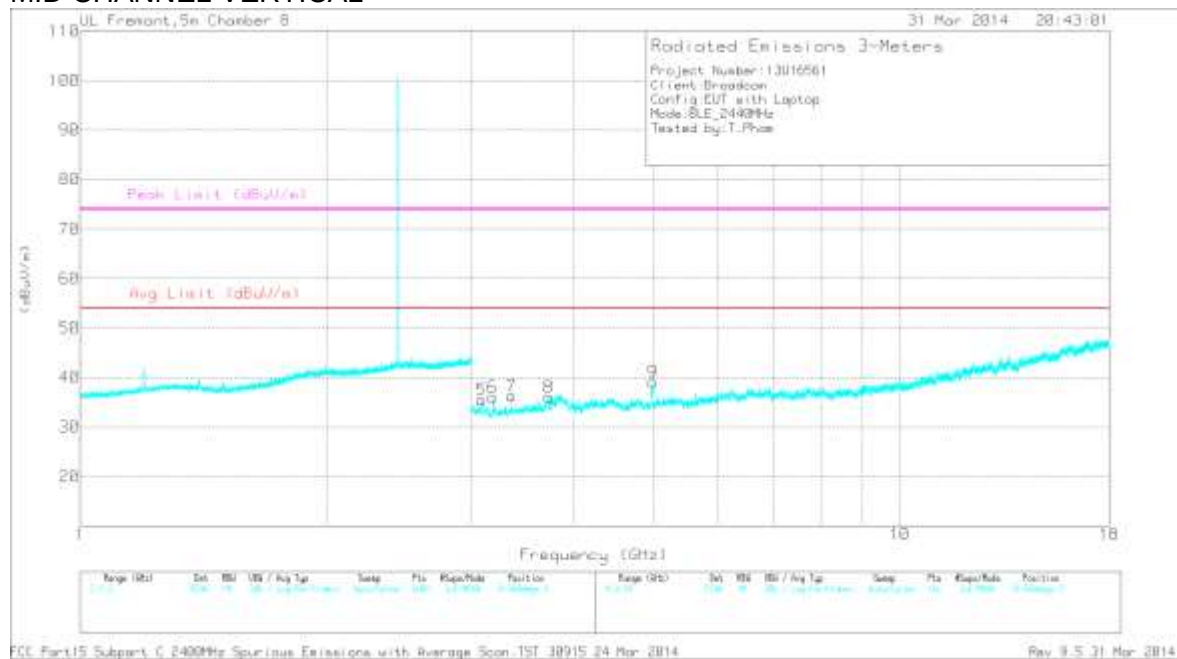
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Mar 2014

Rev 9.5 31 Mar 2014

## MID CHANNEL HORIZONTAL



## MID CHANNEL VERTICAL



## MID CHANNEL DATA

### Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (dB/m) | Amp/Cbl/F ltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 3      | * 3.717         | 35.71                | PK  | 33.4           | -31.3                  | 37.81                      | -                  | -           | 74                  | -36.19         | 0-360          | 201         | H        |
| 4      | * 4.978         | 31.78                | PK  | 34.2           | -29.9                  | 36.08                      | -                  | -           | 74                  | -37.92         | 0-360          | 201         | H        |
| 8      | * 3.731         | 34.27                | PK  | 33.4           | -31.6                  | 36.07                      | -                  | -           | 74                  | -37.93         | 0-360          | 202         | V        |
| 9      | * 4.997         | 34.25                | PK  | 34.2           | -29.4                  | 39.05                      | -                  | -           | 74                  | -34.95         | 0-360          | 202         | V        |
| 5      | 3.086           | 34.19                | PK  | 32.9           | -31.6                  | 35.49                      | -                  | -           | -                   | -              | 0-360          | 202         | V        |
| 1      | 3.097           | 32.35                | PK  | 32.9           | -31.5                  | 33.75                      | -                  | -           | -                   | -              | 0-360          | 99          | H        |
| 2      | 3.186           | 32.12                | PK  | 32.8           | -31.4                  | 33.52                      | -                  | -           | -                   | -              | 0-360          | 201         | H        |
| 6      | 3.187           | 34.62                | PK  | 32.8           | -31.4                  | 36.02                      | -                  | -           | -                   | -              | 0-360          | 202         | V        |
| 7      | 3.36            | 34.93                | PK  | 32.8           | -31.4                  | 36.33                      | -                  | -           | -                   | -              | 0-360          | 202         | V        |

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

### Radiated Emissions

| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T345 (dB/m) | Amp/Cbl/F ltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|------|----------------|------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 3.722         | 42.32                | PK2  | 33.4           | -31.4                  | 44.32                      | -                  | -           | 74                  | -29.68         | 251            | 320         | H        |
| * 3.72          | 31.39                | MAv1 | 33.4           | -31.4                  | 33.39                      | 54                 | -20.61      | -                   | -              | 251            | 320         | H        |
| * 4.985         | 41.57                | PK2  | 34.2           | -29.8                  | 45.97                      | -                  | -           | 74                  | -28.03         | 255            | 120         | H        |
| * 4.979         | 30.78                | MAv1 | 34.2           | -29.9                  | 35.08                      | 54                 | -18.92      | -                   | -              | 255            | 120         | H        |
| * 4.986         | 42.91                | PK2  | 34.2           | -29.8                  | 47.31                      | -                  | -           | 74                  | -26.69         | 10             | 288         | V        |
| * 4.983         | 30.89                | MAv1 | 34.2           | -29.8                  | 35.29                      | 54                 | -18.71      | -                   | -              | 10             | 288         | V        |

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

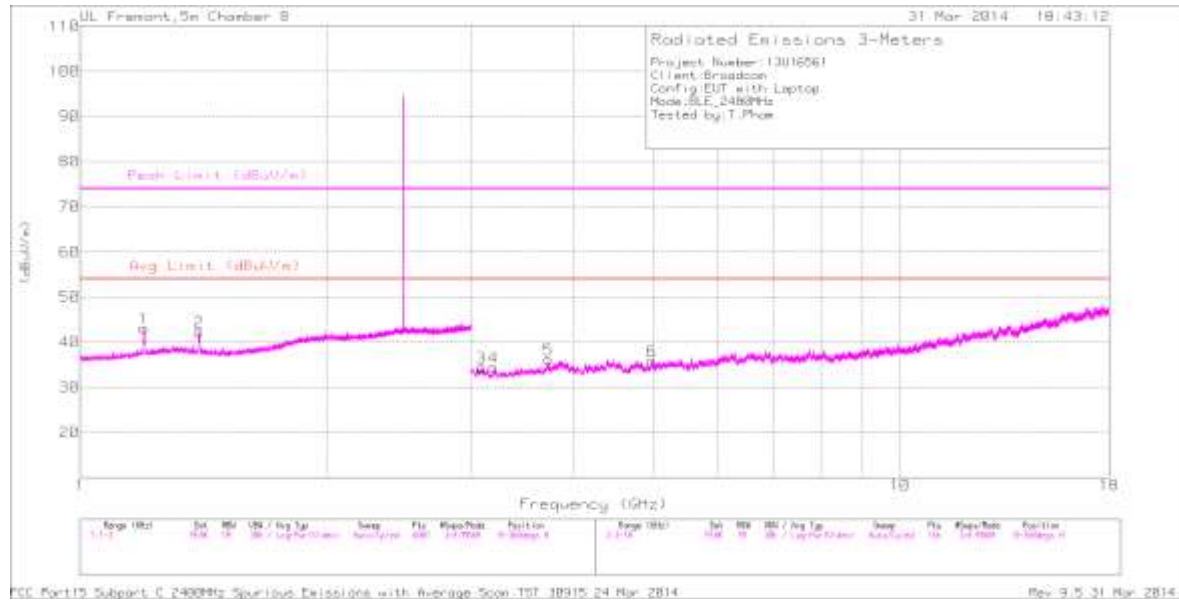
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

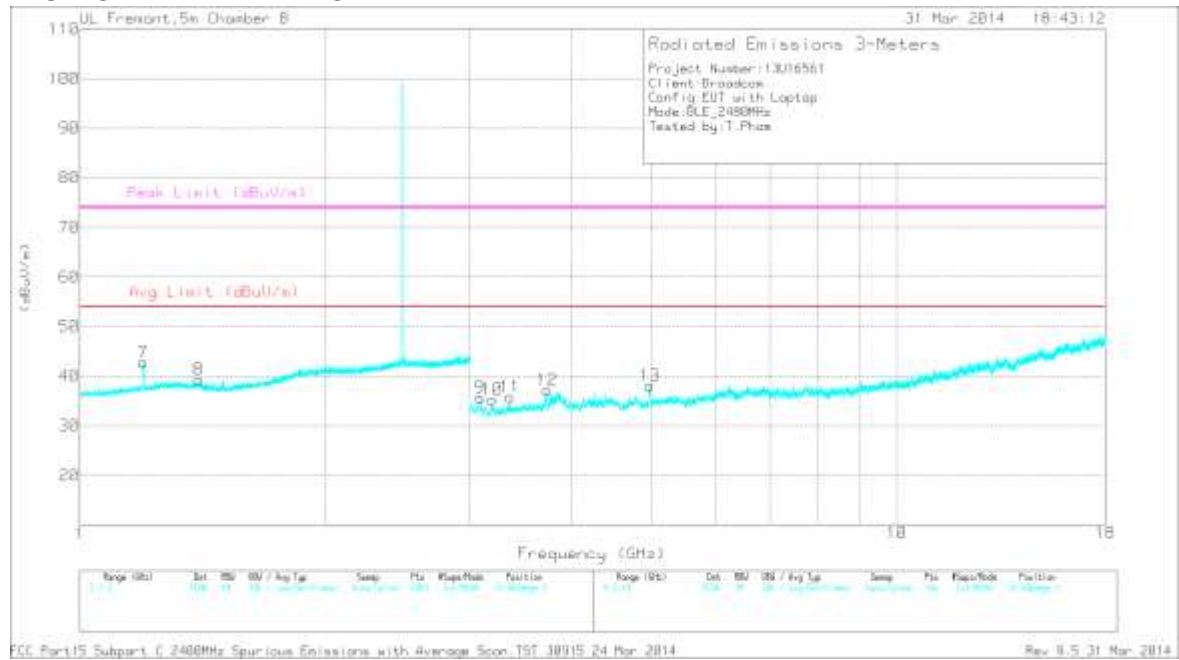
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Mar 2014

Rev 9.5 31 Mar 2014

## HIGH CHANNEL HORIZONTAL



## HIGH CHANNEL VERTICAL



## HIGH CHANNEL DATA

### Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (dB/m) | Amp/Cbl/Filtr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 1.195         | 39.67                | PK  | 28.2           | -24.7                  | 43.17                      | -                  | -           | 74                  | -30.83         | 0-360          | 201         | H        |
| 2      | * 1.398         | 38.43                | PK  | 28.5           | -24.5                  | 42.43                      | -                  | -           | 74                  | -31.57         | 0-360          | 99          | H        |
| 7      | * 1.195         | 39.22                | PK  | 28.2           | -24.7                  | 42.72                      | -                  | -           | 74                  | -31.28         | 0-360          | 202         | V        |
| 8      | * 1.398         | 35.36                | PK  | 28.5           | -24.5                  | 39.36                      | -                  | -           | 74                  | -34.64         | 0-360          | 202         | V        |
| 5      | * 3.727         | 34.24                | PK  | 33.4           | -31.5                  | 36.14                      | -                  | -           | 74                  | -37.86         | 0-360          | 201         | H        |
| 6      | * 4.984         | 31.5                 | PK  | 34.2           | -29.8                  | 35.9                       | -                  | -           | 74                  | -38.1          | 0-360          | 201         | H        |
| 12     | * 3.73          | 35.32                | PK  | 33.4           | -31.6                  | 37.12                      | -                  | -           | 74                  | -36.88         | 0-360          | 202         | V        |
| 13     | * 4.978         | 33.75                | PK  | 34.2           | -29.9                  | 38.05                      | -                  | -           | 74                  | -35.95         | 0-360          | 202         | V        |
| 9      | 3.086           | 34.36                | PK  | 32.9           | -31.6                  | 35.66                      | -                  | -           | -                   | -              | 0-360          | 202         | V        |
| 3      | 3.09            | 32.92                | PK  | 32.9           | -31.5                  | 34.32                      | -                  | -           | -                   | -              | 0-360          | 99          | H        |
| 4      | 3.193           | 33.06                | PK  | 32.8           | -31.3                  | 34.56                      | -                  | -           | -                   | -              | 0-360          | 201         | H        |
| 10     | 3.197           | 33.73                | PK  | 32.8           | -31.3                  | 35.23                      | -                  | -           | -                   | -              | 0-360          | 202         | V        |
| 11     | 3.36            | 34.34                | PK  | 32.8           | -31.4                  | 35.74                      | -                  | -           | -                   | -              | 0-360          | 202         | V        |

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

### Radiated Emissions

| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T345 (dB/m) | Amp/Cbl/Filtr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|------|----------------|------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 1.199         | 45.89                | PK2  | 28.2           | -24.7                  | 49.39                      | -                  | -           | 74                  | -24.61         | 38             | 113         | H        |
| * 1.198         | 36.49                | MAV1 | 28.2           | -24.7                  | 39.99                      | 54                 | -14.01      | -                   | -              | 38             | 113         | H        |
| * 1.399         | 46.14                | PK2  | 28.5           | -24.5                  | 50.14                      | -                  | -           | 74                  | -23.86         | 182            | 368         | H        |
| * 1.396         | 35.6                 | MAV1 | 28.5           | -24.5                  | 39.6                       | 54                 | -14.4       | -                   | -              | 182            | 368         | H        |
| * 1.196         | 45.84                | PK2  | 28.2           | -24.7                  | 49.34                      | -                  | -           | 74                  | -24.66         | 333            | 193         | V        |
| * 1.198         | 34.07                | MAV1 | 28.2           | -24.7                  | 37.57                      | 54                 | -16.43      | -                   | -              | 333            | 193         | V        |
| * 1.394         | 43.37                | PK2  | 28.5           | -24.5                  | 47.37                      | -                  | -           | 74                  | -26.63         | 209            | 233         | V        |
| * 1.399         | 32.75                | MAV1 | 28.5           | -24.5                  | 36.75                      | 54                 | -17.25      | -                   | -              | 209            | 233         | V        |
| * 3.724         | 47.41                | PK2  | 33.4           | -31.5                  | 49.31                      | -                  | -           | 74                  | -24.69         | 316            | 313         | H        |
| * 3.723         | 34.62                | MAV1 | 33.4           | -31.4                  | 36.62                      | 54                 | -17.38      | -                   | -              | 316            | 313         | H        |
| * 4.985         | 45.59                | PK2  | 34.2           | -29.8                  | 49.99                      | -                  | -           | 74                  | -24.01         | 322            | 280         | H        |
| * 4.982         | 33.5                 | MAV1 | 34.2           | -29.8                  | 37.9                       | 54                 | -16.1       | -                   | -              | 322            | 280         | H        |
| * 3.729         | 45.11                | PK2  | 33.4           | -31.6                  | 46.91                      | -                  | -           | 74                  | -27.09         | 332            | 264         | V        |
| * 3.725         | 32.83                | MAV1 | 33.4           | -31.5                  | 34.73                      | 54                 | -19.27      | -                   | -              | 332            | 264         | V        |
| * 4.981         | 42.19                | PK2  | 34.2           | -29.8                  | 46.59                      | -                  | -           | 74                  | -27.41         | 168            | 338         | V        |
| * 4.98          | 31.2                 | MAV1 | 34.2           | -29.8                  | 35.6                       | 54                 | -18.4       | -                   | -              | 168            | 338         | V        |

\* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Mar 2014

Rev 9.5 31 Mar 2014

### 8.3. WORST-CASE 18\_26 GHz

#### SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION)



#### Trace Markers

| Marker | Frequenc<br>y<br>(GHz) | Meter<br>Reading<br>(dBuV) | Det | AF T89<br>(dB/m) | Amp/Cbl<br>(dB) | Dist Corr<br>(dB) | Corrected<br>Reading<br>(dBuVolts<br>) | Avg Limit<br>(dBuV/m) | Margin<br>(dB) | Peak<br>Limit<br>(dBuV/m) | PK<br>Margin<br>(dB) |
|--------|------------------------|----------------------------|-----|------------------|-----------------|-------------------|----------------------------------------|-----------------------|----------------|---------------------------|----------------------|
| 1      | 19.186                 | 39.33                      | PK  | 32.5             | -23.5           | -9.5              | 38.83                                  | 54                    | -15.167        | 74                        | -35.167              |
| 2      | 22.263                 | 42.5                       | PK  | 33.2             | -23.2           | -9.5              | 43                                     | 54                    | -11            | 74                        | -31                  |
| 3      | 24.008                 | 43.37                      | PK  | 33.6             | -22.8           | -9.5              | 44.67                                  | 54                    | -9.333         | 74                        | -29.333              |
| 4      | 19.319                 | 38.8                       | PK  | 32.5             | -23.8           | -9.5              | 38                                     | 54                    | -16            | 74                        | -36                  |
| 5      | 22.31                  | 41.3                       | PK  | 33.3             | -23.1           | -9.5              | 42                                     | 54                    | -12            | 74                        | -32                  |
| 6      | 25.087                 | 44.5                       | PK  | 33.9             | -22.9           | -9.5              | 46                                     | 54                    | -8             | 74                        | -28                  |

PK - Peak detector

18-26GHz Test.TST 30915 23 Aug 2013 Rev 9.5 19 Jan 2014



## EMISSIONS DATA

### Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AF T477 (dB/m) | Amp/Cbl (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|--------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 5      | 32.465          | 30.05                | PK  | 19.2           | -28.8        | 20.45                      | 40                 | -19.55      | 0-360          | 101         | V        |
| 1      | 76.4525         | 44.86                | PK  | 8              | -28.3        | 24.56                      | 40                 | -15.44      | 0-360          | 400         | H        |
| 6      | 99.615          | 45.22                | PK  | 10.2           | -28.1        | 27.32                      | 43.52              | -16.2       | 0-360          | 101         | V        |
| 2      | 99.9125         | 52.34                | PK  | 10.3           | -28.1        | 34.54                      | 43.52              | -8.98       | 0-360          | 300         | H        |
| 3      | 299.8           | 55.07                | PK  | 13.2           | -26          | 42.27                      | 46.02              | -3.75       | 0-360          | 101         | H        |
| 4      | 497.9           | 51.82                | PK  | 17.6           | -25.8        | 43.62                      | 46.02              | -2.4        | 0-360          | 200         | H        |
| 7      | 499.6           | 47.72                | PK  | 17.7           | -25.8        | 39.62                      | 46.02              | -6.4        | 0-360          | 101         | V        |
| 8      | 597.4           | 39.33                | PK  | 18.5           | -25.4        | 32.43                      | 46.02              | -13.59      | 0-360          | 300         | V        |

PK - Peak detector

### Radiated Emissions

| Frequency (MHz) | Meter Reading (dBuV) | Det | AF T477 (dB/m) | Amp/Cbl (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|----------------|--------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 300.024         | 49.33                | QP  | 13.2           | -26          | 36.53                      | 46.02              | -9.49       | 0              | 101         | H        |
| 498.444         | 38.92                | QP  | 18             | -25.7        | 31.22                      | 46.02              | -14.8       | 158            | 370         | H        |

QP - Quasi-Peak detector

FCC Part 15 Subpart C 30-1000MHz.TST 30915 20 Mar 2014

Rev 9.5 31 Mar 2014

## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

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

<sup>\*</sup> Decreases with the logarithm of the frequency.

### TEST PROCEDURE

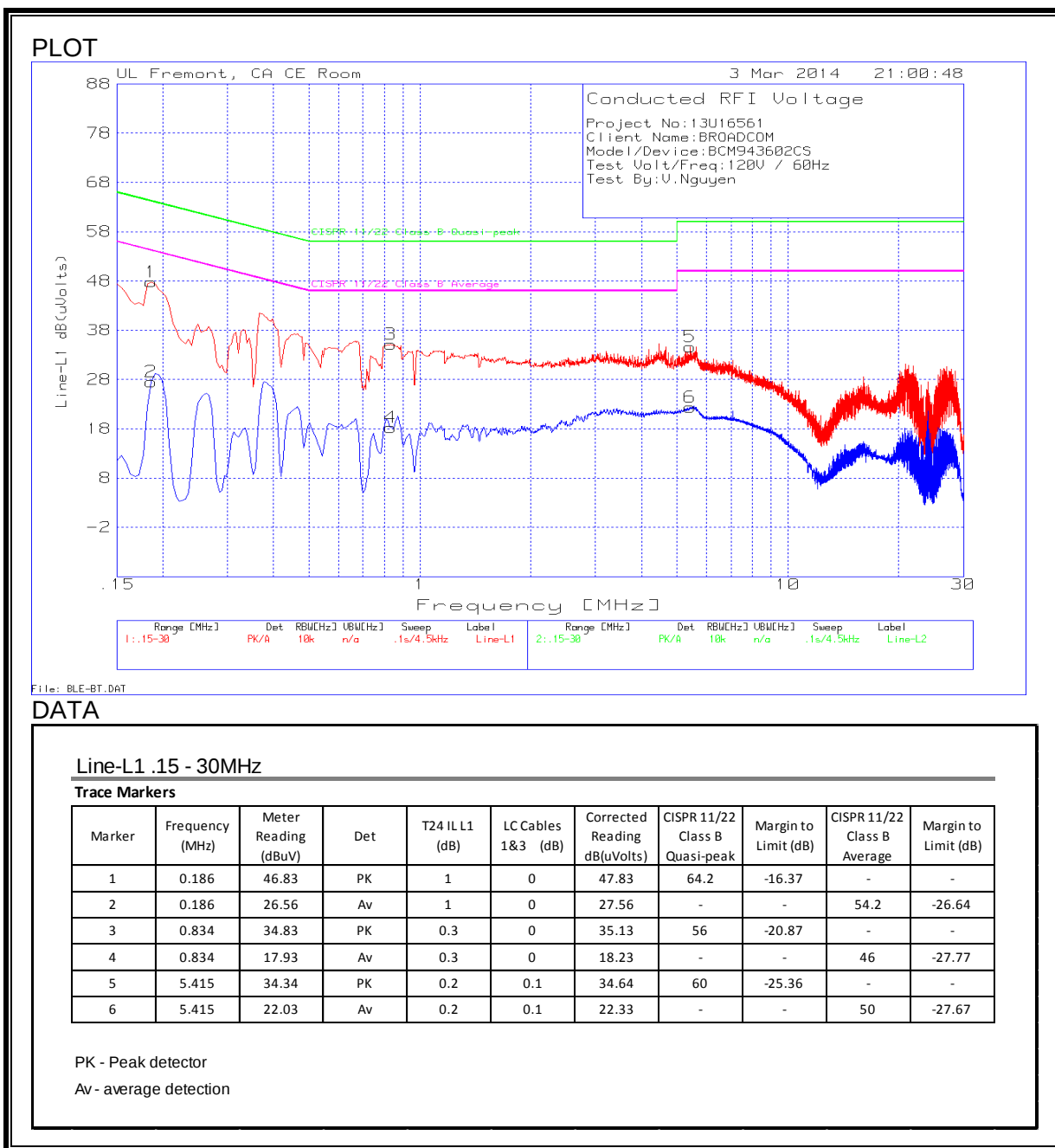
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

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.

## 6 WORST EMISSIONS

### LINE 1 RESULTS



## LINE 2 RESULTS

