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

# CERTIFICATION TEST REPORT

**FOR**

**BLUETOOTH HEADSET**

**MODEL NUMBER: BackBeat GO 2**

**FCC ID:AL8-BBG2**
**IC:457A-BBG2**

**REPORT NUMBER: 13U14904-2, REVISION A**

**ISSUE DATE: APRIL 25, 2013**

*Prepared for*
**PLANTRONICS, INC.**
**345 ENCINAL STREET**
**SANTA CRUZ, CA 95060, U.S.A.**

*Prepared by*
**UL CCS**
**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 |
|---|---|---|---|
| -- | 04/15/2013 | Initial Issue | F. de Anda |
| A | 4/25/2013 | Added MPE | T. LEE |

# TABLE OF CONTENTS

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** PLANTRONICS, INC.
345 ENCINAL STREET
SANTA CRUZ, CA. 95060, U.S.A.

**EUT DESCRIPTION:** BLUETOOTH HEADSET

**MODEL:** BackBeat GO 2

**SERIAL NUMBER:** 445EF3001E86, 445EF3001E09, 445EF3001E0A, 48C1AC796F40, 48C1AC7AF5C8

**DATE TESTED:** DECEMBER 5-9, 2011, MARCH 12-15,-2013

| 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 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:

FRANCISCO DEANDA
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 C63.10-2009, 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 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 a Bluetooth Headset.

The radio module is manufactured by CSR.

The manufacturer declares that they support AFH with a minimum of 20 channels, following the Bluetooth protocol to ensure compliance with the pseudo-hopping sequence and dwell time requirements of FCC 15.247.

## 5.2. 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 | Basic GFSK | 6.95 | 4.95 |
| 2402 - 2480 | DQPSK | 7.51 | 5.64 |
| 2402 - 2480 | 8PSK | 6.71 | 4.69 |

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB antenna, with a maximum gain of -1.8 dBi.

## 5.4. SOFTWARE AND FIRMWARE

Software and Firmware revision = P1D

## 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission 30-1000 MHz was performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

Power line conducted emission was performed with the EUT connected to a charging adapter; the EUT can't operate while being charged.

Three orthogonal orientations were investigated to find worst-case orientation; it turned out to be Y orientation. Final radiated testing was performed with EUT in Y orientation.

## 5.6. DESCRIPTION OF TEST SETUP

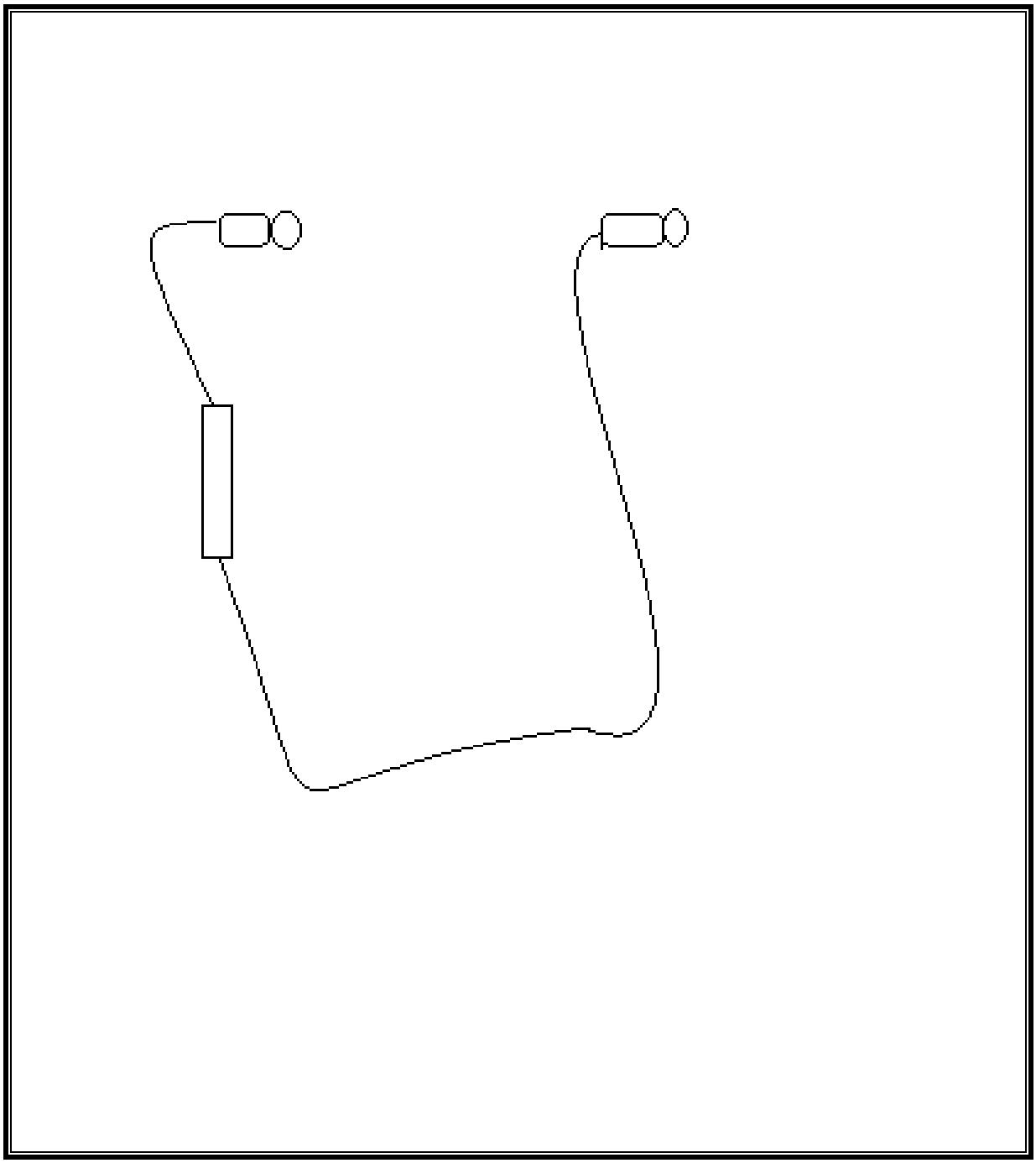
**SUPPORT EQUIPMENT**

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID** |
| AC Adapter | Plantronics | SSA-5W-05US050018P | 82920-01 | NA |
| AC Adapter | Plantronics | SSA-4W5-050075 | NA | NA |

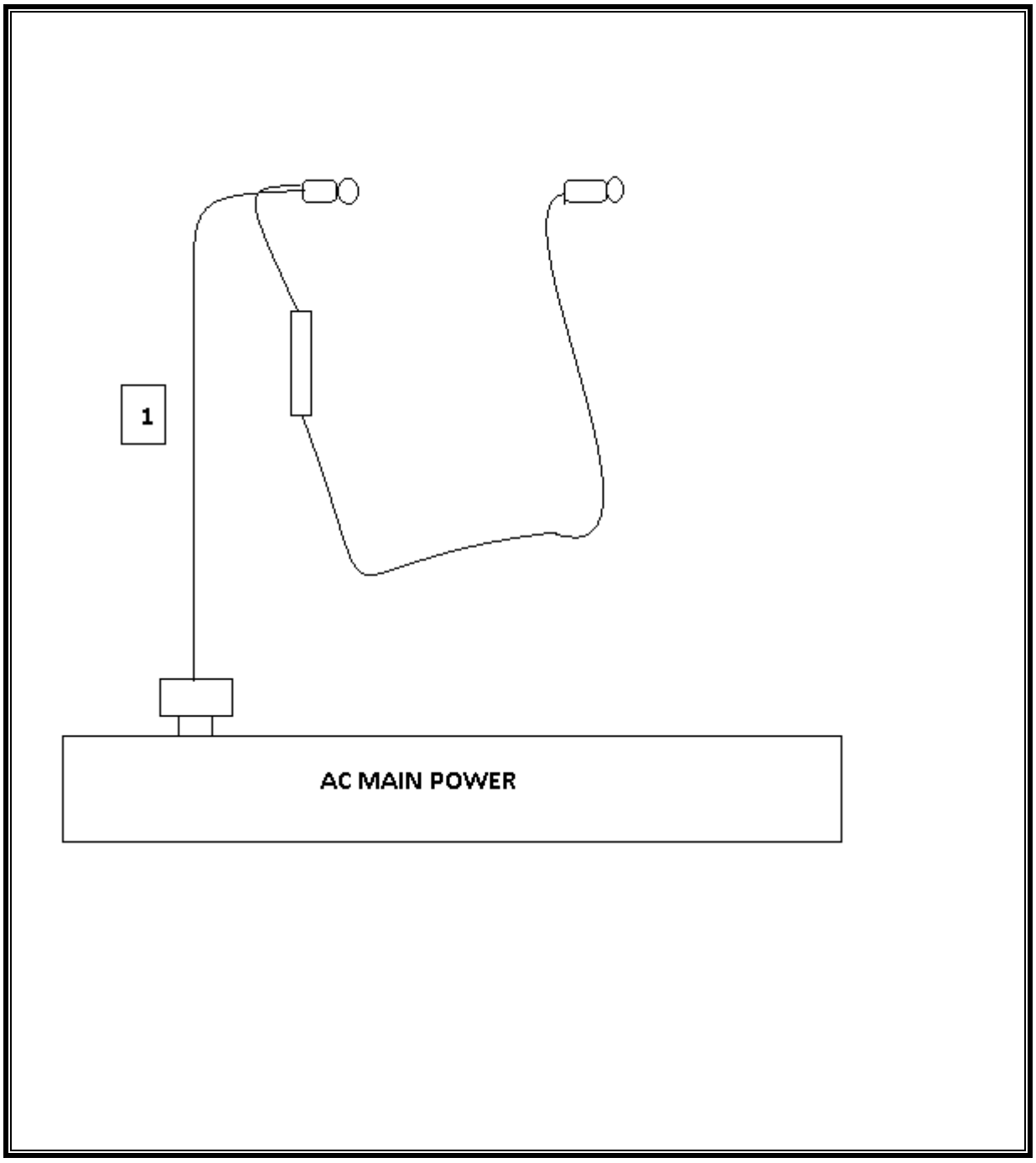
**I/O CABLES**

| I/O CABLE LIST | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No.** | **Port** | **# of Identical Ports** | **Connector Type** | **Cable Type** | **Cable Length** | **Remarks** |
| 1 | AC | 1 | mini USB | Unshielded | 2m | charging only |

**SETUP DIAGRAM FOR TESTS**



**IN CHARGING MODE**



# 6. TEST AND MEASUREMENT EQUIPMENT

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

DECEMBER 5-9, 2011

| TEST EQUIPMENT LIST | | | | | |
|---|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Asset** | **Cal Date** | **Cal Due** |
| Spectrum Analyzer, 26.5 GHz | Agilent / HP | E4440A | C01176 | 08/04/11 | 08/04/12 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01176 | 08/04/11 | 08/04/12 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00872 | 06/29/11 | 06/29/12 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C00749 | 07/18/11 | 07/18/12 |
| Antenna, Bilog, 2 GHz | Sunol Sciences | JB1 | C01171 | 07/16/11 | 07/16/12 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00558 | 01/27/11 | 01/27/12 |
| Power Meter | Agilent / HP | 437B | CCS-154 | 07/29/11 | 10/29/12 |
| Average Power Sensor | Agilent / HP | 8481A | CCS-157 | 07/29/11 | 10/29/12 |
| EMI Test Receiver, 9 kHz-7 GHz | R & S | ESCI 7 | 1000741 | 7/6/2011 | 7/6/2012 |
| LISN, 30 MHz | FCC | LISN-50/250-25-2 | N02625 | 11/10/11 | 11/10/12 |
| Horn Antenna, 26 GHz | ARA | MWH-1826/B | C00589 | 07/28/11 | 07/28/12 |

MARCH 12-15,-2013

| Test Equipment List | | | | | |
|---|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Asset** | **Cal Date** | **Cal Due** |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01159 | 04/09/12 | 04/09/13 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01069 | 12/20/12 | 12/20/13 |
| Antenna, Bilog, 30MHz-1 GHz | Sunol Sciences | JB1 | C01171 | 02/13/13 | 02/13/14 |
| Antenna, Horn, 18 GHz | ETS | 3117 | C01022 | 02/21/13 | 02/21/14 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00558 | 03/23/13 | 03/23/14 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C01052 | 10/22/12 | 10/22/13 |
| Peak Power Meter | Agilent / HP | E4416A | C00963 | 12/13/12 | 12/13/13 |
| EMI Test Receiver, 30 MHz | R & S | ESHS 20 | N02396 | 08/08/12 | 08/08/13 |
| LISN, 30 MHz | FCC | 50/250-25-2 | C00626 | 01/14/13 | 01/14/14 |
| Antenna, Horn, 26.5 GHz | ARA | MWH-1826/B | C00980 | 11/14/12 | 11/14/13 |

# 7. ANTENNA PORT TEST RESULTS

## 7.1. BASIC DATA RATE GFSK MODULATION

### 7.1.1. 20 dB AND 99% BANDWIDTH

**LIMIT**

None; for reporting purposes only.

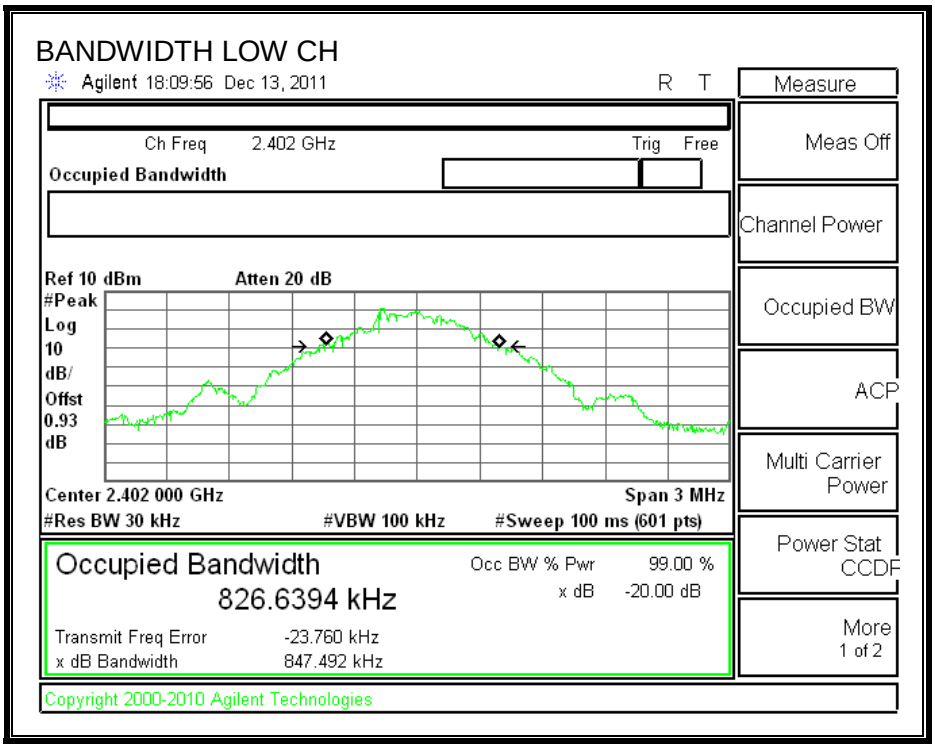
**TEST PROCEDURE**

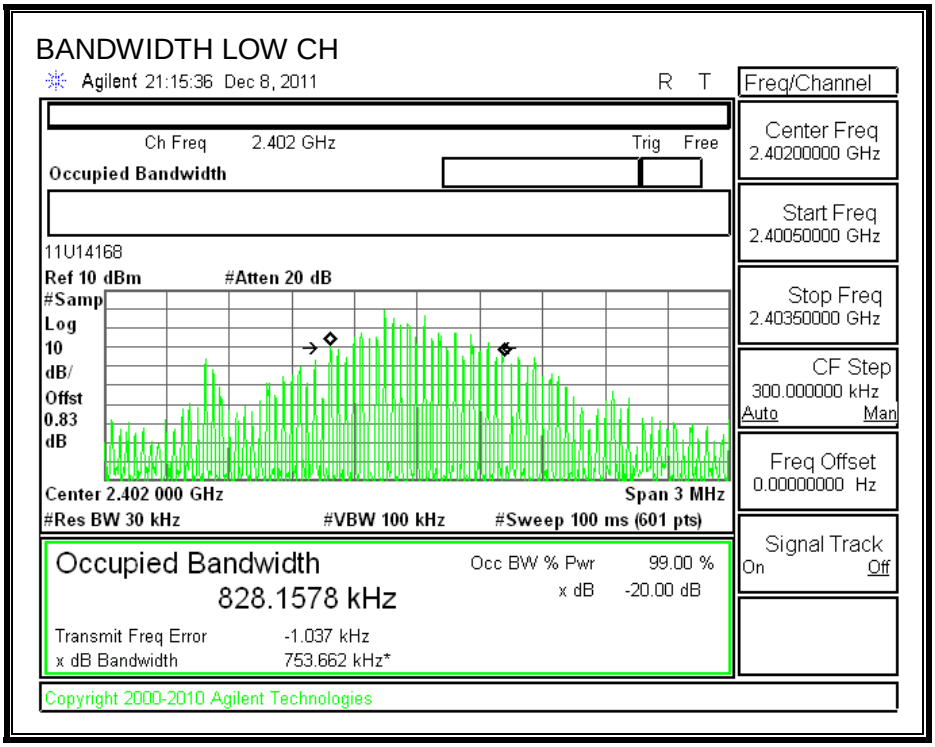
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

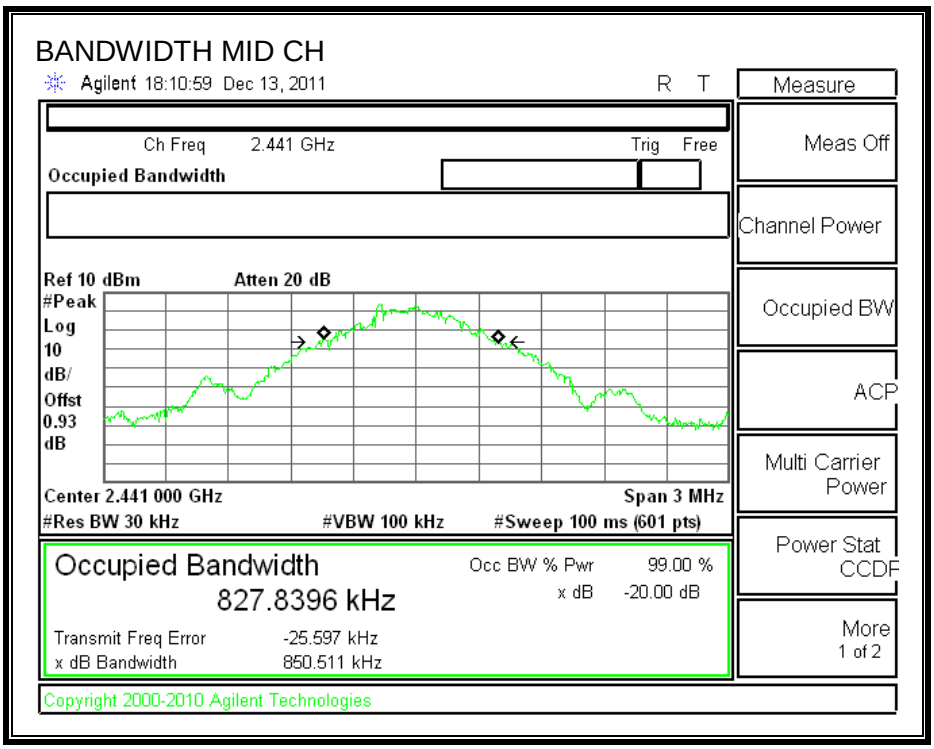
**RESULTS**

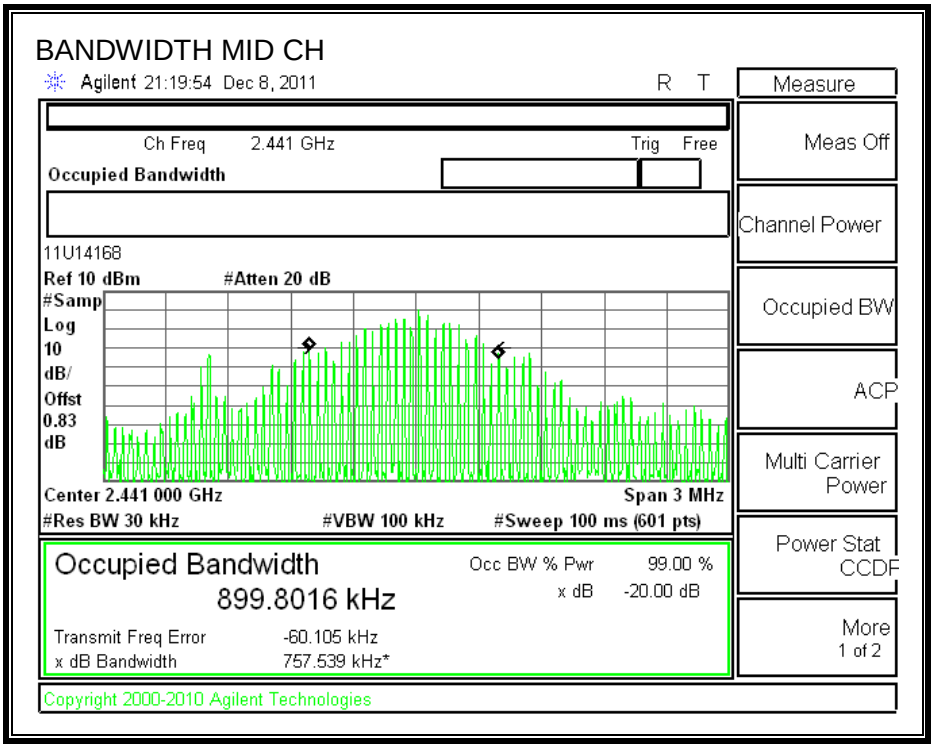
| Channel | Frequency (MHz) | 20 dB Bandwidth (kHz) | 99% Bandwidth (kHz) |
|---|---|---|---|
| Low | 2402 | 847.492 | 828.1578 |
| Middle | 2441 | 850.511 | 899.8016 |
| High | 2480 | 904.856 | 969.0564 |

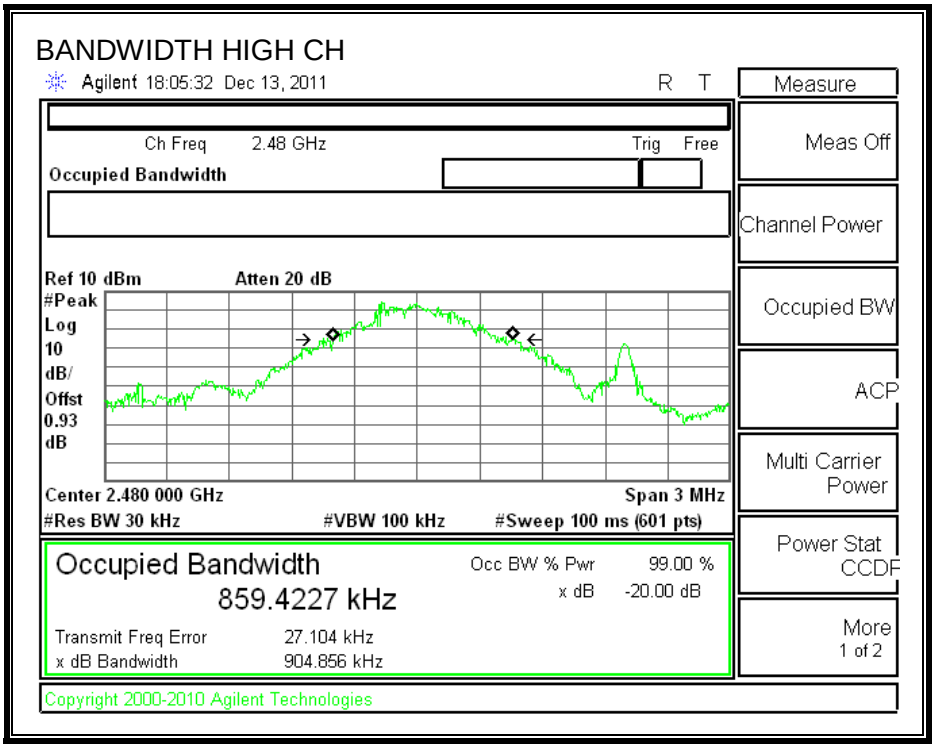
**20 dB AND 99% BANDWIDTH**

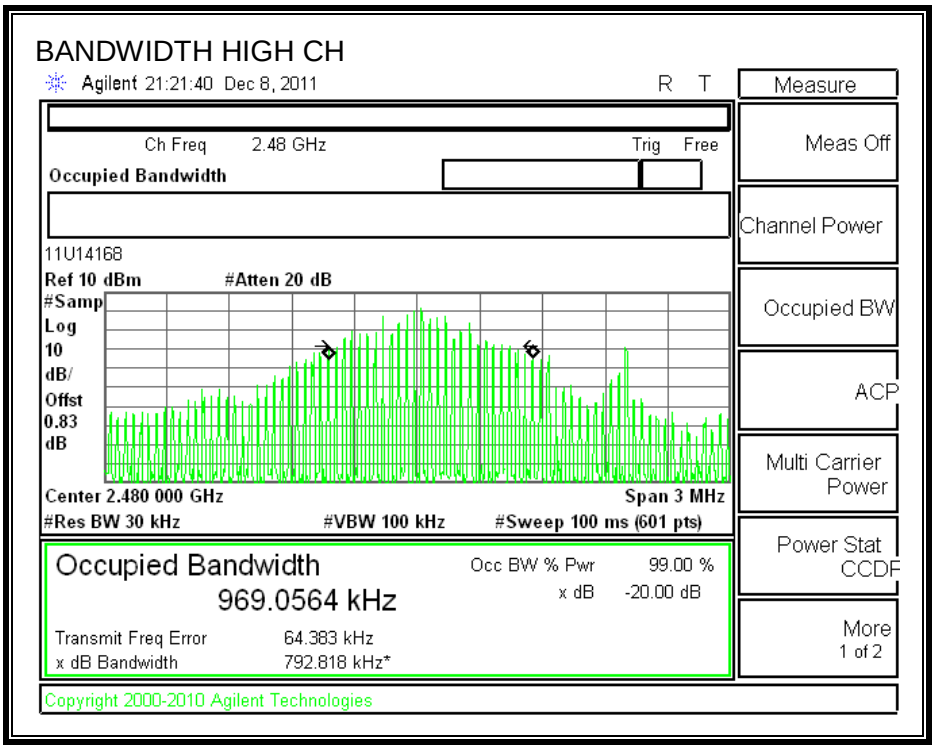






## 7.1.2. HOPPING FREQUENCY SEPARATION

**LIMIT**

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

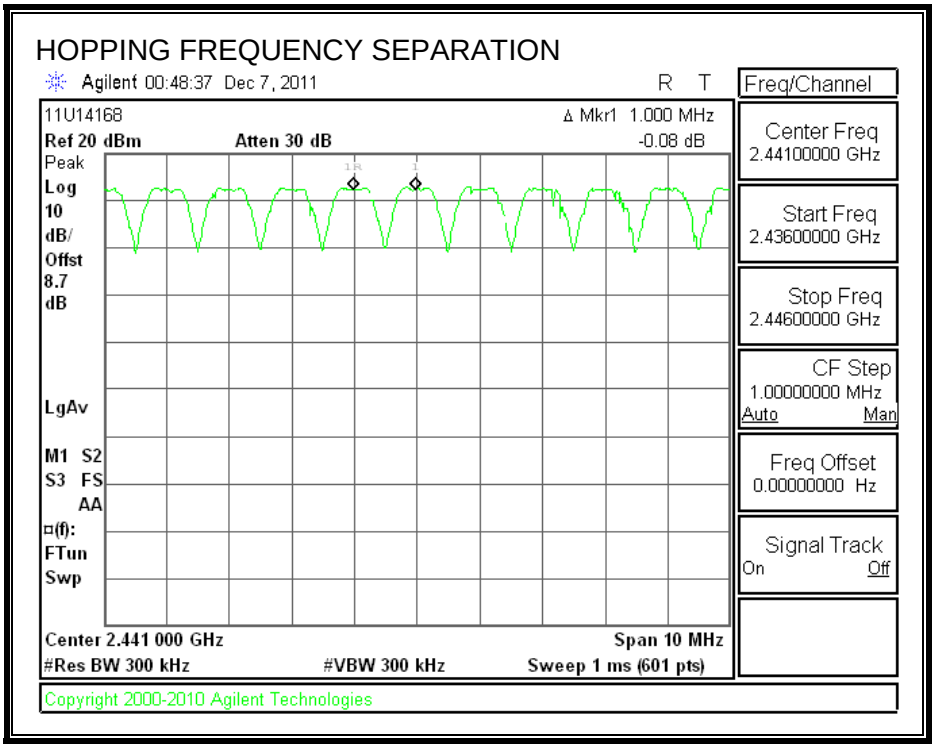
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

## RESULTS

## HOPPING FREQUENCY SEPARATION



## 7.1.3. NUMBER OF HOPPING CHANNELS

**LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

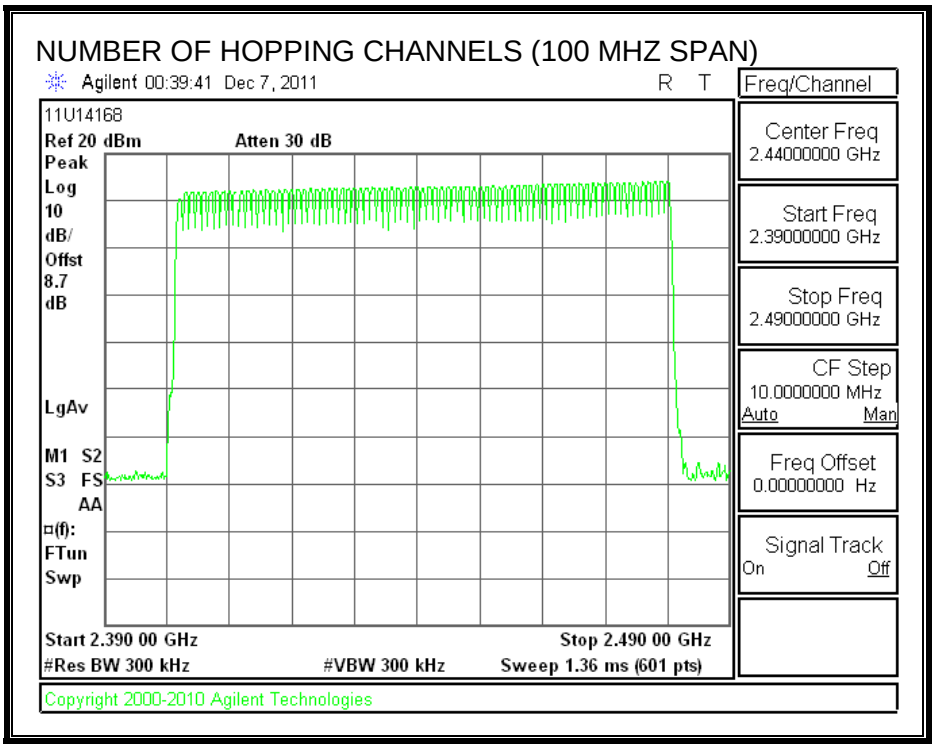
**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

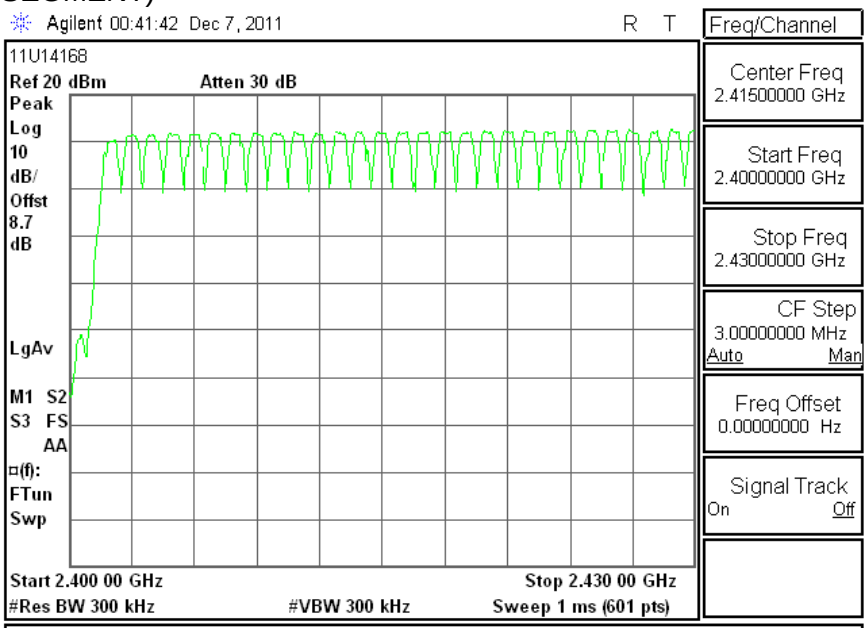
**RESULTS**

79 Channels observed.

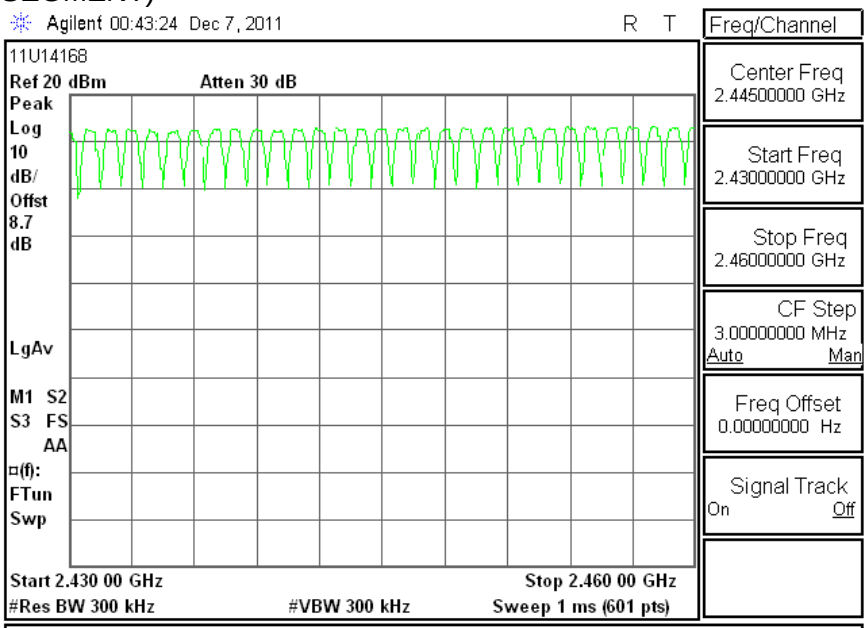
**NUMBER OF HOPPING CHANNELS**



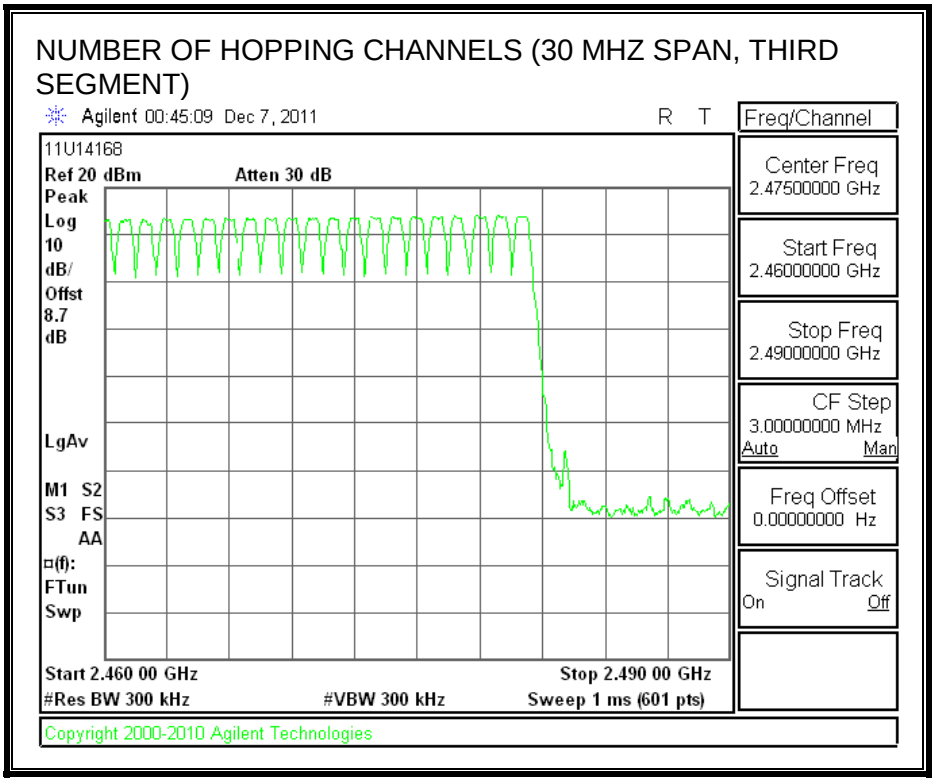
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



## 7.1.4. AVERAGE TIME OF OCCUPANCY

**LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

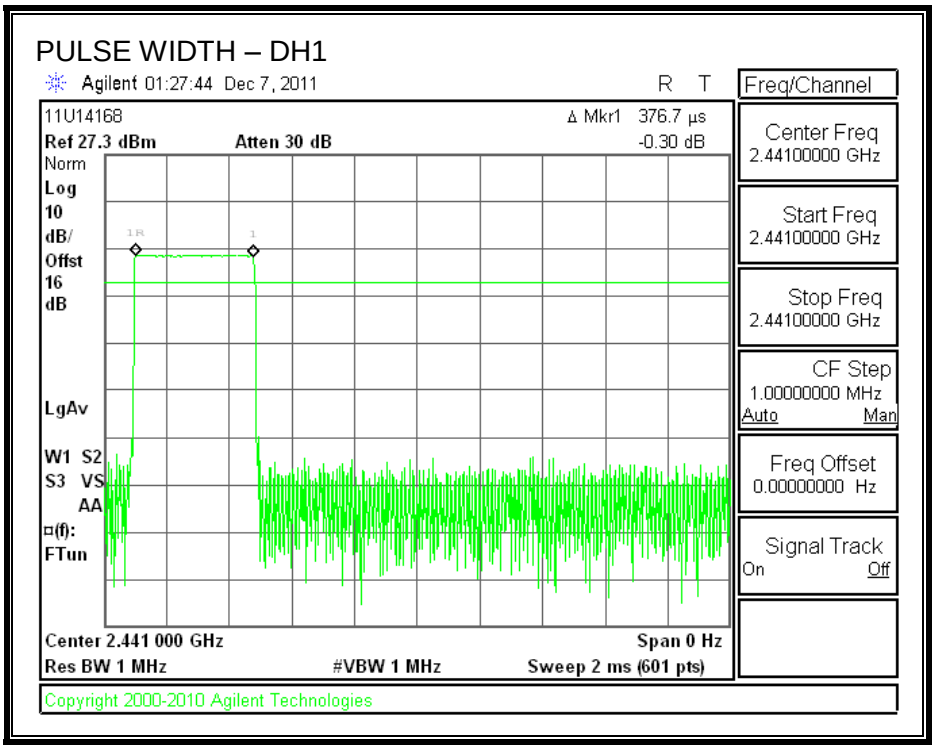
**RESULTS**

Time Of Occupancy = 10 * xx pulses * yy msec = zz msec

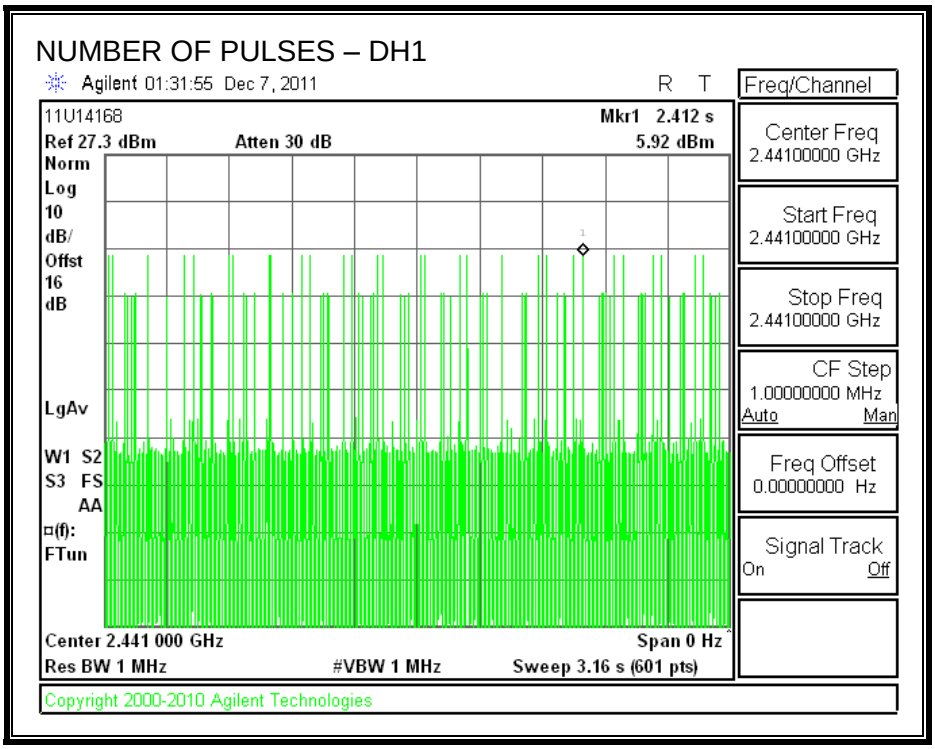
GFSK Mode

| DH Packet | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of (sec) | Limit (sec) | Margin (sec) |
|---|---|---|---|---|---|
| DH1 | 0.3767 | 29 | 0.109 | 0.4 | -0.291 |
| DH3 | 1.642 | 14 | 0.230 | 0.4 | -0.170 |
| DH5 | 2.892 | 11 | 0.318 | 0.4 | -0.082 |

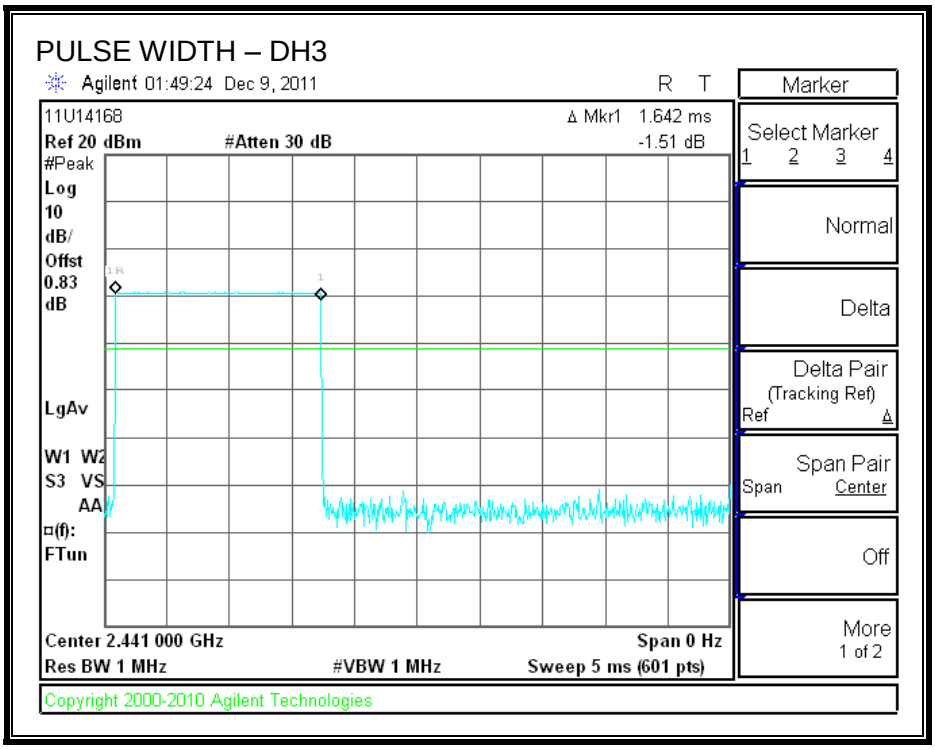
**PULSE WIDTH – DH1**



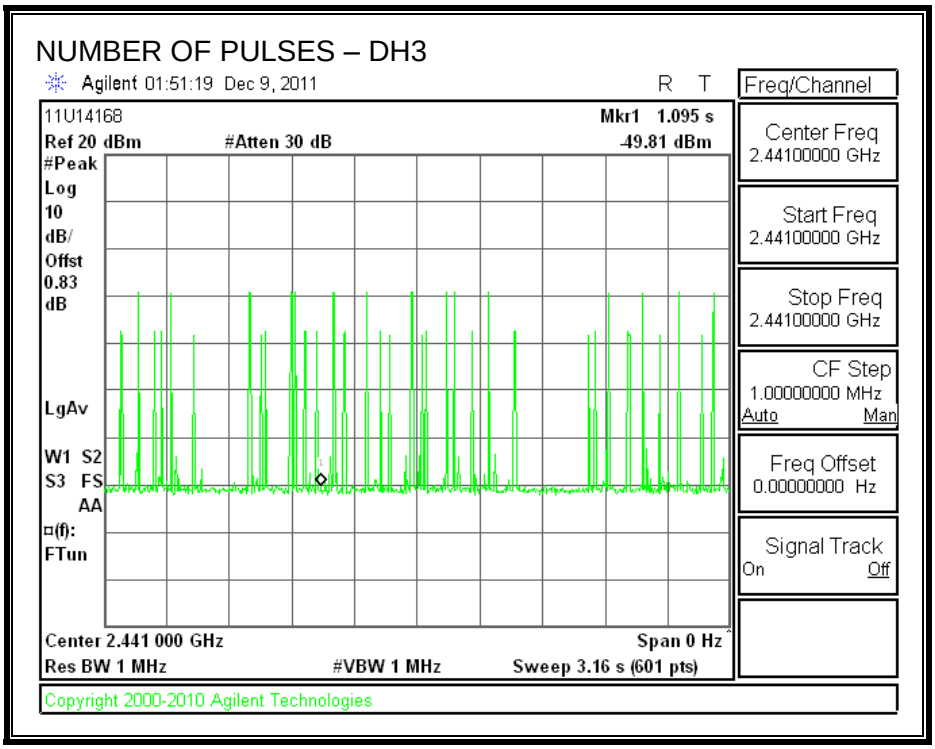
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1**



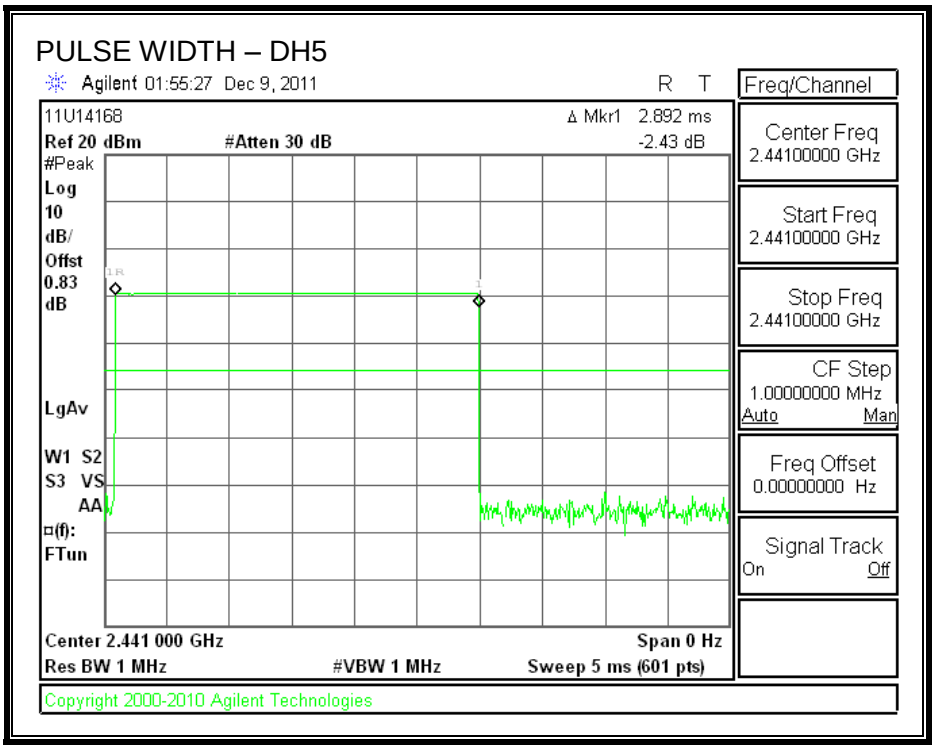
**PULSE WIDTH – DH3**



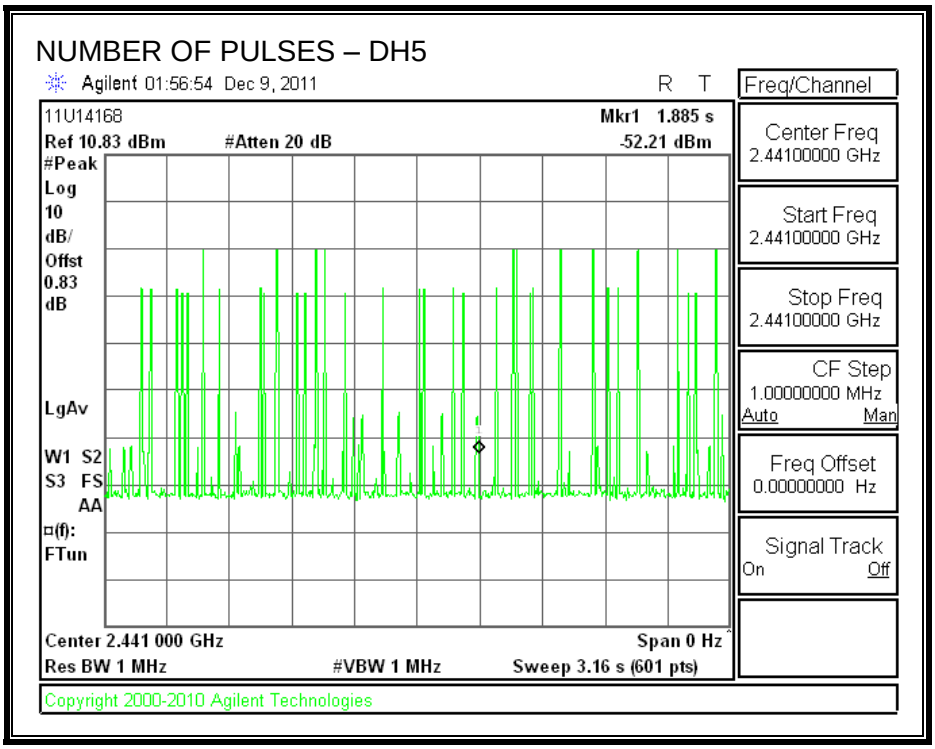
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3**



**PULSE WIDTH – DH5**



**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5**



## 7.1.5. OUTPUT POWER

**LIMIT**

§15.247 (b) (1)

RSS-210 Issue 8 Clause A8.4

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

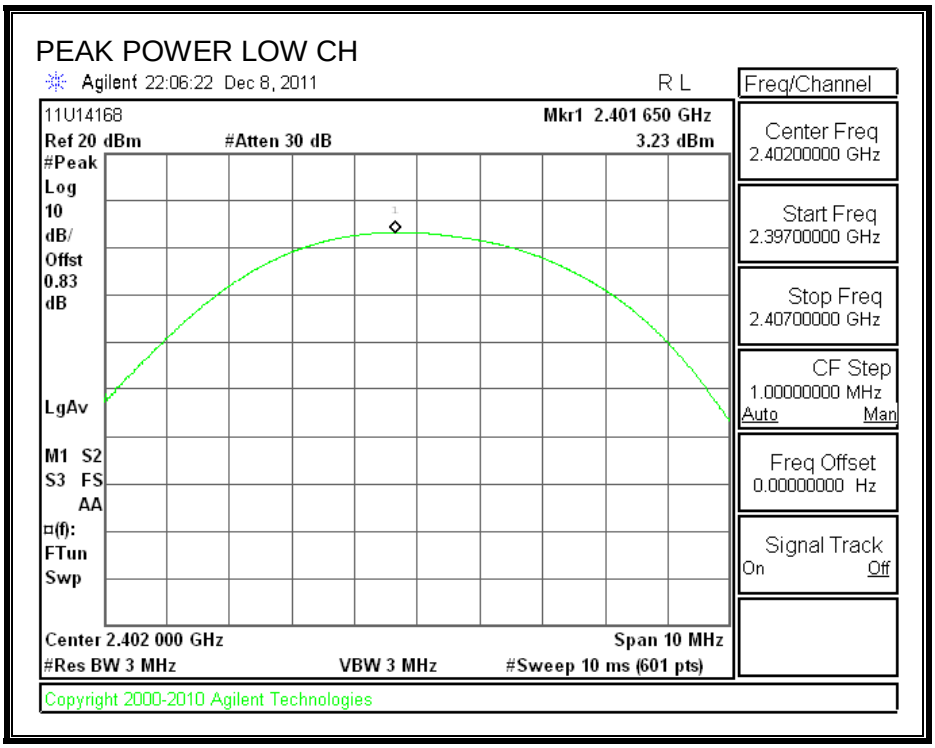
**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

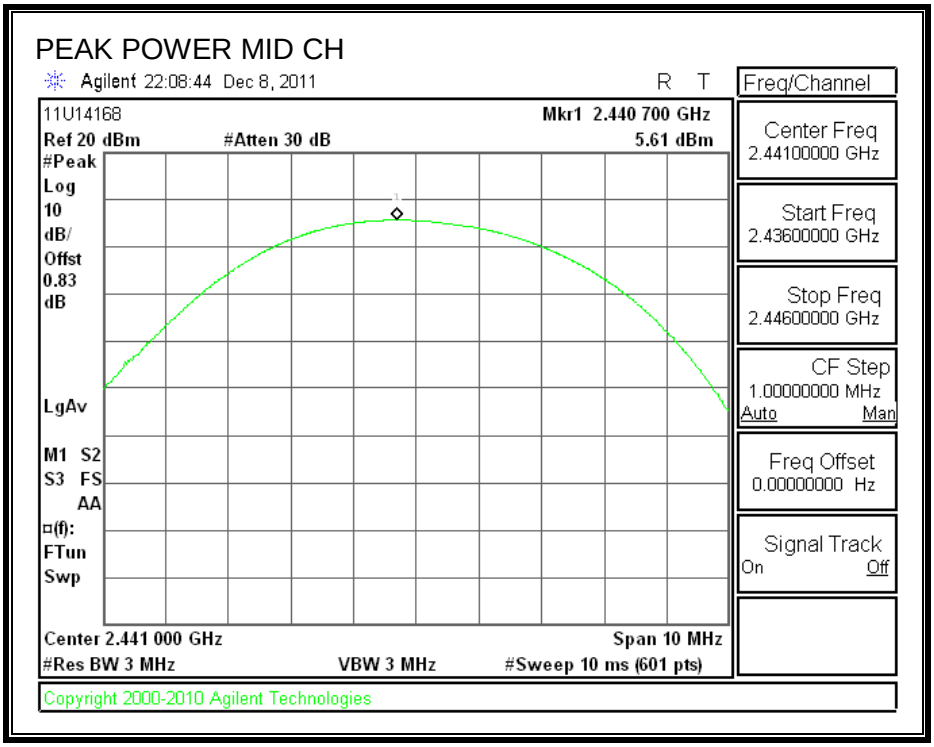
**RESULTS**

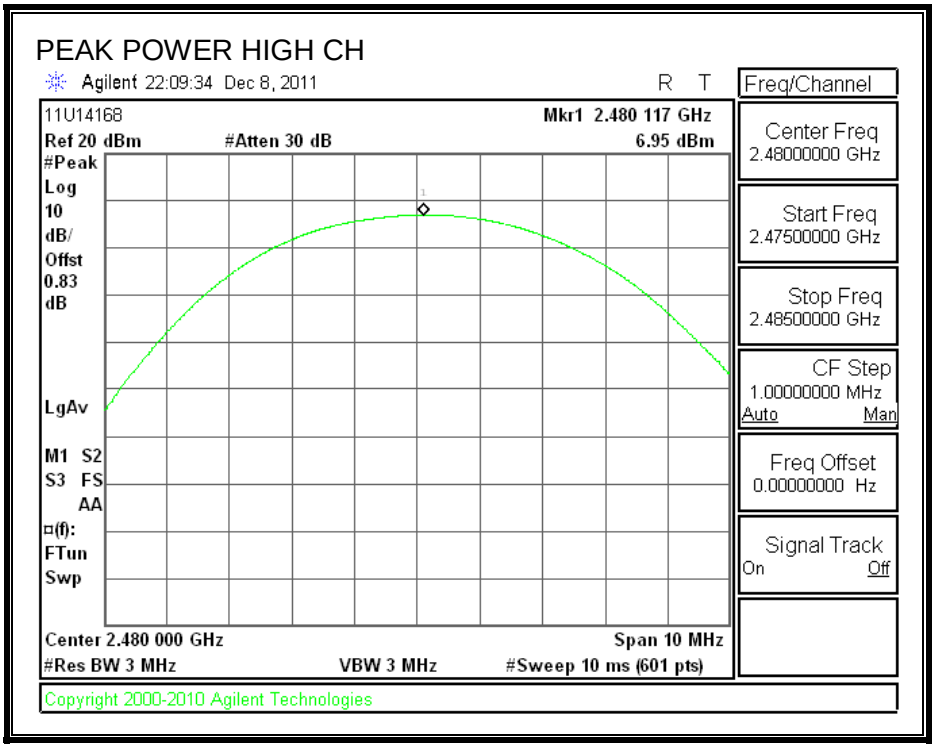
| Channel | Frequency (MHz) | Output Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 3.23 | 30 | -26.77 |
| Middle | 2441 | 5.61 | 30 | -24.39 |
| High | 2480 | 6.95 | 30 | -23.05 |

**OUTPUT POWER**



PEAK POWER MID CH





## 7.1.6. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

**TEST PROCEDURE**

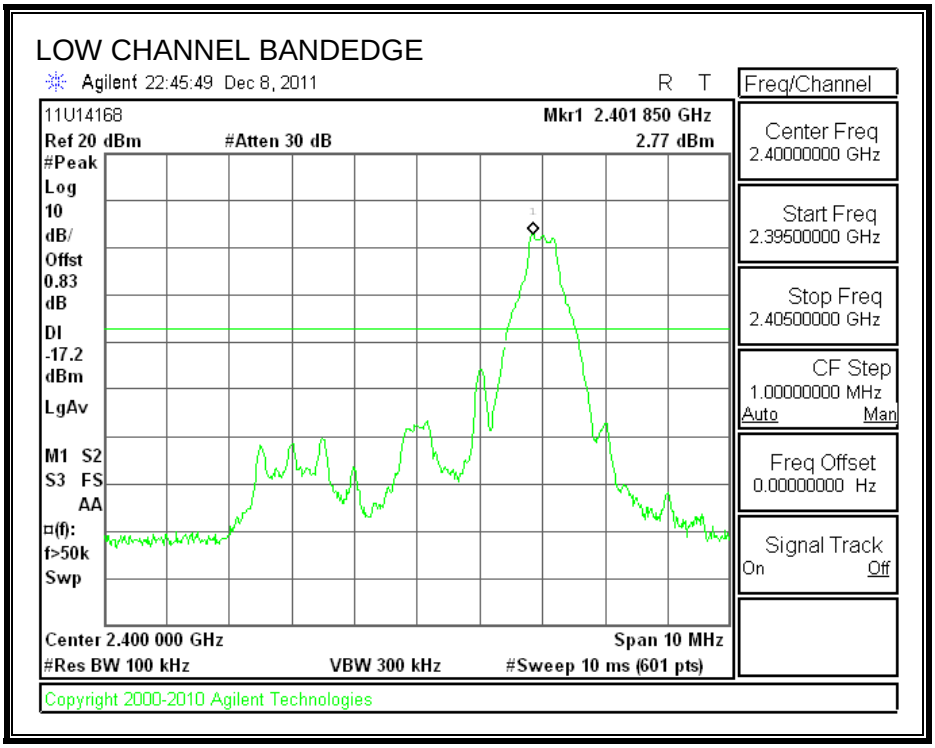
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

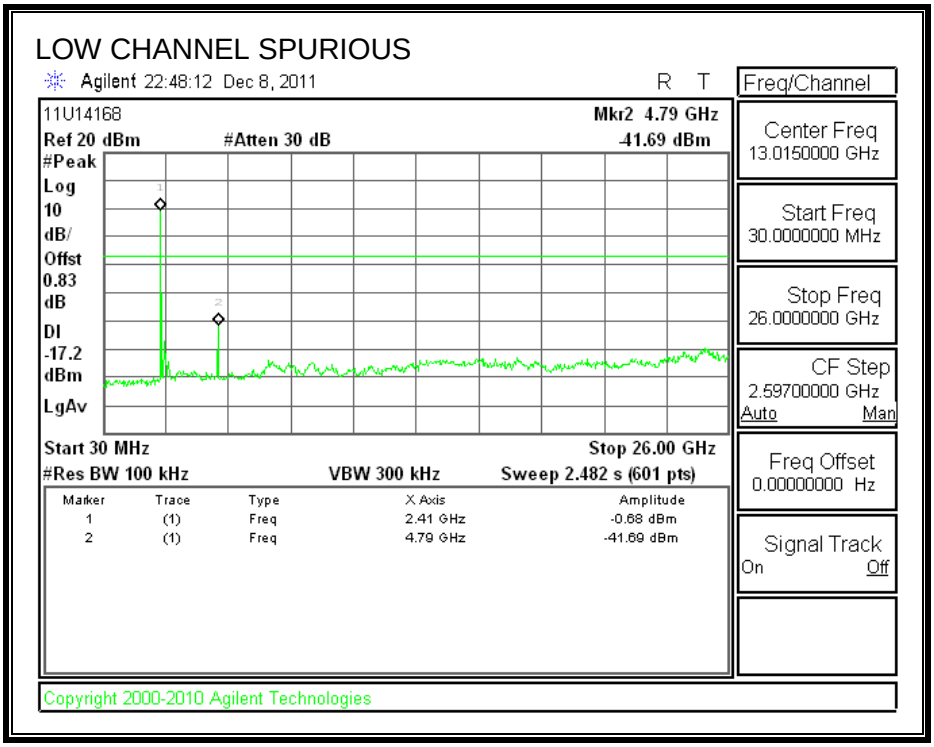
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

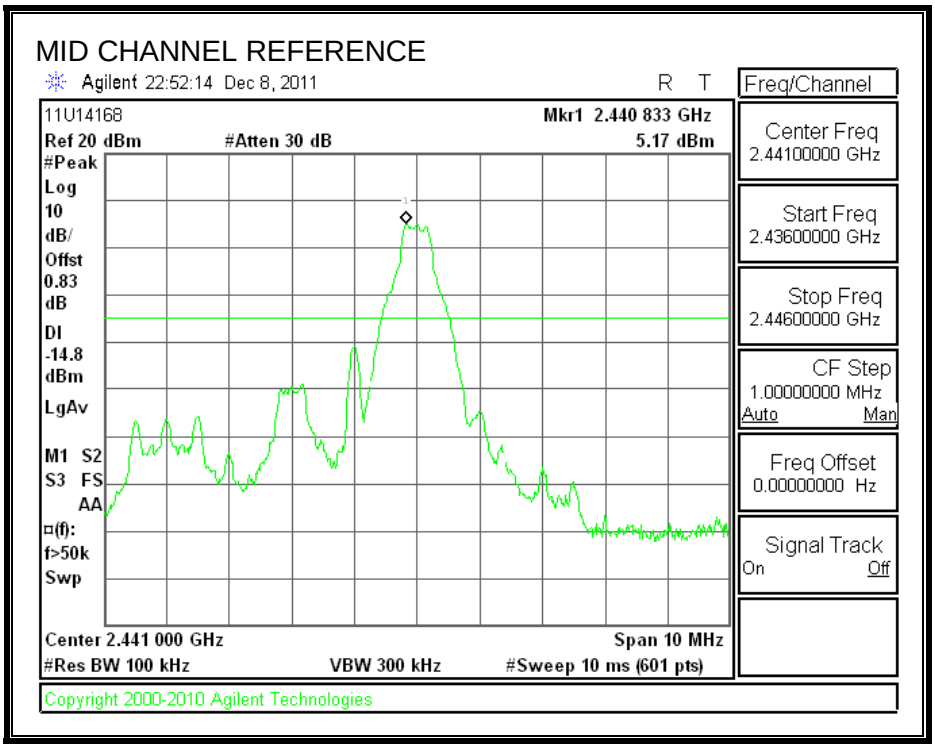
## RESULTS

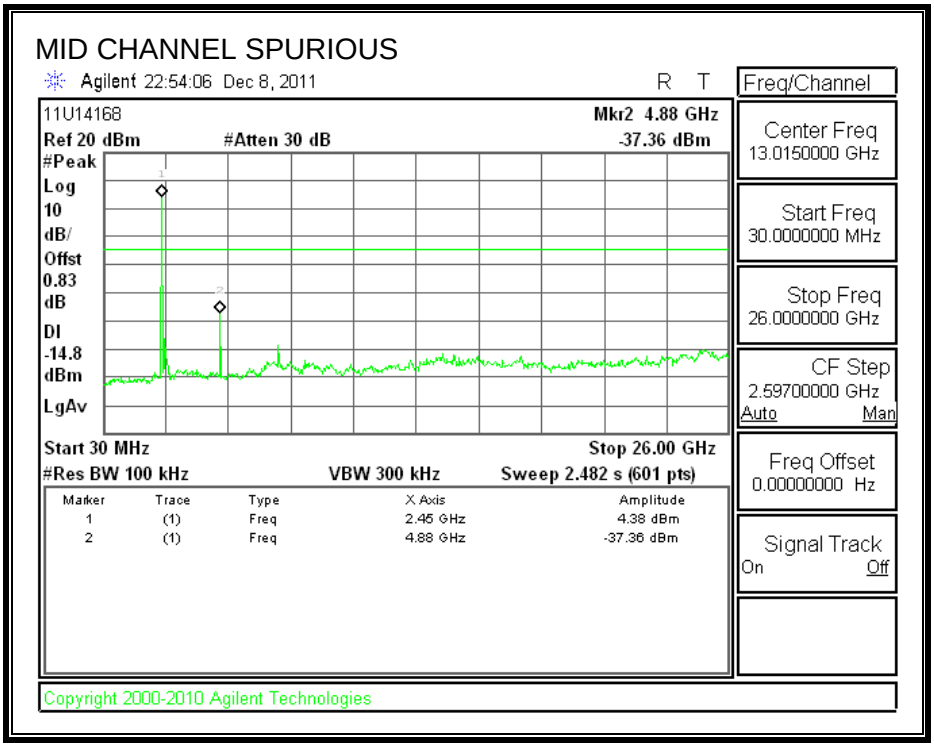
## SPURIOUS EMISSIONS, LOW CHANNEL



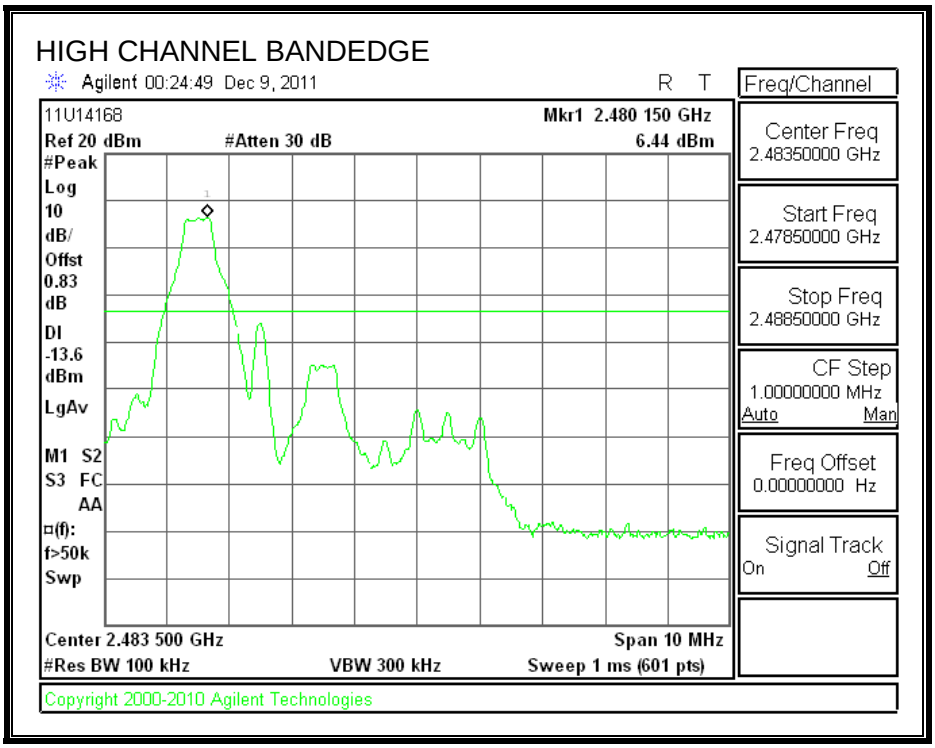


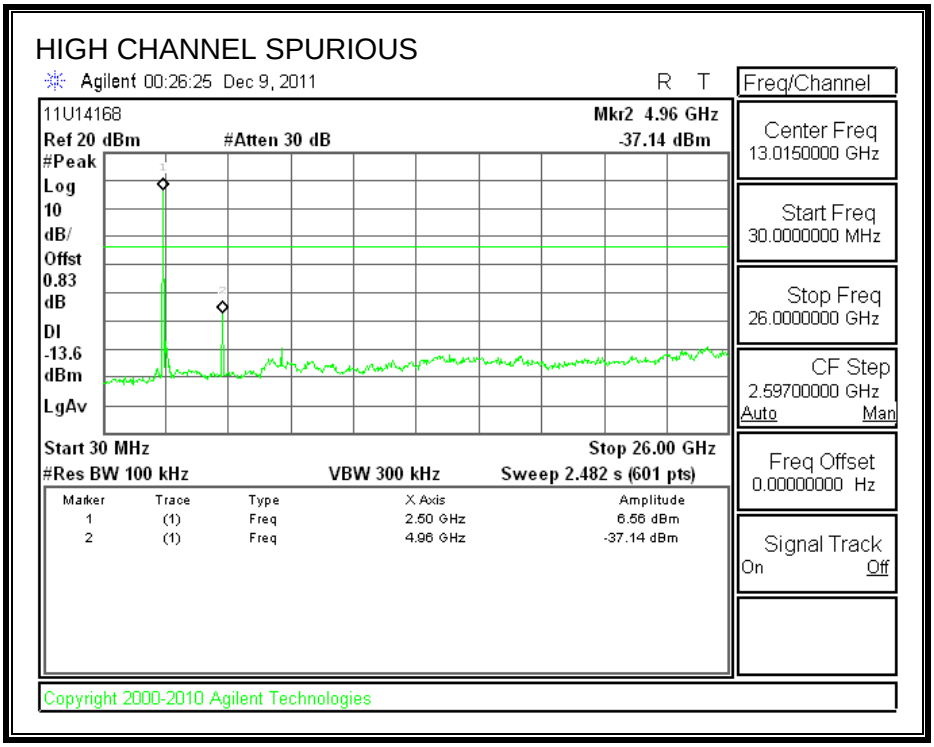
**SPURIOUS EMISSIONS, MID CHANNEL**



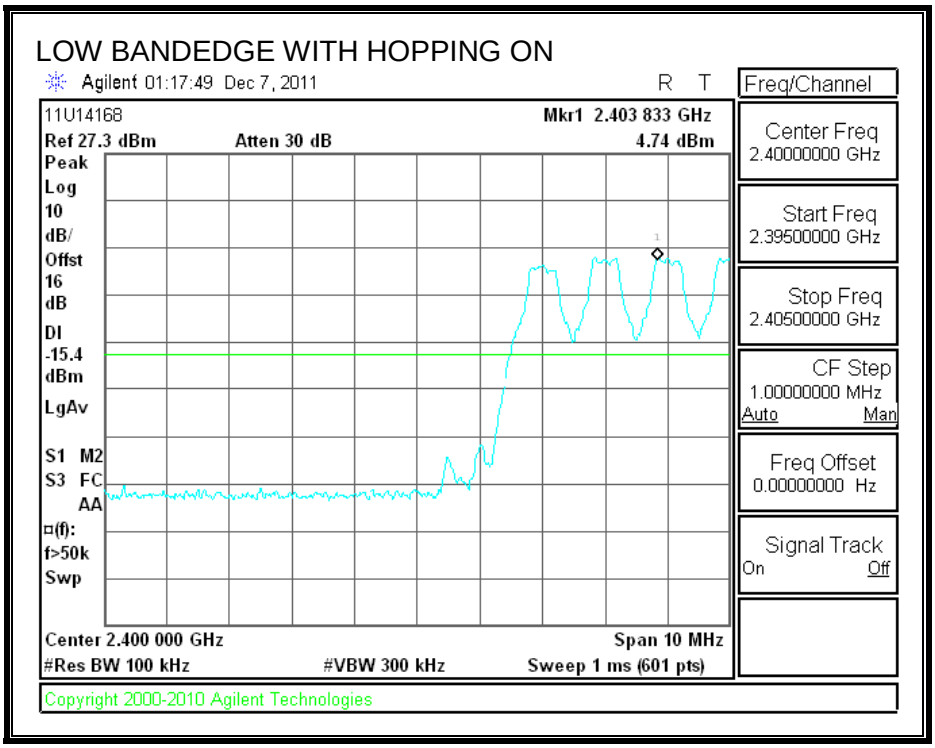


**SPURIOUS EMISSIONS, HIGH CHANNEL**

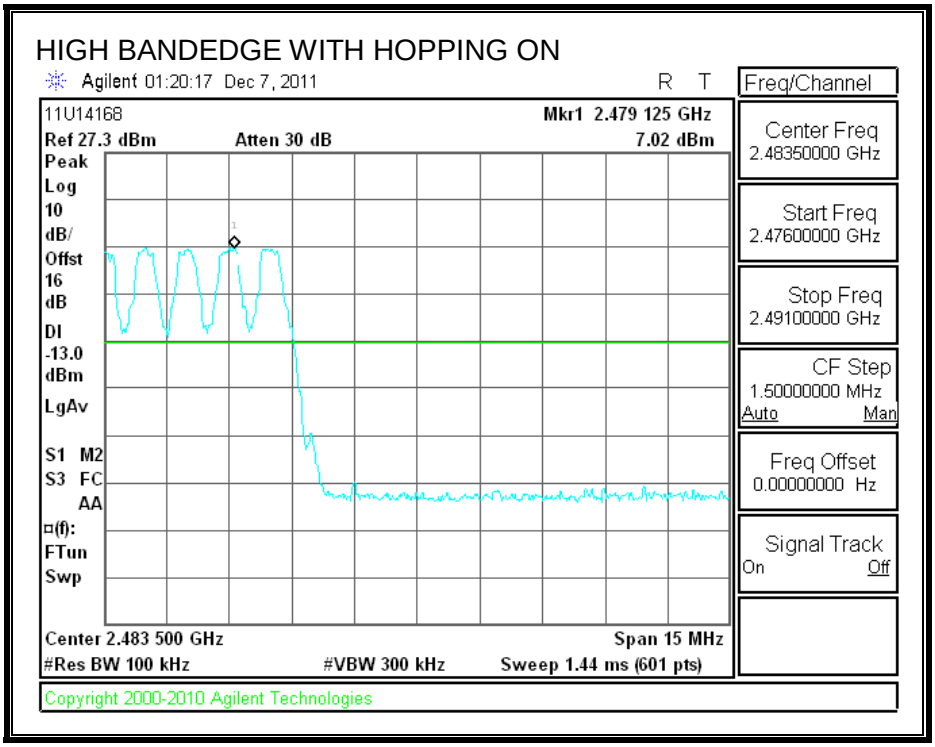




**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**



HIGH BANDEDGE WITH HOPPING ON



# 7.2. ENHANCED DATA RATE 8PSK MODULATION

## 7.2.1. 20 dB AND 99% BANDWIDTH

**LIMIT**

None; for reporting purposes only.

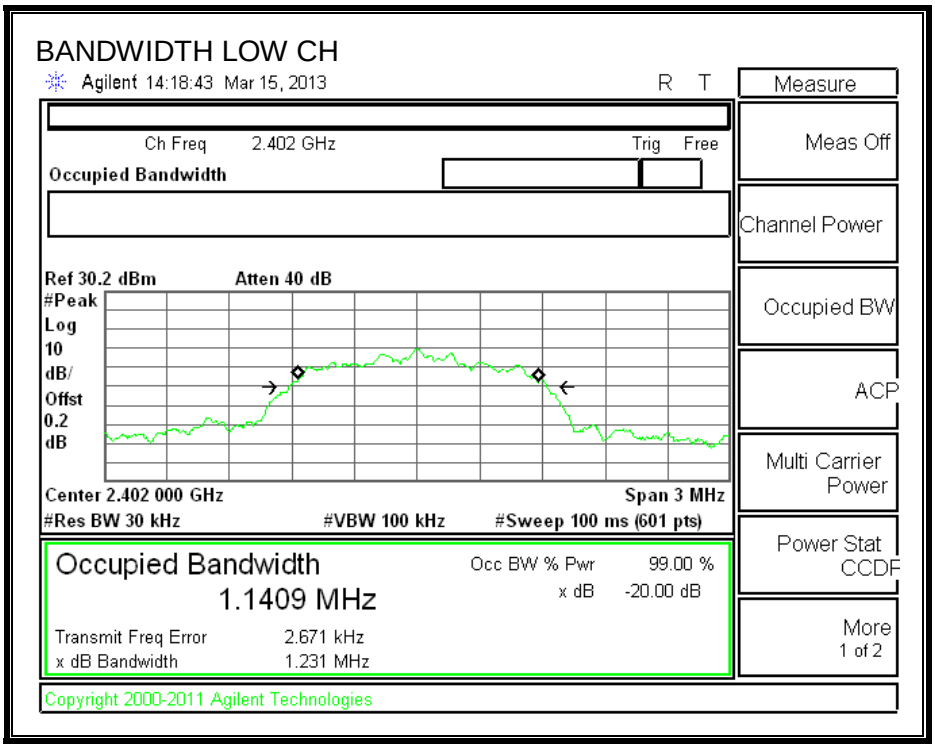
**TEST PROCEDURE**

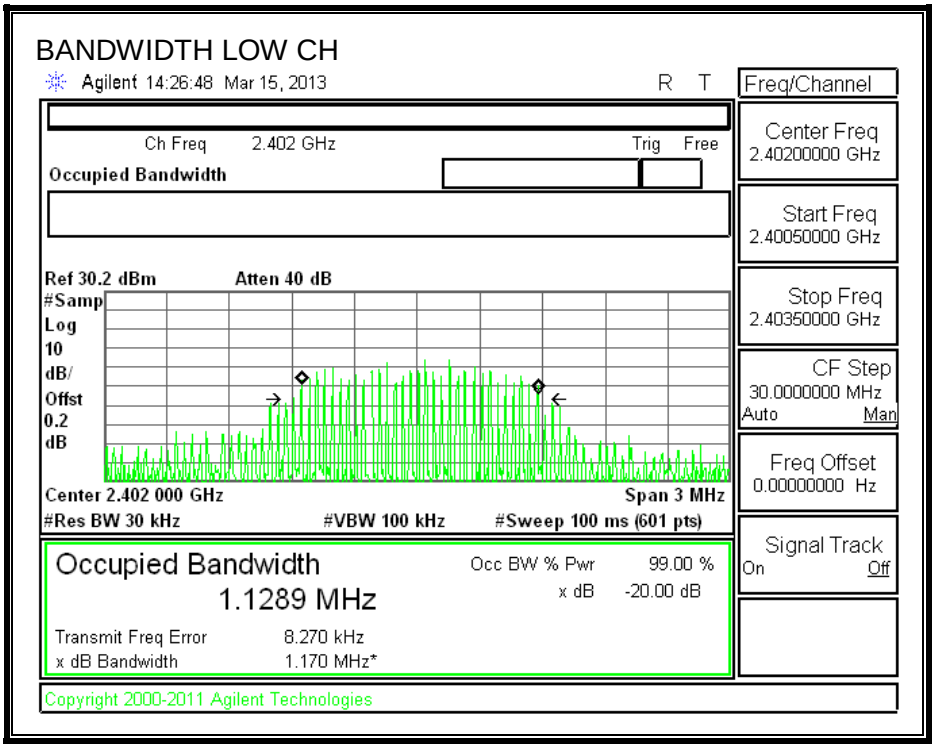
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

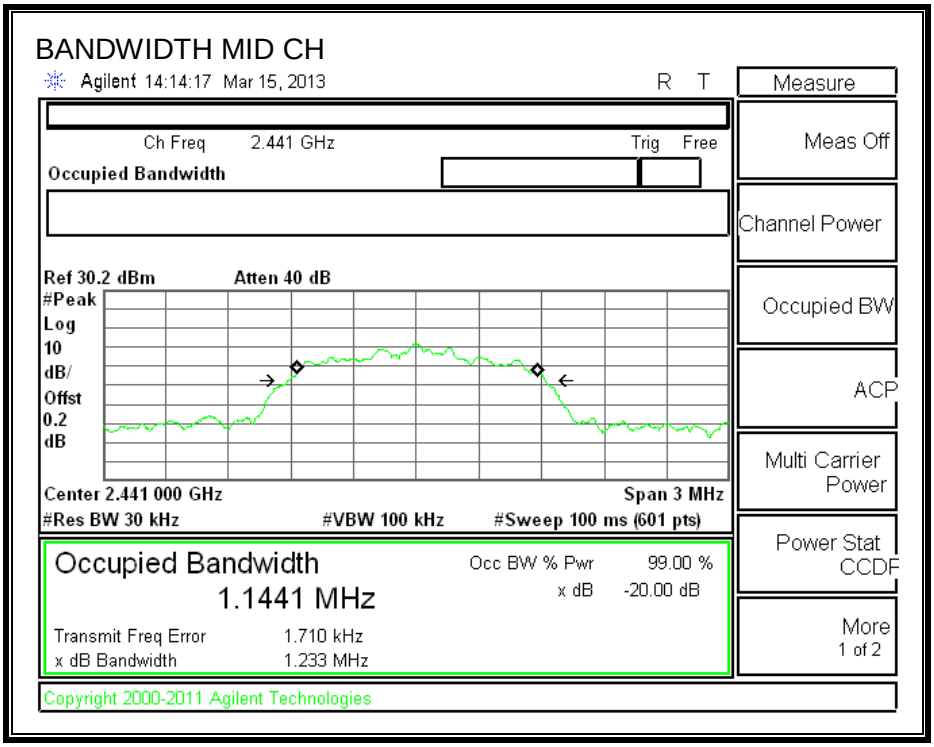
**RESULTS**

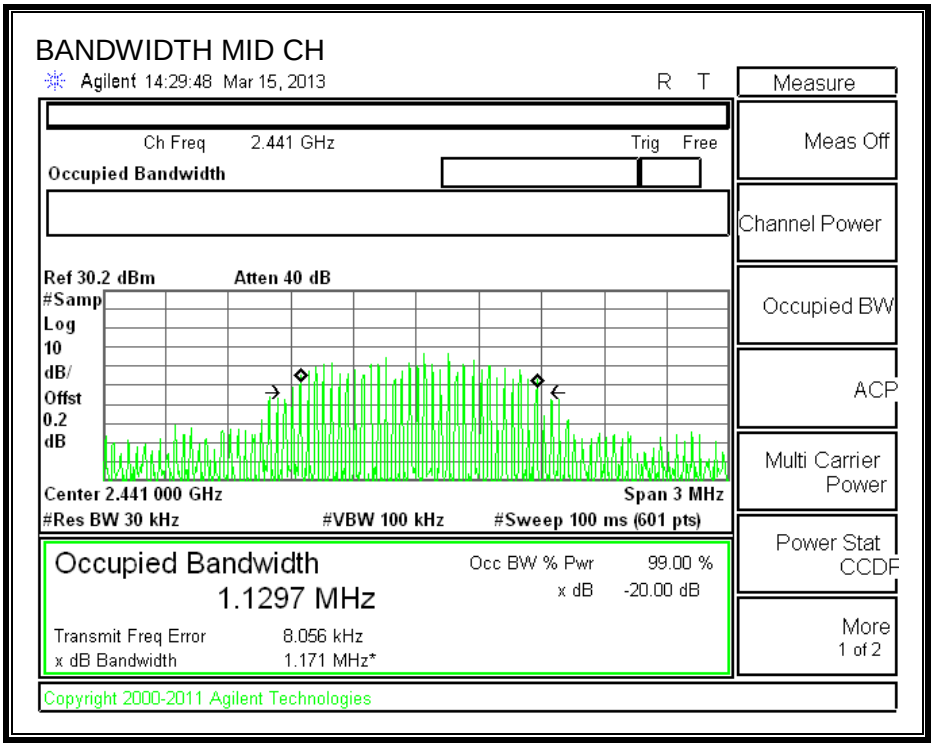
| Channel | Frequency (MHz) | 20 dB Bandwidth (kHz) | 99% Bandwidth (kHz) |
|---|---|---|---|
| Low | 2402 | 1.2310 | 1.2890 |
| Middle | 2441 | 1.2330 | 1.1297 |
| High | 2480 | 1.2330 | 1.1610 |

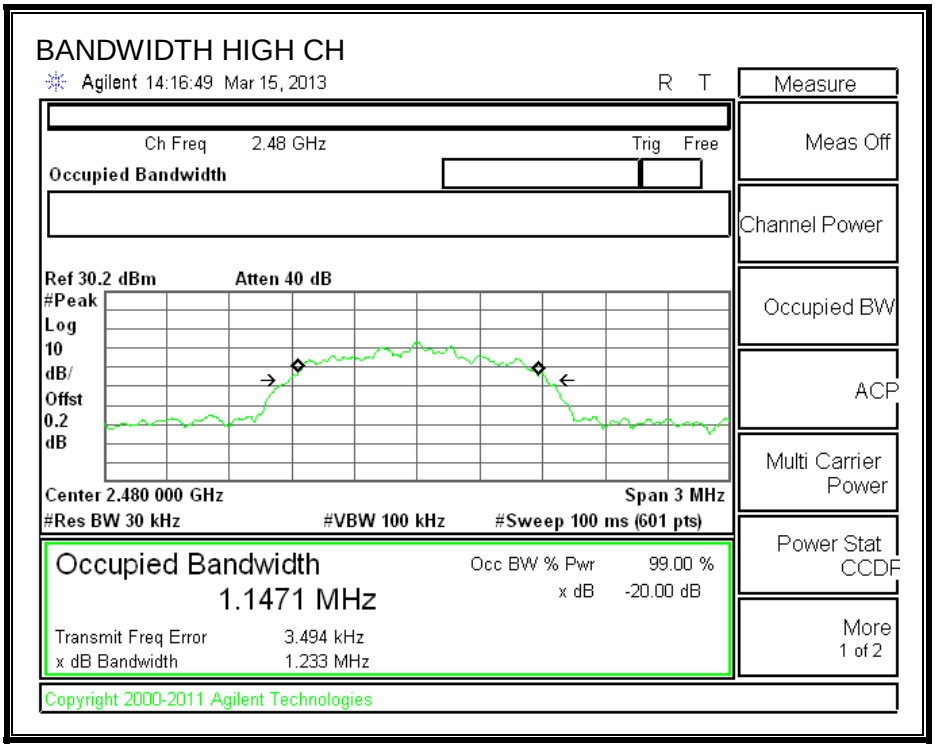
**20 dB AND 99% BANDWIDTH**

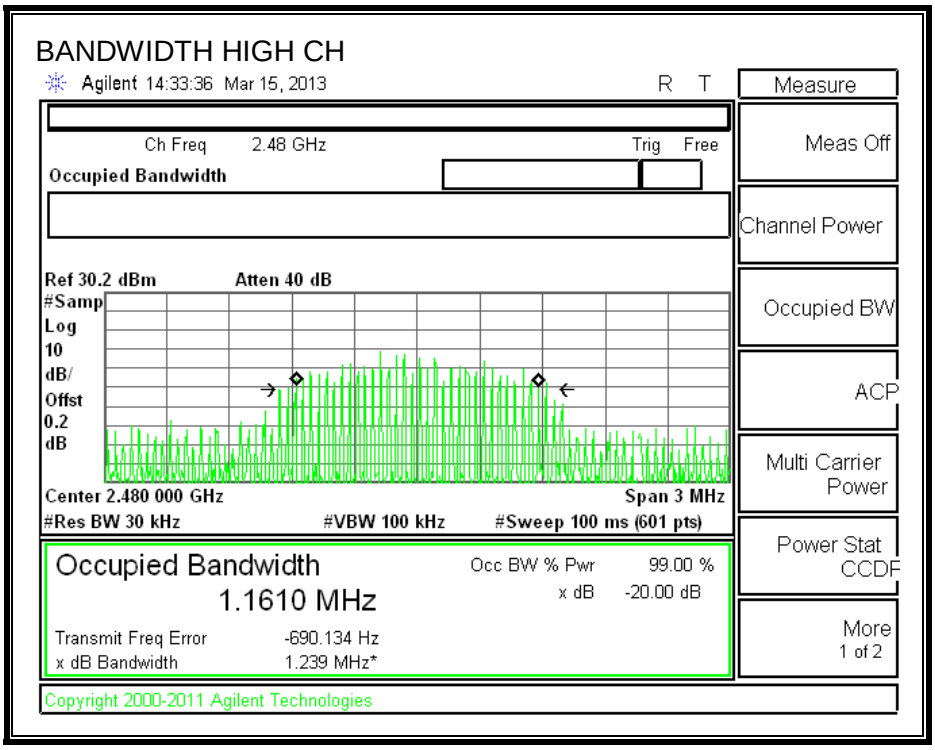






## 7.2.2. HOPPING FREQUENCY SEPARATION

**LIMIT**

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

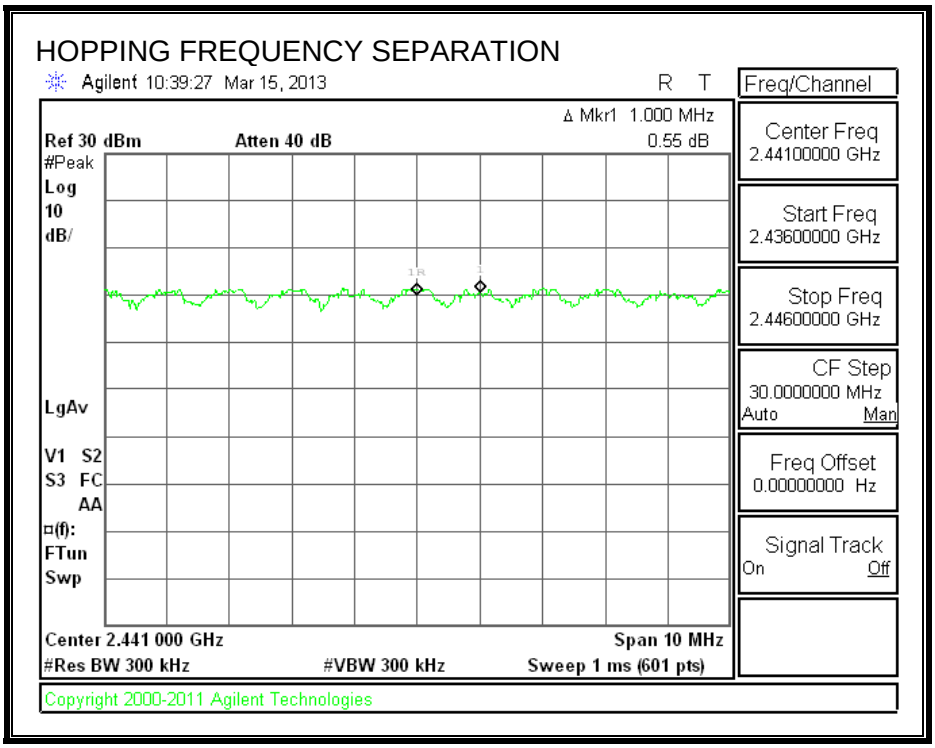
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

**RESULTS**

**HOPPING FREQUENCY SEPARATION**



## 7.2.3. NUMBER OF HOPPING CHANNELS

**LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

**TEST PROCEDURE**

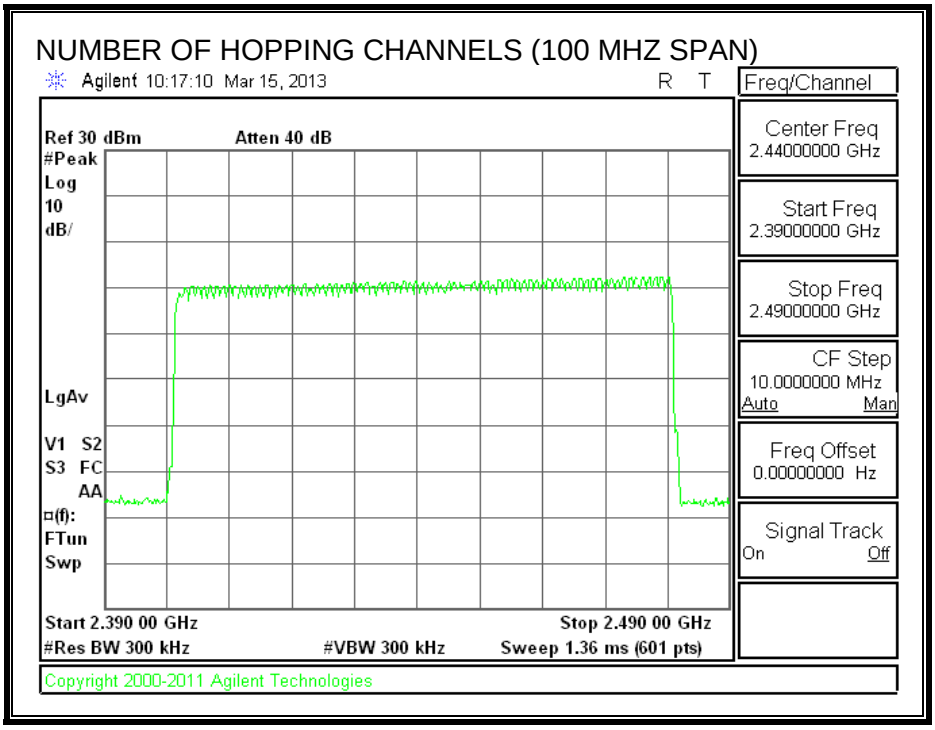
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

**RESULTS**

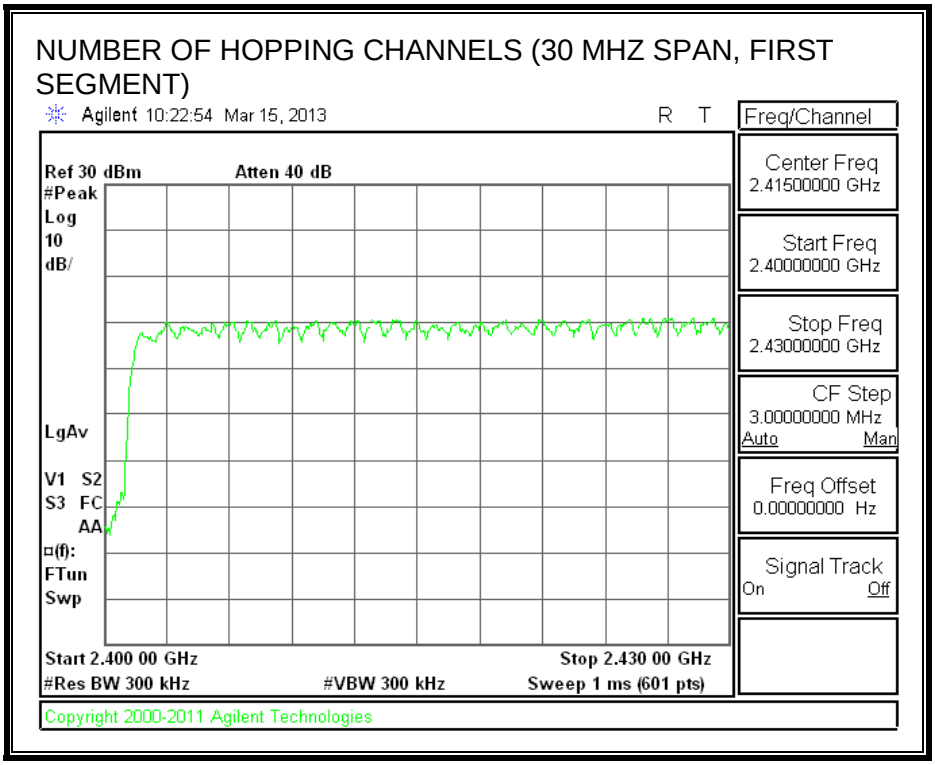
Normal Mode: 79 Channels observed.

**NUMBER OF HOPPING CHANNELS**

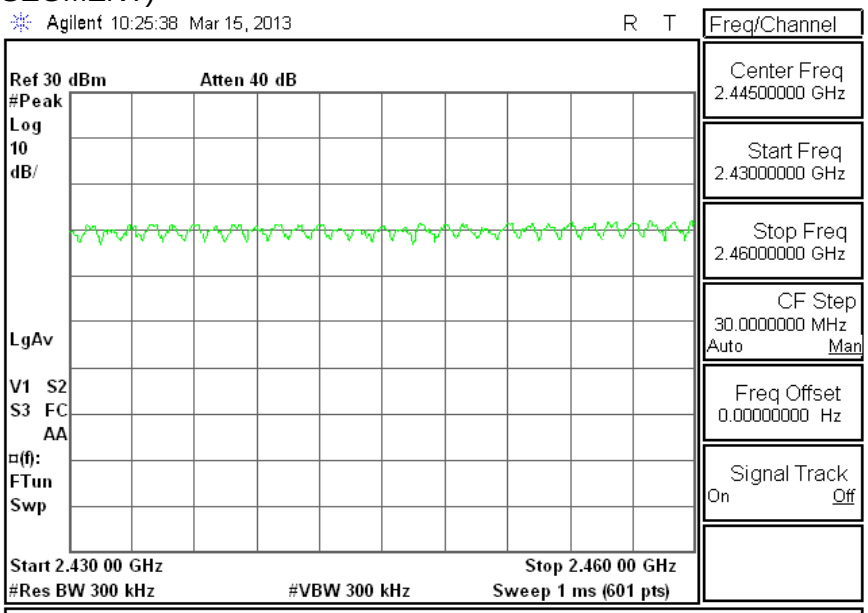
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



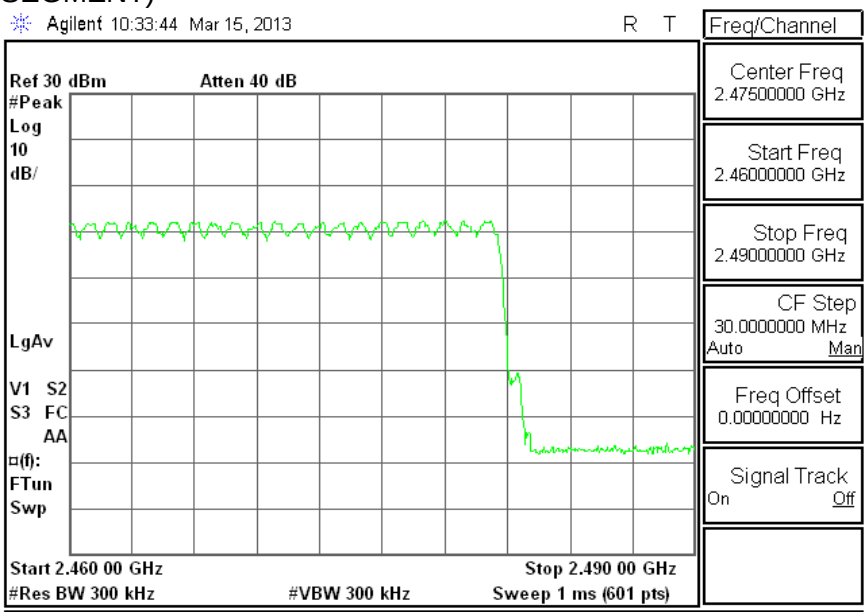

NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)




NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



## 7.2.4. AVERAGE TIME OF OCCUPANCY

**LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

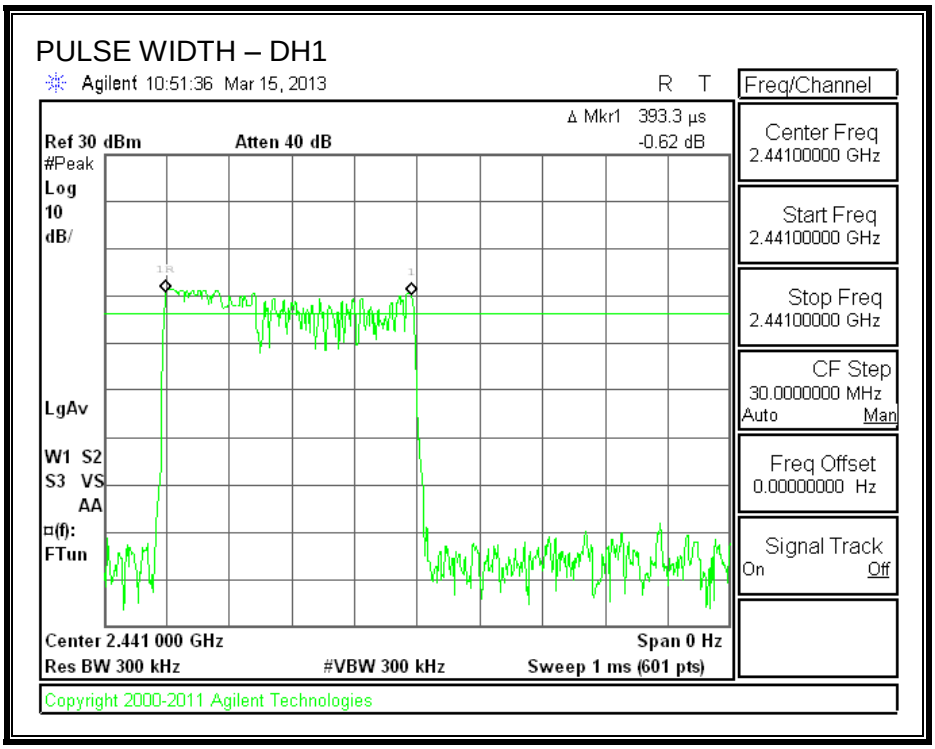
**RESULTS**

Time Of Occupancy = 10 * xx pulses * yy msec = zz msec

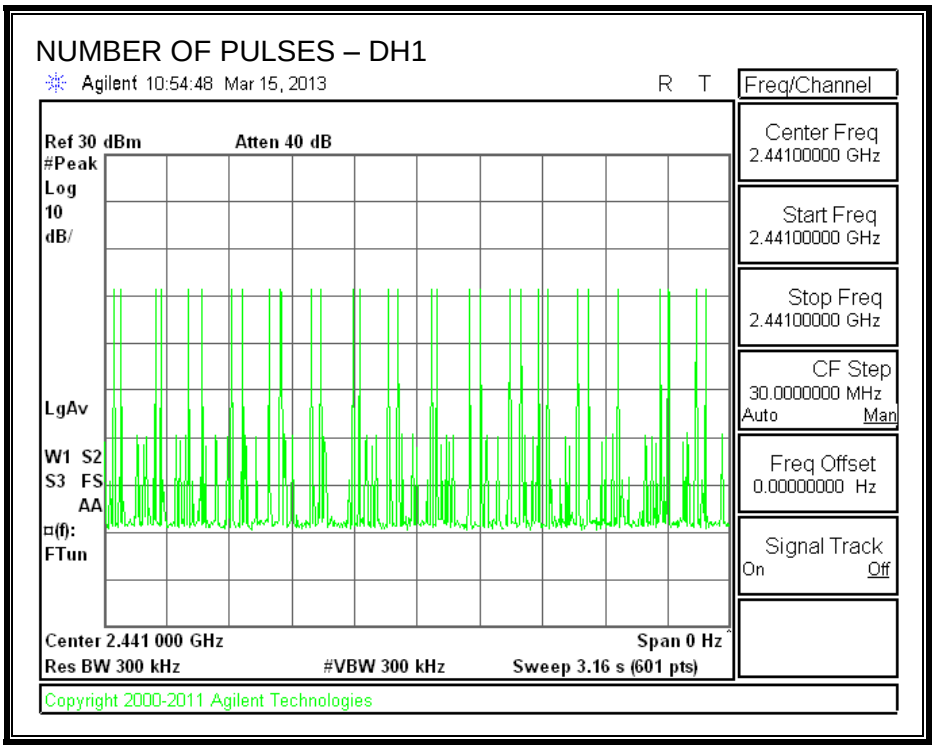
8PSK (EDR) Mode

| DH Packet | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of (sec) | Limit (sec) | Margin (sec) |
|---|---|---|---|---|---|
| DH1 | 0.3933 | 31 | 0.122 | 0.4 | -0.278 |
| DH3 | 1.642 | 13 | 0.213 | 0.4 | -0.187 |
| DH5 | 2.9 | 6 | 0.174 | 0.4 | -0.226 |

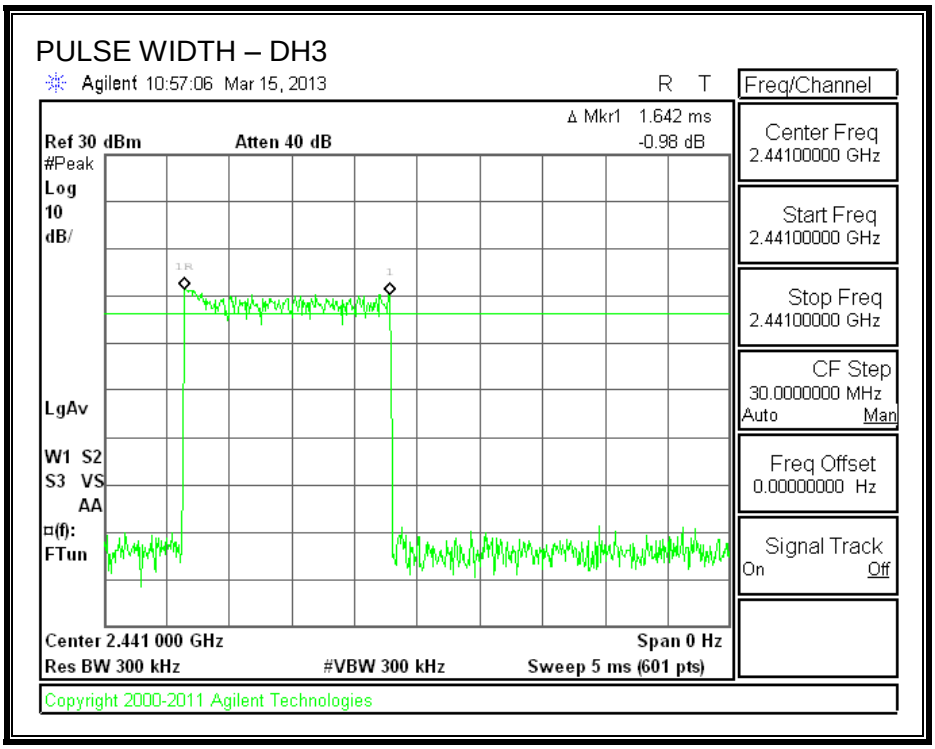
**PULSE WIDTH - DH1**



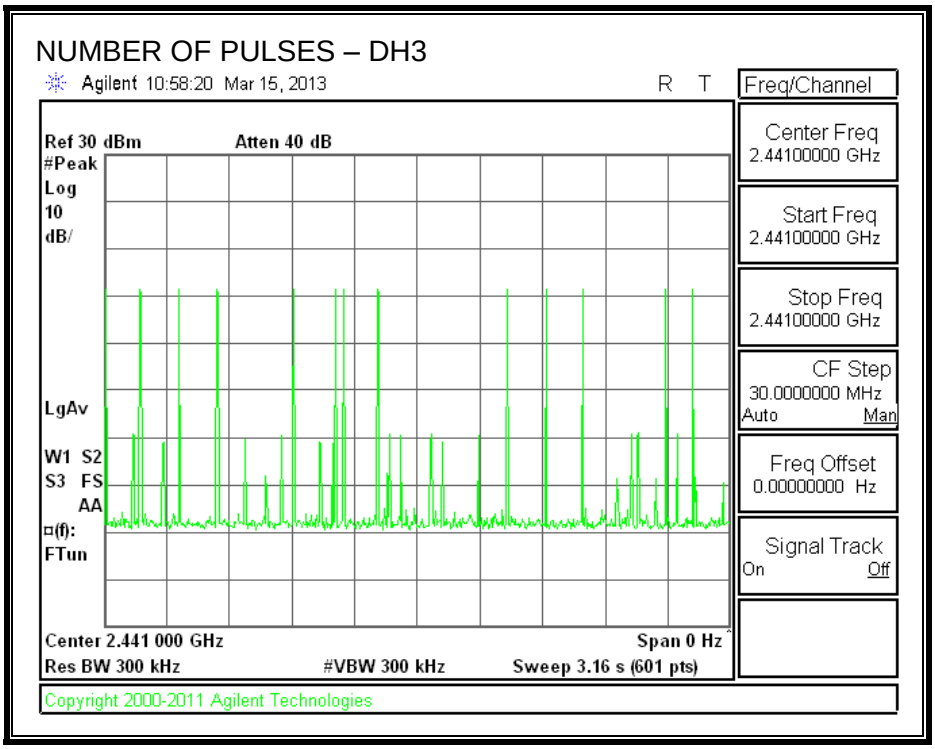
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1**



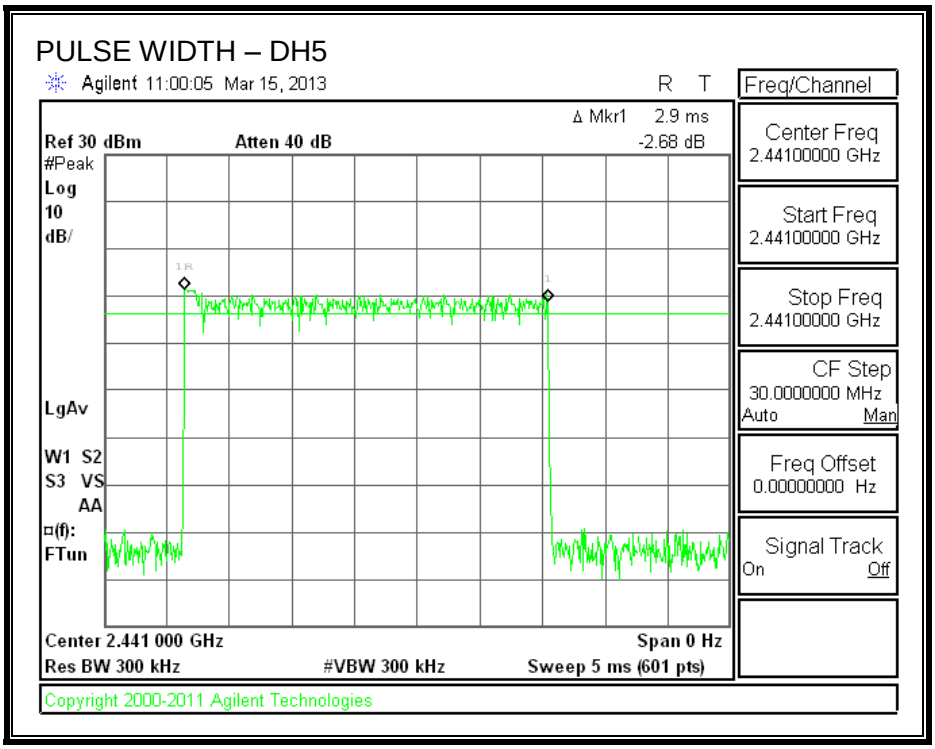
**PULSE WIDTH – DH3**



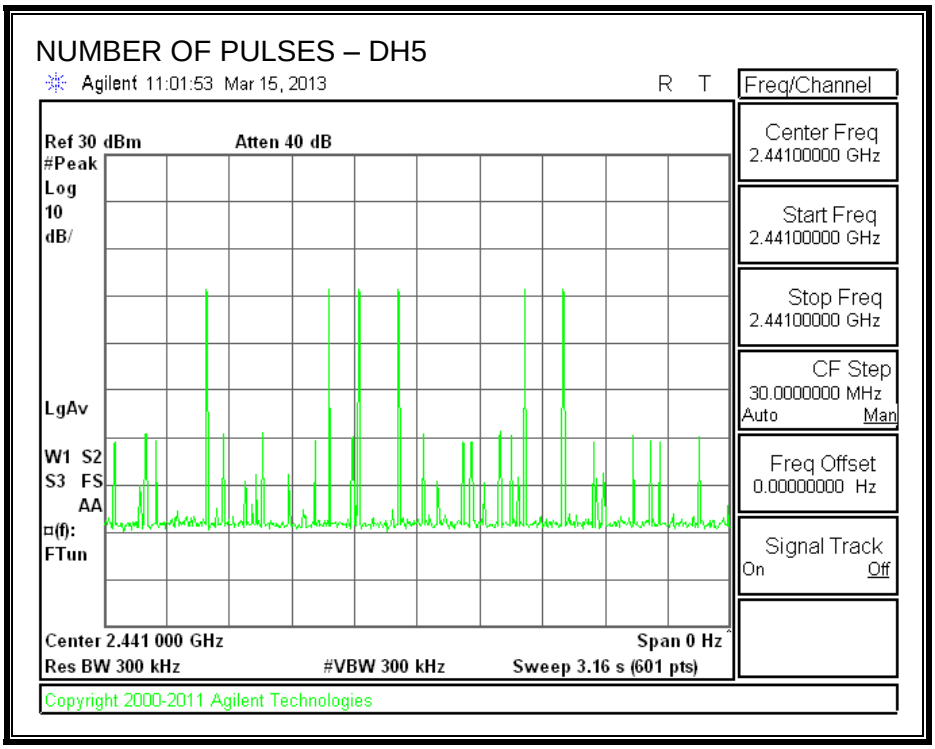
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3**



**PULSE WIDTH – DH5**



**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5**



## 7.2.5. OUTPUT POWER

**LIMIT**

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

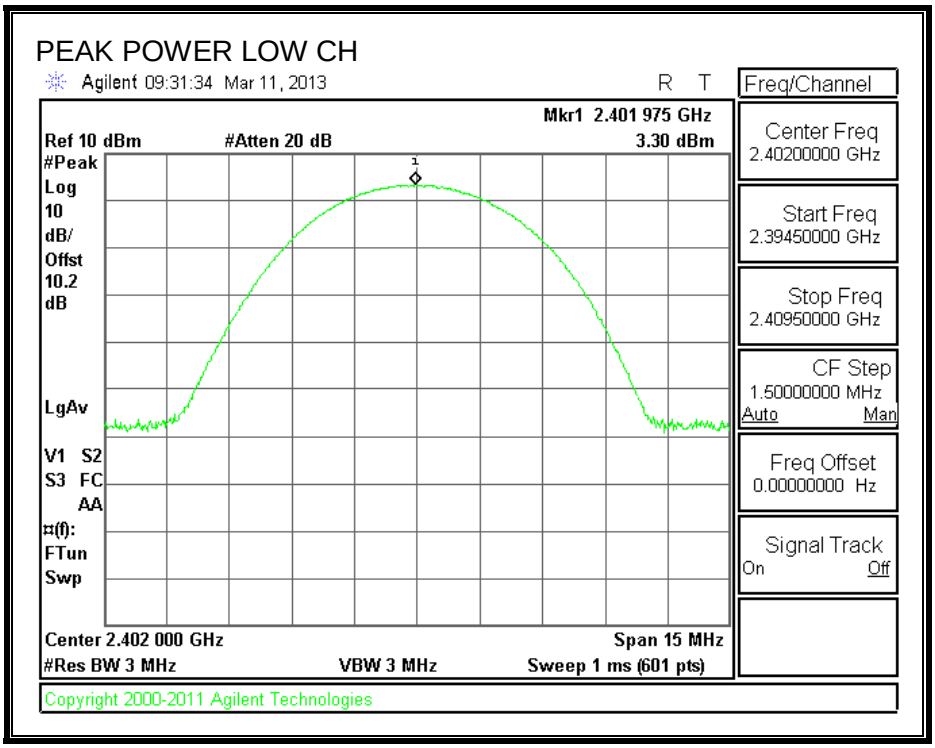
**TEST PROCEDURE**

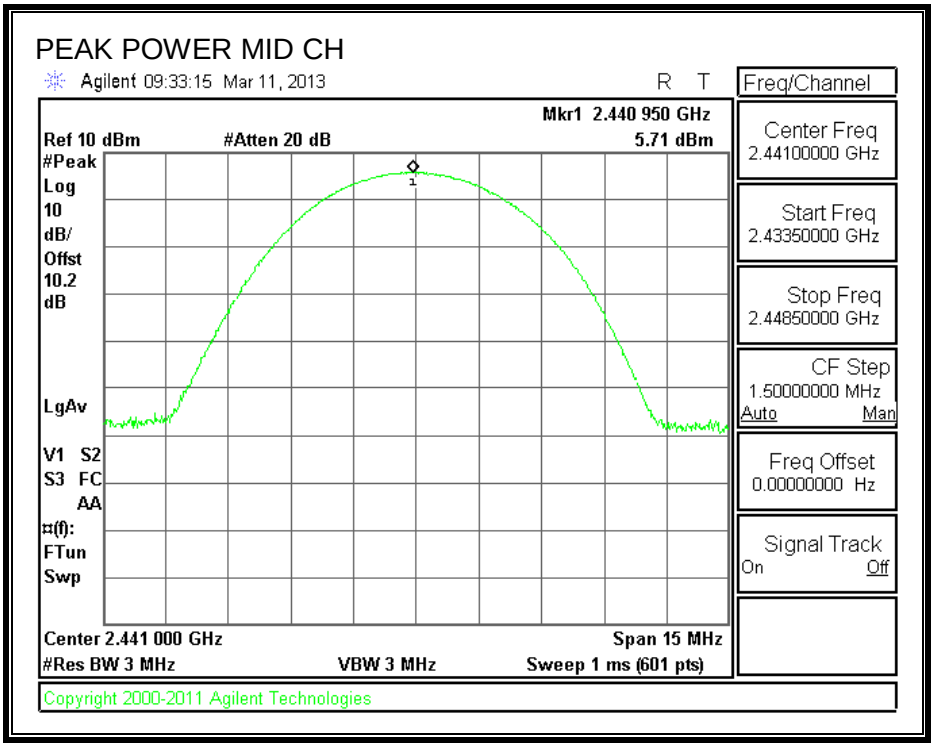
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

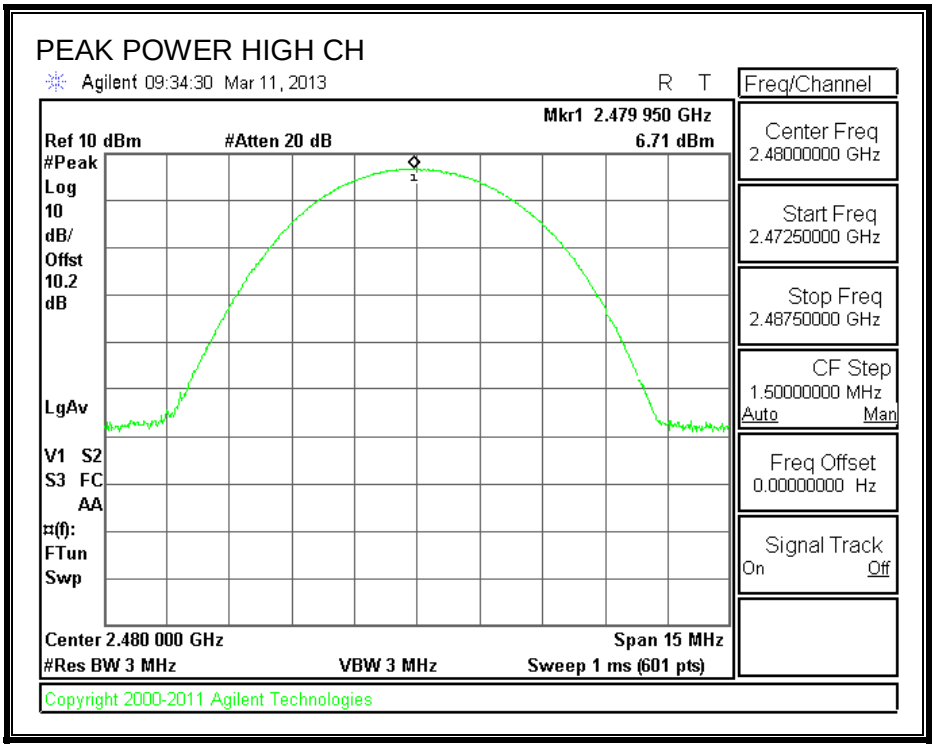
**RESULTS**

| Channel | Frequency (MHz) | Output Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 3.30 | 30 | -26.70 |
| Middle | 2441 | 5.71 | 30 | -24.29 |
| High | 2480 | 6.71 | 30 | -23.29 |

**OUTPUT POWER**







## 7.2.6. AVERAGE POWER

**LIMIT**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

**RESULTS**

The cable assembly insertion loss of 10.21 dB (including 9.71 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

| Channel | Frequency (MHz) | Average Power (dBm) |
|---|---|---|
| Low | 2402 | -4.18 |
| Middle | 2441 | -1.65 |
| High | 2480 | -0.65 |

## 7.2.7. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

**TEST PROCEDURE**

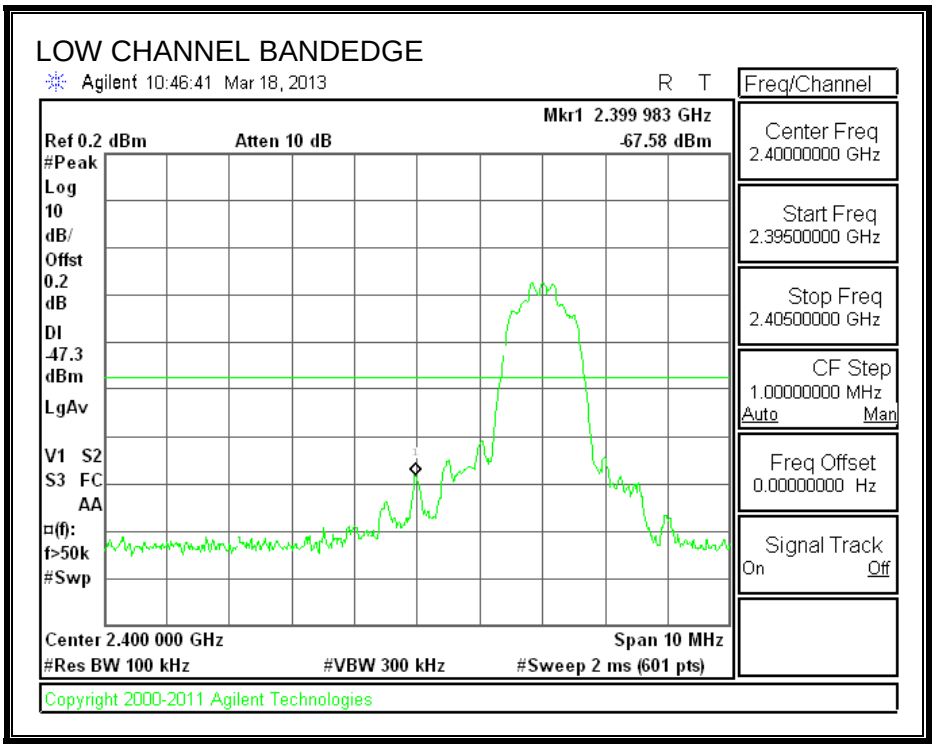
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

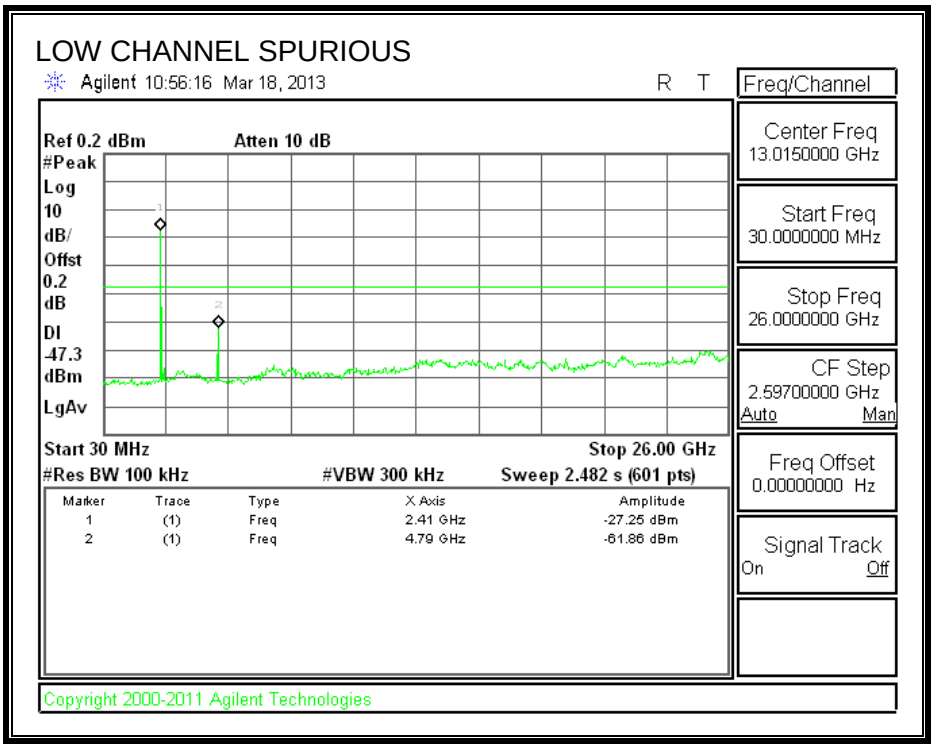
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

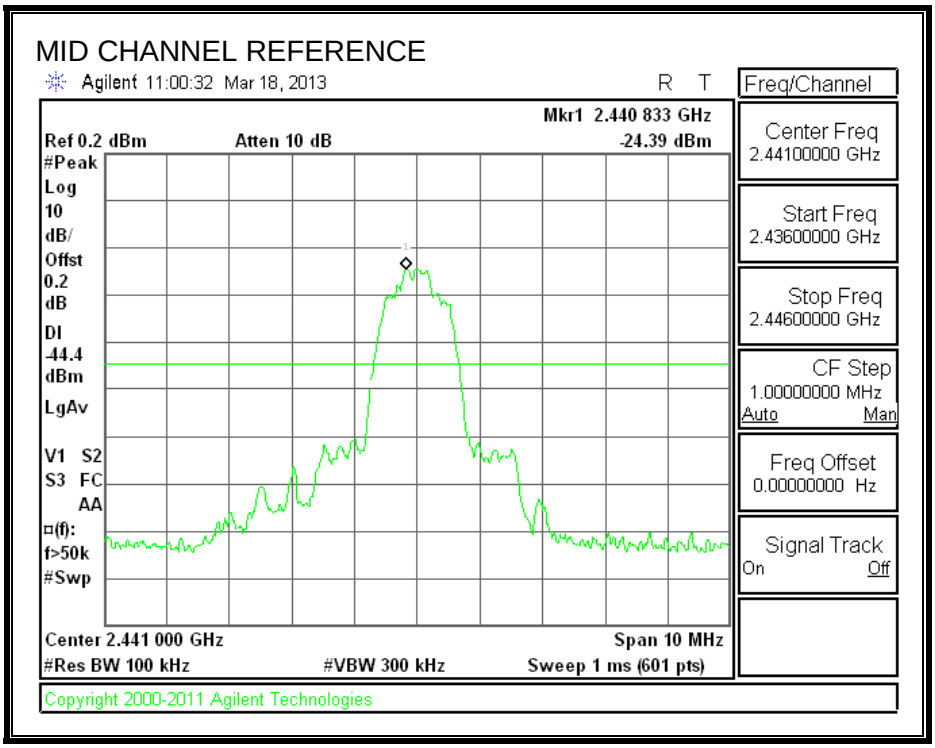
**RESULTS**

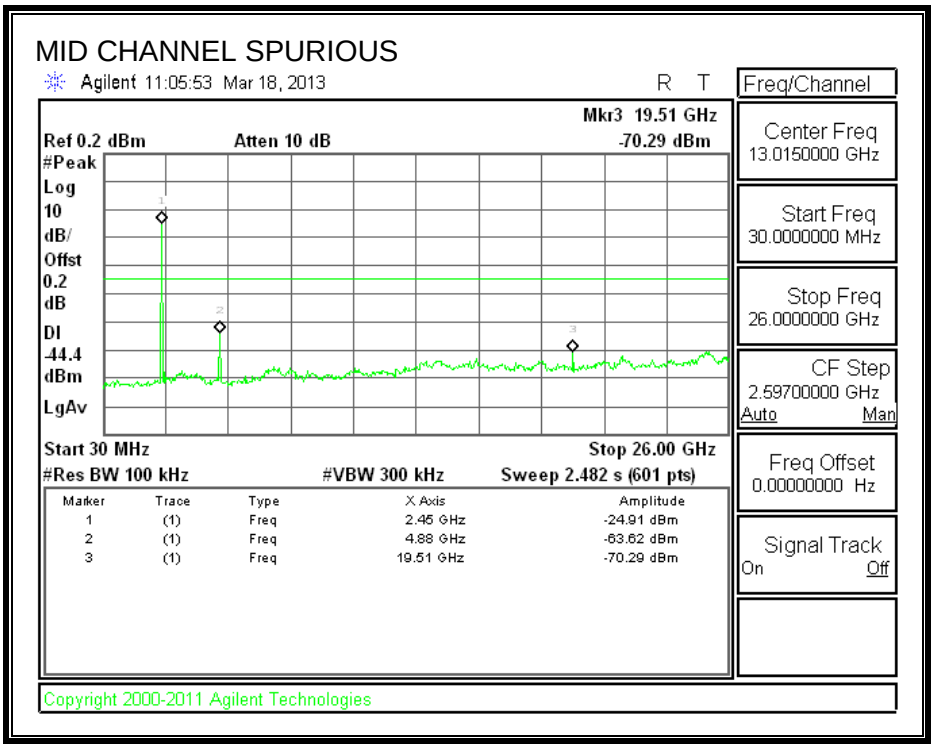
**SPURIOUS EMISSIONS, LOW CHANNEL**



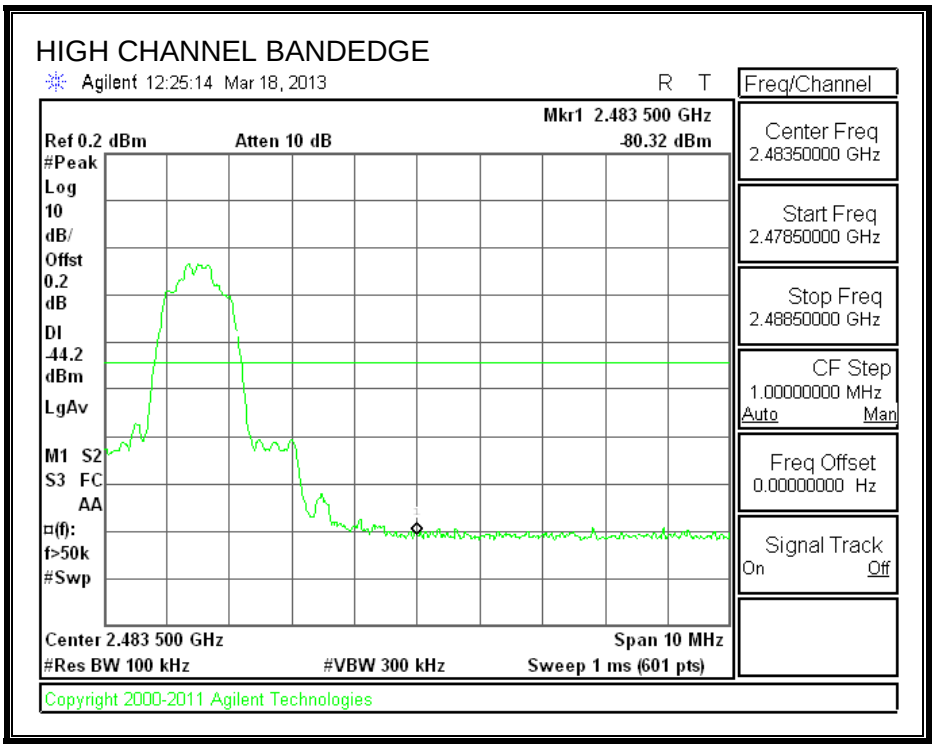



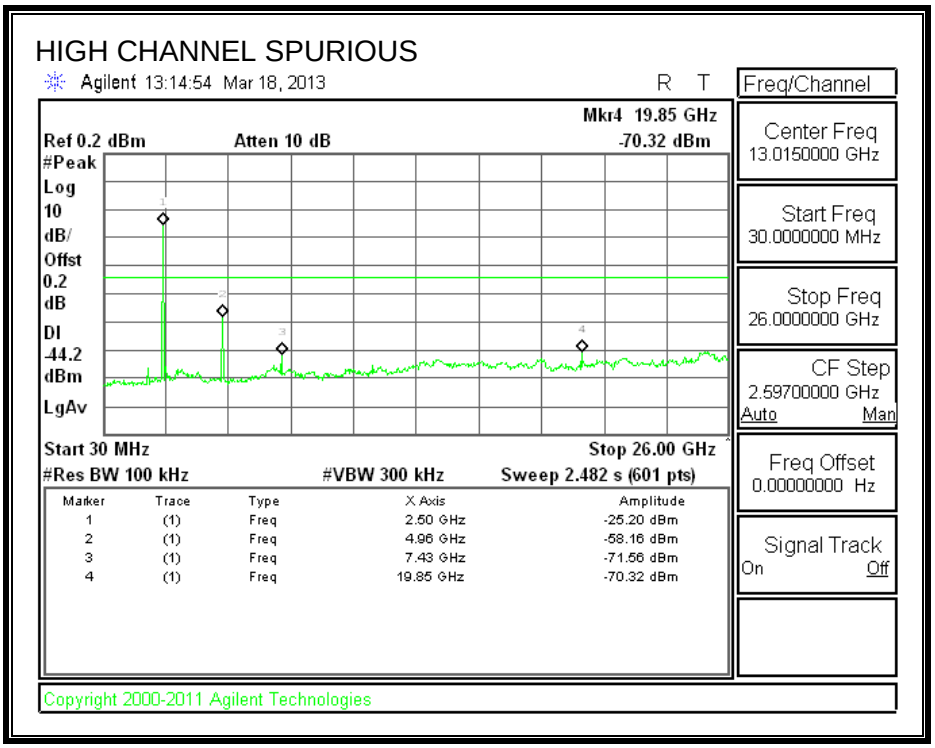
**SPURIOUS EMISSIONS, MID CHANNEL**



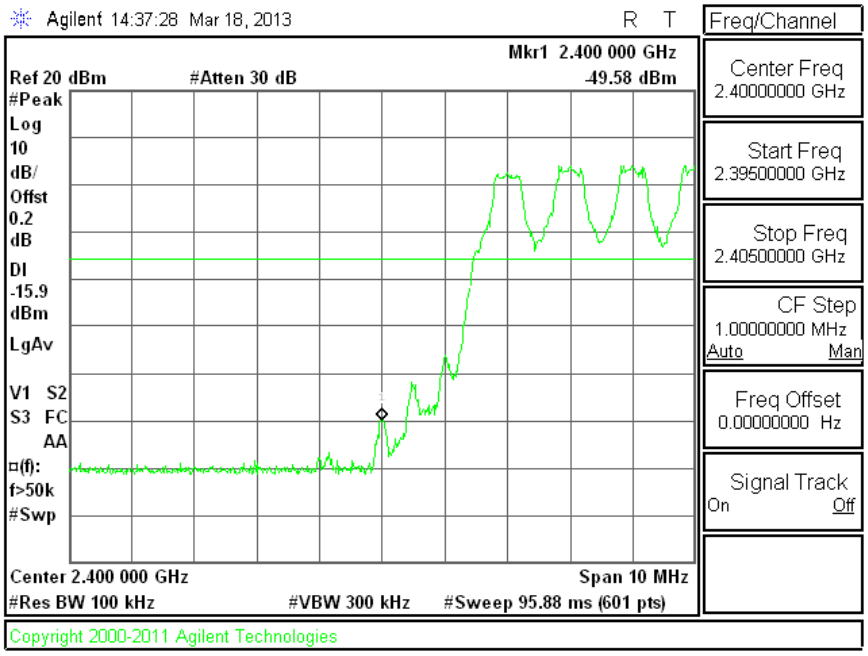
**SPURIOUS EMISSIONS, HIGH CHANNEL**



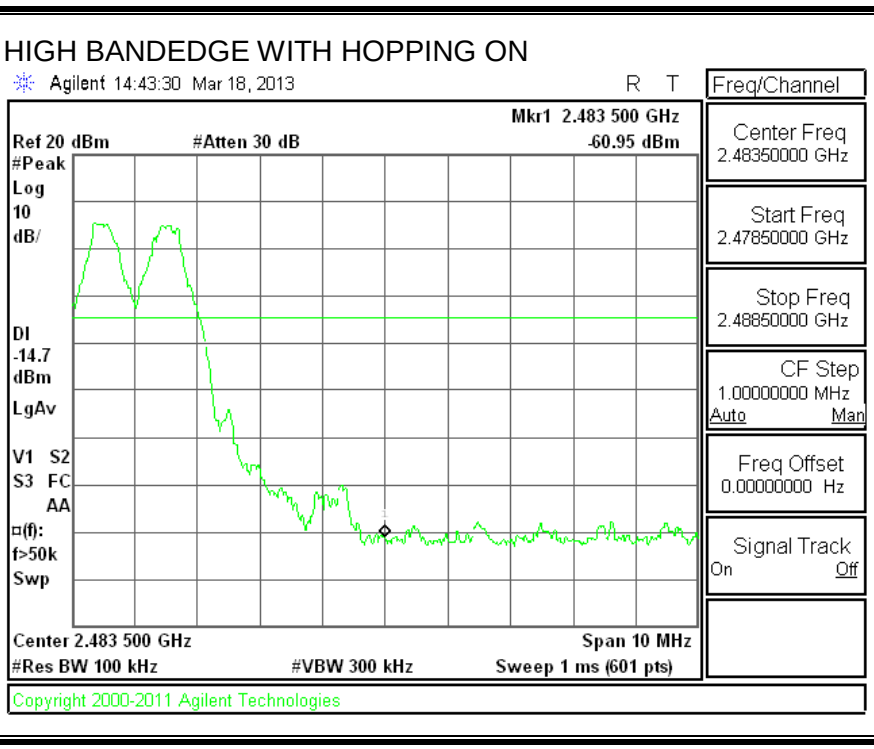



**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**

LOW BANDEDGE WITH HOPPING ON




HIGH BANDEDGE WITH HOPPING ON



# 7.3. ENHANCED DATA RATE DQPSK MODULATION

## 7.3.1. 20 dB AND 99% BANDWIDTH

**LIMIT**

None; for reporting purposes only.

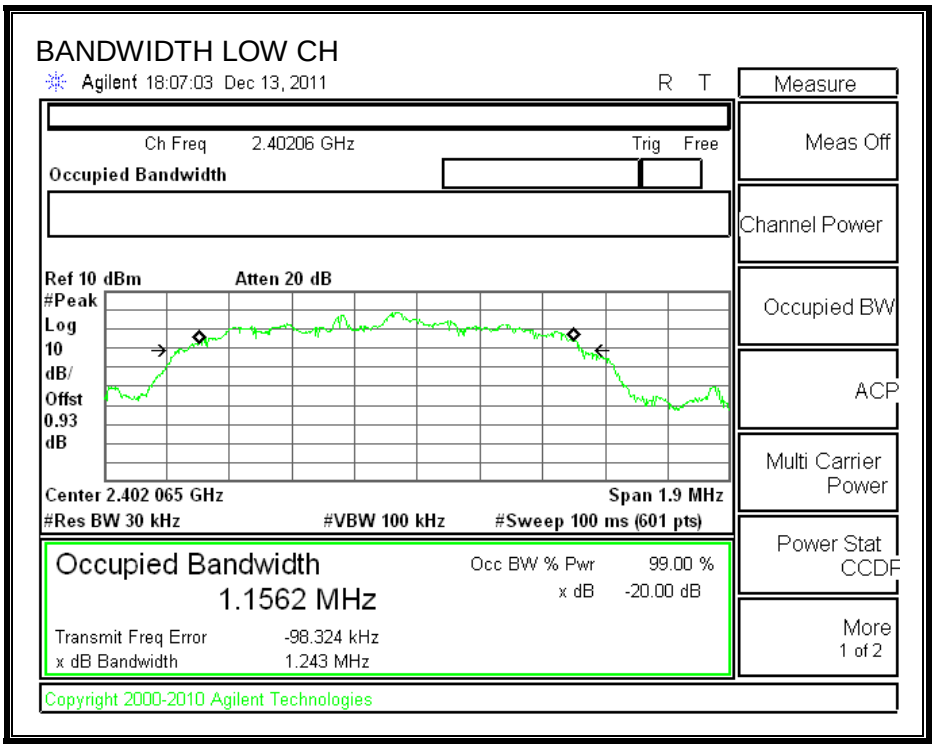
**TEST PROCEDURE**

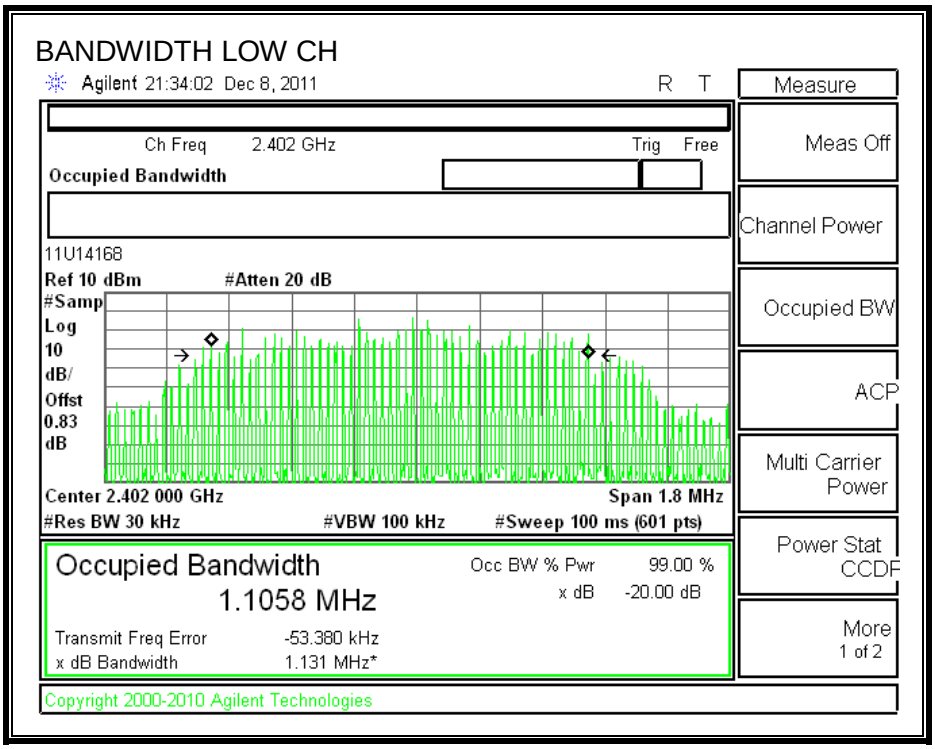
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

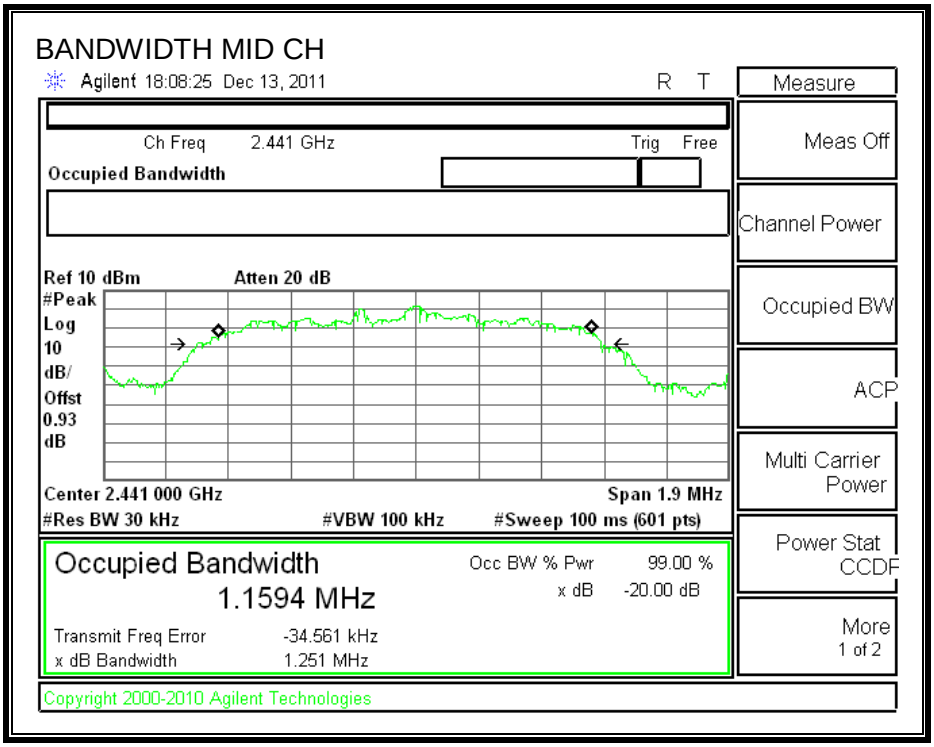
**RESULTS**

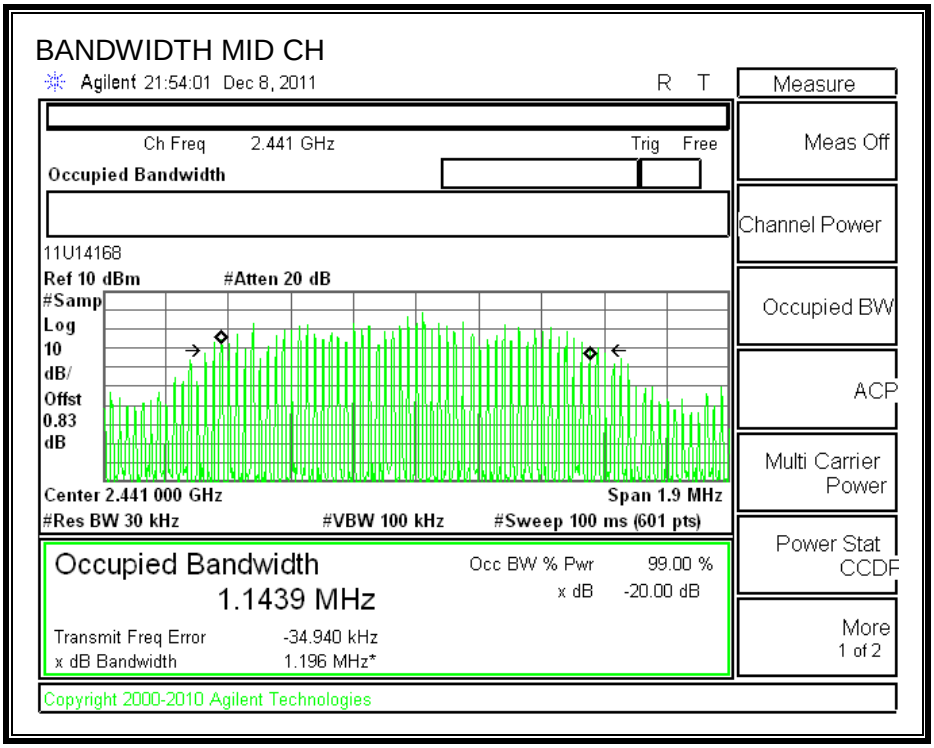
| Channel | Frequency (MHz) | 20 dB Bandwidth (kHz) | 99% Bandwidth (kHz) |
|---|---|---|---|
| Low | 2402 | 1243 | 1105.8 |
| Middle | 2441 | 1251 | 1143.9 |
| High | 2480 | 1259 | 1122.1 |

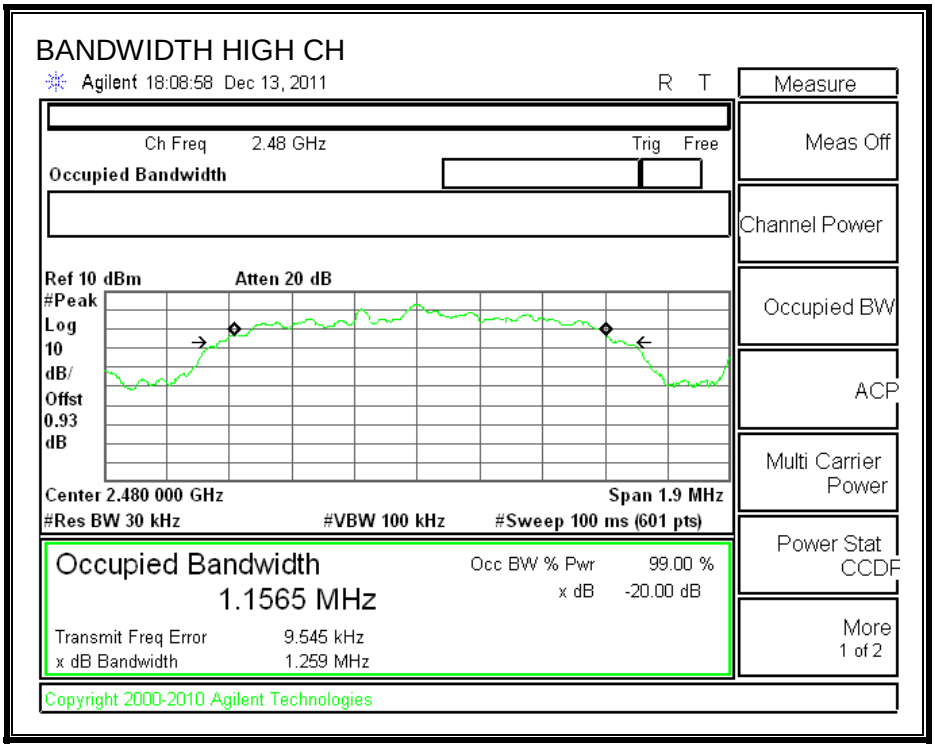
**20 dB AND 99% BANDWIDTH**

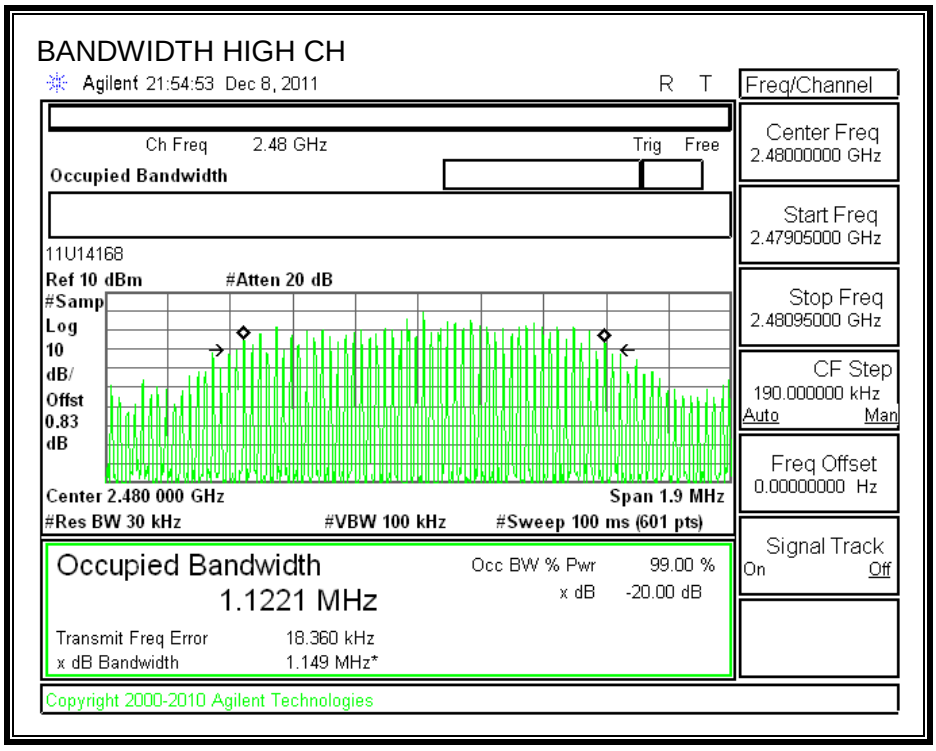






## 7.3.2. HOPPING FREQUENCY SEPARATION

**LIMIT**

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

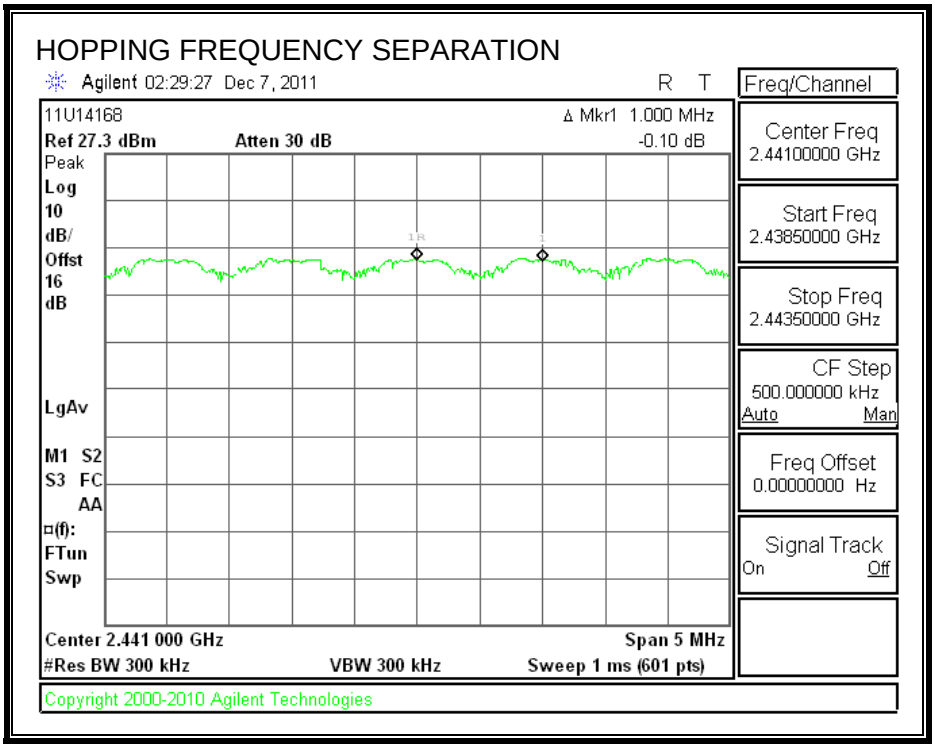
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

## RESULTS

## HOPPING FREQUENCY SEPARATION



## 7.3.3. NUMBER OF HOPPING CHANNELS

**LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

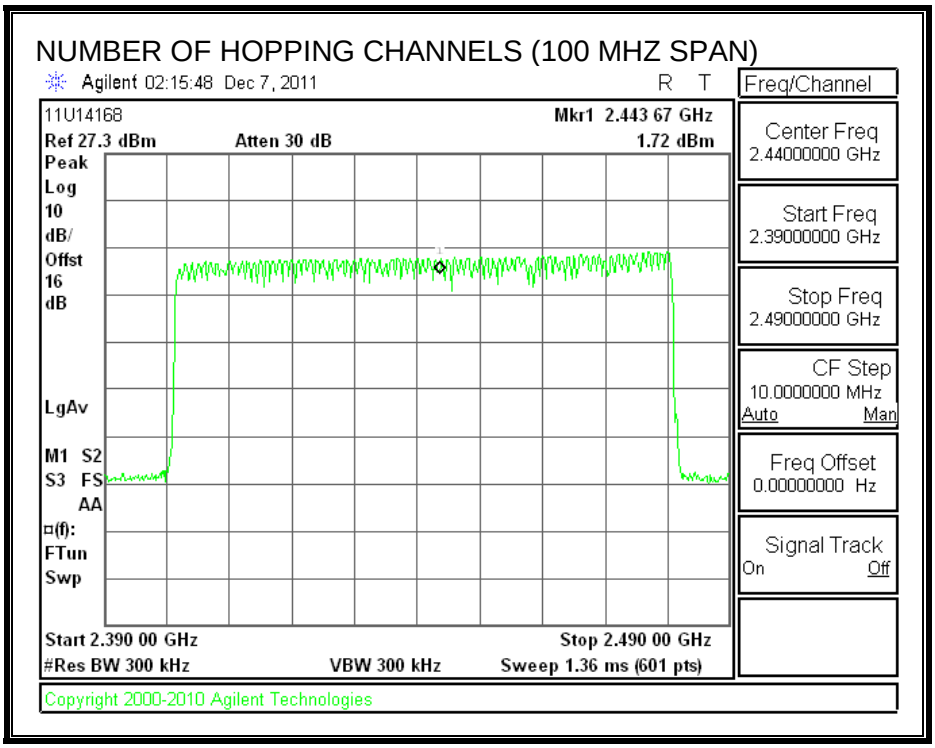
**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

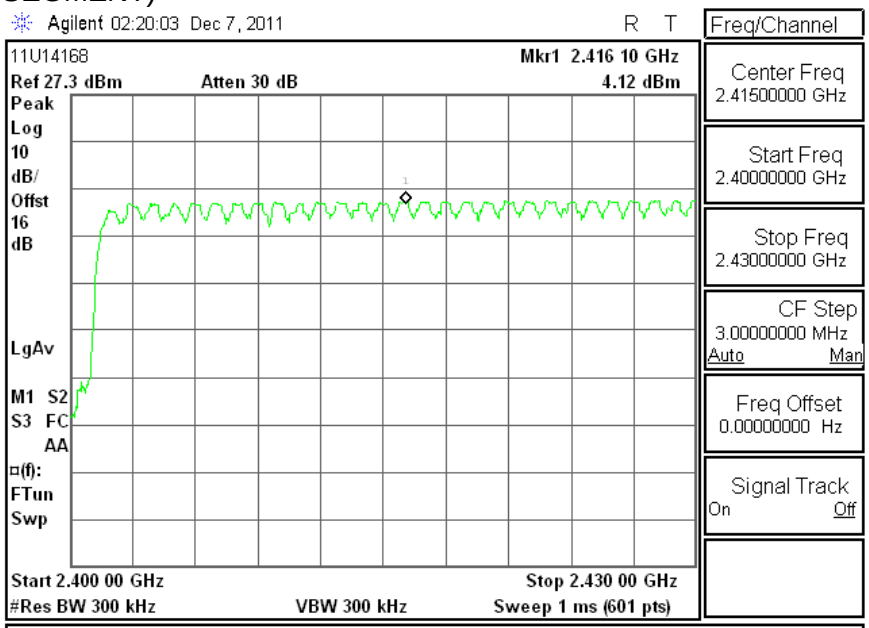
**RESULTS**

79 Channels observed.

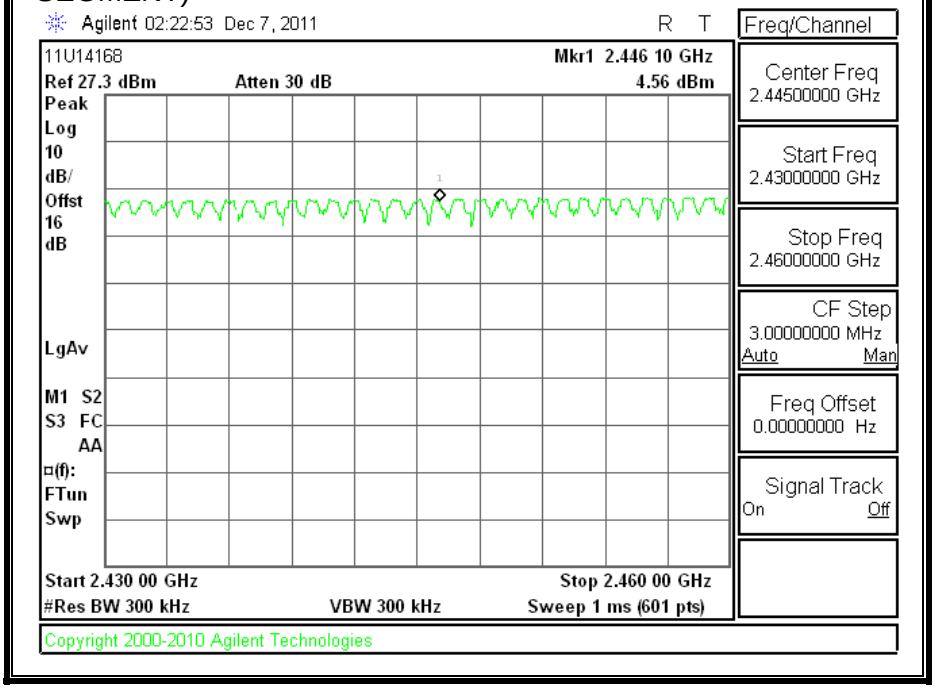
**NUMBER OF HOPPING CHANNELS**



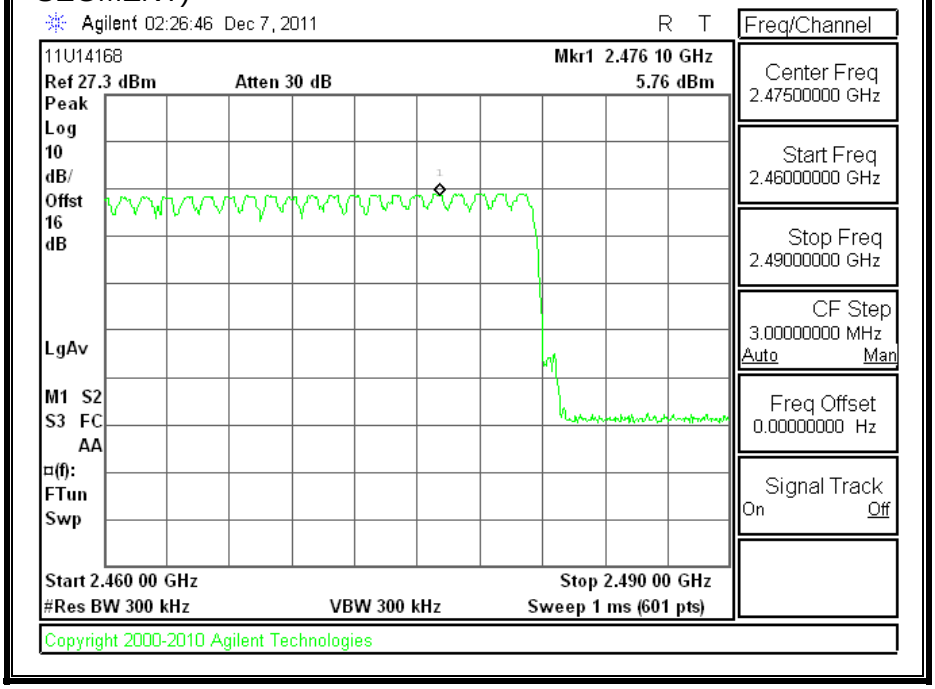
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



## 7.3.4. AVERAGE TIME OF OCCUPANCY

**LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

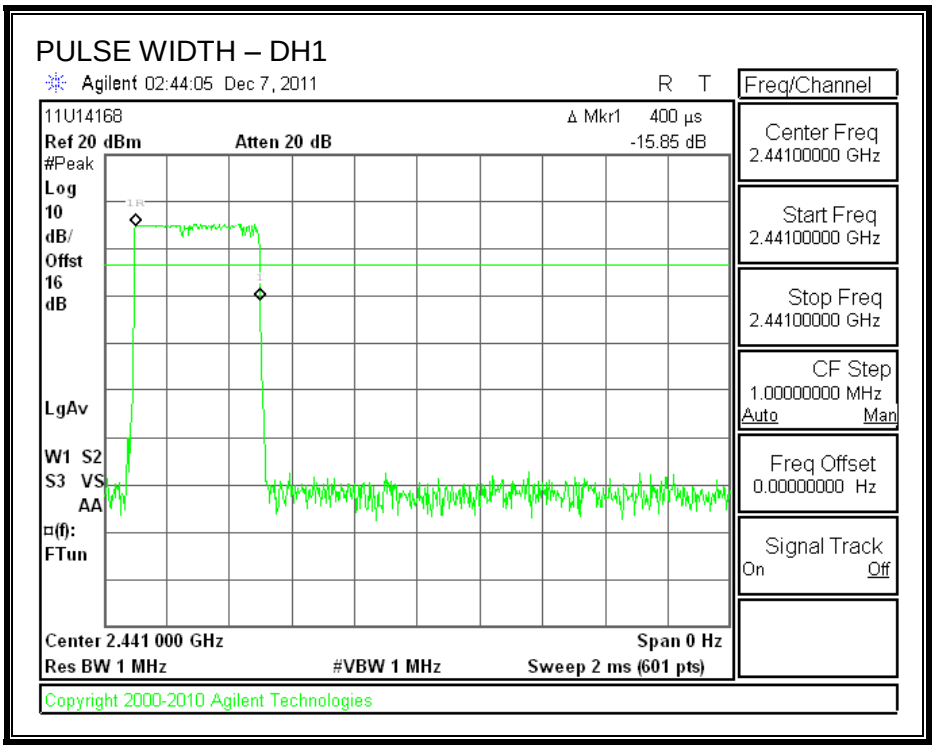
**RESULTS**

Time Of Occupancy = 10 * xx pulses * yy msec = zz msec

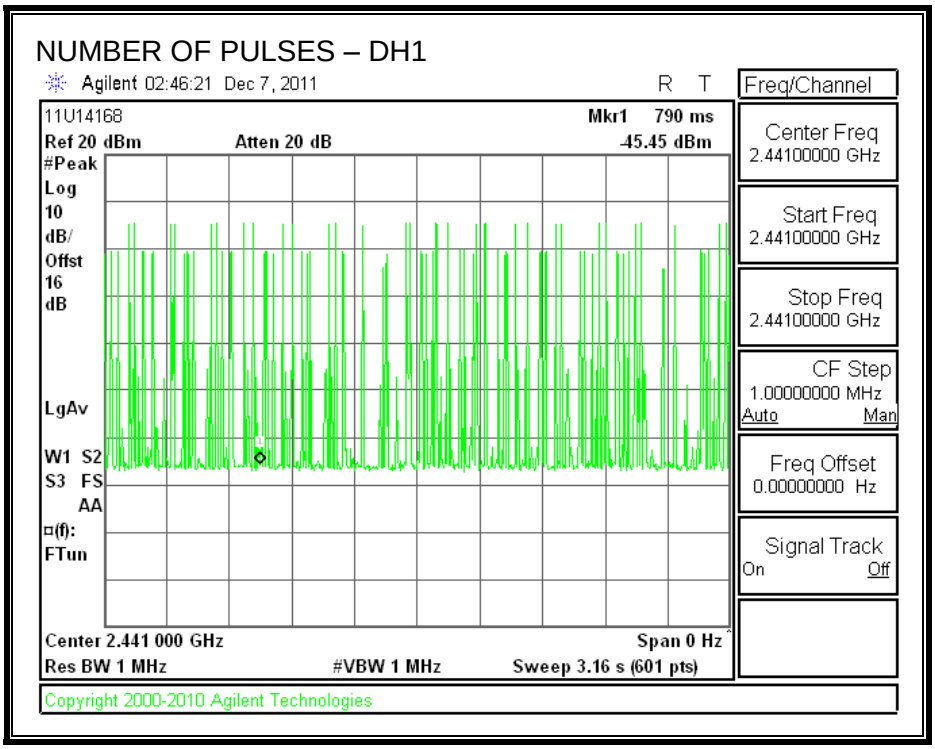
DQPSK Mode

| DH Packet | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of (sec) | Limit (sec) | Margin (sec) |
|---|---|---|---|---|---|
| DH1 | 0.4 | 31 | 0.124 | 0.4 | -0.276 |
| DH3 | 1.655 | 12 | 0.199 | 0.4 | -0.201 |
| DH5 | 2.9 | 10 | 0.290 | 0.4 | -0.110 |

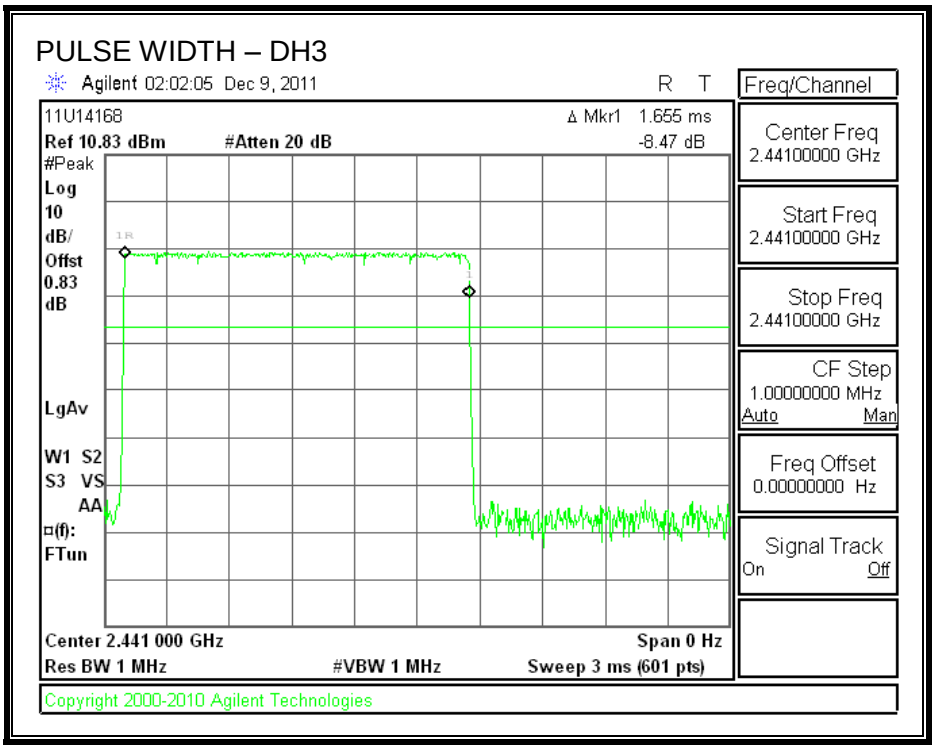
**PULSE WIDTH – DH1**



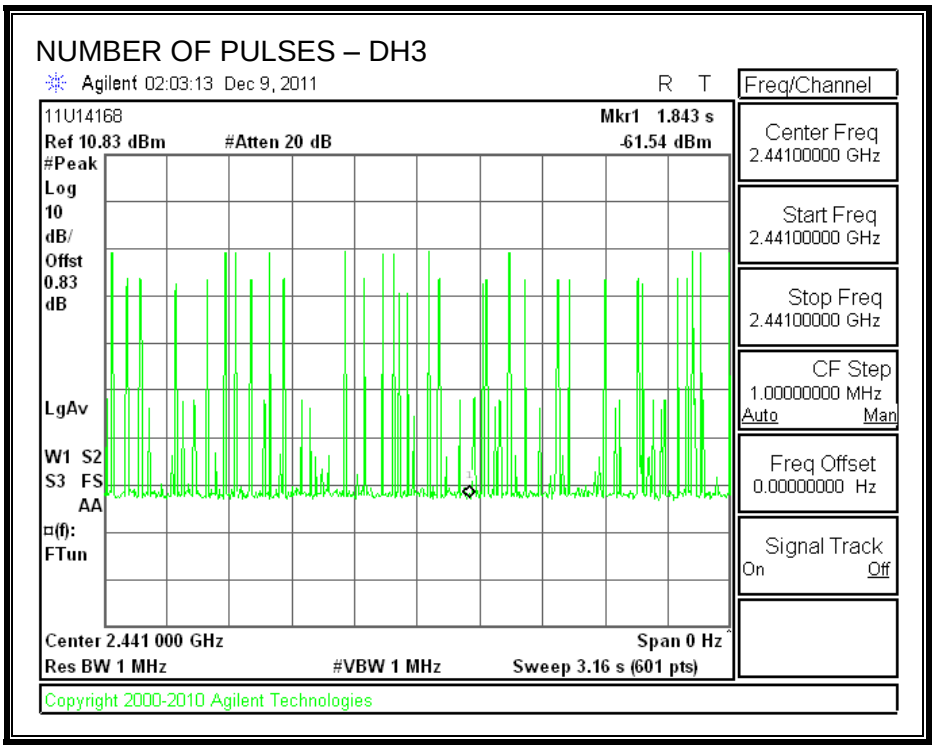
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1**



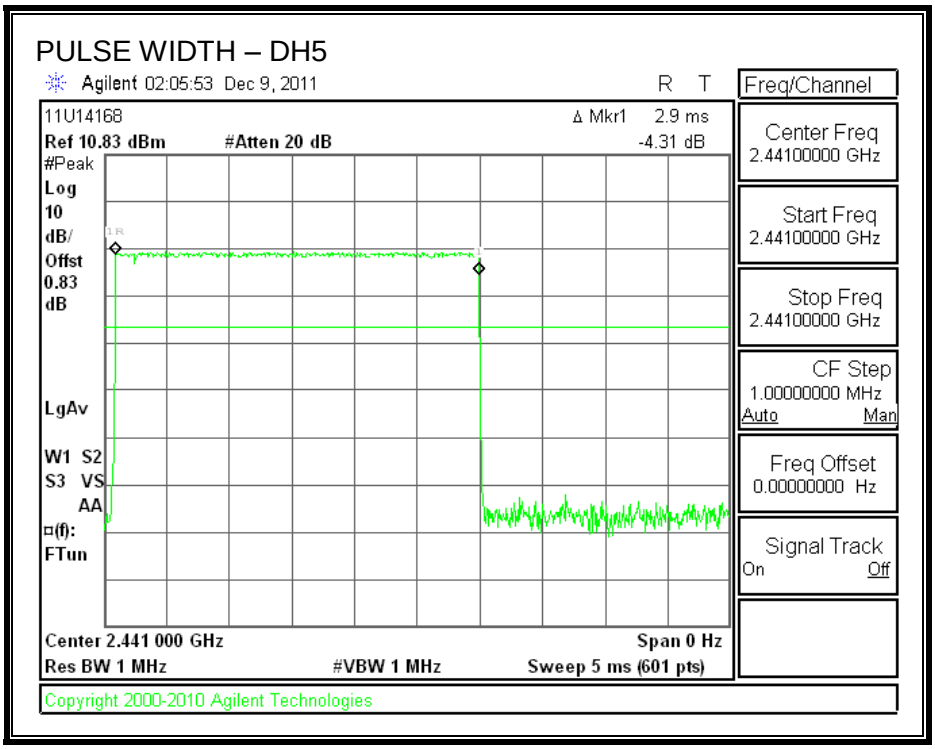
**PULSE WIDTH – DH3**



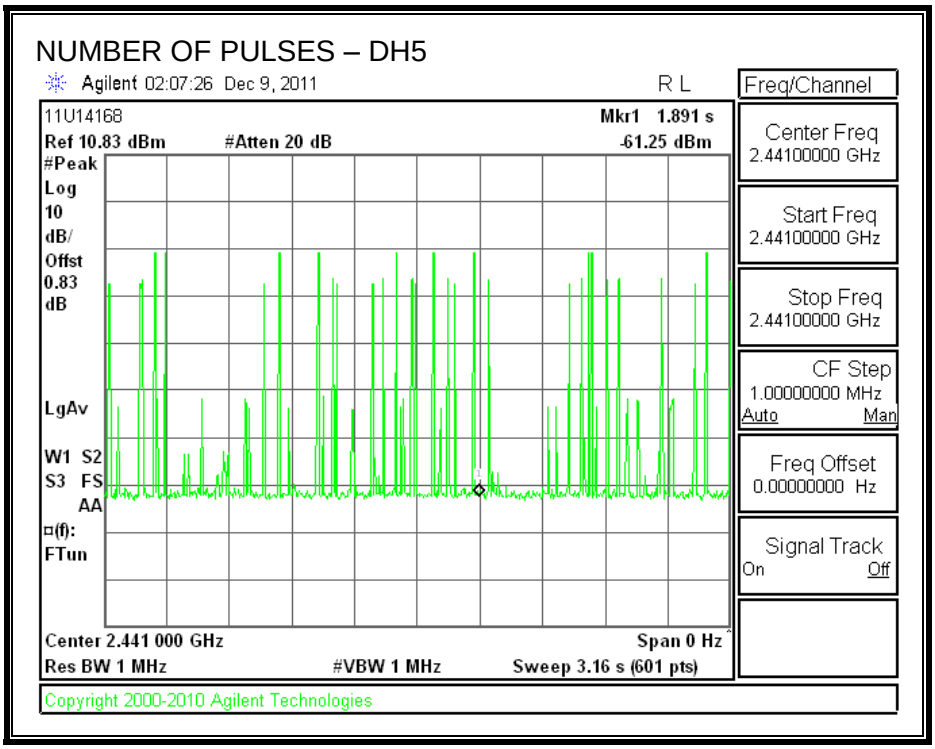
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3**



**PULSE WIDTH – DH5**



**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5**



## 7.3.5. OUTPUT POWER

**LIMIT**

§15.247 (b) (1)

RSS-210 Issue 8 Clause A8.4

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

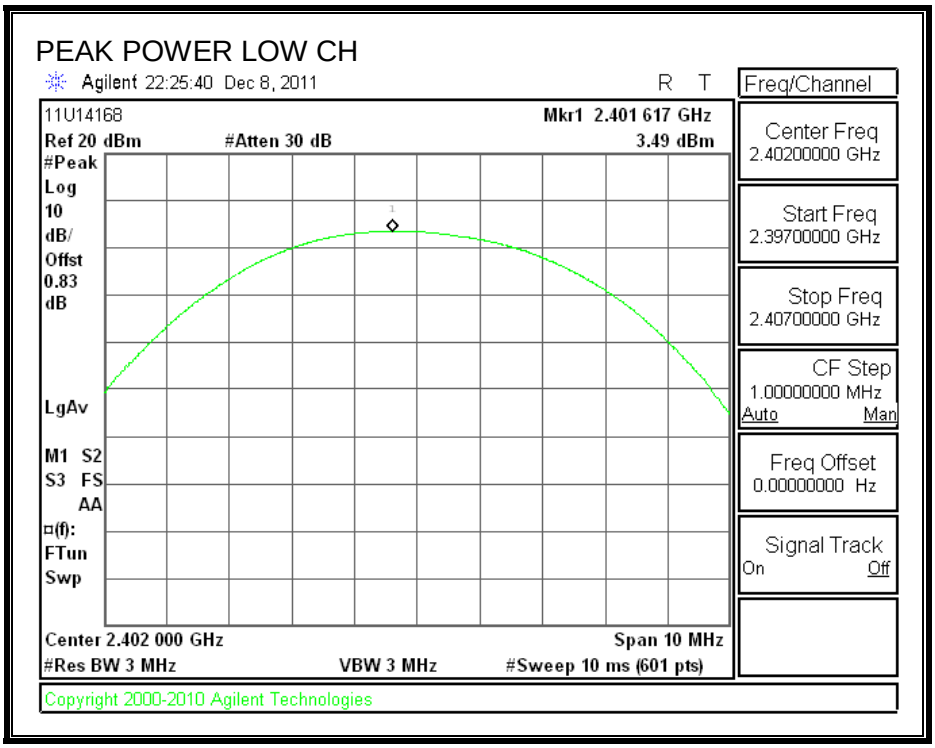
**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

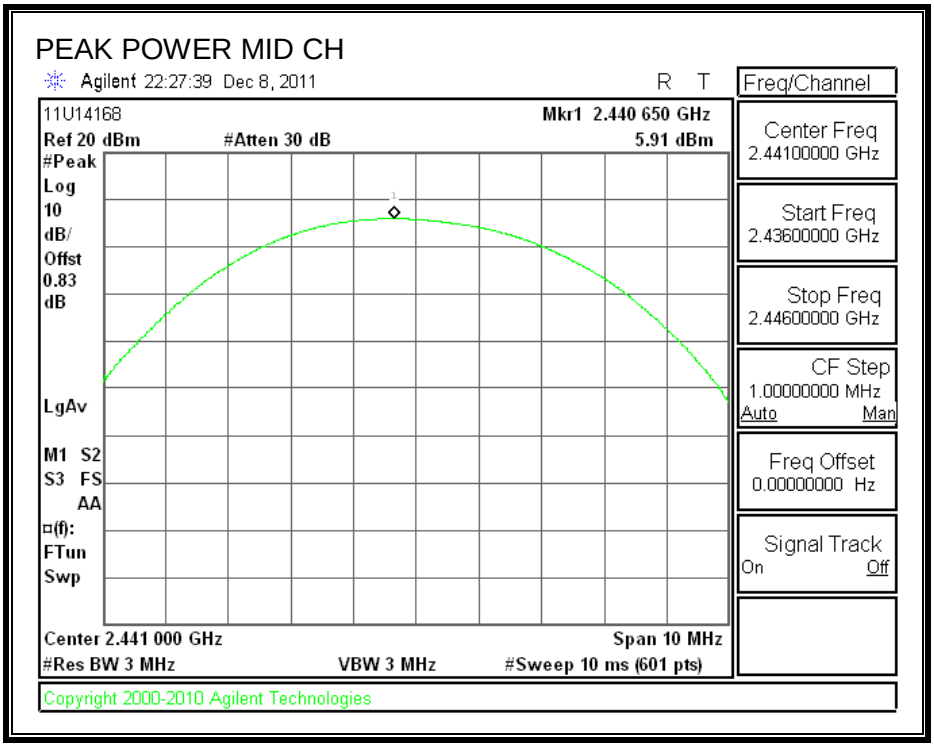
**RESULTS**

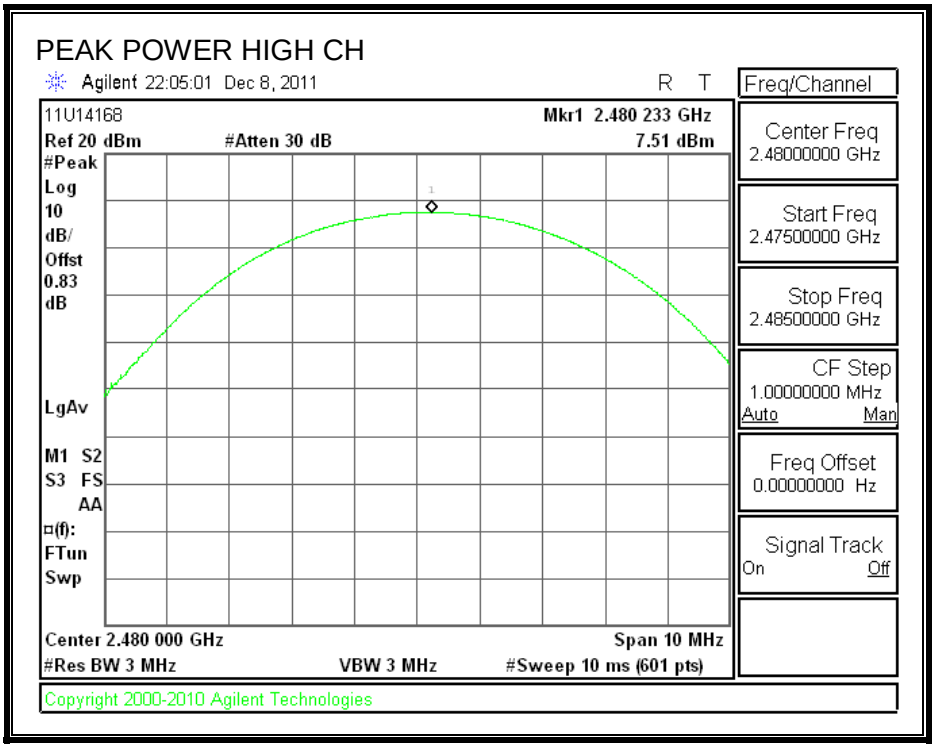
| Channel | Frequency (MHz) | Output Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 3.49 | 30 | -26.51 |
| Middle | 2441 | 5.91 | 30 | -24.09 |
| High | 2480 | 7.51 | 30 | -22.49 |

**OUTPUT POWER**



PEAK POWER MID CH





## 7.3.6. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

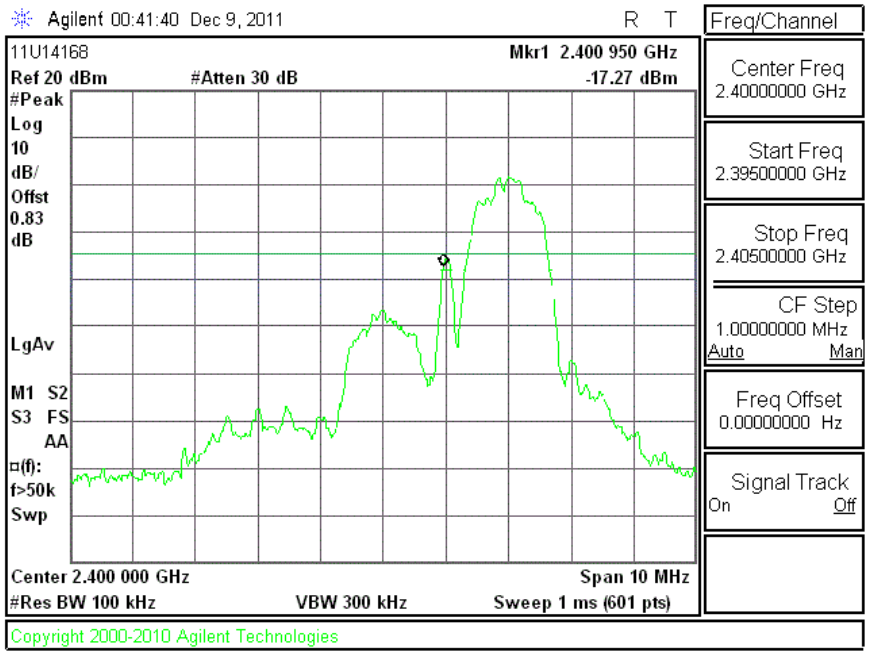
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

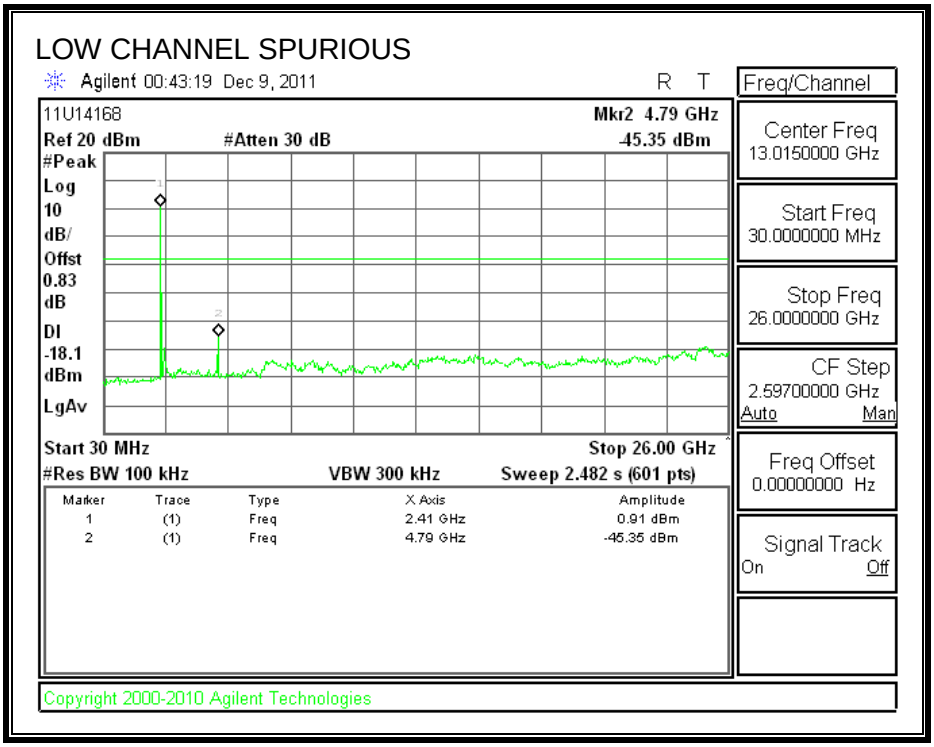
**RESULTS**

**SPURIOUS EMISSIONS, LOW CHANNEL**

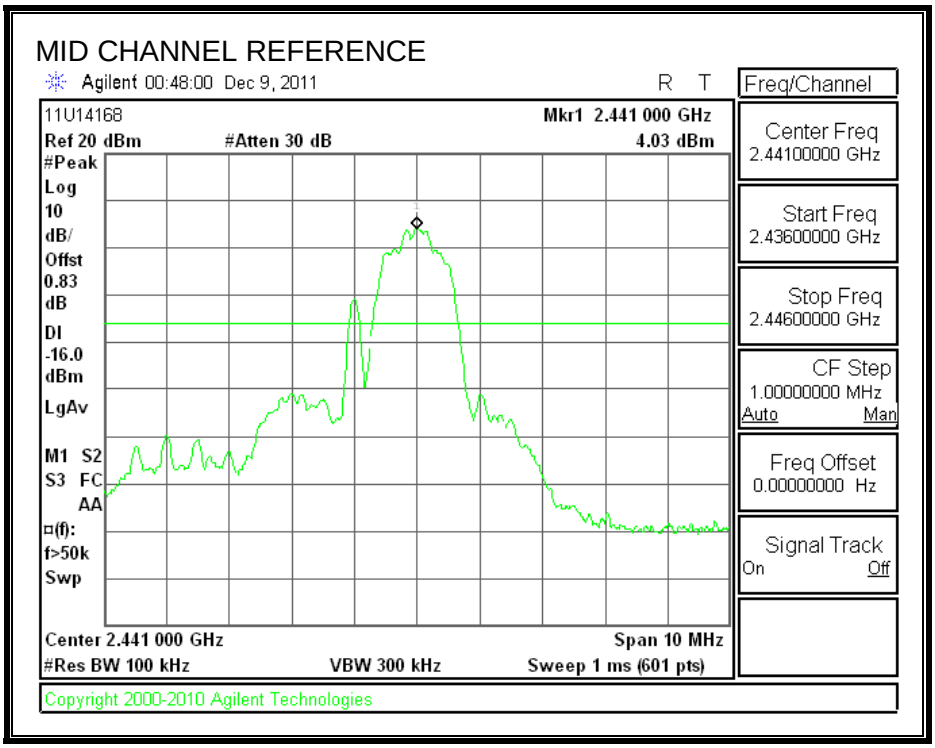
LOW CHANNEL BANDEDGE

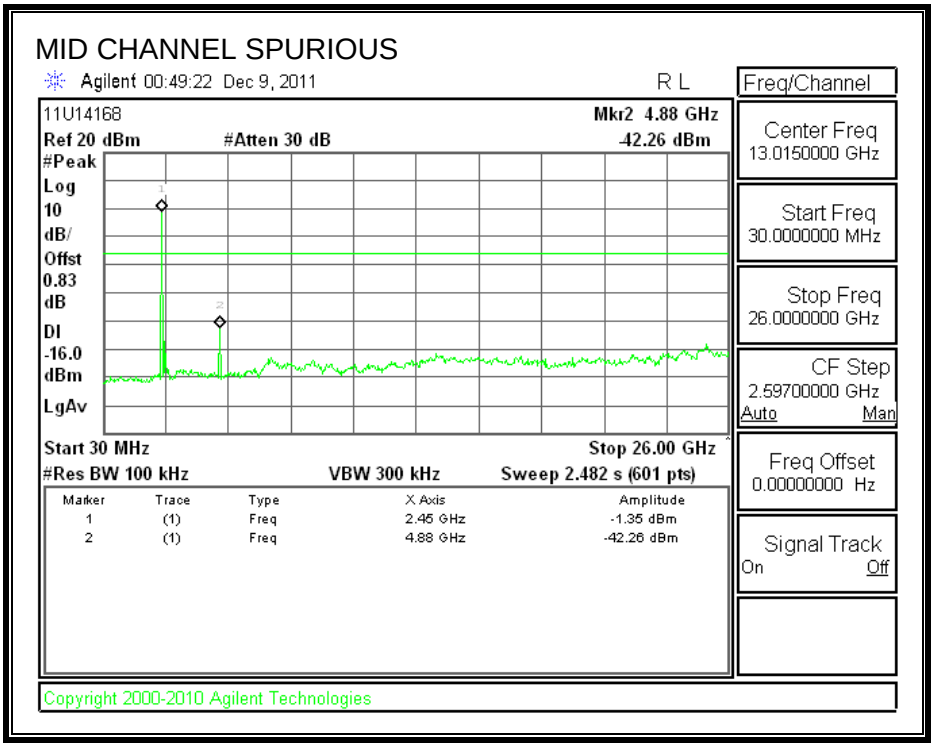



Display Line = -14.7 dBm

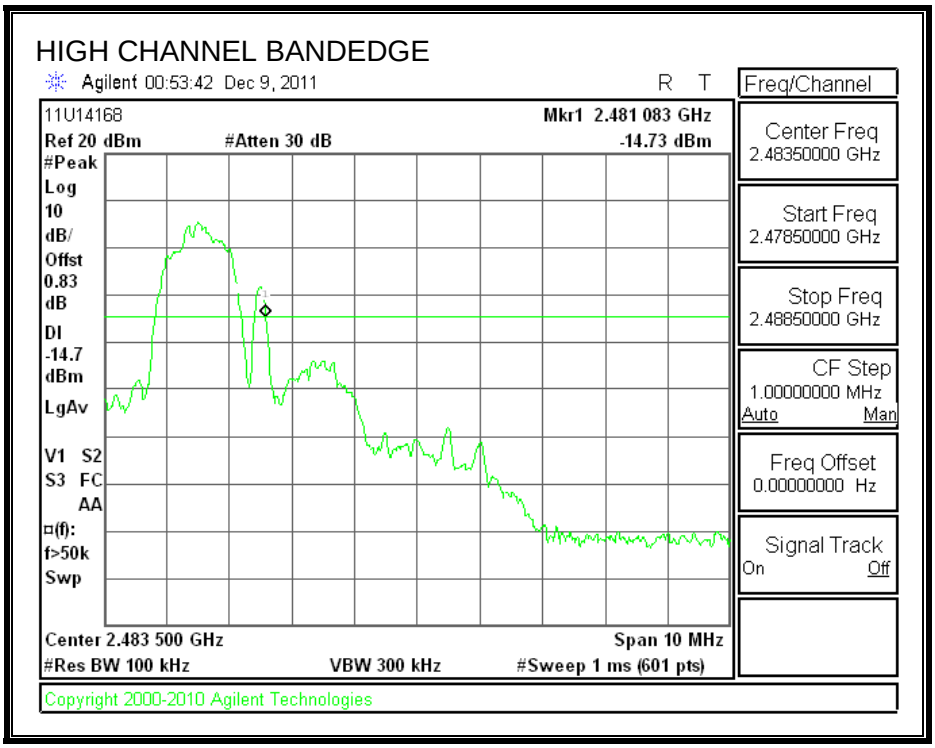


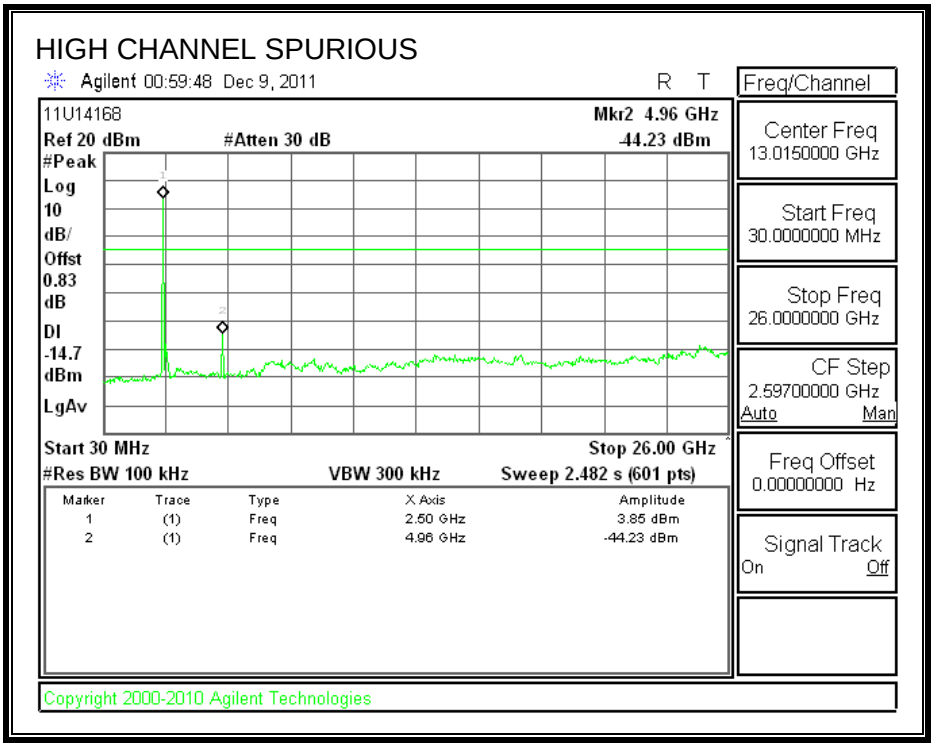
**SPURIOUS EMISSIONS, MID CHANNEL**



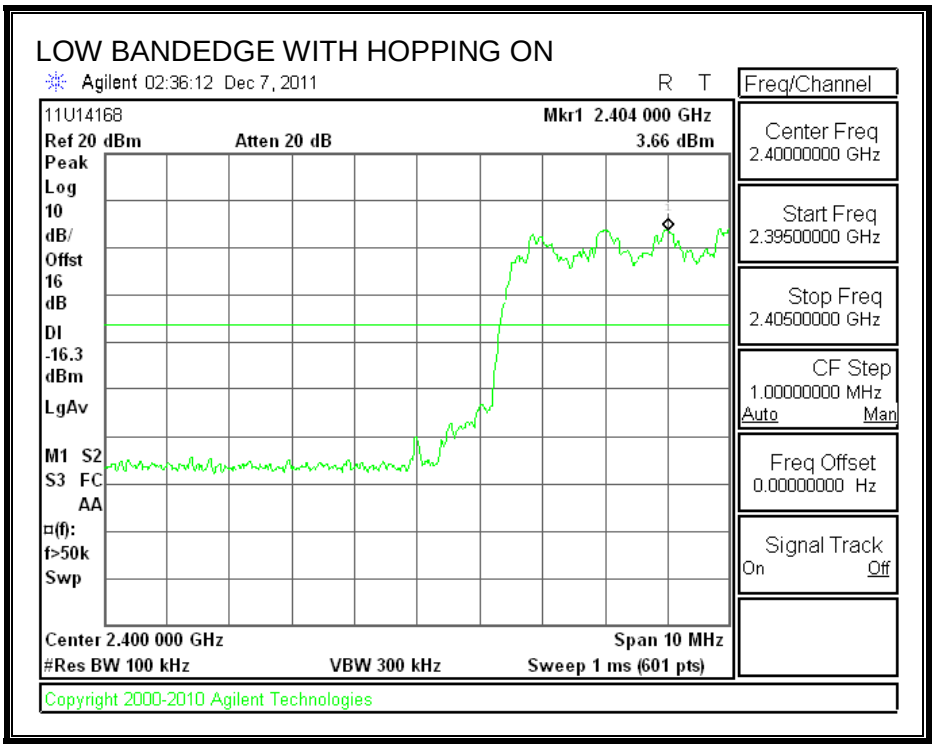


**SPURIOUS EMISSIONS, HIGH CHANNEL**

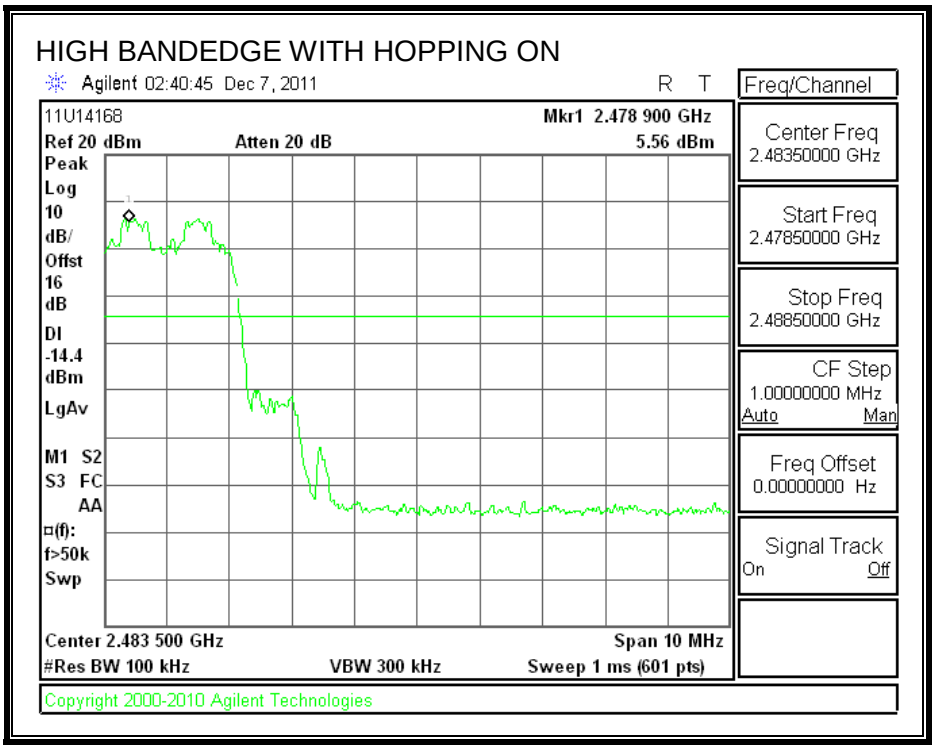




**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**



HIGH BANDEDGE WITH HOPPING ON



# 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.

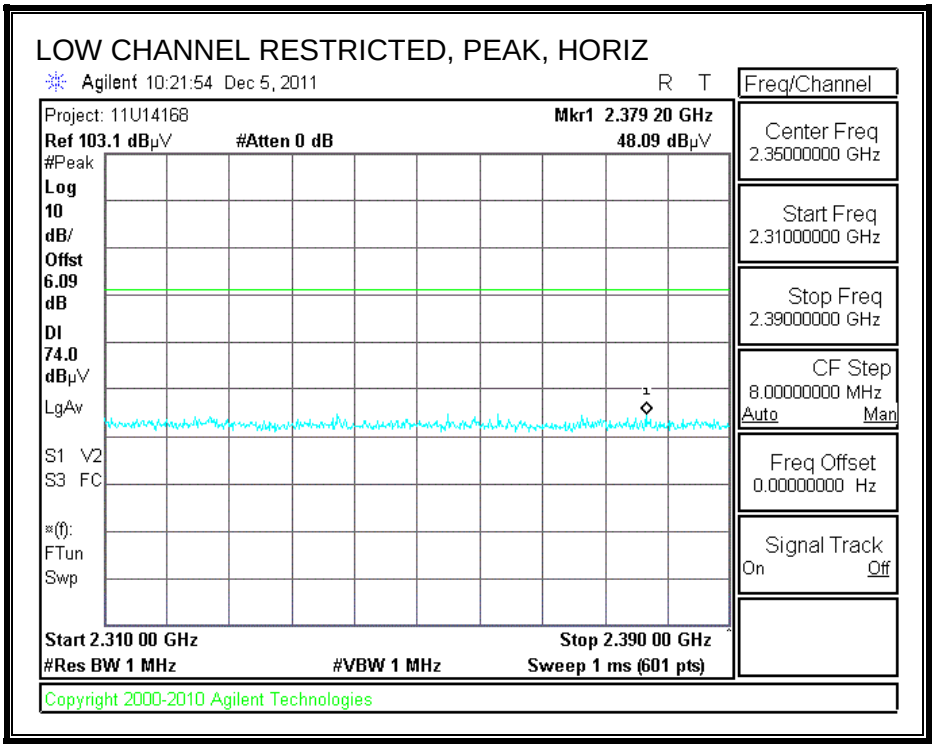
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

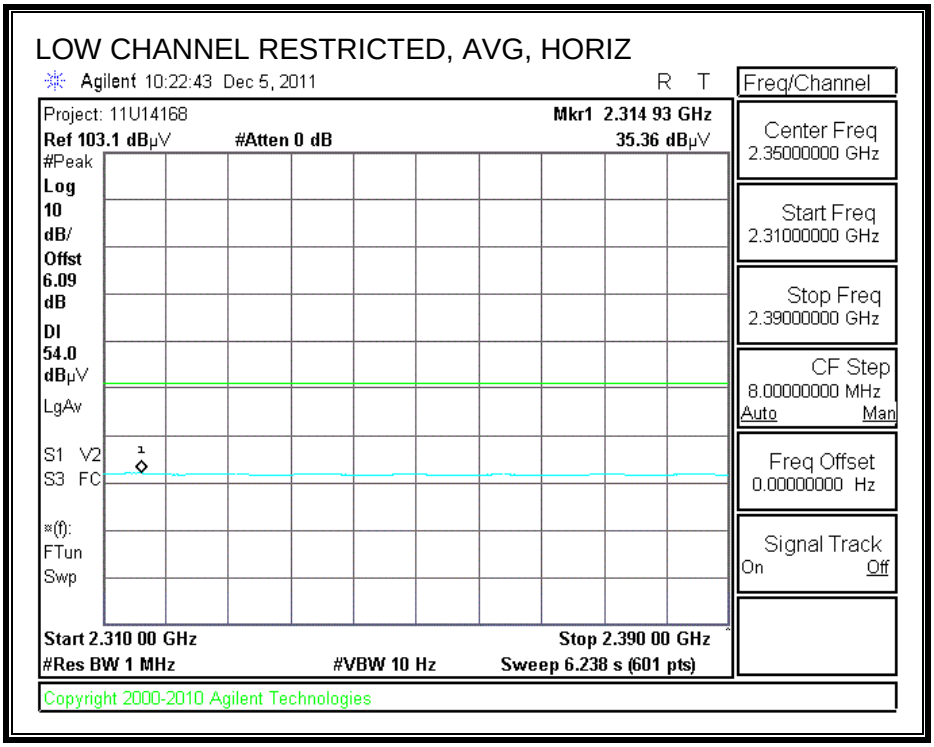
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. TRANSMITTER ABOVE 1 GHz

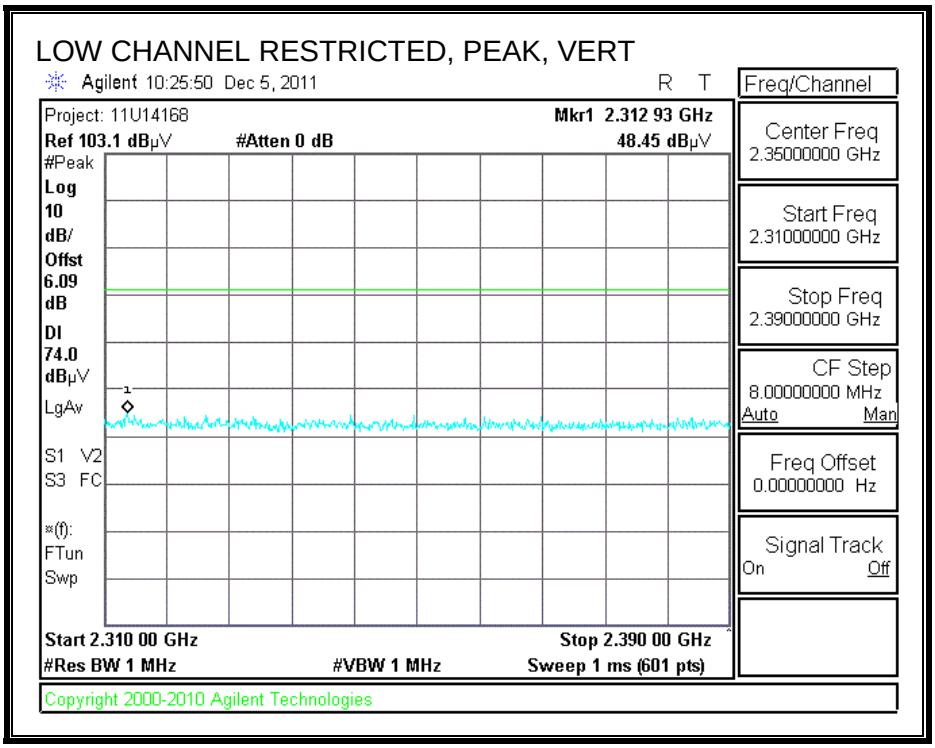
### 8.2.1. BASIC DATA RATE GFSK MODULATION

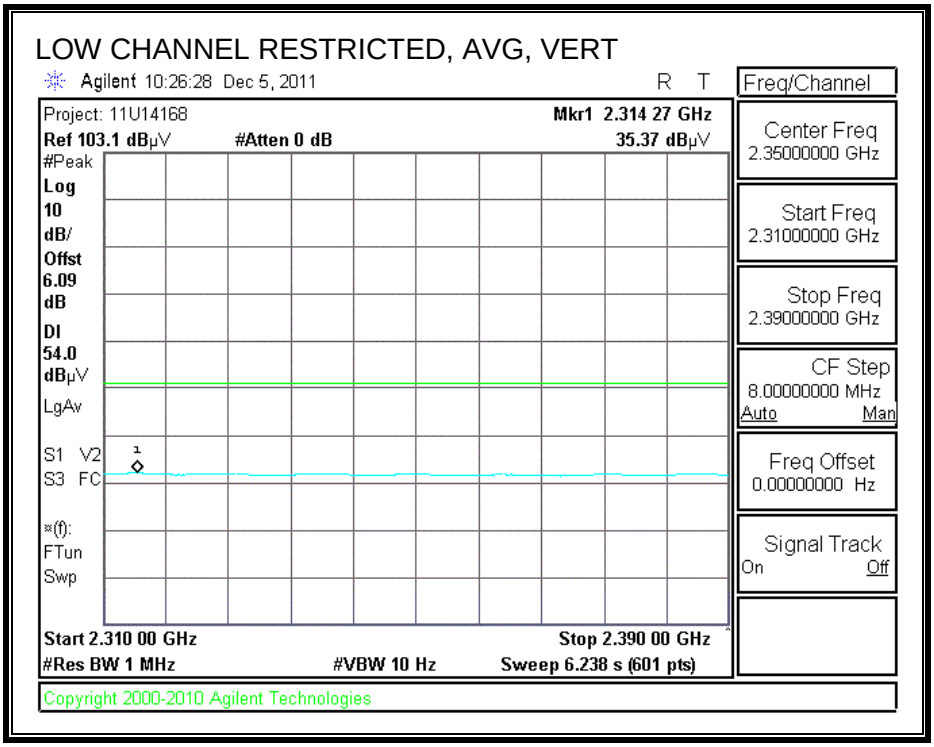
**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



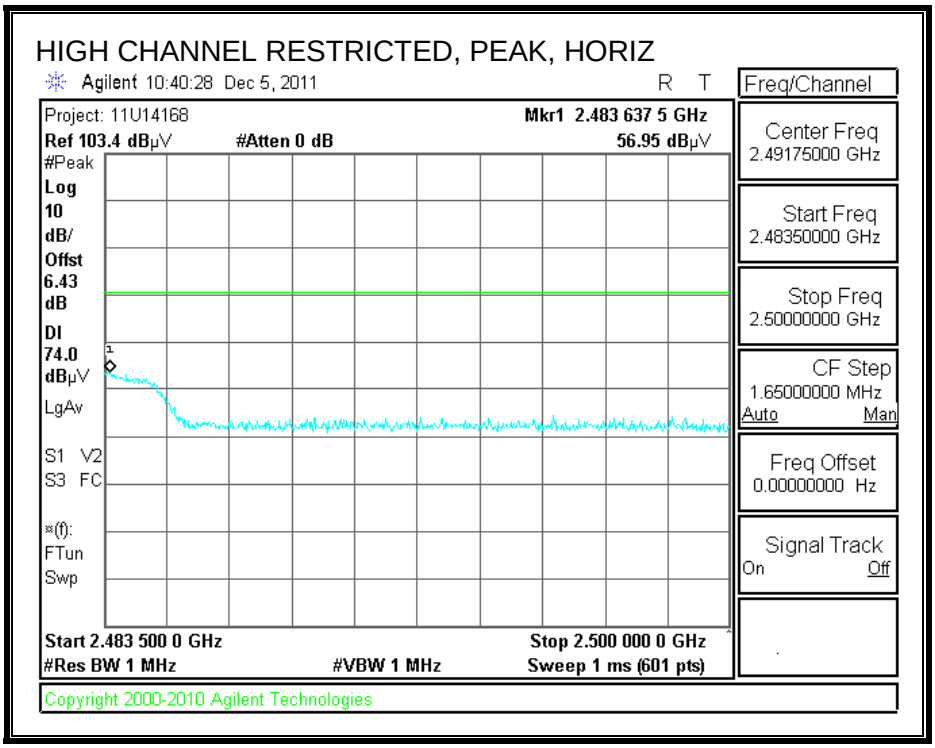


**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

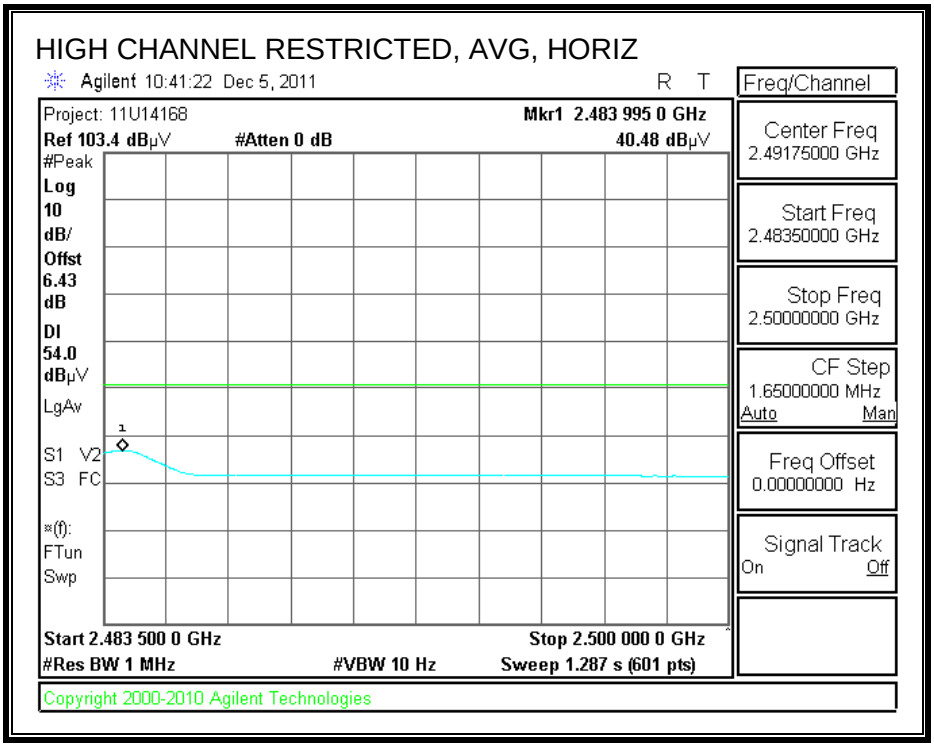




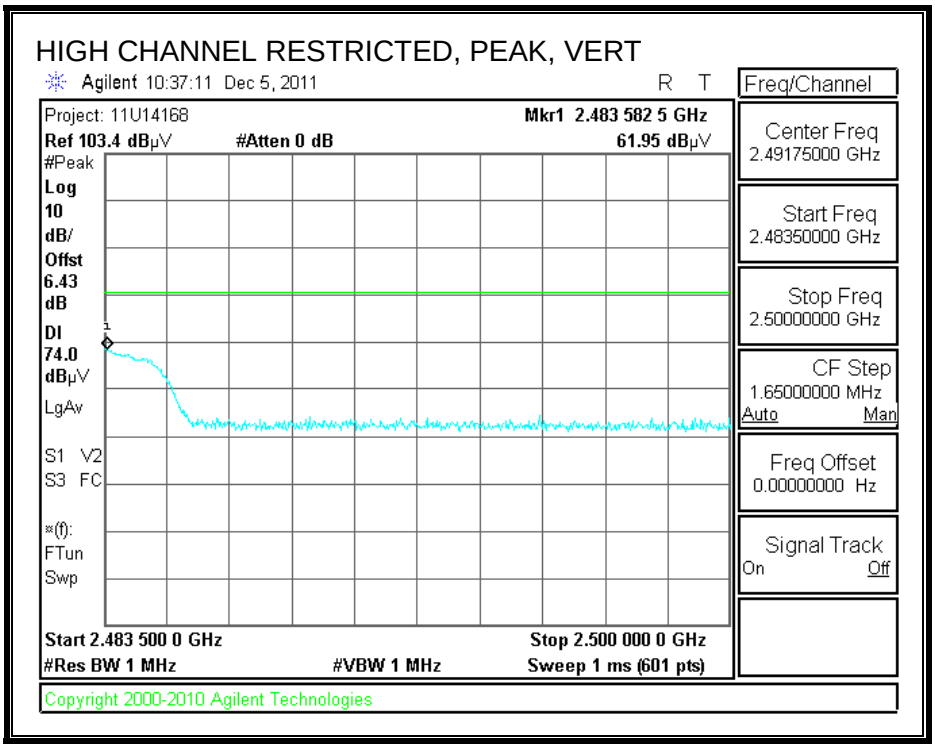
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



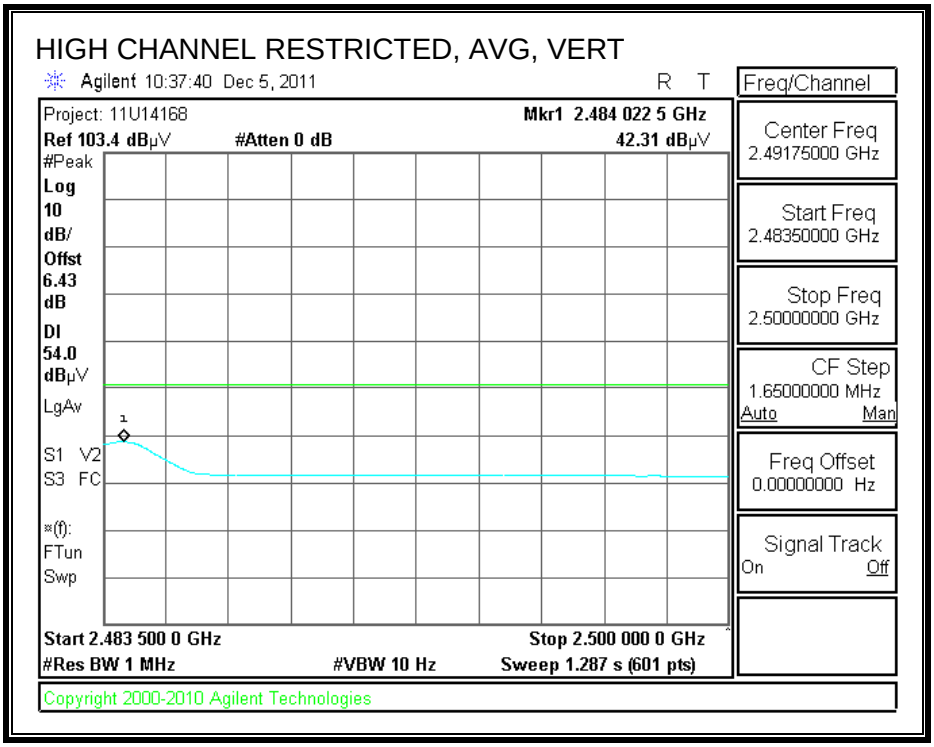
HIGH CHANNEL RESTRICTED, AVG, HORIZ



**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:** Tom Chen
**Date:** 12/05/11
**Project #:** 11U14168
**Company:** Plantronics
**Test Target:** FCC Class B
**Mode Oper:** BT, GFSK mode TX worst Case

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

| Average Field Strength Limit |
|---|
| Peak Field Strength Limit |
| Margin vs. Average Limit |
| Margin vs. Peak Limit |

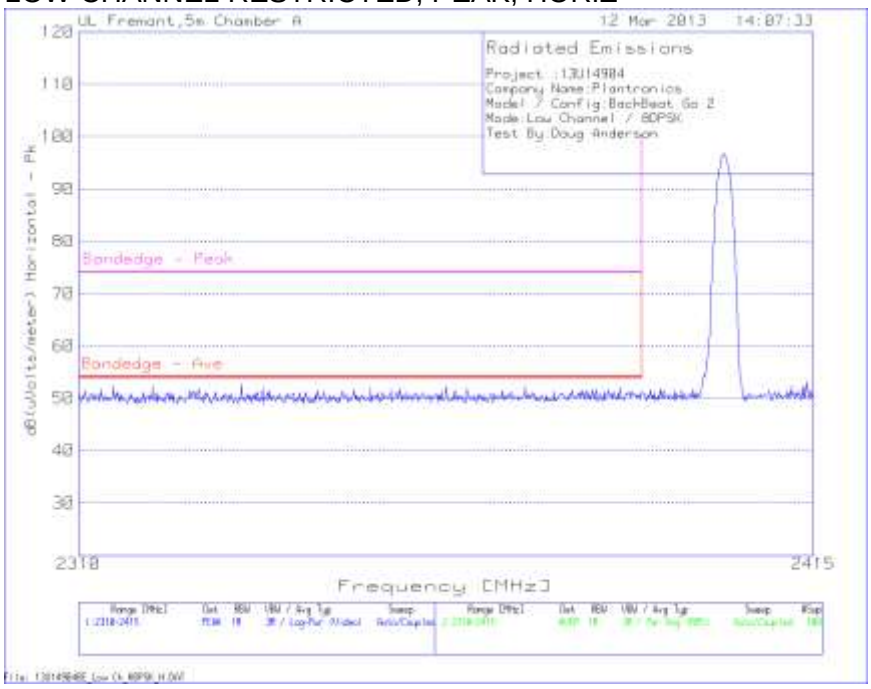
| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2402 MHz GFSK | | | | | | | | | | | | | |
| 4.804 | 3.0 | 47.7 | 33.1 | 5.8 | -34.8 | 0.0 | 0.0 | 51.8 | 74.0 | -22.3 | H | P | |
| 4.804 | 3.0 | 31.1 | 33.1 | 5.8 | -34.8 | 0.0 | 0.0 | 35.2 | 54.0 | -18.8 | H | A | |
| 4.804 | 3.0 | 45.7 | 33.1 | 5.8 | -34.8 | 0.0 | 0.0 | 49.7 | 74.0 | -24.3 | V | P | |
| 4.804 | 3.0 | 30.3 | 33.1 | 5.8 | -34.8 | 0.0 | 0.0 | 34.3 | 54.0 | -19.7 | V | A | |
| 2441 MHz GFSK | | | | | | | | | | | | | |
| 4.882 | 3.0 | 50.0 | 33.2 | 5.8 | -34.8 | 0.0 | 0.0 | 54.2 | 74.0 | -19.8 | V | P | |
| 4.882 | 3.0 | 31.9 | 33.2 | 5.8 | -34.8 | 0.0 | 0.0 | 36.1 | 54.0 | -17.9 | V | A | |
| 4.882 | 3.0 | 50.4 | 33.2 | 5.8 | -34.8 | 0.0 | 0.0 | 54.6 | 74.0 | -19.4 | H | P | |
| 4.882 | 3.0 | 32.0 | 33.2 | 5.8 | -34.8 | 0.0 | 0.0 | 36.2 | 54.0 | -17.8 | H | A | |
| 7.323 | 3.0 | 36.1 | 36.3 | 7.3 | -34.1 | 0.0 | 0.0 | 45.5 | 74.0 | -28.5 | H | P | |
| 7.323 | 3.0 | 23.4 | 36.3 | 7.3 | -34.1 | 0.0 | 0.0 | 32.9 | 54.0 | -21.1 | H | A | |
| 2480 MHz GFSK | | | | | | | | | | | | | |
| 4.960 | 3.0 | 51.9 | 33.2 | 5.9 | -34.8 | 0.0 | 0.0 | 56.2 | 74.0 | -17.8 | H | P | |
| 4.960 | 3.0 | 32.2 | 33.2 | 5.9 | -34.8 | 0.0 | 0.0 | 36.5 | 54.0 | -17.5 | H | A | |
| 7.440 | 3.0 | 35.7 | 36.5 | 7.3 | -34.1 | 0.0 | 0.0 | 45.5 | 74.0 | -28.5 | H | P | |
| 7.440 | 3.0 | 23.4 | 36.5 | 7.3 | -34.1 | 0.0 | 0.0 | 33.2 | 54.0 | -20.8 | H | A | |
| 2480 MHz GFSK | | | | | | | | | | | | | |
| 4.960 | 3.0 | 50.2 | 33.2 | 5.9 | -34.8 | 0.0 | 0.0 | 54.5 | 74.0 | -19.5 | V | P | |
| 4.960 | 3.0 | 31.7 | 33.2 | 5.9 | -34.8 | 0.0 | 0.0 | 36.0 | 54.0 | -18.0 | V | A | |
| 7.440 | 3.0 | 35.5 | 36.5 | 7.3 | -34.1 | 0.0 | 0.0 | 45.3 | 74.0 | -28.7 | V | P | |
| 7.440 | 3.0 | 23.4 | 36.5 | 7.3 | -34.1 | 0.0 | 0.0 | 33.2 | 54.0 | -20.8 | V | A | |

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

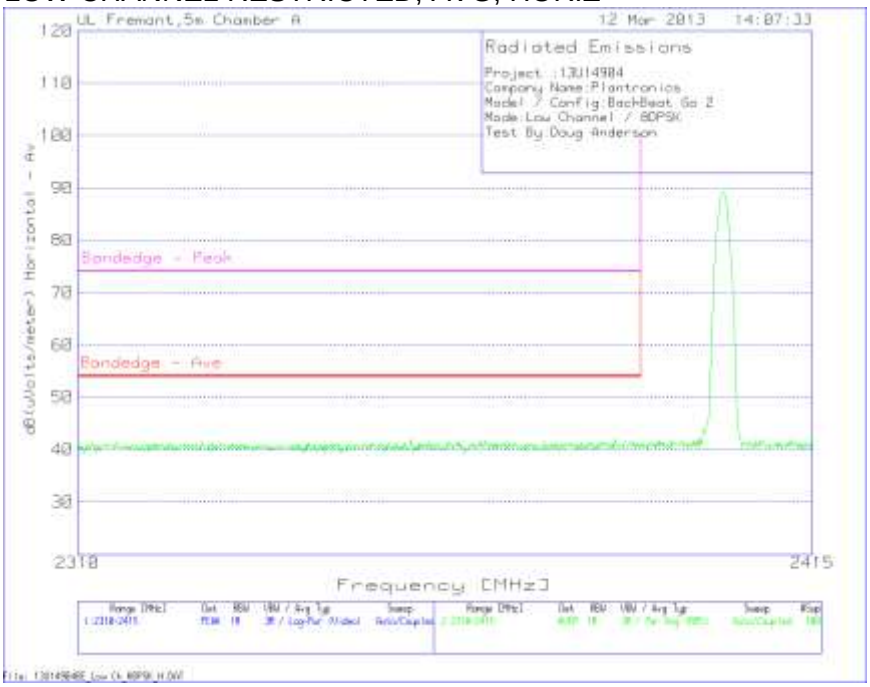
## 8.2.2. ENHANCED DATA RATE 8DPSK MODULATION

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

LOW CHANNEL RESTRICTED, PEAK, HORIZ

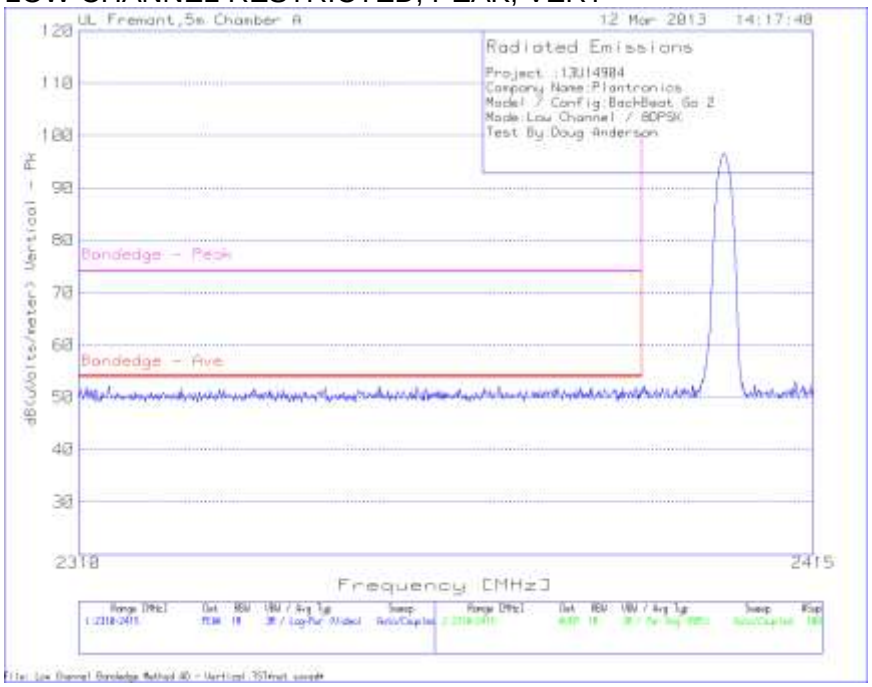


LOW CHANNEL RESTRICTED, AVG, HORIZ

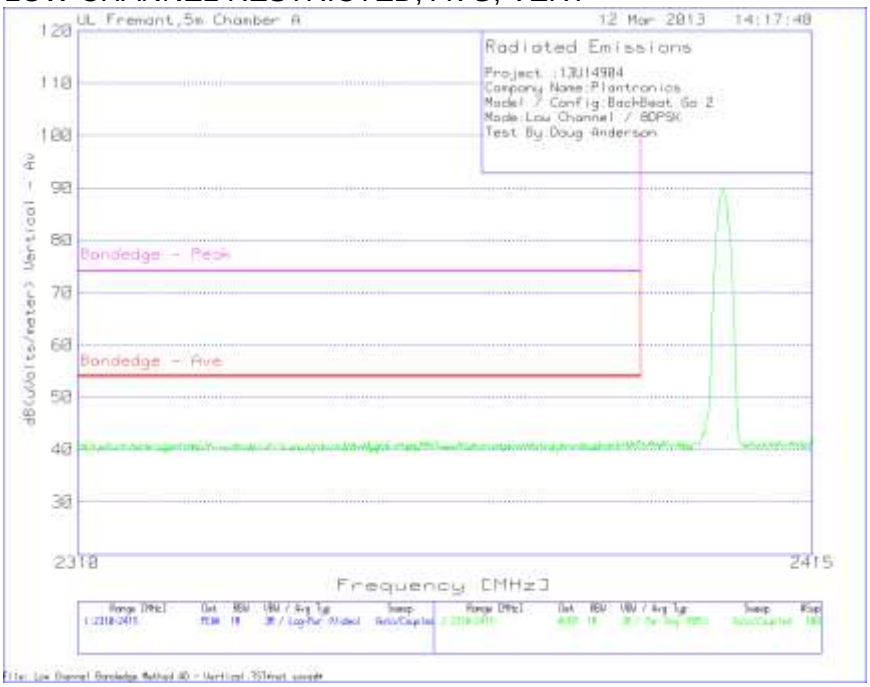


**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

LOW CHANNEL RESTRICTED, PEAK, VERT

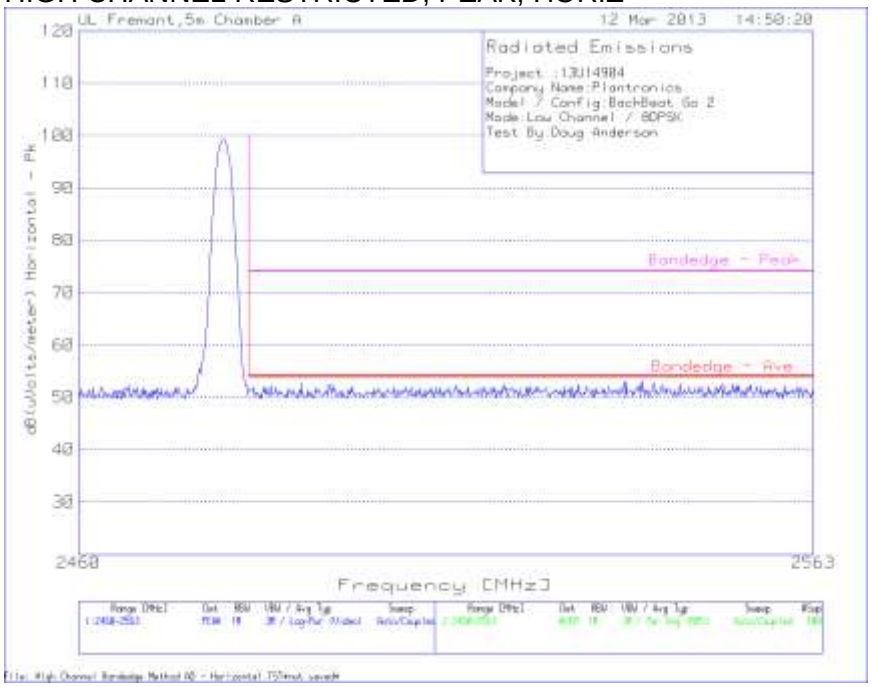


LOW CHANNEL RESTRICTED, AVG, VERT

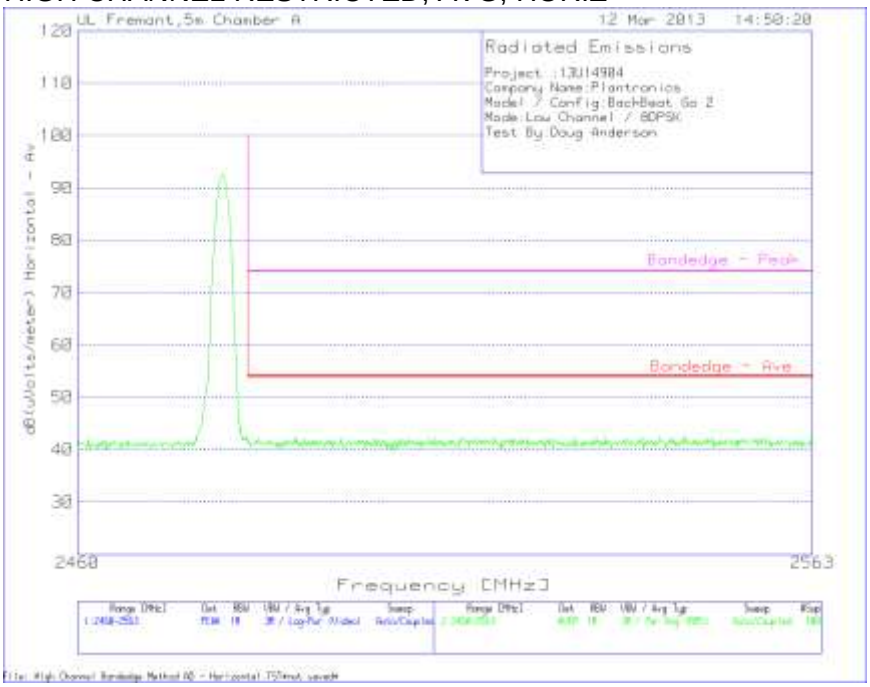


**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

HIGH CHANNEL RESTRICTED, PEAK, HORIZ

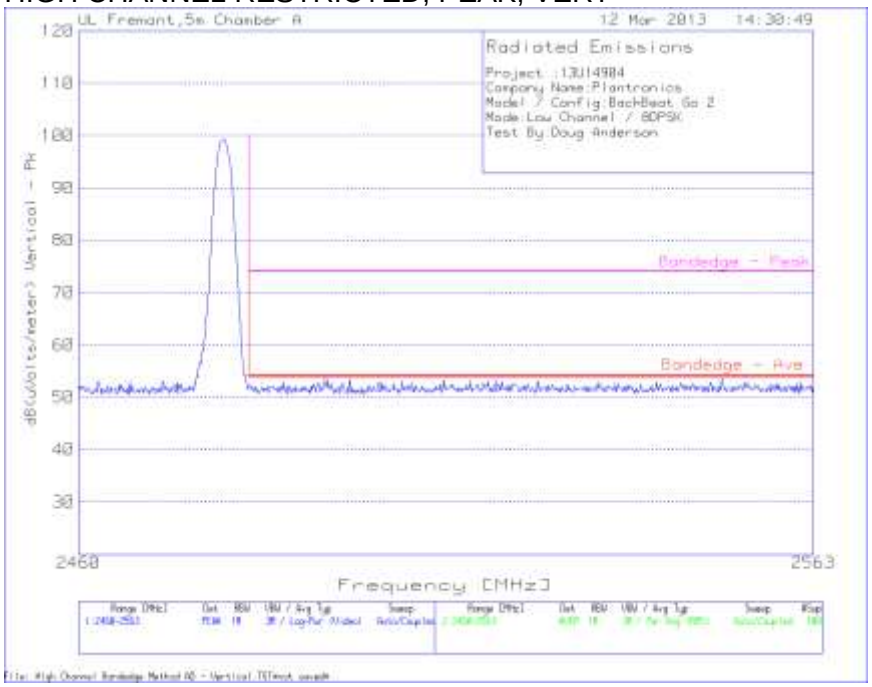


HIGH CHANNEL RESTRICTED, AVG, HORIZ

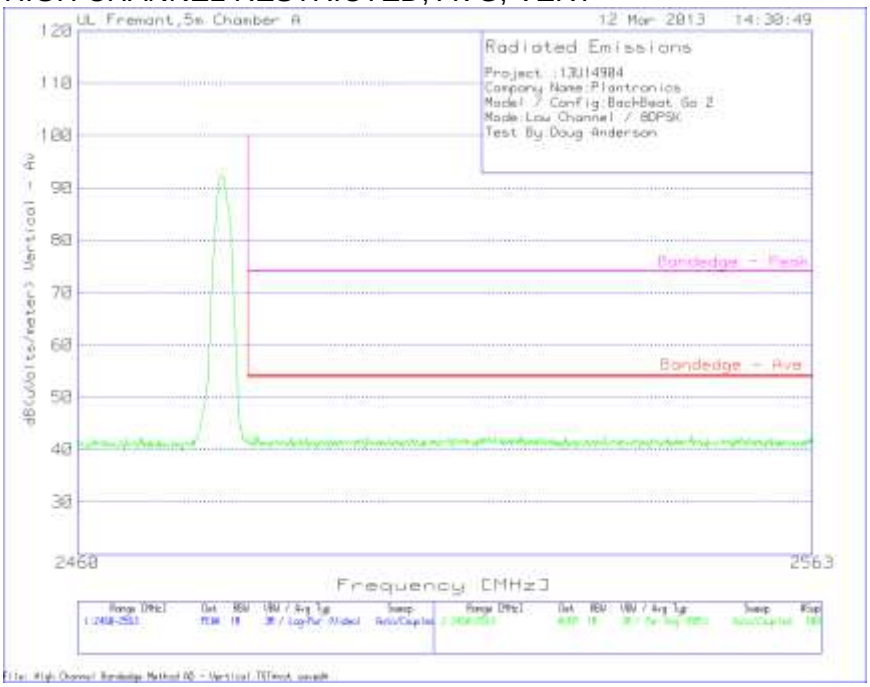


**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**

HIGH CHANNEL RESTRICTED, PEAK, VERT

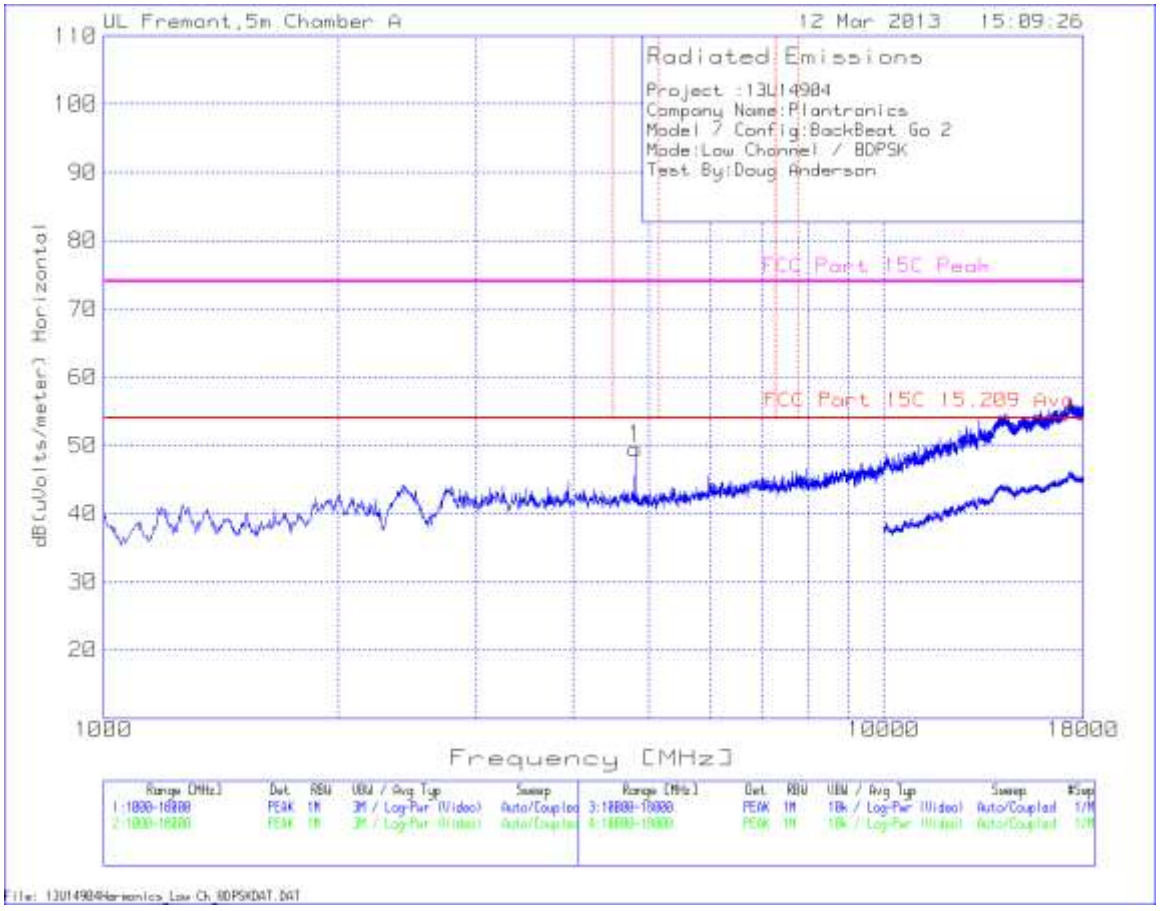


HIGH CHANNEL RESTRICTED, AVG, VERT

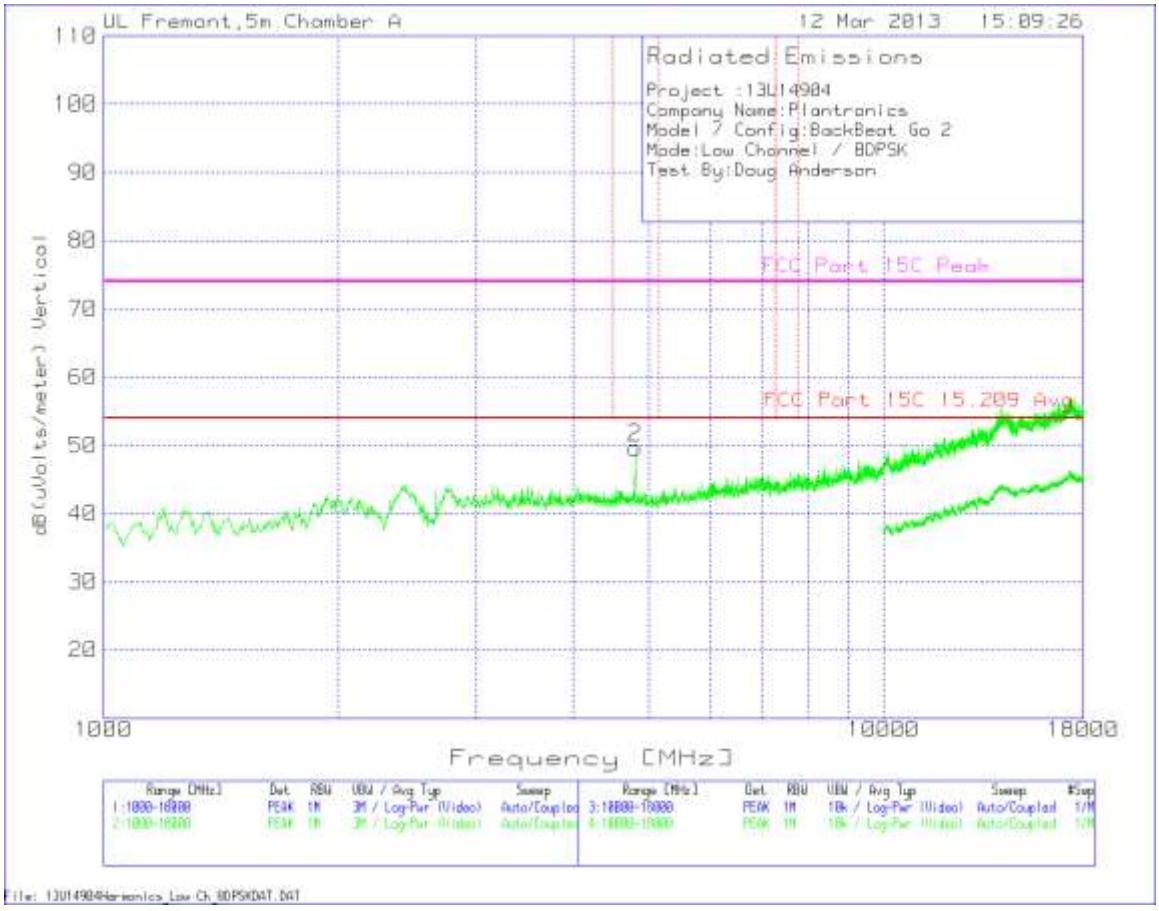


**HARMONICS AND SPURIOUS EMISSIONS**

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



LOW CHANNEL

Project : 13U14904
Company Name: Plantronics
Model / Config: BackBeat Go 2
Mode: Low Channel / 8DPSK
Test By: Doug Anderson

Range 1 30 - 1000MHz

| Marker No. | Test Freq. | Meter Reading | Detector | T136 ETS 3117 (dB) | T144 HP8449B (dB) | Cable Factor (dB) | T160 BRF (dB) | dB(uVolts/ meter) | FCC Part 15C 15.209 Avg | Avg. Margin | FCC Part 15C Peak | Peak Margin | Azimuth | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4804.04 | 45.95 | PK2 | 33.9 | -35.7 | 6.7 | 0.2 | 51.05 | 54 | -2.95 | 74 | -22.95 | 22 | 102 | Horz |
| 1 | 4803.99 | 38.03 | MAv1 | 33.9 | -35.7 | 6.7 | 0.2 | 43.13 | 54 | -10.87 | - | - | 22 | 102 | Horz |

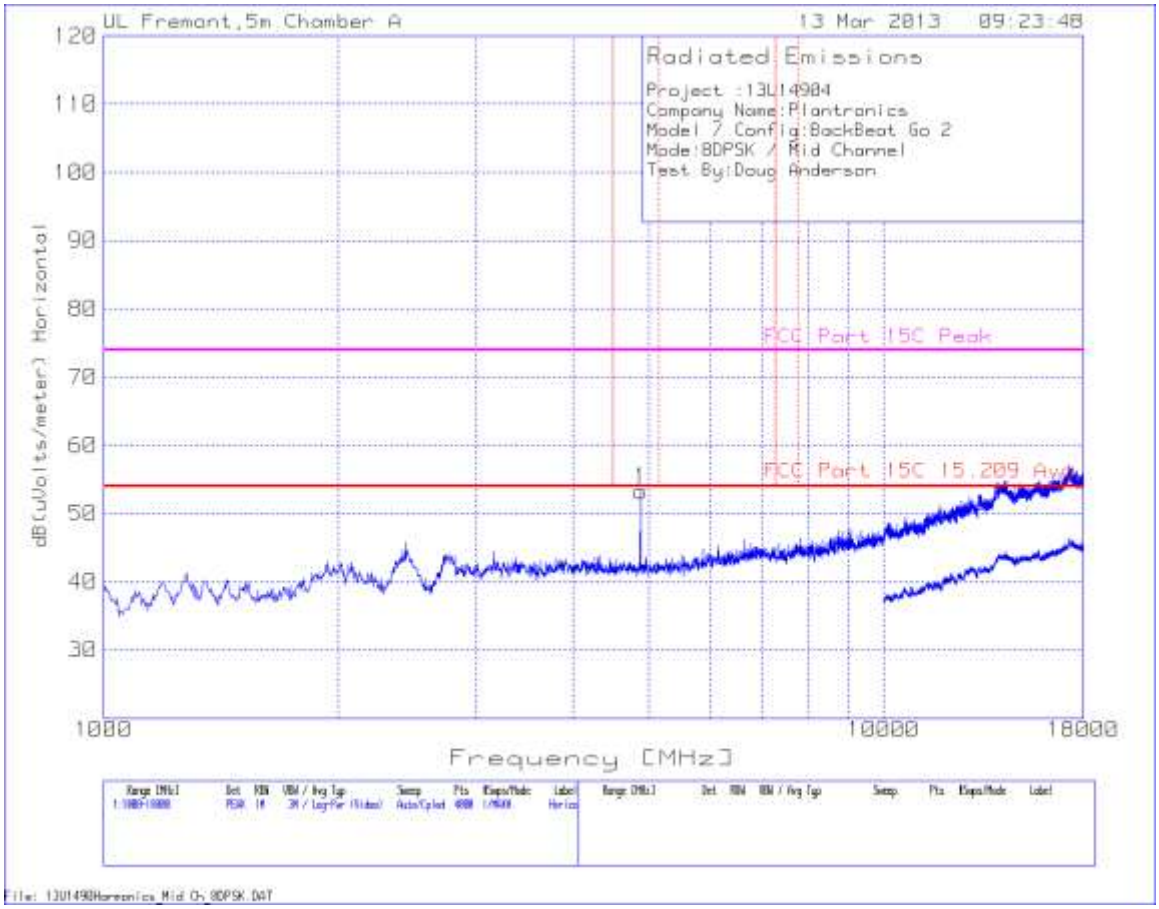
Range 2 30 - 1000MHz

| Marker No. | Test Frequency | Meter Reading | Detector | T136 ETS 3117 (dB) | T144 HP8449B (dB) | Cable Factor (dB) | T160 BRF (dB) | dB(uVolts/ meter) | FCC Part 15C 15.209 Avg | Avg. Margin | FCC Part 15C Peak | Peak Margin | Azimuth | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 4803.98 | 46.36 | PK2 | 33.9 | -35.7 | 6.7 | 0.2 | 51.46 | 54 | -2.54 | 74 | -22.54 | 268 | 105 | Vert |
| 2 | 4804.01 | 35.3 | MAv1 | 33.9 | -35.7 | 6.7 | 0.2 | 40.4 | 54 | -13.6 | - | - | 268 | 105 | Vert |

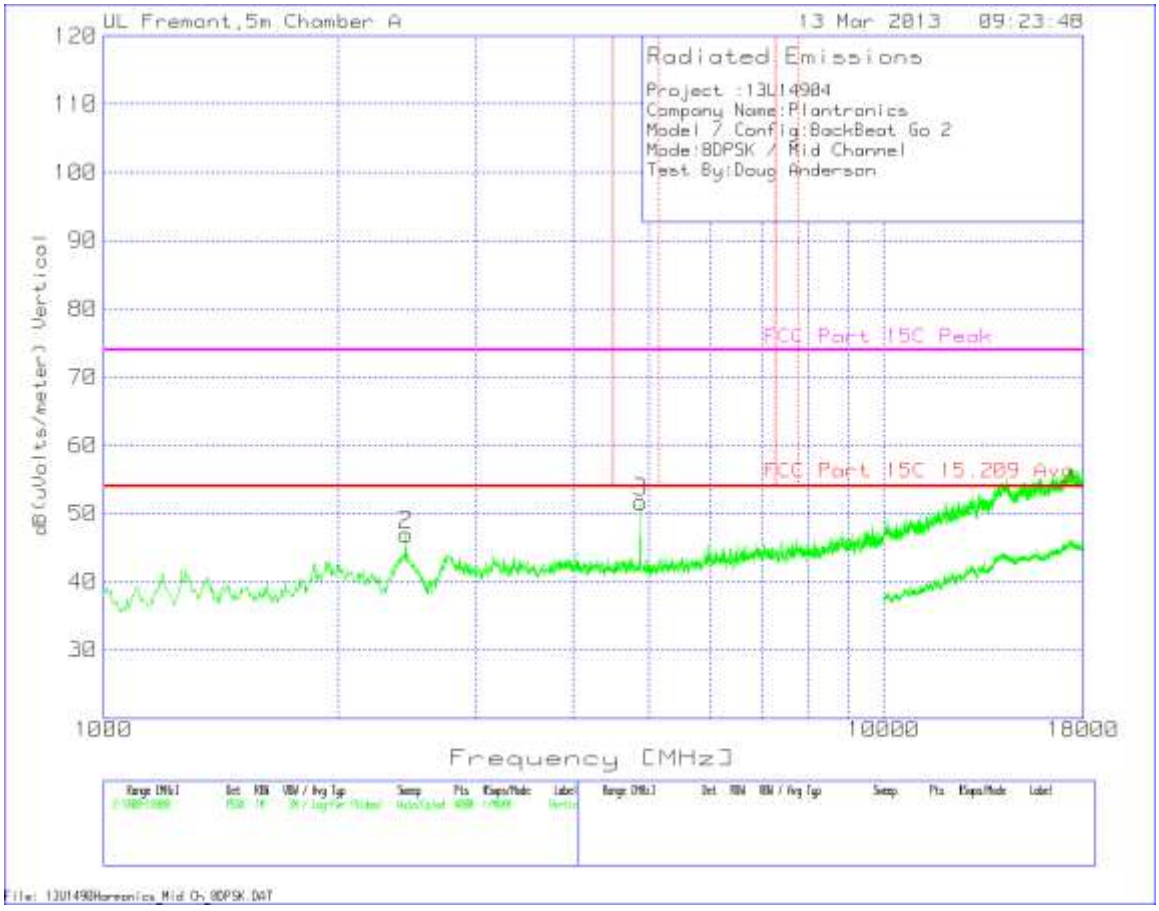
PK - Peak detector
Av - Average detector

**HARMONICS AND SPURIOUS EMISSIONS**

MIDDLE CHANNEL HORIZONTAL



MIDDLE CHANNEL VERTICAL



MIDDLE CHANNEL

Project : 13U14904
Company Name: Plantronics
Model / Config: BackBeat Go 2
Mode: Mid Channel / 8DPSK
Test By: Doug Anderson

Range 1 30 - 1000MHz

| Marker No. | Test Freq. | Meter Reading | Detector | T136 ETS 3117 (dB) | T144 HP8449B (dB) | Cable Factor (dB) | T160 BRF (dB) | dB(uVolts/ meter) | FCC Part 15C 15.209 Avg | Avg. Margin | FCC Part 15C Peak | Peak Margin | Azimuth | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4882.05 | 49.71 | PK2 | 34 | -35.7 | 6.8 | 0.2 | 55.01 | 54 | 1.01 | 74 | -18.99 | 264 | 109 | Horz |
| 1 | 4881.81 | 39.64 | MAv1 | 34 | -35.7 | 6.8 | 0.2 | 44.94 | 54 | -9.06 | - | - | 264 | 109 | Horz |

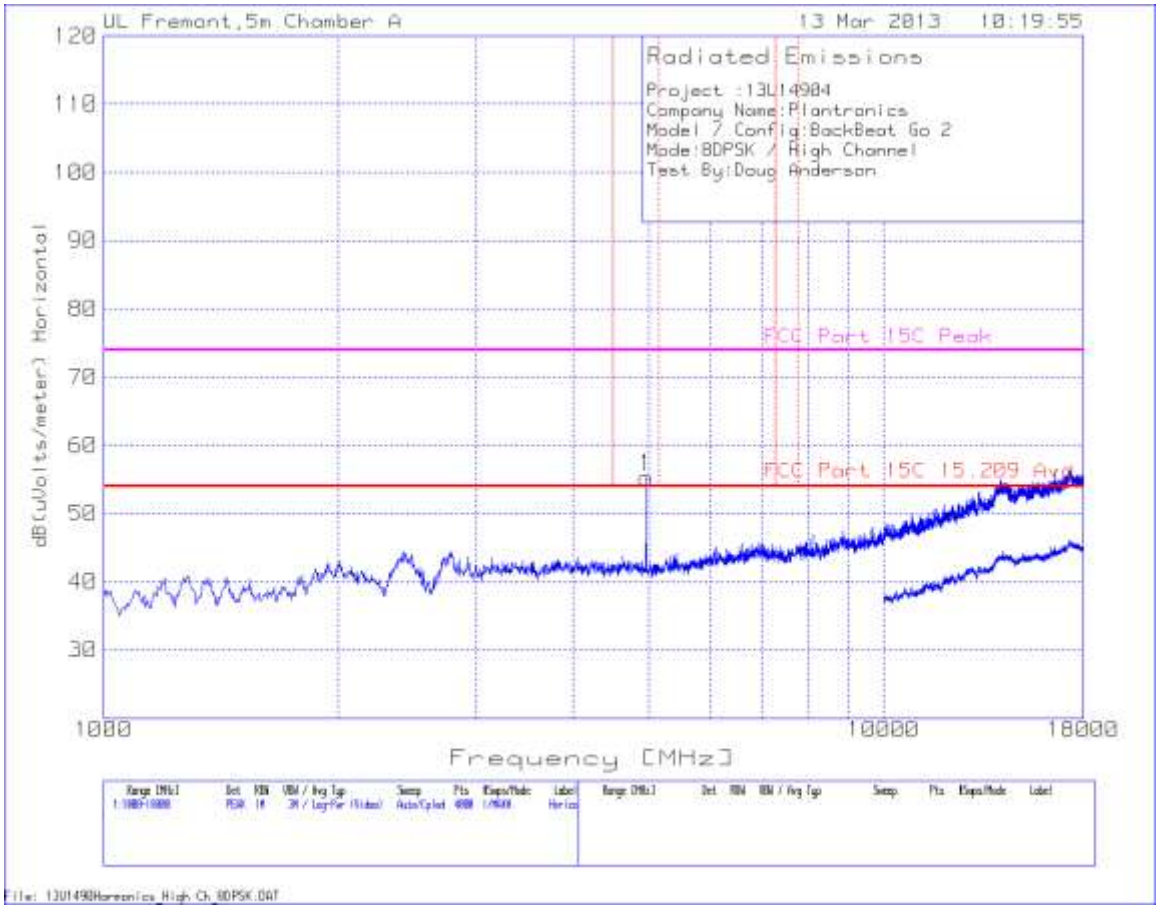
Range 2 30 - 1000MHz

| Marker No. | Test Freq. | Meter Reading | Detector | T136 ETS 3117 (dB) | T144 HP8449B (dB) | Cable Factor (dB) | T160 BRF (dB) | dB(uVolts/ meter) | FCC Part 15C 15.209 Avg | Avg. Margin | FCC Part 15C Peak | Peak Margin | Azimuth | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2439.67 | 46.18 | PK | 32.3 | -36.9 | 4.5 | 0.9 | 46.98 | 54 | -7.02 | 74 | -27.02 | - | 200 | Vert |
| 3 | 4881.85 | 49.36 | PK2 | 34 | -35.7 | 6.8 | 0.2 | 54.66 | 54 | 0.66 | 74 | -19.34 | 93 | 171 | Vert |
| 3 | 4881.87 | 41.3 | MAv1 | 34 | -35.7 | 6.8 | 0.2 | 46.6 | 54 | -7.4 | - | - | 93 | 171 | Vert |

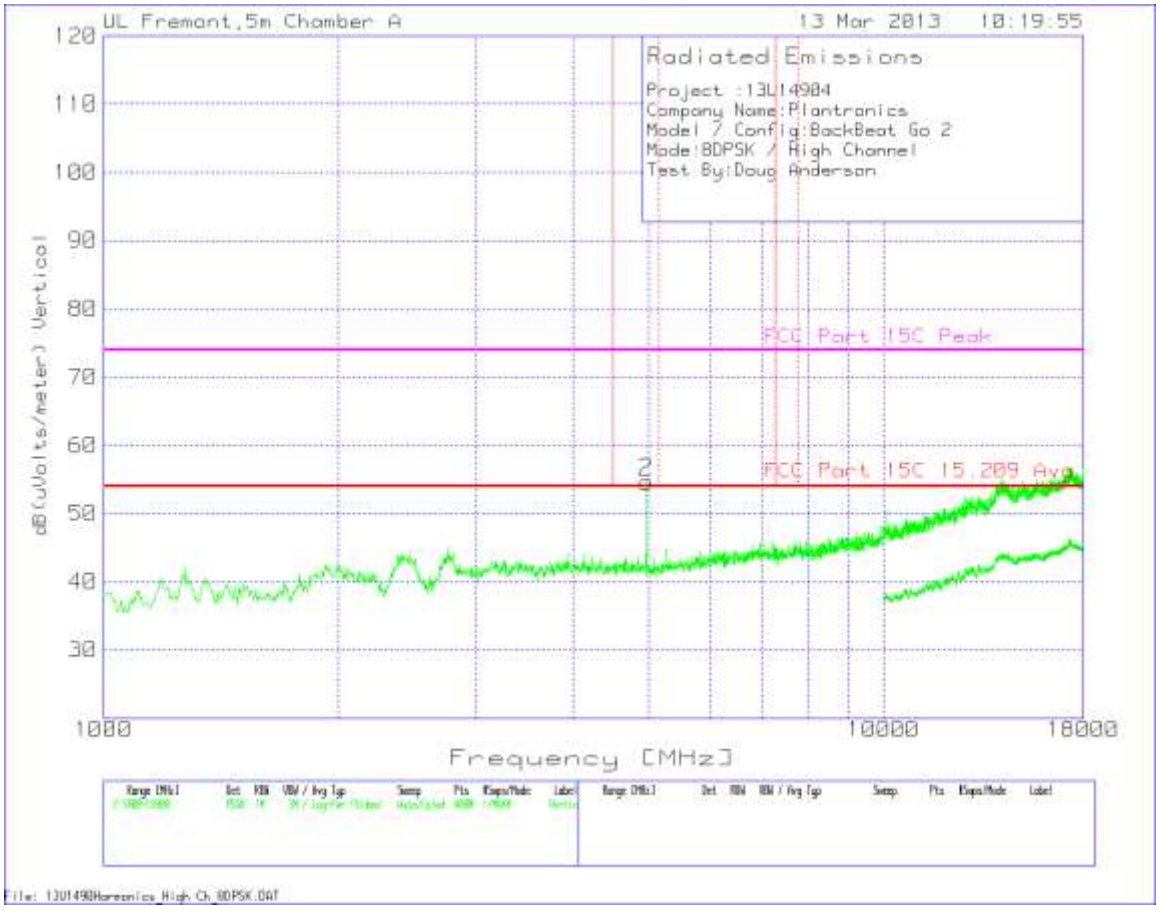
PK - Peak detector
Av - Average detector

**HARMONICS AND SPURIOUS EMISSIONS**

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



## HIGH CHANNEL

Project : 13U14904
Company Name: Plantronics
Model / Config: BackBeat Go 2
Mode: High Channel / 8DPSK
Test By: Doug Anderson

Range 1 30 - 1000MHz

| Marker No. | Test Freq. | Meter Reading | Detector | T136 ETS 3117 (dB) | T144 HP8449B (dB) | Cable Factor (dB) | T160 BRF (dB) | dB(uVolts/ meter) | FCC Part 15C 15.209 Avg | Avg. Margin | FCC Part 15C Peak | Peak Margin | Azimuth | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4959.92 | 51.9 | PK2 | 33.9 | -35.6 | 6.9 | 0.2 | 57.3 | 54 | 3.3 | 74 | -16.7 | 210 | 122 | Horz |
| 1 | 4959.84 | 42.42 | MAv1 | 33.9 | -35.6 | 6.9 | 0.2 | 47.82 | 54 | -6.18 | - | - | 210 | 122 | Horz |

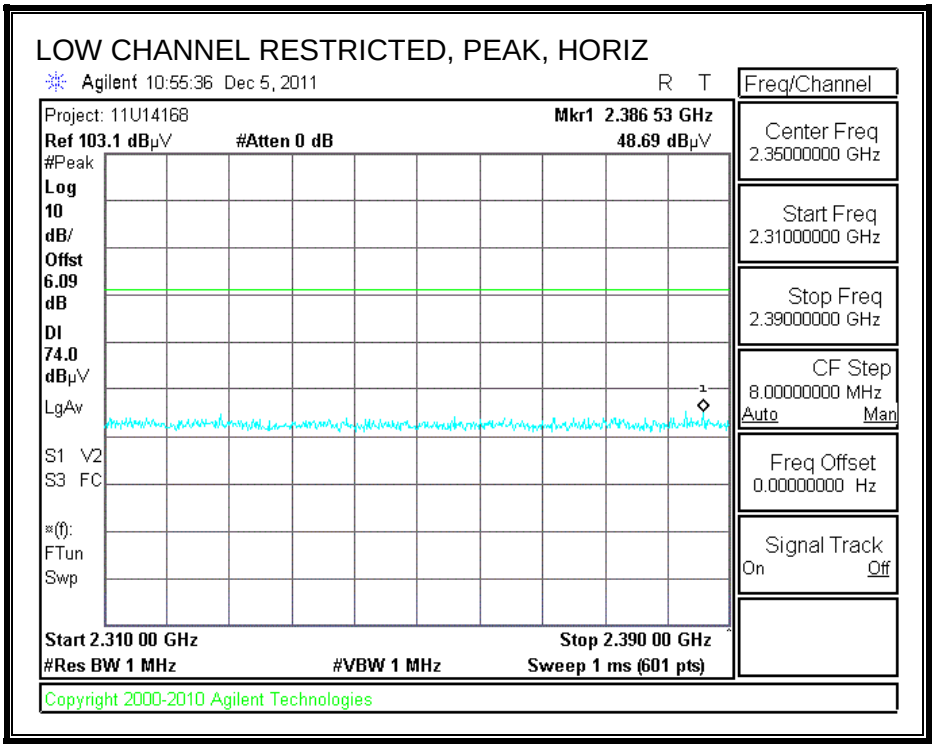
Range 2 30 - 1000MHz

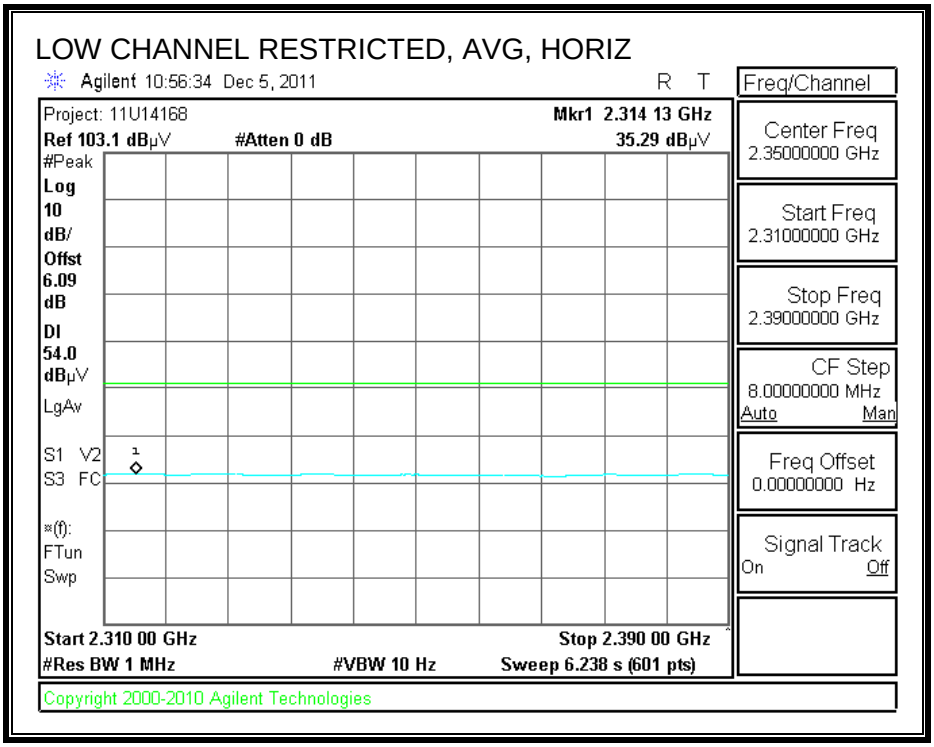
| Marker No. | Test Freq. | Meter Reading | Detector | T136 ETS 3117 (dB) | T144 HP8449B (dB) | Cable Factor (dB) | T160 BRF (dB) | dB(uVolts/ meter) | FCC Part 15C 15.209 Avg | Avg. Margin | FCC Part 15C Peak | Peak Margin | Azimuth | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 4959.71 | 51.64 | PK2 | 33.9 | -35.6 | 6.9 | 0.2 | 57.04 | 54 | 3.04 | 74 | -16.96 | 155 | 204 | Vert |
| 2 | 4959.96 | 44.09 | MAv1 | 33.9 | -35.6 | 6.9 | 0.2 | 49.49 | 54 | -4.51 | - | - | 155 | 204 | Vert |

PK - Peak detector
AV - Average detector

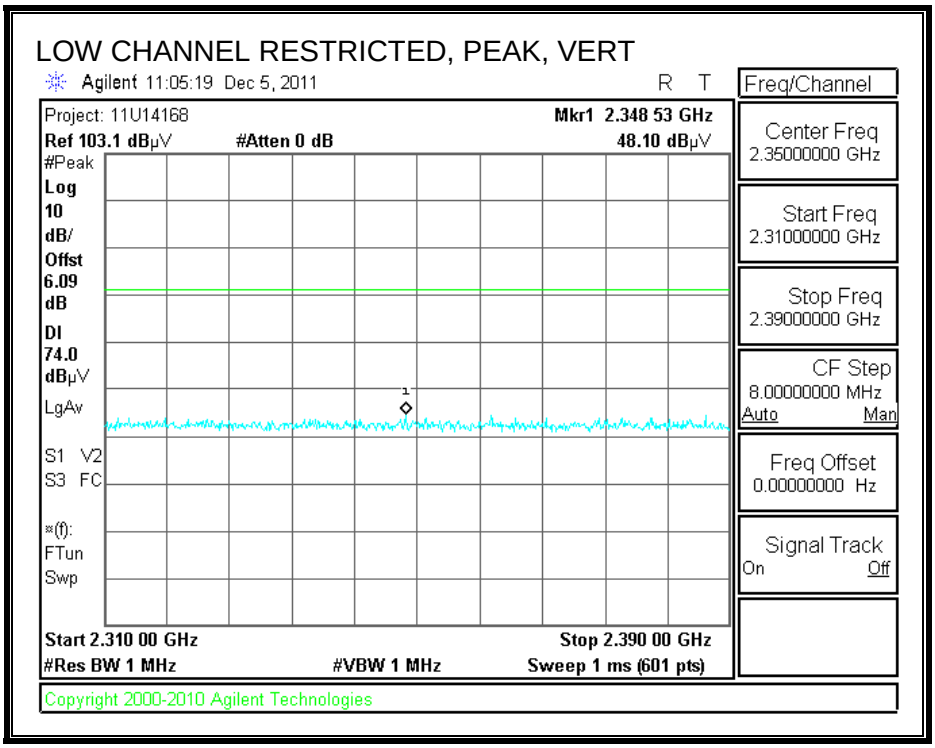
## 8.2.3. ENHANCED DATA RATE QPSK MODULATION

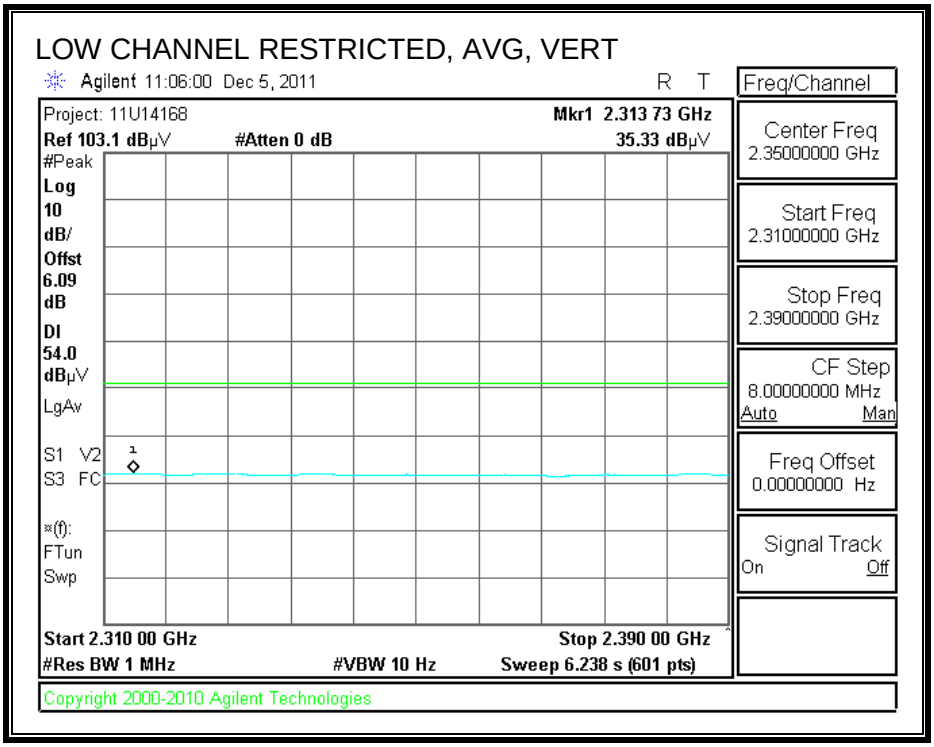
**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



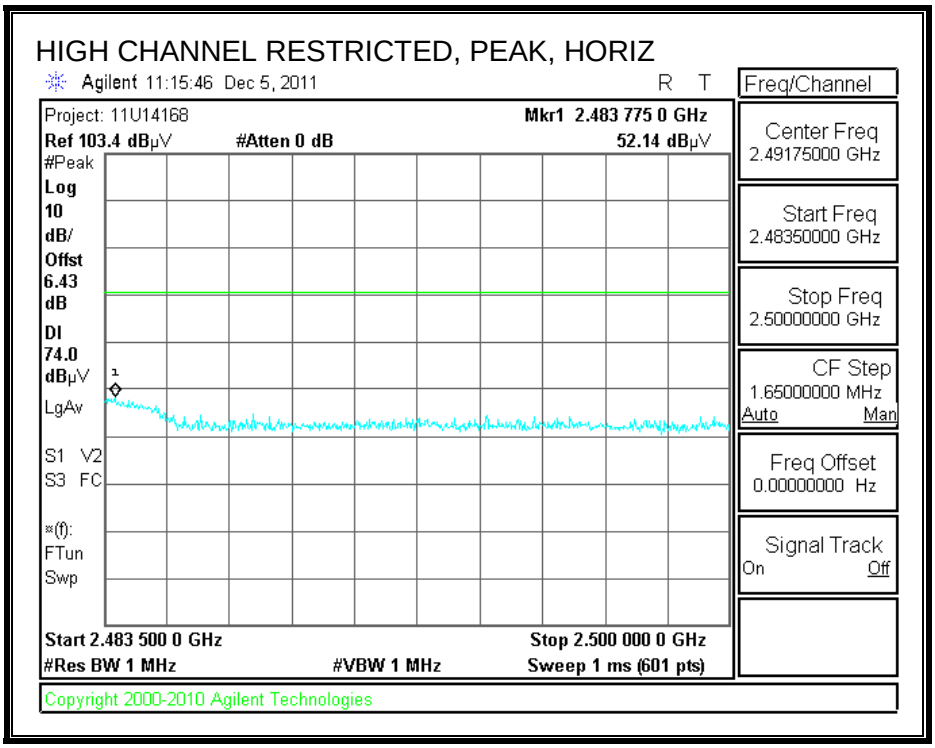


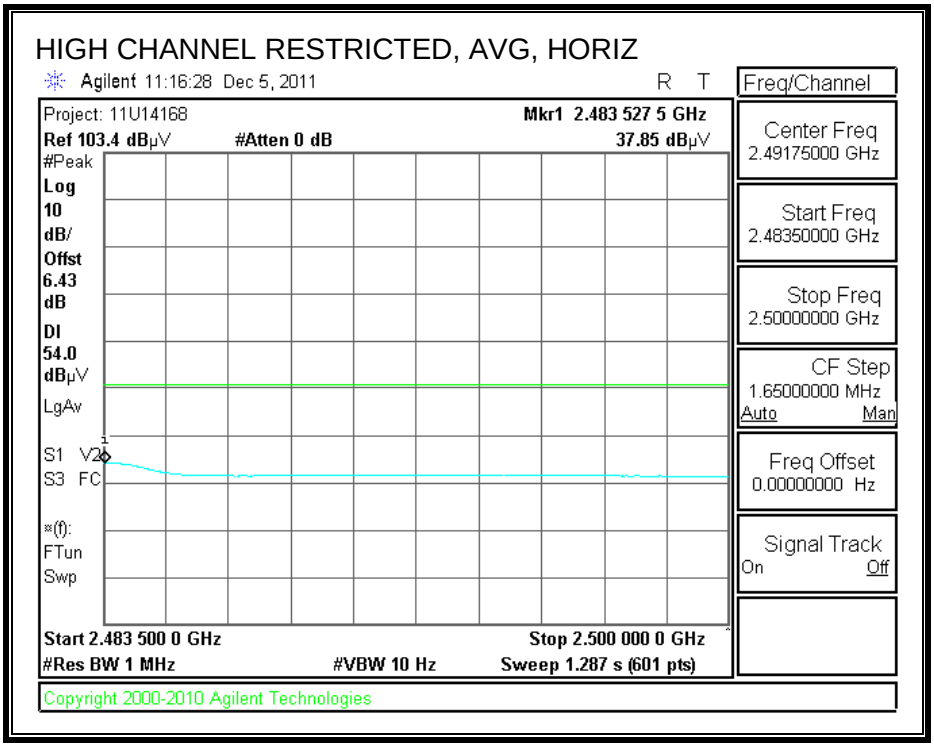
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



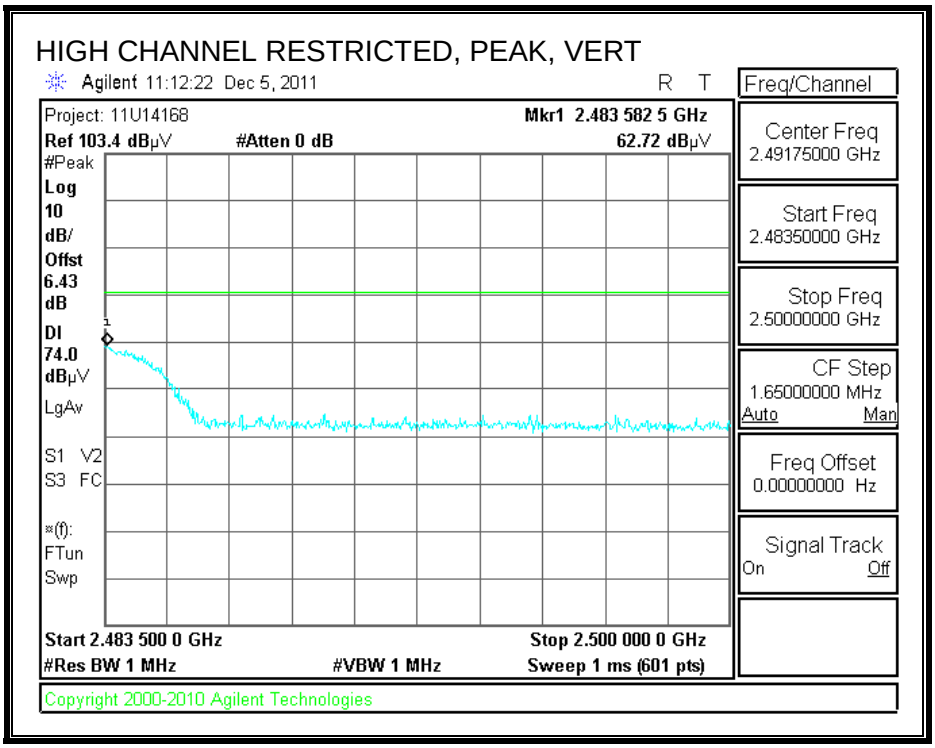


**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

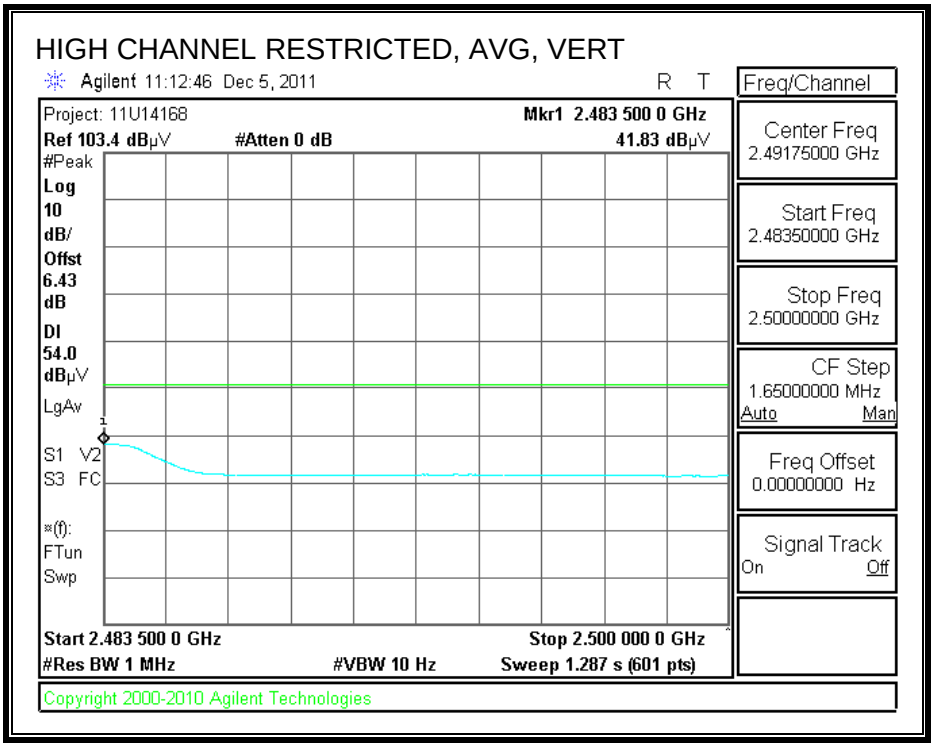




**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



HIGH CHANNEL RESTRICTED, AVG, VERT



## HARMONICS AND SPURIOUS EMISSIONS

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

**Test Engr:** Tom Chen
**Date:** 12/05/11
**Project #:** 11U14168
**Company:** Plantronics
**Test Target:** FCC Class B
**Mode Oper:** BT, DQPSK mode TX worst Case

| | | | |
|---|---|---|---|
| f | Measurement Frequency | Amp | Preamp Gain |
| Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters |
| Read | Analyzer Reading | Avg | Average Field Strength @ 3 m |
| AF | Antenna Factor | Peak | Calculated Peak Field Strength |
| 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 |
| 2402 MHz DQPSK | | | | | | | | | | | | | |
| 4.804 | 3.0 | 40.5 | 33.1 | 5.8 | -34.8 | 0.0 | 0.0 | 44.5 | 74.0 | -29.5 | V | P | |
| 4.804 | 3.0 | 26.6 | 33.1 | 5.8 | -34.8 | 0.0 | 0.0 | 30.7 | 54.0 | -23.3 | V | A | |
| 4.804 | 3.0 | 44.4 | 33.1 | 5.8 | -34.8 | 0.0 | 0.0 | 48.5 | 74.0 | -25.5 | H | P | |
| 4.804 | 3.0 | 28.9 | 33.1 | 5.8 | -34.8 | 0.0 | 0.0 | 32.9 | 54.0 | -21.1 | H | A | |
| 2441 MHz DQPSK | | | | | | | | | | | | | |
| 4.882 | 3.0 | 49.3 | 33.2 | 5.8 | -34.8 | 0.0 | 0.0 | 53.5 | 74.0 | -20.5 | H | P | |
| 4.882 | 3.0 | 30.8 | 33.2 | 5.8 | -34.8 | 0.0 | 0.0 | 35.0 | 54.0 | -19.0 | H | A | |
| 4.882 | 3.0 | 44.0 | 33.2 | 5.8 | -34.8 | 0.0 | 0.0 | 48.2 | 74.0 | -25.8 | V | P | |
| 4.882 | 3.0 | 28.8 | 33.2 | 5.8 | -34.8 | 0.0 | 0.0 | 33.0 | 54.0 | -21.0 | V | A | |
| 2480 MHz DQPSK | | | | | | | | | | | | | |
| 4.960 | 3.0 | 46.1 | 33.2 | 5.9 | -34.8 | 0.0 | 0.0 | 50.4 | 74.0 | -23.6 | V | P | |
| 4.960 | 3.0 | 29.1 | 33.2 | 5.9 | -34.8 | 0.0 | 0.0 | 33.4 | 54.0 | -20.6 | V | A | |
| 7.440 | 3.0 | 35.6 | 36.5 | 7.3 | -34.1 | 0.0 | 0.0 | 45.3 | 74.0 | -28.7 | V | P | |
| 7.440 | 3.0 | 23.3 | 36.5 | 7.3 | -34.1 | 0.0 | 0.0 | 33.0 | 54.0 | -21.0 | V | A | |
| 2480 MHz DQPSK | | | | | | | | | | | | | |
| 4.960 | 3.0 | 50.4 | 33.2 | 5.9 | -34.8 | 0.0 | 0.0 | 54.7 | 74.0 | -19.3 | H | P | |
| 4.960 | 3.0 | 30.9 | 33.2 | 5.9 | -34.8 | 0.0 | 0.0 | 35.2 | 54.0 | -18.8 | H | A | |
| 7.440 | 3.0 | 35.8 | 36.5 | 7.3 | -34.1 | 0.0 | 0.0 | 45.6 | 74.0 | -28.4 | H | P | |
| 7.440 | 3.0 | 23.2 | 36.5 | 7.3 | -34.1 | 0.0 | 0.0 | 33.0 | 54.0 | -21.0 | H | A | |

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

## 8.3. RECEIVER ABOVE 1 GHz

**High Frequency Measurement**
**Compliance Certification Services, Fremont 3m Chamber**

**Company:** Plantronics
**Project #:** 11U14168
**Date:** 12/5/2011
**Test Engineer:** Tom Chen
**Configuration:** EUT alone
**Mode:** RX mode

**Test Equipment:**

| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz | Limit |
|---|---|---|---|---|
| T60; S/N: 2238 @3m | T34 HP 8449B | | | RX RSS 210 |

Hi Frequency Cables

| 3' cable 22807700 | 12' cable 22807600 | 20' cable 22807500 | HPF | Reject Filter |
|---|---|---|---|---|
| 3' cable 22807700 | 12' cable 22807600 | 20' cable 22807500 | | |

**Peak Measurements**
RBW=VBW=1MHz
**Average Measurements**
RBW=1MHz ; VBW=10Hz

| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.112 | 3.0 | 47.6 | 37.2 | 25.3 | 2.9 | -37.6 | 0.0 | 0.0 | 38.1 | 27.7 | 74 | 54 | -35.9 | -26.3 | V |
| 3.940 | 3.0 | 42.0 | 29.3 | 32.4 | 6.1 | -34.4 | 0.0 | 0.0 | 46.2 | 33.5 | 74 | 54 | -27.8 | -20.5 | V |
| | | | | | | | | | | | | | | | V |
| 1.112 | 3.0 | 48.3 | 36.3 | 25.3 | 2.9 | -37.6 | 0.0 | 0.0 | 38.8 | 26.8 | 74 | 54 | -35.2 | -27.2 | H |
| 2.560 | 3.0 | 44.3 | 36.7 | 29.0 | 4.7 | -35.6 | 0.0 | 0.0 | 42.5 | 34.8 | 74 | 54 | -31.5 | -19.2 | H |
| | | | | | | | | | | | | | | | H |

**Note: No other emissions were detected above the system noise floor.**
Rev. 07.08.11

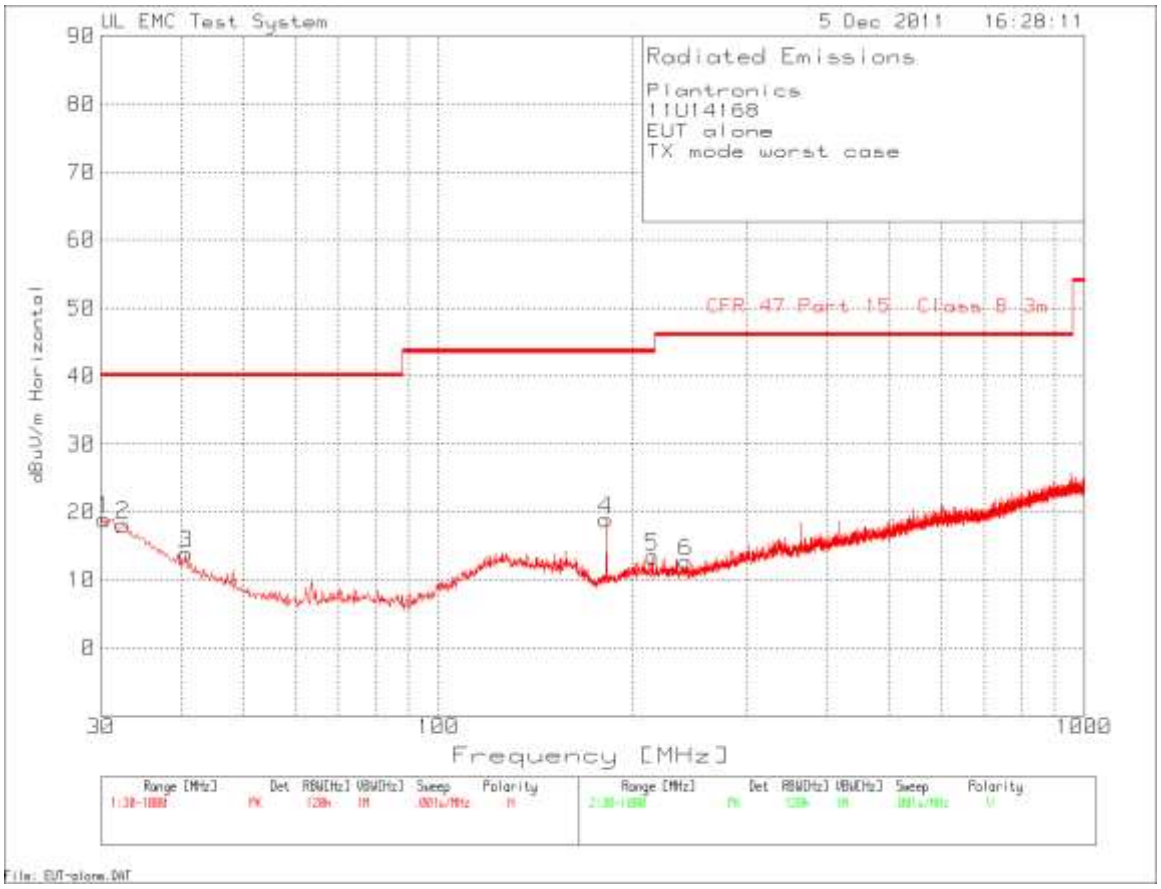
| | | | | | |
|---|---|---|---|---|---|
| f | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit |
| Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim | Peak Field Strength Limit |
| Read | Analyzer Reading | Avg | Average Field Strength @ 3 m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

## 8.4. WORST-CASE BELOW 1 GHz

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

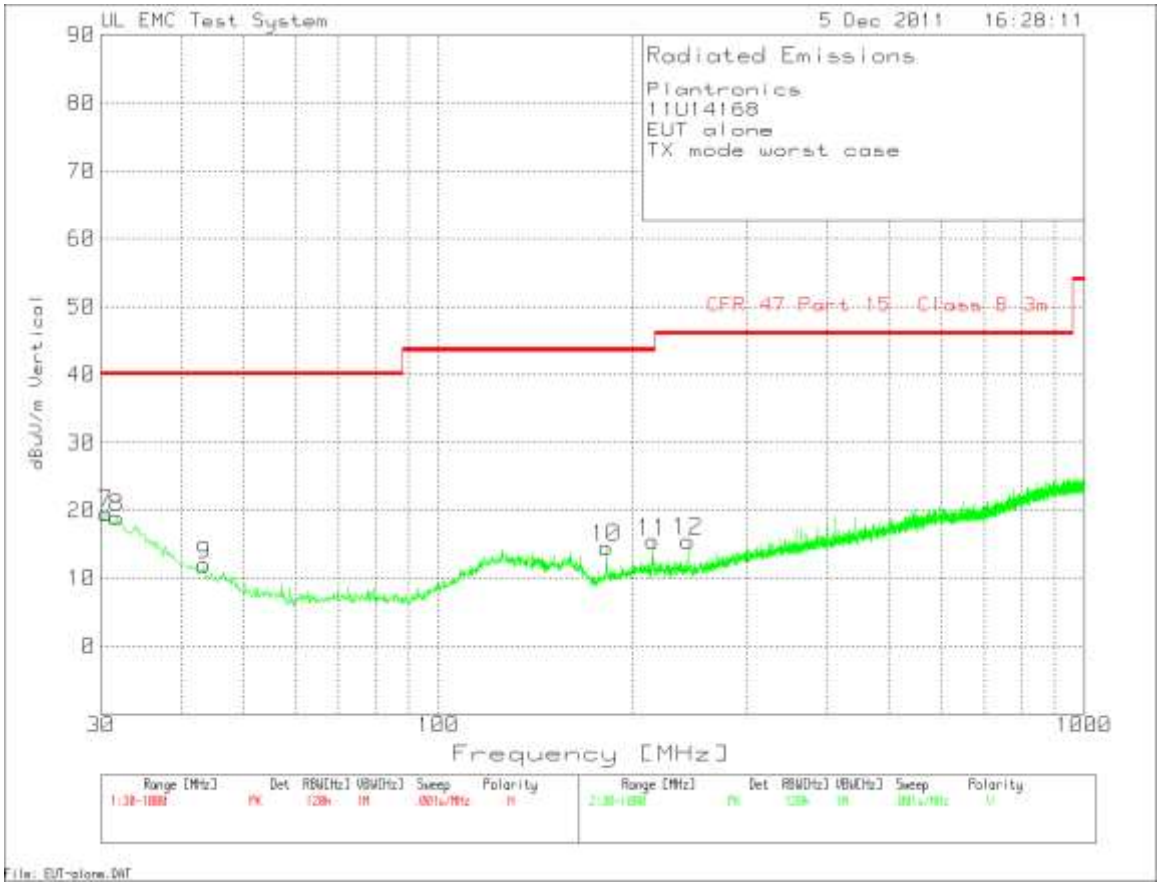
EUT standalone

HORIZONTAL PLOT



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

VERTICAL PLOT



## HORIZONTAL AND VERTICAL DATA

Plantronics
11U14168
EUT alone
TX mode worst case

Horizontal 30 - 1000MHz

| Test Frequency | Meter Reading | Detector | 3m below 1GHz Cable.TXT [dB] | 3m T15 PreAmp below 1GHz.TXT [dB] | 3m Bilog T185 below 1GHz.TXT [dB] | dBuV/m | CFR 47 Part 15 Class B 3m | Margin | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 30.3877 | 26.82 | PK | 0.6 | -28.3 | 19.8 | 18.92 | 40 | -21.08 | Horz |
| 32.52 | 27.03 | PK | 0.6 | -28.3 | 18.8 | 18.13 | 40 | -21.87 | Horz |
| 40.6615 | 28.24 | PK | 0.7 | -28.2 | 13.1 | 13.84 | 40 | -26.16 | Horz |
| 181.7806 | 34.35 | PK | 1.3 | -27.7 | 10.9 | 18.85 | 43.5 | -24.65 | Horz |
| 214.5404 | 27.73 | PK | 1.4 | -27.6 | 11.9 | 13.43 | 43.5 | -30.07 | Horz |
| 241.8725 | 26.76 | PK | 1.6 | -27.5 | 11.8 | 12.66 | 46 | -33.34 | Horz |

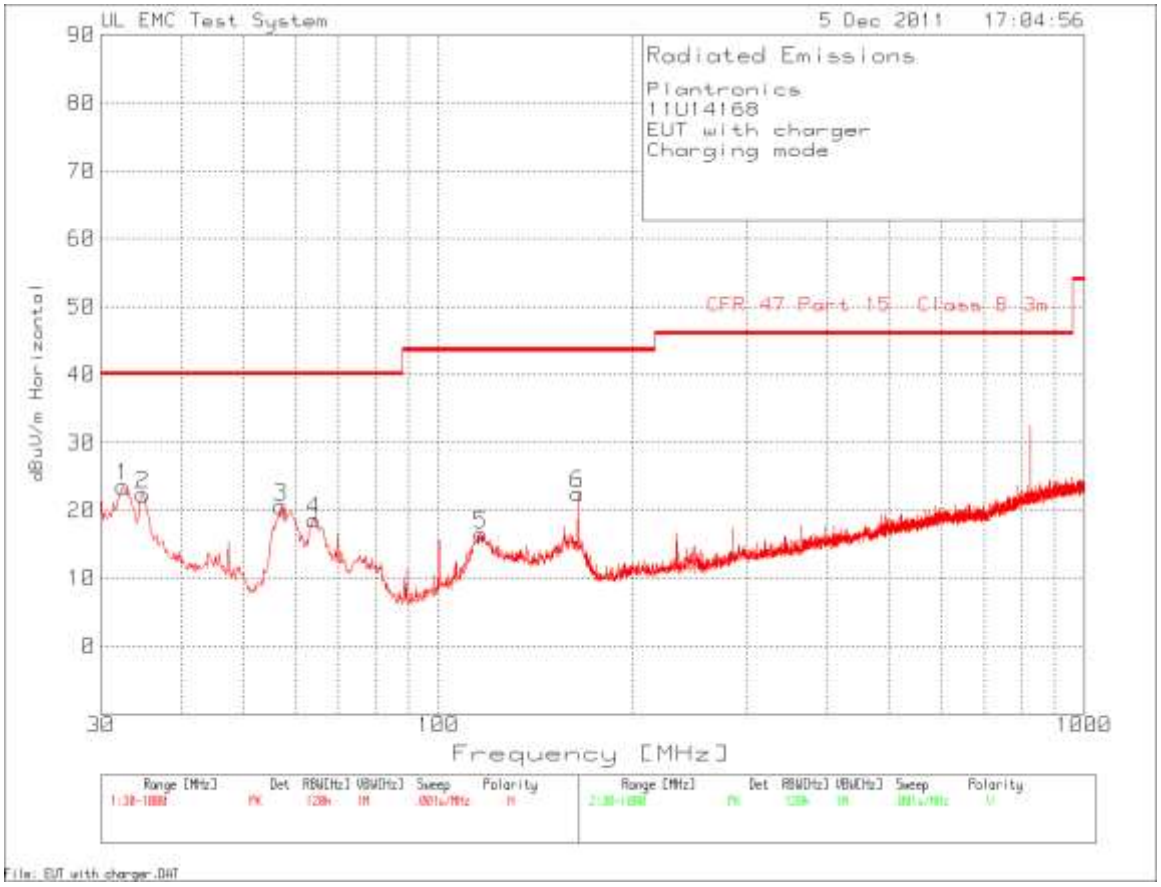
Vertical 30 - 1000MHz

| Test Frequency | Meter Reading | Detector | 3m below 1GHz Cable.TXT [dB] | 3m T15 PreAmp below 1GHz.TXT [dB] | 3m Bilog T185 below 1GHz.TXT [dB] | dBuV/m | CFR 47 Part 15 Class B 3m | Margin | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 30.5815 | 27.56 | PK | 0.6 | -28.3 | 19.7 | 19.56 | 40 | -20.44 | Vert |
| 31.7446 | 27.57 | PK | 0.6 | -28.3 | 19.1 | 18.97 | 40 | -21.03 | Vert |
| 43.3753 | 27.18 | PK | 0.7 | -28.2 | 12.3 | 11.98 | 40 | -28.02 | Vert |
| 181.9744 | 30.06 | PK | 1.3 | -27.7 | 10.9 | 14.56 | 43.5 | -28.94 | Vert |
| 214.5404 | 29.71 | PK | 1.4 | -27.6 | 11.9 | 15.41 | 43.5 | -28.09 | Vert |
| 243.4233 | 29.59 | PK | 1.6 | -27.5 | 11.8 | 15.49 | 46 | -30.51 | Vert |

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

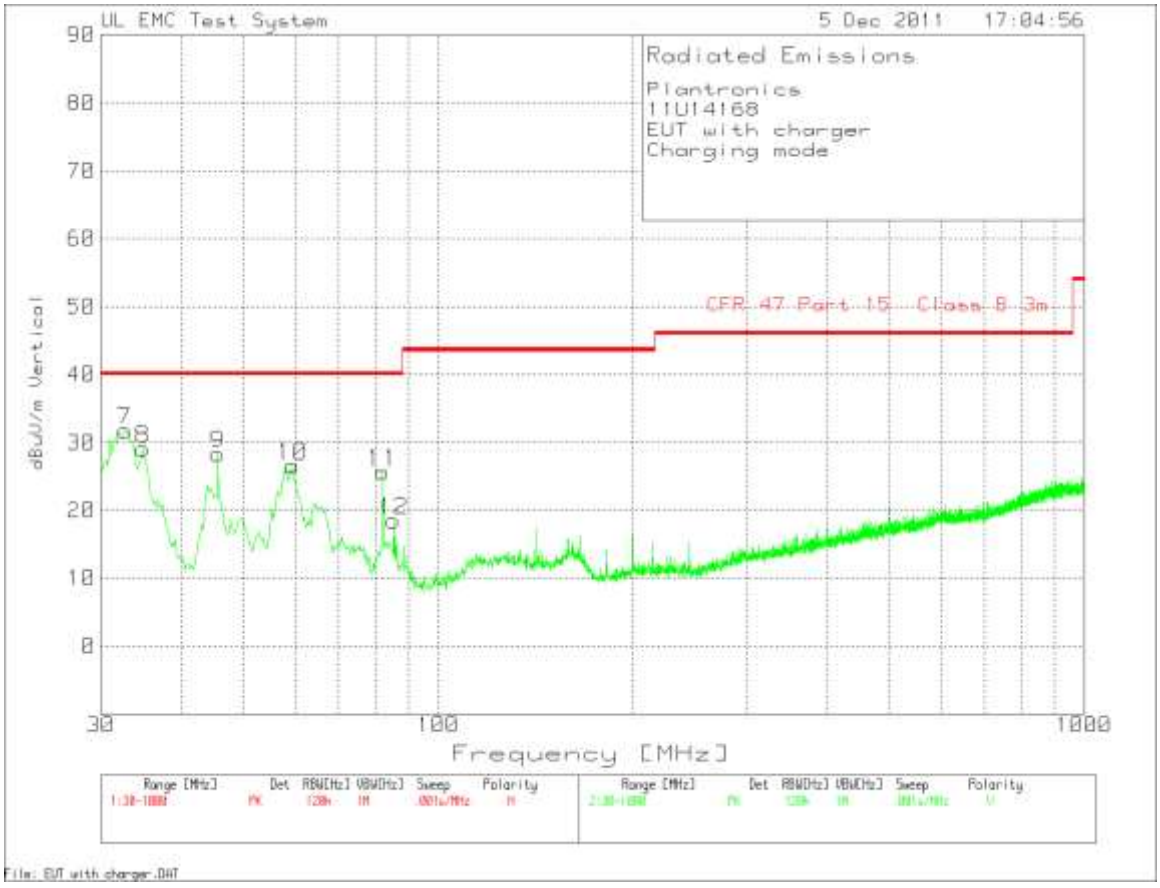
EUT with Charger

HORIZONTAL PLOT



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

VERTICAL PLOT



## HORIZONTAL AND VERTICAL DATA

Plantronics
11U14168
EUT with charger
Charging mode

Horizontal 30 - 1000MHz

| Test Frequency | Meter Reading | Detector | 3m below 1GHz Cable.TXT [dB] | 3m T15 PreAmp below 1GHz.TXT [dB] | 3m Bilog T185 below 1GHz.TXT [dB] | dBuV/m | CFR 47 Part 15 Class B 3m | Margin | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 32.52 | 32.45 | PK | 0.6 | -28.3 | 18.8 | 23.55 | 40 | -16.45 | Horz |
| 34.8461 | 32.47 | PK | 0.6 | -28.3 | 17.6 | 22.37 | 40 | -17.63 | Horz |
| 56.9444 | 39.69 | PK | 0.8 | -28.2 | 8.3 | 20.59 | 40 | -19.41 | Horz |
| 64.1167 | 37.86 | PK | 0.9 | -28.2 | 8 | 18.56 | 40 | -21.44 | Horz |
| 116.4548 | 30.57 | PK | 1.1 | -28 | 12.8 | 16.47 | 43.5 | -27.03 | Horz |
| 164.3345 | 36.56 | PK | 1.3 | -27.8 | 12.4 | 22.46 | 43.5 | -21.04 | Horz |

Vertical 30 - 1000MHz

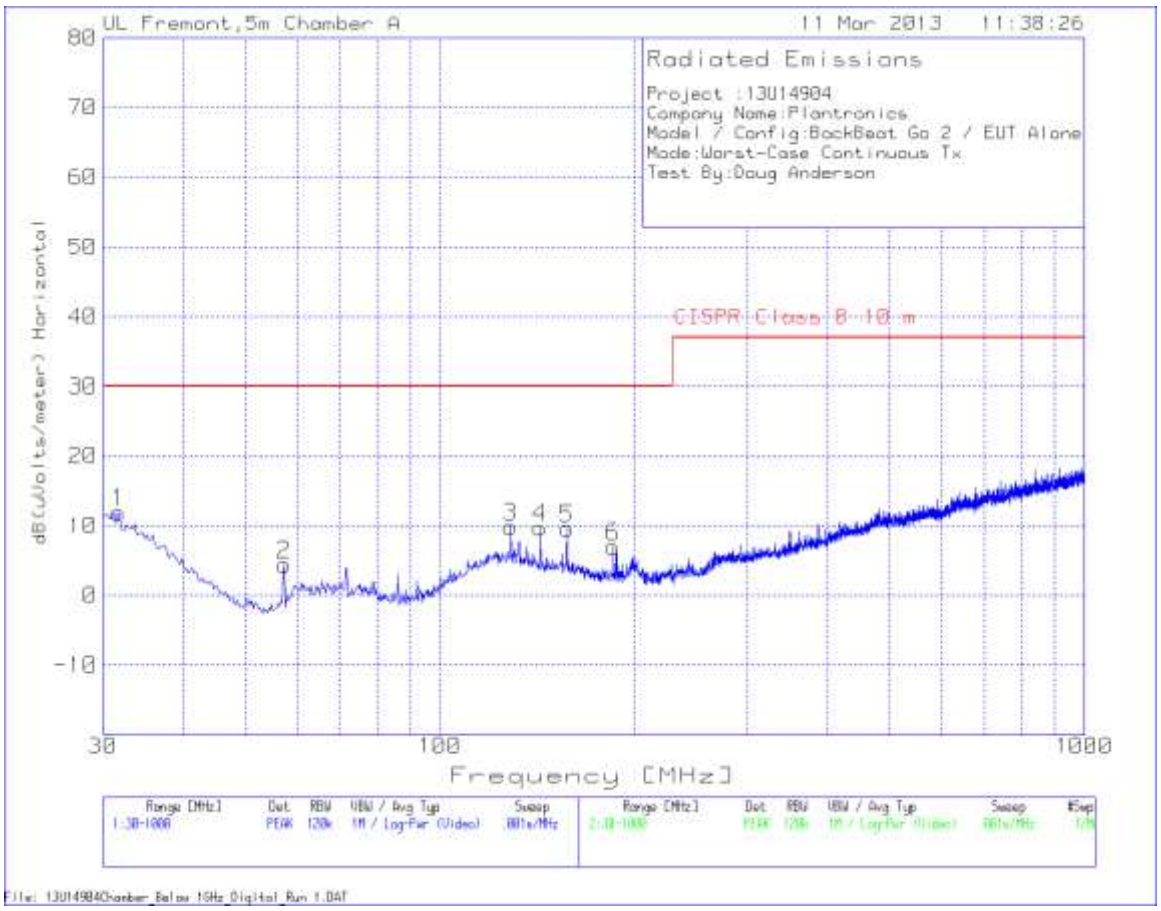
| Test Frequency | Meter Reading | Detector | 3m below 1GHz Cable.TXT [dB] | 3m T15 PreAmp below 1GHz.TXT [dB] | 3m Bilog T185 below 1GHz.TXT [dB] | dBuV/m | CFR 47 Part 15 Class B 3m | Margin | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 32.7138 | 40.77 | PK | 0.6 | -28.3 | 18.7 | 31.77 | 40 | -8.23 | Vert |
| 34.8461 | 39.18 | PK | 0.6 | -28.3 | 17.6 | 29.08 | 40 | -10.92 | Vert |
| 45.5076 | 44.31 | PK | 0.7 | -28.2 | 11.5 | 28.31 | 40 | -11.69 | Vert |
| 59.4644 | 45.95 | PK | 0.8 | -28.2 | 8 | 26.55 | 40 | -13.45 | Vert |
| 81.9504 | 44.92 | PK | 1 | -28.1 | 7.8 | 25.62 | 40 | -14.38 | Vert |
| 85.2458 | 38 | PK | 1 | -28.1 | 7.6 | 18.5 | 40 | -21.5 | Vert |

## 8.5. WORST-CASE BELOW 1 GHz

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

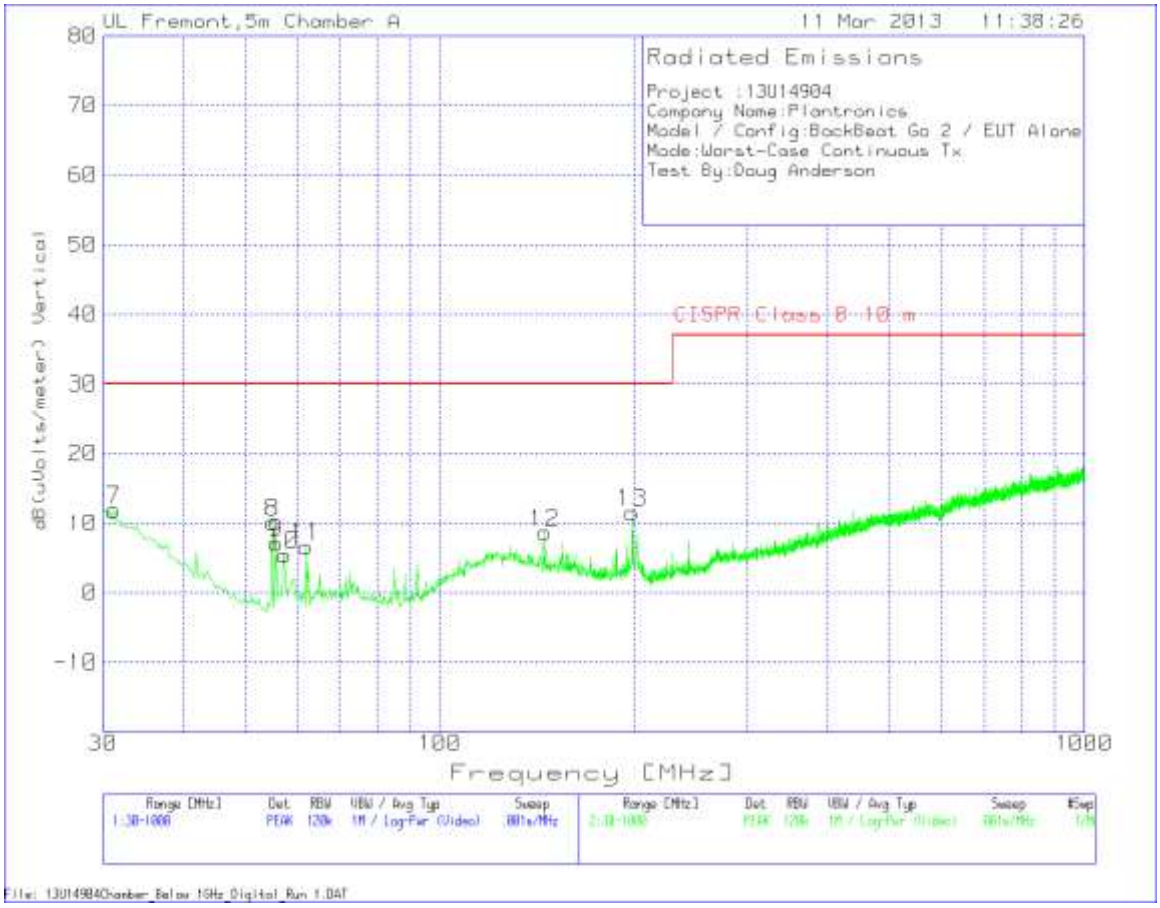
8DPSK Mode

HORIZONTAL PLOT



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

VERTICAL PLOT



## HORIZONTAL AND VERTICAL DATA

**Project : 13U14904**
**Company Name: Plantronics**
**Model / Config: BackBeat Go 2 / EUT Alone**
**Mode:Worst- Case Continuous Tx**
**Test By: Doug Anderson**

Range 1 30 - 1000MHz

| Marker No. | Test Frequency | Meter Reading | Detector | T185 Antenna Factor (dB) | T64 preamp/cable loss loop (dB) | Distance Correction (dB) | dB(uVolts/ meter) | CISPR Class B 10 m | Margin | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31.6962 | 30.23 | PK | 19.9 | -27.7 | -10.5 | 11.93 | 30 | -18.07 | 100 | Horz |
| 2 | 57.382 | 35.36 | PK | 6.9 | -27.4 | -10.5 | 4.36 | 30 | -25.64 | 400 | Horz |
| 3 | 128.8659 | 33.06 | PK | 14.1 | -26.8 | -10.5 | 9.86 | 30 | -20.14 | 200 | Horz |
| 4 | 143.1626 | 34.15 | PK | 12.8 | -26.7 | -10.5 | 9.75 | 30 | -20.25 | 200 | Horz |
| 5 | 157.4594 | 34.45 | PK | 12.2 | -26.6 | -10.5 | 9.55 | 30 | -20.45 | 100 | Horz |
| 6 | 186.053 | 32.91 | PK | 10.9 | -26.3 | -10.5 | 7.01 | 30 | -22.99 | 400 | Horz |

Range 2 30 - 1000MHz

| Marker No. | Test Frequency | Meter Reading | Detector | T185 Antenna Factor (dB) | T64 preamp/cable loss loop (dB) | Distance Correction (dB) | dB(uVolts/ meter) | CISPR Class B 10 m | Margin | Height [cm] | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 31.2116 | 29.86 | PK | 20.3 | -27.7 | -10.5 | 11.96 | 30 | -18.04 | 100 | Vert |
| 8 | 54.9588 | 41.18 | PK | 6.8 | -27.4 | -10.5 | 10.08 | 30 | -19.92 | 200 | Vert |
| 9 | 55.6857 | 38.14 | PK | 6.9 | -27.4 | -10.5 | 7.14 | 30 | -22.86 | 200 | Vert |
| 10 | 57.382 | 36.5 | PK | 6.9 | -27.4 | -10.5 | 5.5 | 30 | -24.5 | 100 | Vert |
| 11 | 61.986 | 37 | PK | 7.4 | -27.3 | -10.5 | 6.6 | 30 | -23.4 | 100 | Vert |
| 12 | 145.5858 | 33.32 | PK | 12.5 | -26.7 | -10.5 | 8.62 | 30 | -21.38 | 100 | Vert |
| 13 | 198.8958 | 36.11 | PK | 12.1 | -26.2 | -10.5 | 11.51 | 30 | -18.49 | 100 | Vert |

PK - Peak detector
QP - Quasi-Peak 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

Plantronics
11U14168
BackBeat GO (Bluetooth Headset)
FCC Class B
In charging mode

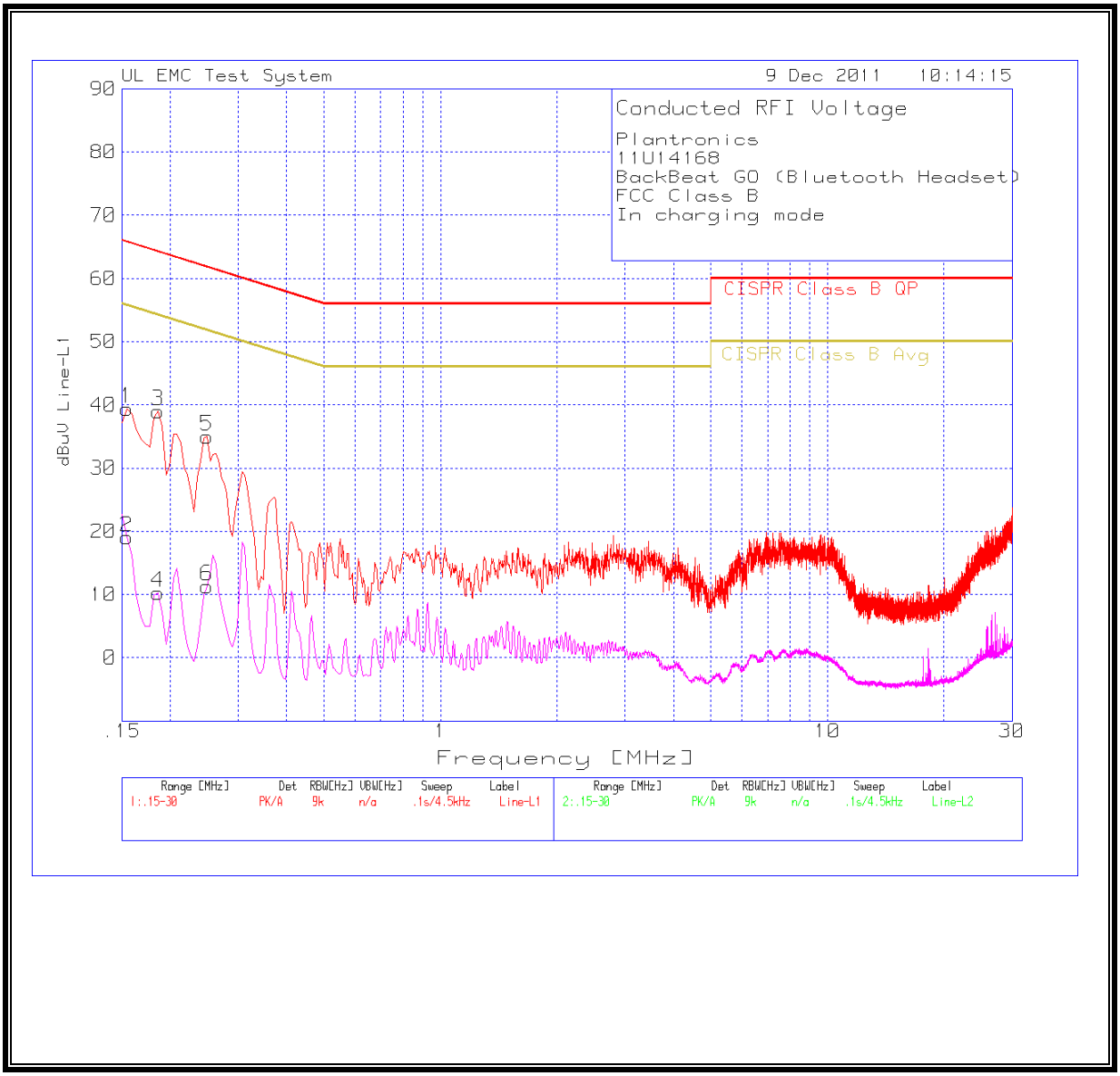
Line-L1 .15 - 30MHz

| Test Frequency | Meter Reading | Detector | T24 Lisn & Path Loss L1. [dB] | dBuV | CISPR Class B QP | Margin | CISPR Class B Avg | Margin |
|---|---|---|---|---|---|---|---|---|
| 0.1545 | 37.75 | PK | 1.6 | 39.35 | 65.8 | -26.45 | 55.8 | -16.45 |
| 0.1545 | 17.41 | Av | 1.6 | 19.01 | 65.8 | -46.79 | 55.8 | -36.79 |
| 0.186 | 37.65 | PK | 1.3 | 38.95 | 64.2 | -25.25 | 54.2 | -15.25 |
| 0.186 | 8.93 | Av | 1.3 | 10.23 | 64.2 | -53.97 | 54.2 | -43.97 |
| 0.249 | 34.05 | PK | 0.9 | 34.95 | 61.8 | -26.85 | 51.8 | -16.85 |
| 0.249 | 10.44 | Av | 0.9 | 11.34 | 61.8 | -50.46 | 51.8 | -40.46 |

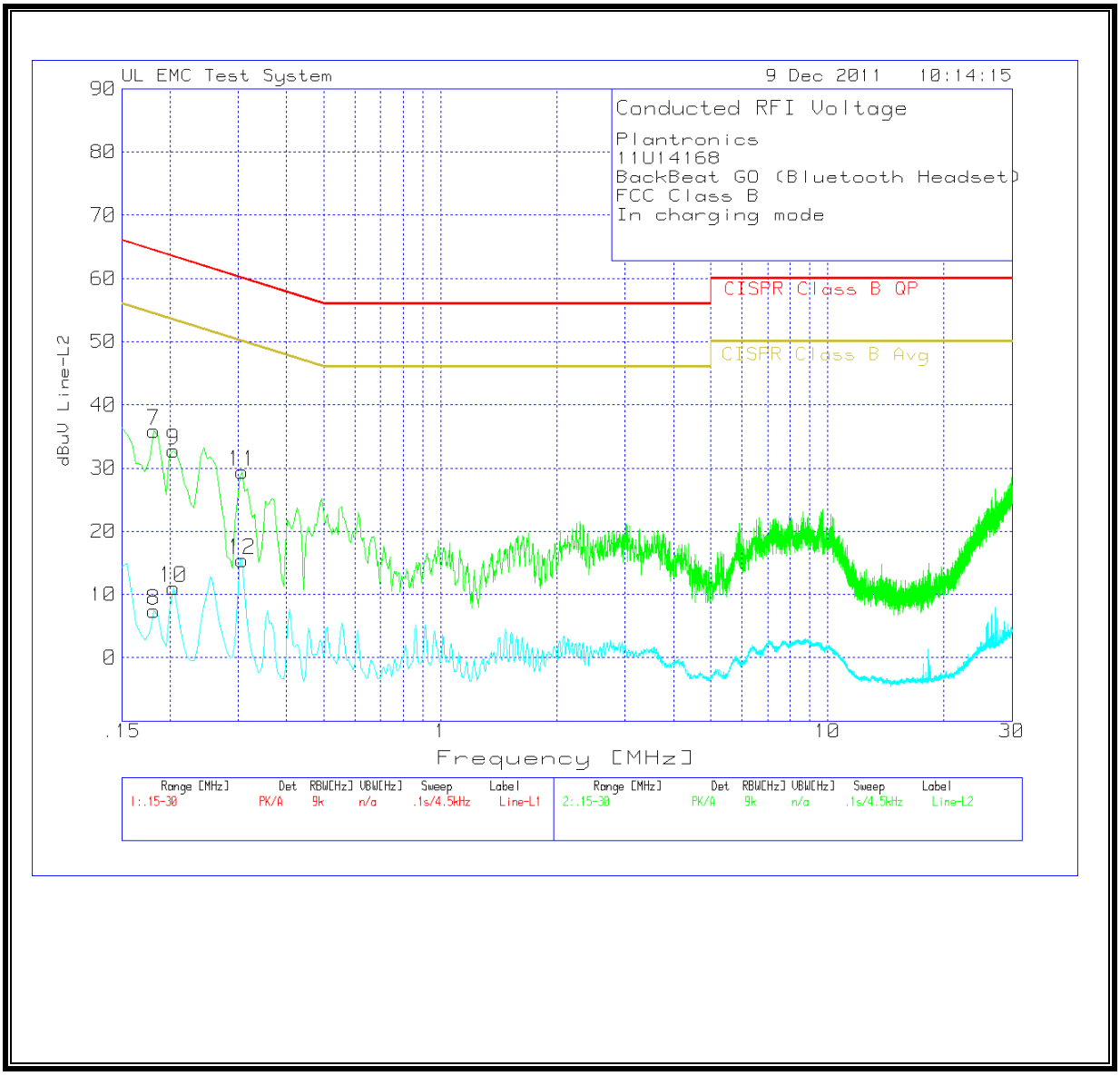
Line-L2 .15 - 30MHz

| Test Frequency | Meter Reading | Detector | T24 Lisn & Path Loss Data L2. [dB] | dBuV | CISPR Class B QP | Margin | CISPR Class B Avg | Margin |
|---|---|---|---|---|---|---|---|---|
| 0.1815 | 34.69 | PK | 1.2 | 35.89 | 64.4 | -28.51 | 54.4 | -18.51 |
| 0.1815 | 6.22 | Av | 1.2 | 7.42 | 64.4 | -56.98 | 54.4 | -46.98 |
| 0.204 | 31.75 | PK | 1 | 32.75 | 63.4 | -30.65 | 53.4 | -20.65 |
| 0.204 | 9.99 | Av | 1 | 10.99 | 63.4 | -52.41 | 53.4 | -42.41 |
| 0.3075 | 28.82 | PK | 0.6 | 29.42 | 60 | -30.58 | 50 | -20.58 |
| 0.3075 | 14.8 | Av | 0.6 | 15.4 | 60 | -44.6 | 50 | -34.6 |

**LINE 1 RESULTS**



**LINE 2 RESULTS**



**8DPSK Mode**

**6 WORST EMISSIONS**

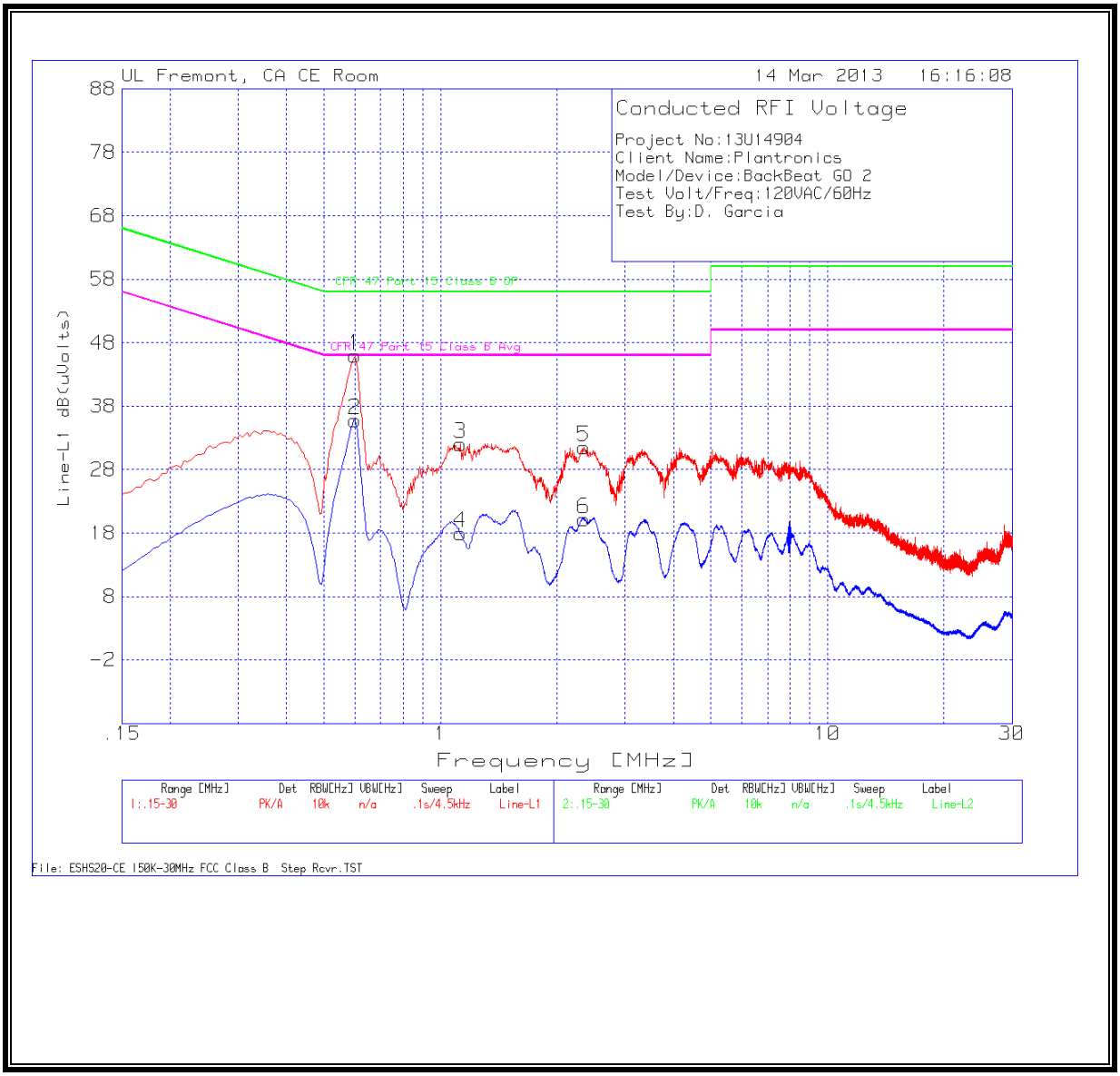
| | |
|---|---|
| **Project No:** | 13U14904 |
| **Client Name:** | Plantronics |
| **Model/Device:** | BackBeat GO 2 |
| **Test Volt/Freq:** | 120VAC/60Hz |
| **Test By:** | D. Garcia |
| **Date Tested :** | 3/13/2013 |

| Test Frequency MHz | Meter Reading dBµV | Detector | T24 LISN dB | Cables Factors dB | Corrected dBµV | CFR 47 Part 15 Class B QP | Margin dB | CFR 47 Part 15 Class B Avg | Margin dB |
|---|---|---|---|---|---|---|---|---|---|
| **Line-L1 .15 - 30MHz** | | | | | | | | | |
| 0.6 | 45.84 | PK | 0.1 | 0 | 45.94 | 56 | -10.06 | - | - |
| 0.6 | 35.64 | Av | 0.1 | 0 | 35.74 | - | - | 46 | -10.26 |
| 1.1265 | 31.98 | PK | 0.1 | 0 | 32.08 | 56 | -23.92 | - | - |
| 1.1265 | 17.84 | Av | 0.1 | 0 | 17.94 | - | - | 46 | -28.06 |
| 2.3505 | 31.33 | PK | 0.1 | 0.1 | 31.53 | 56 | -24.47 | - | - |
| 2.3505 | 20.03 | Av | 0.1 | 0.1 | 20.23 | - | - | 46 | -25.77 |
| **Line-L2 .15 - 30MHz** | | | | | | | | | |
| 0.5955 | 38.53 | PK | 0.1 | 0 | 38.63 | 56 | -17.37 | - | - |
| 0.5955 | 25.19 | Av | 0.1 | 0 | 25.29 | - | - | 46 | -20.71 |
| 1.158 | 31.34 | PK | 0.1 | 0 | 31.44 | 56 | -24.56 | - | - |
| 1.158 | 9.16 | Av | 0.1 | 0 | 9.26 | - | - | 46 | -36.74 |
| 1.815 | 26.12 | PK | 0.1 | 0.1 | 26.32 | 56 | -29.68 | - | - |
| 1.815 | 5.89 | Av | 0.1 | 0.1 | 6.09 | - | - | 46 | -39.91 |

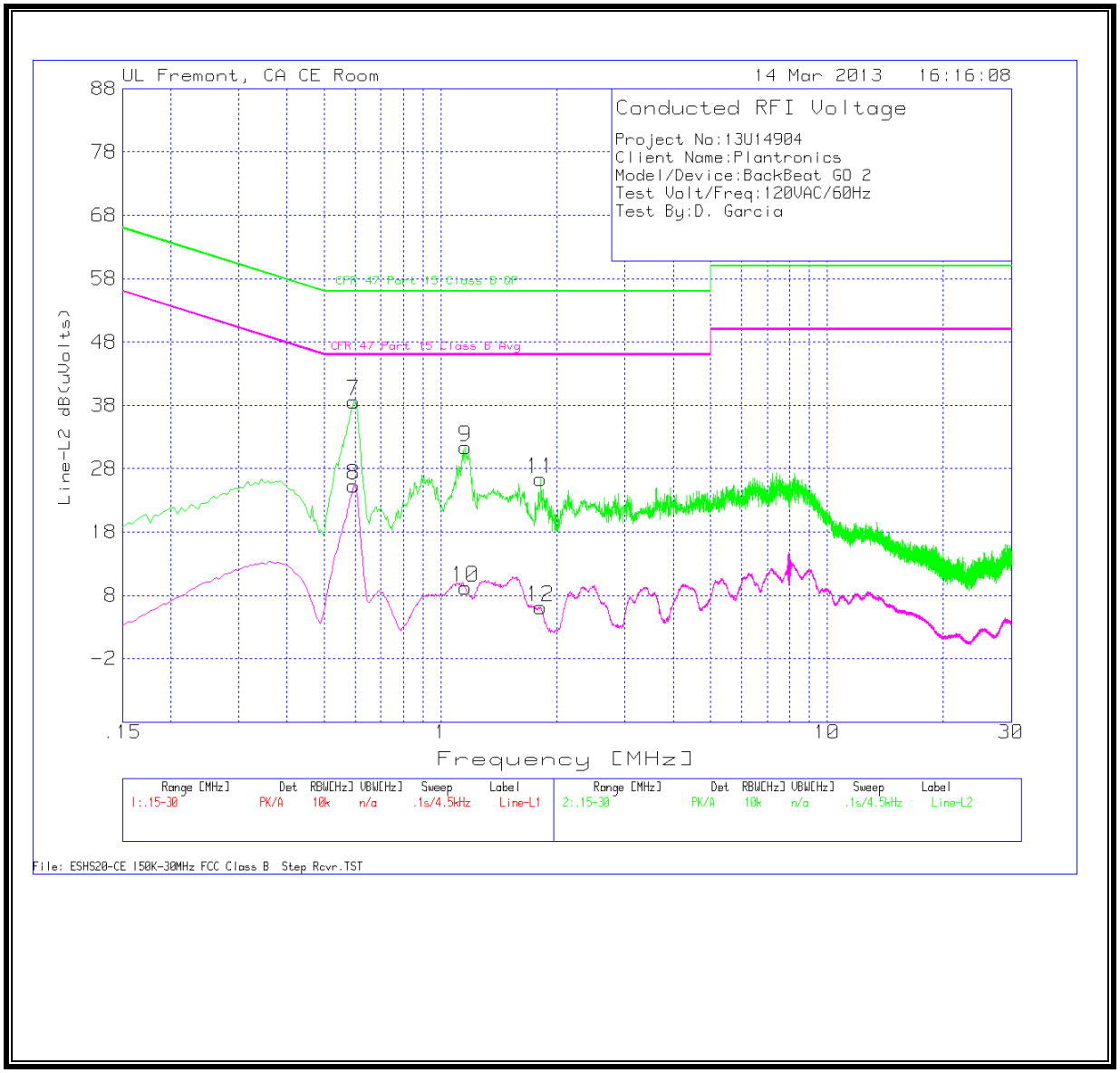
PK - Peak detector

Av - Average detector

**LINE 1 RESULTS**



**LINE 2 RESULTS**



# 10. MAXIMUM PERMISSIBLE EXPOSURE

As the DUT is a portable device it was assessed in accordance using the standalone test exclusion guidelines of FCC KDB 447498 D01 General RF Exposure Guidance v05.

RF exposure evaluation was not required as determined in the following

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

$f_{(GHz)}$ is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation[17]
The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz.
When the minimum *test separation distance* is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

| Antenna | Tx | Frequency (MHz) | Output power | | Separation distance (mm) | SAR exclusion Threshold value | SAR exclusion Threshold Limit (1g SAR) |
|---|---|---|---|---|---|---|---|
| | | | dBm | mW | | | |
| Bluetooth | Bluetooth | 2400 | -0.65 | 1 | 0 | 0.310 | <3 |