



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

CERTIFICATION TEST REPORT

FOR

802.11a/b/g/n WiFi and BLUETOOTH AUDIO/VIDEO DEVICE

MODEL NUMBER: W1

FCC ID: A4R-W1

REPORT NUMBER: 11U14119-1

ISSUE DATE: MAY 22, 2012

Prepared for
**GOOGLE INC.
1600 AMPHITHEATRE PARKWAY
MONTAINVIEW
CA, 94043, U.S.A**

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NVLAP LAB CODE 200065-0

Revision History

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--	5/22/12	Initial Issue	T. LEE

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION.....	6
4. CALIBRATION AND UNCERTAINTY	6
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. SAMPLE CALCULATION.....	6
4.3. MEASUREMENT UNCERTAINTY	6
5. EQUIPMENT UNDER TEST	7
5.1. DESCRIPTION OF EUT.....	7
5.2. MAXIMUM OUTPUT POWER.....	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	7
5.4. SOFTWARE AND FIRMWARE	7
5.5. WORST-CASE CONFIGURATION AND MODE.....	7
5.6. DESCRIPTION OF TEST SETUP	8
6. TEST AND MEASUREMENT EQUIPMENT	10
7. ANTENNA PORT TEST RESULTS	11
7.1. 802.11b MODE IN THE 2.4 GHz BAND.....	11
7.1.1. 6 dB BANDWIDTH	11
7.1.2. 99% BANDWIDTH	15
7.1.3. OUTPUT POWER	19
7.1.4. AVERAGE POWER	23
7.1.5. POWER SPECTRAL DENSITY	24
7.1.6. CONDUCTED SPURIOUS EMISSIONS.....	28
7.2. 802.11g MODE IN THE 2.4 GHz BAND.....	35
7.2.1. 6 dB BANDWIDTH	35
7.2.2. 99% BANDWIDTH	39
7.2.3. OUTPUT POWER	43
7.2.4. AVERAGE POWER	47
7.2.5. POWER SPECTRAL DENSITY	48
7.2.6. CONDUCTED SPURIOUS EMISSIONS.....	52
7.3. 802.11n HT 20 MODE IN THE 2.4 GHz BAND	59
7.3.1. 6 dB BANDWIDTH	59
7.3.2. 99% BANDWIDTH	63
7.3.3. OUTPUT POWER	67
7.3.4. AVERAGE POWER	71
7.3.5. POWER SPECTRAL DENSITY	72
7.3.6. CONDUCTED SPURIOUS EMISSIONS.....	76
7.4. 802.11a MODE IN THE 5.8 GHz BAND.....	83
7.4.1. 6 dB BANDWIDTH	83

7.4.2.	99% BANDWIDTH	87
7.4.3.	OUTPUT POWER	91
7.4.4.	AVERAGE POWER	95
7.4.5.	POWER SPECTRAL DENSITY	96
7.4.6.	CONDUCTED SPURIOUS EMISSIONS.....	100
7.5.	<i>802.11HT20 MODE IN THE 5.8 GHz BAND</i>	107
7.5.1.	6 dB BANDWIDTH	107
7.5.2.	99% BANDWIDTH	110
7.5.3.	OUTPUT POWER	113
7.5.4.	AVERAGE POWER	116
7.5.5.	POWER SPECTRAL DENSITY	117
7.5.6.	CONDUCTED SPURIOUS EMISSIONS.....	120
8.	RADIATED TEST RESULTS	124
8.1.	<i>LIMITS AND PROCEDURE</i>	124
8.2.	<i>TRANSMITTER ABOVE 1 GHz</i>	125
8.2.1.	TX ABOVE 1 GHz FOR 802.11b 1TX MODE IN THE 2.4 GHz BAND	125
8.2.2.	TX ABOVE 1 GHz FOR 802.11g 1TX MODE IN THE 2.4 GHz BAND	130
8.2.3.	TX ABOVE 1 GHz FOR 802.11n HT20 1TX MODE IN THE 2.4 GHz BAND.....	135
8.2.4.	TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.8 GHz BAND ..	141
8.2.5.	TRANSMITTER ABOVE 1 GHz FOR 802.11n 20 MODE IN THE 5.8 GHz BAND 142	
8.3.	<i>WORST-CASE BELOW 1 GHz</i>	143
9.	AC POWER LINE CONDUCTED EMISSIONS	147
10.	MAXIMUM PERMISSIBLE EXPOSURE	151
11.	SETUP PHOTOS	155

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: GOOGLE INC.
1600 AMPHITHEATRE PARKWAY
MOUNTAIN VIEW, CA, 94043, U.S.A

EUT DESCRIPTION: 802.11a/b/g/n and Bluetooth Audio /Video Device

MODEL: W1

SERIAL NUMBER: AD3C12020001, AD3C12020005, AD6C12160093

DATE TESTED: JANUARY 18~30 to May 22, 2012

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

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

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

Approved & Released For UL CCS By:



TIM LEE
STAFF ENGINEER
UL CCS

Tested By:



THANH NGUYEN
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:

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

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 audio/video device running Android incorporating 802.11 a/b/g/n, Bluetooth, and near field communicator technology. The EUT has TOSLINK, audio, Ethernet, HDMI, and USB ports.

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)
2412 - 2462	802.11b	19.42	87.50
2412 - 2462	802.11g	24.96	313.33
2412 - 2462	802.11n20	22.56	180.30
5745 - 5825	802.11a	25.33	341.19
5745 - 5825	802.11n20	25.76	376.70

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an PCB antenna, with a maximum gain of 2.3 dBi at 2.4GHz band and 6.0 dBi at 5 GHz band.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was rev. 1.0.

The EUT driver software installed during testing was rev. 1.0.

The test utility software used during testing was rev. 1.0.

5.5. WORST-CASE CONFIGURATION AND MODE

For Radiated Emissions below 1 GHz and Power line Conducted Emissions, the channel with the highest conducted output power was selected as worst-case scenario.

Based on the manufacturer's attestation that the nominal output power is reduced as the data rate increases, the data rates tested represent the highest power and worst-case with respect to EMC performance. Worst-case data rates are:

For 11b mode: 1Mbps

For 11g mode: 6Mbps

For 11n mode (2.4 GHz band): MCS0

For 11a mode (5.8 GHz band): MCS0

For 11n mode (5.8 GHz band): MCS0

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

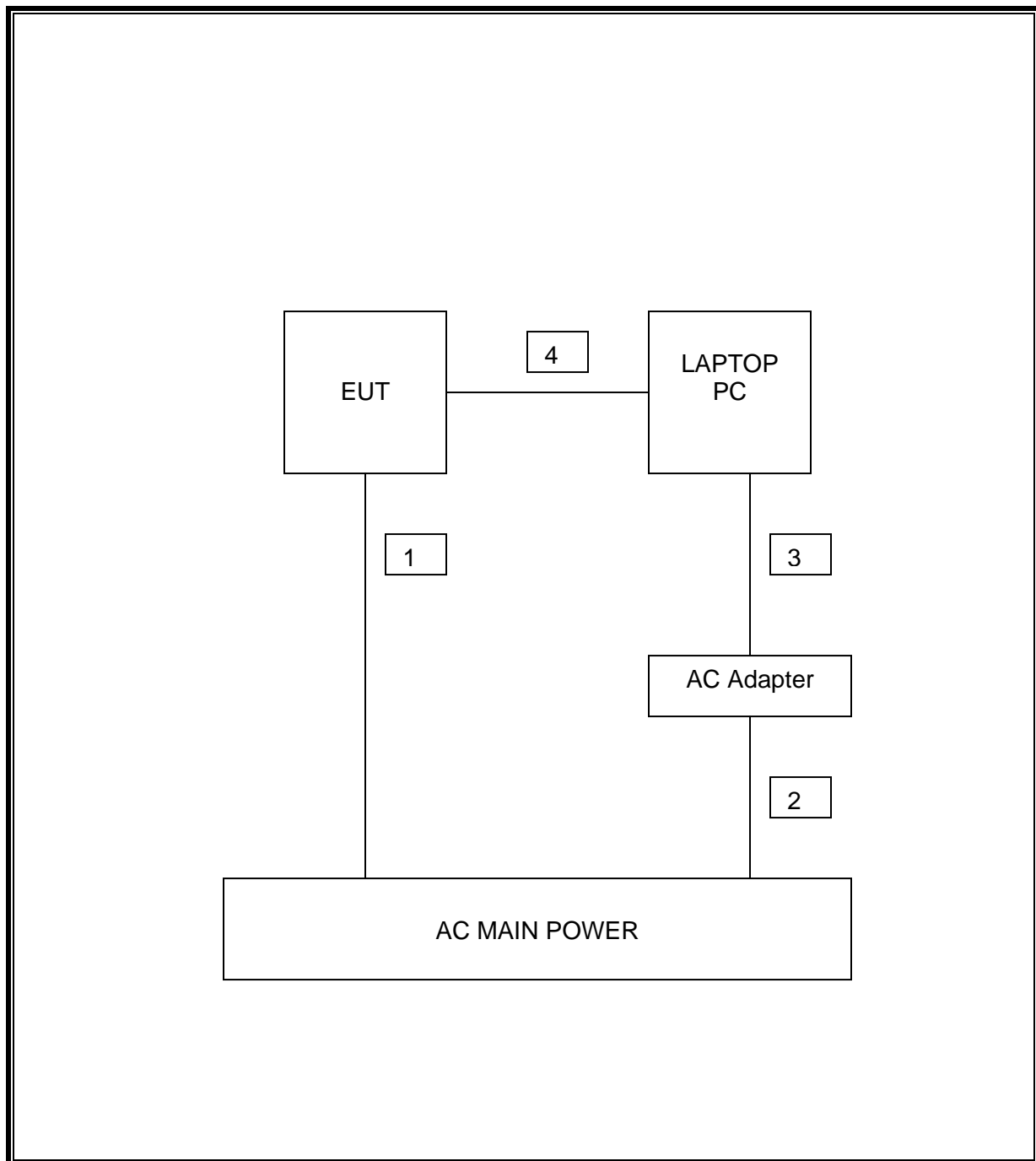
PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	2768-HH4	R8-PCNFE 210124	DoC
Laptop AC Adapter	Lenovo	92P1109	Z1ZBTZ85VM0	DoC

I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	1.8m	N/A
2	AC	1	US 115V	Un-shielded	1m	N/A
3	DC	1	DC	Un-shielded	1.8m	N/A
4	USB	1	Mini USB	Un-shielded	1.2m	Connect to Laptop

TEST SETUP

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	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	11/11/11	11/11/12
Peak Power Meter	Agilent / HP	N1911A	1282124A	08/04/11	08/04/12
Peak and Avg Power Sensor	Agilent / HP	E9323A	1240537J	08/04/11	08/04/12
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	MVH-1826/B	C00589	07/28/11	07/28/12
Horn Antenna, 40 GHz	ARA	MVH-2640/B	C00981	06/14/11	06/14/12
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	08/12/11	08/12/12

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b MODE IN THE 2.4 GHz BAND

7.1.1. 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.

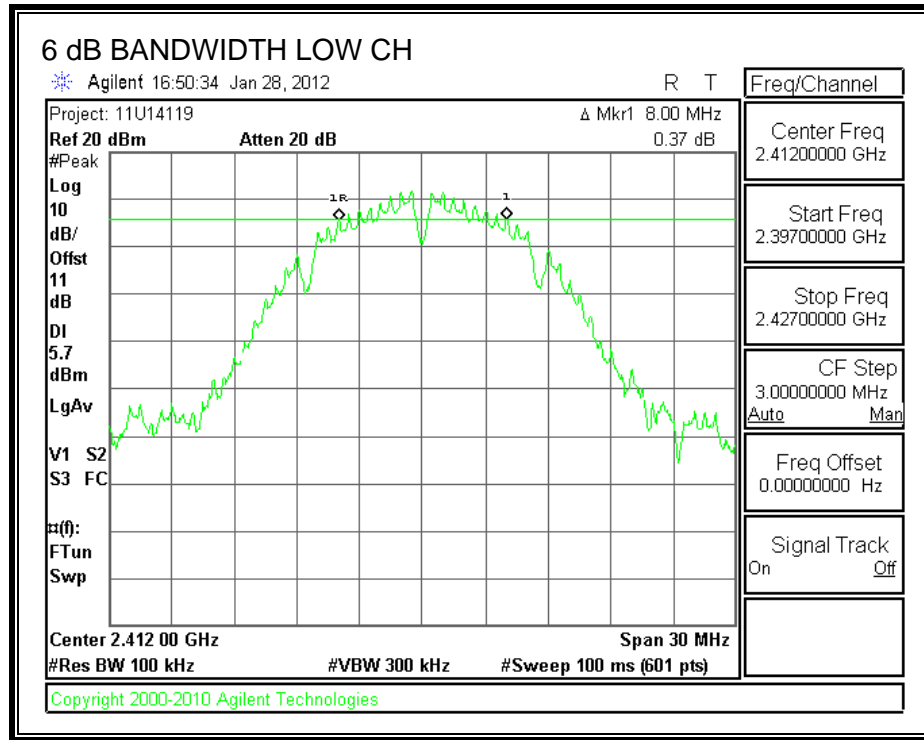
TEST PROCEDURE

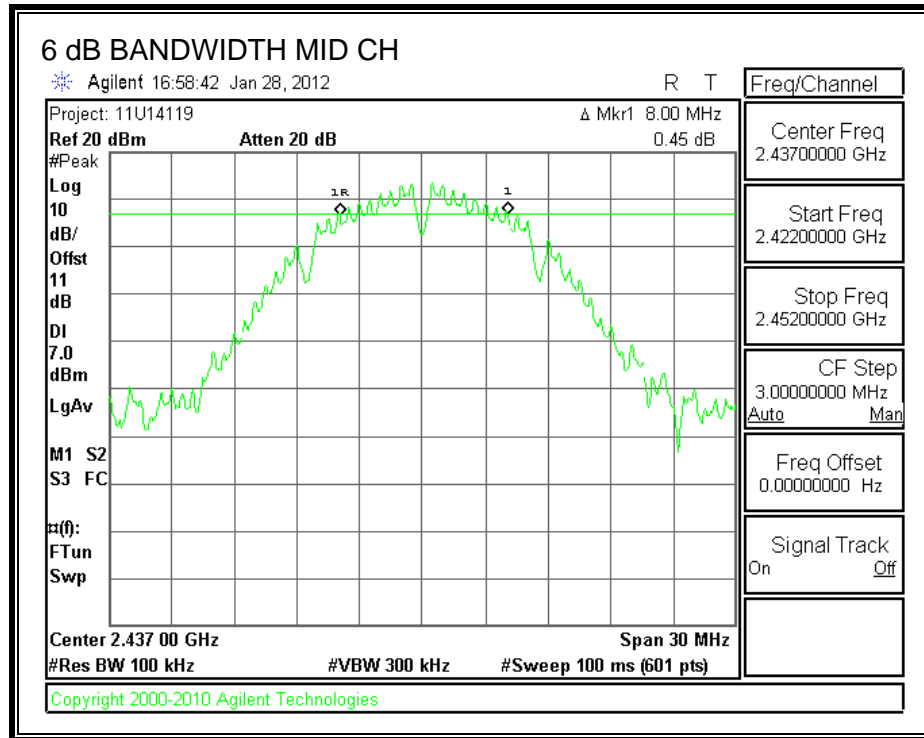
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

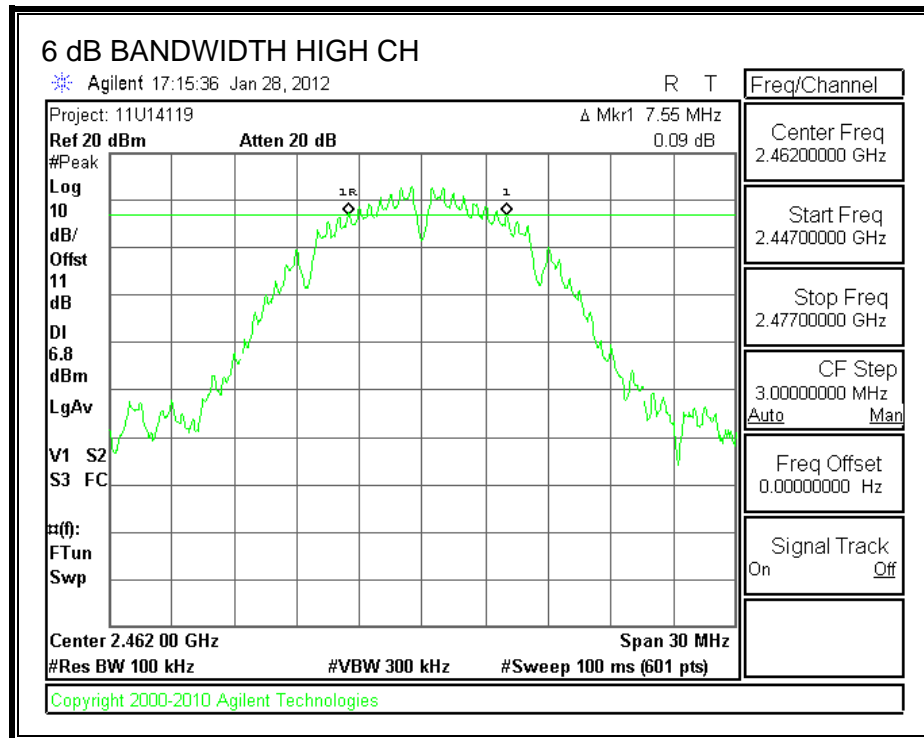
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	8.00	0.5
Middle	2437	8.00	0.5
High	2462	7.55	0.5

6 dB BANDWIDTH







7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

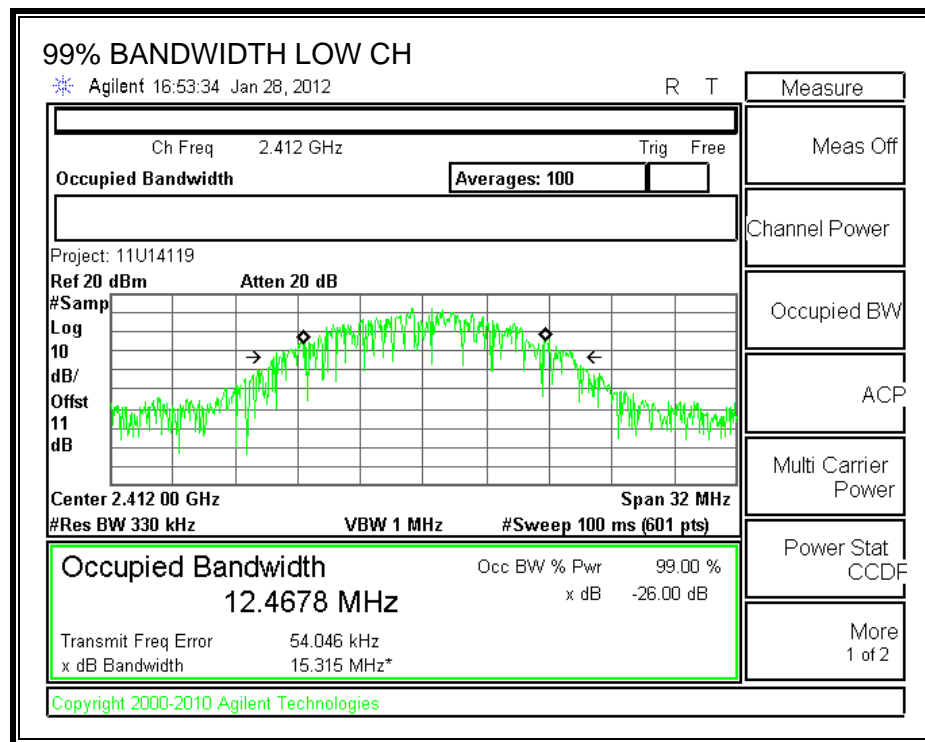
TEST PROCEDURE

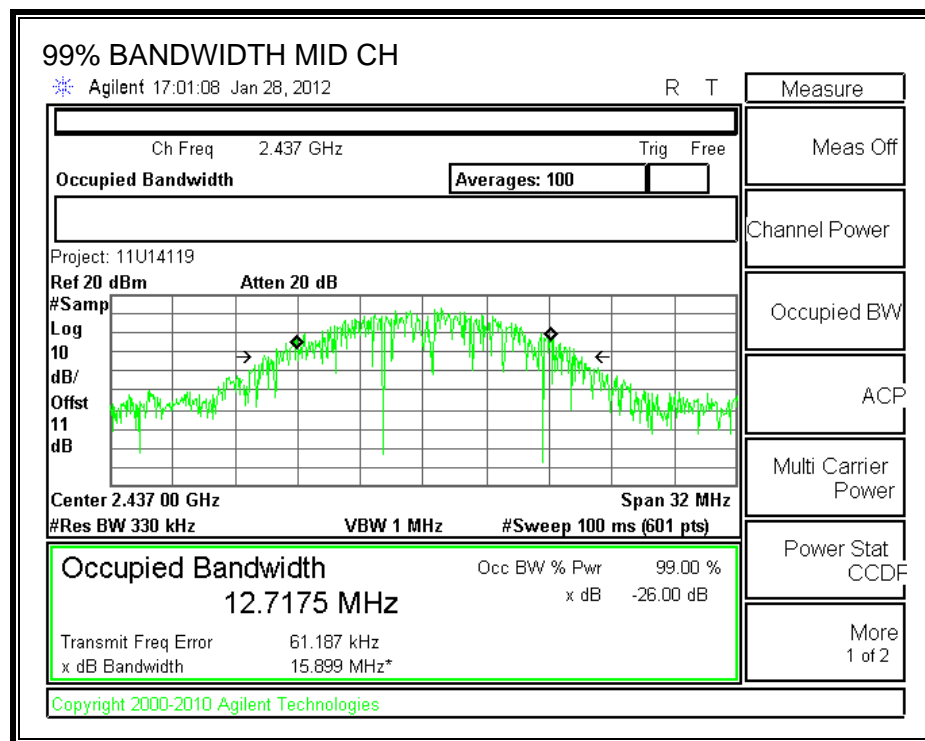
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

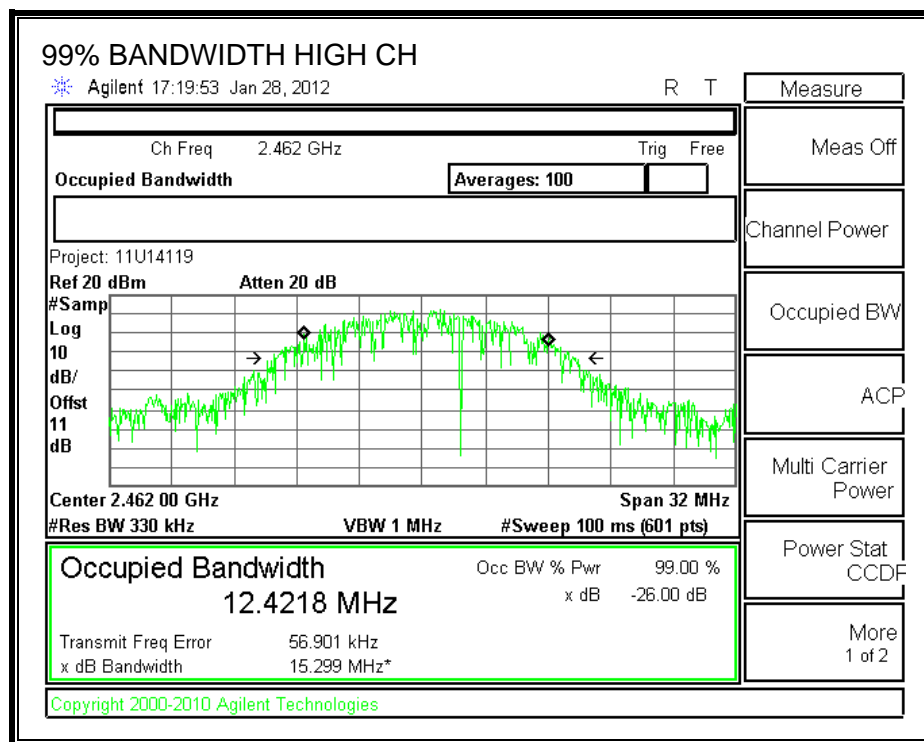
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.4678
Middle	2437	12.7175
High	2462	12.4218

99% BANDWIDTH







7.1.3. 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.

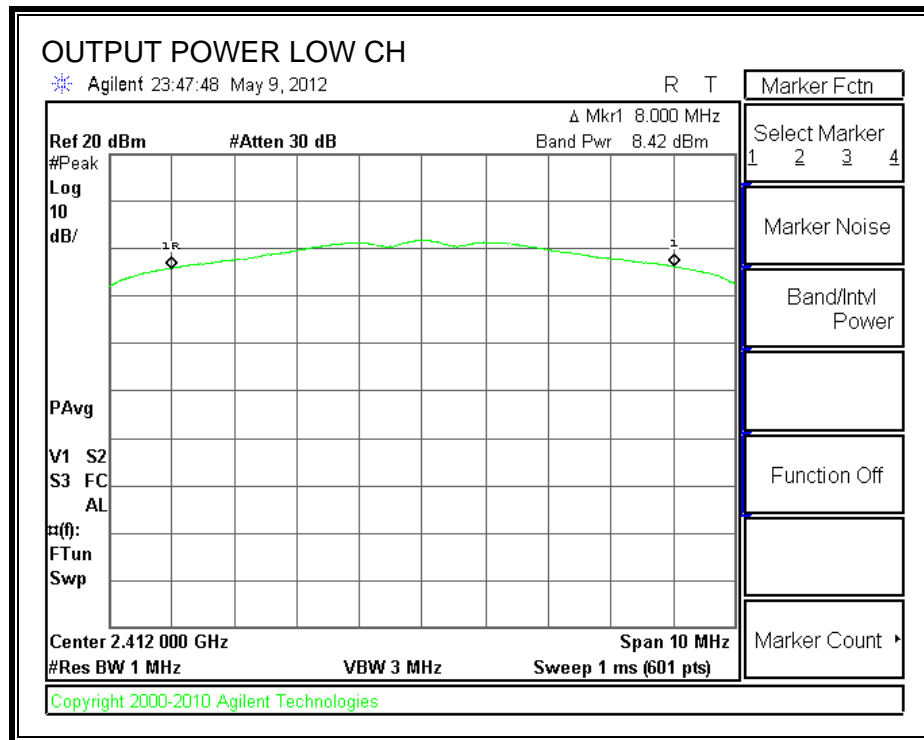
TEST PROCEDURE

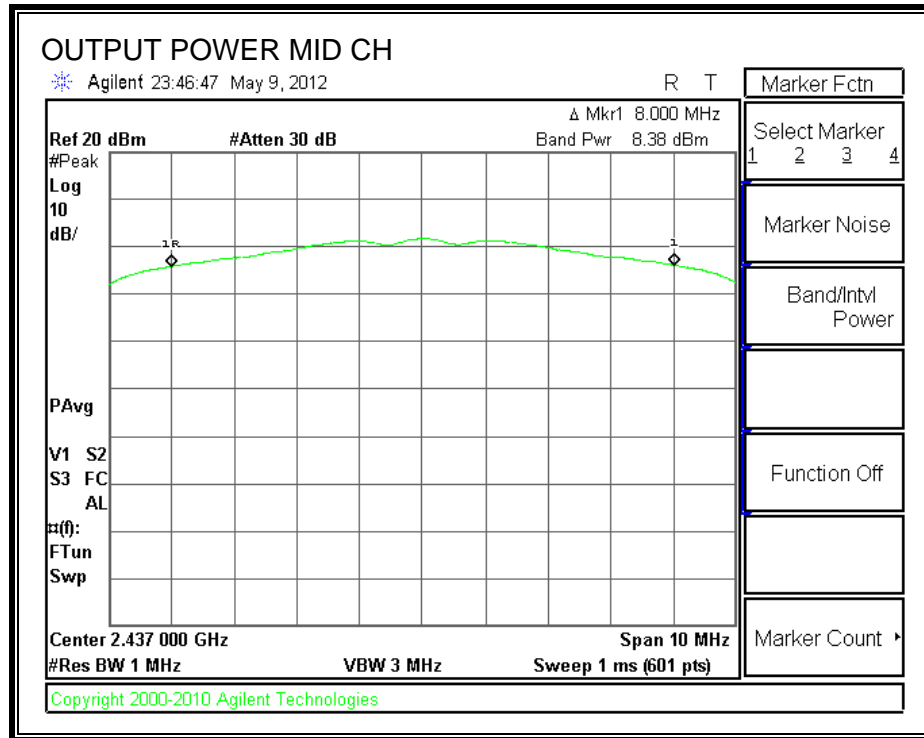
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

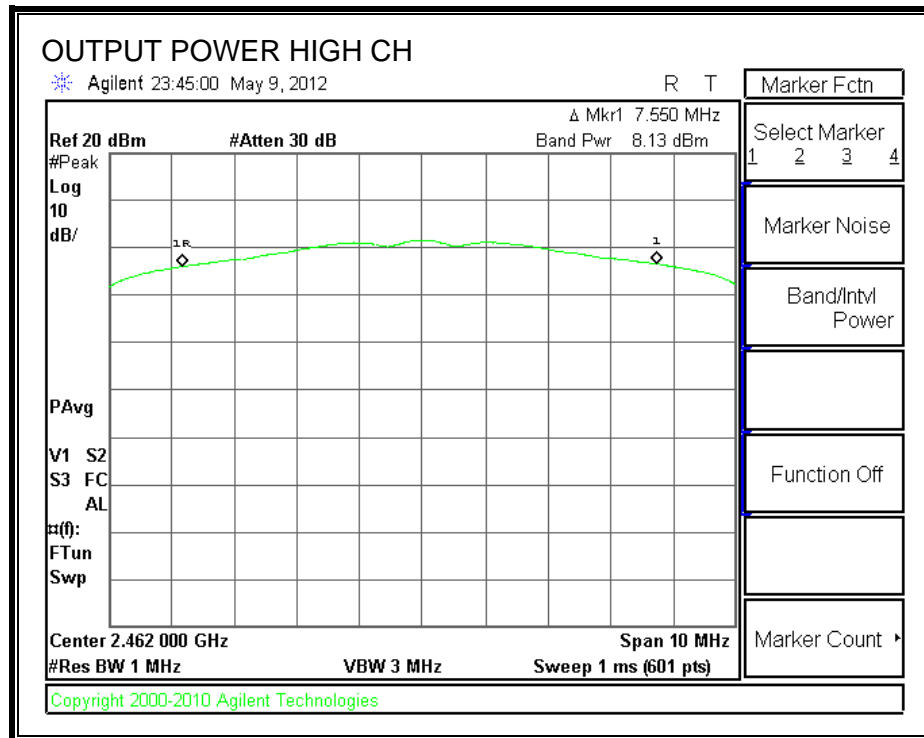
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	8.42	11	19.42	30	-10.58
Middle	2437	8.38	11	19.38	30	-10.62
High	2462	8.13	11	19.13	30	-10.87

OUTPUT POWER







7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	16.73
Middle	2437	16.85
High	2462	16.83

7.1.5. 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

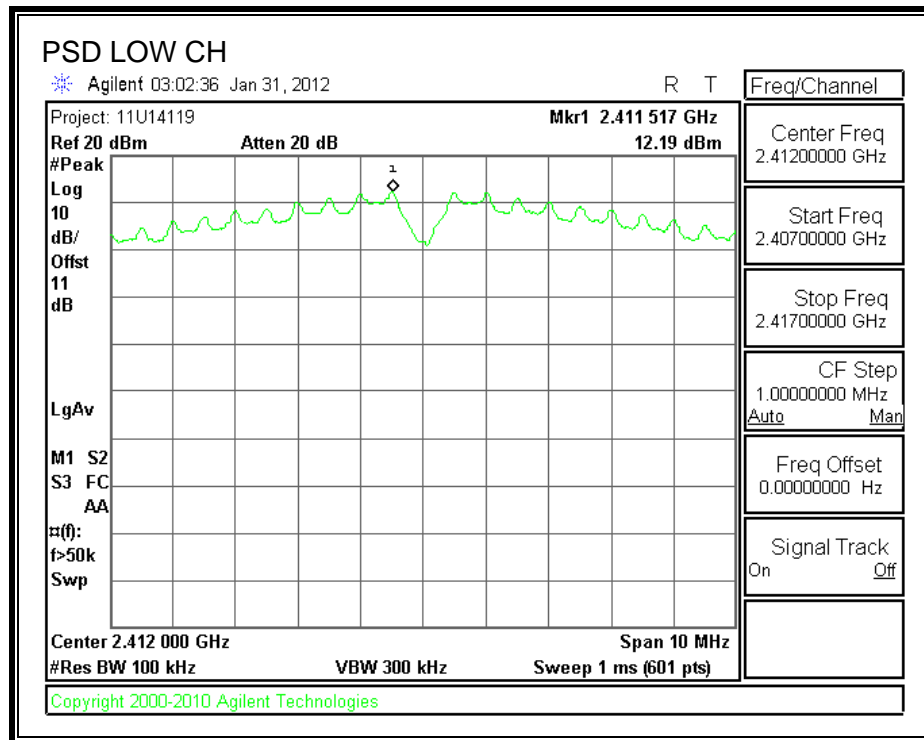
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:

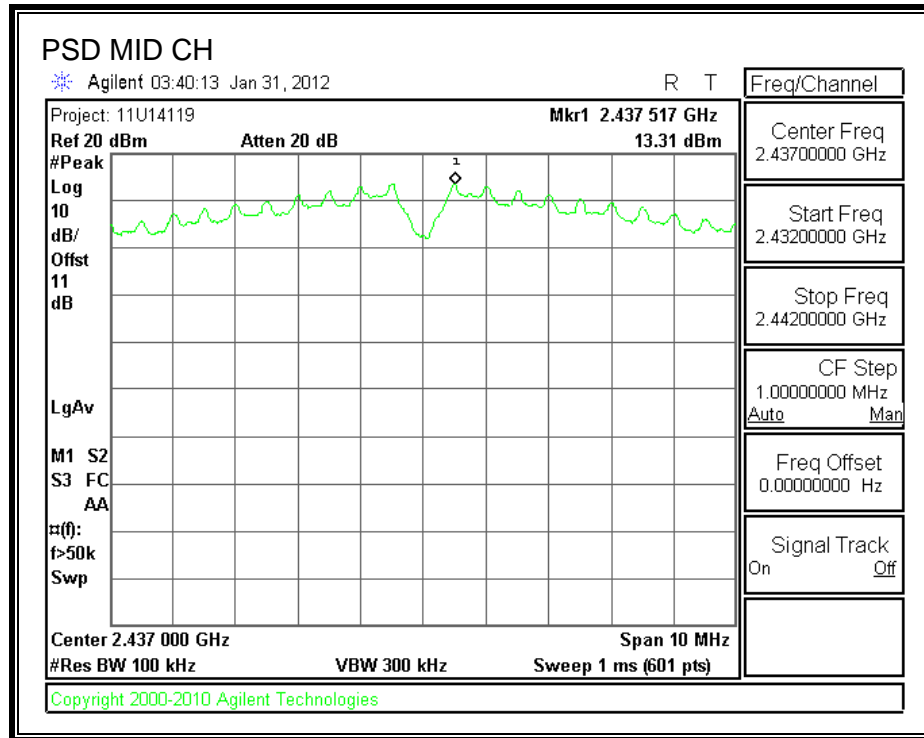
“Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.”

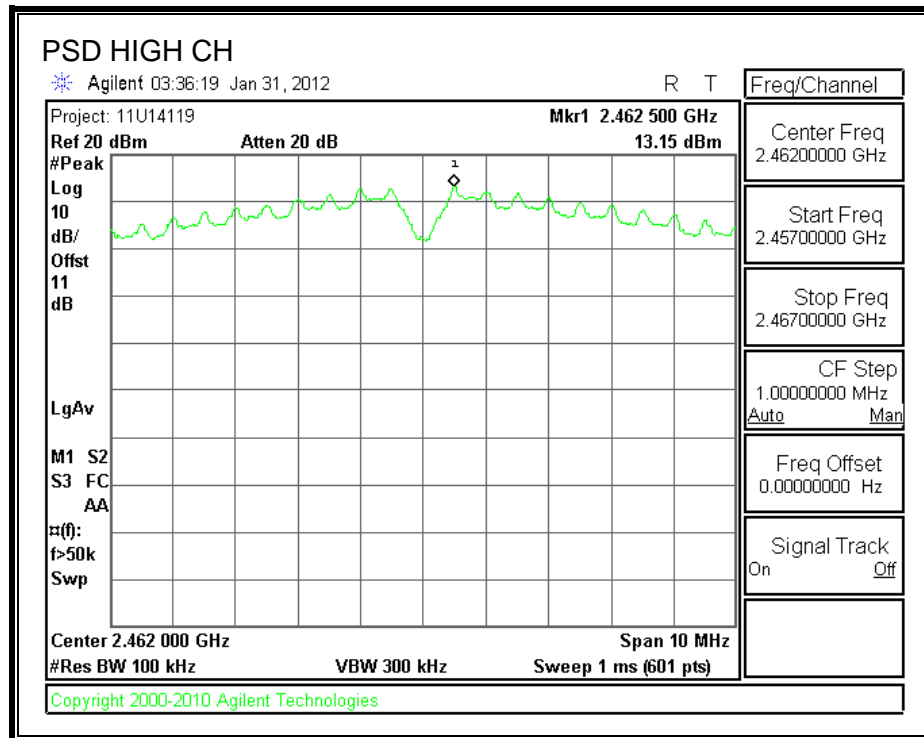
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	10log(3KHz /100KHz)	Limit (dBm)	Margin (dB)
Low	2412	12.19	15.20	8	-11.01
Middle	2437	13.31	15.20	8	-9.89
High	2462	13.15	15.20	8	-10.05

POWER SPECTRAL DENSITY







7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

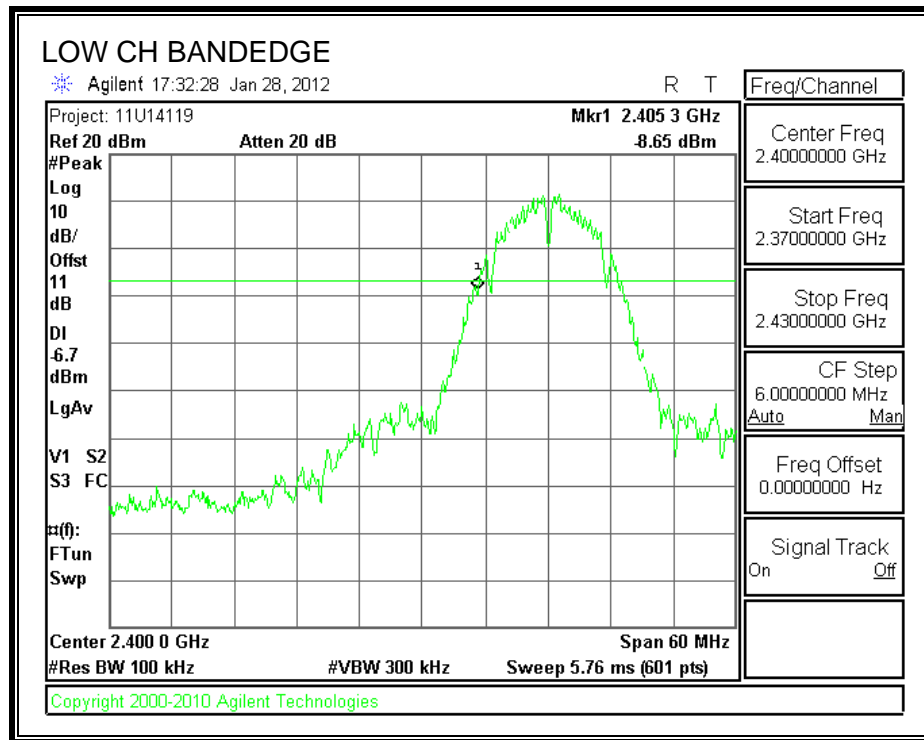
TEST PROCEDURE

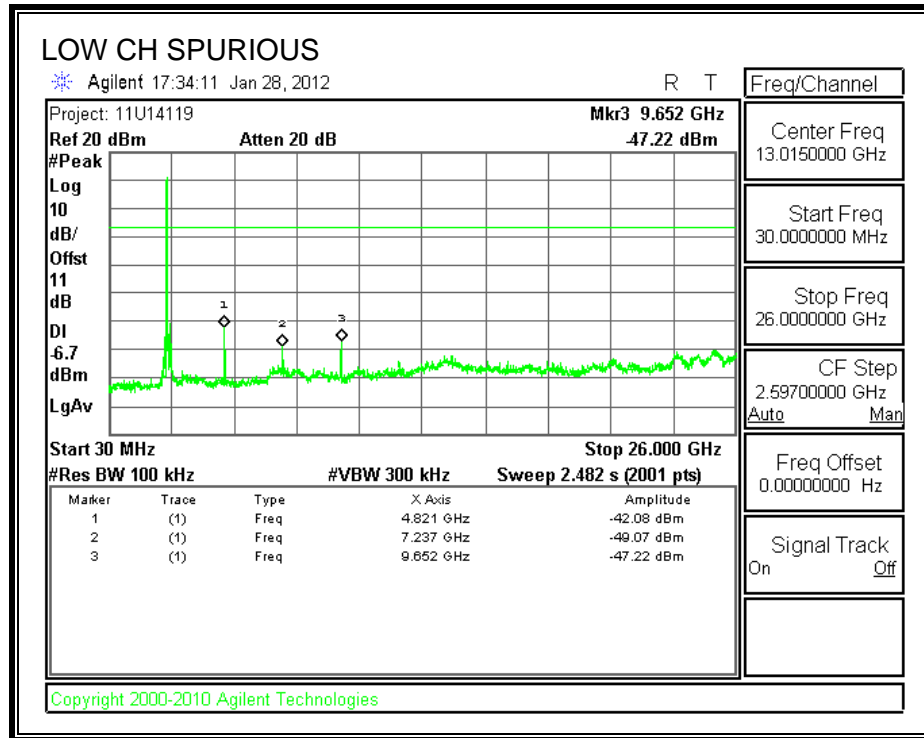
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:

“Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.”

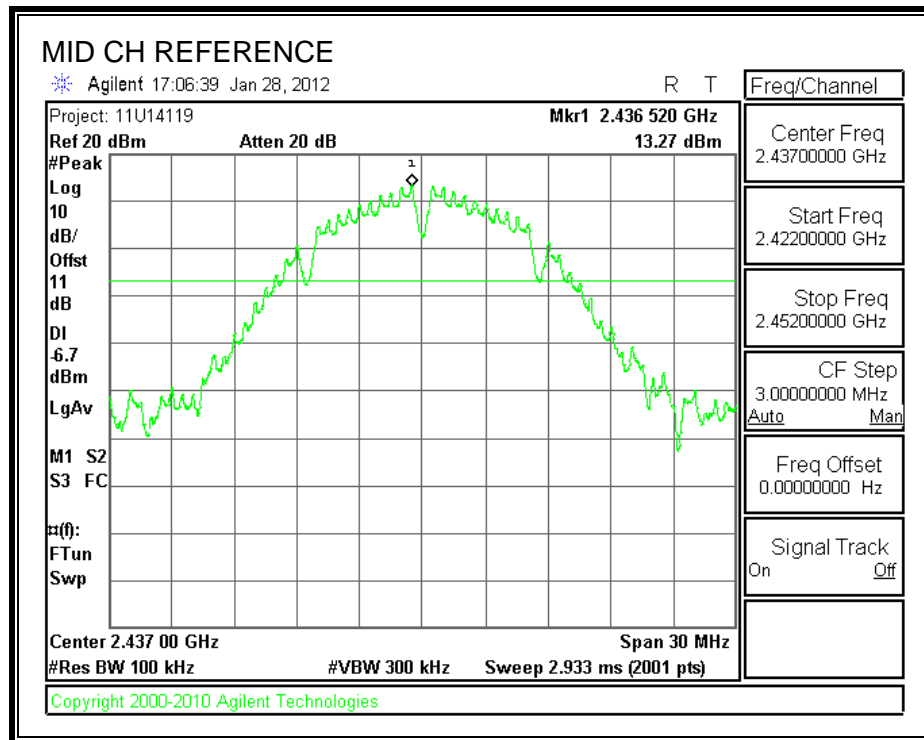
RESULTS

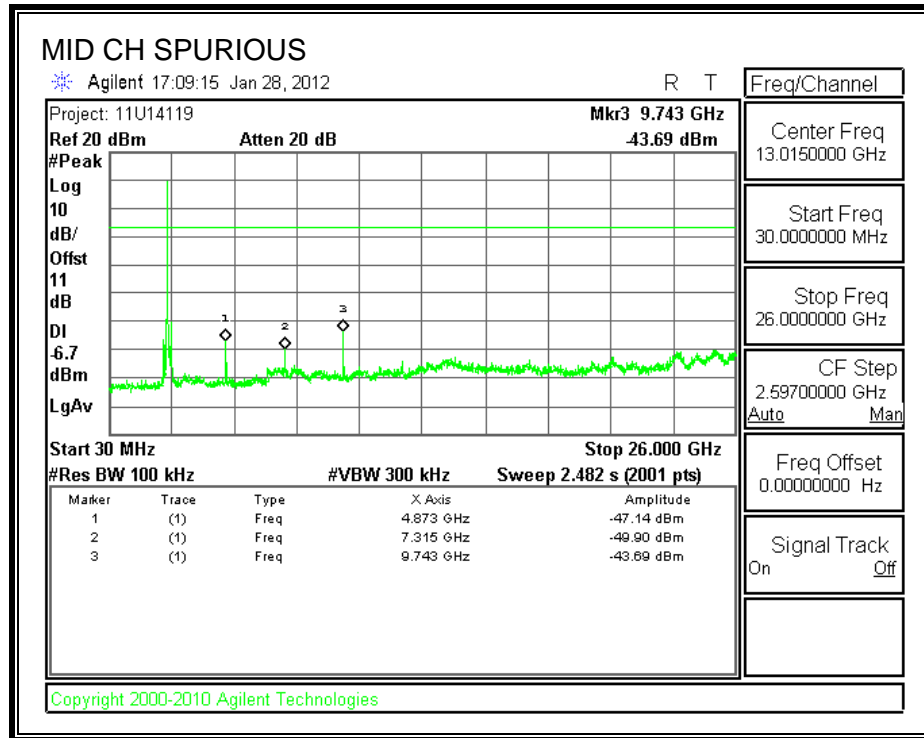
SPURIOUS EMISSIONS, LOW CHANNEL



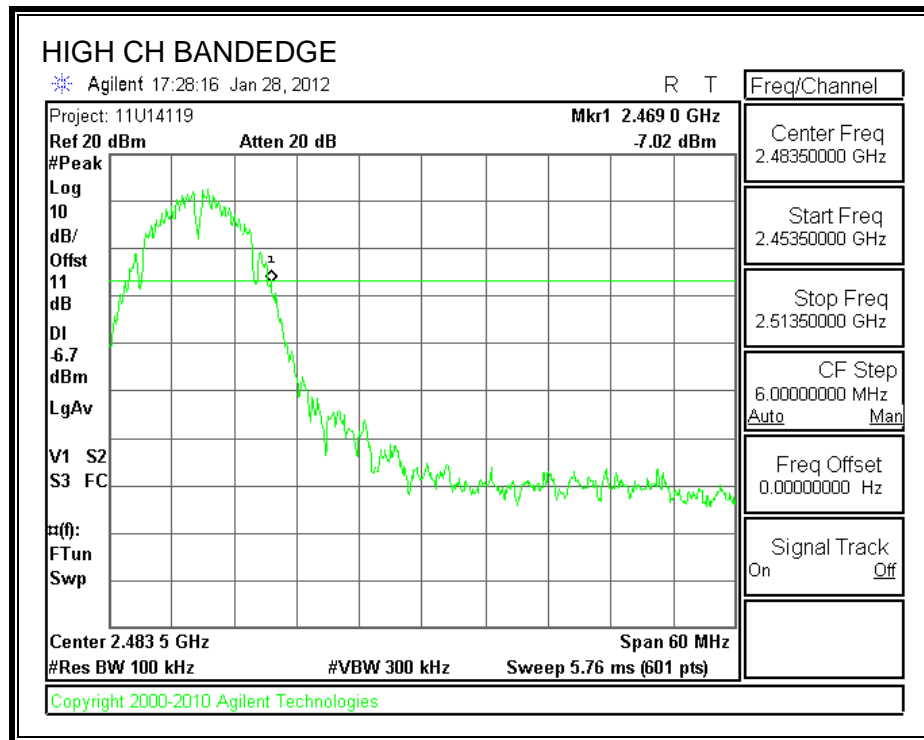


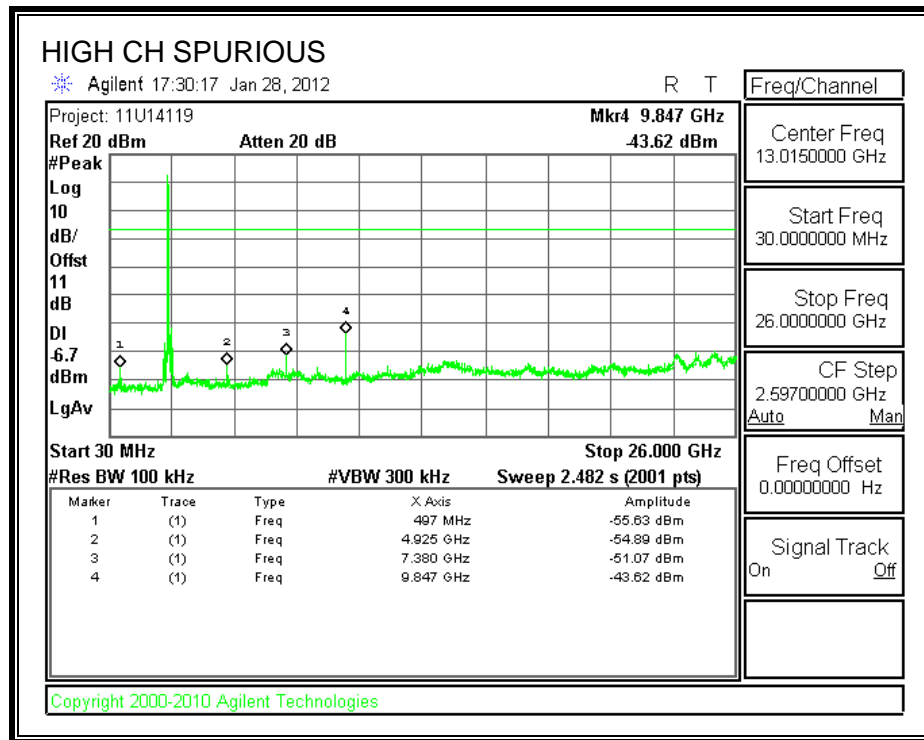
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.2. 802.11g MODE IN THE 2.4 GHz BAND

7.2.1. 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.

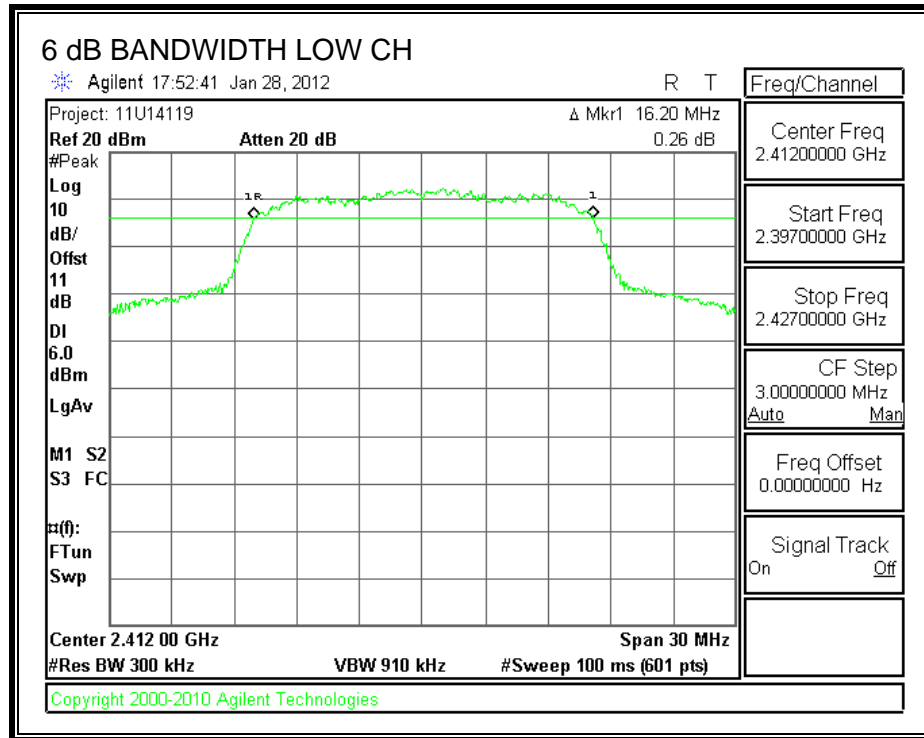
TEST PROCEDURE

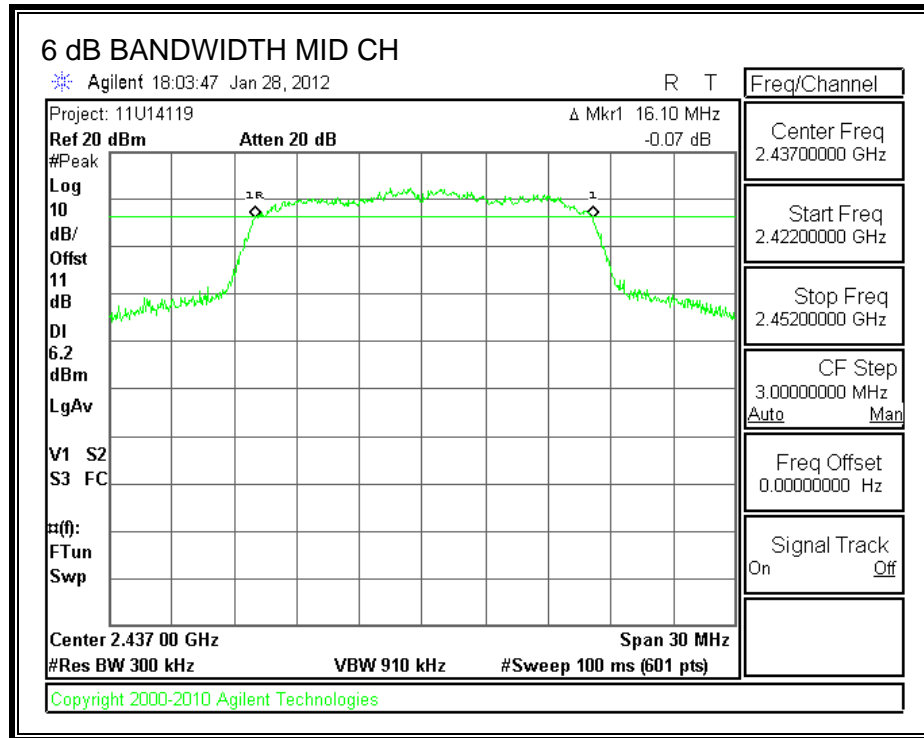
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

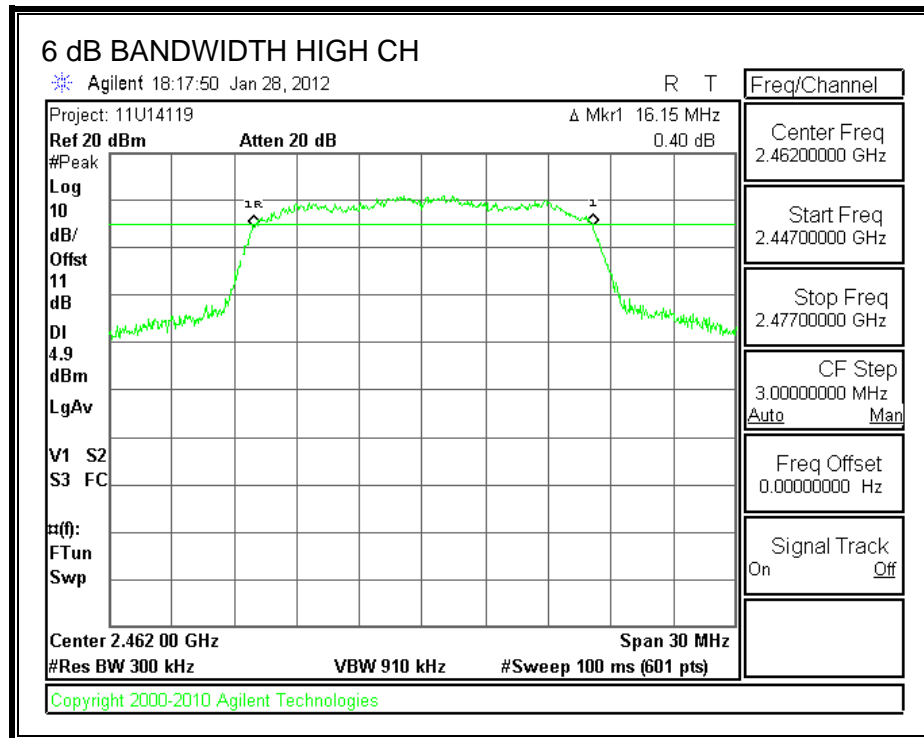
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.20	0.5
Middle	2437	16.10	0.5
High	2462	16.15	0.5

6 dB BANDWIDTH







7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

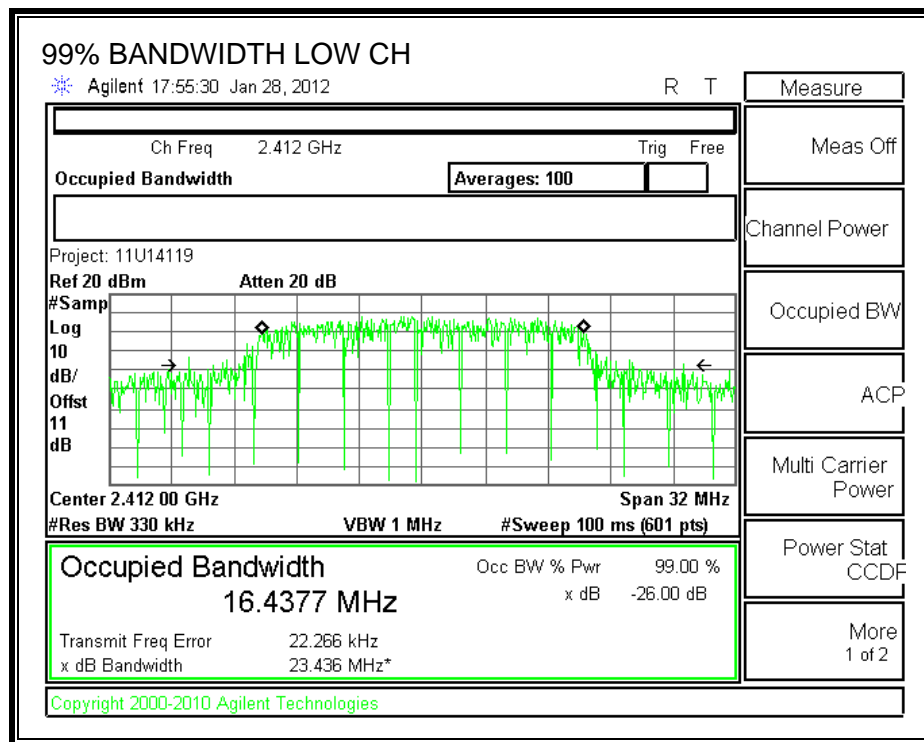
TEST PROCEDURE

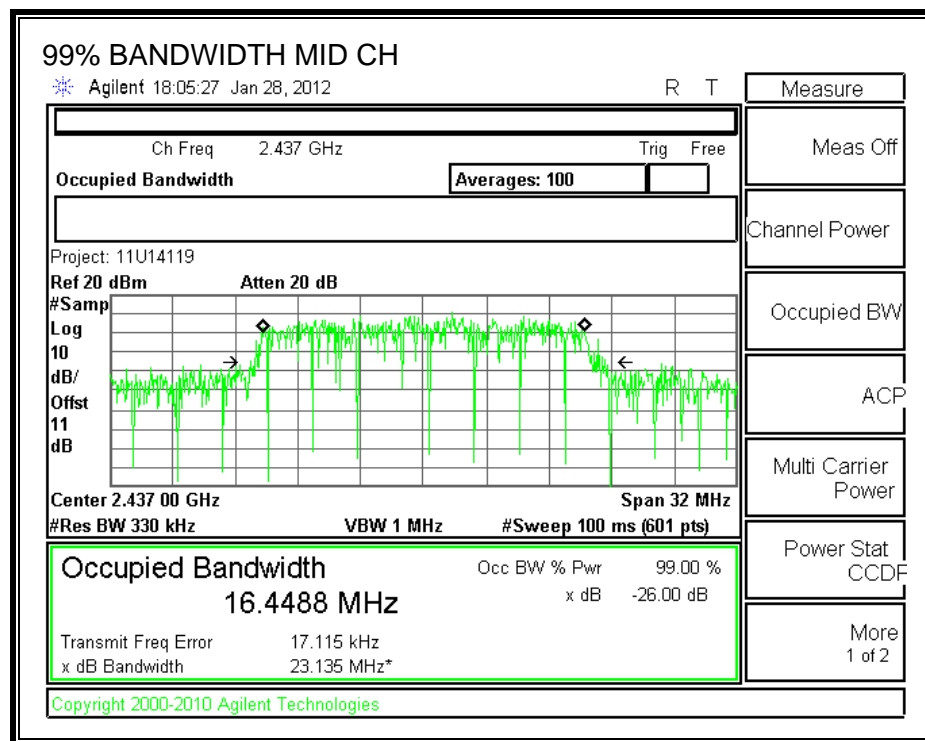
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

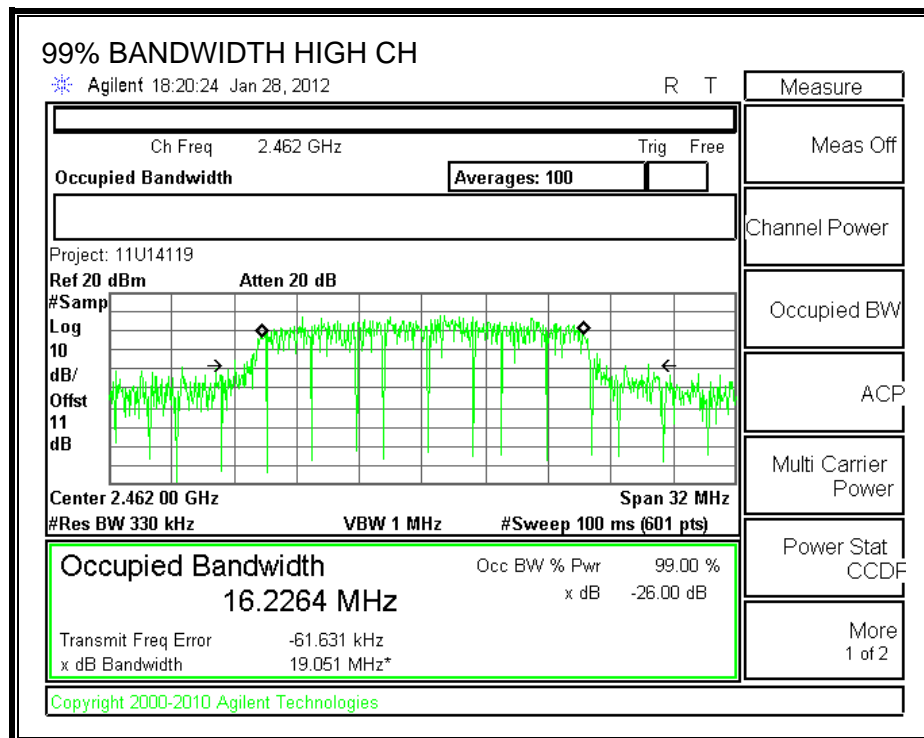
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.4377
Middle	2437	16.4488
High	2462	16.2264

99% BANDWIDTH







7.2.3. 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.

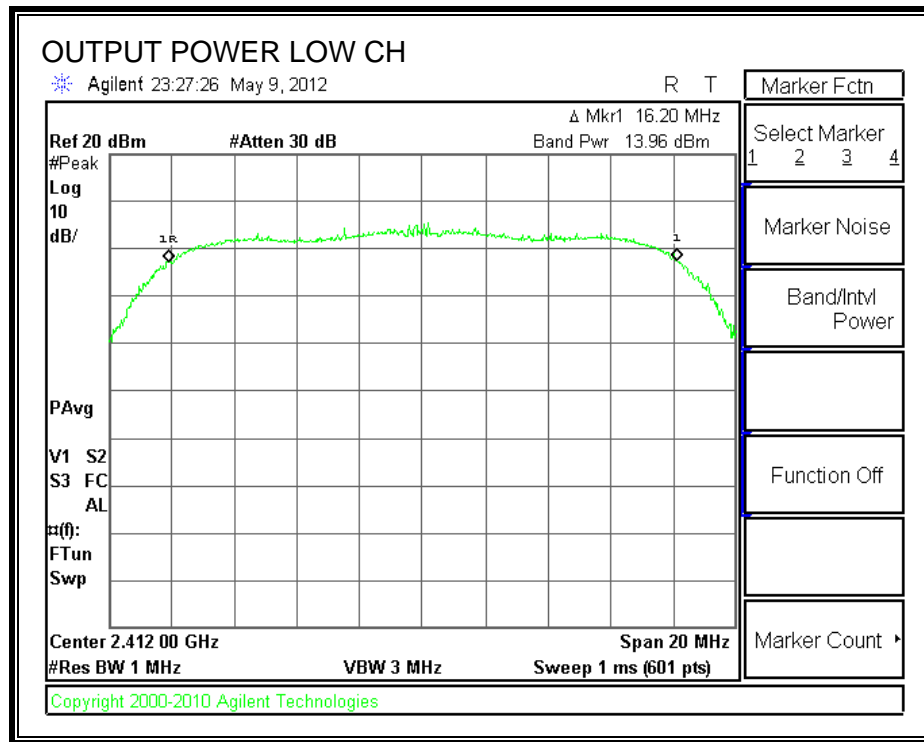
TEST PROCEDURE

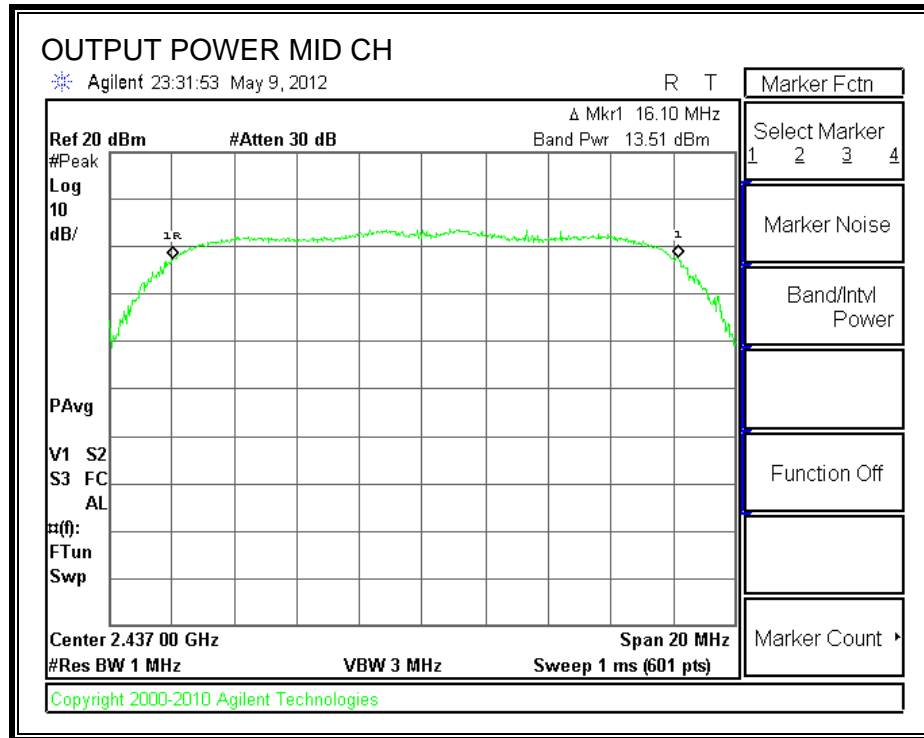
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

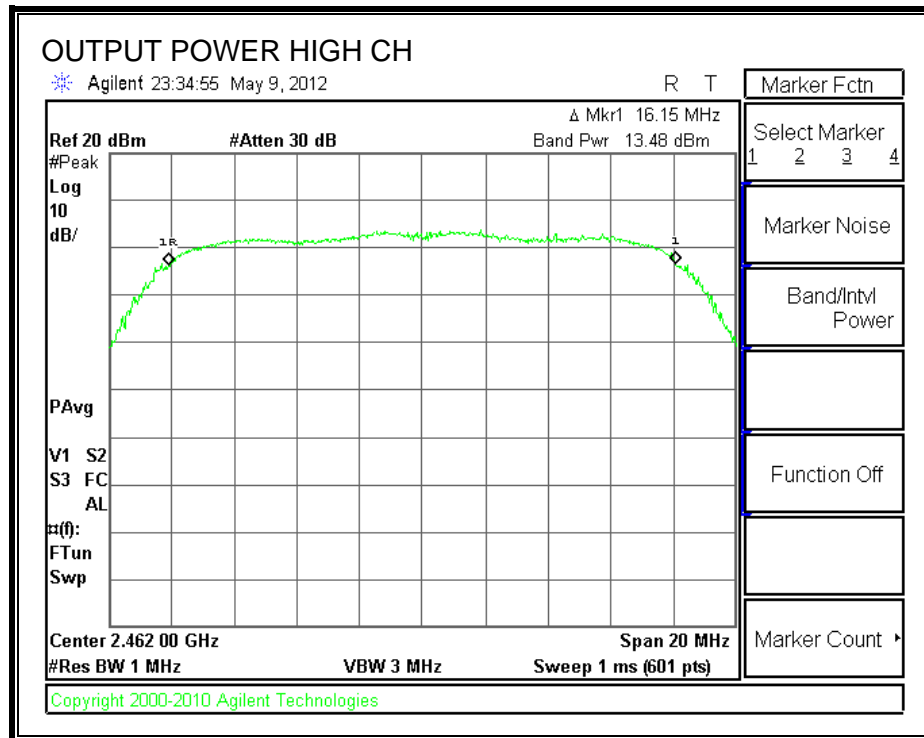
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	13.96	11	24.96	30	-5.04
Middle	2437	13.51	11	24.51	30	-5.49
High	2462	13.48	11	24.48	30	-5.52

OUTPUT POWER







7.2.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	17.12
Middle	2437	17.04
High	2462	17.16

7.2.5. 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

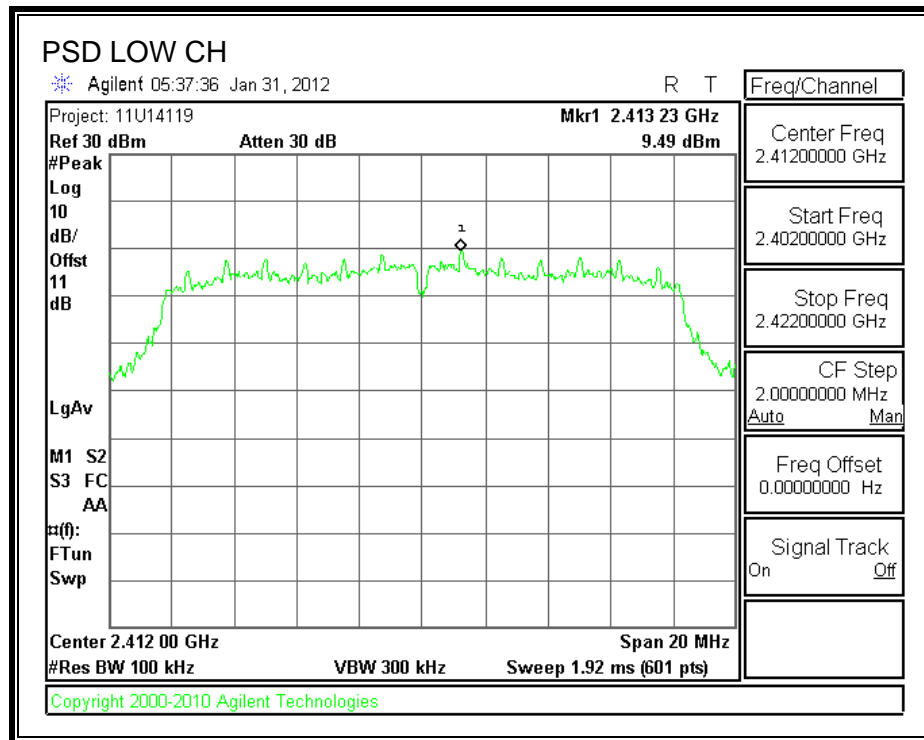
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:

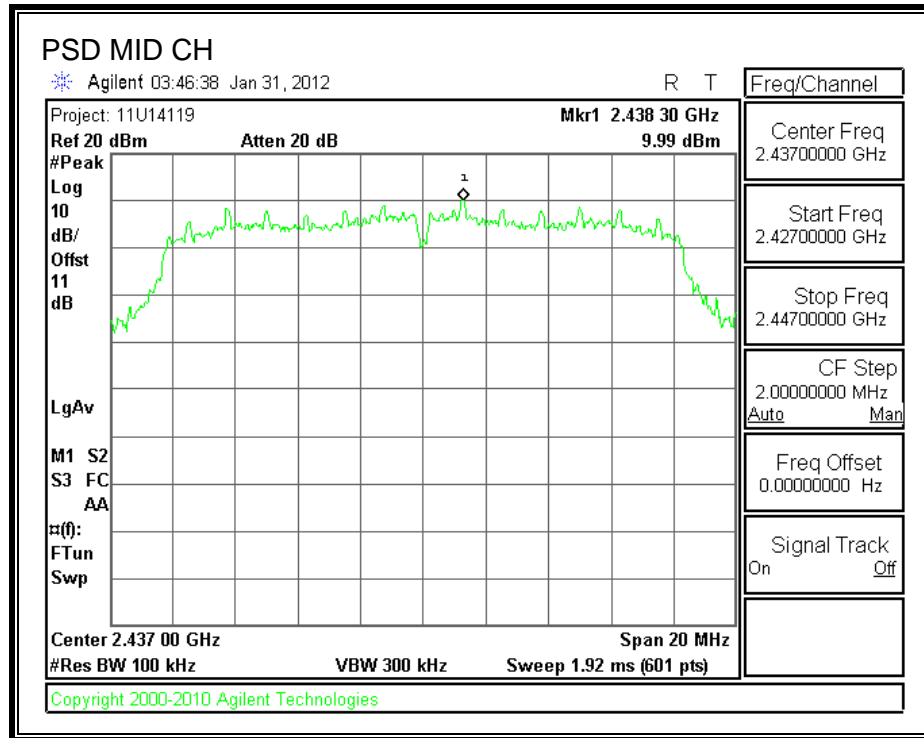
“Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.”

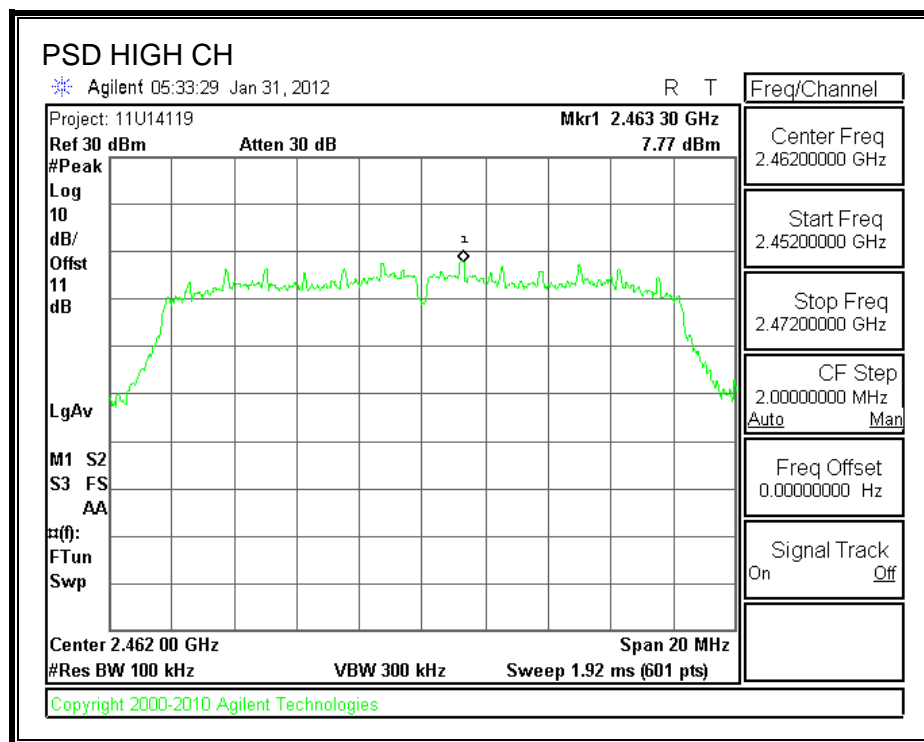
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	10log(3KHz /100KHz)	Limit (dBm)	Margin (dB)
Low	2412	9.49	15.20	8	-13.71
Middle	2437	9.99	15.20	8	-13.21
High	2462	7.77	15.20	8	-15.43

POWER SPECTRAL DENSITY







7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

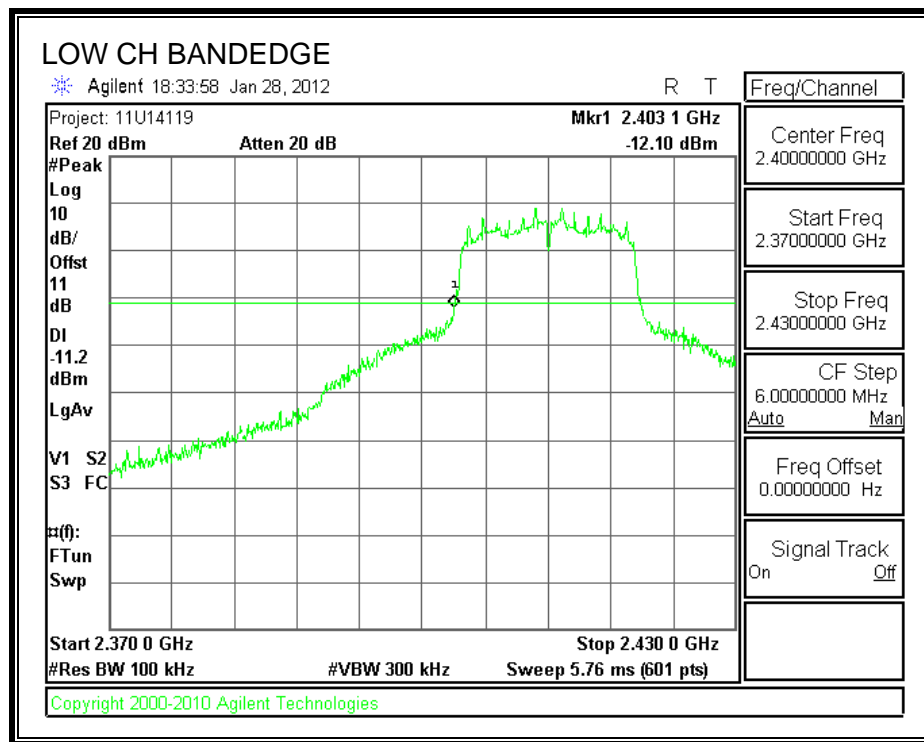
TEST PROCEDURE

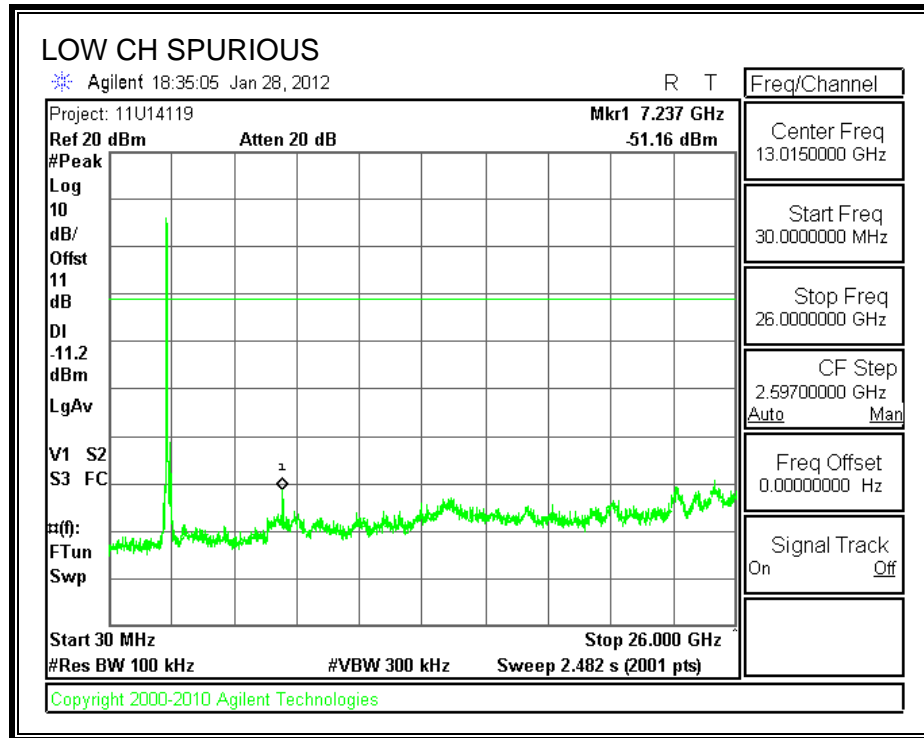
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:

“Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.”

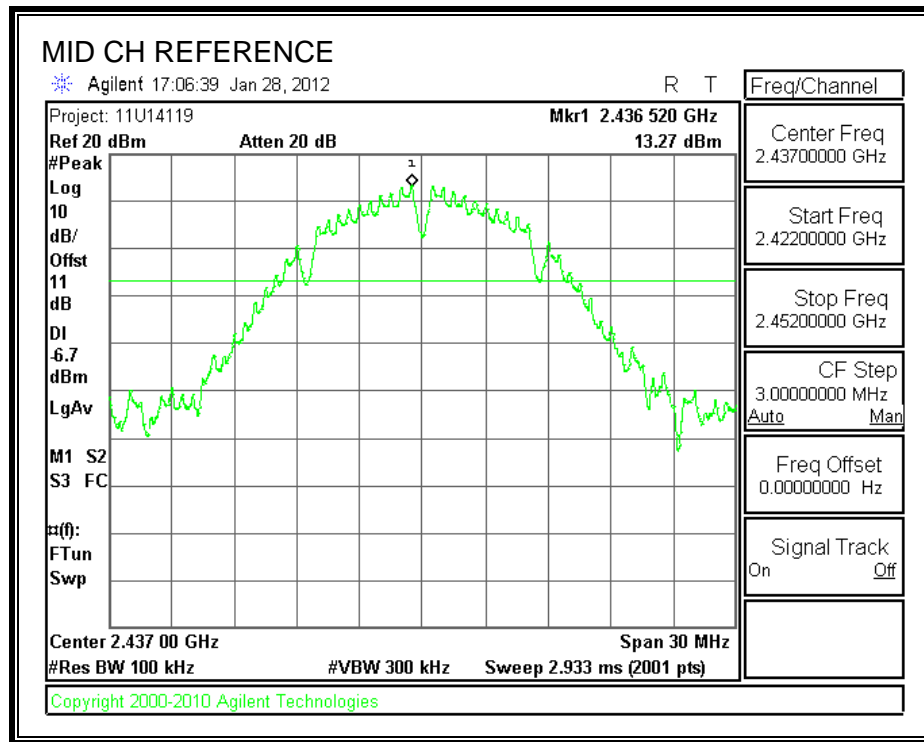
RESULTS

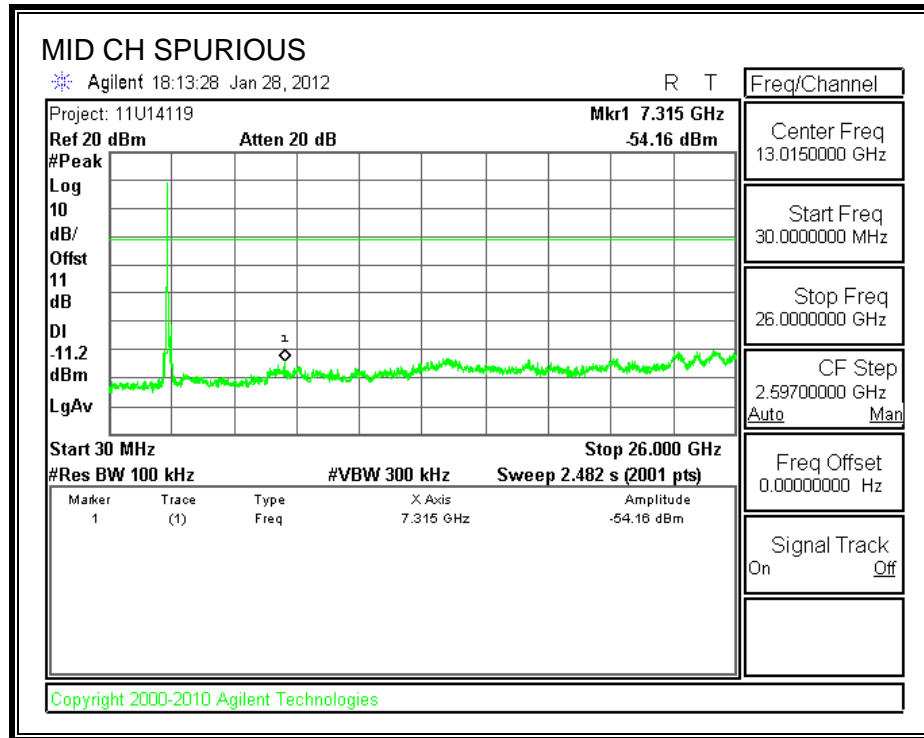
SPURIOUS EMISSIONS, LOW CHANNEL



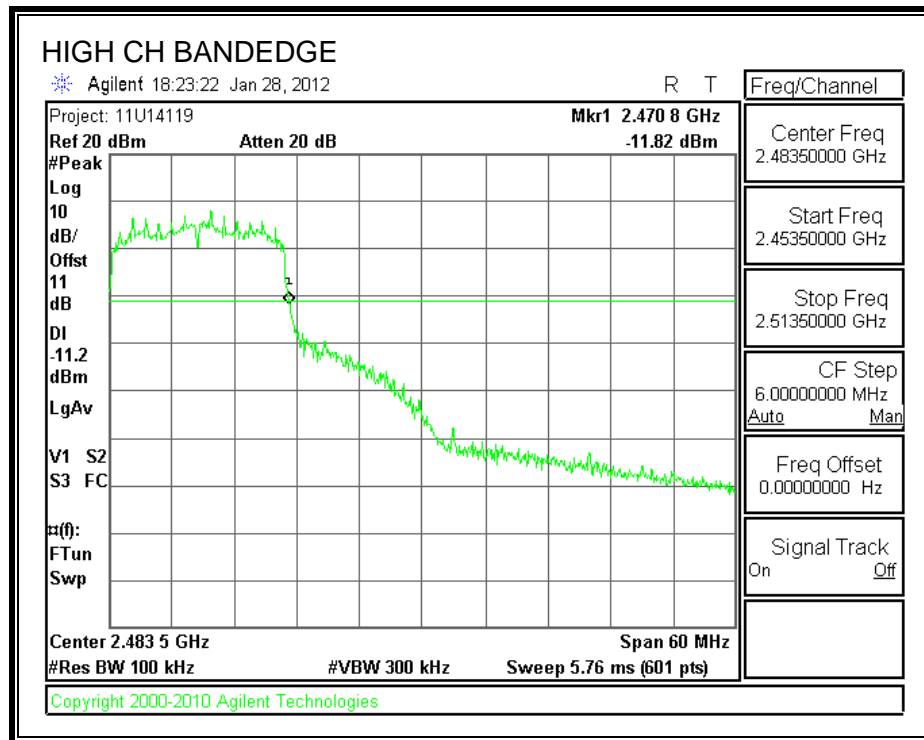


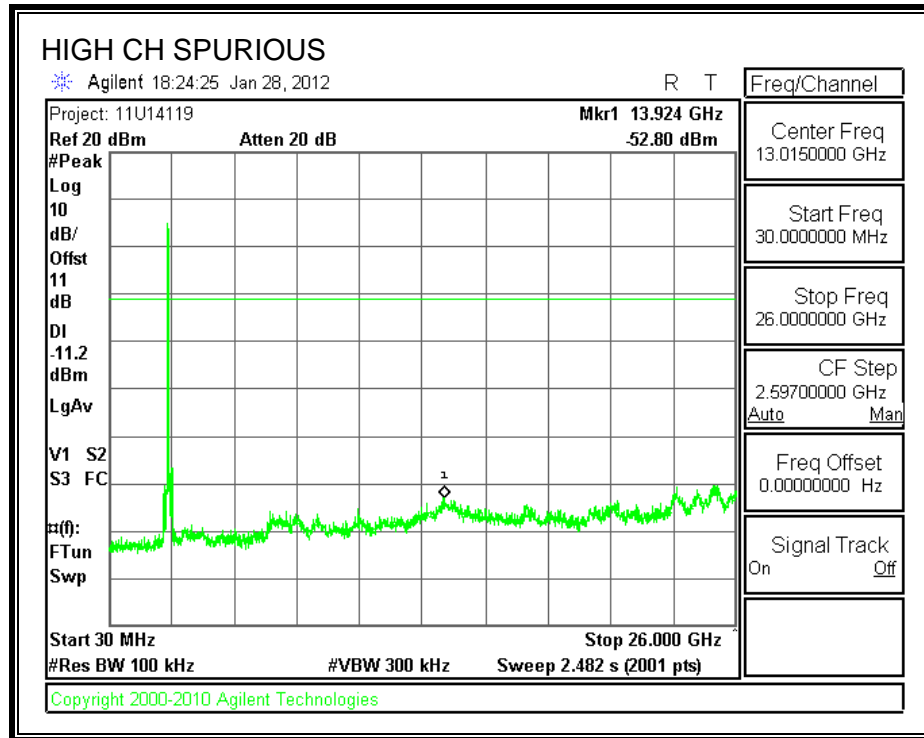
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.3. 802.11n HT 20 MODE IN THE 2.4 GHz BAND

7.3.1. 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.

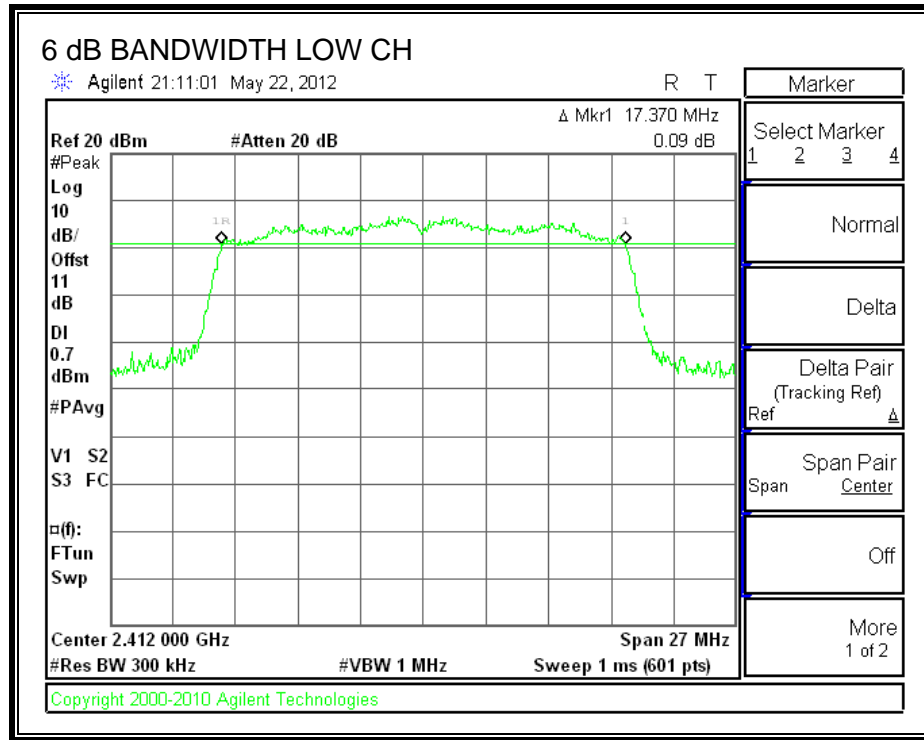
TEST PROCEDURE

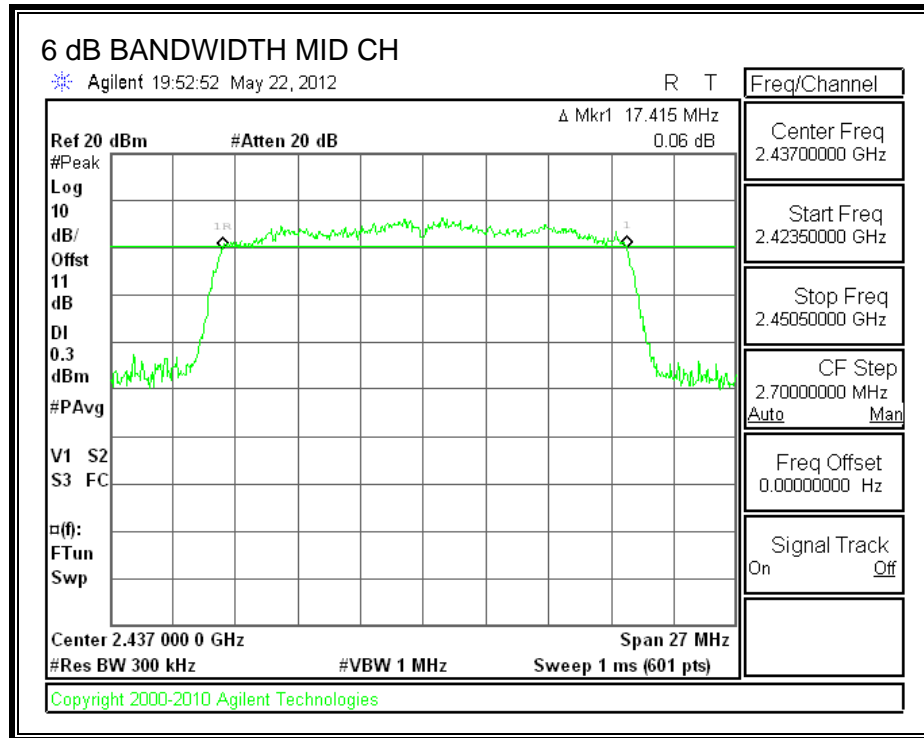
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

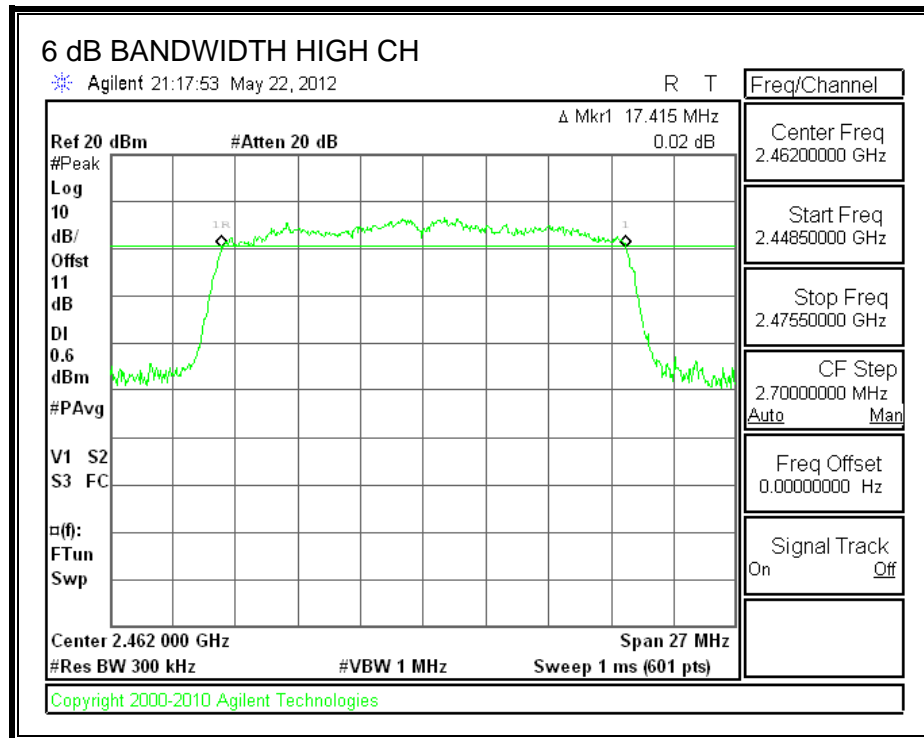
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.37	0.5
Middle	2437	17.42	0.5
High	2462	17.42	0.5

6 dB BANDWIDTH







7.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

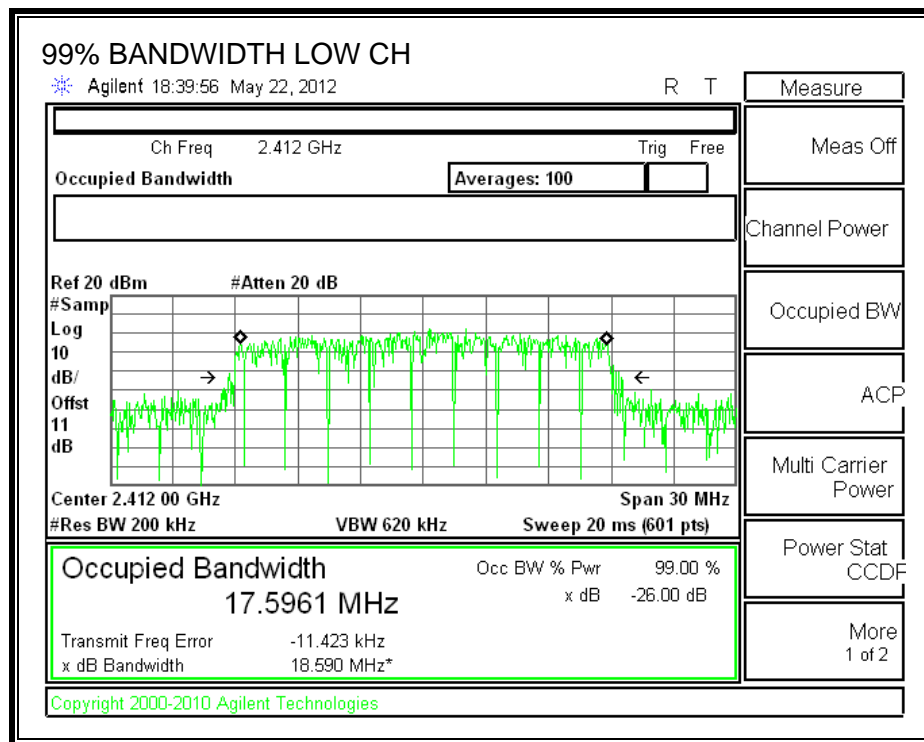
TEST PROCEDURE

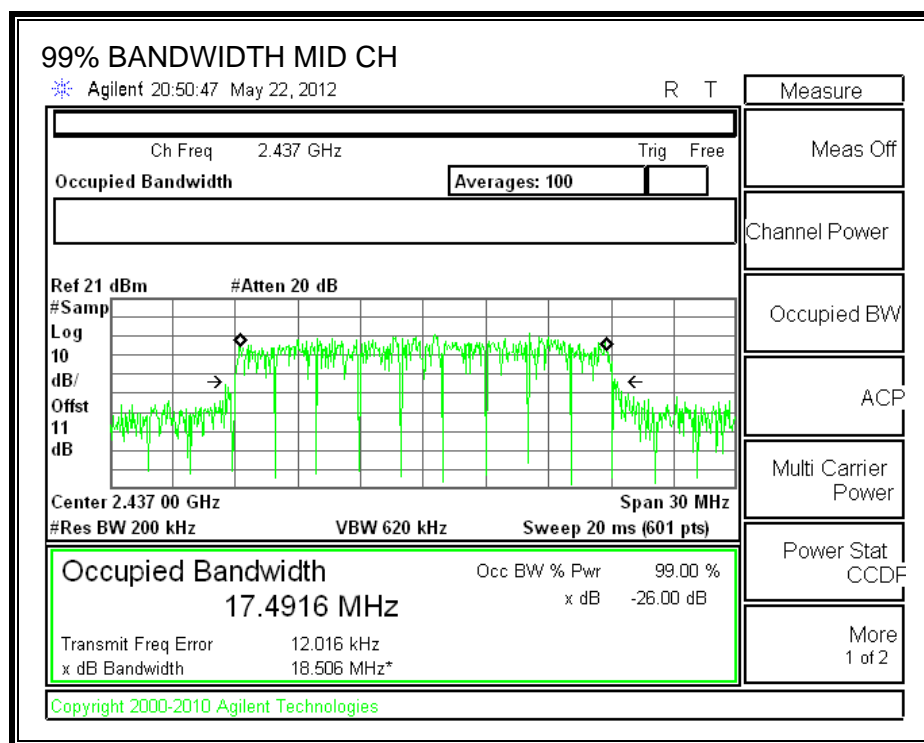
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

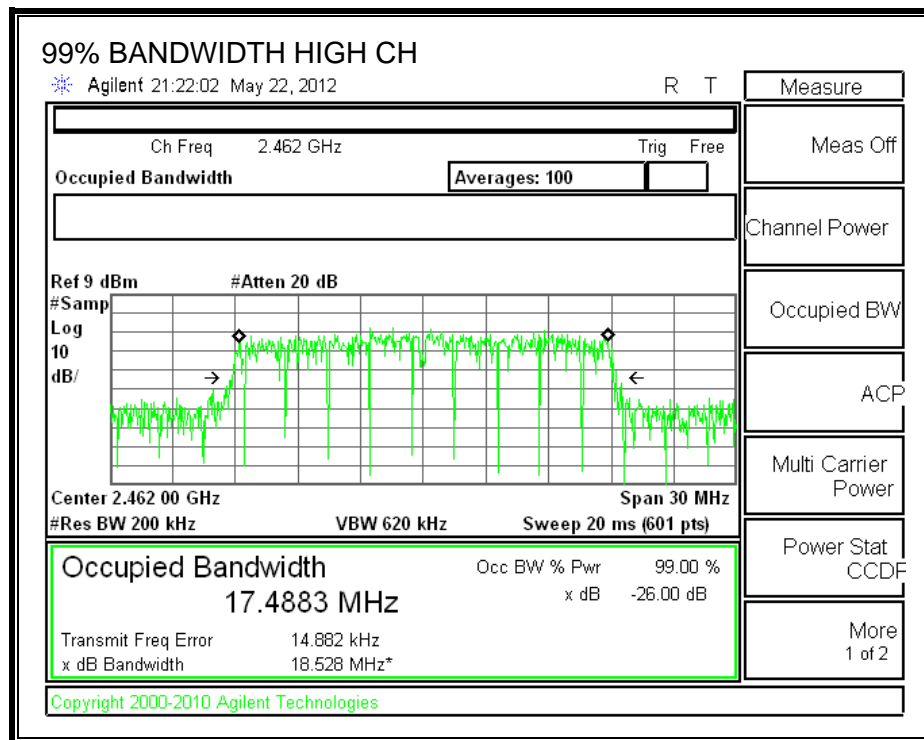
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.5691
Middle	2437	17.4916
High	2462	17.4883

99% BANDWIDTH







7.3.3. 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.

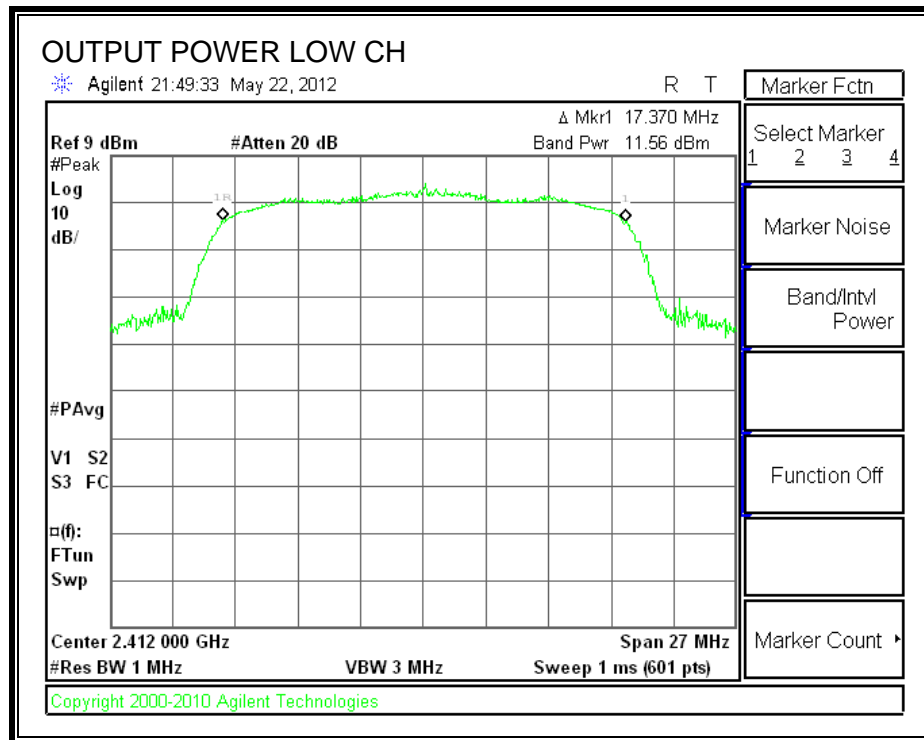
TEST PROCEDURE

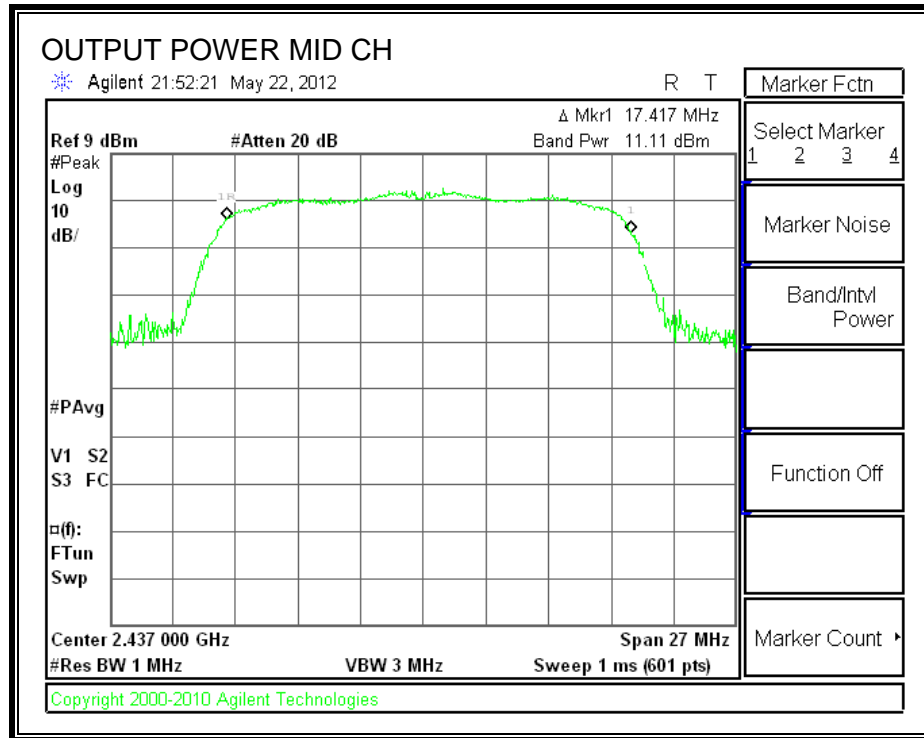
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

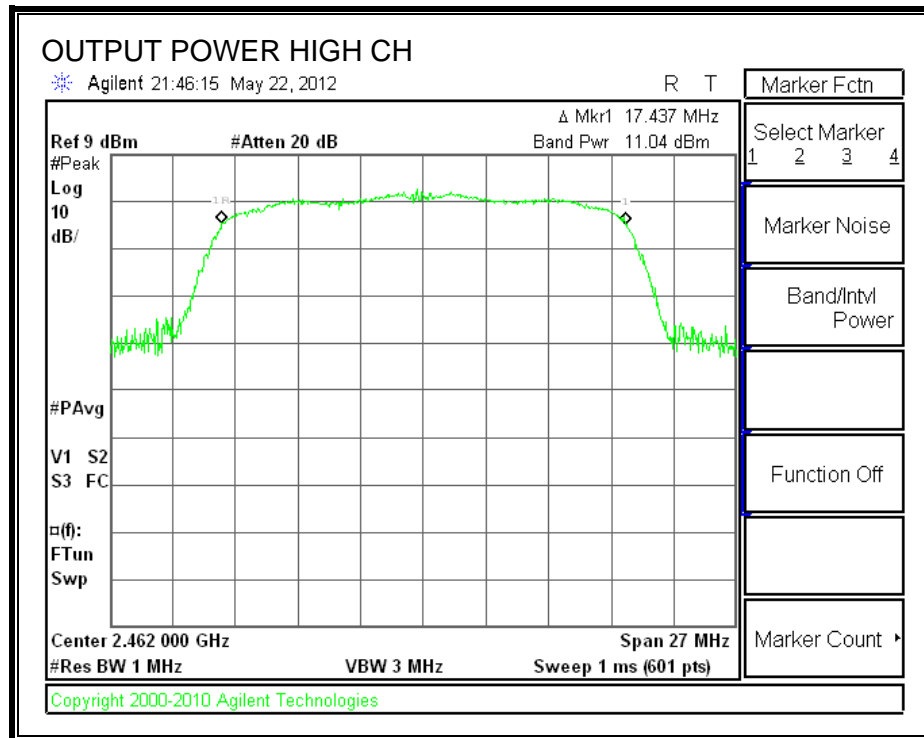
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	11.56	11	22.56	30	-7.44
Middle	2437	11.11	11	22.11	30	-7.89
High	2462	11.04	11	22.04	30	-7.96

OUTPUT POWER







7.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	14.04
Middle	2437	13.98
High	2462	14.03

7.3.5. 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

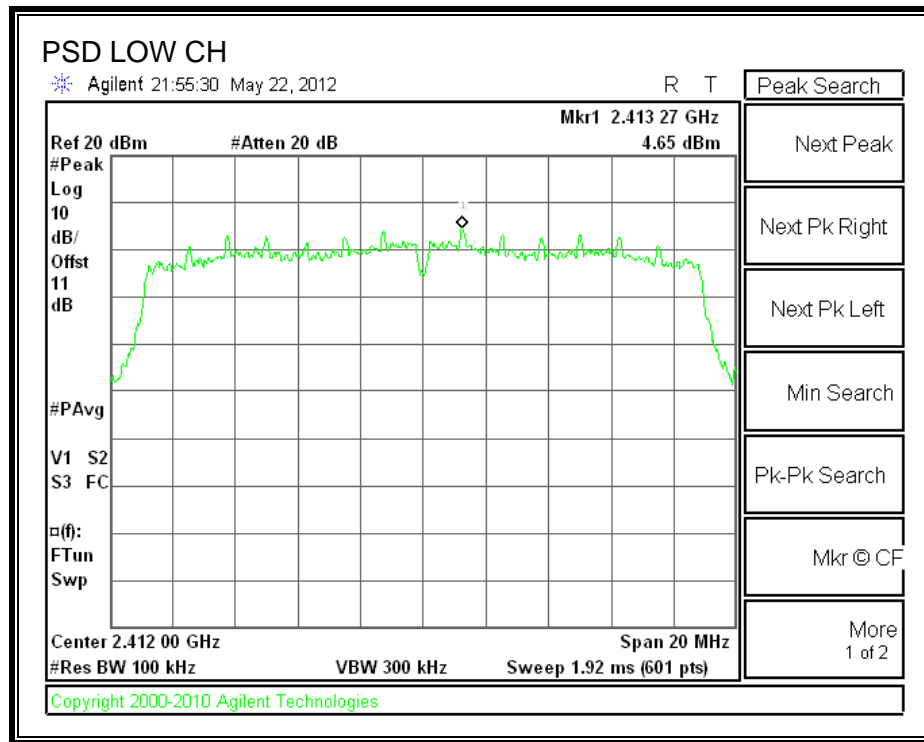
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:

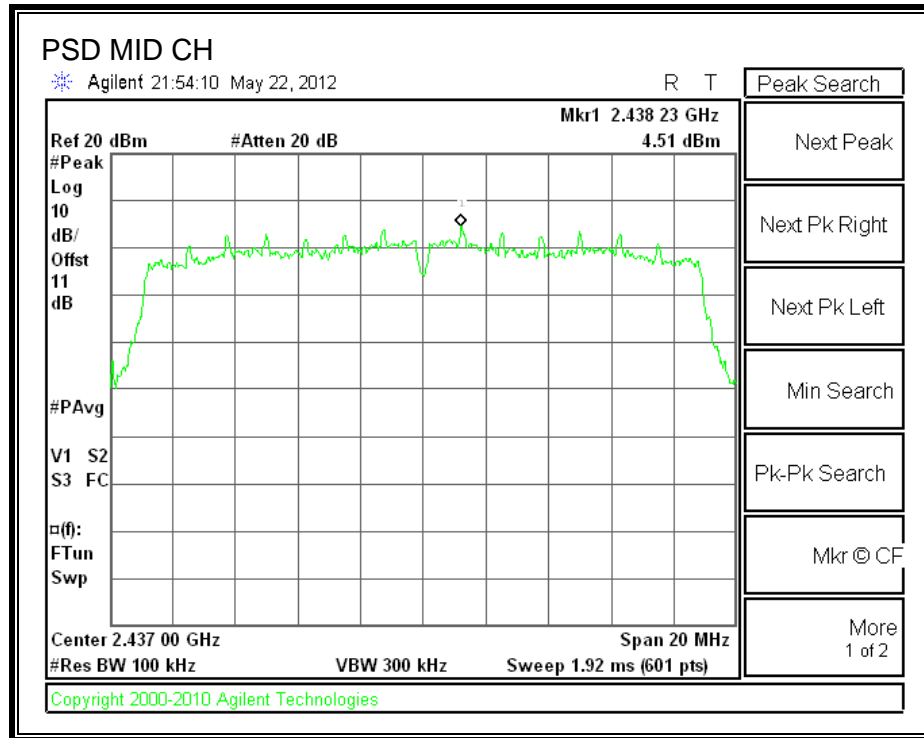
“Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.”

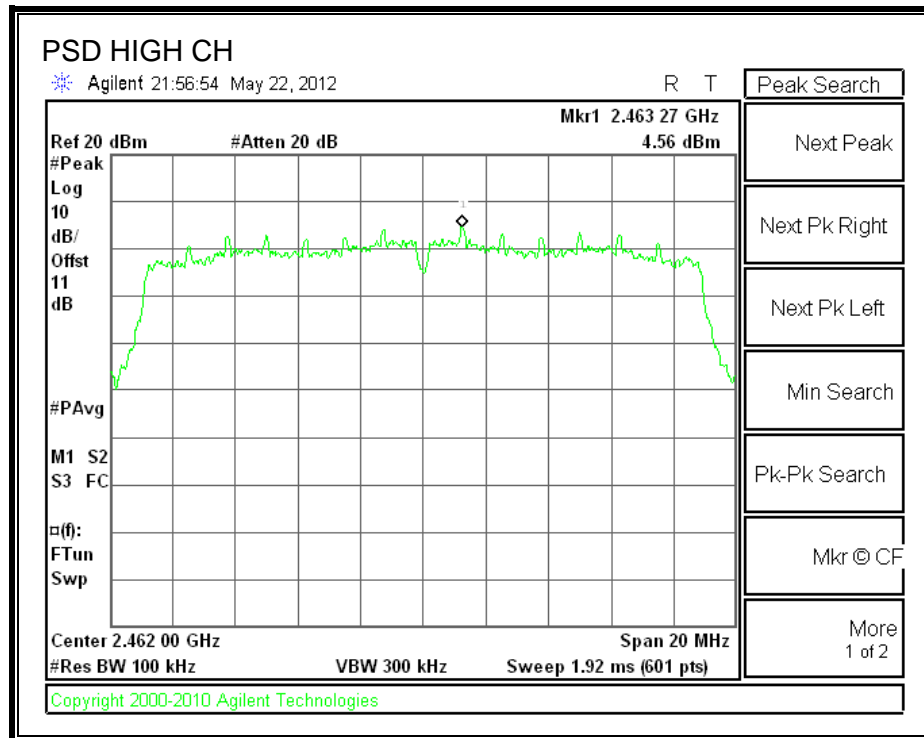
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	10log(3KHz /100KHz)	Limit (dBm)	Margin (dB)
Low	2412	4.65	15.20	8	-18.55
Middle	2437	4.51	15.20	8	-18.69
High	2462	4.56	15.20	8	-18.64

POWER SPECTRAL DENSITY







7.3.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

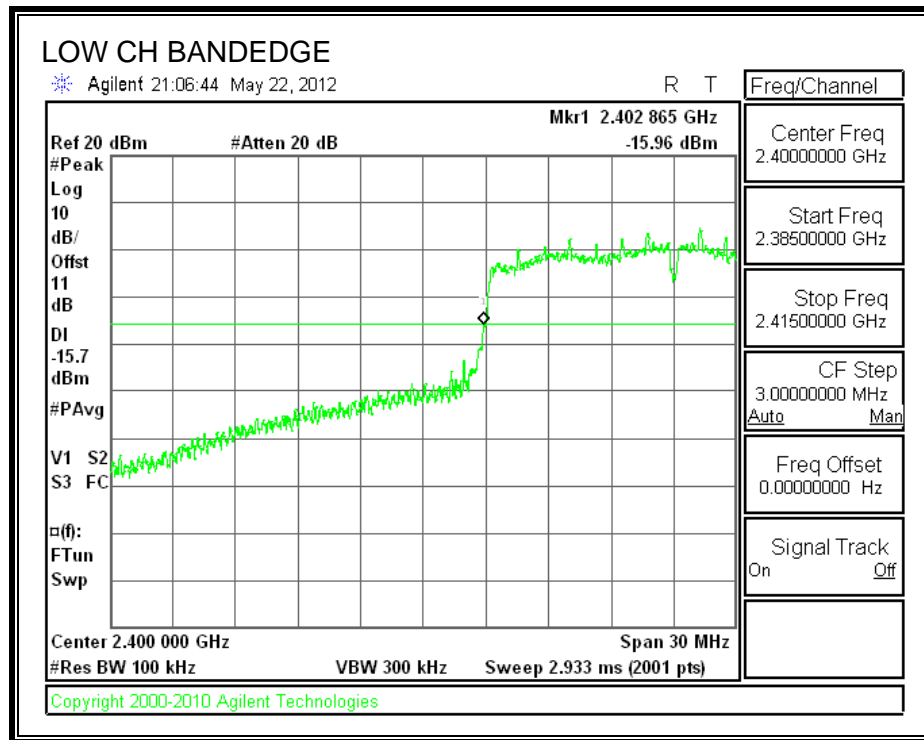
TEST PROCEDURE

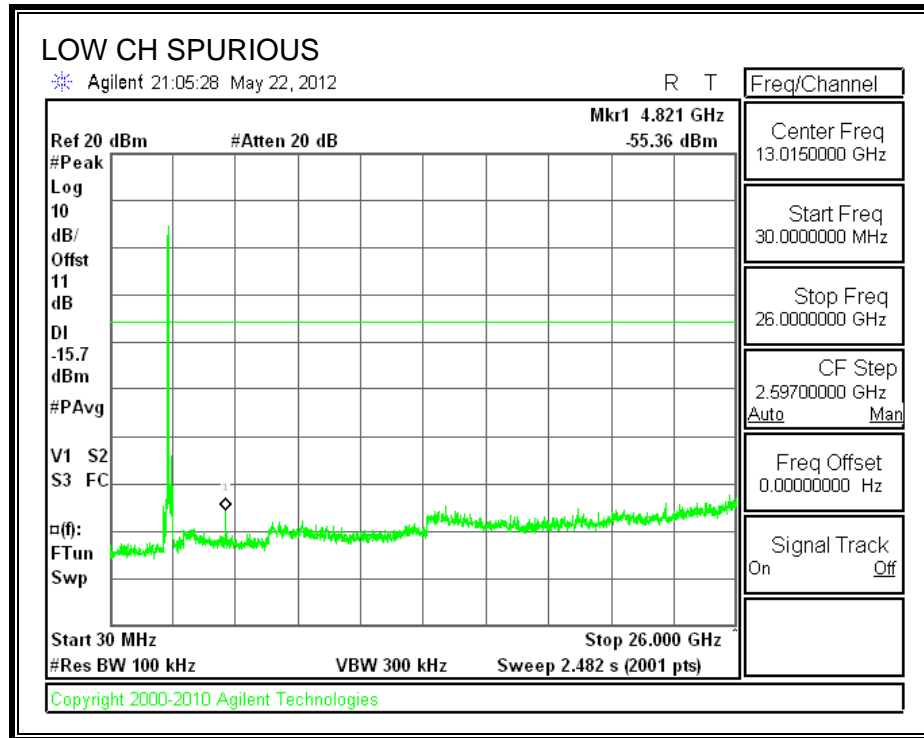
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:

“Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.”

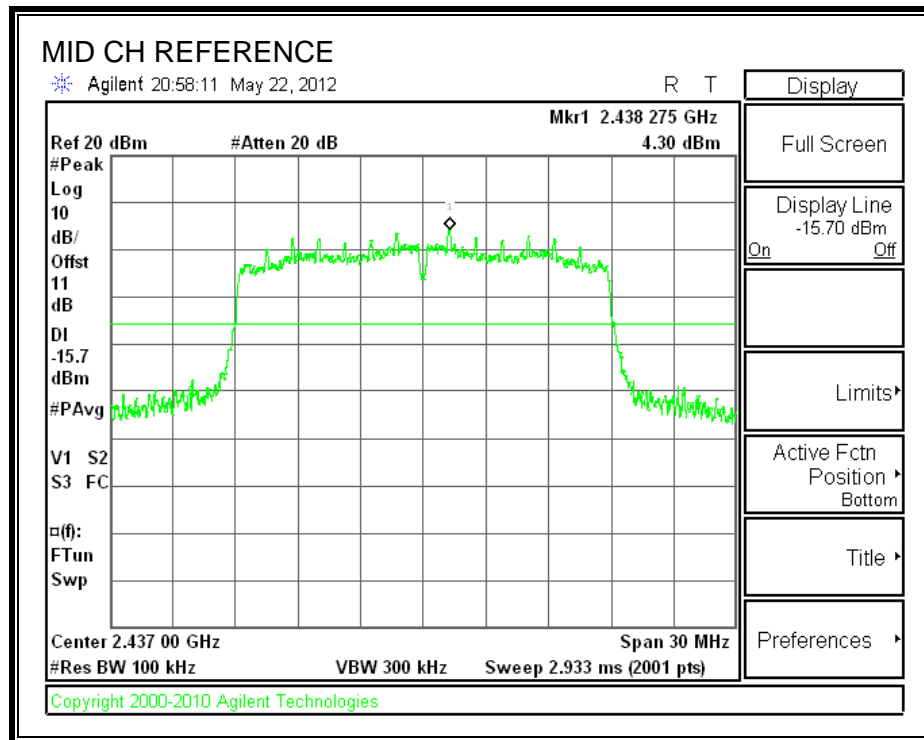
RESULTS

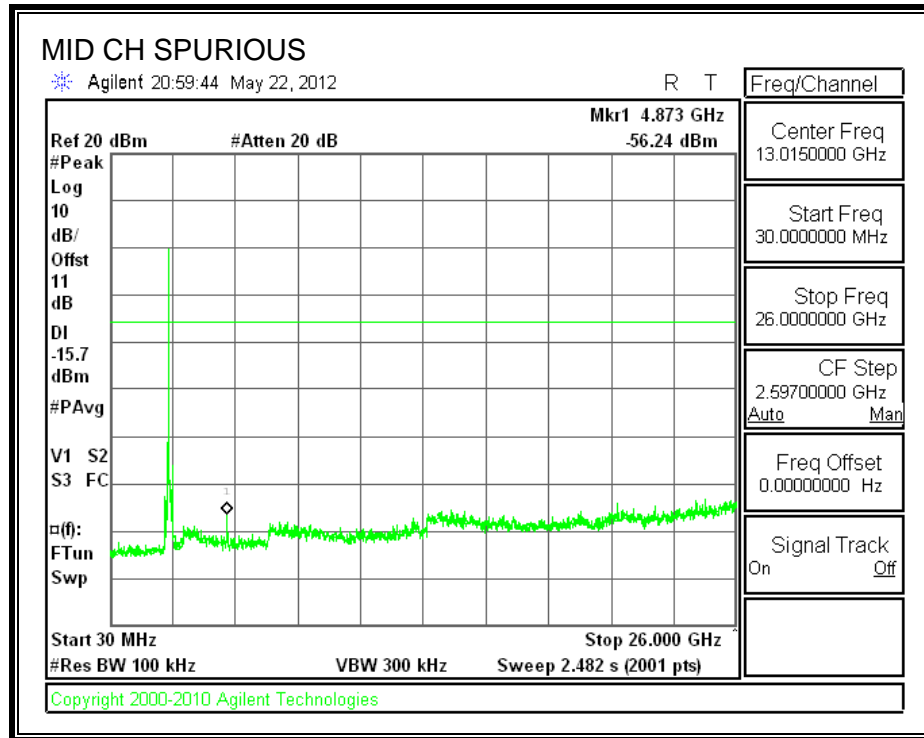
SPURIOUS EMISSIONS, LOW CHANNEL



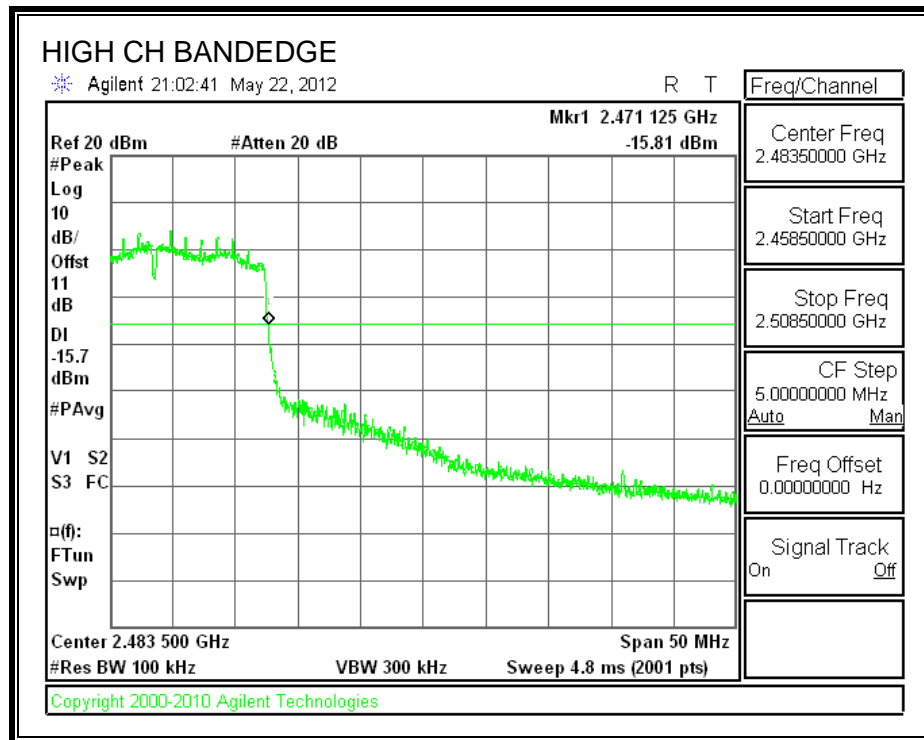


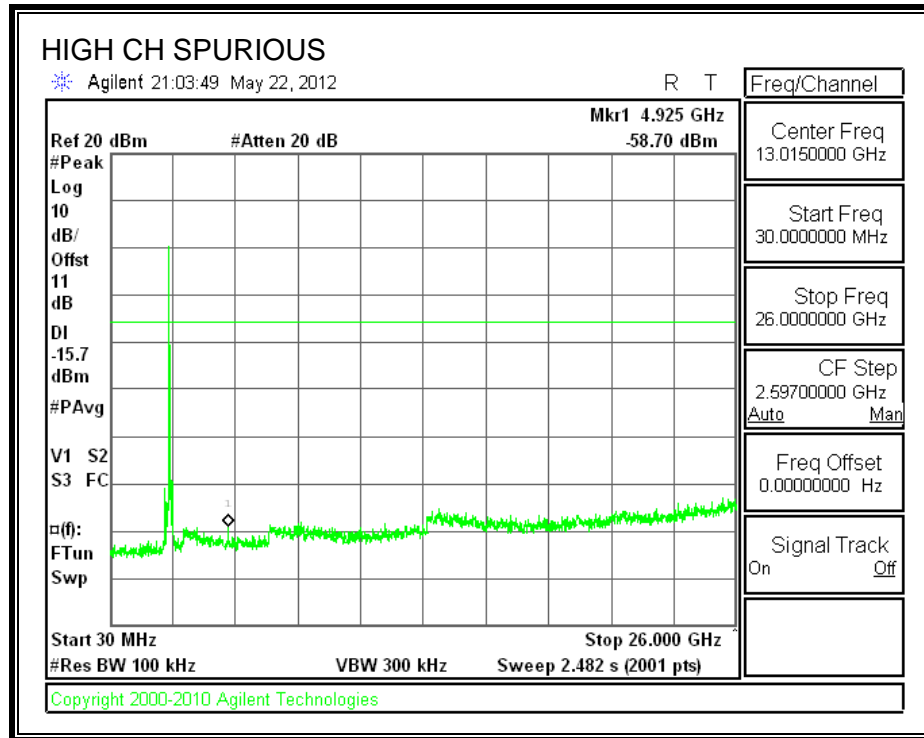
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.4. 802.11a MODE IN THE 5.8 GHz BAND

7.4.1. 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.

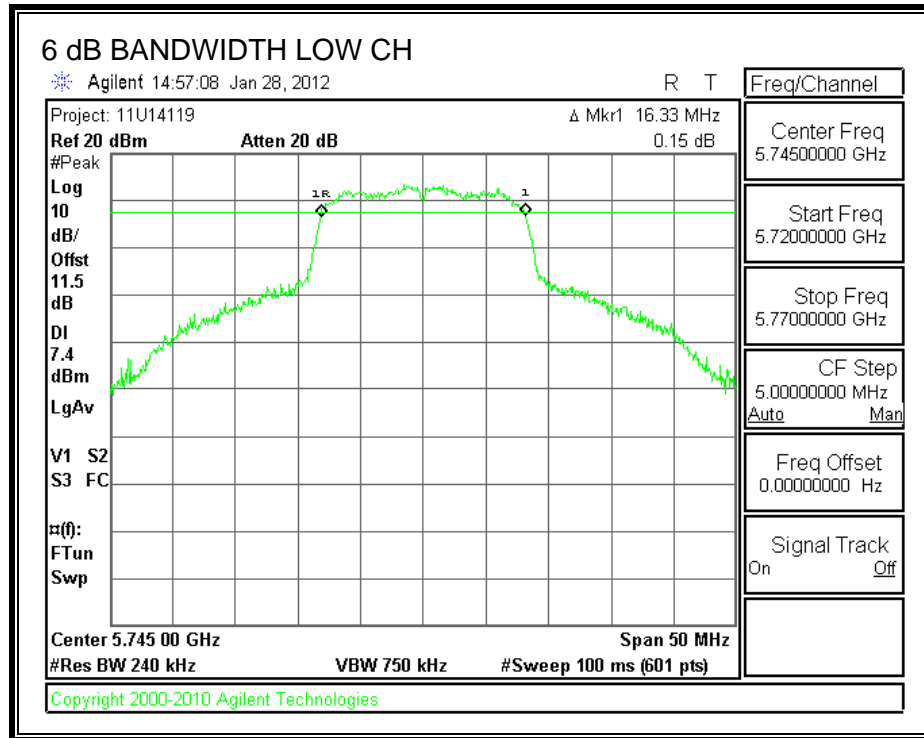
TEST PROCEDURE

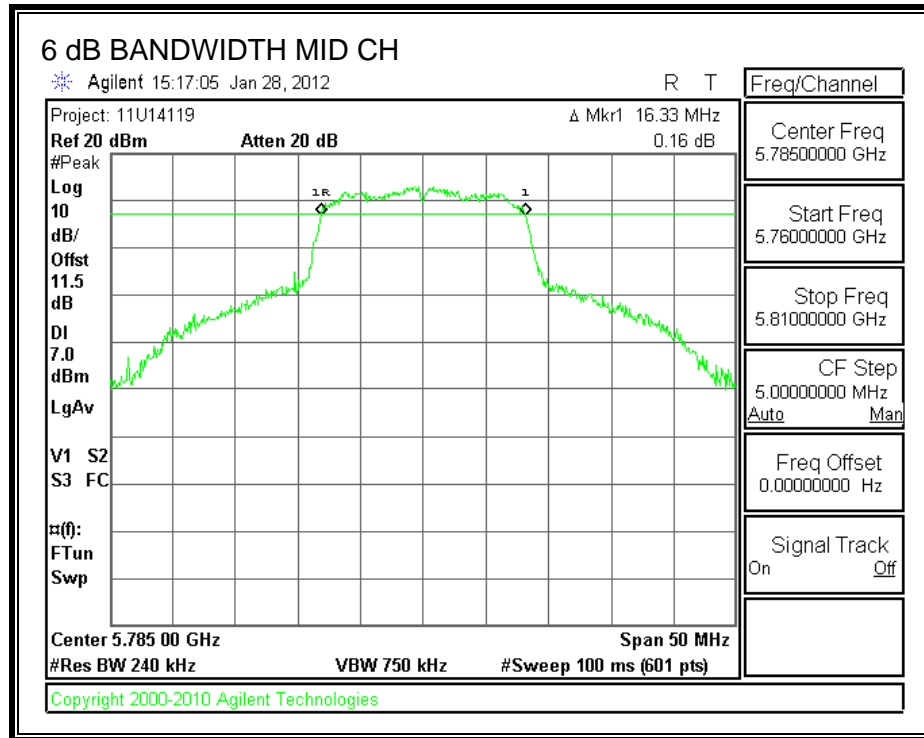
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

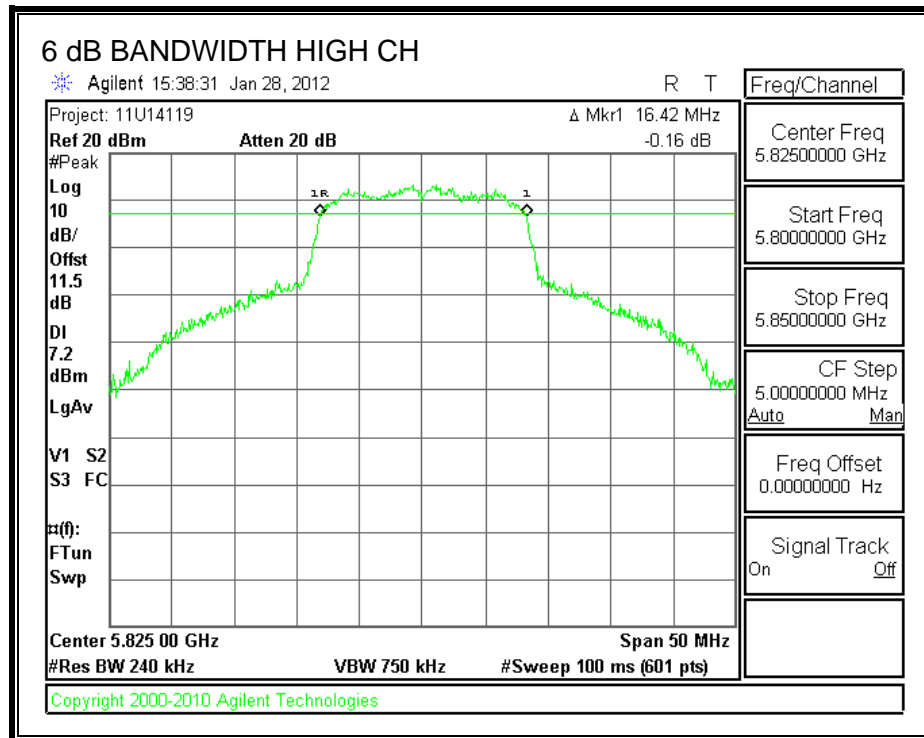
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	16.33	0.5
Middle	5785	16.33	0.5
High	5825	16.42	0.5

6 dB BANDWIDTH







7.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

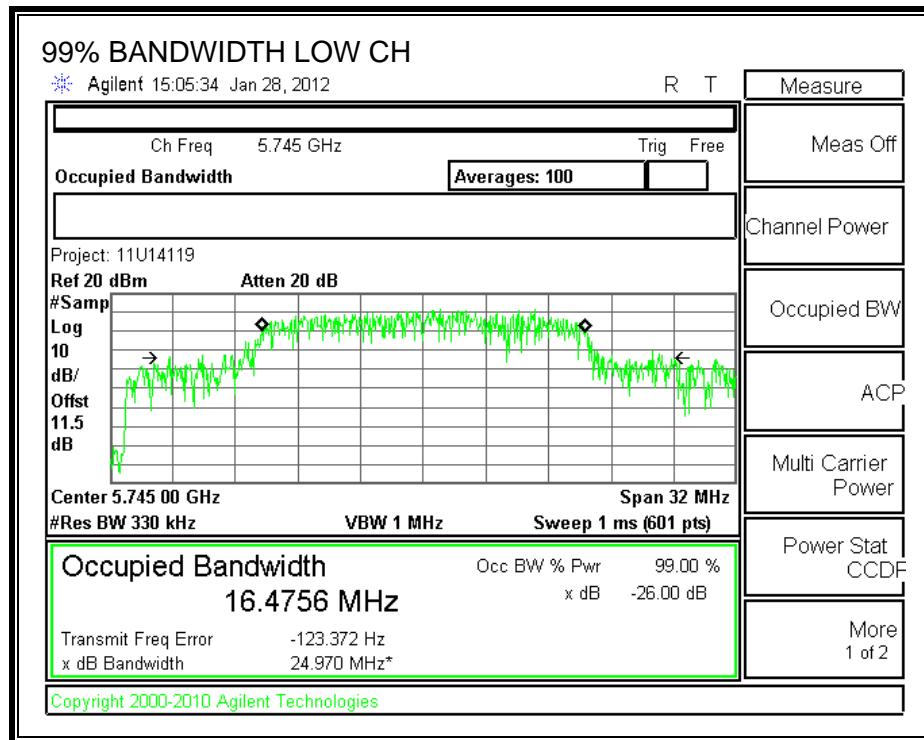
TEST PROCEDURE

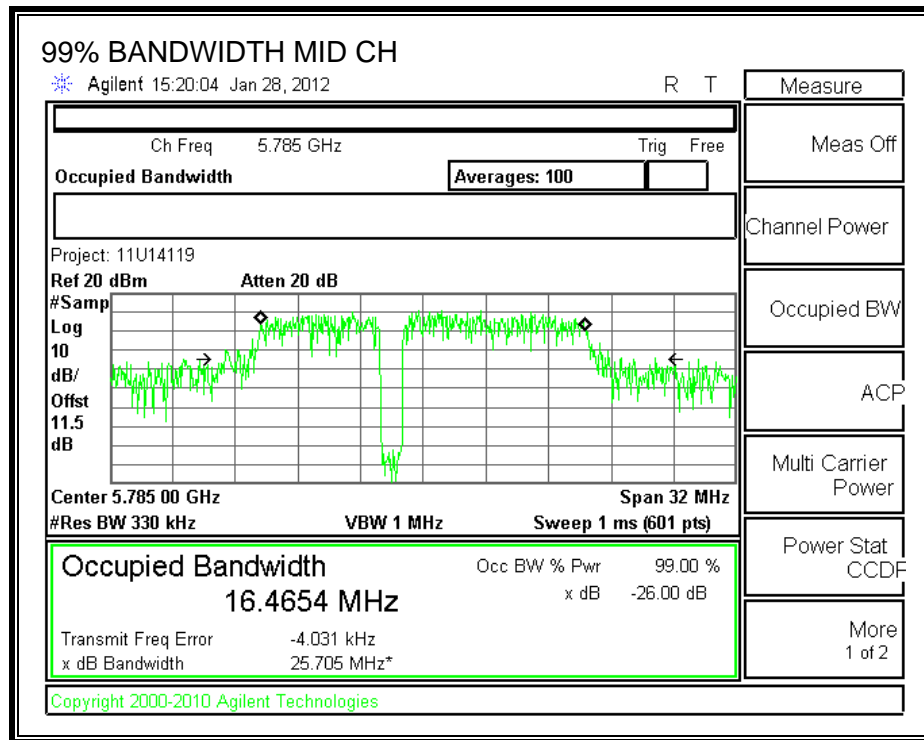
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

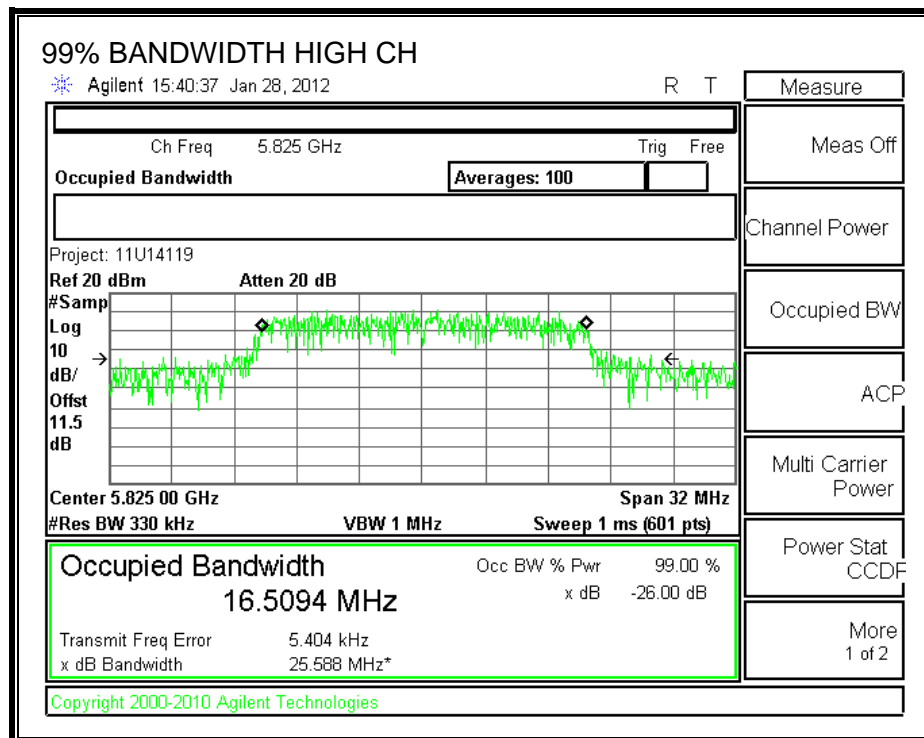
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.4756
Middle	5785	16.4654
High	5825	16.5094

99% BANDWIDTH







7.4.3. 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.

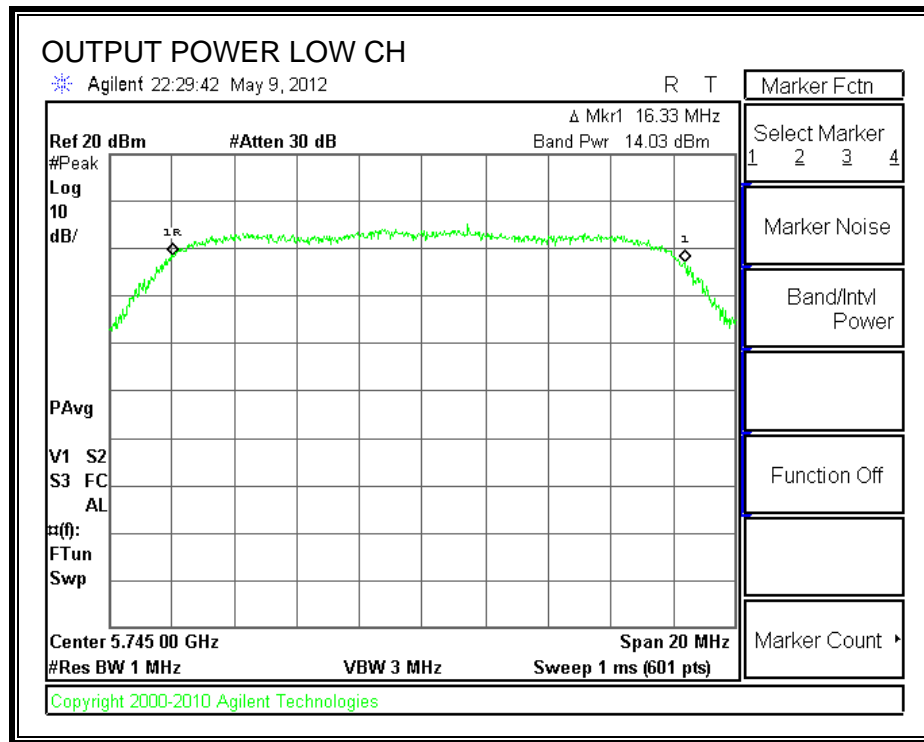
TEST PROCEDURE

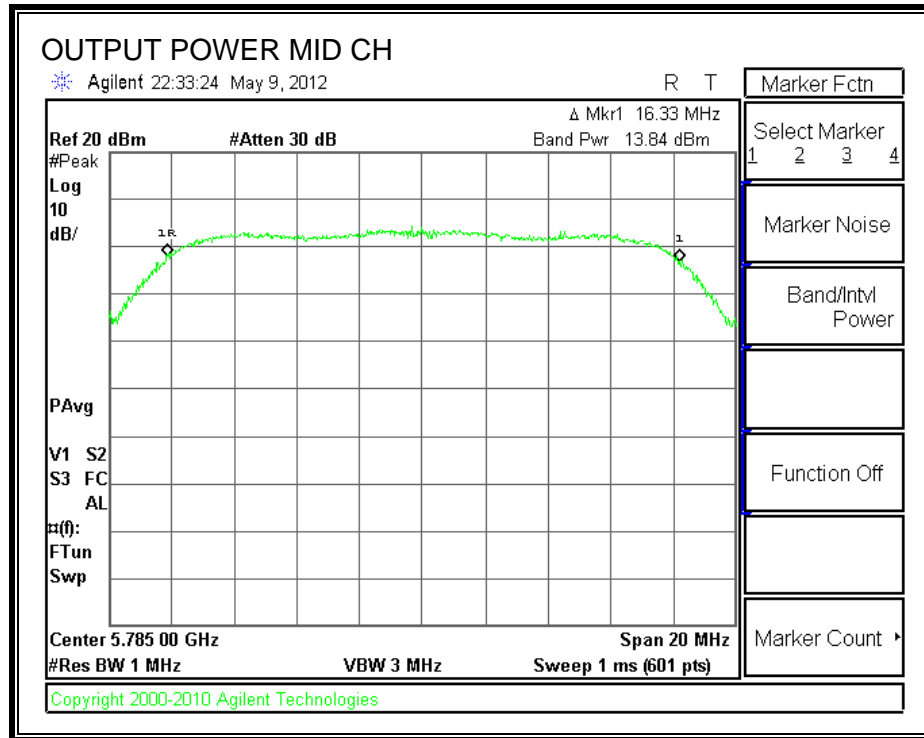
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

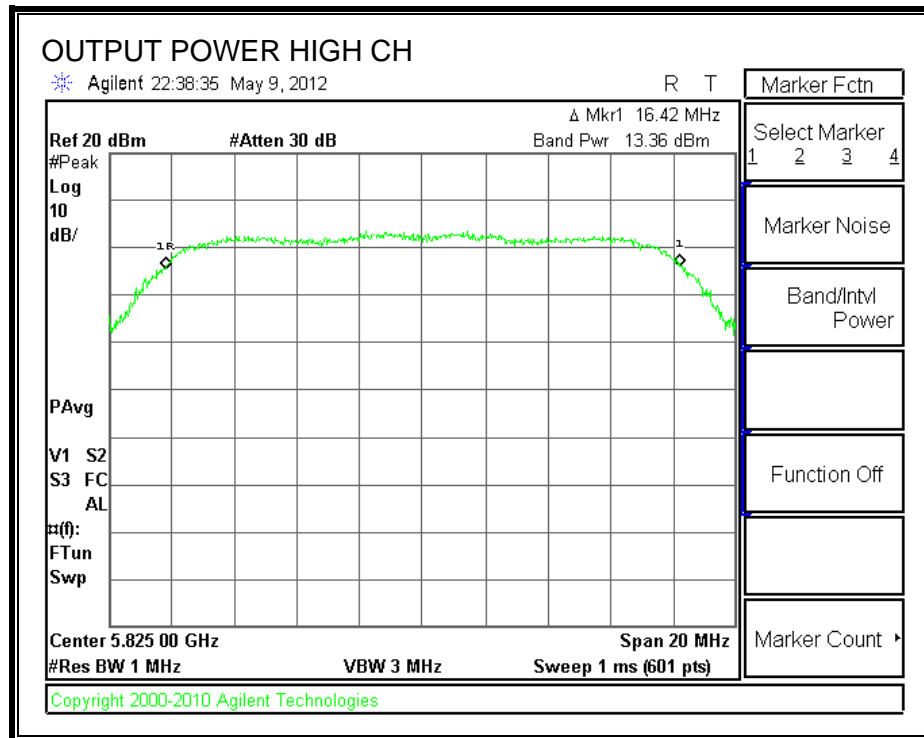
RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	14.03	11.3	25.33	30	-4.67
Middle	5785	13.84	11.3	25.14	30	-4.86
High	5825	13.36	11.3	24.66	30	-5.34

OUTPUT POWER







7.4.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5745	17.80
Middle	5785	17.42
High	5825	17.11

7.4.5. 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

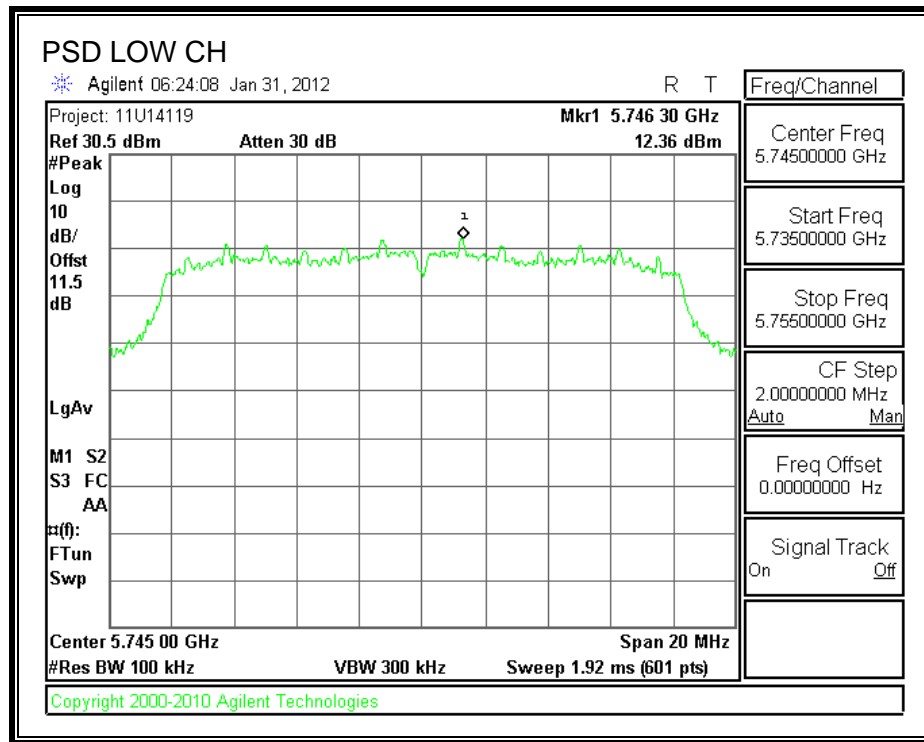
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:

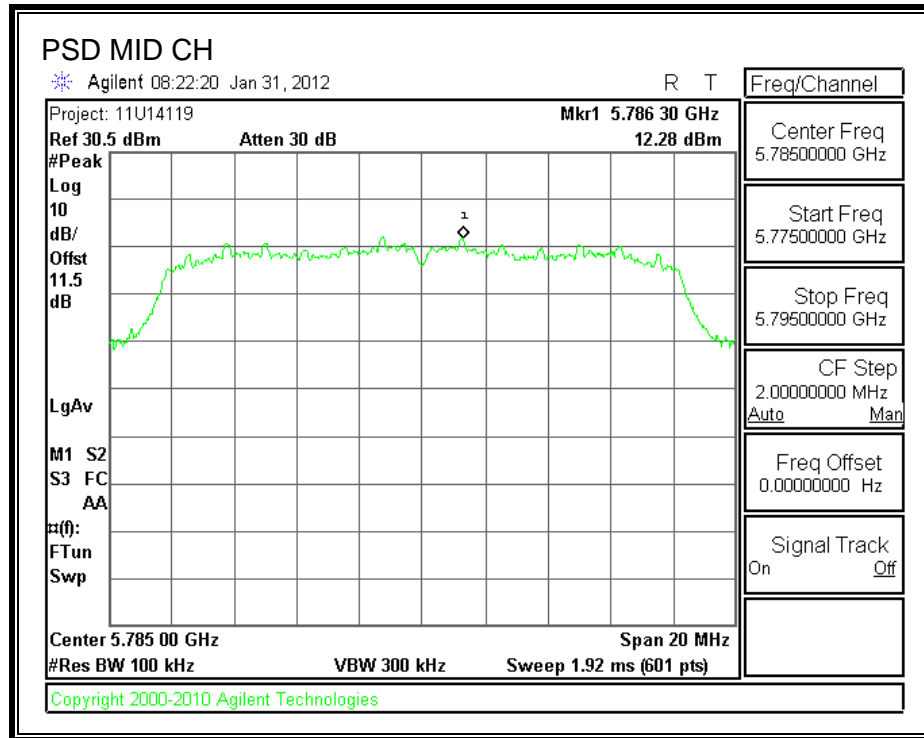
“Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.”

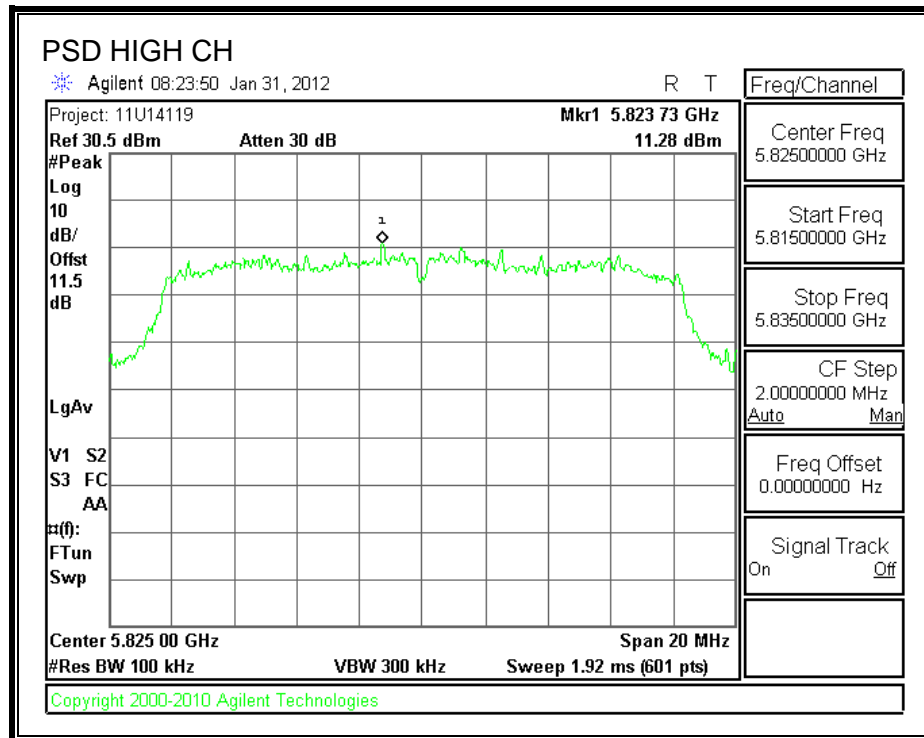
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	10log(3KHz /100KHz)	Limit (dBm)	Margin (dB)
Low	5745	12.36	15.20	8	-10.84
Middle	5785	12.28	15.20	8	-10.92
High	5825	11.28	15.20	8	-11.92

POWER SPECTRAL DENSITY







7.4.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

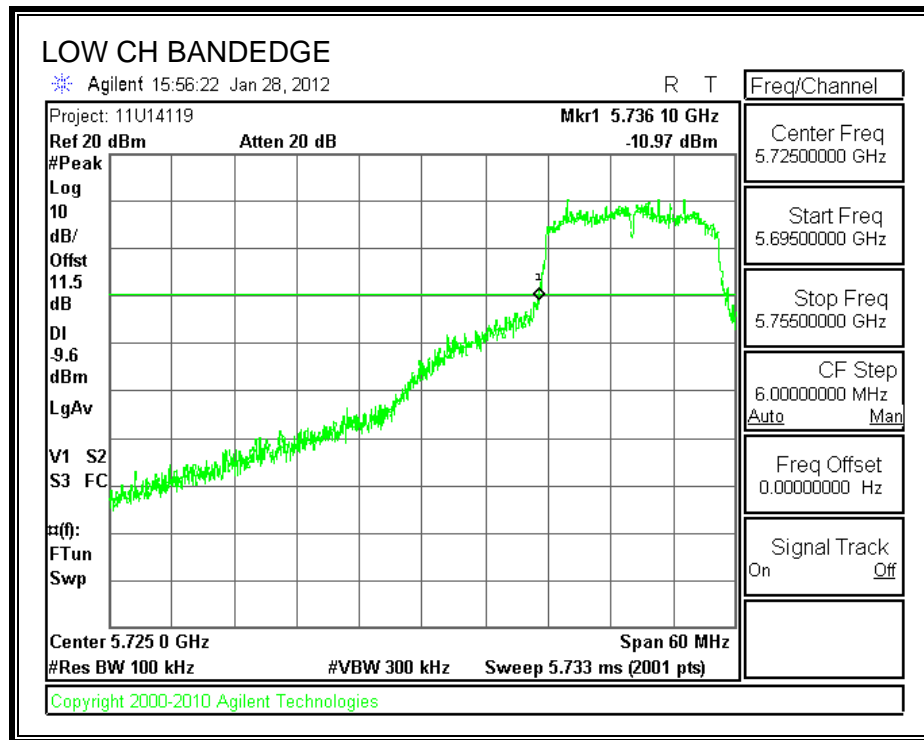
TEST PROCEDURE

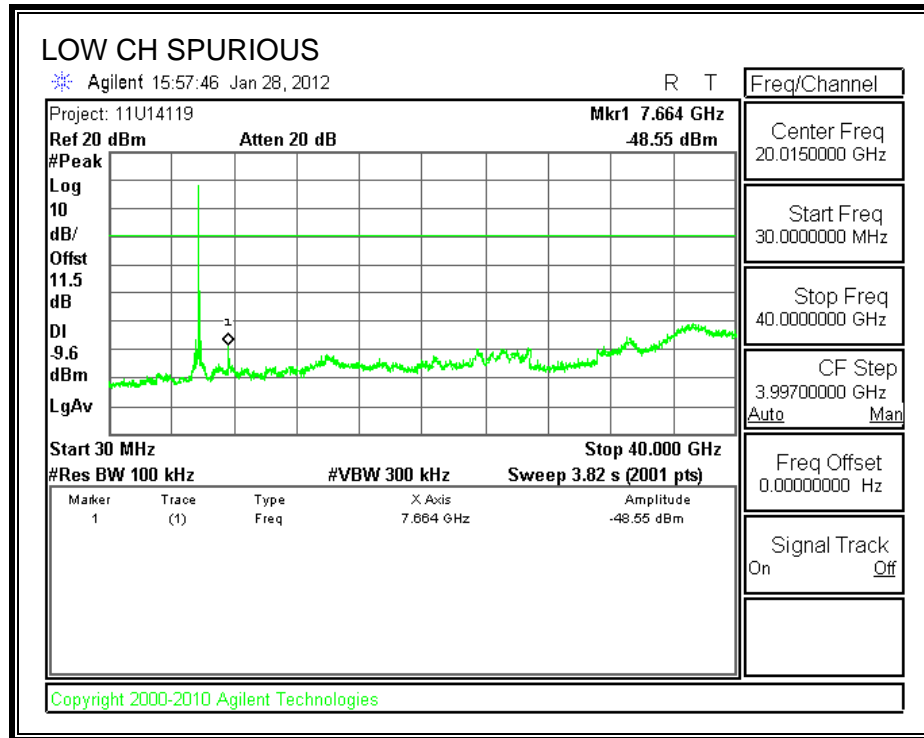
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

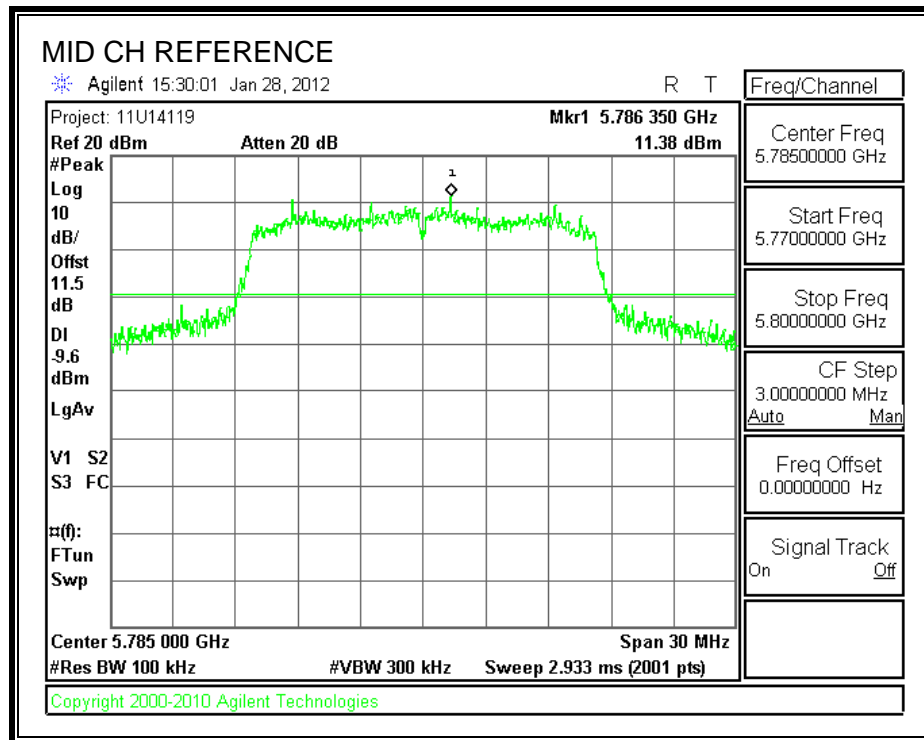
RESULTS

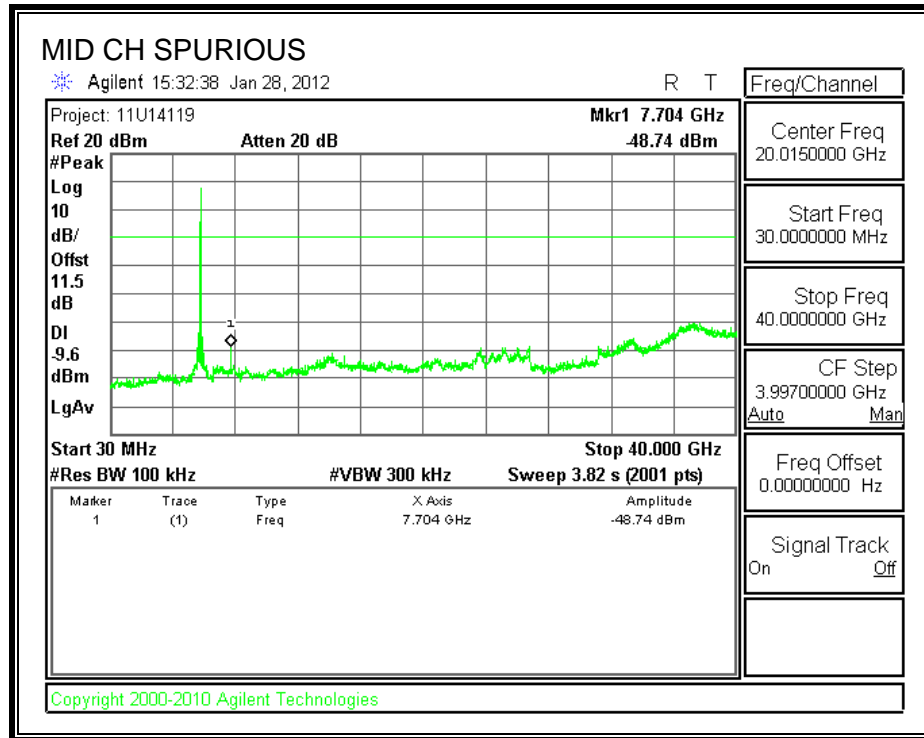
SPURIOUS EMISSIONS, LOW CHANNEL



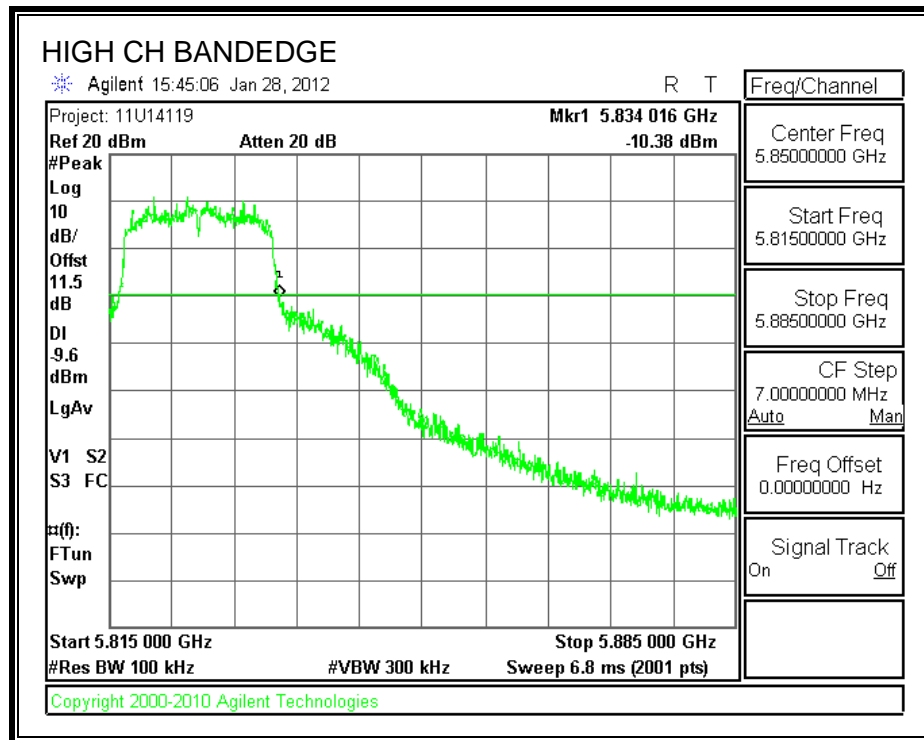


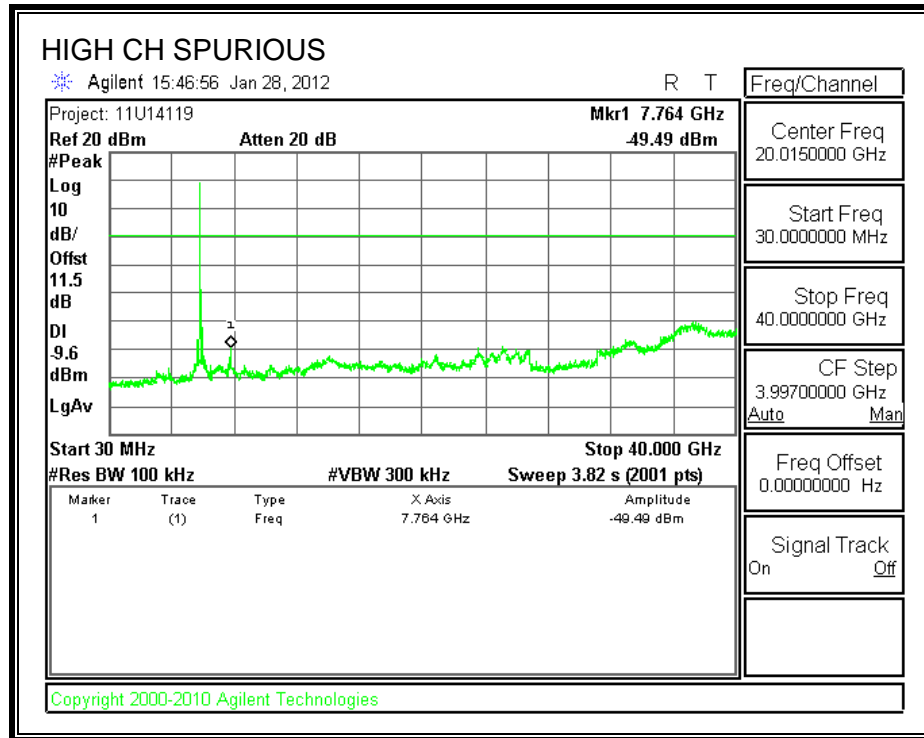
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





7.5. 802.11HT20 MODE IN THE 5.8 GHz BAND

7.5.1. 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.

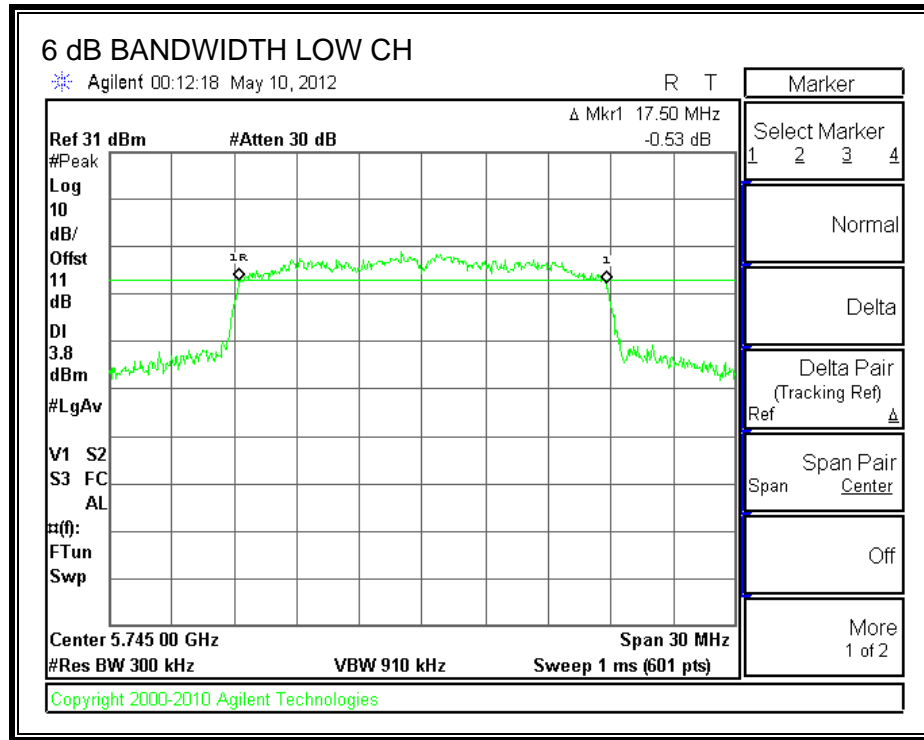
TEST PROCEDURE

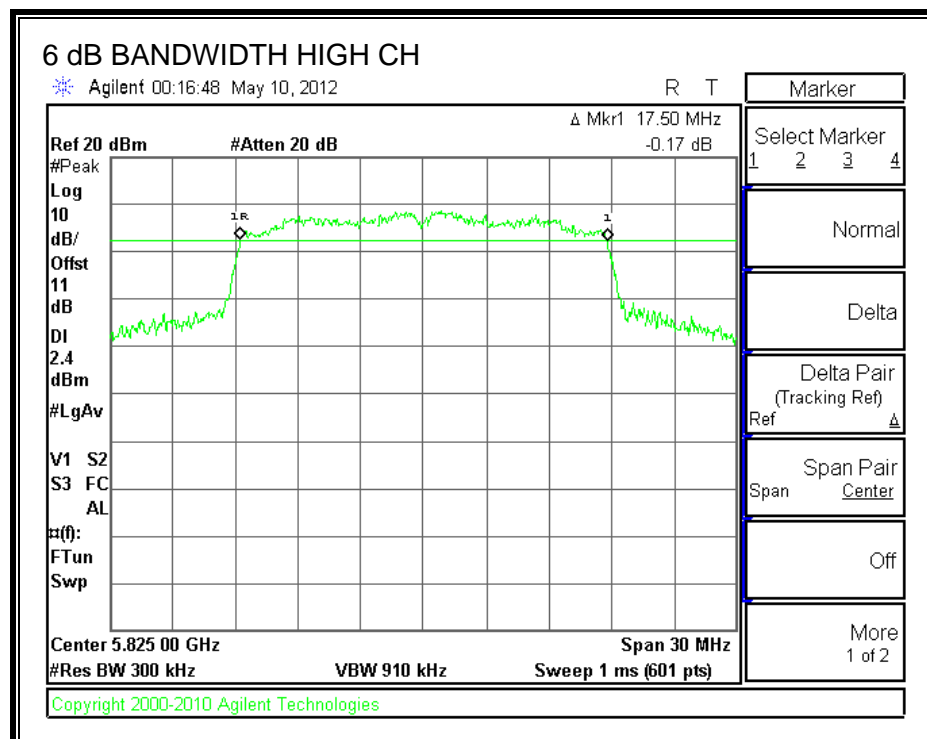
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	5745	17.5	0.5
Middle	5785	17.6	0.5
High	5825	17.5	0.5

6 dB BANDWIDTH





7.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

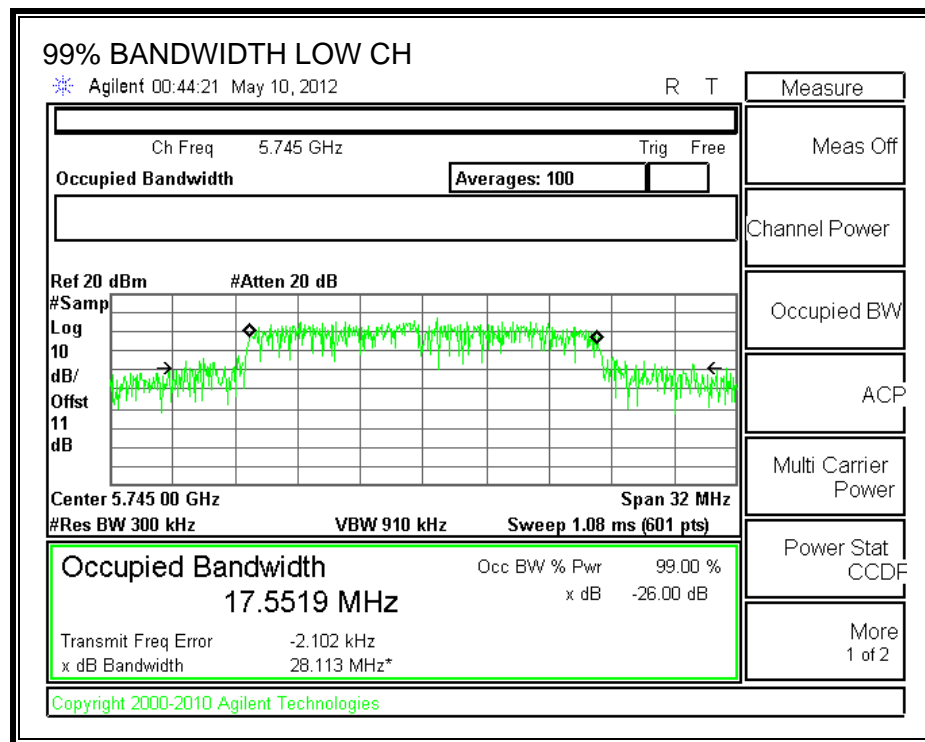
TEST PROCEDURE

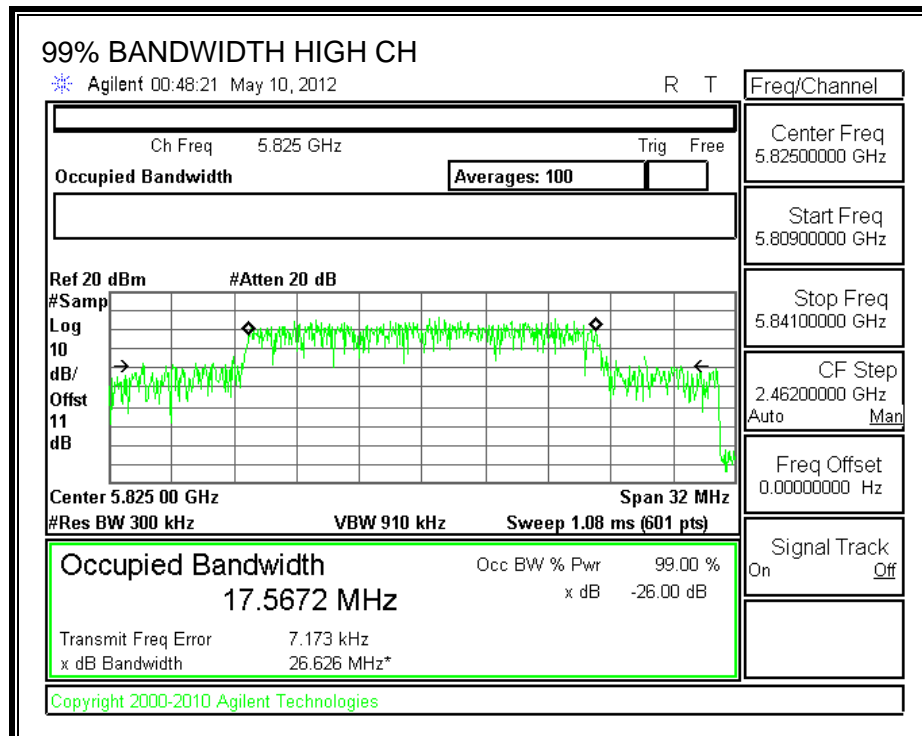
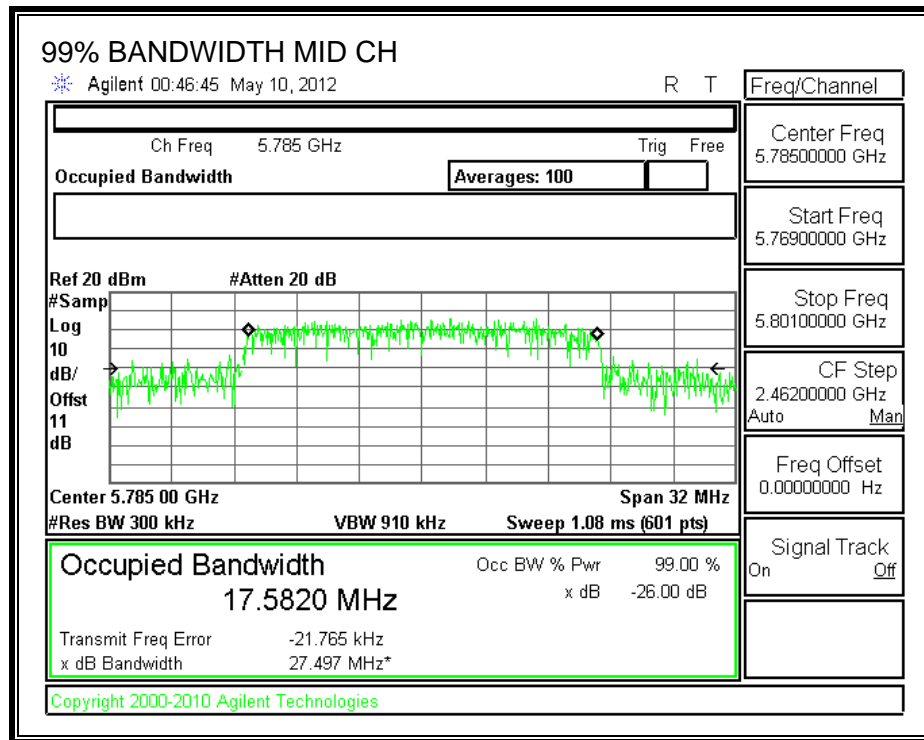
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	17.5519
Middle	5785	17.582
High	5825	17.5672

99% BANDWIDTH





7.5.3. 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.

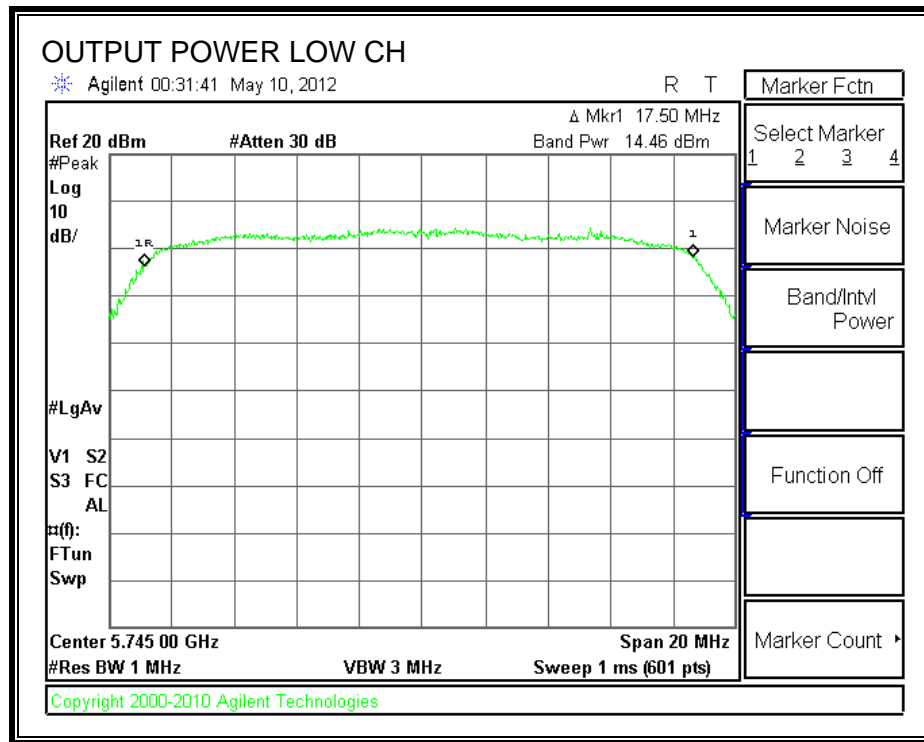
TEST PROCEDURE

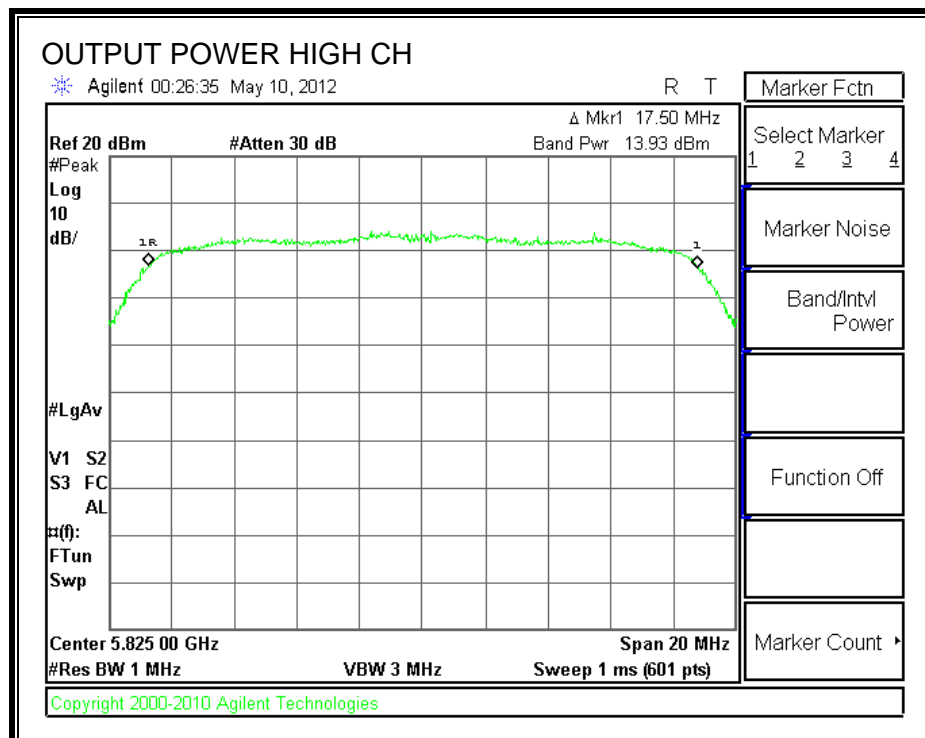
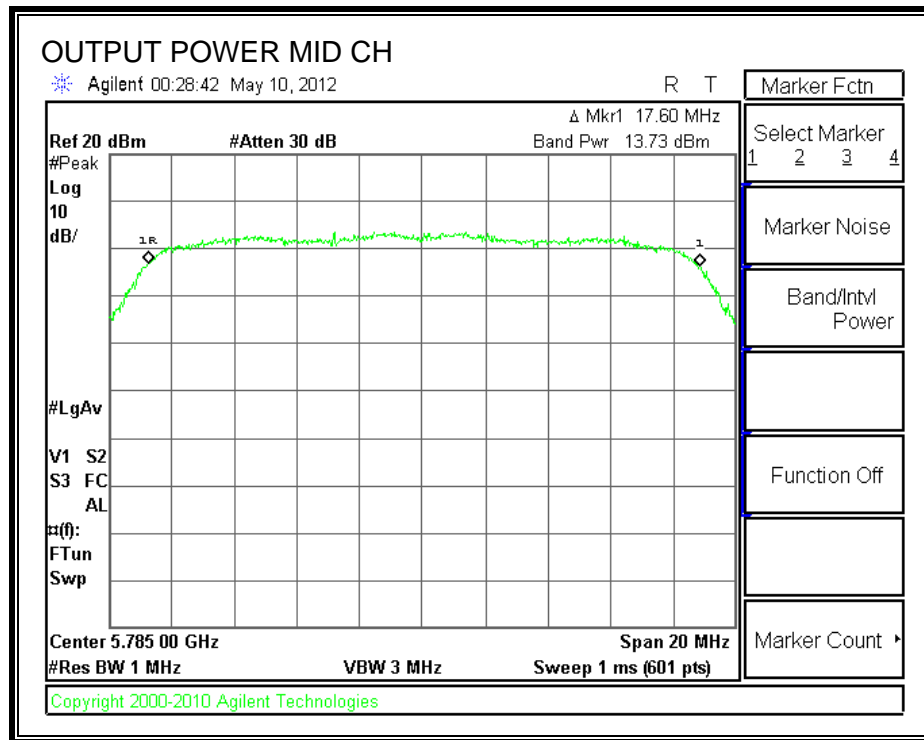
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	14.46	11.3	25.76	30	-4.24
Middle	5785	13.73	11.3	25.03	30	-4.97
High	5825	13.93	11.3	25.23	30	-4.77

OUTPUT POWER





7.5.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.3 dB (including 10 dB pad and 1.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5745	18.10
Middle	5785	17.62
High	5825	17.37

7.5.5. 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

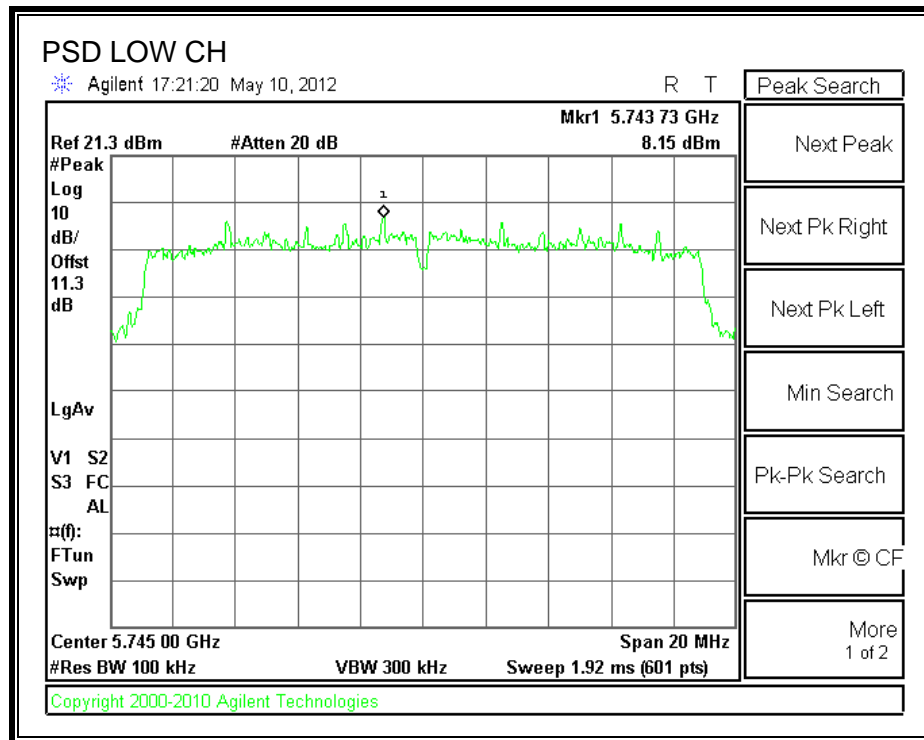
KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:

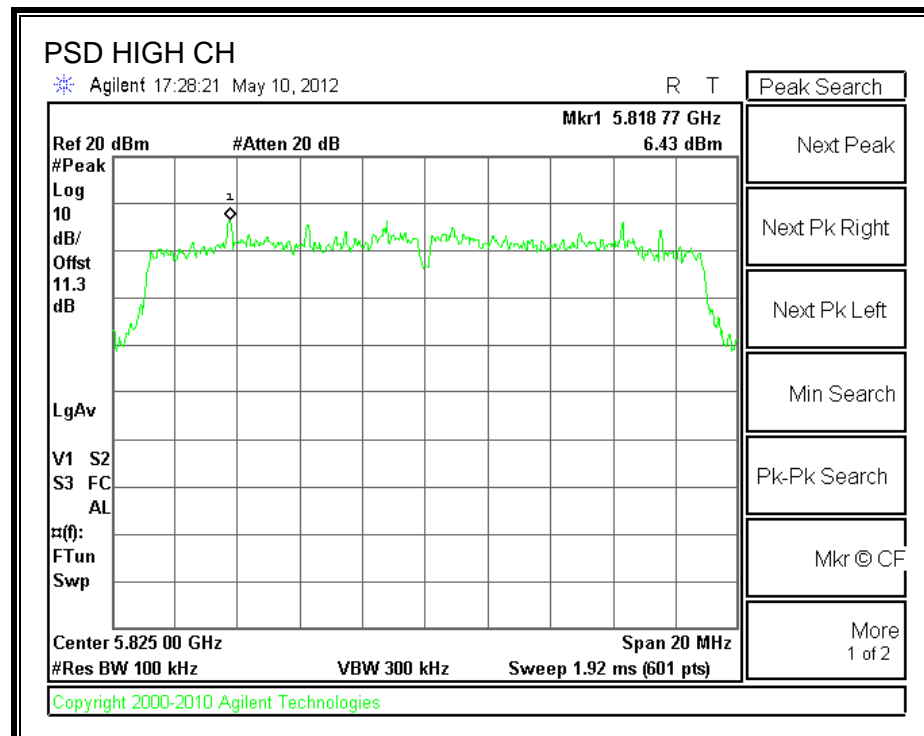
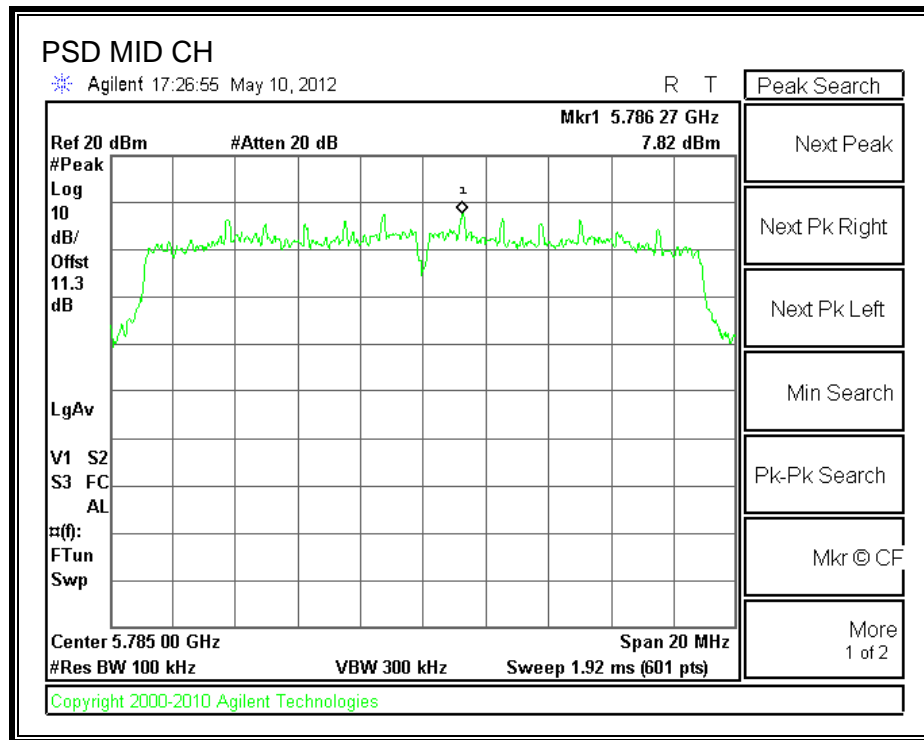
“Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.”

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	10log(3KHz /100KHz)	Limit (dBm)	Margin (dB)
Low	5745	8.15	15.20	8	-15.05
Middle	5785	7.82	15.20	8	-15.38
High	5825	6.43	15.20	8	-16.77

POWER SPECTRAL DENSITY





7.5.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

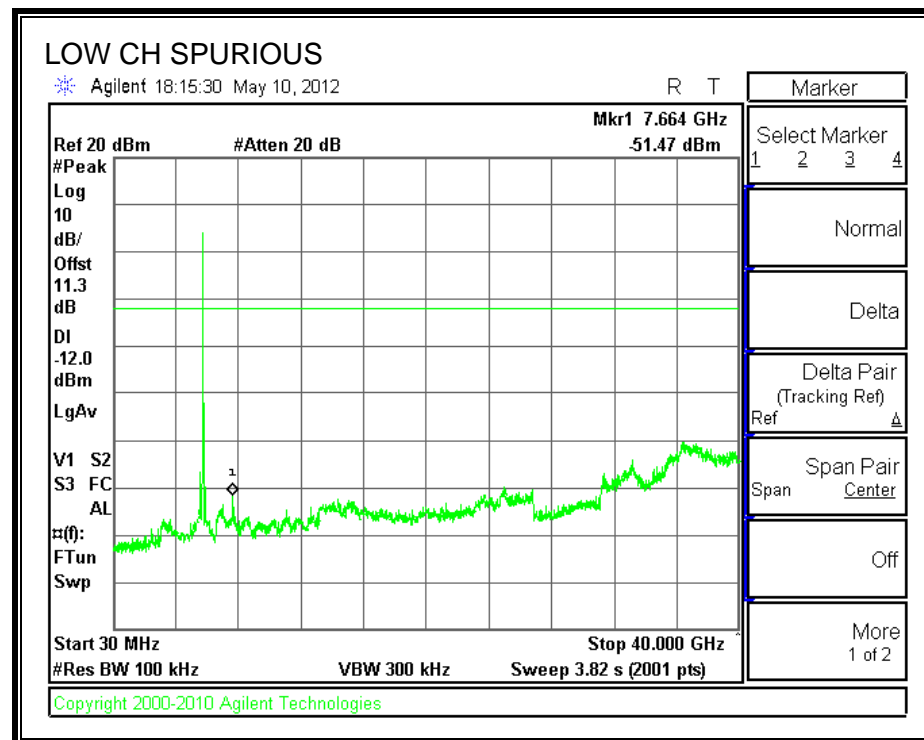
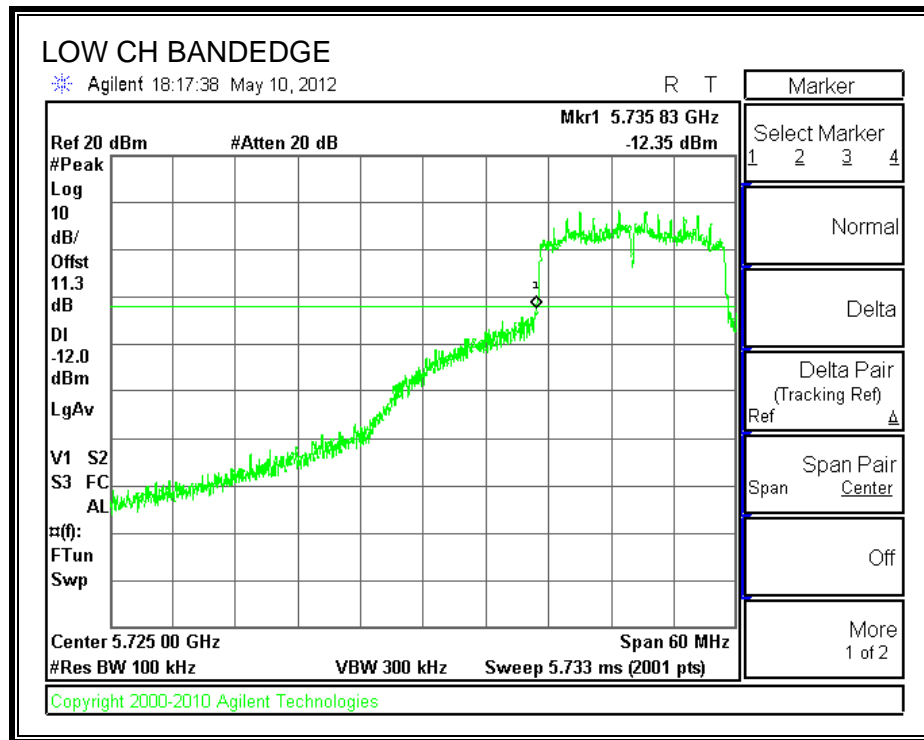
TEST PROCEDURE

KDB 558074 D01 DTS Meas Guidance v01, dated 1/18/2012:

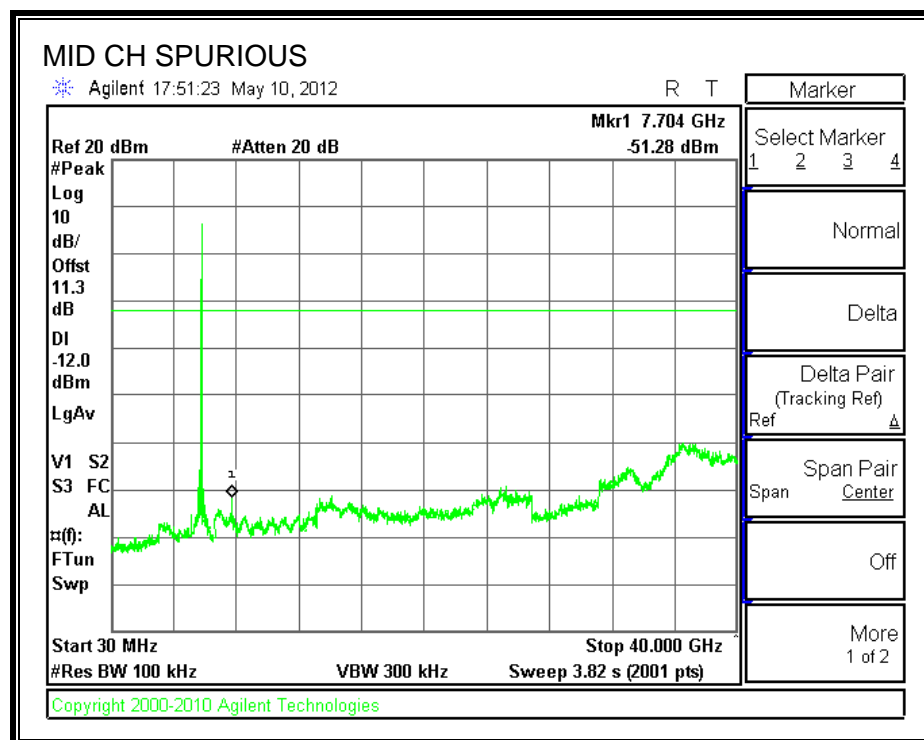
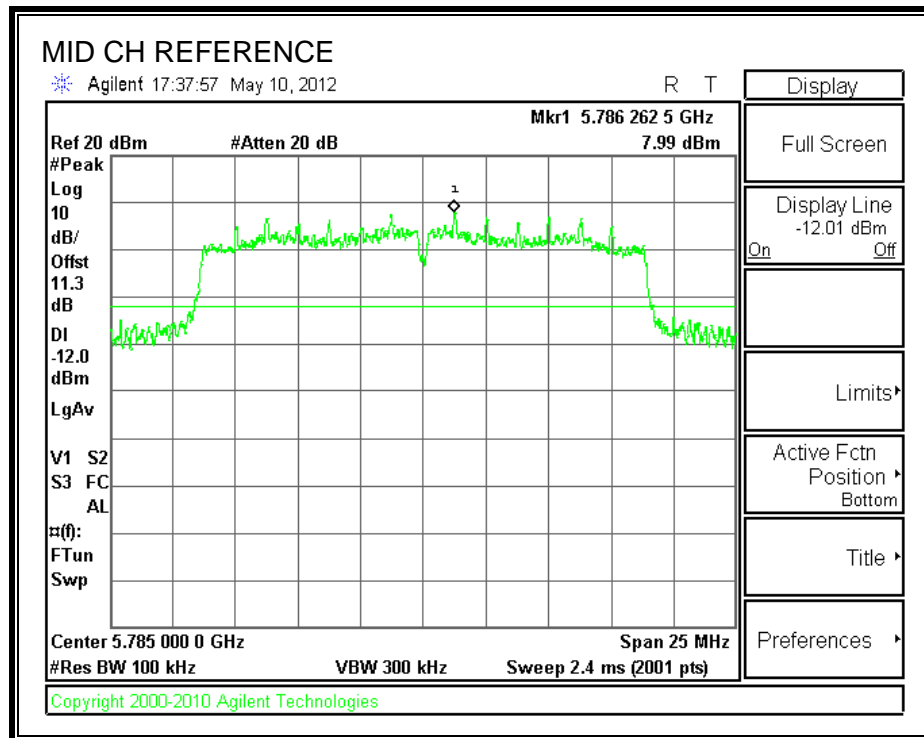
“Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.”

RESULTS

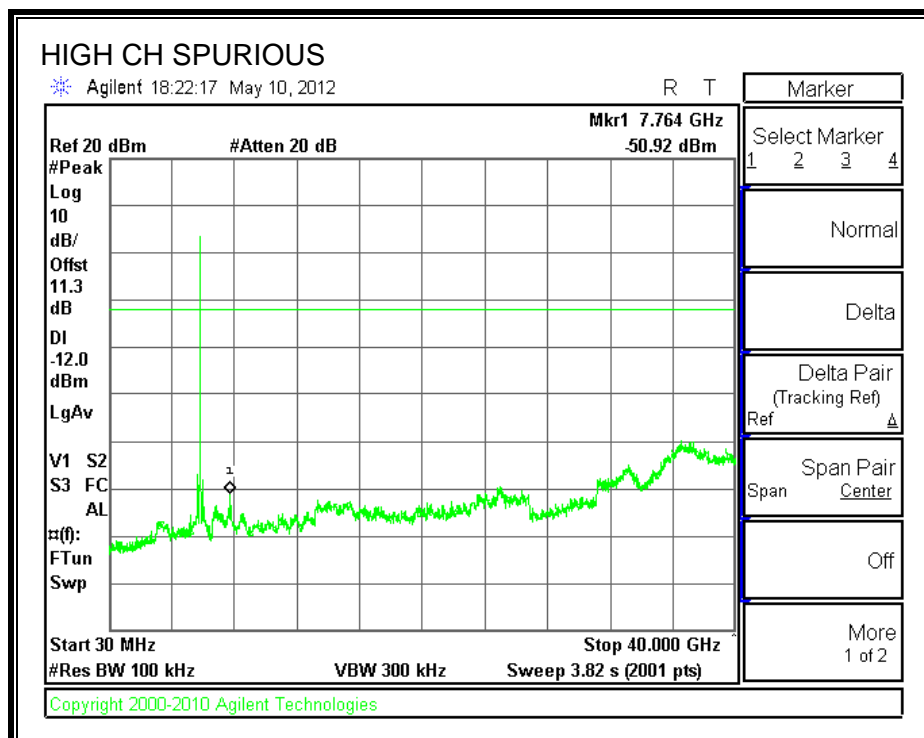
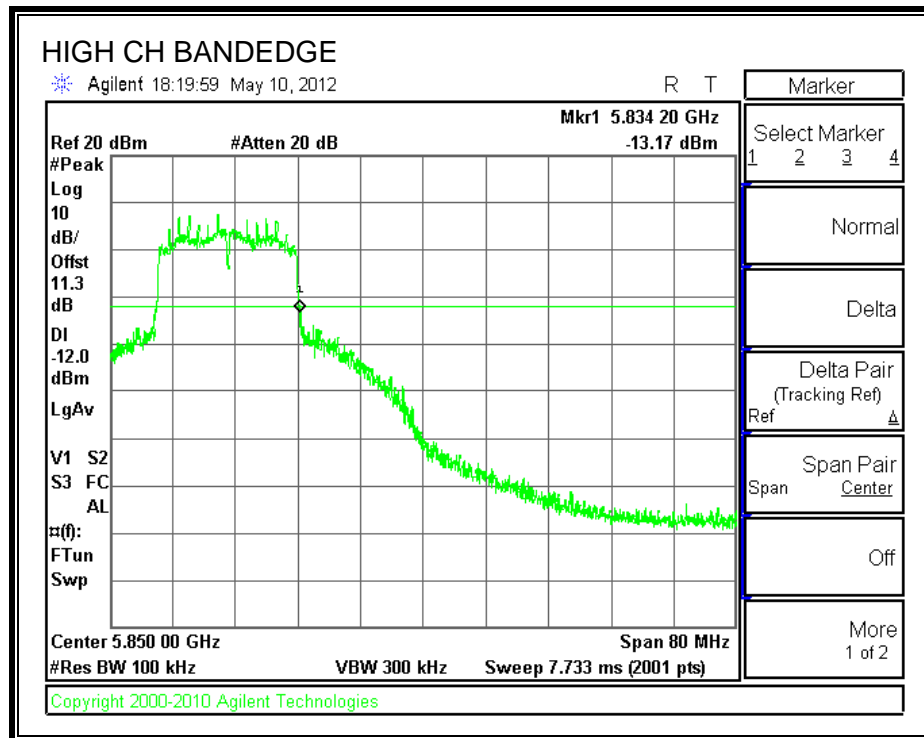
SPURIOUS EMISSIONS, LOW CHANNEL



SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

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

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

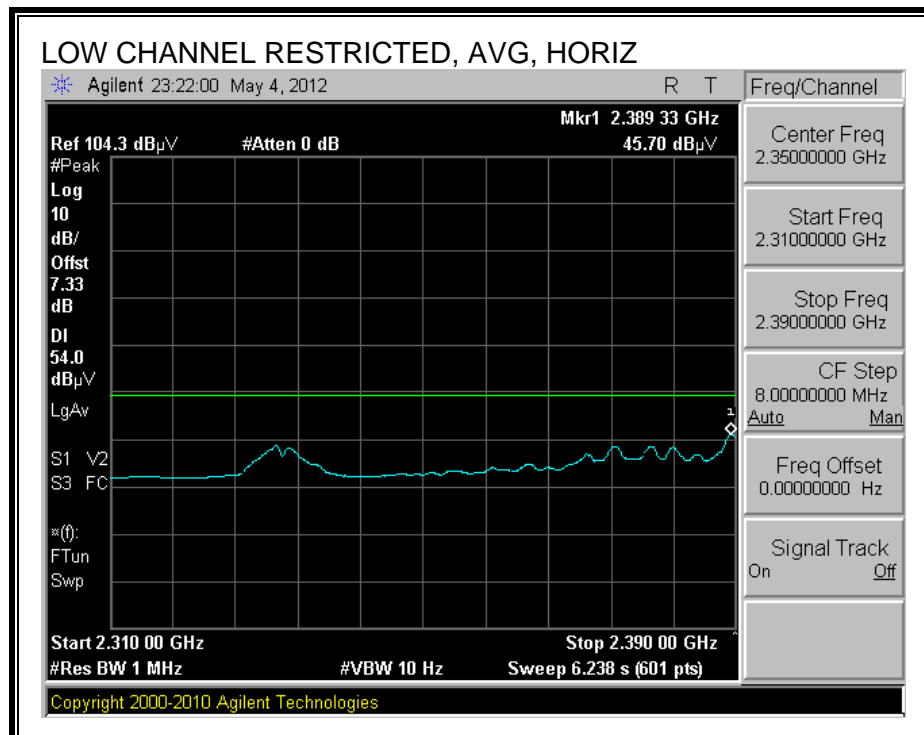
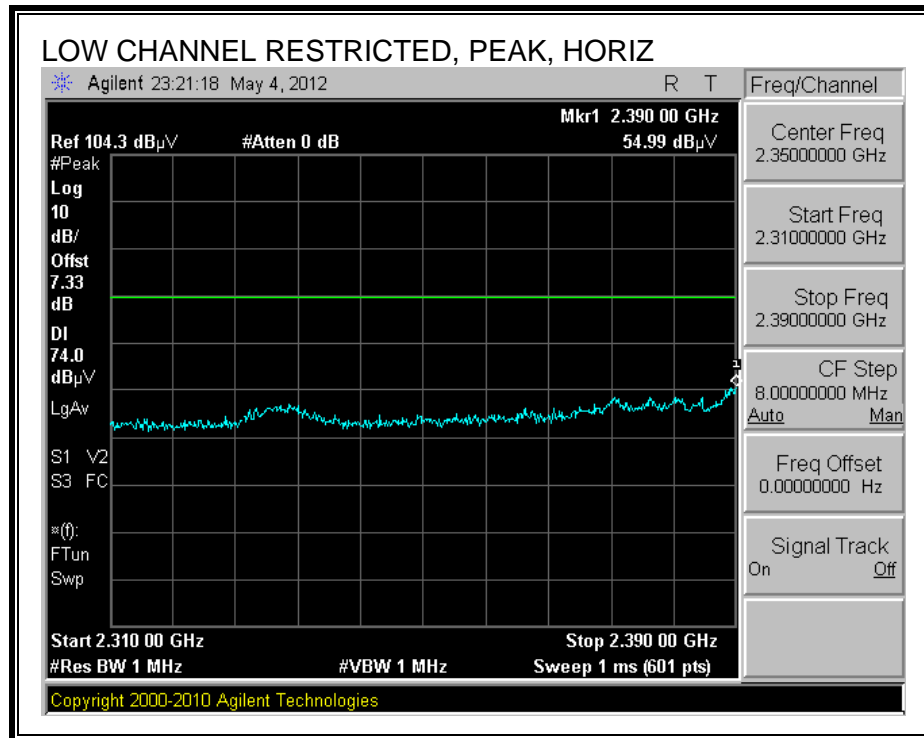
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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

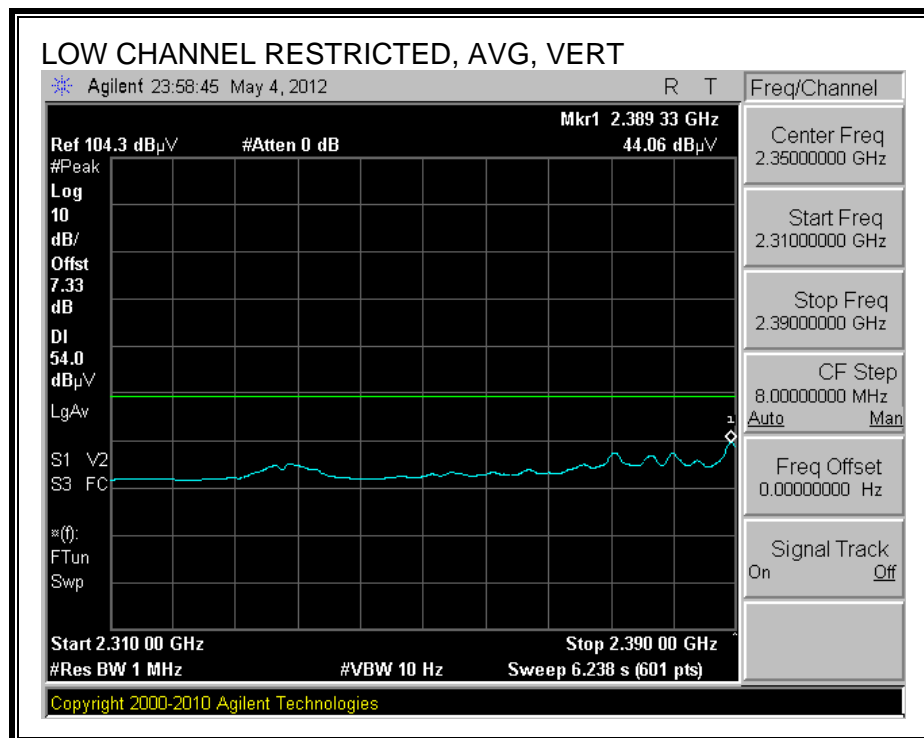
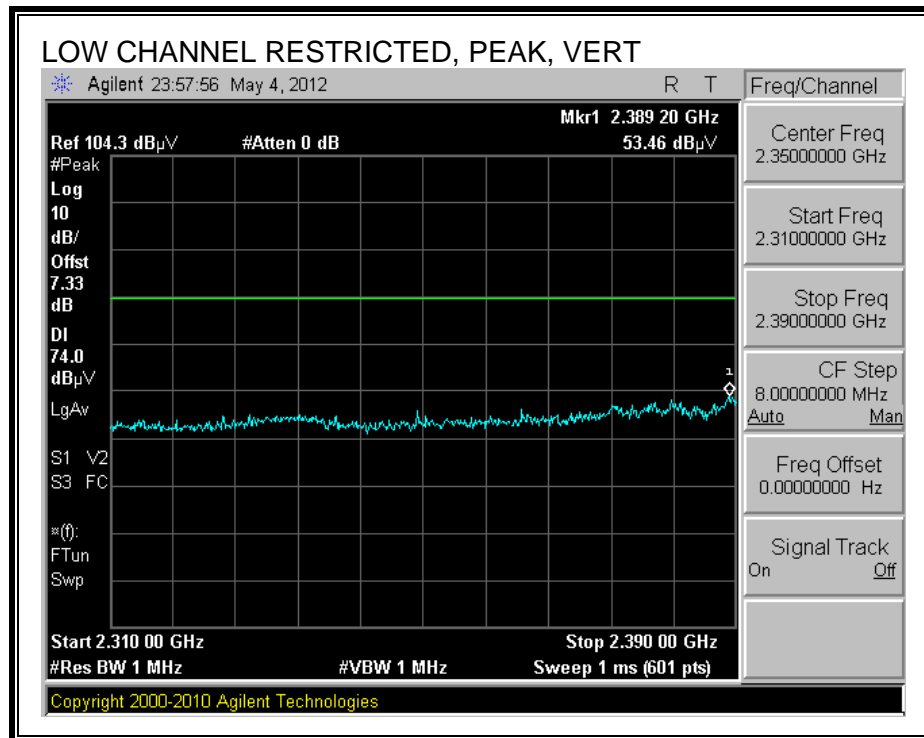
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. TX ABOVE 1 GHz FOR 802.11b 1TX MODE IN THE 2.4 GHz BAND

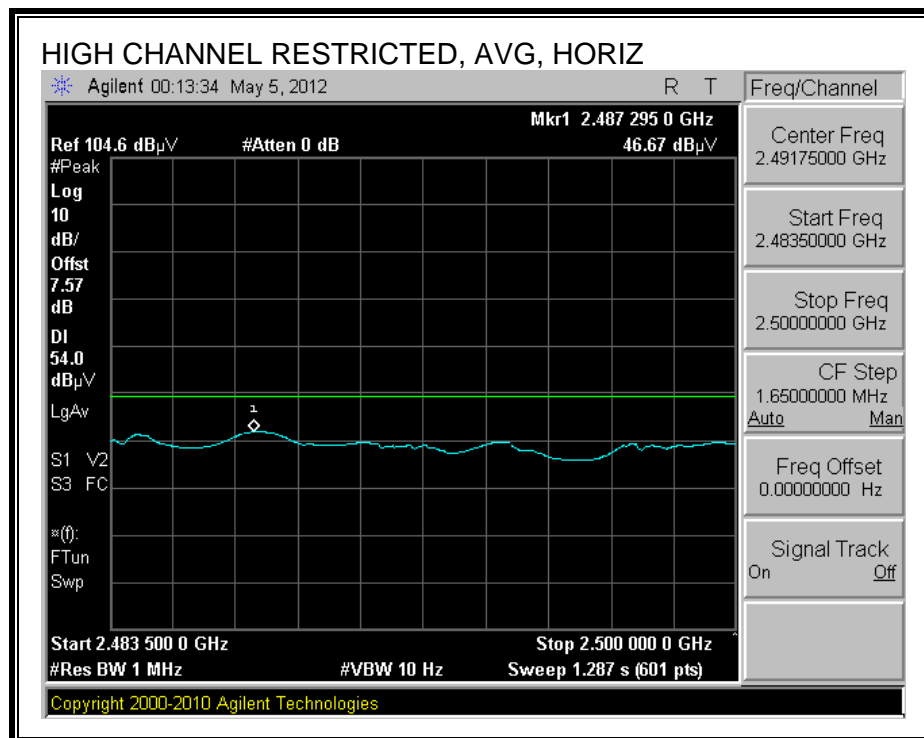
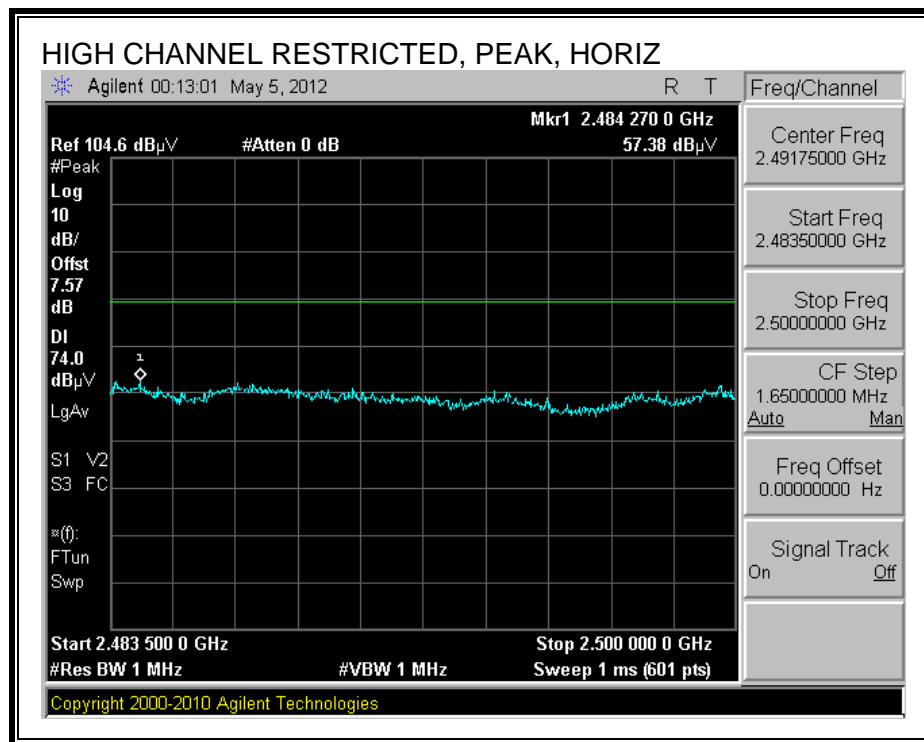
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



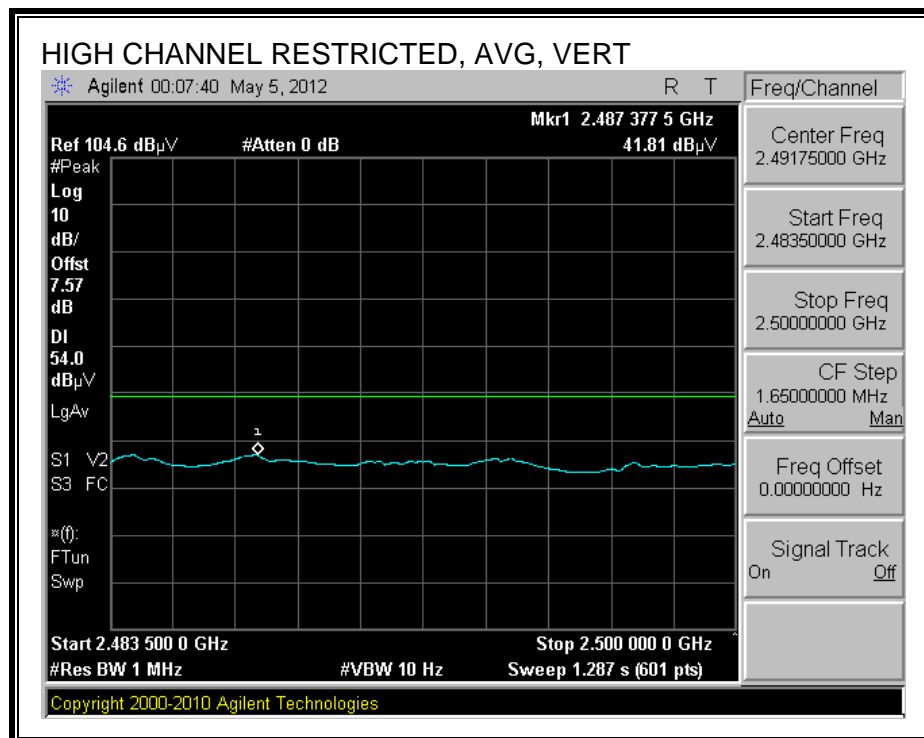
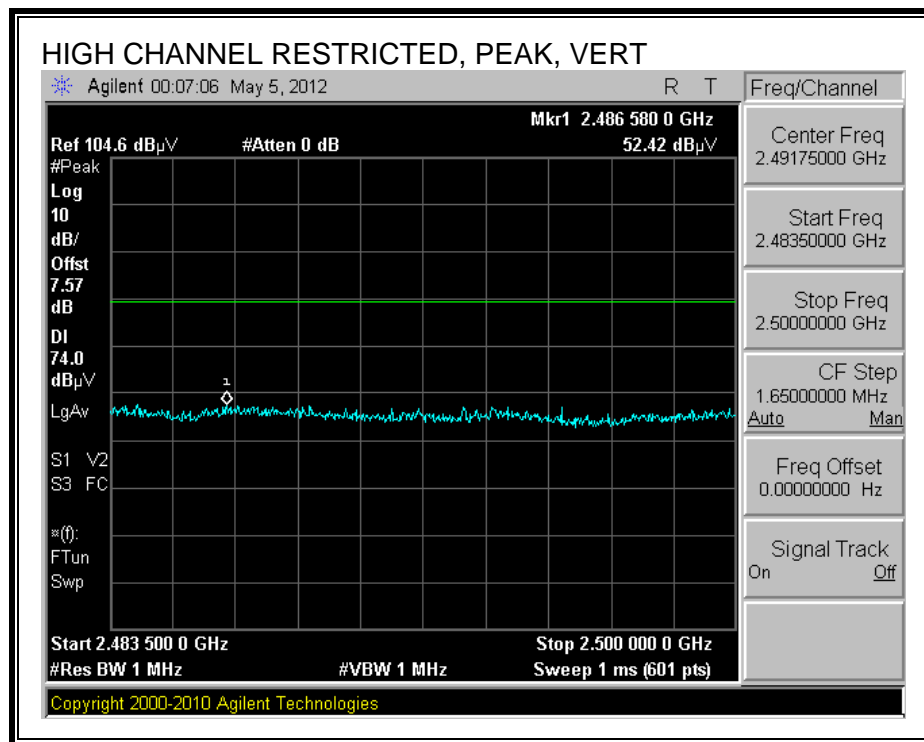
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Google
Project #: 11U14119
Date: 05/04/12
Test Engineer: Thanh Nguyen
Configuration: EUT # 93 with remote Support Laptop
Mode: Continuous Tx 802.11b

Test Equipment:

Horn 1-18GHz
T73; S/N: 6717 @3m

Pre-amplifier 1-26GHz
T144 Miteq 3008A00931

Pre-amplifier 26-40GHz

Horn > 18GHz
T125; ARA 18-26GHz; S/N:1007

Limit
FCC 15.205

Hi Frequency Cables

3' cable 22807700
3' cable 22807700

12' cable 22807600
12' cable 22807600

20' cable 22807500
20' cable 22807500

HPF

Reject Filter
R_001

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	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
DVT6-93															
Low Ch															
4.824	3.0	50.1	47.2	33.4	6.8	-35.5	0.0	0.0	54.8	51.9	74	54	-19.2	-2.1	H
4.824	3.0	47.8	44.1	33.4	6.8	-35.5	0.0	0.0	52.5	48.8	74	54	-21.5	-5.2	V
Mid ch															
4.874	3.0	51.4	48.7	33.5	6.8	-35.5	0.0	0.0	56.1	53.5	74	54	-17.9	-0.5	H
7.311	3.0	41.5	29.4	35.7	9.1	-35.4	0.0	0.0	50.8	38.8	74	54	-23.2	-15.2	H
4.874	3.0	49.1	46.0	33.5	6.8	-35.5	0.0	0.0	53.9	50.8	74	54	-20.1	-3.2	V
7.311	3.0	40.6	30.0	35.7	9.1	-35.4	0.0	0.0	50.0	39.3	74	54	-24.0	-14.7	V
High ch															
4.924	3.0	49.1	45.7	33.5	6.8	-35.5	0.0	0.0	53.9	50.6	74	54	-20.1	-3.4	H
7.386	3.0	42.1	31.1	35.8	9.1	-35.5	0.0	0.0	51.6	40.6	74	54	-22.4	-13.4	H
4.924	3.0	47.6	44.1	33.5	6.8	-35.5	0.0	0.0	52.4	49.0	74	54	-21.6	-5.0	V
7.386	3.0	42.2	30.8	35.8	9.1	-35.5	0.0	0.0	51.7	40.3	74	54	-22.3	-13.7	V

f Measurement Frequency

Dist Distance to Antenna

Read Analyzer Reading

AF Antenna Factor

CL Cable Loss

Amp Preamp Gain

D Corr Distance Correct to 3 meters

Avg Average Field Strength @ 3 m

Peak Calculated Peak Field Strength

HPF High Pass Filter

Avg Lim Average Field Strength Limit

Pk Lim Peak Field Strength Limit

Avg Mar Margin vs. Average Limit

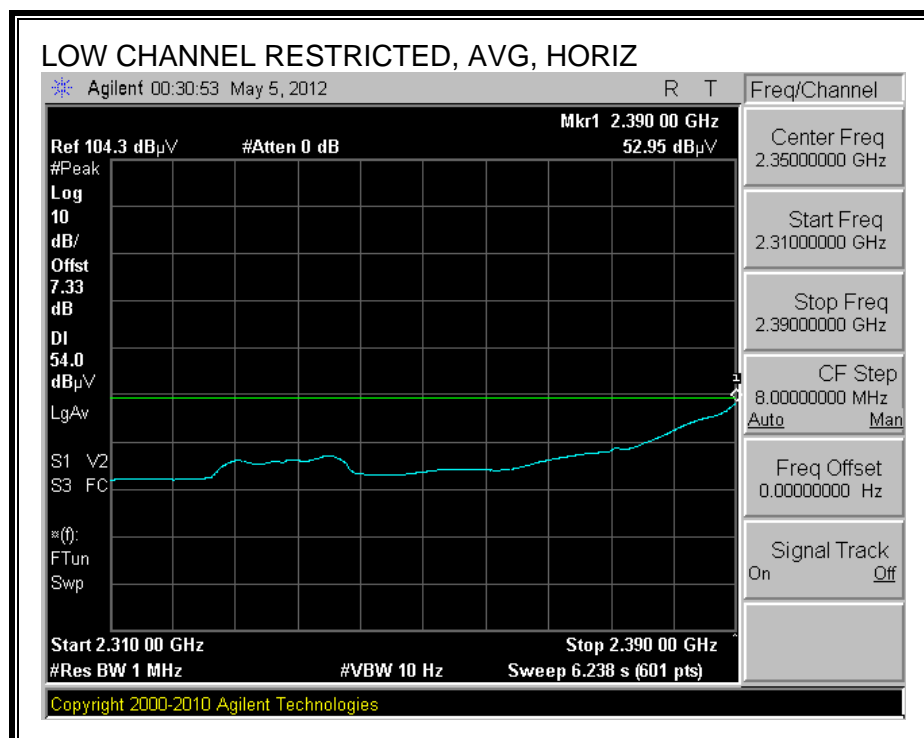
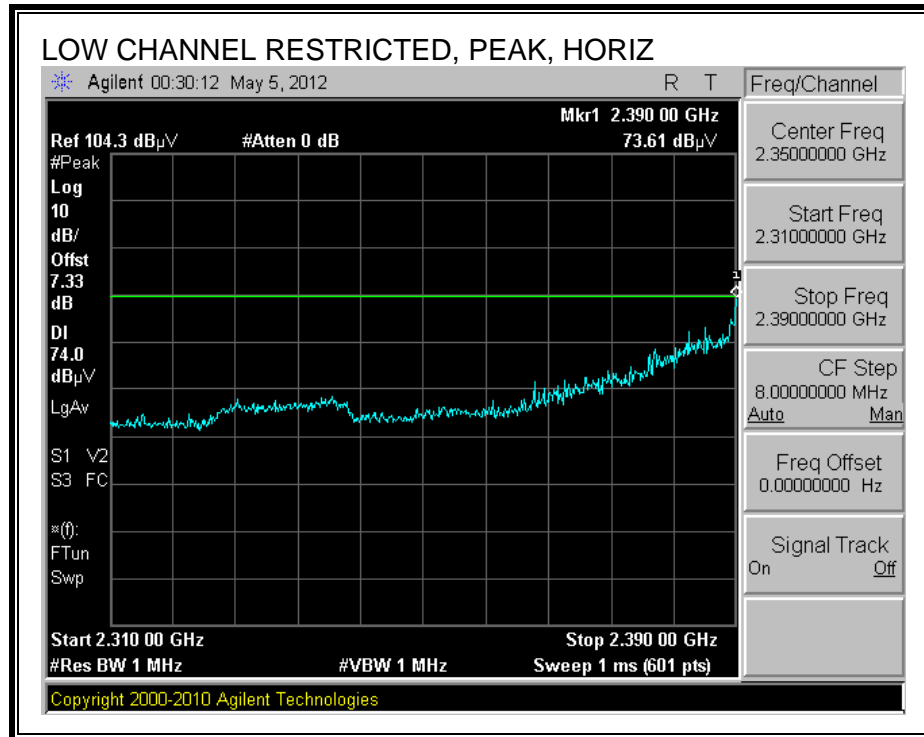
Pk Mar Margin vs. Peak Limit

Page 129 of 159

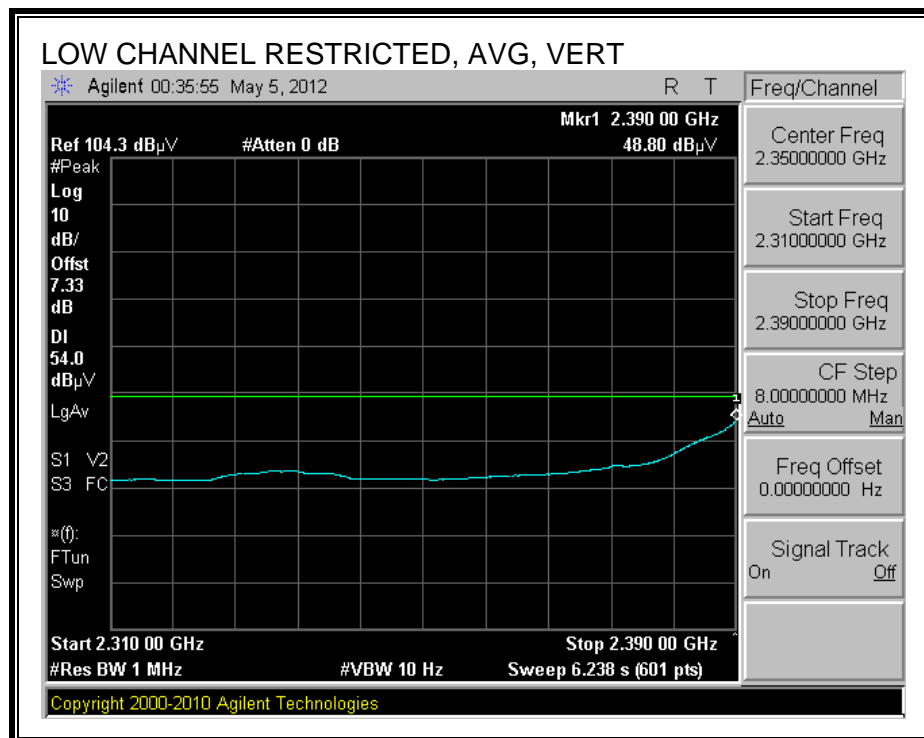
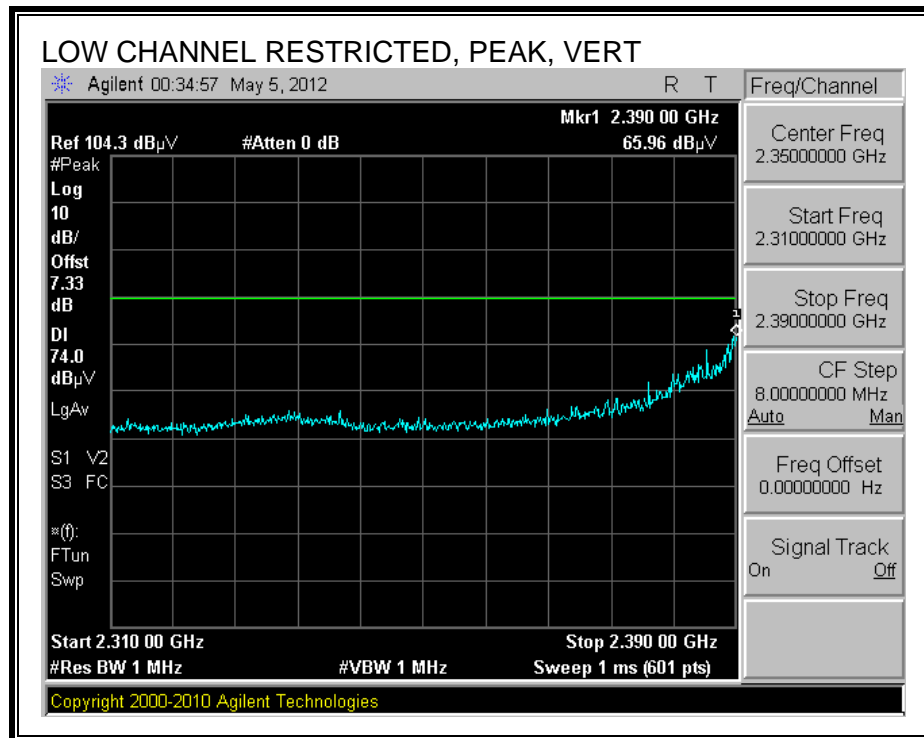
COMPLIANCE CERTIFICATION SERVICES (UL CCS) FORM NO: CCSUP4701D
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
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8.2.2. TX ABOVE 1 GHz FOR 802.11g 1TX MODE IN THE 2.4 GHz BAND

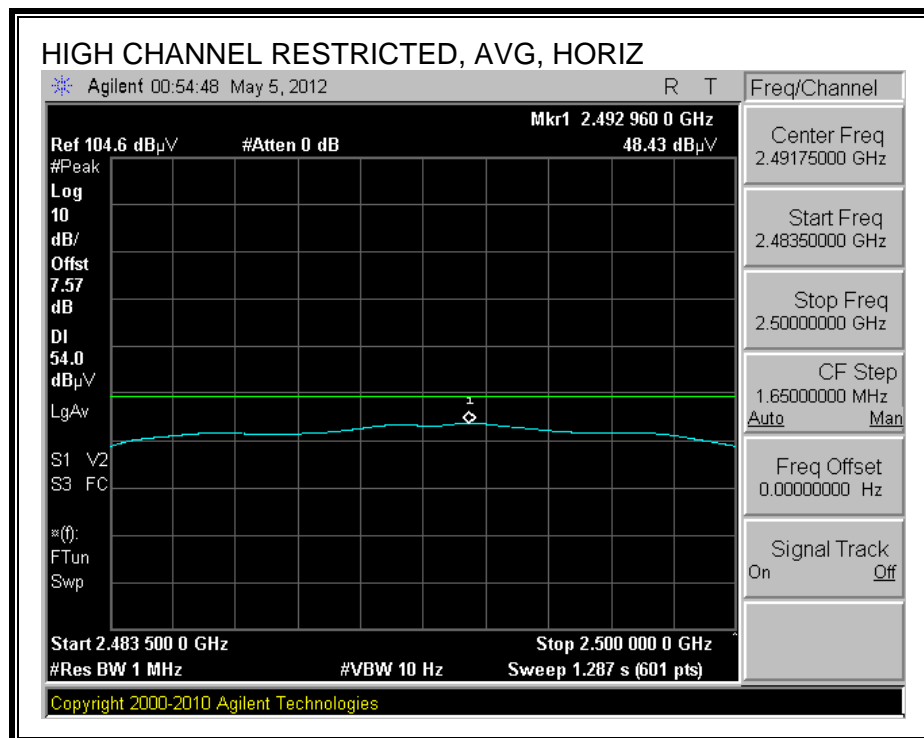
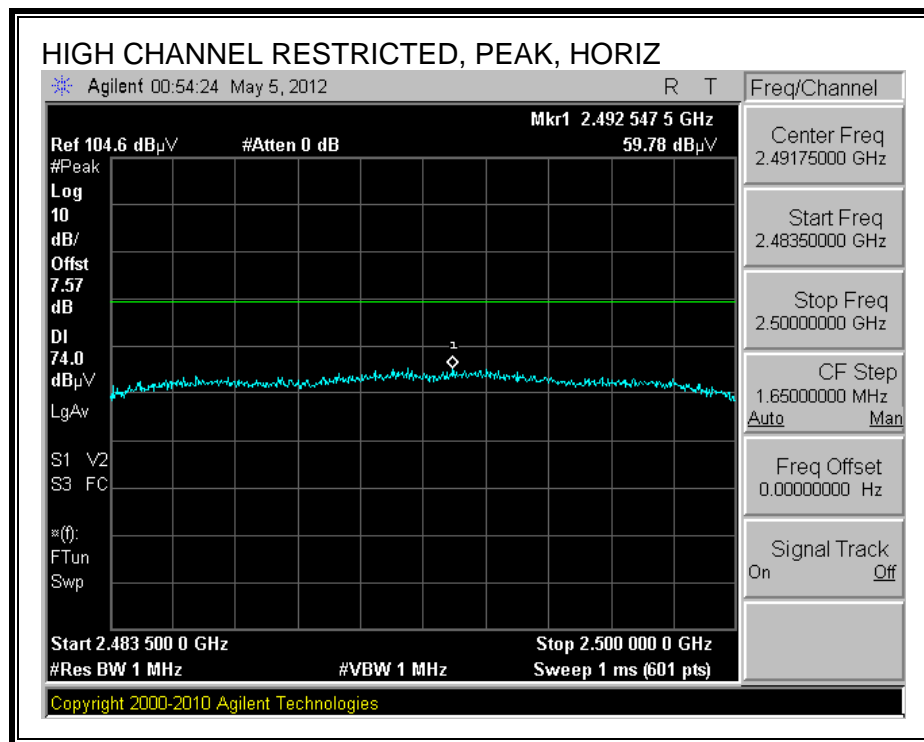
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



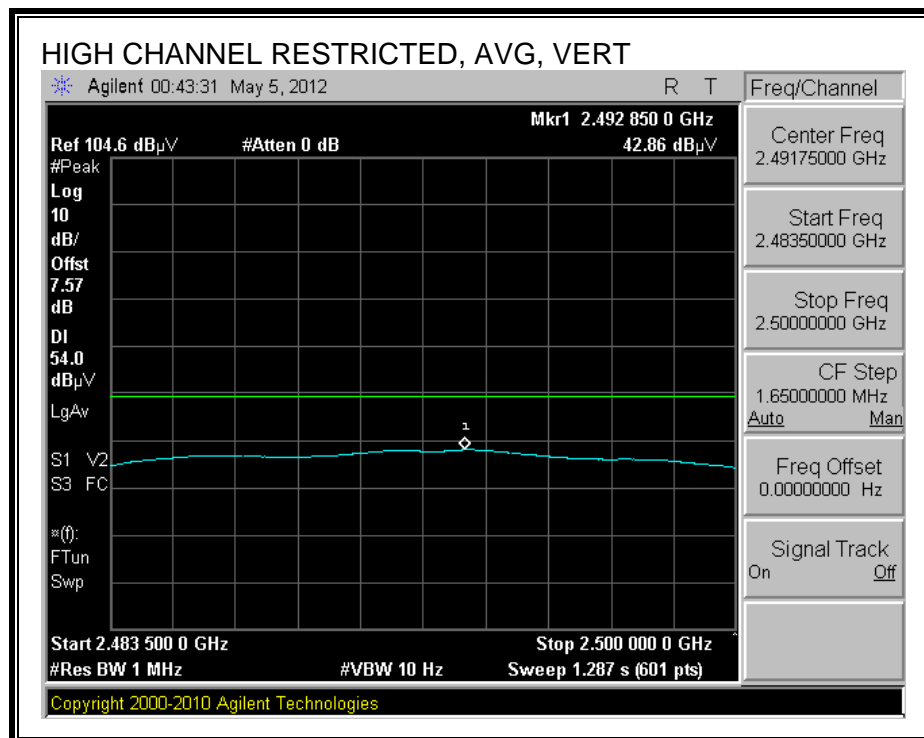
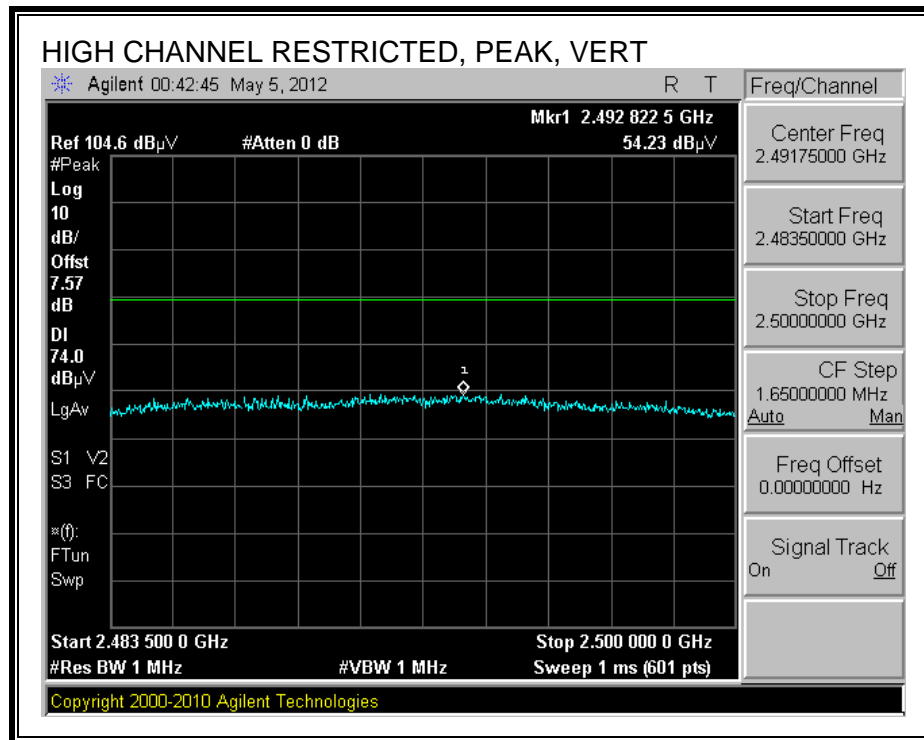
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Google
Project #: 11U14119
Date: 05/04/12
Test Engineer: Thanh Nguyen
Configuration: EUT # 93 with remote Support Laptop
Mode: Continuous Tx 802.11g

Test Equipment:

Horn 1-18GHz
T73; S/N: 6717 @3m

Pre-amplifier 1-26GHz
T144 Miteq 3008A00931

Pre-amplifier 26-40GHz

Horn > 18GHz
T125; ARA 18-26GHz; S/N:1007

Limit
FCC 15.205 5.205

Hi Frequency Cables

3' cable 22807700
3' cable 22807700

12' cable 22807600
12' cable 22807600

20' cable 22807500
20' cable 22807500

HPF

Reject Filter
R_001

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	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
DVT6-93															
Low Ch															
4.824	3.0	46.0	33.5	33.4	6.8	-35.5	0.0	0.0	50.7	38.2	74	54	-23.3	-15.8	H
4.824	3.0	43.9	30.8	33.4	6.8	-35.5	0.0	0.0	48.6	35.5	74	54	-25.4	-18.5	V
Mid ch															
4.874	3.0	46.8	34.2	33.5	6.8	-35.5	0.0	0.0	51.6	39.0	74	54	-22.4	-15.0	H
7.311	3.0	41.5	29.3	35.7	9.1	-35.4	0.0	0.0	50.9	38.7	74	54	-23.1	-15.3	H
4.874	3.0	43.4	30.4	33.5	6.8	-35.5	0.0	0.0	48.2	35.2	74	54	-25.8	-18.8	V
7.311	3.0	41.3	29.8	35.7	9.1	-35.4	0.0	0.0	50.7	39.1	74	54	-23.3	-14.9	V
High ch															
4.924	3.0	44.6	33.7	33.5	6.8	-35.5	0.0	0.0	49.4	38.5	74	54	-24.6	-15.5	H
7.386	3.0	42.6	30.1	35.8	9.1	-35.5	0.0	0.0	52.1	39.6	74	54	-21.9	-14.4	H
4.924	3.0	40.6	30.1	33.5	6.8	-35.5	0.0	0.0	45.5	35.0	74	54	-28.5	-19.0	V
7.386	3.0	42.3	30.1	35.8	9.1	-35.5	0.0	0.0	51.8	39.5	74	54	-22.2	-14.5	V

f Measurement Frequency

Dist Distance to Antenna

Read Analyzer Reading

AF Antenna Factor

CL Cable Loss

Amp Preamp Gain

D Corr Distance Correct to 3 meters

Avg Average Field Strength @ 3 m

Peak Calculated Peak Field Strength

HPF High Pass Filter

Avg Lim Average Field Strength Limit

Pk Lim Peak Field Strength Limit

Avg Mar Margin vs. Average Limit

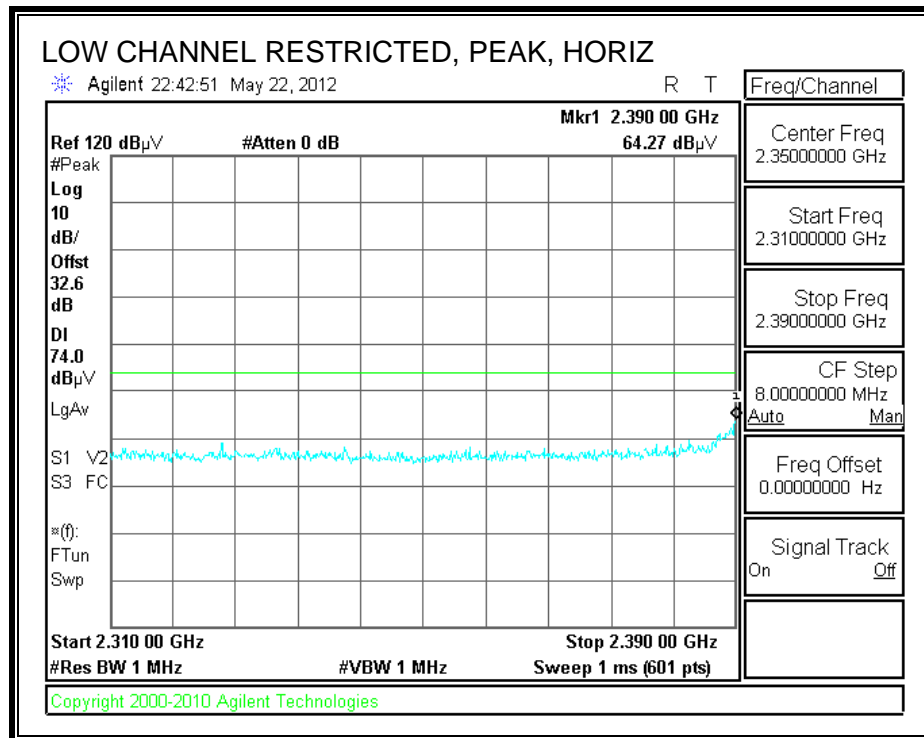
Pk Mar Margin vs. Peak Limit

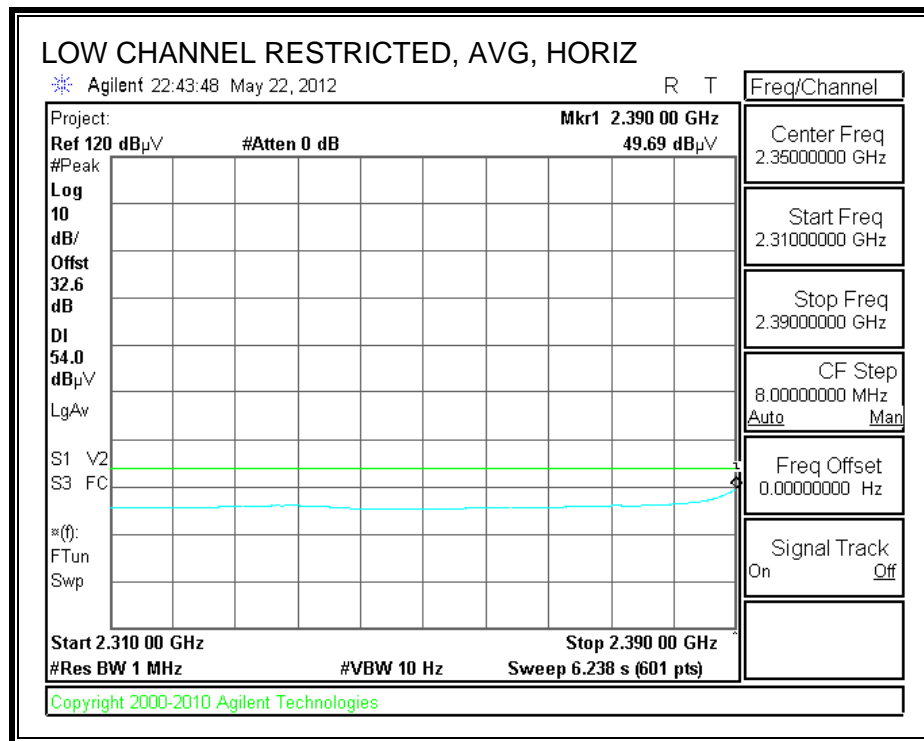
Page 134 of 159

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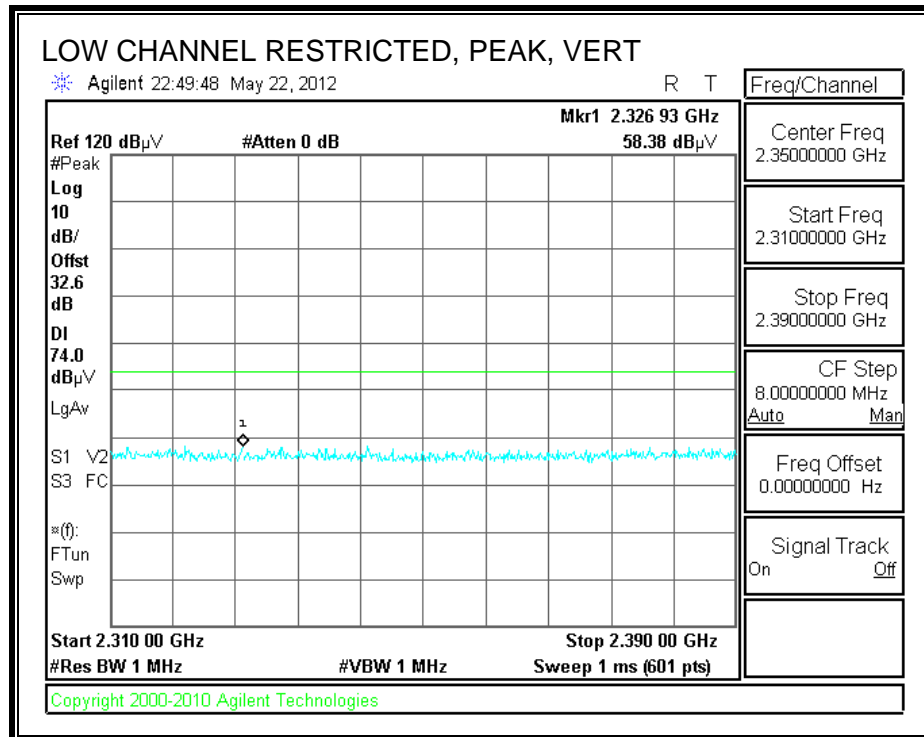
8.2.3. TX ABOVE 1 GHz FOR 802.11n HT20 1TX MODE IN THE 2.4 GHz BAND

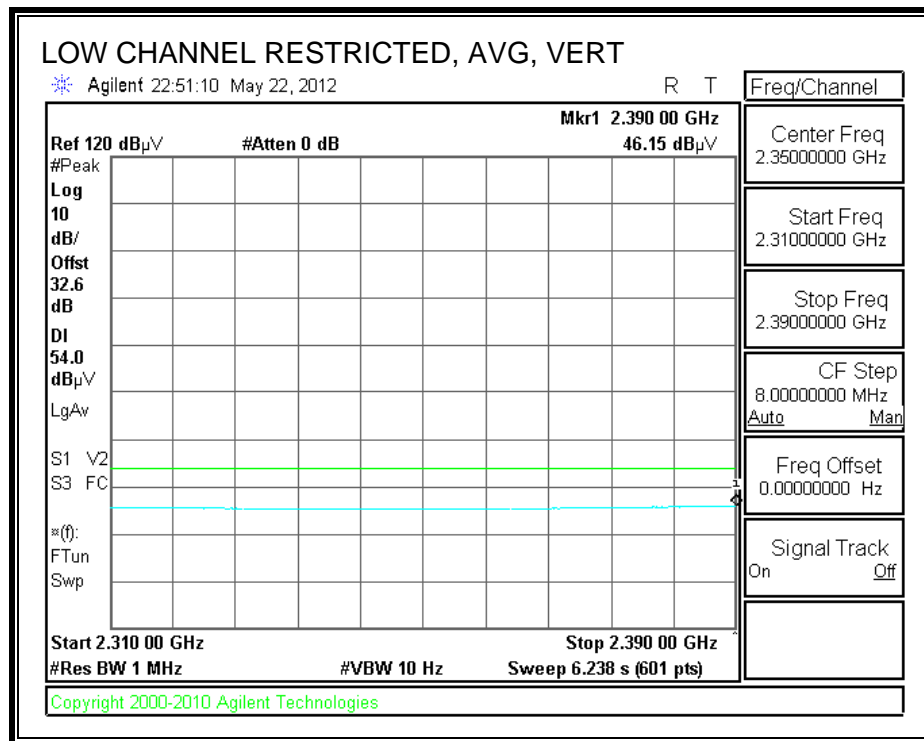
RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)



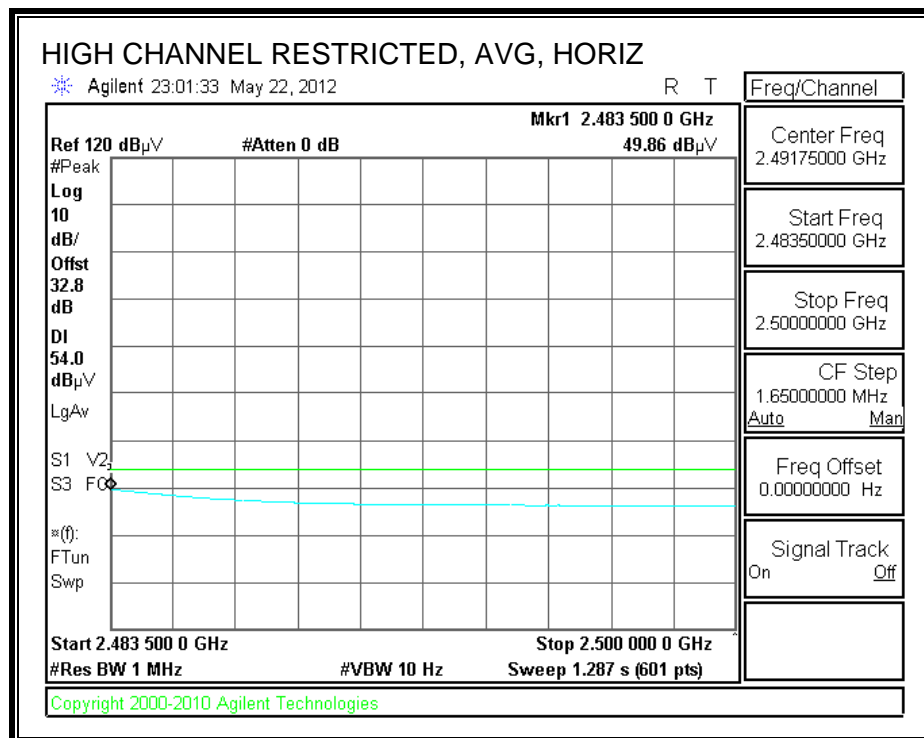
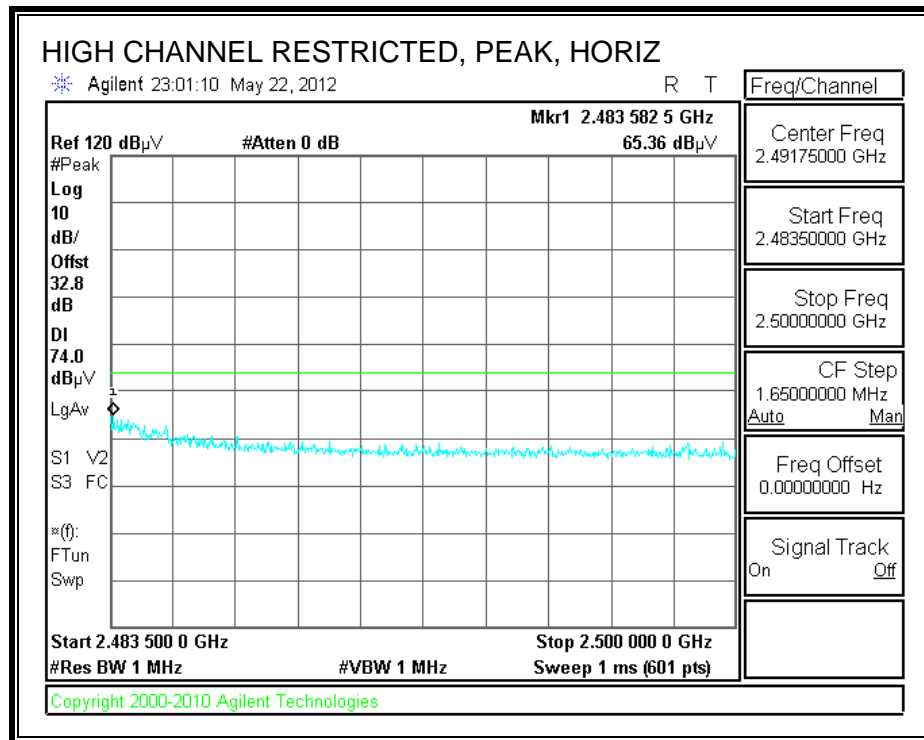


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

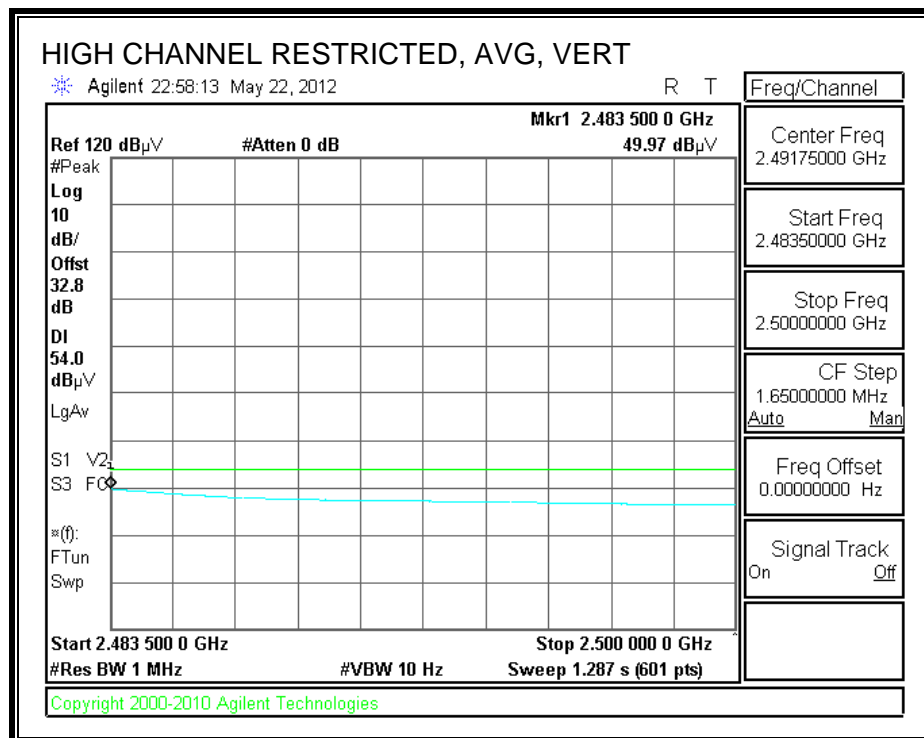
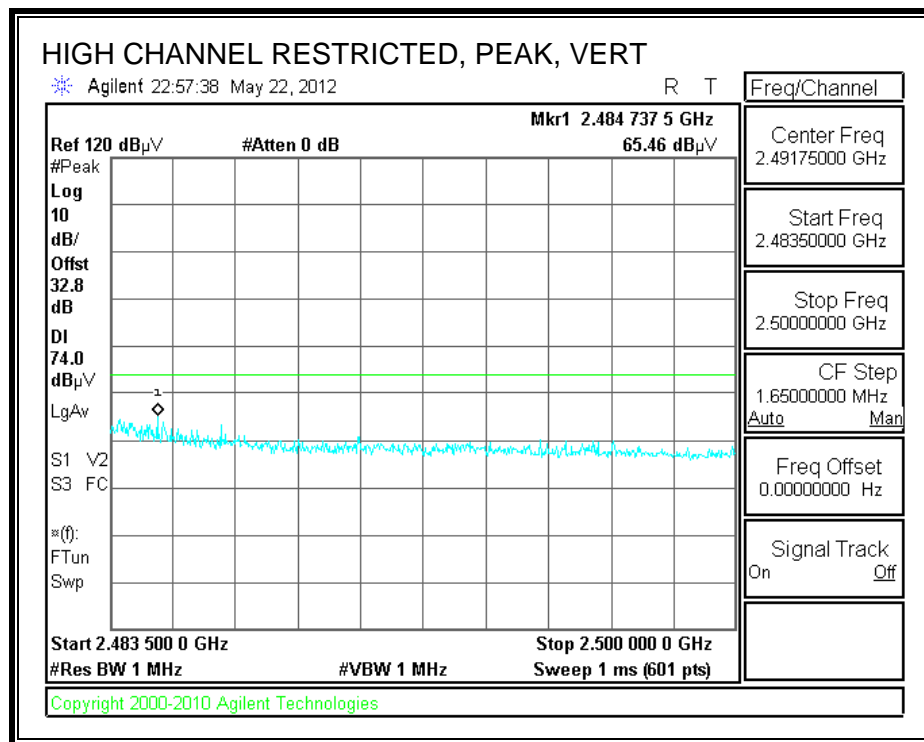




RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement															
Compliance Certification Services, Fremont 3m Chamber															
Company:		Google													
Project #:		11U14119													
Date:		05/22/12													
Test Engineer:		Thanh Nguyen													
Configuration:		EUT # 93 with remote Support Laptop													
Mode:		Continuous Tx 802.11 n20, 2.4GHz													
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T59; S/N: 3245 @3m		T34 HP 8449B				T125; ARA 18-26GHz; S/N:1007		FCC 15.205 15.205							
Hi Frequency Cables															
3' cable 22807700		12' cable 22807600		20' cable 22807500		HPF		Reject Filter		Peak Measurements					
3' cable 22807700		12' cable 22807600		20' cable 22807500				R_001		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)
DVT6-93															
Low Ch															
4.824	3.0	43.2	30.5	33.1	6.8	-34.1	0.0	0.0	49.0	36.3	74	54	-25.0	-17.7	H
4.824	3.0	40.9	30.3	33.1	6.8	-34.1	0.0	0.0	46.7	36.1	74	54	-27.3	-17.9	V
Mid ch															
4.874	3.0	43.8	31.2	33.1	6.8	-34.0	0.0	0.0	49.7	37.1	74	54	-24.3	-16.9	H
7.311	3.0	41.5	29.3	35.8	9.1	-33.1	0.0	0.0	53.3	41.1	74	54	-20.7	-12.9	H
4.874	3.0	40.4	30.3	33.1	6.8	-34.0	0.0	0.0	46.3	36.2	74	54	-27.7	-17.8	V
7.311	3.0	41.3	29.8	35.8	9.1	-33.1	0.0	0.0	53.1	41.6	74	54	-20.9	-12.4	V
High ch															
4.924	3.0	41.6	30.3	33.2	6.8	-34.0	0.0	0.0	47.6	36.3	74	54	-26.4	-17.7	H
7.386	3.0	40.2	29.4	35.9	9.1	-33.1	0.0	0.0	52.2	41.3	74	54	-21.8	-12.7	H
4.924	3.0	40.6	30.1	33.2	6.8	-34.0	0.0	0.0	46.6	36.1	74	54	-27.4	-17.9	V
7.386	3.0	40.2	29.0	35.9	9.1	-33.1	0.0	0.0	52.2	40.9	74	54	-21.8	-13.1	V
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								

8.2.4. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																	
Compliance Certification Services, Fremont 3m Chamber																	
Company:		GOOGLE															
Project #:		11U14119															
Date:		5/8/2012															
Test Engineer:		Thanh Nguyen															
Configuration:		EUT only															
Mode:		Tx 5.8GHz															
Test Equipment:																	
Horn 1-18GHz				Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz				Horn > 18GHz				Limit	
T60; S/N: 2238 @3m				T34 HP 8449B								T125; ARA 18-26GHz; S/N:1007				FCC 15.209	
Hi Frequency Cables																	
3' cable 22807700				12' cable 22807600				20' cable 22807500				HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz	
3' cable 22807700				12' cable 22807600				20' cable 22807500									
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)		
Low Ch 5745MHz																	
11.490	3.0	35.8	21.6	38.9	11.2	-32.4	0.0	0.0	53.5	39.3	74	54	-20.5	-14.7	H/Noise floor		
15.540	3.0	36.8	22.3	39.1	13.0	-31.9	0.0	0.0	56.9	42.4	74	54	-17.1	-11.6	V/Noise floor		
Mid Ch 5785MHz																	
11.545	3.0	36.4	22.1	38.9	11.3	-32.4	0.0	0.0	54.2	39.9	74	54	-19.8	-14.1	V/Noise floor		
11.545	3.0	36.2	22.5	38.9	11.3	-32.4	0.0	0.0	54.0	40.3	74	54	-20.0	-13.7	H/Noise floor		
High ch 5825MHz																	
11.650	3.0	36.1	22.7	39.0	11.4	-32.4	0.0	0.0	54.2	40.8	74	54	-19.8	-13.2	H/Noise floor		
11.650	3.0	36.3	22.8	39.0	11.4	-32.4	0.0	0.0	54.3	40.8	74	54	-19.7	-13.2	V/Noise floor		
Rev. 11.10.11																	
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												

8.2.5. TRANSMITTER ABOVE 1 GHz FOR 802.11n 20 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: GOOGLE
Project #: 11U14119
Date: 5/8/2012
Test Engineer: Thanh Nguyen
Configuration: EUT only
Mode: Tx 802.11 HT 20, 5.8GHz

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B		T125; ARA 18-26GHz; S/N:1007	FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz
3' cable 22807700	12' cable 22807600	20' cable 22807500			

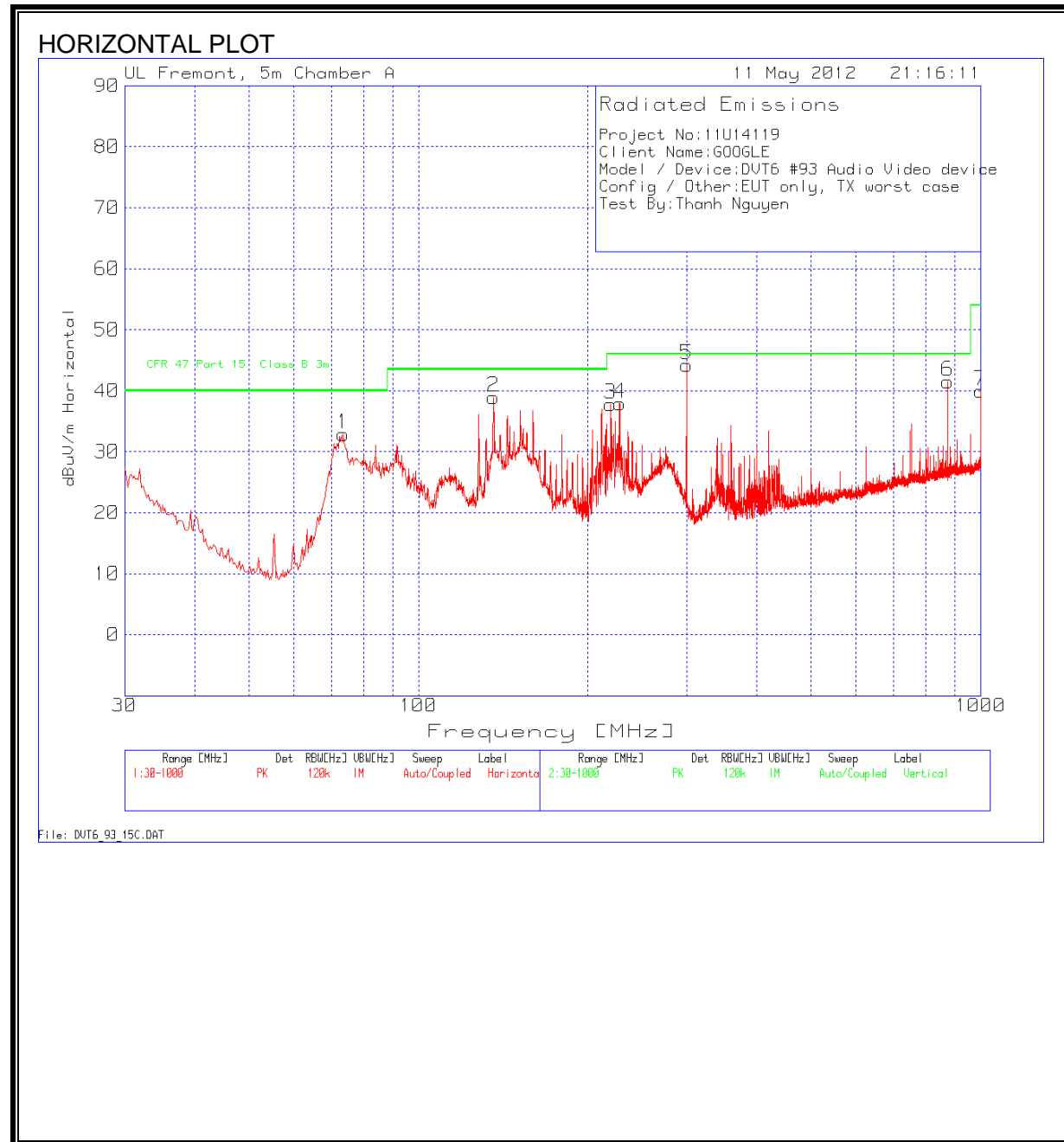
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch 5745MHz															
11.490	3.0	36.24	21.75	38.9	11.2	-32.4	0.0	0.0	53.9	39.4	74	54	-20.1	-14.6	H/Noise floor
15.540	3.0	36.43	22.43	39.1	13.0	-31.9	0.0	0.0	56.5	42.5	74	54	-17.5	-11.5	V/Noise floor
Mid Ch 5785MHz															
11.545	3.0	36.33	22.46	38.9	11.3	-32.4	0.0	0.0	54.1	40.3	74	54	-19.9	-13.7	V/Noise floor
11.545	3.0	36.25	22.52	38.9	11.3	-32.4	0.0	0.0	54.1	40.3	74	54	-19.9	-13.7	H/Noise floor
High ch 5825MHz															
11.650	3.0	36.24	22.82	39.0	11.4	-32.4	0.0	0.0	54.3	40.9	74	54	-19.7	-13.1	H/Noise floor
11.650	3.0	36.37	22.82	39.0	11.4	-32.4	0.0	0.0	54.5	40.9	74	54	-19.5	-13.1	V/Noise floor

Rev. 11.10.11

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		

8.3. WORST-CASE BELOW 1 GHz

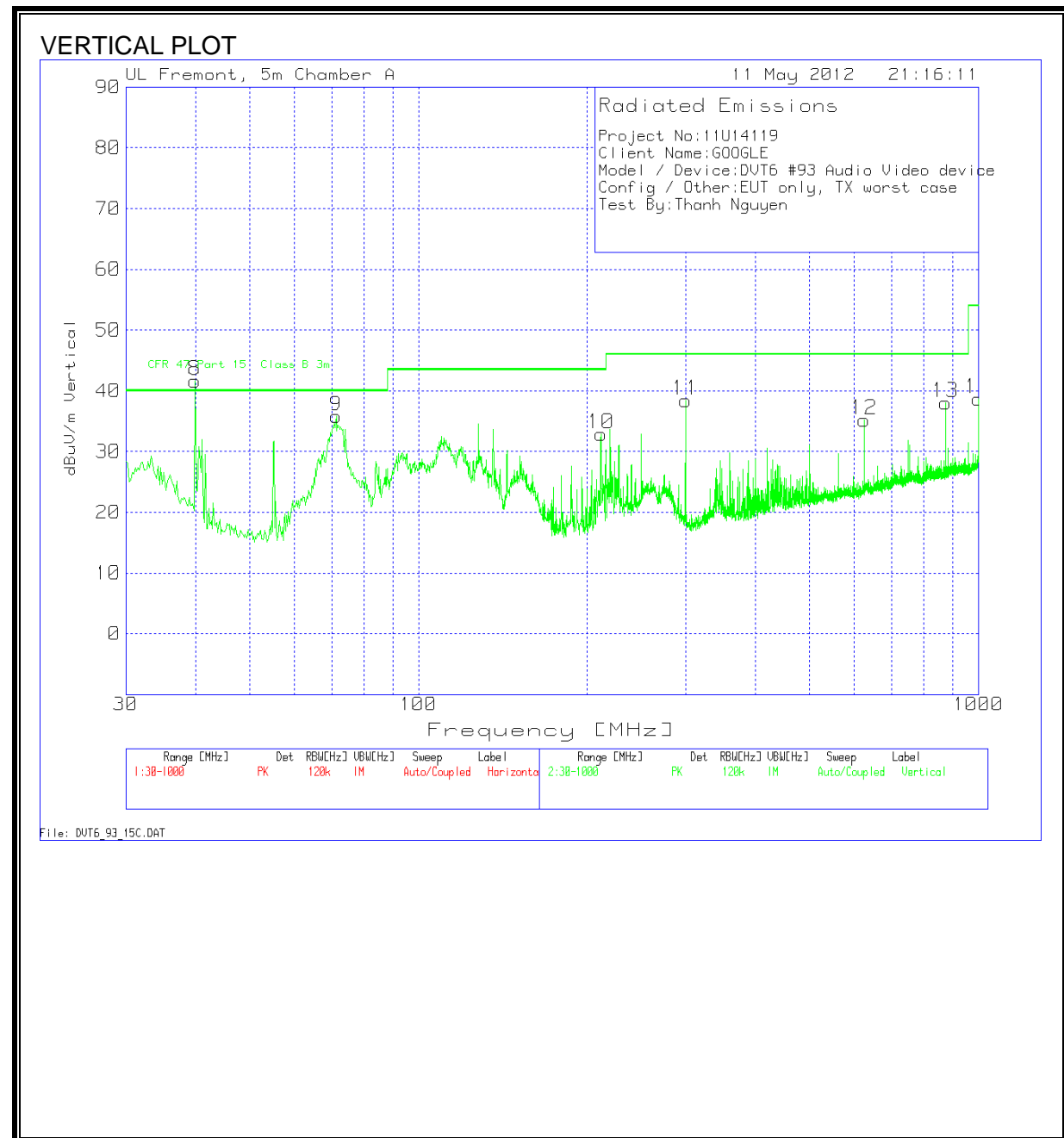
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



HORIZONTAL DATA

Project No:11U14119									
Client Name:GOOGLE									
Model / Device:DVT6 #93 Audio Video device									
Config / Other:EUT only, TX worst case									
Test By:Thanh Nguyen									
Horizontal 30 - 1000MHz									
Test Frequency	Meter Reading	Detector	PreAmp Gain (dB)	Antenna +Cable Factor	EMI Value dBuV/m	CFR 47 Part 15 Class B 3m limit	Margin	Height [cm]	Polarity
73.6151	52.04	PK	-27.1	8	32.94	40	-7.06	200	Horz
135.8393	52.7	PK	-26.7	13	39	43.5	-4.5	300	Horz
219.7742	53.34	PK	-26.2	10.6	37.74	46	-8.26	100	Horz
228.1095	53.18	PK	-26.1	10.8	37.88	46	-8.12	100	Horz
300.026	56.84	PK	-25.8	13.2	44.24	46	-1.76	100	Horz
300.0044	56.36	QP	-25.8	13.2	43.76	46	-2.24	101	Horz
875.1639	43.18	PK	-23.2	21.5	41.48	46	-4.52	100	Horz
1000	40.04	PK	-23.1	23	39.94	54	-14.06	100	Horz

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



VERTICAL DATA

Vertical 30 - 1000MHz									
Test Frequency	Meter Reading	Detector	PreAmp Gain (dB)	Antenna +Cable Factor	EMI Value dBuV/m	CFR 47 Part 15 Class B 3m limit	Margin	Height [cm]	Polarity
40.3997	30.58	QP	-27.3	13.7	16.98	40	-23.02	135	Vert
71.289	54.79	PK	-27.1	8.1	35.79	40	-4.21	100	Vert
211.8265	48.55	PK	-26.1	10.4	32.85	43.5	-10.65	200	Vert
300.026	50.98	PK	-25.8	13.2	38.38	46	-7.62	200	Vert
625.1039	39.93	PK	-23.7	19	35.23	46	-10.77	100	Vert
875.1639	39.7	PK	-23.2	21.5	38	46	-8	100	Vert
1000	38.82	PK	-23.1	23	38.72	54	-15.28	100	Vert

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

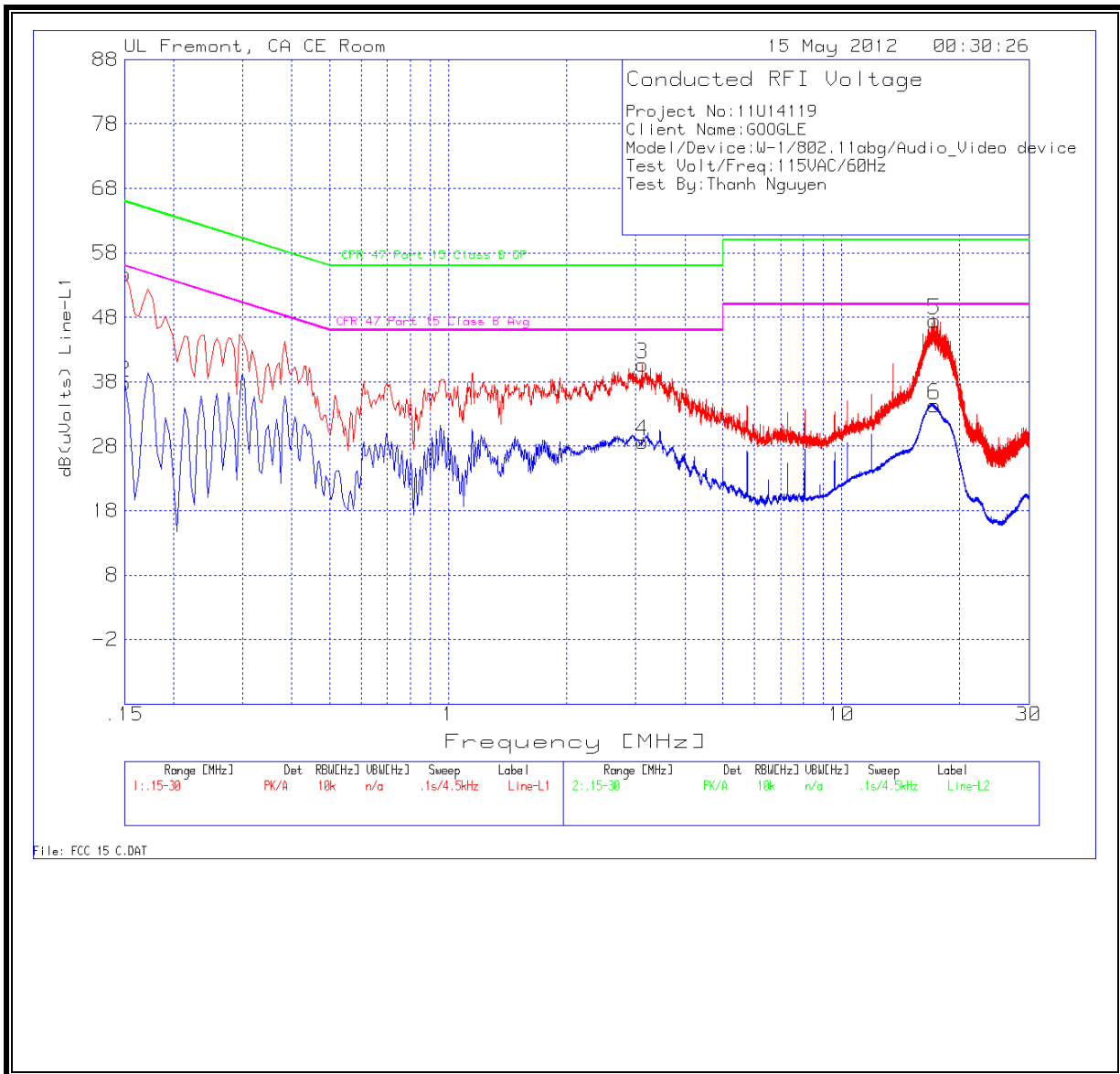
ANSI C63.4

RESULTS

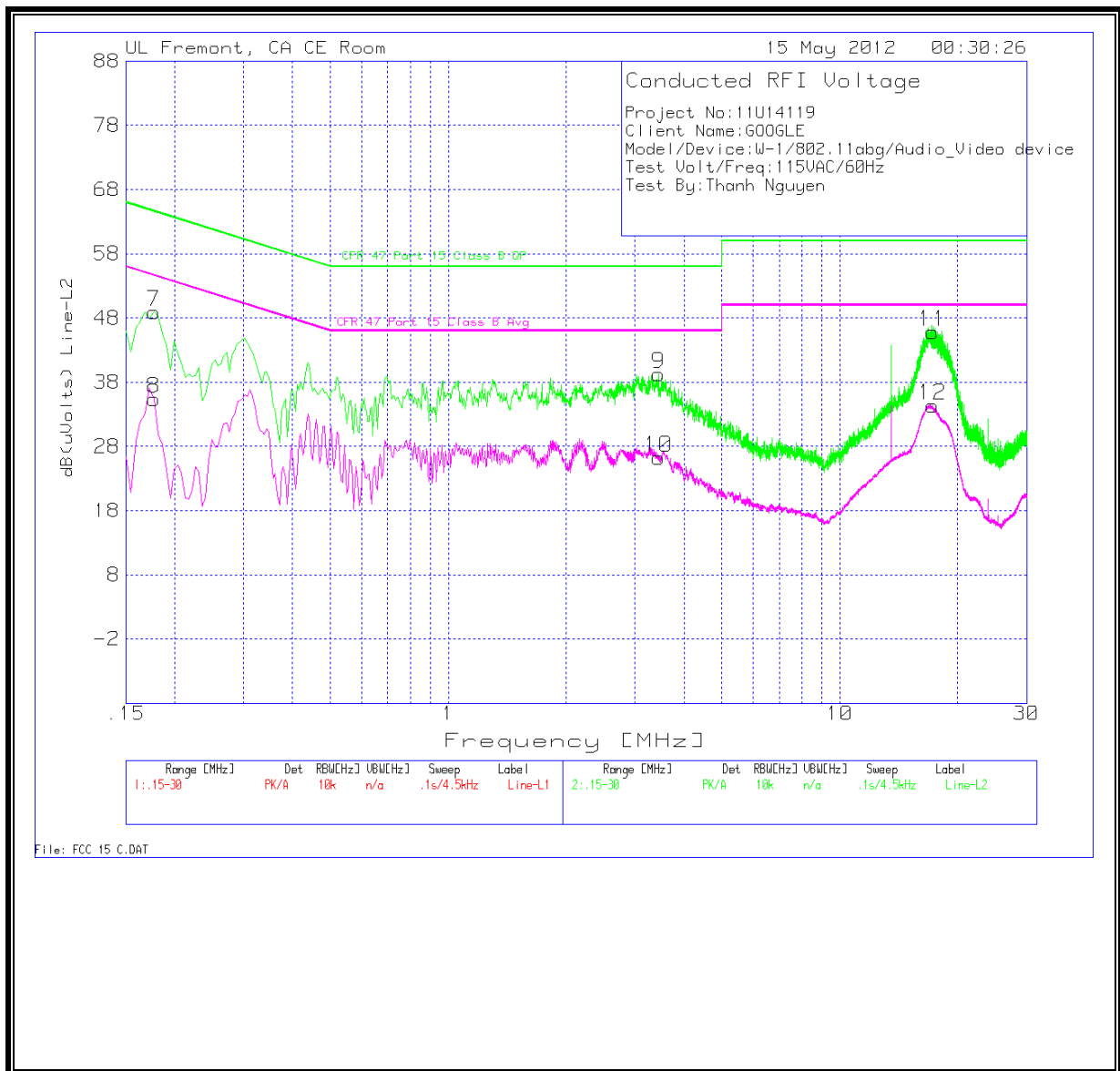
6 WORST EMISSIONS

Project No:11U14119									
Client Name:GOOGLE									
Model/Device:W-1/802.11abg/Audio_Video device									
Test Volt/Freq:115VAC/60Hz									
Test By:Thanh Nguyen									
Line-L1 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dB(uVolts)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
0.15	54.57	PK	0.1	0	54.67	66	-11.33	-	-
0.15	37.69	Av	0.1	0	37.79	-	-	56	-18.21
3.12	40.53	PK	0.1	0.1	40.73	56	-15.27	-	-
3.12	28.44	Av	0.1	0.1	28.64	-	-	46	-17.36
17.2275	47.15	PK	0.2	0.2	47.55	60	-12.45	-	-
17.2275	33.91	Av	0.2	0.2	34.31	-	-	50	-15.69
Line-L2 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	T24 IL L1.TXT (dB)	LC Cables 1&3.TXT (dB)	dB(uVolts)	CFR 47 Part 15 Class B QP	Margin	CFR 47 Part 15 Class B Avg	Margin
0.177	48.89	PK	0.1	0	48.99	64.6	-15.61	-	-
0.177	35.31	Av	0.1	0	35.41	-	-	54.6	-19.19
3.4485	39.11	PK	0.1	0.1	39.31	56	-16.69	-	-
3.4485	26.04	Av	0.1	0.1	26.24	-	-	46	-19.76
17.2365	45.47	PK	0.2	0.2	45.87	60	-14.13	-	-
17.2365	33.95	Av	0.2	0.2	34.35	-	-	50	-15.65

LINE 1 RESULTS



LINE 2 RESULTS



10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> ^{0.5}	0.0042 <i>f</i> ^{0.5}	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> ^{1.2}
150 000–300 000	0.158 <i>f</i> ^{0.5}	4.21 × 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 × 10 ⁻⁵ <i>f</i>	616 000 / <i>f</i> ^{1.2}

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, *f*, is in MHz.
2. A power density of 10 W/m² is equivalent to 1 mW/cm².
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

$$S = \text{EIRP} / (4 * \pi * D^2)$$

where

S = Power density in W/m²

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m² is converted to units of mW/cm² by dividing by 10.

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \pi * S))$$

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m²

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

$$\text{Total EIRP} = (P_1 * G_1) + (P_2 * G_2) + \dots + (P_n * G_n)$$

where

P_x = Power of transmitter x

G_x = Numeric gain of antenna x

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m^2)	FCC Power Density (mW/cm^2)
2.4 GHz	WLAN	0.20	17.16	2.30	0.18	0.018
5 GHz	WLAN	0.20	18.10	6.00	0.51	0.051