FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA Phone + Bluetooth & WLAN 2.4GHz b/g/n + NFC

MODEL NUMBER: SM-G3518

FCC ID: A3LSMG3518

REPORT NUMBER: 13I16695-4, Revision B

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Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/13/13	Initial Issue	P. Kim
A	1/20/14	Updated equipment list; statement in page 8; summary table	P. Kim
B	1/22/14	Updated summary table	P. Kim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA Phone + Bluetooth & WLAN 2.4GHz b/g/n + NFC

MODEL: SM-G3518

SERIAL NUMBER: SM-G3518-A, SM-G3518-B, SM-G3518-C, SM-G3518-D

DATE TESTED: DECEMBER 9-13, 2013

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

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

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

Approved & Released
For UL Verification Services Inc. By:

PHILIP KIM
WiSE PROGRAM MANAGER
UL Verification Services Inc.

Tested By:

STEVEN TRAN
WiSE LAB TECHNICIAN
UL Verification Services Inc.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2009.

3. FACILITIES AND ACCREDITATION

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

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://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 18000 MHz	4.94 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA Phone + Bluetooth & WLAN 2.4GHz b/g/n + NFC.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	19.47	88.51
2412 - 2462	802.11g	23.2	208.93
2412 - 2462	802.11n HT20	23.29	213.30

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -3.3 dBi.

5.4. SOFTWARE AND FIRMWARE

Software version was 3.4.0-g9f6ebe1-00072-gcee1ab4b

The firmware used was M8974A-0.0.19.0.01.

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5.5. WORST-CASE CONFIGURATION AND MODE

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

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

Based on the baseline scan, the worst-case data rates were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20mode: MCS0

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Samsung	SM-G3518	DK4DA09TS	N/A
Earphone	Samsung	SM-G3518	N/A	N/A

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

TEST SETUP

The EUT is a stand-alone unit during the tests. Test software exercised the radio card.

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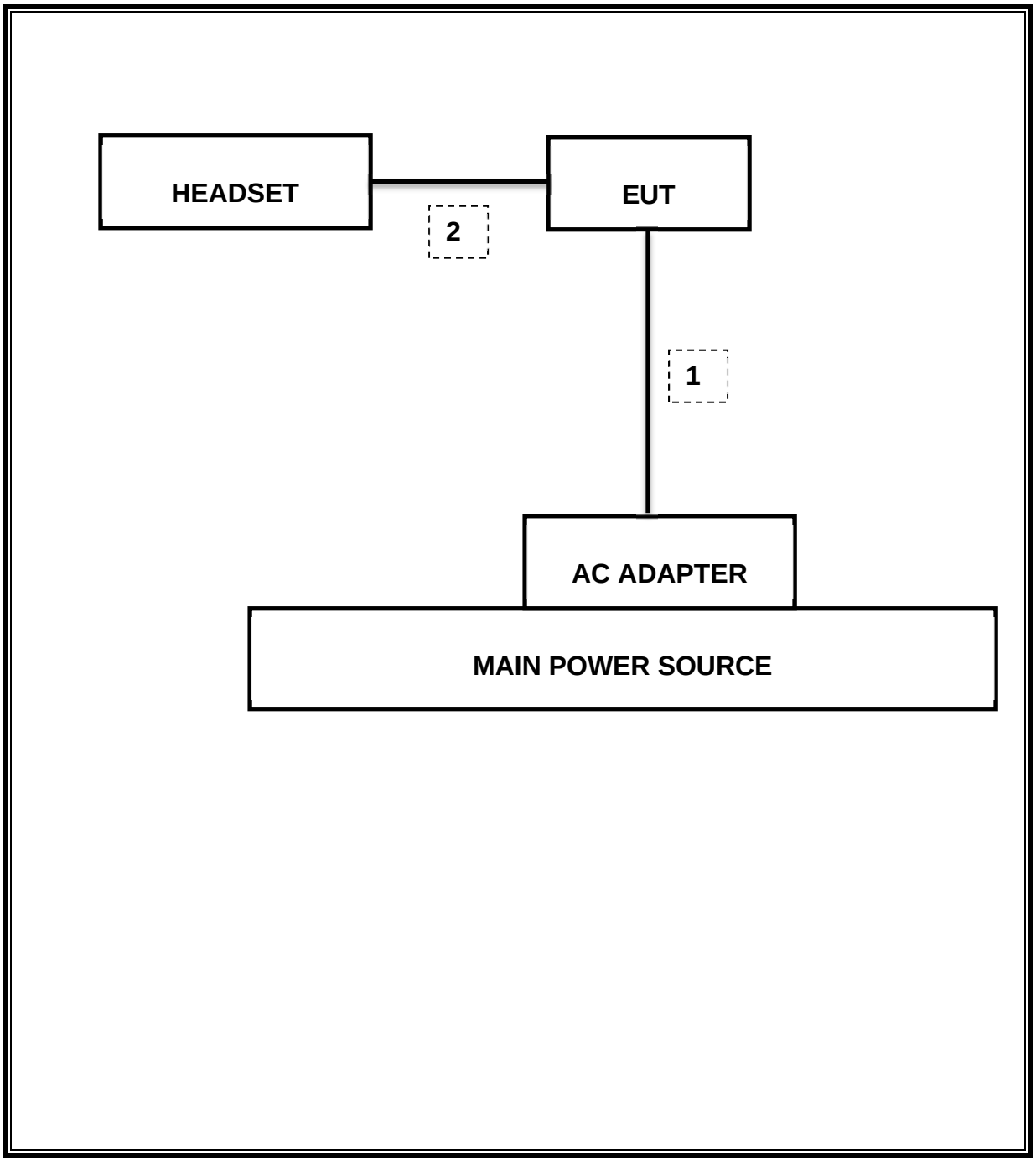
SETUP DIAGRAM FOR TESTS



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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**
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01016	08/14/13	08/14/14
Antenna, Horn, 18 GHz	EMCO	3115	C00783	10/25/13	10/25/14
Antenna, Horn, 25.5 GHz	ARA	MWH-1826/B	C00980	11/14/13	11/14/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/16/13	01/16/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	F00167	03/23/13	03/23/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	10/21/13	10/21/14
PXA SIGNAL ANALYZER	Agilent / HP	N9030A	N/A		05/09/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/13	08/08/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/13	01/14/14
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR	CNR
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/2013	12/13/2014
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/2013	12/13/2014

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7. MEASUREMENT METHODS

KDB 558074 Measurement Procedure PK2 is used for power and PKPSD is used for power spectral density.

Unwanted emissions within Restricted Bands are measured using traditional radiated procedures.

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8. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
15.247 (a)(2)	RSS-210 A8.2(a)	Occupied Band width (6dB)	>500KHz	Conducted	Pass	7.61 MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-28.26 dBc
15.247	RSS-210 A8.4	TX conducted output power	<30dBm		Pass	23.29 dBm
15.247	RSS-210 A8.2	PSD	<8dBm		Pass	-4.58 dBm
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	38.77 dBuV
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	50.58 dBuV/m

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9. ANTENNA PORT TEST RESULTS

9.1. 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

Reference to KDB 558074 DTS Meas Guidance 8.0: The transmitter output is connected to a spectrum analyzer with the RBW set to100KHz, the VBW >= 3 x RBW, peak detector and max hold.

RESULTS

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9.1.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	7.61	0.5
Mid	2437	7.61	0.5
High	2462	8.04	0.5
Worst		7.61	

9.1.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.38	0.5
Mid	2437	16.46	0.5
High	2462	16.50	0.5
Worst		16.38	

9.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.46	0.5
Mid	2437	17.67	0.5
High	2462	17.67	0.5
Worst		17.46	

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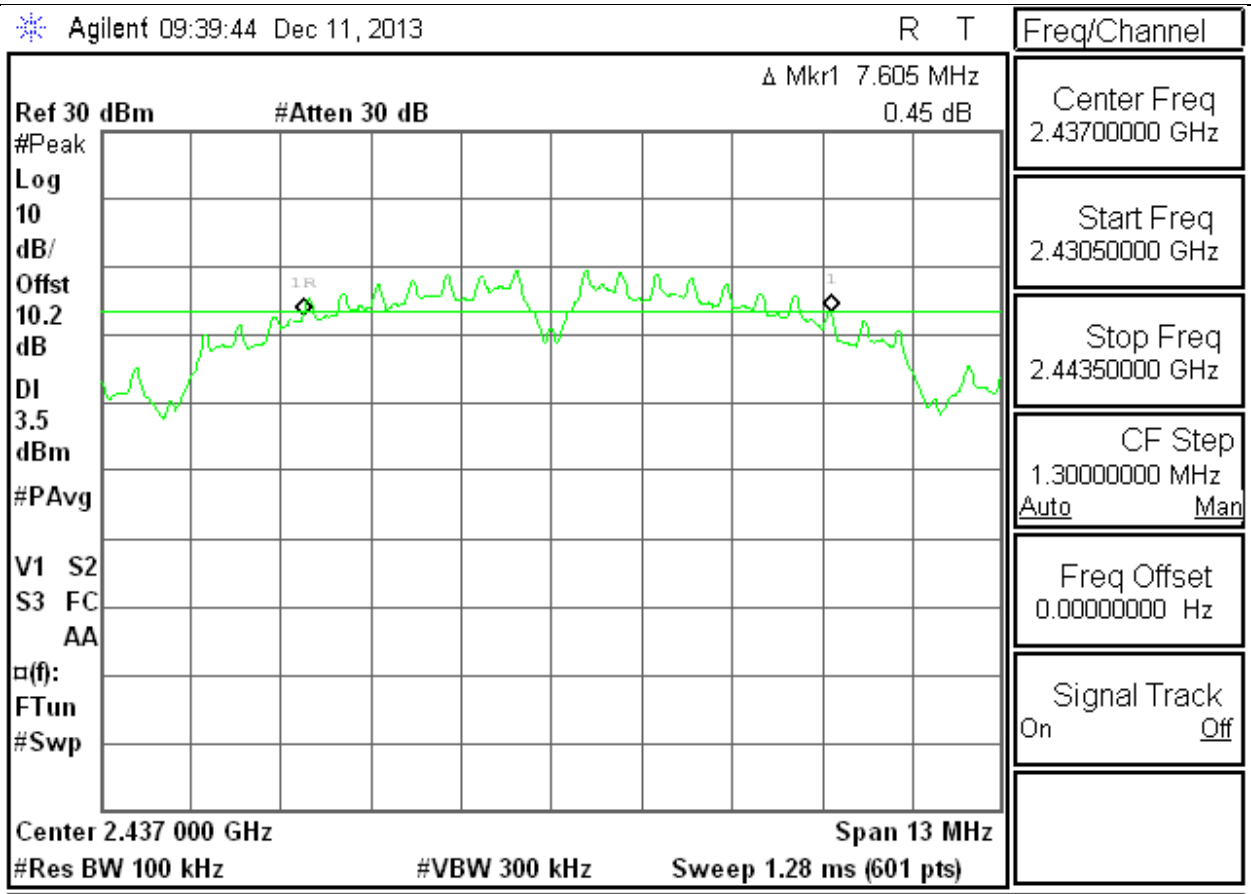
802.11b 6 dB BANDWIDTH

6 dB BANDWIDTH MID CH



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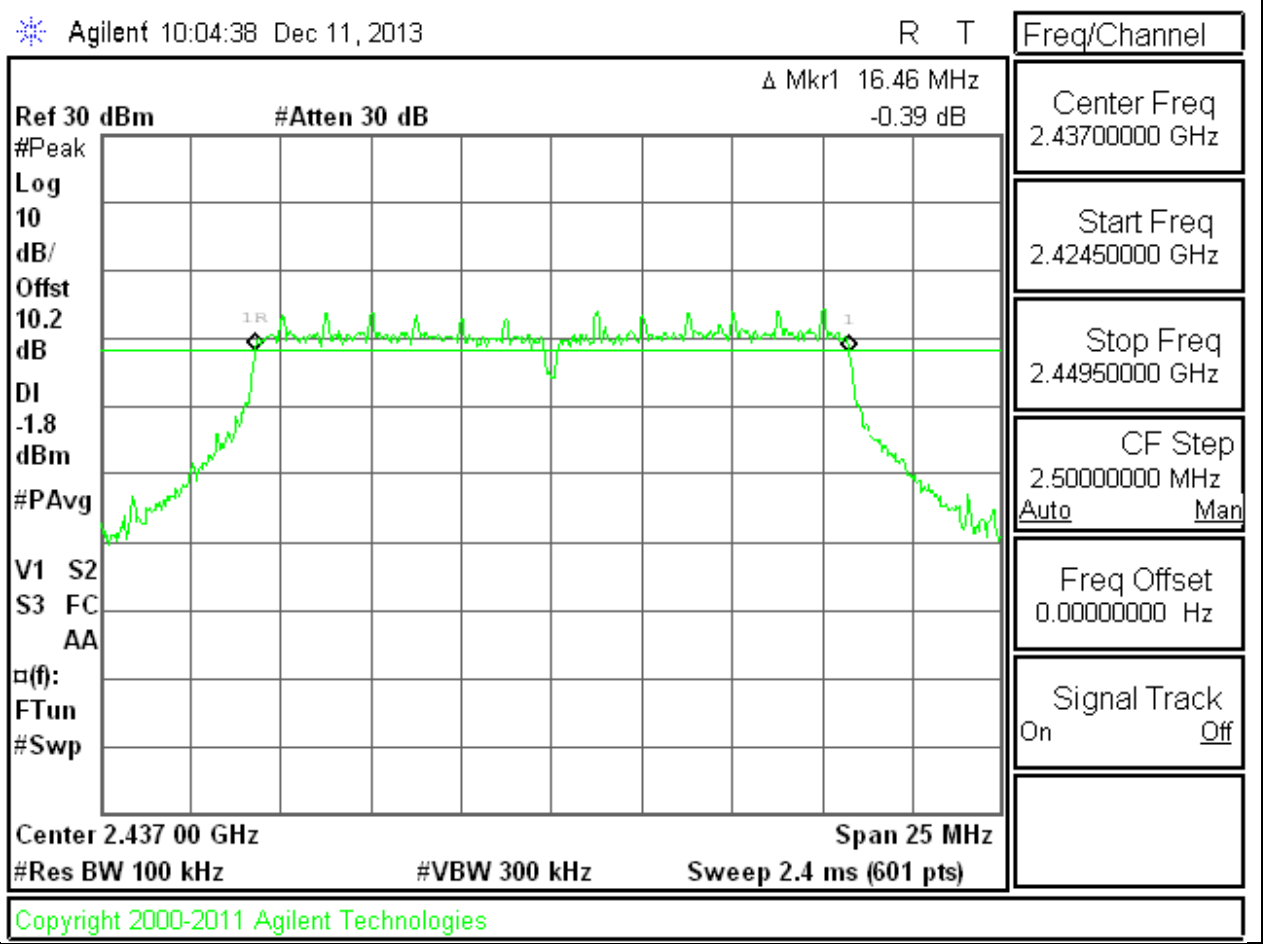
802.11g 6 dB BANDWIDTH

6 dB BANDWIDTH MID CH



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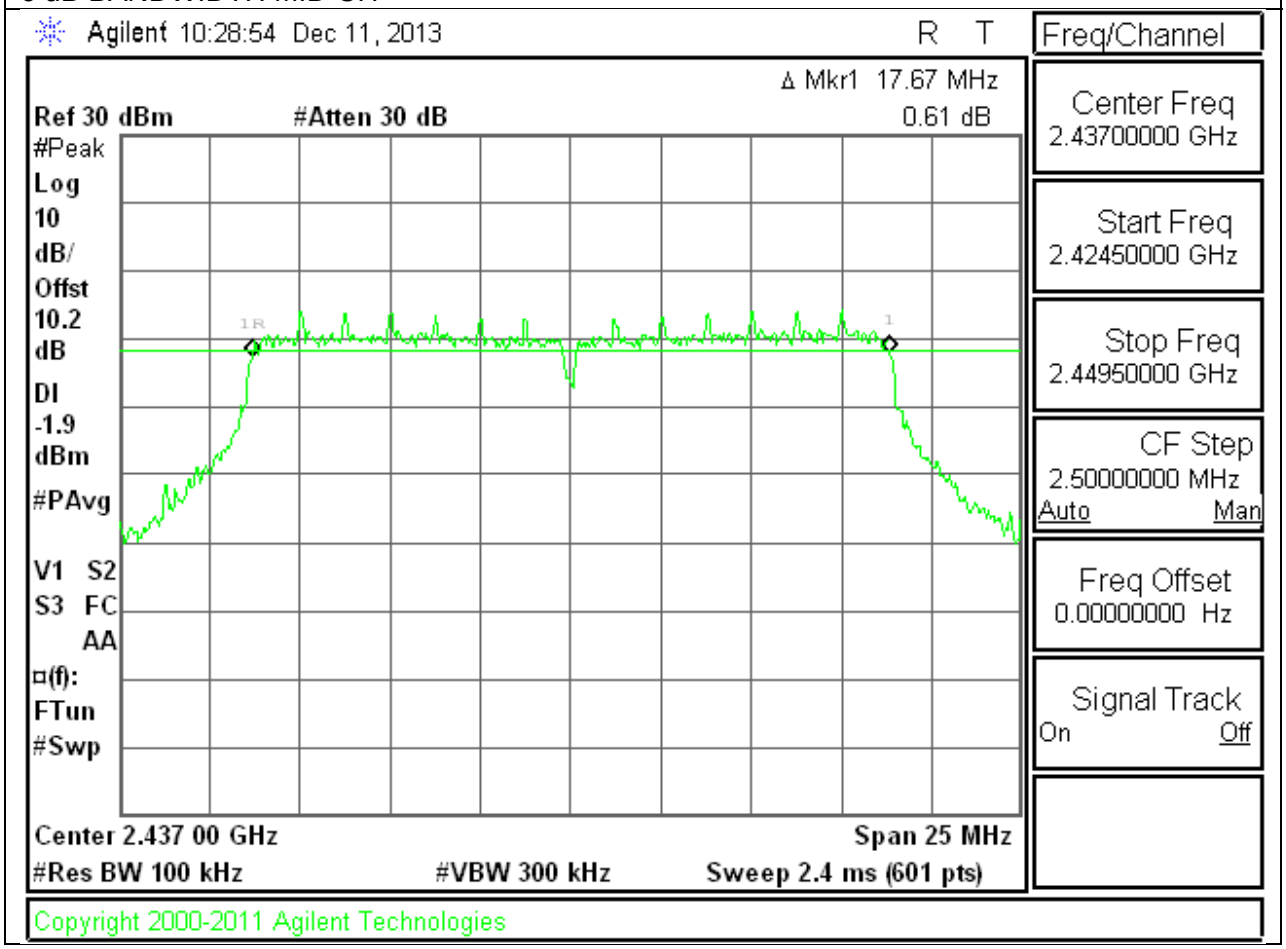
802.11n 6 dB BANDWIDTH

6 dB BANDWIDTH MID CH



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9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.33
Mid	2437	12.05
High	2462	12.06
Worst		12.33

9.2.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.29
Mid	2437	16.39
High	2462	16.44
Worst		16.44

9.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.51
Mid	2437	17.63
High	2462	17.51
Worst		17.63

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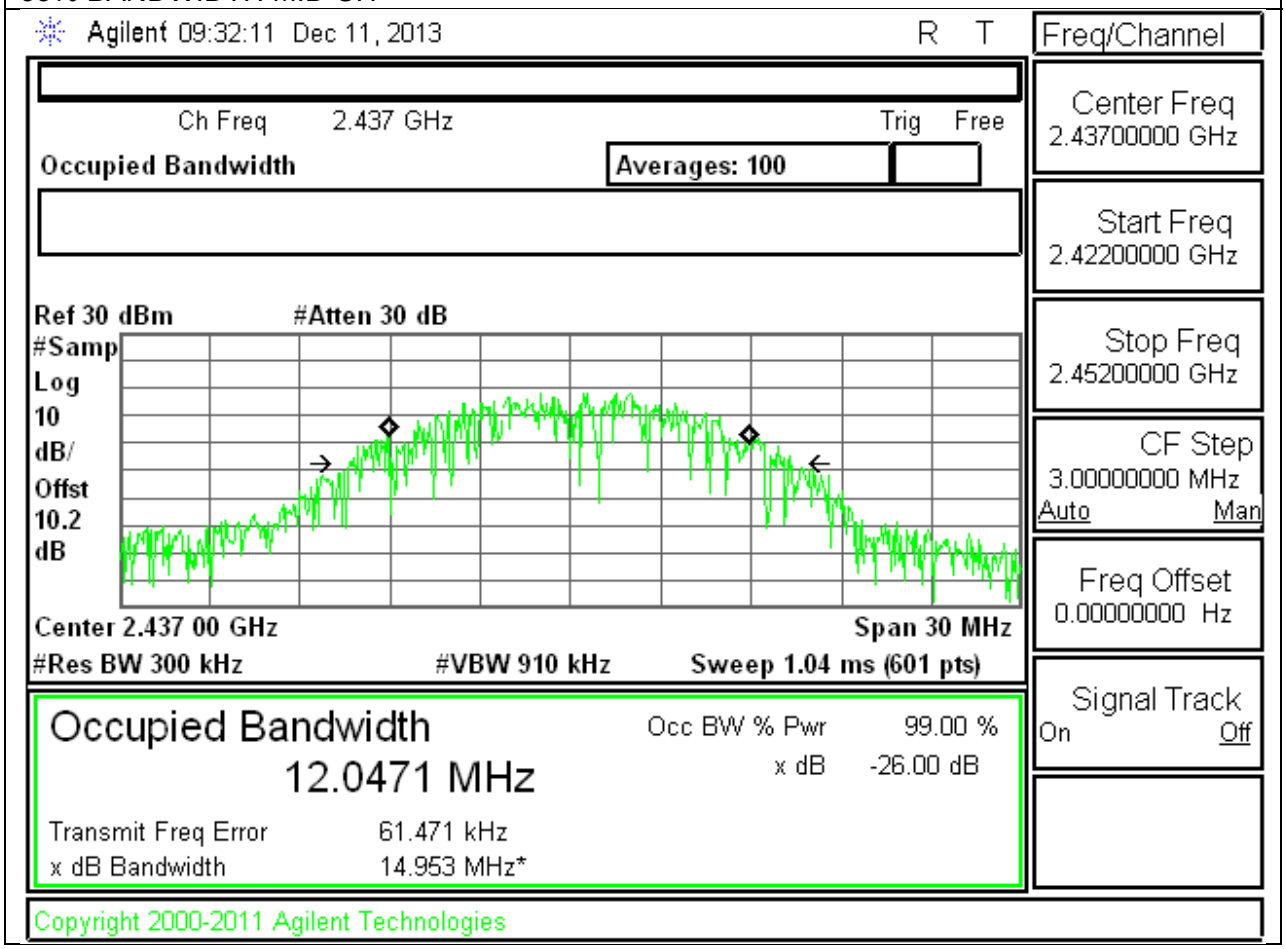
802.11b 99% BANDWIDTH

99% BANDWIDTH MID CH



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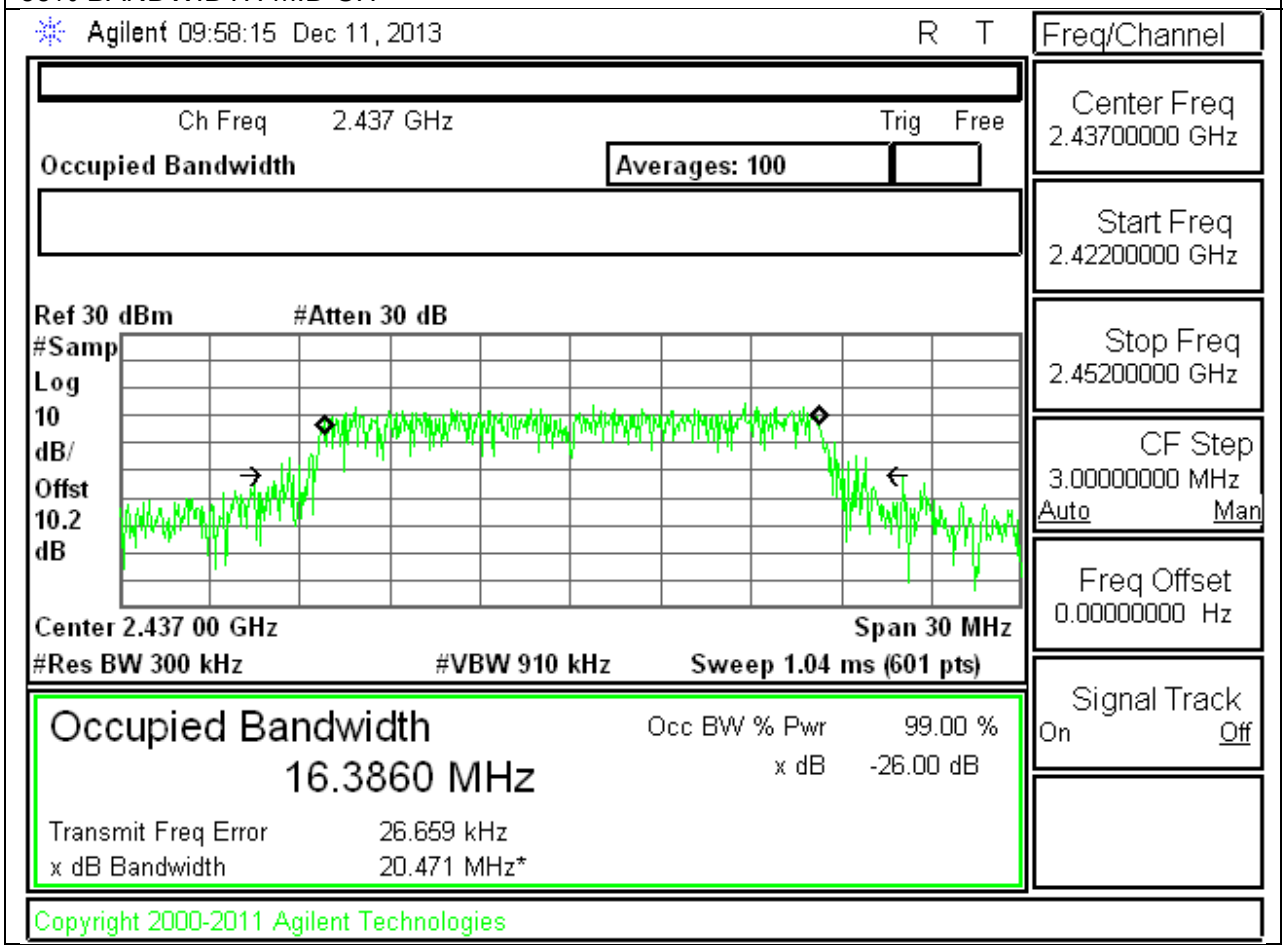
802.11g 99% BANDWIDTH

99% BANDWIDTH MID CH



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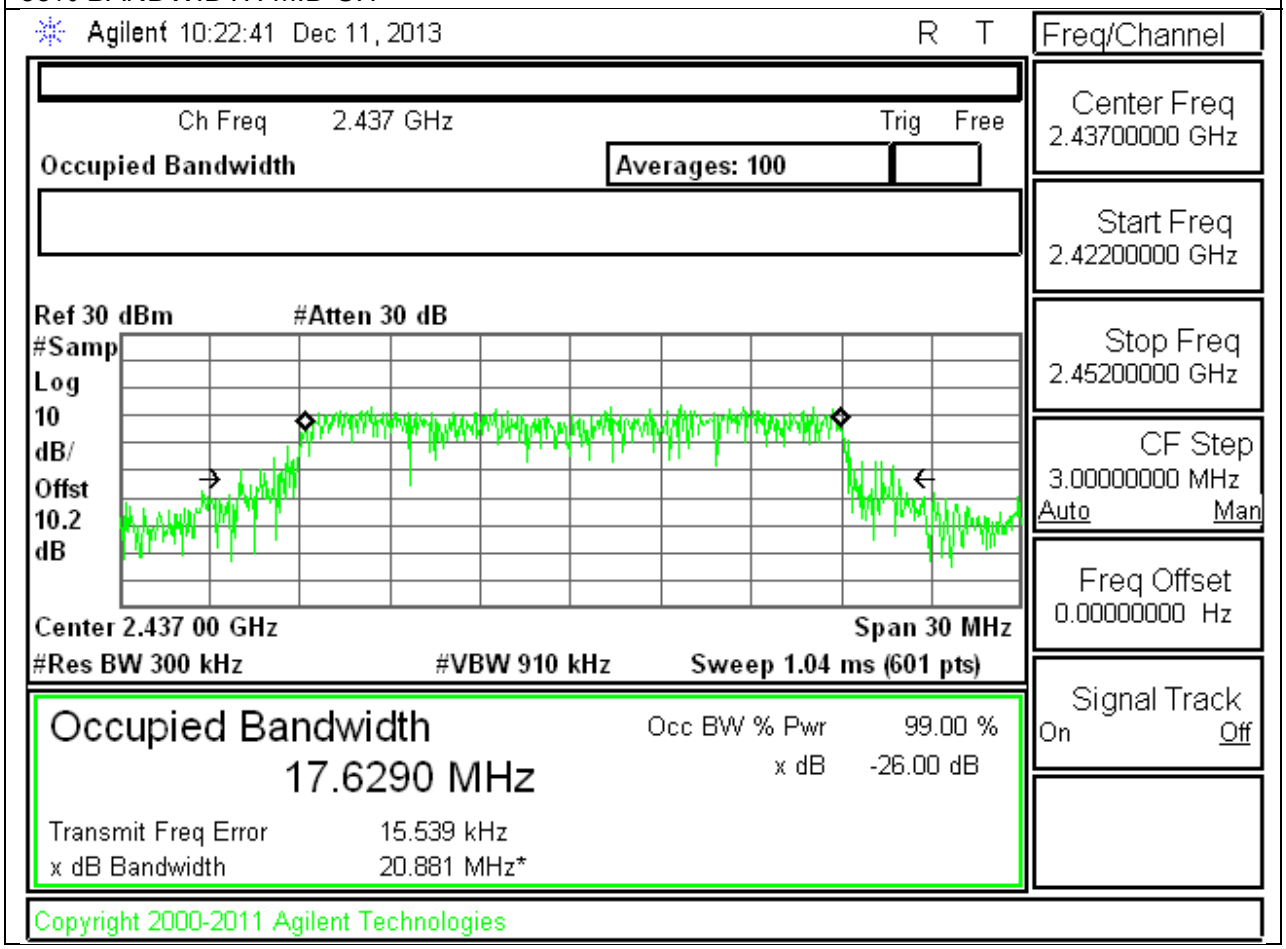
802.11n 99% BANDWIDTH

99% BANDWIDTH MID CH



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9.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.2 dB (including 10 dB pad and 0.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

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9.3.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Avg Power (dBm)
Low	2412	15.80
Mid	2437	16.10
High	2462	15.40
Worst		16.100

9.3.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Avg Power (dBm)
Low	2412	14.20
Mid	2437	14.30
High	2462	13.80
Worst		14.300

9.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Avg Power (dBm)
Low	2412	14.20
Mid	2437	14.30
High	2462	13.80
Worst		14.300

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9.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

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RESULTS

9.4.1. 802.11b MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-3.30	30.00	30	36	30.00
Mid	2437	-3.30	30.00	30	36	30.00
High	2462	-3.30	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	19.25	19.25	30.00	-10.75
Mid	2437	19.47	19.47	30.00	-10.53
High	2462	18.91	18.91	30.00	-11.09
Worst			19.47		

9.4.2. 802.11g MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-3.30	30.00	30	36	30.00
Mid	2437	-3.30	30.00	30	36	30.00
High	2462	-3.30	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	22.95	22.95	30.00	-7.05
Mid	2437	23.20	23.20	30.00	-6.80
High	2462	22.56	22.56	30.00	-7.44
Worst			23.20		

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9.4.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-3.30	30.00	30	36	30.00
Mid	2437	-3.30	30.00	30	36	30.00
High	2462	-3.30	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	22.95	22.95	30.00	-7.05
Mid	2437	23.29	23.29	30.00	-6.71
High	2462	22.72	22.72	30.00	-7.28
Worst			23.29		

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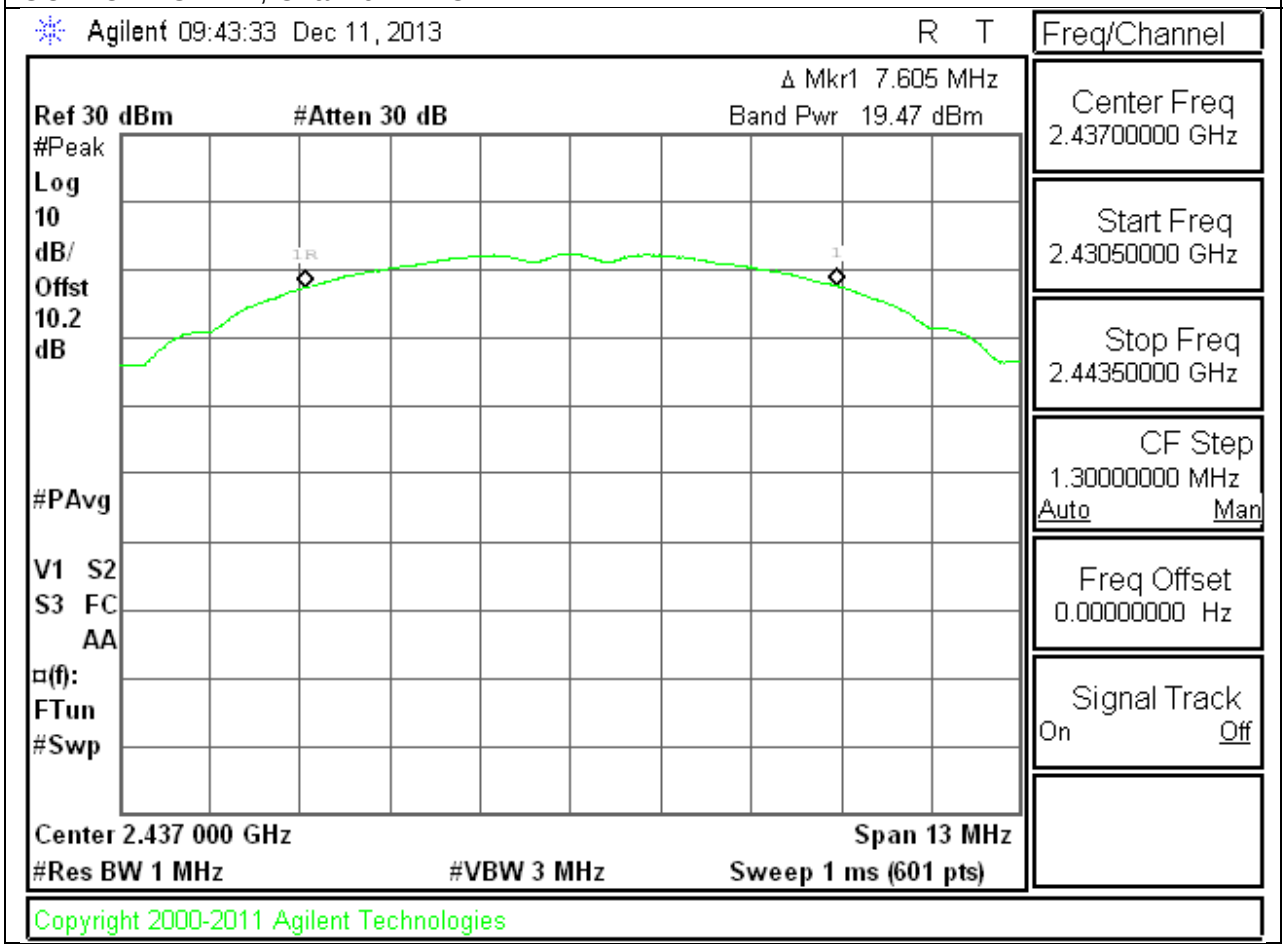
802.11b OUTPUT POWER, Chain 0

OUTPUT POWER, Chain 0 MID CH



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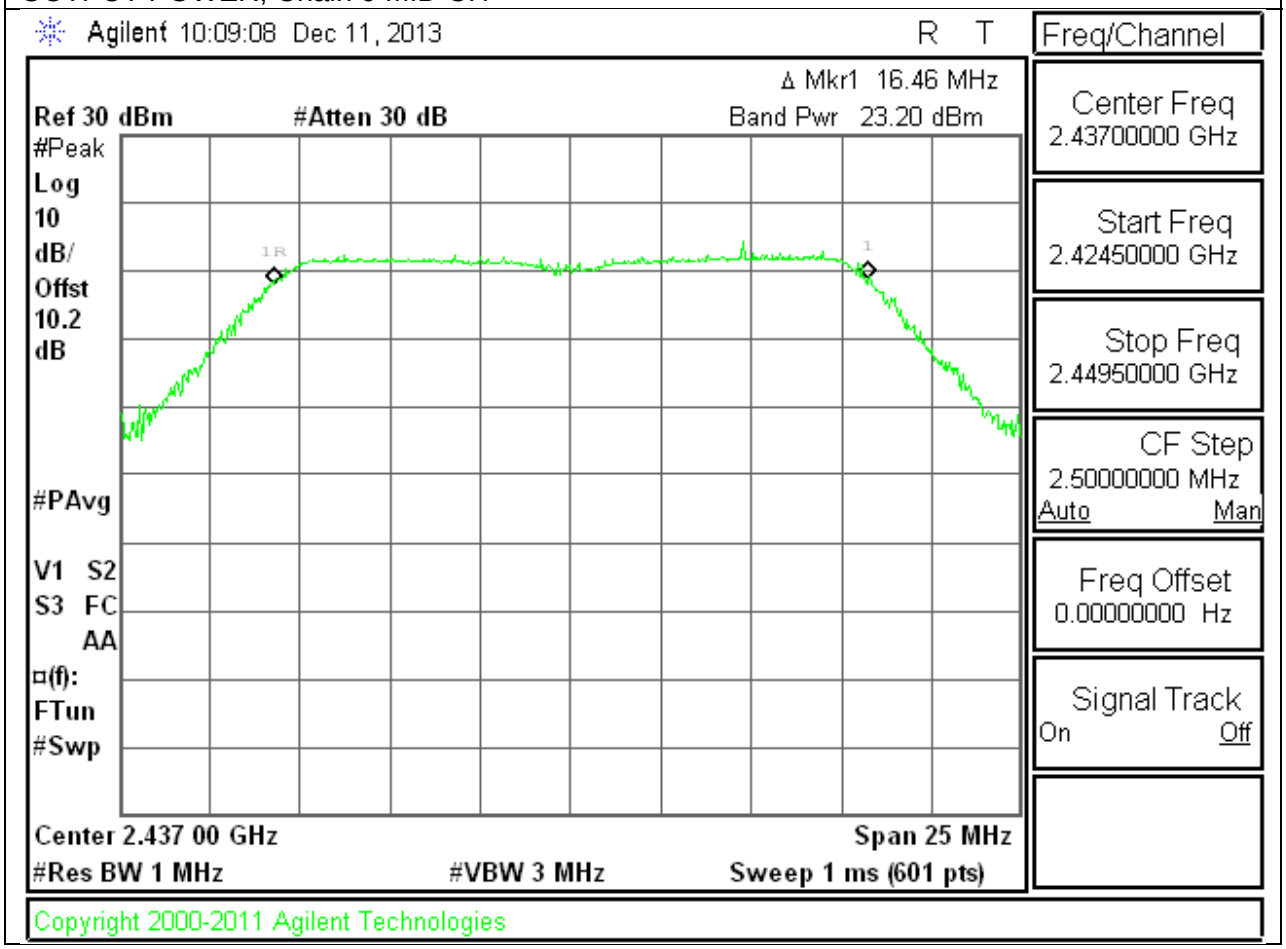
802.11g OUTPUT POWER, Chain 0

OUTPUT POWER, Chain 0 MID CH



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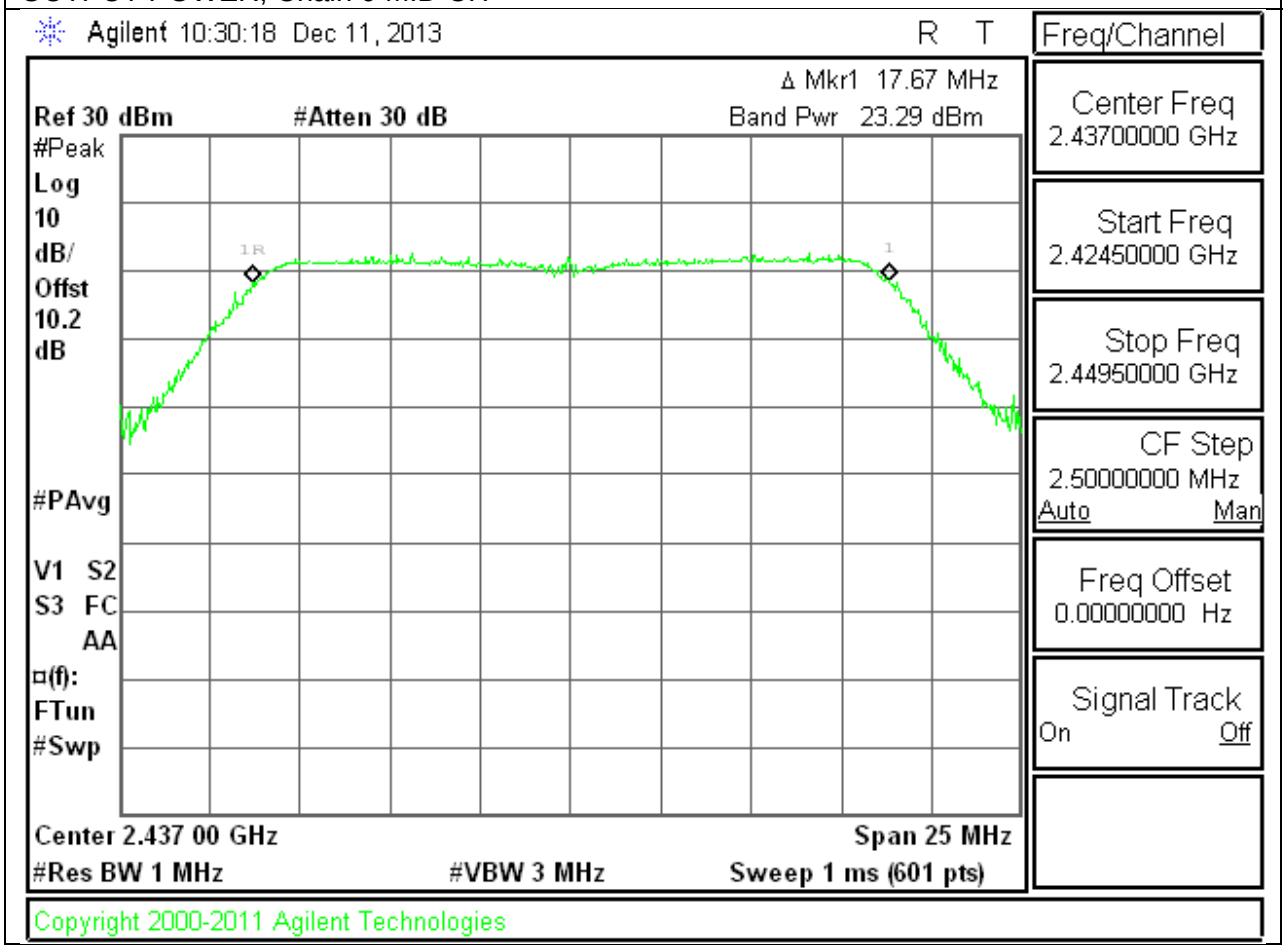
802.11n OUTPUT POWER, Chain 0

OUTPUT POWER, Chain 0 MID CH



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9.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

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.

RESULTS

9.5.1. 802.11b MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-4.58	8.0	-12.6
Mid	2437	-4.61	8.0	-12.6
High	2462	-5.08	8.0	-13.1

9.5.2. 802.11g MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-10.26	8.0	-18.3
Mid	2437	-9.23	8.0	-17.2
High	2462	-10.78	8.0	-18.8

9.5.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.79	8.0	-17.8
Mid	2437	-9.86	8.0	-17.9
High	2462	-10.15	8.0	-18.2

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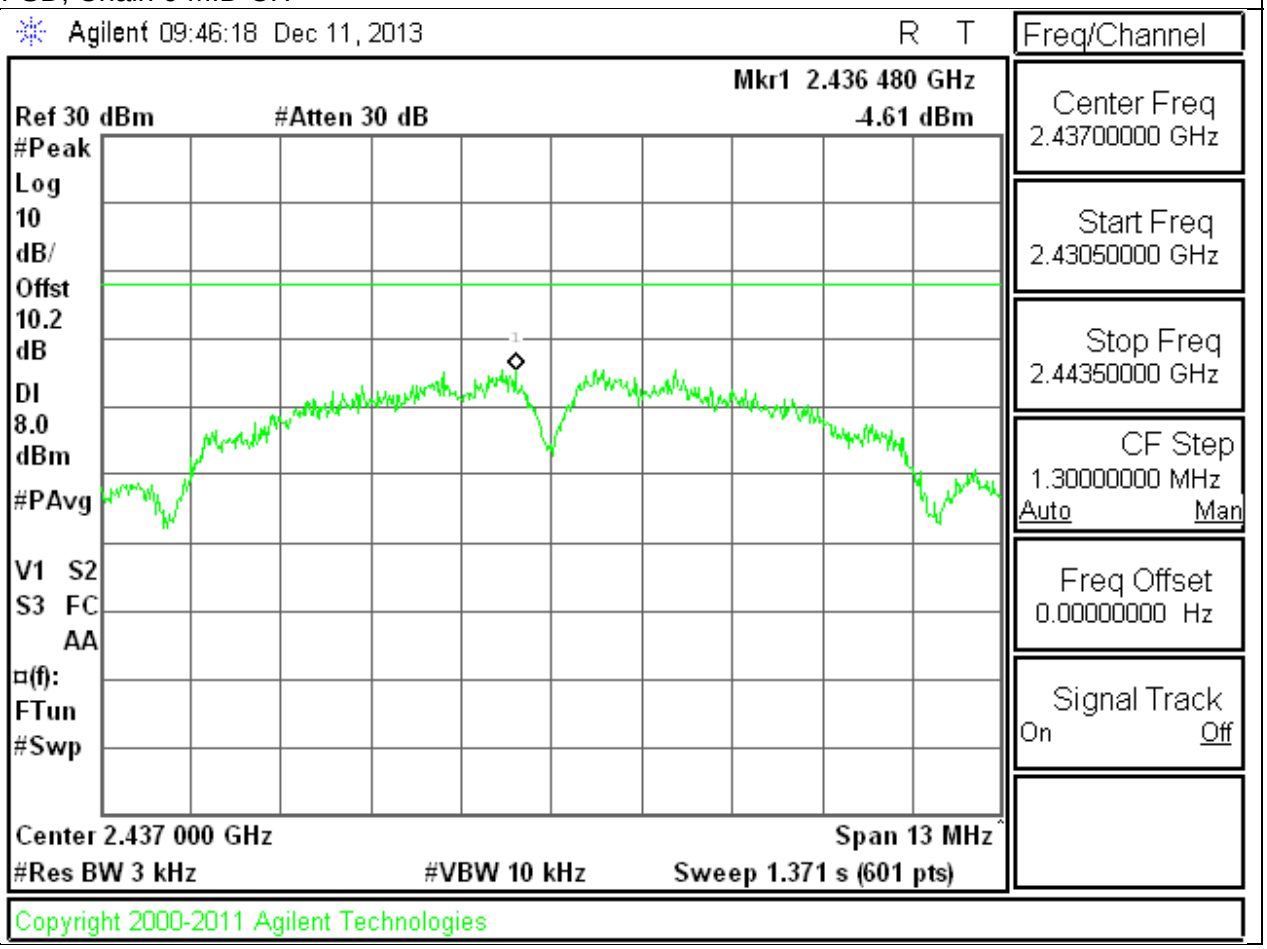
802.11b PSD, Chain 0

PSD, Chain 0 MID CH



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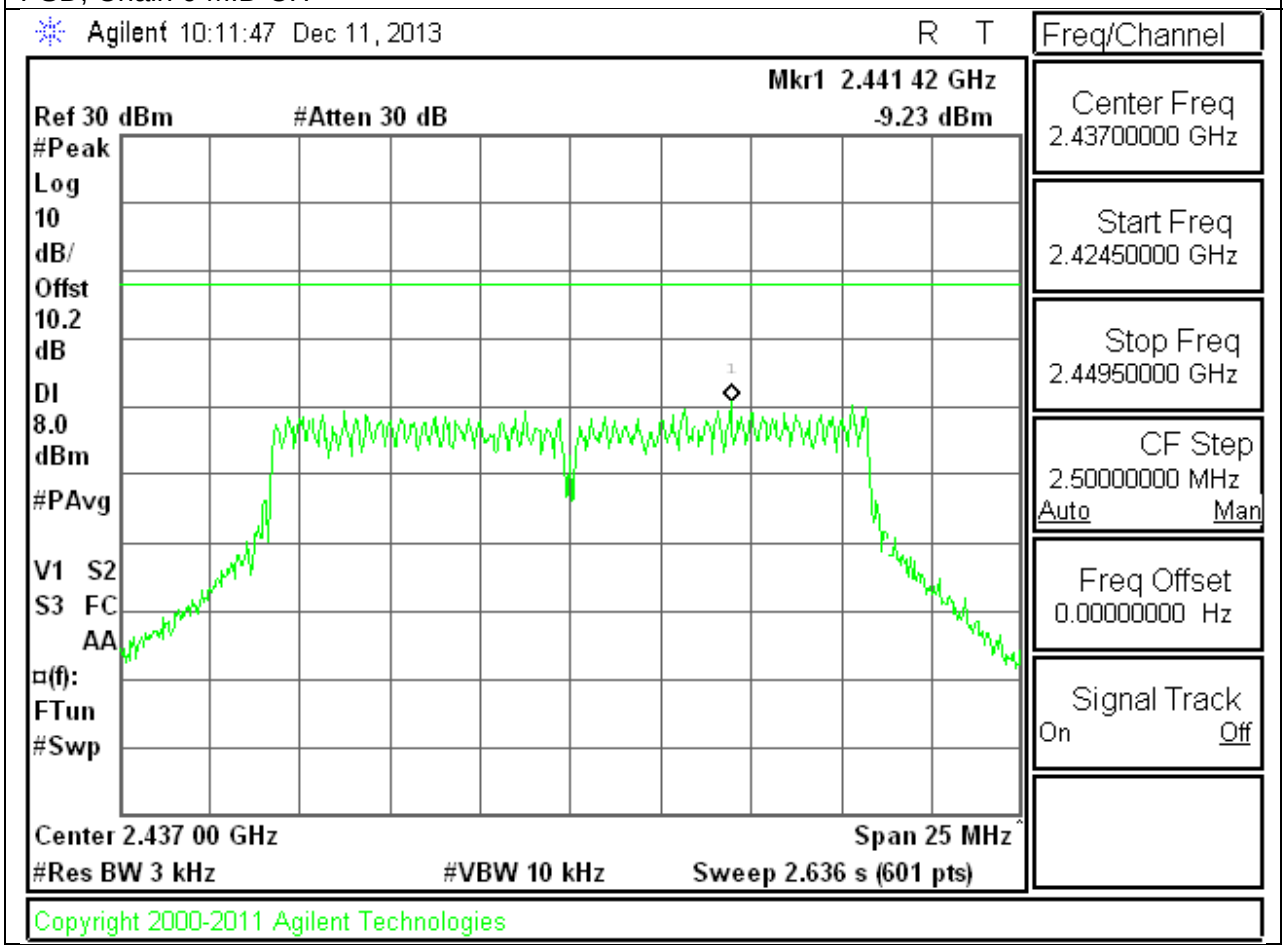
802.11g PSD, Chain 0

PSD, Chain 0 MID CH



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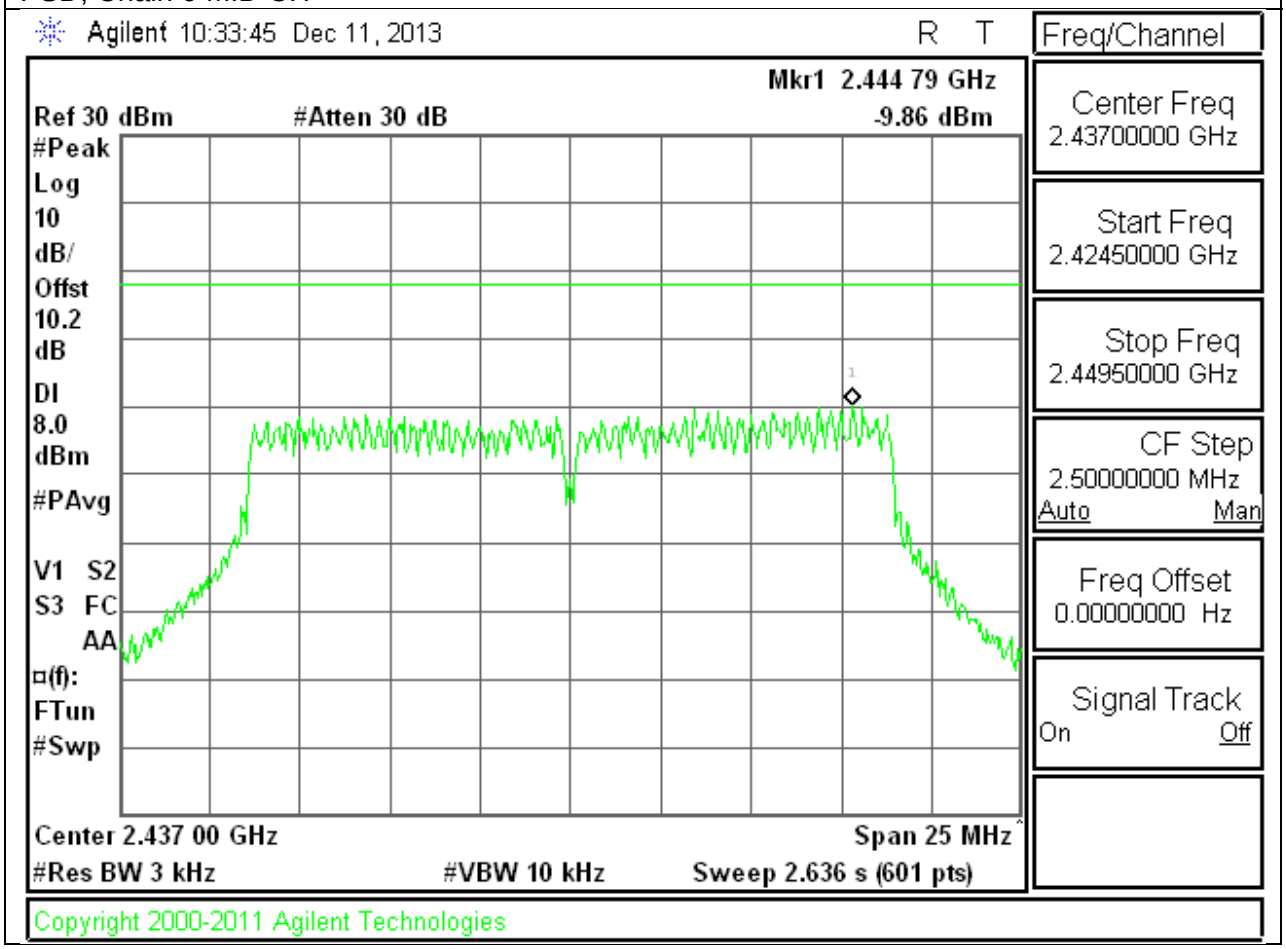
802.11n PSD, Chain 0

PSD, Chain 0 MID CH



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9.6. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

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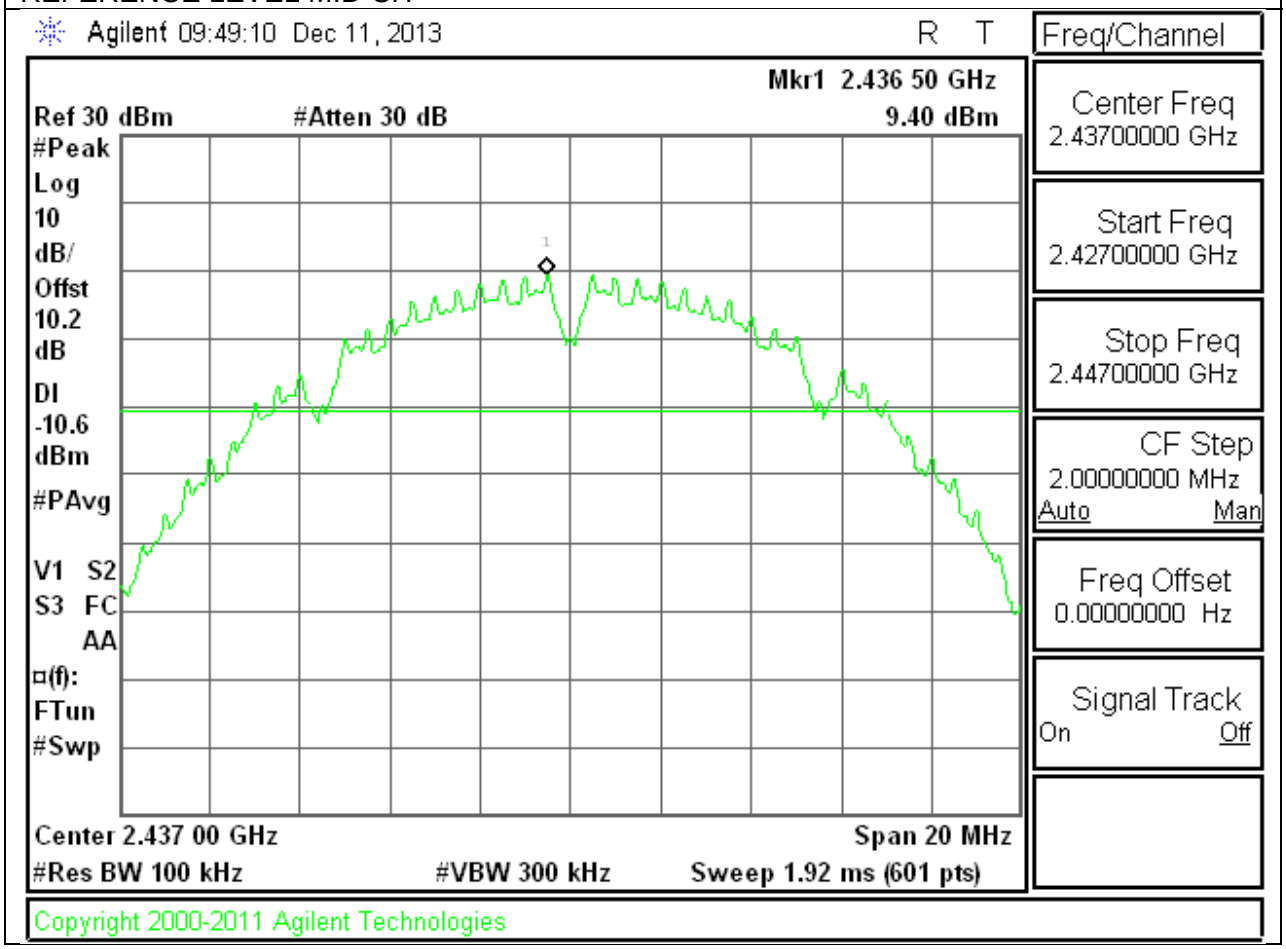
RESULTS

9.6.1. 802.11b MODE IN THE 2.4 GHz BAND

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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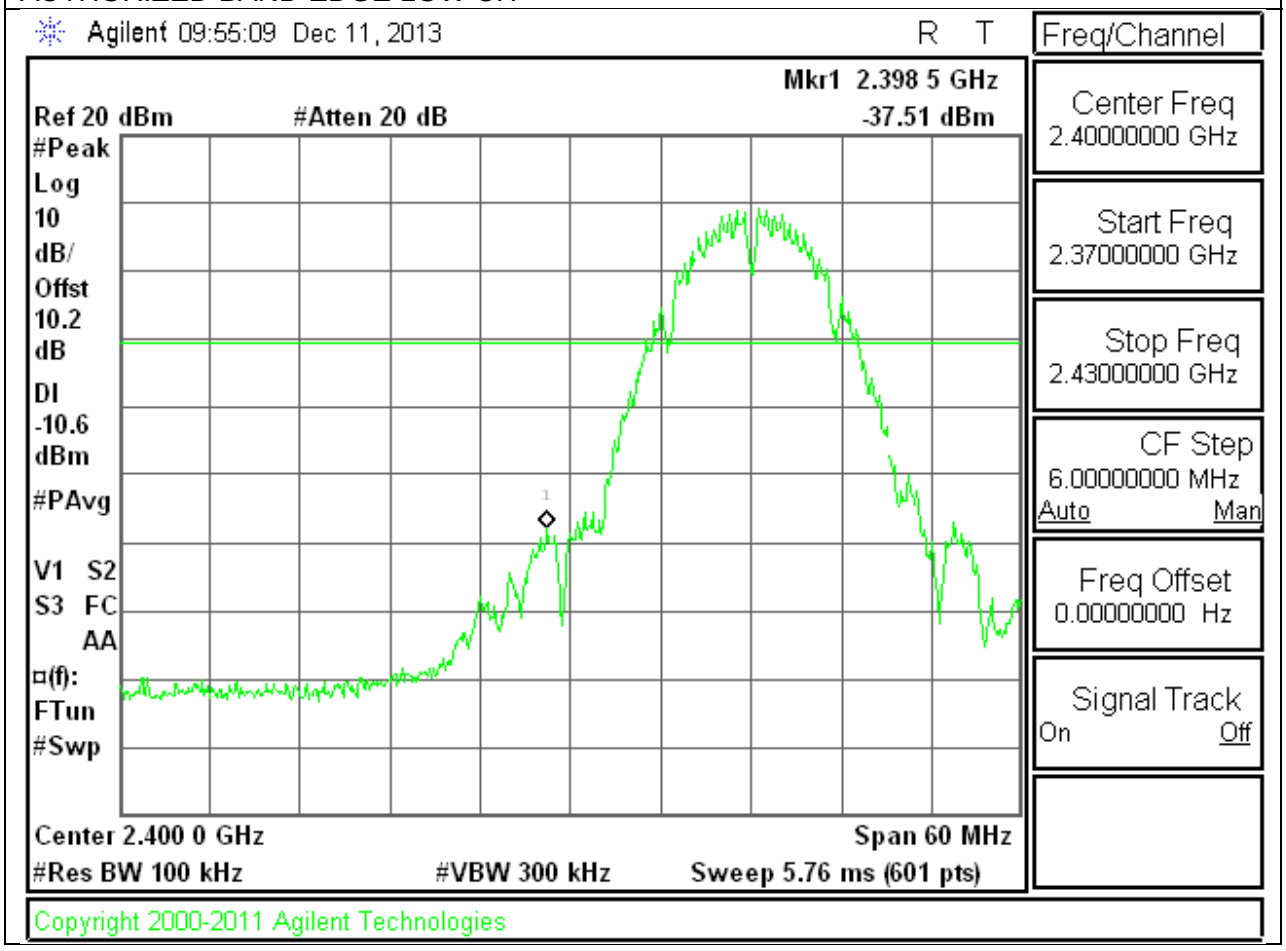
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH

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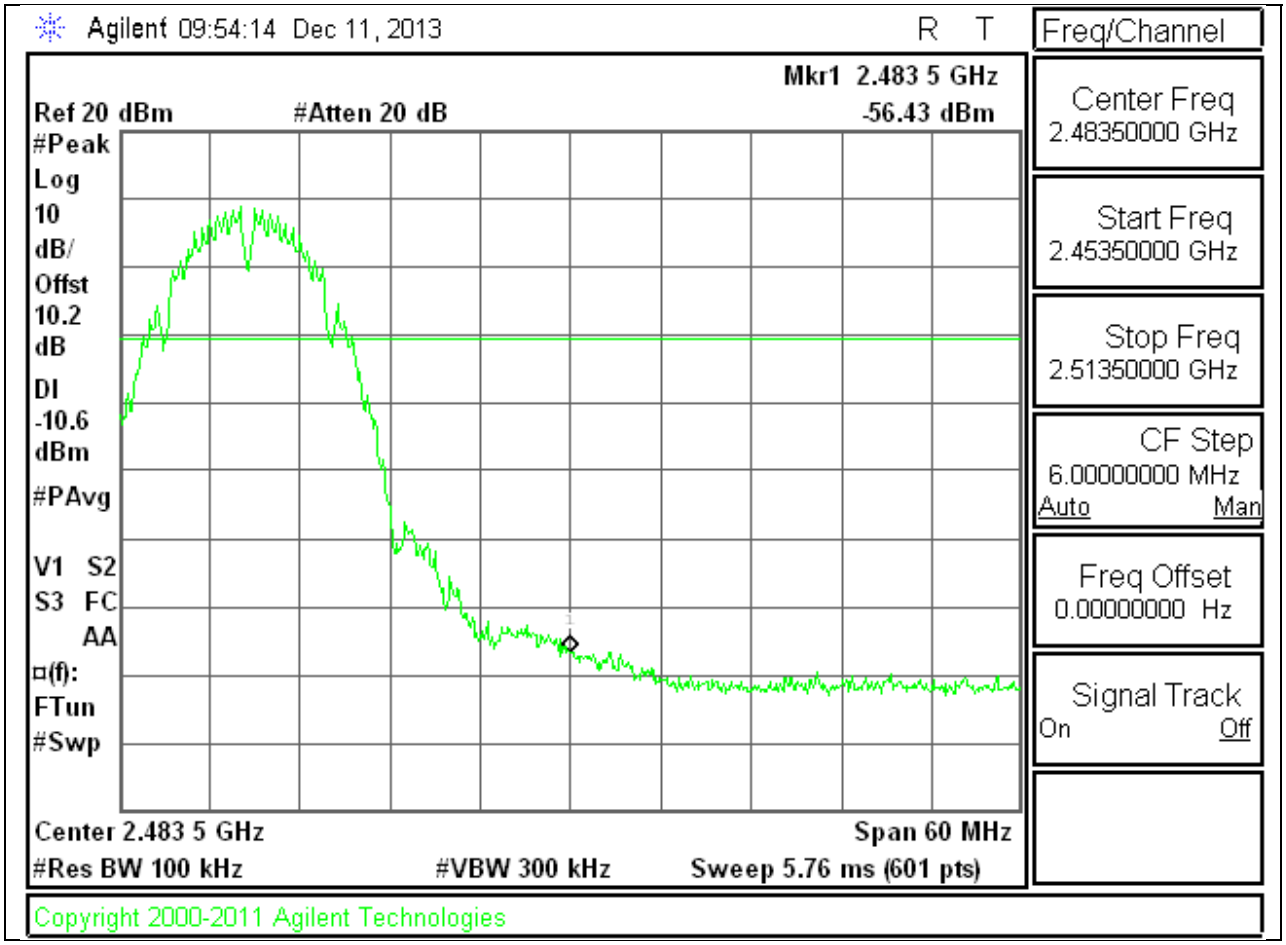

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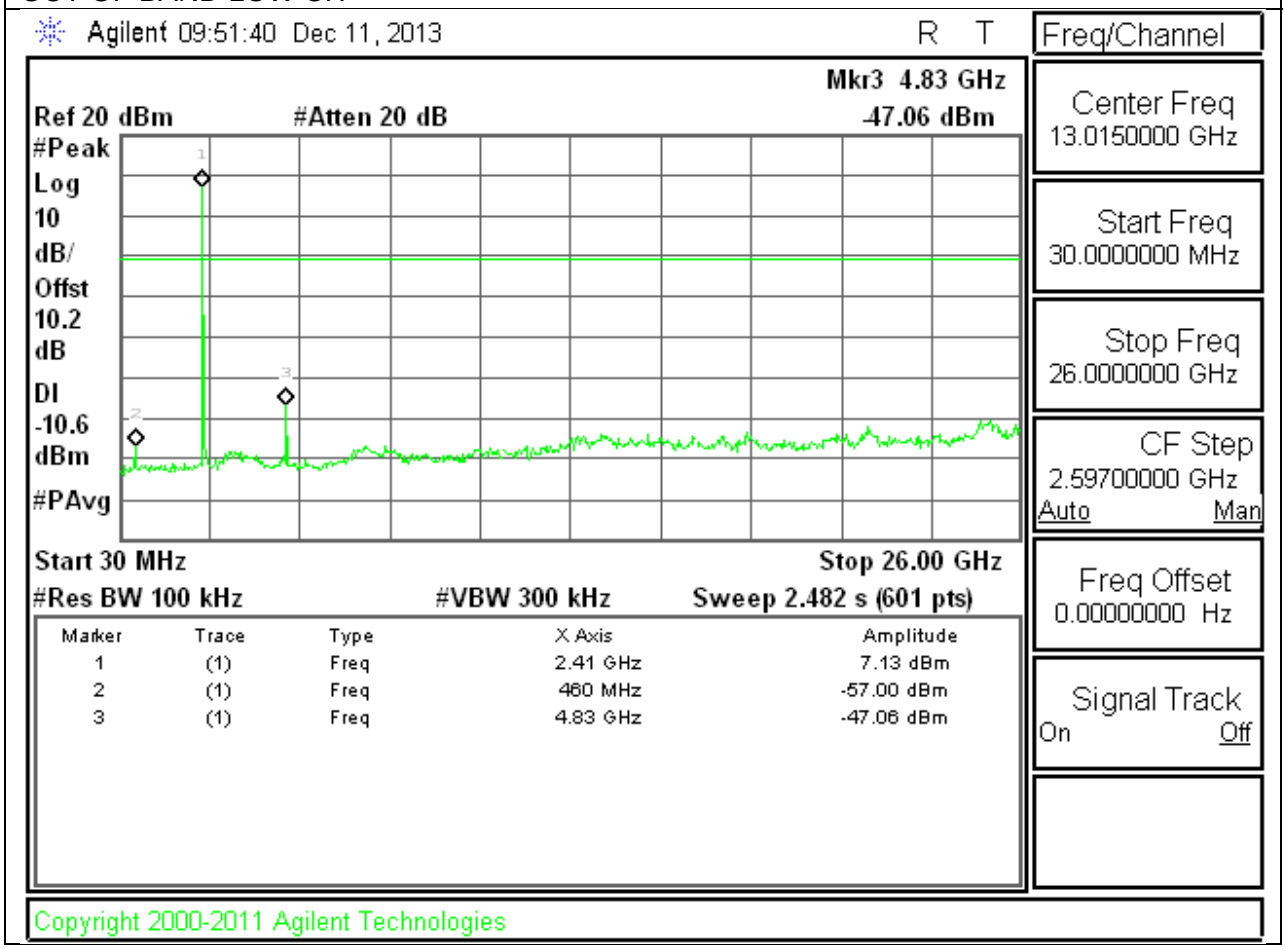
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



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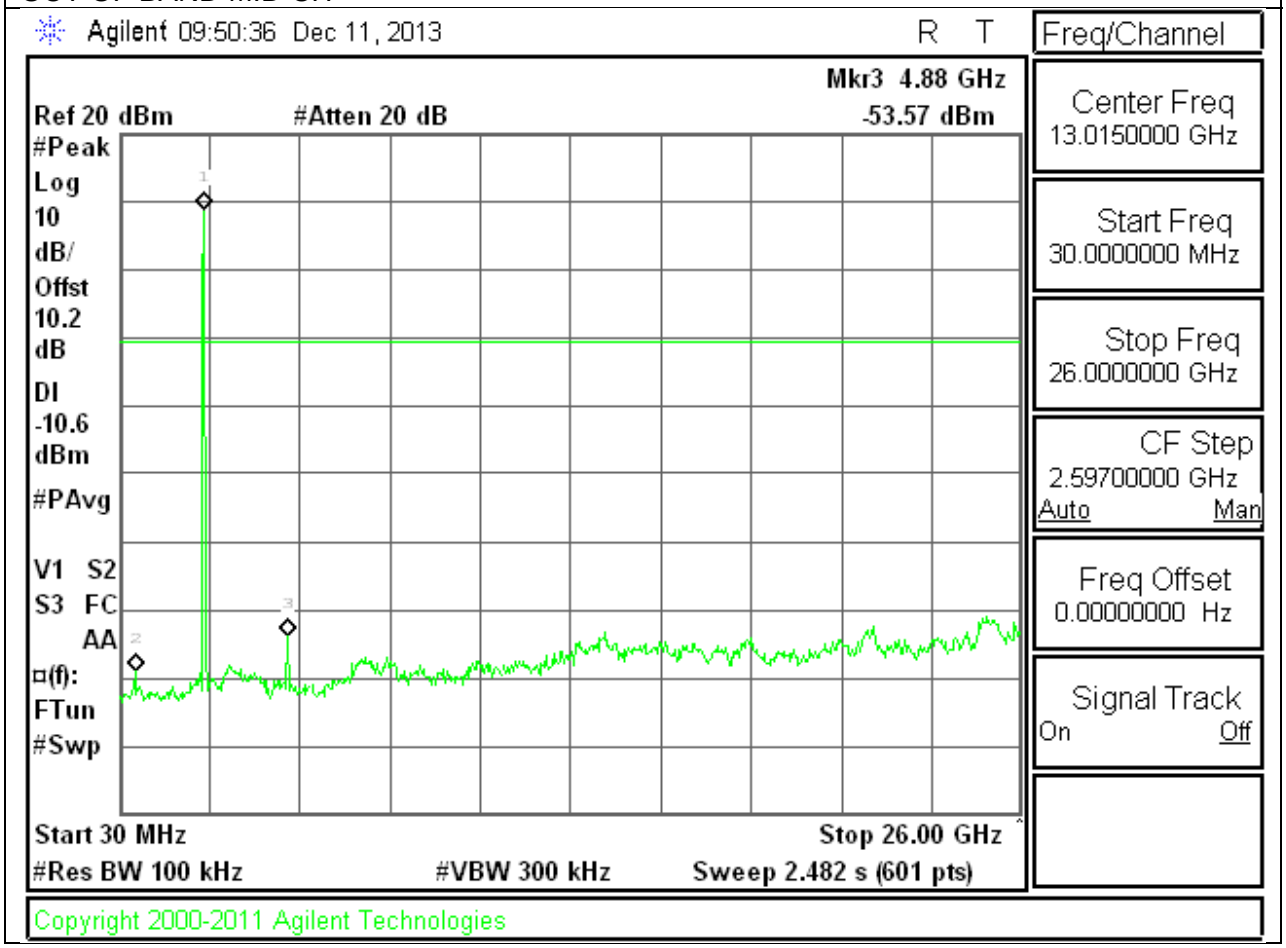
OUT OF BAND MID CH



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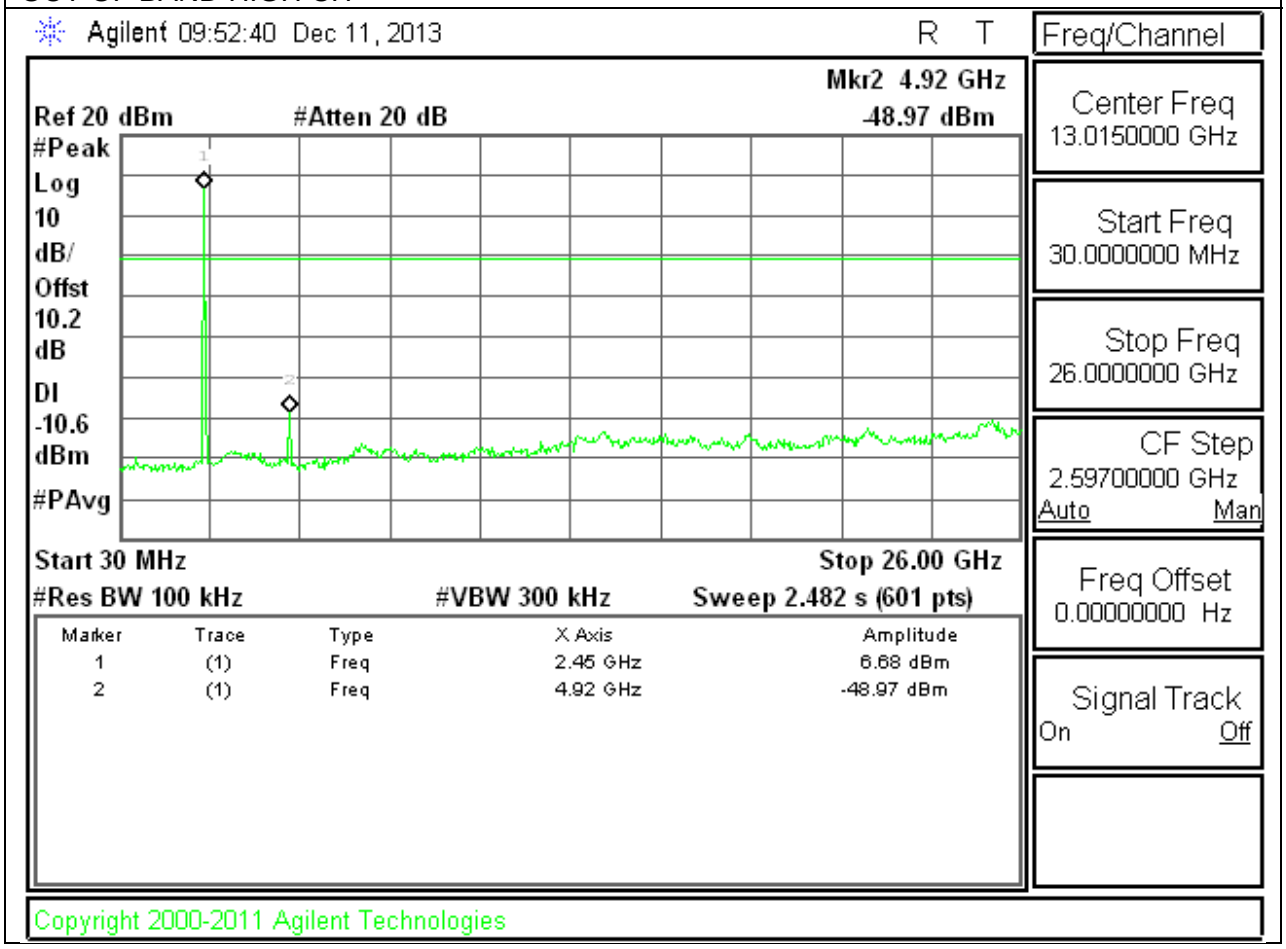
OUT OF BAND HIGH CH



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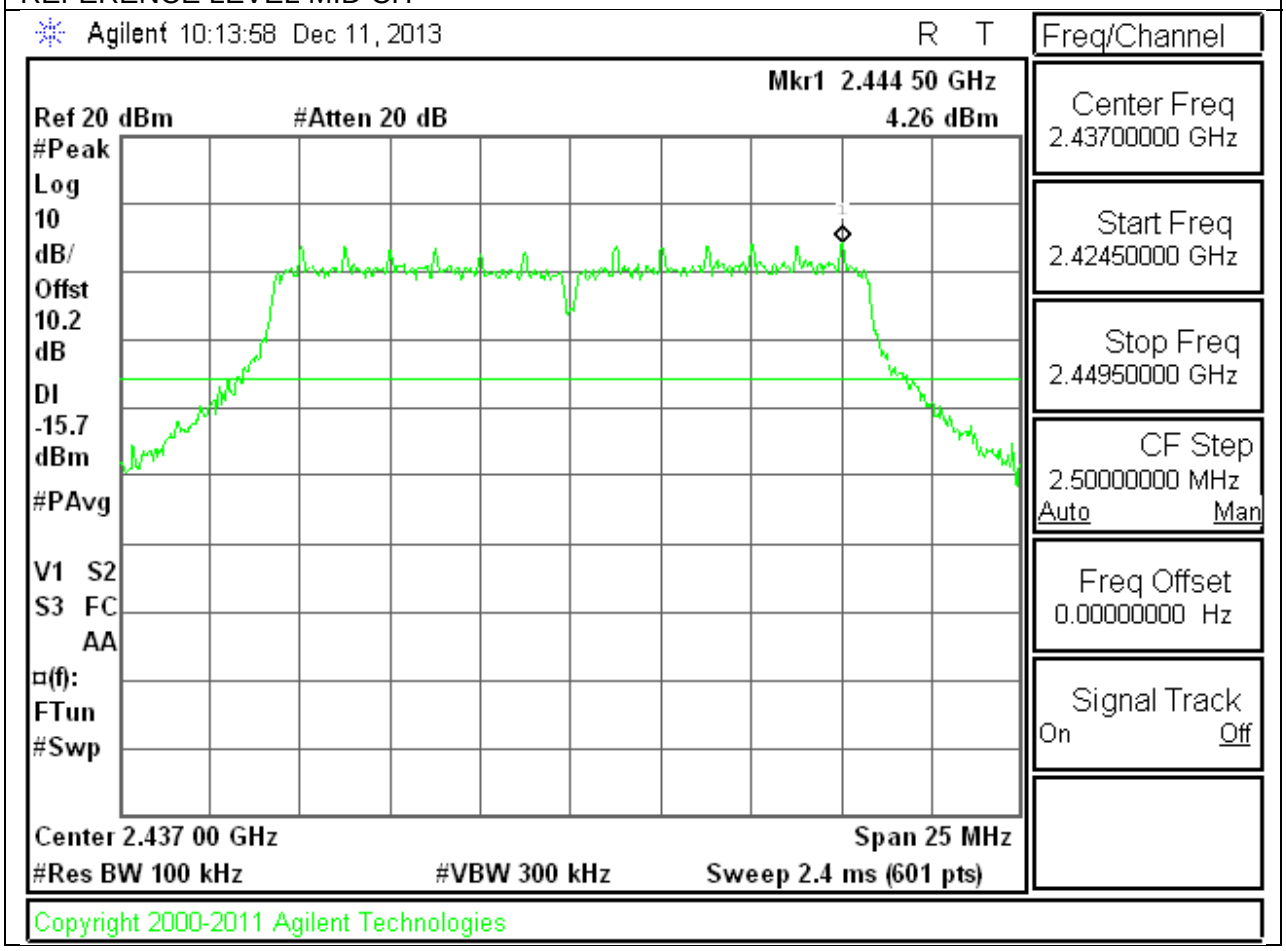
9.6.2. 802.11g MODE IN THE 2.4 GHz BAND

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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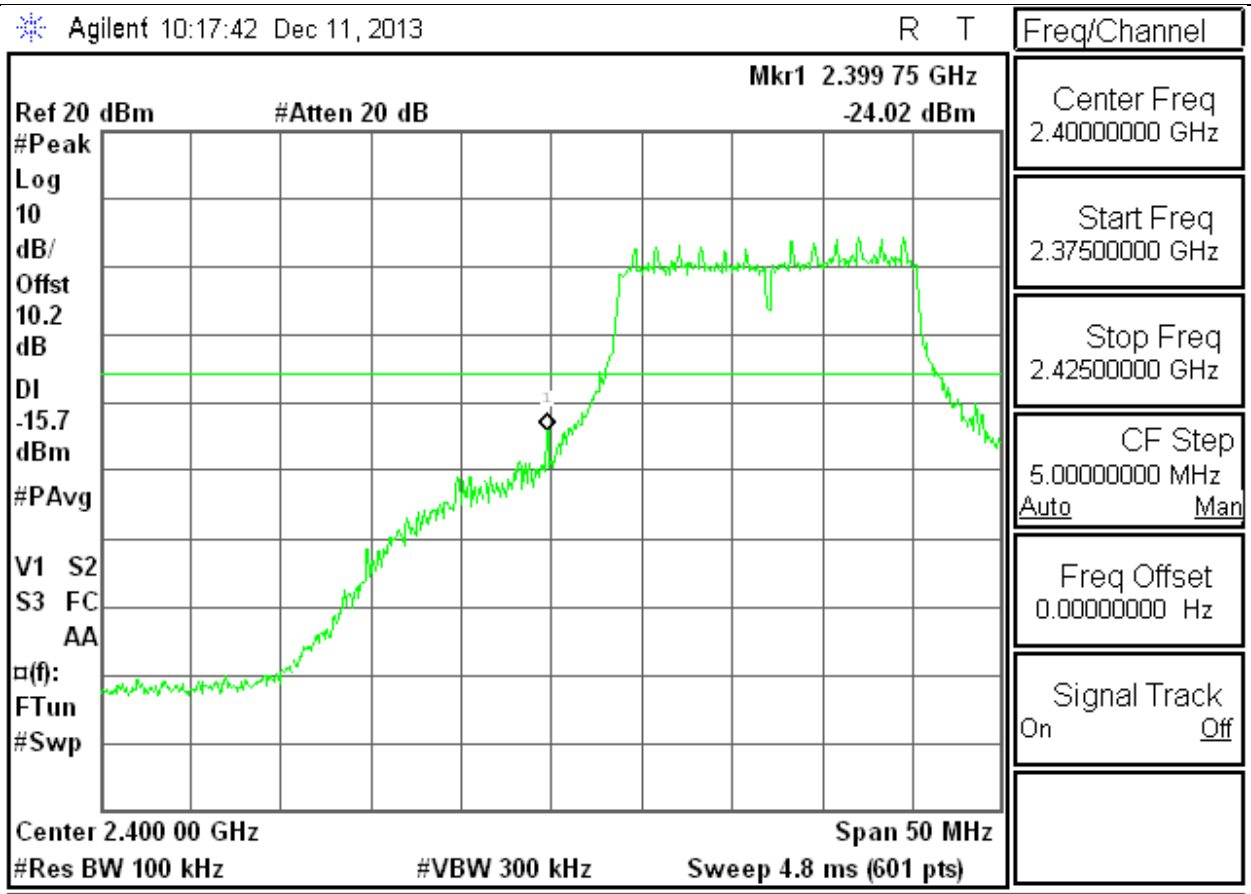
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH

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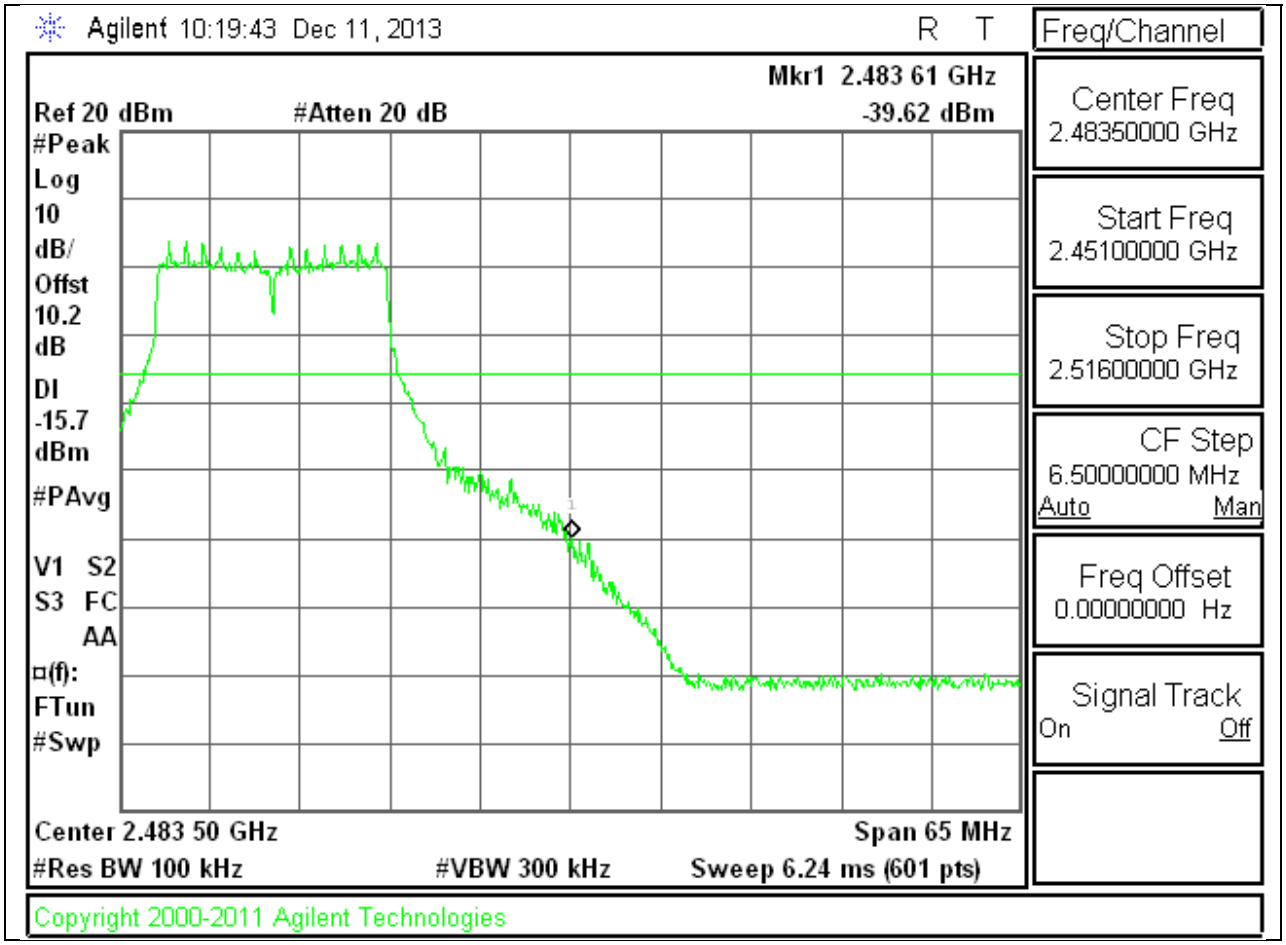

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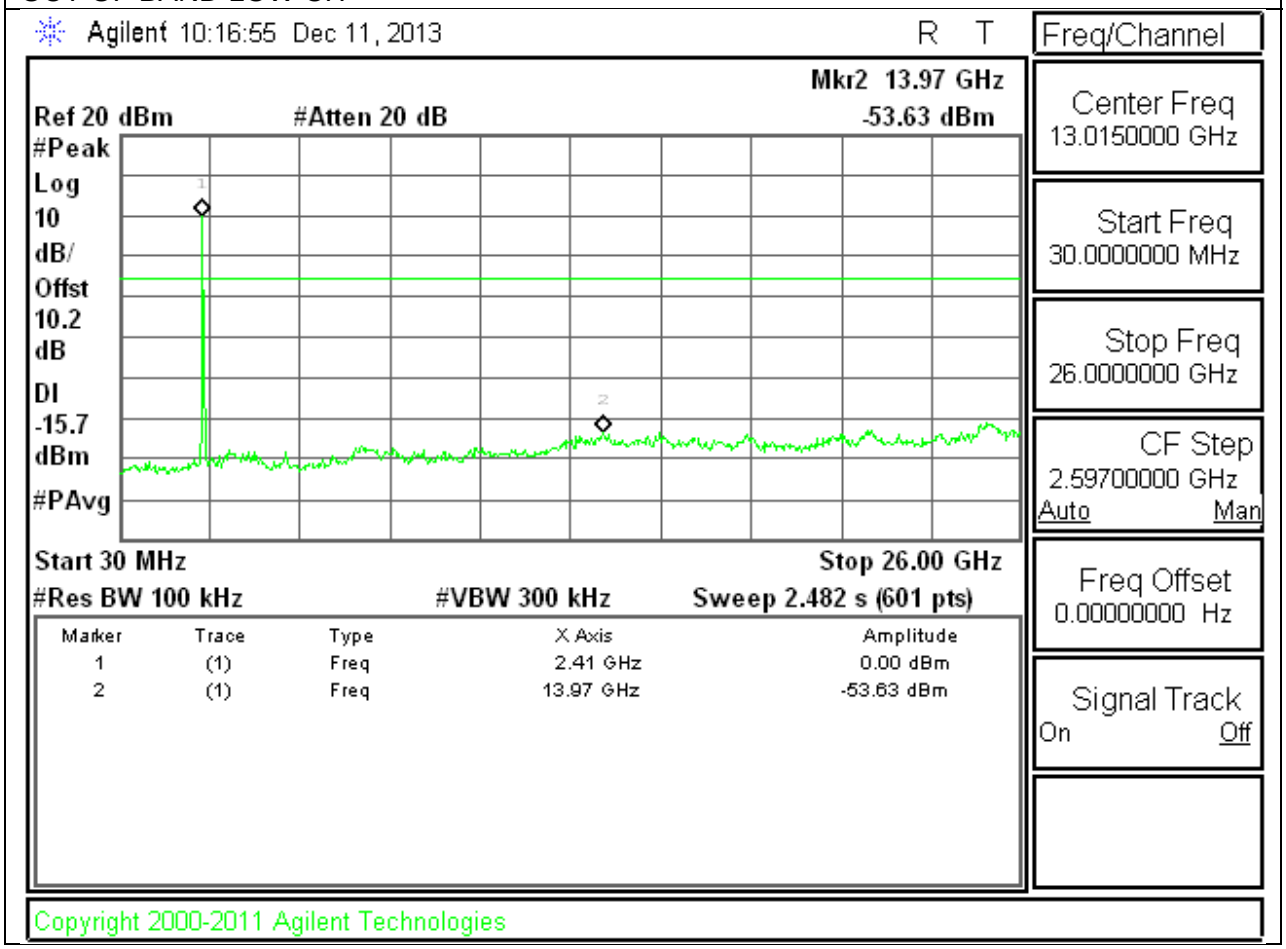
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



OUT OF BAND MID CH

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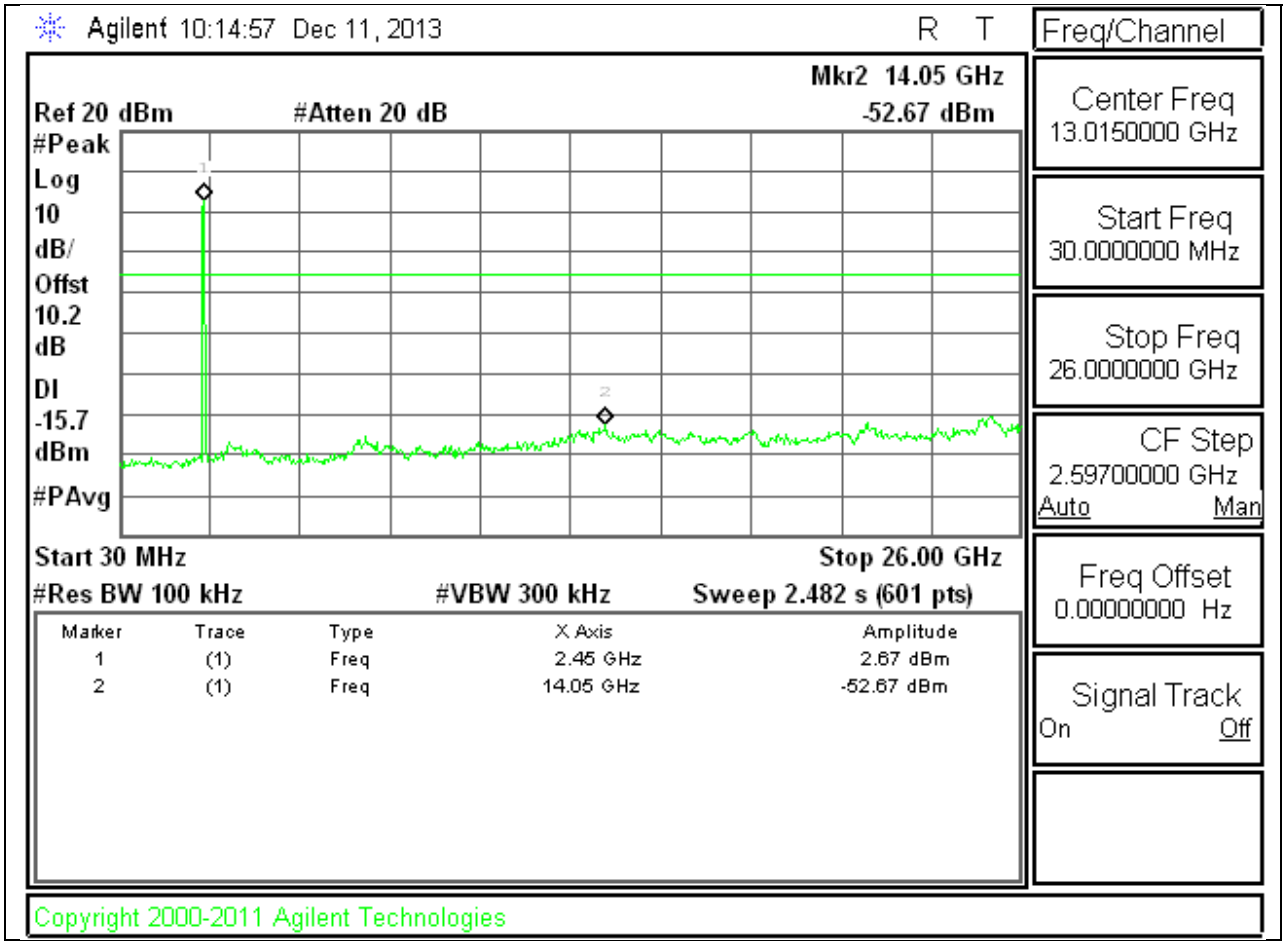

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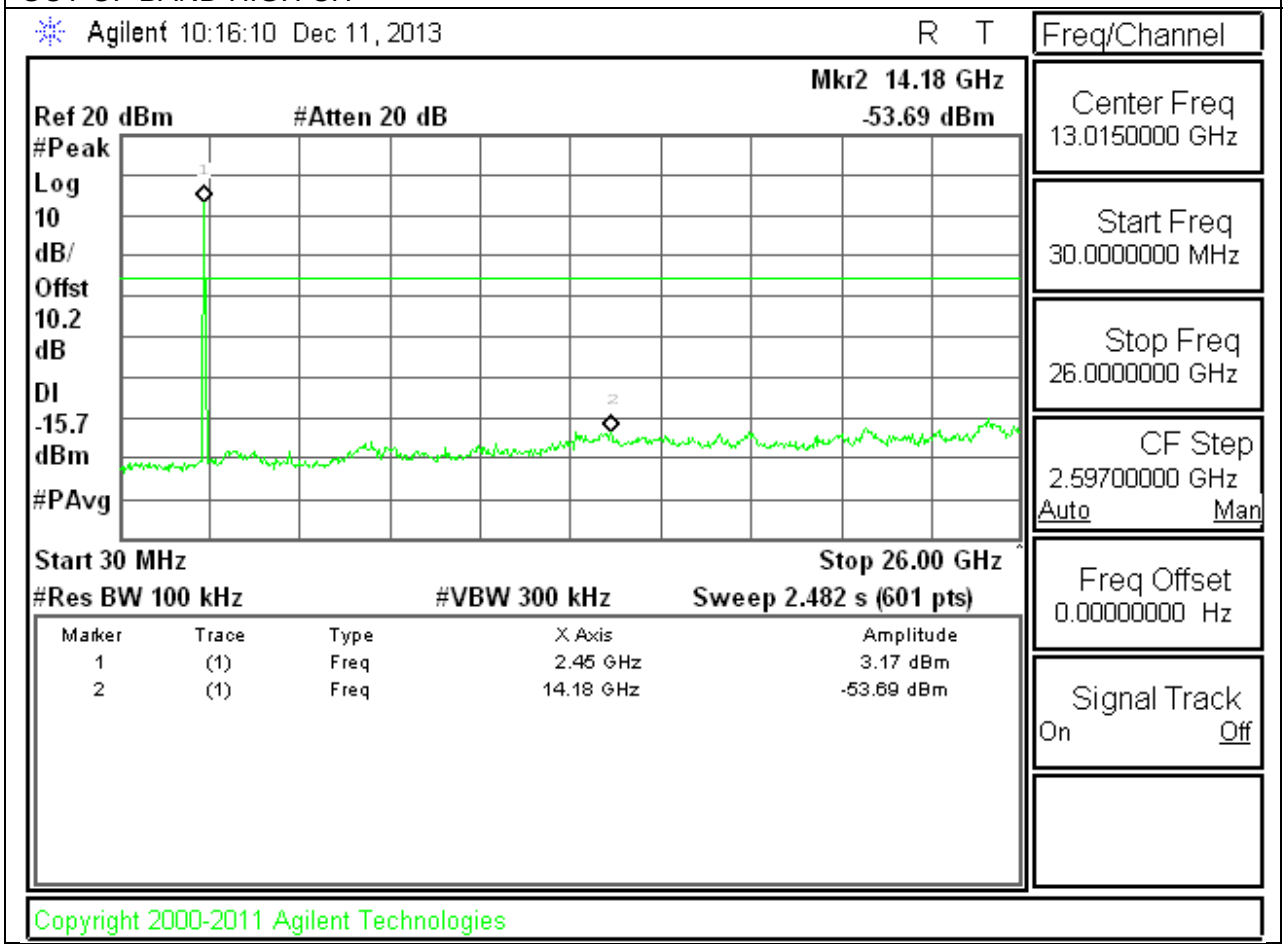
OUT OF BAND HIGH CH



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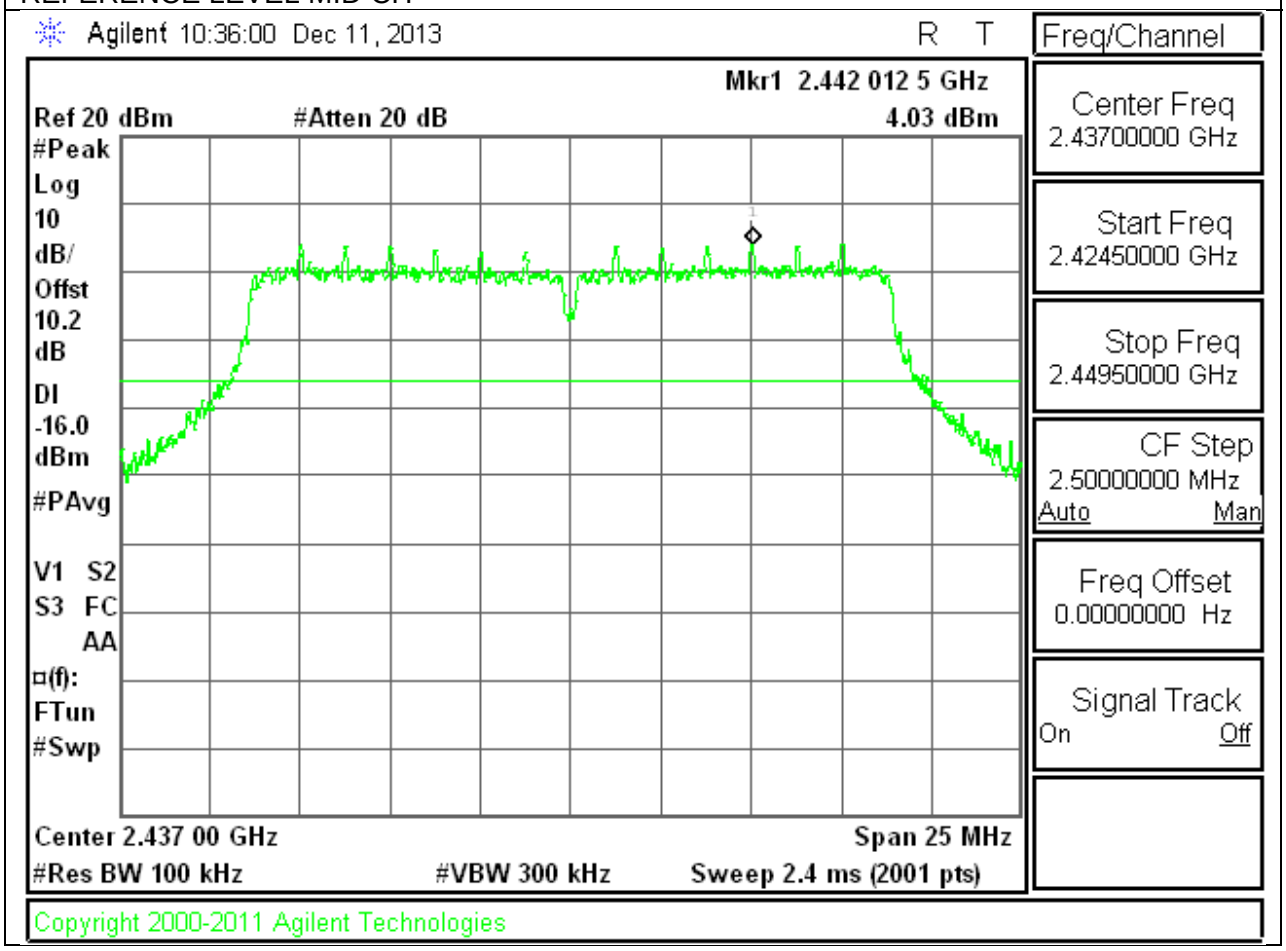
9.6.3. 802.11n MODE IN THE 2.4 GHz BAND

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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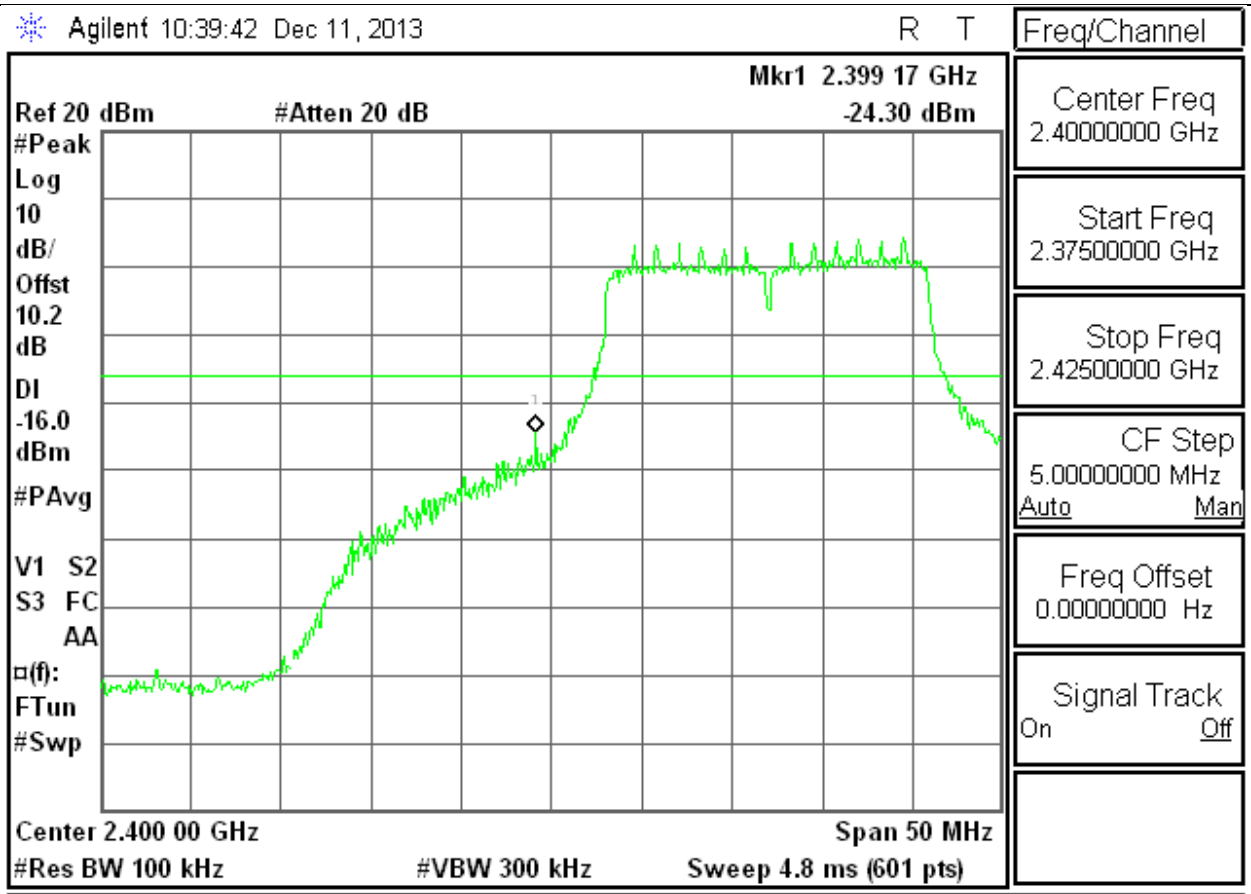
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH

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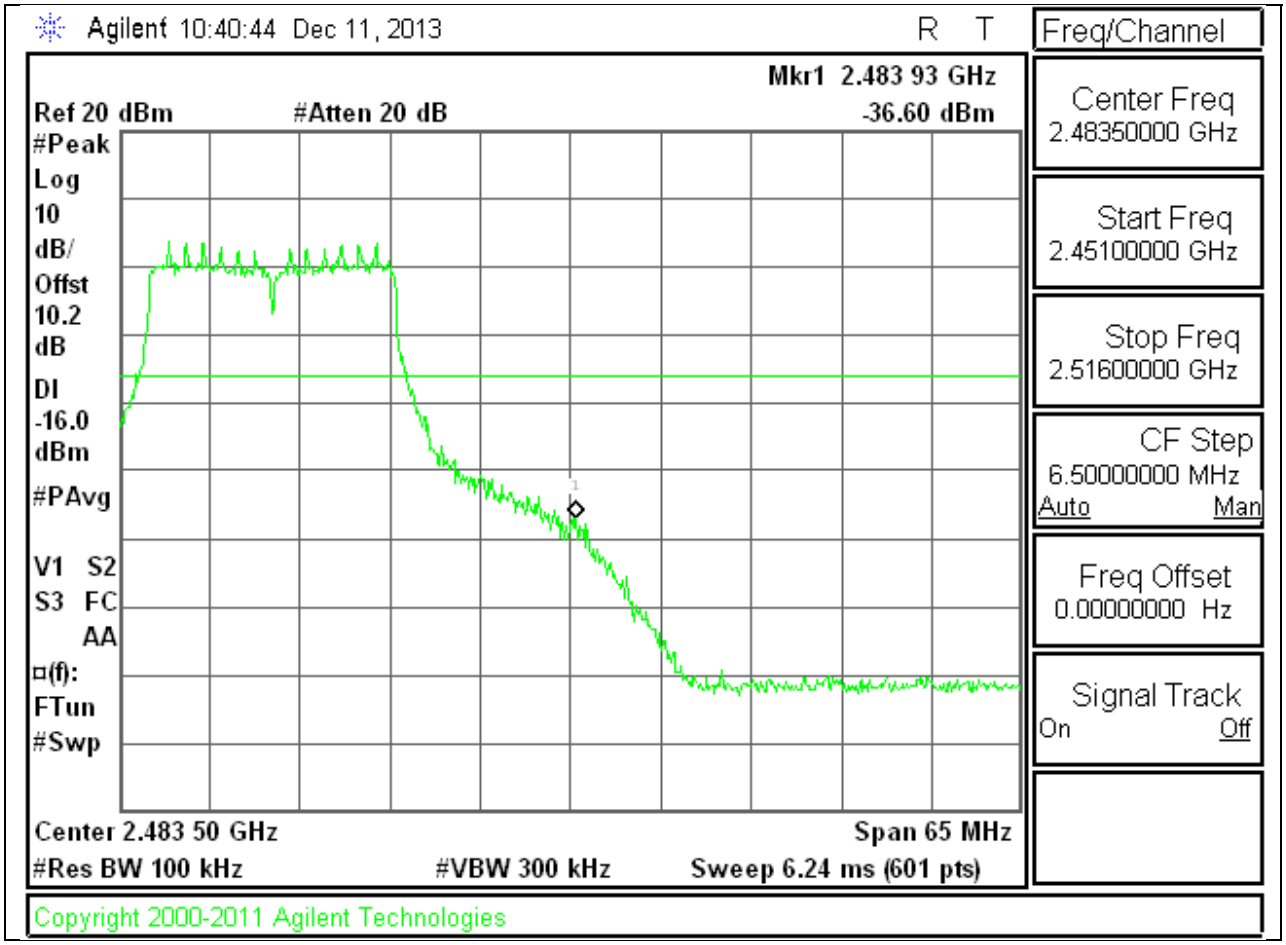

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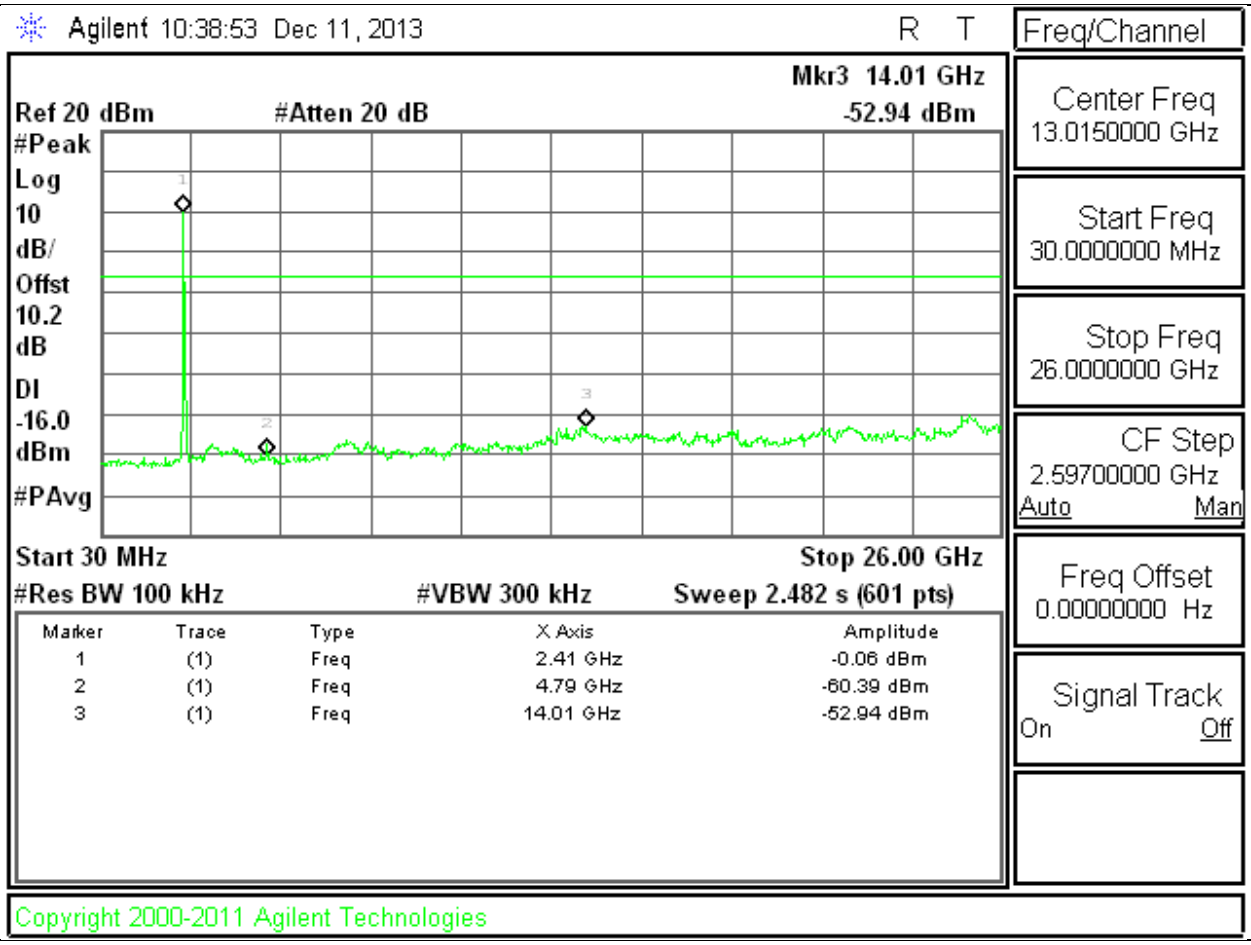
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



OUT OF BAND MID CH

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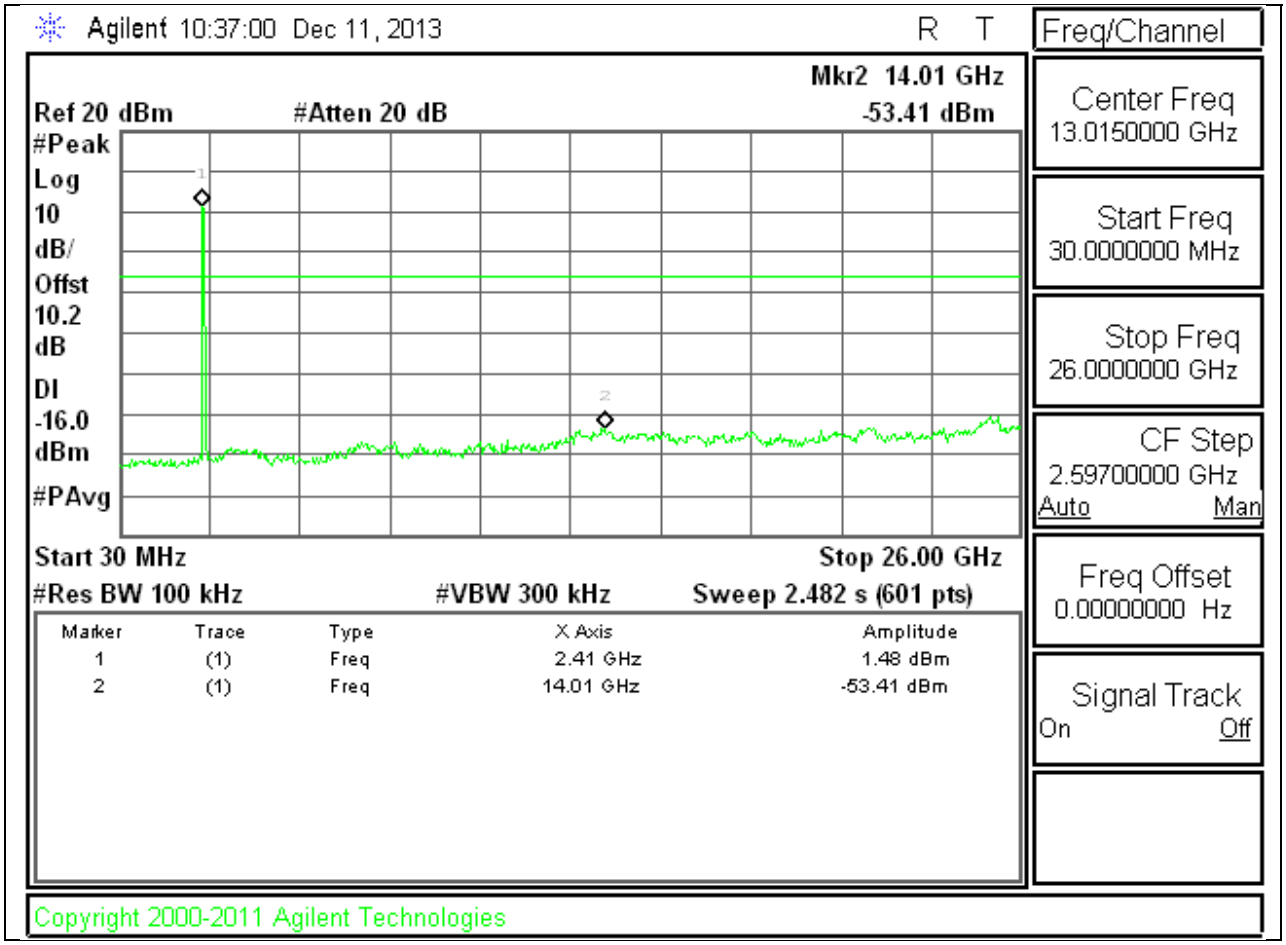

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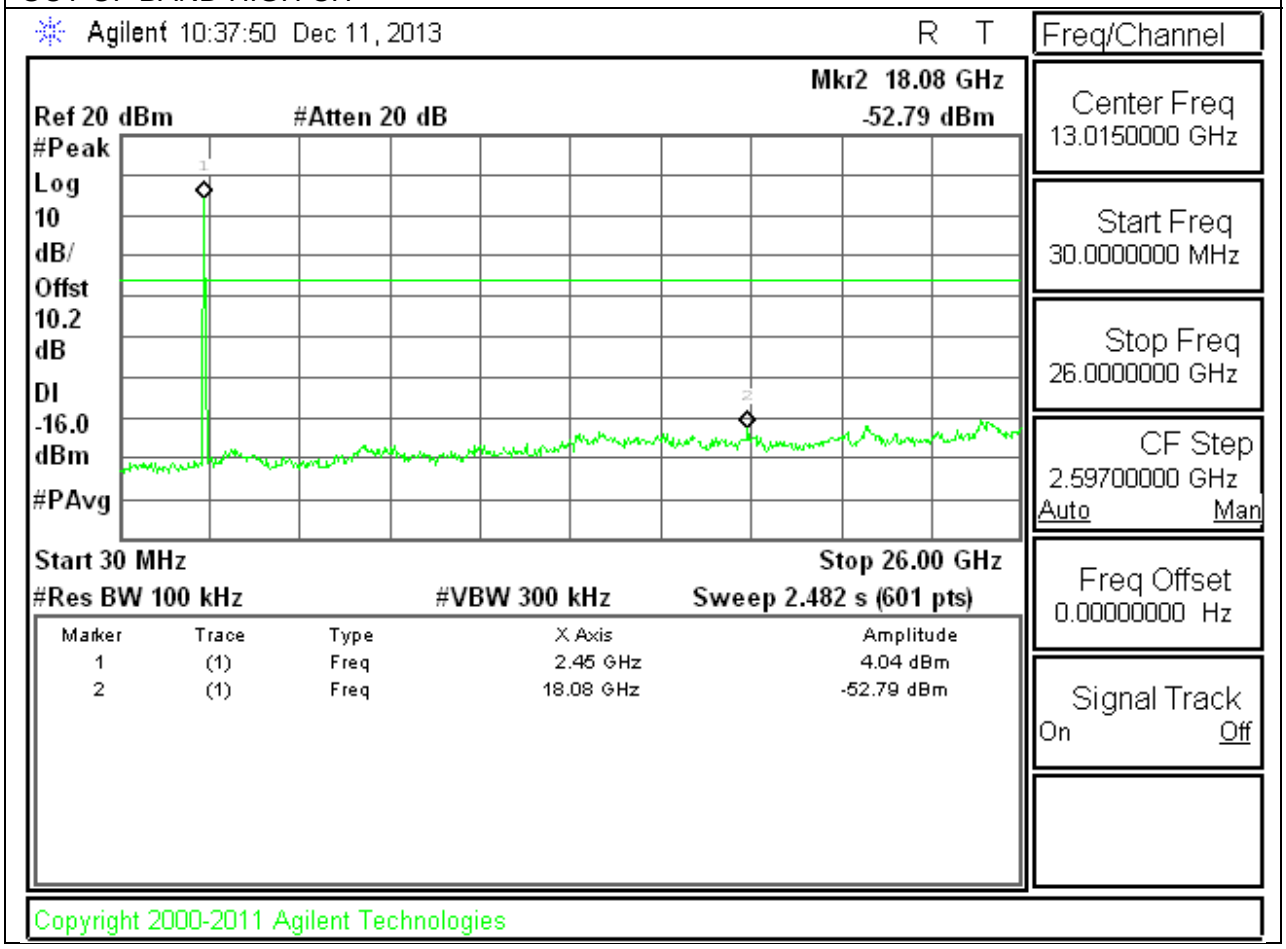
OUT OF BAND HIGH CH



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10. RADIATED TEST RESULTS

10.1. 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.

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; the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor= 10log (1/x) For this sample B mode = 0dB(duty cycle>98%); G mode = 0.3dB; N mode = 0.32dB.

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.

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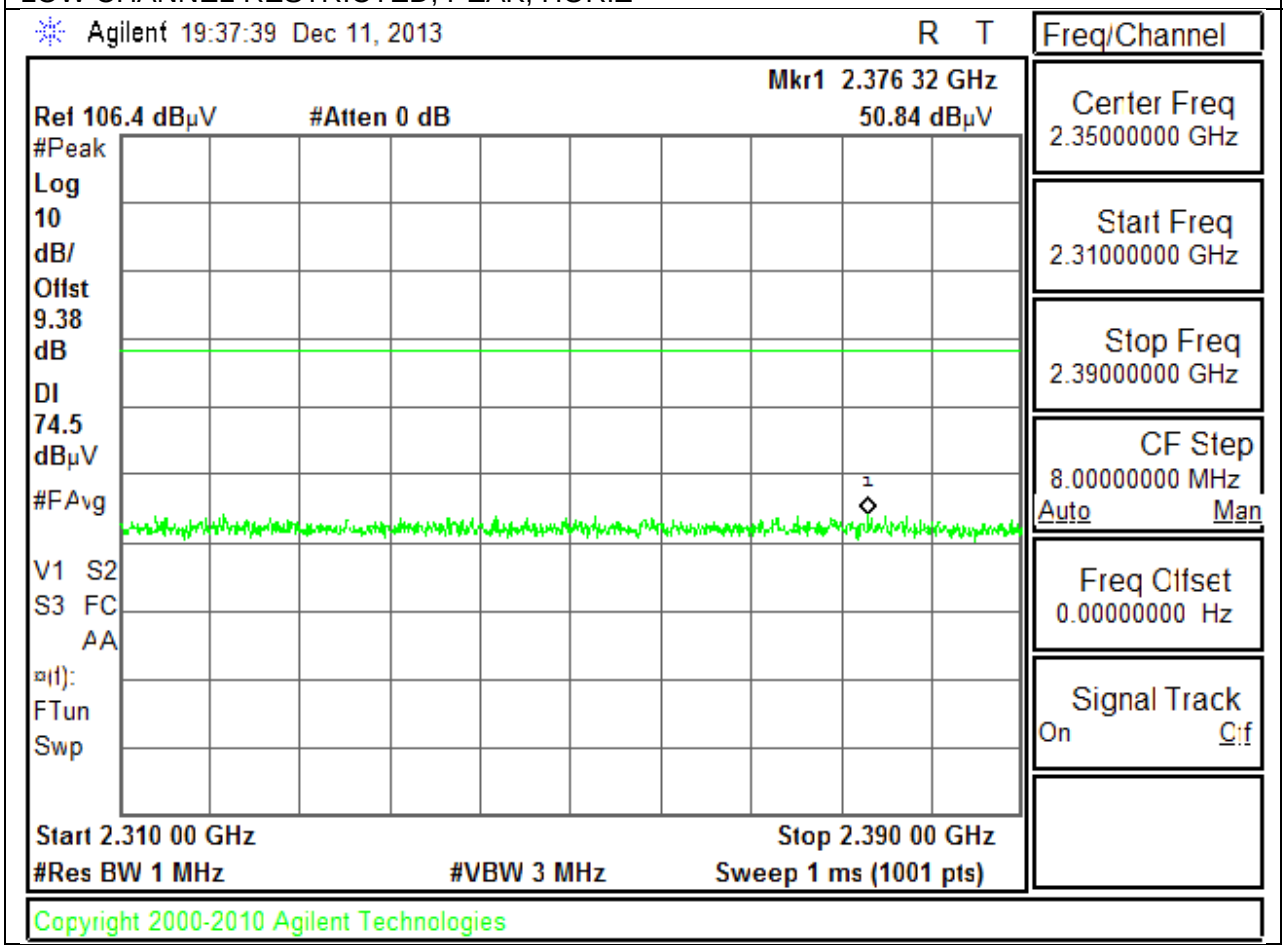
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

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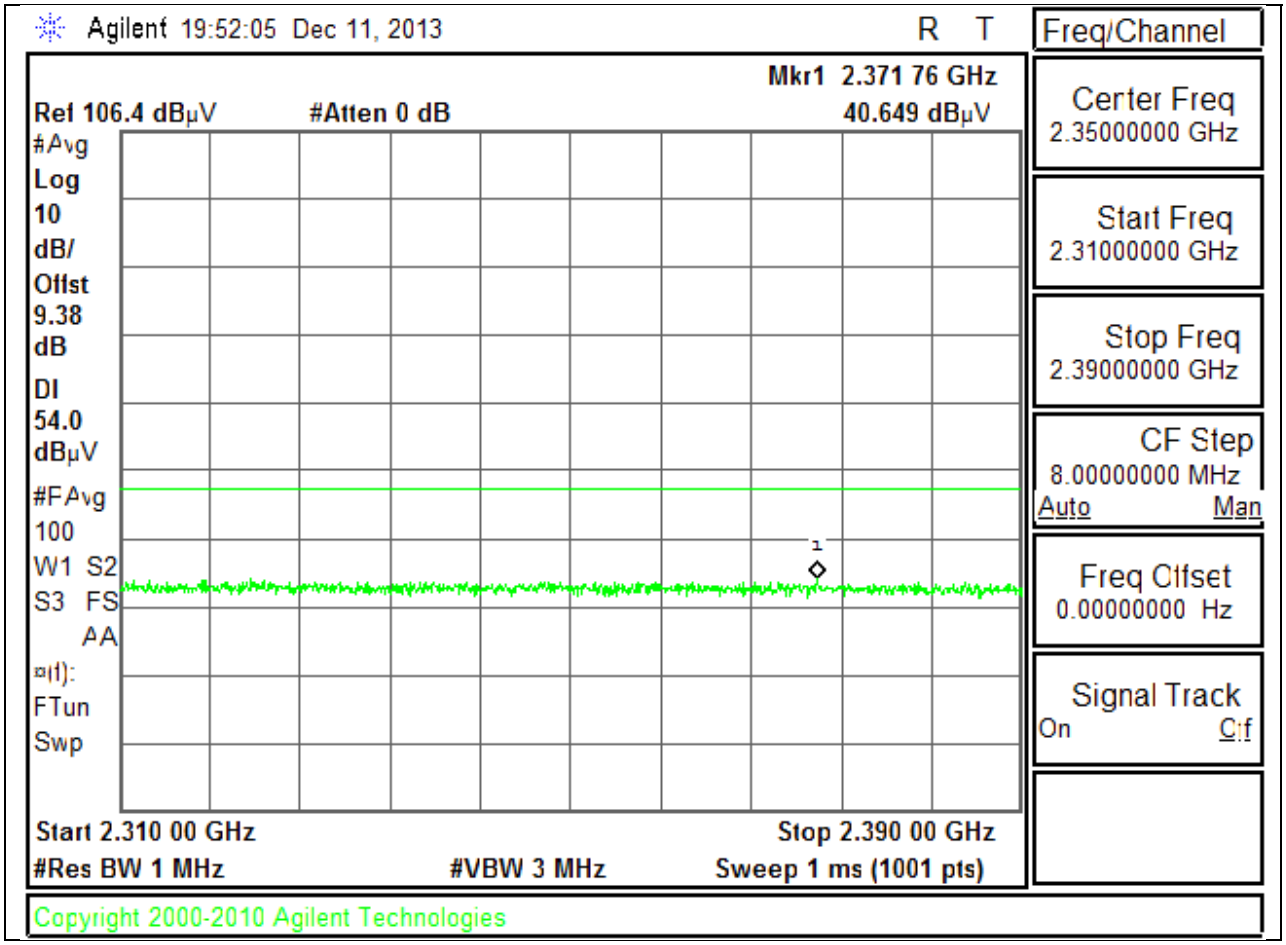

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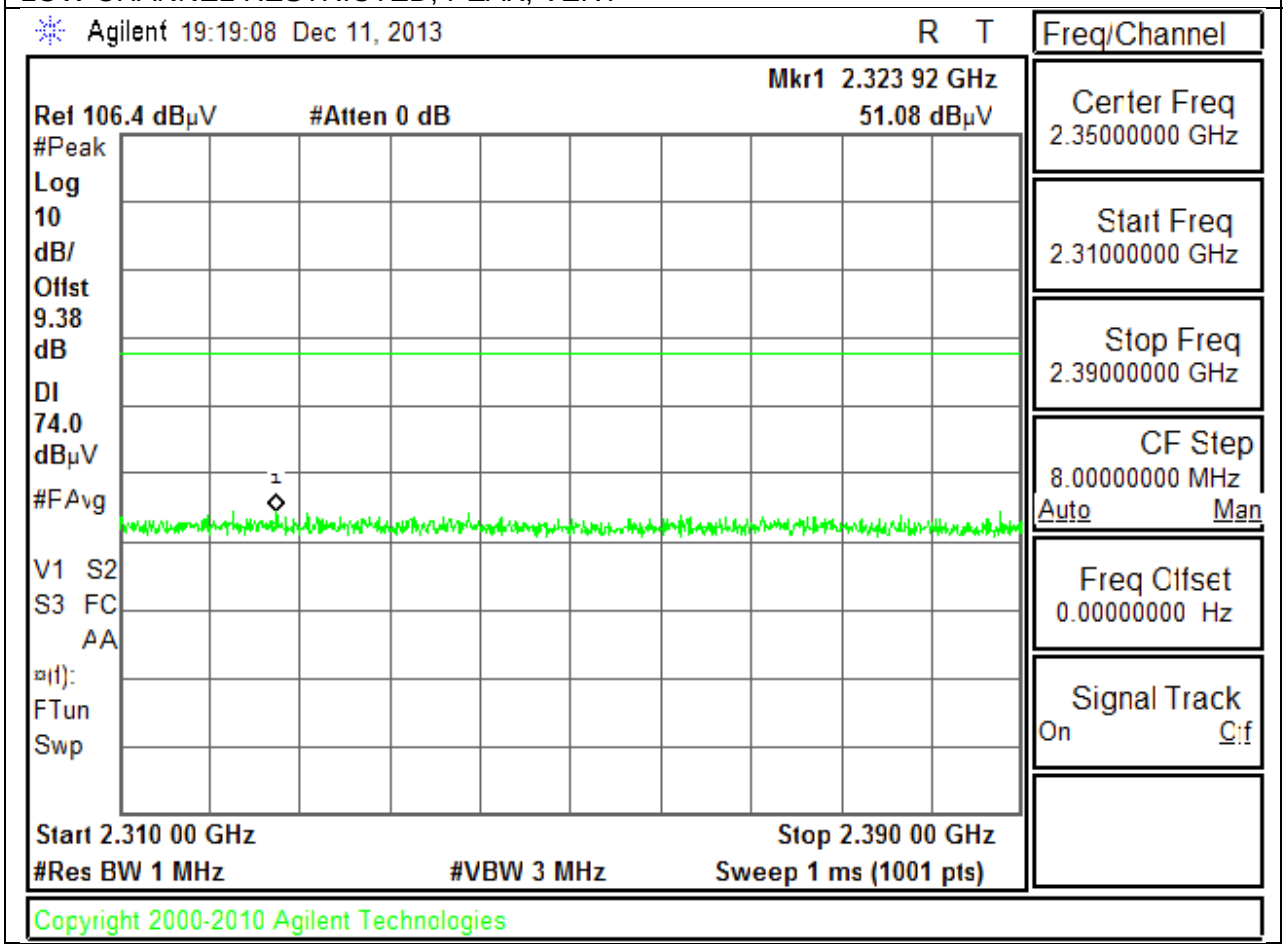
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT

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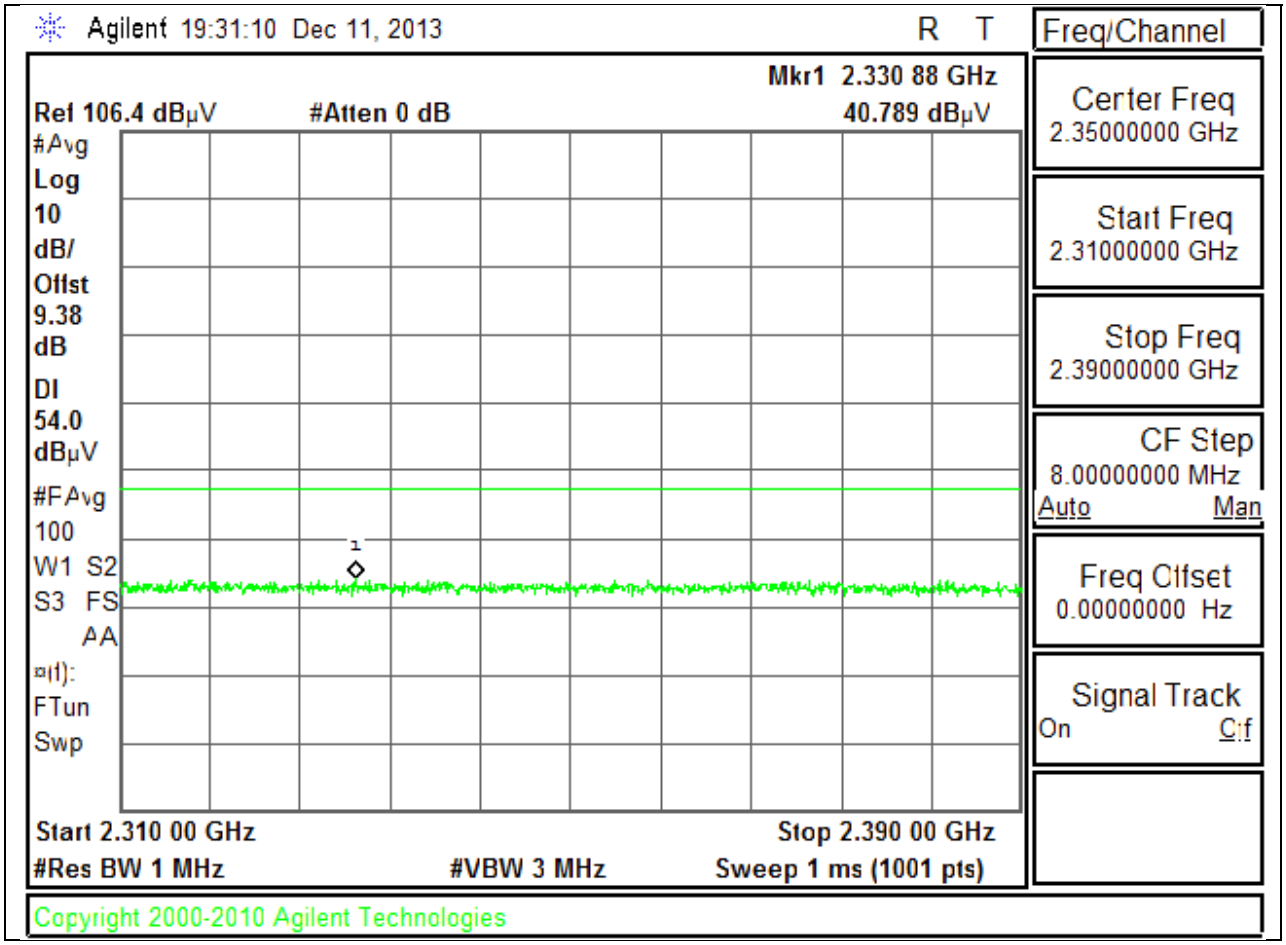

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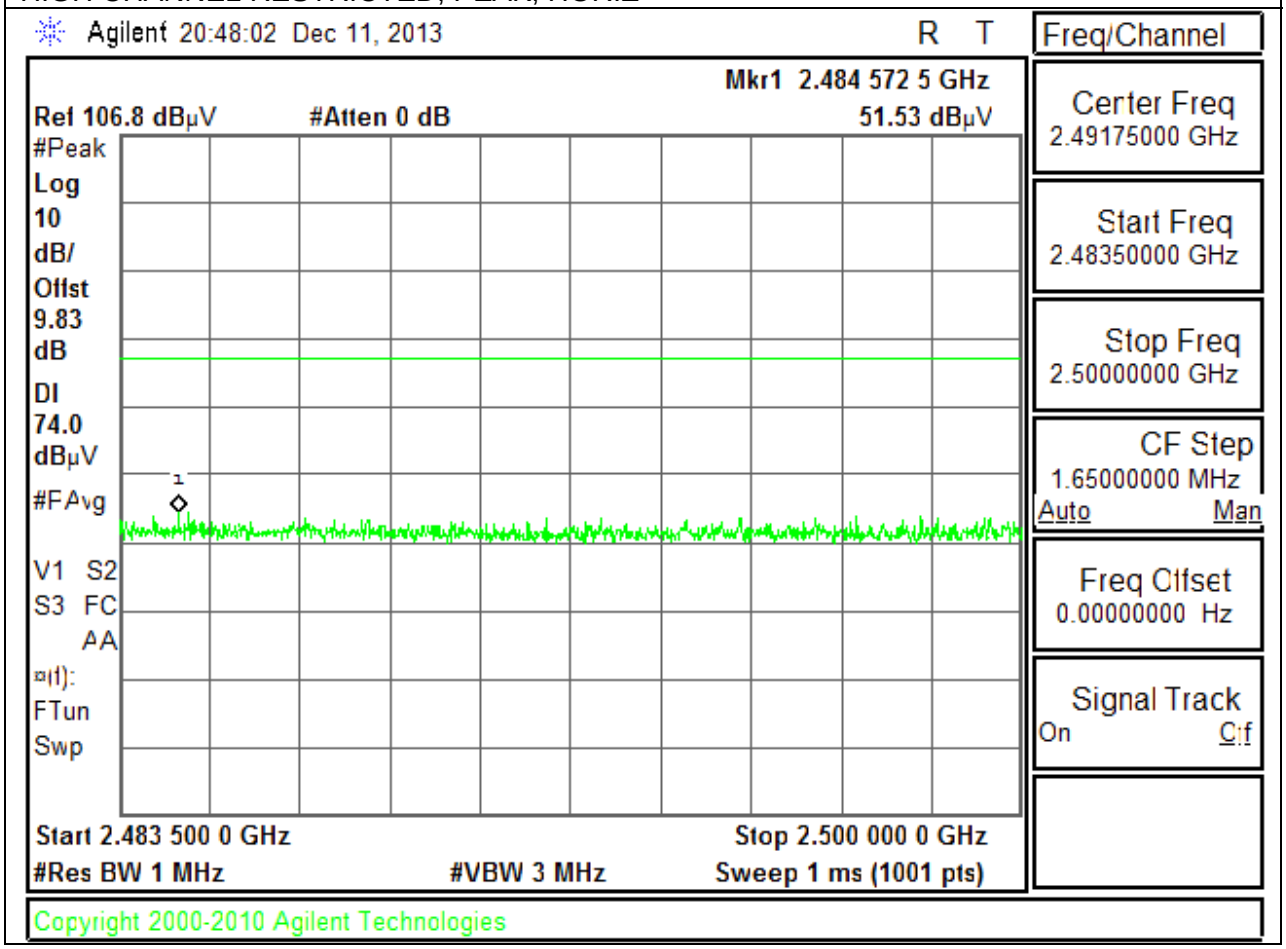
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ

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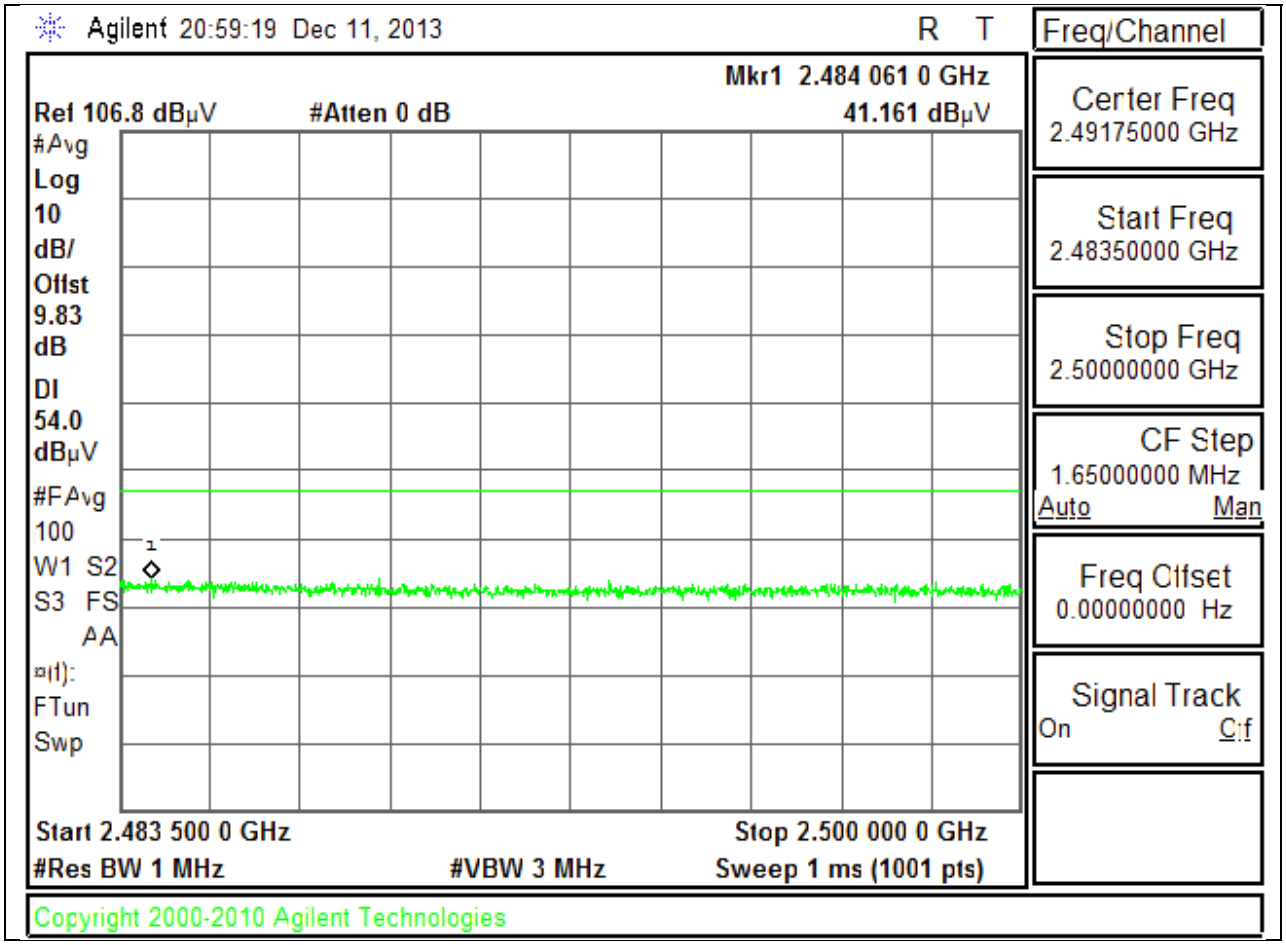

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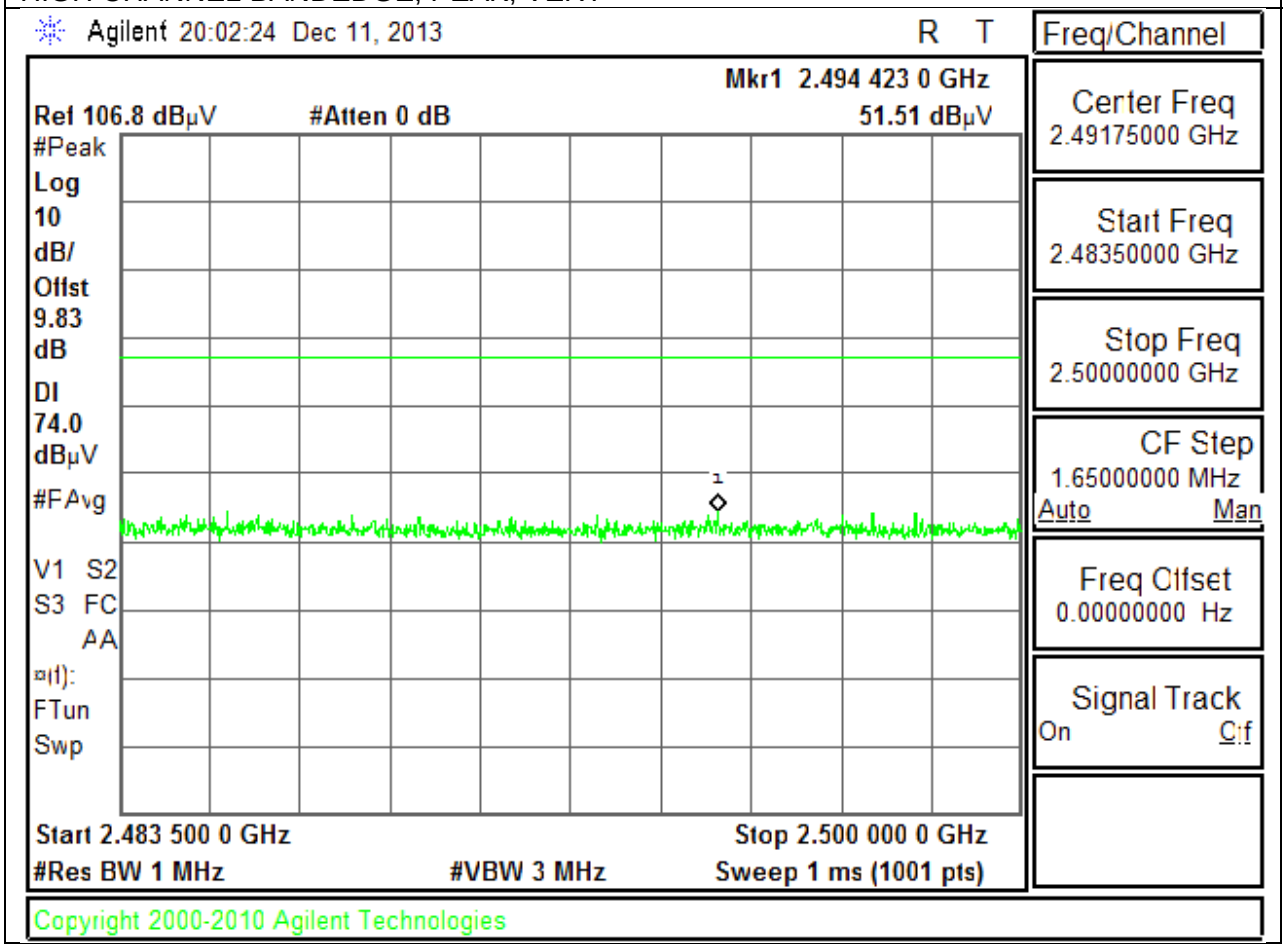
HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT

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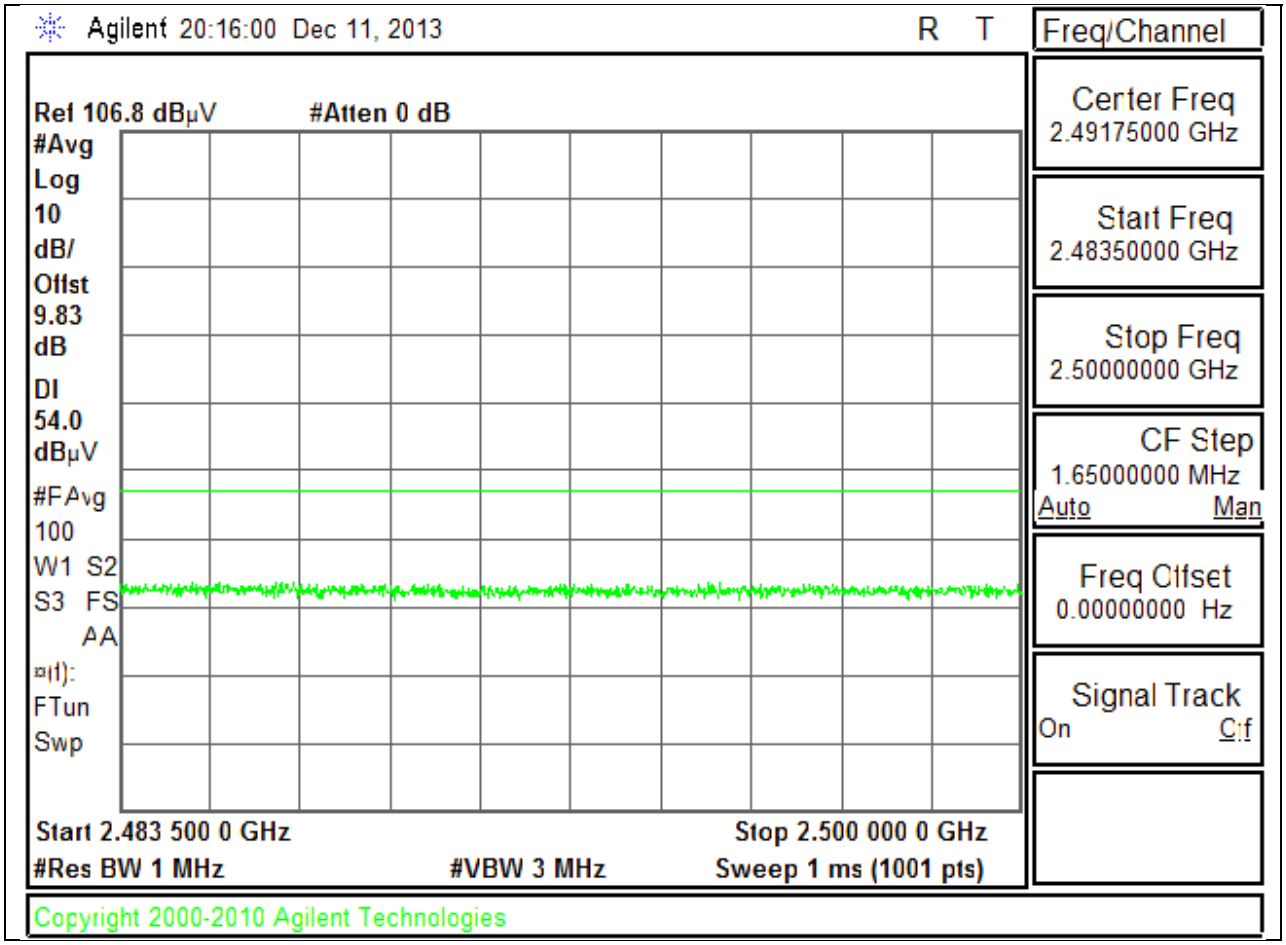

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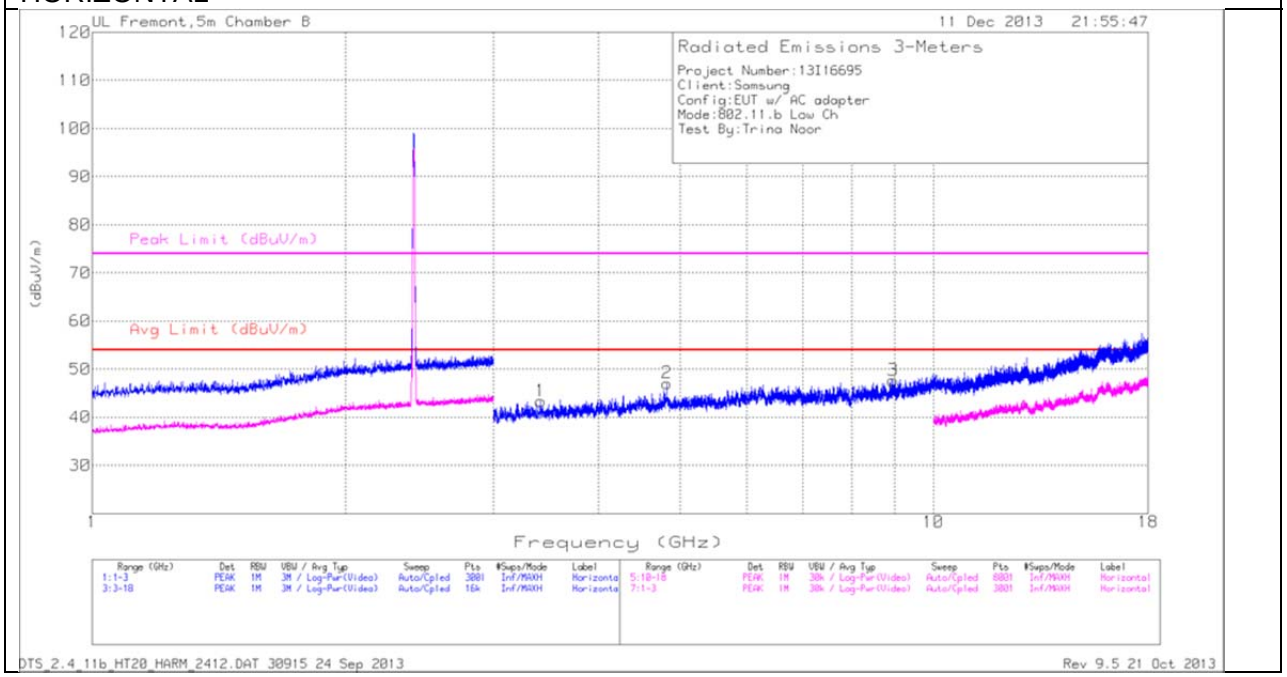
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL
HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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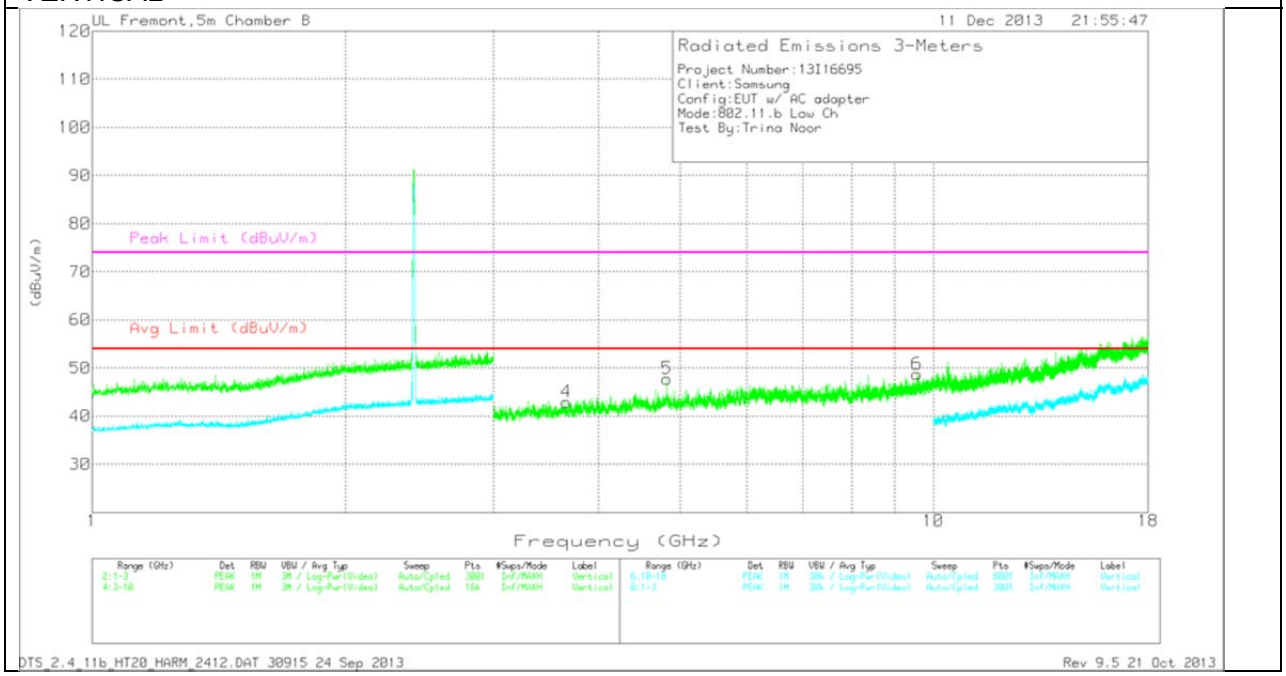
LOW CHANNEL
VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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LOW CHANNEL DATA
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.414	41.27	PK	33.2	-31.1	43.37	53.97	-10.6	74	-30.63	0-360	201	H
4	3.662	40.29	PK	33.6	-31	42.89	53.97	-11.08	74	-31.11	0-360	99	V
2	4.823	41.65	PK	34.7	-29.3	47.05	53.97	-6.92	74	-26.95	0-360	99	H
5	4.824	42.34	PK	34.7	-29.3	47.74	53.97	-6.23	74	-26.26	0-360	202	V
3	8.955	35.92	PK	36.7	-25	47.62	53.97	-6.35	74	-26.38	0-360	201	H
6	9.564	35.52	PK	37.3	-24.1	48.72	53.97	-5.25	74	-25.28	0-360	99	V

PK - Peak detector

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

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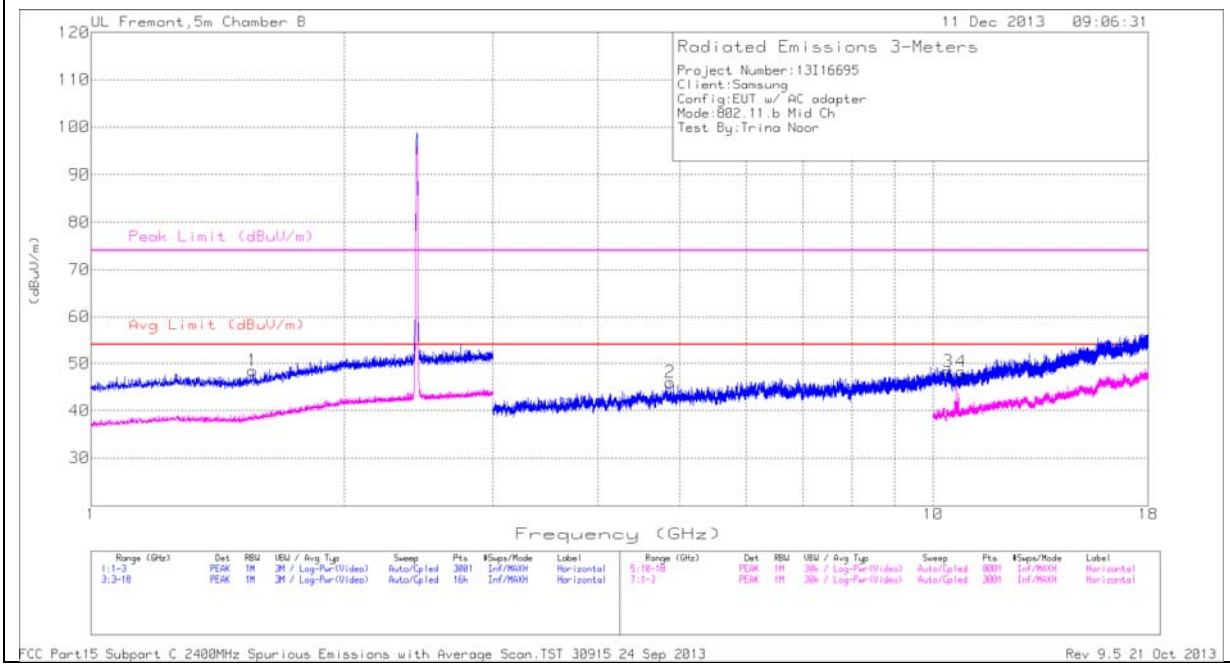
MID CHANNEL
HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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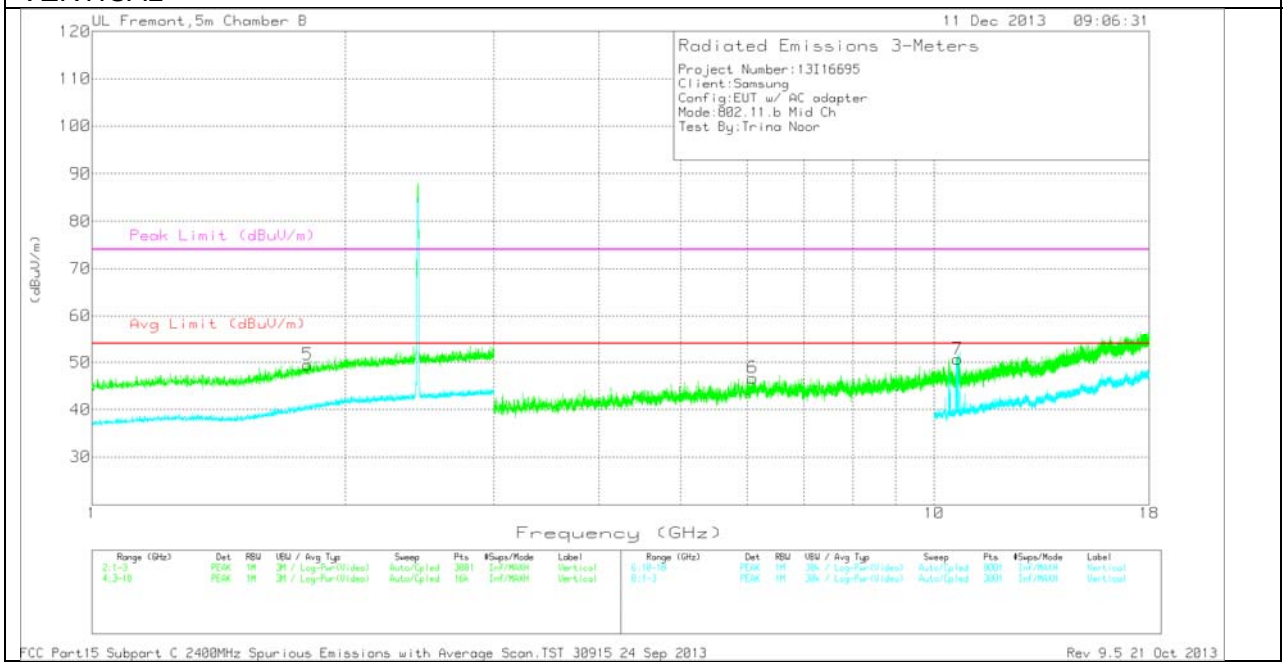
MID CHANNEL
VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.555	43.92	PK	28.6	-24.1	48.42	53.97	-5.55	74	-25.58	0-360	99	H
5	1.804	42.69	PK	30.5	-23.7	49.49	53.97	-4.48	74	-24.51	0-360	201	V
2	4.874	41.87	PK	34.7	-30.6	45.97	53.97	-8	74	-28.03	0-360	99	H
6	6.087	39.92	PK	35.9	-29.1	46.72	53.97	-7.25	74	-27.28	0-360	99	V
3	10.415	33.55	PK	38.1	-23.4	48.25	53.97	-5.72	74	-25.75	0-360	201	H
7	10.66	35.57	PK	38.3	-23.2	50.67	53.97	-3.3	74	-23.33	0-360	202	V
4	10.799	33.21	PK	38.3	-23.3	48.21	53.97	-5.76	74	-25.79	0-360	99	H

PK - Peak detector

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

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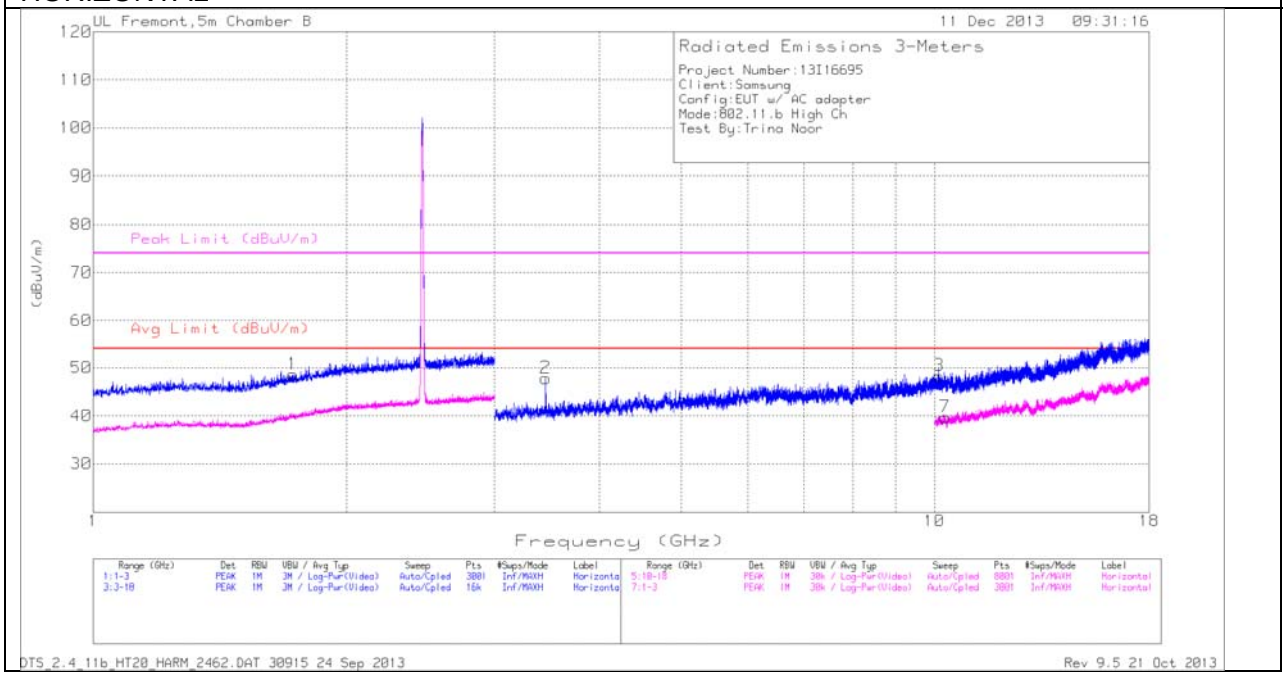
HIGH CHANNEL
HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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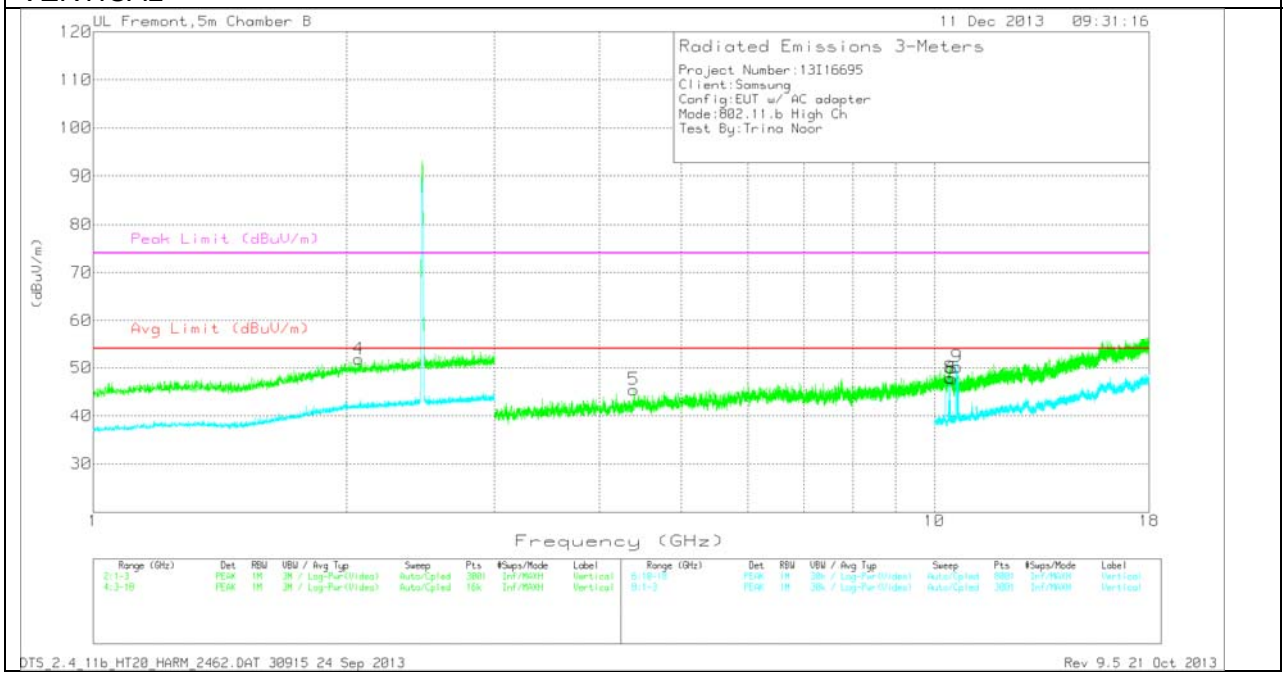
HIGH CHANNEL
VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.727	42.39	PK	29.9	-23.7	48.59	53.97	-5.38	74	-25.41	0-360	201	H
4	2.069	43.3	PK	31.9	-23.4	51.8	53.97	-2.17	74	-22.2	0-360	202	V
2	3.45	45.73	PK	33.2	-31.1	47.83	53.97	-6.14	74	-26.17	0-360	99	H
5	4.391	41.31	PK	34.3	-30.2	45.41	53.97	-8.56	74	-28.59	0-360	99	V
3	10.126	34.31	PK	37.9	-23.9	48.31	53.97	-5.66	74	-25.69	0-360	99	H
7	10.298	25.35	Avg	38	-23.7	39.65	53.97	-14.32	74	-34.35	0-360	201	H
8	10.434	32.98	Avg	38.1	-23.2	47.88	53.97	-6.09	74	-26.12	0-360	201	V
6	10.496	32.86	PK	38.2	-23.3	47.76	53.97	-6.21	74	-26.24	0-360	99	V
9	10.638	35.18	Avg	38.3	-23.3	50.18	53.97	-3.79	74	-23.82	0-360	99	V

PK - Peak detector

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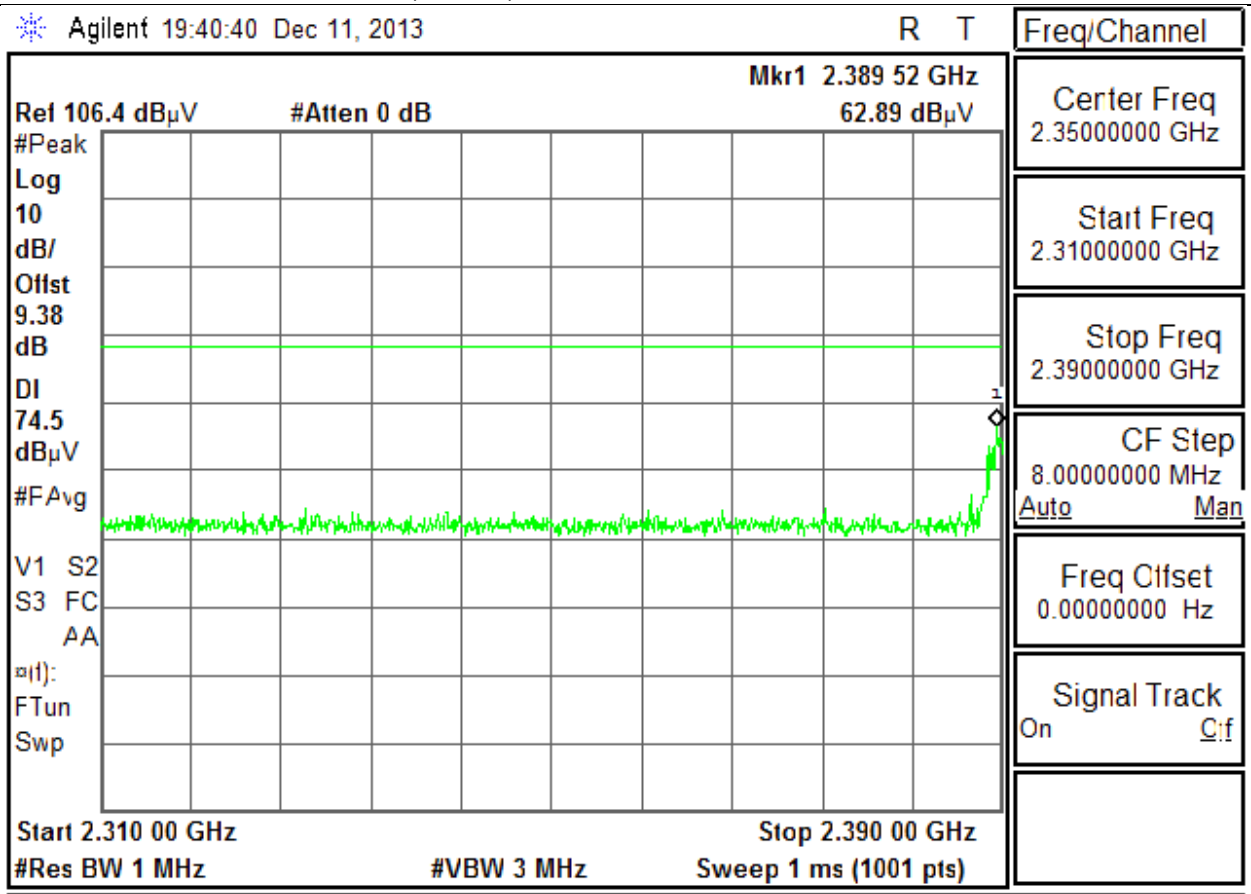
10.2.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

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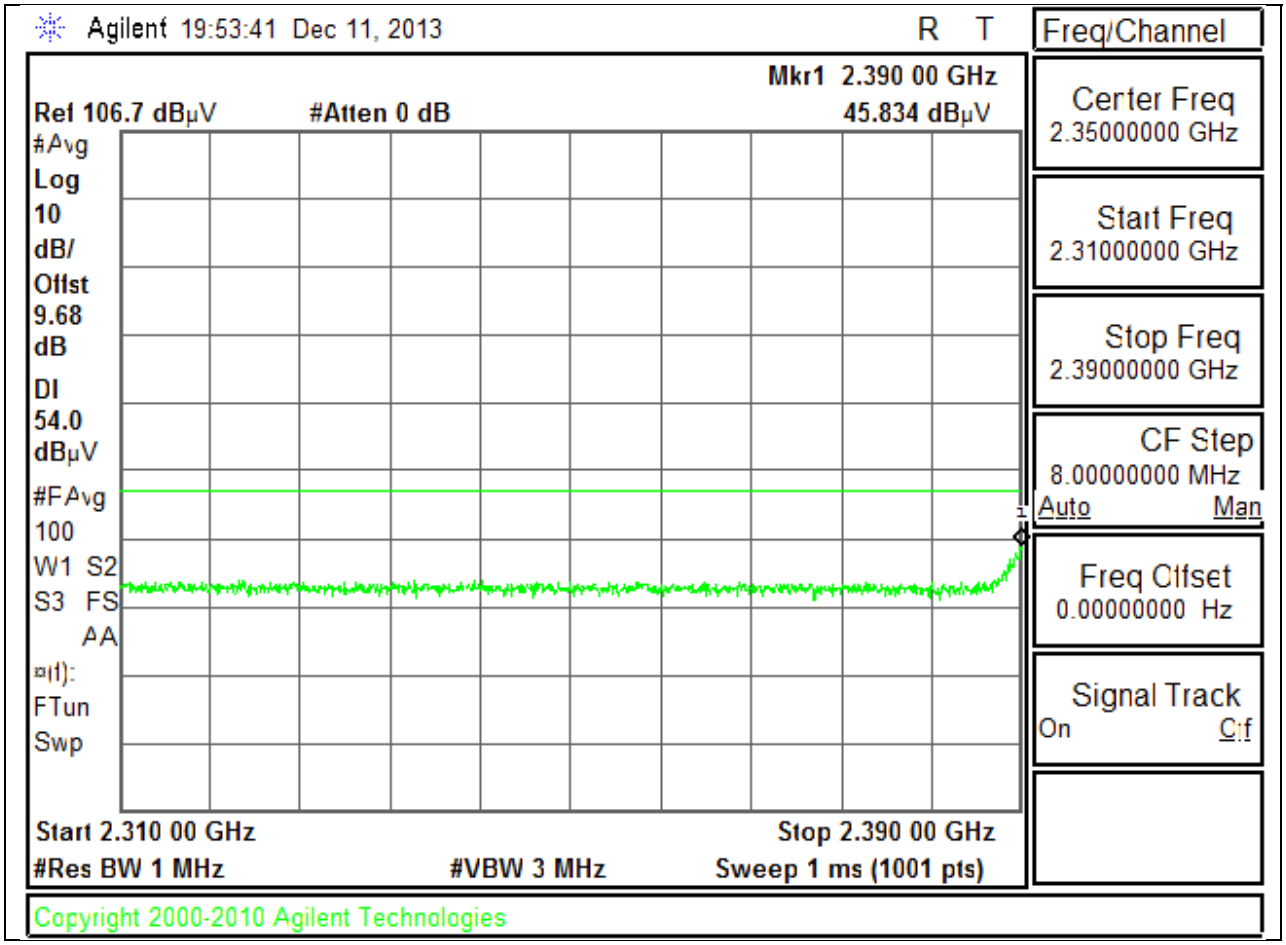

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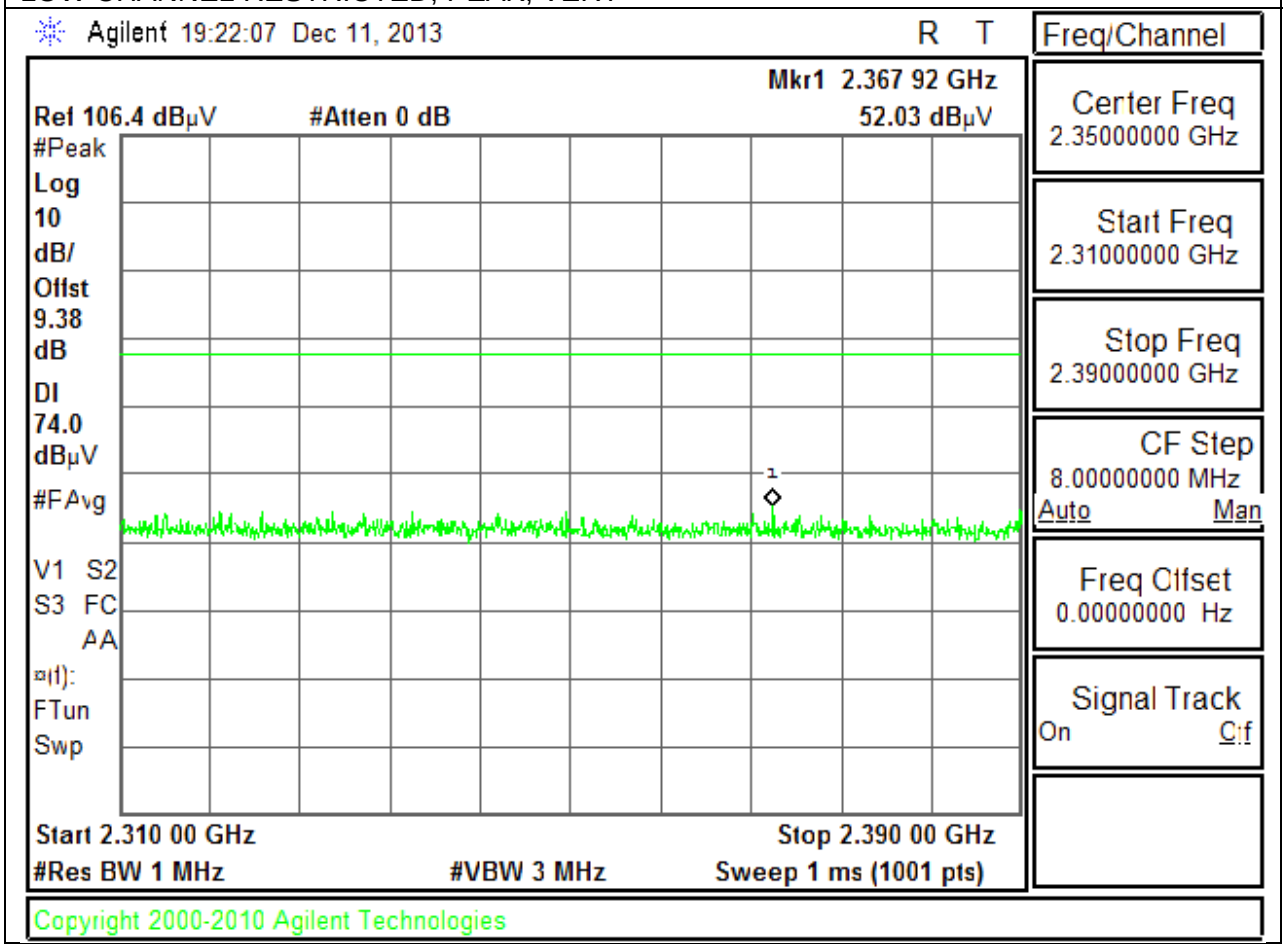
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT

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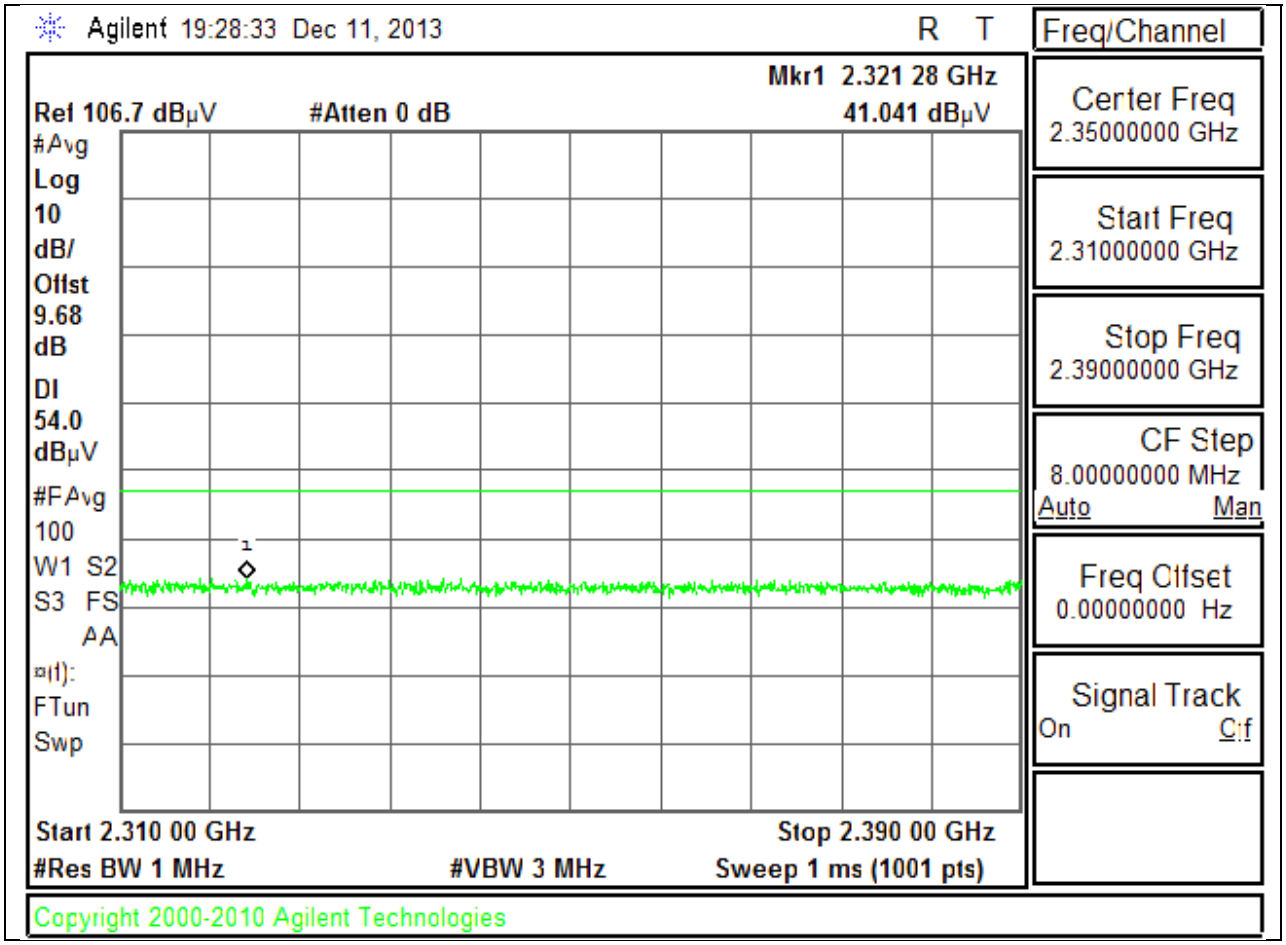

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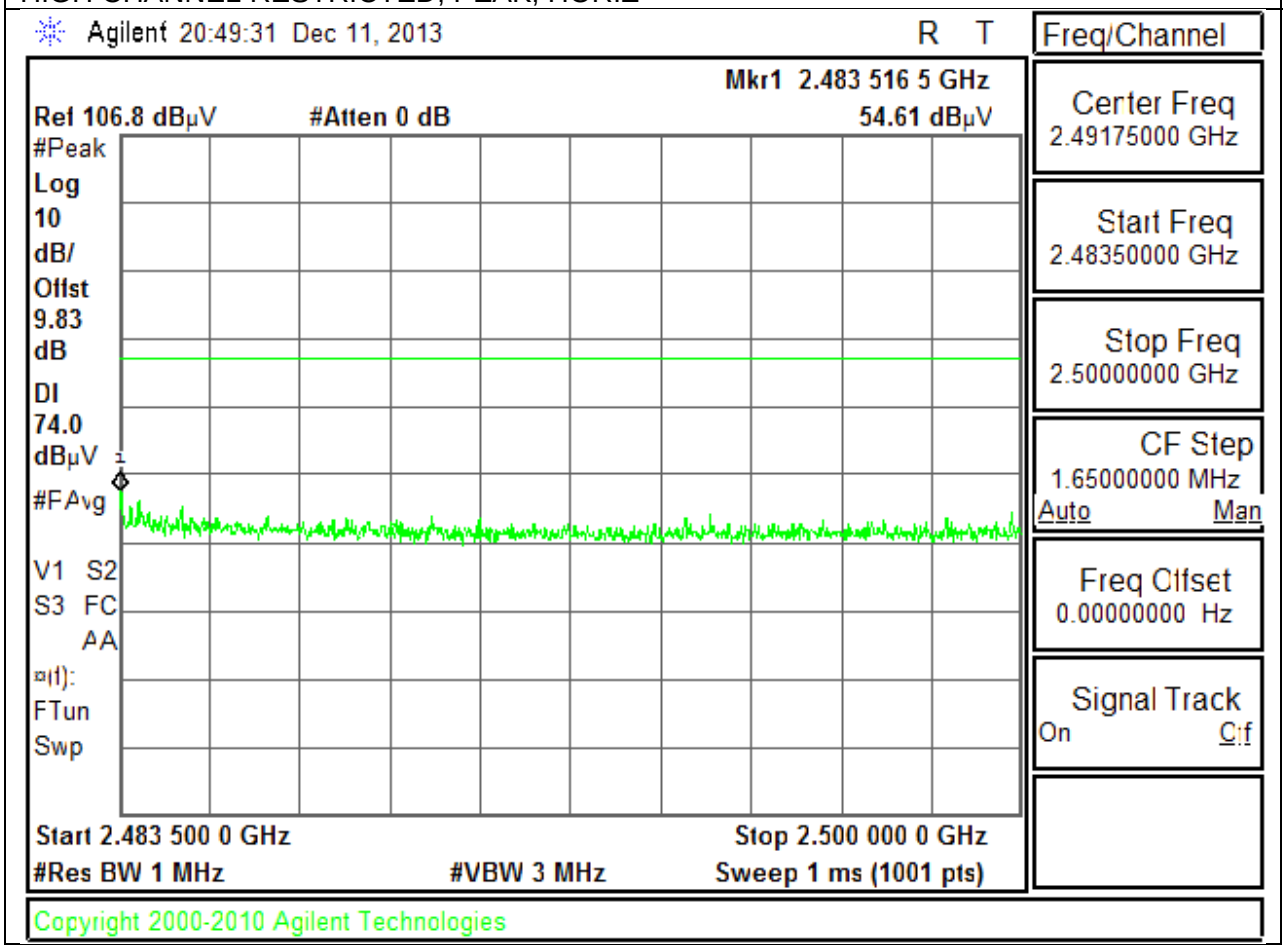
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ

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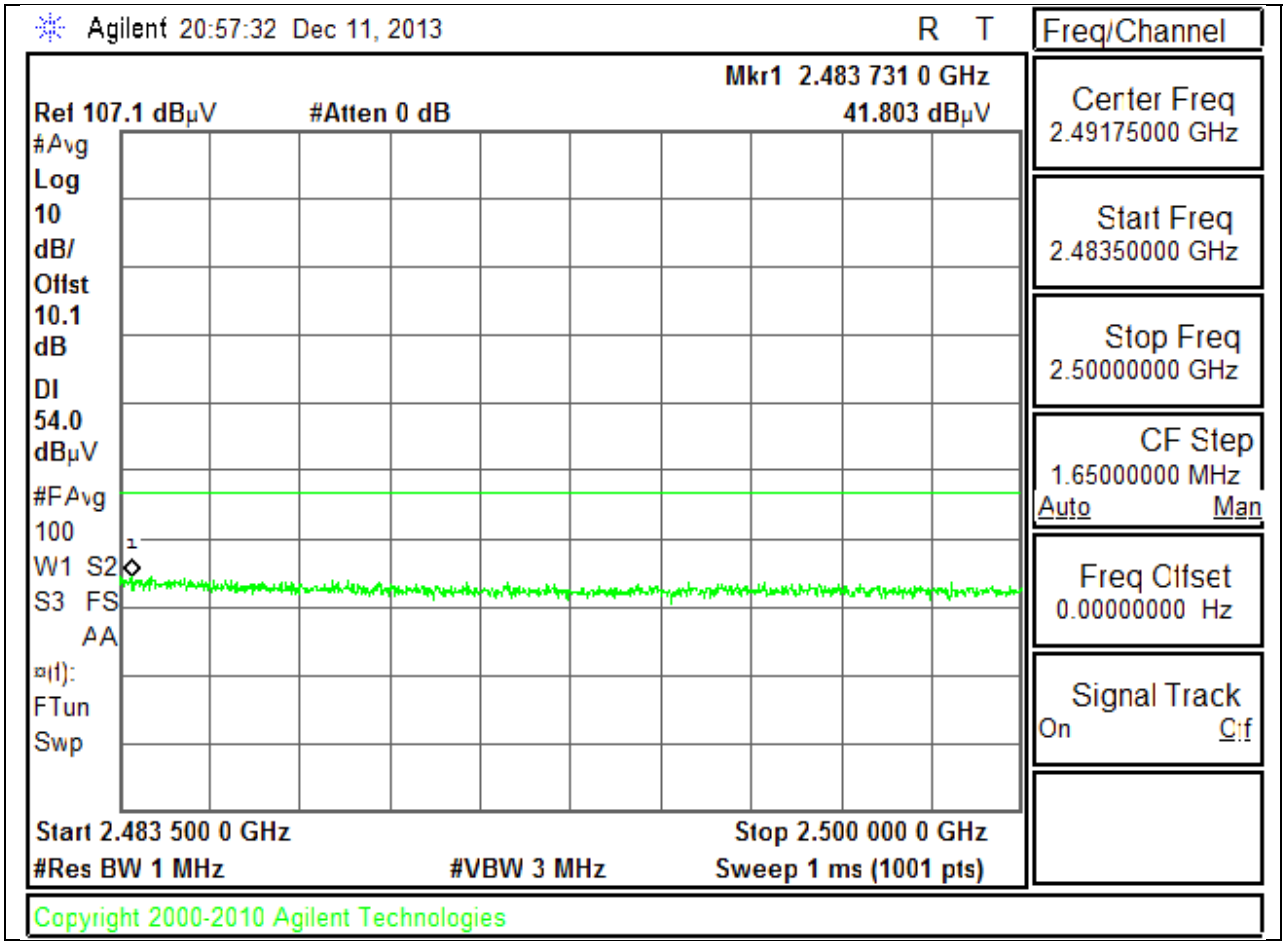

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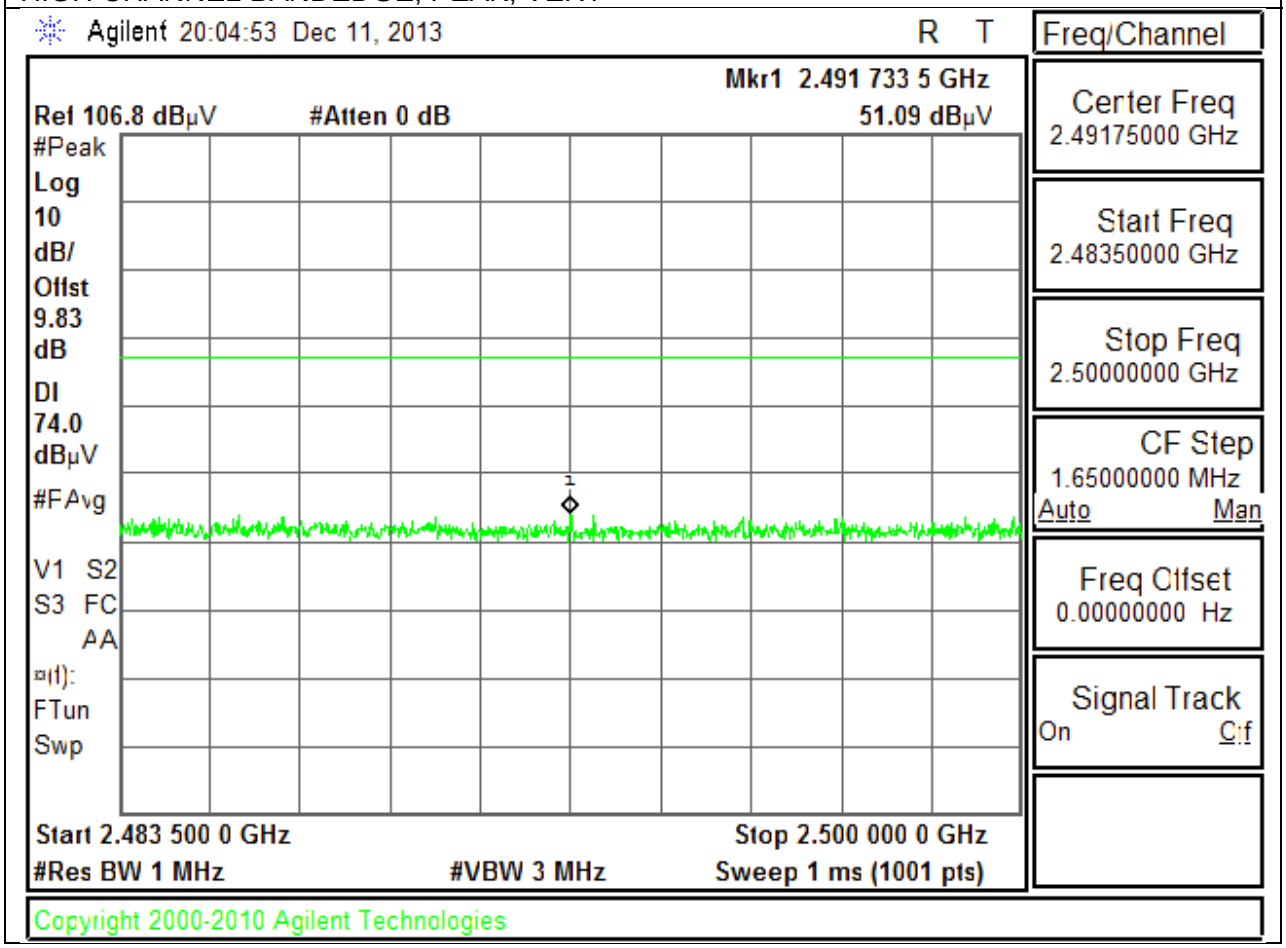
HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT

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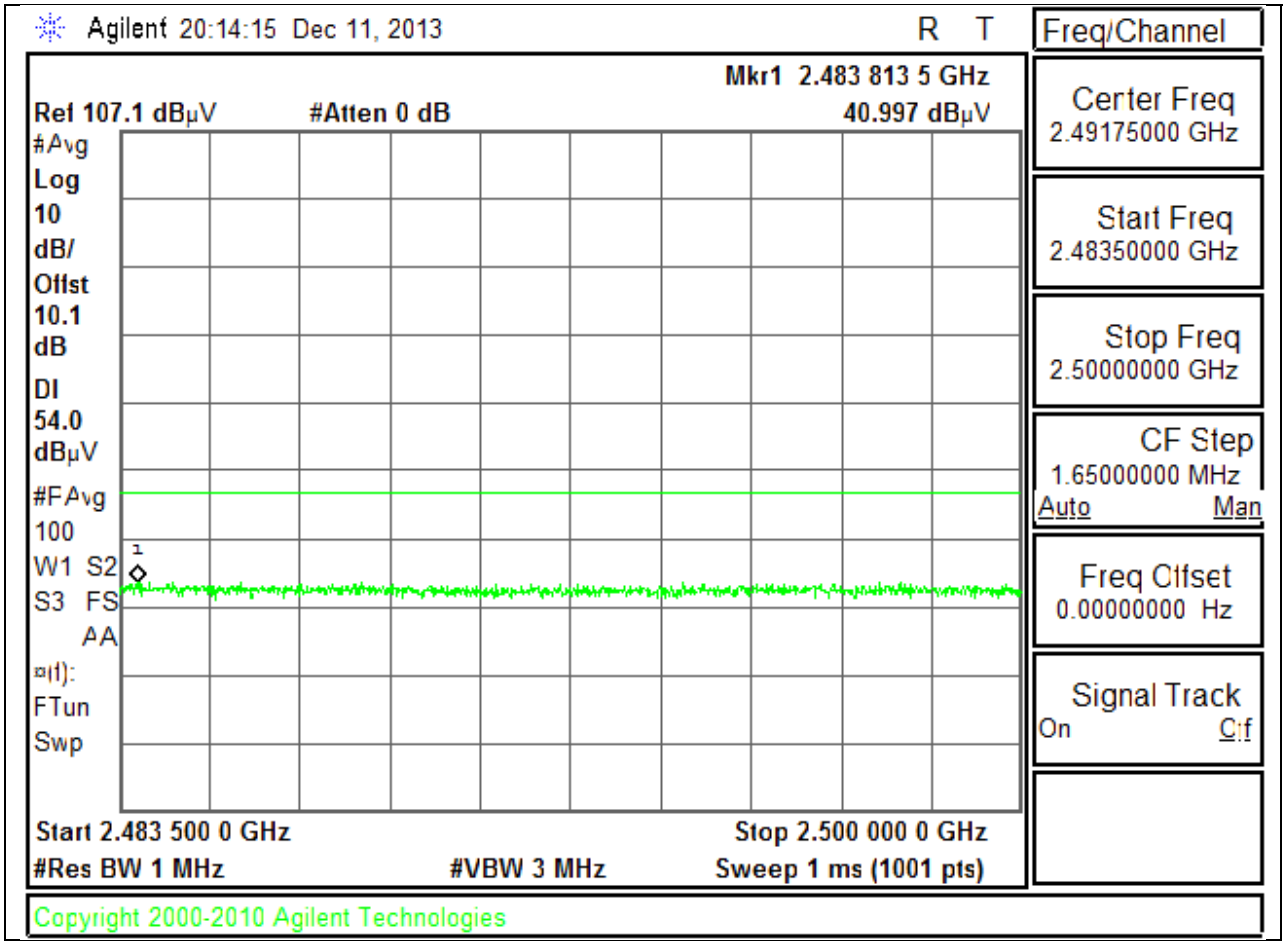

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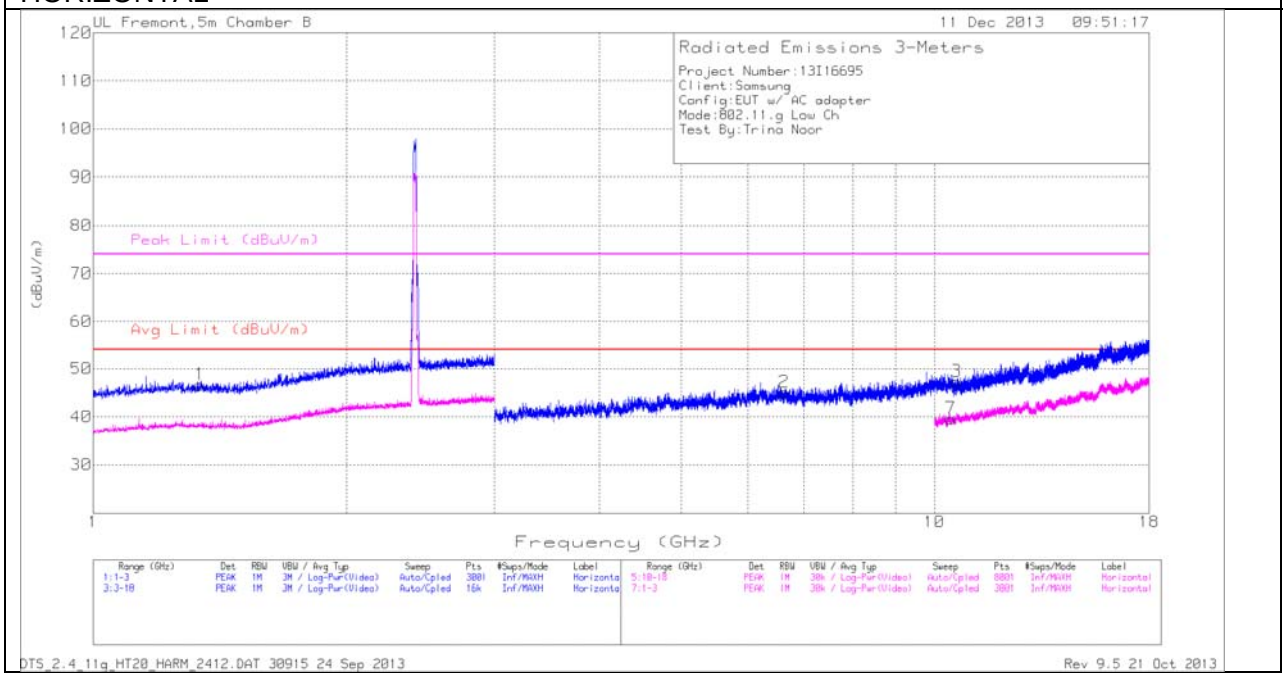
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL
HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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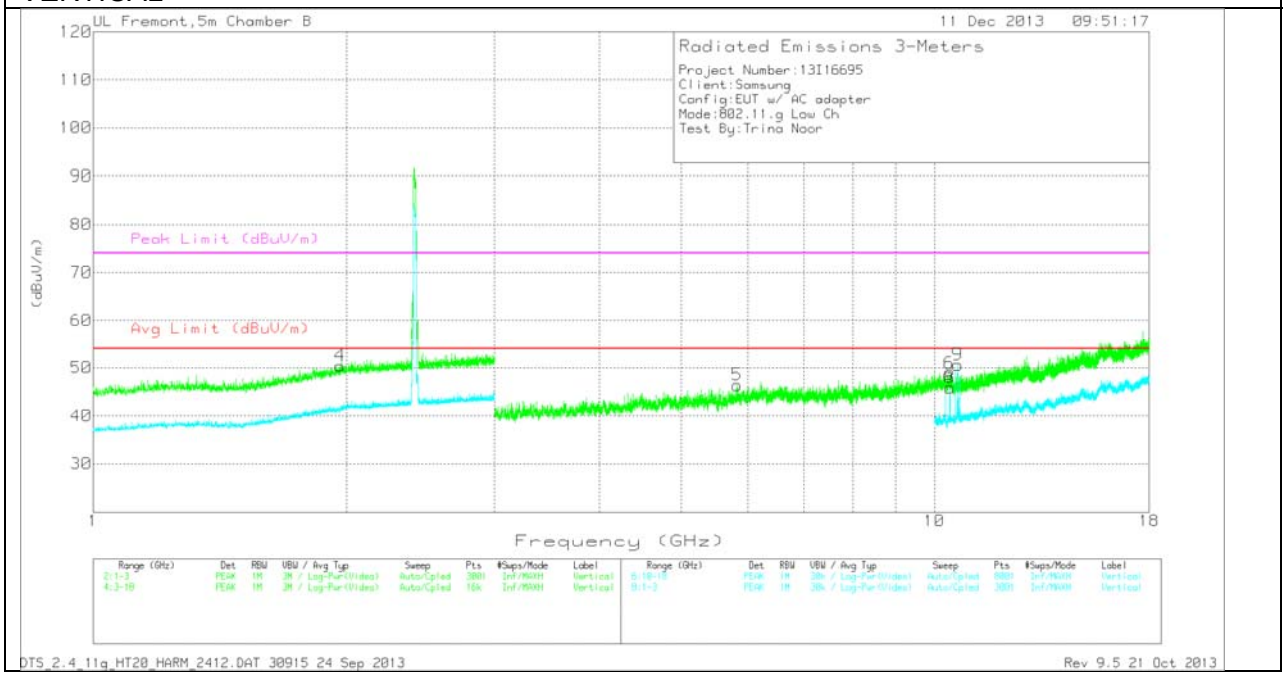
LOW CHANNEL
VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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LOW CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.34	42.62	PK	28.5	-24.5	46.62	53.97	-7.35	74	-27.38	0-360	201	H
4	1.967	42.27	PK	31.6	-23.5	50.37	53.97	-3.6	74	-23.63	0-360	201	V
5	5.831	40.26	PK	35.4	-29.3	46.36	53.97	-7.61	74	-27.64	0-360	99	V
2	6.629	37.71	PK	35.8	-28.4	45.11	53.97	-8.86	74	-28.89	0-360	201	H
6	10.414	34.07	PK	38.1	-23.4	48.77	53.97	-5.2	74	-25.23	0-360	202	V
8	10.427	31.04	Avg	38.1	-23.3	45.84	53.97	-8.13	74	-28.16	0-360	99	V
7	10.459	24.62	Avg	38.2	-23.3	39.52	53.97	-14.45	74	-34.48	0-360	201	H
3	10.625	32.33	PK	38.3	-23.3	47.33	53.97	-6.64	74	-26.67	0-360	99	H
9	10.66	35.48	Avg	38.3	-23.2	50.58	53.97	-3.39	74	-23.42	0-360	99	V

PK - Peak detector

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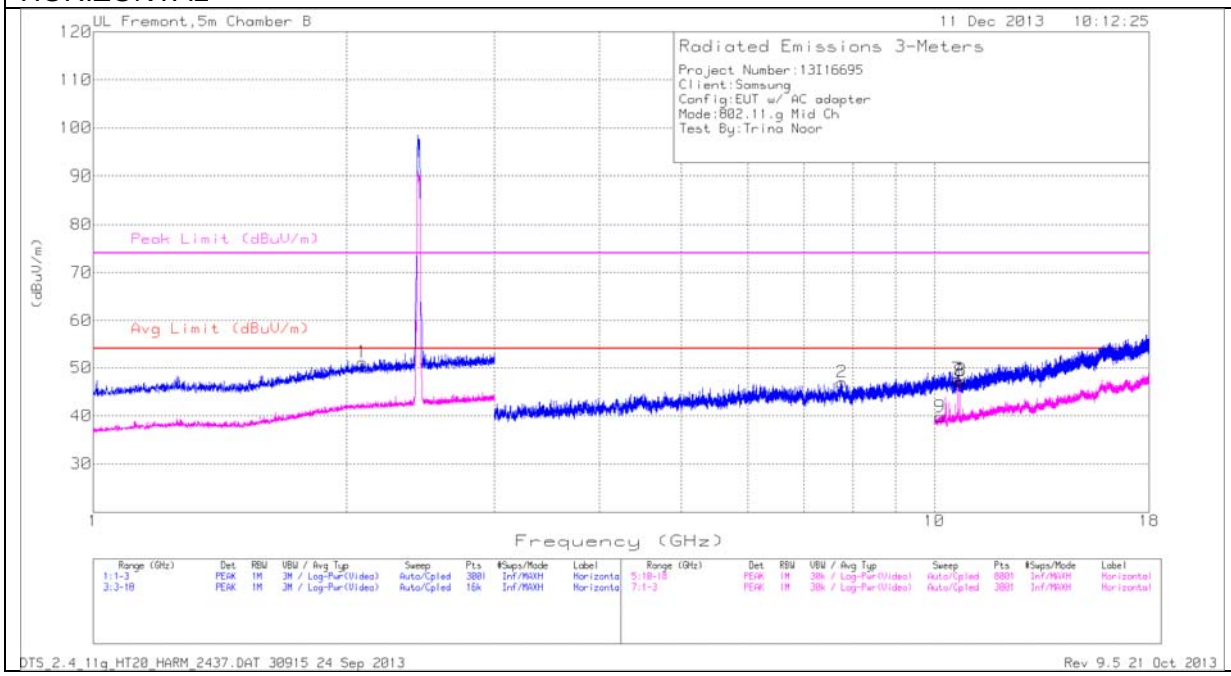
MID CHANNEL
HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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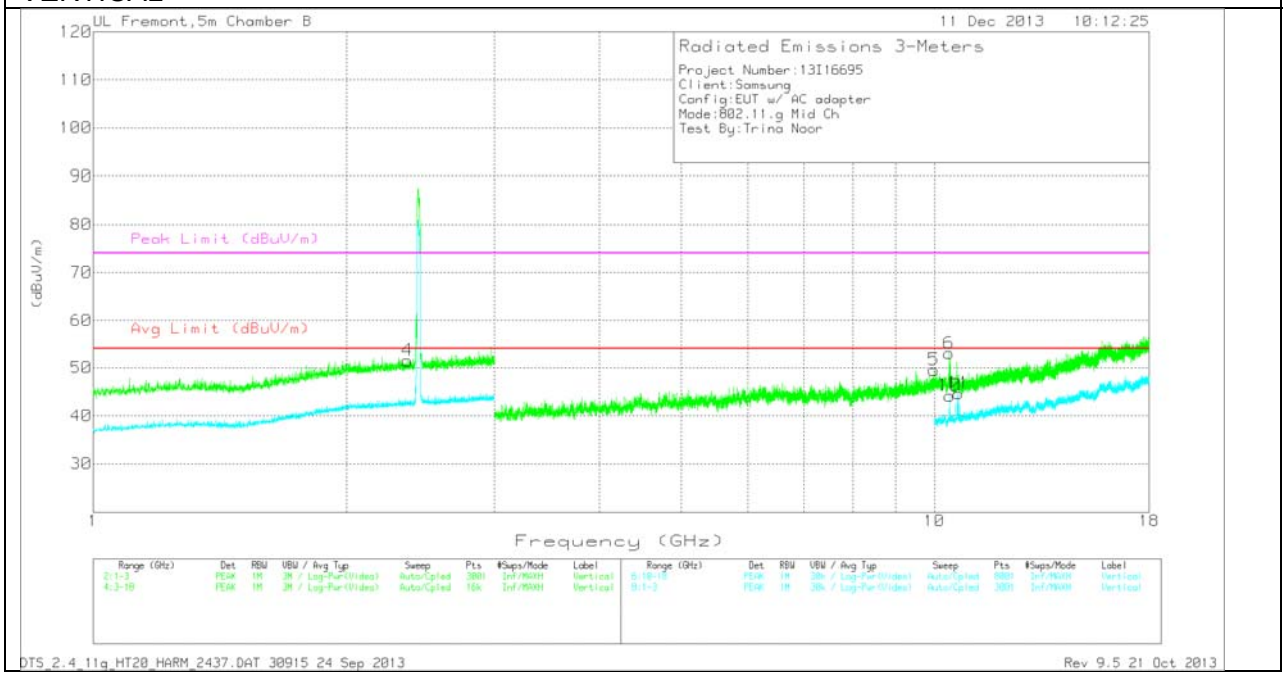
MID CHANNEL
VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.089	42.61	PK	31.9	-23.4	51.11	53.97	-2.86	74	-22.89	0-360	99	H
4	2.364	42.08	PK	32.3	-22.9	51.48	53.97	-2.49	74	-22.52	0-360	99	V
2	7.768	36.77	PK	36.2	-26	46.97	53.97	-7	74	-27.03	0-360	201	H
5	9.983	35.86	PK	37.8	-24.1	49.56	53.97	-4.41	74	-24.44	0-360	201	V
9	10.153	25.76	Avg	37.9	-23.9	39.76	53.97	-14.21	74	-34.24	0-360	201	H
6	10.409	38.34	PK	38.1	-23.4	53.04	53.97	-0.93	74	-20.96	0-360	201	V
10	10.426	29.34	Avg	38.1	-23.3	44.14	53.97	-9.83	74	-29.86	0-360	202	V
7	10.659	32.47	Avg	38.3	-23.2	47.57	53.97	-6.4	74	-26.43	0-360	99	H
11	10.678	29.64	Avg	38.3	-23.3	44.64	53.97	-9.33	74	-29.36	0-360	202	V
8	10.724	32.11	Avg	38.3	-23.3	47.11	53.97	-6.86	74	-26.89	0-360	99	H
3	10.766	32.27	PK	38.3	-23.3	47.27	53.97	-6.7	74	-26.73	0-360	201	H

PK - Peak detector

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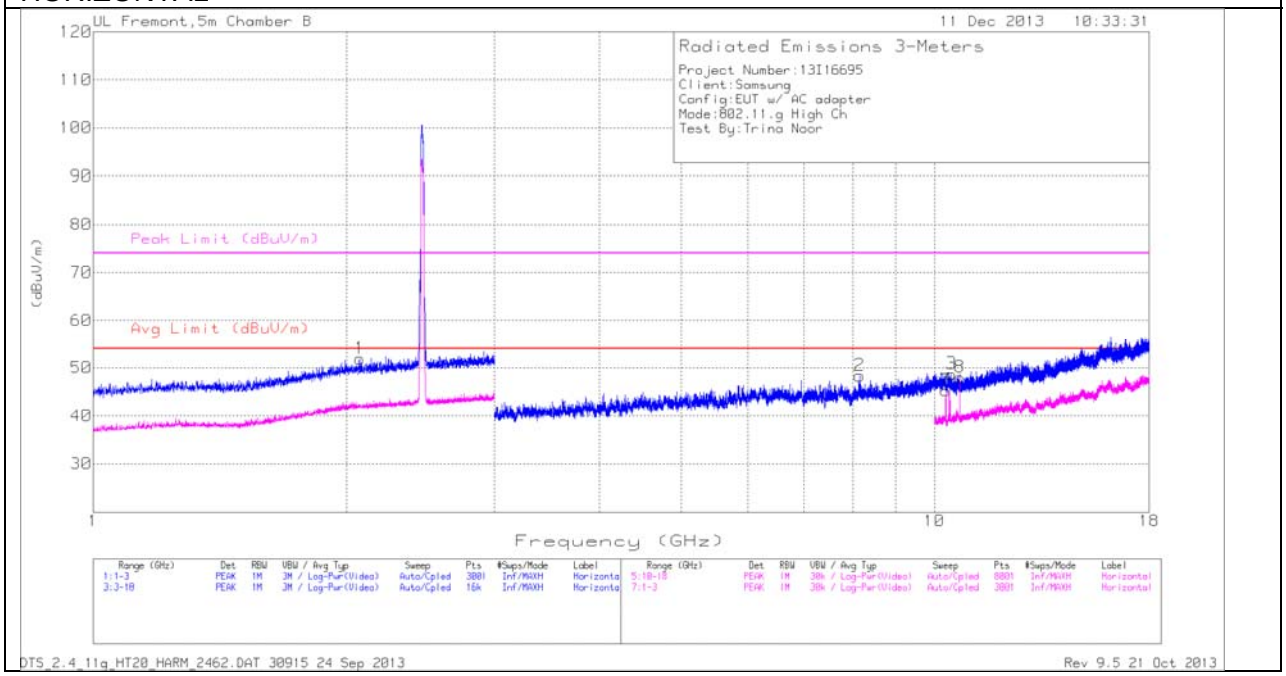
HIGH CHANNEL
HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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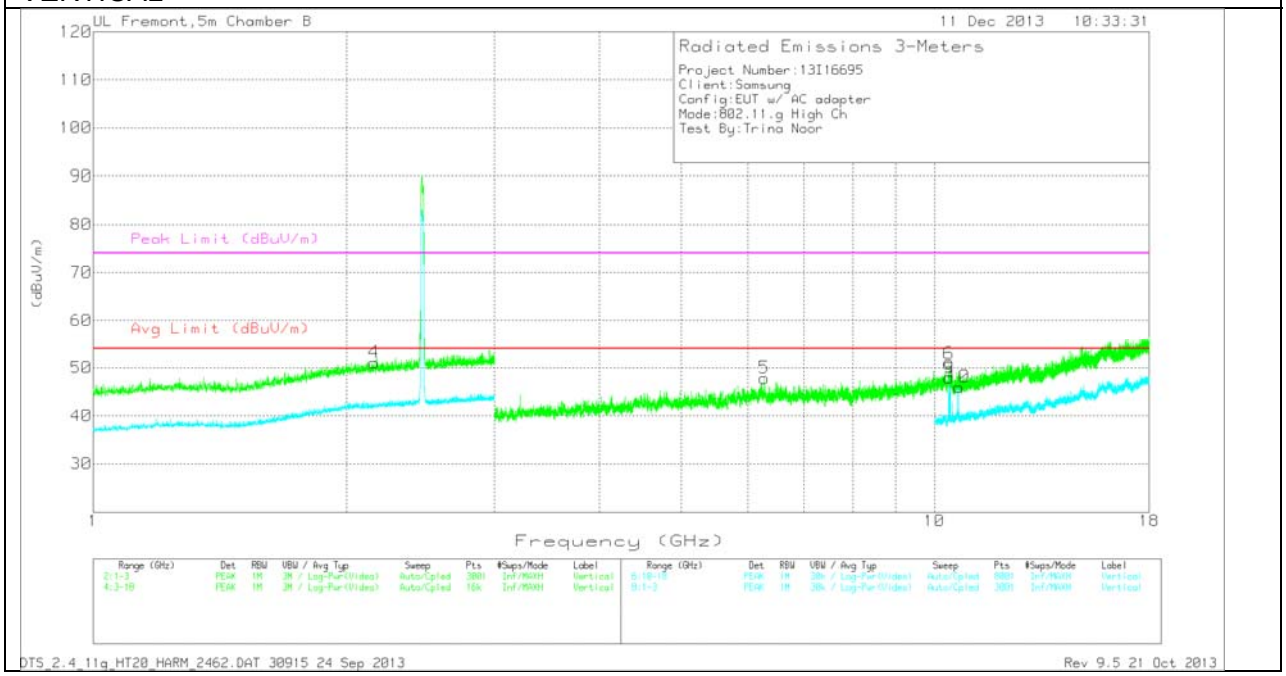
HIGH CHANNEL
VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.075	43.36	PK	31.9	-23.4	51.86	53.97	-2.11	74	-22.14	0-360	99	H
4	2.158	42.26	PK	32	-23.2	51.06	53.97	-2.91	74	-22.94	0-360	202	V
5	6.276	39.95	PK	36	-28.1	47.85	53.97	-6.12	74	-26.15	0-360	202	V
2	8.149	38.94	PK	36.1	-26.7	48.34	53.97	-5.63	74	-25.66	0-360	201	H
7	10.315	30.67	Avg	38.1	-23.5	45.27	53.97	-8.7	74	-28.73	0-360	99	H
6	10.408	36.12	PK	38.1	-23.4	50.82	53.97	-3.15	74	-23.18	0-360	99	V
9	10.409	33.26	Avg	38.1	-23.4	47.96	53.97	-6.01	74	-26.04	0-360	202	V
3	10.471	33.8	PK	38.2	-23.3	48.7	53.97	-5.27	74	-25.3	0-360	99	H
10	10.69	30.94	Avg	38.3	-23.3	45.94	53.97	-8.03	74	-28.06	0-360	99	V
8	10.72	33.01	Avg	38.3	-23.3	48.01	53.97	-5.96	74	-25.99	0-360	99	H

PK - Peak detector

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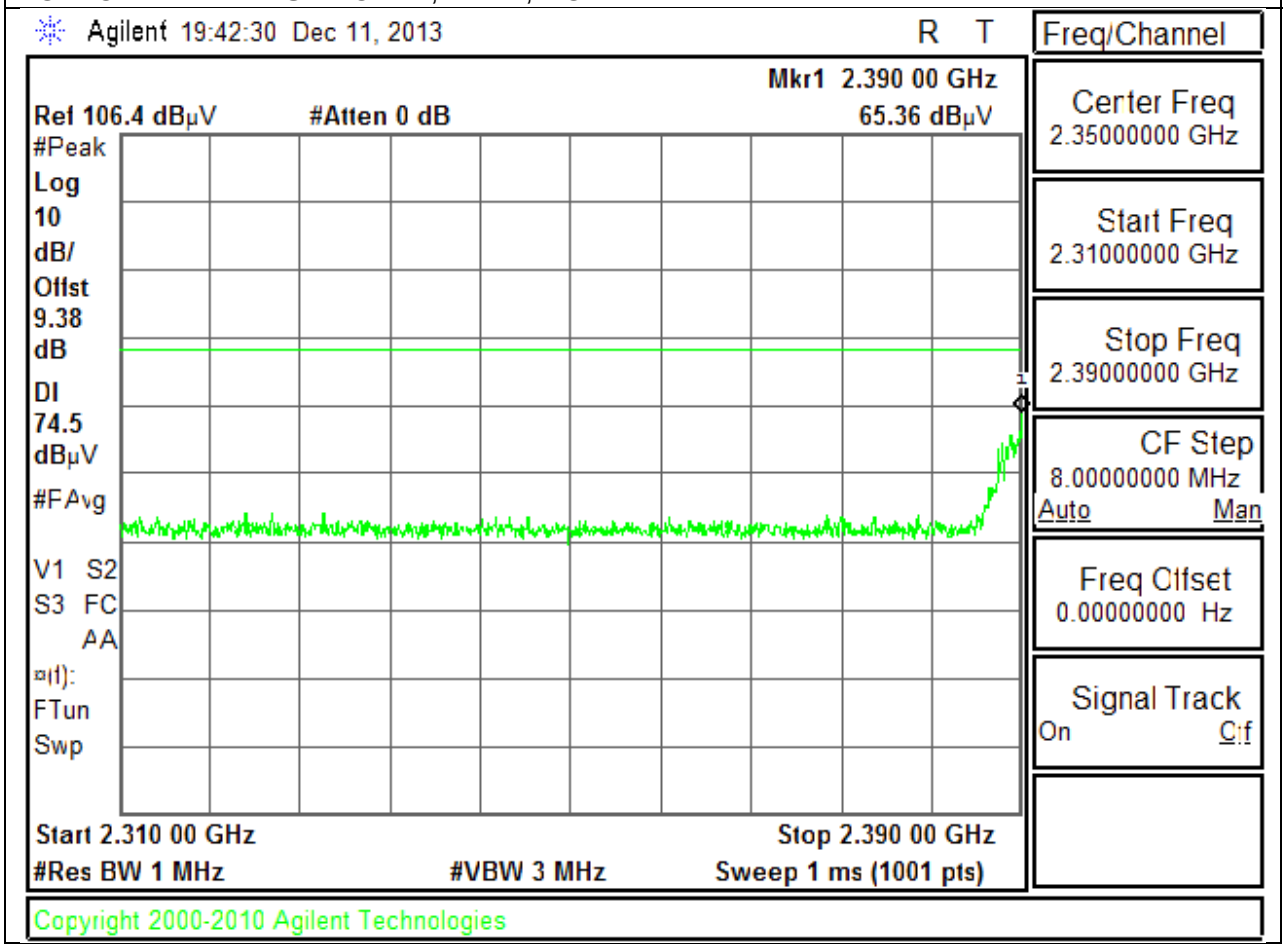
10.2.3. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

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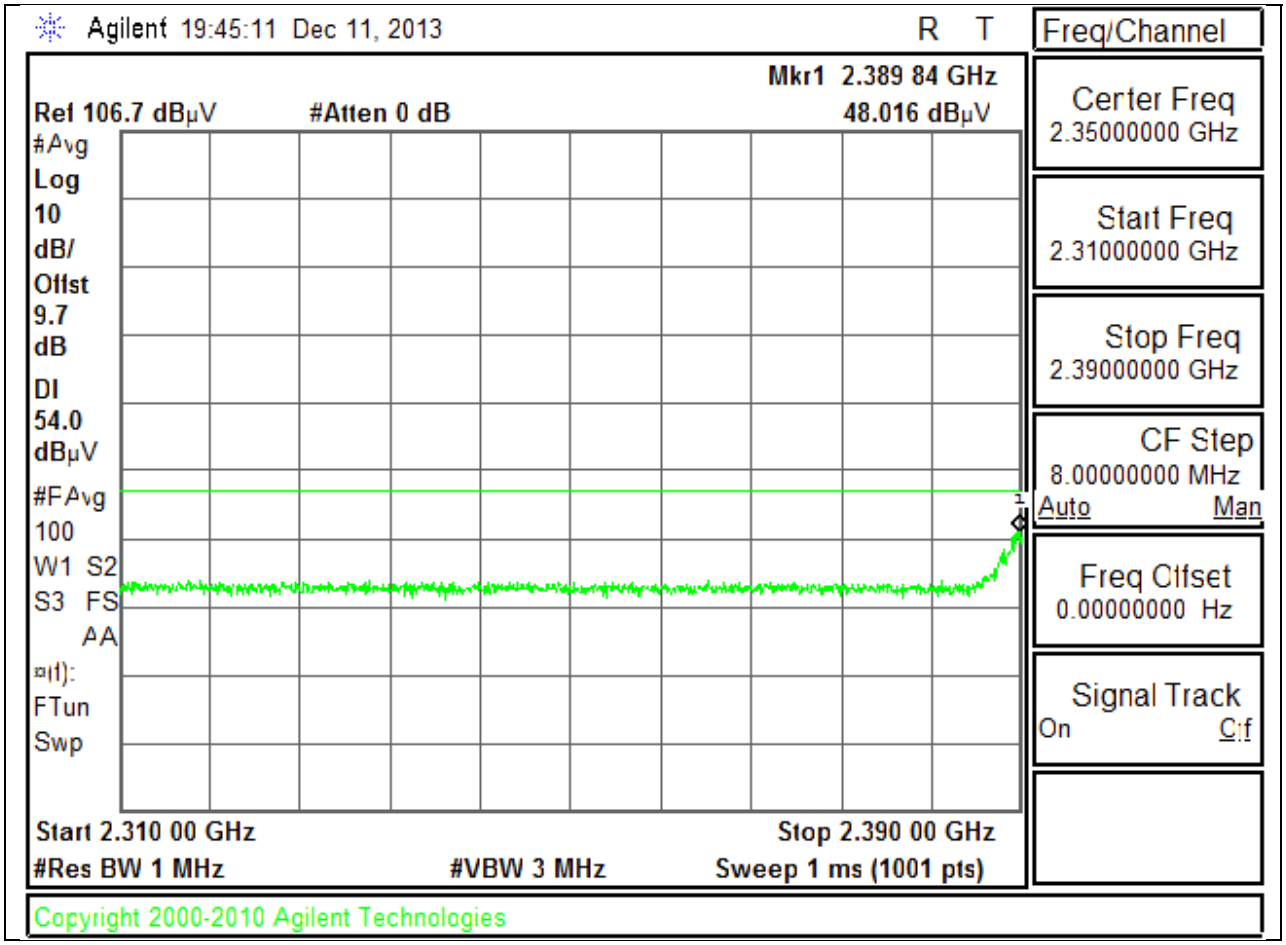

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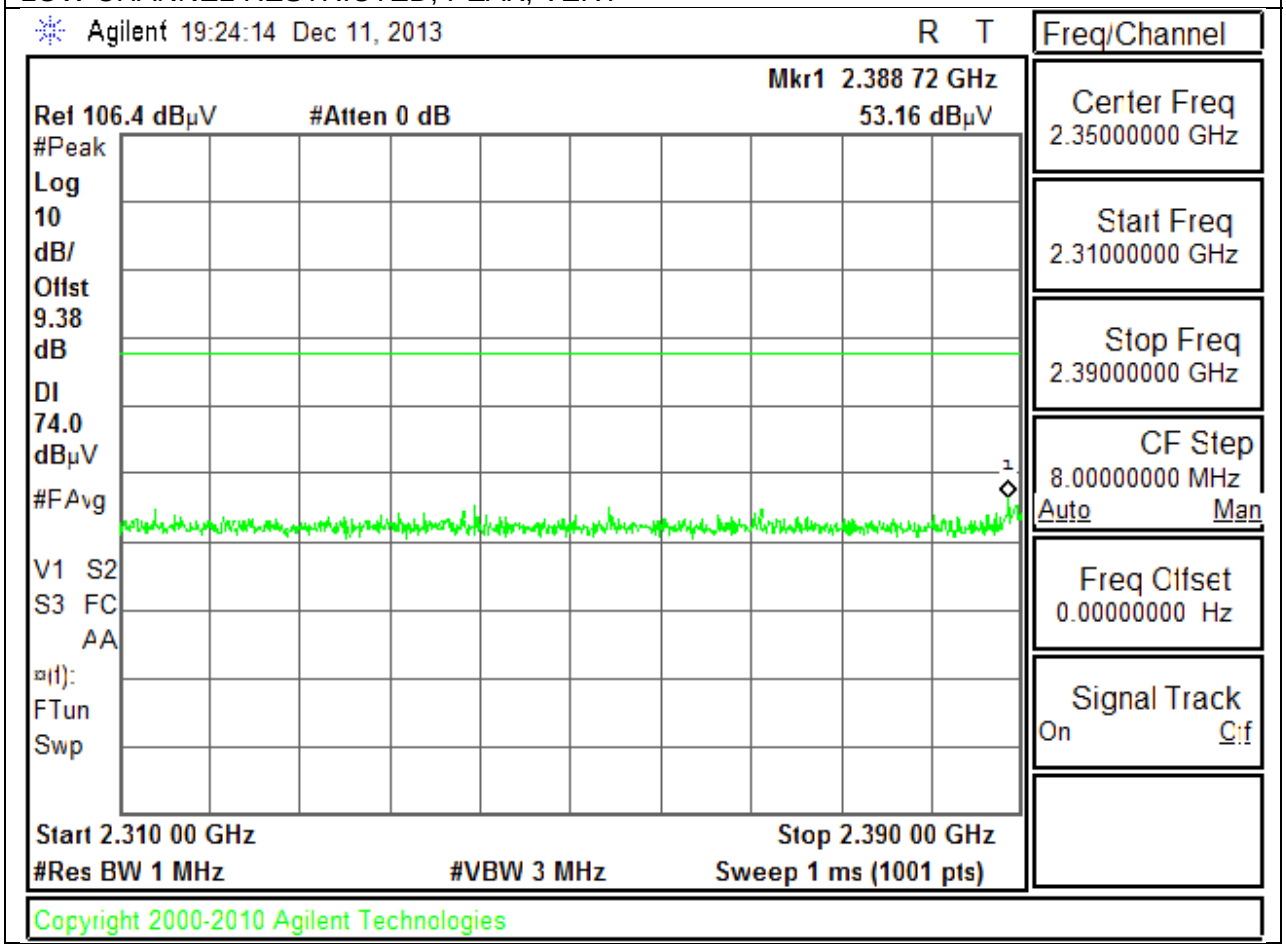
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT

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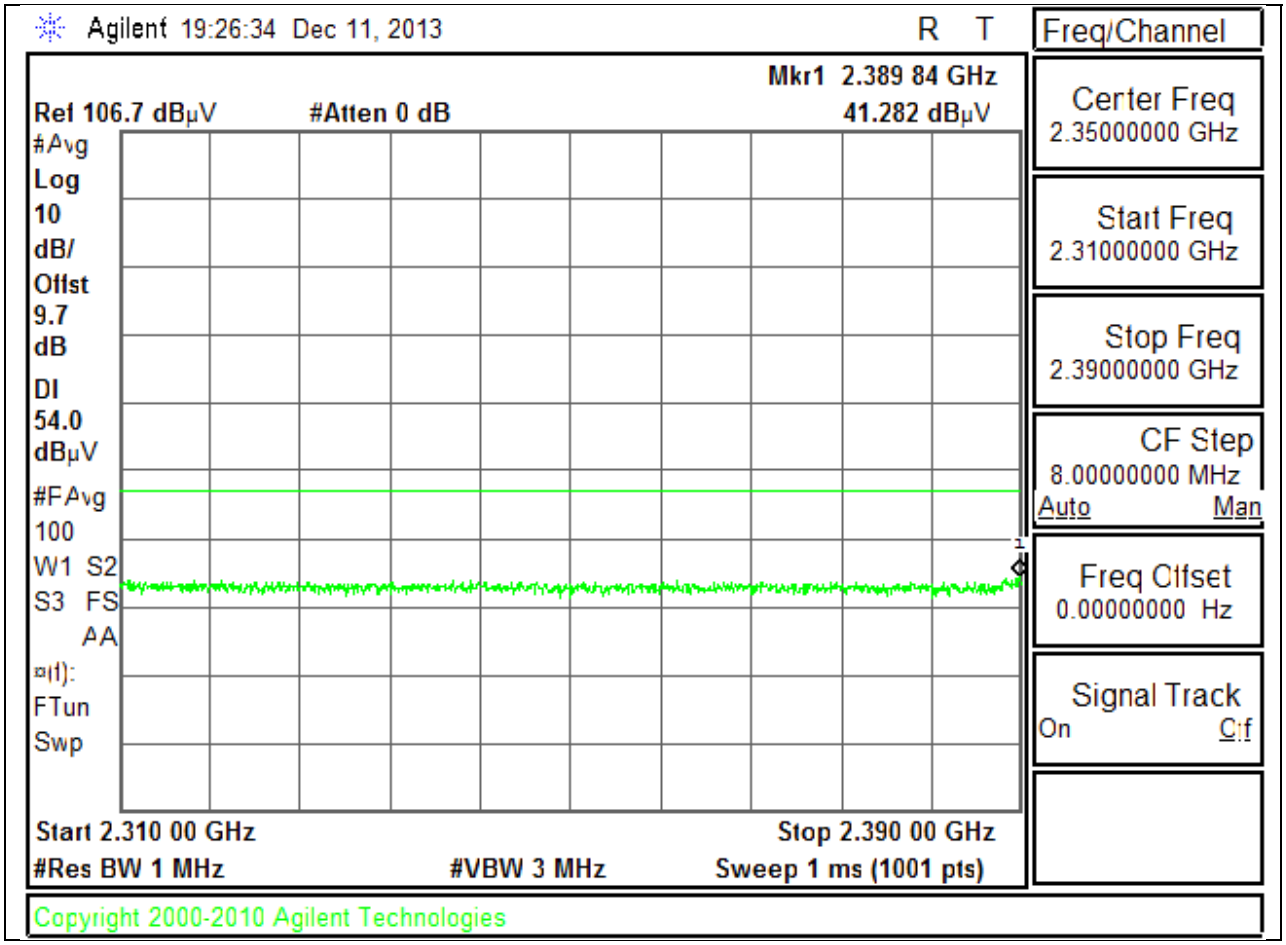

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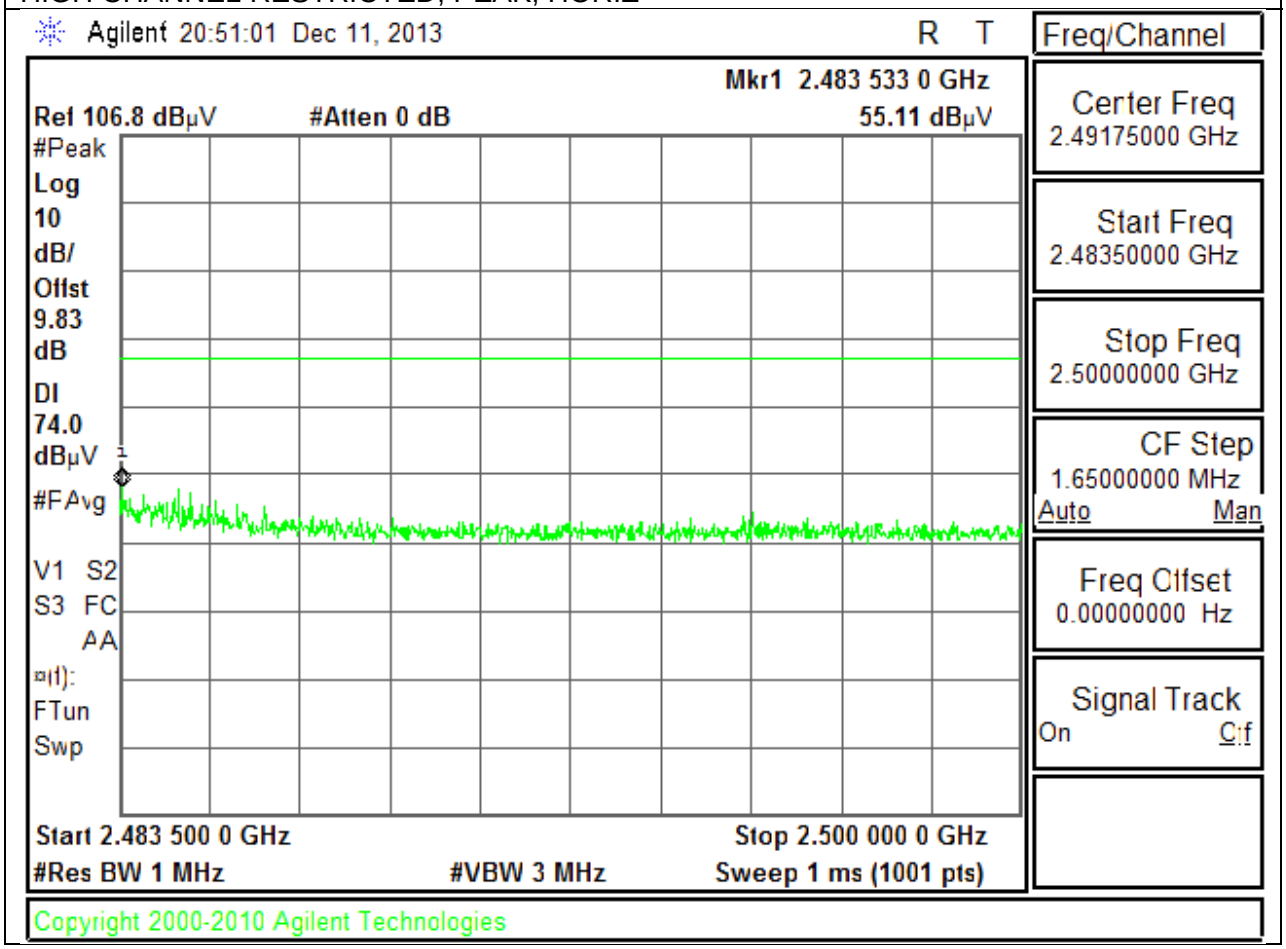
AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ

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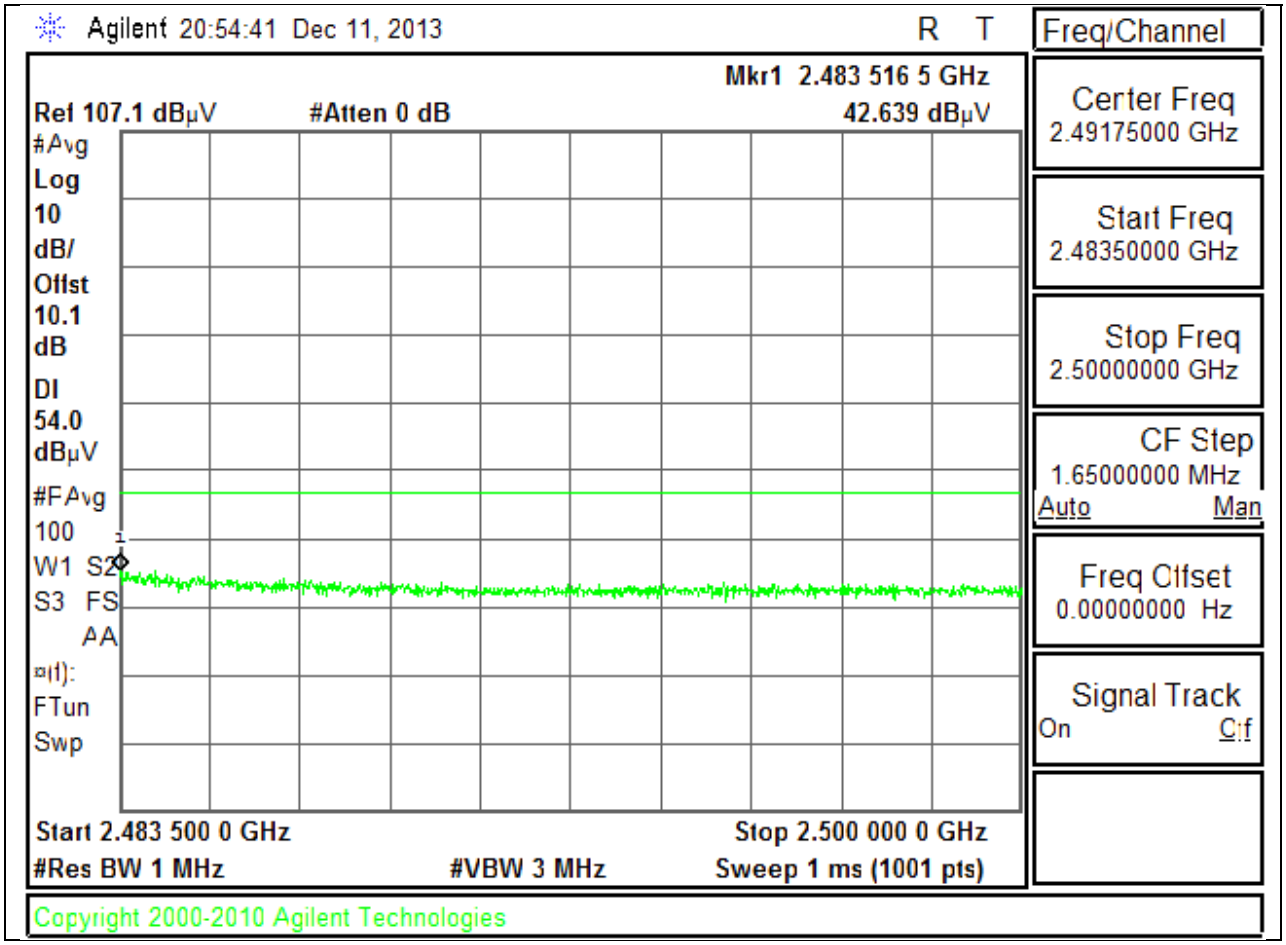

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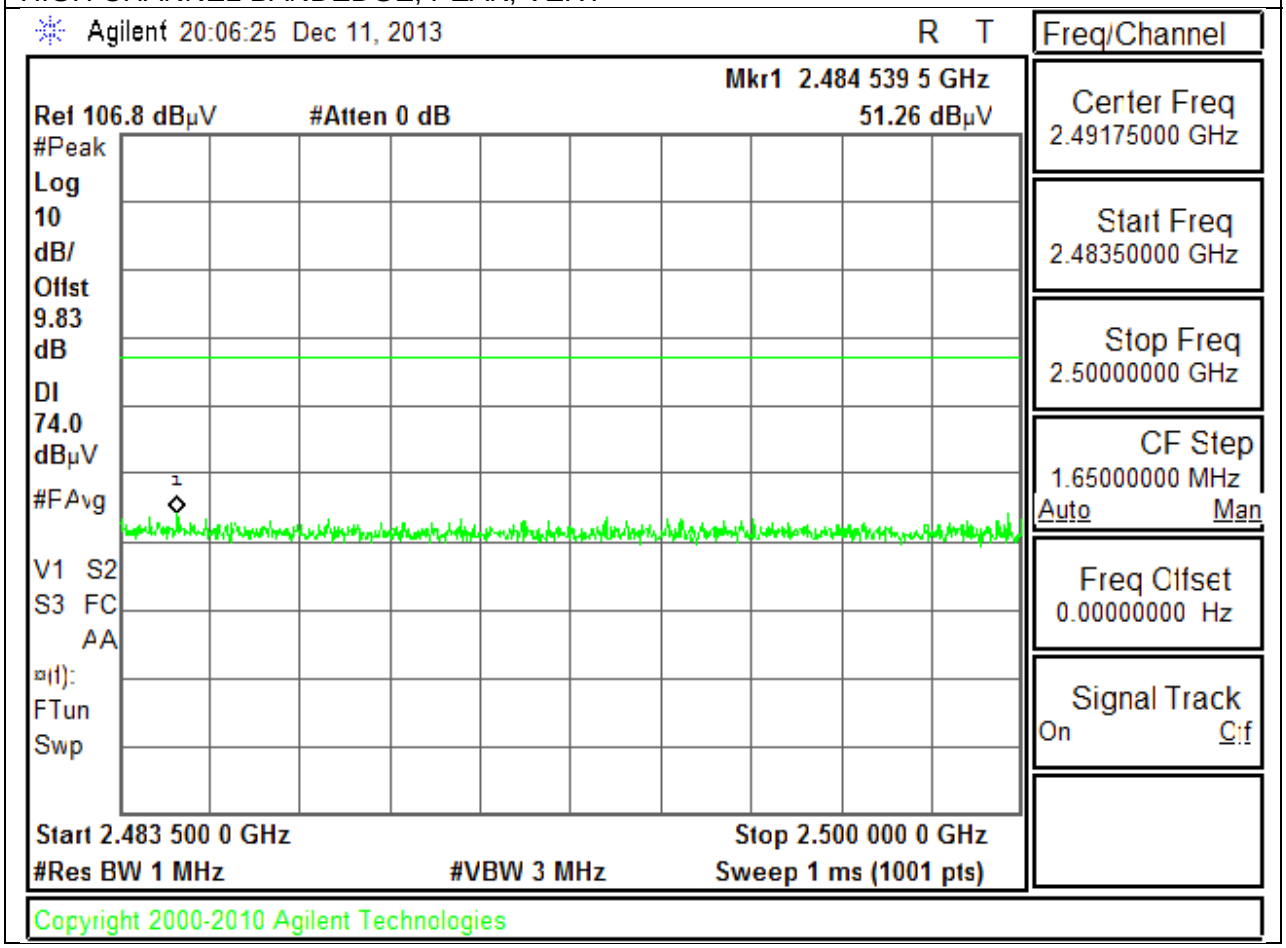
HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT

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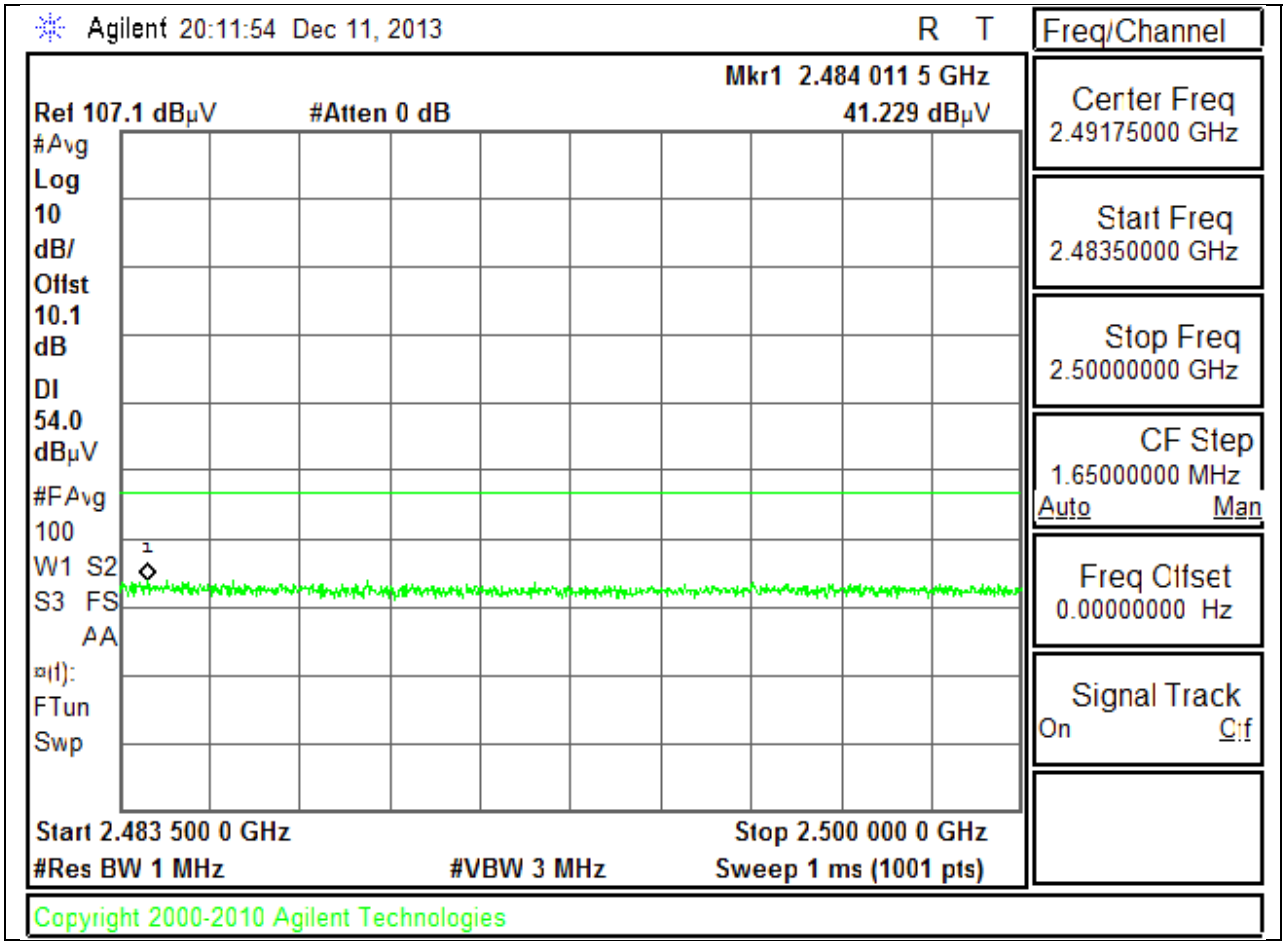

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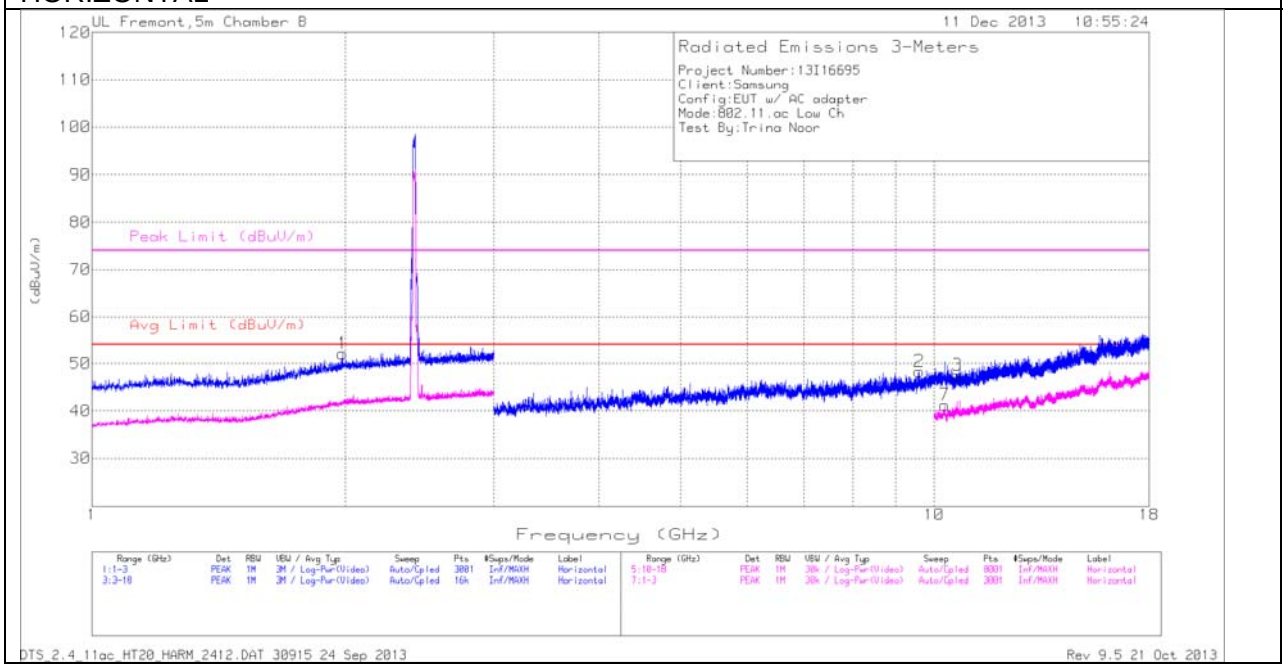
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL
HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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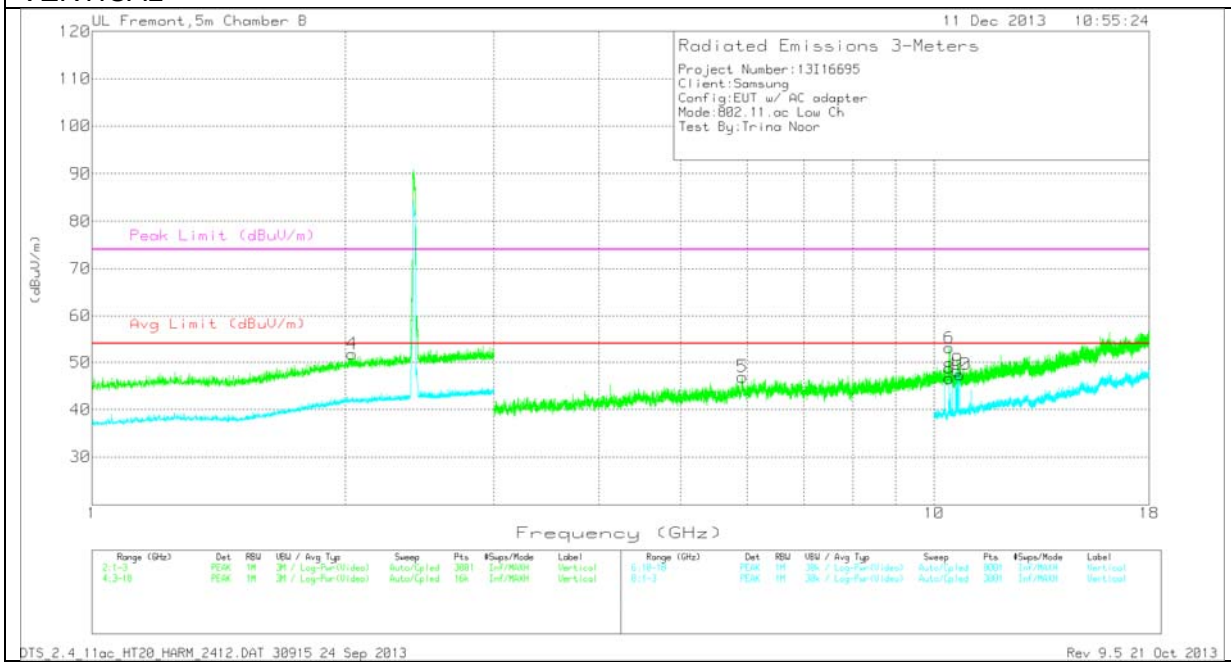
LOW CHANNEL
VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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LOW CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.985	43.88	PK	31.7	-23.5	52.08	53.97	-1.89	74	-21.92	0-360	201	H
4	2.036	43.44	PK	31.8	-23.5	51.74	53.97	-2.23	74	-22.26	0-360	99	V
5	5.92	39.62	PK	35.7	-28.4	46.92	53.97	-7.05	74	-27.08	0-360	99	V
2	9.599	35.16	PK	37.3	-24.2	48.26	53.97	-5.71	74	-25.74	0-360	201	H
7	10.297	26.99	Avg	38	-23.8	41.19	53.97	-12.78	74	-32.81	0-360	201	H
6	10.418	38.39	PK	38.1	-23.4	53.09	53.97	-0.88	74	-20.91	0-360	202	V
8	10.422	31.82	Avg	38.1	-23.3	46.62	53.97	-7.35	74	-27.38	0-360	201	V
3	10.654	32.41	PK	38.3	-23.2	47.51	53.97	-6.46	74	-26.49	0-360	201	H
9	10.659	33.13	Avg	38.3	-23.2	48.23	53.97	-5.74	74	-25.77	0-360	99	V
10	10.725	32.4	Avg	38.3	-23.3	47.4	53.97	-6.57	74	-26.6	0-360	99	V

PK - Peak detector

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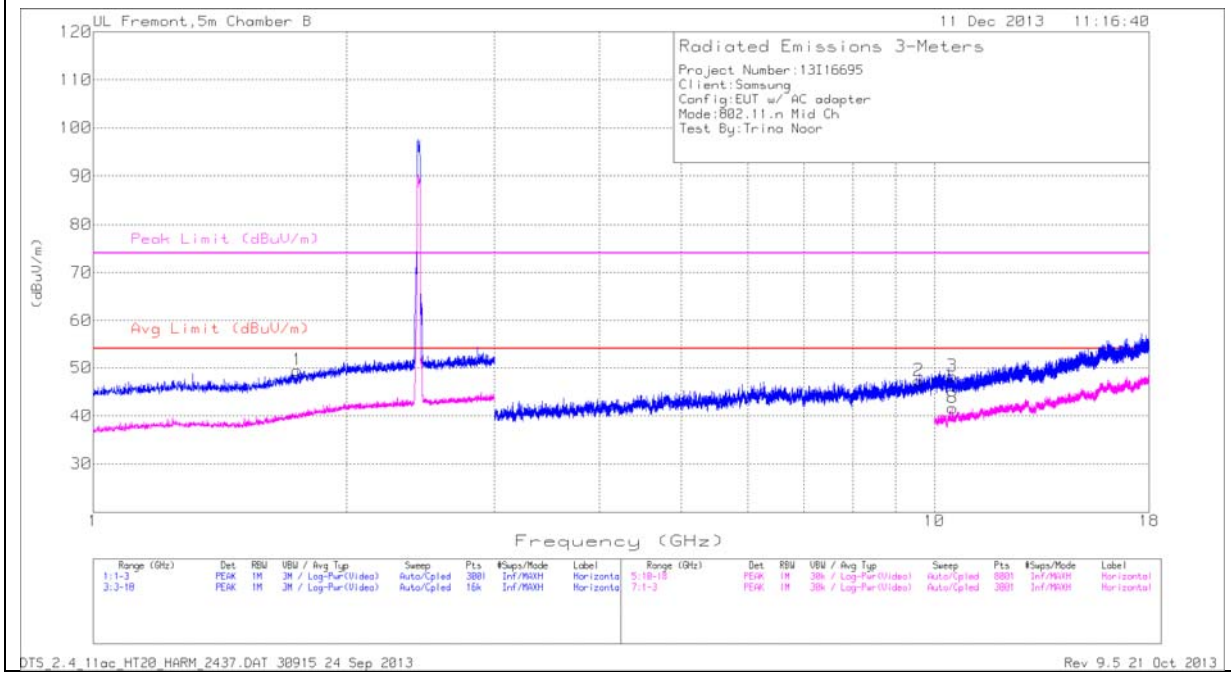
MID CHANNEL
HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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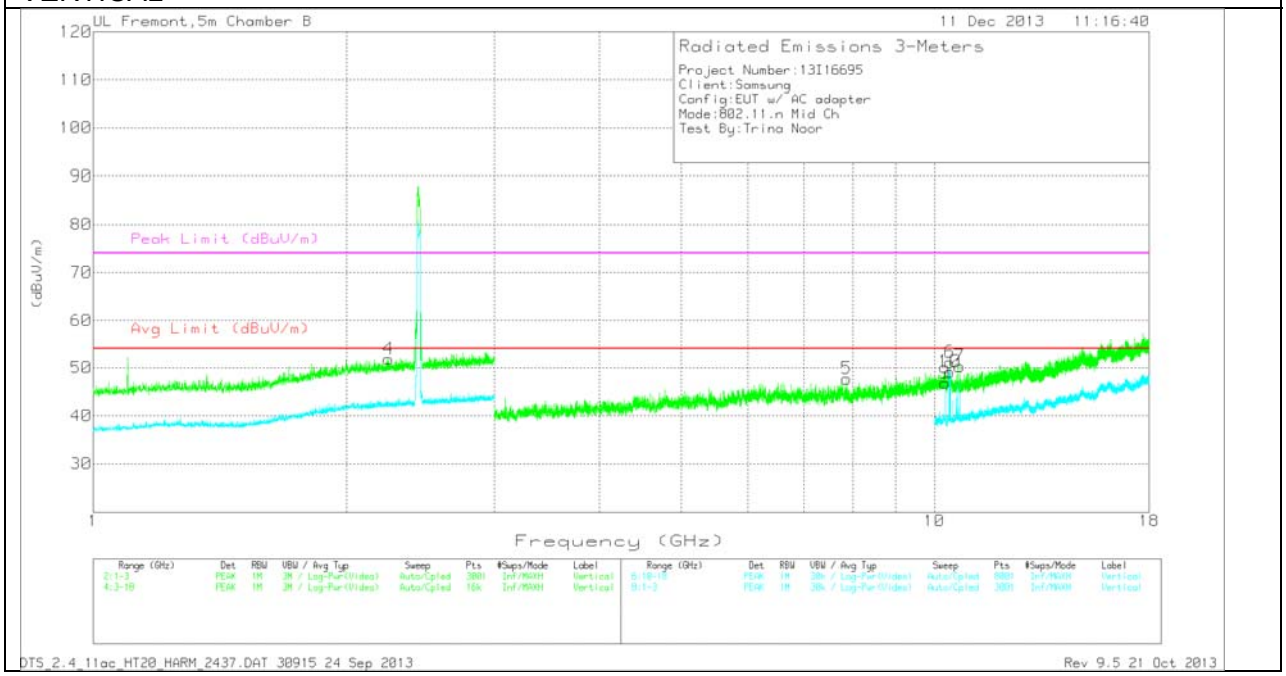
MID CHANNEL
VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.749	43.17	PK	30.1	-23.8	49.47	53.97	-4.5	74	-24.53	0-360	201	H
4	2.245	42.8	PK	32.1	-23.1	51.8	53.97	-2.17	74	-22.2	0-360	202	V
5	7.865	38.63	PK	36.2	-27.1	47.73	53.97	-6.24	74	-26.27	0-360	99	V
2	9.575	34.17	PK	37.3	-24.2	47.27	53.97	-6.7	74	-26.73	0-360	201	H
9	10.298	32.53	Avg	38	-23.7	46.83	53.97	-7.14	74	-27.17	0-360	99	V
6	10.429	36.22	PK	38.1	-23.2	51.12	53.97	-2.85	74	-22.88	0-360	202	V
10	10.429	34.22	Avg	38.1	-23.2	49.12	53.97	-4.85	74	-24.88	0-360	99	V
3	10.493	33.35	PK	38.2	-23.3	48.25	53.97	-5.72	74	-25.75	0-360	99	H
8	10.509	27.04	Avg	38.2	-23.6	41.64	53.97	-12.33	74	-32.36	0-360	201	H
7	10.713	35.21	PK	38.3	-23.2	50.31	53.97	-3.66	74	-23.69	0-360	202	V

PK - Peak detector

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

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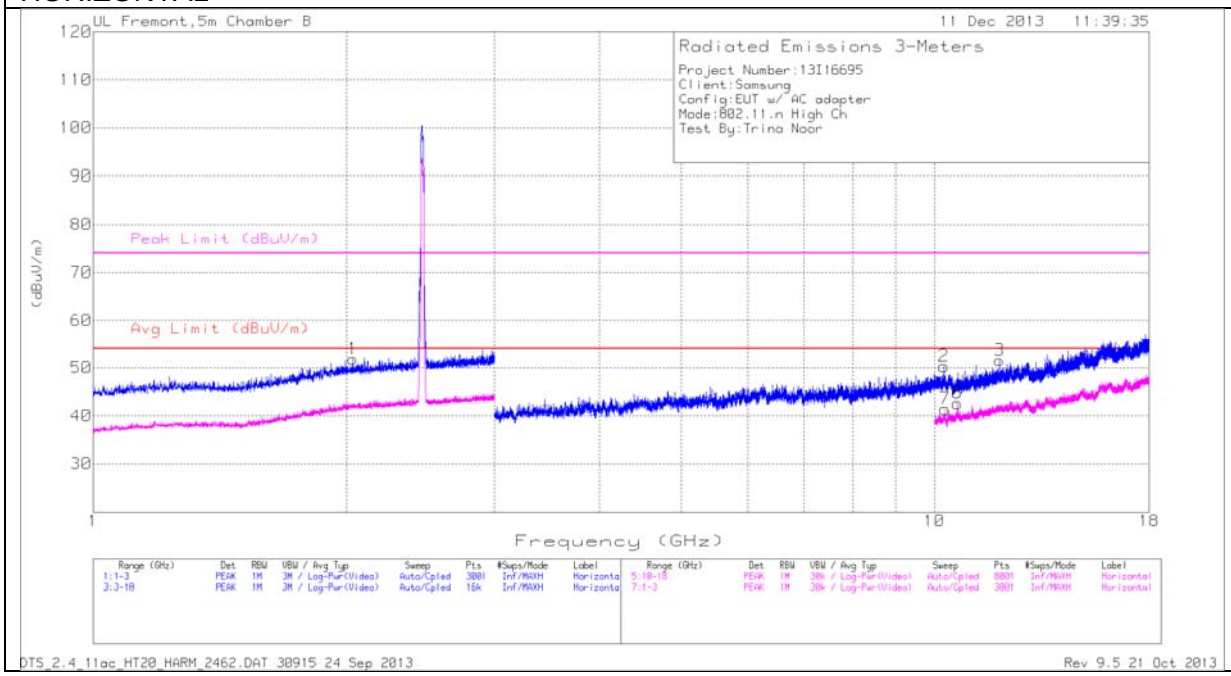
HIGH CHANNEL
HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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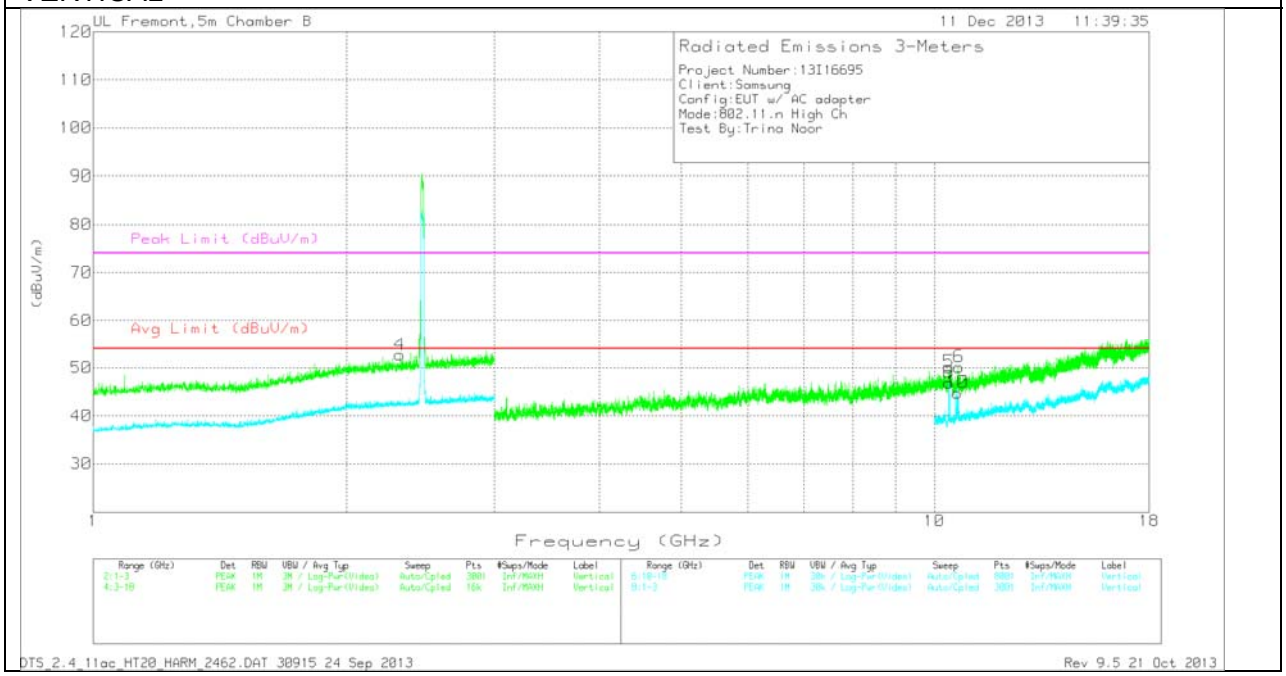
HIGH CHANNEL
VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.037	43.51	PK	31.8	-23.5	51.81	53.97	-2.16	74	-22.19	0-360	99	H
4	2.316	43.52	PK	32.2	-23	52.72	53.97	-1.25	74	-21.28	0-360	99	V
2	10.265	35.9	PK	38	-23.6	50.3	53.97	-3.67	74	-23.7	0-360	99	H
7	10.297	27.19	Avg	38	-23.8	41.39	53.97	-12.58	74	-32.61	0-360	99	H
9	10.398	32.18	Avg	38.1	-23.4	46.88	53.97	-7.09	74	-27.12	0-360	99	V
5	10.406	34.41	PK	38.1	-23.4	49.11	53.97	-4.86	74	-24.89	0-360	202	V
8	10.647	27.51	Avg	38.3	-23.2	42.61	53.97	-11.36	74	-31.39	0-360	99	H
10	10.65	29.67	Avg	38.3	-23.2	44.77	53.97	-9.2	74	-29.23	0-360	99	V
6	10.69	35.15	PK	38.3	-23.3	50.15	53.97	-3.82	74	-23.85	0-360	202	V
3	11.948	34.63	PK	39.2	-22.3	51.53	53.97	-2.44	74	-22.47	0-360	201	H

PK - Peak detector

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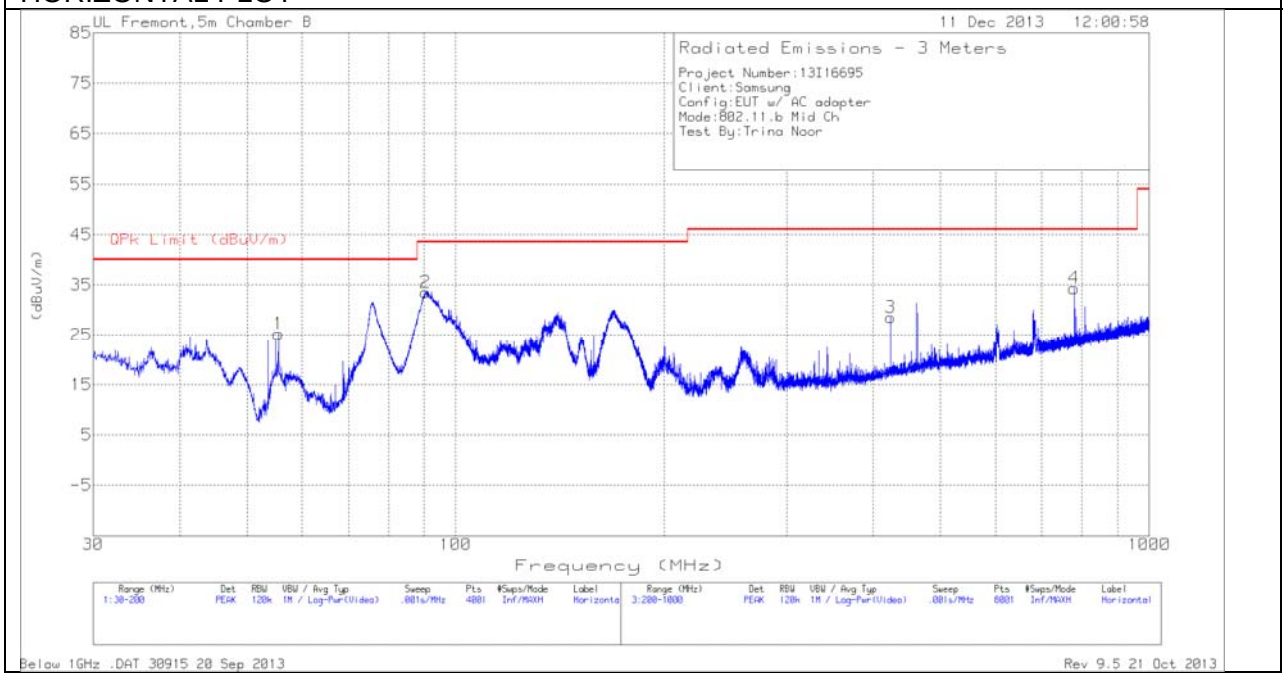
10.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



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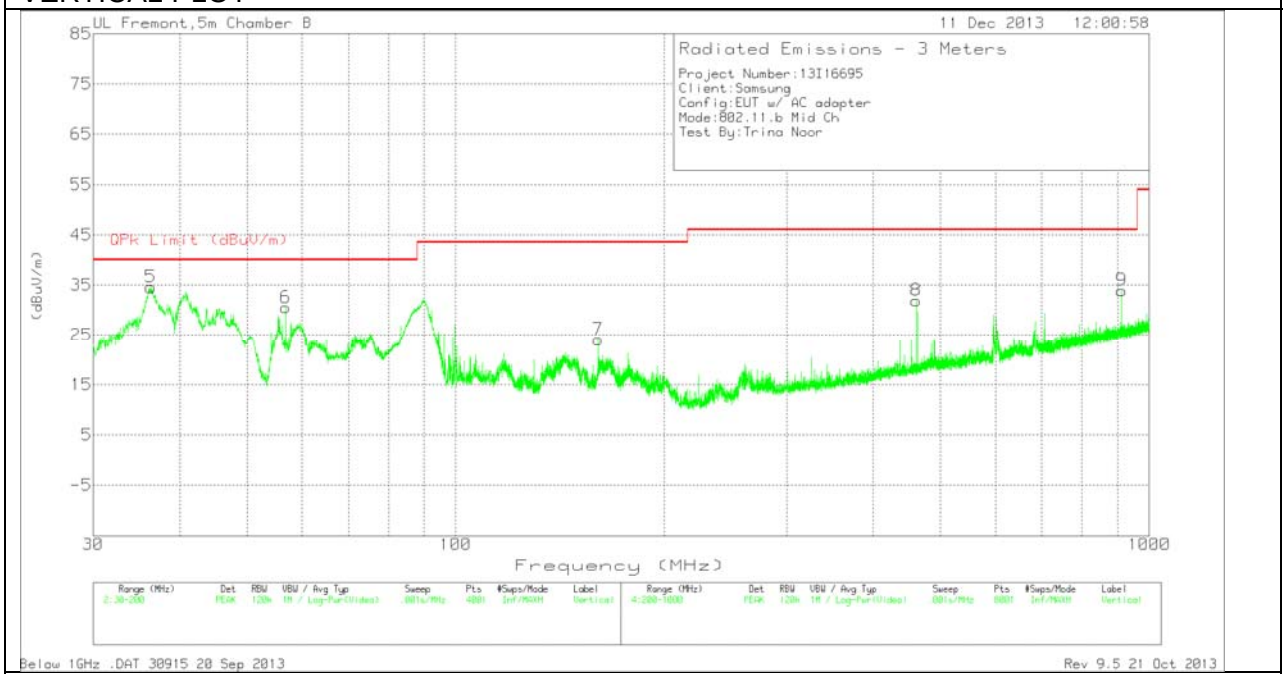
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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Below 1G Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	36.3325	47.08	PK	16.3	-28.8	34.58	40	-5.42	0-360	100	V
1	55.5425	46.89	PK	6.9	-28.6	25.19	40	-14.81	0-360	100	H
6	56.86	52.08	PK	6.9	-28.5	30.48	40	-9.52	0-360	100	V
2	90.52	53.88	PK	7.7	-28.1	33.48	43.52	-10.04	0-360	200	H
7	160.56	39.38	PK	12	-27.3	24.08	43.52	-19.44	0-360	100	V
3	424	38.08	PK	16.4	-26	28.48	46.02	-17.54	0-360	300	H
8	461.5	40.78	PK	17	-25.9	31.88	46.02	-14.14	0-360	300	V
4	779.4	37.2	PK	21.2	-24.1	34.3	46.02	-11.72	0-360	200	H
9	912.5	34.47	PK	22.4	-23	33.87	46.02	-12.15	0-360	100	V

PK - Peak detector

Below 1GHz .DAT 30915 20 Sep 2013 Rev 9.5 21 Oct 2013

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11. 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 2009.

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.

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RESULTS

6 WORST EMISSIONS

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin to Limit (dB)	CISPR 11/22 Class B Average	Margin to Limit (dB)
1	.168	51.34	PK	.1	0	51.44	65.1	-13.66	-	-
2	.168	38.67	Av	.1	0	38.77	-	-	55.1	-16.33
3	.3975	41.92	PK	.1	0	42.02	57.9	-15.88	-	-
4	.3975	31.4	Av	.1	0	31.5	-	-	47.9	-16.4
5	2.22	46.37	PK	.1	.1	46.57	56	-9.43	-	-
6	2.22	30.8	Av	.1	.1	31	-	-	46	-15
7	17.1555	33.87	PK	.2	.2	34.27	60	-25.73	-	-
8	17.1555	14.12	Av	.2	.2	14.52	-	-	50	-35.48

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin to Limit (dB)	CISPR 11/22 Class B Average	Margin to Limit (dB)
9	.15	48.61	PK	.1	0	48.71	66	-17.29	-	-
10	.15	16.07	Av	.1	0	16.17	-	-	56	-39.83
11	.276	42.03	PK	.1	0	42.13	60.9	-18.77	-	-
12	.276	17.46	Av	.1	0	17.56	-	-	50.9	-33.34
13	2.319	43.14	PK	.1	.1	43.34	56	-12.66	-	-
14	2.319	27.71	Av	.1	.1	27.91	-	-	46	-18.09
15	28.6035	31.55	PK	.5	.3	32.35	60	-27.65	-	-
16	28.6035	13.3	Av	.5	.3	14.1	-	-	50	-35.9

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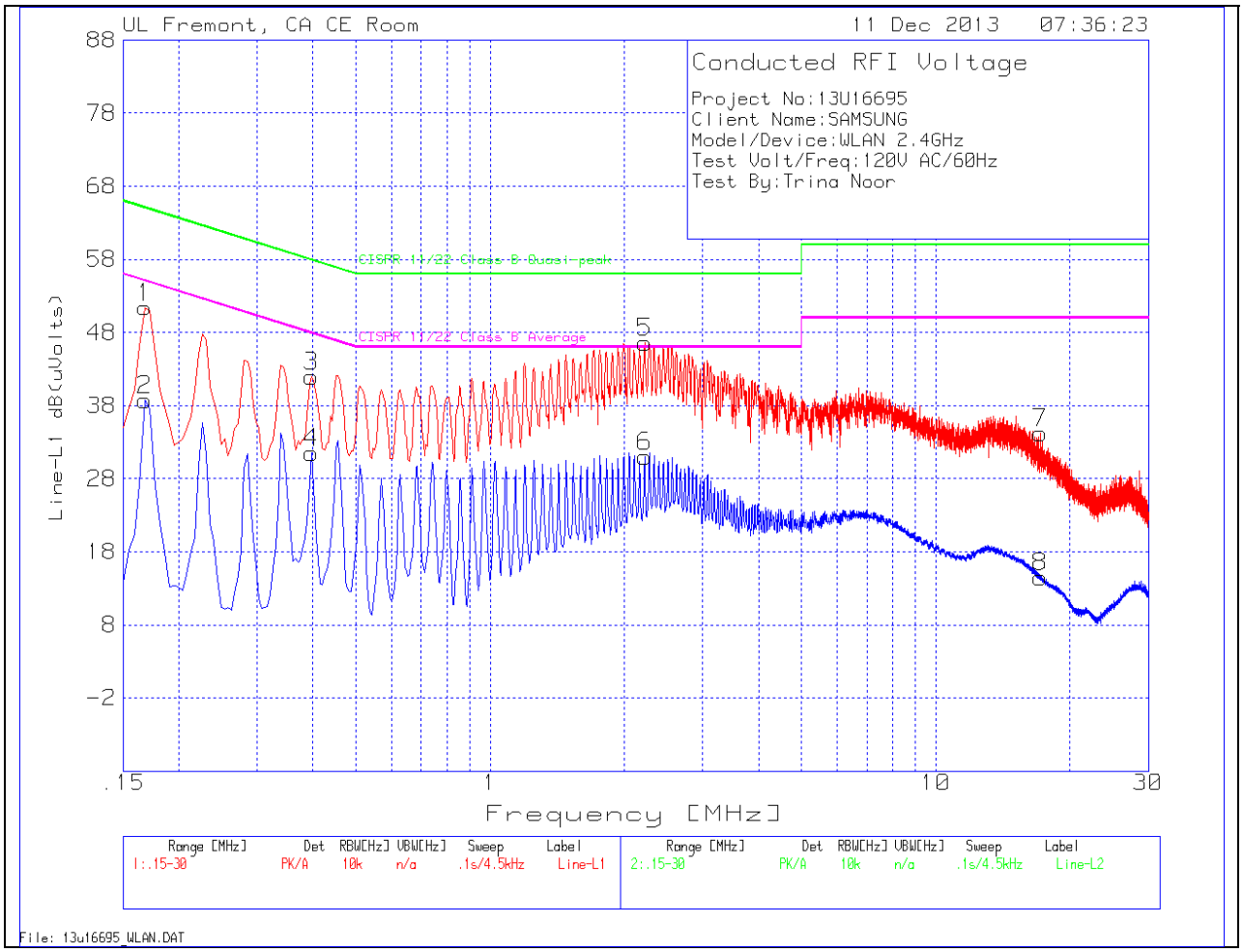
LINE 1 RESULTS



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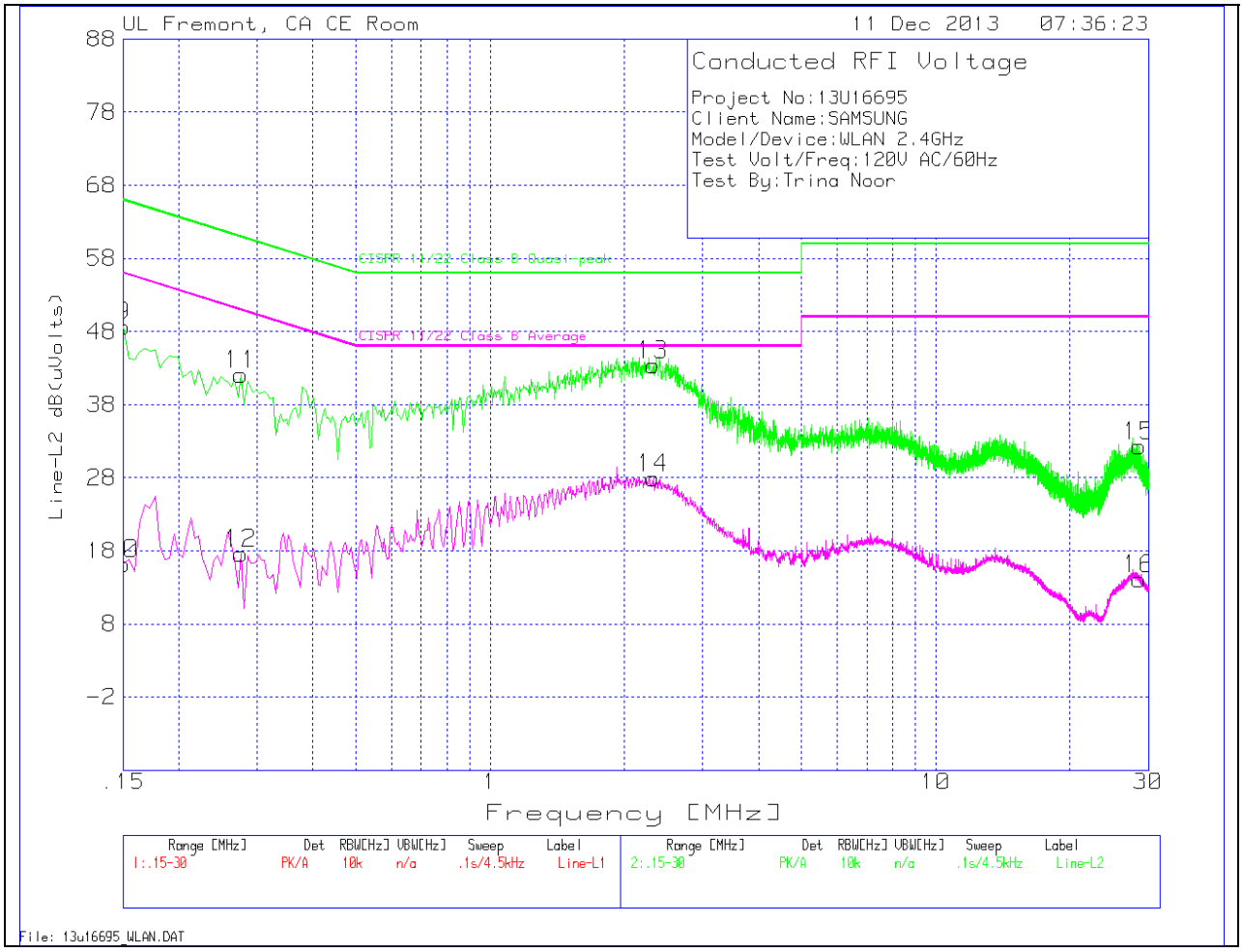
LINE 2 RESULTS



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