FCC CFR47 PART 15 SUBPART C

INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

Notebook with Bluetooth/BLE and 802.11a/b/g/n/ac

MODEL NUMBER: XE503C12

FCC ID: A3LXE503C12

IC: 649E- XE503C12

REPORT NUMBER: 14U17027-3

ISSUE DATE: February 22, 2014

Prepared for

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NVLAP LAB CODE 200065-0

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

EUT DESCRIPTION: Notebook with Bluetooth/BLE and 802.11a/b/g/n/ac

MODEL: XE503C12

SERIAL NUMBER: LC11DV2F100191A 01.2014 (CONDUCTED)
LC11DV2F100193A 01.2014 (RADIATED)

DATE TESTED: February 13-22, 2014

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

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

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

Approved & Released
For UL Verification Services Inc. By:

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UL Verification Services Inc.

Tested By:

STEVEN TRAN
WiSE LAB TECHNICIAN
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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 C63.4-2009, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://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 Notebook with Bluetooth/BLE and 802.11a/b/g/n/ac.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Total Output Power (dBm)	Total Output Power (mW)
2412 - 2462	802.11b	23.63	230.67
2412 - 2462	802.11g	25.65	367.28
2412 - 2462	802.11n HT20	24.18	261.82
2412 - 2462	802.11n HT40	23.95	248.31

The transmitter has average conducted output power as follows:

Band (GHz)	Mode	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)	
						Chain 0	Chain 1
2.4	802.11b	1 Mbps	1 Tx	1	2412	11.8	
				6	2437	16.0	
				11	2462	10.8	
			1 Tx	1	2412		12.7
				6	2437		17.5
				11	2462		10.7
			2 Tx	1	2412	12.0	12.7
				6	2437	16.5	17.5
				11	2462	11.2	10.9
	802.11g	6 Mbps	1 Tx	1	2412	9.90	
				6	2437	13.3	
				11	2462	9.3	
			1 Tx	1	2412		10.3
				6	2437		14.2
				11	2462		10.9
			2 Tx	1	2412	10.7	10.3
				6	2437	13.8	14.4
				11	2462	9.7	10.9
	802.11n (HT20)	MCS0	1 Tx	1	2412	10.3	
				6	2437	12.7	

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				11	2462	9.5	
			1 Tx	1	2412		10.0
				6	2437		13.2
				11	2462		10.2
		MCS0	2 Tx	1	2412	10.3	10.0
				6	2437	12.9	13.2
				11	2462	9.8	10.2
	802.11n (HT40)	MCS0	1 Tx	1	2422	9.0	
				4	2437	8.0	
				7	2452	8.3	
			1 Tx	1	2422		8.9
				4	2437		8.9
				7	2452		9.6
		MCS8	2 Tx	1	2422	9.0	9.0
				4	2437	8.0	8.9
				7	2452	8.7	9.6

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two FPCB antenna, with main antenna maximum gain of -0.78 dBi; aux antenna maximum gain of-1.30 dBi

5.1. List of test reduction and modes covering other modes:

2400 - 2483.5 MHz Authorized Frequency Band (Antenna Port & Radiated Testing)		
Frequency Range (MHz)	**Mode**	**Covered by**
2412 - 2462	802.11b Legacy 1TX	802.11b CDD 2TX
2412 - 2462	802.11g Legacy 1TX	802.11g CDD 2TX
2412 - 2462	802.11n 1TX	802.11n HT20 CDD 2TX
2412 - 2462	802.11n STBC 2TX	802.11n HT20 CDD 2TX
2412 - 2462	802.11n HT40 1TX	802.11n HT40 CDD 2TX
2412 - 2462	802.11n HT40 STBC 2TX	802.11n HT40 CDD 2TX

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5.2. 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 X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X 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
802.11n HT40mode: MCS0

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5.3. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Samsung	A13-040N1A	CNS440002088DON8 36J00D9	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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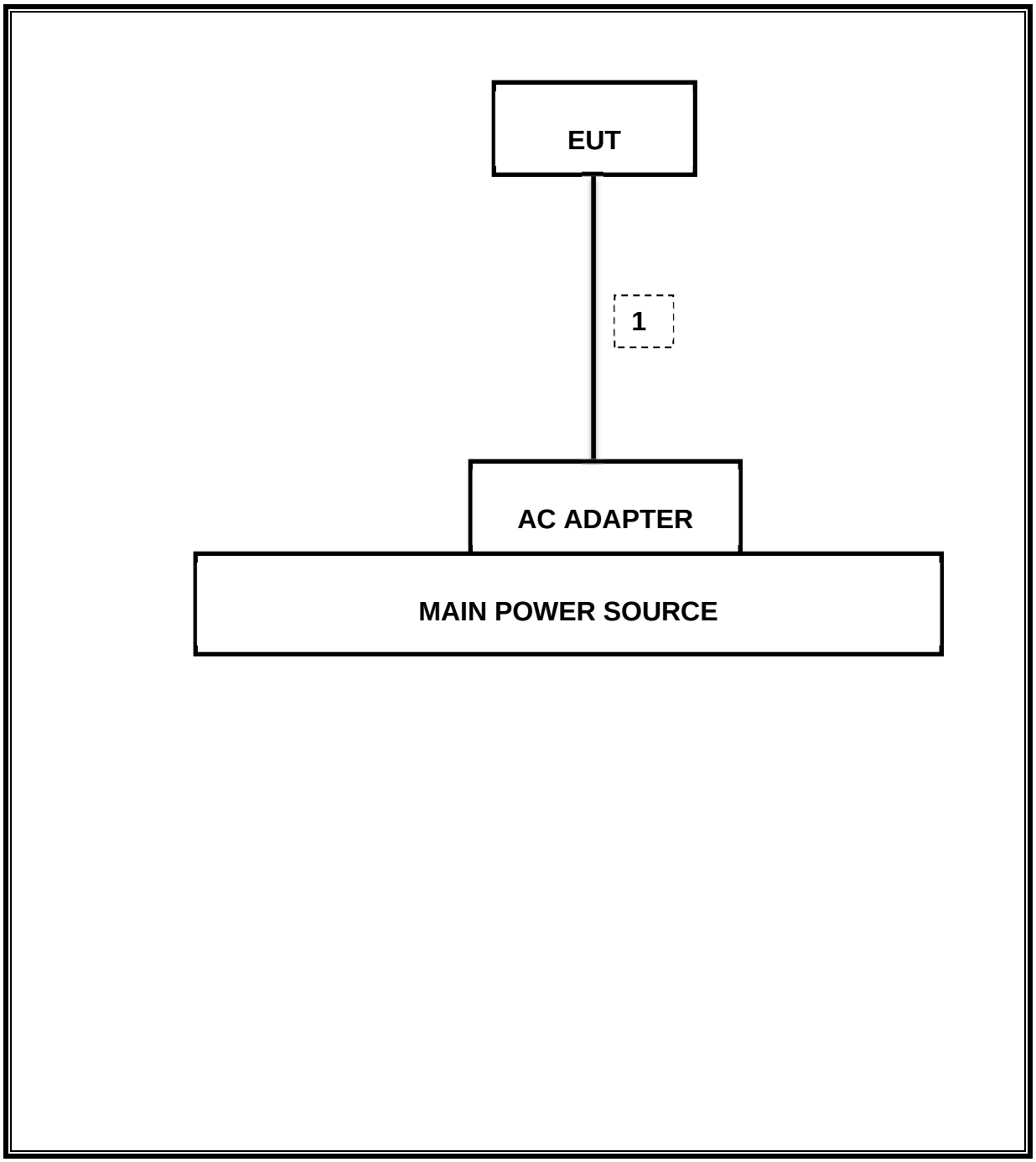
SETUP DIAGRAM FOR TESTS



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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 Due**
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01016	08/14/14
Antenna, Horn, 18 GHz	ETS	3117	C01006	12/11/14
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/16/15
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/22/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	10/21/14
PXA SIGNAL ANALYZER	Agilent / HP	N9030A	N/A	05/09/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/15
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14

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7. MEASUREMENT METHODS

KDB 558074 D01 DTS Meas Guidance v03r01:Measurement Procedure PK2 is used for power and PKPSD is used for power spectral density.

For spurious emission measurement refer to MAv1 - KDB558074 Option 1 Maximum RMS Average

For Band edge emission measurement refer to KDB558074 RMS Average with duty cycle factor

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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	10.03 MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-37.69 dBm
15.247	RSS-210 A8.4	TX conducted output power	<30dBm		Pass	23.81 dBm
15.247	RSS-210 A8.2	PSD	<8dBm		Pass	-6.44 dBm
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	45.77 dBuV
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	50.976 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 D01 DTS Meas Guidance v03r01: 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 BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	10.12	10.09	0.5
Mid	2437	10.09	10.03	0.5
High	2462	10.90	10.92	0.5

9.1.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	16.40	16.50	0.5
Mid	2437	16.40	16.46	0.5
High	2462	16.43	16.46	0.5

9.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	17.53	17.60	0.5
Mid	2437	17.48	17.60	0.5
High	2462	17.58	17.60	0.5

9.1.4. 802.11n HT40 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2422	35.75	35.95	0.5
Mid	2437	35.60	36.00	0.5
High	2452	35.85	36.35	0.5

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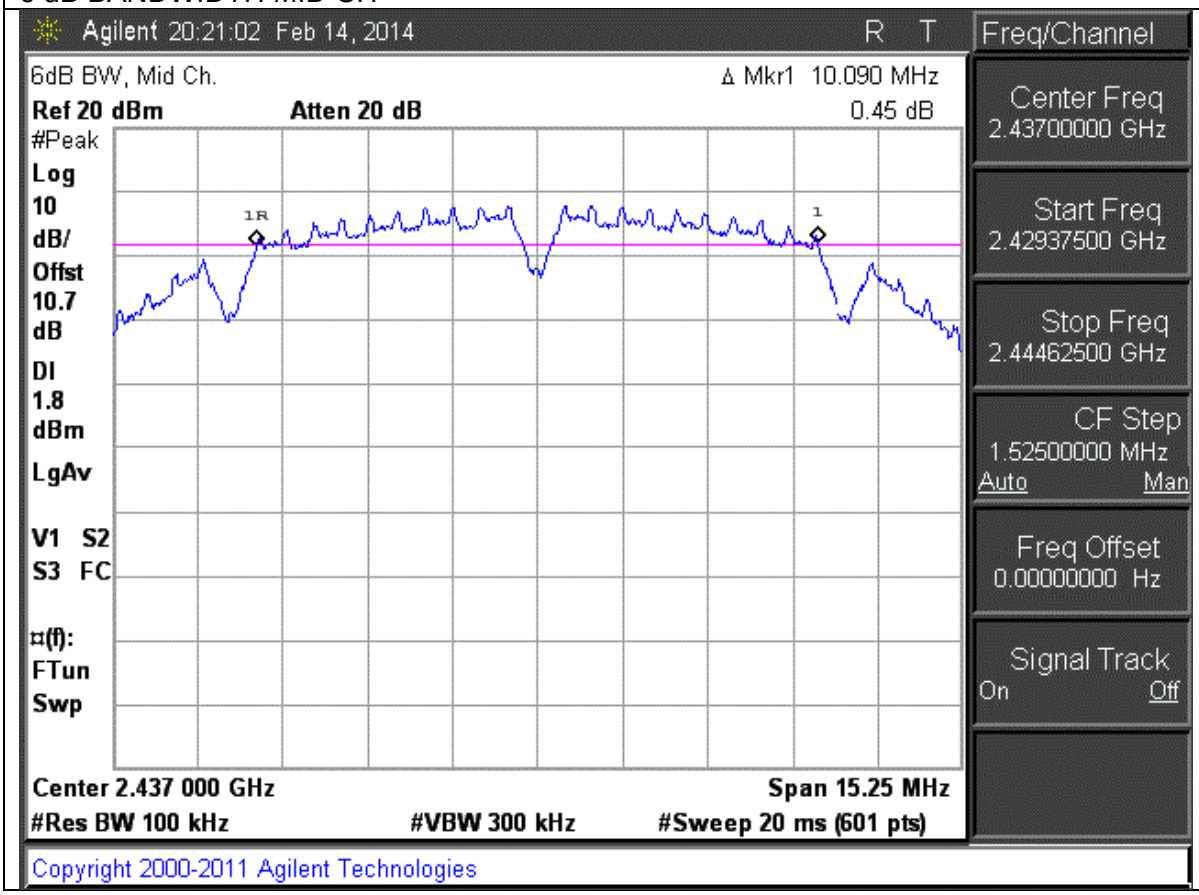
9.1.5. 2.4GHz Plots

802.11b 6 dB BANDWIDTH CHAIN 0

6 dB BANDWIDTH MID CH



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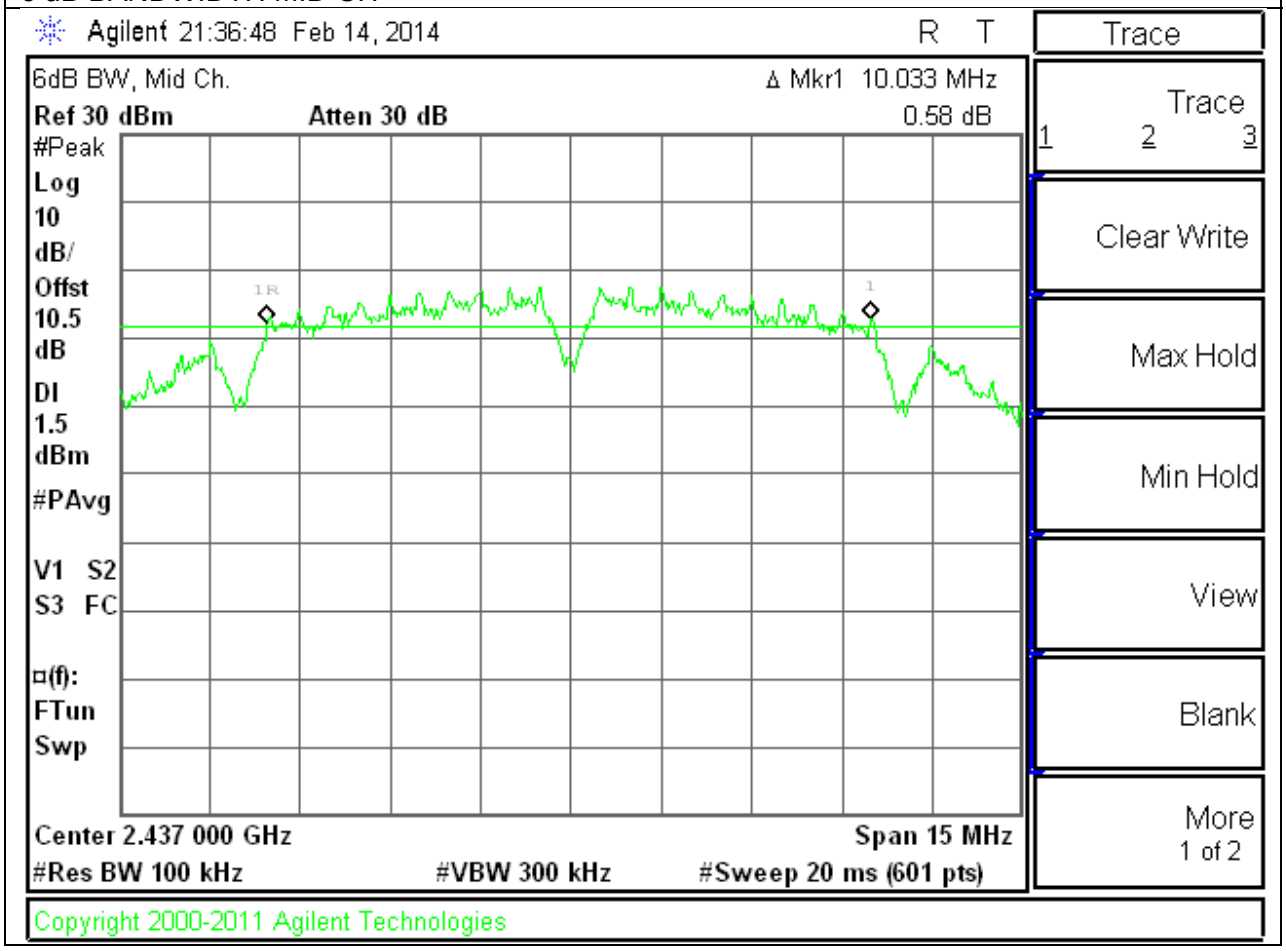
802.11b 6 dB BANDWIDTH CHAIN 1

6 dB BANDWIDTH MID CH



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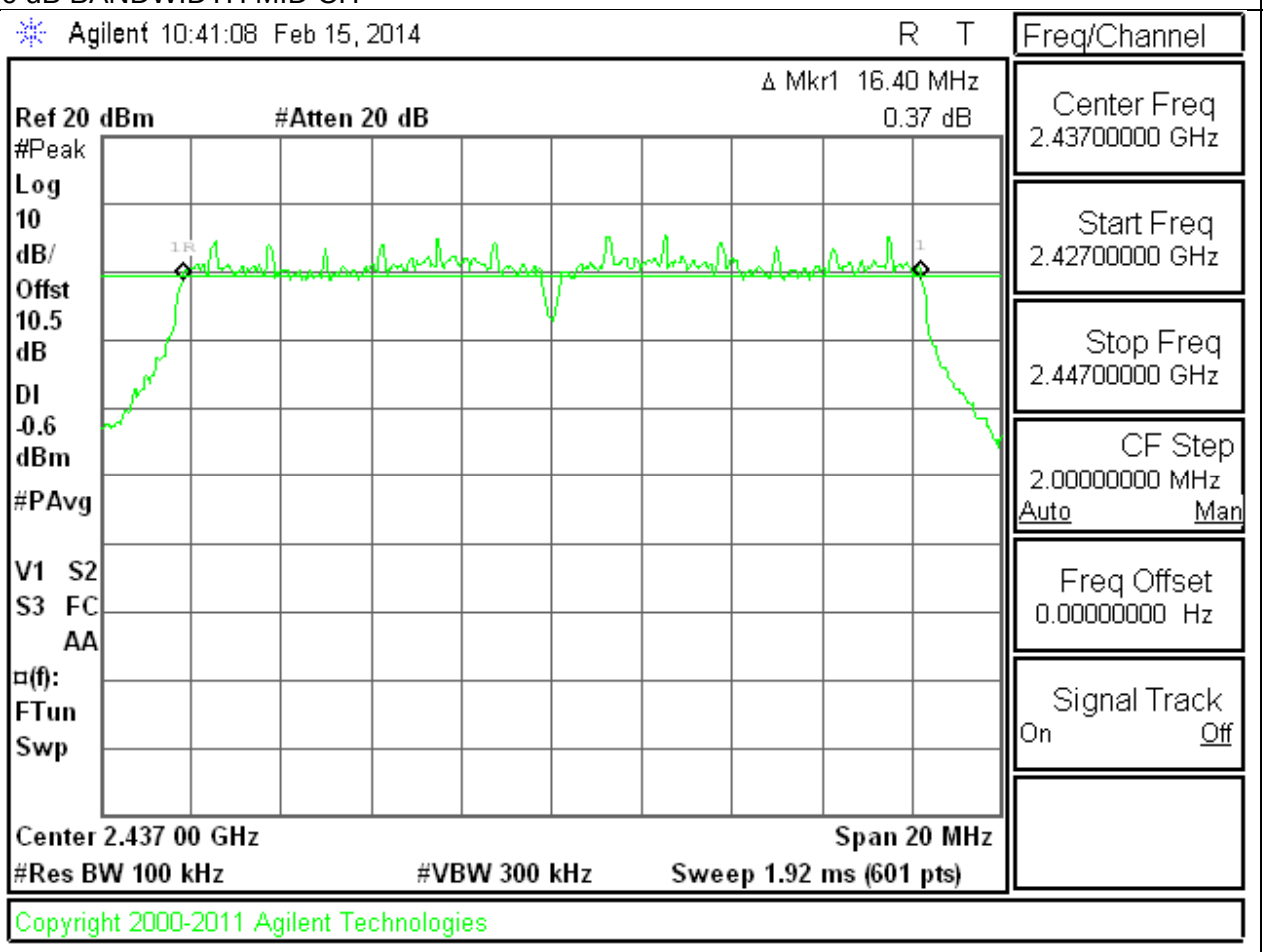
802.11g 6 dB BANDWIDTH CHAIN 0

6 dB BANDWIDTH MID CH



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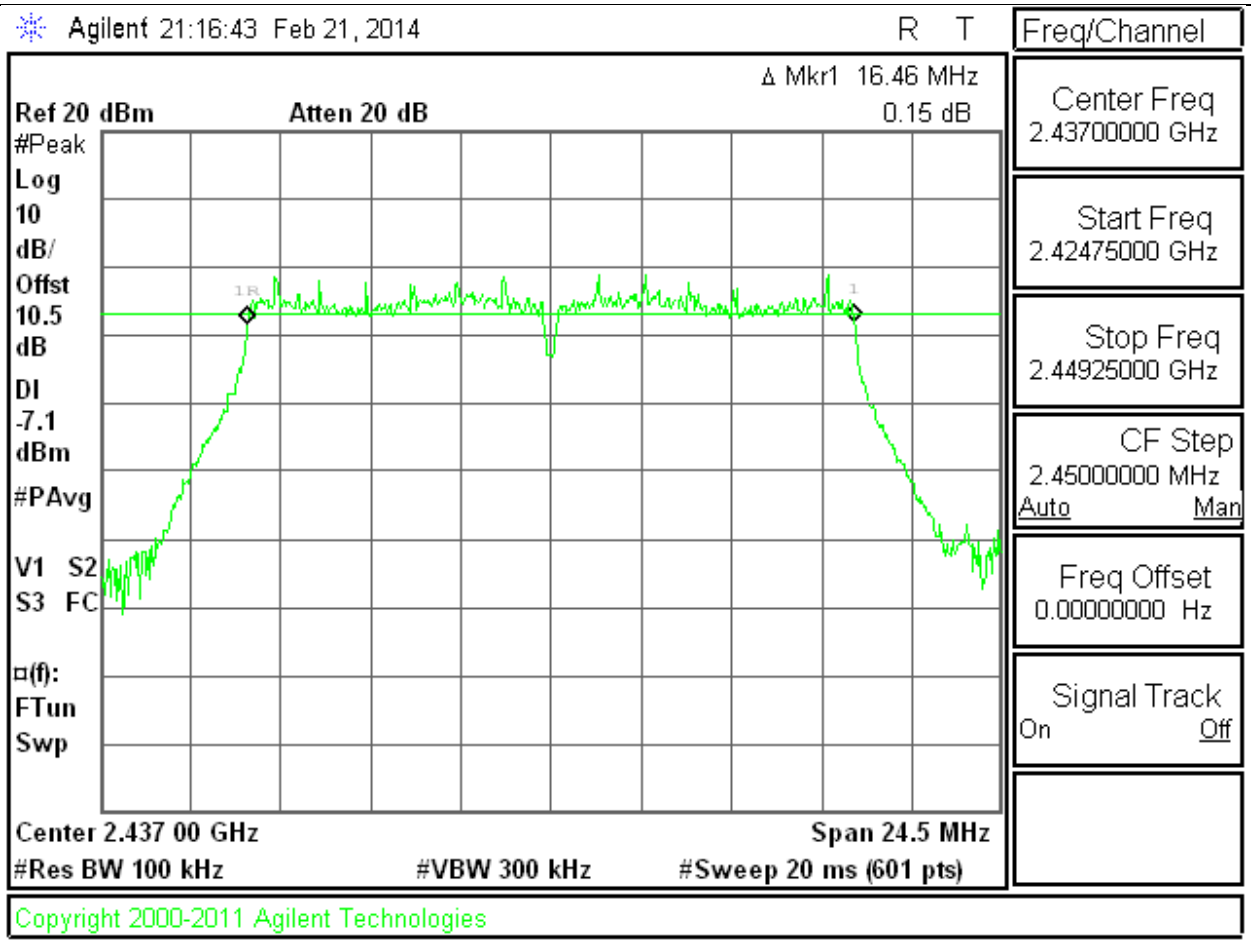
802.11g 6 dB BANDWIDTH CHAIN 0

6 dB BANDWIDTH MID CH



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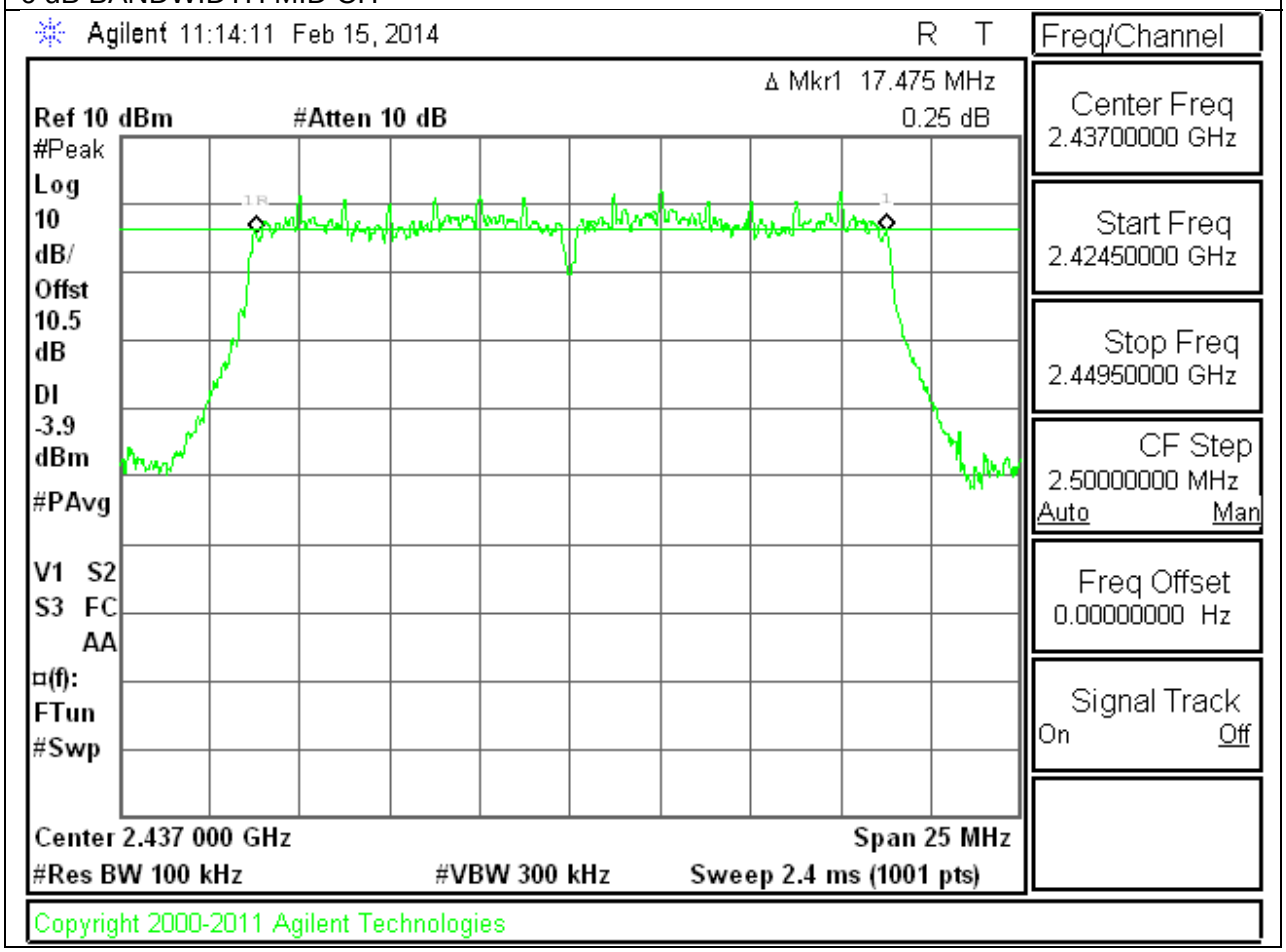
802.11n 6 dB BANDWIDTH CHAIN 0

6 dB BANDWIDTH MID CH



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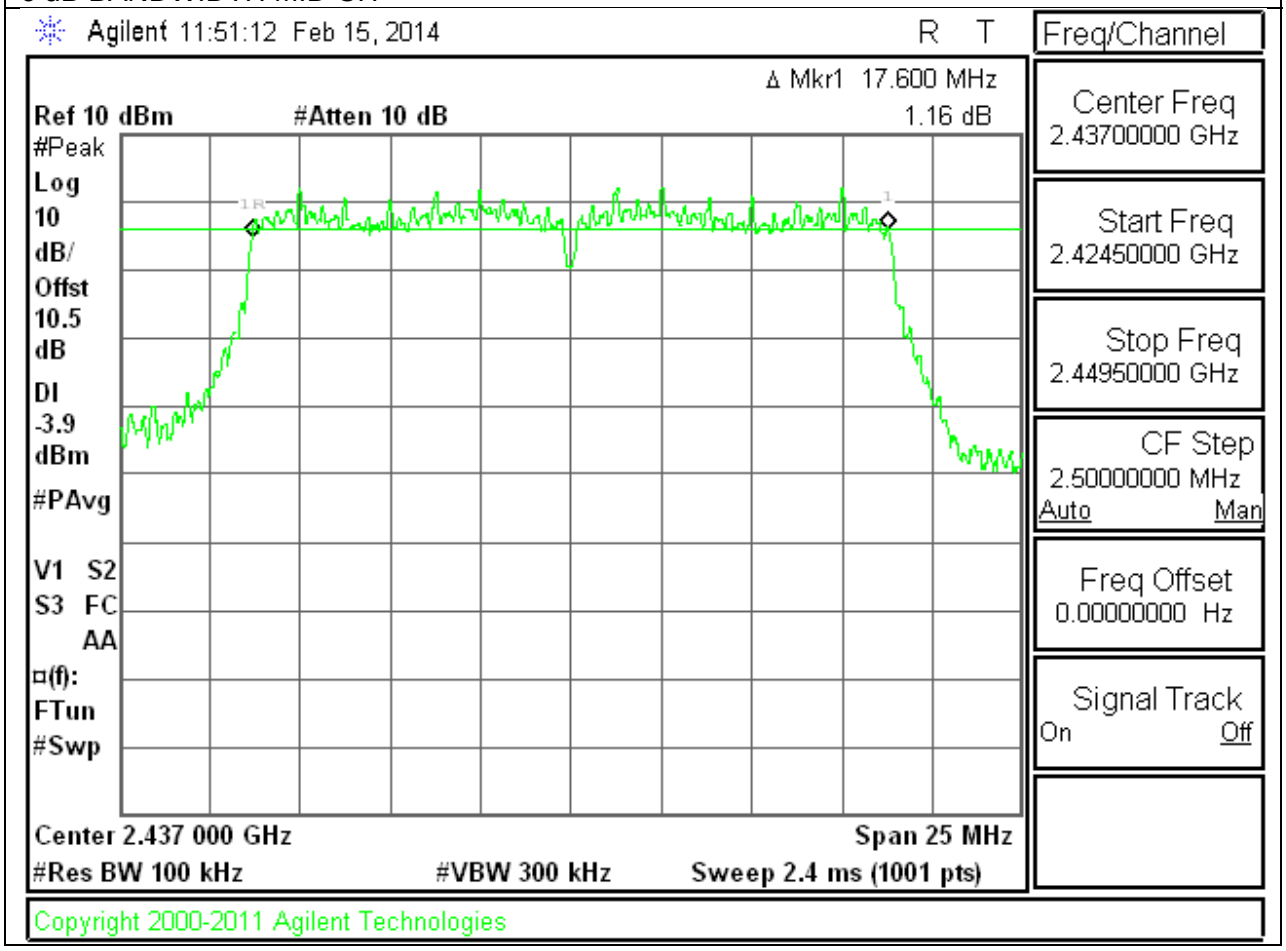
802.11n 6 dB BANDWIDTH CHAIN 1

6 dB BANDWIDTH MID CH



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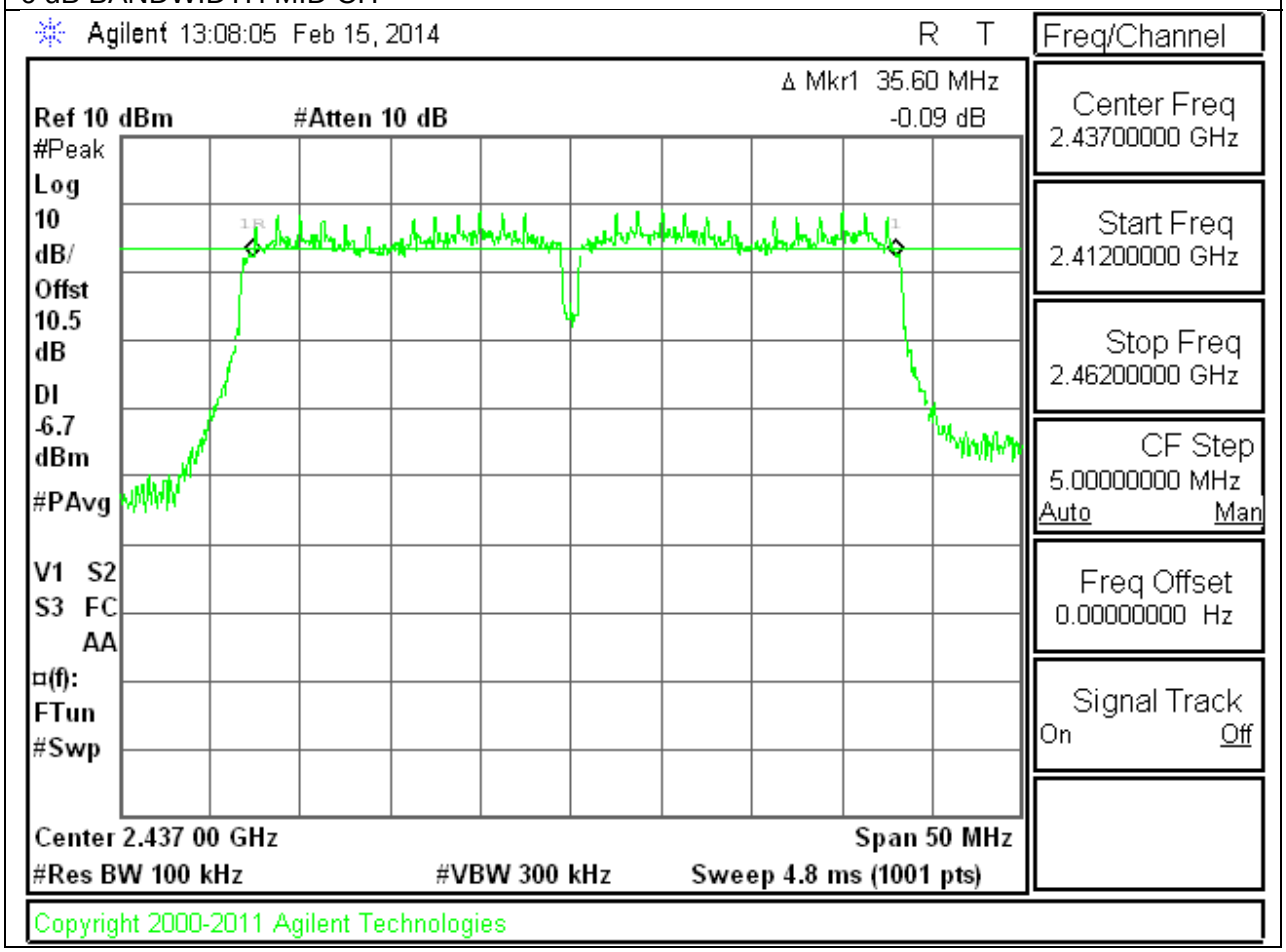
802.11n HT40 6 dB BANDWIDTH CHAIN 0

6 dB BANDWIDTH MID CH



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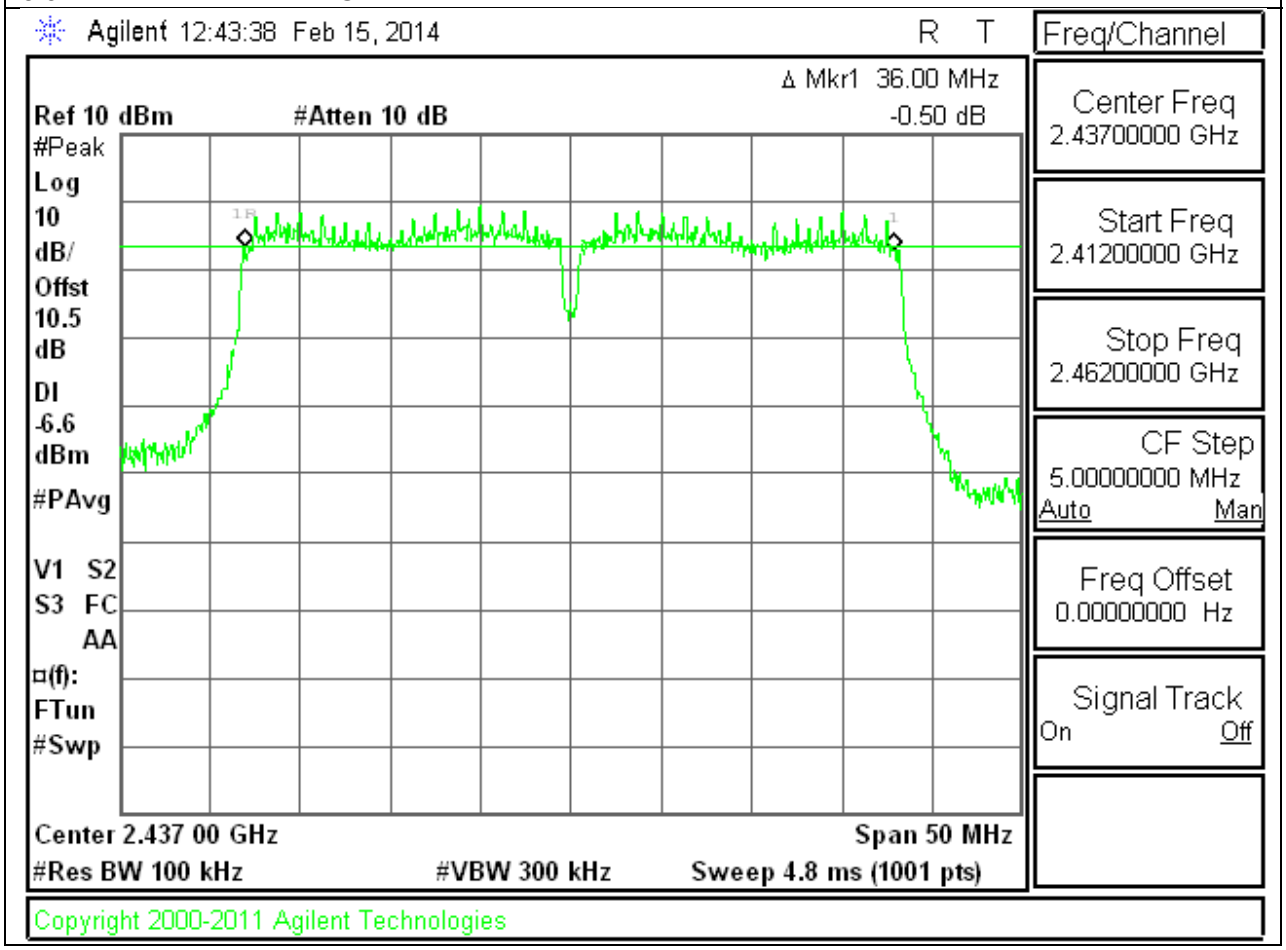
802.11n HT40 6 dB BANDWIDTH CHAIN 1

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% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2412	12.98	13.17
Mid	2437	13.29	13.70
High	2462	13.04	13.12

9.2.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2412	16.32	16.42
Mid	2437	16.43	16.42
High	2462	16.44	16.42

9.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2412	17.57	17.82
Mid	2437	17.41	17.54
High	2462	17.41	17.55

9.2.4. 802.11n HT40 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% BW Chain 0 (MHz)	99% BW Chain 1 (MHz)
Low	2422	36.96	37.10
Mid	2437	37.28	36.49
High	2452	37.68	38.25

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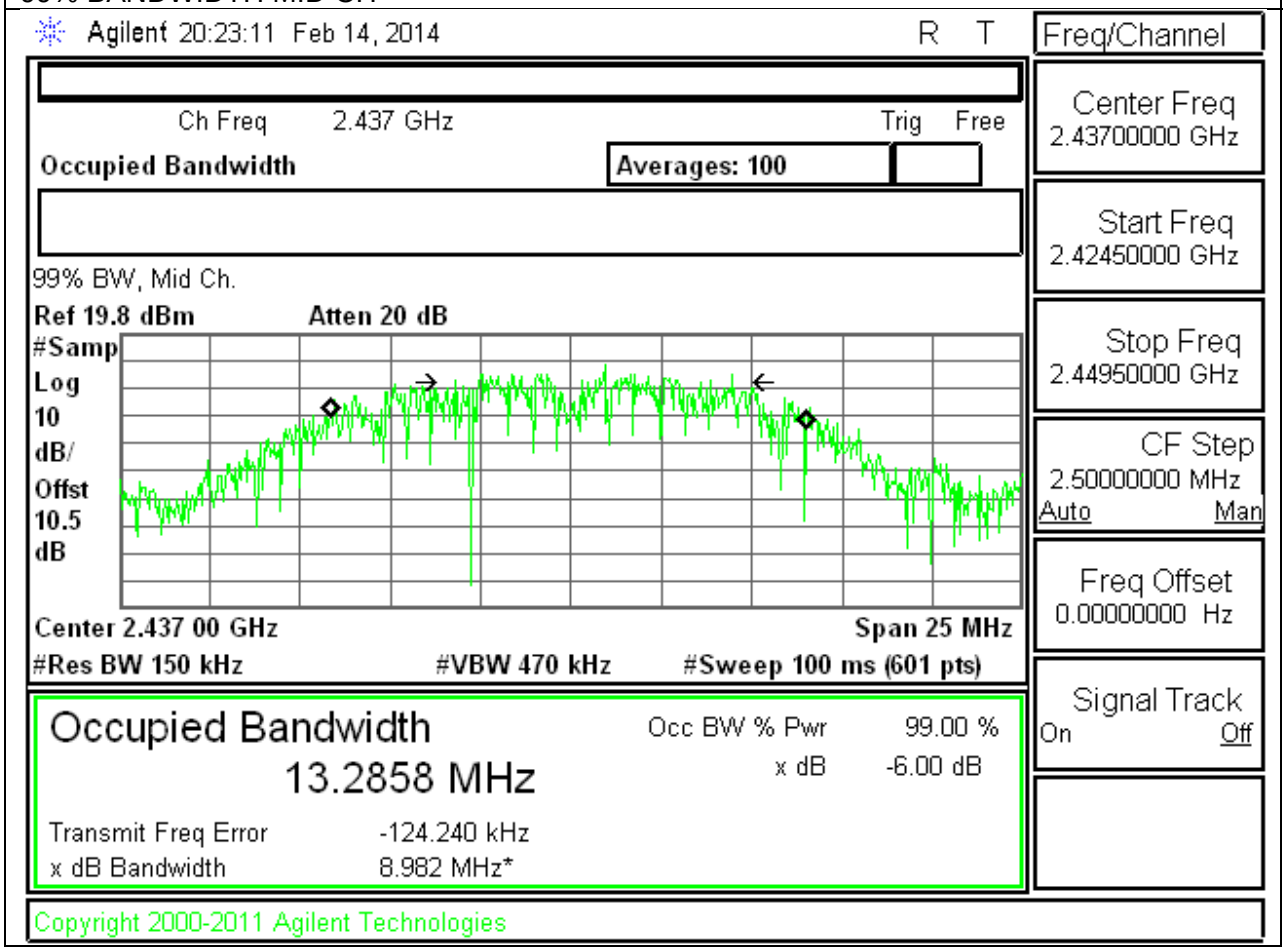
9.2.5. 2.4GHz Plots

802.11b 99% BANDWIDTH CHAIN 0

99% BANDWIDTH MID CH



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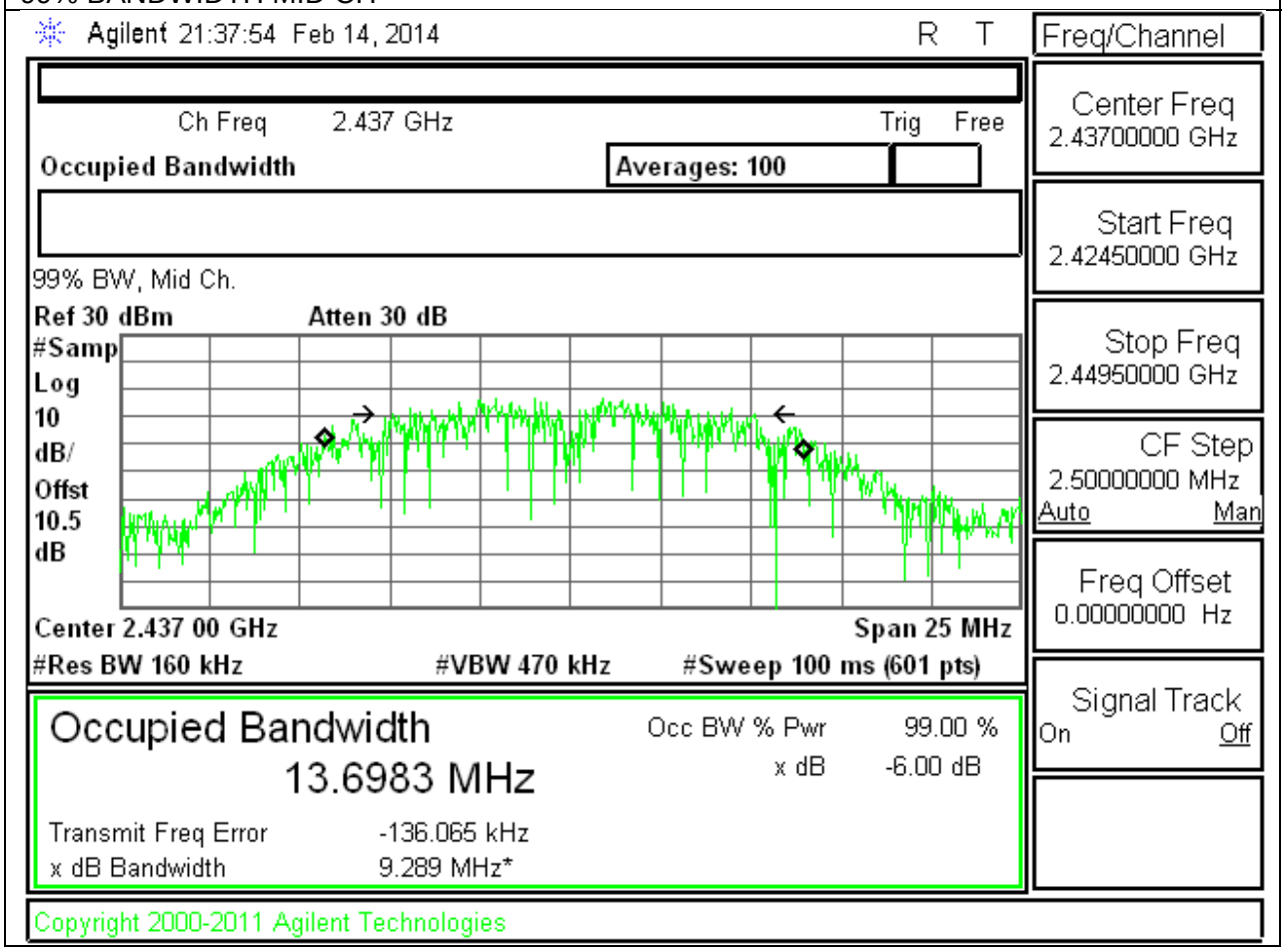
802.11b 99% BANDWIDTH CHAIN 1

99% BANDWIDTH MID CH



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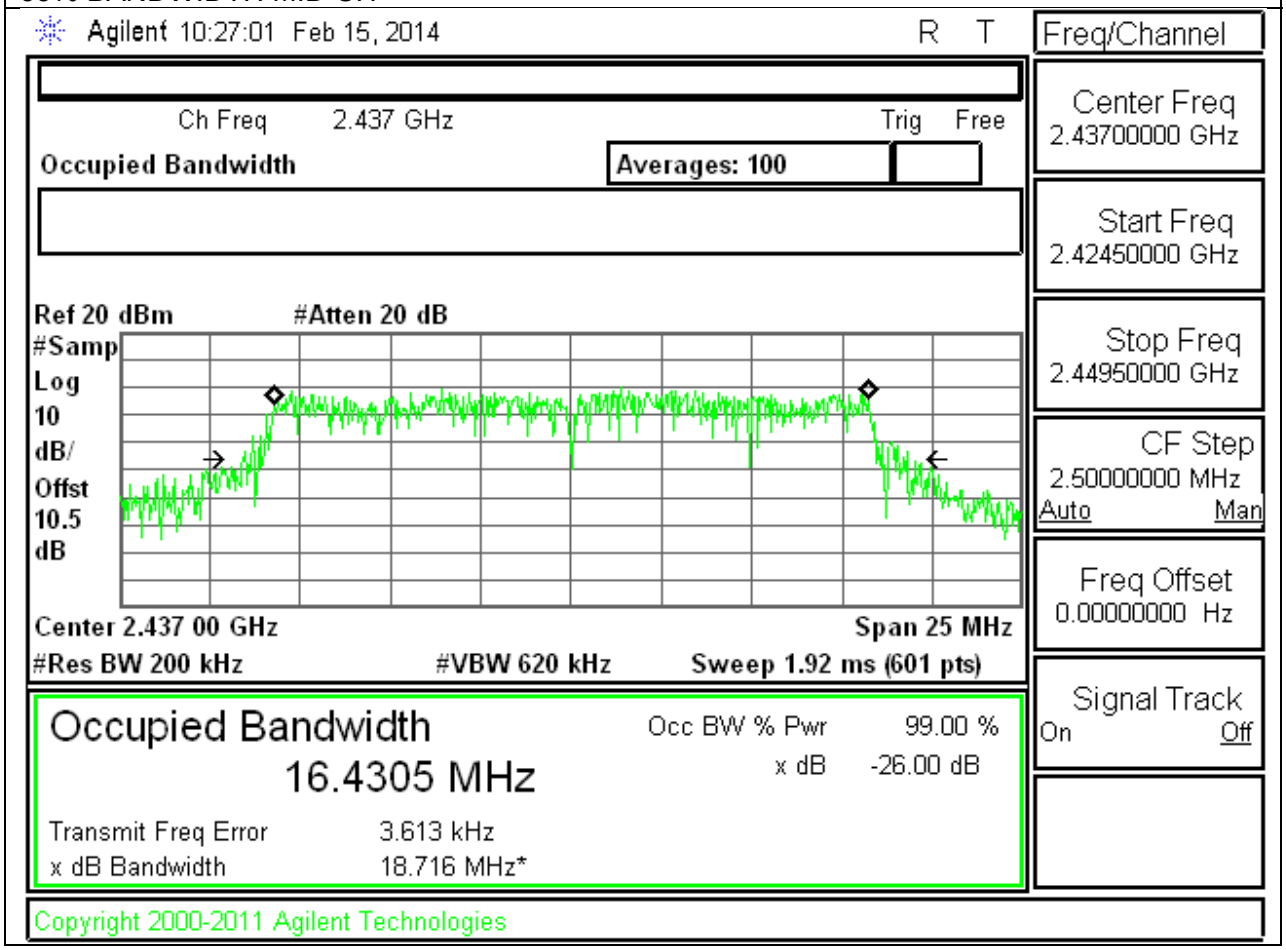
802.11g 99% BANDWIDTH CHAIN 0

99% BANDWIDTH MID CH



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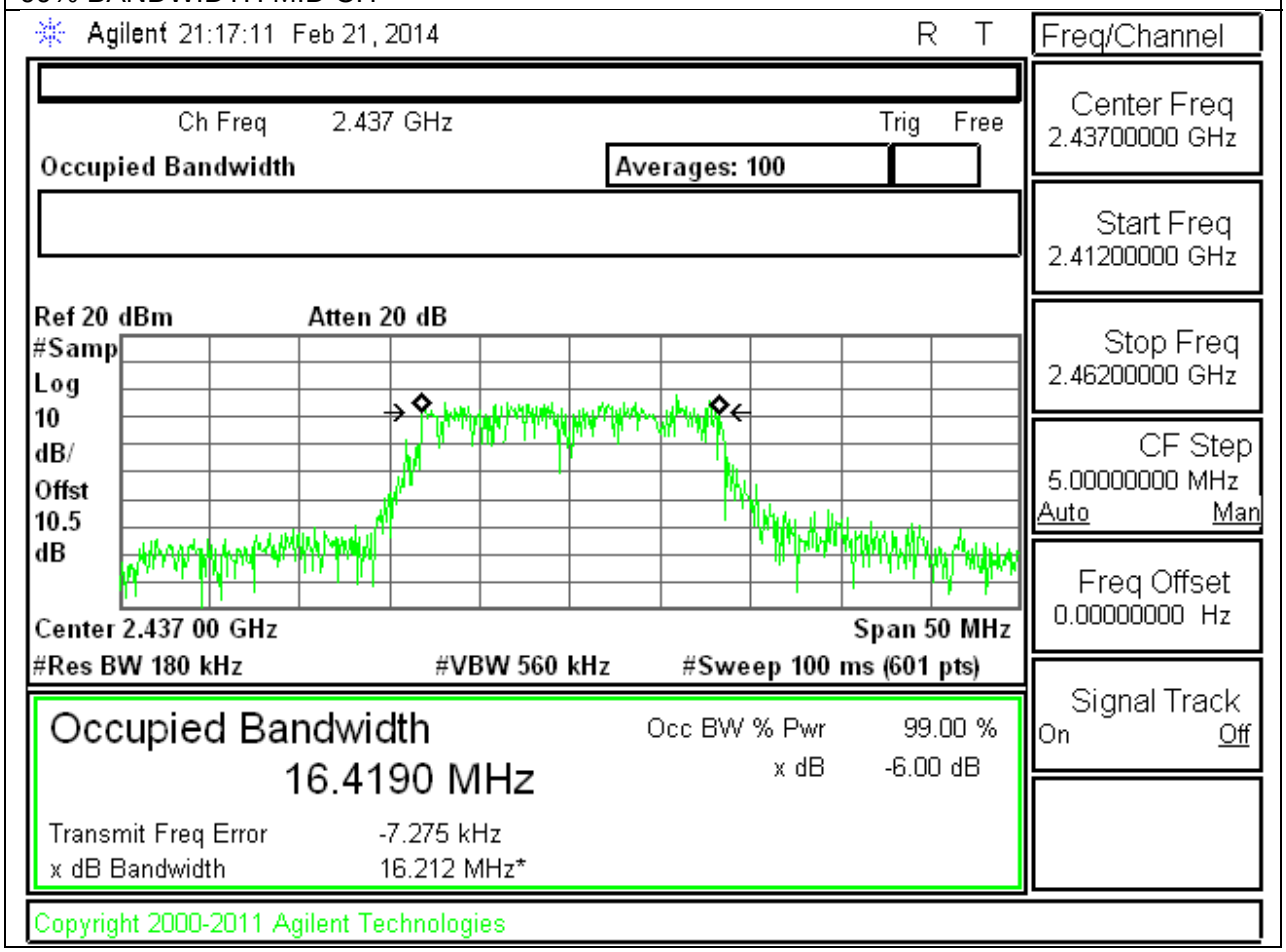
802.11g 99% BANDWIDTH CHAIN 1

99% BANDWIDTH MID CH



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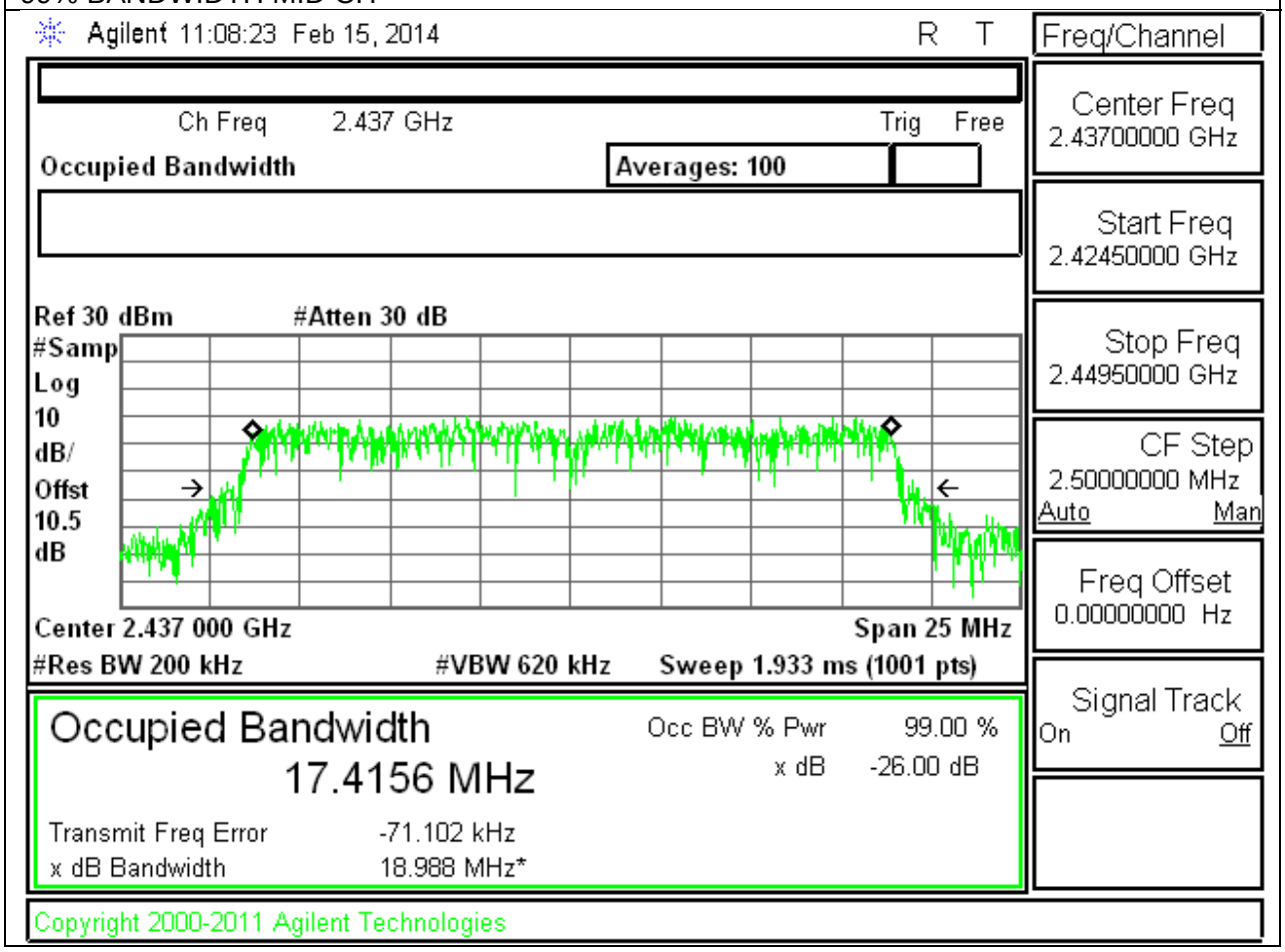
802.11n 99% BANDWIDTH CHAIN 0

99% BANDWIDTH MID CH



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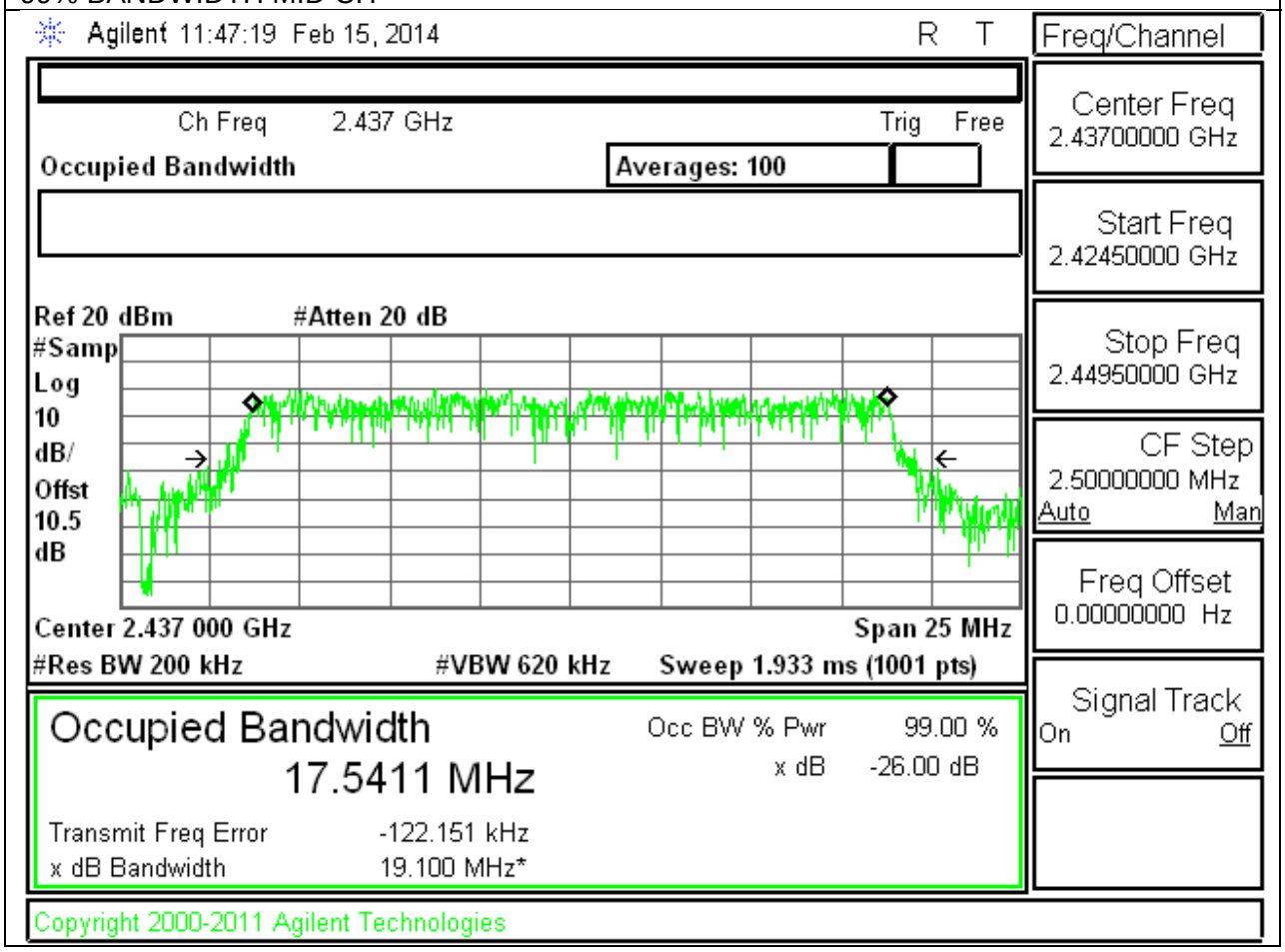
802.11n 99% BANDWIDTH CHAIN 1

99% BANDWIDTH MID CH



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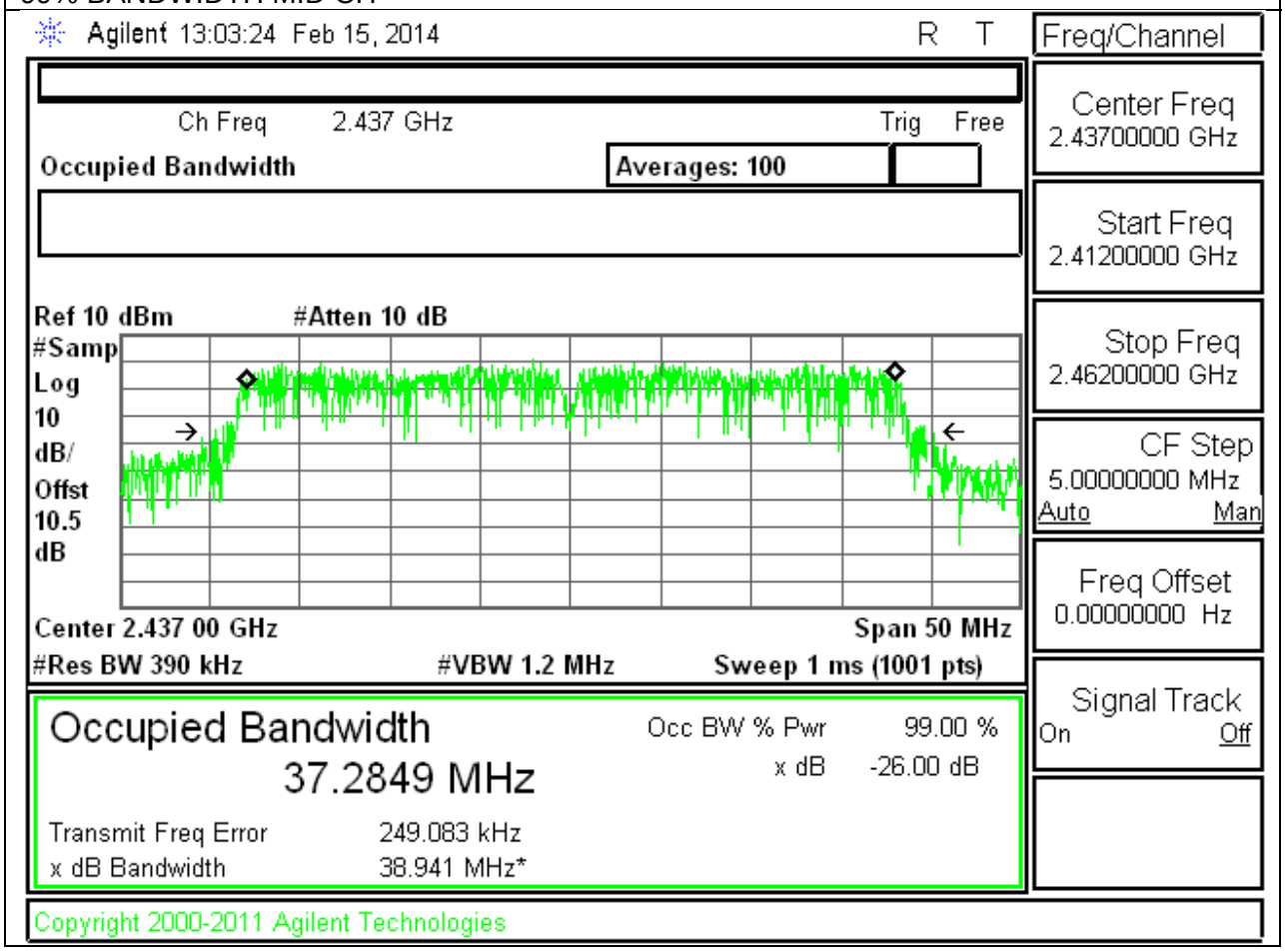
802.11n HT 40 99% BANDWIDTH CHAIN 0

99% BANDWIDTH MID CH



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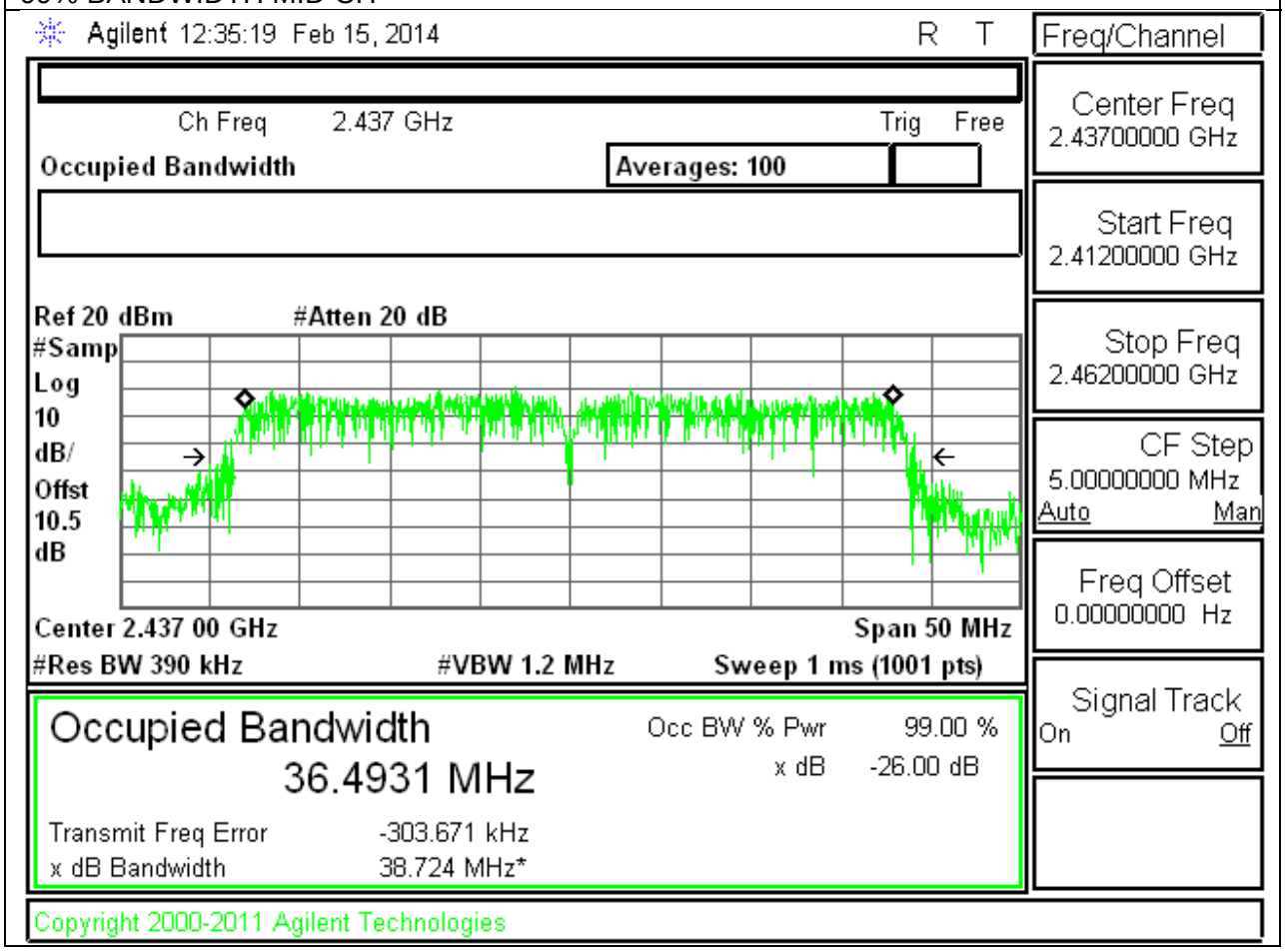
802.11n HT40 99% BANDWIDTH CHAIN 1

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 10.5 dB (including 10 dB pad and 0.5 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)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	2412	11.80	12.60	15.23
Mid	2437	16.00	17.50	19.82
High	2462	12.10	13.40	15.81

9.3.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	2412	9.90	11.30	13.67
Mid	2437	13.30	14.40	16.90
High	2462	9.00	10.50	12.82

9.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	2412	9.80	10.00	12.91
Mid	2437	12.70	13.20	15.97
High	2462	9.80	9.90	12.86

9.3.4. 802.11n HT40 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Chain 0 Power (dBm)	Chain 1 Power (dBm)	Total Power (dBm)
Low	2422	10.00	10.90	13.48
Mid	2437	9.20	10.50	12.91
High	2452	8.30	9.60	12.01

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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

For Power: The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
-0.78	-1.30	-1.03

For PSD: The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain is:

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
-0.78	-1.30	1.97

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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	-0.65	30.00	30	36	30.00
Mid	2437	-0.65	30.00	30	36	30.00
High	2462	-0.65	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2412	15.48	17.05	19.35	30.00	-10.65
Mid	2437	20.66	20.57	23.63	30.00	-6.37
High	2462	15.68	16.02	18.86	30.00	-11.14

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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	-0.65	30.00	30	36	30.00
Mid	2437	-0.65	30.00	30	36	30.00
High	2462	-0.65	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2412	18.77	21.39	23.28	30.00	-6.72
Mid	2437	21.04	23.81	25.65	30.00	-4.35
High	2462	17.70	20.62	22.41	30.00	-7.59

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	-0.65	30.00	30	36	30.00
Mid	2437	-0.65	30.00	30	36	30.00
High	2462	-0.65	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2412	18.38	19.15	21.79	30.00	-8.21
Mid	2437	20.72	21.57	24.18	30.00	-5.82
High	2462	17.68	18.48	21.11	30.00	-8.89

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9.4.4. 802.11n HT 40 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	2422	-0.65	30.00	30	36	30.00
Mid	2437	-0.65	30.00	30	36	30.00
High	2452	-0.65	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2422	18.40	18.75	21.59	30.00	-8.41
Mid	2437	20.91	20.96	23.95	30.00	-6.05
High	2452	17.77	18.52	21.17	30.00	-8.83

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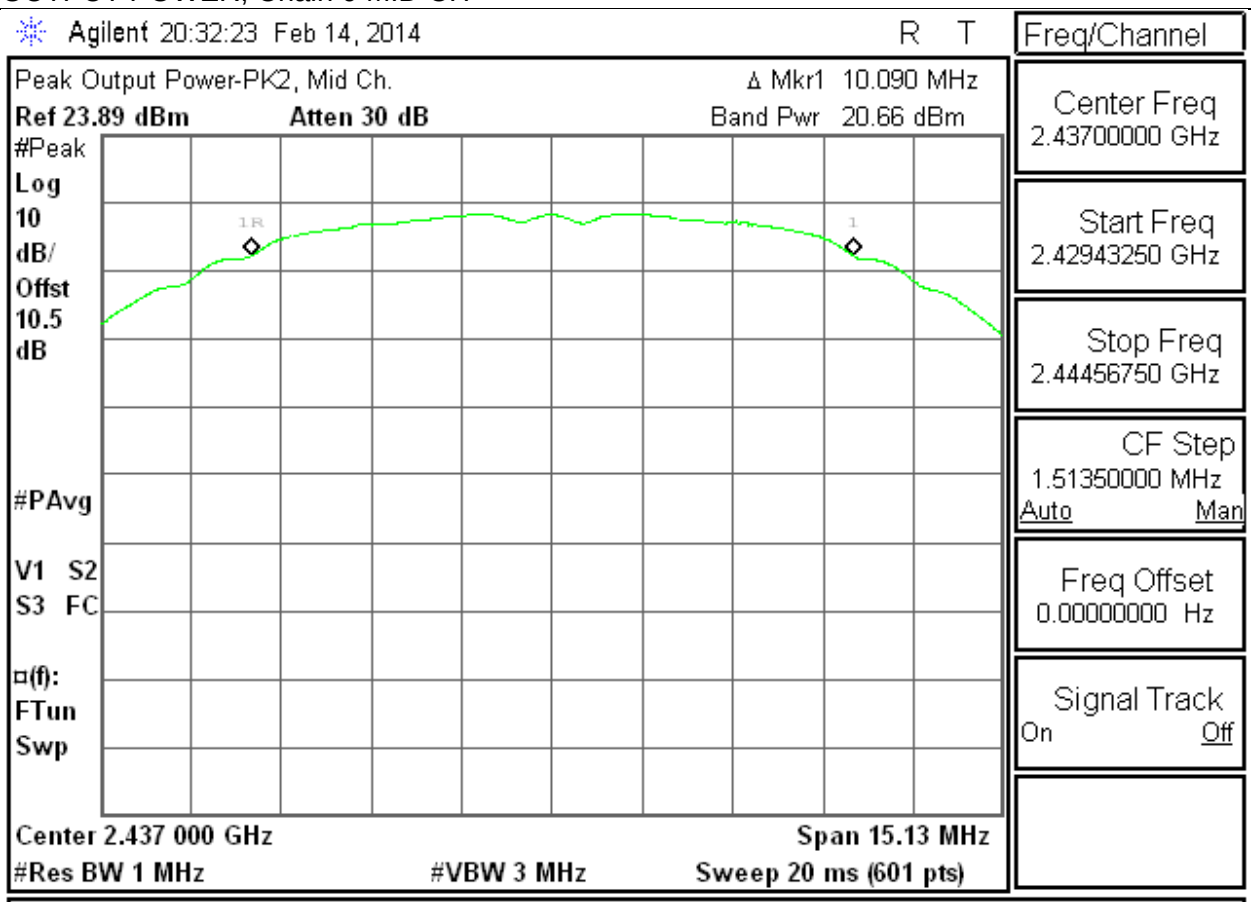
9.4.5. 2.4GHz Plots

802.11b OUTPUT POWER, Chain 0

OUTPUT POWER, Chain 0 MID CH



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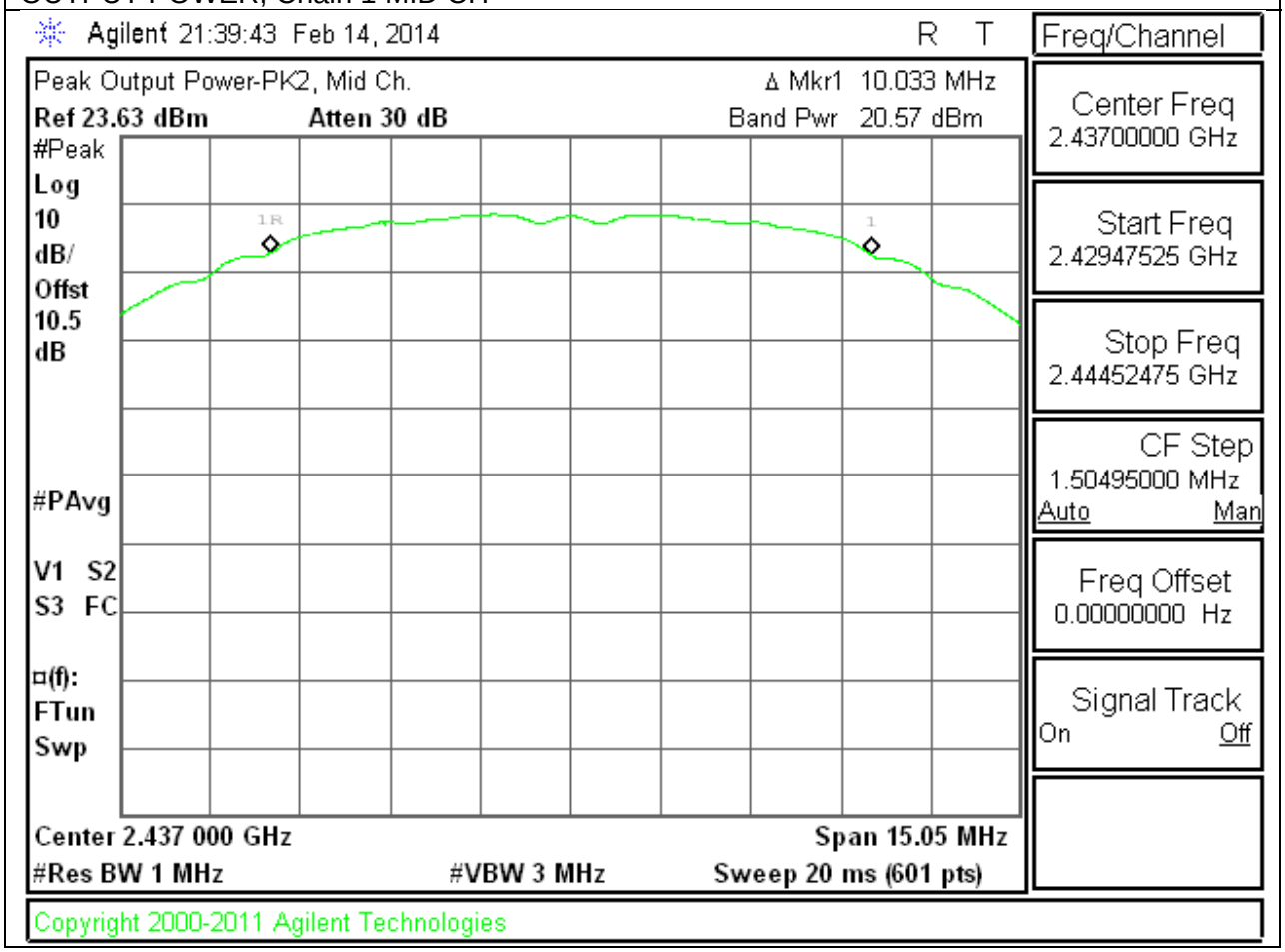
802.11b OUTPUT POWER, Chain 1

OUTPUT POWER, Chain 1 MID CH



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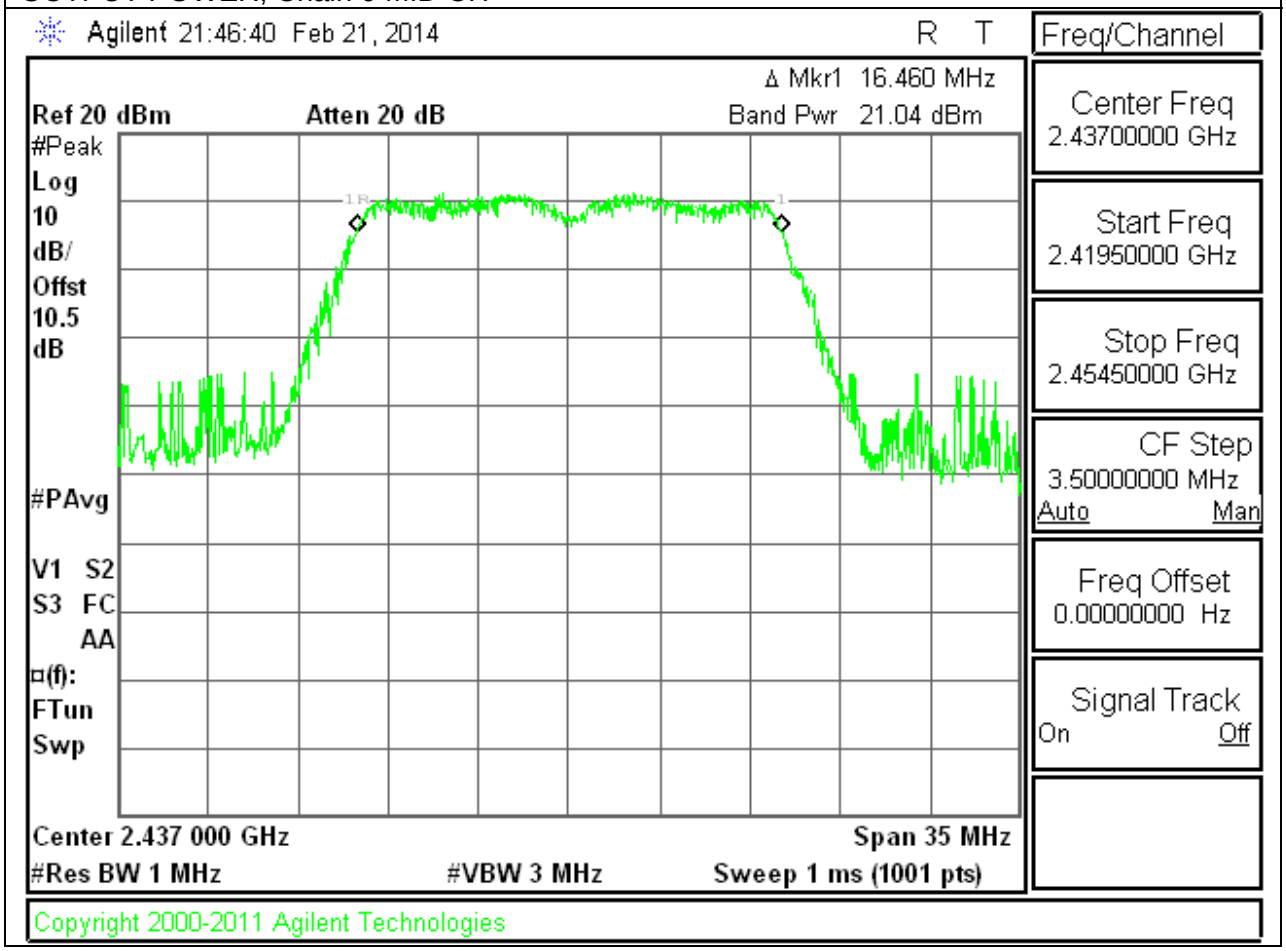
802.11g OUTPUT POWER, Chain 0

OUTPUT POWER, Chain 0 MID CH



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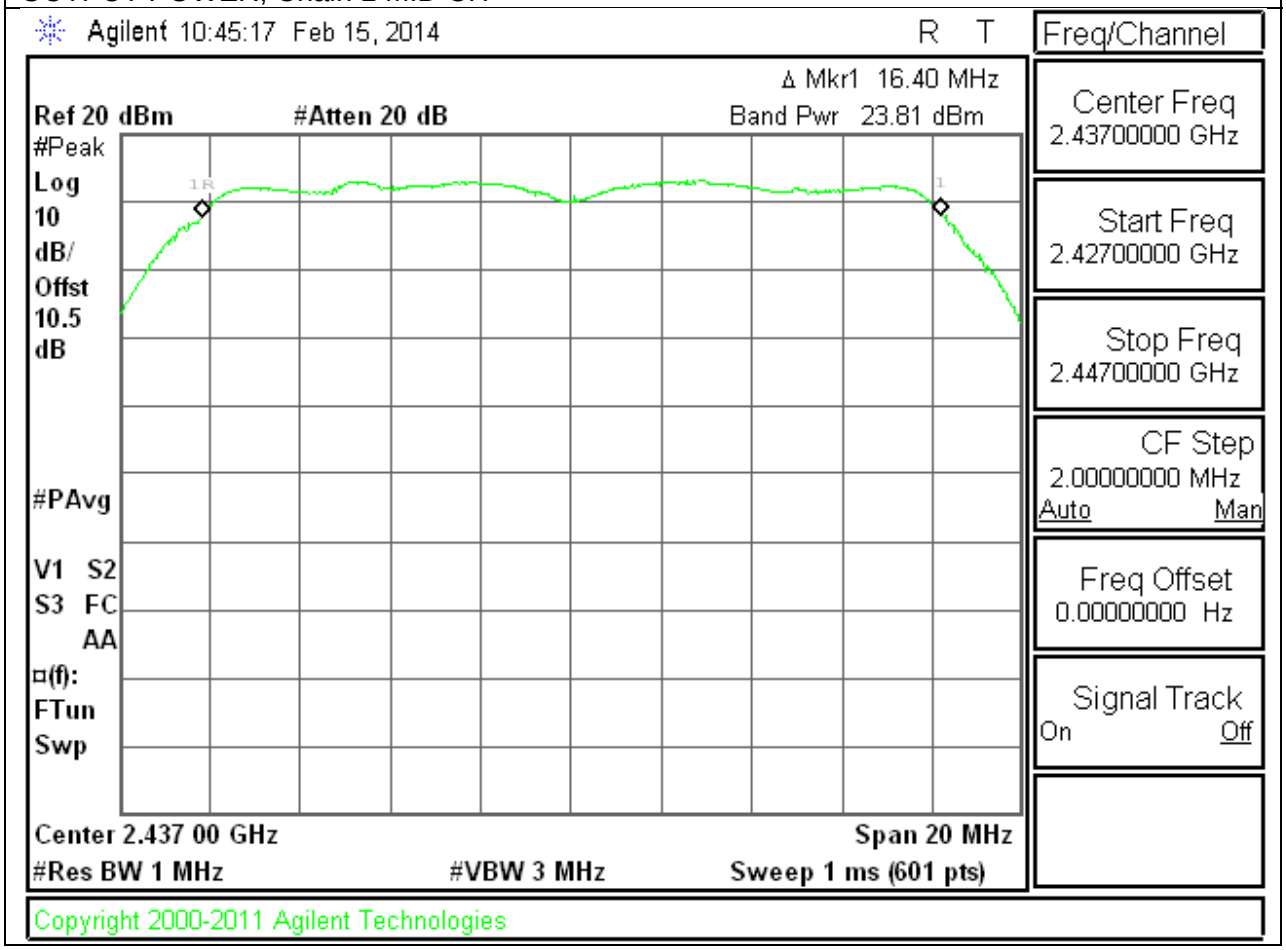
802.11g OUTPUT POWER, Chain 1

OUTPUT POWER, Chain 1 MID CH



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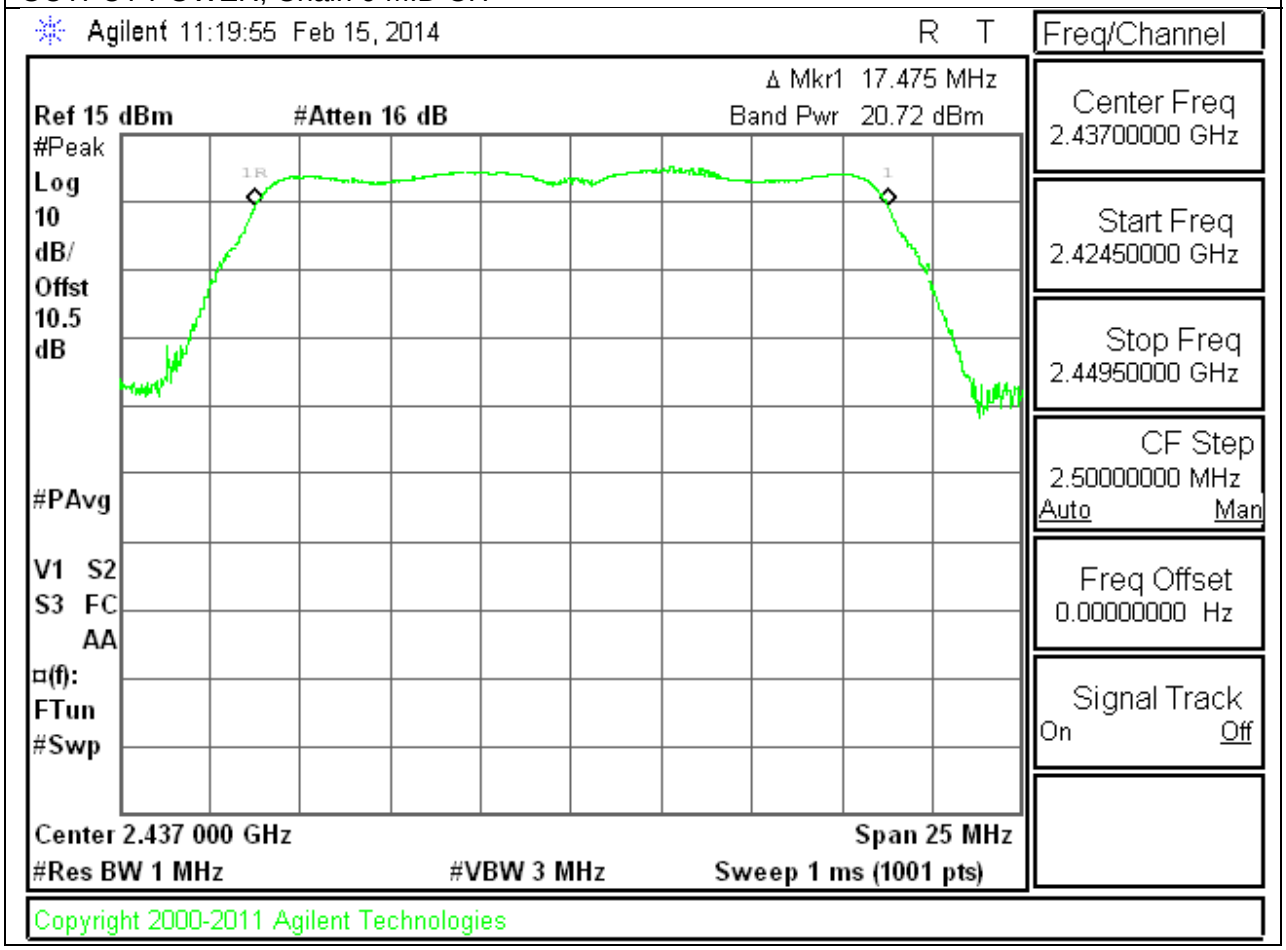
802.11n OUTPUT POWER, Chain 0

OUTPUT POWER, Chain 0 MID CH



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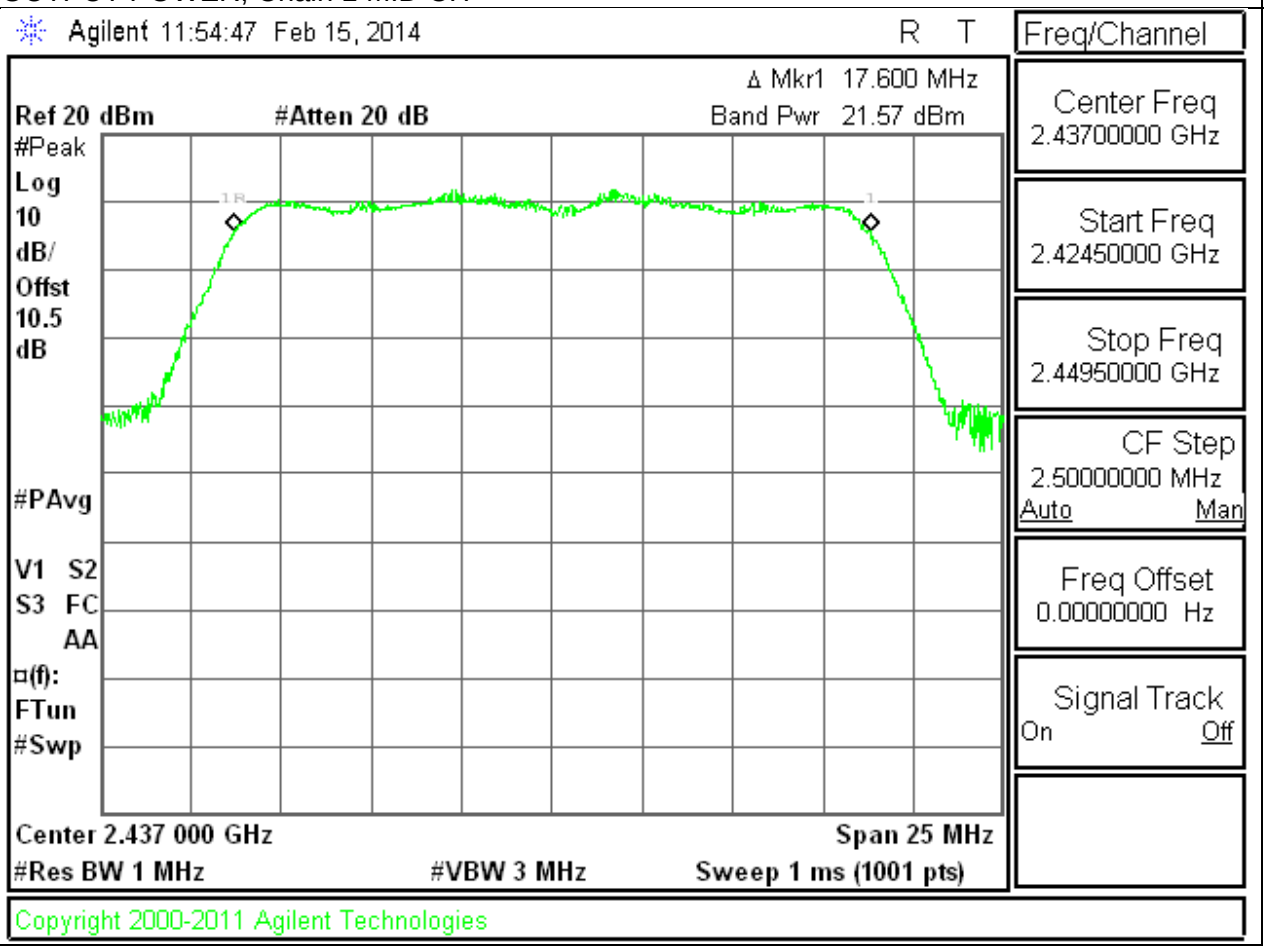
802.11n OUTPUT POWER, Chain 1

OUTPUT POWER, Chain 1 MID CH



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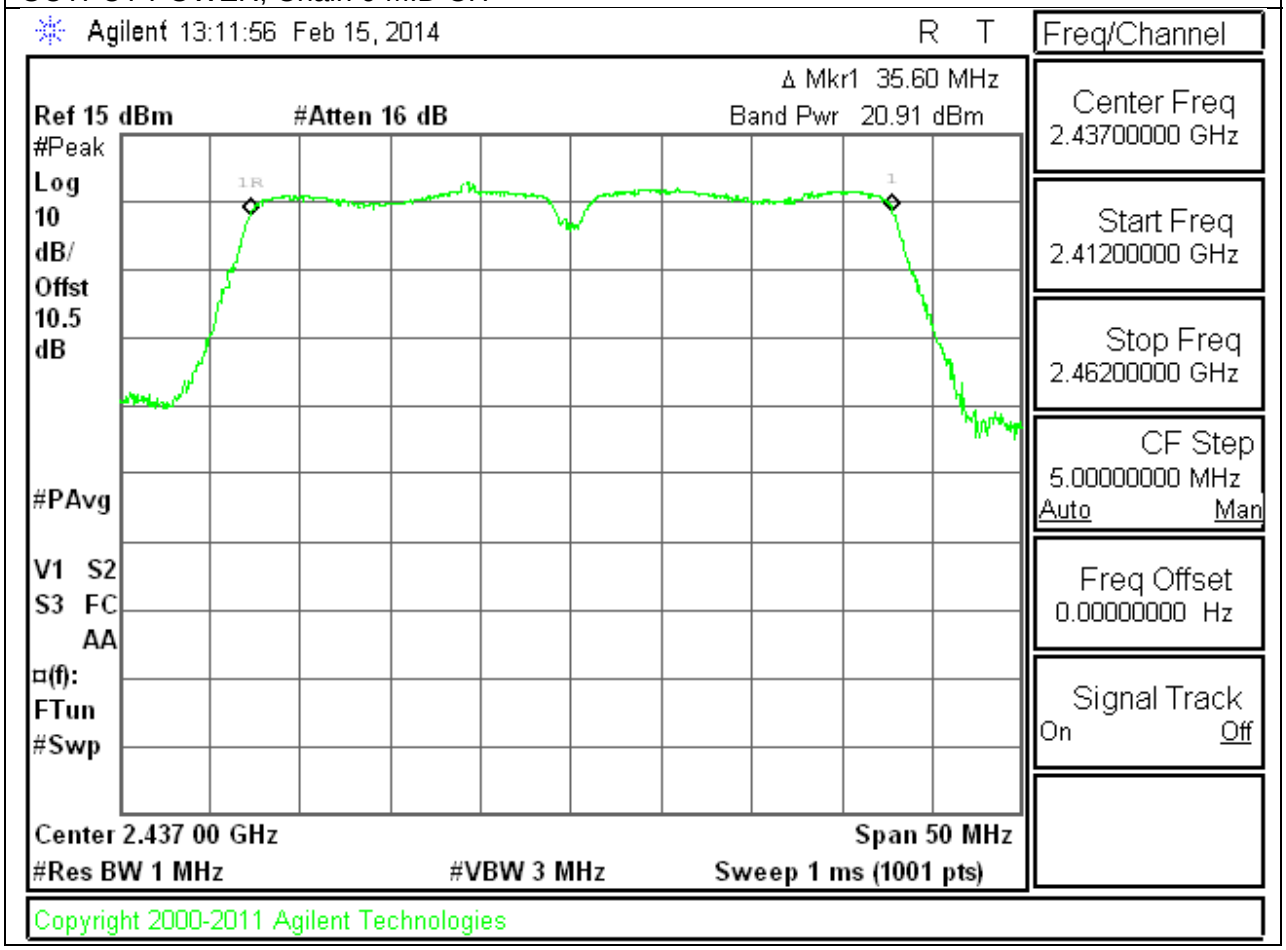
802.11n HT40 OUTPUT POWER, Chain 0

OUTPUT POWER, Chain 0 MID CH



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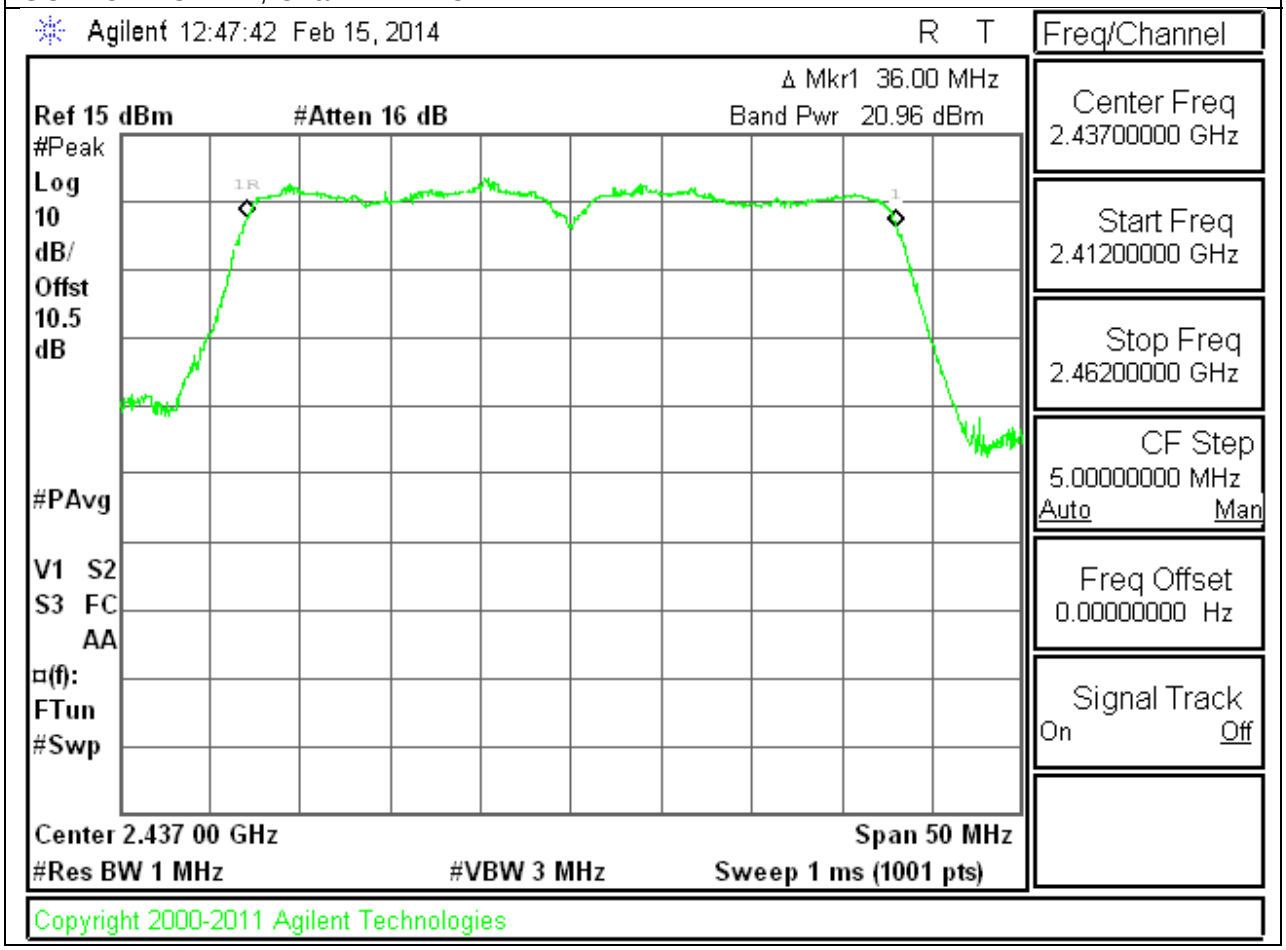
802.11n HT 40 OUTPUT POWER, Chain 1

OUTPUT POWER, Chain 1 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)	Chain 1 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-12.42	-13.00	-9.69	8.0	-17.7
Mid	2437	-9.16	-9.77	-6.44	8.0	-14.4
High	2462	-13.36	-14.06	-10.69	8.0	-18.7

9.5.2. 802.11g MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-15.54	-13.37	-11.31	8.0	-19.3
Mid	2437	-16.23	-10.55	-9.51	8.0	-17.5
High	2462	-17.10	-14.14	-12.36	8.0	-20.4

9.5.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-16.78	-15.82	-13.26	8.0	-21.3
Mid	2437	-14.19	-12.87	-10.47	8.0	-18.5
High	2462	-17.31	-16.57	-13.91	8.0	-21.9

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9.5.4. 802.11n HT40 MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2422	-19.35	-18.38	-15.83	8.0	-23.8
Mid	2437	-16.24	-15.48	-12.83	8.0	-20.8
High	2452	-19.47	-18.74	-16.08	8.0	-24.1

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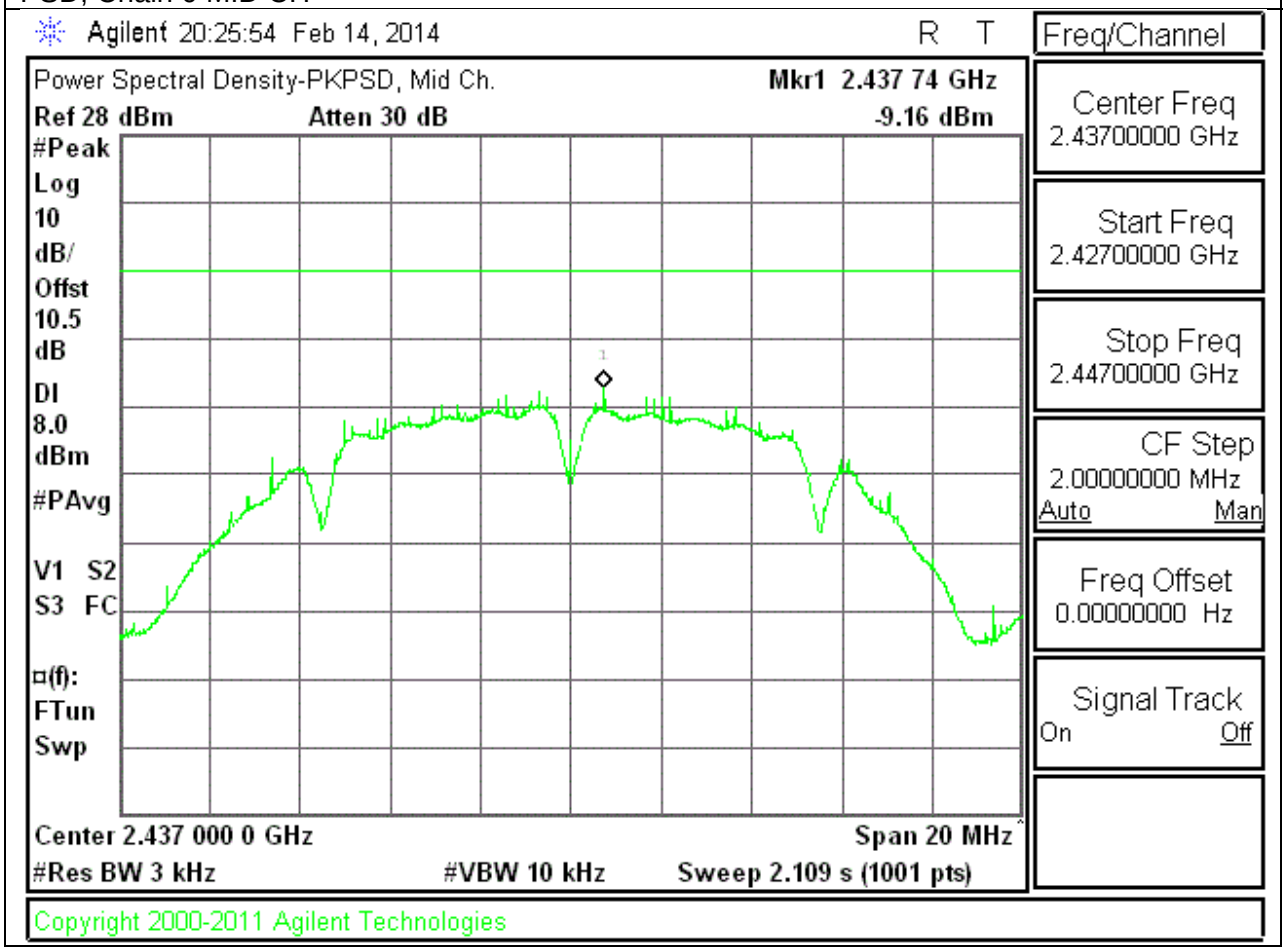
9.5.5. 2.4GHz Plots

802.11b PSD, Chain 0

PSD, Chain 0 MID CH



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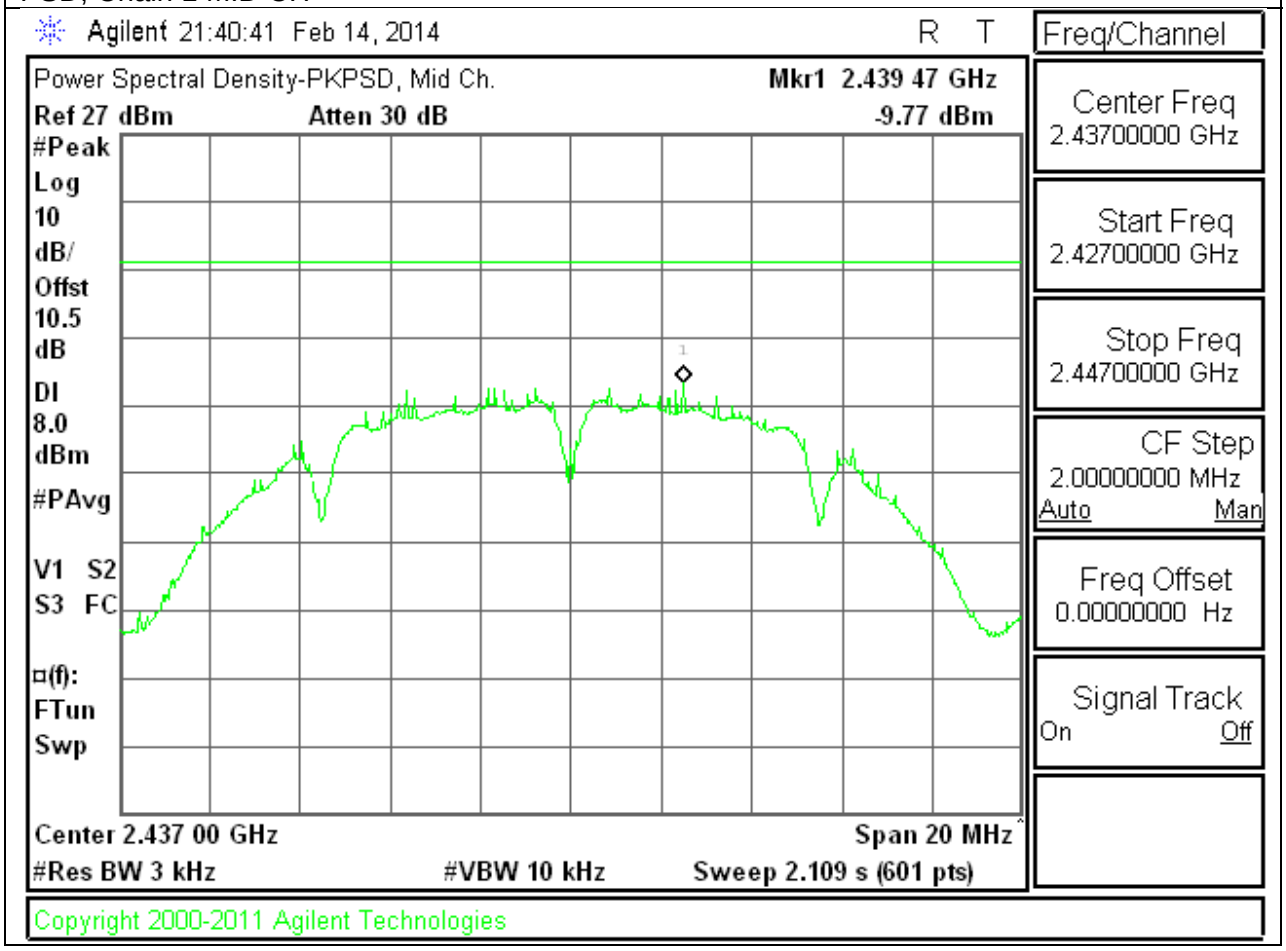
802.11b PSD, Chain 1

PSD, Chain 1 MID CH



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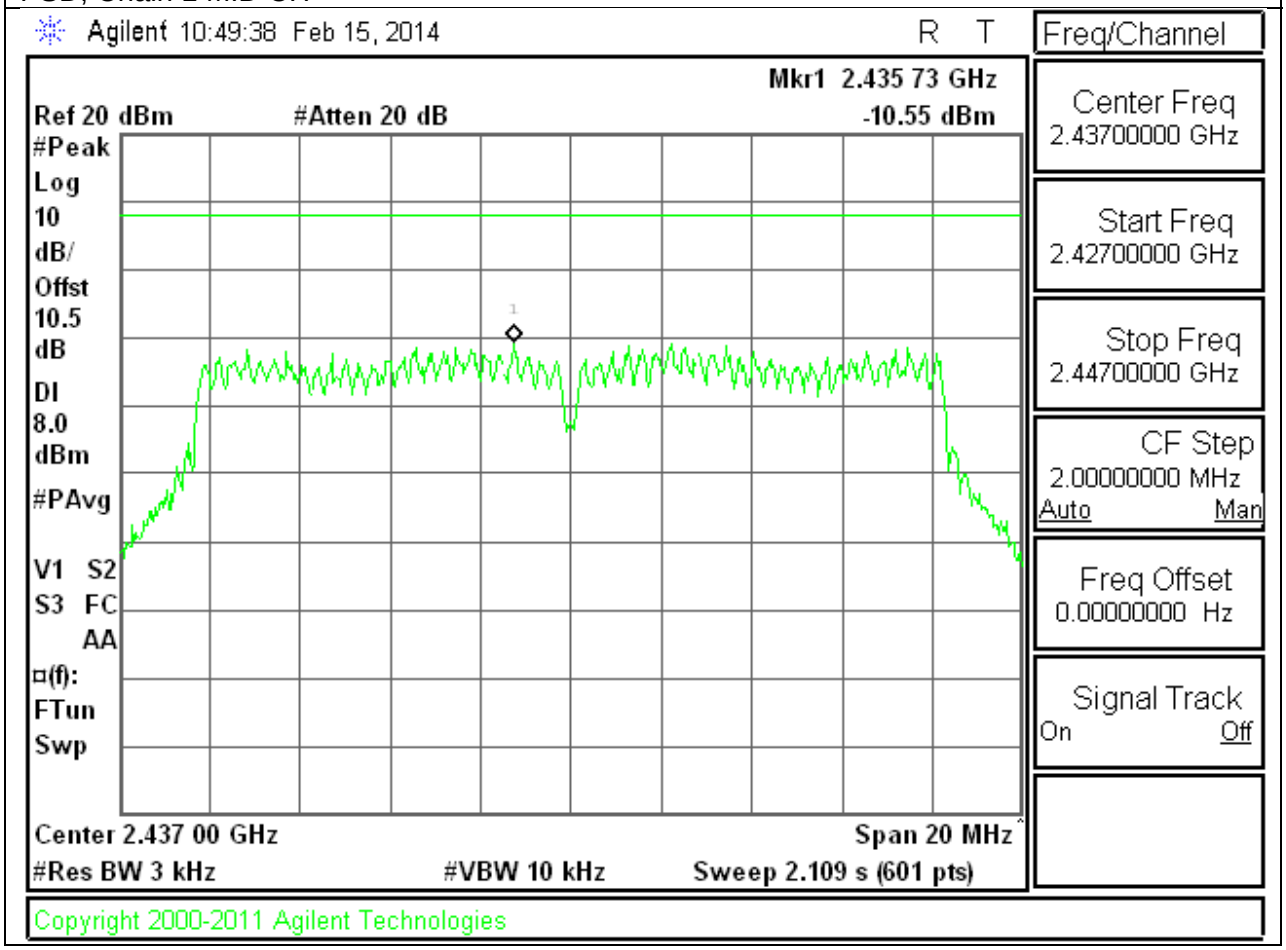
802.11g PSD, Chain 1

PSD, Chain 1 MID CH



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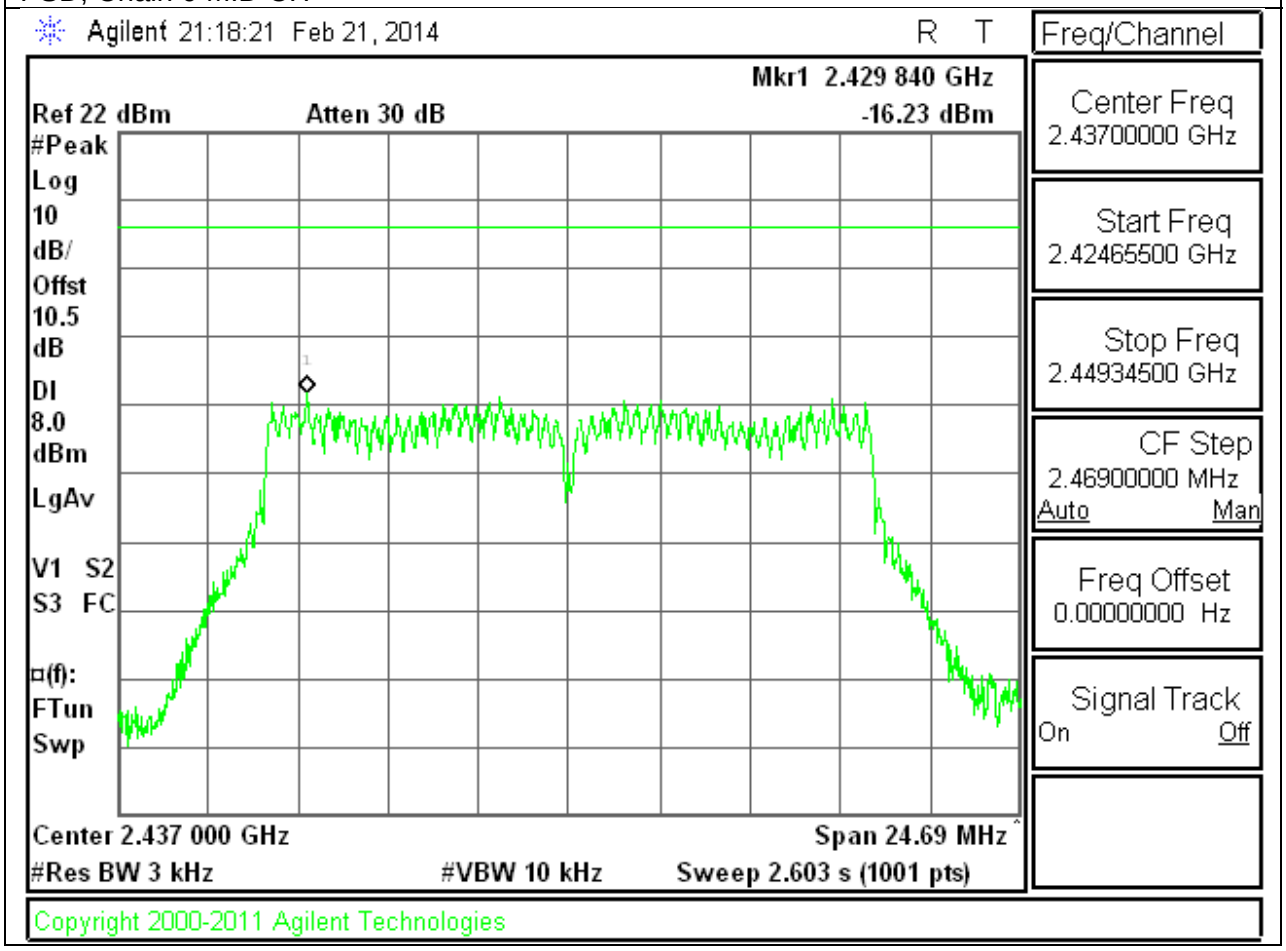
802.11g PSD, Chain 0

PSD, Chain 0 MID CH



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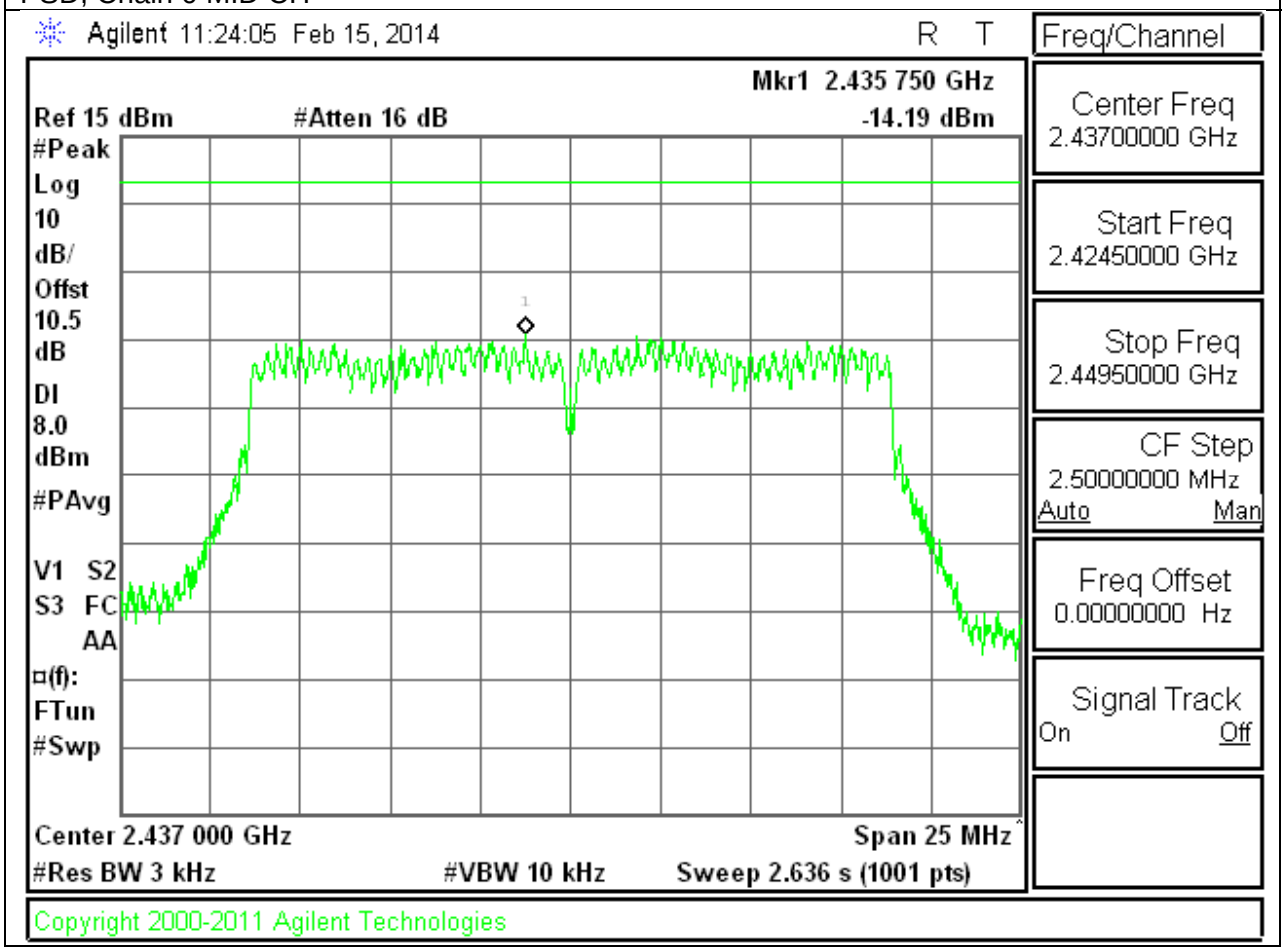
802.11n PSD, Chain 0

PSD, Chain 0 MID CH



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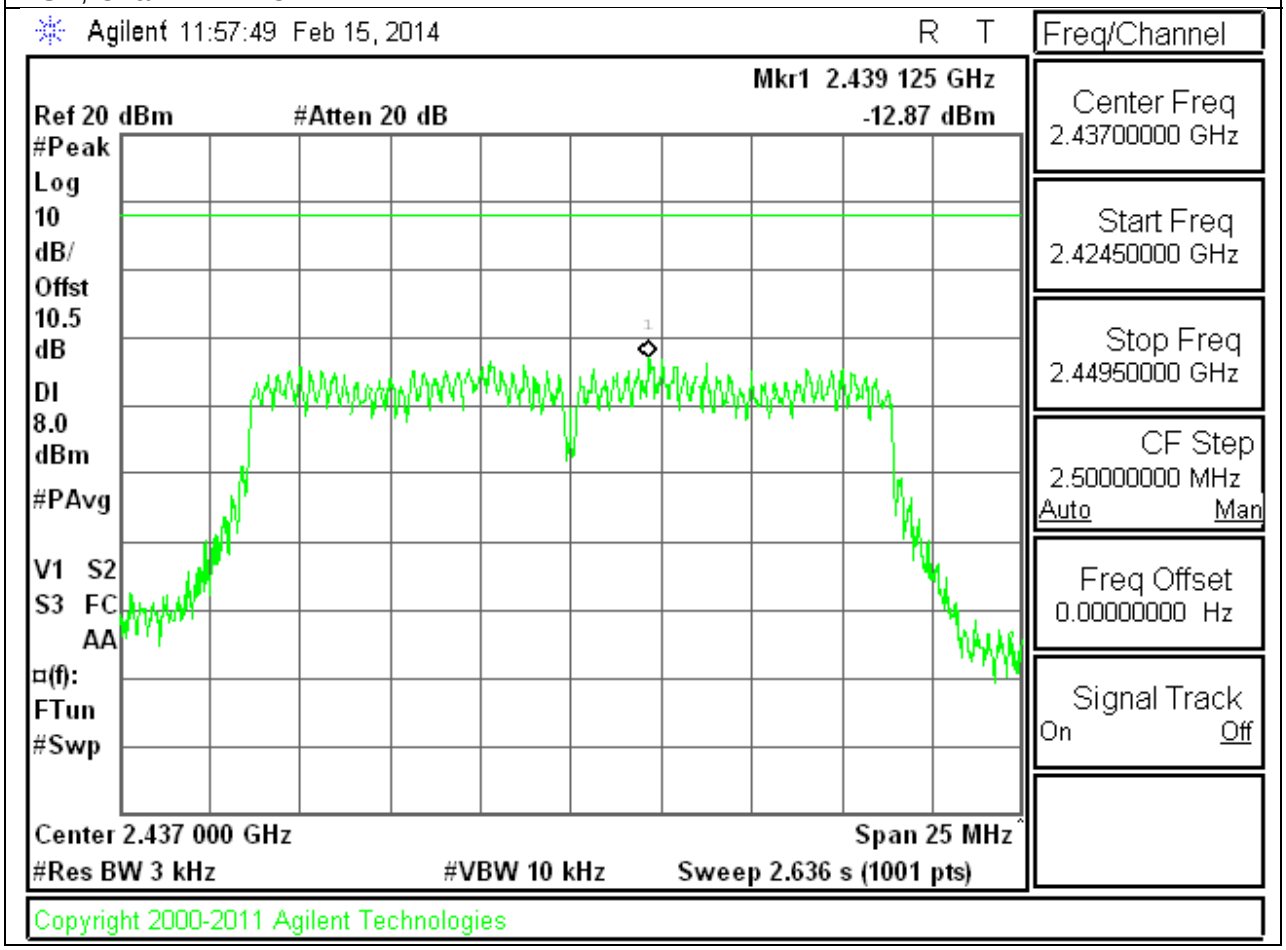
802.11n PSD, Chain 1

PSD, Chain 1 MID CH



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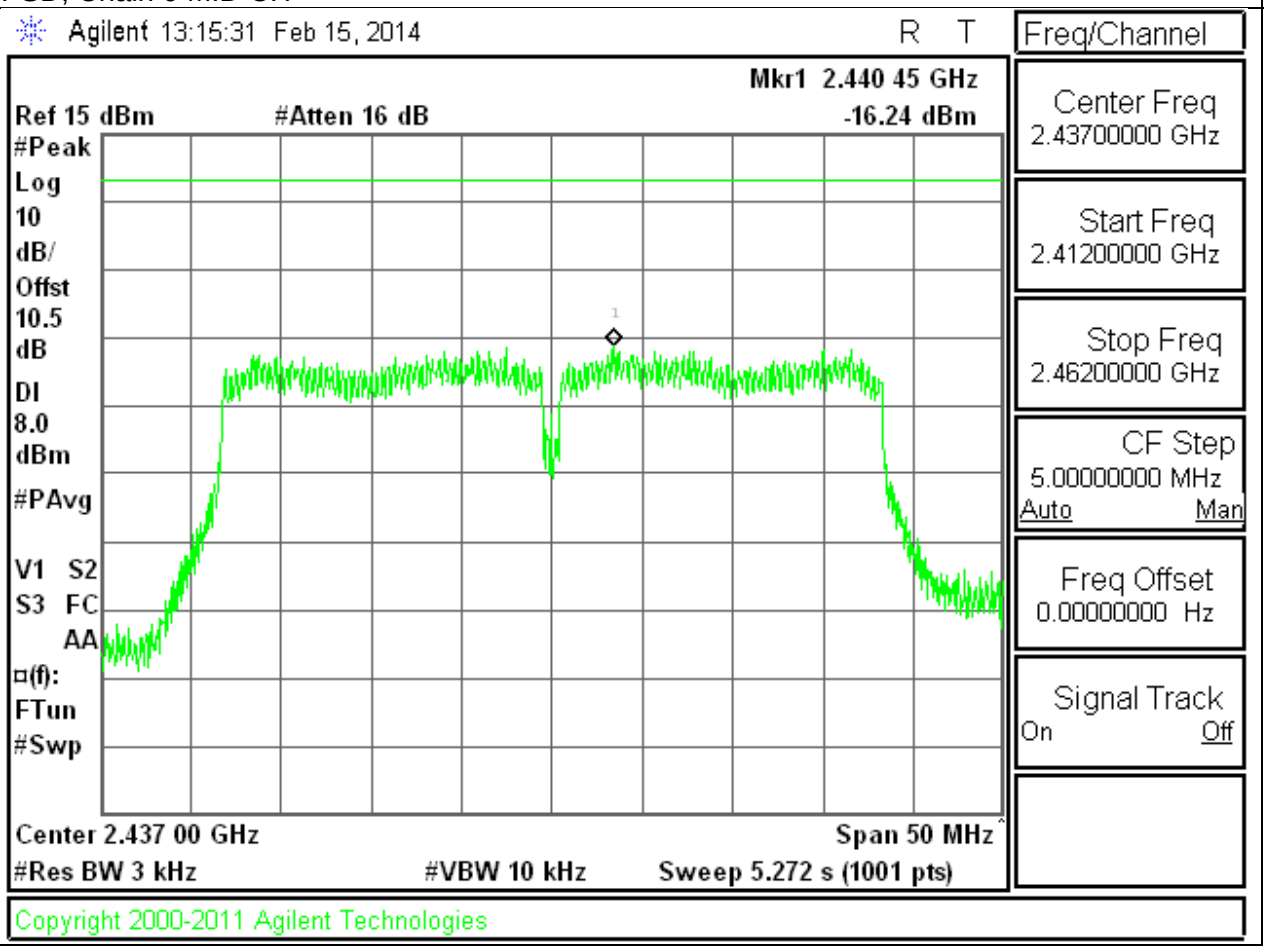
802.11n HT40 PSD, Chain 0

PSD, Chain 0 MID CH



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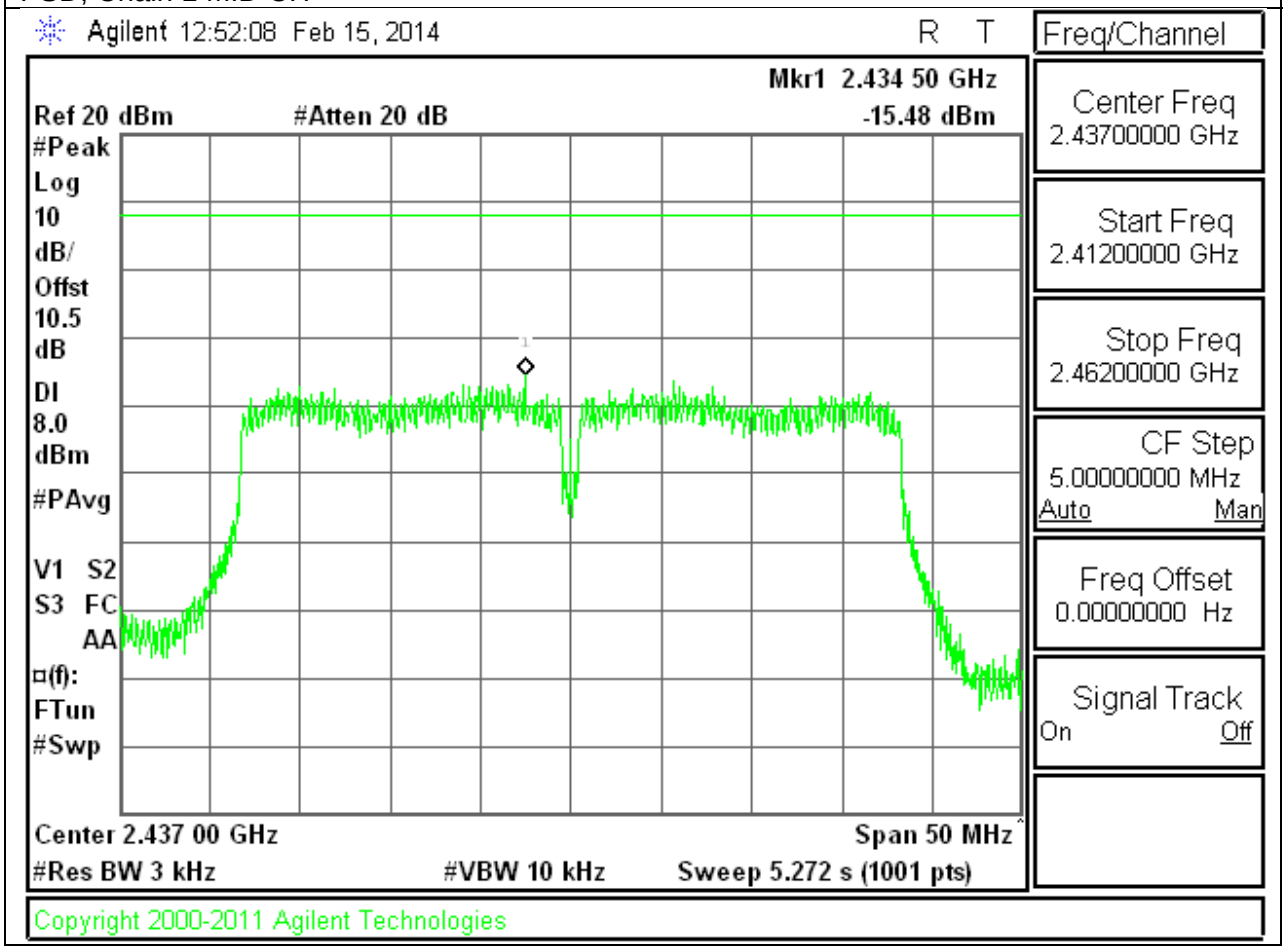
802.11n HT40 PSD, Chain 1

PSD, Chain 1 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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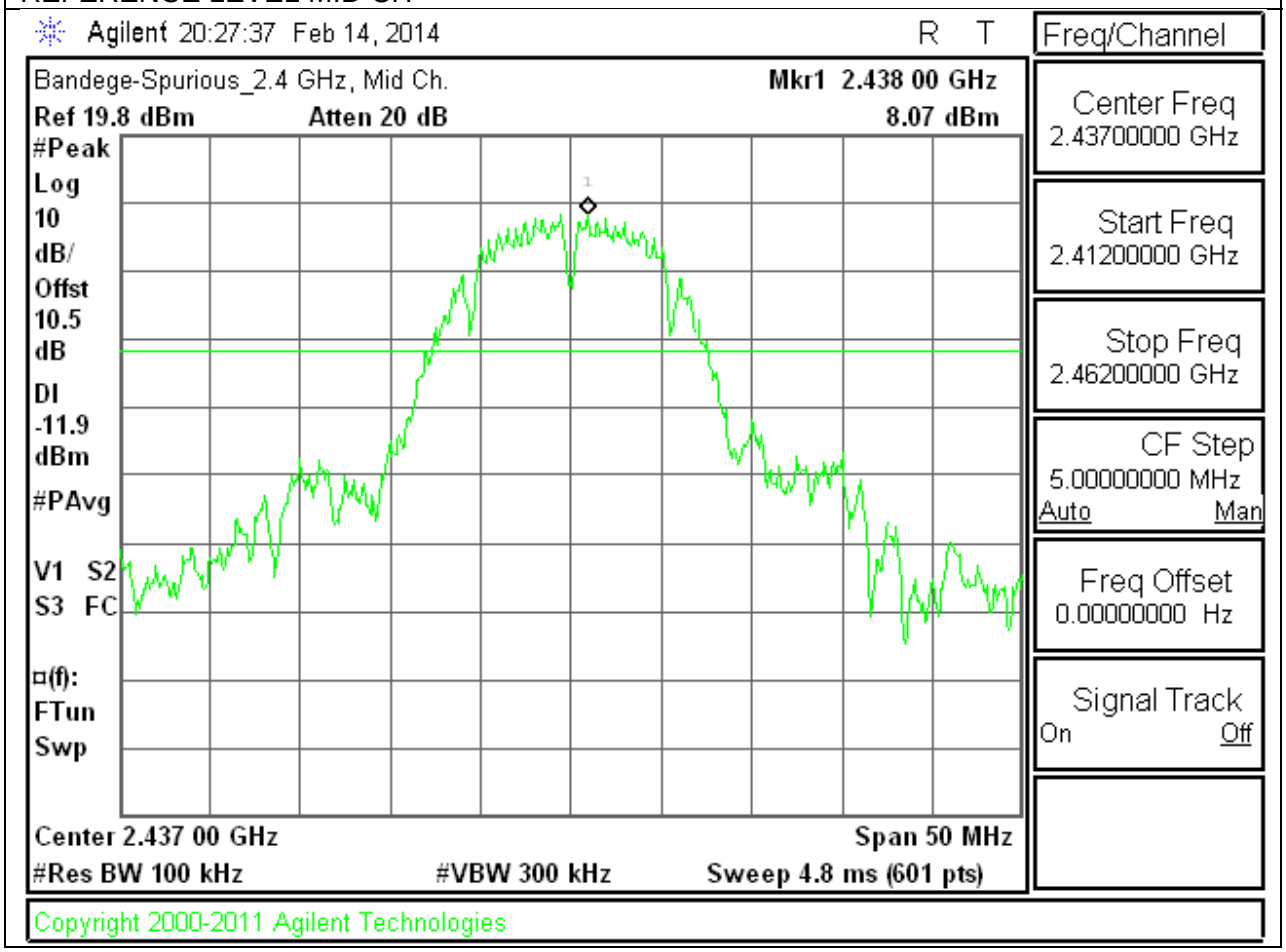
RESULTS

9.6.1. 802.11b MODE IN THE 2.4 GHz BAND CHAIN 0

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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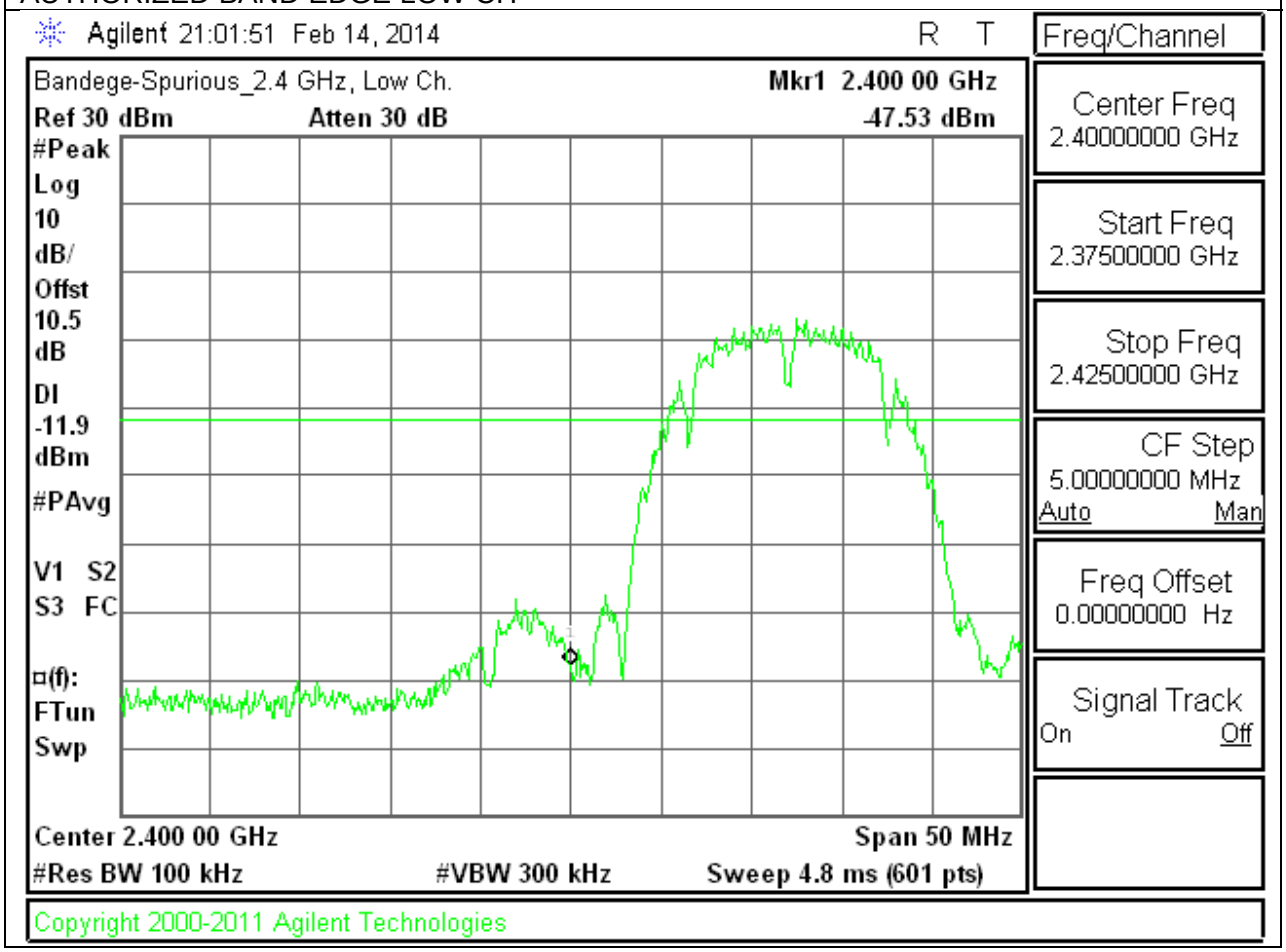
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



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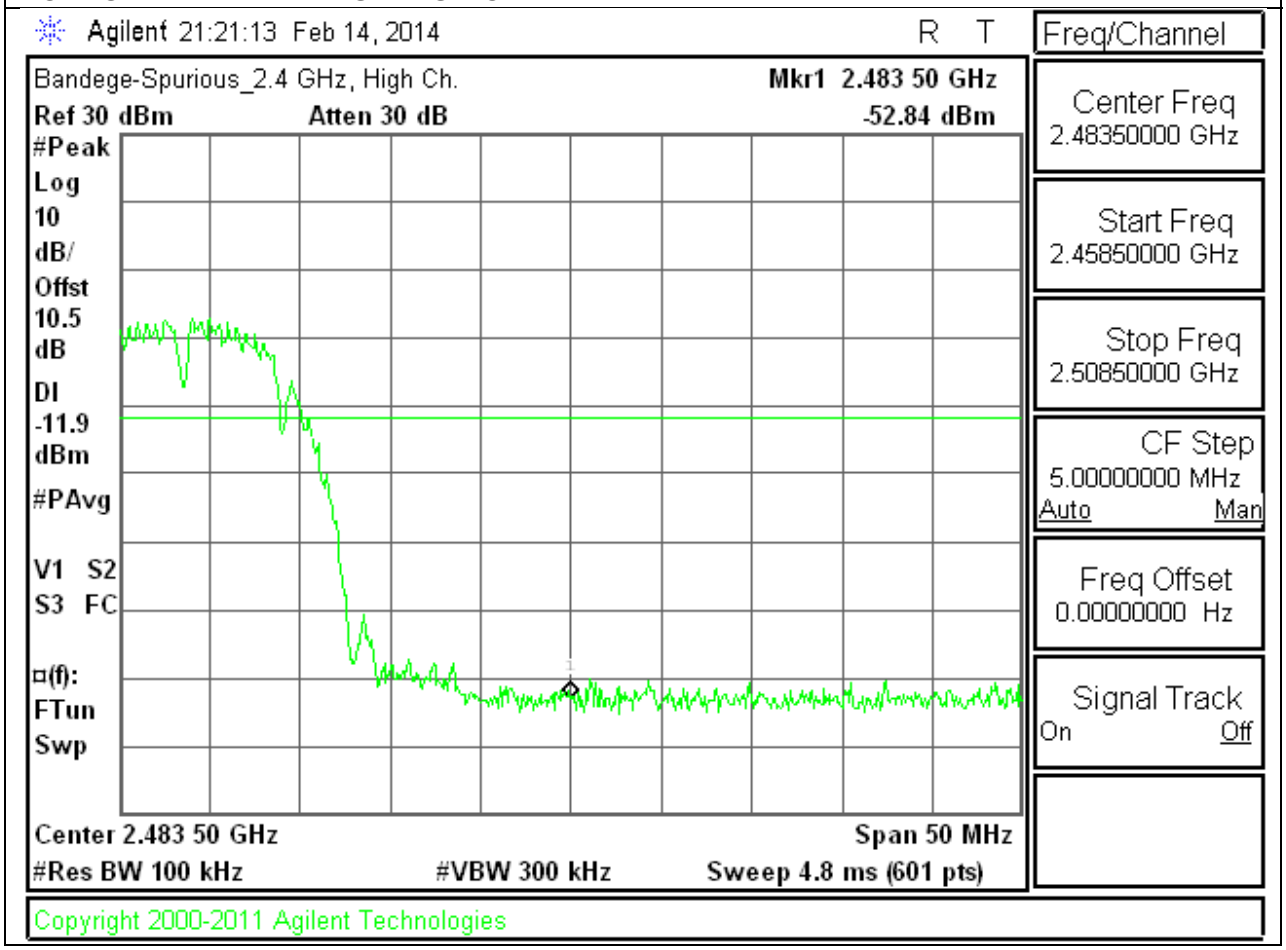
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH



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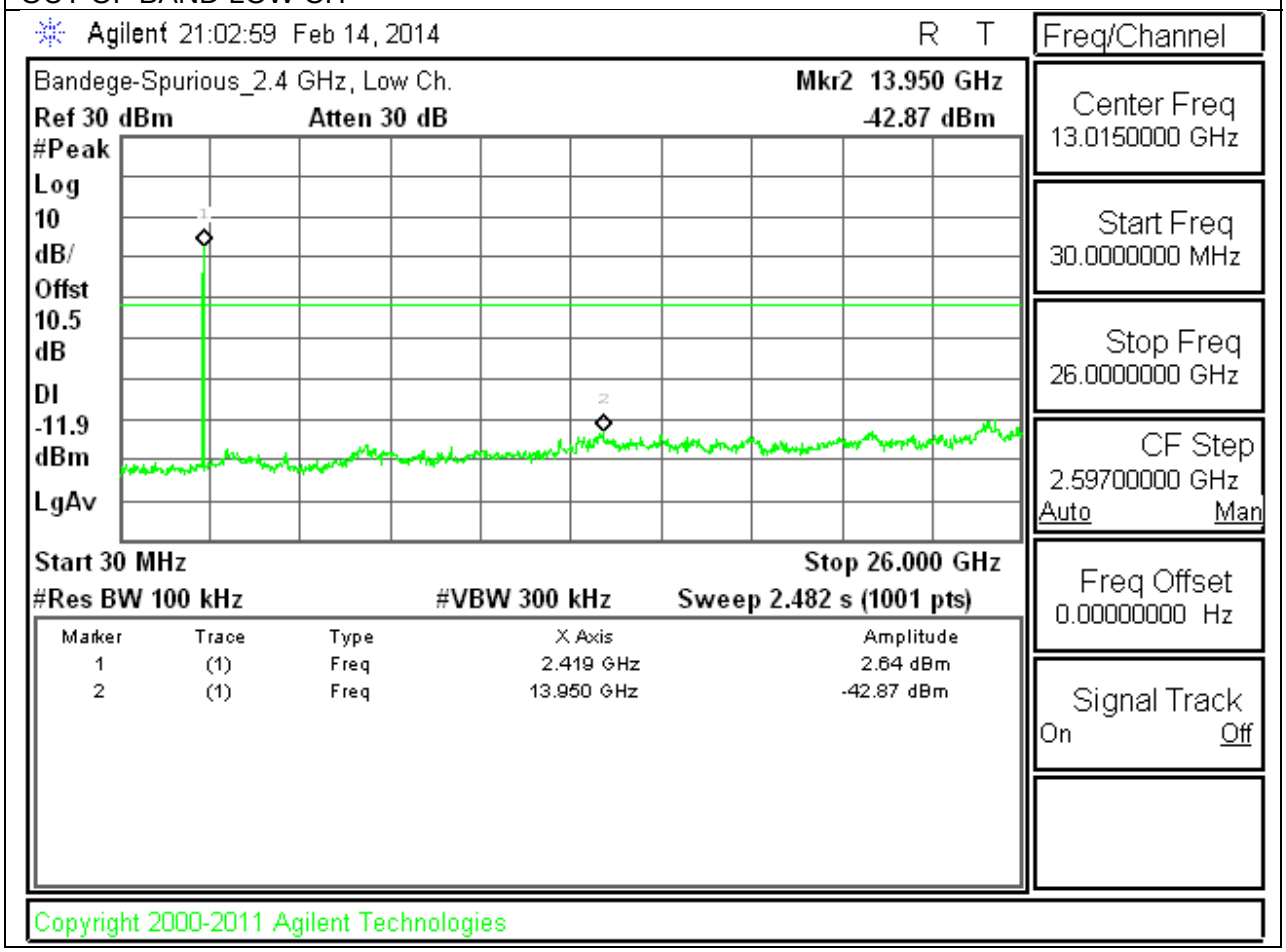
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



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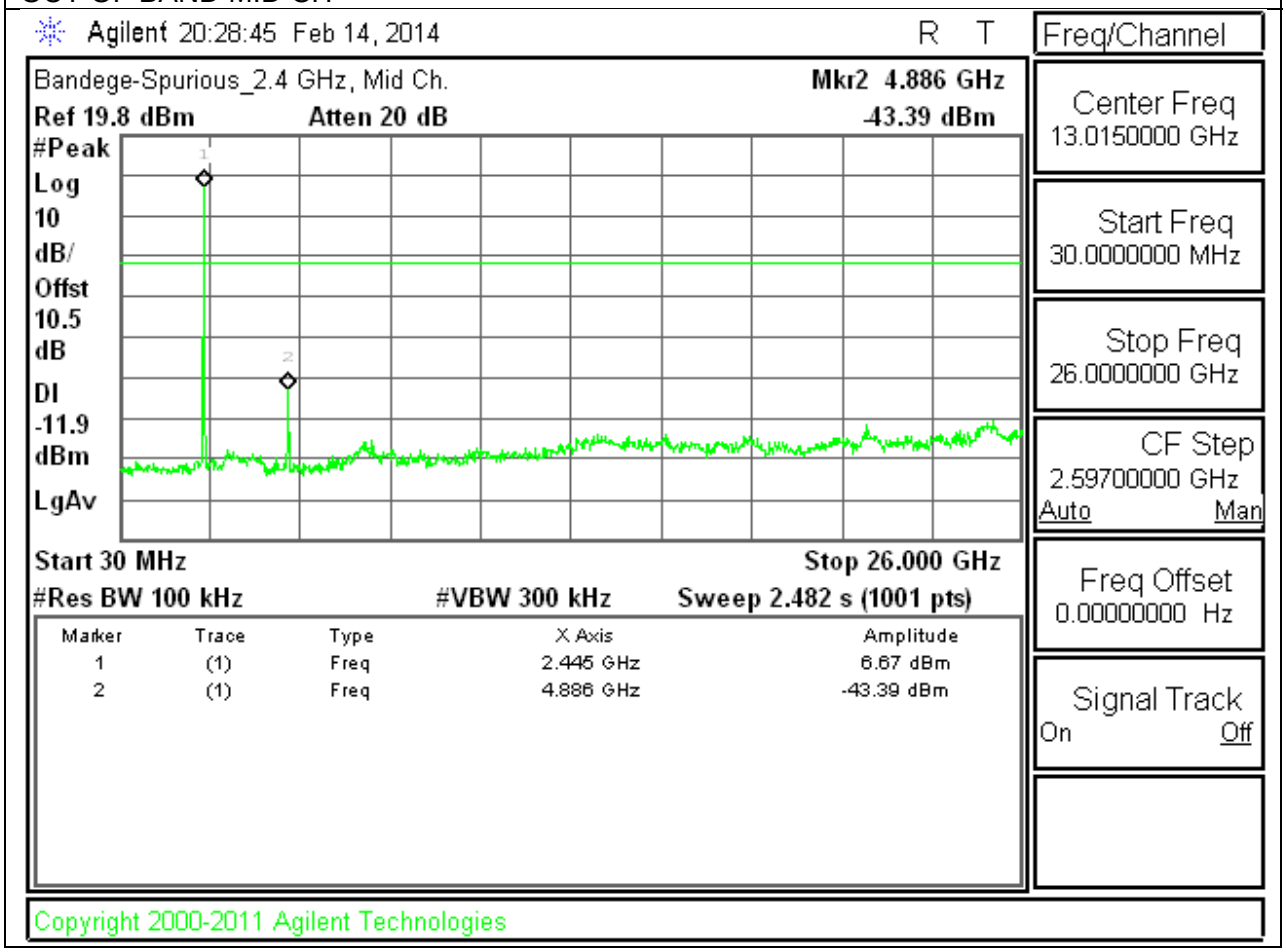
OUT OF BAND MID CH



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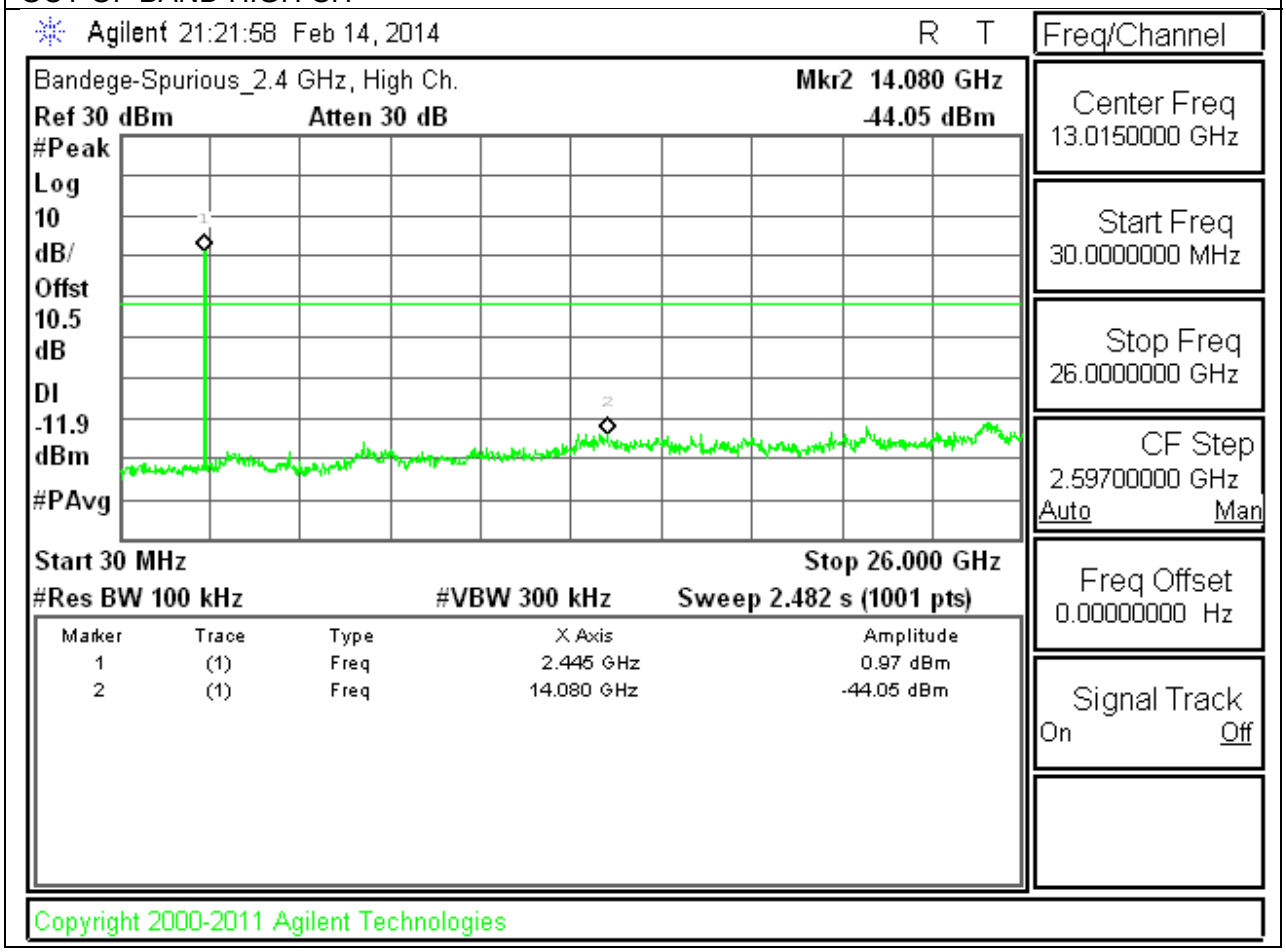
OUT OF BAND HIGH CH



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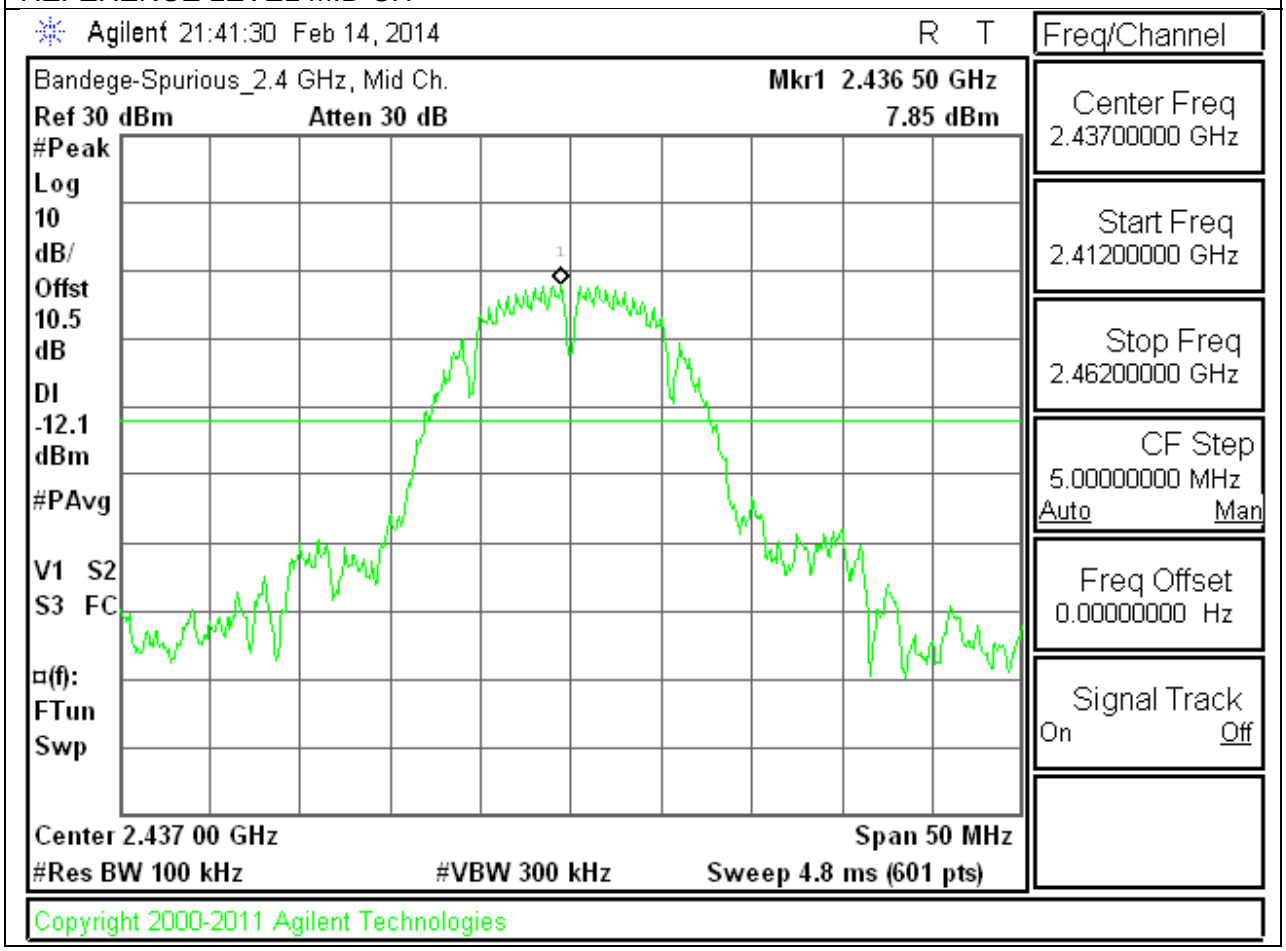
9.6.2. 802.11b MODE IN THE 2.4 GHz BAND CHAIN 1

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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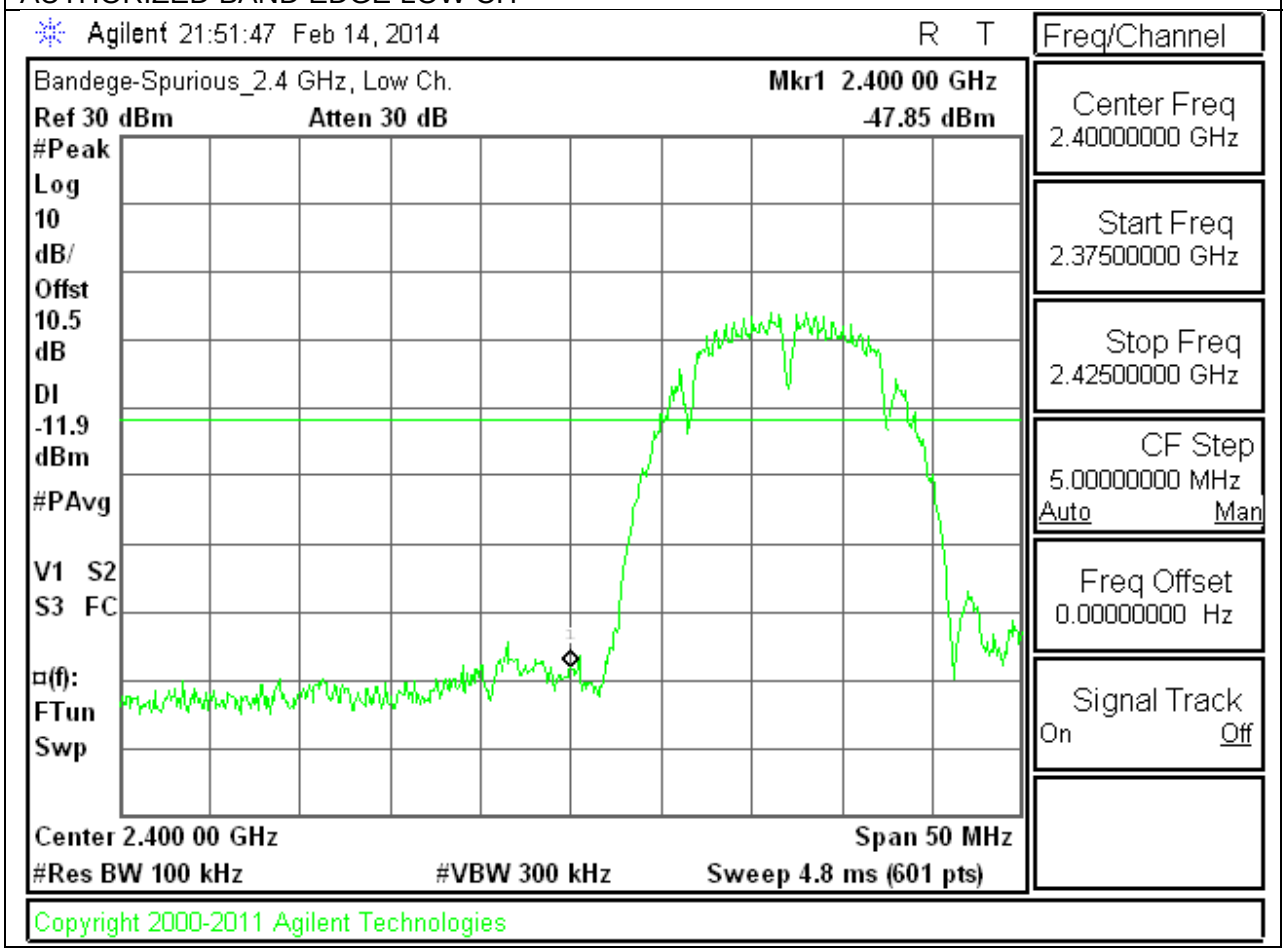
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



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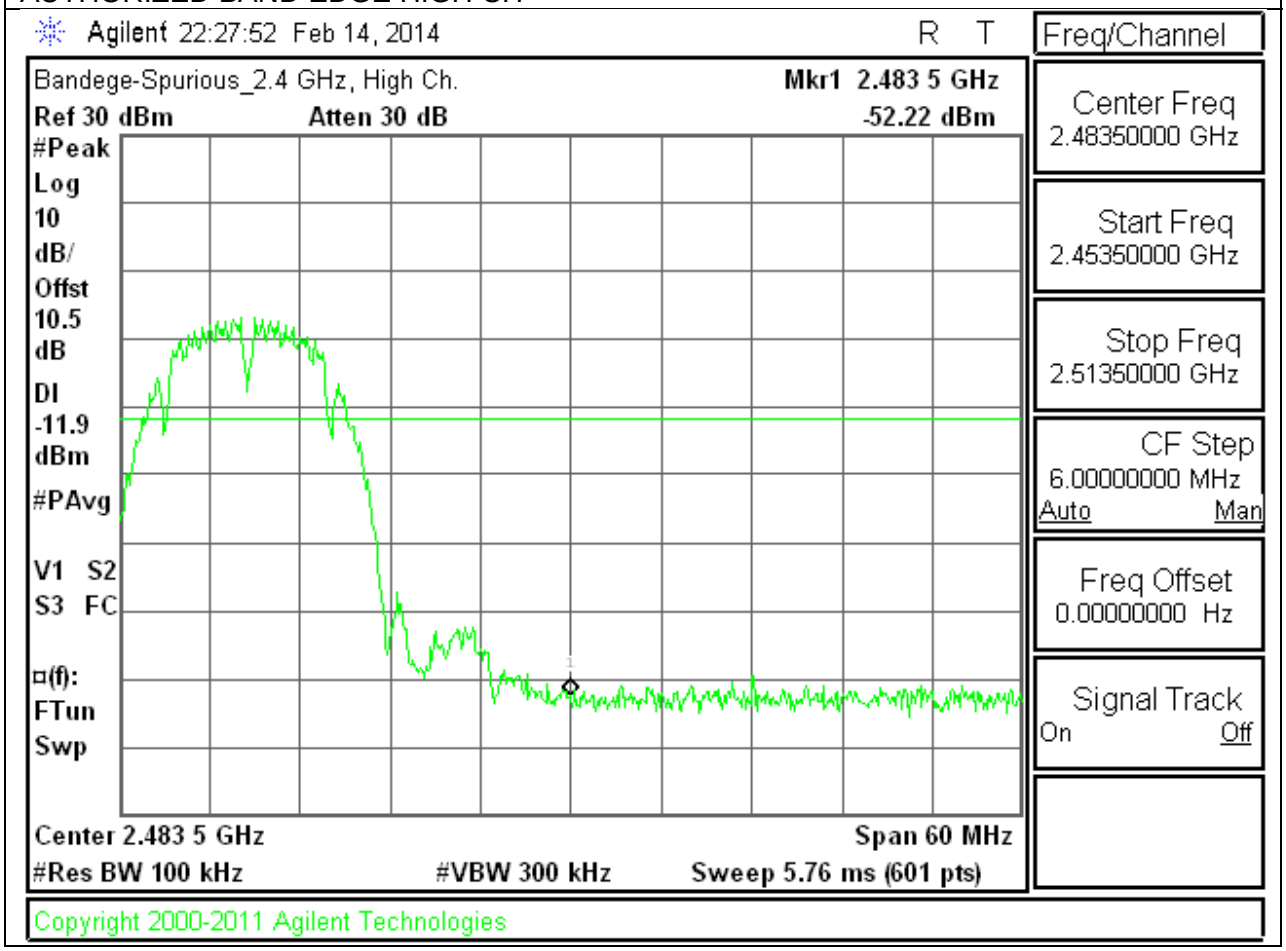
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH



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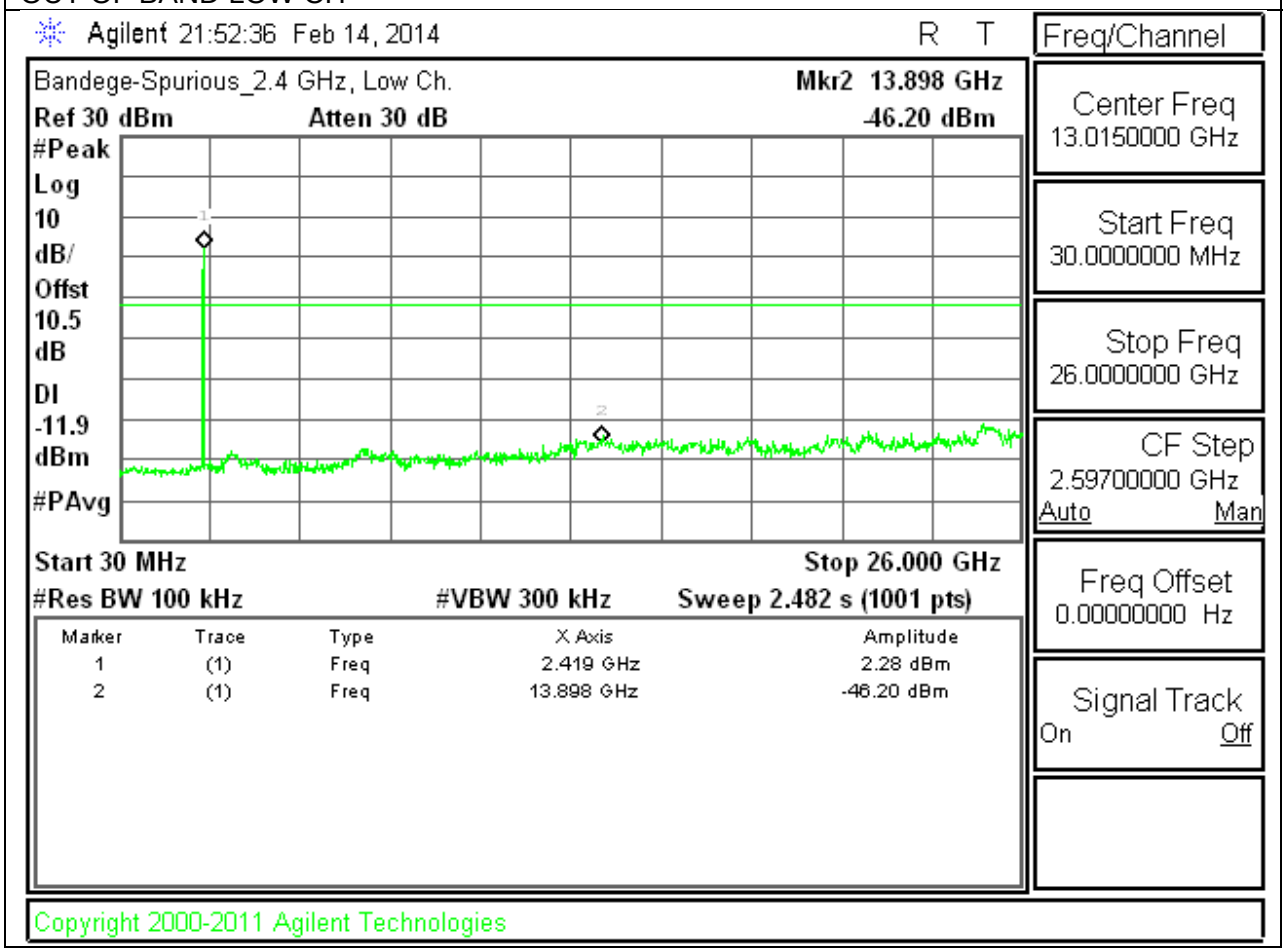
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



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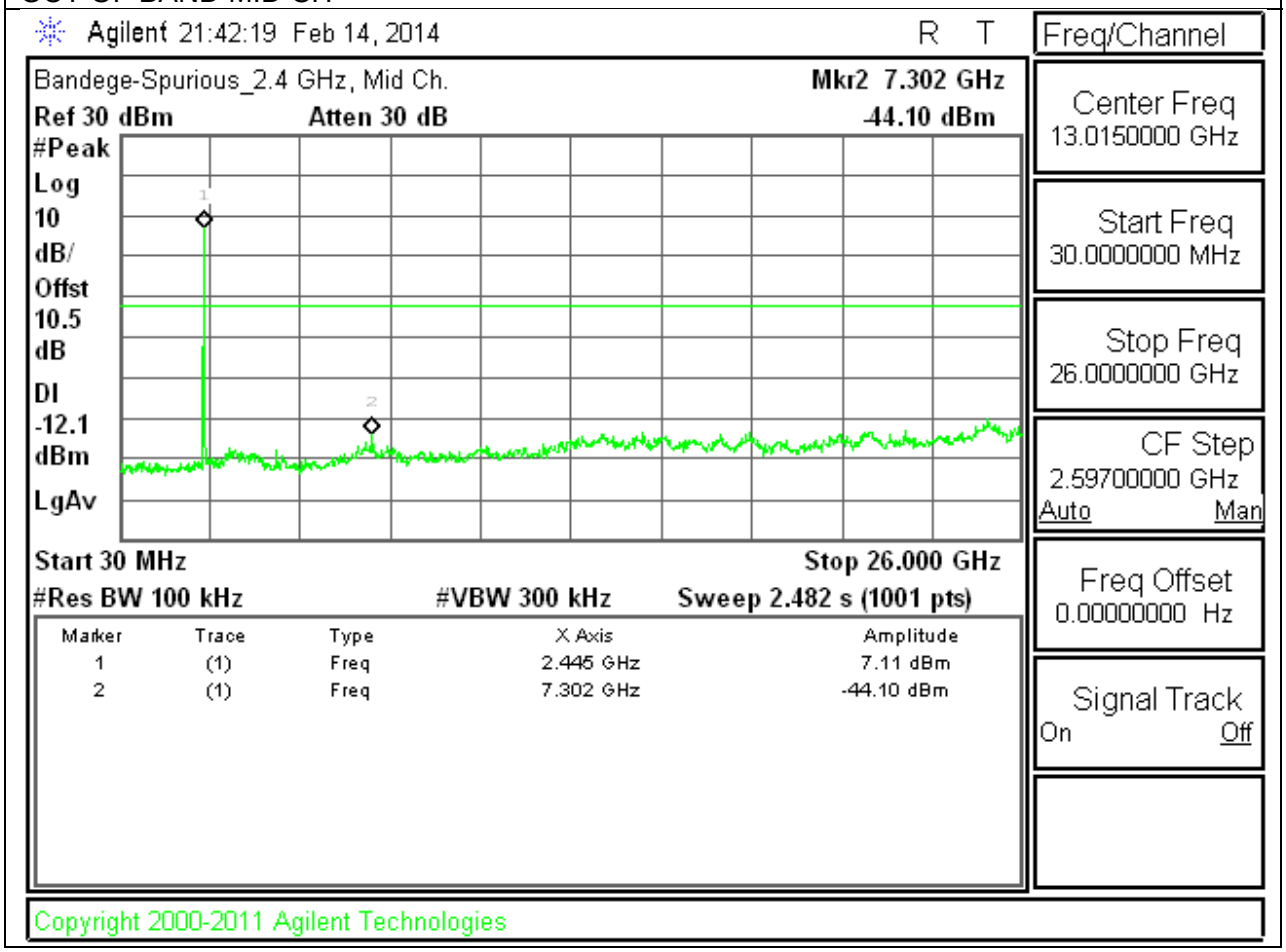
OUT OF BAND MID CH



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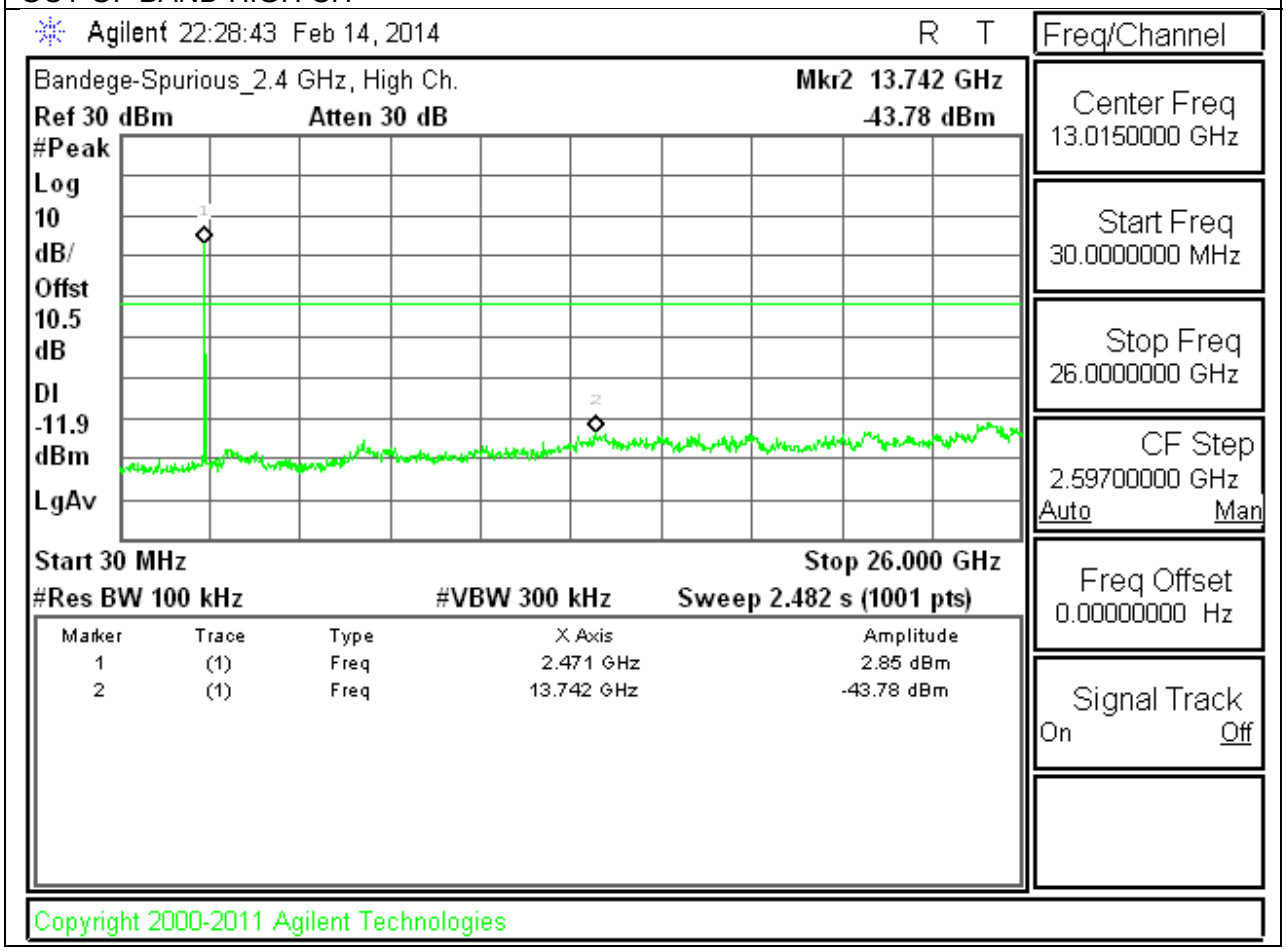
OUT OF BAND HIGH CH



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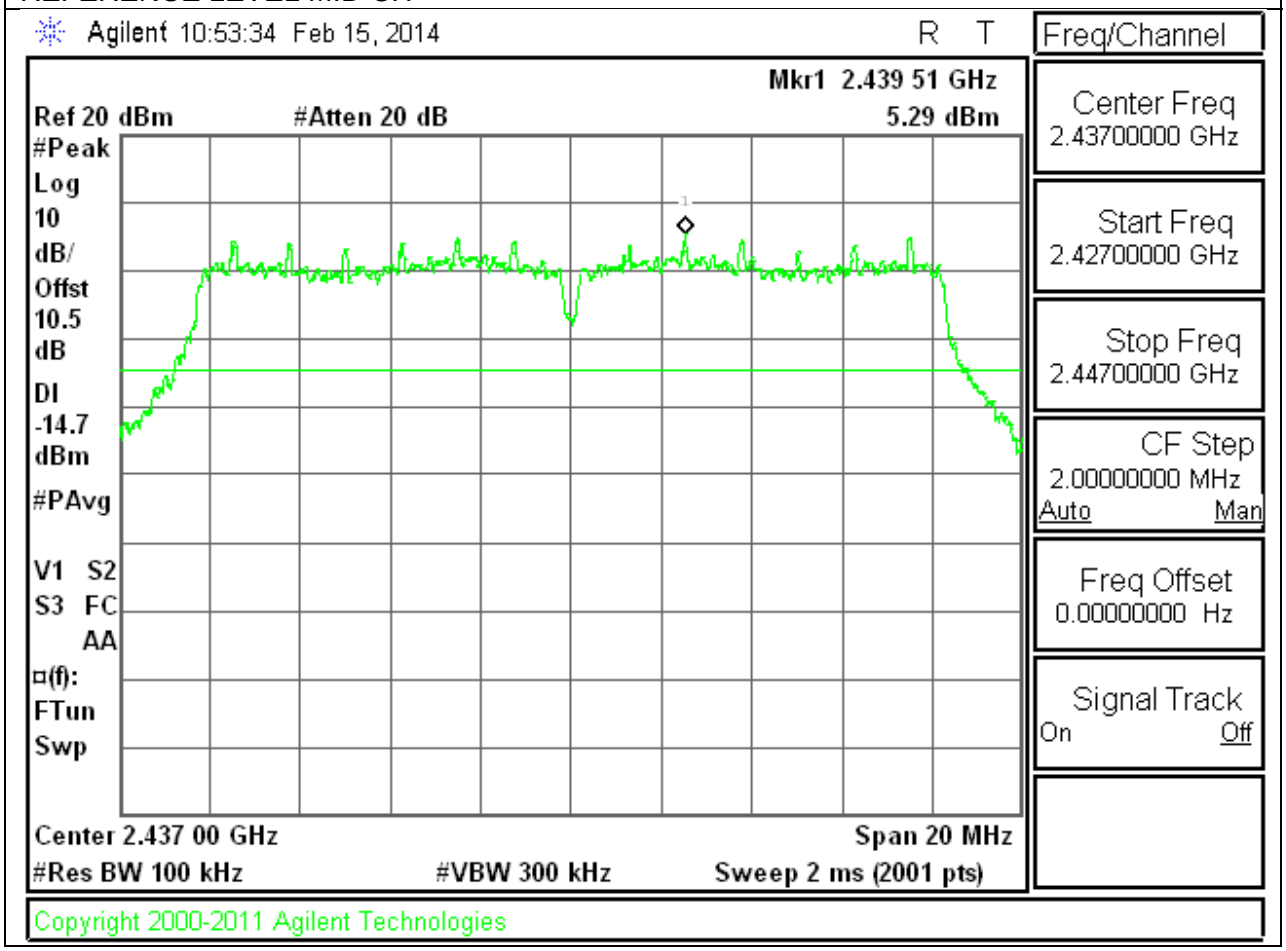
9.6.3. 802.11g MODE IN THE 2.4 GHz BAND CHAIN 0

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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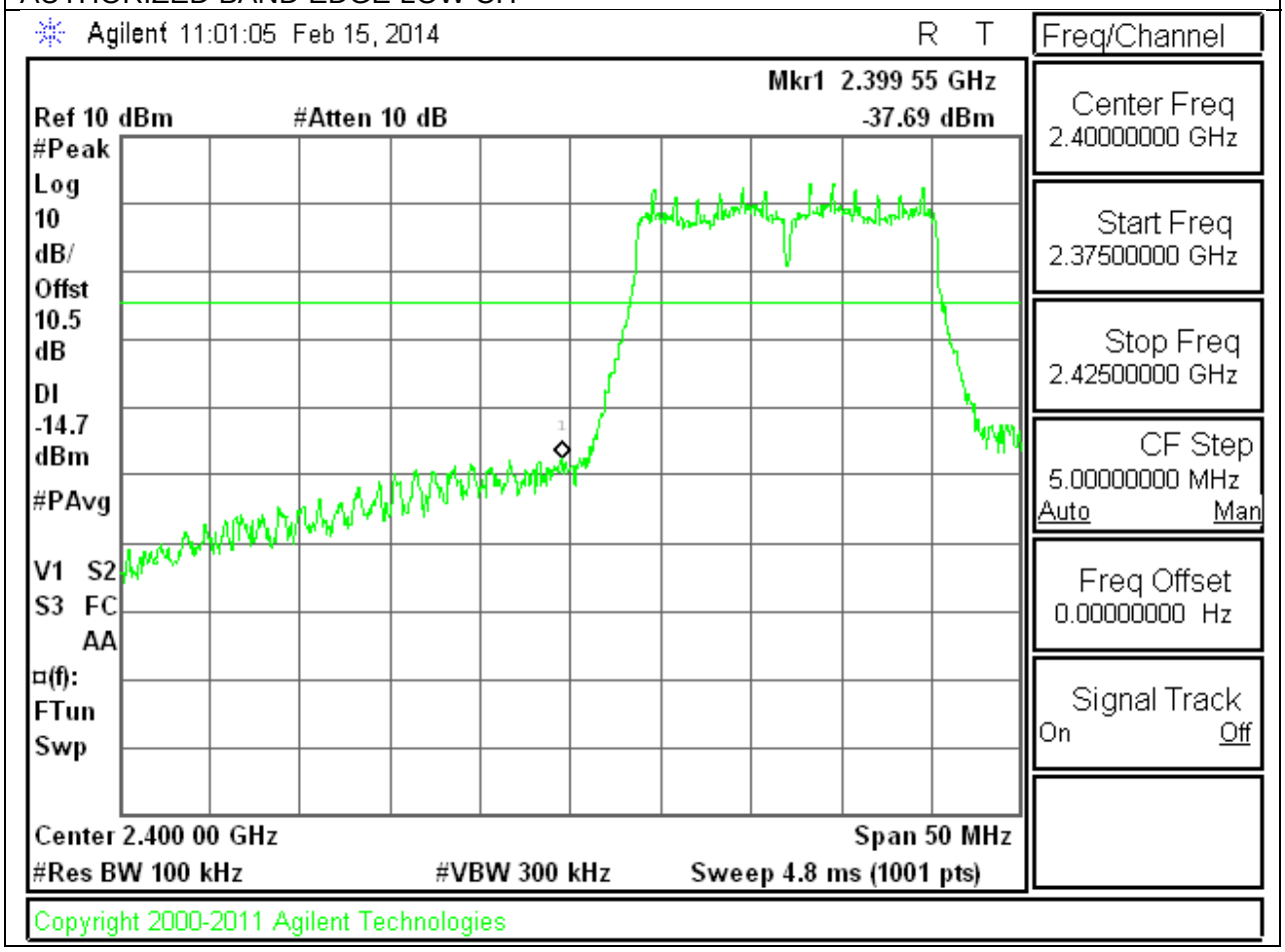
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



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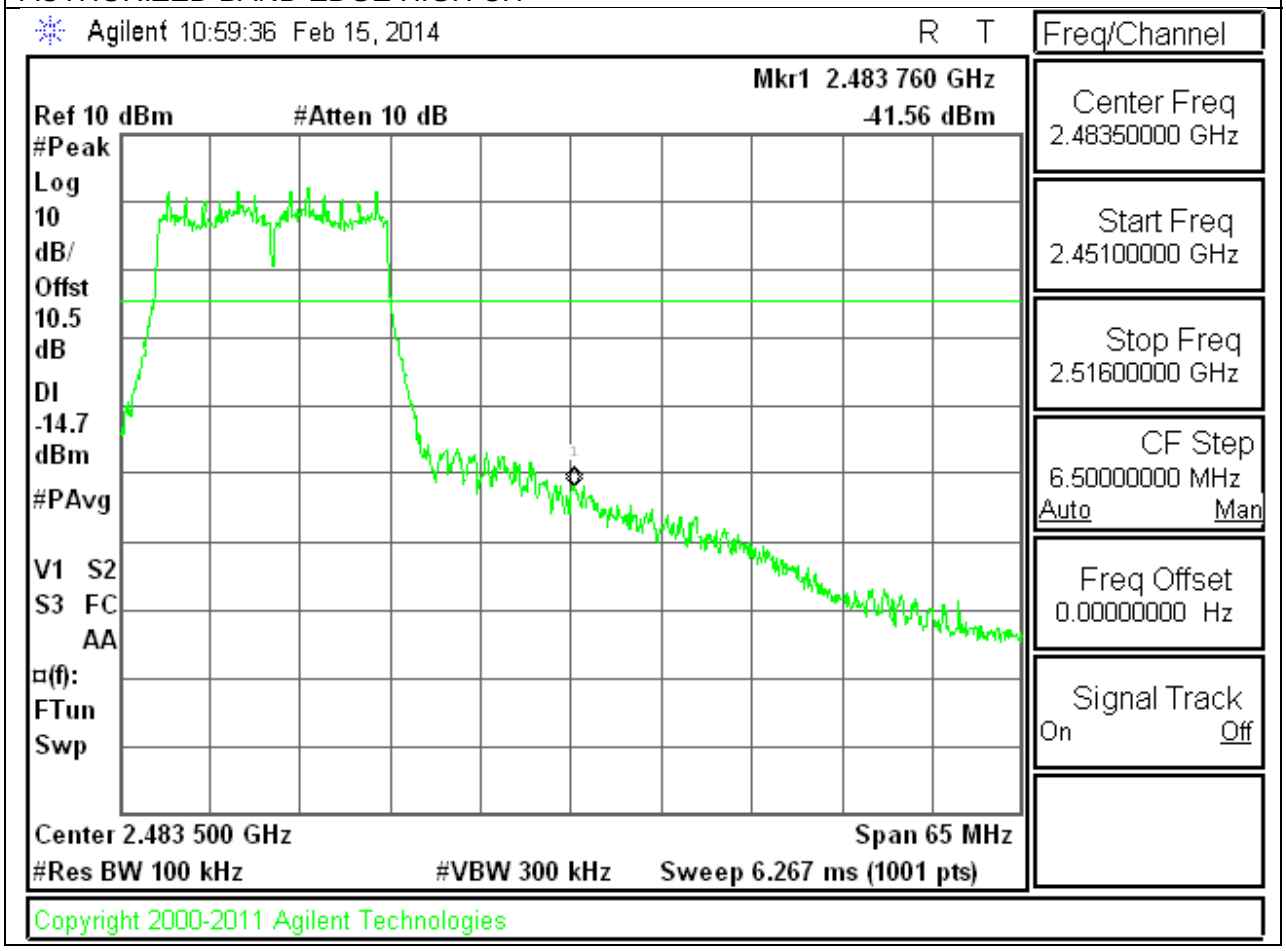
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH



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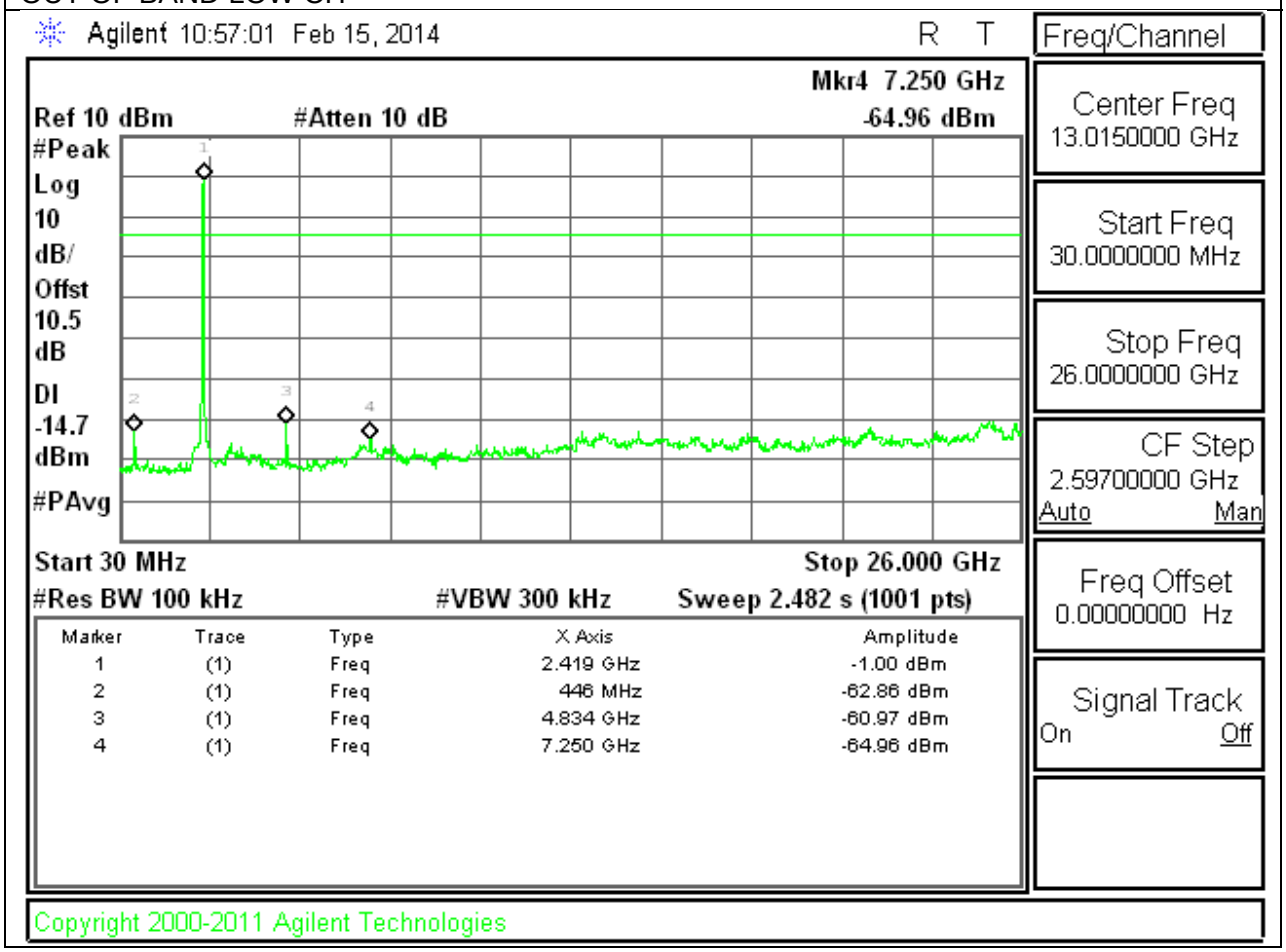
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.419 GHz	-1.00 dBm
2	(1)	Freq	446 MHz	-62.86 dBm
3	(1)	Freq	4.834 GHz	-60.97 dBm
4	(1)	Freq	7.250 GHz	-64.96 dBm

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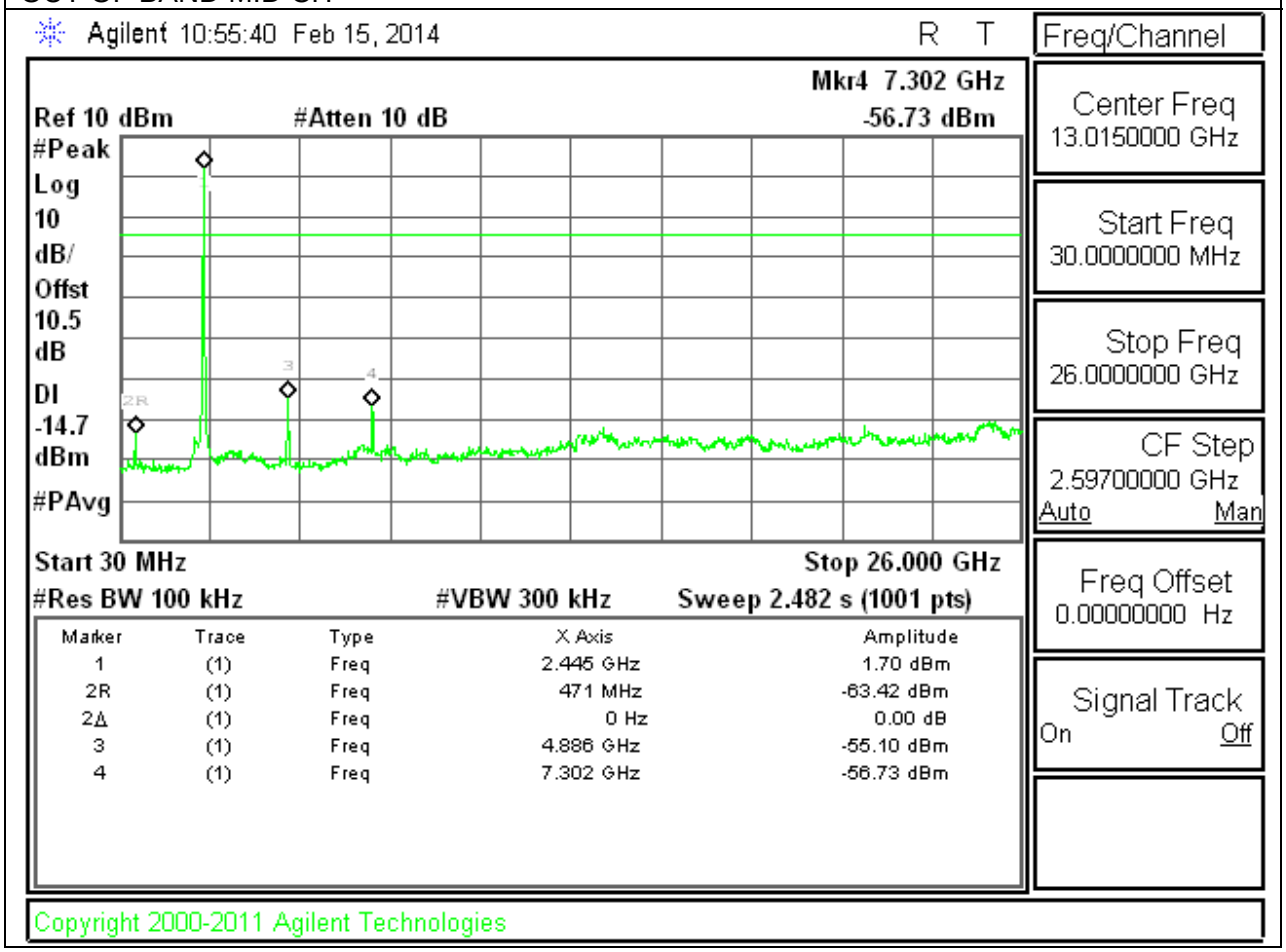
OUT OF BAND MID CH



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.445 GHz	1.70 dBm
2R	(1)	Freq	471 MHz	-63.42 dBm
2Δ	(1)	Freq	0 Hz	0.00 dB
3	(1)	Freq	4.886 GHz	-55.10 dBm
4	(1)	Freq	7.302 GHz	-56.73 dBm

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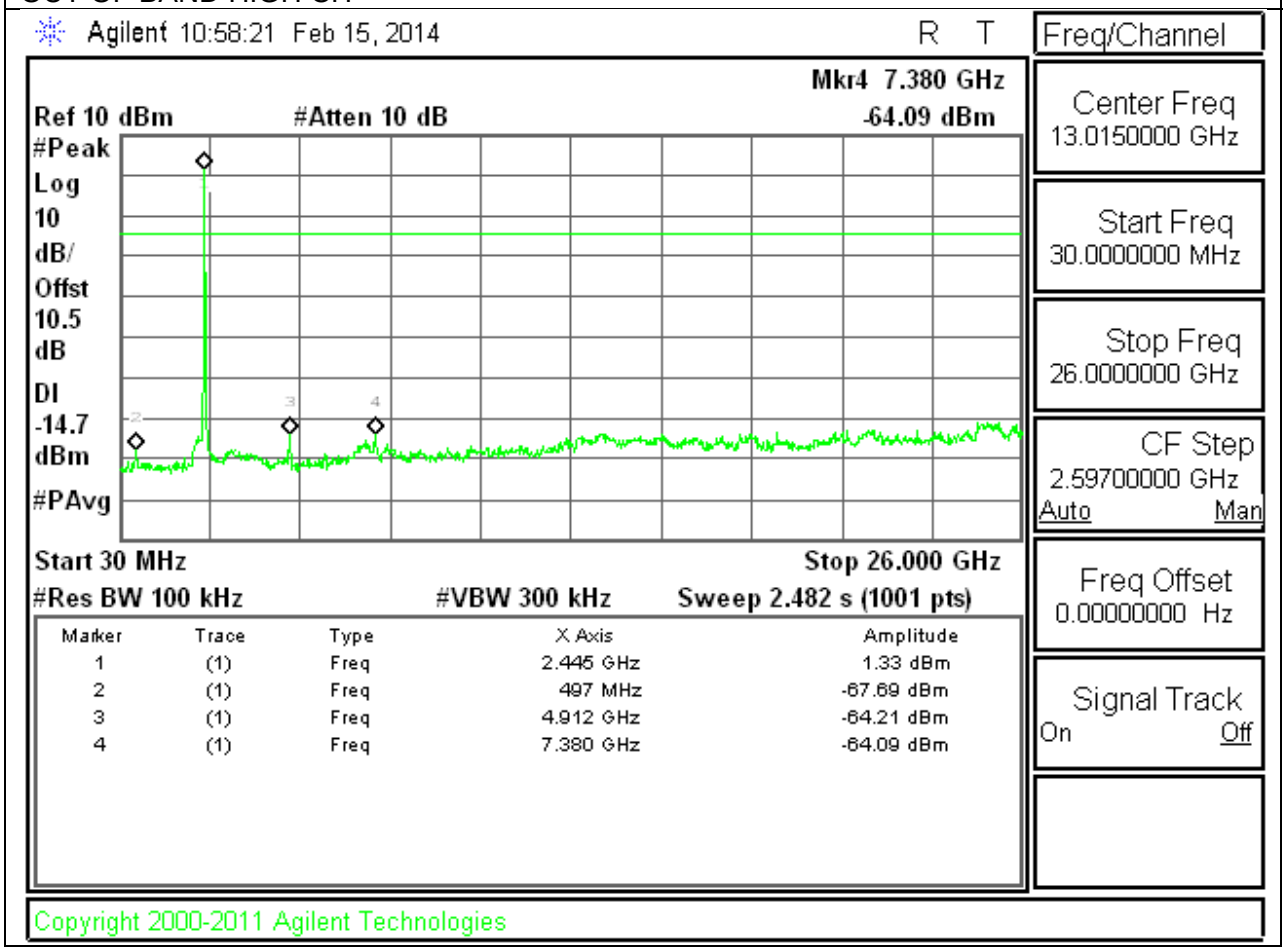
OUT OF BAND HIGH CH



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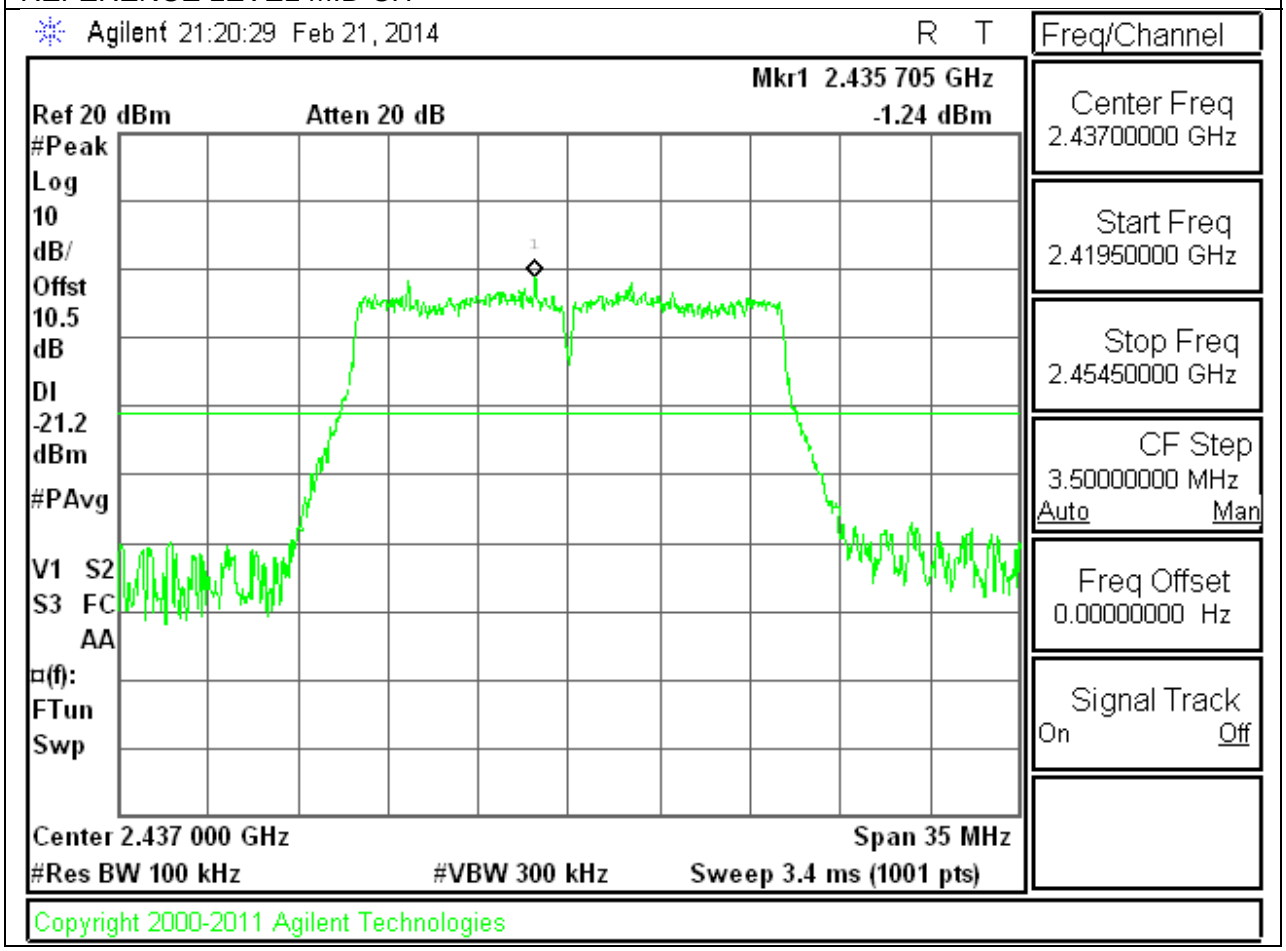
9.6.4. 802.11g MODE IN THE 2.4 GHz BAND CHAIN 1

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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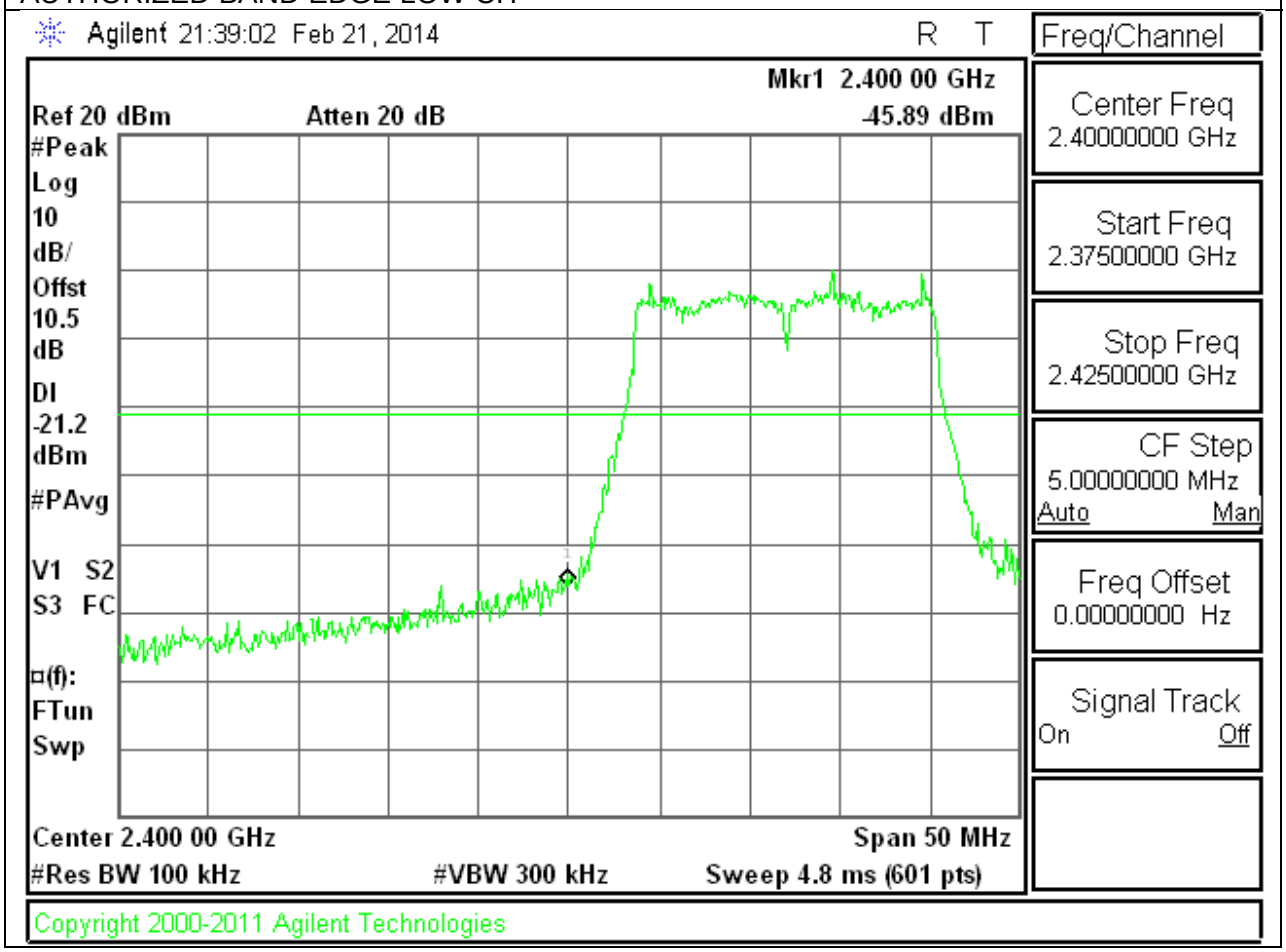
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



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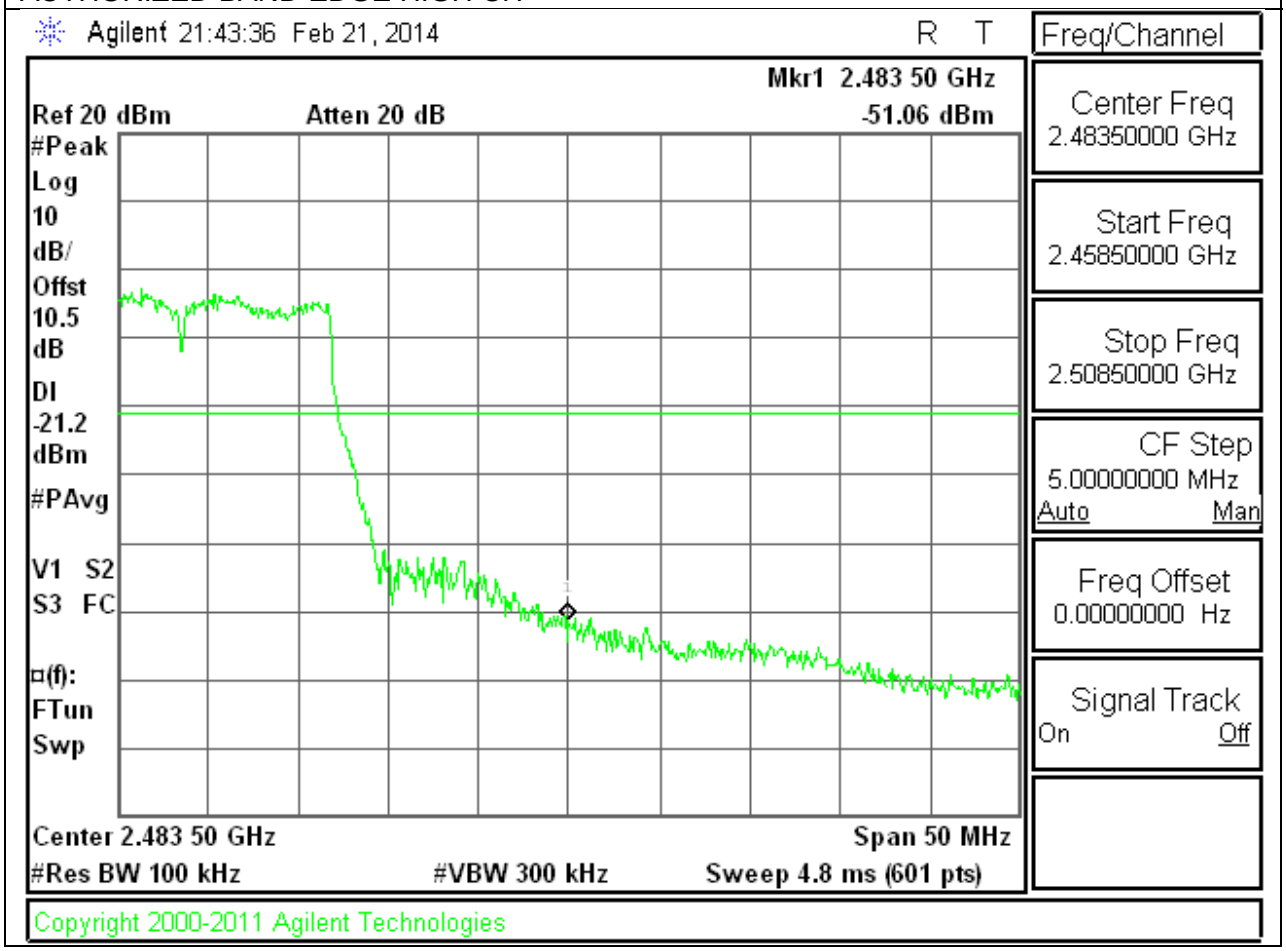
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH



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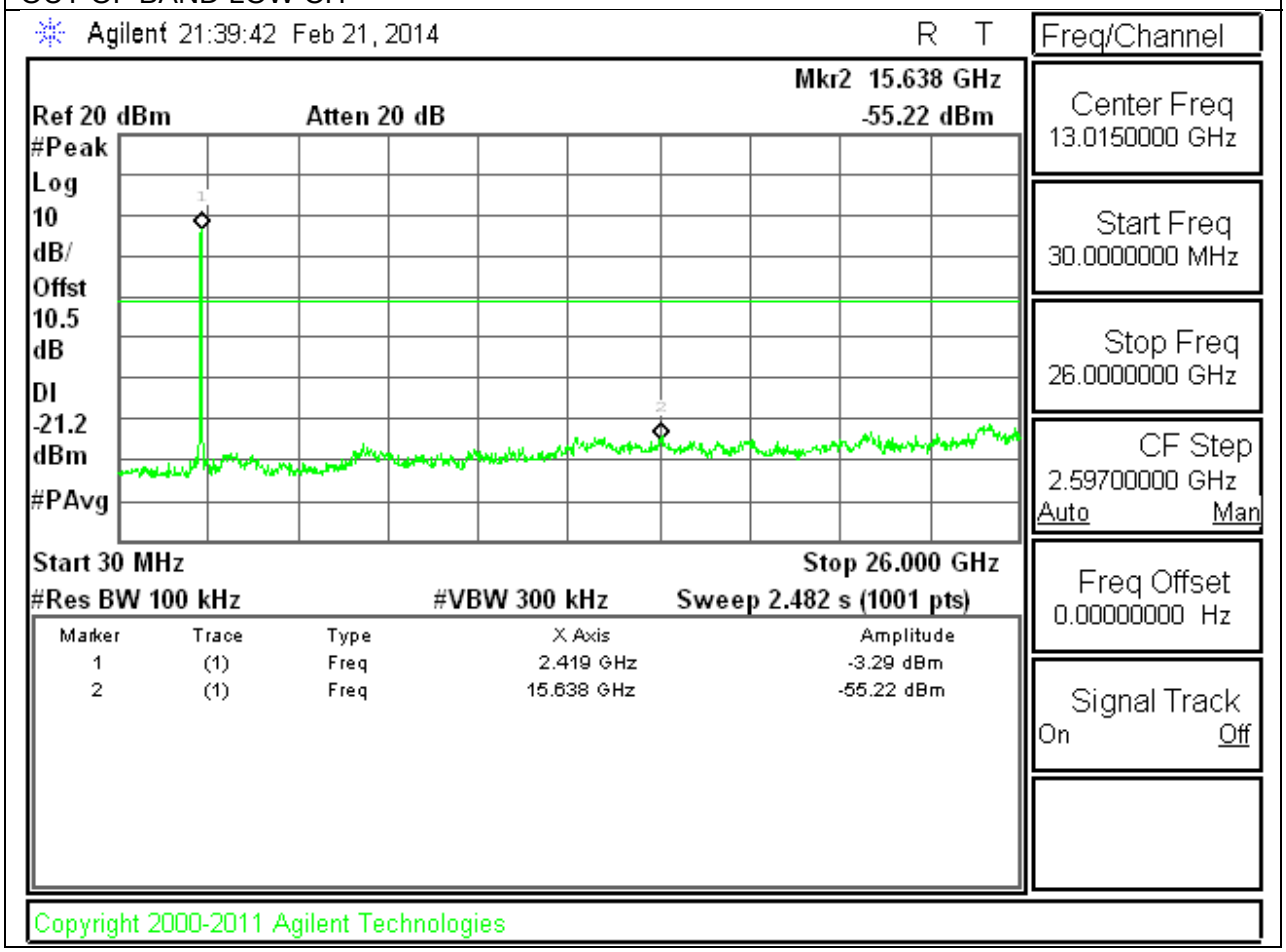
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



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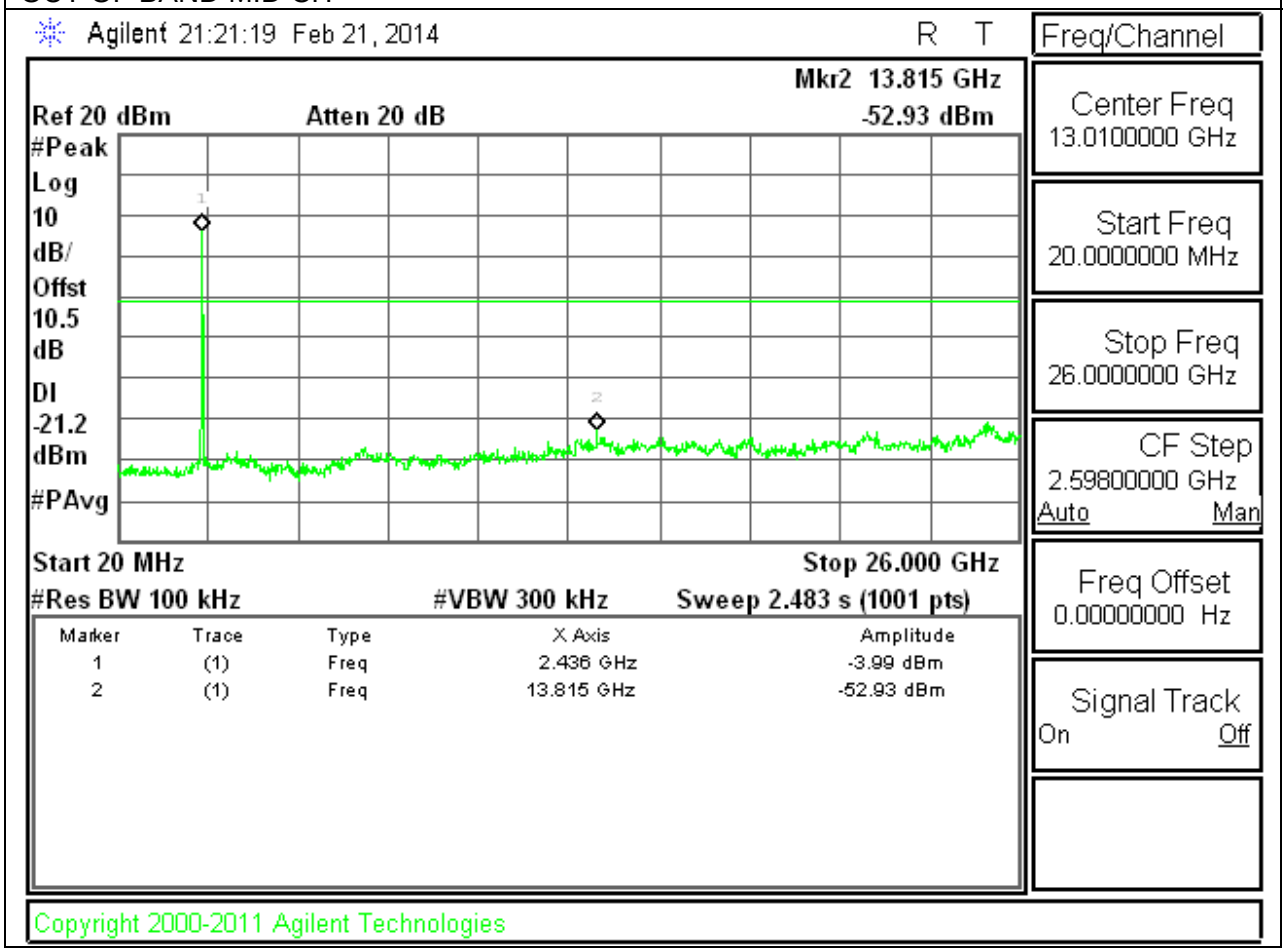
OUT OF BAND MID CH



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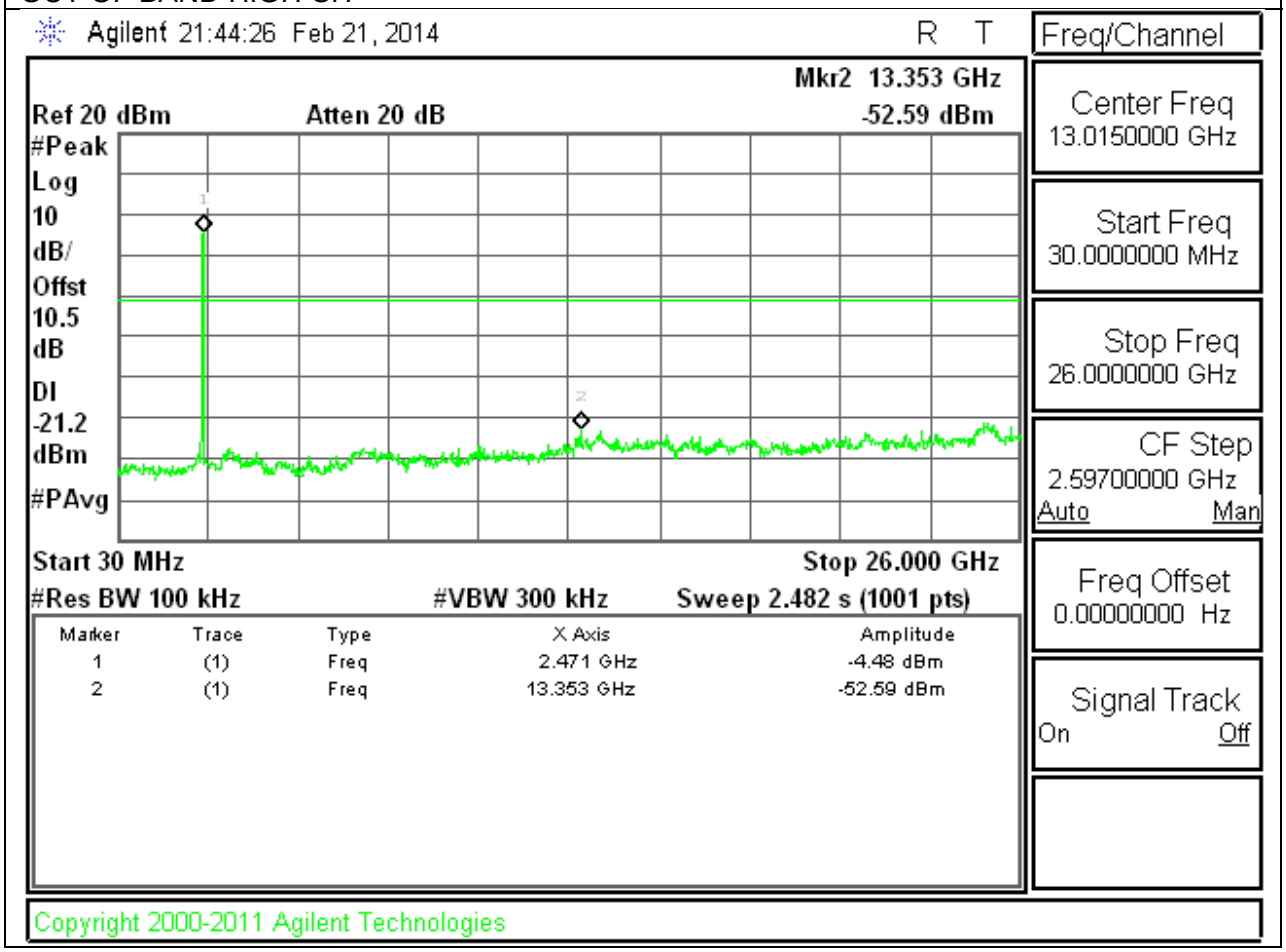
OUT OF BAND HIGH CH



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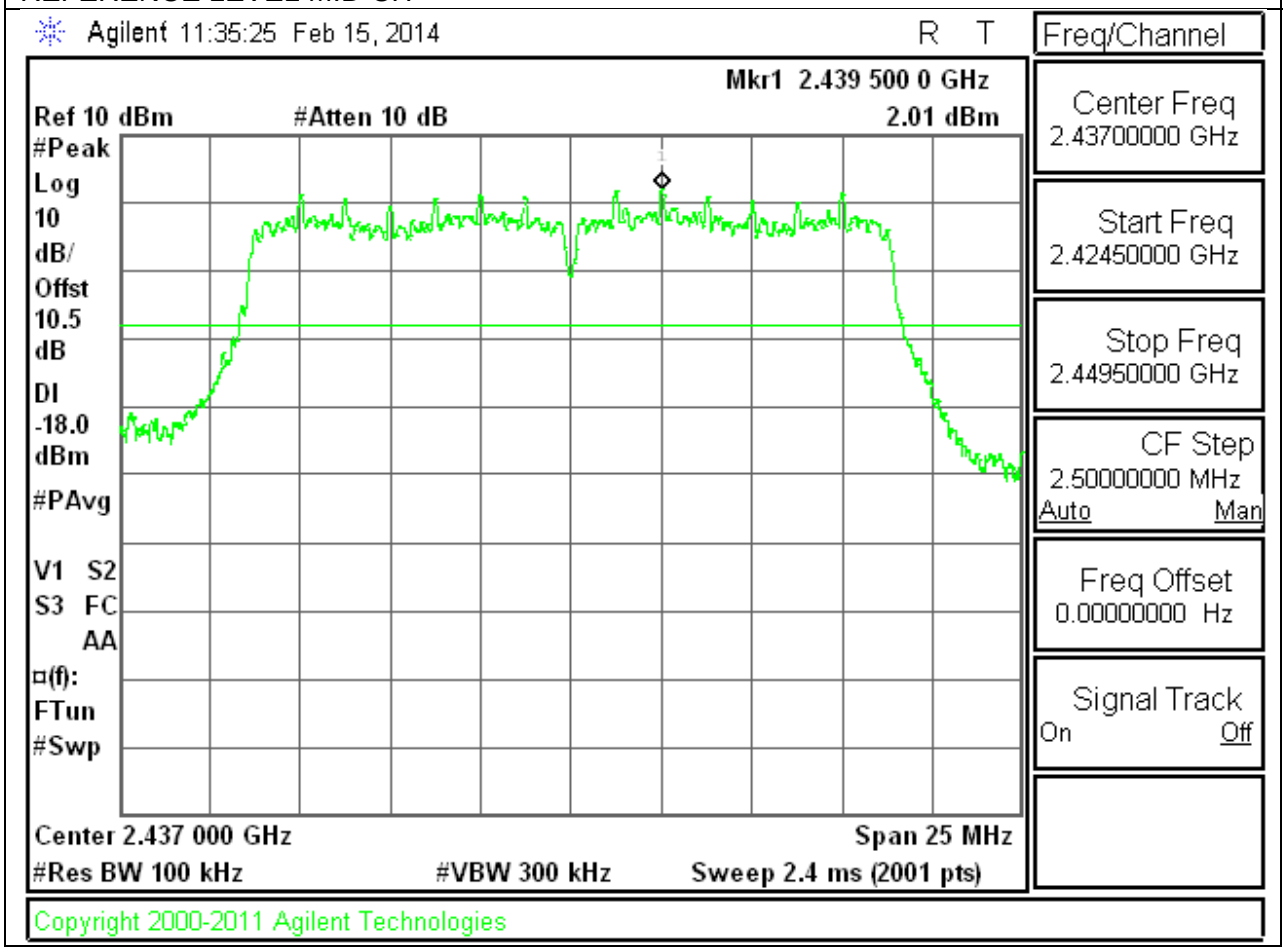
9.6.5. 802.11n MODE IN THE 2.4 GHz BAND CHAIN 0

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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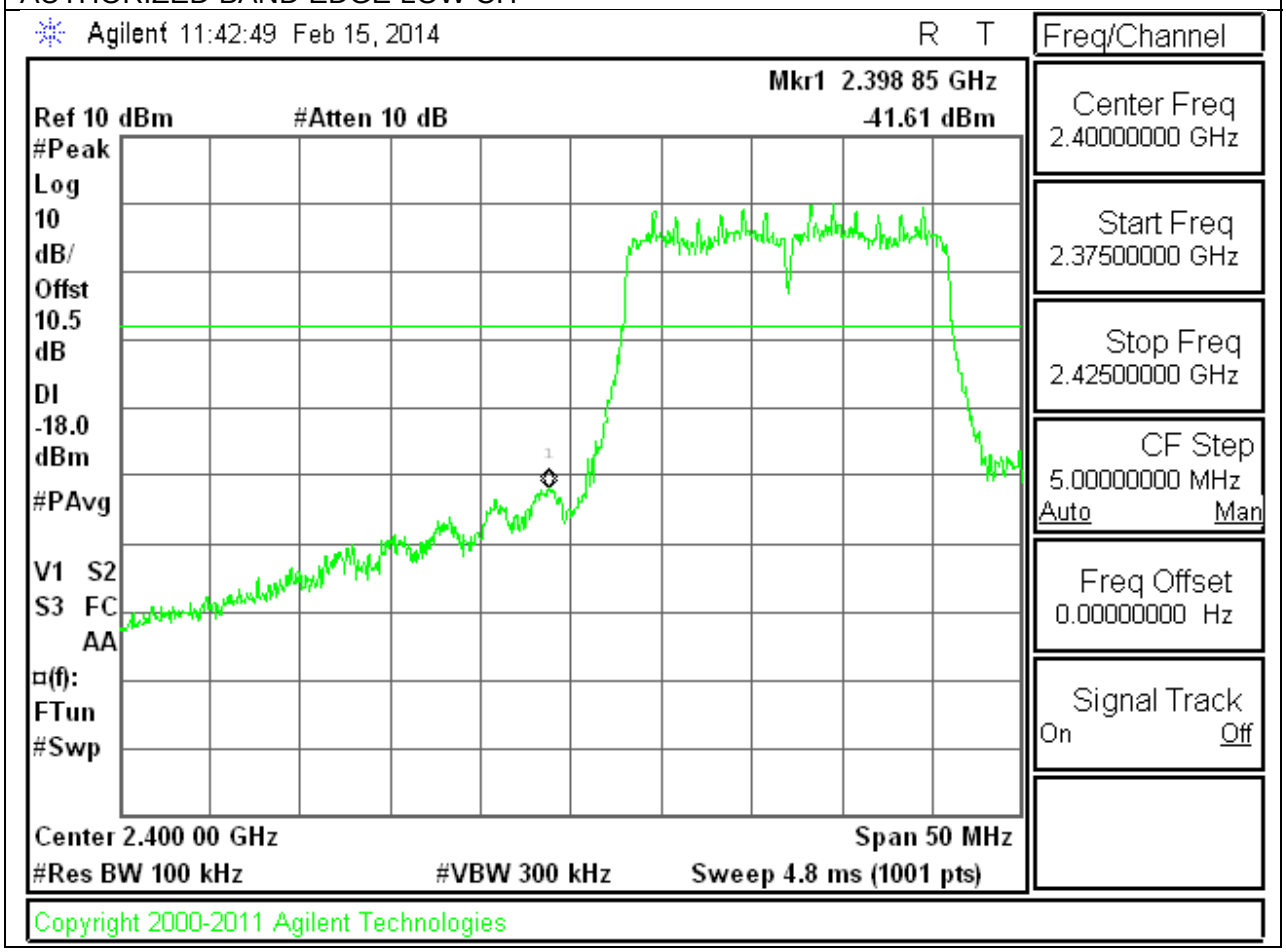
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



HIGH CHANNEL BANDEDGE

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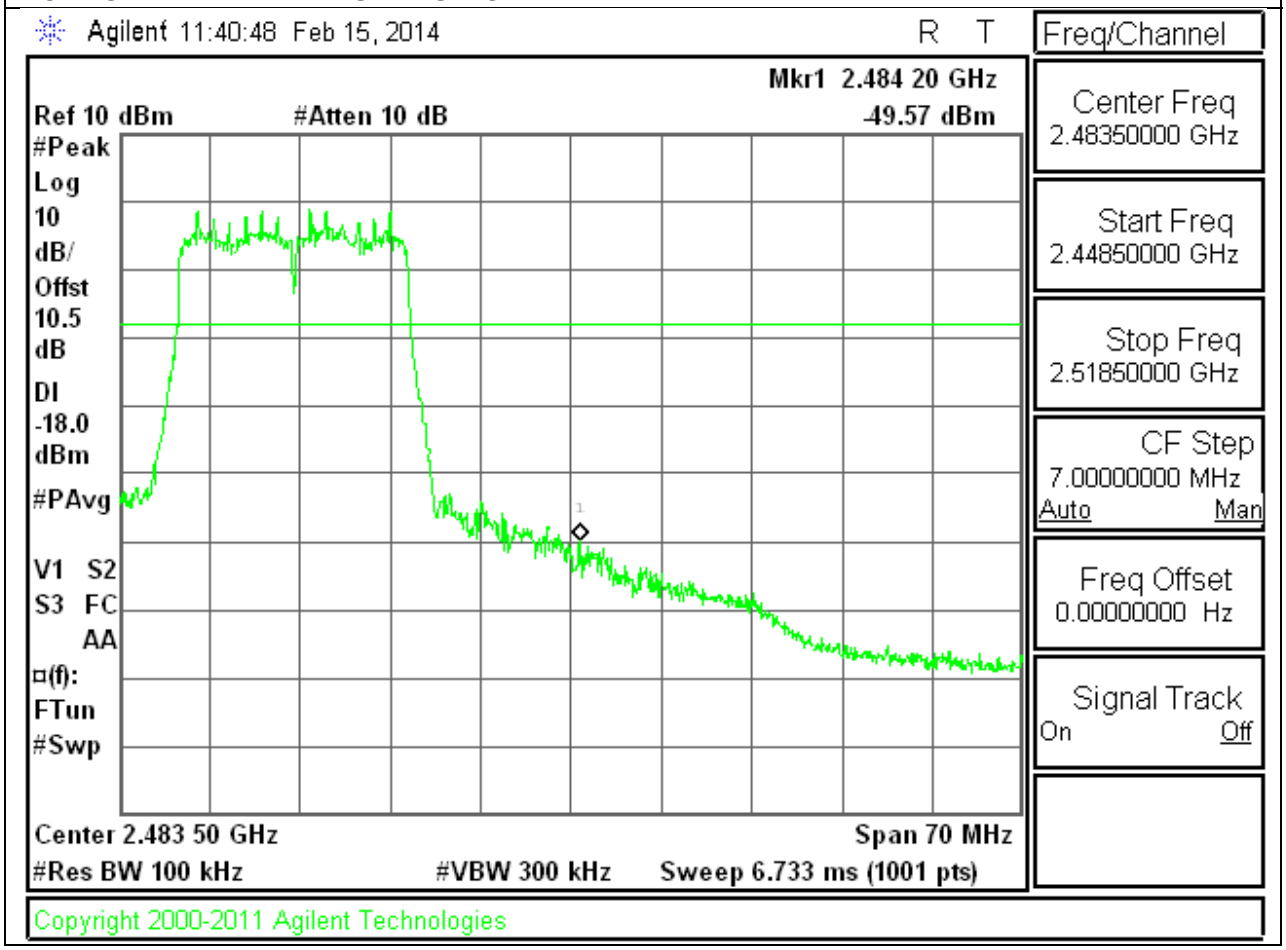
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH



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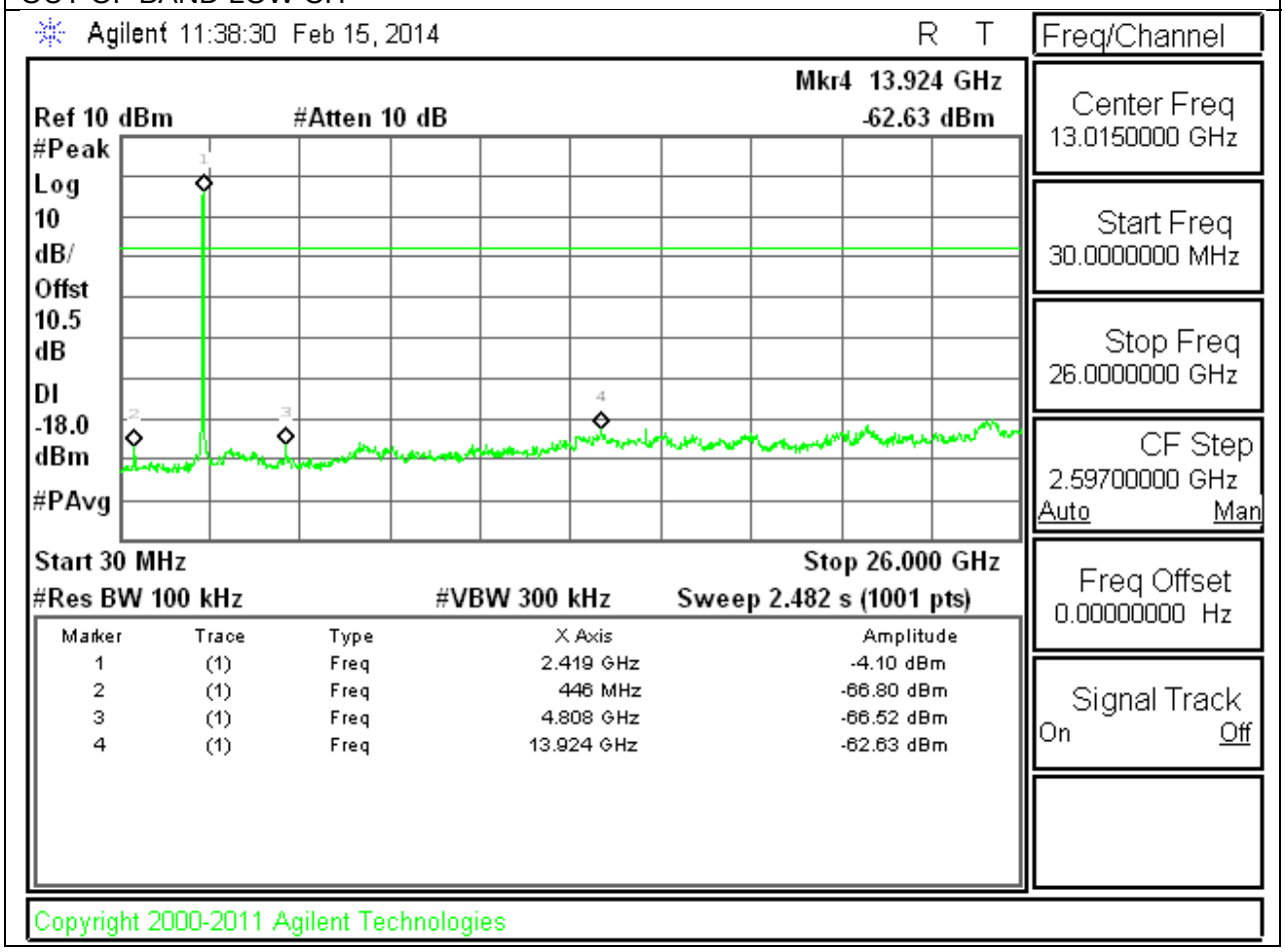
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.419 GHz	-4.10 dBm
2	(1)	Freq	446 MHz	-66.80 dBm
3	(1)	Freq	4.808 GHz	-66.52 dBm
4	(1)	Freq	13.924 GHz	-62.63 dBm

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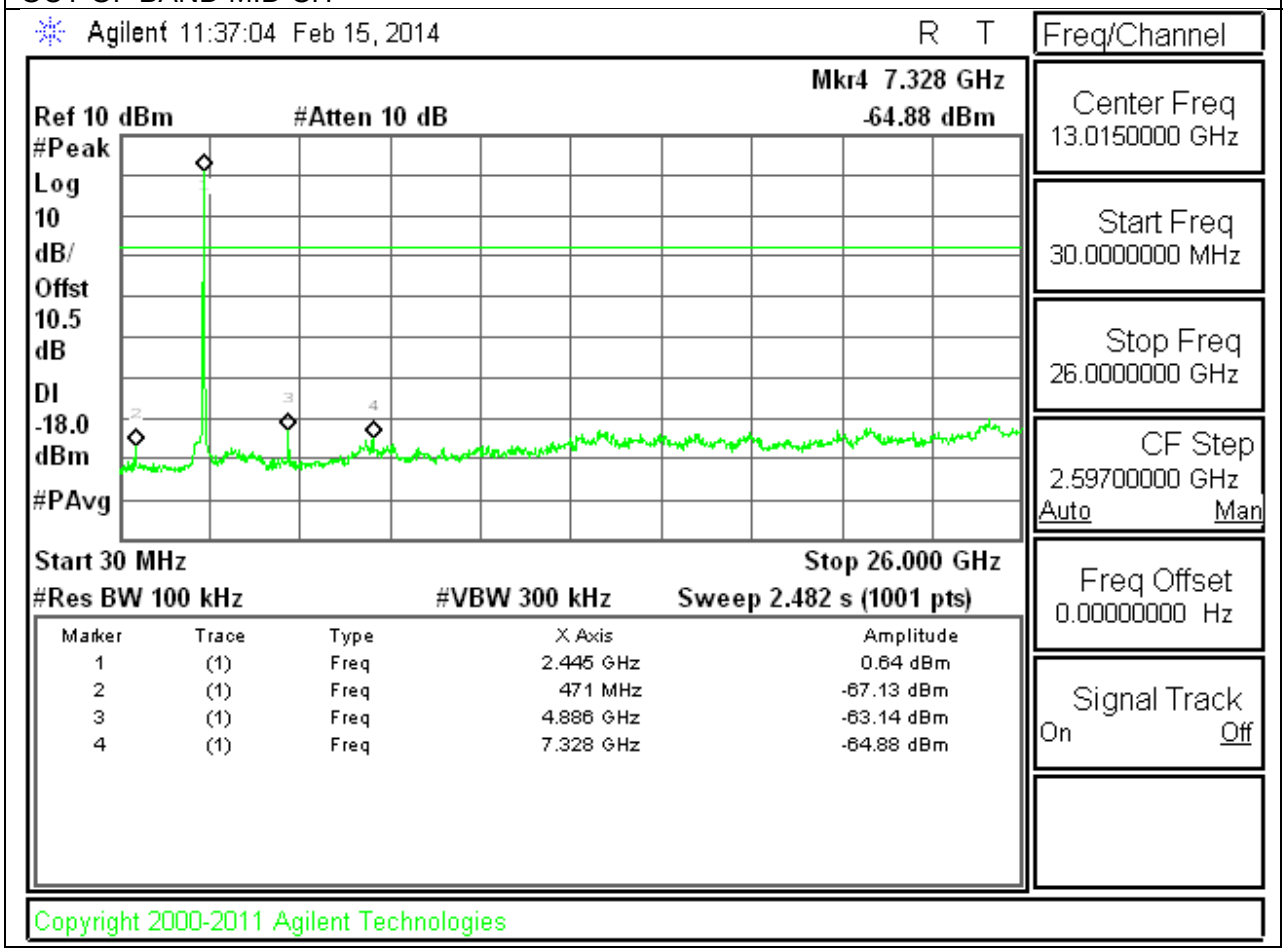
OUT OF BAND MID CH



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.445 GHz	0.64 dBm
2	(1)	Freq	471 MHz	-67.13 dBm
3	(1)	Freq	4.886 GHz	-63.14 dBm
4	(1)	Freq	7.328 GHz	-64.88 dBm

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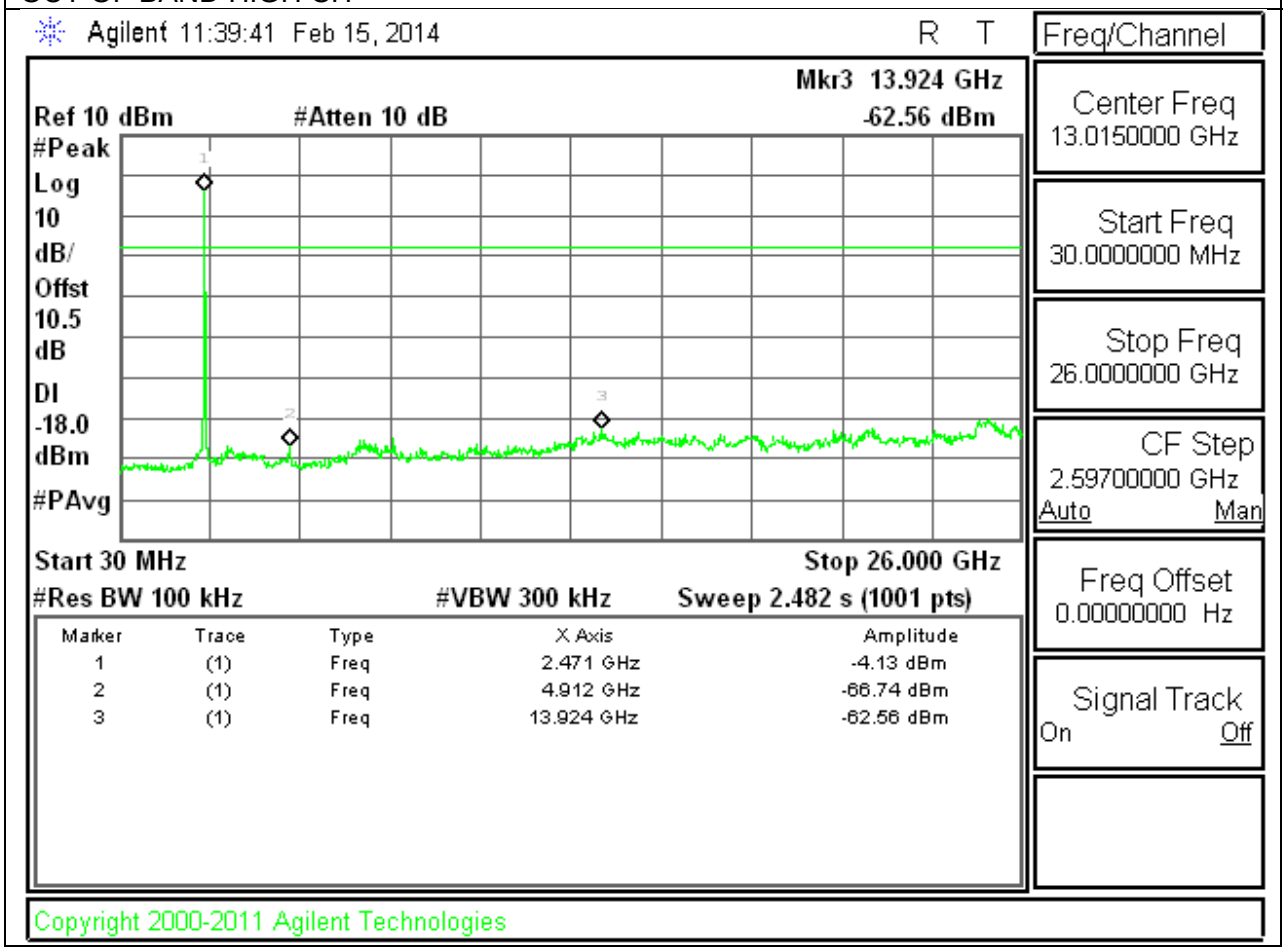
OUT OF BAND HIGH CH



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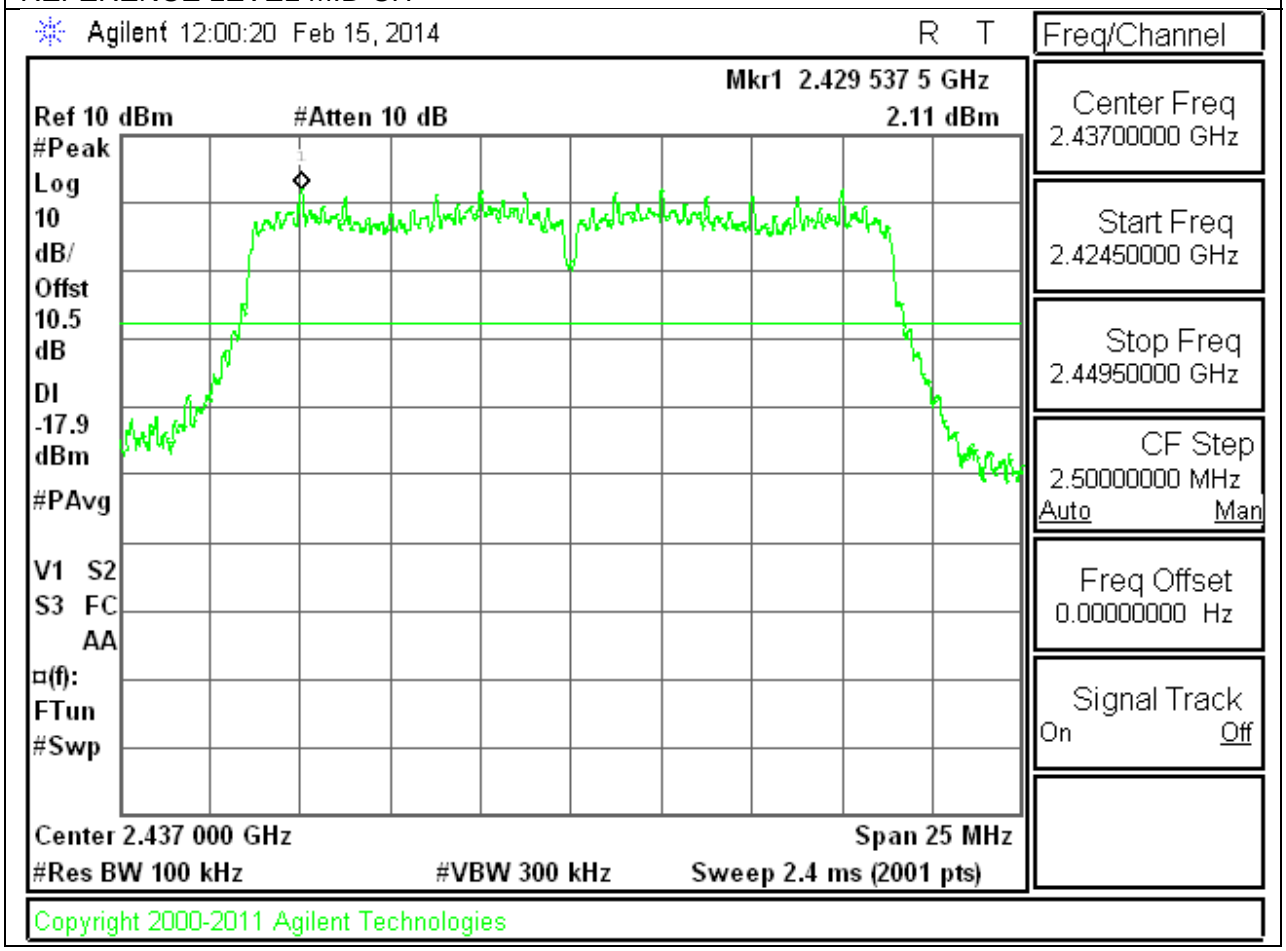
9.6.6. 802.11n MODE IN THE 2.4 GHz BAND CHAIN 1

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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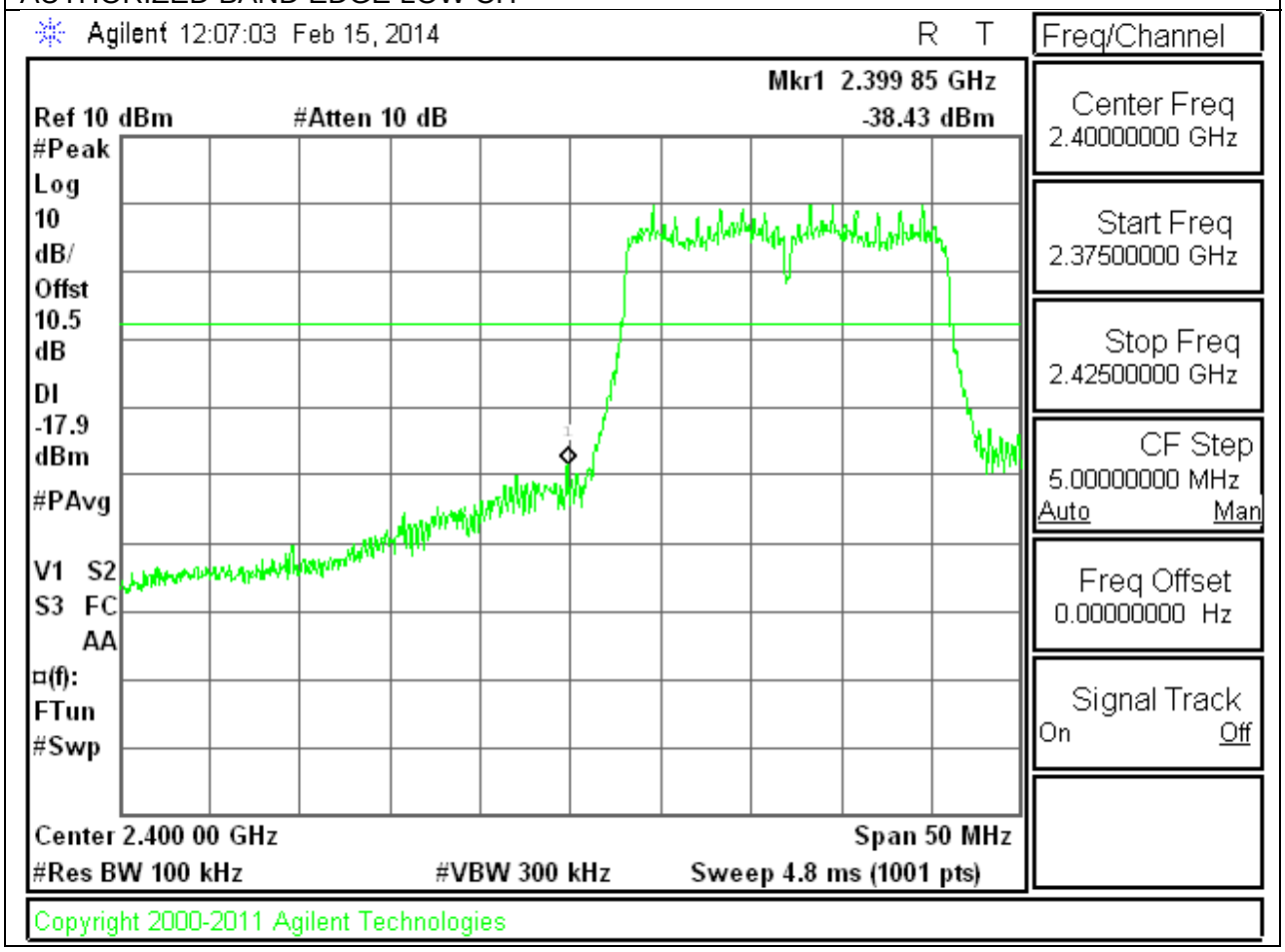
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



HIGH CHANNEL BANDEDGE

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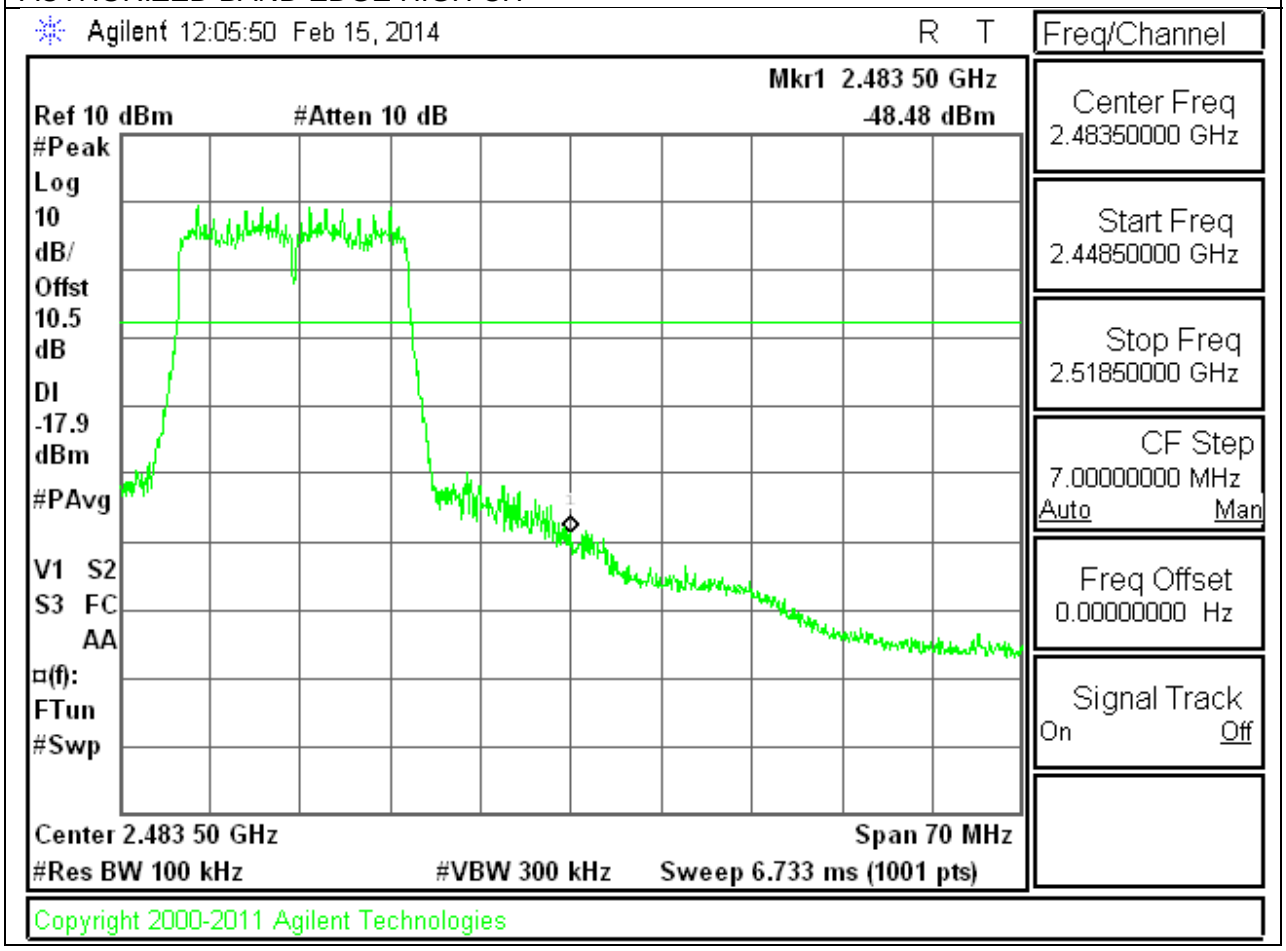
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH



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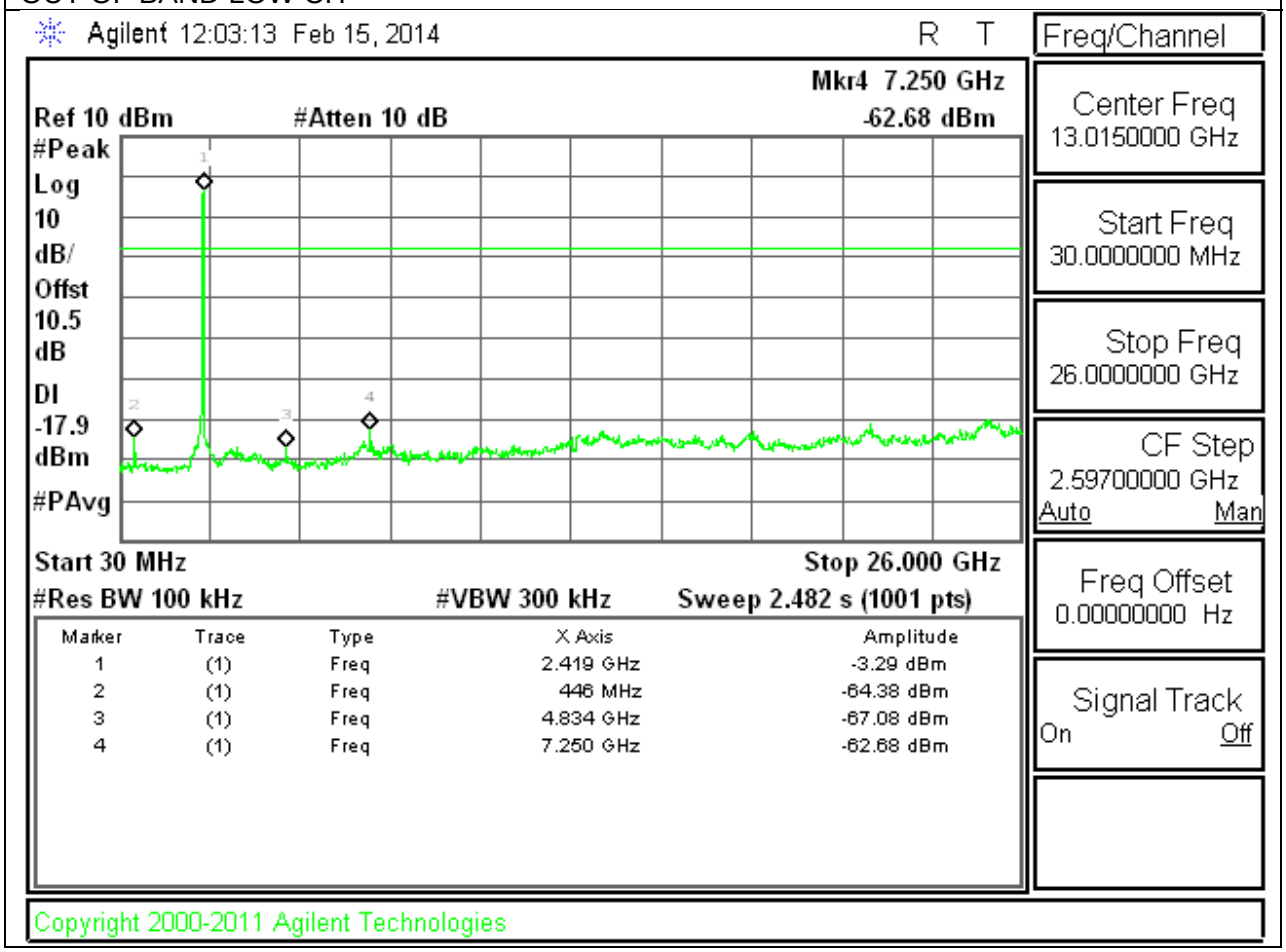
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



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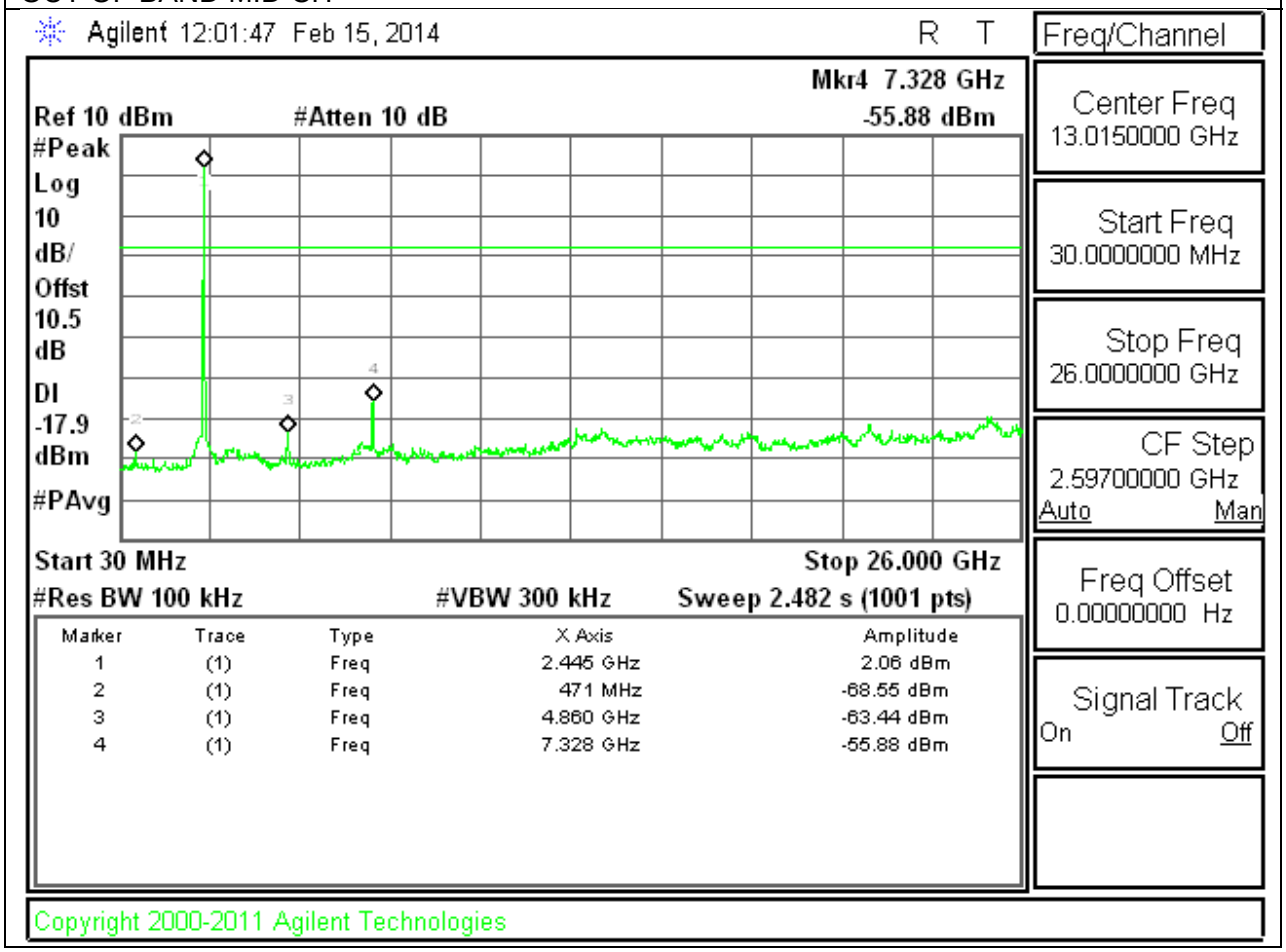
OUT OF BAND MID CH



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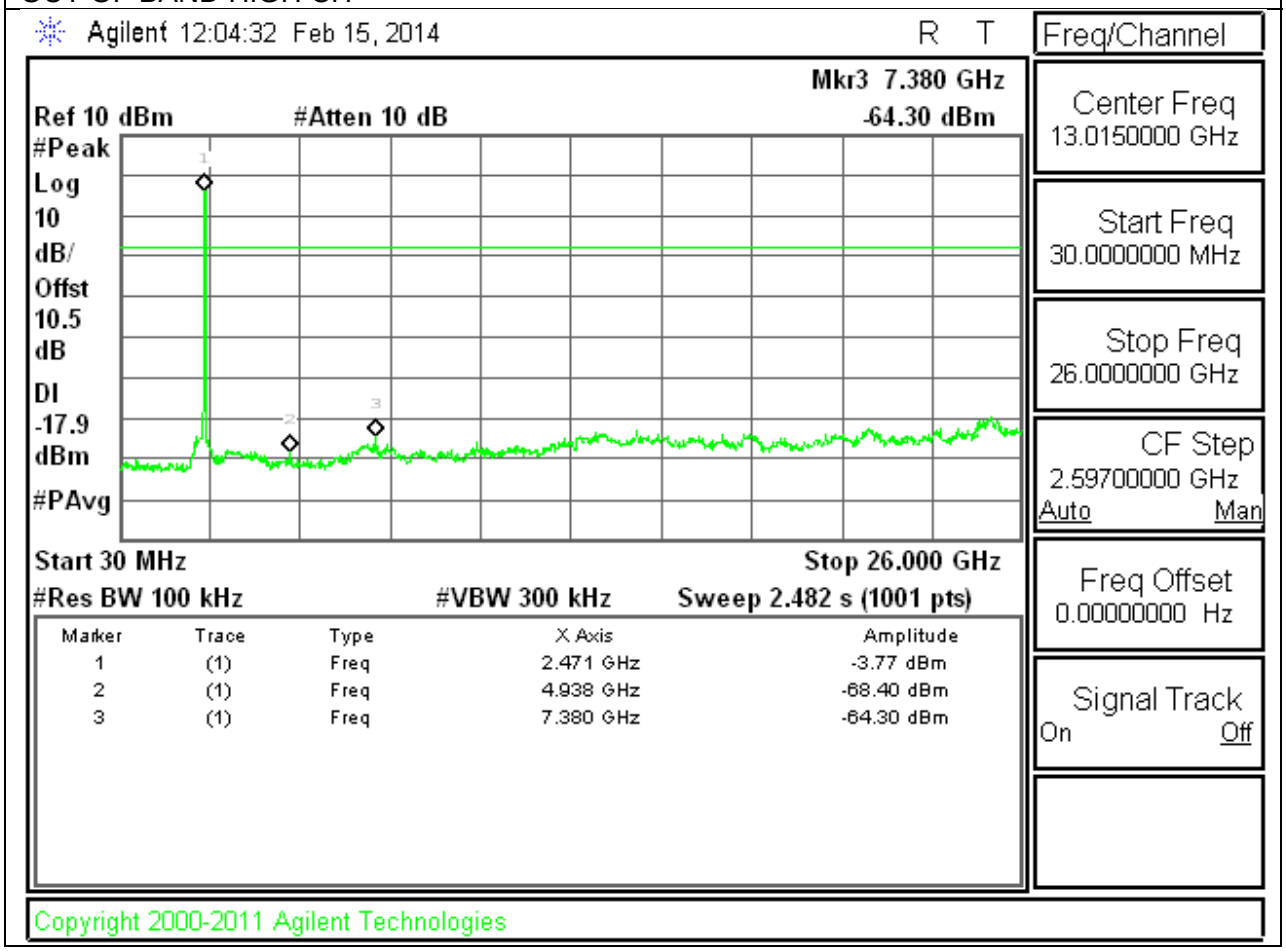
OUT OF BAND HIGH CH



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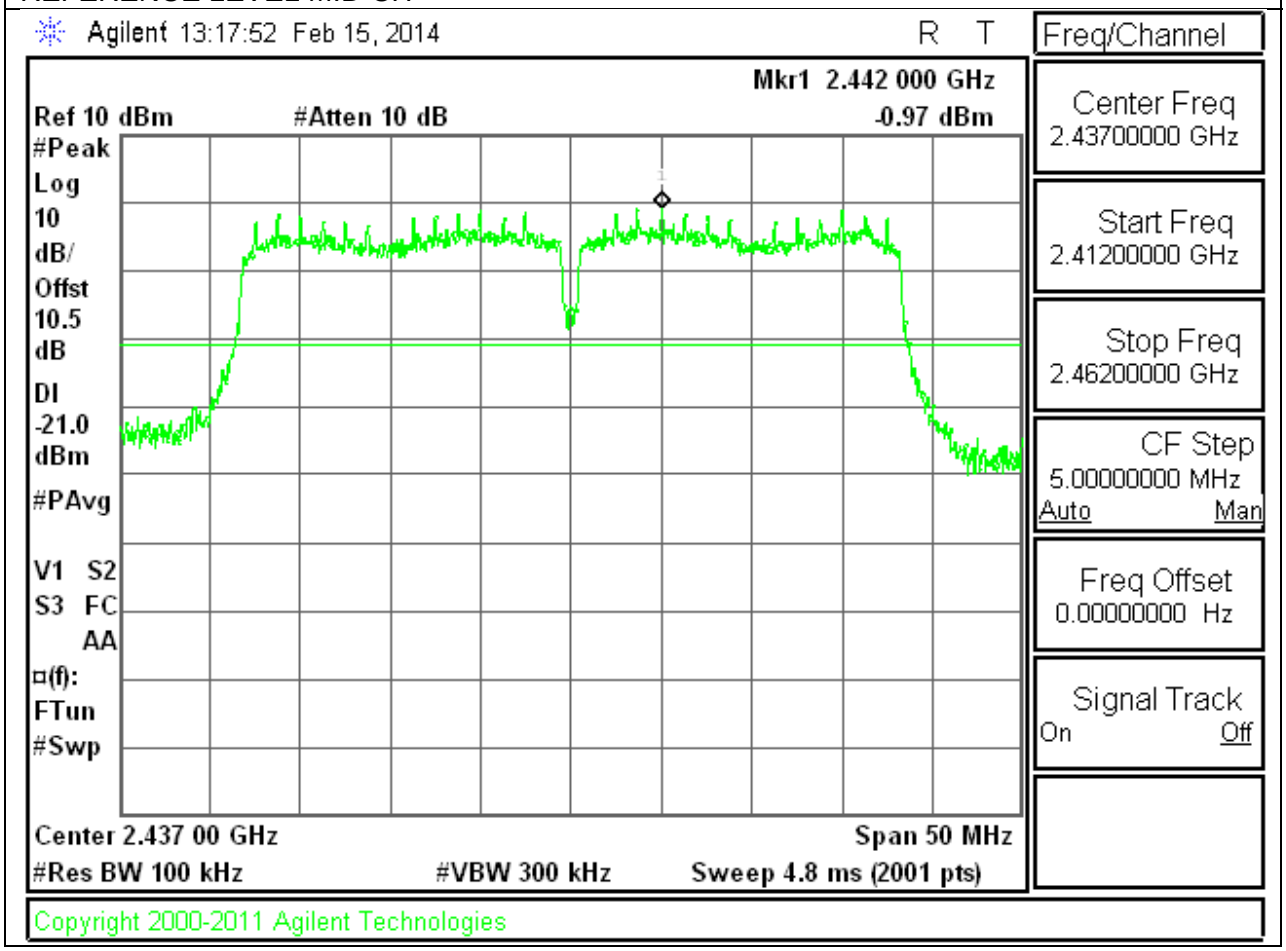
9.6.7. 802.11n HT40 MODE IN THE 2.4 GHz BAND CHAIN 0

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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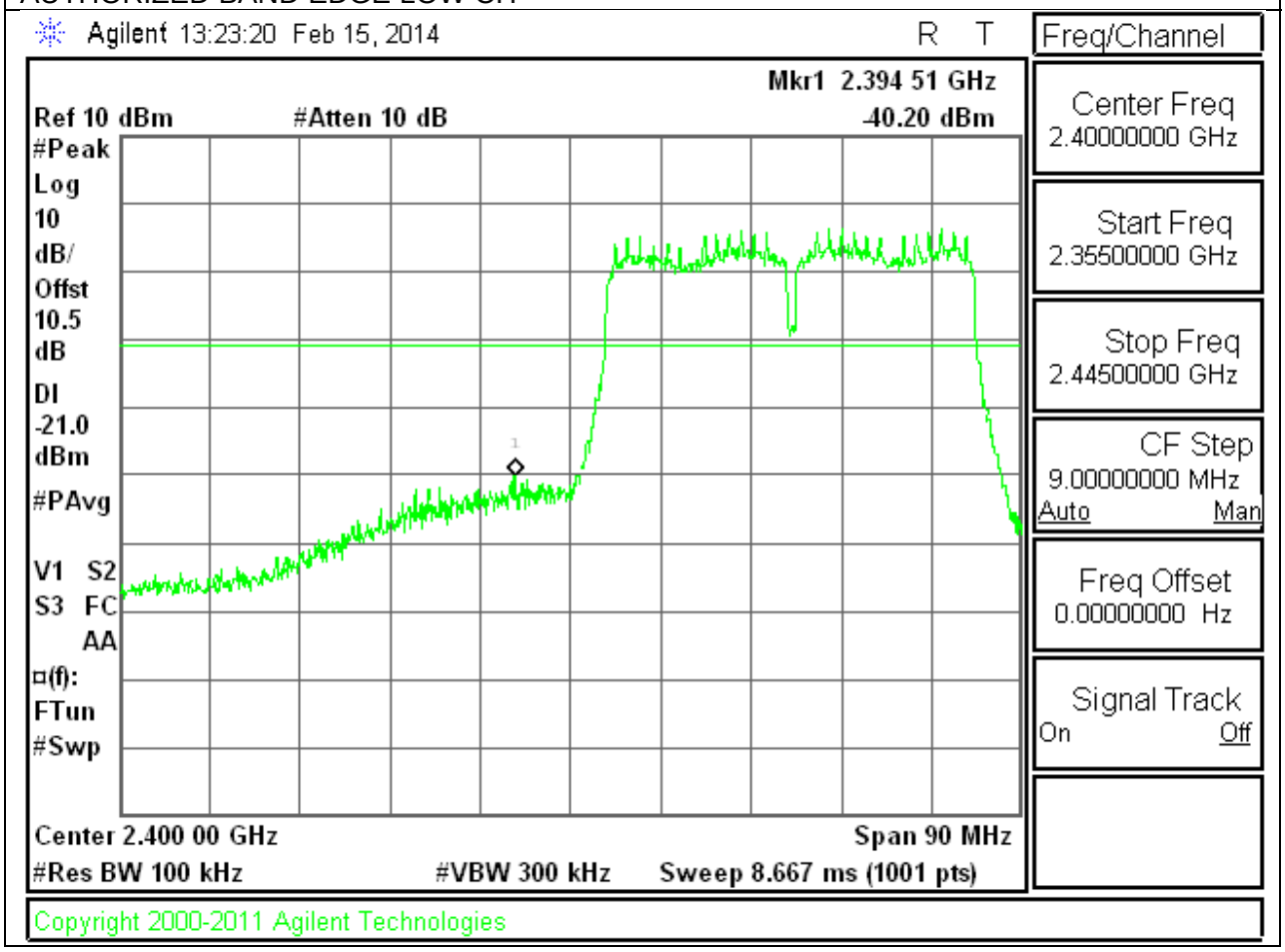
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



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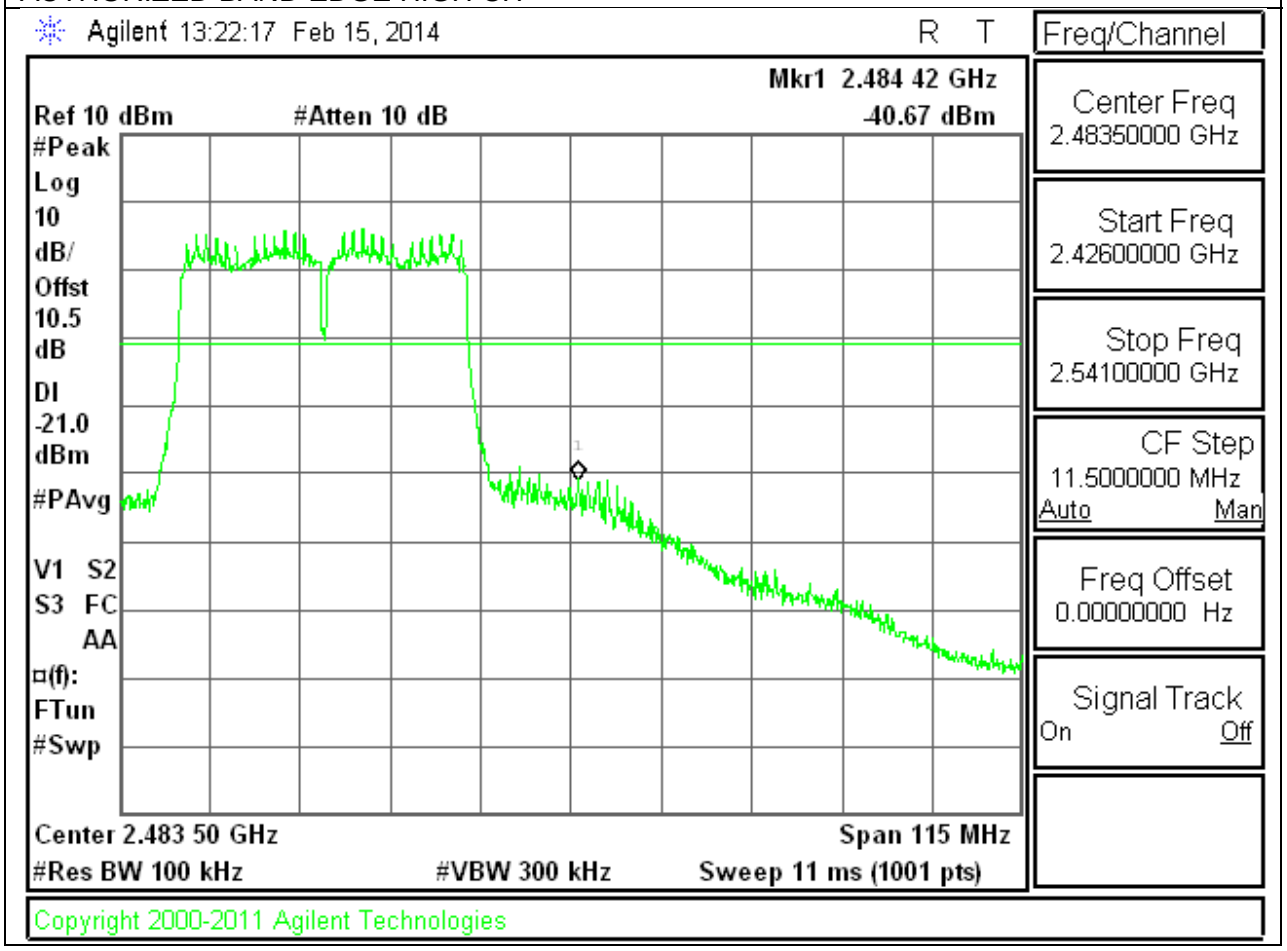
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH



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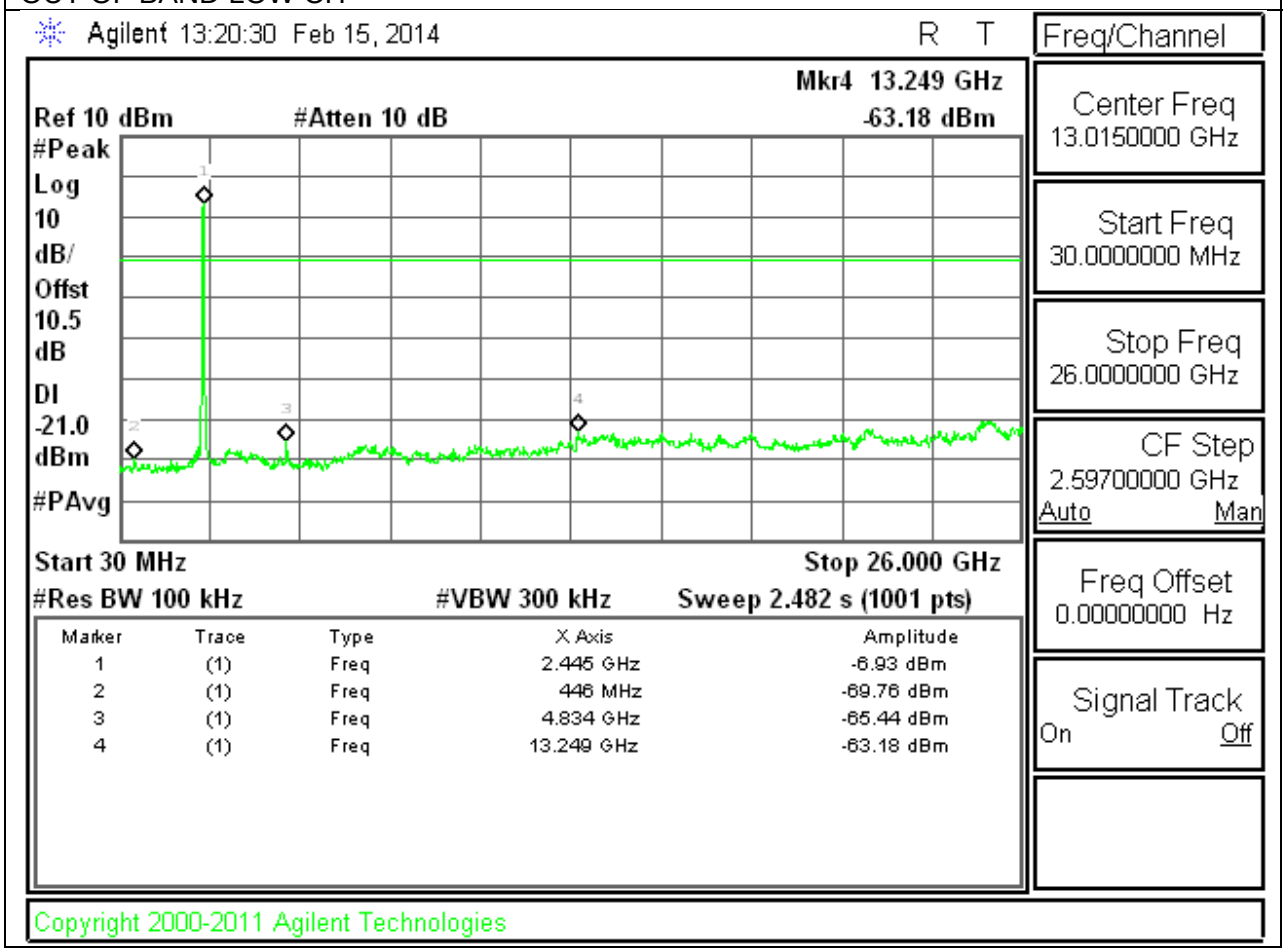
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



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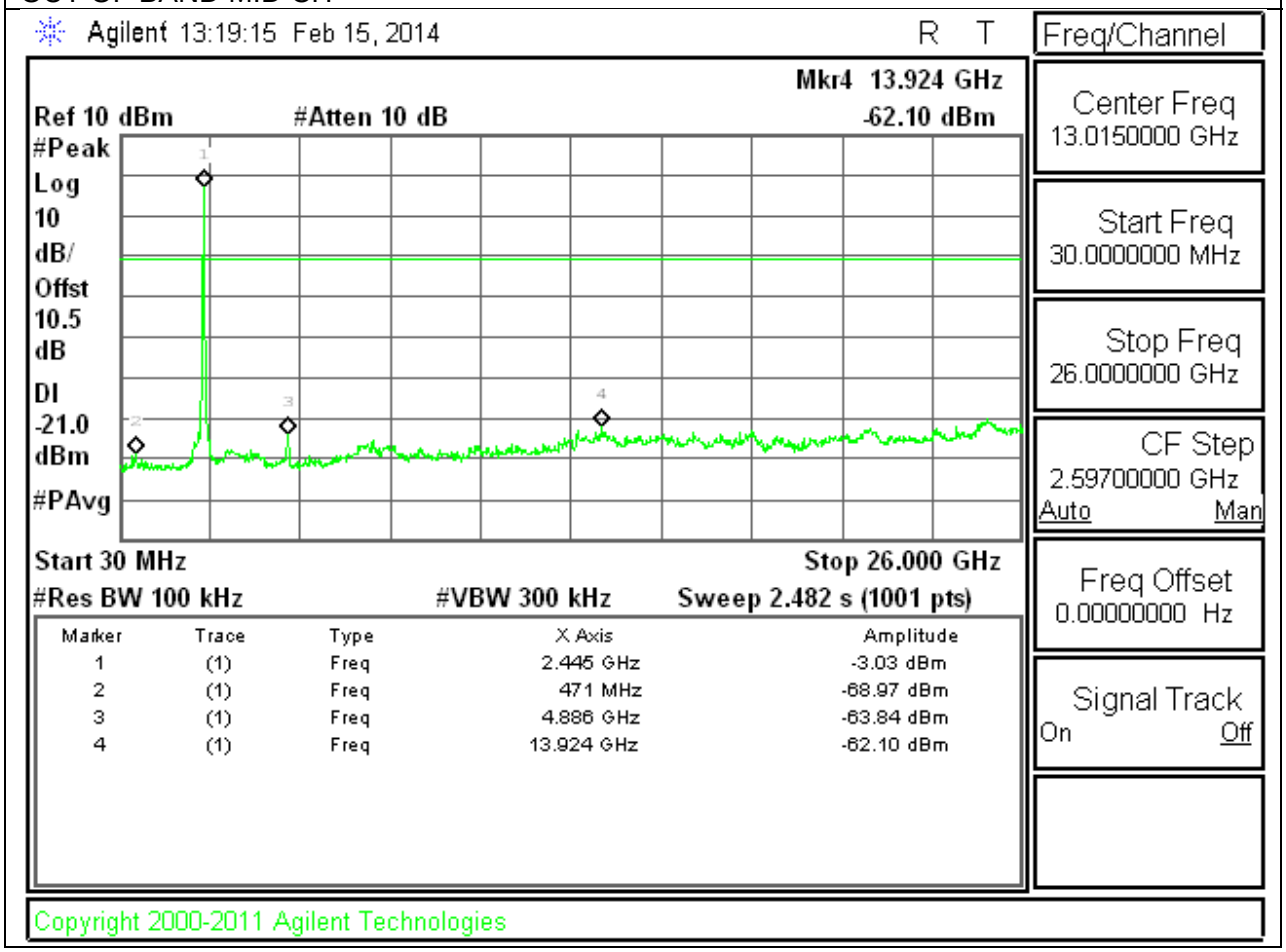
OUT OF BAND MID CH



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.445 GHz	-3.03 dBm
2	(1)	Freq	471 MHz	-68.97 dBm
3	(1)	Freq	4.886 GHz	-63.84 dBm
4	(1)	Freq	13.924 GHz	-62.10 dBm

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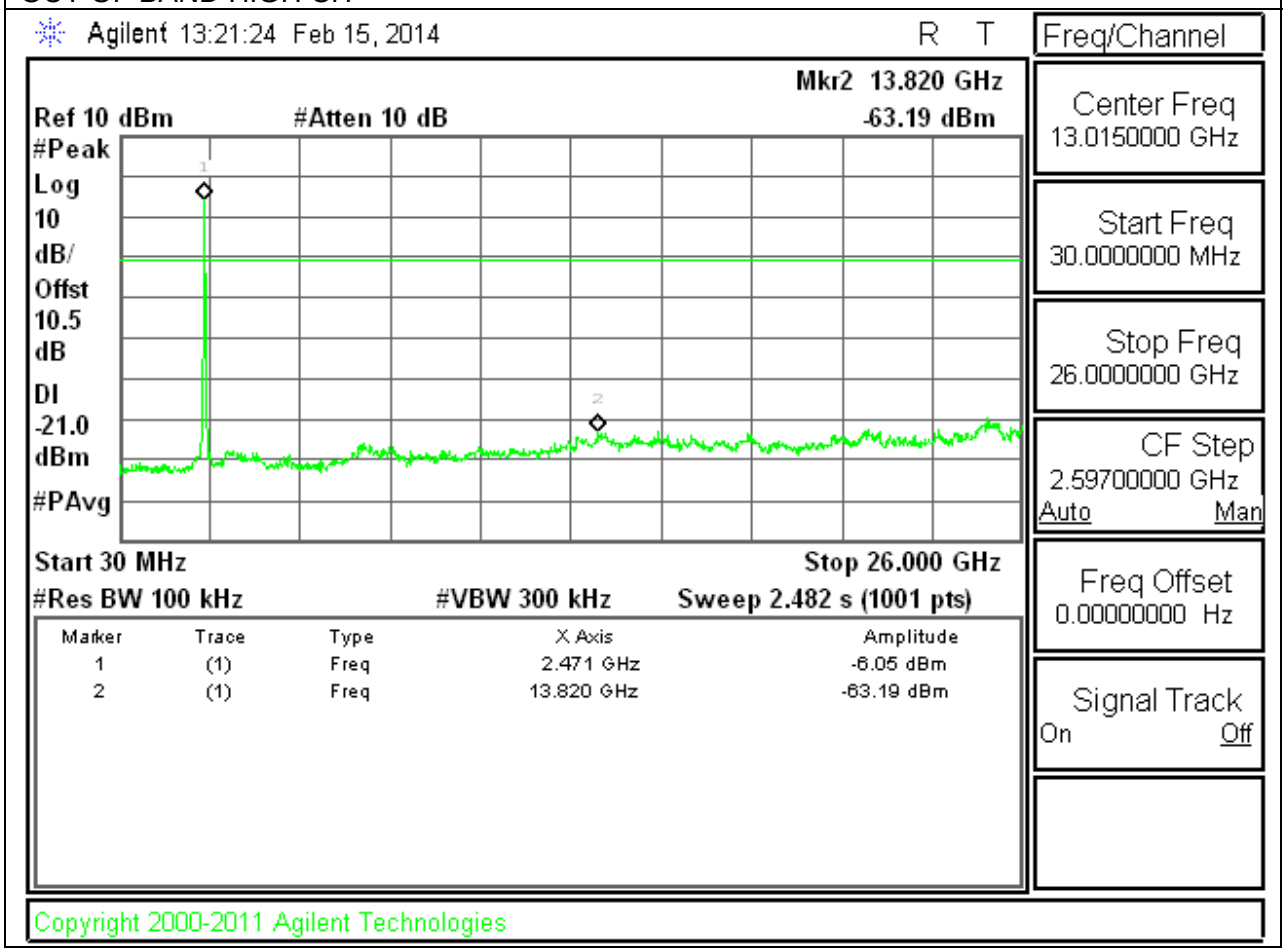
OUT OF BAND HIGH CH



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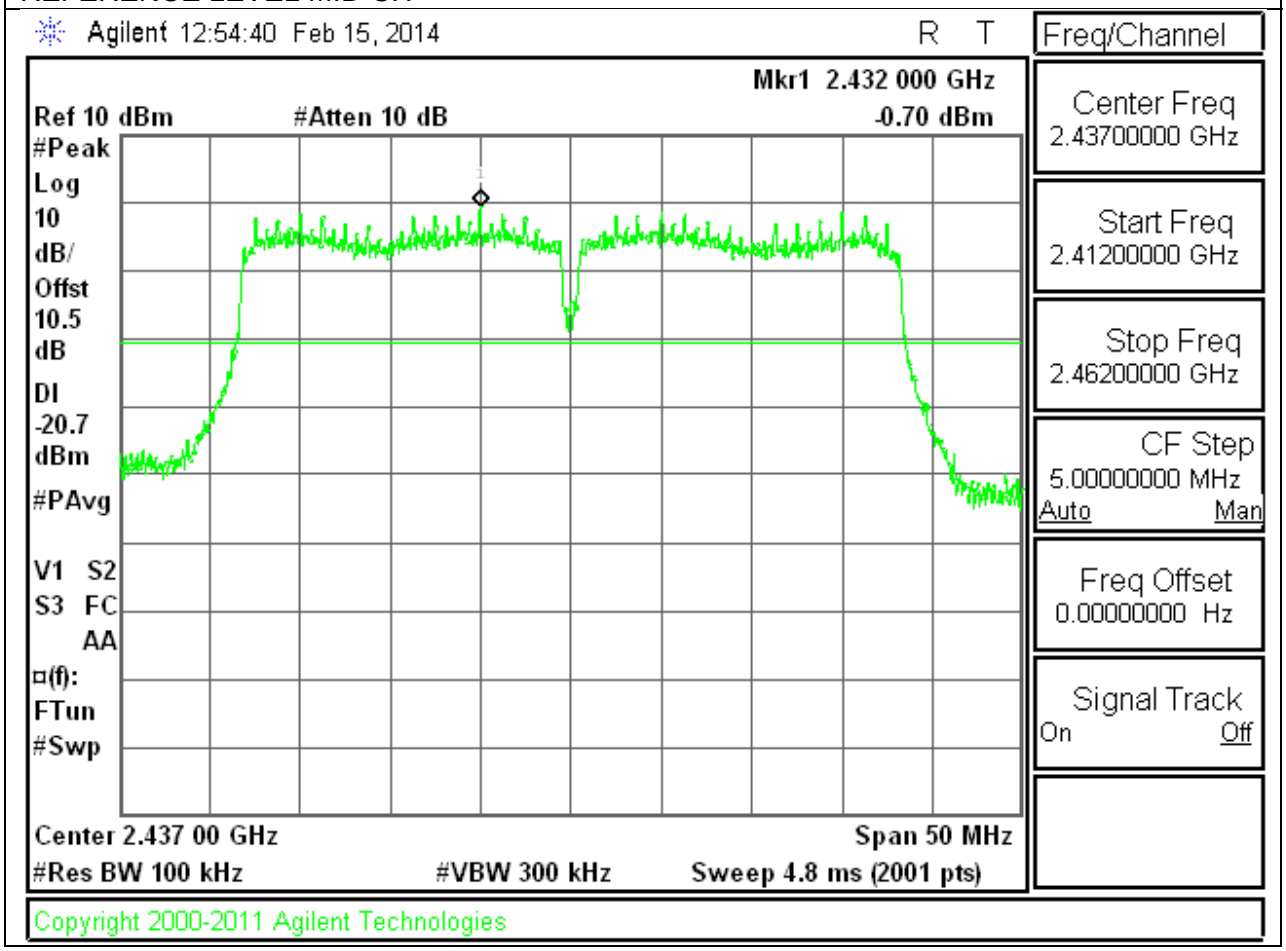
9.6.8. 802.11n HT40 MODE IN THE 2.4 GHz BAND CHAIN 1

IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



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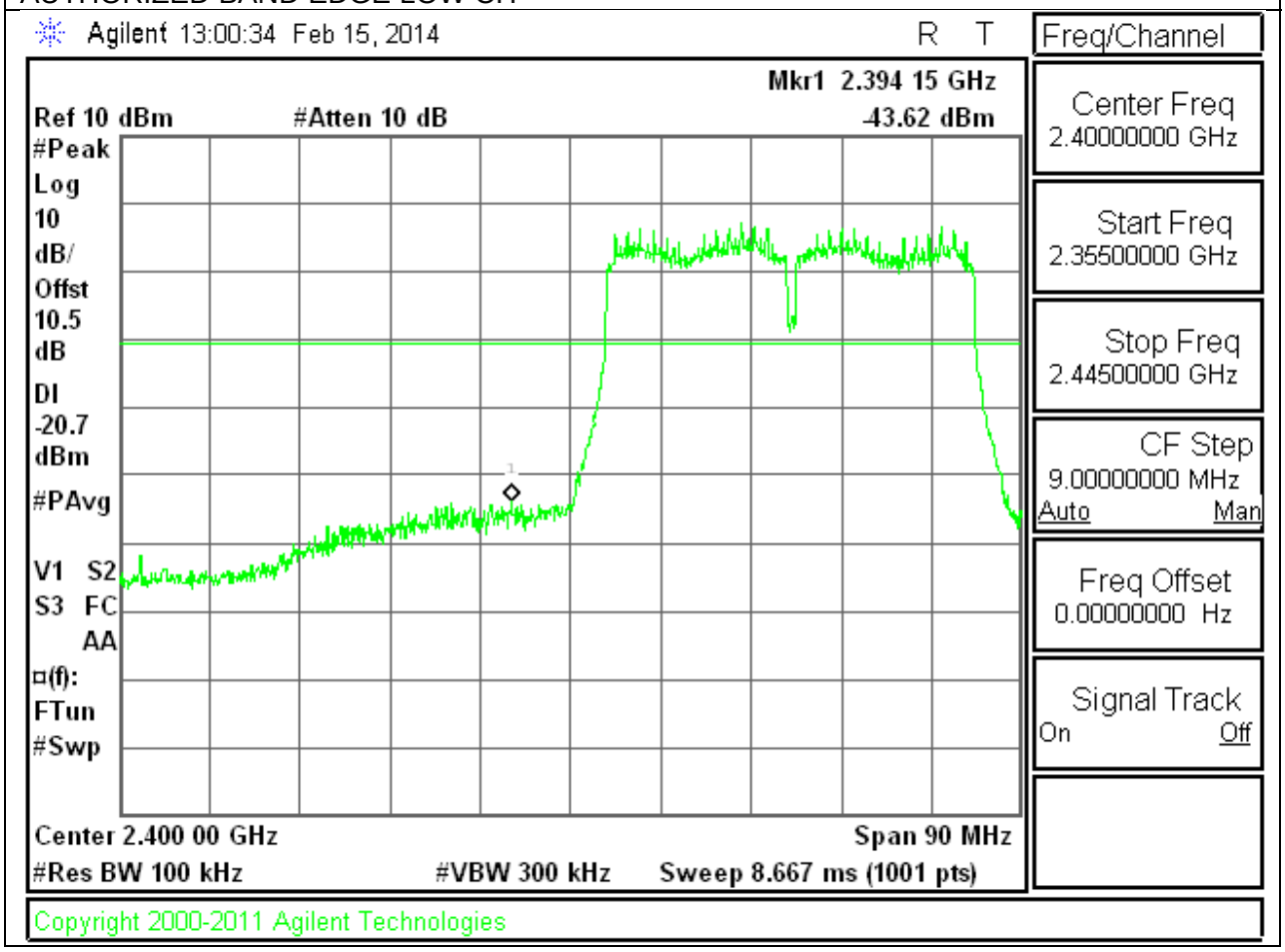
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



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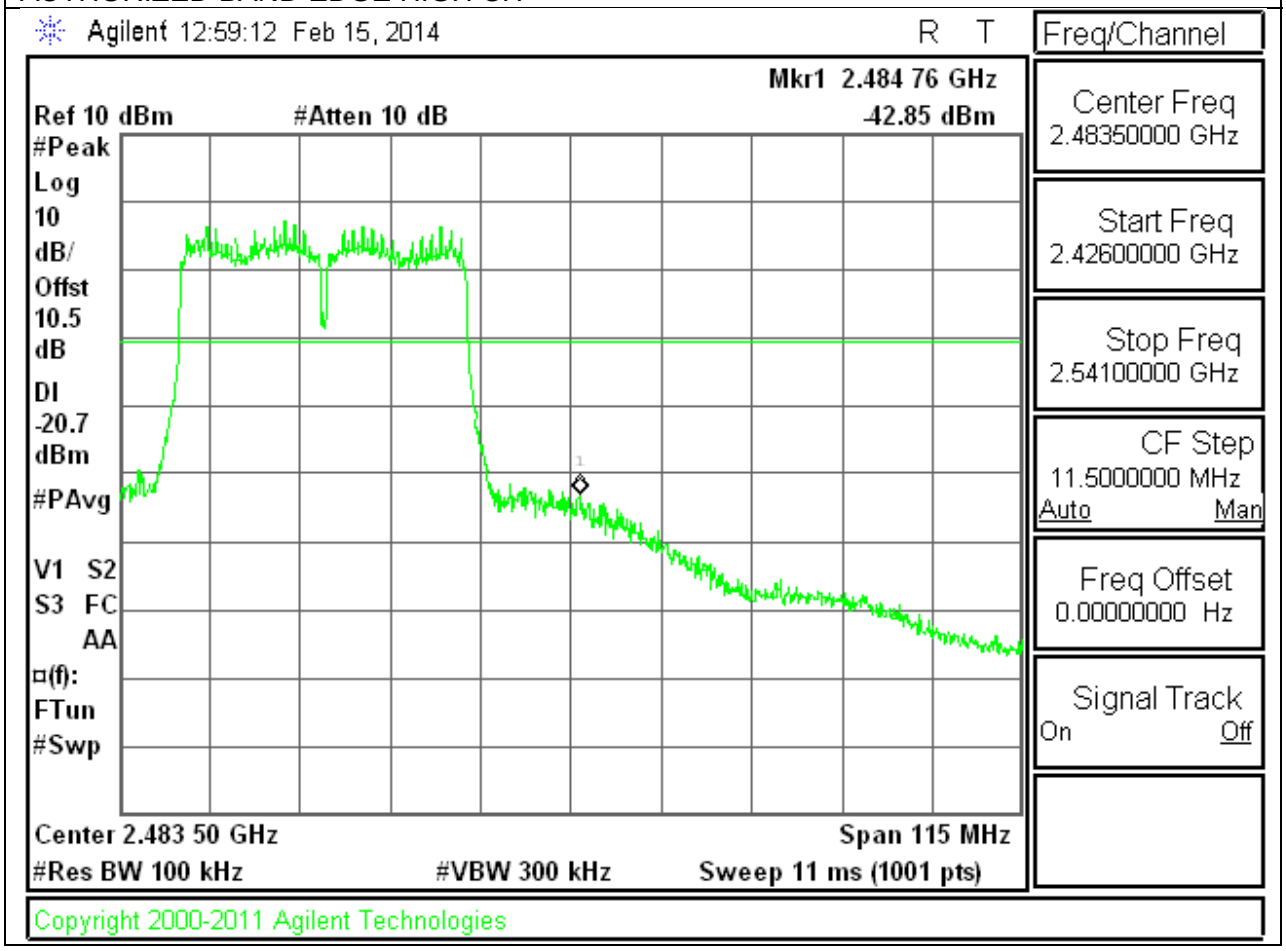
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH



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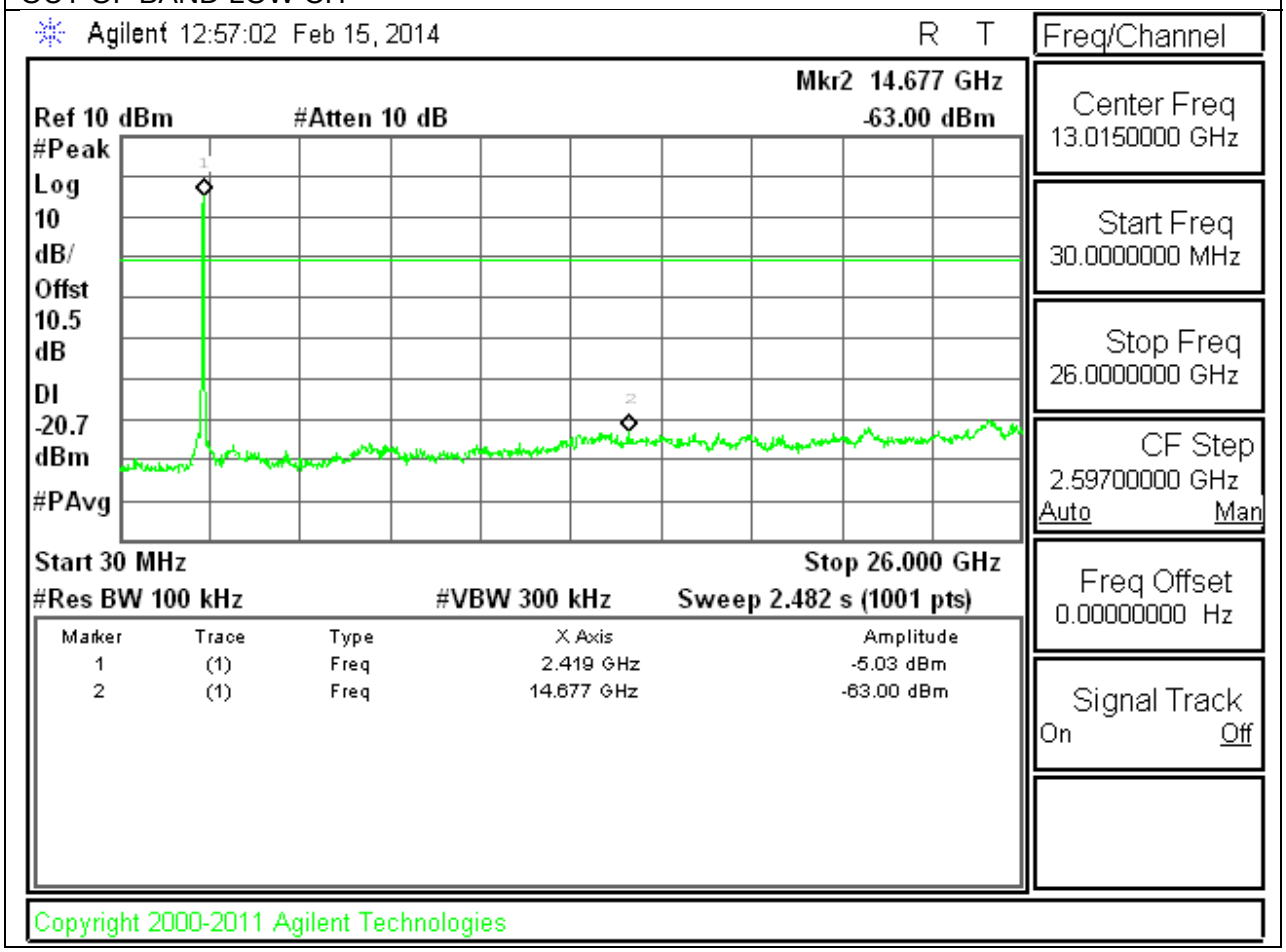
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



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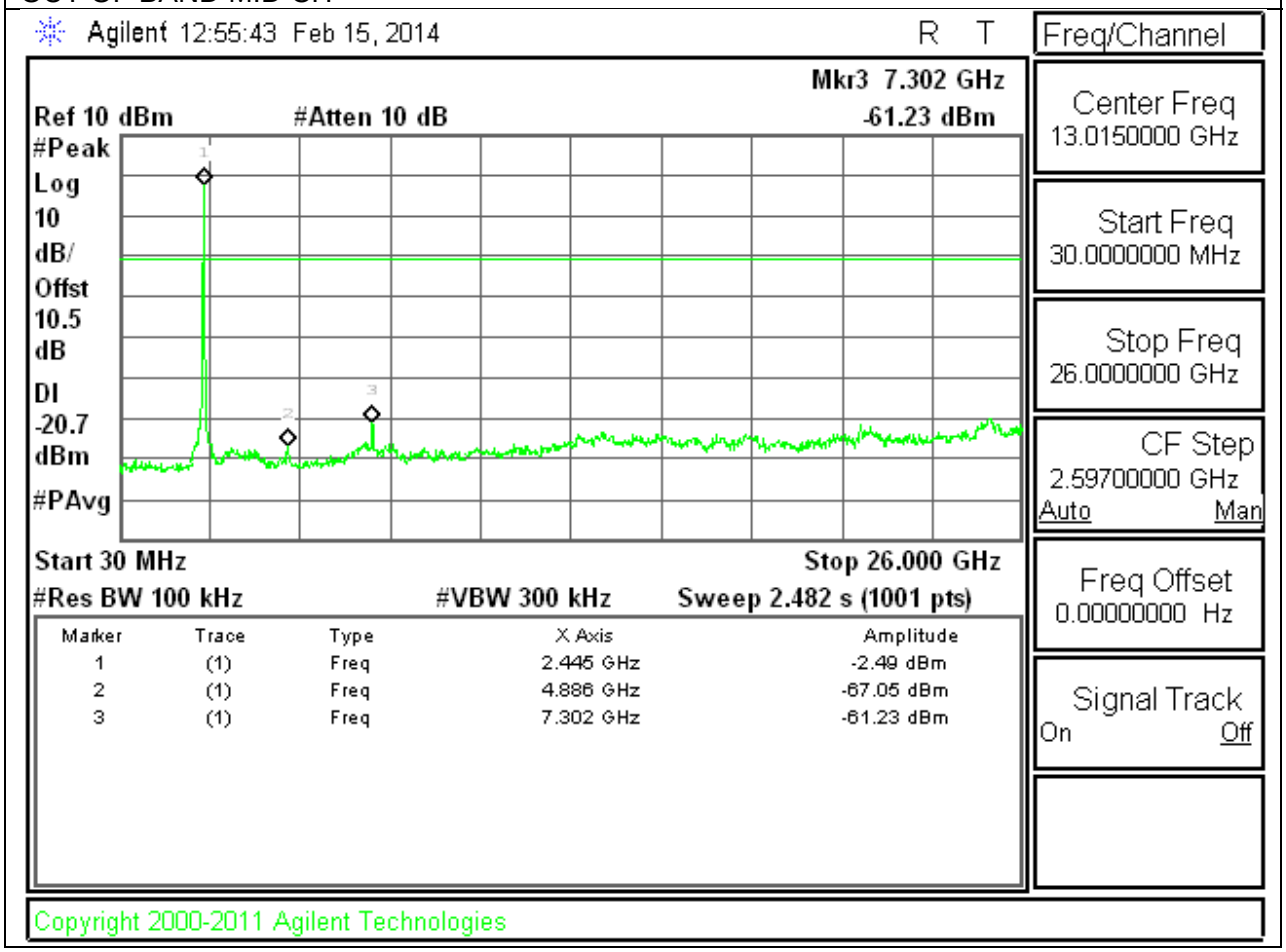
OUT OF BAND MID CH



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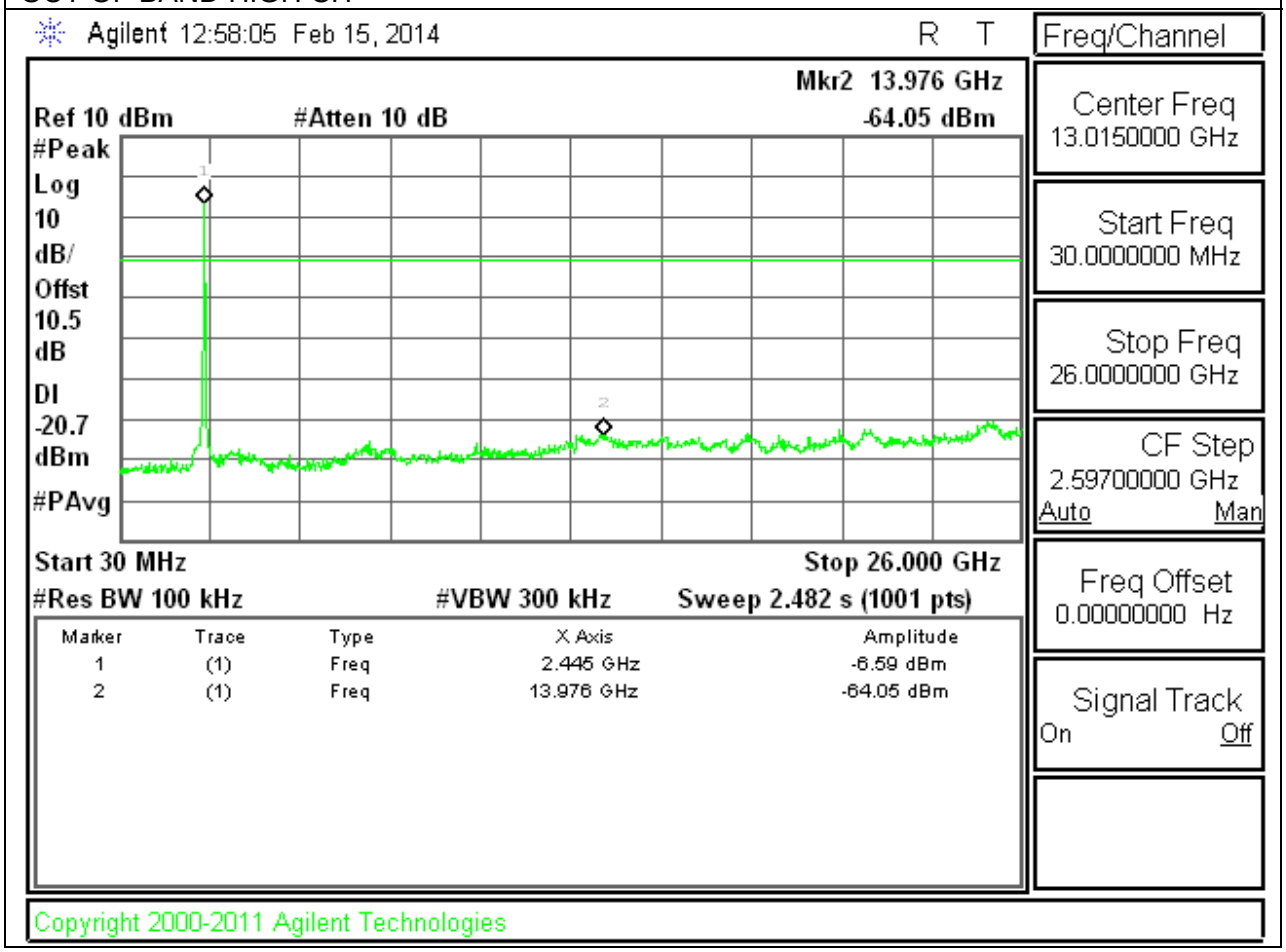
OUT OF BAND HIGH CH



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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 band edge 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 spurious emission measurement refer to MAv1 - KDB558074 Option 1 Maximum RMS Average

The spectrum from 1GHz 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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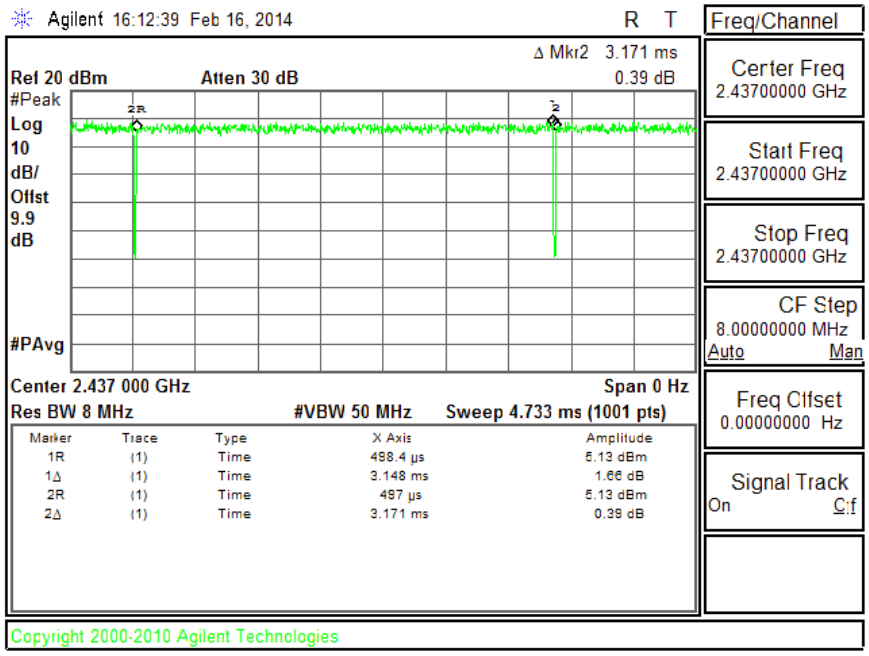
10.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
802.11b	3.15	3.17	0.992	99.2%	0.00	0.010
802.11g	3.15	3.17	0.992	99.2%	0.00	0.010
802.11n HT20	2.93	2.95	0.992	99.2%	0.00	0.010
802.11n HT40	0.72	0.77	0.944	94.4%	0.25	1.382

10.2. DUTY CYCLE PLOTS

DUTY CYCLE 802.11b MODE



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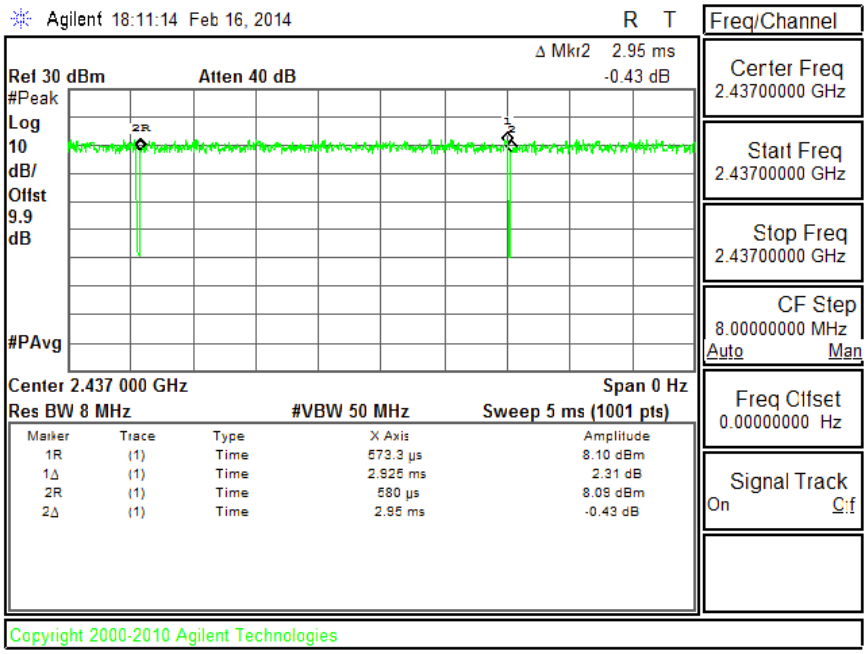
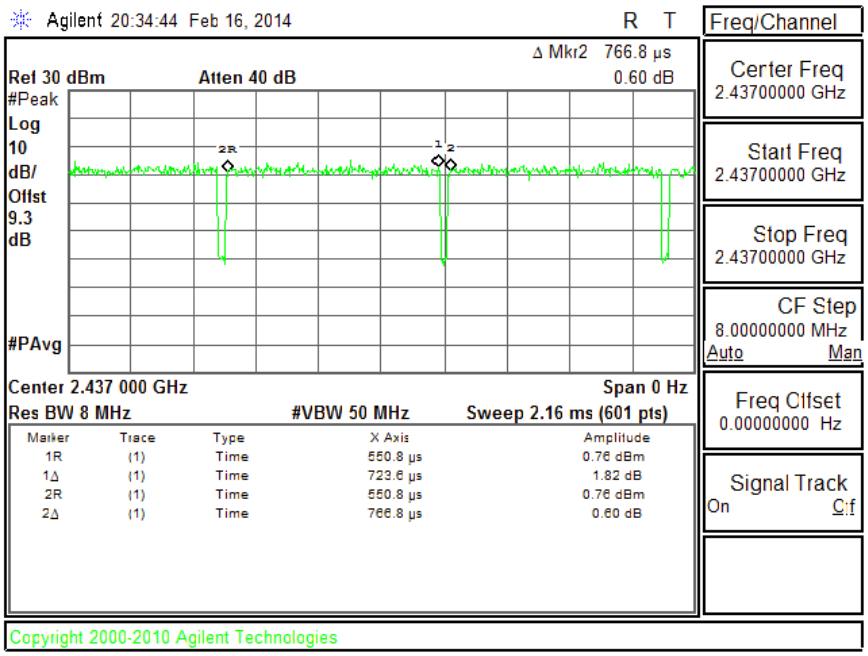
DUTY CYCLE 802.11n HT20 MODE



DUTY CYCLE 802.11n HT40 MODE



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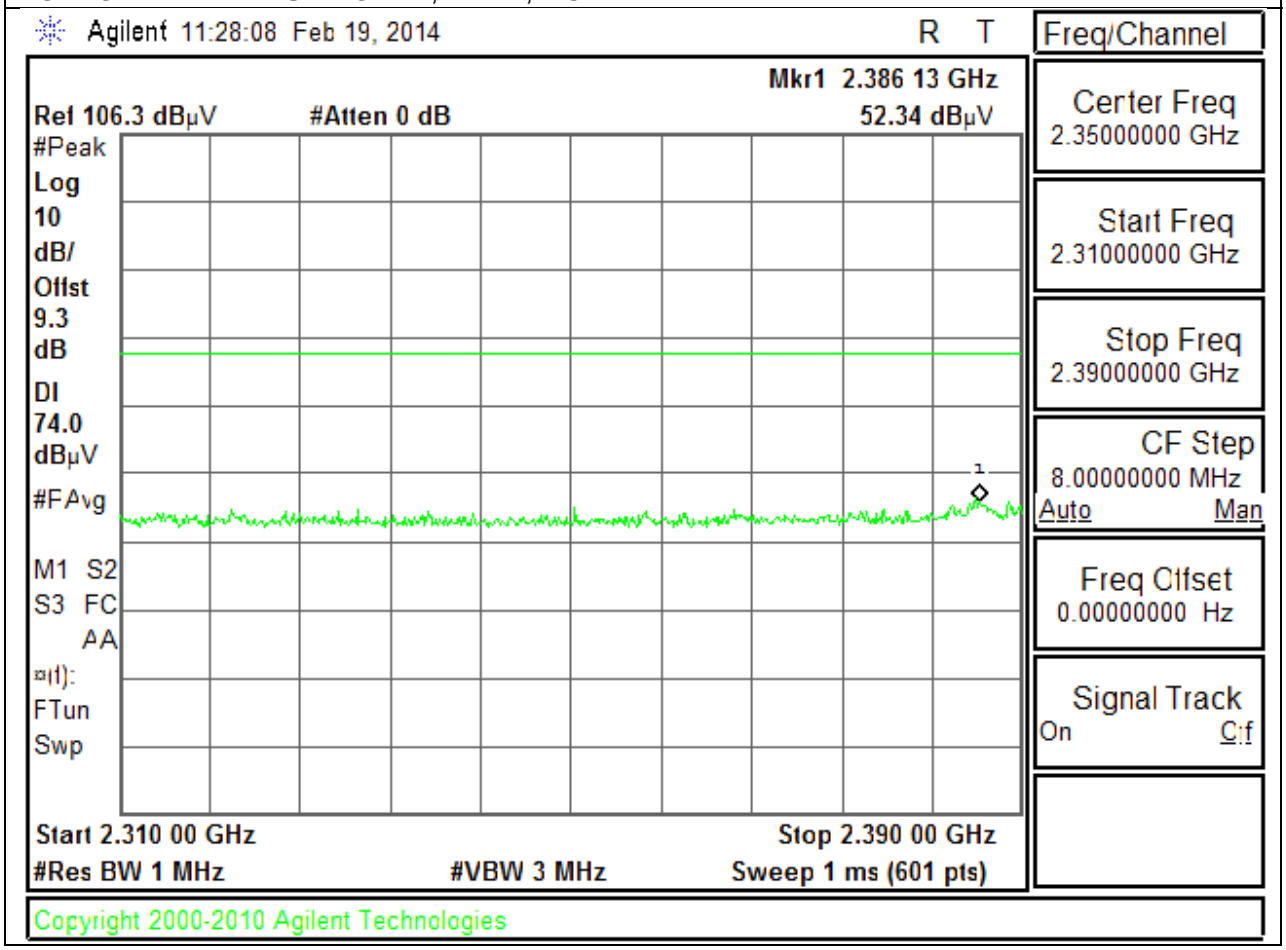
10.3. TRANSMITTER ABOVE 1 GHz

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

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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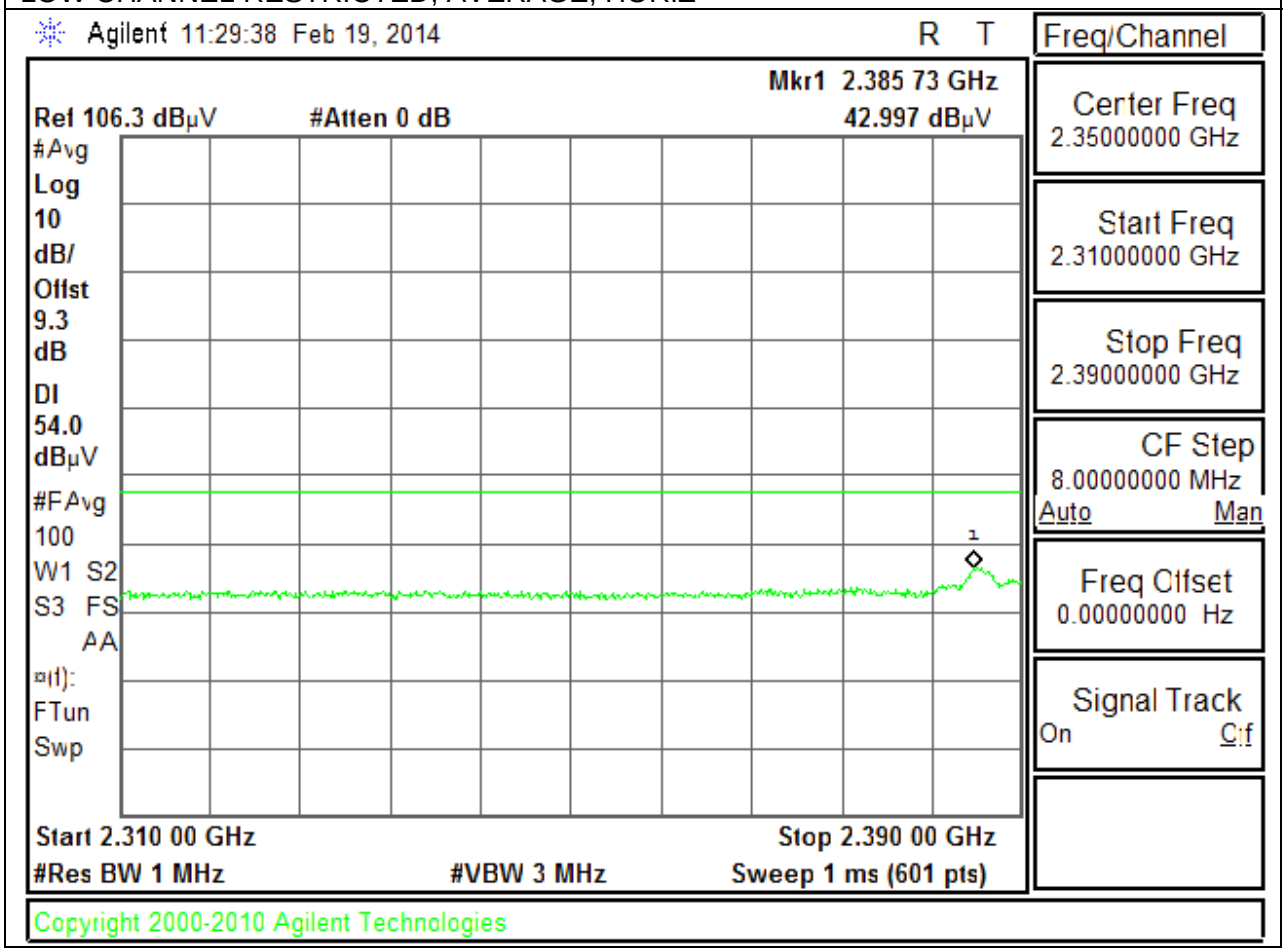
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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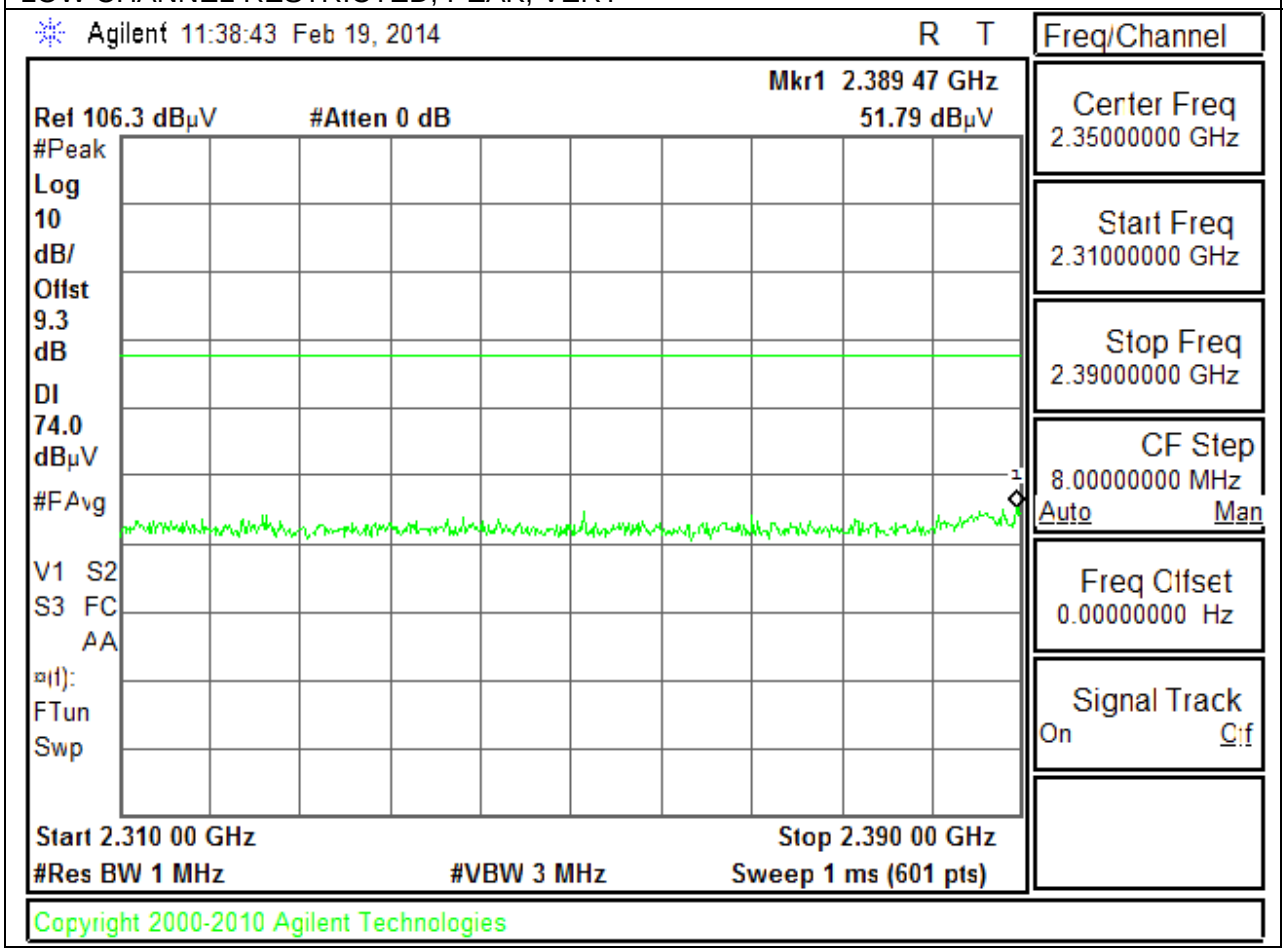
LOW CHANNEL RESTRICTED, PEAK, VERT



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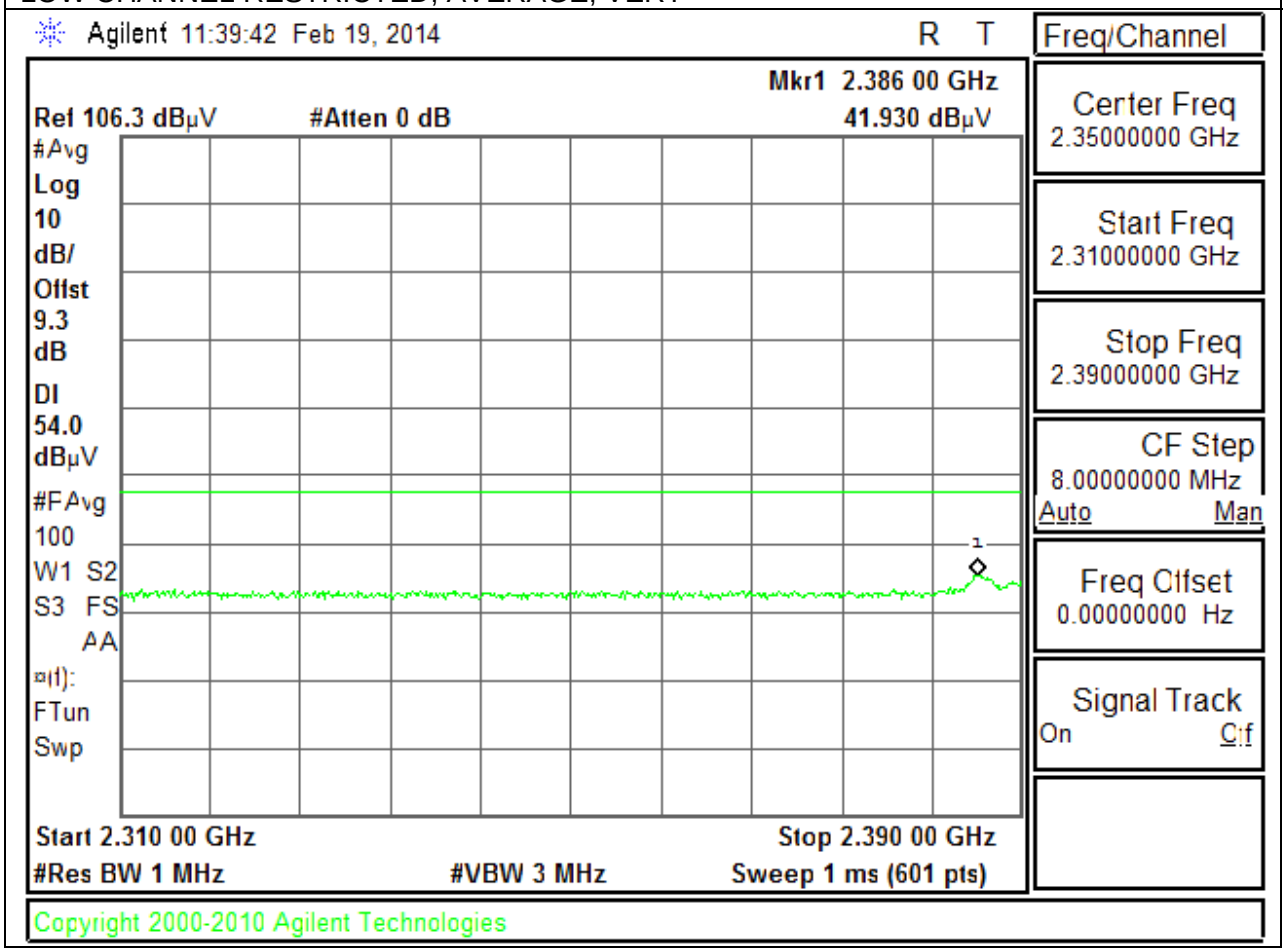
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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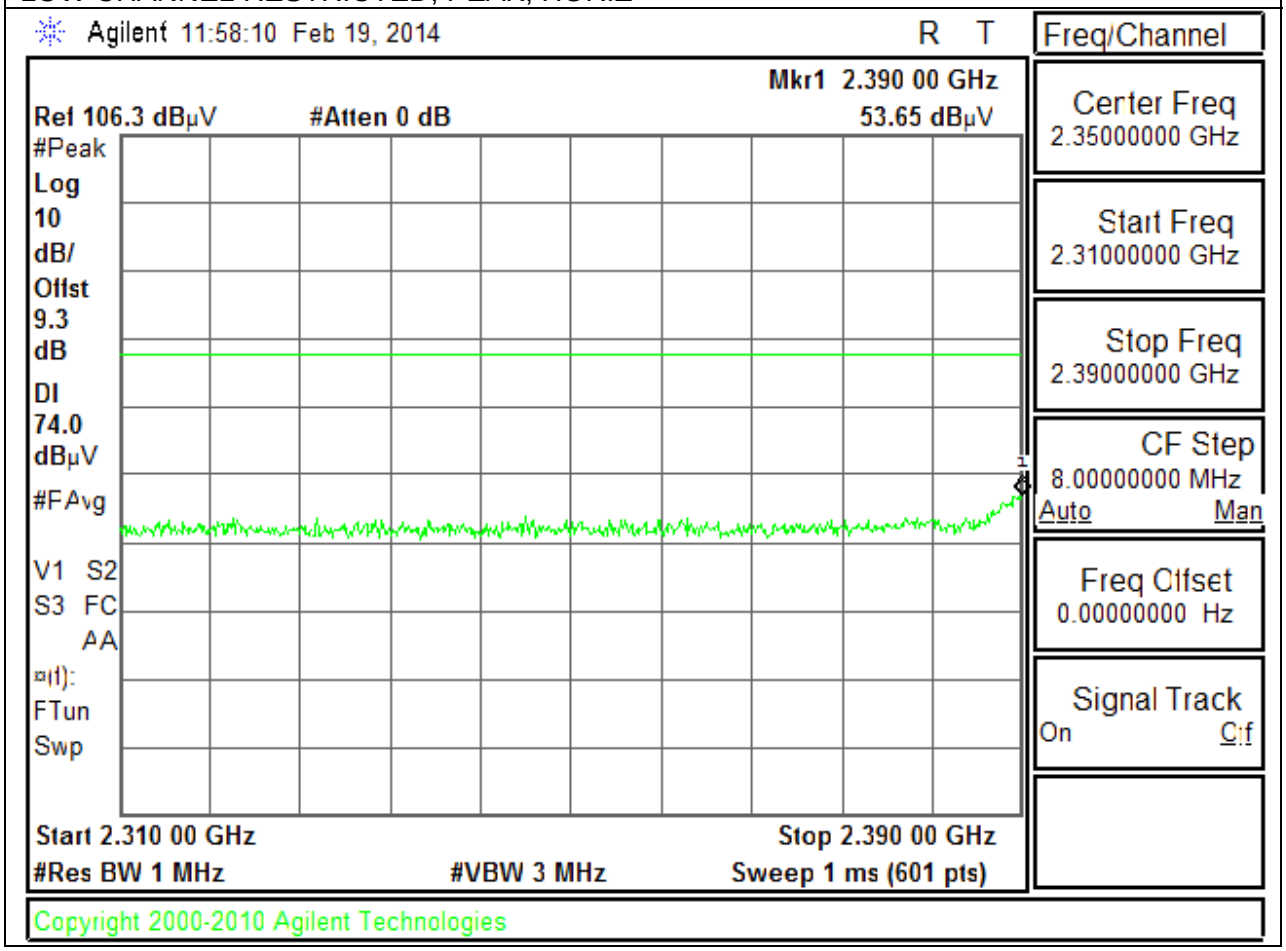
TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND BANDEDGE (LOW CHANNEL 2) RESTRICTED

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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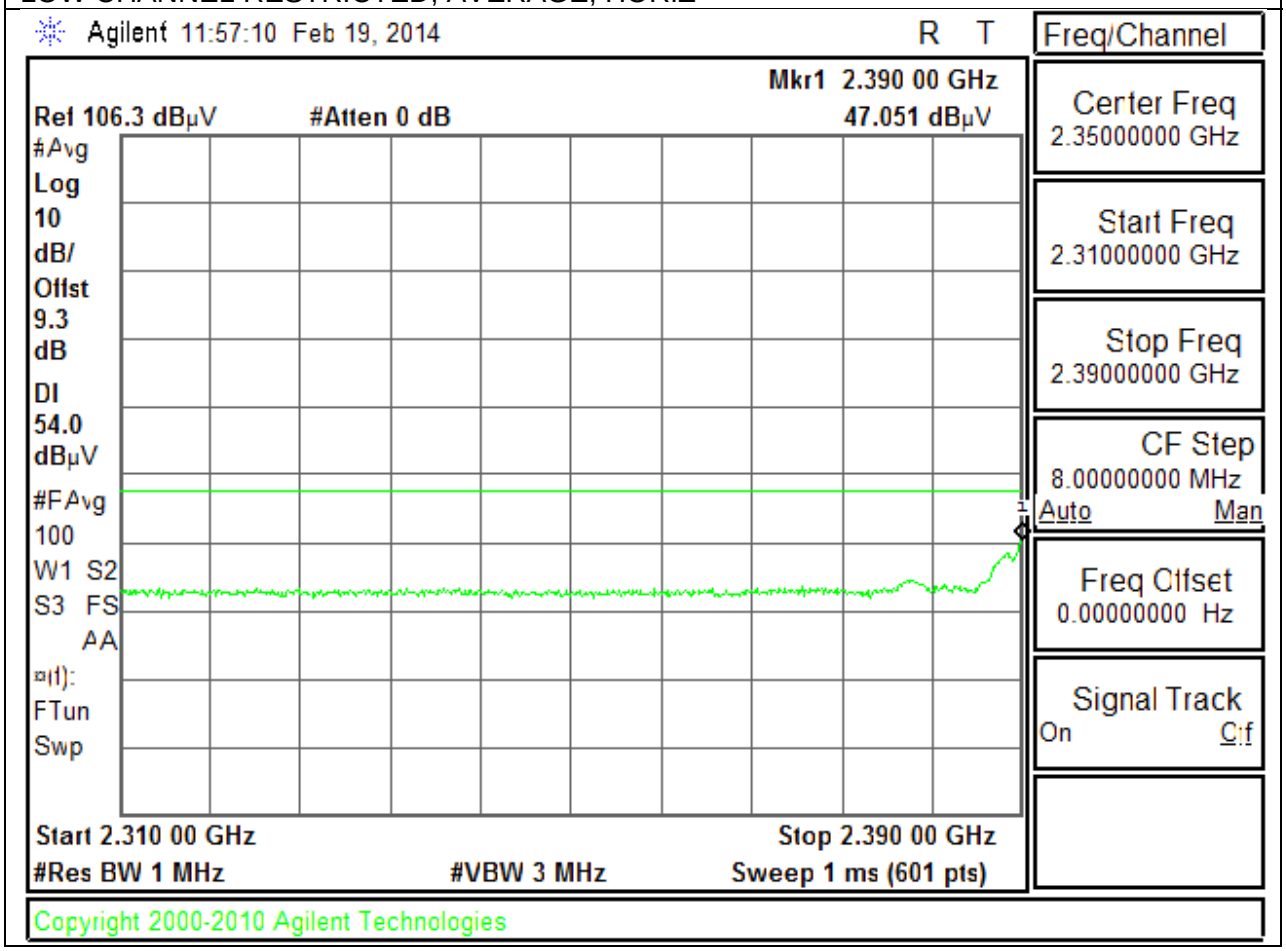
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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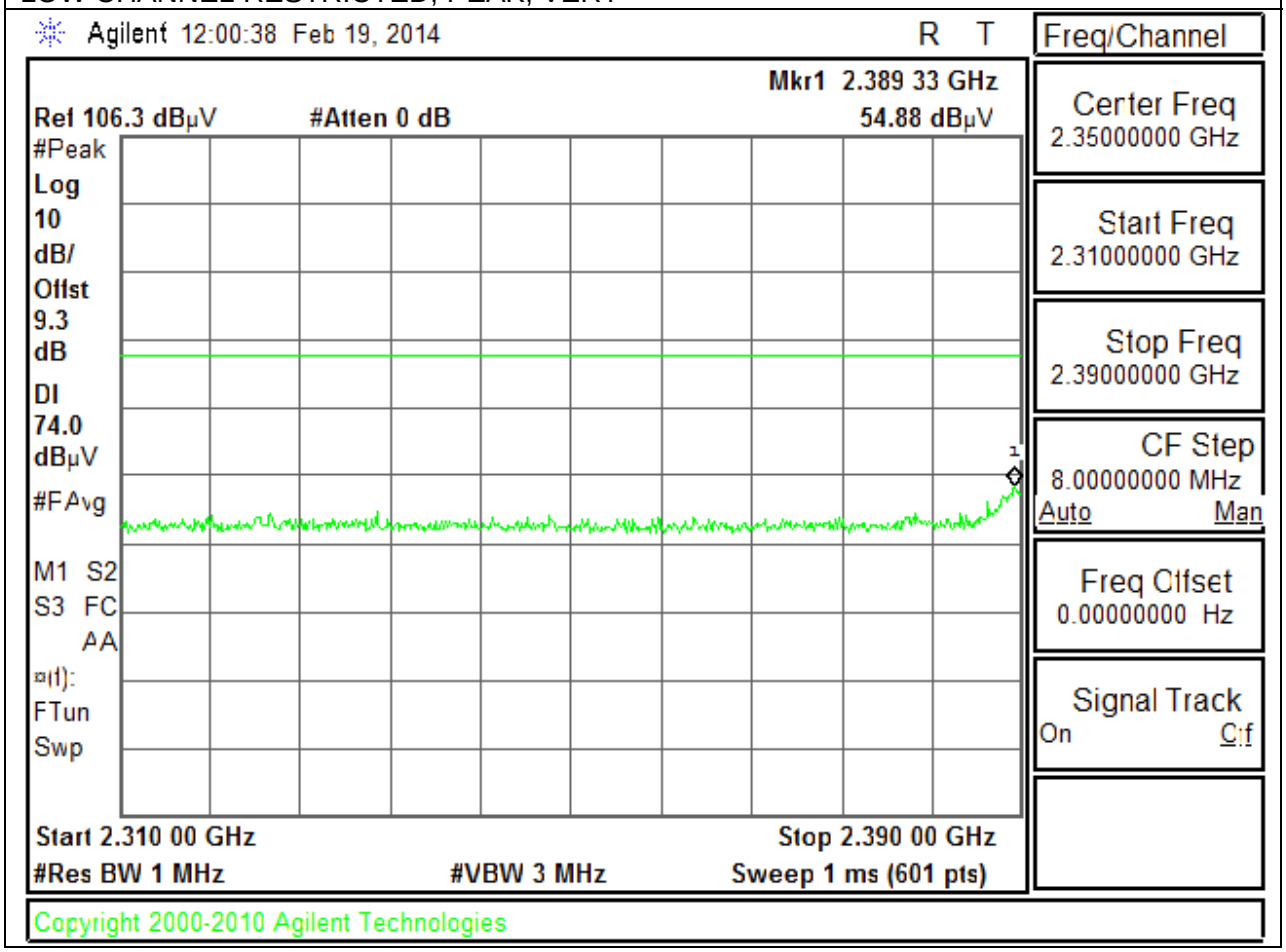
LOW CHANNEL RESTRICTED, PEAK, VERT



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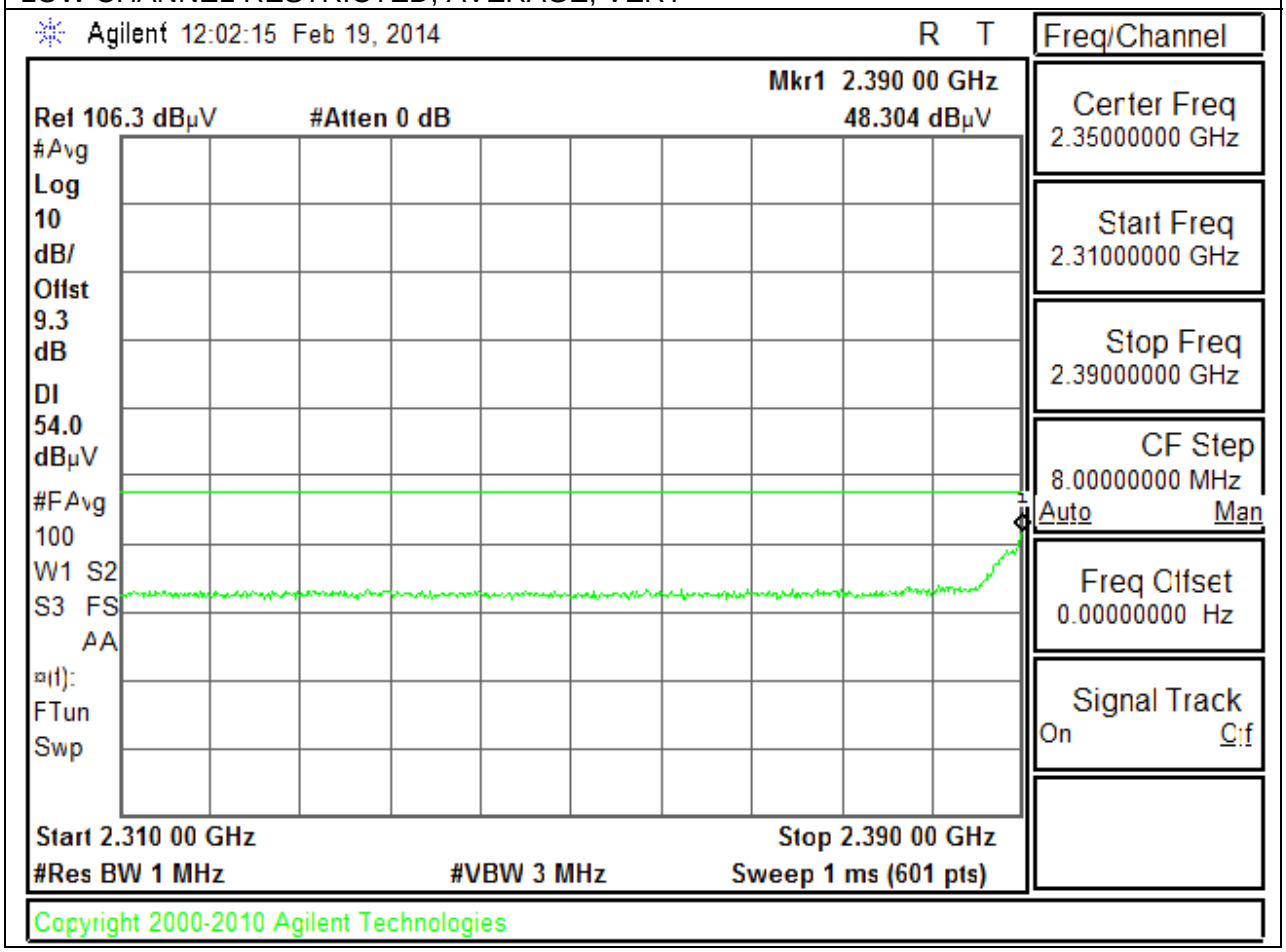
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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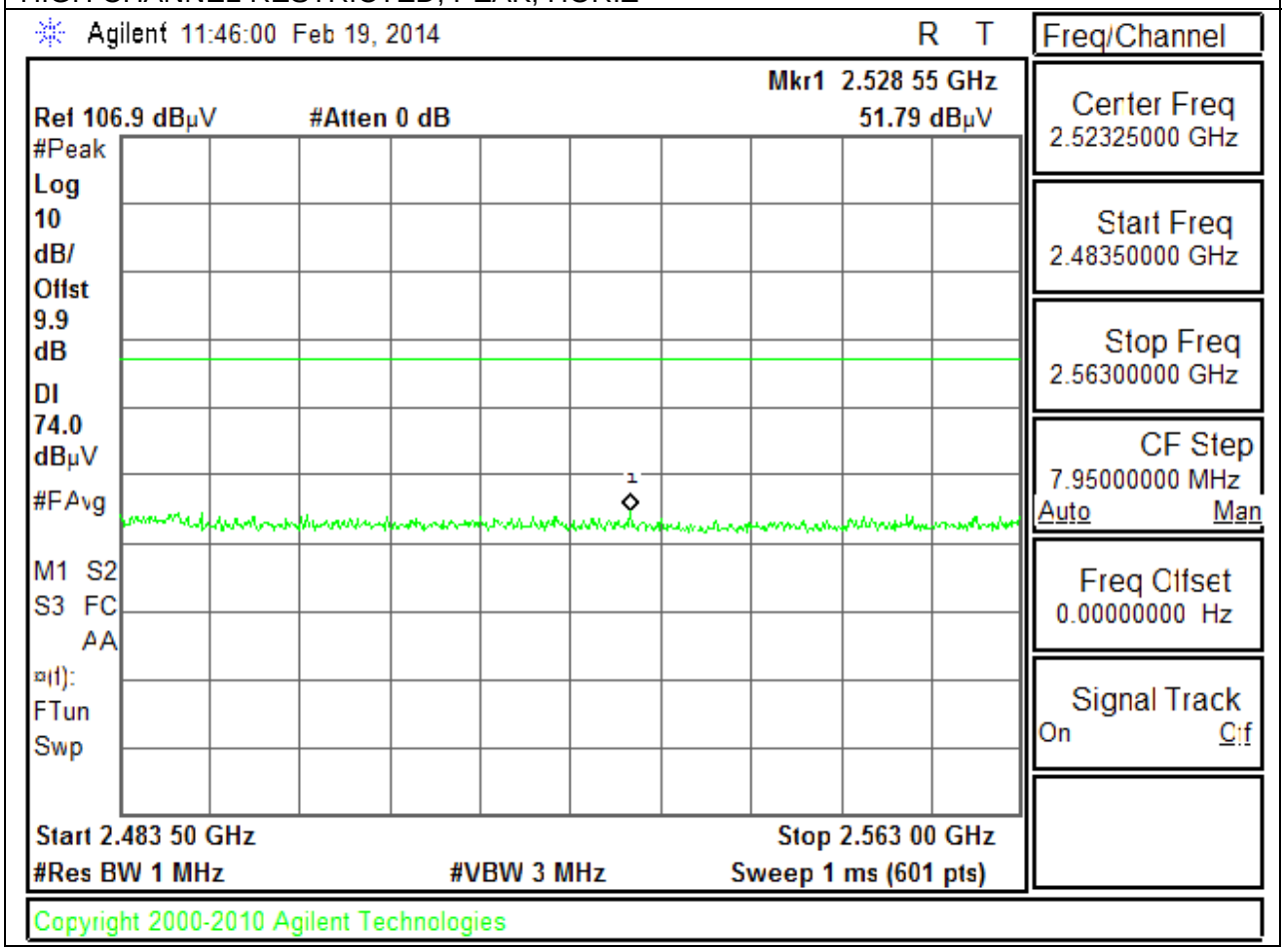
AUTHORIZED BANDEDGE (HIGH CHANNEL 1)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



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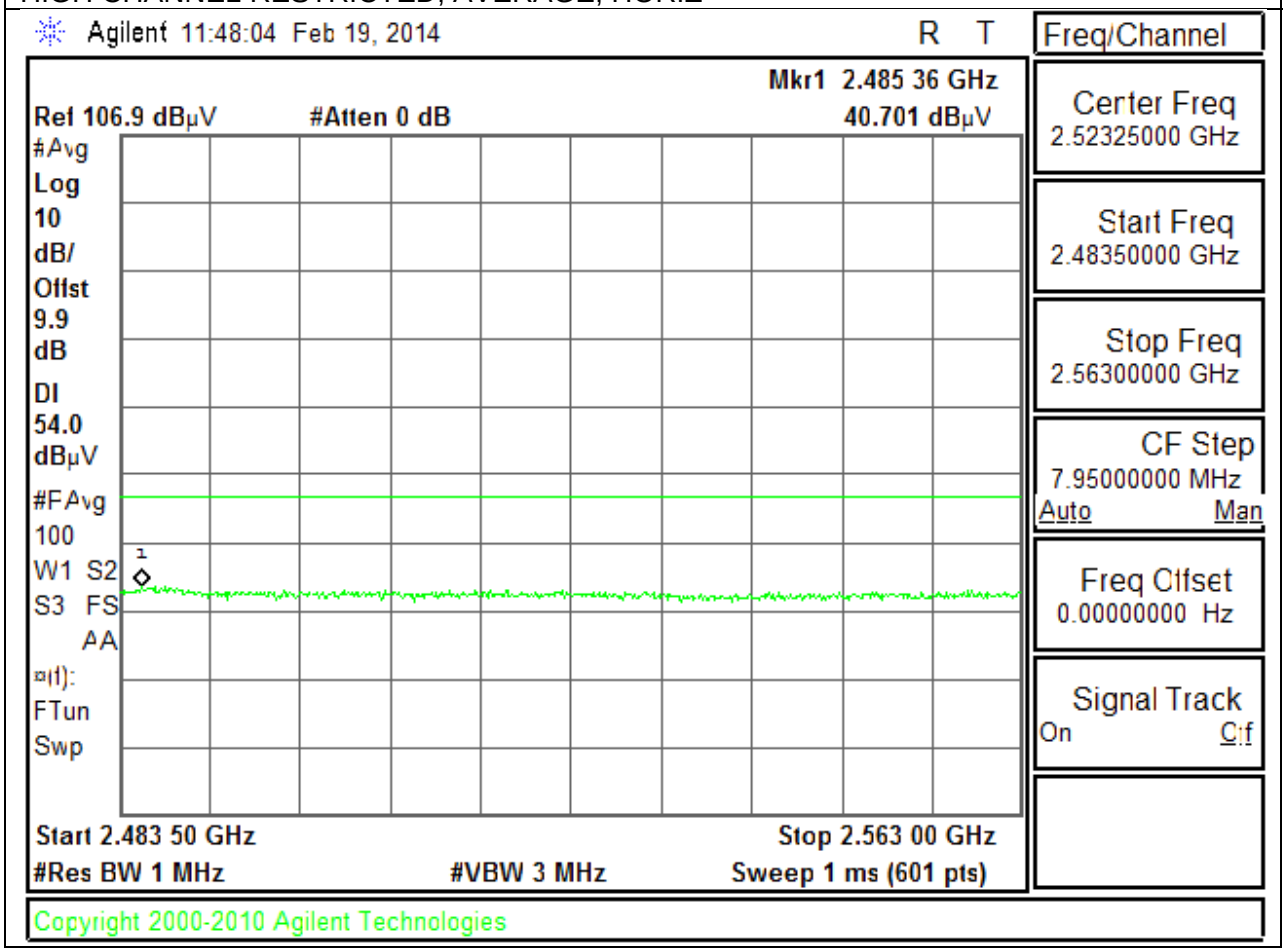
HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



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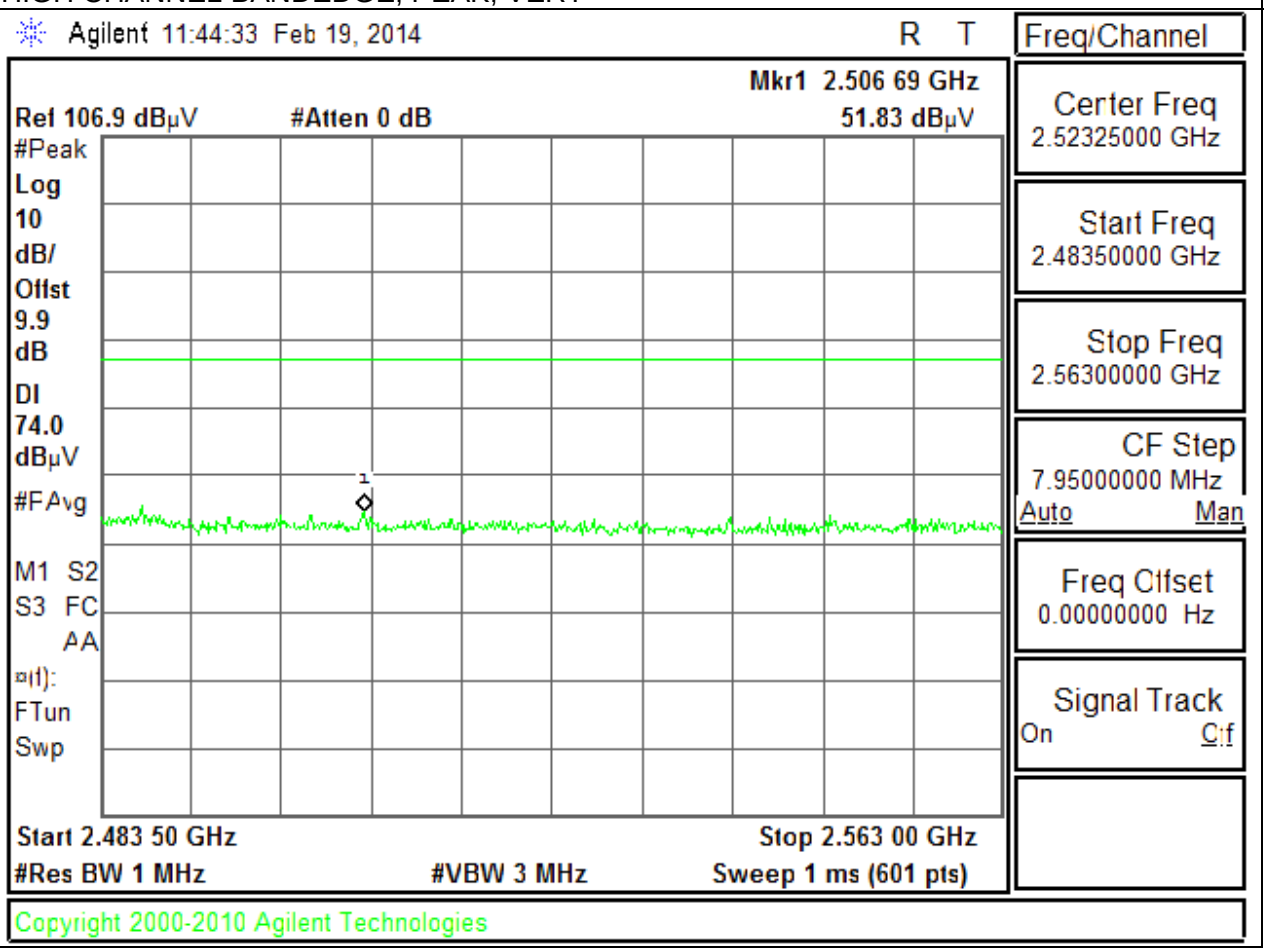
HIGH CHANNEL BANDEDGE, PEAK, VERT



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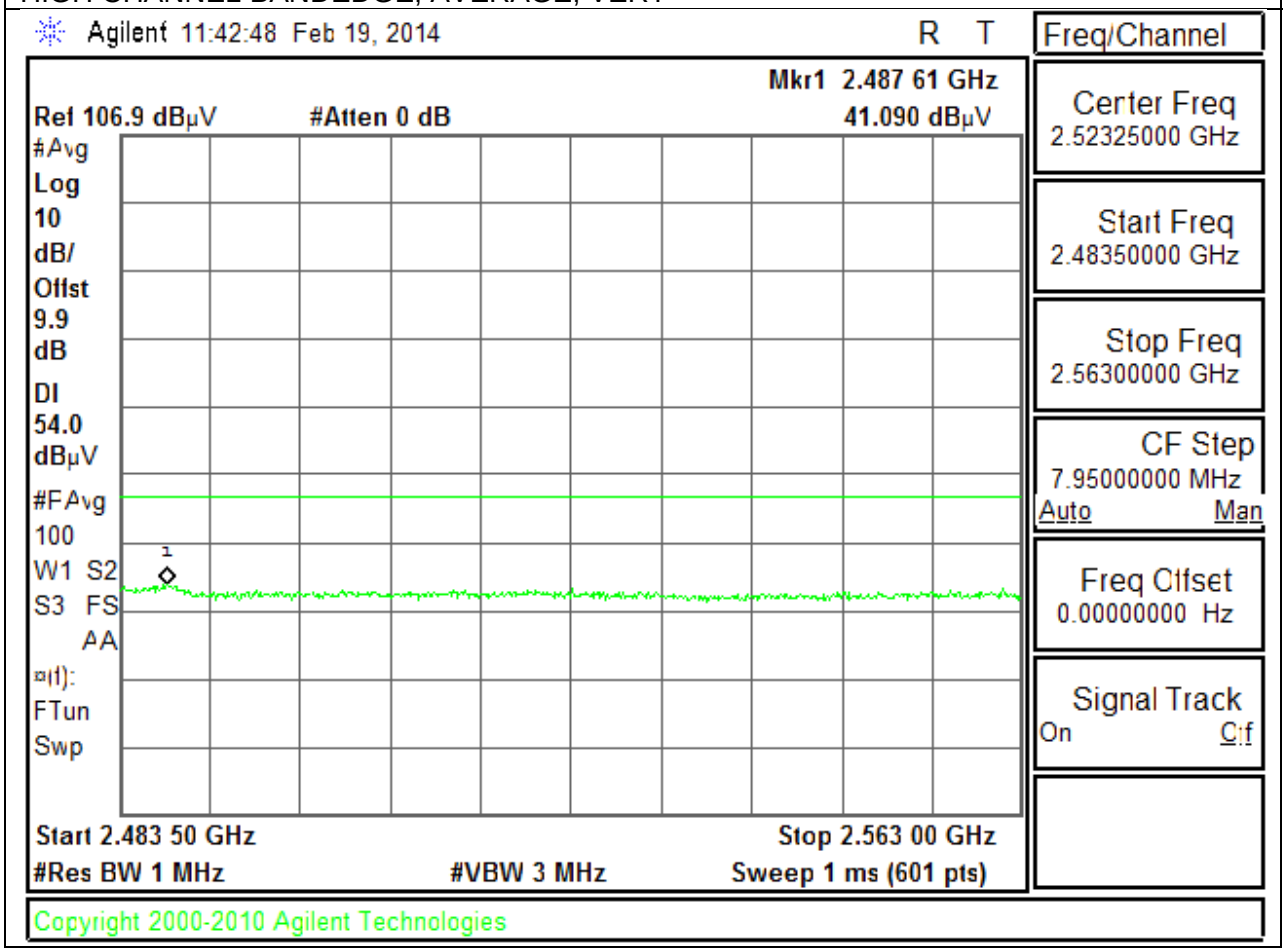
HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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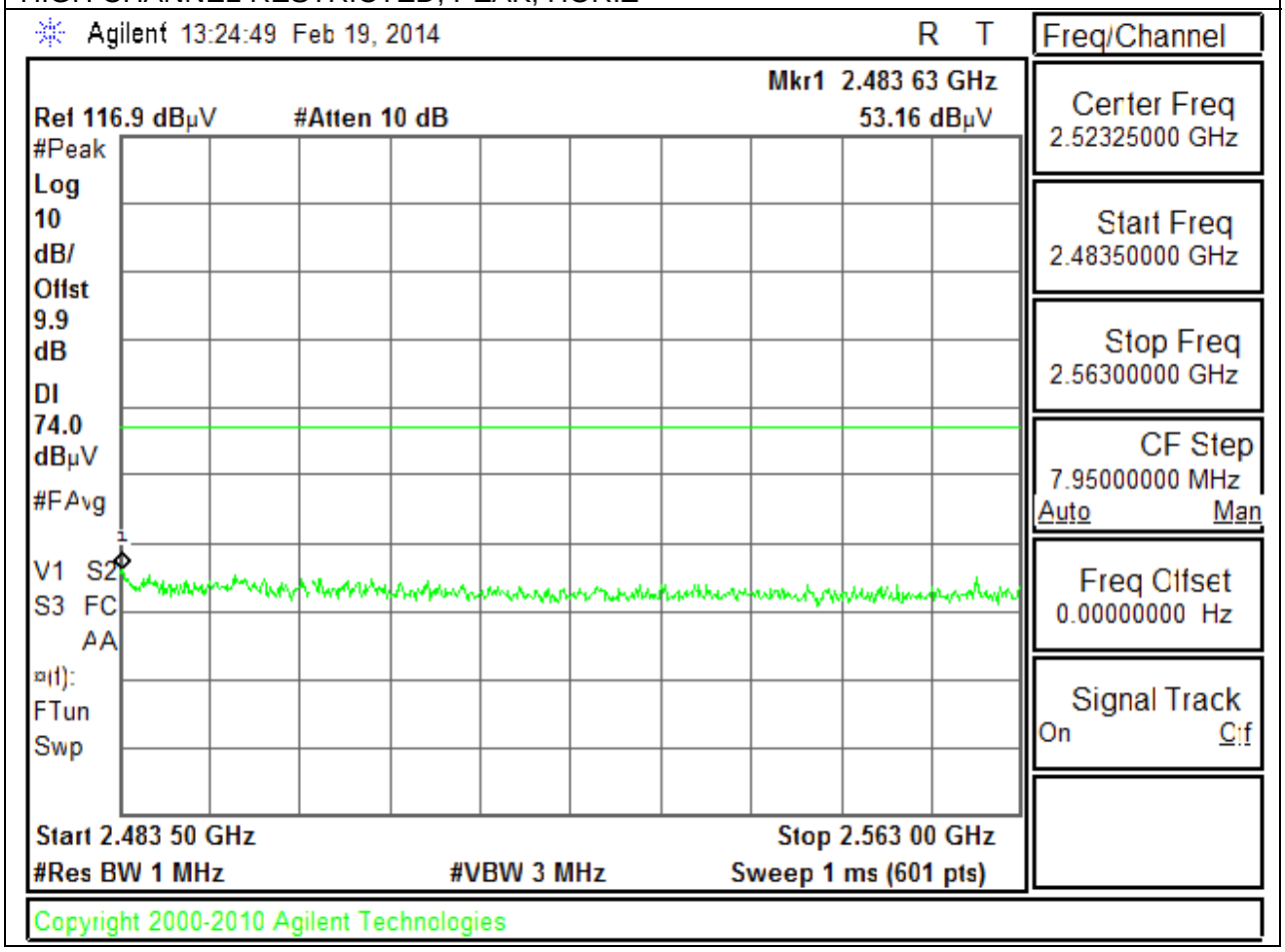
AUTHORIZED BANDEDGE (HIGH CHANNEL 2)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



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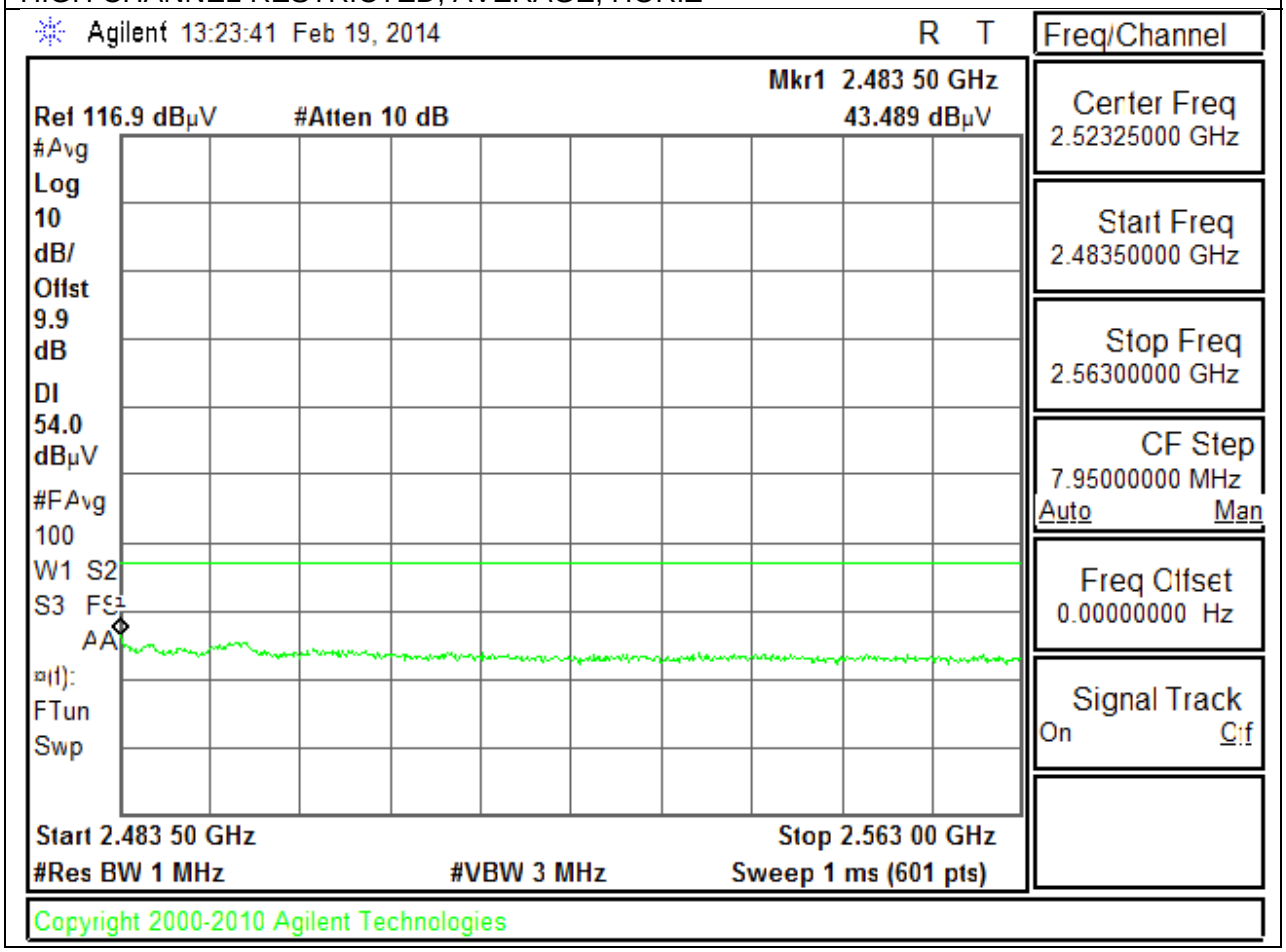
HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



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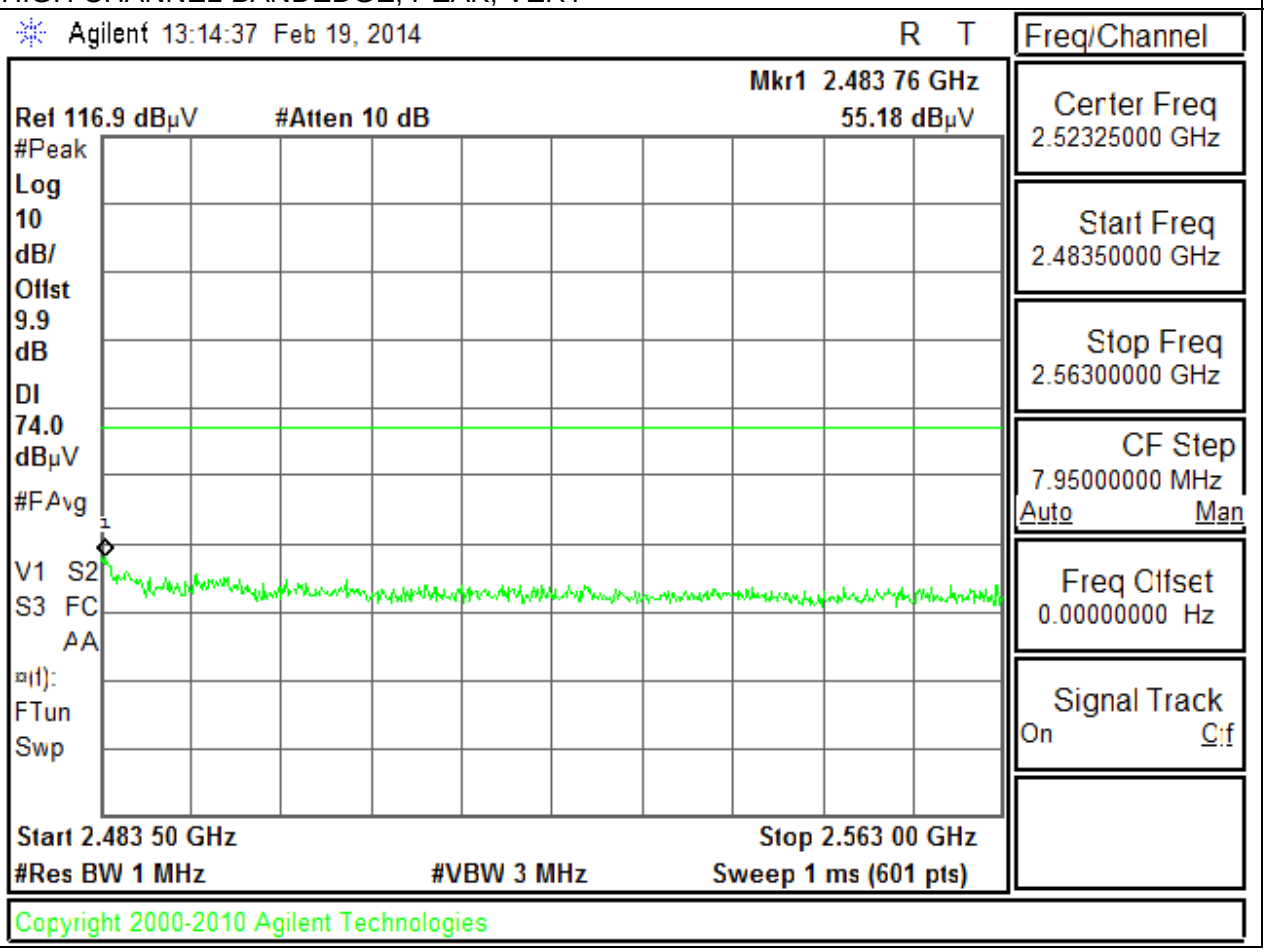
HIGH CHANNEL BANDEDGE, PEAK, VERT



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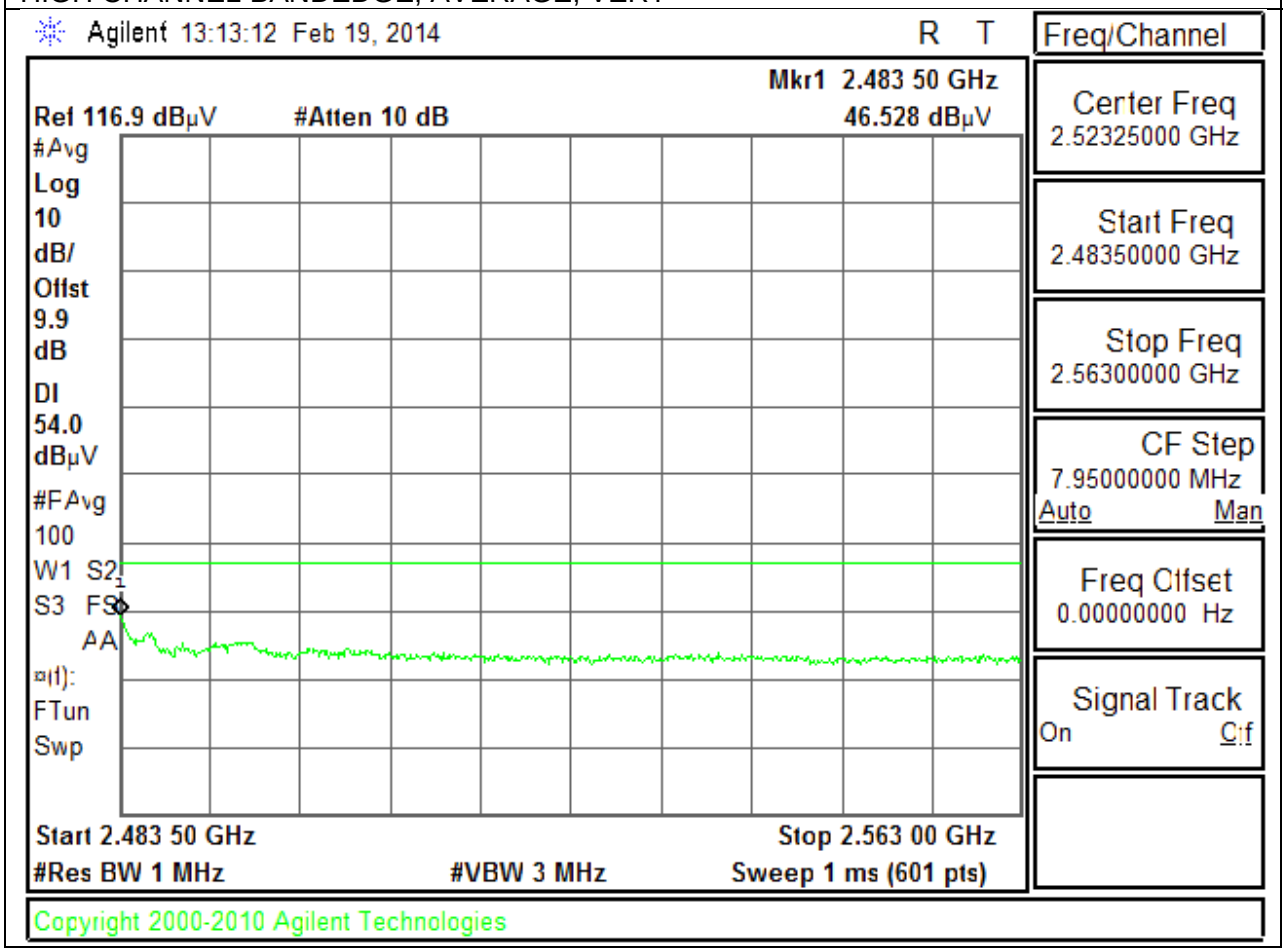
HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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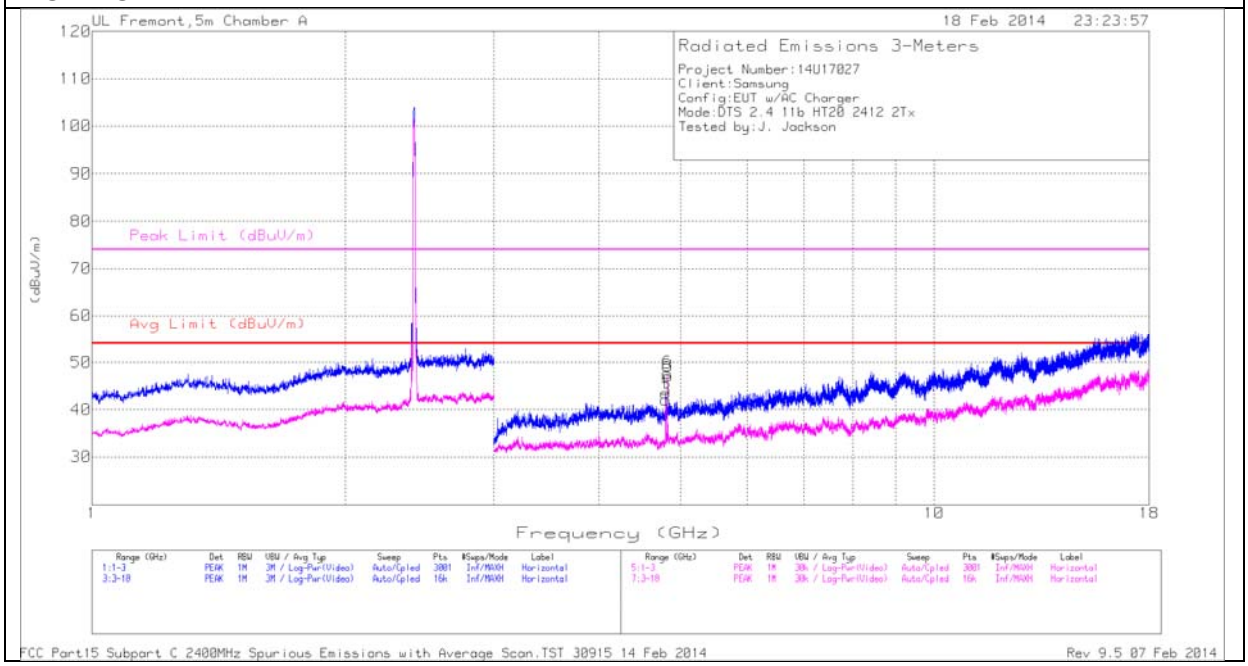
HARMONICS AND SPURIOUS EMISSIONS

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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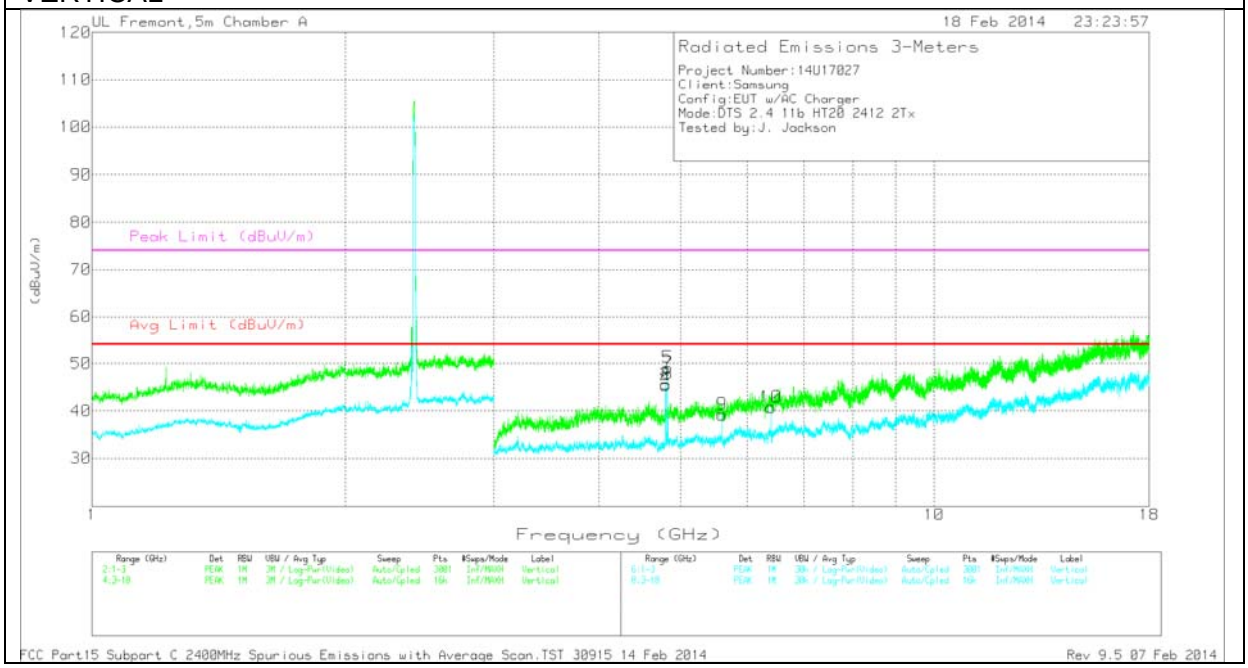
LOW CHANNEL
VERTICAL



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 T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.8	39.85	PK	33.9	-30.2	43.55	54	-10.45	74	-30.45	0-360	200	H
2	* 4.8	41.76	PK	33.9	-30.2	45.46	54	-8.54	74	-28.54	0-360	201	V
3	* 4.8	38.42	Avg	33.9	-30.2	42.12	54	-11.88	-	-	0-360	200	H
4	* 4.8	41.93	Avg	33.9	-30.2	45.63	54	-8.37	-	-	0-360	200	V
6	* 4.823	43.3	Avg	33.9	-29.5	47.7	54	-6.3	-	-	0-360	100	H
8	* 4.824	42.59	PK	33.9	-29.4	47.09	54	-6.91	74	-26.91	0-360	100	H
7	* 4.824	43.4	PK	33.9	-29.4	47.9	54	-6.1	74	-26.1	0-360	201	V
5	* 4.824	44.61	Avg	33.9	-29.4	49.11	54	-4.89	-	-	0-360	200	V
9	5.6	34.29	Avg	34.4	-29.5	39.19	54	-14.81	-	-	0-360	200	V
10	6.4	33.67	Avg	35.5	-28.4	40.77	54	-13.23	-	-	0-360	200	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.824	47.01	PK2	33.9	-29.5	51.41			74	-22.59	121	200	V
* 4.824	44.21	MAv1	33.9	-29.5	48.61	54	-5.39	-	-	121	200	V

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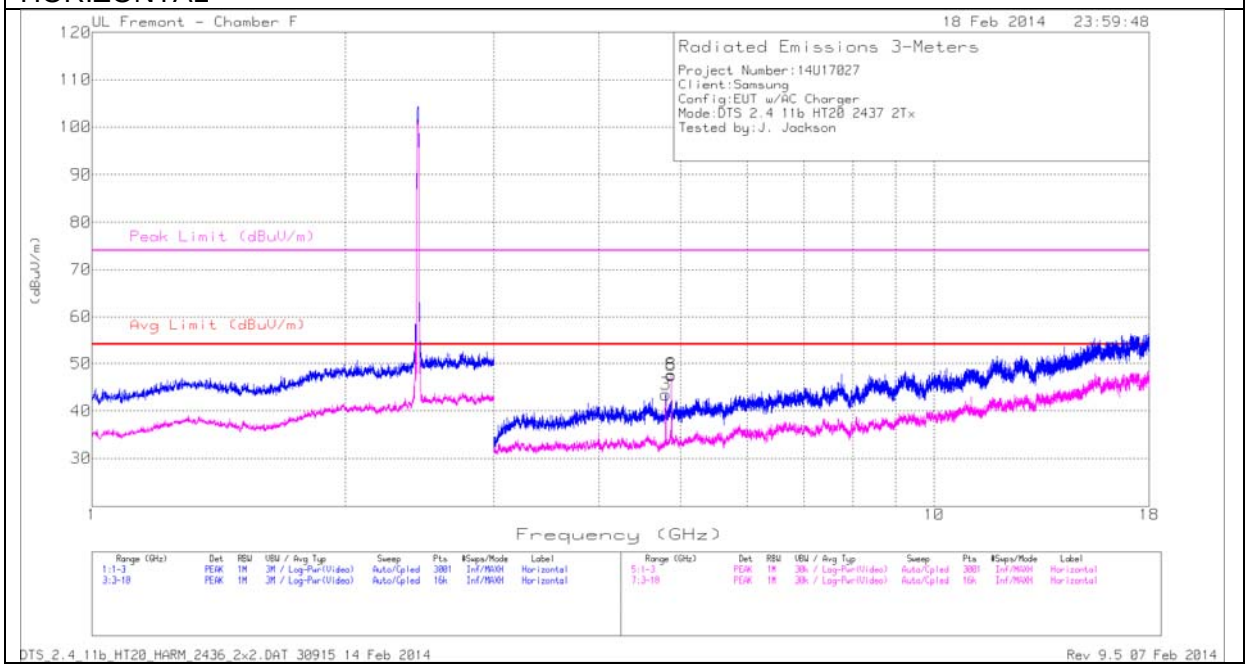
MID CHANNEL
HORIZONTAL



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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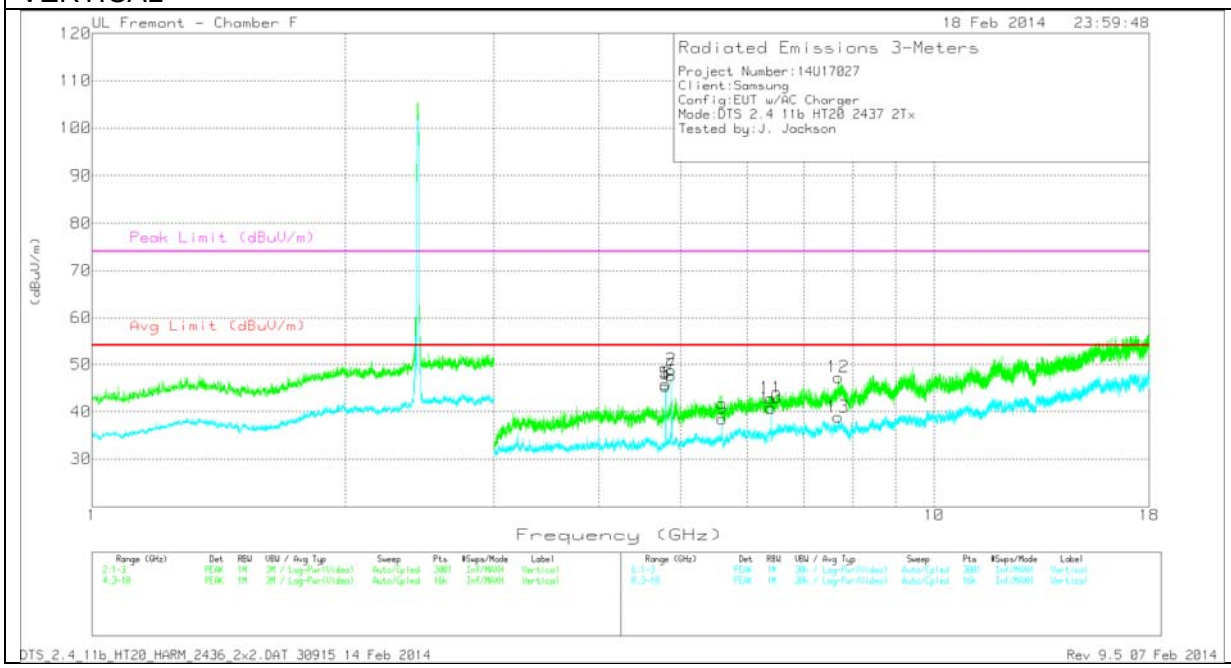
MID CHANNEL
VERTICAL



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 T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 4.801	39.67	PK	33.9	-30.1	43.47	54	-10.53	74	-30.53	0-360	200	H
6	* 4.874	41.78	PK	34	-28.3	47.48	54	-6.52	74	-26.52	0-360	101	H
4	* 4.799	41.66	PK	33.9	-30.2	45.36	54	-8.64	74	-28.64	0-360	201	V
7	* 4.874	41.93	PK	34	-28.3	47.63	54	-6.37	74	-26.37	0-360	201	V
11	6.399	35.69	PK	35.5	-28.3	42.89	54	- 11.11	-	-	0-360	201	V
12	* 7.694	36.17	PK	35.5	-24.4	47.27	54	-6.73	74	-26.73	0-360	201	V
8	* 4.874	41.96	Avg	34	-28.3	47.66	54	-6.34	-	-	0-360	101	H
1	* 4.8	42.15	Avg	33.9	-30.2	45.85	54	-8.15	-	-	0-360	200	V
2	* 4.874	43.12	Avg	34	-28.3	48.82	54	-5.18	-	-	0-360	200	V
5	* 4.8	42.15	Avg	33.9	-30.2	45.85	54	-8.15	-	-	0-360	200	V
9	5.6	33.58	Avg	34.4	-29.5	38.48	54	-15.52	-	-	0-360	200	V
10	6.4	33.68	Avg	35.5	-28.4	40.78	54	-13.22	-	-	0-360	200	V
13	* 7.691	28.03	Avg	35.5	-24.7	38.83	54	-15.17	-	-	0-360	200	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.874	46.14	PK2	34	-28.3	51.84			74	-22.16	123	179	V
* 4.874	43.48	MAv1	34	-28.3	49.18	54	-4.82	-	-	123	179	V

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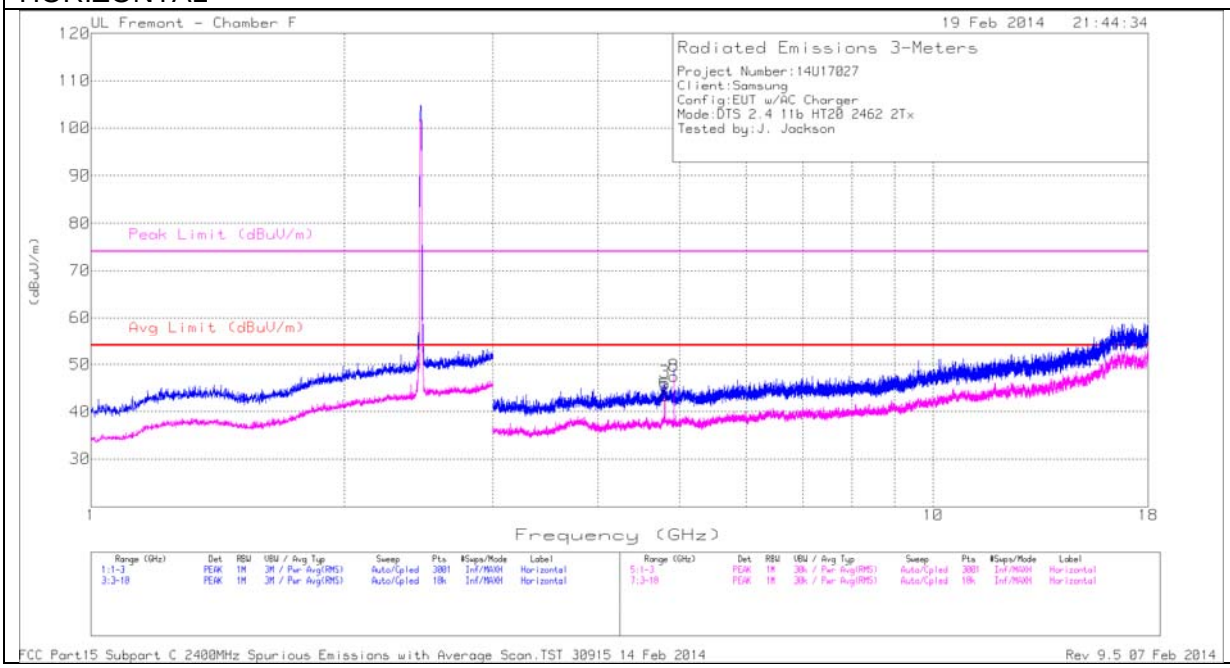
HIGH CHANNEL
HORIZONTAL



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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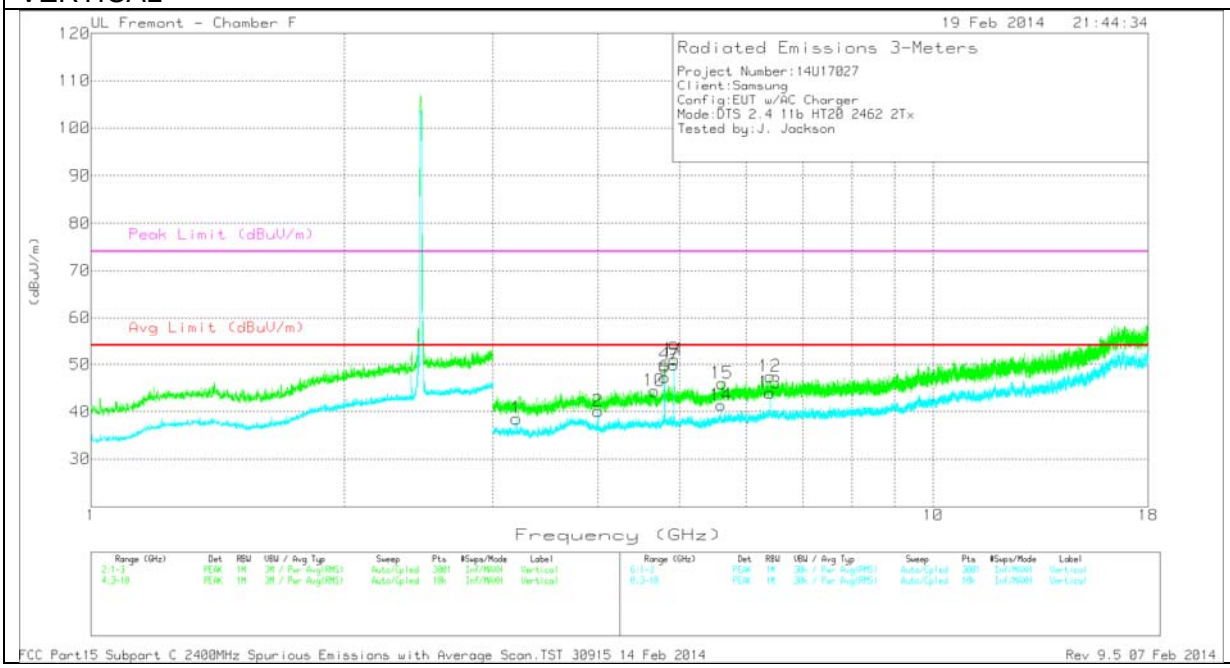
HIGH CHANNEL
VERTICAL



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 T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 4.801	39.58	PK	34.1	-27.5	46.18	54	-7.82	74	-27.82	0-360	200	H
4	* 4.801	43.35	PK	34.1	-27.5	49.95	54	-4.05	74	-24.05	0-360	201	V
9	* 4.925	46.12	PK	34	-29.1	51.02	-	-	74	-22.98	0-360	201	V
10	* 4.666	39.09	PK	34.1	-28.8	44.39	54	-9.61	74	-29.61	0-360	201	V
11	* 4.925	46.12	PK	34	-29.1	51.02	-	-	74	-22.98	0-360	201	V
12	6.401	39.03	PK	35.7	-27.3	47.43	-	-	74	-26.57	0-360	101	V
15	5.613	39.59	PK	34.8	-28.4	45.99	-	-	74	-28.01	0-360	201	V
5	* 4.8	36.82	Avg	34.1	-27.5	43.42	54	-10.58	-	-	0-360	200	H
8	* 4.924	42.58	Avg	34	-29.1	47.48	54	-6.52	-	-	0-360	101	H
2	* 4	36.01	Avg	33.5	-29.4	40.11	54	-13.89	-	-	0-360	101	V
6	* 4.8	40.68	Avg	34.1	-27.5	47.28	54	-6.72	-	-	0-360	101	V
7	* 4.924	44.97	Avg	34	-29.1	49.87	54	-4.13	-	-	0-360	201	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.924	45.94	PK2	34	-29.1	50.84			74	-23.16	102	199	V
* 4.924	42.22	MAv1	34	-29.1	47.12	54	-6.88	-	-	102	199	V
* 4.8	43.69	PK2	34.1	-27.5	50.29			74	-23.71	87	253	V
* 4.8	38.29	MAv1	34.1	-27.5	44.89	54	-9.11	-	-	87	253	V

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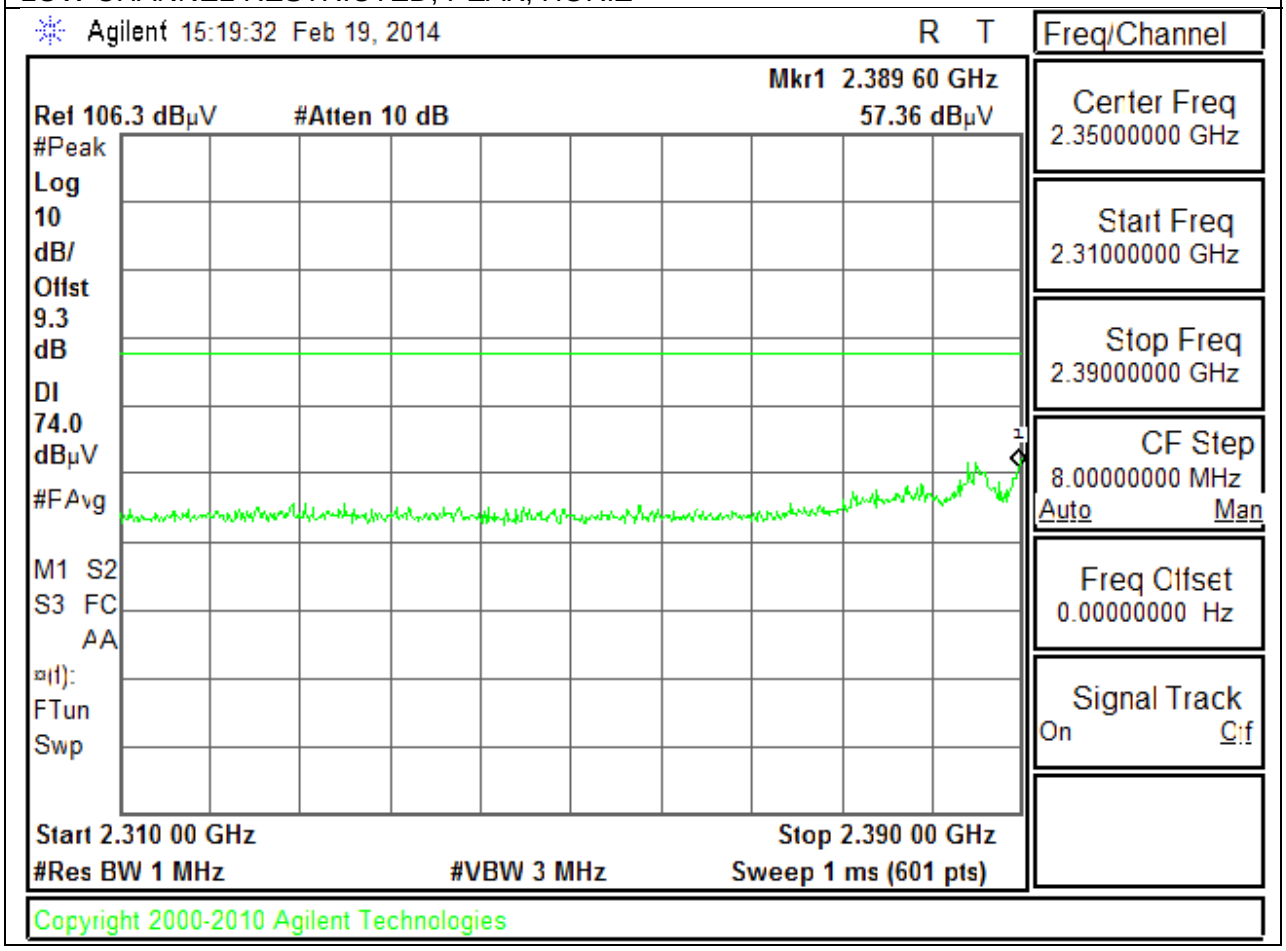
10.3.2. TX ABOVE 1 GHz 802.11g CDD MODE IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL 1)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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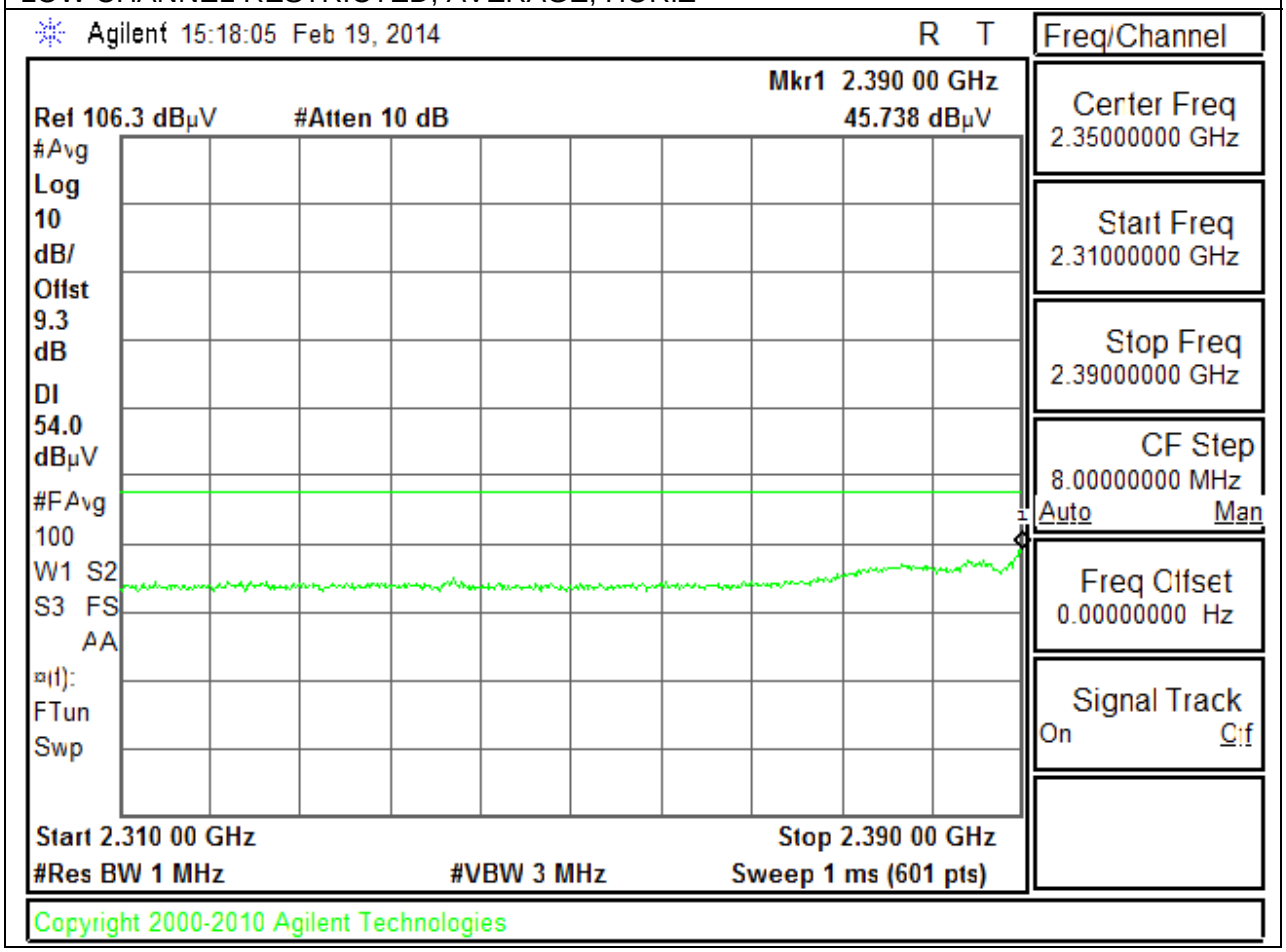
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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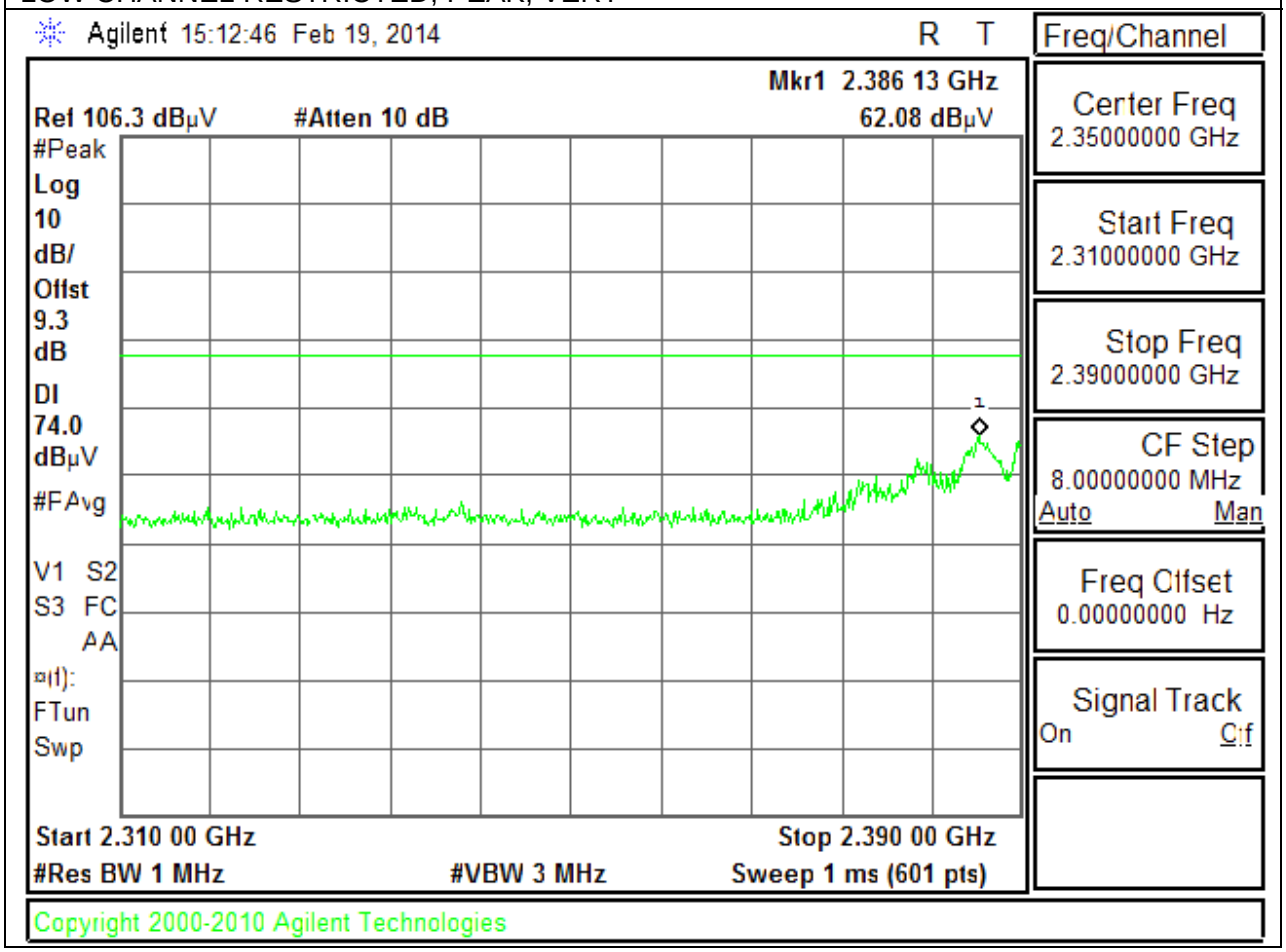
LOW CHANNEL RESTRICTED, PEAK, VERT



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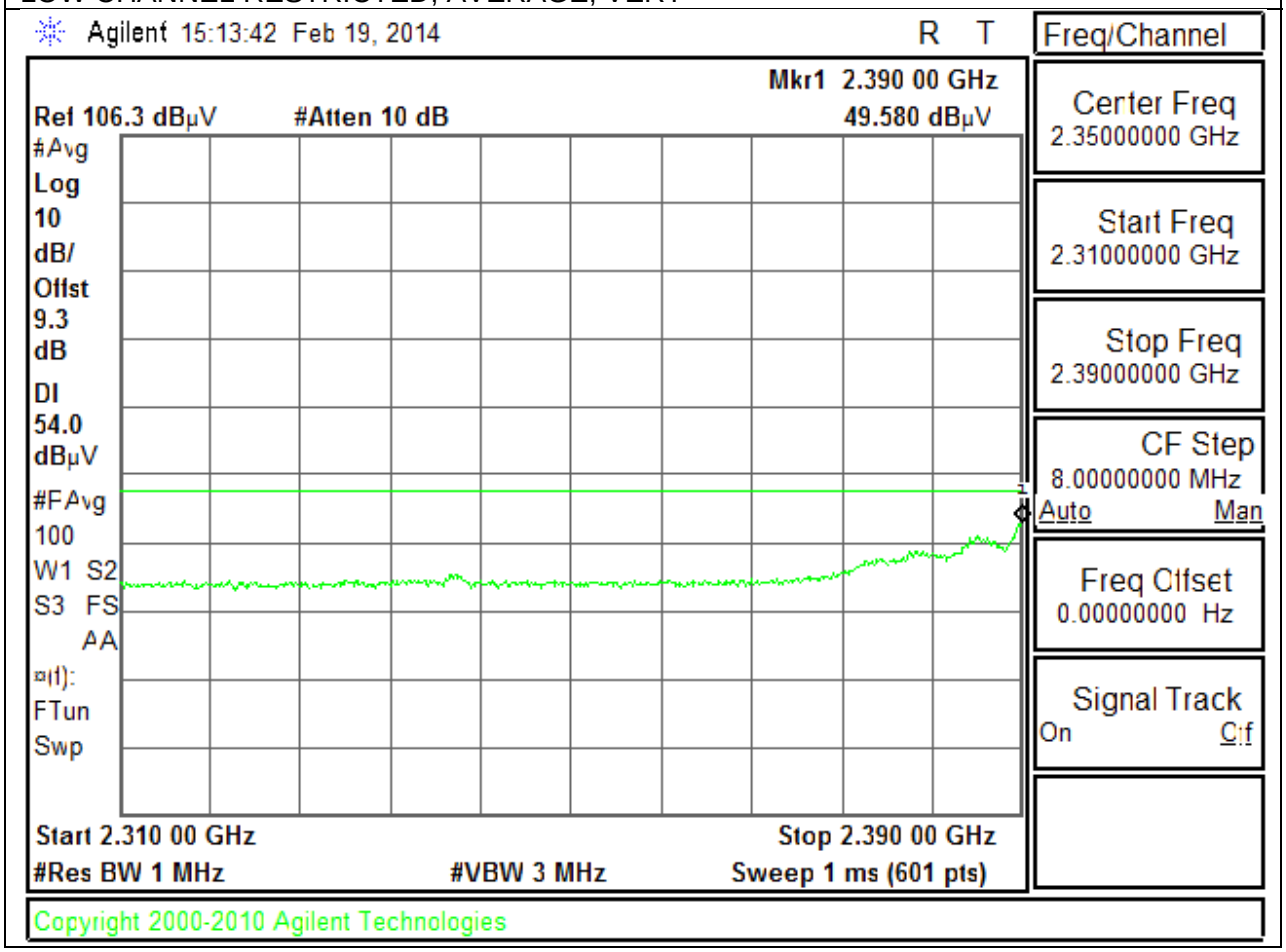
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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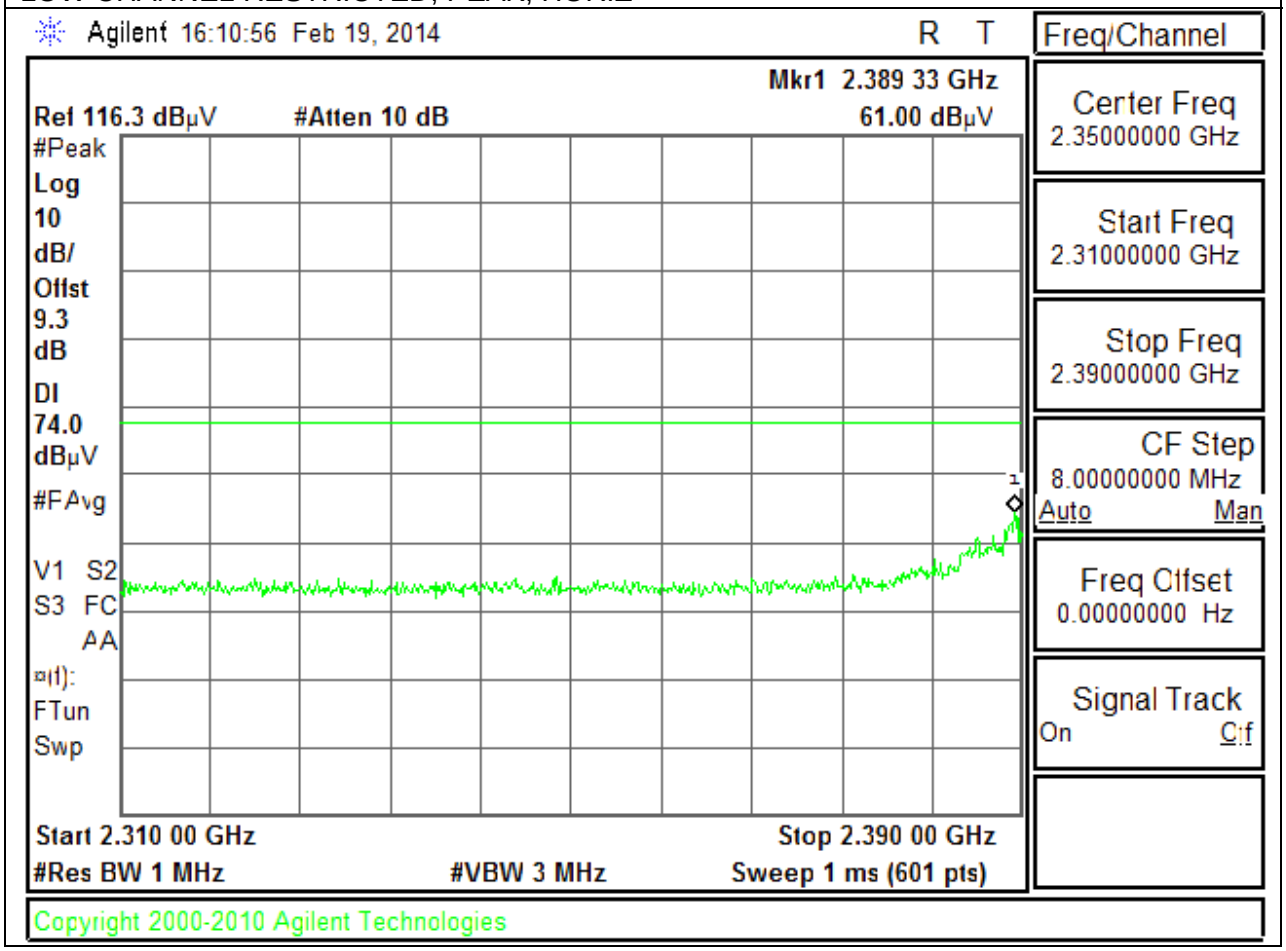
TX ABOVE 1 GHz 802.11g CDD MODE IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL 2)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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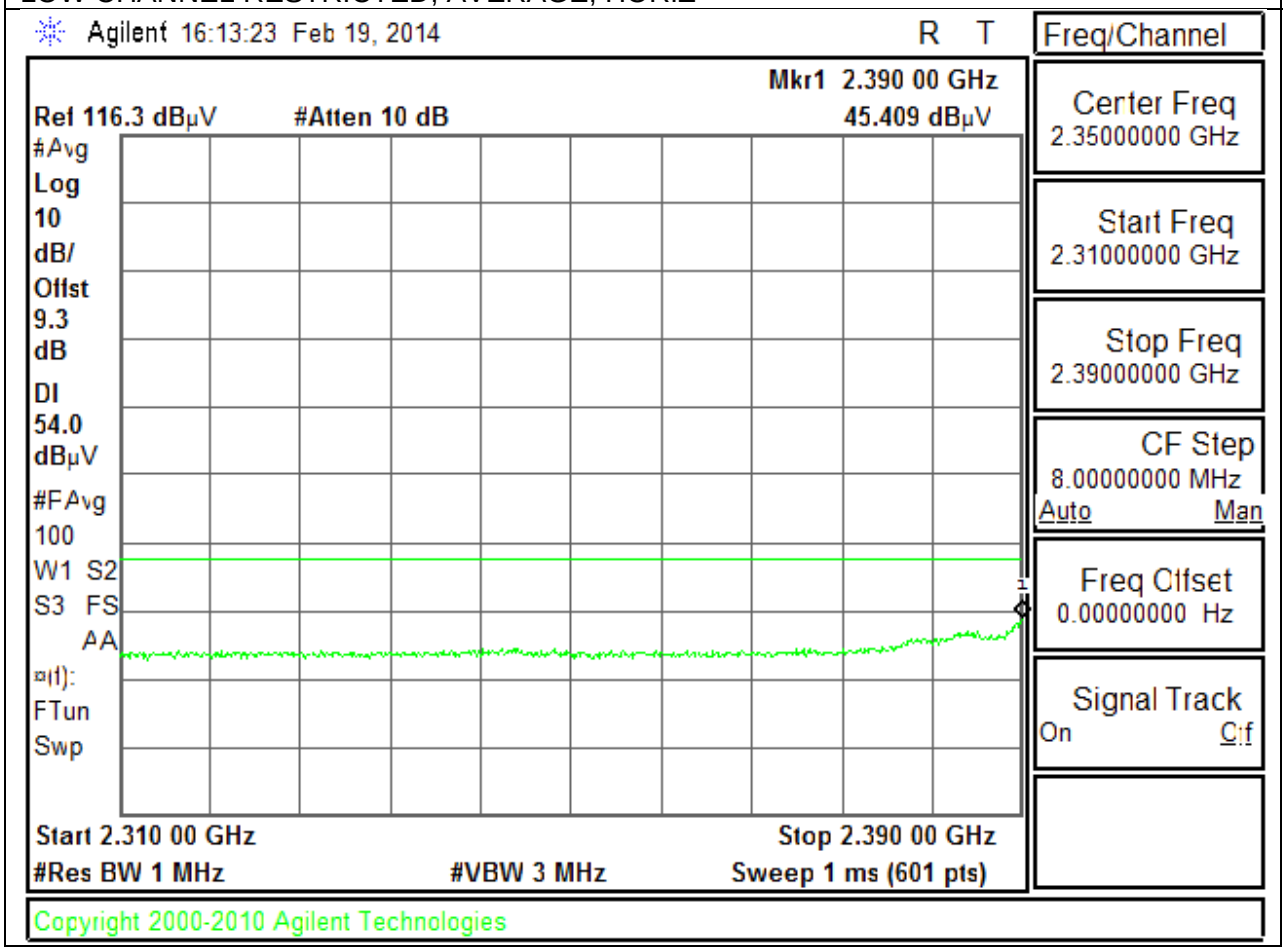
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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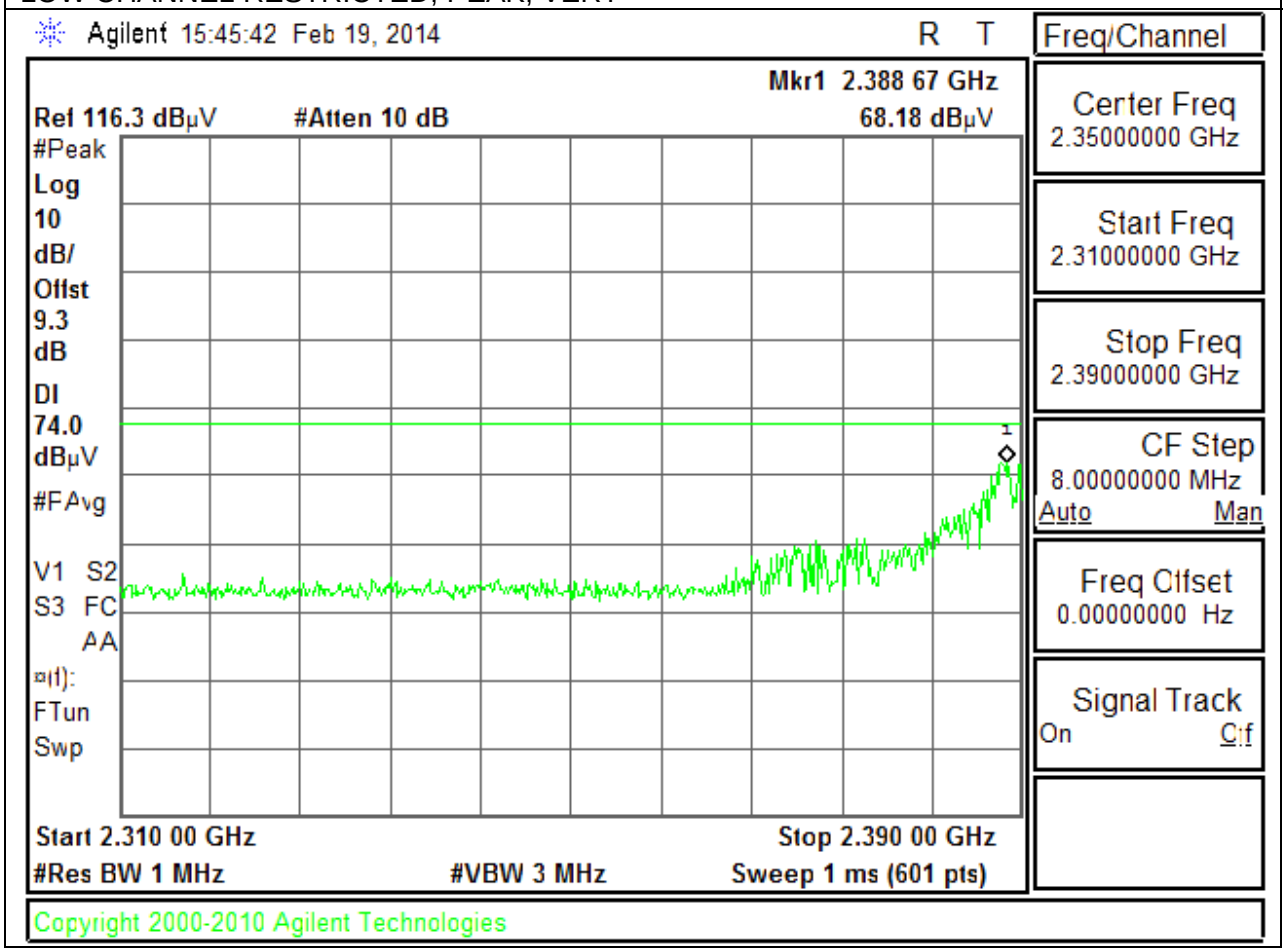
LOW CHANNEL RESTRICTED, PEAK, VERT



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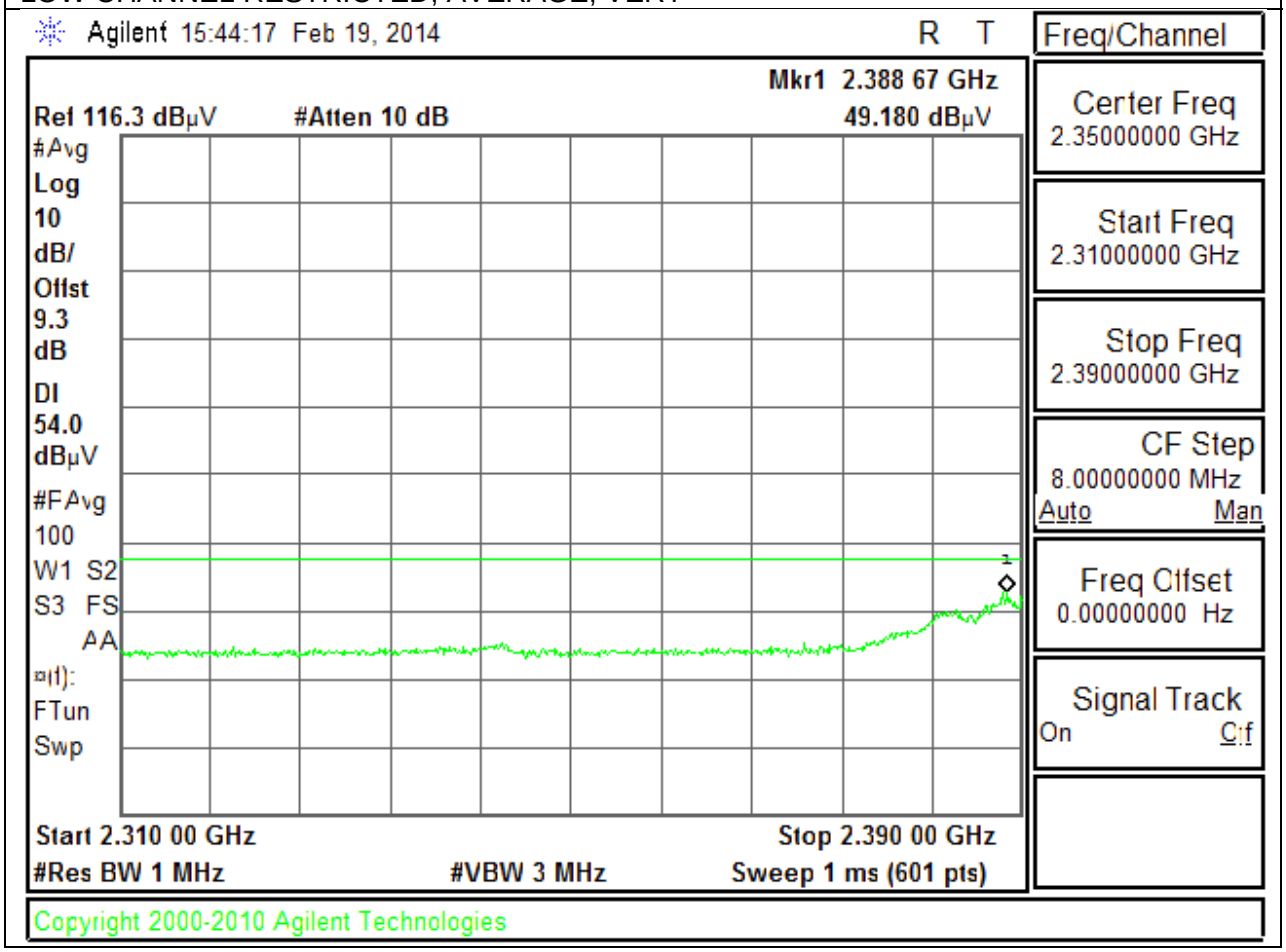
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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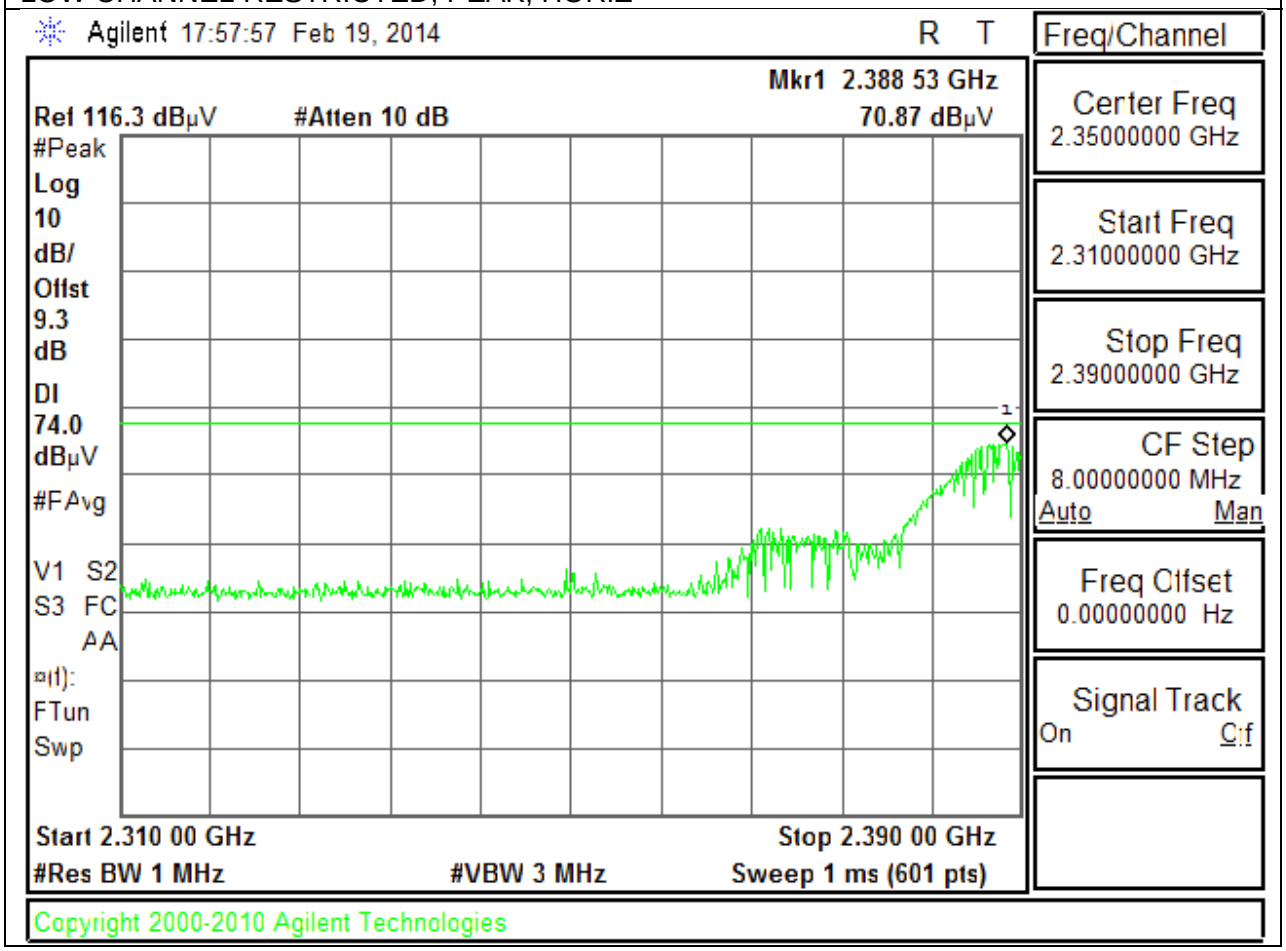
TX ABOVE 1 GHz 802.11g CDD MODE IN THE 2.4 GHz BAND
RESTRICTED BANDEDGE (LOW CHANNEL 3)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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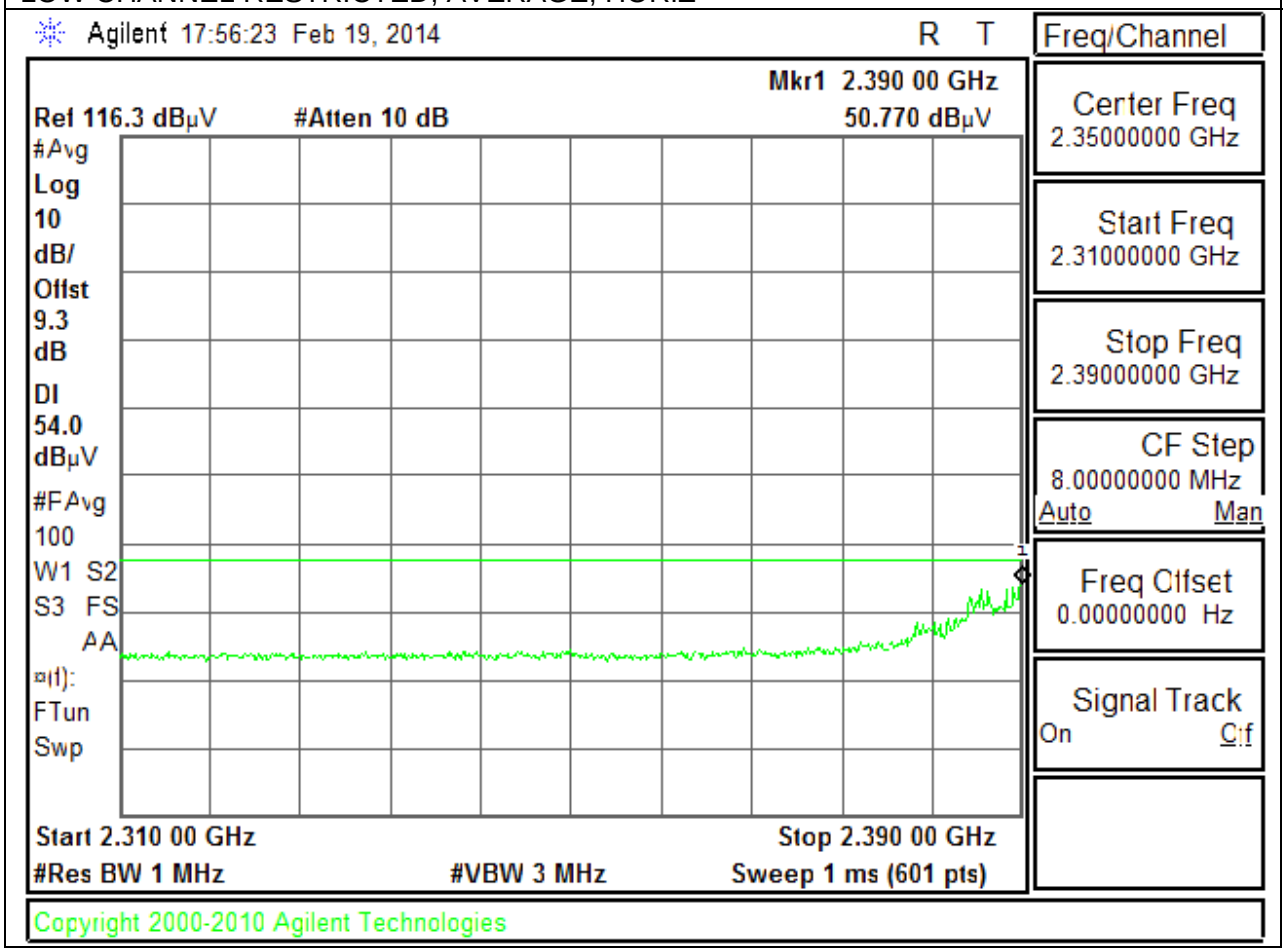
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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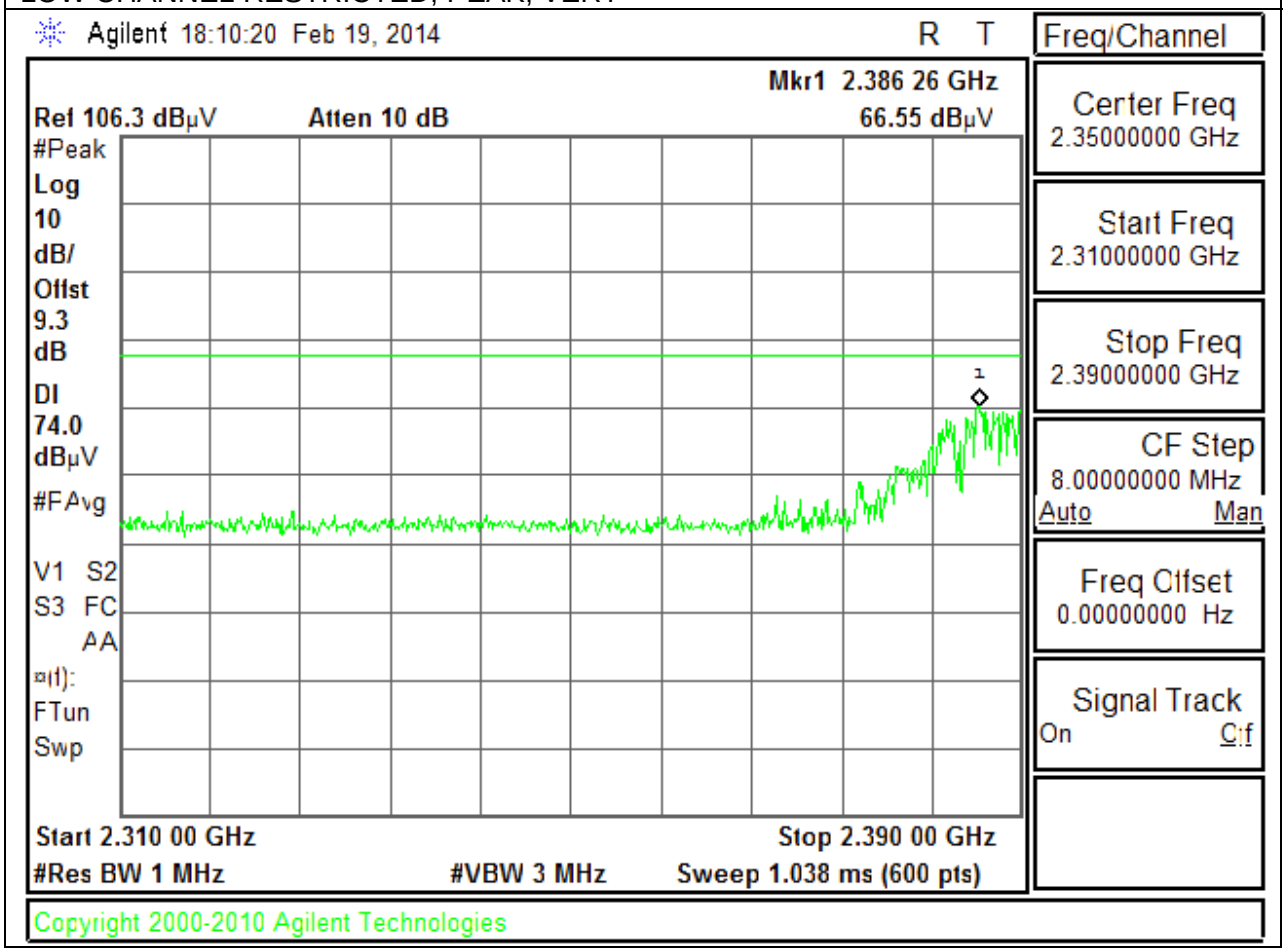
LOW CHANNEL RESTRICTED, PEAK, VERT



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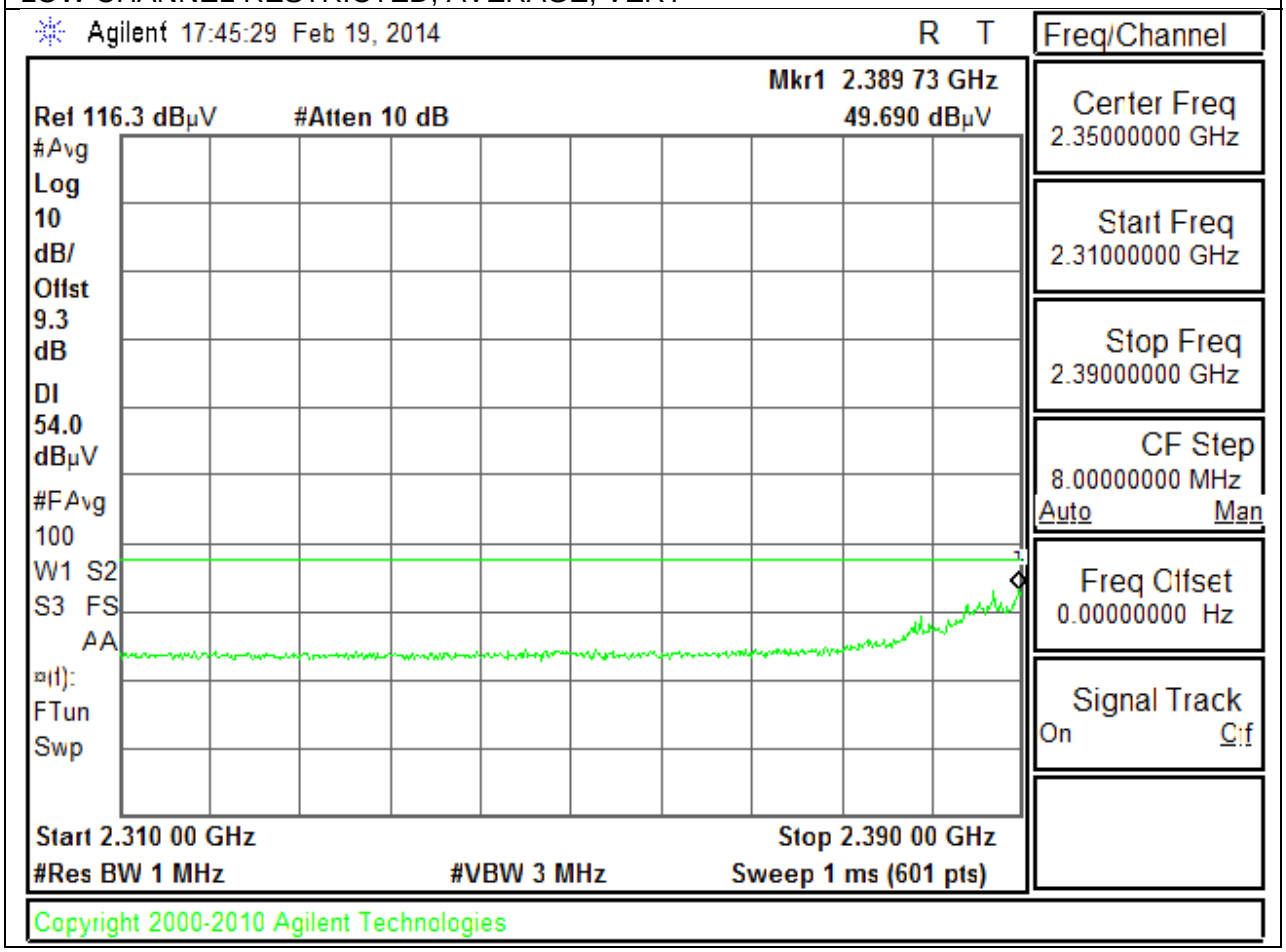
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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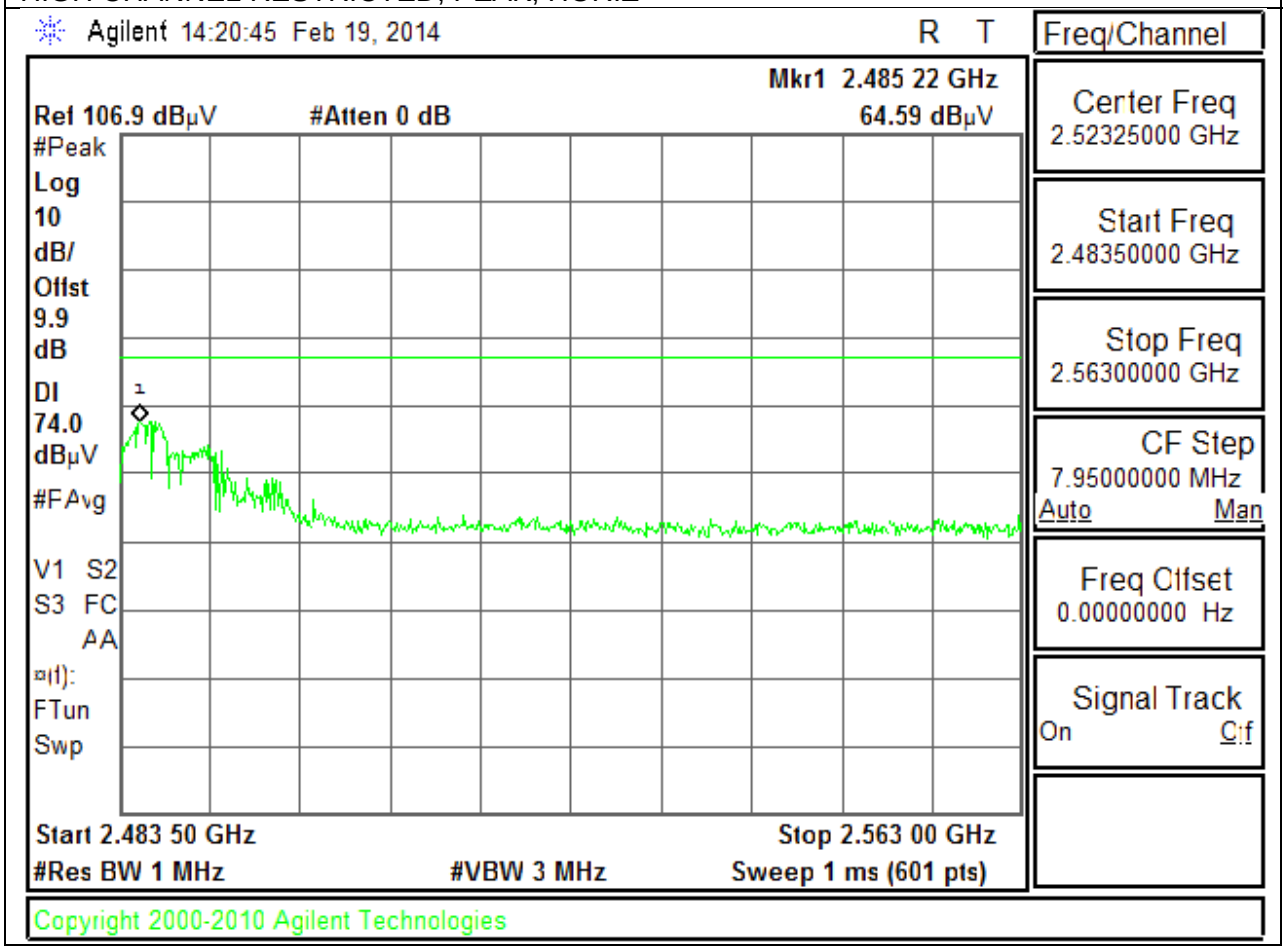
AUTHORIZED BANDEDGE (HIGH CHANNEL1)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



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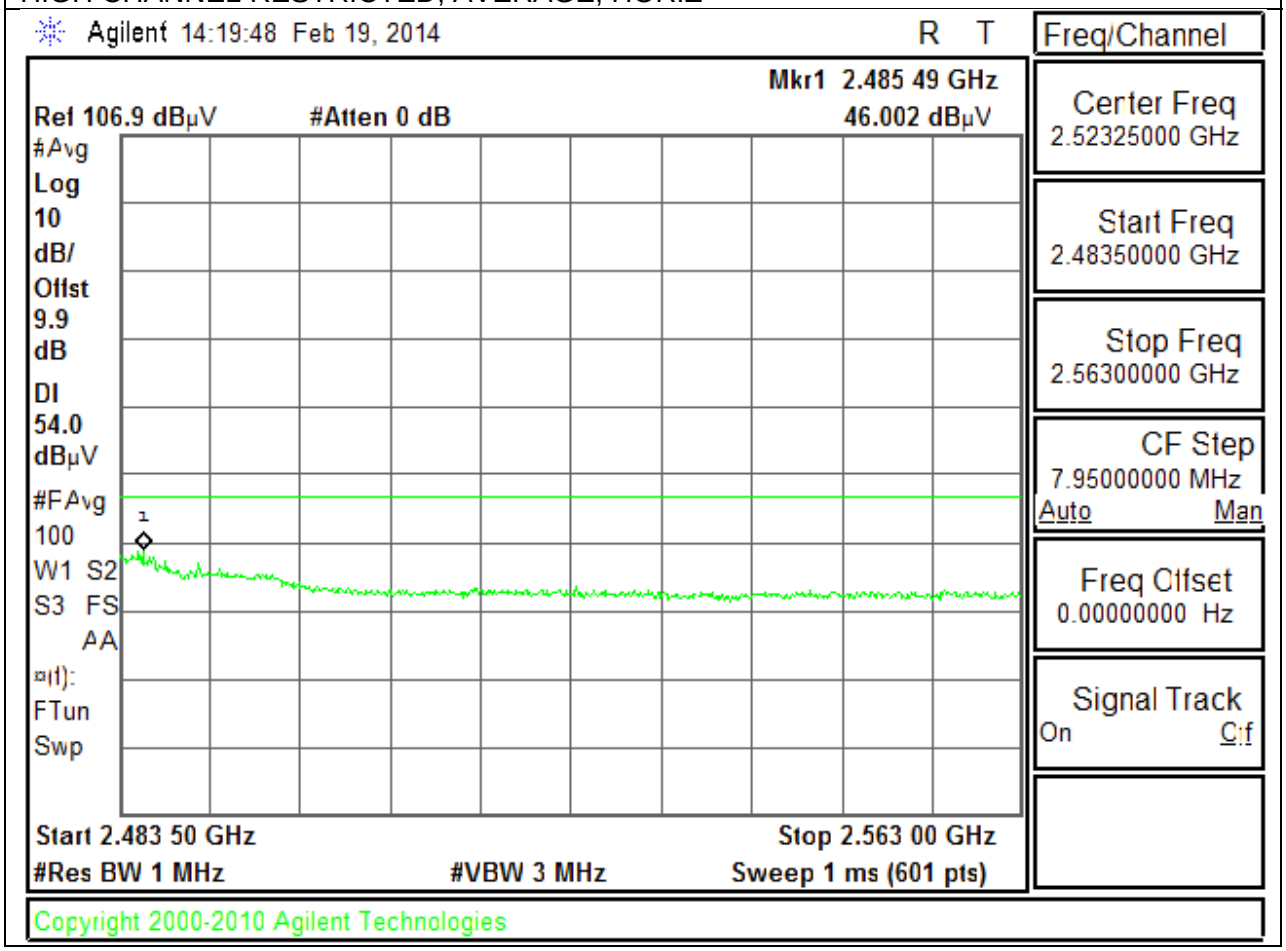
HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



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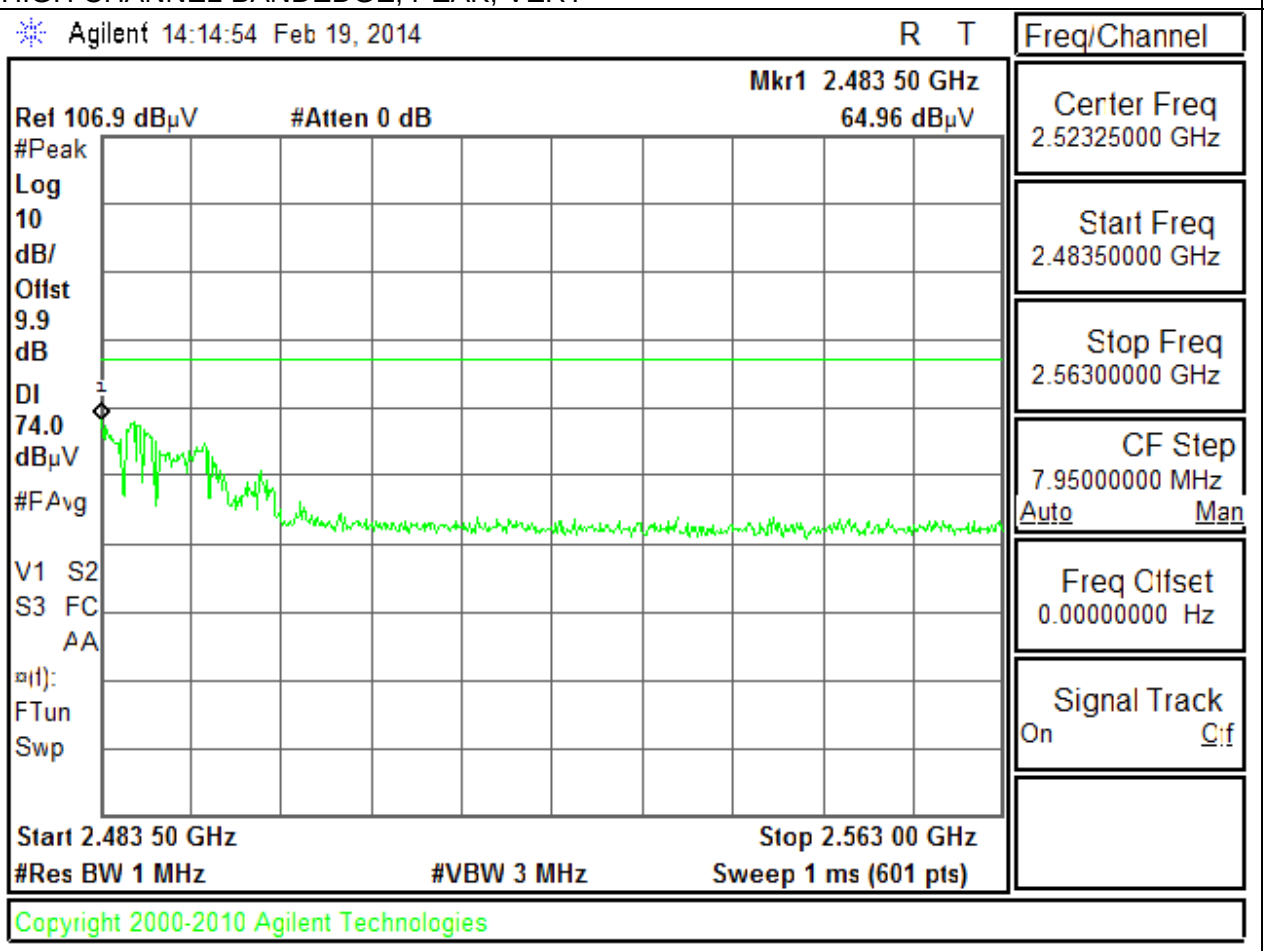
HIGH CHANNEL BANDEDGE, PEAK, VERT



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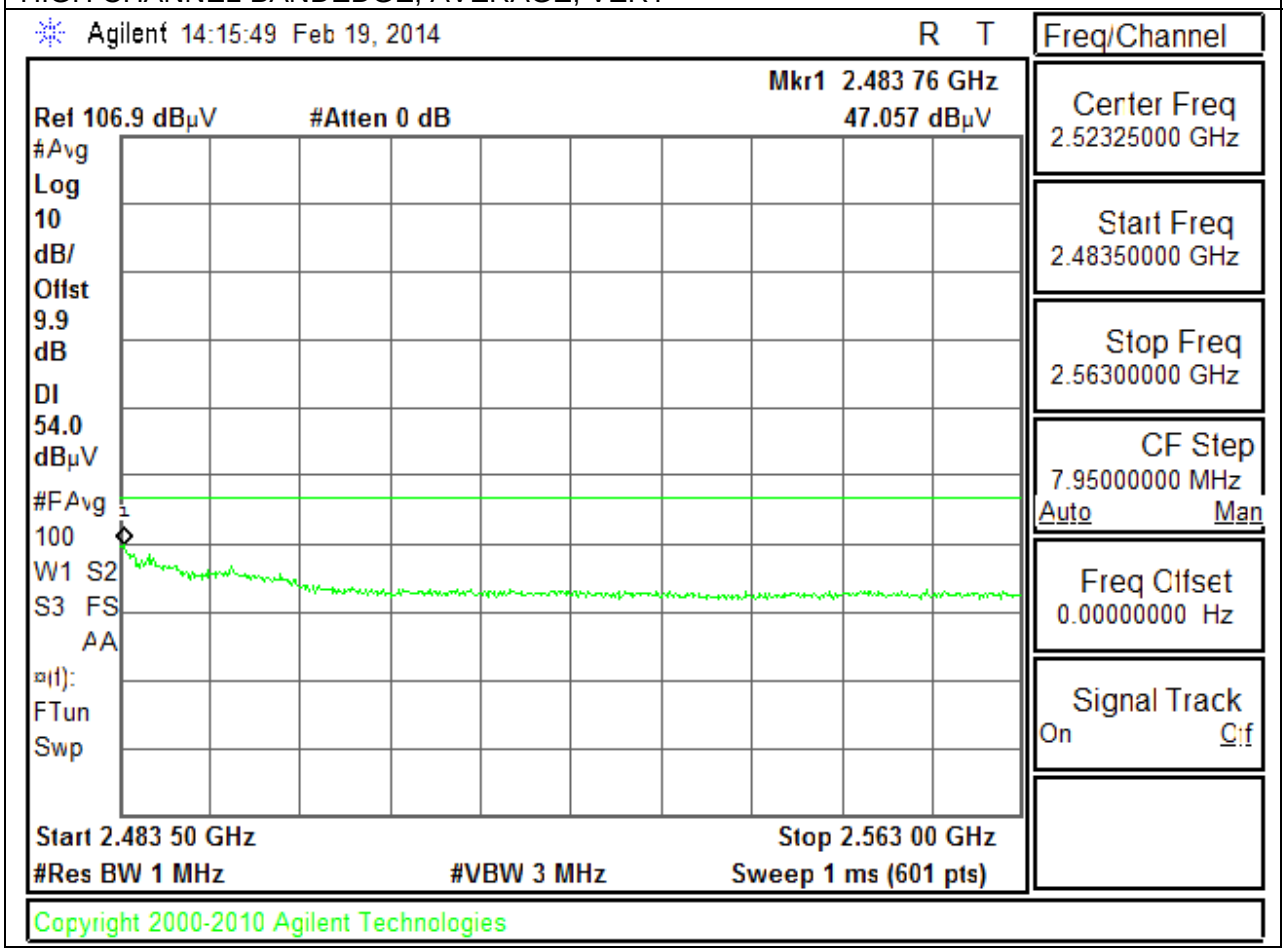
HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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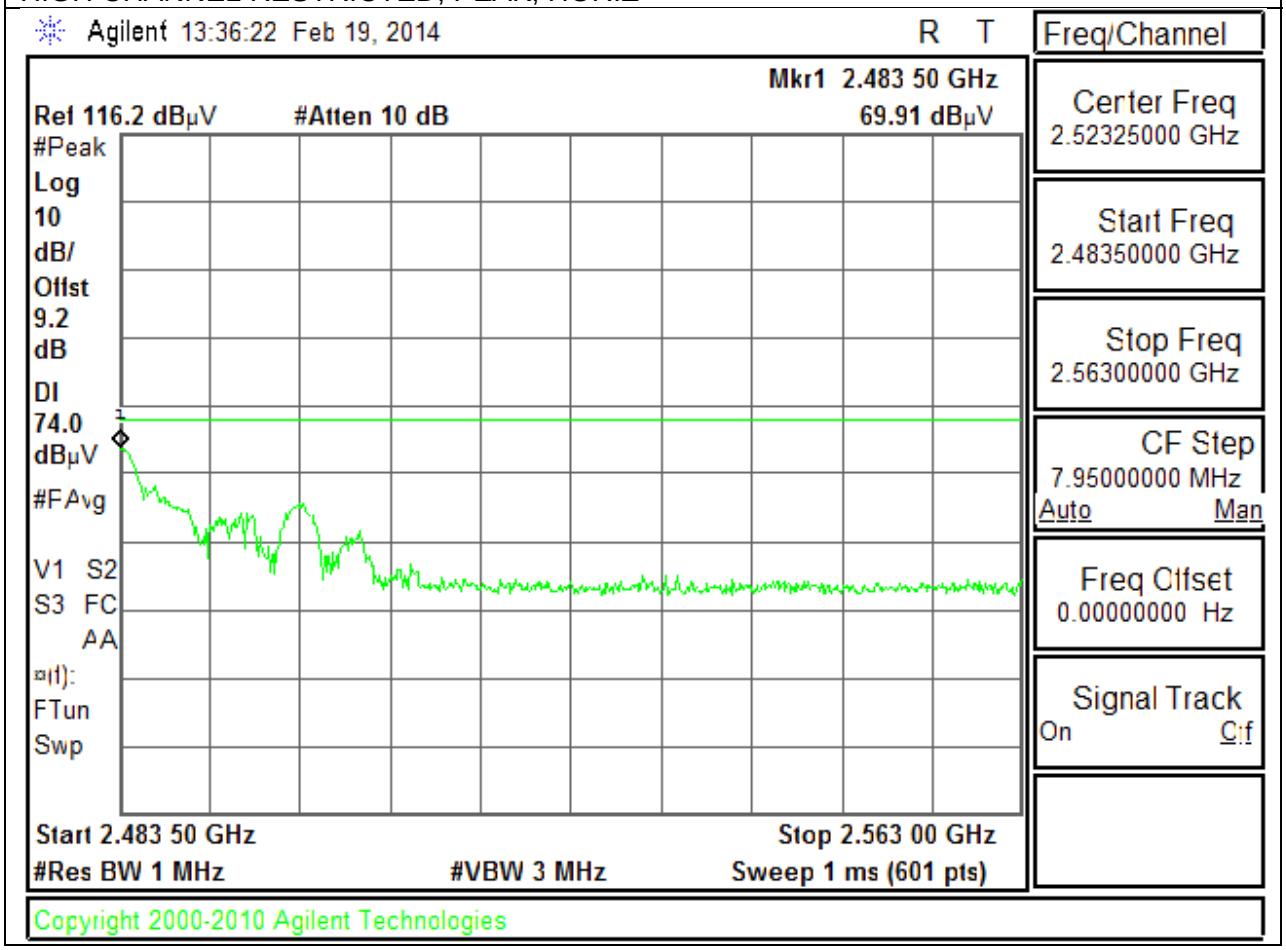
AUTHORIZED BANDEDGE (HIGH CHANNEL2)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



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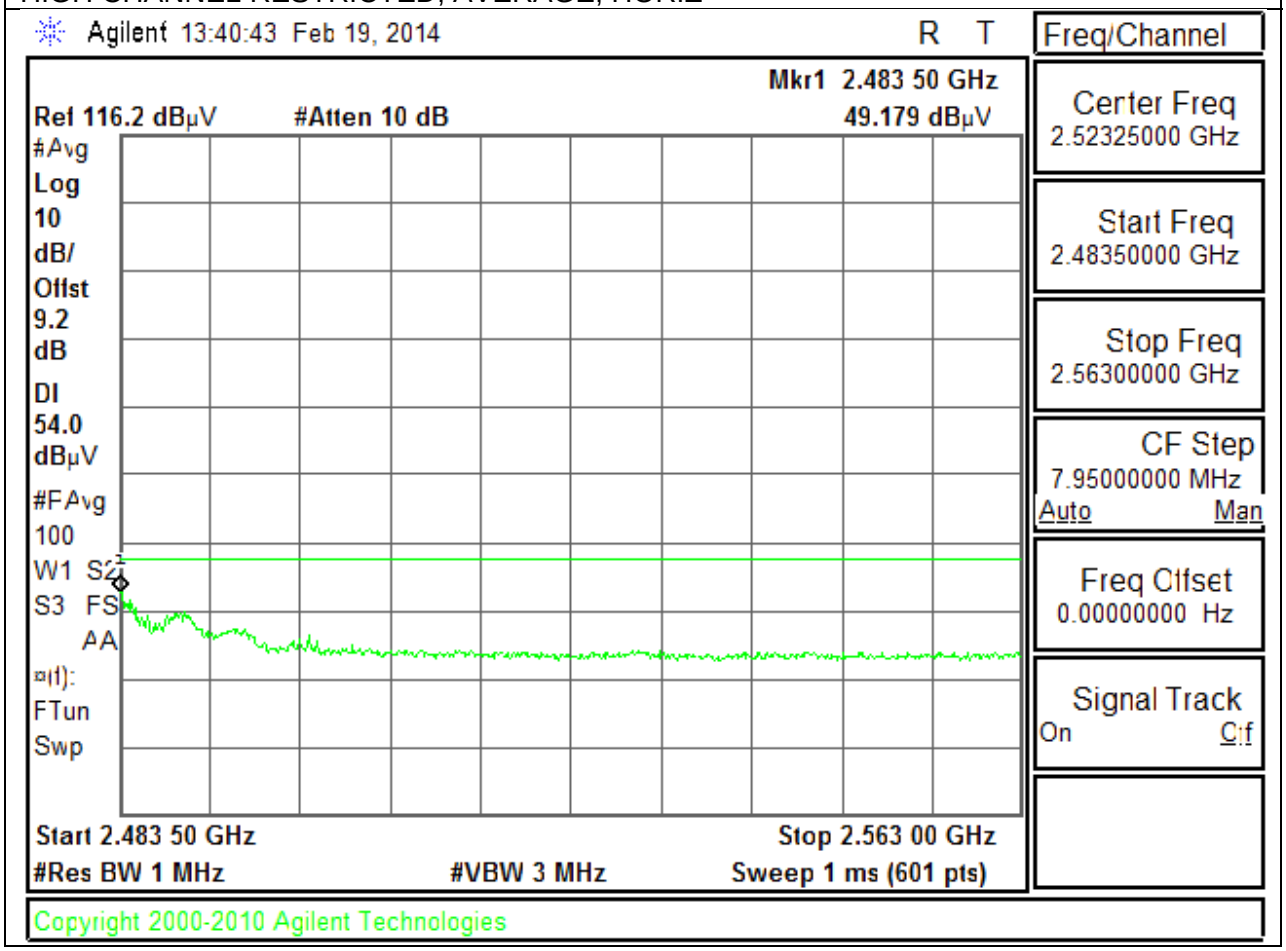
HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



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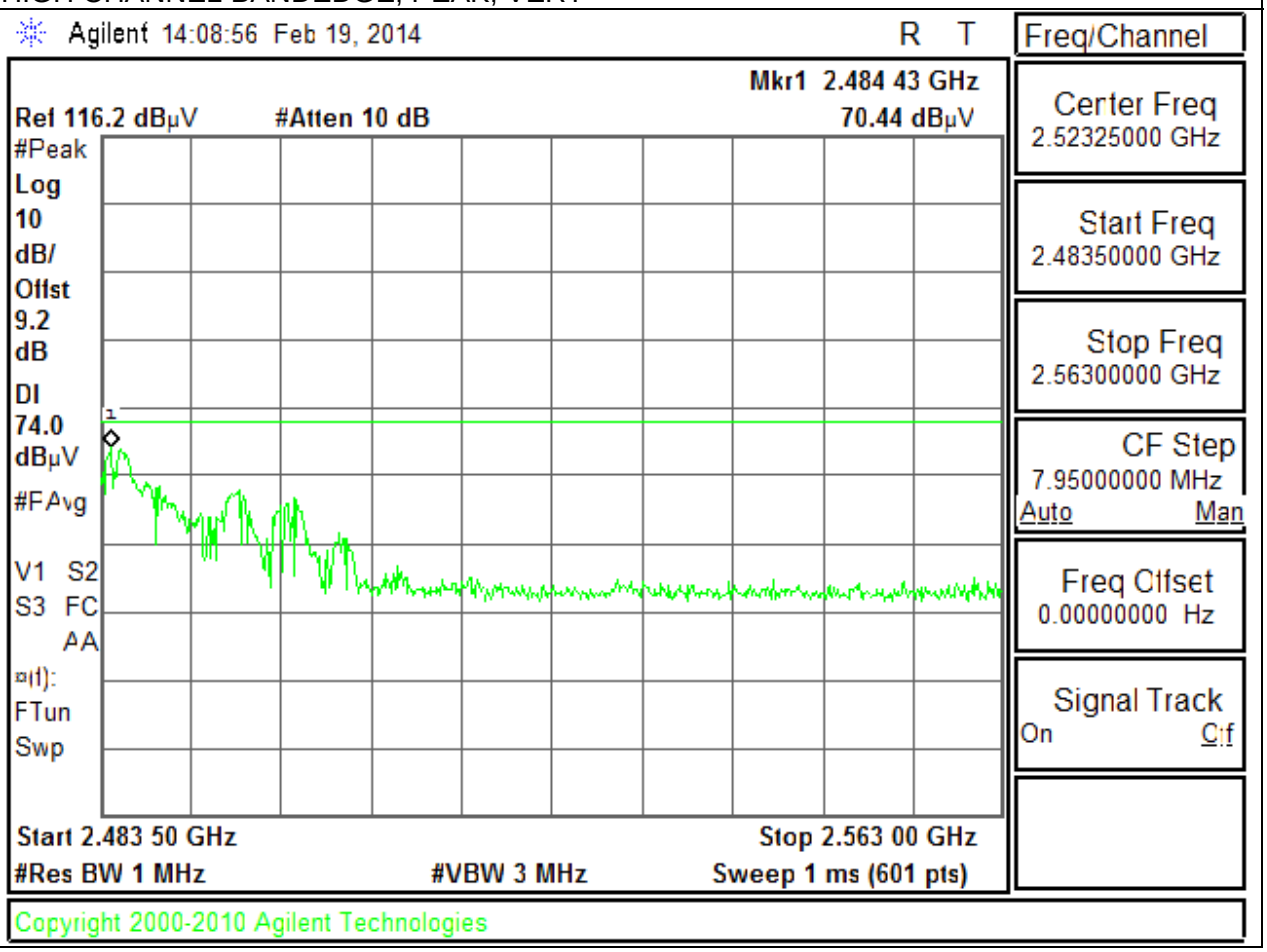
HIGH CHANNEL BANDEDGE, PEAK, VERT



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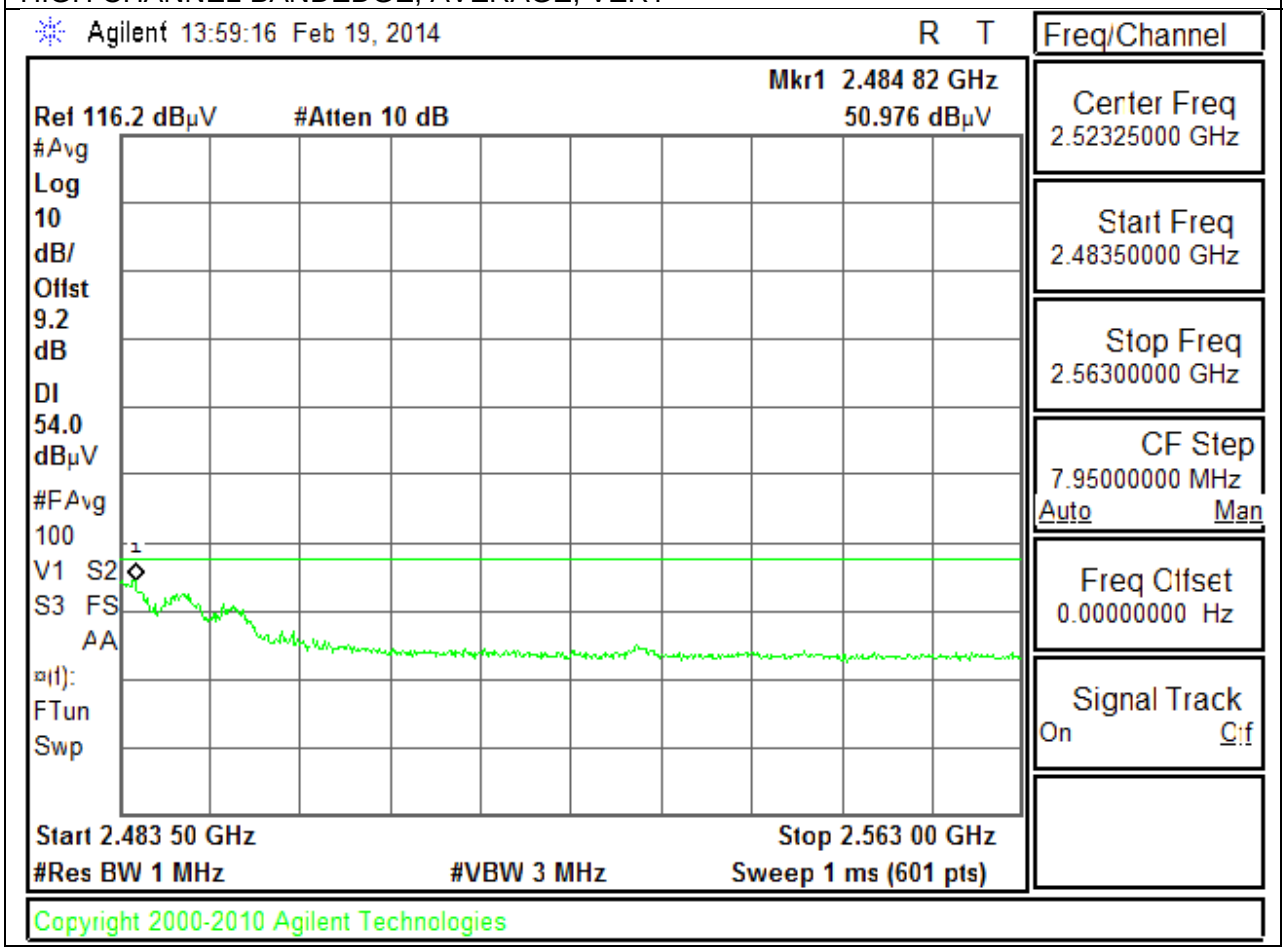
HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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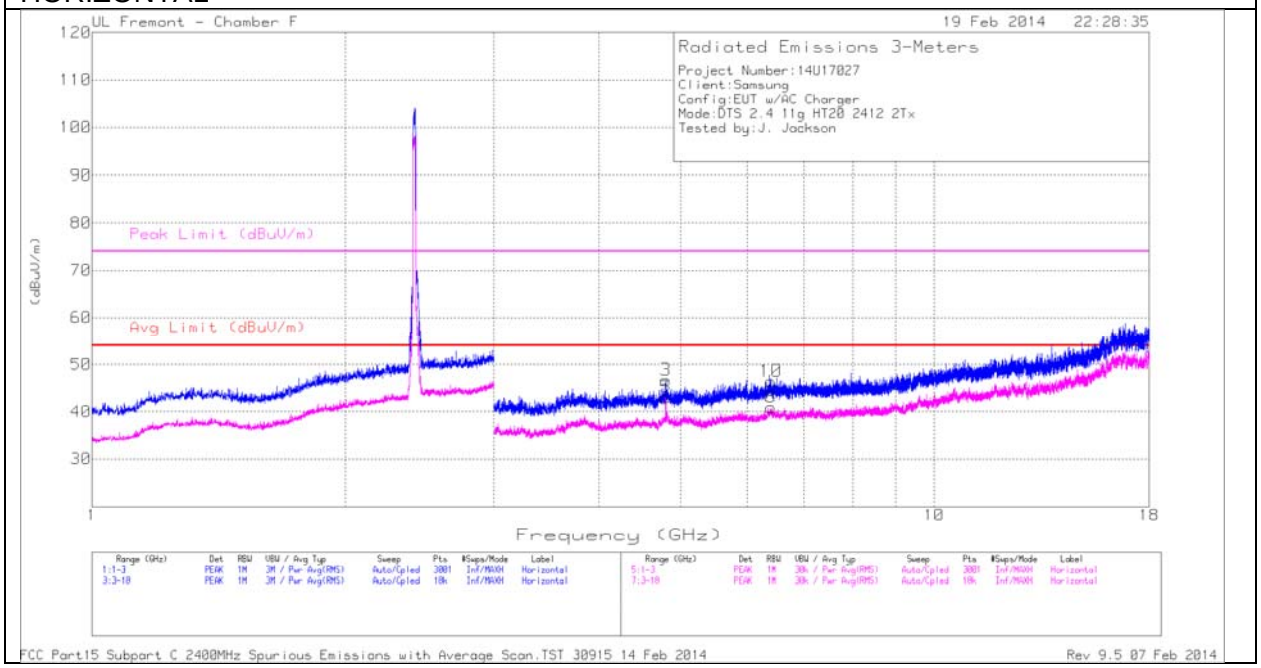
HARMONICS AND SPURIOUS EMISSIONS

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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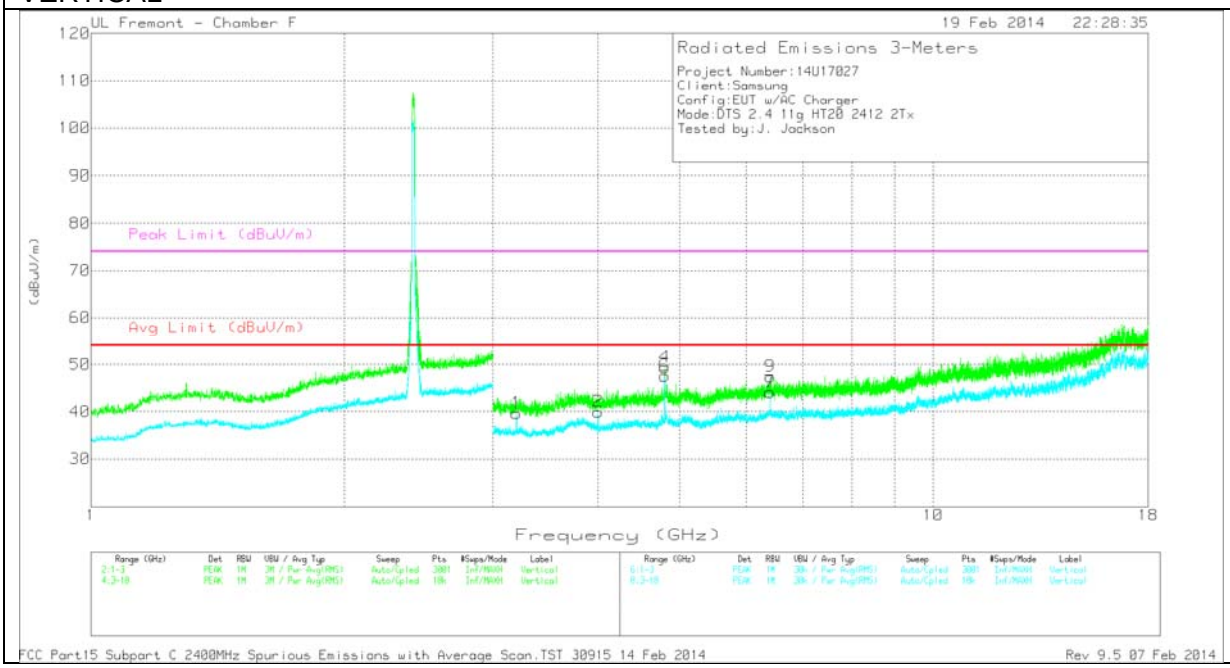
LOW CHANNEL
VERTICAL



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 T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 4.801	40.03	PK	34.1	-27.5	46.63	54	-7.37	74	-27.37	0-360	199	H
4	* 4.802	42.78	PK	34.1	-27.5	49.38	54	-4.62	74	-24.62	0-360	201	V
5	* 4.8	36.43	Avg	34.1	-27.5	43.03	54	-10.97	-	-	0-360	200	H
2	* 4	35.84	Avg	33.5	-29.4	39.94	54	-14.06	-	-	0-360	101	V
6	* 4.8	40.99	Avg	34.1	-27.5	47.59	54	-6.41	-	-	0-360	201	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.8	43.74	PK2	34.1	-27.5	50.34			74	-23.66	127	147	V
* 4.8	38.16	MAv1	34.1	-27.5	44.76	54	-9.24	-	-	127	147	V

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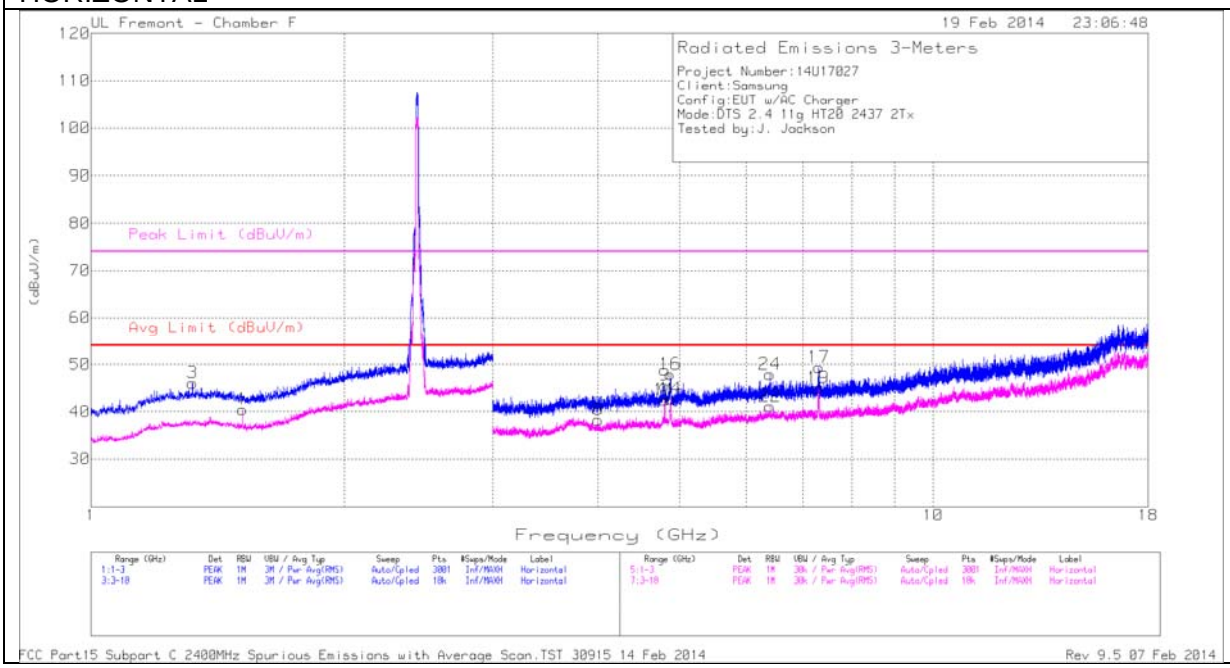
MID CHANNEL
HORIZONTAL



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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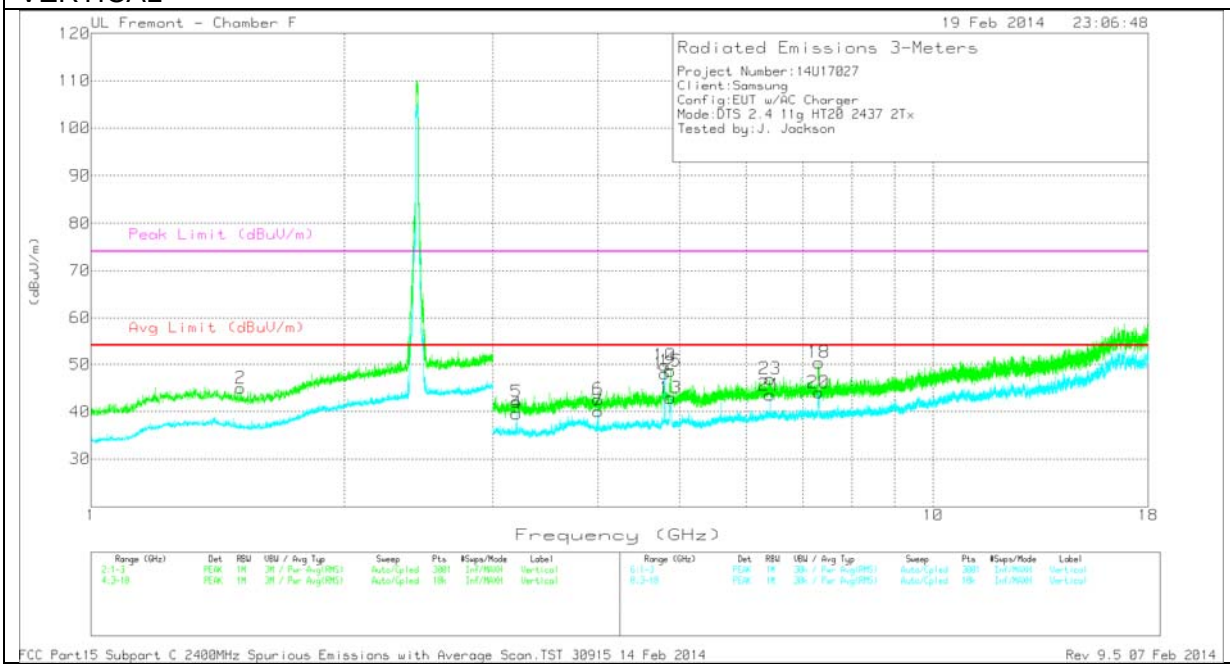
MID CHANNEL
VERTICAL



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 T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 1.32	42.86	PK	29.9	-26.7	46.06	54	-7.94	74	-27.94	0-360	101	H
2	* 1.505	42.46	PK	28.7	-26.2	44.96	54	-9.04	74	-29.04	0-360	201	V
9	* 4.8	38.94	PK	34.1	-27.5	45.54	54	-8.46	74	-28.46	0-360	199	H
16	* 4.872	41.58	PK	34	-27.7	47.88	54	-6.12	74	-26.12	0-360	101	H
17	* 7.314	40.23	PK	35.7	-26.6	49.33	54	-4.67	74	-24.67	0-360	101	H
6	* 4.001	38.48	PK	33.5	-29.4	42.58	54	-11.42	74	-31.42	0-360	201	V
10	* 4.801	43.21	PK	34.1	-27.5	49.81	54	-4.19	74	-24.19	0-360	201	V
15	* 4.877	42.25	PK	34	-27.7	48.55	54	-5.45	74	-25.45	0-360	201	V
18	* 7.314	41.27	PK	35.7	-26.6	50.37	54	-3.63	74	-23.63	0-360	101	V
1	* 1.513	37.99	Avg	28.7	-26.2	40.49	54	-13.51	-	-	0-360	101	H
8	* 4	34.15	Avg	33.5	-29.4	38.25	54	-15.75	-	-	0-360	199	H
11	* 4.8	35.82	Avg	34.1	-27.5	42.42	54	-11.58	-	-	0-360	199	H
14	* 4.876	36.41	Avg	34	-27.7	42.71	54	-11.29	-	-	0-360	101	H
19	* 7.306	35.81	Avg	35.7	-26.5	45.01	54	-8.99	-	-	0-360	101	H
7	* 4	35.99	Avg	33.5	-29.4	40.09	54	-13.91	-	-	0-360	201	V
12	* 4.8	41.43	Avg	34.1	-27.5	48.03	54	-5.97	-	-	0-360	201	V
13	* 4.876	36.6	Avg	34	-27.7	42.9	54	-11.1	-	-	0-360	101	V
20	* 7.308	34.91	Avg	35.7	-26.6	44.01	54	-9.99	-	-	0-360	101	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.312	46.3	PK2	35.7	-26.6	55.4			74	-18.6	177	198	H
* 7.308	32.27	MAv1	35.7	-26.6	41.37	54	-12.63	-	-	177	198	H
* 4.8	43.25	PK2	34.1	-27.5	49.85	54	-4.15	74	-24.15	127	122	V
* 4.8	38.22	MAv1	34.1	-27.5	44.82	54	-9.18	-	-	127	122	V
* 7.313	32.3	MAv1	35.7	-26.6	41.4	54	-12.6	-	-	83	335	V
* 4.871	44.05	PK2	34	-27.6	50.45	54	-3.55	74	-23.55	332	196	V
* 4.876	32	MAv1	34	-27.7	38.3	54	-15.7	-	-	332	196	V

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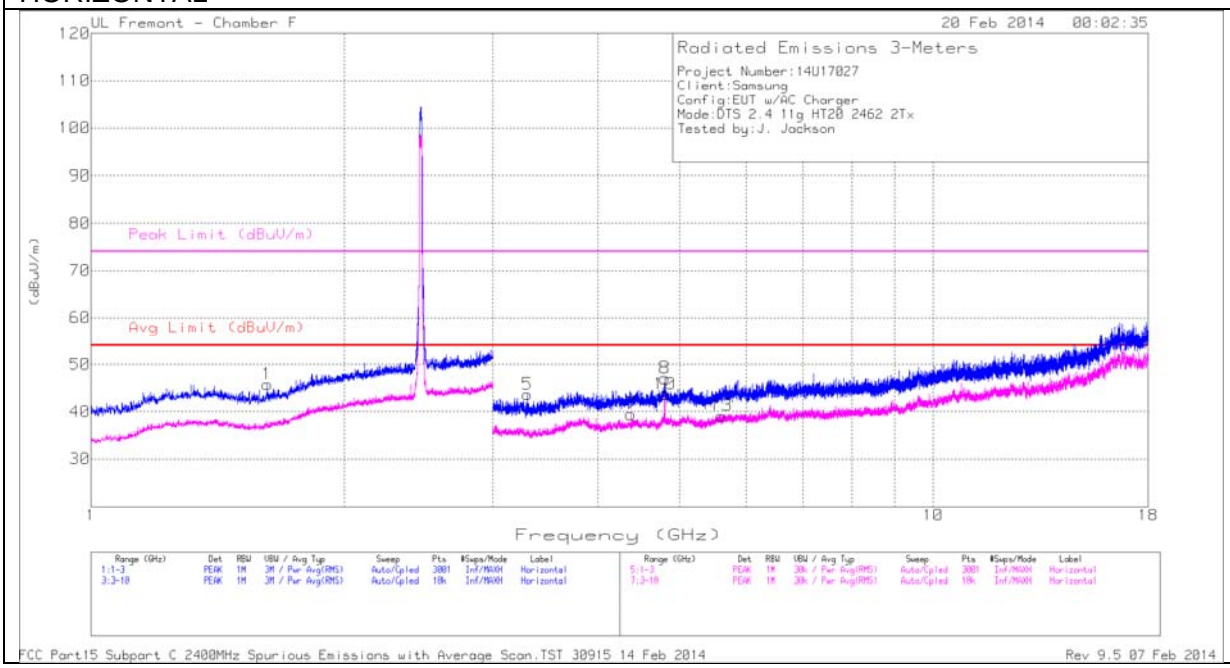
HIGH CHANNEL
HORIZONTAL



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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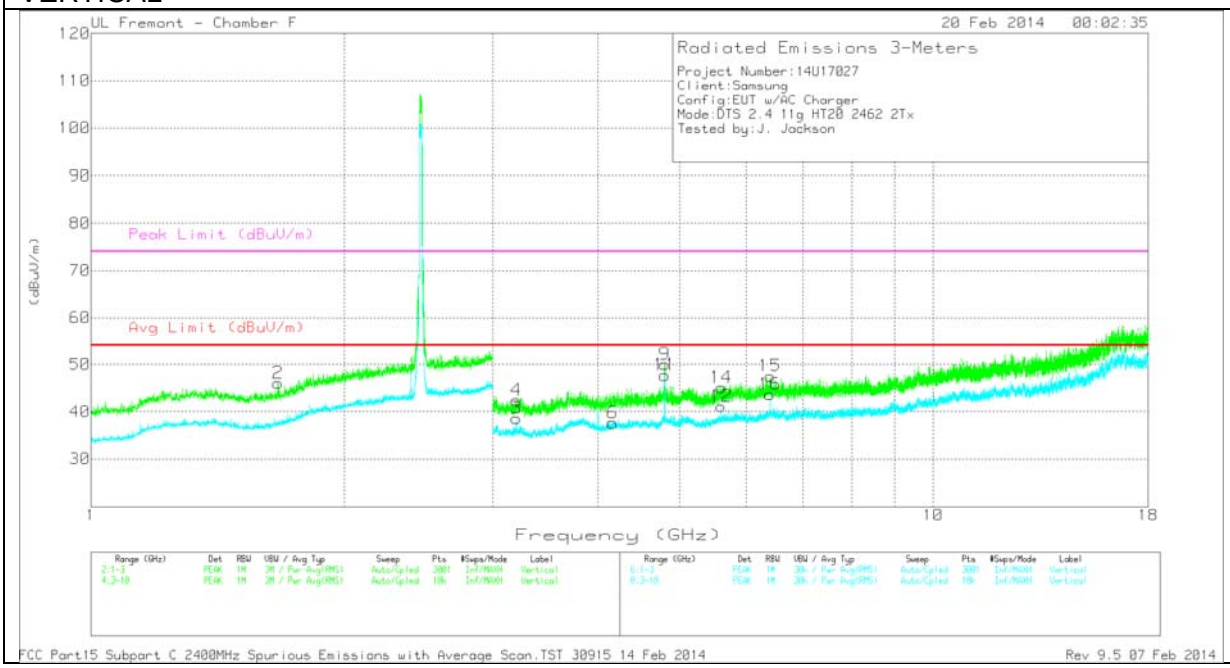
HIGH CHANNEL
VERTICAL



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 T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.619	42.71	PK	28.2	-25.1	45.81	54	-8.19	74	-28.19	0-360	101	H
2	* 1.667	42.34	PK	28.7	-25	46.04	54	-7.96	74	-27.96	0-360	201	V
8	* 4.801	40.45	PK	34.1	-27.5	47.05	54	-6.95	74	-26.95	0-360	199	H
9	* 4.801	43.41	PK	34.1	-27.5	50.01	54	-3.99	74	-23.99	0-360	201	V
7	* 4.377	35.48	Avg	33.6	-29.6	39.48	54	-14.52	-	-	0-360	200	H
10	* 4.8	37.09	Avg	34.1	-27.5	43.69	54	-10.31	-	-	0-360	200	H
6	* 4.163	32.61	Avg	33.4	-28.4	37.61	54	-16.39	-	-	0-360	101	V
11	* 4.8	41.11	Avg	34.1	-27.5	47.71	54	-6.29	-	-	0-360	201	V

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.8	41.13	PK2	34.1	-27.5	47.73			74	-26.27	86	226	V
* 4.8	38.83	MAv1	34.1	-27.5	45.43	54	-8.57	-	-	86	226	V

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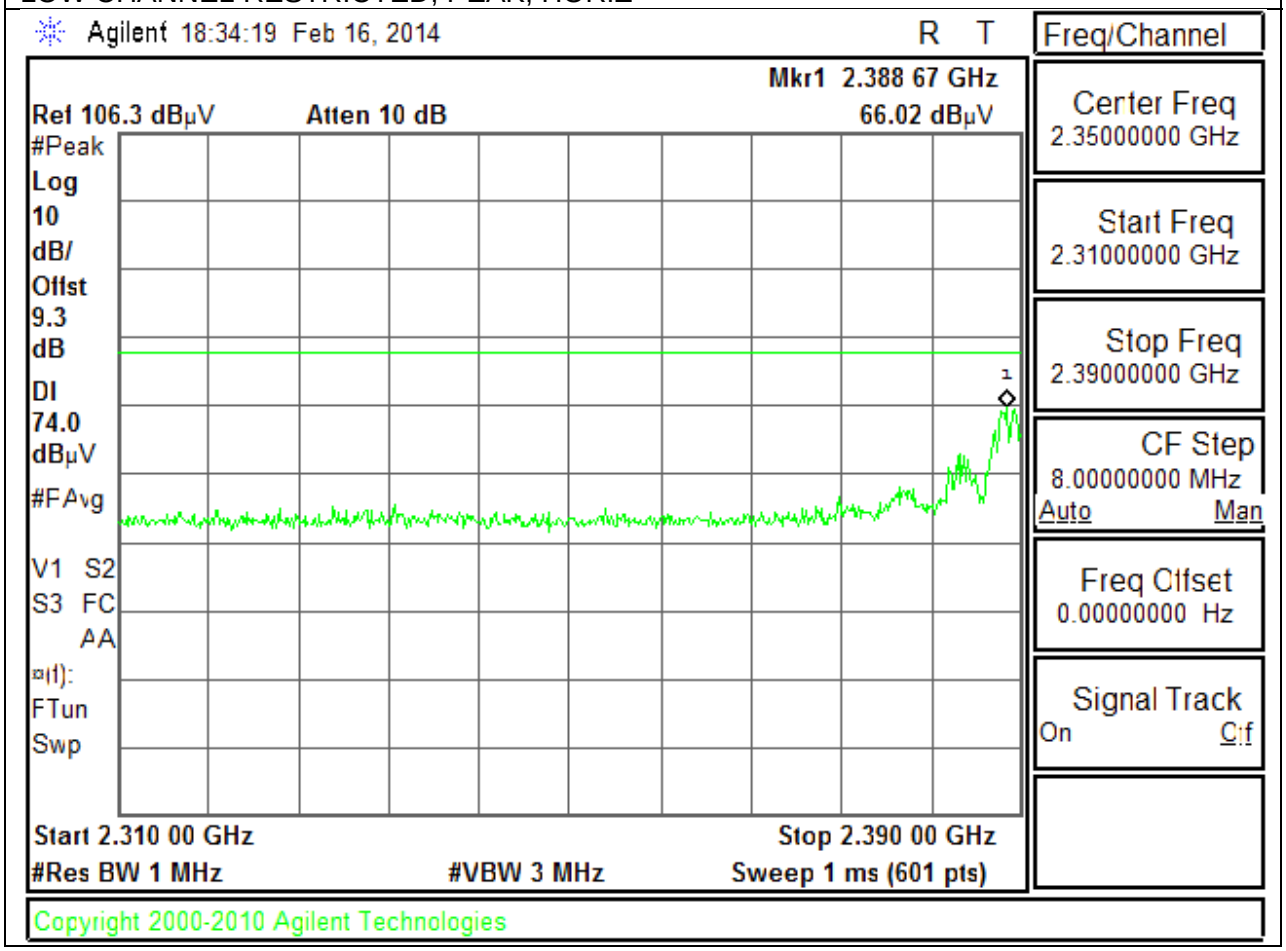
10.3.3. TX ABOVE 1 GHz 802.11n HT20 CDD MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL1)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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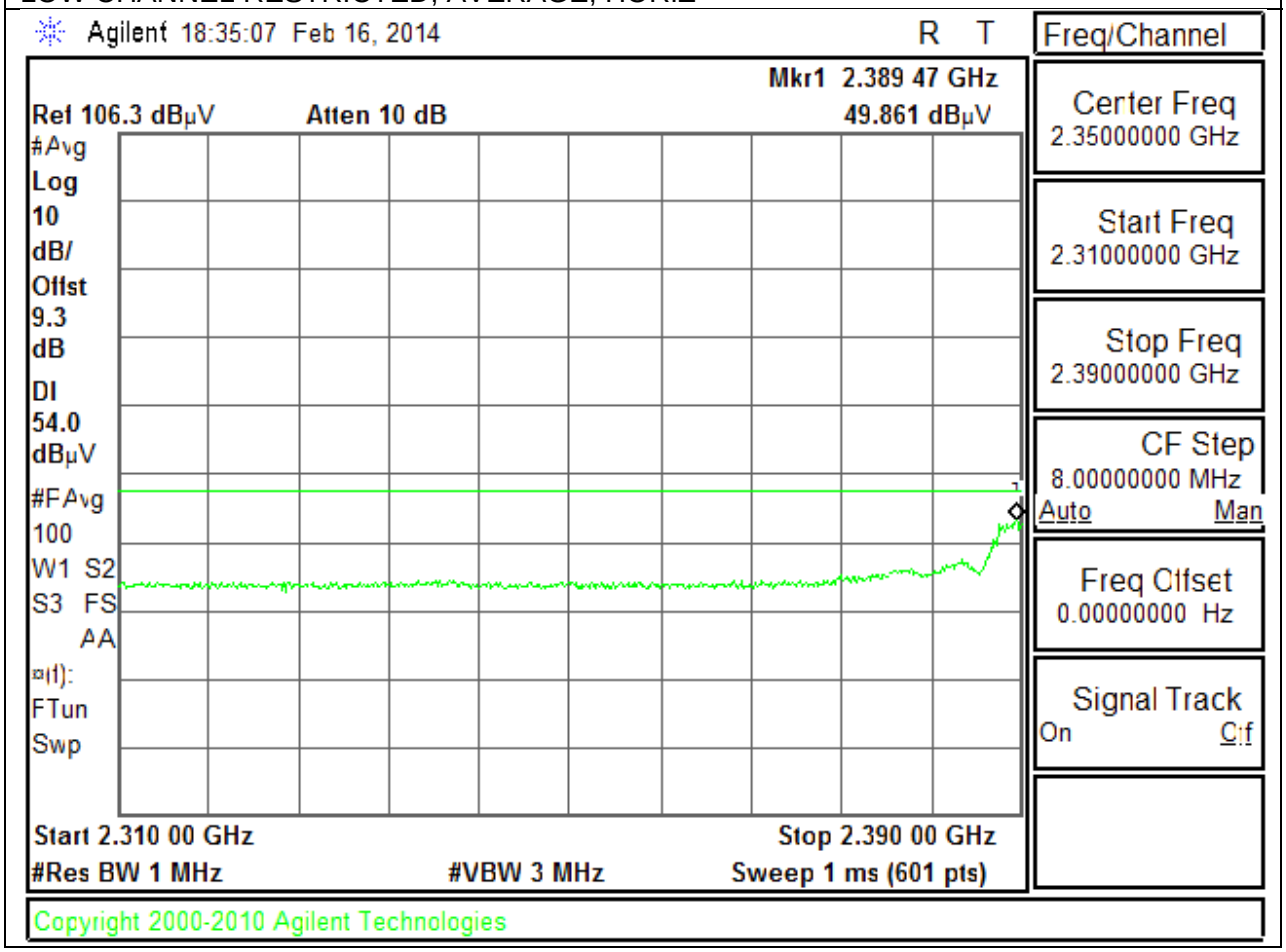
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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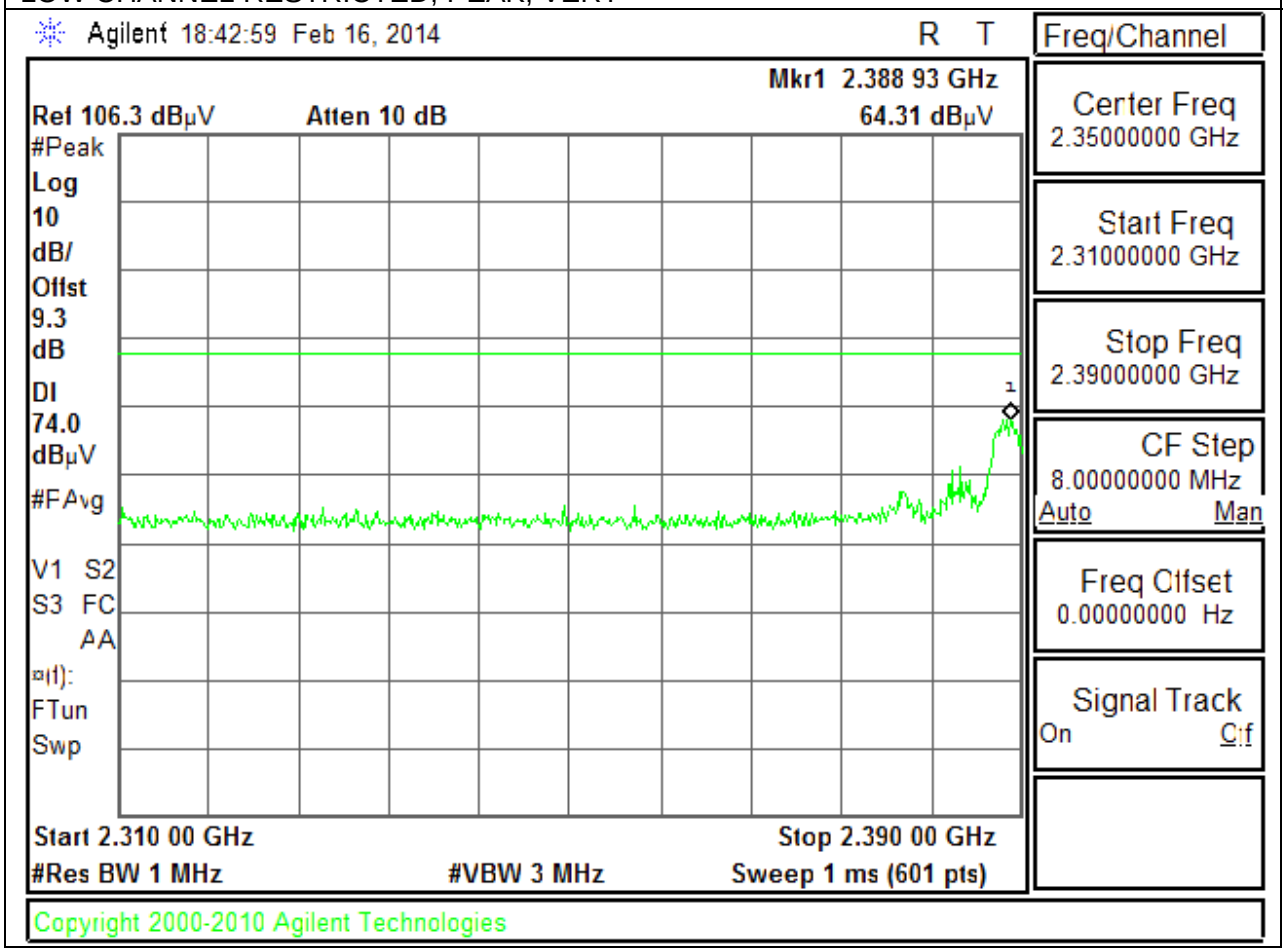
LOW CHANNEL RESTRICTED, PEAK, VERT



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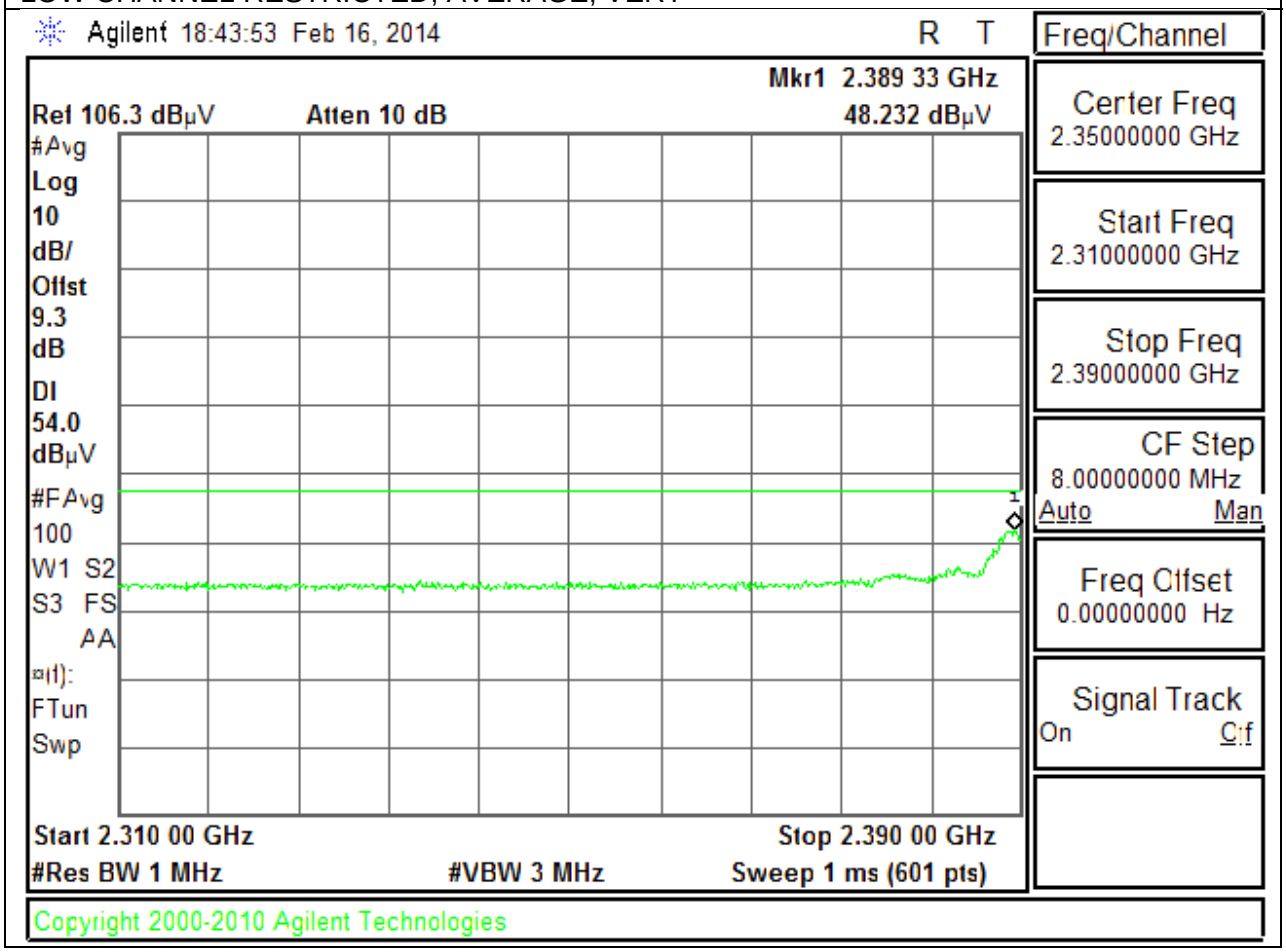
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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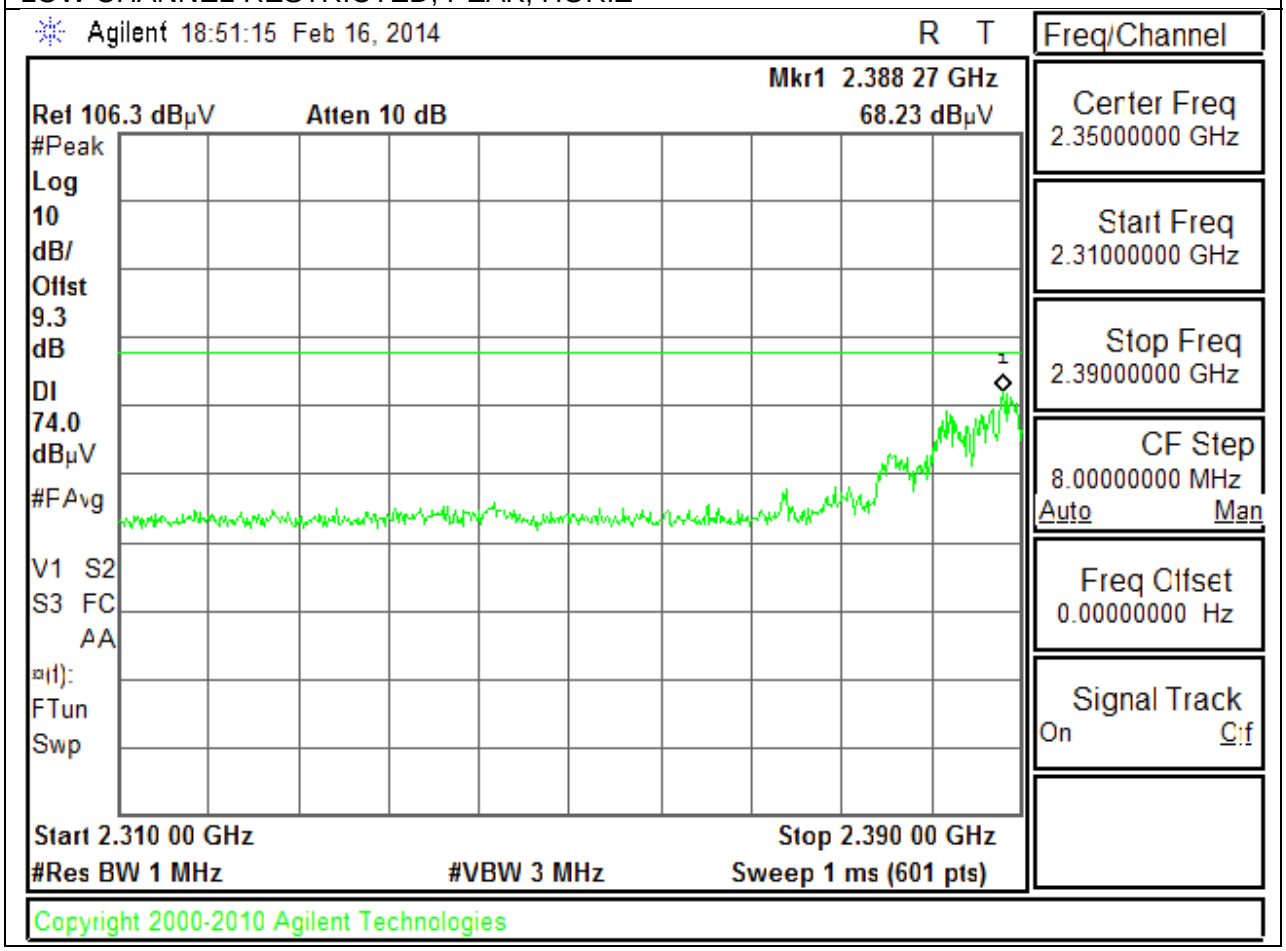
TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND
RESTRICTED BANDEDGE (LOW CHANNEL 2)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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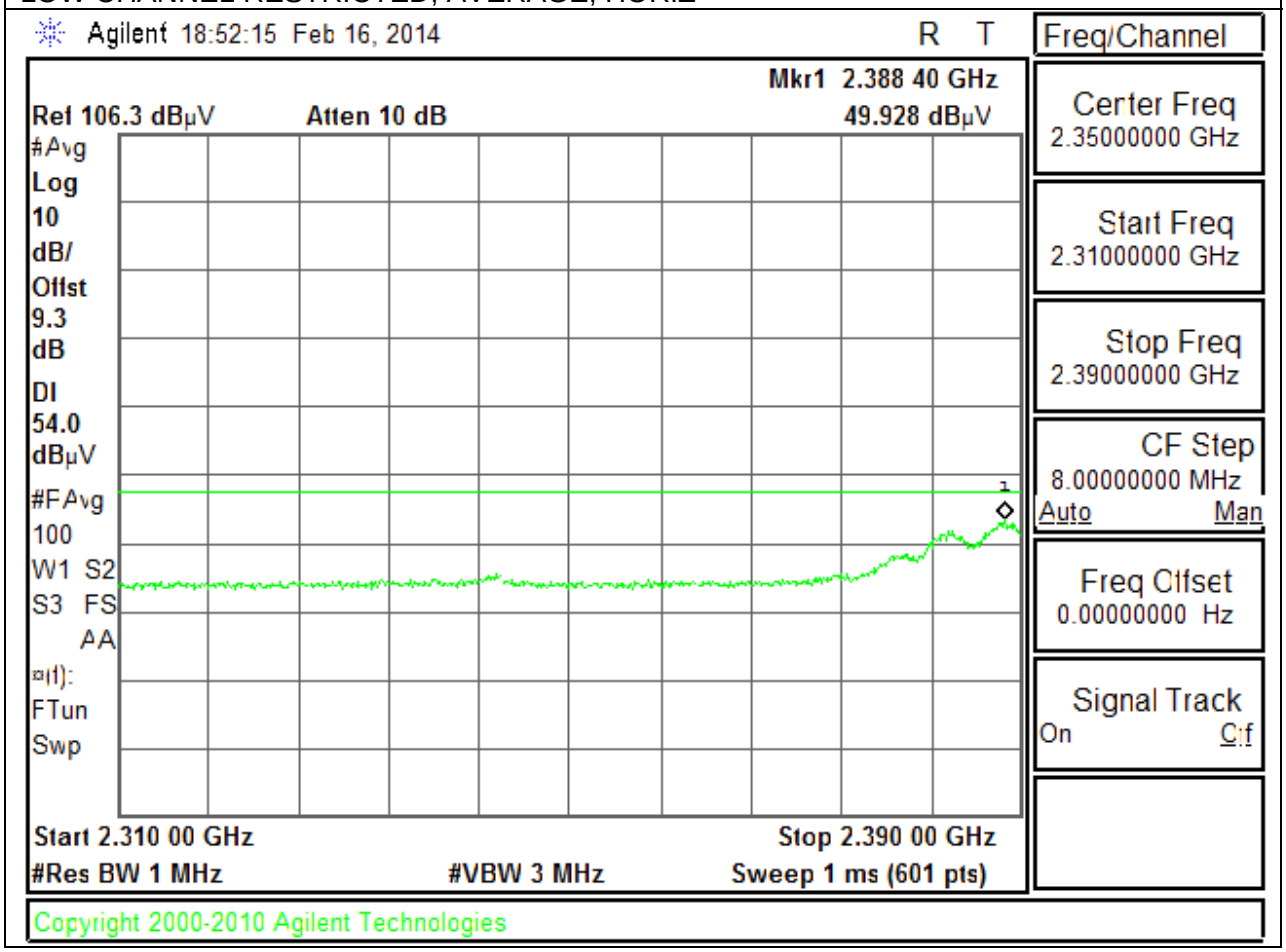
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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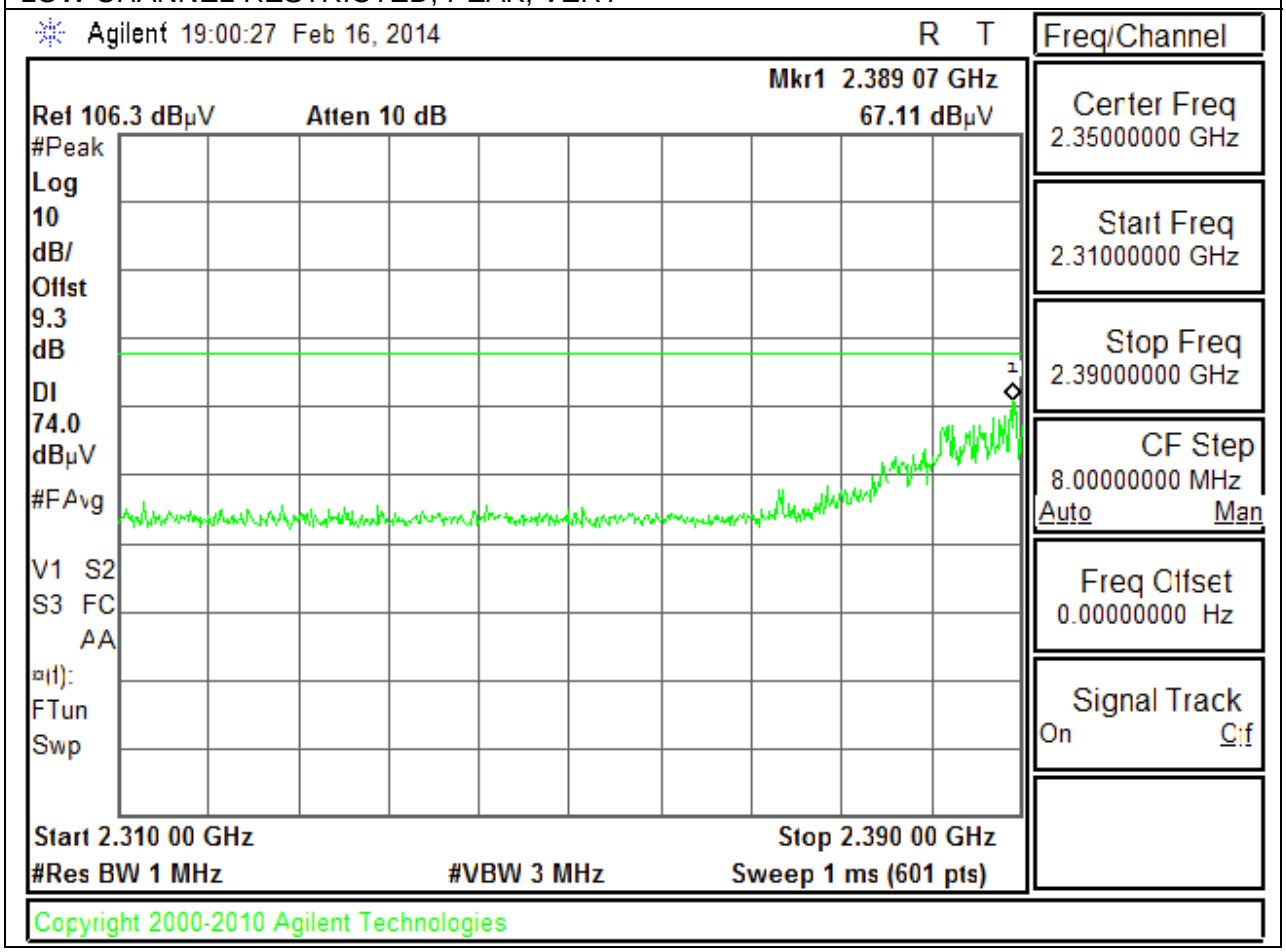
LOW CHANNEL RESTRICTED, PEAK, VERT



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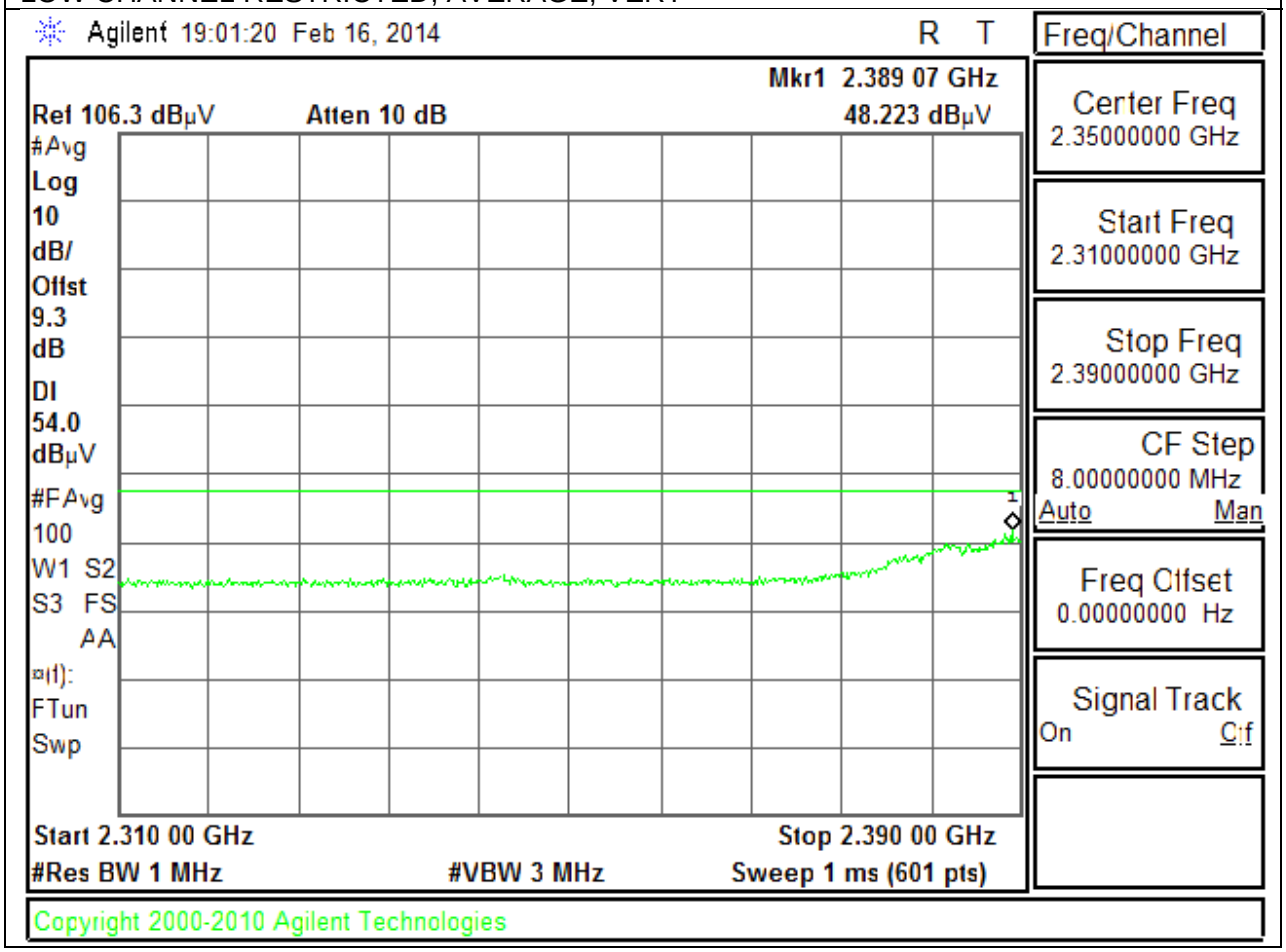
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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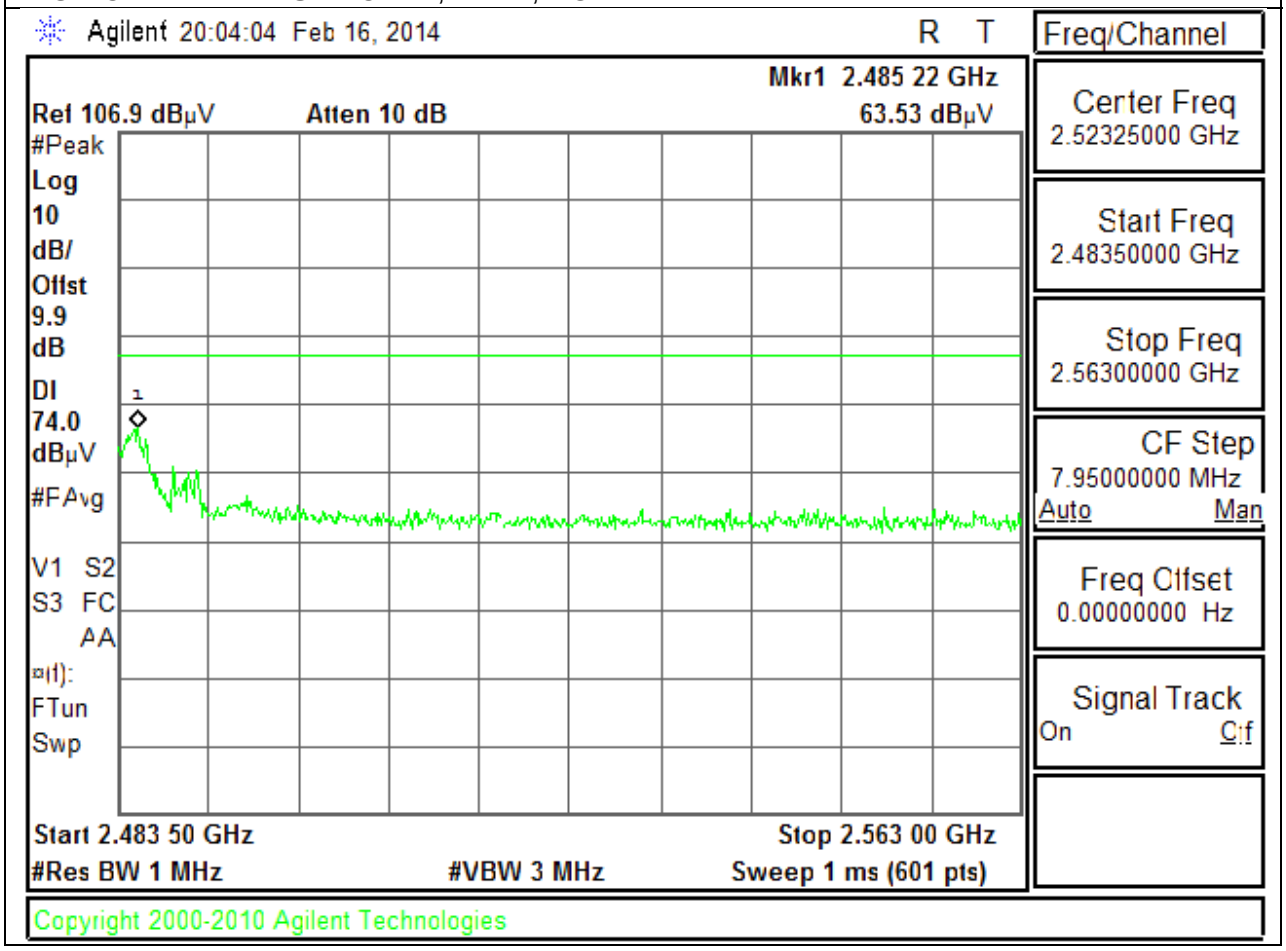
AUTHORIZED BANDEDGE (HIGH CHANNEL 1)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



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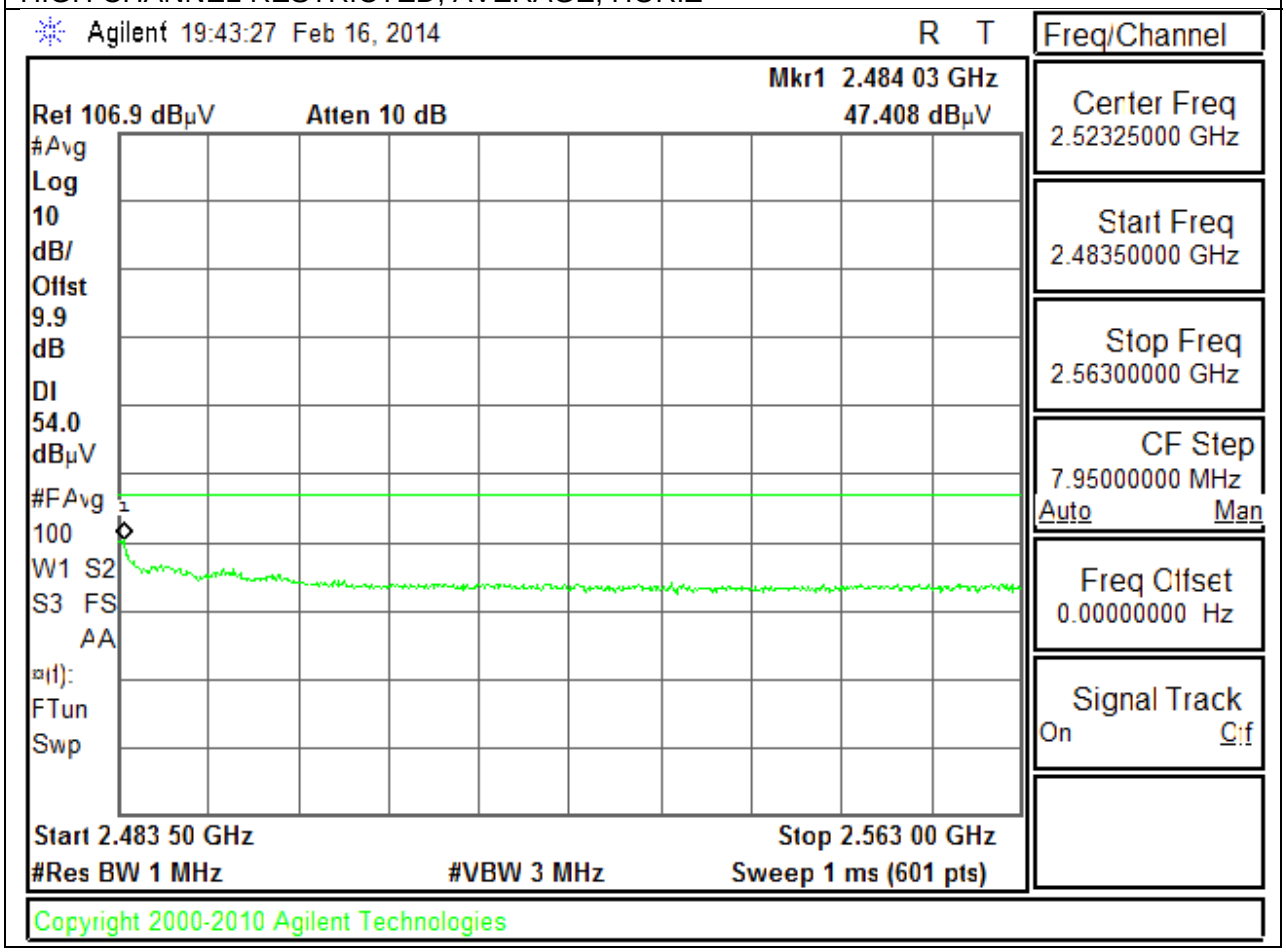
HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



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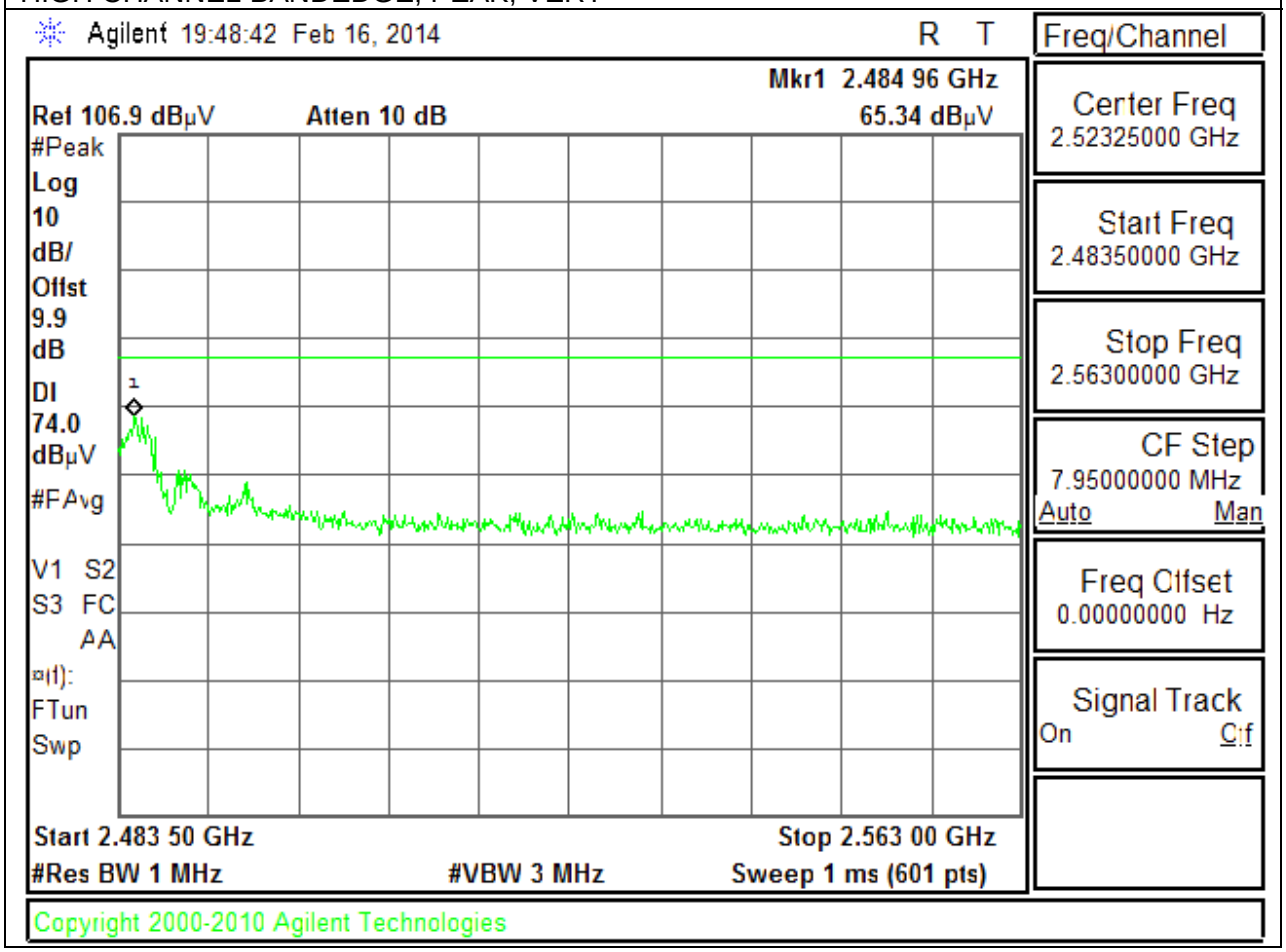
HIGH CHANNEL BANDEDGE, PEAK, VERT



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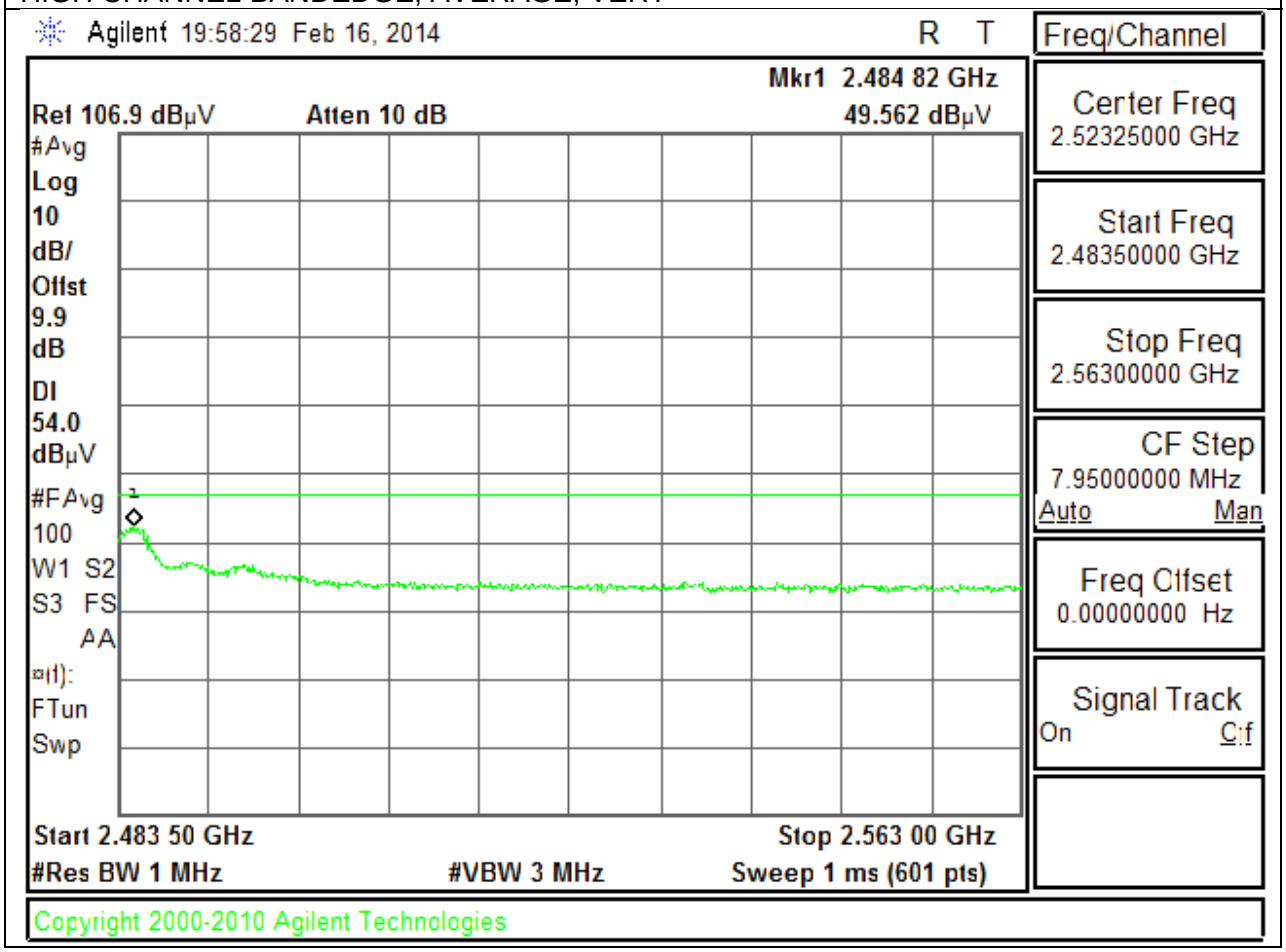
HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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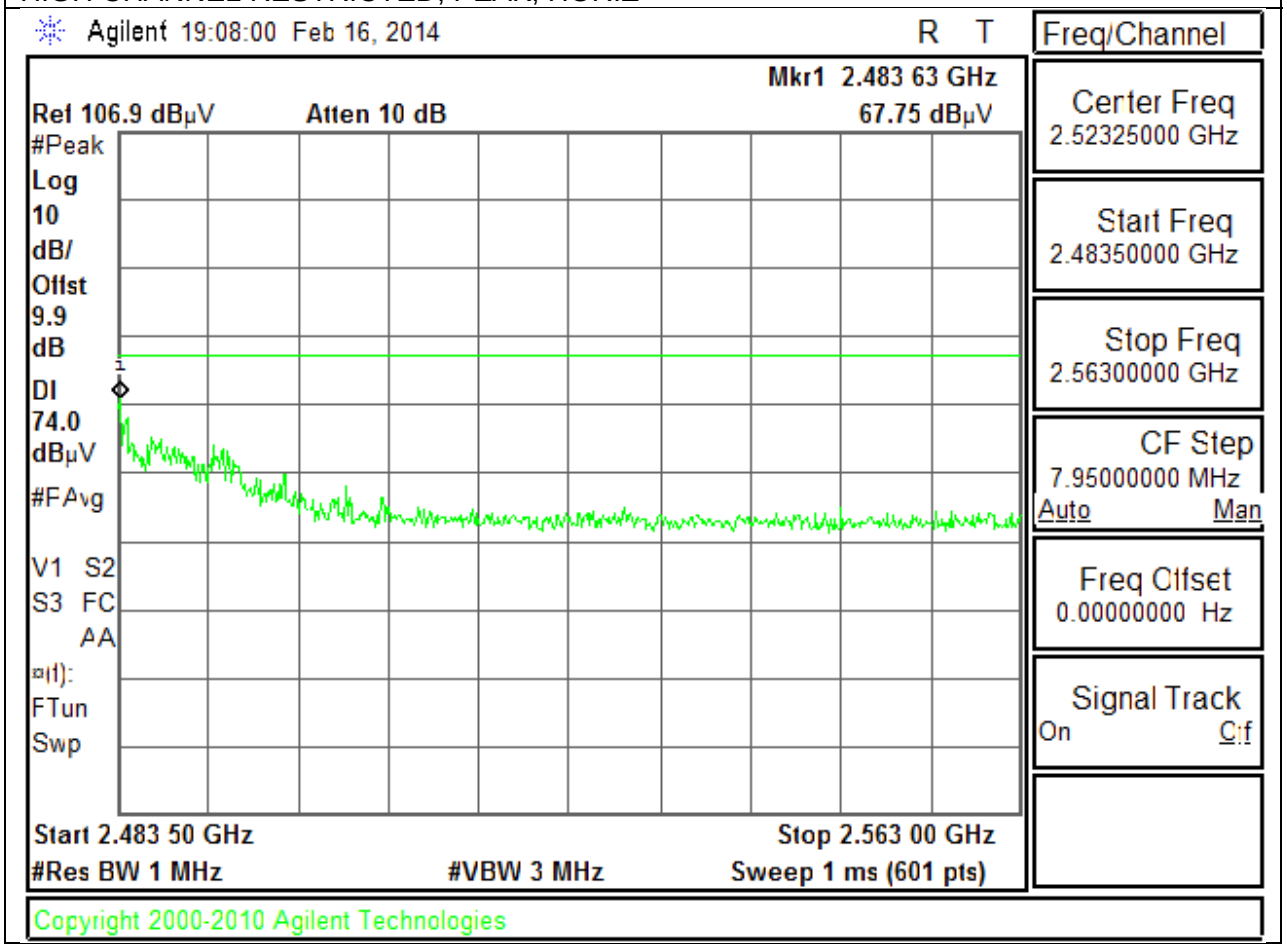
AUTHORIZED BANDEDGE (HIGH CHANNEL 2)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



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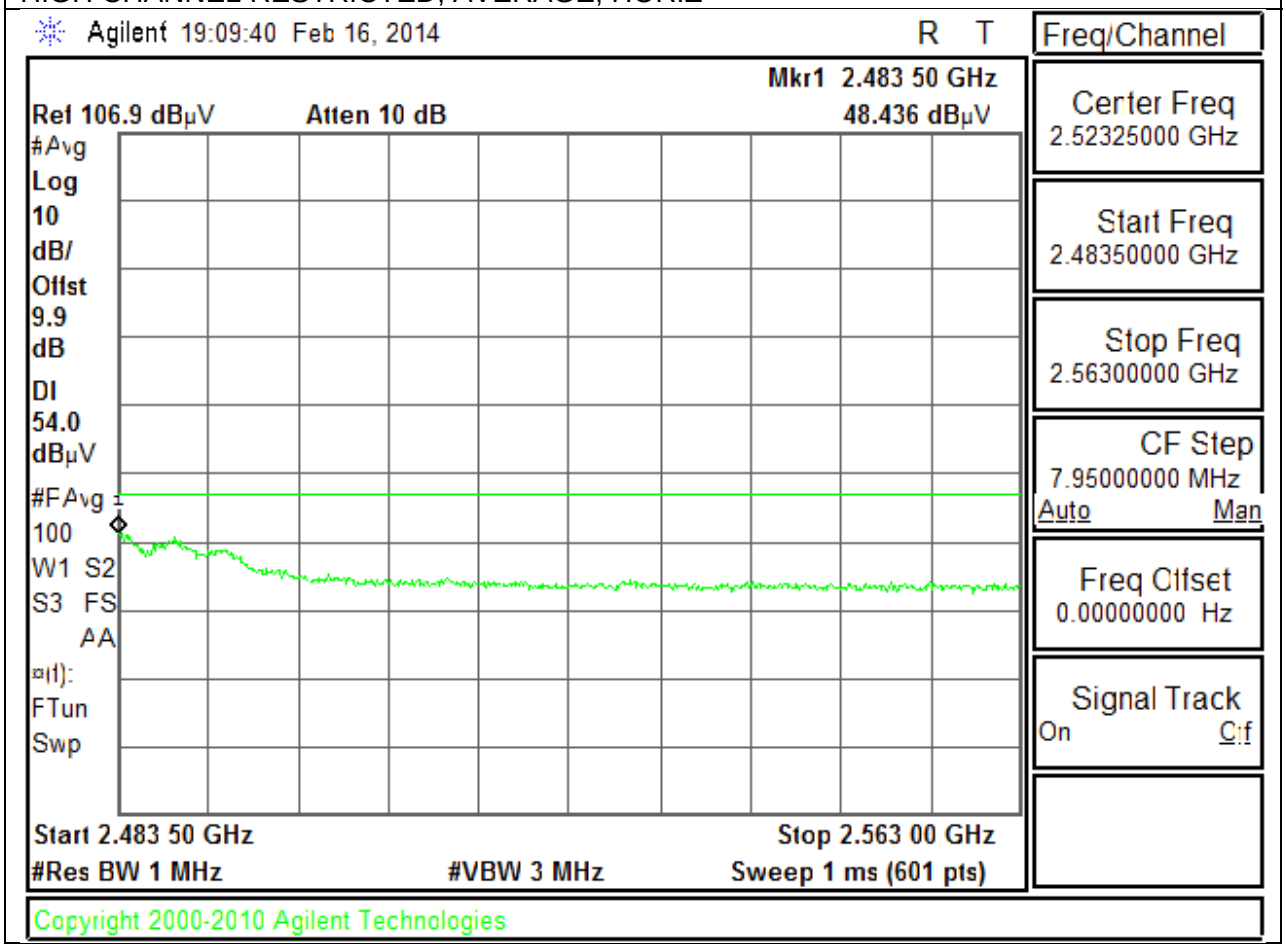
HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



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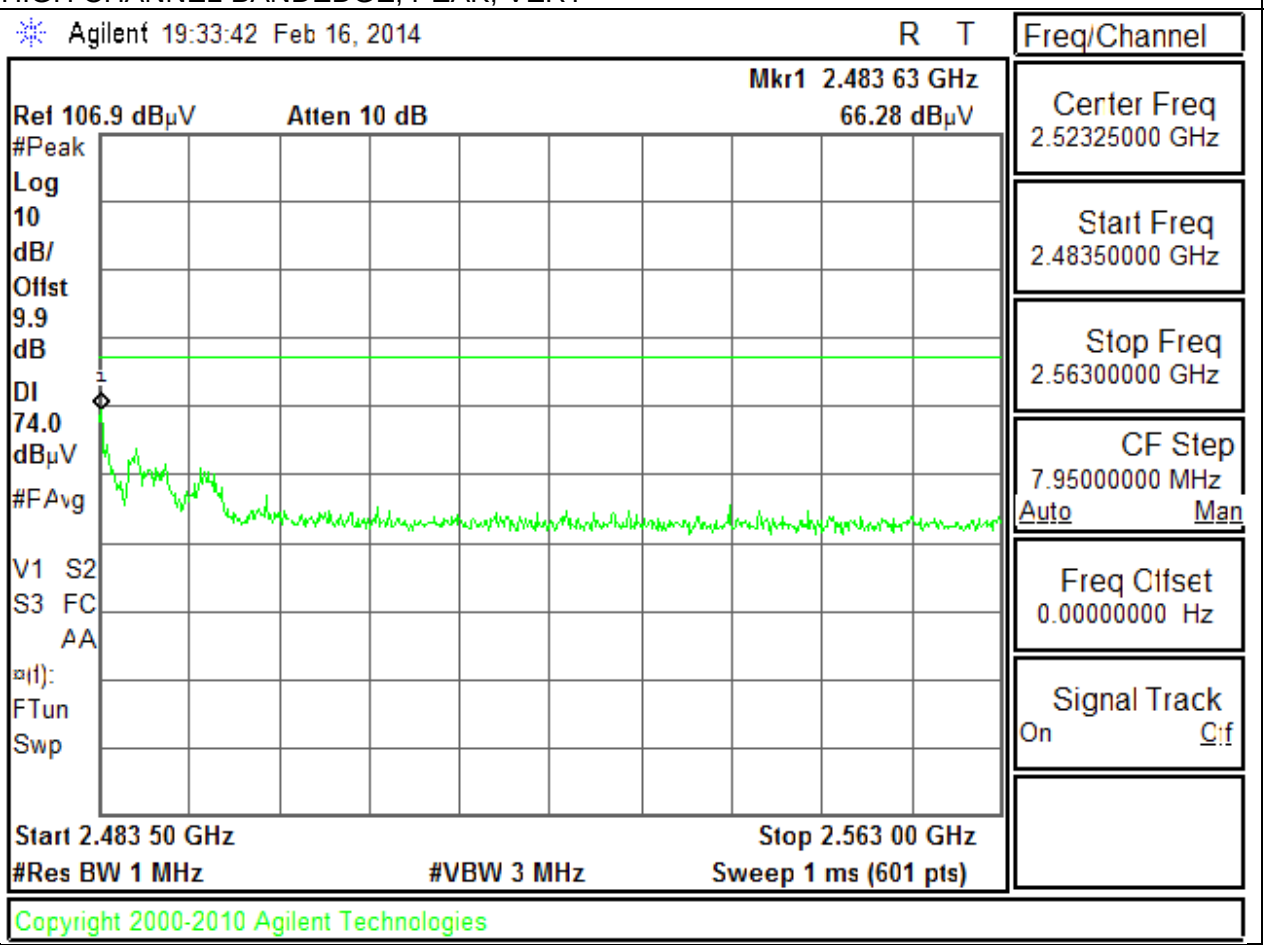
HIGH CHANNEL BANDEDGE, PEAK, VERT



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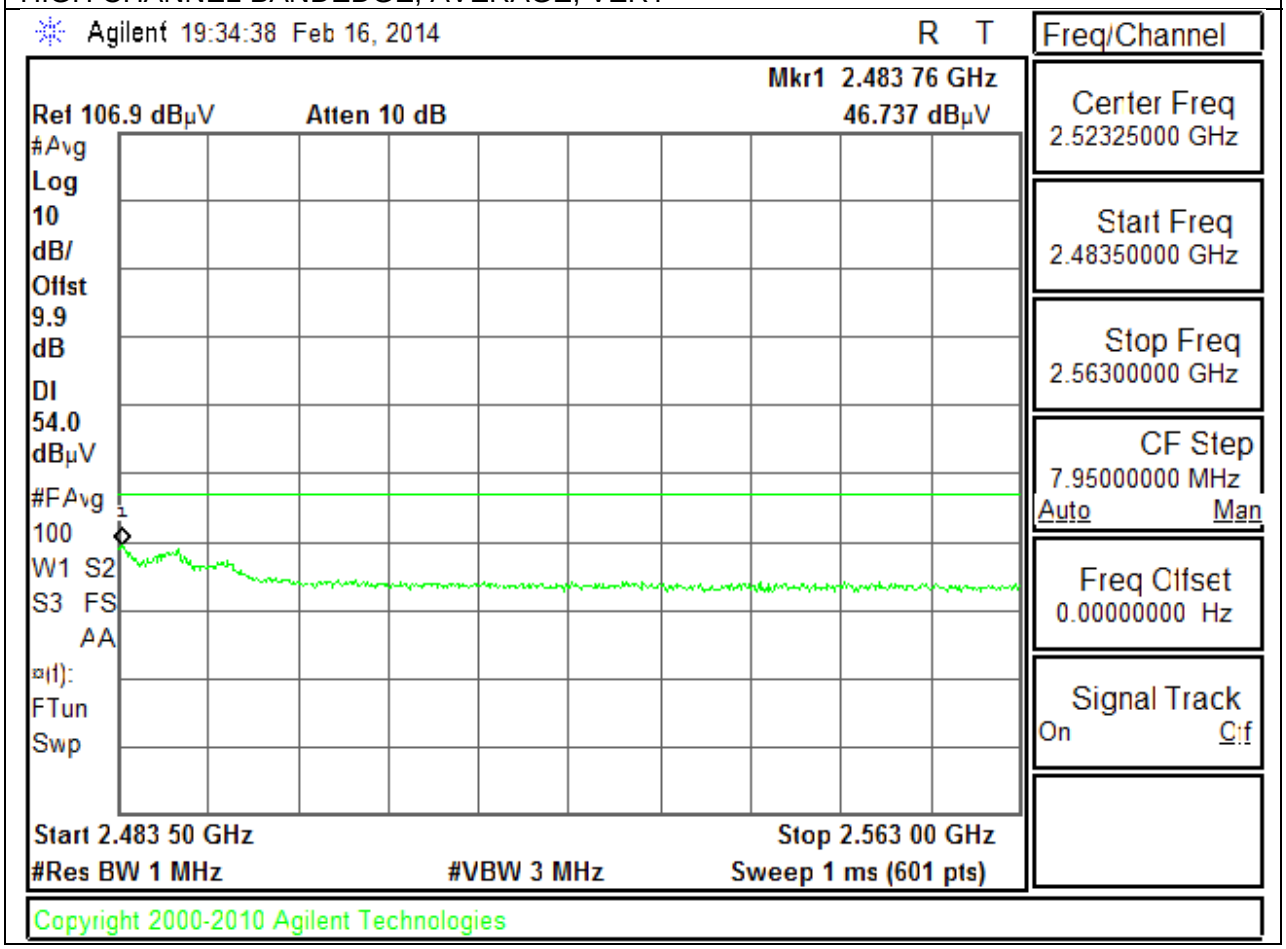
HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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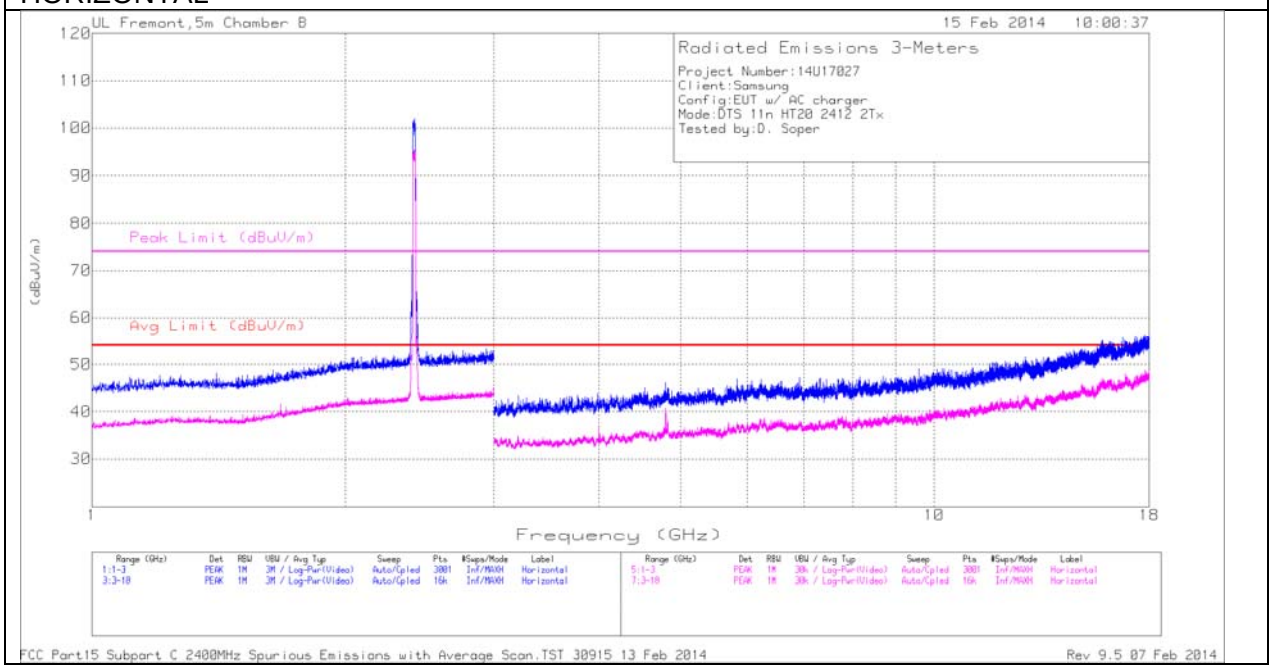
HARMONICS AND SPURIOUS EMISSIONS

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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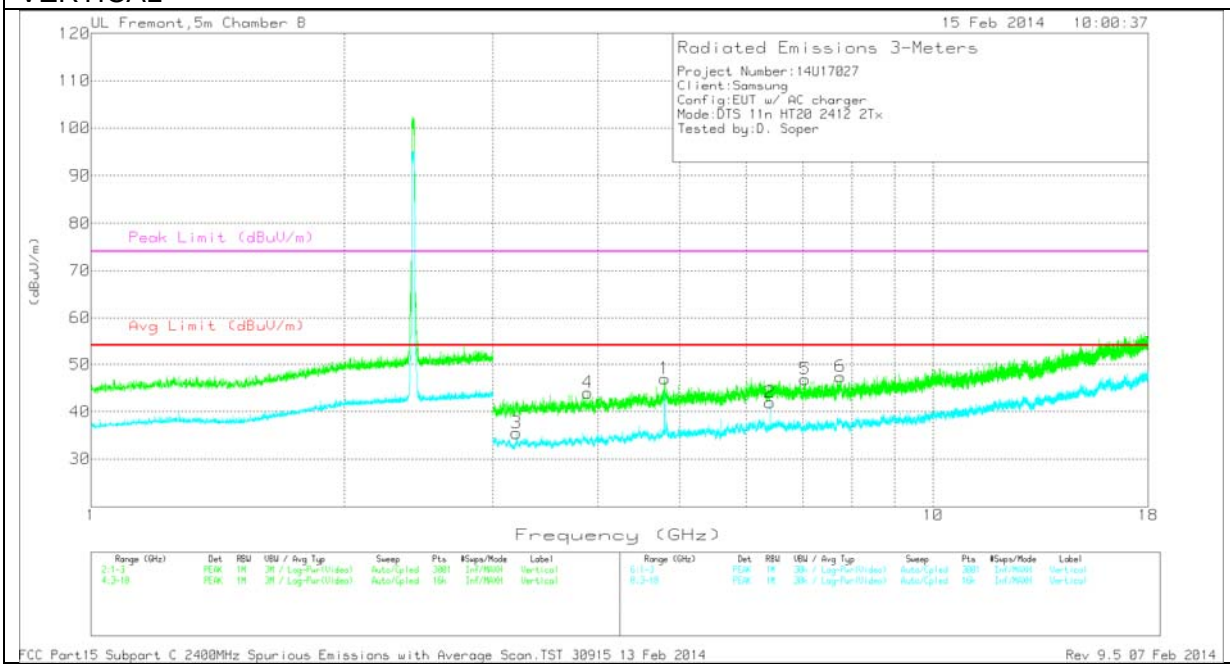
LOW CHANNEL
VERTICAL



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)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.8	41.03	PK	34.7	-28.8	46.93	54	-7.07	74	-27.07	0-360	202	V
4	* 3.888	40.5	PK	33.9	-30.4	44	54	-10	74	-30	0-360	99	V
3	3.2	33.39	Avg	33.3	-31.2	35.49	54	-18.51	-	-	0-360	202	V
2	6.4	34.97	Avg	35.9	-28.9	41.97	54	-12.03	-	-	0-360	202	V
5	7.046	38.55	PK	35.9	-27.6	46.85	-	-	74	-27.15	0-360	99	V
6	7.759	37.29	PK	36.2	-26.1	47.39	-	-	74	-26.61	0-360	202	V

PK - Peak detector

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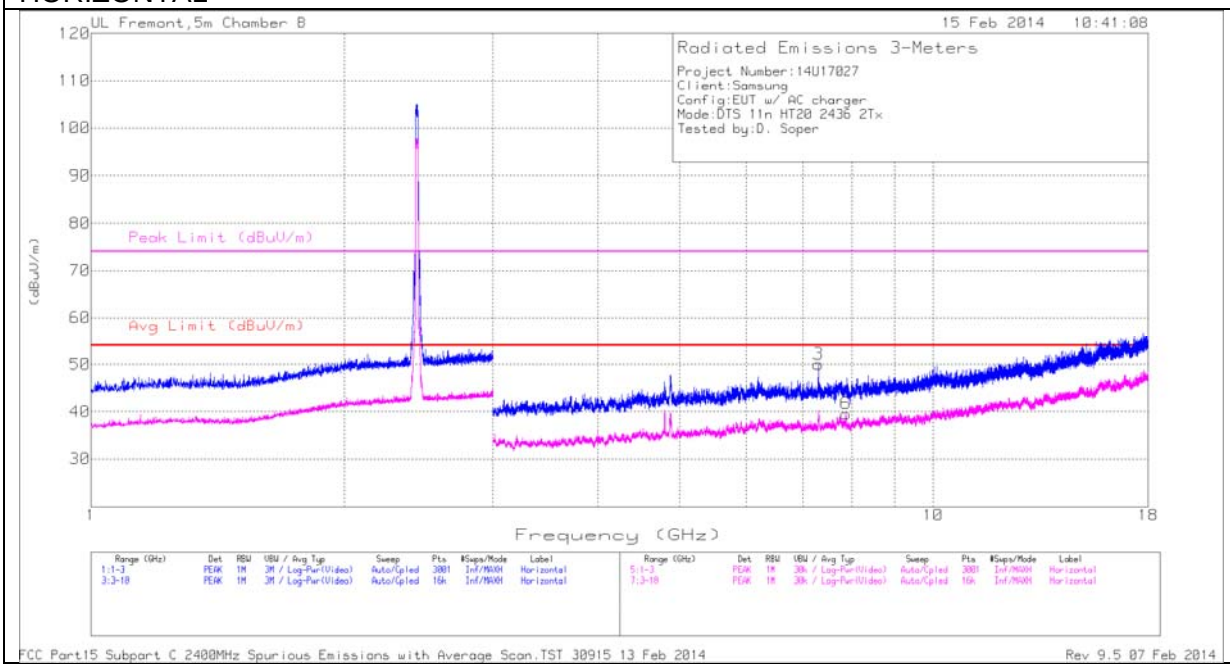
MID CHANNEL
HORIZONTAL



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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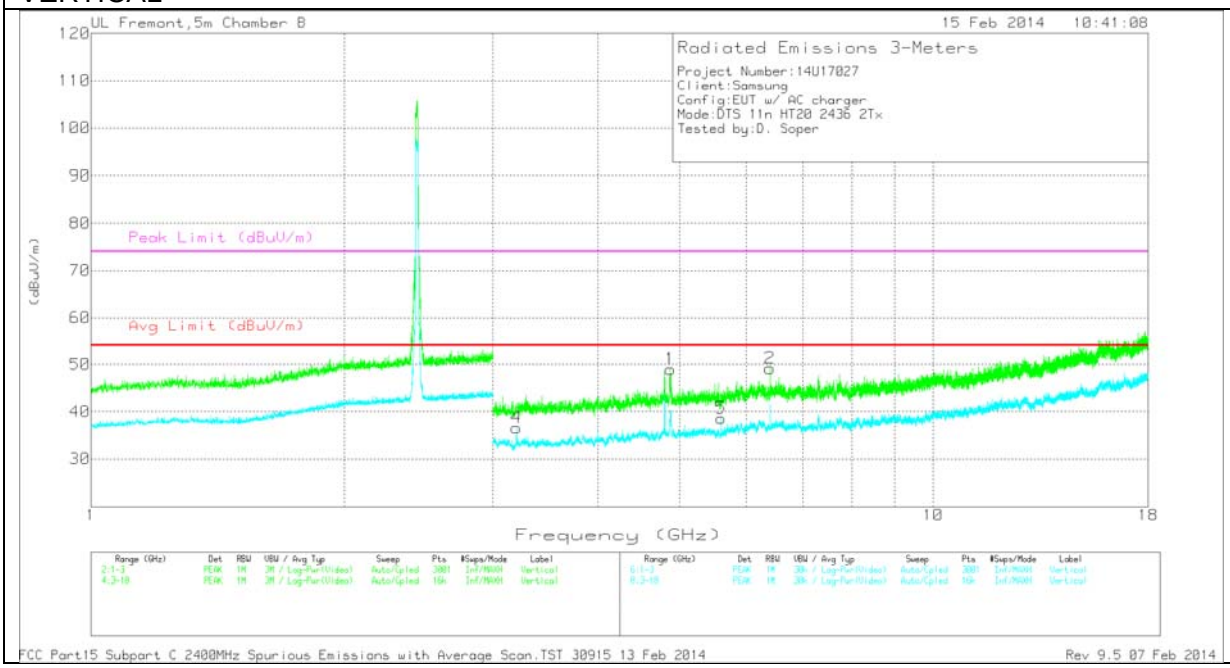
MID CHANNEL
VERTICAL



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)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.875	44.9	PK	34.7	-30.6	49	54	-5	74	-25	0-360	202	V
3	* 7.307	41.9	PK	35.8	-27.7	50	54	-4	74	-24	0-360	99	H
4	3.2	34.51	Avg	33.3	-31.2	36.61	54	-17.39	-	-	0-360	202	V
5	5.6	32.99	Avg	35	-29.4	38.59	54	-15.41	-	-	0-360	99	V
2	6.4	42.15	PK	35.9	-28.9	49.15	-	-	74	-24.85	0-360	99	V
6	7.877	30.64	Avg	36.1	-27.2	39.54	54	-14.46	-	-	0-360	202	H

PK - Peak detector

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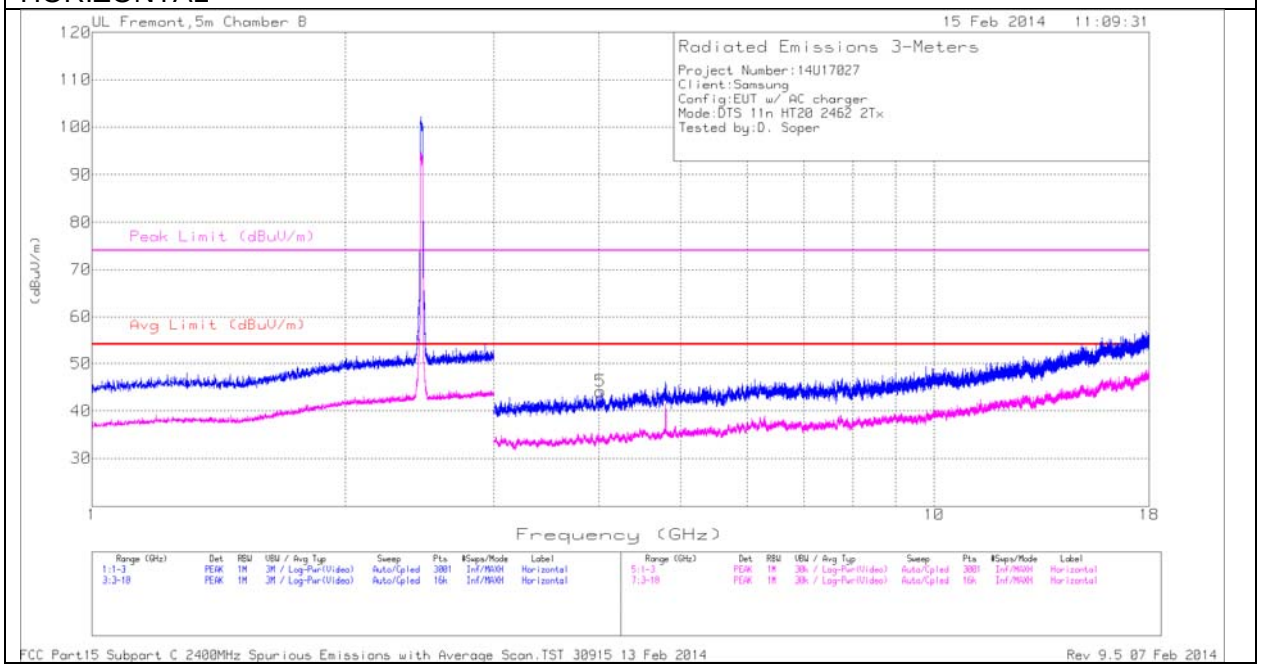
HIGH CHANNEL
HORIZONTAL



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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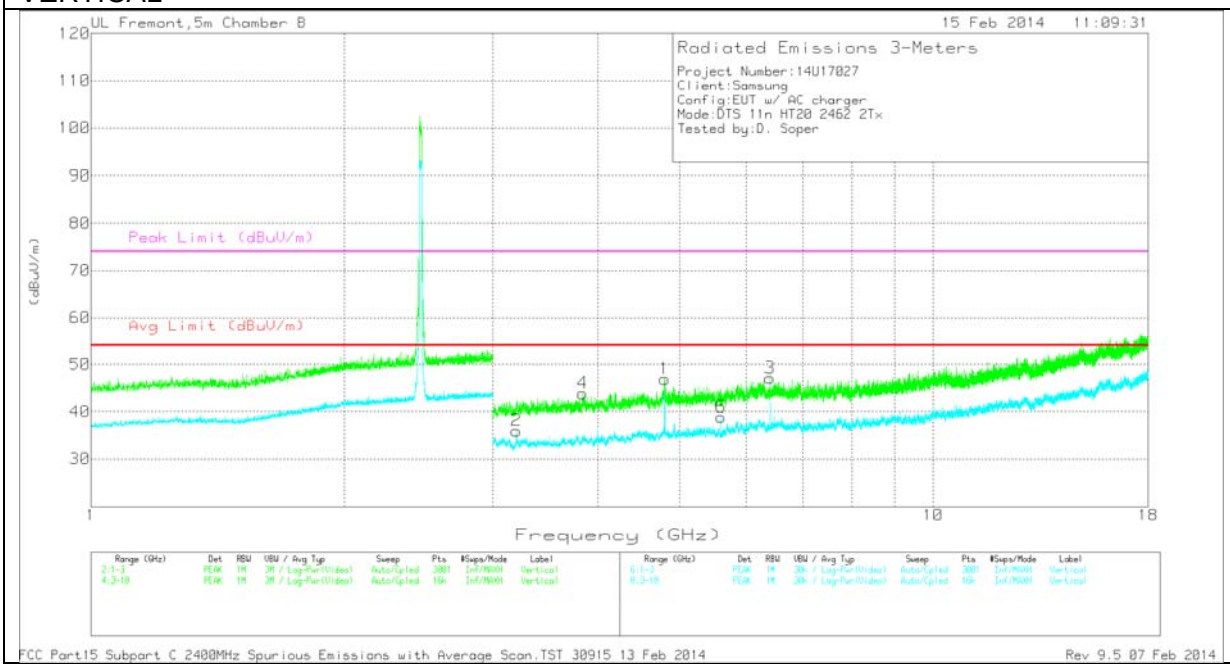
HIGH CHANNEL
VERTICAL



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)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 3.835	40.25	PK	33.8	-30.2	43.85	54	-10.15	74	-30.15	0-360	99	V
5	* 4.016	41.2	PK	33.9	-31	44.1	54	-9.9	74	-29.9	0-360	99	H
1	* 4.801	40.99	PK	34.7	-28.8	46.89	54	-7.11	74	-27.11	0-360	99	V
2	3.2	33.88	Avg	33.3	-31.2	35.98	54	-18.02	-	-	0-360	202	V
6	5.6	33.27	Avg	35	-29.4	38.87	54	-15.13	-	-	0-360	99	V
3	6.4	40.06	PK	35.9	-28.9	47.06	-	-	74	-26.94	0-360	99	V

PK - Peak detector

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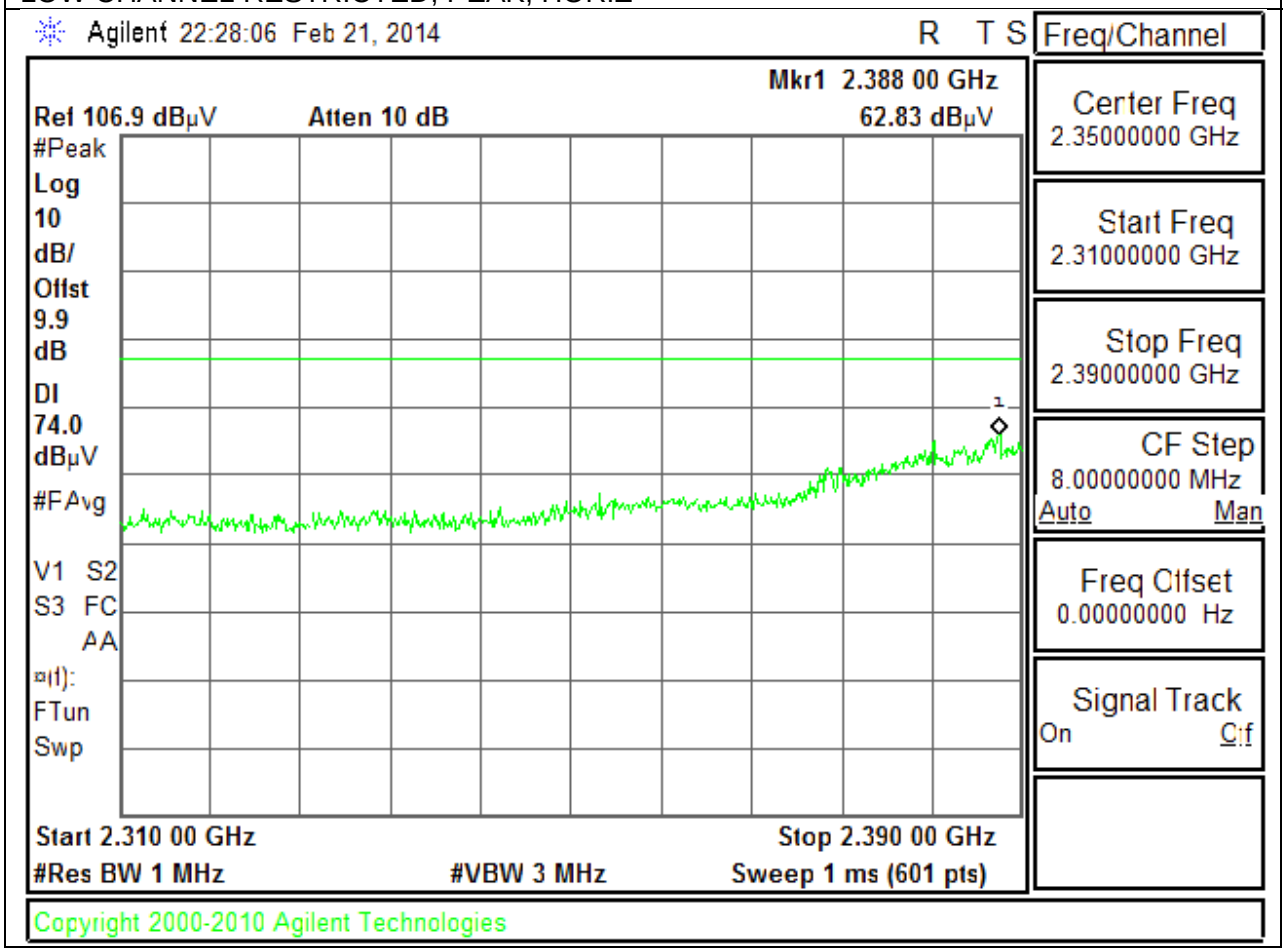
10.3.4. TX ABOVE 1 GHz 802.11n HT40 CDD MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL 2422 MHZ)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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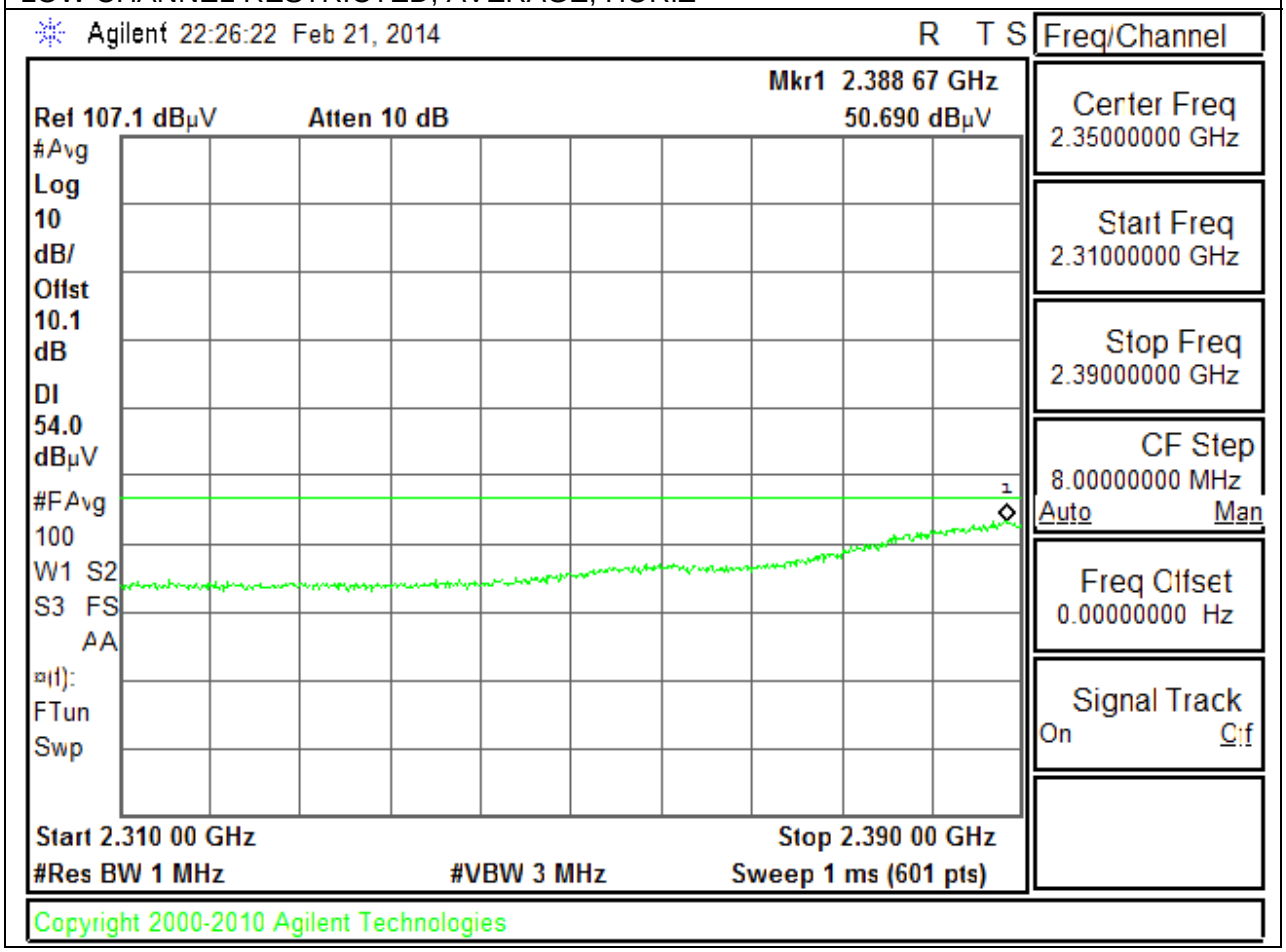
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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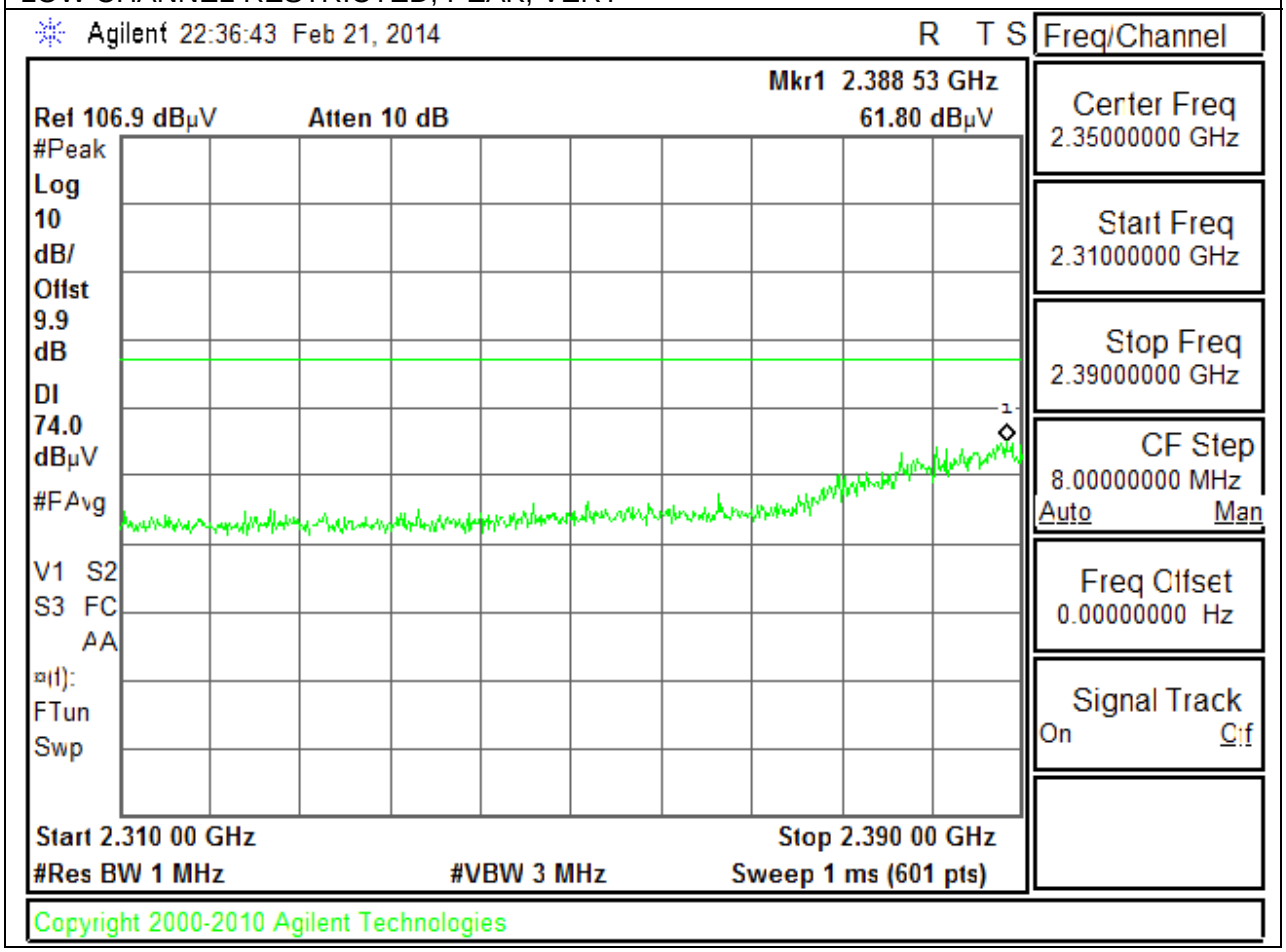
LOW CHANNEL RESTRICTED, PEAK, VERT



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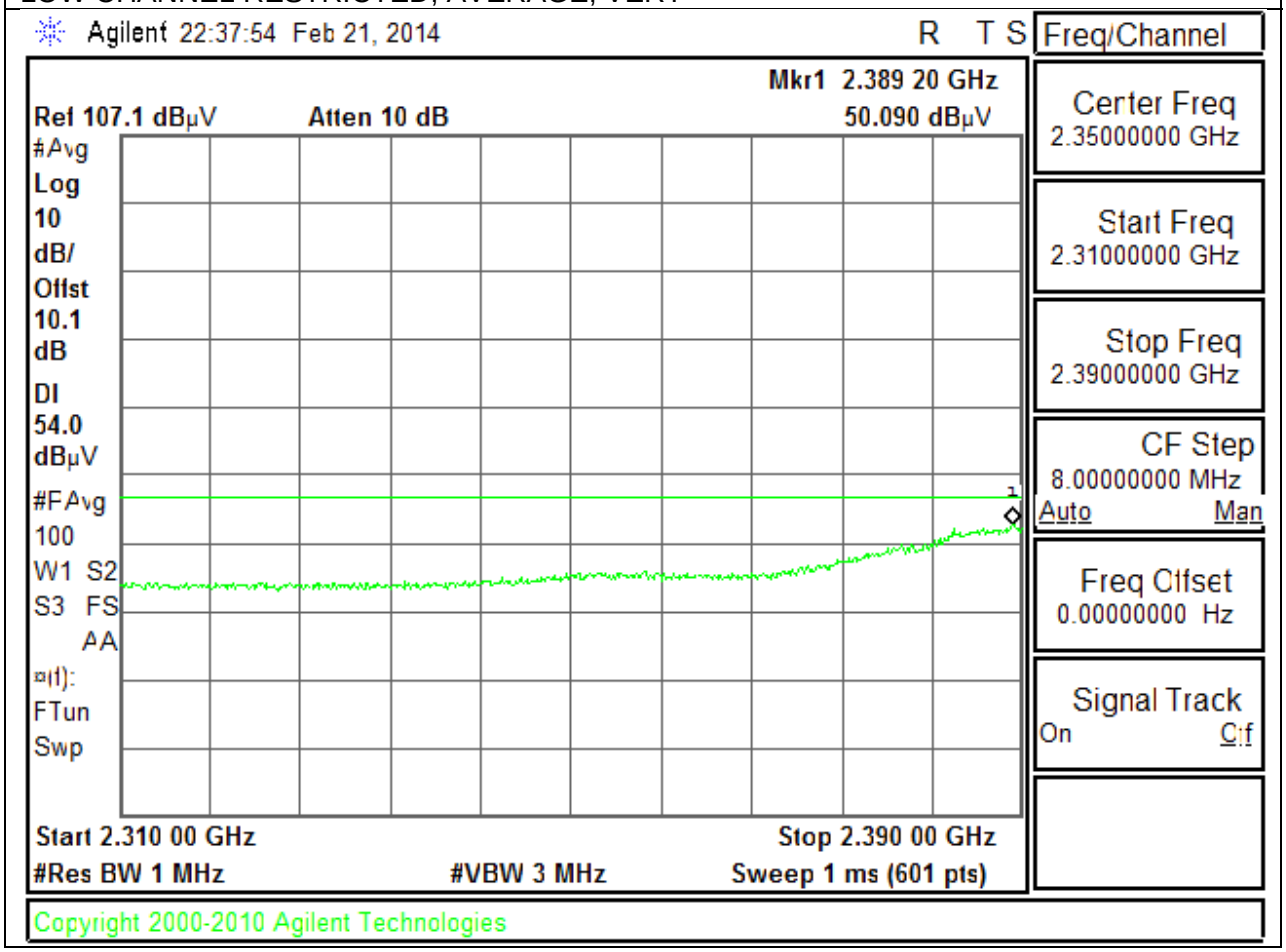
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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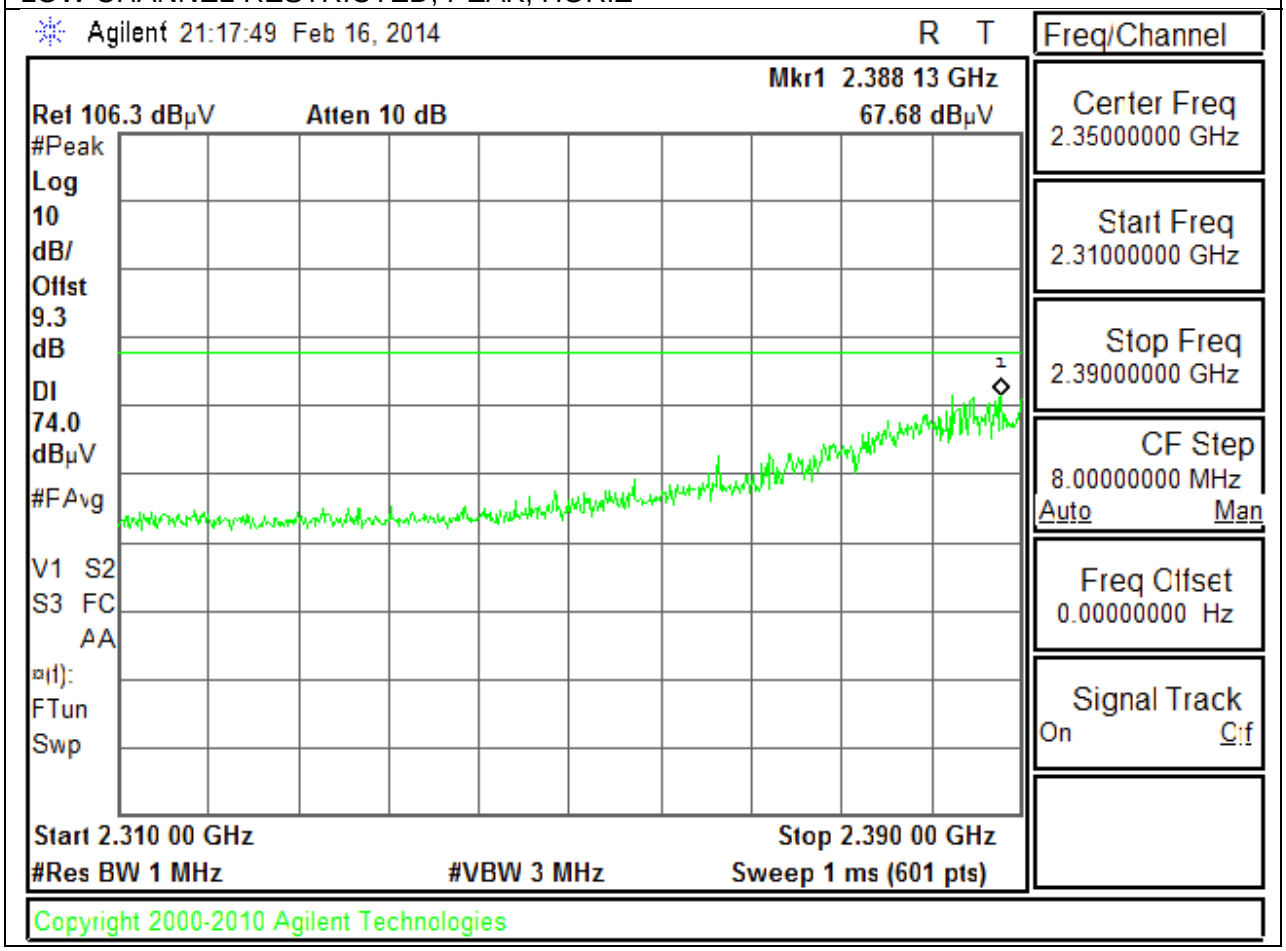
TX ABOVE 1 GHz 802.11n HT40 CDD MODE IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL 2427)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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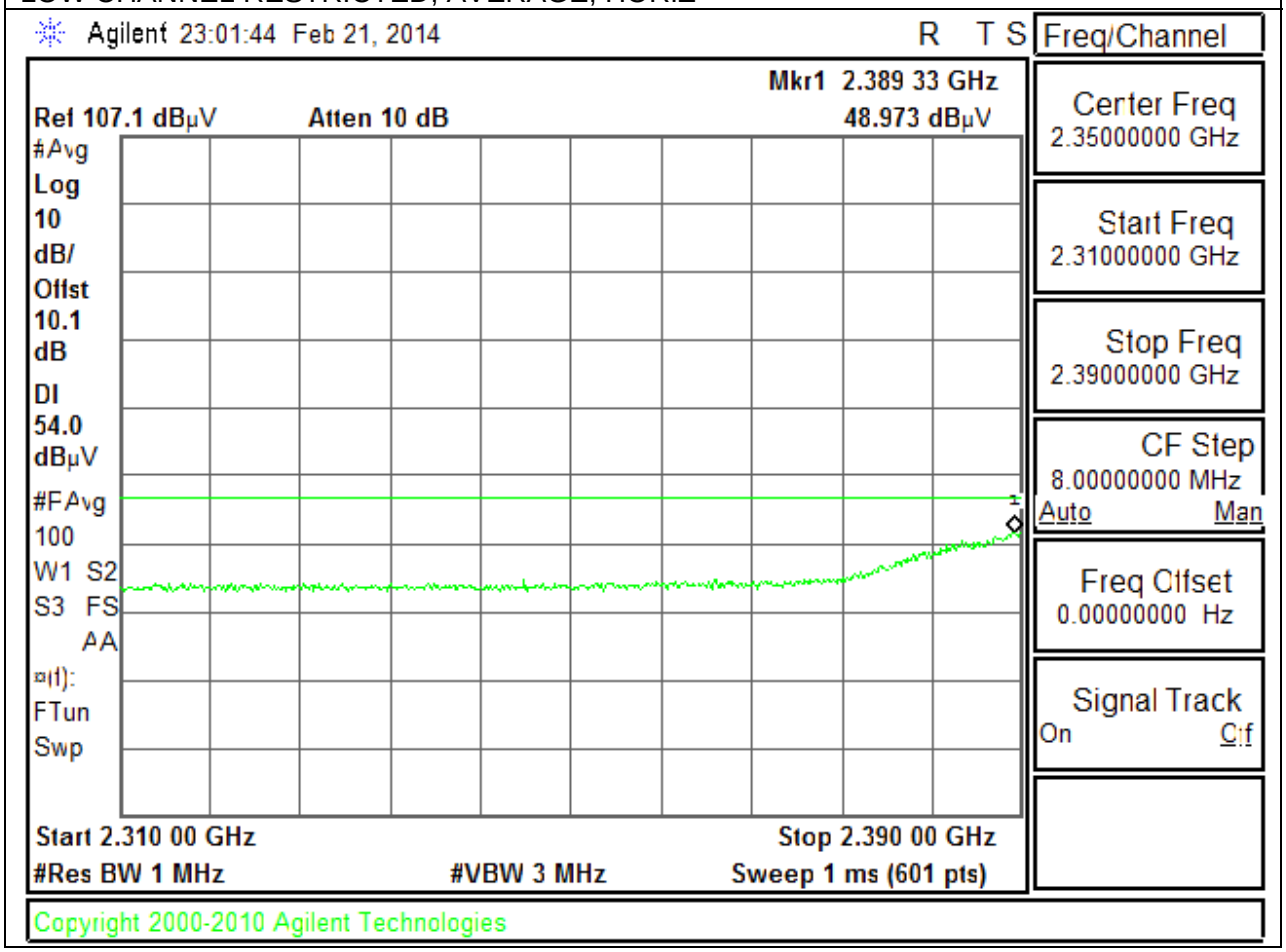
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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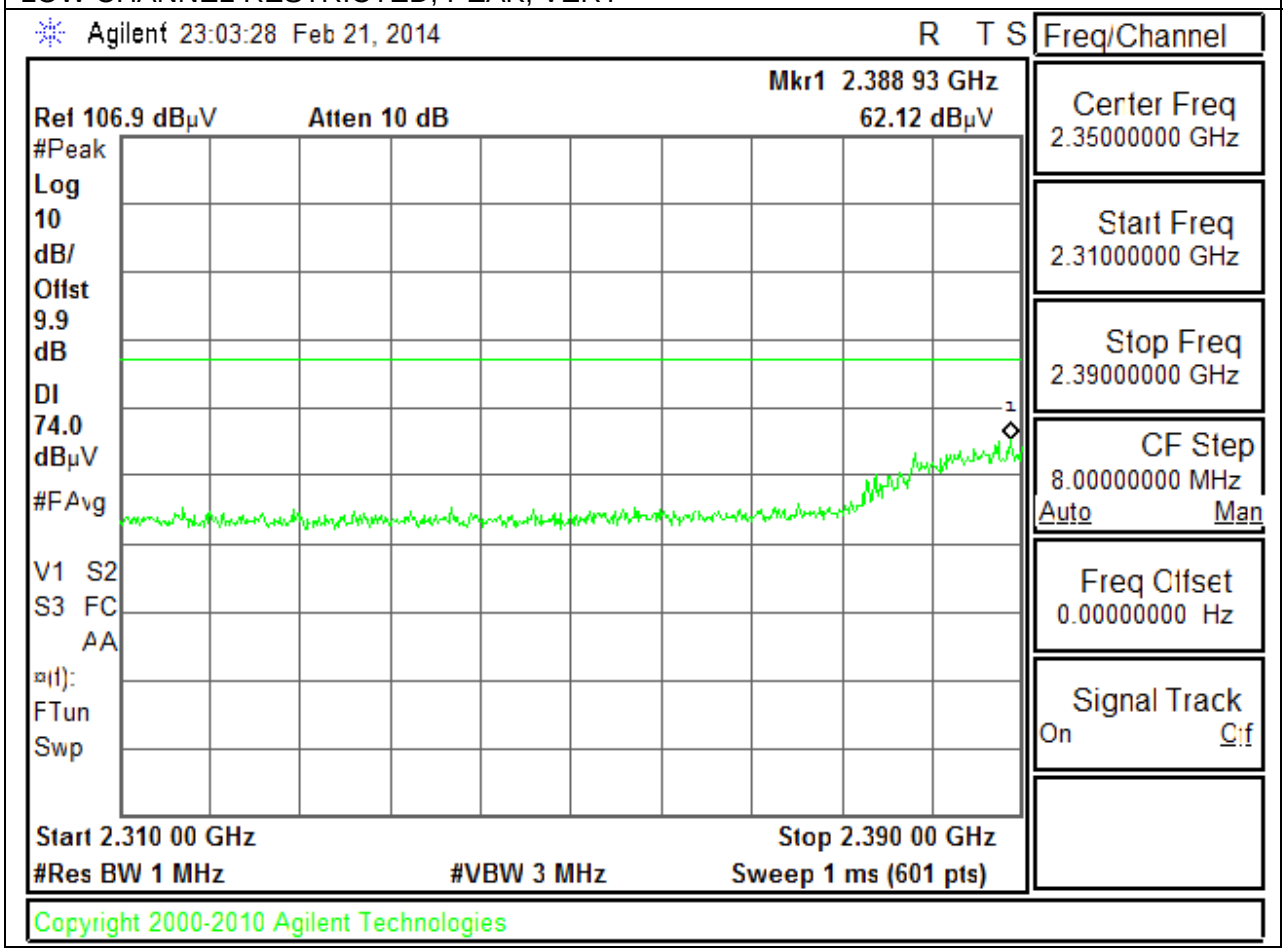
LOW CHANNEL RESTRICTED, PEAK, VERT



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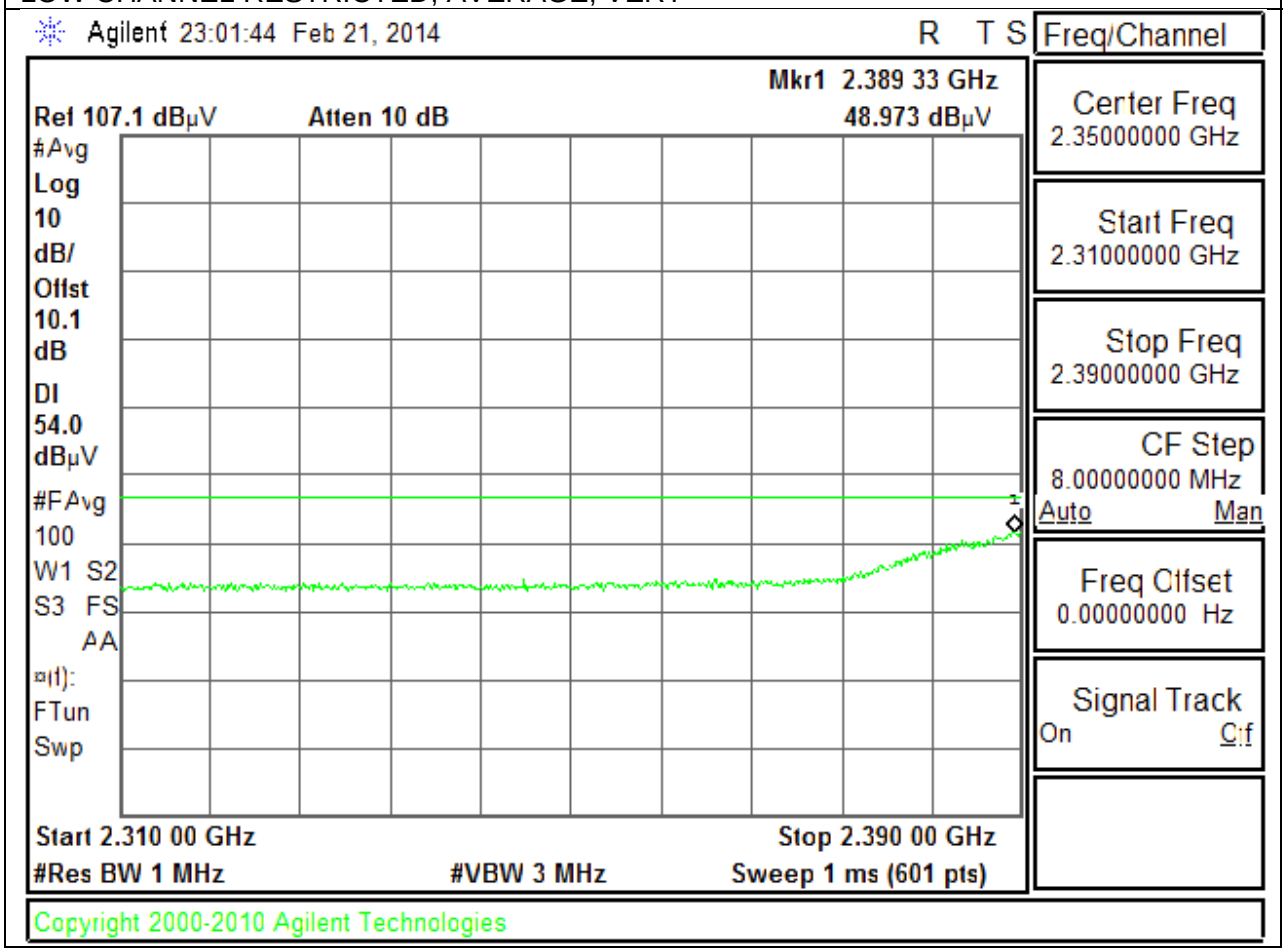
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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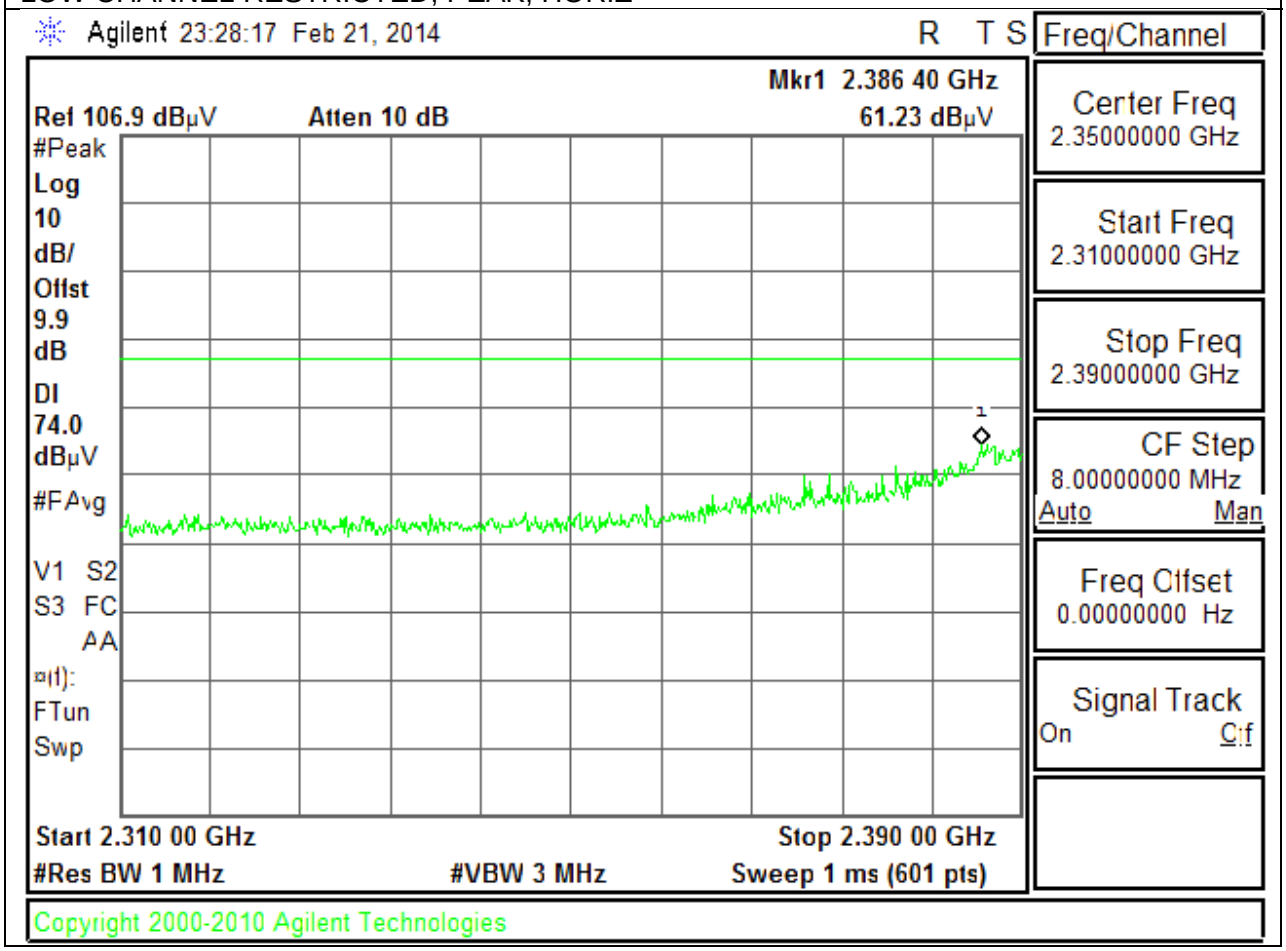
TX ABOVE 1 GHz 802.11n HT40 CDD MODE IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL 2432)

LOW CHANNEL RESTRICTED, PEAK, HORIZ



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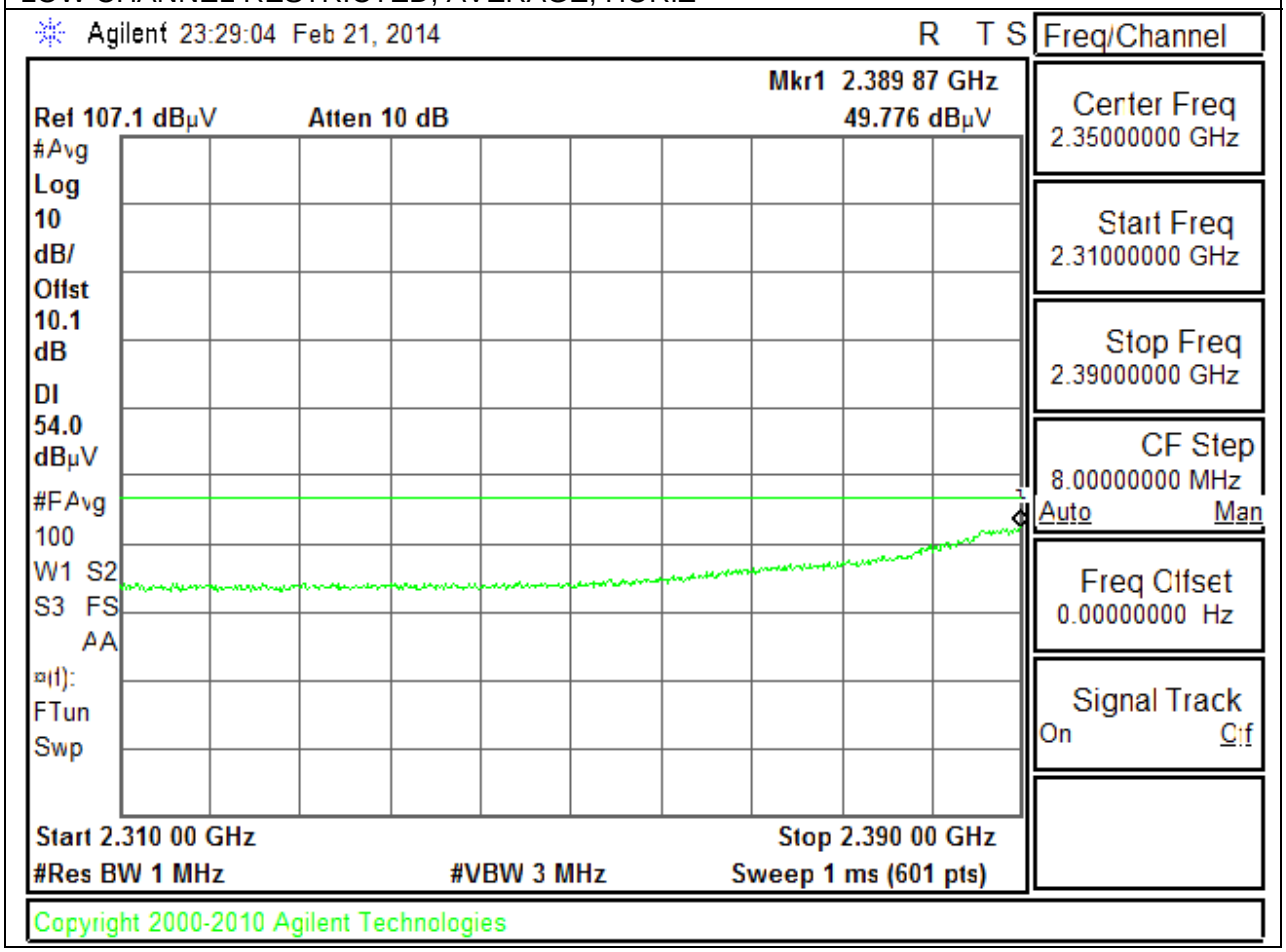
LOW CHANNEL RESTRICTED, AVERAGE, HORIZ



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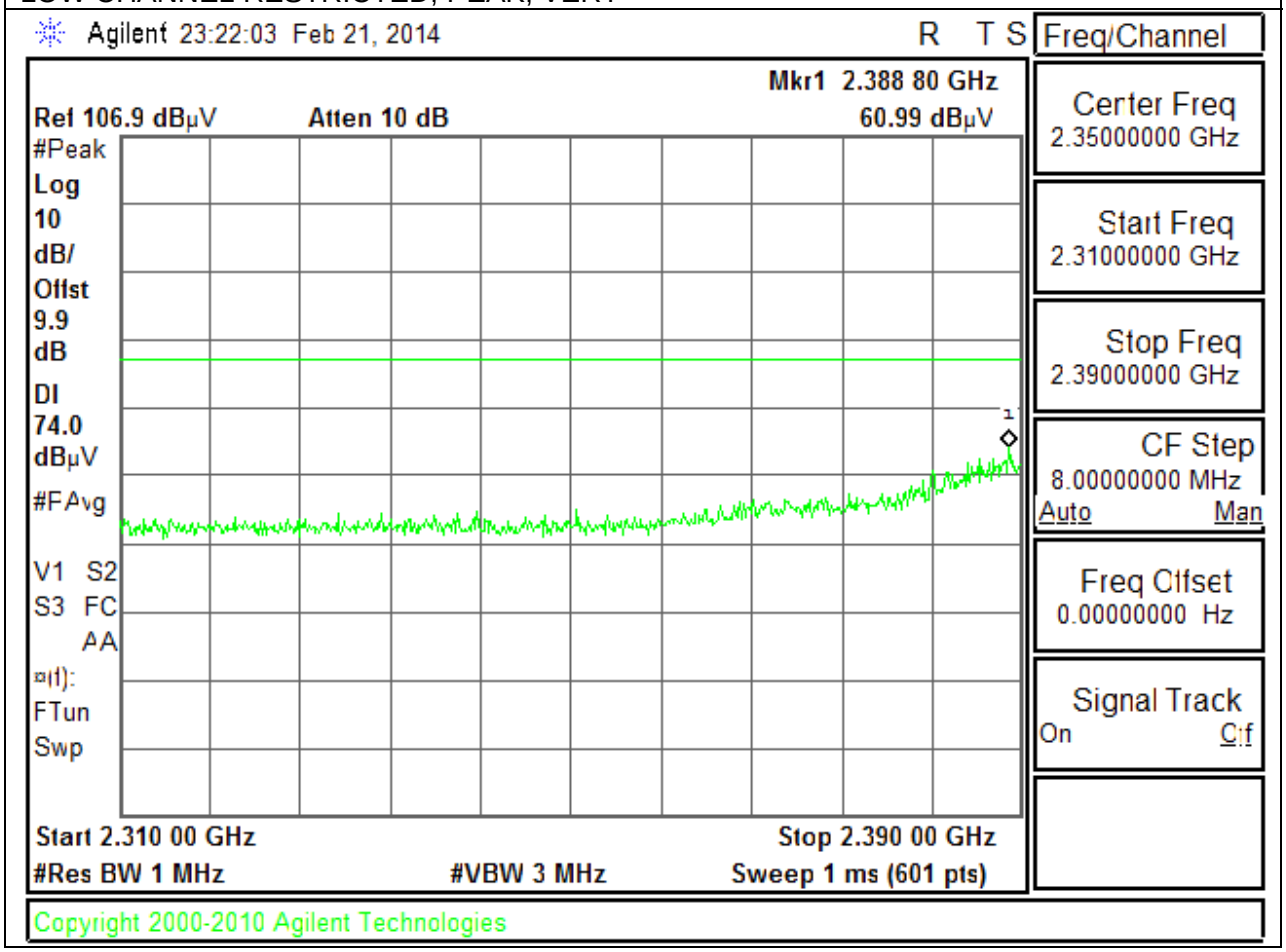
LOW CHANNEL RESTRICTED, PEAK, VERT



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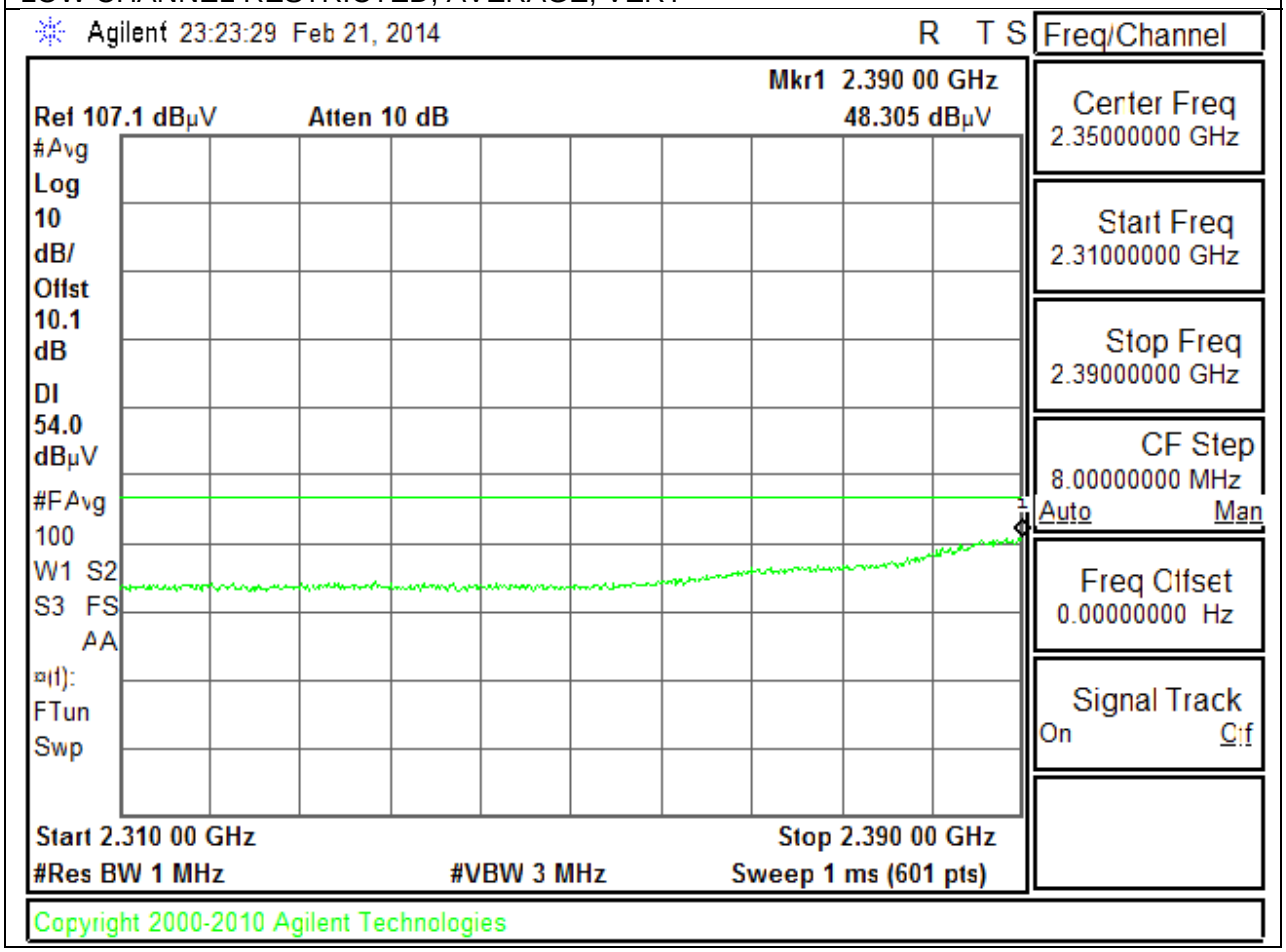
LOW CHANNEL RESTRICTED, AVERAGE, VERT



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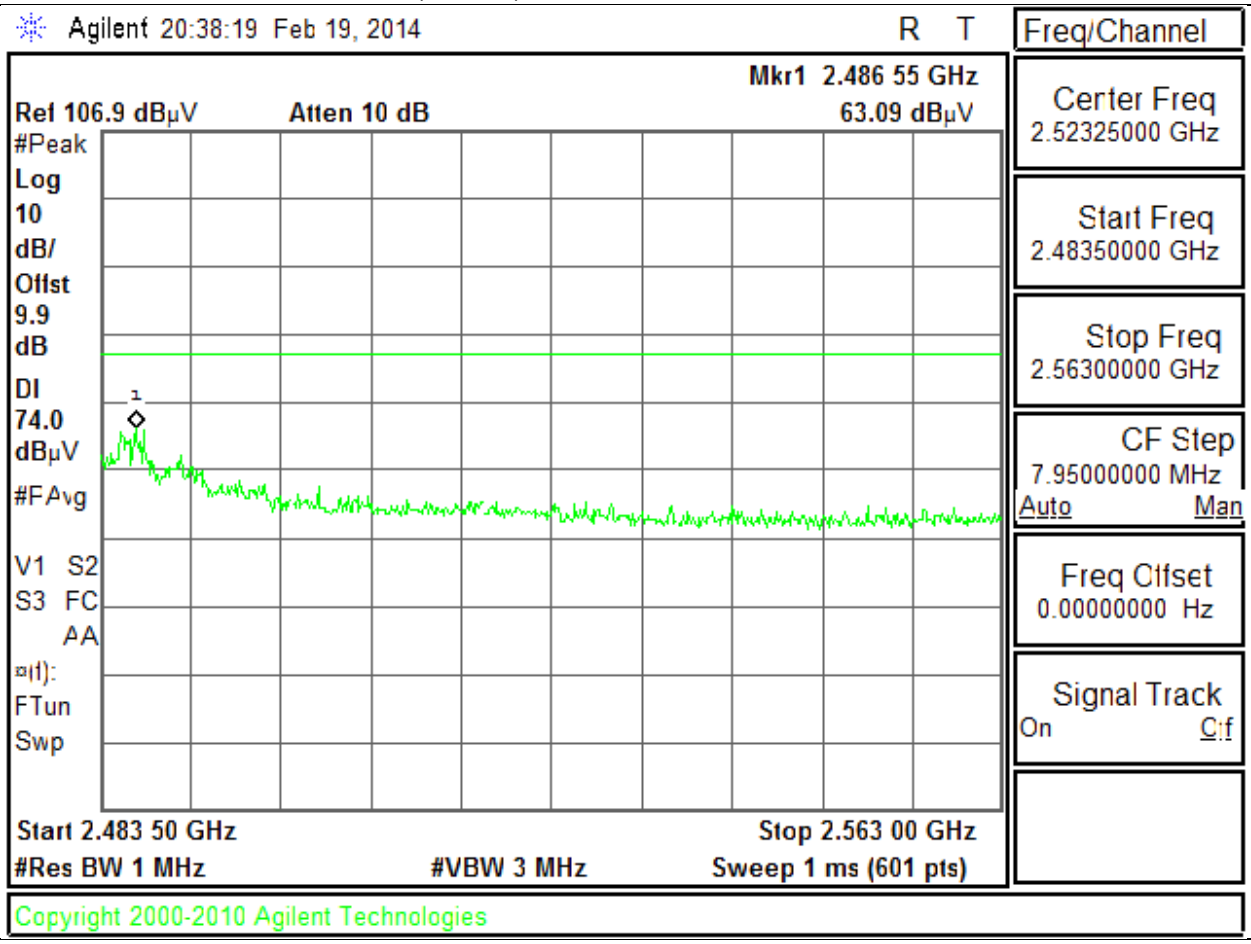
AUTHORIZED BANDEDGE (HIGH CHANNEL 2452MHz)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



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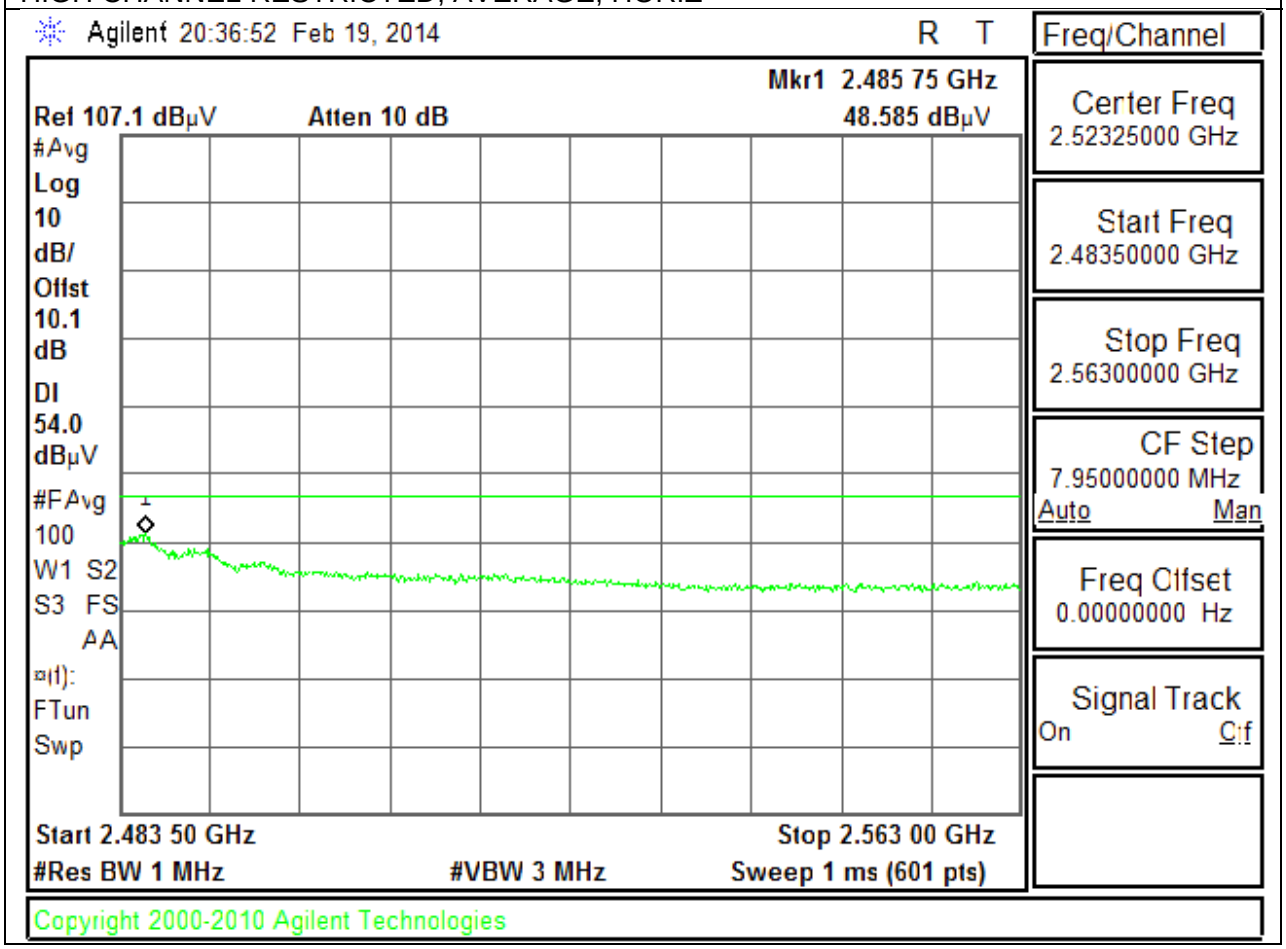
HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



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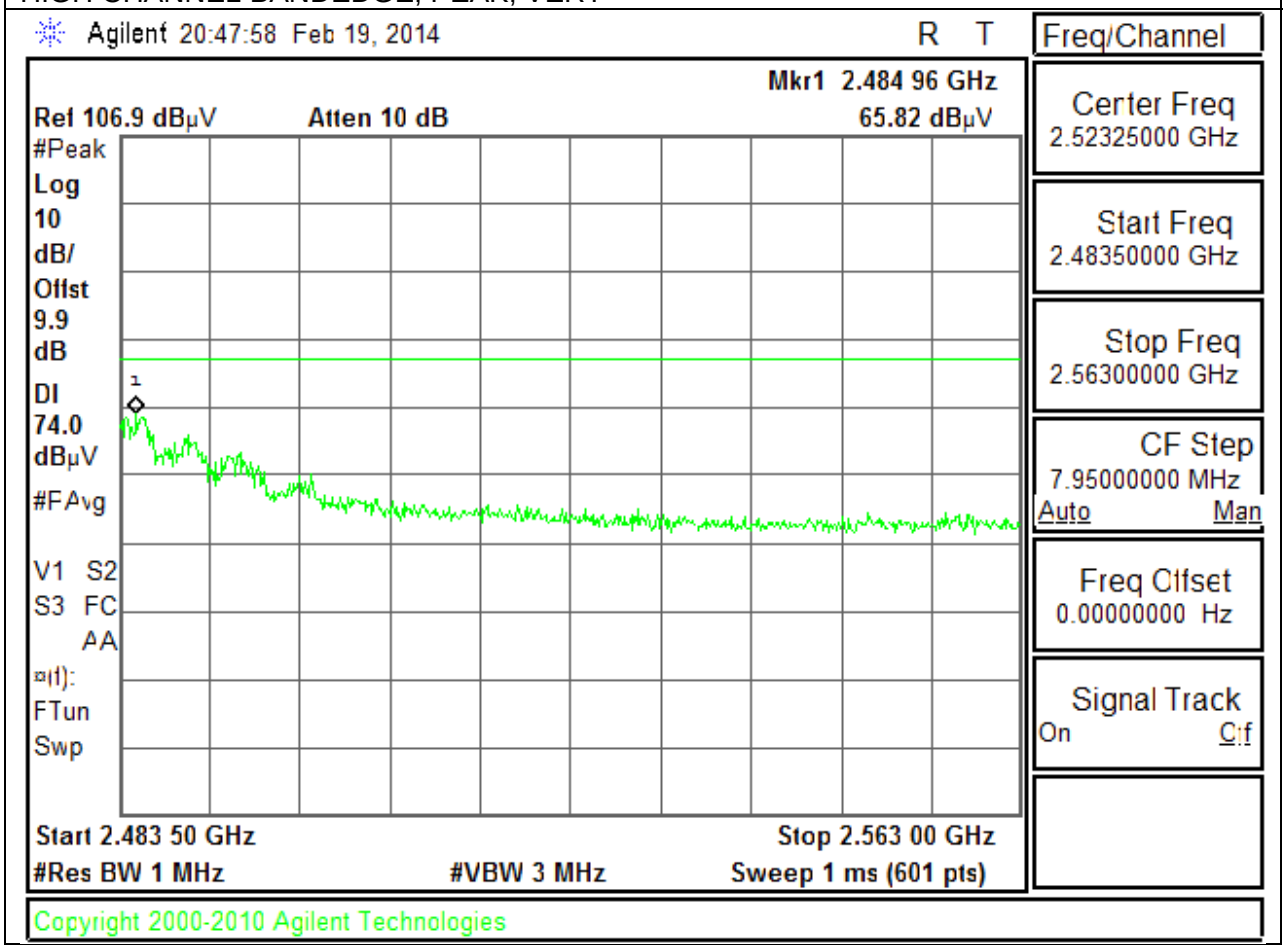
HIGH CHANNEL BANDEDGE, PEAK, VERT



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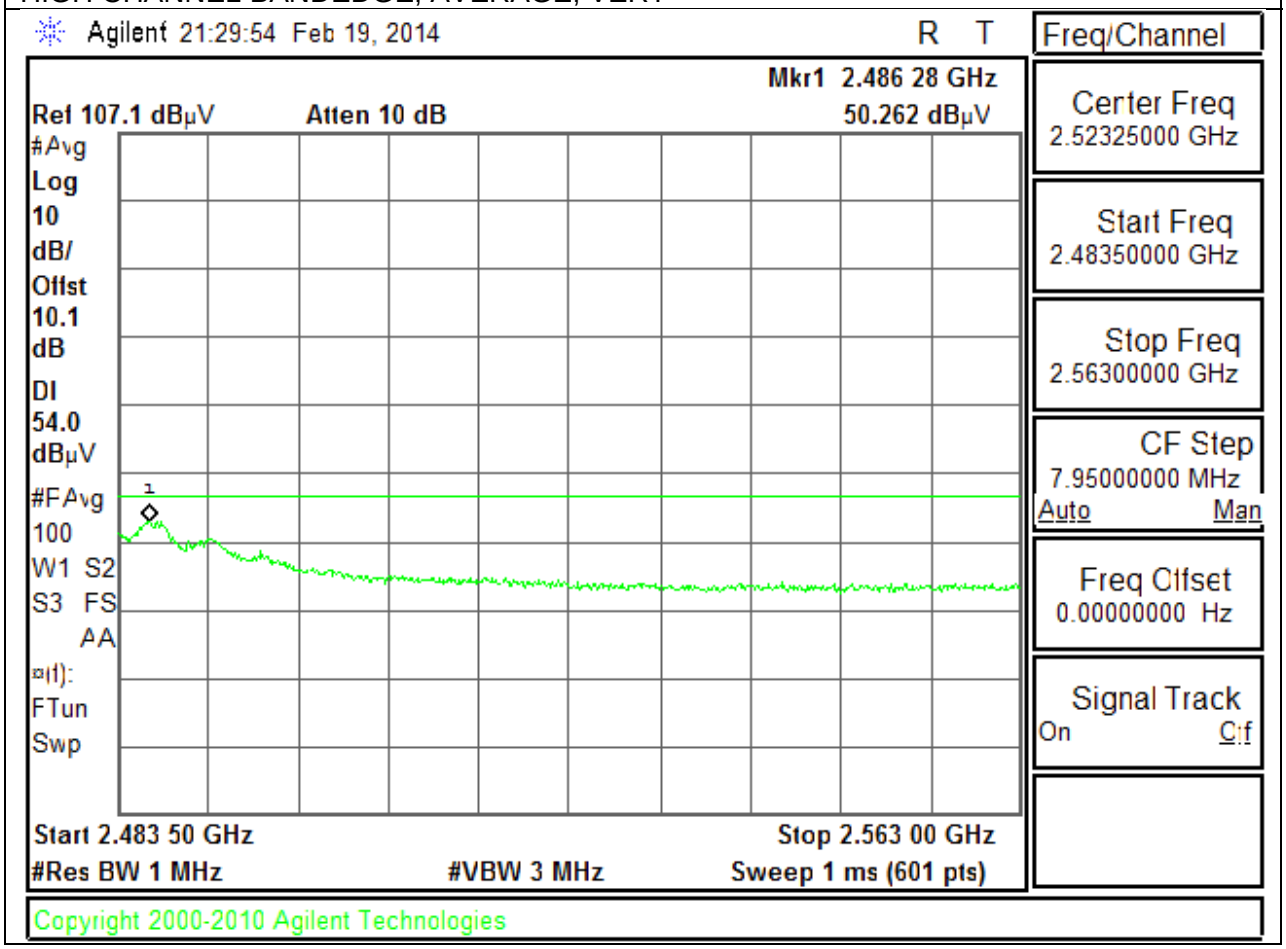
HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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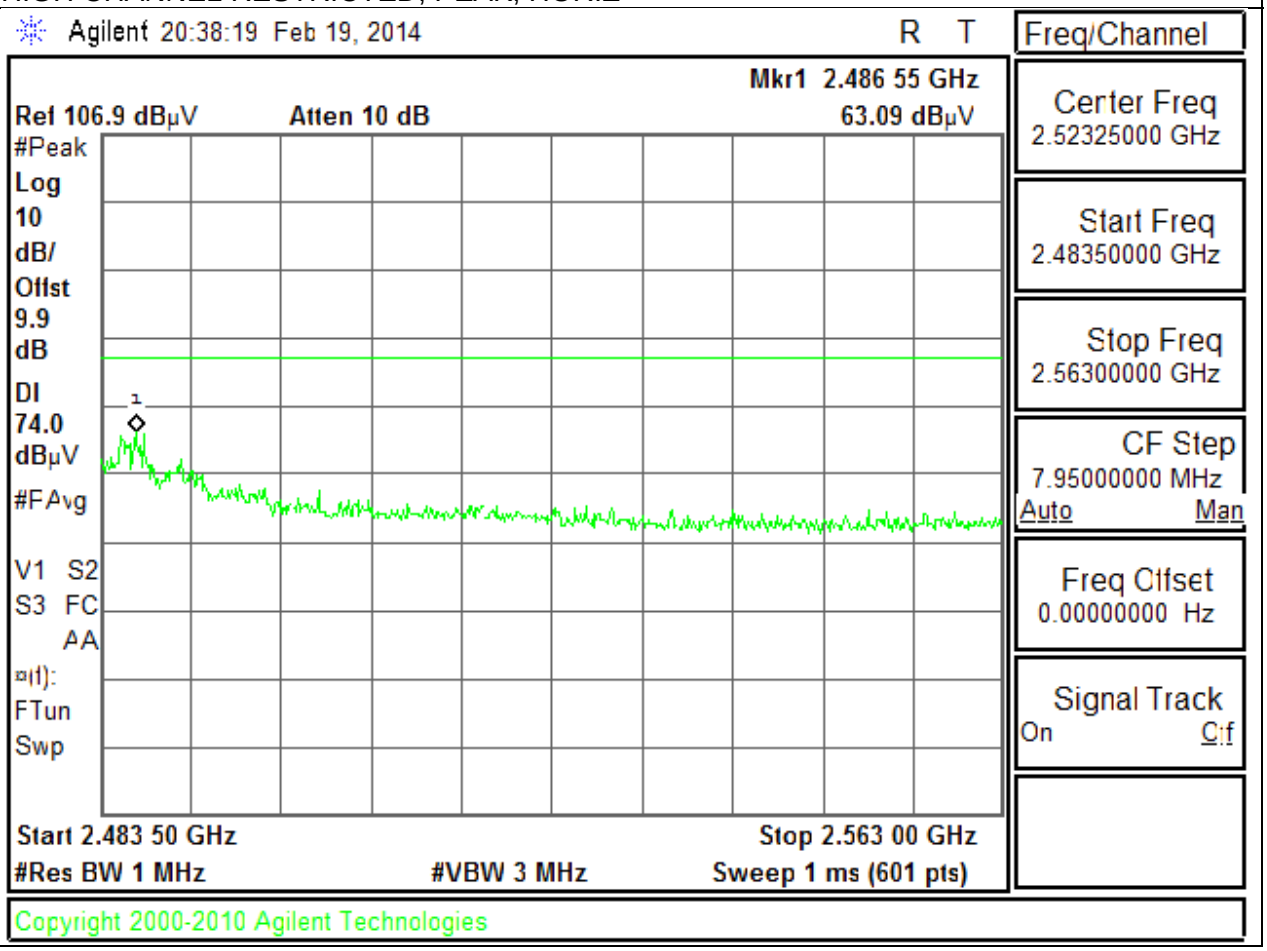
AUTHORIZED BANDEDGE (HIGH CHANNEL 2452MHz)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



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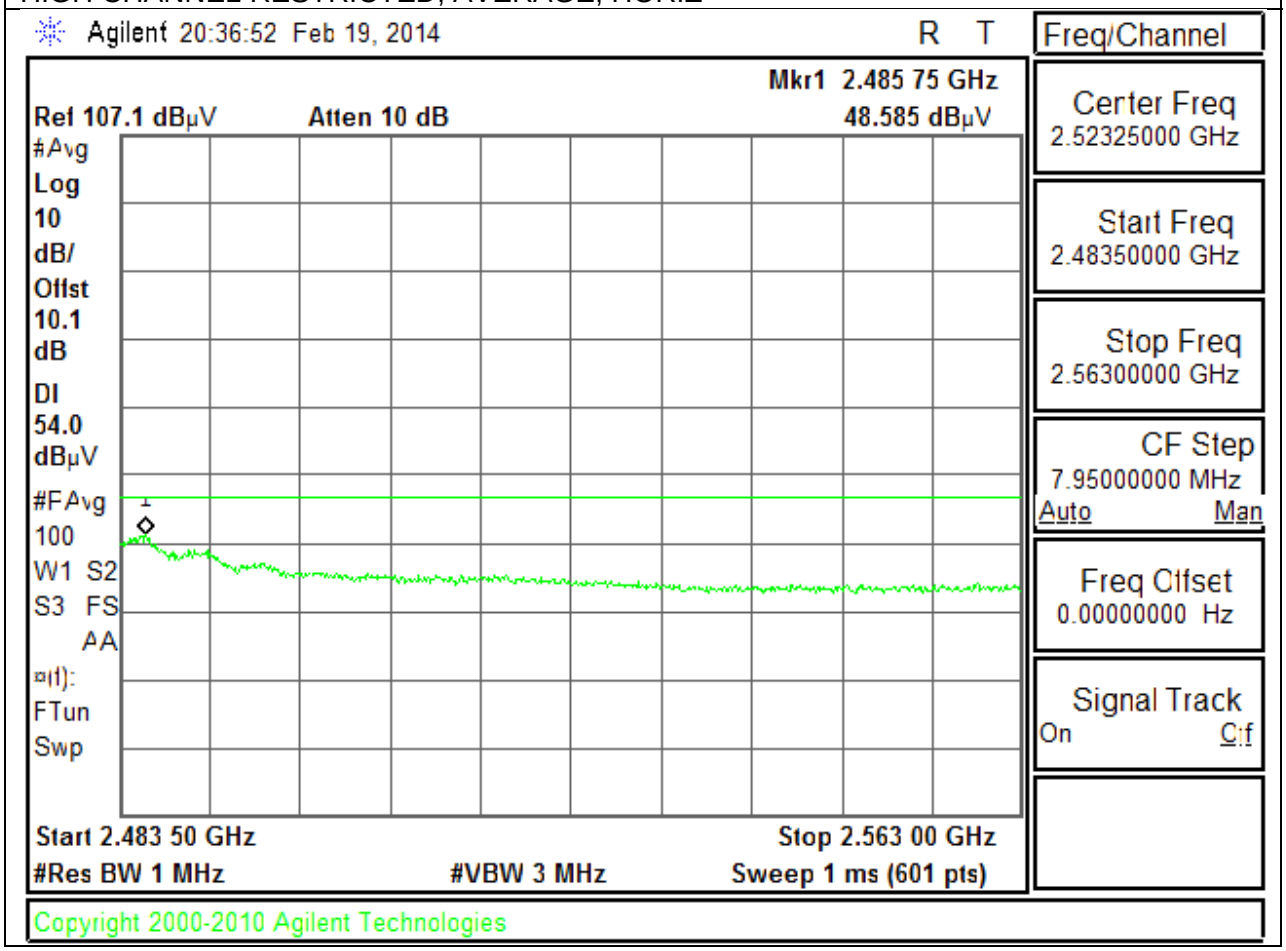
HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



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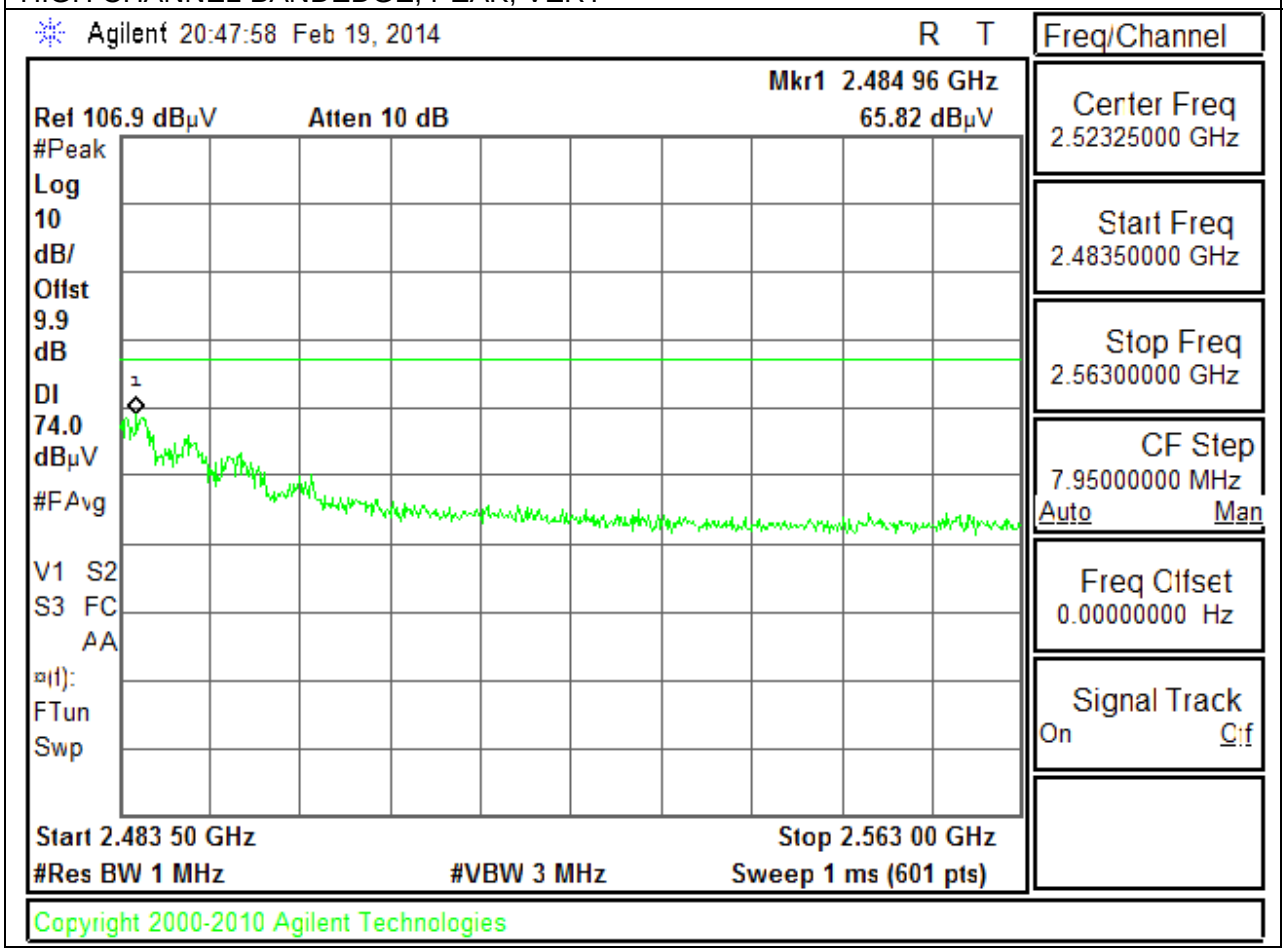
HIGH CHANNEL BANDEDGE, PEAK, VERT



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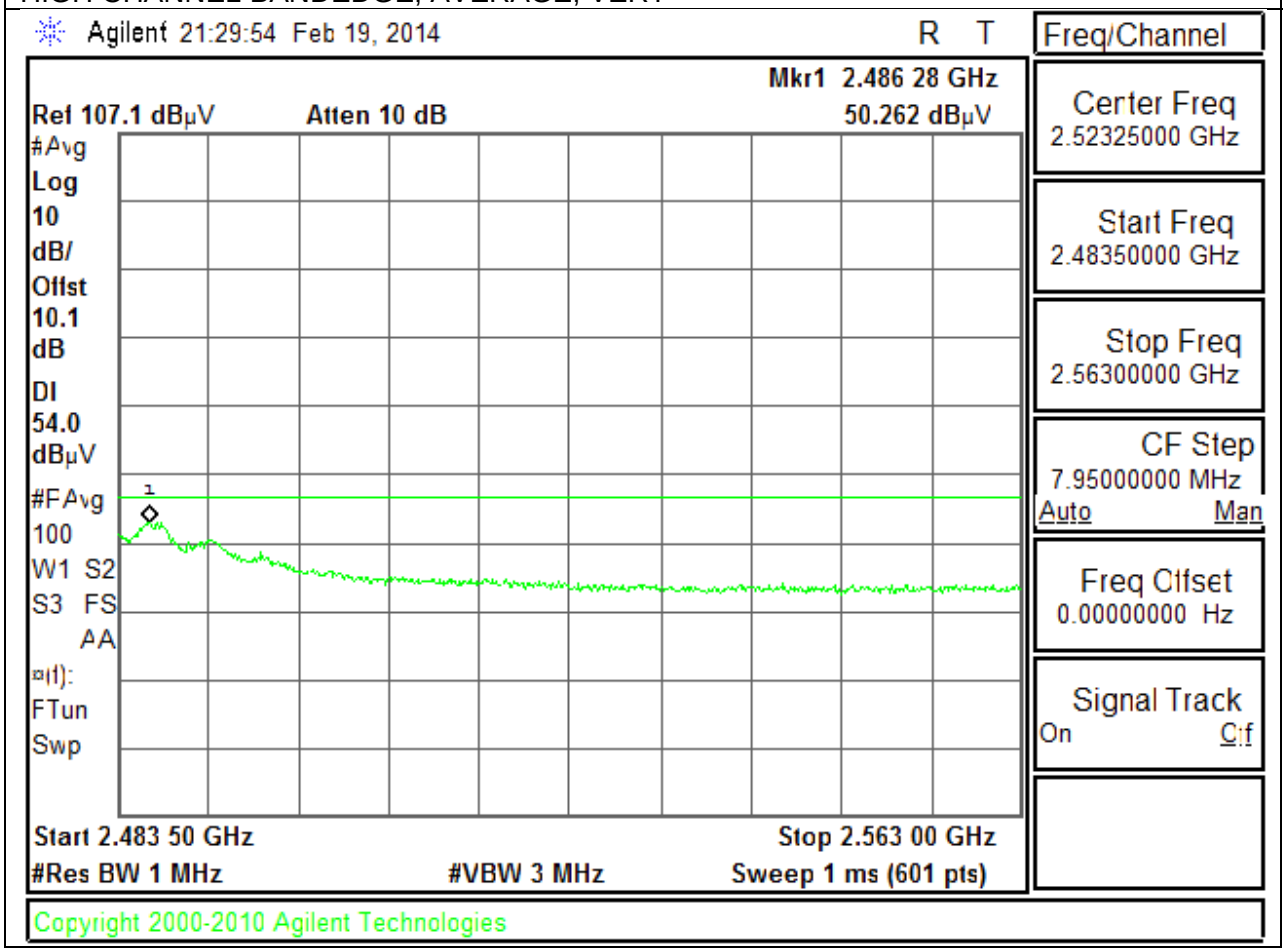
HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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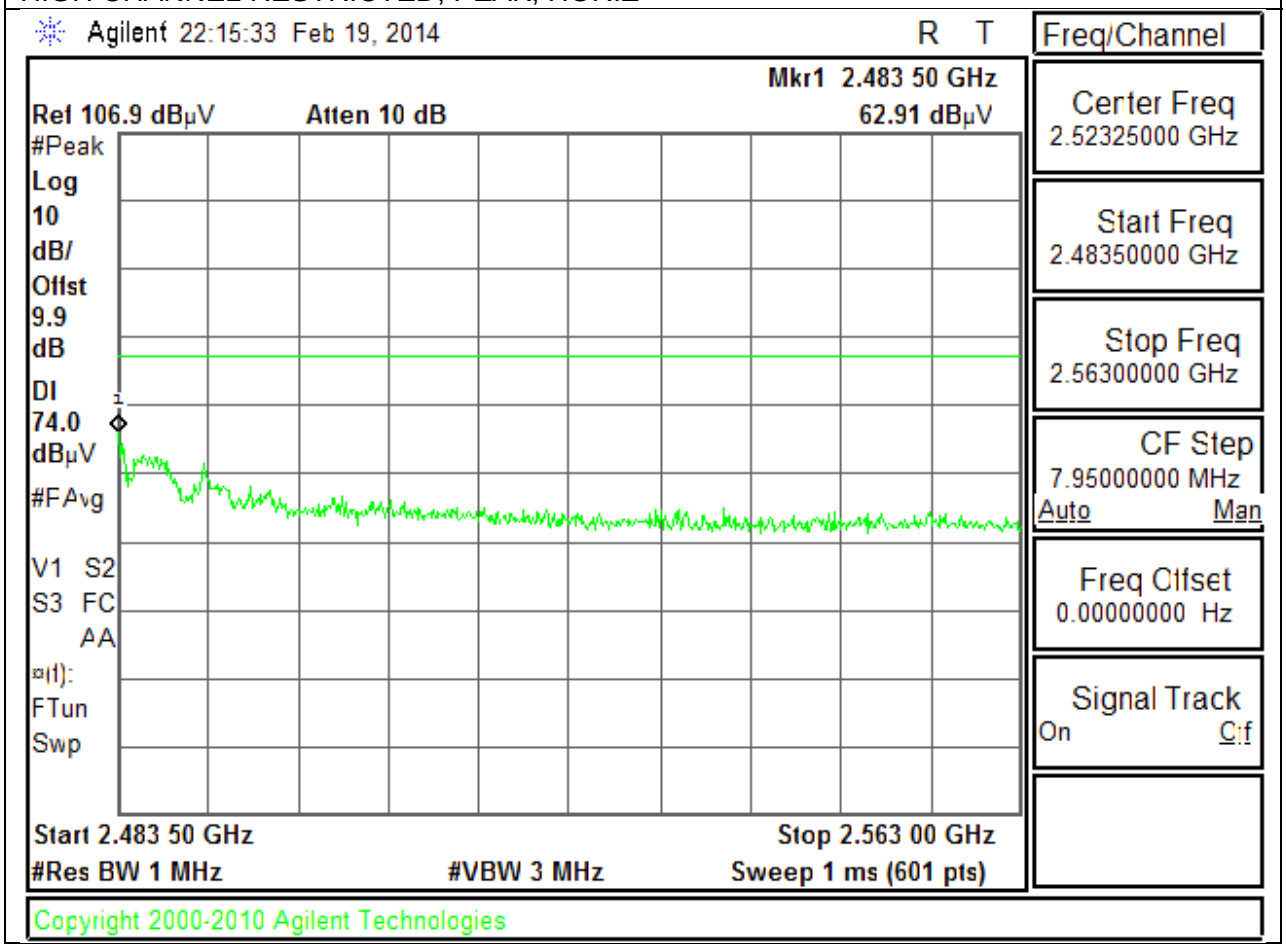
AUTHORIZED BANDEDGE (HIGH CHANNEL 2447MHz)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ



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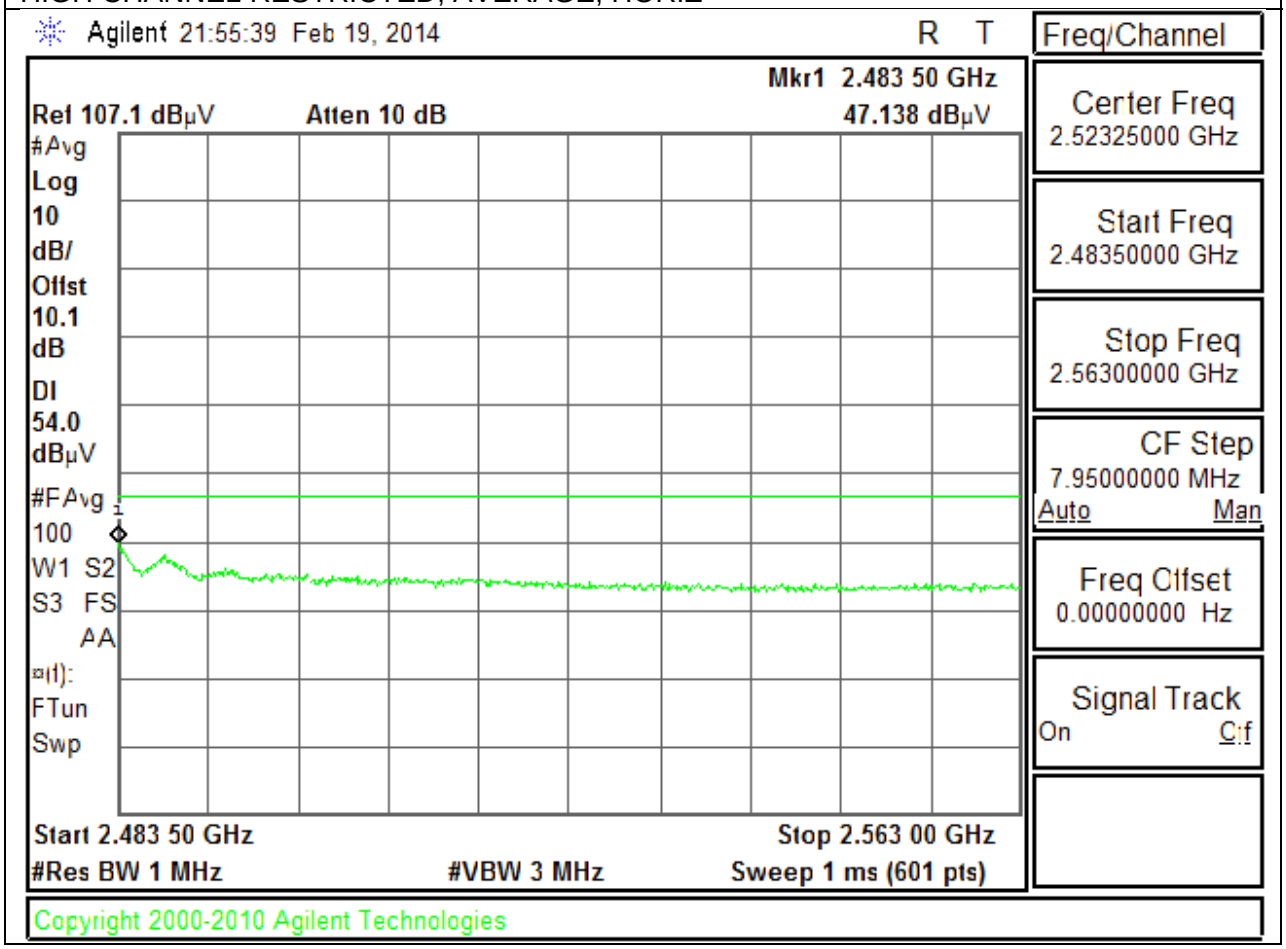
HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



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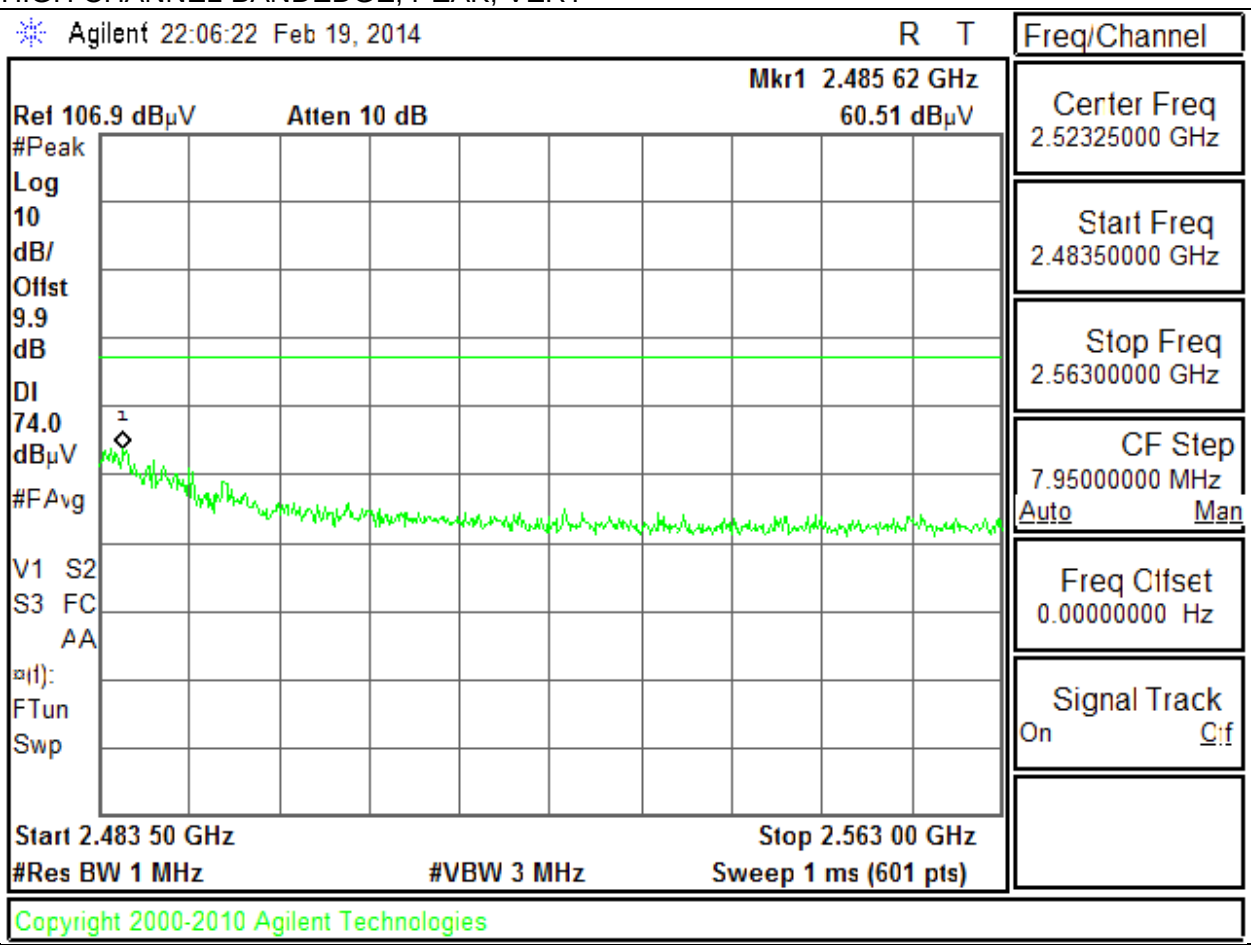
HIGH CHANNEL BANDEDGE, PEAK, VERT



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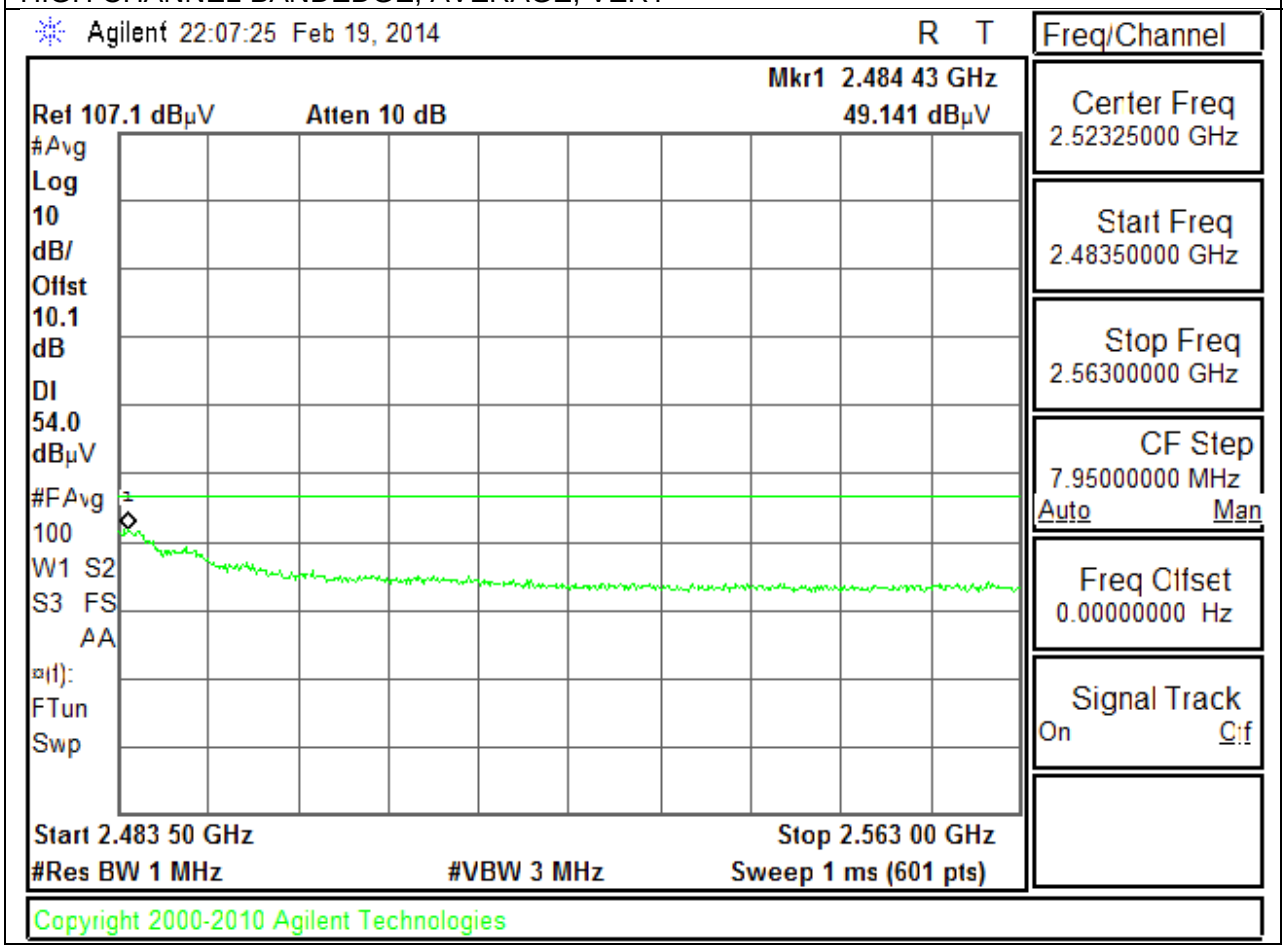
HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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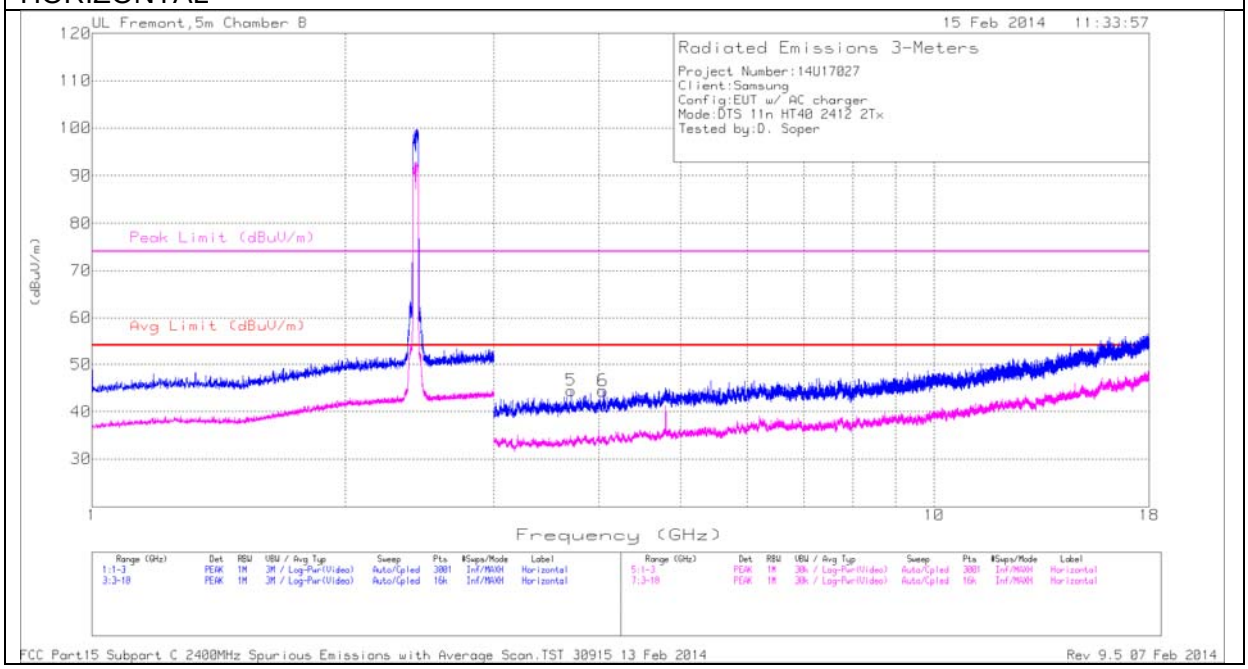
HARMONICS AND SPURIOUS EMISSIONS

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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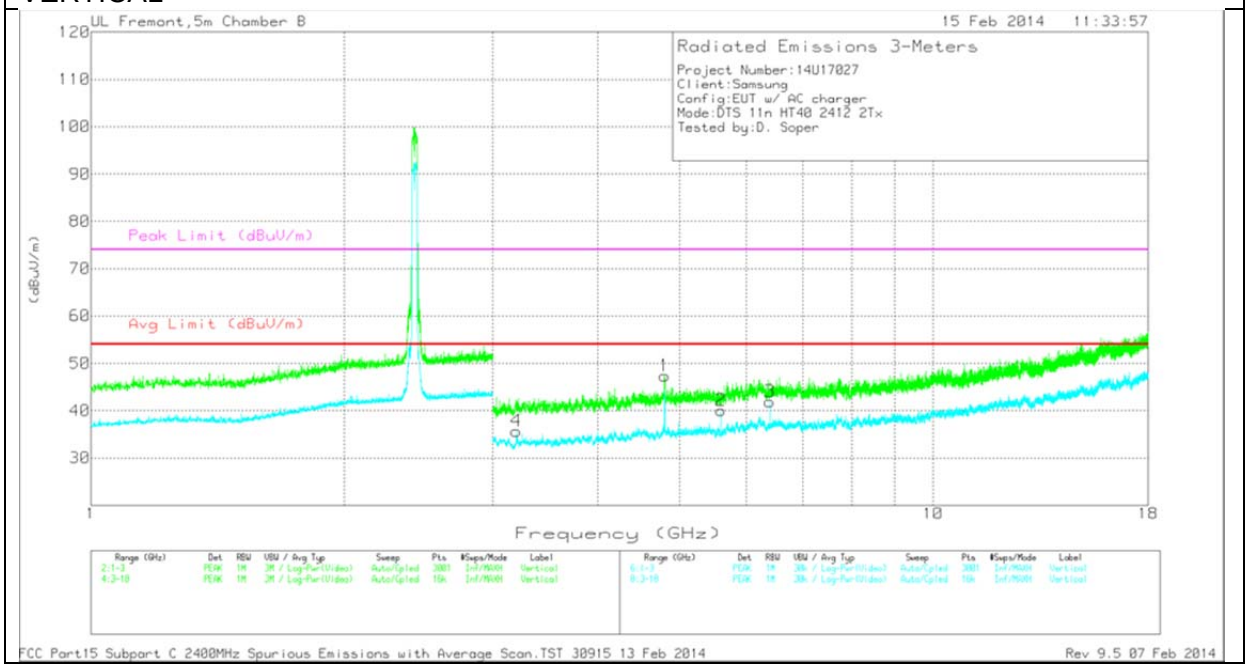
LOW CHANNEL
VERTICAL



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)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 3.707	41.87	PK	33.7	-31.1	44.47	54	-9.53	74	-29.53	0-360	202	H
6	* 4.044	41.4	PK	33.9	-30.9	44.4	54	-9.6	74	-29.6	0-360	99	H
1	* 4.8	41.47	PK	34.7	-28.8	47.37	54	-6.63	74	-26.63	0-360	202	V
4	3.2	33.57	Avg	33.3	-31.2	35.67	54	-18.33	-	-	0-360	202	V
2	5.6	34.45	Avg	35	-29.4	40.05	54	-13.95	-	-	0-360	99	V
3	6.399	34.91	Avg	35.9	-28.9	41.91	54	-12.09	-	-	0-360	202	V

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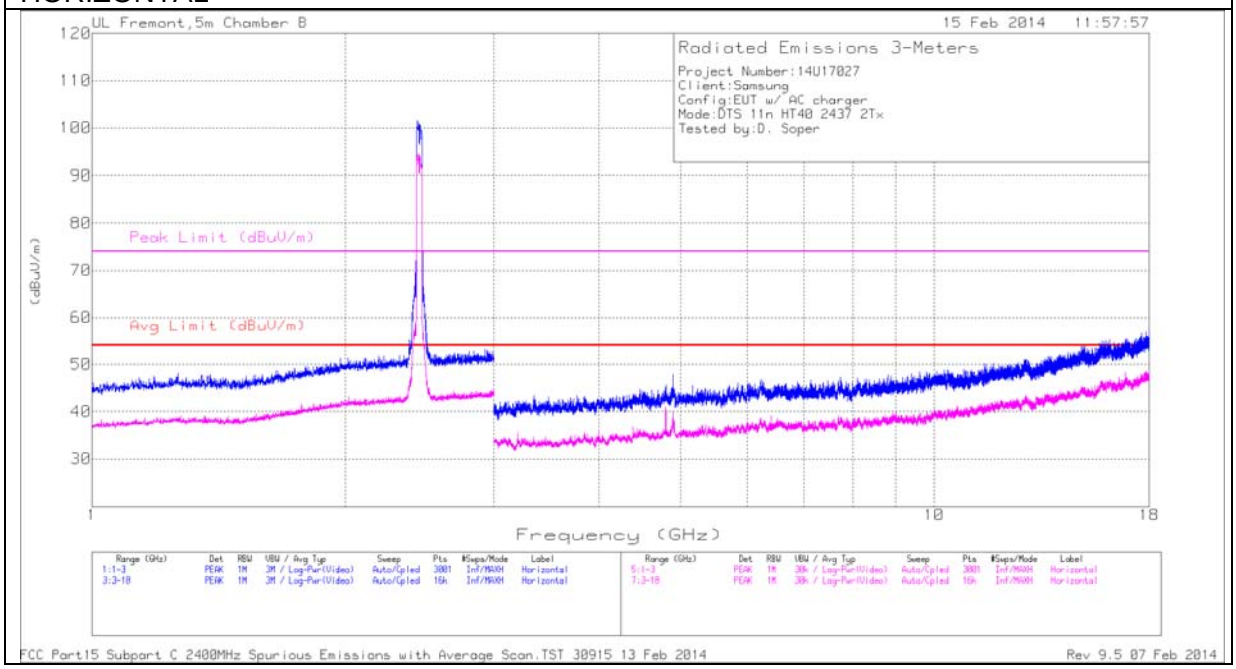
MID CHANNEL
HORIZONTAL



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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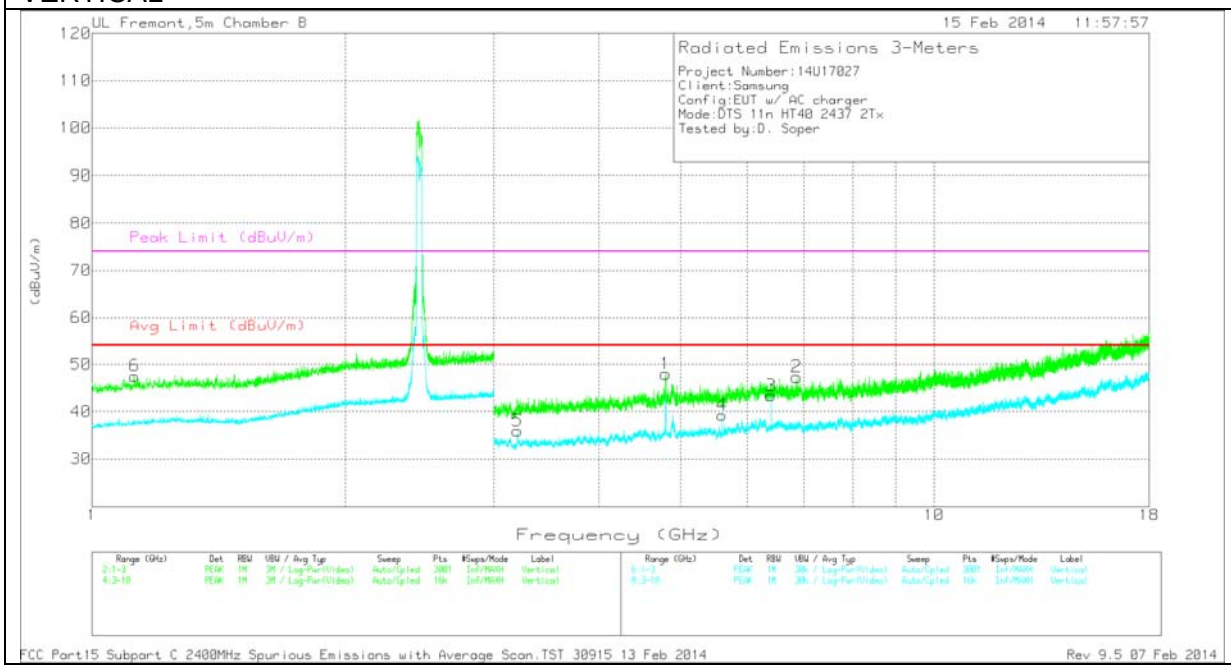
MID CHANNEL
VERTICAL



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)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	* 1.124	44.23	PK	28	-24.7	47.53	54	-6.47	74	-26.47	0-360	202	V
1	* 4.8	42.07	PK	34.7	-28.8	47.97	54	-6.03	74	-26.03	0-360	202	V
5	3.2	33.83	Avg	33.3	-31.2	35.93	54	-18.07	-	-	0-360	202	V
4	5.6	33.64	Avg	35	-29.4	39.24	54	-14.76	-	-	0-360	99	V
3	6.4	36.34	Avg	35.9	-28.9	43.34	54	-10.66	-	-	0-360	202	V
2	6.865	38.81	PK	35.8	-27.3	47.31	-	-	74	-26.69	0-360	99	V

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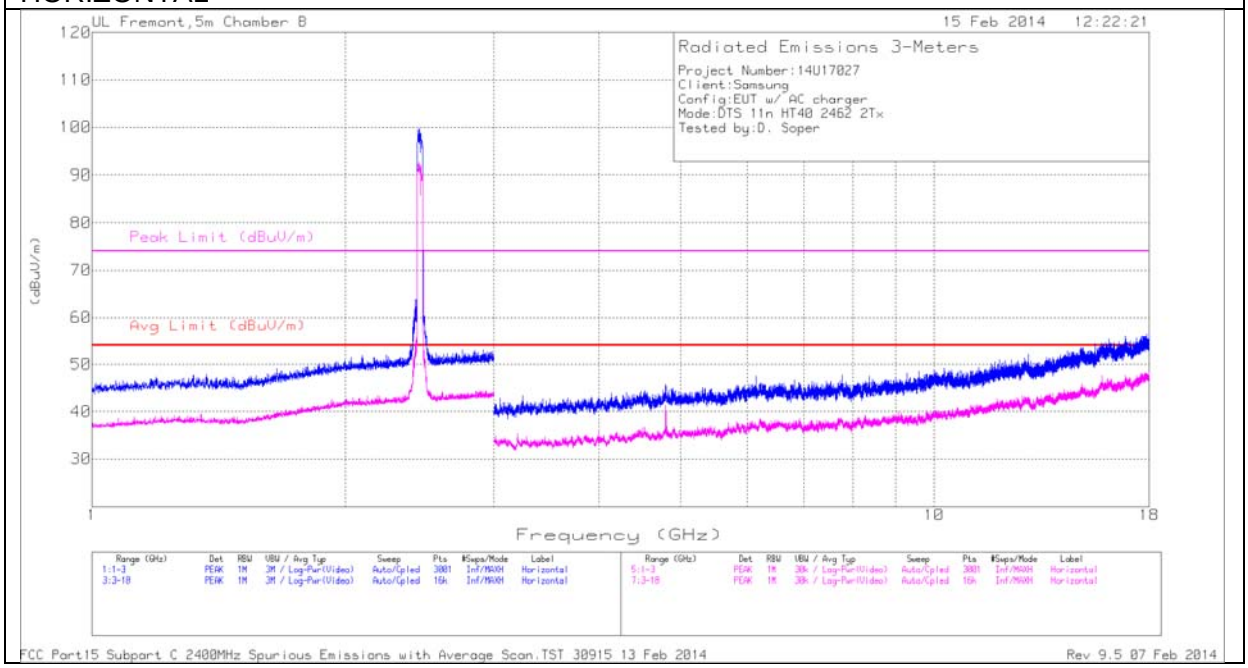
HIGH CHANNEL
HORIZONTAL



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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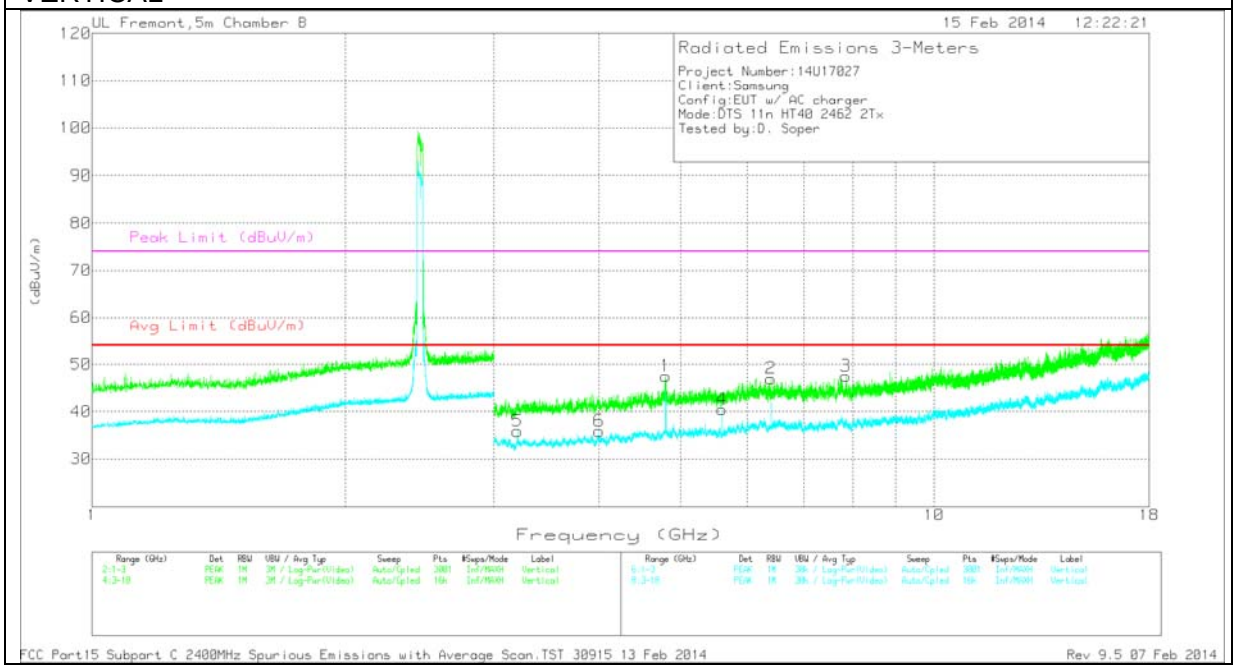
HIGH CHANNEL
VERTICAL



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)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	* 4	33.07	Avg	33.9	-31.1	35.87	54	-18.13	-	-	0-360	99	V
1	* 4.8	41.59	PK	34.7	-28.8	47.49	54	-6.51	74	-26.51	0-360	202	V
5	3.2	33.76	Avg	33.3	-31.2	35.86	54	-18.14	-	-	0-360	202	V
4	5.6	34.84	Avg	35	-29.4	40.44	54	-13.56	-	-	0-360	99	V
2	6.399	39.99	PK	35.9	-28.9	46.99	-	-	74	-27.01	0-360	99	V
3	7.853	38.6	PK	36.2	-27.3	47.5	-	-	74	-26.5	0-360	202	V

PK - Peak detector

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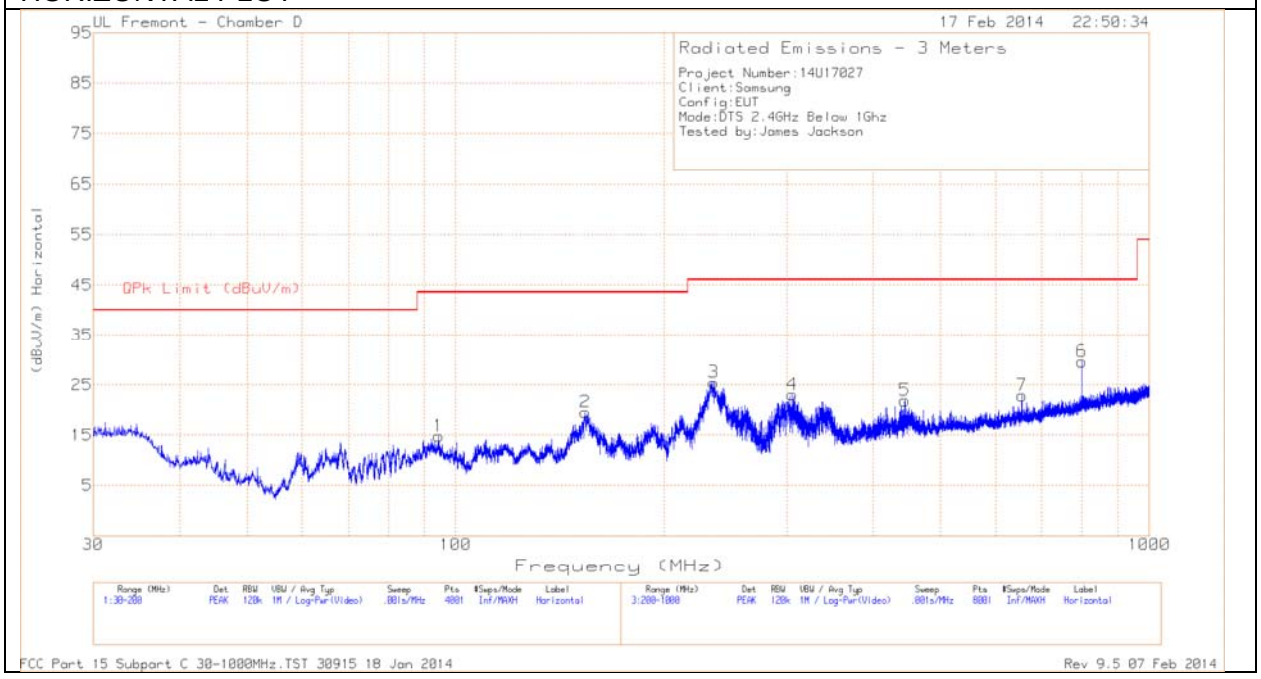
10.4. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



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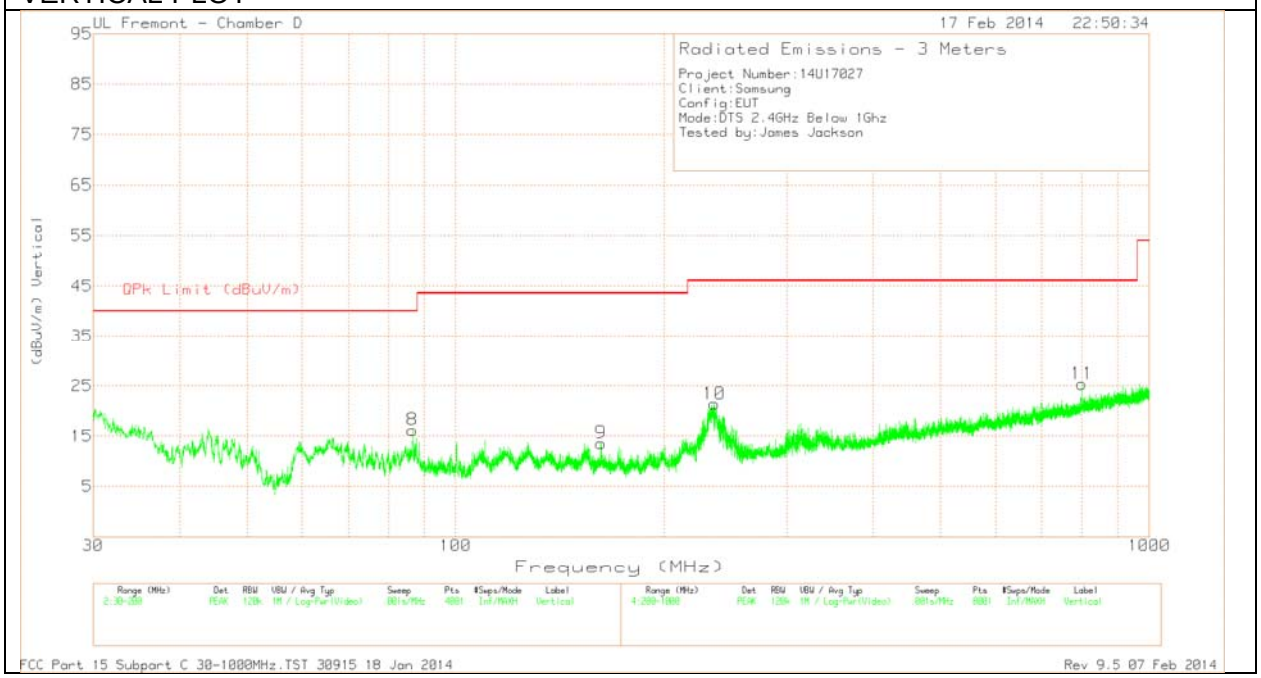
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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Below 1G Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T407 dB/m	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
8	86.6525	39.51	PK	7.7	-31	16.21	40	-23.79	0-360	100	V
1	94.515	37.39	PK	8.8	-31.4	14.79	43.52	-28.73	0-360	301	H
2	153.76	37.95	PK	12.3	-30.7	19.55	43.52	-23.97	0-360	200	H
9	162.005	32.38	PK	12.1	-30.9	13.58	43.52	-29.94	0-360	100	V
3	235.4	44.73	PK	11.4	-30.7	25.43	46.02	-20.59	0-360	102	H
10	236	40.71	PK	11.4	-30.7	21.41	46.02	-24.61	0-360	200	V
4	305.6	40.13	PK	13.3	-30.4	23.03	46.02	-22.99	0-360	102	H
5	444.2	34.9	PK	16.9	-29.9	21.9	46.02	-24.12	0-360	102	H
7	655.6	33.08	PK	19.5	-29.7	22.88	46.02	-23.14	0-360	201	H
6	800	37.14	PK	21.5	-29	29.64	46.02	-16.38	0-360	102	H
11	800	32.89	PK	21.5	-29	25.39	46.02	-20.63	0-360	300	V

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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	.3795	45.37	PK	.4	0	45.77	58.3	-12.53	-	-
2	.3795	35.95	Av	.4	0	36.35	-	-	48.3	-11.95
3	2.679	38.78	PK	.2	.1	39.08	56	-16.92	-	-
4	2.679	30.03	Av	.2	.1	30.33	-	-	46	-15.67
5	4.578	37.1	PK	.2	.1	37.4	56	-18.6	-	-
6	4.578	29.2	Av	.2	.1	29.5	-	-	46	-16.5
7	15.7425	32.42	PK	.3	.2	32.92	60	-27.08	-	-
8	15.7425	17.57	Av	.3	.2	18.07	-	-	50	-31.93

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)
11	.384	45.1	PK	.5	0	45.6	58.2	-12.6	-	-
12	.384	34.59	Av	.5	0	35.09	-	-	48.2	-13.11
9	.90375	34.69	PK	.3	0	34.99	56	-21.01	-	-
10	.90375	22.82	Av	.3	0	23.12	-	-	46	-22.88
13	15.8685	32.49	PK	.3	.2	32.99	60	-27.01	-	-
14	15.8685	17.9	Av	.3	.2	18.4	-	-	50	-31.6

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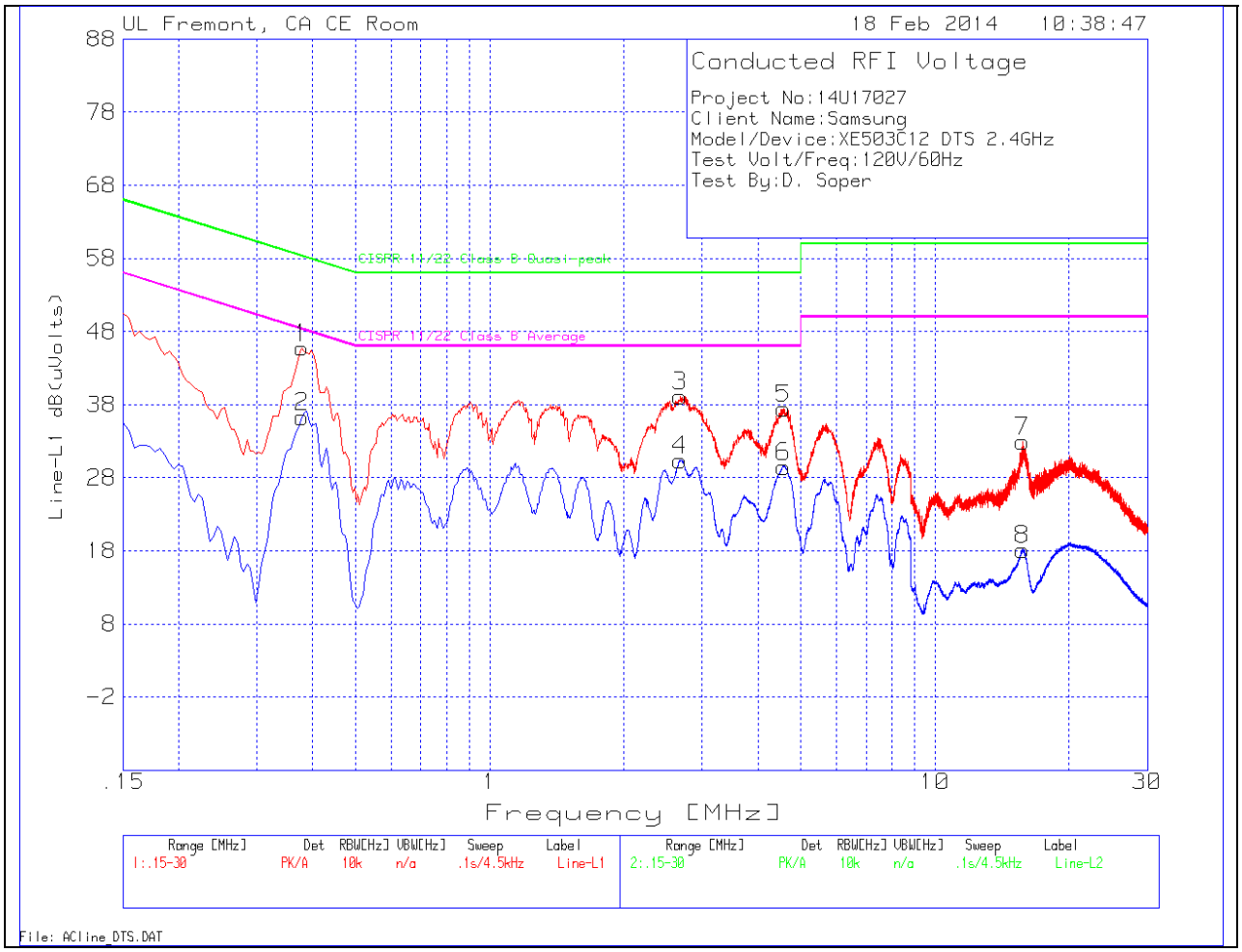
LINE 1 RESULTS



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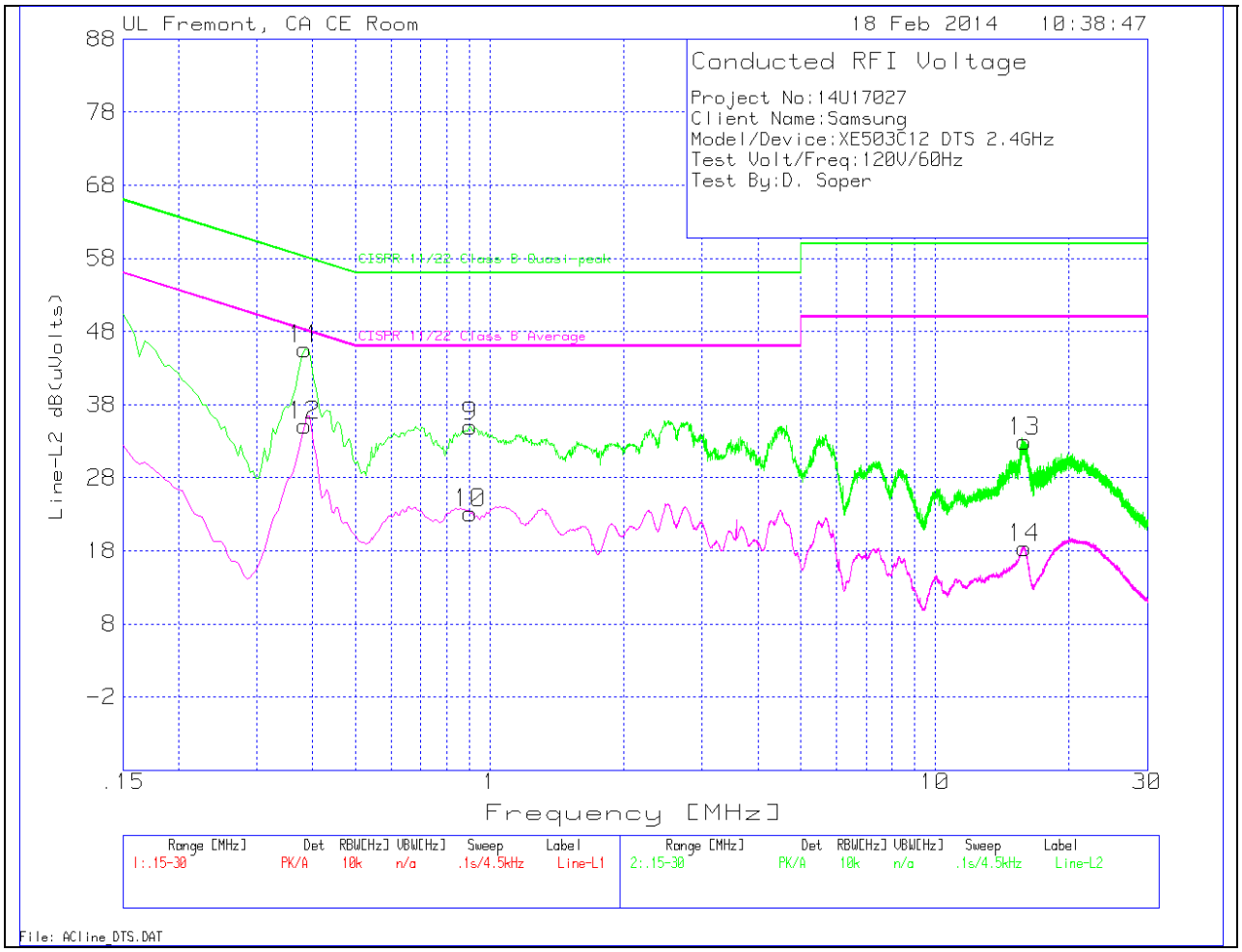
LINE 2 RESULTS



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