



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + Bluetooth & DTS b/g/n

MODEL NUMBER: LGL31L, L31L, LG-L31L

FCC ID: ZNFL31L

REPORT NUMBER: 13U16673-2 REV A

ISSUE DATE: January 27, 2014

Prepared for

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	1/6/14	Initial Issue	P. Kim
A	1/27/14	Updated antenna information	P. Kim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: LG ELECTRONICS MOBILECOMM U.S.A., INC.
EUT DESCRIPTION: GSM/WCDMA/LTE Phone + Bluetooth & DTS b/g/n
MODEL: LGL31L, L31L, LG-L31L
SERIAL NUMBER: 1792208-VS
DATE TESTED: DECEMBER 14 – 30, 2013

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

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

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

Approved & Released
For UL Verification Services Inc. By:

Tested By:



PHILIP KIM
WiSE PROGRAM MANAGER
UL Verification Services Inc.

STEVEN TRAN
WiSE LAB TECHNICIAN
UL Verification Services Inc.

2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

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

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 18000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + Bluetooth & DTS b/g/n

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	18.03	63.53
2412 - 2462	802.11g	20.18	104.23
2412 - 2462	802.11n HT20	20.24	105.68

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of 0.1dBi.

5.4. 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 Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z 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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

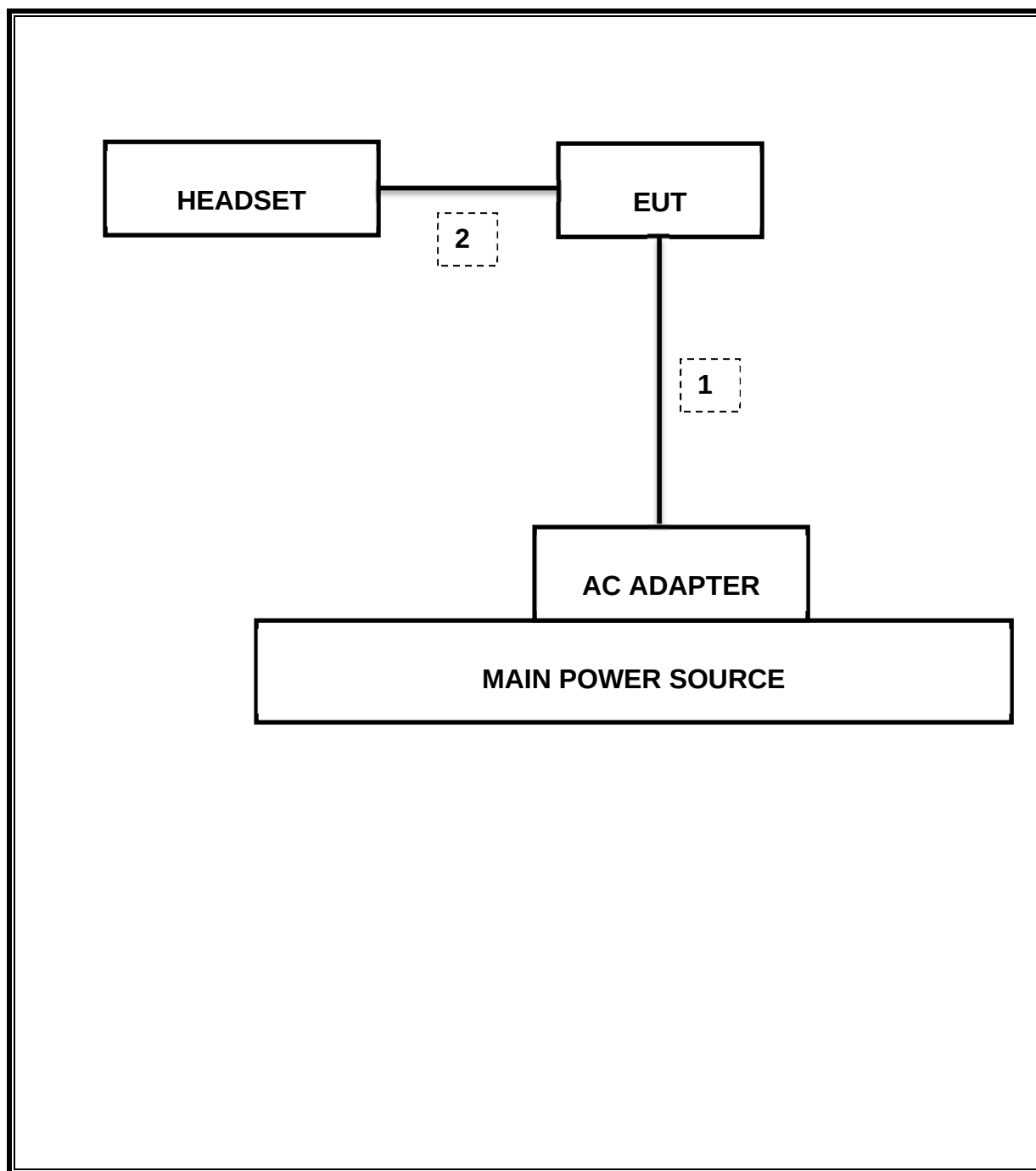
Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG	LGL31L	N/A	N/A
Earphone	LG	N/A	N/A	N/A

I/O CABLES

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

TEST SETUP

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

SETUP DIAGRAM FOR TESTS

6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01016	08/14/13	08/14/14
Antenna, Horn, 18 GHz	ETS	3117	C01006	12/11/13	12/11/14
Antenna, Horn, 25.5 GHz	ARA	MWH-1826/B	C00980	11/14/13	11/14/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/16/13	01/16/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/22/13	10/22/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	10/21/13	10/21/14
PXA SIGNAL ANALYZER	Agilent / HP	N9030A	N/A		05/09/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/08/13	08/08/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/13	01/14/14
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR	CNR

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.

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

8. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
15.247 (a)(2)	RSS-210 A8.2(a)	Occupied Band width (6dB)	>500KHz	Conducted	Pass	7.60 MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-32.67 dBm
15.247	RSS-210 A8.4	TX conducted output power	<30dBm		Pass	20.24 dBm
15.247	RSS-210 A8.2	PSD	<8dBm		Pass	-6.43 dBm
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	48.62 dBuV(PK)
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	44.098dBuV/m

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 to 100 kHz, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

RESULTS

9.1.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	7.60	0.5
Mid	2437	7.65	0.5
High	2462	8.08	0.5
Worst		7.60	

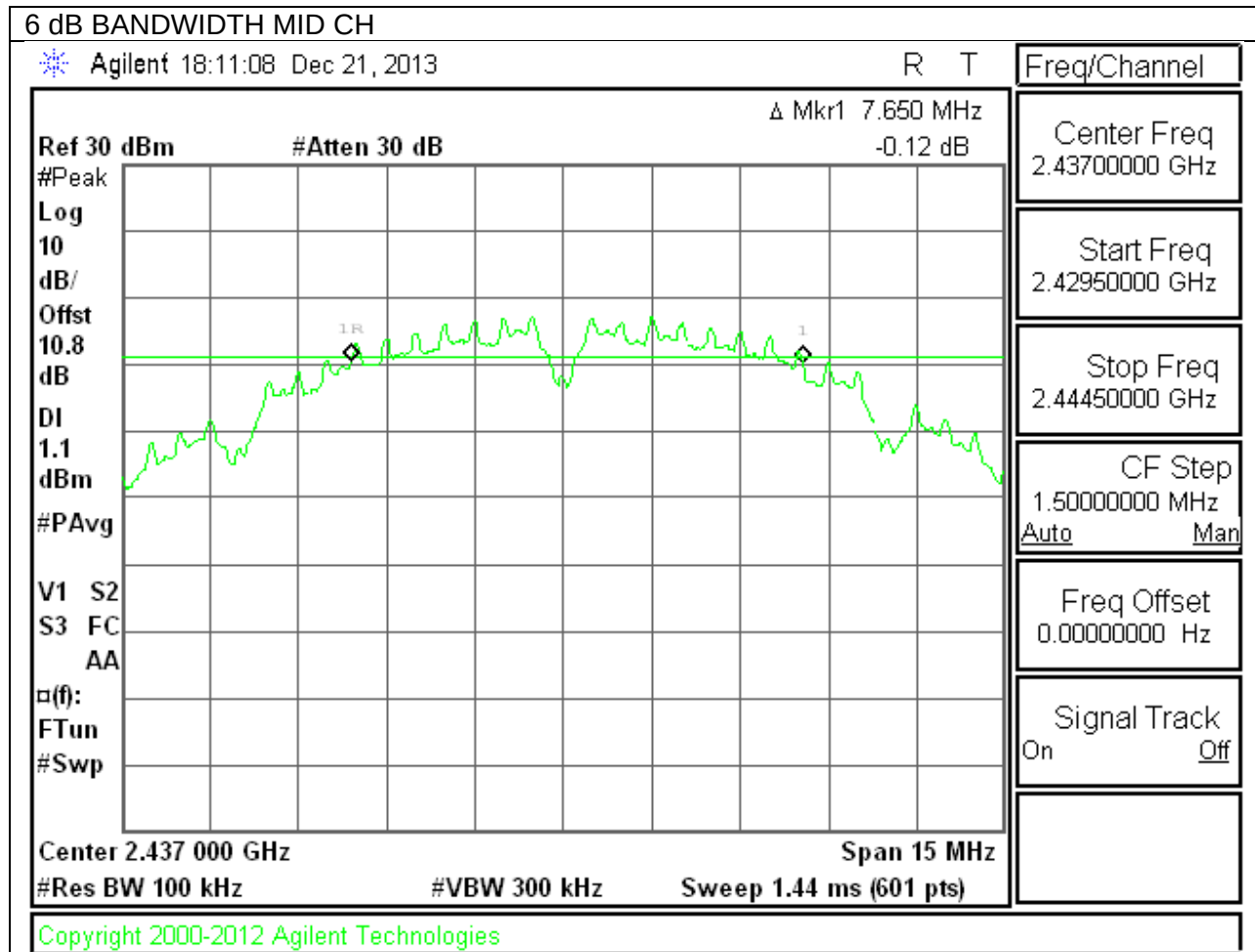
9.1.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.43	0.5
Mid	2437	16.43	0.5
High	2462	16.50	0.5
Worst		16.43	

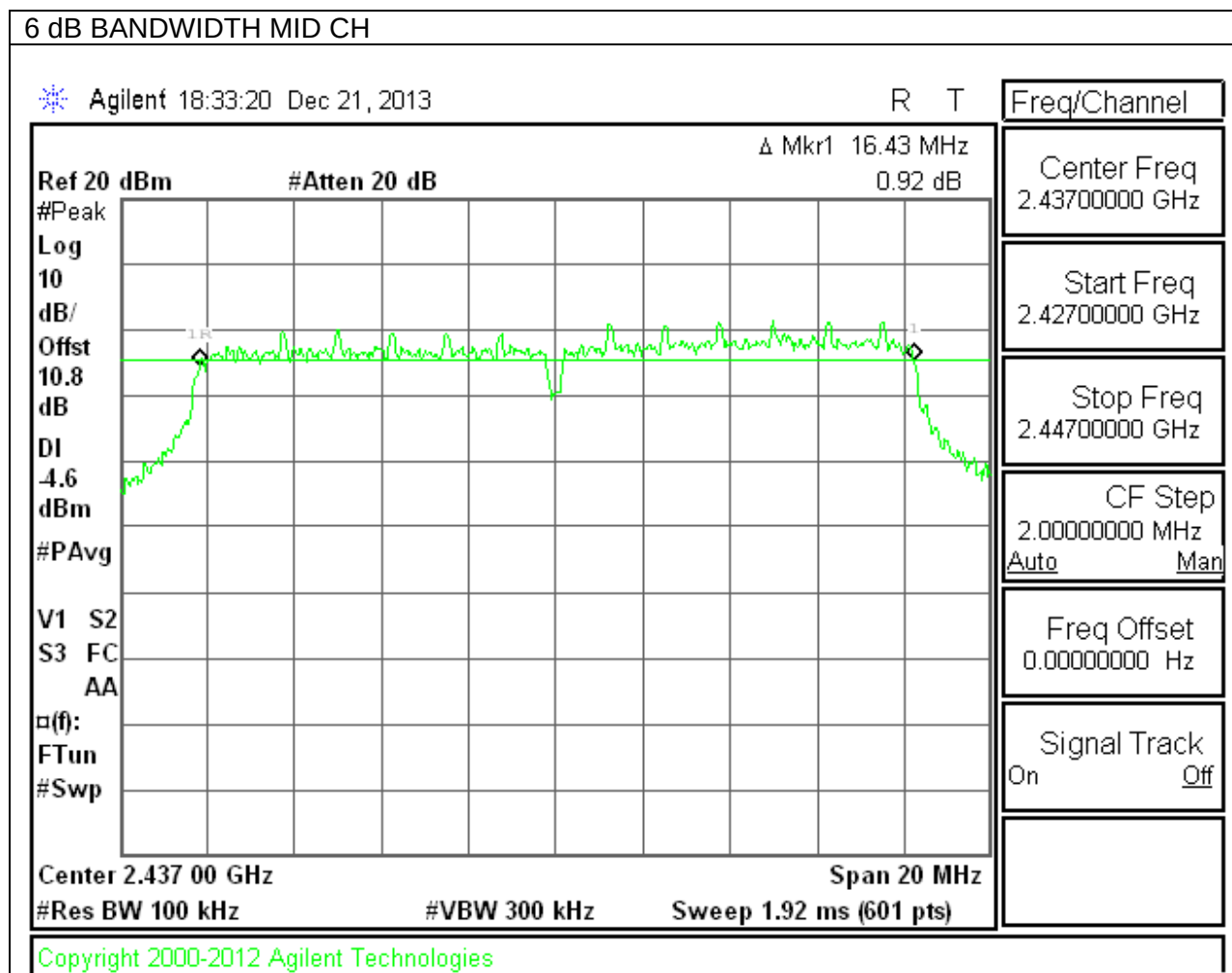
9.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.46	0.5
Mid	2437	17.42	0.5
High	2462	17.71	0.5
Worst		17.42	

802.11b 6 dB BANDWIDTH



802.11g 6 dB BANDWIDTH



Signal Track
On Off

9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	11.77
Mid	2437	12.05
High	2462	12.05
Worst		12.05

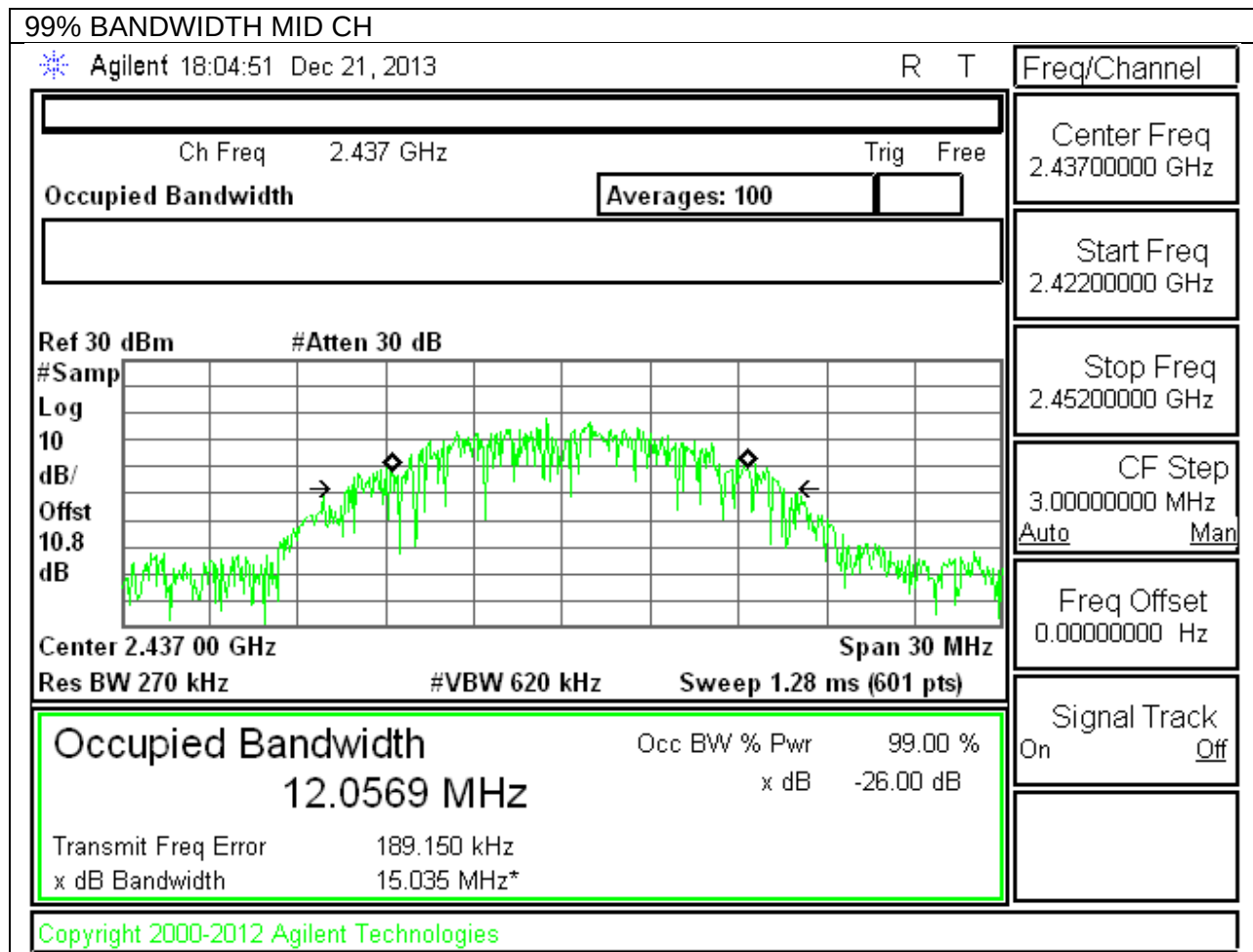
9.2.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.38
Mid	2437	16.32
High	2462	16.43
Worst		16.43

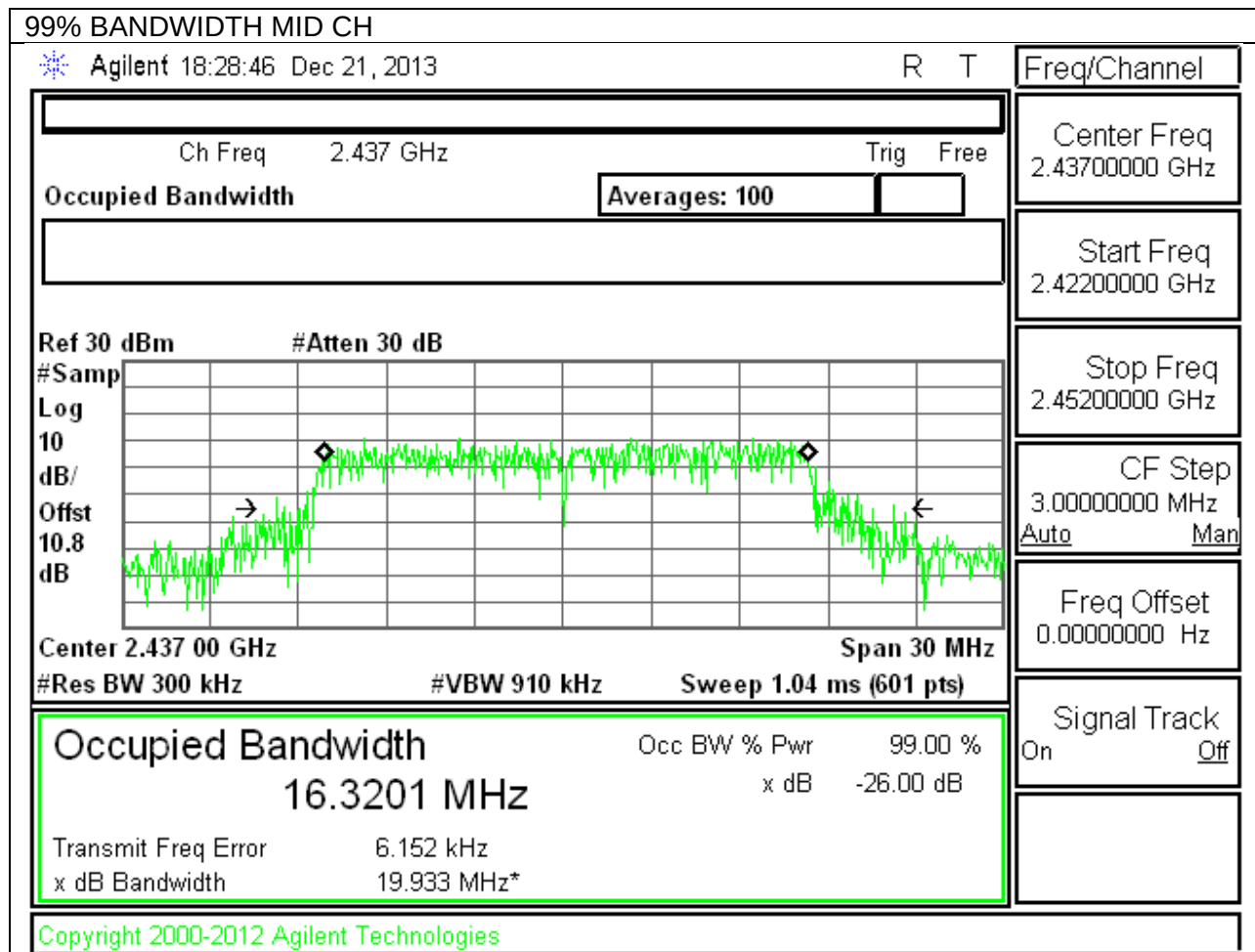
9.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.58
Mid	2437	17.54
High	2462	17.62
Worst		17.62

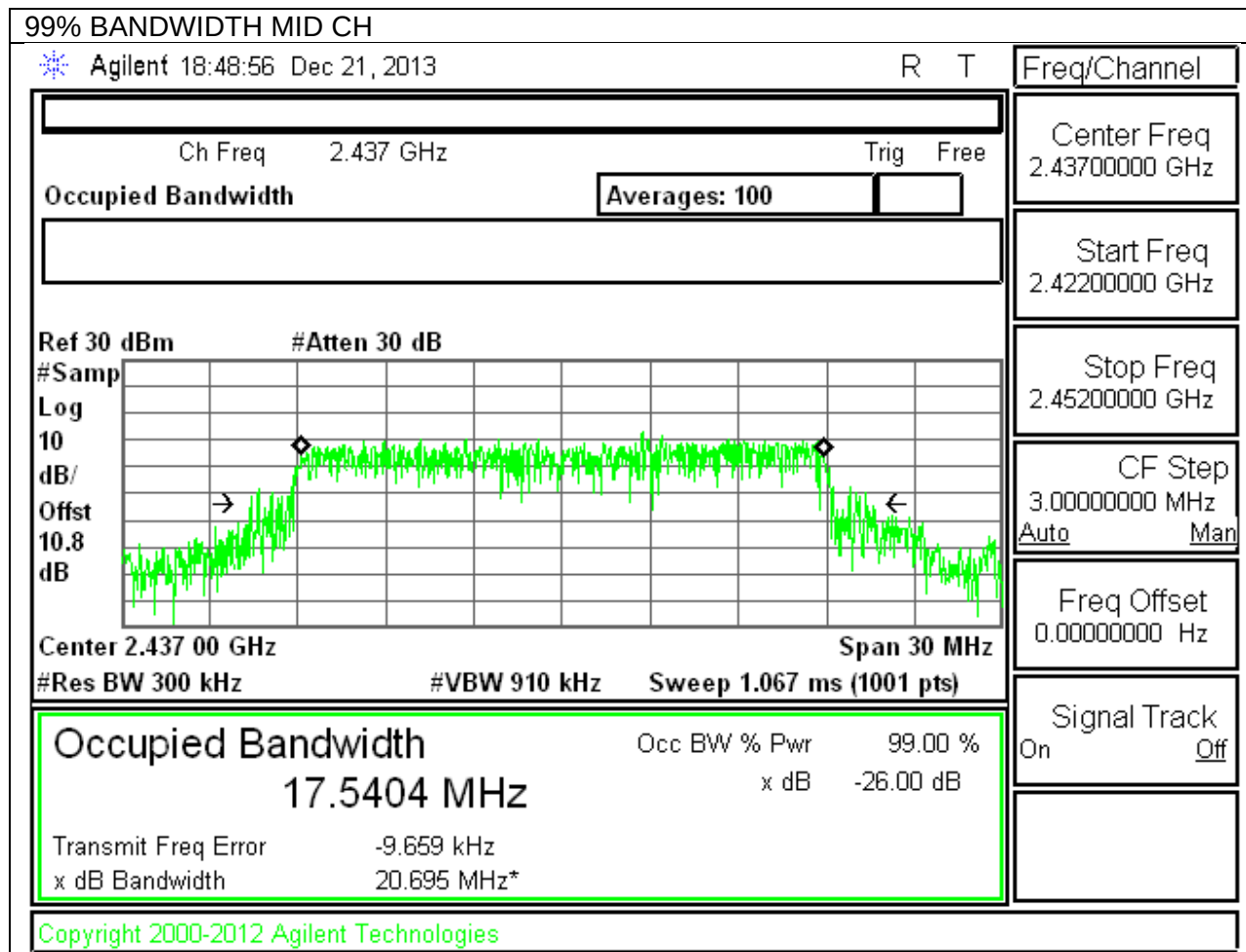
802.11b 99% BANDWIDTH



802.11g 99% BANDWIDTH



802.11n 99% BANDWIDTH



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

RESULTS

9.3.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Avg Power (dBm)
Low	2412	15.90
Mid	2437	15.50
High	2462	15.10
Worst		15.900

9.3.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Avg Power (dBm)
Low	2412	12.40
Mid	2437	12.30
High	2462	11.90
Worst		12.400

9.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Avg Power (dBm)
Low	2412	12.30
Mid	2437	12.30
High	2462	11.90
Worst		12.300

9.4. OUTPUT POWER

LIMITS

FCC §15.247

IC RSS-210 A8.4

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

DIRECTIONAL ANTENNA GAIN

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

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	0.10	30.00	30	36	30.00
Mid	2437	0.10	30.00	30	36	30.00
High	2462	0.10	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	18.03	18.03	30.00	-11.97
Mid	2437	17.48	17.48	30.00	-12.52
High	2462	17.26	17.26	30.00	-12.74
Worst			18.03		

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	0.10	30.00	30	36	30.00
Mid	2437	0.10	30.00	30	36	30.00
High	2462	0.10	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	20.18	20.18	30.00	-9.82
Mid	2437	19.95	19.95	30.00	-10.05
High	2462	19.73	19.73	30.00	-10.27
Worst			20.18		

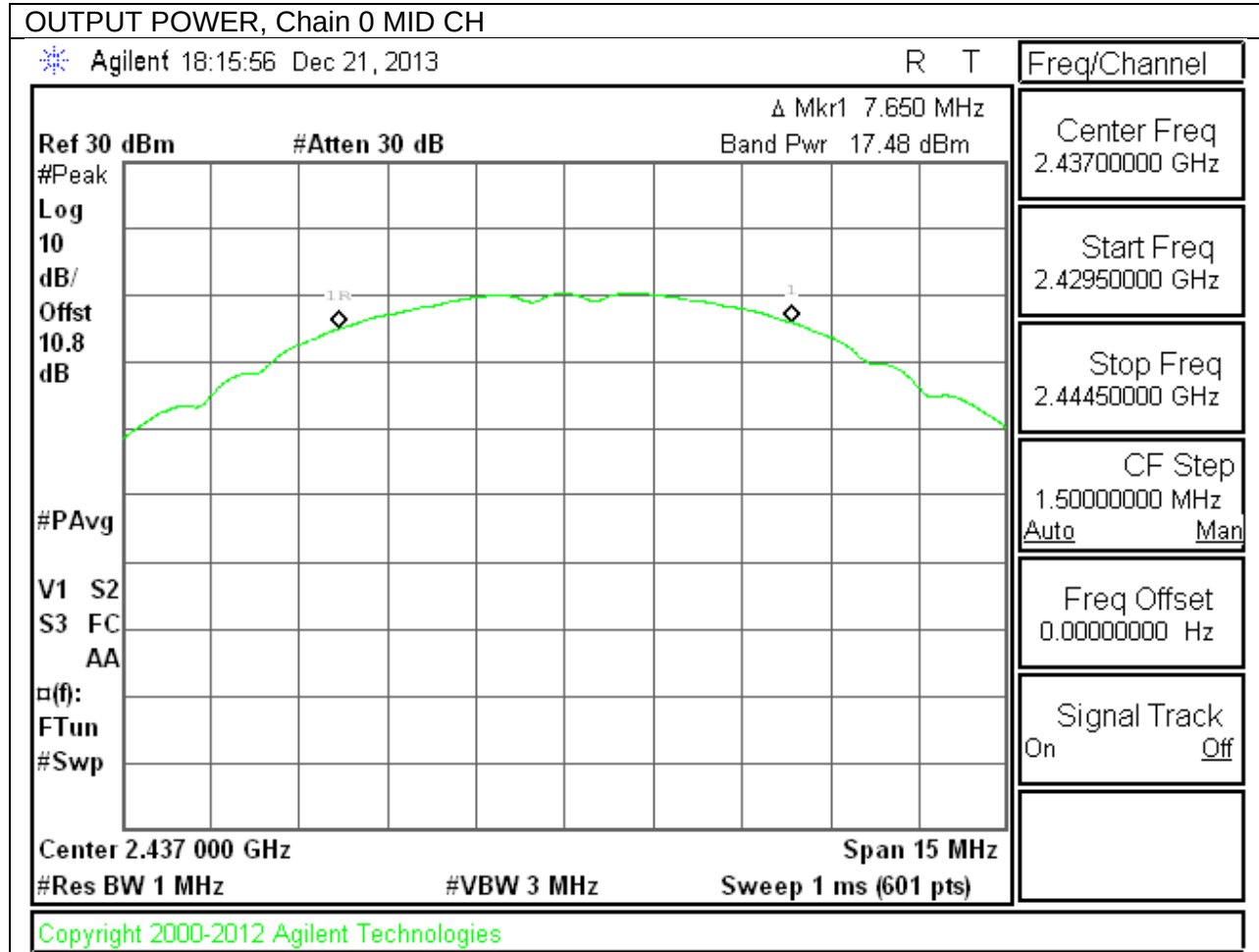
9.4.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Limits

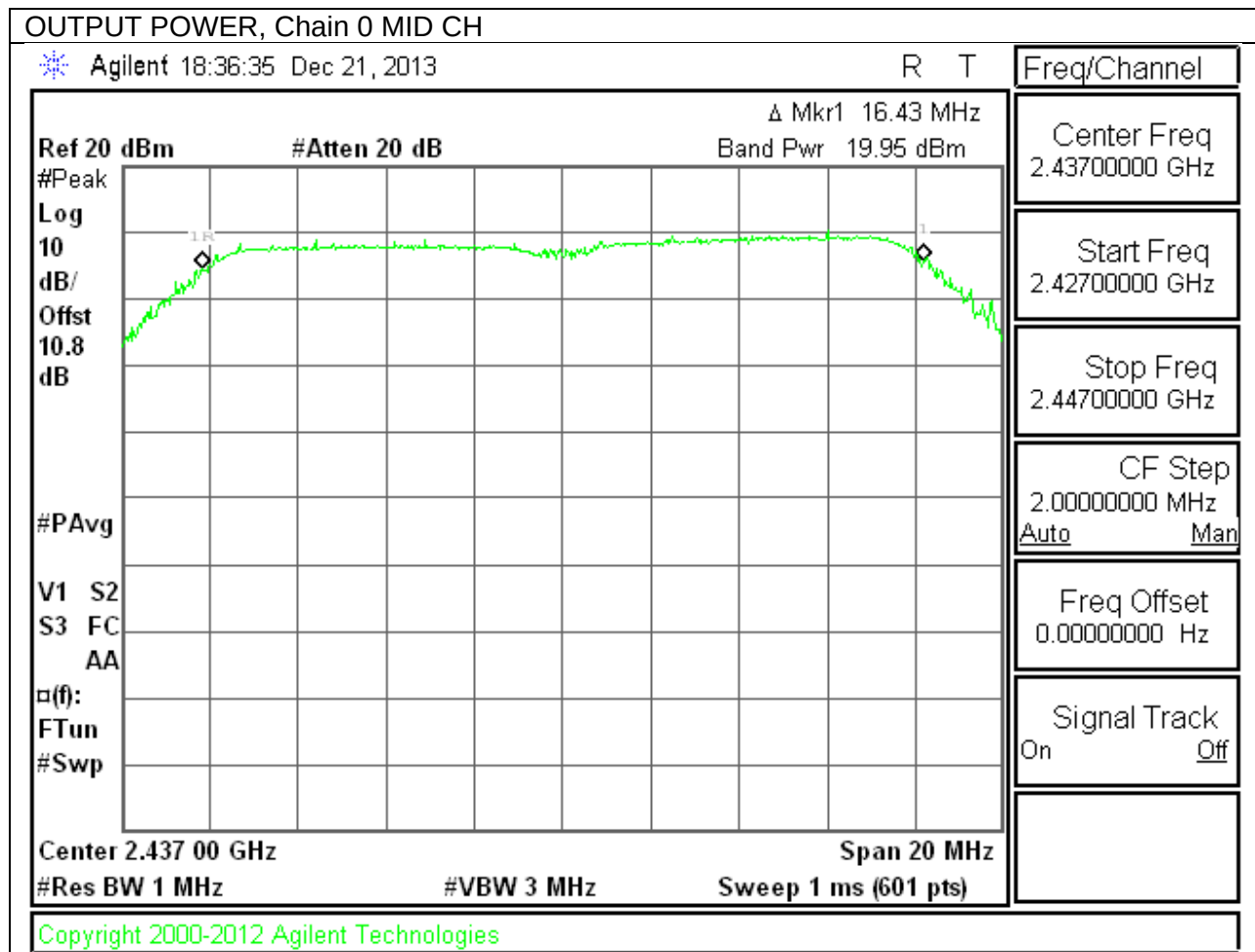
Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	0.10	30.00	30	36	30.00
Mid	2437	0.10	30.00	30	36	30.00
High	2462	0.10	30.00	30	36	30.00

Results

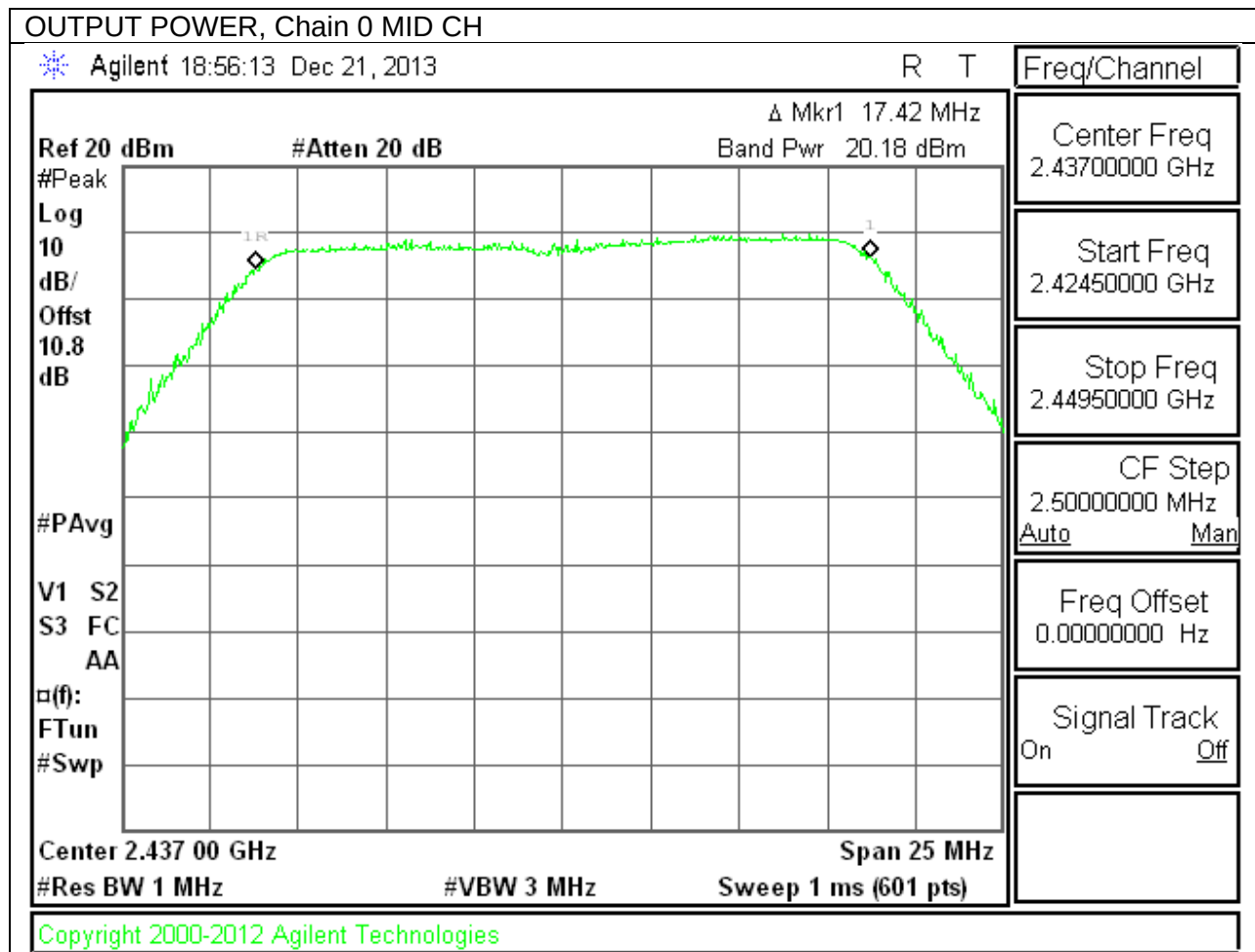
Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	20.24	20.24	30.00	-9.76
Mid	2437	20.18	20.18	30.00	-9.82
High	2462	19.79	19.79	30.00	-10.21
Worst			20.24		

802.11b OUTPUT POWER, Chain 0

802.11g OUTPUT POWER, Chain 0



802.11n OUTPUT POWER, Chain 0



9.5. PSD

LIMITS

FCC §15.247

IC RSS-210 A8.2

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

RESULTS

9.5.1. 802.11b MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.83	8.0	-14.8
Mid	2437	-6.43	8.0	-14.4
High	2462	-7.60	8.0	-15.6

9.5.2. 802.11g MODE IN THE 2.4 GHz BAND

PSD Results

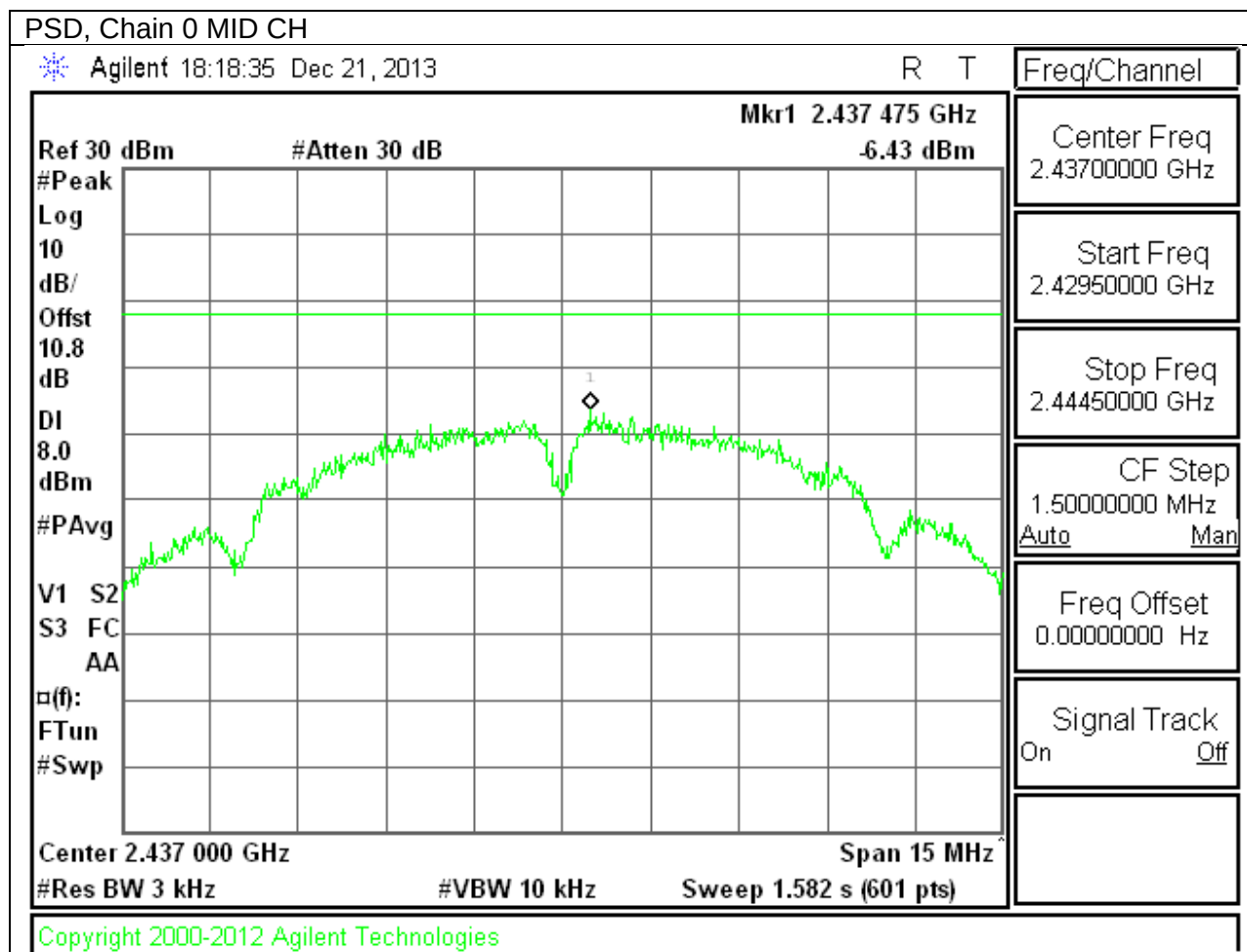
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-12.82	8.0	-20.8
Mid	2437	-12.02	8.0	-20.0
High	2462	-13.44	8.0	-21.4

9.5.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

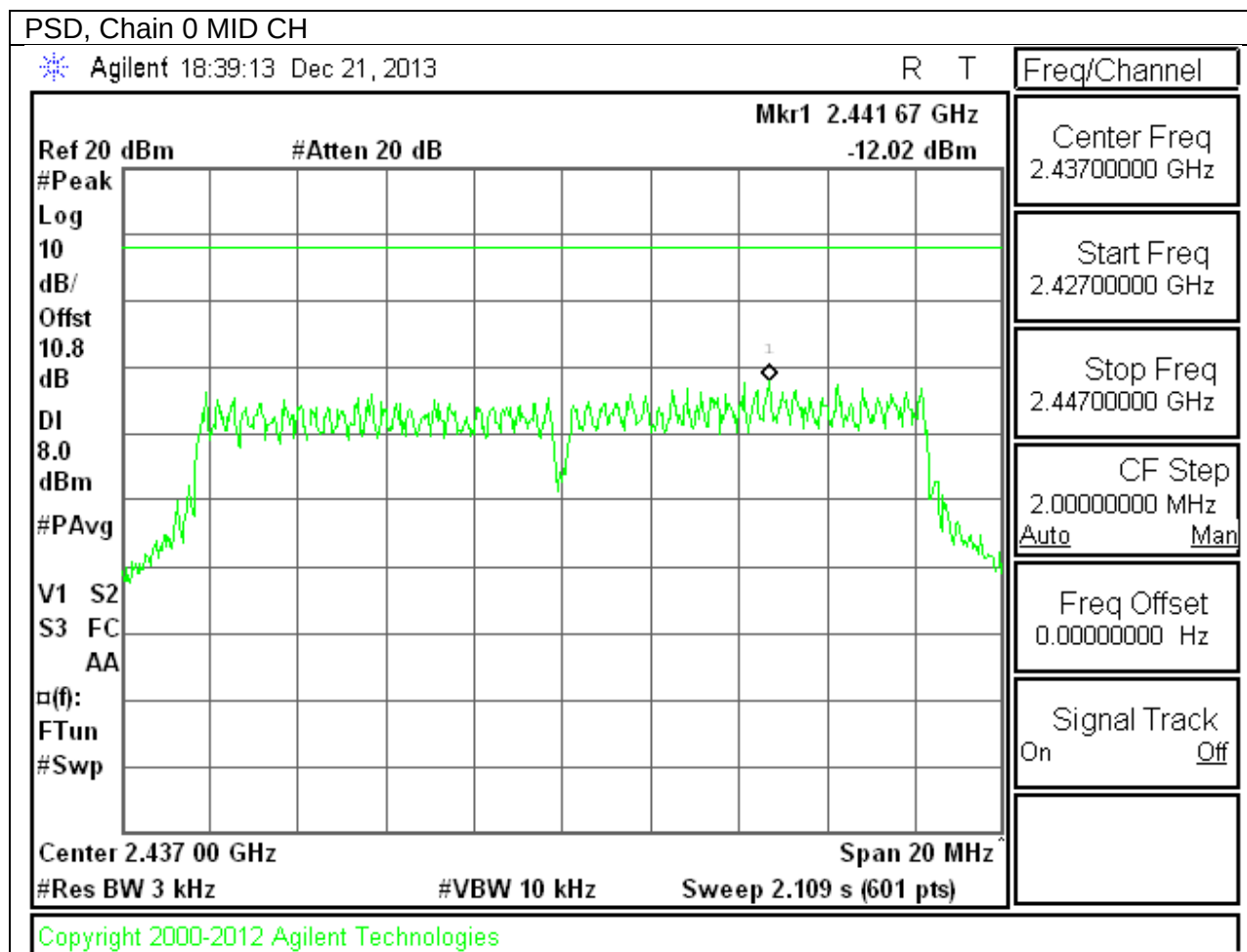
PSD Results

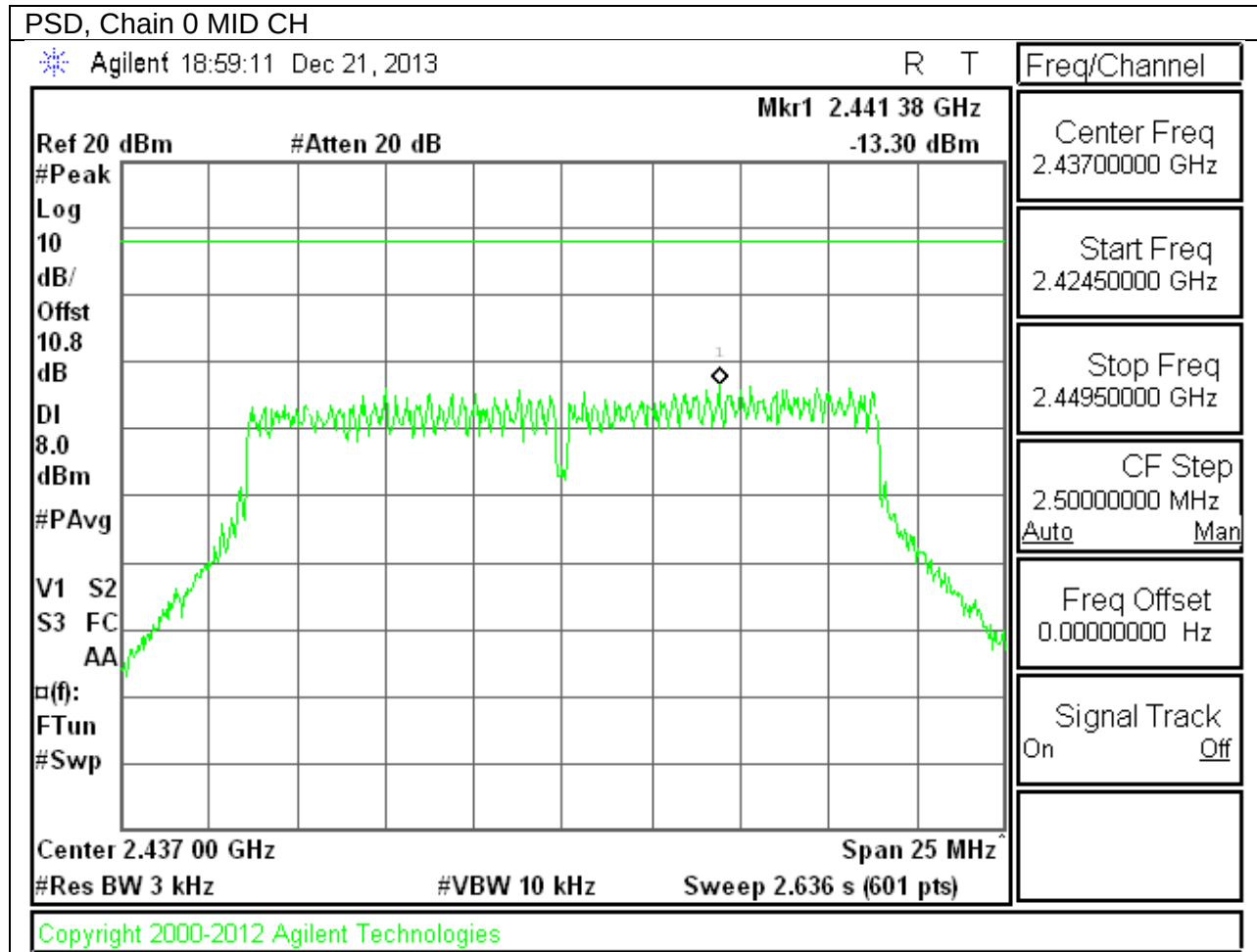
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-13.48	8.0	-21.5
Mid	2437	-13.30	8.0	-21.3
High	2462	-13.64	8.0	-21.6

802.11b PSD, Chain 0



802.11g PSD, Chain 0



802.11n PSD, Chain 0

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.

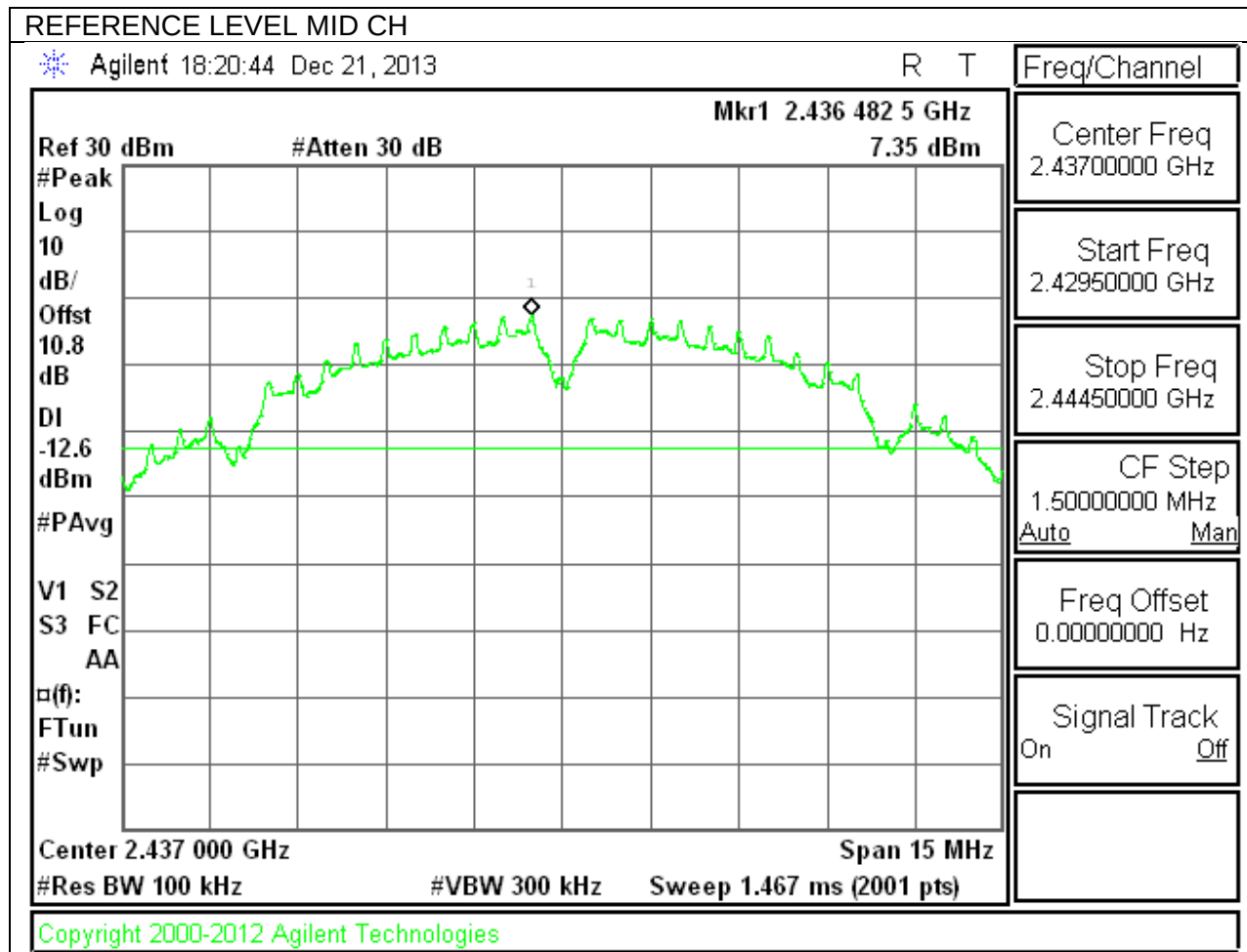
TEST PROCEDURE

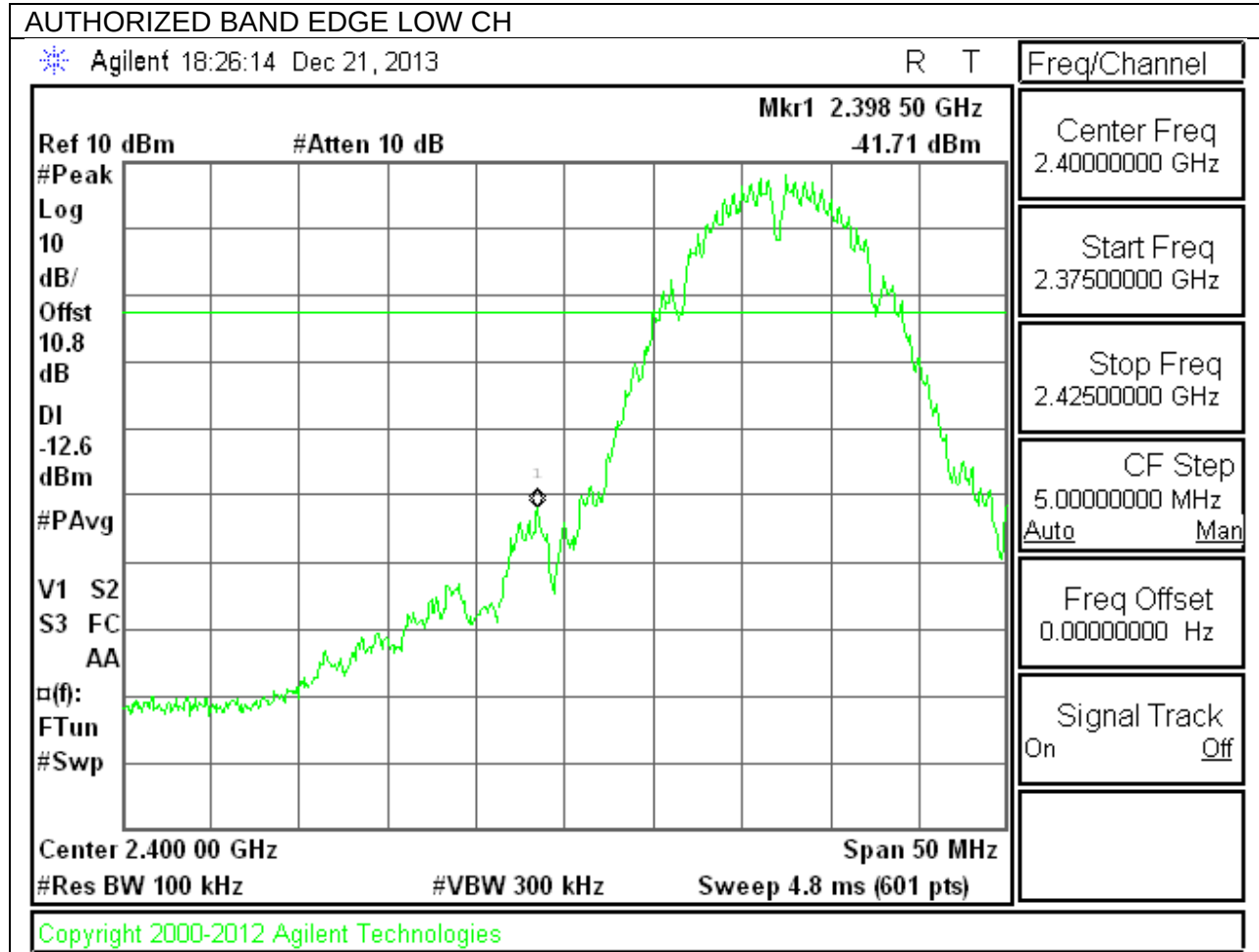
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

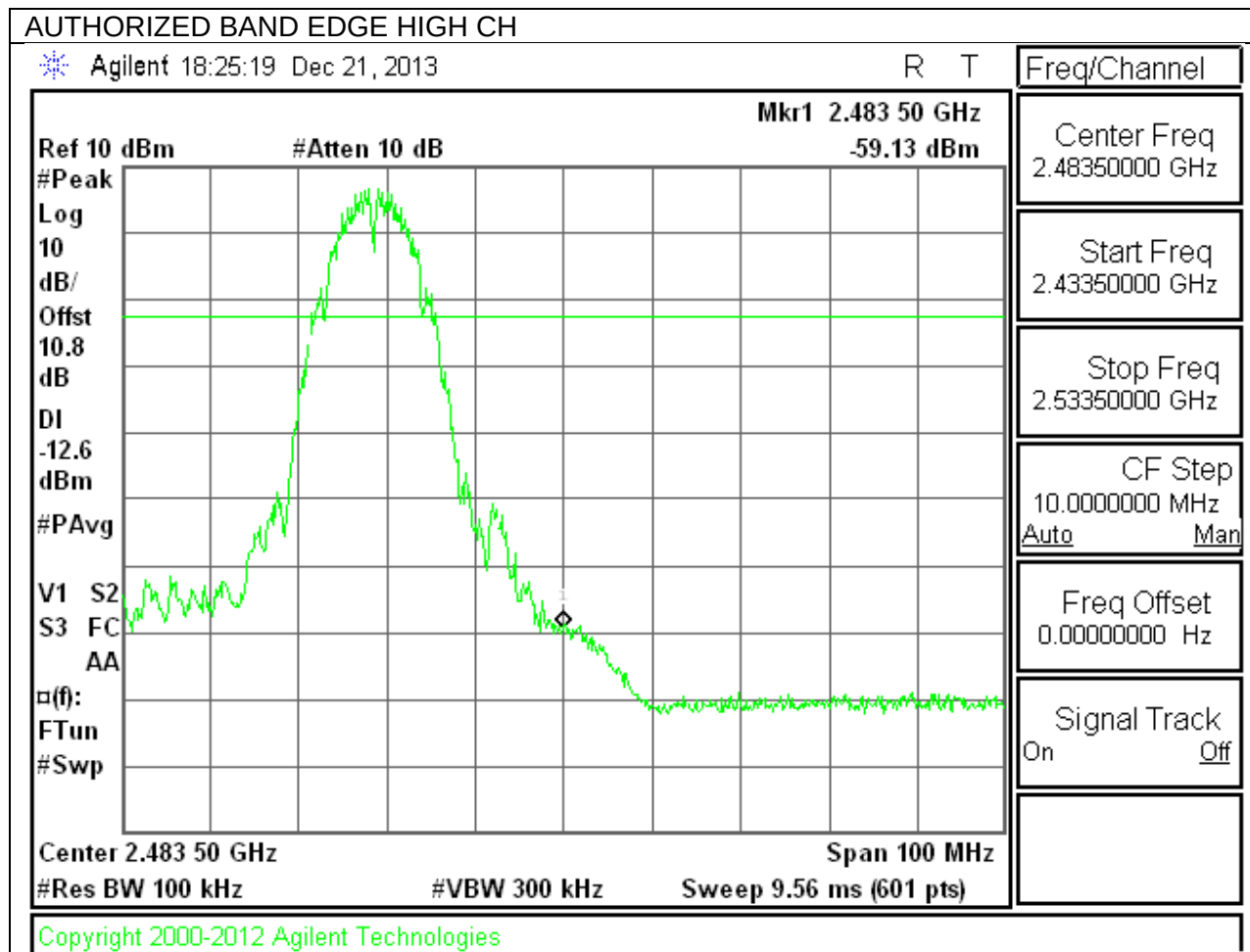
9.6.1. 802.11b MODE IN THE 2.4 GHz BAND

IN-BAND REFERENCE LEVEL

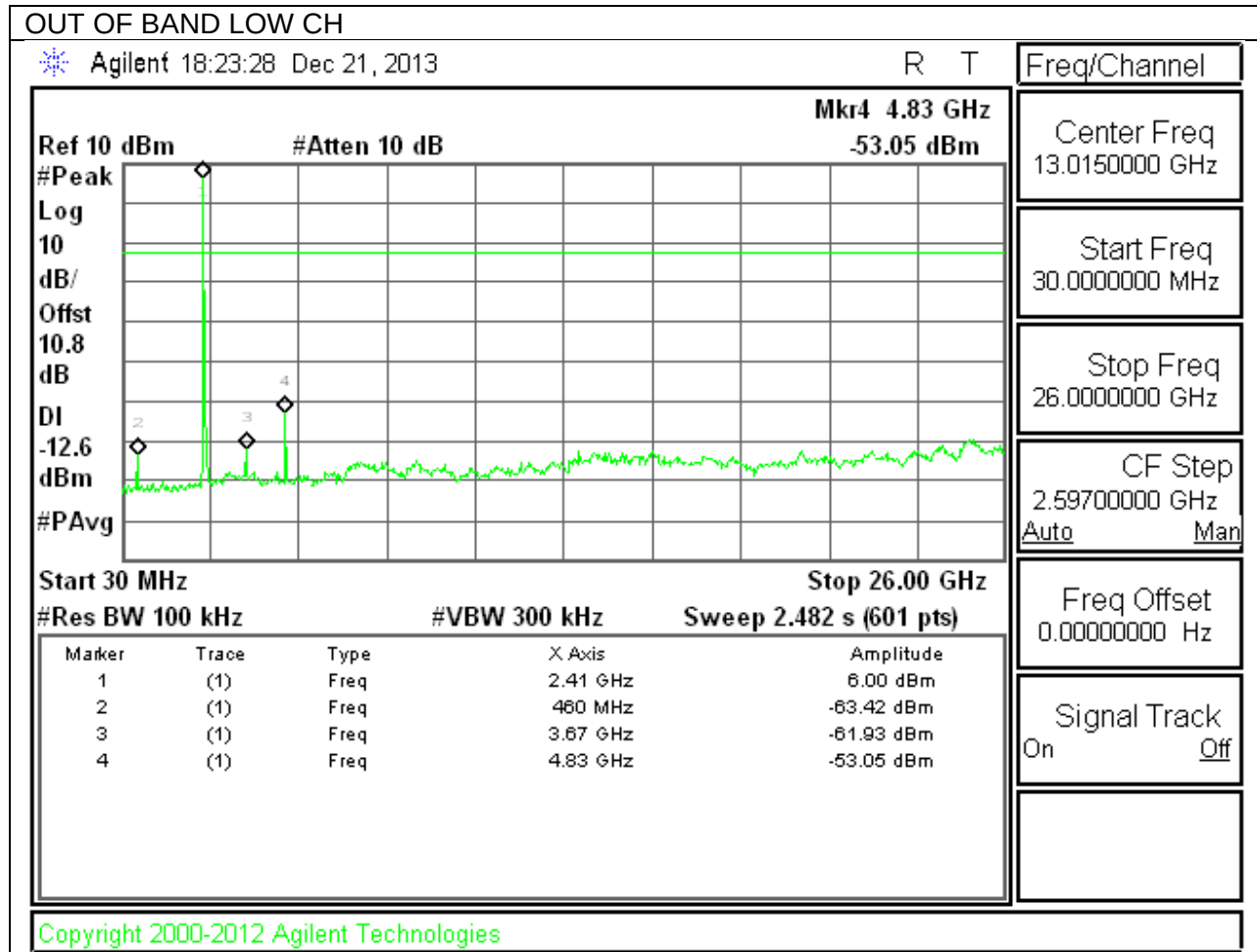


LOW CHANNEL BANDEDGE

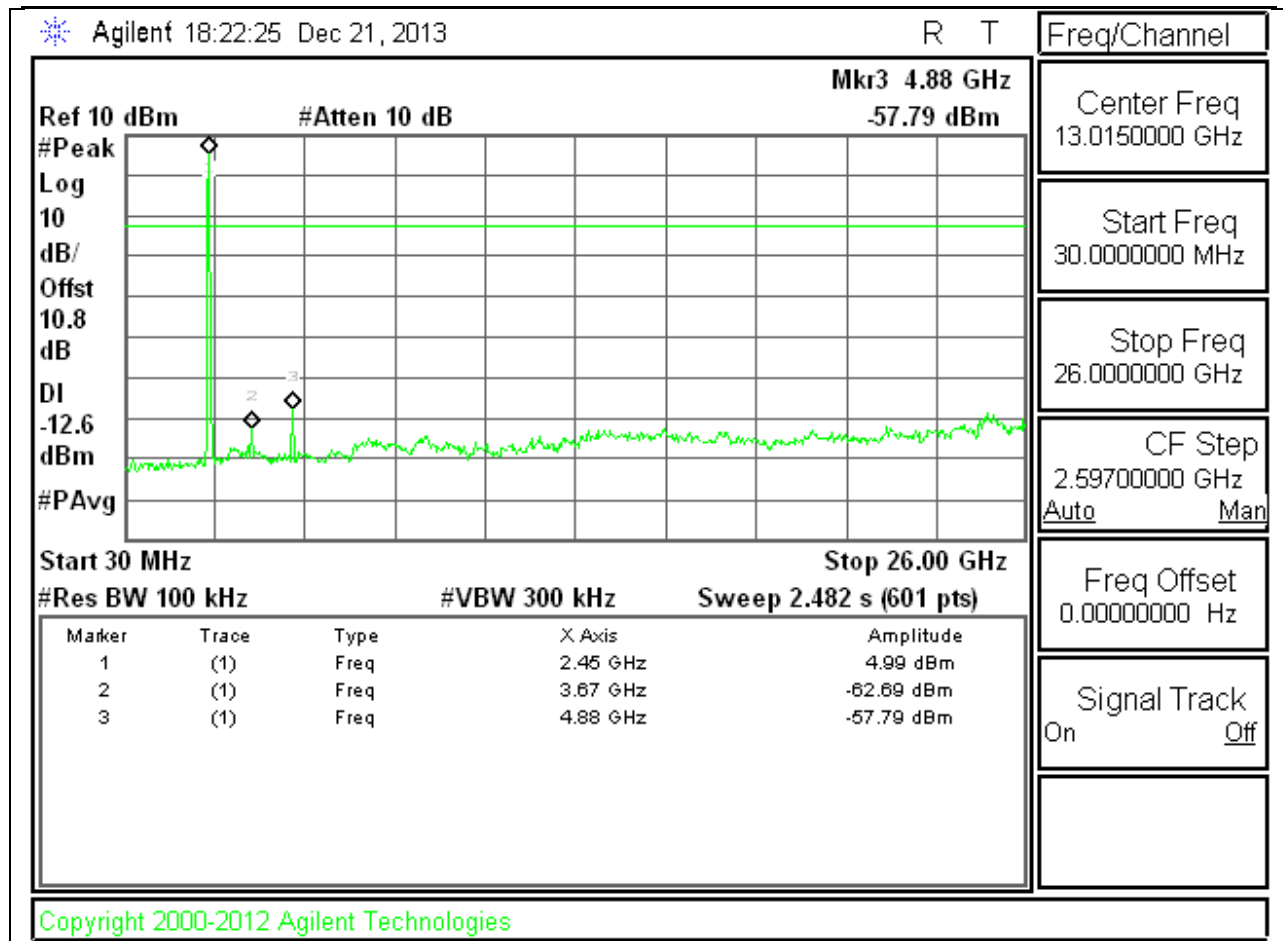
HIGH CHANNEL BANDEDGE



OUT-OF-BAND EMISSIONS



OUT OF BAND MID CH



OUT OF BAND HIGH CH

Agilent 18:24:29 Dec 21, 2013

R T

Freq/Channel

Ref 10 dBm

#Atten 10 dB

Mkr4 4.92 GHz

-59.68 dBm

#Peak

Log

10

dB/

Offst

10.8

dB

DI

-12.6

dBm

#PAvg

Start 30 MHz

#Res BW 100 kHz

#VBW 300 kHz

Stop 26.00 GHz

Sweep 2.482 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.45 GHz	5.01 dBm
2	(1)	Freq	510 MHz	-62.29 dBm
3	(1)	Freq	3.71 GHz	-58.47 dBm
4	(1)	Freq	4.92 GHz	-59.68 dBm

Center Freq
13.0150000 GHz

Start Freq
30.0000000 MHz

Stop Freq
26.0000000 GHz

CF Step
2.59700000 GHz
Auto Man

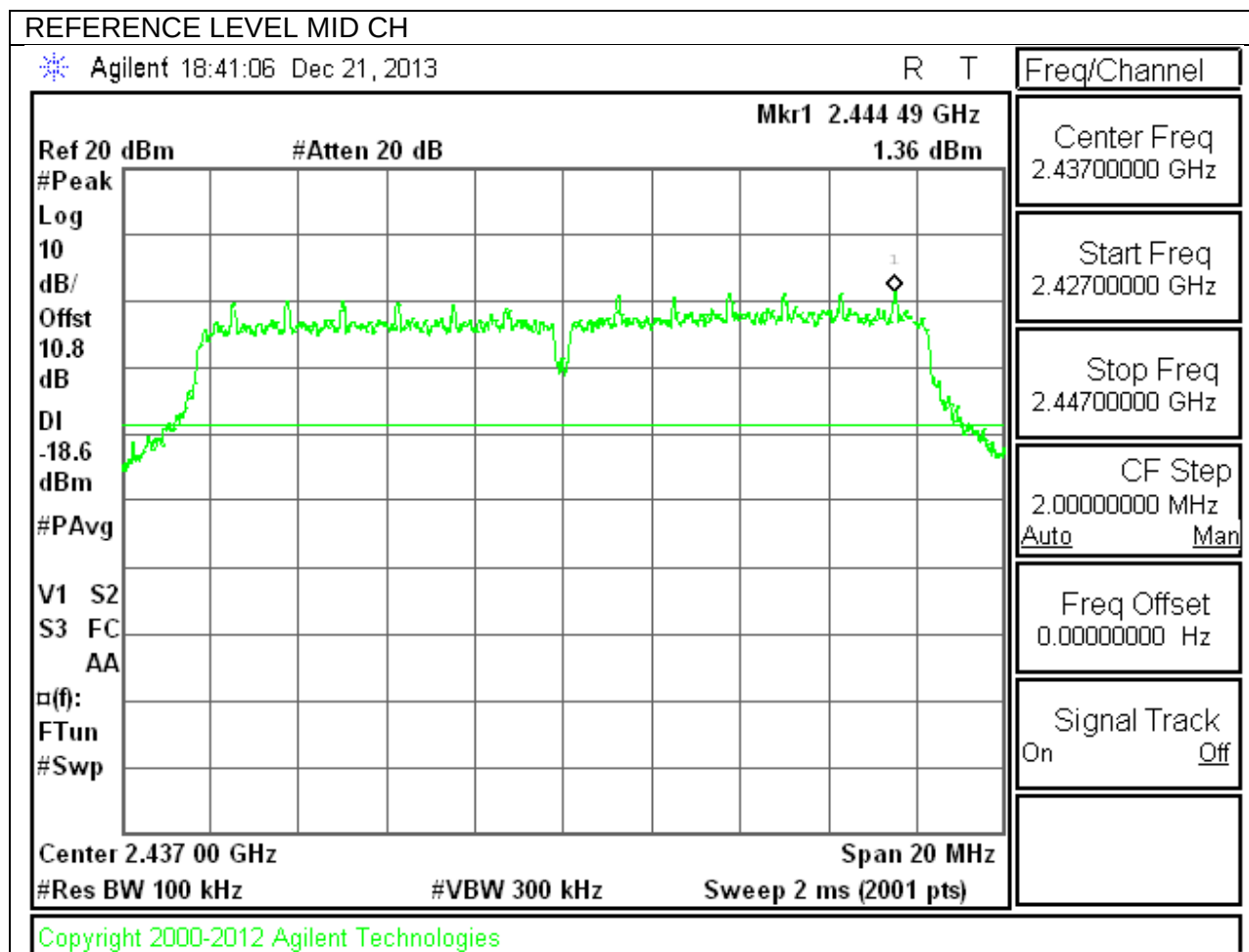
Freq Offset
0.00000000 Hz

Signal Track
On Off

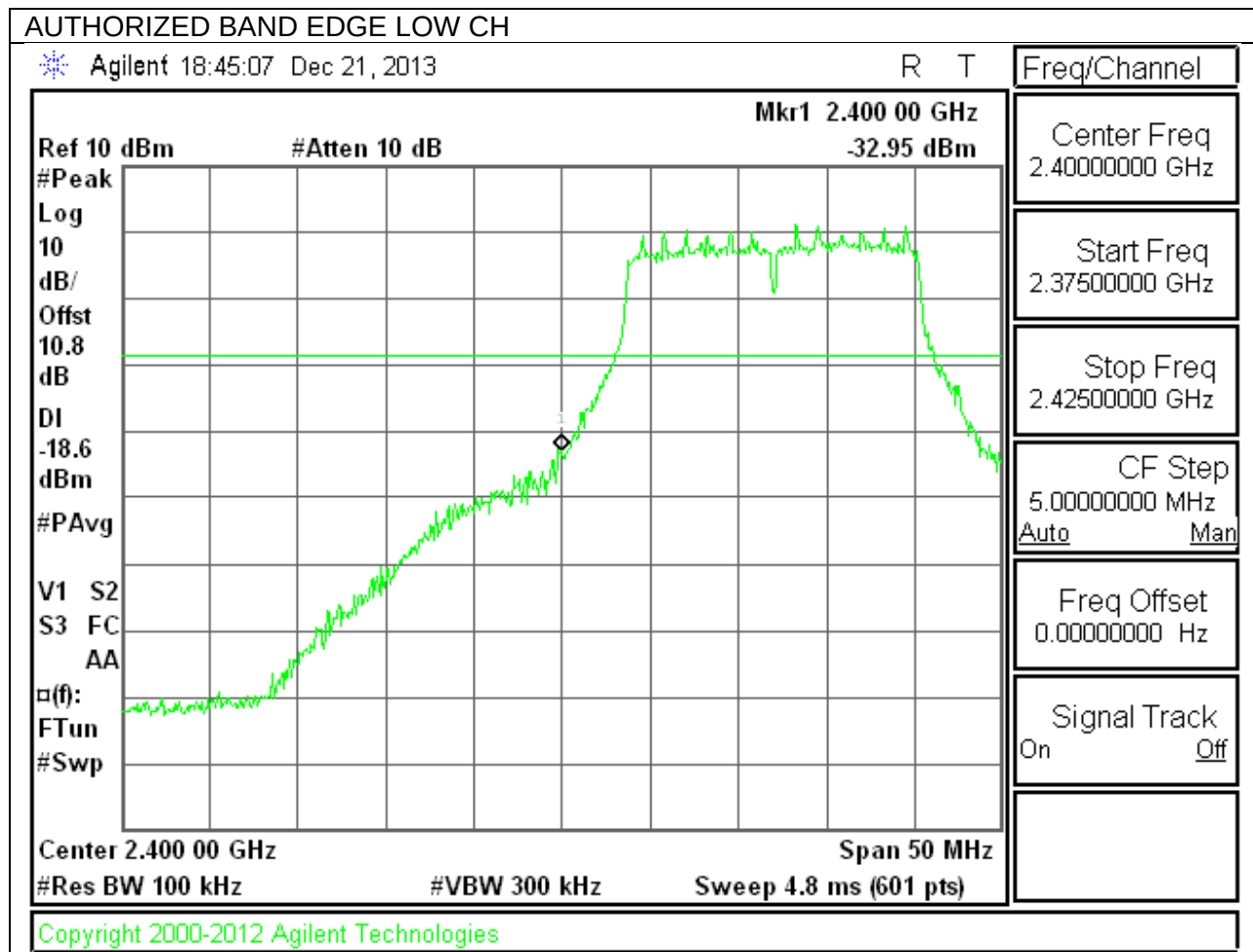
Copyright 2000-2012 Agilent Technologies

9.6.2. 802.11g MODE IN THE 2.4 GHz BAND

IN-BAND REFERENCE LEVEL

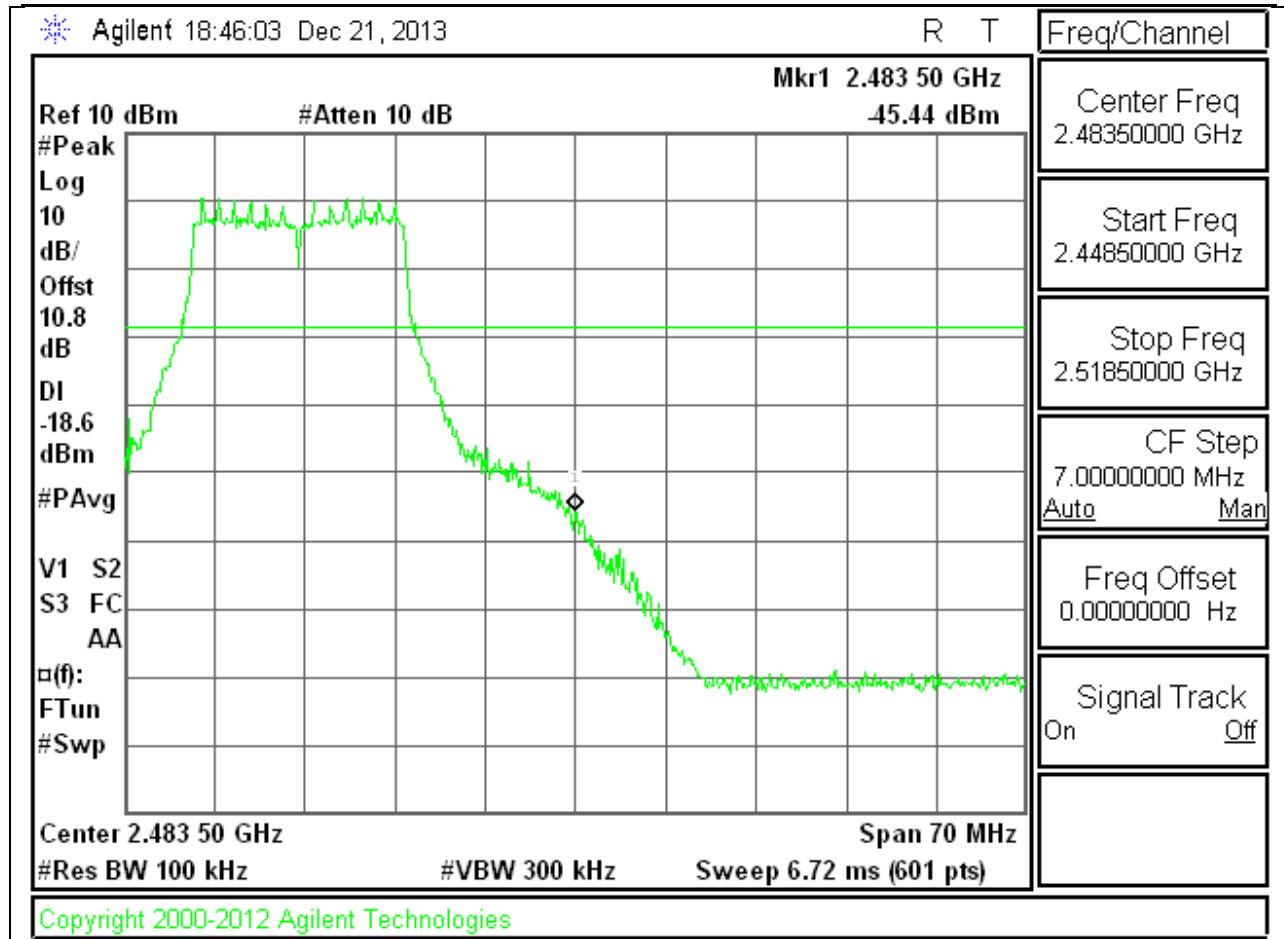


LOW CHANNEL BANDEDGE

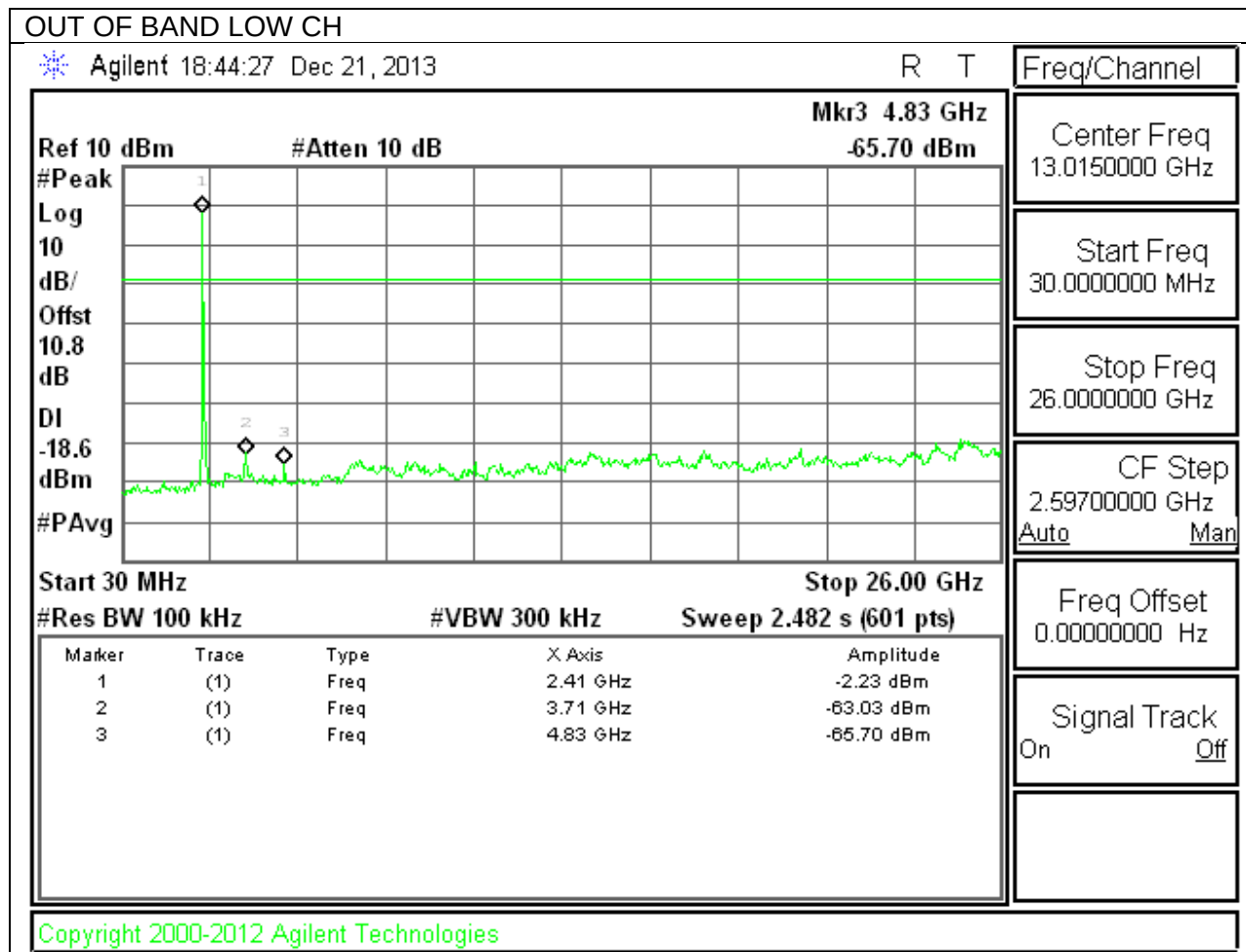


HIGH CHANNEL BANDEDGE

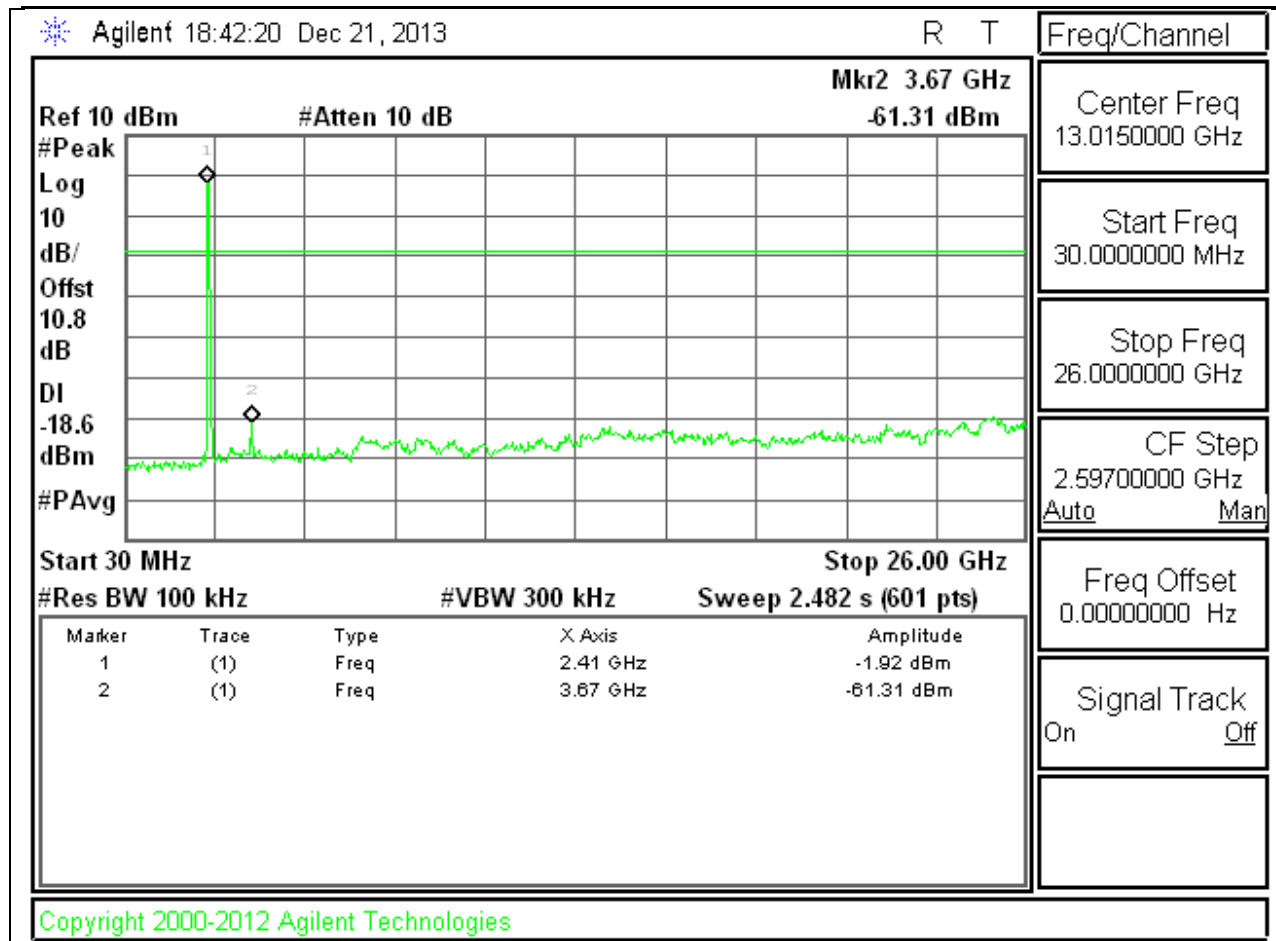
AUTHORIZED BAND EDGE HIGH CH



OUT-OF-BAND EMISSIONS



OUT OF BAND MID CH



OUT OF BAND HIGH CH

Agilent 18:43:33 Dec 21, 2013

R T

Freq/Channel

Ref 10 dBm

#Atten 10 dB

Mkr2 3.67 GHz

-60.63 dBm

#Peak

Log

10

dB/

Offst

10.8

dB

DI

-18.6

dBm

#PAvg

Start 30 MHz

#Res BW 100 kHz

#VBW 300 kHz

Stop 26.00 GHz

Sweep 2.482 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.45 GHz	-0.26 dBm
2	(1)	Freq	3.67 GHz	-60.63 dBm

Center Freq
13.0150000 GHz

Start Freq
30.0000000 MHz

Stop Freq
26.0000000 GHz

CF Step
2.59700000 GHz
Auto Man

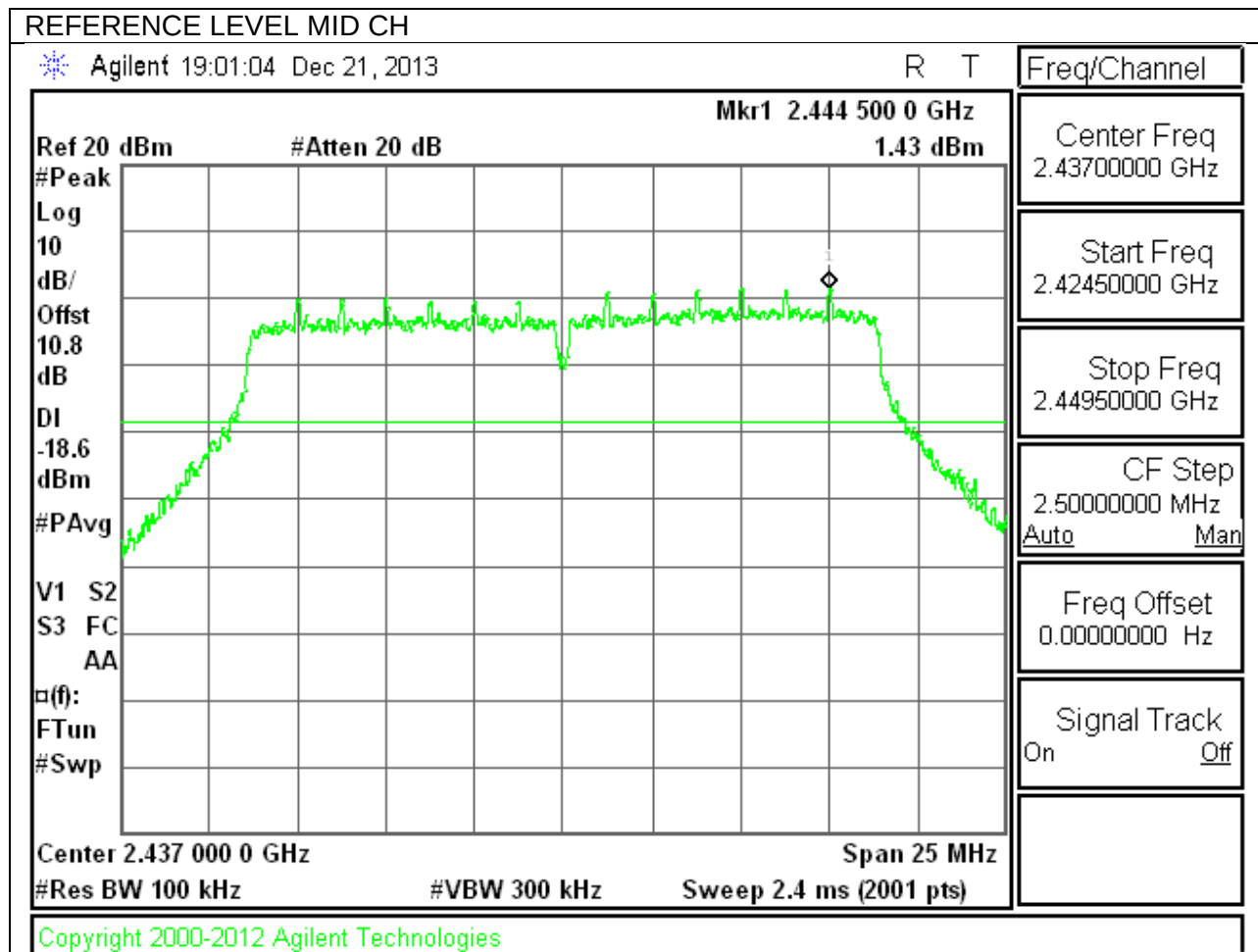
Freq Offset
0.00000000 Hz

Signal Track
On Off

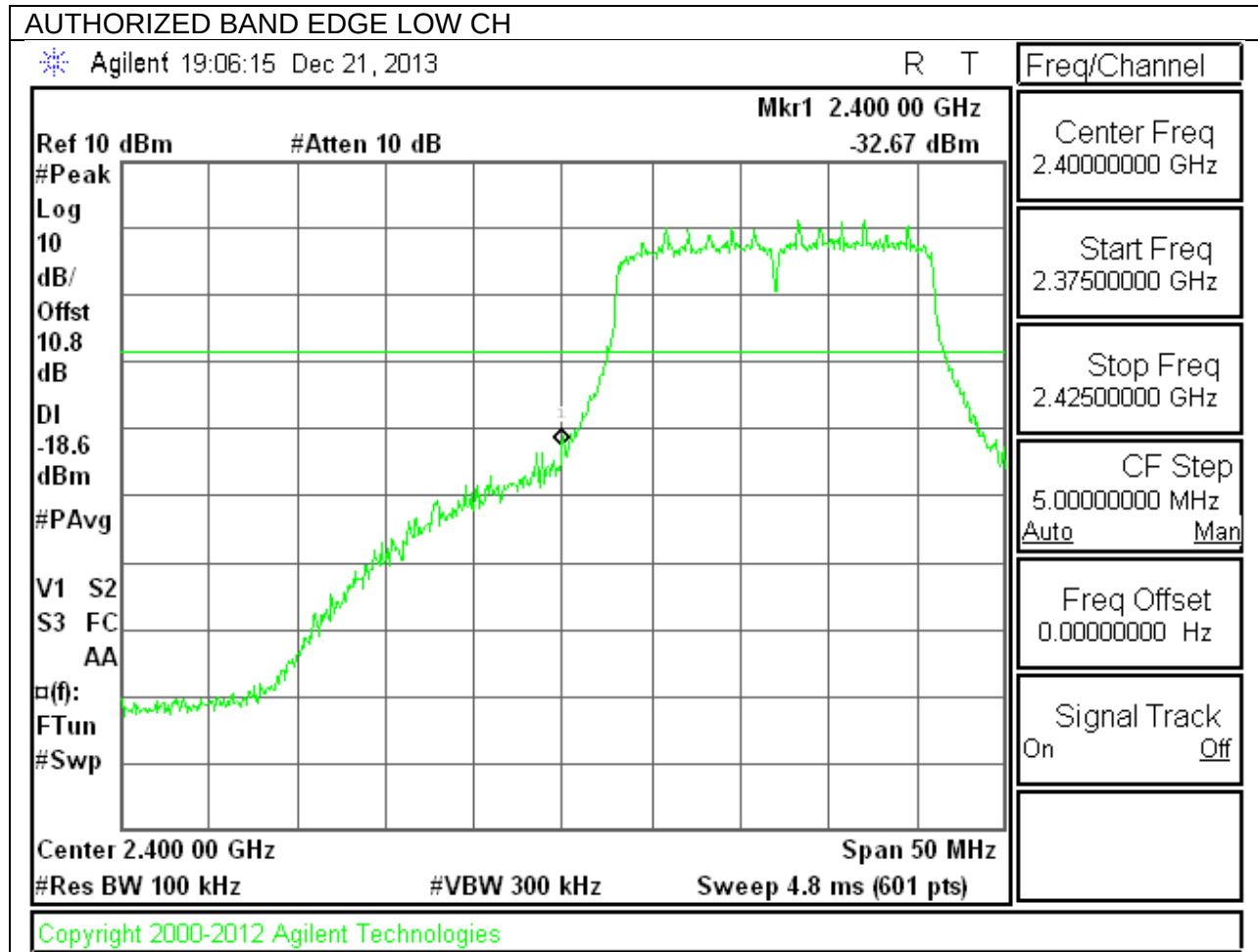
Copyright 2000-2012 Agilent Technologies

9.6.3. 802.11n MODE IN THE 2.4 GHz BAND

IN-BAND REFERENCE LEVEL

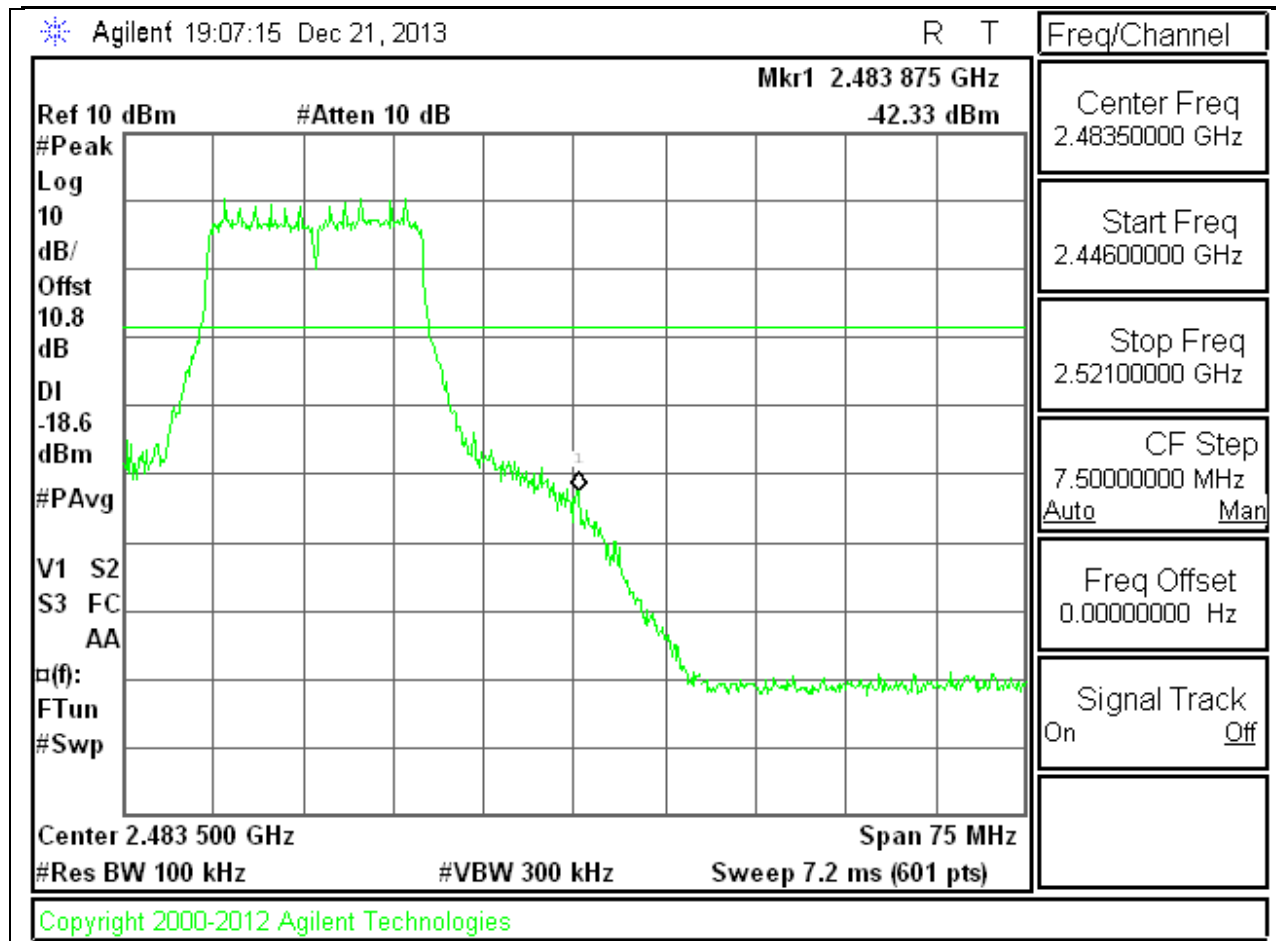


LOW CHANNEL BANDEDGE

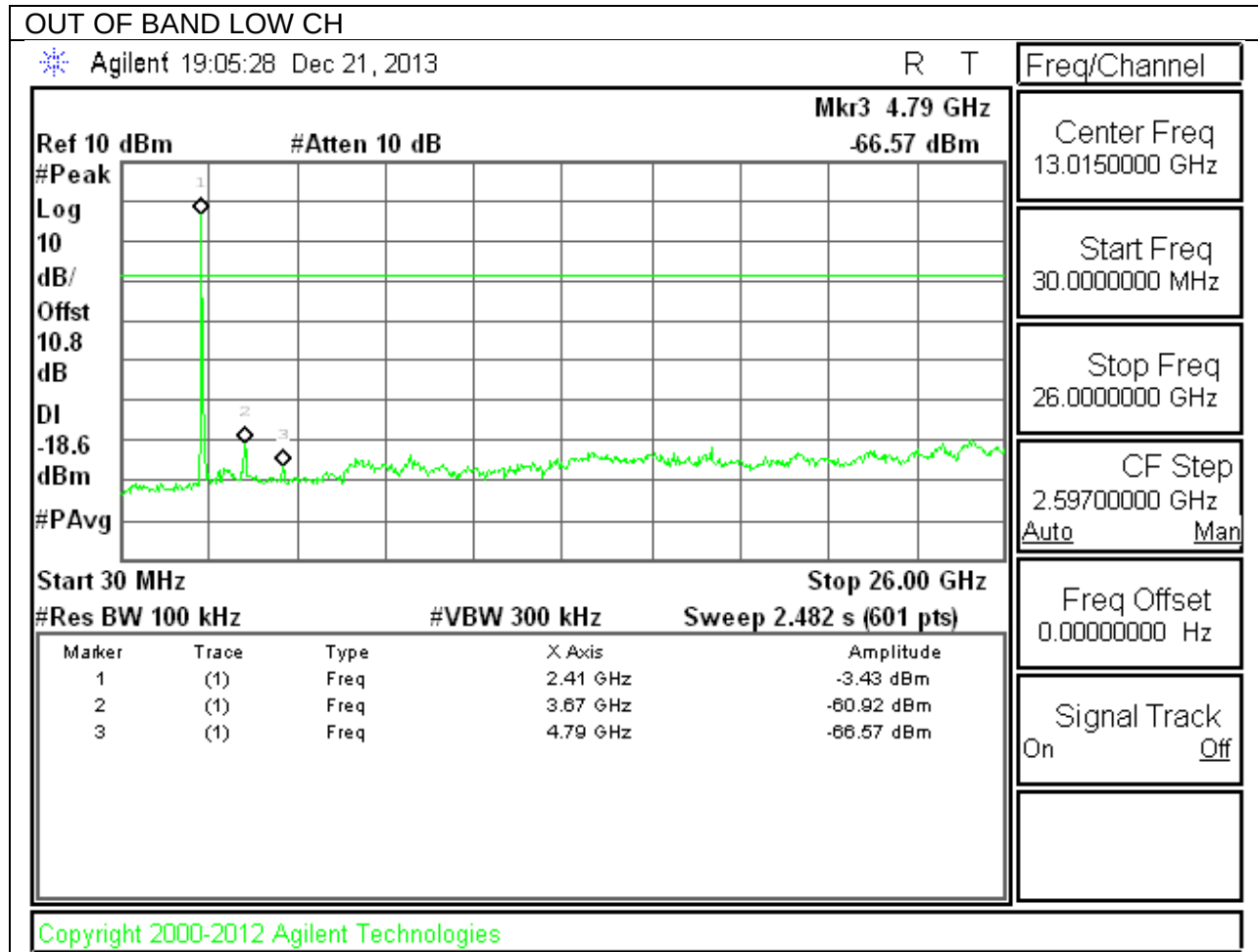


HIGH CHANNEL BANDEDGE

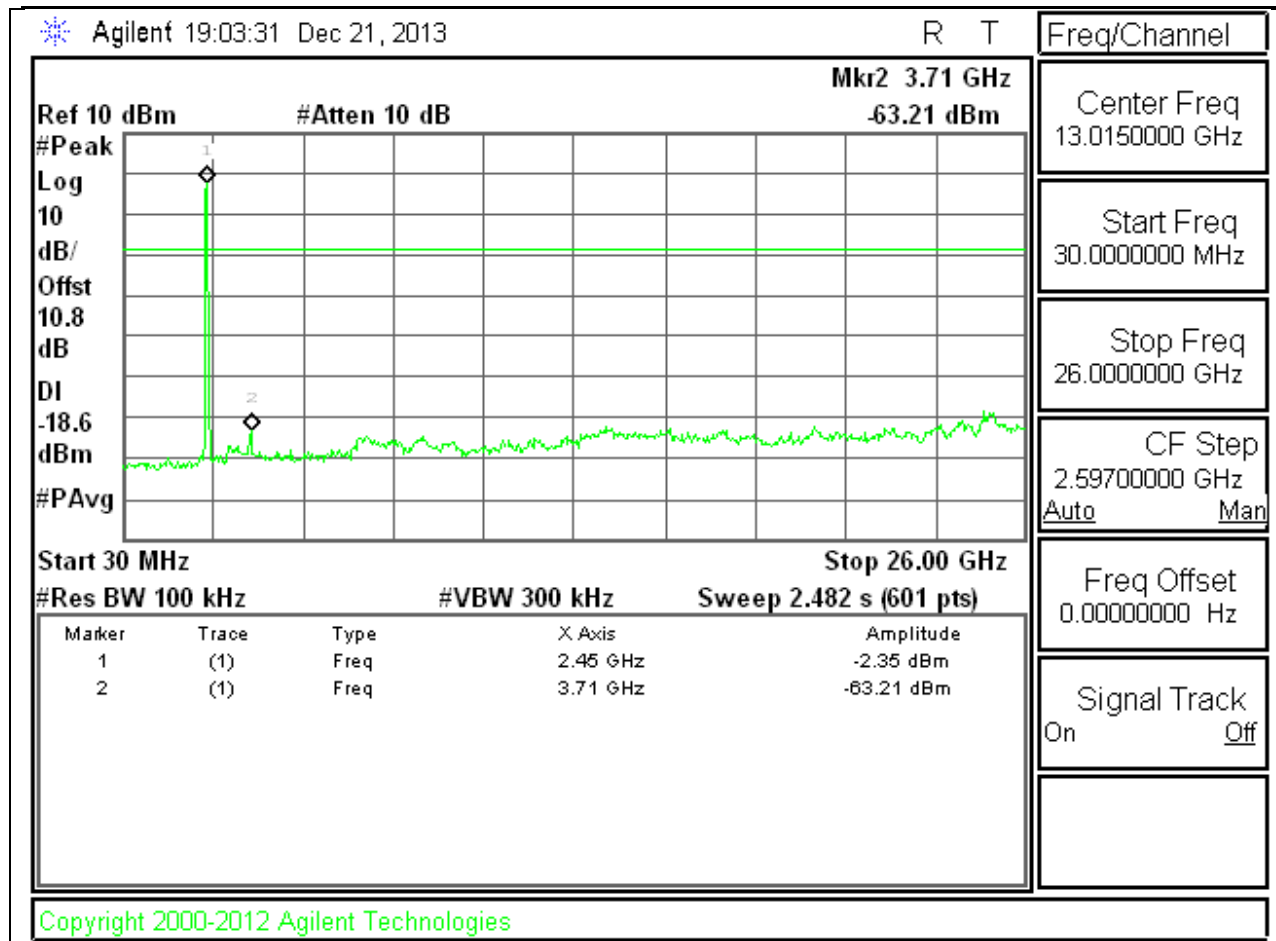
AUTHORIZED BAND EDGE HIGH CH



OUT-OF-BAND EMISSIONS



OUT OF BAND MID CH

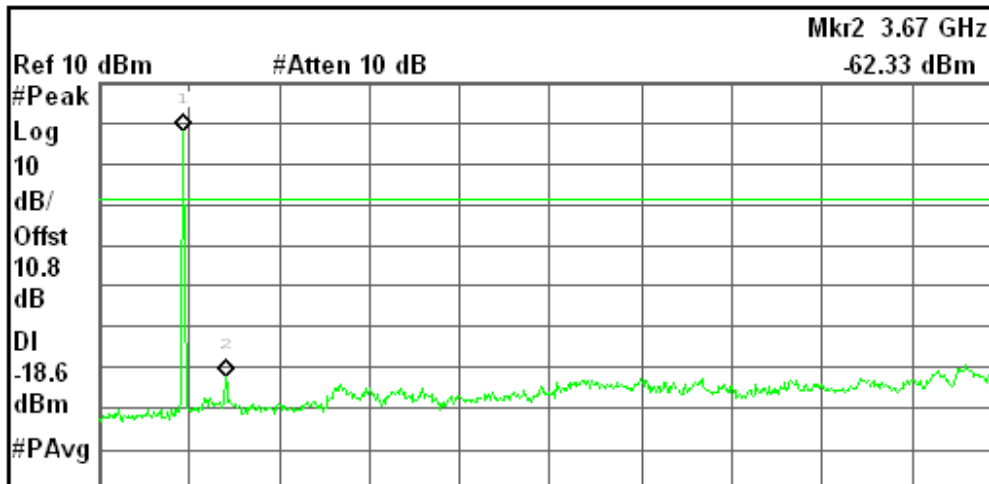


OUT OF BAND HIGH CH

Agilent 19:04:26 Dec 21, 2013

R T

Freq/Channel



Center Freq
13.0150000 GHz

Start Freq
30.0000000 MHz

Stop Freq
26.0000000 GHz

CF Step
2.59700000 GHz
Auto Man

Start 30 MHz Stop 26.00 GHz
#Res BW 100 kHz #VBW 300 kHz Sweep 2.482 s (601 pts)

Freq Offset
0.00000000 Hz

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.45 GHz	-1.85 dBm
2	(1)	Freq	3.67 GHz	-62.33 dBm

Signal Track
On Off

Copyright 2000-2012 Agilent Technologies

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters.

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

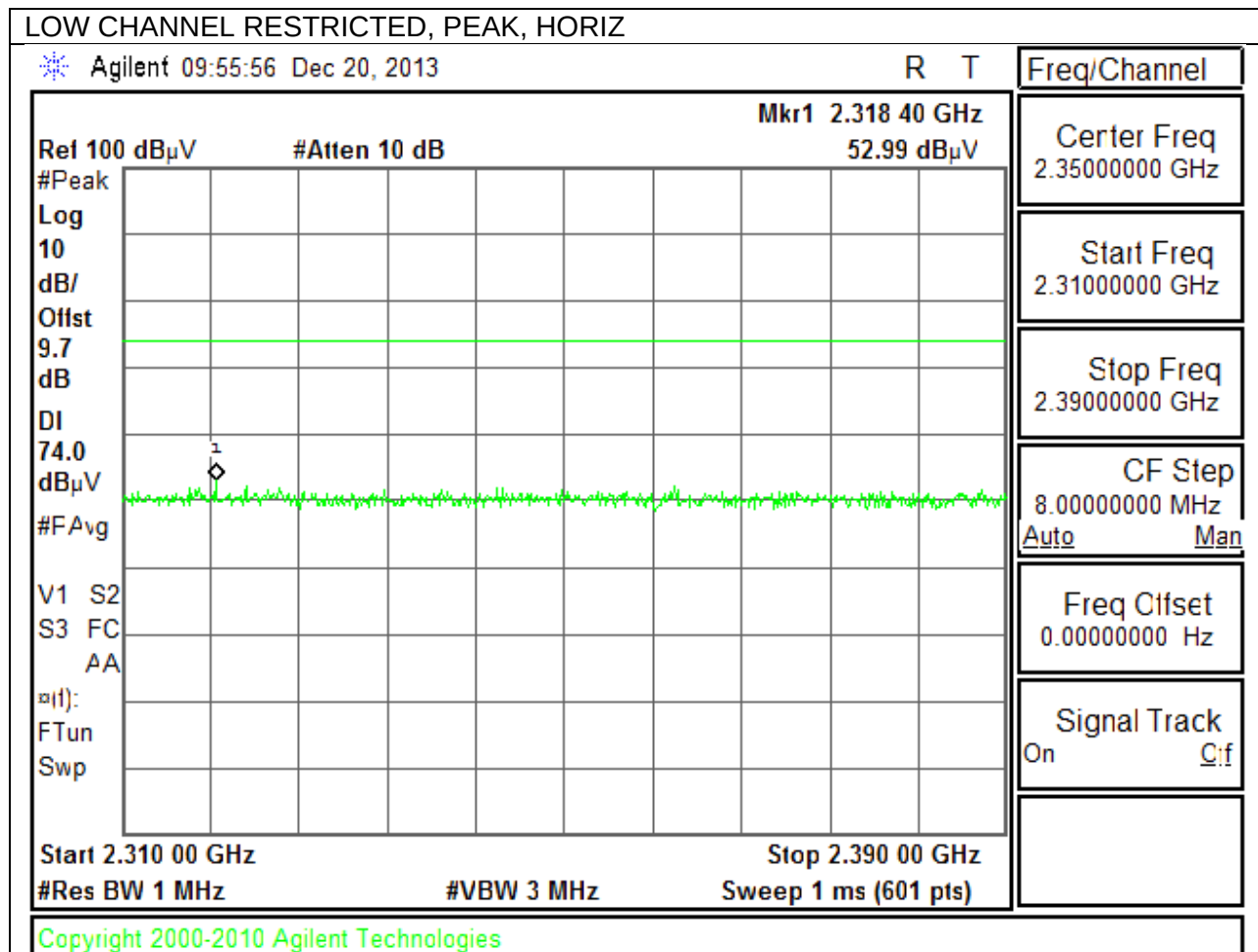
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor= $10\log(1/x)$ For this sample B mode = 0dB (duty cycle >98%); G mode = 0.21dB; N mode = 0.23dB.

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

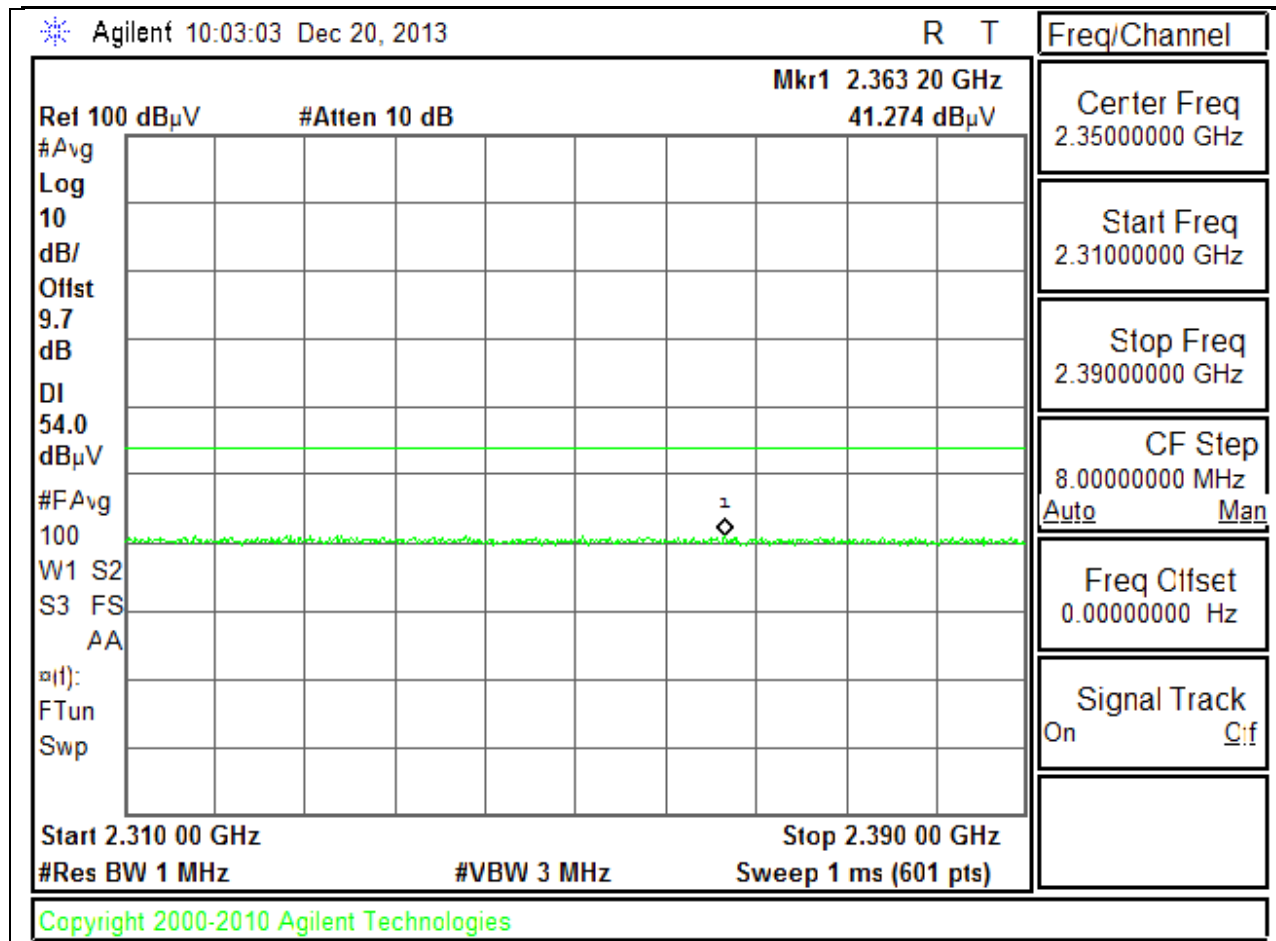
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

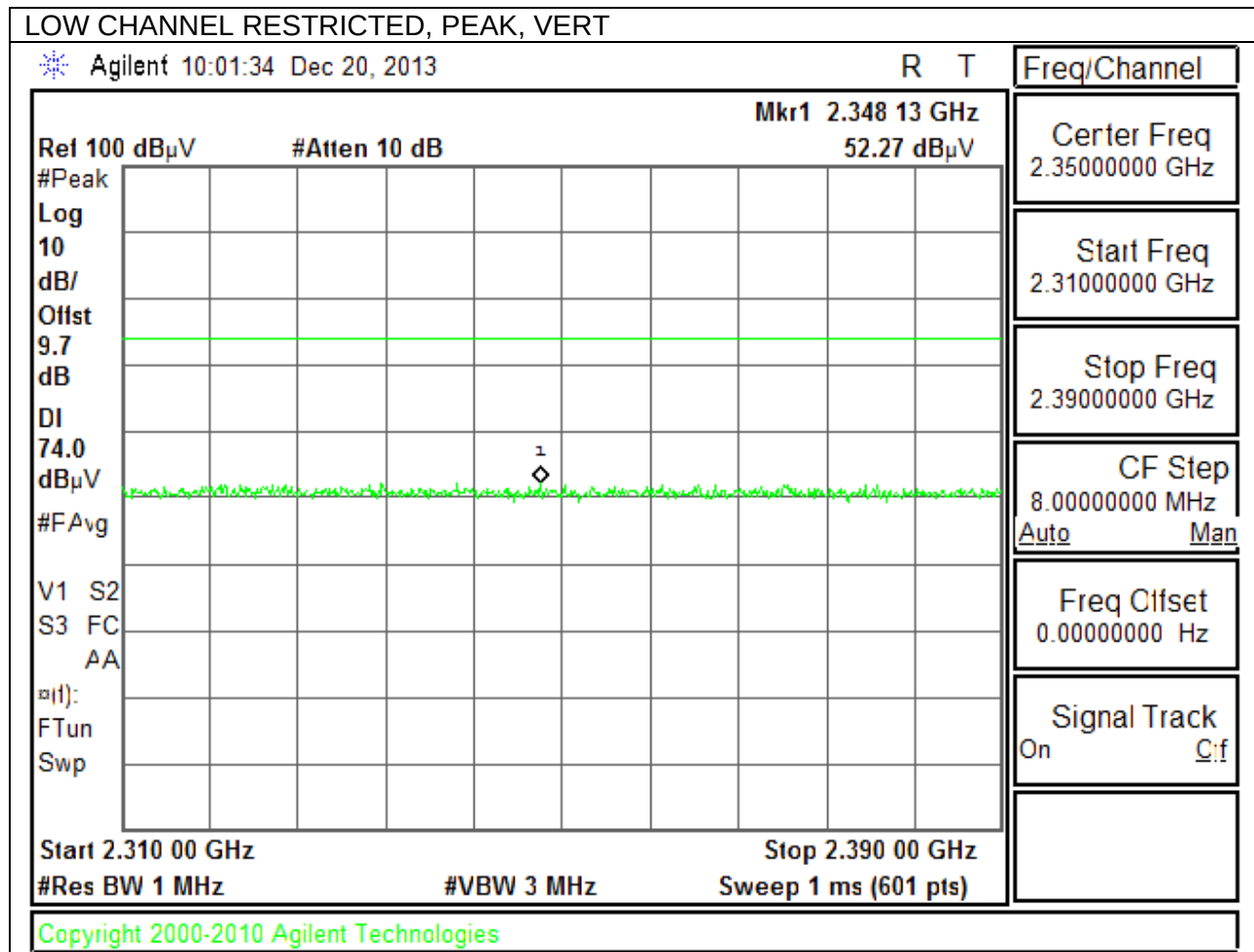
10.2. TRANSMITTER ABOVE 1 GHz

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

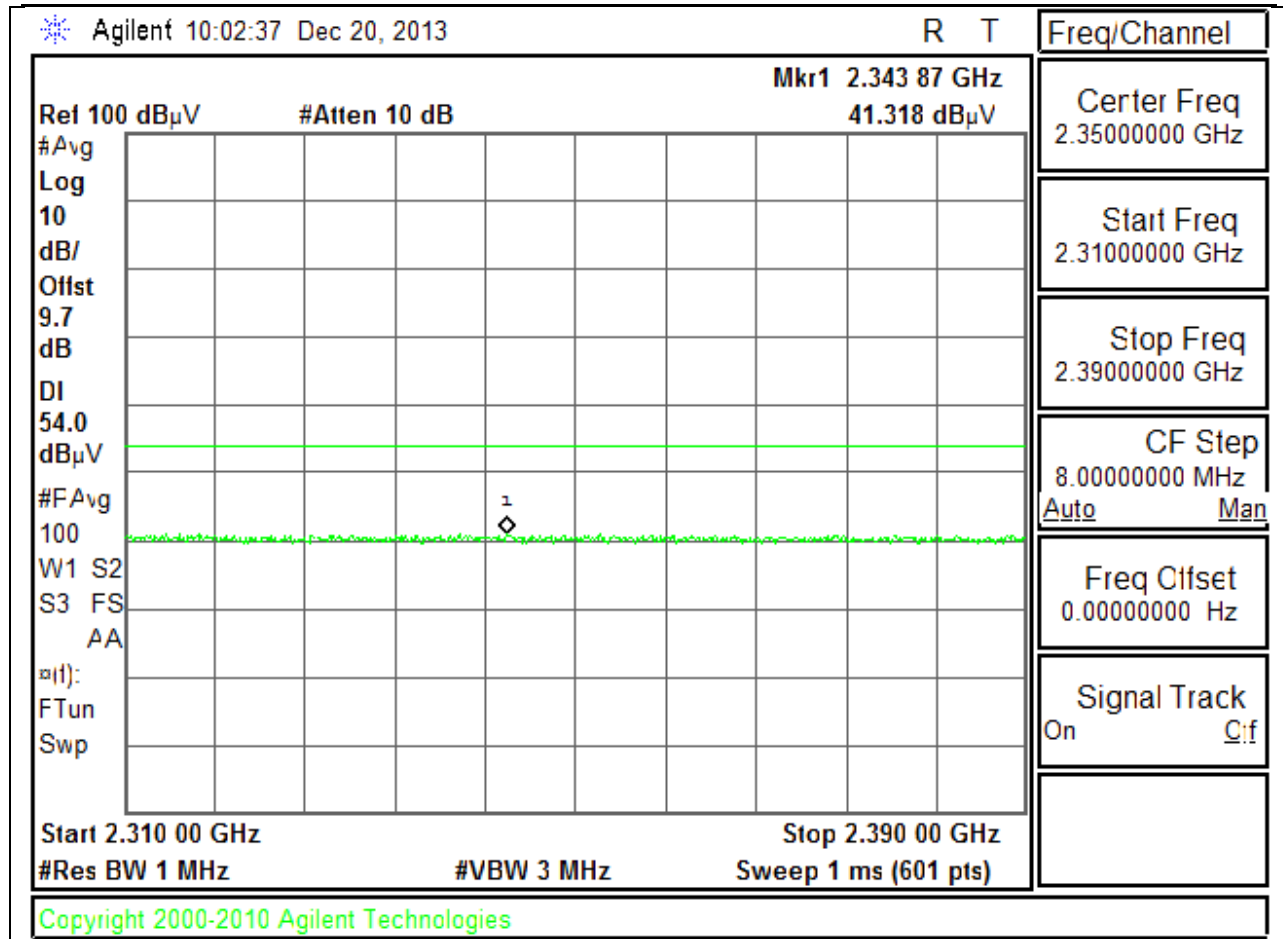


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

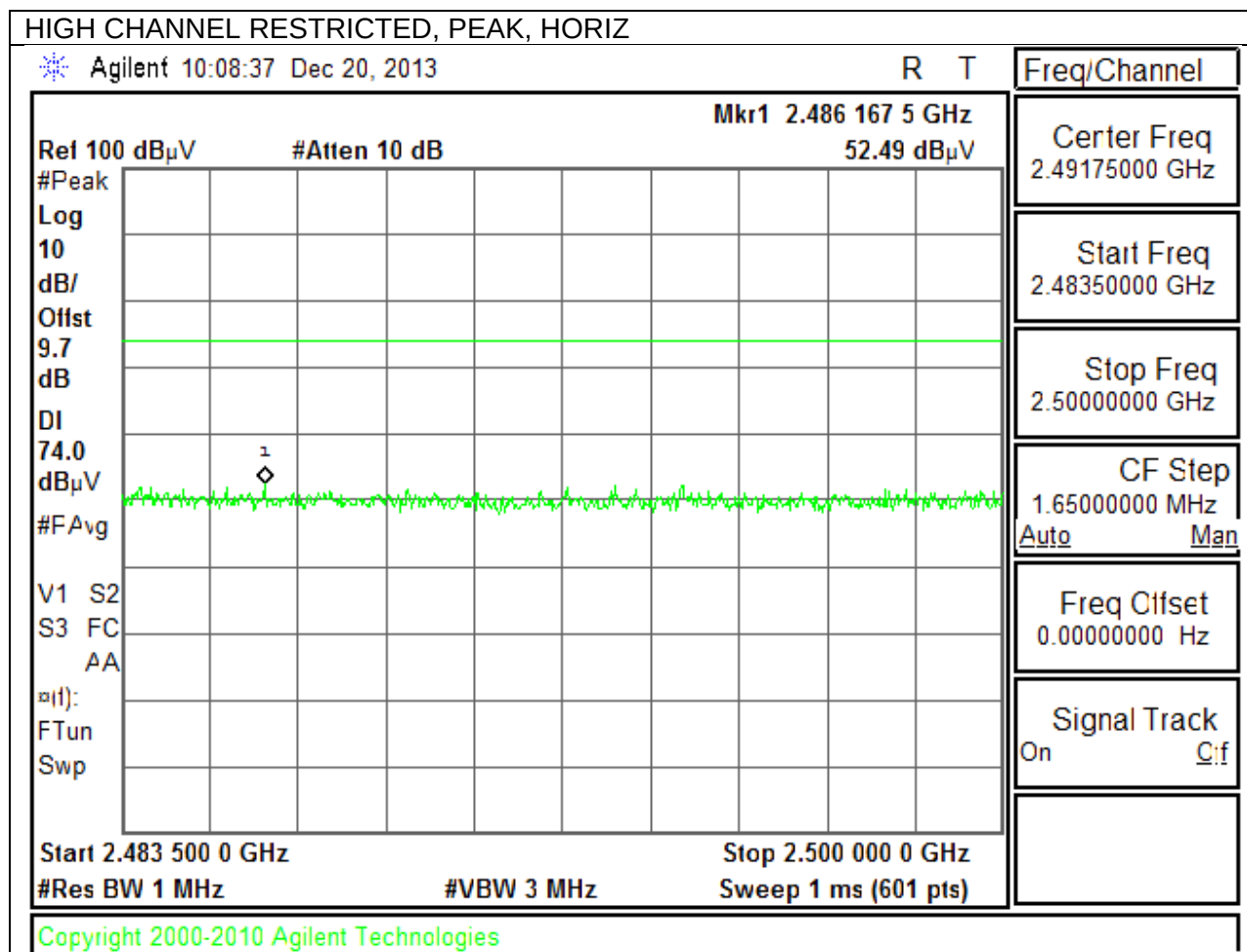




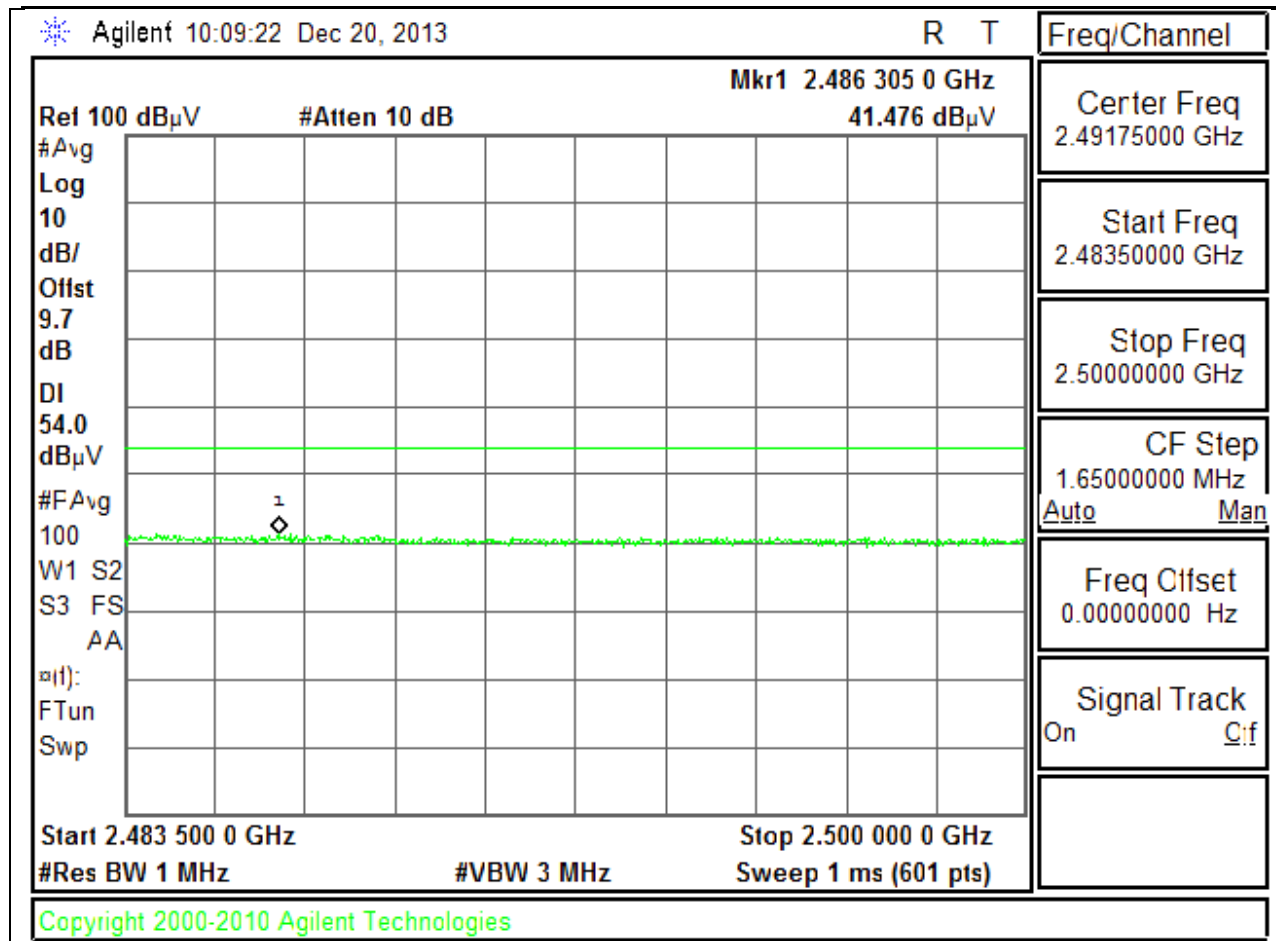
LOW CHANNEL RESTRICTED, AVERAGE, VERT

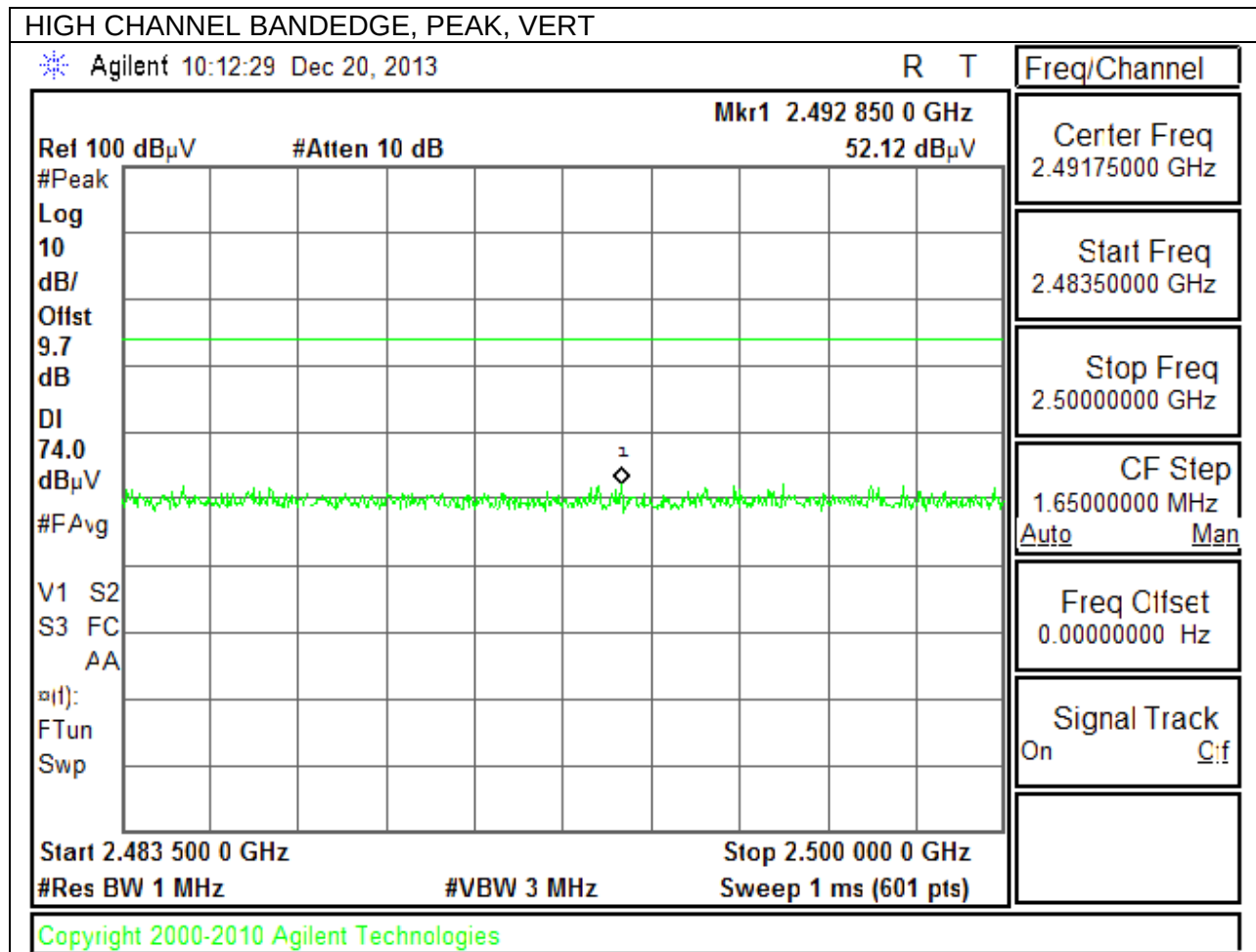


AUTHORIZED BANDEDGE (HIGH CHANNEL)

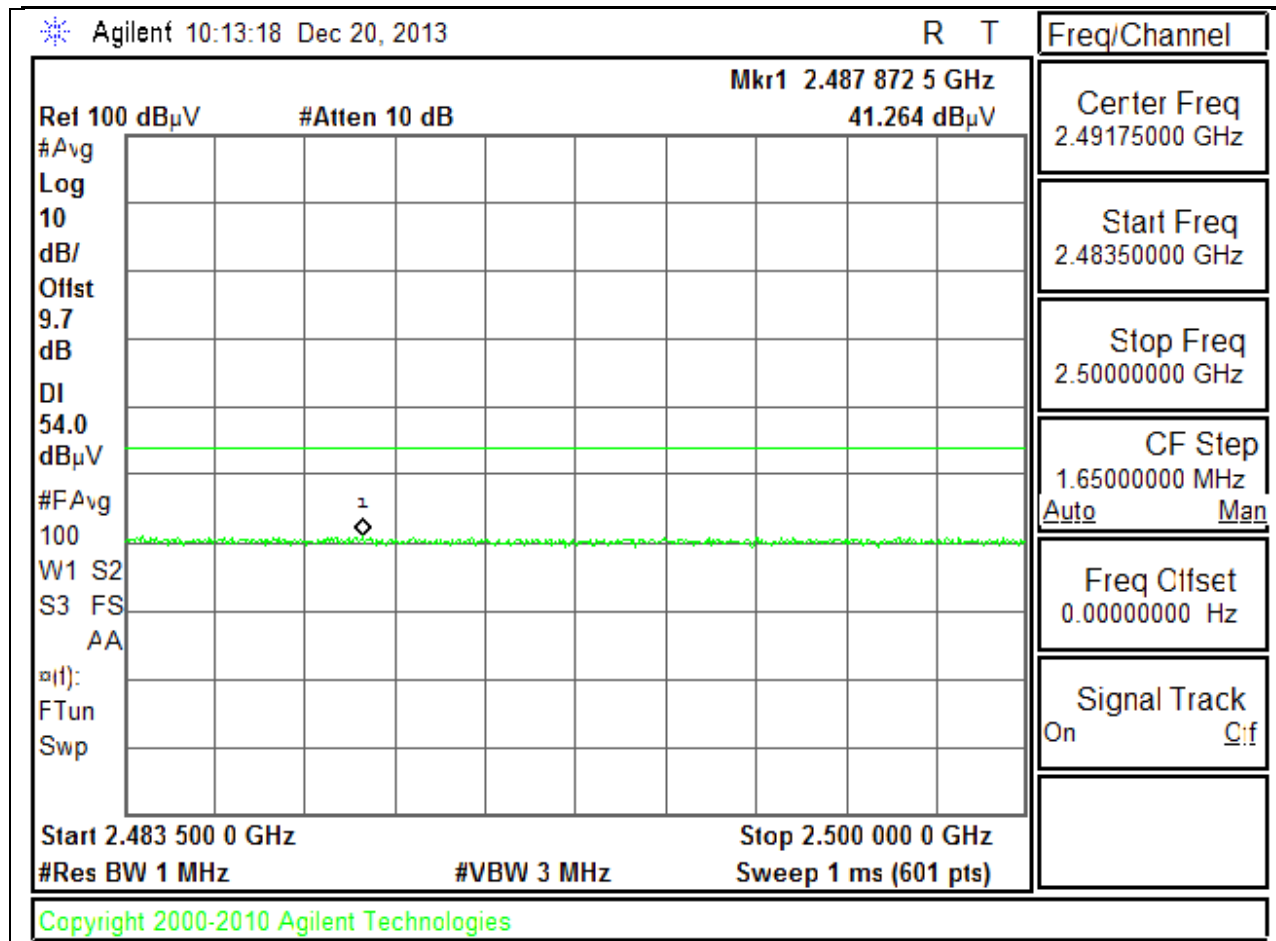


HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



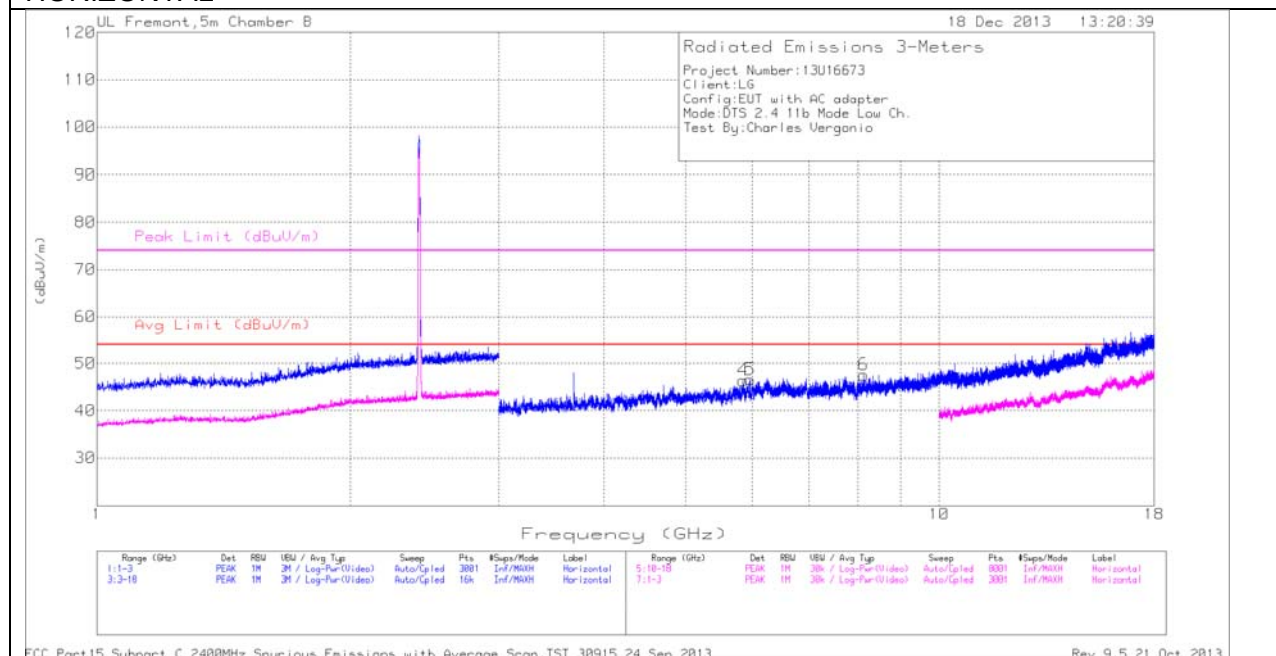


HIGH CHANNEL BANDEDGE, AVERAGE, VERT



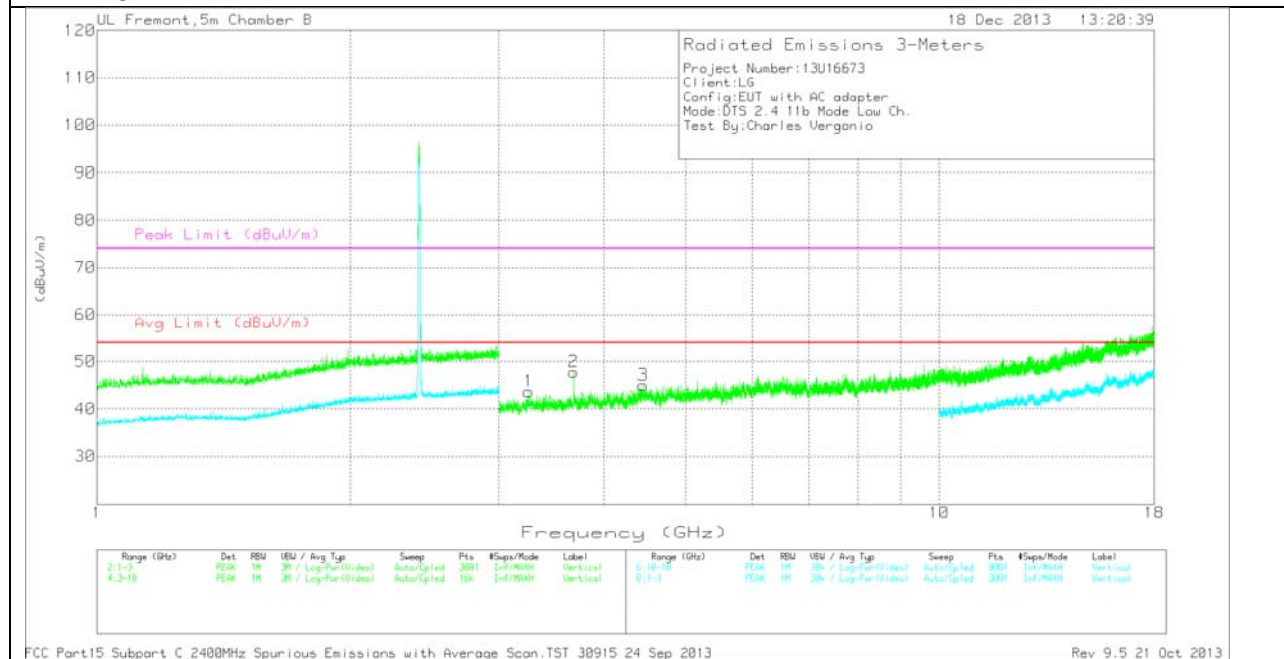
HARMONICS AND SPURIOUS EMISSIONS

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.

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.

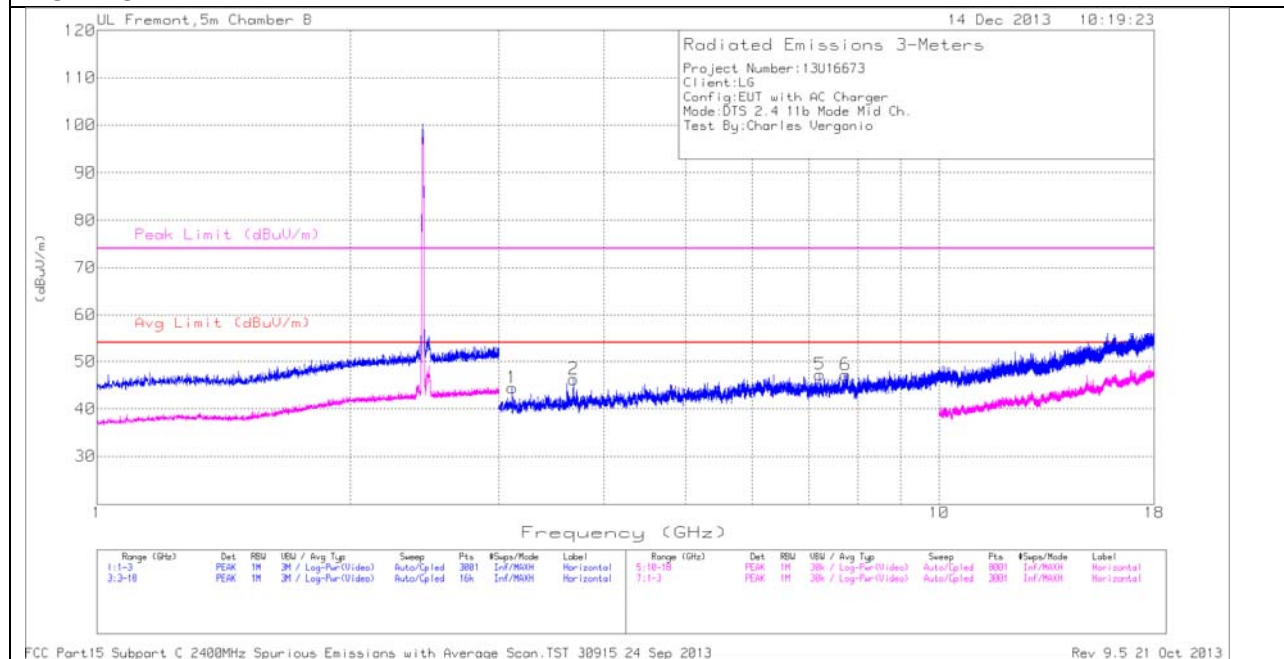
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb I/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.256	41.36	PK	33.3	-31	43.66	53.97	-10.31	74	-30.34	0-360	201	V
2	3.682	45.4	PK	33.6	-31.2	47.8	53.97	-6.17	74	-26.2	0-360	201	V
3	4.451	39.56	PK	34.4	-29	44.96	53.97	-9.01	74	-29.04	0-360	99	V
4	5.85	40.08	PK	35.5	-29.2	46.38	53.97	-7.59	74	-27.62	0-360	99	H
5	5.962	39.34	PK	35.8	-28.6	46.54	53.97	-7.43	74	-27.46	0-360	201	H
6	8.132	37.77	PK	36.1	-26.3	47.57	53.97	-6.4	74	-26.43	0-360	99	H

PK - Peak detector

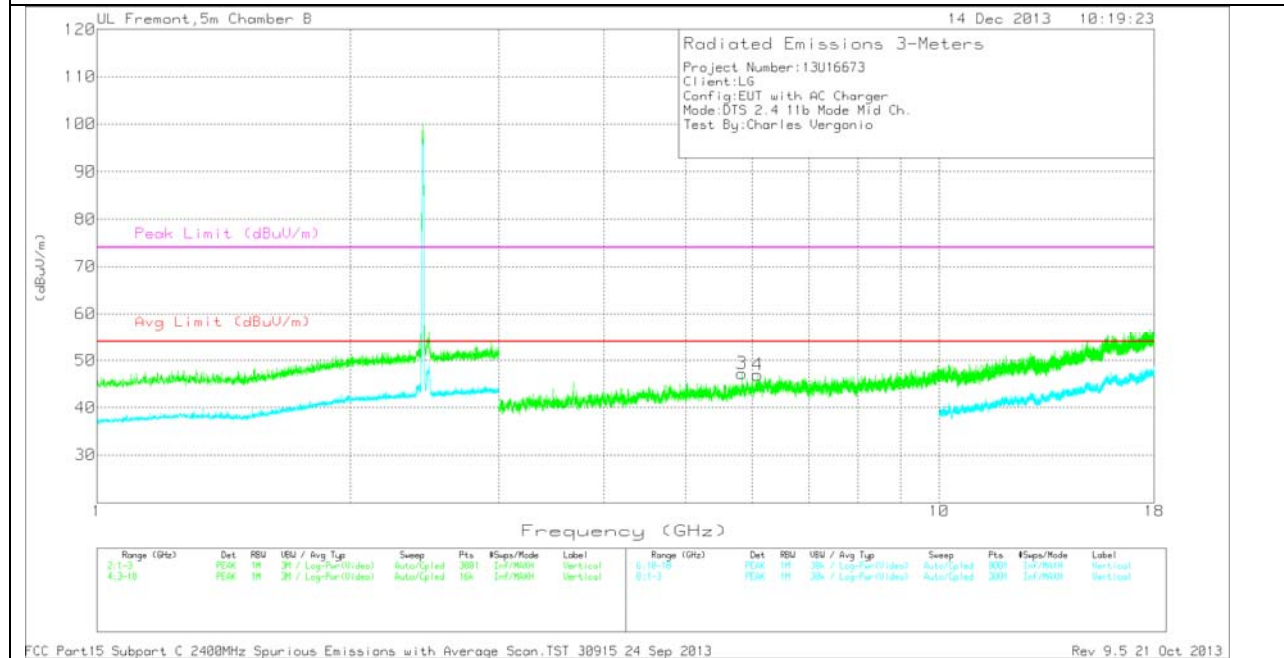
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

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.

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.

MID CHANNEL DATA

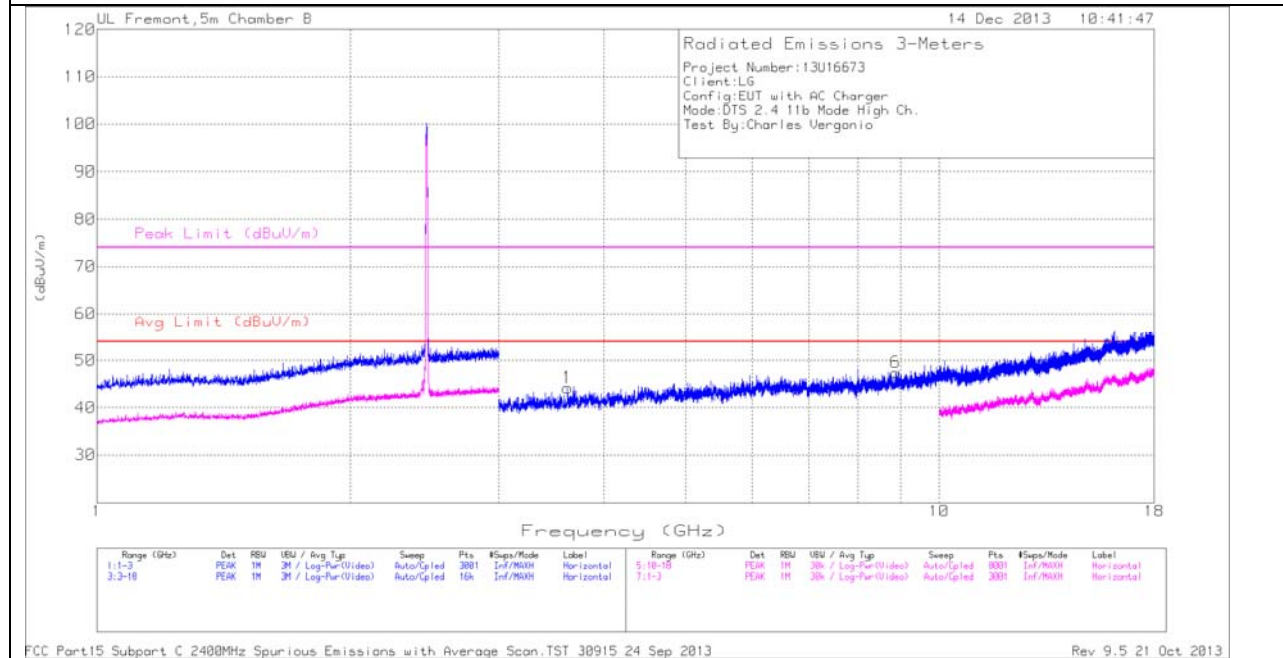
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb I/Filtr/Pad (dB)	Correct ed Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.112	42.82	PK	33.2	-31.6	44.42	53.97	-9.55	74	-29.58	0-360	99	H
2	3.681	43.86	PK	33.6	-31.2	46.26	53.97	-7.71	74	-27.74	0-360	99	H
3	5.832	41.11	PK	35.4	-29.3	47.21	53.97	-6.76	74	-26.79	0-360	202	V
4	6.088	40.1	PK	35.9	-29.1	46.9	53.97	-7.07	74	-27.1	0-360	99	V
5	7.215	38.05	PK	35.8	-26.6	47.25	53.97	-6.72	74	-26.75	0-360	99	H
6	7.741	36.96	PK	36.2	-26	47.16	53.97	-6.81	74	-26.84	0-360	99	H

PK - Peak detector

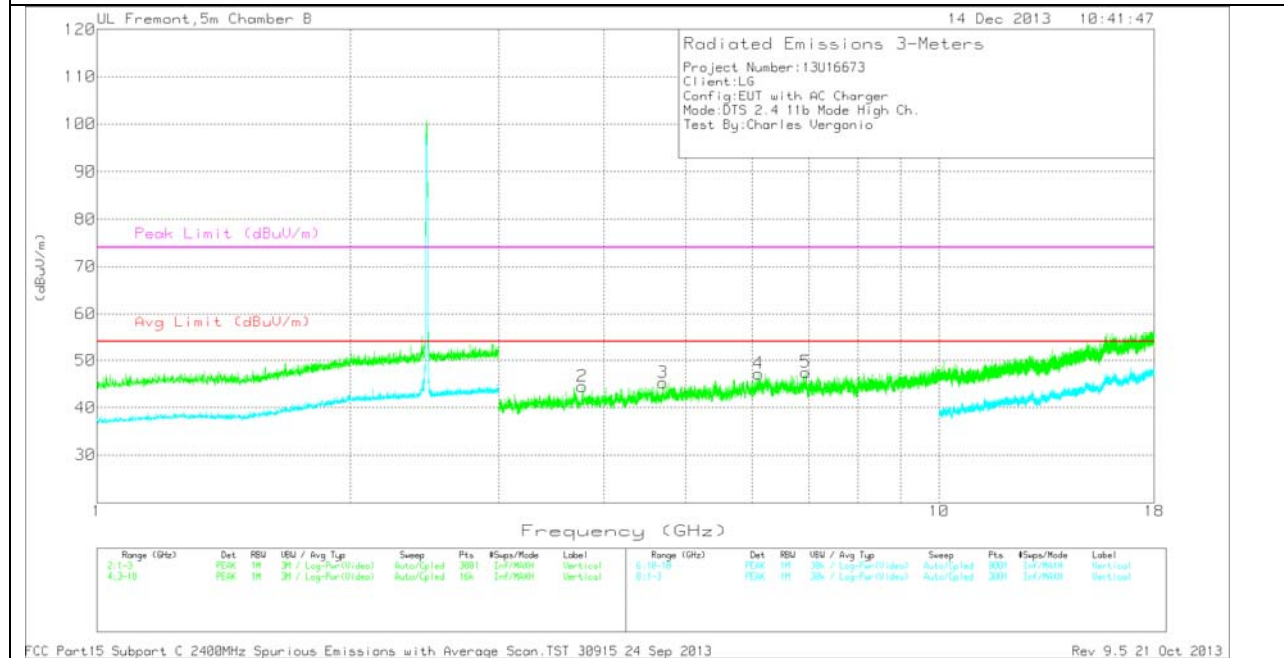
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

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.

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.

HIGH CHANNEL DATA

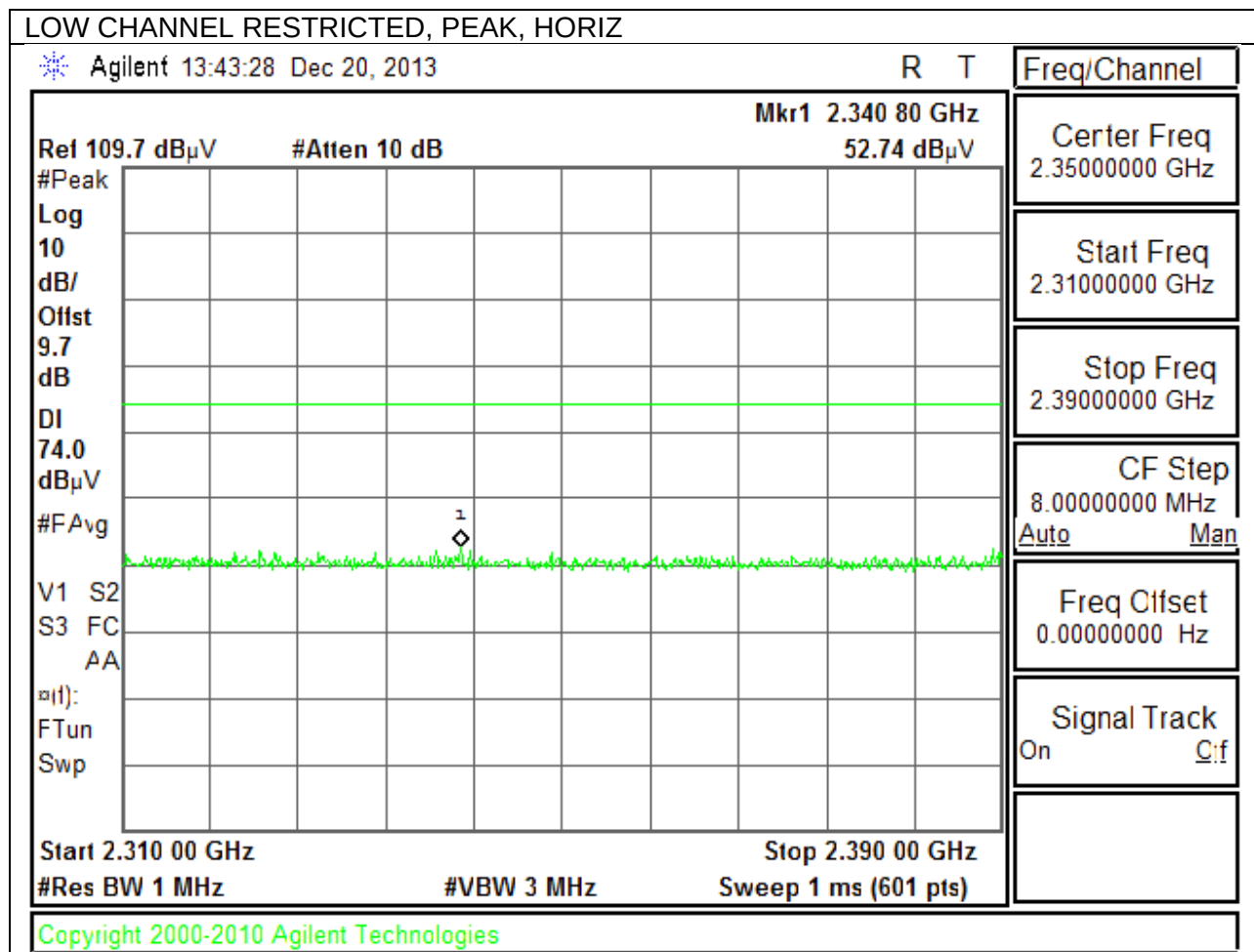
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb I/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.621	41.84	PK	33.5	-31.2	44.14	53.97	-9.83	74	-29.86	0-360	99	H
2	3.769	41.89	PK	33.8	-31.2	44.49	53.97	-9.48	74	-29.51	0-360	99	V
3	4.7	40.39	PK	34.7	-29.8	45.29	53.97	-8.68	74	-28.71	0-360	202	V
4	6.105	40.48	PK	35.9	-29.2	47.18	53.97	-6.79	74	-26.82	0-360	99	V
5	6.943	39.59	PK	35.9	-28	47.49	53.97	-6.48	74	-26.51	0-360	99	V
6	8.881	36.68	PK	36.6	-25.9	47.38	53.97	-6.59	74	-26.62	0-360	99	H

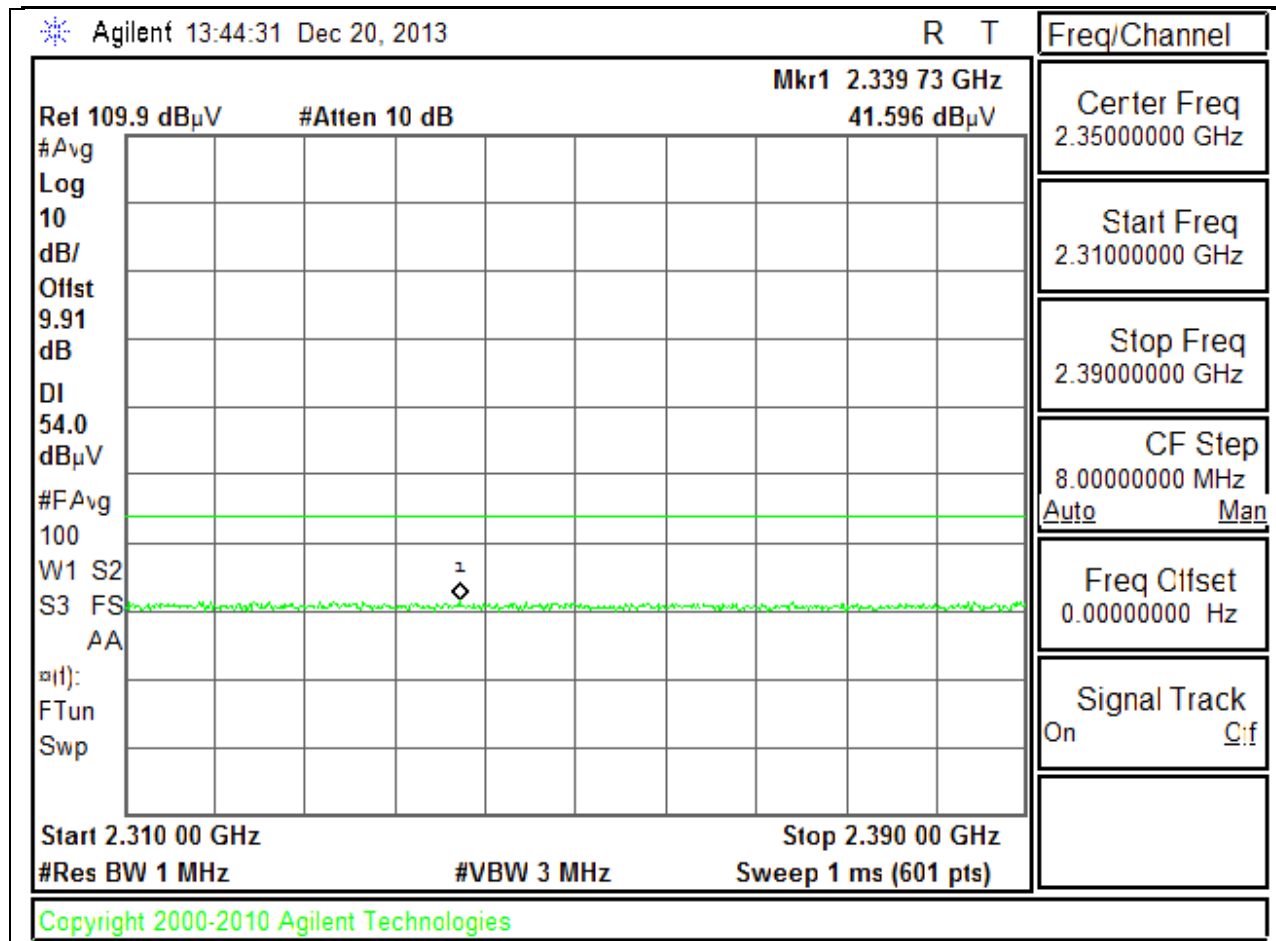
PK - Peak detector

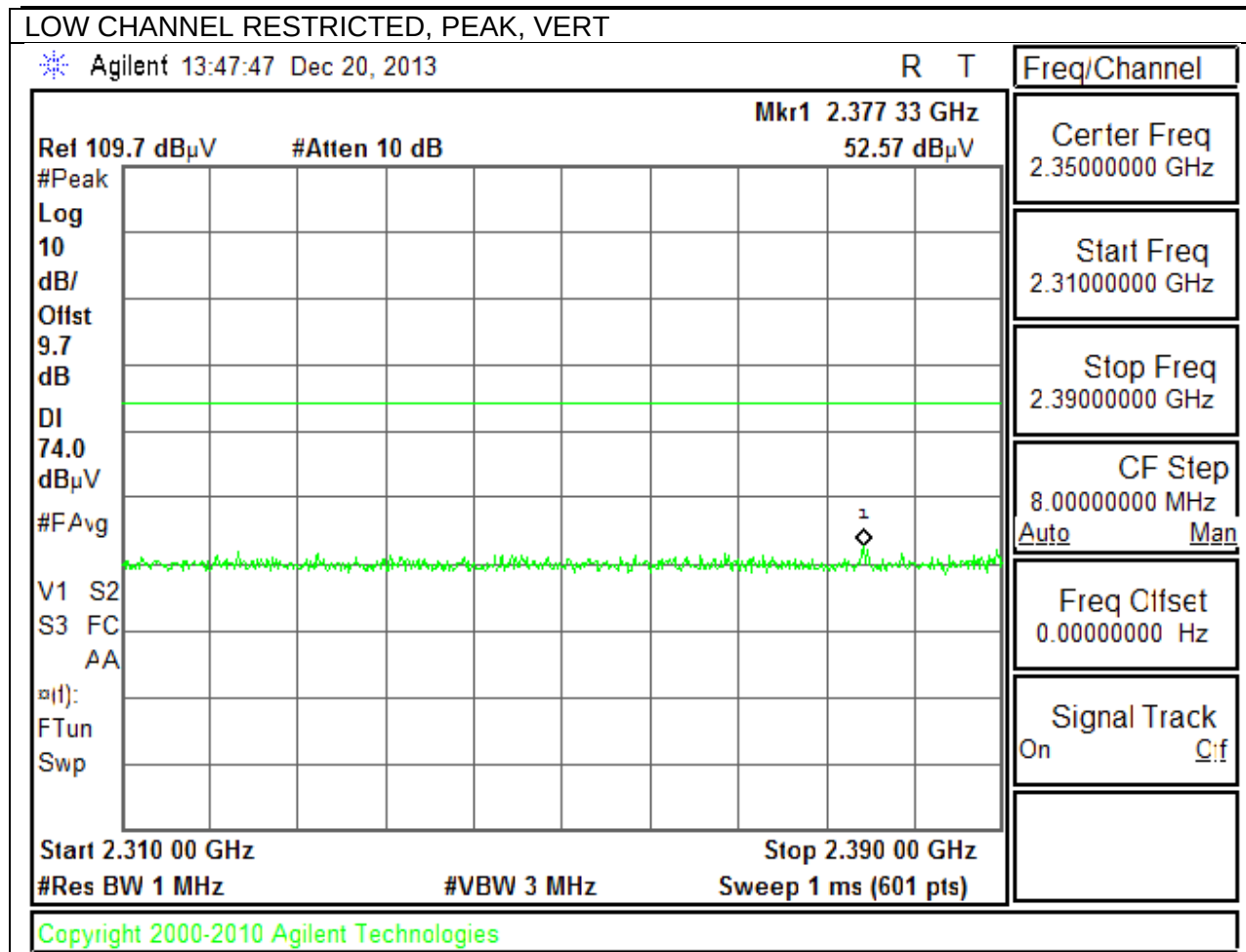
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

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

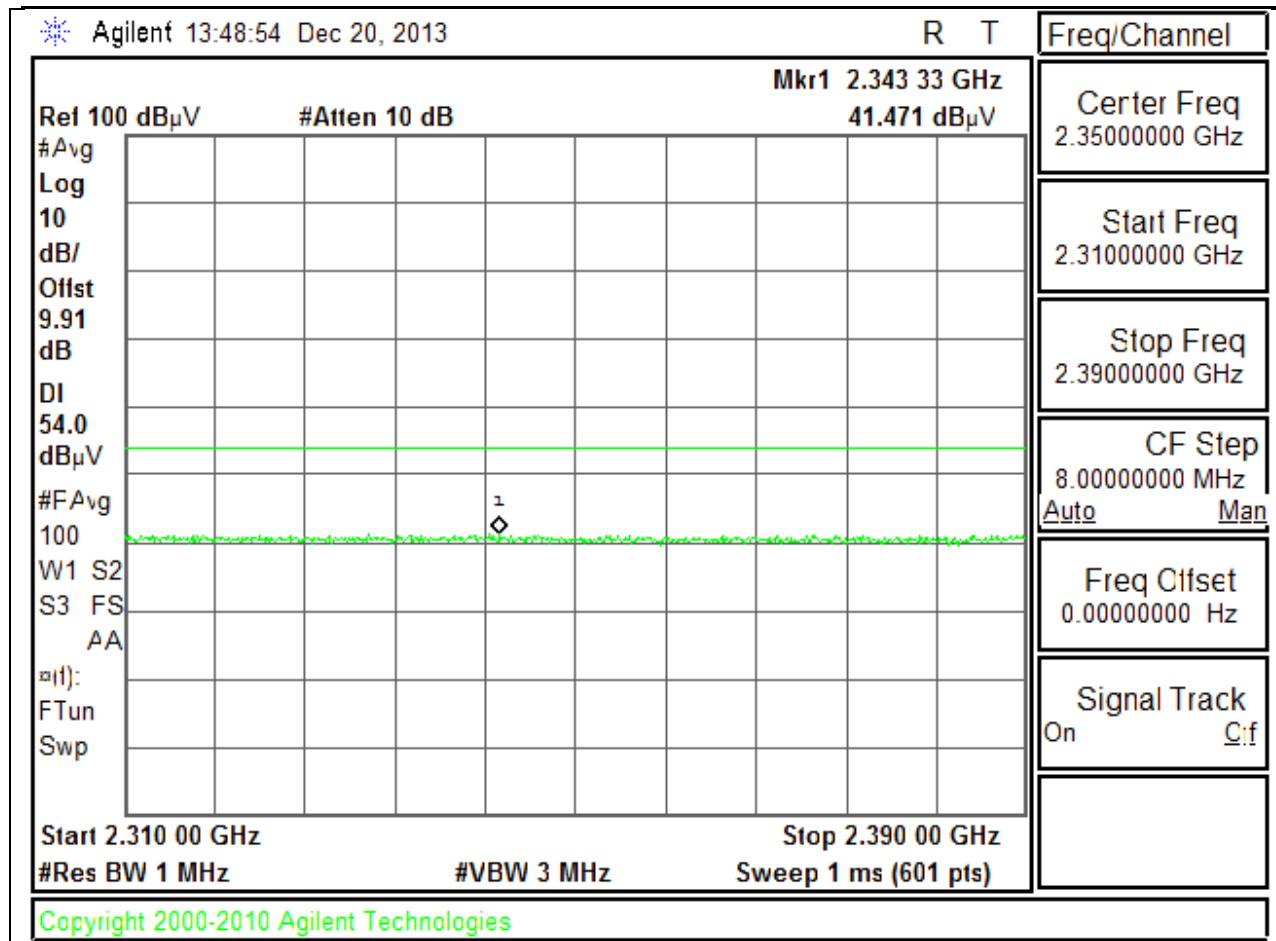


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

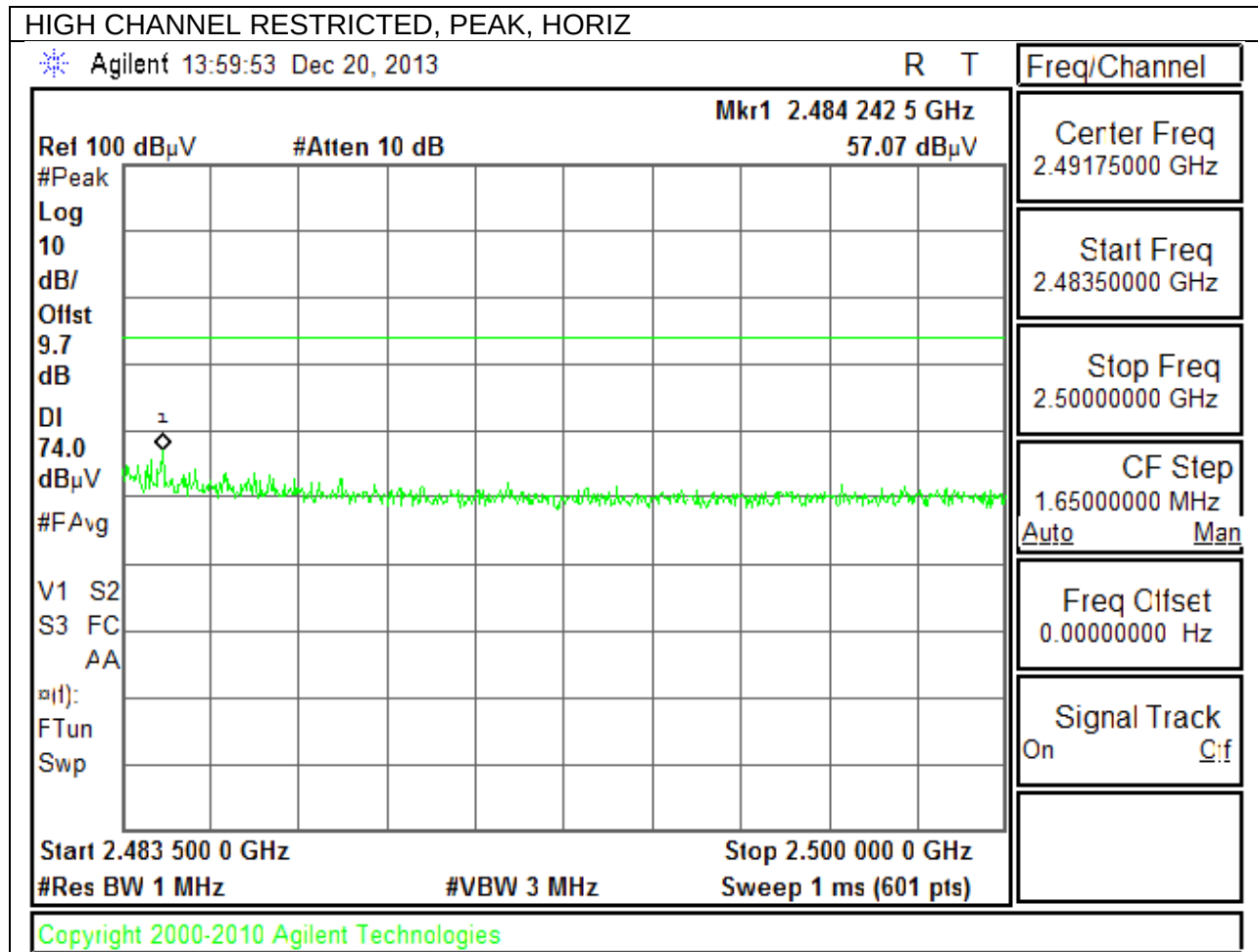




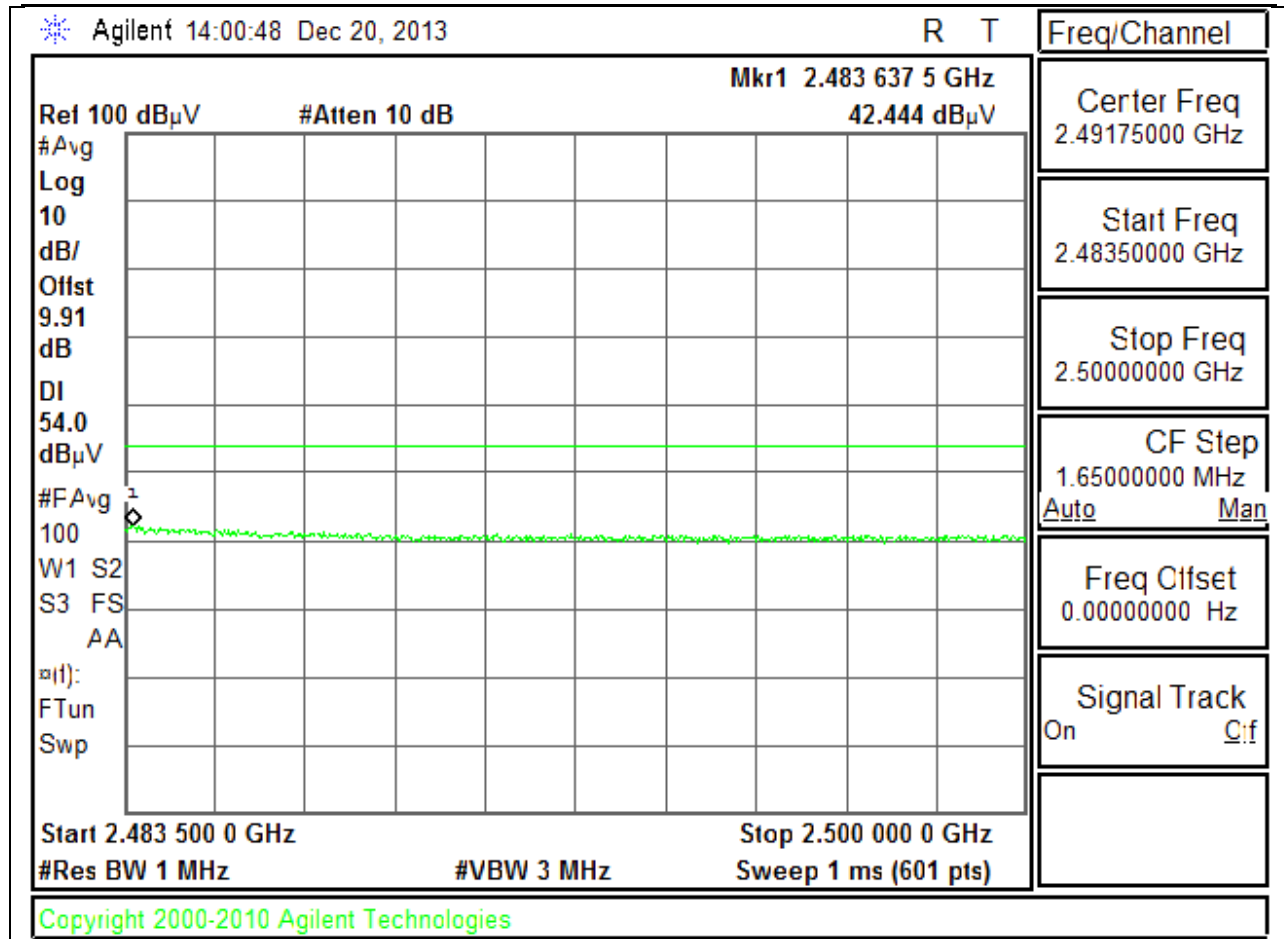
LOW CHANNEL RESTRICTED, AVERAGE, VERT

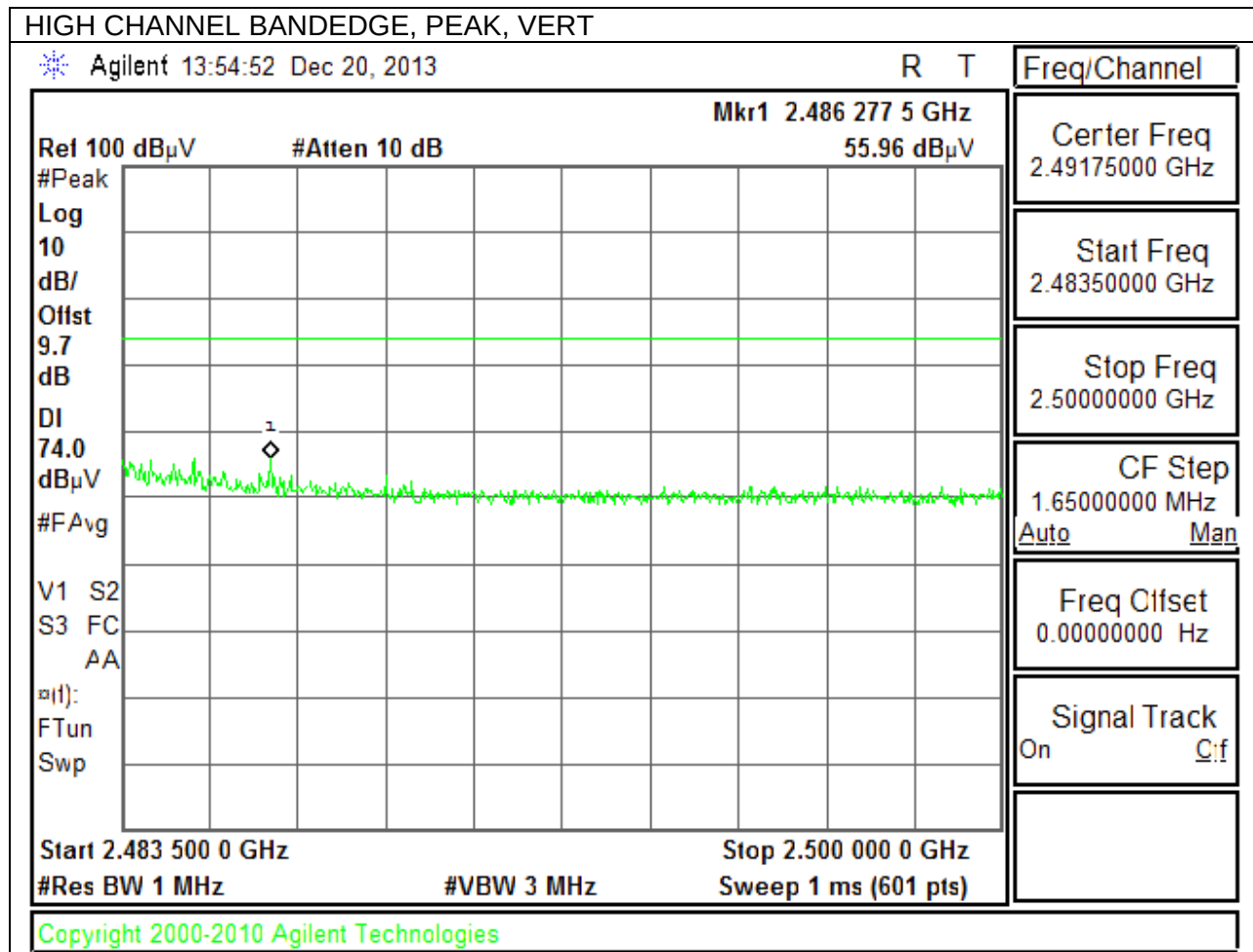


AUTHORIZED BANDEDGE (HIGH CHANNEL)

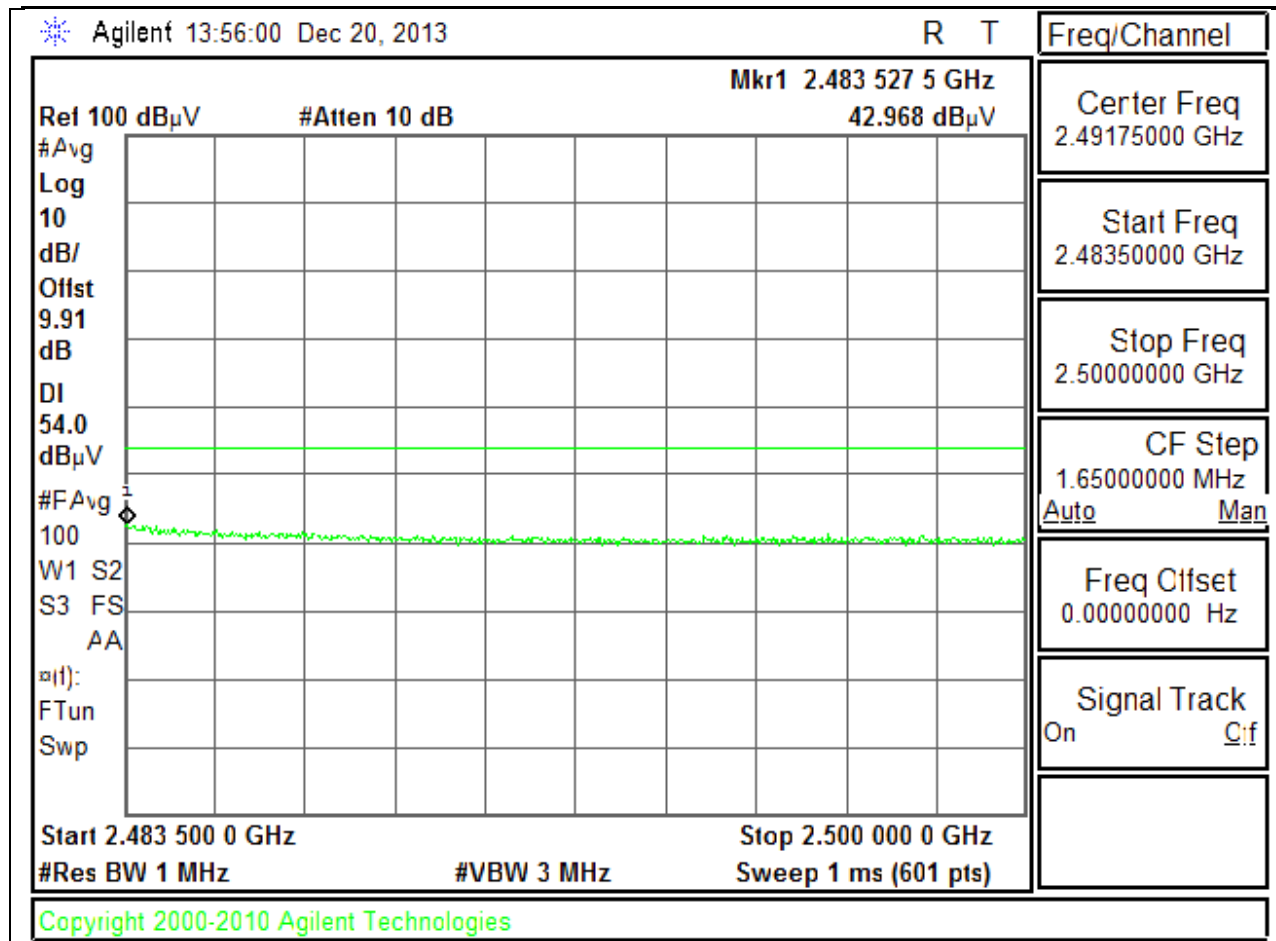


HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



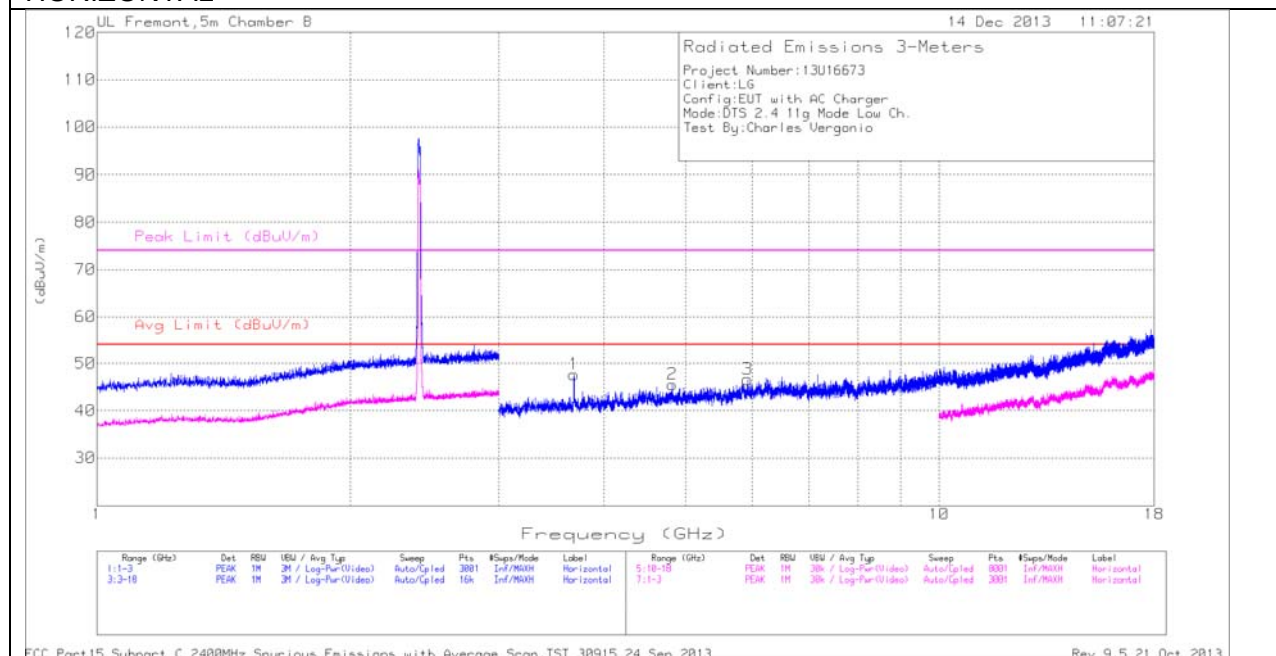


HIGH CHANNEL BANDEDGE, AVERAGE, VERT



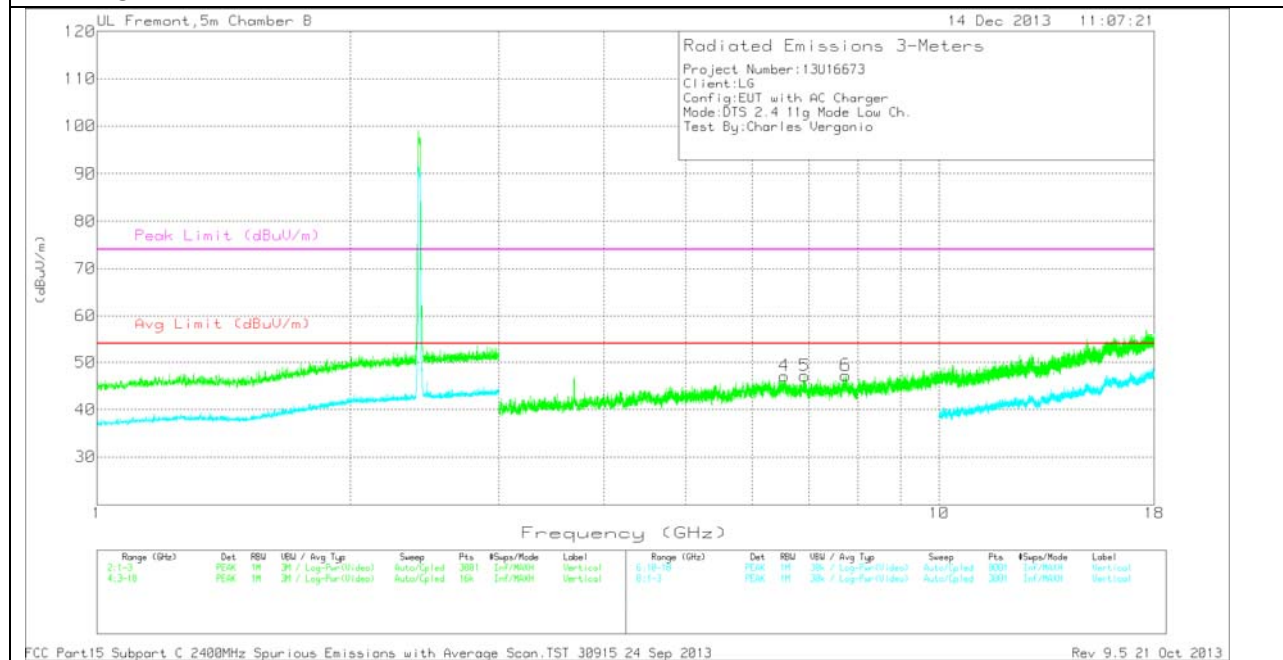
HARMONICS AND SPURIOUS EMISSIONS

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.

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.

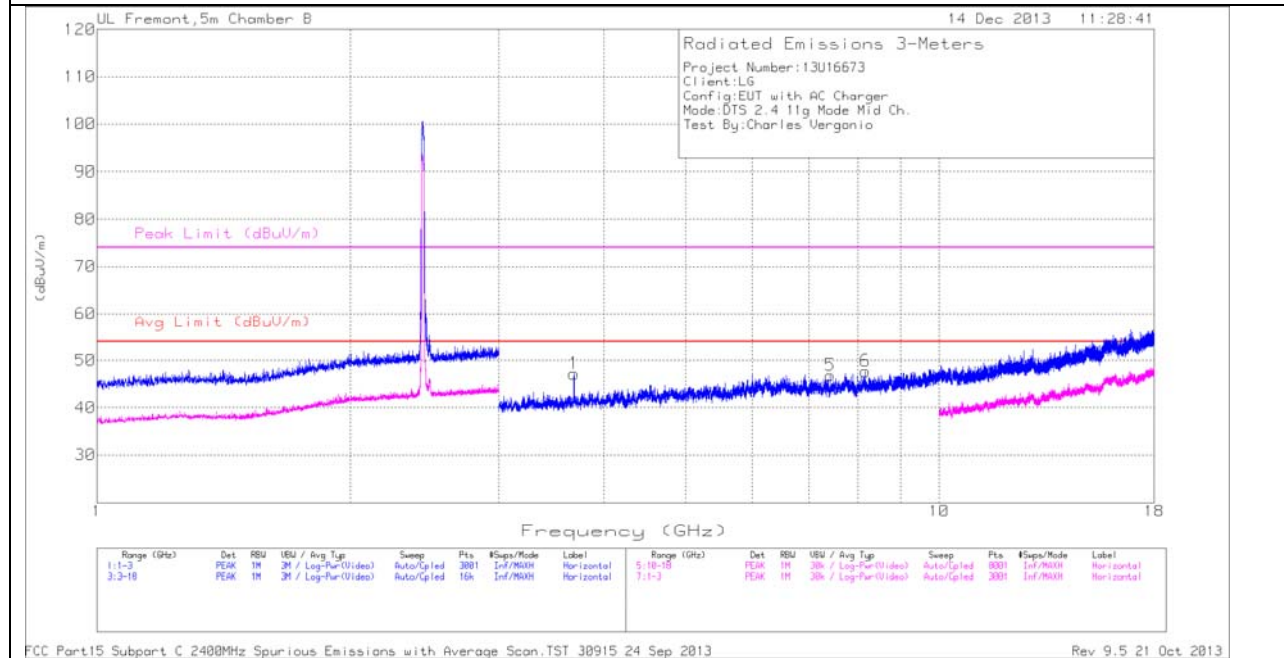
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb I/Filtr/Pad (dB)	Correct ed Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.684	45.27	PK	33.6	-31.2	47.67	53.97	-6.3	74	-26.33	0-360	99	H
2	4.822	40.13	PK	34.7	-29.3	45.53	53.97	-8.44	74	-28.47	0-360	201	H
3	5.921	39.32	PK	35.7	-28.4	46.62	53.97	-7.35	74	-27.38	0-360	99	H
4	6.551	38.52	PK	35.9	-27.3	47.12	53.97	-6.85	74	-26.88	0-360	202	V
5	6.922	38.85	PK	35.9	-27.6	47.15	53.97	-6.82	74	-26.85	0-360	202	V
6	7.743	37.01	PK	36.2	-26	47.21	53.97	-6.76	74	-26.79	0-360	202	V

PK - Peak detector

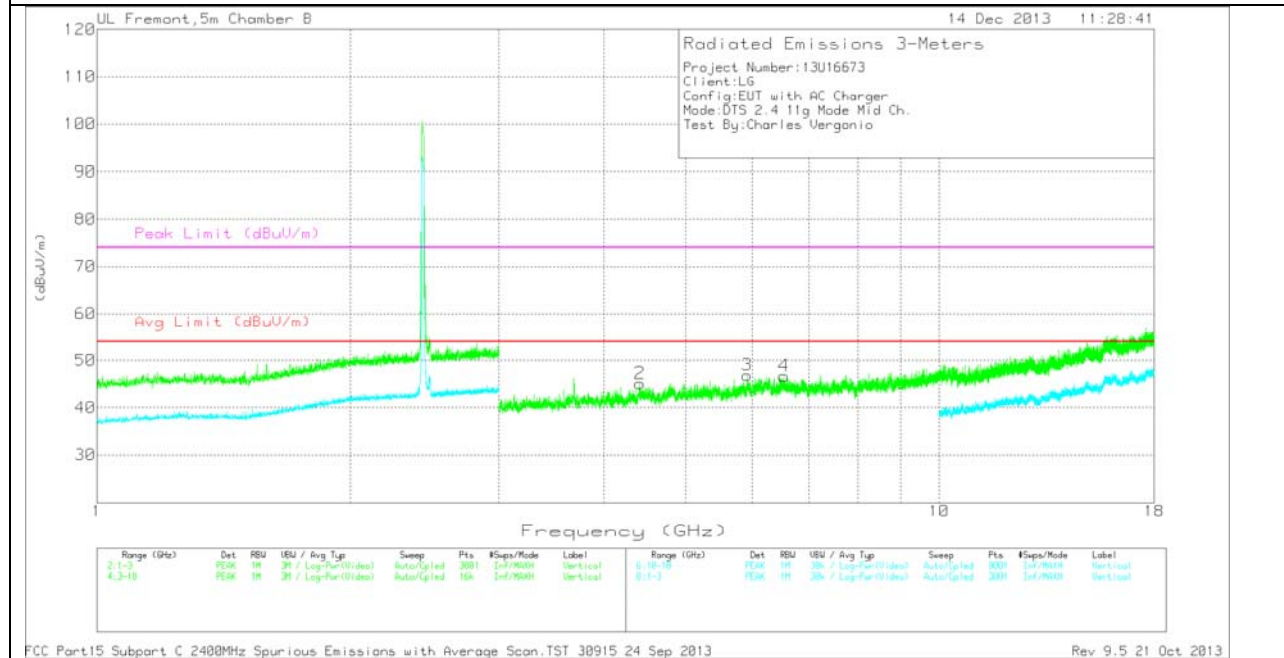
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

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.

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.

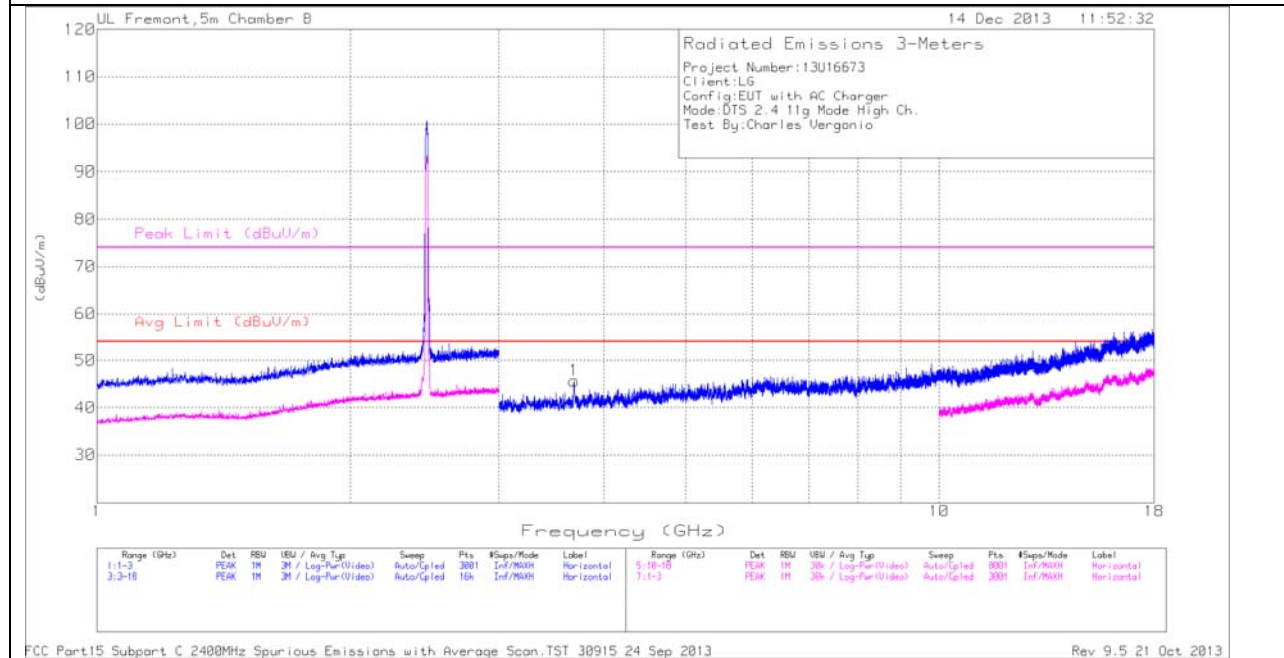
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb I/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.684	44.76	PK	33.6	-31.2	47.16	53.97	-6.81	74	-26.84	0-360	99	H
2	4.412	40.27	PK	34.4	-29.6	45.07	53.97	-8.9	74	-28.93	0-360	201	V
3	5.915	39.55	PK	35.7	-28.4	46.85	53.97	-7.12	74	-27.15	0-360	99	V
4	6.542	38.27	PK	35.9	-27.5	46.67	53.97	-7.3	74	-27.33	0-360	99	V
5	7.426	37.6	PK	35.9	-26.7	46.8	53.97	-7.17	74	-27.2	0-360	99	H
6	8.175	38.39	PK	36.1	-26.8	47.69	53.97	-6.28	74	-26.31	0-360	99	H

PK - Peak detector

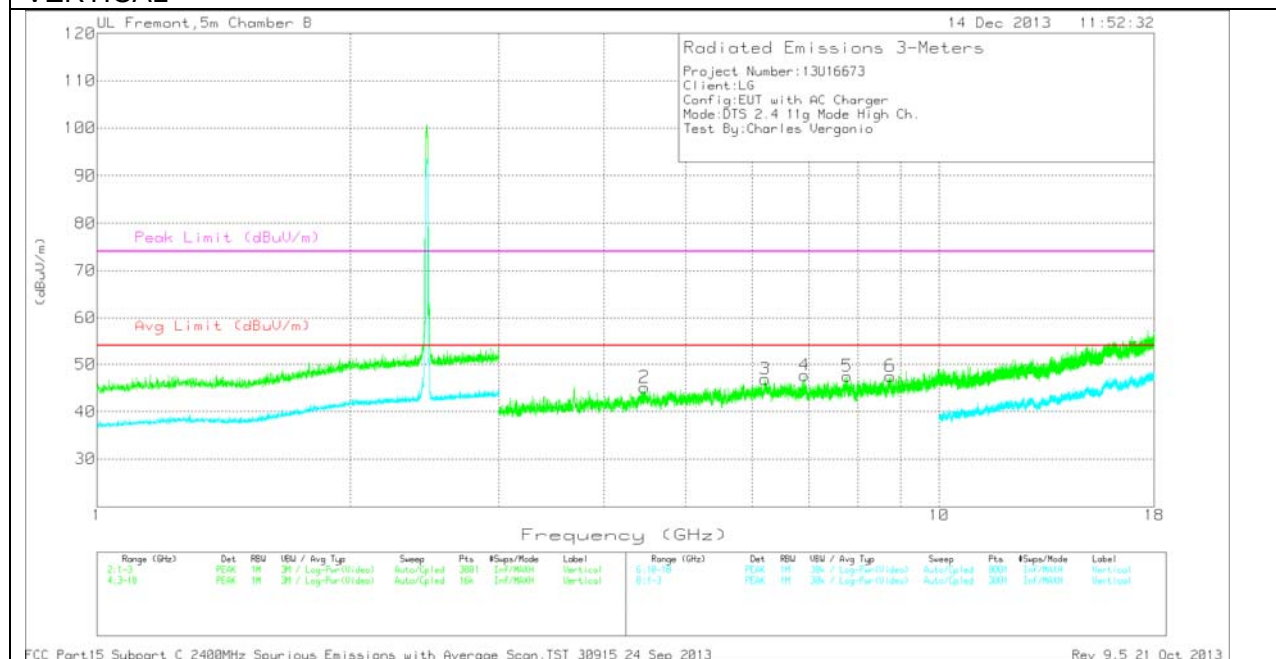
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

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.

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.

HIGH CHANNEL DATA

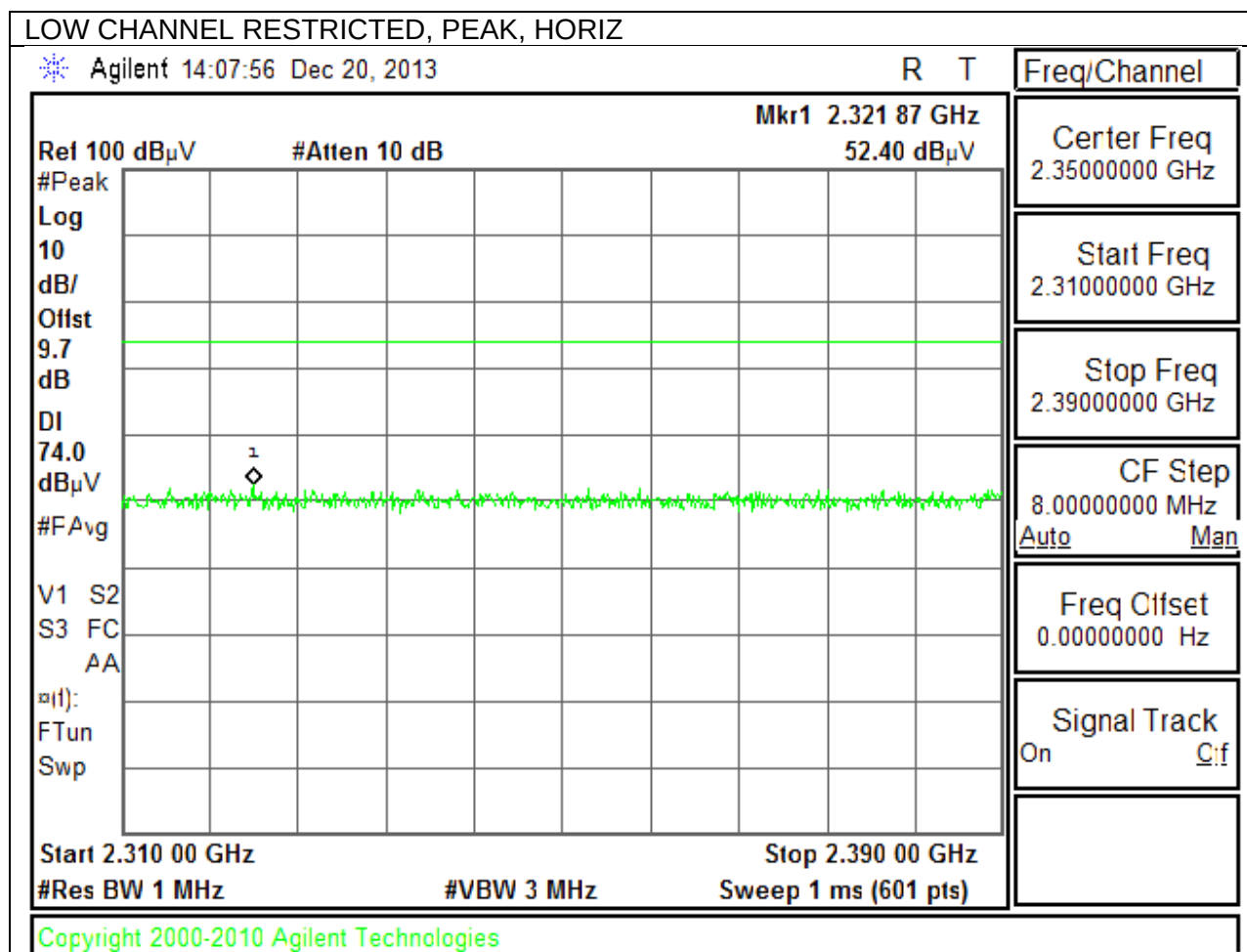
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb I/Filtr/Pad (dB)	Correct ed Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.685	43.29	PK	33.6	-31.2	45.69	53.97	-8.28	74	-28.31	0-360	99	H
2	4.466	39.72	PK	34.4	-29	45.12	53.97	-8.85	74	-28.88	0-360	202	V
3	6.213	38.68	PK	36	-27.8	46.88	53.97	-7.09	74	-27.12	0-360	99	V
4	6.917	39.18	PK	35.9	-27.4	47.68	53.97	-6.29	74	-26.32	0-360	202	V
5	7.773	37.27	PK	36.2	-26	47.47	53.97	-6.5	74	-26.53	0-360	202	V
6	8.749	36.18	PK	36.4	-25.1	47.48	53.97	-6.49	74	-26.52	0-360	202	V

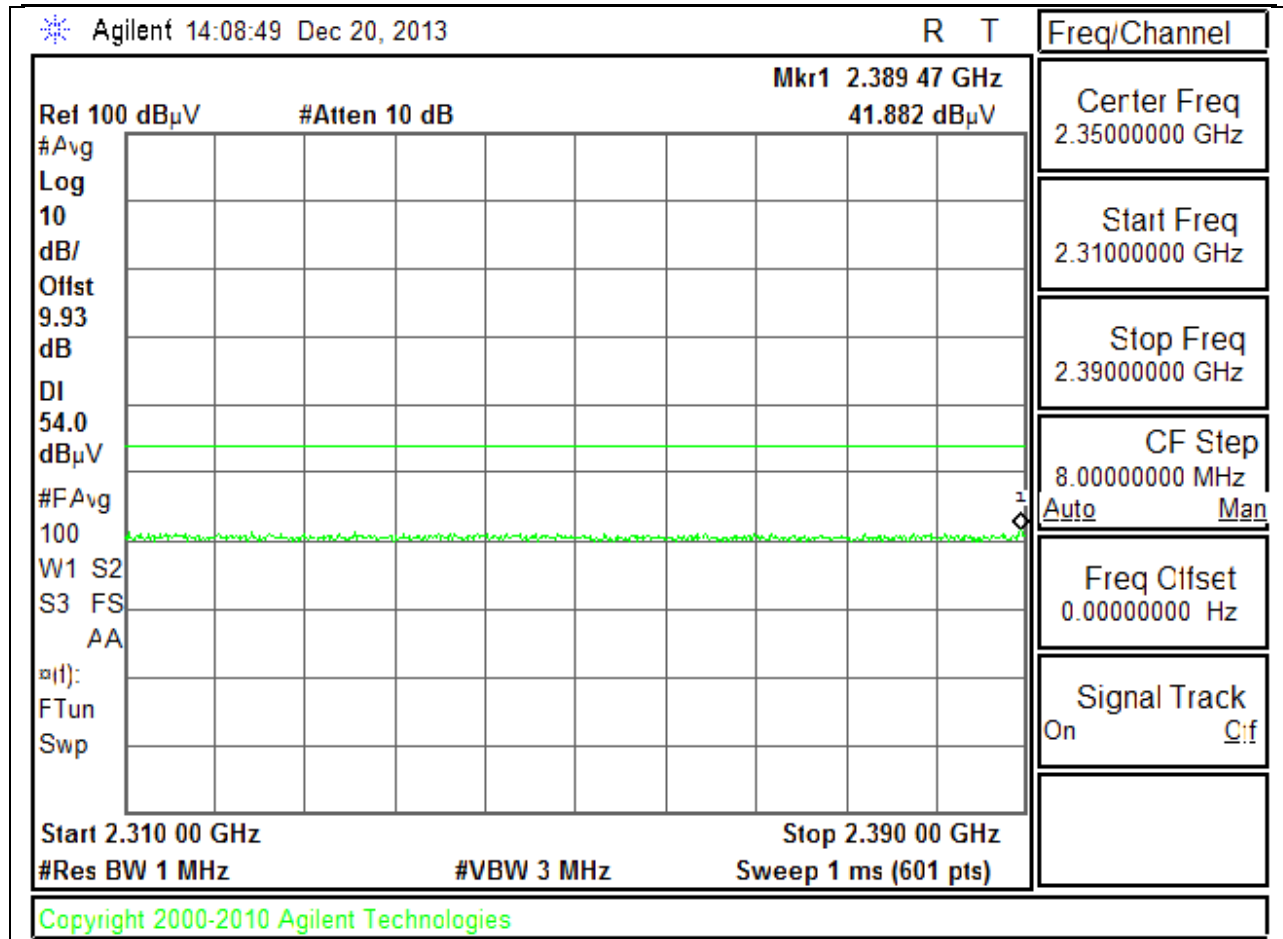
PK - Peak detector

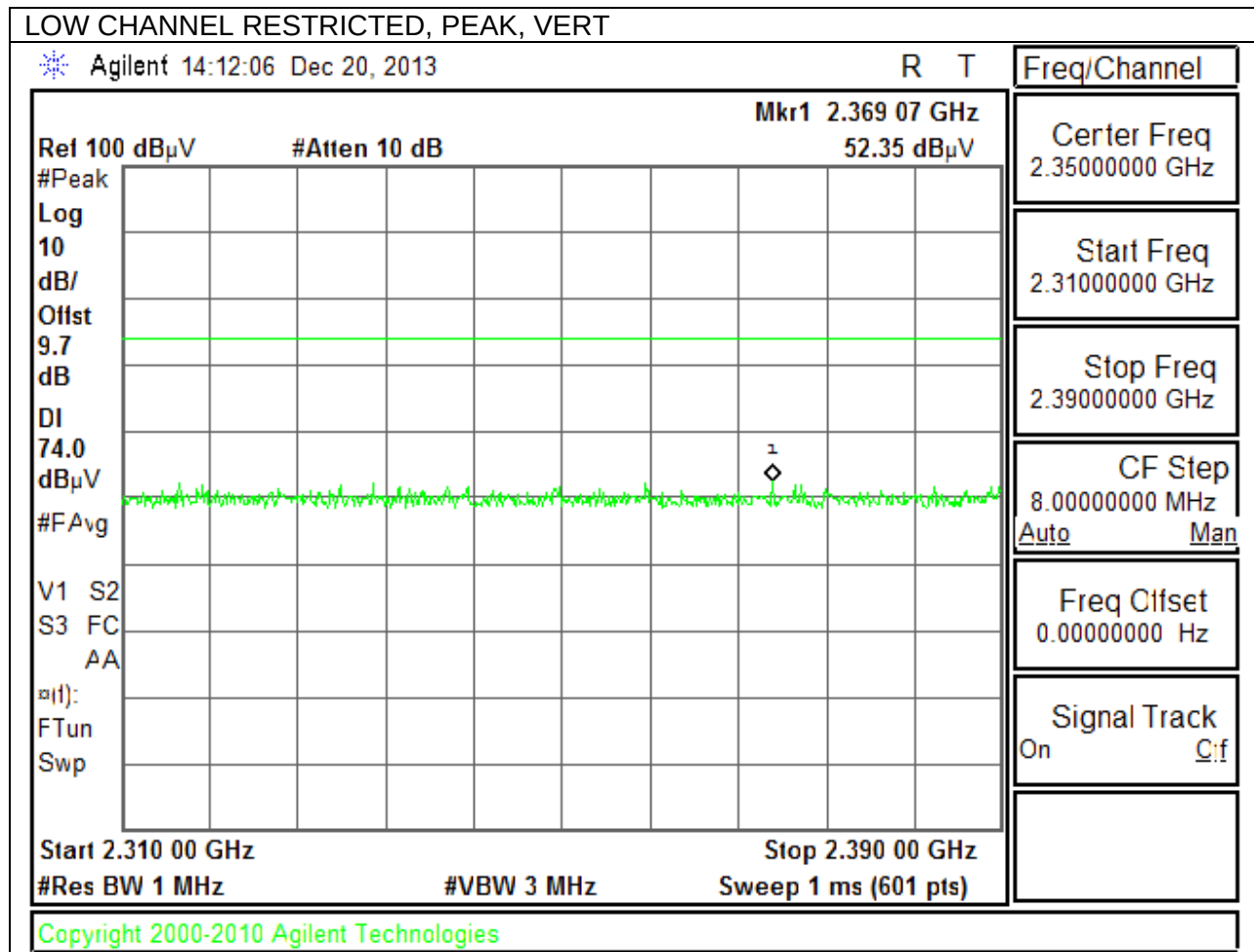
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

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

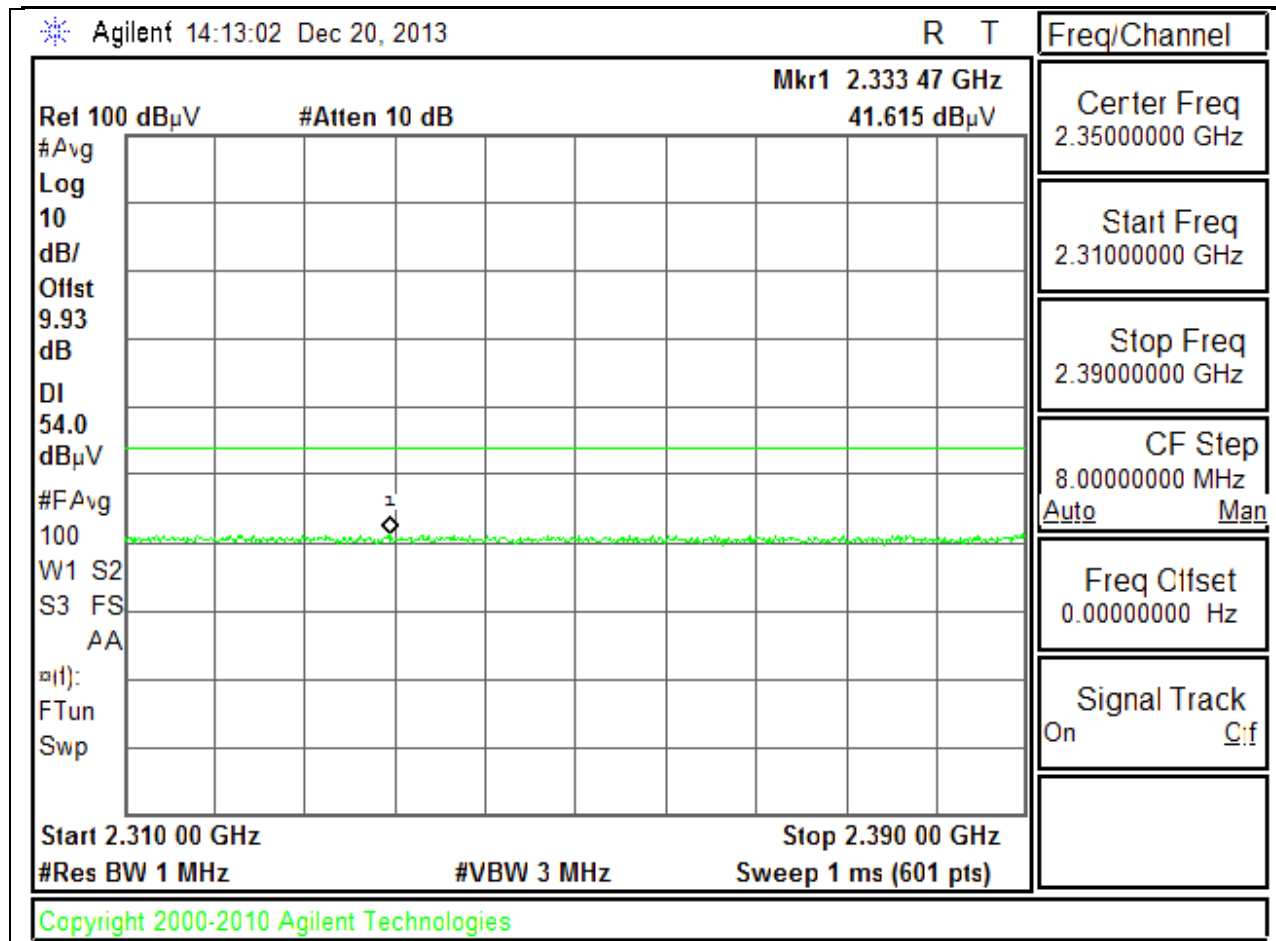


LOW CHANNEL RESTRICTED, AVERAGE, HORIZ

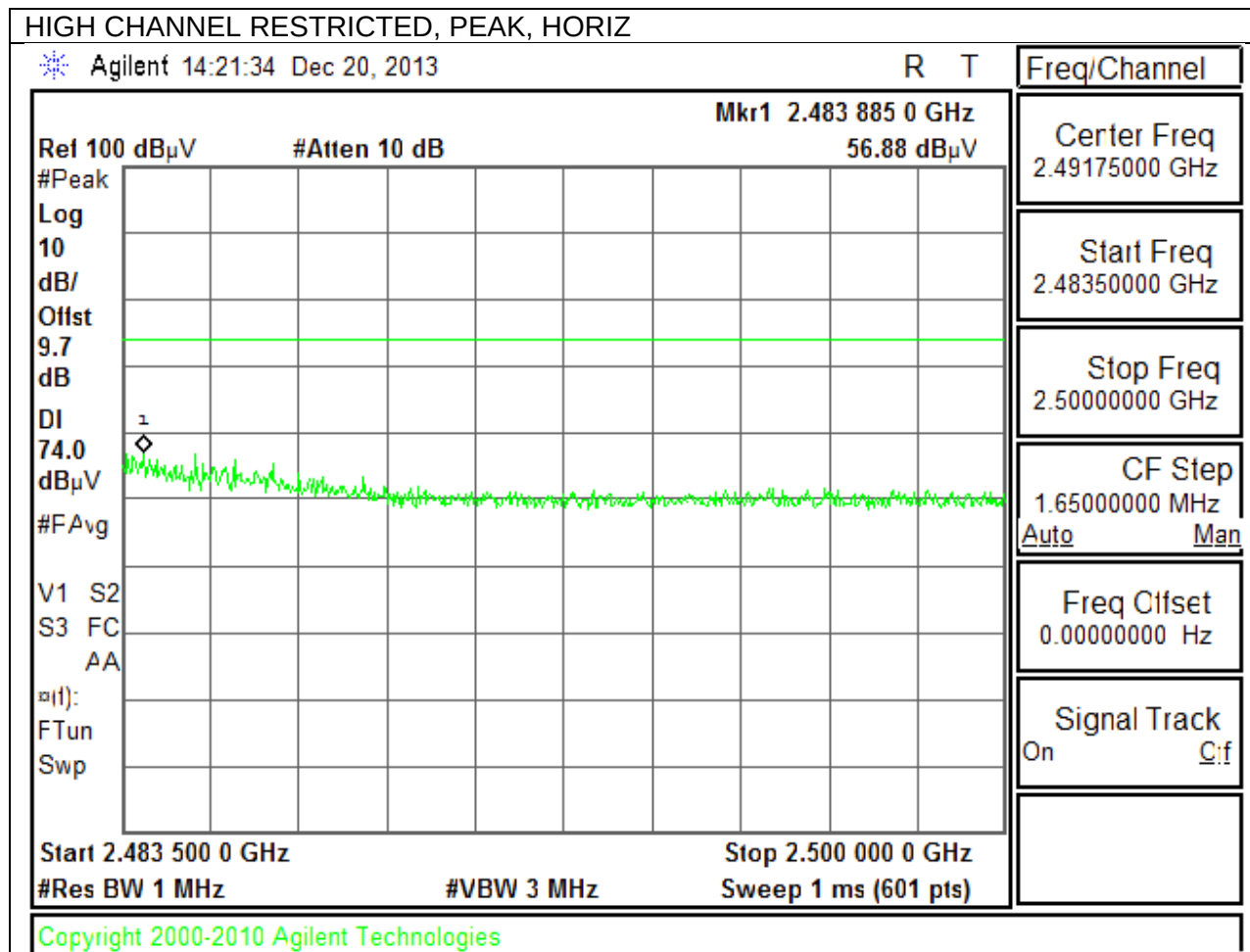




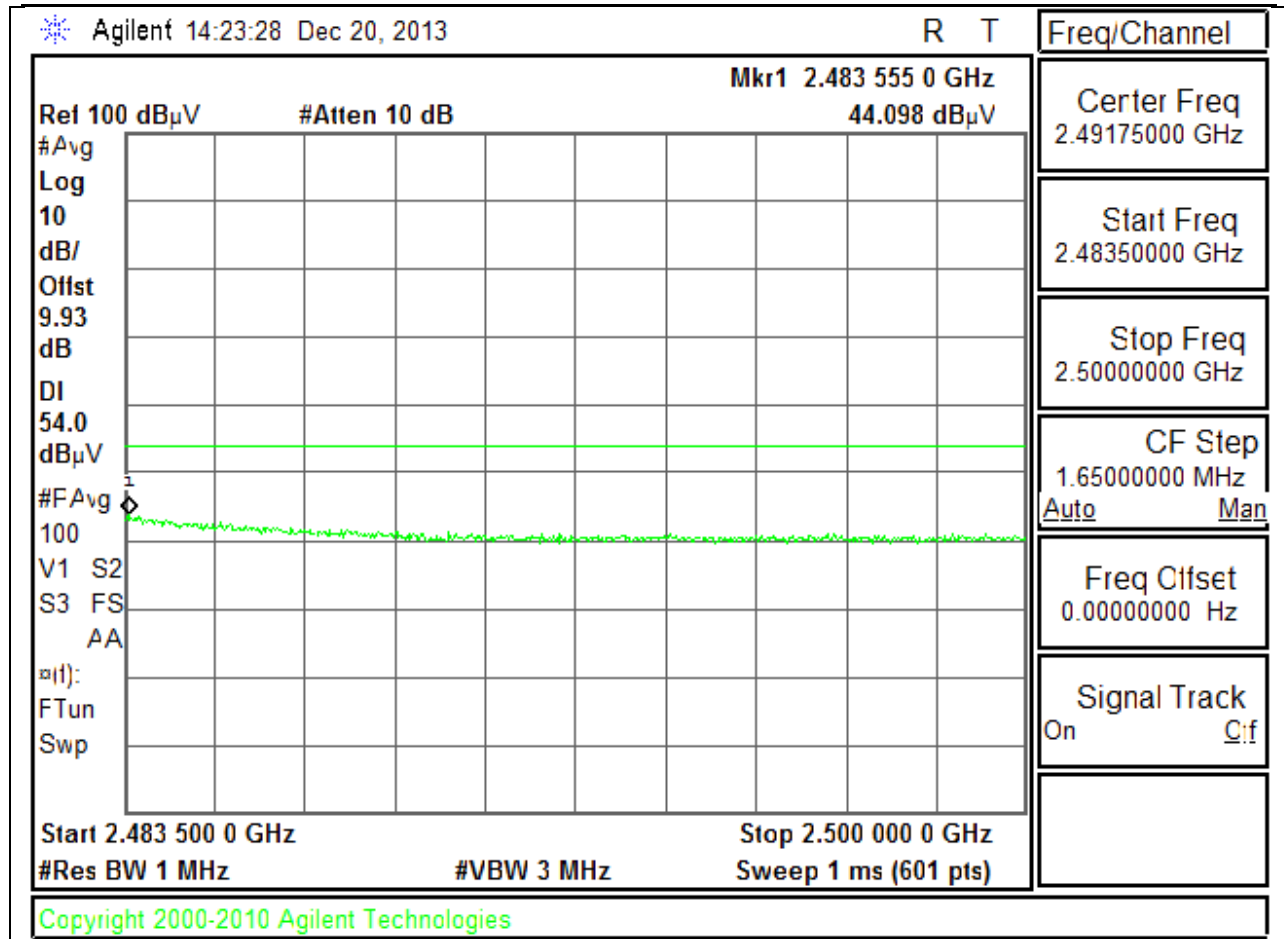
LOW CHANNEL RESTRICTED, AVERAGE, VERT

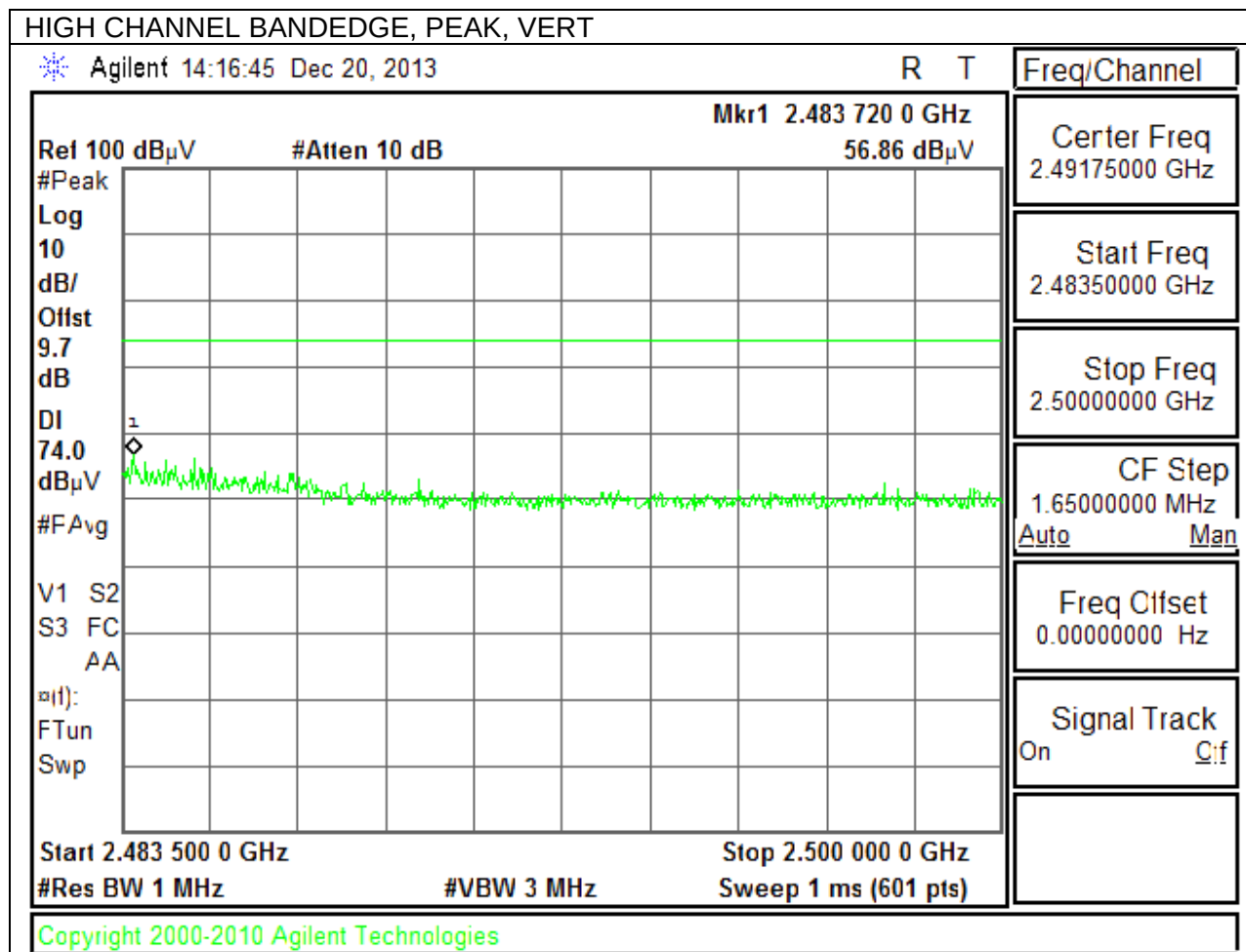


AUTHORIZED BANDEDGE (HIGH CHANNEL)

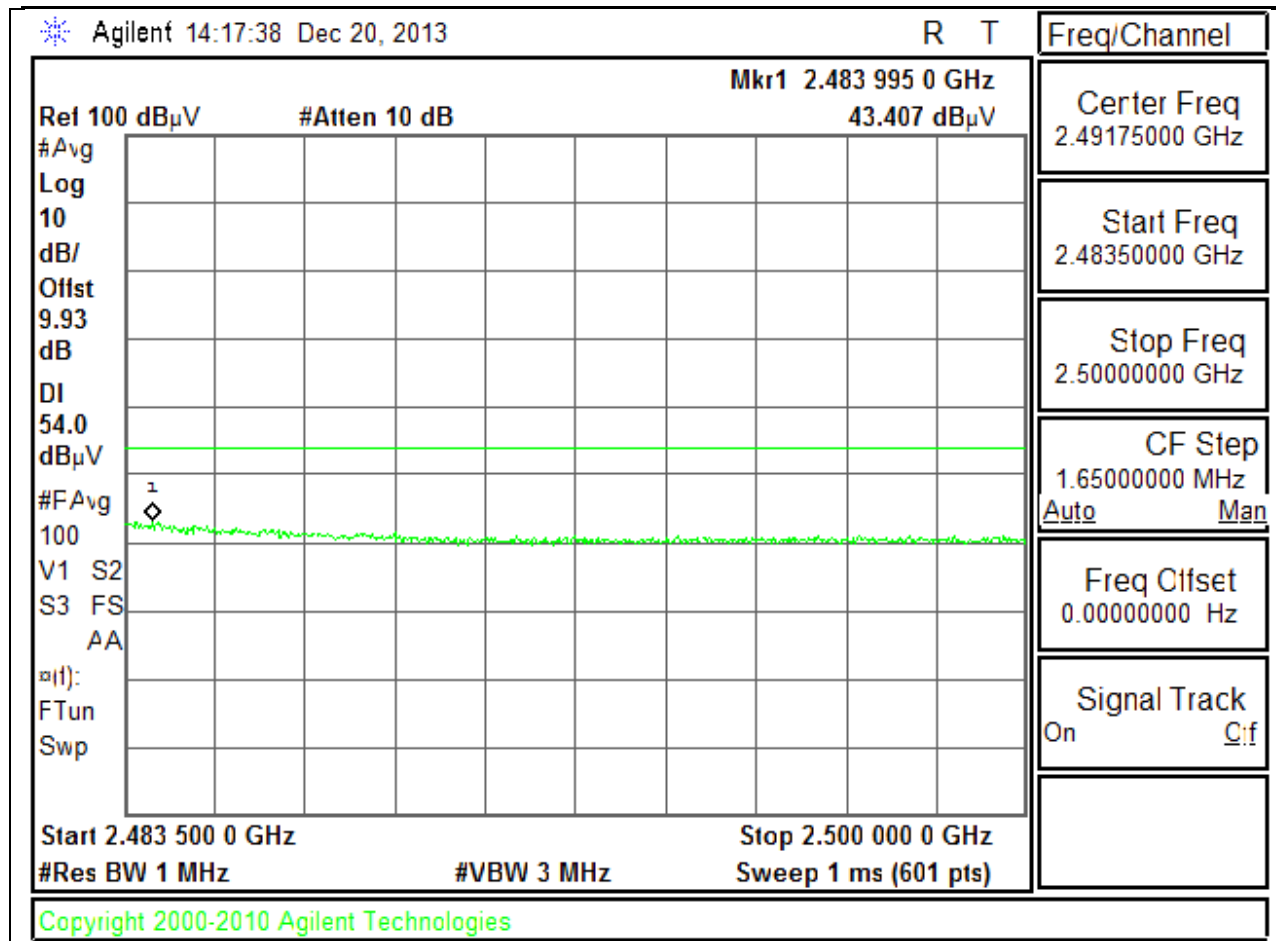


HIGH CHANNEL RESTRICTED, AVERAGE, HORIZ



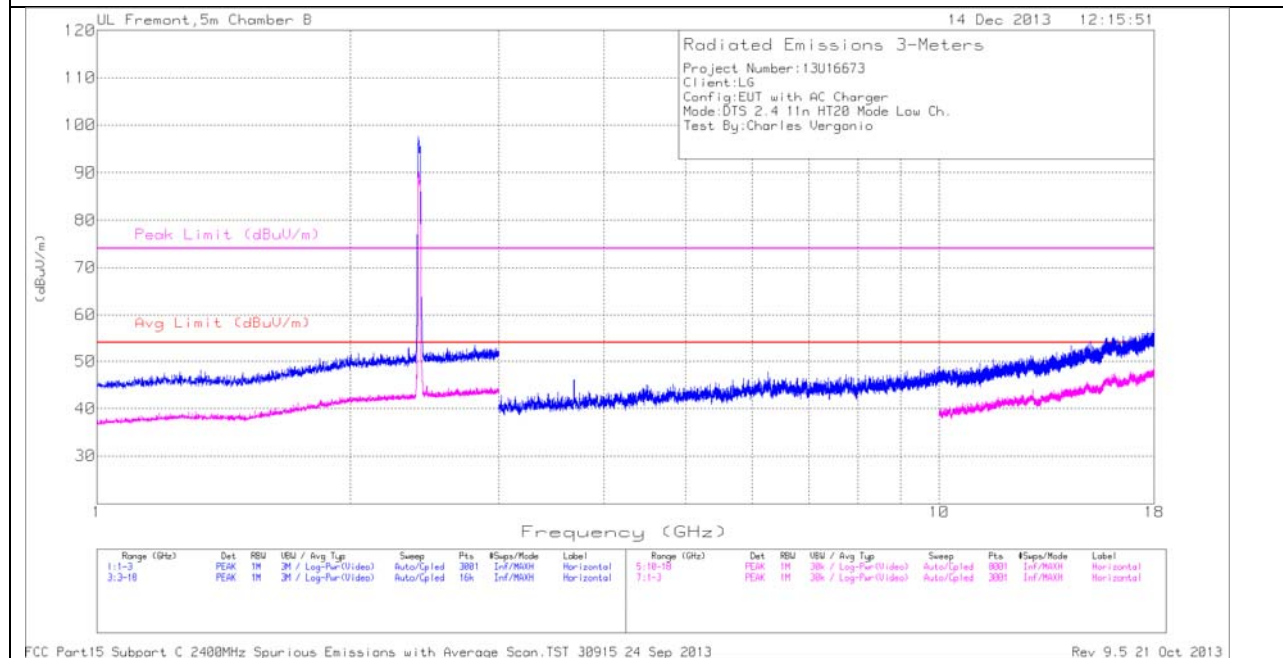


HIGH CHANNEL BANDEDGE, AVERAGE, VERT



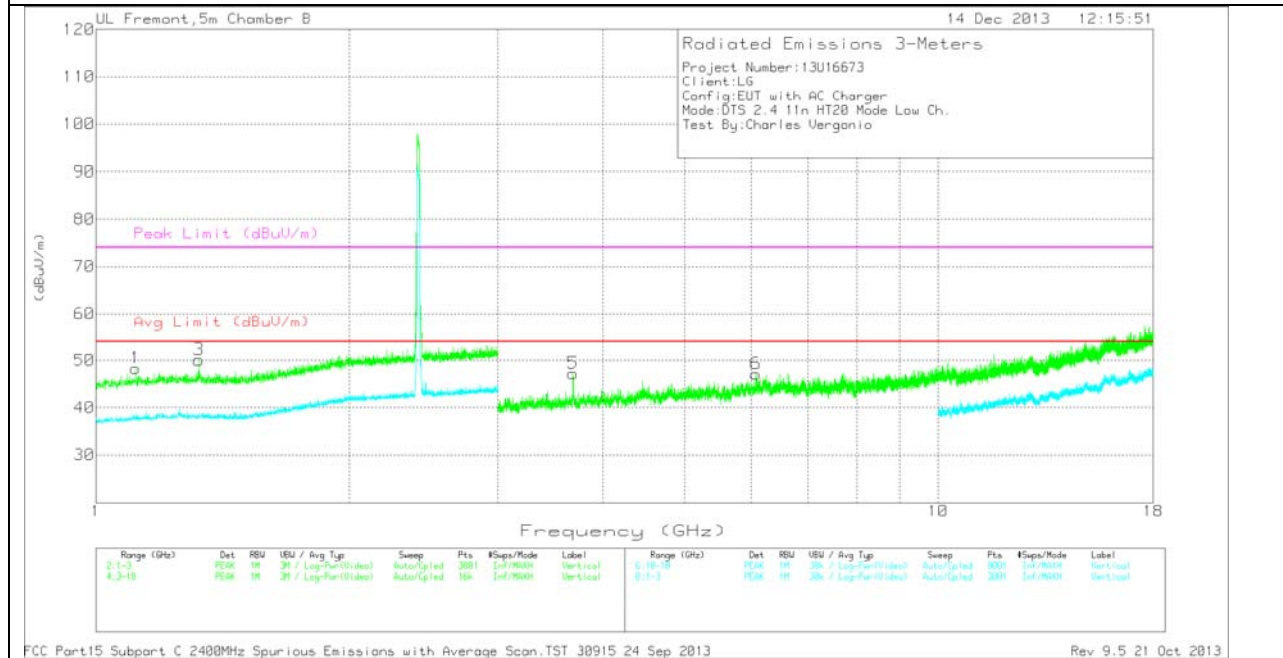
HARMONICS AND SPURIOUS EMISSIONS

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.

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.

LOW CHANNEL DATA

Trace Markers

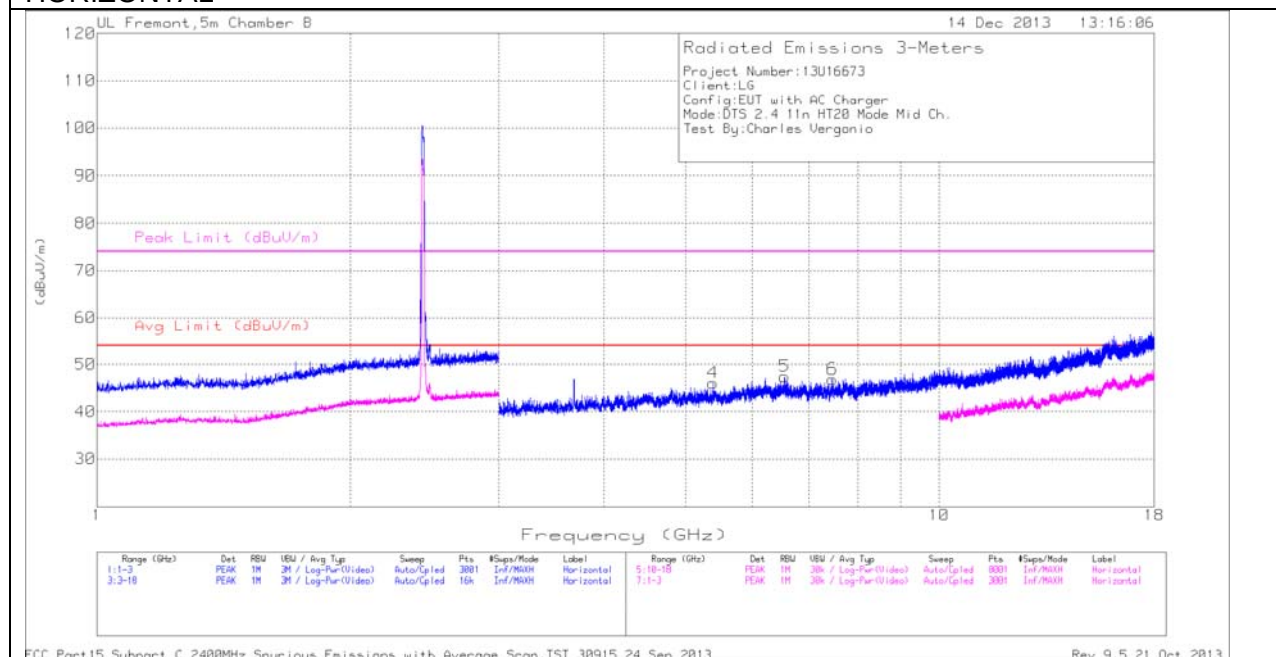
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb I/Filtr/Pad (dB)	Correct ed Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	1.109	35.6	Avg	27.9	-24.8	38.7	-	-	-	-	0-360	202	V
1	1.114	45.12	PK	27.9	-24.7	48.32	53.97	-5.65	74	-25.68	0-360	202	V
4	1.323	35.12	Avg	28.5	-24.6	39.02	-	-	-	-	0-360	99	V
3	1.325	46.2	PK	28.5	-24.6	50.1	53.97	-3.87	74	-23.9	0-360	202	V
5	3.683	44.84	PK	33.6	-31.2	47.24	53.97	-6.73	74	-26.76	0-360	99	V
6	6.076	40.34	PK	35.9	-29.1	47.14	53.97	-6.83	74	-26.86	0-360	202	V

PK - Peak detector

Avg - Video bandwidth < Resolution bandwidth

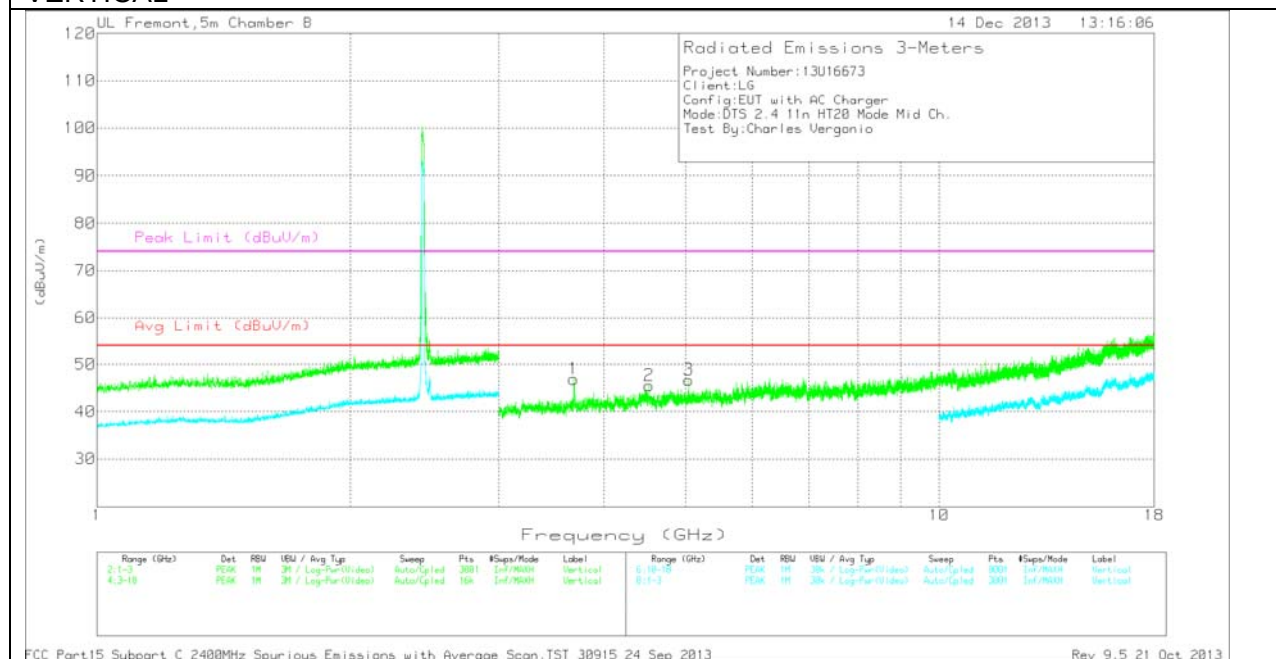
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

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.

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.

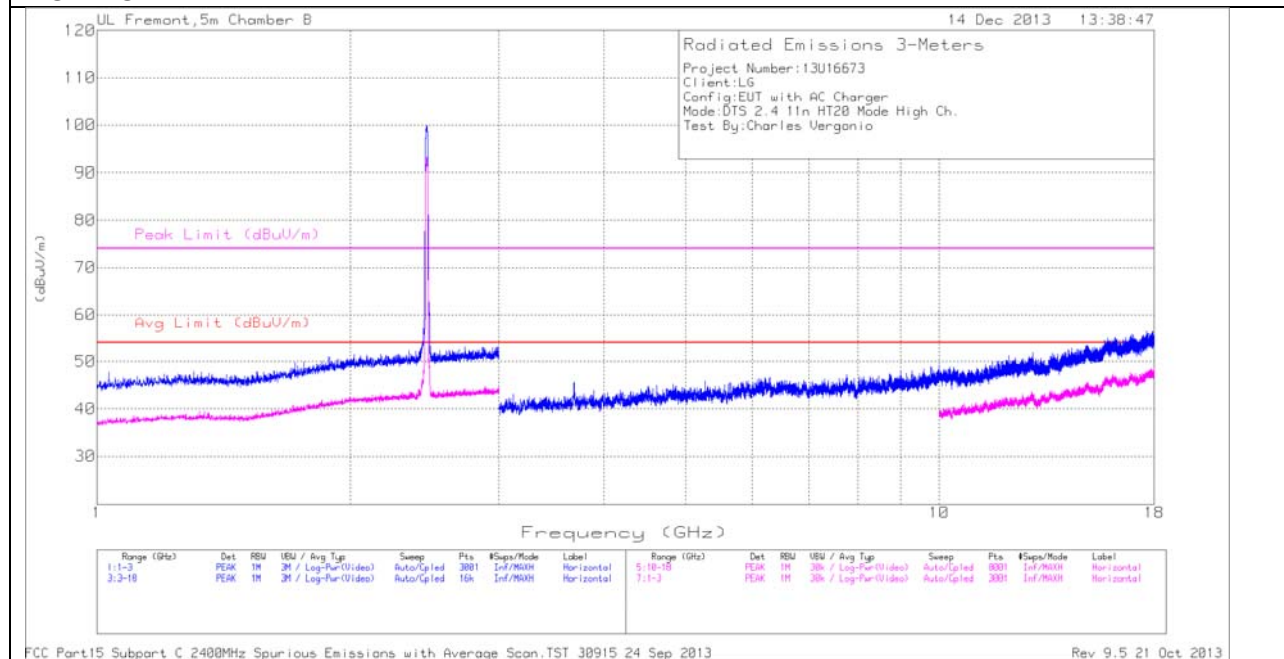
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb I/Filtr/Pad (dB)	Correct ed Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.682	44.49	PK	33.6	-31.2	46.89	53.97	-7.08	74	-27.11	0-360	99	V
2	4.523	40.31	PK	34.5	-29.3	45.51	53.97	-8.46	74	-28.49	0-360	99	V
3	5.045	40.71	PK	34.7	-28.7	46.71	53.97	-7.26	74	-27.29	0-360	202	V
4	5.387	39.66	PK	34.9	-28.5	46.06	53.97	-7.91	74	-27.94	0-360	99	H
5	6.552	38.81	PK	35.9	-27.3	47.41	53.97	-6.56	74	-26.59	0-360	201	H
6	7.469	37.74	PK	36	-26.9	46.84	53.97	-7.13	74	-27.16	0-360	99	H

PK - Peak detector

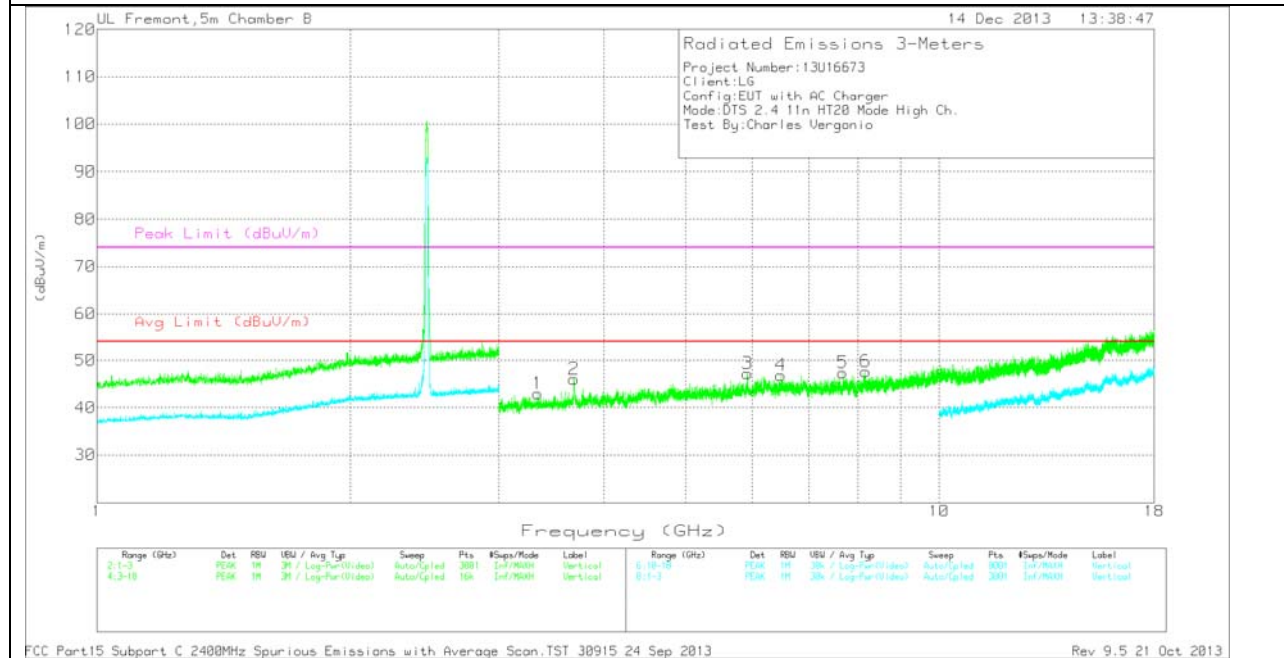
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

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.

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.

Trace Markers

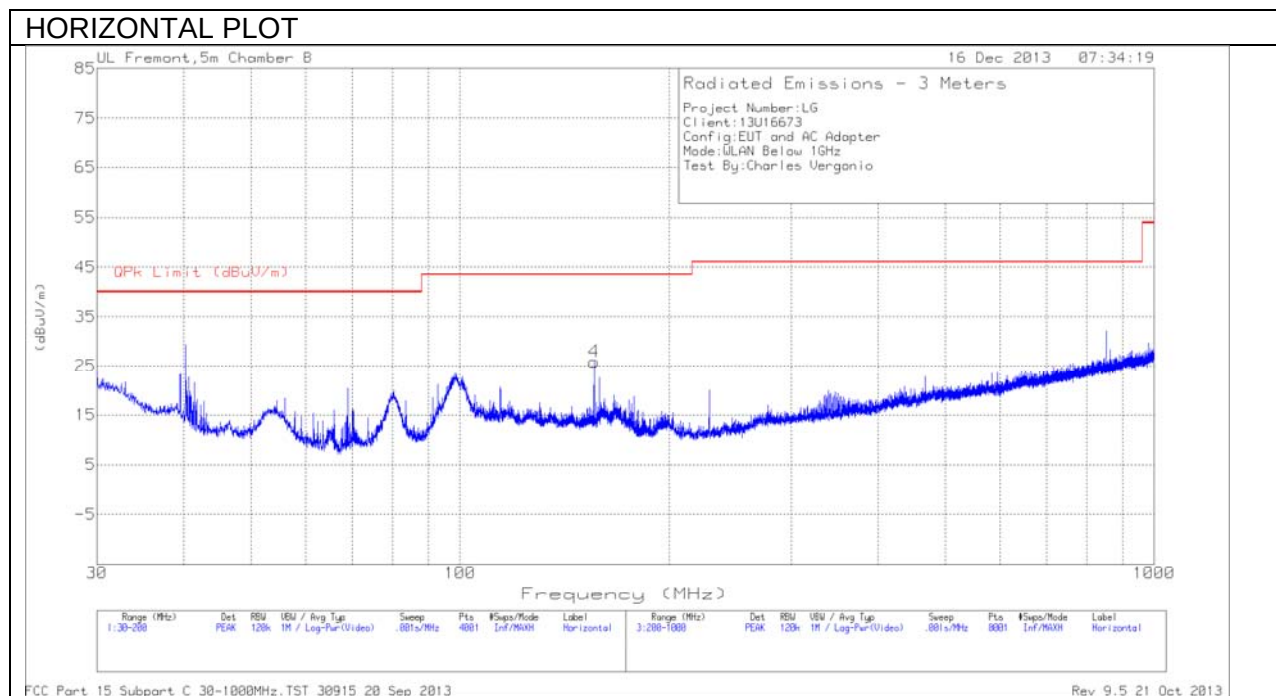
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb I/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	3.338	41.18	PK	33.3	-31.5	42.98	53.97	-10.99	74	-31.02	0-360	202	V
2	3.683	43.62	PK	33.6	-31.2	46.02	53.97	-7.95	74	-27.98	0-360	99	V
3	5.92	39.93	PK	35.7	-28.4	47.23	53.97	-6.74	74	-26.77	0-360	99	V
4	6.488	39.33	PK	35.9	-28.4	46.83	53.97	-7.14	74	-27.17	0-360	99	V
5	7.684	37.96	PK	36.1	-26.7	47.36	53.97	-6.61	74	-26.64	0-360	99	V
6	8.178	38.44	PK	36.1	-26.9	47.64	53.97	-6.33	74	-26.36	0-360	99	V

PK - Peak detector

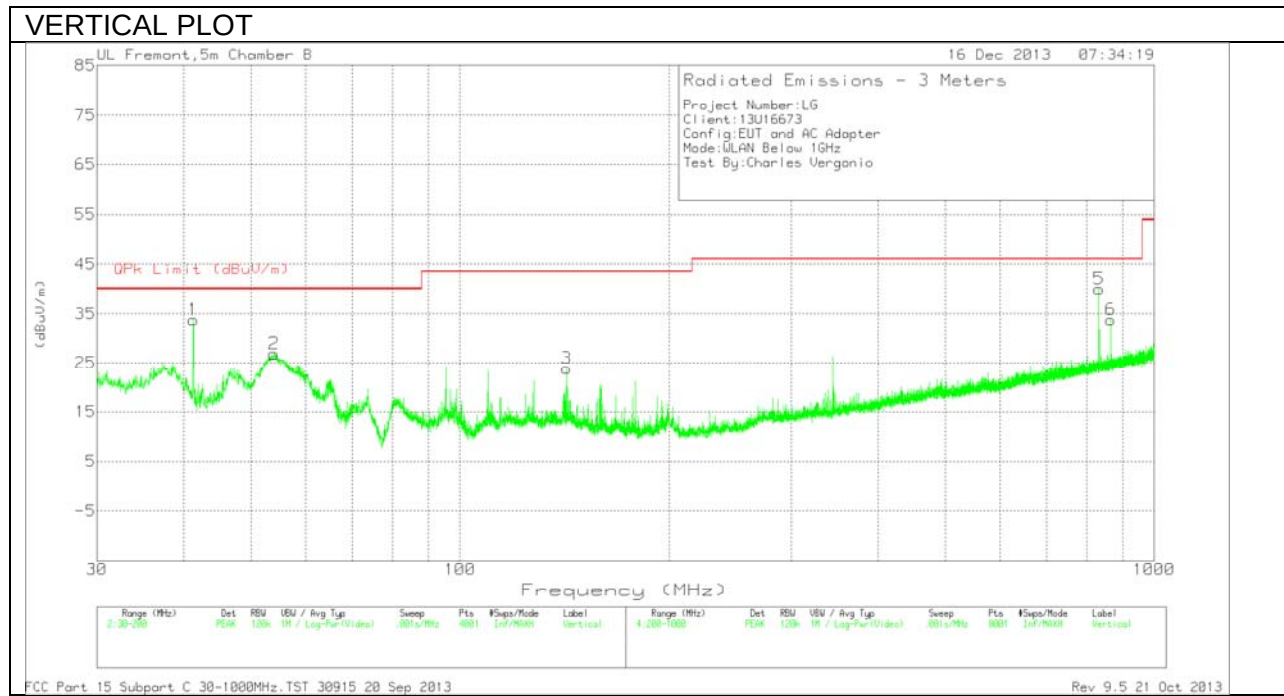
FCC Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 30915 24 Sep 2013 Rev 9.5 21 Oct 2013

10.3. WORST-CASE BELOW 1 GHz

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



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



Below 1G Data

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	41.305	49.95	PK	12.5	-28.7	33.75	40	-6.25	0-360	100	V
2	53.97	48.57	PK	6.9	-28.6	26.87	40	-13.13	0-360	100	V
3	142.4975	38.79	PK	12.7	-27.6	23.89	43.52	-19.63	0-360	100	V
4	156.0125	41.13	PK	12.1	-27.4	25.83	43.52	-17.69	0-360	200	H
5	832.8	41.98	PK	21.7	-23.7	39.98	46.02	-6.04	0-360	100	V
6	866.2	35.39	PK	21.7	-23.3	33.79	46.02	-12.23	0-360	100	V

PK - Peak detector

FCC Part 15 Subpart C 30-1000MHz.TST 30915 20 Sep 2013 Rev 9.5 21 Oct 2013

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.

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	.1905	48.52	PK	.1	0	48.62	64	-15.38	-	-
2	.1905	37.08	Av	.1	0	37.18	-	-	54	-16.82
3	.339	42.63	PK	.1	0	42.73	59.2	-16.47	-	-
4	.339	31.45	Av	.1	0	31.55	-	-	49.2	-17.65
5	1.59	42.17	PK	.1	.1	42.37	56	-13.63	-	-
6	1.59	31.4	Av	.1	.1	31.6	-	-	46	-14.4

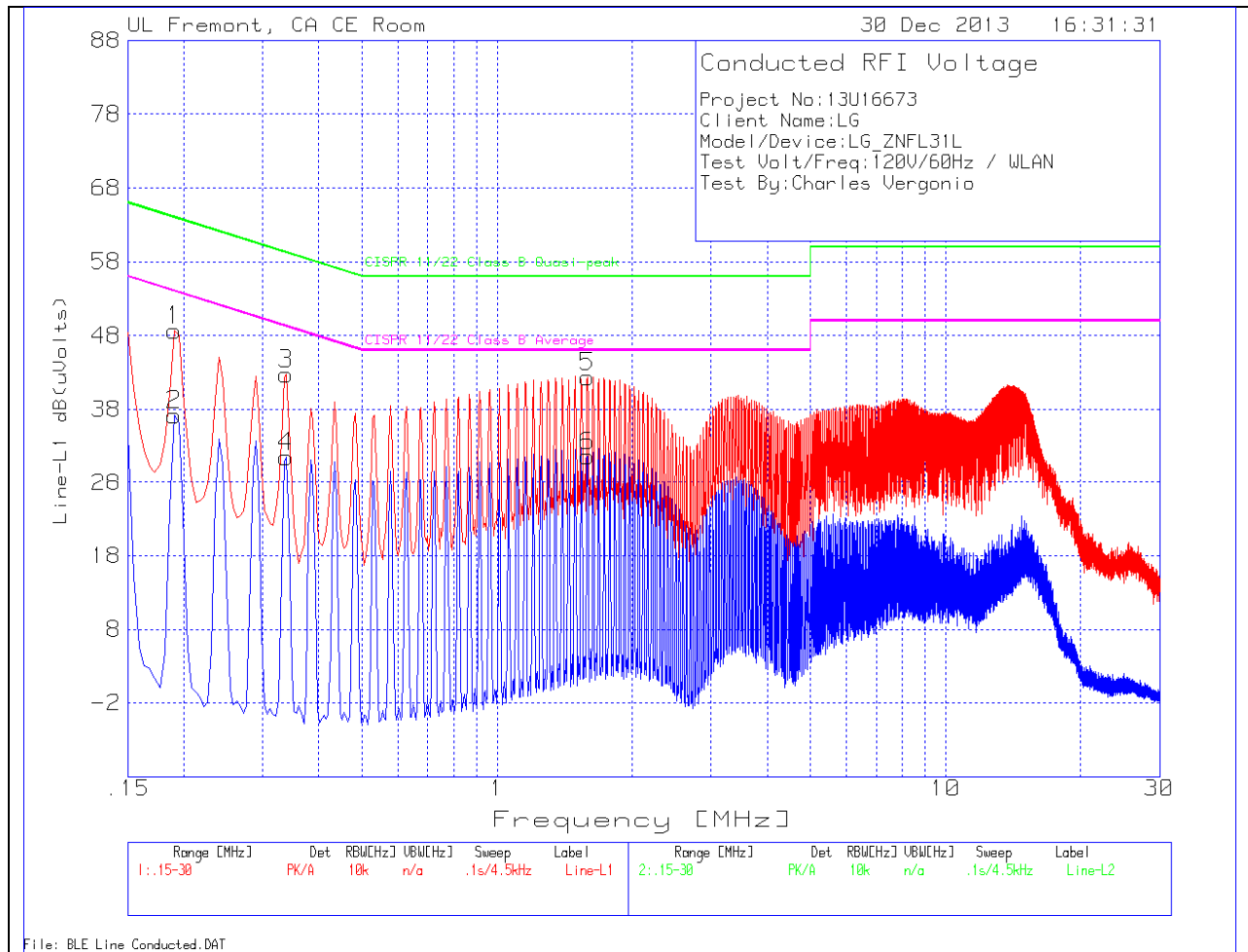
Line-L2 .15 - 30MHz

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)
7	.2895	39.62	PK	.1	0	39.72	60.5	-20.78	-	-
8	.2895	29.29	Av	.1	0	29.39	-	-	50.5	-21.11
9	.4335	39.42	PK	.1	0	39.52	57.2	-17.68	-	-
10	.4335	29.14	Av	.1	0	29.24	-	-	47.2	-17.96
11	1.491	40.97	PK	.1	.1	41.17	56	-14.83	-	-
12	1.491	30.98	Av	.1	.1	31.18	-	-	46	-14.82

PK - Peak detector
Av - average detection

LINE 1 RESULTS



LINE 2 RESULTS