FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER: SM-G316M/DS & SM-G316M

FCC ID: A3LSMG316M

REPORT NUMBER: 14I19534-E4

ISSUE DATE: DECEMBER 17, 2014

Prepared for
SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 443-742, KOREA

Prepared by
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/17/14	Initial Issue	P. Zhang

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

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

MODEL: SM-G316M/DS & SM-G316M

SERIAL NUMBER: RV1F91D027A (conducted) RV1F91CWXVA (radiated)

DATE TESTED: OCTOBER 2-3, 2014

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:

PENG ZHANG
CONSUMER TECHNOLOGY DIVISION
PROJECT LEAD
UL Verification Services Inc.

Tested By:

CHARLES VERGONIO
CONSUMER TECHNOLOGY DIVISION
LAB ENGINEER
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 C63.4-2009

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☒ Chamber A(IC: 2324B-1)	☐ Chamber D(IC: 2324B-4)
☐ Chamber B(IC: 2324B-2)	☐ Chamber E(IC: 2324B-5)
☐ Chamber C(IC: 2324B-3)	☐ Chamber F(IC: 2324B-6)
	☐ Chamber G(IC: 2324B-7)
	☐ Chamber H(IC: 2324B-8)

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm

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%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM Phone + Bluetooth & WLAN 2.4GHz 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	16	39.81
2412 - 2462	802.11g	13.3	21.38
2412 - 2462	802.11n HT20	11.3	13.49

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -0.7 dBi.

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 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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Samsung	ETA0U10IBE	N/A	N/A
Earphone	Samsung	GH59	N/A	N/A

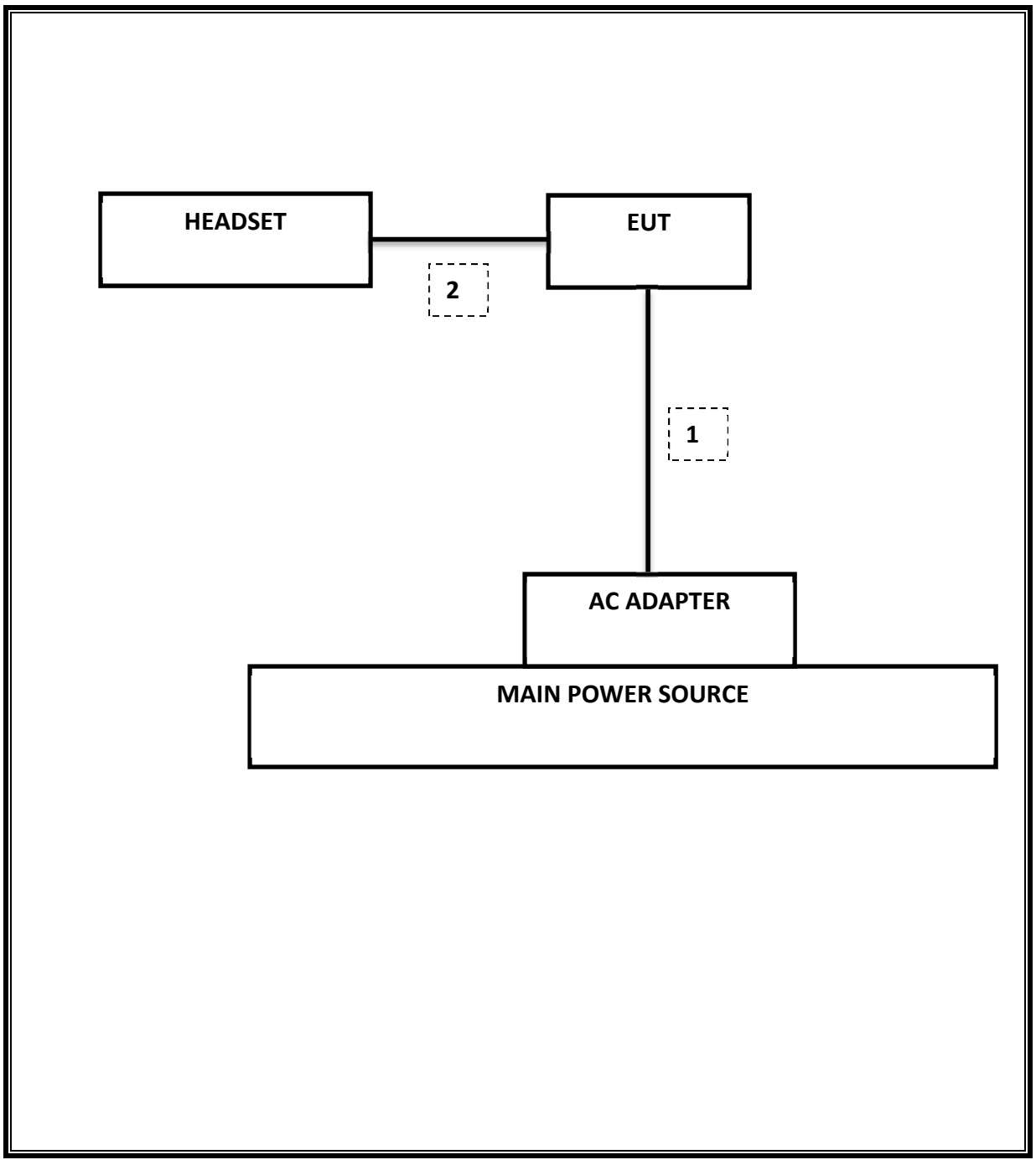
I/O CABLES

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 Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
Spectrum Analyzer,9KHz-40GHz	HP	8564E	C00986	04/01/15
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	08/13/15
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/18/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14
Antenna, Horn, 1-18 GHz	ETS	3117	C01022	02/21/15
Antenna, Horn,18- 26 GHz	ARA	MWH-1826/B	C00946	11/12/14
Antenna, Horn, 26-40 GHz	ARA	MWH-2640	C00891	06/28/15
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	03/06/15
RF Preamplifier, 100KHz -> 1300MHz	HP	TBD	C00825	06/01/15
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/15
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/15
AC Power Supply, 2,500VA 45-500Hz	Elgar-Ametek	CW2501M	F00013	CNR
RF Preamplifier, 1GHz - 40GHz	Miteq	NSP4000-SP2	C00990	08/20/15
Attenuator / Switch driver	HP	11713A	F00204	CNR
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	F00219	05/23/15
High Pass Filter 5GHz	Micro-Tronics	HPS17542	F00222	05/22/15
High Pass Filter 6GHz	Micro-Tronics	HPM17543	F00224	05/22/15

7. MEASUREMENT METHODS

KDB 558074 D01 DTS Meas Guidance v03r02: Measurement Procedure AVGPM-G is used for power and AVGPSD-3 is used for power spectral density.

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

Band edge emissions within Restricted Bands are measured using RMS with duty cycle factor offset method.

8. SUMMARY TABLE

The model FCC ID: A3LSMG316M shares the same enclosure and circuit board as mode FCC ID: A3LSMG316HU. The WLAN/Bluetooth circuitry and layout, including antenna, are almost identical between the two units. The WLAN/Bluetooth antenna and surrounding circuitry is the same between these two units.

After confirming through preliminary radiated emissions that the performance of the A3LSMG316HU DTS remains representative of this model (FCC ID: A3LSMG316M) test data for FCC ID: A3LSMG316HU is being submitted for this application.

Radiated emissions were fully re-evaluated against FCC Part 15B requirements for digital devices and results indicated no significant differences between the two versions.

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	9.01 MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-52.13 dBm
15.247	RSS-210 A8.4	TX conducted output power	<30dBm		Pass	16.0 dBm
15.247	RSS-210 A8.2	PSD	<8dBm		Pass	-15.53 dBm
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	47.6 dBuV
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	52.6 dBuV/m

9. ANTENNA PORT TEST RESULTS

9.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

Reference to KDB 558074 D01 DTS Meas Guidance v03r02: 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

9.1.1. 802.11b MODE IN THE 2.4 GHz BAND

	(MHz)	(MHz)	(MHz)
Low	2412	9.01	0.5
Mid	2437	9.05	0.5
High	2462	9.01	0.5
Worst		9.01	

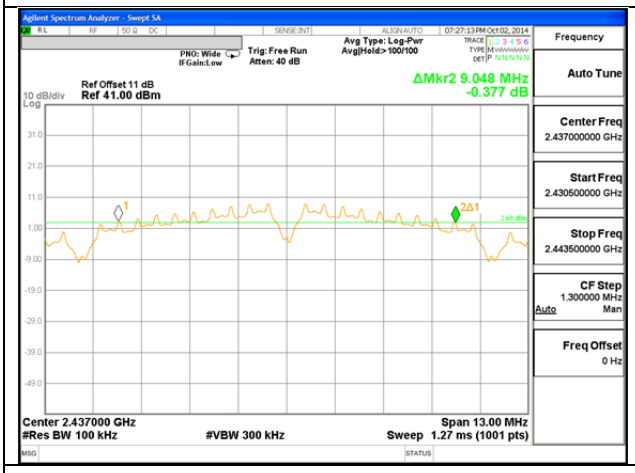
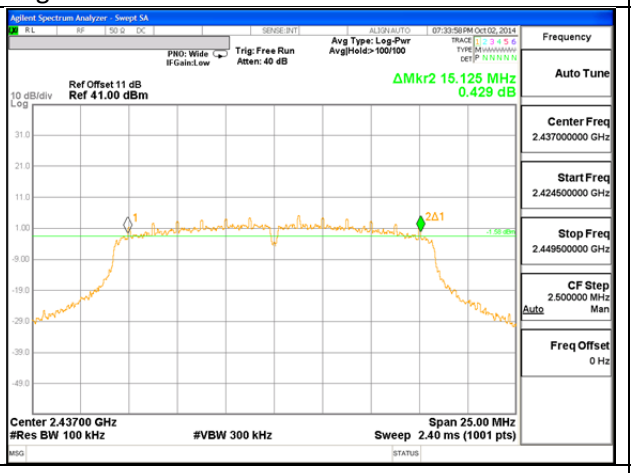
9.1.2. 802.11g MODE IN THE 2.4 GHz BAND

	(MHz)	(MHz)	(MHz)
Low	2412	15.15	0.5
Mid	2437	15.13	0.5
High	2462	15.12	0.5
Worst		15.12	

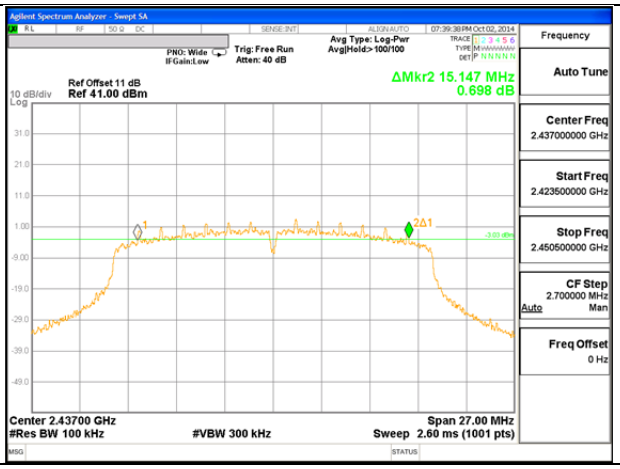
9.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

	(MHz)	(MHz)	(MHz)
Low	2412	15.16	0.5
Mid	2437	15.15	0.5
High	2462	15.15	0.5
Worst		15.15	

9.1.4. 6 dB BANDWIDTH MID CH PLOTS

11b	11g
	

11n HT20



9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

1.1.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	14.02
Mid	2437	13.97
High	2462	13.96
Worst		14.02

1.1.2. 802.11g MODE IN THE 2.4 GHz BAND

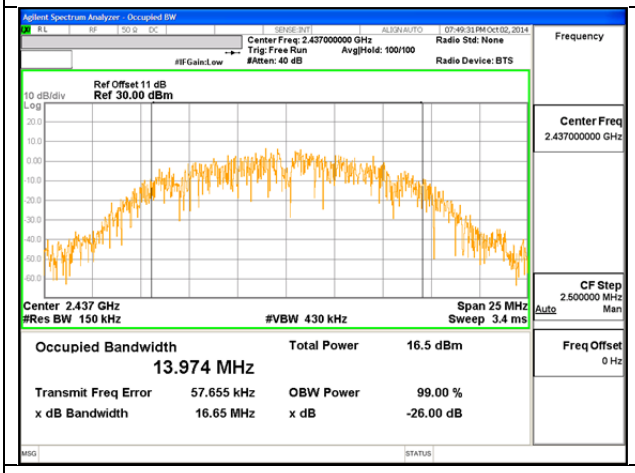
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.18
Mid	2437	16.20
High	2462	16.15
Worst		16.20

1.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

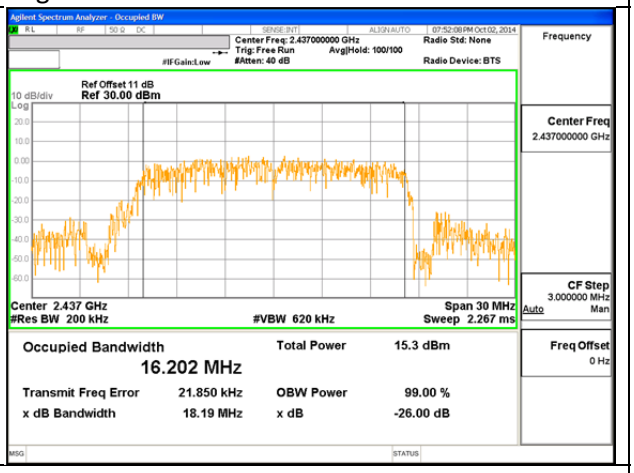
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.36
Mid	2437	17.52
High	2462	17.54
Worst		17.54

99% BANDWIDTH MID CH PLOTS

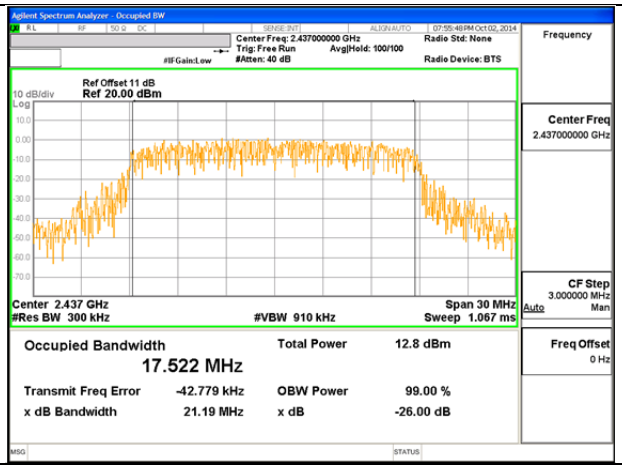
11b



11g



11n HT20



9.3. OUTPUT POWER

LIMITS

FCC §15.247

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

1.1.4. 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	-0.70	30.00	30	36	30.00
Mid	2437	-0.70	30.00	30	36	30.00
High	2462	-0.70	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	16.00	16.00	30.00	-14.00
Mid	2437	16.00	16.00	30.00	-14.00
High	2462	16.00	16.00	30.00	-14.00
Worst			16.00		

1.1.5. 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	-0.70	30.00	30	36	30.00
Mid	2437	-0.70	30.00	30	36	30.00
High	2462	-0.70	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	13.30	13.30	30.00	-16.70
Mid	2437	13.30	13.30	30.00	-16.70
High	2462	13.10	13.10	30.00	-16.90
Worst			13.30		

1.1.6. 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	-0.70	30.00	30	36	30.00
Mid	2437	-0.70	30.00	30	36	30.00
High	2462	-0.70	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	11.30	11.30	30.00	-18.70
Mid	2437	11.30	11.30	30.00	-18.70
High	2462	11.30	11.30	30.00	-18.70
Worst			11.30		

9.4. PSD

LIMITS

FCC §15.247

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

1.1.7. 802.11b MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.15	8.0	-14.2
Mid	2437	-5.53	8.0	-13.5
High	2462	-6.37	8.0	-14.4

1.1.8. 802.11g MODE IN THE 2.4 GHz BAND

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.86	8.0	-17.9
Mid	2437	-8.80	8.0	-16.8
High	2462	-9.98	8.0	-18.0

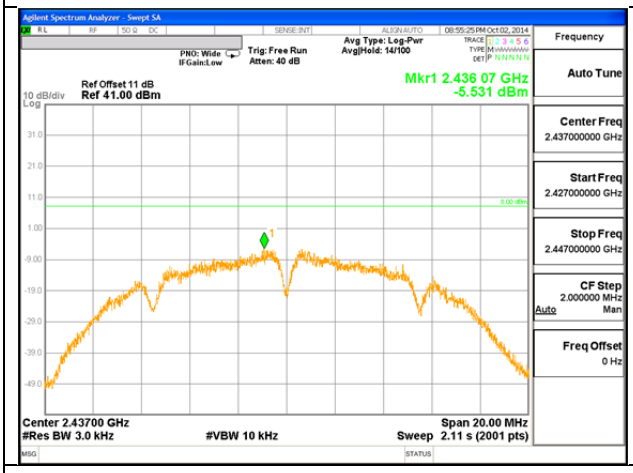
1.1.9. 802.11n HT20 MODE IN THE 2.4 GHz BAND

PSD Results

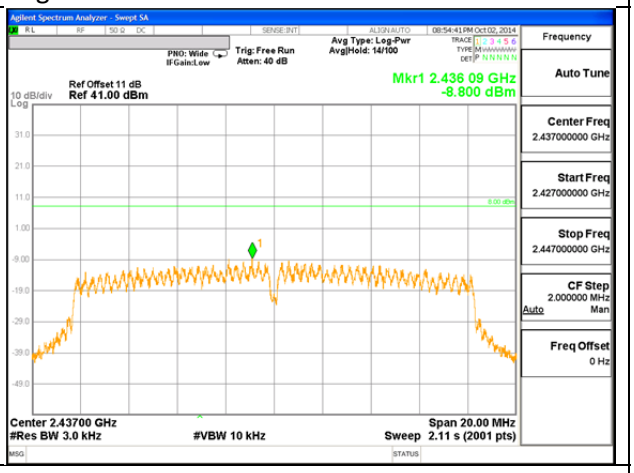
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-10.62	8.0	-18.6
Mid	2437	-11.23	8.0	-19.2
High	2462	-12.29	8.0	-20.3

9.4.1. PSD Chain 0 MID CH PLOTS

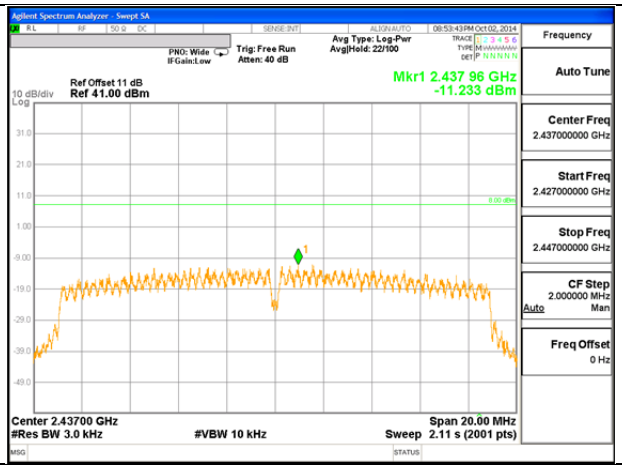
11b



11g



11n HT20



9.5. OUT-OF-BAND EMISSIONS

LIMITS

FCC §15.247 (d)

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

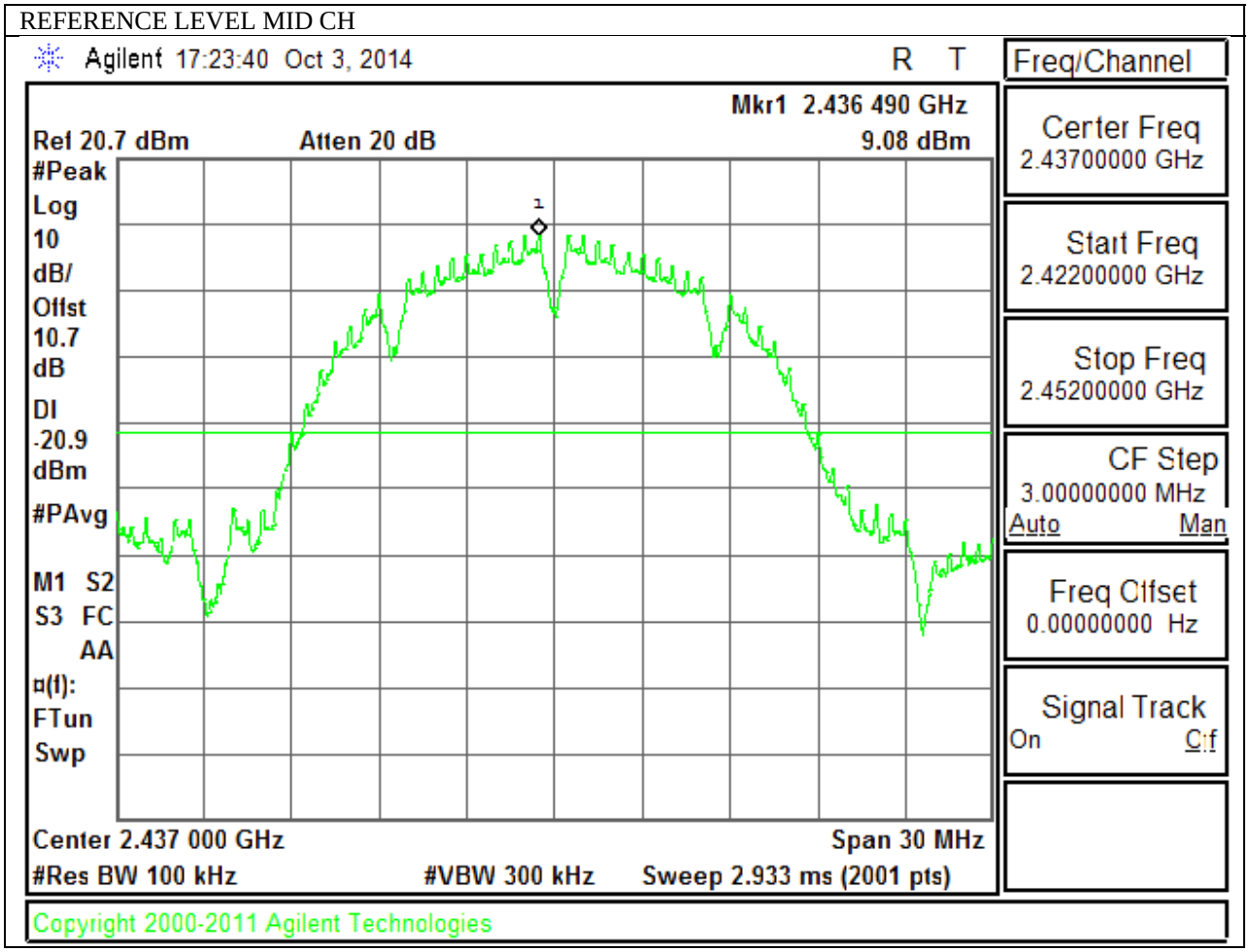
The transmitter output is connected to a spectrum analyzer with RBW = 100 kHz, VBW = 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge (where measurements to the general radiated limits will not be made) and out-of-band emissions.

RESULTS

1.1.10. 802.11b MODE IN THE 2.4 GHz BAND

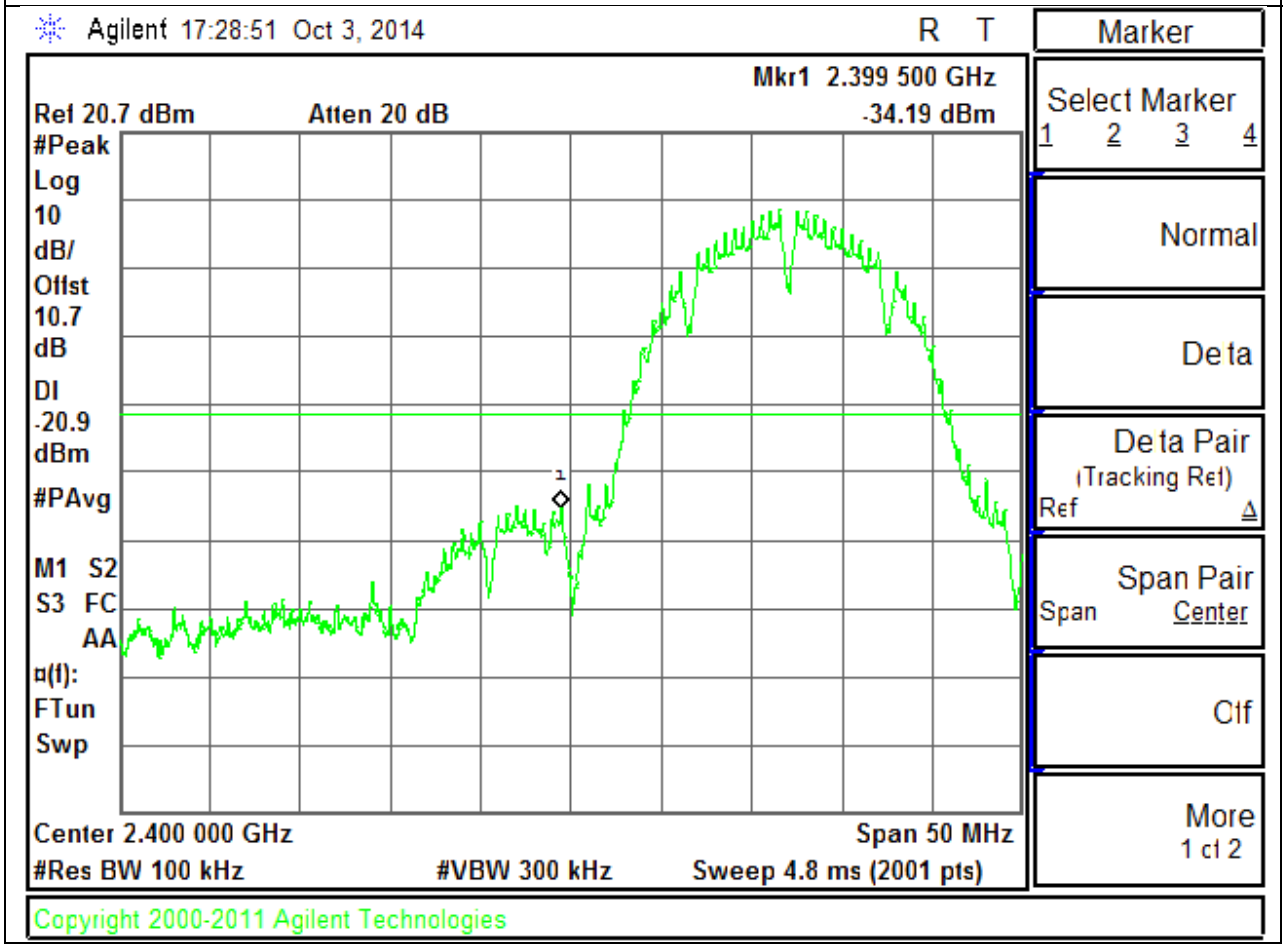
IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



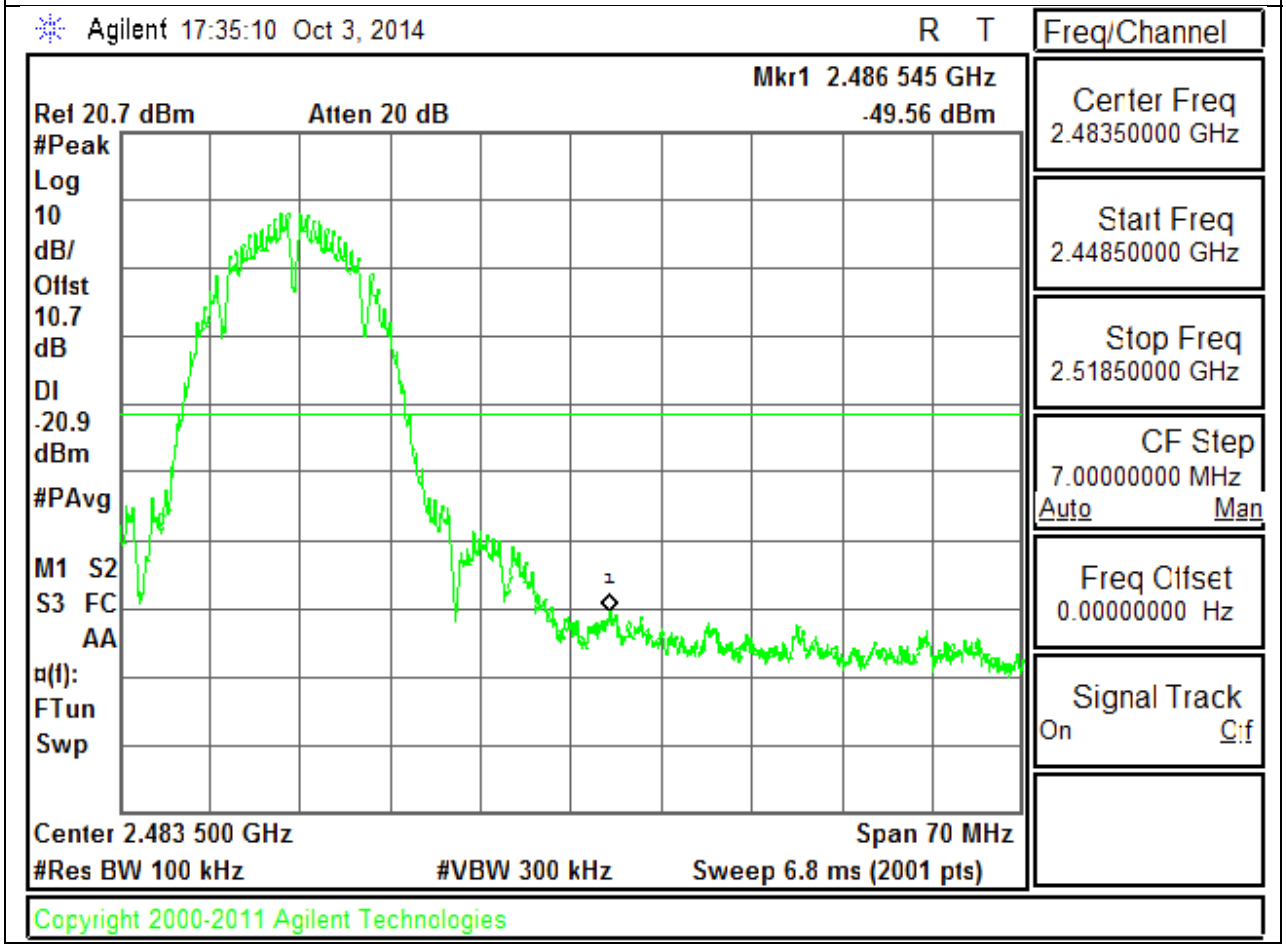
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



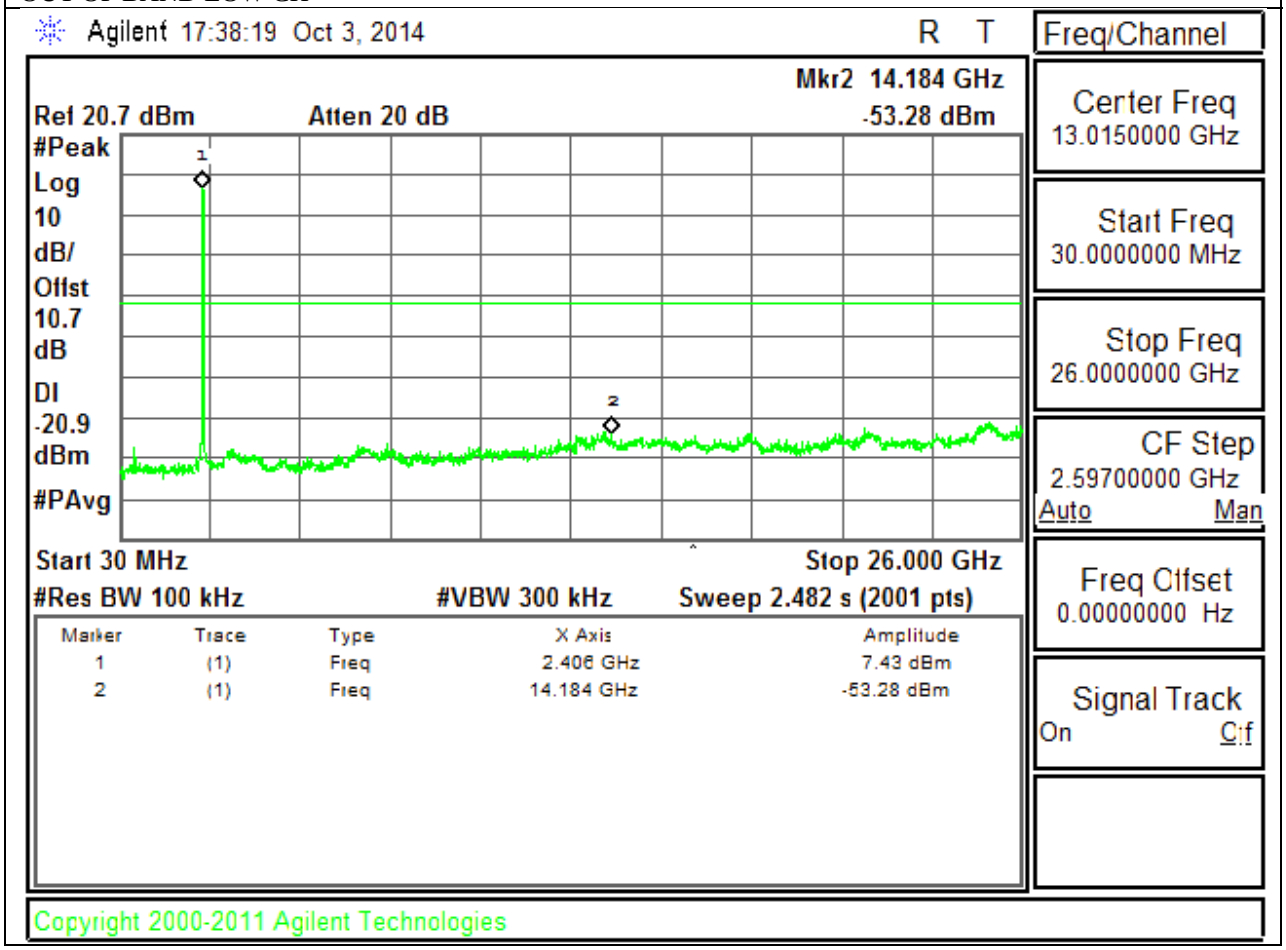
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH

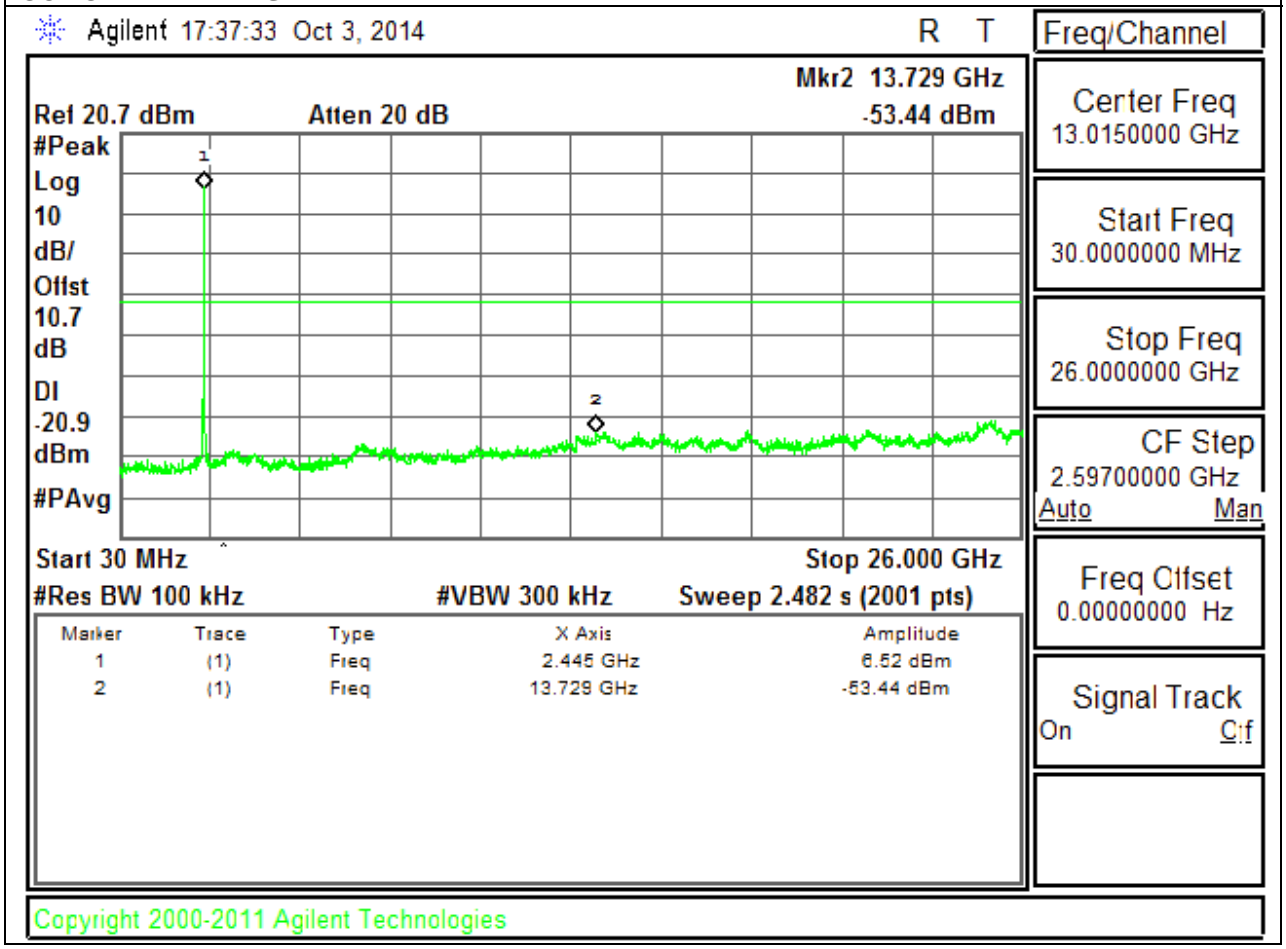


OUT-OF-BAND EMISSIONS

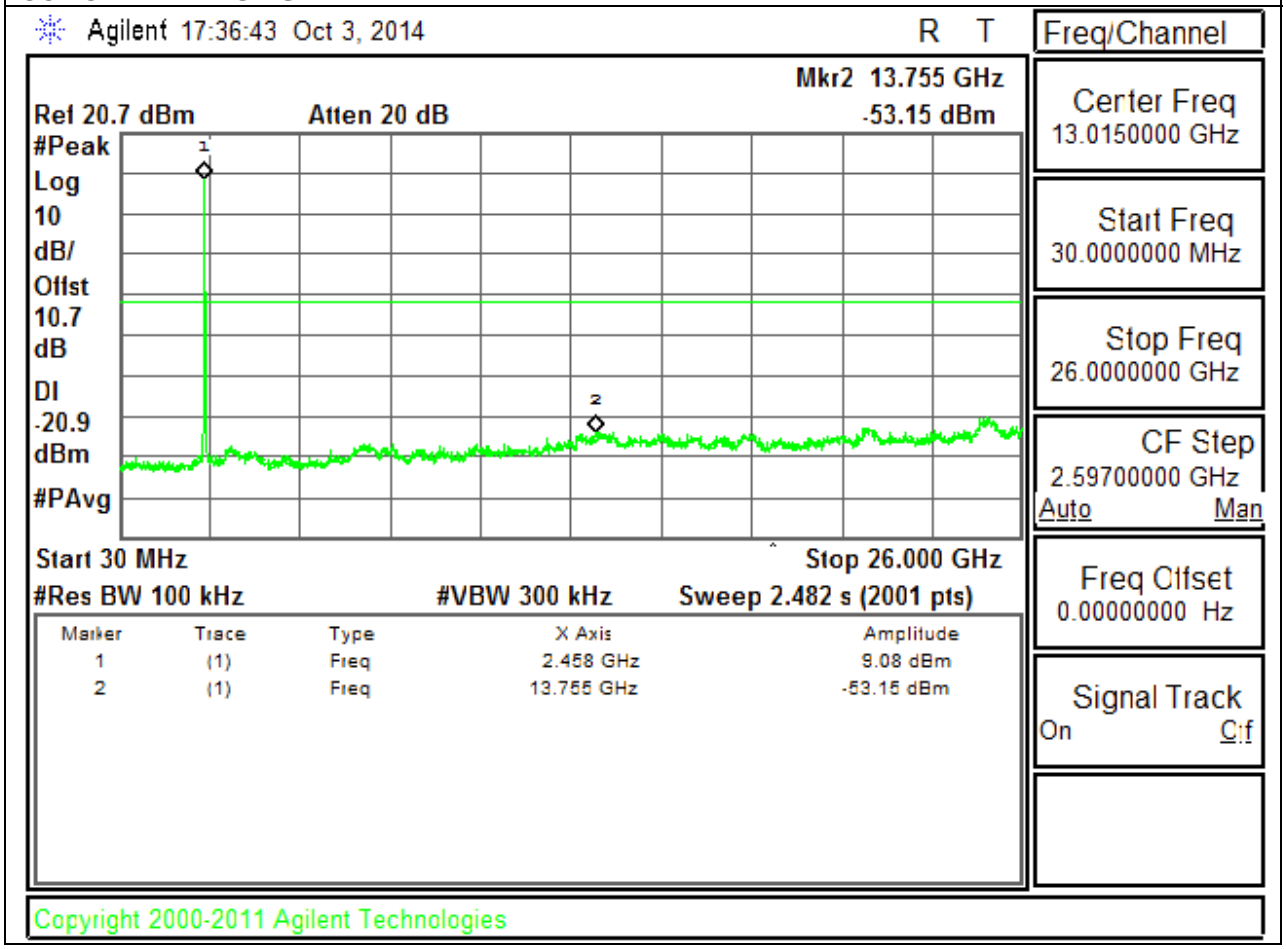
OUT OF BAND LOW CH



OUT OF BAND MID CH



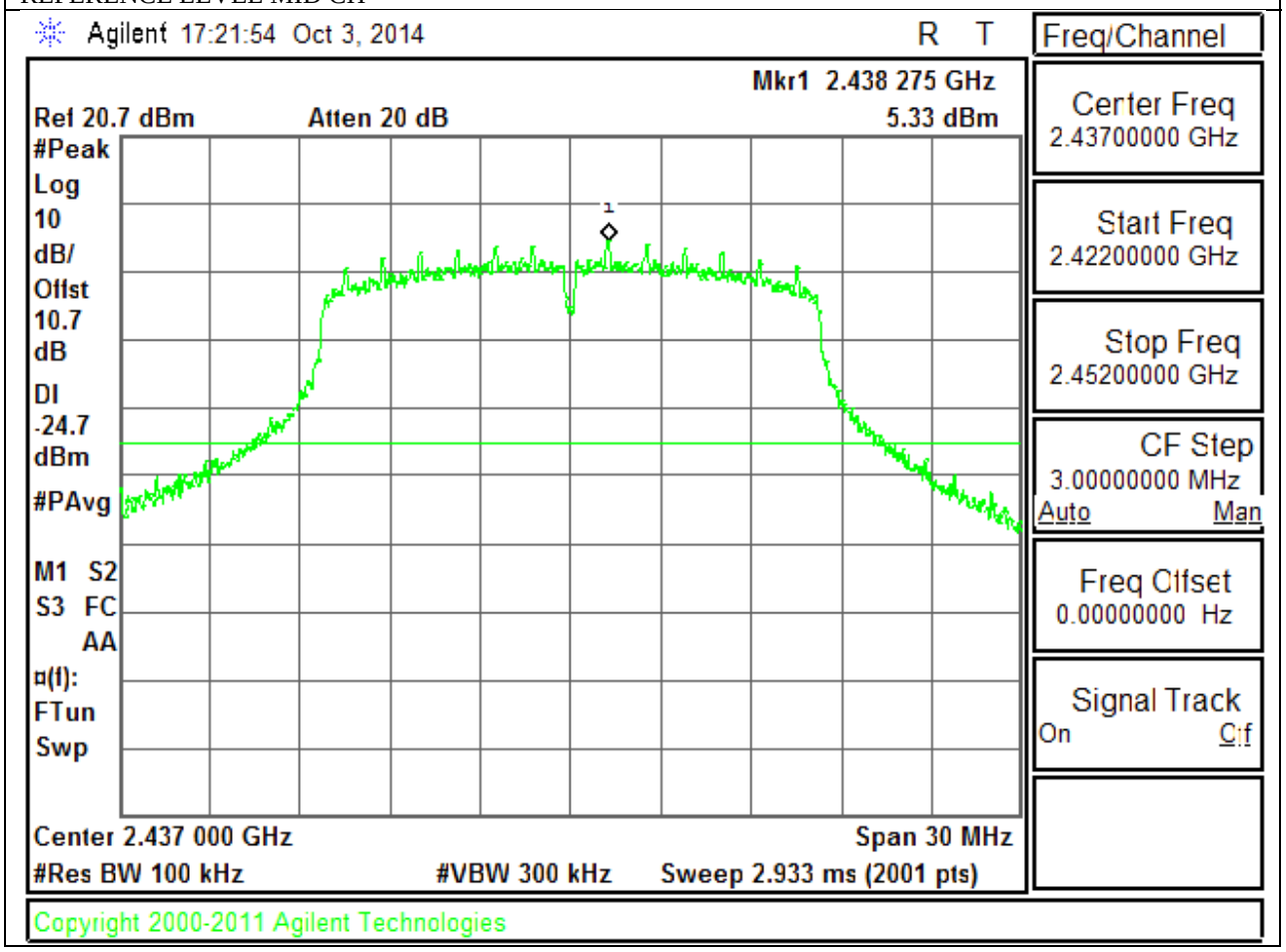
OUT OF BAND HIGH CH



1.1.11. 802.11g MODE IN THE 2.4 GHz BAND

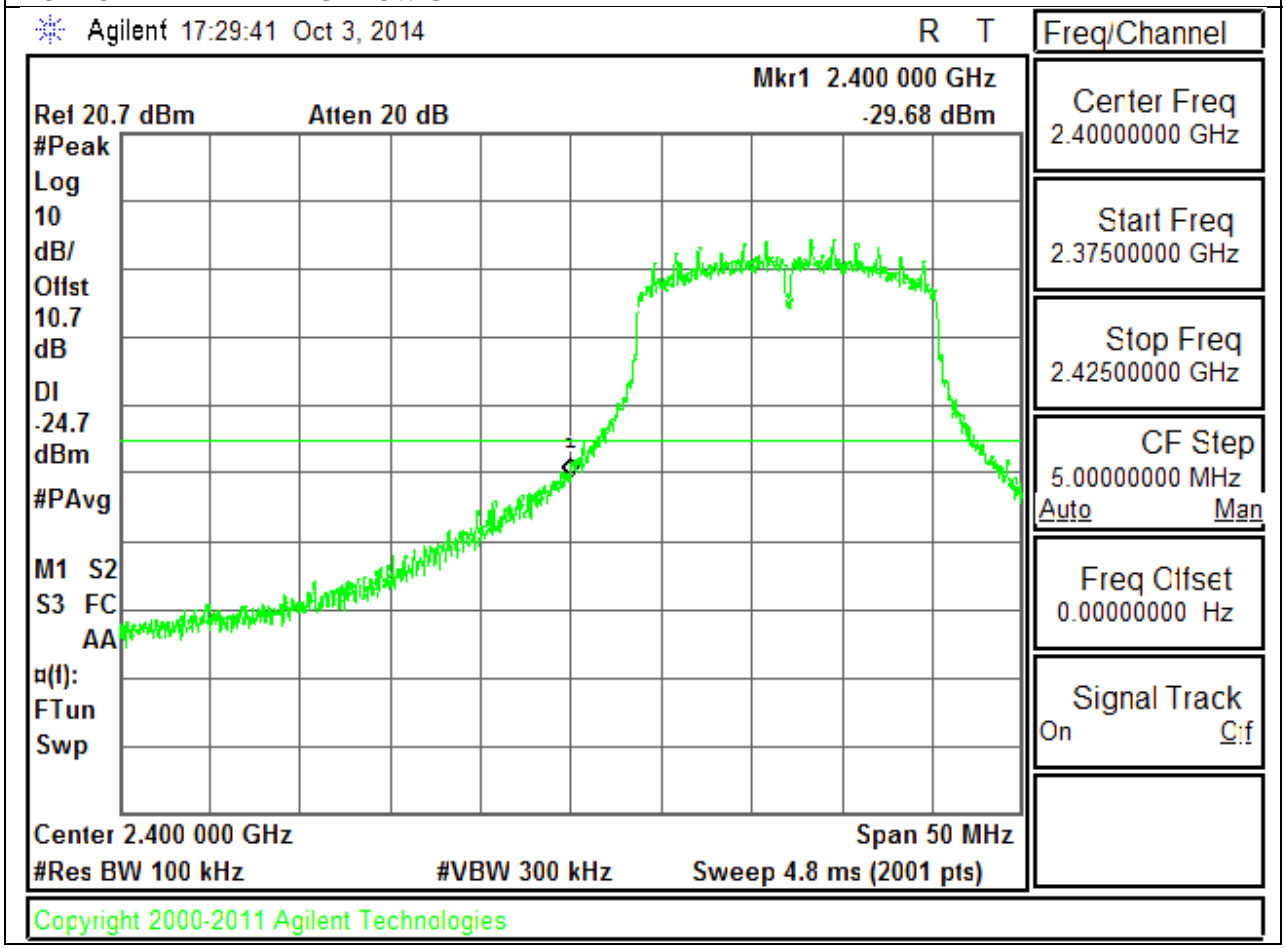
IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



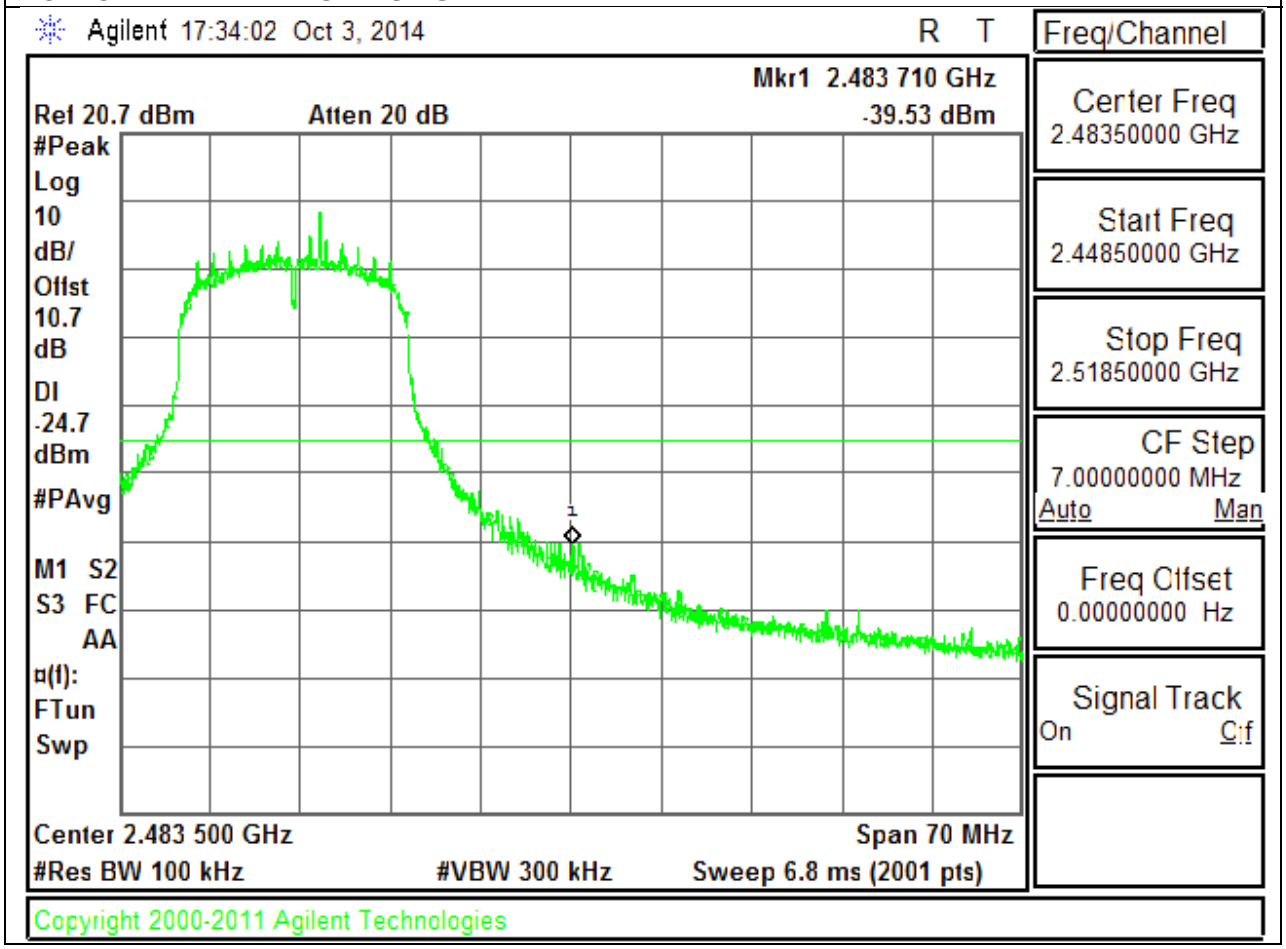
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



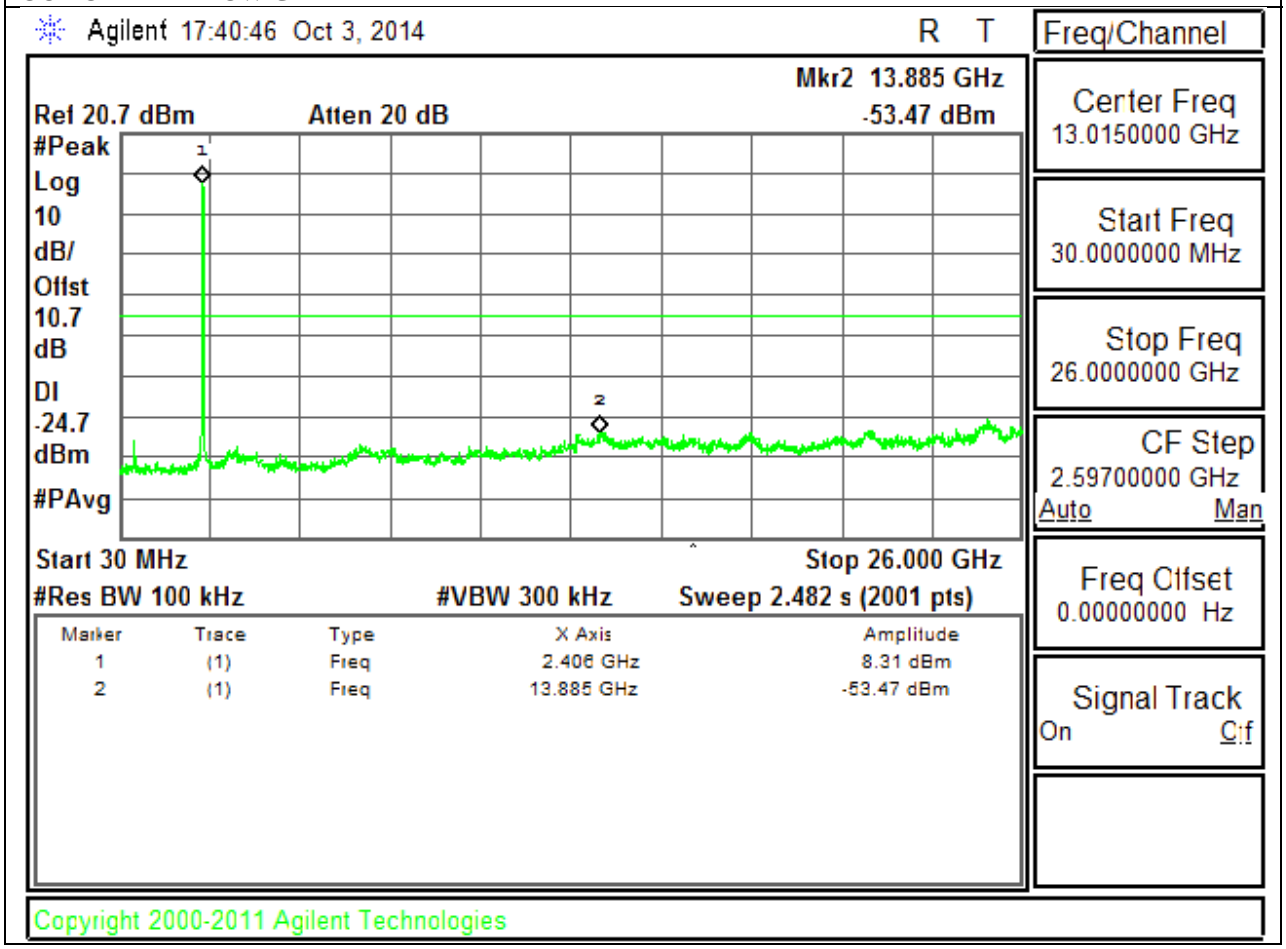
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH

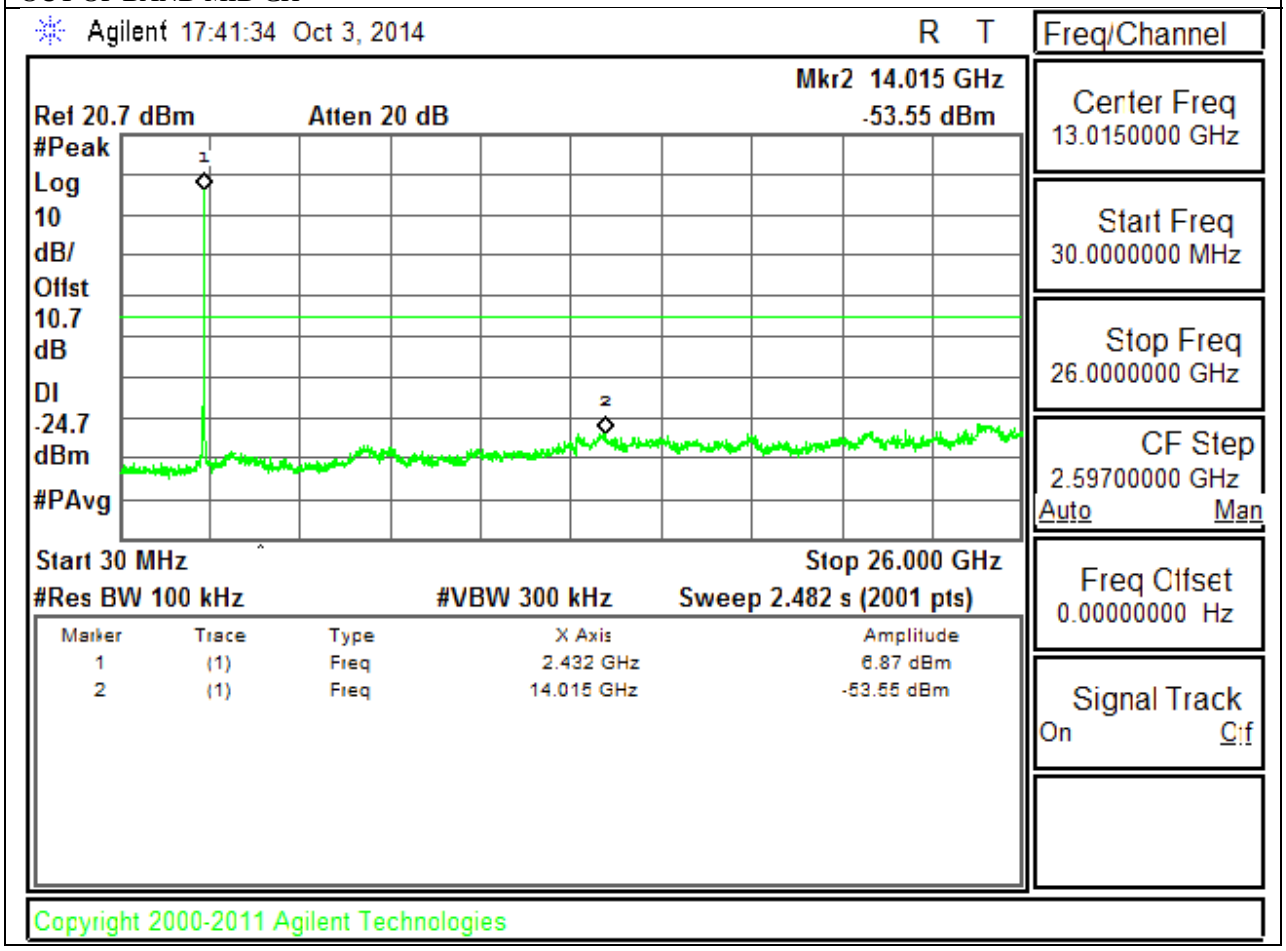


OUT-OF-BAND EMISSIONS

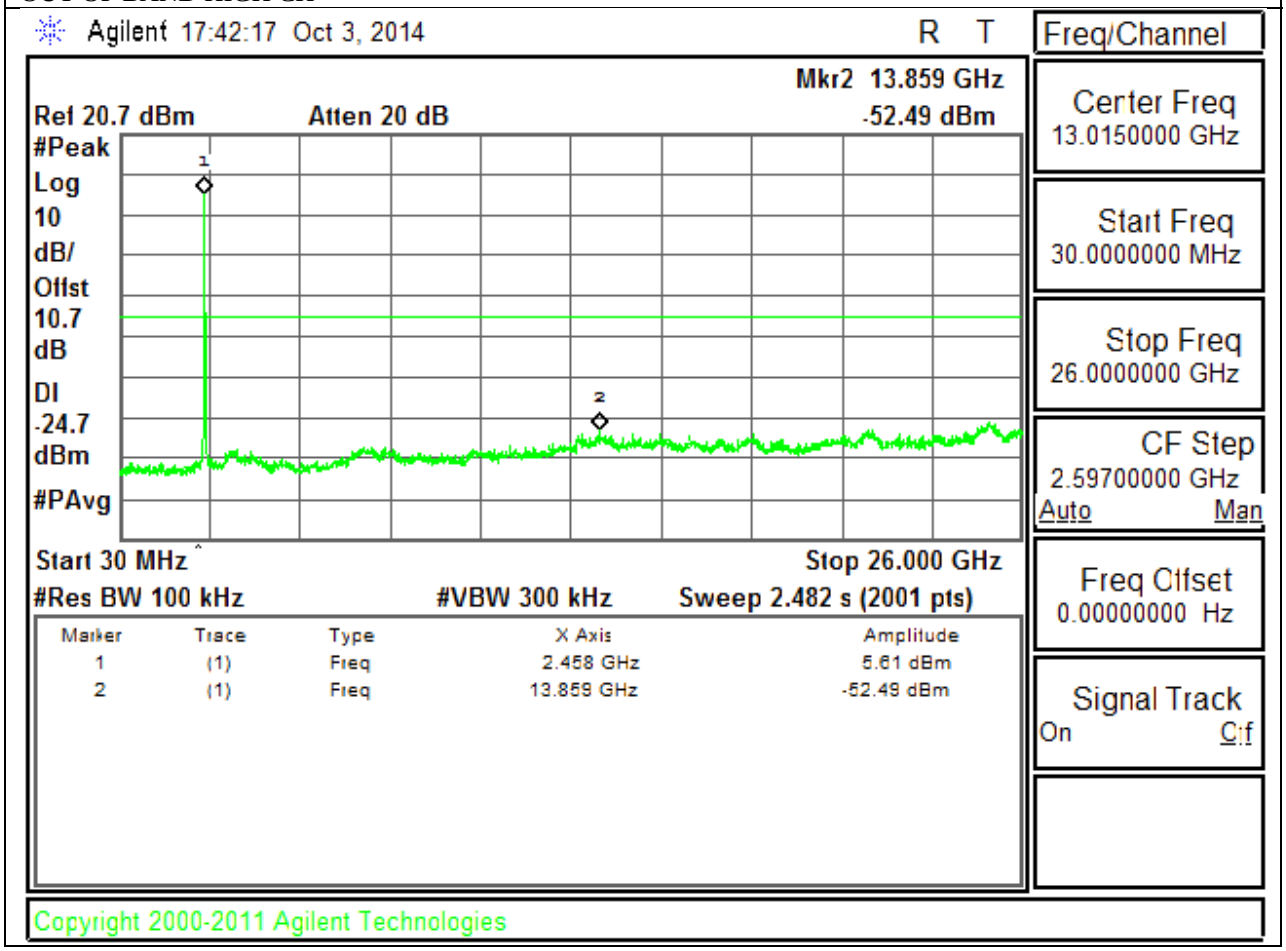
OUT OF BAND LOW CH



OUT OF BAND MID CH



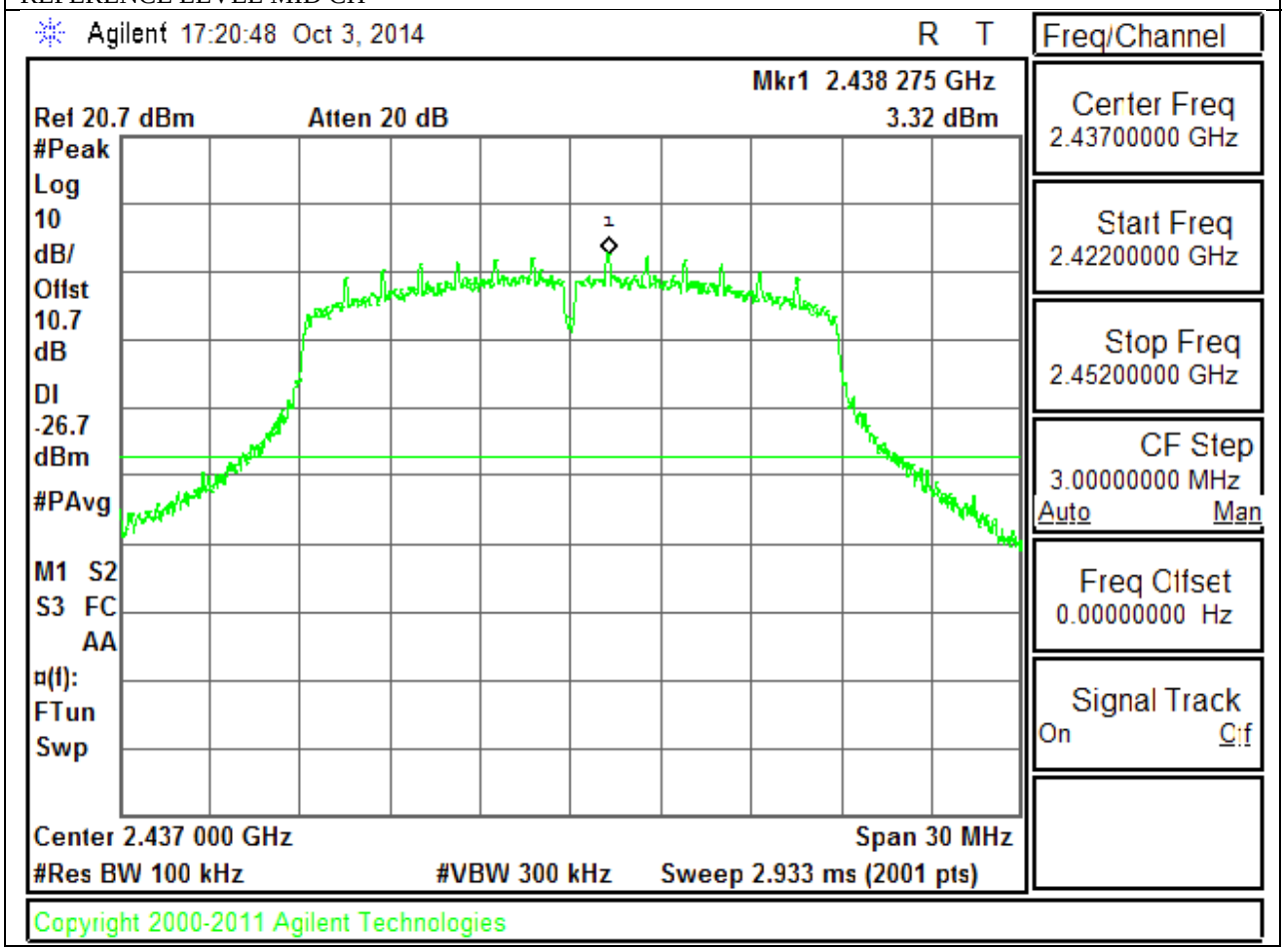
OUT OF BAND HIGH CH



10.1.1. 802.11n HT20 MODE IN THE 2.4 GHz BAND

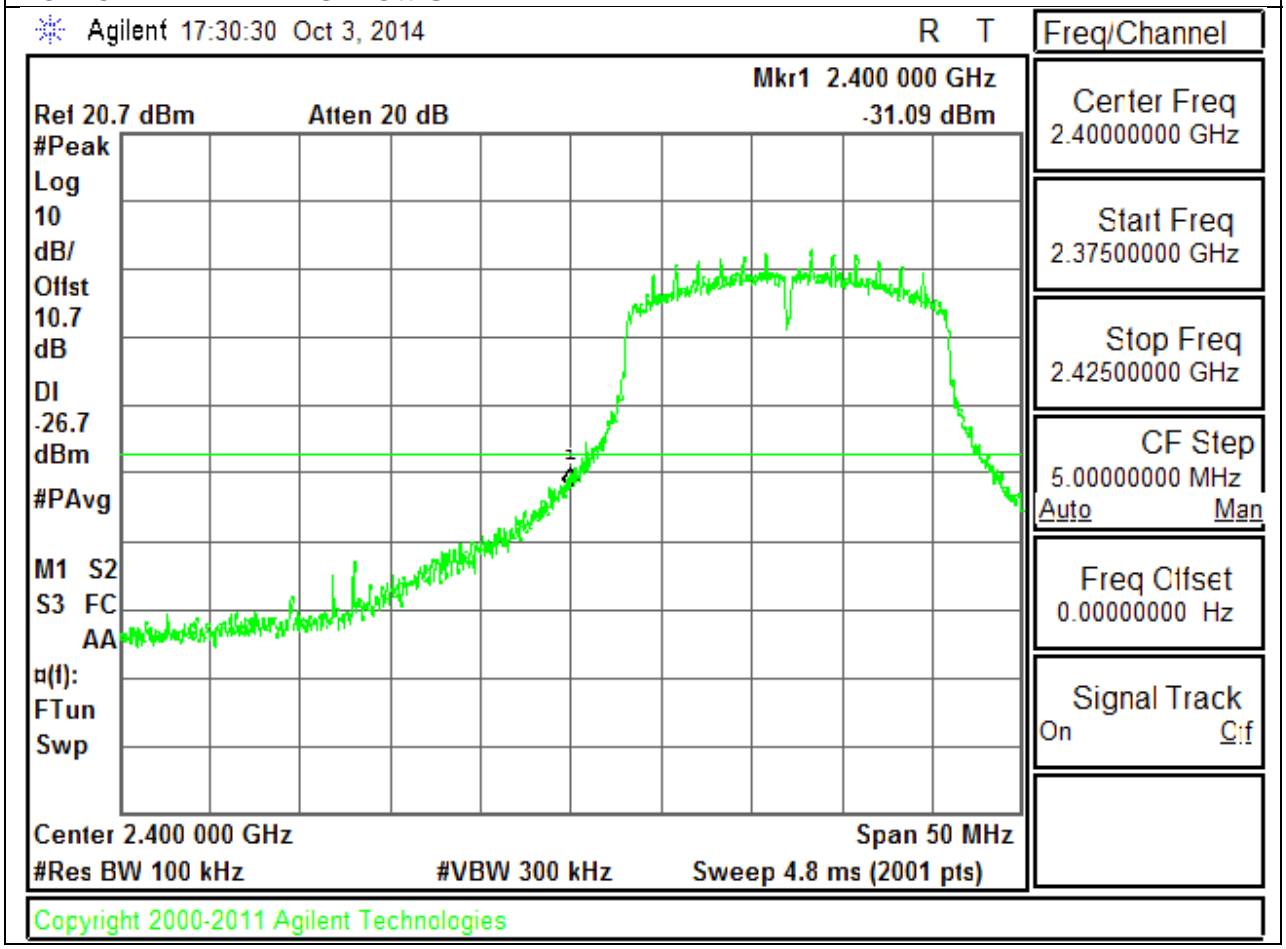
IN-BAND REFERENCE LEVEL

REFERENCE LEVEL MID CH



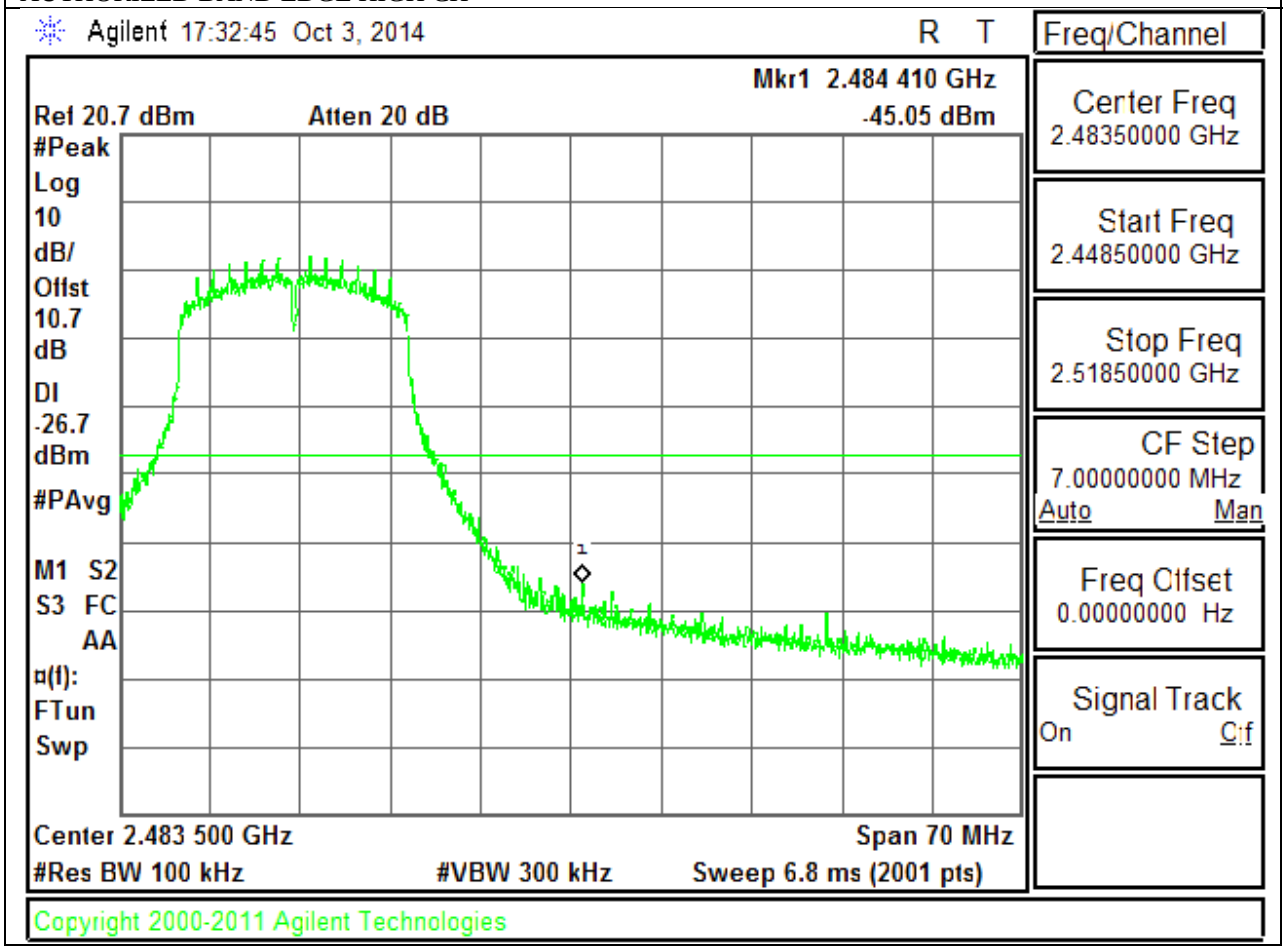
LOW CHANNEL BANDEDGE

AUTHORIZED BAND EDGE LOW CH



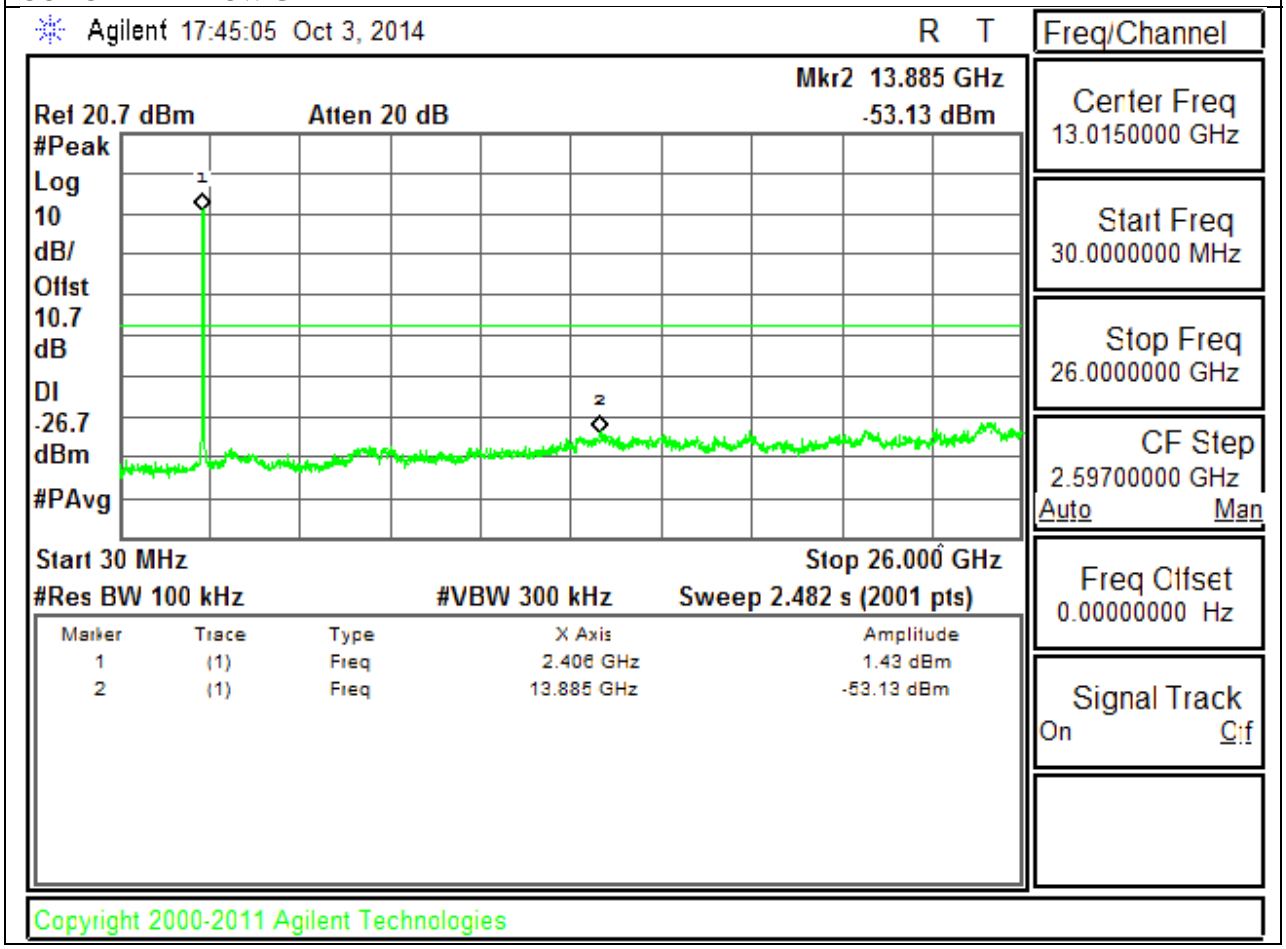
HIGH CHANNEL BANDEDGE

AUTHORIZED BAND EDGE HIGH CH

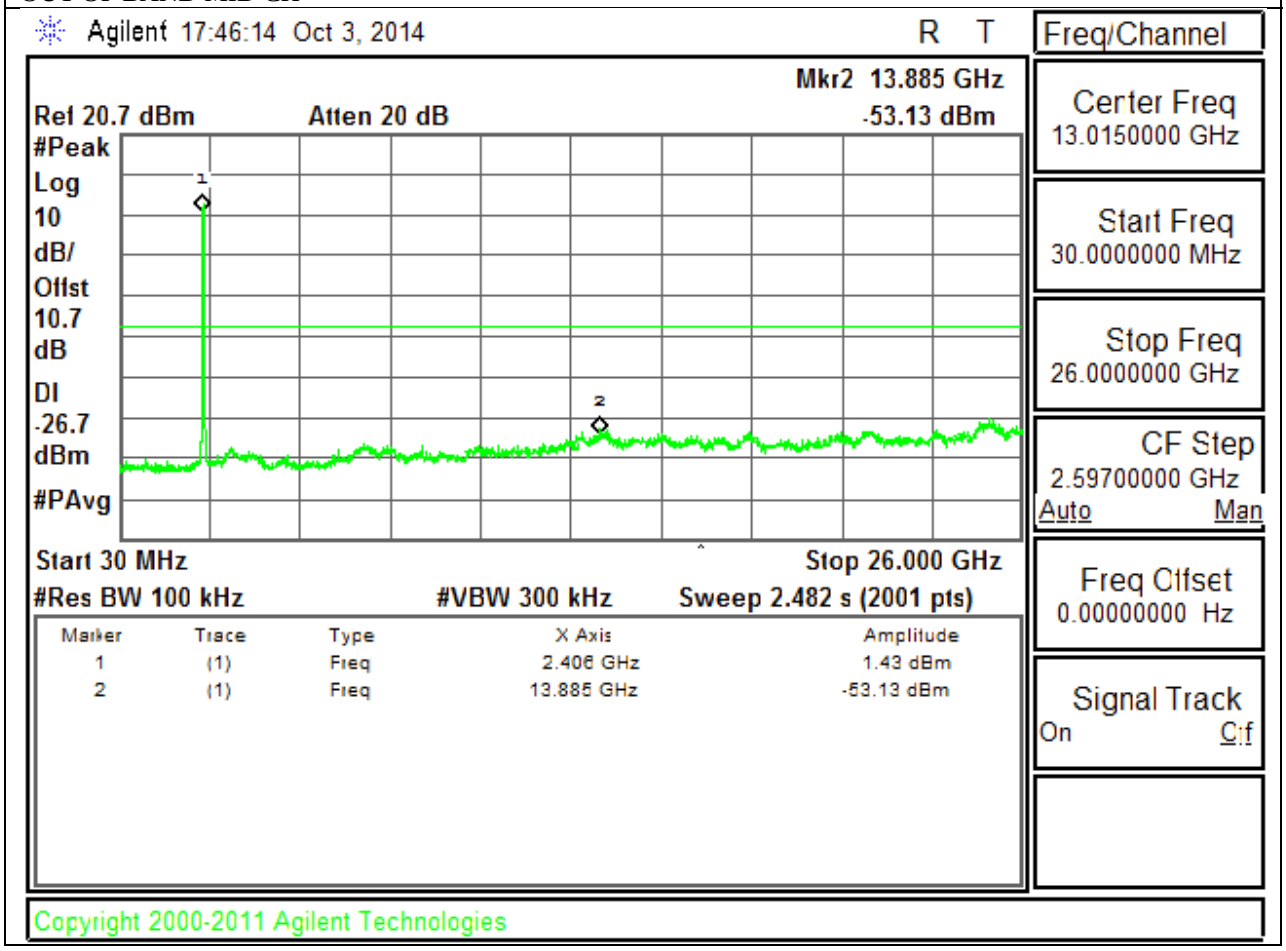


OUT-OF-BAND EMISSIONS

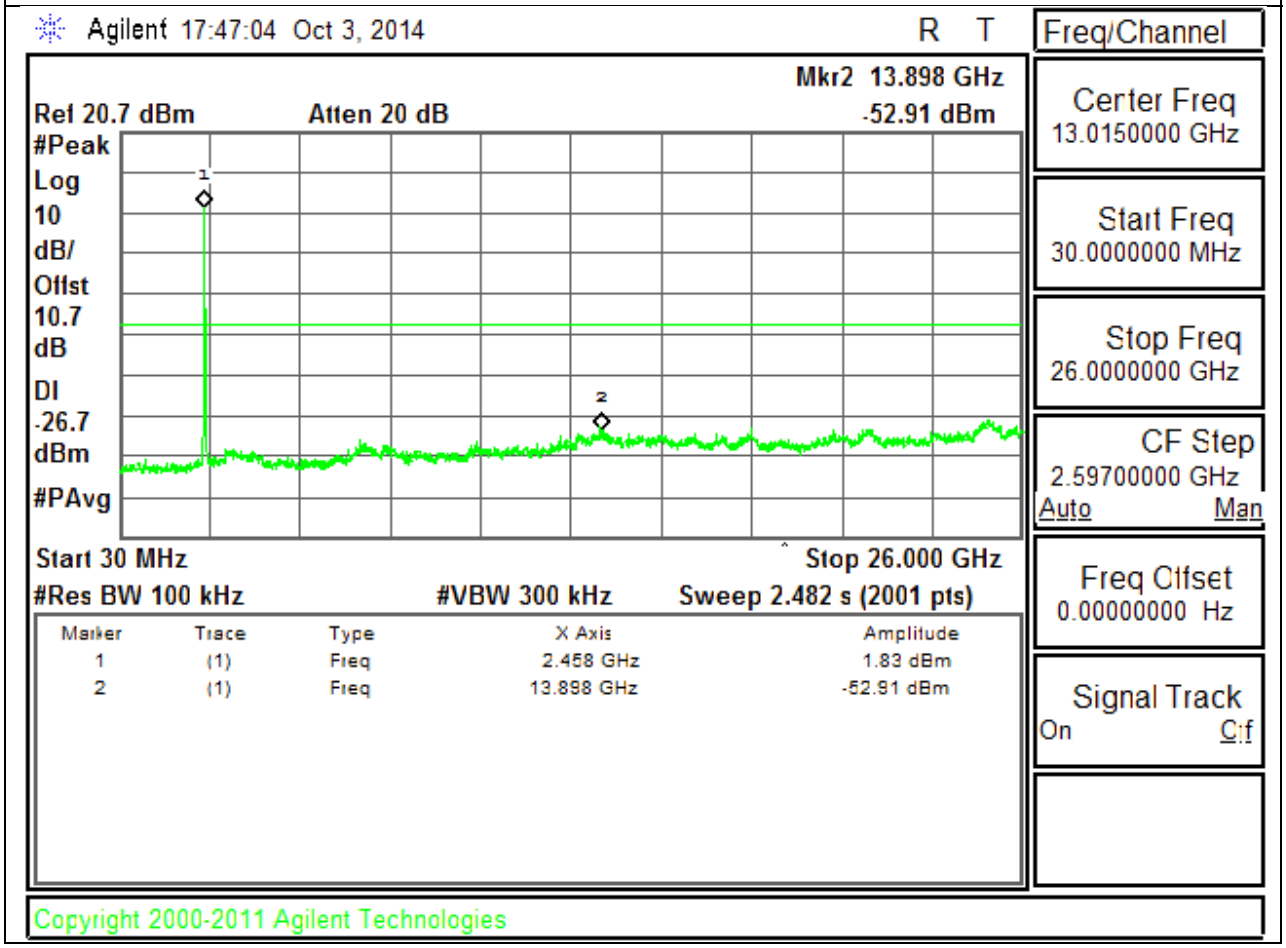
OUT OF BAND LOW CH



OUT OF BAND MID CH



OUT OF BAND HIGH CH



11. RADIATED TEST RESULTS

11.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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

TEST PROCEDURE

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

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

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

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.

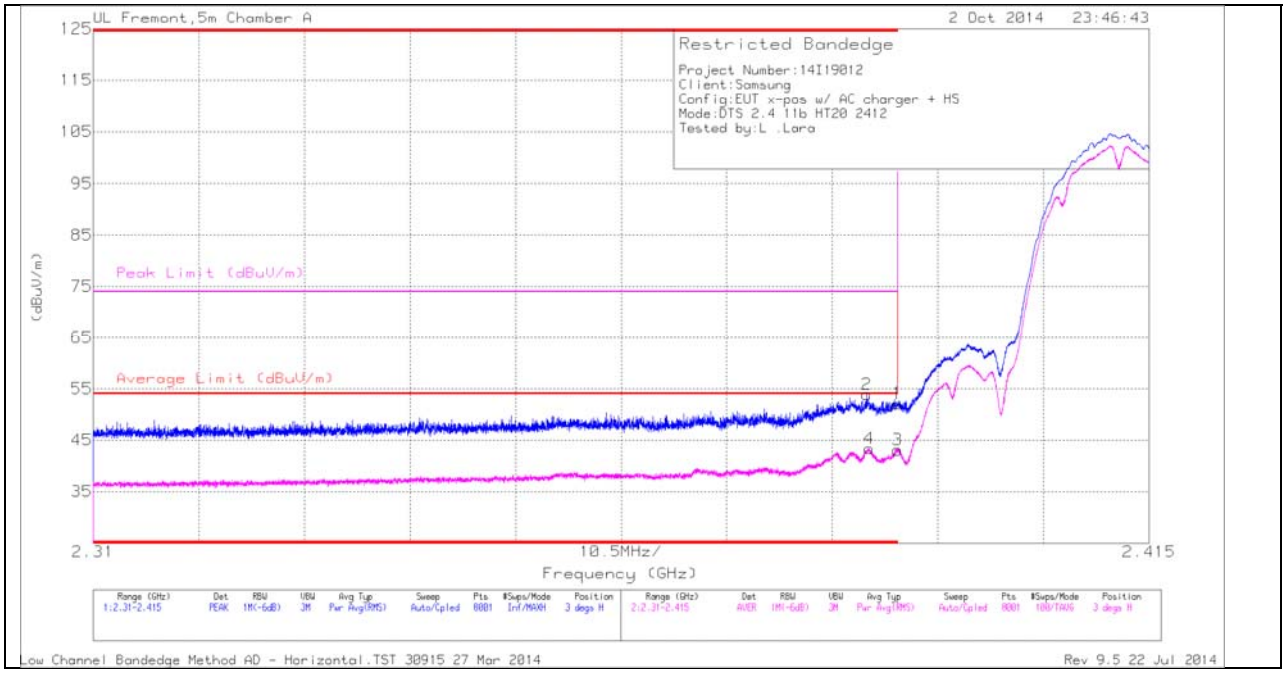
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

11.2. TRANSMITTER ABOVE 1 GHz

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

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

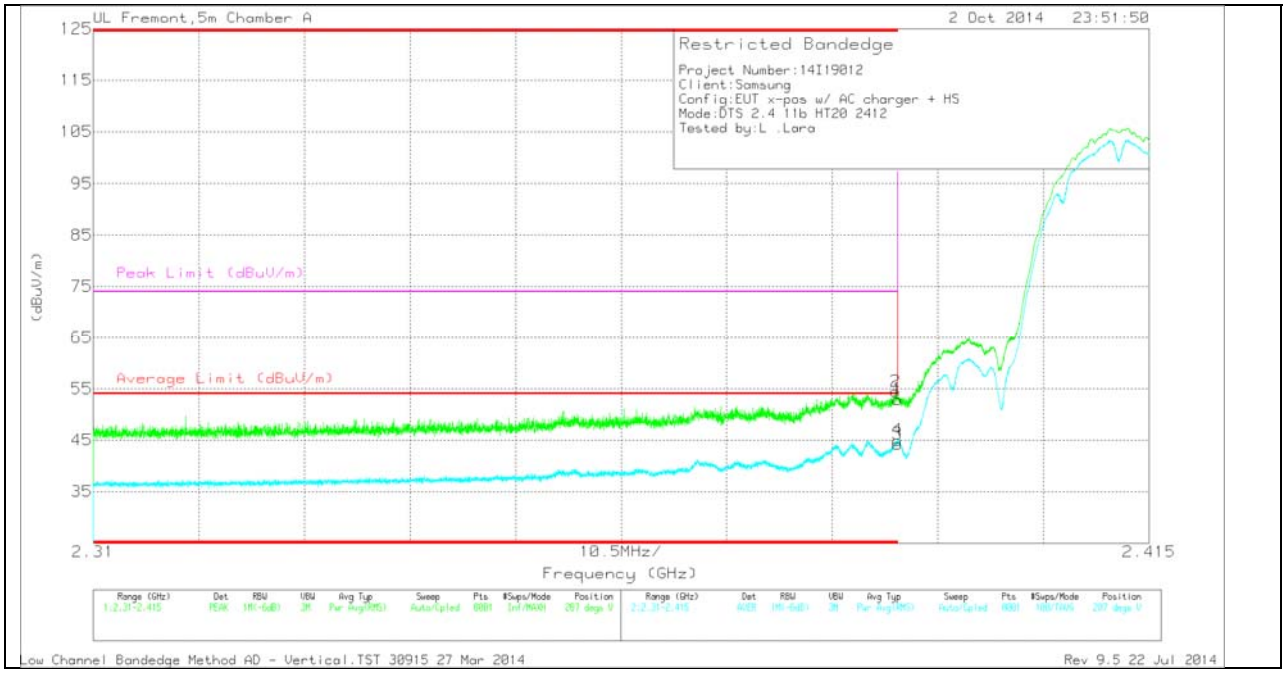
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.387	45.65	PK	32.2	-24	53.85	-	-	74	-20.15	3	362	H
4	* 2.387	35.16	RMS	32.2	-24	43.36	54	-10.64	-	-	3	362	H
1	* 2.39	43.96	PK	32.2	-24.1	52.06	-	-	74	-21.94	3	362	H
3	* 2.39	34.98	RMS	32.2	-24.1	43.08	54	-10.92	-	-	3	362	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	44.82	PK	32.2	-24.1	52.92	-	-	74	-21.08	287	362	V
2	* 2.39	46.36	PK	32.2	-24.1	54.46	-	-	74	-19.54	287	362	V
3	* 2.39	36.17	RMS	32.2	-24.1	44.27	54	-9.73	-	-	287	362	V
4	* 2.39	36.9	RMS	32.2	-24.1	45	54	-9	-	-	287	362	V

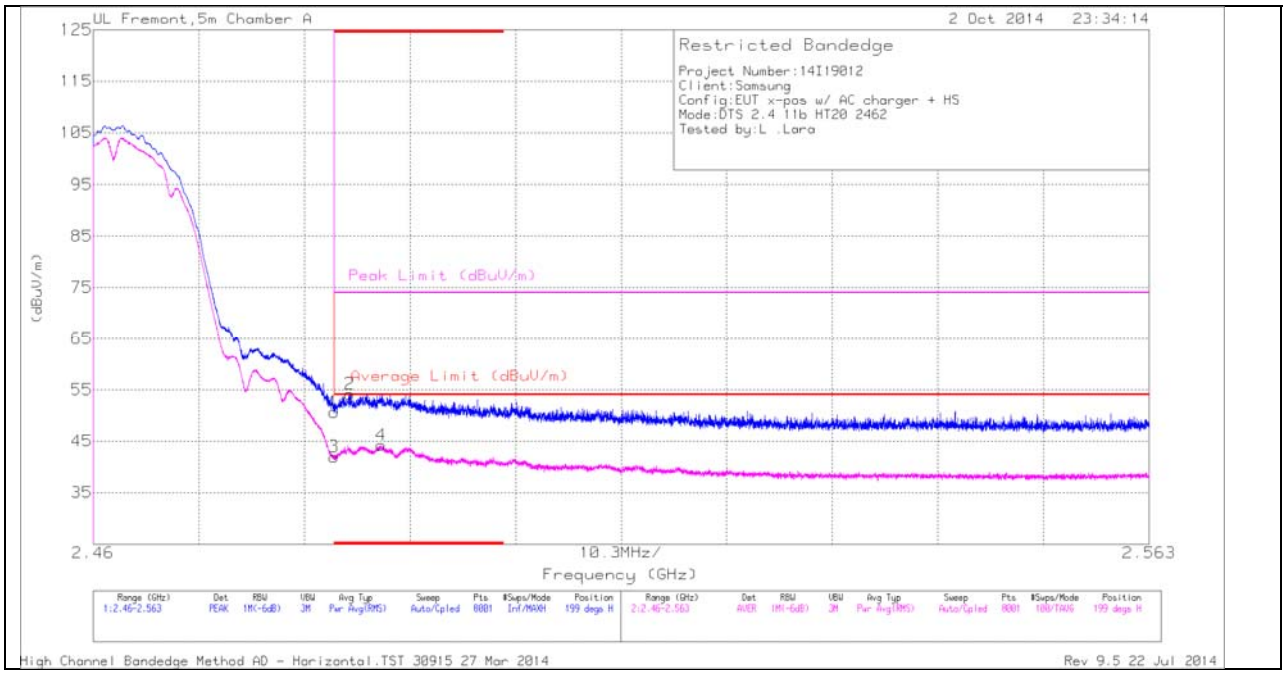
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

AUTHORIZED BANDEDGE (HIGH CHANNEL)

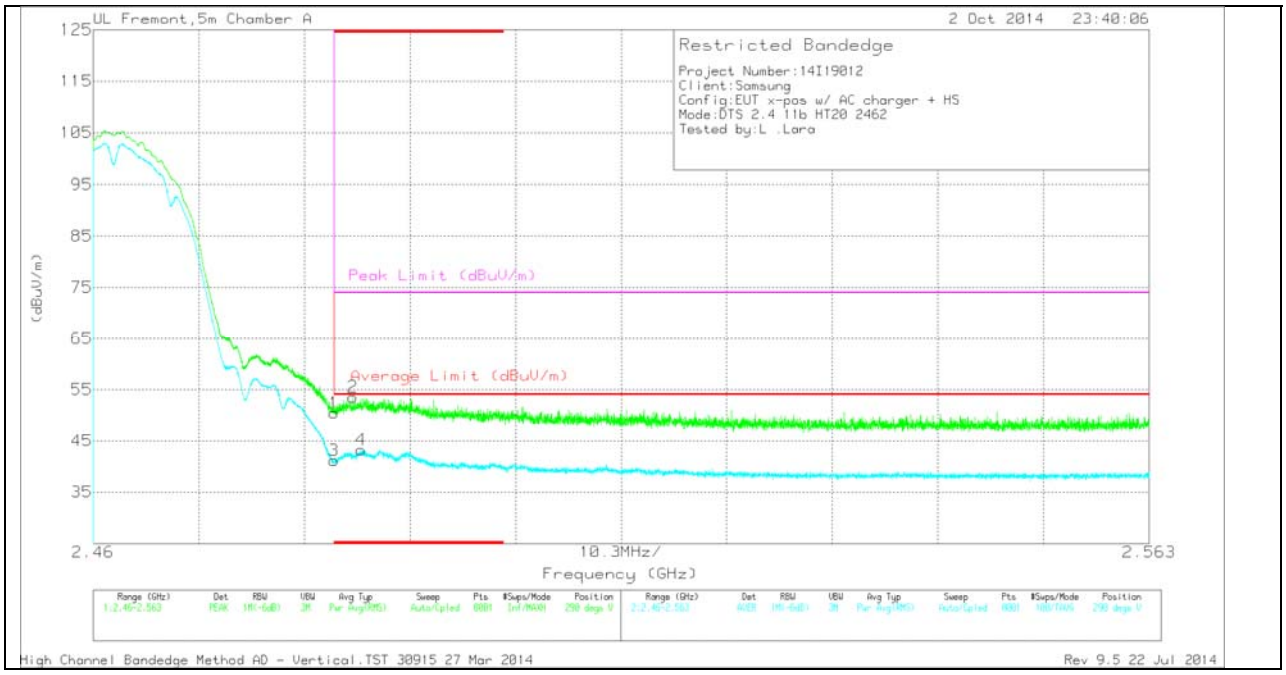
HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	42.15	PK	32.7	-24.2	50.65	-	-	74	-23.35	199	280	H
3	* 2.484	33.44	RMS	32.7	-24.2	41.94	54	-12.06	-	-	199	280	H
2	* 2.485	45.54	PK	32.7	-24.1	54.14	-	-	74	-19.86	199	280	H
4	* 2.488	35.5	RMS	32.8	-24.1	44.2	54	-9.8	-	-	199	280	H

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.93	PK	32.7	-24.2	50.43	-	-	74	-23.57	290	343	V
3	* 2.484	32.67	RMS	32.7	-24.2	41.17	54	-12.83	-	-	290	343	V
2	* 2.485	44.92	PK	32.7	-24.1	53.52	-	-	74	-20.48	290	343	V
4	* 2.486	34.51	RMS	32.8	-24.1	43.21	54	-10.79	-	-	290	343	V

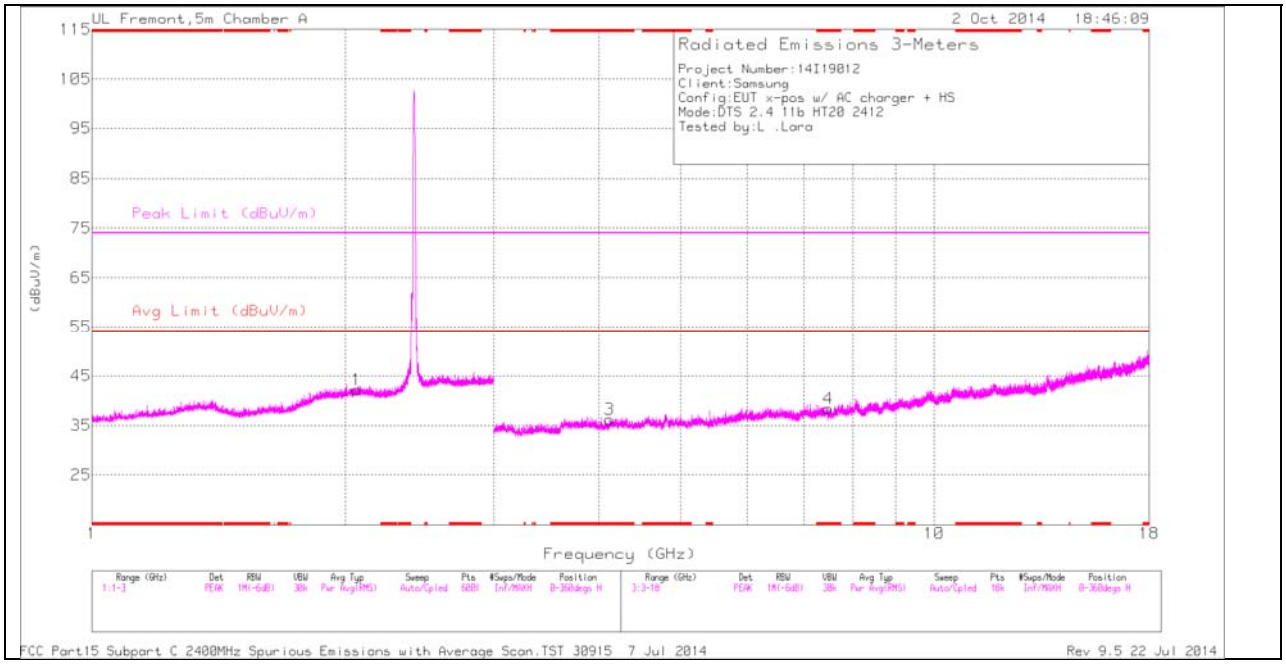
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

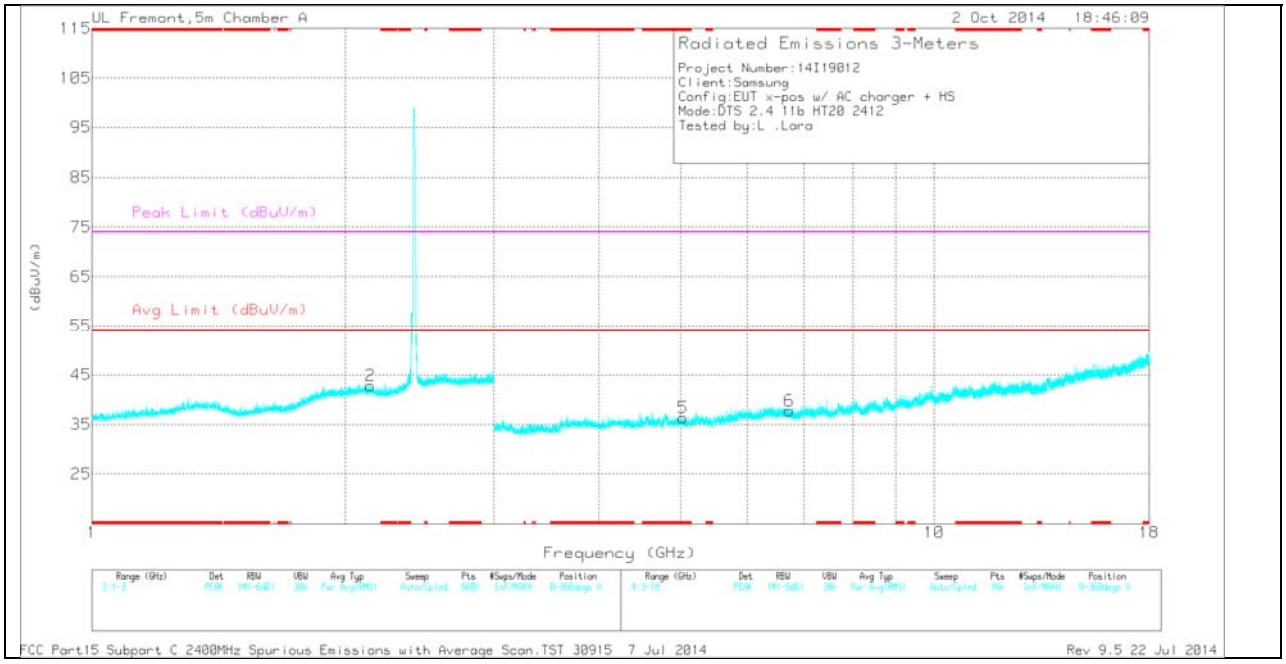
HARMONICS AND SPURIOUS EMISSIONS

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 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	* 4.119	32.45	PK	33.9	-30.2	36.15	-	-	74	-37.85	0-360	201	H
4	* 7.488	29.61	PK	35.3	-26.5	38.41	-	-	74	-35.59	0-360	100	H
5	* 5.036	32.09	PK	33.8	-29.5	36.39	-	-	74	-37.61	0-360	201	V
1	2.064	35.22	PK	31.9	-24.9	42.22	-	-	-	-	0-360	201	H
2	2.141	35.8	PK	31.6	-24.6	42.8	-	-	-	-	0-360	201	V
6	6.731	29.47	PK	35.4	-27.1	37.77	-	-	-	-	0-360	201	V

PK - Peak detector

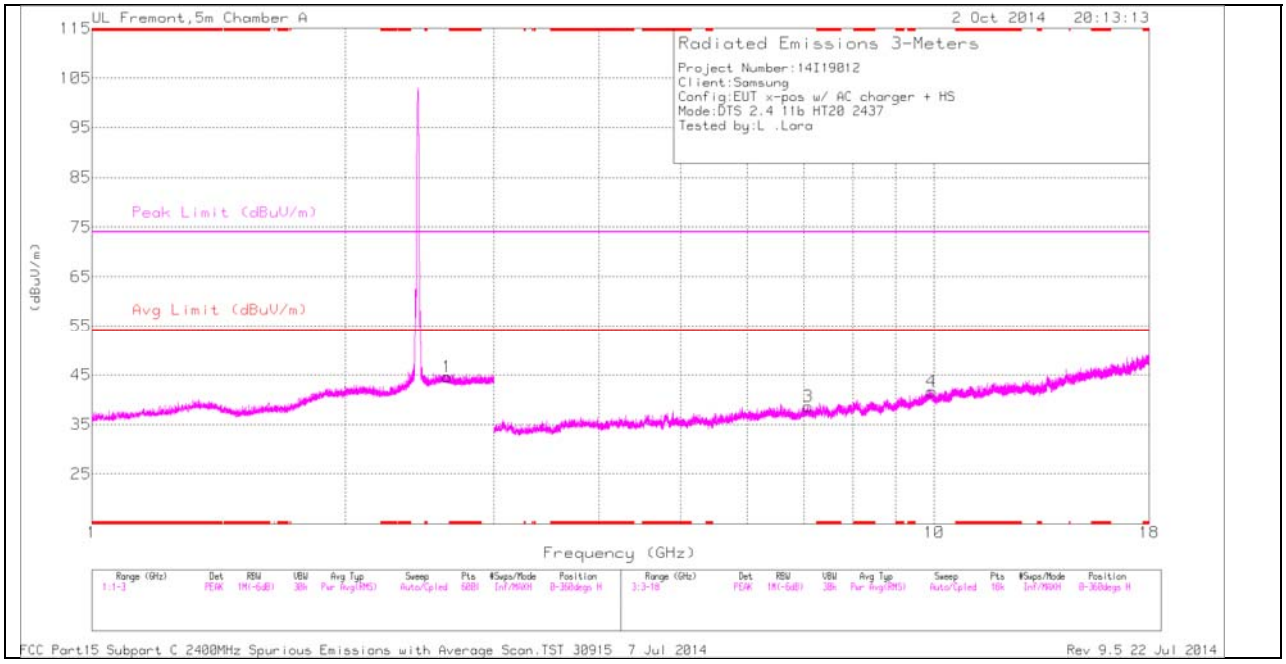
RADIATED EMISSIONS

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
* 4.12	40.19	PK2	33.9	-30.2	43.89	-	-	74	-30.11	359	202	H
* 4.119	28.99	MAv1	33.9	-30.2	32.69	54	-21.31	-	-	359	202	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

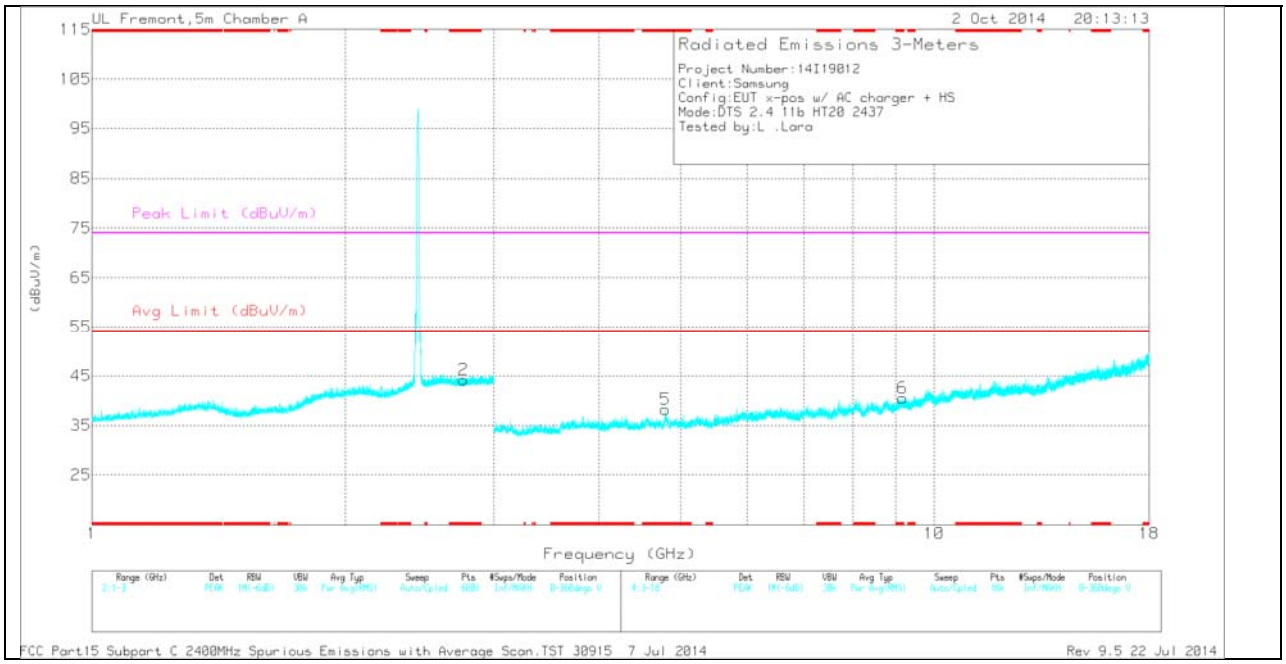
PK2 - KDB558074 Method: Maximum Peak

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 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
2	* 2.761	35.06	PK	32.7	-23.5	44.26	-	-	74	-29.74	0-360	201	V
5	* 4.799	33.39	PK	34	-29.2	38.19	-	-	74	-35.81	0-360	100	V
6	* 9.165	27.77	PK	36.1	-23.3	40.57	-	-	74	-33.43	0-360	201	V
1	2.642	35.19	PK	32.9	-23.5	44.59	-	-	-	-	0-360	100	H
3	7.086	30.13	PK	35.3	-26.8	38.63	-	-	-	-	0-360	201	H
4	9.919	26.64	PK	37.1	-22.1	41.64	-	-	-	-	0-360	100	H

PK - Peak detector

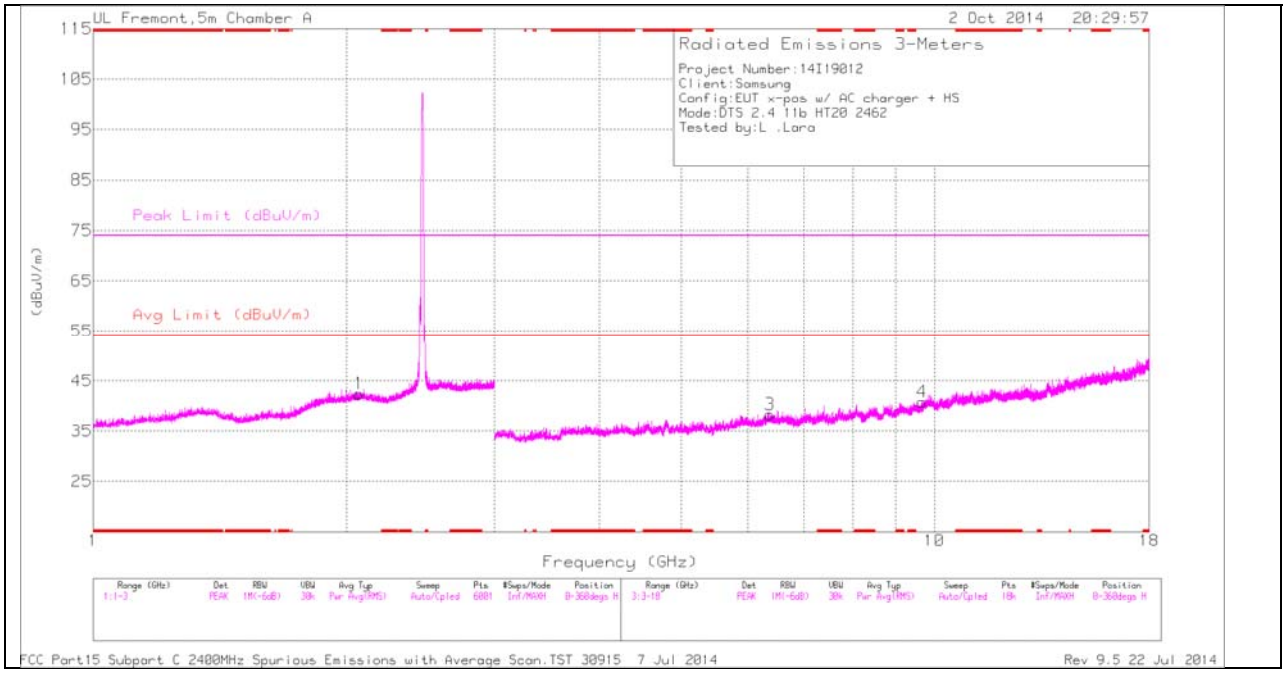
RADIATED EMISSIONS

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
* 4.799	40.53	PK2	34	-29.2	45.33	-	-	74	-28.67	359	100	V
* 4.799	29.29	MAv1	34	-29.2	34.09	54	-19.91	-	-	359	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

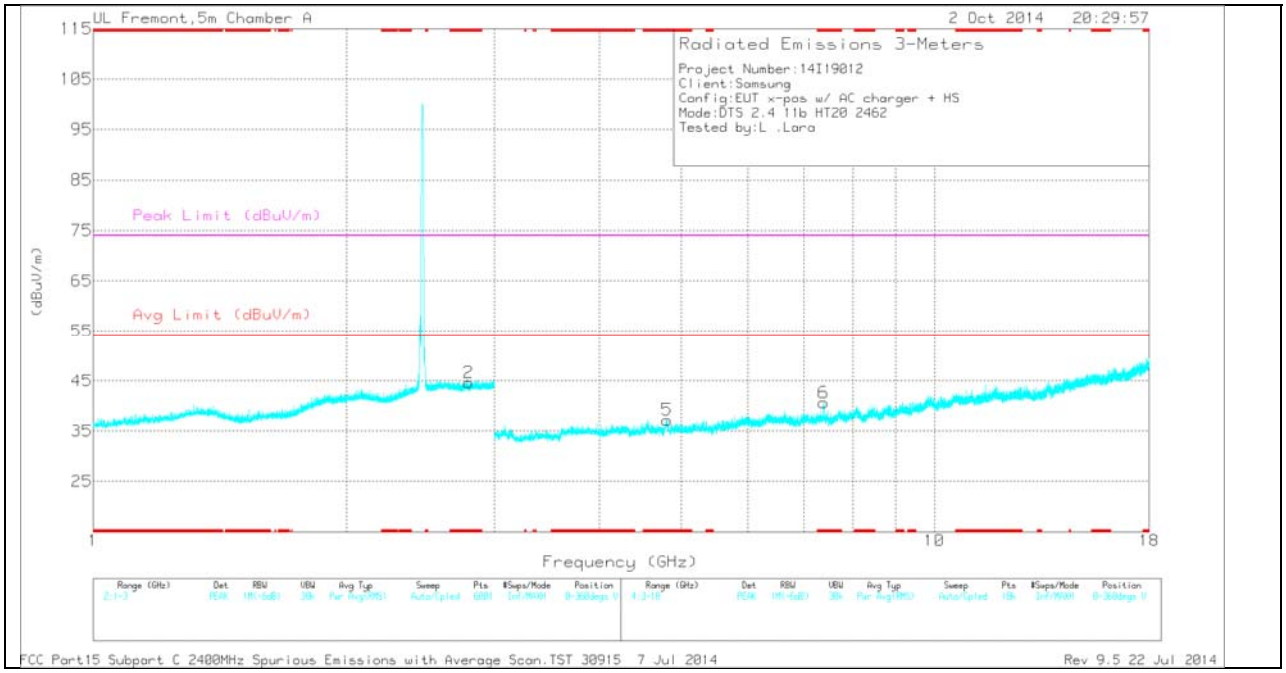
PK2 - KDB558074 Method: Maximum Peak

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 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
2	* 2.794	35.46	PK	32.6	-23.4	44.66	-	-	74	-29.34	0-360	100	V
5	* 4.812	32.41	PK	34	-29.2	37.21	-	-	74	-36.79	0-360	201	V
6	* 7.385	30.65	PK	35.3	-25.3	40.65	-	-	74	-33.35	0-360	100	V
1	2.071	35.33	PK	31.9	-24.8	42.43	-	-	-	-	0-360	100	H
3	6.376	30.6	PK	35.5	-27.8	38.3	-	-	-	-	0-360	100	H
4	9.672	28.21	PK	36.8	-24.2	40.81	-	-	-	-	0-360	100	H

PK - Peak detector

RADIATED EMISSIONS

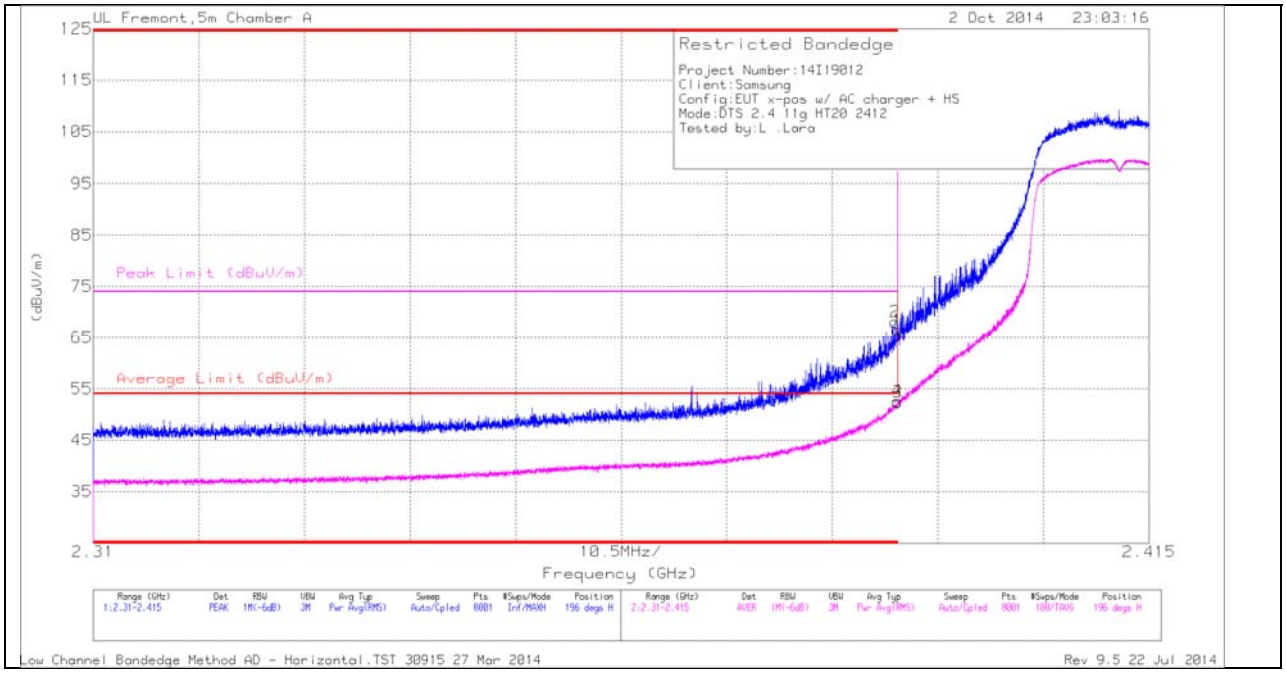
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.387	36.16	PK2	35.3	-25.3	46.16	-	-	74	-27.84	359	100	V
* 7.385	25.85	MAv1	35.3	-25.3	35.85	54	-18.15	-	-	359	100	V

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

11.2.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

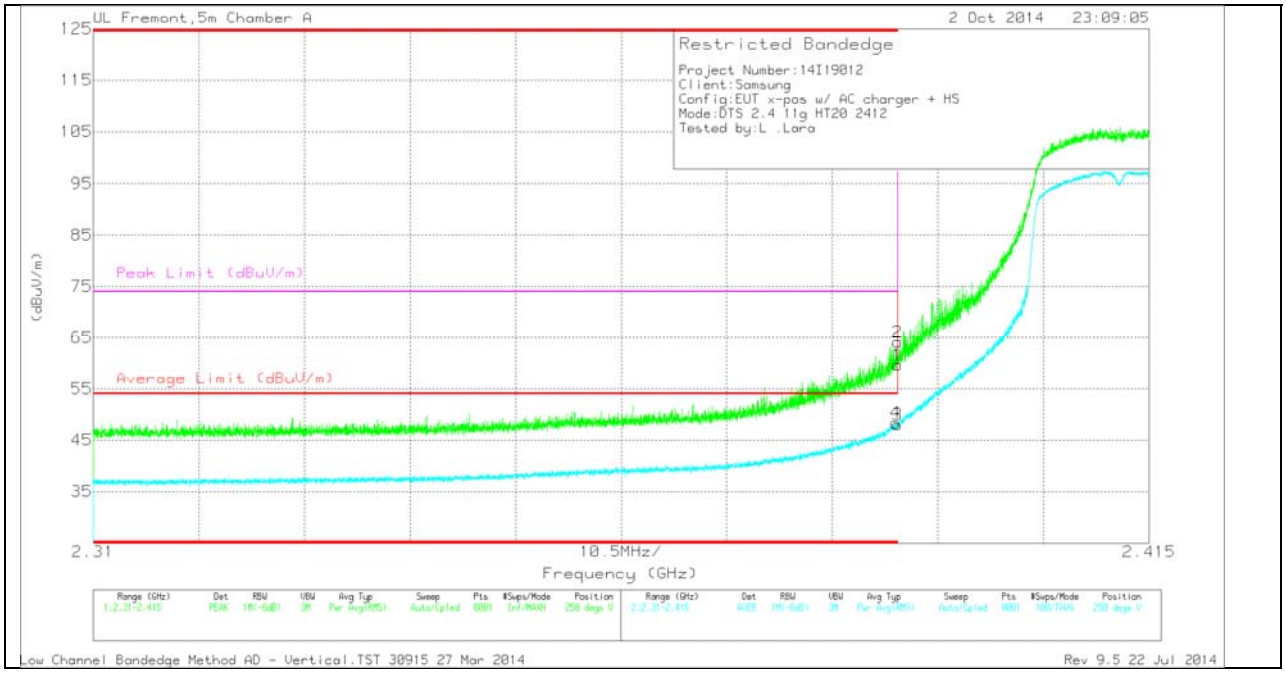
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	58.47	PK	32.2	-24.1	0	66.57	-	-	74	-7.43	196	239	H
2	* 2.39	60.02	PK	32.2	-24.1	0	68.12	-	-	74	-5.88	196	239	H
3	* 2.39	43.96	RMS	32.2	-24.1	.3	52.36	54	-1.64	-	-	196	239	H
4	* 2.39	44.2	RMS	32.2	-24.1	.3	52.6	54	-1.4	-	-	196	239	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE PLOT

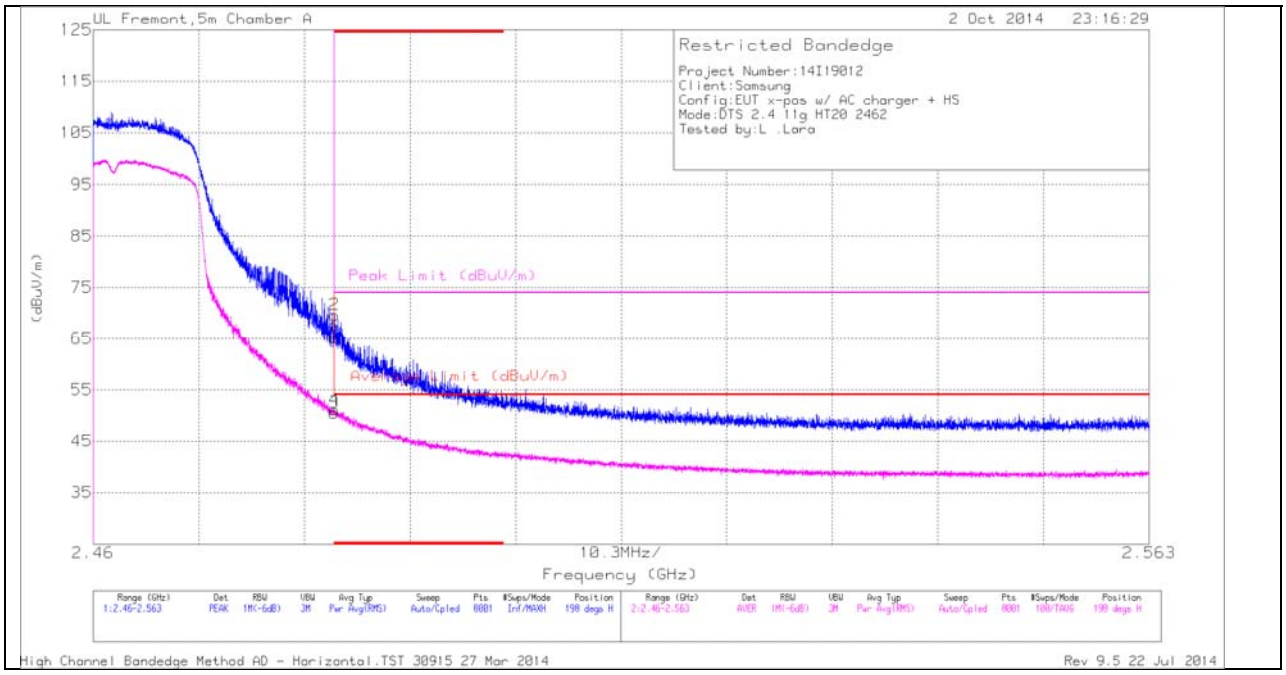


VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	51.52	PK	32.2	-24.1	0	59.62	-	-	74	-14.38	250	372	V
2	* 2.39	56.04	PK	32.2	-24.1	0	64.14	-	-	74	-9.86	250	372	V
3	* 2.39	39.61	RMS	32.2	-24.1	.3	48.01	54	-5.99	-	-	250	372	V
4	* 2.39	39.92	RMS	32.2	-24.1	.3	48.32	54	-5.68	-	-	250	372	V

AUTHORIZED BANDEDGE (HIGH CHANNEL)

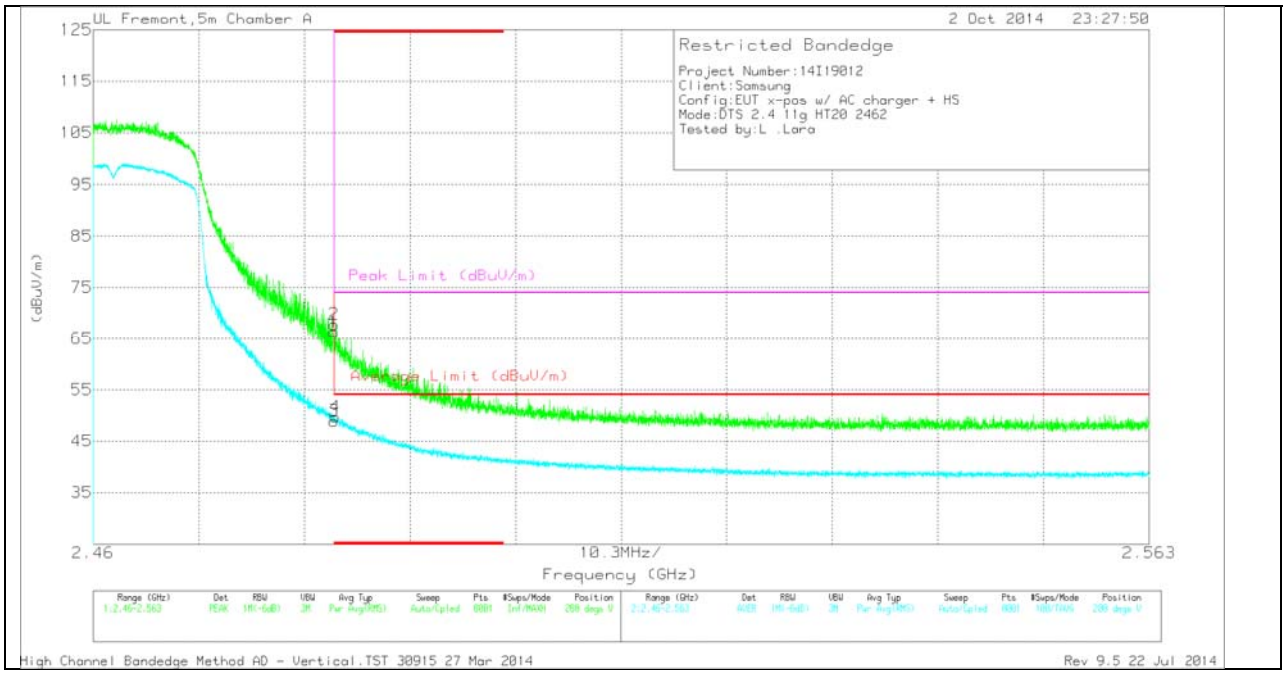
HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	56.65	PK	32.7	-24.2	0	65.15	-	-	74	-8.85	198	278	H
2	* 2.484	61.19	PK	32.7	-24.2	0	69.69	-	-	74	-4.31	198	278	H
3	* 2.484	41.72	RMS	32.7	-24.2	.3	50.52	54	-3.48	-	-	198	278	H
4	* 2.484	42.27	RMS	32.7	-24.2	.3	51.07	54	-2.93	-	-	198	278	H

VERTICAL PEAK AND AVERAGE PLOT

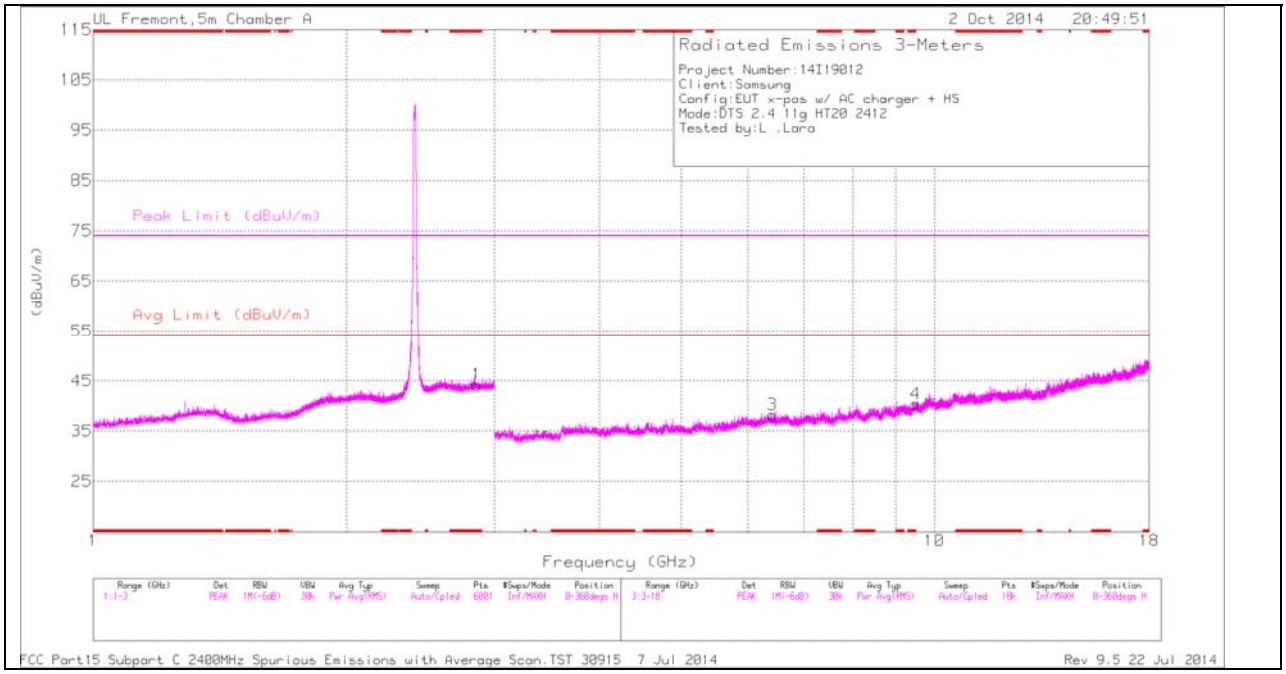


VERTICAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	57.81	PK	32.7	-24.2	0	66.31	-	-	74	-7.69	288	345	V
2	* 2.484	59.33	PK	32.7	-24.2	0	67.83	-	-	74	-6.17	288	345	V
3	* 2.484	40.11	RMS	32.7	-24.2	.3	48.91	54	-5.09	-	-	288	345	V
4	* 2.484	40.9	RMS	32.7	-24.2	.3	49.7	54	-4.3	-	-	288	345	V

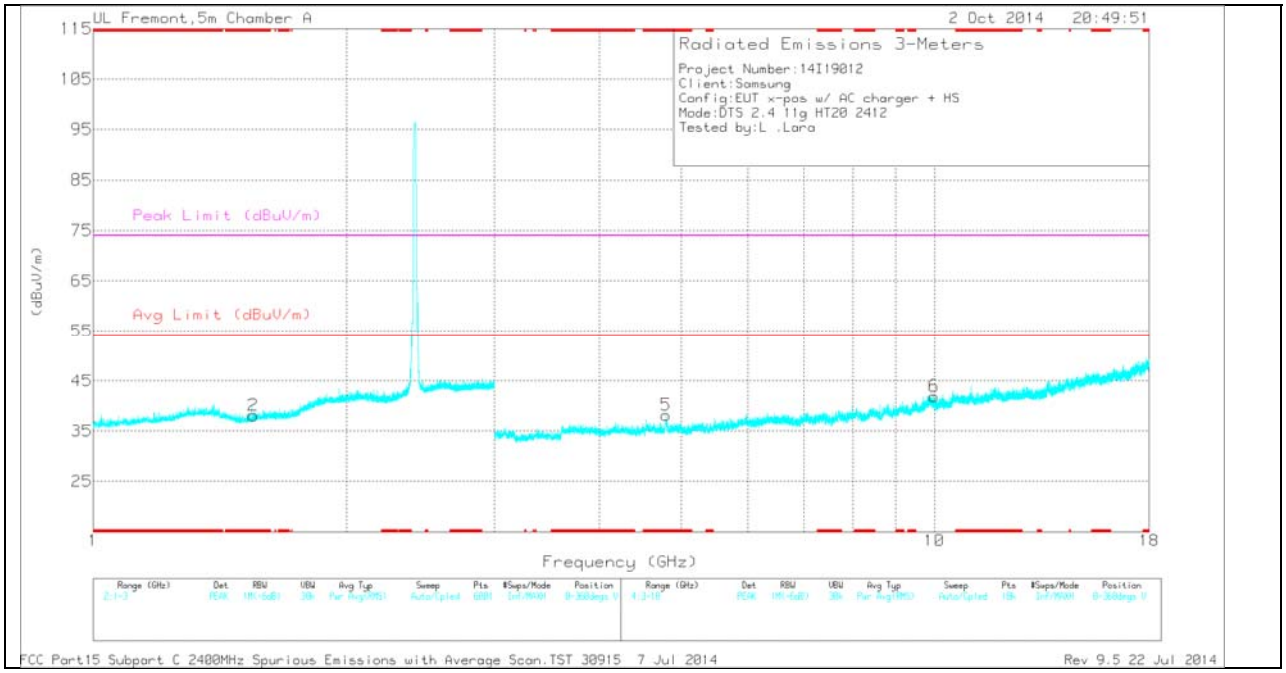
HARMONICS AND SPURIOUS EMISSIONS

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 T136 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.857	34.74	PK	32.6	-23.1	0	44.24	-	-	74	-29.76	0-360	201	H
2	* 1.55	35.72	PK	28.7	-26.3	0	38.12	-	-	74	-35.88	0-360	201	V
5	* 4.799	33.39	PK	34	-29.2	0	38.19	-	-	74	-35.81	0-360	201	V
3	6.421	31.22	PK	35.5	-28.5	0	38.22	-	-	-	-	0-360	201	H
4	9.501	26.97	PK	36.6	-23.2	0	40.37	-	-	-	-	0-360	201	H
6	9.986	27.44	PK	37.1	-22.6	0	41.94	-	-	-	-	0-360	201	V

PK - Peak detector

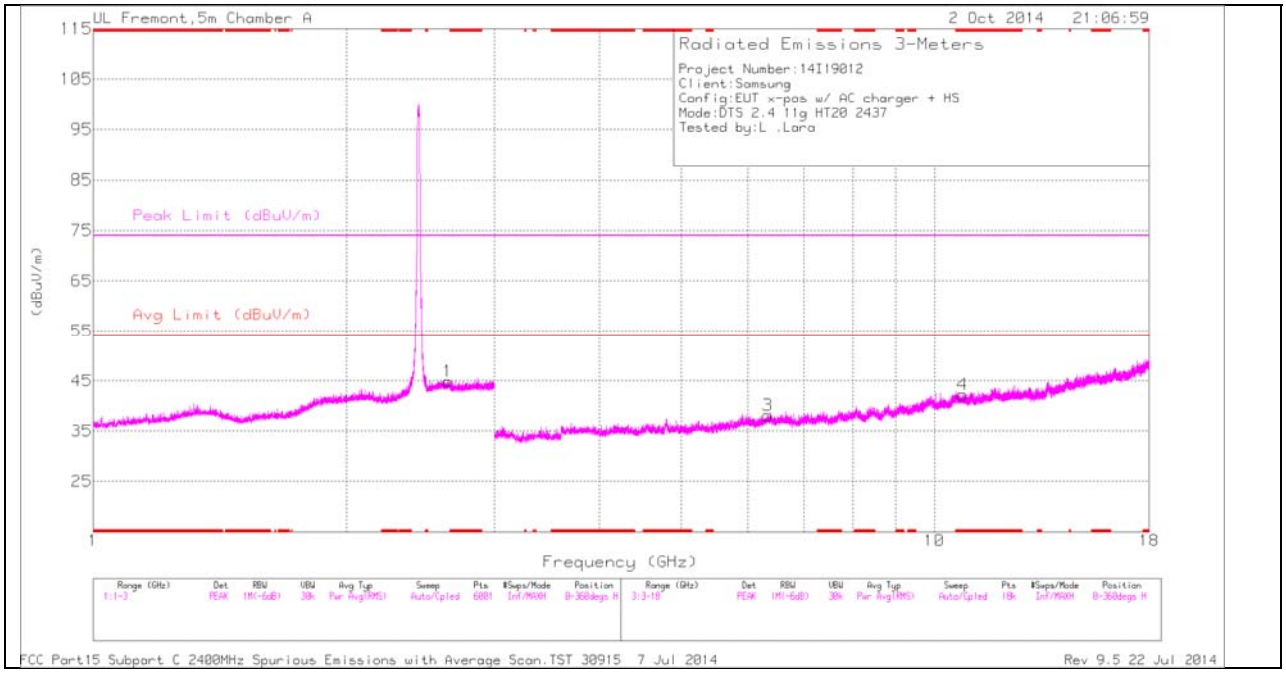
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.799	40.42	PK2	34	-29.2	0	45.22	-	-	74	-28.78	359	202	V
* 4.799	29.44	MAv1	34	-29.2	.3	34.54	54	-19.46	-	-	359	202	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

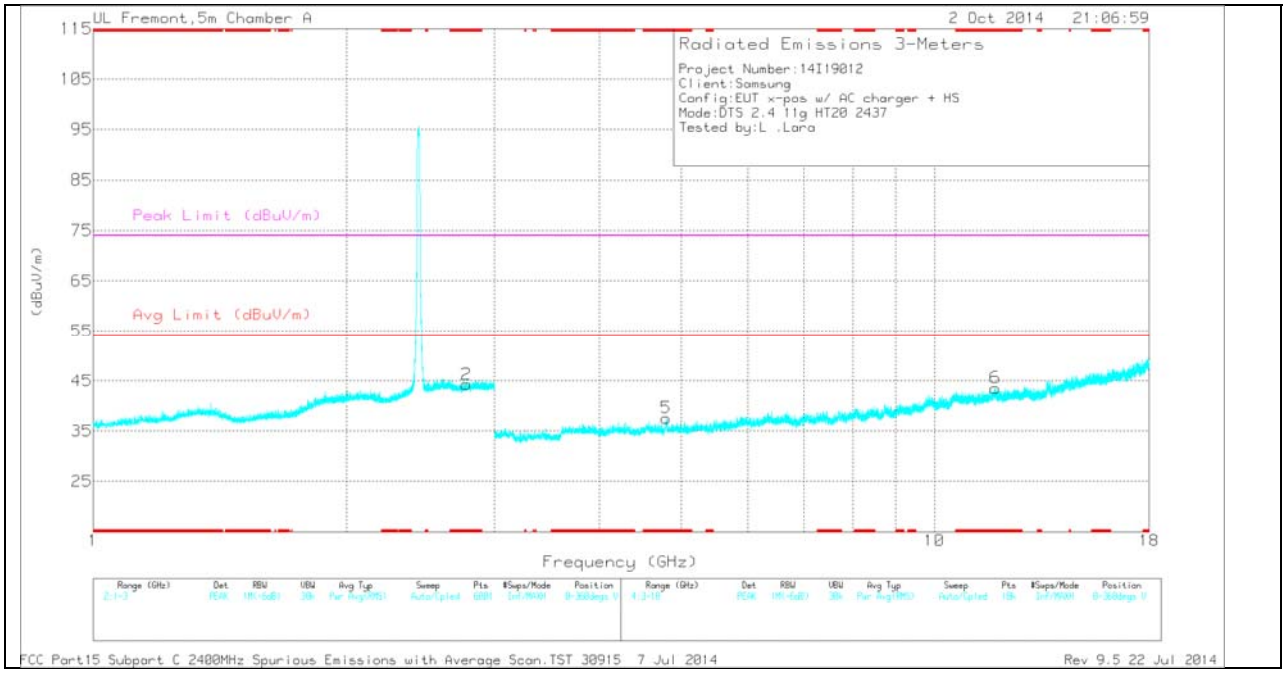
PK2 - KDB558074 Method: Maximum Peak

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 T136 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.778	35.06	PK	32.6	-23.4	0	44.26	-	-	74	-29.74	0-360	100	V
4	* 10.802	26.93	PK	37.9	-22.6	0	42.23	-	-	74	-31.77	0-360	201	H
5	* 4.797	32.89	PK	34	-29.3	0	37.59	-	-	74	-36.41	0-360	100	V
6	* 11.817	26.69	PK	38.8	-21.9	0	43.59	-	-	74	-30.41	0-360	201	V
1	2.64	35.48	PK	32.9	-23.5	0	44.88	-	-	-	-	0-360	201	H
3	6.336	30.11	PK	35.5	-27.5	0	38.11	-	-	-	-	0-360	201	H

PK - Peak detector

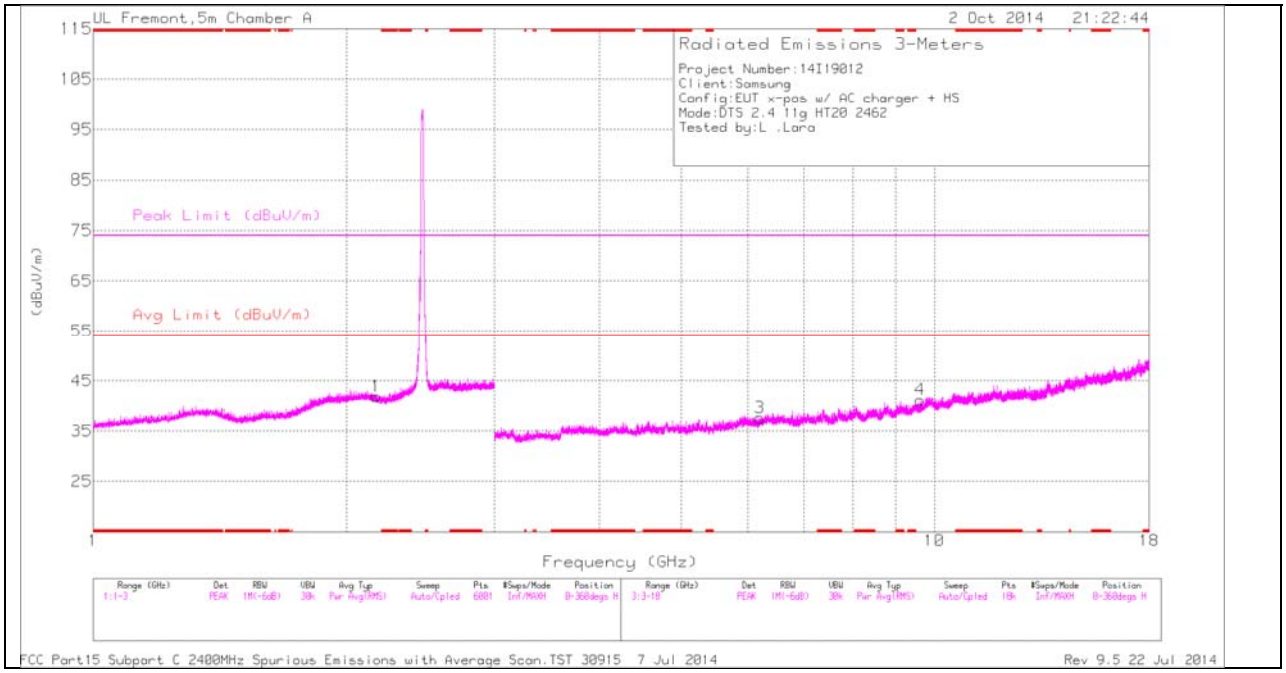
RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.797	40.32	PK2	34	-29.3	0	45.02	-	-	74	-28.98	359	100	V
* 4.797	29.34	MAv1	34	-29.3	.3	34.34	54	-19.66	-	-	359	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

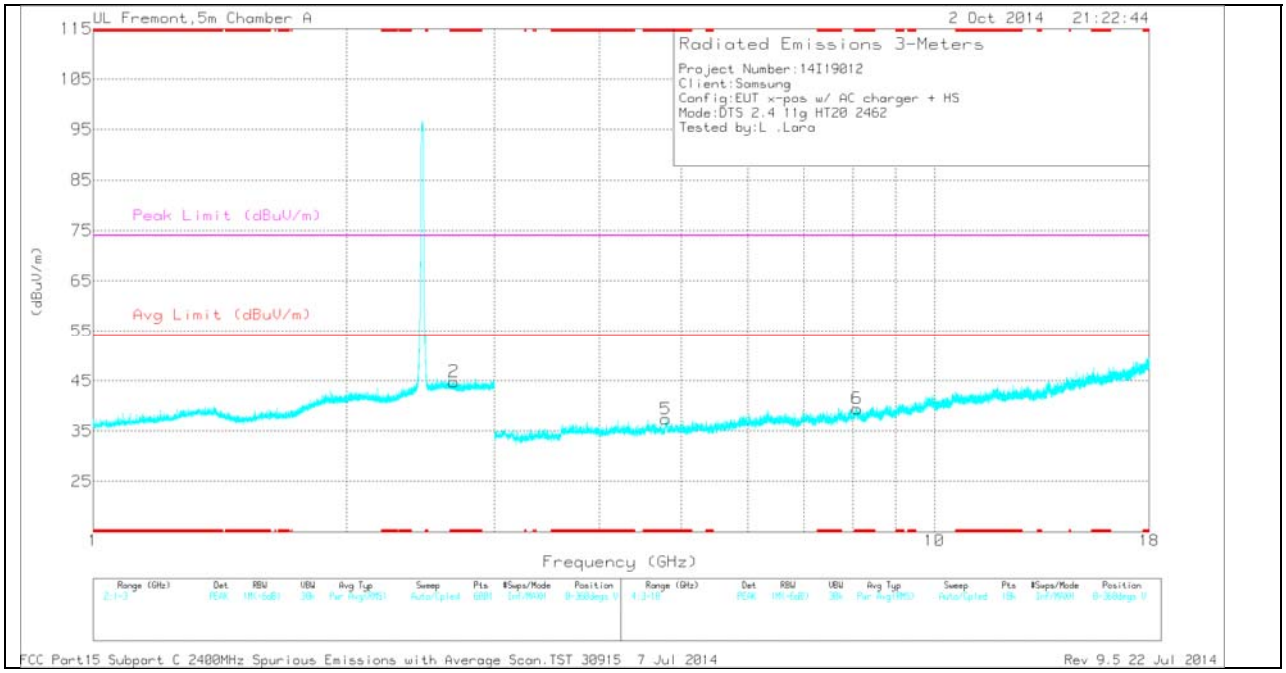
PK2 - KDB558074 Method: Maximum Peak

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 T136 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.684	35.73	PK	32.8	-23.7	0	44.83	-	-	74	-29.17	0-360	100	V
5	* 4.795	32.82	PK	34	-29.4	0	37.42	-	-	74	-36.58	0-360	100	V
6	* 8.09	28.06	PK	35.5	-24.1	0	39.46	-	-	74	-34.54	0-360	100	V
1	2.171	35.19	PK	31.4	-24.7	0	41.89	-	-	-	-	0-360	201	H
3	6.199	30.5	PK	35.4	-28.3	0	37.6	-	-	-	-	0-360	100	H
4	9.615	28.51	PK	36.8	-24.1	0	41.21	-	-	-	-	0-360	201	H

PK - Peak detector

RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.796	39.95	PK2	34	-29.3	0	44.65	-	-	74	-29.35	359	100	V
* 4.795	29.26	MAv1	34	-29.4	.3	34.16	54	-19.84	-	-	359	100	V

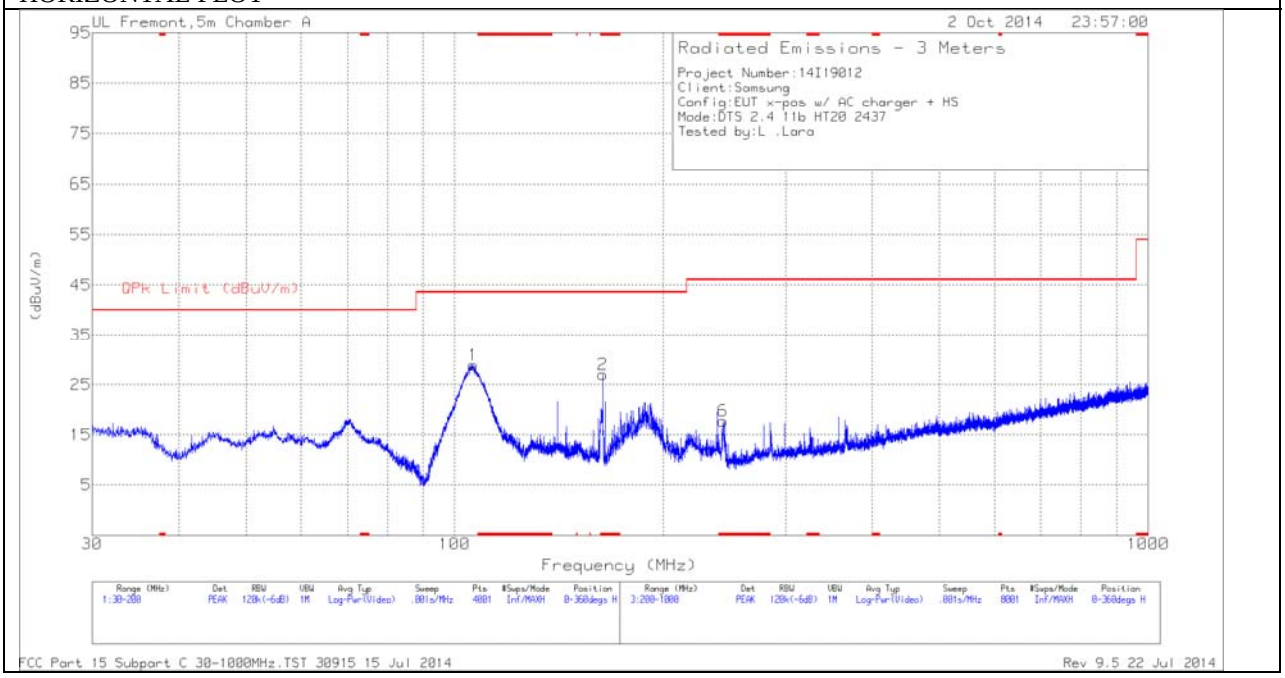
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

11.3. WORST-CASE BELOW 1 GHz

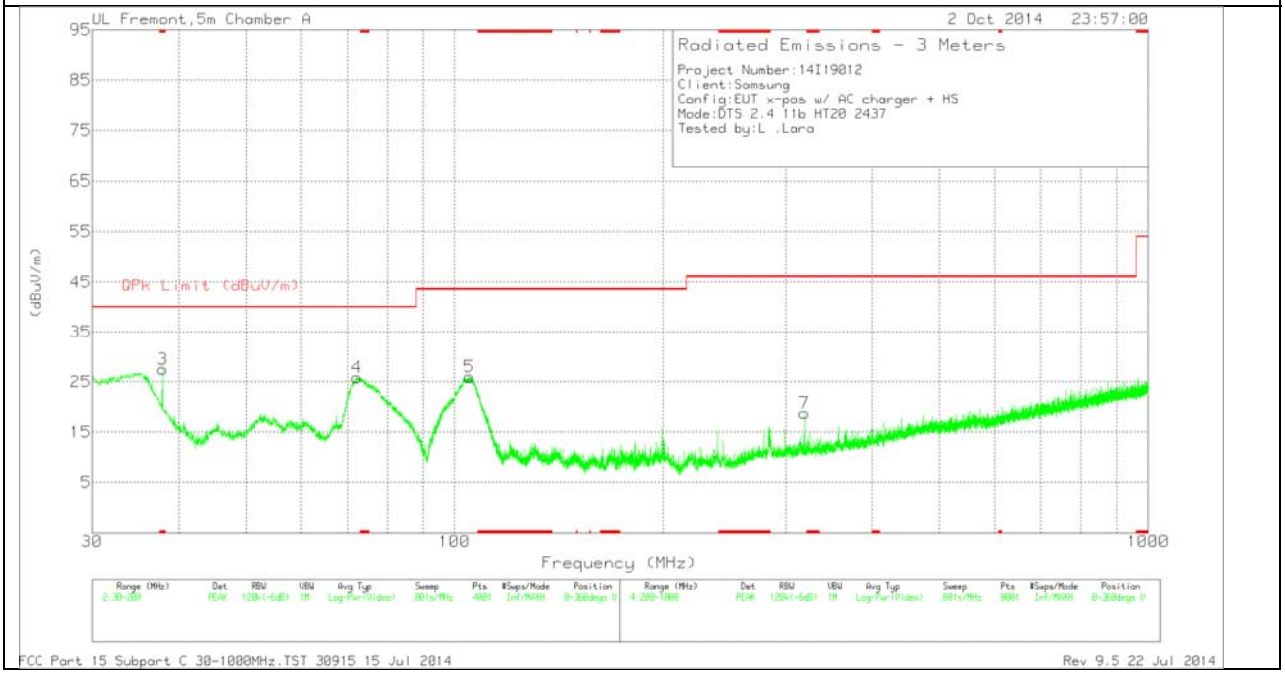
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



Below 1G Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 163.45	45.2	PK	11.8	-30	27	43.52	-16.52	0-360	100	H
3	* 37.905	42.81	PK	15.7	-31	27.51	40	-12.49	0-360	101	V
6	* 243.8	35.84	PK	11.5	-29.6	17.74	46.02	-28.28	0-360	101	H
4	72.33	48.76	PK	7.9	-30.8	25.86	40	-14.14	0-360	101	V
5	105.055	44.89	PK	11.6	-30.5	25.99	43.52	-17.53	0-360	101	V
1	106.2875	47.48	PK	11.8	-30.4	28.88	43.52	-14.64	0-360	300	H
7	319.4	33.96	PK	14	-29.2	18.76	46.02	-27.26	0-360	101	V

PK - Peak detector

Radiated Emissions

12. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

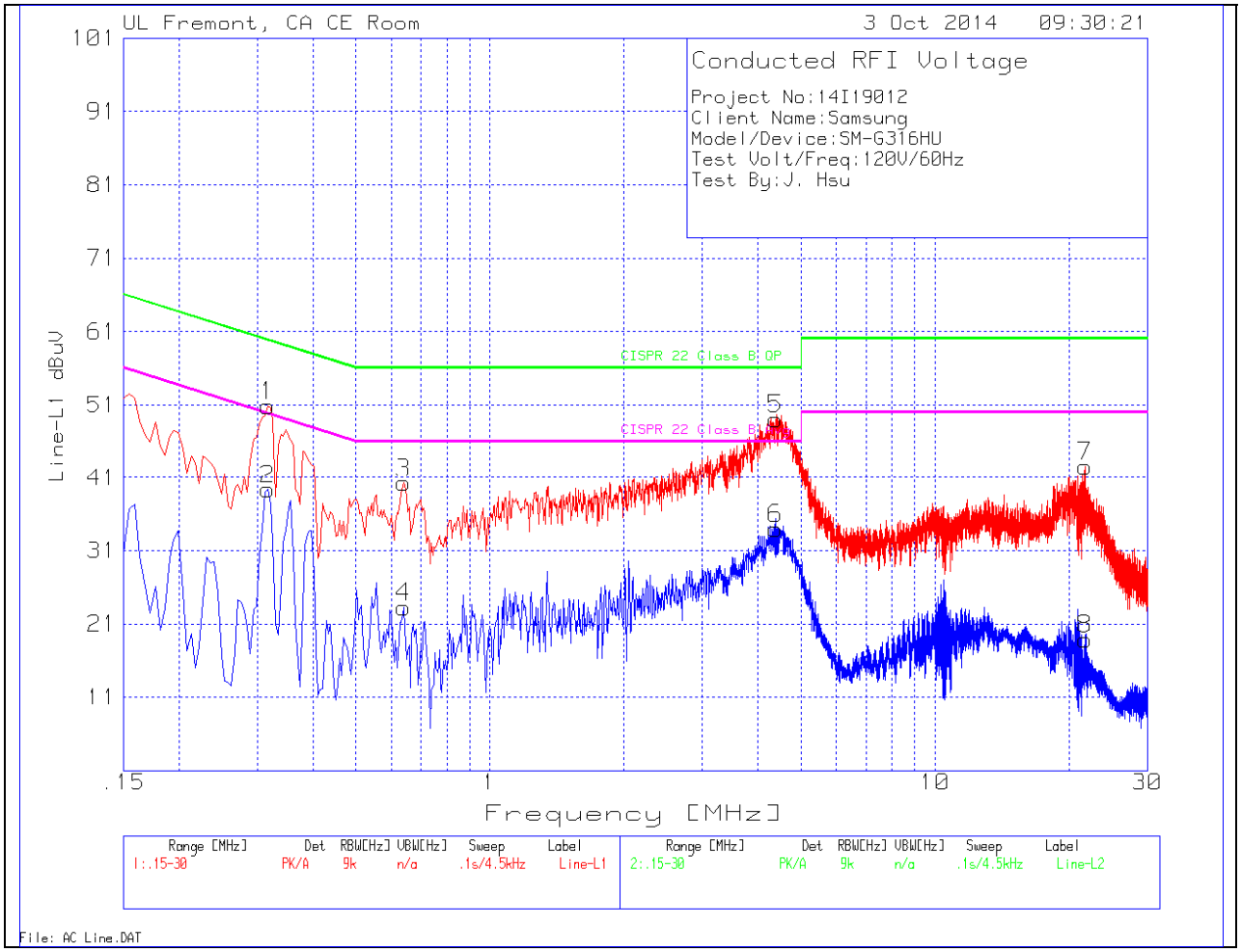
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4 2009.

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

LINE 1 PLOT



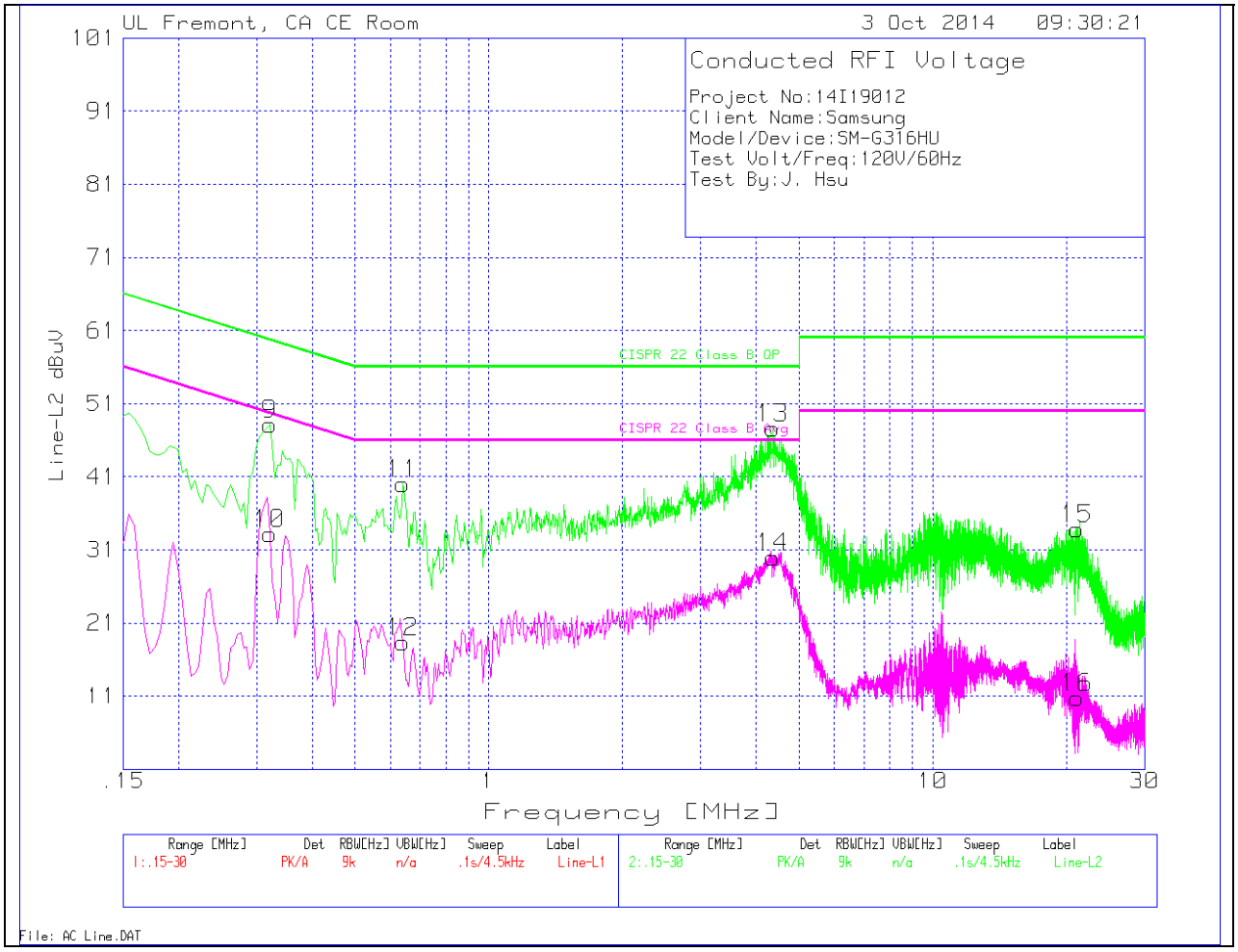
LINE 1 RESULTS

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.3165	50.33	PK	.5	0	50.83	59.8	-8.97	-	-
2	.3165	38.82	Av	.5	0	39.32	-	-	49.8	-10.48
3	.6405	39.99	PK	.3	0	40.29	56	-15.71	-	-
4	.6405	22.95	Av	.3	0	23.25	-	-	46	-22.75
5	4.38	48.7	PK	.2	.1	49	56	-7	-	-
6	4.38	33.69	Av	.2	.1	33.99	-	-	46	-12.01
7	21.7095	42.15	PK	.3	.2	42.65	60	-17.35	-	-
8	21.7095	18.42	Av	.3	.2	18.92	-	-	50	-31.08

LINE 2 PLOT



LINE 2 RESULTS

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
9	.321	47.53	PK	.6	0	48.13	59.7	-11.57	-	-
10	.321	32.54	Av	.6	0	33.14	-	-	49.7	-16.56
11	.6405	39.76	PK	.3	0	40.06	56	-15.94	-	-
12	.6405	18.02	Av	.3	0	18.32	-	-	46	-27.68
13	4.3575	47.3	PK	.2	.1	47.6	56	-8.4	-	-
14	4.3575	29.69	Av	.2	.1	29.99	-	-	46	-16.01
15	21.1425	33.37	PK	.3	.2	33.87	60	-26.13	-	-
16	21.1425	10.3	Av	.3	.2	10.8	-	-	50	-39.2