FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

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

MODEL NUMBER: SM-G3586V

FCC ID: A3LSMG3586V

REPORT NUMBER: 14I17354-4

ISSUE DATE: MARCH 26, 2014

Prepared for

SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH 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
--	3/26/14	Initial Issue	P. Kim

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5

2. TEST METHODOLOGY 6

3. FACILITIES AND ACCREDITATION 6

4. CALIBRATION AND UNCERTAINTY 6

4.1. MEASURING INSTRUMENT CALIBRATION 6

4.2. SAMPLE CALCULATION 6

4.3. MEASUREMENT UNCERTAINTY 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. MAXIMUM OUTPUT POWER 7

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 7

5.4. WORST-CASE CONFIGURATION AND MODE 8

5.5. DESCRIPTION OF TEST SETUP 9

6. TEST AND MEASUREMENT EQUIPMENT 11

7. MEASUREMENT METHODS 12

8. SUMMARY TABLE 13

9. ANTENNA PORT TEST RESULTS 14

9.1. 6 dB BANDWIDTH 14

9.1.1. 802.11b MODE IN THE 2.4 GHz BAND 15
9.1.2. 802.11g MODE IN THE 2.4 GHz BAND 15
9.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND 15

9.2. 99% BANDWIDTH 19

9.2.1. 802.11b MODE IN THE 2.4 GHz BAND 19
9.2.2. 802.11g MODE IN THE 2.4 GHz BAND 19
9.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND 19

9.3. AVERAGE POWER 23

9.3.1. 802.11b MODE IN THE 2.4 GHz BAND 24
9.3.2. 802.11g MODE IN THE 2.4 GHz BAND 24
9.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND 24

9.4. OUTPUT POWER 25

9.4.1. 802.11b MODE IN THE 2.4 GHz BAND 26
9.4.2. 802.11g MODE IN THE 2.4 GHz BAND 26
9.4.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND 26

9.5. PSD 31

9.5.1. 802.11b MODE IN THE 2.4 GHz BAND 31
9.5.2. 802.11g MODE IN THE 2.4 GHz BAND 31
9.5.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND 31

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.6. OUT-OF-BAND EMISSIONS 35
9.6.1. 802.11b MODE IN THE 2.4 GHz BAND 36
9.6.2. 802.11g MODE IN THE 2.4 GHz BAND 42
9.6.3. 802.11n MODE IN THE 2.4 GHz BAND 48

10. RADIATED TEST RESULTS 54

10.1. LIMITS AND PROCEDURE 54

10.2. TRANSMITTER ABOVE 1 GHz 55
10.2.1. TX ABOVE 1 GHz 802.11b MODE IN THE 2.4 GHz BAND 55
10.2.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND 68
10.2.3. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND 81

10.3. WORST-CASE BELOW 1 GHz 94

11. AC POWER LINE CONDUCTED EMISSIONS 97

12. SETUP PHOTOS 101

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

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

MODEL: SM-G3586V

SERIAL NUMBER: FL-102-D (Conducted); FL-102-A (Radiated)

DATE TESTED: MARCH 14 - 21, 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:

PHILIP KIM
CONSUMER TECHNOLOGY DIVISION
PROGRAM MANAGER
UL Verification Services Inc.

Tested By:

CHARLES VERGONIO
CONSUMER TECHNOLOGY DIVISION
LAB TECHNICIAN
UL Verification Services Inc.

This report shall not be reproduced except in full, without the written approval of 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 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%.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	18.89	77.45
2412 - 2462	802.11g	22.48	177.01
2412 - 2462	802.11n HT20	23.08	203.24

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -2.27 dBi 2.4GHz

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

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

I/O CABLES

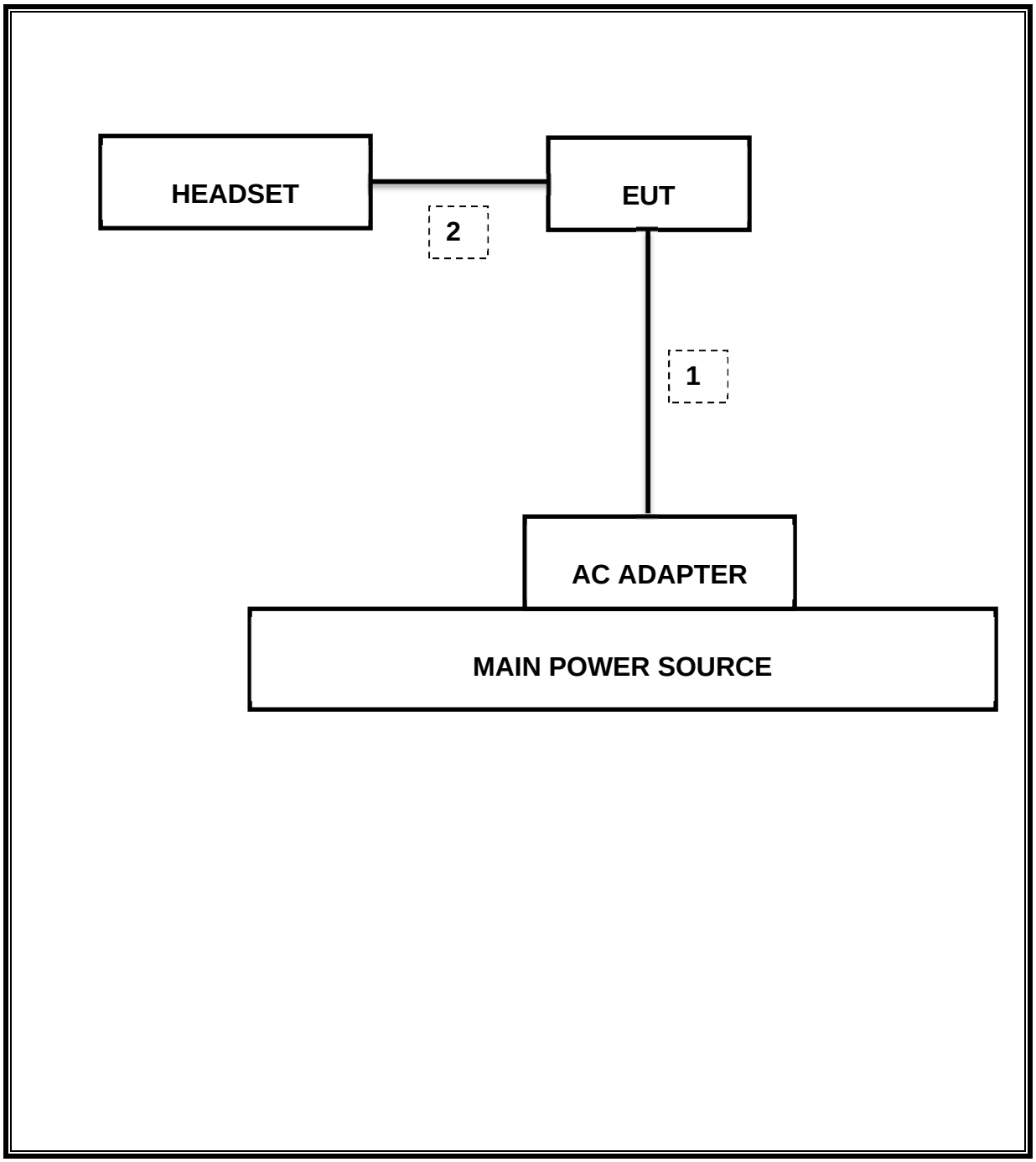
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

TEST SETUP

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

SETUP DIAGRAM FOR TESTS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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	04/01/14
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	08/13/14
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/18/14
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	06/28/14
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	T243	03/06/15
RF Preamplifier, 100KHz -> 1300MHz	HP	TBD	C00825	06/01/14
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/14
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/14
AC Power Supply, 2,500VA 45-500Hz	Elgar-Ametek	CW2501M	F00013	CNR
RF Preamplifier, 1GHz - 40GHz	Miteq	NSP4000-SP2	C00990	08/20/14
Attenuator / Switch driver	HP	11713A	F00204	CNR
Low Pass Filter 3GHz	Micro-Tronics	LPS17541	F00219	05/23/14
High Pass Filter 5GHz	Micro-Tronics	HPS17542	F00222	05/22/14
High Pass Filter 6GHz	Micro-Tronics	HPM17543	F00224	05/22/14

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

8. SUMMARY TABLE

The model FCC ID: A3LSMG3586Vshares the same enclosure and circuit board as mode FCC ID: A3LSMG3588V. 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 A3LSMG3588V WLAN remains representative of this model (FCC ID A3LSMG3586V) test data for FCC ID: A3LSMG3588V is being submitted for this application.
Radiated emissions were fully re-evaluated against 15B requirements for digital devices and results indicated no significant differences between the two versions. Other differences between the two FCC IDs are in the WWAN RF Transceiver, RF FEM, PAM design and WWAN SAR and EMC has been fully retested for FCC ID: A3LSMG3586V.

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	8.08MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-25.83dBm
15.247	RSS-210 A8.4	TX conducted output power	<30dBm		Pass	23.08dBm
15.247	RSS-210 A8.2	PSD	<8dBm		Pass	-5.60dBm
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	52.21 dBuV
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	49.35dBuV/m

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.1.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	8.10	0.5
Mid	2437	8.10	0.5
High	2462	8.08	0.5
Worst		8.08	

9.1.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.46	0.5
Mid	2437	16.54	0.5
High	2462	16.54	0.5
Worst		16.46	

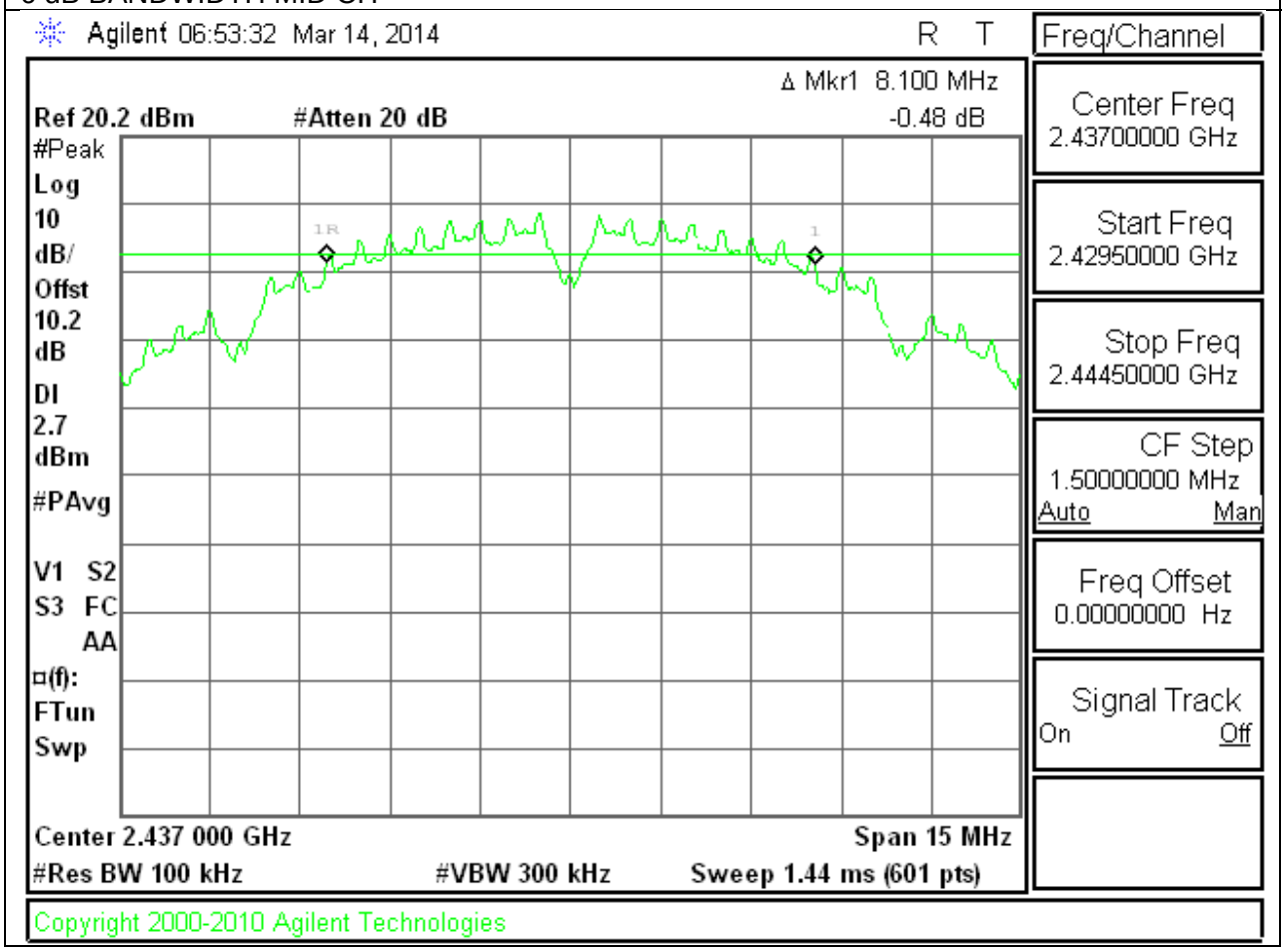
9.1.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.62	0.5
Mid	2437	17.75	0.5
High	2462	17.71	0.5
Worst		17.62	

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11b 6 dB BANDWIDTH

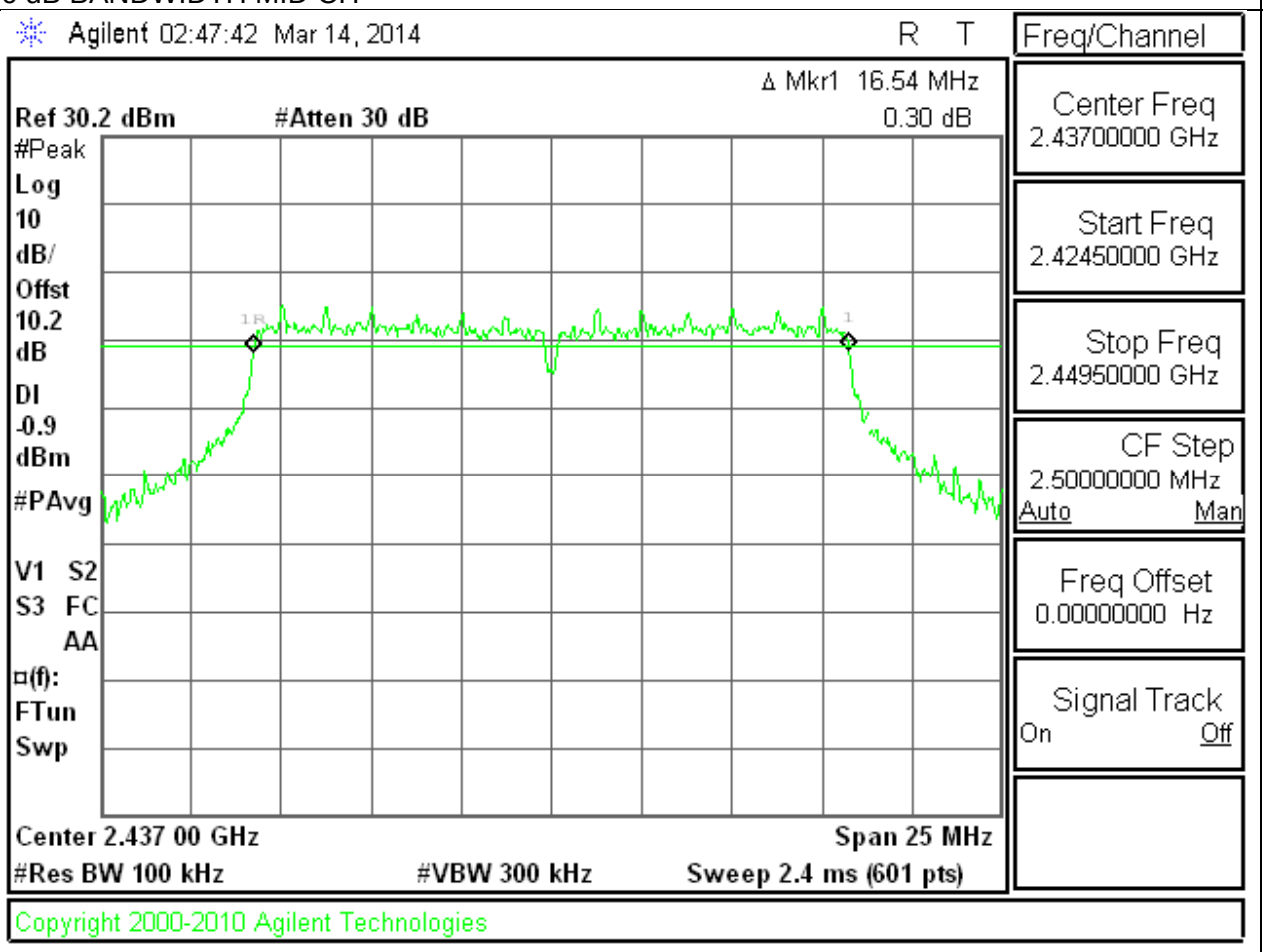
6 dB BANDWIDTH MID CH



UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11g 6 dB BANDWIDTH

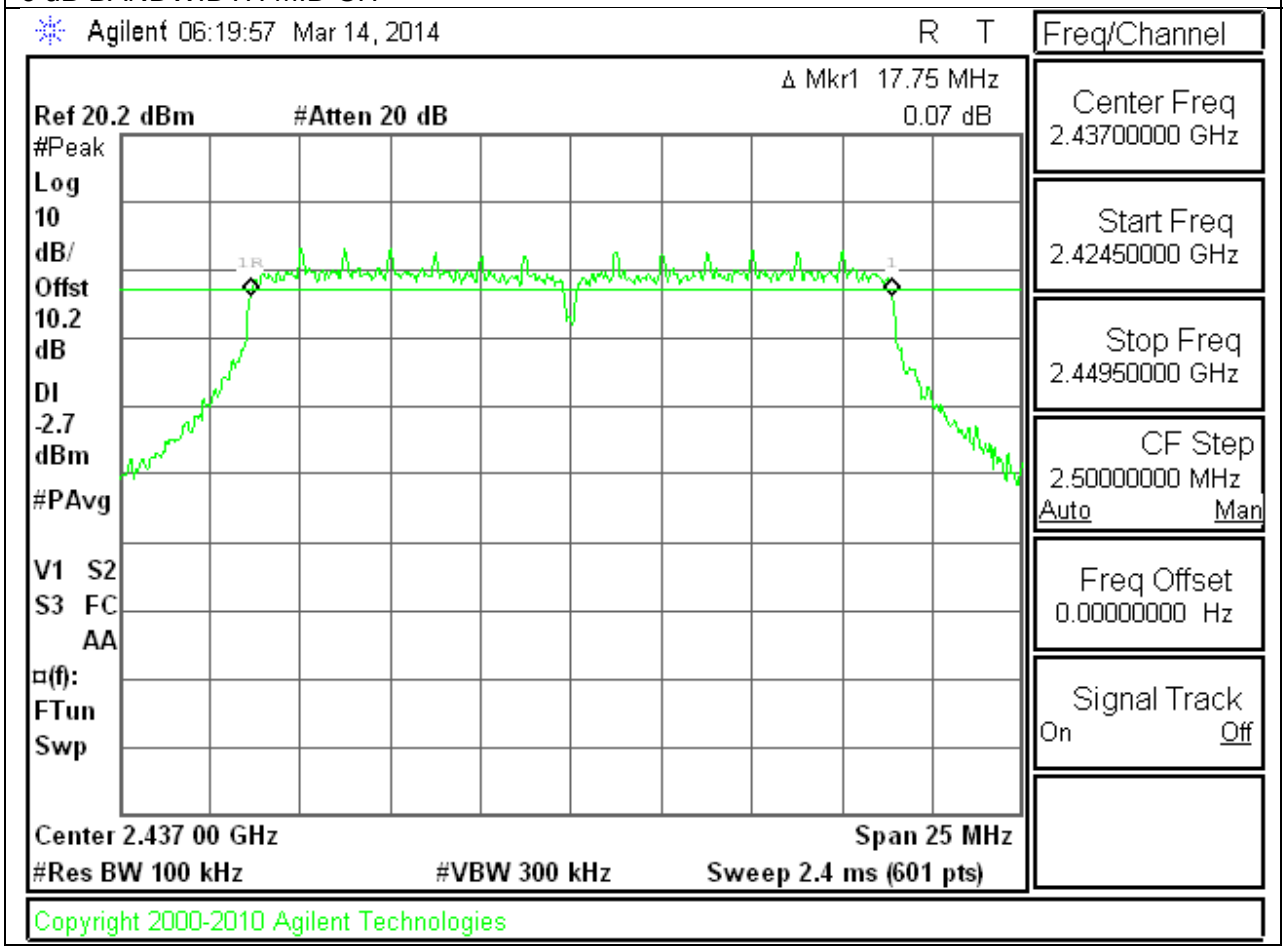
6 dB BANDWIDTH MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11n 6 dB BANDWIDTH

6 dB BANDWIDTH MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	12.59
Mid	2437	12.32
High	2462	12.21
Worst		12.59

9.2.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.46
Mid	2437	16.35
High	2462	16.34
Worst		16.46

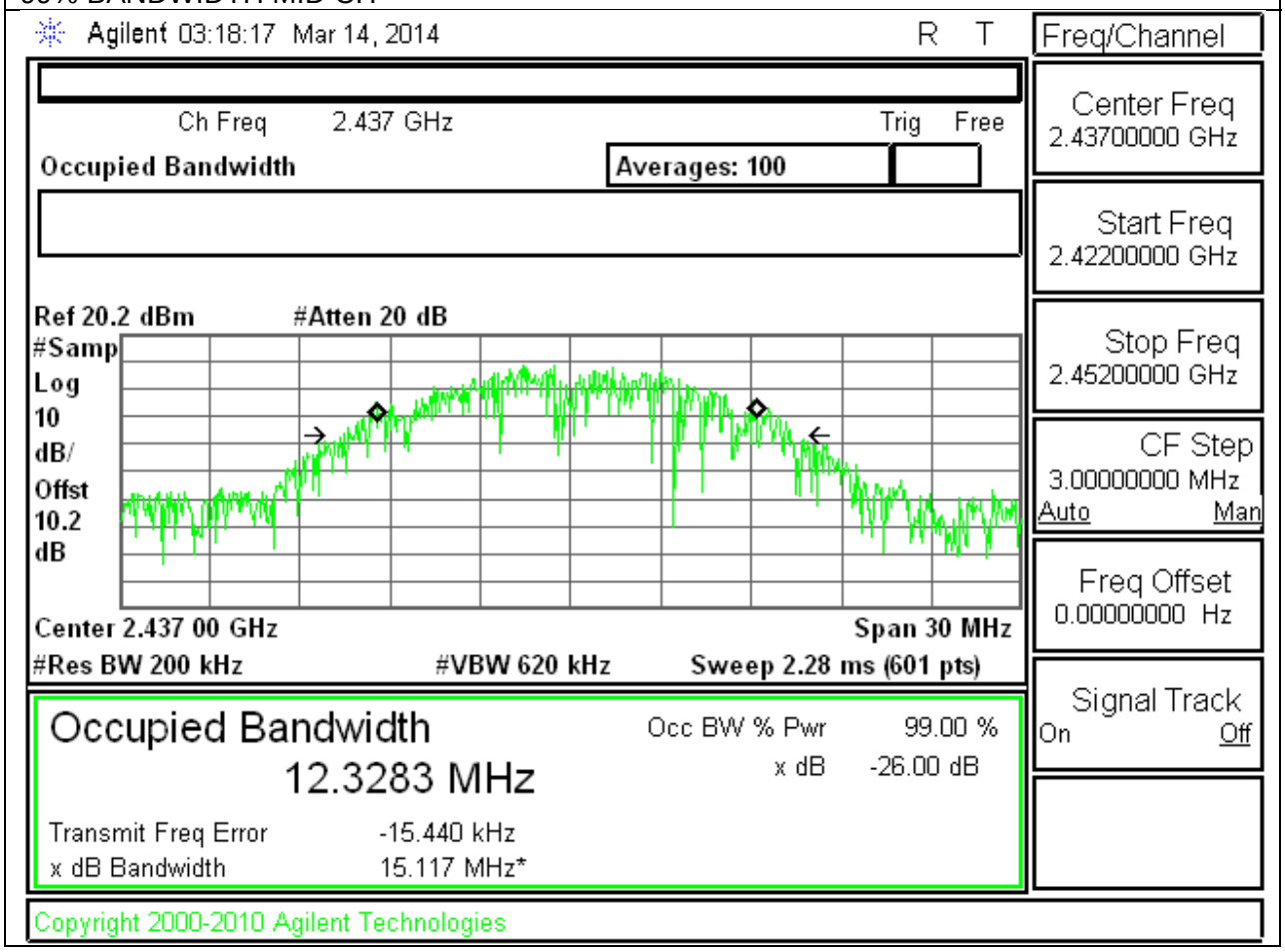
9.2.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.44
Mid	2437	17.59
High	2462	17.50
Worst		17.59

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11b 99% BANDWIDTH

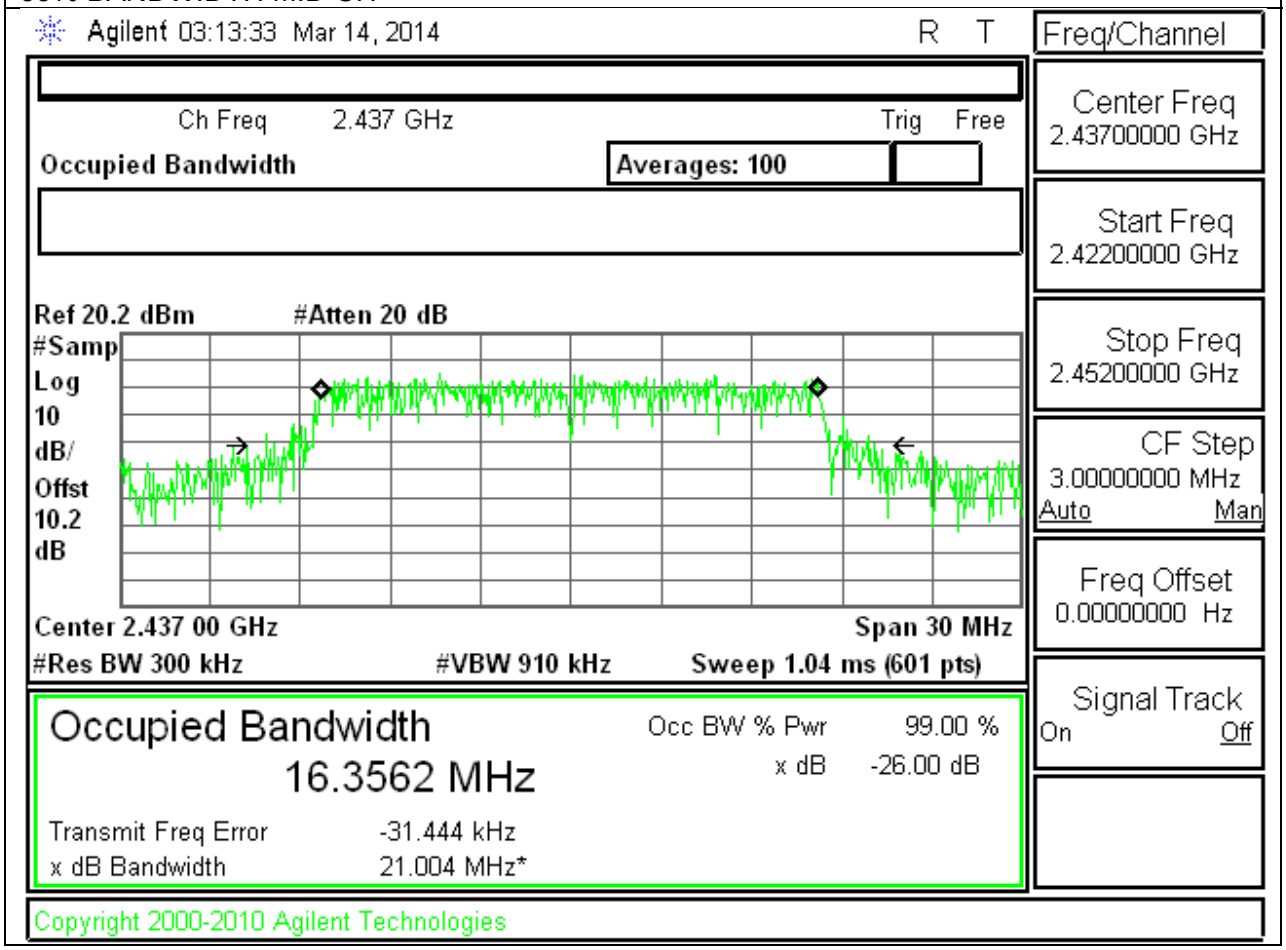
99% BANDWIDTH MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11g 99% BANDWIDTH

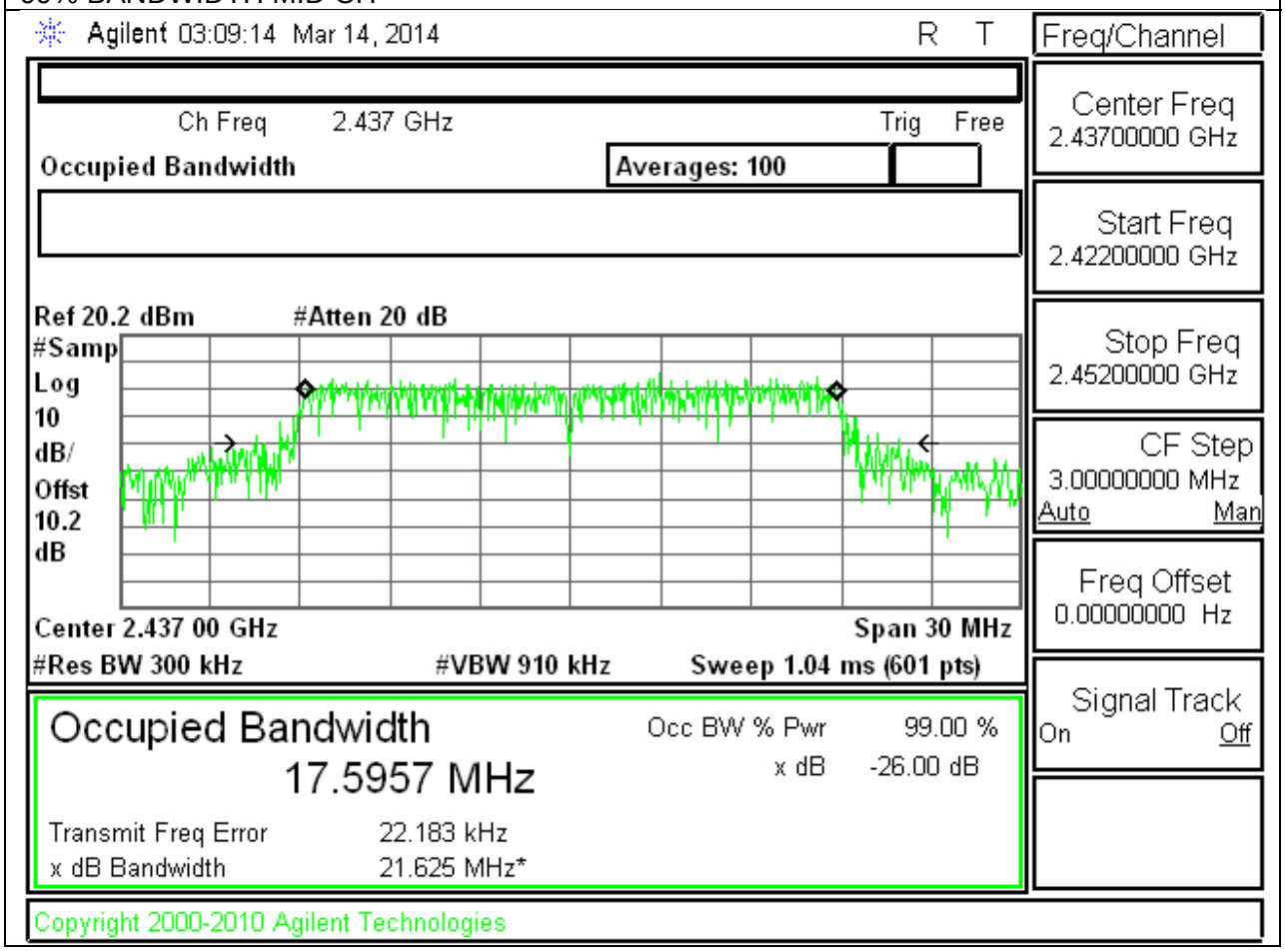
99% BANDWIDTH MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11n 99% BANDWIDTH

99% BANDWIDTH MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.3.1. 802.11b MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Avg Power (dBm)
Low	2412	15.80
Mid	2437	16.00
High	2462	16.30
Worst		16.300

9.3.2. 802.11g MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Avg Power (dBm)
Low	2412	13.70
Mid	2437	14.00
High	2462	14.20
Worst		14.200

9.3.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

Channel	Frequency (MHz)	Avg Power (dBm)
Low	2412	13.30
Mid	2437	13.50
High	2462	12.90
Worst		13.500

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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	-2.27	30.00	30	36	30.00
Mid	2437	-2.27	30.00	30	36	30.00
High	2462	-2.27	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	18.29	18.29	30.00	-11.71
Mid	2437	18.71	18.71	30.00	-11.29
High	2462	18.89	18.89	30.00	-11.11
Worst			18.89		

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	-2.27	30.00	30	36	30.00
Mid	2437	-2.27	30.00	30	36	30.00
High	2462	-2.27	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	21.91	21.91	30.00	-8.09
Mid	2437	22.43	22.43	30.00	-7.57
High	2462	22.48	22.48	30.00	-7.52
Worst			22.48		

9.4.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-2.27	30.00	30	36	30.00
Mid	2437	-2.27	30.00	30	36	30.00
High	2462	-2.27	30.00	30	36	30.00

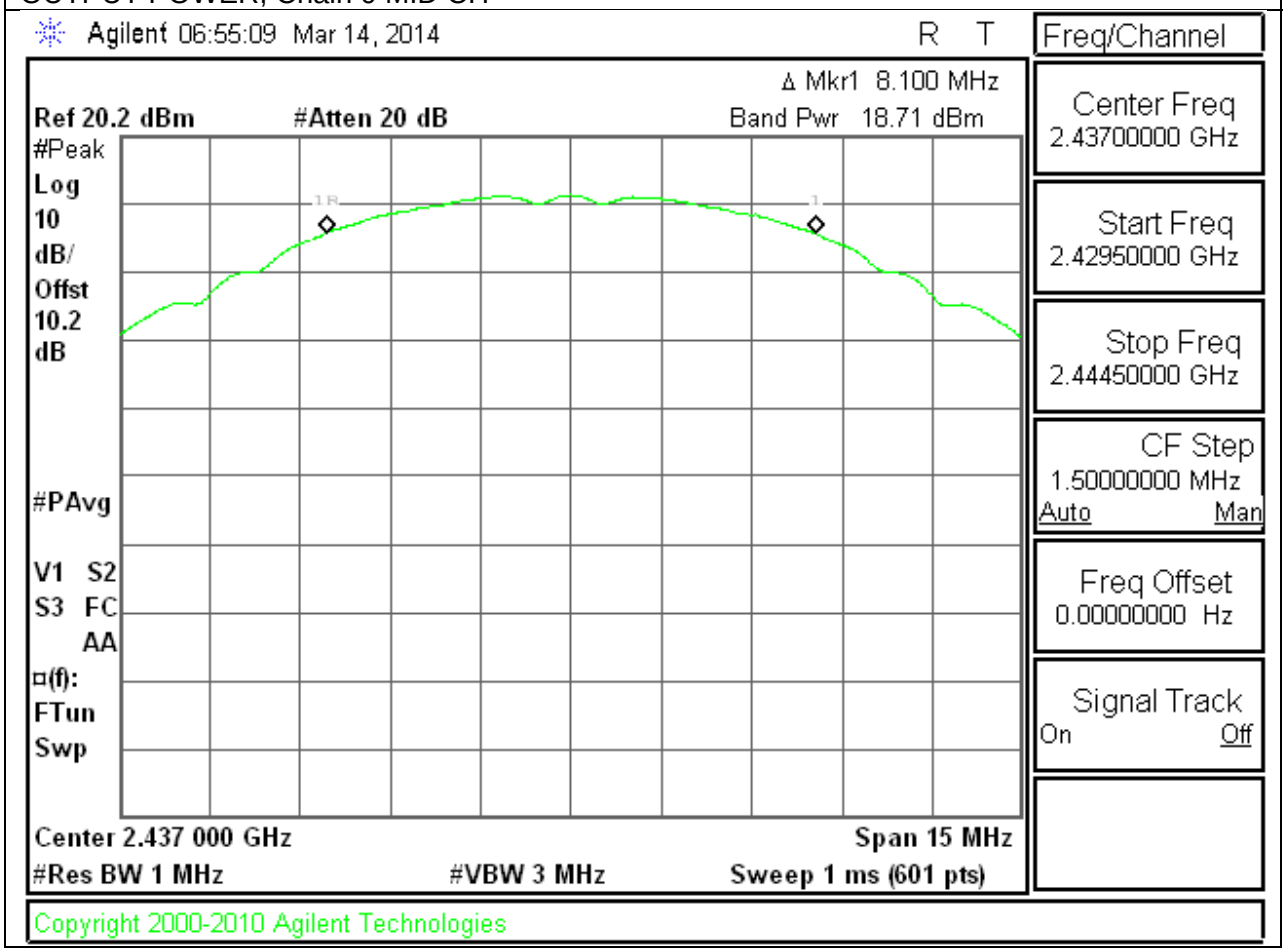
Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	22.17	22.17	30.00	-7.83
Mid	2437	23.00	23.00	30.00	-7.00
High	2462	23.08	23.08	30.00	-6.92
Worst			23.08		

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11b OUTPUT POWER, Chain 0

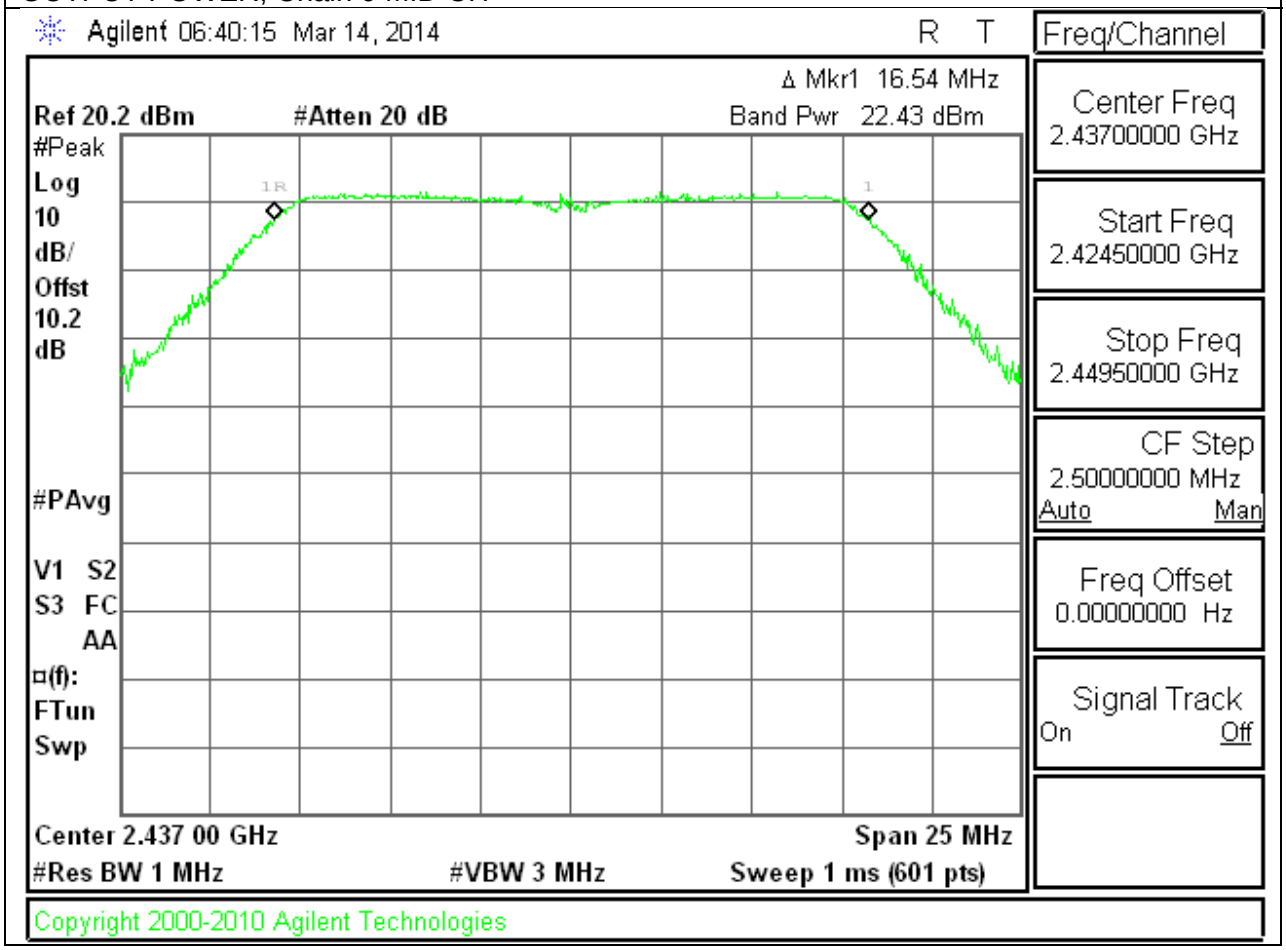
OUTPUT POWER, Chain 0 MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11g OUTPUT POWER, Chain 0

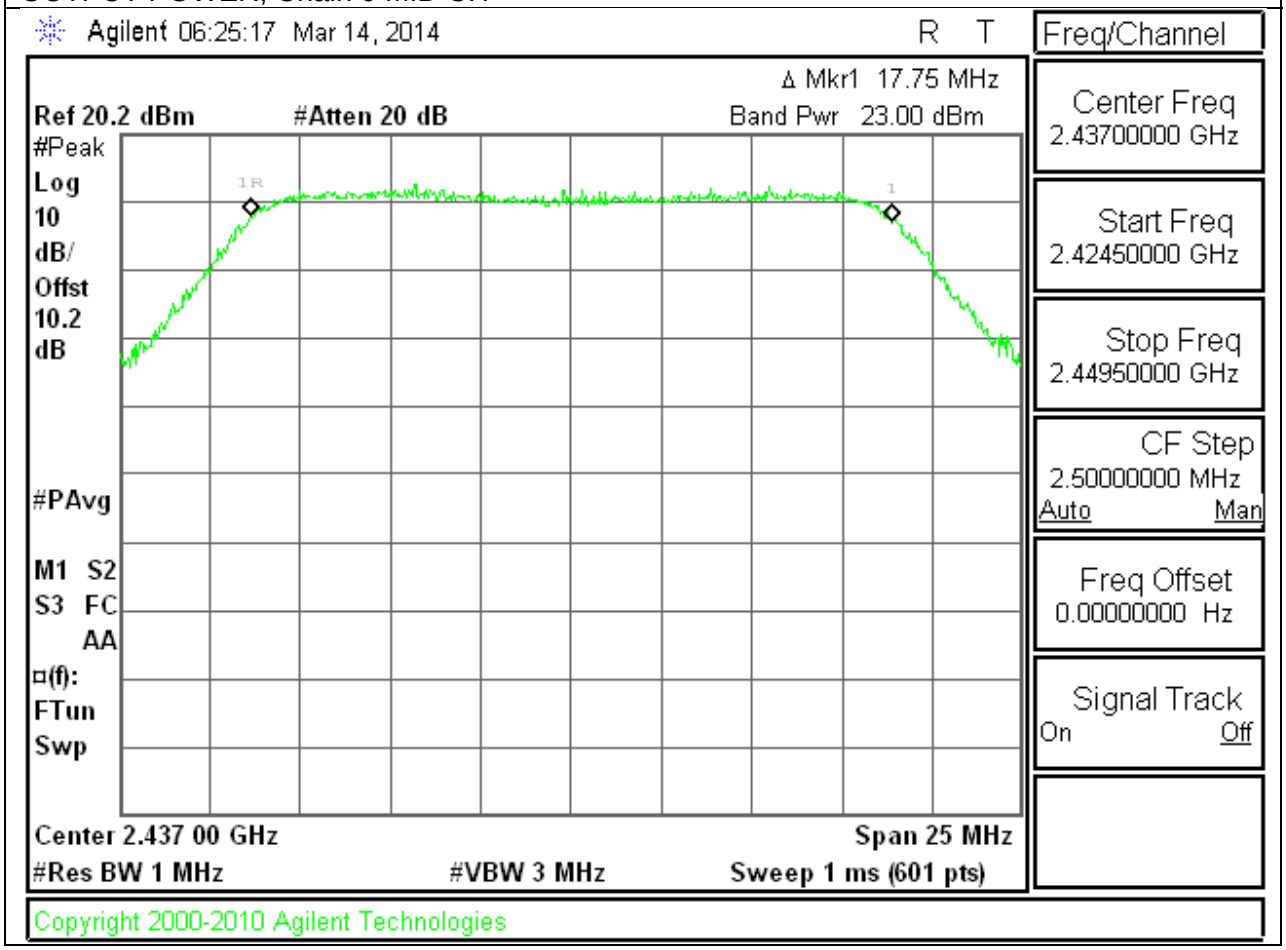
OUTPUT POWER, Chain 0 MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11n OUTPUT POWER, Chain 0

OUTPUT POWER, Chain 0 MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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	-6.05	8.0	-14.1
Mid	2437	-5.60	8.0	-13.6
High	2462	-5.67	8.0	-13.7

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	-9.41	8.0	-17.4
Mid	2437	-9.43	8.0	-17.4
High	2462	-9.92	8.0	-17.9

9.5.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

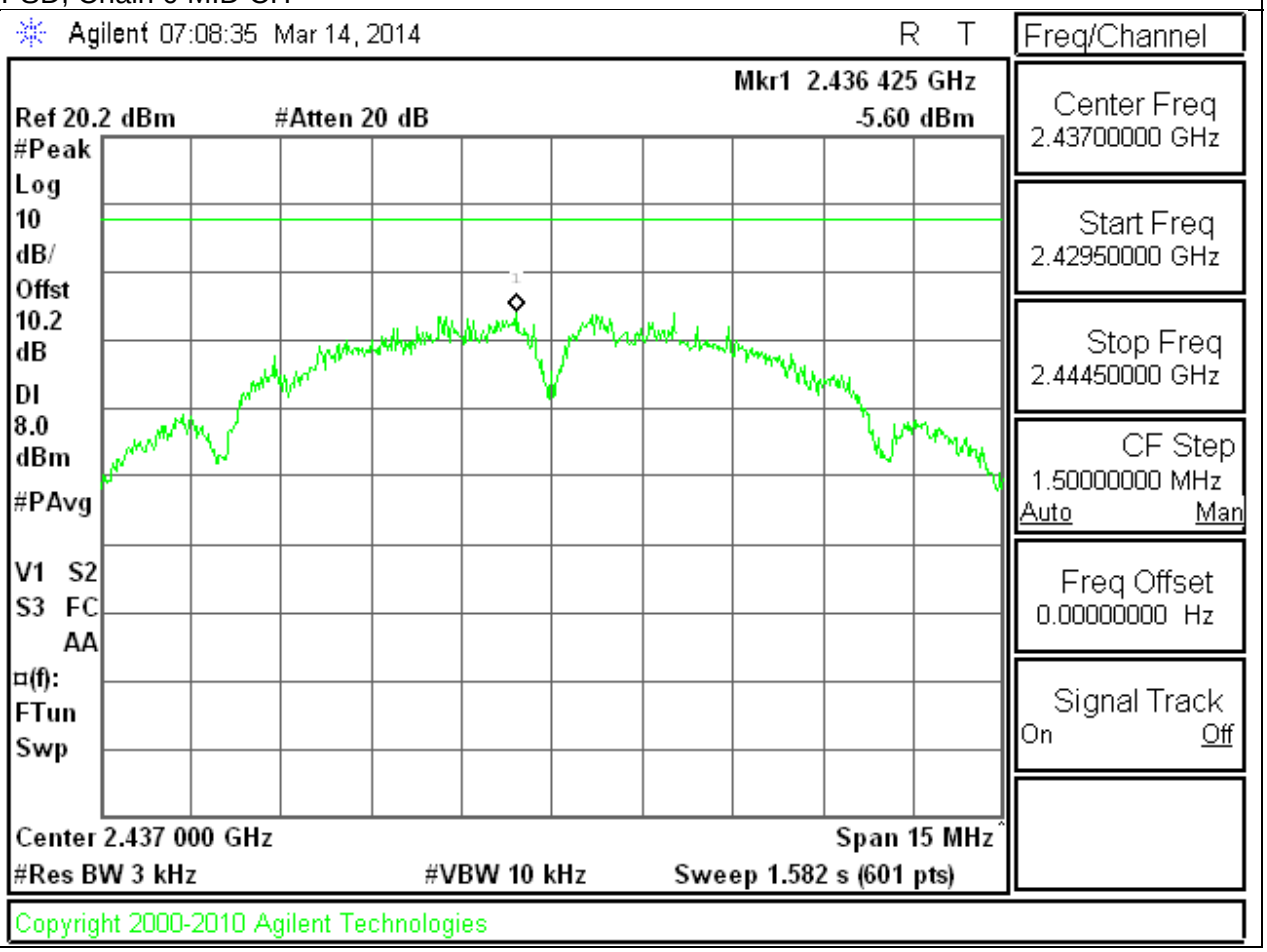
PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-11.24	8.0	-19.2
Mid	2437	-11.19	8.0	-19.2
High	2462	-10.81	8.0	-18.8

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11b PSD, Chain 0

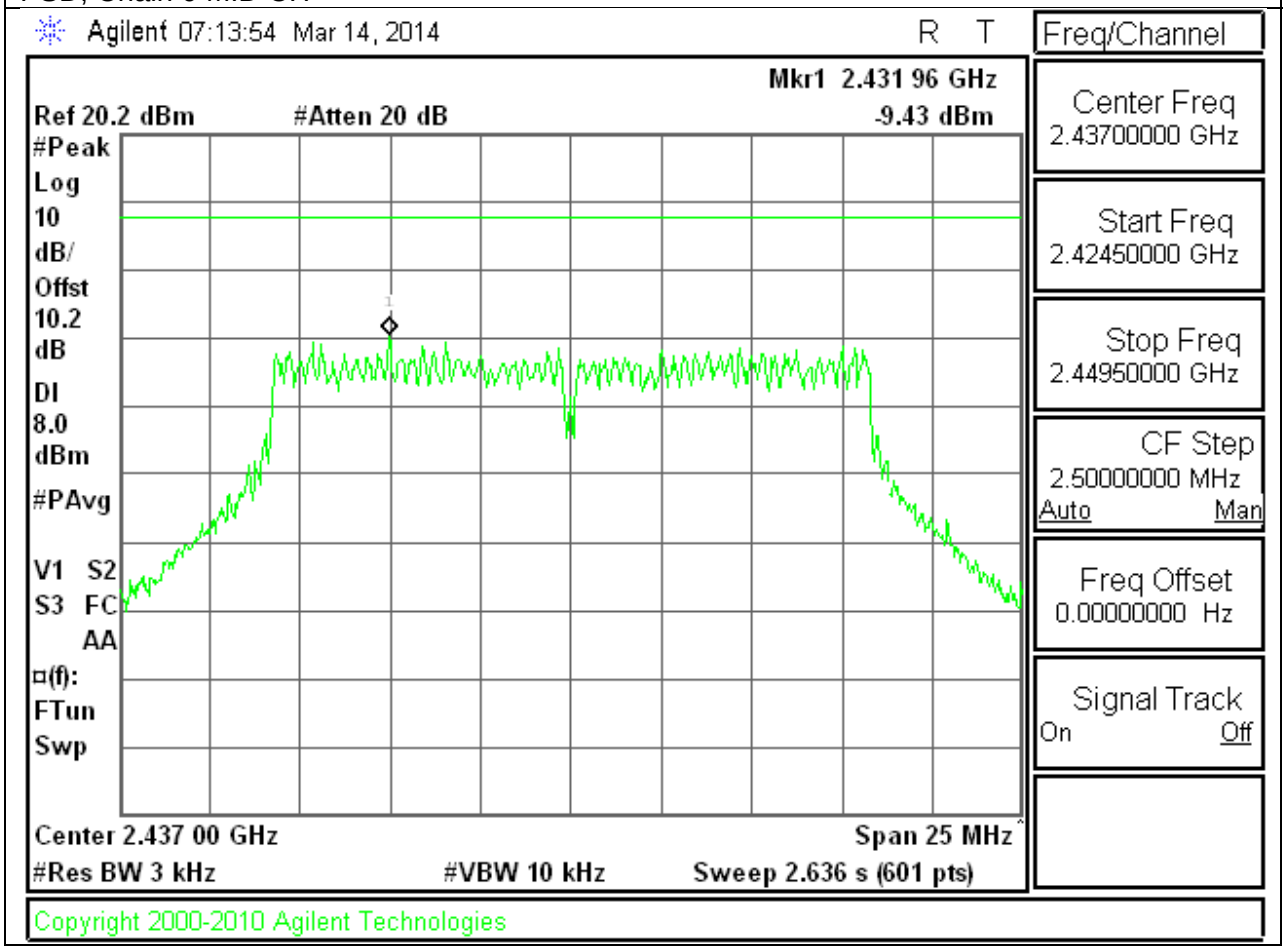
PSD, Chain 0 MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11g PSD, Chain 0

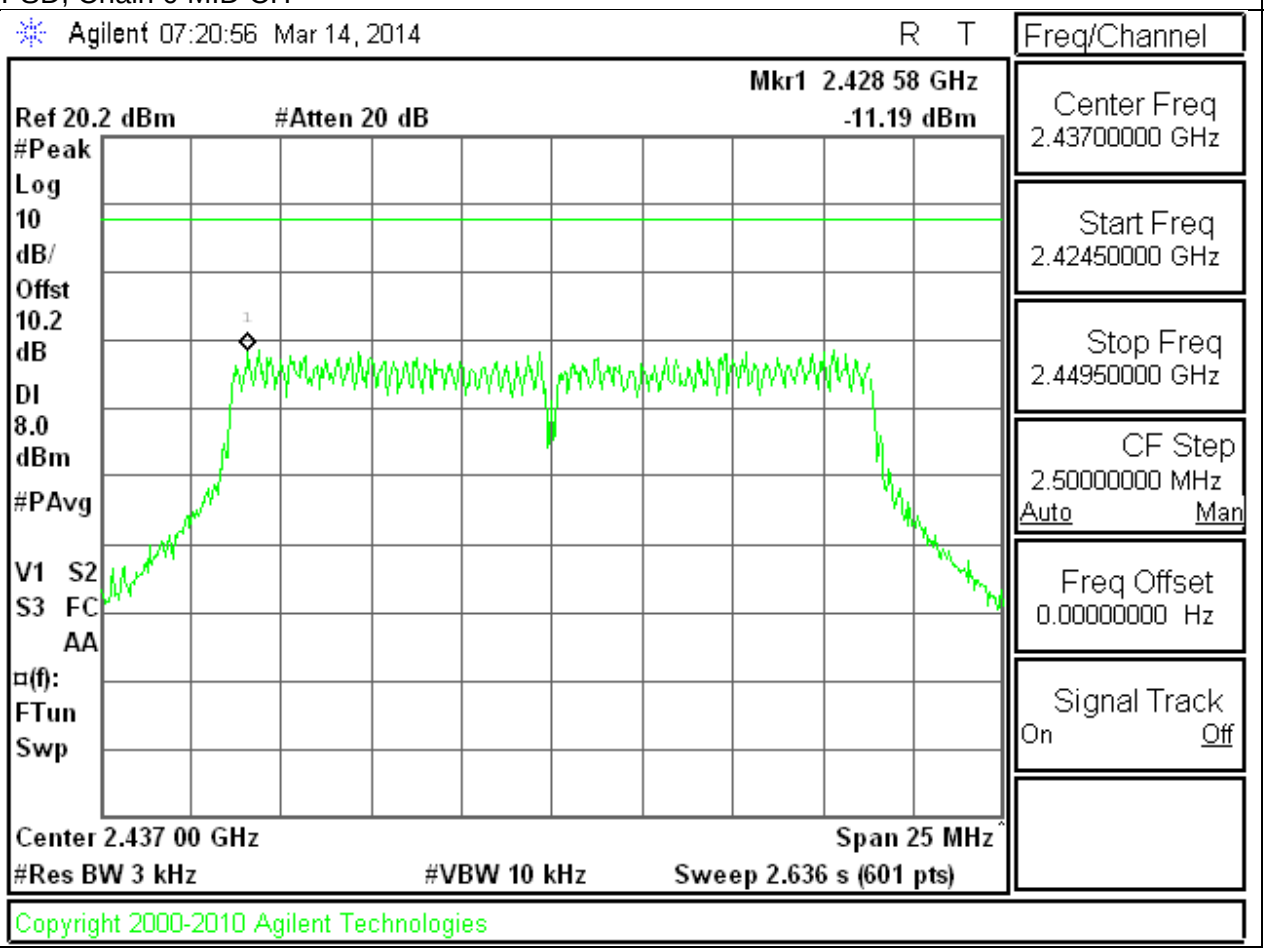
PSD, Chain 0 MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

802.11n PSD, Chain 0

PSD, Chain 0 MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

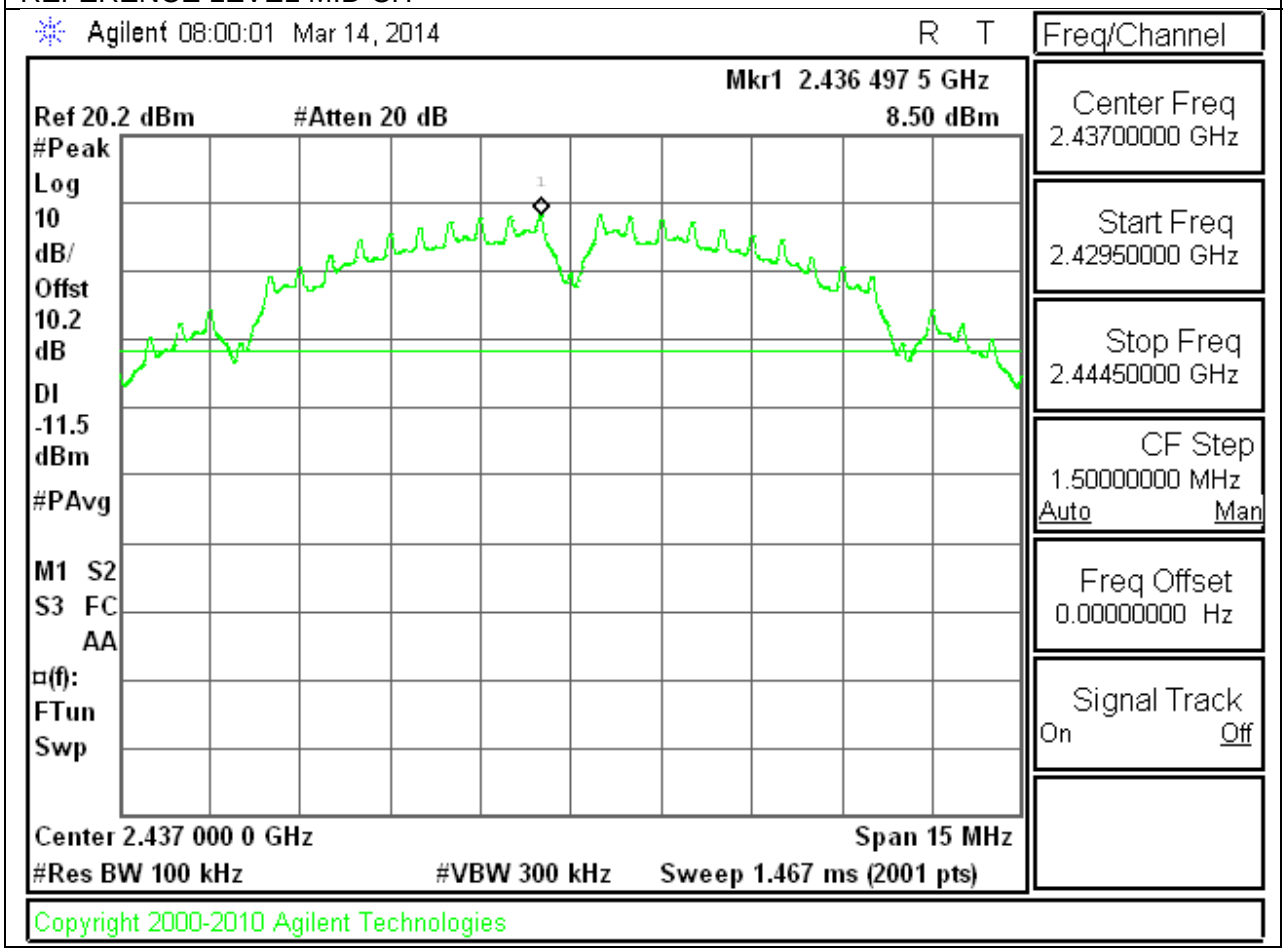
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

RESULTS

9.6.1. 802.11b MODE IN THE 2.4 GHz BAND

IN-BAND REFERENCE LEVEL

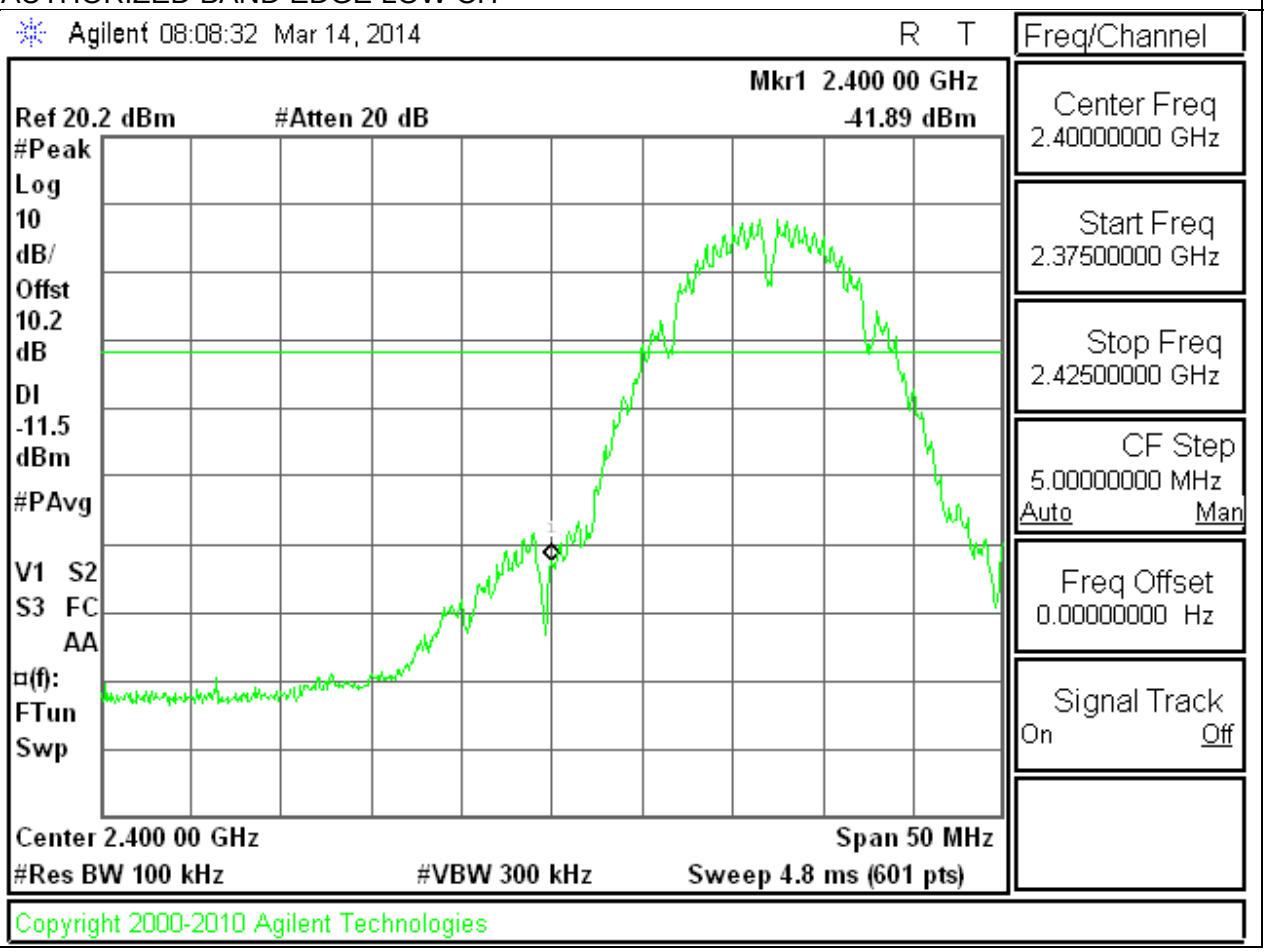
REFERENCE LEVEL MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL BANDEDGE

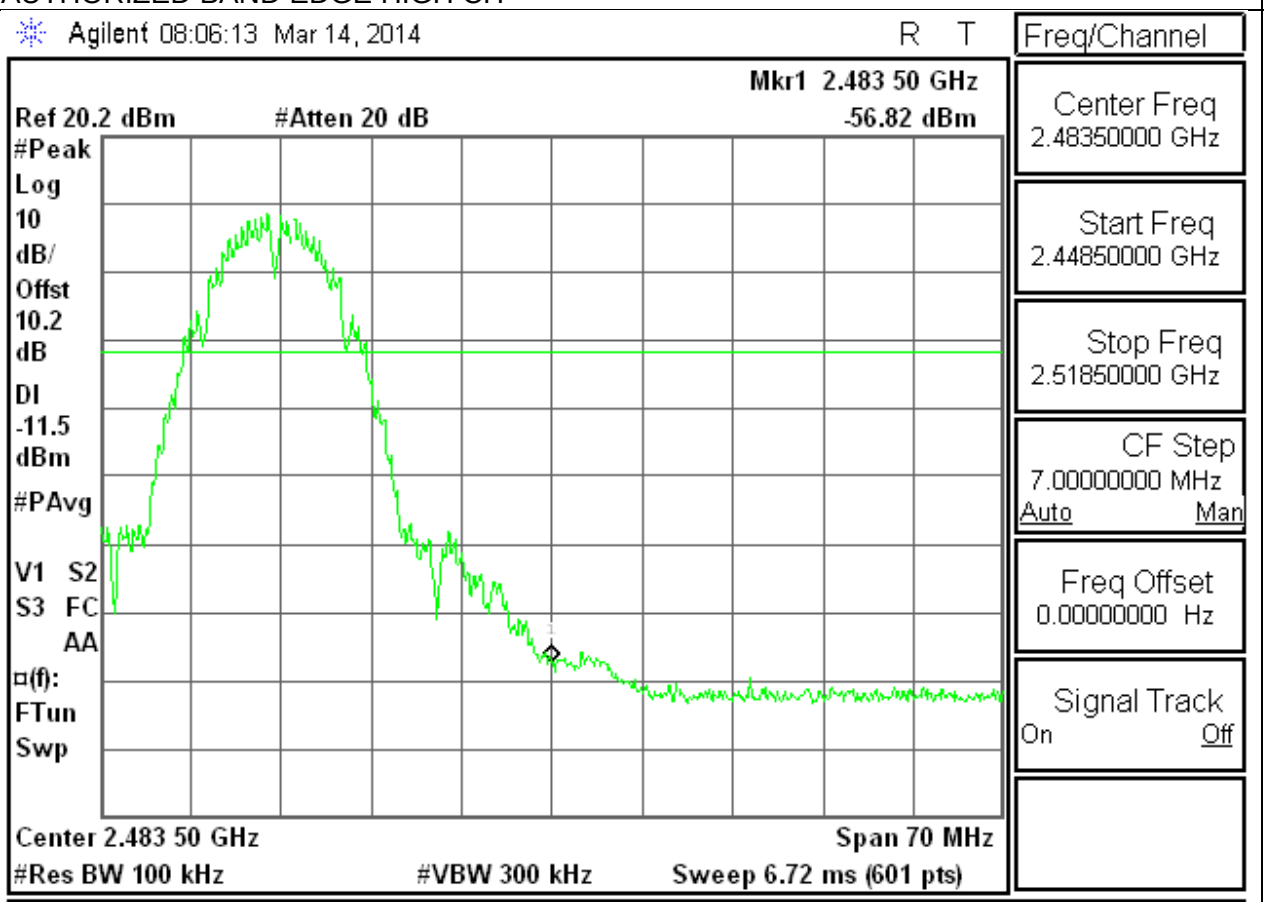
AUTHORIZED BAND EDGE LOW CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL BANDEDGE

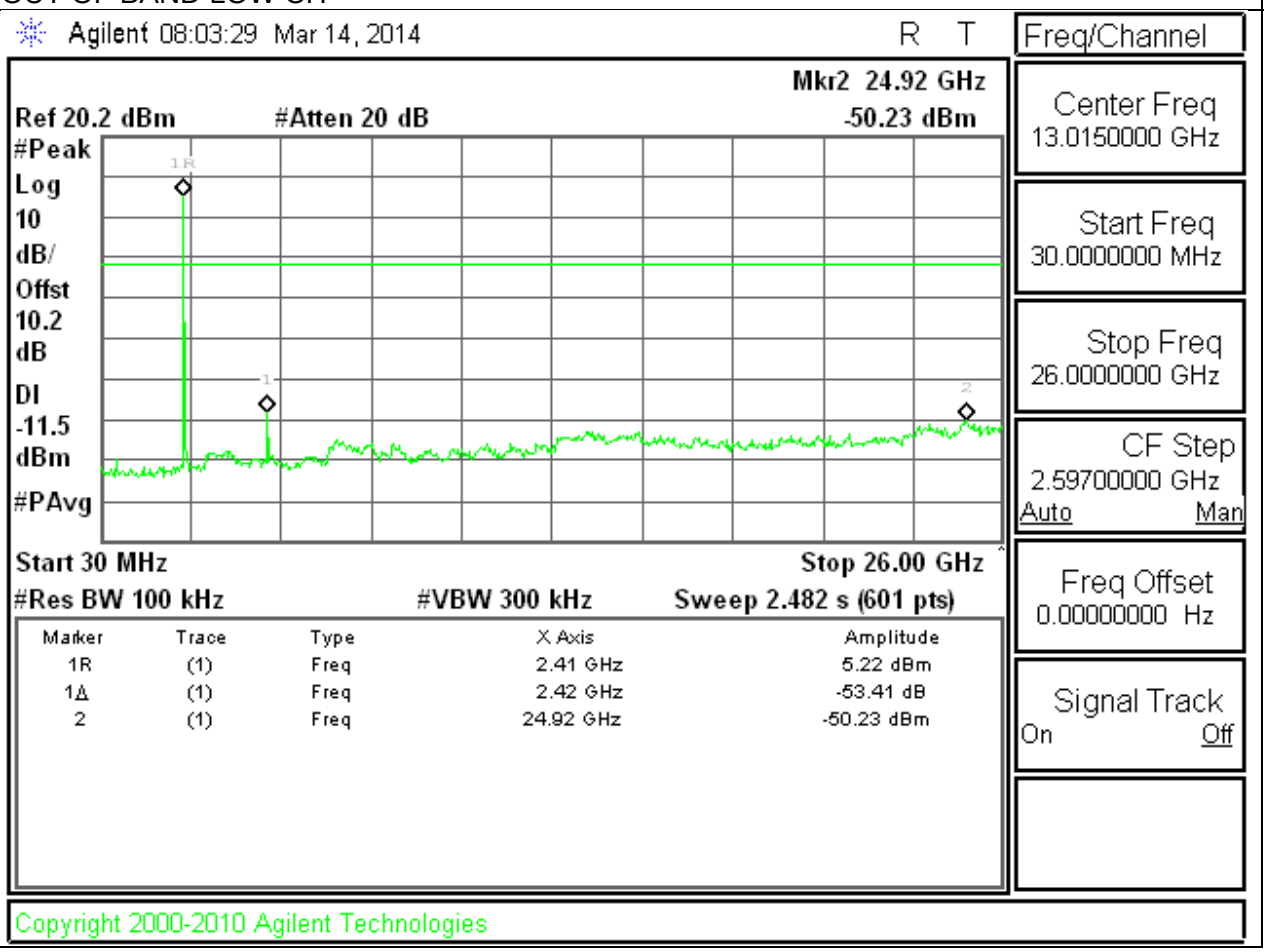
AUTHORIZED BAND EDGE HIGH CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

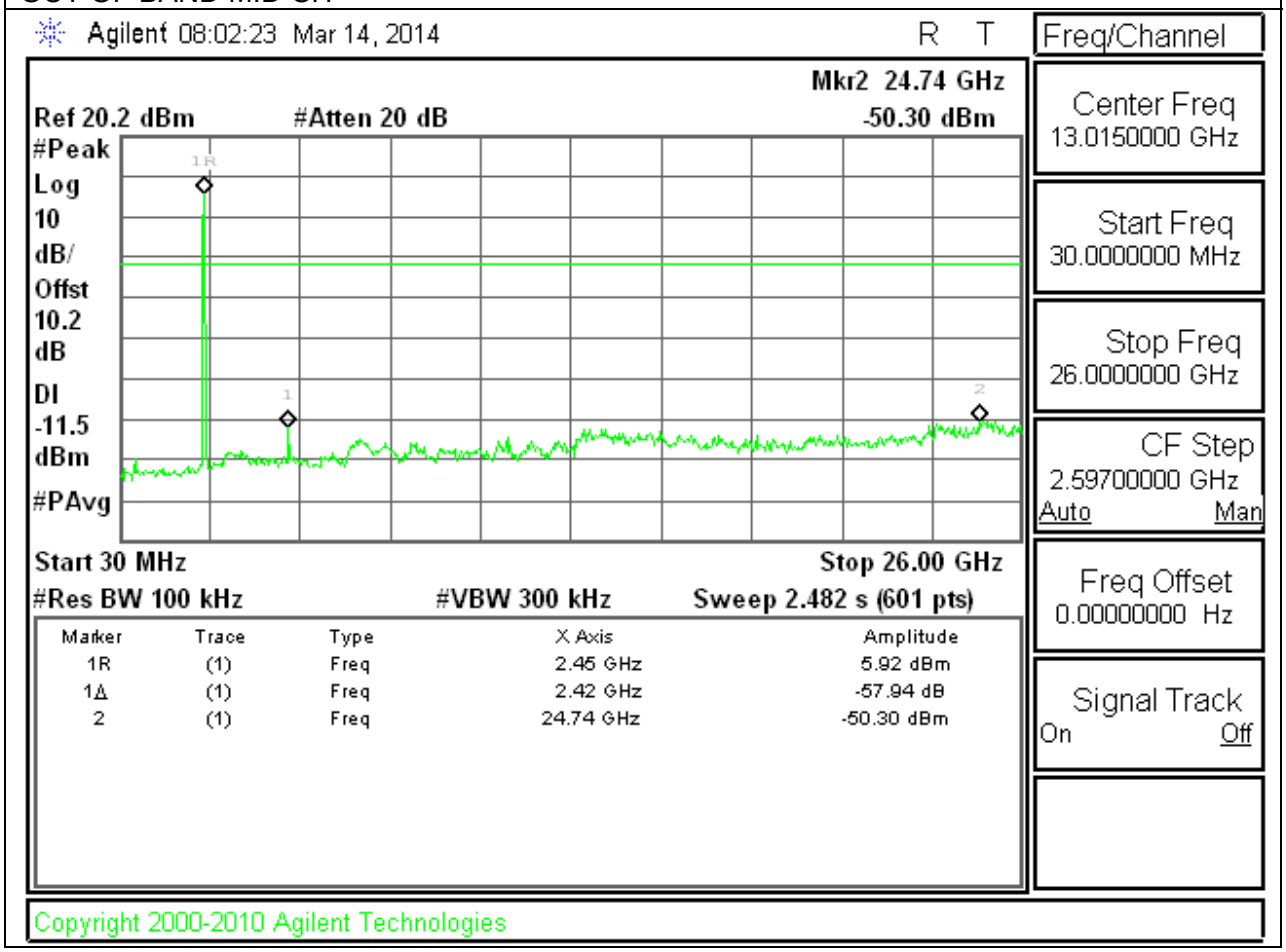
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



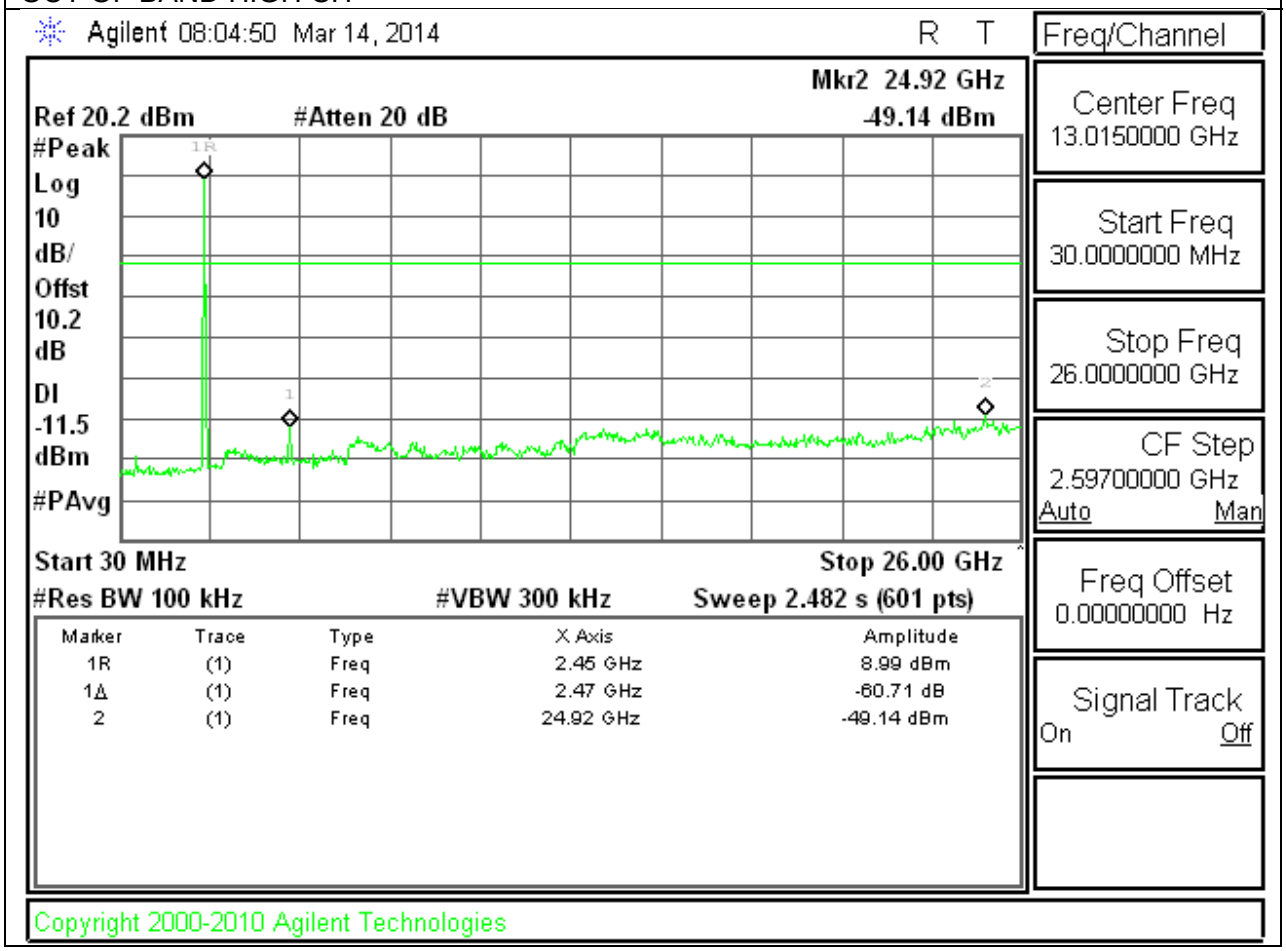
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

OUT OF BAND MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

OUT OF BAND HIGH CH

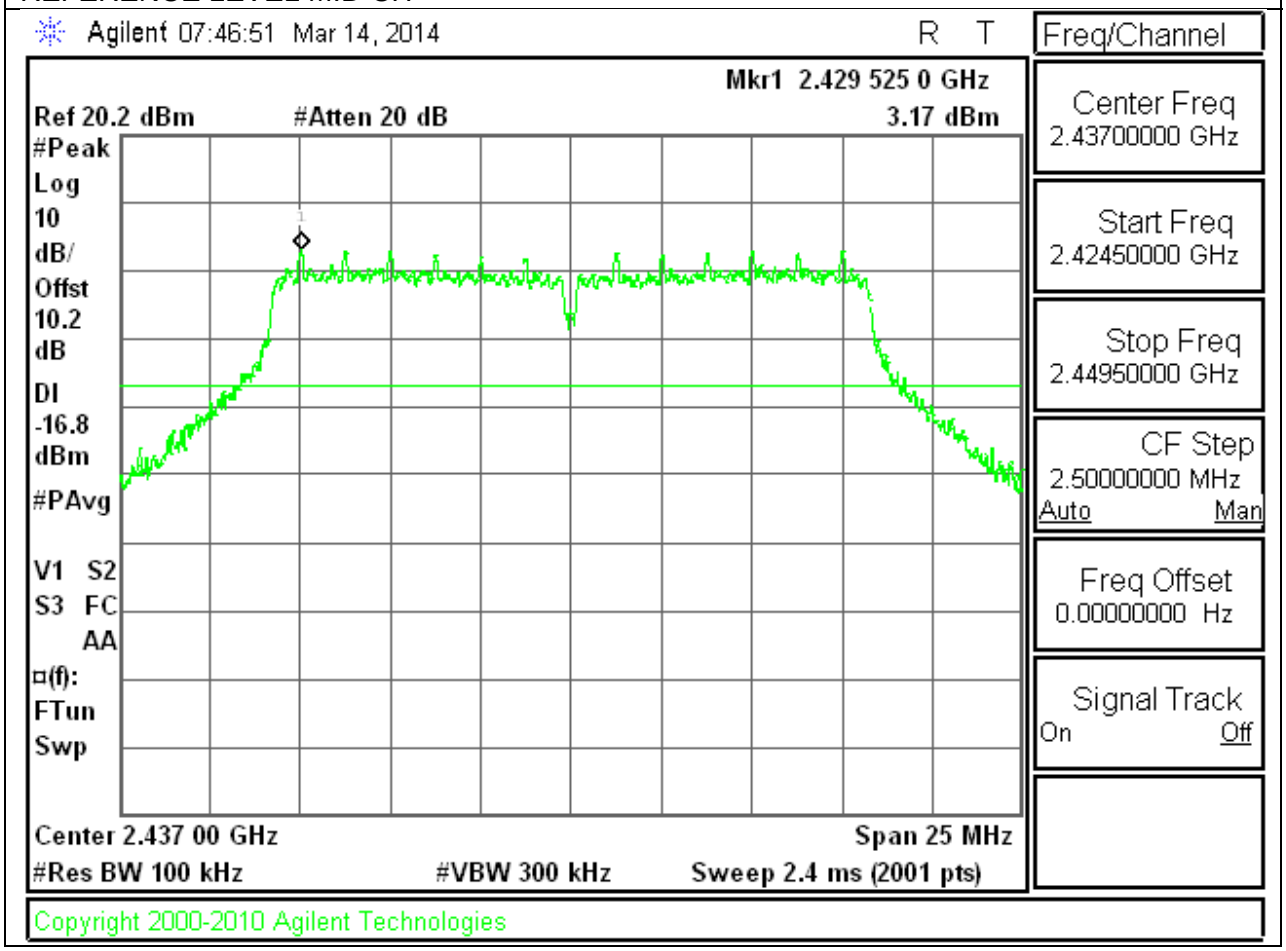


This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.6.2. 802.11g MODE IN THE 2.4 GHz BAND

IN-BAND REFERENCE LEVEL

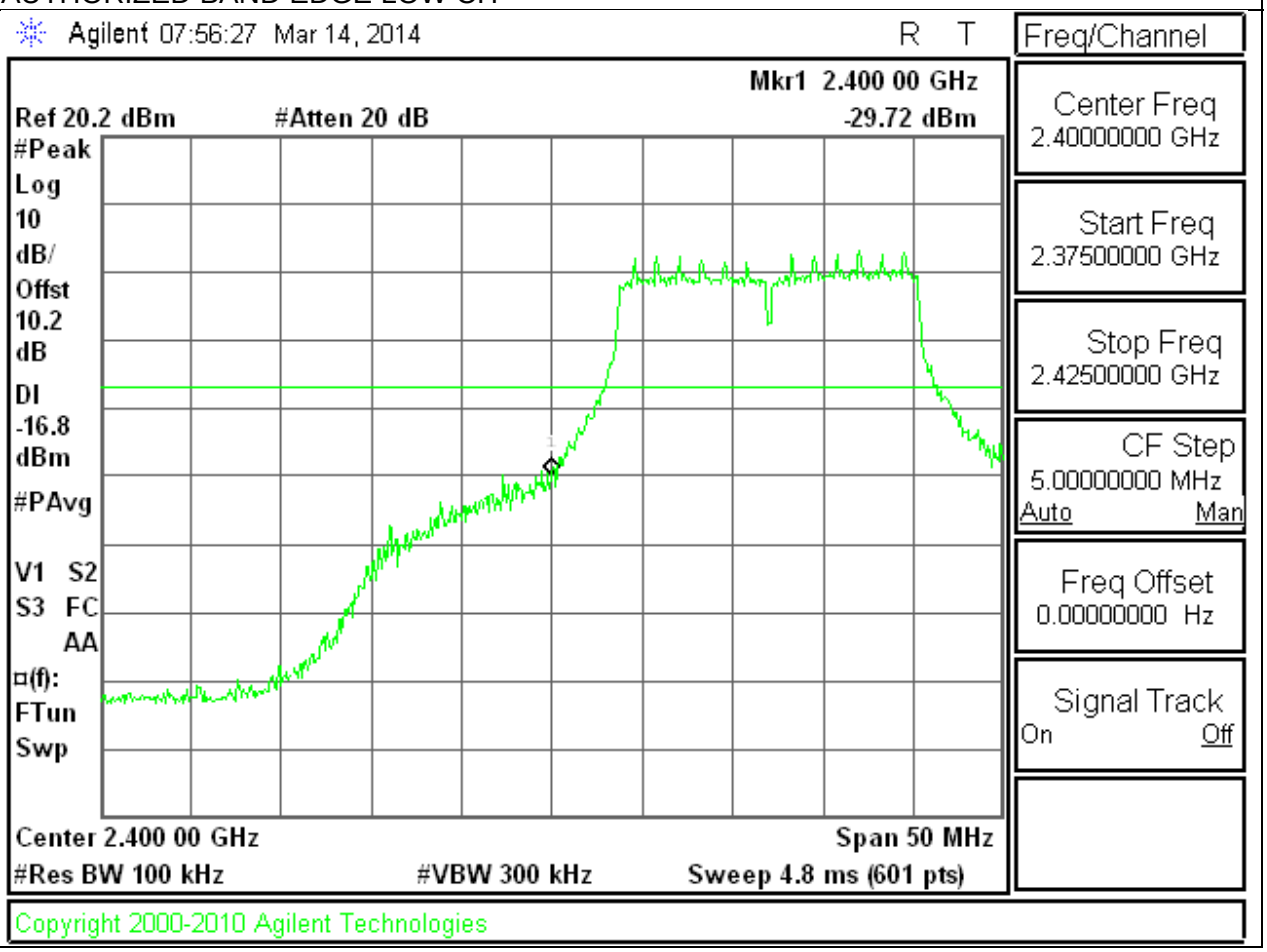
REFERENCE LEVEL MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL BANDEDGE

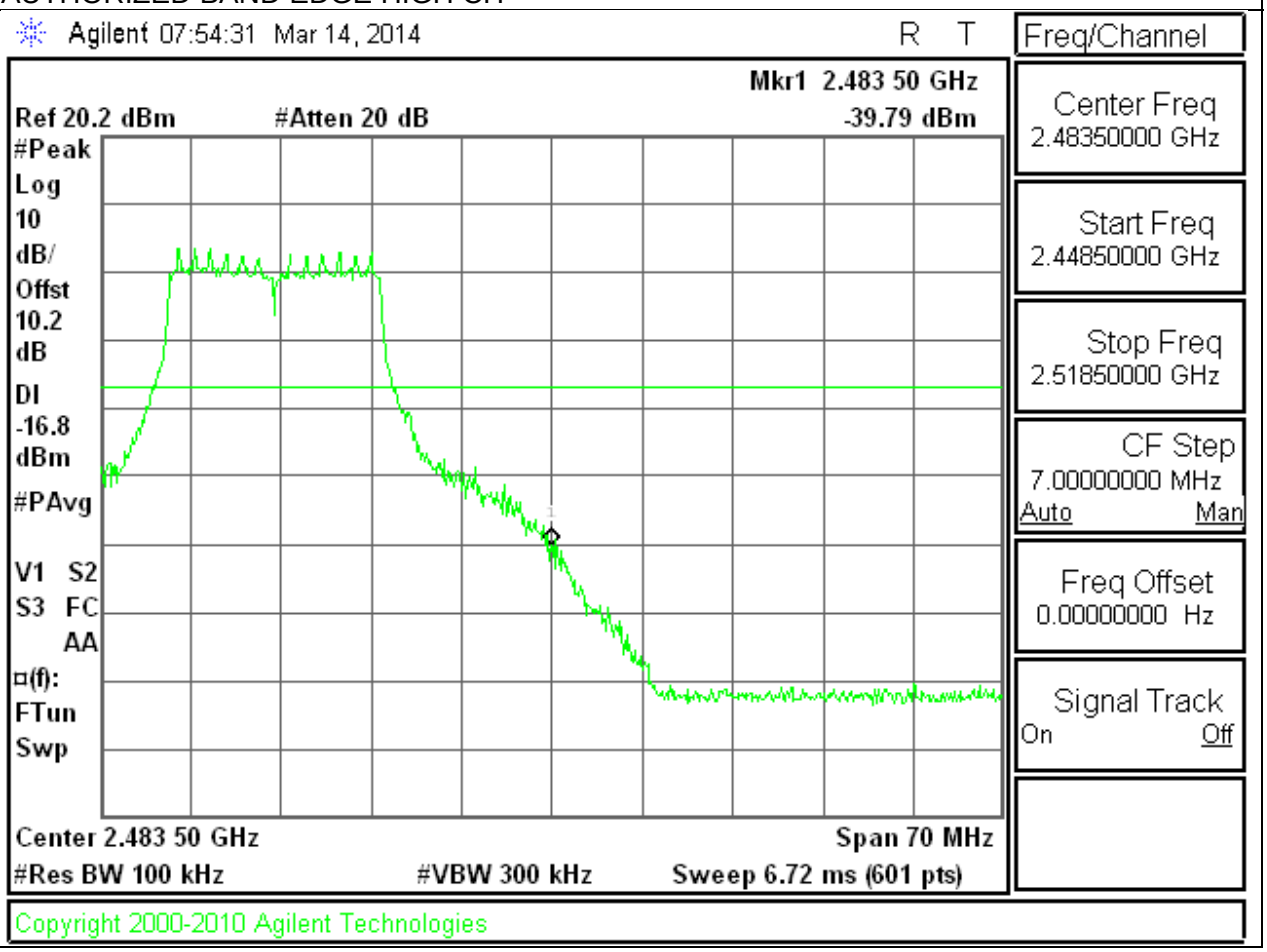
AUTHORIZED BAND EDGE LOW CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL BANDEDGE

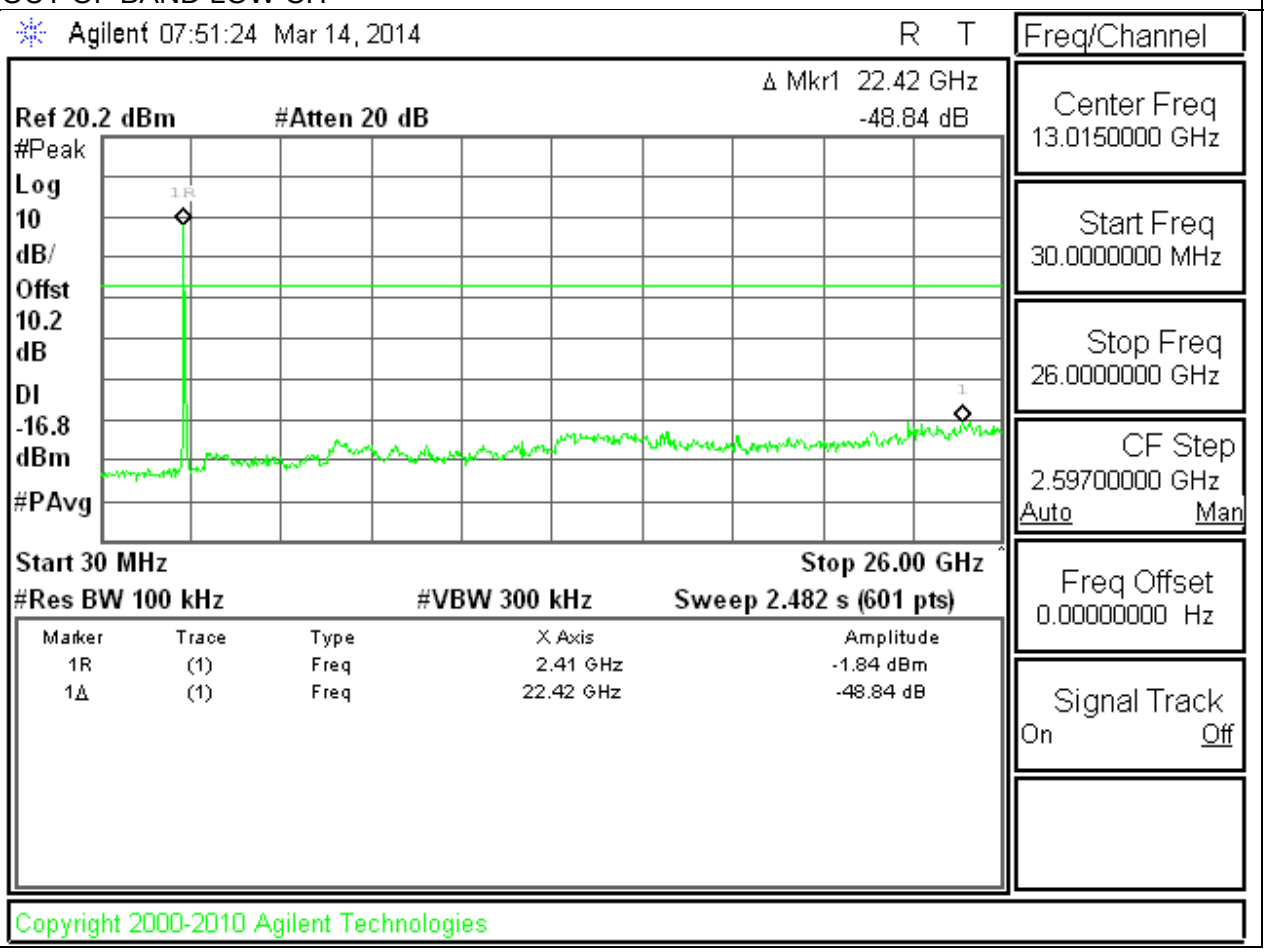
AUTHORIZED BAND EDGE HIGH CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

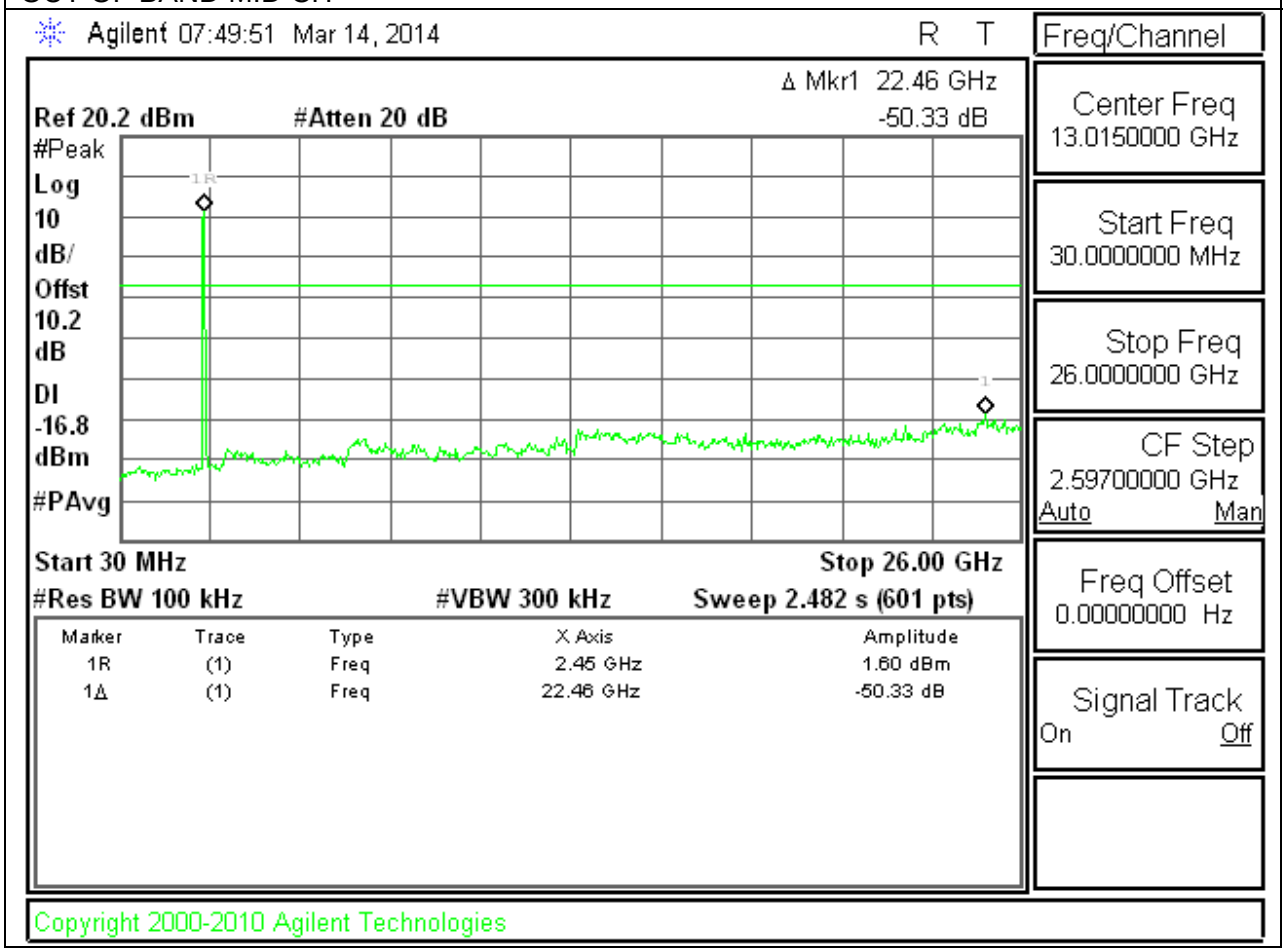
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



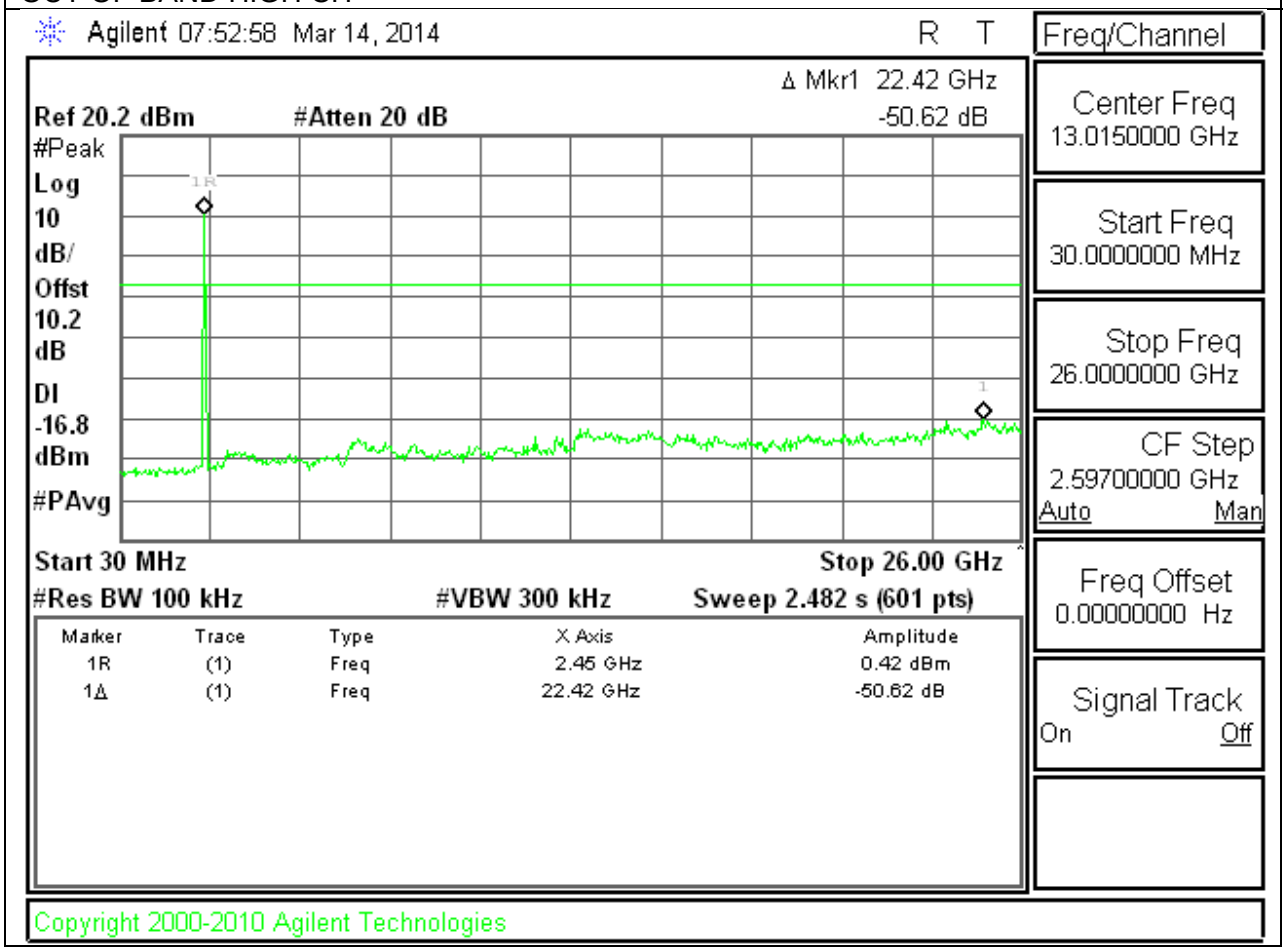
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

OUT OF BAND MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

OUT OF BAND HIGH CH

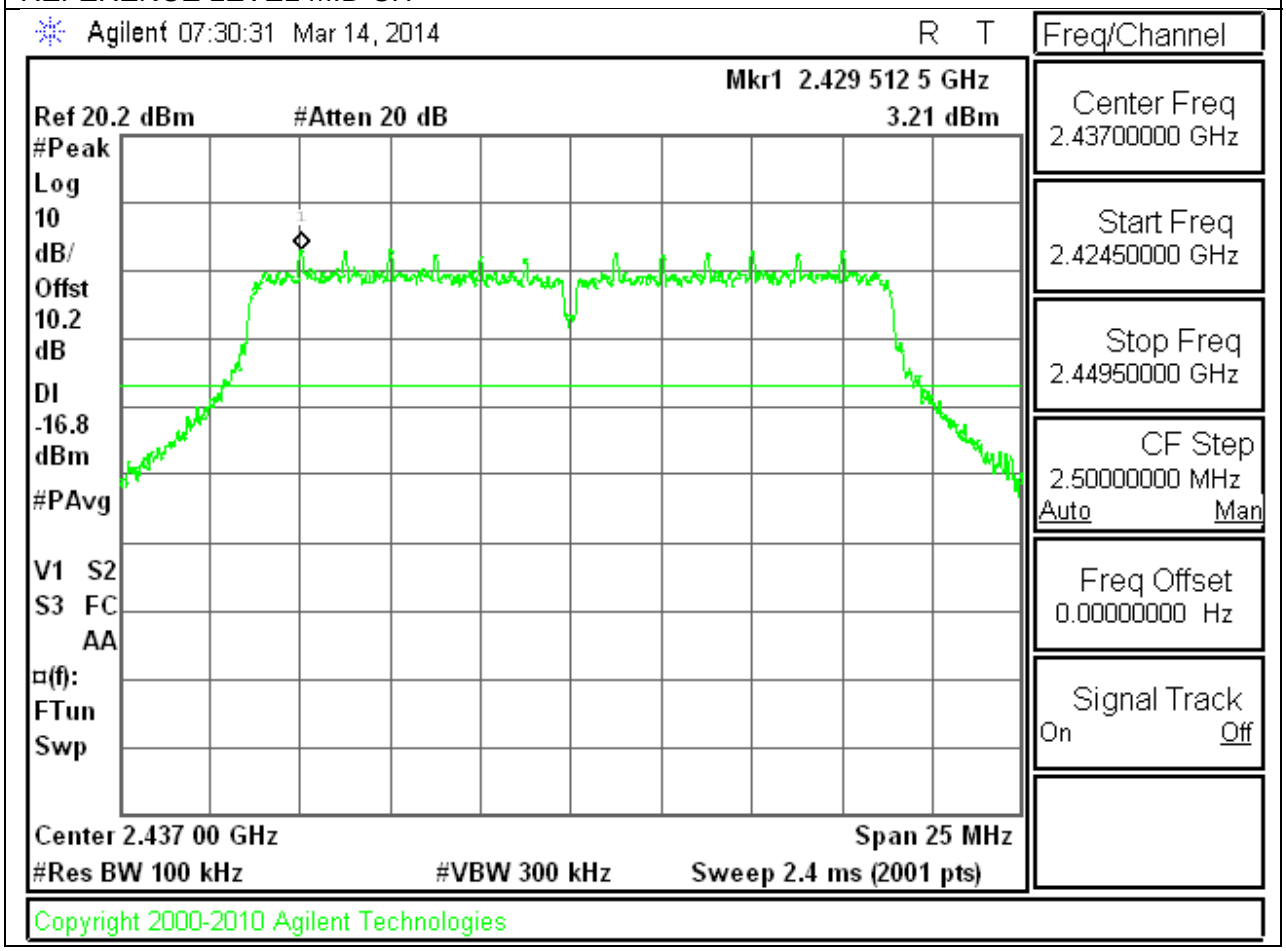


This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

9.6.3. 802.11n MODE IN THE 2.4 GHz BAND

IN-BAND REFERENCE LEVEL

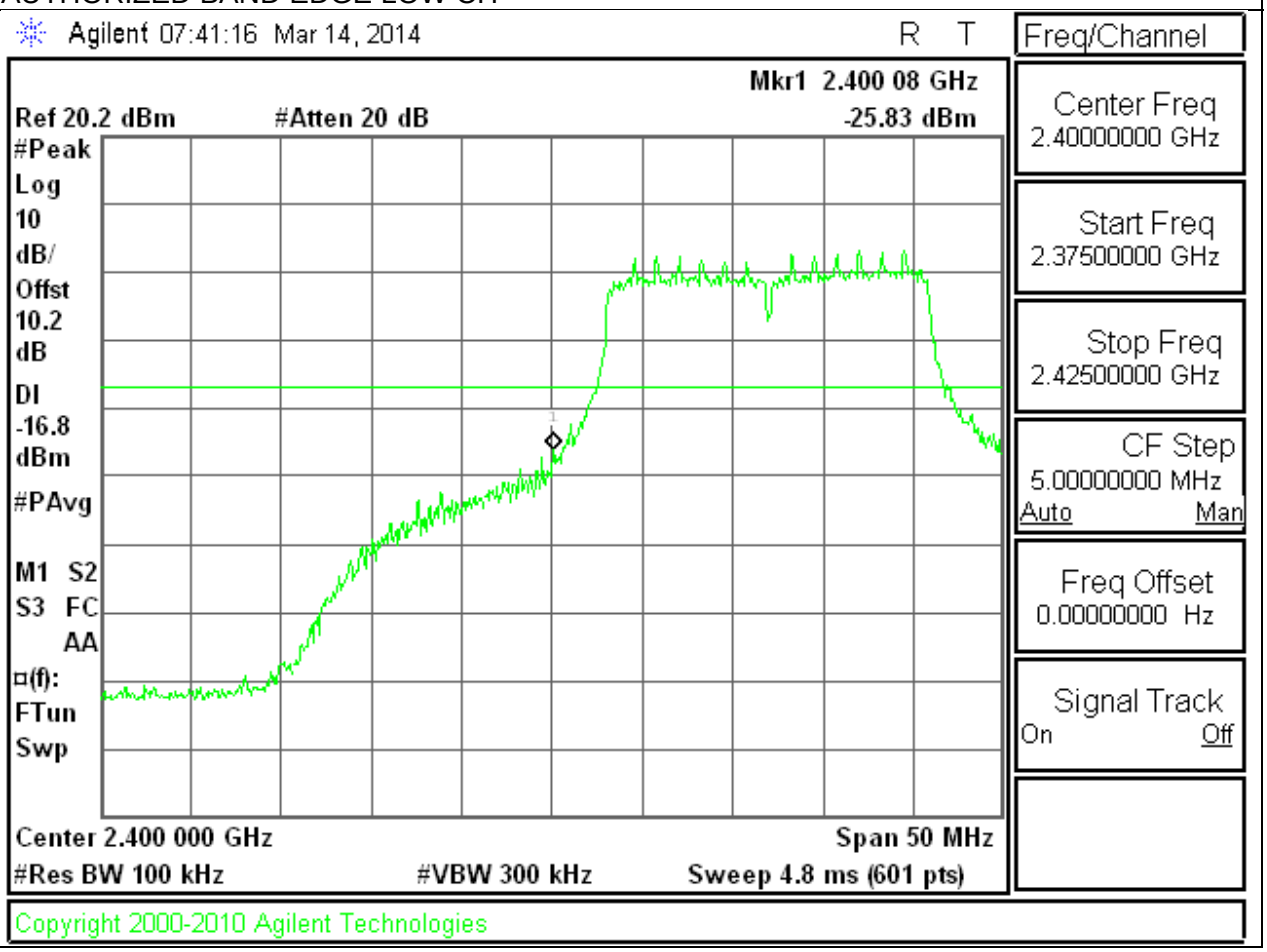
REFERENCE LEVEL MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL BANDEDGE

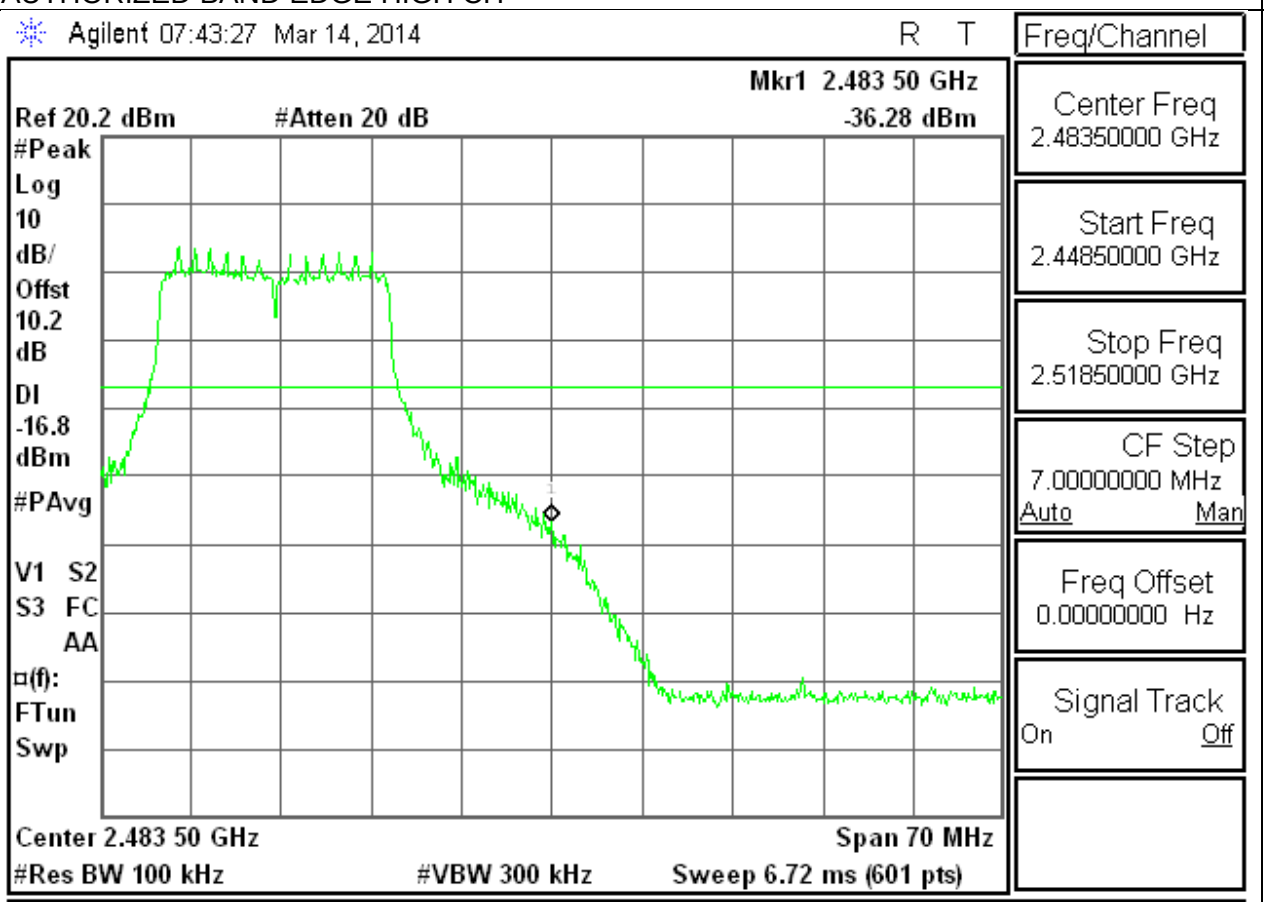
AUTHORIZED BAND EDGE LOW CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL BANDEDGE

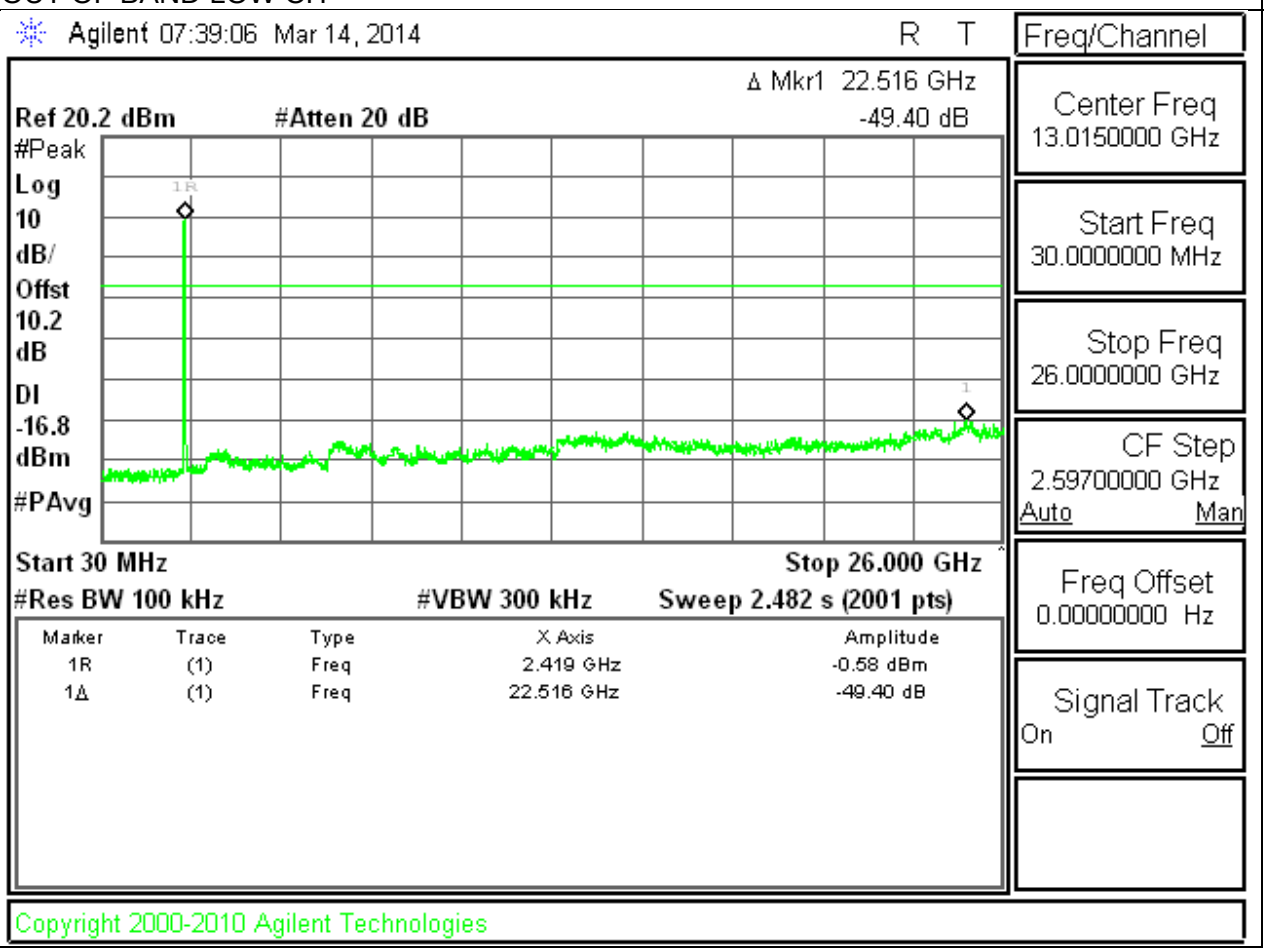
AUTHORIZED BAND EDGE HIGH CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

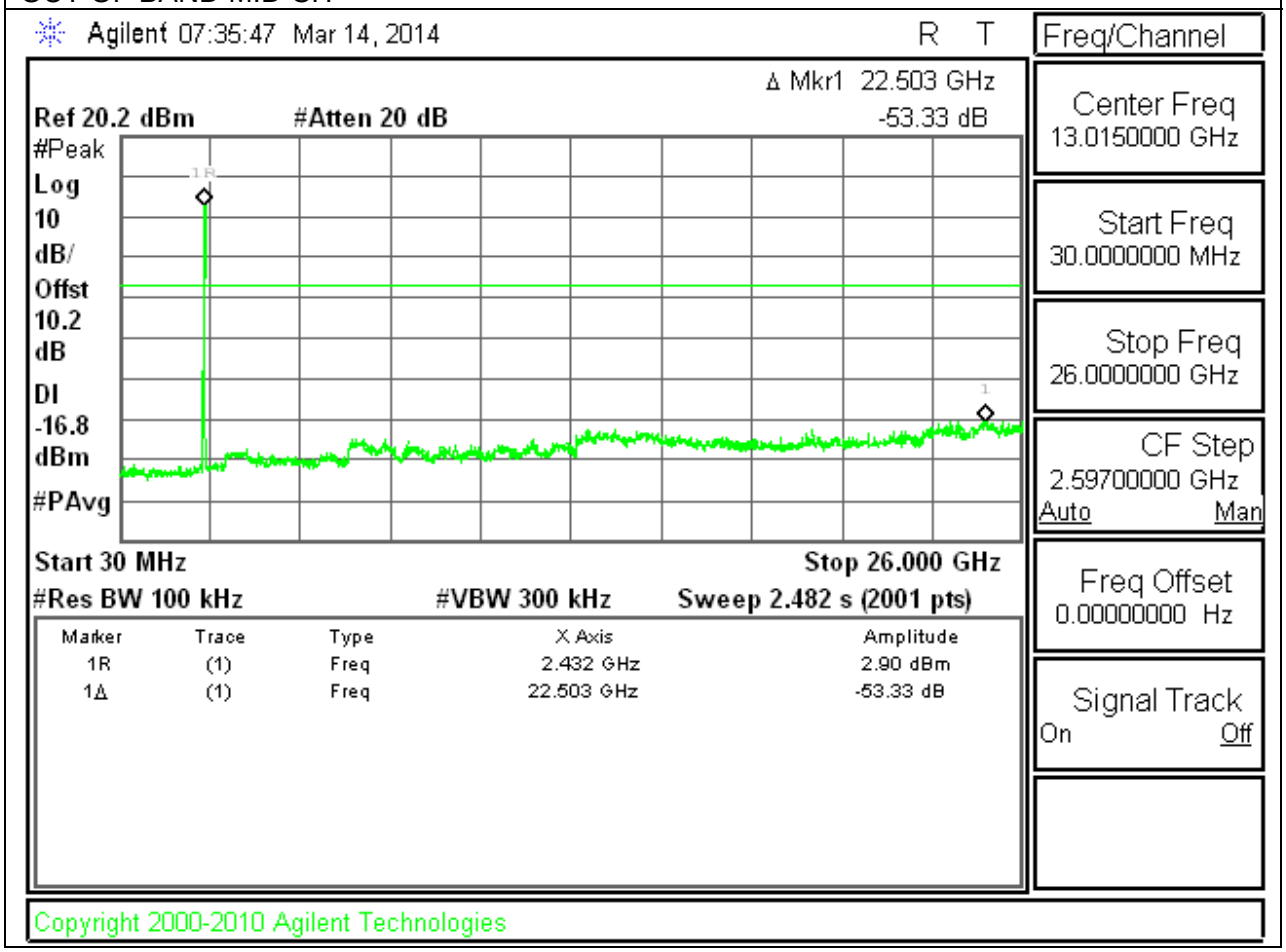
OUT-OF-BAND EMISSIONS

OUT OF BAND LOW CH



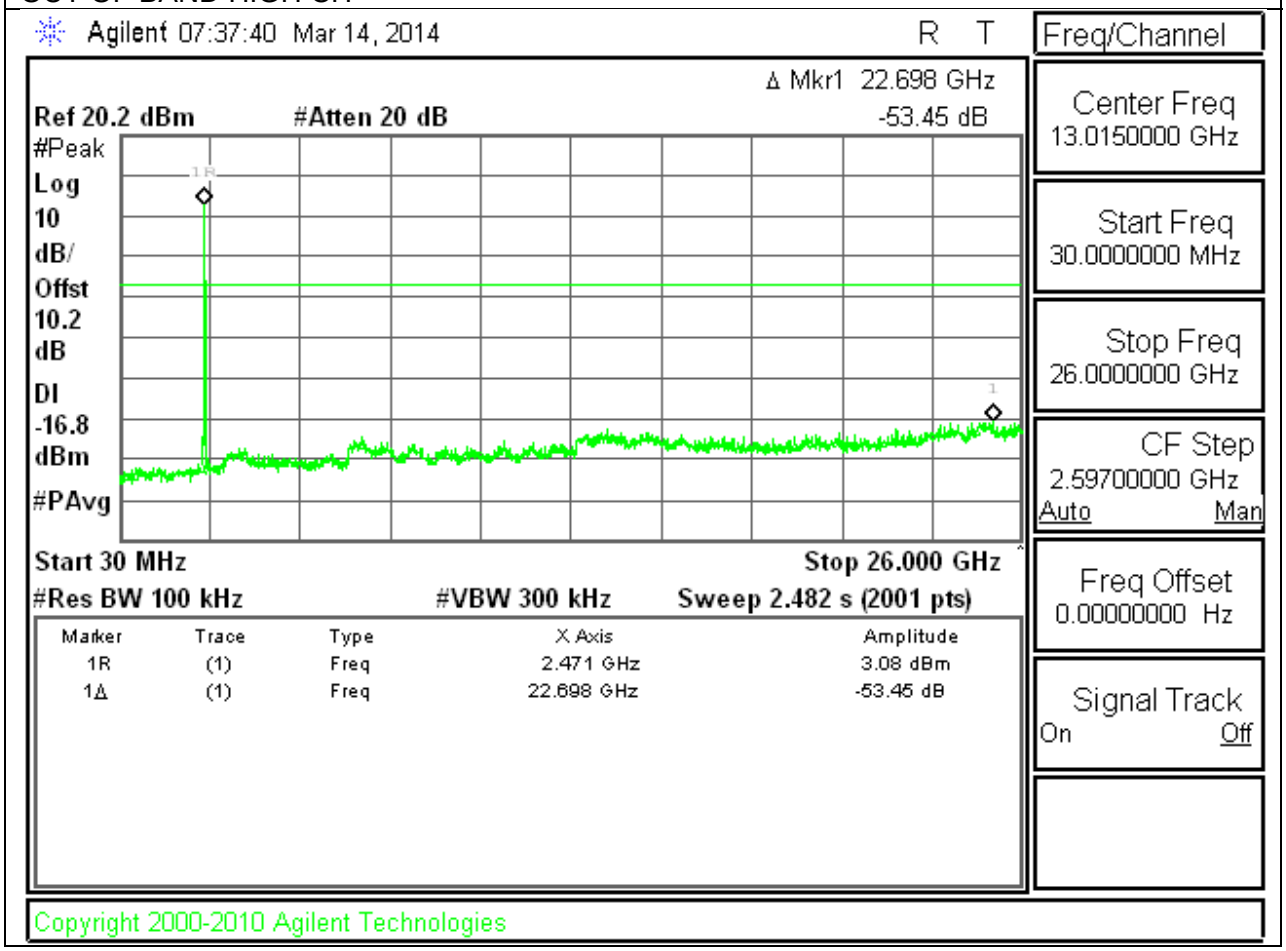
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

OUT OF BAND MID CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

OUT OF BAND HIGH CH



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

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

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

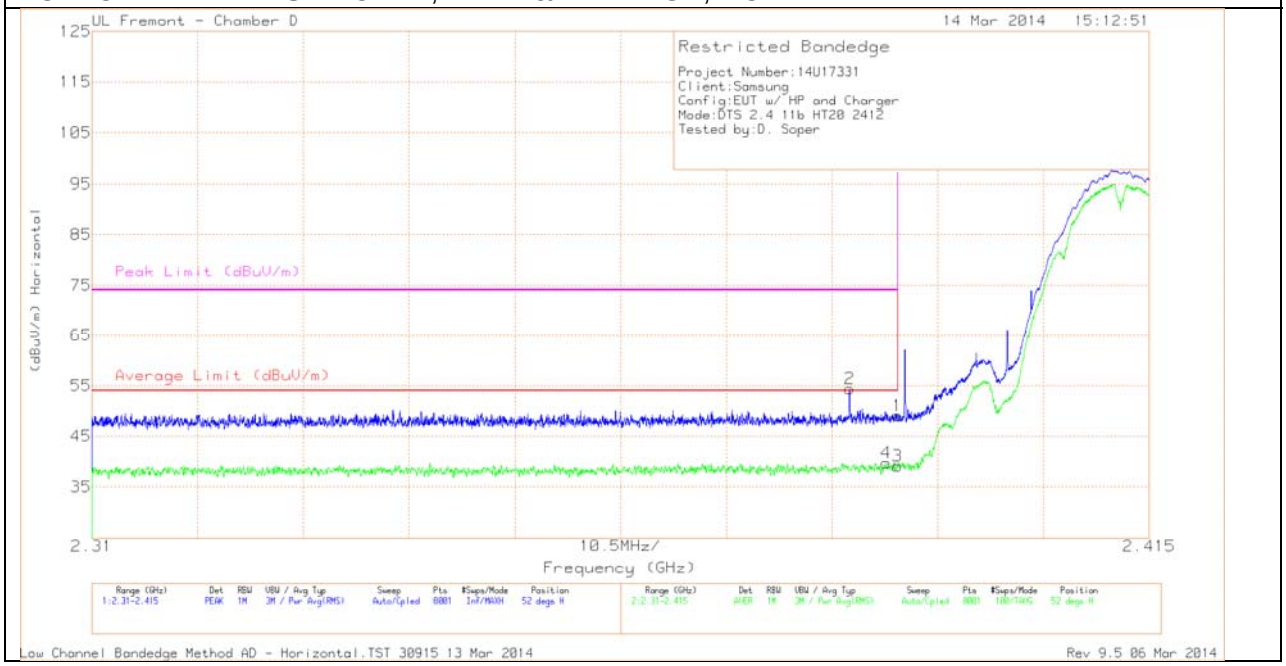
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.2. TRANSMITTER ABOVE 1 GHz

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

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

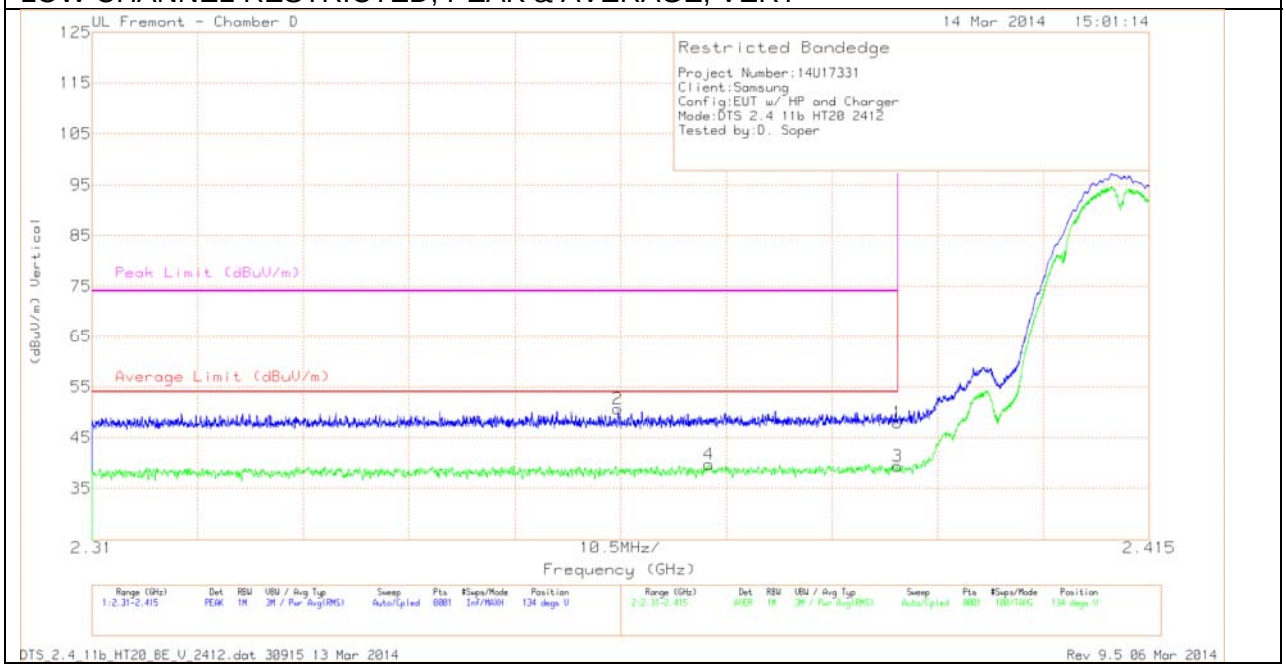


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.14	PK	31.5	-20.6	0	49.04	-	-	74	-24.96	52	333	H
2	* 2.385	43.53	PK	31.5	-20.6	0	54.43	-	-	74	-19.57	52	333	H
3	* 2.39	28.19	RMS	31.5	-20.6	0	39.09	54	-14.91	-	-	52	333	H
4	* 2.389	28.89	RMS	31.5	-20.6	0	39.79	54	-14.21	-	-	52	333	H

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



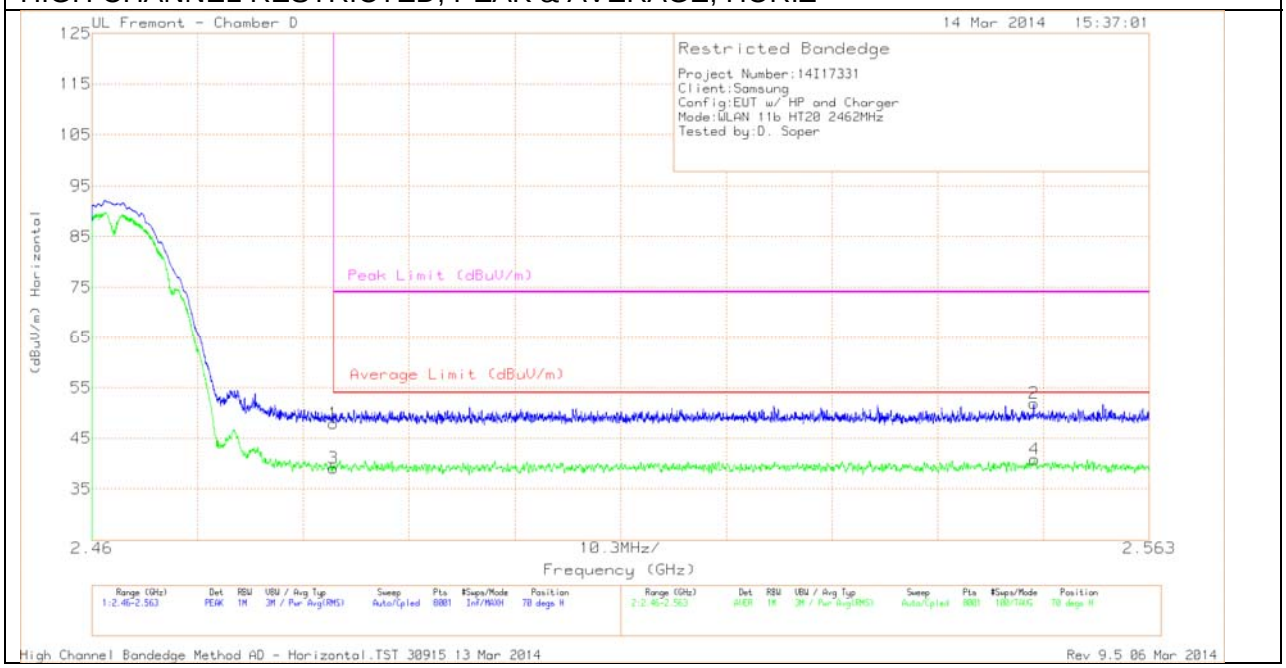
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	37.03	PK	31.5	-20.6	0	47.93	-	-	74	-26.07	134	346	V
2	* 2.362	40.22	PK	31.3	-20.8	0	50.72	-	-	74	-23.28	134	346	V
3	* 2.39	28.41	RMS	31.5	-20.6	0	39.31	54	-14.69	-	-	134	346	V
4	* 2.371	29.07	RMS	31.4	-20.7	0	39.77	54	-14.23	-	-	134	346	V

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ

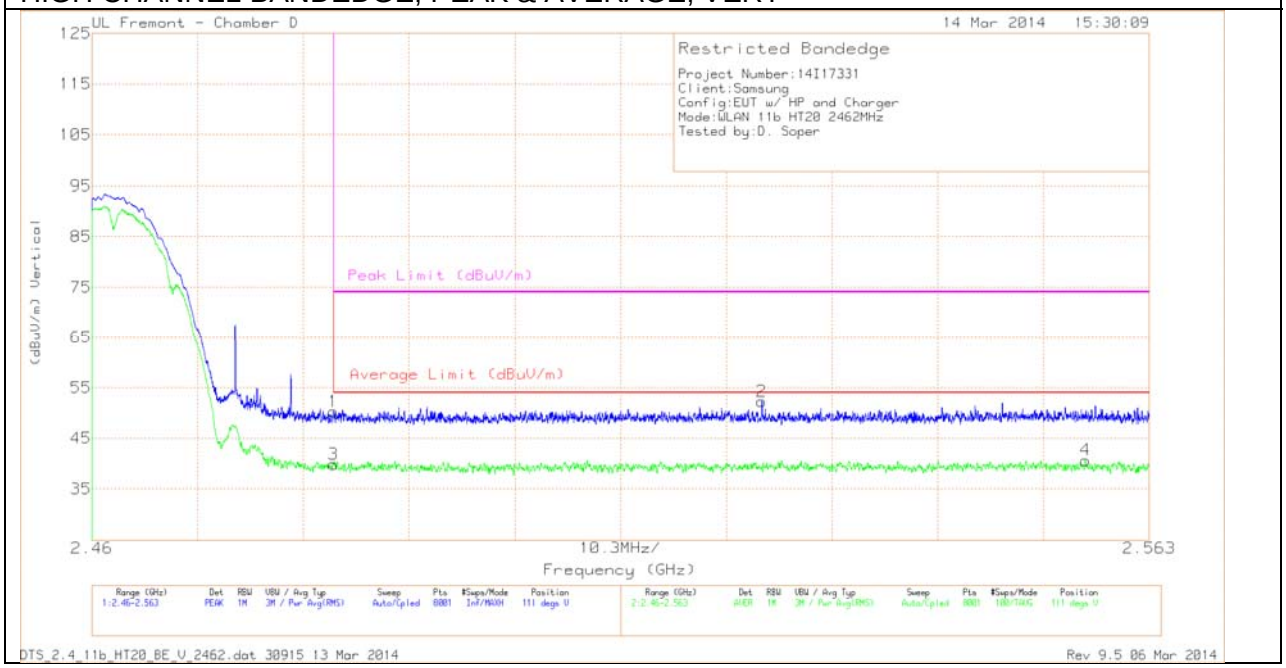


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	36.39	PK	32.1	-20.6	0	47.89	-	-	74	-26.11	70	324	H
3	* 2.484	27.58	RMS	32.1	-20.6	0	39.08	54	-14.92	-	-	70	324	H
2	2.552	39.95	PK	32.1	-20.2	0	51.85	-	-	74	-22.15	70	324	H
4	2.552	28.96	RMS	32.1	-20.2	0	40.86	54	-13.14	-	-	70	324	H

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL BANDEDGE, PEAK & AVERAGE, VERT



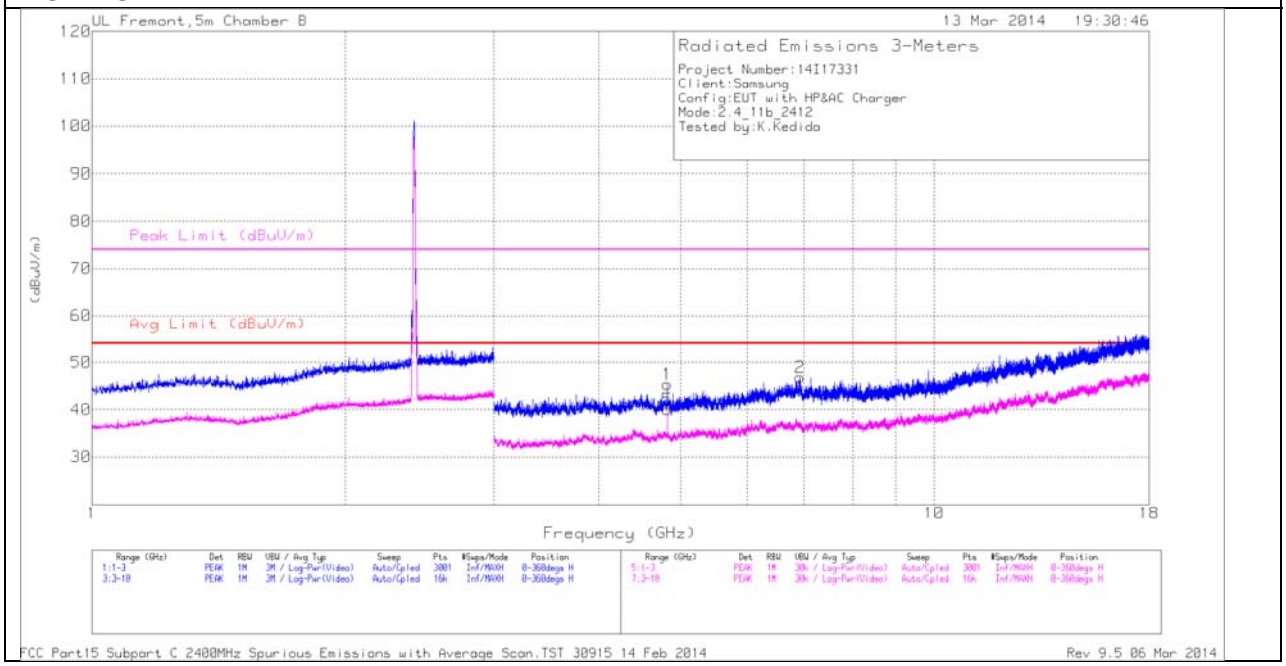
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Flt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	38.84	PK	32.1	-20.6	0	50.34	-	-	74	-23.66	111	324	V
3	* 2.484	28.37	RMS	32.1	-20.6	0	39.87	54	-14.13	-	-	111	324	V
2	2.525	40.69	PK	32.1	-20.5	0	52.29	-	-	74	-21.71	111	324	V
4	2.557	29.07	RMS	32	-20.4	0	40.67	54	-13.33	-	-	111	324	V

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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HARMONICS AND SPURIOUS EMISSIONS

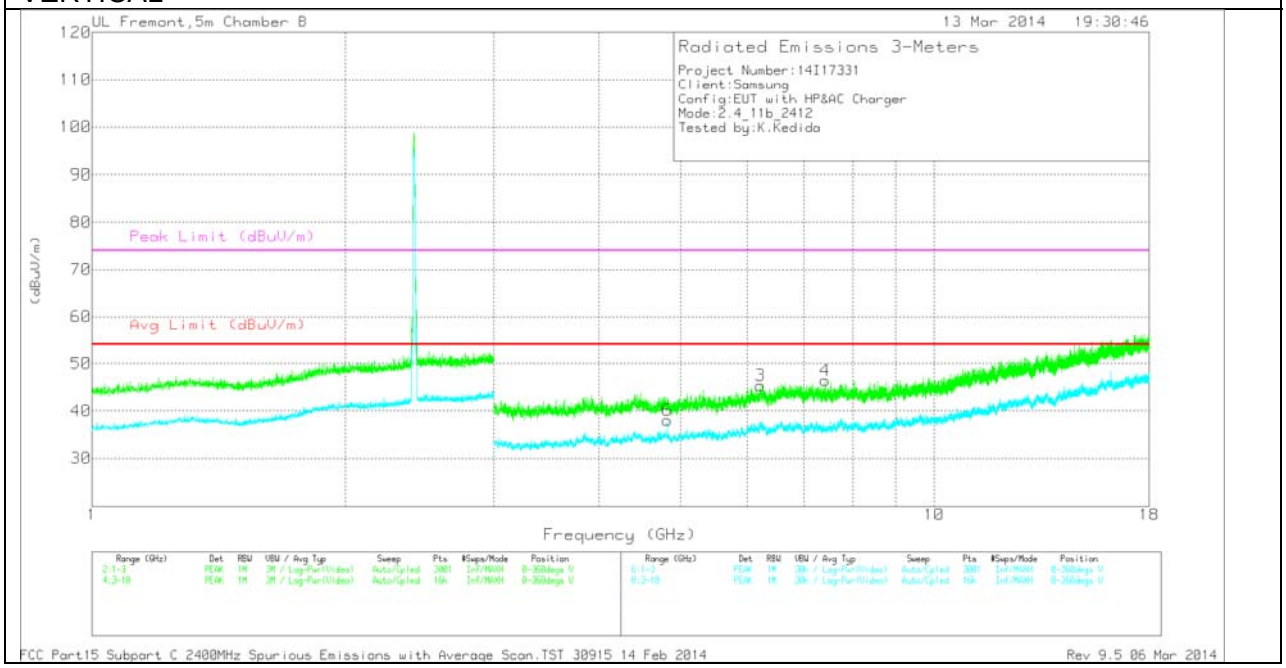
LOW CHANNEL
HORIZONTAL



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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL DATA

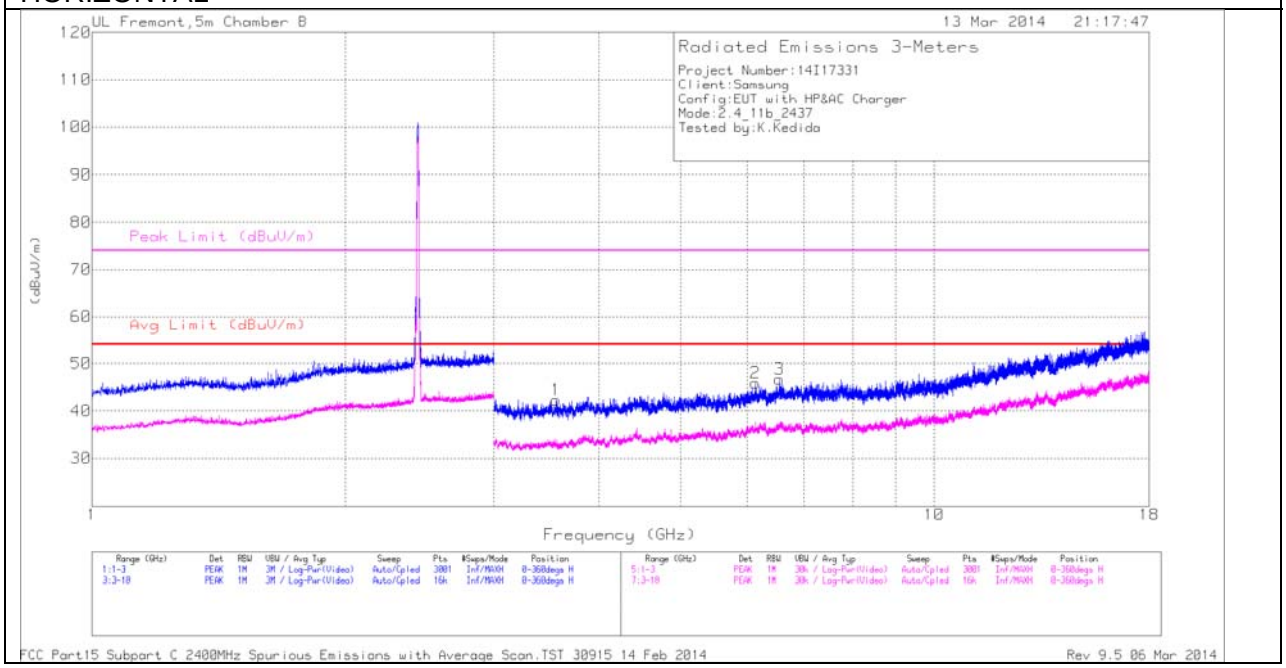
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.823	40.48	PK	34.2	-29.3	45.38	54	-8.62	74	-28.62	0-360	202	H
4	* 7.419	37.64	PK	35.6	-26.8	46.44	54	-7.56	74	-27.56	0-360	99	V
5	* 4.824	35.16	PK	34.2	-29.3	40.06	54	-13.94	74	-33.94	0-360	99	H
6	* 4.823	33.13	PK	34.2	-29.3	38.03	54	-15.97	74	-35.97	0-360	202	V
3	6.223	37.72	PK	35.4	-27.8	45.32	54	-8.68	74	-28.68	0-360	99	V
2	6.927	39	PK	35.6	-27.8	46.8	54	-7.2	74	-27.2	0-360	202	H

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

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

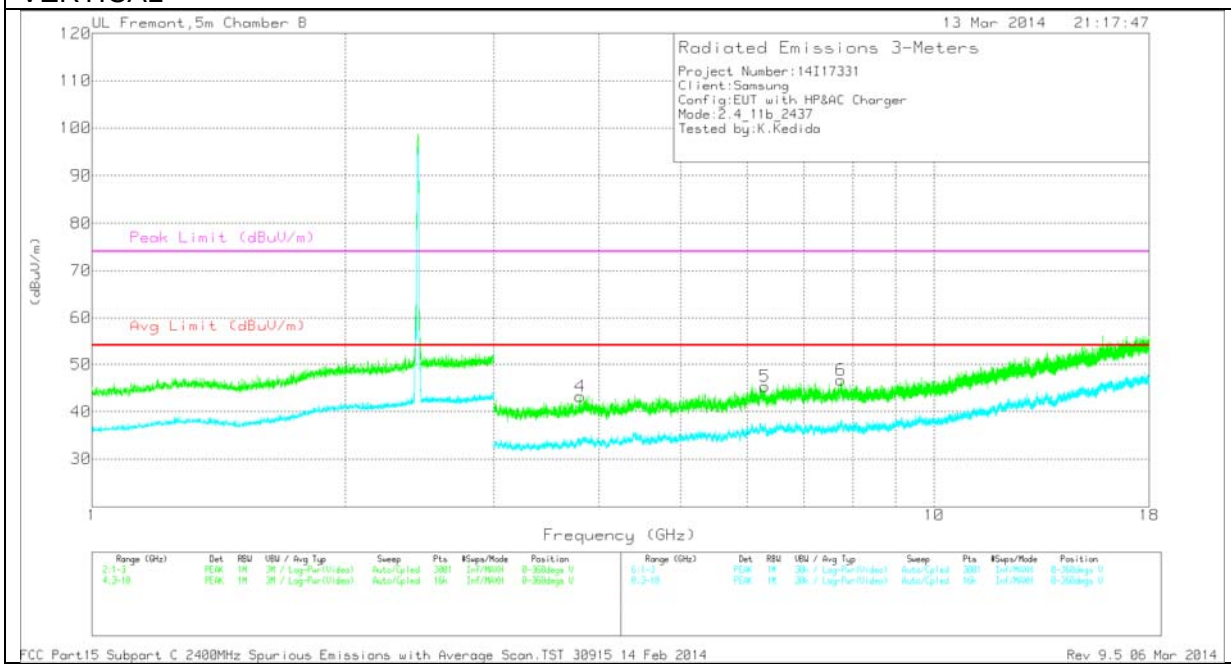
MID CHANNEL
HORIZONTAL



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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL DATA

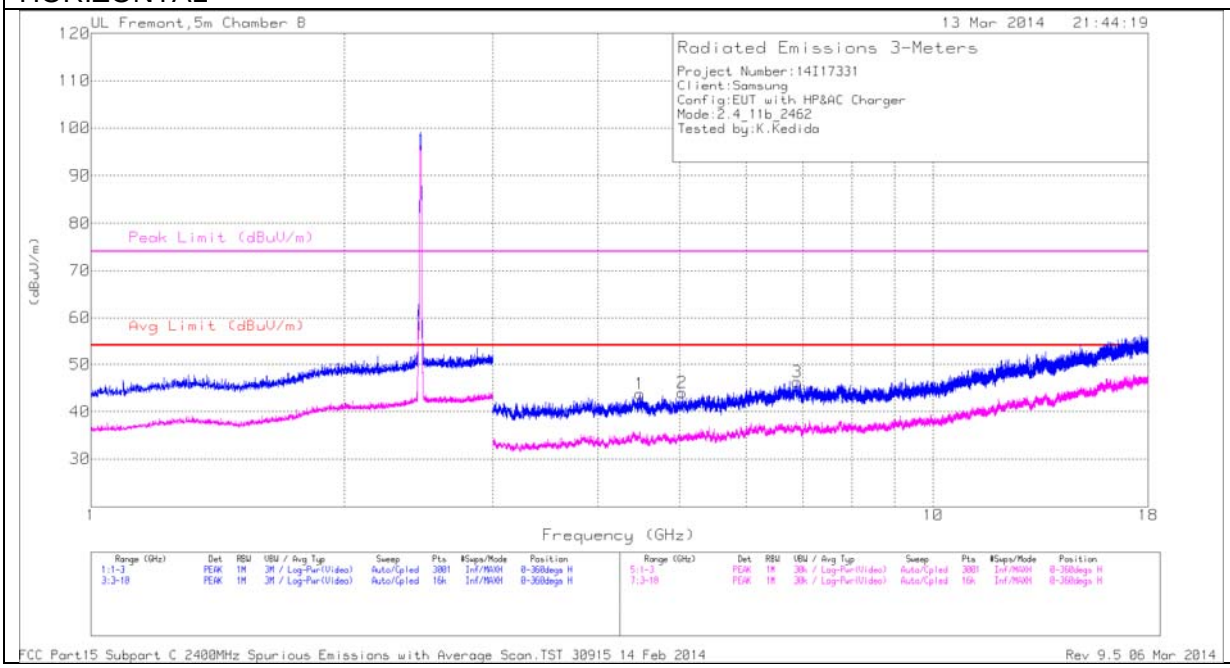
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.559	40.44	PK	33	-31.2	42.24	54	-11.76	74	-31.76	0-360	202	H
4	* 3.8	40.42	PK	33.6	-30.8	43.22	54	-10.78	74	-30.78	0-360	202	V
2	6.137	39.64	PK	35.4	-29.1	45.94	54	-8.06	74	-28.06	0-360	99	H
5	6.298	38.01	PK	35.5	-28.1	45.41	54	-8.59	74	-28.59	0-360	202	V
3	6.553	38.27	PK	35.7	-27.3	46.67	54	-7.33	74	-27.33	0-360	99	H
6	7.753	37.01	PK	35.7	-26	46.71	54	-7.29	74	-27.29	0-360	99	V

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

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

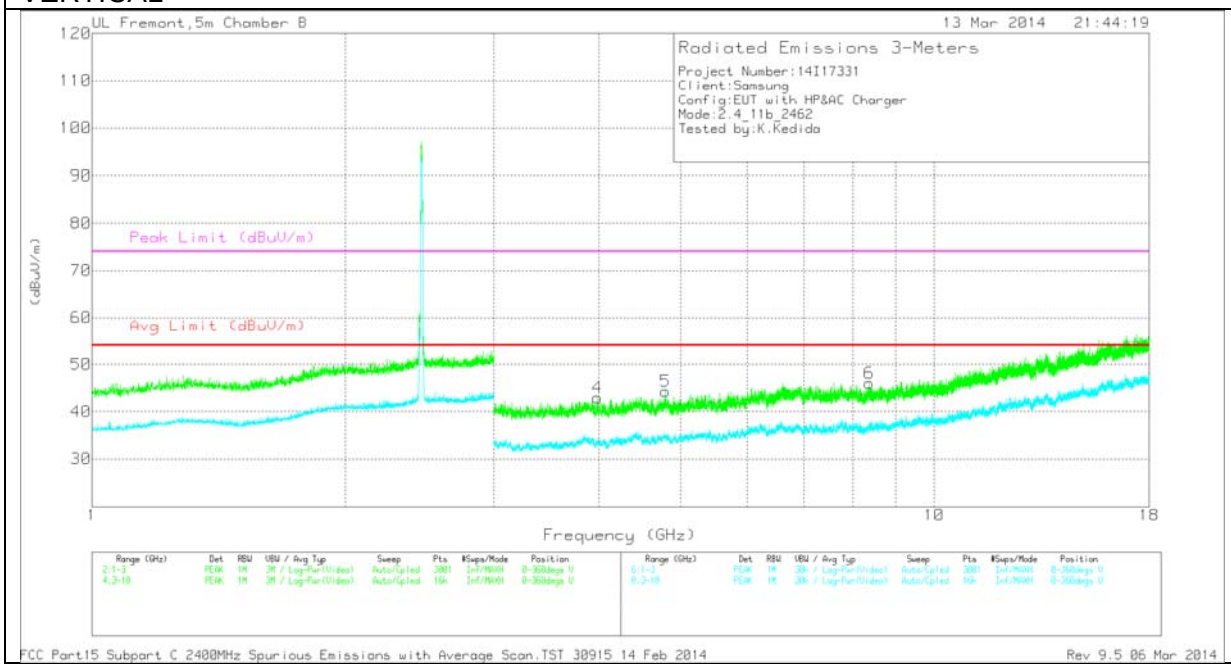
HIGH CHANNEL
HORIZONTAL



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

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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
2	* 5.032	38.58	PK	34.2	-28.8	43.98	54	-10.02	74	-30.02	0-360	99	H
4	* 3.981	40.24	PK	33.6	-30.9	42.94	54	-11.06	74	-31.06	0-360	202	V
5	* 4.8	38.9	PK	34.2	-28.8	44.3	54	-9.7	74	-29.7	0-360	202	V
6	* 8.367	35.78	PK	35.7	-25.5	45.98	54	-8.02	74	-28.02	0-360	99	V
1	4.482	38.97	PK	34	-29.2	43.77	54	-10.23	74	-30.23	0-360	99	H
3	6.892	38.15	PK	35.6	-27.5	46.25	54	-7.75	74	-27.75	0-360	201	H

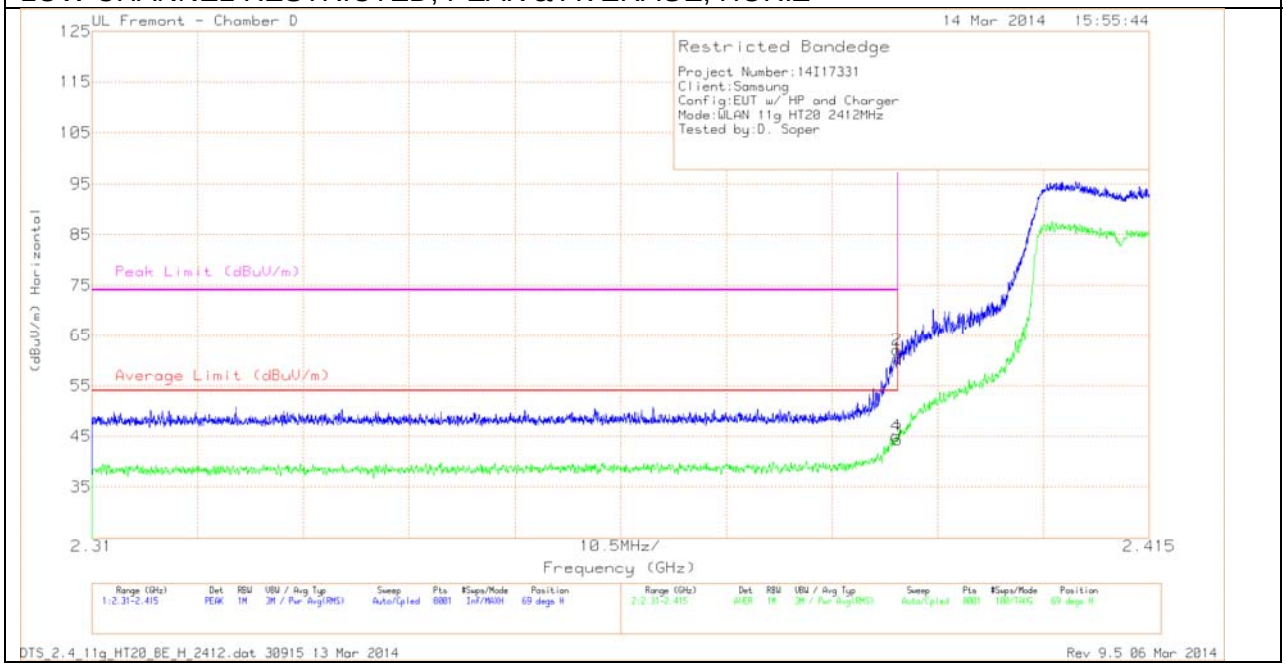
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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	49.5	PK	31.5	-20.6	0	60.4	-	-	74	-13.6	69	219	H
2	* 2.39	51.2	PK	31.5	-20.6	0	62.1	-	-	74	-11.9	69	219	H
3	* 2.39	33.17	RMS	31.5	-20.6	.3	44.37	54	-9.63	-	-	69	219	H
4	* 2.39	33.92	RMS	31.5	-20.6	.3	45.12	54	-8.88	-	-	69	219	H

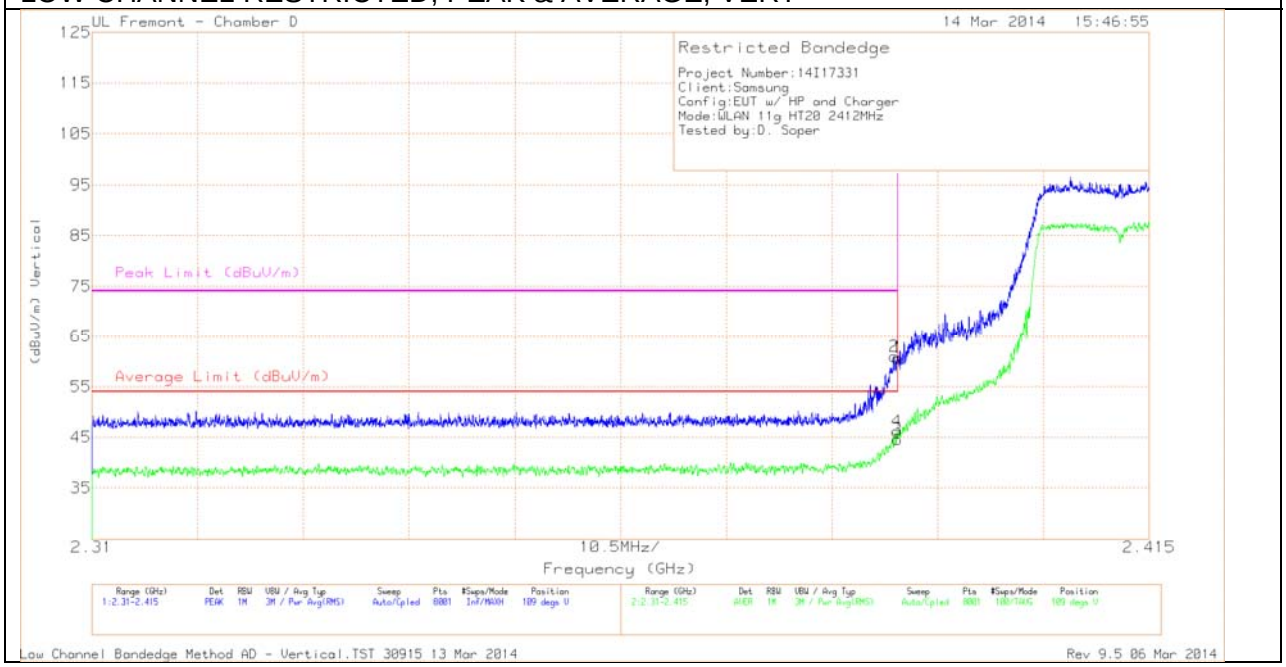
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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	49.76	PK	31.5	-20.6	0	60.66	-	-	74	-13.34	109	330	V
2	* 2.39	50.11	PK	31.5	-20.6	0	61.01	-	-	74	-12.99	109	330	V
3	* 2.39	33.34	RMS	31.5	-20.6	.3	44.54	54	-9.46	-	-	109	330	V
4	* 2.39	34.99	RMS	31.5	-20.6	.3	46.19	54	-7.81	-	-	109	330	V

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

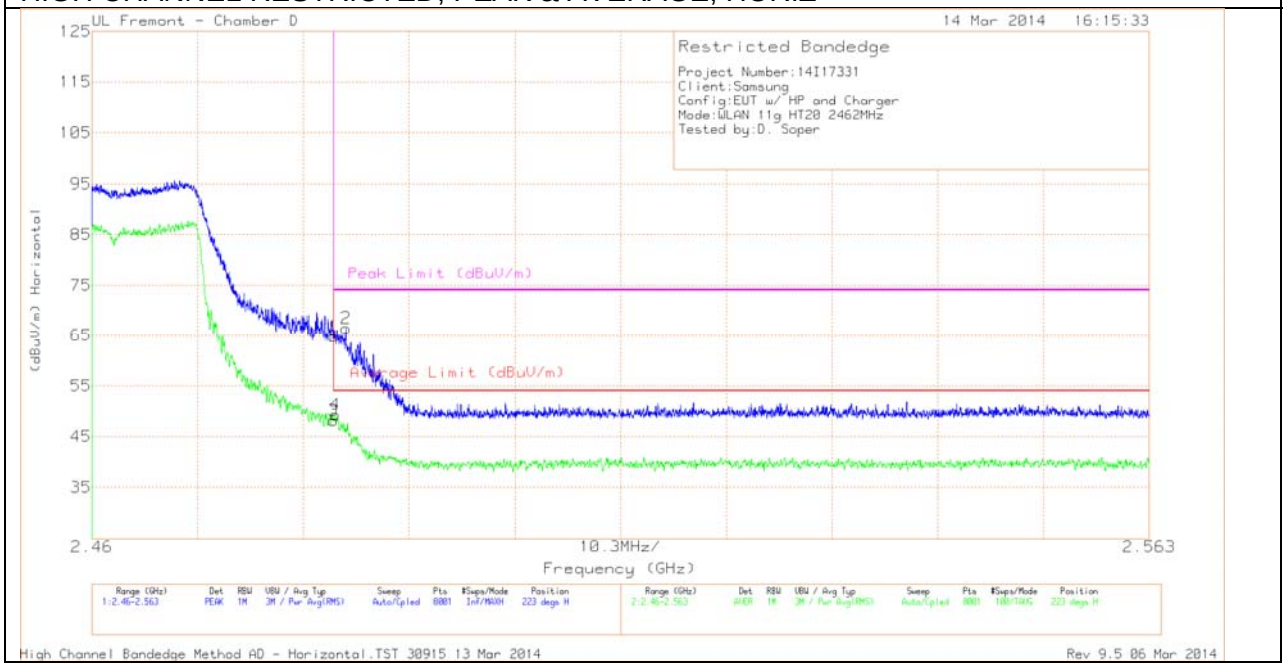
PK - Peak detector

RMS - RMS detection

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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	53.33	PK	32.1	-20.6	0	64.83	-	-	74	-9.17	223	265	H
2	* 2.485	54.99	PK	32.1	-20.6	0	66.49	-	-	74	-7.51	223	265	H
3	* 2.484	36.34	RMS	32.1	-20.6	.3	48.14	54	-5.86	-	-	223	265	H
4	* 2.484	37.55	RMS	32.1	-20.6	.3	49.35	54	-4.65	-	-	223	265	H

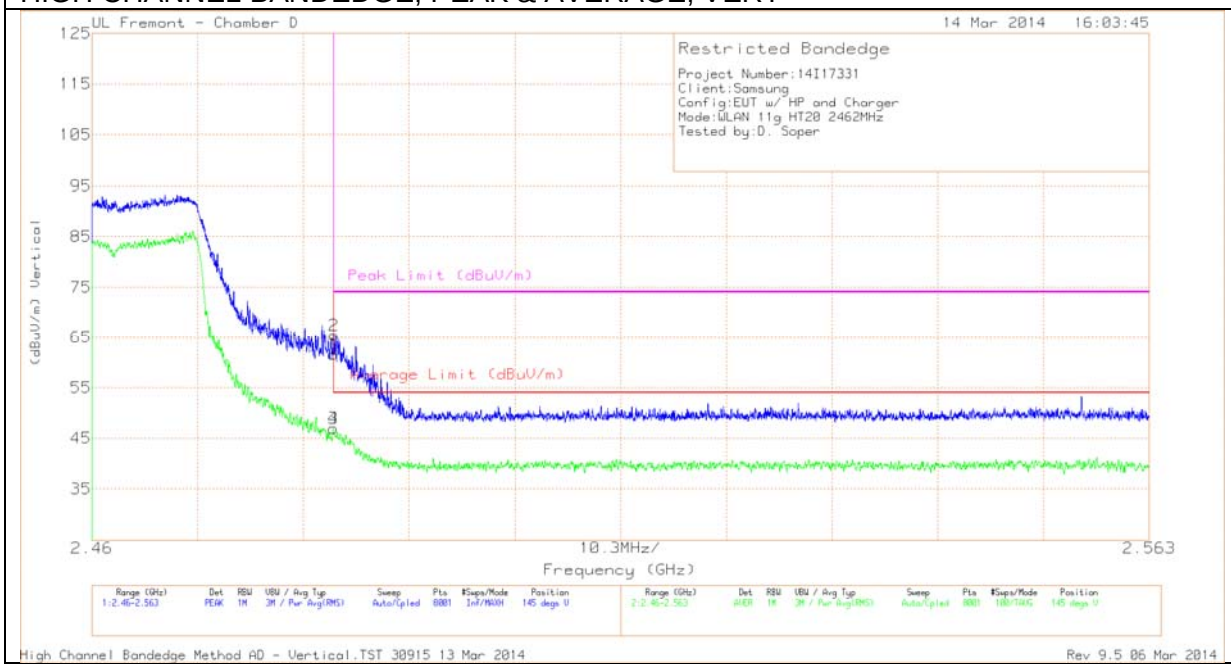
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL BANDEDGE, PEAK & AVERAGE, VERT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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	50.06	PK	32.1	-20.6	0	61.56	-	-	74	-12.44	145	269	V
2	* 2.484	53.89	PK	32.1	-20.6	0	65.39	-	-	74	-8.61	145	269	V
3	* 2.484	35.11	RMS	32.1	-20.6	.3	46.91	54	-7.09	-	-	145	269	V
4	* 2.484	35.16	RMS	32.1	-20.6	.3	46.96	54	-7.04	-	-	145	269	V

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

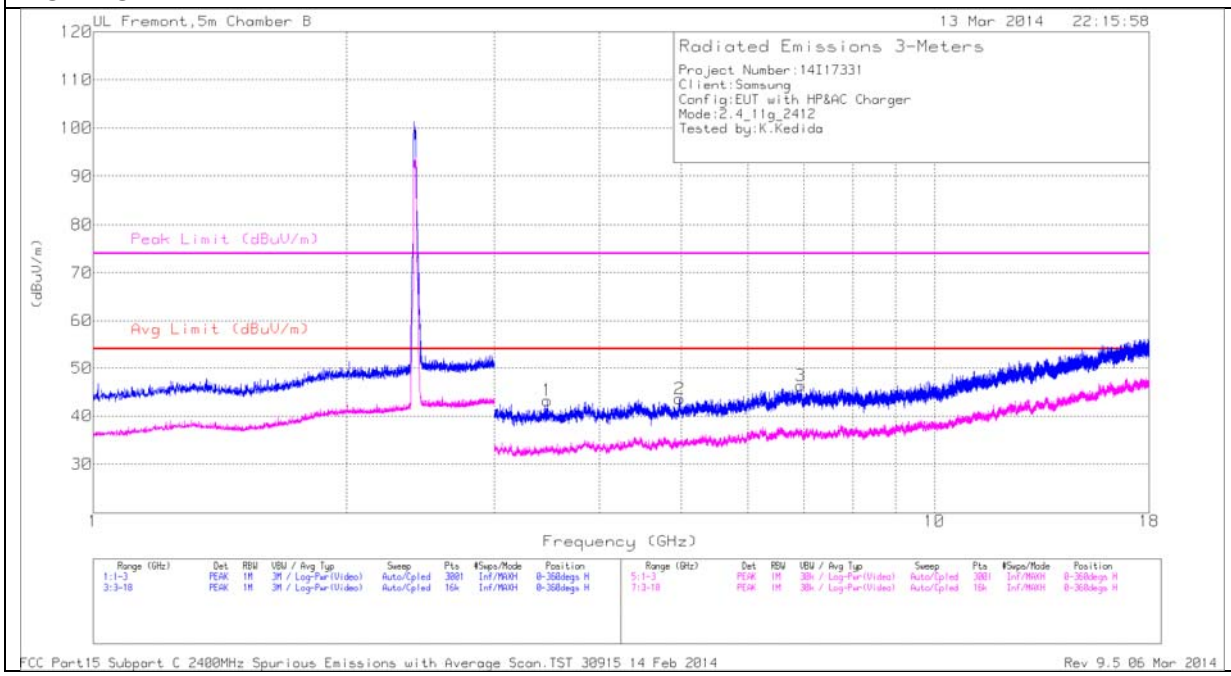
PK - Peak detector

RMS - RMS detection

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HARMONICS AND SPURIOUS EMISSIONS

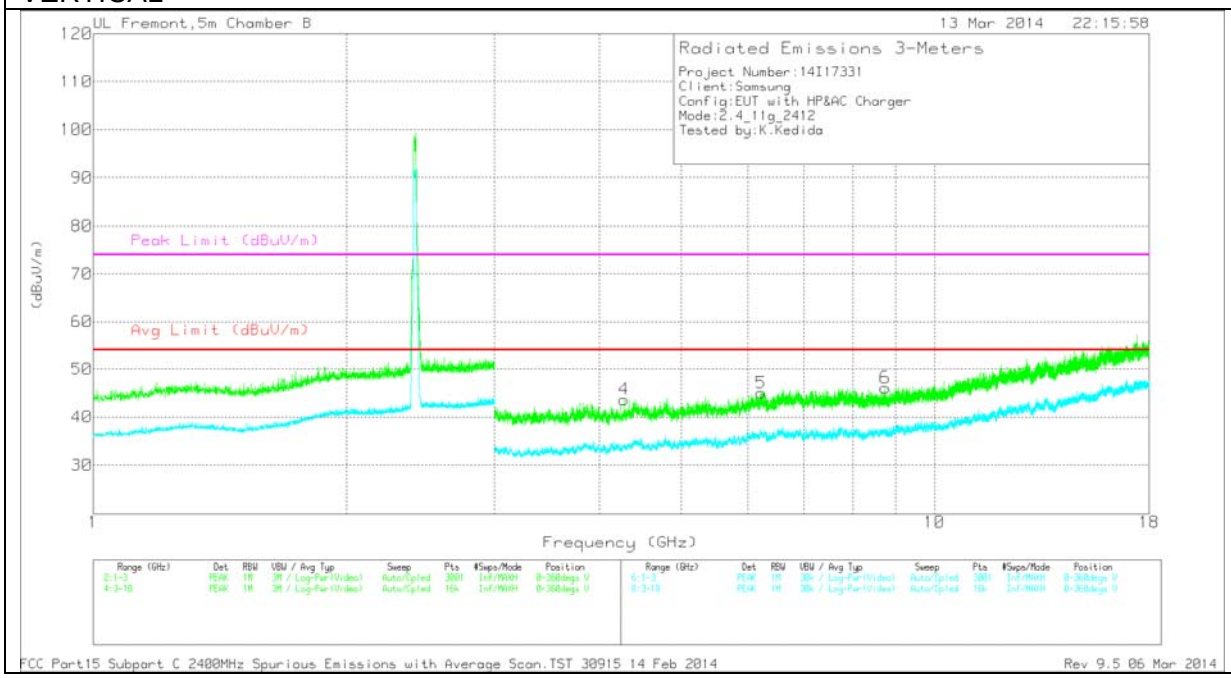
LOW CHANNEL
HORIZONTAL



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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL DATA

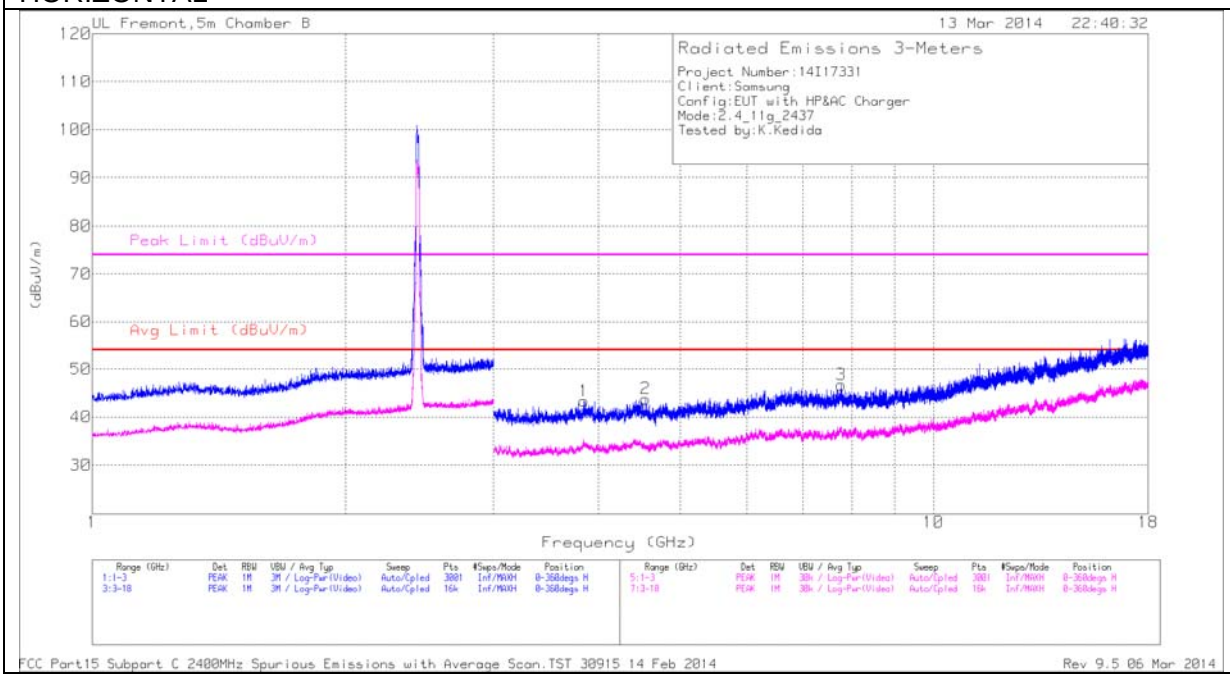
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 4.98	39.19	PK	34.2	-29.8	43.59	54	-10.41	74	-30.41	0-360	99	H
4	* 4.275	40.97	PK	33.7	-31	43.67	54	-10.33	74	-30.33	0-360	99	V
1	3.468	41.67	PK	32.8	-31.2	43.27	54	-10.73	74	-30.73	0-360	99	H
5	6.223	37.45	PK	35.4	-27.8	45.05	54	-8.95	74	-28.95	0-360	99	V
3	6.937	38.74	PK	35.6	-28	46.34	54	-7.66	74	-27.66	0-360	99	H
6	8.741	35.32	PK	35.9	-25.1	46.12	54	-7.88	74	-27.88	0-360	202	V

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

PK - Peak detector

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

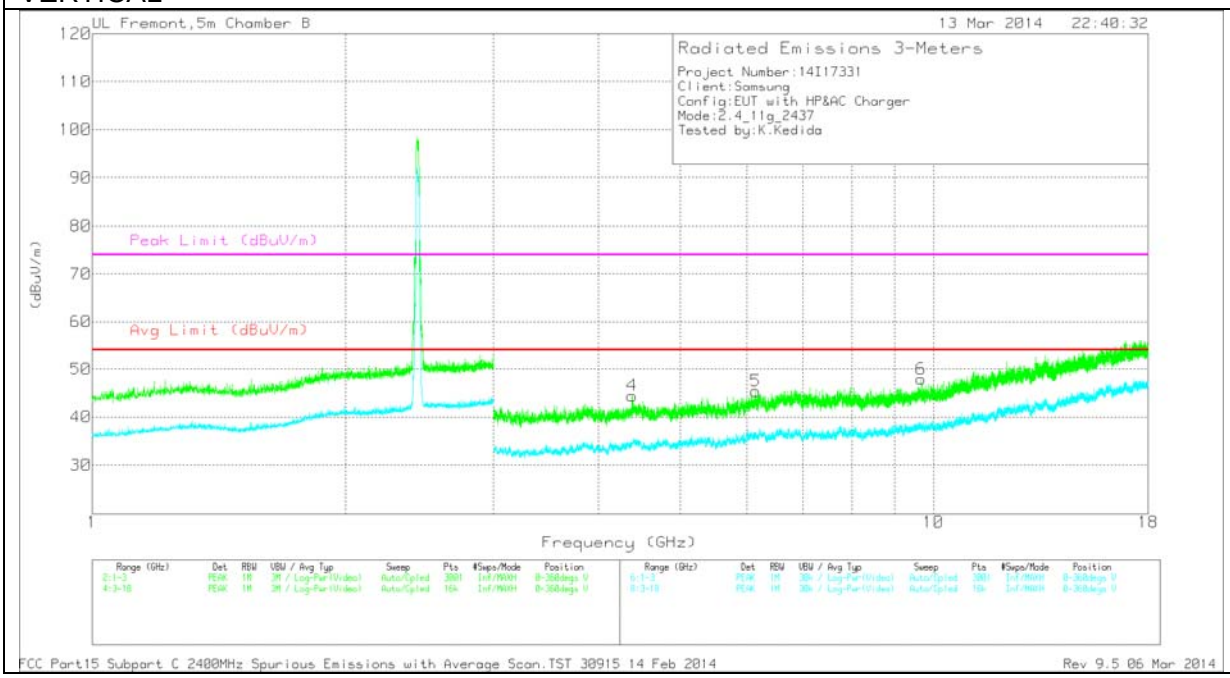
MID CHANNEL
HORIZONTAL



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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL DATA

Trace Markers

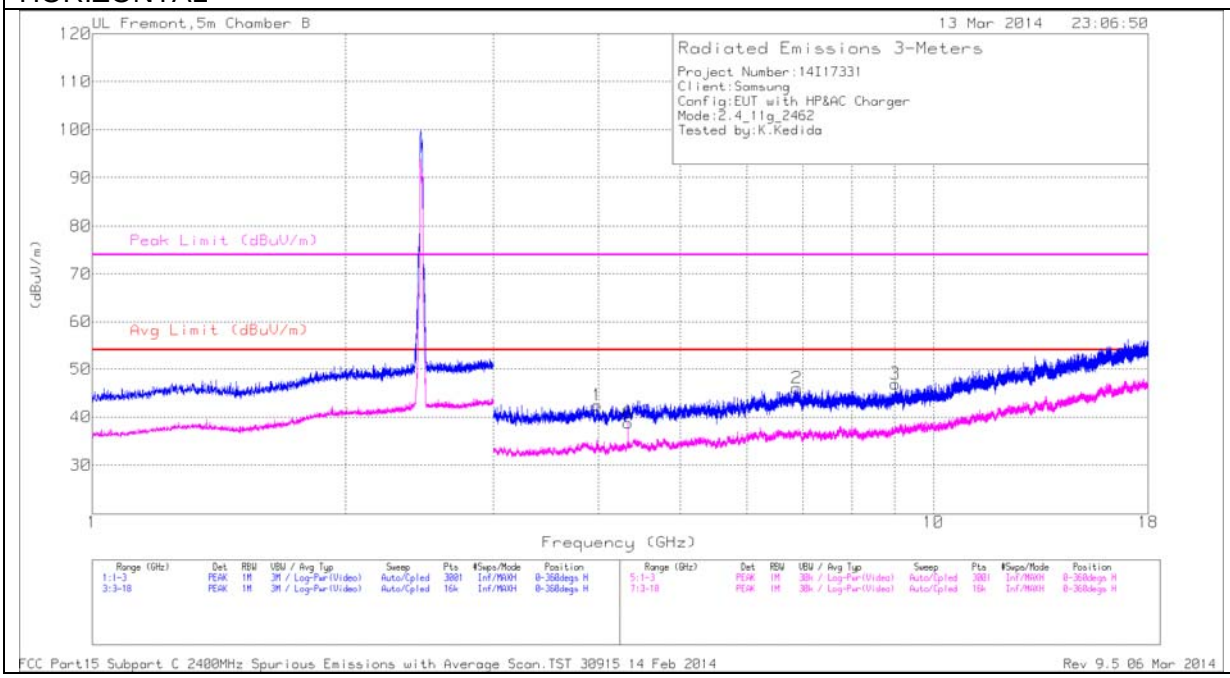
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.843	39.86	PK	33.7	-30.2	43.36	54	-10.64	74	-30.64	0-360	202	H
4	* 4.384	41.06	PK	33.8	-30.4	44.46	54	-9.54	74	-29.54	0-360	202	V
2	* 4.551	40.21	PK	34.1	-30.5	43.81	54	-10.19	74	-30.19	0-360	202	H
5	6.152	38.9	PK	35.4	-28.9	45.4	54	-8.6	74	-28.6	0-360	202	V
3	7.771	37.01	PK	35.7	-26	46.71	54	-7.29	74	-27.29	0-360	99	H
6	9.663	35.11	PK	36.8	-24	47.91	54	-6.09	74	-26.09	0-360	99	V

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

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

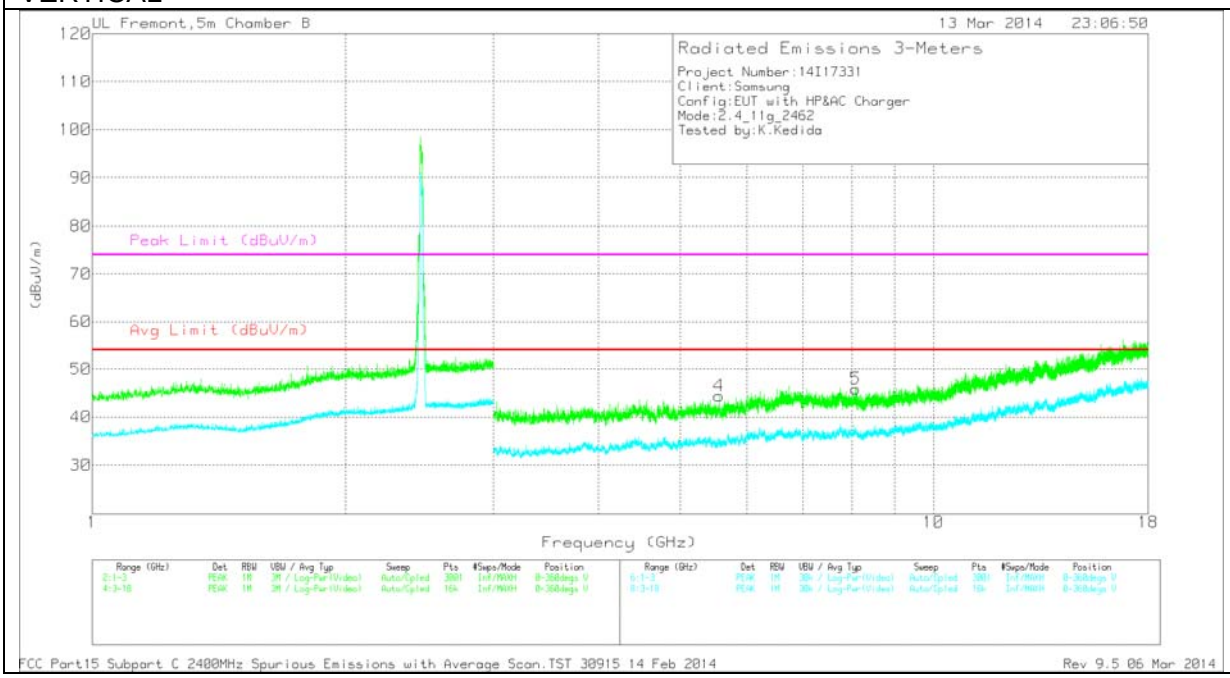
HIGH CHANNEL
HORIZONTAL



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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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
1	* 3.984	39.86	PK	33.6	-31	42.46	54	-11.54	74	-31.54	0-360	201	H
6	* 4.334	36.07	PK	33.7	-31	38.77	54	-15.23	74	-35.23	0-360	202	H
5	* 8.078	36.09	PK	35.7	-25.9	45.89	54	-8.11	74	-28.11	0-360	99	V
3	* 9.004	35.62	PK	36.2	-24.9	46.92	54	-7.08	74	-27.08	0-360	201	H
4	5.56	39.43	PK	34.5	-29.5	44.43	54	-9.57	74	-29.57	0-360	202	V
2	6.883	37.95	PK	35.6	-27.5	46.05	54	-7.95	74	-27.95	0-360	201	H

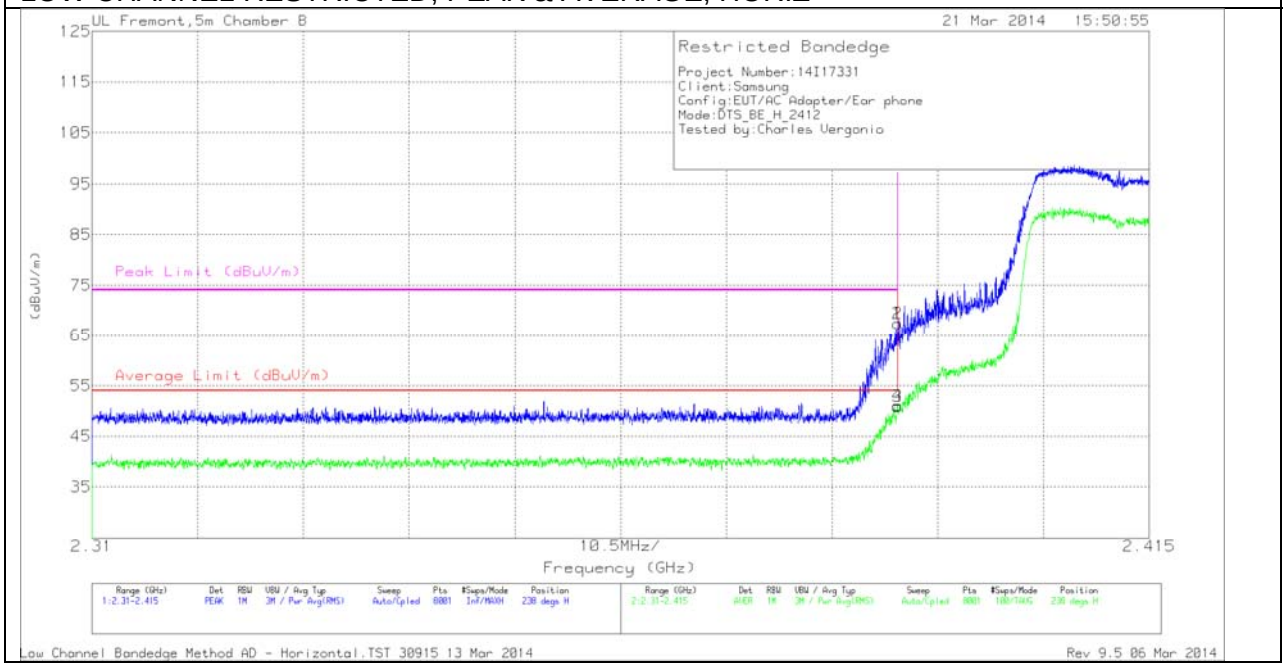
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	58.26	PK	32.1	-22.9	0	67.46	-	-	74	-6.54	238	101	H
2	* 2.39	58.26	PK	32.1	-22.9	0	67.46	-	-	74	-6.54	238	101	H
3	* 2.39	41.4	RMS	32.1	-22.9	.3	50.9	54	-3.1	-	-	238	101	H
4	* 2.39	41.54	RMS	32.1	-22.9	.3	51.04	54	-2.96	-	-	238	101	H

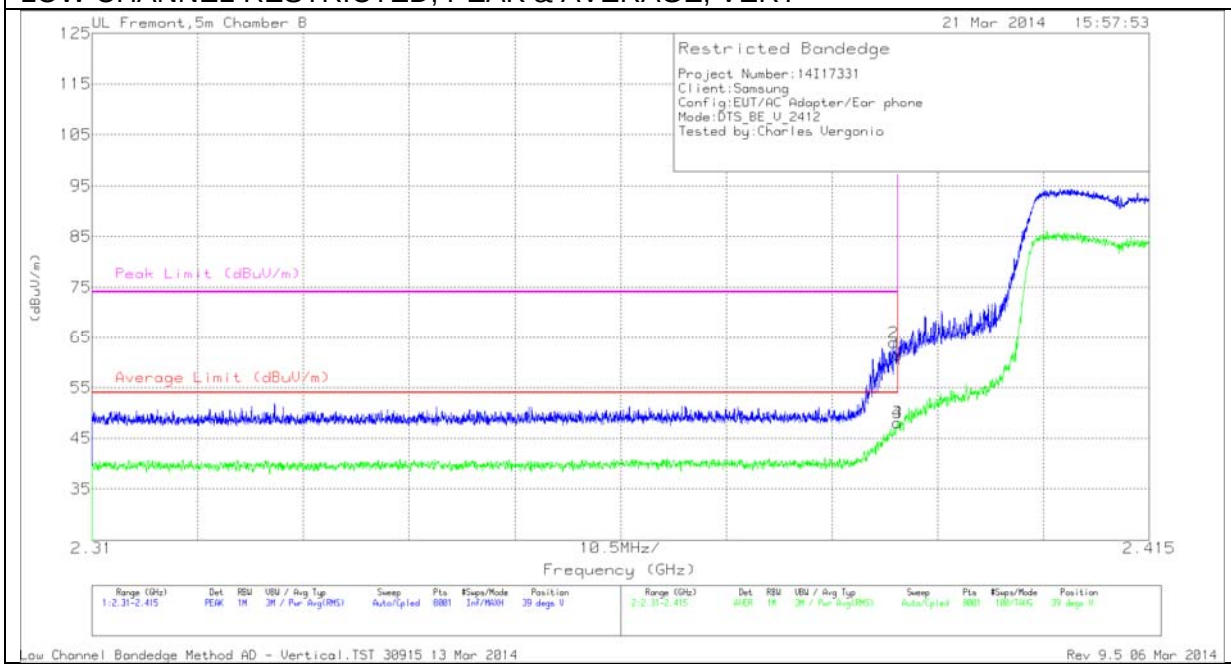
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL RESTRICTED, PEAK & AVERAGE, VERT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	52.29	PK	32.1	-22.9	0	61.49	-	-	74	-12.51	39	324	V
2	* 2.39	54.7	PK	32.1	-22.9	0	63.9	-	-	74	-10.1	39	324	V
3	* 2.39	38.59	RMS	32.1	-22.9	.3	48.09	54	-5.91	-	-	39	324	V
4	* 2.39	38.59	RMS	32.1	-22.9	.3	48.09	54	-5.91	-	-	39	324	V

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

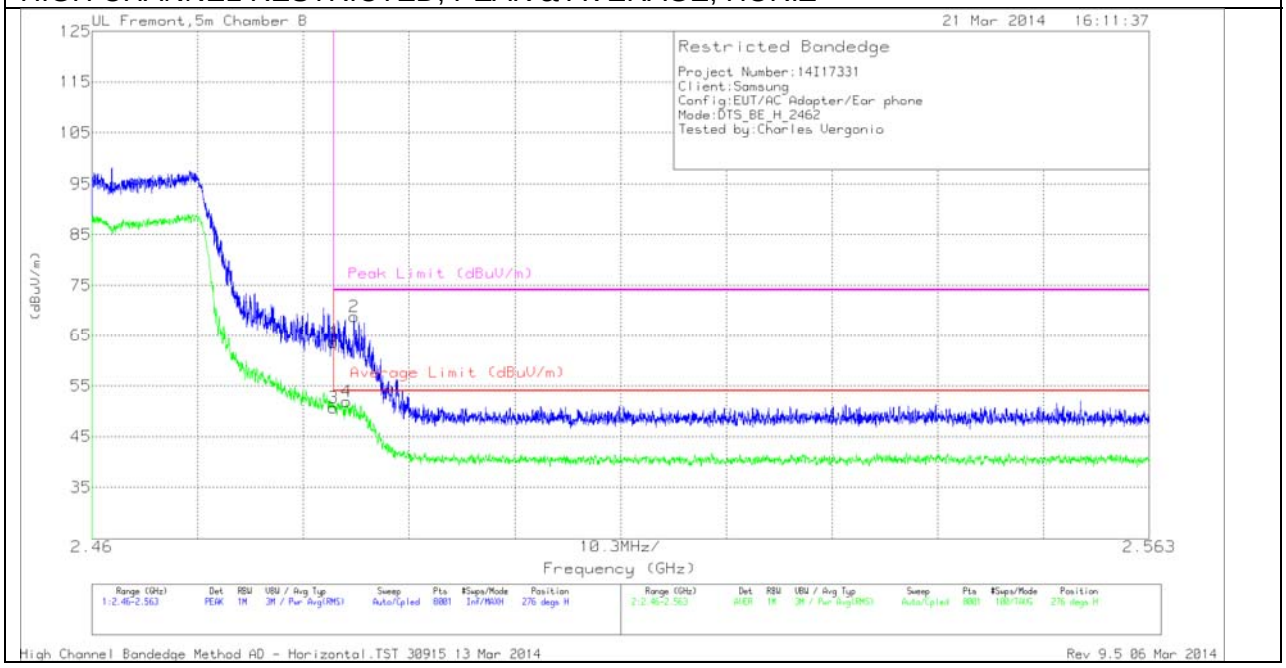
PK - Peak detector

RMS - RMS detection

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL RESTRICTED, PEAK & AVERAGE, HORIZ



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	53.72	PK	32.4	-22.6	0	63.52	-	-	74	-10.48	276	104	H
3	* 2.484	40.53	RMS	32.4	-22.6	.3	50.63	54	-3.37	-	-	276	104	H
4	* 2.485	41.8	RMS	32.4	-22.6	.3	51.9	54	-2.1	-	-	276	104	H
2	* 2.486	58.95	PK	32.4	-22.6	0	68.75	-	-	74	-5.25	276	104	H

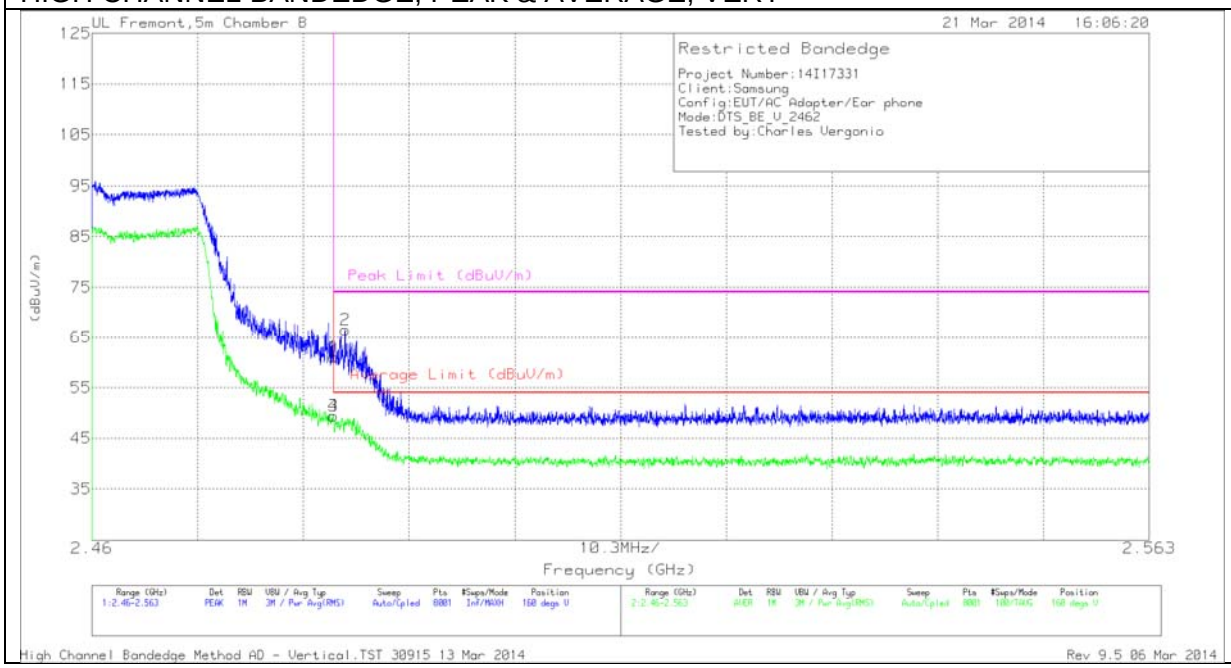
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL BANDEDGE, PEAK & AVERAGE, VERT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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	51.29	PK	32.4	-22.6	0	61.09	-	-	74	-12.91	160	340	V
3	* 2.484	39.3	RMS	32.4	-22.6	.3	49.4	54	-4.6	-	-	160	340	V
4	* 2.484	39.3	RMS	32.4	-22.6	.3	49.4	54	-4.6	-	-	160	340	V
2	* 2.485	56.72	PK	32.4	-22.6	0	66.52	-	-	74	-7.48	160	340	V

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

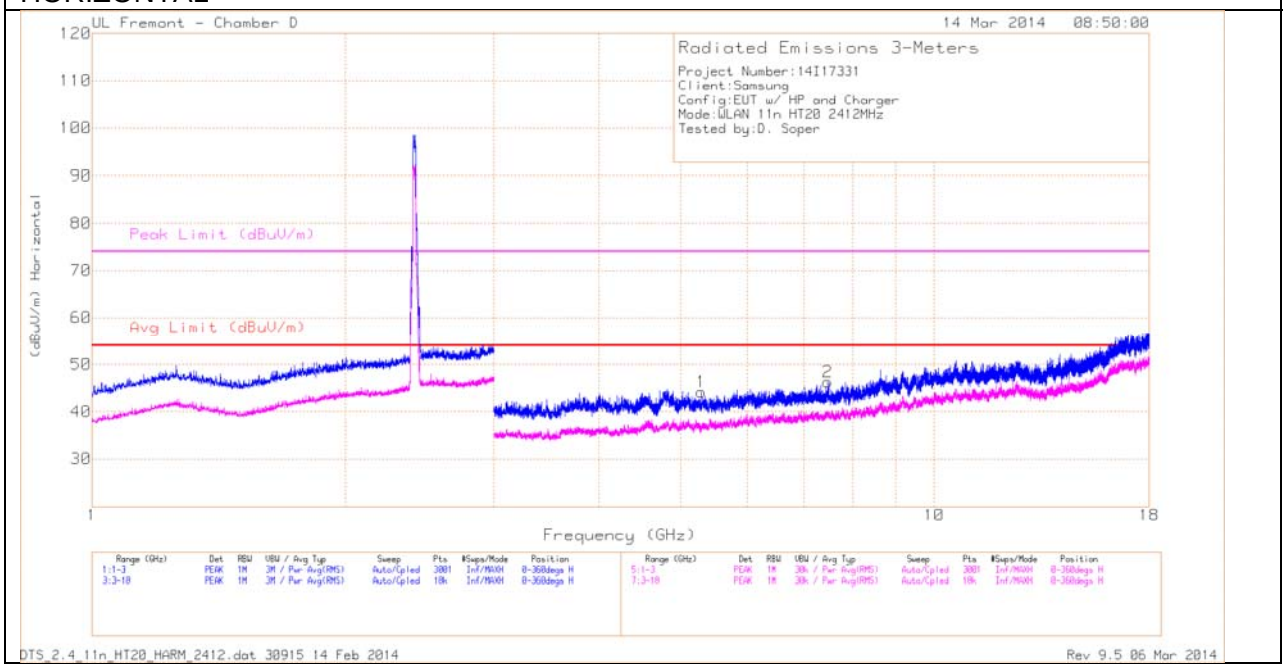
PK - Peak detector

RMS - RMS detection

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HARMONICS AND SPURIOUS EMISSIONS

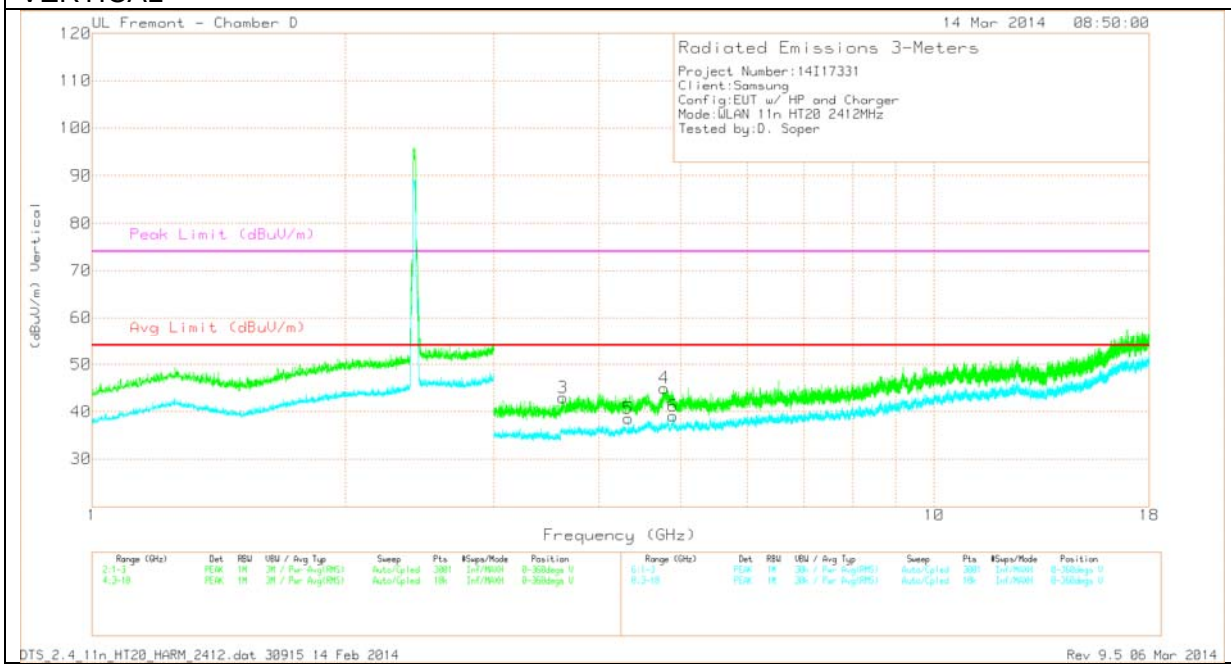
LOW CHANNEL
HORIZONTAL



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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LOW CHANNEL DATA

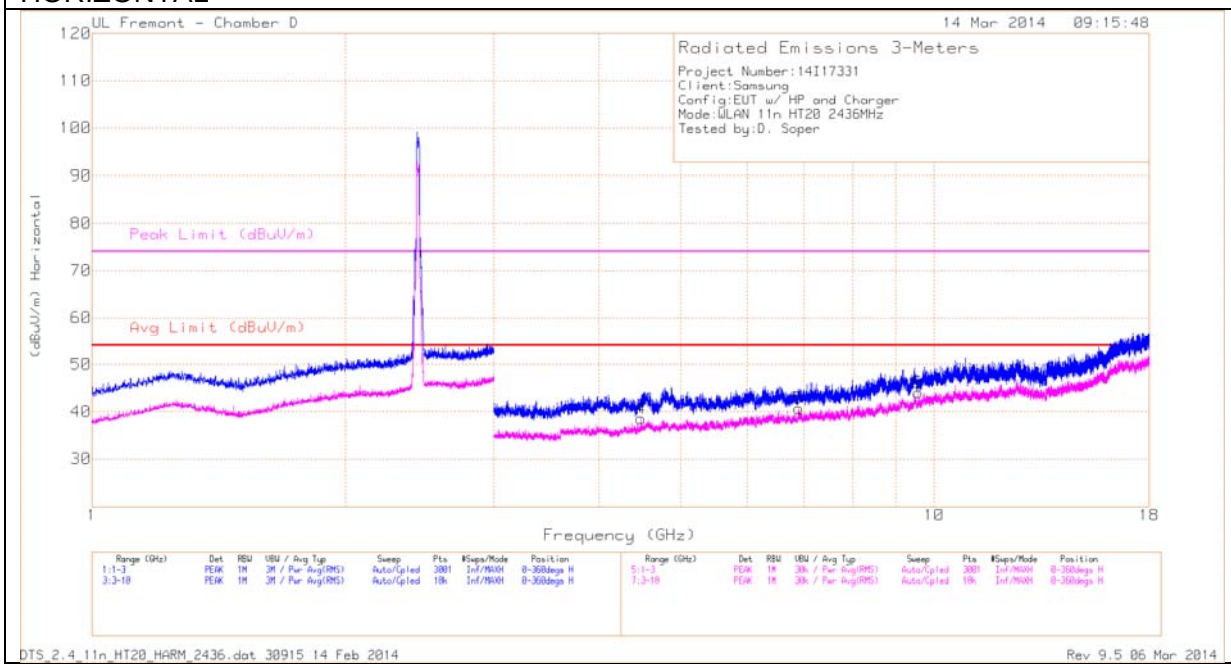
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 7.48	36.12	PK	35.2	-25	46.32	54	-7.68	74	-27.68	0-360	201	H
3	* 3.622	38.71	PK	32.5	-28.3	42.91	54	-11.09	74	-31.09	0-360	100	V
4	* 4.777	39.12	PK	33.5	-27.6	45.02	54	-8.98	74	-28.98	0-360	201	V
5	* 4.334	33.1	PK	33.1	-27.6	38.6	54	-15.4	74	-35.4	0-360	100	V
6	* 4.9	33.03	PK	33.5	-27.4	39.13	54	-14.87	74	-34.87	0-360	201	V
1	5.292	38.02	PK	33.8	-27.6	44.22	54	-9.78	74	-29.78	0-360	100	H

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

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

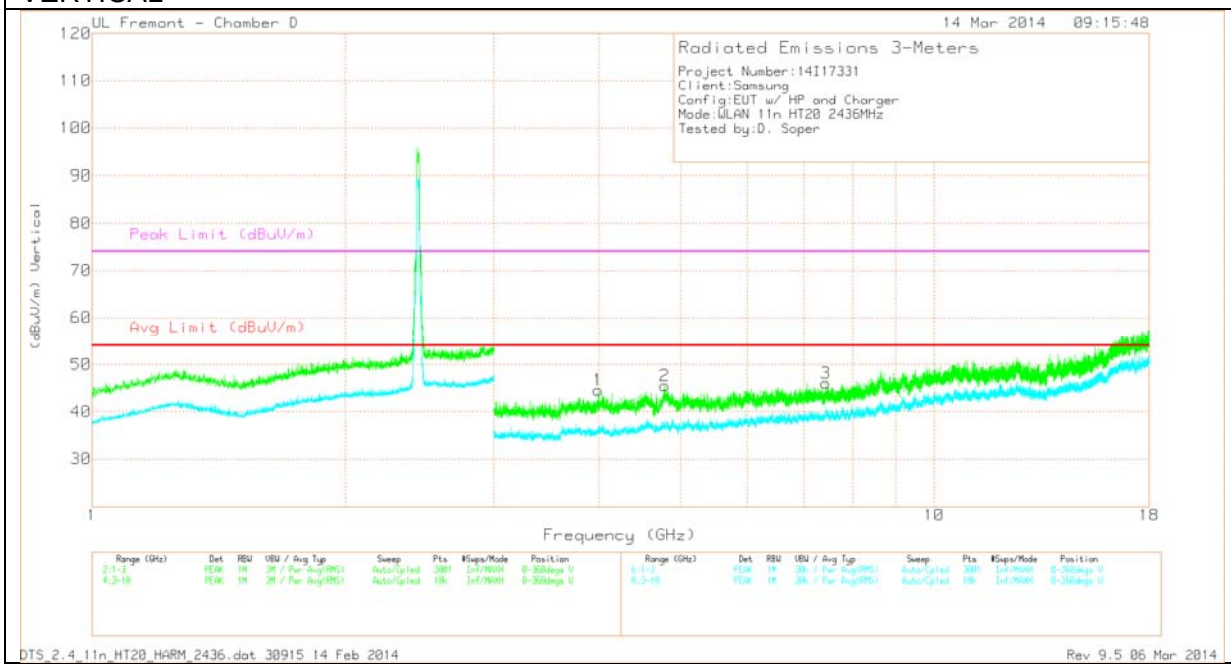
MID CHANNEL
HORIZONTAL



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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

MID CHANNEL DATA

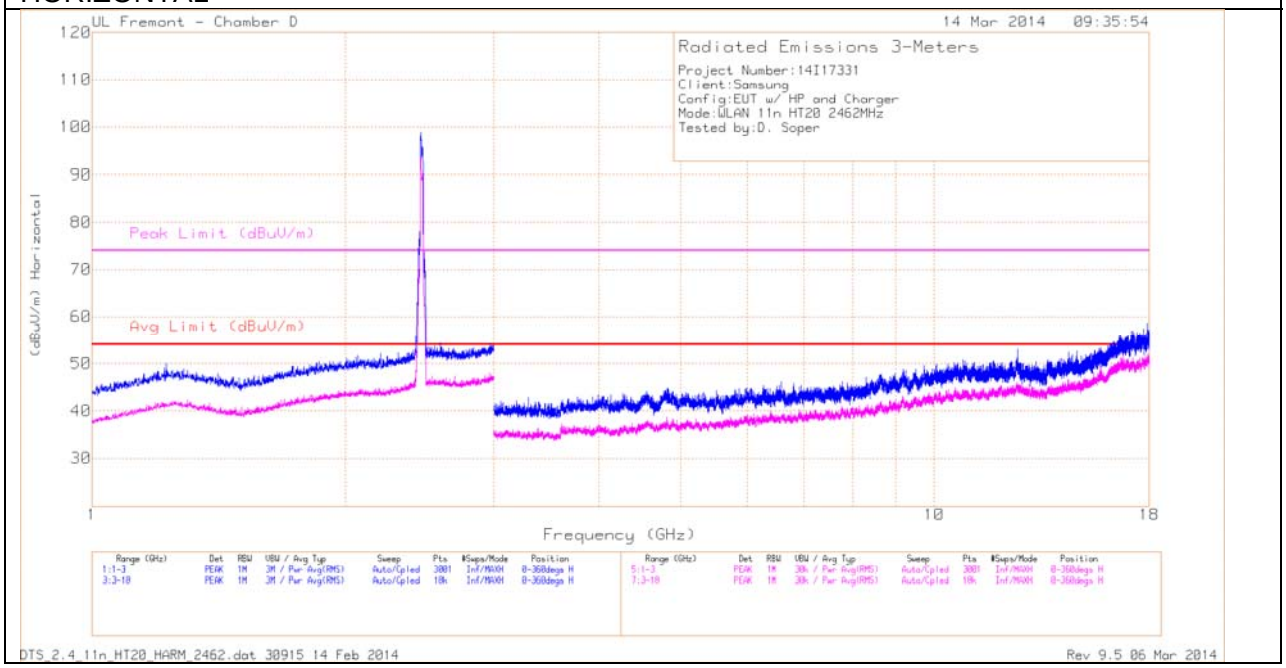
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.99	39.92	PK	32.9	-28.3	44.52	54	-9.48	74	-29.48	0-360	100	V
2	* 4.79	39.25	PK	33.5	-27.3	45.45	54	-8.55	74	-28.55	0-360	201	V
3	* 7.431	35.73	PK	35.2	-24.9	46.03	54	-7.97	74	-27.97	0-360	201	V
4	4.486	33.26	PK	33.5	-28.2	38.56	54	-15.44	74	-35.44	0-360	201	H
5	6.91	31.43	PK	35.1	-25.8	40.73	54	-13.27	74	-33.27	0-360	100	H
6	9.576	29.86	PK	36.3	-22.1	44.06	54	-9.94	74	-29.94	0-360	201	H

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

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

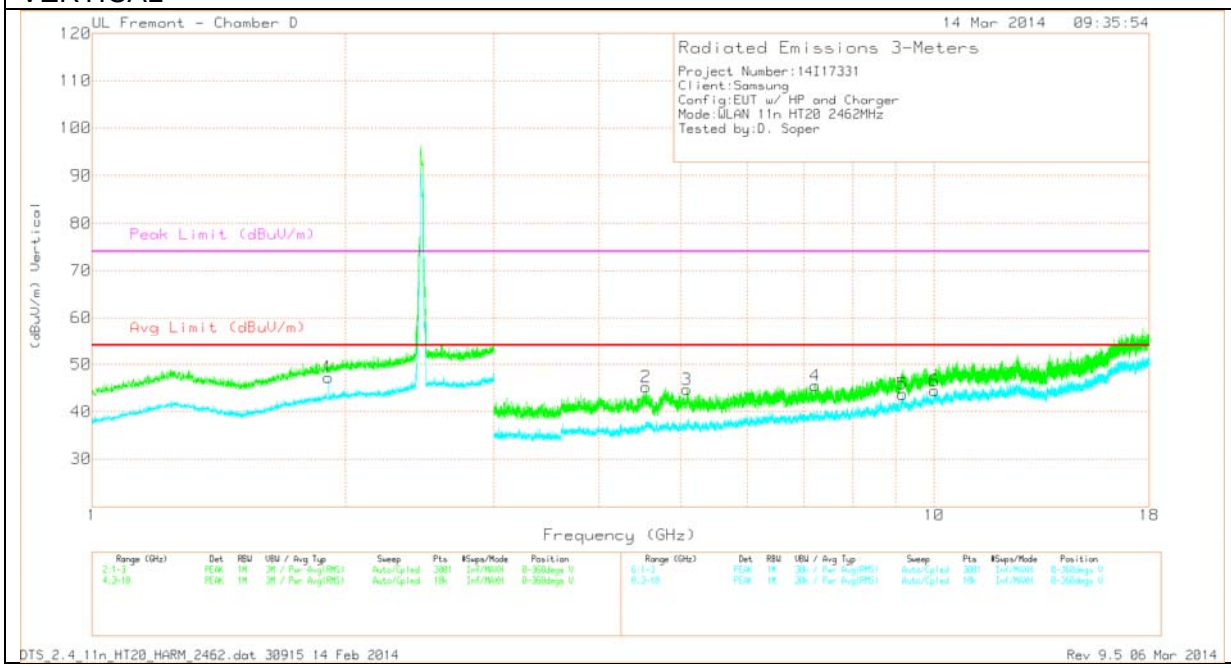
HIGH CHANNEL
HORIZONTAL



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

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (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	* 4.544	38.28	PK	33.5	-26.5	0	45.28	54	-8.72	74	-28.72	0-360	201	V
3	* 5.088	37.09	PK	33.6	-26	0	44.69	54	-9.31	74	-29.31	0-360	100	V
5	* 9.171	29.1	PK	35.9	-21.3	0	43.7	54	-10.3	74	-30.3	0-360	201	V
1	1.909	38.28	PK	30.2	-21.2	0	47.28	54	-6.72	74	-26.72	0-360	201	V
4	7.225	35.34	PK	35.1	-24.9	0	45.54	54	-8.46	74	-28.46	0-360	100	V
6	10.005	28.68	PK	36.8	-21	0	44.48	54	-9.52	74	-29.52	0-360	100	V

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

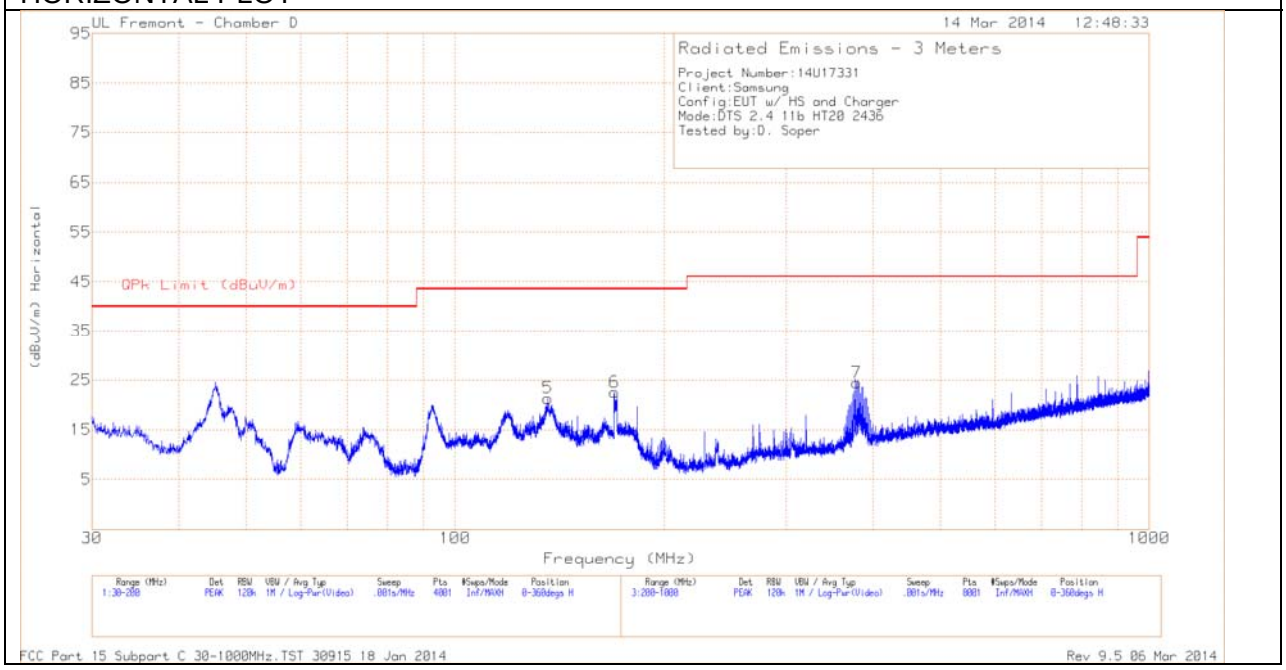
PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

10.3. WORST-CASE BELOW 1 GHz

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

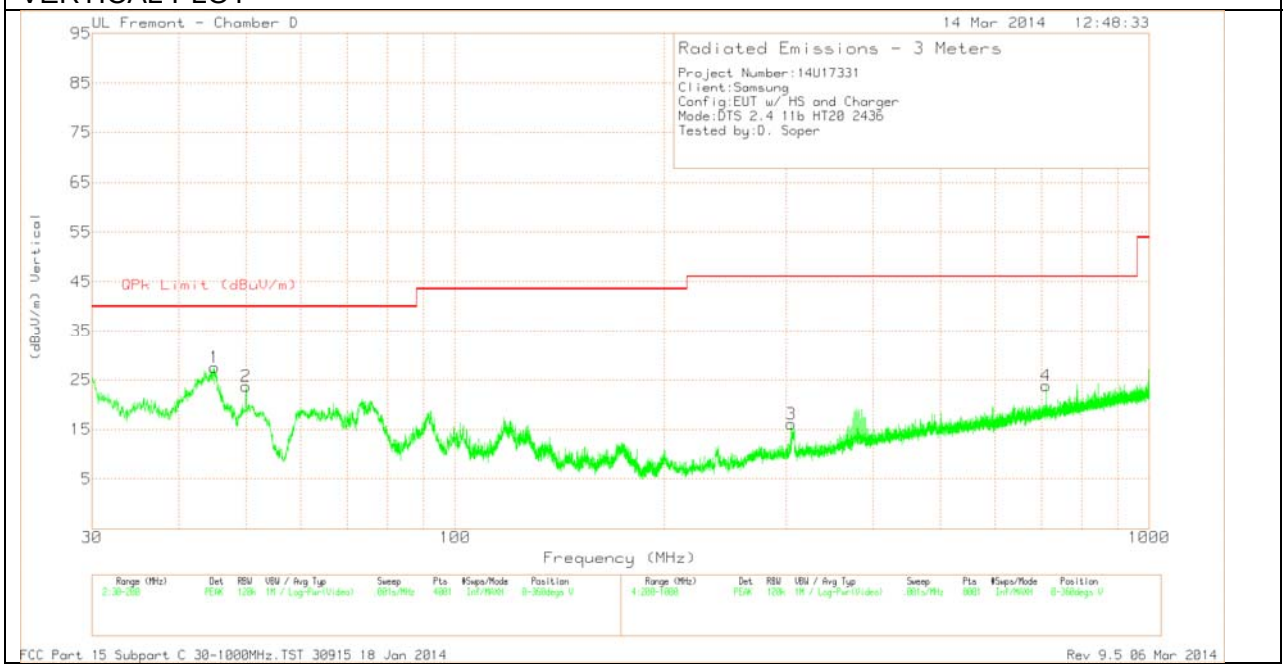
HORIZONTAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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

VERTICAL PLOT



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

Below 1G Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 136.08	39.15	PK	13.4	-31.2	21.35	43.52	-22.17	0-360	100	H
6	* 169.6125	42.13	PK	11.4	-31	22.53	43.52	-20.99	0-360	100	H
1	45.0025	49.32	PK	10.1	-31.9	27.52	40	-12.48	0-360	100	V
2	50.0175	47.33	PK	7.7	-31.3	23.73	40	-16.27	0-360	100	V
3	305.2	32.91	PK	13.5	-30.3	16.11	46.02	-29.91	0-360	300	V
7	379.2	39.61	PK	15	-30.2	24.41	46.02	-21.61	0-360	100	H
4	710.4	32.74	PK	20.4	-29.3	23.84	46.02	-22.18	0-360	200	V

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

PK - Peak detector

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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.

This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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	.393	51.81	PK	.4	0	52.21	58	-5.79	-	-
2	.393	42.65	Av	.4	0	43.05	-	-	48	-4.95
3	.8565	45.01	PK	.3	0	45.31	56	-10.69	-	-
4	.8565	32.87	Av	.3	0	33.17	-	-	46	-12.83
5	2.0445	48.23	PK	.2	.1	48.53	56	-7.47	-	-
6	2.0445	33.62	Av	.2	.1	33.92	-	-	46	-12.08
7	3.003	47.67	PK	.2	.1	47.97	56	-8.03	-	-
8	3.003	32.58	Av	.2	.1	32.88	-	-	46	-13.12
9	10.3155	35.24	PK	.2	.2	35.64	60	-24.36	-	-
10	10.3155	17.99	Av	.2	.2	18.39	-	-	50	-31.61
11	11.04	33.61	PK	.2	.2	34.01	60	-25.99	-	-
12	11.04	16.73	Av	.2	.2	17.13	-	-	50	-32.87

Line-L2 .15 - 30MHz

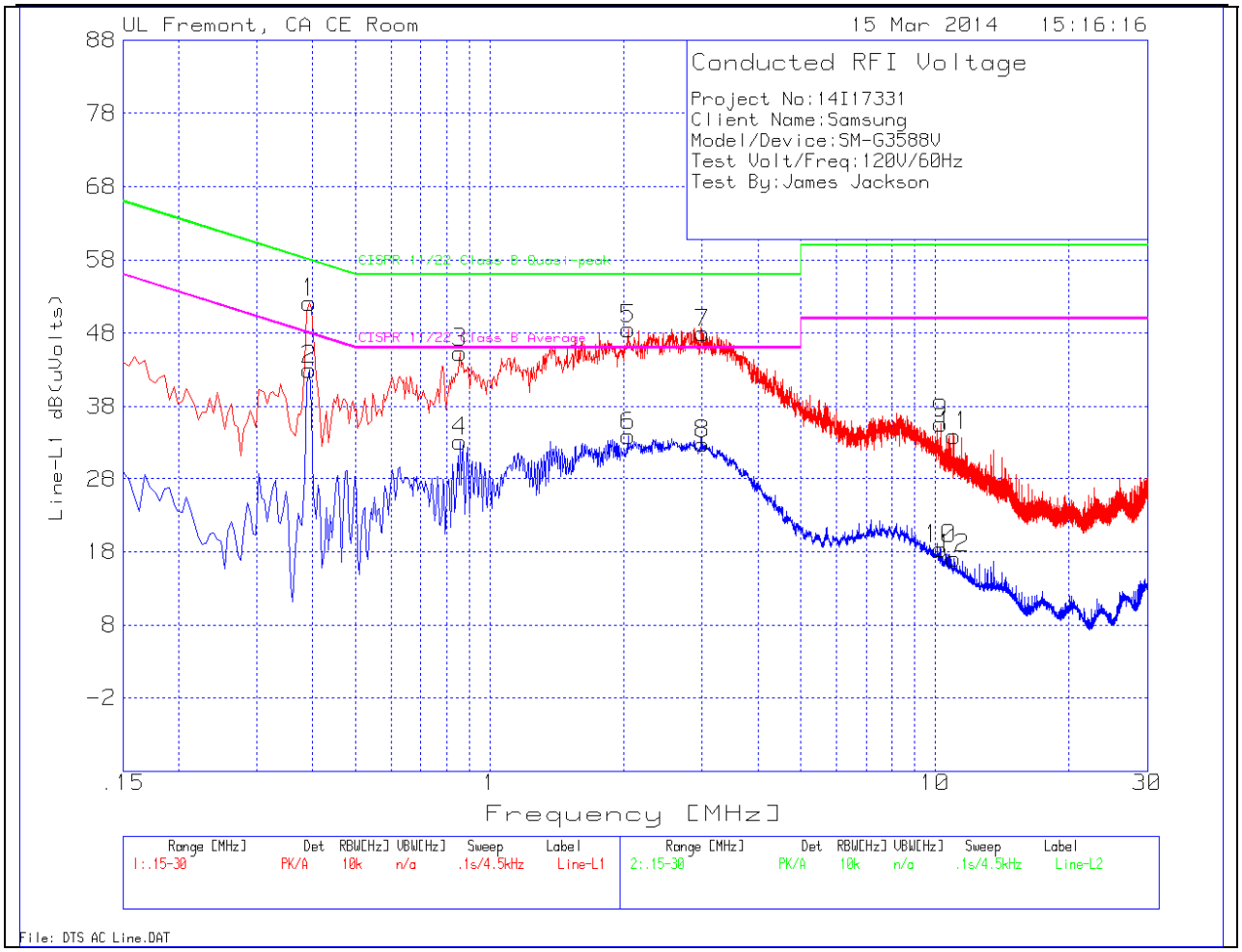
Trace Markers

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)
13	.3165	39.35	PK	.6	0	39.95	59.8	-19.85	-	-
14	.3165	25.25	Av	.6	0	25.85	-	-	49.8	-23.95
15	.3885	48.23	PK	.5	0	48.73	58.1	-9.37	-	-
16	.3885	38.61	Av	.5	0	39.11	-	-	48.1	-8.99
17	1.7025	44.79	PK	.2	.1	45.09	56	-10.91	-	-
18	1.7025	27.78	Av	.2	.1	28.08	-	-	46	-17.92
19	2.5935	45.02	PK	.2	.1	45.32	56	-10.68	-	-
20	2.5935	30	Av	.2	.1	30.3	-	-	46	-15.7
21	3.291	46.42	PK	.2	.1	46.72	56	-9.28	-	-
22	3.291	27.48	Av	.2	.1	27.78	-	-	46	-18.22
23	5.4285	37.85	PK	.2	.1	38.15	60	-21.85	-	-
24	5.4285	17.23	Av	.2	.1	17.53	-	-	50	-32.47
25	7.3185	36.96	PK	.2	.1	37.26	60	-22.74	-	-
26	7.3185	18.44	Av	.2	.1	18.74	-	-	50	-31.26
27	14.64	32.03	PK	.3	.2	32.53	60	-27.47	-	-
28	14.64	12.55	Av	.3	.2	13.05	-	-	50	-36.95
29	15.5985	29.33	PK	.3	.2	29.83	60	-30.17	-	-
30	15.5985	10.27	Av	.3	.2	10.77	-	-	50	-39.23

PK - Peak detector
Av - average detection

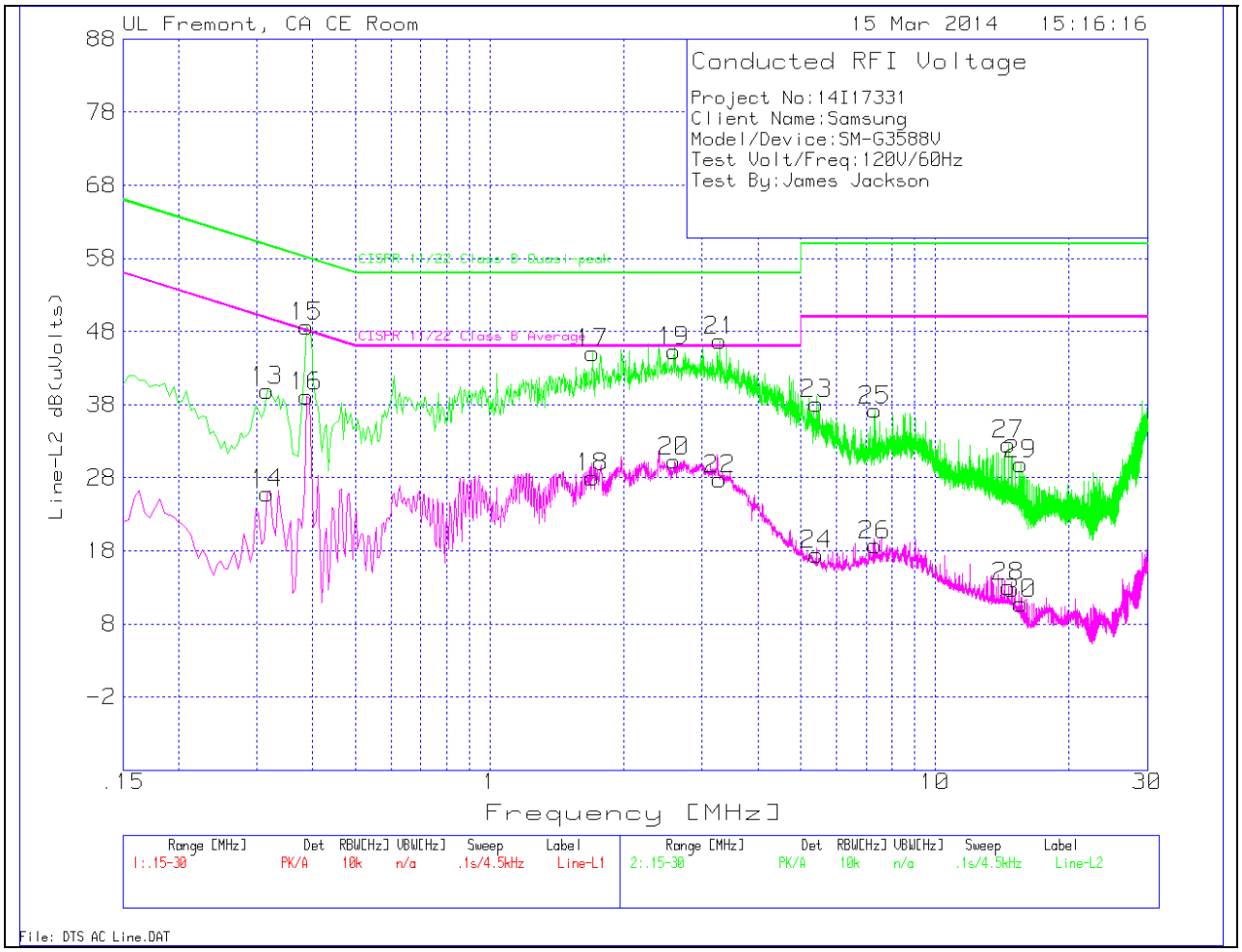
LINE 1 RESULTS

UL VERIFICATION SERVICES INC. FORM NO: CCSUP4701H
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

LINE 2 RESULTS



This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.