FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + Bluetooth &
WLAN (2.4GHz & 5GHz) and NFC

MODEL NUMBER: SHV-E470S

FCC ID: A3LSHVE470S

REPORT NUMBER: 13U15753-5

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Prepared for
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416, MAETAN 3-DONG, YEONGTONG-GU
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Revision History

Rev.	Issue Date	Revisions	Revised By
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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11 B/G/N 1X1 HT20, HT40, +BT4.0 (LE) + GSM1900/WCDMA850 & 1900MHz/LTE AND NFC BAR PHONE

MODEL: SHV-E470S

SERIAL NUMBER: 1693673-VS

DATE TESTED: AUGUST 5-17, 2013

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

UL CCS 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 CCS 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS 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 CCS By:

PHILIP KIM
EMC Program Manager
UL Verification Services Inc.

Tested By:

ROLLY ALEGRE
WiSE LAB TECHNICIAN
UL Verification Services Inc.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2009, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

UL CCS 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 1000 MHz	4.94 dB

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a 802.11 A/B/G/N/AC 1X1 HT20, HT40, HT80 + BT4.0 (LE) + GSM/ WCDMA / LTE BAR PHONE.

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	16.8	47.86
2412 - 2462	802.11g	14.4	27.54
2412 - 2462	802.11n HT20	12.4	17.38
5745 - 5825	802.11a	12.3	16.98
5745 - 5825	802.11n HT20	11.3	13.49
5755 - 5795	802.11n HT40	11	12.59

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -1.1 dBi for 2.4GHz and -0.04 for 5GHz

5.4. SOFTWARE AND FIRMWARE

Software version was E470S.001

The firmware used was Android 4.2.2.

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5.5. WORST-CASE CONFIGURATION AND MODE

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

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

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	SAMSUNG	ETA-U90KWK	N/A	N/A
Earphone	SAMSUNG	E0-HS3303WE	N/A	N/A

I/O CABLES

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

TEST SETUP

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

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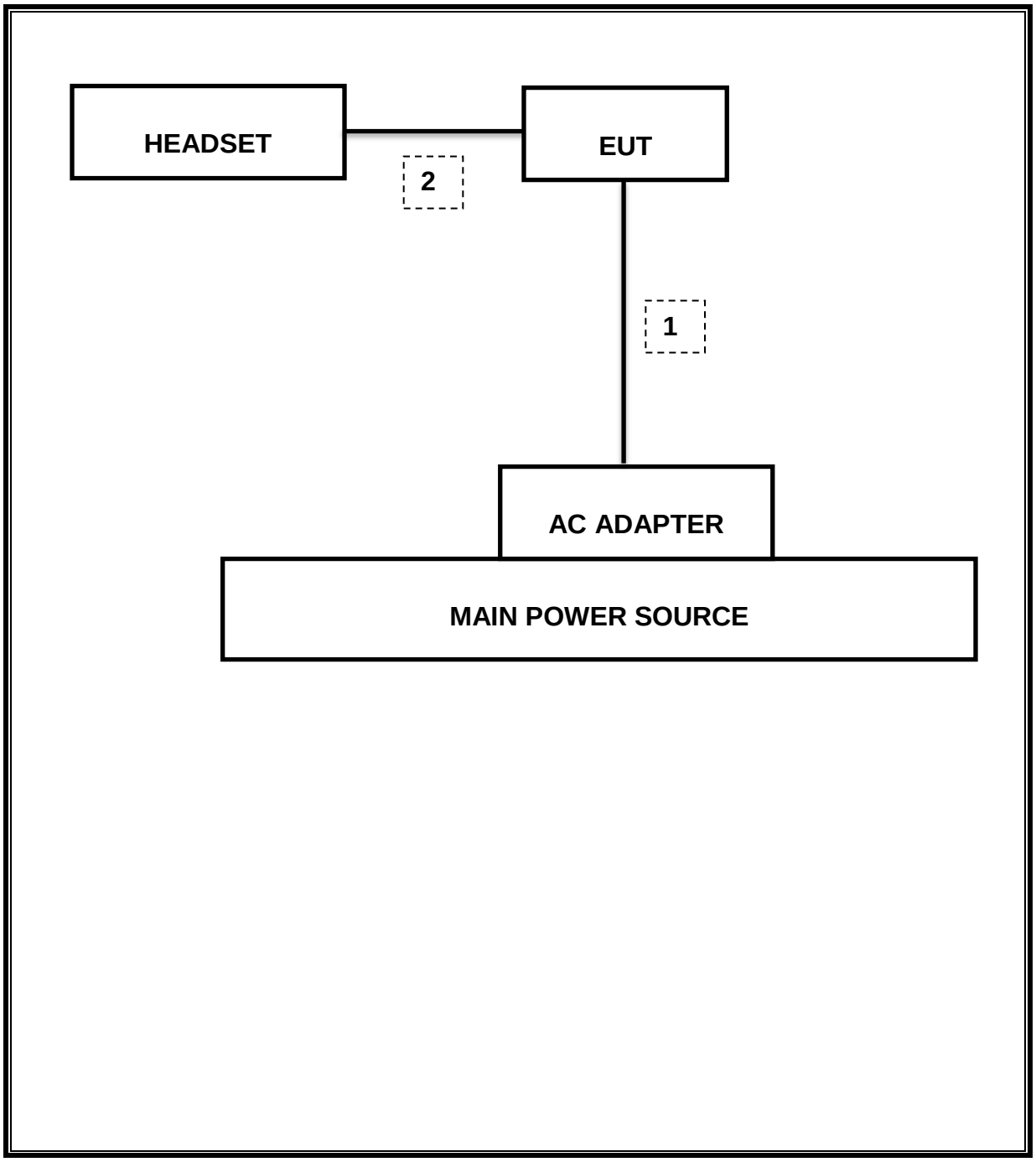
SETUP DIAGRAM FOR TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

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

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

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7. MEASUREMENT METHODS

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

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

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8. ANTENNA PORT TEST RESULTS

8.1. 802.11b MODE IN THE 2.4 GHz BAND

8.1.1. 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 DTS Meas Guidance 8.0: The transmitter output is connected to a spectrum analyzer with the RBW set to 100KHz, the VBW >= 3 x RBW, peak detector and max hold.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	10.000	0.5
Mid	2437	10.050	0.5
High	2462	10.025	0.5

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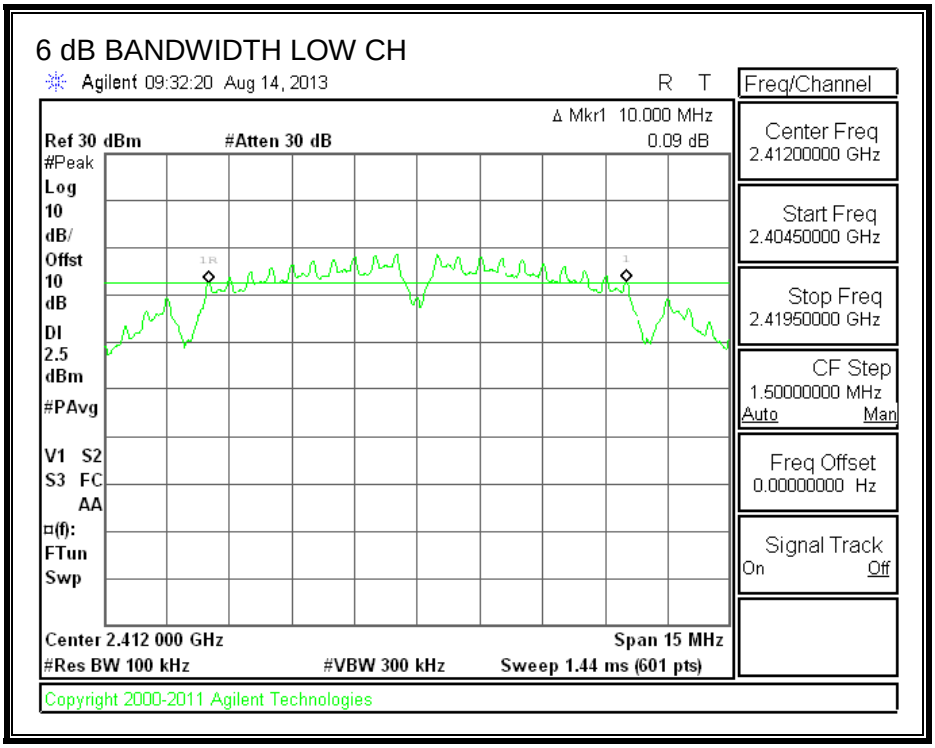
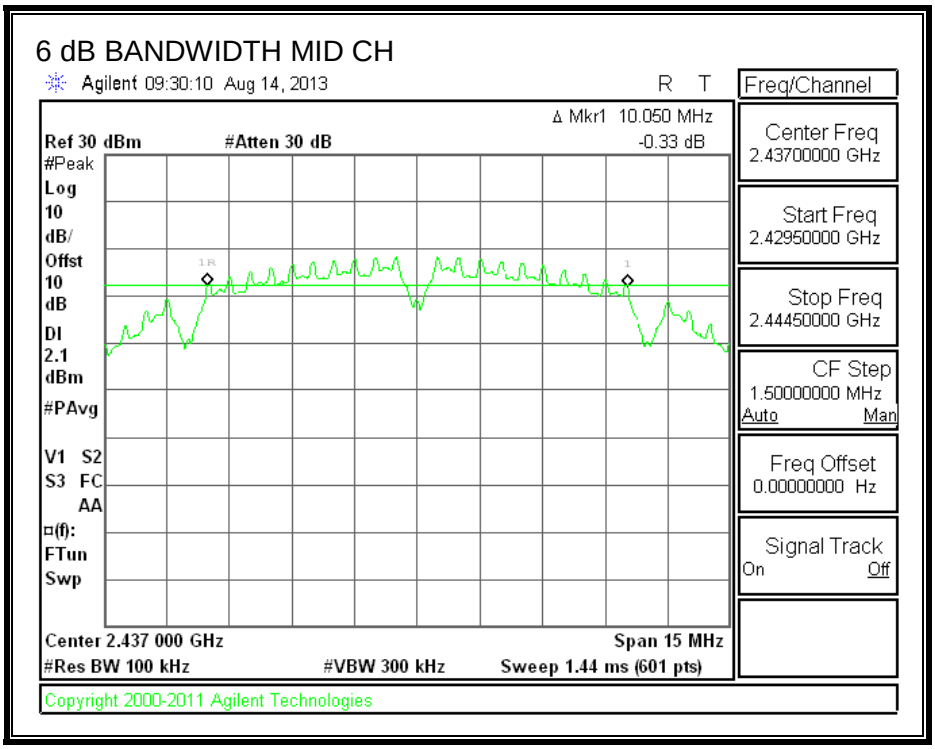
6 dB BANDWIDTH





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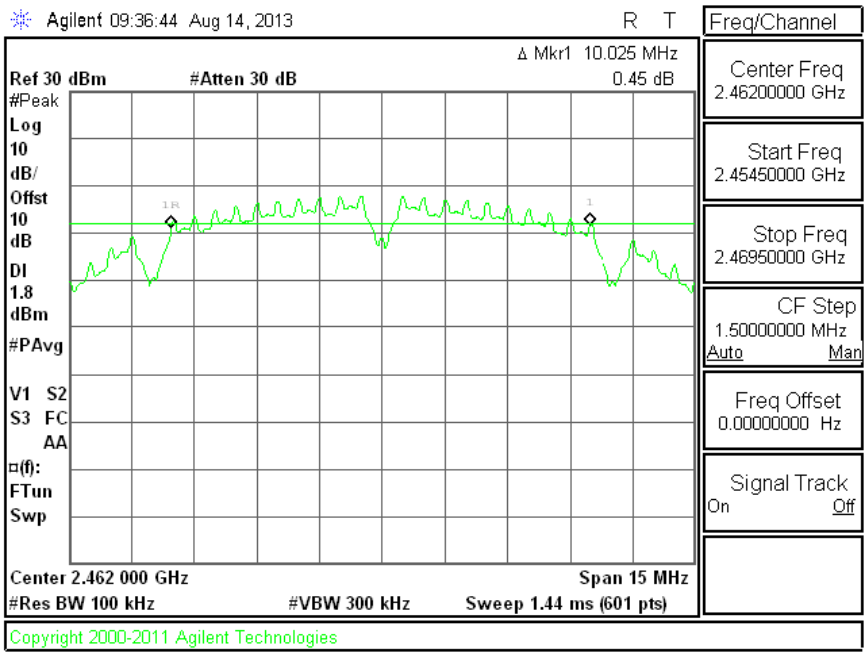
6 dB BANDWIDTH HIGH CH



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8.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	13.1722
Mid	2437	13.1740
High	2462	13.2381

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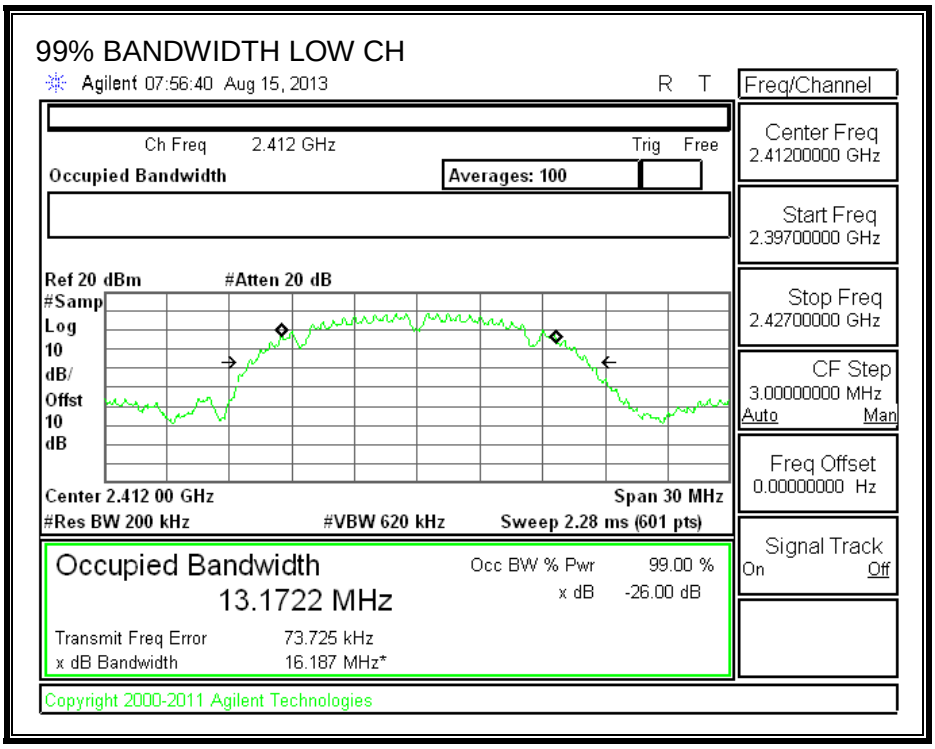
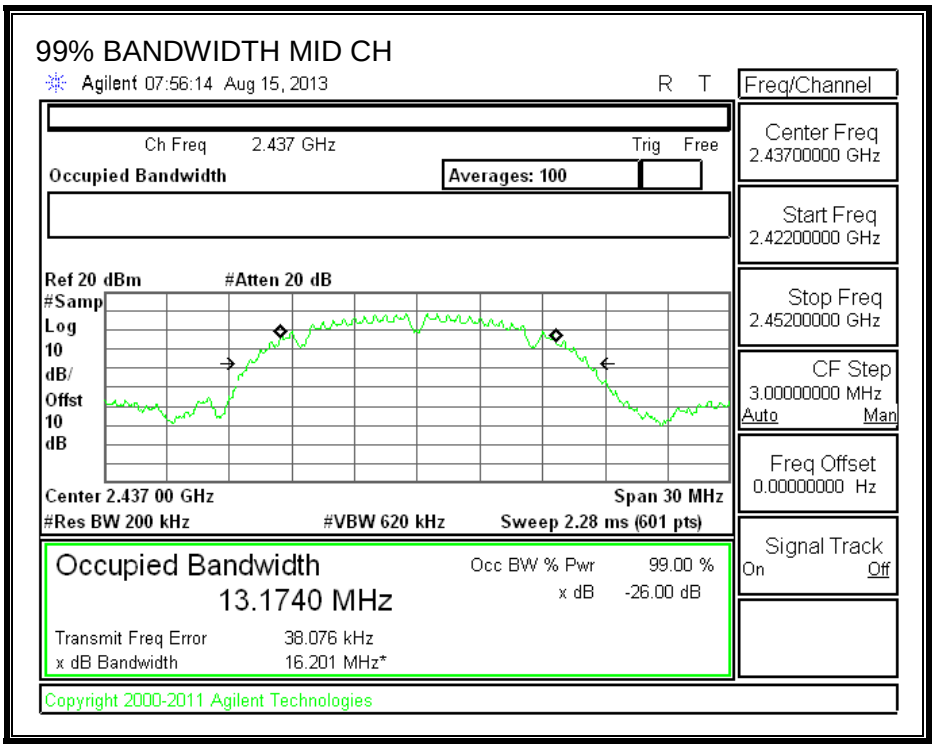
99% BANDWIDTH





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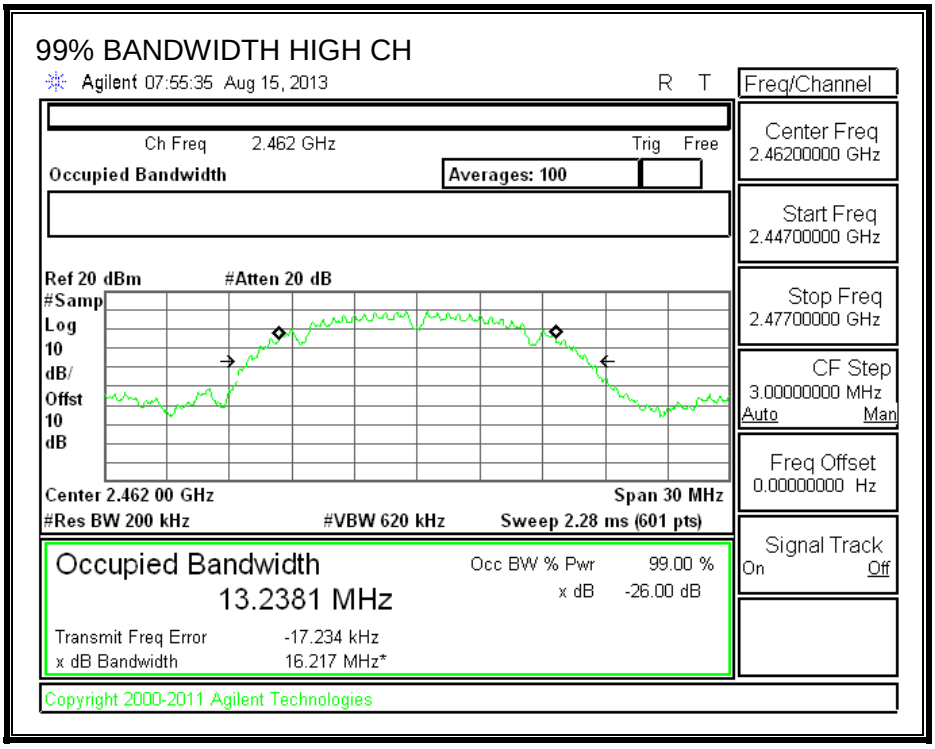

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8.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Reference to KDB 558074 DTS Meas Guidance 9.2.3: The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	16.70
Mid	2437	16.80
High	2462	16.80

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8.1.4. 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.

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RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-1.10	30.00	30	36	30.00
Mid	2437	-1.33	30.00	30	36	30.00
High	2462	-1.21	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	19.88	19.88	30.00	-10.12
Mid	2437	19.44	19.44	30.00	-10.56
High	2462	20.00	20.00	30.00	-10.00

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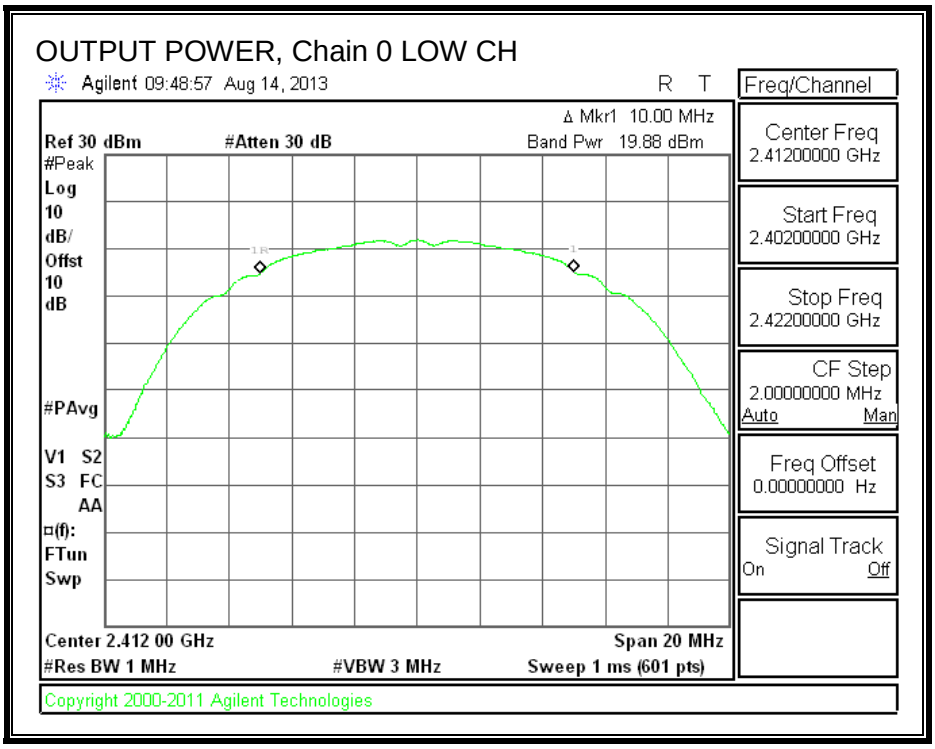
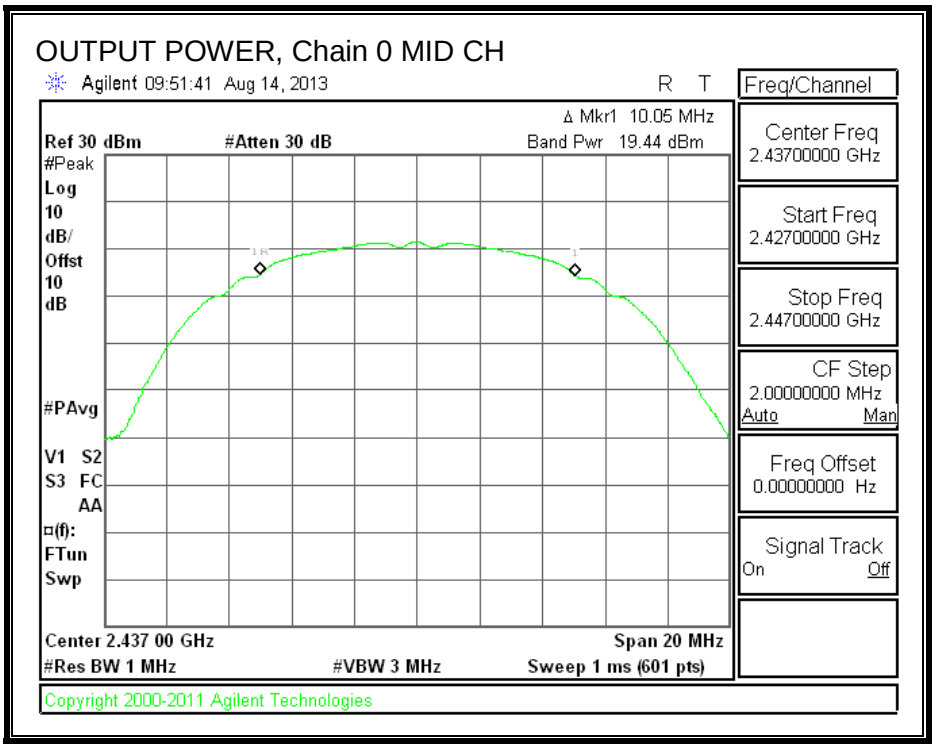
OUTPUT POWER, Chain 0





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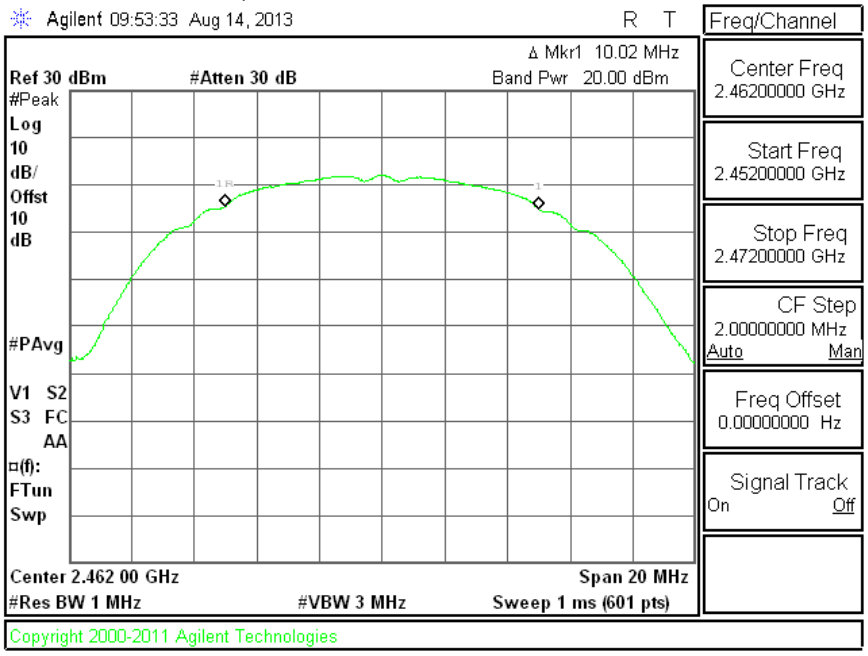
OUTPUT POWER, Chain 0 HIGH CH



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8.1.5. 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

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-4.88	8.0	-12.9
Mid	2437	-5.68	8.0	-13.7
High	2462	-5.34	8.0	-13.3

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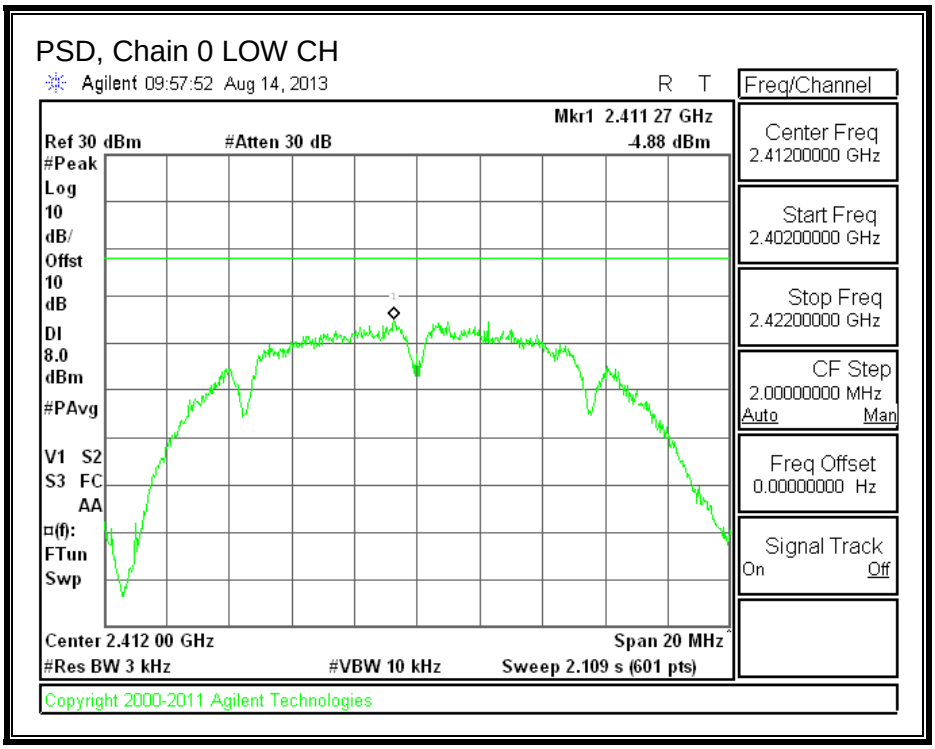
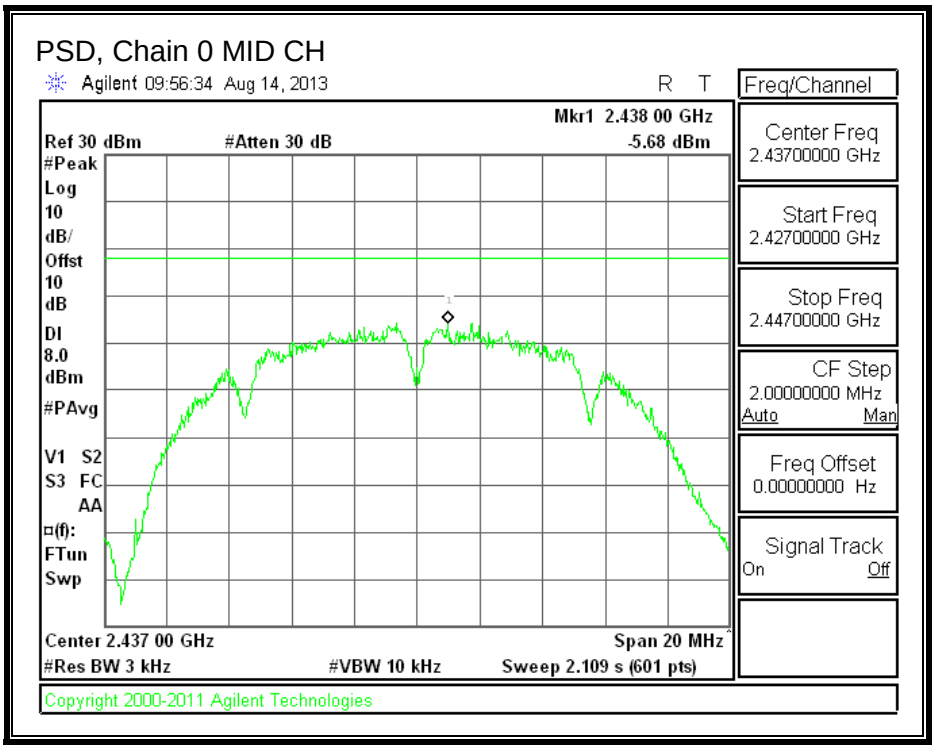
PSD, Chain 0





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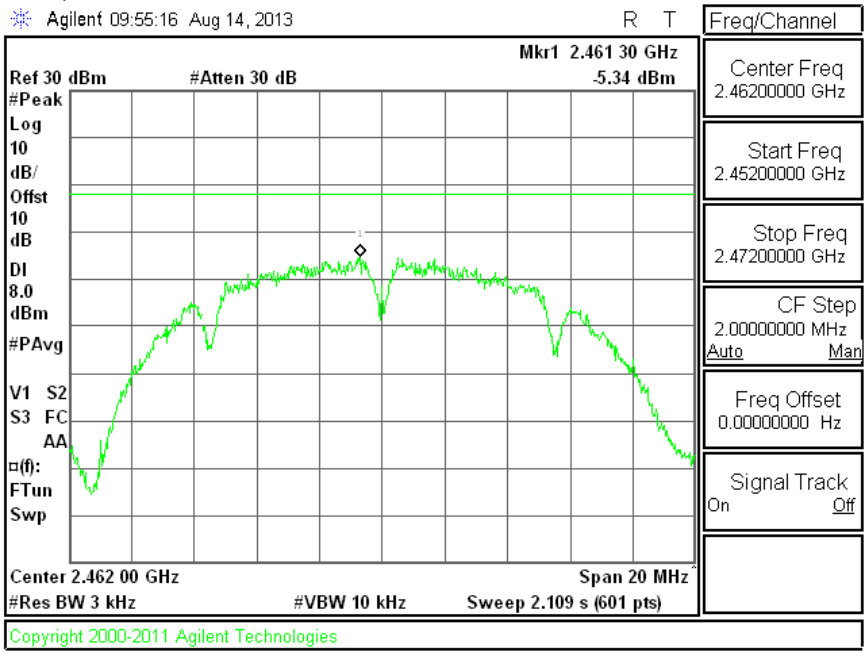
PSD, Chain 0 HIGH CH



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8.1.6. 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.

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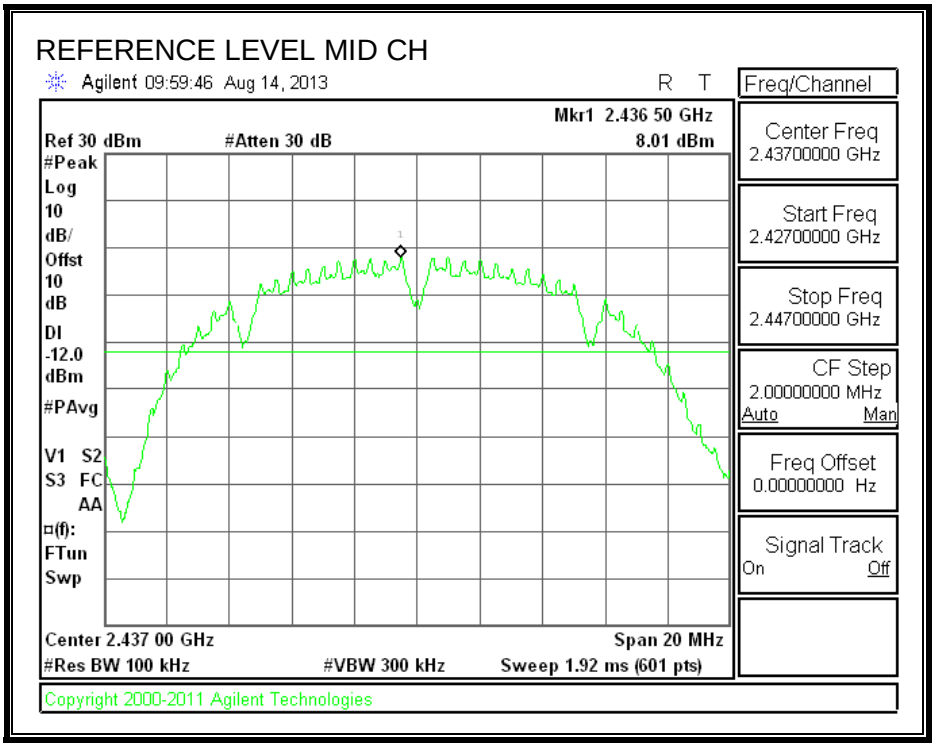
RESULTS

IN-BAND REFERENCE LEVEL



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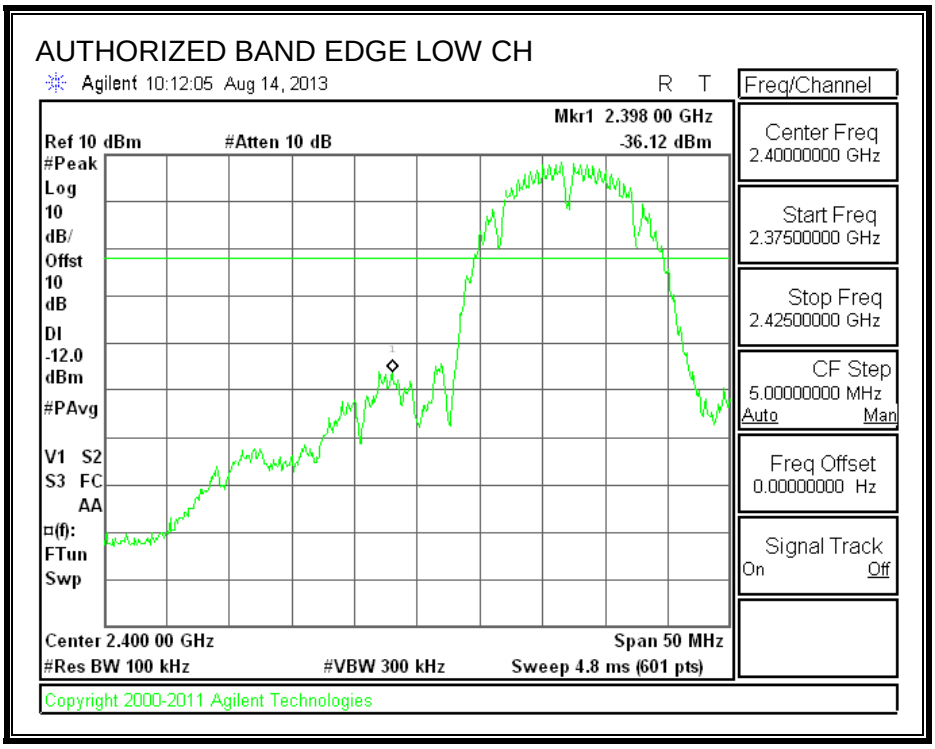
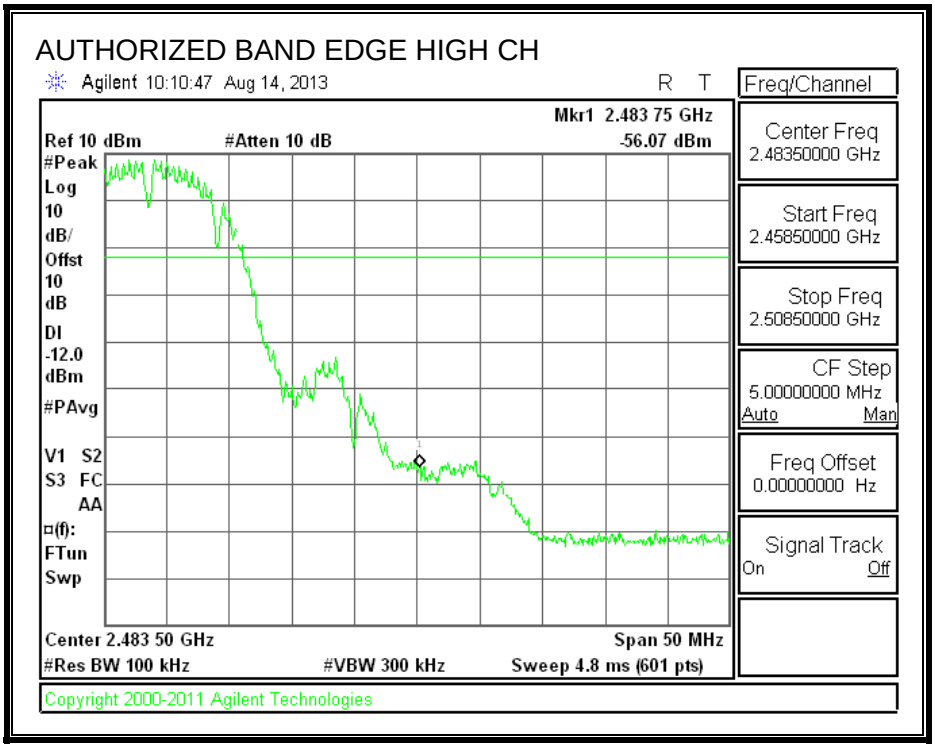
LOW CHANNEL BANDEDGE



HIGH CHANNEL BANDEDGE



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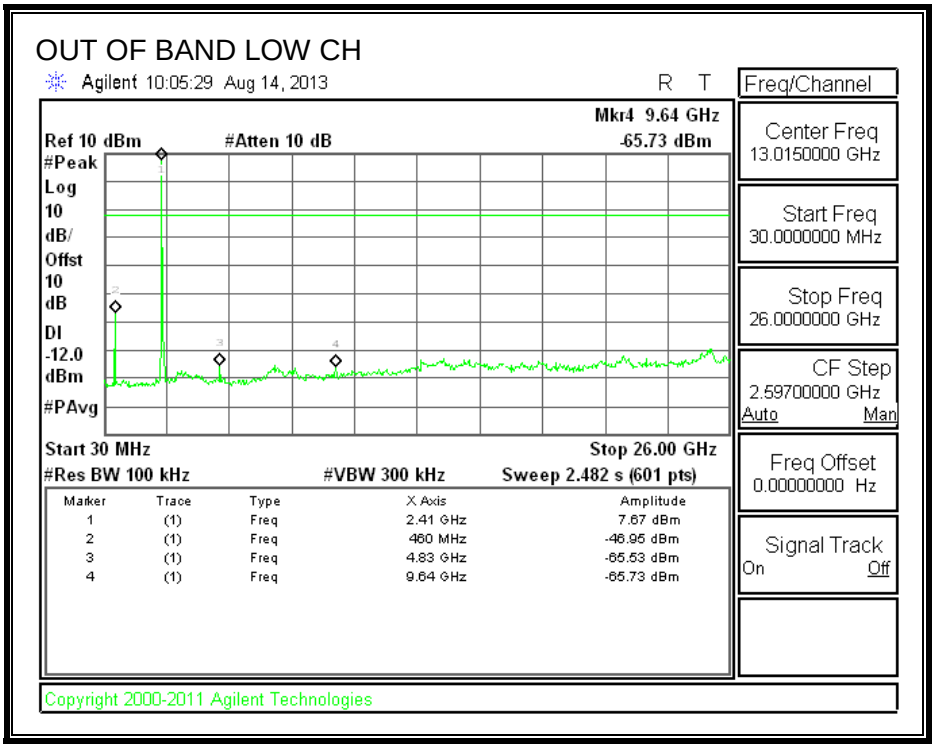
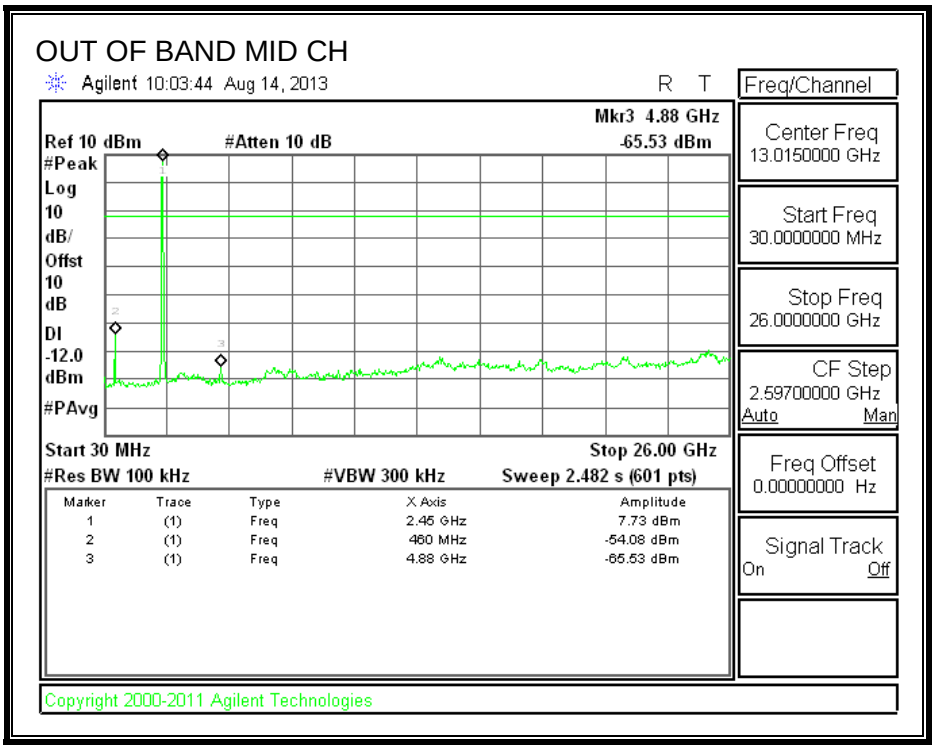
OUT-OF-BAND EMISSIONS (SPURIOUS)





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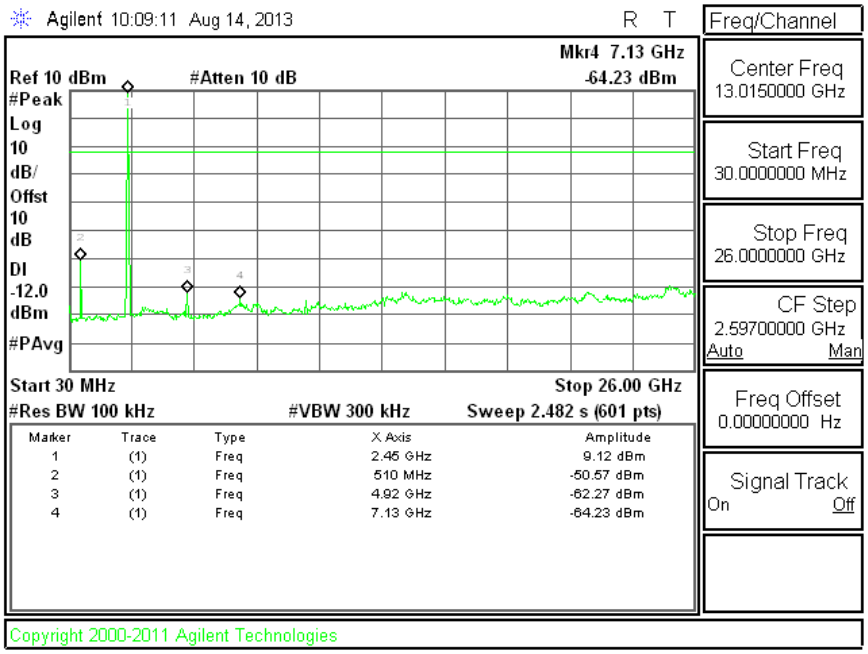
OUT OF BAND HIGH CH



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8.2. 802.11g MODE IN THE 2.4 GHz BAND

8.2.1. 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 DTS Meas Guidance 8.0: The transmitter output is connected to a spectrum analyzer with the RBW set to 100KHz, the VBW >= 3 x RBW, peak detector and max hold.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.460	0.5
Mid	2437	16.460	0.5
High	2462	16.420	0.5

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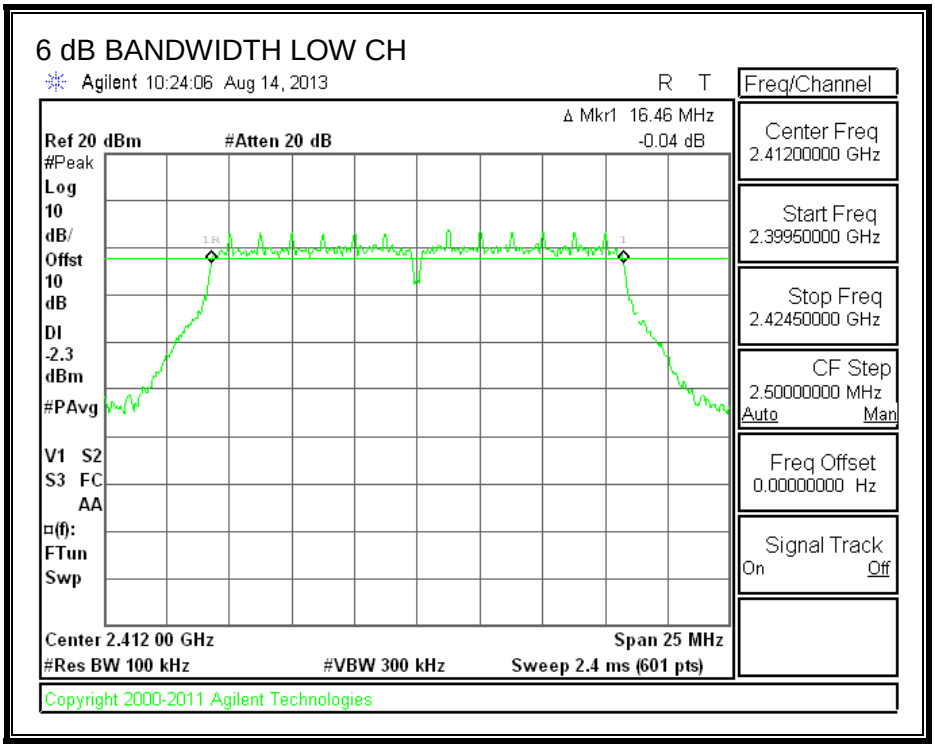
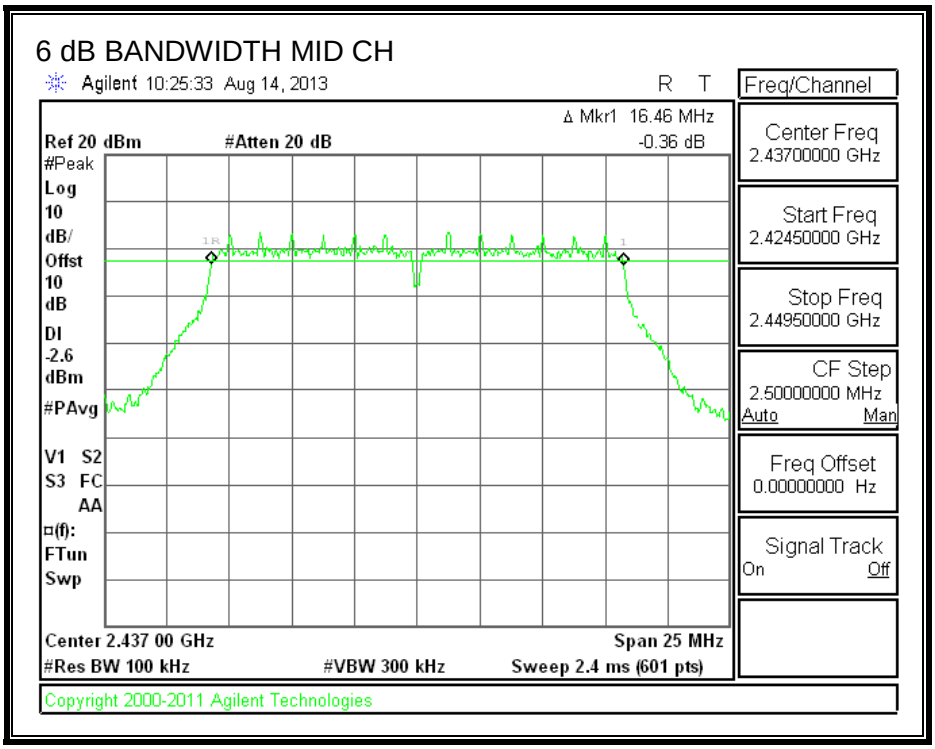
6 dB BANDWIDTH





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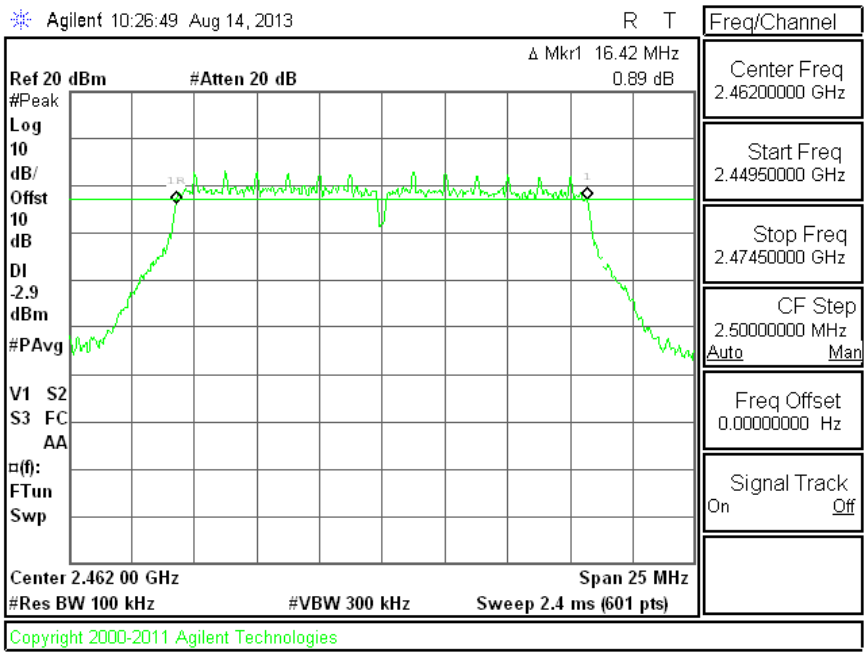
6 dB BANDWIDTH HIGH CH



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

8.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.5765
Mid	2437	16.5860
High	2462	16.5997

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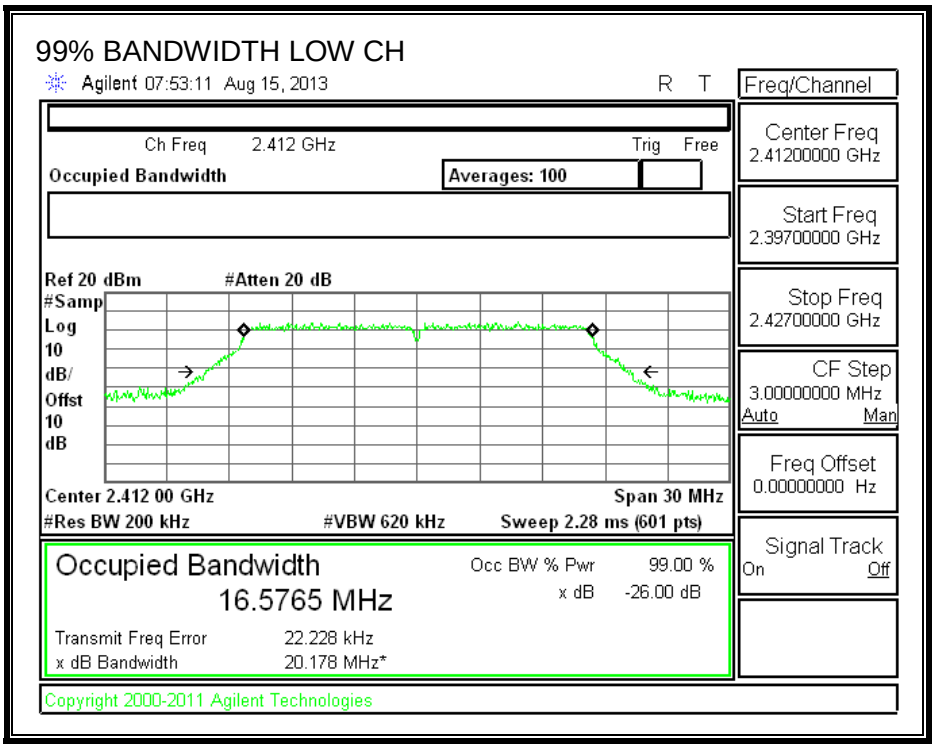
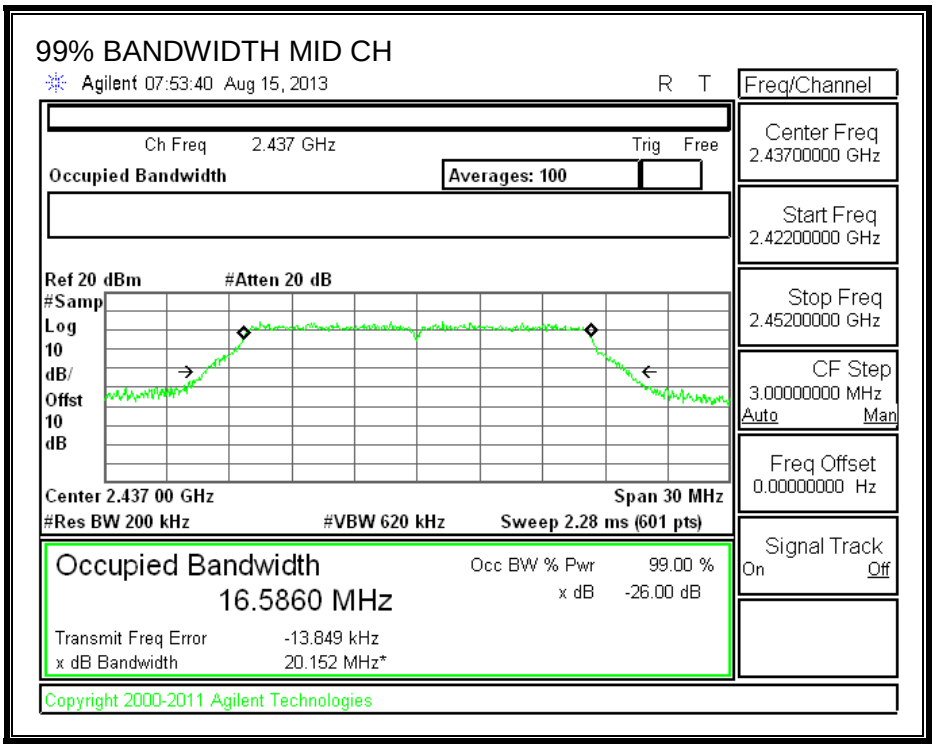
99% BANDWIDTH





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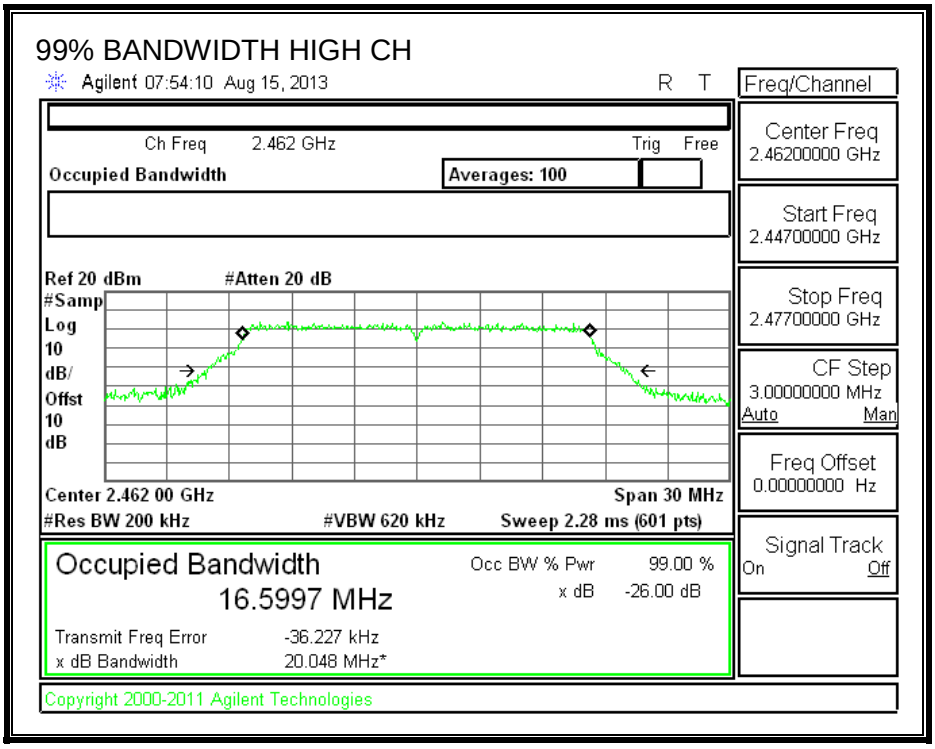

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8.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Reference to KDB 558074 DTS Meas Guidance 9.2.3: The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	14.40
Mid	2437	14.10
High	2462	13.60

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8.2.4. 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.

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

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-1.10	30.00	30	36	30.00
Mid	2437	-1.33	30.00	30	36	30.00
High	2462	-1.21	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	22.48	22.48	30.00	-7.52
Mid	2437	22.22	22.22	30.00	-7.78
High	2462	21.80	21.80	30.00	-8.20

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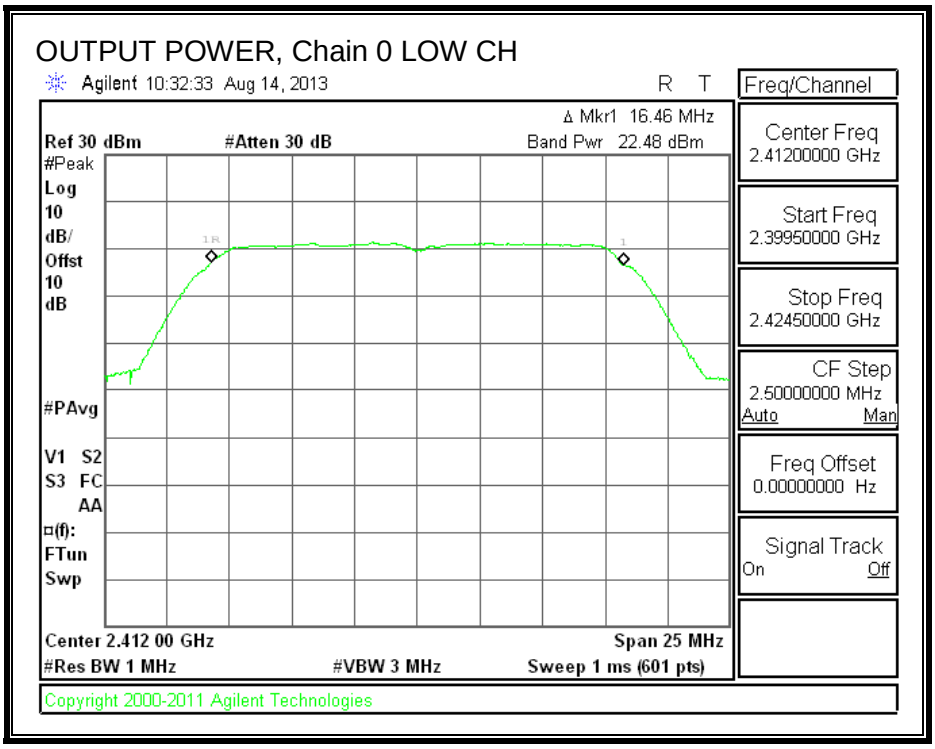
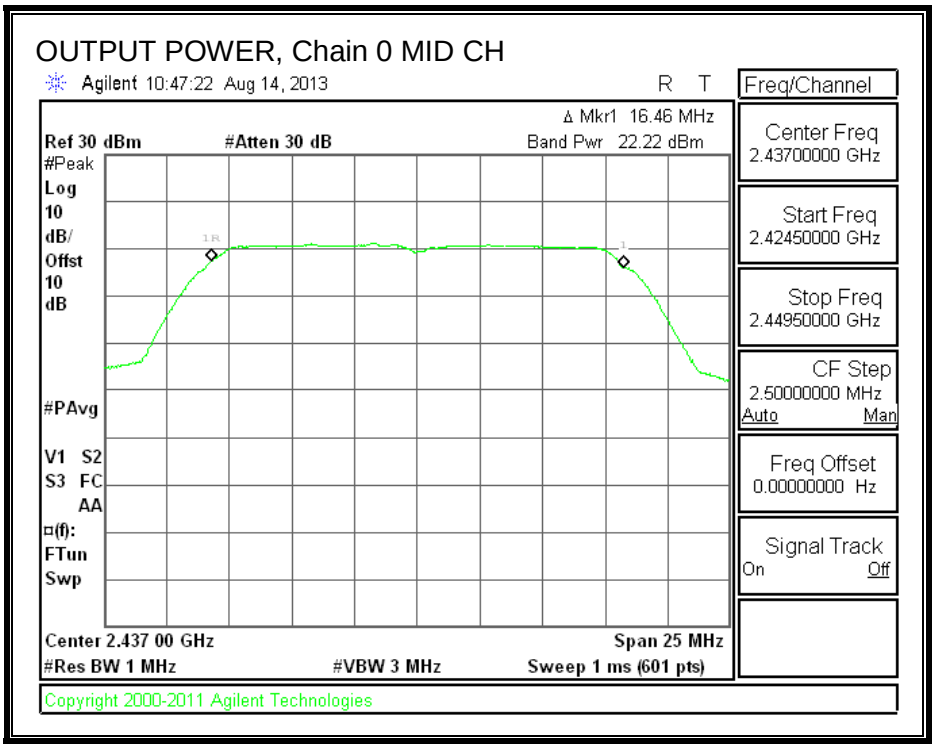
OUTPUT POWER, Chain 0





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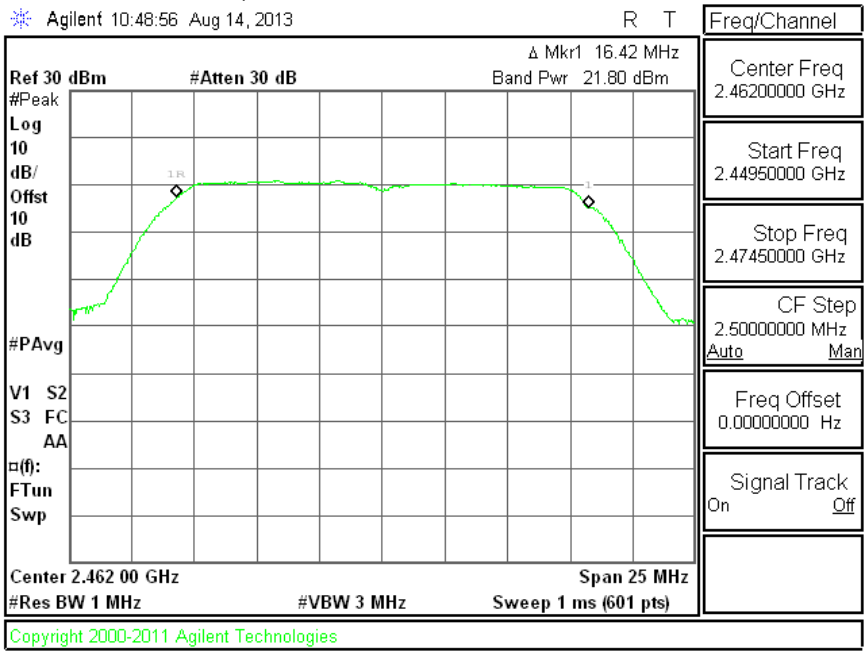
OUTPUT POWER, Chain 0 HIGH CH



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8.2.5. 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

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.64	8.0	-17.6
Mid	2437	-9.97	8.0	-18.0
High	2462	-10.07	8.0	-18.1

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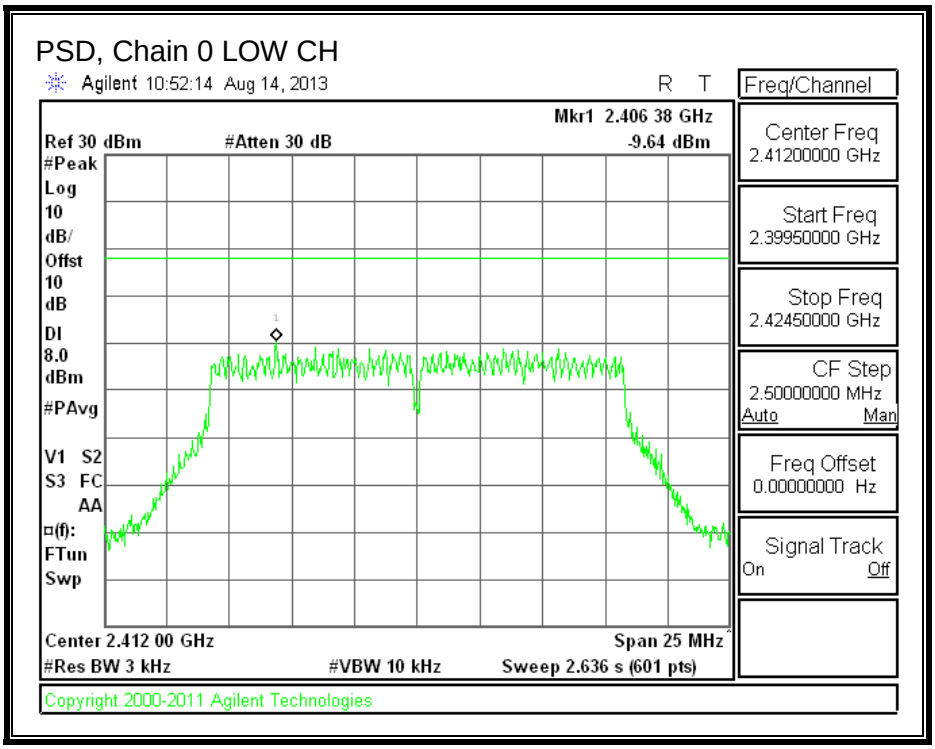
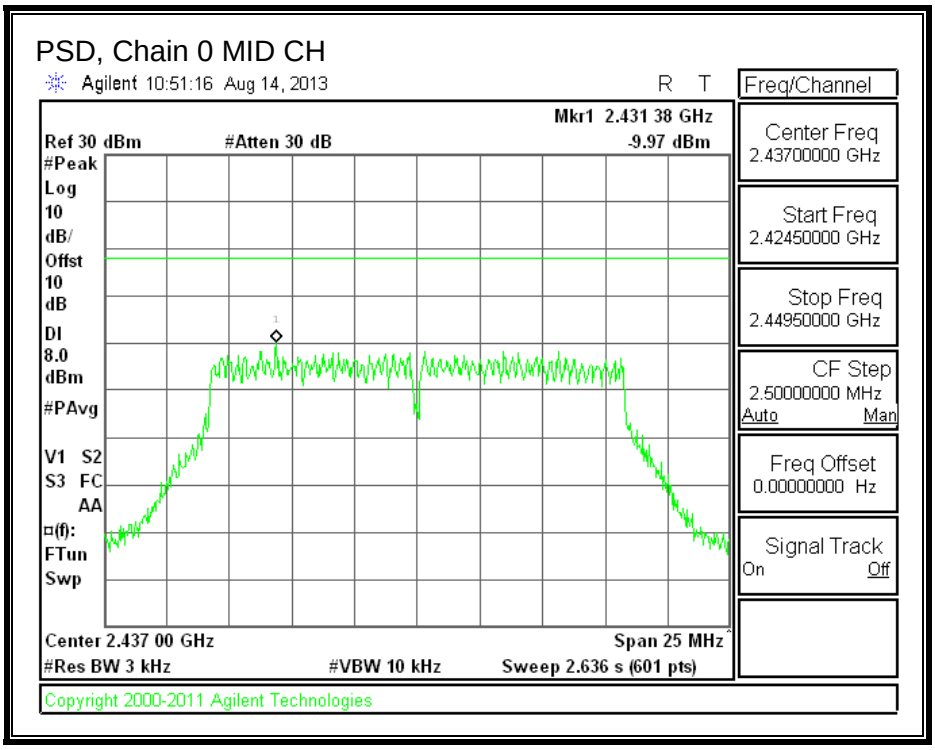
PSD, Chain 0





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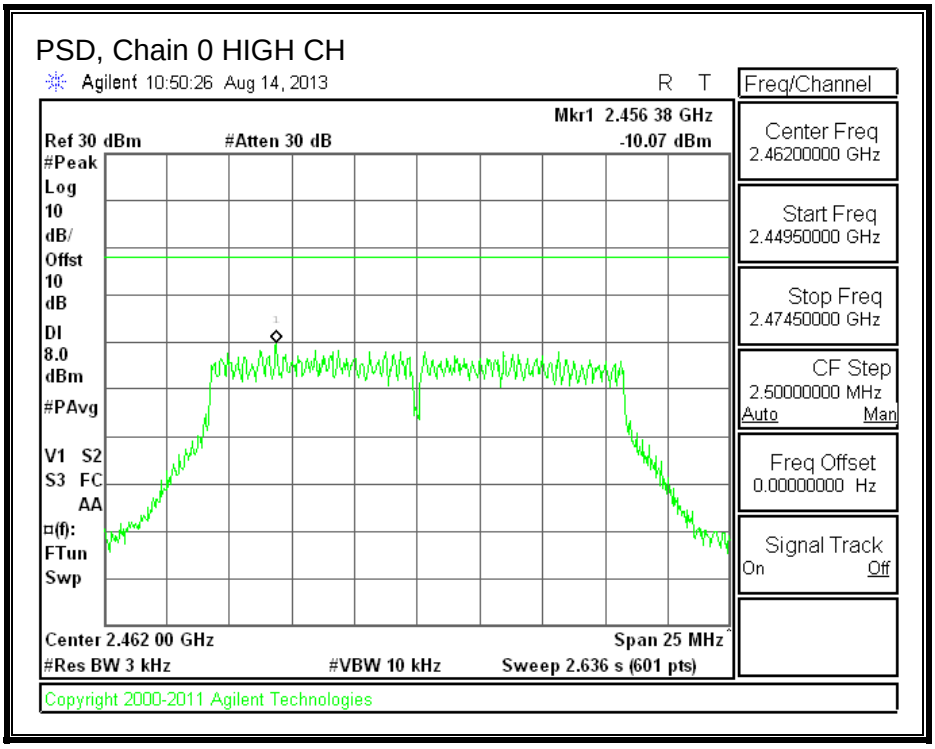

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8.2.6. OUT-OF-BAND EMISSIONS

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.

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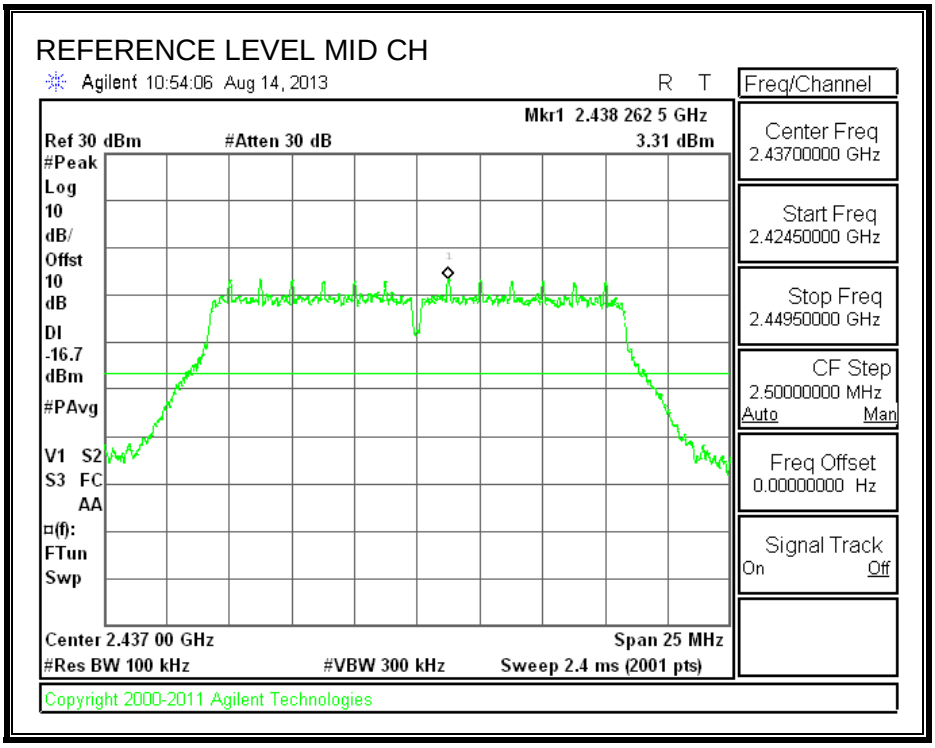
RESULTS

IN-BAND REFERENCE LEVEL



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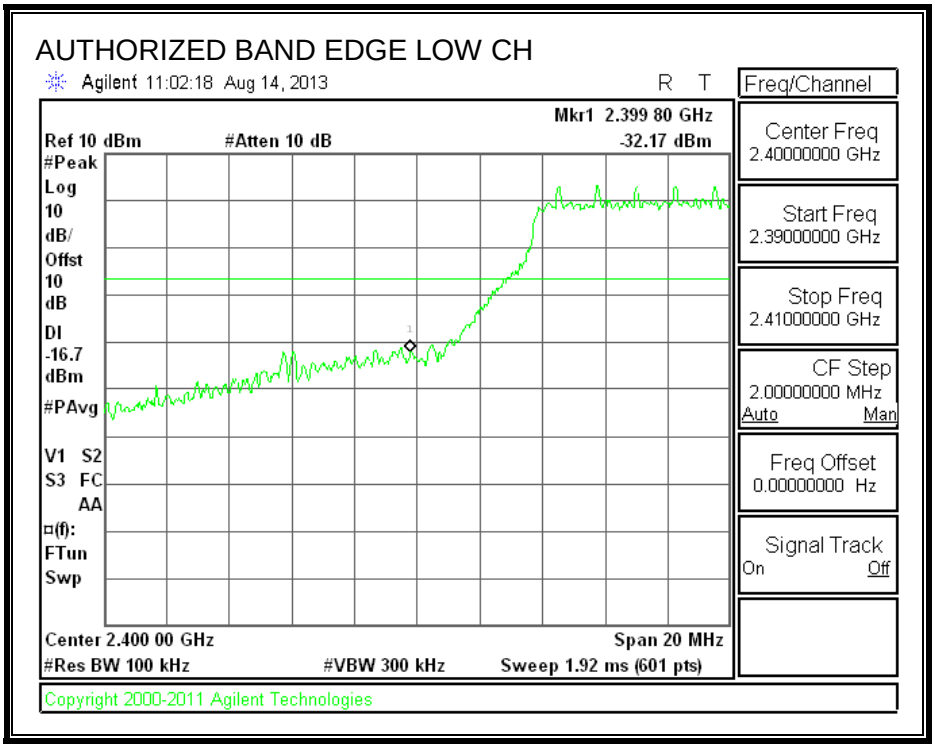
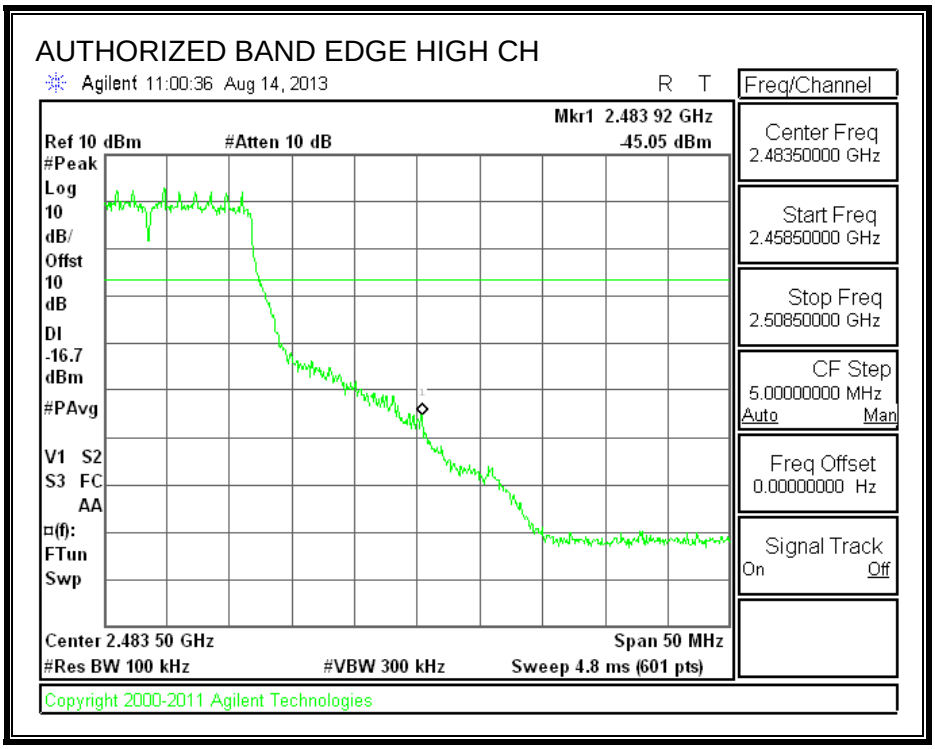
LOW CHANNEL BANDEDGE



HIGH CHANNEL BANDEDGE



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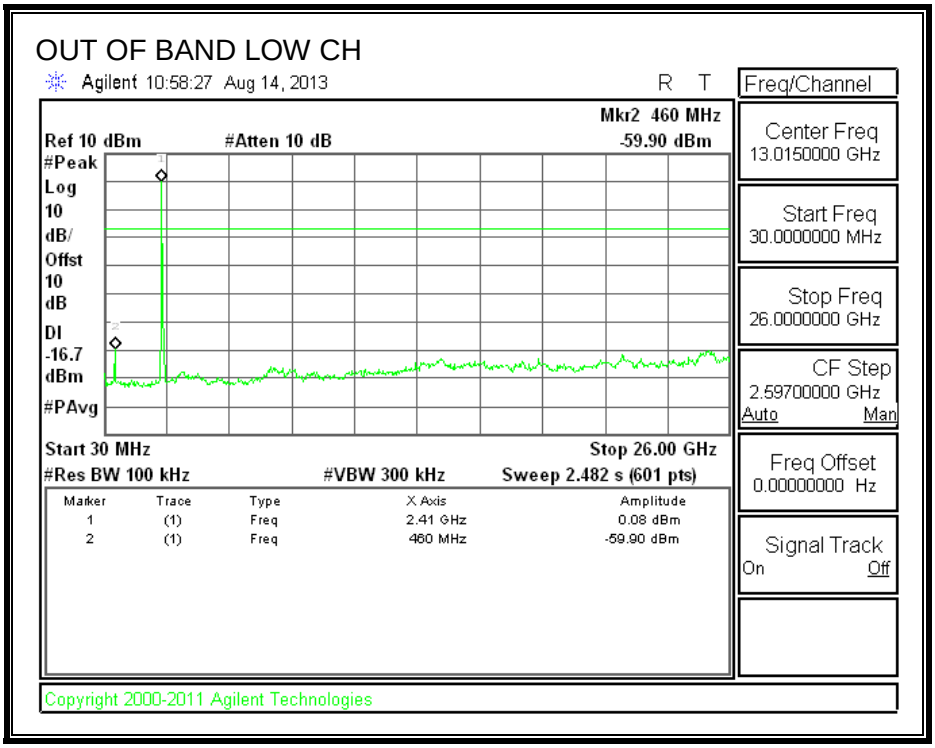
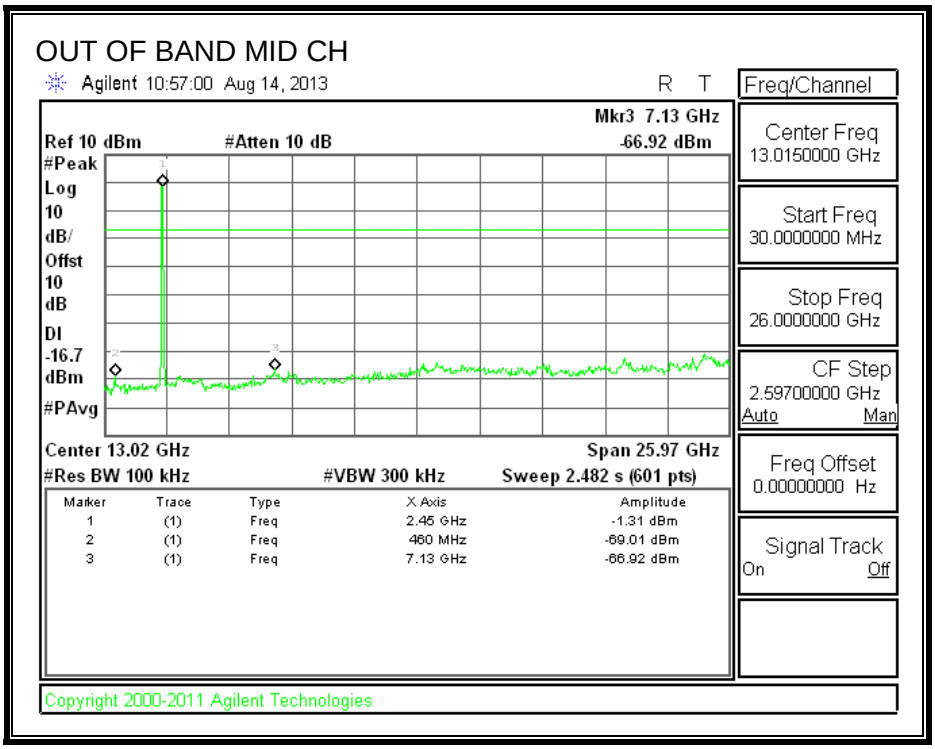
OUT-OF-BAND EMISSIONS (SPURIOUS)





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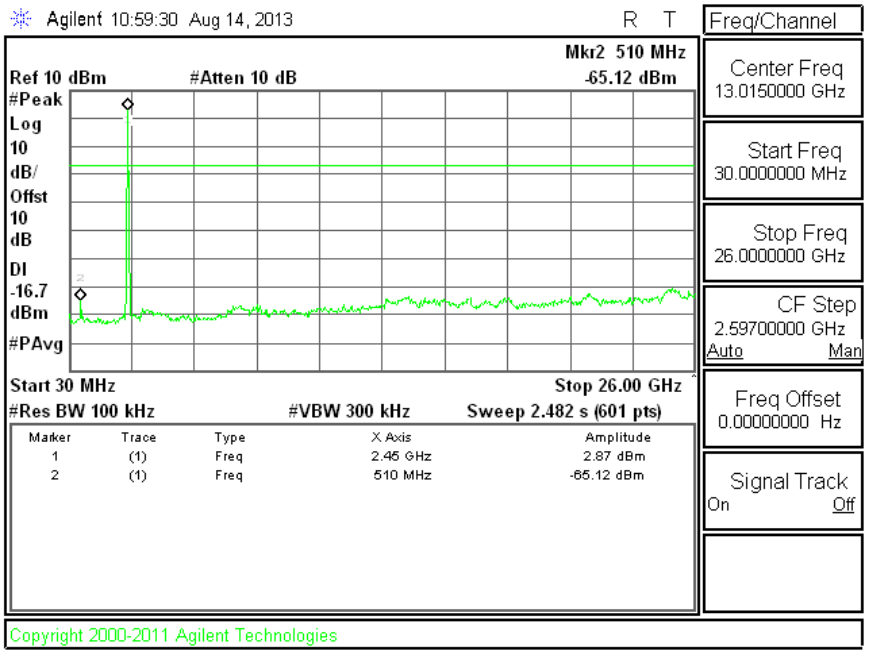
OUT OF BAND HIGH CH



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8.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

8.3.1. 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 DTS Meas Guidance 8.0: The transmitter output is connected to a spectrum analyzer with the RBW set to 100KHz, the VBW >= 3 x RBW, peak detector and max hold.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.675	0.5
Mid	2437	17.675	0.5
High	2462	17.650	0.5

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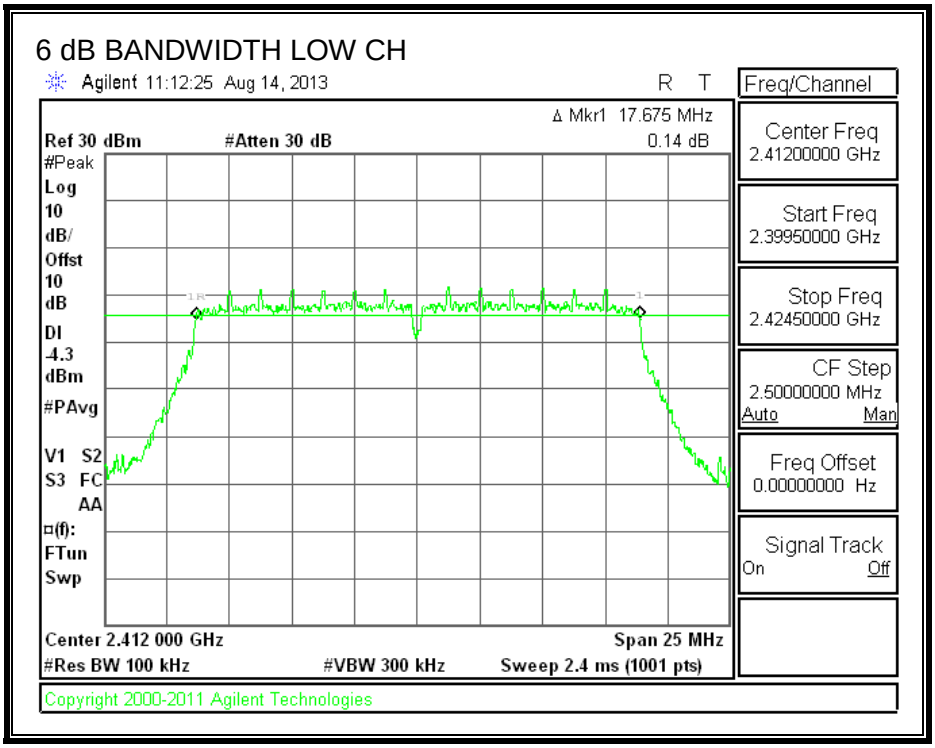
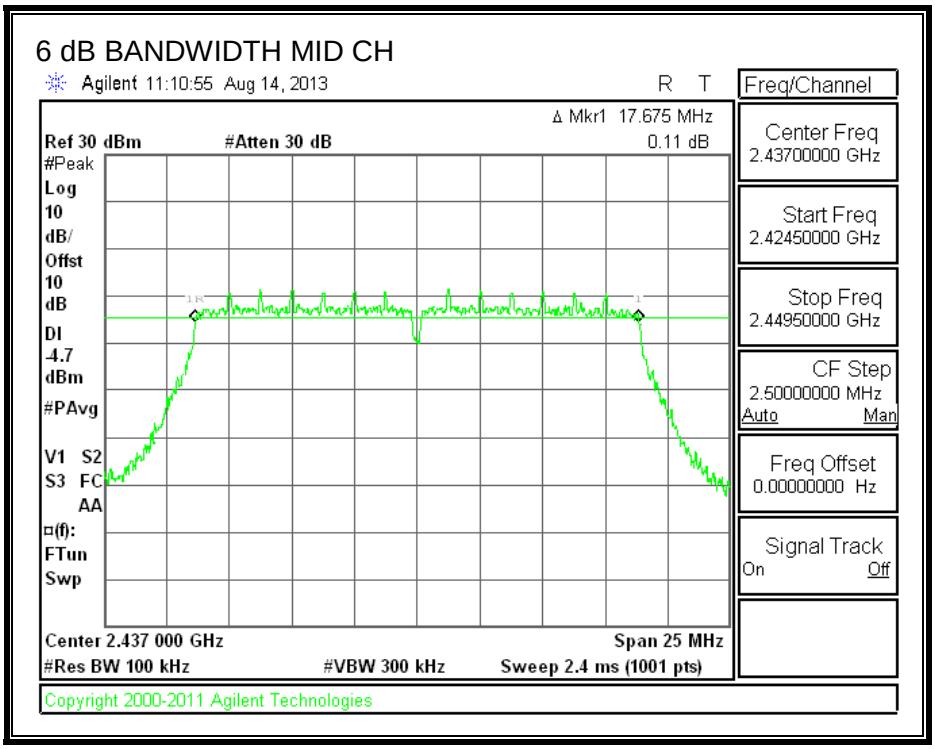
6 dB BANDWIDTH





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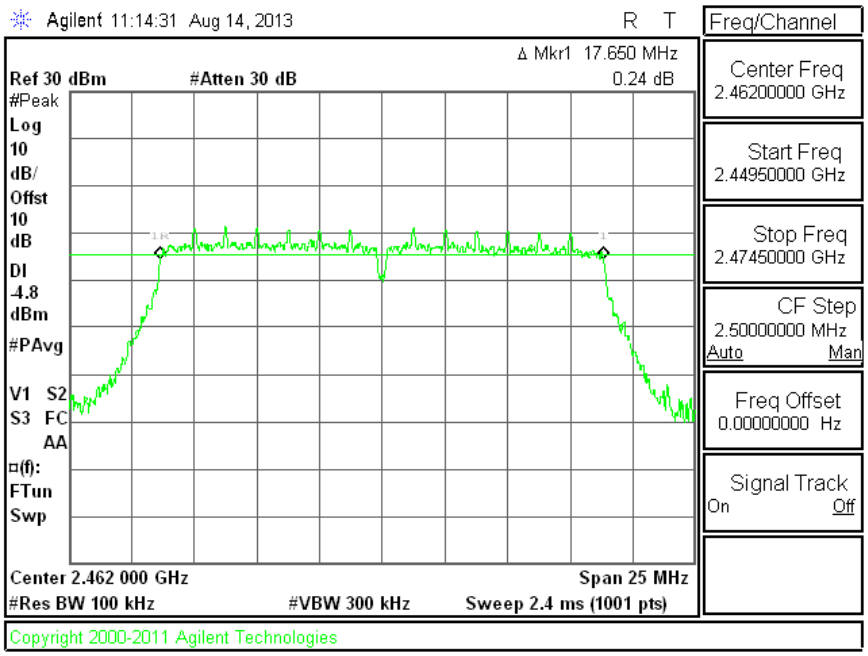
6 dB BANDWIDTH HIGH CH



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

8.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.7097
Mid	2437	17.7470
High	2462	17.7483

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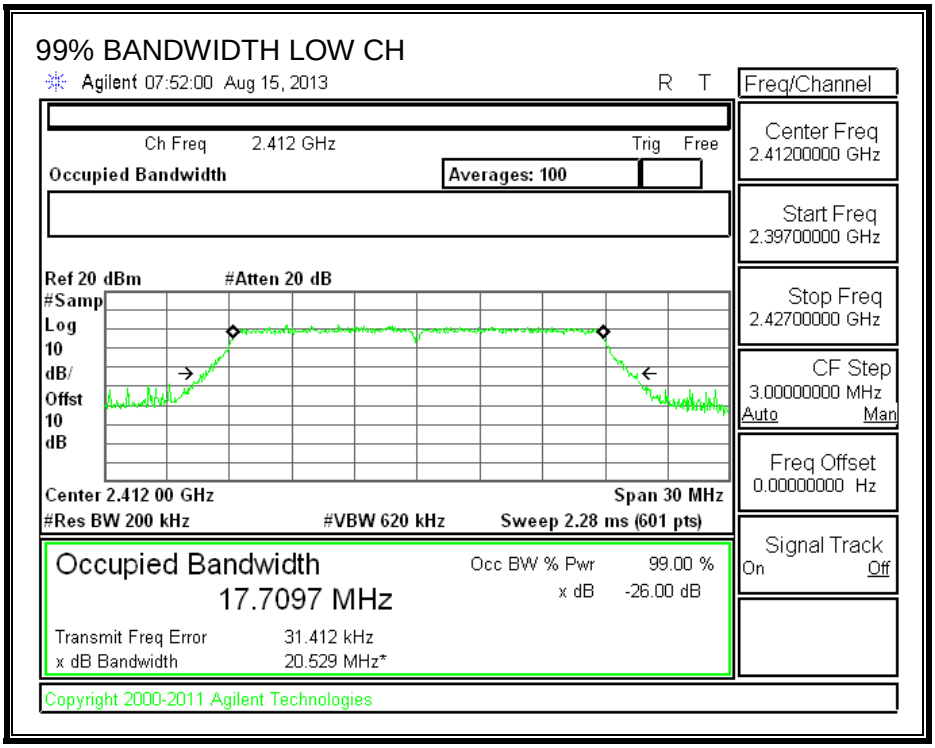
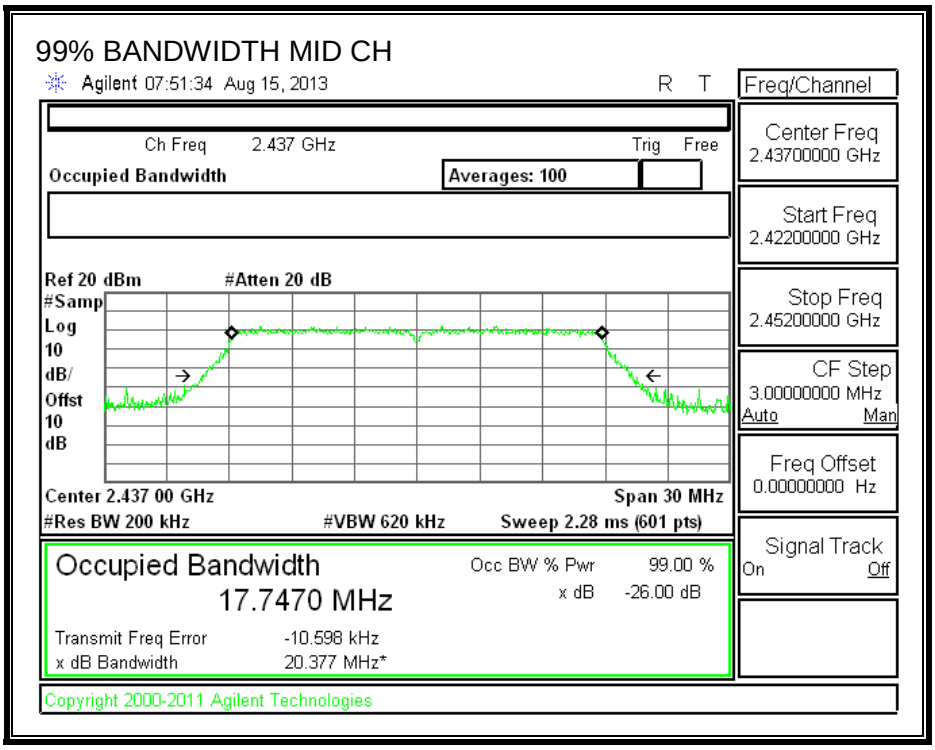
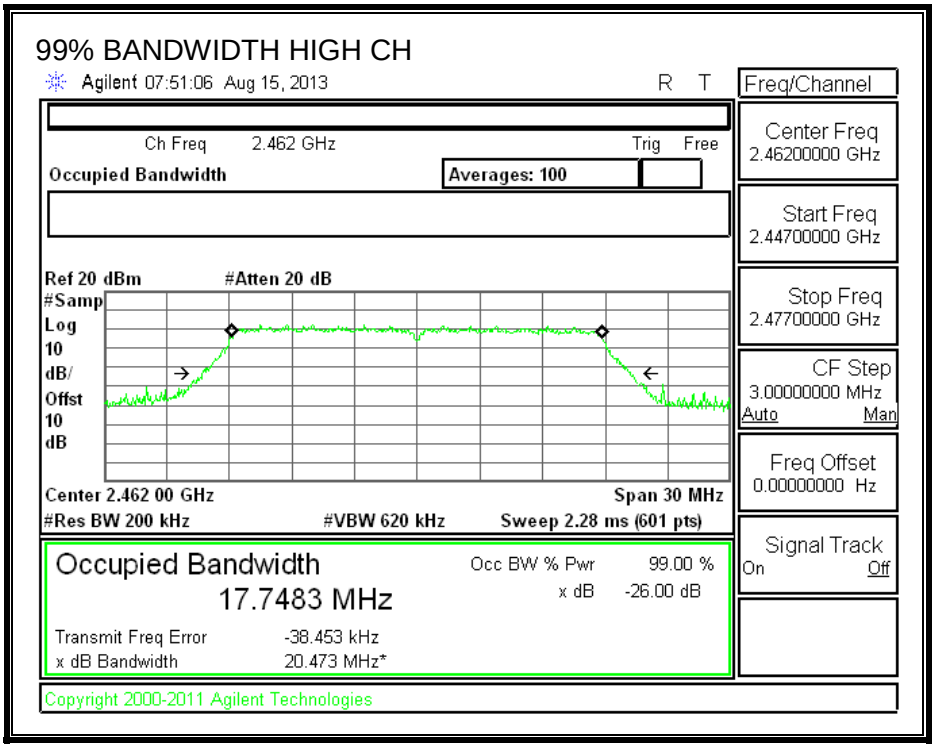
99% BANDWIDTH





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



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8.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Reference to KDB 558074 DTS Meas Guidance 9.2.3: The transmitter output is connected to a power meter.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	12.40
Mid	2437	12.40
High	2462	11.50

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8.3.4. 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.

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

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-1.10	30.00	30	36	30.00
Mid	2437	-1.33	30.00	30	36	30.00
High	2462	-1.21	30.00	30	36	30.00

Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2412	20.53	20.53	30.00	-9.47
Mid	2437	20.18	20.18	30.00	-9.82
High	2462	19.74	19.74	30.00	-10.26

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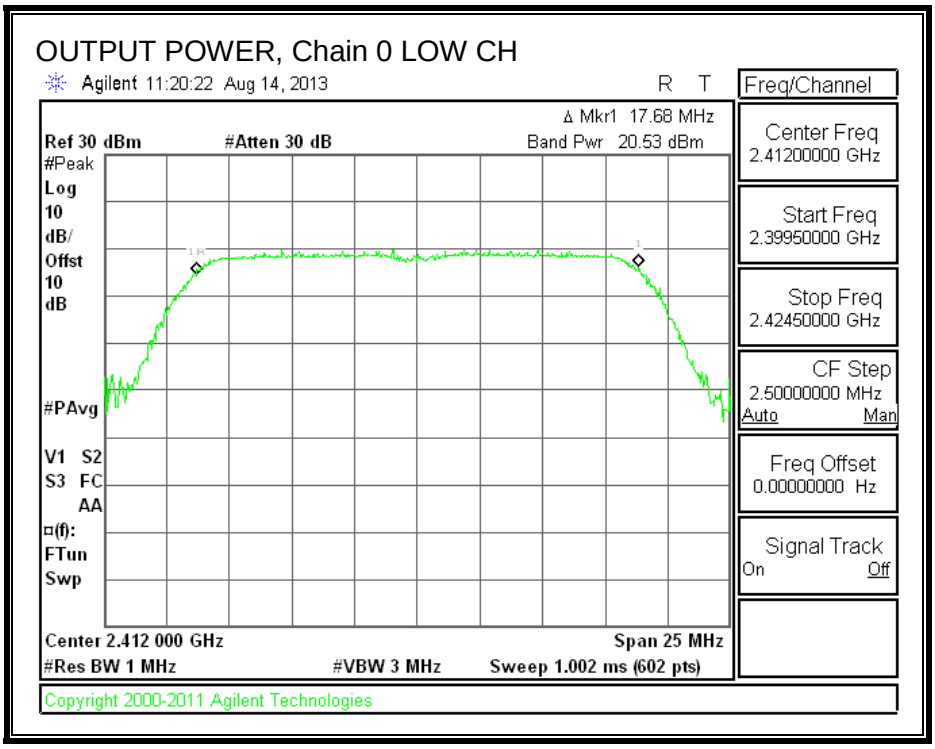
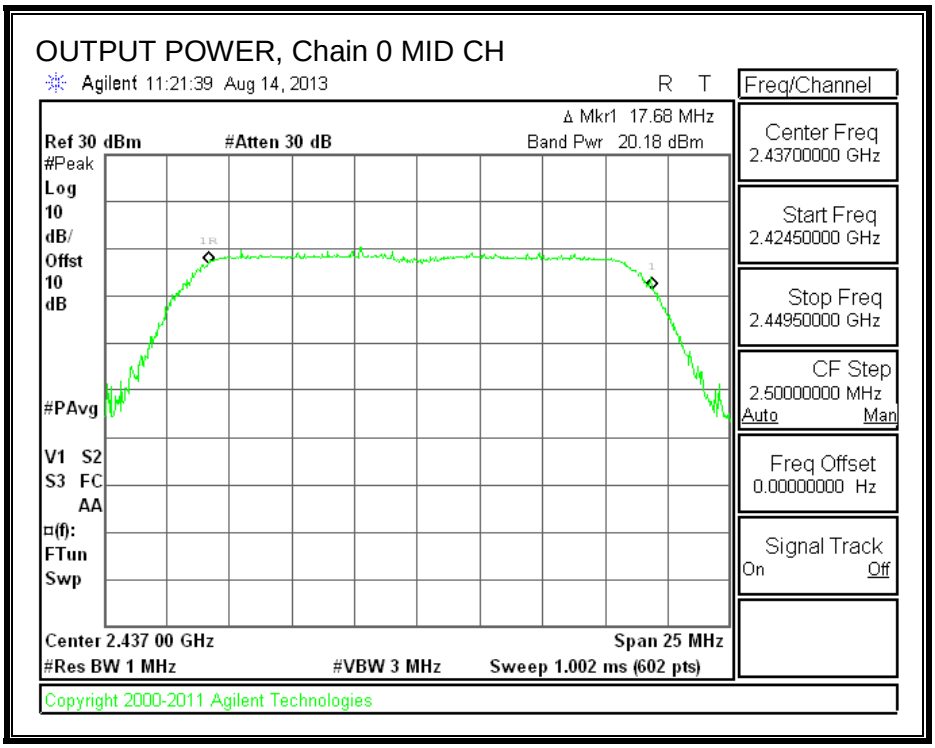
OUTPUT POWER, Chain 0





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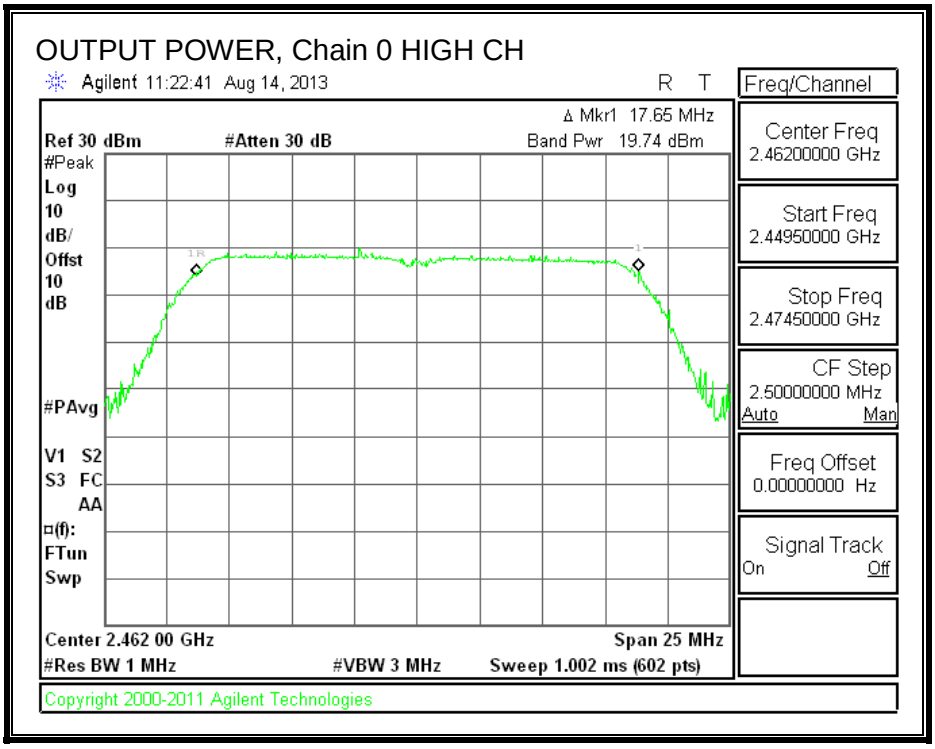

This report shall not be reproduced except in full, without the written approval of UL CCS.

8.3.5. 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

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-12.47	8.0	-20.5
Mid	2437	-12.98	8.0	-21.0
High	2462	-12.87	8.0	-20.9

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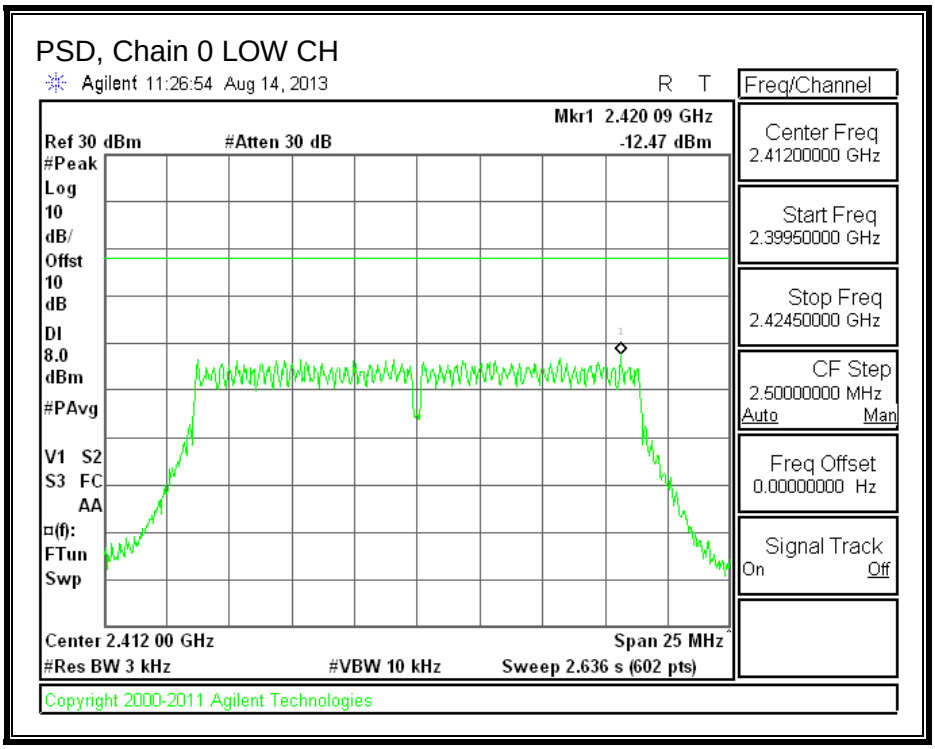
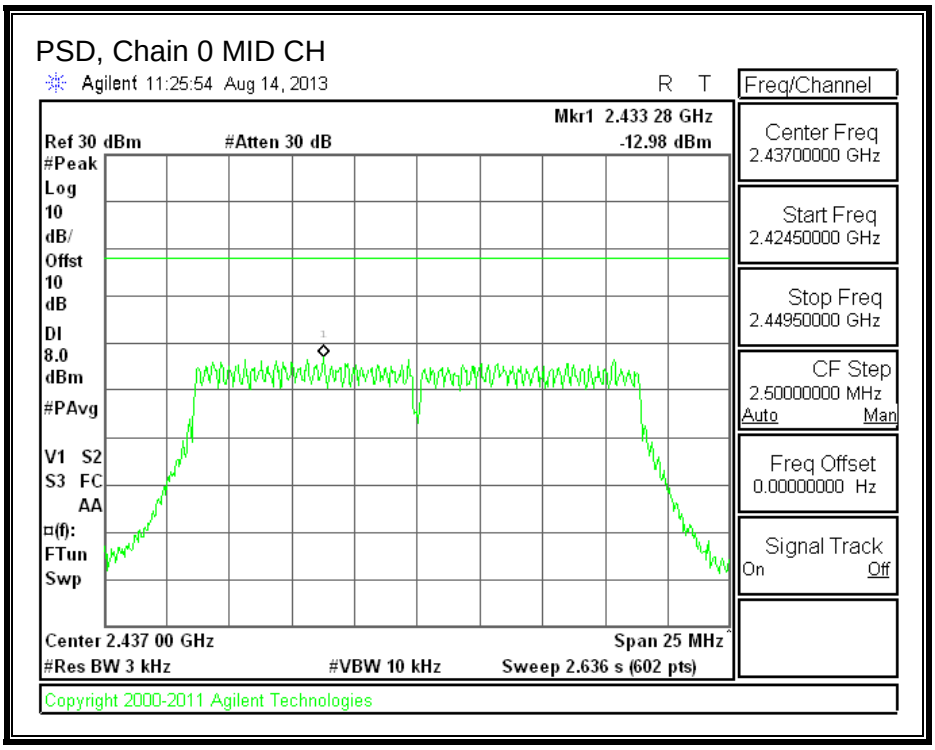
PSD, Chain 0





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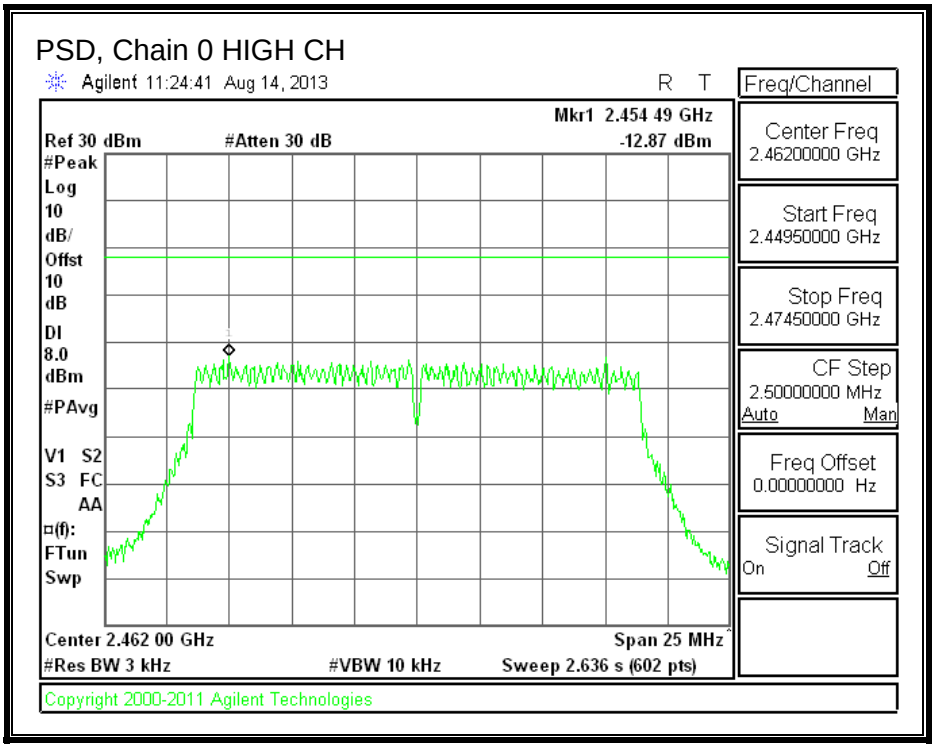

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8.3.6. OUT-OF-BAND EMISSIONS

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.

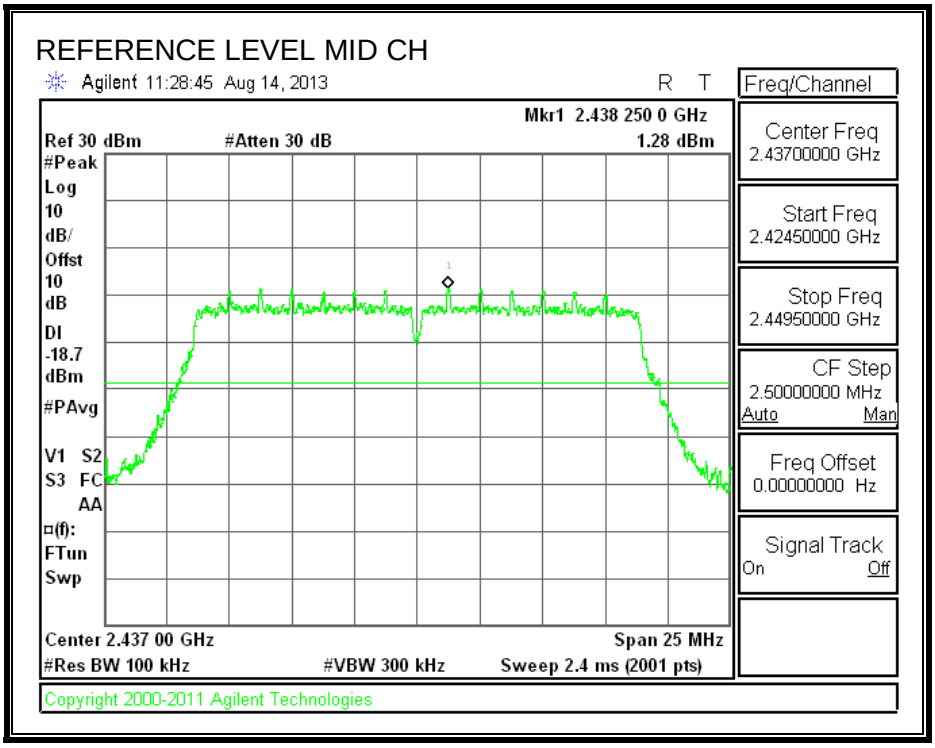
TEST PROCEDURE

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.

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

RESULTS

IN-BAND REFERENCE LEVEL



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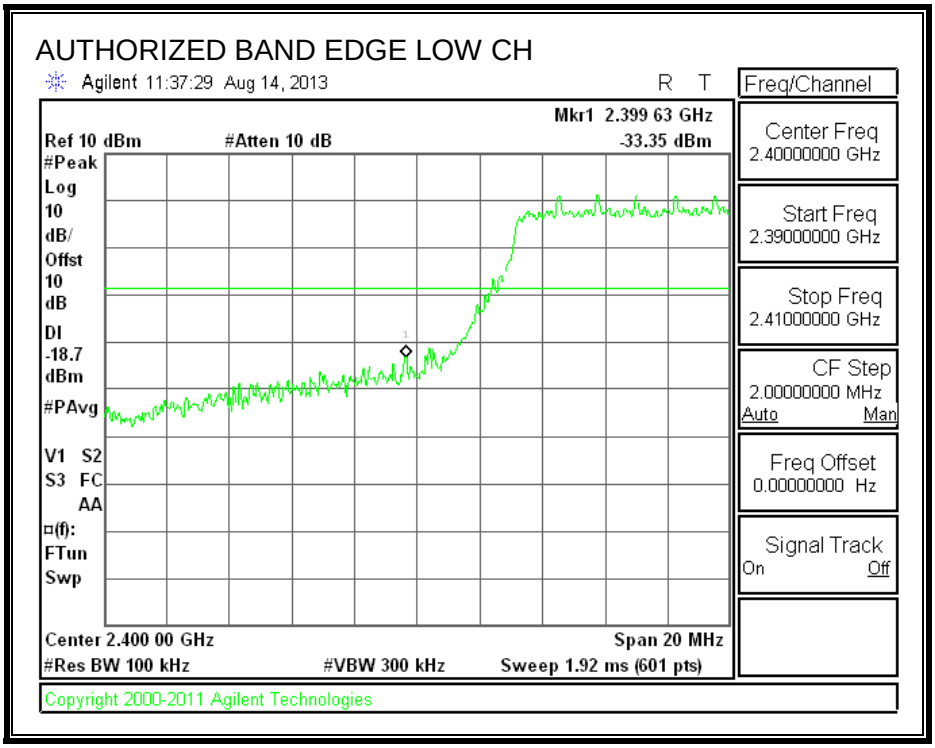
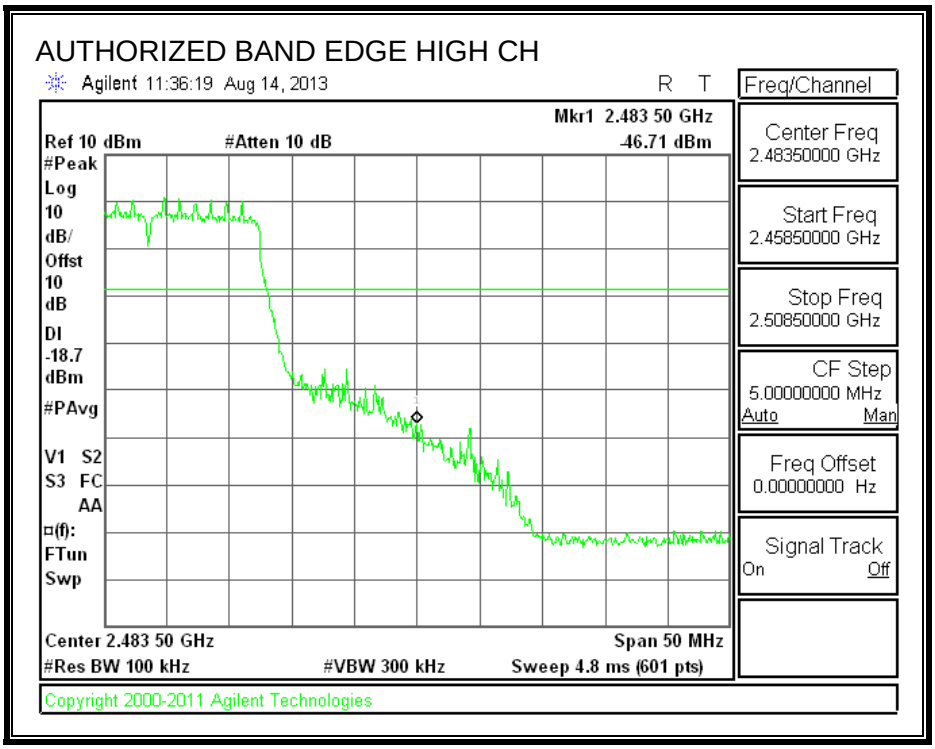
LOW CHANNEL BANDEDGE



HIGH CHANNEL BANDEDGE



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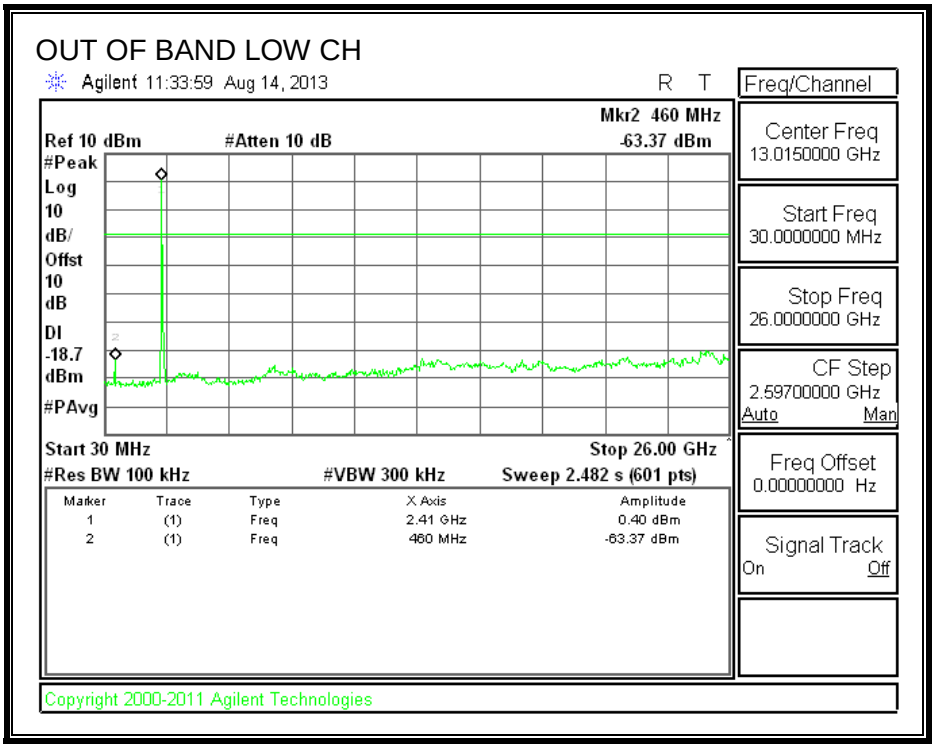
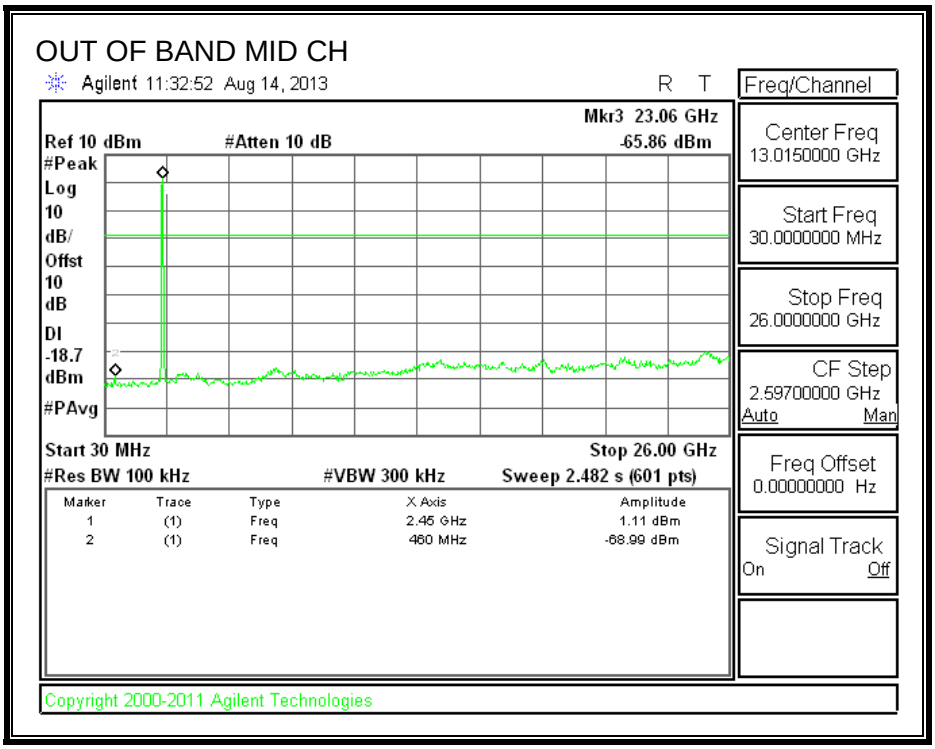
OUT-OF-BAND EMISSIONS (SPURIOUS)





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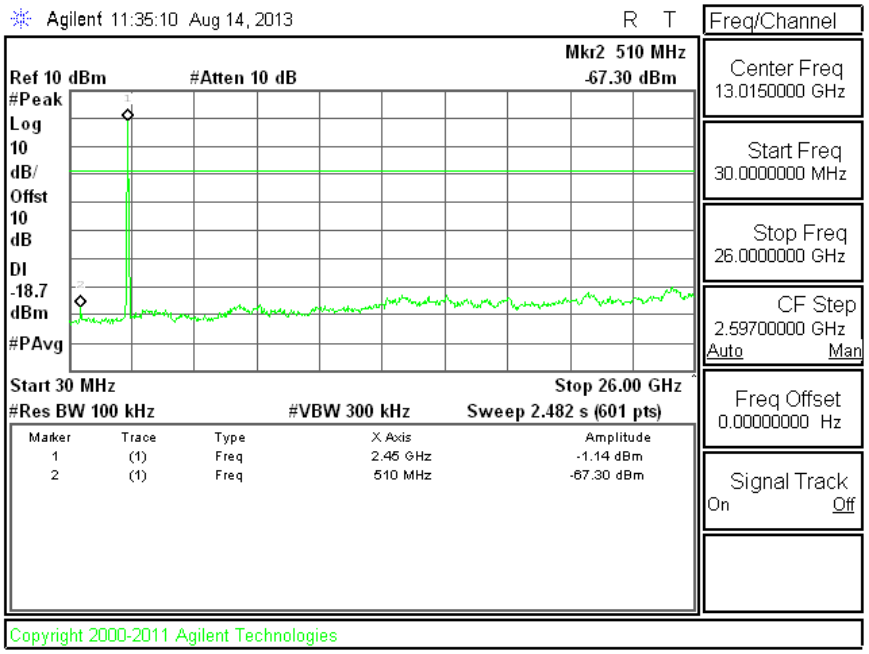
OUT OF BAND HIGH CH



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9. RADIATED TEST RESULTS

9.1. 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 DCF= 10 log (1/ 0.988) = 0.05dB; G mode DCF = 10 log(1/0.931) =0.3dB; N mode DCF = 10 log(1/0.929) = 0.32dB

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 1 MHz for peak measurements and as applicable for average measurements.

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

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

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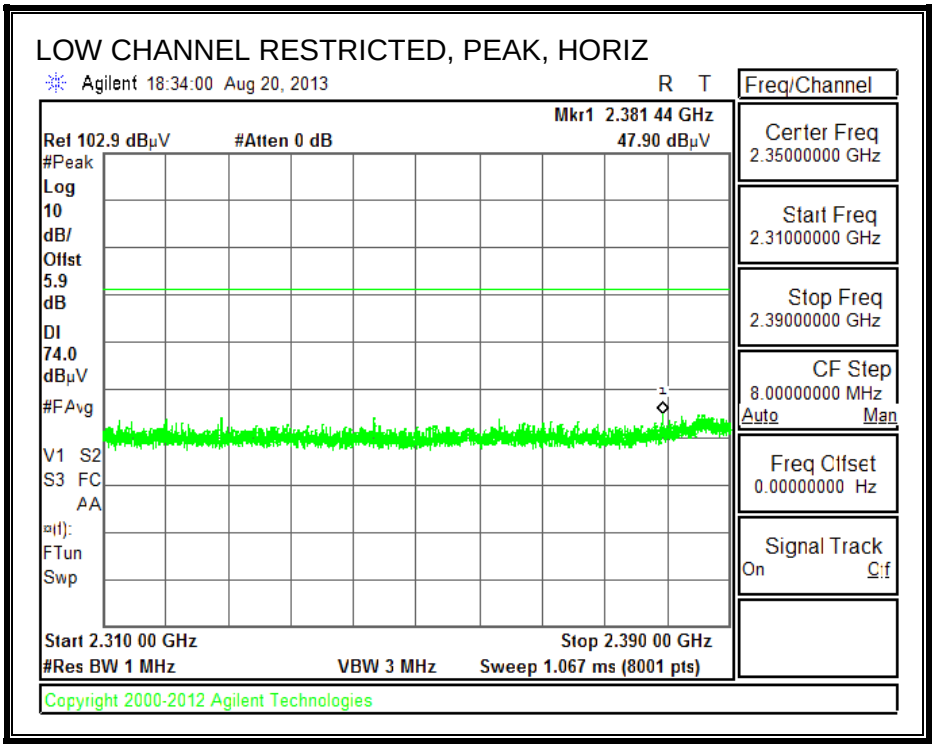
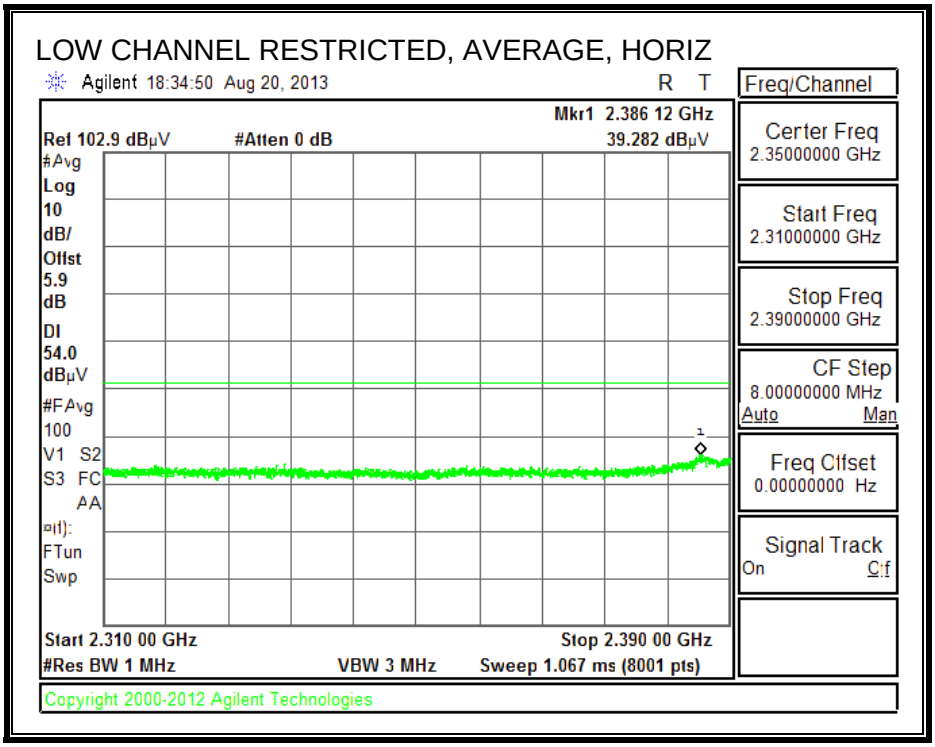
9.2. TRANSMITTER ABOVE 1 GHz

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





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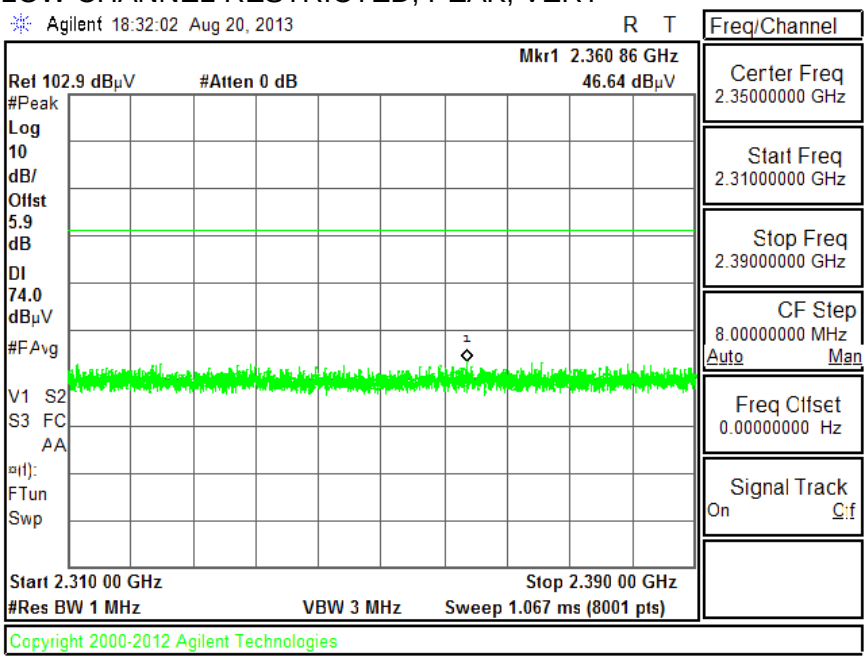
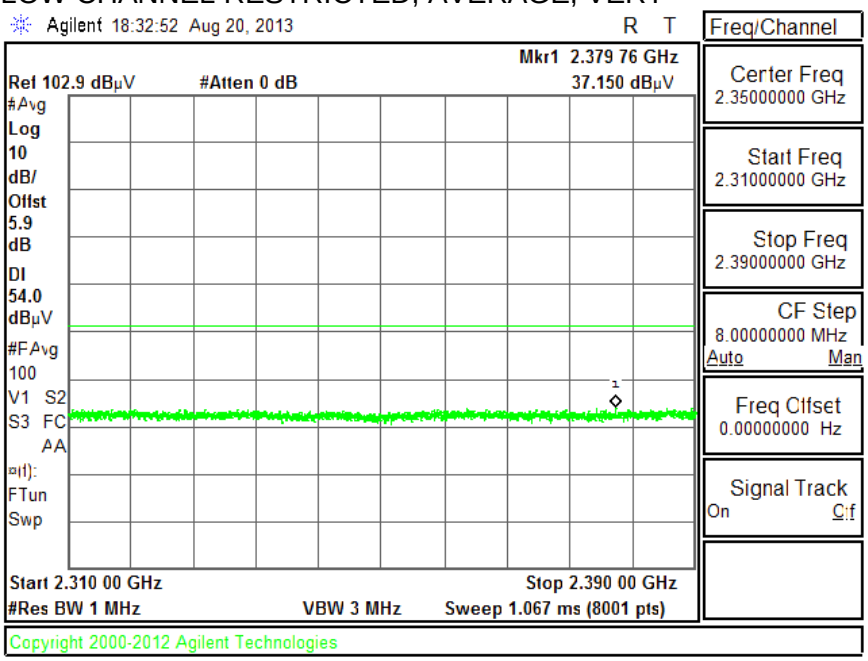
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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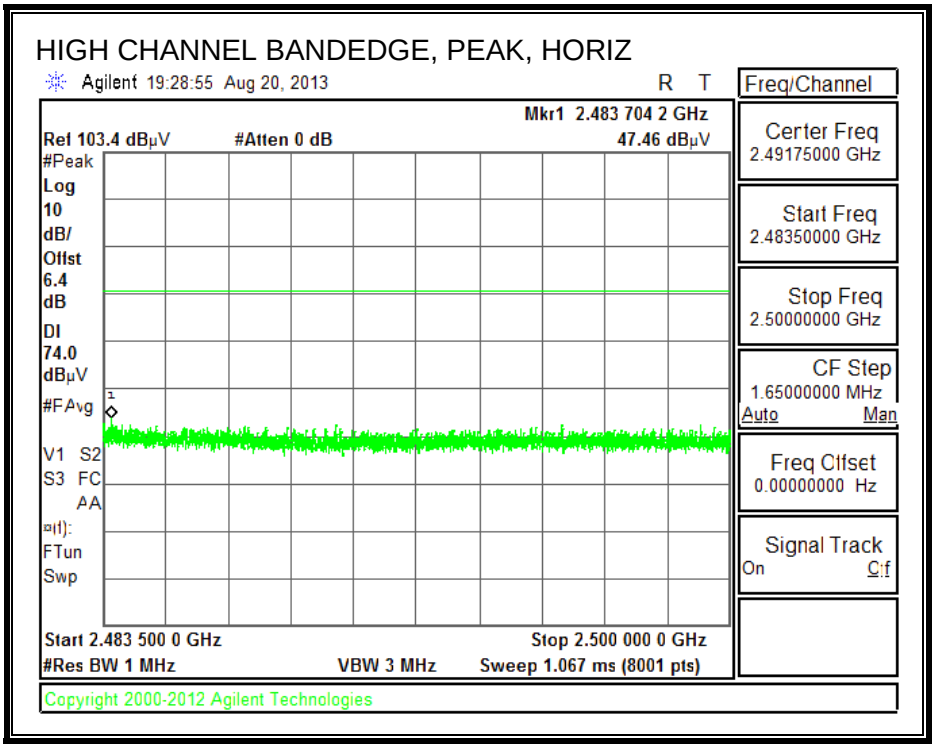
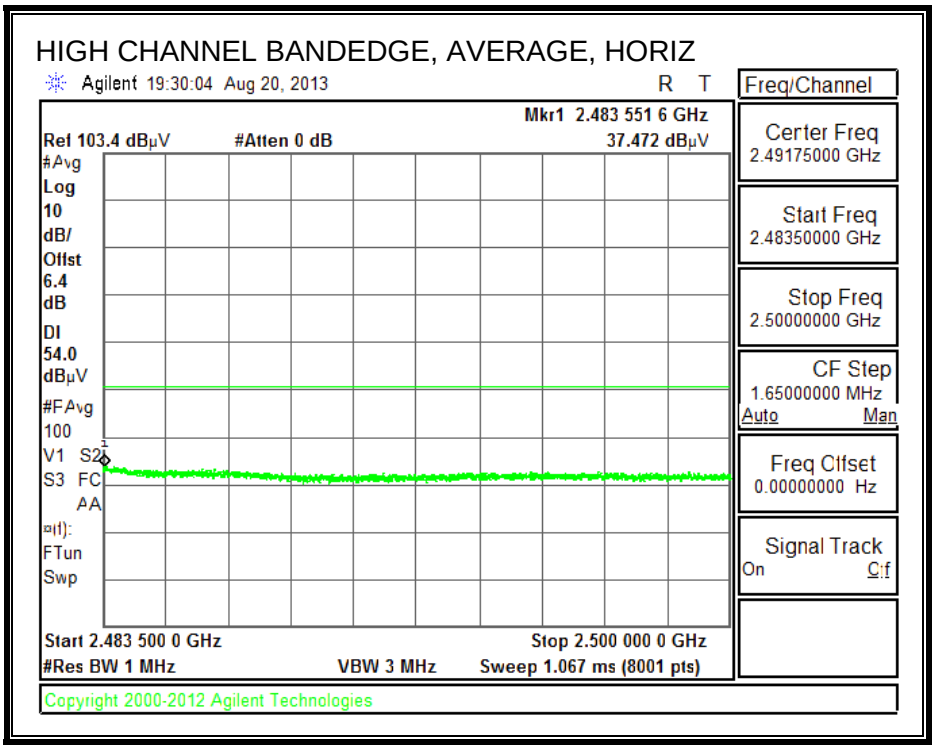
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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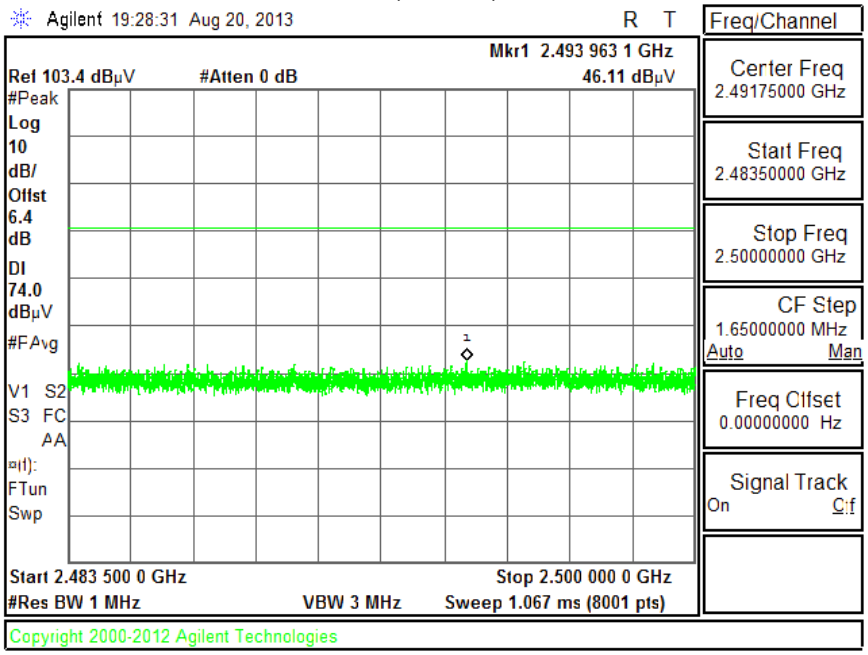
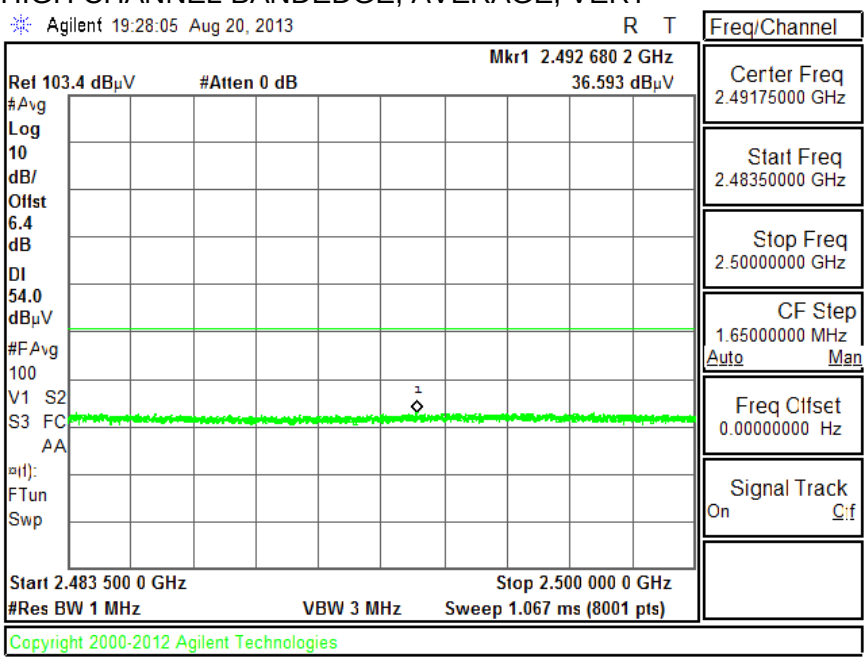
HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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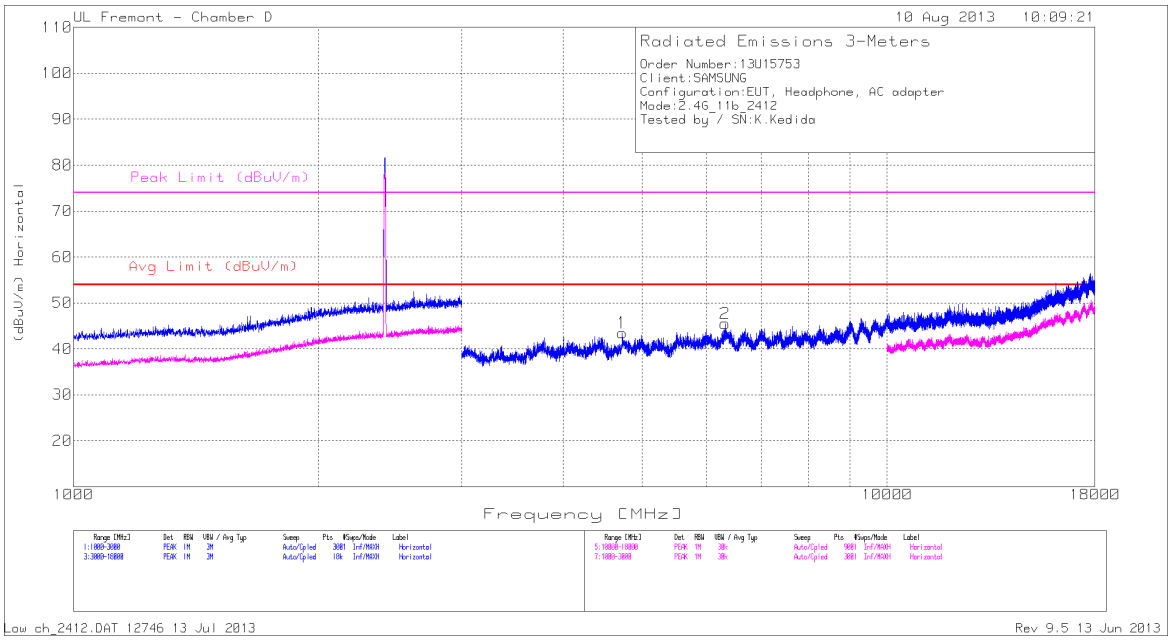
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL
HORIZONTAL



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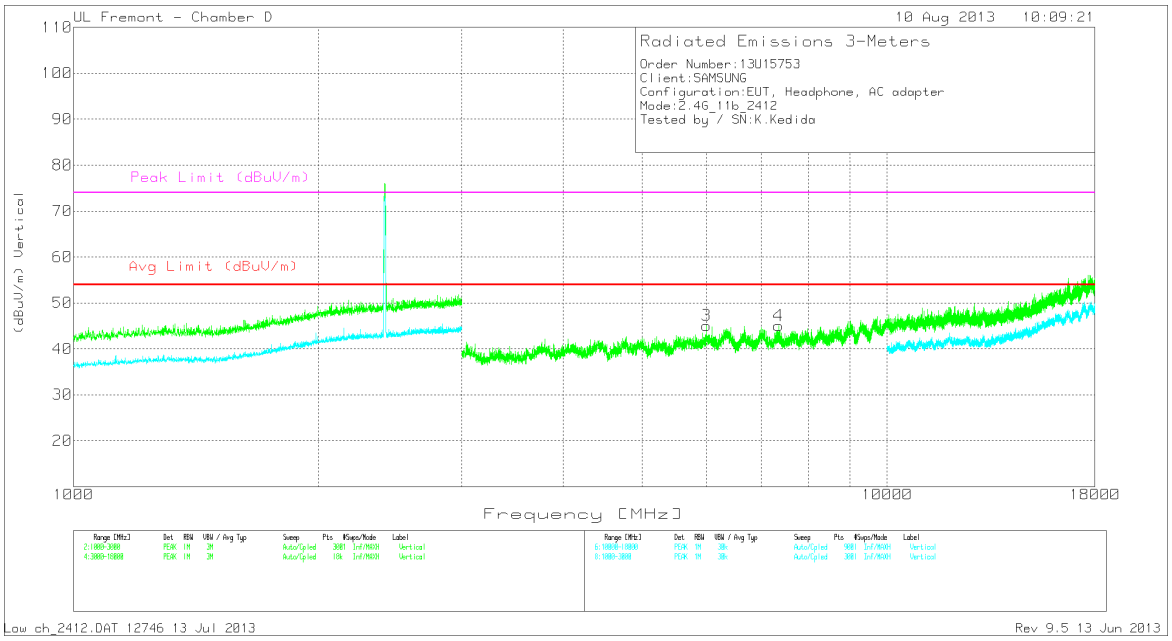
VERTICAL



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LOW CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T344 Ant Factor [dB/m]	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	4.727	40.18	PK	34.4	-31.1	43.48	53.97	-10.49	74	-30.52	201	H
2	6.323	39.02	PK	35.9	-29.4	45.52	53.97	-8.45	74	-28.48	100	H
3	5.997	39.4	PK	35.7	-30	45.1	53.97	-8.87	74	-28.9	300	V
4	7.356	37.45	PK	35.9	-28.3	45.05	53.97	-8.92	74	-28.95	401	V

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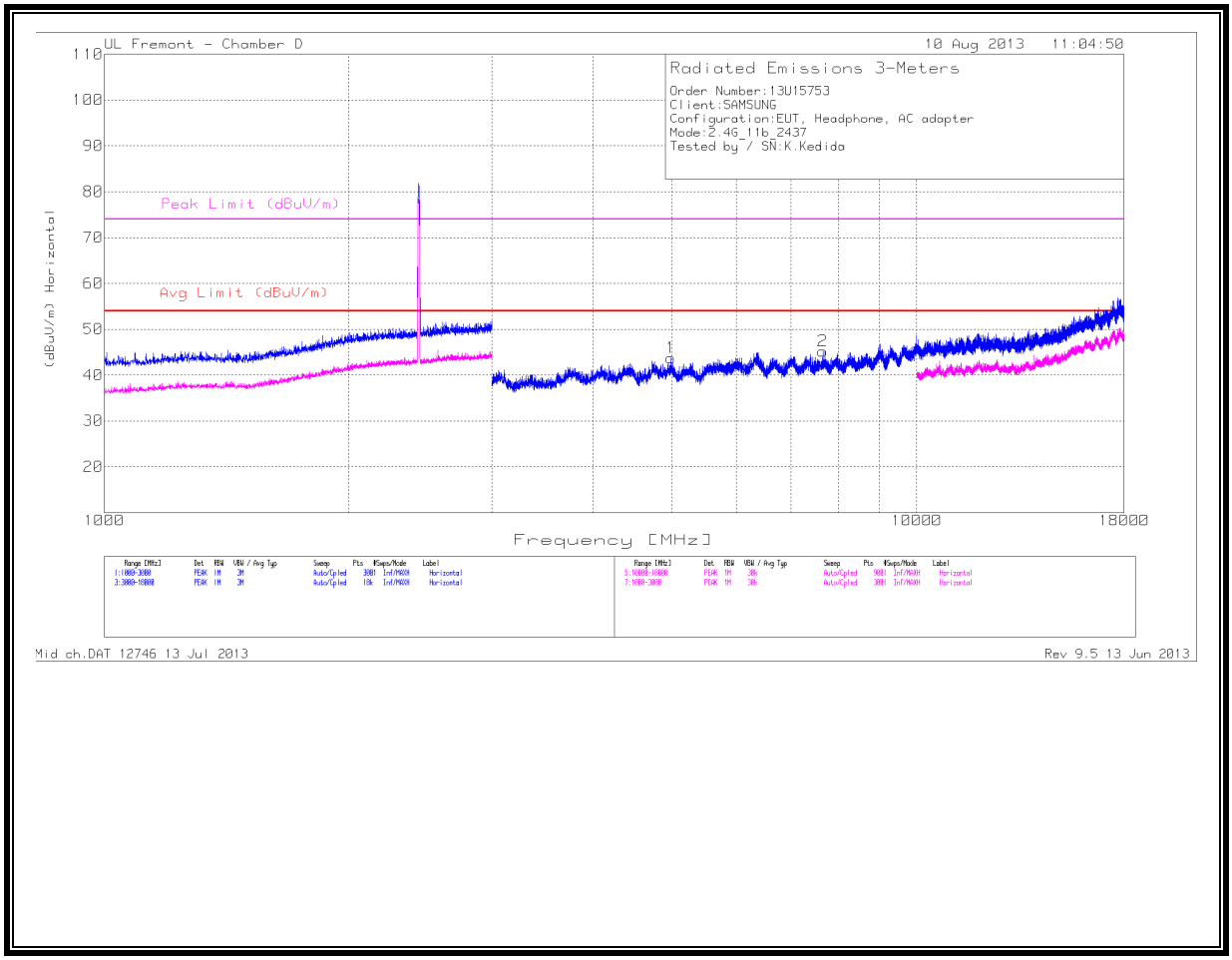
MID CHANNEL
HORIZONTAL



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47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
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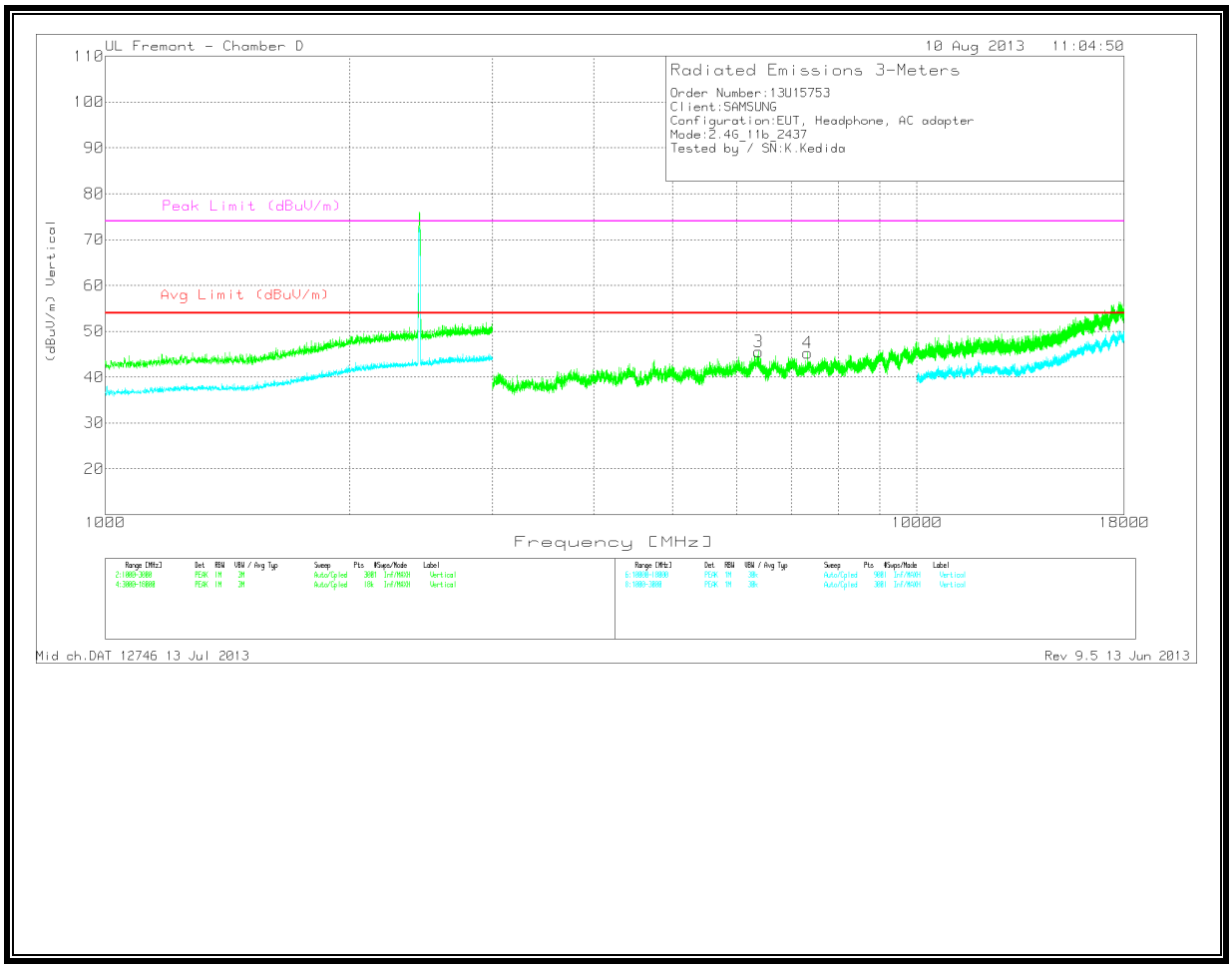
VERTICAL



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MID CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T344 Ant Factor [dB/m]	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	4.983	40.68	PK	34.3	-31.2	43.78	53.97	-10.19	74	-30.22	100	H
2	7.664	37.23	PK	36	-28	45.23	53.97	-8.74	74	-28.77	100	H
3	6.38	38.63	PK	35.9	-29	45.53	53.97	-8.44	74	-28.47	401	V
4	7.335	37.68	PK	35.9	-28.3	45.28	53.97	-8.69	74	-28.72	200	V

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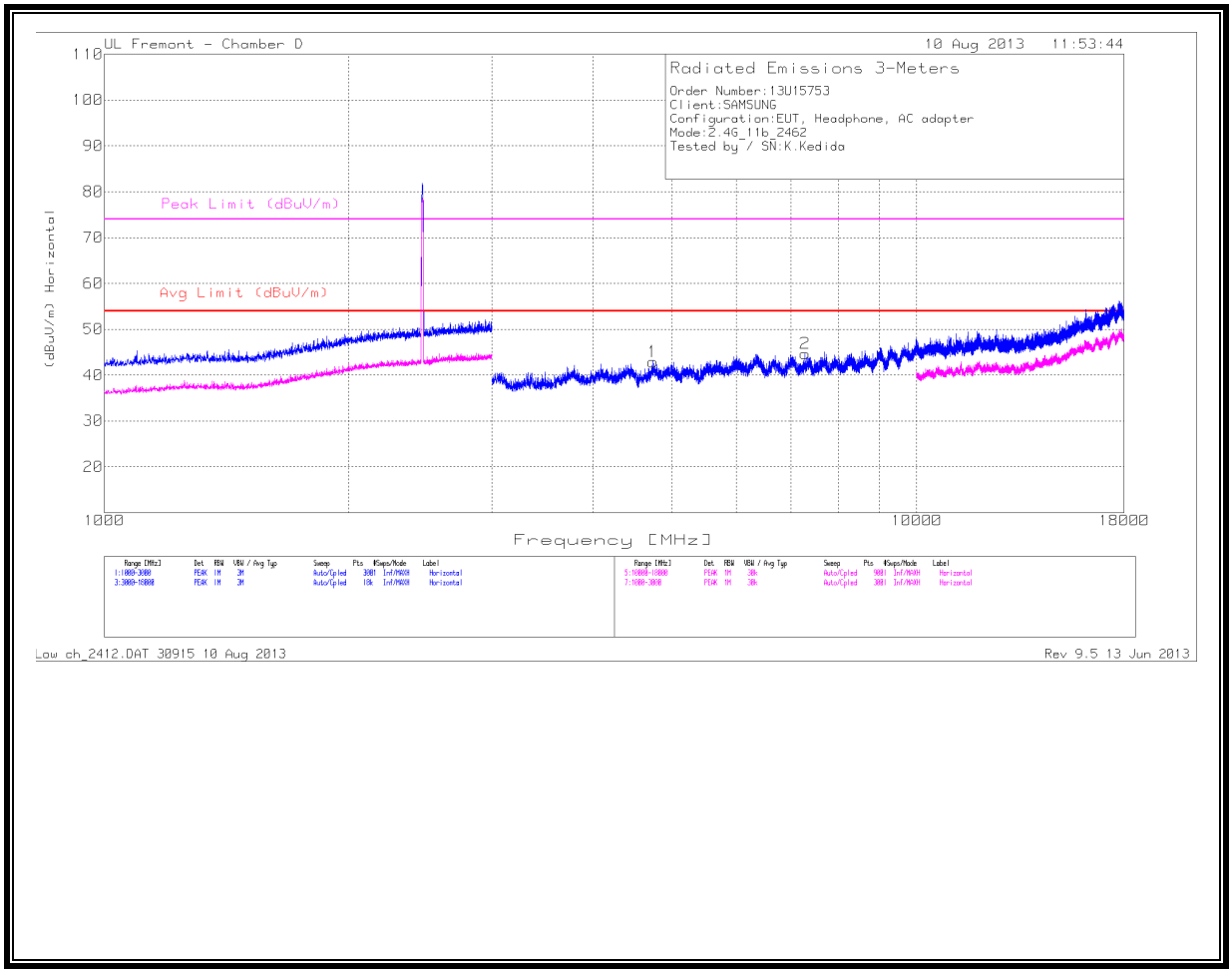
HIGH CHANNEL
HORIZONTAL



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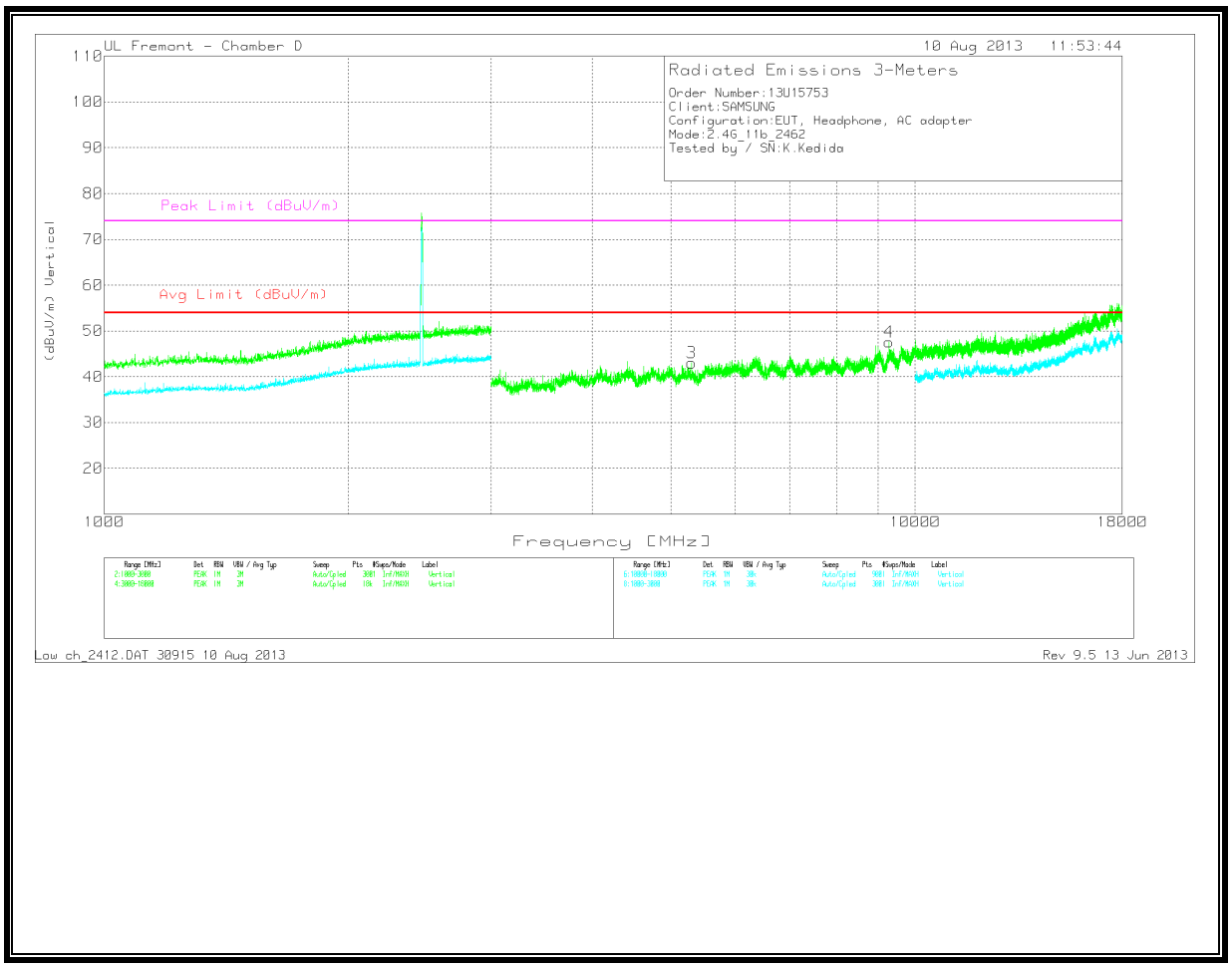
VERTICAL



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HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T344 Ant Factor [dB/m]	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	4.734	39.58	PK	34.4	-31.1	42.88	53.97	-11.09	74	-31.12	100	H
2	7.289	37.79	PK	35.9	-29	44.69	53.97	-9.28	74	-29.31	201	H
3	5.302	39.23	PK	34.7	-30.9	43.03	53.97	-10.94	74	-30.97	201	V
4	9.285	36.08	PK	36.9	-25.4	47.58	53.97	-6.39	74	-26.42	401	V

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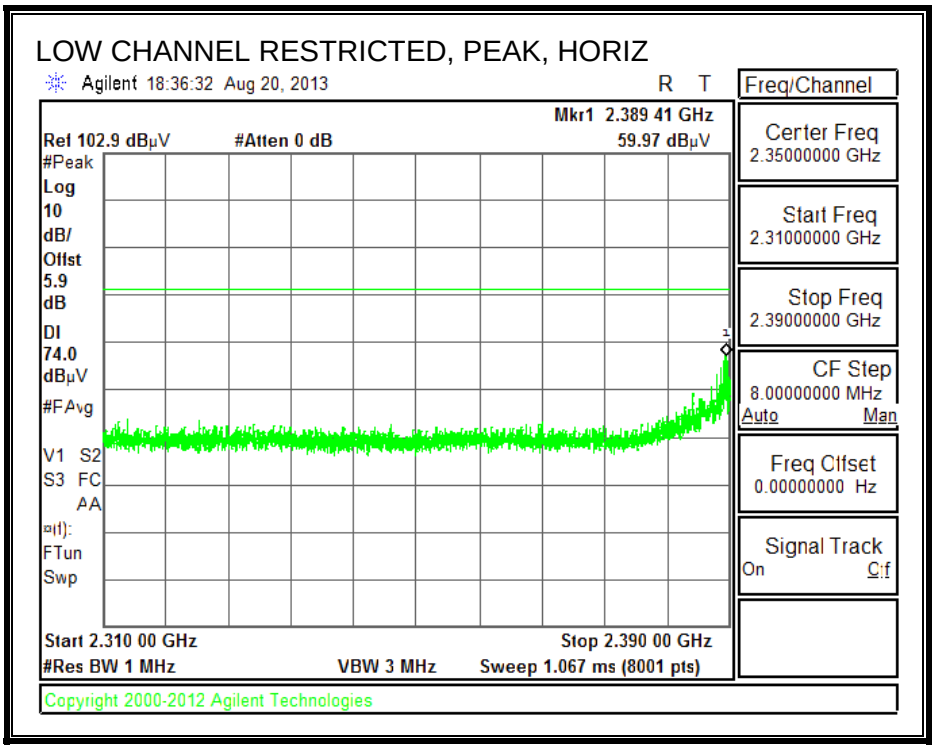
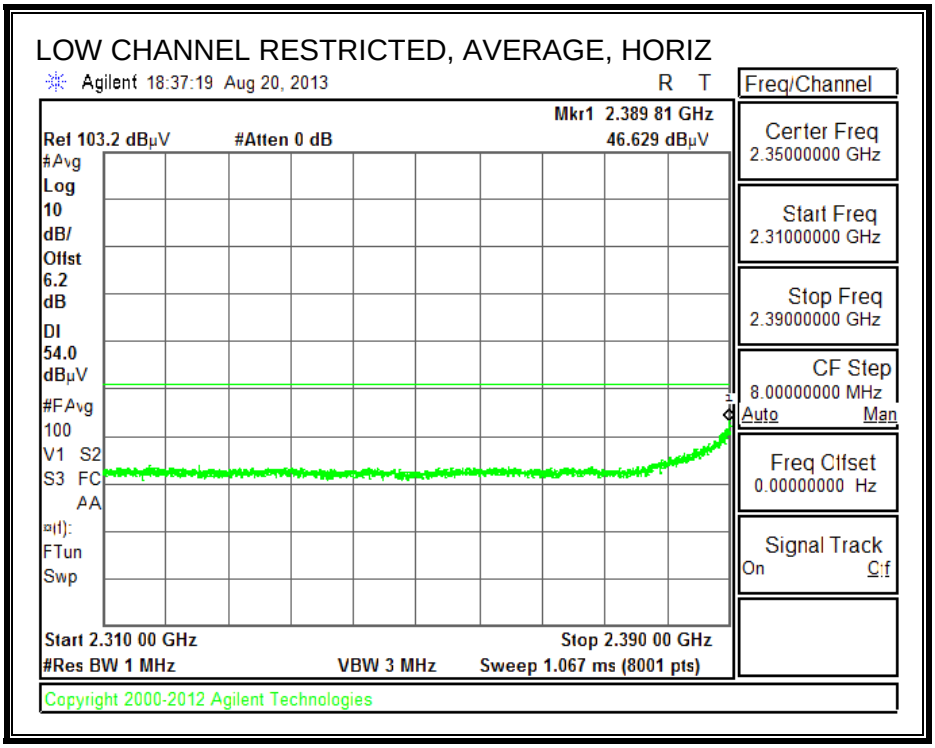
9.2.2. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL)





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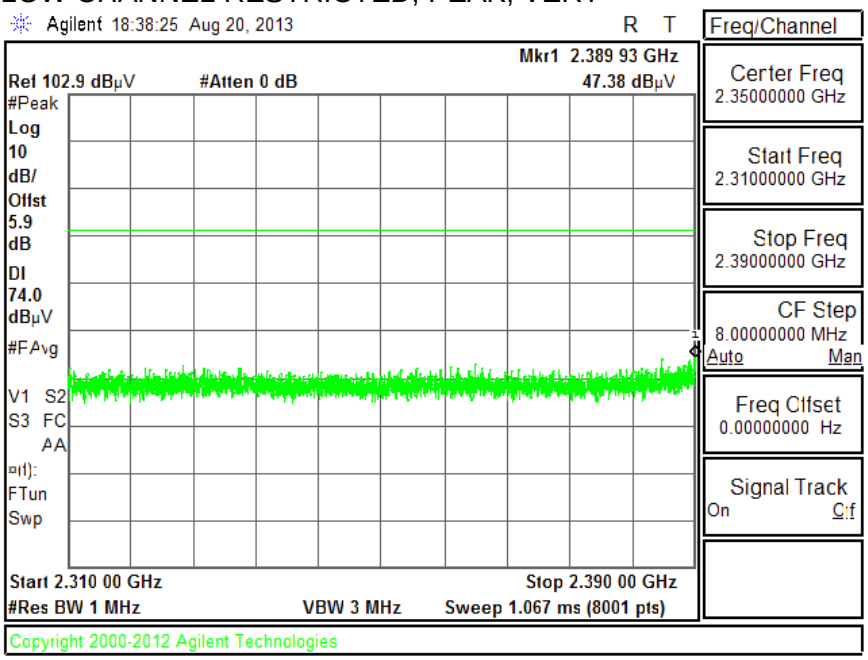
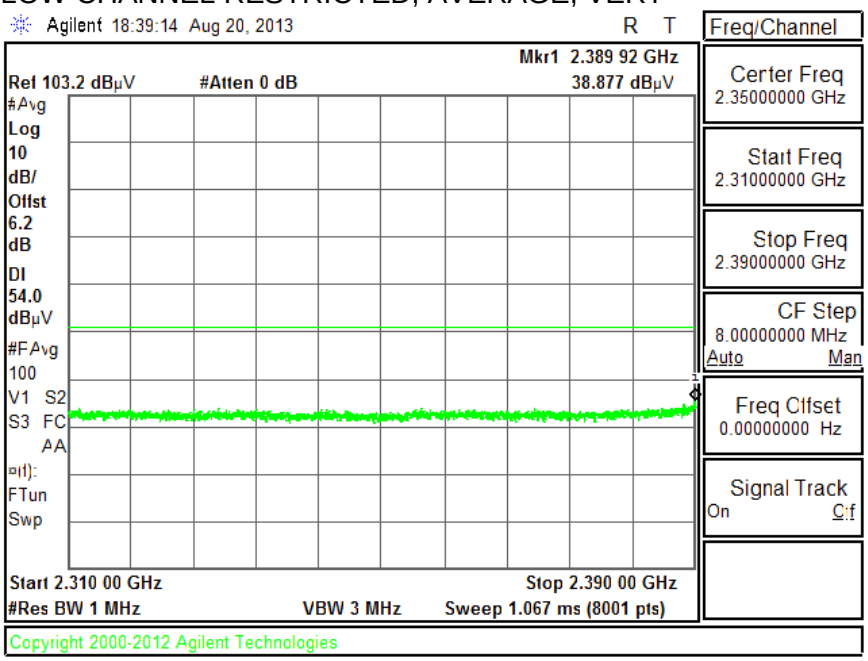
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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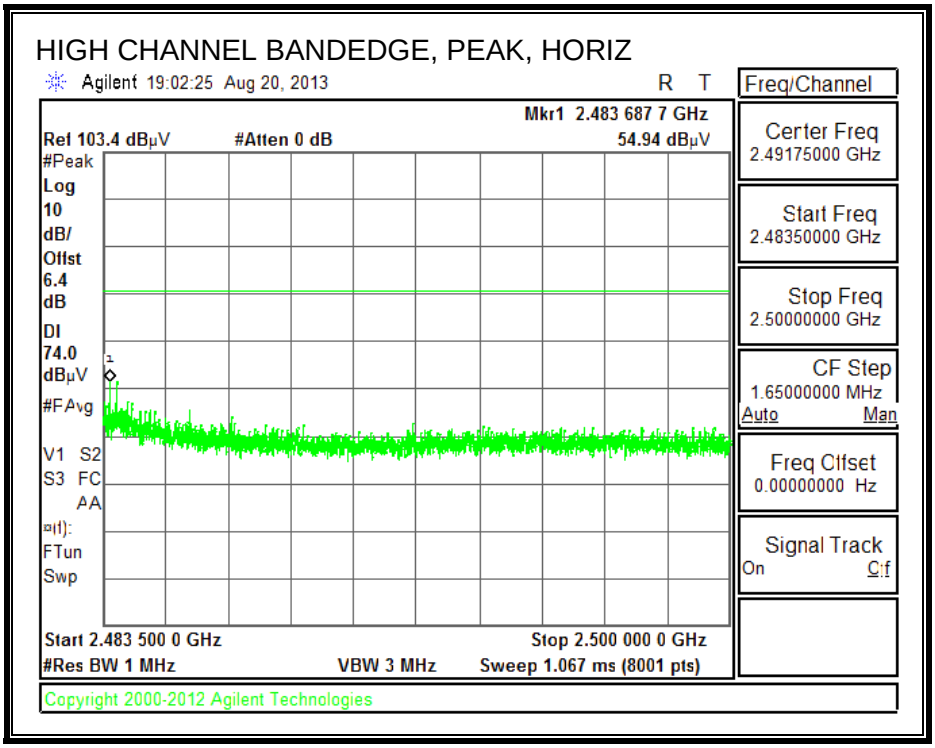
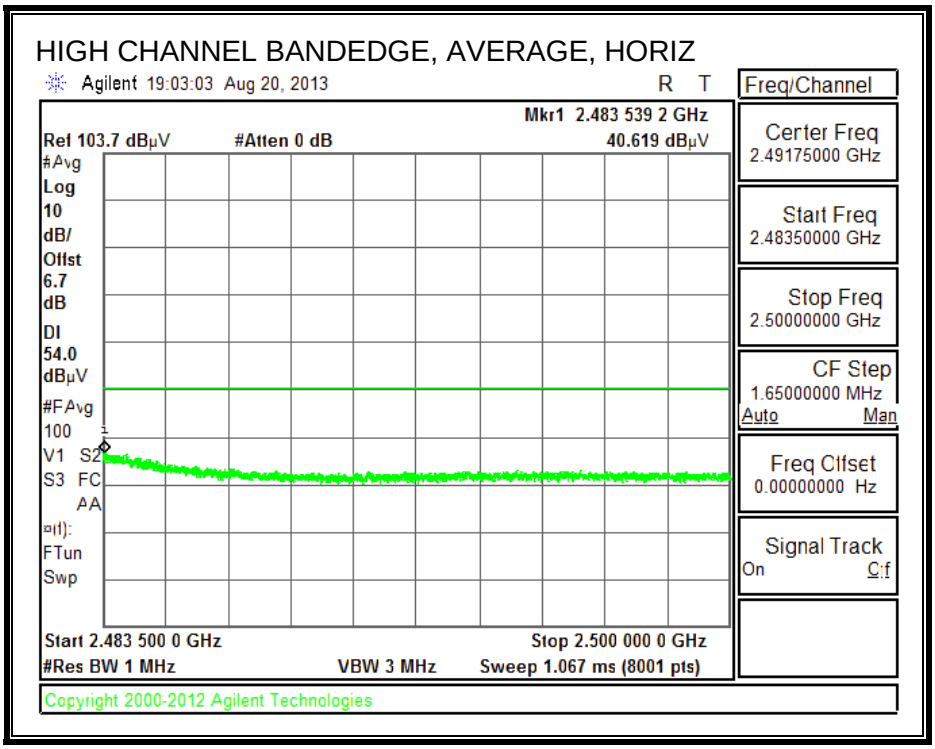
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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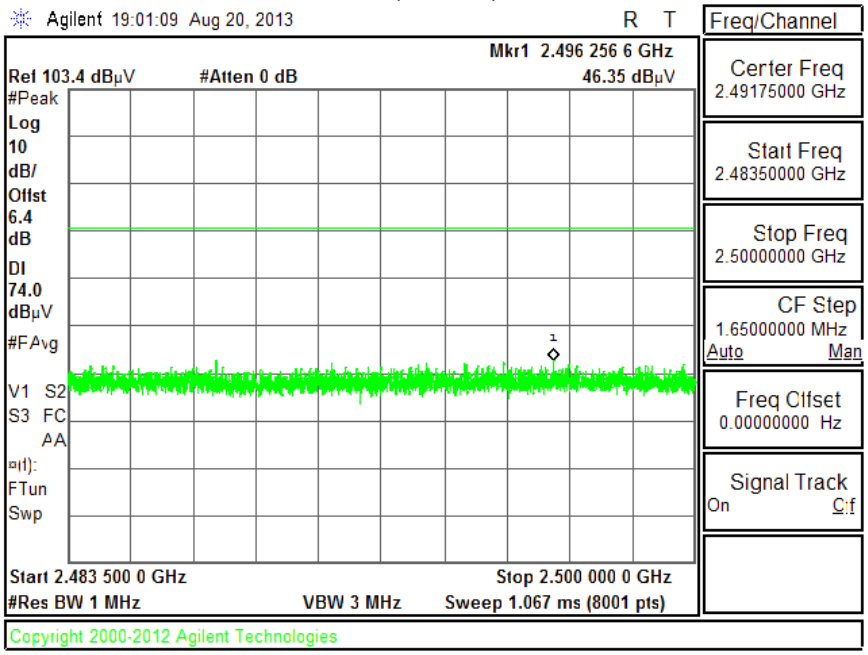
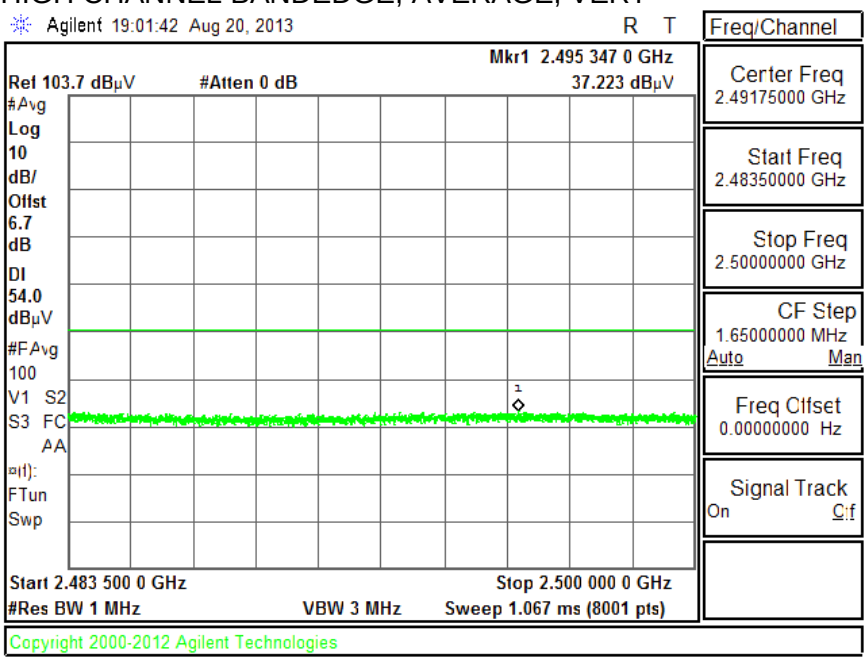
HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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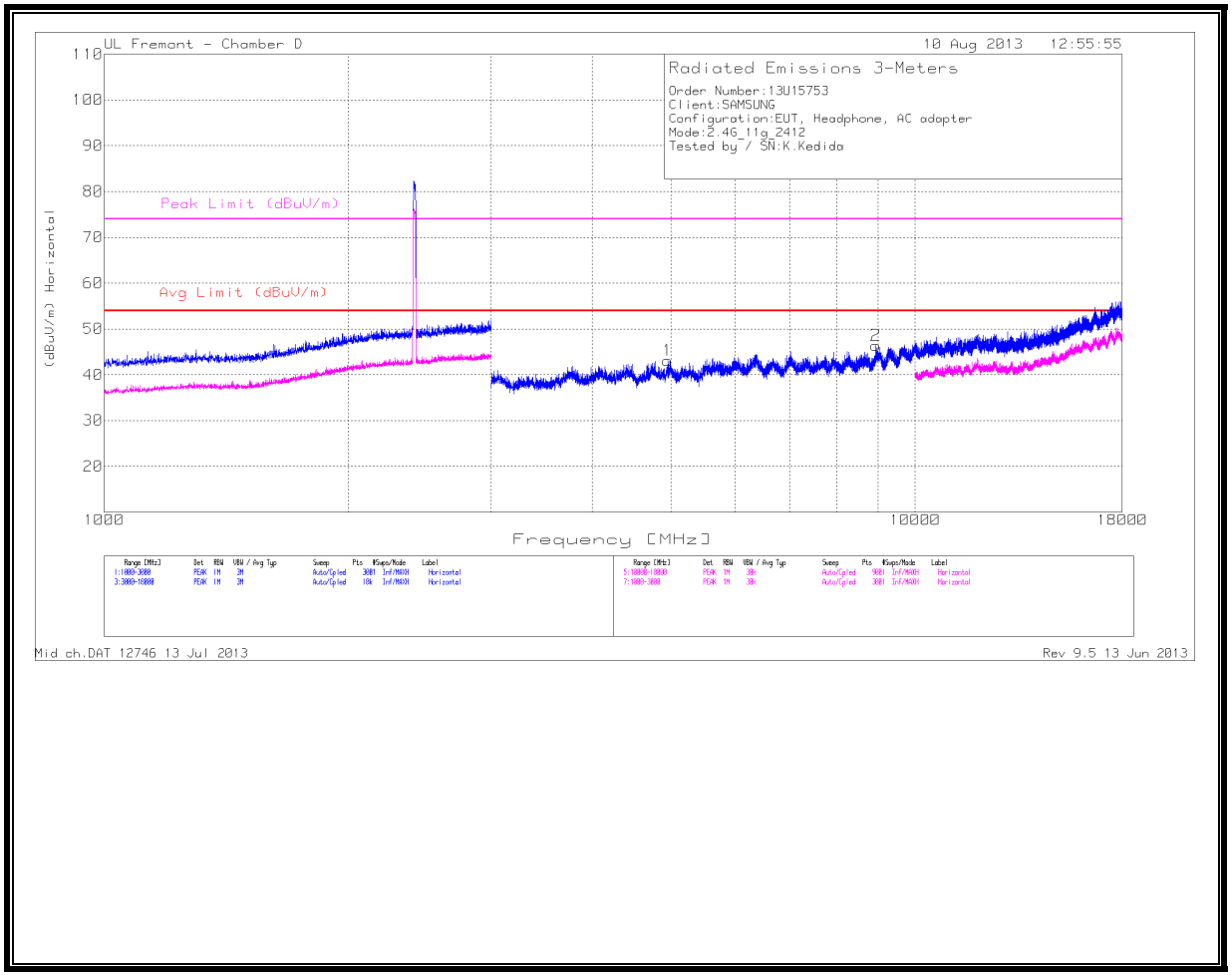
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL
HORIZONTAL



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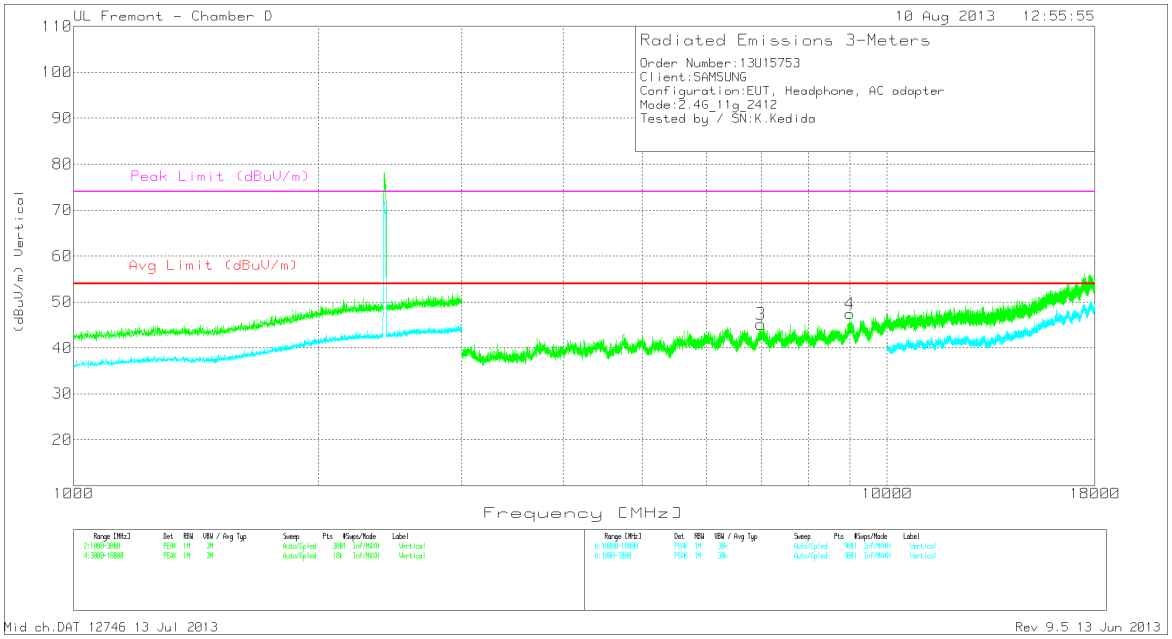
VERTICAL



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LOW CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T344 Ant Factor [dB/m]	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	4.952	40.1	PK	34.3	-31.3	43.1	53.97	-10.87	74	-30.9	201	H
2	8.944	36.08	PK	36.6	-26.3	46.38	53.97	-7.59	74	-27.62	201	H
3	6.998	37.66	PK	35.9	-28.4	45.16	53.97	-8.81	74	-28.84	401	V
4	8.998	36.33	PK	36.7	-25.6	47.43	53.97	-6.54	74	-26.57	401	V

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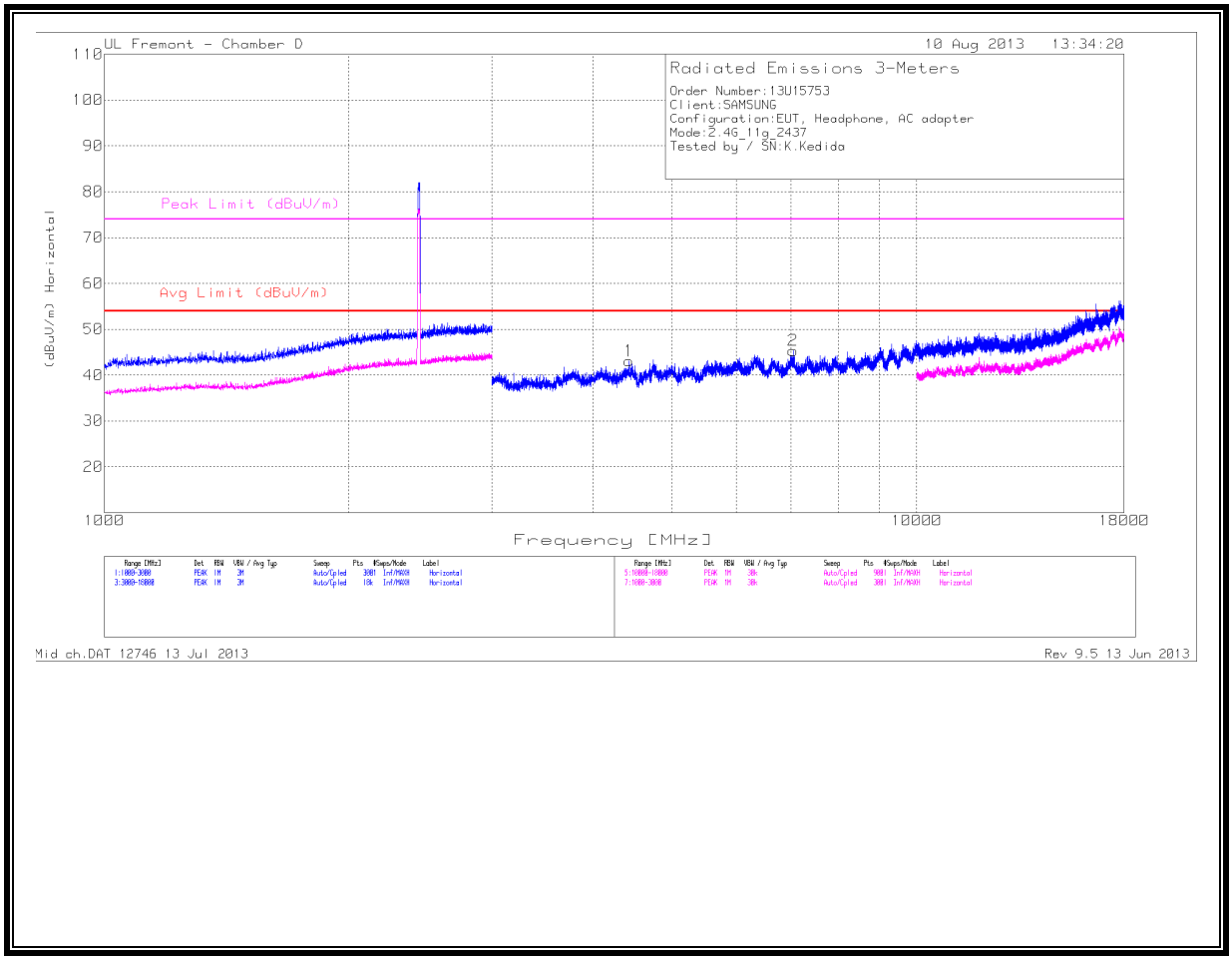
MID CHANNEL
HORIZONTAL



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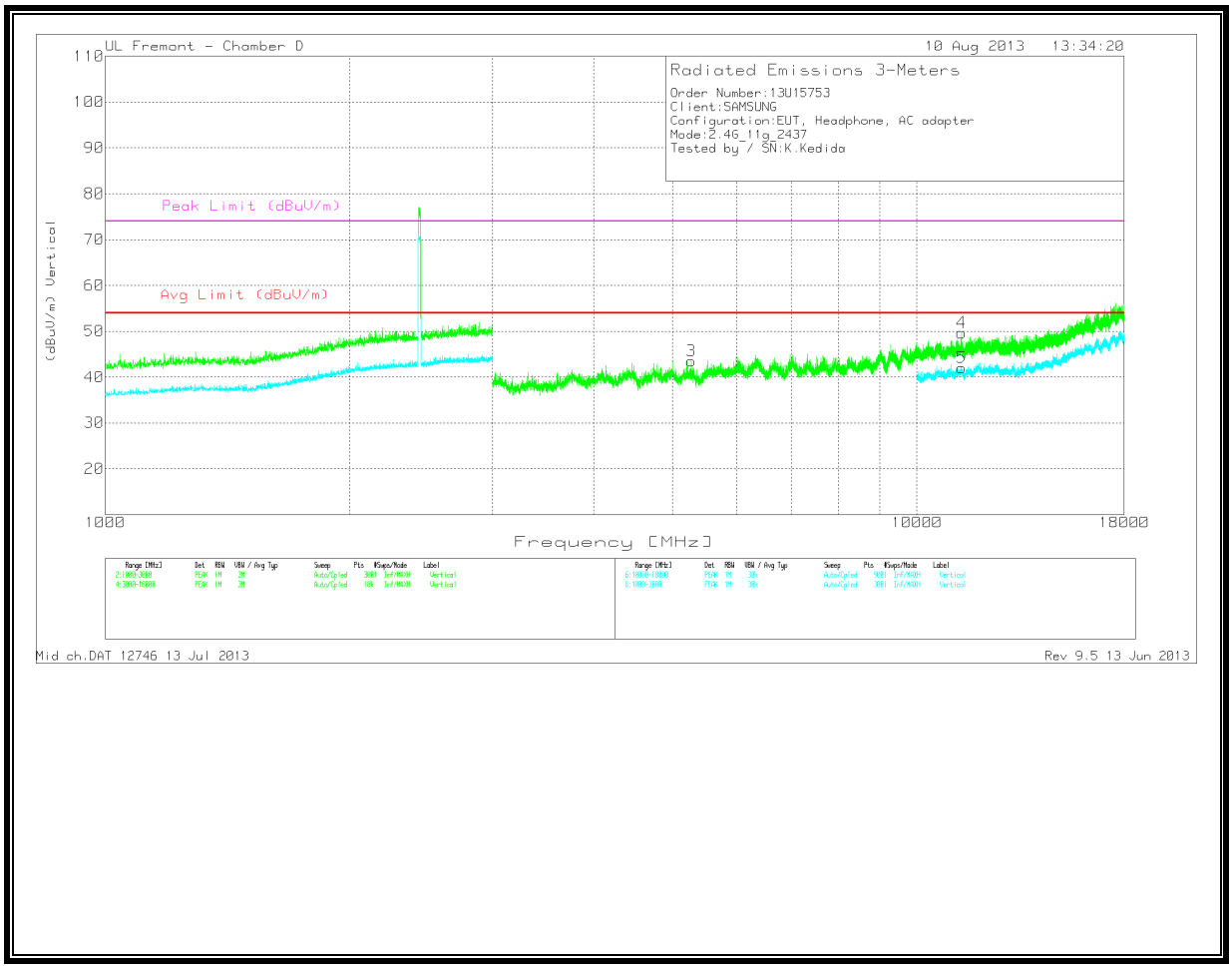
VERTICAL



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MID CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T344 Ant Factor [dB/m]	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	4.424	40.15	PK	34.1	-31.2	43.05	53.97	-10.92	74	-30.95	301	H
2	7.047	37.97	PK	35.9	-28.5	45.37	53.97	-8.6	74	-28.63	400	H
3	5.272	39.8	PK	34.7	-31	43.5	53.97	-10.47	74	-30.5	401	V
5	11.355	27.86	PK	38.5	-24.3	42.06	53.97	-11.91	74	-31.94	401	V

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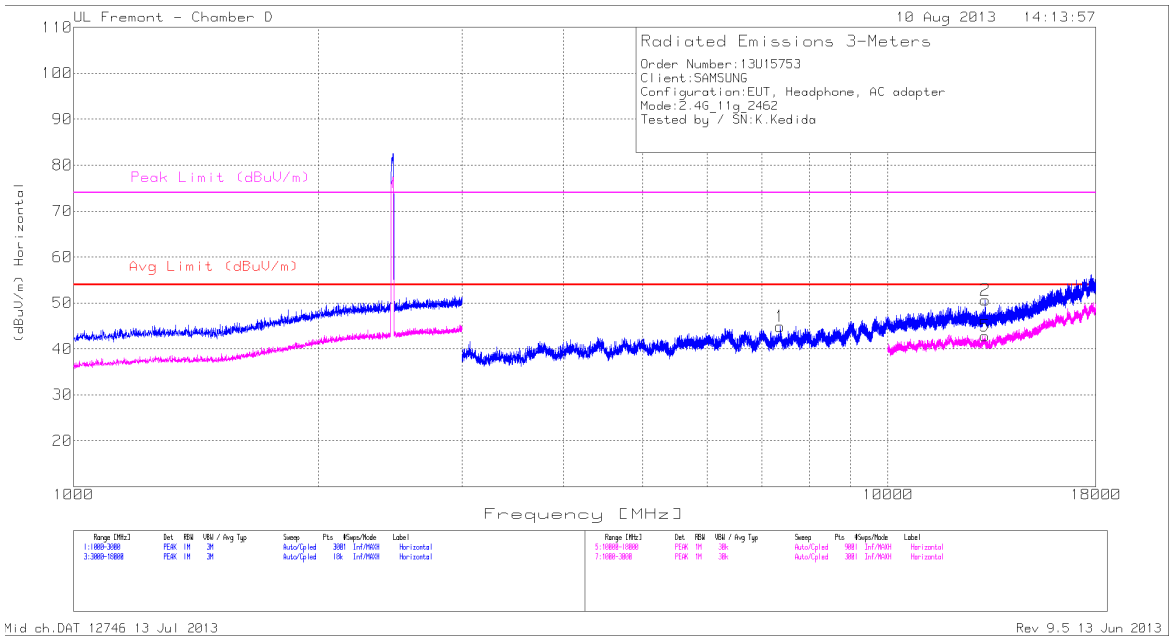
HIGH CHANNEL
HORIZONTAL



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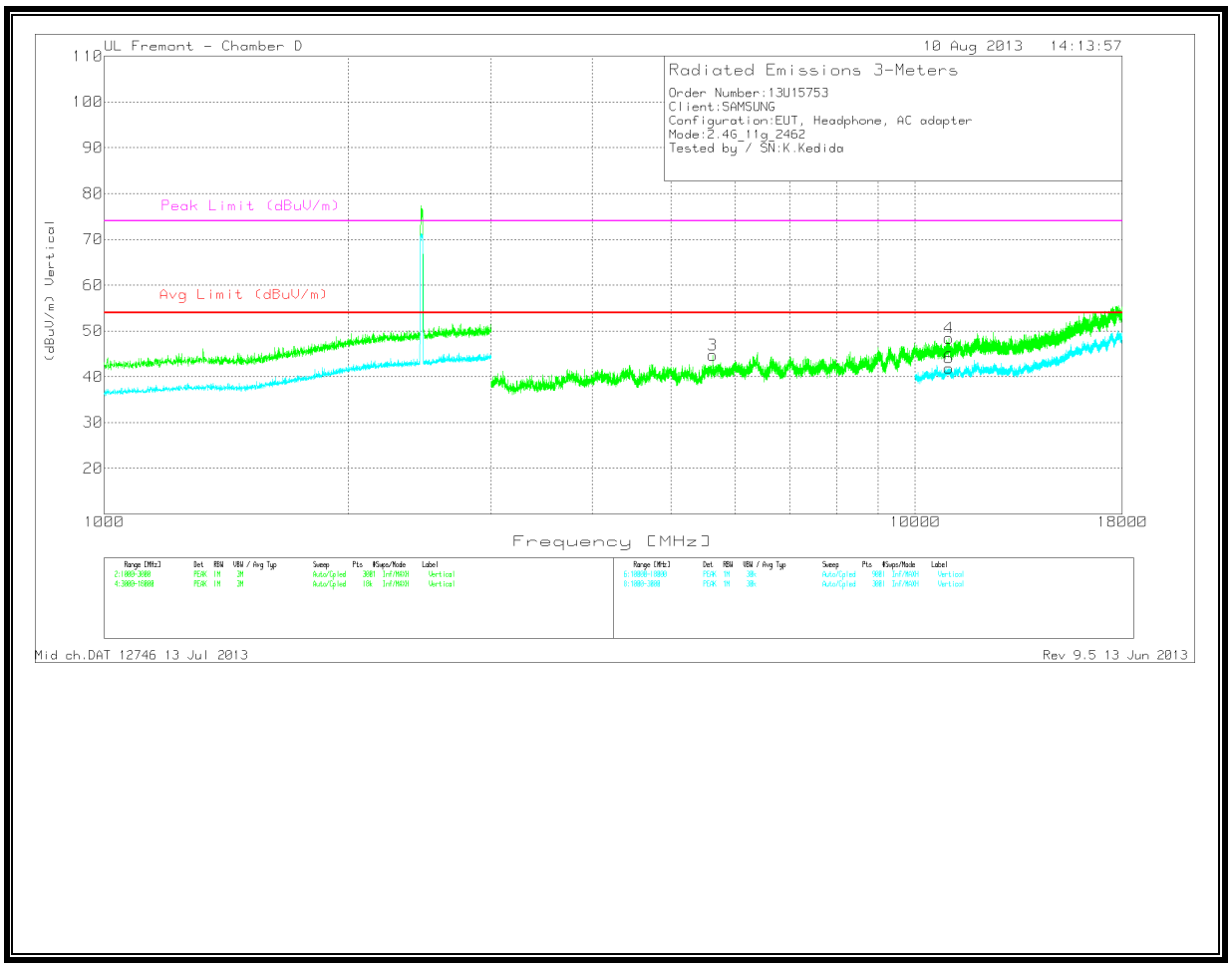
VERTICAL



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HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T344 Ant Factor [dB/m]	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	7.373	37.27	PK	35.9	-28.3	44.87	53.97	-9.1	74	-29.13	300	H
2	13.17	37.52	PK	39	-25.9	50.62	53.97	-3.35	74	-23.38	100	H
3	5.628	40.22	PK	35.1	-30.6	44.72	53.97	-9.25	74	-29.28	301	V
4	11.011	34.83	PK	38.4	-24.8	48.43	53.97	-5.54	74	-25.57	201	V
5	13.163	29.52	PK	39	-25.7	42.82	53.97	-11.15	74	-31.18	400	H
6	11.002	28.43	PK	38.4	-24.9	41.93	53.97	-12.04	74	-32.07	100	V

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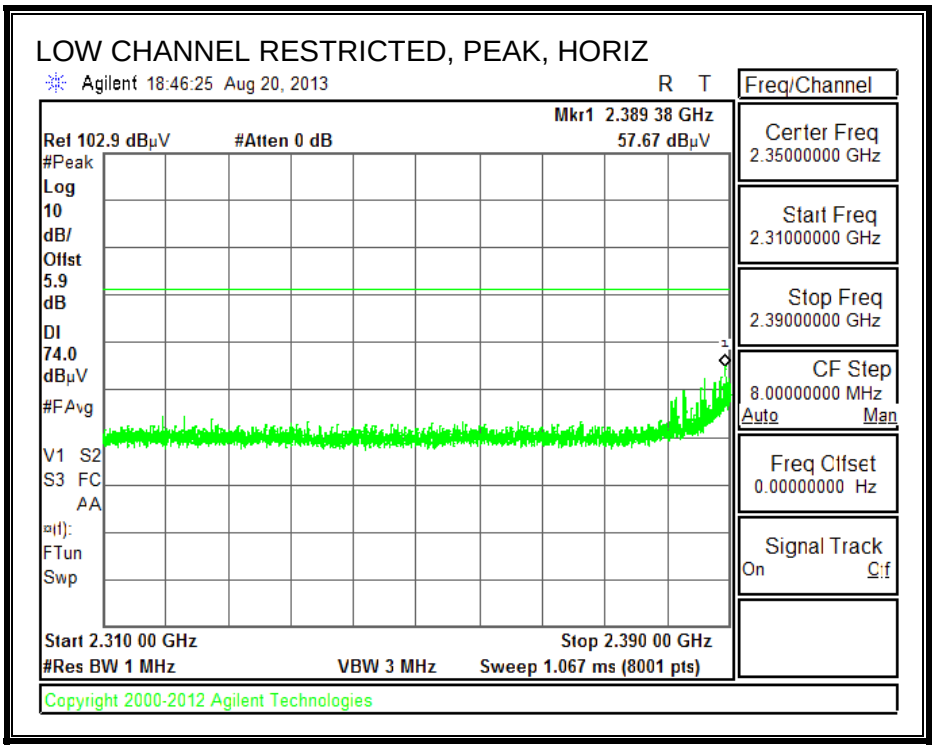
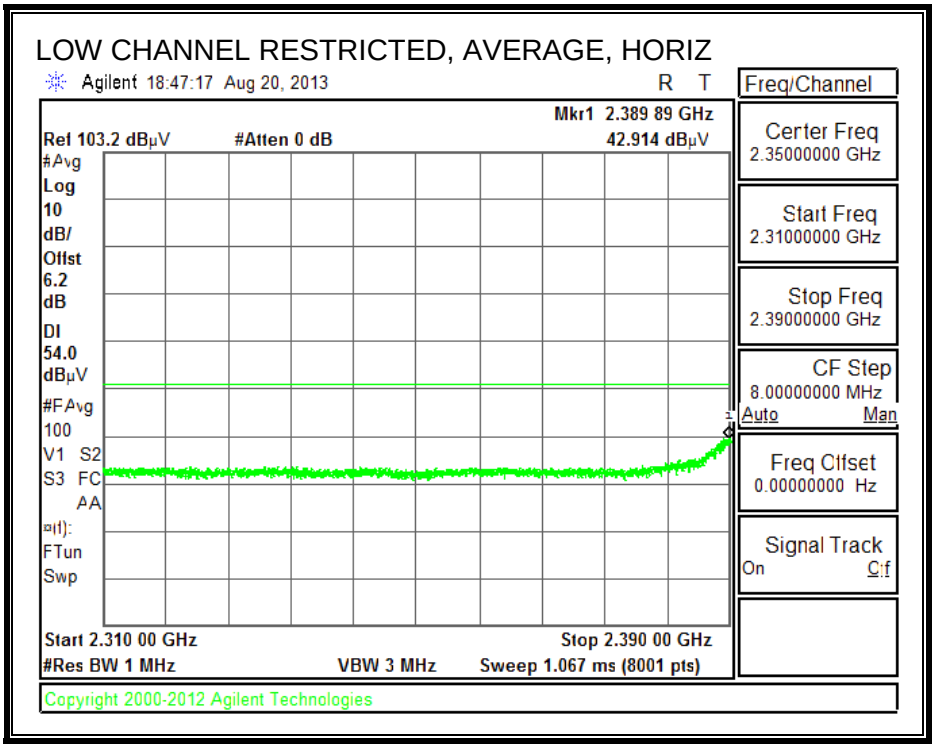
9.2.3. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL)





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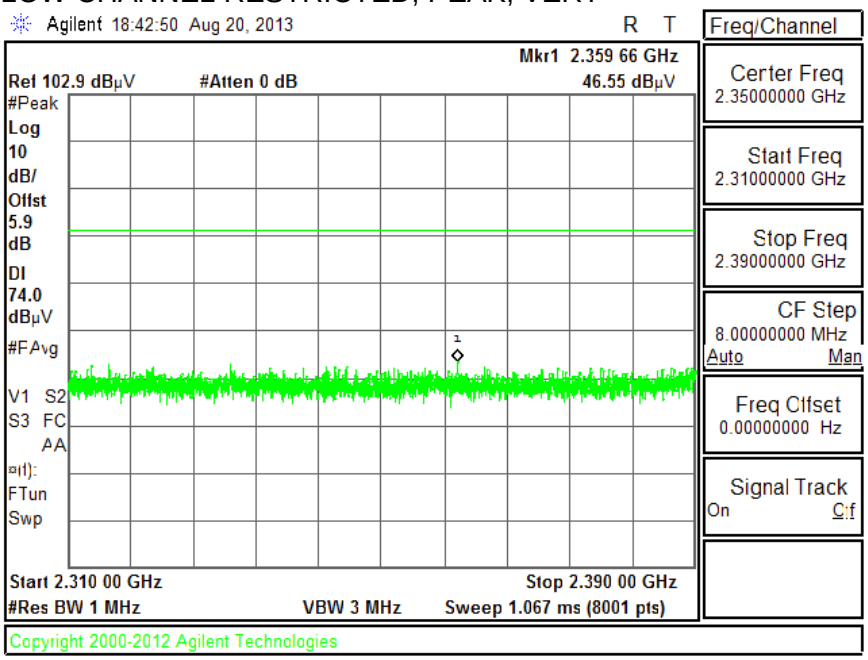
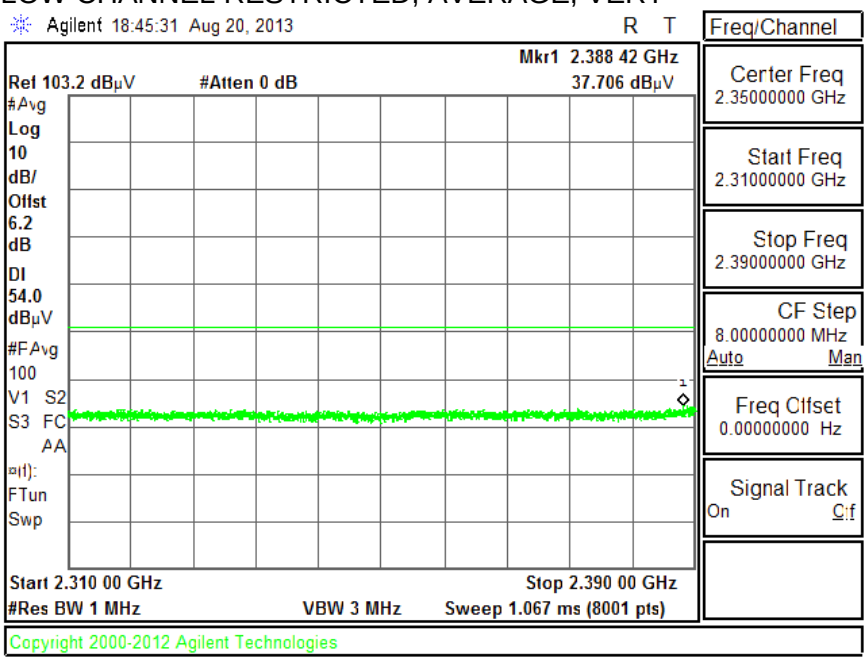
LOW CHANNEL RESTRICTED, PEAK, VERT



LOW CHANNEL RESTRICTED, AVERAGE, VERT



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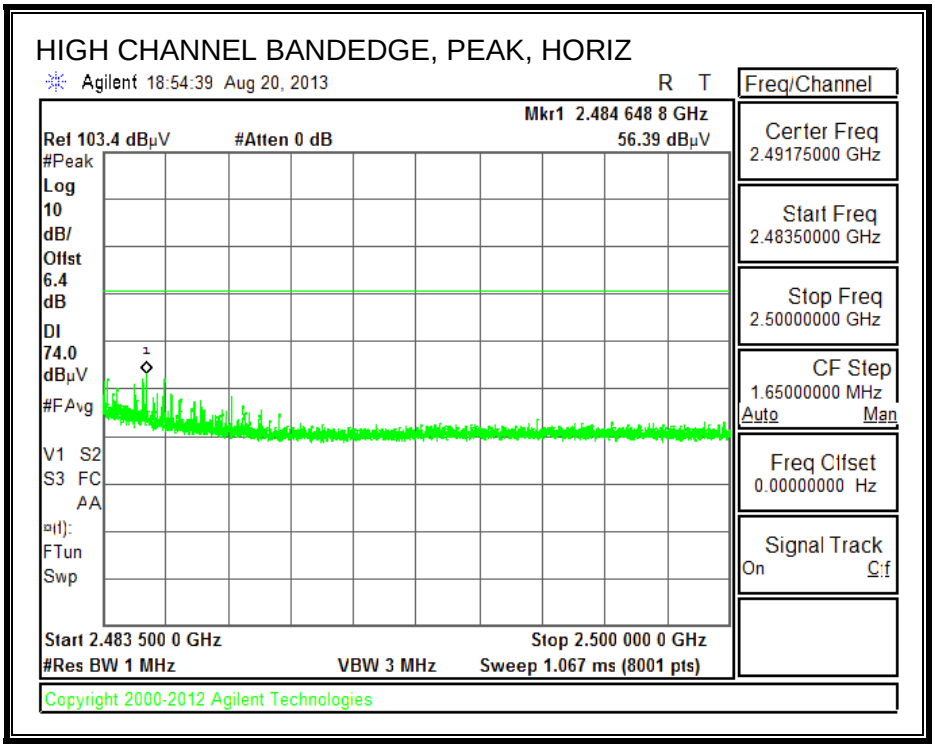
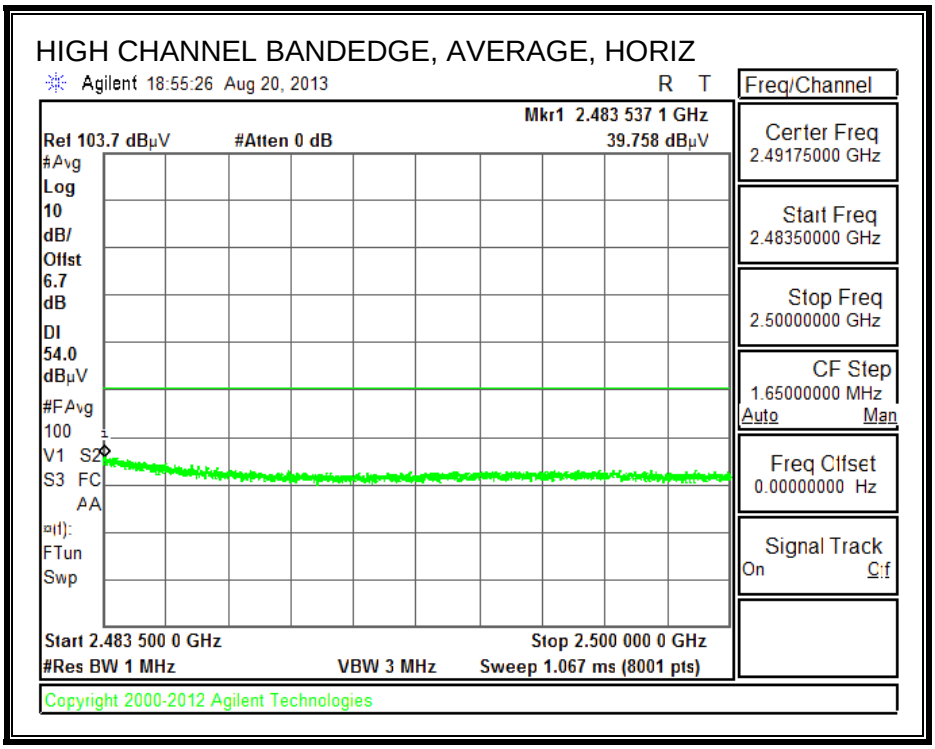
AUTHORIZED BANDEDGE (HIGH CHANNEL)





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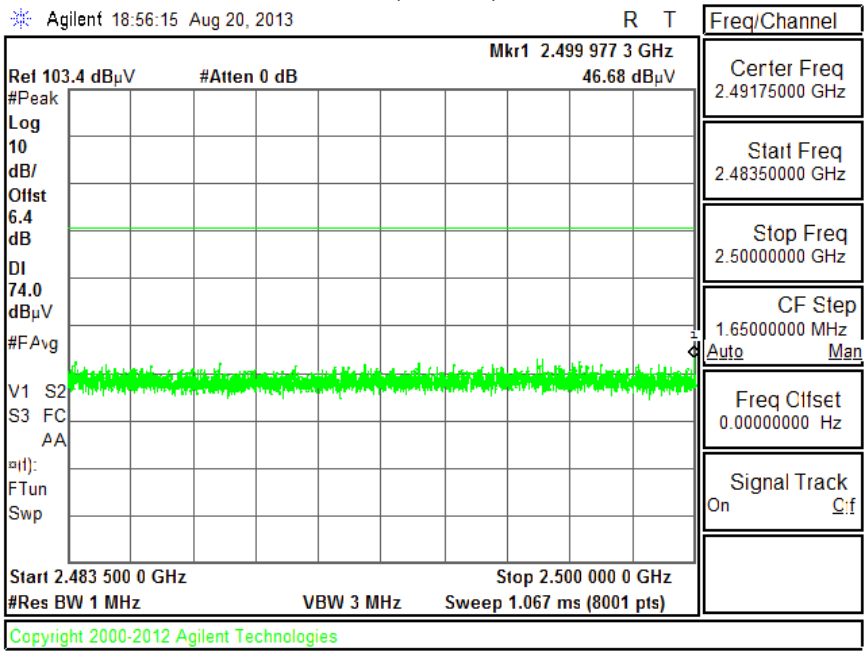
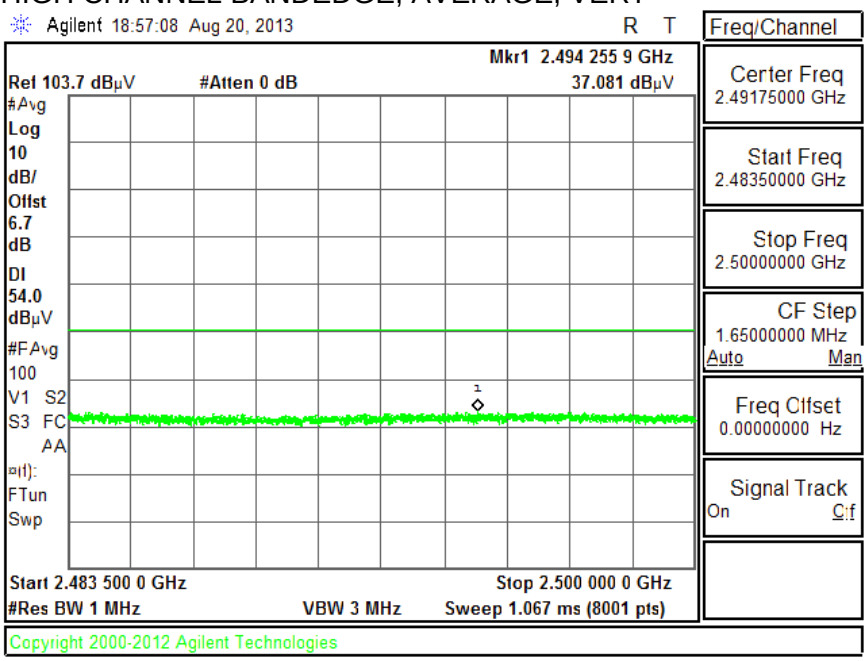
HIGH CHANNEL BANDEDGE, PEAK, VERT



HIGH CHANNEL BANDEDGE, AVERAGE, VERT



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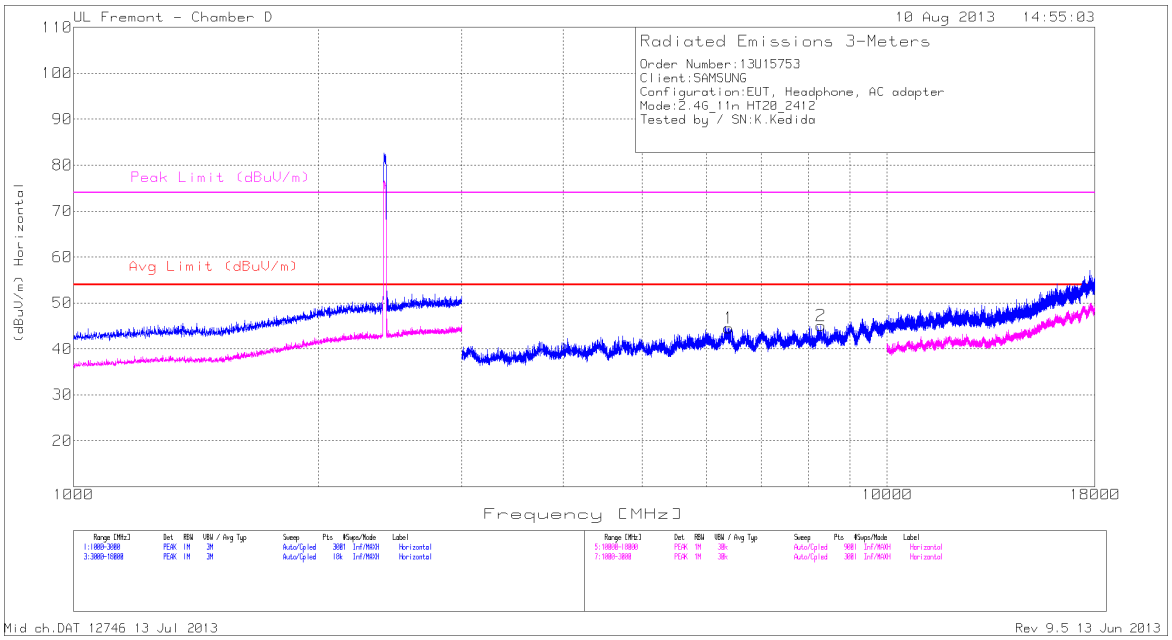
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL
HORIZONTAL



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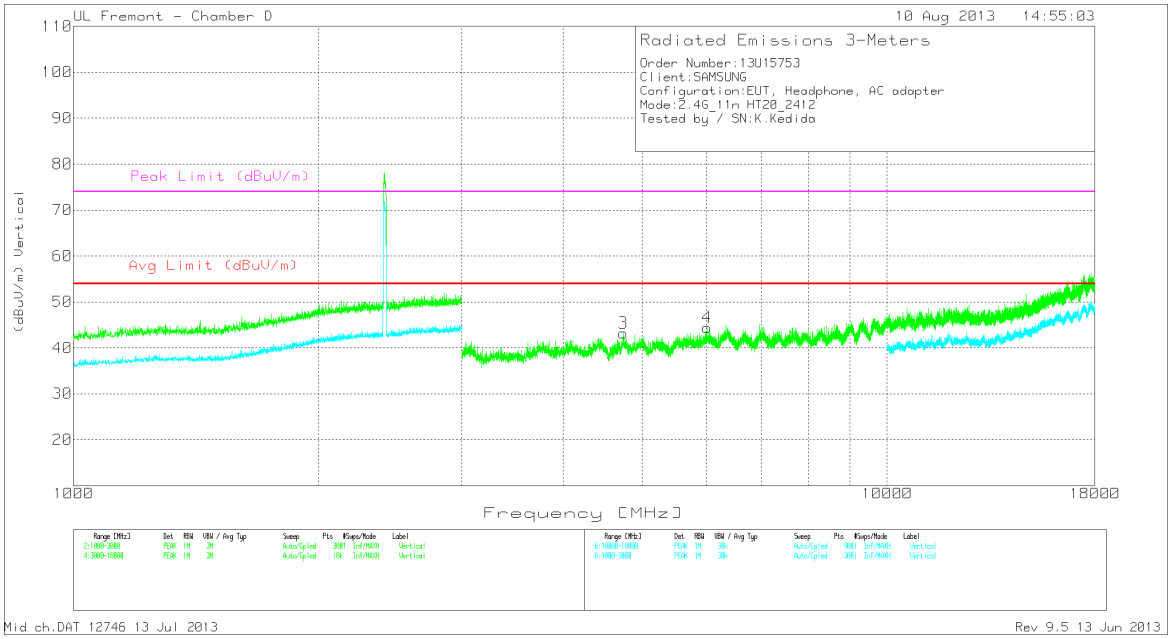
VERTICAL



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LOW CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T344 Ant Factor [dB/m]	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	6.388	37.63	PK	35.9	-29	44.53	53.97	-9.44	74	-29.47	201	H
2	8.292	35.94	PK	36	-26.9	45.04	53.97	-8.93	74	-28.96	401	H
3	4.742	39.92	PK	34.4	-31.1	43.22	53.97	-10.75	74	-30.78	201	V
4	6.009	38.5	PK	35.7	-29.8	44.4	53.97	-9.57	74	-29.6	301	V

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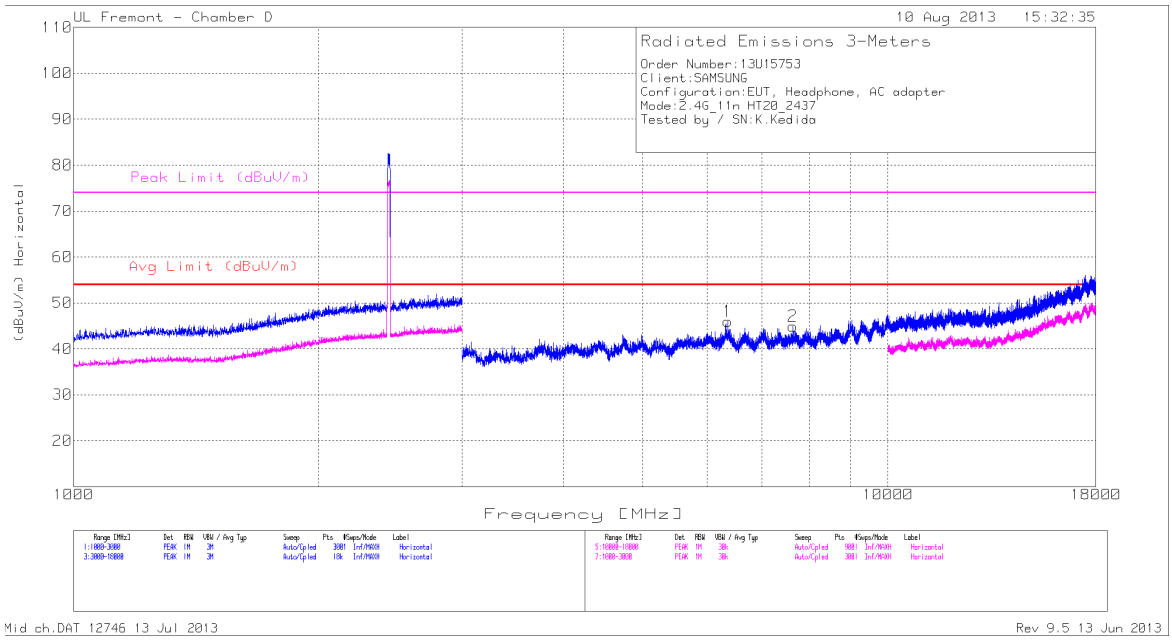
MID CHANNEL
HORIZONTAL



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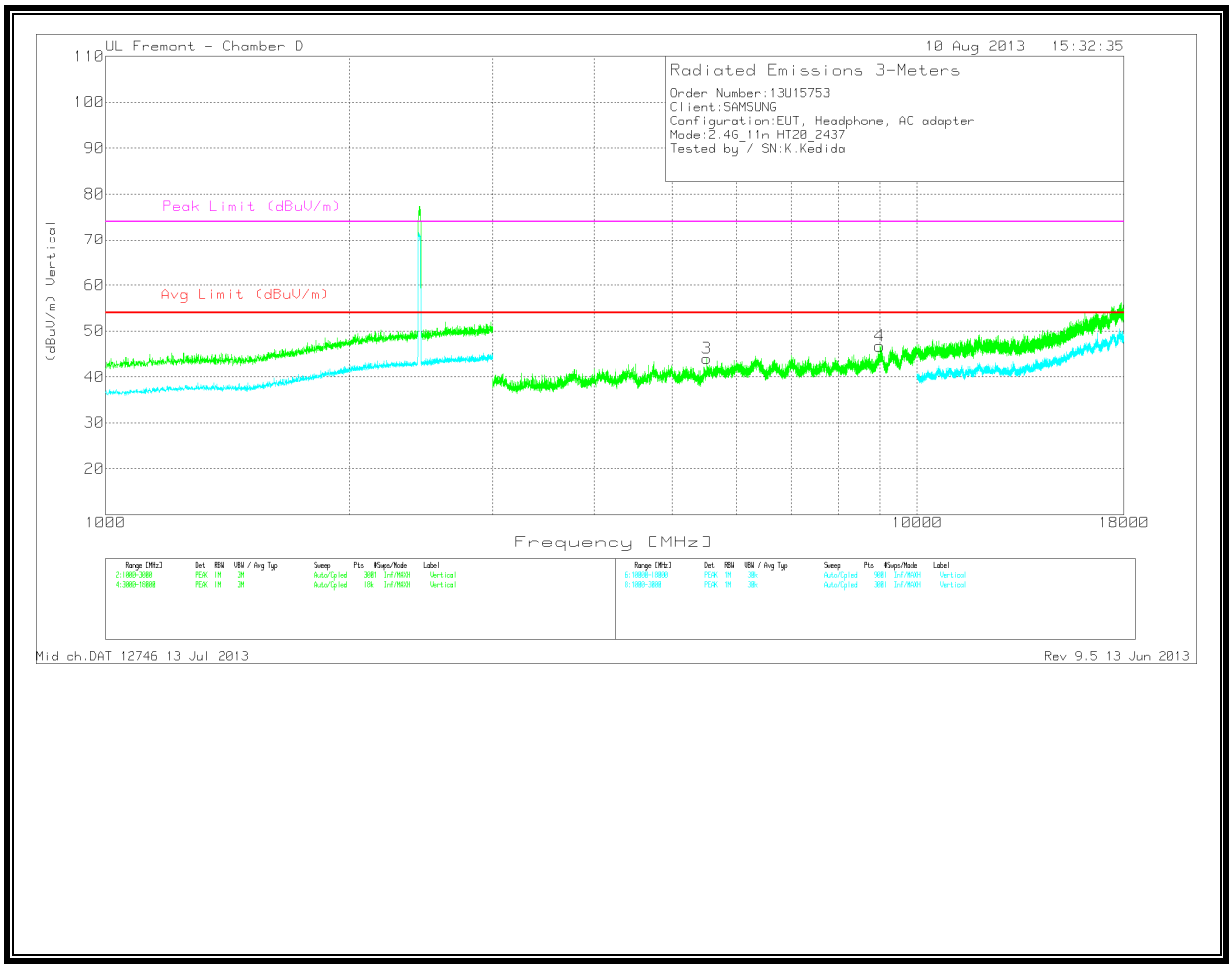
VERTICAL



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MID CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T344 Ant Factor [dB/m]	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	6.36	39.17	PK	35.9	-29.1	45.97	53.97	-8	74	-28.03	301	H
2	7.646	37.01	PK	36	-28.1	44.91	53.97	-9.06	74	-29.09	201	H
3	5.515	40.24	PK	34.8	-31	44.04	53.97	-9.93	74	-29.96	401	V
4	8.994	35.82	PK	36.7	-25.8	46.72	53.97	-7.25	74	-27.28	301	V

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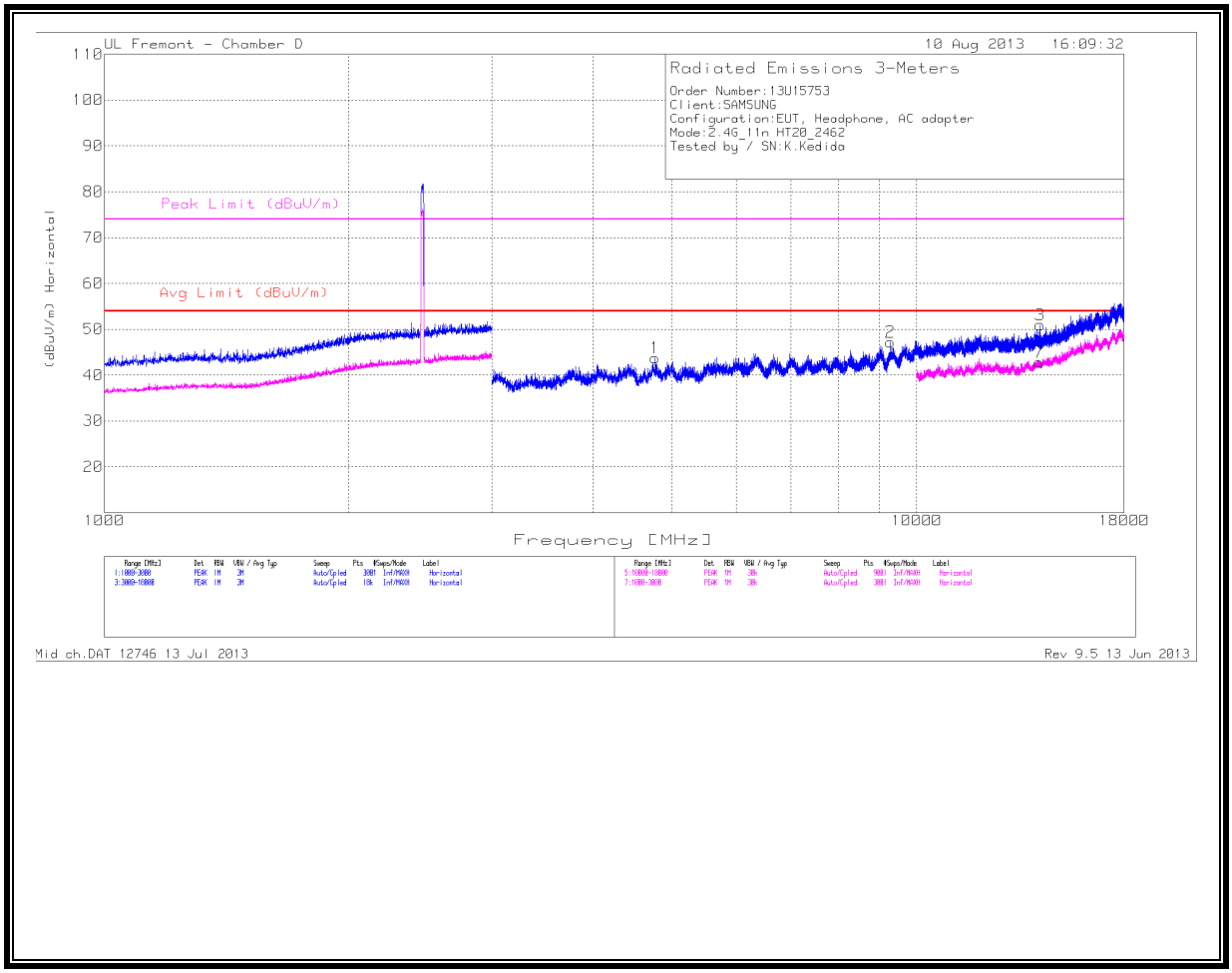
HIGH CHANNEL
HORIZONTAL



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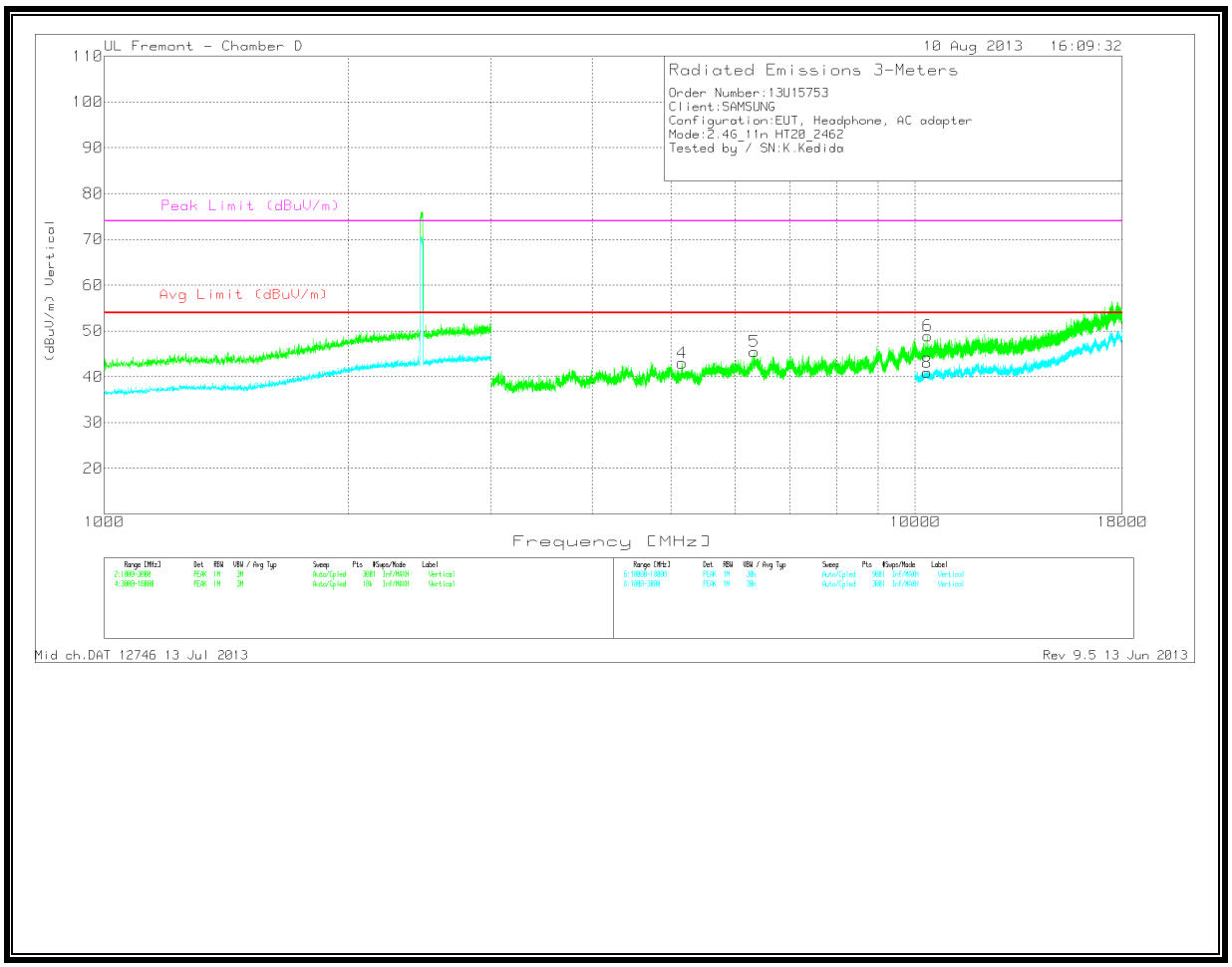
VERTICAL



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HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T344 Ant Factor [dB/m]	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	4.763	40.74	PK	34.4	-31.4	43.74	53.97	-10.23	74	-30.26	401	H
2	9.28	35.7	PK	36.9	-25.4	47.2	53.97	-6.77	74	-26.8	301	H
3	14.189	38.24	PK	39.6	-26.9	50.94	53.97	-3.03	74	-23.06	401	H
4	5.159	39.11	PK	34.6	-30.7	43.01	53.97	-10.96	74	-30.99	401	V
5	6.335	38.61	PK	35.9	-29	45.51	53.97	-8.46	74	-28.49	201	V
6	10.365	35.85	PK	38.2	-25.1	48.95	53.97	-5.02	74	-25.05	301	V
7	14.145	30.02	PK	39.6	-26.8	42.82	53.97	-11.15	74	-31.18	300	H
8	10.35	27.83	PK	38.2	-25.1	40.93	53.97	-13.04	74	-33.07	100	V

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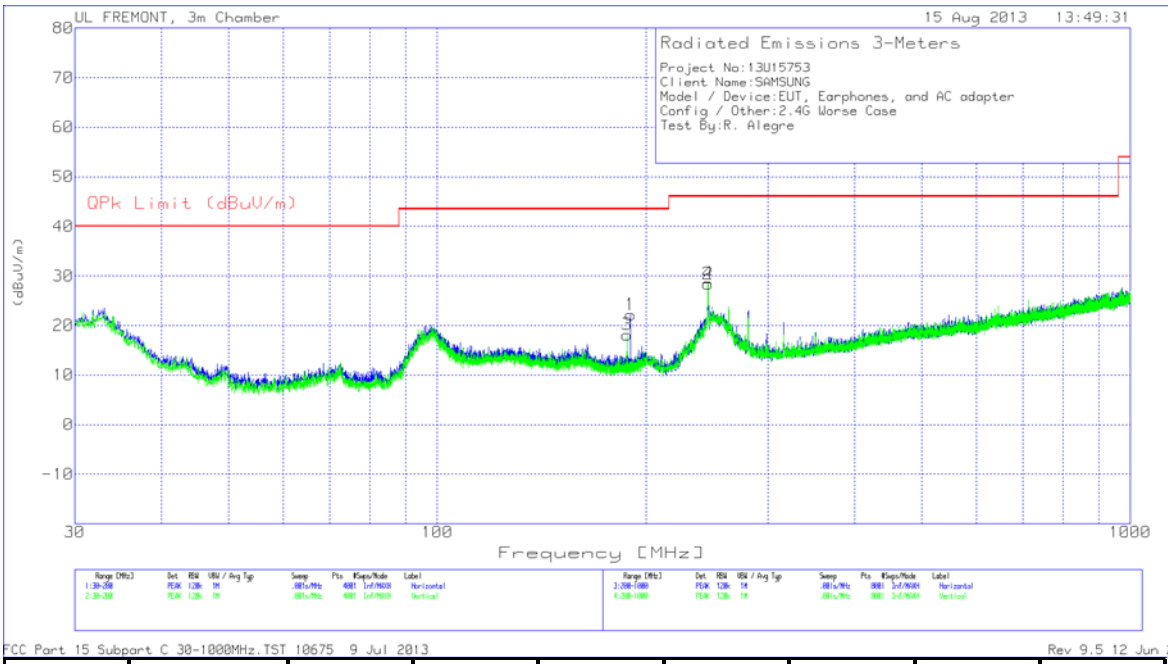
9.3. WORST-CASE BELOW 1 GHz

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



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)
1	190.14	37.05	PK	11.1	-26	22.15	43.52	-21.37
3	187.845	33.23	PK	10.9	-26	18.13	43.52	-25.39
2	245.8	42.05	PK	11.6	-25.3	28.35	46.02	-17.67
4	245.9	42.16	PK	11.6	-25.3	28.46	46.02	-17.56

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10. 2.4GHz 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.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

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RESULTS

6 WORST EMISSIONS

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.1545	48.46	PK	.1	0	48.56	65.8	-17.24	-	-
2	.1545	26.38	Av	.1	0	26.48	-	-	55.8	-29.32
3	.447	40.95	PK	.1	0	41.05	56.9	-15.85	-	-
4	.447	26.78	Av	.1	0	26.88	-	-	46.9	-20.02
5	5.0865	39.4	PK	.1	.1	39.6	60	-20.4	-	-
6	5.0865	22.26	Av	.1	.1	22.46	-	-	50	-27.54
7	20.3955	40.72	PK	.3	.2	41.22	60	-18.78	-	-
8	20.3955	20.42	Av	.3	.2	20.92	-	-	50	-29.08

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	.15	46.24	PK	.1	0	46.34	66	-19.66	-	-
10	.15	24.94	Av	.1	0	25.04	-	-	56	-30.96
11	.438	38.51	PK	.1	0	38.61	57.1	-18.49	-	-
12	.438	25.02	Av	.1	0	25.12	-	-	47.1	-21.98
13	5.379	42.66	PK	.1	.1	42.86	60	-17.14	-	-
14	5.379	23.12	Av	.1	.1	23.32	-	-	50	-26.68
15	21.9255	39.67	PK	.3	.2	40.17	60	-19.83	-	-
16	21.9255	25.2	Av	.3	.2	25.7	-	-	50	-24.3

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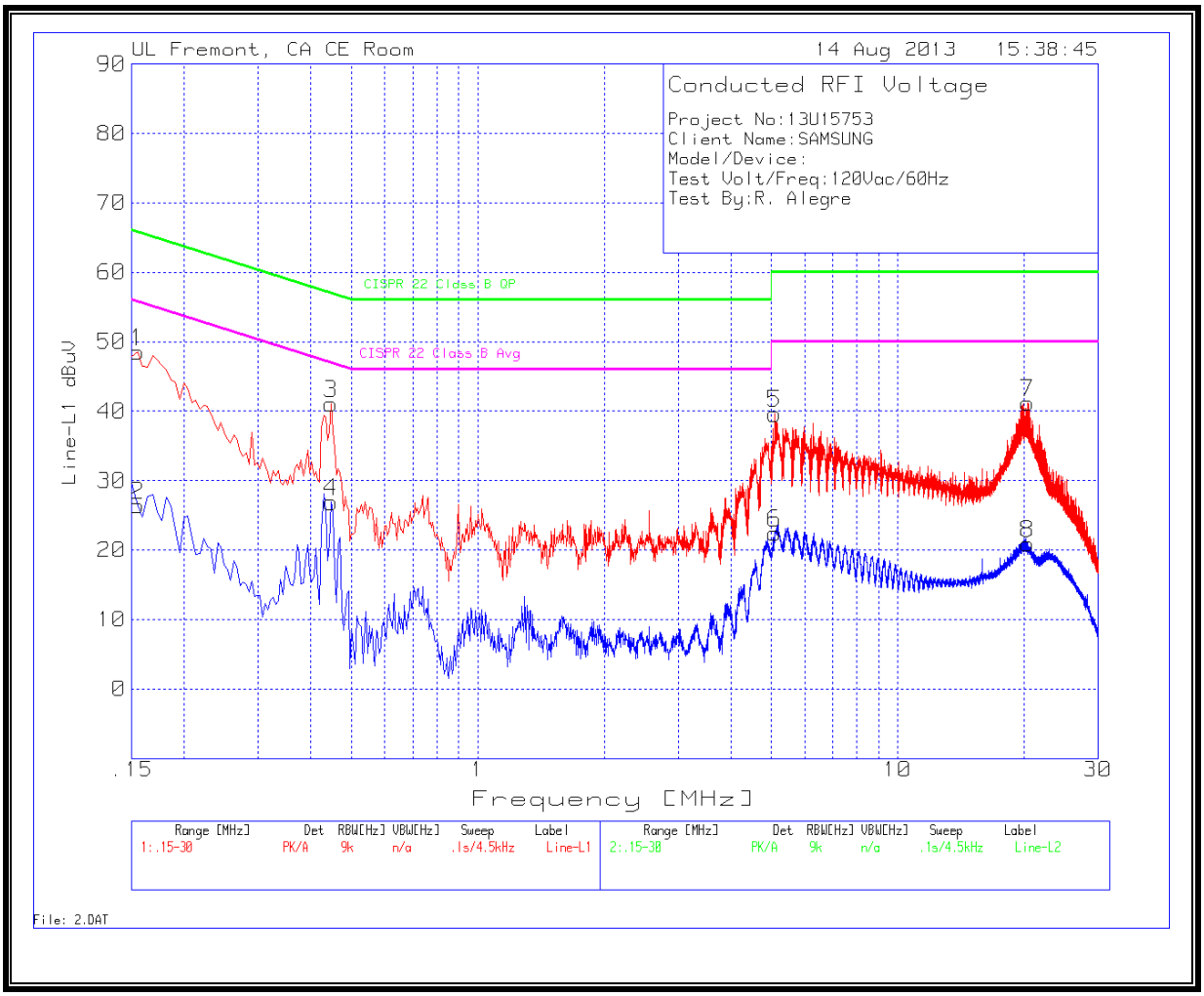
LINE 1 RESULTS



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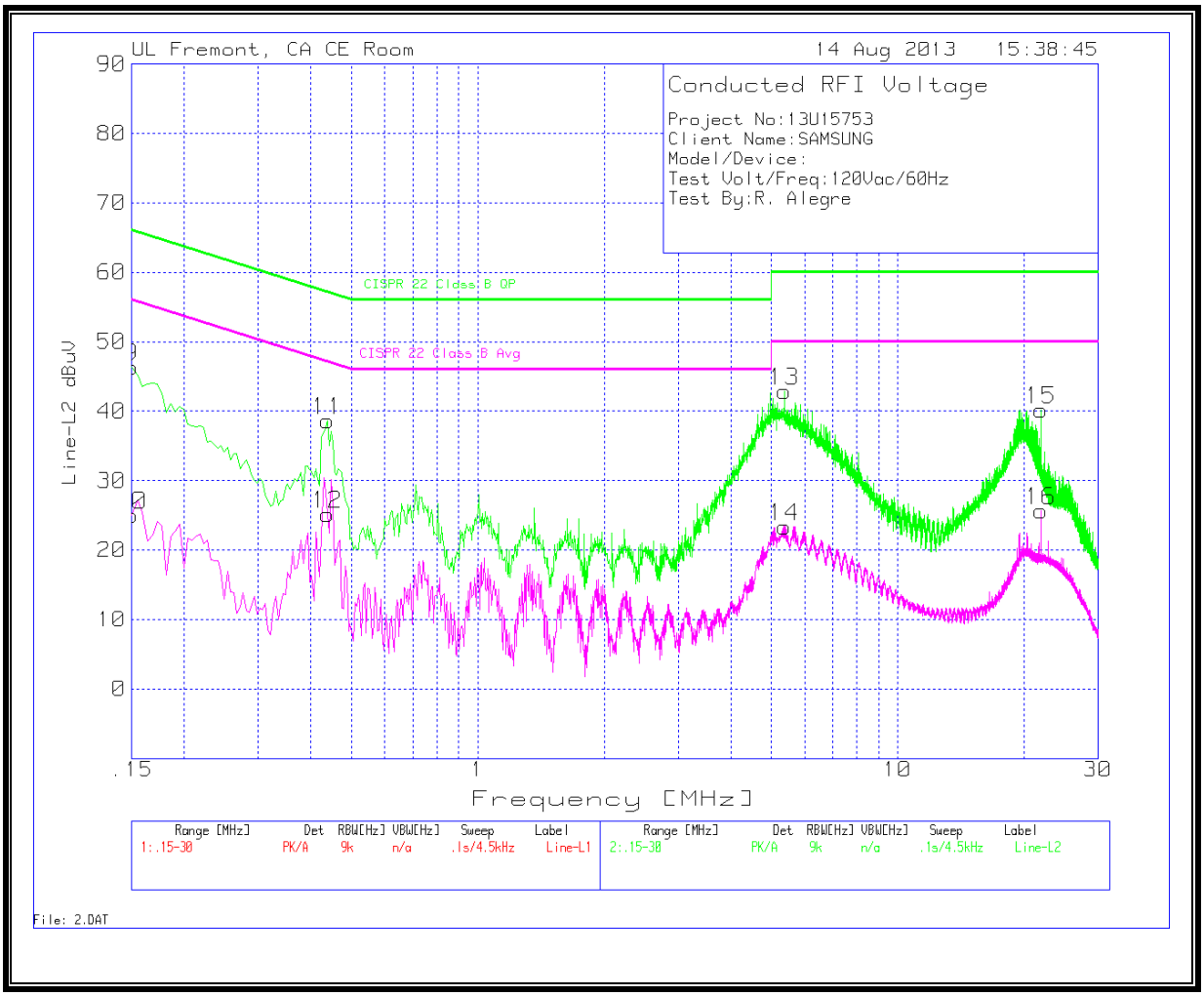
LINE 2 RESULTS



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