



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

WIRELESS INPUT DEVICE

MODEL NUMBER: 1697

FCC ID: C3K1697

REPORT NUMBER: 14U19258-E2 Revision C

ISSUE DATE: MAY 14, 2015

Prepared for
**MICROSOFT CORPORATION
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	1/27/15	Initial Issue	F. de Anda
A	4/25/15	Update antenna gains. Output power KDB reference updated, Output power tables updated to correspond to updated KDB reference. Plots removed from sections 8.2.3 and 8.3.3. Duty cycle CF changed to 0 for sections 8.2.4 and 8.3.4. Added test procedure to section 9.	J. Gomez
B	4/30/15	Removed duty cycle correction factors for sections 8.2.4, 8.2.5, 8.3.4, 8.3.5, 8.4.4, 8.4.5, Updated average power section 8.2.2	C. Susa
C	5/14/15	Updated EUT name	F. de Anda

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	7
5. EQUIPMENT UNDER TEST	8
5.1. DESCRIPTION OF EUT	8
5.2. MAXIMUM OUTPUT POWER.....	8
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	8
5.4. SOFTWARE AND FIRMWARE.....	8
5.5. WORST-CASE CONFIGURATION AND MODE.....	8
5.6. DESCRIPTION OF TEST SETUP.....	9
6. TEST AND MEASUREMENT EQUIPMENT	12
7. MEASUREMENT METHODS	13
8. ANTENNA PORT TEST RESULTS	14
8.1. ON TIME AND DUTY CYCLE.....	14
8.2. 802.11g MODE IN THE 2.4 GHz BAND.....	16
8.2.1. 6 dB BANDWIDTH.....	16
8.2.2. AVERAGE POWER	19
8.2.3. OUTPUT POWER	20
8.2.4. POWER SPECTRAL DENSITY	22
8.2.5. OUT-OF-BAND EMISSIONS	25
8.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND	29
8.3.1. 6 dB BANDWIDTH.....	29
8.3.2. AVERAGE POWER	32
8.3.3. OUTPUT POWER	33
8.3.4. POWER SPECTRAL DENSITY	35
8.3.5. OUT-OF-BAND EMISSIONS	38
9. RADIATED TEST RESULTS.....	42
9.1. LIMITS AND PROCEDURE	42
9.2. TRANSMITTER ABOVE 1 GHz	43
9.2.1. TX ABOVE 1 GHz 802.11g MODE IN THE 2.4 GHz BAND	43
9.2.2. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 2.4 GHz BAND.....	53

9.3.	WORST-CASE BELOW 1 GHz.....	63
9.4.	WORST-CASE ABOVE 18 to 26GHz.....	65
10.	SETUP PHOTOS	67

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MICROSOFT CORPORATION
ONE MICROSOFT WAY
REDMOND, WA 98052, U.S.A.

EUT DESCRIPTION: WIRELESS INPUT DEVICE

MODEL: 1697

SERIAL NUMBER: EV2-007 (CONDUCTED), EV2-004 (RADIATED)

DATE TESTED: DECEMBER 8 -15, 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.

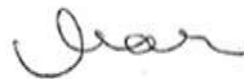
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. 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:



FRANCISCO DE ANDA
PROJECT LEAD
UL Verification Services Inc.

Tested By:



MONA HUA
EMC ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

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

47173 Benicia Street	47266 Benicia Street
☐ Chamber A	☐ Chamber D
☐ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F
	☒ Chamber G
	☒ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/g/n transceiver, Model 1697.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11g	6.28	4.25
2412 - 2462	802.11n HT20	6.32	4.29

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an integral antenna, with a maximum gain of -1.62 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was R73.

The test utility software used during testing was Atheros ART2 ver 2.3.

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.

Worst-case data rates as provided by the client were:

802.11g mode: 6 Mbps

802.11n HT20mode: MCS0

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	D830	HY469A01	CXSMM01BRD02D330
AC/DC Adapter	Dell	DA90PS1-00	CN0MM5454866188JHZ9R	N/A

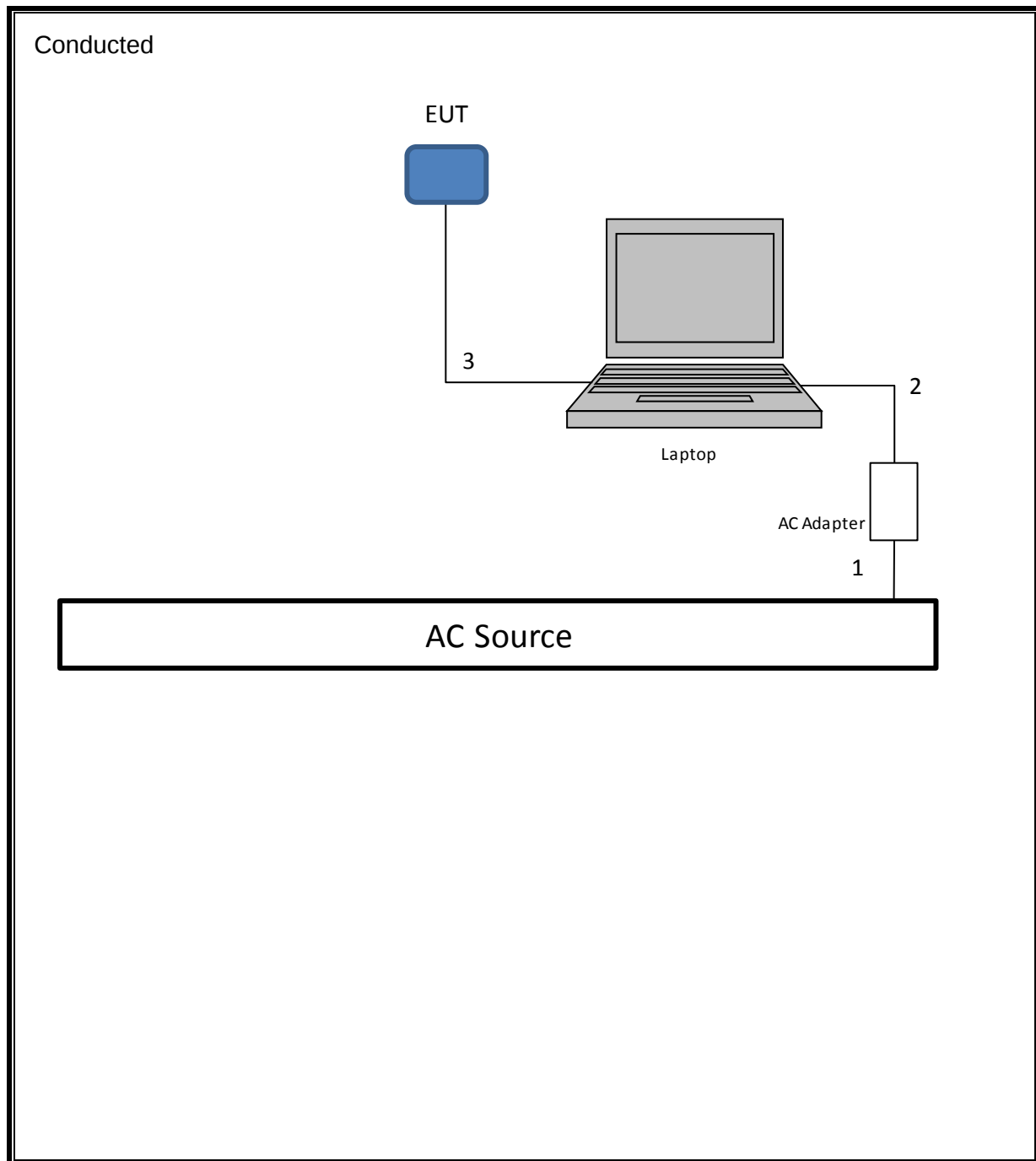
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	3-Prong	Unshielded	0.8	
2	DC	1	Barrel	Shielded	1.5	
3	USB	1	USB	Shielded	0.6	

TEST SETUP

The EUT is connected to a host laptop computer during conducted tests and standalone, battery powered, for radiated tests. Test software exercised the EUT.

SETUP DIAGRAM FOR TESTS



Radiated

EUT



AC Source

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	Cal Due
Chamber G			
Antenna, Horn 18 GHz	ETS Lindgren	3117	04/14/15
Antenna, Biconolog, 30MHz-1GHz	Sunol Sciences	JB3	04/27/15
High Pass Filter, fc: 3.0GHz, 50 Ohms	Micro-Tronics	HPM17543	05/13/15
Low Pass Filter, fc: 5GHz, 50 Ohms	Micro-Tronics	LPS17541	05/13/15
High Pass Filter, fc: 6GHz, 50 Ohms	Micro-Tronics	HPS17542	05/13/15
RF PreAmplifier, 1-18GHz	Miteq	AFS42-00101800-25-S-42	06/05/15
Preamp, 1000MHz	Sonoma	310N	06/05/15
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	05/17/15
Chamber H			
Antenna, Horn 18 GHz	ETS Lindgren	3117	04/14/15
Antenna, Biconolog, 30MHz-1GHz	Sunol Sciences	JB3	04/27/15
High Pass Filter, fc: 3.0GHz, 50 Ohms	Micro-Tronics	HPM17543	05/13/15
Low Pass Filter, fc: 5GHz, 50 Ohms	Micro-Tronics	LPS17541	05/13/15
High Pass Filter, fc: 6GHz, 50 Ohms	Micro-Tronics	HPS17542	05/13/15
RF PreAmplifier, 1-18GHz	Miteq	AFS42-00101800-25-S-42	06/05/15
Preamp, 1000MHz	Sonoma	310N	06/05/15
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	05/07/15
Antenna, Horn 18 to 26.5GHz	ARA	SWH-28	05/09/15
Amp. 26GHz	Agilent	8449B	03/25/15
Spectrum Analyzer, 40GHz	HP	8564E	08/06/15
Conducted			
Spectrum Analyzer	Agilent	E4440A	05/09/15
Power Meter, P-series single channel	Agilent	N1911A	04/09/15
Power Sensor, Peak and average, 50 MHz to 6 GHz, 5 MHz BW	Agilent	E9323A	05/02/15
Power Meter, P-series single channel	Agilent	N1911A	04/30/15
Power Sensor, Peak and average, 50 MHz to 18 GHz, 5 MHz BW	Agilent	E9327A	05/15/15

7. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v03r02, Section 8.1.

Output Power: KDB 558074 D01 v03r02, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r02, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r02, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r02, Section 12.1.

Band-edge: KDB 558074 D01 v03r02, Section 13.2.

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

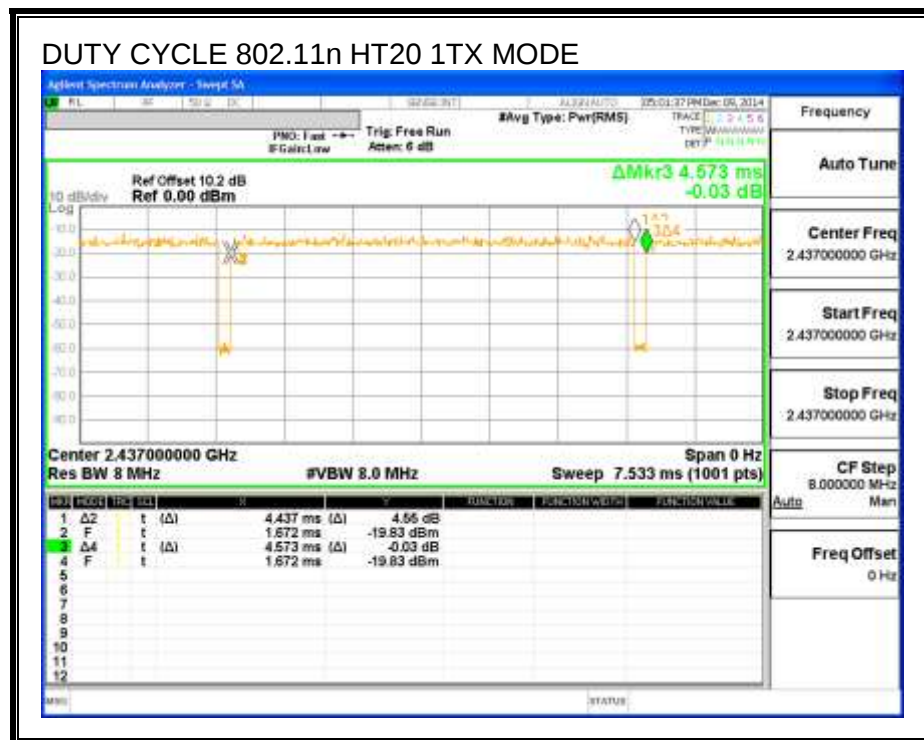
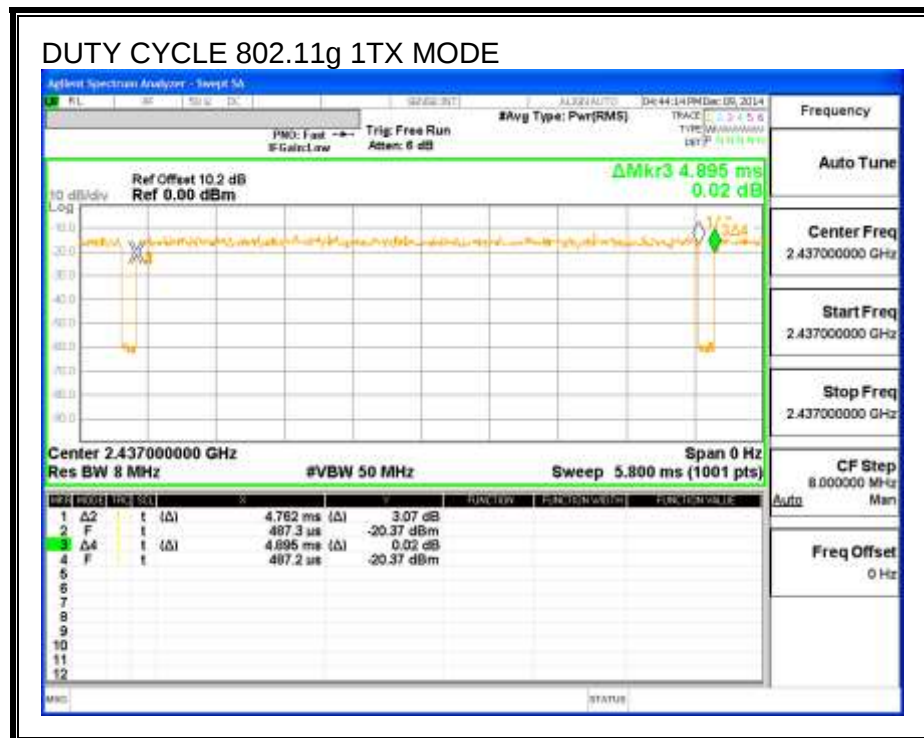
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
802.11g 1TX	4.762	4.895	0.973	97.28%	0.12	0.210
802.11n HT20 1TX	4.437	4.573	0.970	97.03%	0.13	0.225

DUTY CYCLE PLOTS



8.2. 802.11g MODE IN THE 2.4 GHz BAND

8.2.1. 6 dB BANDWIDTH

LIMITS

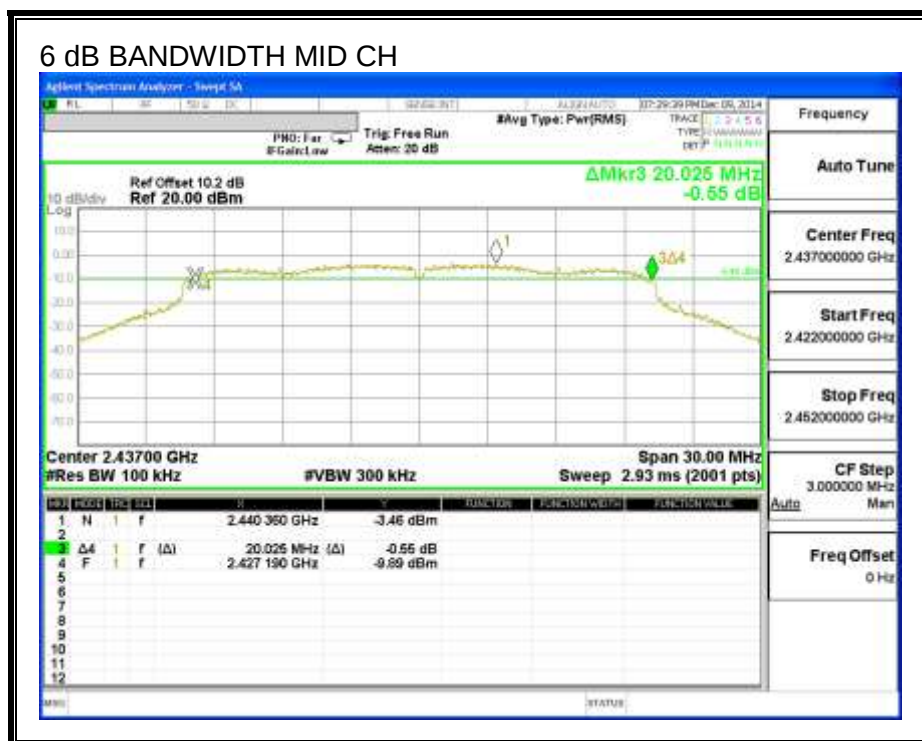
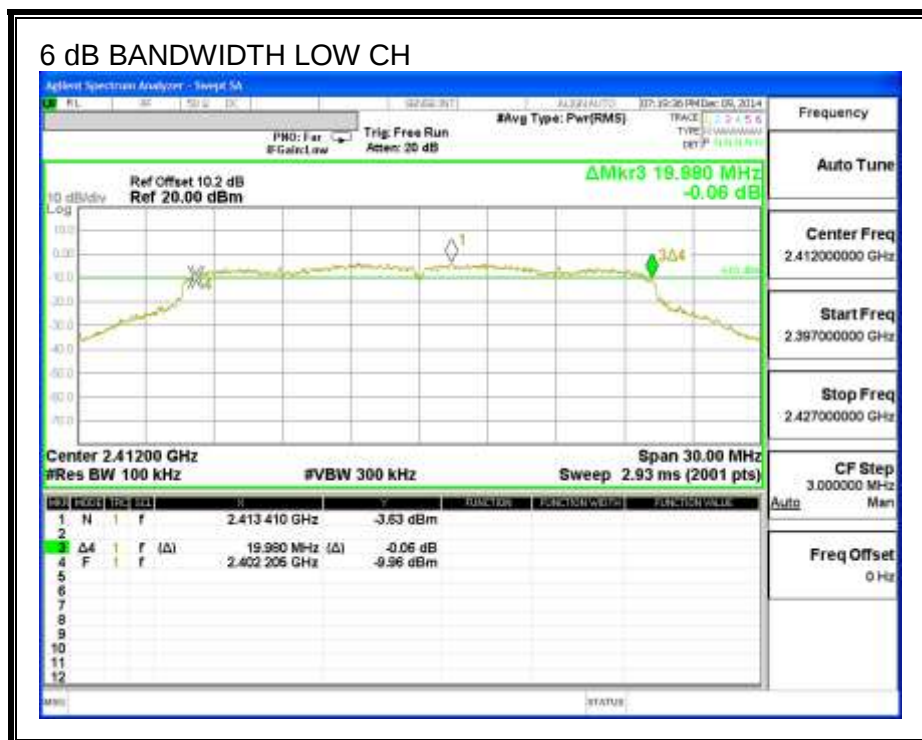
FCC §15.247 (a) (2)

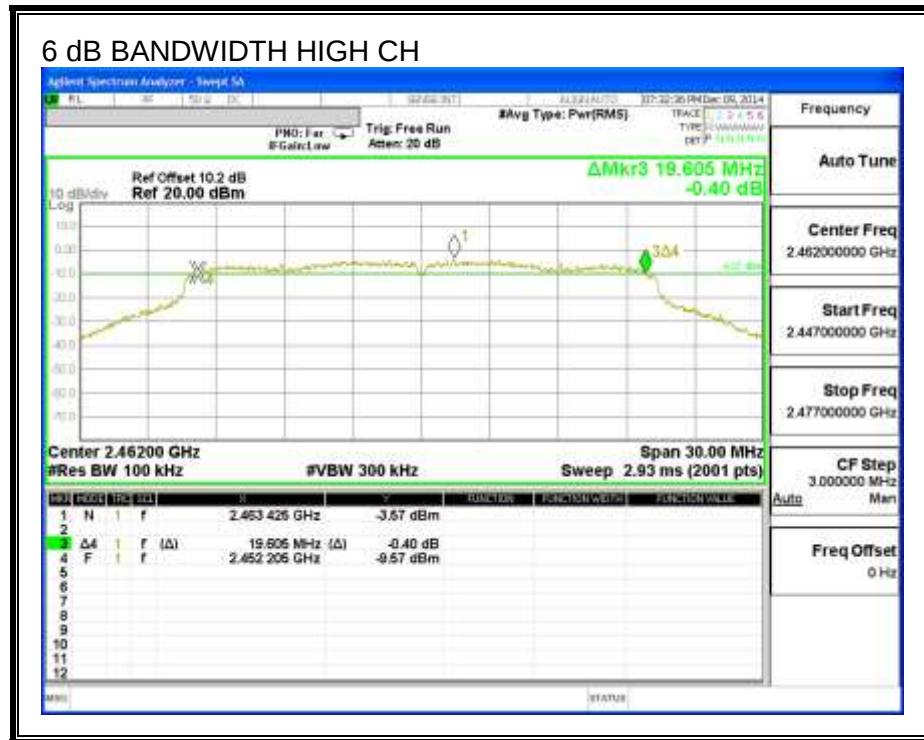
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	19.980	0.5
Mid	2437	20.025	0.5
High	2462	19.605	0.5

6 dB BANDWIDTH





8.2.2. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	6.09
Mid	2437	6.28
High	2462	6.02

8.2.3. OUTPUT POWER

LIMITS

FCC §15.247

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

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-1.62	30.00	30	36	30.00
Mid	2437	-1.62	30.00	30	36	30.00
High	2462	-1.62	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	17.19	17.19	30.00	-12.81
Mid	2437	17.32	17.32	30.00	-12.68
High	2462	17.22	17.22	30.00	-12.78

8.2.4. POWER SPECTRAL DENSITY

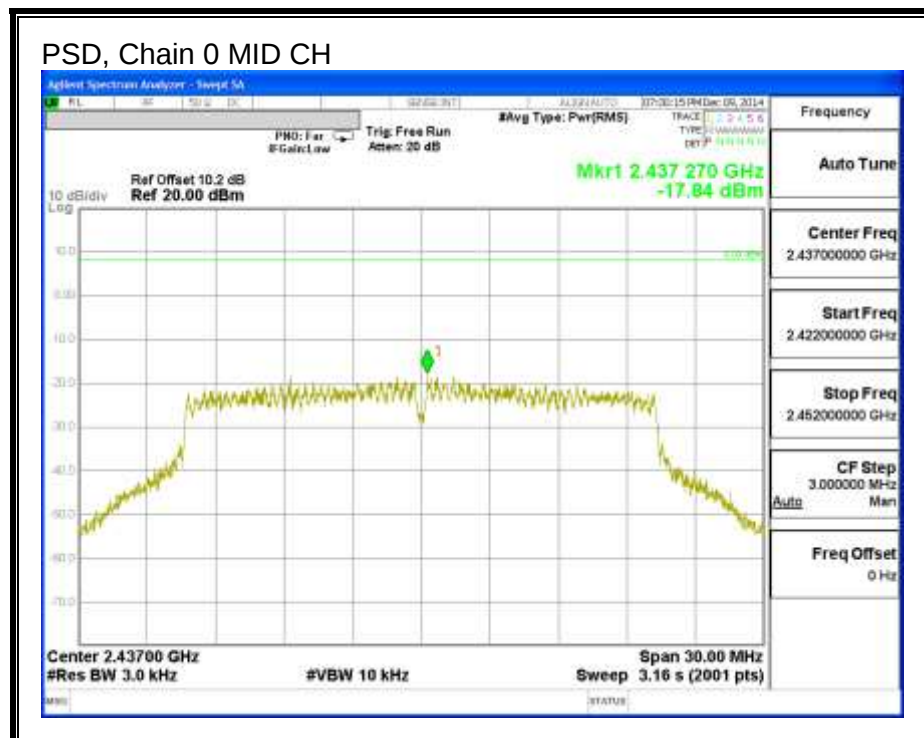
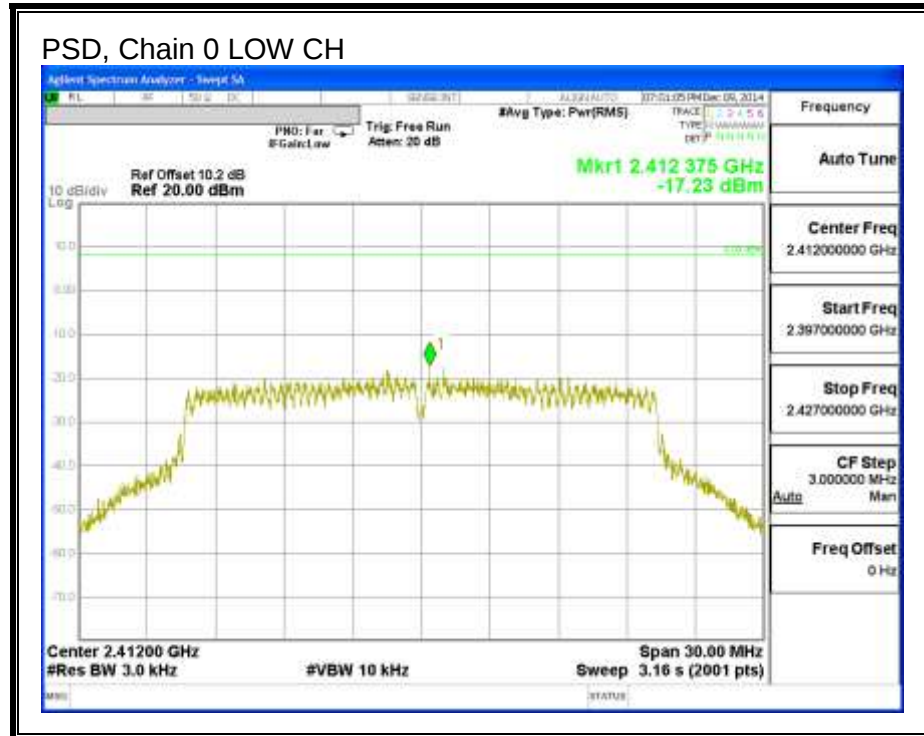
LIMITS

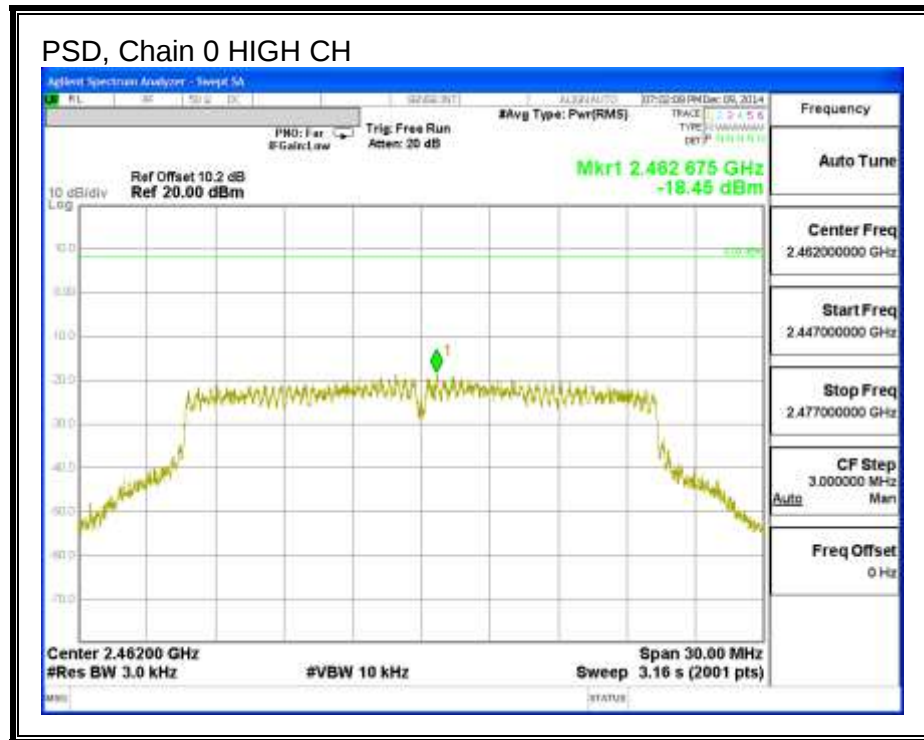
FCC §15.247

RESULTS

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-17.23	-17.23	8.0	-25.2
Mid	2437	-17.84	-17.84	8.0	-25.8
High	2462	-18.45	-18.45	8.0	-26.5





8.2.5. OUT-OF-BAND EMISSIONS

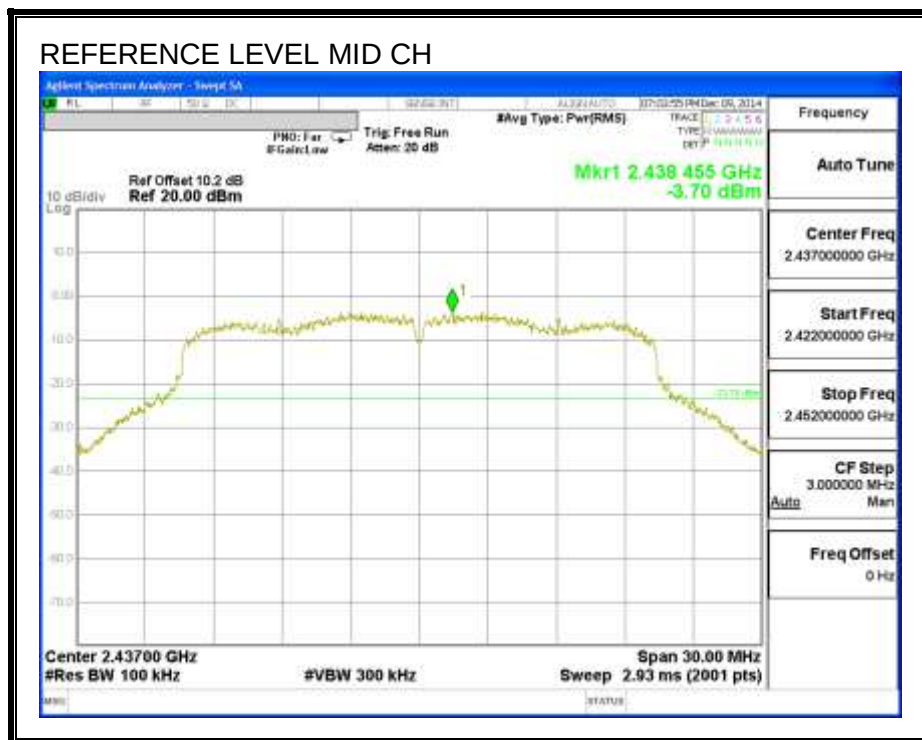
LIMITS

FCC §15.247 (d)

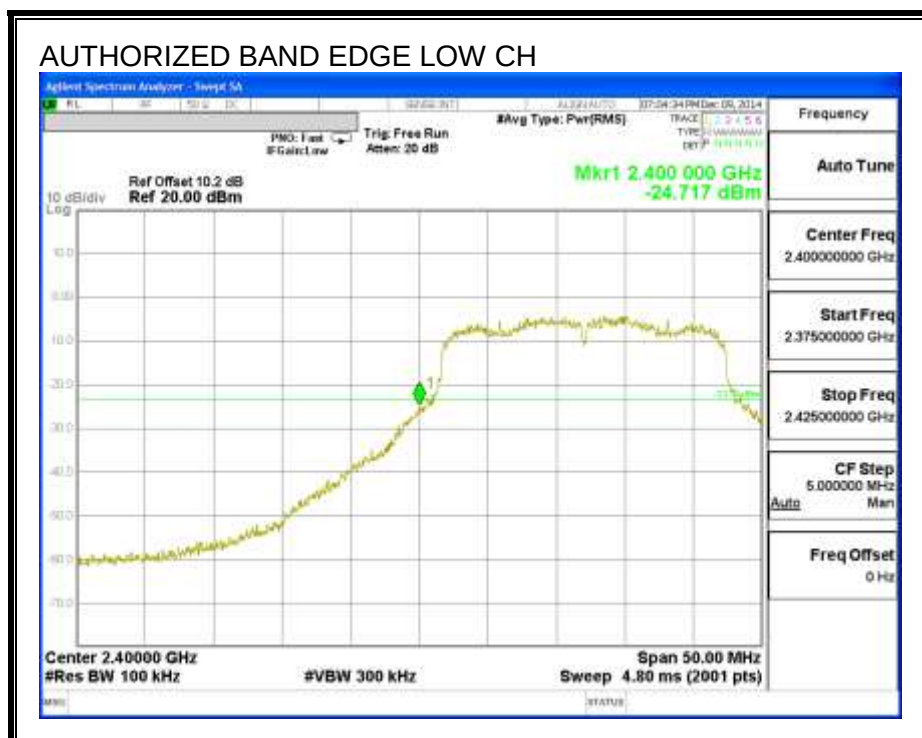
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RESULTS

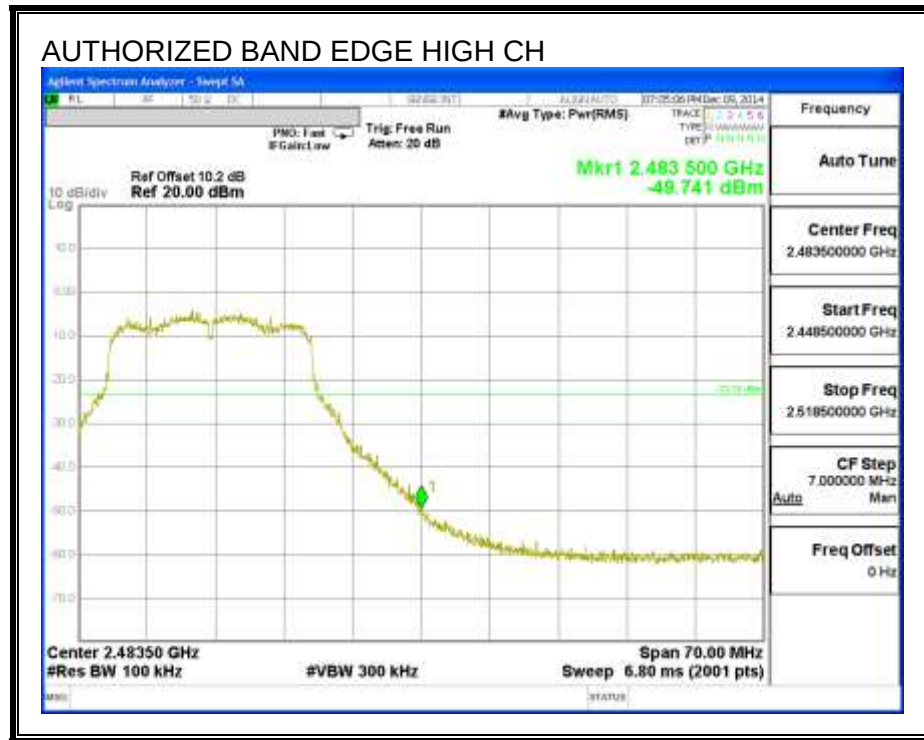
IN-BAND REFERENCE LEVEL



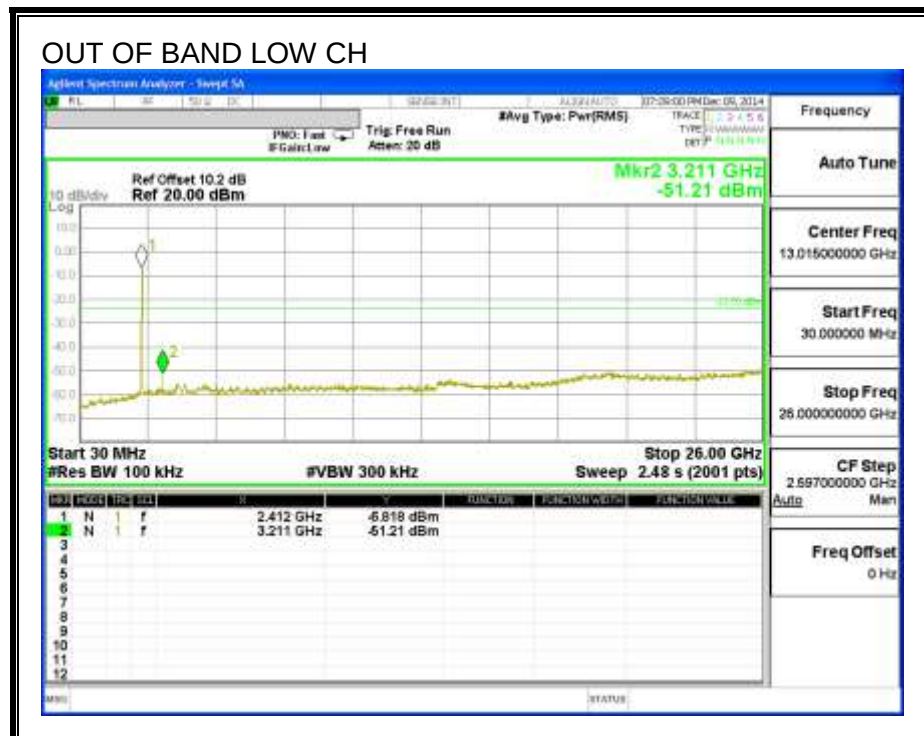
LOW CHANNEL BANDEDGE



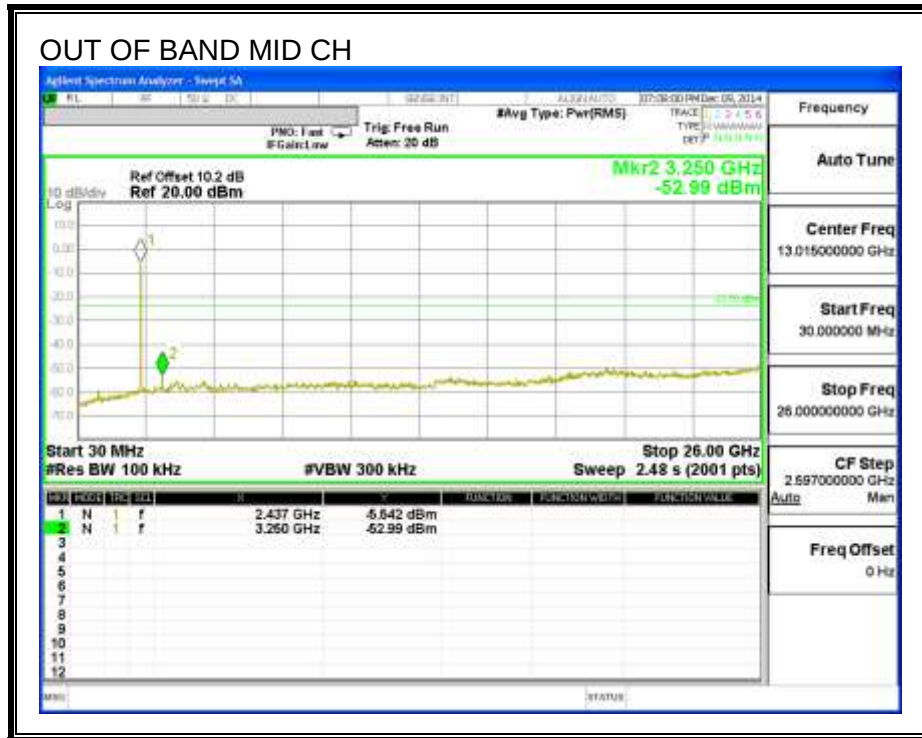
HIGH CHANNEL BANDEDGE



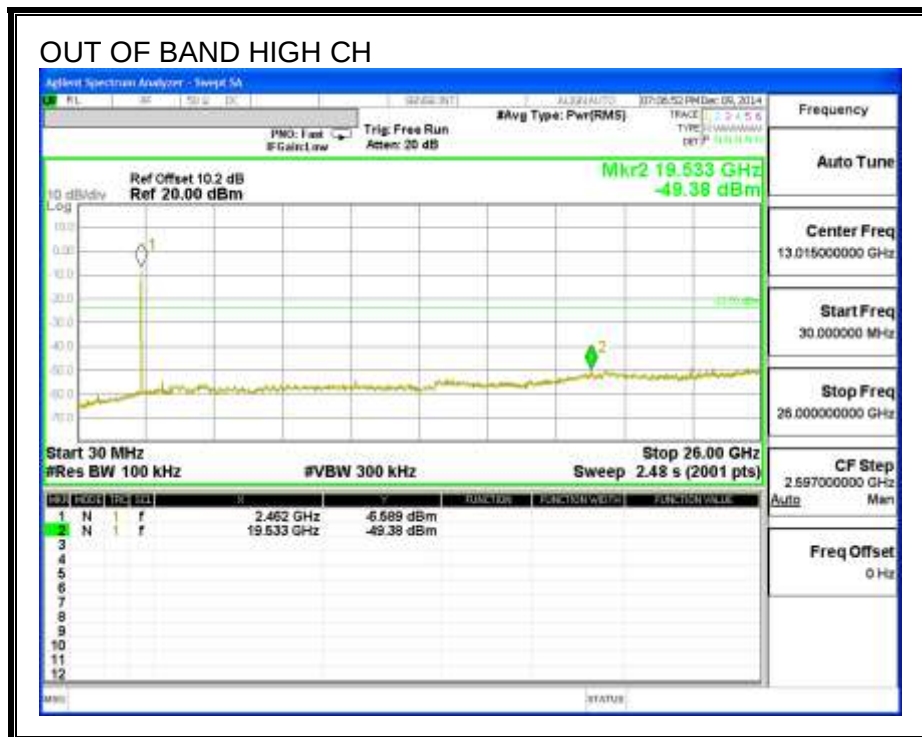
OUT-OF-BAND EMISSIONS



OUT OF BAND MID CH



OUT OF BAND HIGH CH



8.3. 802.11n HT20 MODE IN THE 2.4 GHz BAND

8.3.1. 6 dB BANDWIDTH

LIMITS

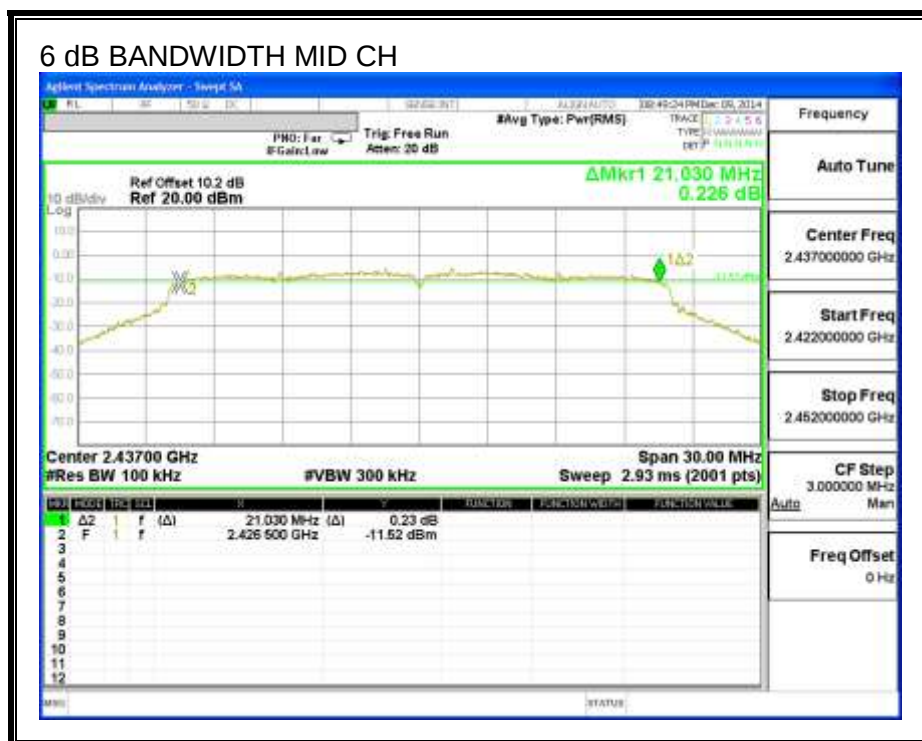
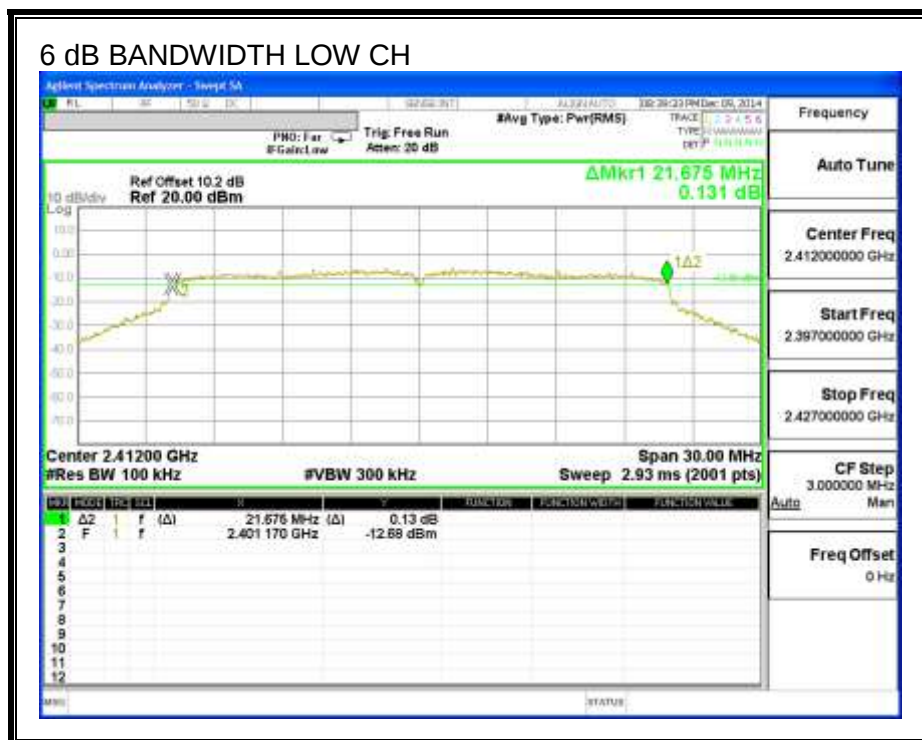
FCC §15.247 (a) (2)

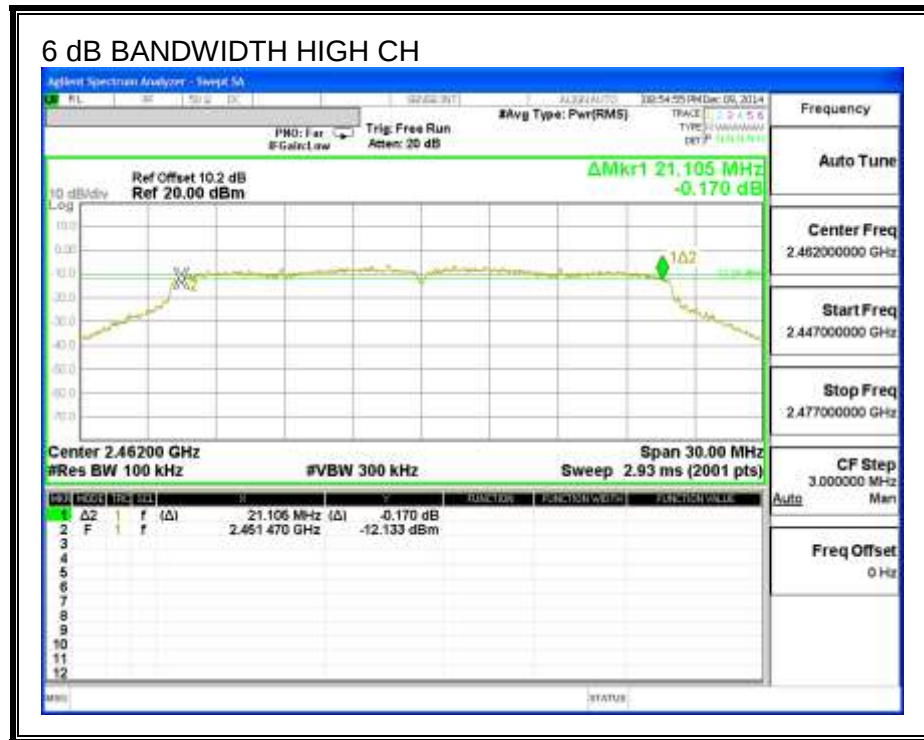
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	21.675	0.5
Mid	2437	21.030	0.5
High	2462	21.105	0.5

6 dB BANDWIDTH





8.3.2. AVERAGE POWER

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	Power (dBm)
Low	2412	6.25
Mid	2437	6.32
High	2462	6.06

8.3.3. OUTPUT POWER

LIMITS

FCC §15.247

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

DIRECTIONAL ANTENNA GAIN

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

RESULTS

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-1.62	30.00	30	36	30.00
Mid	2437	-1.62	30.00	30	36	30.00
High	2462	-1.62	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	17.62	17.62	30.00	-12.38
Mid	2437	17.27	17.27	30.00	-12.73
High	2462	18.32	18.32	30.00	-11.68

8.3.4. POWER SPECTRAL DENSITY

LIMITS

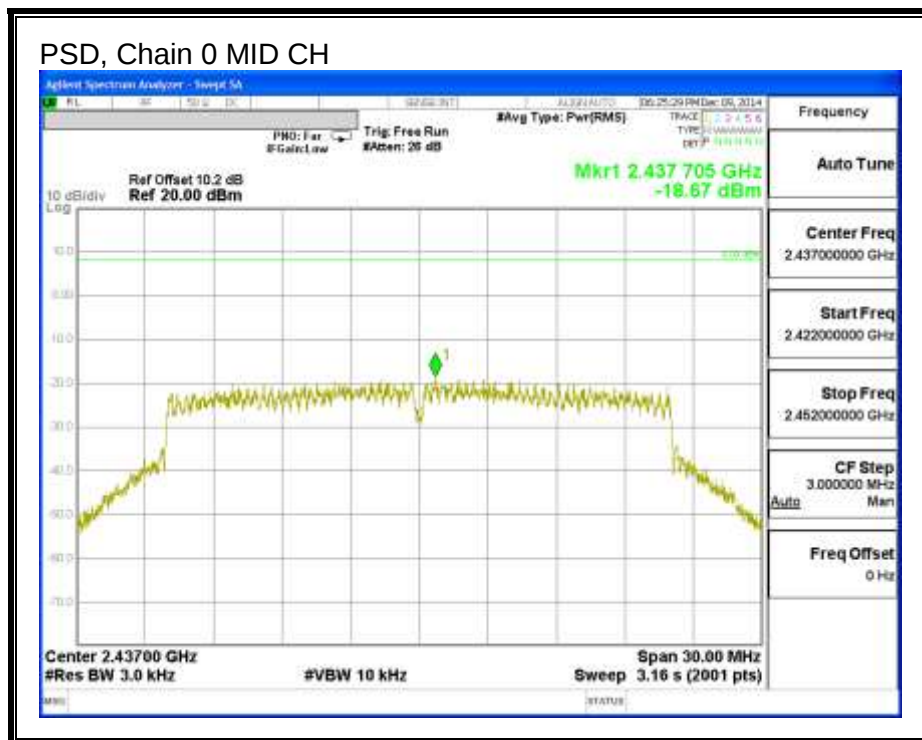
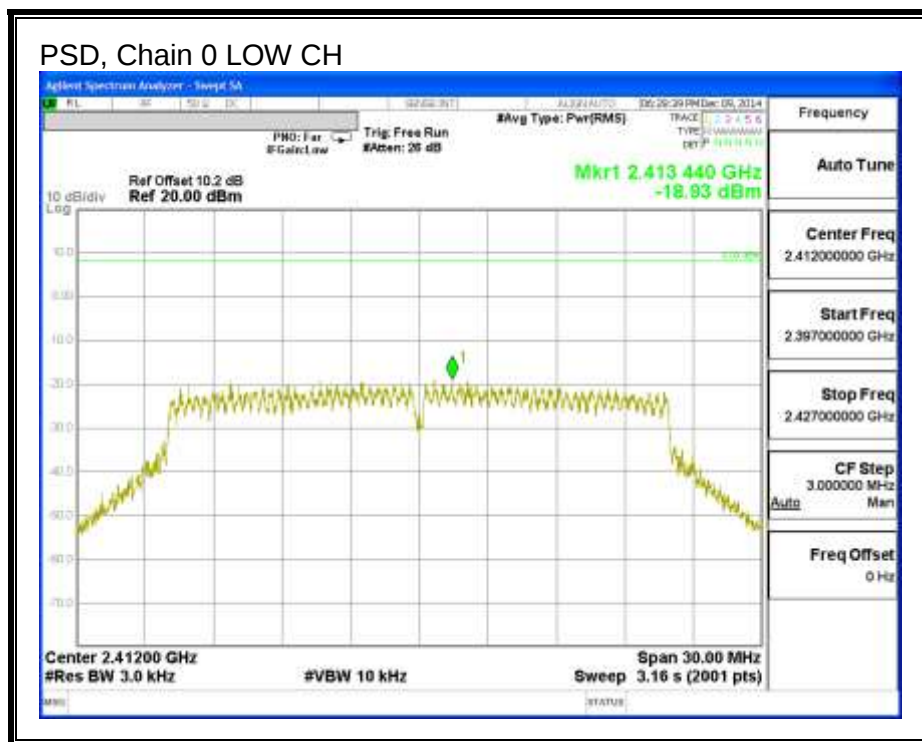
FCC §15.247

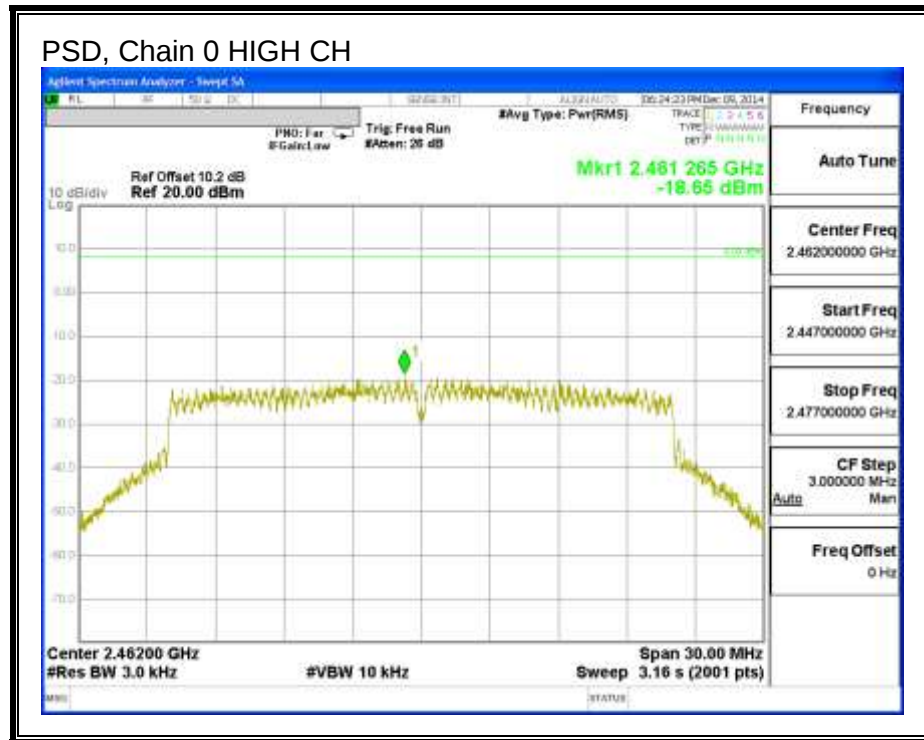
RESULTS

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-18.93	-18.93	8.0	-26.9
Mid	2437	-18.67	-18.67	8.0	-26.7
High	2462	-18.65	-18.65	8.0	-26.7

PSD, Chain 0





8.3.5. OUT-OF-BAND EMISSIONS

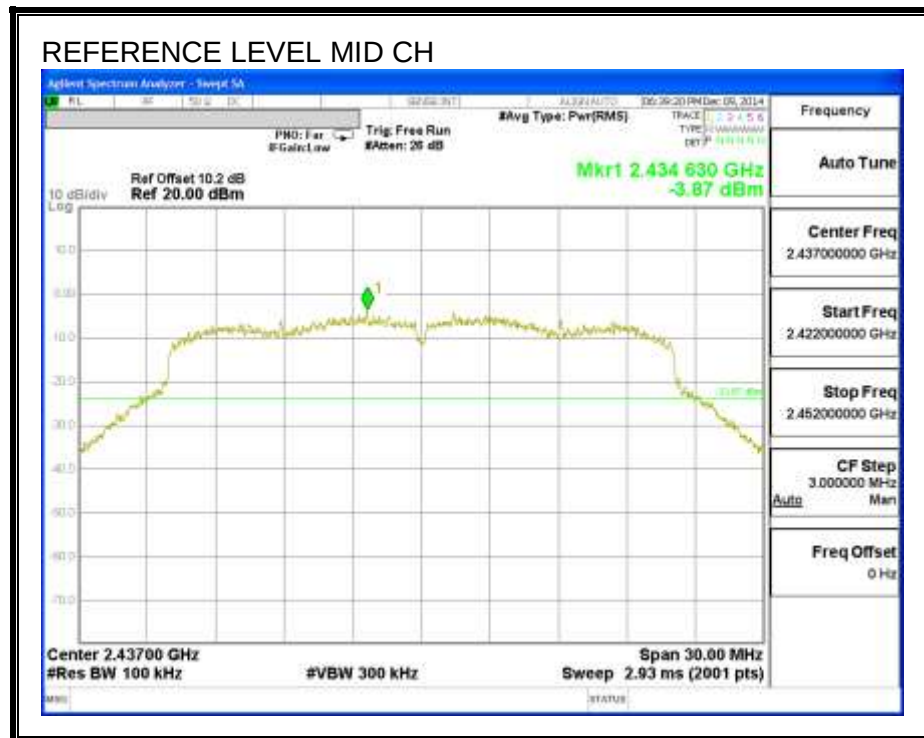
LIMITS

FCC §15.247 (d)

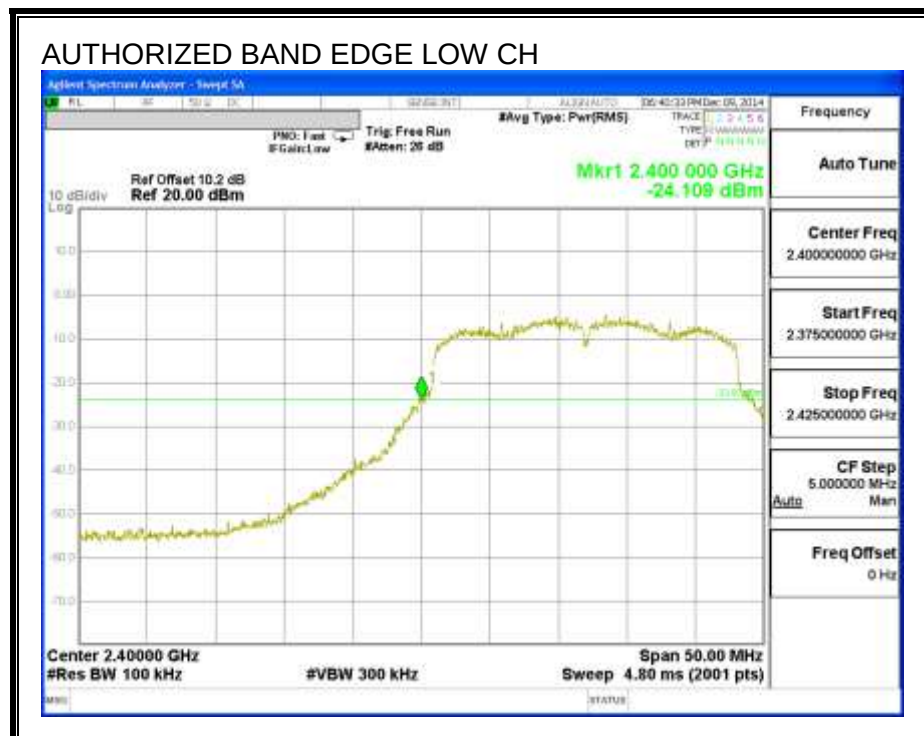
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

RESULTS

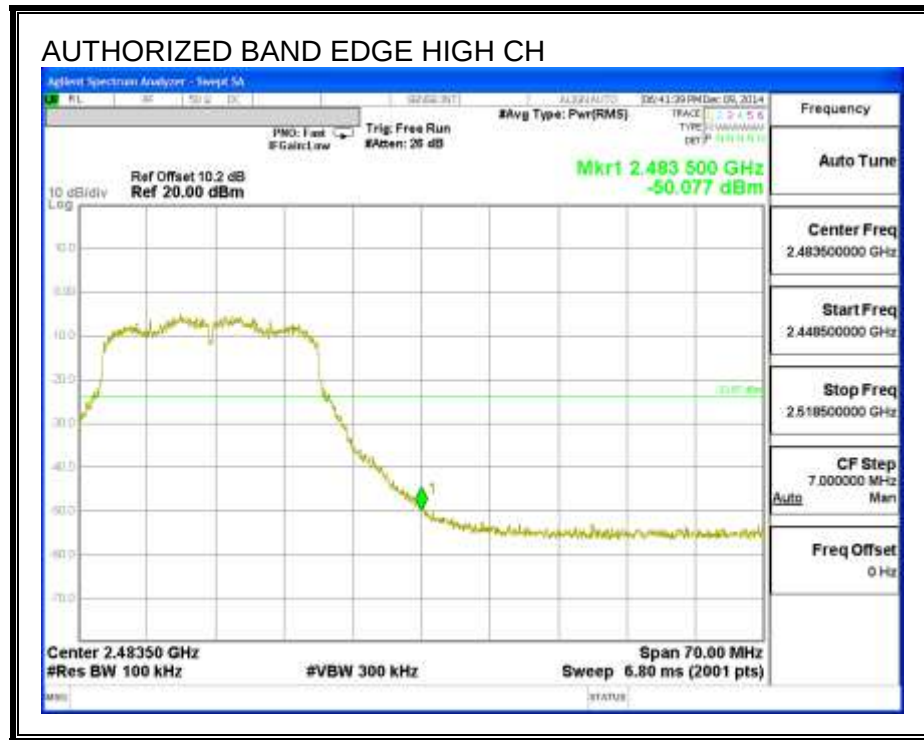
IN-BAND REFERENCE LEVEL



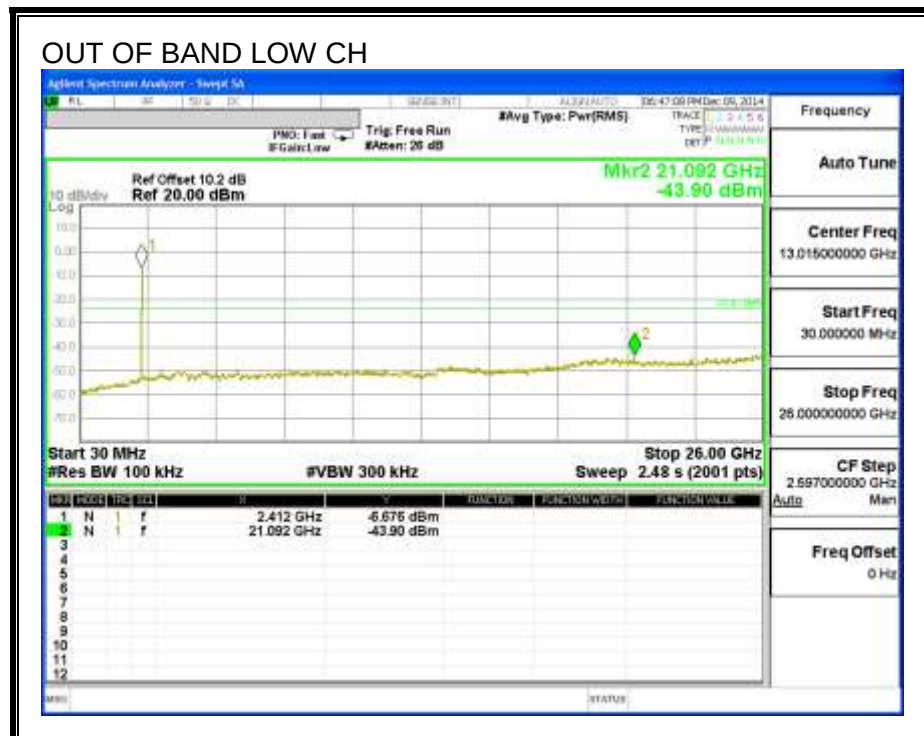
LOW CHANNEL BANDEDGE



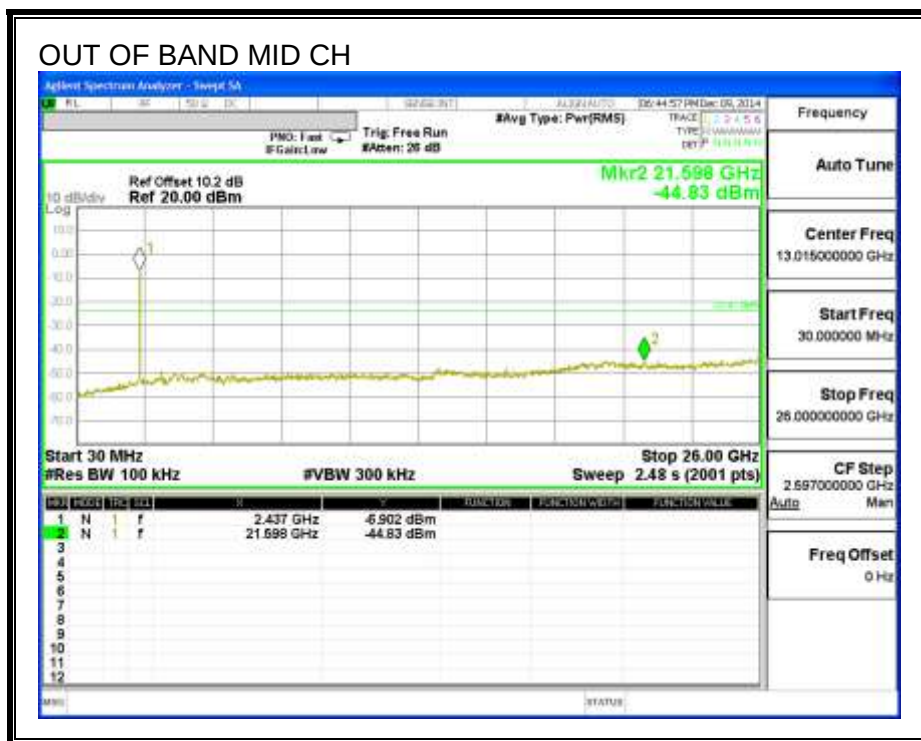
HIGH CHANNEL BANDEDGE



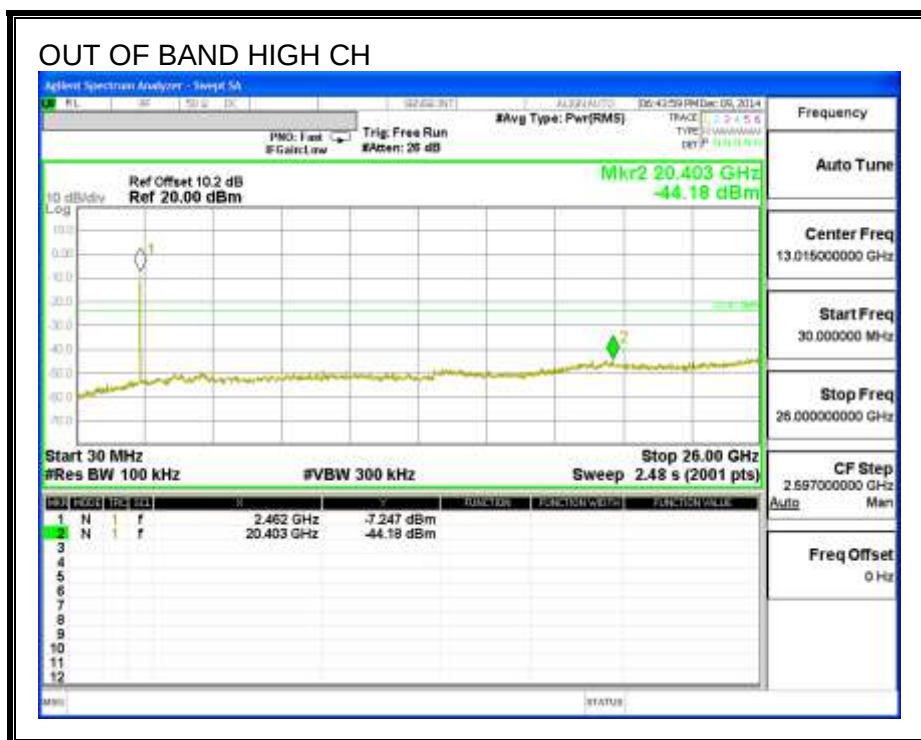
OUT-OF-BAND EMISSIONS



OUT OF BAND MID CH



OUT OF BAND HIGH CH



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 1 MHz for peak measurements and as applicable for average measurements.

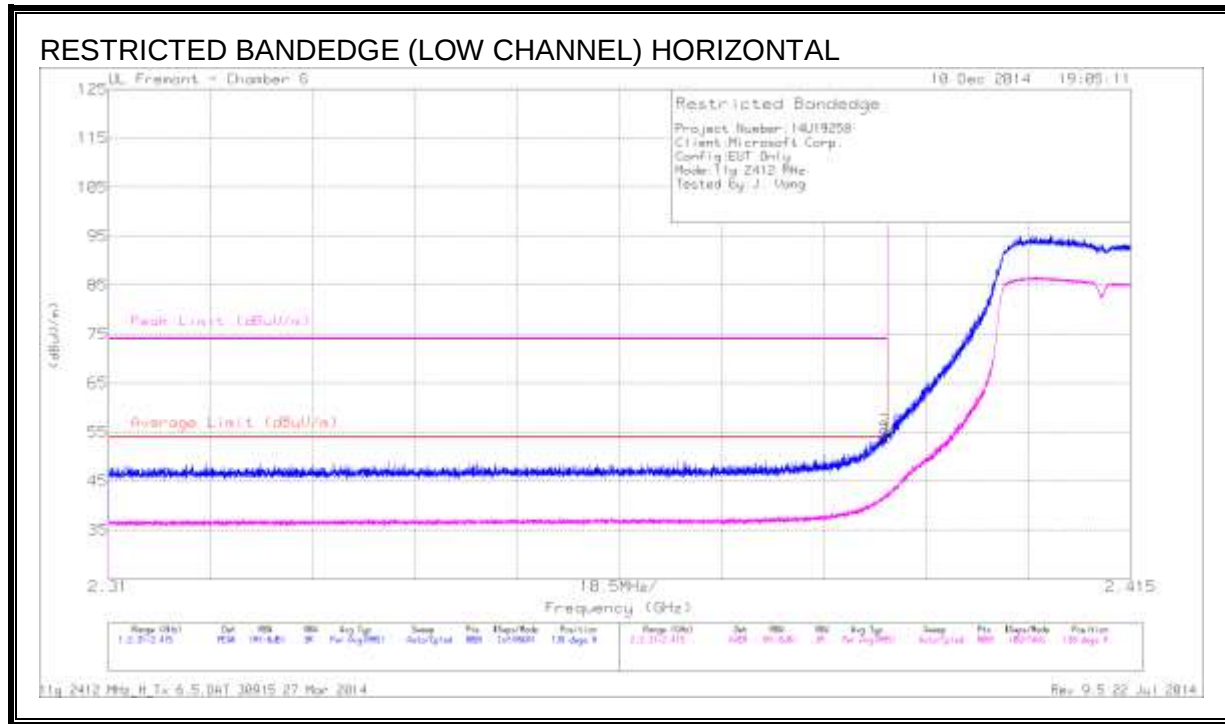
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

9.2. TRANSMITTER ABOVE 1 GHz

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

BANDEDGE (LOW CHANNEL)



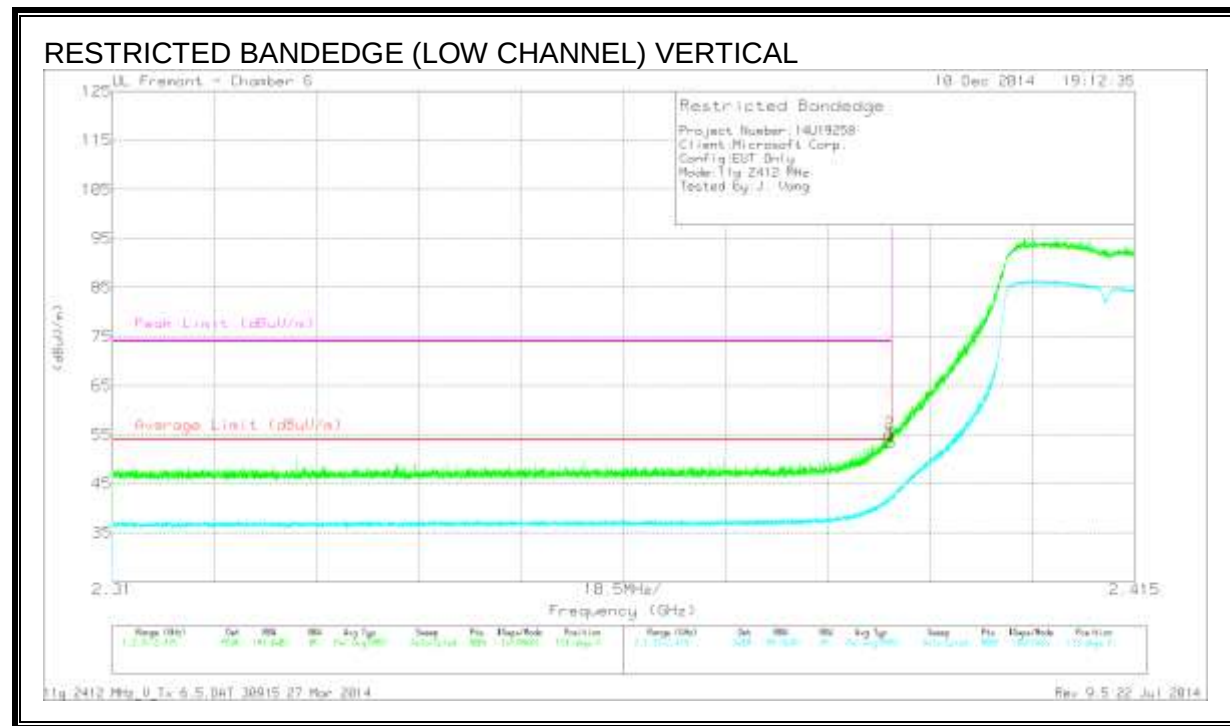
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dBm)	Amp/Cbl/Filt/ 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	47.01	PK	31.8	-24.9	0	53.91	-	-	74	-20.09	138	345	H
2	* 2.39	48.54	PK	31.8	-24.9	0	55.44	-	-	74	-18.56	138	345	H
3	* 2.39	34.93	RMS	31.8	-24.9	.12	41.95	54	-12.05	-	-	138	345	H
4	* 2.39	35.47	RMS	31.8	-24.9	.12	42.49	54	-11.51	-	-	138	345	H

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

PK - Peak detector

RMS - RMS detection



DATA

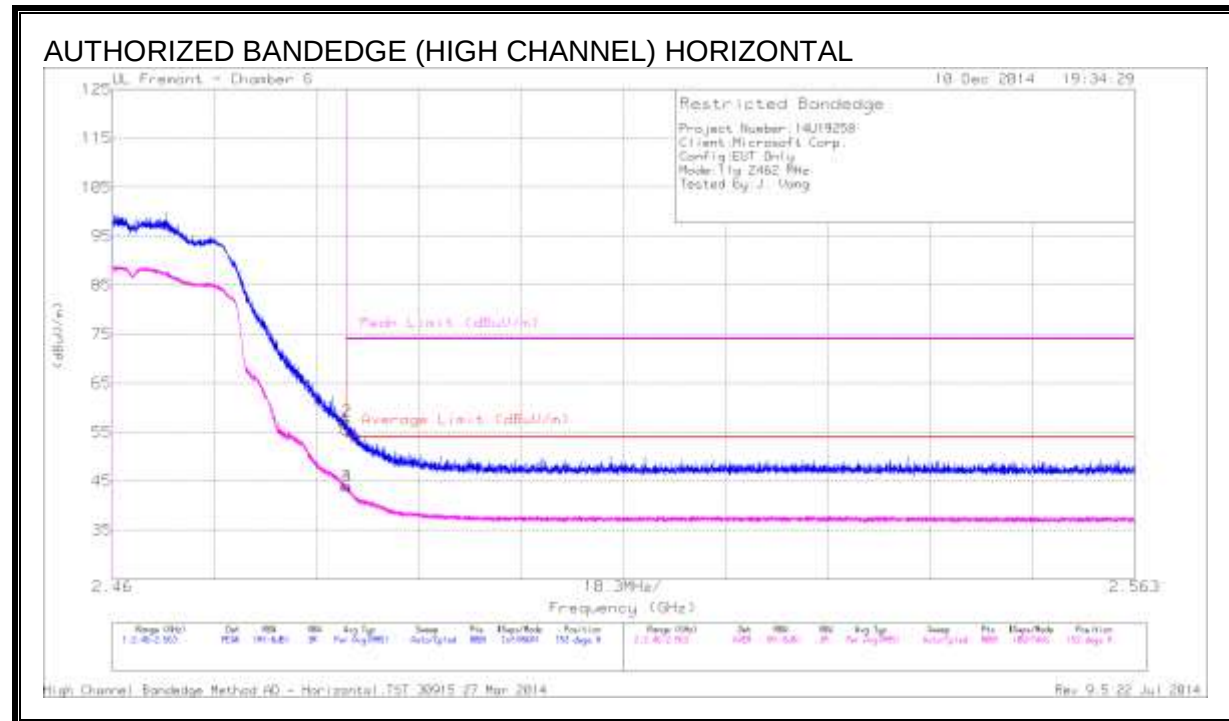
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Ampl/Cbl/FI tri/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.390	46.64	PK	31.8	-24.9	0	53.54	-	-	74	-20.46	113	350	V
2	* 2.390	48.33	PK	31.8	-24.9	0	55.23	-	-	74	-18.77	113	350	V
3	* 2.390	34.91	RMS	31.8	-24.9	.12	41.93	54	-12.07	-	-	113	350	V
4	* 2.390	35.36	RMS	31.8	-24.9	.12	42.38	54	-11.62	-	-	113	350	V

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

PK - Peak detector

RMS - RMS detection

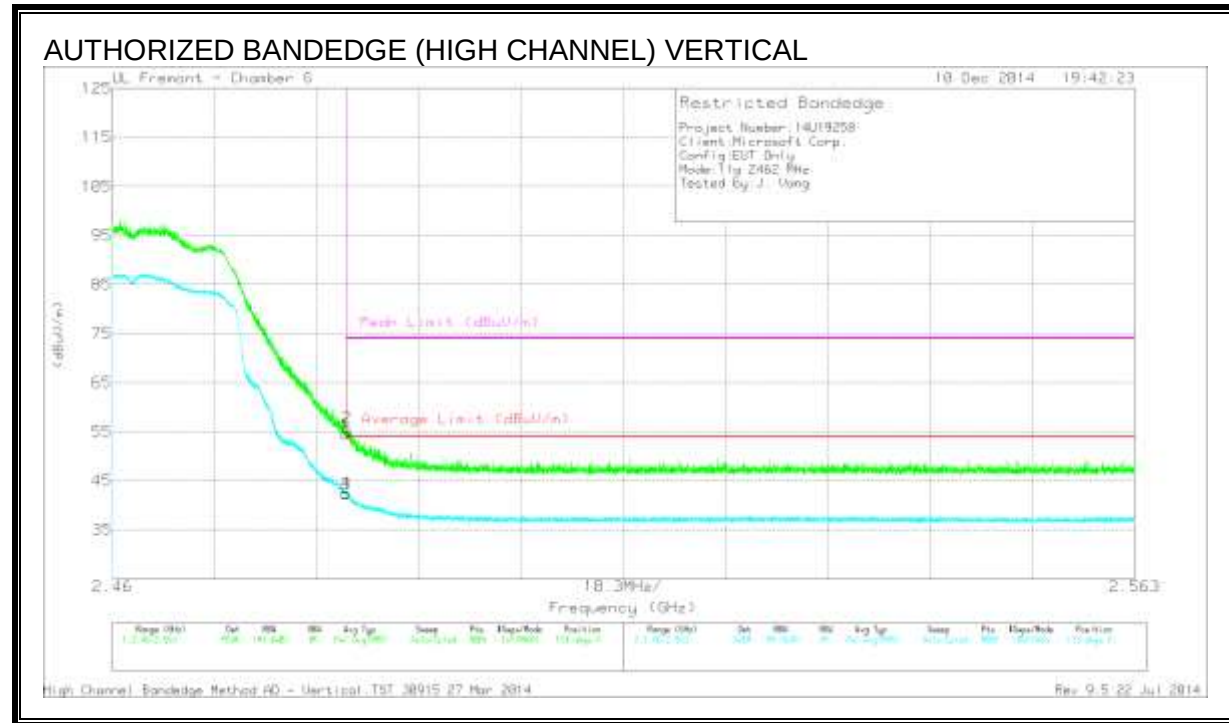
BANDEDGE (HIGH CHANNEL)



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fit 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	48.46	PK	32	-24.9	0	55.56	-	-	74	-18.44	152	214	H
2	* 2.484	50.18	PK	32	-24.9	0	57.28	-	-	74	-16.72	152	214	H
3	* 2.484	36.72	RMS	32	-24.9	.12	43.94	54	-10.06	-	-	152	214	H
4	* 2.484	36.71	RMS	32	-24.9	.12	43.93	54	-10.07	-	-	152	214	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK - Peak detector
RMS - RMS detection



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Ampl/Cbl/FI tri/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	47.37	PK	32	-24.9	0	54.47	-	-	74	-19.53	113	265	V
2	* 2.484	48.61	PK	32	-24.9	0	55.71	-	-	74	-18.29	113	265	V
3	* 2.484	35.10	RMS	32	-24.9	.12	42.32	54	-11.68	-	-	113	265	V
4	* 2.484	35.21	RMS	32	-24.9	.12	42.43	54	-11.57	-	-	113	265	V

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

PK - Peak detector

RMS - RMS detection

DATA

Radiated Emissions

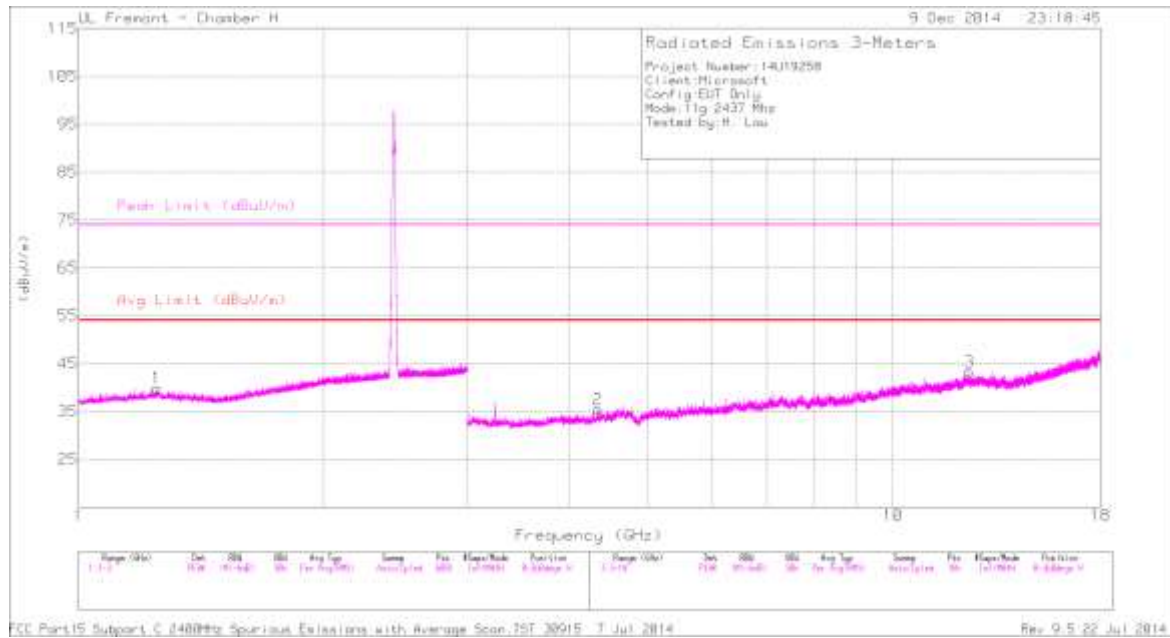
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.335	44.14	PK2	31.7	-25	0	50.84	-	-	74	-23.16	358	342	H
* 2.334	31.96	MAv1	31.7	-25	.12	38.78	54	-15.22	-	-	358	342	H
* 2.828	43.52	PK2	32.3	-24.8	0	51.02	-	-	74	-22.98	13	194	H
* 2.825	31.65	MAv1	32.3	-24.9	.12	39.17	54	-14.83	-	-	13	194	H
* 1.530	43.98	PK2	28.1	-25.6	0	46.48	-	-	74	-27.52	189	197	V
* 1.532	31.96	MAv1	28.1	-25.6	.12	34.58	54	-19.42	-	-	189	197	V
* 4.964	41.75	PK2	34.1	-32.9	0	42.95	-	-	74	-31.05	6	149	H
* 4.962	30.07	MAv1	34.1	-32.9	.12	31.39	54	-22.61	-	-	6	149	H
* 11.276	35.99	PK2	38.0	-26.0	0	47.99	-	-	74	-26.01	25	260	V
* 11.277	24.88	MAv1	38.0	-26.0	.12	37.00	54	-17.00	-	-	25	260	V
3.216	44.45	PK2	32.9	-33.9	0	43.45	-	-	-	-	128	273	V

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

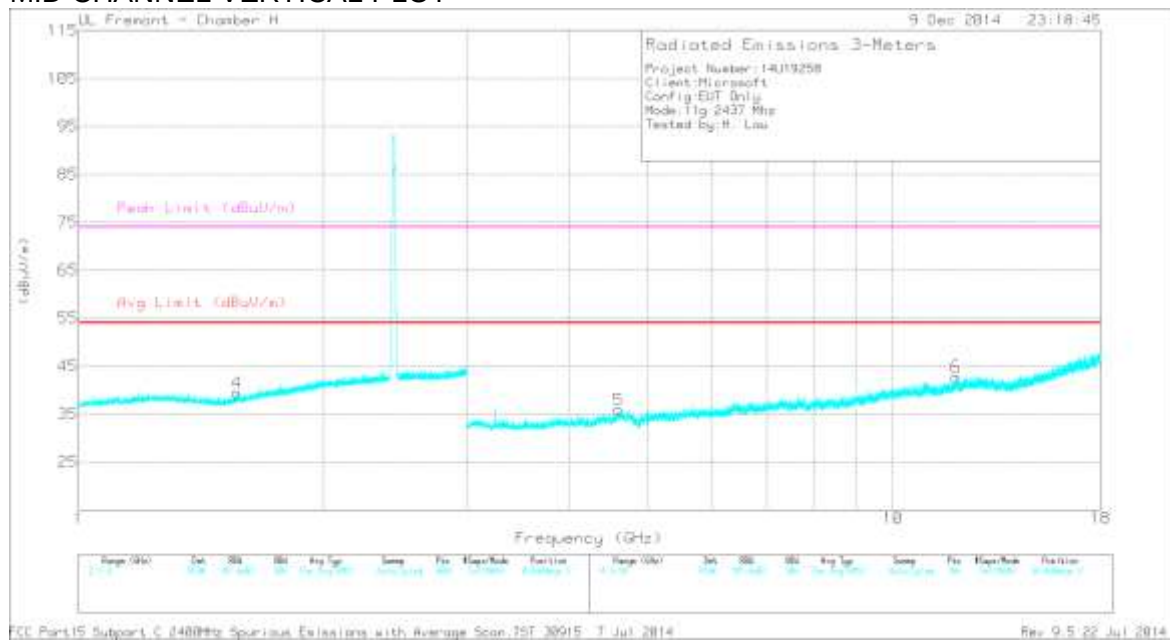
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT

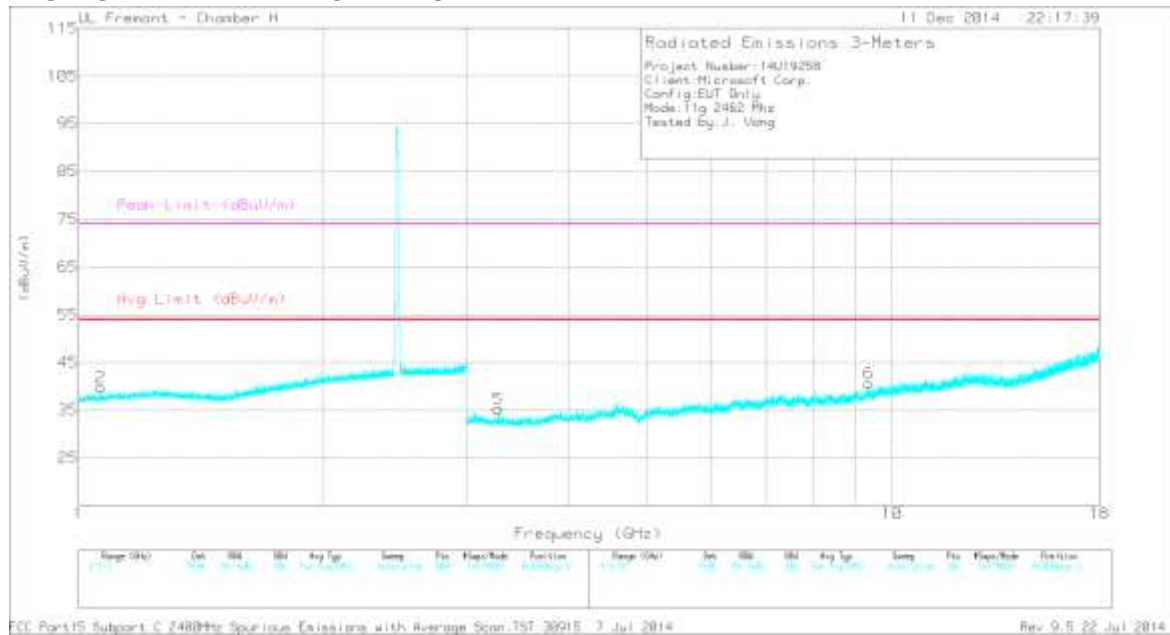
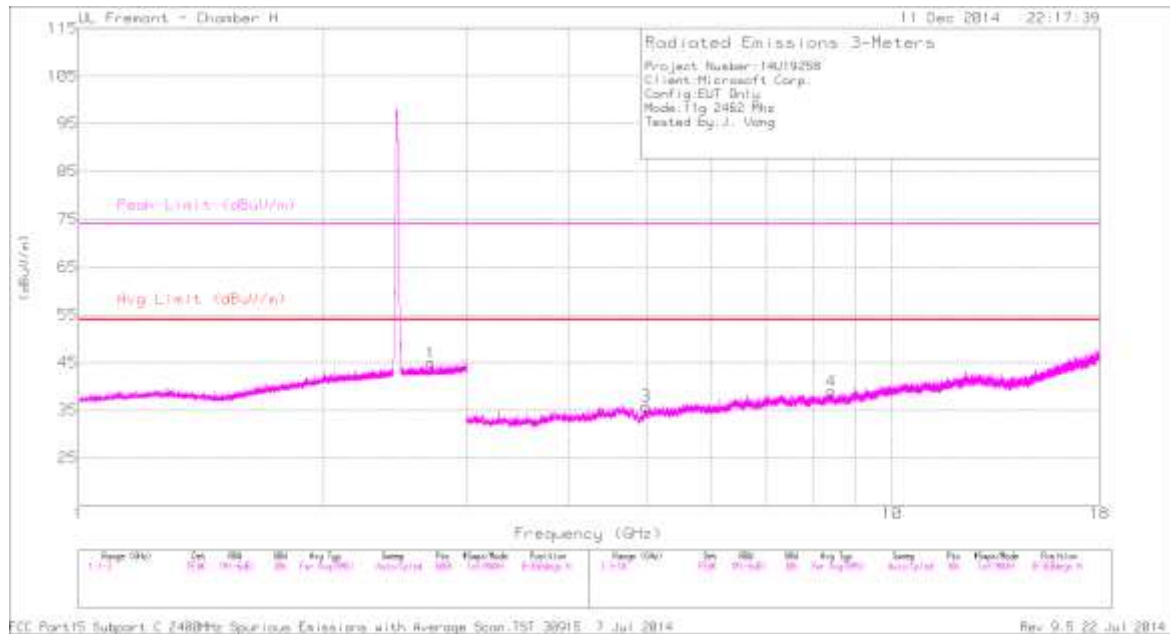


DATA

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl /Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.246	43.80	PK2	29.0	-25.9	0	46.90	-	-	74	-27.10	300	115	H
* 1.246	32.64	MAv1	29.0	-25.9	.12	35.86	54	-18.14	-	-	300	115	H
* 4.343	41.11	PK2	33.7	-32.0	0	42.81	-	-	74	-31.19	196	224	H
* 4.343	29.97	MAv1	33.7	-32.0	.12	31.79	54	-22.21	-	-	196	224	H
* 12.405	36.92	PK2	39.1	-25.9	0	50.12	-	-	74	-23.88	220	117	H
* 12.404	25.74	MAv1	39.1	-25.9	.12	39.06	54	-14.94	-	-	220	117	H
* 1.564	43.17	PK2	28.2	-25.2	0	46.17	-	-	74	-27.83	263	182	V
* 1.565	32.25	MAv1	28.2	-25.2	.12	35.37	54	-18.63	-	-	263	182	V
* 4.601	42.22	PK2	34.1	-32.4	0	43.92	-	-	74	-30.08	255	128	V
* 4.601	31.09	MAv1	34.1	-32.4	.12	32.91	54	-21.09	-	-	255	128	V
* 11.955	36.25	PK2	38.7	-24.9	0	50.05	-	-	74	-23.95	193	100	V
* 11.954	25.08	MAv1	38.7	-24.9	.12	39.00	54	-15.00	-	-	193	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average



DATA

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl /Ftr/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
* 2.710	43.35	PK2	32.3	-24.3	0	51.35	-	-	74	-22.65	46	306	H
* 2.711	31.52	MAv1	32.3	-24.3	.12	39.64	54	-14.36	-	-	46	306	H
* 1.066	43.81	PK2	28.0	-25.8	0	46.01	-	-	74	-27.99	215	156	V
* 1.067	32.04	MAv1	28.0	-25.8	.12	34.36	54	-19.64	-	-	215	156	V
* 4.981	40.10	PK2	34.3	-31.9	0	42.50	-	-	74	-31.5	184	102	H
* 4.980	29.01	MAv1	34.3	-31.9	.12	31.53	54	-22.47	-	-	184	102	H
* 8.416	38.14	PK2	36.1	-27.6	0	46.64	-	-	74	-27.36	20	151	H
* 8.415	26.56	MAv1	36.1	-27.6	.12	35.18	54	-18.82	-	-	20	151	H
* 9.368	35.99	PK2	36.7	-26.4	0	46.29	-	-	74	-27.71	280	132	V
* 9.370	25.29	MAv1	36.7	-26.4	.12	35.71	54	-18.29	-	-	280	132	V
3.283	42.63	PK2	32.9	-32.5	0	43.03	-	-	-	-	262	196	V

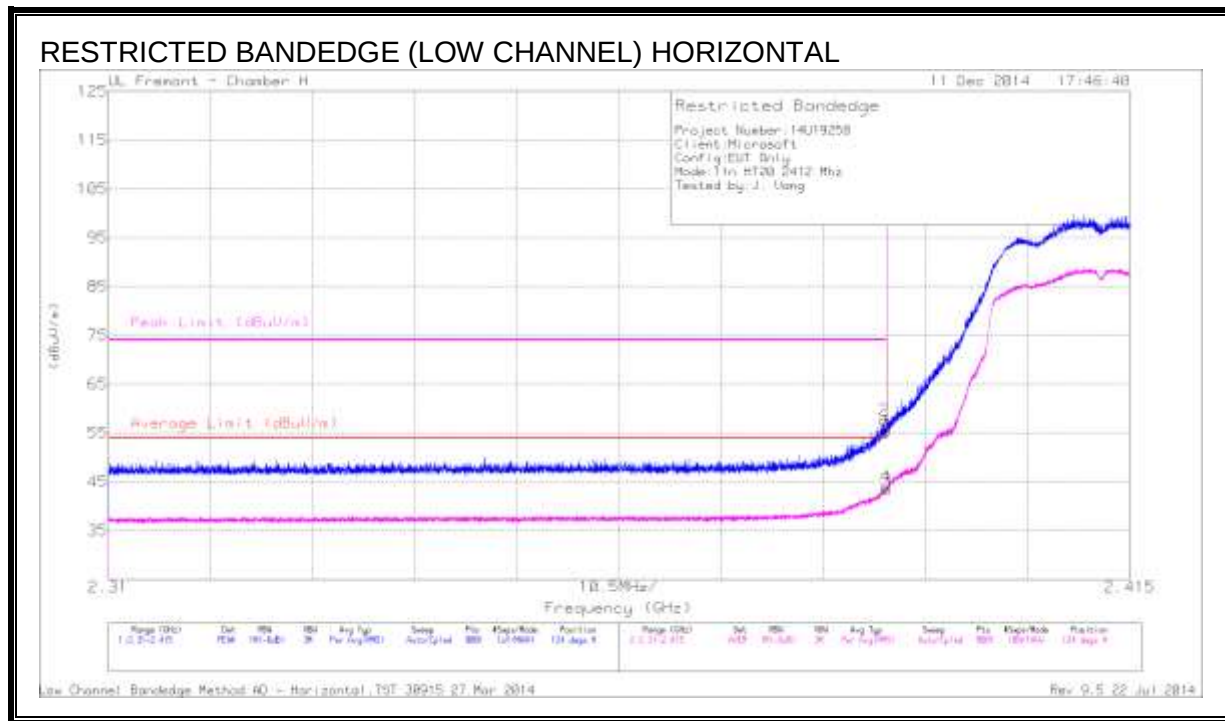
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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

BANDEDGE (LOW CHANNEL)



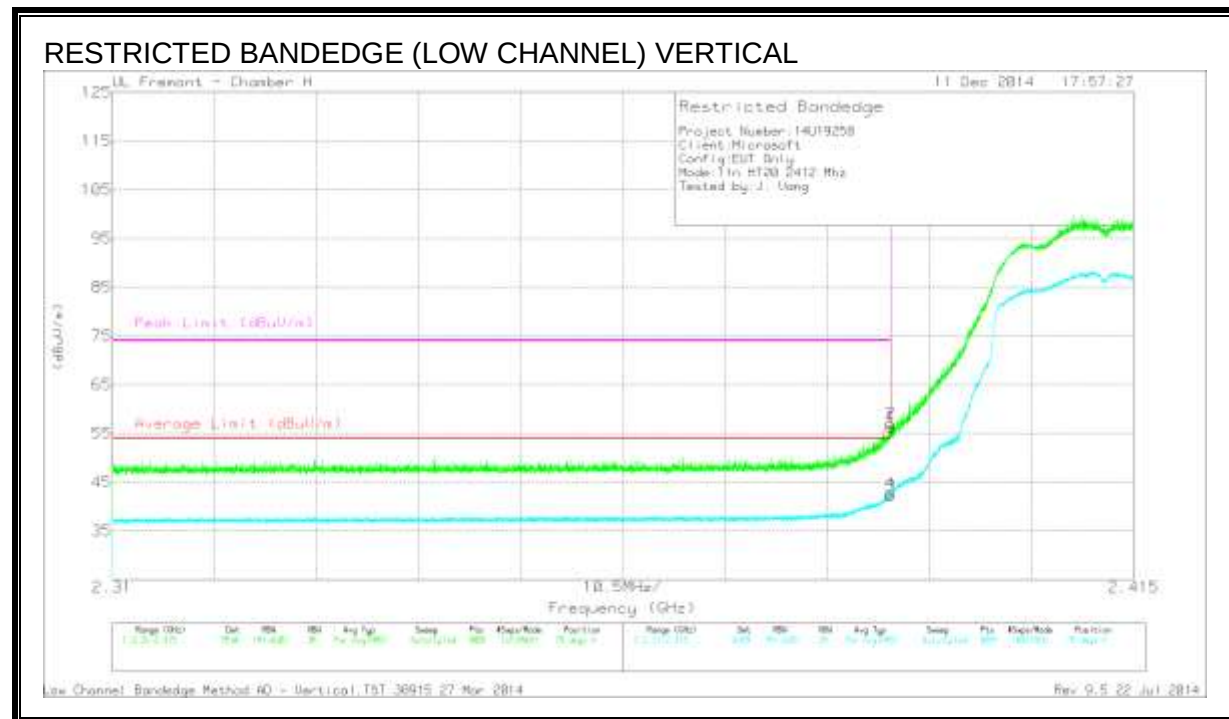
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dBm)	Amp/Cbl/FI tr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	* 2.390	48.06	PK	32	-24.6	0	55.46	-	-	74	-18.54	124	272	H
2	* 2.390	50.16	PK	32	-24.6	0	57.56	-	-	74	-16.44	124	272	H
3	* 2.390	35.85	RMS	32	-24.6	.13	43.38	54	-10.62	-	-	124	272	H
4	* 2.390	36.50	RMS	32	-24.6	.13	44.03	54	-9.97	-	-	124	272	H

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

PK - Peak detector

RMS - RMS detection



DATA

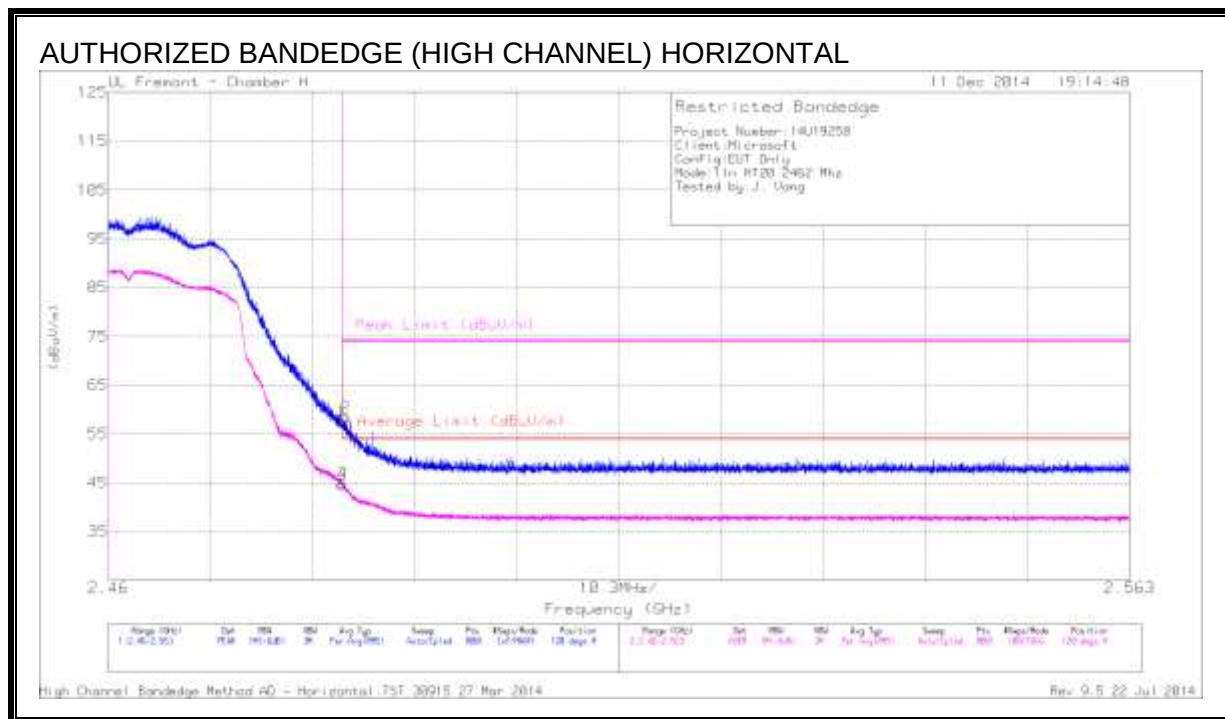
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dBm)	Amp/Cbl/FI tr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.390	49.00	PK	32	-24.6	0	56.40	-	-	74	-17.6	79	277	V
2	* 2.390	49.74	PK	32	-24.6	0	57.14	-	-	74	-16.86	79	277	V
3	* 2.390	34.71	RMS	32	-24.6	.13	42.24	54	-11.76	-	-	79	277	V
4	* 2.390	35.14	RMS	32	-24.6	.13	42.67	54	-11.33	-	-	79	277	V

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

PK - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL)



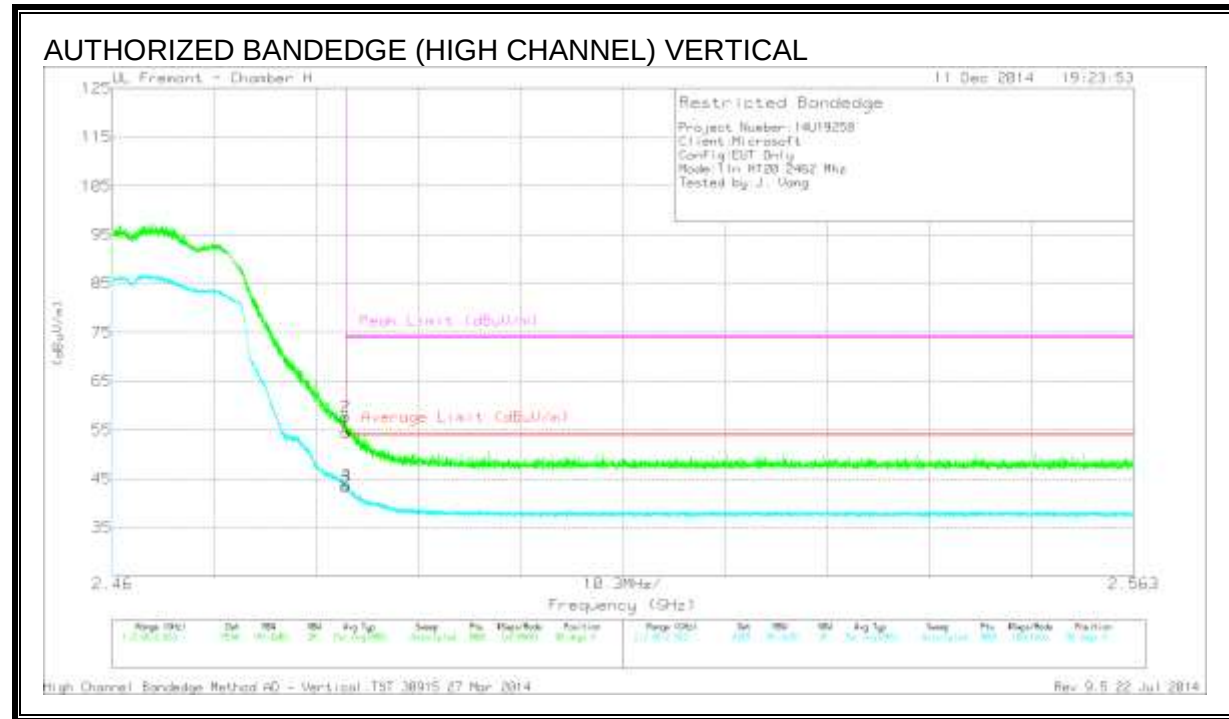
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Ampl/Cbl/FI tr/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	49.96	PK	32.2	-24.5	0	57.66	-	-	74	-16.34	120	260	H
2	* 2.484	50.7	PK	32.2	-24.5	0	58.40	-	-	74	-15.60	120	260	H
3	* 2.484	36.9	RMS	32.2	-24.5	.13	44.73	54	-9.27	-	-	120	260	H
4	* 2.484	37.05	RMS	32.2	-24.5	.13	44.88	54	-9.12	-	-	120	260	H

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

PK - Peak detector

RMS - RMS detection



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dBm)	Amp/Cbl/FI tr/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	46.84	PK	32.2	-24.5	0	54.54	-	-	74	-19.46	96	322	V
2	* 2.484	49.99	PK	32.2	-24.5	0	57.69	-	-	74	-16.31	96	322	V
3	* 2.484	35.61	RMS	32.2	-24.5	.13	43.44	54	-10.56	-	-	96	322	V
4	* 2.484	35.93	RMS	32.2	-24.5	.13	43.76	54	-10.24	-	-	96	322	V

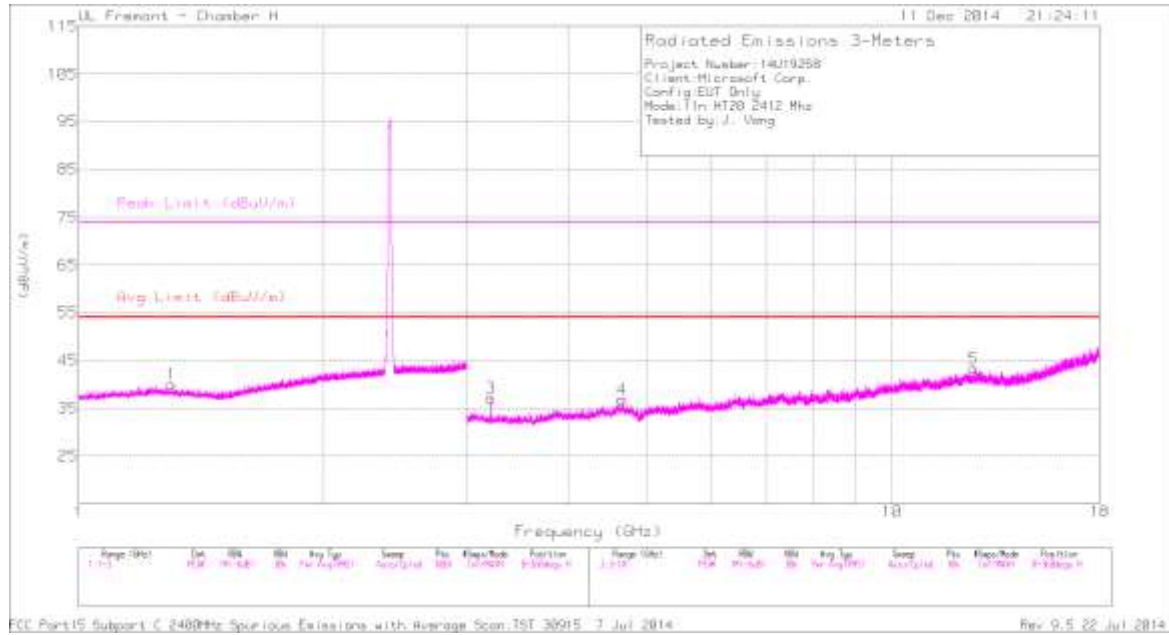
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



DATA

Radiated Emissions

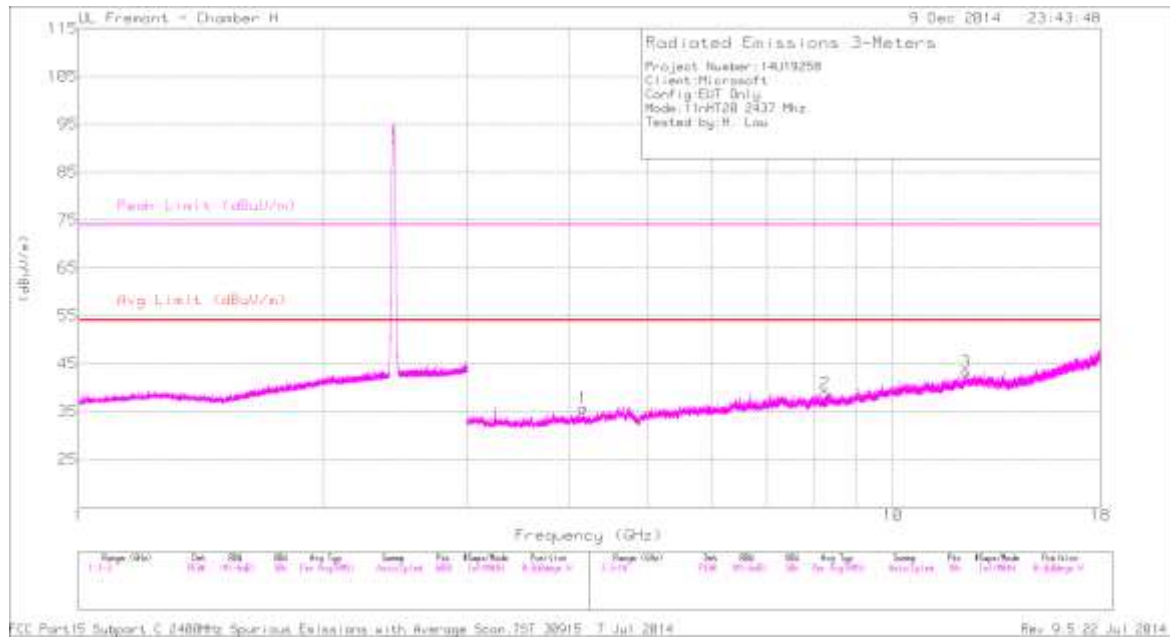
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl /Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.300	43.77	PK2	28.7	-25.8	0	46.67	-	-	74	-27.33	39	258	H
* 1.301	32.16	MAv1	28.7	-25.8	.13	35.19	54	-18.81	-	-	39	258	H
* 2.807	43.03	PK2	32.4	-24.3	0	51.13	-	-	74	-22.87	288	173	V
* 2.806	31.40	MAv1	32.4	-24.3	.13	39.63	54	-14.37	-	-	288	173	V
* 4.661	41.37	PK2	34.2	-31.9	0	43.67	-	-	74	-30.33	3	226	H
* 4.659	29.98	MAv1	34.2	-31.9	.13	32.41	54	-21.59	-	-	3	226	H
* 12.592	36.17	PK2	39.2	-25.2	0	50.17	-	-	74	-23.83	0	210	H
* 12.592	24.69	MAv1	39.2	-25.2	.13	38.82	54	-15.18	-	-	0	210	H
3.216	44.59	PK2	32.9	-33.5	0	43.99	-	-	-	-	126	274	H
3.216	44.72	PK2	32.9	-33.5	0	44.12	-	-	-	-	109	231	V

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

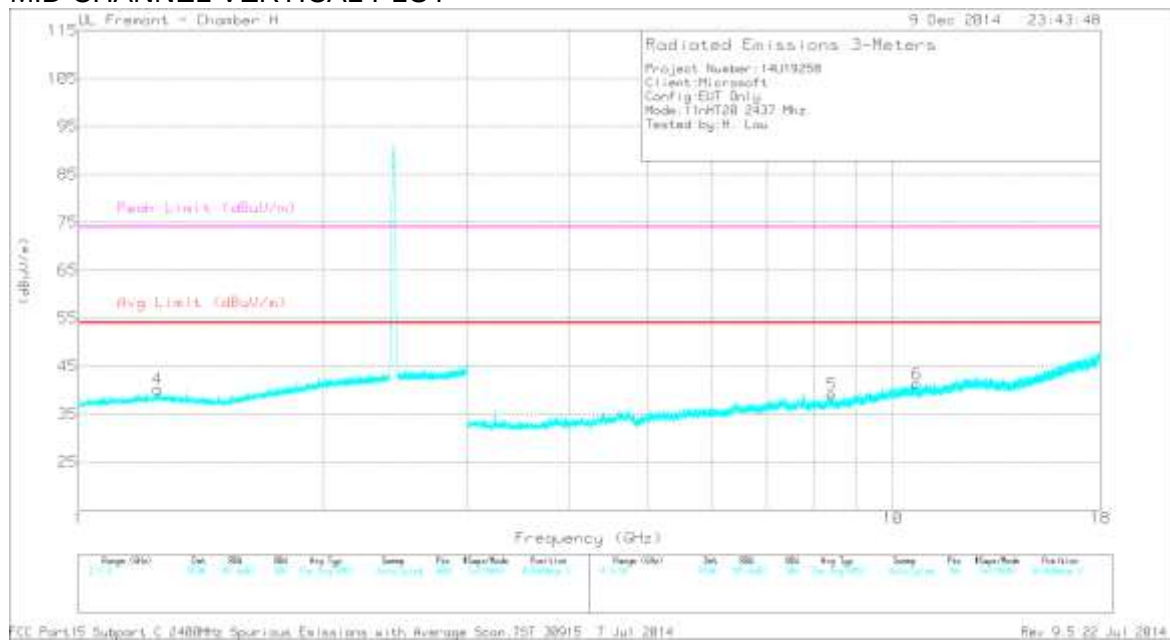
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT



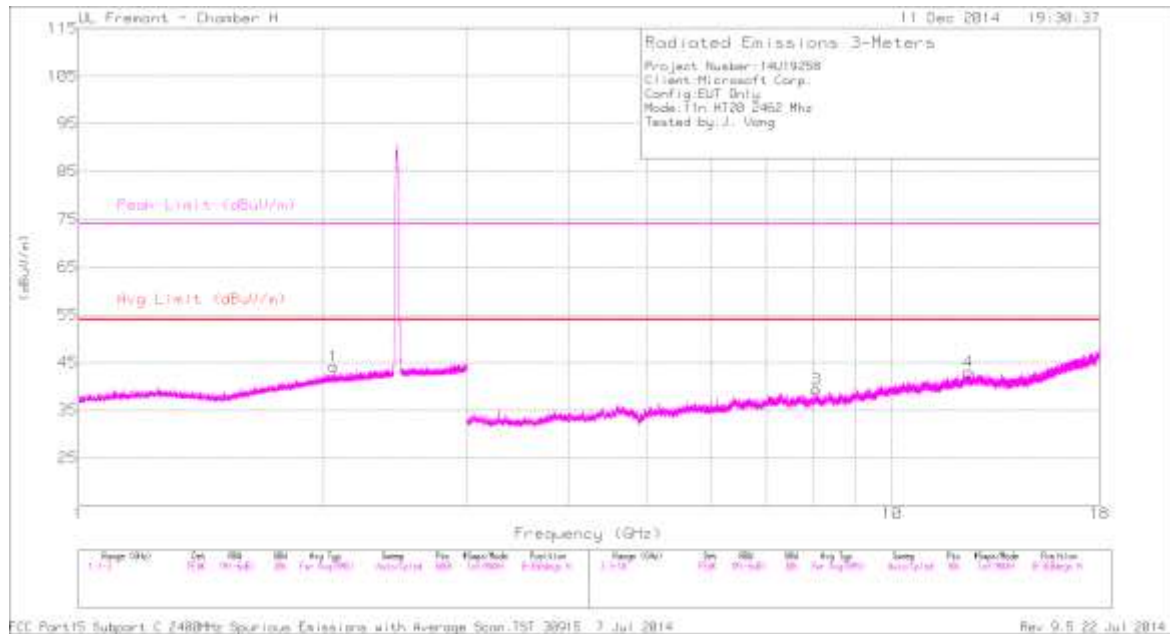
DATA

Radiated Emissions

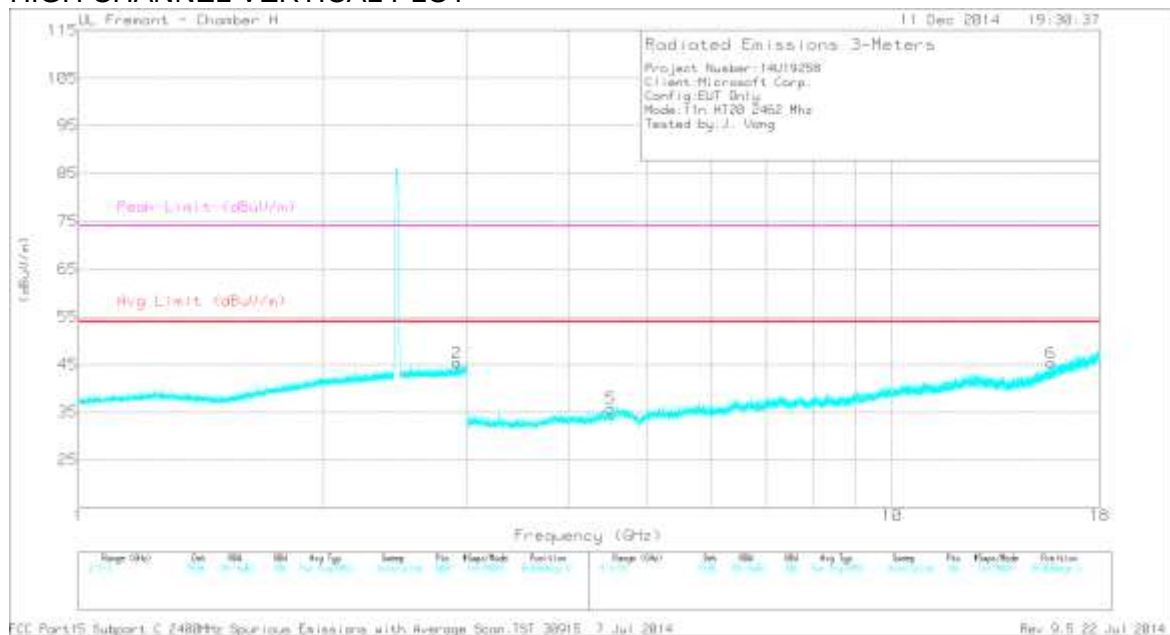
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl /Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.169	41.79	PK2	33.5	-32.5	0	42.79	-	-	74	-31.21	268	227	H
* 4.169	30.23	MAv1	33.5	-32.5	.13	31.36	54	-22.64	-	-	268	227	H
* 8.264	39.17	PK2	36.1	-28.7	0	46.57	-	-	74	-27.43	220	161	H
* 8.264	27.19	MAv1	36.1	-28.7	.13	34.72	54	-19.28	-	-	220	161	H
* 12.297	36.59	PK2	39.0	-24.9	0	50.69	-	-	74	-23.31	285	118	H
* 12.296	25.11	MAv1	39.0	-24.9	.13	39.34	54	-14.66	-	-	285	118	H
* 1.249	43.62	PK2	29.0	-25.9	0	46.72	-	-	74	-27.28	337	125	V
* 1.250	32.68	MAv1	29.0	-25.9	.13	35.91	54	-18.09	-	-	337	125	V
* 8.418	38.58	PK2	36.1	-27.6	0	47.08	-	-	74	-26.92	326	187	V
* 8.417	27.00	MAv1	36.1	-27.6	.13	35.63	54	-18.37	-	-	326	187	V
* 10.708	35.31	PK2	37.6	-25.1	0	47.81	-	-	74	-26.19	359	235	V
* 10.712	24.9	MAv1	37.6	-25.1	.13	37.53	54	-16.47	-	-	359	235	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



DATA

Radiated Emissions

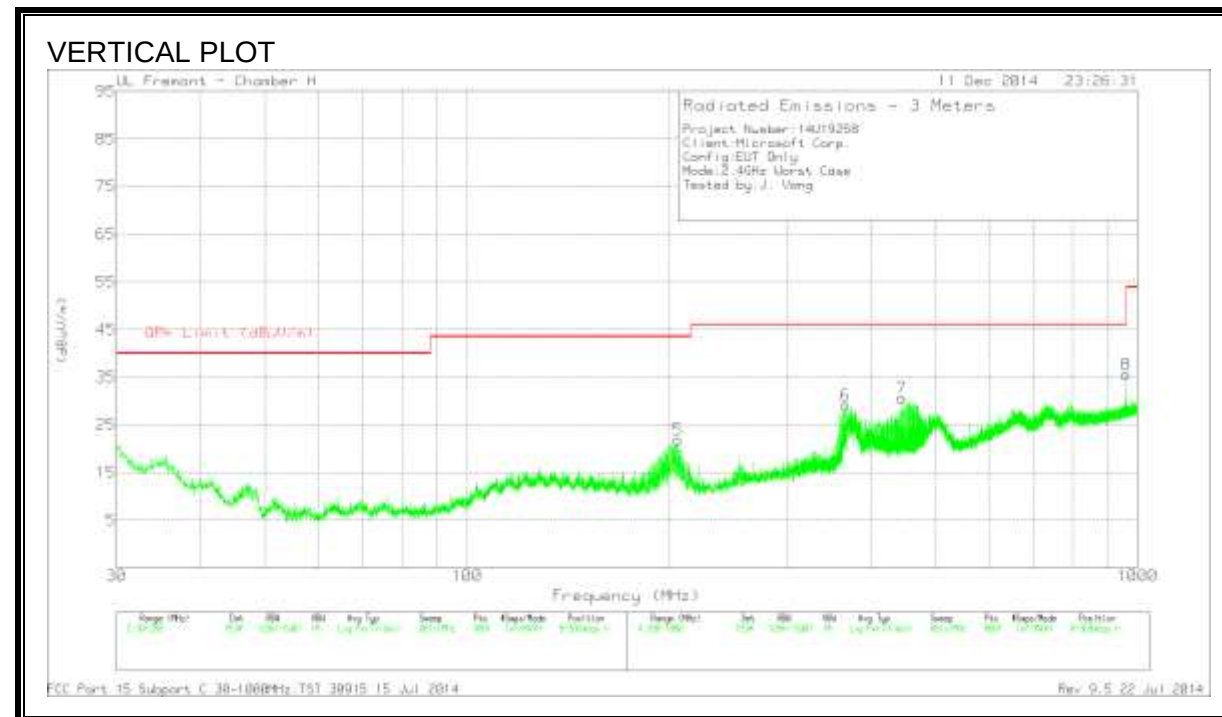
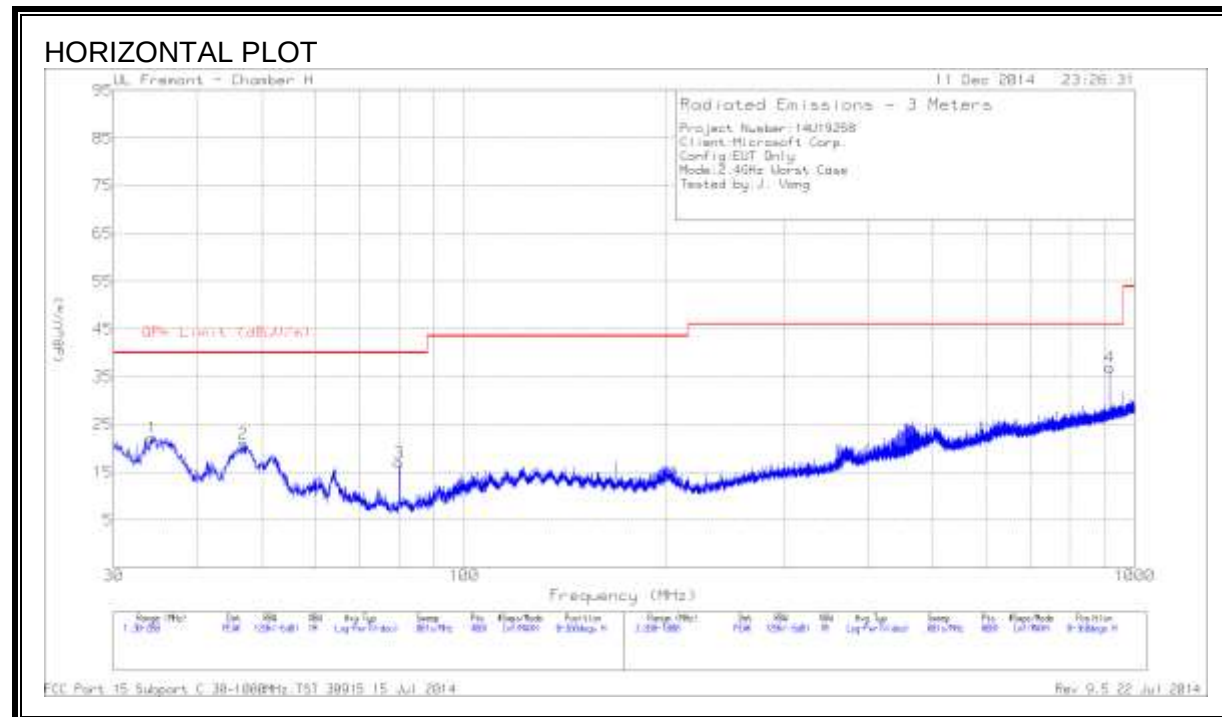
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl /Ftr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 8.081	38.10	PK2	36.0	-28.5	0	45.60	-	-	74	-28.40	45	105	H
* 8.082	26.86	MAv1	36.0	-28.5	.13	34.49	54	-19.51	-	-	45	105	H
* 12.402	36.34	PK2	39.1	-25.9	0	49.54	-	-	74	-24.46	212	236	H
* 12.404	25.17	MAv1	39.1	-25.9	.13	38.50	54	-15.50	-	-	212	236	H
* 4.512	41.44	PK2	34.0	-32.7	0	42.74	-	-	74	-31.26	10	122	V
* 4.511	29.86	MAv1	34.0	-32.7	.13	31.29	54	-22.71	-	-	10	122	V
* 15.675	35.61	PK2	40.9	-24.9	0	51.61	-	-	74	-22.39	125	361	V
* 15.676	24.35	MAv1	40.9	-24.9	.13	40.48	54	-13.52	-	-	125	361	V
2.060	42.86	PK2	31.4	-24.9	0	49.36	-	-	-	-	122	228	H
2.922	43.19	PK2	32.6	-24.1	0	51.69	-	-	-	-	152	164	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

9.3. WORST-CASE BELOW 1 GHz



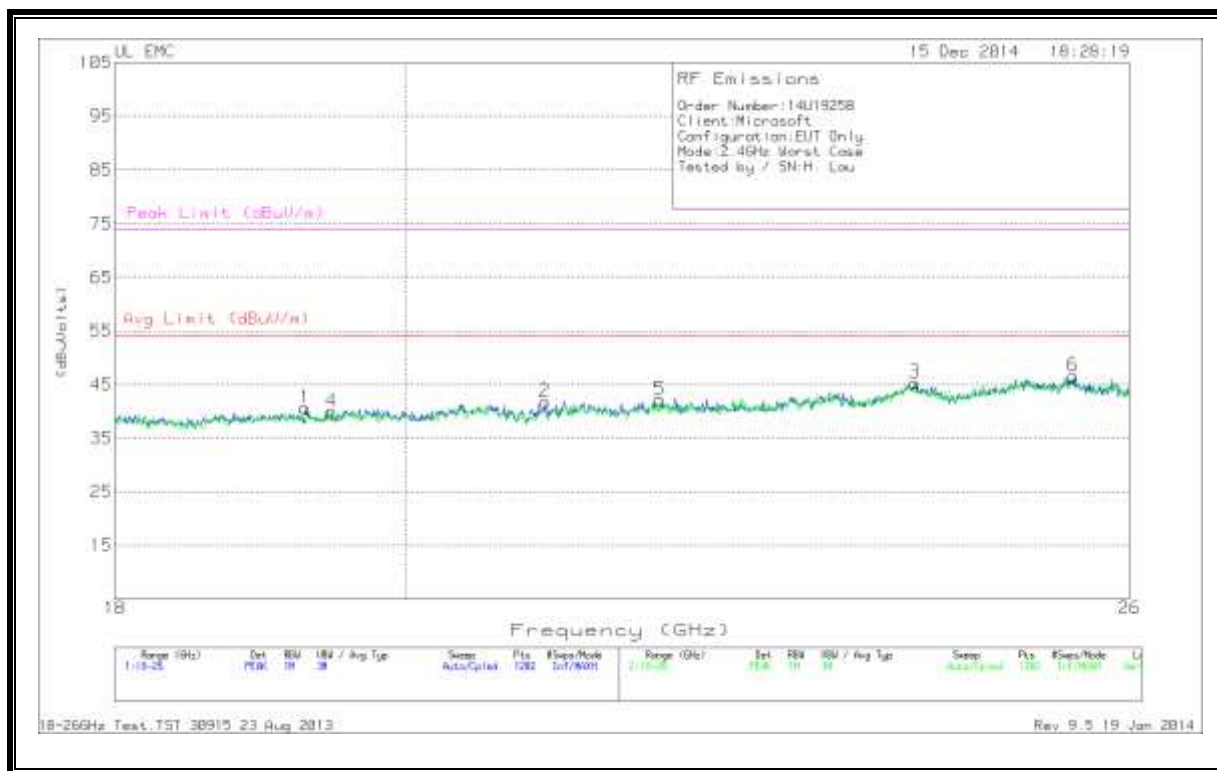
DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	SS JB3 SN A051314-1	Amp/Cbl (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	34.250	31.97	PK	21.2	-30.9	0	22.27	40.00	-17.73	0-360	100	H
2	46.830	39.34	PK	12.4	-30.7	0	21.04	40.00	-18.96	0-360	100	H
3	80.0225	36.88	PK	10.4	-30.3	0	16.98	40.00	-23.02	0-360	100	H
4	917.90	36.86	PK	25.3	-25.2	0	36.96	46.02	-9.06	0-360	301	H
5	206.30	36.17	PK	15.0	-29.2	0	21.97	43.52	-21.55	0-360	100	V
6	366.30	39.41	PK	17.7	-28.0	0	29.11	46.02	-16.91	0-360	100	V
7	445.00	38.81	PK	19.7	-27.8	0	30.71	46.02	-15.31	0-360	201	V
8	* 960.0	34.48	PK	25.8	-24.6	0	35.68	46.02	-10.34	0-360	100	V

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

9.4. WORST-CASE ABOVE 18 to 26GHz

SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION, HORIZONTAL & VERTICAL)



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T125 (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.286	41.57	PK	32.8	-24.2	-9.5	40.667	54	-13.333	74	-33.333
2	21.037	42.53	PK	33.2	-24.4	-9.5	41.833	54	-12.167	74	-32.167
3	24.055	43.63	PK	33.9	-22.7	-9.5	45.333	54	-8.667	74	-28.667
4	19.472	40.9	PK	32.8	-24.2	-9.5	40	54	-14	74	-34
5	21.93	42.27	PK	33.4	-24	-9.5	42.167	54	-11.833	74	-31.833
6	25.474	44.87	PK	34.1	-22.8	-9.5	46.667	54	-7.333	74	-27.333

PK - Peak detector