



**FCC 47 CFR PART 15 SUBPART C
ISED RSS-247 ISSUE 2
ISED RSS-GEN ISSUE 4**

FOR

RACHIO 3 SPRINKLER CONTROLLER

MODEL NUMBER: 16ZULW-C

**FCC ID: 2AOTB-ZULWC
IC: 23555-ZULWC**

REPORT NUMBER: 11988952 – E1V2

ISSUE DATE: APRIL 4, 2018

Prepared for
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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	03/13/18	Initial Issue	--
V2	04/04/18	Updated sections 5.5, 8.4, 8.6.1, 8.6.2, 8.6.3, 9.2.1, 9.2.2, 9.2.3	David Garcia

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: RACHIO, INC.
1321 15 ST
DENVER, CO 80202, U.S.A.

EUT DESCRIPTION: RACHIO 3 SPRINKLER CONTROLLER

MODEL: 16ZULW-C

SERIAL NUMBER: 1109141171

DATE TESTED: AUG 20, 2017 – JAN 10, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 4	Complies

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, or any agency of the U.S. Government.

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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 C63.10-2013, RSS-GEN Issue 4, RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 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. Chambers A through C are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under Industry Canada company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

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:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Radiated Disturbance, 26000 to 40000 MHz	5.24 dB
Occupied Channel Bandwidth	± 0.39 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a RACHIO 3 SPRINKLER CONTROLLER.

5.2. DESCRIPTION OF DIFFERENCES BETWEEN 16 ZONE AND 8 ZONE DEVICES

The 8 zone device uses the same circuit board as the 16 zone with some small population differences. The 8 zone has 8 fewer triacs (analog switches) populated as well as supporting resistors/capacitors around the triacs. There are also jumpers populated differently to route connections to different poles on the connector. None of these parts are related to the RF circuitry, power supply or any high frequency operation.

A spot test was performed on harmonics and spurious for the 8 zone unit, the results showed that the levels of harmonics and spurious were not higher than the original ones by more than 3 dB, therefore, this qualifies for C1PC for the 8 zone unit.

5.3. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	19.94	98.63
2412 - 2462	802.11g	22.82	191.43
2412 - 2462	802.11n HT20	22.45	175.79

5.4. DESCRIPTION OF CHANGE

Based on the manufacturer's declaration, the reason for the additional testing as covered by this report is the co-location of an additional radio (LoRa 915 MHz radio) on their device that is not covered under the Murata WiFi module's certification.

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (MHz)	Antenna Gain (dBi)
	Chain 0
2400 - 2483.5	-1.00

5.6. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was SONY, s_atp_1_00139_B_10_5.
The test utility software used during testing was Tera Term Ver 4.79.

5.7. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1 GHz, radiated emissions from 18 to 26 GHz 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 and Z it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

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

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20mode: MCS0

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
AC Adapter	Rachio	ILA48-24 1000	N/A

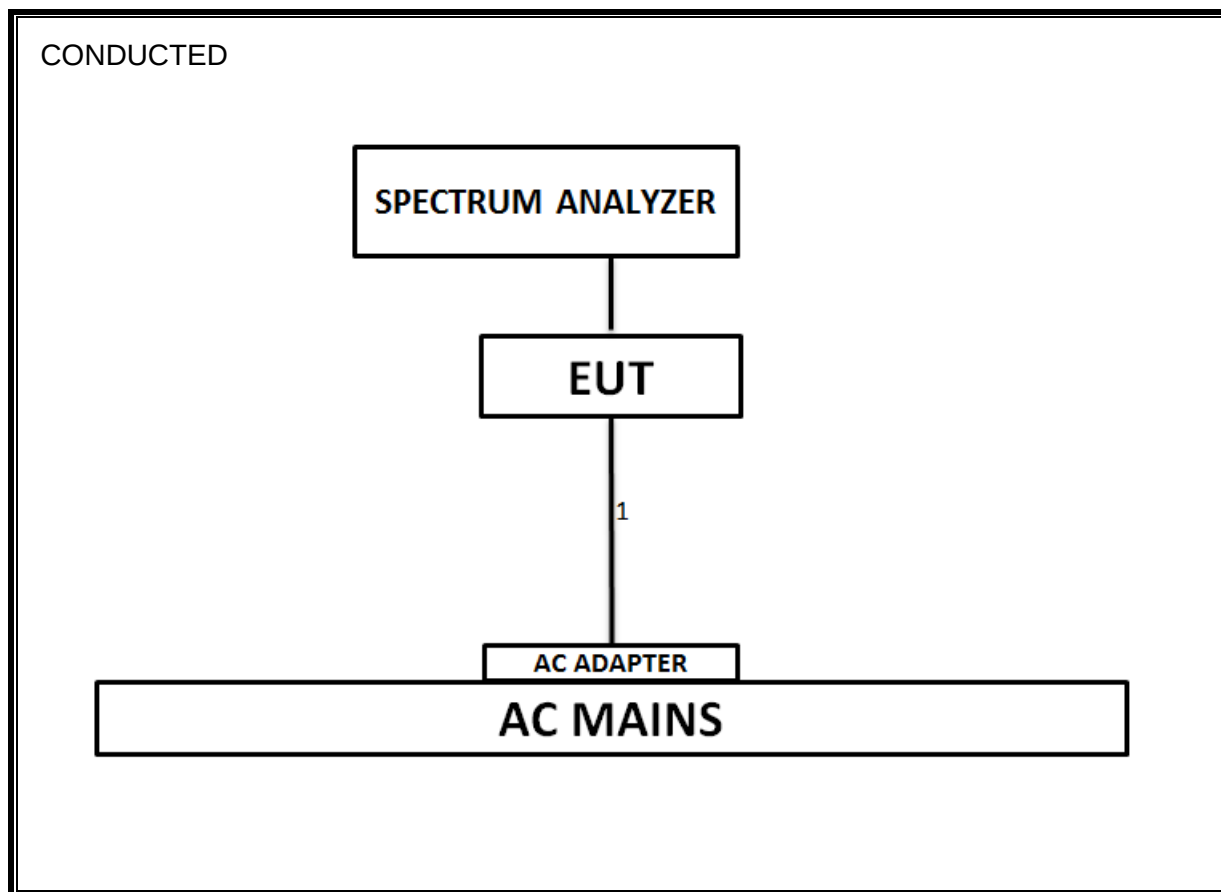
I/O CABLES

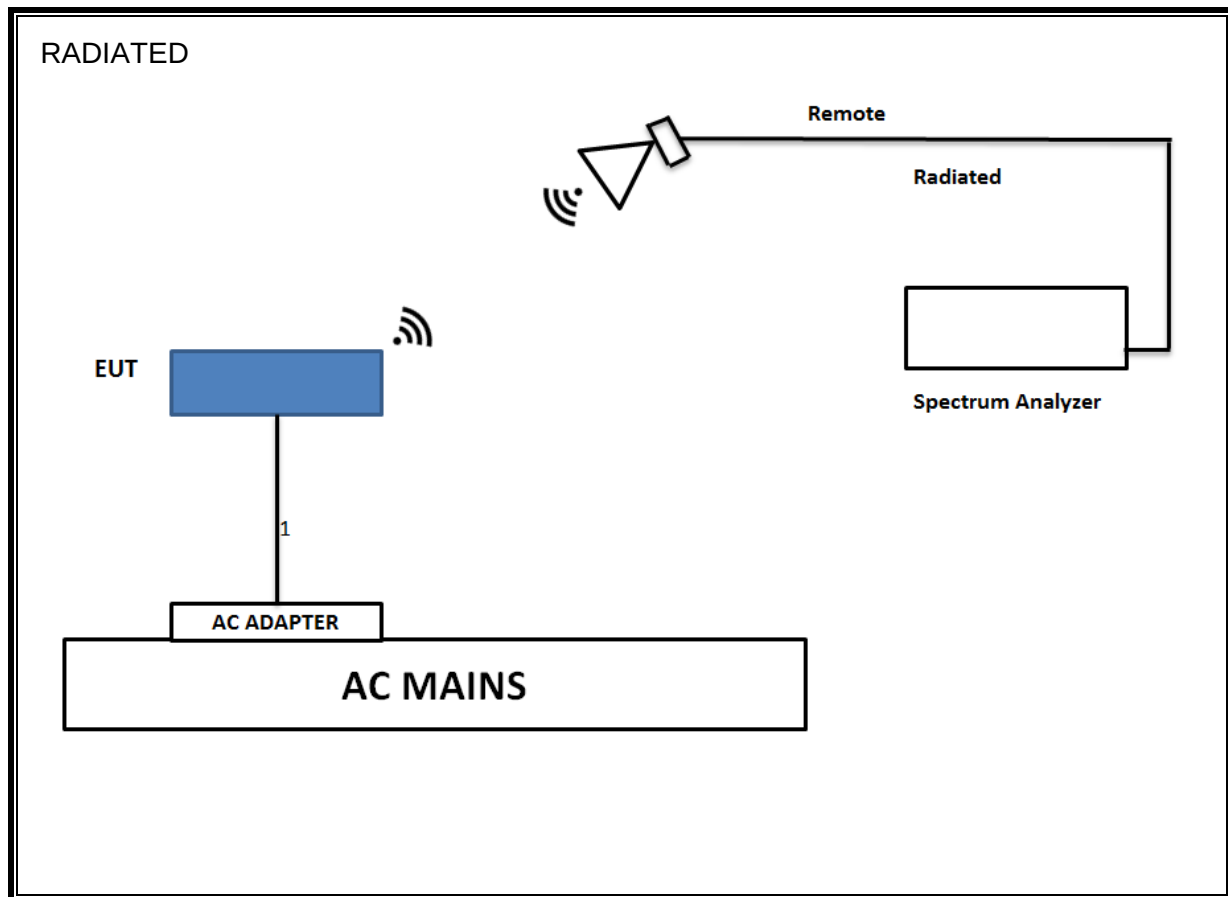
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	2-Prong	Unshielded	1.5	

TEST SETUP

The EUT is a standalone device. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS





6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	T Number	Cal Due
Amplifier, 1-18GHz	Miteq	AFS42-00101800-25-S-42	493	06/23/18
Filter, HPF 6 HPF	Micro-Tronics	HPS17542	483	06/24/18
Filter, HPF 3GHz	Micro-Tronics	HPM17543	485	06/24/18
Switch Driver	Keysight	11713A	457	N/A
Filter, LPF 5GHz	Micro-Tronics	LPS17541	482	06/24/18
Antenna, Horn 1-18GHz	ETS Lindgren	3117	346	03/28/18
Antenna, Active Loop 9KHz to 30MHz	Emco	6502	35	03/09/18
Controller	Sunol Sciences	SC110V	1290	N/A
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	899	06/15/18
Amplifier, 10KHz to 1GHz, 32dB	Keysight	8447D	10	02/15/18
Amplifier, 1 to 8 GHz, 35dB	Miteq	AMF-4D-01000800-30-29P	1156	06/24/18
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	907	01/23/18
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	1466	04/11/18

Test Software List					
Description	Manufacturer	Model	T No.	Cal Date	Cal Due
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016		
Conducted Software	UL	UL EMC	Ver 9.5, May 26 2015		

7. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 558074 D01 v04, Section 6.

6 dB BW: KDB 558074 D01 v04, Section 8.1.

99% BW: ANSI C63.10-2013, Section 6.9.3.

Output Power: KDB 558074 D01 v04, Section 9.1.3.

Power Spectral Density: KDB 558074 D01 v04, Section 10.3.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v04, Section 11.0

Out-of-band emissions in restricted bands: KDB 558074 D01 v04, Section 12.1

Band-edge: KDB 558074 D01 v04, Section 12.1.

Band-edge: KDB 558074 D01 v04, Section 12.1.

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

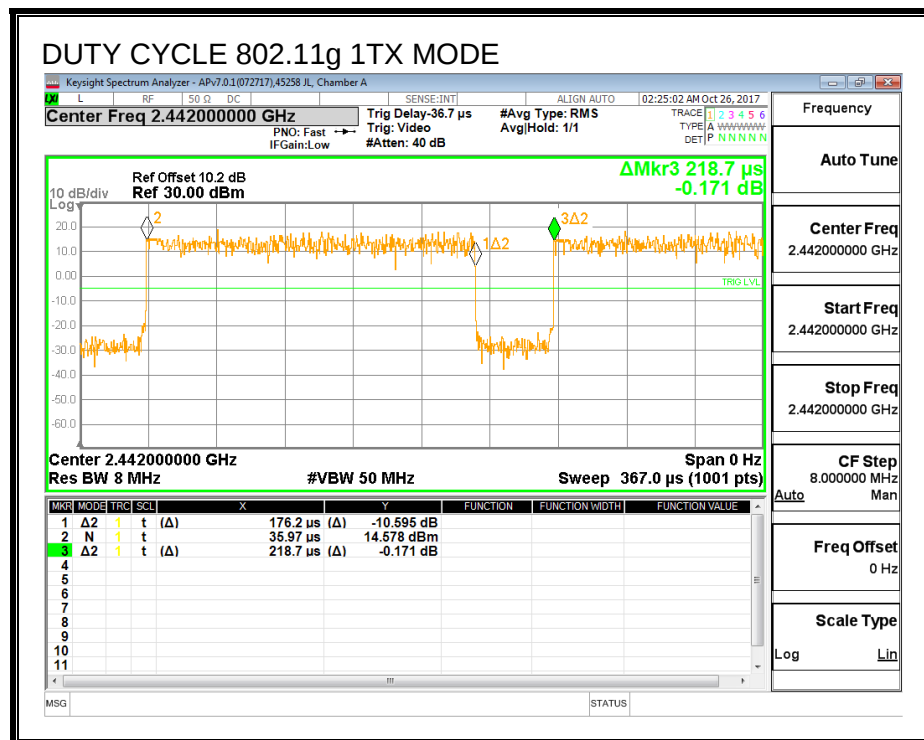
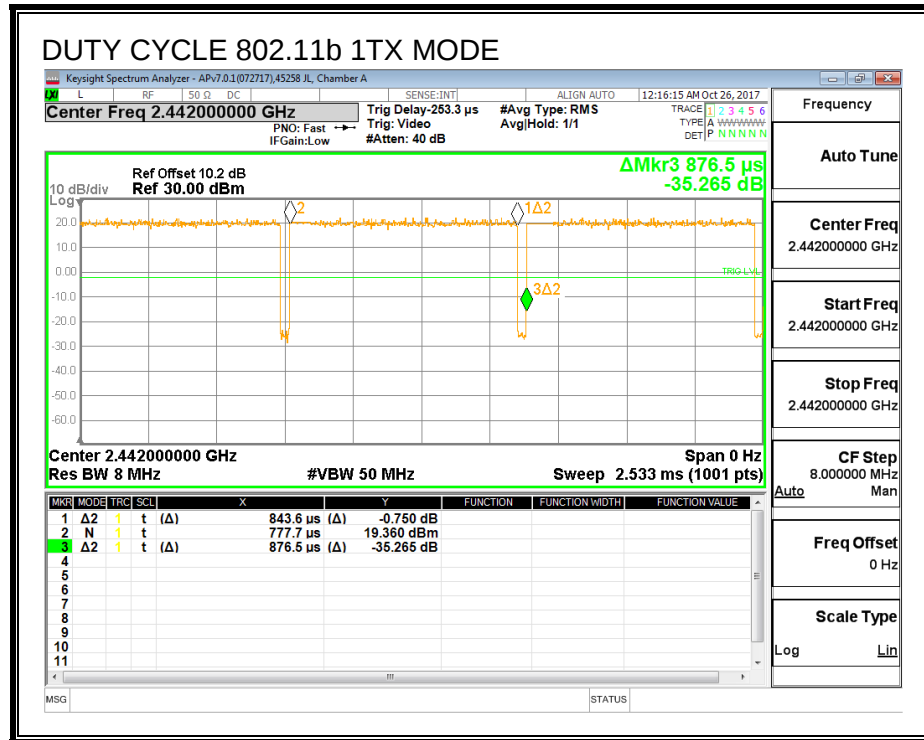
KDB 558074 Zero-Span Spectrum Analyzer Method.

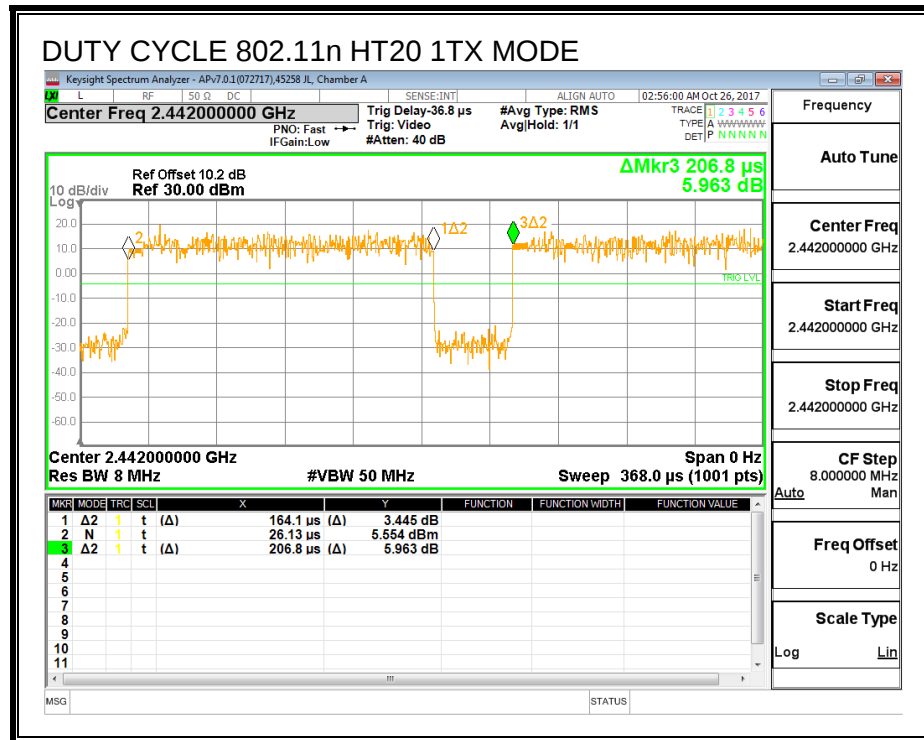
ON TIME AND DUTY CYCLE RESULTS

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						
802.11b 1TX	0.844	0.877	0.962	96.25%	0.17	1.185
802.11g 1TX	0.176	0.219	0.806	80.57%	0.94	5.675
802.11n HT20 1TX	0.164	0.207	0.794	79.35%	1.00	6.094

DUTY CYCLE PLOTS

2.4 GHz BAND





8.2. 6 dB BANDWIDTH

LIMITS

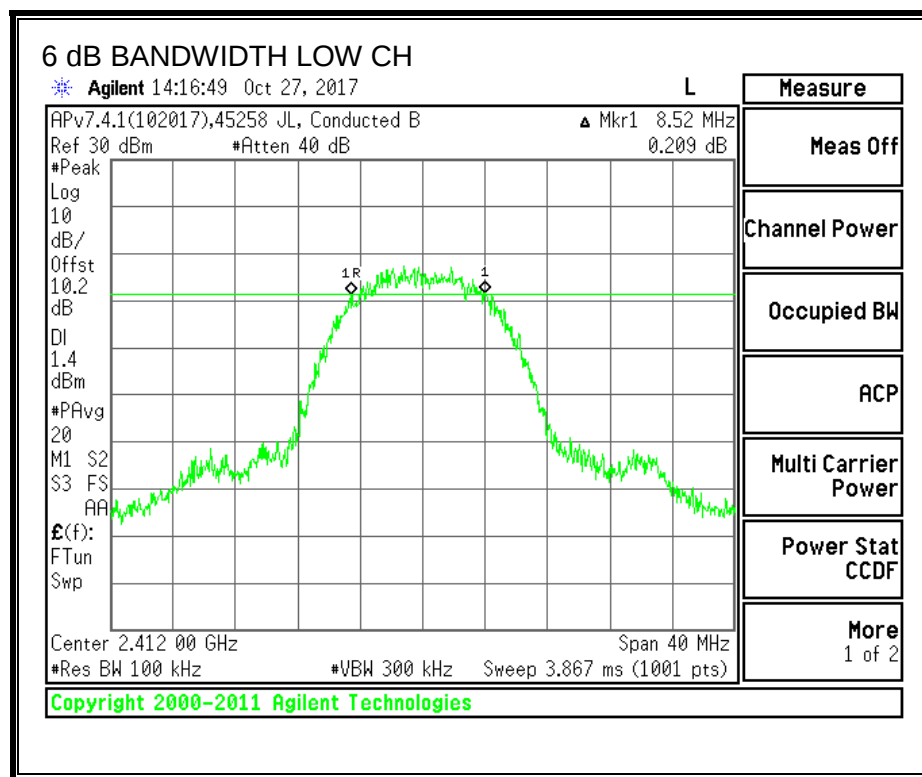
FCC §15.247 (a) (2)

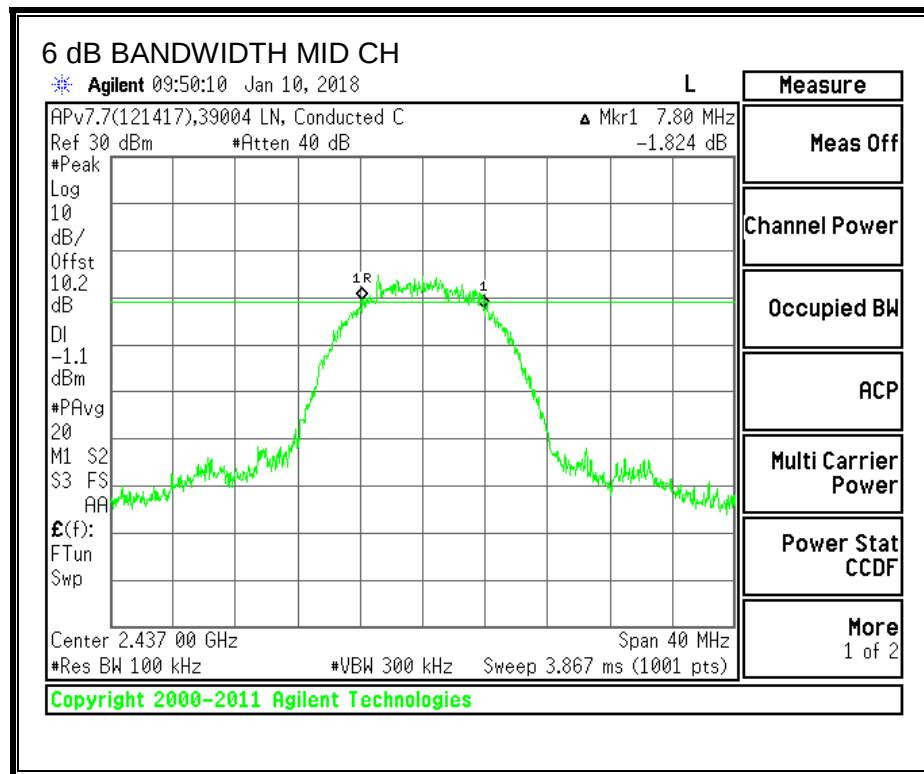
The minimum 6 dB bandwidth shall be at least 500 kHz.

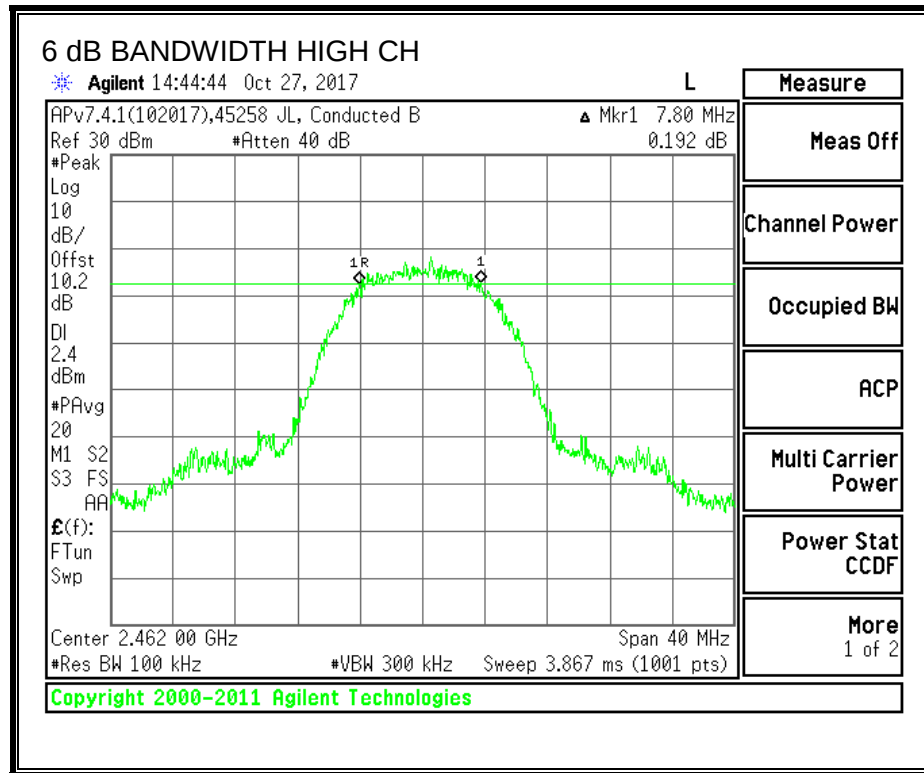
RESULTS

8.2.1. 802.11b MODE

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	8.520	0.5
Mid	2437	7.800	0.5
High	2462	7.800	0.5

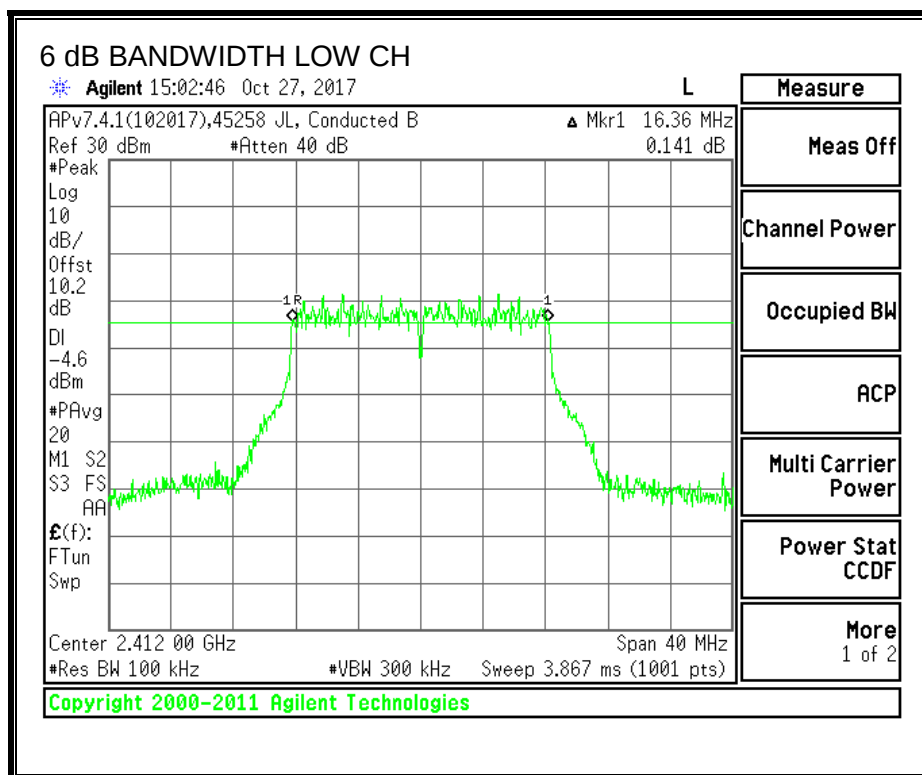


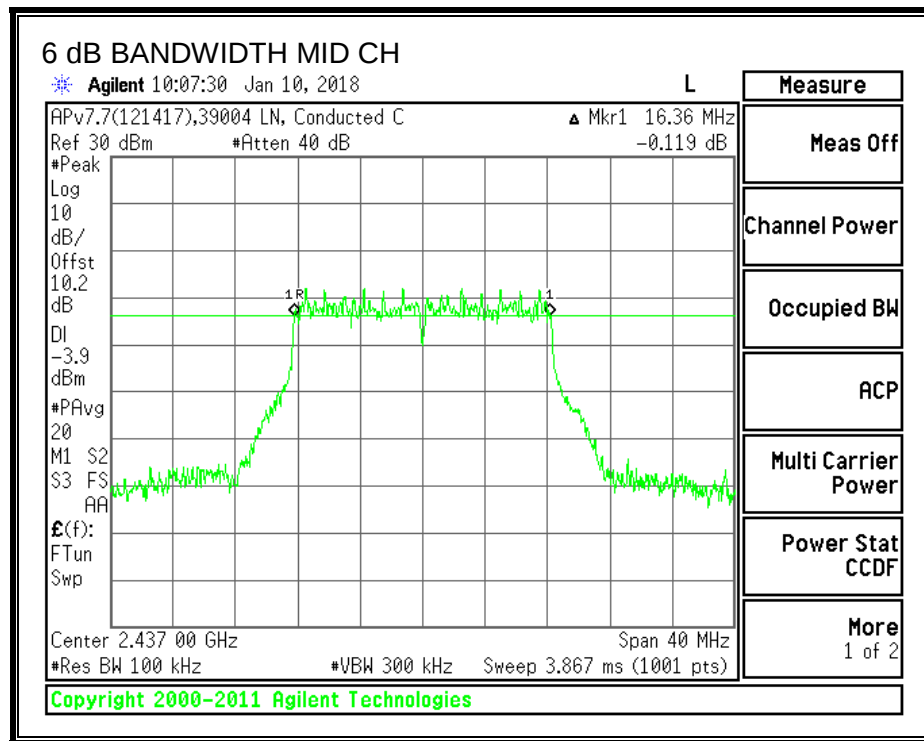


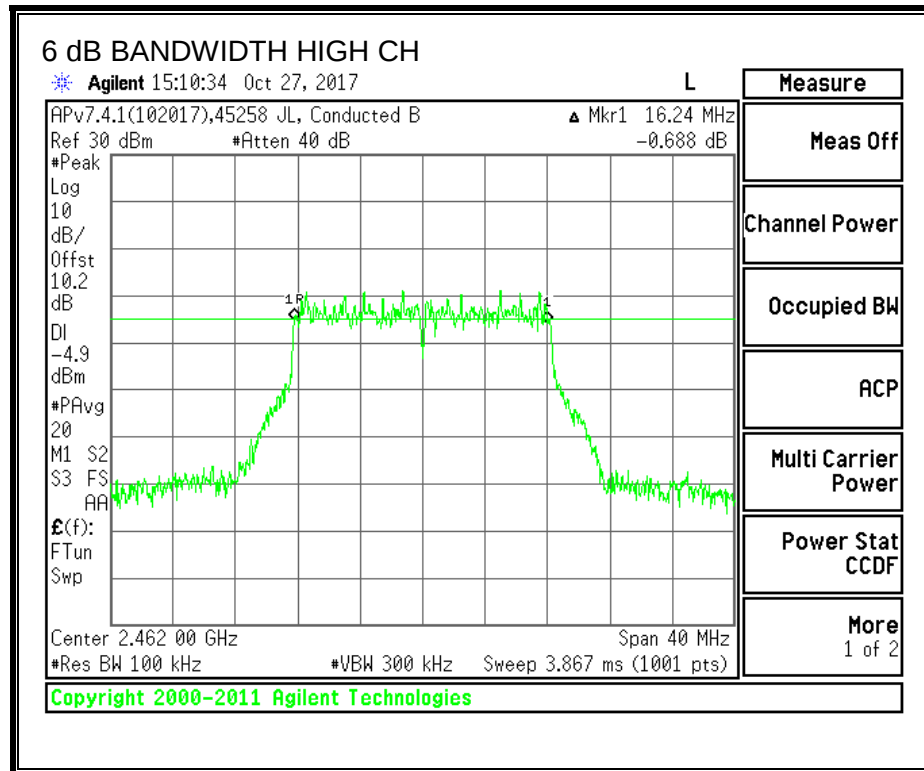


8.2.2. 802.11g MODE

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.360	0.5
Mid	2437	16.360	0.5
High	2462	16.240	0.5

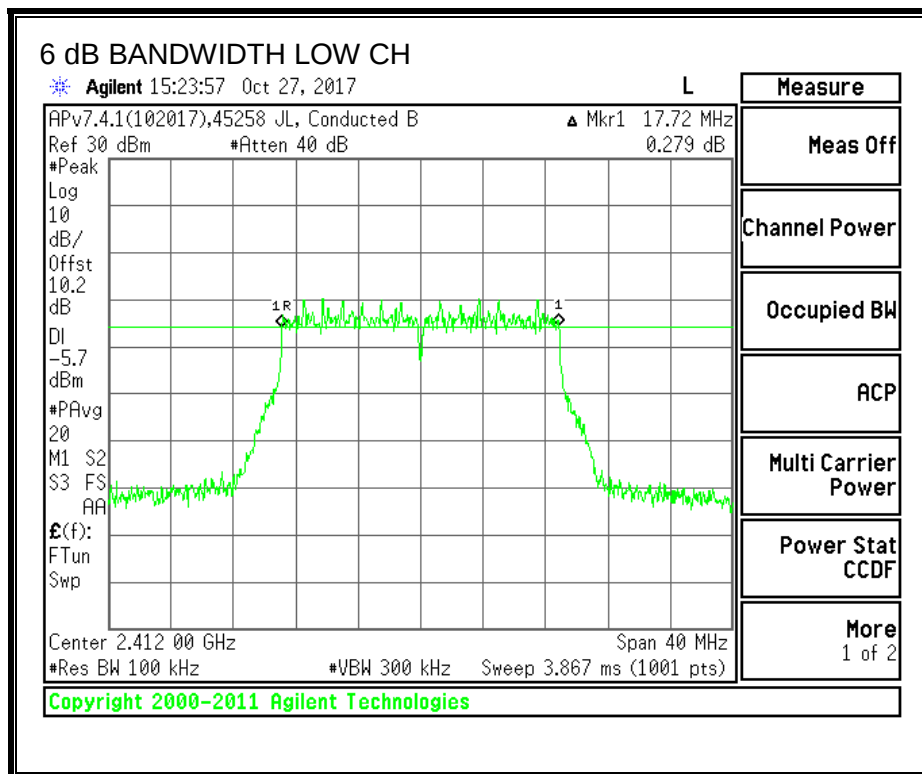


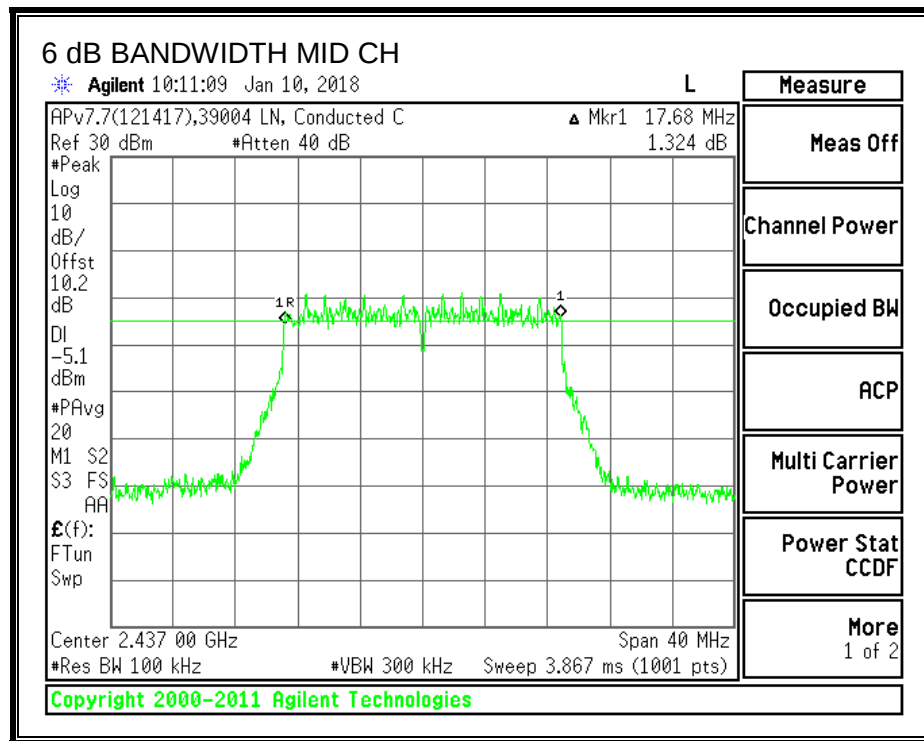


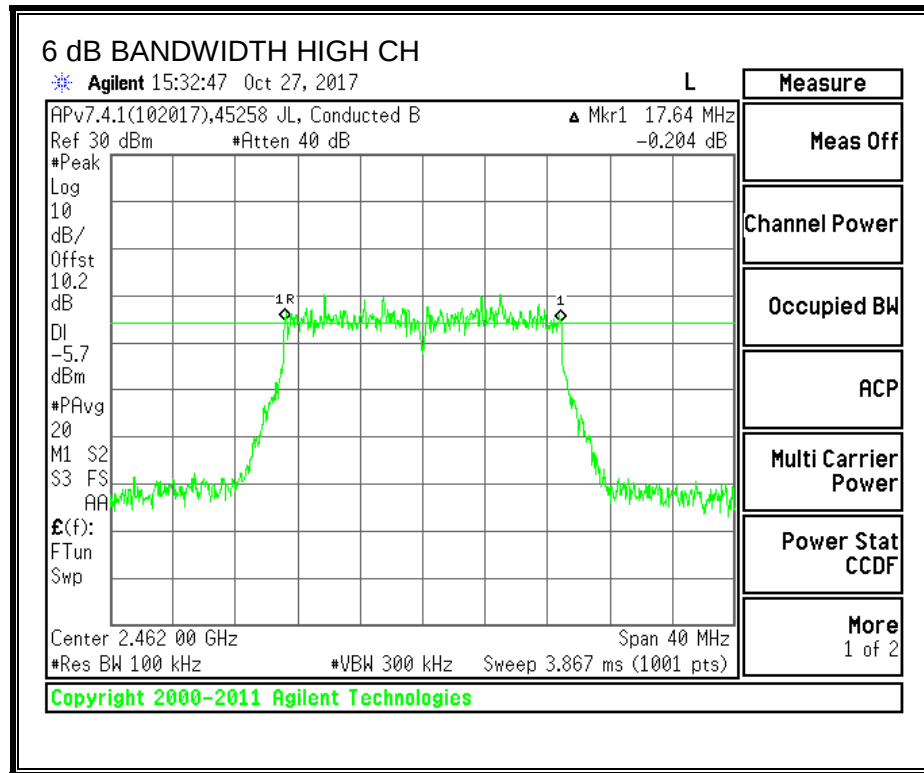


8.2.3. 802.11n HT20 MODE

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	17.720	0.5
Mid	2437	17.680	0.5
High	2462	17.640	0.5







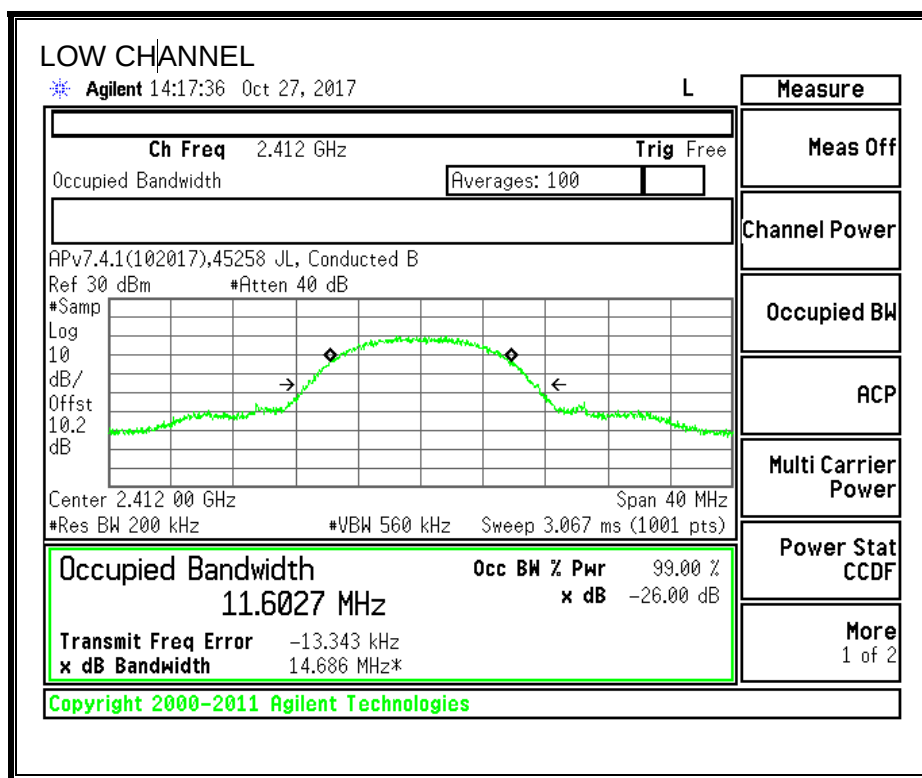
8.3. 99% BANDWIDTH LIMITS

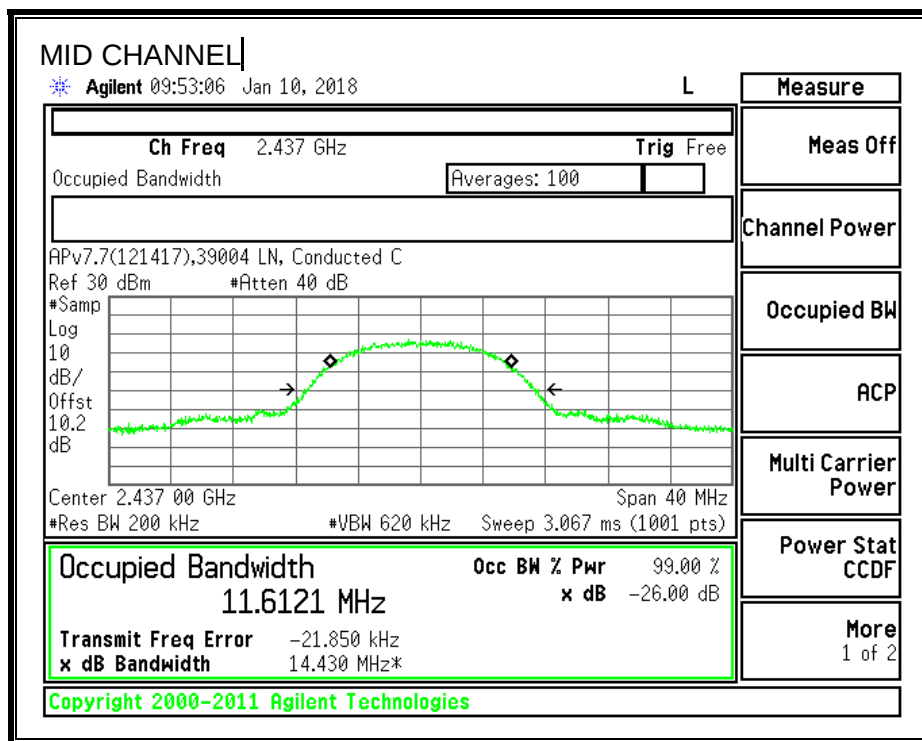
None; for reporting purposes only.

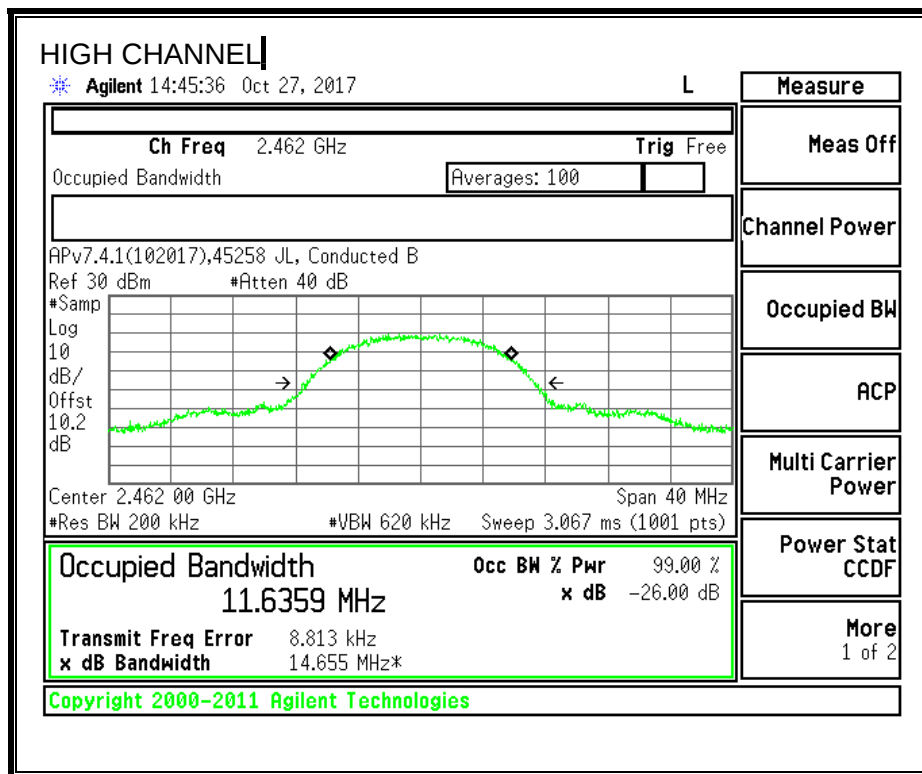
RESULTS

8.3.1. 802.11b MODE

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2412	11.6027
Mid	2437	11.6120
High	2462	11.6359

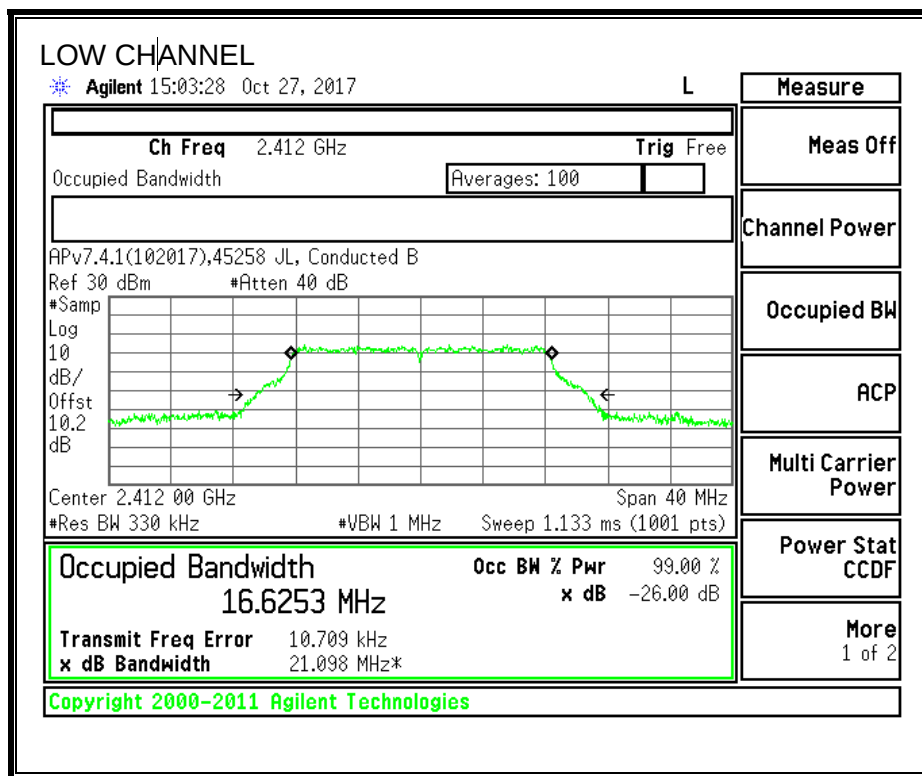


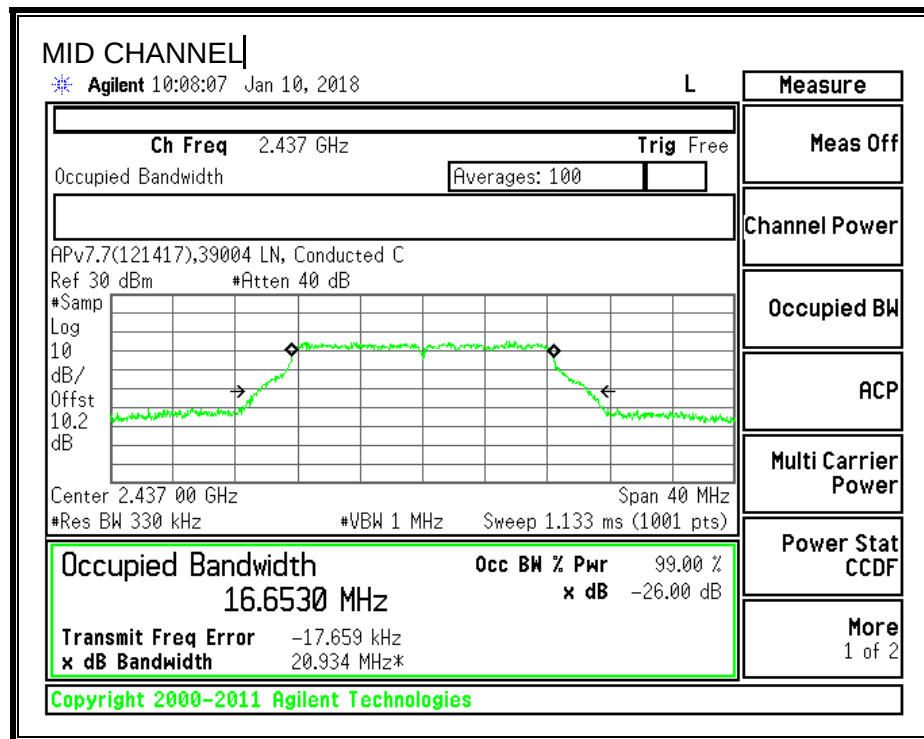


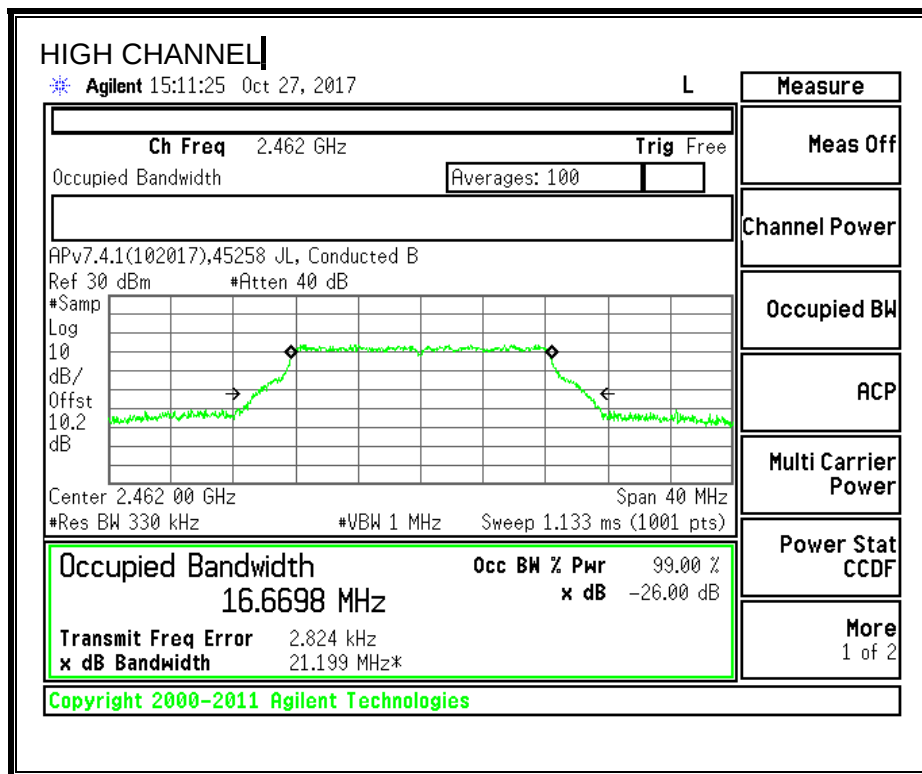


8.3.2. 802.11g MODE

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.6253
Mid	2437	16.6530
High	2462	16.6698

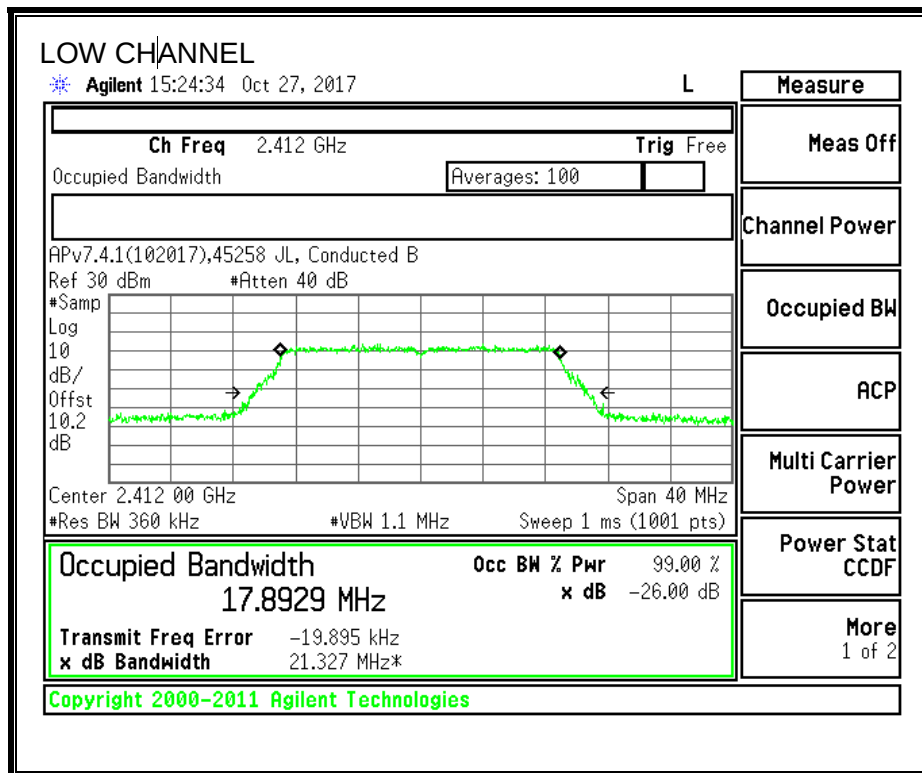


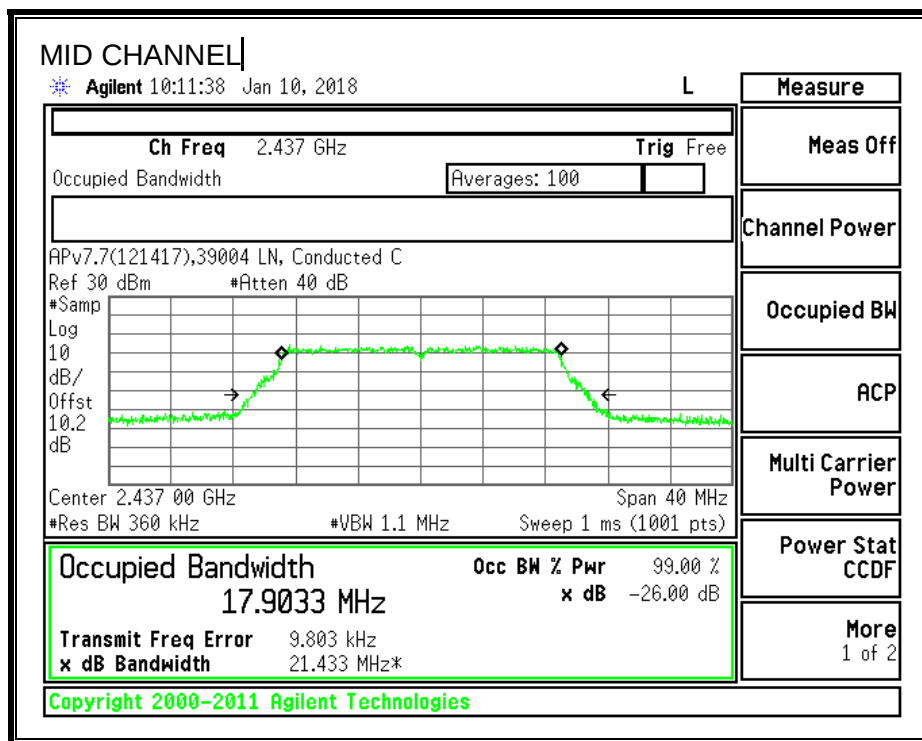


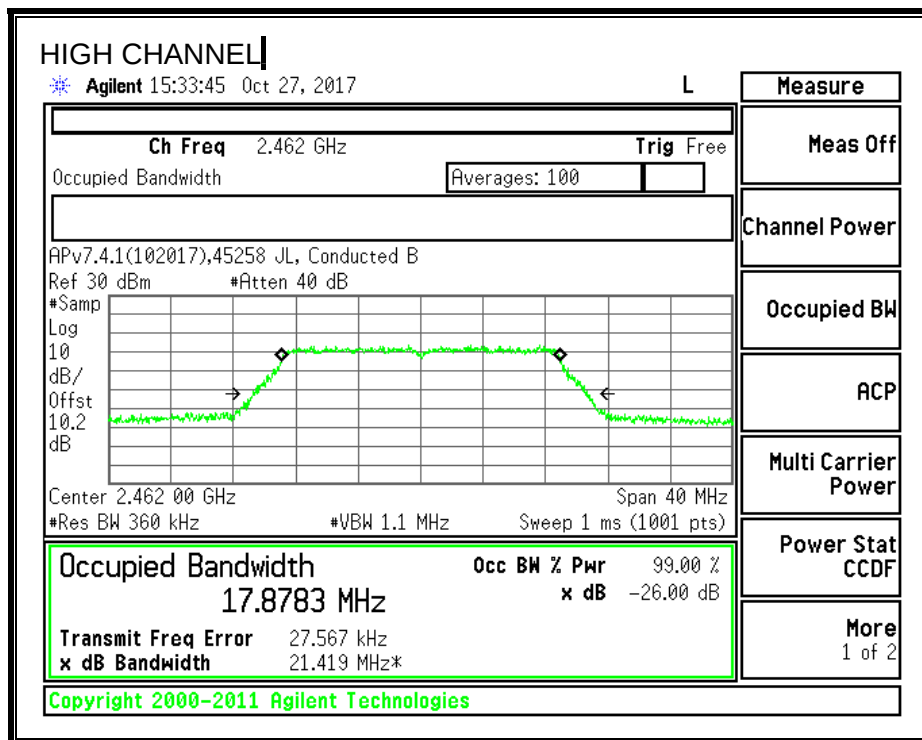


8.3.3. 802.11n HT20 MODE

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	17.8929
Mid	2437	17.9033
High	2462	17.8783







8.4. PEAK OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

RSS-247 (5.4) (d)

For systems using digital modulation in the 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

8.4.1. 802.11b MODE

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-1.00	30.00	30	36	30.00
Mid	2437	-1.00	30.00	30	36	30.00
High	2462	-1.00	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	19.91	19.91	30.00	-10.09
Mid	2437	19.77	19.77	30.00	-10.23
High	2462	19.94	19.94	30.00	-10.06

8.4.2. 802.11g MODE

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-1.00	30.00	30	36	30.00
Mid	2437	-1.00	30.00	30	36	30.00
High	2462	-1.00	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	22.60	22.60	30.00	-7.40
Mid	2437	22.82	22.82	30.00	-7.18
High	2462	22.17	22.17	30.00	-7.83

8.4.3. 802.11n HT20 MODE

Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Max Power (dBm)
Low	2412	-1.00	30.00	30	36	30.00
Mid	2437	-1.00	30.00	30	36	30.00
High	2462	-1.00	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	22.02	22.02	30.00	-7.98
Mid	2437	22.10	22.10	30.00	-7.90
High	2462	22.45	22.45	30.00	-7.55

8.5. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

8.5.1. 802.11b MODE

ID:	45258	Date:	10/26/2017
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Channel	Frequency (MHz)	Chain 0 Power (dBm)
Low	2412	16.52
Mid	2437	16.35
High	2462	16.39

8.5.2. 802.11g MODE

ID:	45258	Date:	10/26/2017
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Channel	Frequency (MHz)	Chain 0 Power (dBm)
Low	2412	11.75
Mid	2437	11.88
High	2462	11.75

8.5.3. 802.11n HT20 MODE

ID:	45258	Date:	10/26/2017
------------	-------	--------------	------------

Channel	Frequency (MHz)	Chain 0 Power (dBm)
Low	2412	10.54
Mid	2437	10.52
High	2462	10.41

8.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

RSS-247 (5.2) (b)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmissions.

RESULTS

8.6.1. 802.11b MODE

1TX Chain 0 MODE

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-5.61	-5.61	8.0	-13.6
Mid	2437	-5.10	-5.10	8.0	-13.1
High	2462	-5.96	-5.96	8.0	-14.0

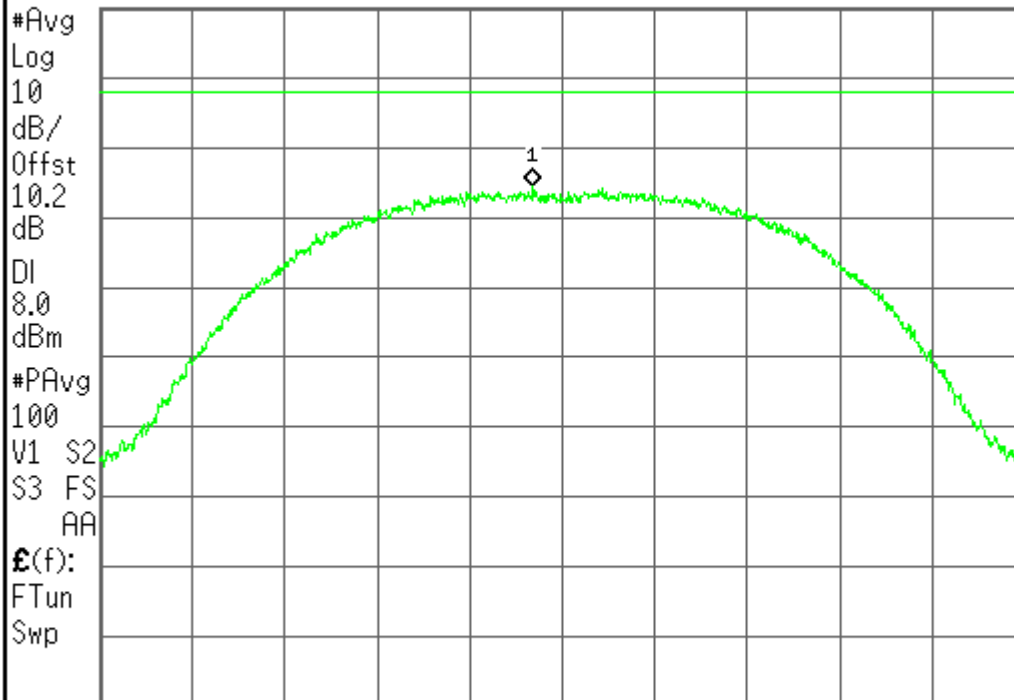
CPSD LOW CHANNEL

Agilent 15:42:02 Oct 27, 2017

L

APv7.4.1(102017),45258 JL, Conducted B
Ref 20 dBm #Atten 30 dB

Mkr1 2.411 433 GHz
-5.610 dBm



Center 2.412 000 GHz

Span 18 MHz

#Res BW 30 kHz

#VBW 91 kHz

Sweep 60.42 ms (1160 pts)

Measure

Meas Off

Channel Power

Occupied BW

ACP

Multi Carrier
Power

Power Stat
CCDF

More
1 of 2

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CPSD MID CHANNEL

Agilent 10:04:49 Jan 10, 2018

L

APv7.7(121417),39004 LN, Conducted C

Mkr1 2.436 147 GHz

Ref 30 dBm

#Atten 40 dB

-5.097 dBm

#Avg

Log

10

dB/

Offst

10.2

dB

DI

8.0

dBm

#PAvg

100

V1 S2

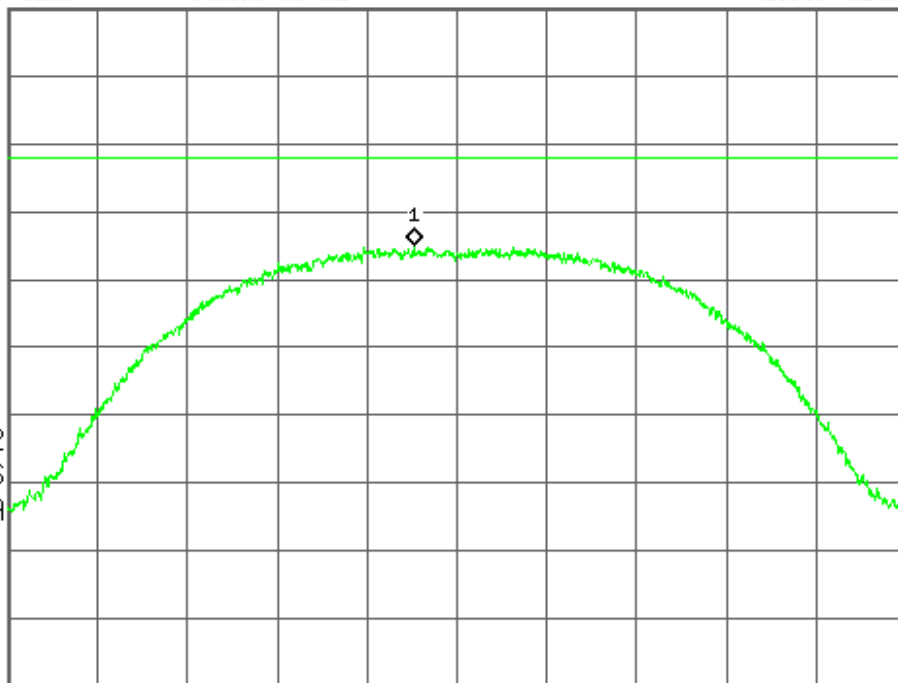
S3 FS

AA

$\mathcal{E}(f)$:

FTun

Swp



Center 2.437 000 GHz

Span 18 MHz

#Res BW 30 kHz

#VBW 91 kHz

Sweep 60.4 ms (1161 pts)

Measure

Meas Off

Channel Power

Occupied BW

ACP

Multi Carrier
Power

Power Stat
CCDF

More

1 of 2

Copyright 2000-2011 Agilent Technologies

CPSD HIGH CHANNEL

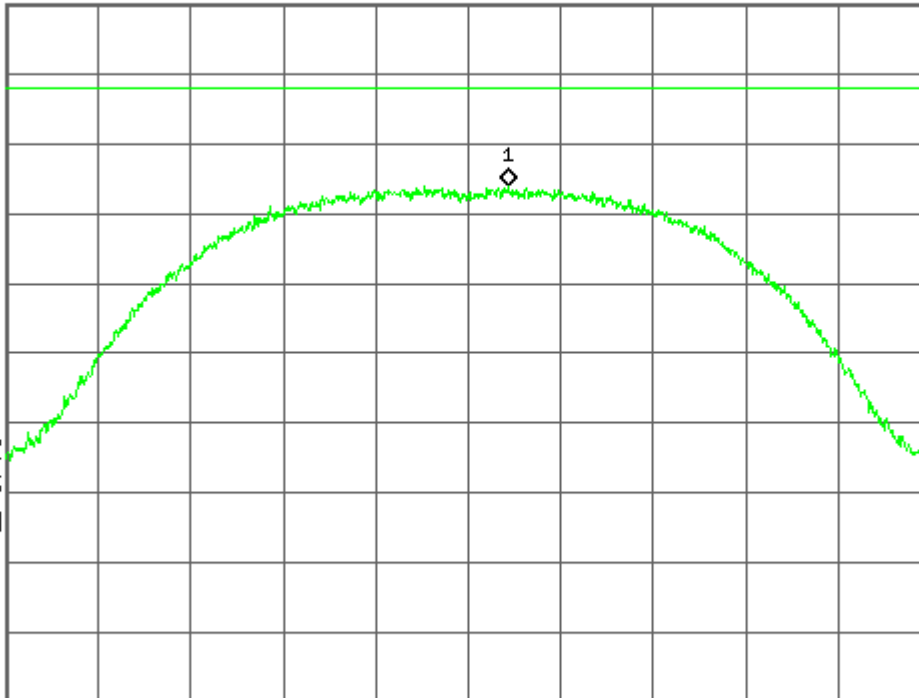
Agilent 14:46:16 Oct 27, 2017

L

APv7.4.1(102017),45258 JL, Conducted B
Ref 20 dBm #Atten 30 dB

Mkr1 2.462 766 GHz
-5.959 dBm

#Avg
Log
10
dB/
Offst
10.2
dB
DI
8.0
dBm
#PAvg
100
V1 S2
S3 FS
AA
f(f):
FTun
Swp



Center 2.462 000 GHz

Span 18 MHz

#Res BW 30 kHz

#VBW 91 kHz

Sweep 60.4 ms (1164 pts)

Measure

Meas Off

Channel Power

Occupied Bk

ACF

Multi Carrier
Power

Power Stat
CCDF

More
1 of 2

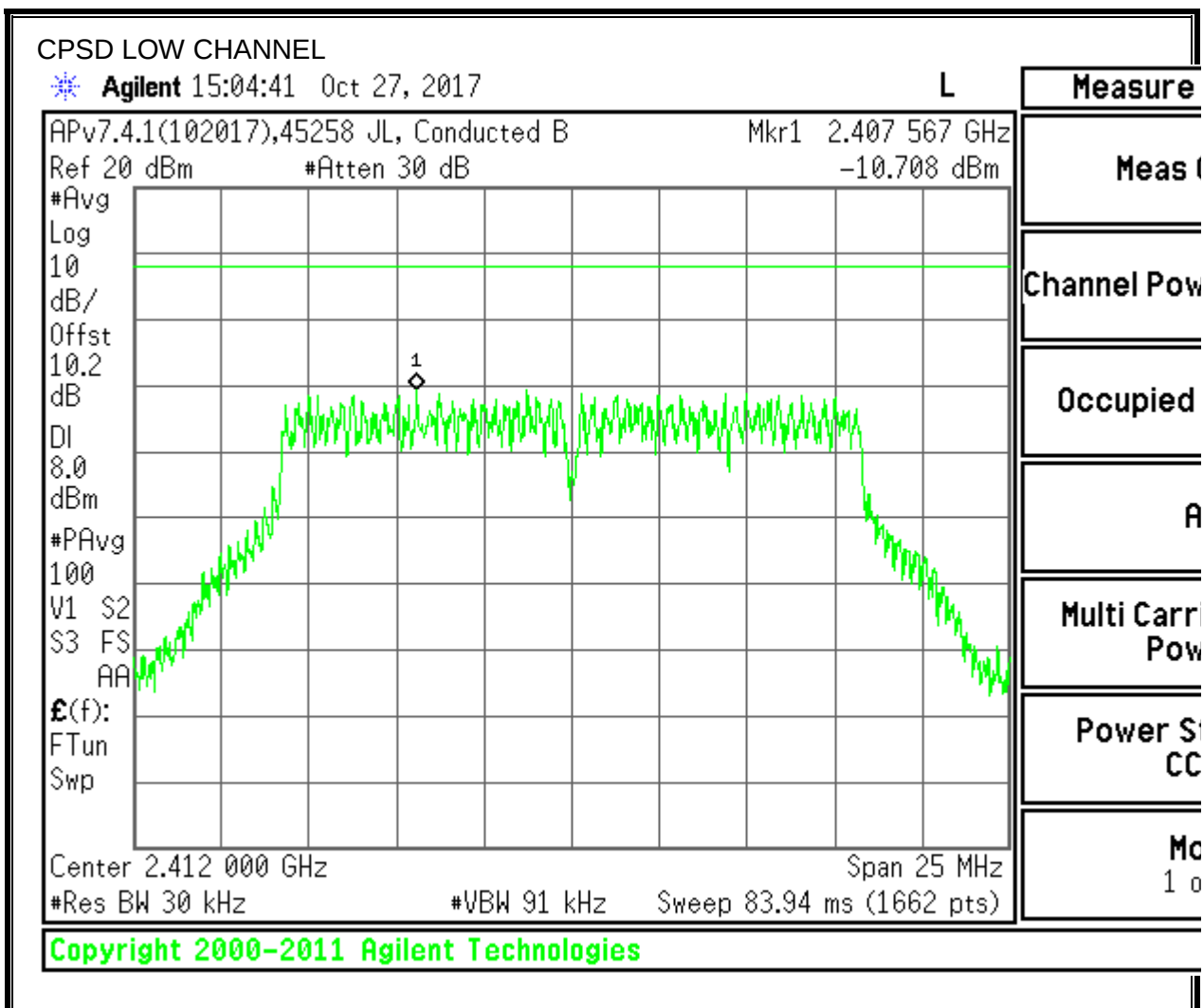
Copyright 2000-2011 Agilent Technologies

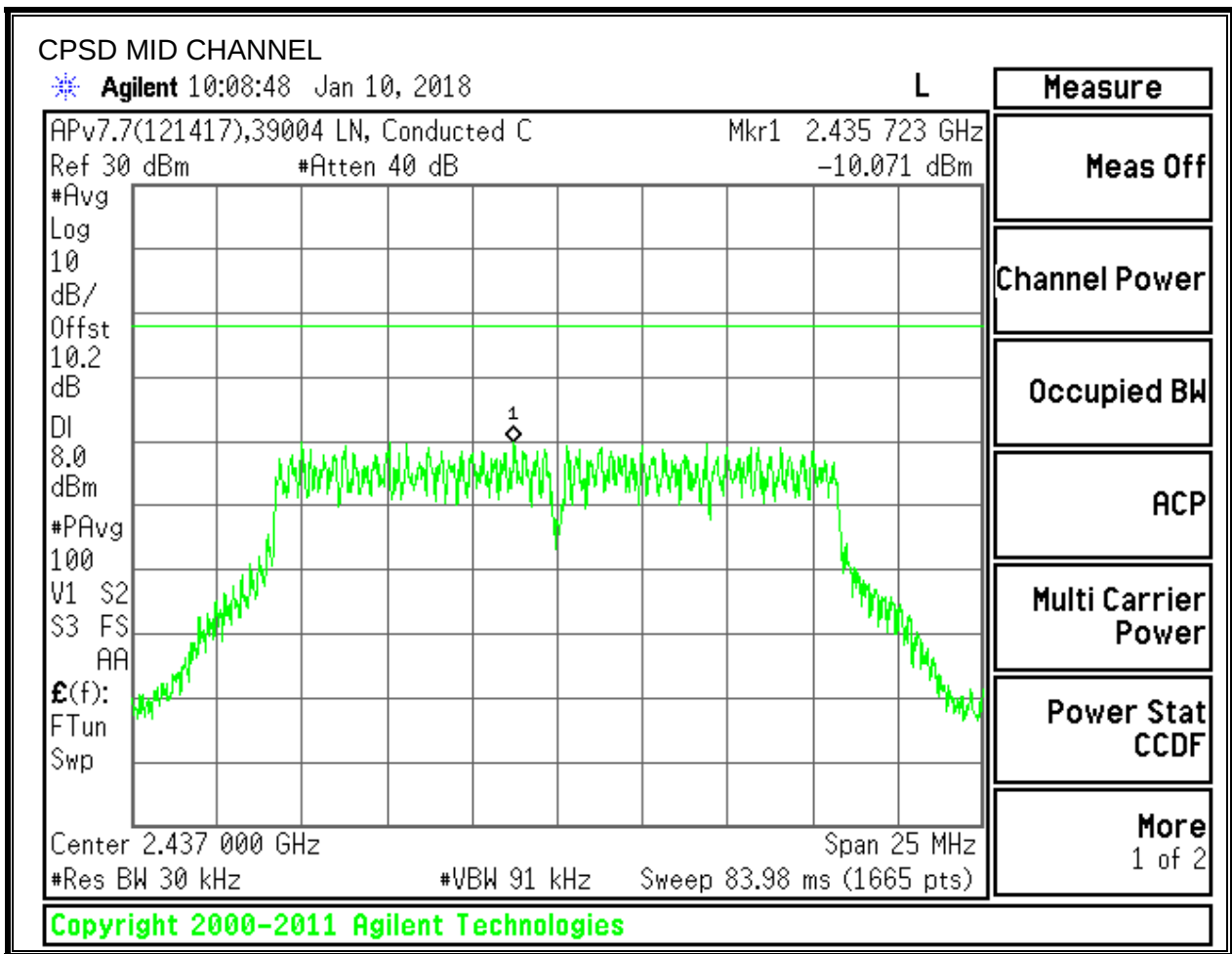
8.6.2. 802.11g MODE

1TX Chain 0 MODE

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-10.71	-10.71	8.0	-18.7
Mid	2437	-10.07	-10.07	8.0	-18.1
High	2462	-11.08	-11.08	8.0	-19.1





CPSD HIGH CHANNEL

Agilent 15:12:16 Oct 27, 2017

L

Measure

APv7.4.1(102017),45258 JL, Conducted B
Ref 20 dBm #Atten 30 dB

Mkr1 2.457 568 GHz
-11.075 dBm

Meas Off

#Avg

Log

10

dB/

Offst

10.2

dB

DI

8.0

dBm

#PAvg

100

V1 S2

S3 FS

AA

f(f):

FTun

Swp

Channel Power

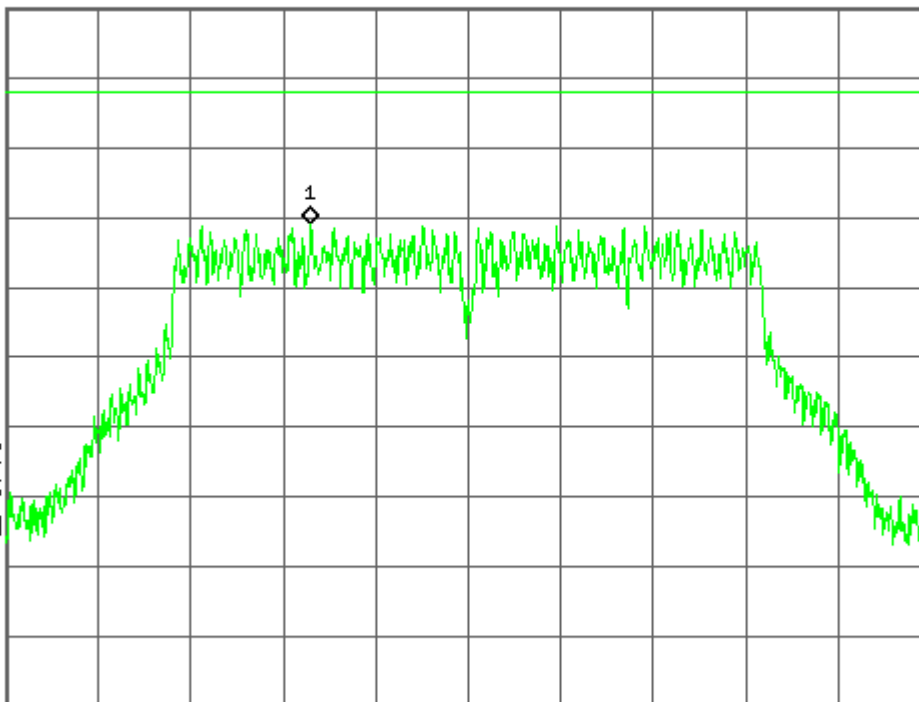
Occupied Bk

ACF

Multi Carrier
Power

Power Stat
CCDF

More
1 of 2



Center 2.462 000 GHz

Span 26 MHz

#Res BW 30 kHz

#VBW 91 kHz

Sweep 87.3 ms (1667 pts)

Copyright 2000-2011 Agilent Technologies

8.6.3. 802.11n HT20 MODE

1TX Chain 0 MODE

PSD Results

Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-11.71	-11.71	8.0	-19.7
Mid	2437	-10.84	-10.84	8.0	-18.8
High	2462	-11.38	-11.38	8.0	-19.4

CPSD LOW CHANNEL

Agilent 15:25:29 Oct 27, 2017

L

Measure

APv7.4.1(102017),45258 JL, Conducted B

Mkr1 2.410 716 GHz

Ref 20 dBm

#Atten 30 dB

-11.707 dBm

Meas Off

#Avg

Log

10

dB/

Offst

10.2

dB

DI

8.0

dBm

#PAvg

100

V1 S2

S3 FS

AA

E(f):

FTun

Swp

Channel Power

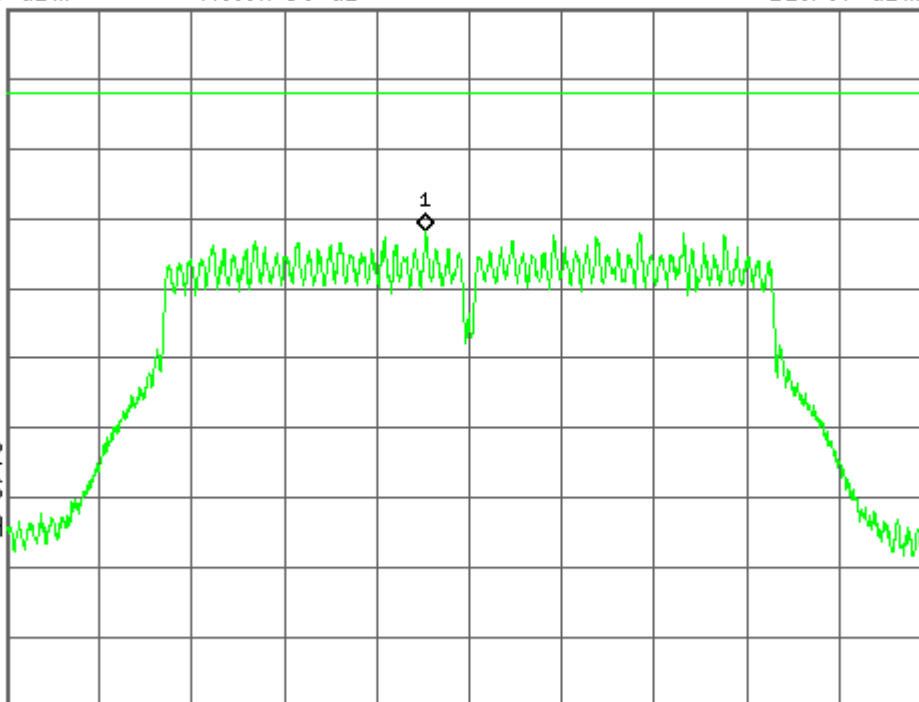
Occupied BW

ACP

Multi Carrier
Power

Power Stat
CCDF

More
1 of 2



Center 2.412 000 GHz

Span 27 MHz

#Res BW 30 kHz

#VBW 91 kHz

Sweep 90.59 ms (1789 pts)

Copyright 2000-2011 Agilent Technologies

CPSPD MID CHANNEL

Agilent 10:12:08 Jan 10, 2018

L

Measure

APv7.7(121417),39004 LN, Conducted C

Mkr1 2.435 725 GHz

Ref 30 dBm

#Atten 40 dB

-10.840 dBm

Meas Off

#Avg

Log

10

dB/

Offst

10.2

dB

Channel Power

Occupied BW

DI

8.0

dBm

#PAvg

100

V1 S2

S3 FS

AA

£(f):

FTun

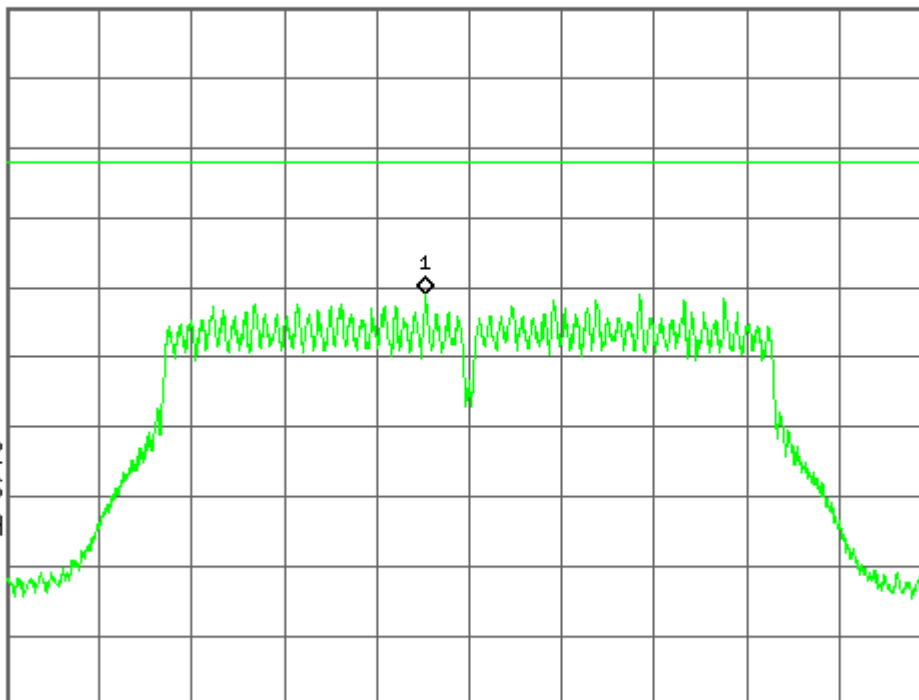
Swp

ACP

Multi Carrier
Power

Power Stat
CCDF

More
1 of 2



Center 2.437 000 GHz

Span 27 MHz

#Res BW 30 kHz

#VBW 91 kHz

Sweep 90.64 ms (1790 pts)

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CPSD HIGH CHANNEL

Agilent 15:34:36 Oct 27, 2017

L

Measure

APv7.4.1(102017),45258 JL, Conducted B

Mkr1 2.460 738 GHz

Ref 20 dBm

#Atten 30 dB

-11.375 dBm

Meas Off

#Avg

Log

10

dB/

Offst

10.2

dB

Channel Power

DI

8.0

dBm

Occupied BW

#PAvg

100

V1 S2

S3 FS

AA

£(f):

FTun

Swp

Center 2.462 000 GHz

Span 27 MHz

#Res BW 30 kHz

#VBW 91 kHz

Sweep 90.66 ms (1788 pts)

ACP

Multi Carrier
Power

Power Stat
CCDF

More
1 of 2

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8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

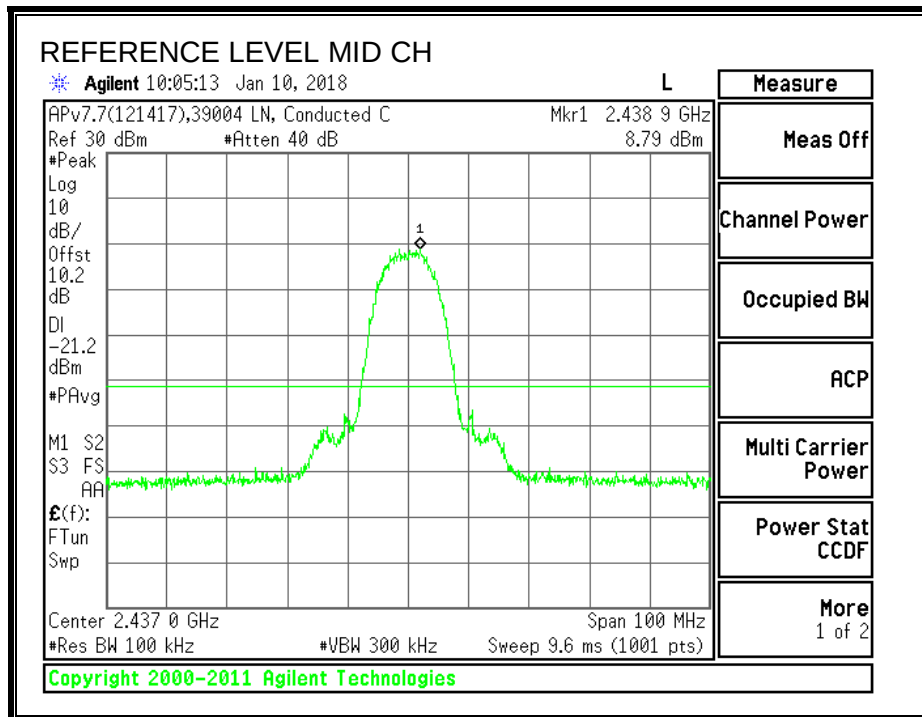
IC RSS-247 5.5

Output power was measured based on the use of peak measurement, therefore the required attenuation is 20 dB.

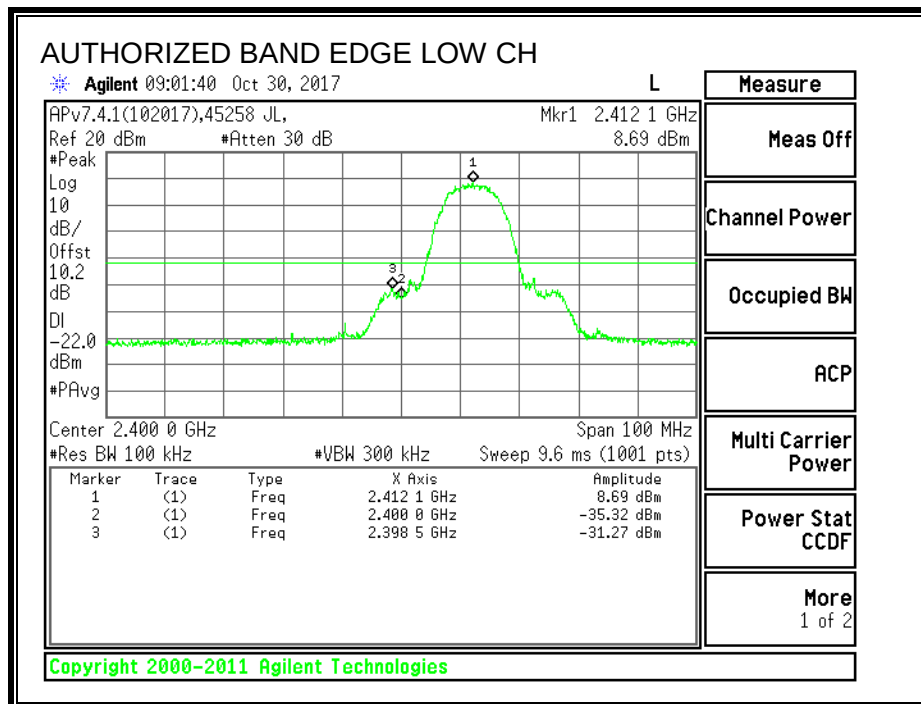
RESULTS

8.7.1. 802.11b MODE

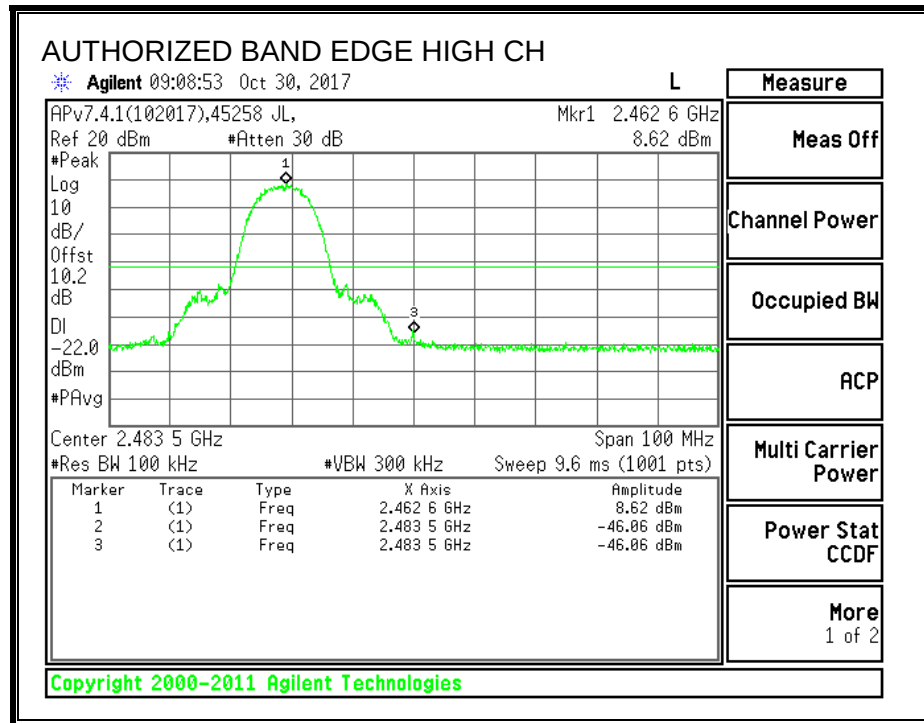
IN-BAND REFERENCE LEVEL



LOW CHANNEL BANDEDGE

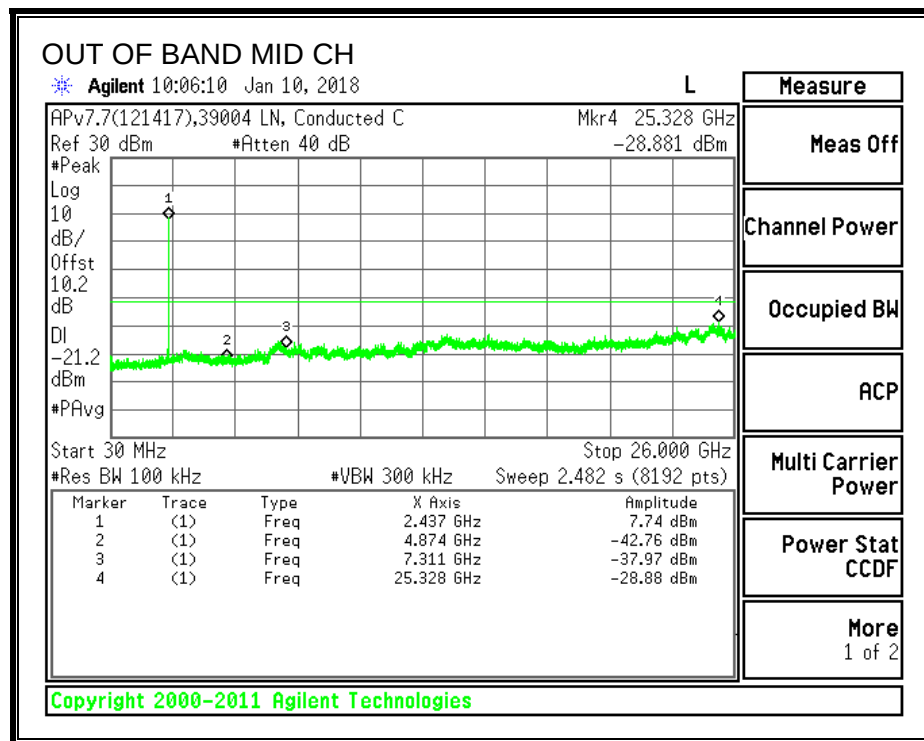
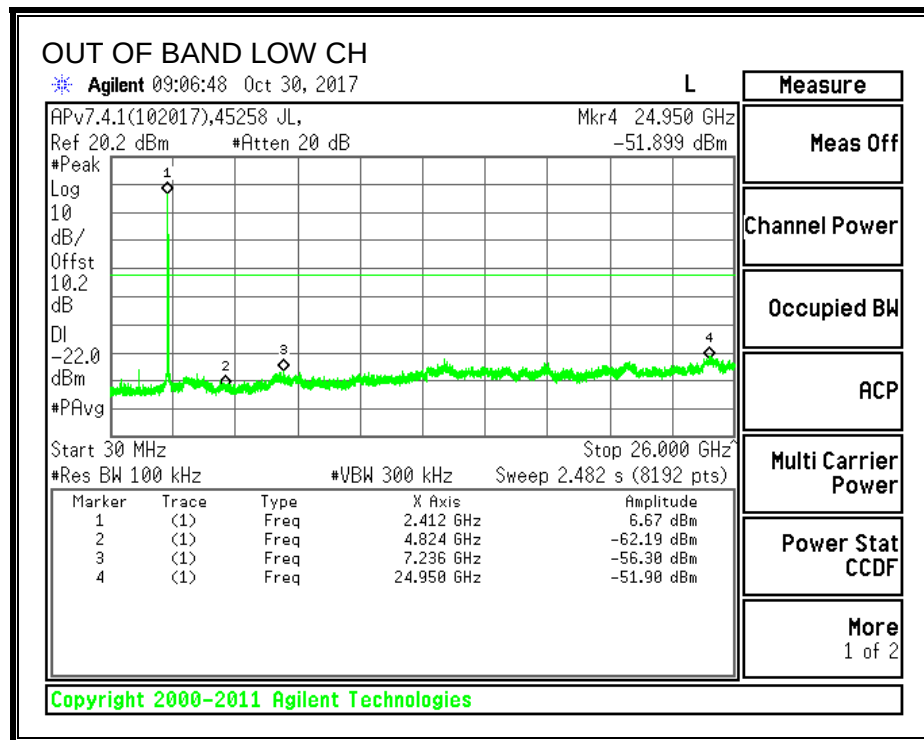


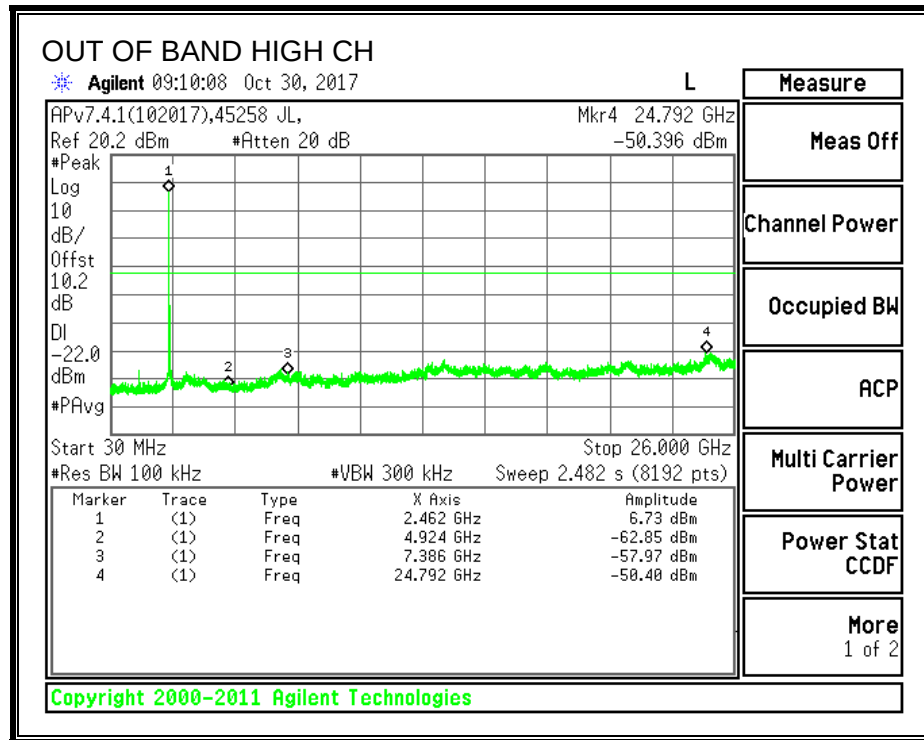
HIGH CHANNEL BANDEDGE



Note: Data is in compliance with the -21.2dBm limit shown in the 11b reference level plot above.

OUT-OF-BAND EMISSIONS

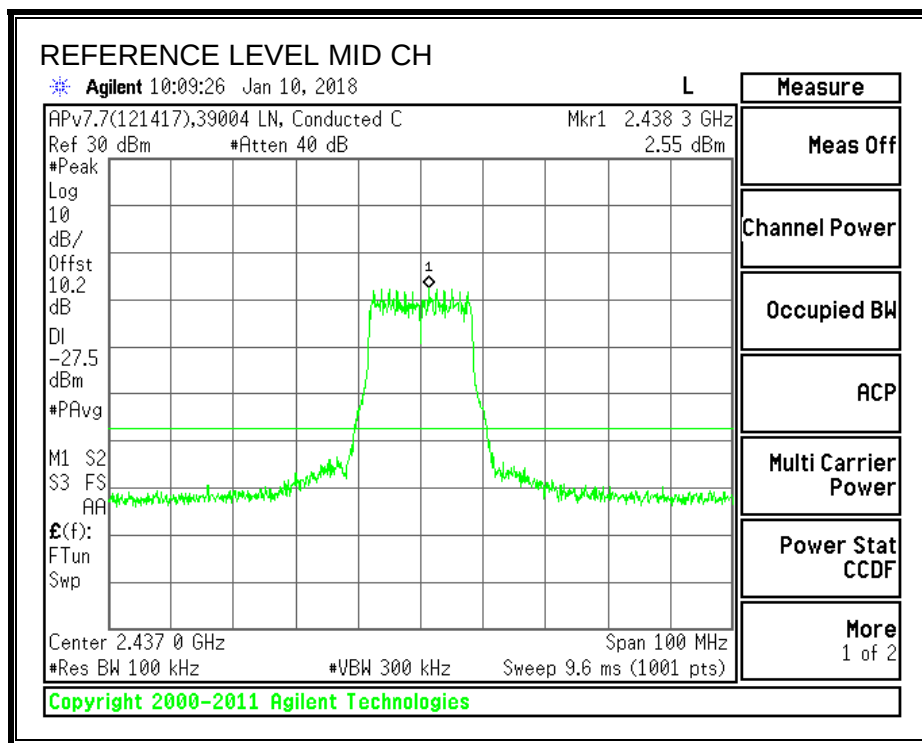




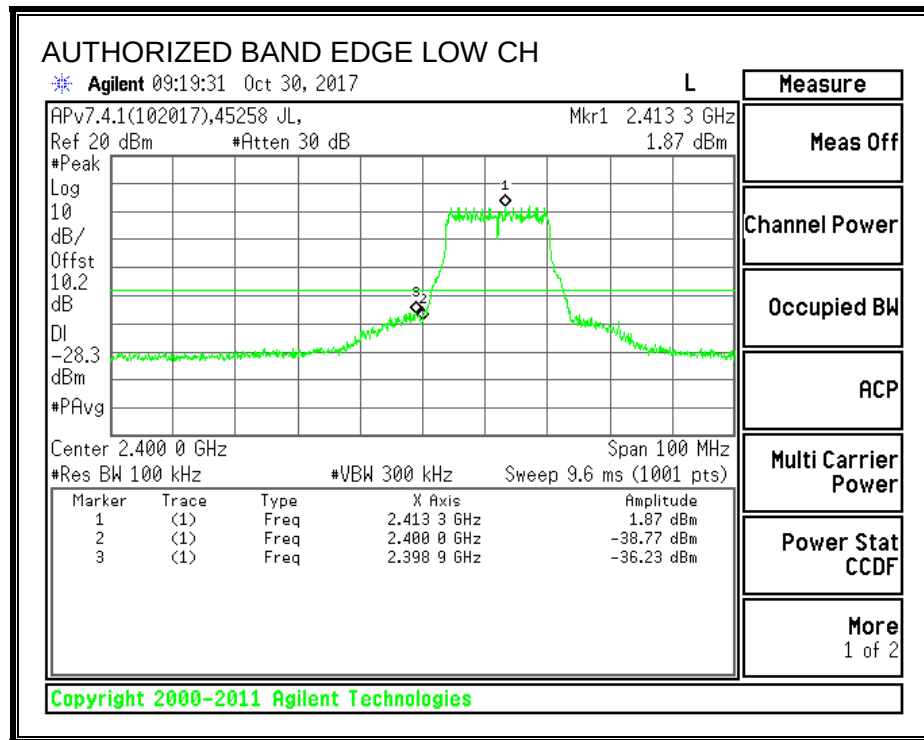
Note: Data is in compliance with the -21.2dBm limit shown in the 11b reference level plot above.

8.7.2. 802.11g MODE

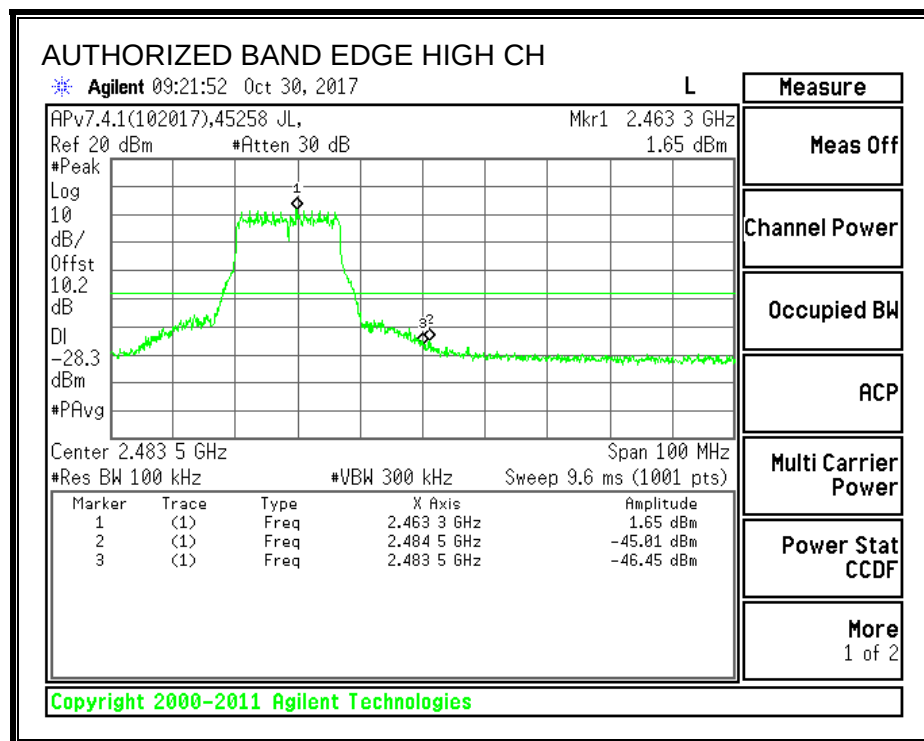
IN-BAND REFERENCE LEVEL



LOW CHANNEL BANDEDGE

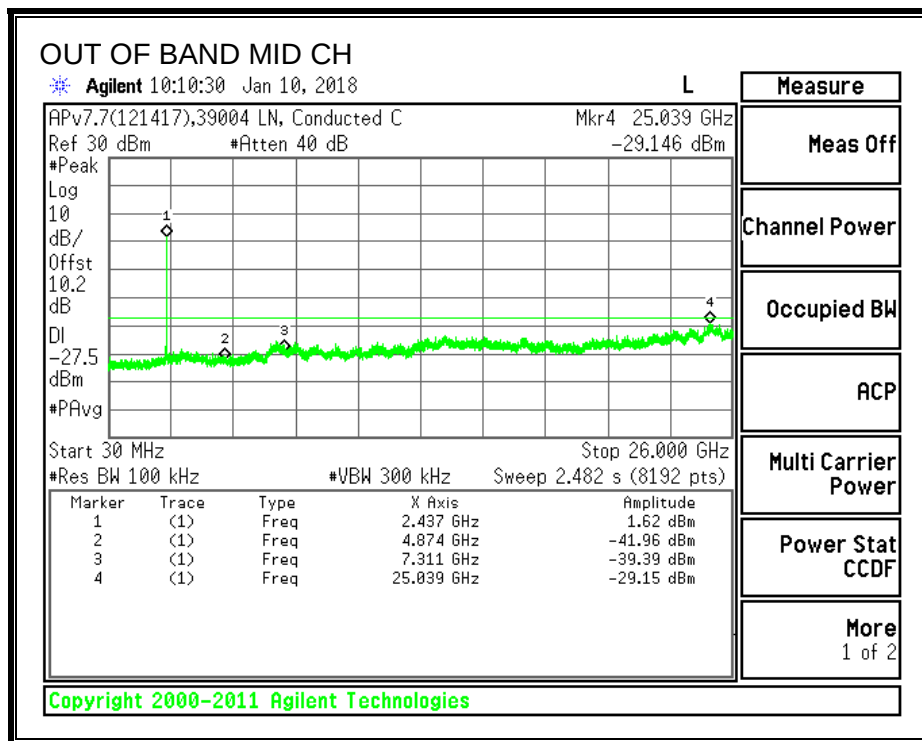
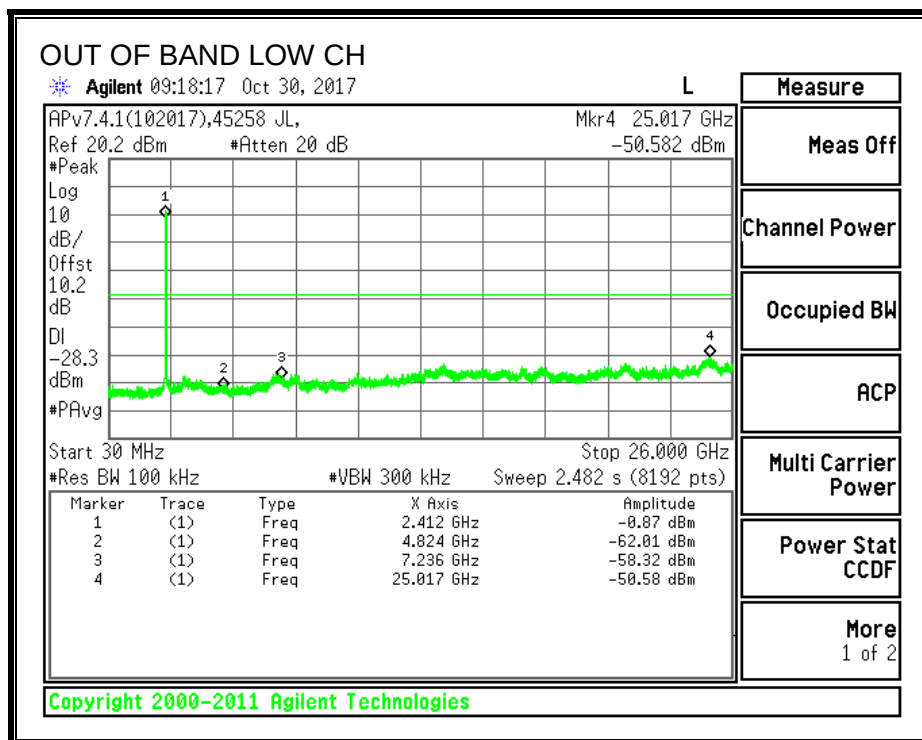


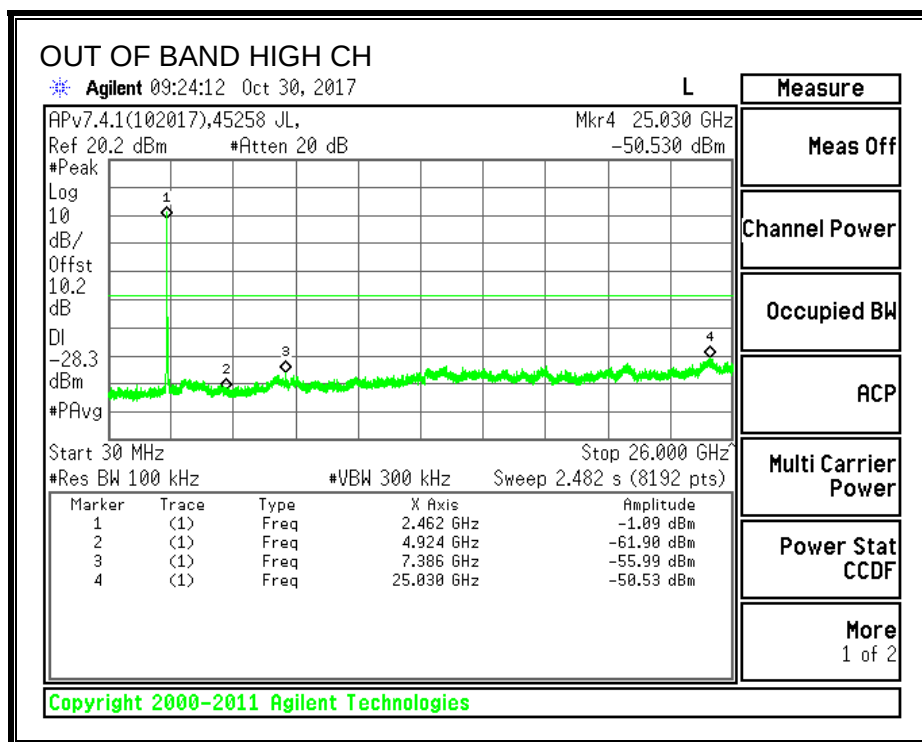
HIGH CHANNEL BANDEDGE



Note: Data is in compliance with the -27.5dBm limit shown in the 11g reference level plot above.

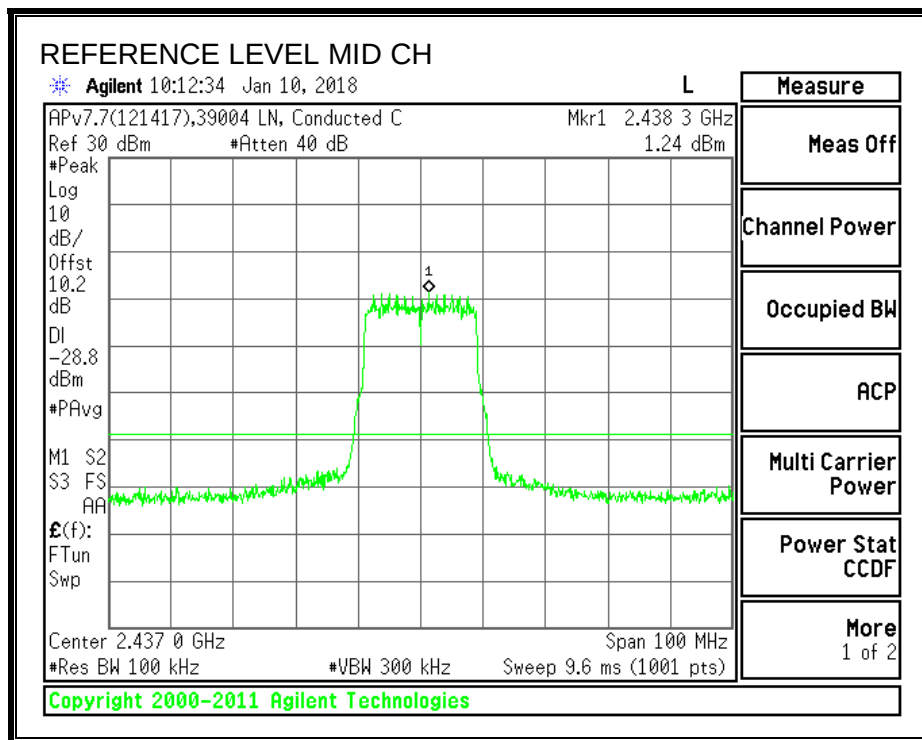
OUT-OF-BAND EMISSIONS



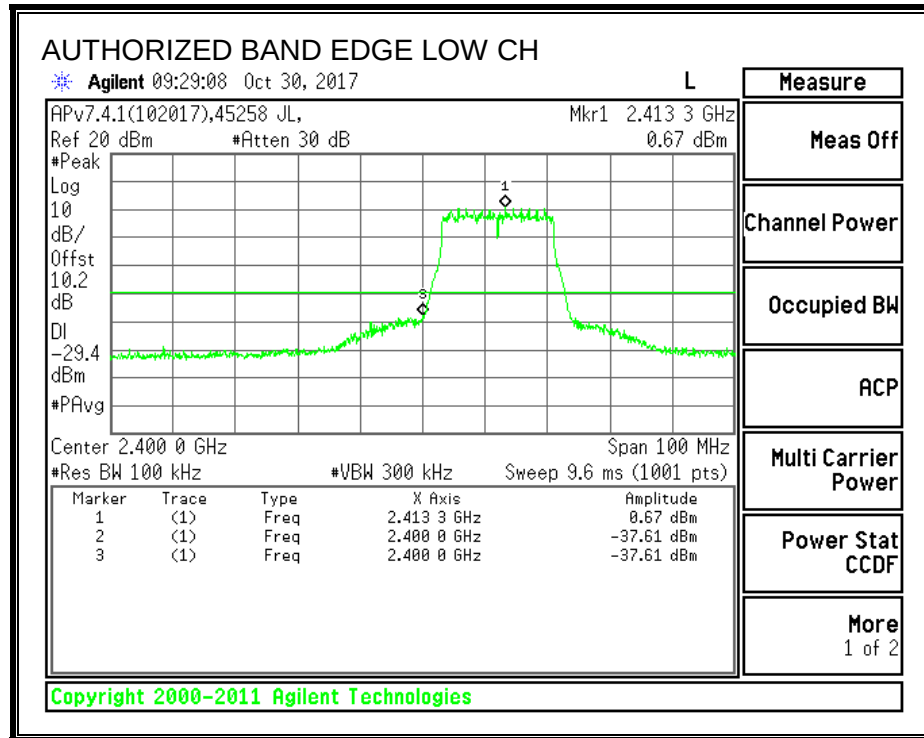


Note: Data is in compliance with the -27.5dBm limit shown in the 11g reference level plot above.

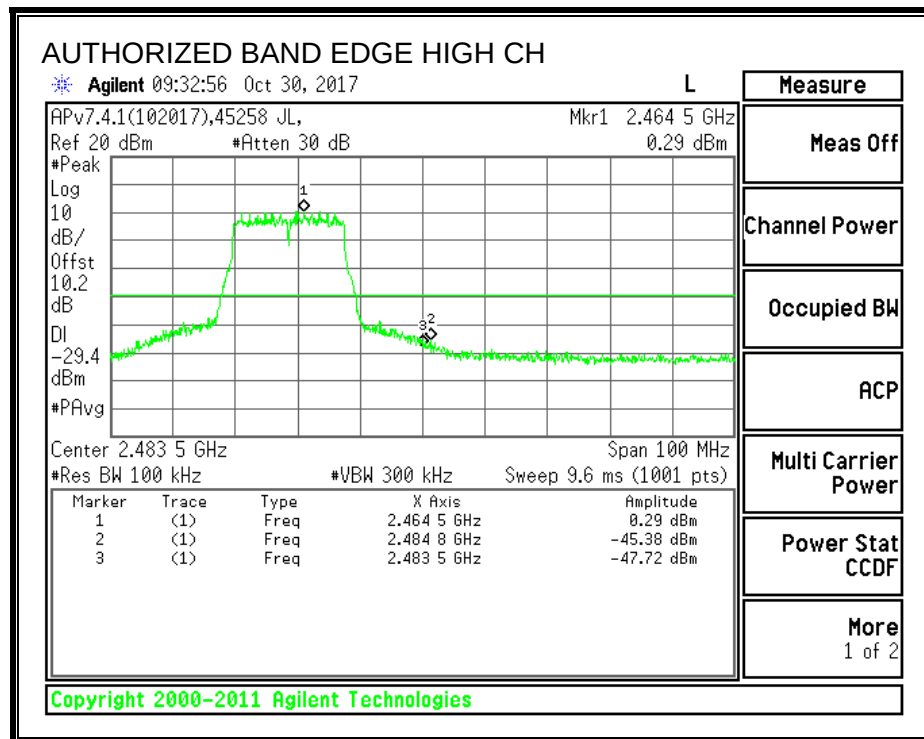
8.7.3. 802.11n HT20 MODE IN-BAND REFERENCE LEVEL



LOW CHANNEL BANDEDGE

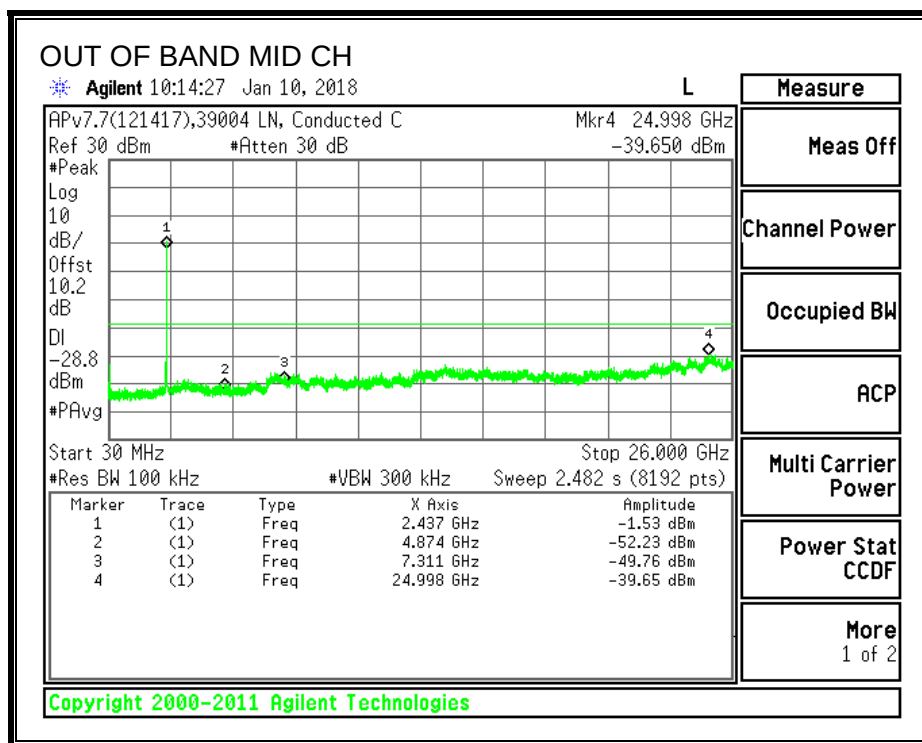
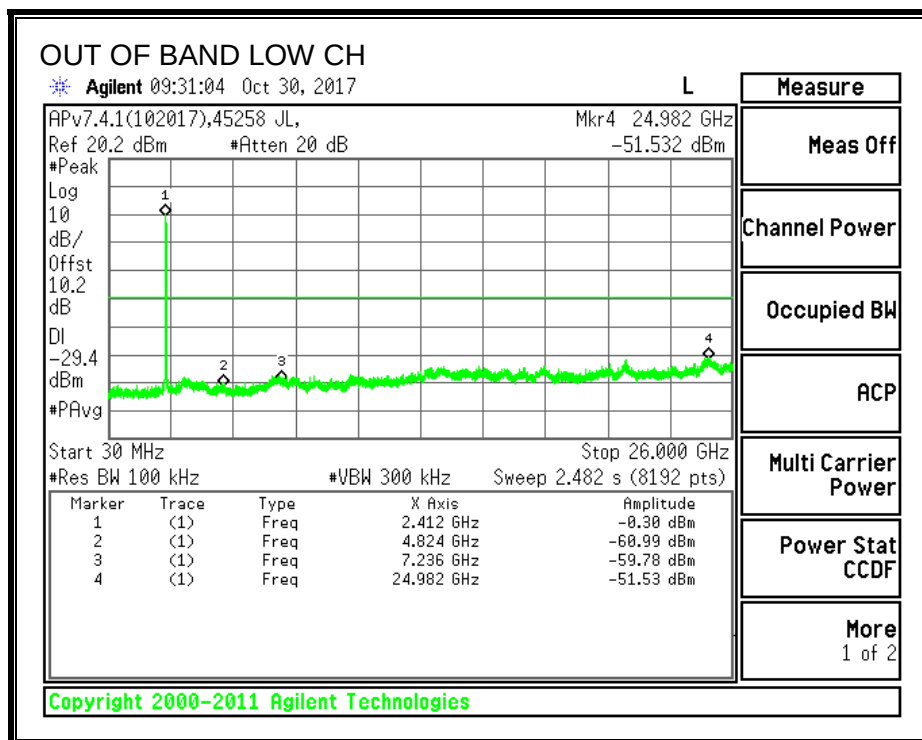


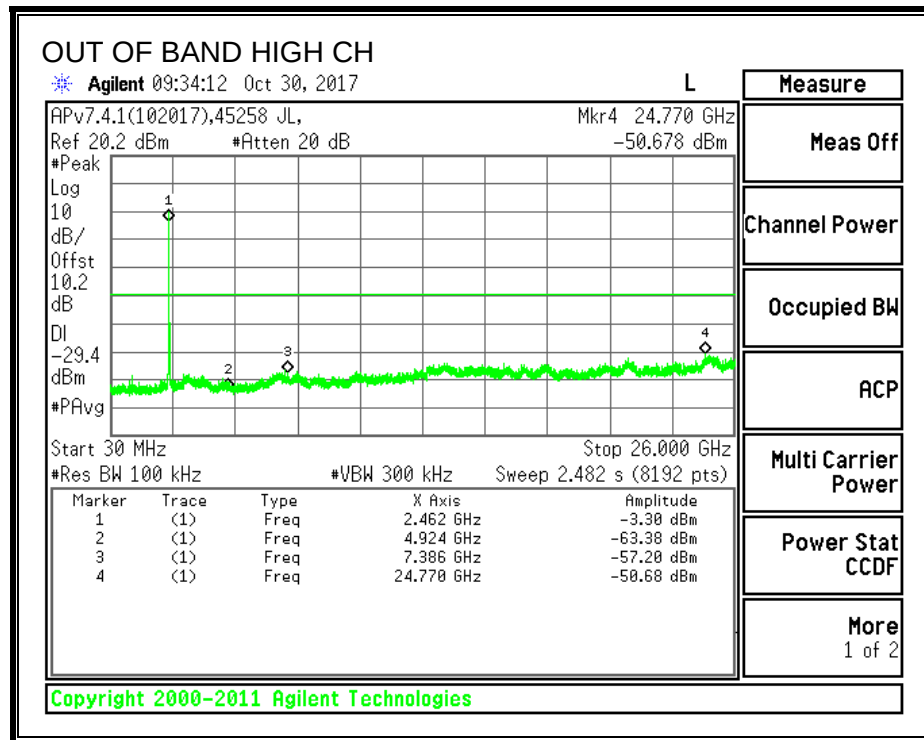
HIGH CHANNEL BANDEDGE



Note: Data is in compliance with the -28.8dBm limit shown in the 11n HT20 reference level plot above.

OUT-OF-BAND EMISSIONS





Note: Data is in compliance with the -28.8dBm limit shown in the 11n HT20 reference level plot above.

9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

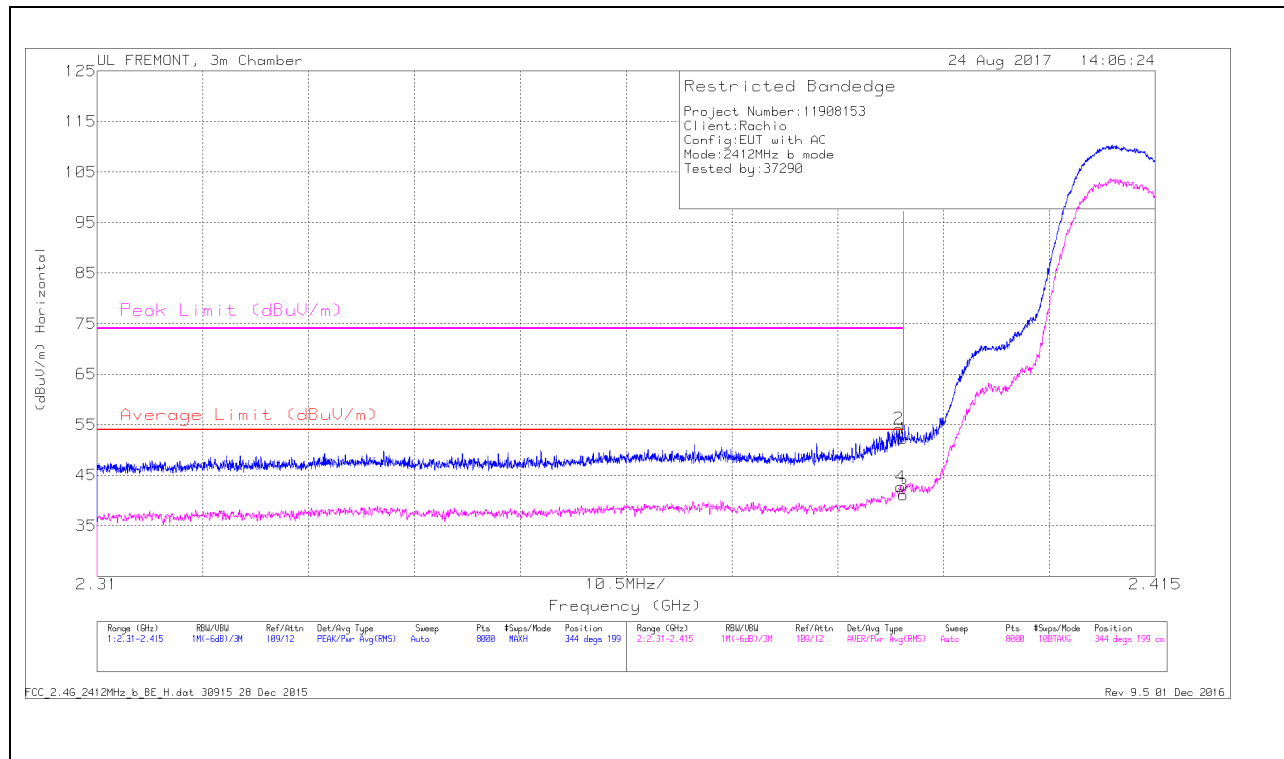
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

9.2. TRANSMITTER ABOVE 1 GHz

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

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



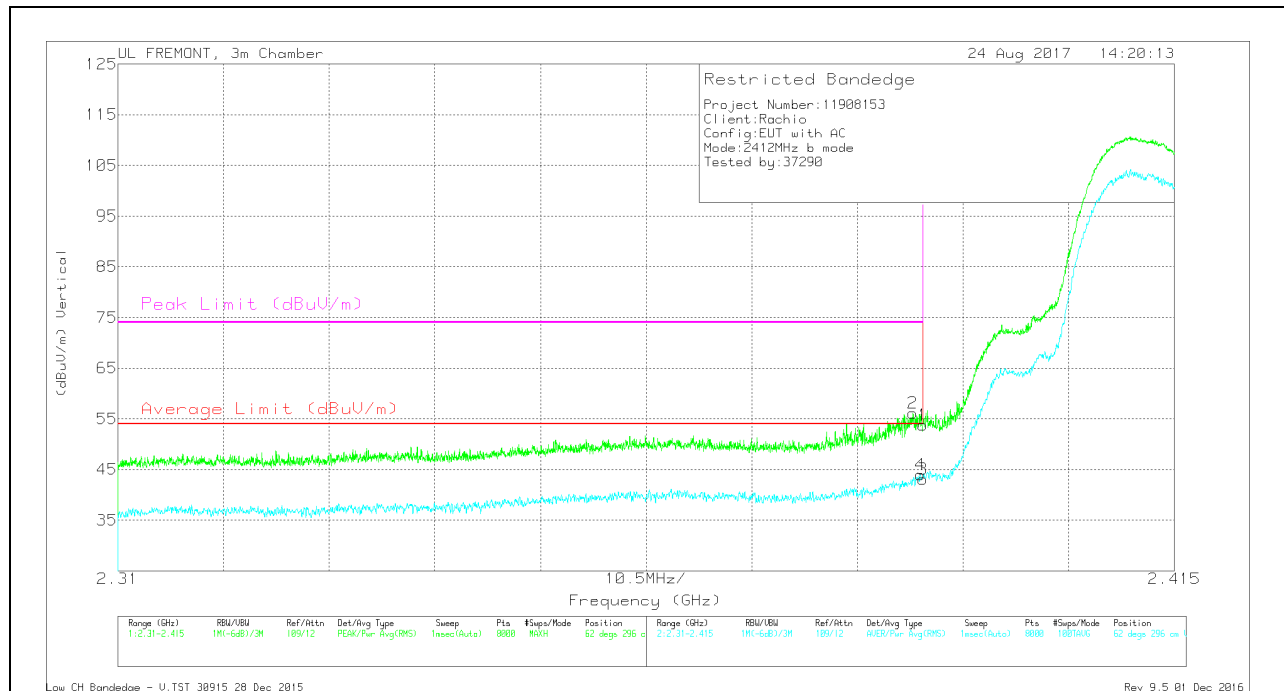
Trace Markers

Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	AF T712 (dBm)	Amp/CbIfTr/Pad (dB)	DC Corr (dB)	Correcte d Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	42.93	Pk	31.9	-22.6	0	52.23	-	-	74	-21.77	344	199	H
2	2.39	44.8	PK	31.9	-22.5	0	54.2	-	-	74	-19.8	344	199	H
3	2.39	31.61	RMS	31.9	-22.6	.17	41.3	54	-12.7	-	-	344	199	H
4	2.39	33.28	RMS	31.9	-22.5	.17	42.87	54	-11.13	-	-	344	199	H

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



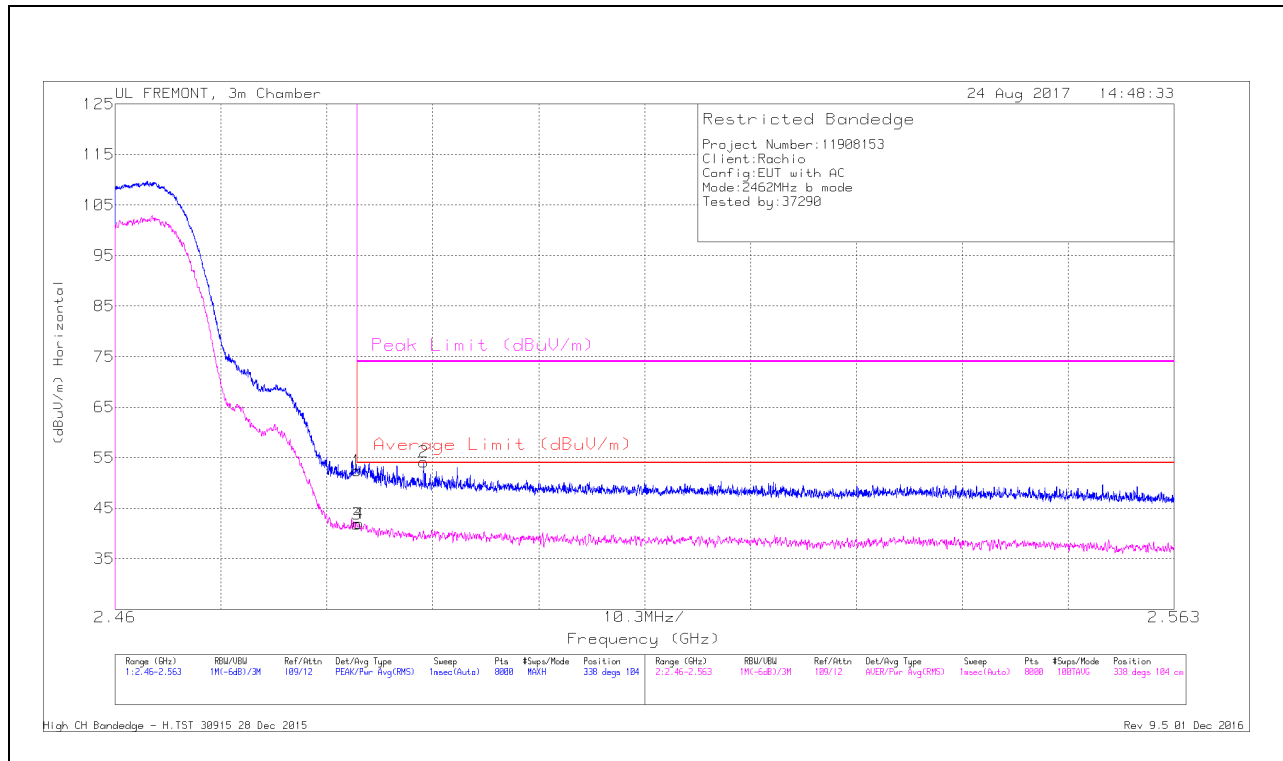
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Filtr/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
2	2.389	46.68	Pk	31.9	-22.5	0	56.08	-	-	74	-17.92	62	296	V
1	2.39	44.45	Pk	31.9	-22.6	0	53.75	-	-	74	-20.25	62	296	V
3	2.39	33.75	RMS	31.9	-22.6	.17	43.24	54	-10.76	-	-	62	296	V
4	2.39	34.57	RMS	31.9	-22.5	.17	44.16	54	-9.84	-	-	62	296	V

Pk - Peak detector
RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



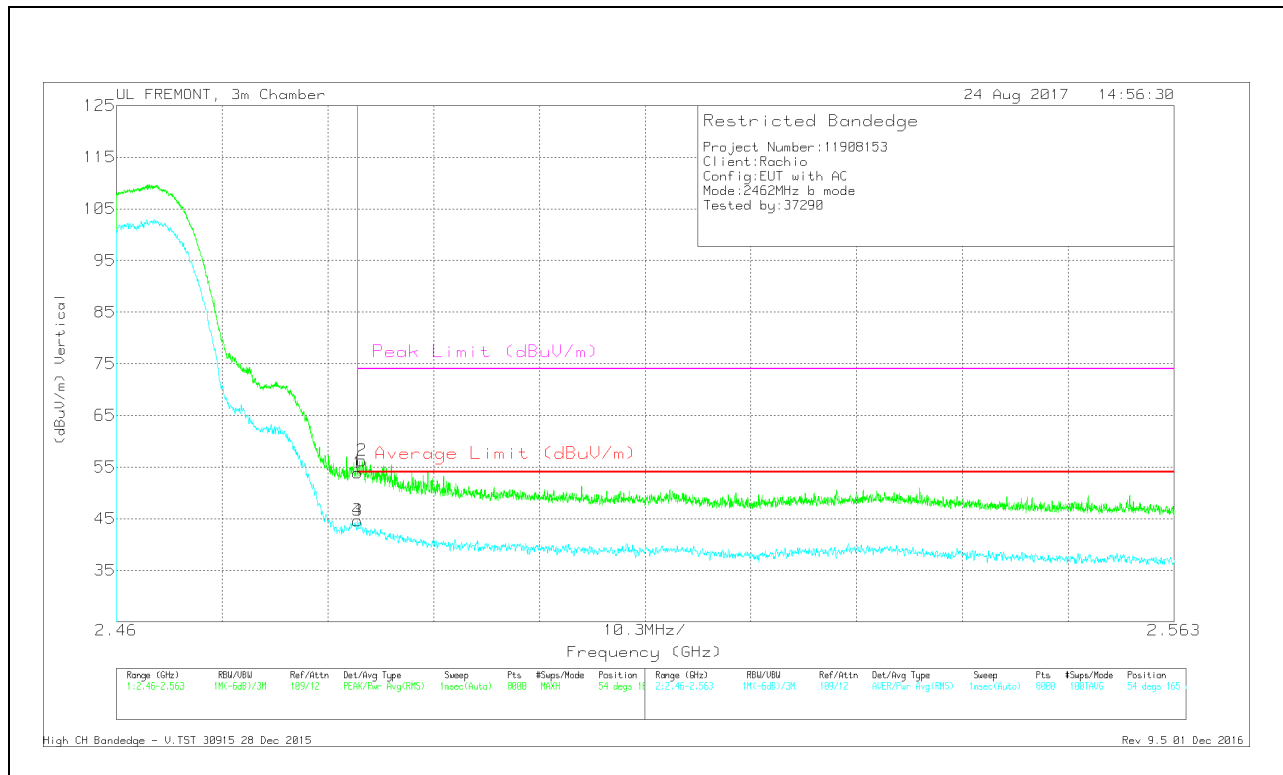
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	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	2.484	42.73	Pk	32.4	-22.7	0	52.43	-	-	74	-21.57	338	104	H
3	2.484	31.91	RMS	32.4	-22.7	.17	41.8	54	-12.2	-	-	338	104	H
4	2.484	32.06	RMS	32.4	-22.7	.17	41.95	54	-12.05	-	-	338	104	H
2	2.49	44.34	Pk	32.5	-22.7	0	54.14	-	-	74	-19.86	338	104	H

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Trace Markers

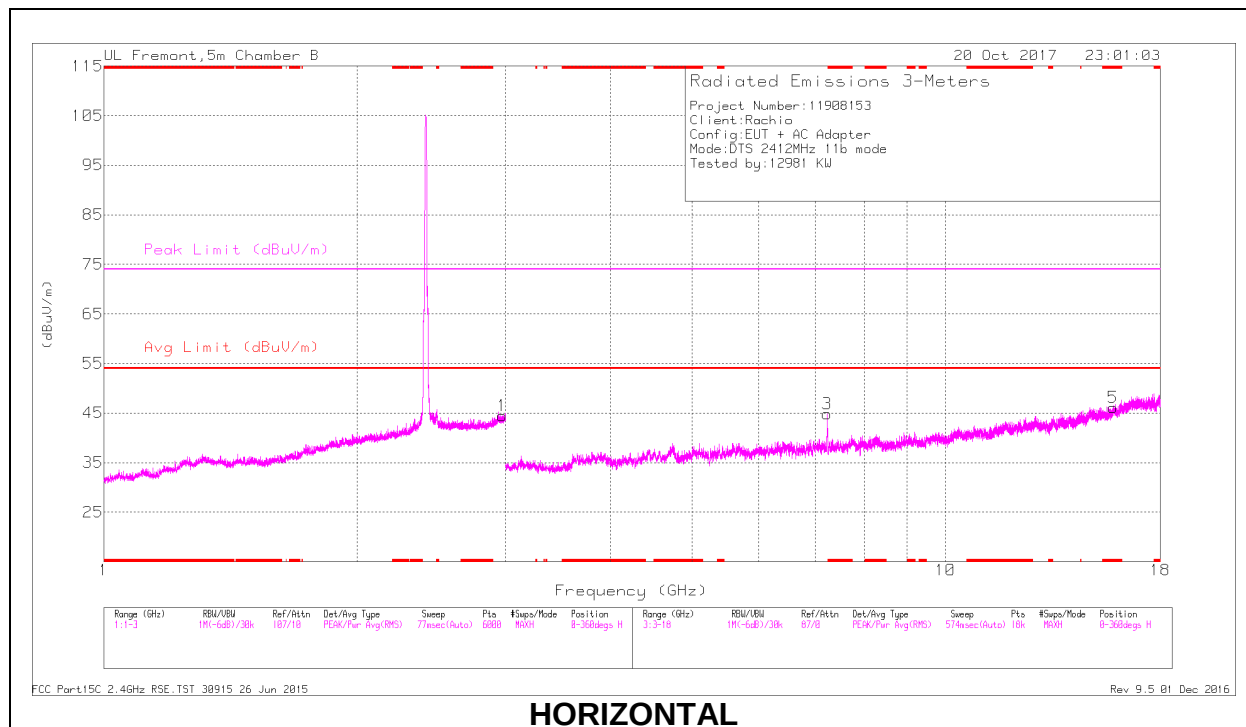
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/C bl/Fitr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarization
1	2.484	44.17	Pk	32.4	-22.7	0	53.87	-	-	74	-20.13	54	165	V
2	2.484	46.56	Pk	32.4	-22.7	0	56.26	-	-	74	-17.74	54	165	V
3	2.484	34.76	RMS	32.4	-22.7	.17	44.65	54	-9.35	-	-	54	165	V
4	2.484	34.76	RMS	32.4	-22.7	.17	44.65	54	-9.35	-	-	54	165	V

Pk - Peak detector

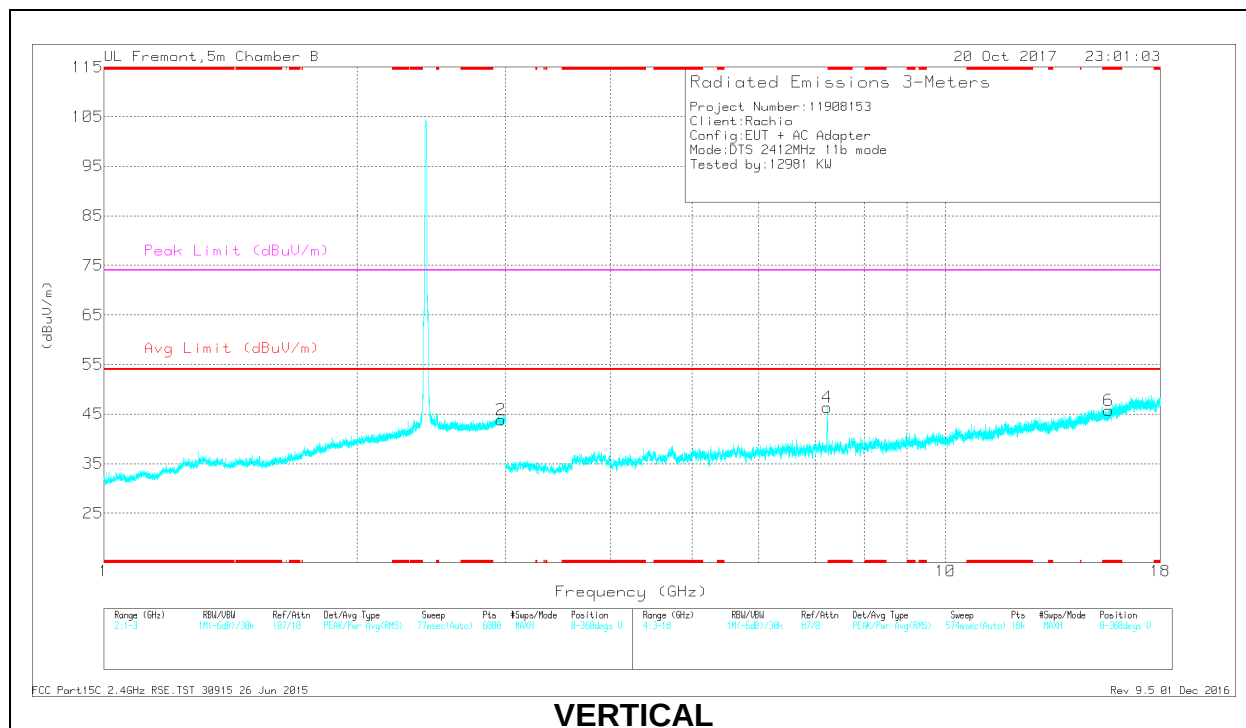
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (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
5	*15.818	31.1	PK2	40.9	-19.6	0	52.4	-	-	74	-21.6	288	334	H
	*15.817	20.51	MAv1	40.9	-19.6	.17	42	54	-12	-	-	288	334	H
6	*15.631	31.86	PK2	40.7	-20.5	0	52.06	-	-	74	-21.94	68	148	V
	*15.63	21.05	MAv1	40.7	-20.6	.17	41.34	54	-12.66	-	-	68	148	V
2	2.965	30.75	Pk	32.7	-19.6	0	43.85	-	-	-	-	0-360	199	V
1	2.976	31.35	Pk	32.7	-19.6	0	44.45	-	-	-	-	0-360	199	H
3	7.236	36.21	Pk	35.8	-27.2	0	44.81	-	-	-	-	0-360	199	H
4	7.237	37.74	Pk	35.8	-27.2	0	46.34	-	-	-	-	0-360	102	V

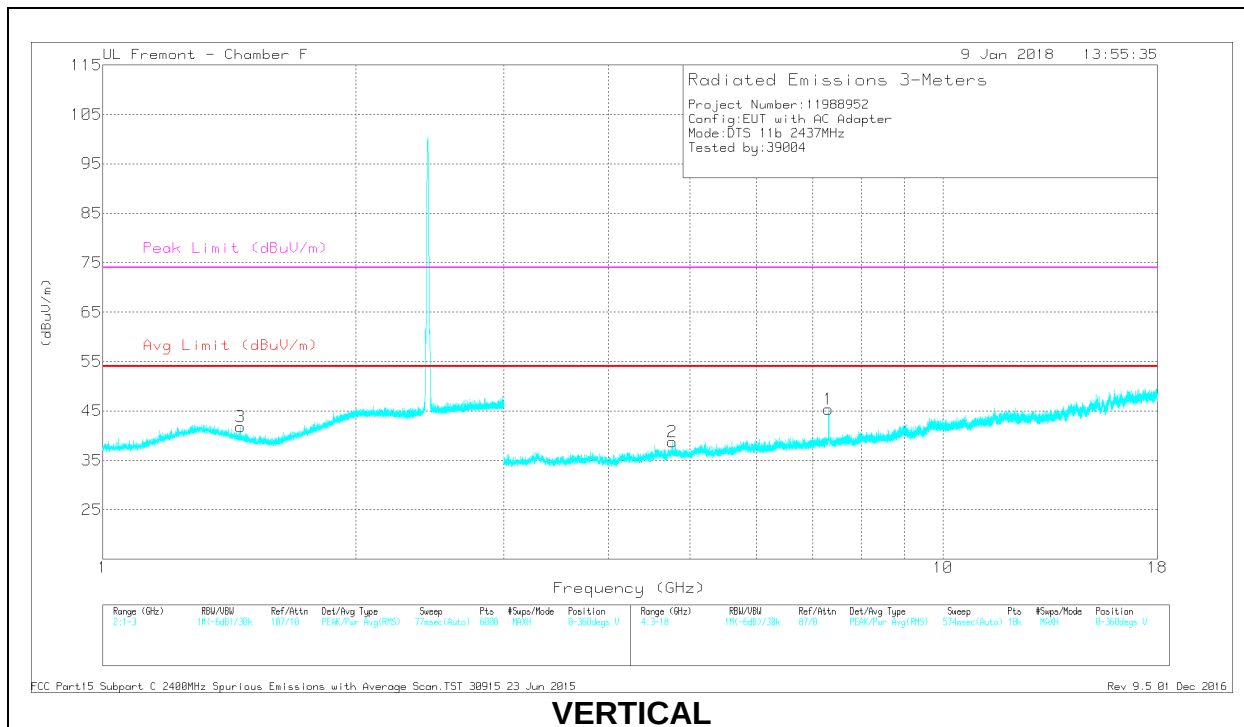
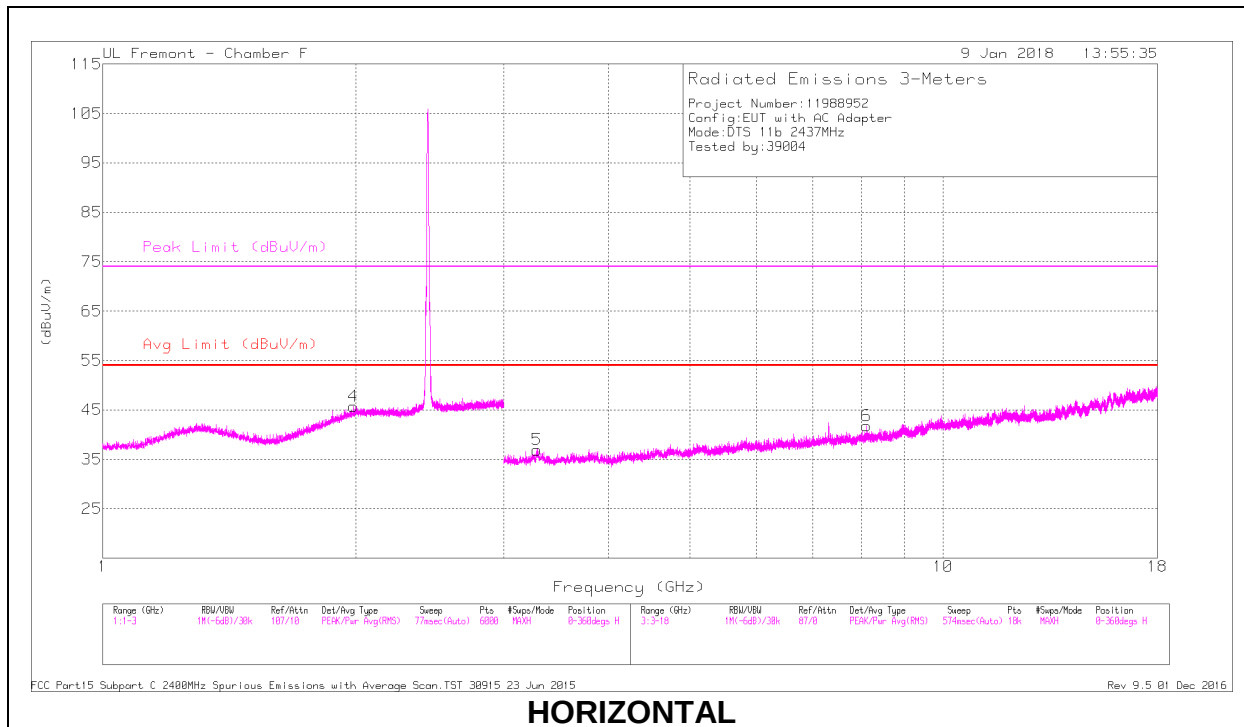
Pk - Peak detector

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL RESULTS



RADIATED EMISSIONS

Radiated Emissions

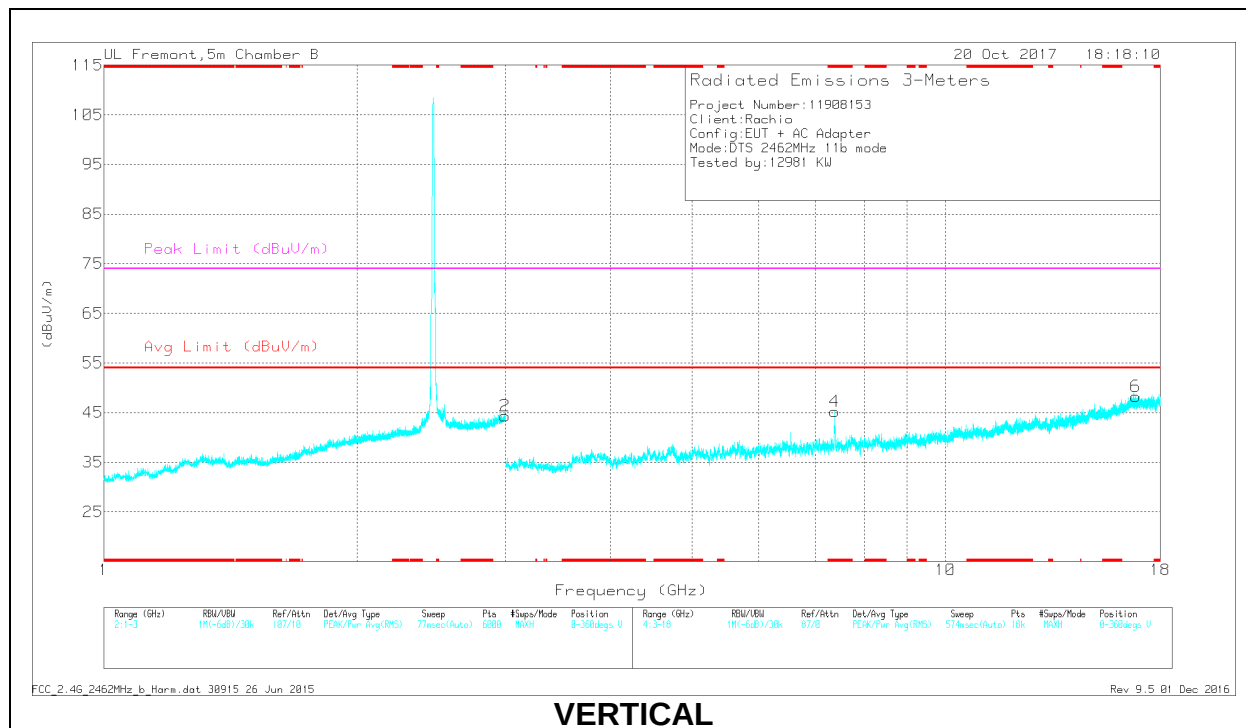
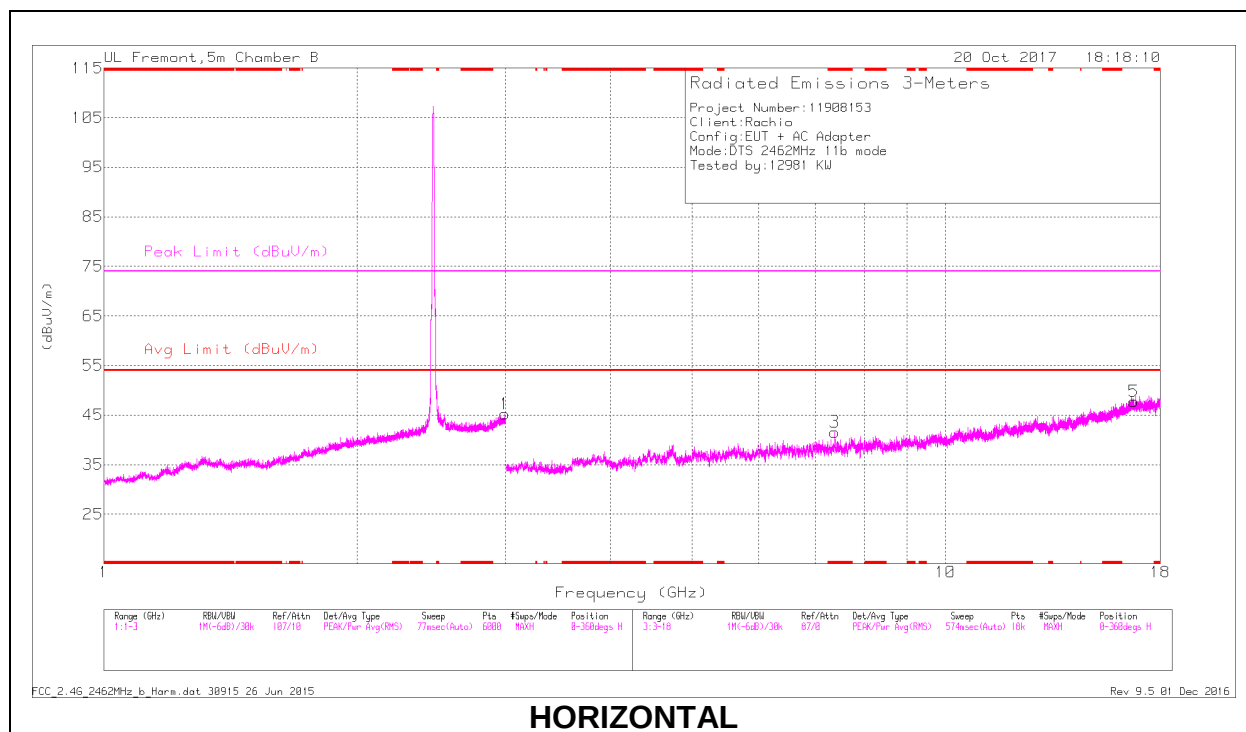
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cb/Ftr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1.987	39.99	PK2	32.2	-21.1	0	51.09	-	-	74	-22.91	244	136	H
3	* 1.459	40.28	PK2	28.3	-21.7	0	46.88	-	-	74	-27.12	274	178	V
	* 1.46	28.73	MAv1	28.3	-21.7	0.17	35.5	54	-18.5	-	-	274	178	V
6	* 8.113	34.62	PK2	36.1	-24	0	46.72	-	-	74	-27.28	299	122	H
	* 8.11	23.85	MAv1	36.1	-24	0.17	36.12	54	-17.88	-	-	299	122	H
5	3.289	38.58	PK2	33.7	-28.5	0	43.78	-	-	74	-30.22	260	131	H
1	* 7.309	42.8	PK2	35.9	-25.8	0	52.9	-	-	74	-21.1	325	101	V
	* 7.312	31.66	MAv1	35.9	-25.8	0.17	41.93	54	-12.07	-	-	325	101	V
2	* 4.765	37.68	PK2	34.1	-27.3	0	44.48	-	-	74	-29.52	309	212	V
	* 4.763	26.41	MAv1	34.1	-27.3	0.17	33.38	54	-20.62	-	-	309	212	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Trace Markers

Marker	Frequ ency (GHz)	Meter Readi ng (dBuV)	Det	AF T863 (dB/m)	Amp/C bl/Filtr/ Pad (dB)	DC Corr (dB)	Correc ted Readi ng (dBuV/ m)	Avg Limit (dBuV/ m)	Margin (dB)	Peak Limit (dBuV/ m)	PK Margin (dB)	Azimet h (Degs)	Height (cm)	Polarit y
3	* 7.388	38.7	PK2	35.9	-26.5	0	48.1	-	-	74	-25.9	359	168	H
	* 7.388	27.14	MAv1	35.9	-26.5	.17	36.73	54	-17.27	-	-	359	168	H
4	* 7.387	42.64	PK2	35.9	-26.5	0	52.04	-	-	74	-21.96	52	114	V
	* 7.387	32.04	MAv1	35.9	-26.5	.17	41.63	54	-12.37	-	-	52	114	V
1	2.996	32.02	Pk	32.7	-19.5	0	45.22	-	-	-	-	0-360	102	H
2	2.997	31.16	Pk	32.7	-19.5	0	44.36	-	-	-	-	0-360	199	V
5	16.752	24.74	Pk	42.4	-19.4	0	47.74	-	-	-	-	0-360	199	H
6	16.818	24.25	Pk	42.3	-18.3	0	48.25	-	-	-	-	0-360	200	V

Pk - Peak detector

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

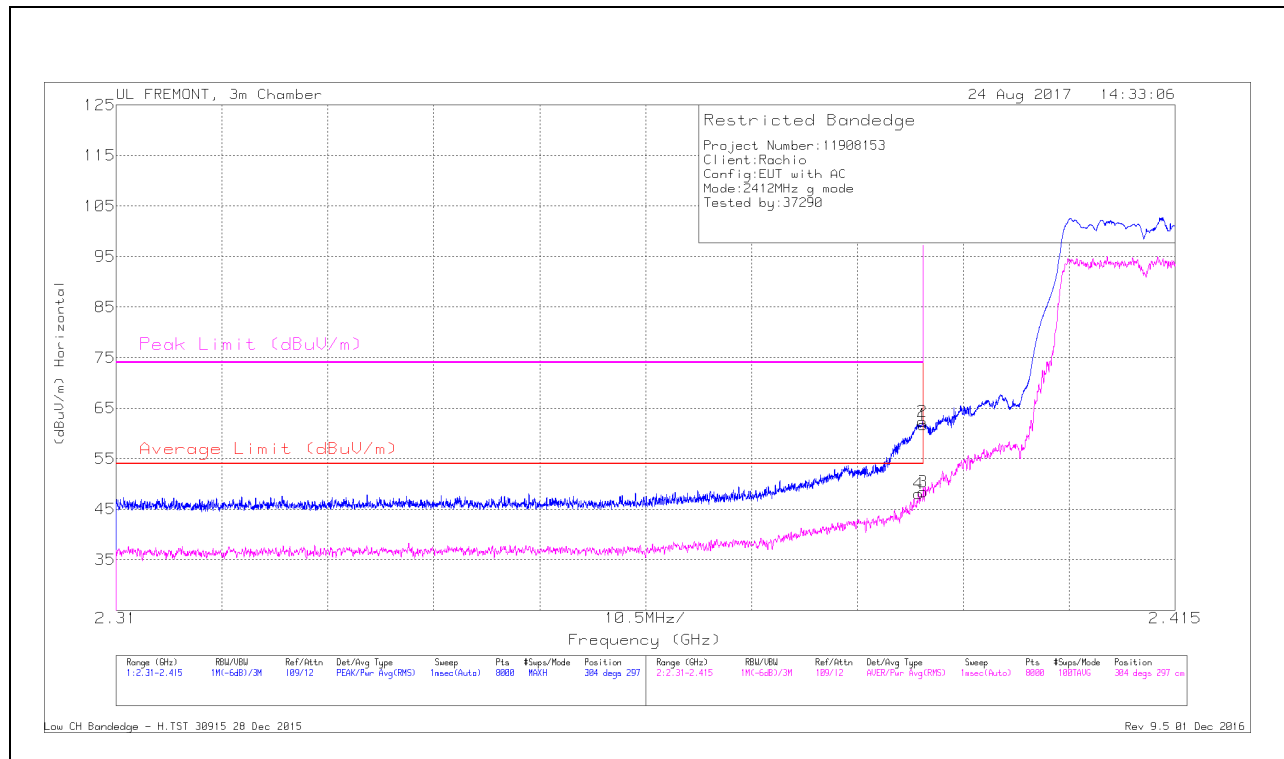
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT

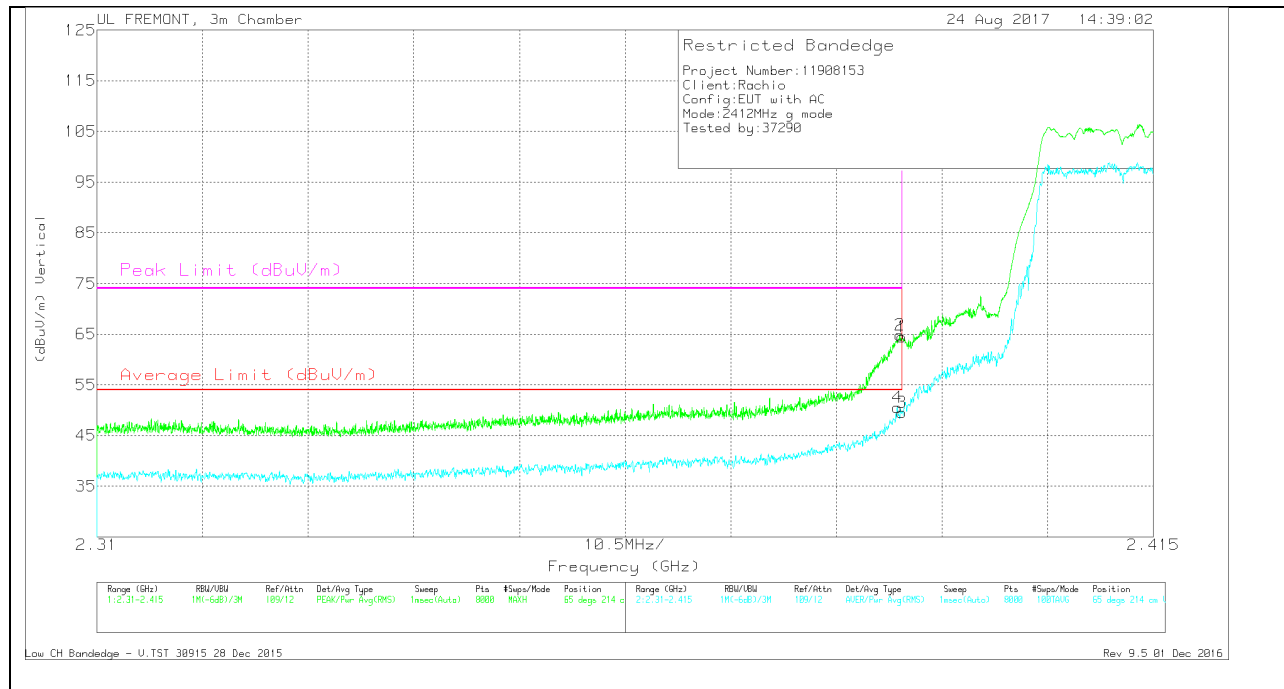


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/C bl/Fitr/ 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)	Polarit y
1	2.39	52.37	Pk	31.9	-22.6	0	61.67	-	-	74	-12.33	304	297	H
2	2.39	52.99	Pk	31.9	-22.6	0	62.29	-	-	74	-11.71	304	297	H
3	2.39	38.17	RMS	31.9	-22.6	.94	48.44	54	-5.56	-	-	304	297	H
4	2.39	37.74	RMS	31.9	-22.5	.94	48.11	54	-5.89	-	-	304	297	H

Pk - Peak detector
RMS - RMS detection

VERTICAL RESULT



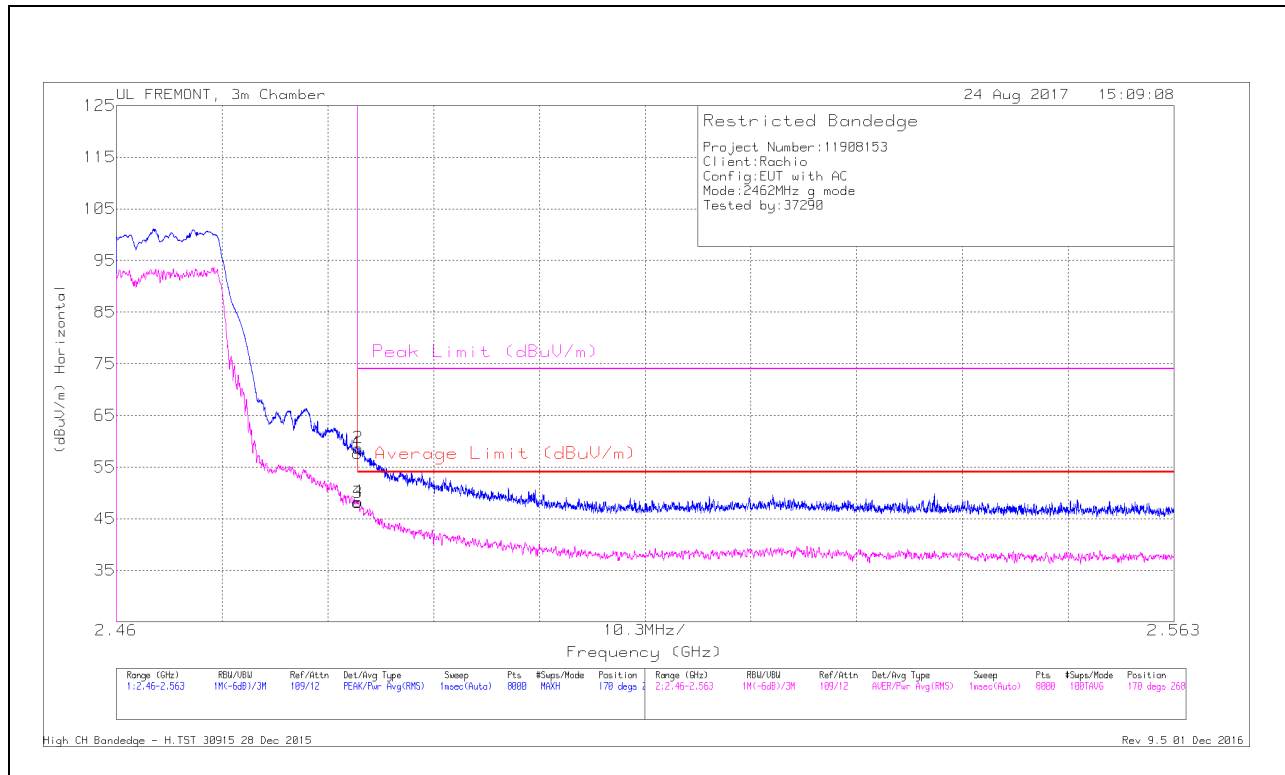
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Filtr/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	55.13	Pk	31.9	-22.6	0	64.43	-	-	74	-9.57	65	214	V
2	2.39	55.4	Pk	31.9	-22.5	0	64.8	-	-	74	-9.2	65	214	V
3	2.39	39.31	RMS	31.9	-22.6	.94	49.58	54	-4.42	-	-	65	214	V
4	2.39	40.12	RMS	31.9	-22.5	.94	50.49	54	-3.51	-	-	65	214	V

Pk - Peak detector
RMS - RMS detection

BANDEGE (HIGH CHANNEL)

HORIZONTAL RESULT

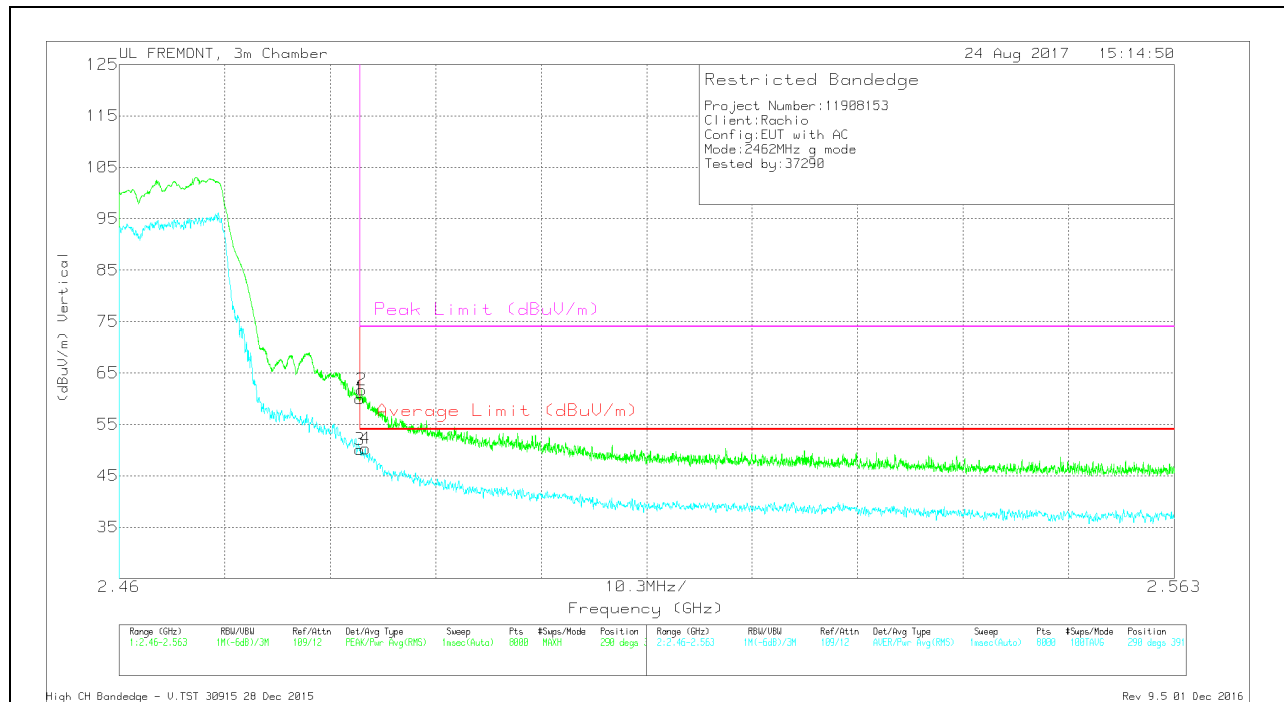


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Filtr/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)	Polarization
1	2.484	47.98	Pk	32.4	-22.7	0	57.68	-	-	74	-16.32	170	268	H
2	2.484	48.99	Pk	32.4	-22.7	0	58.69	-	-	74	-15.31	170	268	H
3	2.484	37.43	RMS	32.4	-22.7	.94	48.1	54	-5.9	-	-	170	268	H
4	2.484	37.64	RMS	32.4	-22.7	.94	48.31	54	-5.69	-	-	170	268	H

Pk - Peak detector
RMS - RMS detection

VERTICAL RESULT



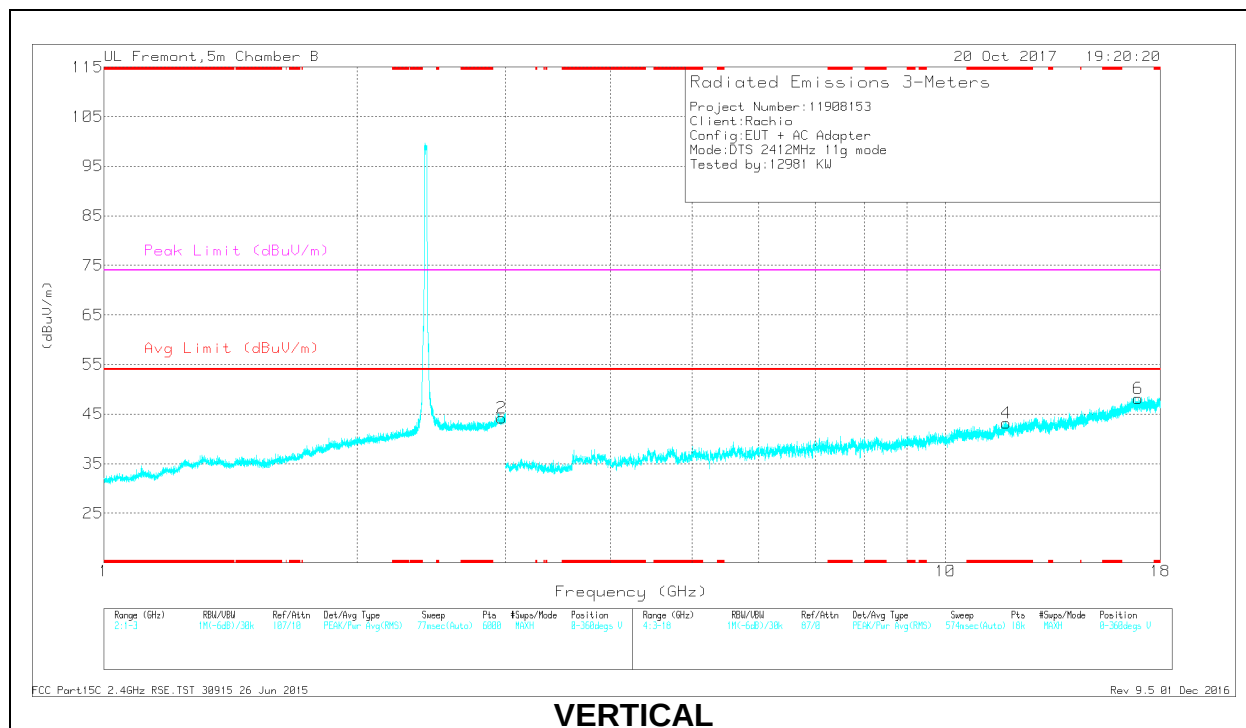
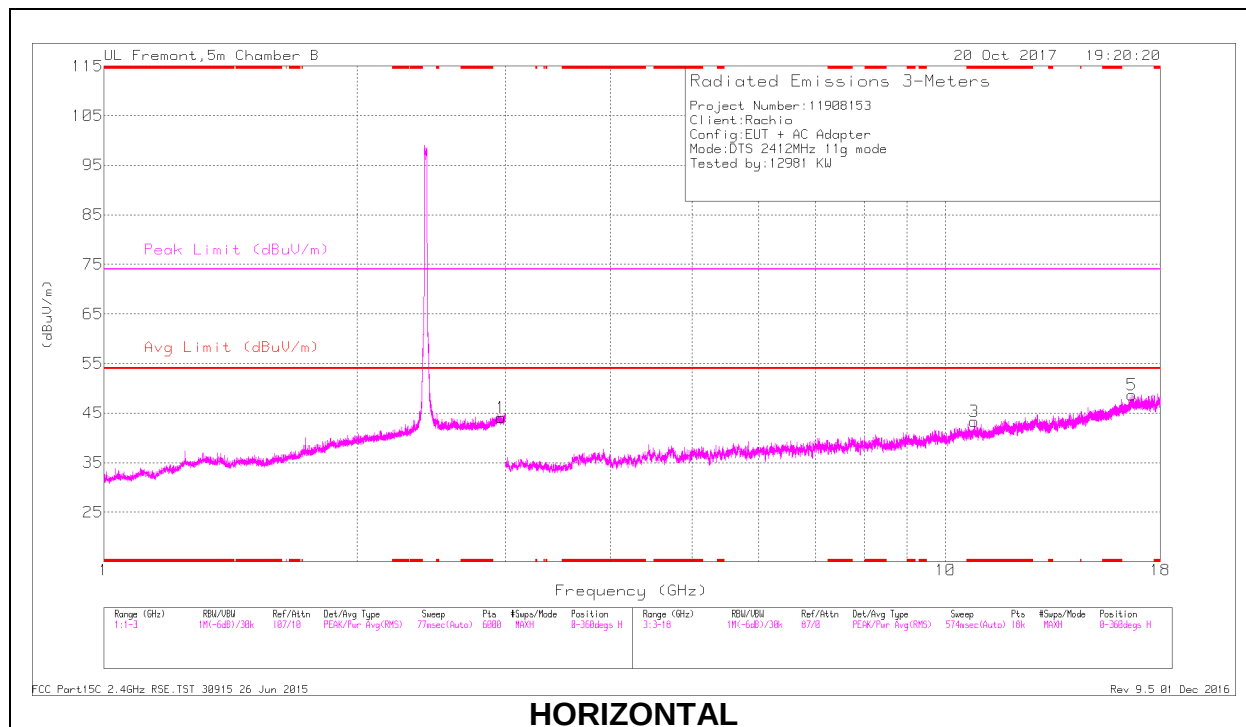
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/C bl/Filtr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	50.31	Pk	32.4	-22.7	0	60.01	-	-	74	-13.99	290	391	V
2	2.484	52.01	Pk	32.4	-22.7	0	61.71	-	-	74	-12.29	290	391	V
3	2.484	39.44	RMS	32.4	-22.7	.94	50.11	54	-3.89	-	-	290	391	V
4	2.484	39.61	RMS	32.4	-22.7	.94	50.28	54	-3.72	-	-	290	391	V

Pk - Peak detector
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (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
3	* 10.818	33.39	PK2	37.7	-22.4	0	48.69	-	-	74	-25.31	283	317	H
	* 10.817	21.36	MAv1	37.7	-22.4	.94	37.63	54	-16.37	-	-	283	317	H
4	* 11.815	31.75	PK2	38.6	-21.6	0	48.75	-	-	74	-25.25	343	378	V
	* 11.815	20.56	MAv1	38.6	-21.6	.94	38.53	54	-15.47	-	-	343	378	V
1	2.965	31.03	Pk	32.7	-19.6	0	44.13	-	-	-	-	0-360	199	H
2	2.969	31.1	Pk	32.7	-19.6	0	44.2	-	-	-	-	0-360	200	V
5	16.651	25.88	Pk	42.2	-19.4	0	48.68	-	-	-	-	0-360	102	H
6	16.945	24.85	Pk	42.2	-18.9	0	48.15	-	-	-	-	0-360	102	V

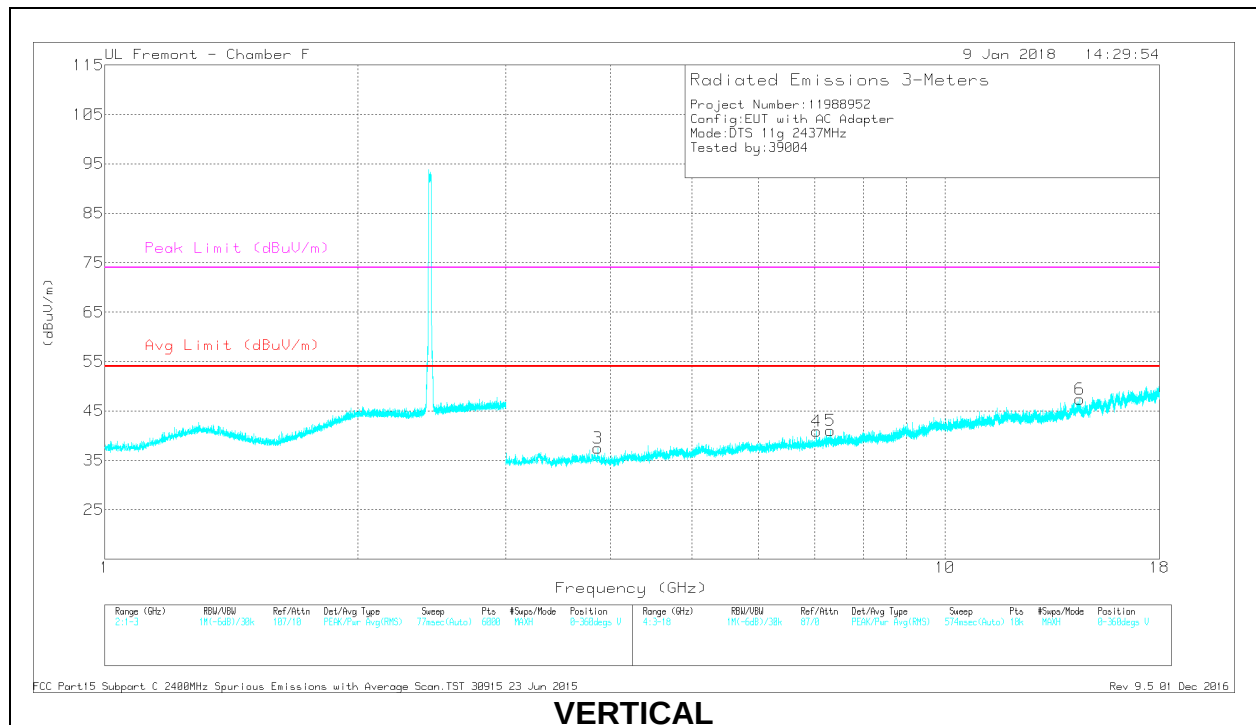
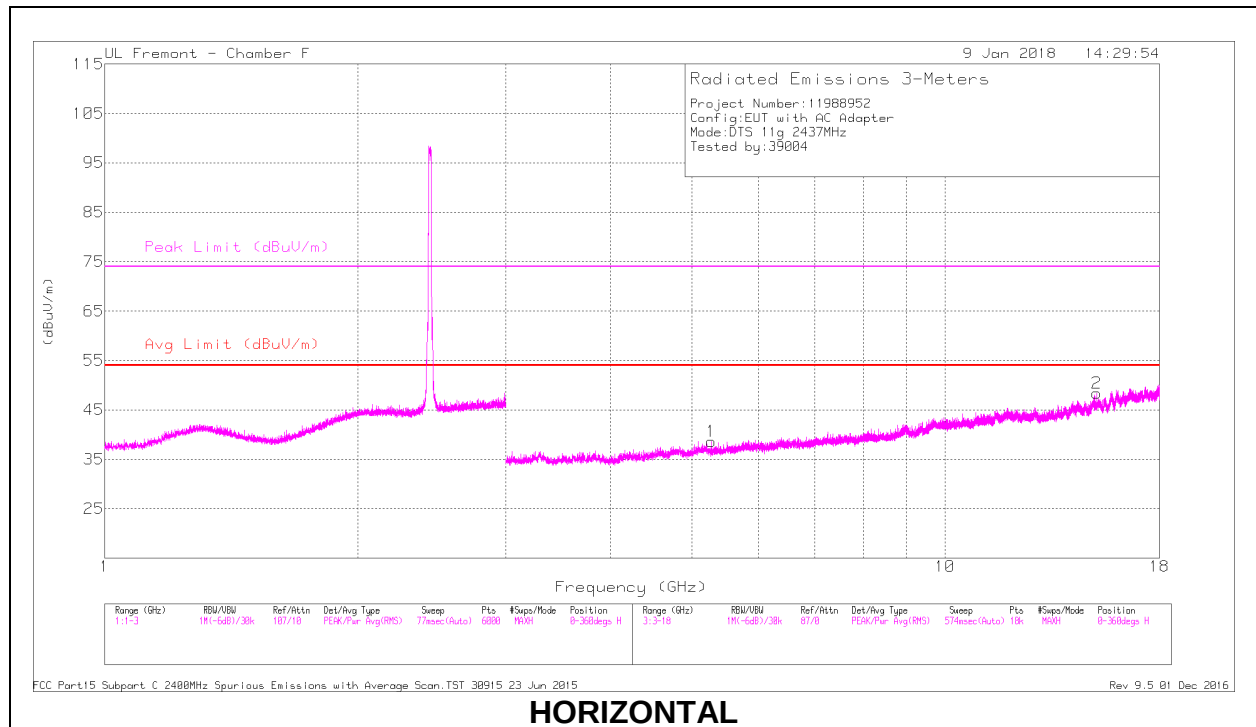
Pk - Peak detector

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL RESULTS



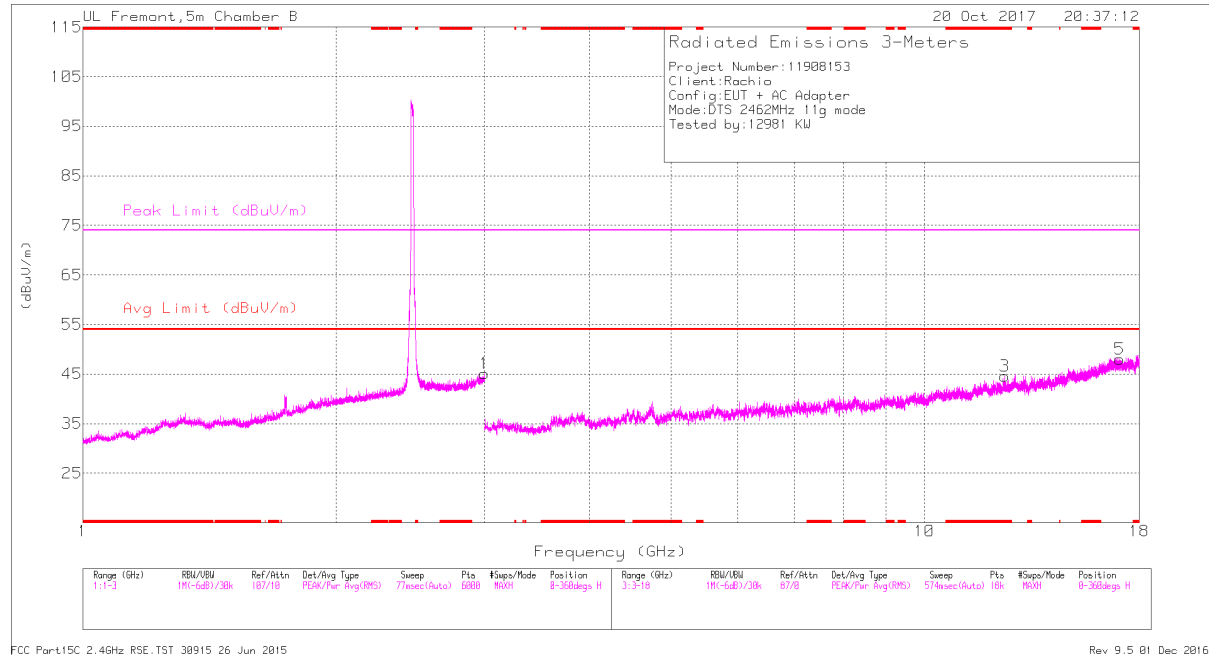
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cb/Filt/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.269	36.92	PK2	34.7	-27.7	0	43.92	-	-	74	-30.08	341	169	H
2	15.153	35.15	PK2	40.7	-22.2	0	53.65	-	-	74	-20.35	319	145	H
3	* 3.864	37.34	PK2	33.3	-28	0	42.64	-	-	74	-31.36	360	226	V
	* 3.866	26.52	MAv1	33.3	-28.1	0.94	32.66	54	-21.34	-	-	360	226	V
4	* 7.308	36.31	PK2	35.9	-25.9	0	46.31	-	-	74	-27.69	355	133	V
	* 7.307	25.24	MAv1	35.9	-25.9	0.94	36.18	54	-17.82	-	-	355	133	V
5	7.039	35.4	PK2	35.8	-25.6	0	45.6	-	-	74	-28.4	295	140	V
6	14.468	35.64	PK2	40.3	-23.1	0	52.84	-	-	74	-21.16	262	123	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

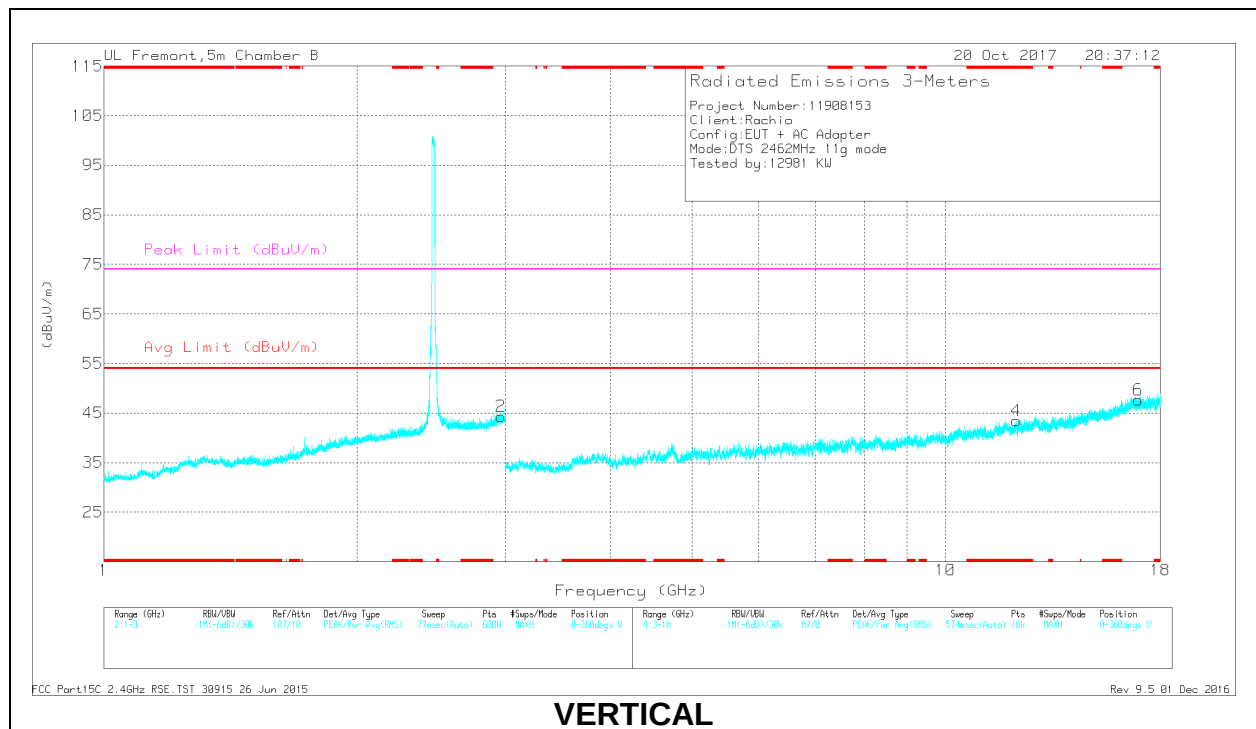
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (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
3	* 12.464	32.75	PK2	39.1	-22.1	0	49.75	-	-	74	-24.25	131	115	H
	* 12.464	20.93	MAv1	39.1	-22.1	.94	38.9	54	-15.1	-	-	131	115	H
4	* 12.141	26.44	Pk	39	-22	0	43.44	-	-	74	-30.56	0-360	102	V
2	2.966	31.19	Pk	32.7	-19.6	0	44.29	-	-	-	-	0-360	199	V
1	2.998	31.92	Pk	32.7	-19.5	0	45.12	-	-	-	-	0-360	199	H
6	16.94	24.18	Pk	42.2	-18.8	0	47.58	-	-	-	-	0-360	102	V
5	17.066	25.17	Pk	42	-19.1	0	48.07	-	-	-	-	0-360	102	H

Pk - Peak detector

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

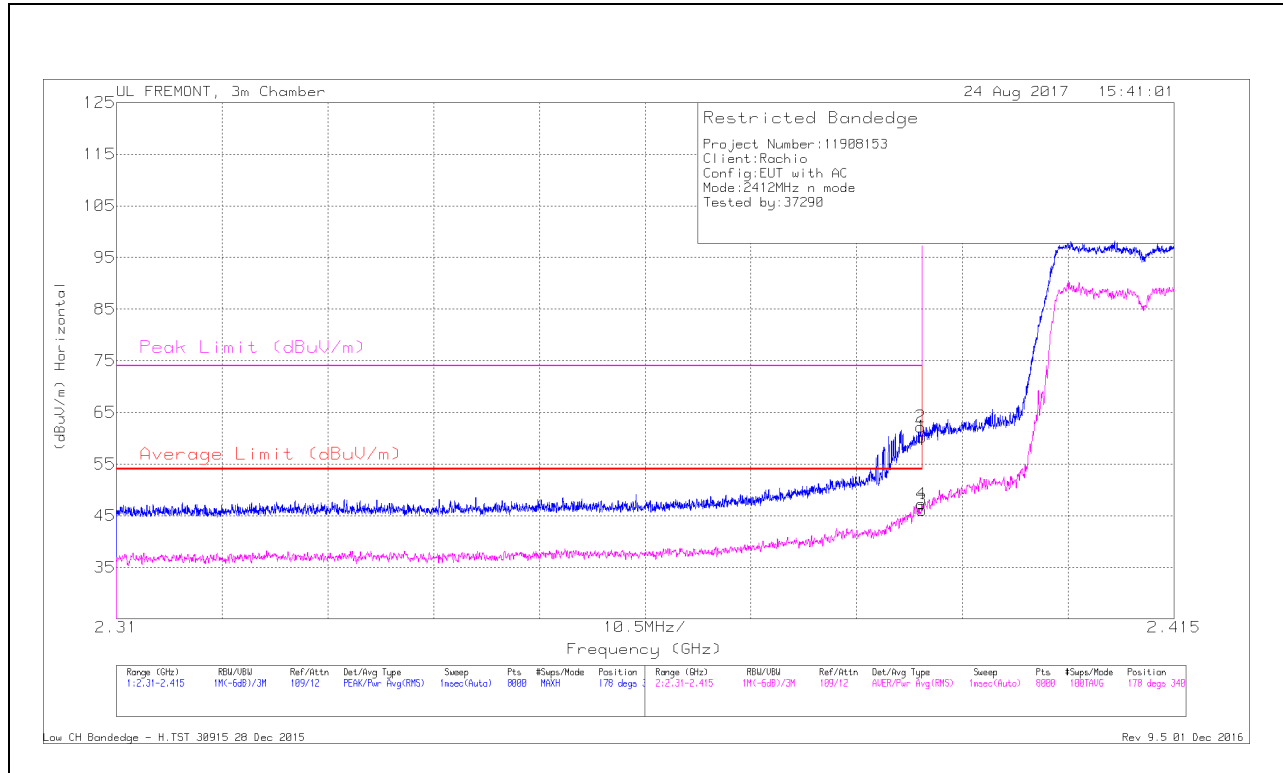
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



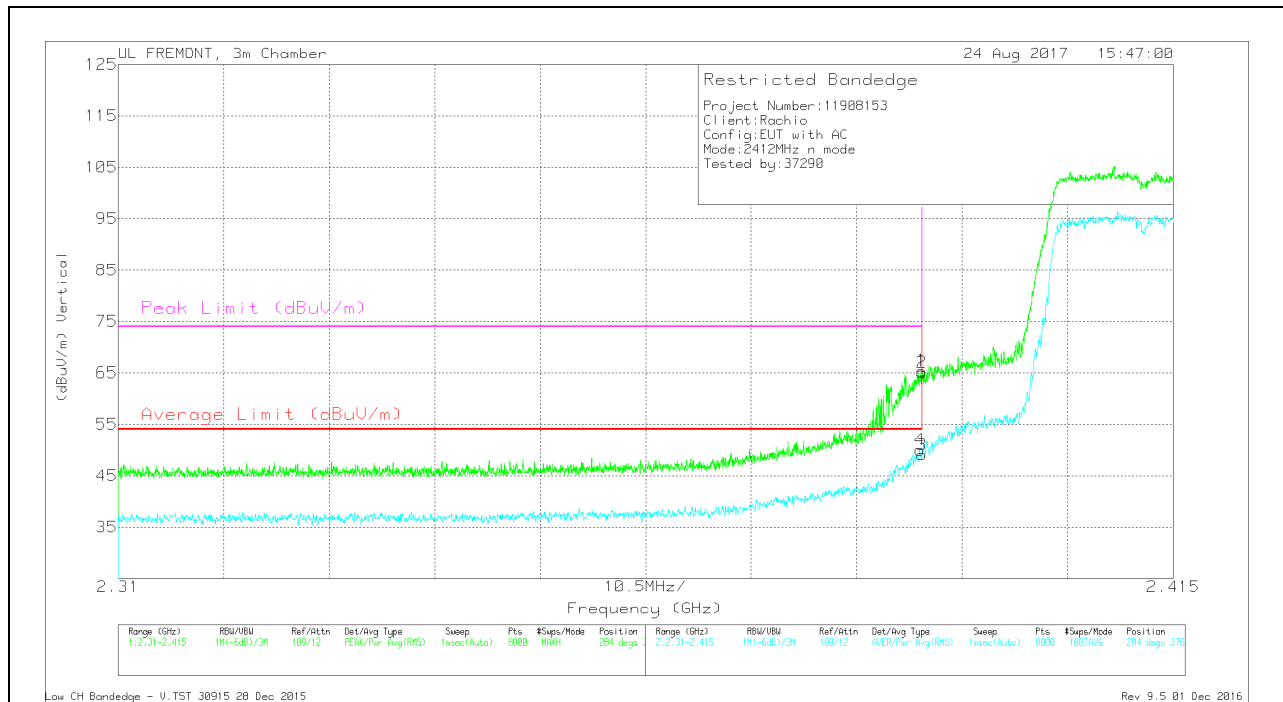
Trace Markers

Marker	Frequ ency (GHz)	Meter Readi ng (dBuV)	Det	AF T712 (dB/m)	Amp/C bl/Fitr/ Pad (dB)	DC Corr (dB)	Correc ted Readin g (dBuV/ m)	Avera ge Limit (dBuV/ m)	Margin (dB)	Peak Limit (dBuV/ m)	PK Margin (dB)	Azimet h (Degs)	Height (cm)	Polarit y
1	2.39	50.95	Pk	31.9	-22.6	0	60.25	-	-	74	-13.75	178	340	H
2	2.39	52.8	Pk	31.9	-22.5	0	62.2	-	-	74	-11.8	178	340	H
3	2.39	35.77	RMS	31.9	-22.6	1.0	46.13	54	-7.87	-	-	178	340	H
4	2.39	36.89	RMS	31.9	-22.6	1.0	47.25	54	-6.75	-	-	178	340	H

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



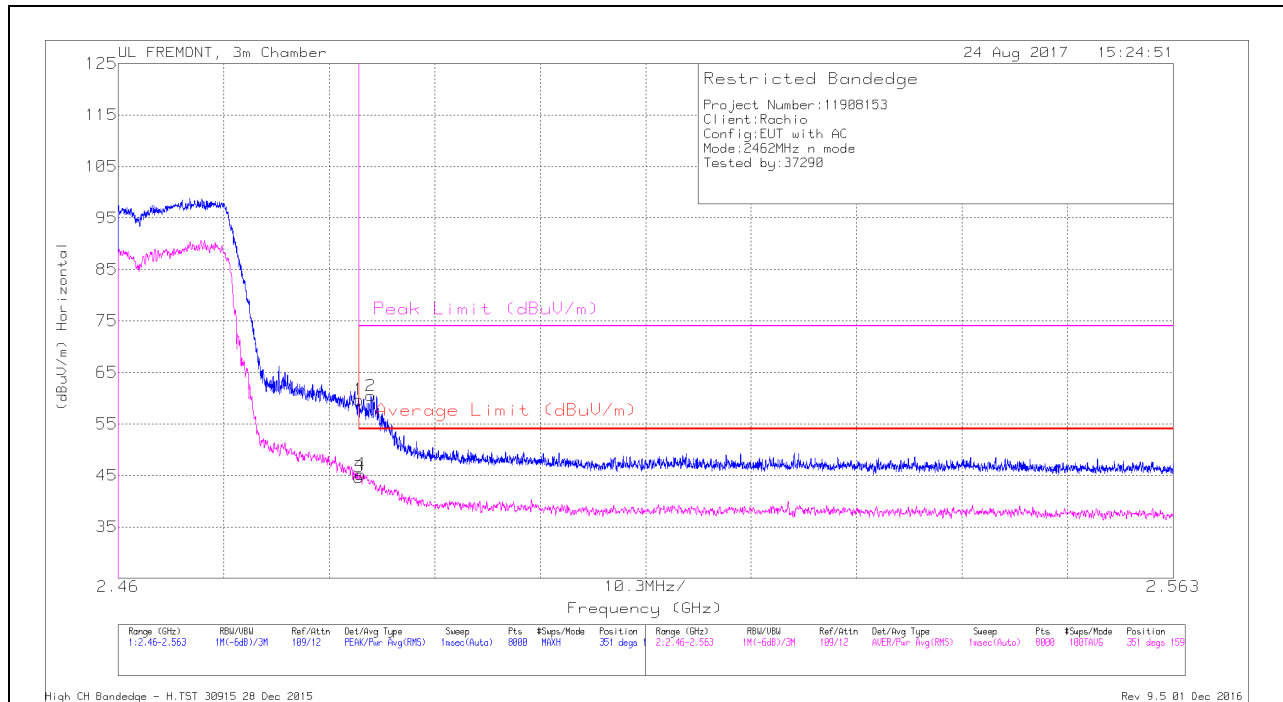
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/C bl/Filtr/ 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	56.1	Pk	31.9	-22.6	0	65.4	-	-	74	-8.6	284	376	V
2	2.39	55.81	Pk	31.9	-22.6	0	65.11	-	-	74	-8.89	284	376	V
3	2.39	38.74	RMS	31.9	-22.6	1.0	49.1	54	-4.9	-	-	284	376	V
4	2.39	39.57	RMS	31.9	-22.5	1.0	50.03	54	-3.97	-	-	284	376	V

Pk - Peak detector
RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT

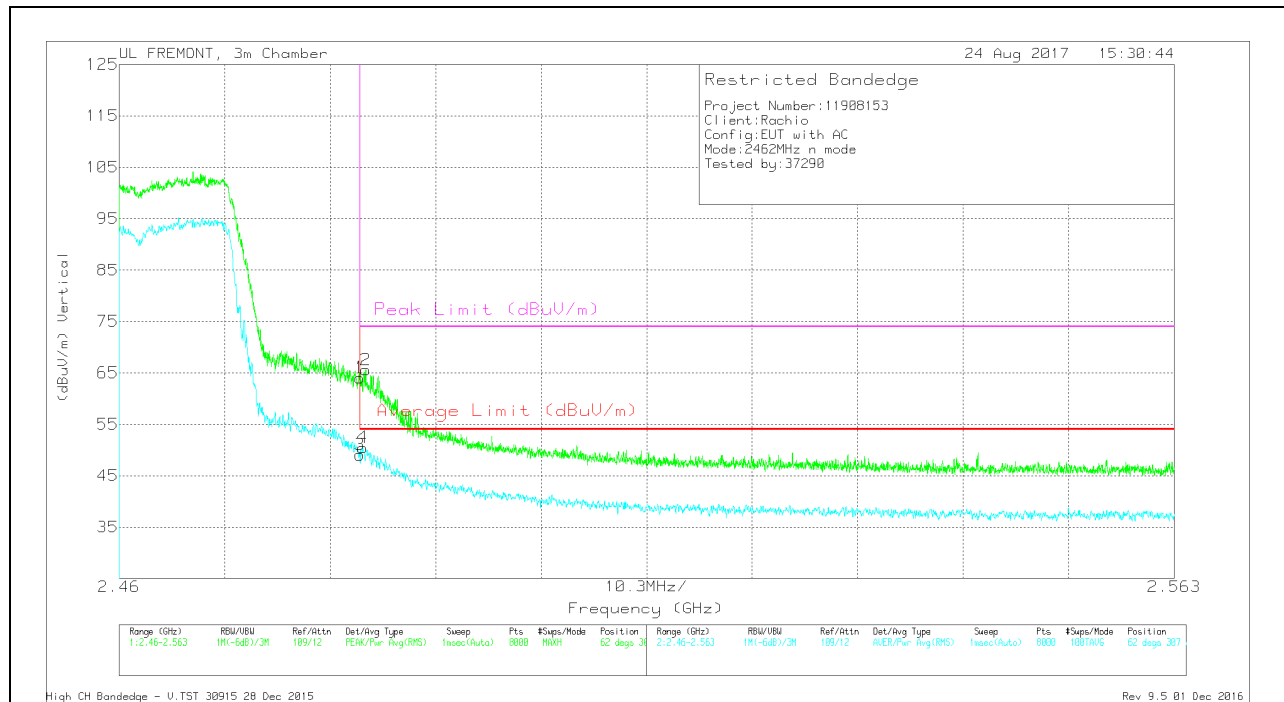


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/C bl/Filtr/ 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	49.98	Pk	32.4	-22.7	0	59.68	-	-	74	-14.32	351	159	H
3	2.484	33.91	RMS	32.4	-22.7	1.0	44.67	54	-9.33	-	-	351	159	H
4	2.484	34.47	RMS	32.4	-22.7	1.0	45.23	54	-8.77	-	-	351	159	H
2	2.485	50.74	Pk	32.4	-22.7	0	60.44	-	-	74	-13.56	351	159	H

Pk - Peak detector
RMS - RMS detection

VERTICAL RESULT



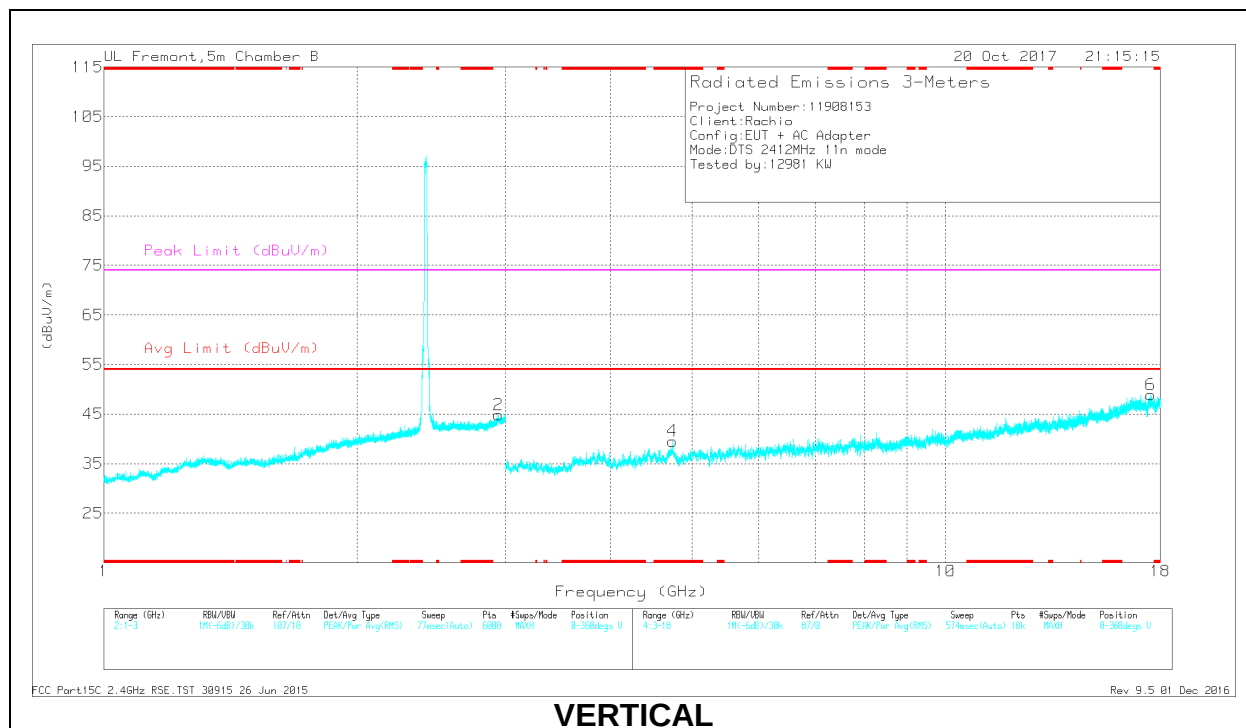
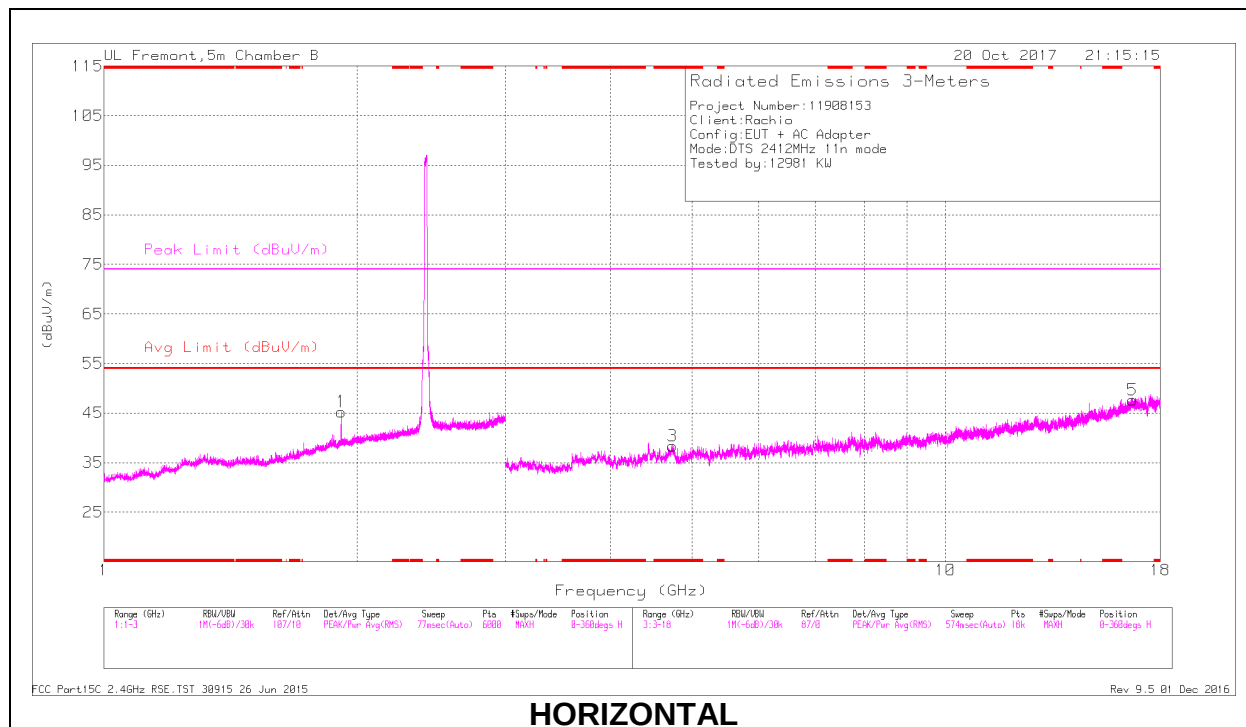
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/C bl/Filtr/ 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	54.36	Pk	32.4	-22.7	0	64.06	-	-	74	-9.94	62	307	V
2	2.484	55.91	Pk	32.4	-22.7	0	65.61	-	-	74	-8.39	62	307	V
3	2.484	38.31	RMS	32.4	-22.7	1.0	49.07	54	-4.93	-	-	62	307	V
4	2.484	39.73	RMS	32.4	-22.7	1.0	50.49	54	-3.51	-	-	62	307	V

Pk - Peak detector
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cb I/Filt/Pa d (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
3	* 4.742	39.48	PK2	34.2	-28.3	0	45.38	-	-	74	-28.62	215	208	H
	* 4.74	27.88	MAv1	34.2	-28.3	1.0	34.84	54	-19.16	-	-	215	208	H
4	* 4.741	39.57	PK2	34.2	-28.3	0	45.47	-	-	74	-28.53	315	320	V
	* 4.741	27.91	MAv1	34.2	-28.3	1.0	34.87	54	-19.13	-	-	315	320	V
1	1.914	35.28	Pk	31	-21	0	45.28	-	-	-	-	0-360	102	H
2	2.942	31.27	Pk	32.6	-19	0	44.87	-	-	-	-	0-360	200	V
5	16.681	24.66	Pk	42.2	-19.2	0	47.66	-	-	-	-	0-360	199	H
6	17.529	25.2	Pk	41.7	-18	0	48.9	-	-	-	-	0-360	102	V

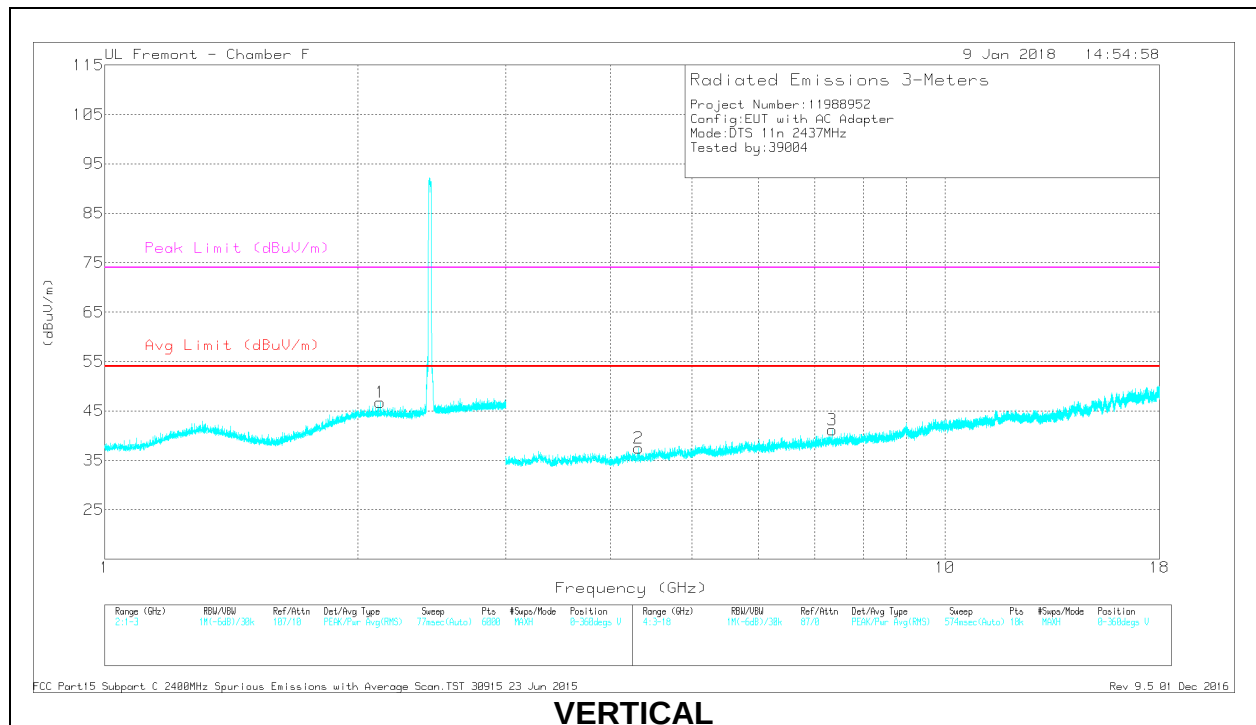
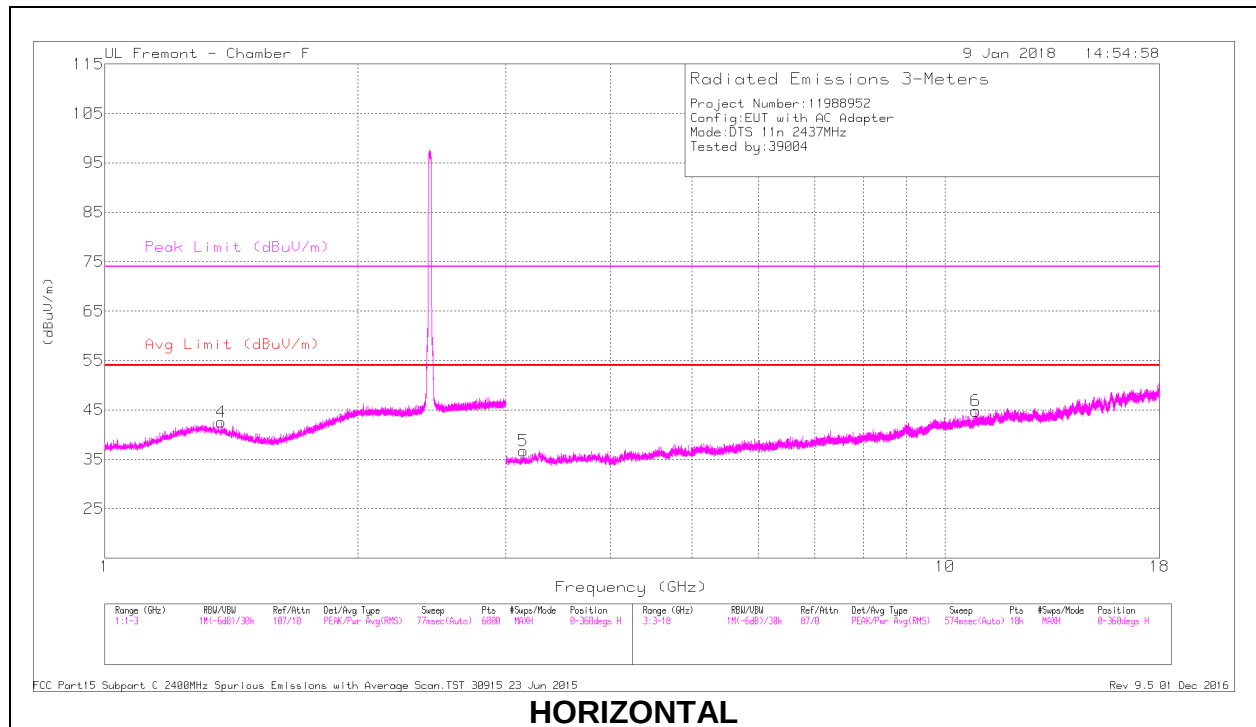
Pk - Peak detector

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL RESULTS



RADIATED EMISSIONS

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Af T119 (dB/m)	Amp/Cb/Filt/ 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	* 1.375	40.19	PK2	29.3	-21.8	0	47.69	-	-	74	-26.31	330	155	H
	* 1.374	28.86	MAv1	29.3	-21.8	1.0	37.36	54	-16.64	-	-	330	155	H
1	2.127	41.22	PK2	32.2	-20.9	0	52.52	-	-	74	-21.48	260	224	V
6	* 10.885	33.65	PK2	37.8	-20.8	0	50.65	-	-	74	-23.35	301	116	H
	* 10.885	22.07	MAv1	37.8	-20.9	1.0	39.97	54	-14.03	-	-	301	116	H
5	3.15	39.16	PK2	32.9	-29.1	0	42.96	-	-	74	-31.04	271	190	H
2	* 4.322	37.45	PK2	33.7	-28.2	0	42.95	-	-	74	-31.05	282	155	V
	* 4.323	26.2	MAv1	33.7	-28.3	1.0	32.6	54	-21.4	-	-	282	155	V
3	* 7.344	35.95	PK2	35.9	-25.4	0	46.45	-	-	74	-27.55	250	179	V
	* 7.342	24.8	MAv1	35.9	-25.5	1.0	36.2	54	-17.8	-	-	250	179	V

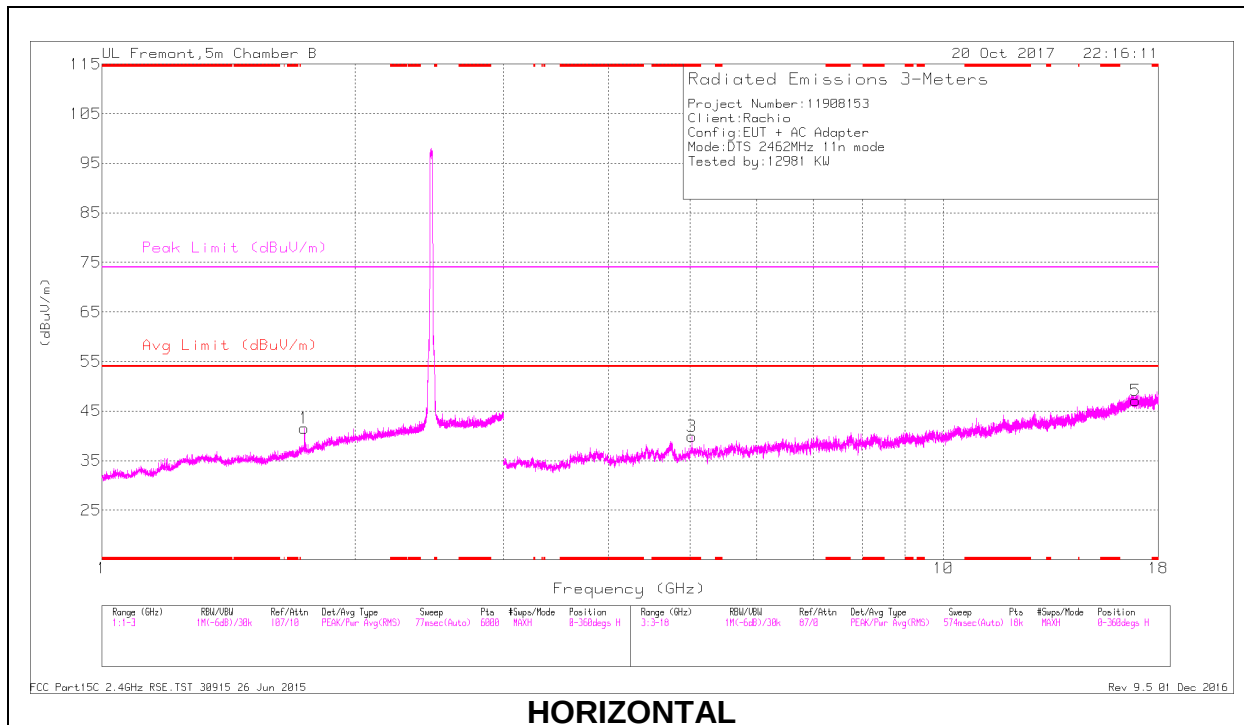
Pk - Peak detector

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

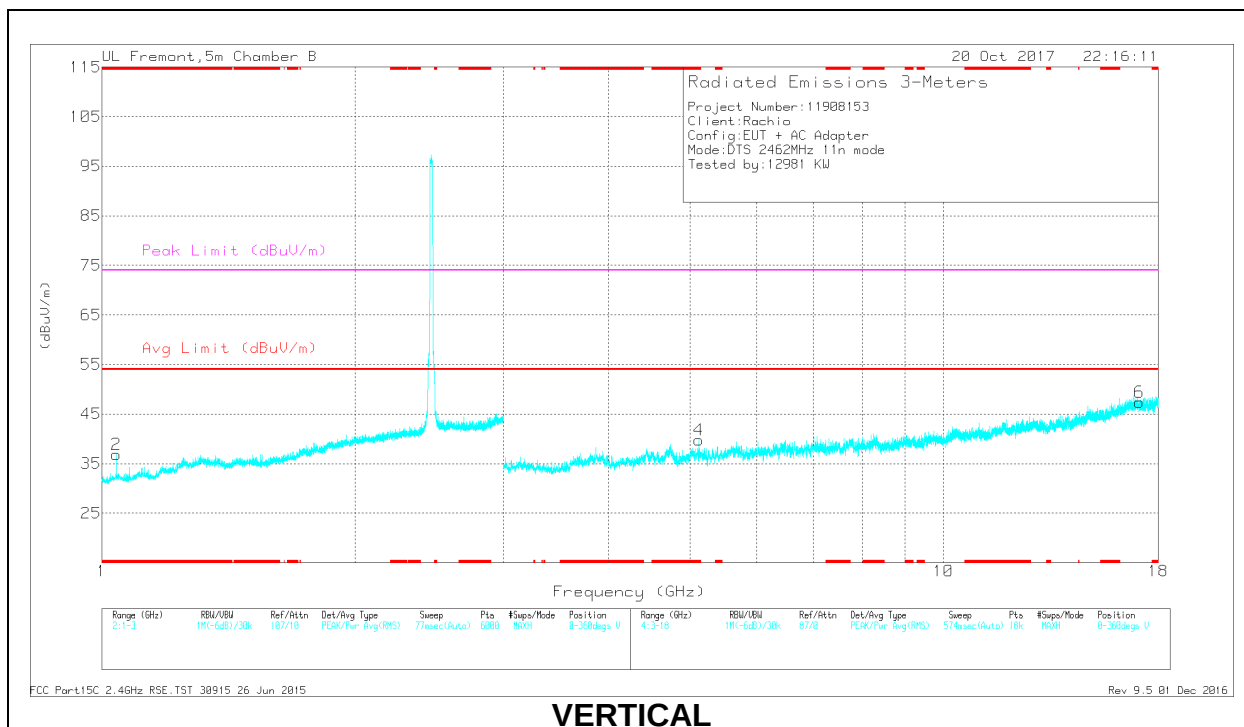
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Trace Markers

Marker	Frequ ency (GHz)	Meter Readi ng (dBuV)	Det	AF T863 (dB/m)	Amp/C bl/Filtr/ Pad (dB)	DC Corr (dB)	Correc ted Readi ng (dBuV/ m)	Avg Limit (dBuV/ m)	Margin (dB)	Peak Limit (dBuV/ m)	PK Margin (dB)	Azimu t (Degs)	Height (cm)	Polarit y
2	*1.04	35.21	PK2	27.1	-23.1	0	39.21	-	-	74	-34.79	28	202	V
	*1.042	23.93	MAv1	27.1	-23.3	1.0	28.79	54	-25.21	-	-	28	202	V
3	*5.029	38.83	PK2	34.4	-28.2	0	45.03	-	-	74	-28.97	115	329	H
	*5.028	27.54	MAv1	34.4	-28.2	1.0	34.8	54	-19.2	-	-	115	329	H
4	*5.125	38.14	PK2	34.4	-28.6	0	43.94	-	-	74	-30.06	205	284	V
	*5.125	27.72	MAv1	34.4	-28.6	1.0	34.58	54	-19.42	-	-	205	284	V
1	1.74	32.88	Pk	29.6	-20.9	0	41.58	-	-	-	-	0-360	102	H
5	16.917	23.89	Pk	42.3	-19.1	0	47.09	-	-	-	-	0-360	102	H
6	17.093	25.19	Pk	41.9	-19.7	0	47.39	-	-	-	-	0-360	102	V

Pk - Peak detector

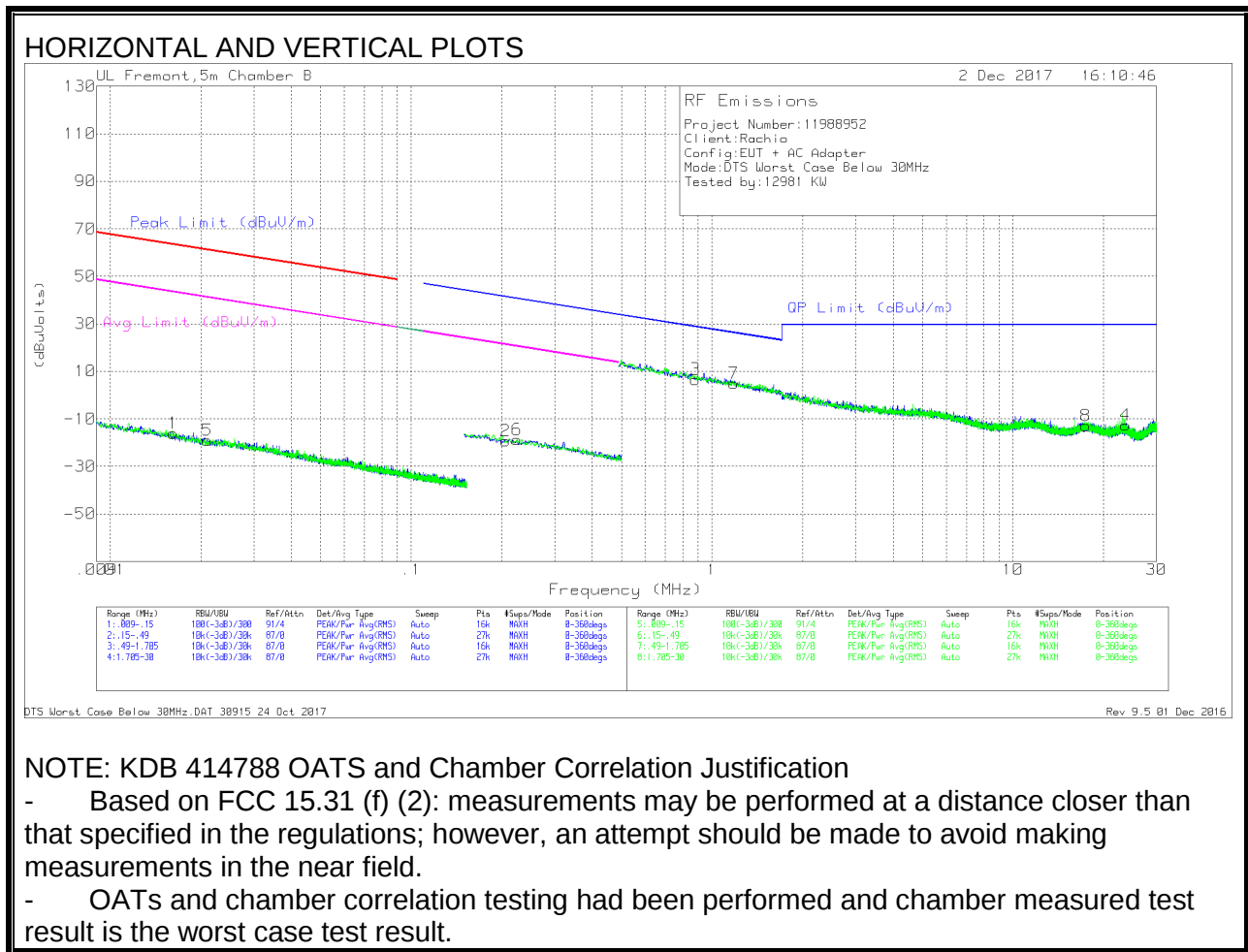
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

9.3. WORST-CASE RADIATED EMISSIONS BELOW 30 MHz

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.0162	47.42	Pk	15.1	1.4	-80	-16.08	63.39	-79.47	43.39	-59.47	-	-	-	-	0-360
5	.02105	44.9	Pk	14.8	1.4	-80	-18.9	61.12	-80.02	41.12	-60.02	-	-	-	-	0-360
2	.20608	45.35	Pk	13.9	1.5	-80	-19.25	-	-	-	-	41.34	-60.59	21.34	-40.59	0-360
6	.22489	45.85	Pk	13.9	1.5	-80	-18.75	-	-	-	-	40.58	-59.33	20.58	-39.33	0-360

Pk - Peak detector

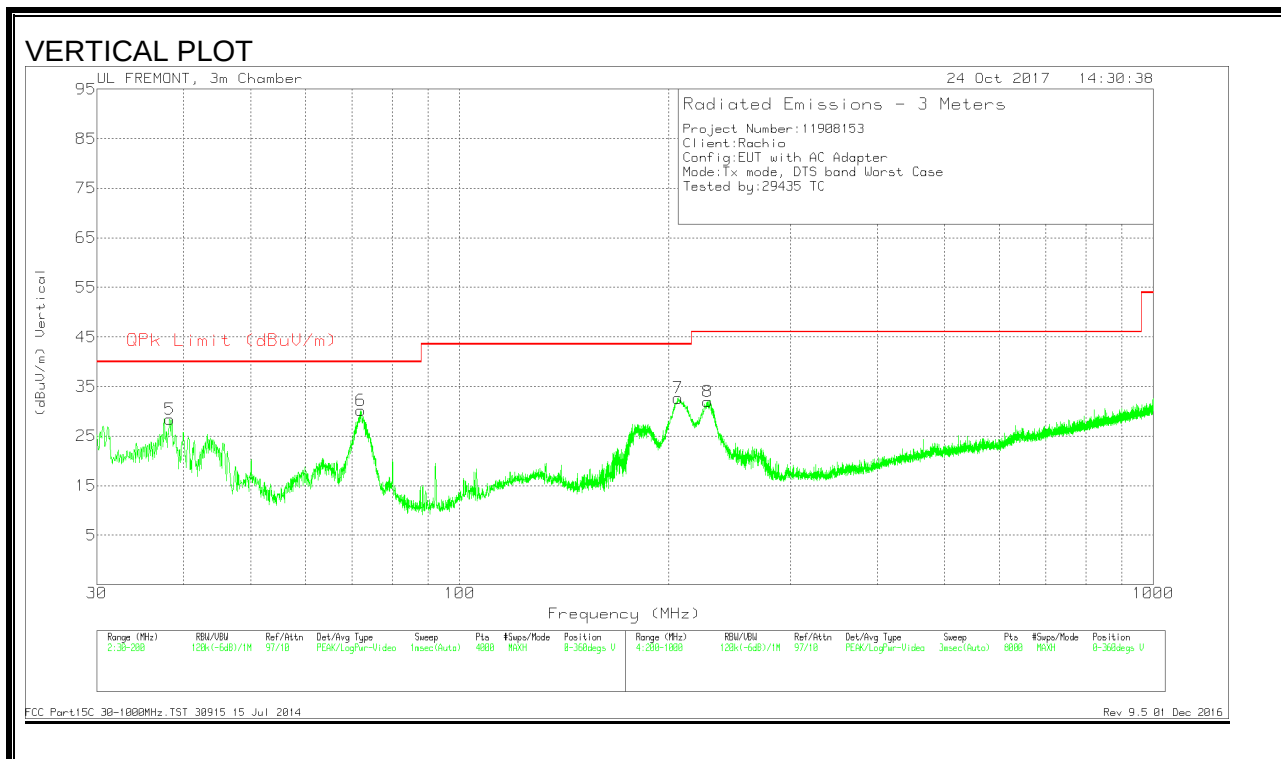
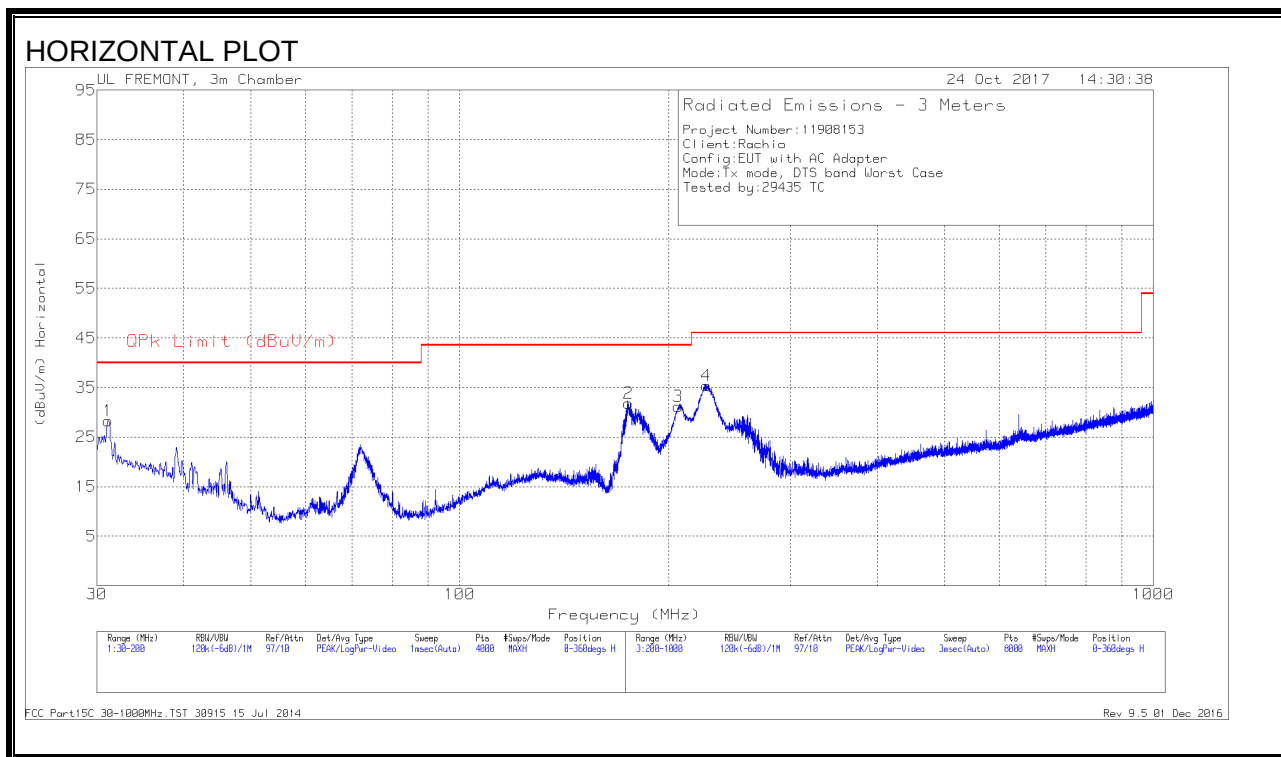
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dBm)	Cbl (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.88049	31.02	Pk	14.1	1.5	-40	6.62	28.72	-22.1	0-360
7	1.18266	29.18	Pk	14.3	1.5	-40	4.98	26.17	-21.19	0-360
8	17.46587	11.02	Pk	14.5	1.6	-40	-12.88	29.5	-42.38	0-360
4	23.66165	12.14	Pk	13.4	1.7	-40	-12.76	29.5	-42.26	0-360

Pk - Peak detector

DTS Worst Case Below 30MHz.DAT 30915 24 Oct 2017
Rev 9.5 01 Dec 2016

9.4. WORST-CASE RADIATED EMISSIONS 30-1000 MHz

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



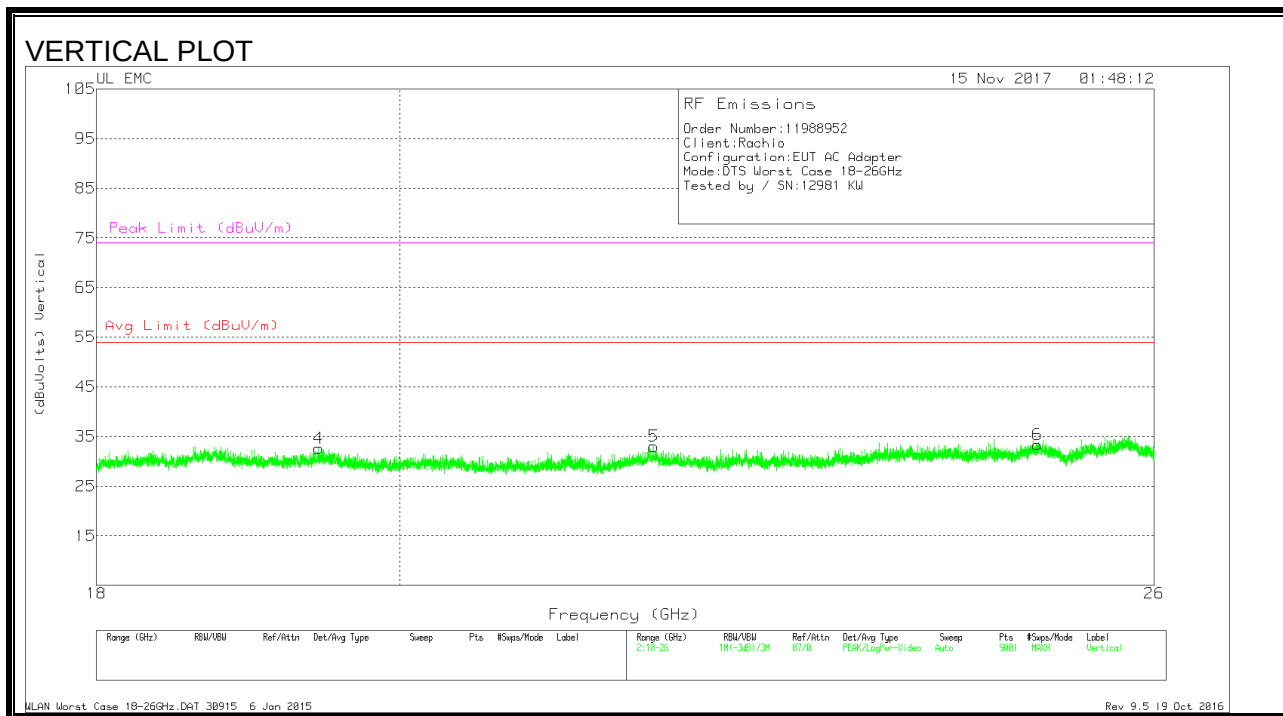
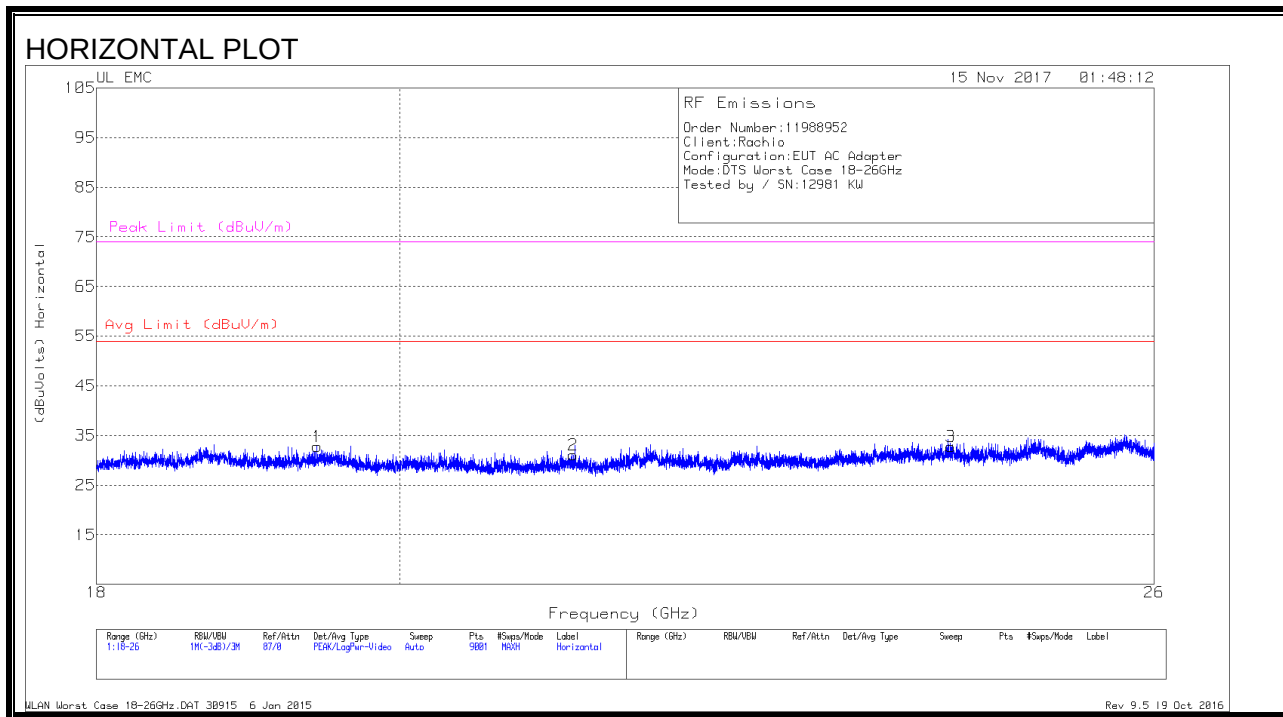
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.1478	35	Pk	24.4	-31.1	28.3	40	-11.7	0-360	100	H
5	38.2046	40.09	Pk	19.3	-31	28.39	40	-11.61	0-360	100	V
6	71.9584	48.69	Pk	12.1	-30.6	30.19	40	-9.81	0-360	100	V
2	175.005	45.78	Pk	15.6	-29.6	31.78	43.52	-11.74	0-360	200	H
7	206.5008	46.95	Pk	15.1	-29.4	32.65	43.52	-10.87	0-360	100	V
3	206.6009	45.53	Pk	15.1	-29.4	31.23	43.52	-12.29	0-360	100	H
4	226.8035	49.9	Pk	14.8	-29.3	35.4	46.02	-10.62	0-360	100	H
8	227.8036	46.37	Pk	14.9	-29.3	31.97	46.02	-14.05	0-360	200	V

Pk - Peak detector

9.5. WORST-CASE RADIATED EMISSIONS ABOVE 18 GHz

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



Trace Markers

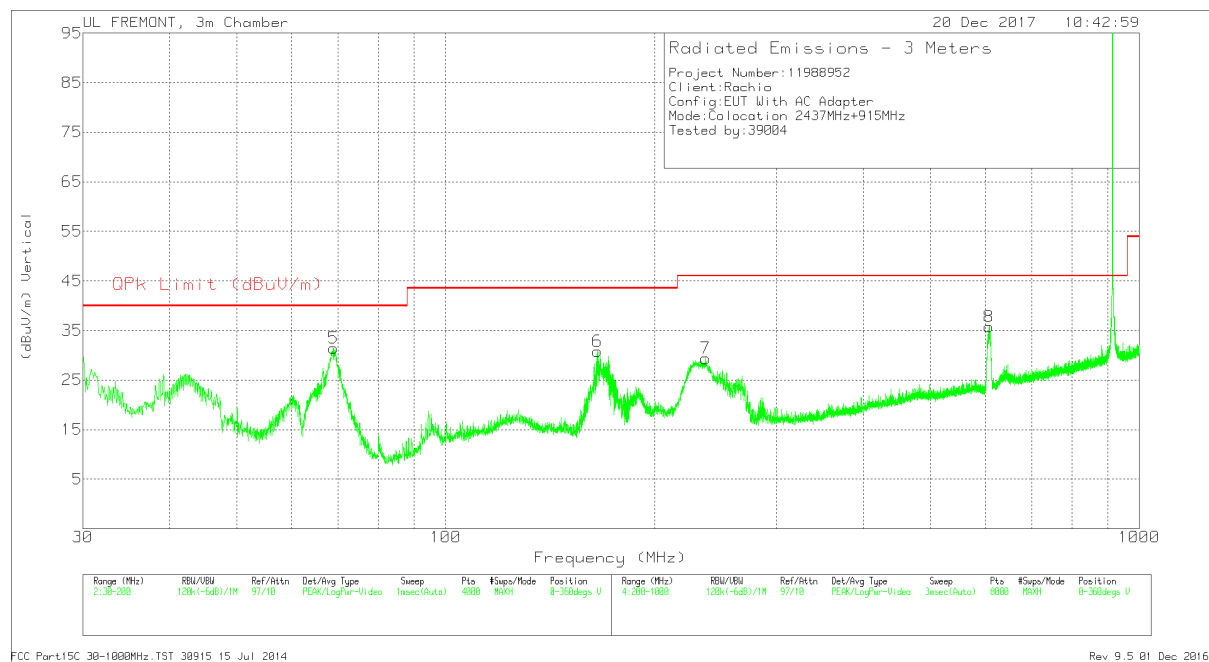
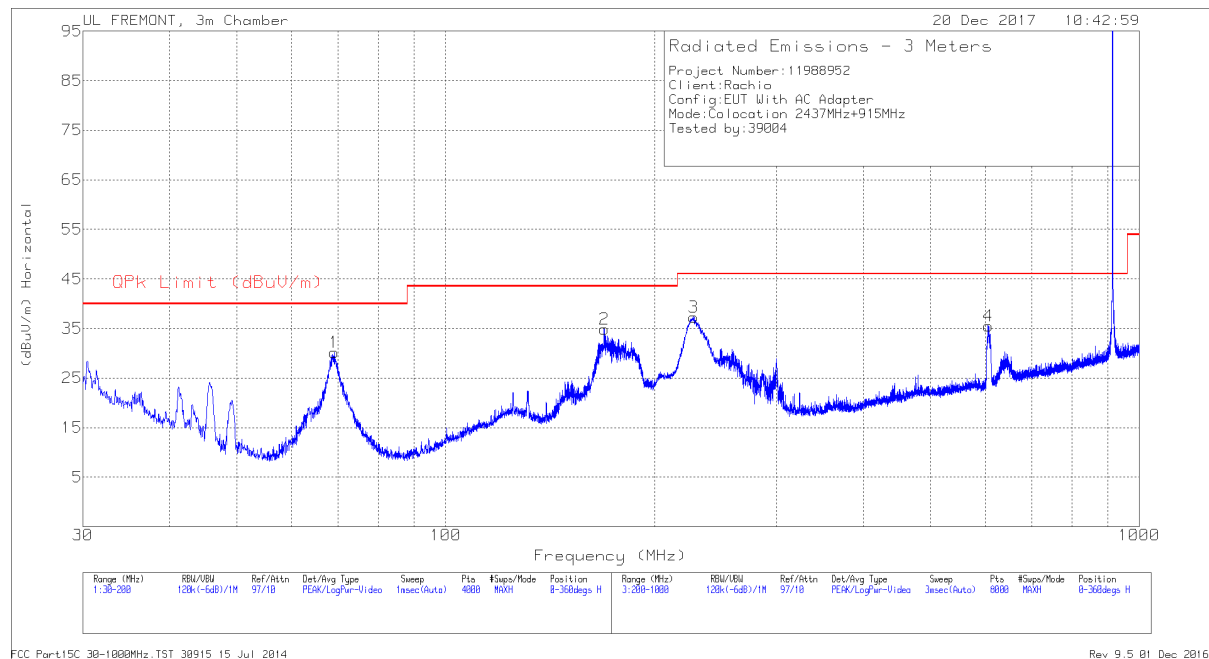
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.435	34.77	Pk	32.5	-25	-9.5	32.77	54	-21.23	74	-41.23
2	21.244	32.68	Pk	33.2	-25.3	-9.5	31.08	54	-22.92	74	-42.92
3	24.226	32.94	Pk	33.5	-24.2	-9.5	32.74	54	-21.26	74	-41.26
4	19.444	34.33	Pk	32.5	-24.7	-9.5	32.63	54	-21.37	74	-41.37
5	21.847	33.88	Pk	33.3	-24.7	-9.5	32.98	54	-21.02	74	-41.02
6	24.964	33.04	Pk	34.1	-24.3	-9.5	33.34	54	-20.66	74	-40.66

Pk - Peak detector

9.6. CO-LOCATION TEST RESULTS

9.6.1. TX SPURIOUS EMISSIONS TEST 30MHz – 1000MHz

900MHz + DTS 2.4GHz



Trace Markers

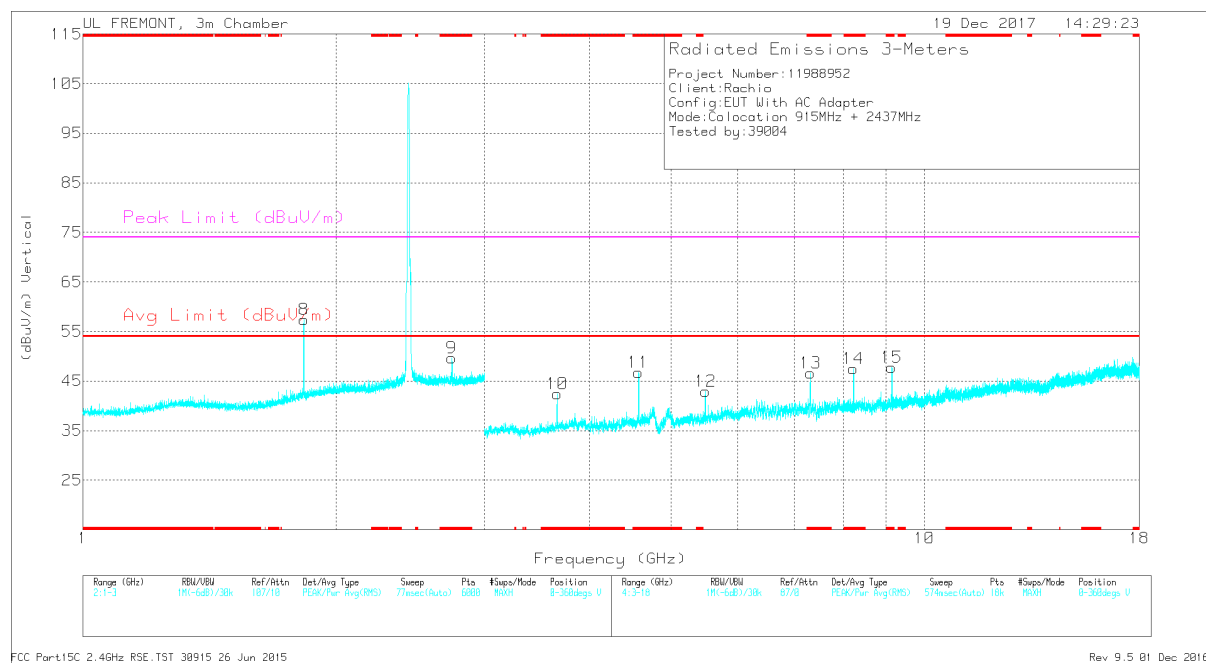
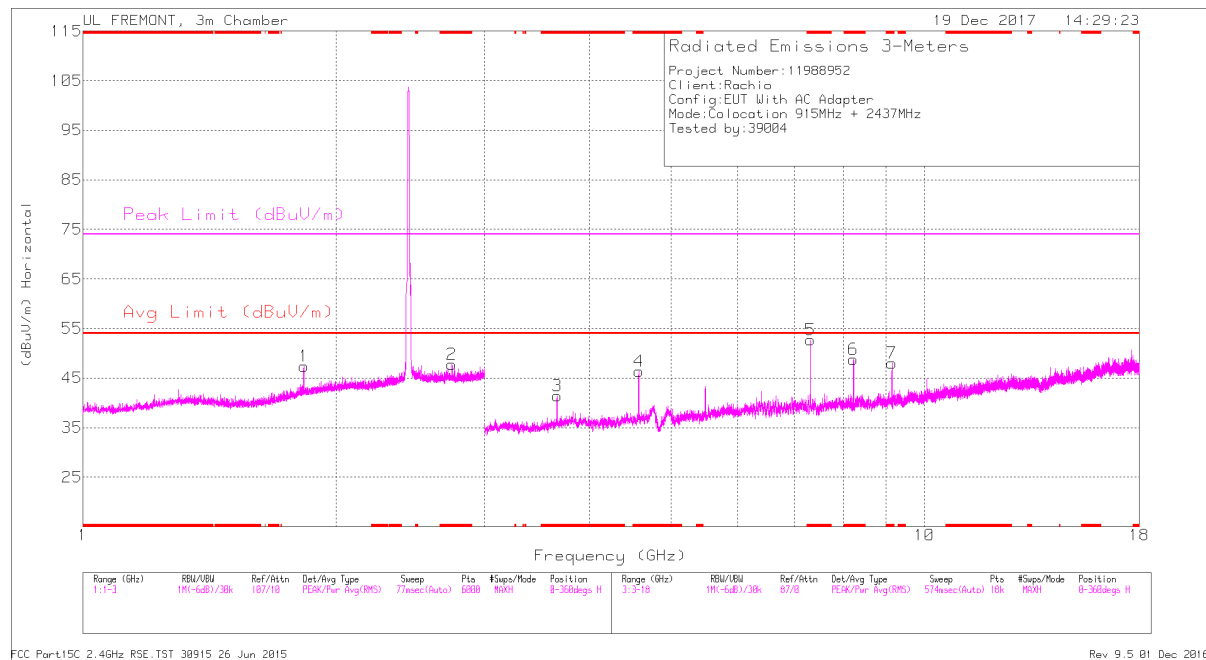
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	68.8976	49.95	Pk	12.1	-30.6	31.45	40	-8.55	0-360	100	V
1	69.1101	48.63	Pk	12.1	-30.6	30.13	40	-9.87	0-360	300	H
6	165.5676	44.69	Pk	15.9	-29.8	30.79	43.52	-12.73	0-360	100	V
2	169.4786	48.91	Pk	15.7	-29.7	34.91	43.52	-8.61	0-360	100	H
3	227.9036	51.53	Pk	15	-29.3	37.23	46.02	-8.79	0-360	100	H
7	237.0048	42.85	Pk	15.6	-29.1	29.35	46.02	-16.67	0-360	100	V
4	605.9528	40.21	Pk	22.7	-27.4	35.51	46.02	-10.51	0-360	200	H
8	606.8529	40.5	Pk	22.7	-27.4	35.8	46.02	-10.22	0-360	100	V

Pk - Peak detector

FCC Part15C 30-1000MHz.TST 30915 15 Jul 2014
Rev 9.5 01 Dec 2016

9.6.2. TX SPURIOUS EMISSIONS TEST 1GHz – 18GHz

900MHz + DTS 2.4GHz



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cb/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.745	36.49	Pk	32.4	-21.1	47.79	-	-	74	-26.21	0-360	100	H
9	* 2.745	38.35	Pk	32.4	-21.1	49.65	-	-	74	-24.35	0-360	100	V
3	* 3.659	38.04	Pk	33.2	-29.8	41.44	-	-	74	-32.56	0-360	100	H
4	* 4.576	41.12	Pk	34	-28.8	46.32	-	-	74	-27.68	0-360	200	H
5	* 7.321	44.2	Pk	35.5	-27	52.7	-	-	74	-21.3	0-360	200	H
6	* 8.236	38.73	Pk	35.8	-25.7	48.83	-	-	74	-25.17	0-360	200	H
7	* 9.148	35.45	Pk	36.1	-23.5	48.05	-	-	74	-25.95	0-360	200	H
10	* 3.659	39.01	Pk	33.2	-29.8	42.41	-	-	74	-31.59	0-360	200	V
11	* 4.574	41.54	Pk	34	-28.8	46.74	-	-	74	-27.26	0-360	200	V
13	* 7.321	38.11	Pk	35.5	-27	46.61	-	-	74	-27.39	0-360	100	V
14	* 8.234	37.36	Pk	35.8	-25.7	47.46	-	-	74	-26.54	0-360	200	V
15	* 9.147	35.1	Pk	36.1	-23.4	47.8	-	-	74	-26.2	0-360	200	V
1	1.83	38.99	Pk	30.4	-22	47.39	-	-	-	-	0-360	200	H
8	1.83	48.98	Pk	30.4	-22	57.38	-	-	-	-	0-360	100	V
12	5.49	35.27	Pk	34.5	-26.8	42.97	-	-	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

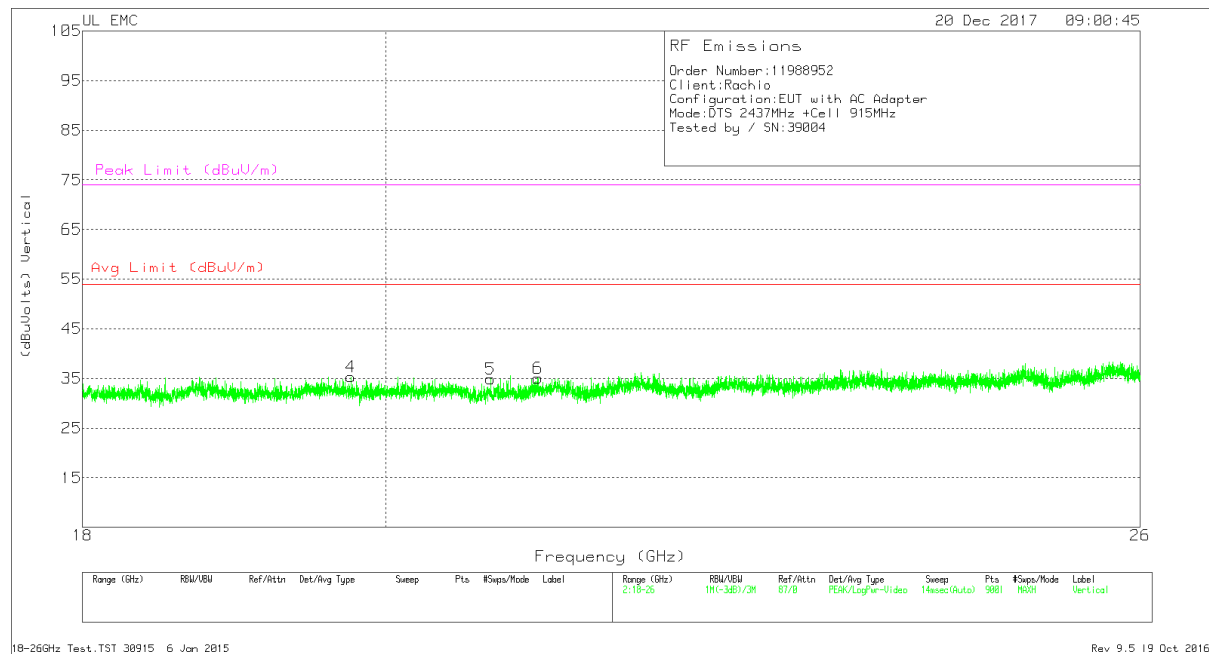
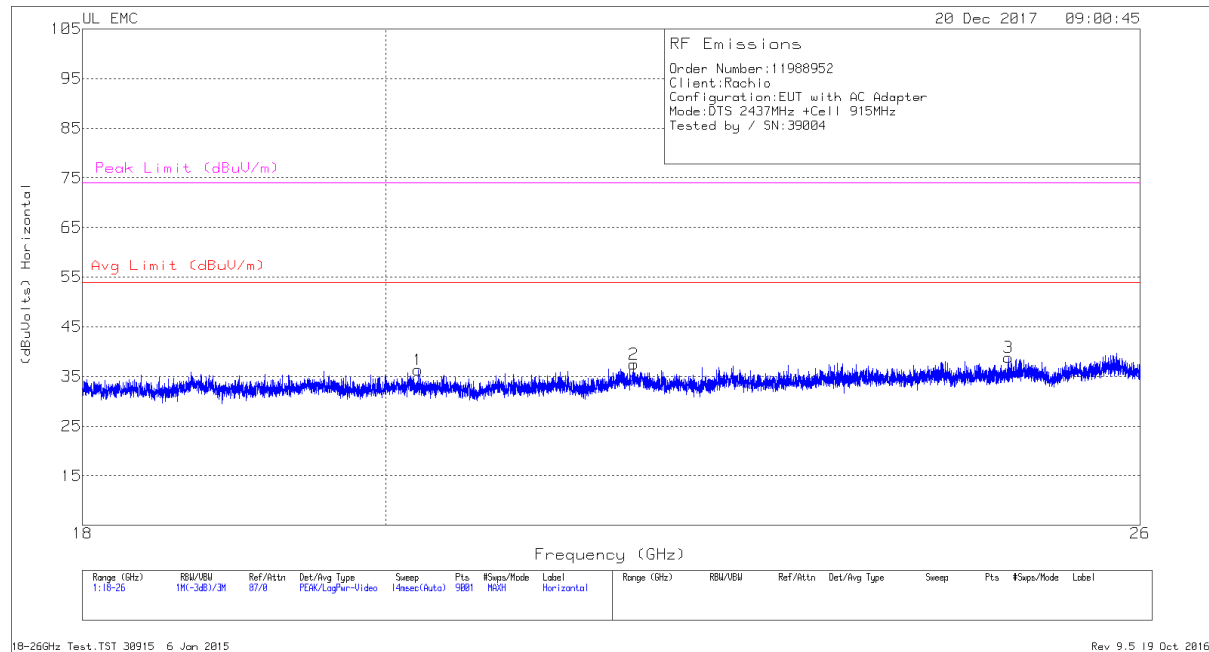
Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cb/Fitr/P ad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 2.745	41.42	PK2	32.4	-21.1	52.72	-	-	74	-21.28	310	115	H
	* 2.745	29.68	MAv1	32.4	-21.1	40.98	54	-13.02	-	-	310	115	H
9	* 2.745	41.9	PK2	32.4	-21.1	53.2	-	-	74	-20.8	287	152	V
	* 2.745	30.55	MAv1	32.4	-21.1	41.85	54	-12.15	-	-	287	152	V
3	* 3.659	40.34	PK2	33.2	-29.8	43.74	-	-	74	-30.26	287	100	H
	* 3.659	28.97	MAv1	33.2	-29.8	32.37	54	-21.63	-	-	287	100	H
4	* 4.576	39.55	PK2	34	-28.8	44.75	-	-	74	-29.25	300	235	H
	* 4.575	28.5	MAv1	34	-28.8	33.7	54	-20.3	-	-	300	235	H
5	* 7.32	44.63	PK2	35.5	-27	53.13	-	-	74	-20.87	250	171	H
	* 7.32	35.81	MAv1	35.5	-27	44.31	54	-9.69	-	-	250	171	H
6	* 8.235	40.96	PK2	35.8	-25.7	51.06	-	-	74	-22.94	231	215	H
	* 8.234	30.01	MAv1	35.8	-25.7	40.11	54	-13.89	-	-	231	215	H
7	* 9.149	35.04	PK2	36.1	-23.6	47.54	-	-	74	-26.46	210	182	H
	* 9.148	23.61	MAv1	36.1	-23.5	36.21	54	-17.79	-	-	210	182	H
10	* 3.661	42.23	PK2	33.3	-29.8	45.73	-	-	74	-28.27	186	182	V
	* 3.66	32.63	MAv1	33.2	-29.8	36.03	54	-17.97	-	-	186	182	V
11	* 4.575	40.96	PK2	34	-28.8	46.16	-	-	74	-27.84	166	225	V
	* 4.575	30.82	MAv1	34	-28.8	36.02	54	-17.98	-	-	166	225	V
13	* 7.32	41.39	PK2	35.5	-27	49.89	-	-	74	-24.11	149	136	V
	* 7.321	30.91	MAv1	35.5	-27	39.41	54	-14.59	-	-	149	136	V
14	* 8.236	41.8	PK2	35.8	-25.7	51.9	-	-	74	-22.1	176	232	V
	* 8.236	32.07	MAv1	35.8	-25.7	42.17	54	-11.83	-	-	176	232	V
15	* 9.148	34.61	PK2	36.1	-23.5	47.21	-	-	74	-26.79	200	178	V
	* 9.148	23.04	MAv1	36.1	-23.5	35.64	54	-18.36	-	-	200	178	V
1	1.828	41.29	PK2	30.3	-22	49.59	-	-	-	-	130	205	H
8	1.83	48.97	PK2	30.4	-22	57.37	-	-	-	-	159	115	V
12	5.491	39.15	PK2	34.5	-26.7	46.95	-	-	-	-	154	244	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average
FCC Part15C 2.4GHz RSE.TST 30915 26 Jun 2015
Rev 9.5 01 Dec 2016

9.6.3. TX SPURIOUS EMISSIONS TEST 18GHz – 26GHz

900MHz + DTS 2.4GHz



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (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	20.227	38.61	Pk	32.6	-25.4	-9.5	36.31	54	-17.69	74	-37.69
2	21.801	38.18	Pk	33.3	-24.5	-9.5	37.48	54	-16.52	74	-36.52
3	24.836	38.72	Pk	33.9	-24.3	-9.5	38.82	54	-15.18	74	-35.18
4	19.76	37.19	Pk	32.5	-24.9	-9.5	35.29	54	-18.71	74	-38.71
5	20.744	36.82	Pk	32.8	-25.2	-9.5	34.92	54	-19.08	74	-39.08
6	21.087	37.08	Pk	32.7	-25.2	-9.5	35.08	54	-18.92	74	-38.92

Pk - Peak detector

18-26GHz Test.TST 30915 6 Jan 2015

Rev 9.5 19 Oct 2016

10. 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

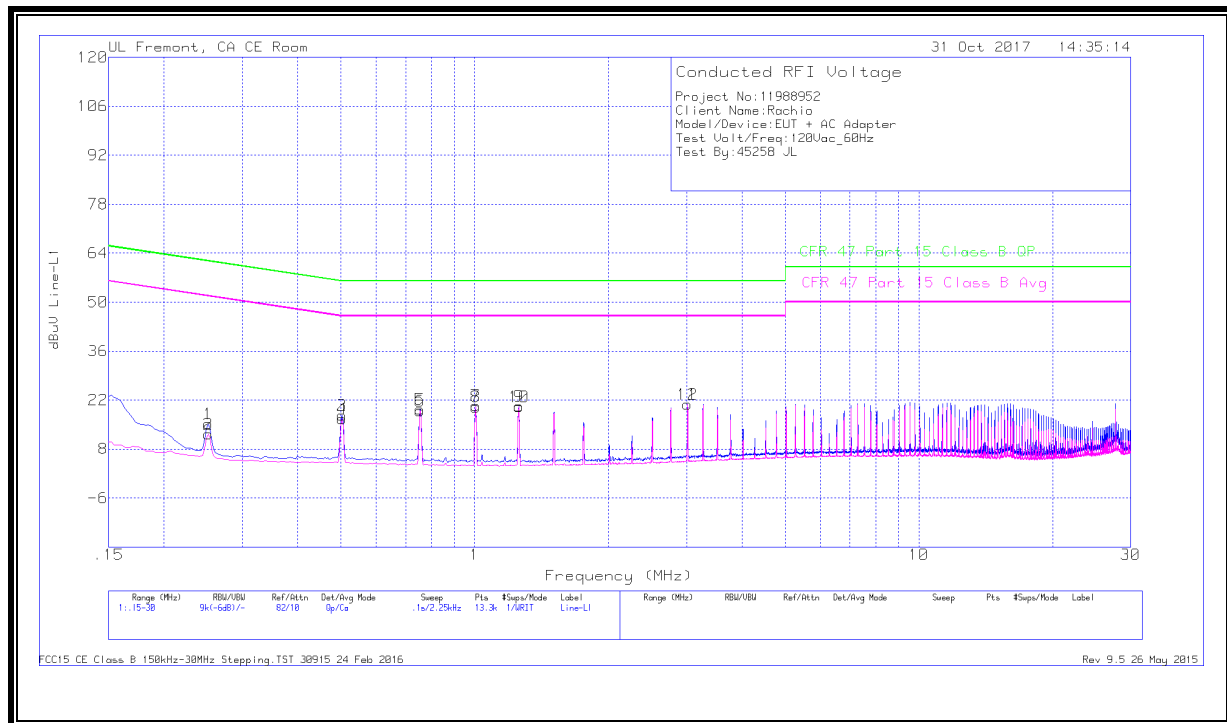
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

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.

RESULTS

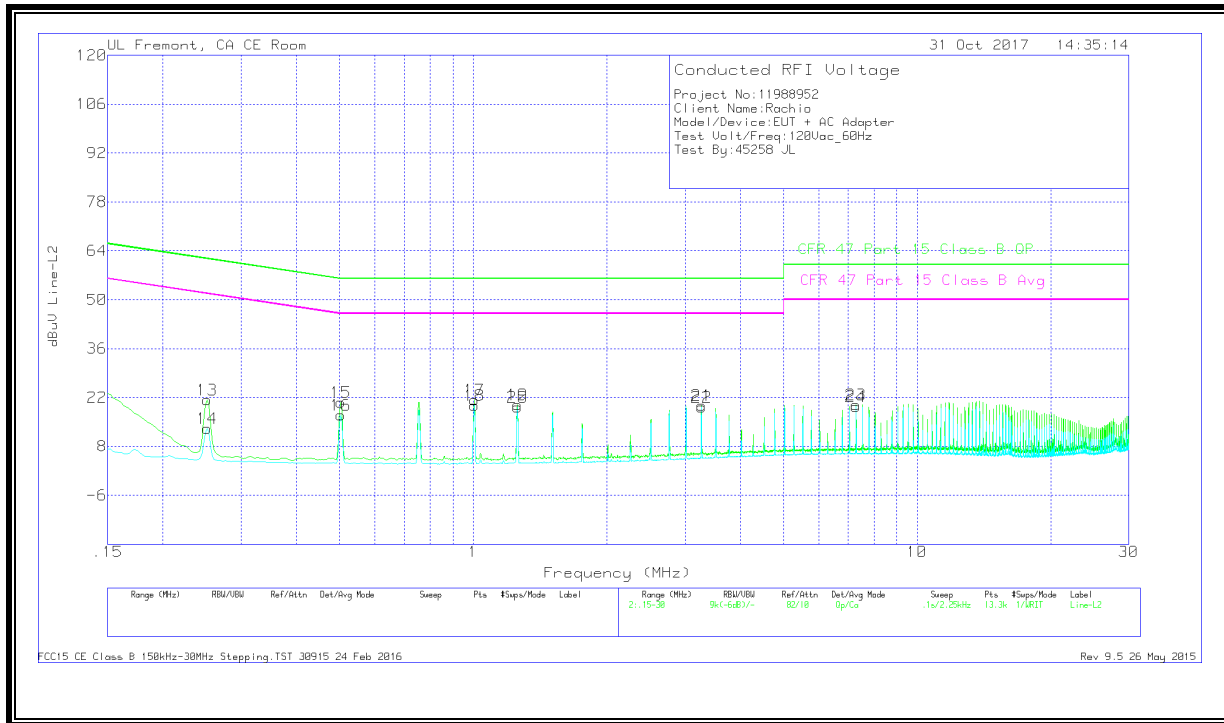
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.25125	5.08	Qp	0	0	10.1	15.18	61.72	-46.54	-	-
2	.25125	2.21	Ca	0	0	10.1	12.31	-	-	51.72	-39.41
3	.50325	7.64	Qp	0	0	10.1	17.74	56	-38.26	-	-
4	.50325	6.54	Ca	0	0	10.1	16.64	-	-	46	-29.36
5	.753	9.37	Qp	0	0	10.1	19.47	56	-36.53	-	-
6	.753	8.85	Ca	0	0	10.1	18.95	-	-	46	-27.05
7	1.005	10.25	Qp	0	.1	10.1	20.45	56	-35.55	-	-
8	1.005	9.82	Ca	0	.1	10.1	20.02	-	-	46	-25.98
9	1.257	10.06	Qp	0	.1	10.1	20.26	56	-35.74	-	-
10	1.257	9.83	Ca	0	.1	10.1	20.03	-	-	46	-25.97
11	3.0165	10.66	Qp	0	.1	10.1	20.86	56	-35.14	-	-
12	3.0165	10.58	Ca	0	.1	10.1	20.78	-	-	46	-25.22

Qp - Quasi-Peak detector
Ca - CISPR average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.25125	11.28	Qp	0	0	10.1	21.38	61.72	-40.34	-	-
14	.25125	3.02	Ca	0	0	10.1	13.12	-	-	51.72	-38.6
15	.50325	10.48	Qp	0	0	10.1	20.58	56	-35.42	-	-
16	.50325	6.84	Ca	0	0	10.1	16.94	-	-	46	-29.06
17	1.005	11.06	Qp	0	.1	10.1	21.26	56	-34.74	-	-
18	1.005	9.48	Ca	0	.1	10.1	19.68	-	-	46	-26.32
19	1.257	9.69	Qp	0	.1	10.1	19.89	56	-36.11	-	-
20	1.257	8.97	Ca	0	.1	10.1	19.17	-	-	46	-26.83
21	3.2685	9.43	Qp	0	.1	10.2	19.73	56	-36.27	-	-
22	3.2685	8.98	Ca	0	.1	10.2	19.28	-	-	46	-26.72
23	7.28925	9.53	Qp	0	.2	10.2	19.93	60	-40.07	-	-
24	7.28925	9.03	Ca	0	.2	10.2	19.43	-	-	50	-30.57

Qp - Quasi-Peak detector
Ca - CISPR average detection