



**FCC 47 CFR PART 15 SUBPART C**

**CERTIFICATION TEST REPORT**

**FOR**

**SET TOP BOX**

**MODEL NUMBER: E76**

**FCC ID: DKN-PHX**

**REPORT NUMBER: R11893030-E2**

**ISSUE DATE: 2017-09-30**

**Prepared for  
ECHOSTAR TECHNOLOGIES LLC  
9601 MERIDIAN BOULEVARD  
ENGLEWOOD, CO 80112, USA**

**Prepared by  
UL LLC  
12 LABORATORY DR.  
RESEARCH TRIANGLE PARK, NC 27709 USA  
TEL: (919) 549-1400**



**NVLAP LAB CODE 200246-0**

Revision History

<u>Ver.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
1	2017-09-30	Initial Issue	Brian T. Kiewra
2	2017-10-03	Added 11ac in Section 5.1	Brian T. Kiewra
3	2017-10-05	Added KDB 5662911 reference in Section 7.	Brian T. Kiewra
4	2017-10-06	Revised Section 5.5 to clarify worst-case testing. Added simultaneous transmission information to Section 5.5. Added conducted testing reference to Section 7.	Brian T. Kiewra

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** EchoStar Technologies LLC  
9601 Meridian Boulevard  
Englewood, CO 80112, USA

**EUT DESCRIPTION:** Set top box

**MODEL:** E76

**SERIAL NUMBER:** Conducted Unit: P2-168  
Radiated Unit: P2-184

**DATE TESTED:** 2017-08-21 to 2017-09-28

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

UL LLC 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 LLC 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.

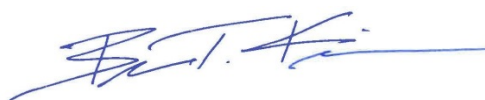
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of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

Approved & Released  
For UL LLC By:



Jeffrey Moser  
Operations Leader  
UL – Consumer Technology Division

Prepared By:



Brian T. Kiewra  
Project Engineer  
UL – Consumer Technology Division

## 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.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Perimeter Park Dr, Suite B, Morrisville, NC 27560.

12 Laboratory Dr., RTP, NC 27709
<input type="checkbox"/> Chamber A
<input type="checkbox"/> Chamber C

2800 Suite B Perimeter Park Dr., Morrisville, NC 27560
<input checked="" type="checkbox"/> Chamber NORTH
<input checked="" type="checkbox"/> Chamber SOUTH

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at <http://www.nist.gov/nvlap/>.

## 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	Required by standard
Occupied Channel Bandwidth	2.00%	±5 %
RF output power, conducted	1.3 dB	±1,5 dB
Power Spectral Density, conducted	2.47 dB	±3 dB
Unwanted Emissions, conducted	2.94 dB	±3 dB
All emissions, radiated	5.36 dB	±6 dB
Temperature	2.26 °C	±3 °C
Supply voltages	2.40%	±3 %
Time	3.39%	±5 %

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an STB that contains a Zigbee and an 802.11a/b/g/n/ac transceiver.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	23.34	215.77
2412 - 2462	802.11g	17.07	50.93
2412 - 2462	802.11n HT20	16.3	42.66
2422 - 2452	802.11n HT40	11.38	13.74

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two antennas, with a maximum gain of 2.71 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was FCE2.

The EUT driver software installed during testing was BRDCM MFG Driver WL1.

The test utility software used during testing was MTOOL v3.0.0.3.



### 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions, 0.009 -1000 MHz and 18-26 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. Radiated emissions 1-18GHz performed with the EUT set to transmit and low, middle and high channels.

The EUT is designed to operate in only one orientation; therefore all radiated testing done in the X-Axis orientation.

EUT supports both MIMO and SISO, therefore all testing performed at CDD MIMO as worst-case.

For simultaneous transmission of multiple channels in the 2.4GHz ZigBee, 2.4GHz WLAN and 5GHz bands, tests were conducted for various configurations having the highest power. No noticeable new emission was found.

Based on the baseline scan, the worst-case data rates were:

802.11b mode: 5.5 Mbps

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
Broadband Modem	D-Link	EBR-2310	F311393000205	N/A
Solid state hard drive	WD Elements	DAADCA	WX51A1424754	N/A
Solid state hard drive	WD Elements	AAAFFA	WX81A31A3906	N/A
Laptop	Hewlett-Packard	EliteBook 740	5CG4382SLC	N/A
Laptop	Hewlett-Packard	EliteBook 8470P	CNU342CP7Y	N/A

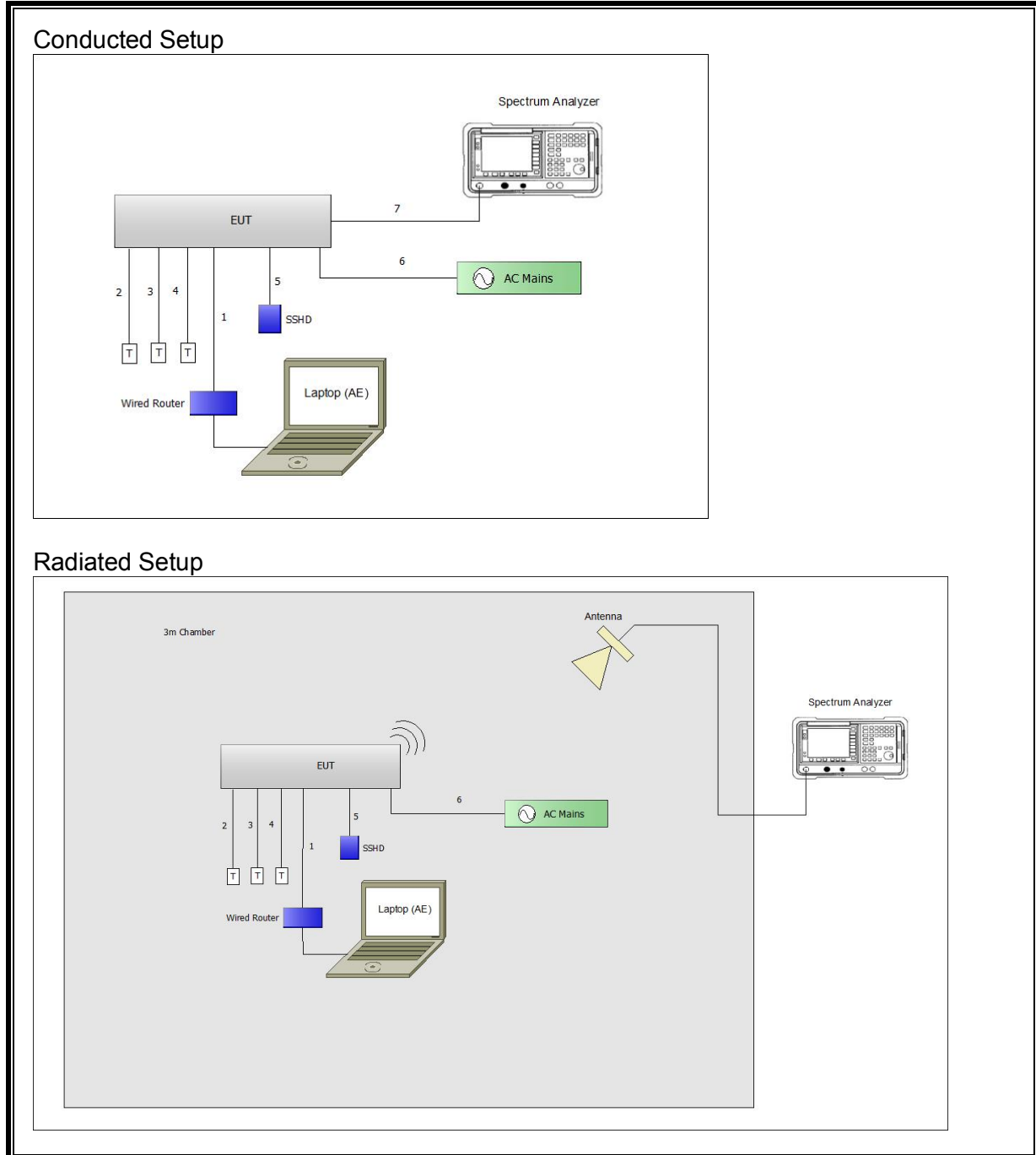
#### I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Ethernet	1	CAT-5	Communication	0.5m	Connected to wired router
2	Coax	1	RG-7	Communication	0.5m	Terminated
3	HDMI	1	Standard	Video	2m	Terminated
4	Component Video	1	RGB	Video	2m	Terminated
5	USB	2	Type A	Data	.25m	To SSD
6	AC	1	AC	AC Mains	>1m	None
7	Antenna	1	RF	RF	<1m	Antenna Port

**TEST SETUP**

The EUT is installed as a standalone unit.

**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 Used –Radiated Measurement Equipment (Morrisville - North Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
<b>18-40 GHz</b>					
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2016-09-06	2017-09-30
<b>Gain-Loss Chains</b>					
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2017-03-03	2018-03-03
<b>Receiver &amp; Software</b>					
SA0026 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2017-02-17	2018-02-28
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
<b>Additional Equipment Used</b>					
s/n 161024690	Environmental Meter	Fisher Scientific	15-077-963	2016-12-21	2018-12-21

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
<b>0.009 – 30MHz</b>					
AT0079	Active Loop Antenna	ETS Lindgren	6502	2016-12-28	2017-12-31
<b>30-1000 MHz</b>					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2017-06-15	2018-06-15
<b>1-18 GHz</b>					
AT0069	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2017-04-05	2018-04-05
<b>Gain-Loss Chains</b>					
S-SAC01	Gain-loss string: 0.009 – 30MHz	Various	Various	2017-09-15	2018-09-15
S-SAC02	Gain-loss string: 30 – 1000MHz	Various	Various	2017-06-11	2018-06-11
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2017-08-18	2018-08-18
<b>Receiver &amp; Software</b>					
SA0025	Spectrum Analyzer	Agilent	N9030A	2017-04-10	2018-04-10
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
<b>Additional Equipment used</b>					
s/n 161024887	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23

Test Equipment Used - Line Conducted Measurement Equipment (RTP)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
<b>Equipment – Ground Plane E</b>					
85496	EMI Test Receiver 9kHz-3.6GHz	Rohde & Schwarz	ESR3	2017-08-22	2018-08-22
ATA509	Coaxial cable, 20 ft., BNC-male to BNC-male	UL	RG-223	2017-08-23	2018-08-23
HI0085	Temp/Humid/Pressure Meter	Extech	SD700	2017-02-27	2018-02-27
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
ATA508	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM 7600	2017-08-23	2018-08-23
LISN002	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2017-08-22	2018-08-22

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
<b>Conducted Room 2 / RTP - NEBS</b>					
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2017-04-25	2018-04-25
SA0026	Spectrum Analyzer	Agilent	N9030A	2017-02-17	2018-02-28
PWM001	RF Power Meter	Keysight Technologies	N1911A	2017-05-18	2018-05-18
PWS001	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2017-05-18	2018-05-18
15557603	Temp/Humidity Sensor	Fisher Scientific	14-650-118	2016-11-02	2018-11-02

## 7. MEASUREMENT METHODS

Duty Cycle: KDB 558074 D01 v04, Section 6.0

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

Output Power: KDB 558074 D01 v04, Section 9.2.3.2.  
KDB 5662911 D01 Multiple Transmitter Output v02r01

Power Spectral Density: KDB 558074 D01 v04, Section 10.2.

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.

General Radiated Emissions: ANSI C63.10:2013 Sections 6.3-6.6

General Conducted Emissions: ANSI C63.10:2013 Section 6.7

## 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.

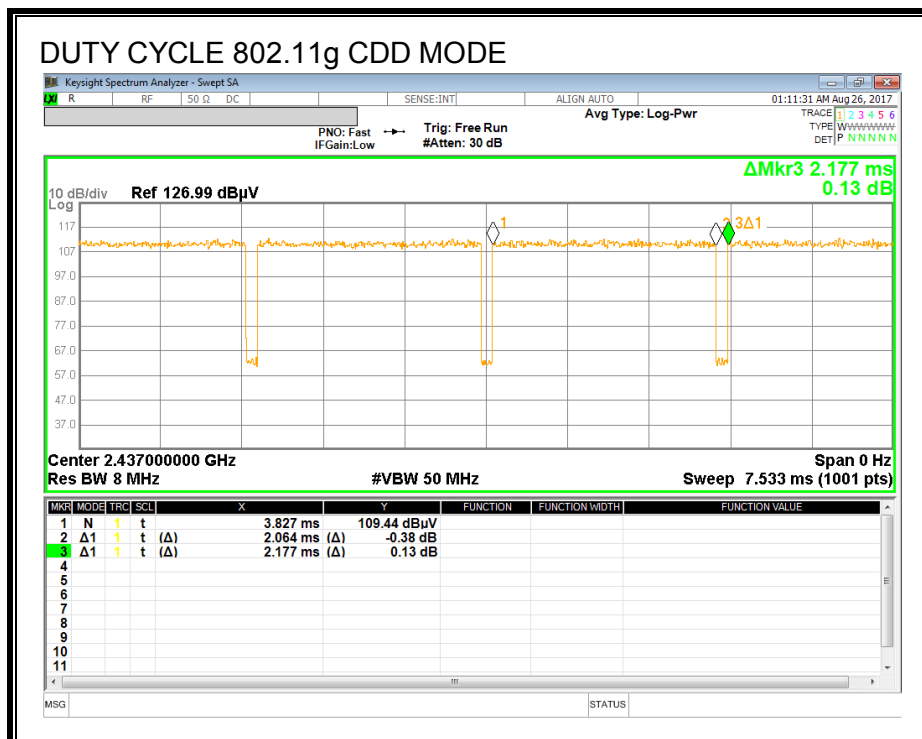
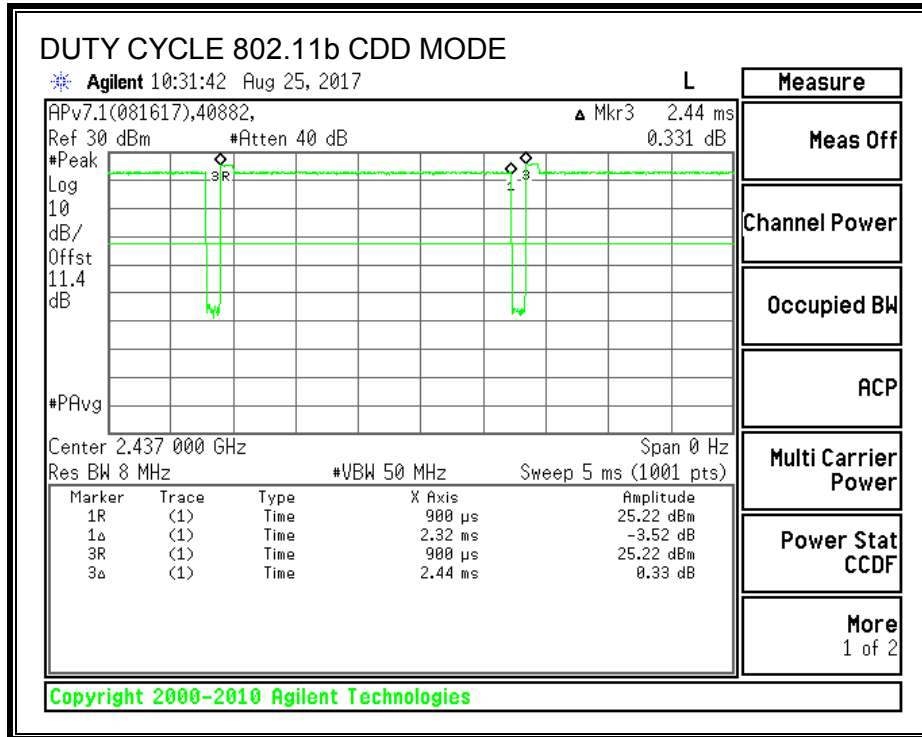
#### ON TIME AND DUTY CYCLE RESULTS

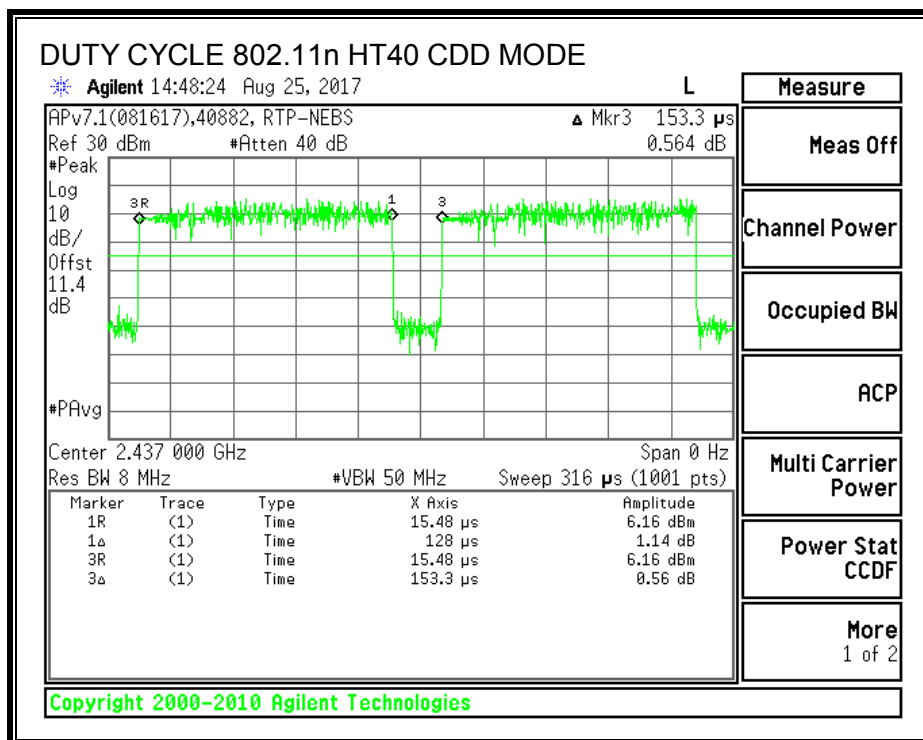
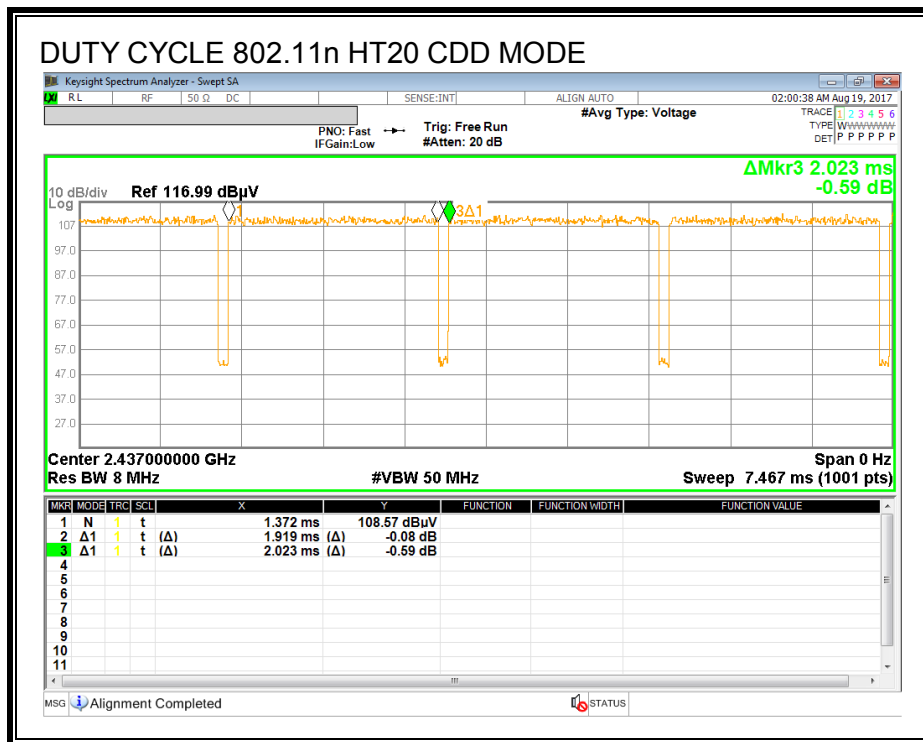
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
<b>2.4GHz Band</b>						
802.11b 1TX	2.320	2.440	0.951	95.08%	0.22	0.431
802.11g CDD	2.064	2.177	0.948	94.81%	0.23	0.484
802.11n HT20 CDD	1.919	2.023	0.949	94.86%	0.23	0.521
802.11n HT40 CDD	0.128	0.153	0.835	83.50%	0.78	7.813

#### Test Information

Date: 2017-08-22  
Project: 11893030  
Tester: Jeff Cabrera

**DUTY CYCLE PLOTS**







## 8.2. 802.11b MODE IN THE 2.4 GHz BAND

### 8.2.1. 6 dB BANDWIDTH

#### LIMITS

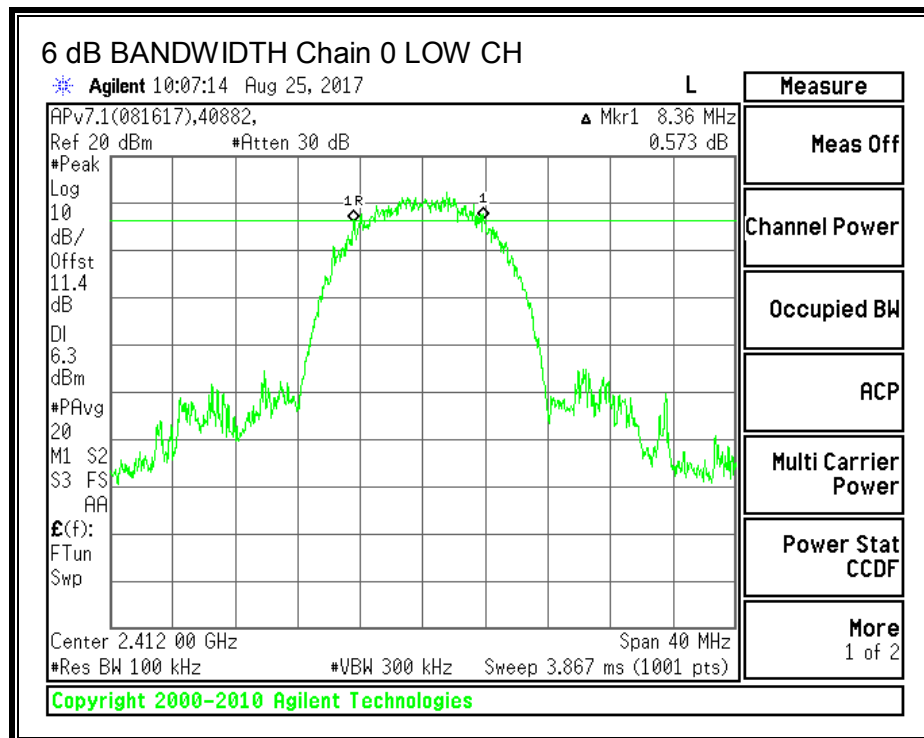
FCC §15.247 (a) (2)

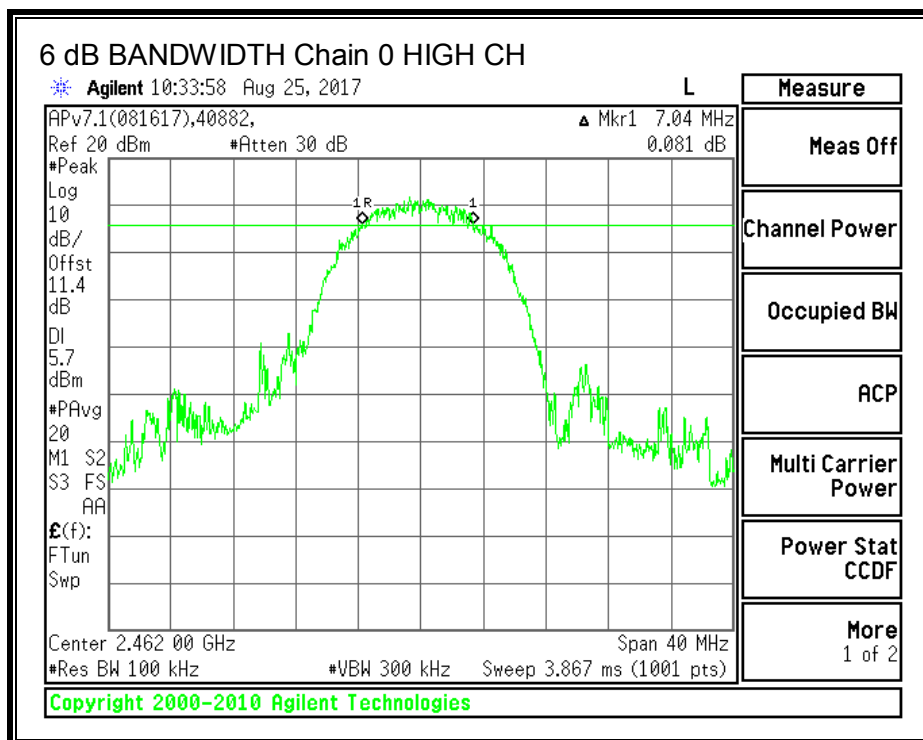
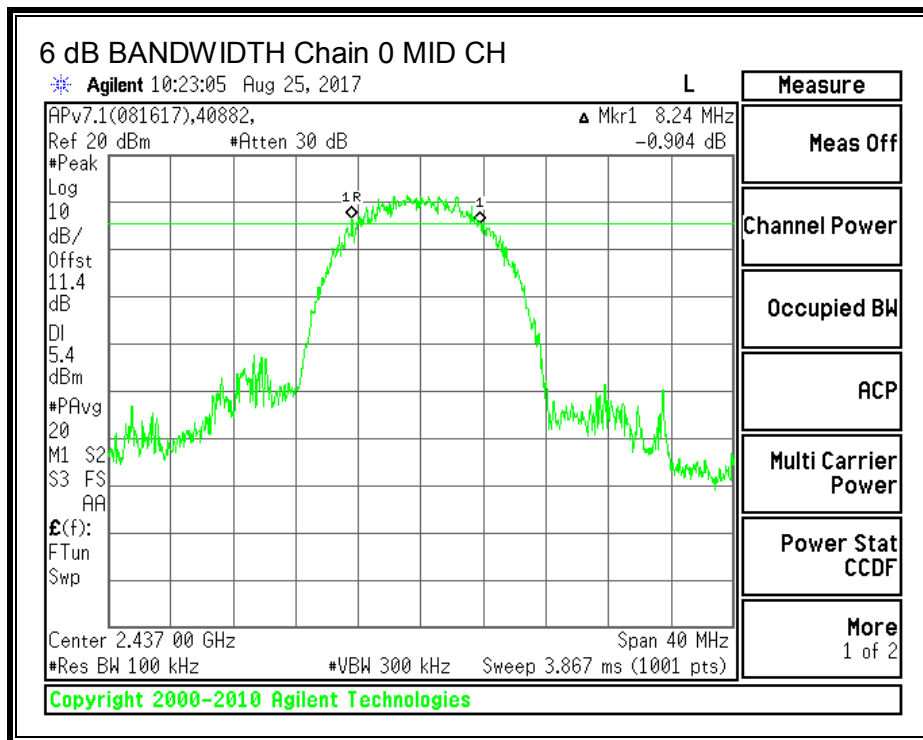
The minimum 6 dB bandwidth shall be at least 500 kHz.

#### RESULTS

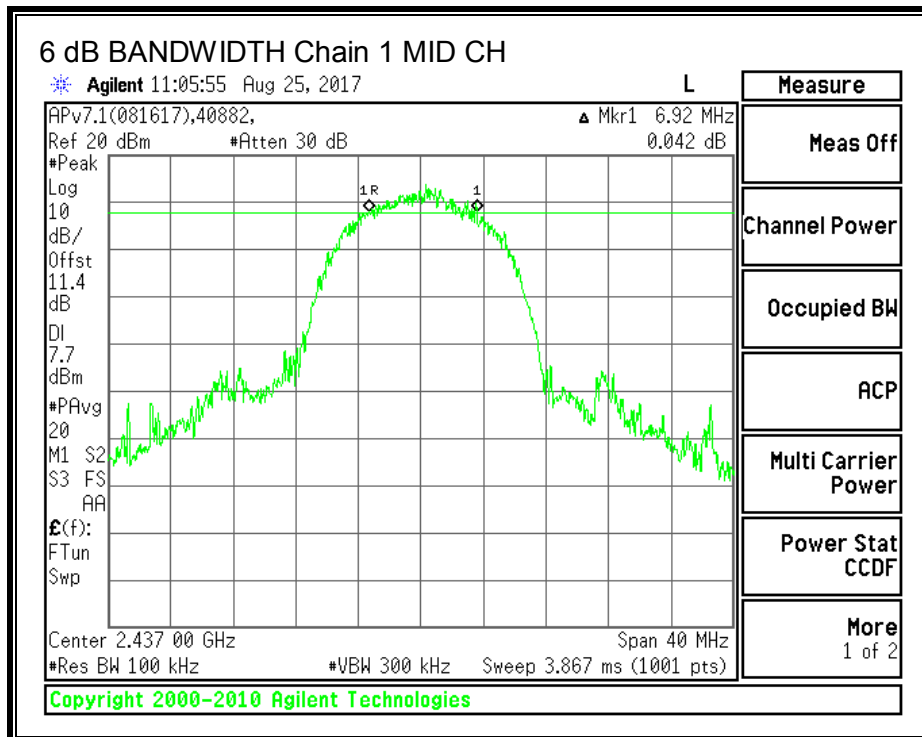
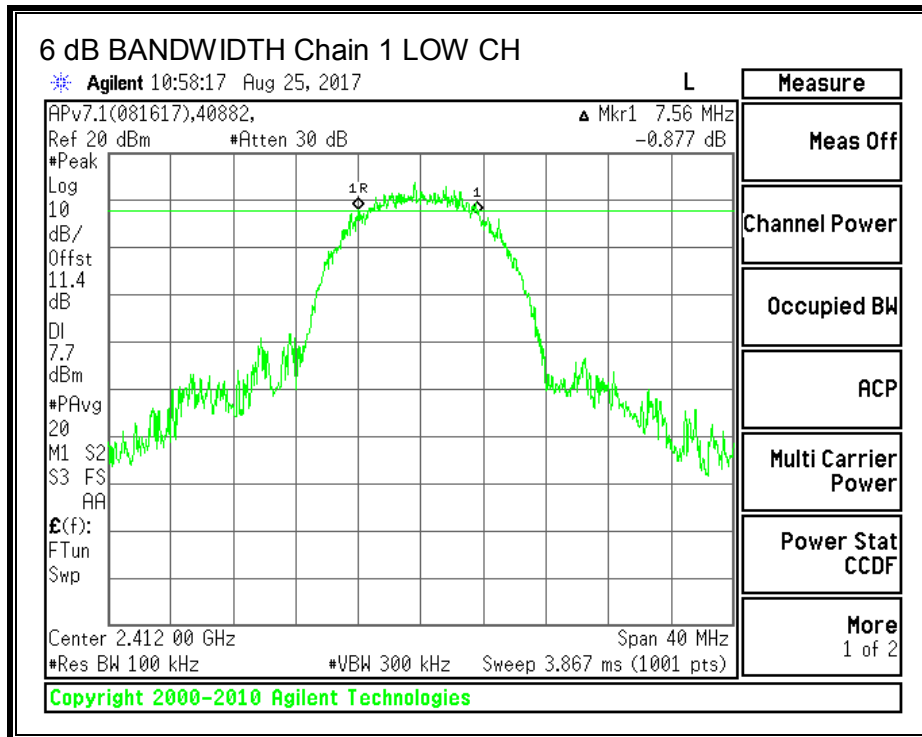
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	8.360	7.560	0.5
Mid	2437	8.240	6.920	0.5
High	2462	7.040	7.560	0.5

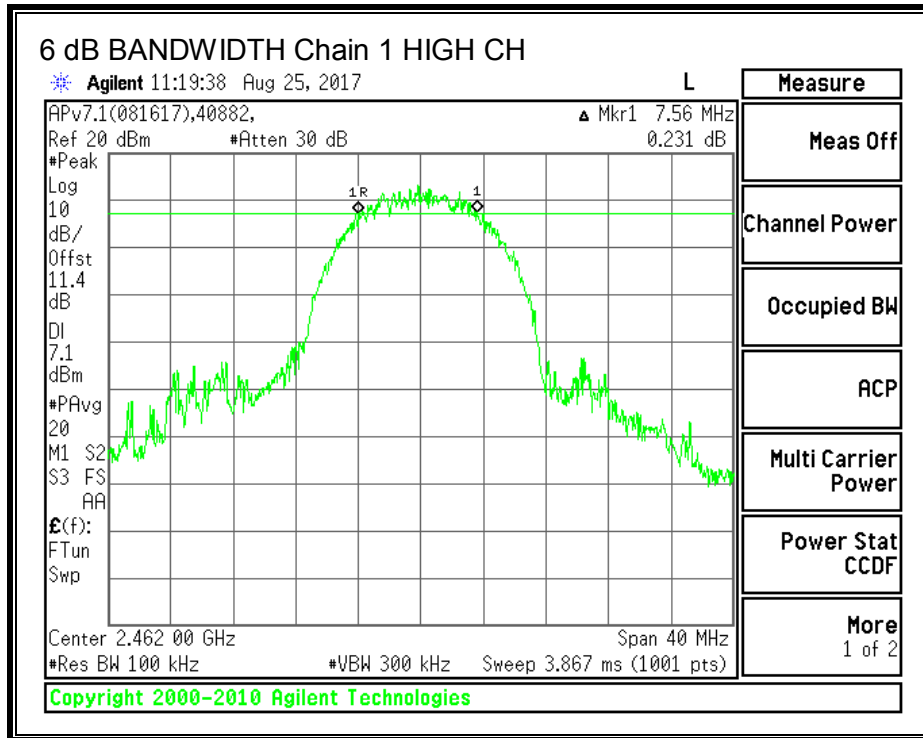
#### 6 dB BANDWIDTH, Chain 0





**6 dB BANDWIDTH, Chain 1**





**Test Information**

Date: 2017-08-25  
Project: 11893030  
Tester: Jeff Cabrera

## 8.2.2. OUTPUT POWER

### LIMITS

FCC §15.247 (b)

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

This EUT mode is 802.11b, and CDD operation. According to KDB 662911, with  $N_{ant} \leq 4$  the array gain is zero. Total directional gain is equal to single antenna gain.

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Directional Gain (dBi)
2.71	2.71	2.71

### Test Information

Date: 2017-08-25  
 Project: 11893030  
 Tester: Jeff Cabrera

### 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	2.71	30.00	30	36	30.00
Mid	2437	2.71	30.00	30	36	30.00
High	2462	2.71	30.00	30	36	30.00

#### Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2412	19.97	20.61	23.31	30.00	-6.69
Mid	2437	20.03	20.61	23.34	30.00	-6.66
High	2462	19.88	20.59	23.26	30.00	-6.74

### 8.2.3. POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.247 (e)

#### RESULTS

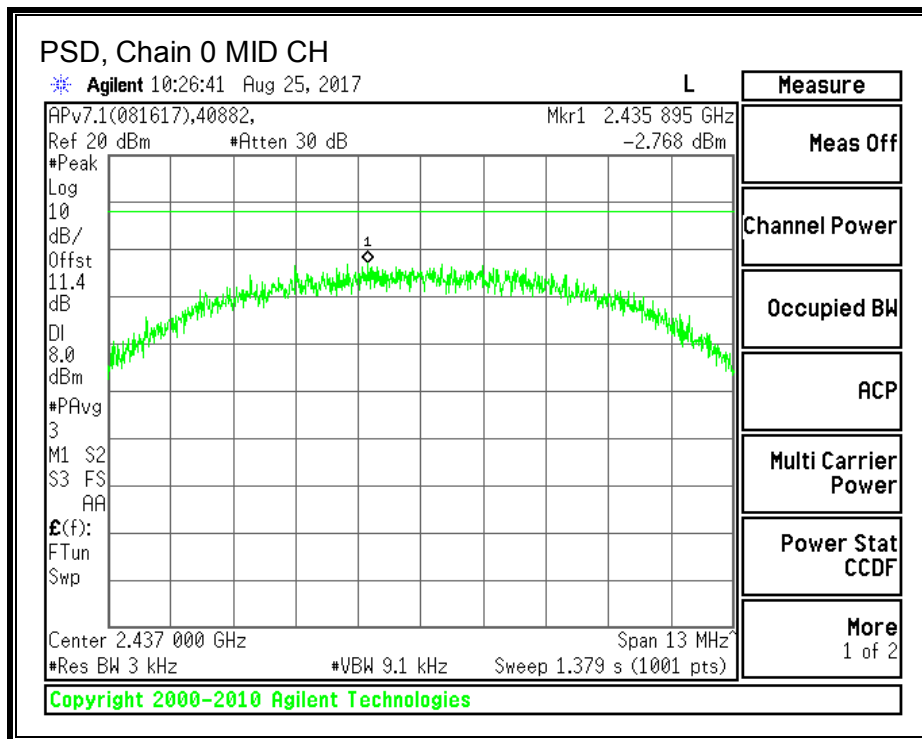
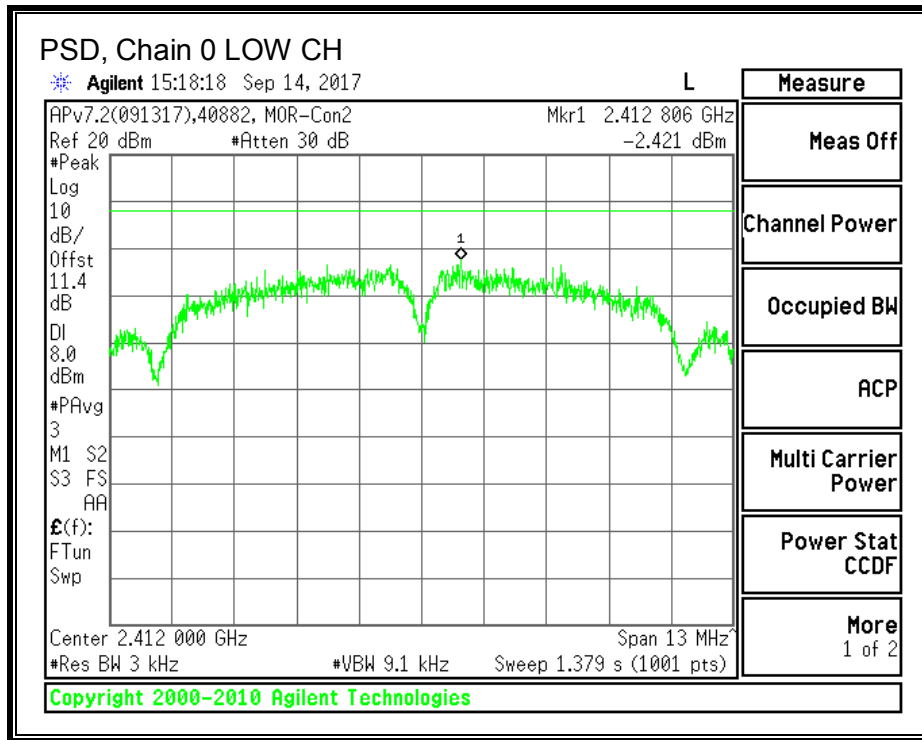
##### PSD Results

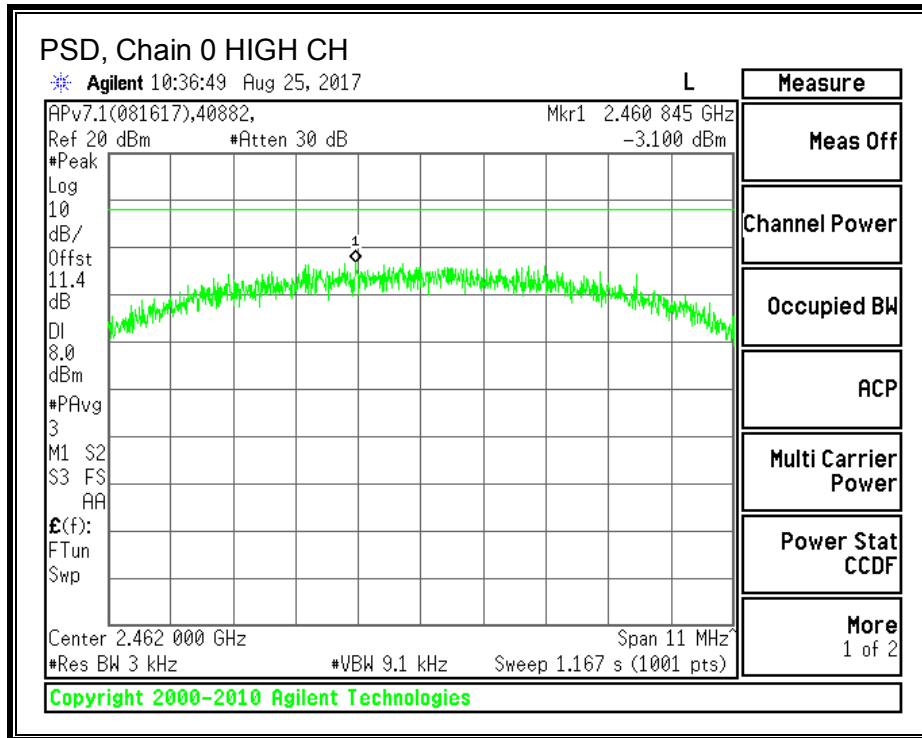
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-2.42	-2.19	0.71	8.0	-7.3
Mid	2437	-2.77	-2.40	0.43	8.0	-7.6
High	2462	-3.10	-1.87	0.57	8.0	-7.4

#### Test Information

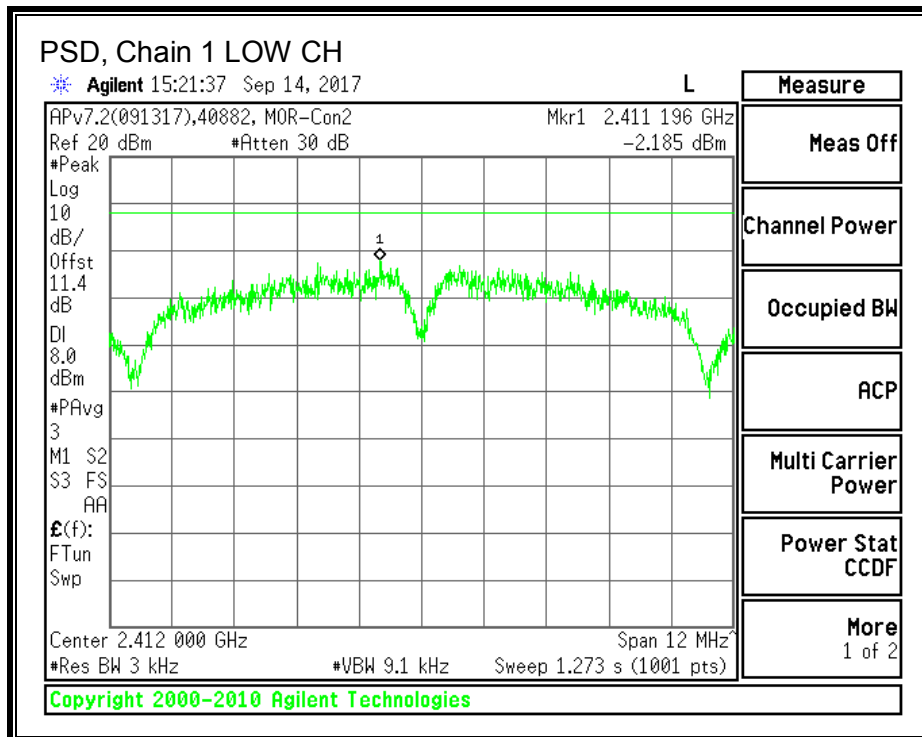
Date: 2017-08-30  
Project: 11893030  
Tester: Jeff Cabrera

**PSD, Chain 0**

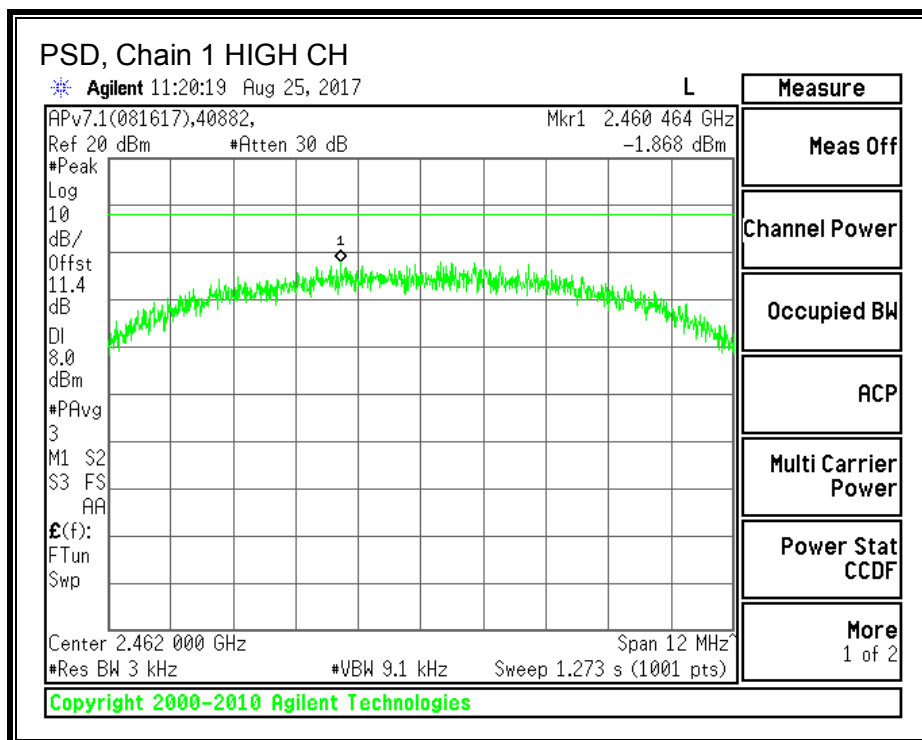
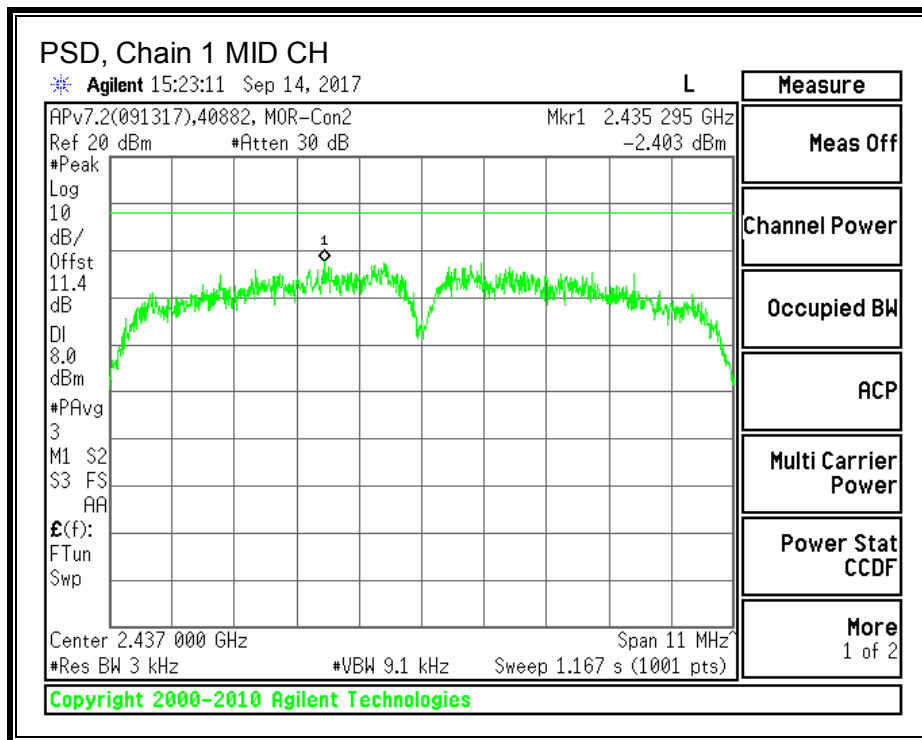




**PSD, Chain 1**







### 8.2.4. OUT-OF-BAND EMISSIONS

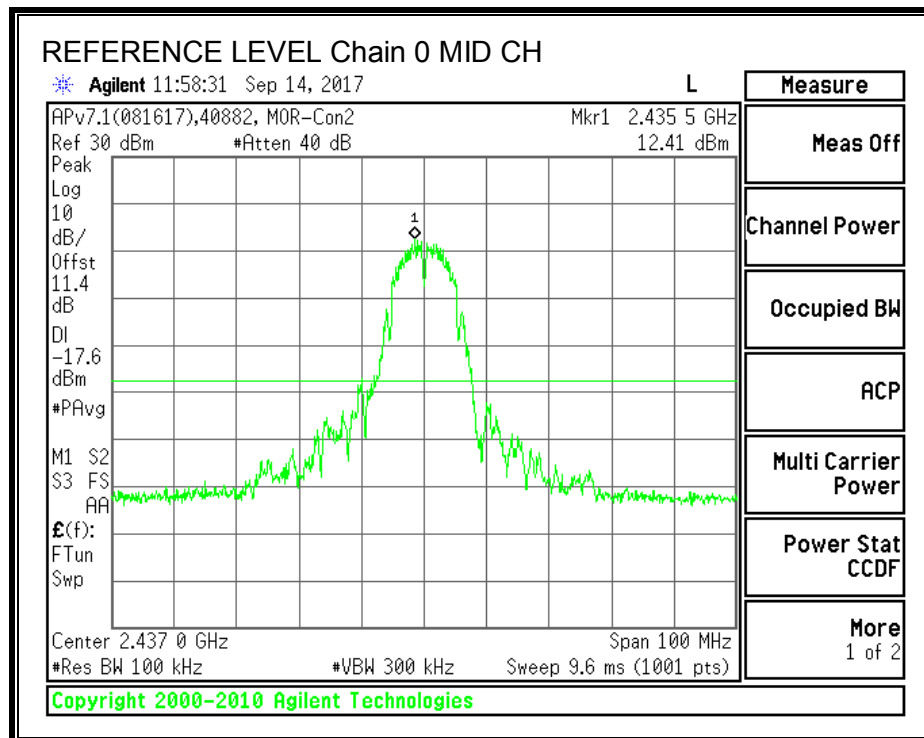
#### LIMITS

FCC §15.247 (d)

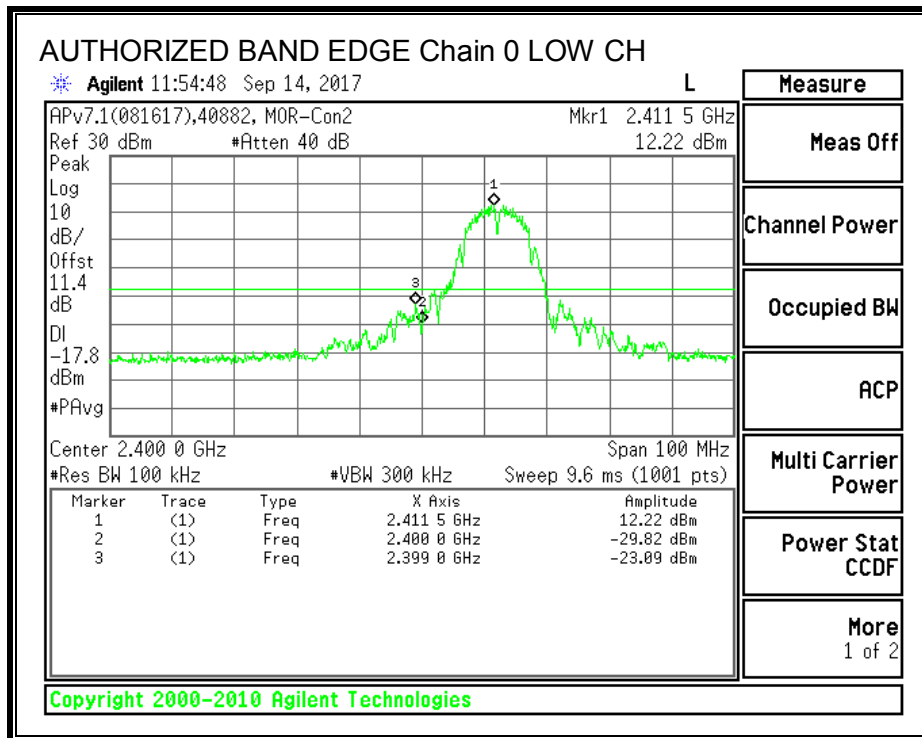
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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

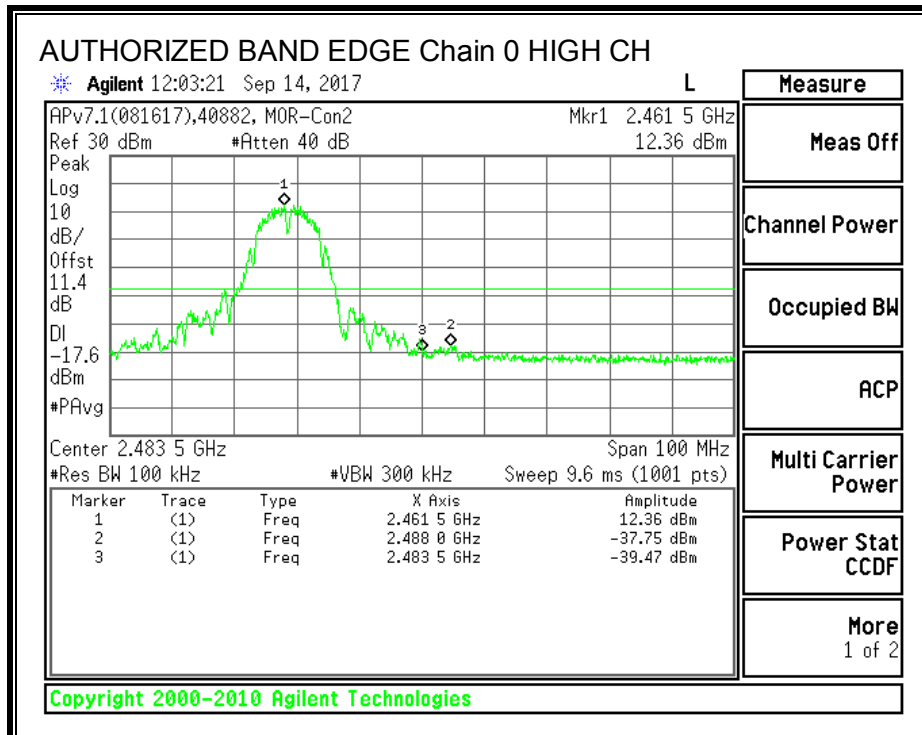
##### IN-BAND REFERENCE LEVEL, Chain 0



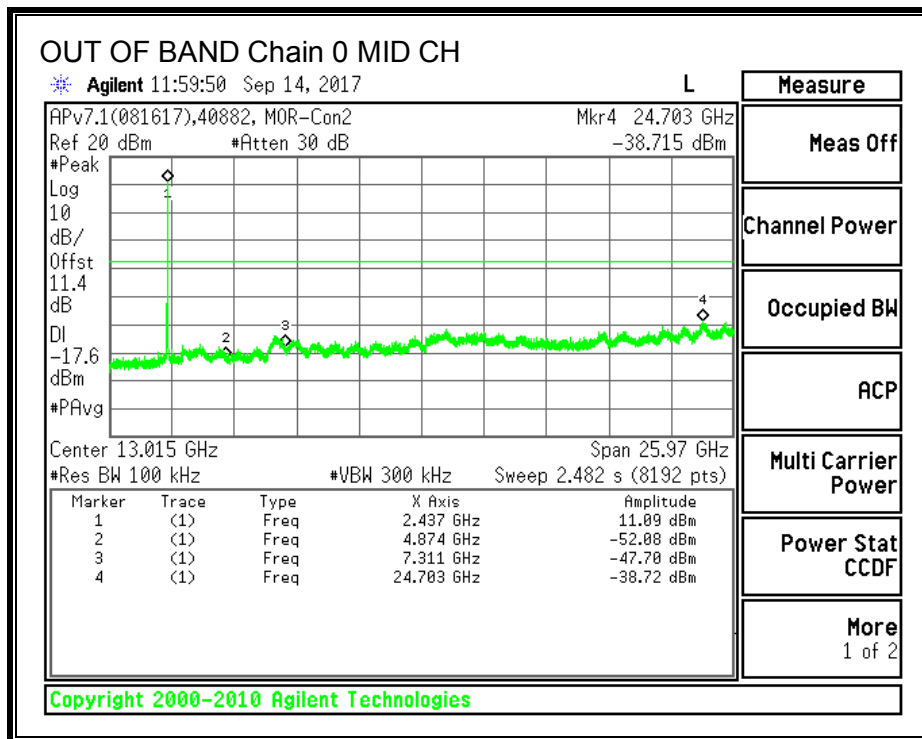
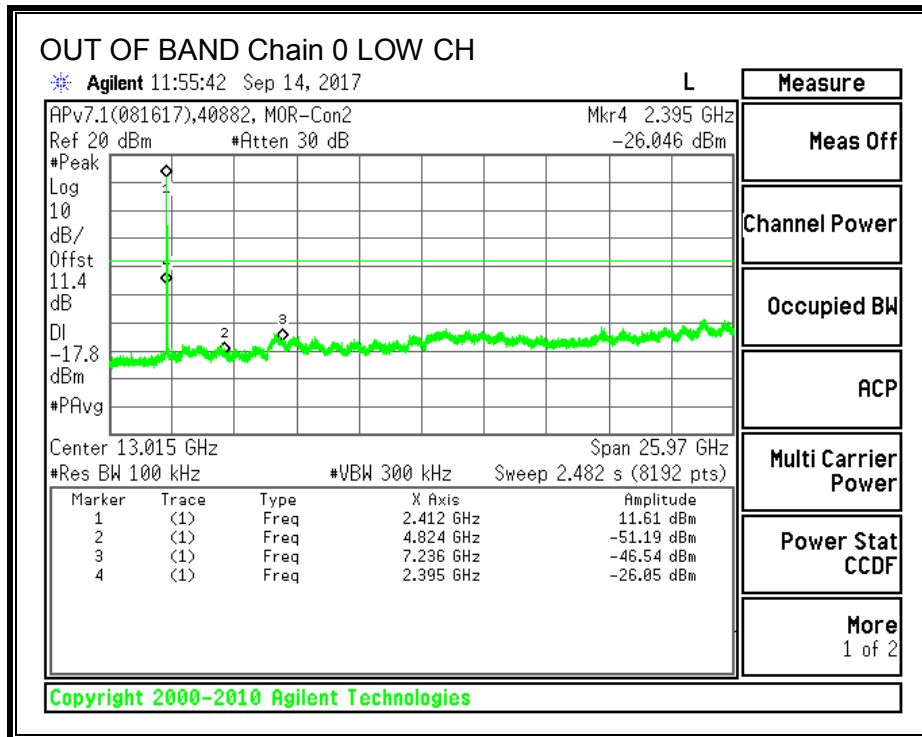
**LOW CHANNEL BANDEDGE, Chain 0**

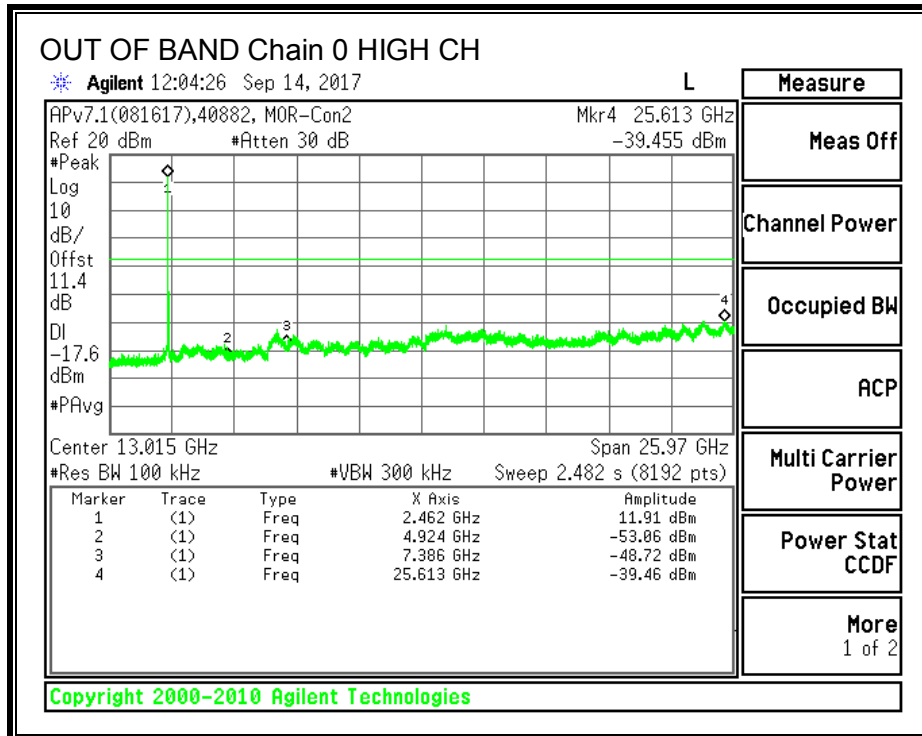


**HIGH CHANNEL BANDEDGE, Chain 0**

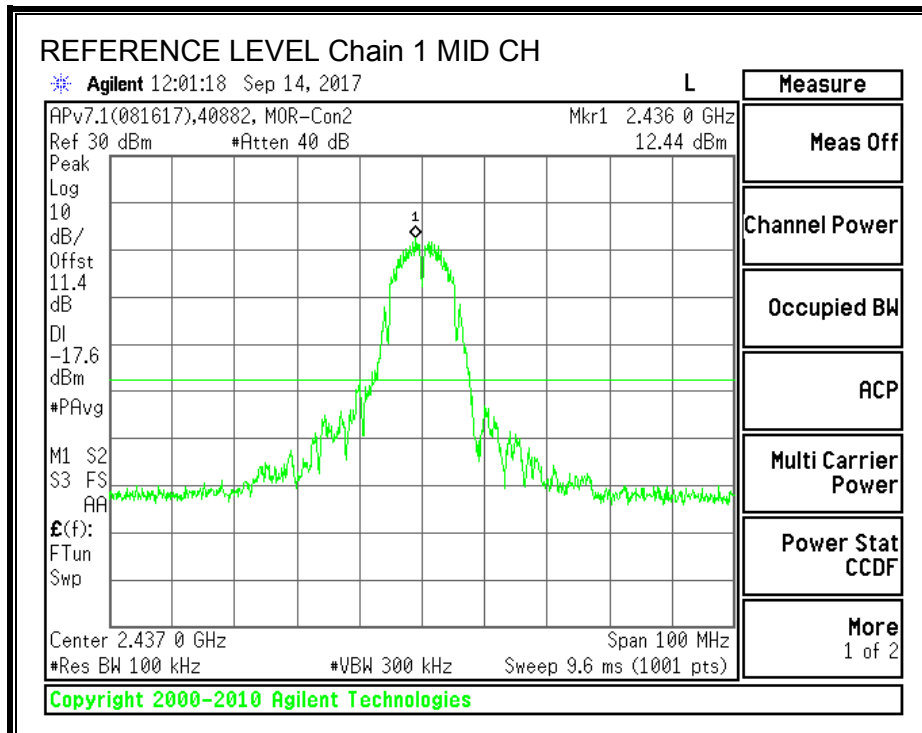


**OUT-OF-BAND EMISSIONS, Chain 0**

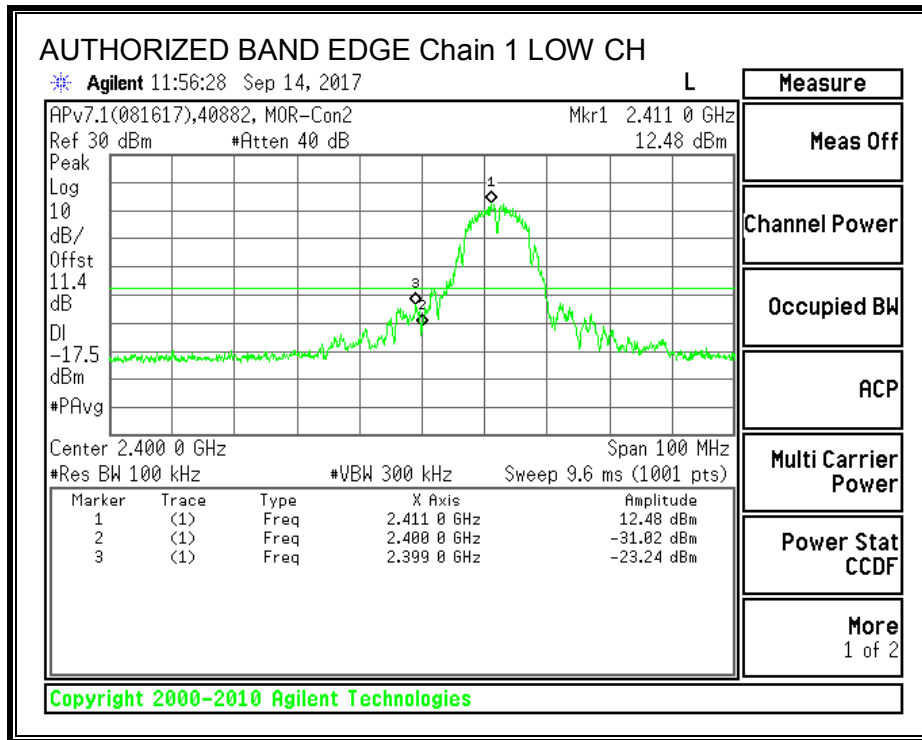




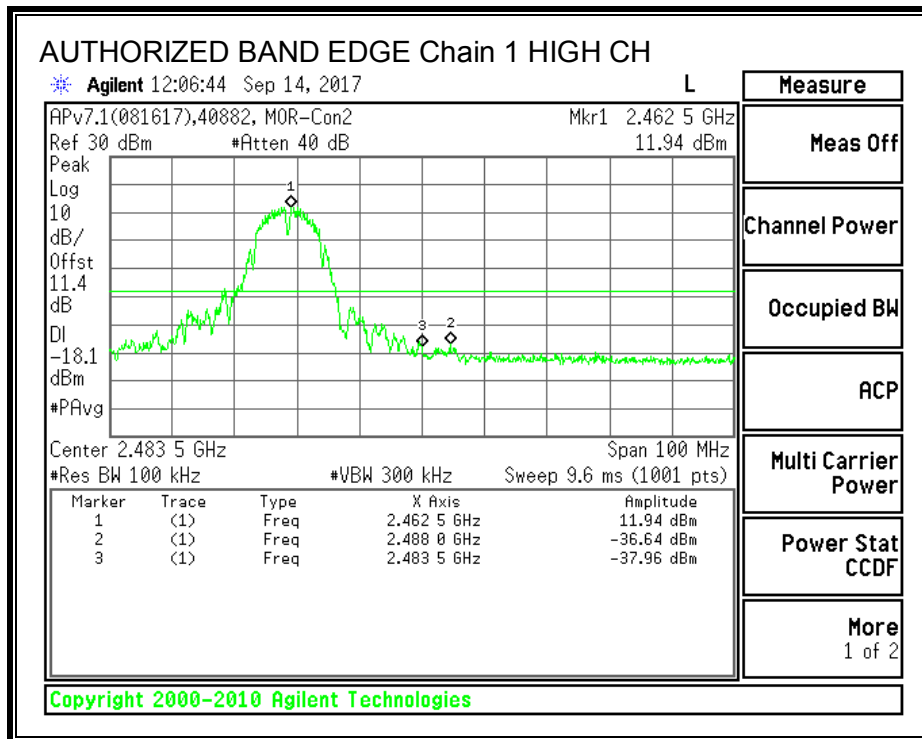
**IN-BAND REFERENCE LEVEL, Chain 1**

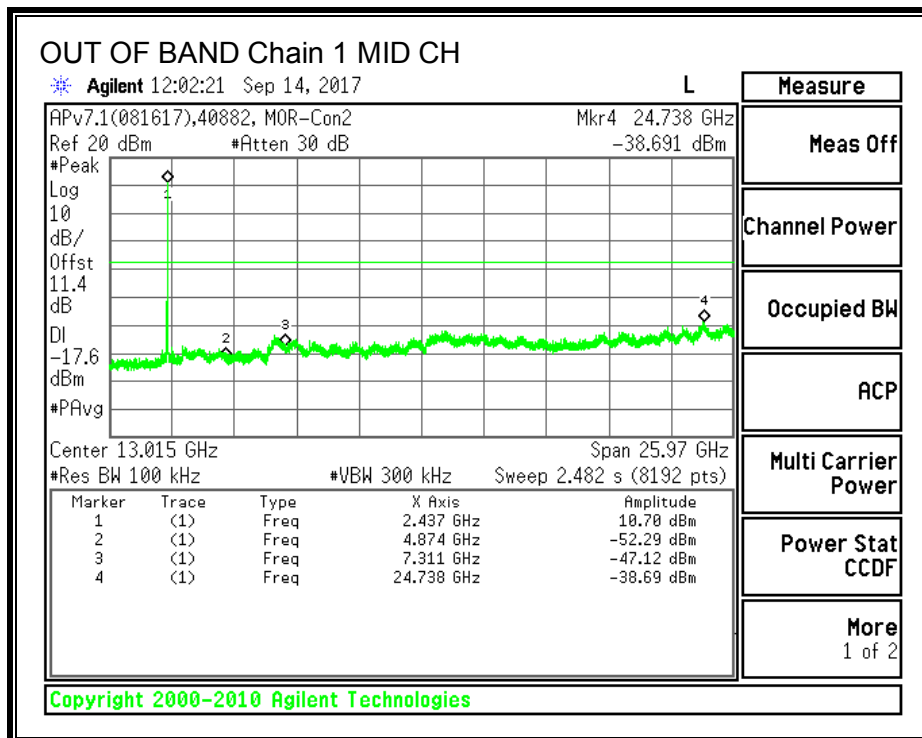
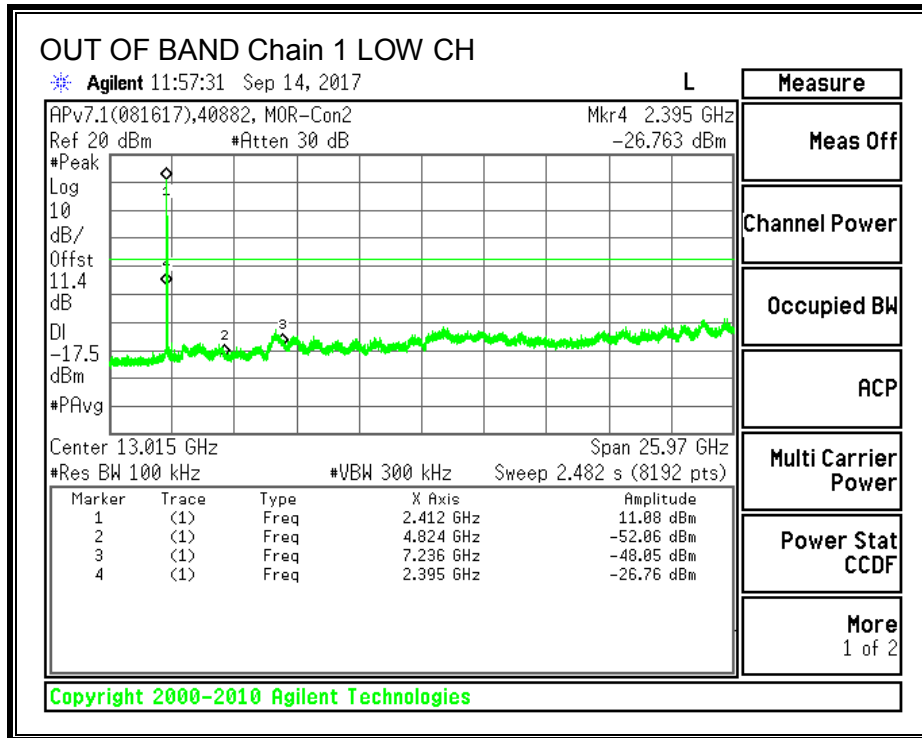


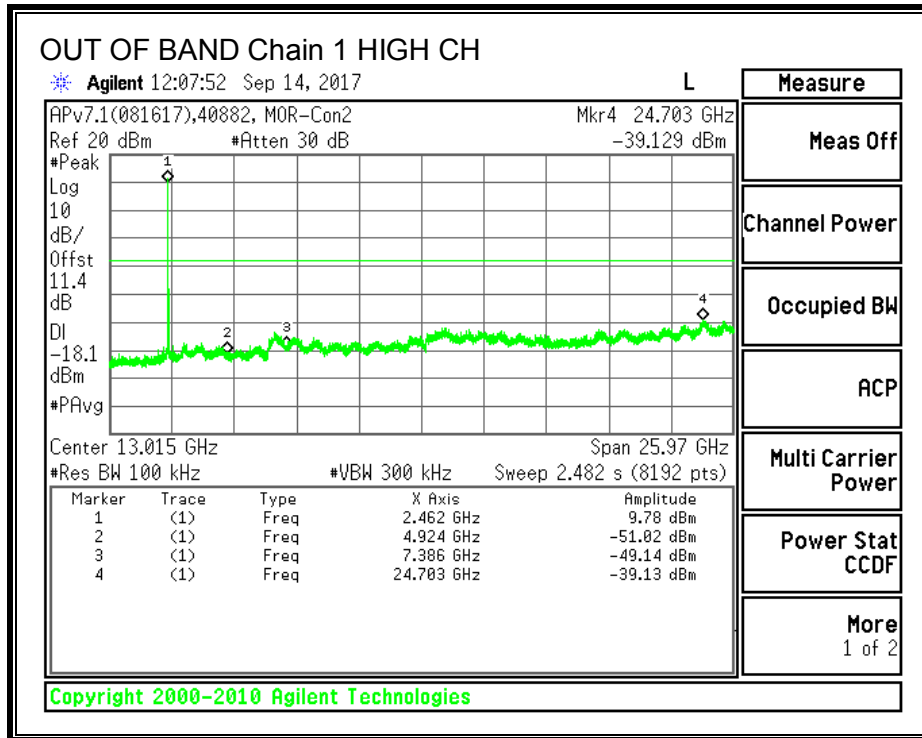
**LOW CHANNEL BANDEDGE, Chain 1**



**HIGH CHANNEL BANDEDGE, Chain 1**







**Test Information**

Date: 2017-09-14  
 Project: 11893030  
 Tester: Jeff Cabrera



### 8.3. 802.11g 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.

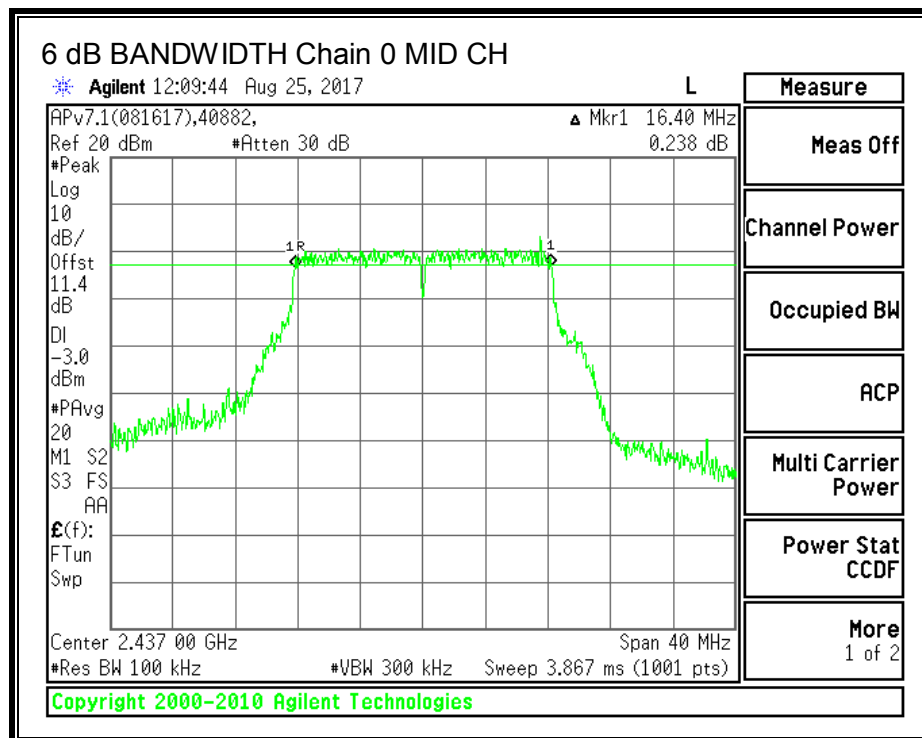
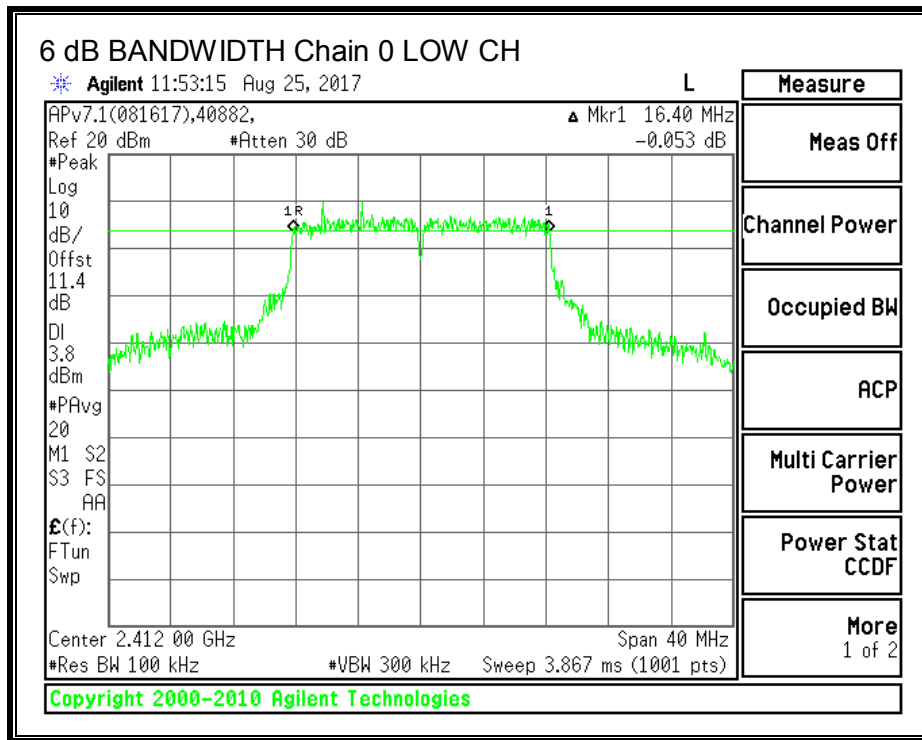
##### RESULTS

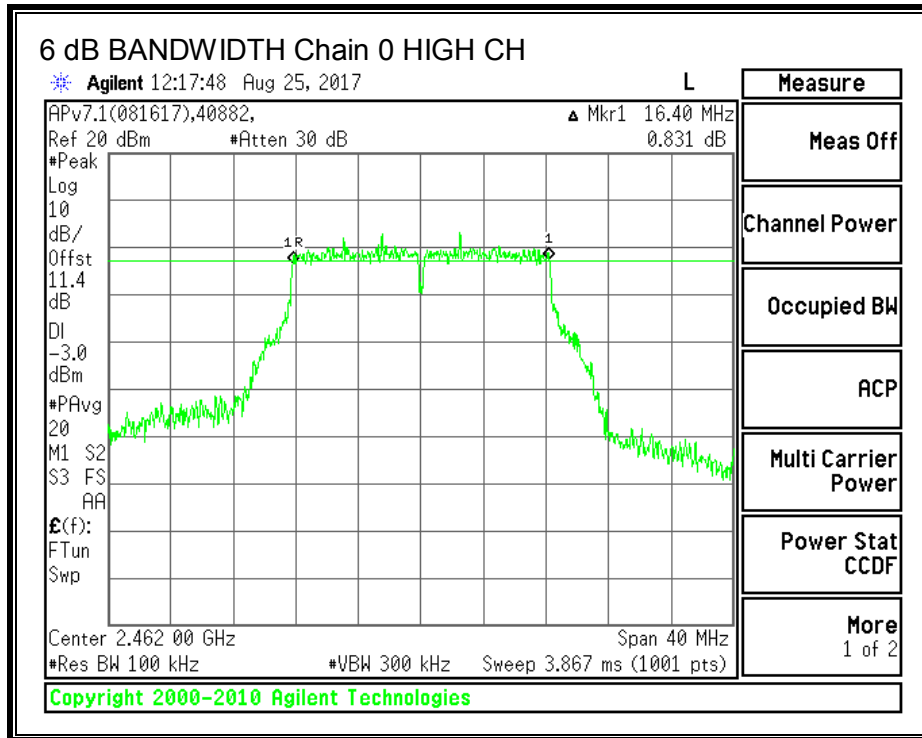
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	16.400	16.400	0.5
Mid	2437	16.400	16.520	0.5
High	2462	16.400	16.400	0.5

##### Test Information

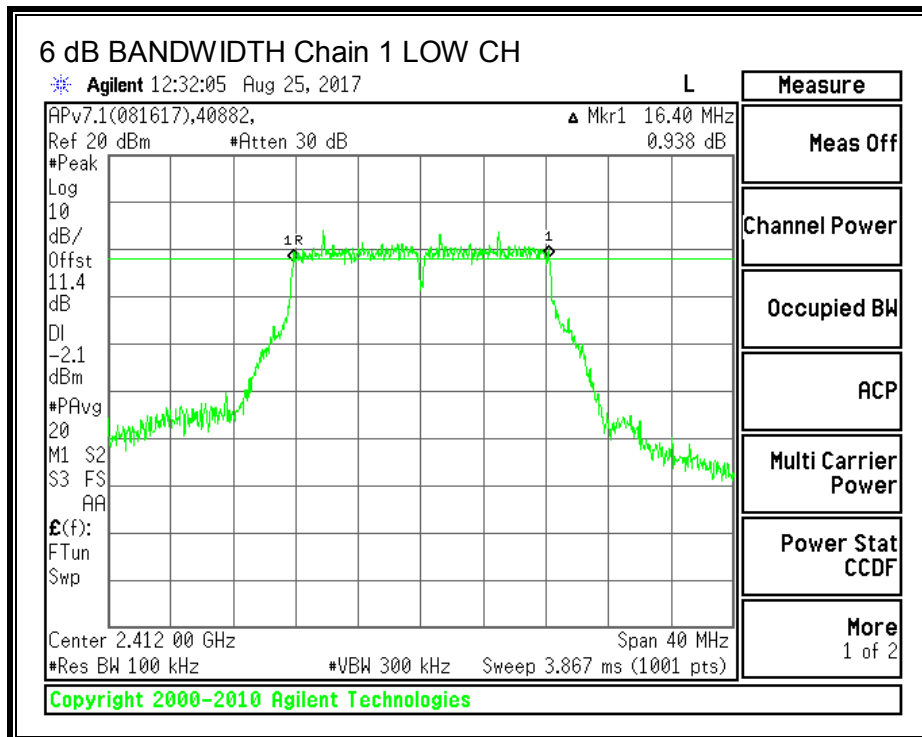
Date: 2017-08-25  
Project: 11893030  
Tester: Jeff Cabrera

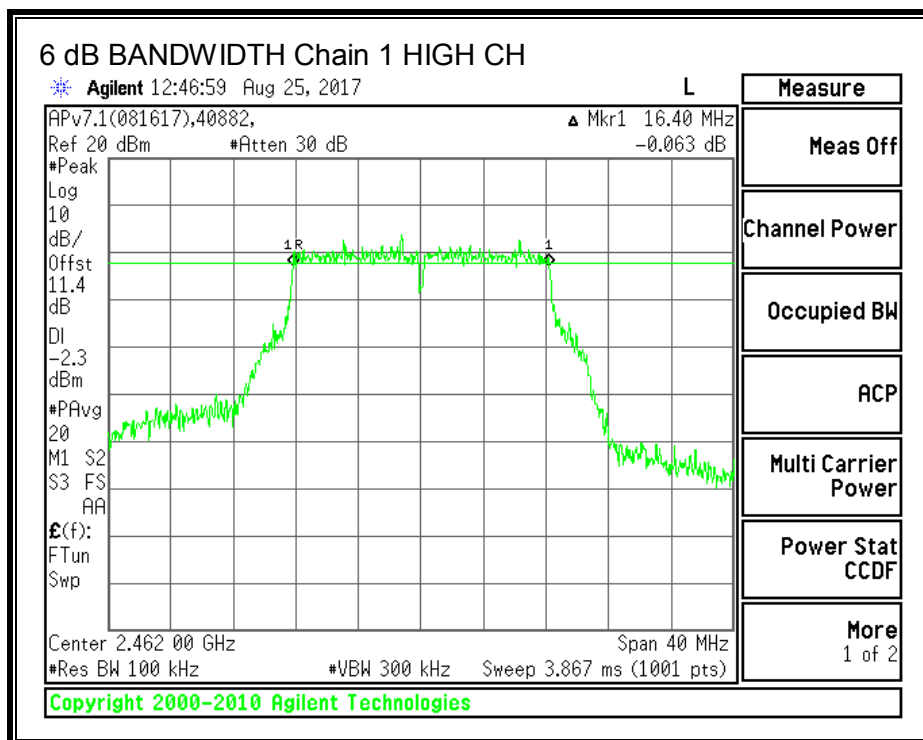
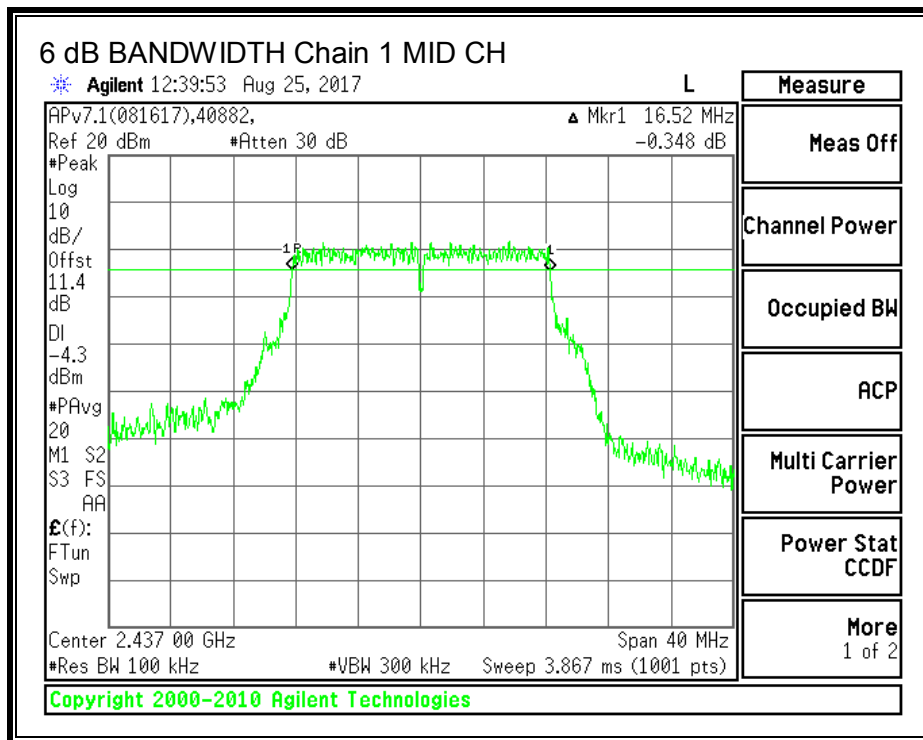
**6 dB BANDWIDTH, Chain 0**





**6 dB BANDWIDTH, Chain 1**





### 8.3.2. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

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

This EUT mode is 802.11b, and CDD operation. According to KDB 662911, with  $N_{ant} \leq 4$  the array gain is zero. Total directional gain is equal to single antenna gain.

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Directional Gain (dBi)
2.71	2.71	2.71

#### Test Information

Date: 2017-08-25  
 Project: 11893030  
 Tester: Jeff Cabrera

#### 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	2.71	30.00	30	36	30.00
Mid	2437	2.71	30.00	30	36	30.00
High	2462	2.71	30.00	30	36	30.00

##### Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2412	13.52	14.25	16.91	30.00	-13.09
Mid	2437	13.55	14.51	17.07	30.00	-12.93
High	2462	13.72	14.10	16.92	30.00	-13.08

**8.3.3. POWER SPECTRAL DENSITY  
LIMITS**

FCC §15.247 (e)

**RESULTS**

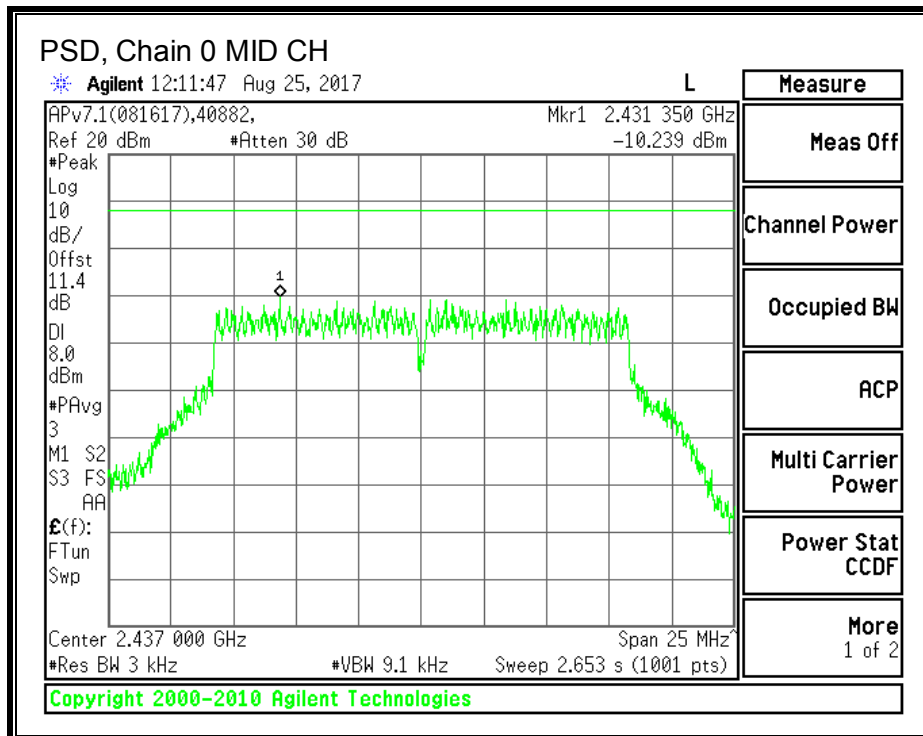
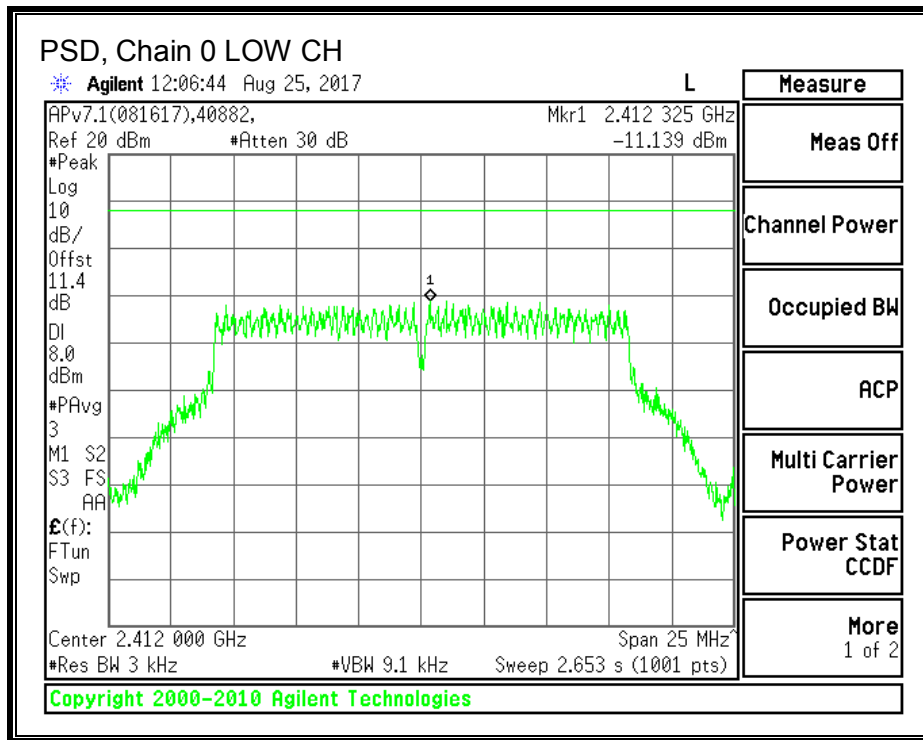
**PSD Results**

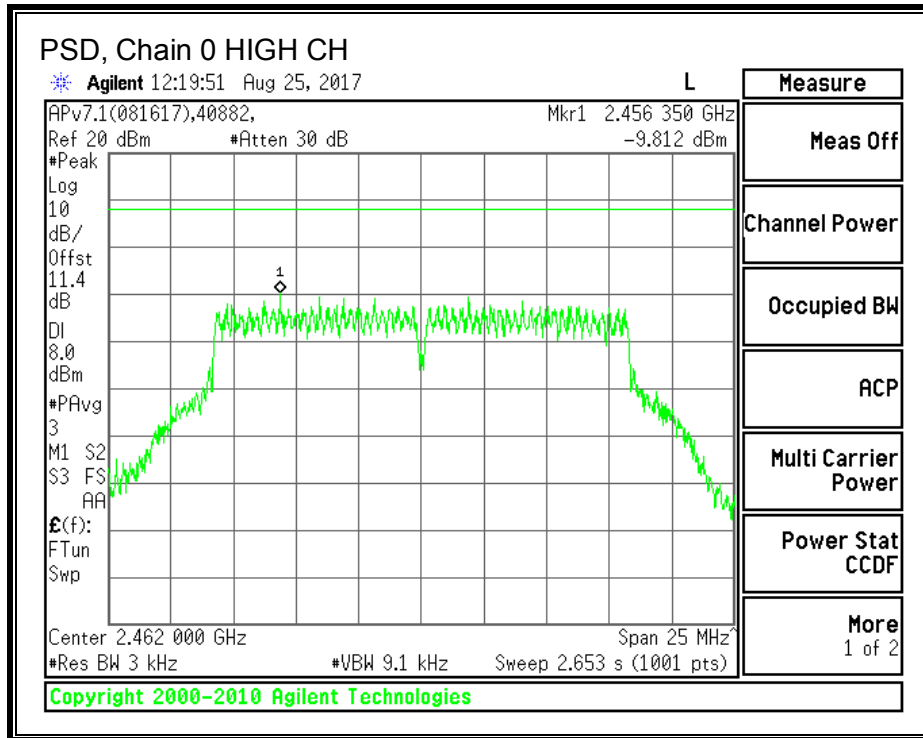
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-11.14	-9.35	-7.14	8.0	-15.1
Mid	2437	-10.24	-10.94	-7.57	8.0	-15.6
High	2462	-9.81	-9.73	-6.76	8.0	-14.8

**Test Information**

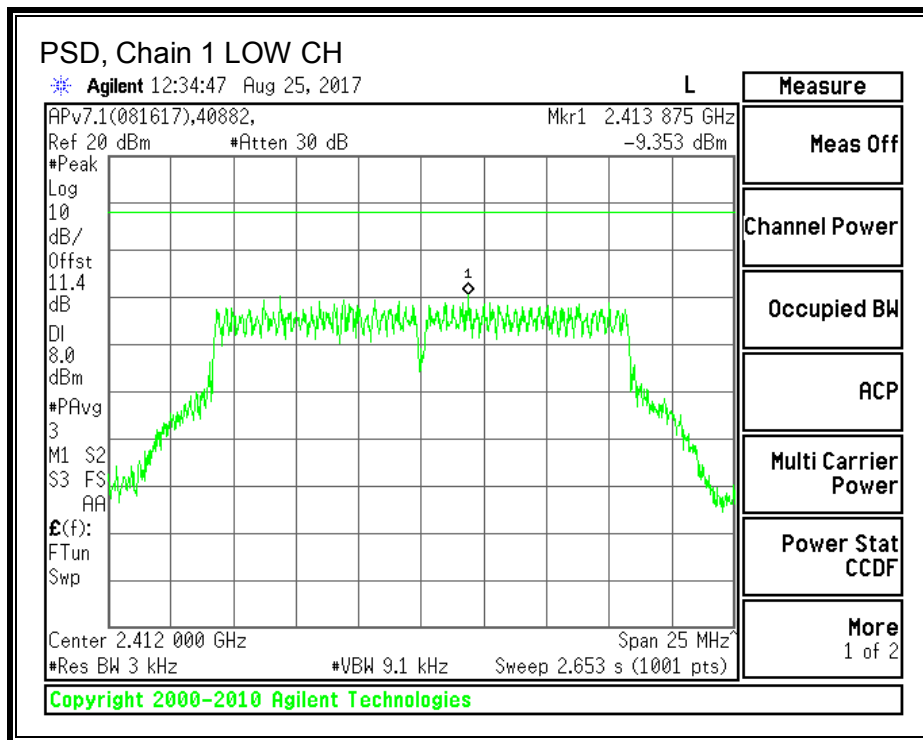
Date: 2017-08-25  
Project: 11893030  
Tester: Jeff Cabrera

**PSD, Chain 0**

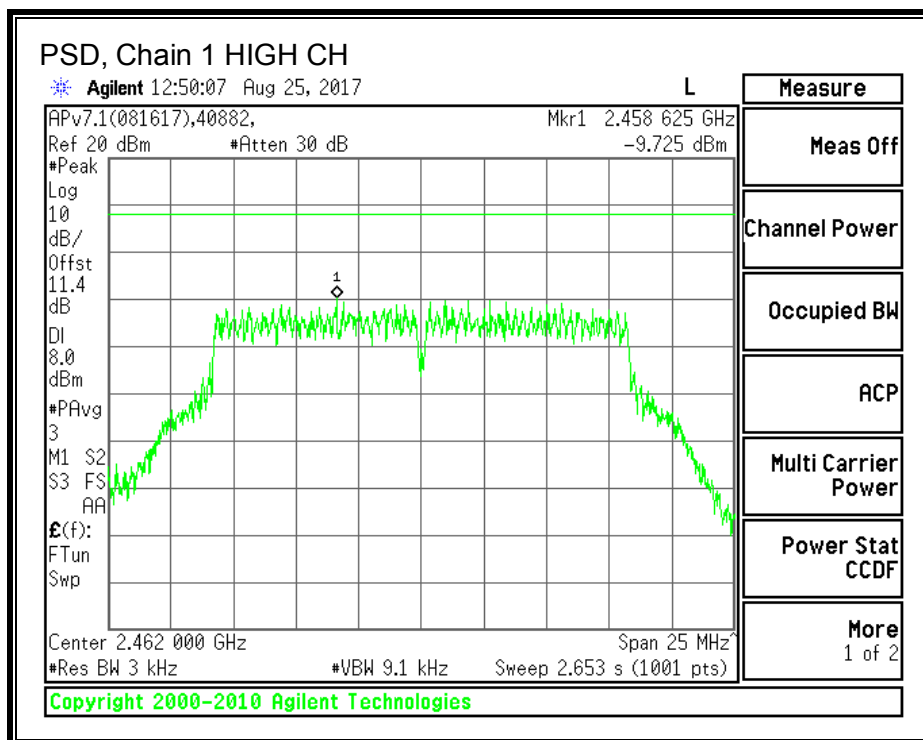
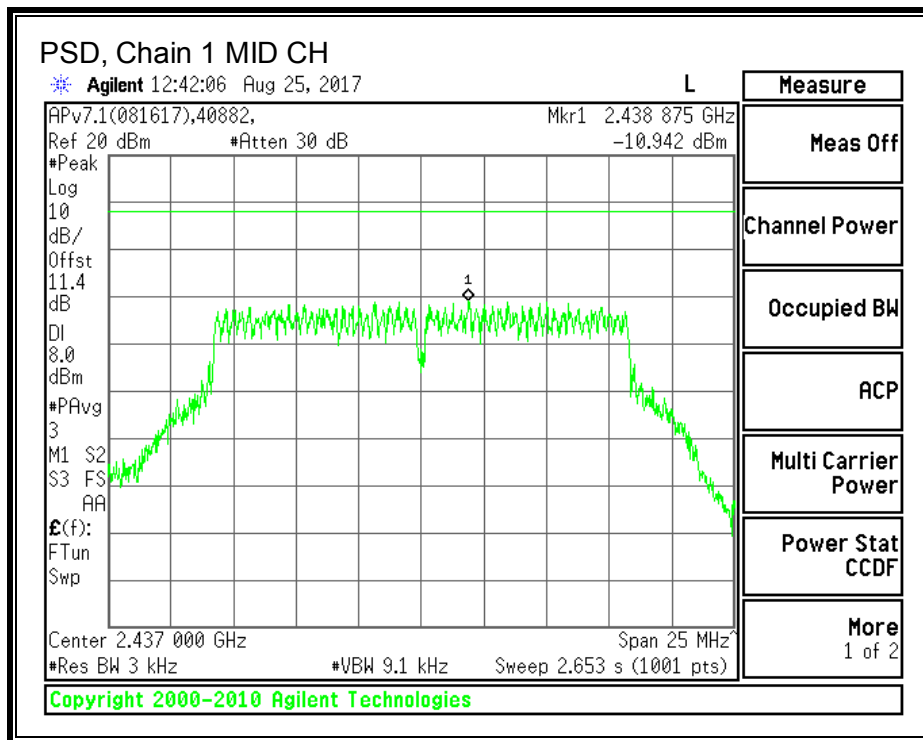




**PSD, Chain 1**







### 8.3.4. OUT-OF-BAND EMISSIONS

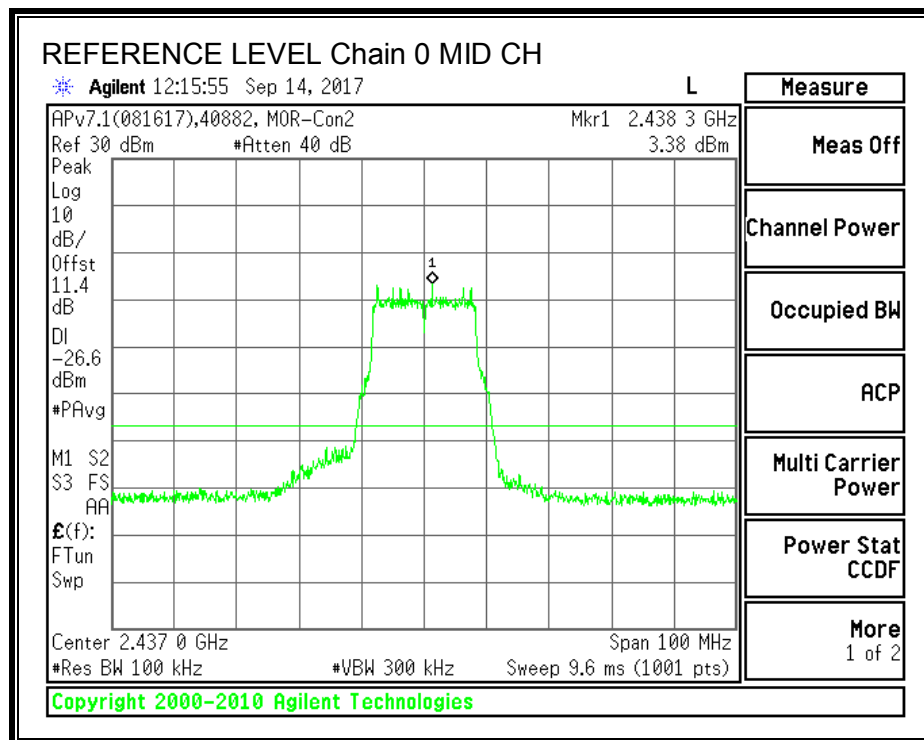
#### LIMITS

FCC §15.247 (d)

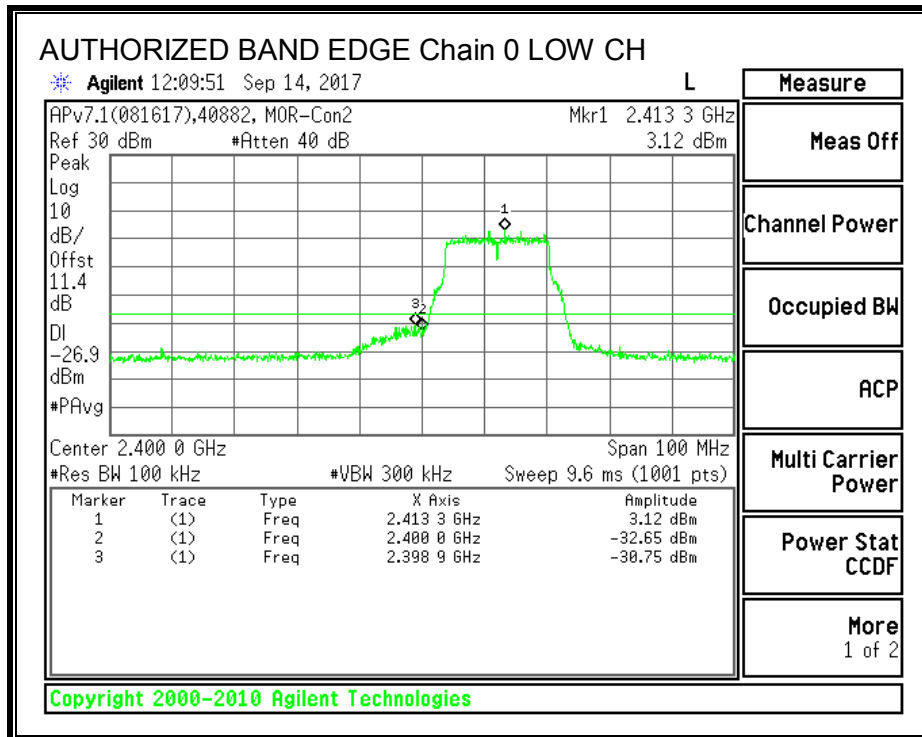
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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

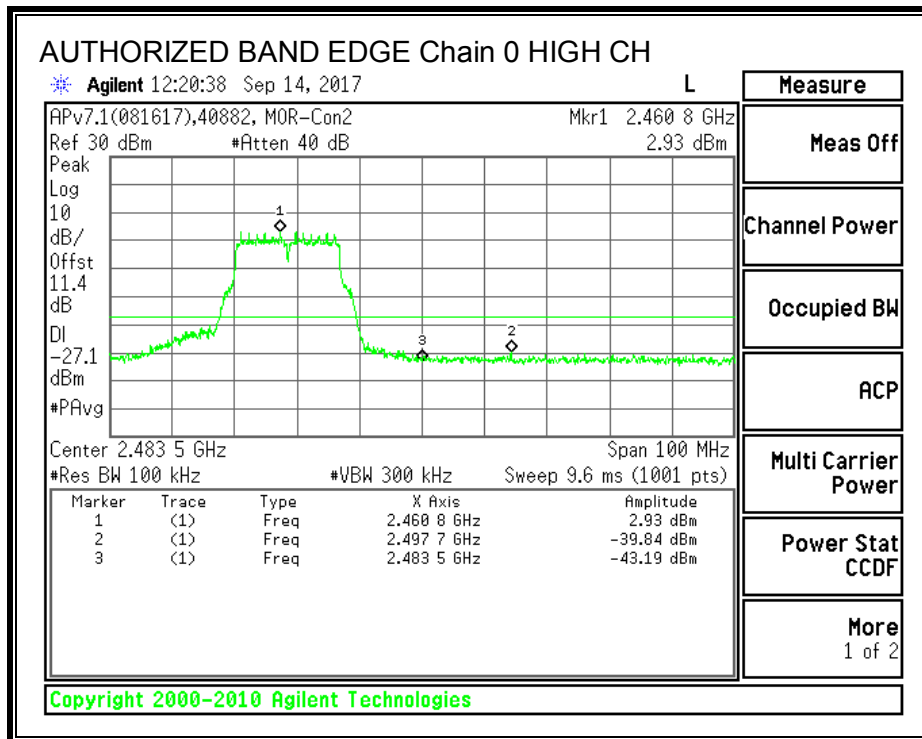
##### IN-BAND REFERENCE LEVEL, Chain 0



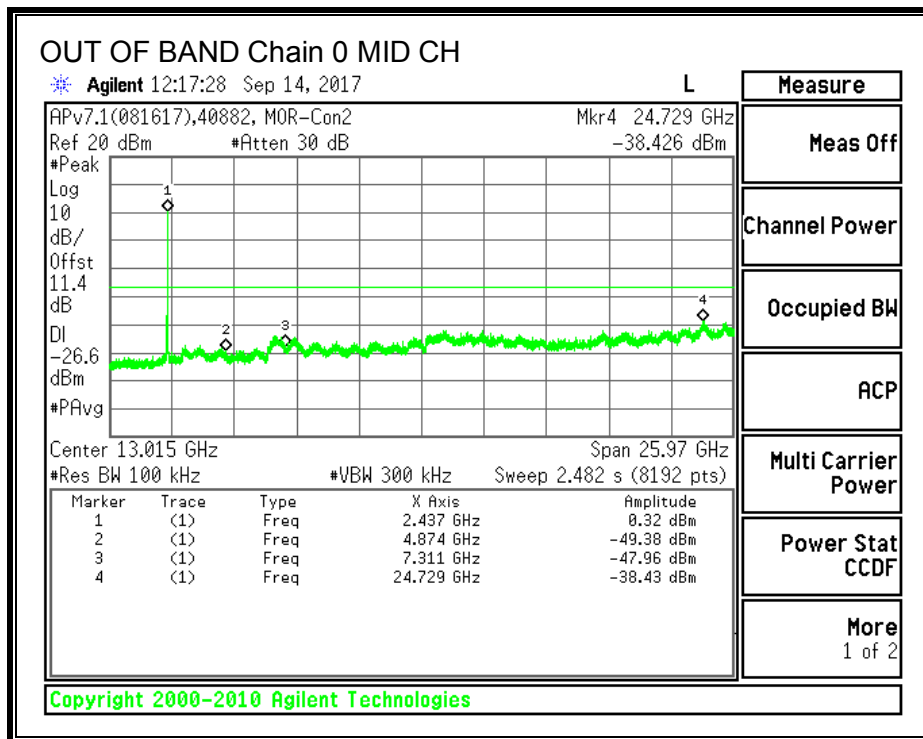
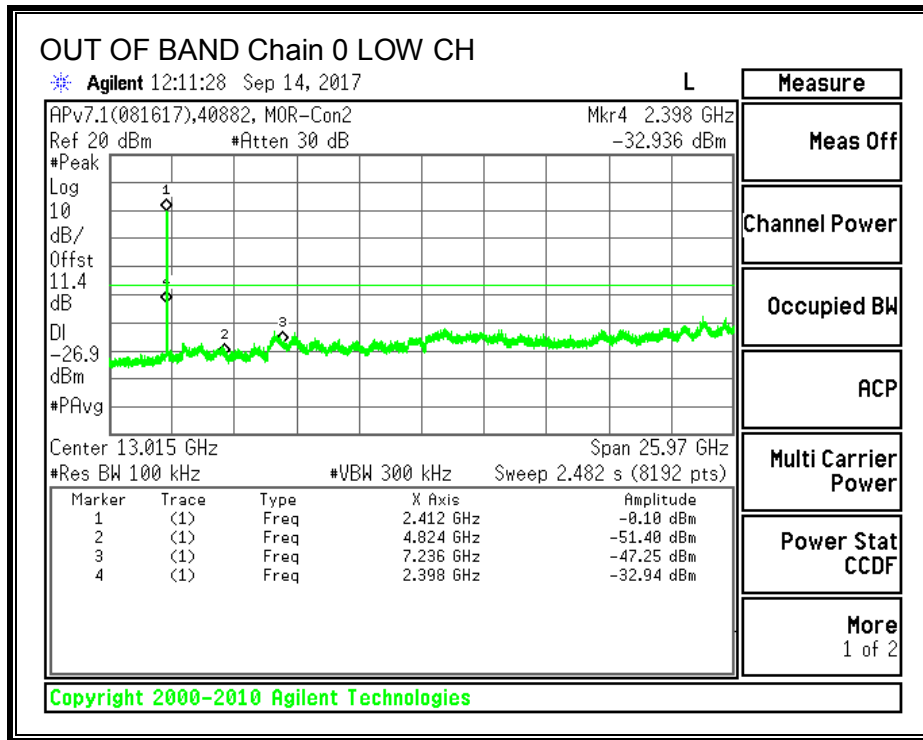
**LOW CHANNEL BANDEDGE, Chain 0**

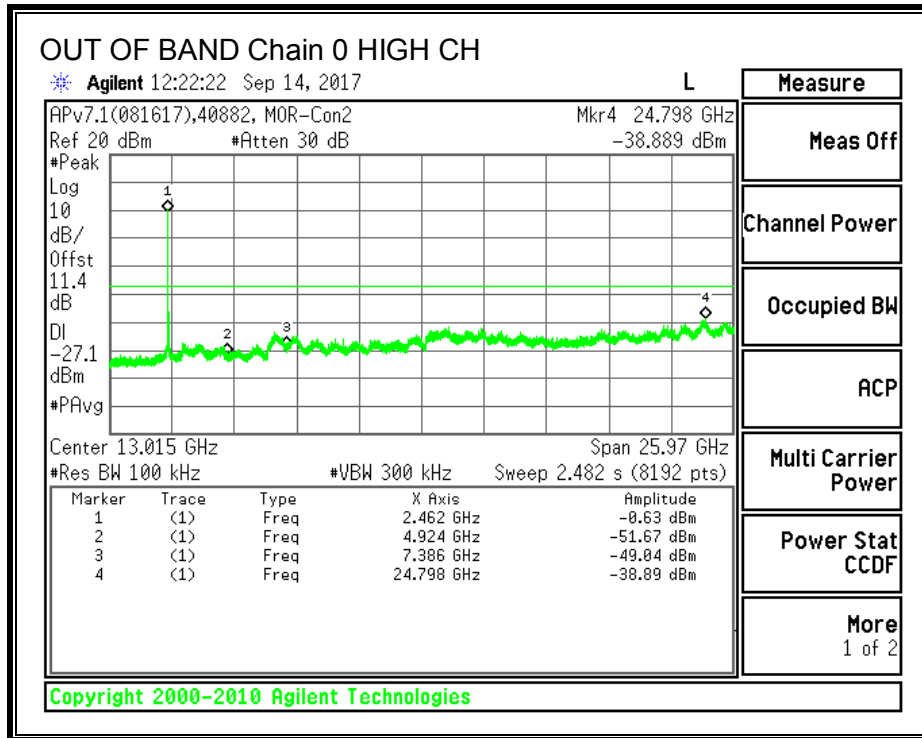


**HIGH CHANNEL BANDEDGE, Chain 0**

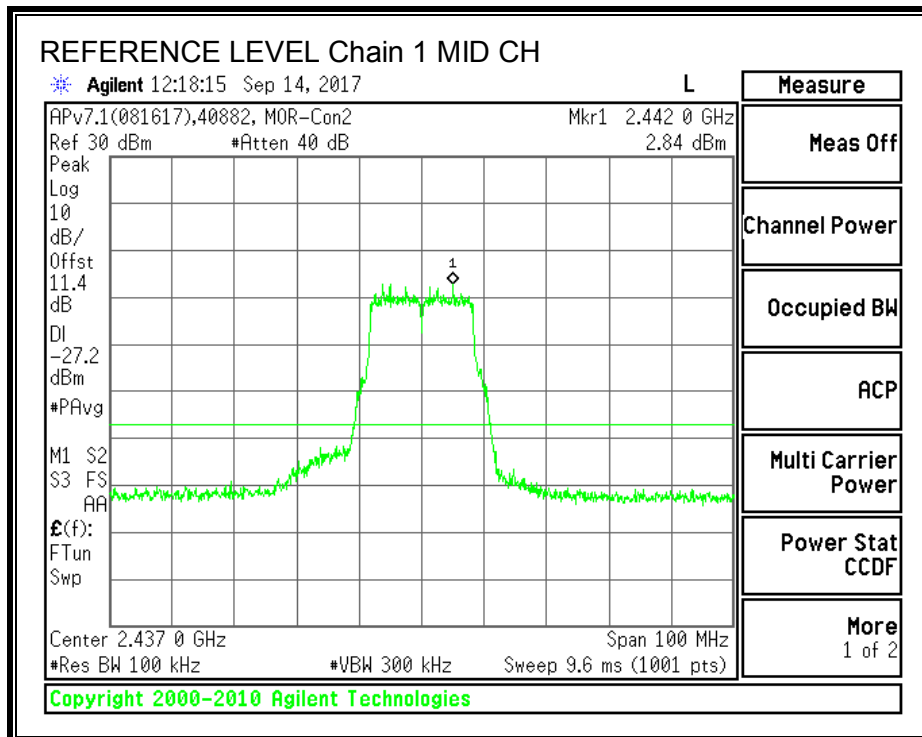


**OUT-OF-BAND EMISSIONS, Chain 0**

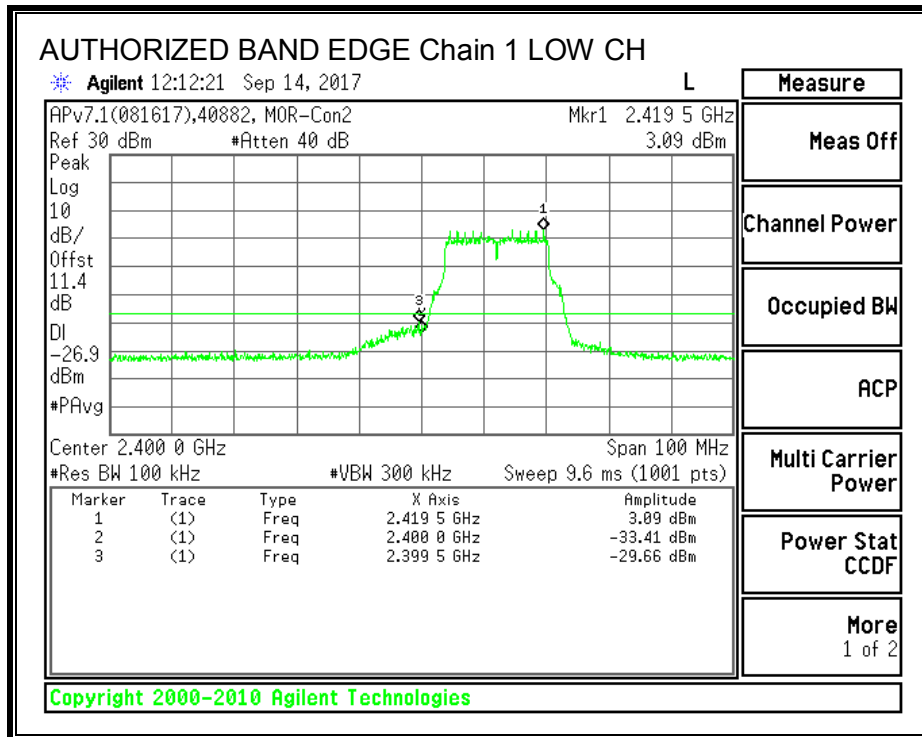




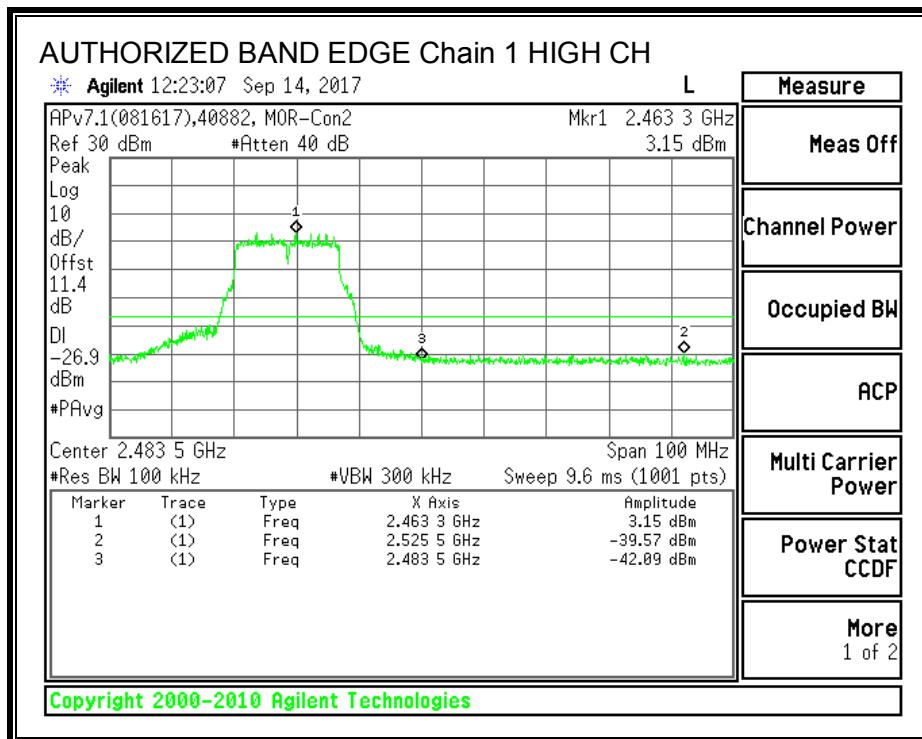
**IN-BAND REFERENCE LEVEL, Chain 1**

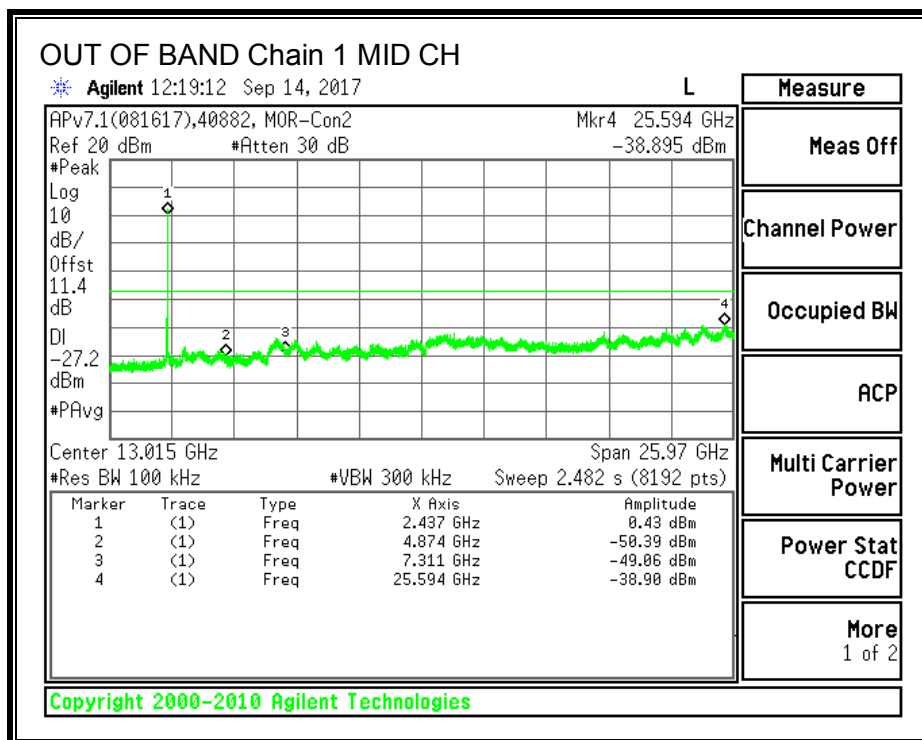
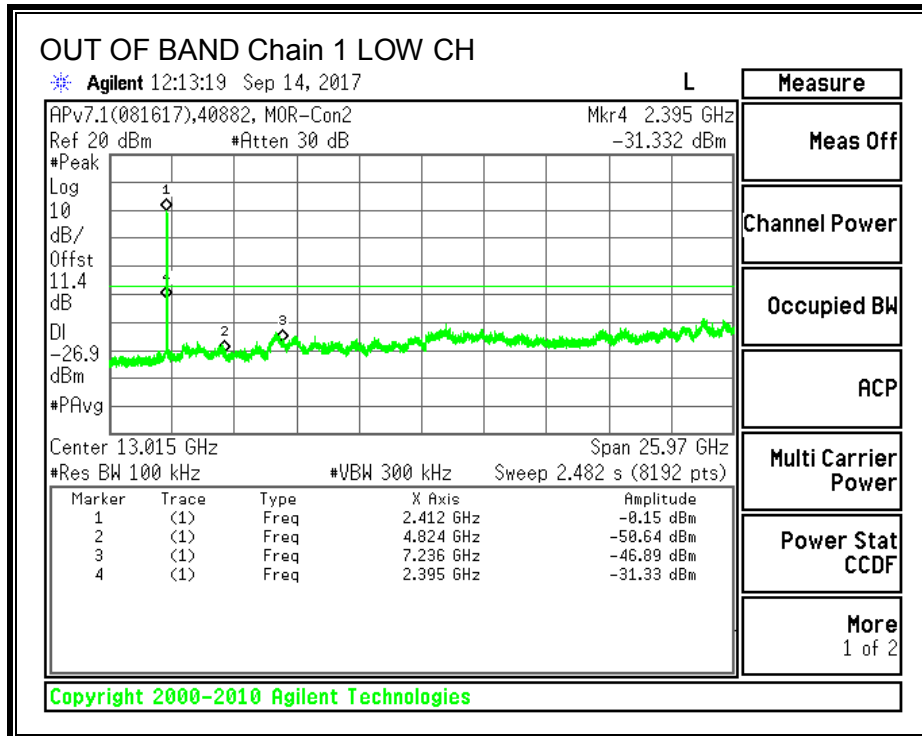


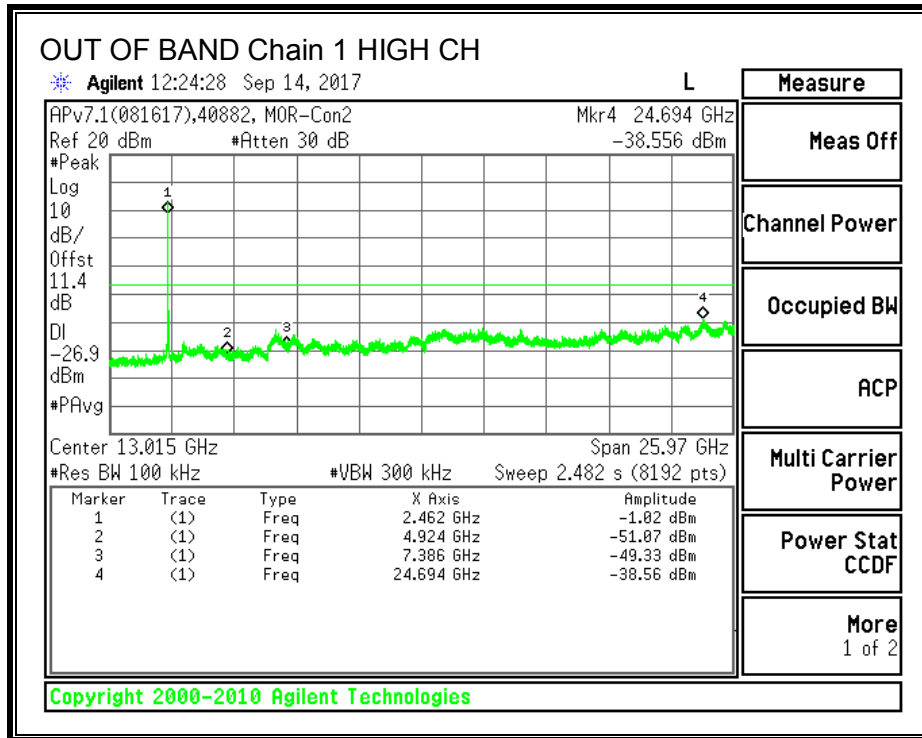
**LOW CHANNEL BANDEDGE, Chain 1**



**HIGH CHANNEL BANDEDGE, Chain 1**







**Test Information**

Date: 2017-09-14  
 Project: 11893030  
 Tester: Jeff Cabrera



## 8.4. 802.11n HT20 MODE IN THE 2.4 GHz BAND

### 8.4.1. 6 dB BANDWIDTH

#### LIMITS

FCC §15.247 (a) (2)

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

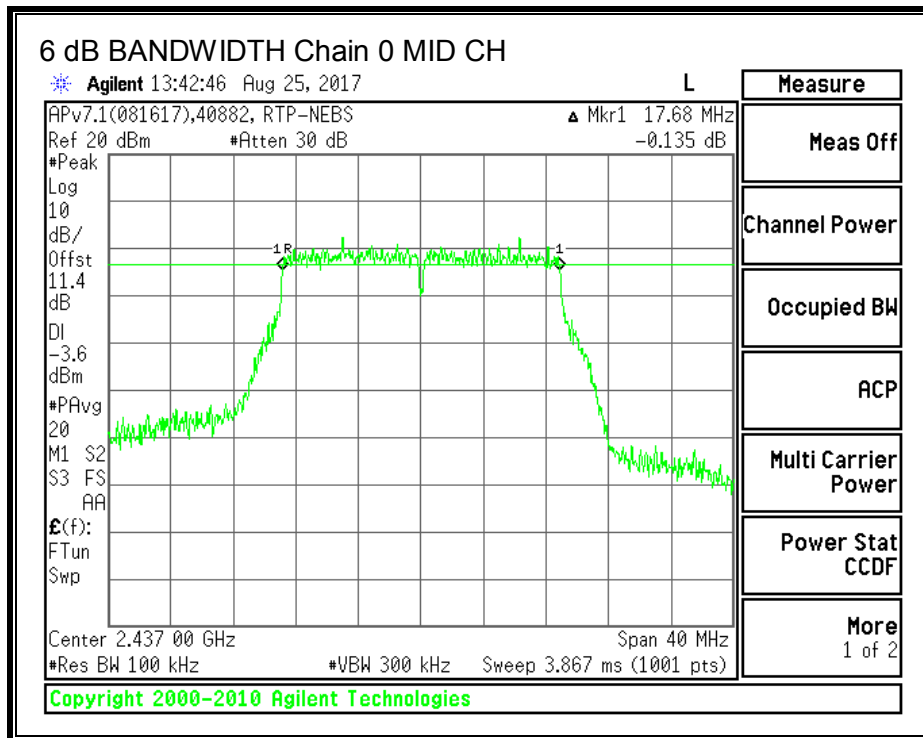
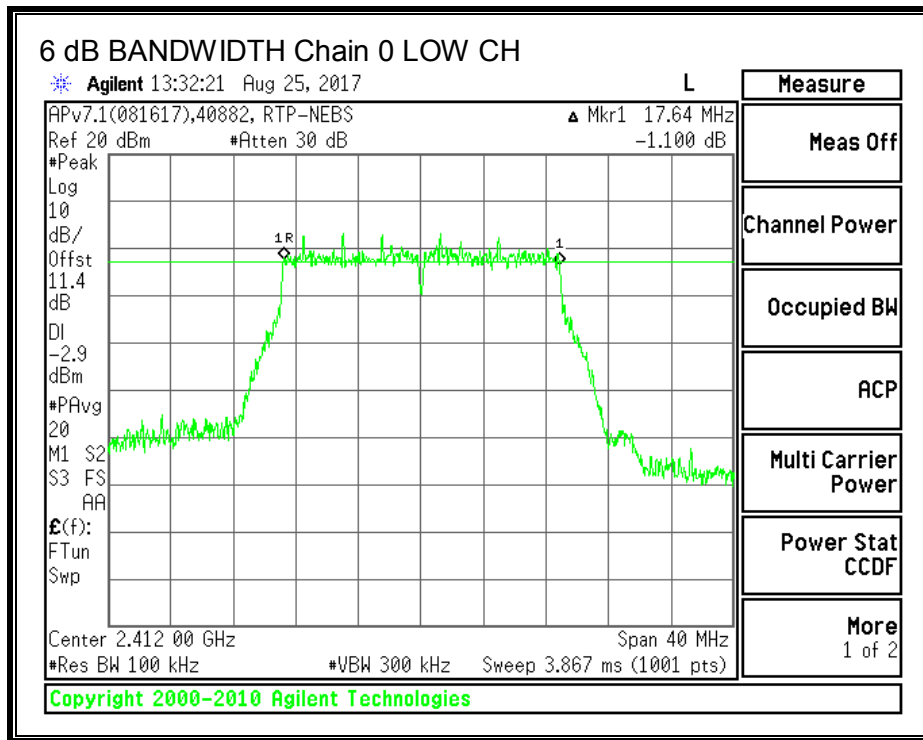
#### RESULTS

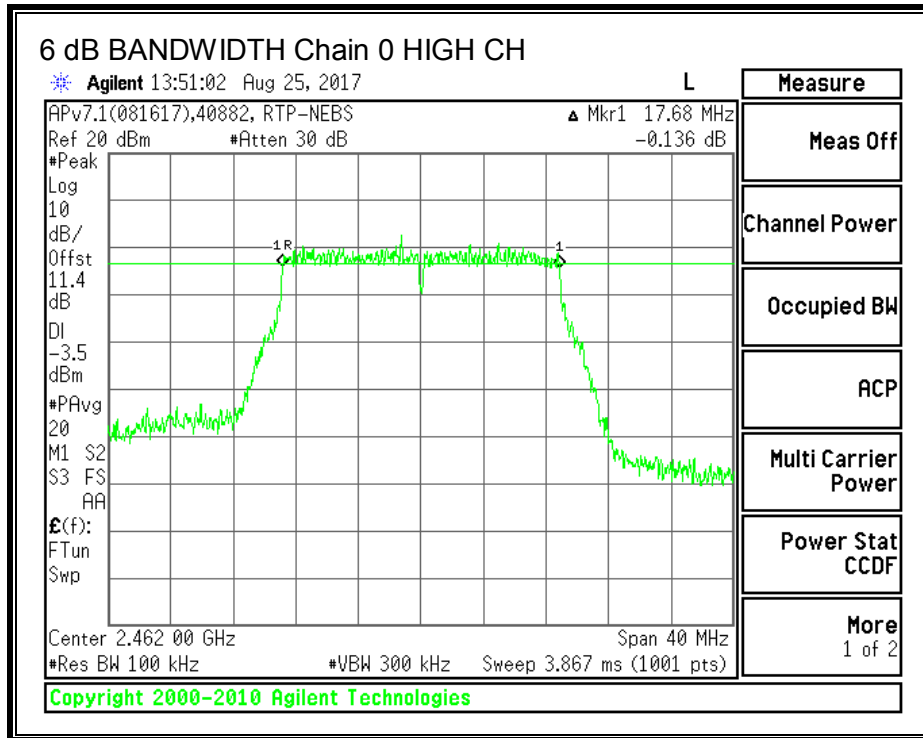
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2412	17.640	17.640	0.5
Mid	2437	17.680	17.720	0.5
High	2462	17.680	17.600	0.5

#### Test Information

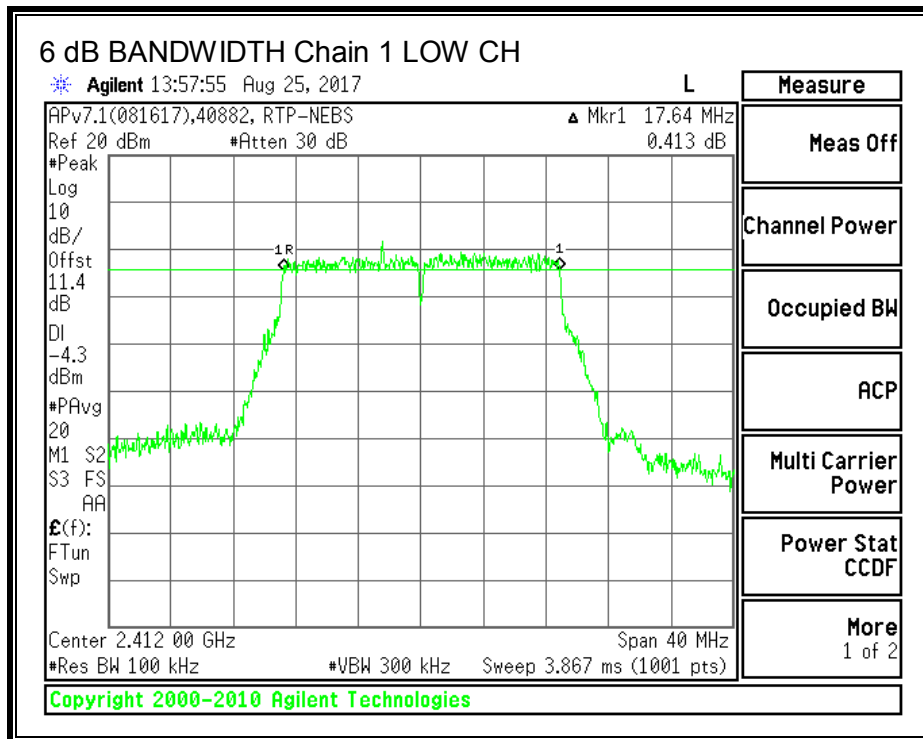
Date: 2017-08-25  
Project: 11893030  
Tester: Jeff Cabrera

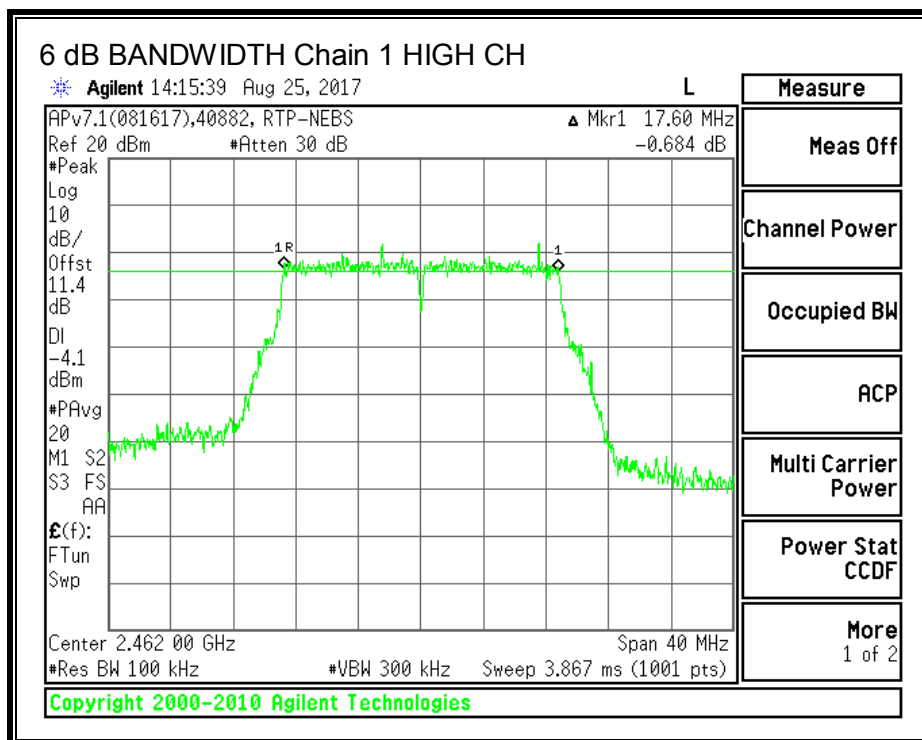
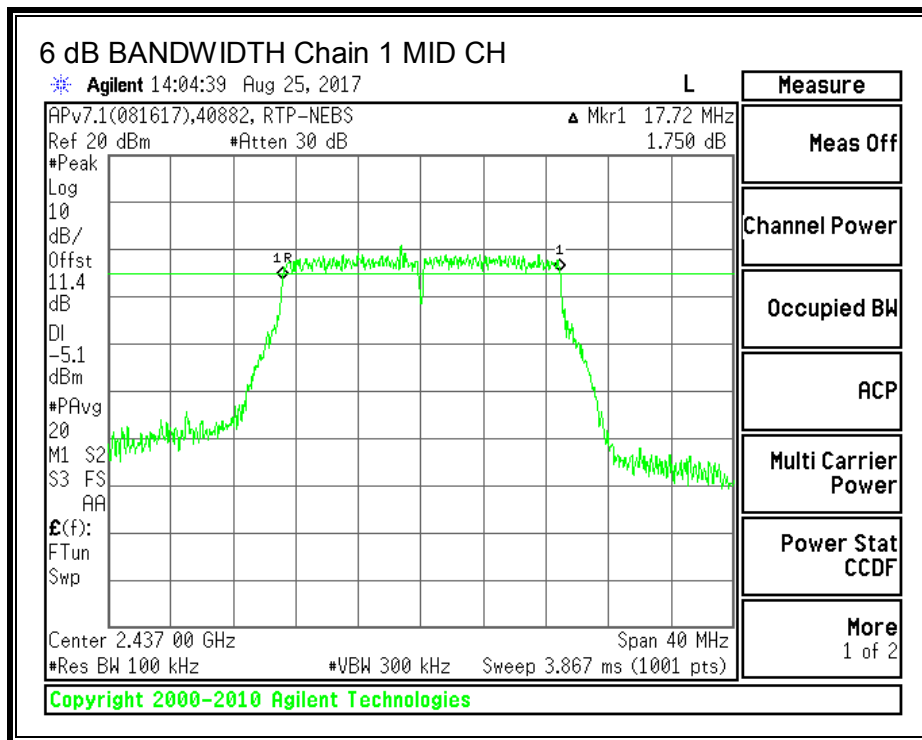
**6 dB BANDWIDTH, Chain 0**





**6 dB BANDWIDTH, Chain 1**





### 8.4.2. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

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

This EUT mode is 802.11b, and CDD operation. According to KDB 662911, with  $N_{ant} \leq 4$  the array gain is zero. Total directional gain is equal to single antenna gain.

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Directional Gain (dBi)
2.71	2.71	2.71

#### 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	2.71	30.00	30	36	30.00
Mid	2437	2.71	30.00	30	36	30.00
High	2462	2.71	30.00	30	36	30.00

##### Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margi (dB)
Low	2412	13.36	13.22	16.30	30.00	-13.70
Mid	2437	12.88	13.56	16.24	30.00	-13.76
High	2462	12.58	13.49	16.07	30.00	-13.93

#### Test Information

Date: 2017-08-25  
 Project: 11893030  
 Tester: Jeff Cabrera

### 8.4.3. POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.247 (e)

#### RESULTS

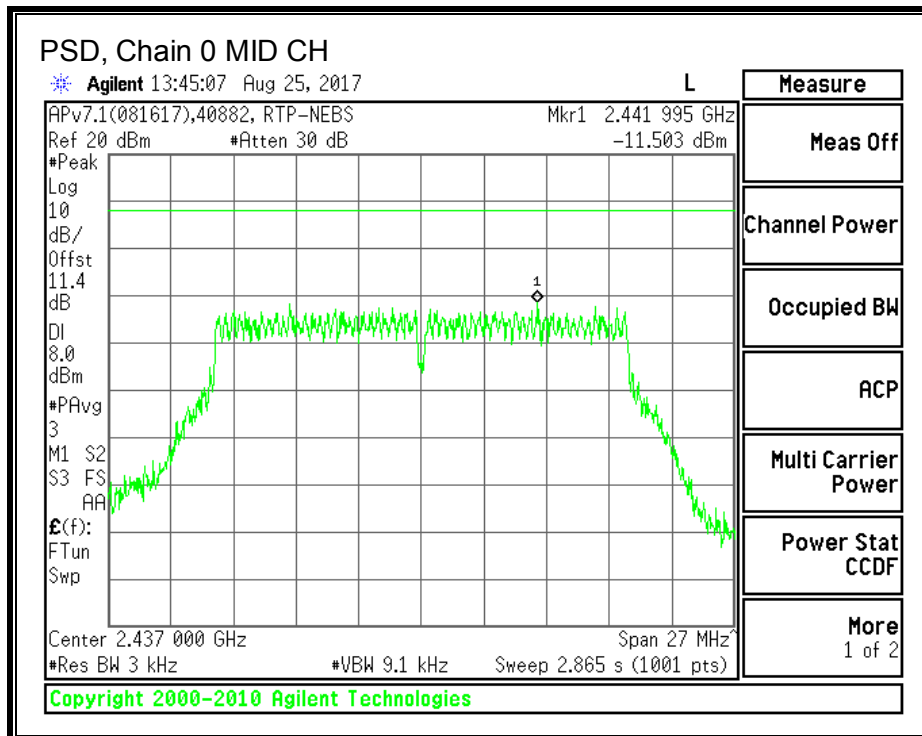
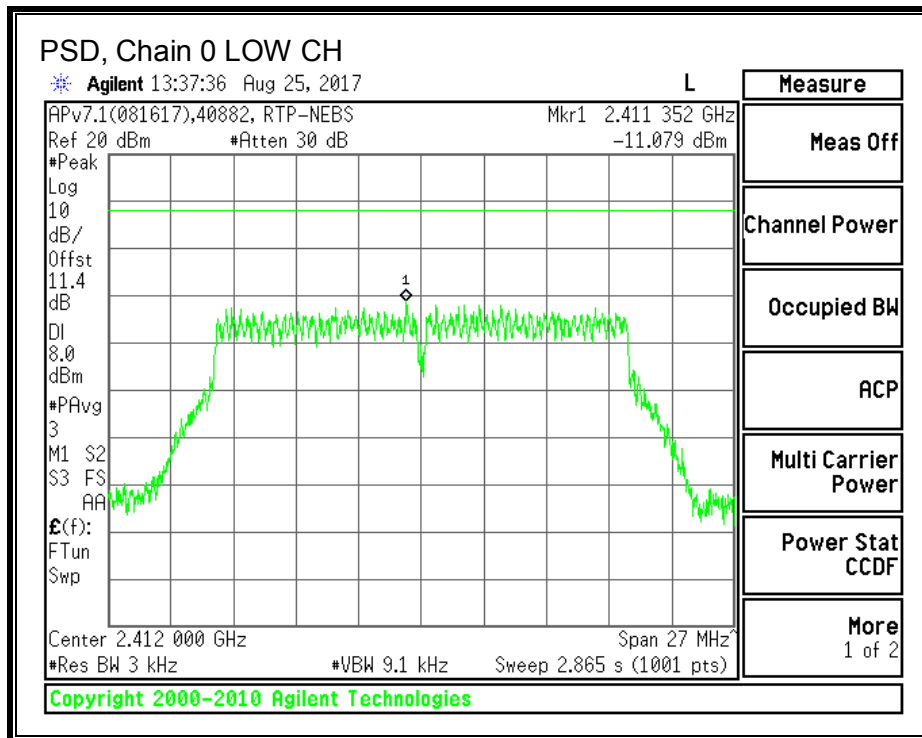
##### PSD Results

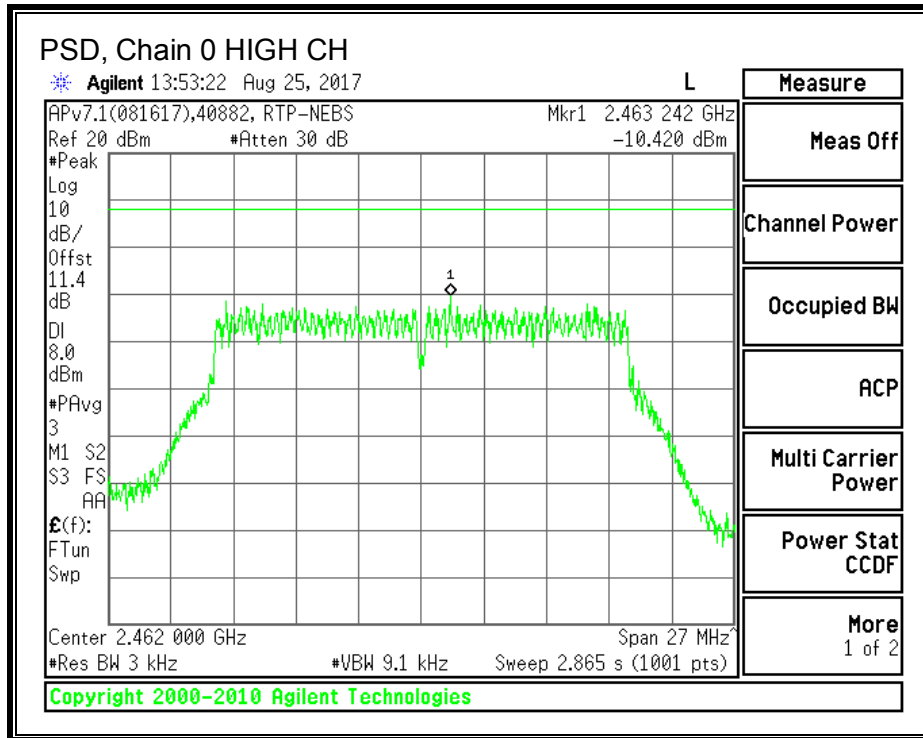
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-11.08	-12.66	-8.79	8.0	-16.8
Mid	2437	-11.50	-12.01	-8.74	8.0	-16.7
High	2462	-10.42	-12.59	-8.36	8.0	-16.4

#### Test Information

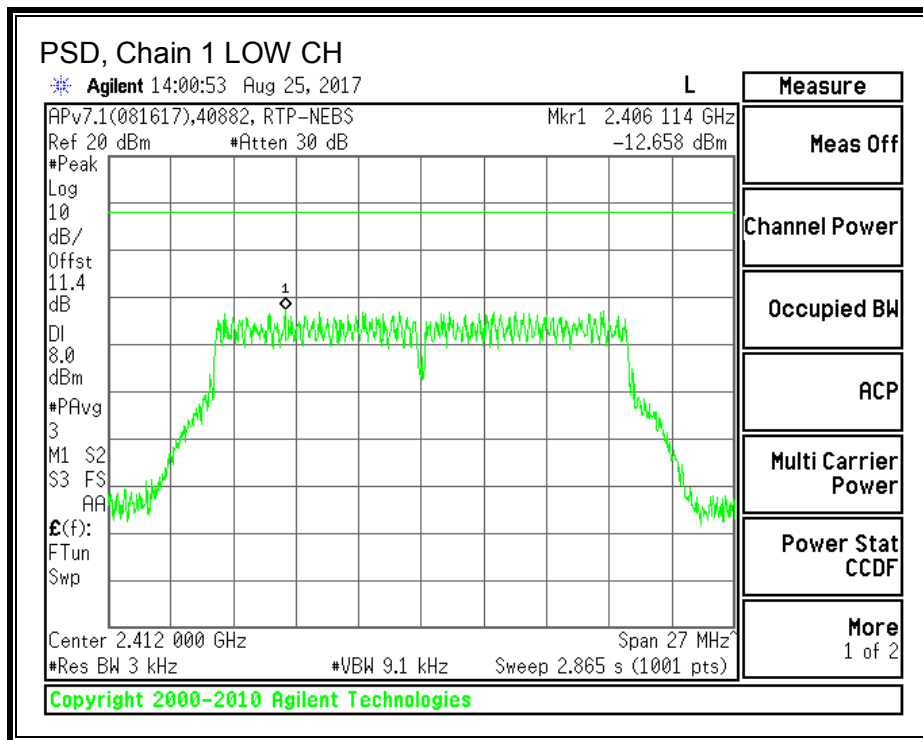
Date: 2017-08-25  
Project: 11893030  
Tester: Jeff Cabrera

**PSD, Chain 0**

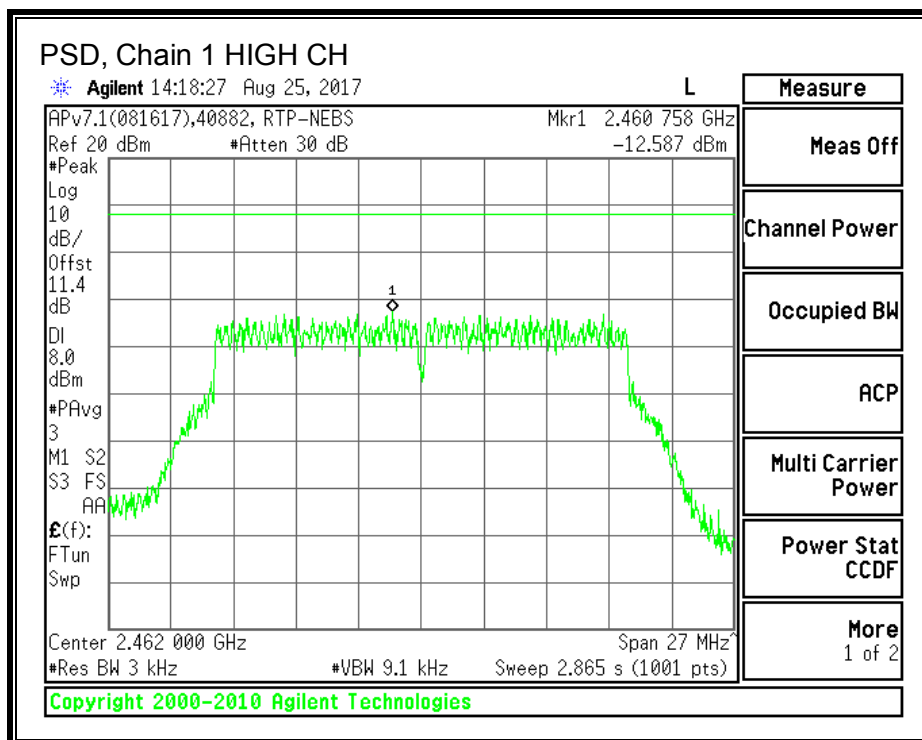
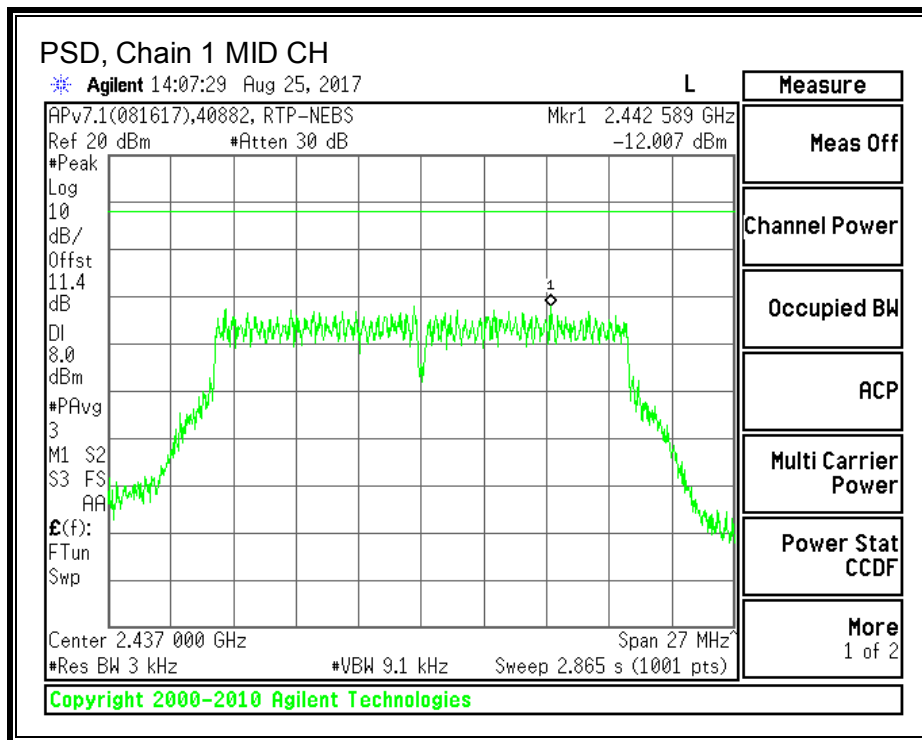




**PSD, Chain 1**







#### **8.4.4. OUT-OF-BAND EMISSIONS**

##### **LIMITS**

FCC §15.247 (d)

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

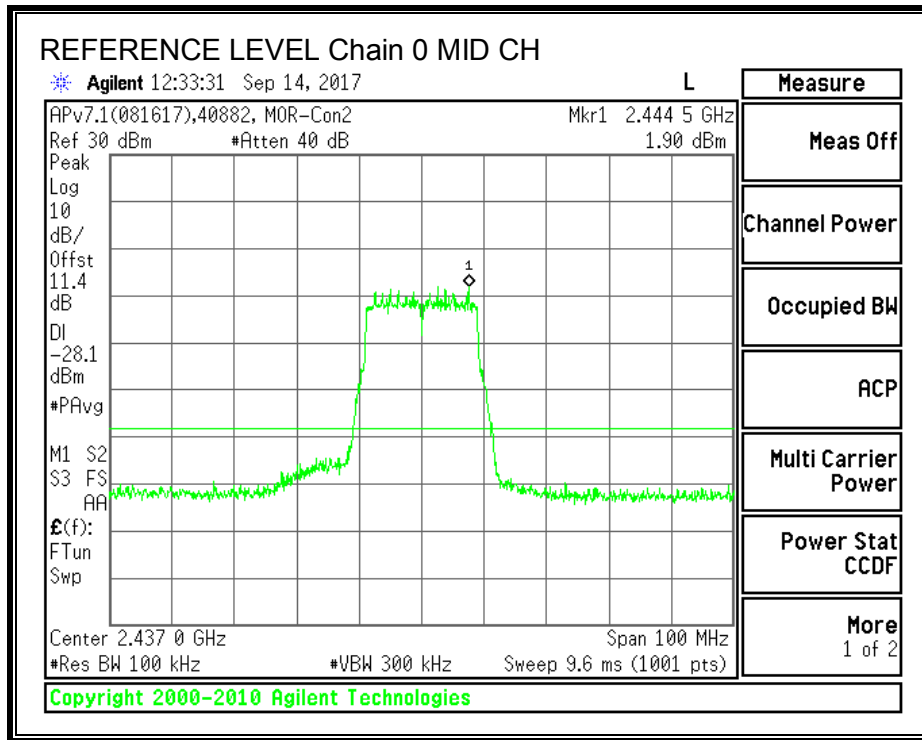
##### **Test Information**

**Date:** 2017-09-14

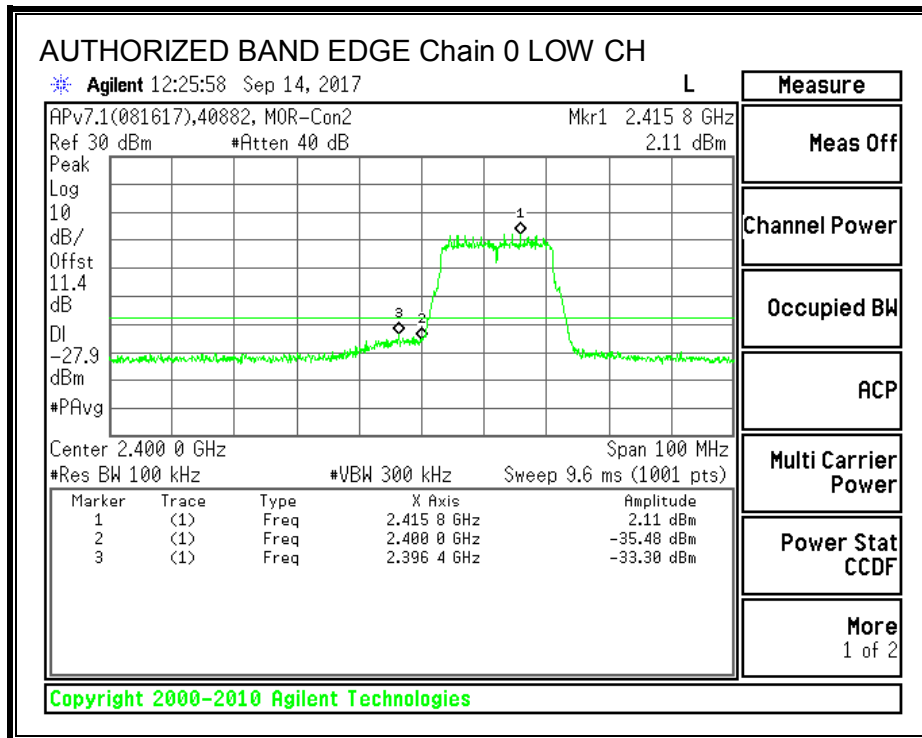
**Project:** 11893030

**Tester:** Jeffrey Cabrera

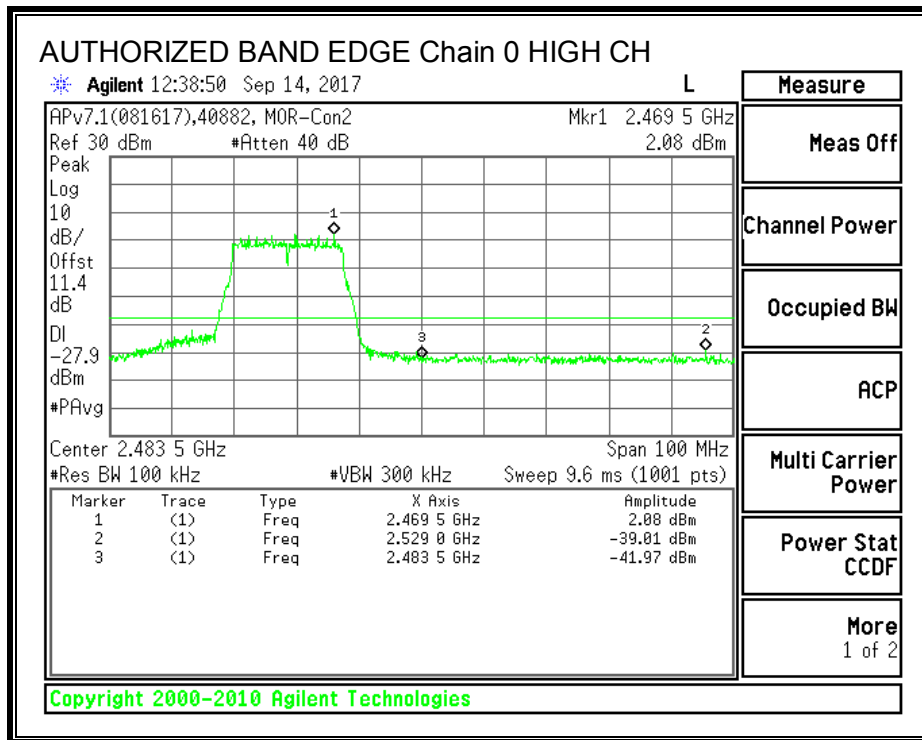
**IN-BAND REFERENCE LEVEL, Chain 0**



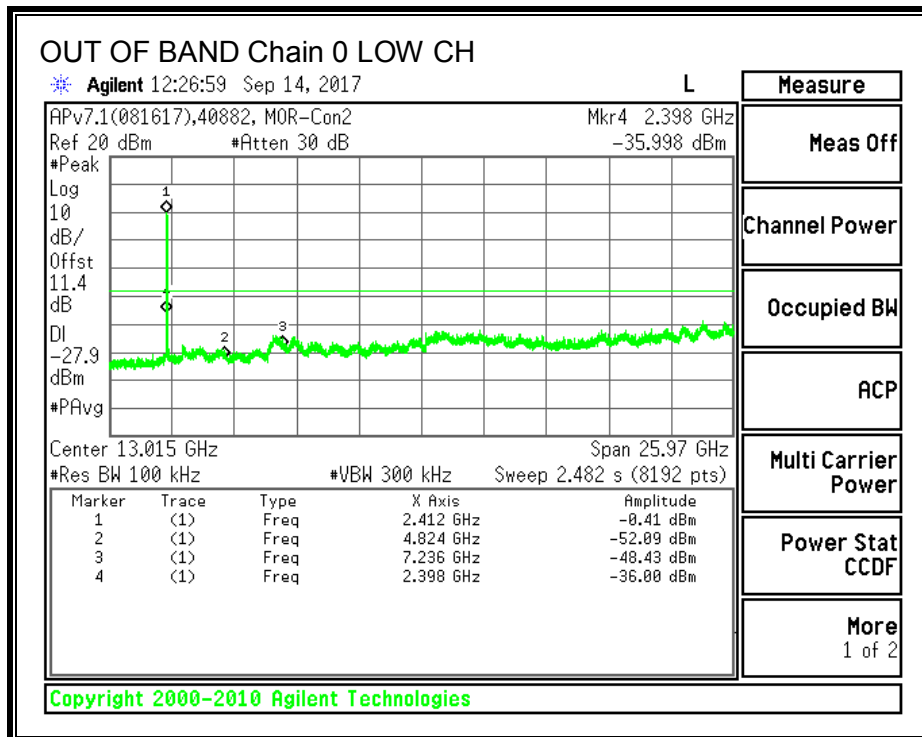
**LOW CHANNEL BANDEDGE, Chain 0**

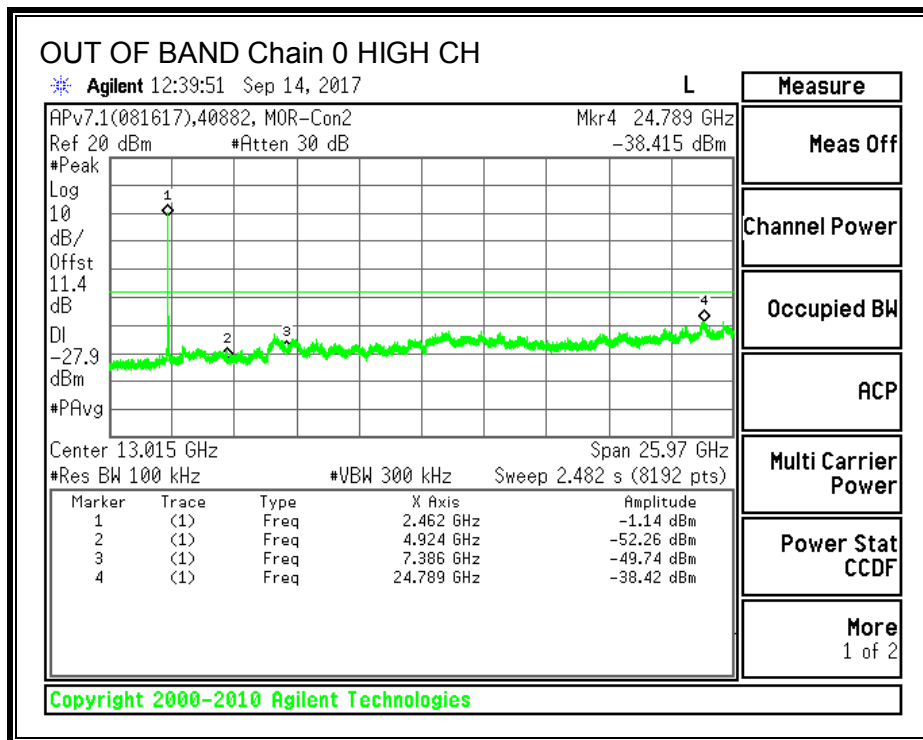
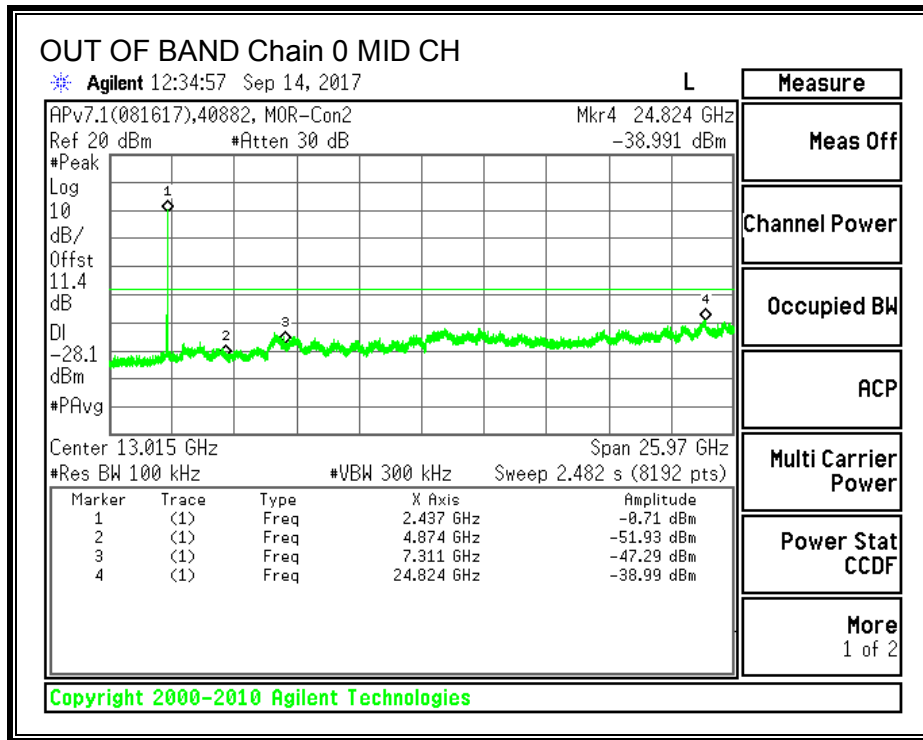


**HIGH CHANNEL BANDEDGE, Chain 0**

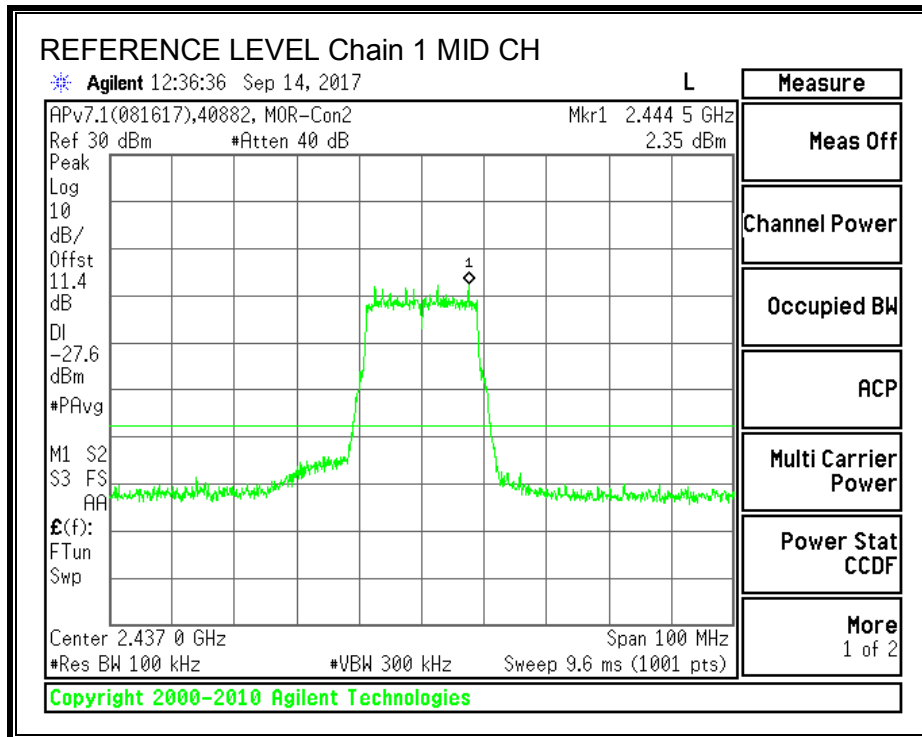


**OUT-OF-BAND EMISSIONS, Chain 0**

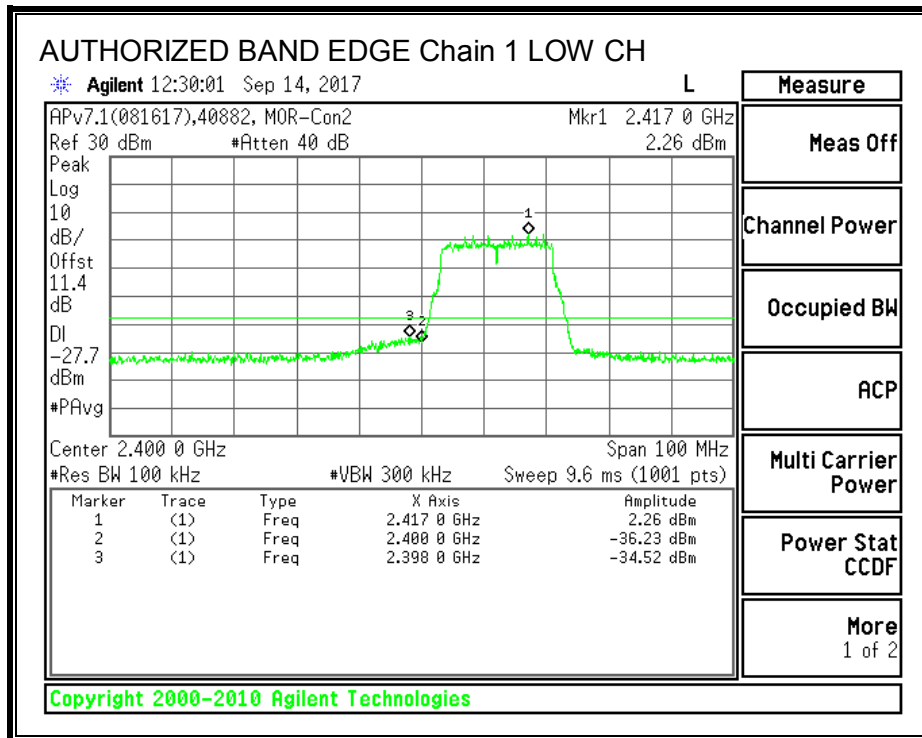




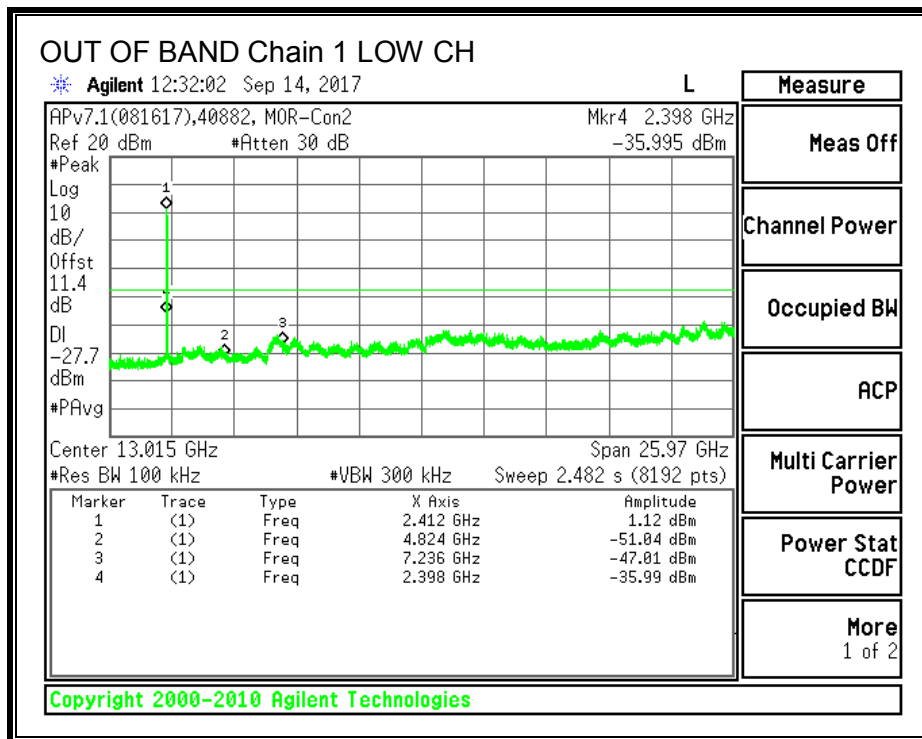
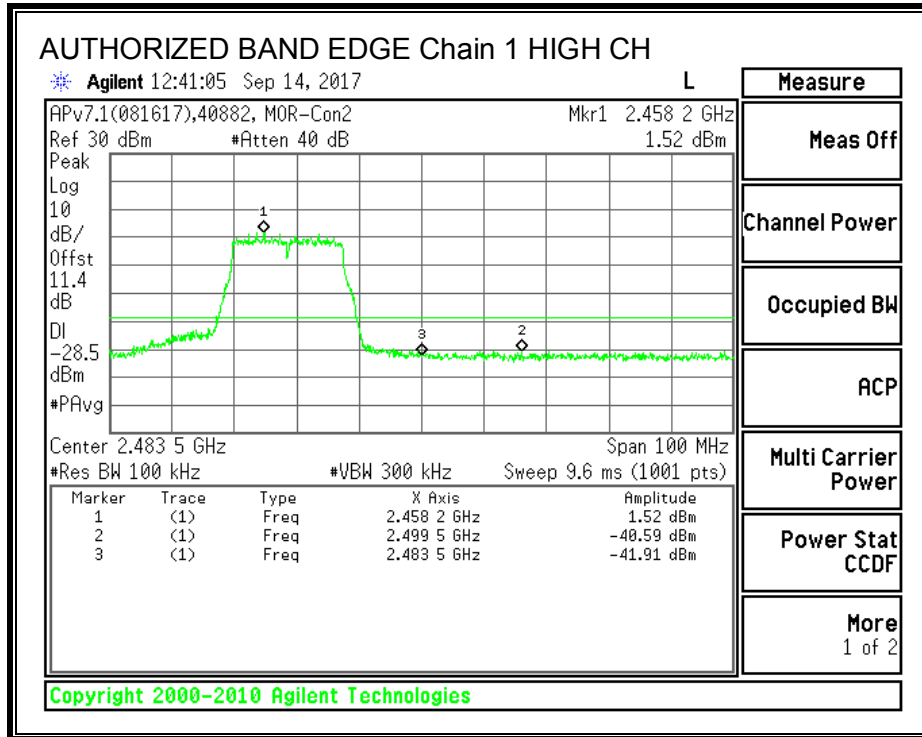
**IN-BAND REFERENCE LEVEL, Chain 1**

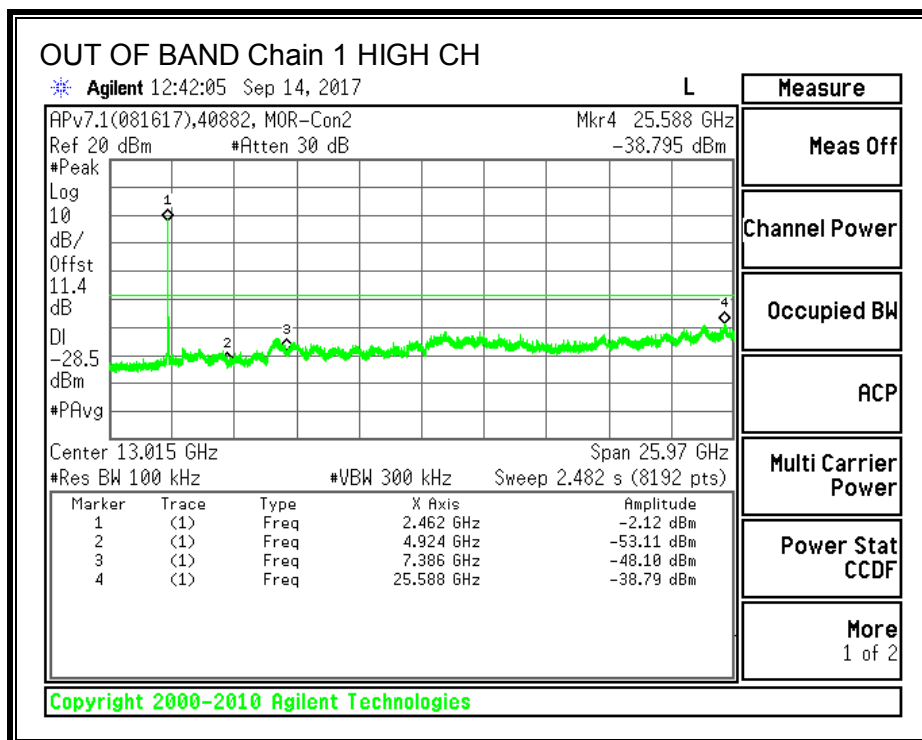
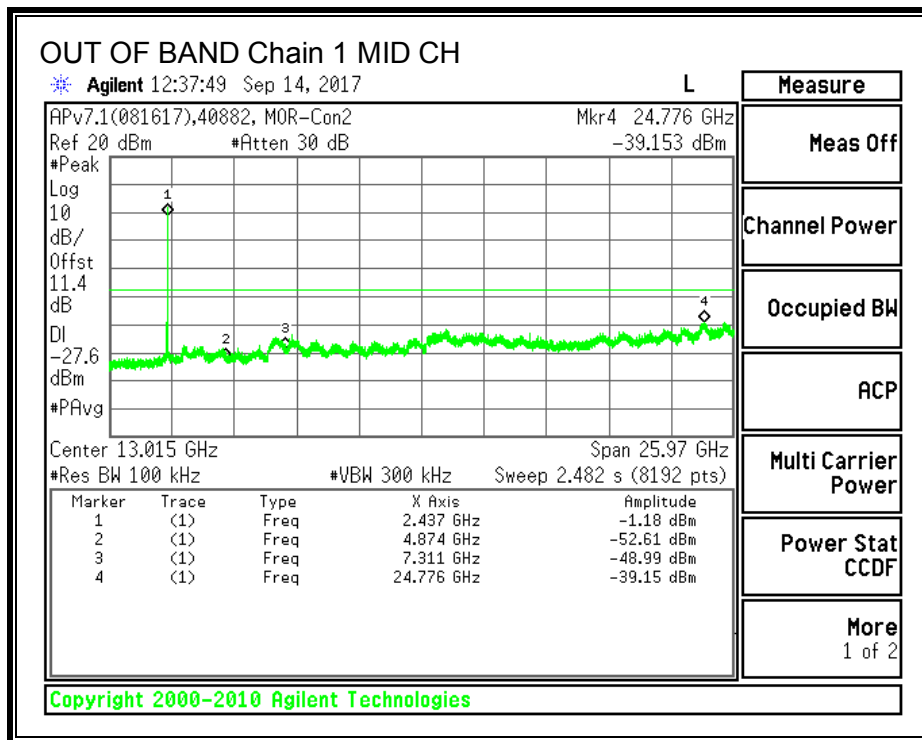


**LOW CHANNEL BANDEDGE, Chain 1**



**HIGH CHANNEL BANDEDGE, Chain 1**







## 8.5. 802.11n HT40 MODE IN THE 2.4 GHz BAND

### 8.5.1. 6 dB BANDWIDTH

#### LIMITS

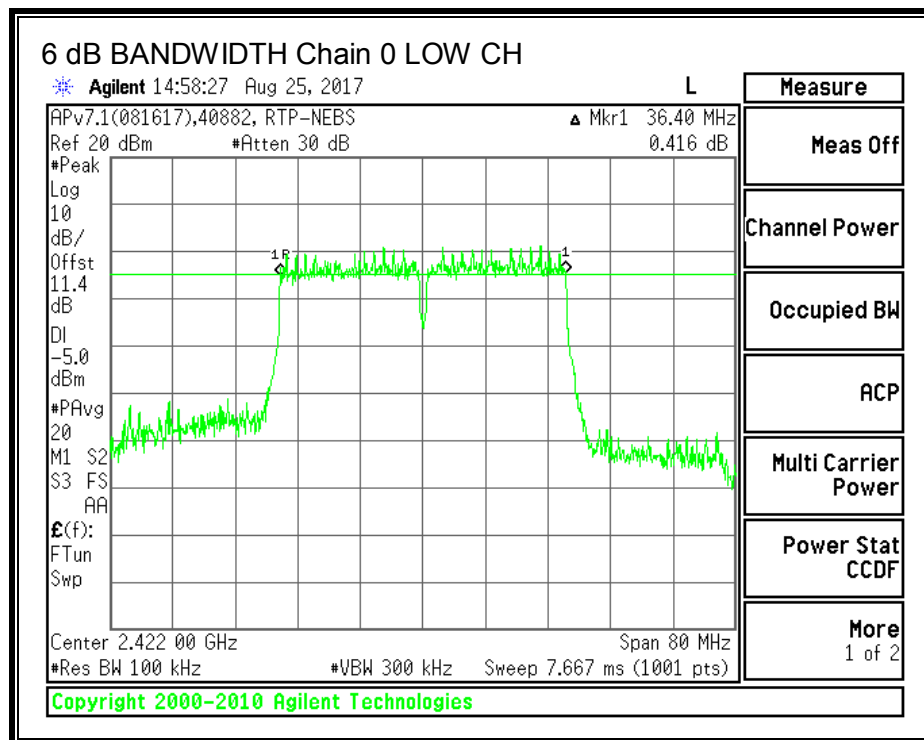
FCC §15.247 (a) (2)

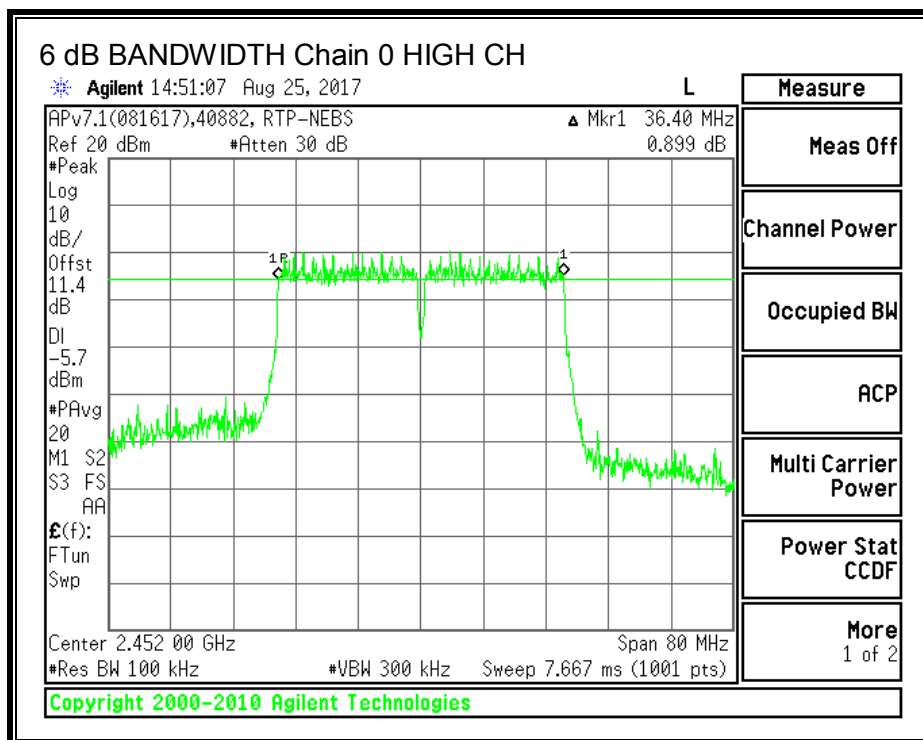
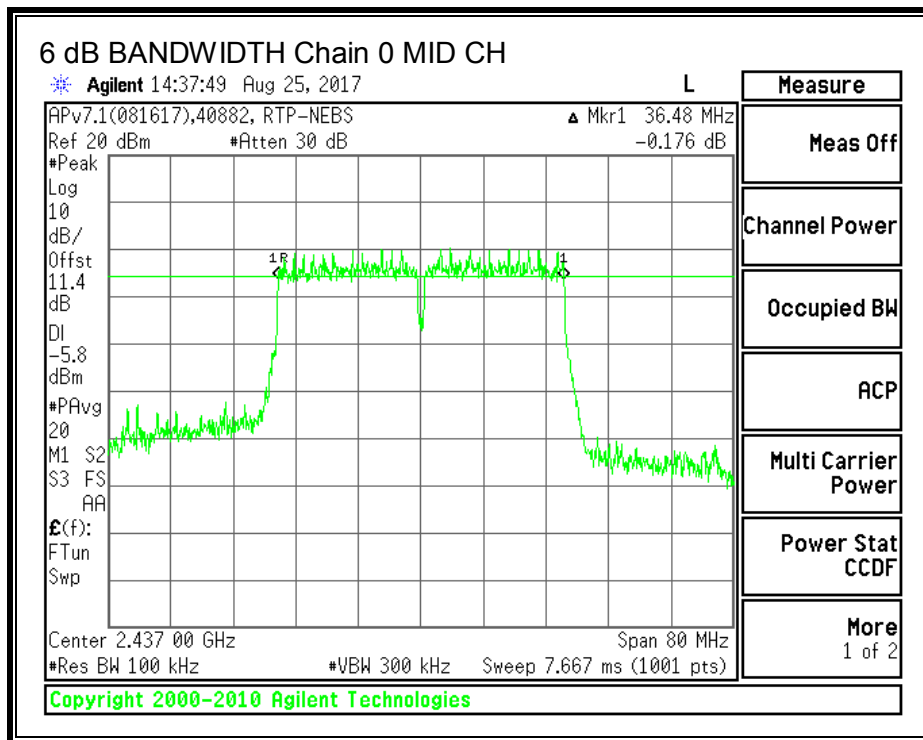
The minimum 6 dB bandwidth shall be at least 500 kHz.

#### RESULTS

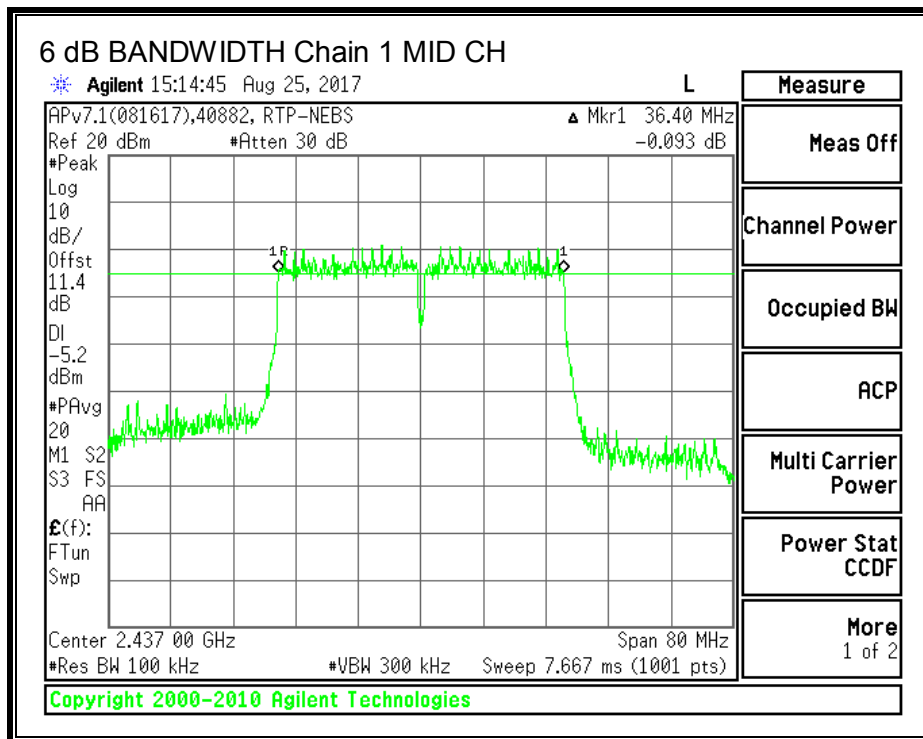
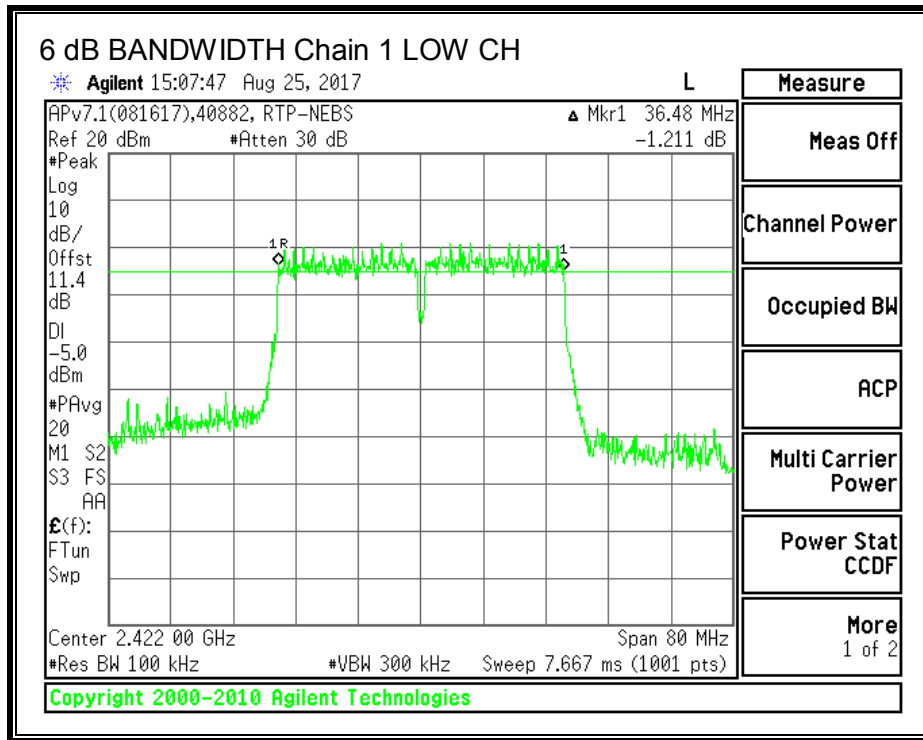
Channel	Frequency (MHz)	6 dB BW Chain 0 (MHz)	6 dB BW Chain 1 (MHz)	Minimum Limit (MHz)
Low	2422	36.400	36.480	0.5
Mid	2437	36.480	36.400	0.5
High	2452	36.400	36.480	0.5

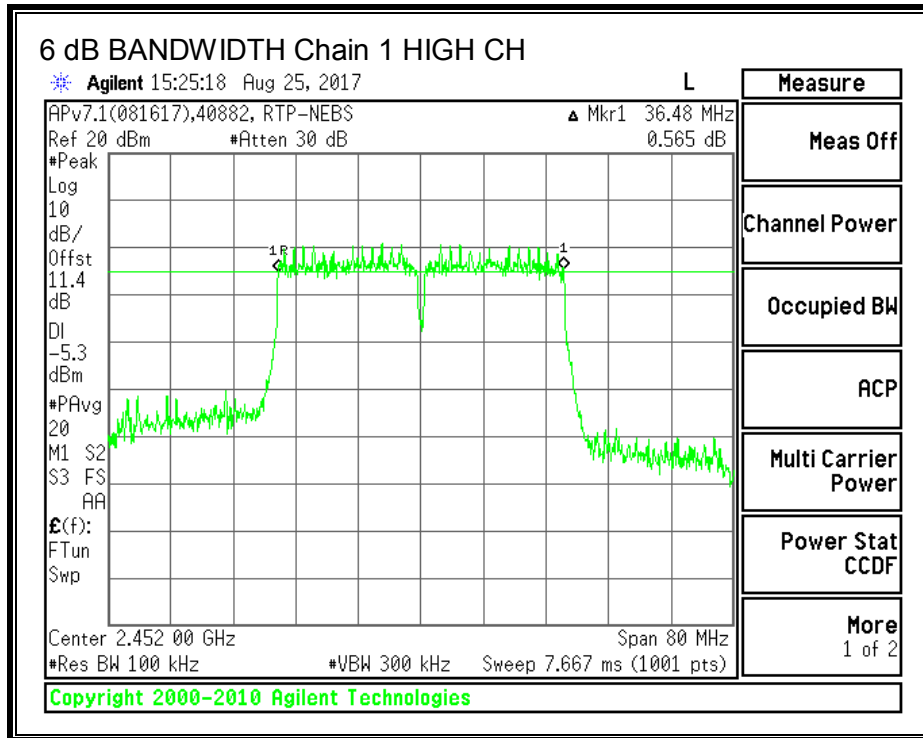
#### 6 dB BANDWIDTH, Chain 0





**6 dB BANDWIDTH, Chain 1**





**Test Information**

Date: 2017-08-25  
 Project: 11893030  
 Tester: Jeff Cabrera

## 8.5.2. OUTPUT POWER

### LIMITS

FCC §15.247 (b)

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

This EUT mode is 802.11b, and CDD operation. According to KDB 662911, with  $N_{\text{ant}} \leq 4$  the array gain is zero. Total directional gain is equal to single antenna gain.

Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Directional Gain (dBi)
2.71	2.71	2.71

### Test Information

Date: 2017-08-30  
 Project: 11893030  
 Tester: Jeff Cabrera

### Limits

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	IC Power Limit (dBm)	IC EIRP Limit (dBm)	Max Power (dBm)
Low	2422	2.71	30.00	30	36	30.00
Mid	2437	2.71	30.00	30	36	30.00
High	2452	2.71	30.00	30	36	30.00

### Results

Channel	Frequency (MHz)	Chain 0 Meas Power (dBm)	Chain 1 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low	2422	8.25	8.39	11.33	30.00	-18.67
Mid	2437	8.29	8.44	11.38	30.00	-18.62
High	2452	8.22	8.32	11.28	30.00	-18.72

**8.5.3. POWER SPECTRAL DENSITY  
LIMITS**

FCC §15.247 (e)

**RESULTS**

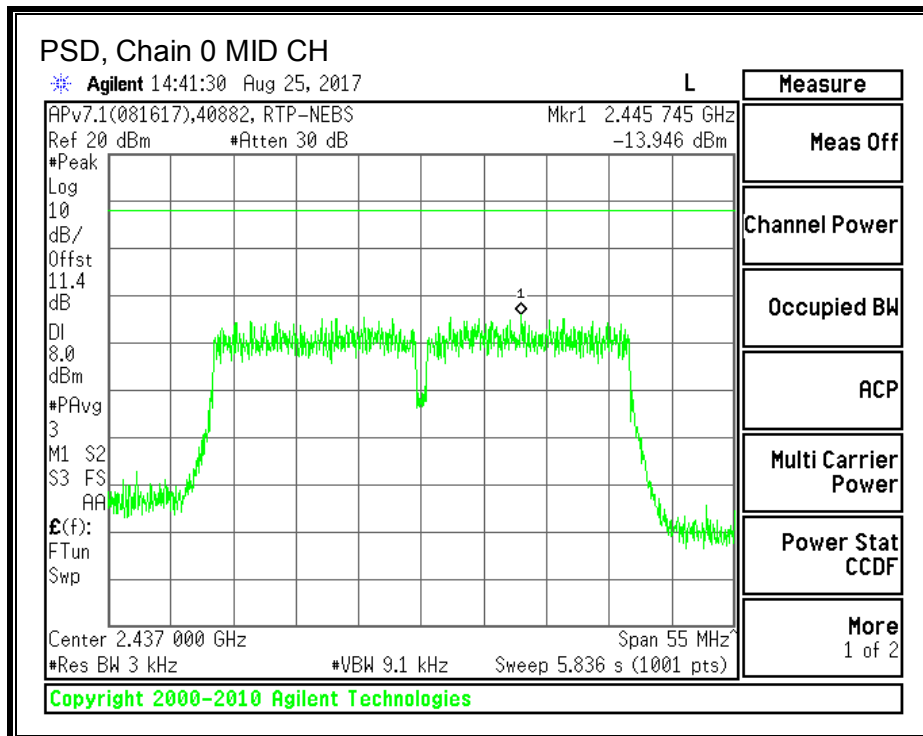
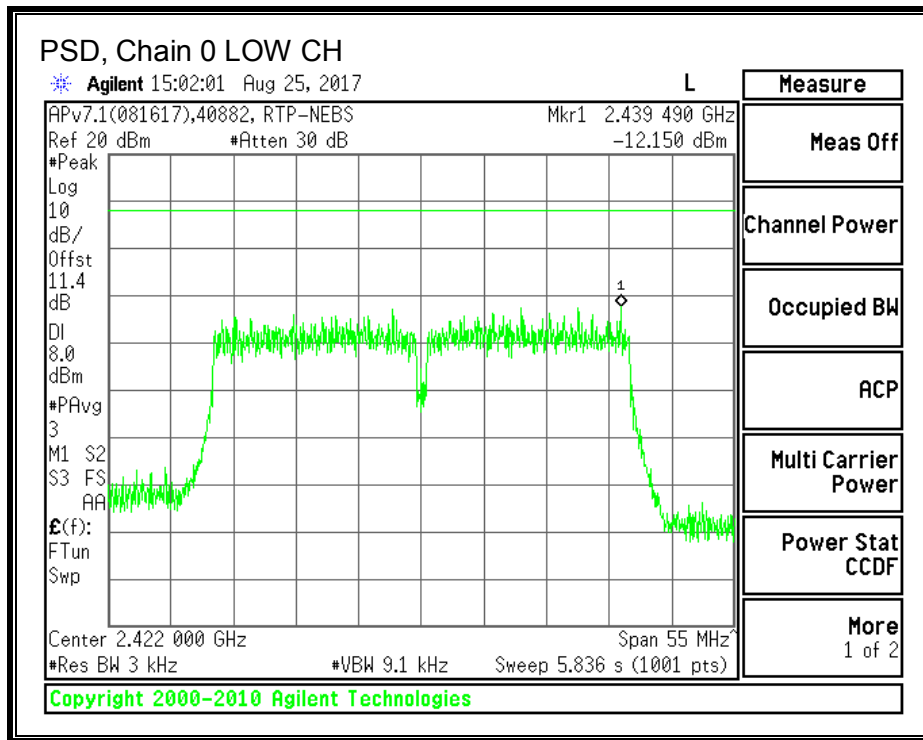
**PSD Results**

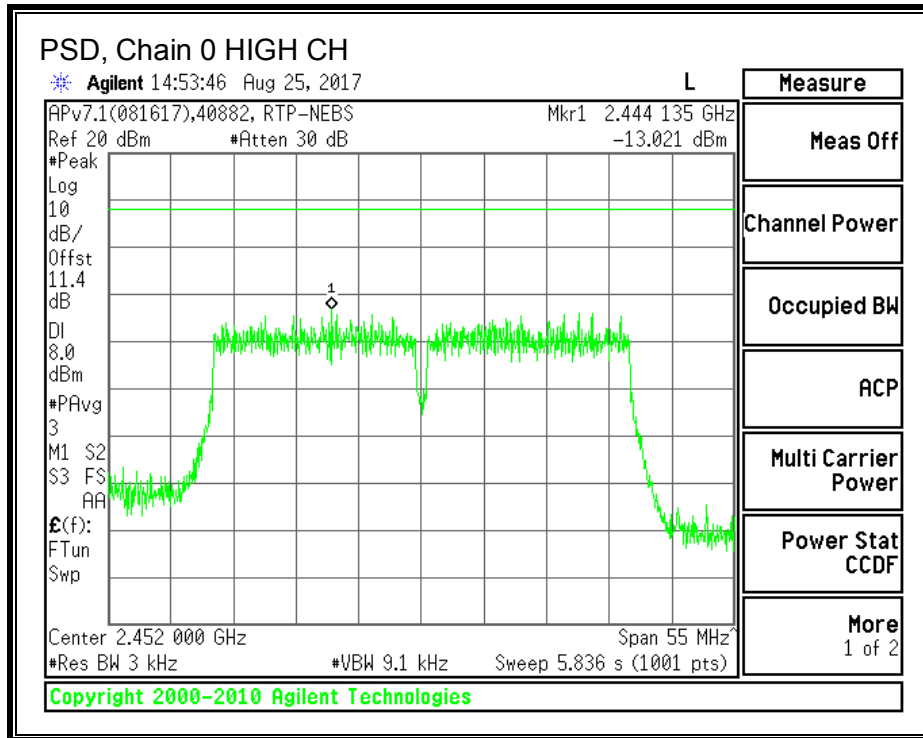
Channel	Frequency (MHz)	Chain 0 Meas (dBm)	Chain 1 Meas (dBm)	Total Corr'd PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2422	-12.15	-11.91	-9.02	8.0	-17.0
Mid	2437	-13.95	-11.48	-9.53	8.0	-17.5
High	2452	-13.02	-12.21	-9.58	8.0	-17.6

**Test Information**

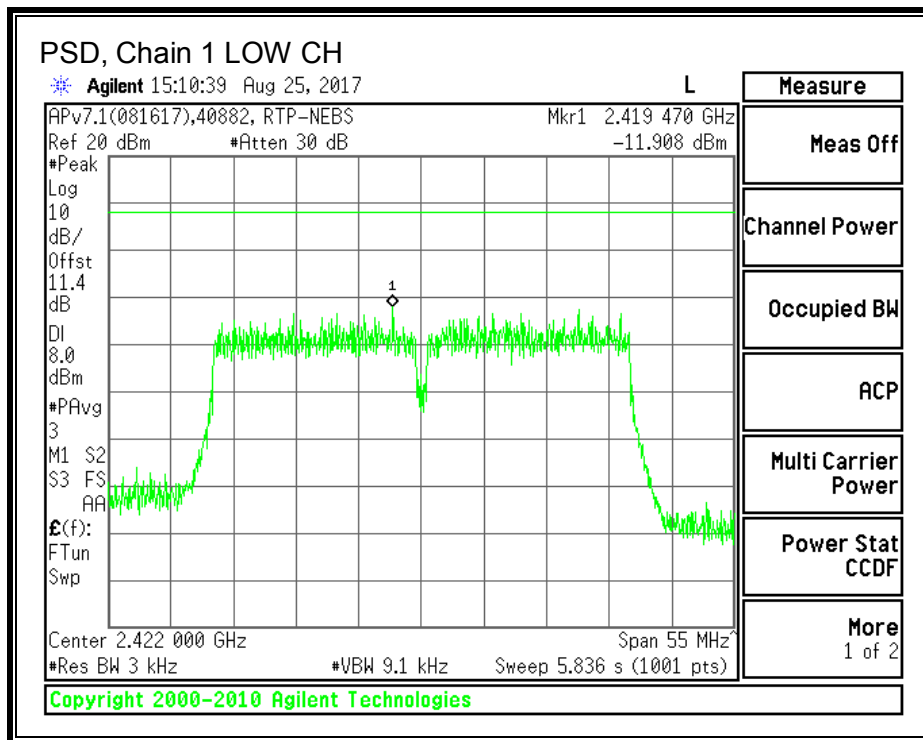
**Date:** 2017-08-25  
**Project:** 11893030  
**Tester:** Jeffrey Cabrera

**PSD, Chain 0**

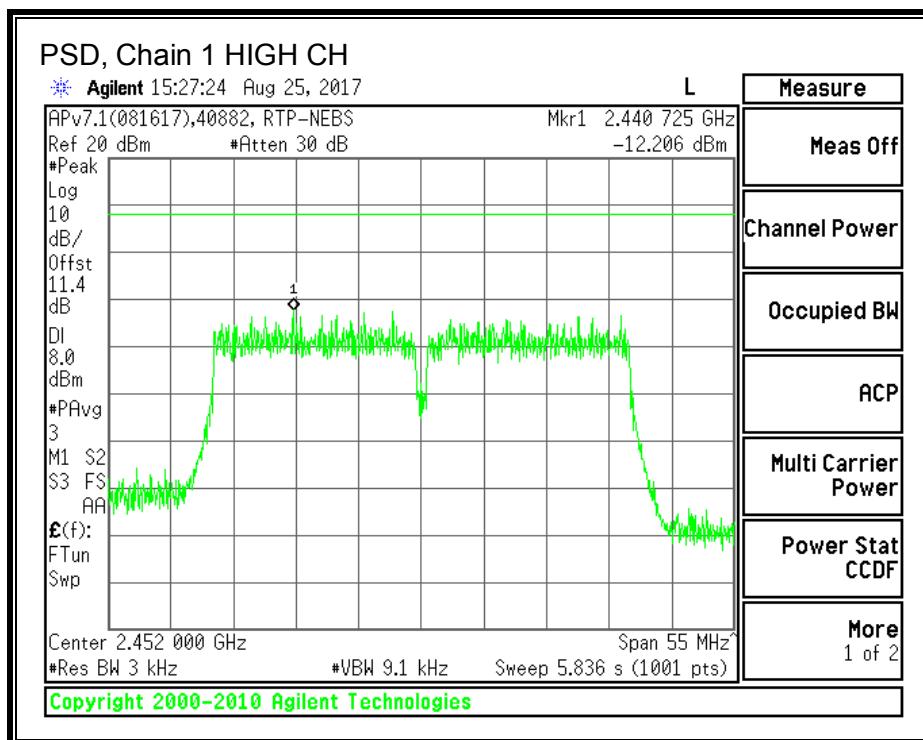
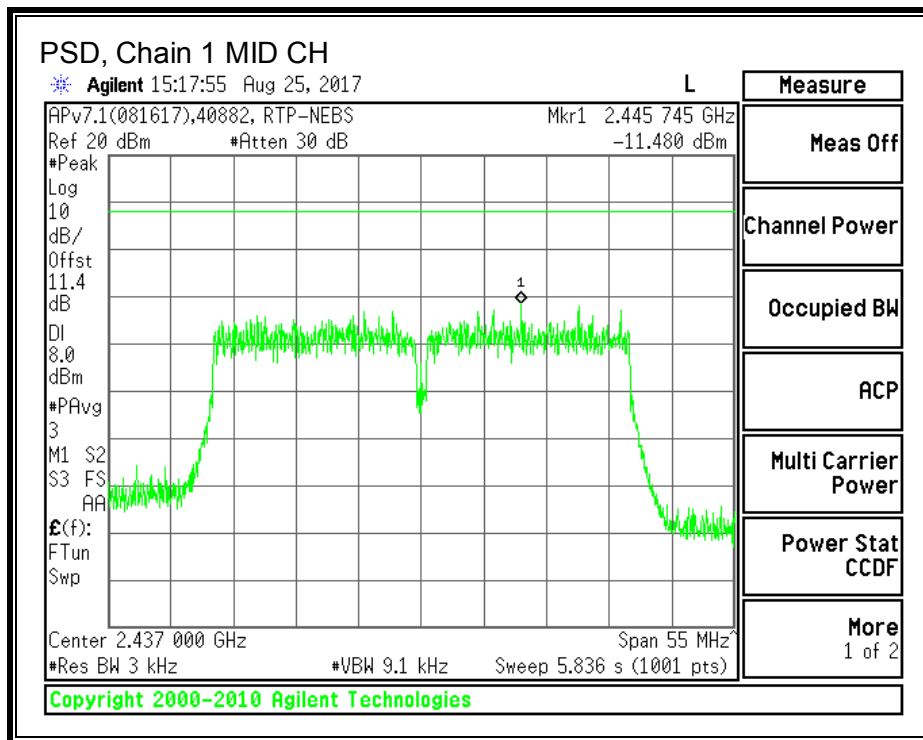




**PSD, Chain 1**







## **8.5.4. OUT-OF-BAND EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

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

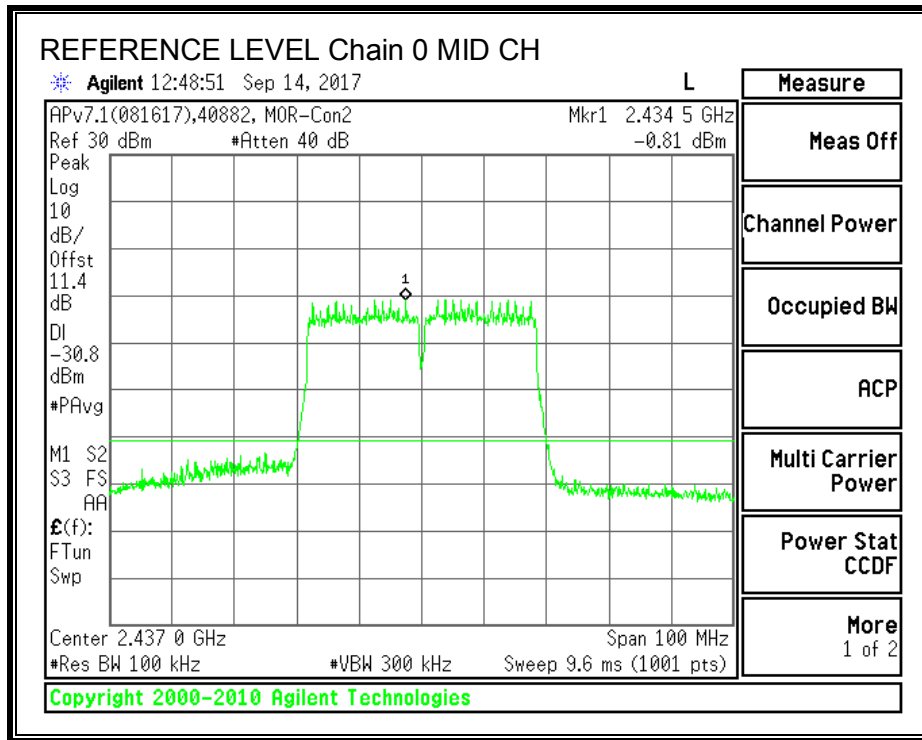
### **Test Information**

**Date:** 2017-09-14

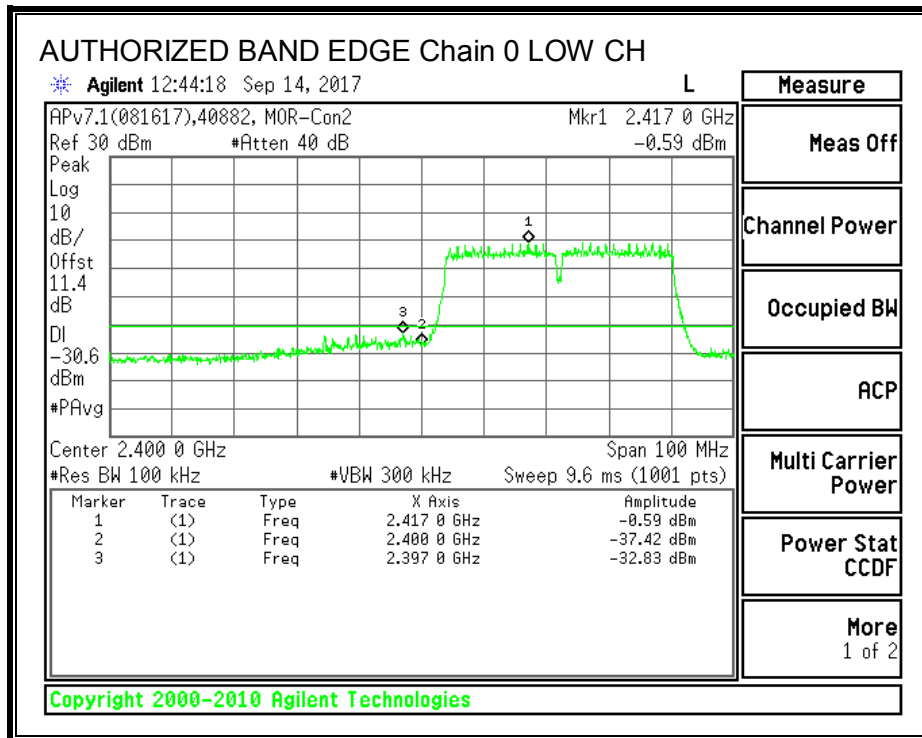
**Project:** 11893030

**Tester:** Jeffrey Cabrera

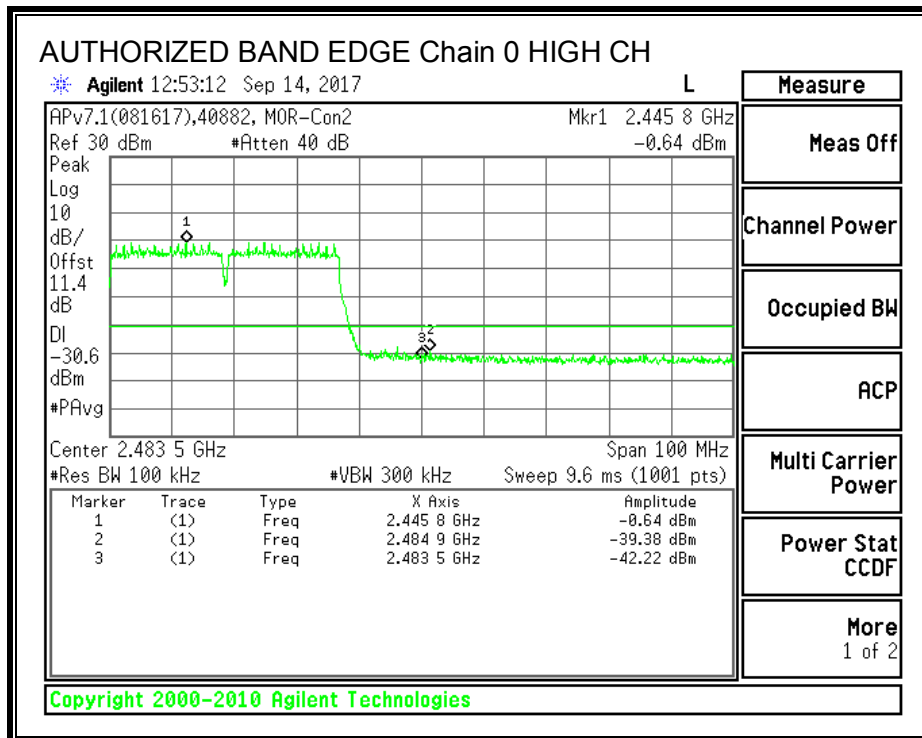
**IN-BAND REFERENCE LEVEL, Chain 0**



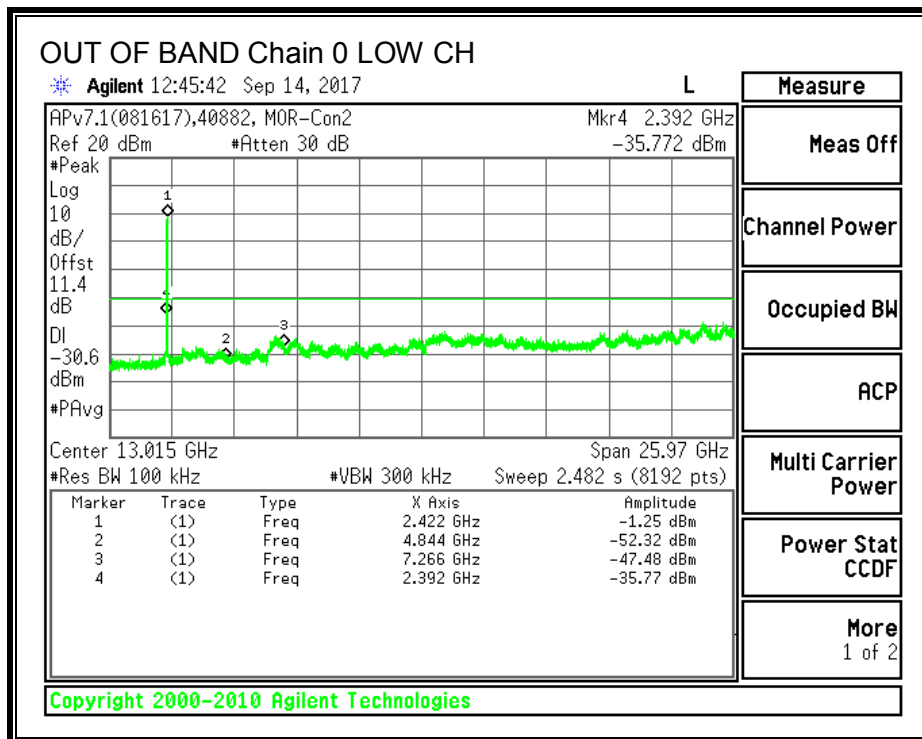
**LOW CHANNEL BANDEDGE, Chain 0**

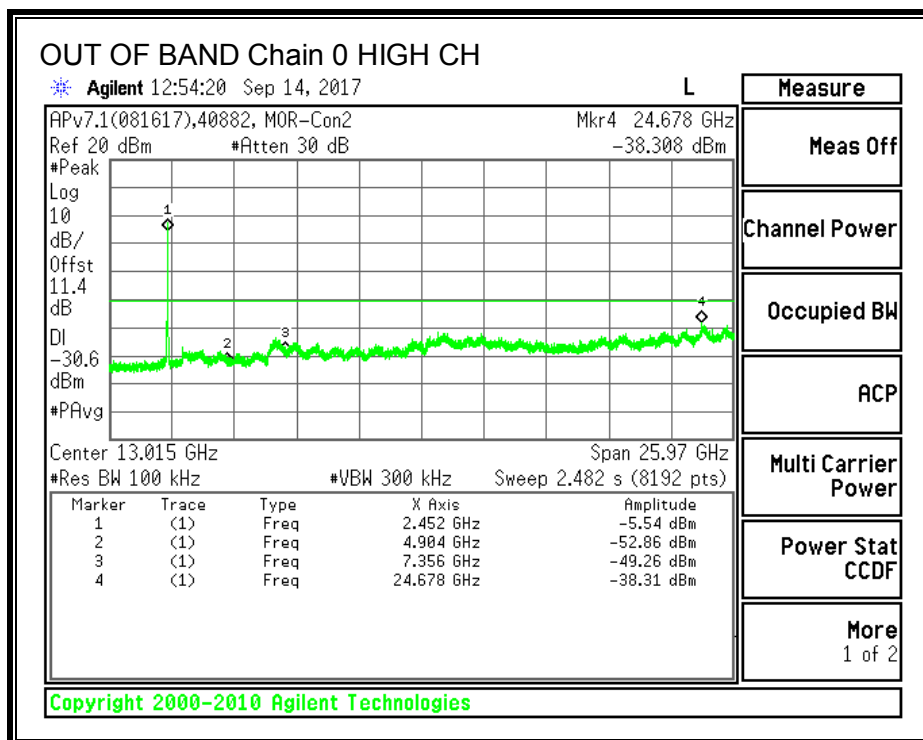
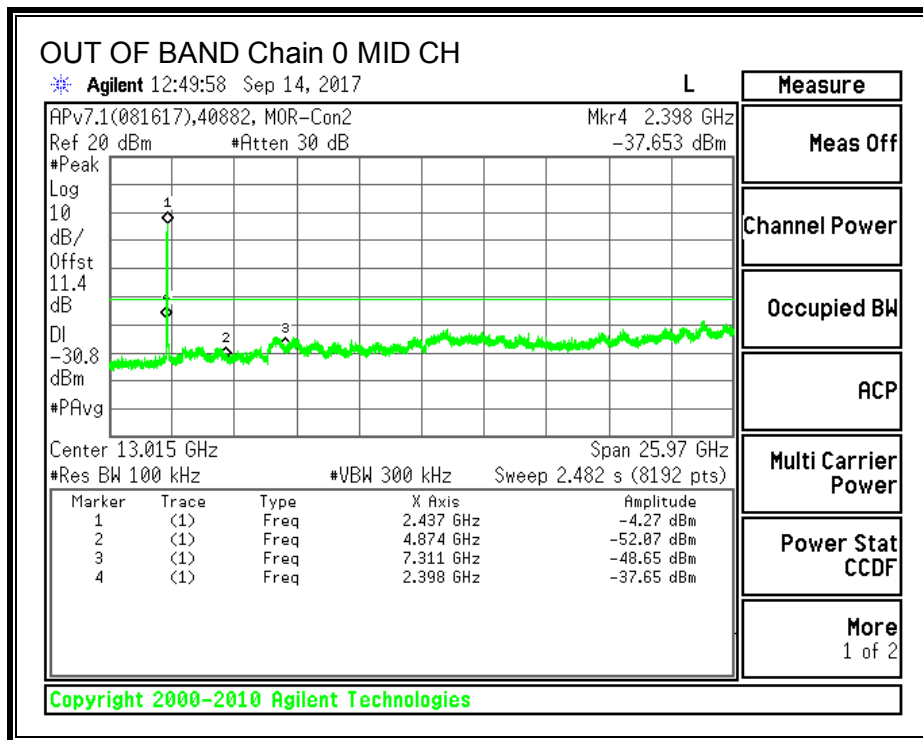


**HIGH CHANNEL BANDEDGE, Chain 0**

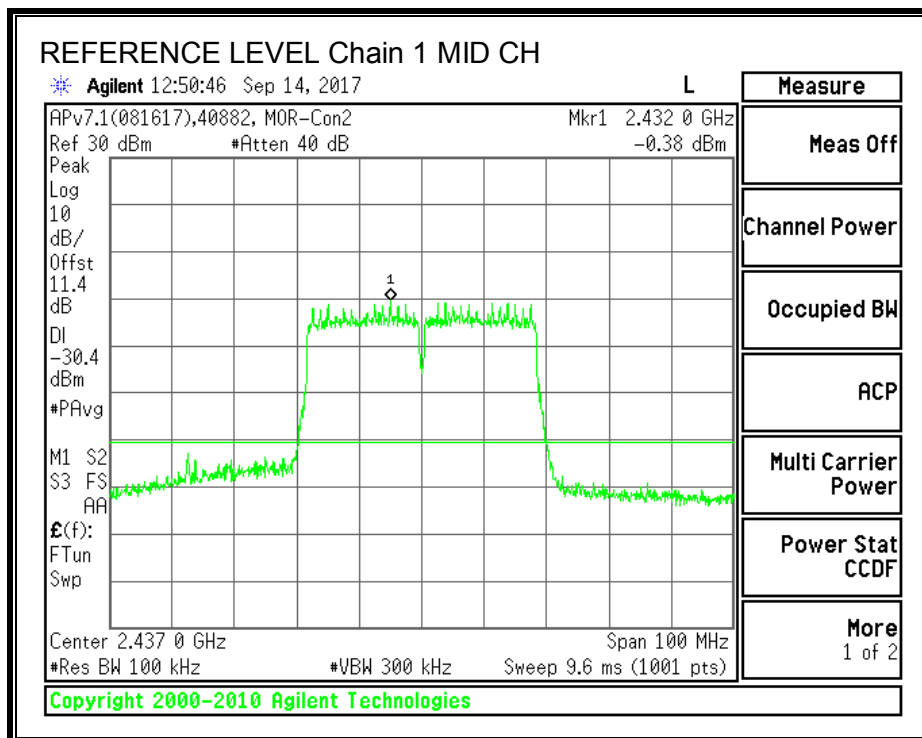


**OUT-OF-BAND EMISSIONS, Chain 0**

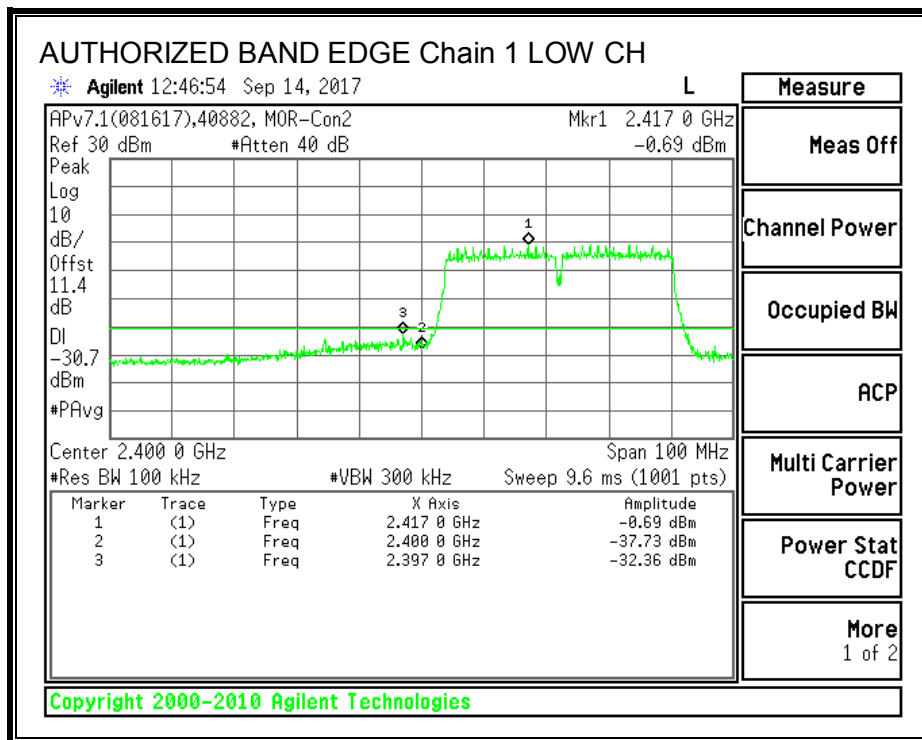




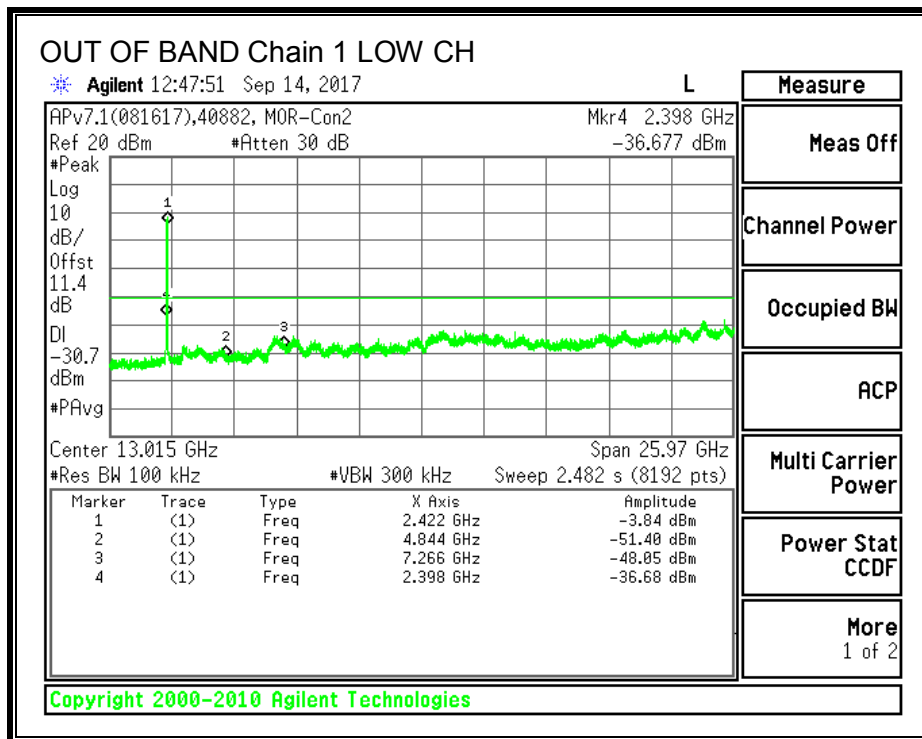
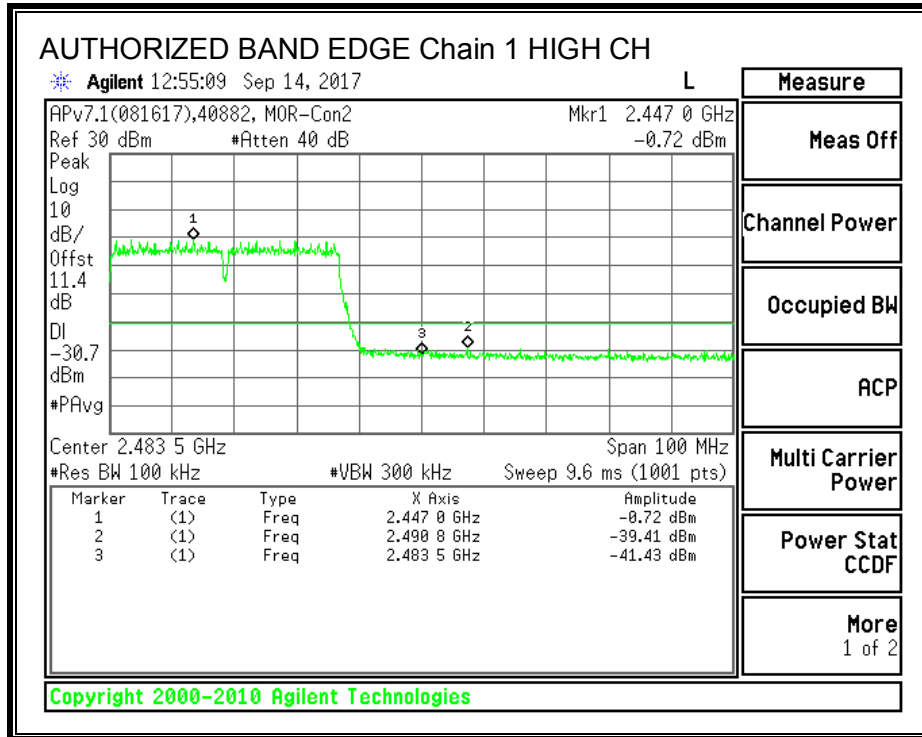
**IN-BAND REFERENCE LEVEL, Chain 1**

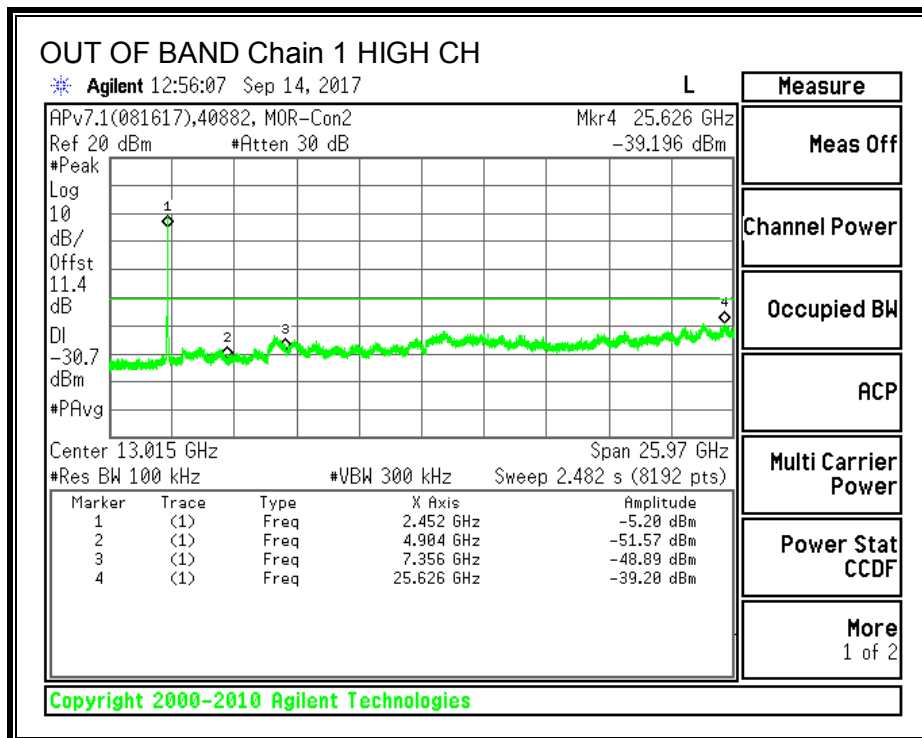
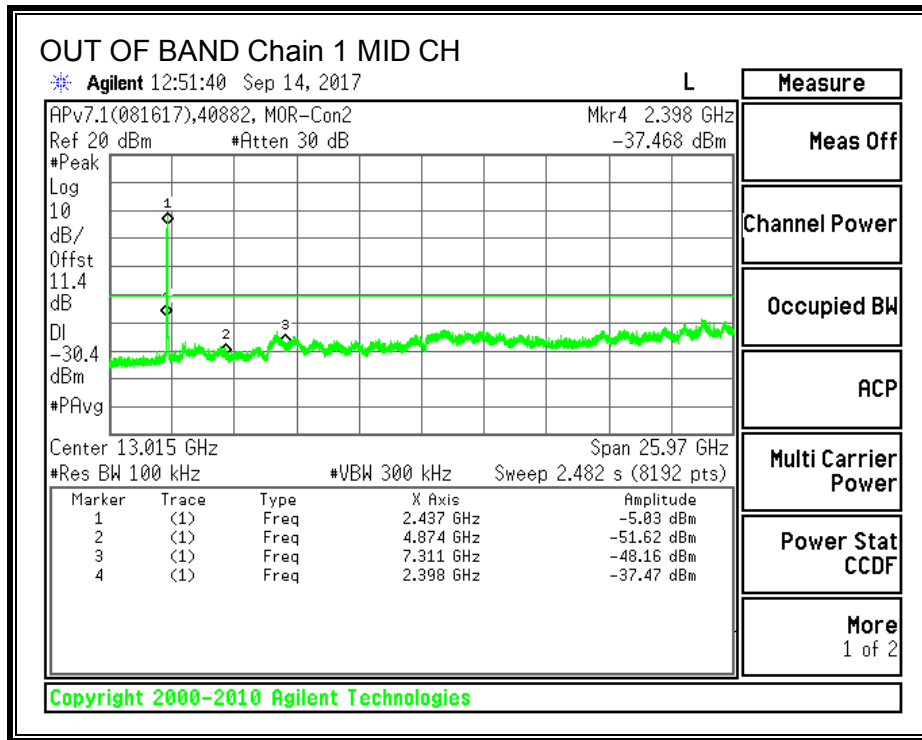


**LOW CHANNEL BANDEDGE, Chain 1**



**HIGH CHANNEL BANDEDGE, Chain 1**







## 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
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

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz measurements and 1.5 m above the ground plane for above 1GHz measurements. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements for the 30-1000 MHz range, 9 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements for the 0.15-30 MHz range and 200 Hz for peak detection measurements or 200 Hz for quasi-peak detection measurements for the 9 to 150 kHz range. Peak detection is used unless otherwise noted as quasi-peak.

For peak measurements above 1 GHz, the resolution bandwidth is set to 1 MHz and the video bandwidth is set to 3 MHz. For average measurements above 1GHz, the resolution bandwidth and video bandwidth are set as described in ANSI C63.10:2013 for the applicable measurement. The particular averaging method used for this test program was RMS averaging.

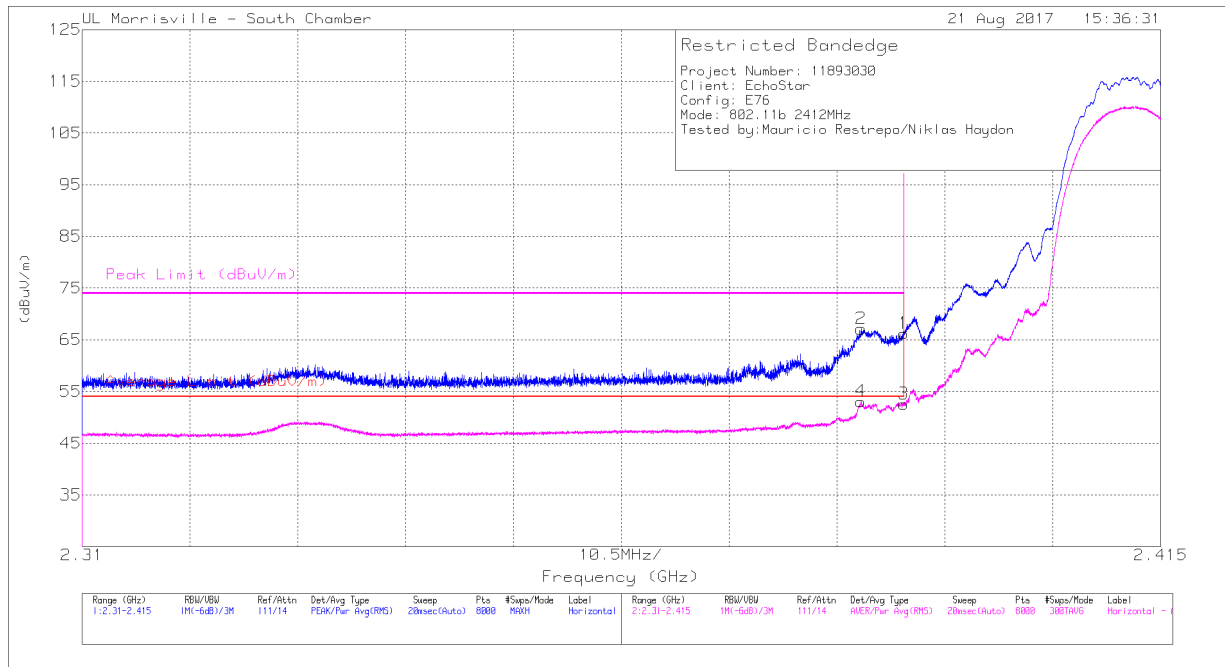
The spectrum from 1 to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. For 9kHz to 1000 MHz and 18 to 26 GHz investigation, the worst-case channel was selected.

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 802.11b MODE IN THE 2.4 GHz BAND

#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



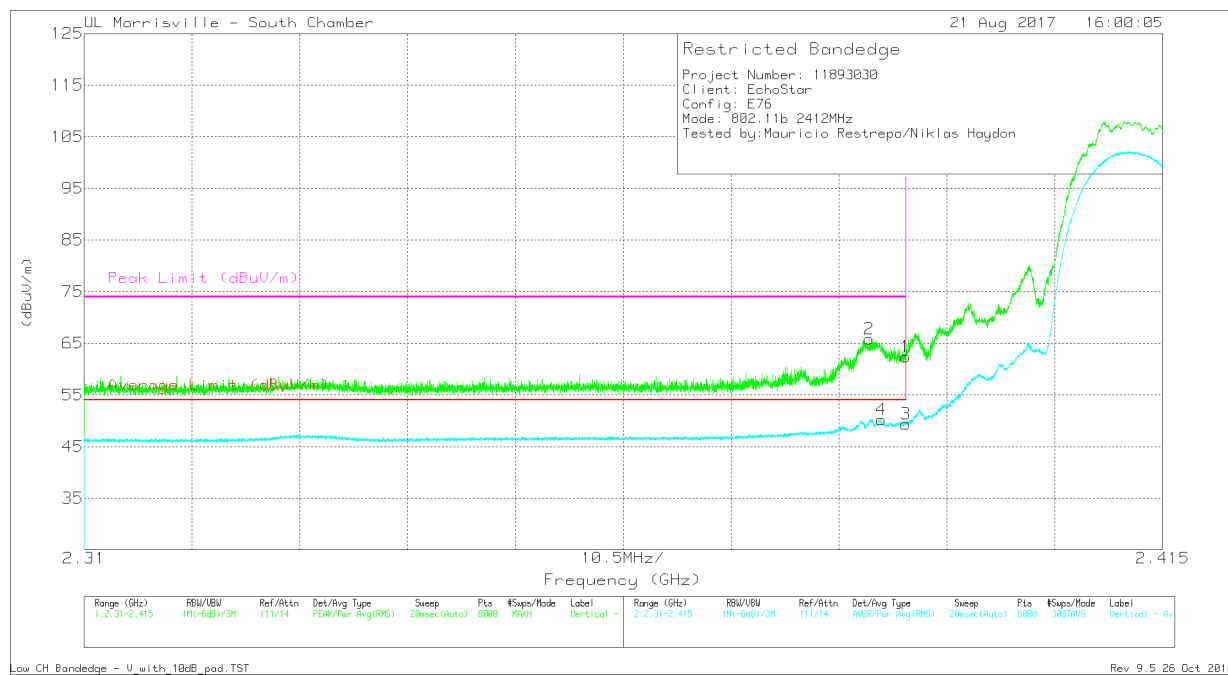
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	48.45	Pk	31.9	-24.1	10	0	66.25	-	-	74	-7.75	137	171	H
2	* 2.386	49.23	Pk	31.9	-24	10	0	67.13	-	-	74	-6.87	137	171	H
3	* 2.39	34.59	RMS	31.9	-24.1	10	.22	52.61	54	-1.39	-	-	137	171	H
4	* 2.386	34.99	RMS	31.9	-24	10	.22	53.11	54	-0.89	-	-	137	171	H

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

Pk - Peak detector

RMS - RMS detection

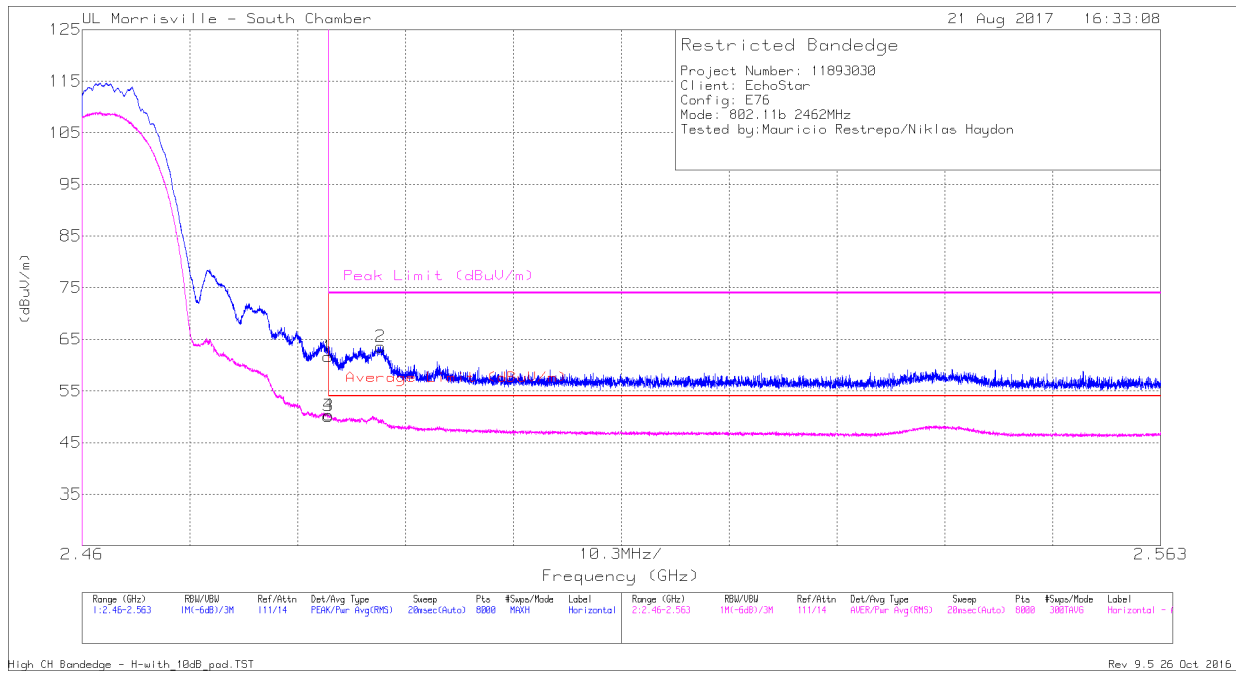
**RESTRICTED BANDEGE (LOW CHANNEL, VERTICAL)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	44.58	Pk	31.9	-24.1	10	0	62.38	-	-	74	-11.62	91	320	V
2	* 2.386	48.06	Pk	31.9	-24.1	10	0	65.86	-	-	74	-8.14	91	320	V
3	* 2.39	31.31	RMS	31.9	-24.1	10	.22	49.33	54	-4.67	-	-	91	320	V
4	* 2.388	32.19	RMS	31.9	-24.1	10	.22	50.21	54	-3.79	-	-	91	320	V

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

**AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



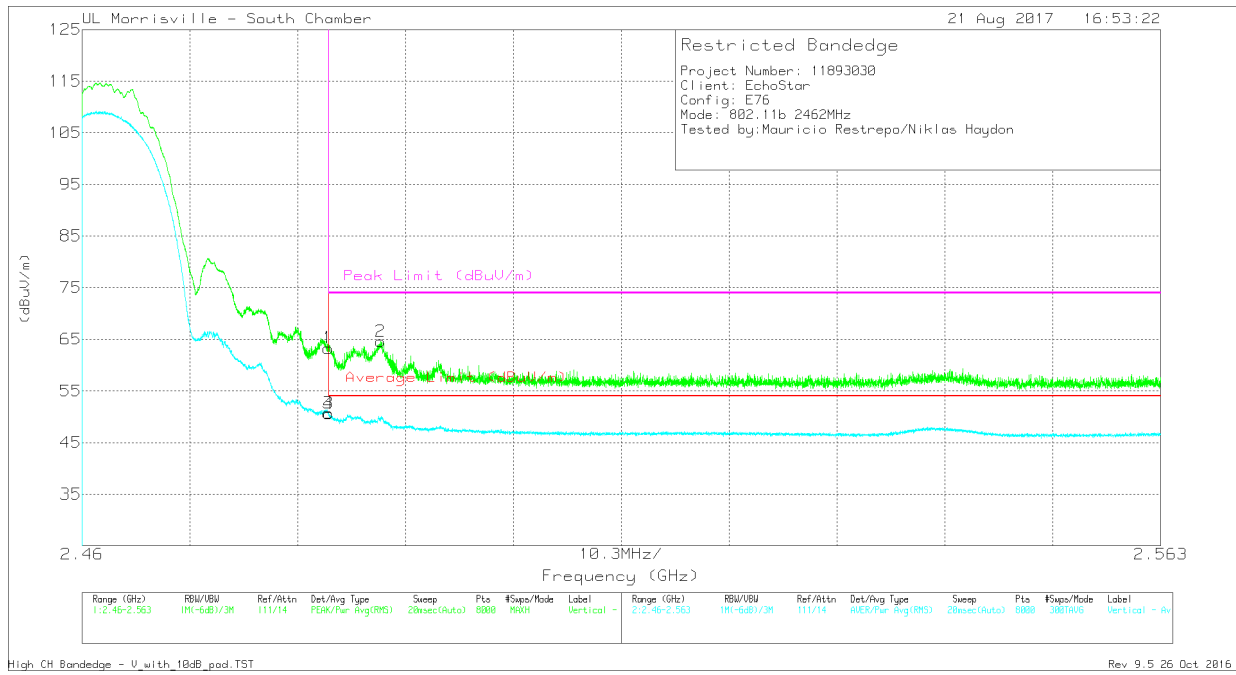
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	43.86	Pk	32.4	-24.6	10	0	61.66	-	-	74	-12.34	136	186	H
2	* 2.488	45.77	Pk	32.4	-24.6	10	0	63.57	-	-	74	-10.43	136	186	H
3	* 2.484	32.14	RMS	32.4	-24.6	10	.22	50.16	54	-3.84	-	-	136	186	H
4	* 2.484	32.3	RMS	32.4	-24.6	10	.22	50.32	54	-3.68	-	-	136	186	H

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

Pk - Peak detector

RMS - RMS detection

**AUTHORIZED BANDEGE (HIGH CHANNEL, VERTICAL)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	45.51	Pk	32.4	-24.6	10	0	63.31	-	-	74	-10.69	64	216	V
2	* 2.489	46.76	Pk	32.4	-24.6	10	0	64.56	-	-	74	-9.44	64	216	V
3	* 2.484	32.69	RMS	32.4	-24.6	10	.22	50.71	54	-3.29	-	-	64	216	V
4	* 2.484	32.53	RMS	32.4	-24.6	10	.22	50.55	54	-3.45	-	-	64	216	V

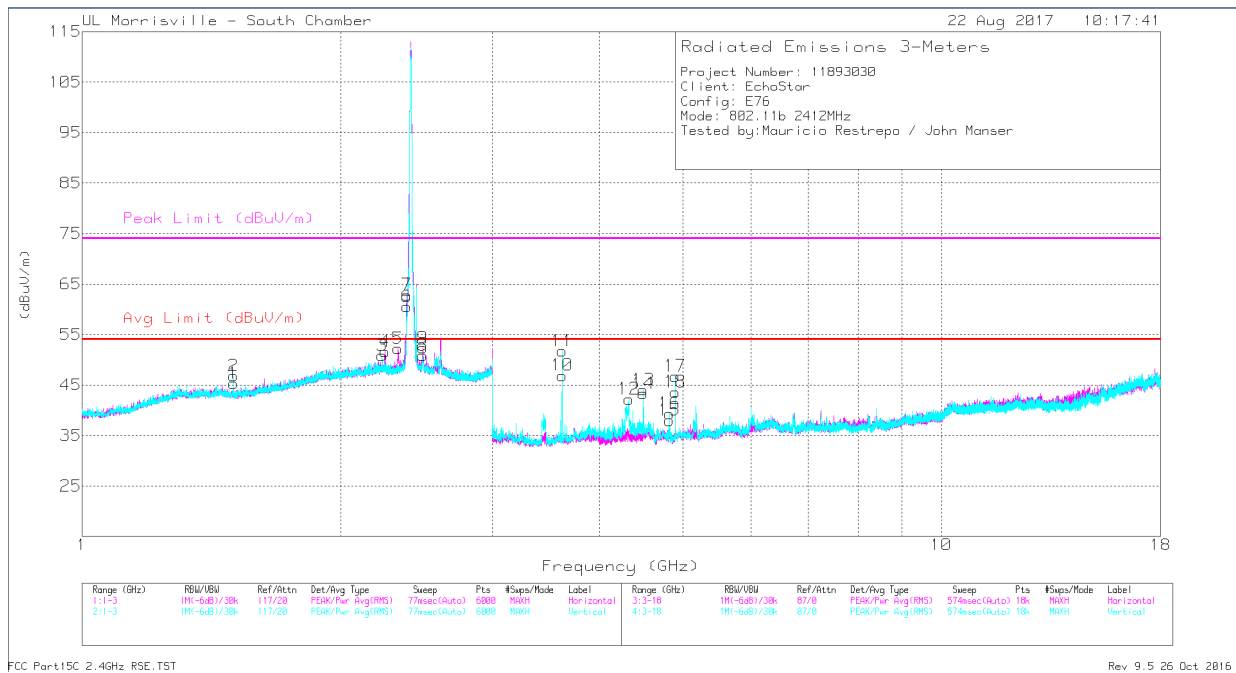
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

**HARMONICS AND SPURIOUS EMISSIONS**

**LOW CHANNEL**



FCC Part15C 2.4GHz RSE.TST

Rev 9.5 26 Oct 2016

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (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
1	* 1.5	46.41	PK2	27.9	-22.4	0	51.91	-	-	74	-22.09	219	375	H
	* 1.5	37.68	MAV1	27.9	-22.4	.22	43.4	54	-10.6	-	-	219	375	H
4	* 2.252	49.25	PK2	31.9	-23.4	0	57.75	-	-	74	-16.25	120	230	H
	* 2.251	38.43	MAV1	31.9	-23.3	.22	47.25	54	-6.75	-	-	120	230	H
5	* 2.332	49.68	PK2	31.7	-23.7	0	57.68	-	-	74	-16.32	116	368	H
	* 2.332	39.59	MAV1	31.7	-23.7	.22	47.81	54	-6.19	-	-	116	368	H
7	* 2.386	59.03	PK2	31.9	-23.9	0	67.03	-	-	74	-6.97	151	127	H
	* 2.387	44.24	MAV1	31.9	-23.9	.22	52.46	54	-1.54	-	-	151	127	H
9	* 2.491	50.29	PK2	32.4	-24.4	0	58.29	-	-	74	-15.71	134	285	H
	* 2.492	39.36	MAV1	32.4	-24.4	.22	47.58	54	-6.42	-	-	134	285	H
2	* 1.5	46.61	PK2	27.9	-22.4	0	52.11	-	-	74	-21.89	357	306	V
	* 1.5	38.56	MAV1	27.9	-22.4	.22	44.28	54	-9.72	-	-	357	306	V
3	* 2.234	46.24	PK2	32	-23.3	0	54.94	-	-	74	-19.06	338	117	V
	* 2.235	34.24	MAV1	32	-23.3	.22	43.16	54	-10.84	-	-	338	117	V
6	* 2.387	57.25	PK2	31.9	-23.9	0	65.25	-	-	74	-8.75	74	273	V
	* 2.387	42.68	MAV1	31.9	-23.9	.22	50.9	54	-3.1	-	-	74	273	V
8	* 2.492	50.49	PK2	32.4	-24.4	0	58.49	-	-	74	-15.51	58	217	V
	* 2.491	39.27	MAV1	32.4	-24.4	.22	47.49	54	-6.51	-	-	58	217	V
10	* 3.618	48.03	PK2	33	-31.8	0	49.23	-	-	74	-24.77	334	112	H
	* 3.618	44.96	MAV1	33	-31.8	.22	46.38	54	-7.62	-	-	334	112	H
14	* 4.5	46.67	PK2	33.9	-31.6	0	48.97	-	-	74	-25.03	57	275	H
	* 4.5	42.47	MAV1	33.9	-31.6	.22	44.99	54	-9.01	-	-	57	275	H
15	* 4.821	39.68	PK2	34	-30.9	0	42.78	-	-	74	-31.22	118	273	H
	* 4.824	27.86	MAV1	34	-30.9	.22	31.18	54	-22.82	-	-	118	273	H
18	* 4.901	45.58	PK2	34	-31.1	0	48.48	-	-	74	-25.52	247	181	H
	* 4.899	38.8	MAV1	34	-31.1	.22	41.92	54	-12.08	-	-	247	181	H
11	* 3.618	51.79	PK2	33	-31.8	0	52.99	-	-	74	-21.01	31	112	V
	* 3.618	49.77	MAV1	33	-31.8	.22	51.19	54	-2.81	-	-	31	112	V

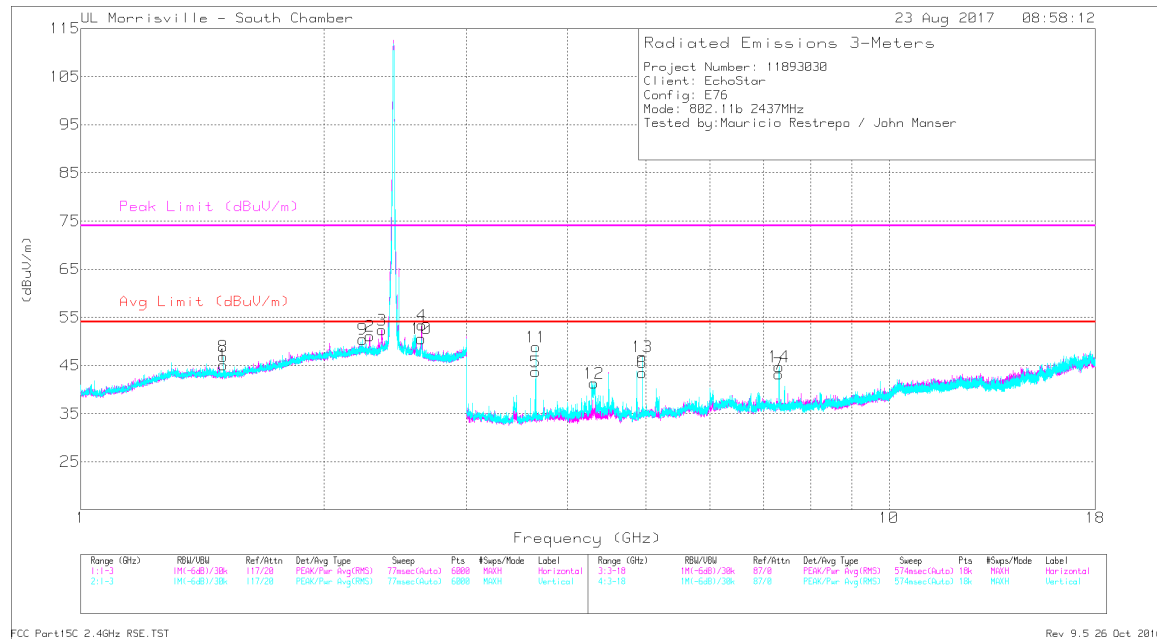
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
12	* 4.33	47.45	PK2	33.5	-32.1	0	48.85	-	-	74	-25.15	240	159	V
	* 4.33	31.9	MAv1	33.5	-32.1	.22	33.52	54	-20.48	-	-	240	159	V
13	* 4.5	45.85	PK2	33.9	-31.6	0	48.15	-	-	74	-25.85	63	227	V
	* 4.5	40.96	MAv1	33.9	-31.6	.22	43.48	54	-10.52	-	-	63	227	V
16	* 4.824	41.36	PK2	34	-30.9	0	44.46	-	-	74	-29.54	142	227	V
	* 4.824	28.45	MAv1	34	-30.9	.22	31.77	54	-22.23	-	-	142	227	V
17	* 4.901	48.5	PK2	34	-31	0	51.5	-	-	74	-22.5	228	204	V
	* 4.899	42.58	MAv1	34	-31.1	.22	45.7	54	-8.3	-	-	228	204	V

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

PK2 - Maximum Peak

MAv1 - Maximum RMS Average

**MID CHANNEL**

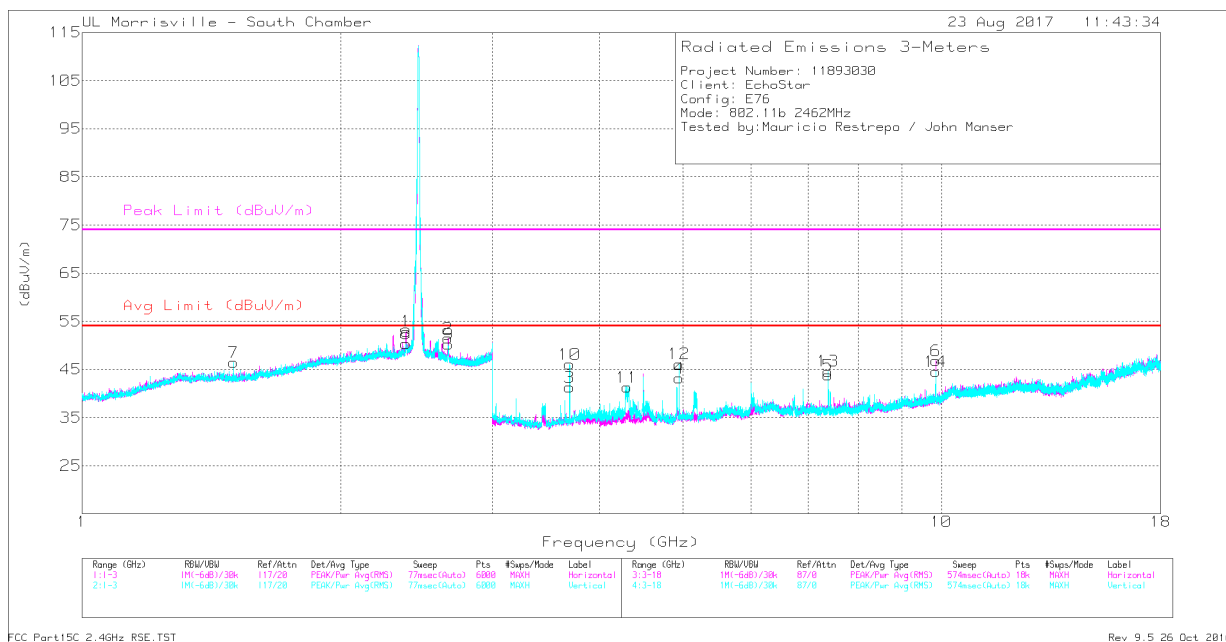


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.5	46.54	PK2	27.9	-22.4	0	52.04	-	-	74	-21.96	211	358	H
	* 1.5	38.01	MAv1	27.9	-22.4	.22	43.73	54	-10.27	-	-	211	358	H
2	* 2.276	48.63	PK2	31.8	-23.5	0	56.93	-	-	74	-17.07	101	290	H
	* 2.277	37.98	MAv1	31.8	-23.5	.22	46.5	54	-7.5	-	-	101	290	H
3	* 2.356	51.05	PK2	31.8	-23.7	0	59.15	-	-	74	-14.85	141	199	H
	* 2.359	40.05	MAv1	31.8	-23.7	.22	48.37	54	-5.63	-	-	141	199	H
8	* 1.5	46.9	PK2	27.9	-22.4	0	52.4	-	-	74	-21.6	11	149	V
	* 1.5	38.24	MAv1	27.9	-22.4	.22	43.96	54	-10.04	-	-	11	149	V
9	* 2.233	46.81	PK2	32	-23.3	0	55.51	-	-	74	-18.49	9	146	V
	* 2.235	34.32	MAv1	32	-23.3	.22	43.24	54	-10.76	-	-	9	146	V
5	* 3.656	46.56	PK2	33	-32.2	0	47.36	-	-	74	-26.64	306	184	H
	* 3.656	42.1	MAv1	33	-32.2	.22	43.12	54	-10.88	-	-	306	184	H
6	* 4.949	44.72	PK2	34	-31	0	47.72	-	-	74	-26.28	242	188	H
	* 4.95	37.75	MAv1	34	-31	.22	40.97	54	-13.03	-	-	242	188	H
7	* 7.312	39.78	PK2	35.5	-27.8	0	47.48	-	-	74	-26.52	99	151	H
	* 7.31	27.57	MAv1	35.5	-27.7	.22	35.59	54	-18.41	-	-	99	151	H
11	* 3.656	51.35	PK2	33	-32.2	0	52.15	-	-	74	-21.85	6	103	V
	* 3.656	48.42	MAv1	33	-32.2	.22	49.44	54	-4.56	-	-	6	103	V
12	* 4.314	46.96	PK2	33.4	-31.9	0	48.46	-	-	74	-25.54	46	102	V
	* 4.315	32.6	MAv1	33.4	-31.9	.22	34.32	54	-19.68	-	-	46	102	V
13	* 4.95	47.72	PK2	34	-31	0	50.72	-	-	74	-23.28	233	200	V
	* 4.95	41.77	MAv1	34	-31	.22	44.99	54	-9.01	-	-	233	200	V
14	* 7.311	38.5	PK2	35.5	-27.8	0	46.2	-	-	74	-27.8	164	287	V
	* 7.313	26.01	MAv1	35.5	-27.8	.22	33.93	54	-20.07	-	-	164	287	V
10	2.64	51.79	PK2	32.4	-25.3	0	58.89	-	-	-	-	112	124	H
	2.64	41.94	MAv1	32.4	-25.3	.22	49.26	-	-	-	-	112	124	H
4	2.64	40.9	MAv1	32.4	-25.3	.22	48.22	-	-	-	-	77	279	V
	2.641	50.7	PK2	32.4	-25.3	0	57.8	-	-	-	-	77	279	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK2 - Maximum Peak  
 MAv1 - Maximum RMS Average



**HIGH CHANNEL**

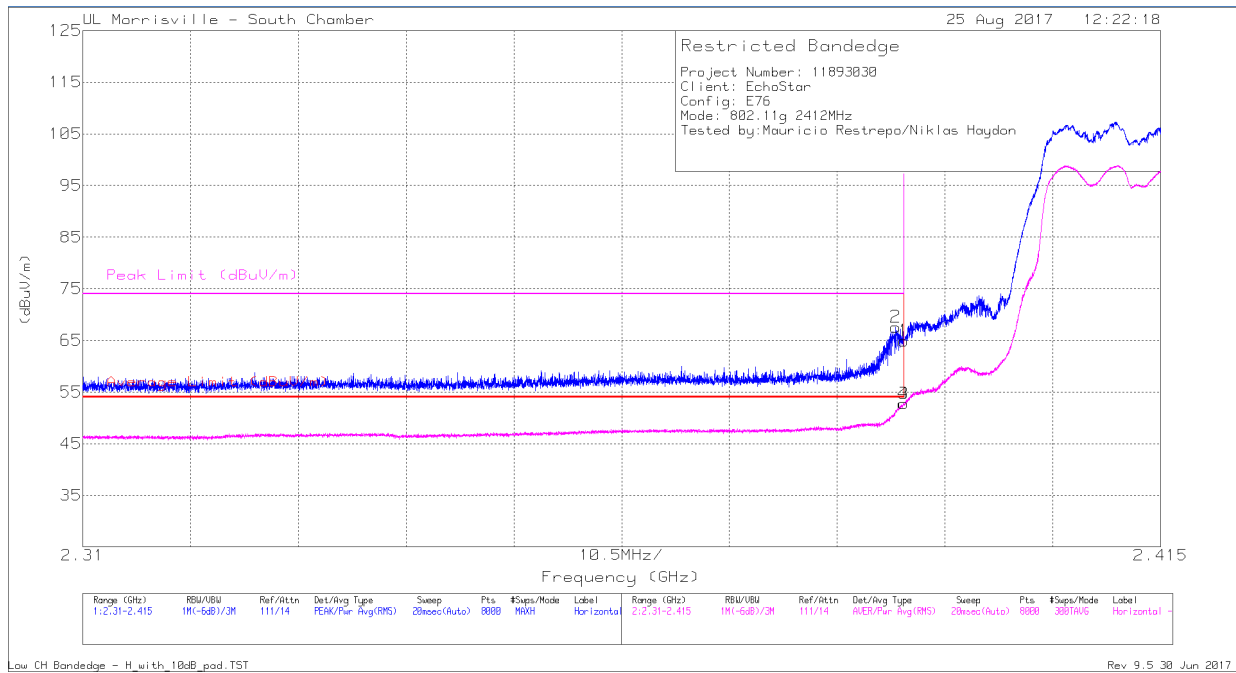


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.383	49.93	PK2	31.9	-23.9	0	57.93	-	-	74	-16.07	105	308	H
	* 2.383	39.17	MAV1	31.9	-23.9	.22	47.39	54	-6.61	-	-	105	308	H
2	* 2.667	50.63	PK2	32.3	-25.5	0	57.43	-	-	74	-16.57	147	327	H
	* 2.667	40.71	MAV1	32.3	-25.5	.22	47.73	54	-6.27	-	-	147	327	H
7	* 1.5	46.73	PK2	27.9	-22.4	0	52.23	-	-	74	-21.77	9	143	V
	* 1.5	38.46	MAV1	27.9	-22.4	.22	44.18	54	-9.82	-	-	9	143	V
8	* 2.383	49.1	PK2	31.9	-23.9	0	57.1	-	-	74	-16.9	50	163	V
	* 2.384	37.19	MAV1	31.9	-23.9	.22	45.41	54	-8.59	-	-	50	163	V
9	* 2.668	50.76	PK2	32.3	-25.5	0	57.56	-	-	74	-16.44	80	202	V
	* 2.666	39.41	MAV1	32.3	-25.5	.22	46.43	54	-7.57	-	-	80	202	V
3	* 3.693	46.91	PK2	33.2	-32.5	0	47.61	-	-	74	-26.39	113	281	H
	* 3.693	42.54	MAV1	33.2	-32.5	.22	43.46	54	-10.54	-	-	113	281	H
4	* 4.95	45.18	PK2	34	-31	0	48.18	-	-	74	-25.82	225	228	H
	* 4.95	38.23	MAV1	34	-31	.22	41.45	54	-12.55	-	-	225	228	H
5	* 7.384	41.21	PK2	35.5	-27.7	0	49.01	-	-	74	-24.99	92	108	H
	* 7.385	28.65	MAV1	35.5	-27.8	.22	36.57	54	-17.43	-	-	92	108	H
10	* 3.693	50.71	PK2	33.2	-32.5	0	51.41	-	-	74	-22.59	195	349	V
	* 3.693	48.25	MAV1	33.2	-32.5	.22	49.17	54	-4.83	-	-	195	349	V
11	* 4.31	48.03	PK2	33.4	-31.8	0	49.63	-	-	74	-24.37	254	116	V
	* 4.311	32.53	MAV1	33.4	-31.8	.22	34.35	54	-19.65	-	-	254	116	V
12	* 4.95	48.06	PK2	34	-31	0	51.06	-	-	74	-22.94	228	209	V
	* 4.95	41.62	MAV1	34	-31	.22	44.84	54	-9.16	-	-	228	209	V
13	* 7.386	41.6	PK2	35.5	-27.8	0	49.3	-	-	74	-24.7	260	108	V
	* 7.384	28.25	MAV1	35.5	-27.7	.22	36.27	54	-17.73	-	-	260	108	V
6	9.848	40.55	PK2	37	-25.8	0	51.75	-	-	-	-	84	270	H
	9.848	27.03	MAV1	37	-25.8	.22	38.45	-	-	-	-	84	270	H
14	9.848	42.19	PK2	37	-25.8	0	53.39	-	-	-	-	154	158	V
	9.848	29.1	MAV1	37	-25.8	.22	40.52	-	-	-	-	154	158	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK2 - Maximum Peak  
 MAV1 - Maximum RMS Average

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

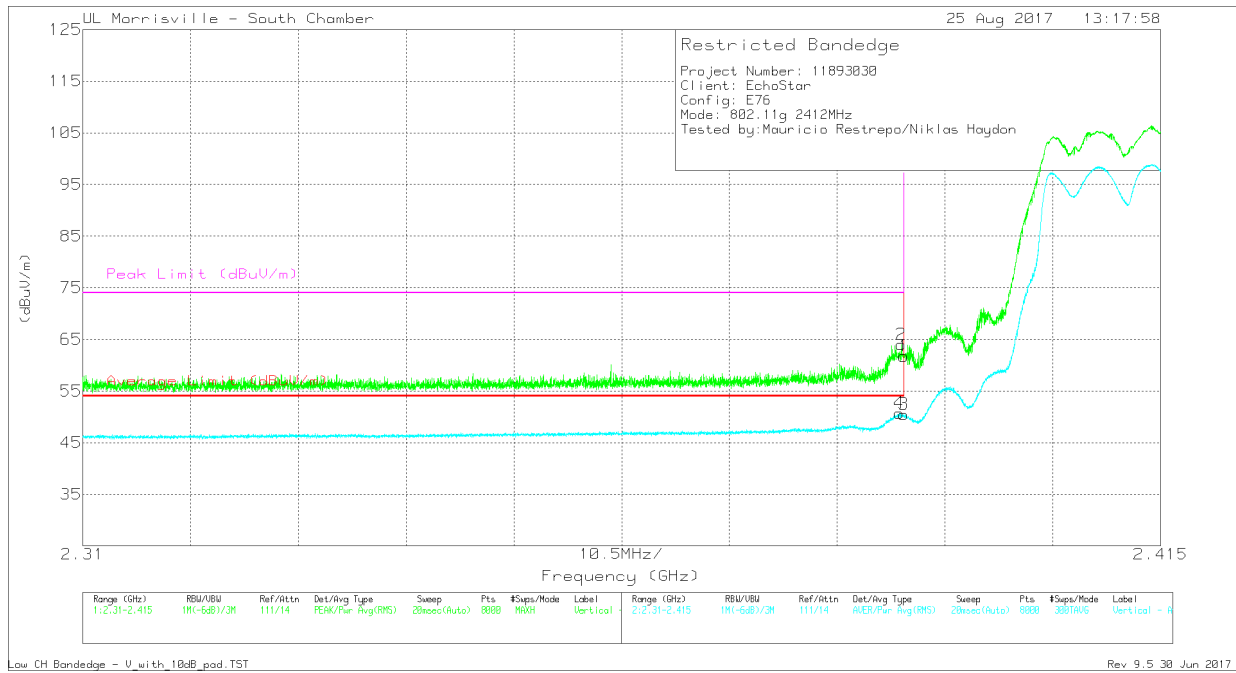
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	46.9	Pk	31.9	-23.9	10	0	64.9	-	-	74	-9.1	68	144	H
2	* 2.389	49.6	Pk	31.9	-23.9	10	0	67.6	-	-	74	-6.4	68	144	H
3	* 2.39	34.52	RMS	31.9	-23.9	10	.23	52.75	54	-1.25	-	-	68	144	H
4	* 2.39	34.51	RMS	31.9	-23.9	10	.23	52.74	54	-1.26	-	-	68	144	H

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

**RESTRICTED BANDEGE (LOW CHANNEL, VERTICAL)**



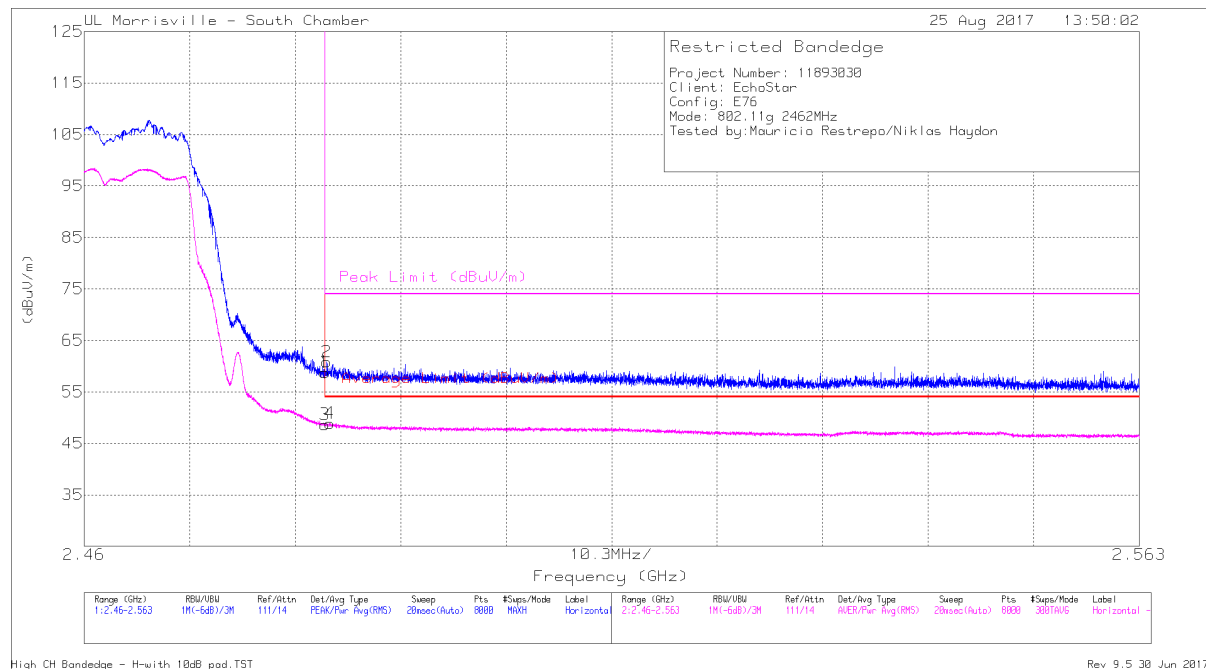
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	43.76	Pk	31.9	-23.9	10	0	61.76	-	-	74	-12.24	11	200	V
2	* 2.39	45.99	Pk	31.9	-23.9	10	0	63.99	-	-	74	-10.01	11	200	V
3	* 2.39	32.27	RMS	31.9	-23.9	10	.23	50.5	54	-3.5	-	-	11	200	V
4	* 2.39	32.5	RMS	31.9	-23.9	10	.23	50.73	54	-3.27	-	-	11	200	V

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

Pk - Peak detector

RMS - RMS detection

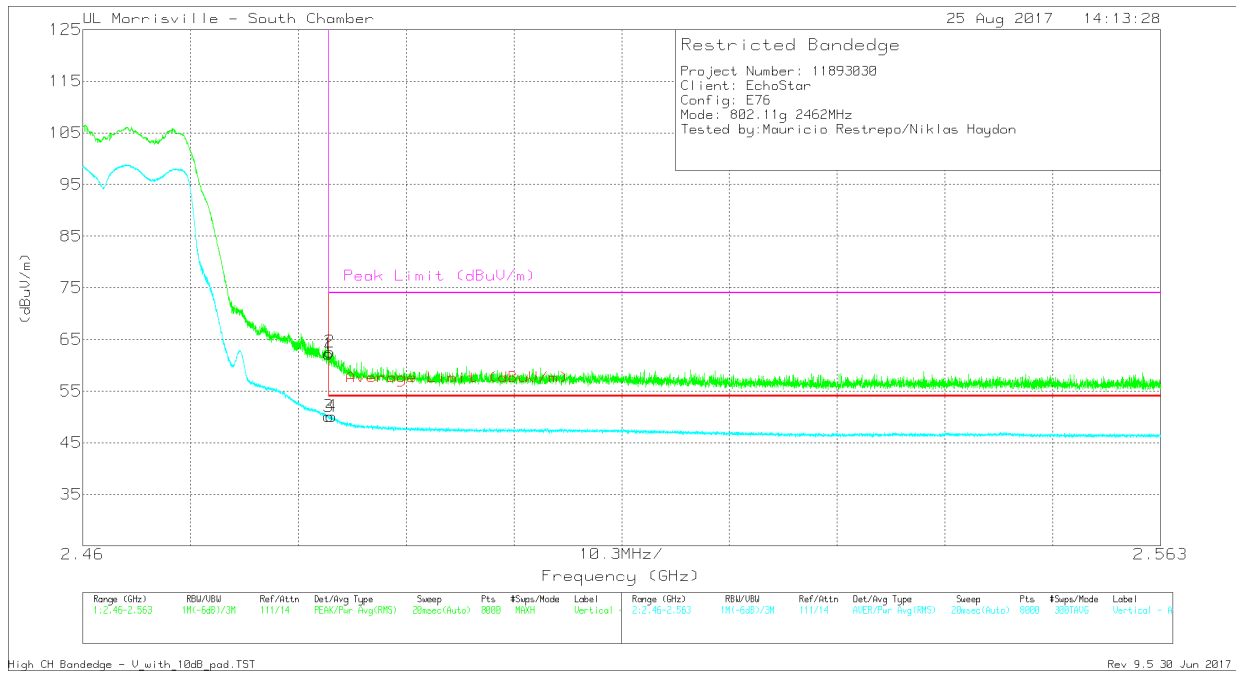
**AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	40.78	Pk	32.4	-24.4	10	0	58.78	-	-	74	-15.22	110	236	H
2	* 2.484	42.84	Pk	32.4	-24.4	10	0	60.84	-	-	74	-13.16	110	236	H
3	* 2.484	30.41	RMS	32.4	-24.4	10	.23	48.64	54	-5.36	-	-	110	236	H
4	* 2.484	30.66	RMS	32.4	-24.4	10	.23	48.89	54	-5.11	-	-	110	236	H

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

**AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	44.15	Pk	32.4	-24.4	10	0	62.15	-	-	74	-11.85	14	149	V
2	* 2.484	44.58	Pk	32.4	-24.4	10	0	62.58	-	-	74	-11.42	14	149	V
3	* 2.484	31.88	RMS	32.4	-24.4	10	.23	50.11	54	-3.89	-	-	14	149	V
4	* 2.484	31.87	RMS	32.4	-24.4	10	.23	50.1	54	-3.9	-	-	14	149	V

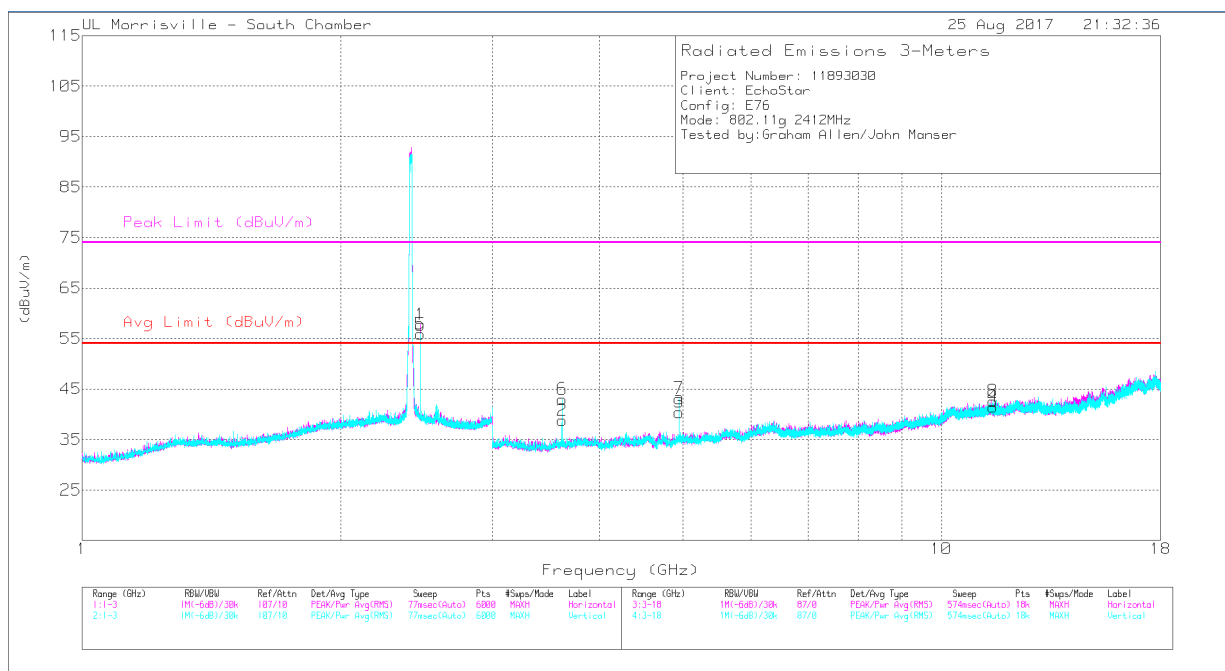
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

**HARMONICS AND SPURIOUS EMISSIONS**

**LOW CHANNEL**



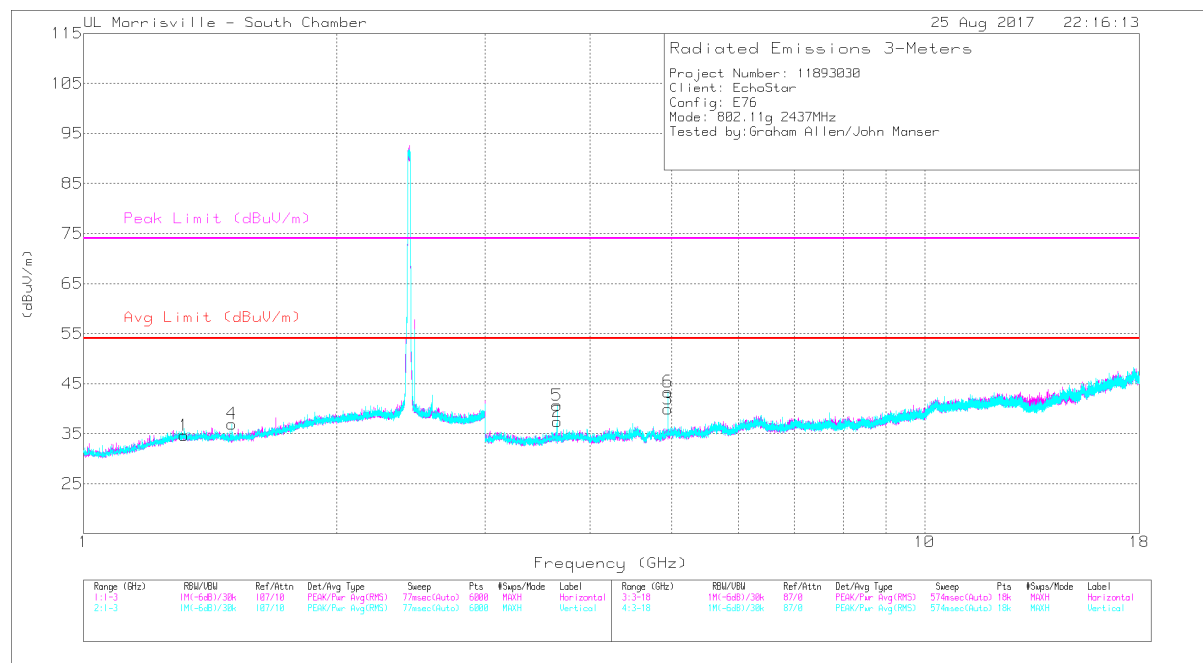
Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 3.618	44.68	PK2	33	-31.8	0	45.88	-	-	74	-28.12	284	170	H
	* 3.618	37.99	MAV1	33	-31.8	.23	39.42	54	-14.58	-	-	284	170	H
3	* 4.95	42.88	PK2	34	-31	0	45.88	-	-	74	-28.12	196	108	H
	* 4.95	35.37	MAV1	34	-31	.23	38.6	54	-15.4	-	-	196	108	H
4	* 11.489	34.59	PK2	38.3	-24.4	0	48.49	-	-	74	-25.51	154	284	H
	* 11.489	22.47	MAV1	38.3	-24.5	.23	36.5	54	-17.5	-	-	154	284	H
6	* 3.618	46.26	PK2	33	-31.8	0	47.46	-	-	74	-26.54	236	102	V
	* 3.618	41.17	MAV1	33	-31.8	.23	42.6	54	-11.4	-	-	236	102	V
7	* 4.95	43.9	PK2	34	-31	0	46.9	-	-	74	-27.1	188	202	V
	* 4.95	38.19	MAV1	34	-31	.23	41.42	54	-12.58	-	-	188	202	V
8	* 11.489	34.8	PK2	38.3	-24.4	0	48.7	-	-	74	-25.3	288	127	V
	* 11.489	22.52	MAV1	38.3	-24.4	.23	36.65	54	-17.35	-	-	288	127	V

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

PK2 - Maximum Peak

MAV1 - Maximum RMS Average

**MID CHANNEL**



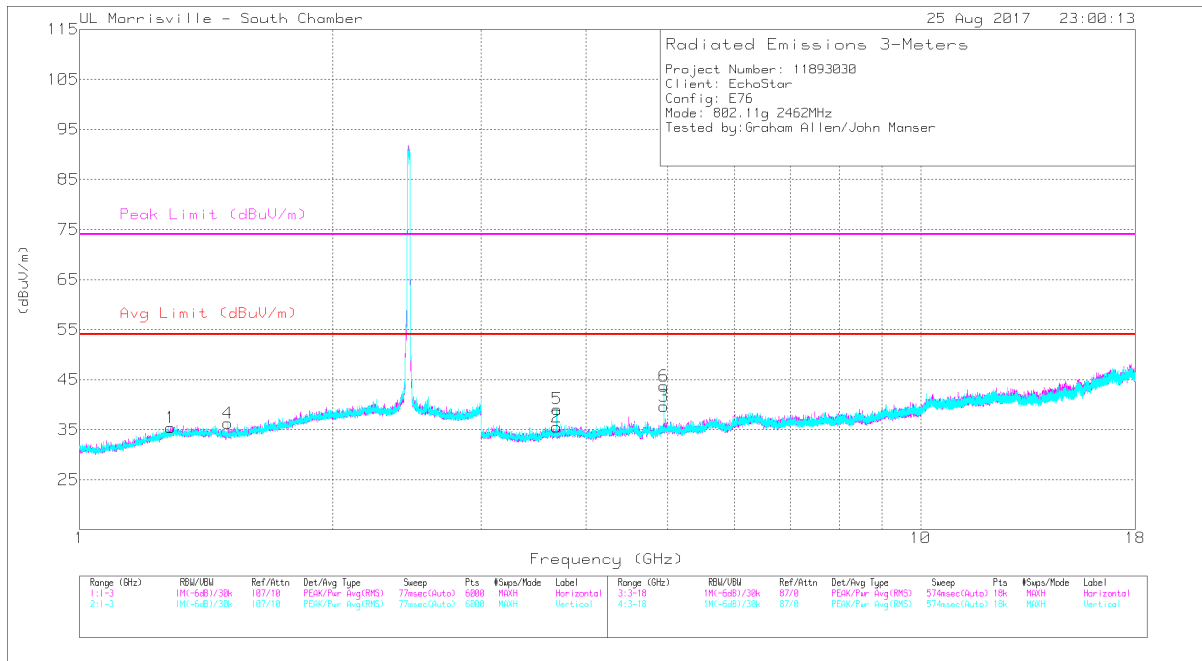
Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.319	35.55	PK2	29	-23.1	0	41.45	-	-	74	-32.55	348	375	H
	* 1.319	23.71	MAV1	29	-23.1	.23	29.84	54	-24.16	-	-	348	375	H
2	* 3.655	43.14	PK2	33	-32.2	0	43.94	-	-	74	-30.06	273	205	H
	* 3.655	33.87	MAV1	33	-32.2	.23	34.9	54	-19.1	-	-	273	205	H
3	* 4.95	42.93	PK2	34	-31	0	45.93	-	-	74	-28.07	208	236	H
	* 4.95	35.96	MAV1	34	-31	.23	39.19	54	-14.81	-	-	208	236	H
4	* 1.5	37.59	PK2	27.9	-22.4	0	43.09	-	-	74	-30.91	325	250	V
	* 1.5	28.33	MAV1	27.9	-22.4	.23	34.06	54	-19.94	-	-	325	250	V
5	* 3.656	44.92	PK2	33	-32.2	0	45.72	-	-	74	-28.28	231	117	V
	* 3.655	38.58	MAV1	33	-32.2	.23	39.61	54	-14.39	-	-	231	117	V
6	* 4.95	44.85	PK2	34	-31	0	47.85	-	-	74	-26.15	191	202	V
	* 4.95	39.61	MAV1	34	-31	.23	42.84	54	-11.16	-	-	191	202	V

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

PK2 - Maximum Peak

MAV1 - Maximum RMS Average

**HIGH CHANNEL**



Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (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
1	* 1.284	35.74	PK2	29	-23.2	0	41.54	-	-	74	-32.46	253	378	H
	* 1.283	23.66	MAV1	29	-23.2	.23	29.69	54	-24.31	-	-	253	378	H
2	* 3.693	42.04	PK2	33.2	-32.5	0	42.74	-	-	74	-31.26	100	341	H
	* 3.693	31.82	MAV1	33.2	-32.5	.23	32.75	54	-21.25	-	-	100	341	H
3	* 4.95	43.32	PK2	34	-31	0	46.32	-	-	74	-27.68	192	260	H
	* 4.95	35.84	MAV1	34	-31	.23	39.07	54	-14.93	-	-	192	260	H
4	* 1.5	38.4	PK2	27.9	-22.4	0	43.9	-	-	74	-30.1	314	172	V
	* 1.5	27.95	MAV1	27.9	-22.4	.23	33.68	54	-20.32	-	-	314	172	V
5	* 3.693	44.99	PK2	33.2	-32.5	0	45.69	-	-	74	-28.31	183	354	V
	* 3.693	38	MAV1	33.2	-32.5	.23	38.93	54	-15.07	-	-	183	354	V
6	* 4.95	44.62	PK2	34	-31	0	47.62	-	-	74	-26.38	190	211	V
	* 4.95	39.34	MAV1	34	-31	.23	42.57	54	-11.43	-	-	190	211	V

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

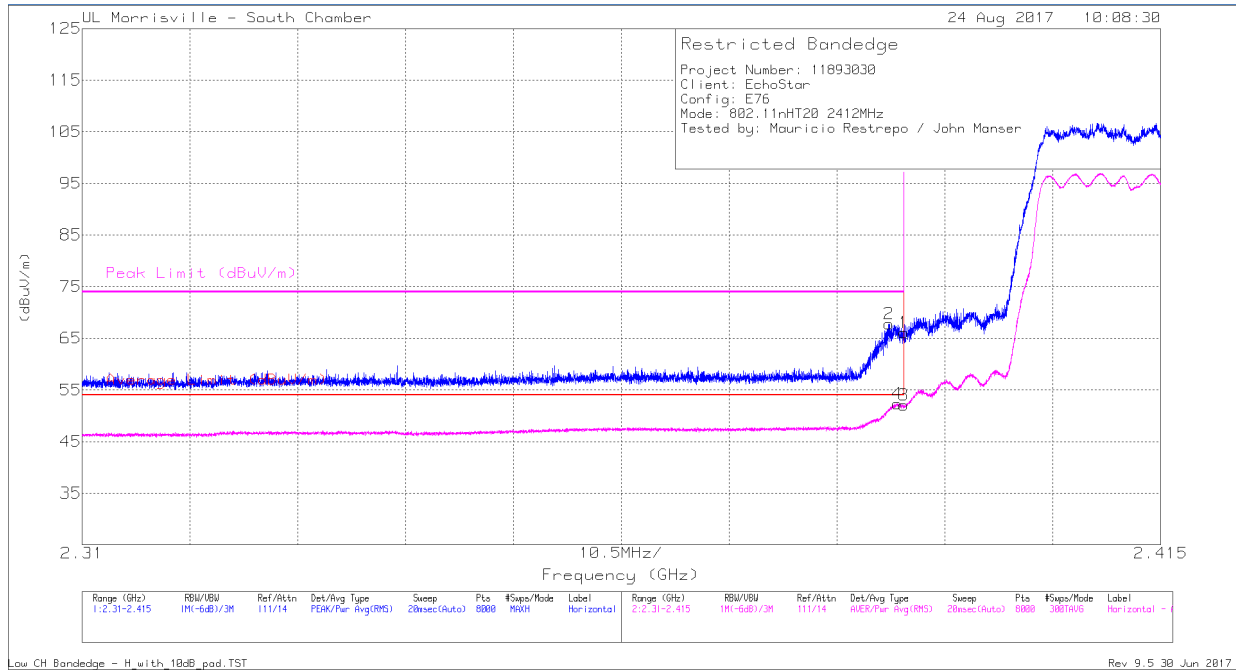
PK2 - Maximum Peak

MAV1 - Maximum RMS Average



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

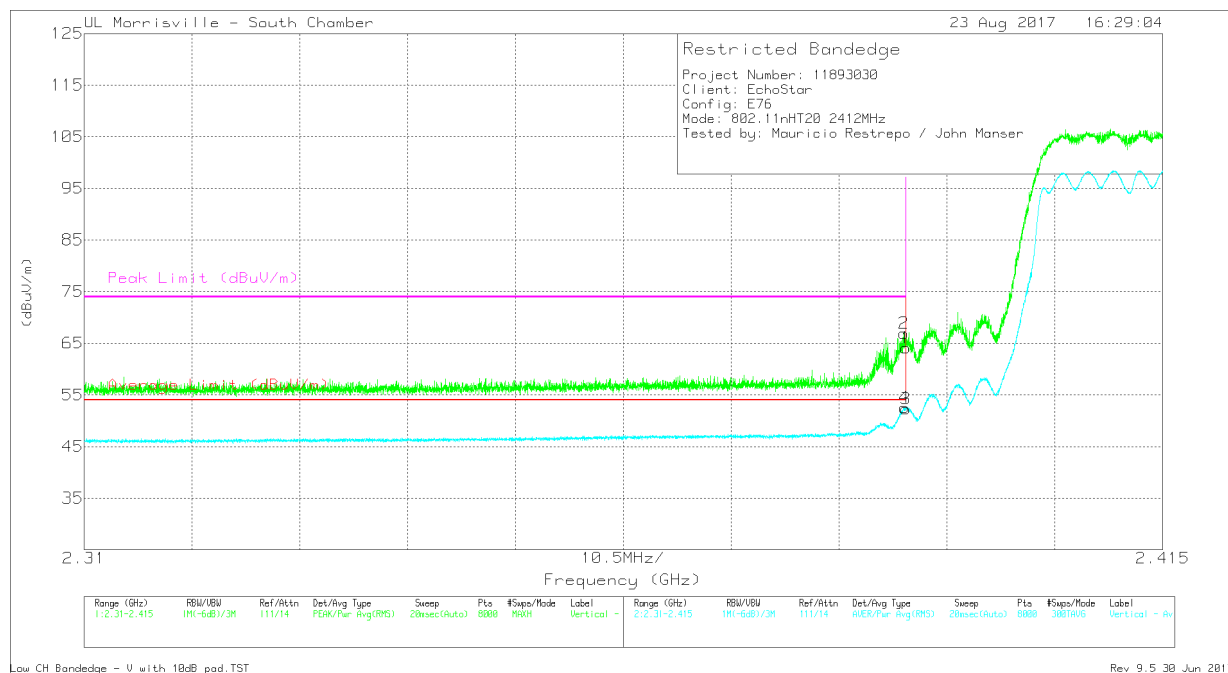
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	48.07	Pk	31.9	-23.9	10	0	66.07	-	-	74	-7.93	145	268	H
2	* 2.389	49.79	Pk	31.9	-23.9	10	0	67.79	-	-	74	-6.21	145	268	H
3	* 2.39	33.82	RMS	31.9	-23.9	10	.23	52.05	54	-1.95	-	-	145	268	H
4	* 2.389	34.11	RMS	31.9	-23.9	10	.23	52.34	54	-1.66	-	-	145	268	H

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

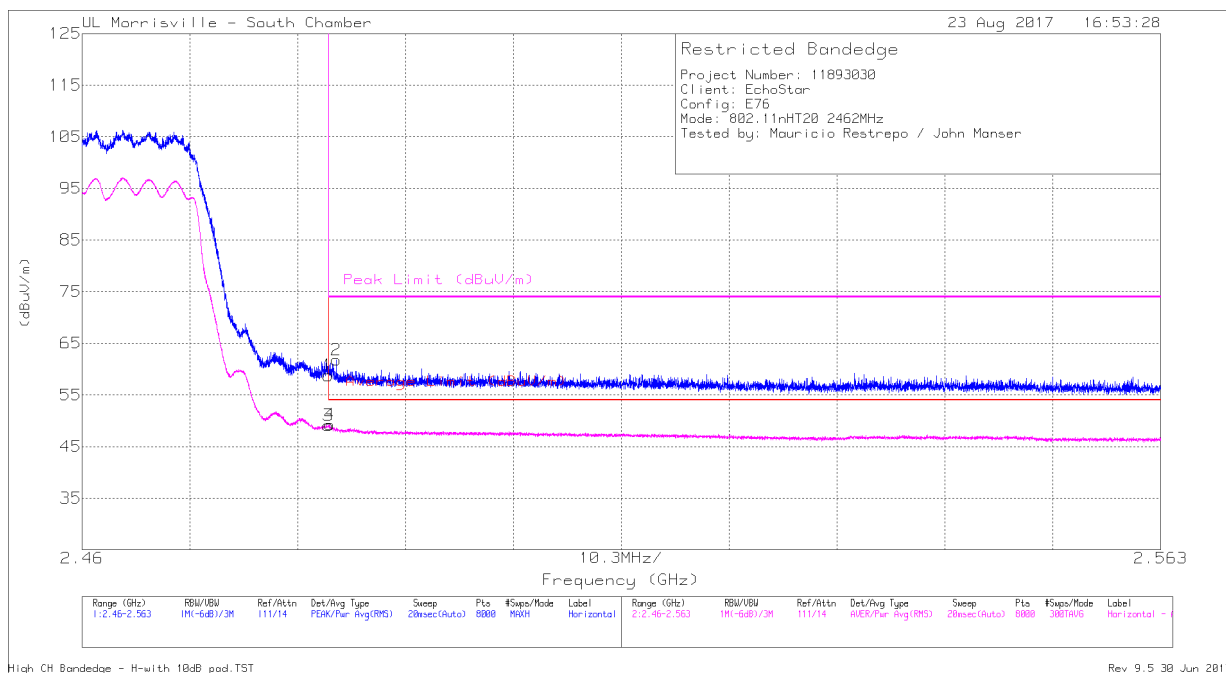
**RESTRICTED BANDEGE (LOW CHANNEL, VERTICAL)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	46.08	Pk	31.9	-23.9	10	0	64.08	-	-	74	-9.92	60	171	V
2	* 2.39	48.94	Pk	31.9	-23.9	10	0	66.94	-	-	74	-7.06	60	171	V
3	* 2.39	34.11	RMS	31.9	-23.9	10	.23	52.34	54	-1.66	-	-	60	171	V
4	* 2.39	34.29	RMS	31.9	-23.9	10	.23	52.52	54	-1.48	-	-	60	171	V

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

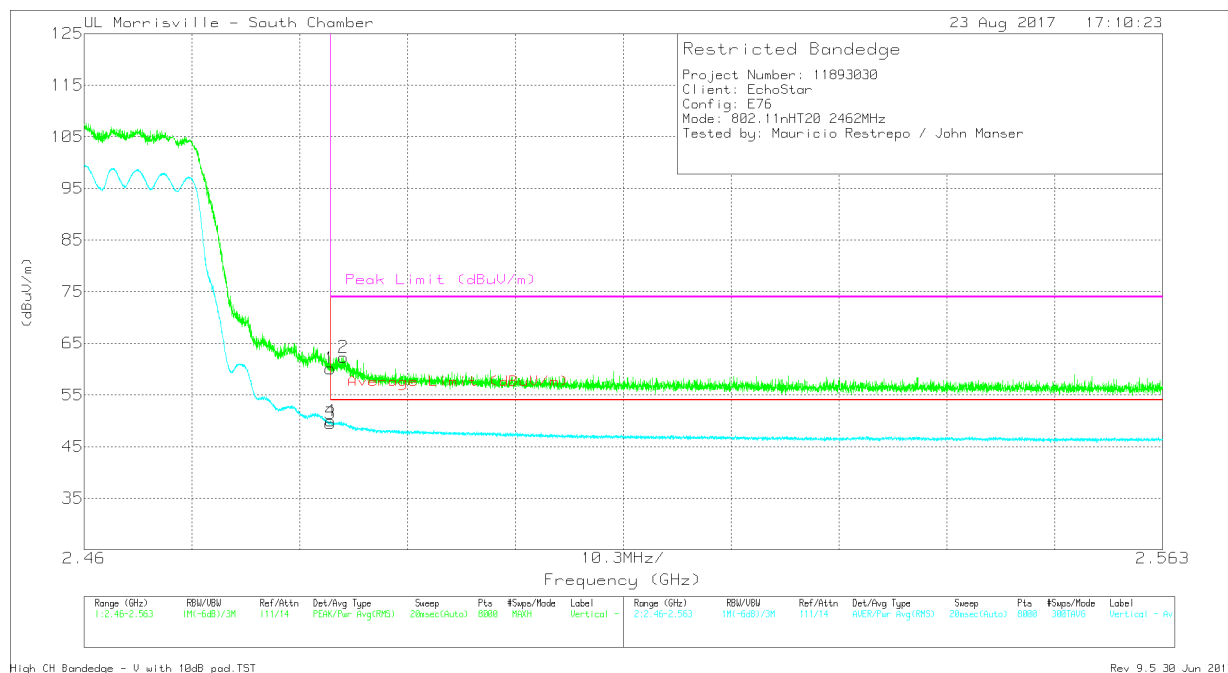
**AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	40.78	Pk	32.4	-24.4	10	0	58.78	-	-	74	-15.22	156	210	H
2	* 2.484	43.8	Pk	32.4	-24.4	10	0	61.8	-	-	74	-12.2	156	210	H
3	* 2.484	30.85	RMS	32.4	-24.4	10	.23	49.08	54	-4.92	-	-	156	210	H
4	* 2.484	30.97	RMS	32.4	-24.4	10	.23	49.2	54	-4.8	-	-	156	210	H

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

**AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**



High CH Bandedge - V with 10dB pad.TST

Rev 9.5 30 Jun 2017

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	42.12	Pk	32.4	-24.4	10	0	60.12	-	-	74	-13.88	59	212	V
2	* 2.485	44.31	Pk	32.4	-24.4	10	0	62.31	-	-	74	-11.69	59	212	V
3	* 2.484	31.24	RMS	32.4	-24.4	10	.23	49.47	54	-4.53	-	-	59	212	V
4	* 2.484	31.76	RMS	32.4	-24.4	10	.23	49.99	54	-4.01	-	-	59	212	V

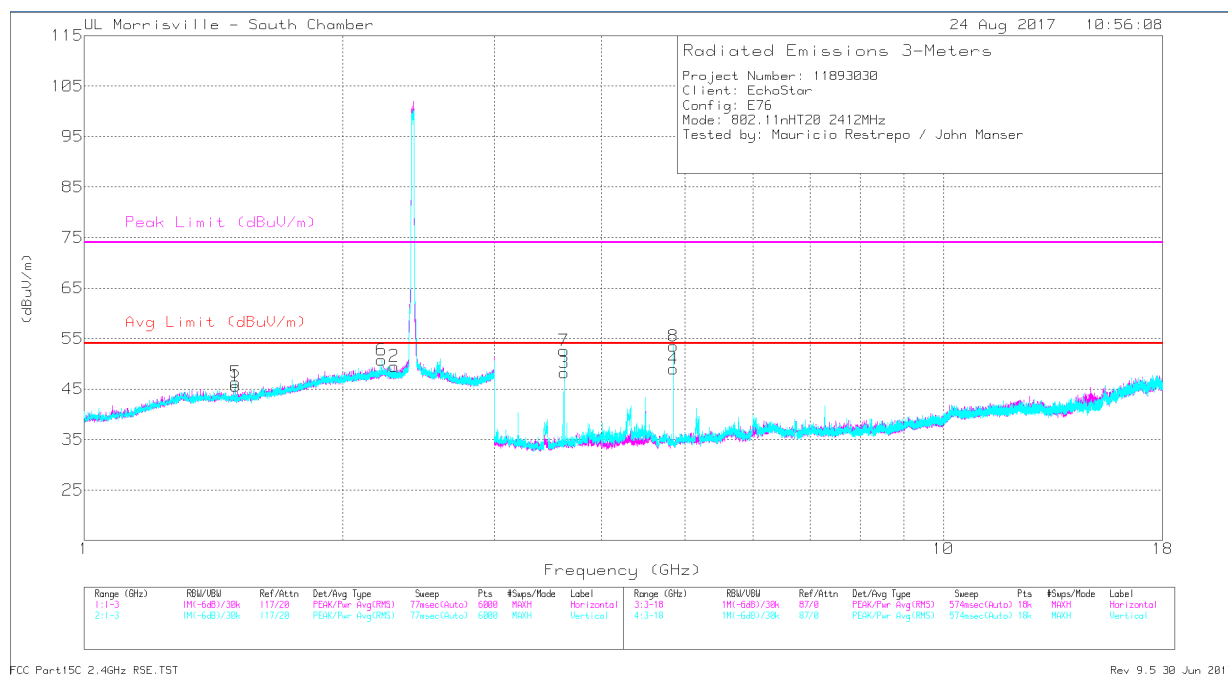
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

**HARMONICS AND SPURIOUS EMISSIONS**

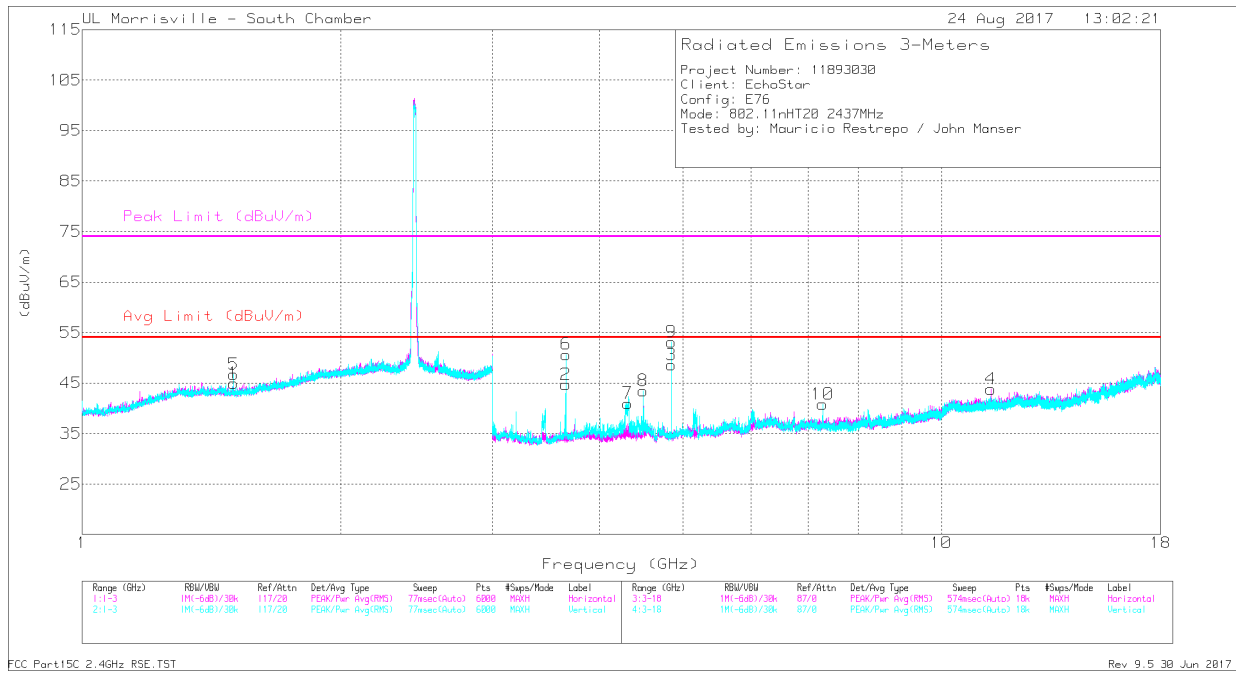
**LOW CHANNEL**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (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
1	* 1.5	46.76	PK2	27.9	-22.4	0	52.26	-	-	74	-21.74	212	337	H
	* 1.5	37.21	MAv1	27.9	-22.4	.23	42.94	54	-11.06	-	-	212	337	H
2	* 2.292	46.33	PK2	31.7	-23.5	0	54.53	-	-	74	-19.47	14	130	H
	* 2.292	33.97	MAv1	31.7	-23.5	.23	42.4	54	-11.6	-	-	14	130	H
3	* 3.618	49.28	PK2	33	-31.8	0	50.48	-	-	74	-23.52	321	200	H
	* 3.618	46.62	MAv1	33	-31.8	.23	48.05	54	-5.95	-	-	321	200	H
4	* 4.85	48.48	PK2	34	-30.9	0	51.58	-	-	74	-22.42	248	178	H
	* 4.85	46.13	MAv1	34	-30.9	.23	49.46	54	-4.54	-	-	248	178	H
5	* 1.5	46.4	PK2	27.9	-22.4	0	51.9	-	-	74	-22.1	206	298	V
	* 1.5	38.31	MAv1	27.9	-22.4	.23	44.04	54	-9.96	-	-	206	298	V
6	* 2.218	46.87	PK2	31.9	-23.2	0	55.57	-	-	74	-18.43	40	126	V
	* 2.218	34.29	MAv1	31.9	-23.2	.23	43.22	54	-10.78	-	-	40	126	V
7	* 3.618	52.81	PK2	33	-31.8	0	54.01	-	-	74	-19.99	34	103	V
	* 3.618	51.15	MAv1	33	-31.8	.23	52.58	54	-1.42	-	-	34	103	V
8	* 4.85	51.43	PK2	34	-30.9	0	54.53	-	-	74	-19.47	229	233	V
	* 4.85	49.76	MAv1	34	-30.9	.23	53.09	54	-0.91	-	-	229	233	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK2 - Maximum Peak  
 MAv1 - Maximum RMS Average

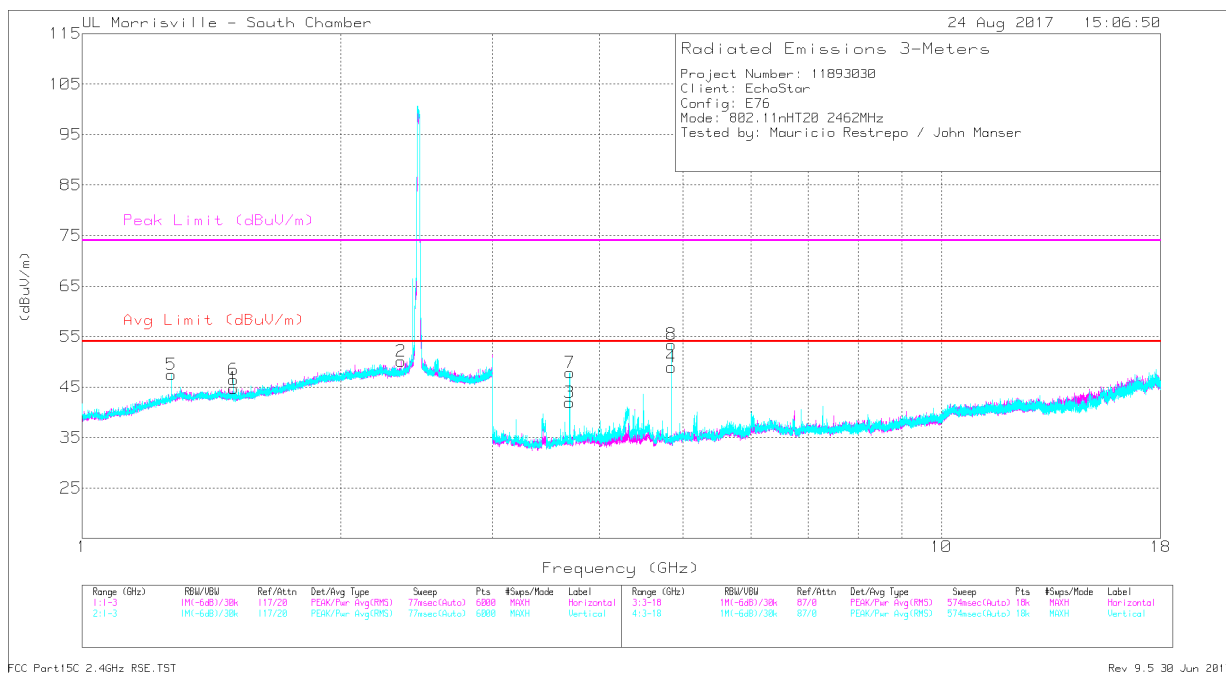
**MID CHANNEL**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (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
1	* 1.5	45.05	PK2	27.9	-22.4	0	50.55	-	-	74	-23.45	139	133	H
	* 1.5	35.33	MAV1	27.9	-22.4	.23	41.06	54	-12.94	-	-	139	133	H
2	* 3.656	49.73	PK2	33	-32.2	0	50.53	-	-	74	-23.47	289	371	H
	* 3.655	47.04	MAV1	33	-32.2	.23	48.07	54	-5.93	-	-	289	371	H
3	* 4.85	48.7	PK2	34	-30.9	0	51.8	-	-	74	-22.2	248	180	H
	* 4.85	46.3	MAV1	34	-30.9	.23	49.63	54	-4.37	-	-	248	180	H
4	* 11.417	33.09	PK2	38.2	-23.9	0	47.39	-	-	74	-26.61	94	291	H
	* 11.417	21.31	MAV1	38.2	-23.9	.23	35.84	54	-18.16	-	-	94	291	H
5	* 1.5	47.06	PK2	27.9	-22.4	0	52.56	-	-	74	-21.44	211	251	V
	* 1.5	38.2	MAV1	27.9	-22.4	.23	43.93	54	-10.07	-	-	211	251	V
6	* 3.656	52.22	PK2	33	-32.2	0	53.02	-	-	74	-20.98	2	106	V
	* 3.656	49.85	MAV1	33	-32.2	.23	50.88	54	-3.12	-	-	2	106	V
7	* 4.318	48.45	PK2	33.4	-31.9	0	49.95	-	-	74	-24.05	0	126	V
	* 4.32	32.81	MAV1	33.4	-32	.23	34.44	54	-19.56	-	-	0	126	V
8	* 4.85	45.6	PK2	34	-30.9	0	48.7	-	-	74	-25.3	63	219	V
	* 4.85	42.72	MAV1	34	-30.9	.23	46.05	54	-7.95	-	-	63	219	V
9	* 4.85	51.16	PK2	34	-30.9	0	54.26	-	-	74	-19.74	226	203	V
	* 4.85	49.56	MAV1	34	-30.9	.23	52.89	54	-1.11	-	-	226	203	V
10	* 7.275	39.02	PK2	35.5	-27.8	0	46.72	-	-	74	-27.28	42	227	V
	* 7.275	32.22	MAV1	35.5	-27.8	.23	40.15	54	-13.85	-	-	42	227	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK2 - Maximum Peak  
 MAV1 - Maximum RMS Average

**HIGH CHANNEL**

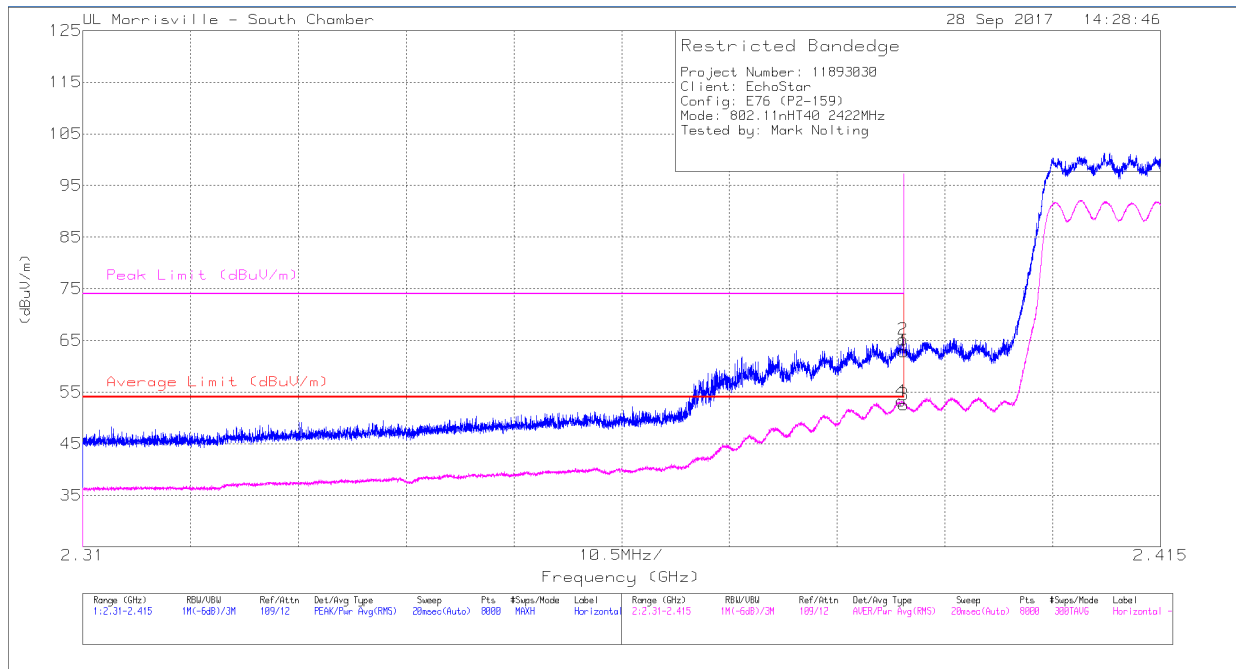


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.5	46.23	PK2	27.9	-22.4	0	51.73	-	-	74	-22.27	206	290	H
	* 1.5	37.06	MAV1	27.9	-22.4	.23	42.79	54	-11.21	-	-	206	290	H
2	* 2.354	46.79	PK2	31.7	-23.7	0	54.79	-	-	74	-19.21	106	339	H
	* 2.354	34.66	MAV1	31.7	-23.7	.23	42.89	54	-11.11	-	-	106	339	H
3	* 3.693	45.81	PK2	33.2	-32.5	0	46.51	-	-	74	-27.49	330	104	H
	* 3.693	40.92	MAV1	33.2	-32.5	.23	41.85	54	-12.15	-	-	330	104	H
4	* 4.85	47.97	PK2	34	-30.9	0	51.07	-	-	74	-22.93	223	239	H
	* 4.85	45.52	MAV1	34	-30.9	.23	48.85	54	-5.15	-	-	223	239	H
5	* 1.268	44.1	PK2	28.9	-23.2	0	49.8	-	-	74	-24.2	276	166	V
	* 1.269	32.27	MAV1	29	-23.2	.23	38.3	54	-15.7	-	-	276	166	V
6	* 1.5	46.51	PK2	27.9	-22.4	0	52.01	-	-	74	-21.99	3	163	V
	* 1.5	38.41	MAV1	27.9	-22.4	.23	44.14	54	-9.86	-	-	3	163	V
7	* 3.693	49.79	PK2	33.2	-32.5	0	50.49	-	-	74	-23.51	222	102	V
	* 3.693	46.95	MAV1	33.2	-32.5	.23	47.88	54	-6.12	-	-	222	102	V
8	* 4.85	51.44	PK2	34	-30.9	0	54.54	-	-	74	-19.46	226	210	V
	* 4.85	49.55	MAV1	34	-30.9	.23	52.88	54	-1.12	-	-	226	210	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK2 -Maximum Peak  
 MAV1 -Maximum RMS Average

**9.2.4. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 2.4 GHz BAND**

**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (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	54.87	Pk	31.9	-23.9	0	62.87	-	-	74	-11.13	135	128	H
2	* 2.39	57.19	Pk	31.9	-23.9	0	65.19	-	-	74	-8.81	135	128	H
3	* 2.39	43.76	RMS	31.9	-23.9	.79	52.55	54	-1.45	-	-	135	128	H
4	* 2.39	44.47	RMS	31.9	-23.9	.79	53.26	54	-0.74	-	-	135	128	H

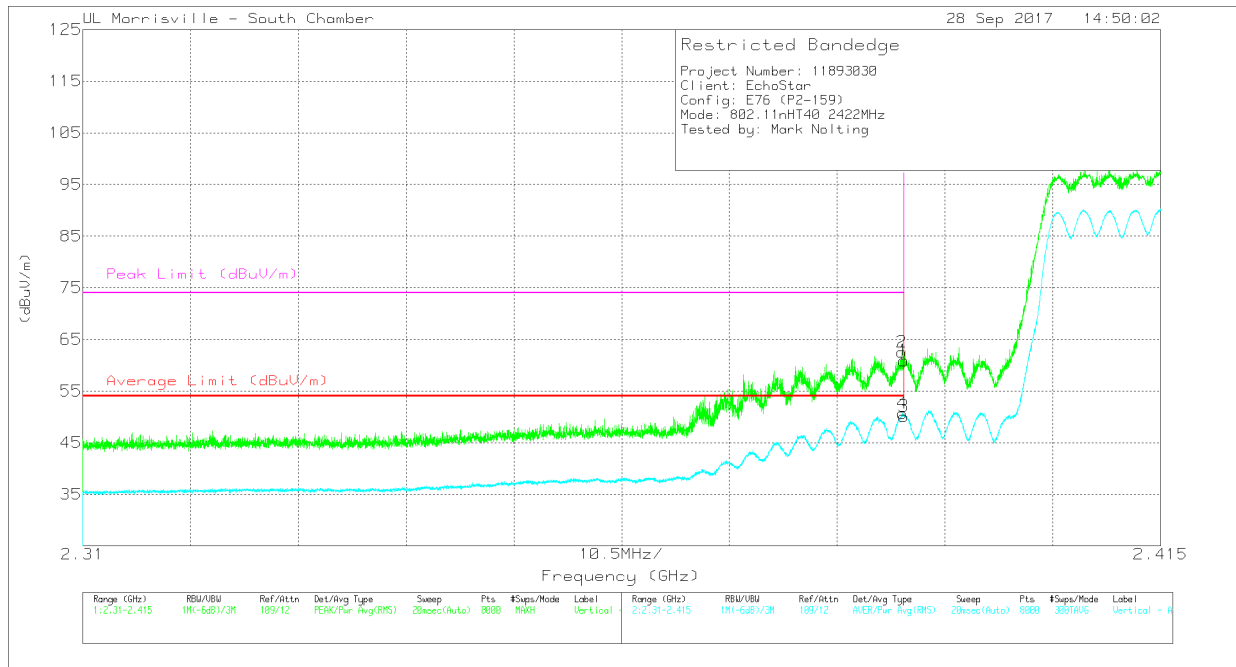
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection



**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



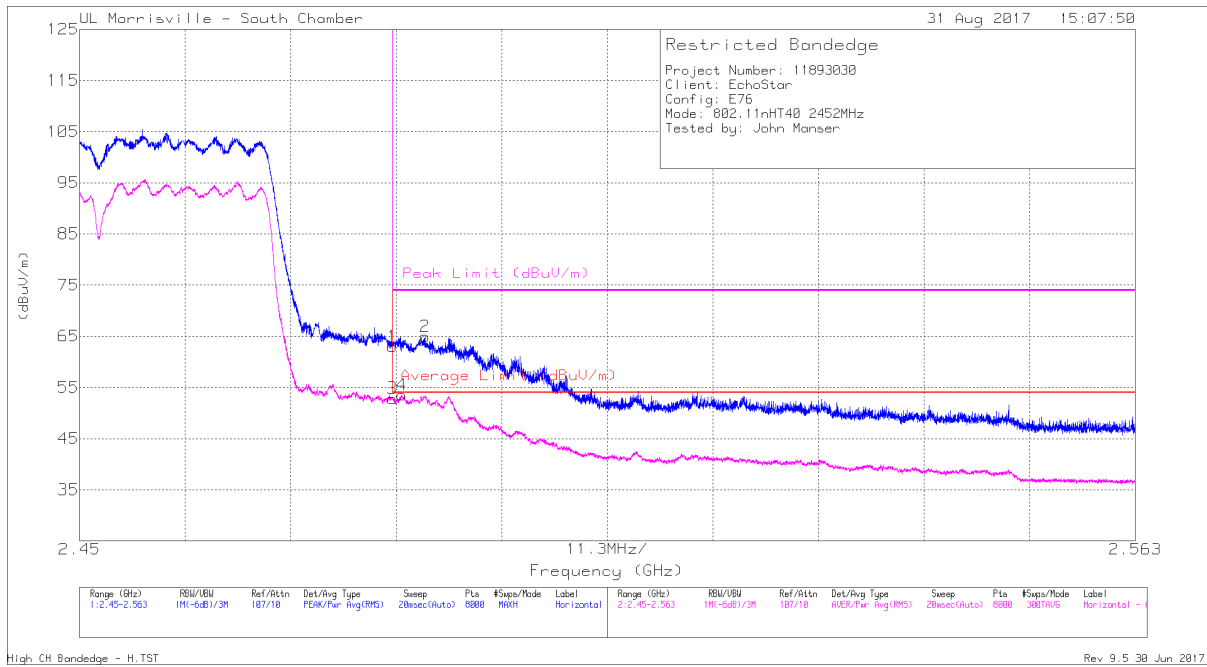
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	52.91	Pk	31.9	-23.9	0	60.91	-	-	74	-13.09	57	242	V
2	* 2.39	54.53	Pk	31.9	-23.9	0	62.53	-	-	74	-11.47	57	242	V
3	* 2.39	41.31	RMS	31.9	-23.9	.79	50.1	54	-3.9	-	-	57	242	V
4	* 2.39	41.88	RMS	31.9	-23.9	.79	50.67	54	-3.33	-	-	57	242	V

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

Pk - Peak detector

RMS - RMS detection

**AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



High CH Bandedge - H.TST

Rev 9.5 30 Jun 2017

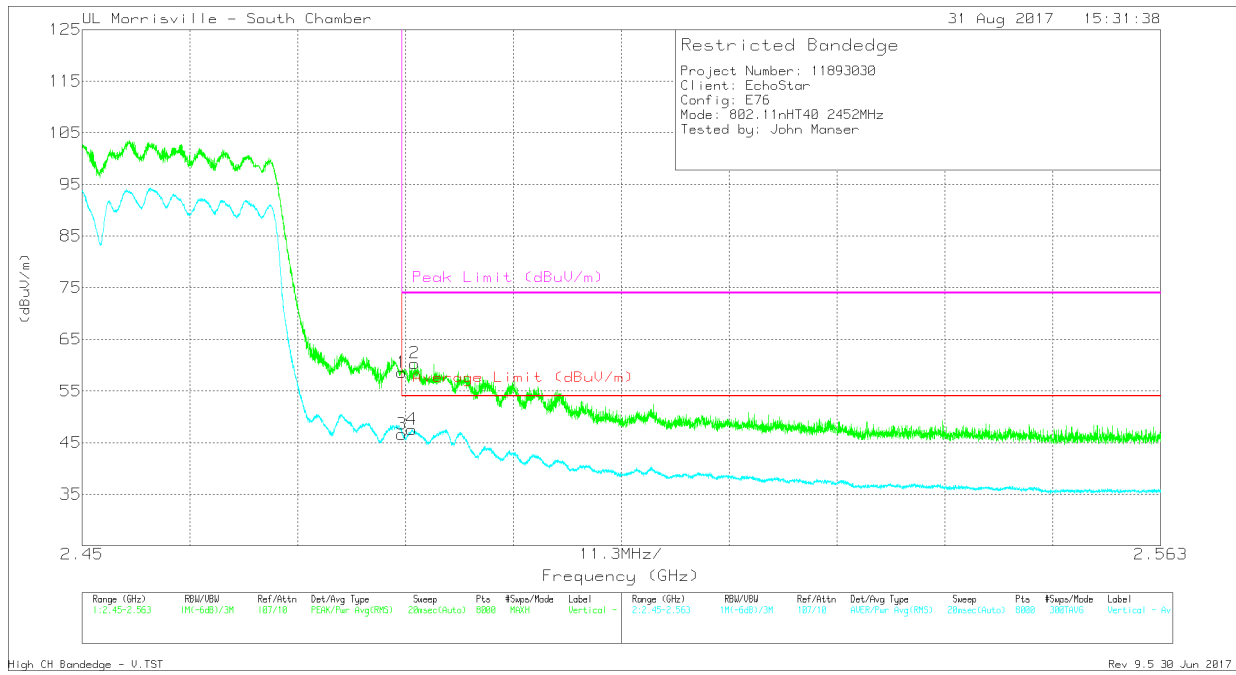
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	54.99	Pk	32.4	-24.4	0	62.99	-	-	74	-11.01	150	121	H
2	* 2.487	56.95	Pk	32.4	-24.4	0	64.95	-	-	74	-9.05	150	121	H
3	* 2.484	44.05	RMS	32.4	-24.4	0.78	52.83	54	-1.17	-	-	150	121	H
4	* 2.484	44.75	RMS	32.4	-24.4	0.78	53.53	54	-0.47	-	-	150	121	H

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

Pk - Peak detector

RMS - RMS detection

**AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**



High CH Bandedge - U.TST

Rev 9.5 30 Jun 2017

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (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	* 2.484	50.57	Pk	32.4	-24.4	0	58.57	-	-	74	-15.43	72	164	V
2	* 2.485	52.36	Pk	32.4	-24.4	0	60.36	-	-	74	-13.64	72	164	V
3	* 2.484	37.82	RMS	32.4	-24.4	0.78	46.6	54	-7.4	-	-	72	164	V
4	* 2.485	38.77	RMS	32.4	-24.4	0.78	47.55	54	-6.45	-	-	72	164	V

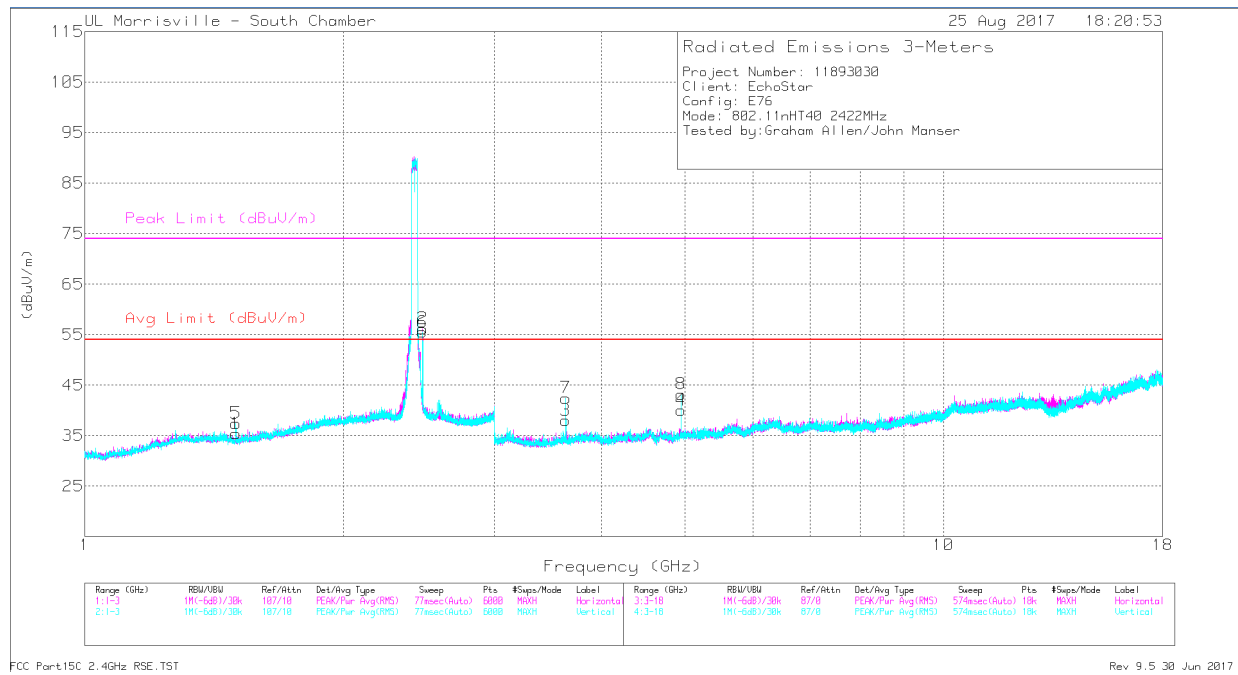
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

**HARMONICS AND SPURIOUS EMISSIONS**

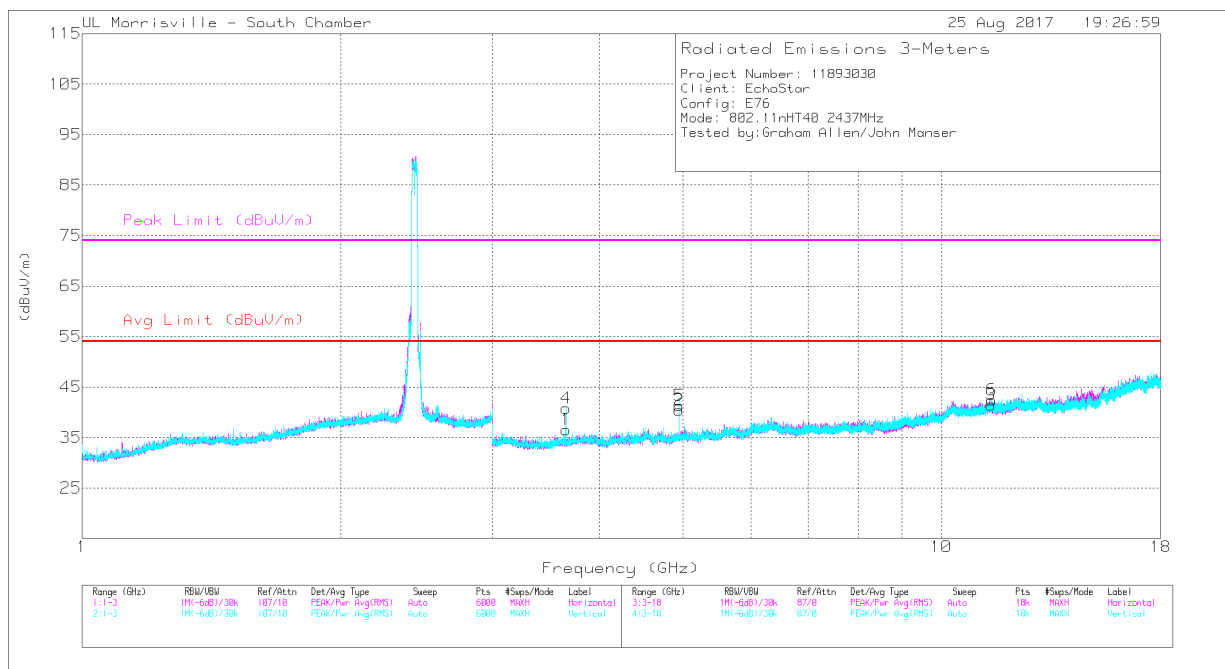
**LOW CHANNEL**



Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (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
1	* 1.5	37.47	PK2	27.9	-22.4	0	42.97	-	-	74	-31.03	188	295	H
	* 1.5	28.1	MAV1	27.9	-22.4	0.78	34.38	54	-19.62	-	-	188	295	H
3	* 3.633	44.35	PK2	33	-31.9	0	45.45	-	-	74	-28.55	279	184	H
	* 3.633	36.75	MAV1	33	-31.9	0.78	38.63	54	-15.37	-	-	279	184	H
4	* 4.95	42.89	PK2	34	-31	0	45.89	-	-	74	-28.11	190	264	H
	* 4.95	35.65	MAV1	34	-31	0.78	39.43	54	-14.57	-	-	190	264	H
5	* 1.5	38.21	PK2	27.9	-22.4	0	43.71	-	-	74	-30.29	326	303	V
	* 1.5	28.52	MAV1	27.9	-22.4	0.78	34.8	54	-19.2	-	-	326	303	V
7	* 3.633	46.22	PK2	33	-31.9	0	47.32	-	-	74	-26.68	232	104	V
	* 3.633	40.75	MAV1	33	-31.9	0.78	42.63	54	-11.37	-	-	232	104	V
8	* 4.95	44.52	PK2	34	-31	0	47.52	-	-	74	-26.48	189	196	V
	* 4.95	38.82	MAV1	34	-31	0.78	42.6	54	-11.4	-	-	189	196	V

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK2 - Maximum Peak  
 MAV1 - Maximum RMS Average

**MID CHANNEL**



Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (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
1	* 3.656	43.05	PK2	33	-32.2	0	43.85	-	-	74	-30.15	275	182	H
	* 3.655	34.46	MAV1	33	-32.2	0.78	36.04	54	-17.96	-	-	275	182	H
2	* 4.95	43.38	PK2	34	-31	0	46.38	-	-	74	-27.62	210	237	H
	* 4.95	36.28	MAV1	34	-31	0.78	40.06	54	-13.94	-	-	210	237	H
3	* 11.42	34.06	PK2	38.2	-23.9	0	48.36	-	-	74	-25.64	197	166	H
	* 11.42	22.23	MAV1	38.2	-23.9	0.78	37.31	54	-16.69	-	-	197	166	H
4	* 3.656	44.99	PK2	33	-32.2	0	45.79	-	-	74	-28.21	229	108	V
	* 3.655	38.26	MAV1	33	-32.2	0.78	39.84	54	-14.16	-	-	229	108	V
5	* 4.95	44.48	PK2	34	-31	0	47.48	-	-	74	-26.52	189	212	V
	* 4.95	39	MAV1	34	-31	0.78	42.78	54	-11.22	-	-	189	212	V
6	* 11.452	34.6	PK2	38.2	-24.3	0	48.5	-	-	74	-25.5	223	259	V
	* 11.45	20.13	Av	38.2	-24.3	0.78	34.81	54	-19.19	-	-	142	201	V

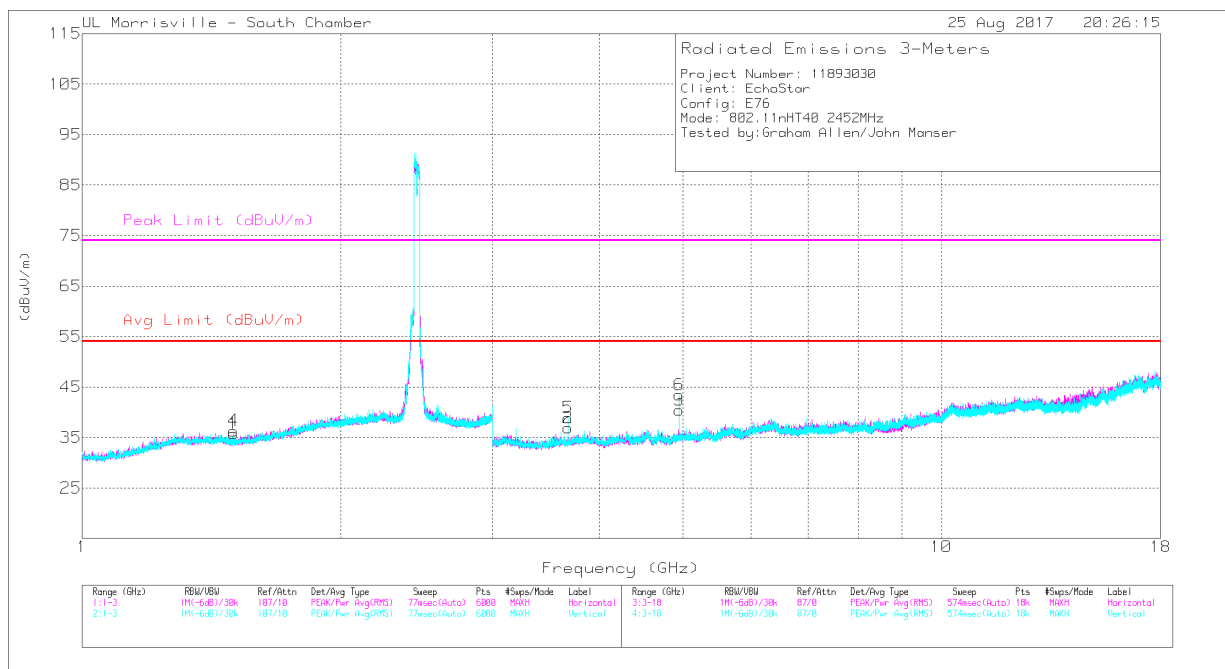
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Av - Average detection

PK2 - Maximum Peak

MAV1 - Maximum RMS Average

**HIGH CHANNEL**



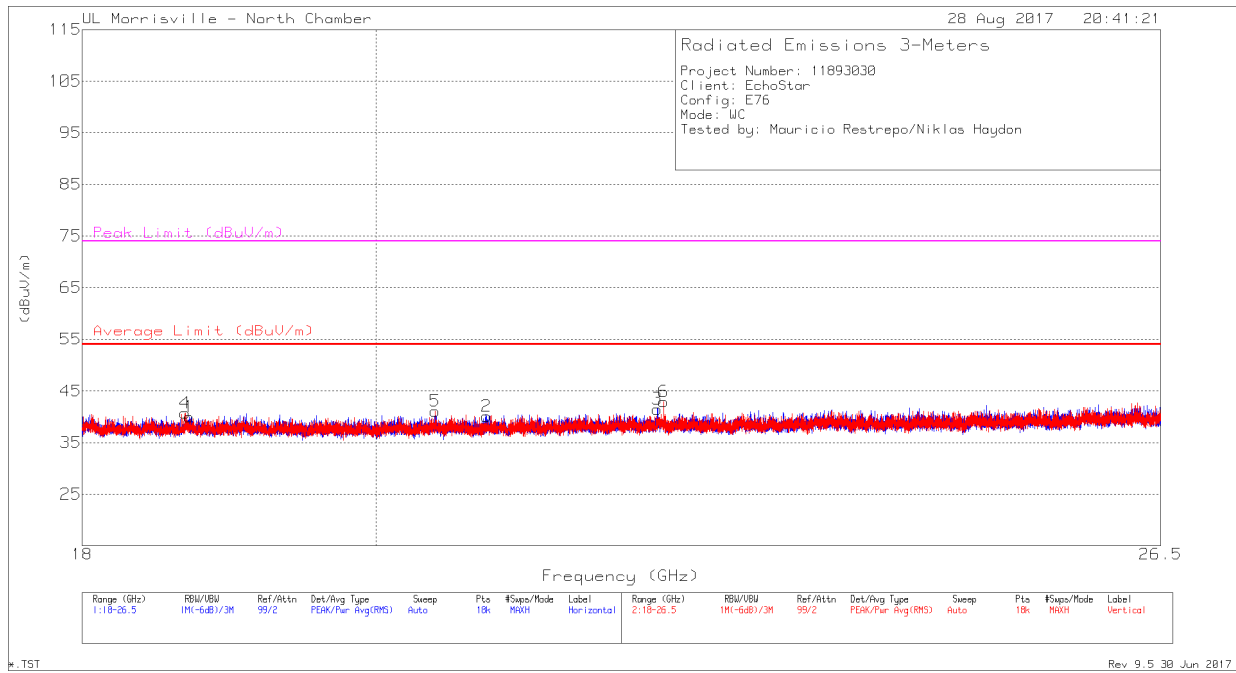
Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0069 AF (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.5	37.79	PK2	27.9	-22.4	0	43.29	-	-	74	-30.71	185	354	H
	* 1.5	27.98	MAV1	27.9	-22.4	0.78	34.26	54	-19.74	-	-	185	354	H
2	* 3.678	43.46	PK2	33.1	-32.3	0	44.26	-	-	74	-29.74	103	254	H
	* 3.678	34	MAV1	33.1	-32.3	0.78	35.58	54	-18.42	-	-	103	254	H
3	* 4.95	43.04	PK2	34	-31	0	46.04	-	-	74	-27.96	198	212	H
	* 4.95	35.64	MAV1	34	-31	0.78	39.42	54	-14.58	-	-	198	212	H
4	* 1.5	37.82	PK2	27.9	-22.4	0	43.32	-	-	74	-30.68	331	148	V
	* 1.5	28.48	MAV1	27.9	-22.4	0.78	34.76	54	-19.24	-	-	331	148	V
5	* 3.678	44.71	PK2	33.1	-32.3	0	45.51	-	-	74	-28.49	228	298	V
	* 3.678	37	MAV1	33.1	-32.3	0.78	38.58	54	-15.42	-	-	228	298	V
6	* 4.95	44.19	PK2	34	-31	0	47.19	-	-	74	-26.81	187	200	V
	* 4.95	38.11	MAV1	34	-31	0.78	41.89	54	-12.11	-	-	187	200	V

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

PK2 - Maximum Peak

MAV1 - Maximum RMS Average

**SPURIOUS EMISSIONS 18 to 26 GHz (WORST-CASE CONFIGURATION)**



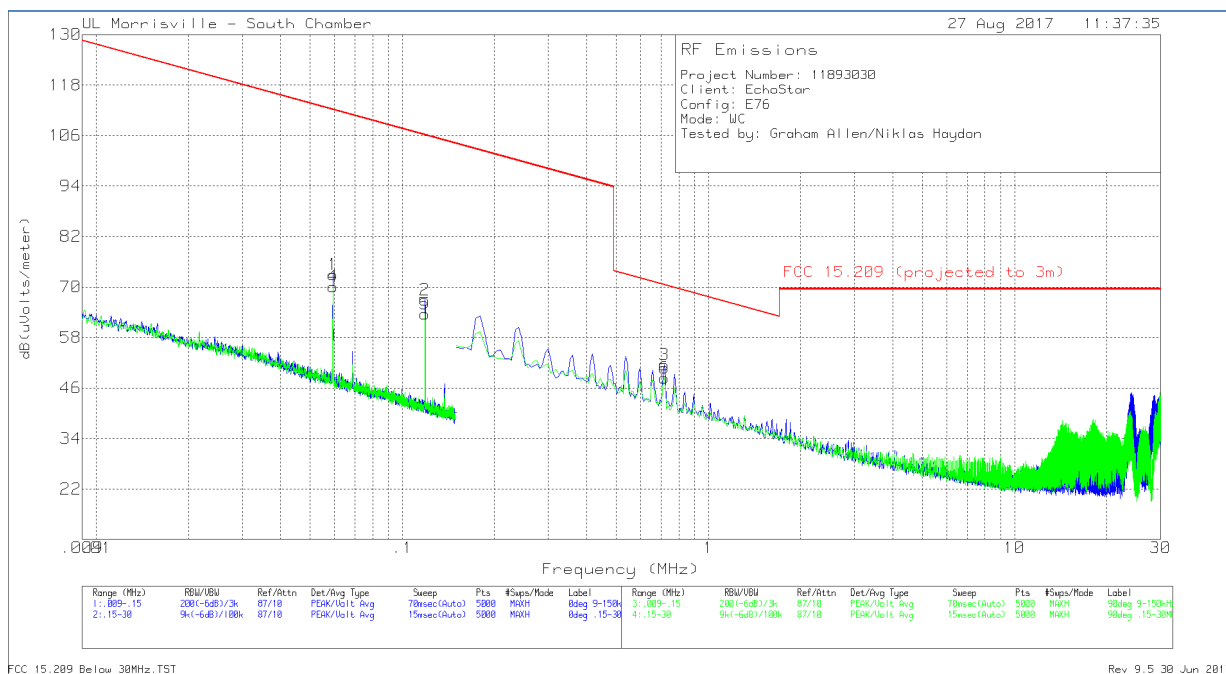
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0076 (dB/m)	Amp/Cbl (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 18.704	48.2	Pk	32.7	-40.9	0	40	54	-14	74	-34	0-360	202	H
2	* 20.809	48.21	Pk	33.2	-41.3	0	40.11	54	-13.89	74	-33.89	0-360	202	H
3	* 22.125	48.6	Pk	33.6	-40.7	0	41.5	54	-12.5	74	-32.5	0-360	202	H
4	* 18.677	48.5	Pk	32.7	-40.5	0	40.7	54	-13.3	74	-33.3	0-360	252	V
5	* 20.427	49.14	Pk	33.2	-41.3	0	41.04	54	-12.96	74	-32.96	0-360	102	V
6	* 22.173	50.54	Pk	33.4	-41	0	42.94	54	-11.06	74	-31.06	0-360	202	V

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

### 9.3. WORST-CASE SPURIOUS EMISSIONS 9 kHz TO 30 MHz (WORST-CASE CONFIGURATION)

**Note:** All measurements were made at a test distance of 3 m. The limits in the plots and tabular data are the FCC/IC limits extrapolated from the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to the measurement distance to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40\*Log (specification distance / test distance) per FCC 15.31 (f) (2).

Although these tests were performed at a test site other than an open area test site, adequate comparison measurements were confirmed against an open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

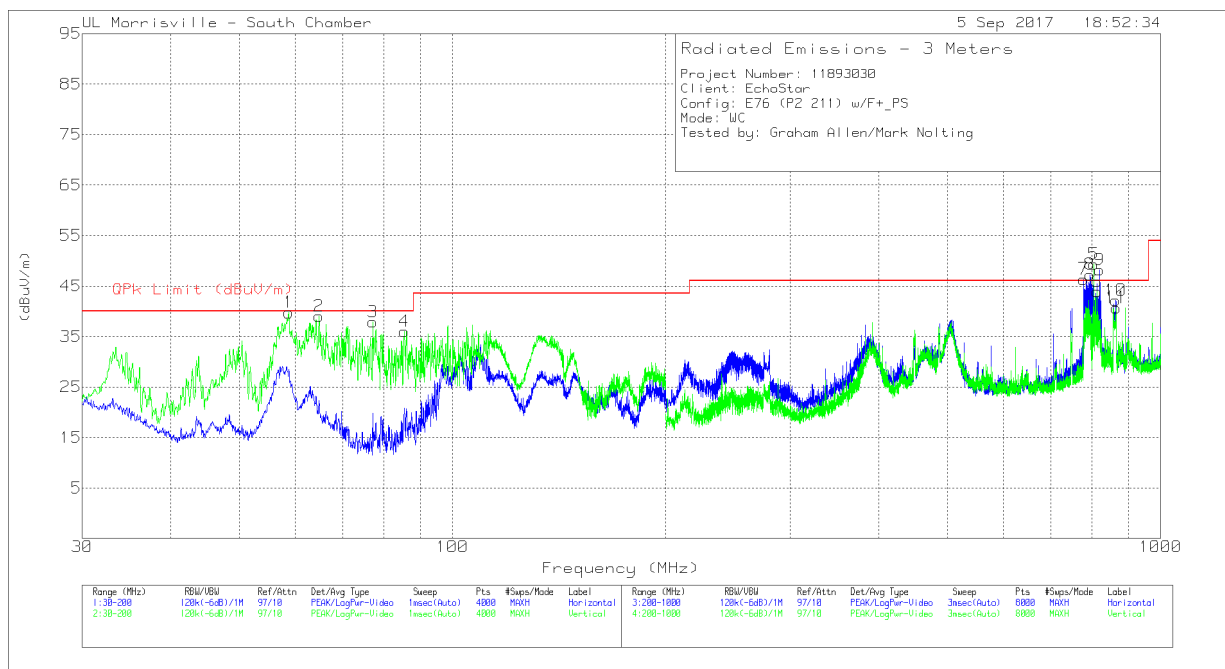


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 (projected to 3m)	Margin (dB)	Azimuth (Degs)
1	.05932	61.34	Pk	11.5	.1	72.94	112.14	-39.2	0-360
4	.05937	58.54	Pk	11.5	.1	70.14	112.13	-41.99	0-360
2	.11868	56.01	Pk	10.8	.1	66.91	106.12	-39.21	0-360
5	.11869	52.66	Pk	10.8	.1	63.56	106.12	-42.56	0-360
3	.71725	40.68	Pk	10.7	.1	51.48	70.49	-19.01	0-360
6	.71725	37.52	Pk	10.7	.1	48.32	70.49	-22.17	0-360

Pk - Peak detector



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



Markers	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7	775.7652	26.97	Qp	25.8	-27.9	.22	25.09	46.02	-20.93	25	209	H
8	794.3874	38.23	Qp	25.7	-28	.22	36.15	46.02	-9.87	335	197	H
9	820.4206	37.4	Qp	26.4	-27.8	.22	36.22	46.02	-9.8	251	187	H
10	864.0223	38.66	Qp	26.6	-27.4	.22	38.08	46.02	-7.94	181	107	H
1	58.6762	55.51	Qp	11.8	-31.4	.22	36.13	40	-3.87	227	105	V
2	64.7645	54.59	Qp	12.2	-31.4	.22	35.61	40	-4.39	240	143	V
3	77.2131	55.65	Qp	12.3	-31.3	.22	36.87	40	-3.13	211	110	V
4	85.5159	53.11	Qp	11.6	-31.1	.22	33.83	40	-6.17	280	110	V
5	805.0386	39.27	Qp	26.1	-27.8	.22	37.79	46.02	-8.23	38	138	V
6	813.1477	34.22	Qp	26.3	-27.7	.22	33.04	46.02	-12.98	337	187	V
11	865.6965	39.73	Qp	26.6	-27.3	.22	39.25	46.02	-6.77	277	127	V

Qp - Quasi-Peak detector

## 10. AC POWER LINE CONDUCTED EMISSIONS LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

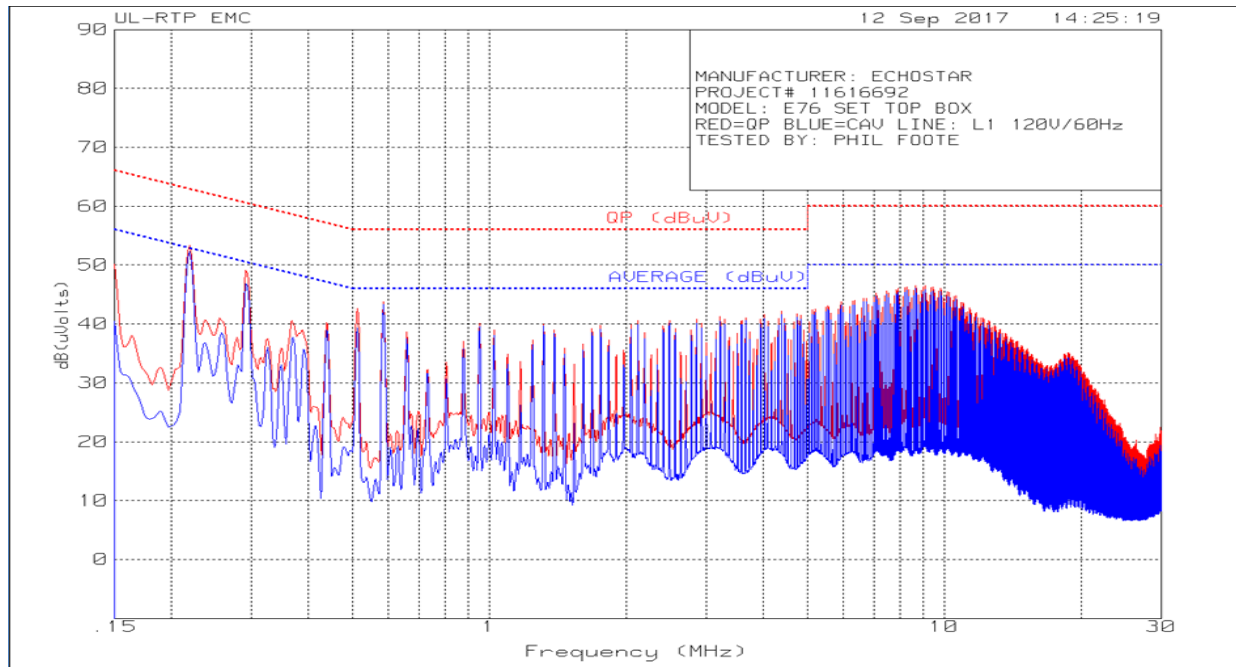
### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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 lines.

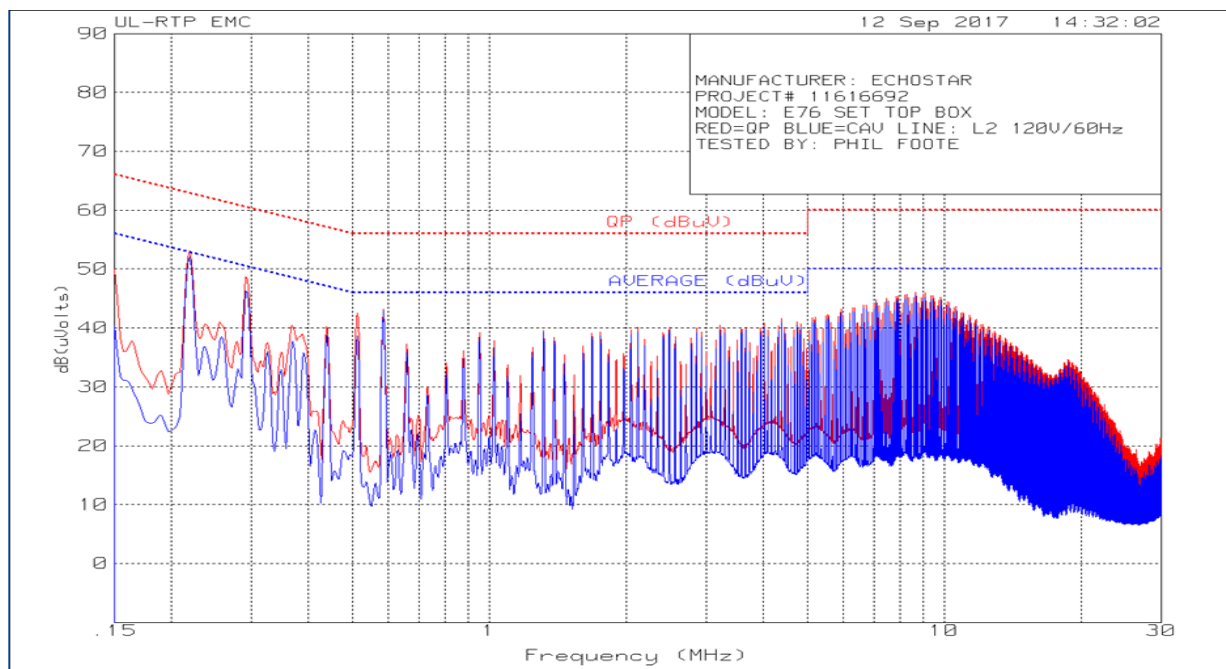
**LINE 1 RESULTS**



Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002_DUE 2018-08-23	ATA508_509 DUE_2018-08-31	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AVERAGE (dBuV)	Margin (dB)
.21975	42.9	Ca	.2	9.2	52.3	-	-	52.83	-.53
.29175	37.61	Ca	.1	9.2	46.91	-	-	50.47	-3.56
.51225	30.09	Ca	.1	9.2	39.39	-	-	46	-6.61
.58425	34.03	Ca	.1	9.2	43.33	-	-	46	-2.67
4.389	32.28	Ca	0	9.3	41.58	-	-	46	-4.42
8.6325	36.54	Ca	.1	9.4	46.04	-	-	50	-3.96
.21975	43.98	Qp	.2	9.2	53.38	62.83	-9.45	-	-
.29175	39.81	Qp	.1	9.2	49.11	60.47	-11.36	-	-
.51225	33.32	Qp	.1	9.2	42.62	56	-13.38	-	-
.58425	34.46	Qp	.1	9.2	43.76	56	-12.24	-	-
4.389	32.91	Qp	0	9.3	42.21	56	-13.79	-	-
8.6325	37.06	Qp	.1	9.4	46.56	60	-13.44	-	-

Qp - Quasi-Peak detector  
 Ca - CISPR average detection

**LINE 2 RESULTS**



Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002_DUE 2018-08-23	ATA508_509 DUE_2018-08-31	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AVERAGE (dBuV)	Margin (dB)
.21975	42.68	Ca	.2	9.2	52.08	-	-	52.83	-.75
.29175	37.05	Ca	.1	9.2	46.35	-	-	50.47	-4.12
.51225	29.37	Ca	.1	9.2	38.67	-	-	46	-7.33
.58425	33.52	Ca	.1	9.2	42.82	-	-	46	-3.18
4.389	31.67	Ca	0	9.3	40.97	-	-	46	-5.03
9.07125	35.71	Ca	.1	9.4	45.21	-	-	50	-4.79
.21975	43.71	Qp	.2	9.2	53.11	62.83	-9.72	-	-
.29175	39.41	Qp	.1	9.2	48.71	60.47	-11.76	-	-
.51225	33.26	Qp	.1	9.2	42.56	56	-13.44	-	-
.58425	33.95	Qp	.1	9.2	43.25	56	-12.75	-	-
4.389	32.32	Qp	0	9.3	41.62	56	-14.38	-	-
9.07125	36.42	Qp	.1	9.4	45.92	60	-14.08	-	-

Qp - Quasi-Peak detector  
 Ca - CISPR average detection