



**FCC 47 CFR PART 15 SUBPART C
CERTIFICATION TEST REPORT**

For

Network Video Recorder

MODEL NUMBER: DHI-NVR2108HS-W-4KS2

FCC ID: SVNDHNVR21HSW

REPORT NUMBER: 4788560194.2-4

ISSUE DATE: September 12, 2018

Prepared for

**ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD.
No.1199, Bin'an Road, Binjiang District, Hangzhou, P.R. China**

Prepared by

**UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch
Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake Hi-
Tech Development Zone Dongguan, 523808, People's Republic of China**

Tel: +86 769 22038881

Fax: +86 769 33244054

Website: www.ul.com

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	09/12/2018	Initial Issue	

Summary of Test Results			
Clause	Test Items	FCC Rules	Test Results
1	6dB Bandwidth	FCC 15.247 (a) (2)	PASS
2	Peak Conducted Output Power	FCC 15.247 (b) (3)	PASS
3	Power Spectral Density	FCC 15.247 (e)	PASS
4	Conducted Bandedge and Spurious Emission	FCC 15.247 (d)	PASS
5	Radiated Bandedge and Spurious Emission	FCC 15.247 (d) FCC 15.209 FCC 15.205	PASS
6	Conducted Emission Test For AC Power Port	FCC 15.207	PASS
7	Antenna Requirement	FCC 15.203	PASS

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD.
Address: No.1199, Bin'an Road, Binjiang District, Hangzhou, P.R. China

Manufacturer Information

Company Name: ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD.
Address: No.1199, Bin'an Road, Binjiang District, Hangzhou, P.R. China

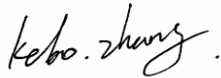
EUT Description

Product Name Network Video Recorder
Model Name DHI-NVR2108HS-W-4KS2

Sample Status Good
Sample Received date August 13, 2018
Date Tested August 15~September 10, 2018

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

Tested By:



Kebo Zhang
Engineer

Checked By:



Shawn Wen
Laboratory Leader

Approved By:



Stephen Guo
Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB558074 D01 DTS Meas Guidance v05, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013 and KDB 662911 D01 Multiple Transmitter Output v02r01.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	<p>A2LA (Certificate No.: 4102.01) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA.</p> <p>FCC (FCC Designation No.: CN1187) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules</p> <p>IC(Company No.: 21320) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320.</p> <p>VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011</p>
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Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OATS.

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 recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

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

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.90dB
Uncertainty for Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	2.2dB
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.52dB
Uncertainty for Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	5.04dB(1-6GHz)
	5.30dB (6GHz-18Gz)
	5.23dB (18GHz-26Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Equipment	Network Video Recorder
Model Name	DHI-NVR2108HS-W-4KS2
Series model	DHI-NVR2108HS-W-4KS2,DHI-NVR2104HS-W-4KS2 N41B1W,DHI-NVR21XYHS-W-4KSZ,DH-NVR21XYHS-W-4KSZ, NVR21XYHS-W-4KSZ, N41BZW
Model difference	Different: only the name and the number of channels for audio, video input and output are different (different ways are supported by software functions, the hardware structure is the same), 04 stands for 4 channels, 08 stands for 8 channels; XY can be 04,08,16,32,64. Z can be 0~9 (only the version number of different product models of the same product is different, no hardware information is involved); the structure of the product is the same as that of the power supply. The electrical principle and key components are identical and do not affect the safety and electromagnetic compatibility of the product.
Radio Technology	IEEE802.11b/g/n HT20
Operation frequency	IEEE 802.11b: 2412MHz—2462MHz IEEE 802.11g: 2412MHz—2462MHz IEEE 802.11n HT20: 2412MHz—2462MHz
Modulation	IEEE 802.11b: DSSS(CCK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)
Power Supply	AC120V/60Hz

5.2. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Number of Transmit ANT's (NTX)	IEE Std. 802.11	Channel Number	Max Conducted PEAK Power (dBm)
2412-2462	2	b	1-11[11]	10.25
2412-2462	2	g	1-11[11]	17.67
2412-2462	2	n HT20	1-11[11]	17.51

Note: All mode support MIMO mode.

5.3. CHANNEL LIST

Channel List for 802.11b/g/n (20 MHz)					
Channel	Frequency (MHz)	Channel	Frequency(MHz)	Channel	Frequency (MHz)
1	2412	5	2432	9	2452
2	2417	6	2437	10	2457
3	2422	7	2442	11	2462
4	2427	8	2447	12	/

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
WiFi TX(802.11b)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11g)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11n HT20)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Software		Tera Term		
Modulation Mode	Transmit Antenna Number	Test Channel		
		NCB: 20MHz		
		CH 1	CH 6	CH 11
802.11b	1	4	4	4
802.11g	1	6.5	6.5	6.5
802.11n HT20	1	6.5	6.5	6.5
802.11b	2	4	4	4
802.11g	2	6.5	6.5	6.5
802.11n HT20	2	6.5	6.5	6.5

5.6. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28°C
Voltage :	VL	N/A
	VN	AC 120V/60Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage
 VN= Nominal Voltage
 VH= Upper Extreme Test Voltage
 TN= Normal Temperature

5.7. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2412-2462	Omni-directional	4.44
2	2412-2462	Omni-directional	3.74

Note: Directional gain= $10\log[(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}] = 7.11 > 6\text{dBi}$

N_{ANT} : the number of Antenna

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11b	<input checked="" type="checkbox"/> 2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.
IEEE 802.11g	<input checked="" type="checkbox"/> 2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.
IEEE 802.11n HT20	<input checked="" type="checkbox"/> 2TX, 2RX	ANT 1, 2 can be used as transmitting/receiving antenna.

Note: All mode support MIMO mode.

5.8. WORST-CASE CONFIGURATIONS

IEE Std. 802.11	Modulation Technology	Modulation Type	Data Rate (Mbps)	Worst Case (Mbps)
b	DSSS	CCK	11/5.5/2/1	1
g	OFDM	BPSK, QPSK, 16QAM, 64QAM	54/48/36/24/18/12/9/6	6
n HT20	OFDM	BPSK, QPSK, 16QAM, 64QAM	MCS0~MCS15	MCS0

Note: 1.All mode support MIMO mode.

2.SISO mode and MIMO mode have the same power setting, so only the worst case MOMI mode will be record in the report.

5.9. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	PC	Dell	Vostro 3902	8KNDDDB2
2	USB TO RS232	N/A	N/A	N/A

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	N/A	N/A	0.5	N/A
2	Network Line	N/A	N/A	0.8	N/A

ACCESSORY

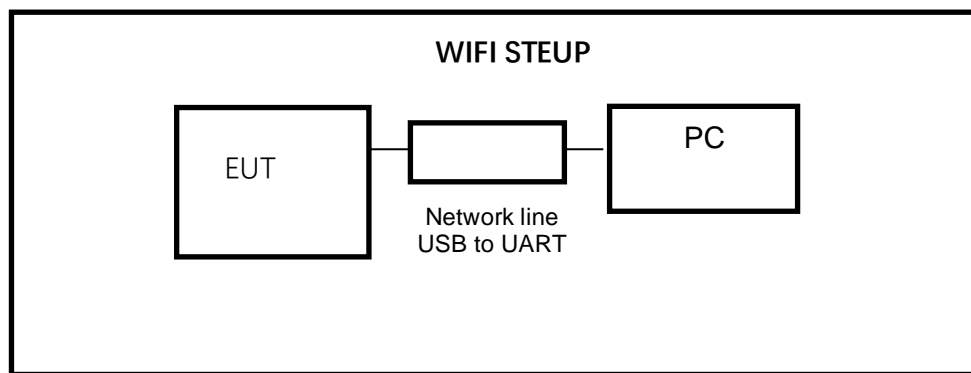
Item	Accessory	Brand Name	Model Name	Description
1	Adapter	HONOR	ADS-26FSG-12	Input: AC 100-240, 50/60Hz, 0.6A Output: 12V 2A
2	Adapter	MASS	S024-1A120200	Input: AC 100-240, 50/60Hz, 0.6A Output: 12V 2A

Note: Both adapters have been pre-tested and only the worst case adapter data(MASS) is recorded in the report.

TEST SETUP

The EUT can work in engineering mode with a software through a PC.

SETUP DIAGRAM FOR TESTS



5.10. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	EMI Test Receiver	R&S	ESR3	101961	Dec.12,2017	Dec.11,2018
<input checked="" type="checkbox"/>	Two-Line V-Network	R&S	ENV216	101983	Dec.12,2017	Dec.11,2018
<input checked="" type="checkbox"/>	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Dec.12,2017	Dec.11,2018
Software						
Used	Description	Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Conducted disturbance	Farad	EZ-EMC	Ver. UL-3A1		
Radiated Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec.12,2017	Dec.11,2018
<input checked="" type="checkbox"/>	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Jan.09, 2016	Jan.09, 2019
<input checked="" type="checkbox"/>	Preamplifier	HP	8447D	2944A09099	Dec.12,2017	Dec.11,2018
<input checked="" type="checkbox"/>	EMI Measurement Receiver	R&S	ESR26	101377	Dec.12,2017	Dec.11,2018
<input checked="" type="checkbox"/>	Horn Antenna	TDK	HRN-0118	130939	Jan. 09, 2016	Jan. 09, 2019
<input checked="" type="checkbox"/>	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Jan.06, 2016	Jan.06, 2019
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Dec.12,2017	Dec.11,2018
<input checked="" type="checkbox"/>	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec.12,2017	Dec.11,2018
<input checked="" type="checkbox"/>	Loop antenna	Schwarzbeck	1519B	00008	Mar. 26, 2016	Mar. 25, 2019
<input checked="" type="checkbox"/>	Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	4	Dec.12, 2017	Dec.11, 2018
<input checked="" type="checkbox"/>	High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Dec.12, 2017	Dec.11, 2018
Software						
Used	Description	Manufacturer	Name	Version		
<input checked="" type="checkbox"/>	Test Software for Radiated disturbance	Farad	EZ-EMC	Ver. UL-3A1		

Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9030A	MY55410512	Dec.12,2017	Dec.11,2018
<input checked="" type="checkbox"/>	Power Meter	Keysight	N1911A	MY55416024	Dec.12,2017	Dec.11,2018
<input checked="" type="checkbox"/>	Power Sensor	Keysight	N1921A	MY51100041	Dec.12,2017	Dec.11,2018

6. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6dB Bandwidth	KDB 558074 D01 DTS Meas Guidance v05	8.0
2	Peak Output Power	KDB 558074 D01 DTS Meas Guidance v05	9.1.1
3	Power Spectral Density	KDB 558074 D01 DTS Meas Guidance v05	10.2
4	Out-of-band emissions in non-restricted bands	KDB 558074 D01 DTS Meas Guidance v05	11.0
5	Out-of-band emissions in restricted bands	KDB 558074 D01 DTS Meas Guidance v05	12.1
6	Band-edge	KDB 558074 D01 DTS Meas Guidance v05	13.3.2
7	Conducted Emission Test For AC Power Port	ANSI C63.10-2013	7.3
8	99% Occupied bandwidth	ANSI C63.10-2013	6.9.3

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

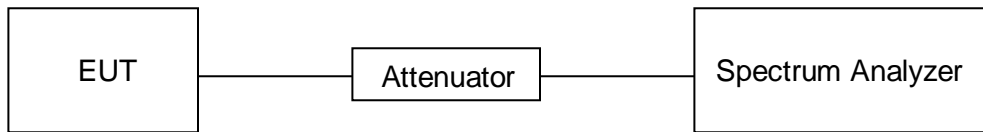
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	24.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

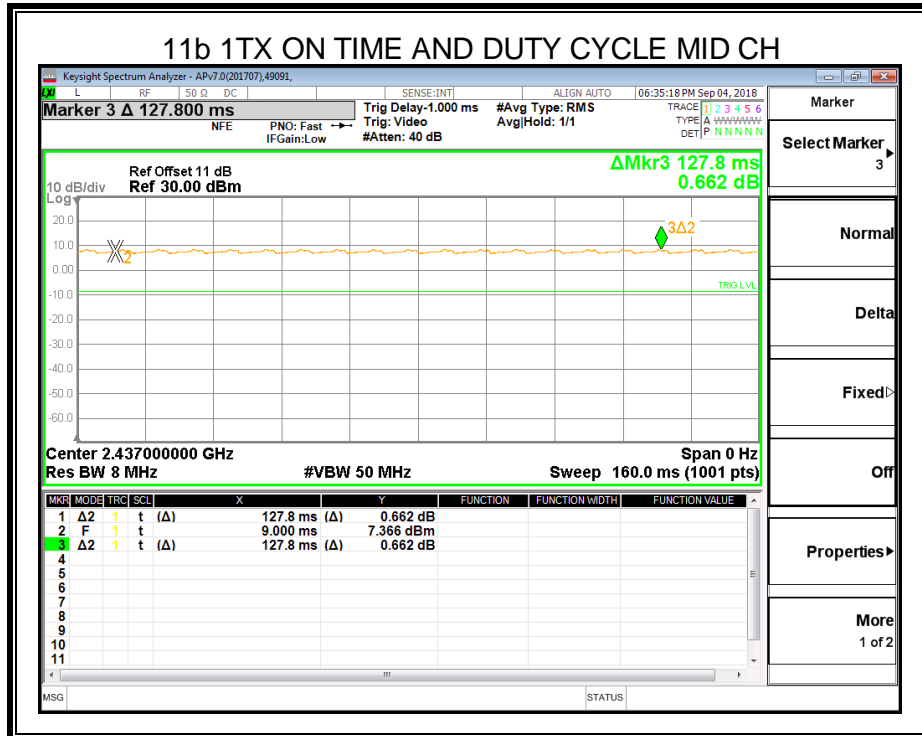
RESULTS

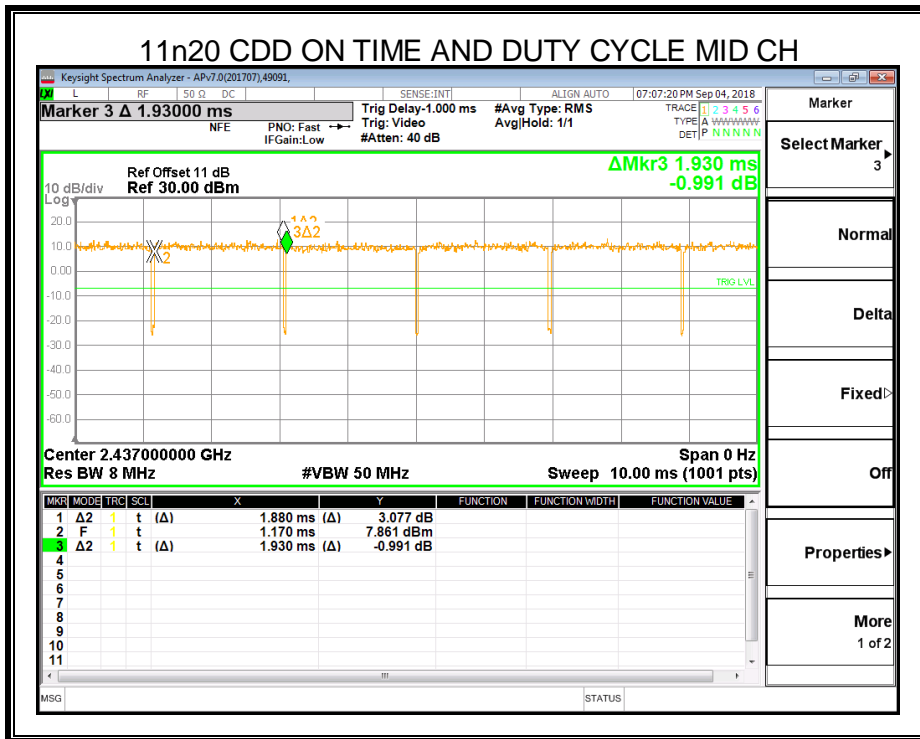
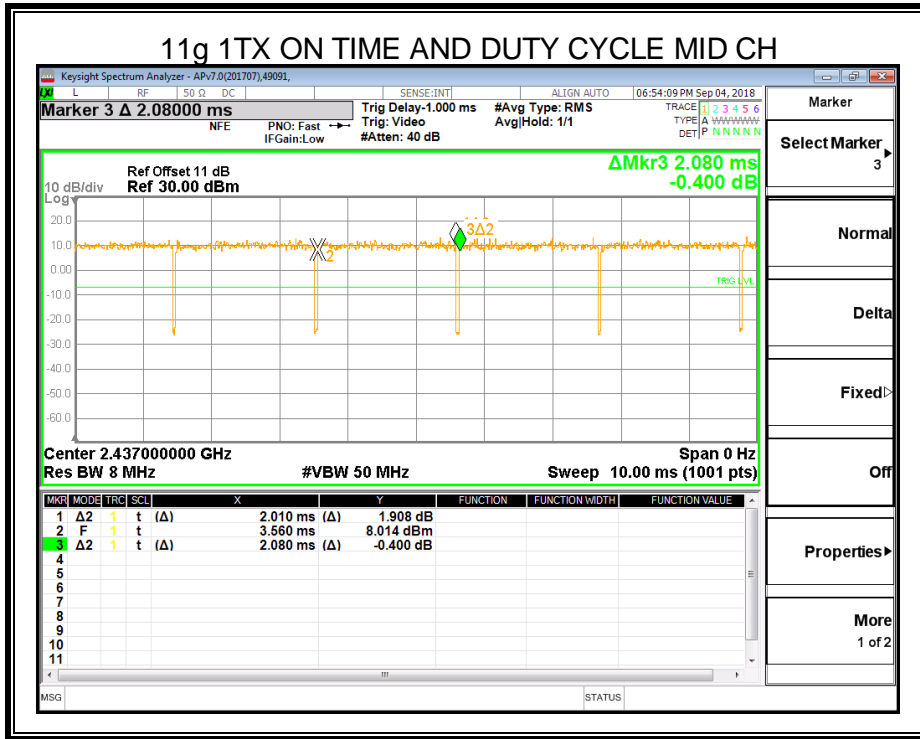
ANTENNA1

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/B Minimum VBW (KHz)
11b	127.8	127.8	1	100	0	0.01
11g	2.01	2.08	0.97	97	0.13	0.50
11n20	1.88	1.93	0.97	97	0.13	1.00

Note: Duty Cycle Correction Factor=10log(1/x).
Where: x is Duty Cycle (Linear)
Where: B is On Time

Antenna 1 and Antenna 2 has the same duty cycle, only Antenna 1 data show here.





7.2. 6 dB DTS BANDWIDTH AND 99% BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(a)(2) RSS-247 5.1 (a)	6 dB Bandwidth	$\geq 500\text{KHz}$	2400-2483.5
C63.10 Clause 6.9.3	99% Bandwidth	For reporting purposes only.	2400-2483.5

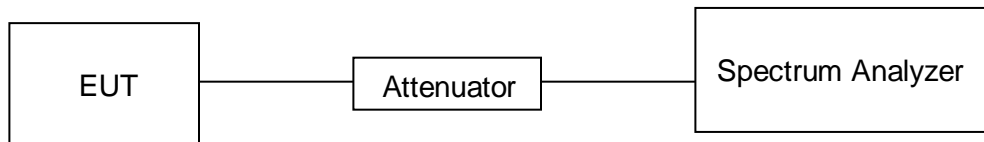
TEST PROCEDURE

Connect the UUT to the spectrum analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 6dB Bandwidth :100K For 99% Bandwidth :1% to 5% of the occupied bandwidth
VBW	For 6dB Bandwidth : $\geq 3 \times \text{RBW}$ For 99% Bandwidth : approximately $3 \times \text{RBW}$
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB and 99% relative to the maximum level measured in the fundamental emission.

TEST SETUP



TEST ENVIRONMENT

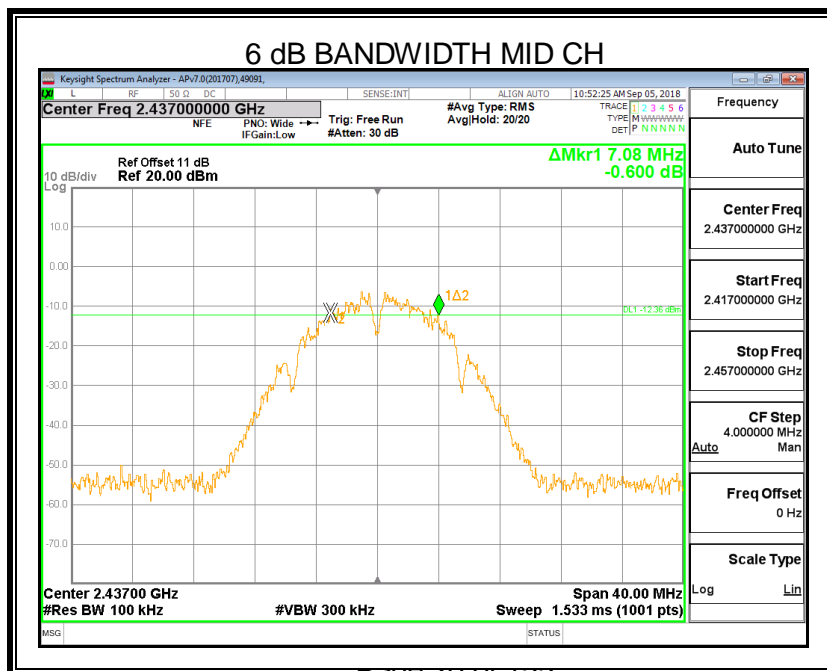
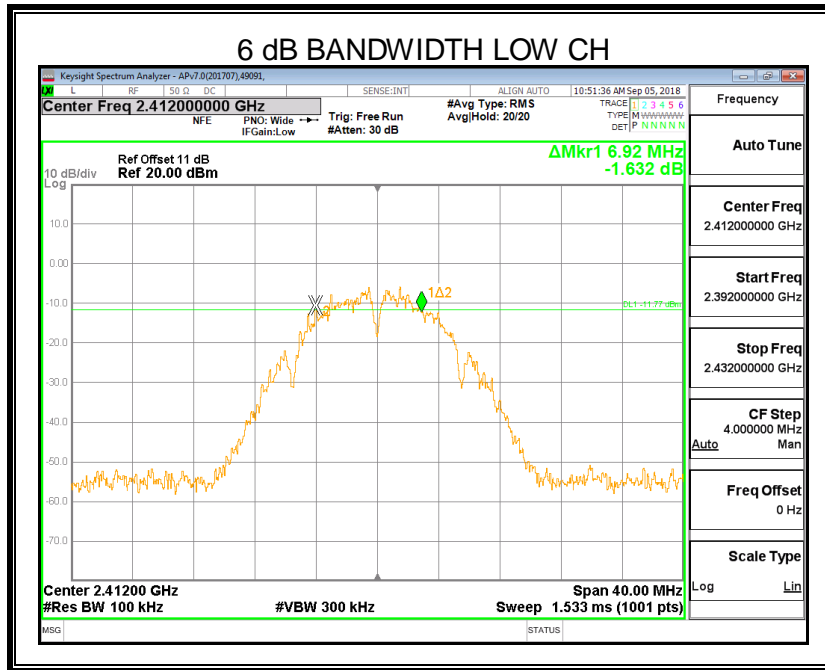
Temperature	24.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

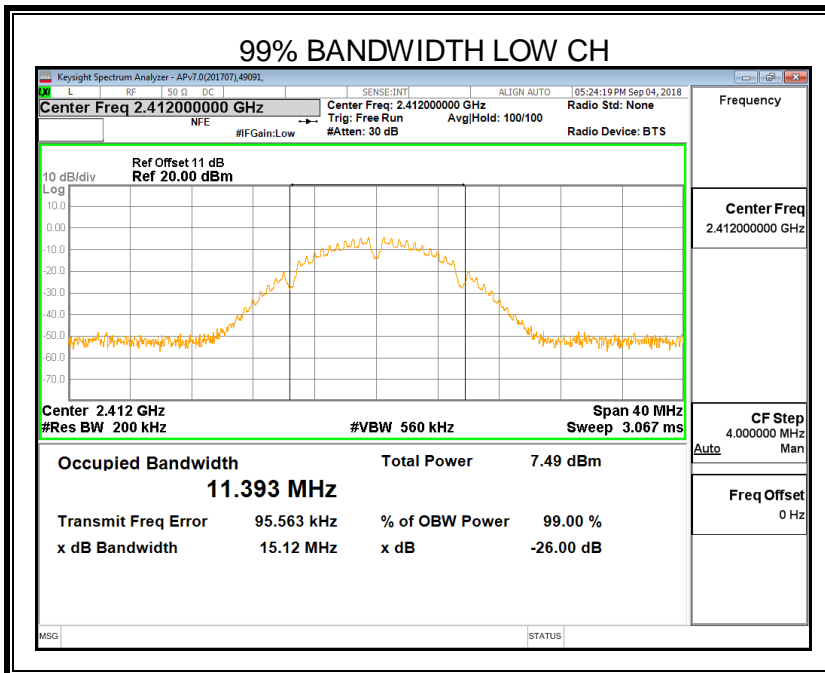
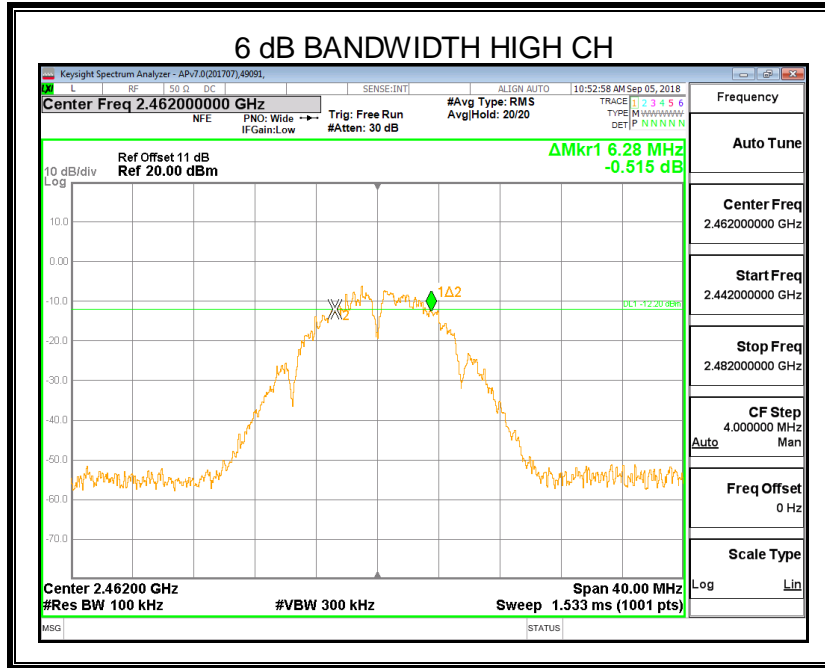
RESULTS

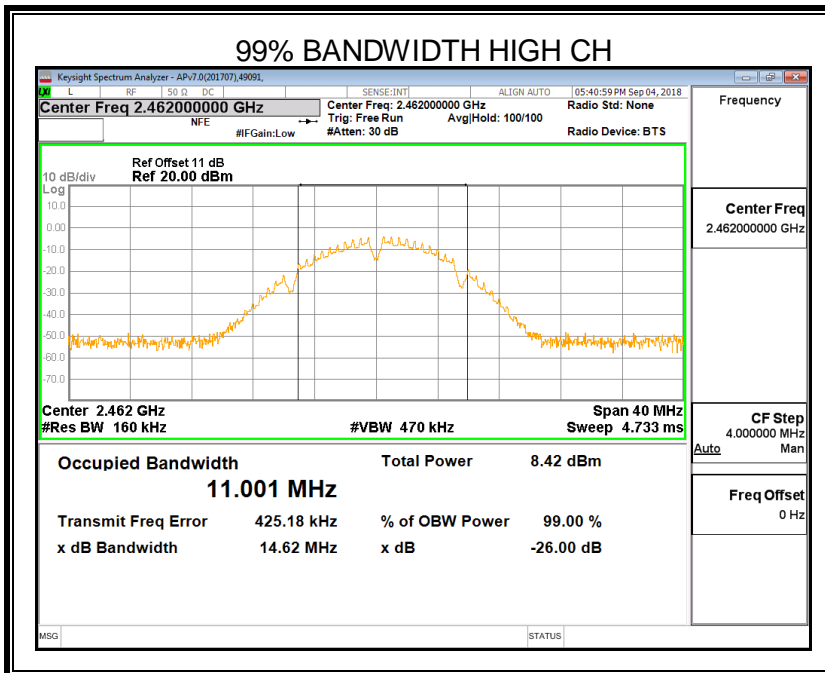
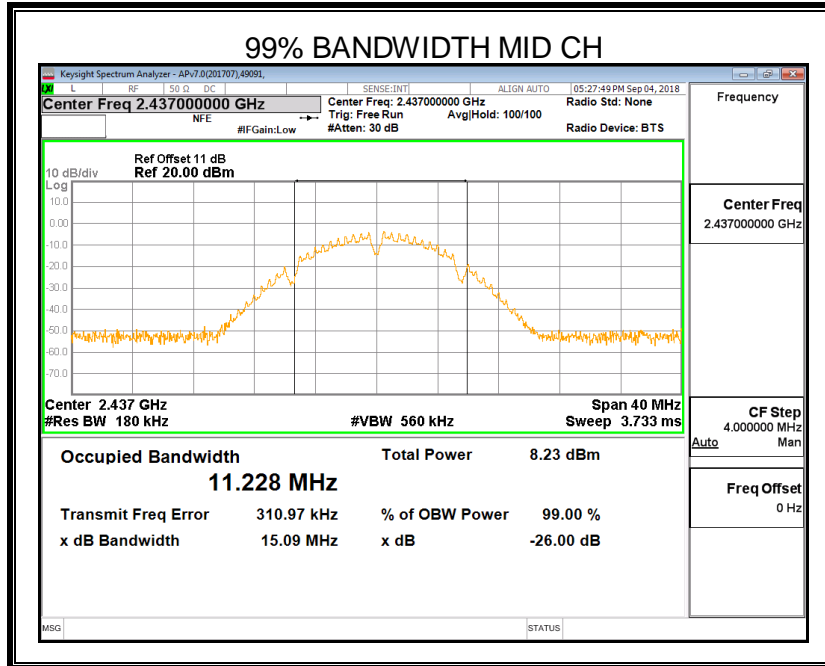
7.2.1. 802.11b MIMO MODE

ANTENNA1

Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB (kHz)	Result
2412	6.92	11.393	500	Pass
2437	7.08	11.228	500	Pass
2462	6.28	11.001	500	Pass

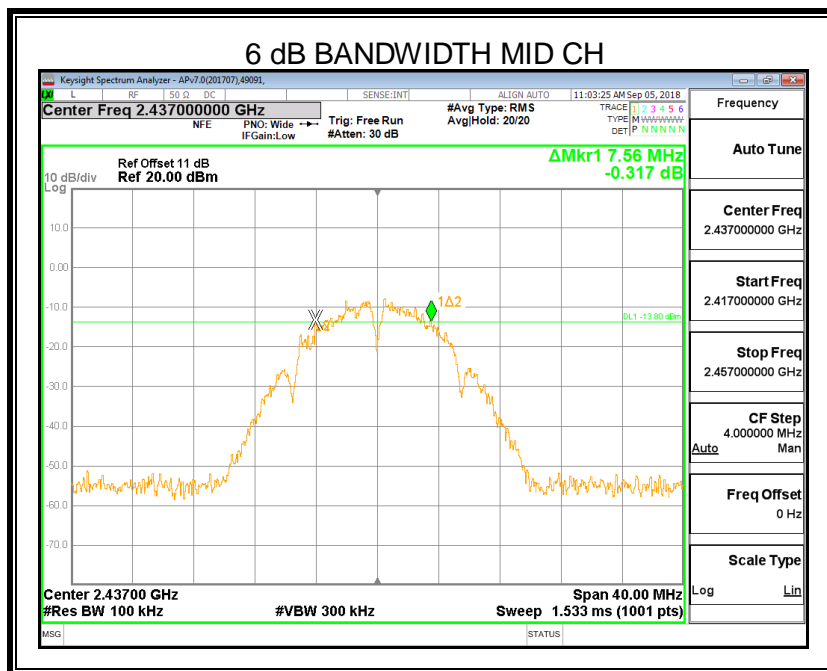
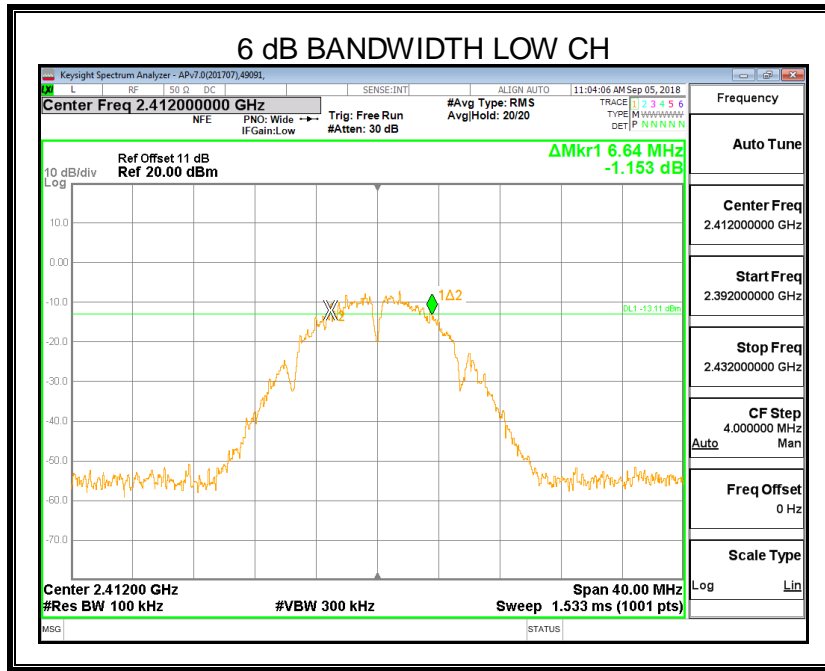


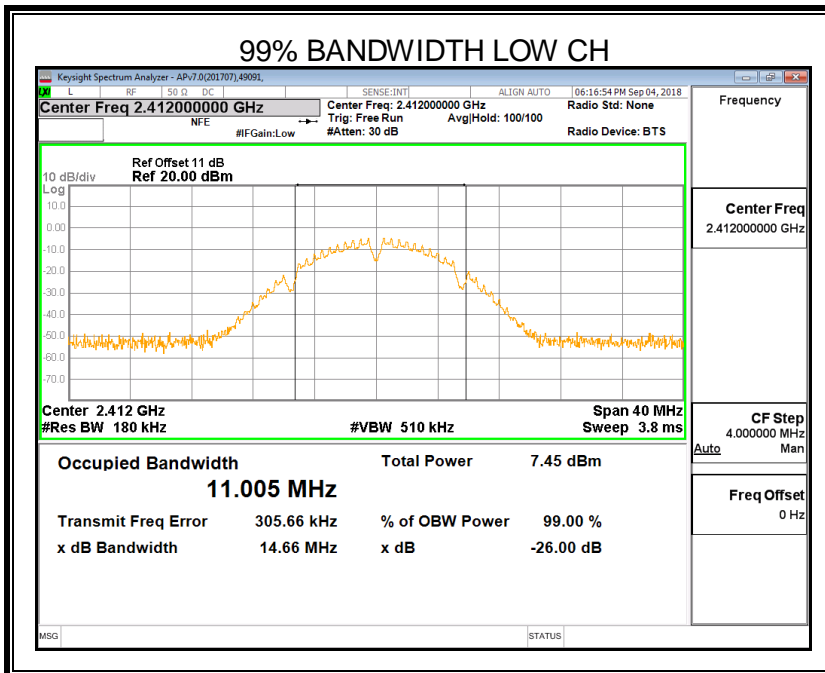
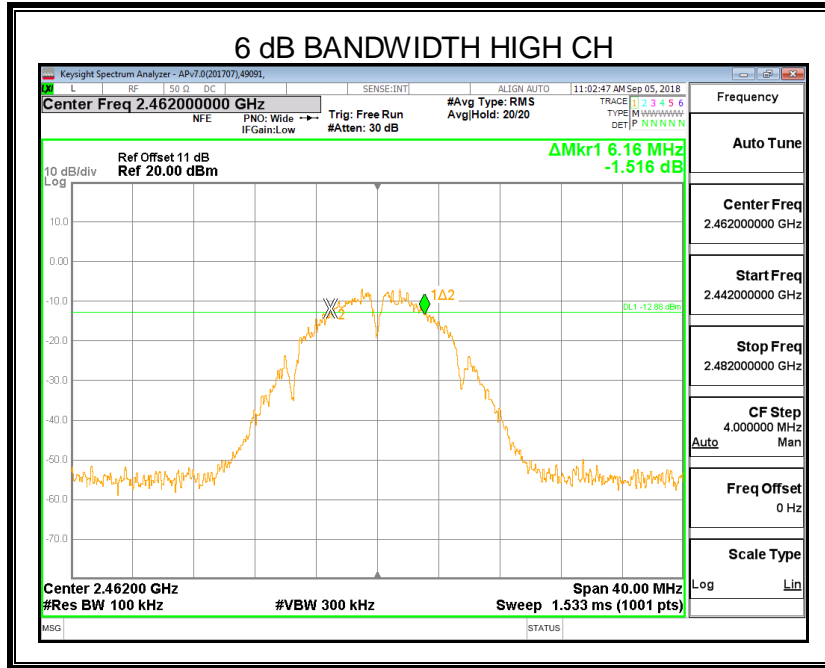


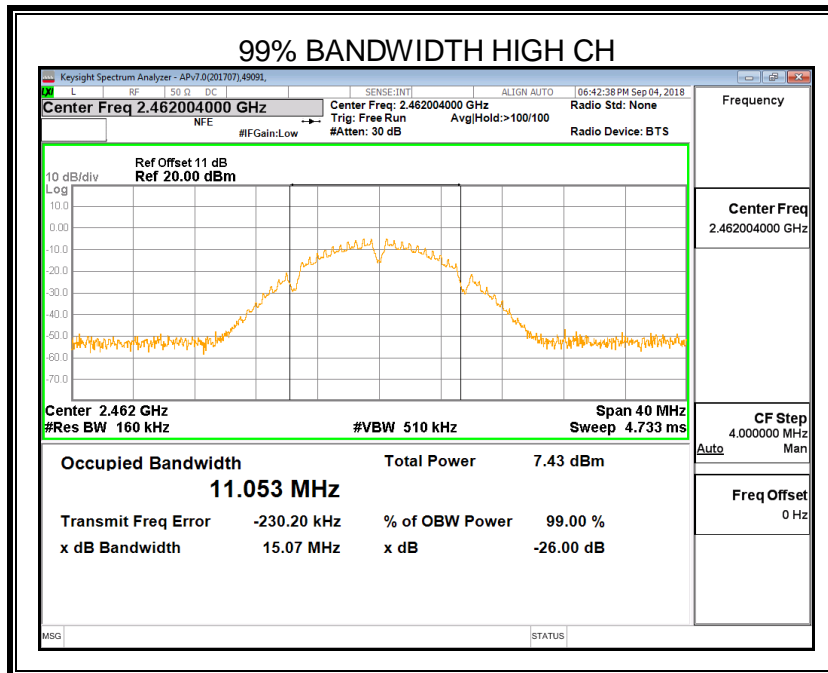
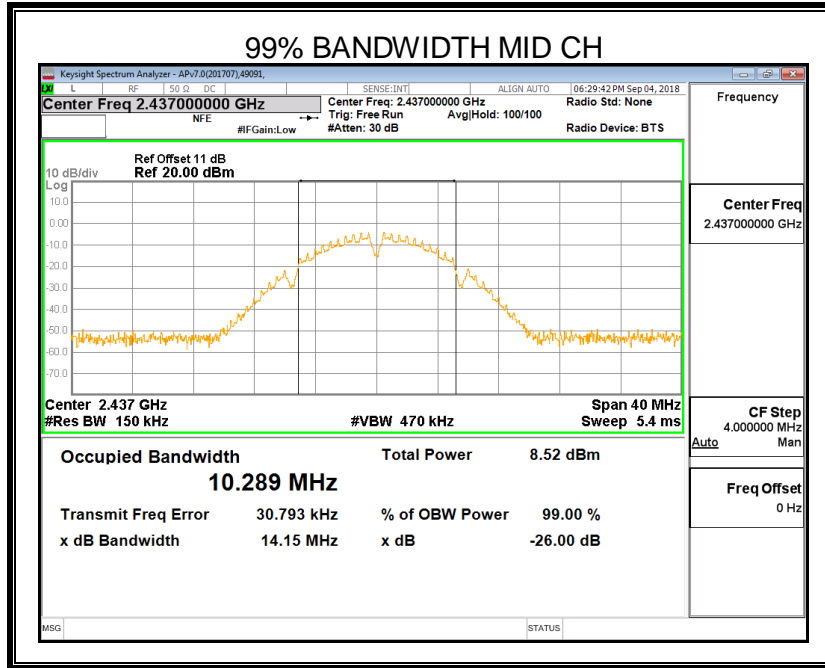


ANTENNA2

Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB (kHz)	Result
2412	6.64	11.005	500	Pass
2437	7.56	10.289	500	Pass
2462	6.16	11.053	500	Pass



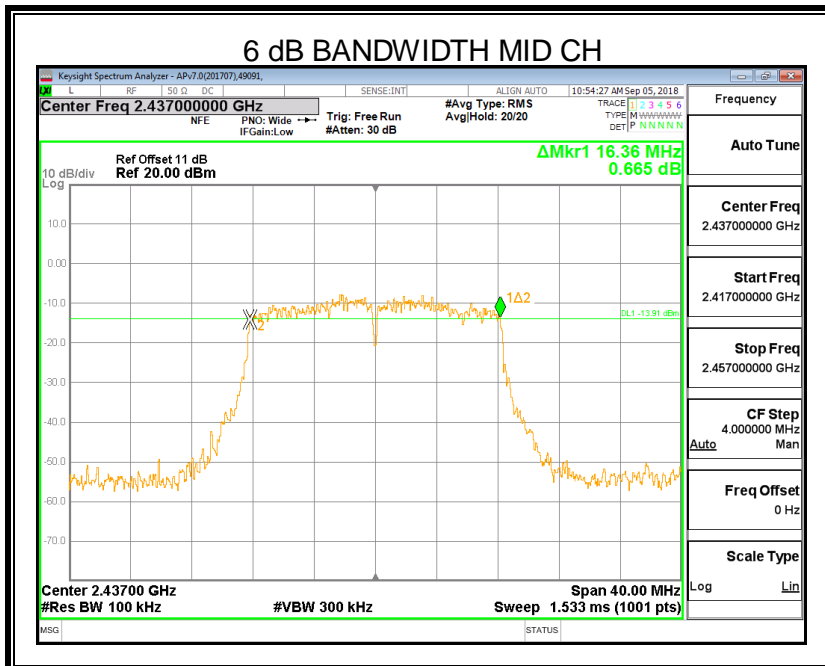
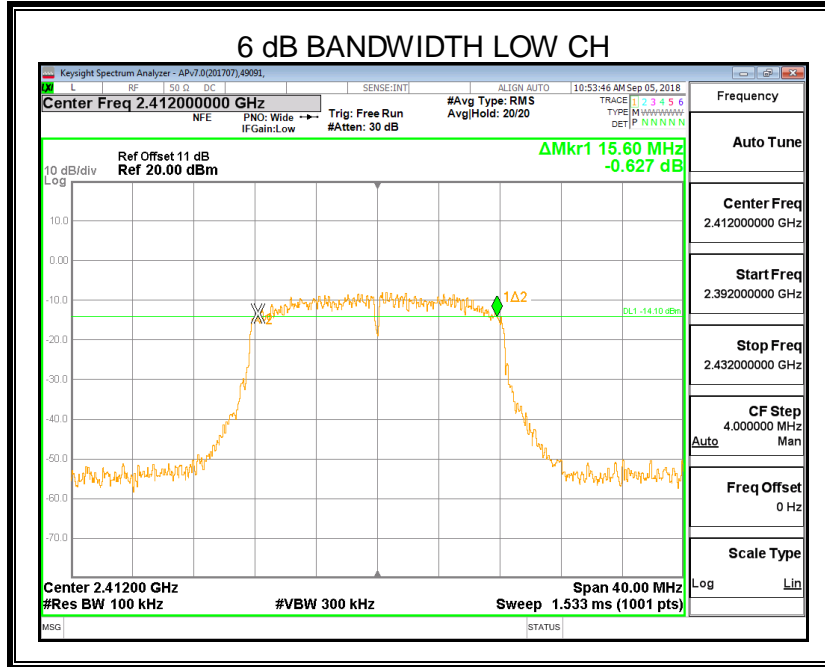


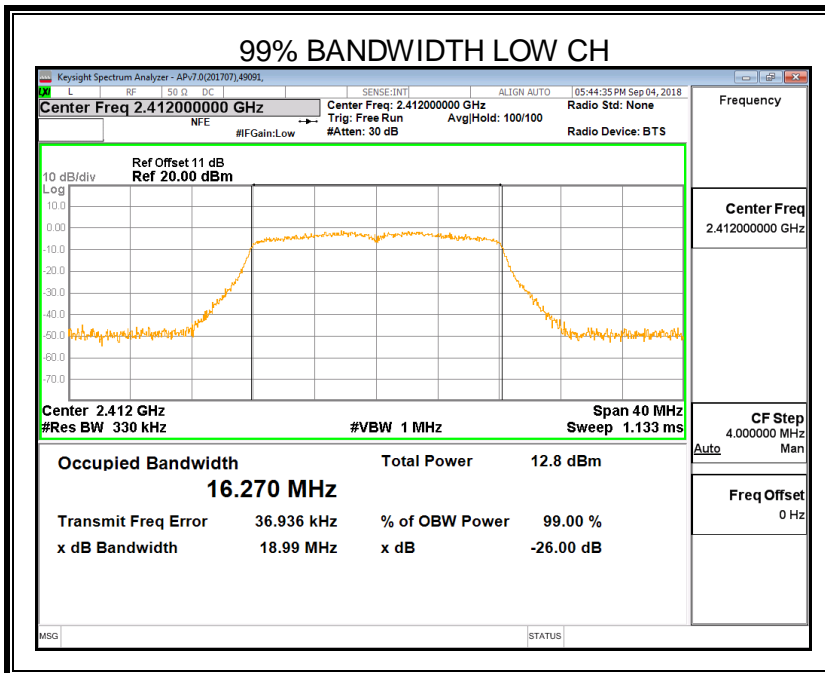
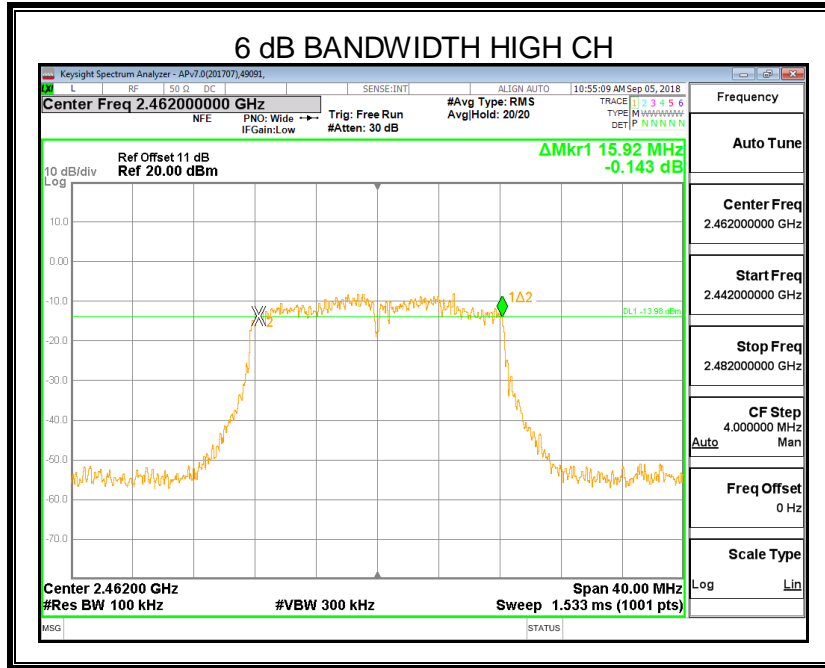


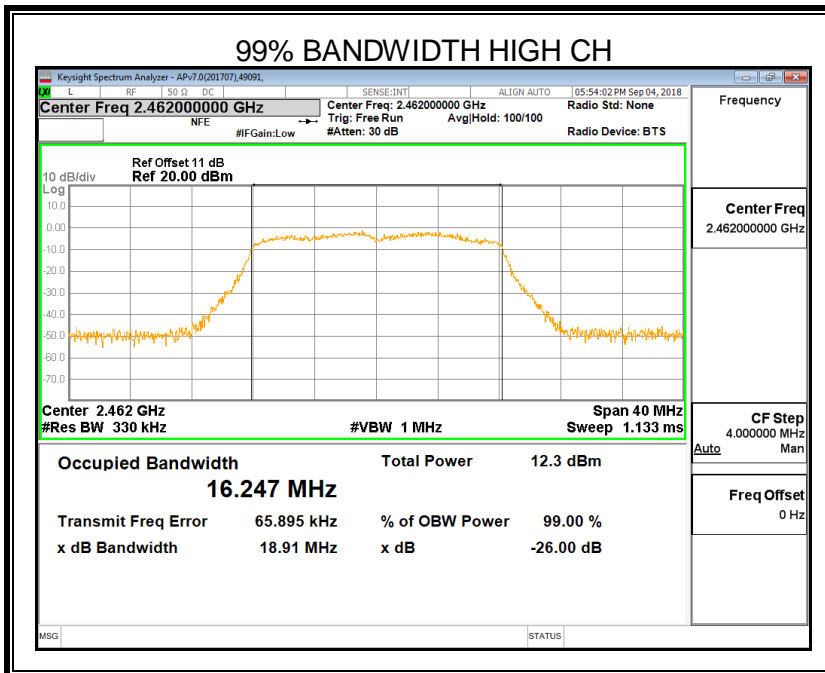
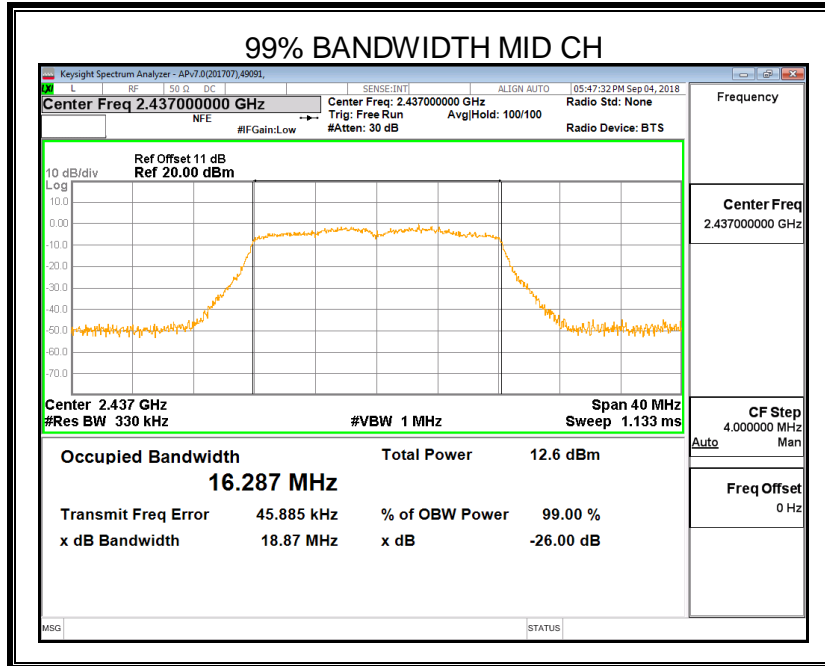
7.2.2. 802.11g MIMO MODE

ANTENNA1

Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB (kHz)	Result
2412	15.60	16.270	500	Pass
2437	16.36	16.287	500	Pass
2462	15.92	16.247	500	Pass

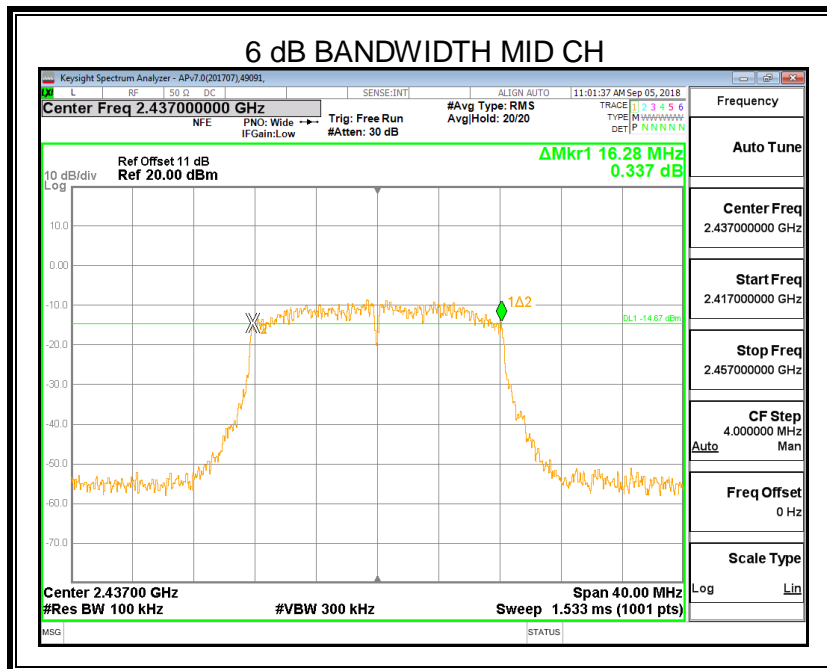
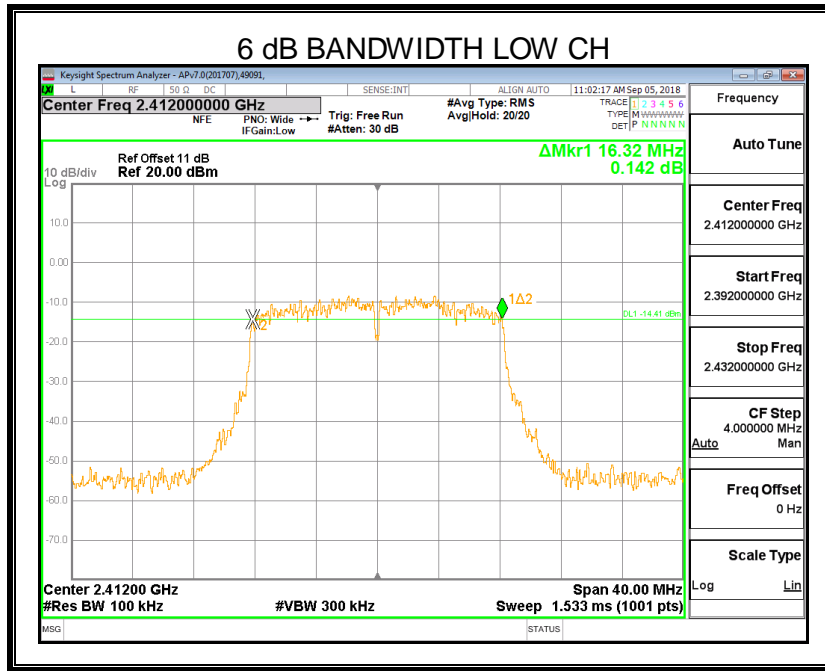


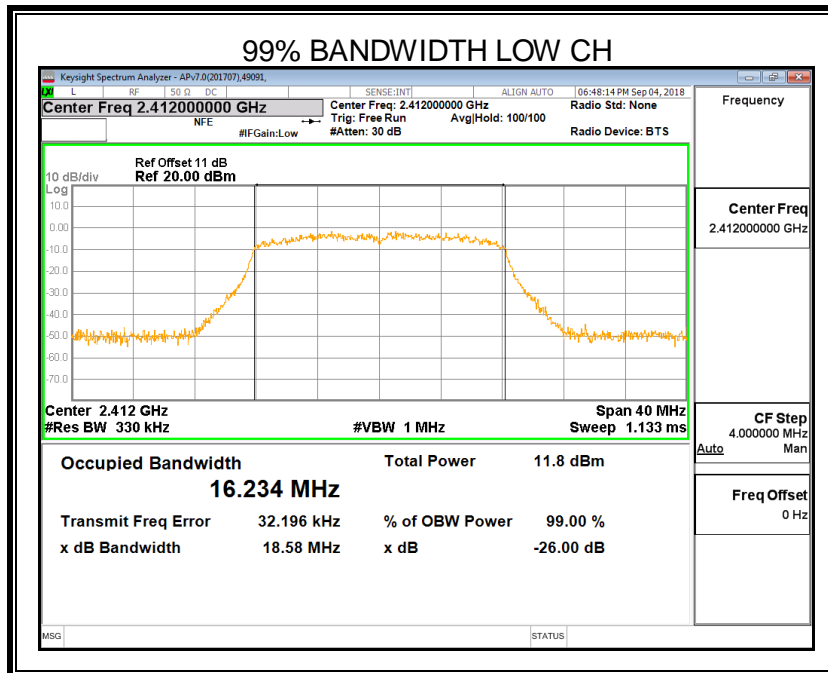
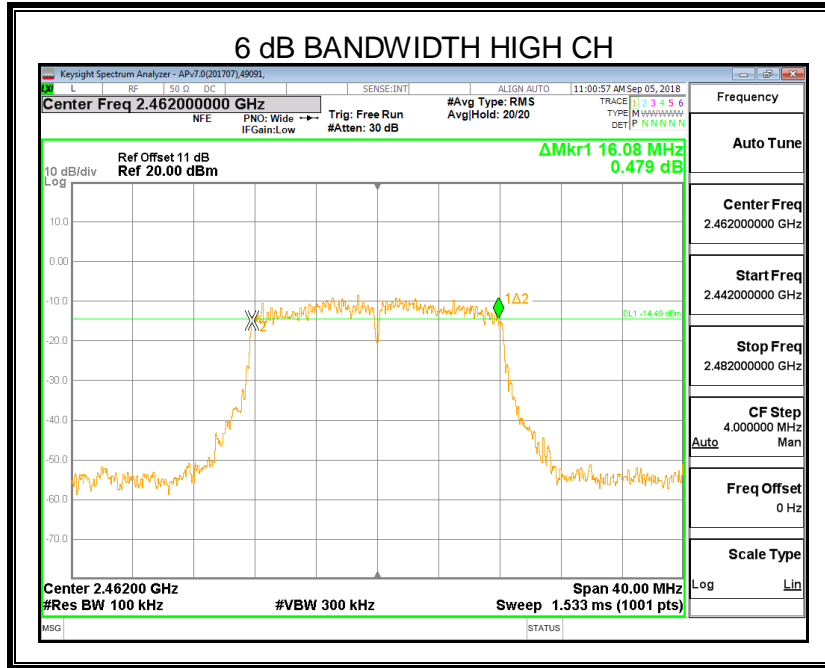


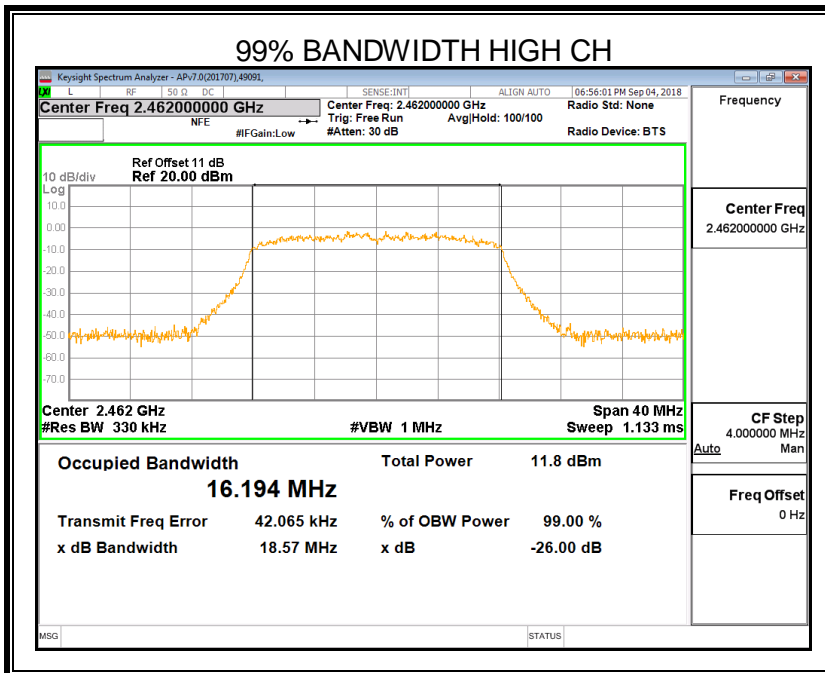
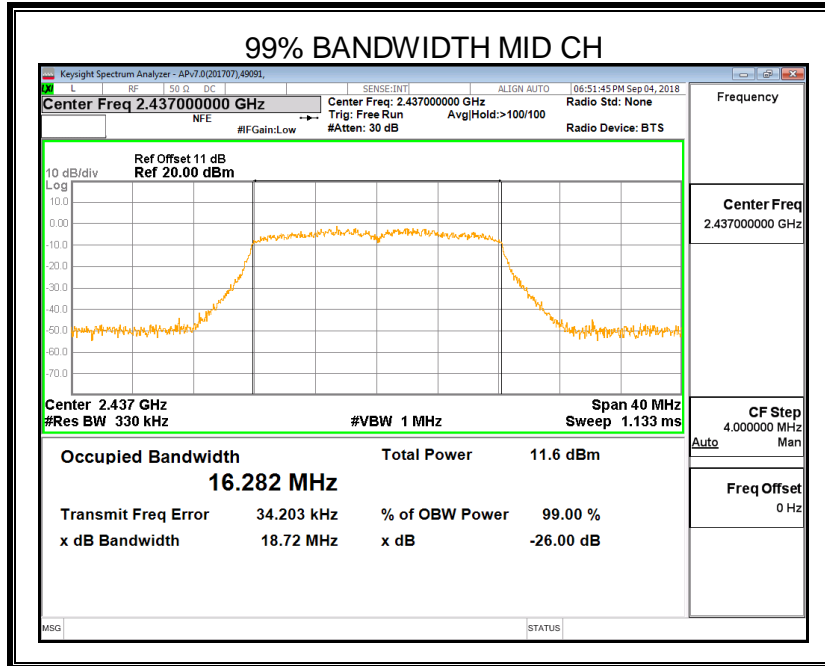


ANTENNA2

Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB (kHz)	Result
2412	16.32	16.234	500	Pass
2437	16.28	16.282	500	Pass
2462	16.08	16.194	500	Pass



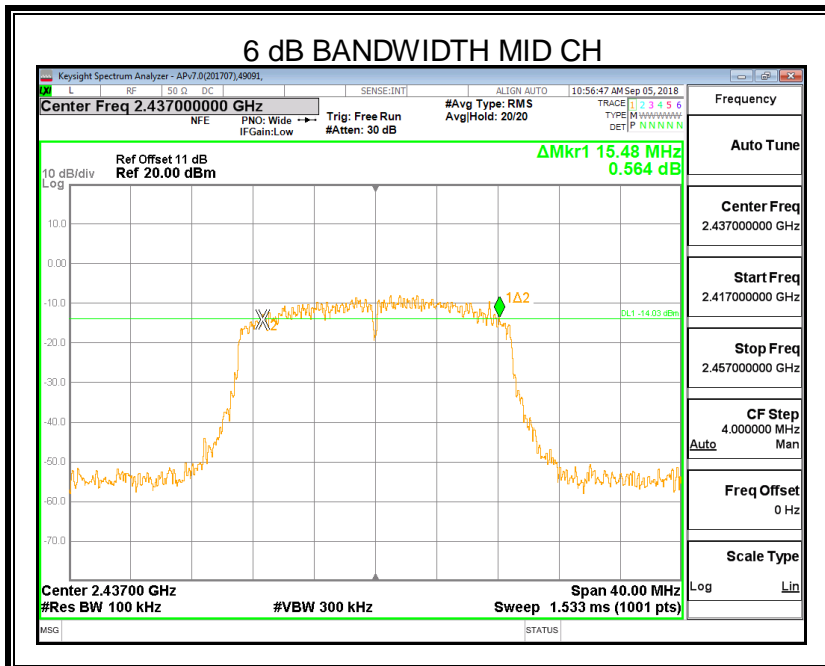
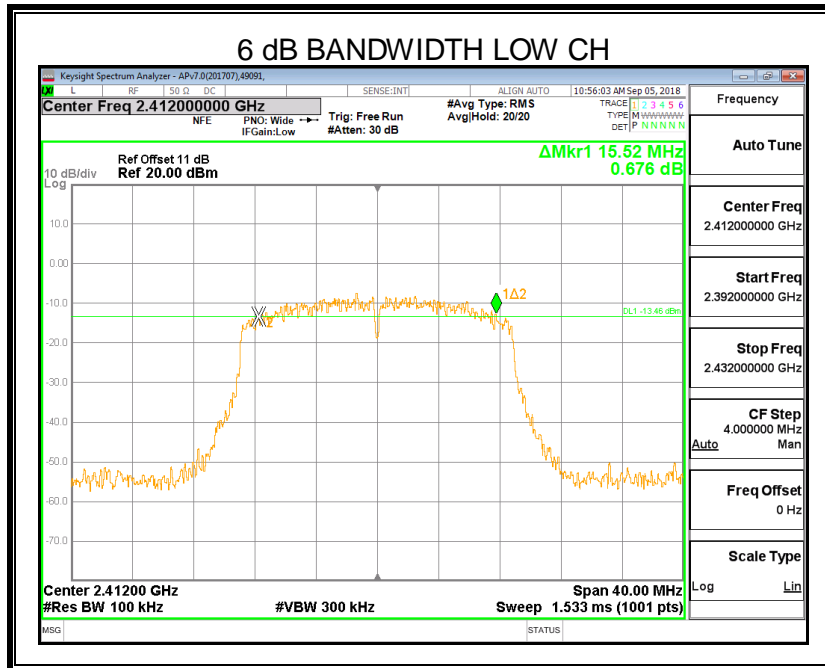


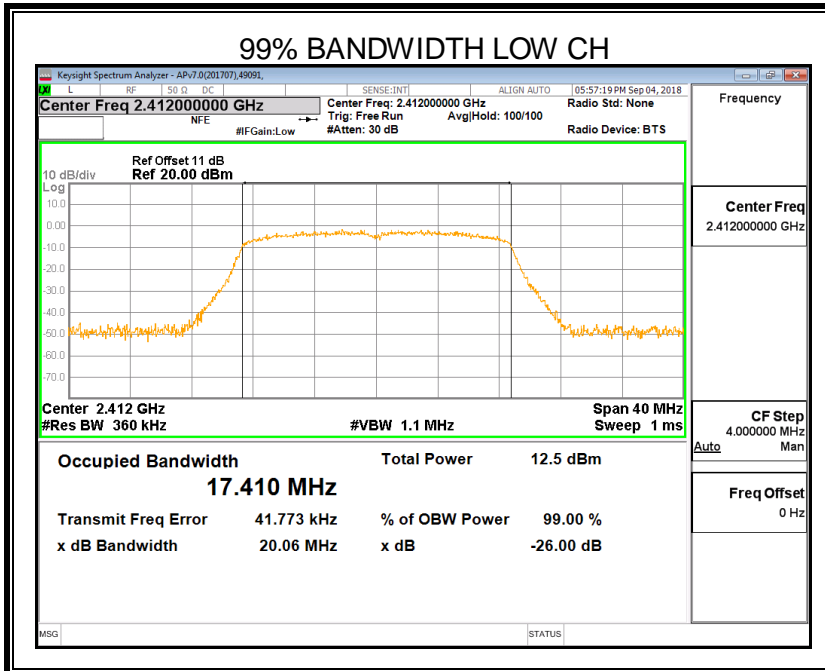
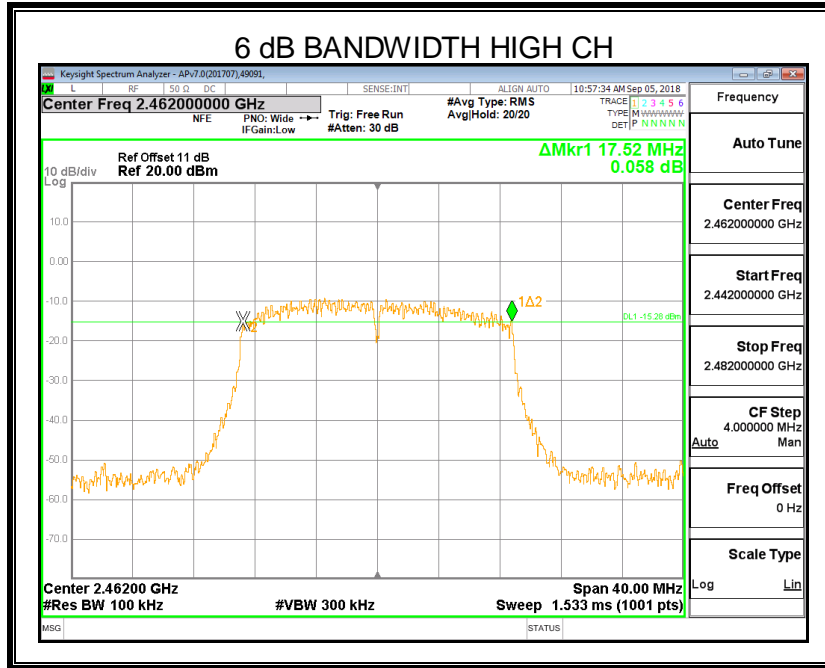


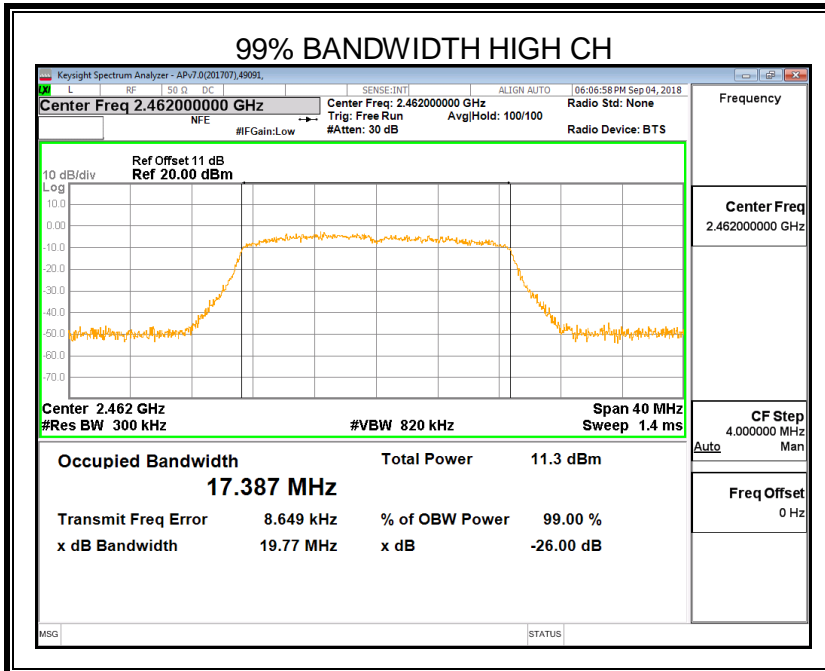
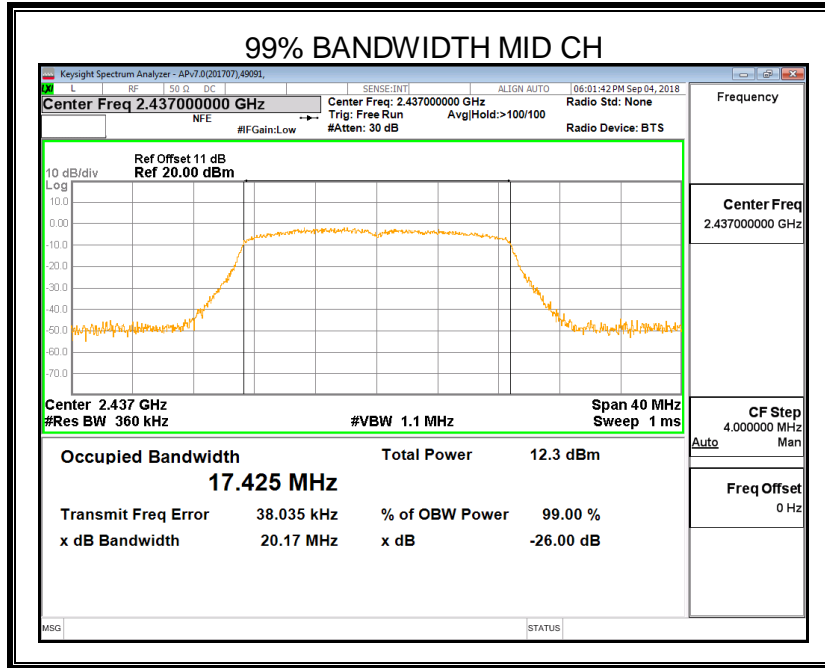
7.2.3. 802.11n20 MIMO MODE

ANTENNA1

Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB (kHz)	Result
2412	15.52	17.410	500	Pass
2437	15.48	17.425	500	Pass
2462	17.52	17.387	500	Pass

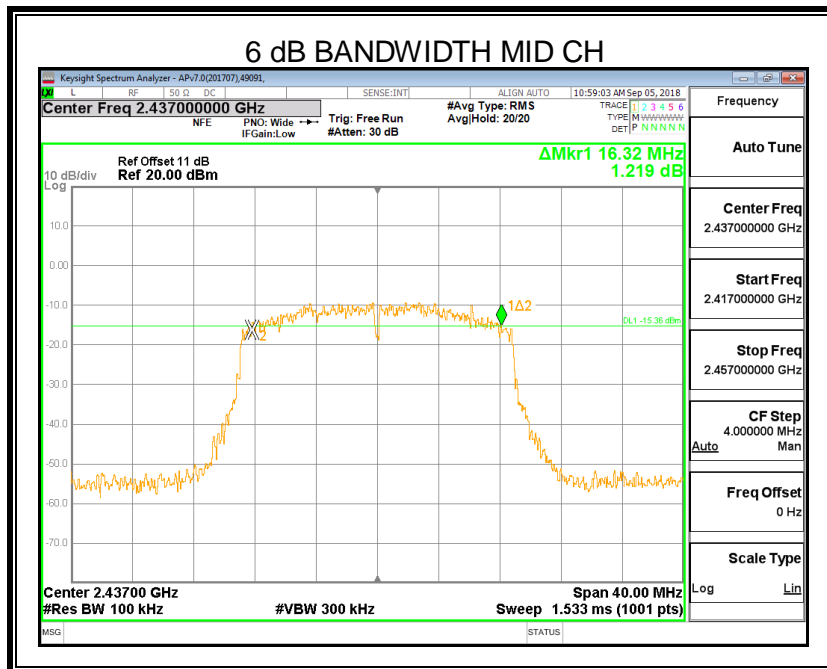
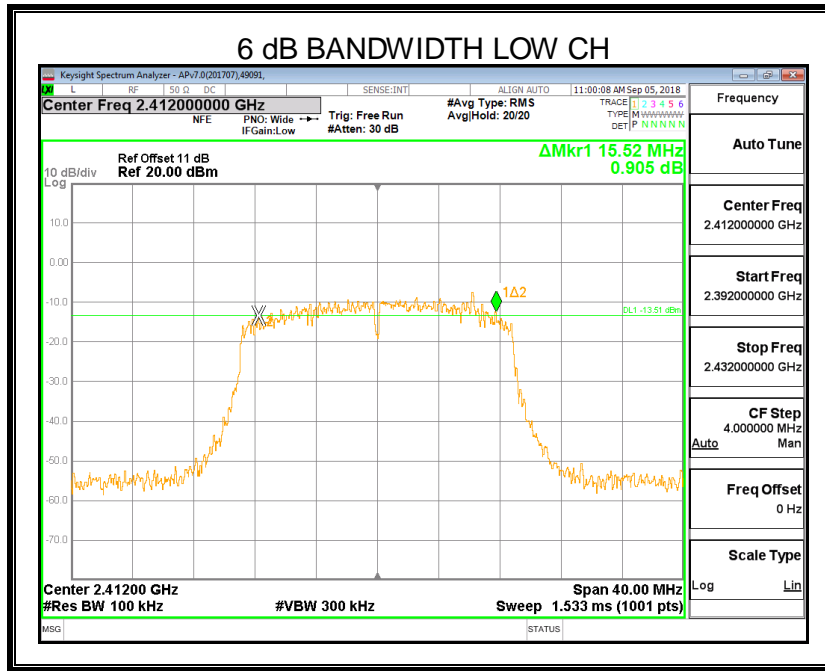


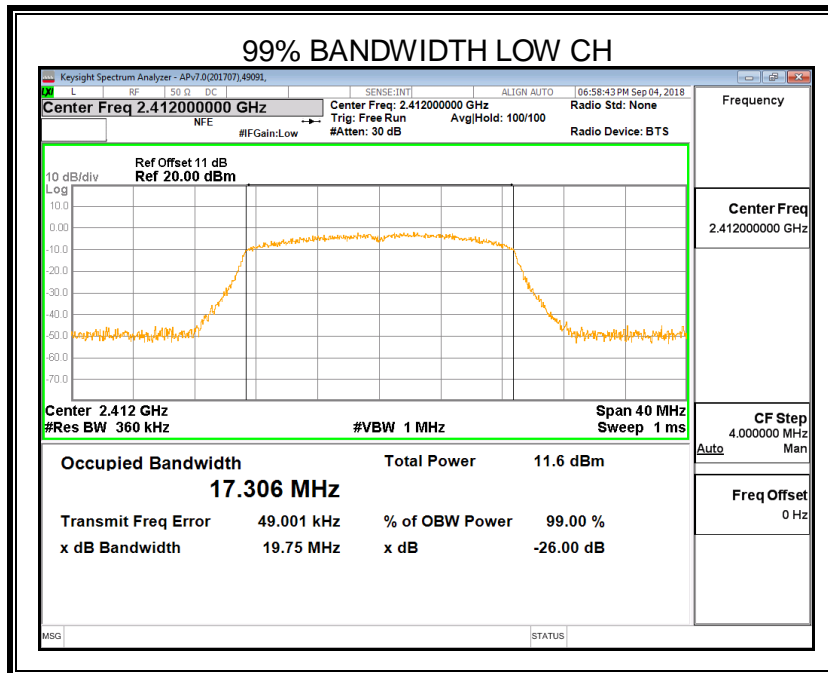
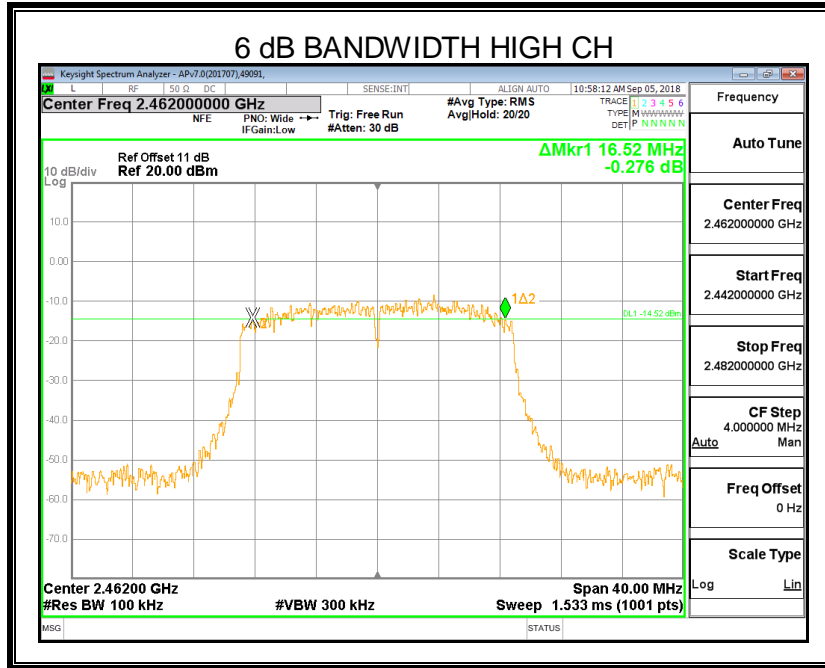


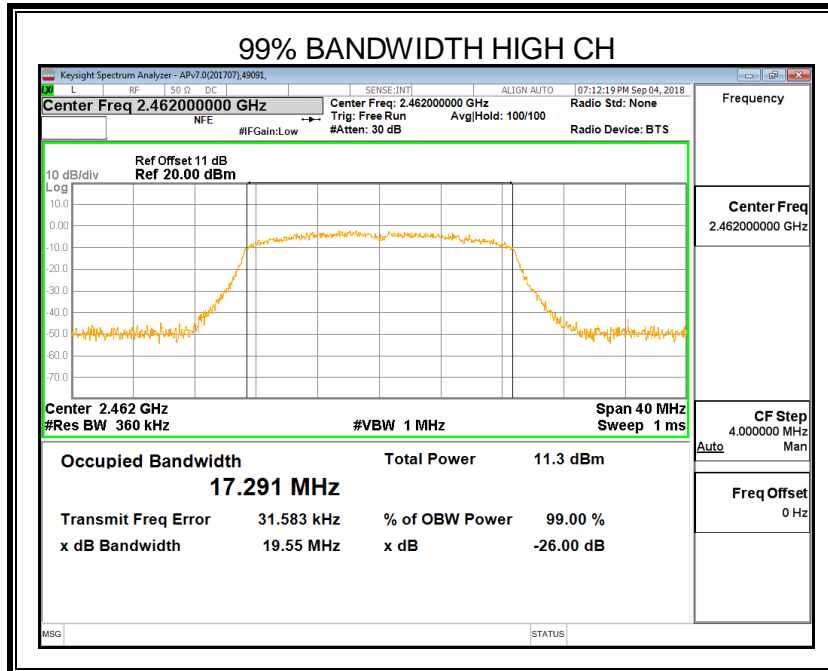
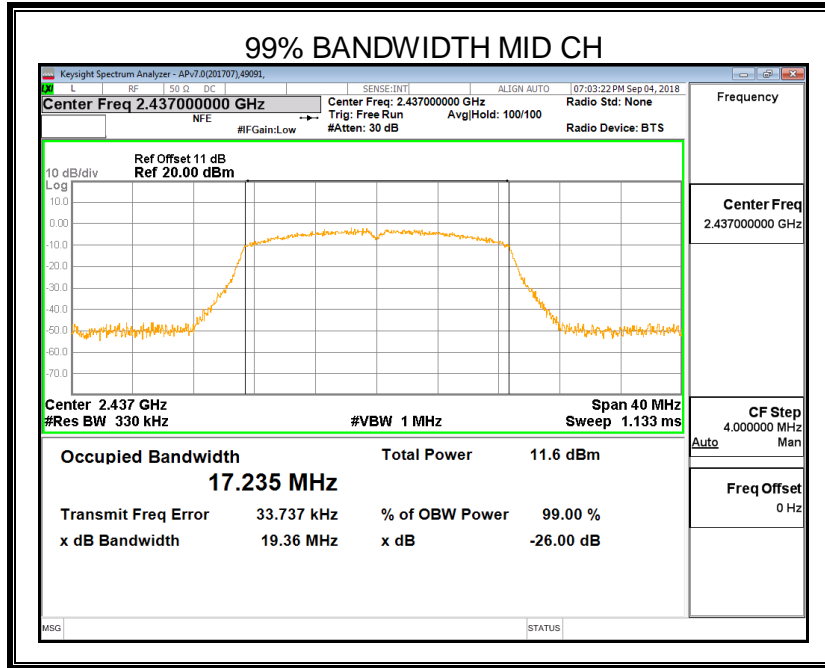


ANTENNA2

Frequency (MHz)	6dB bandwidth (MHz)	99% bandwidth (MHz)	Limit For 6dB (kHz)	Result
2412	15.52	17.306	500	Pass
2437	16.32	17.235	500	Pass
2462	16.52	17.291	500	Pass







7.3. PEAK CONDUCTED OUTPUT POWER

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5

Note:

1. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

2. Limit=30dBm – (Directional gain -6)dBi

Directional gain = $10\log[(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}] = 7.11 > 6\text{dBi}$, where N_{ANT} is the number of outputs, $G_{1/2}$ is the Antenna gain. So the power limit shall be reduced to $30 - (7.11 - 6) = 28.89\text{dBm}$

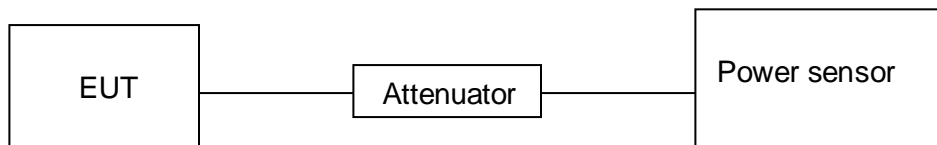
TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.

Measure peak power each channel.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

RESULTS**7.3.1. 802.11b MODE****MIMO MODE**

Mode	Frequency (MHz)	ANT	Maximum PK Conducted Output Power (dBm)		Result
			Single	Total	
802.11b	2412	1	7.56	10.25	PASS
		2	6.90		
	2437	1	6.37	9.86	
		2	7.28		
	2462	1	6.12	9.33	
		2	6.52		

Mode	Frequency (MHz)	ANT	Maximum AV Conducted Output Power (dBm)		Result
			Single	Total	
802.11b	2412	1	4.42	7.16	PASS
		2	3.87		
	2442	1	3.42	6.79	
		2	4.11		
	2462	1	3.12	6.14	
		2	3.13		

SISO MODE

Mode	Frequency (MHz)	ANT	Maximum PK Conducted Output Power (dBm)		Result
			Single	Total	
802.11b	2412	1	7.52	/	PASS
		2	6.88		
	2437	1	6.33	/	
		2	7.21		
	2462	1	6.10	/	
		2	6.51		

Mode	Frequency (MHz)	ANT	Maximum AV Conducted Output Power (dBm)		Result
			Single	Total	
802.11b	2412	1	4.41	/	PASS
		2	3.85		
	2442	1	3.41	/	
		2	4.10		
	2462	1	3.11	/	
		2	3.12		

7.3.2. 802.11g MODE

MIMO MODE

Mode	Frequency (MHz)	ANT	Maximum PK Conducted Output Power (dBm)		Result
			Single	Total	
802.11g	2412	1	14.42	17.67	PASS
		2	14.88		
	2437	1	14.35	17.60	
		2	14.81		
	2462	1	13.64	17.30	
		2	14.86		

Mode	Frequency (MHz)	ANT	Maximum AV Conducted Output Power (dBm)		Result
			Single	Total	
802.11g	2412	1	6.25	9.22	PASS
		2	6.16		
	2442	1	6.25	9.19	
		2	6.11		
	2462	1	5.46	8.63	
		2	5.77		

SISO MODE

Mode	Frequency (MHz)	ANT	Maximum PK Conducted Output Power (dBm)		Result
			Single	Total	
802.11g	2412	1	14.41	/	PASS
		2	14.76		
	2437	1	14.33	/	
		2	14.77		
	2462	1	13.61	/	
		2	14.82		

Mode	Frequency (MHz)	ANT	Maximum AV Conducted Output Power (dBm)		Result
			Single	Total	
802.11g	2412	1	6.21	/	PASS
		2	6.13		
	2442	1	6.23	/	
		2	6.10		
	2462	1	5.43	/	
		2	5.73		

7.3.1. 802.11n HT20 MODE**SISO MODE**

Mode	Frequency (MHz)	ANT	Maximum AV Conducted Output Power (dBm)		Result
			Single	Total	
802.11n HT20	2412	1	14.71	/	PASS
		2	14.15		
	2437	1	14.14	/	
		2	14.23		
	2462	1	13.66	/	
		2	13.87		

Mode	Frequency (MHz)	ANT	Maximum AV Conducted Output Power (dBm)		Result
			Single	Total	
802.11n HT20	2412	1	6.48	/	PASS
		2	5.84		
	2442	1	5.54	/	
		2	5.82		
	2462	1	5.12	/	
		2	5.47		

MIMO MODE

Mode	Frequency (MHz)	ANT	Maximum AV Conducted Output Power (dBm)		Result
			Single	Total	
802.11n HT20	2412	1	14.73	17.51	PASS
		2	14.25		
	2437	1	14.25	17.27	
		2	14.27		
	2462	1	13.74	16.87	
		2	13.97		

Mode	Frequency (MHz)	ANT	Maximum AV Conducted Output Power (dBm)		Result
			Single	Total	
802.11n HT20	2412	1	6.58	9.27	PASS
		2	5.91		
	2442	1	5.65	8.80	
		2	5.92		
	2462	1	5.22	8.39	
		2	5.54		

7.4. POWER SPECTRAL DENSITY

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC §15.247 (e)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5
<p>Note:</p> <p>1. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.</p> <p>2. Limit=30dBm – (Directional gain -6)dBi Directional gain = $10\log[(10^{G_1/20} + 10^{G_2/20})^2 / N_{ANT}] = 7.11 > 6\text{dBi}$, where N_{ANT} is the number of outputs, $G_{1/2}$ is the Antenna gain. So the power density limit shall be reduced to $8 - (7.11 - 6) = 6.89\text{dBm}$ in any 3 kHz band.</p>			

TEST PROCEDURE

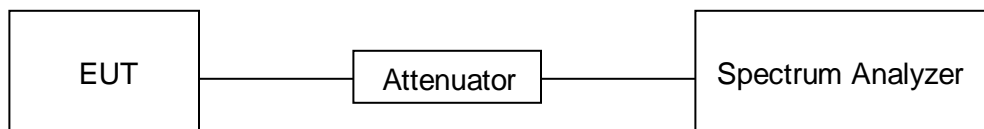
Connect the UUT to the spectrum analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SETUP



TEST ENVIRONMENT

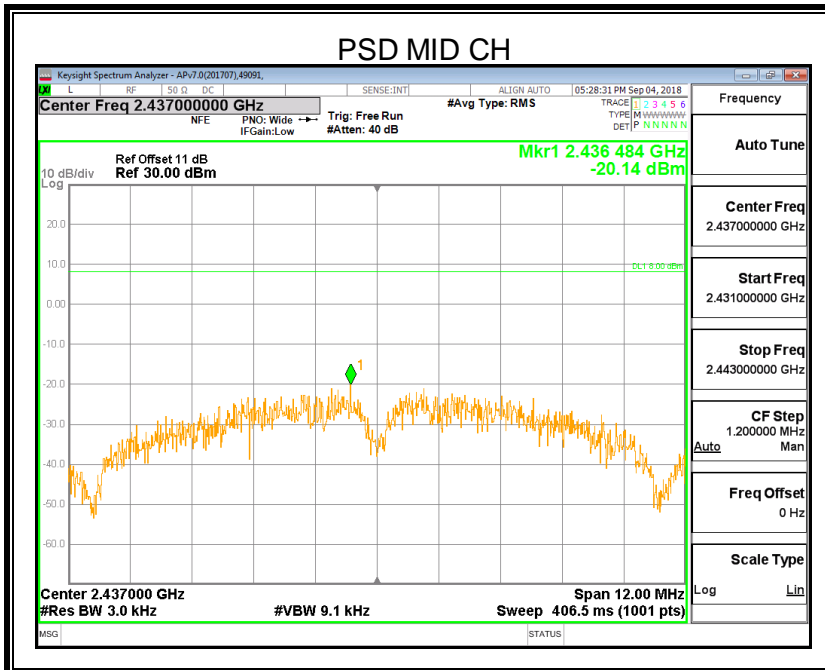
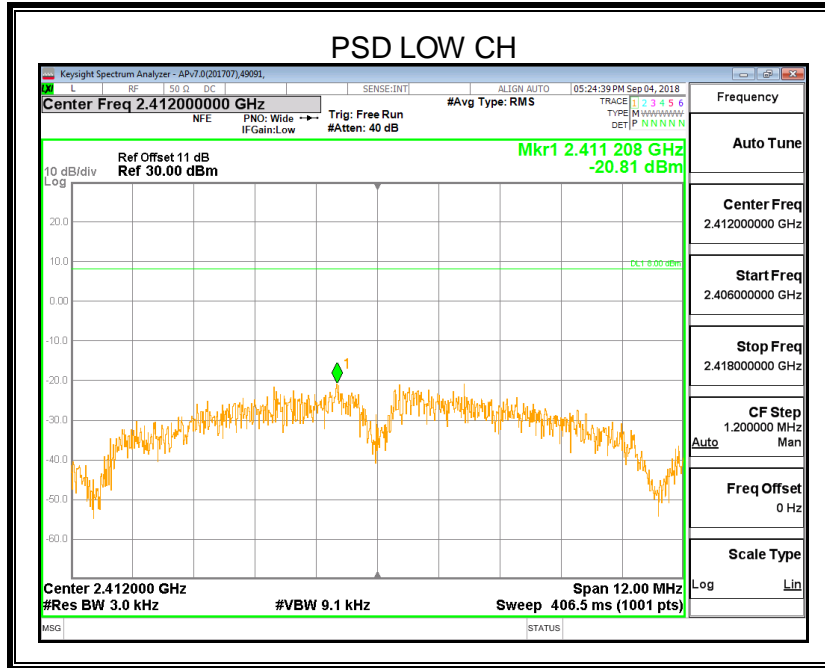
Temperature	24.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

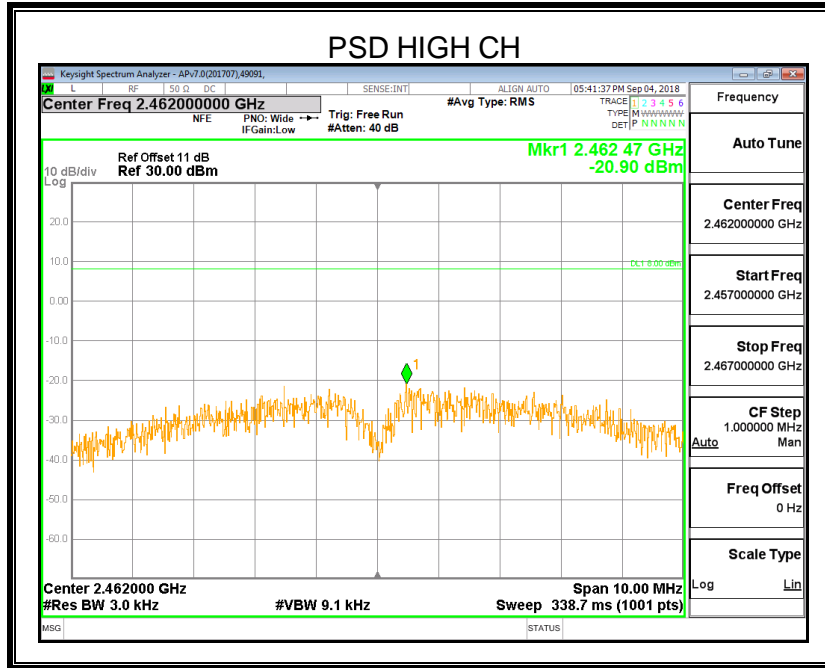
RESULTS

7.4.1. 802.11b MIMO MODE

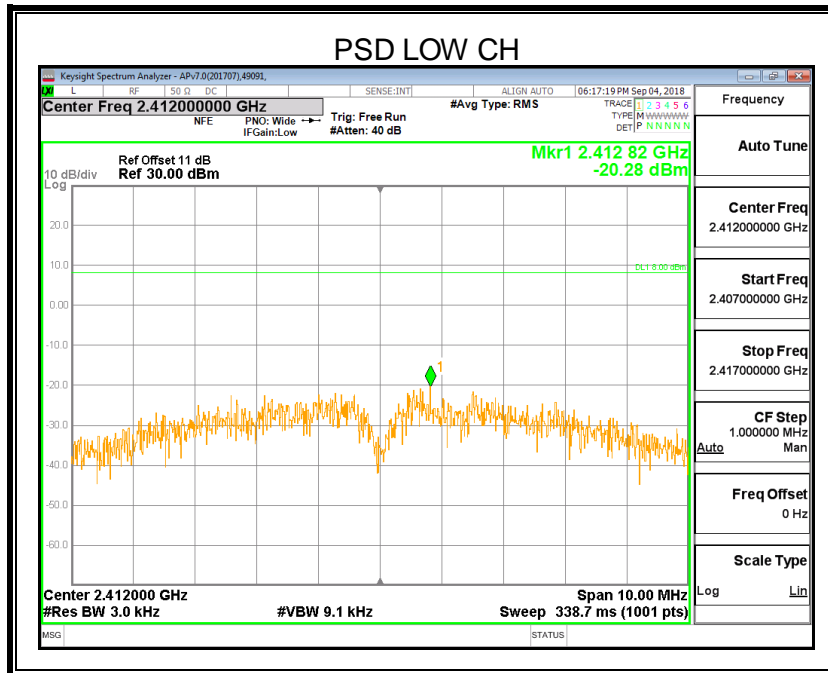
Frequency (MHz)	ANT	Power Spectral Density (dBm/3kHz)		Limit (dBm/3kHz)
		Single	Total	
2412	1	-20.81	-17.53	6.89
	2	-20.28		
2437	1	-20.14	-17.41	
	2	-20.71		
2462	1	-20.90	-17.90	
	2	-20.92		

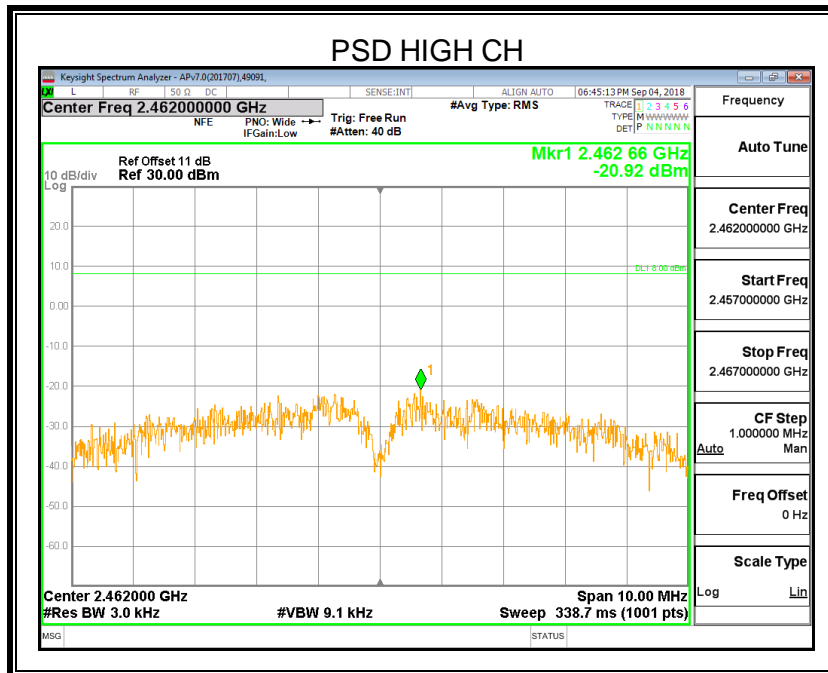
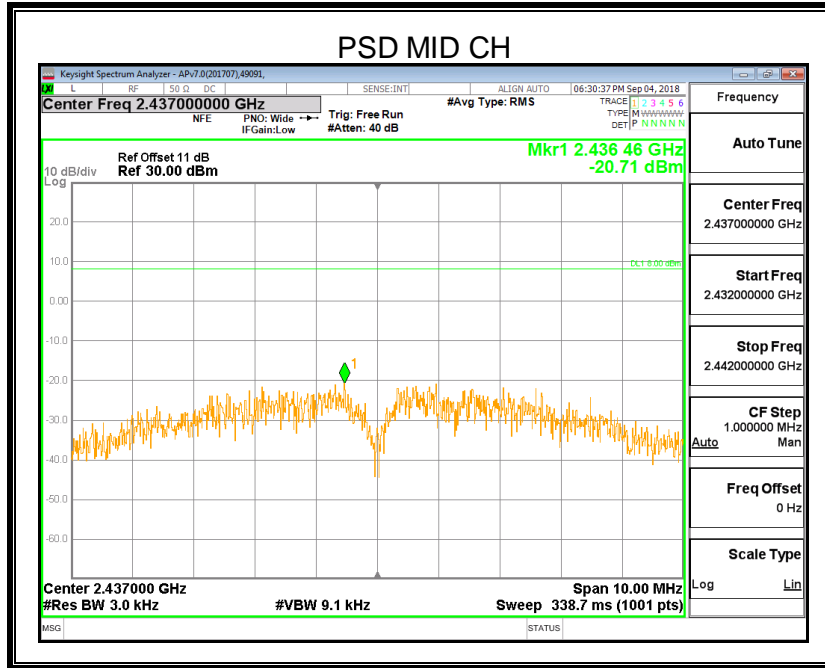
ANTENNA1





ANTENNA2

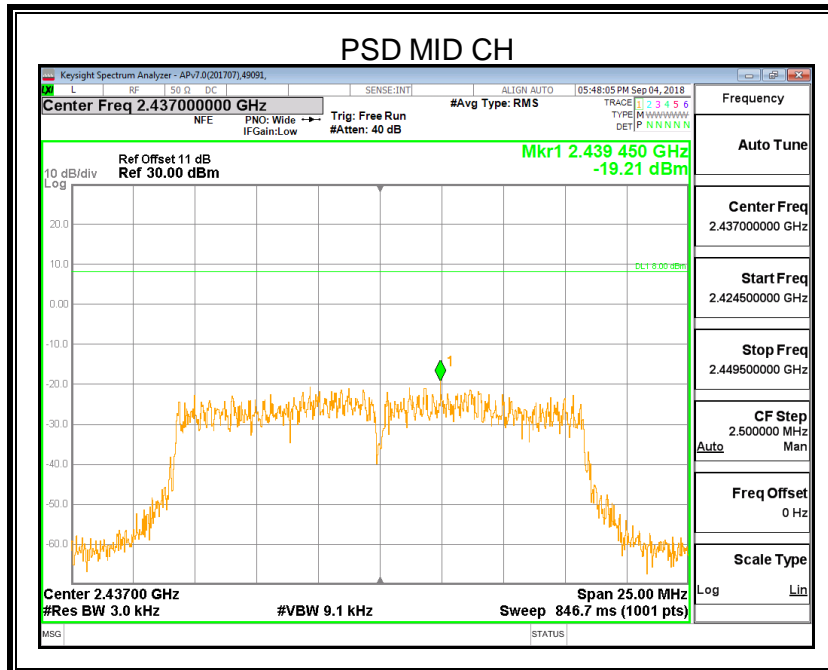
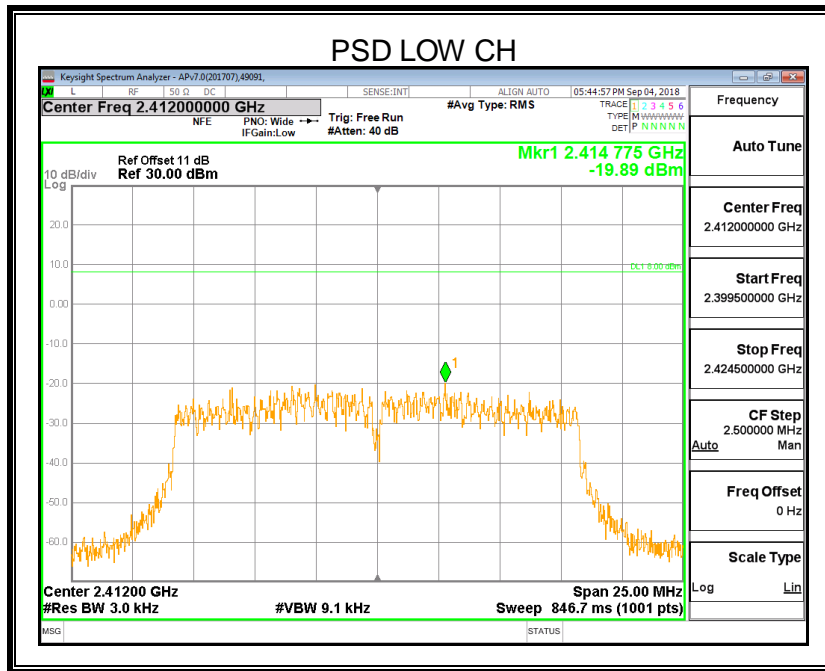


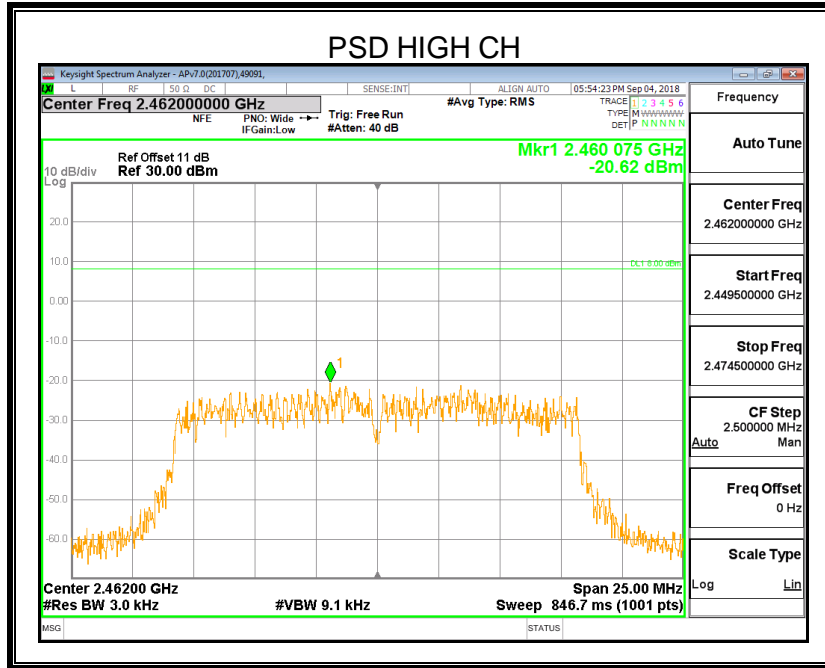


7.4.2. 802.11g MIMO MODE

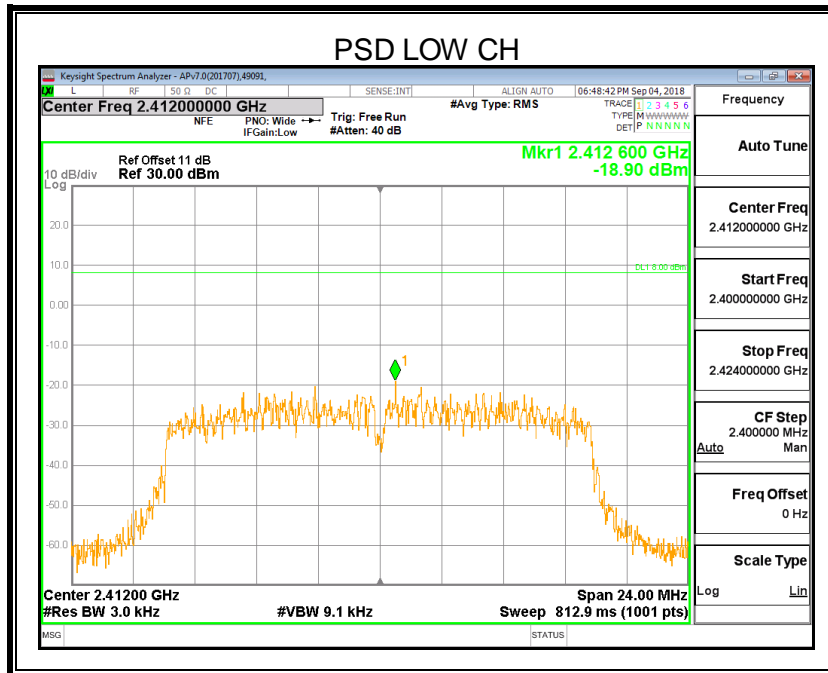
Frequency (MHz)	ANT	Power Spectral Density (dBm/3kHz)		Limit (dBm/3kHz)
		Single	Total	
2412	1	-19.89	-16.36	6.89
	2	-18.90		
2437	1	-19.21	-17.12	
	2	-21.30		
2462	1	-20.62	-17.69	
	2	-20.79		

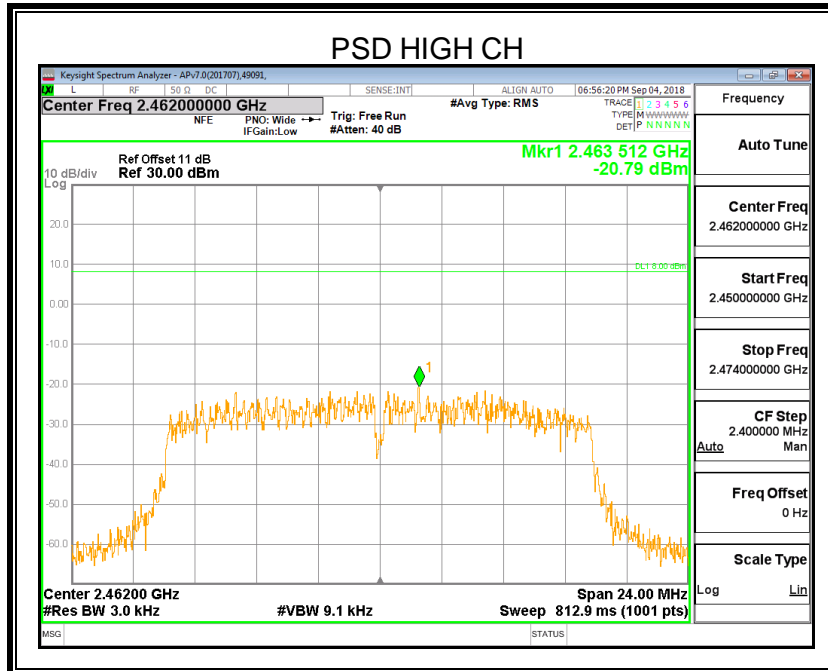
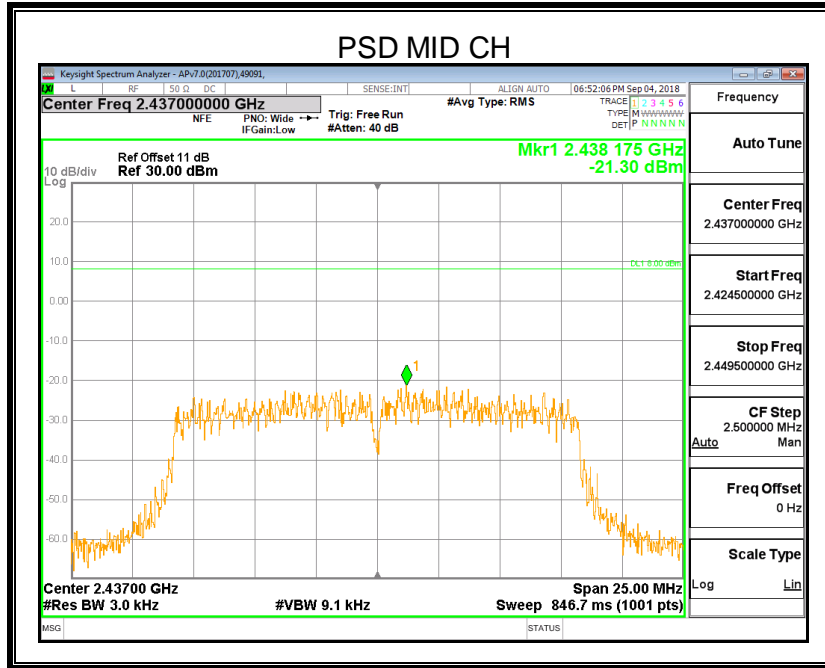
ANTENNA1





ANTENNA2

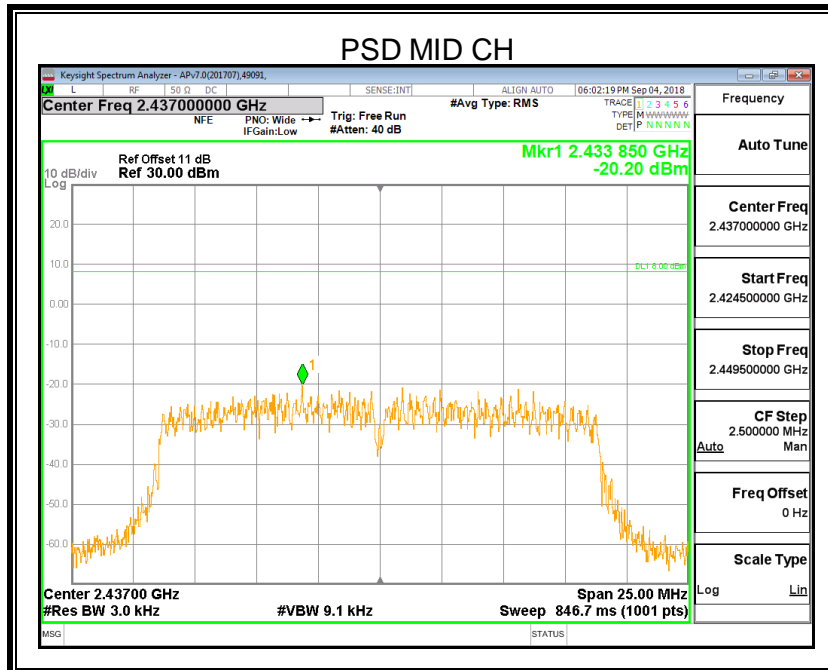
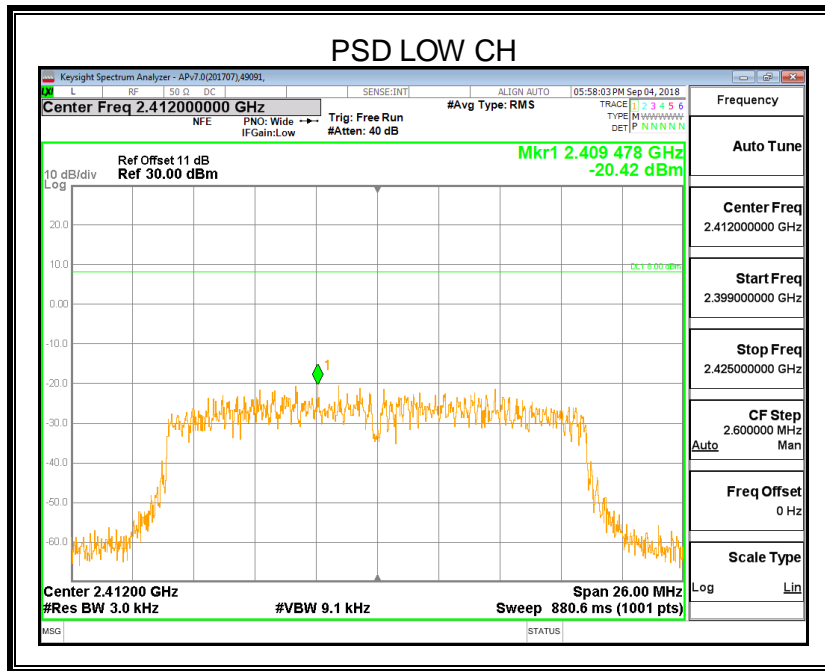


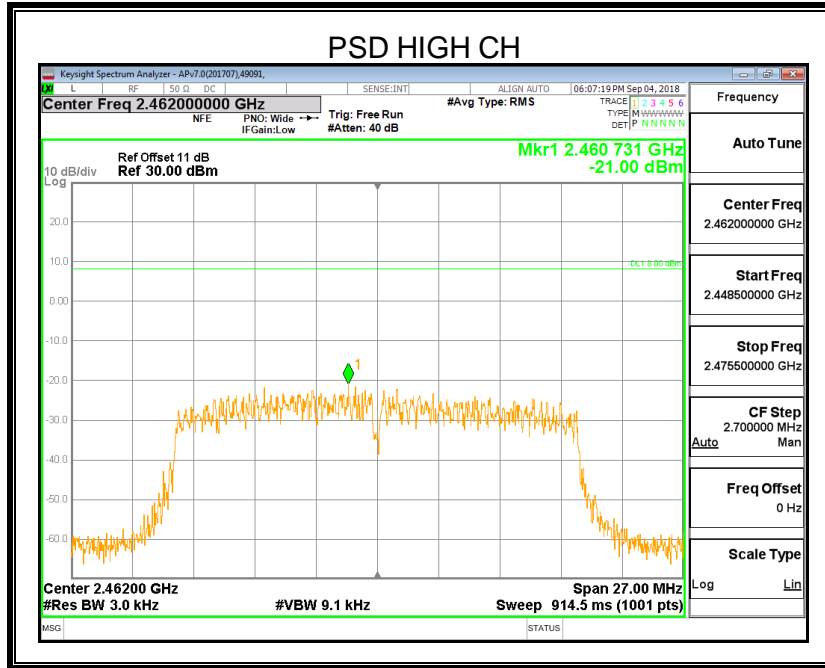


7.4.3. 802.11n20 MIMO MODE

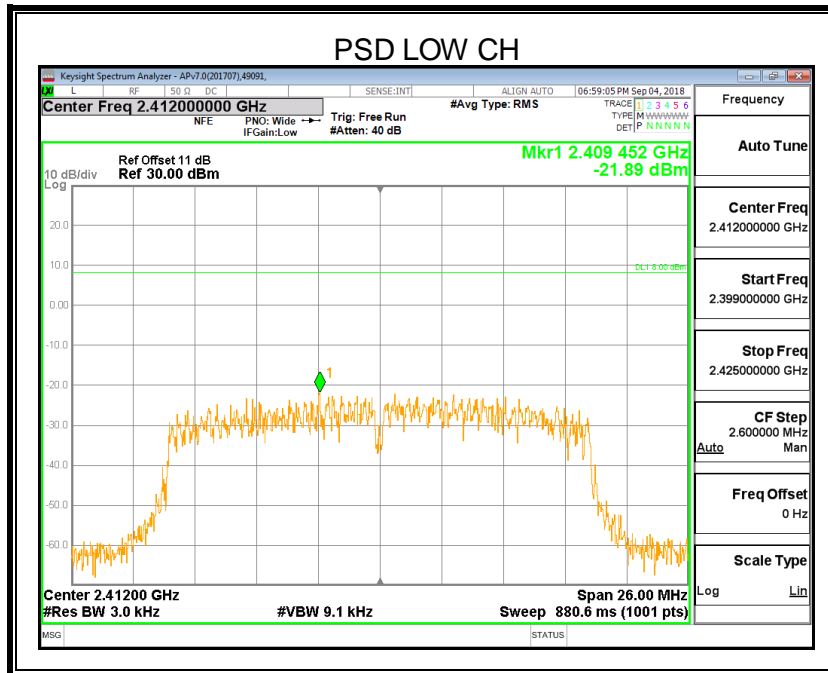
Frequency (MHz)	ANT	Power Spectral Density (dBm/3kHz)		Limit (dBm/3kHz)
		Single	Total	
2412	1	-20.42	-18.08	6.89
	2	-21.89		
2437	1	-20.20	-17.77	
	2	-21.44		
2462	1	-21.00	-18.28	
	2	-21.61		

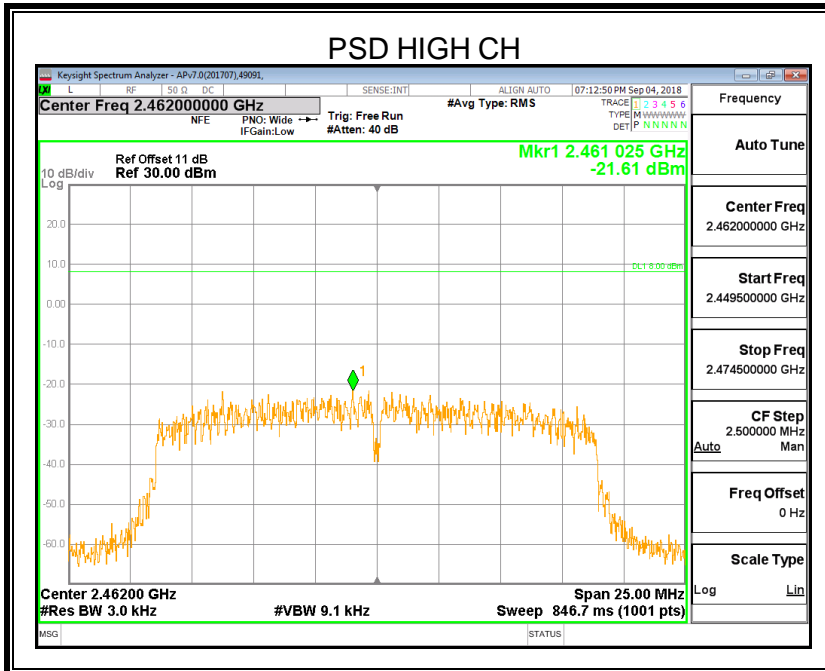
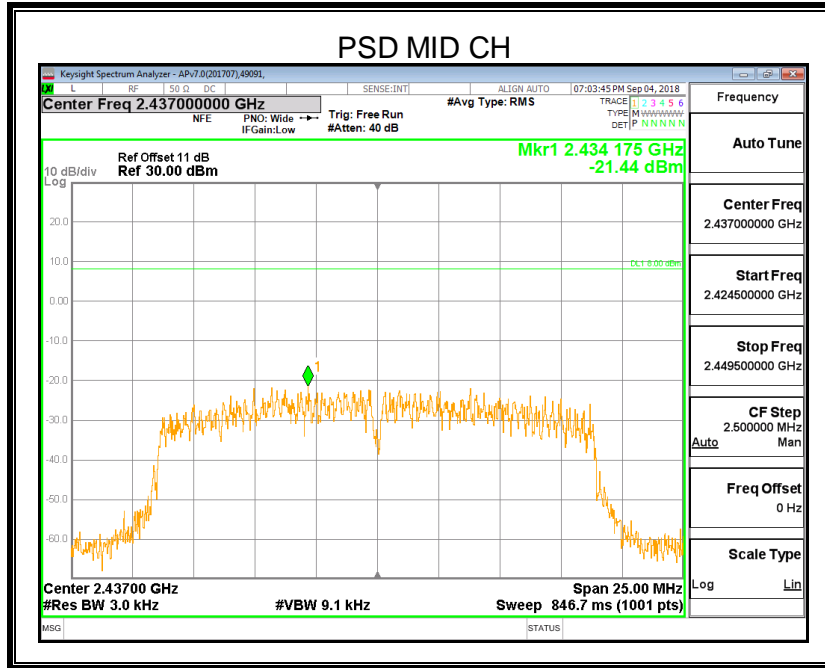
ANTENNA1





ANTENNA2





7.5. CONDUCTED BANEDGE AND SPURIOUS EMISSIONS

LIMITS

FCC Part15 (15.247) Subpart C		
Section	Test Item	Limit
FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Connect the UUT to the spectrum analyzer and use the following settings:

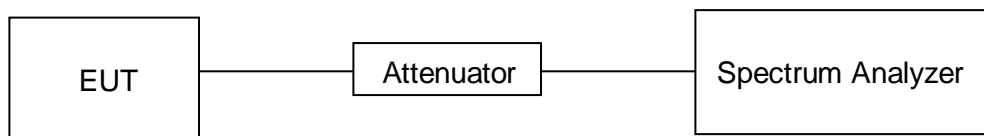
Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum PSD level.

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.

TEST SETUP



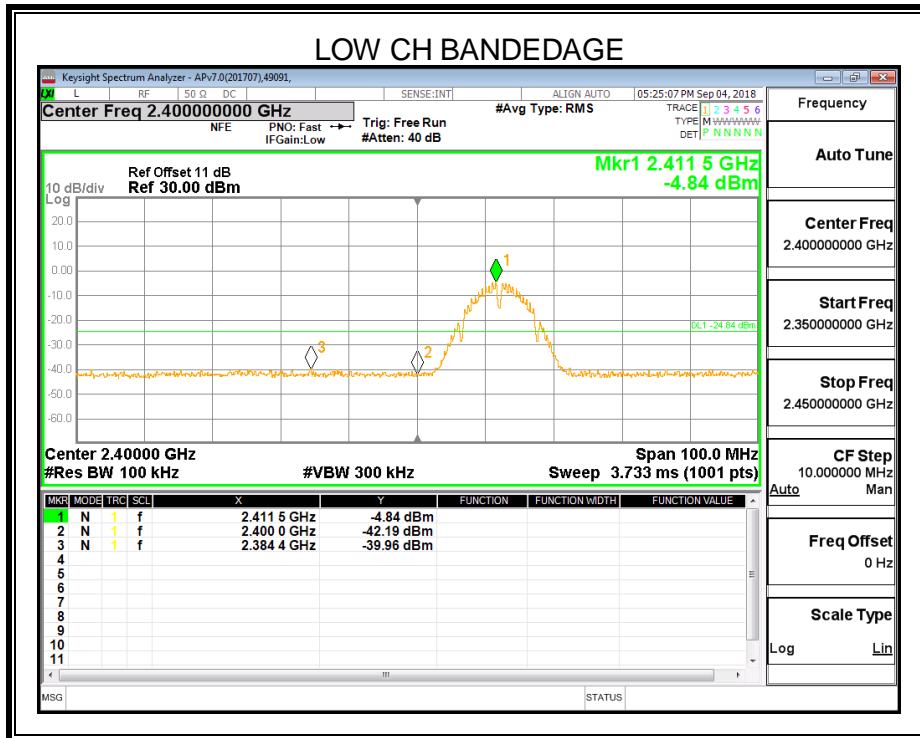
TEST ENVIRONMENT

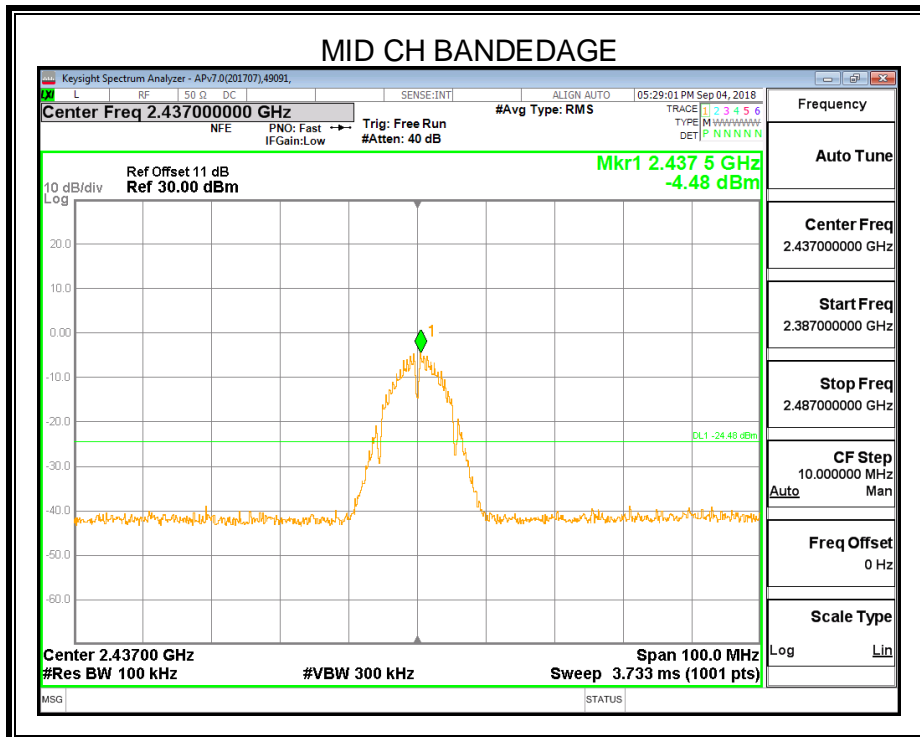
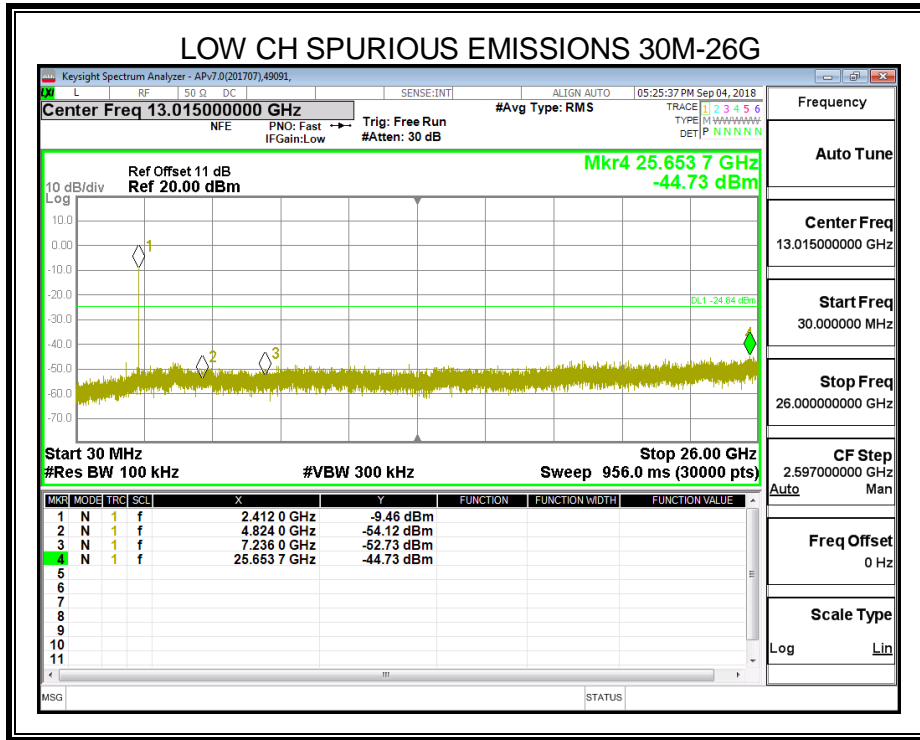
Temperature	24.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

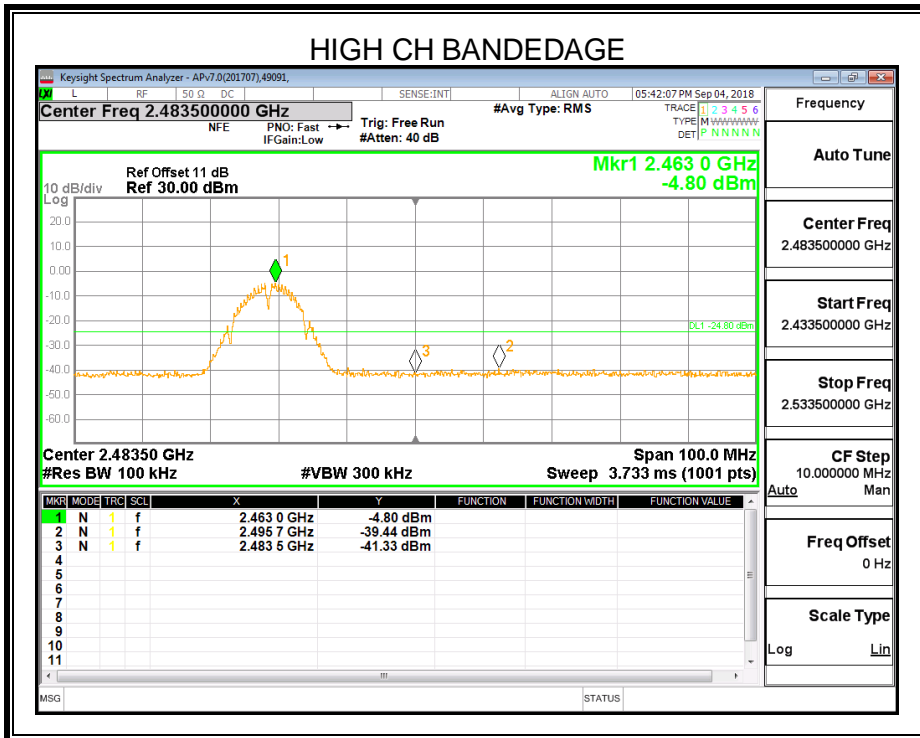
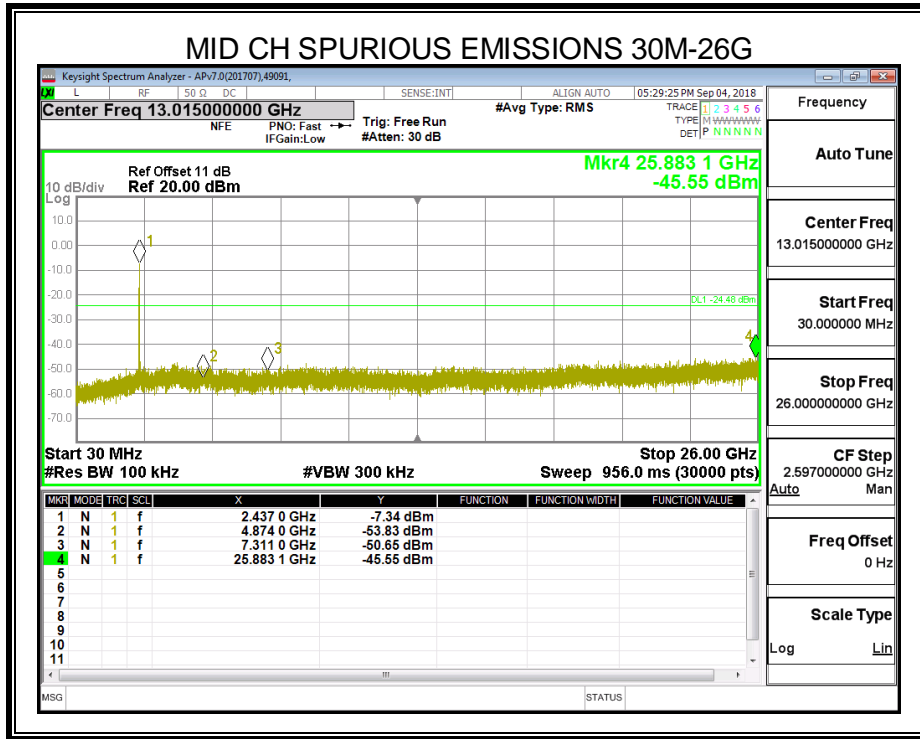
RESULTS

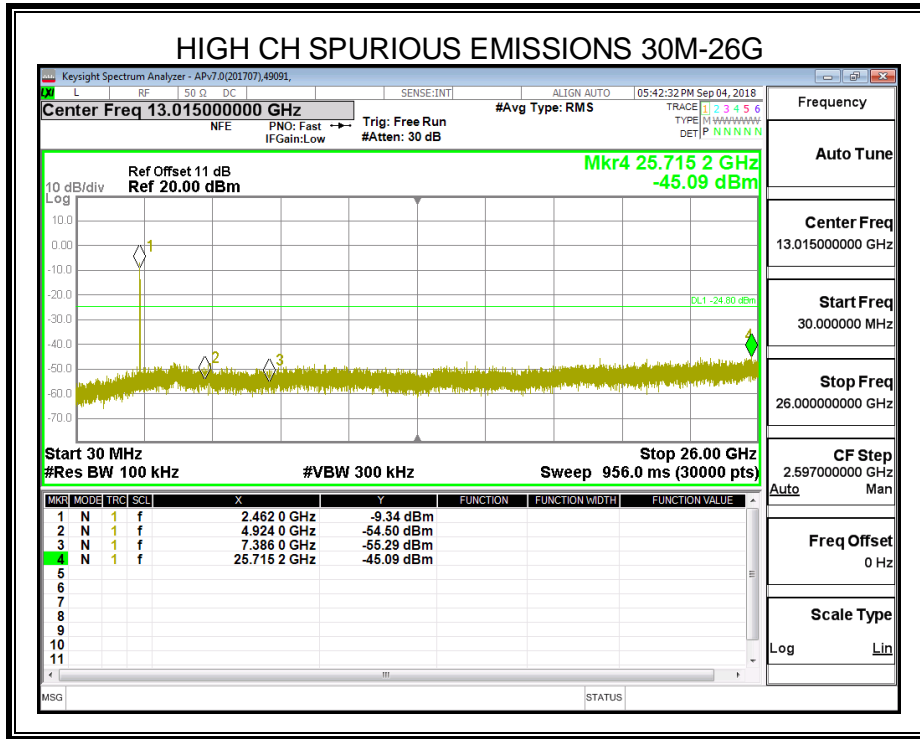
7.5.1. 802.11b MIMO MODE

ANTENNA1

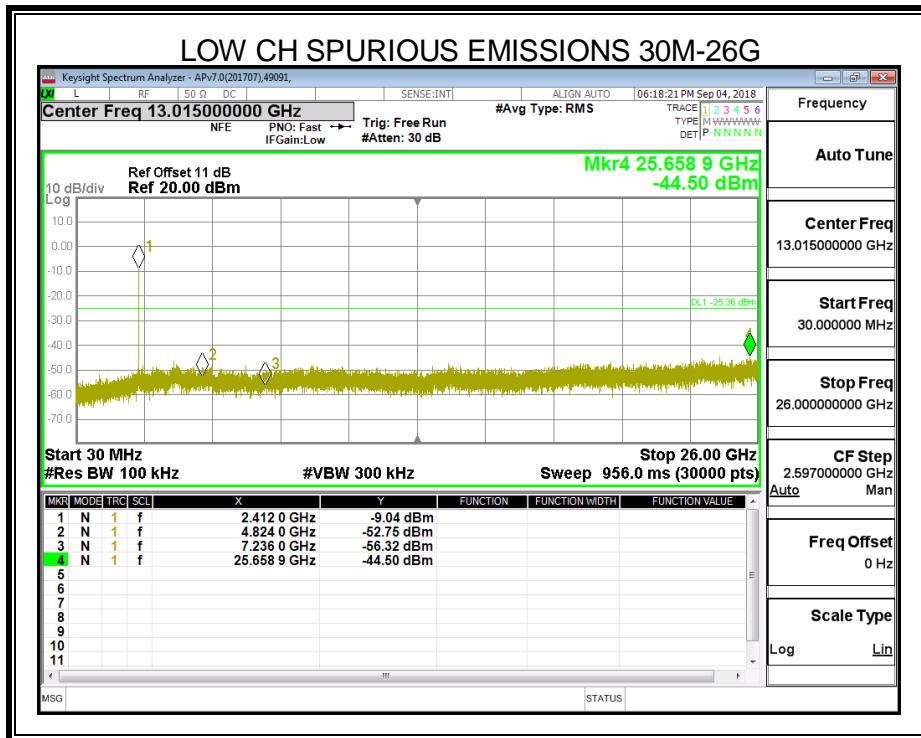
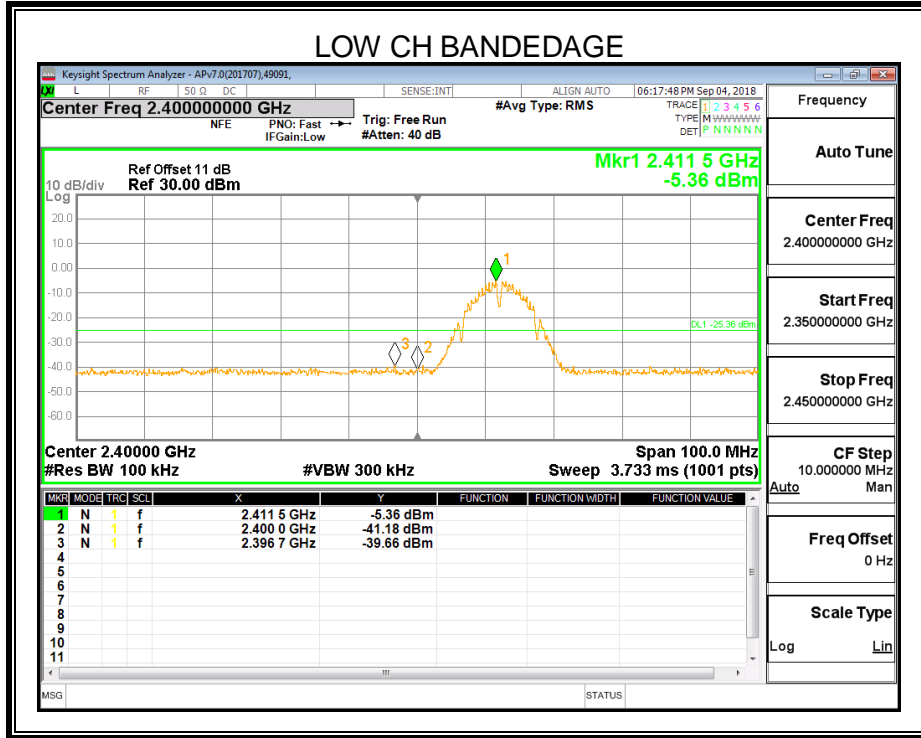


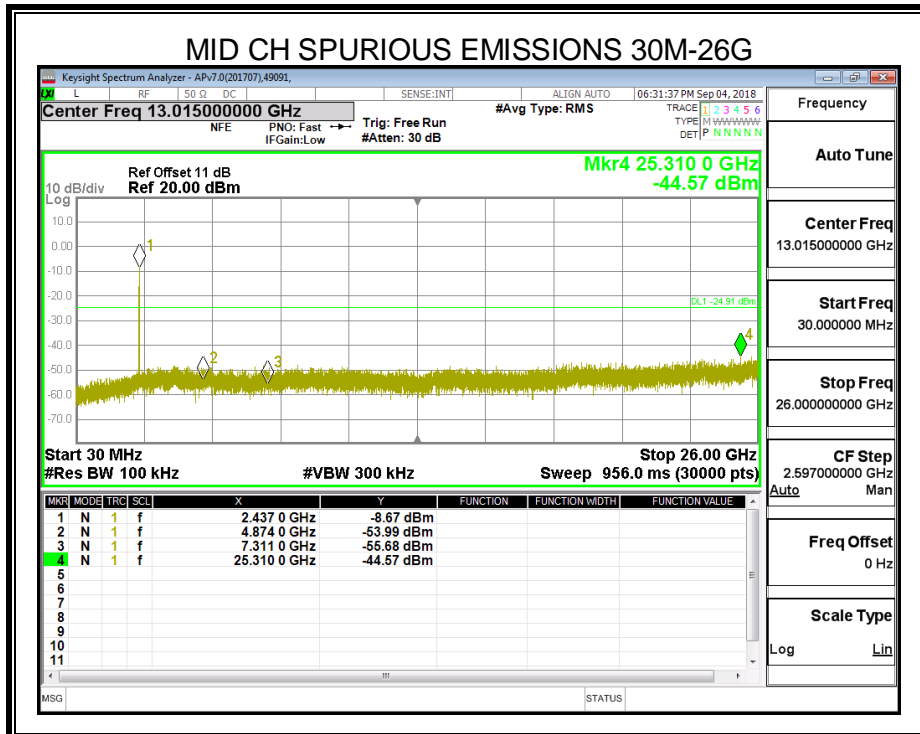
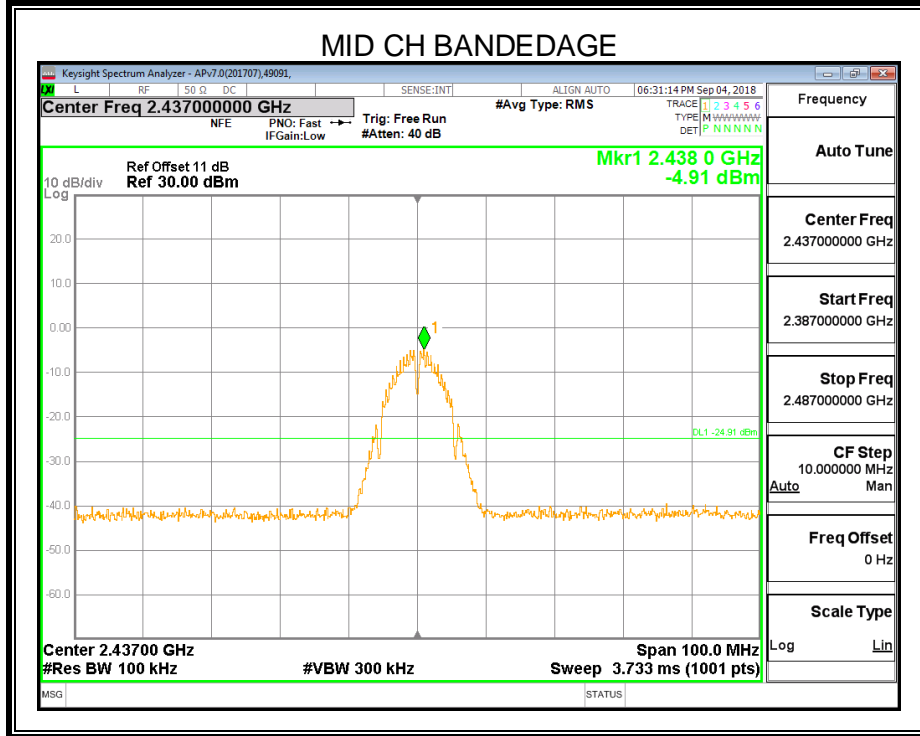


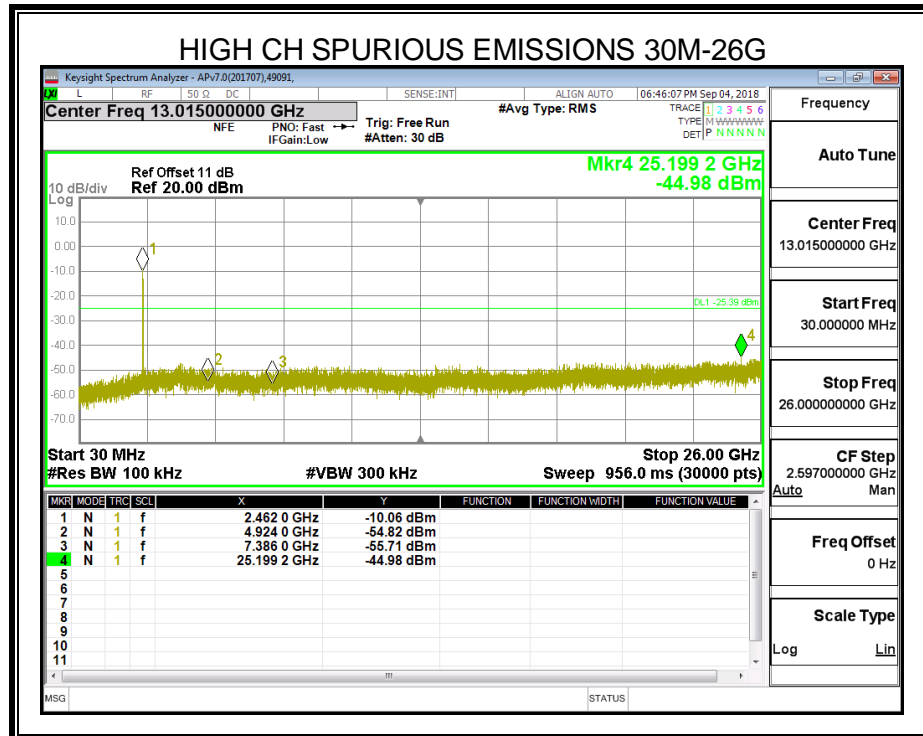
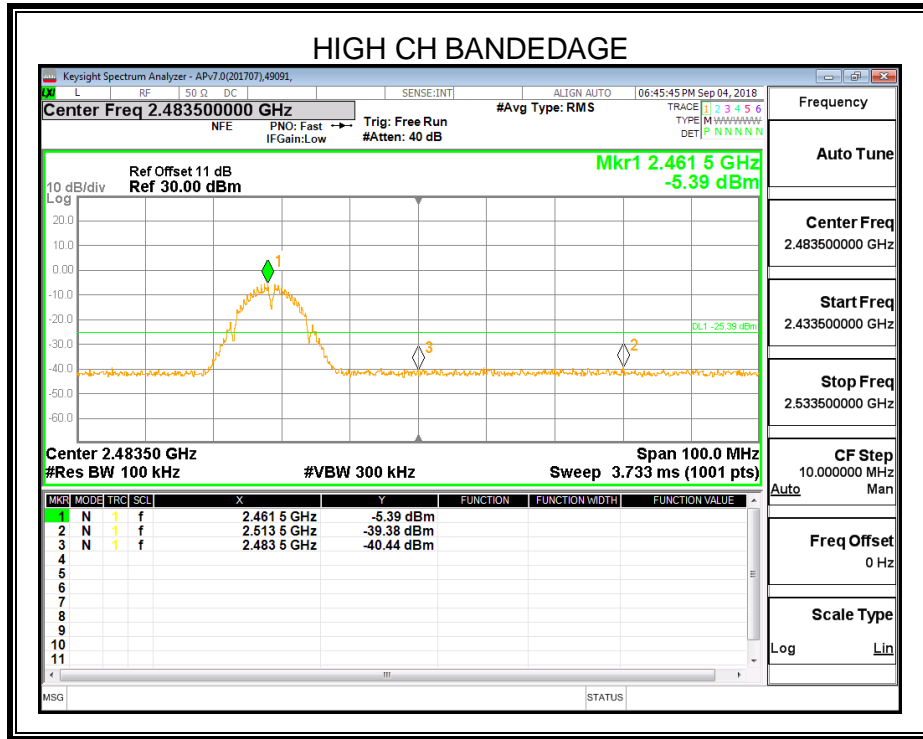




ANTENNA2

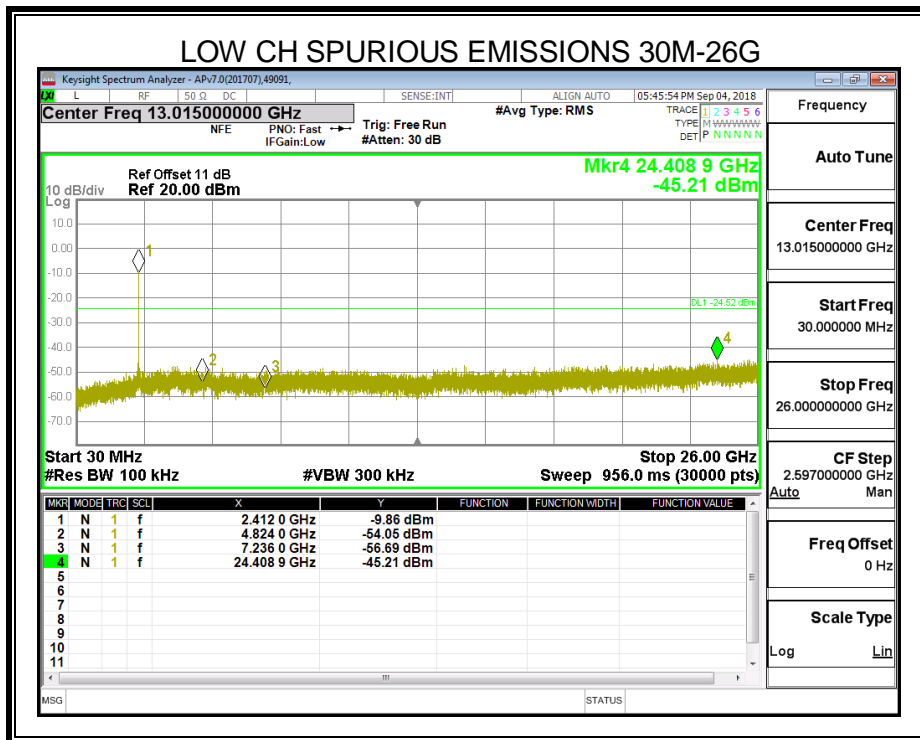
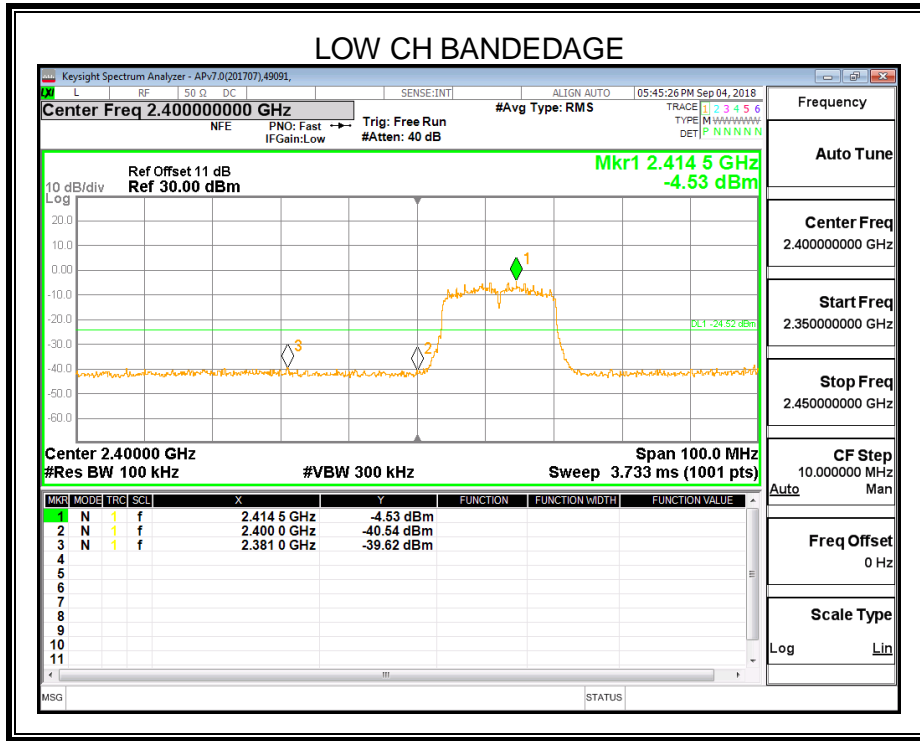


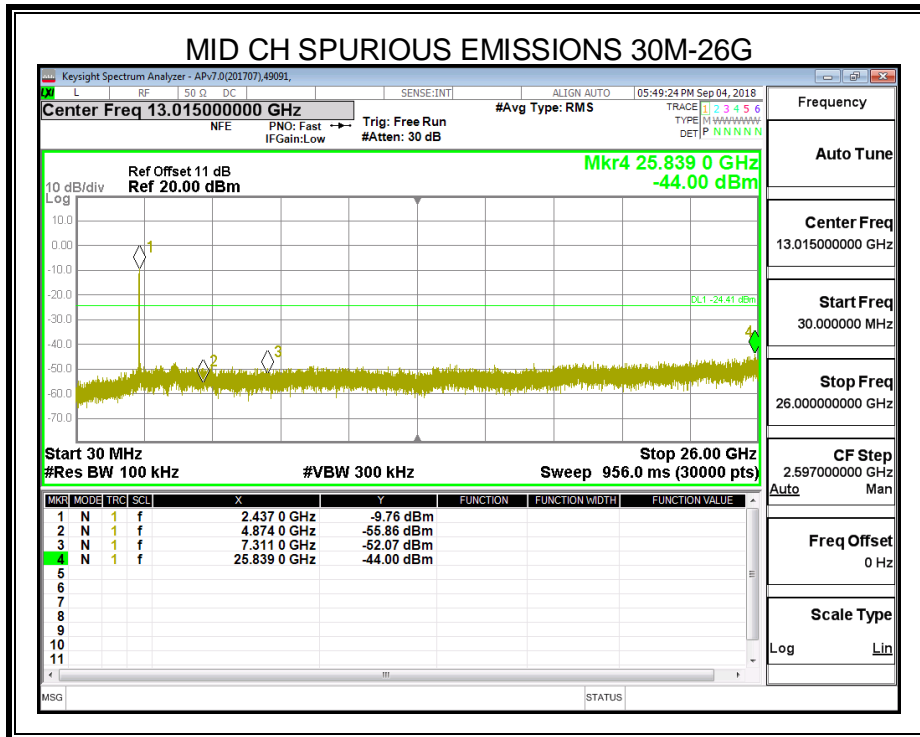
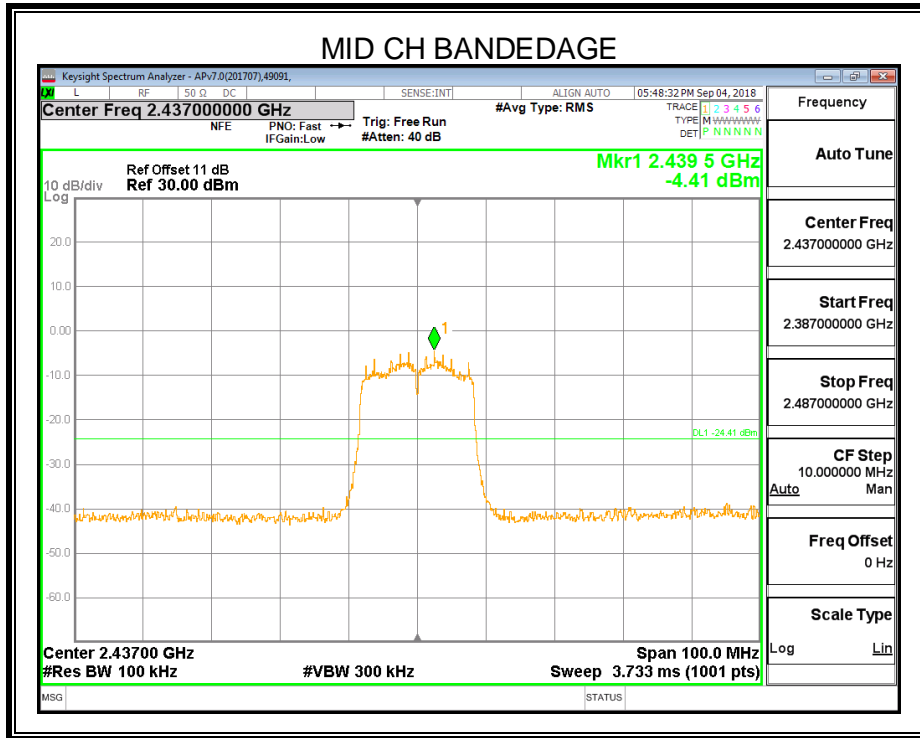


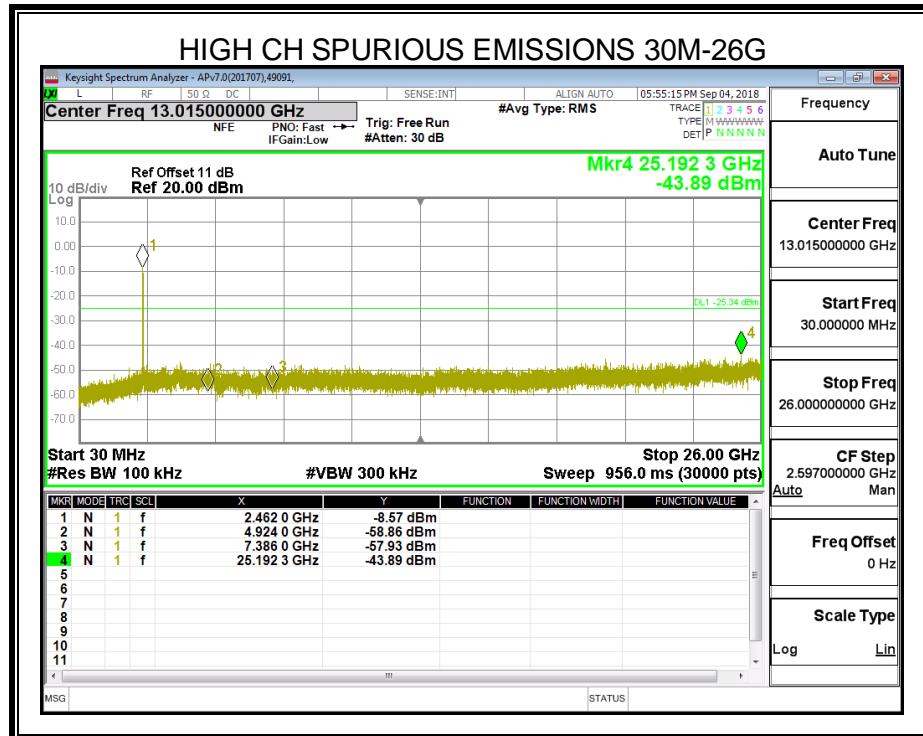
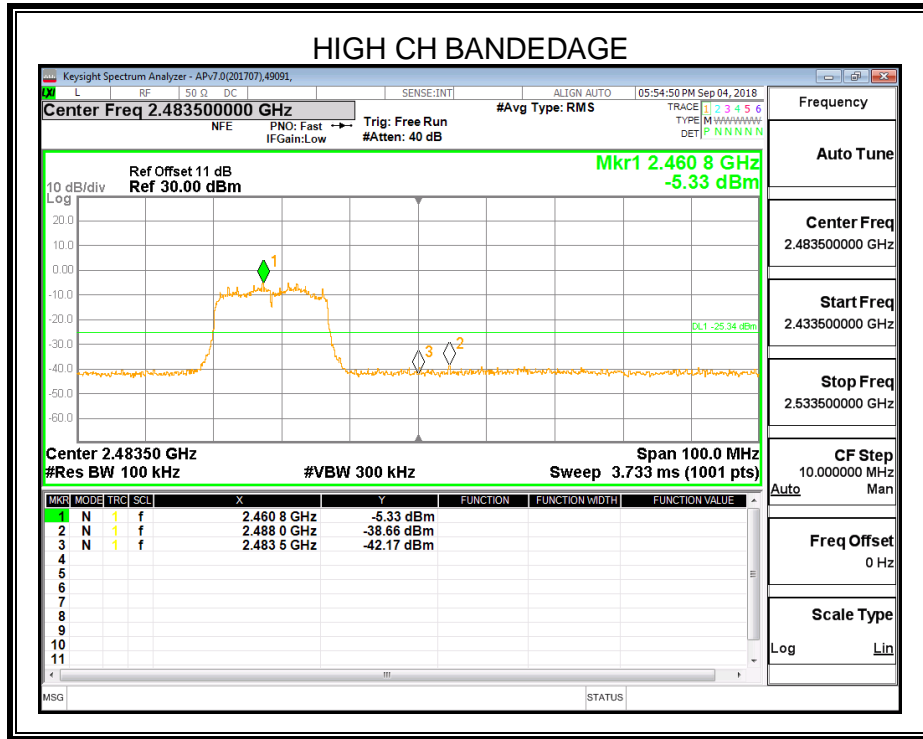


7.5.2. 802.11g MIMO MODE

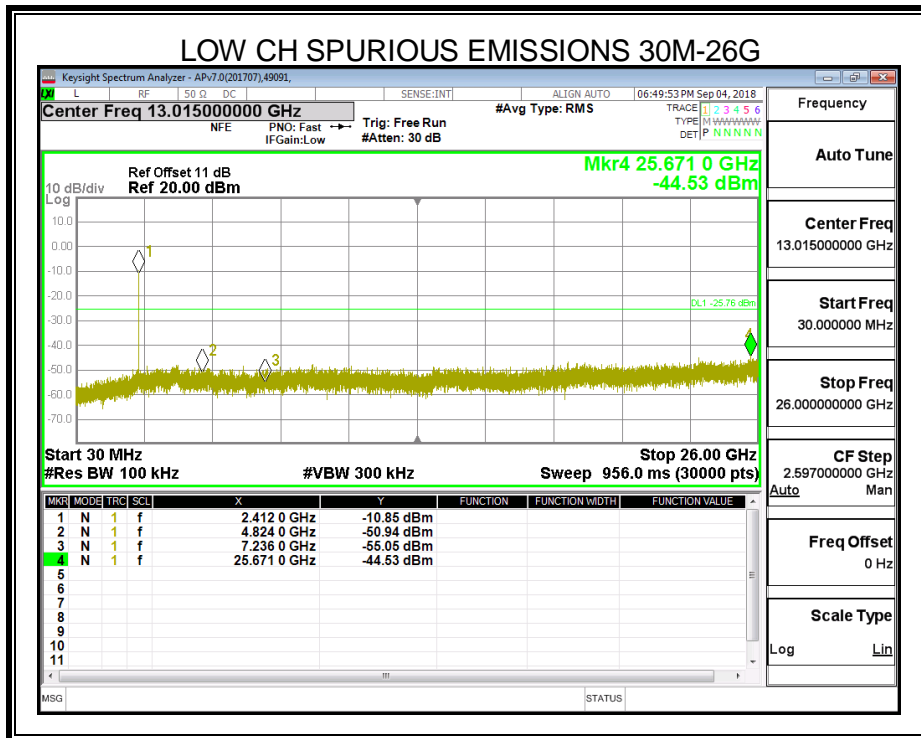
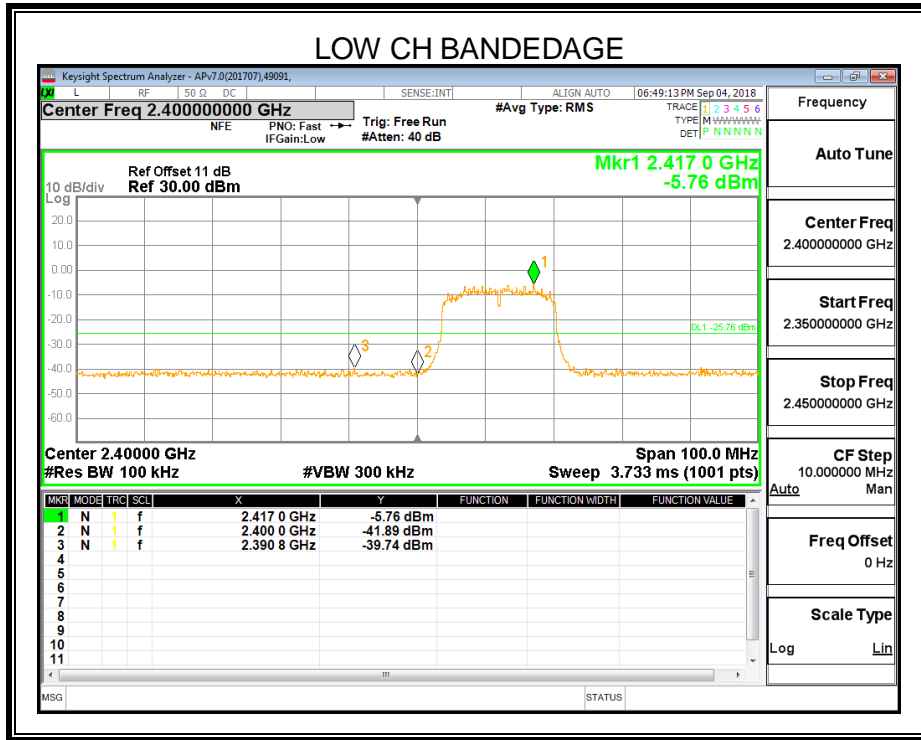
ANTENNA1

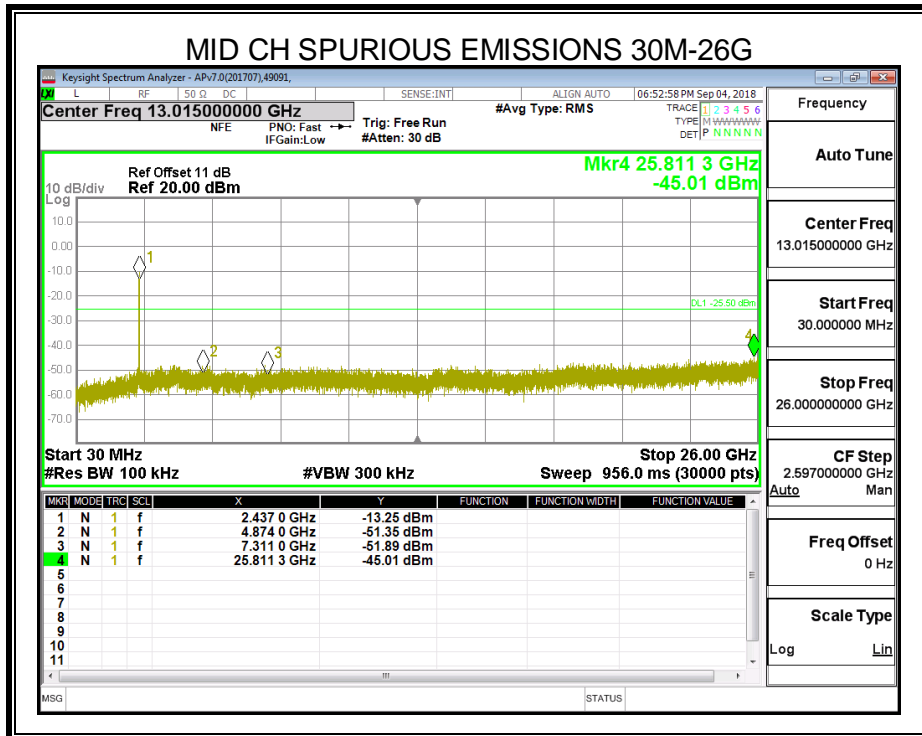
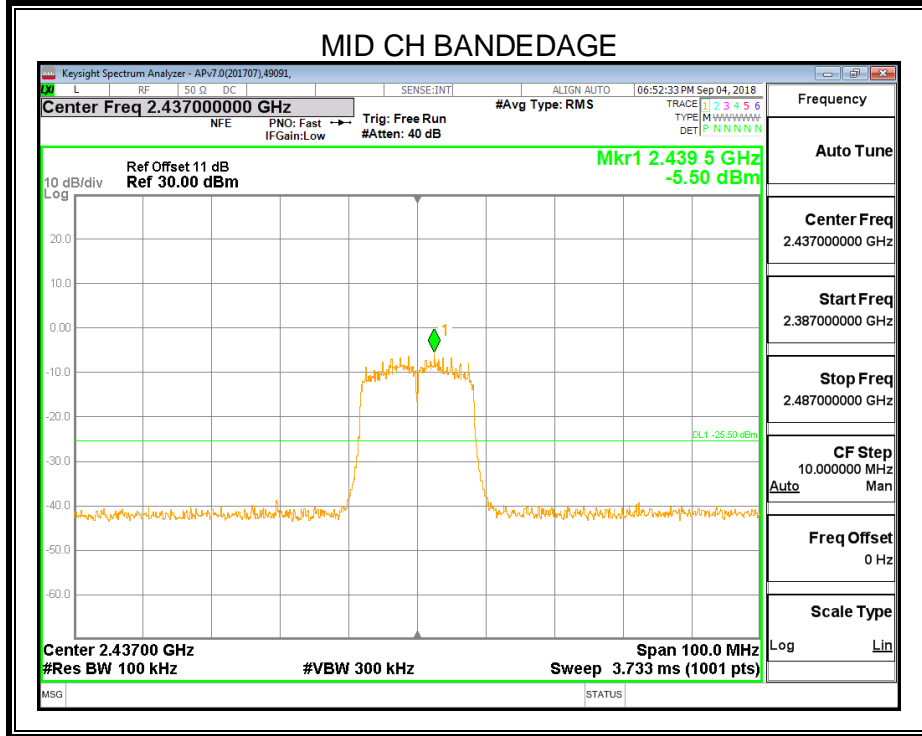


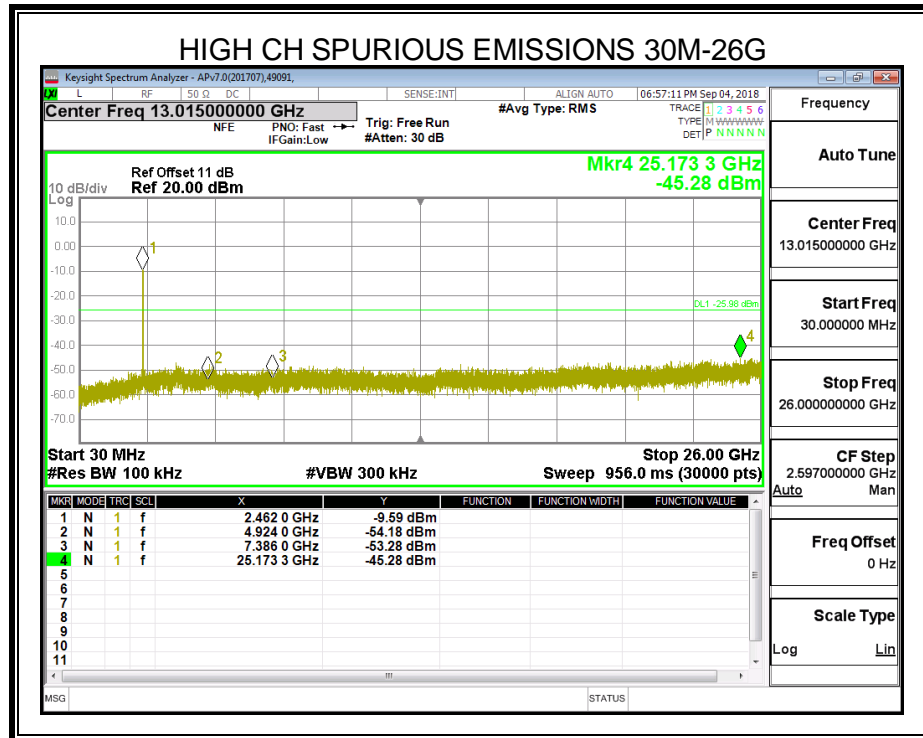
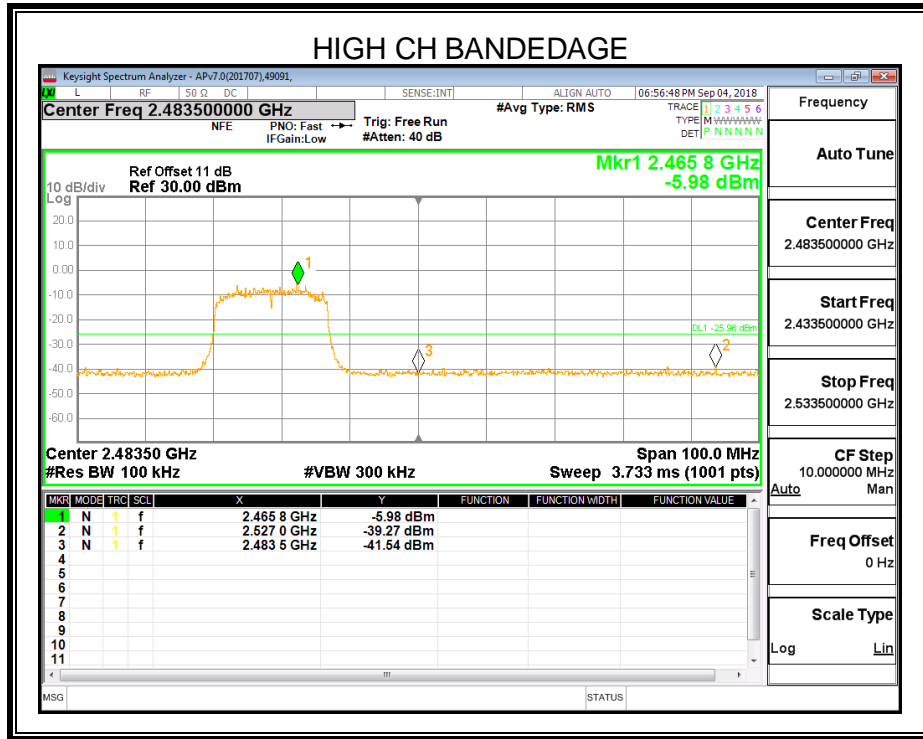




ANTENNA2

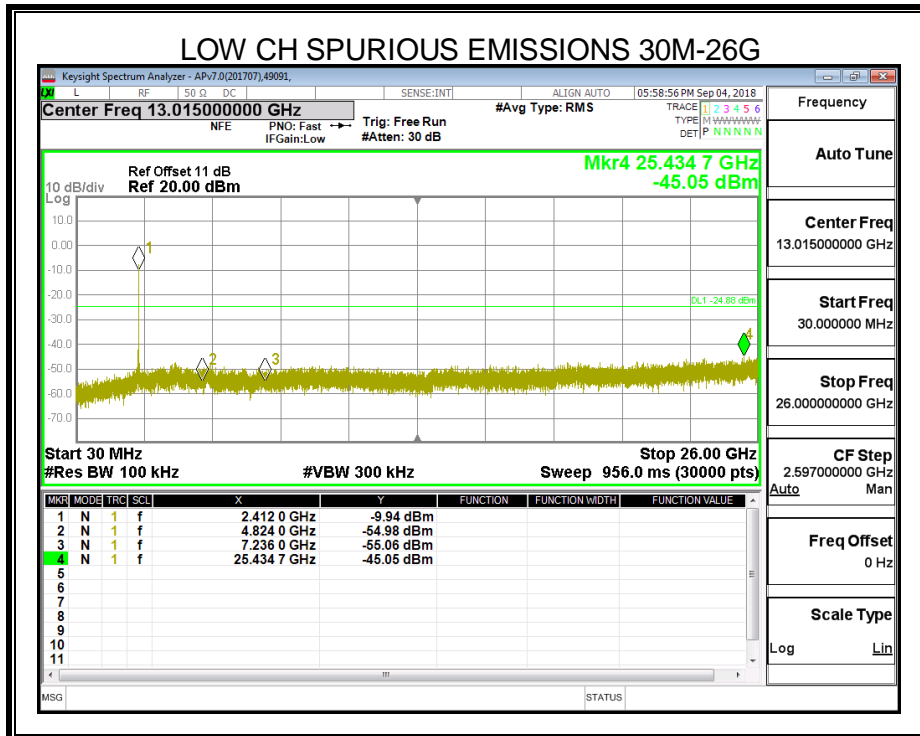
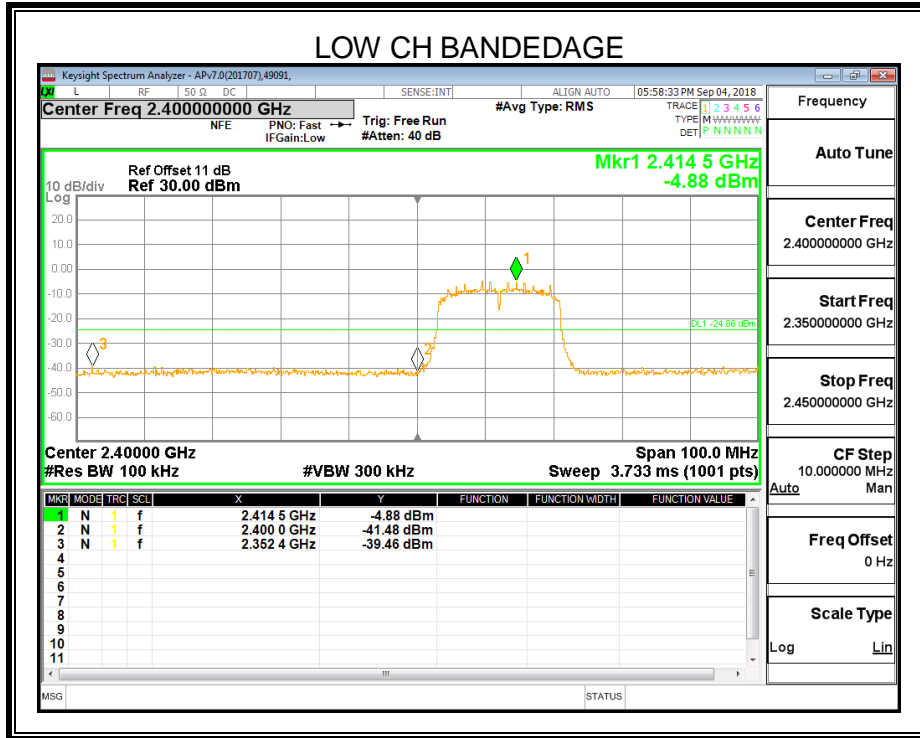


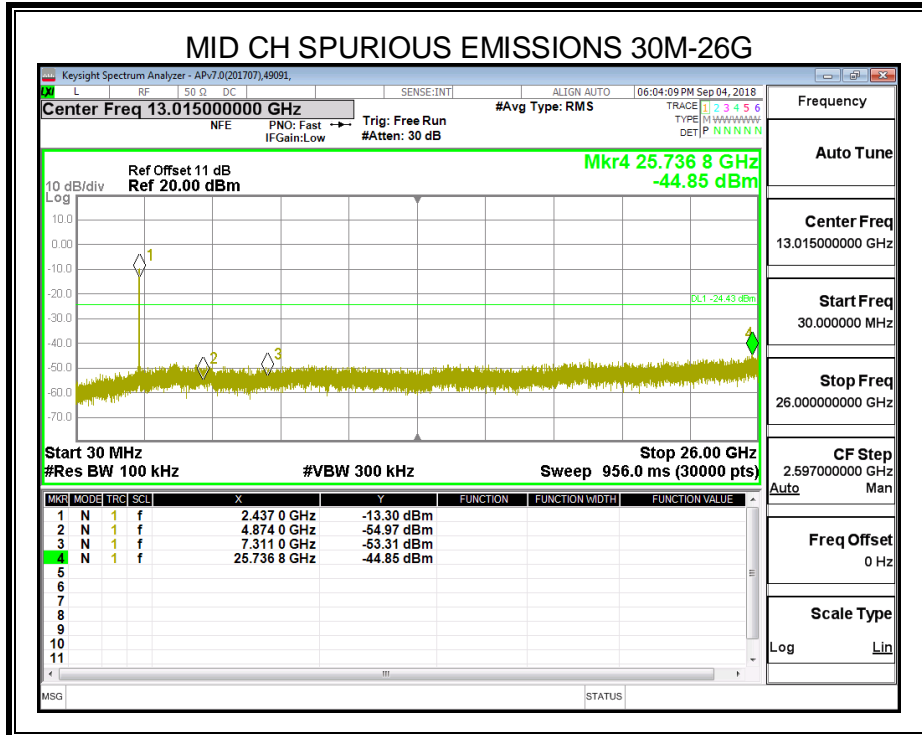
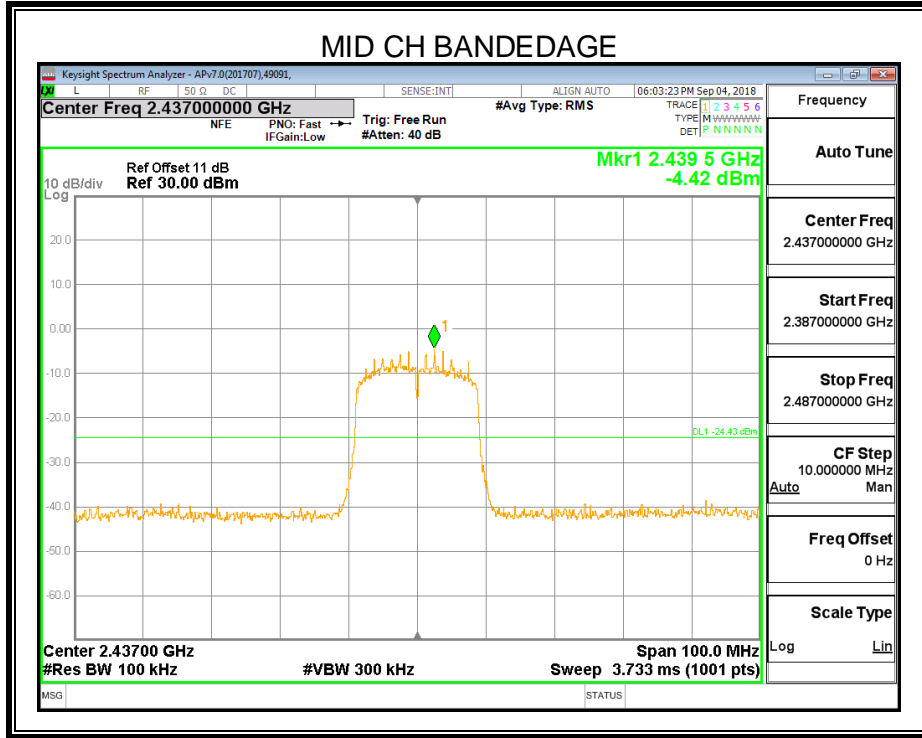


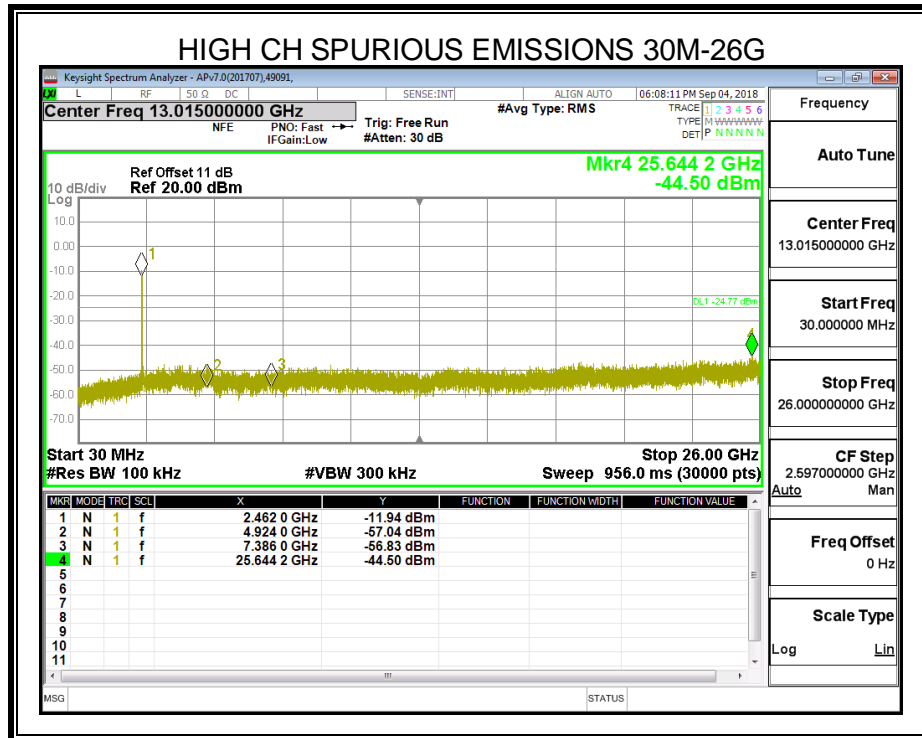
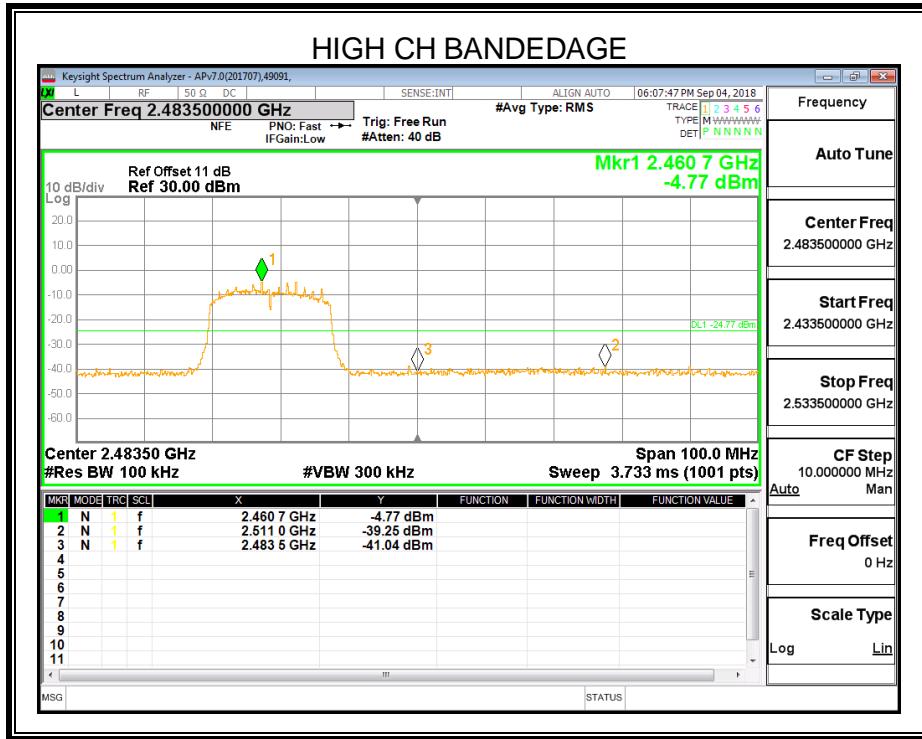


7.5.3. 802.11n20 MIMO MODE

ANTENNA1







ANTENNA2

