FCC TEST REPORT

Product	:	Hover Camera Passport
Trade mark	:	HOVER CAMERA
Model/Type reference	:	HC-6428
Report Number	:	1609060316RFC-1
Date of Issue	:	Sep. 14, 2016
FCC ID	:	2AIDWHCP6428
Test Standards	:	47 CFR Part 15 Subpart C (2015)
Test result	:	PASS

Prepared for:

Shenzhen Zero Zero Infinity Technology Co., Ltd.
1607 Innovation Park, High-Tech Park of Nanshan dist. Shenzhen

Prepared by:

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Tested by: Kevin Liang, Senior Engineer

Reviewed by: Jim Long, Senior Supervisor

Approved by: Billy Li, Technical Director

Date: Sep. 14, 2016

UnionTrust Laboratories UnionTrust * Certified *

Version

Version No.	Date	Description
V1.0	Sep. 14, 2016	Original

Content

1 General Information

1.1 Client Information

Applicant:	Shenzhen Zero Zero Infinity Technology Co., Ltd.
Address of Applicant:	1607 Innovation Park, High-Tech Park of Nanshan dist. Shenzhen
Manufacturer:	Shenzhen Zero Zero Infinity Technology Co., Ltd.
Address of Manufacturer:	1607 Innovation Park, High-Tech Park of Nanshan dist. Shenzhen

1.2 General Description of EUT

Product Name:	Hover Camera Passport	
Model No.(EUT):	HC-6428	
Add. Mode No.:	N/A	
Trade Mark:	HOVER CAMERA	
EUT Supports Radios application:	Wlan 2.4GHz 802.11b/g/n(HT20) Wlan 5.2GHz 802.11a/n(HT20&HT40) Wlan 5.8GHz 802.11a/n(HT20&HT40)	
Power Supply:	AC adapter	Model:HKA03612030-2A Input:100-240V~50/60Hz, 1.0A; Output: 12.0V ⎓ 3A
	Charging Dock:	Model: H-320 Input:11-18V ⎓ 3A MAX; Output: 8.4V ⎓ 2.2A MAX
	Battery 1:	Model: ZB-380 Nominal Voltage: .7.4V ⎓ (Rechargeable LIPO Battery) Battery Capacity: 1100mAh/8.14Wh
	Battery 2:	Model: ZB-381 Nominal Voltage: .7.6V ⎓ (Rechargeable LIPO Battery) Battery Capacity: 1360mAh/10.34Wh
USB Micro-B Plug cable:	0.55m (shielded)	
Sample Received Date:	Sep. 07, 2016	
Sample tested Date:	Sep. 08, 2016 to Sep. 14, 2016	

1.3 Product Specification subjective to this standard

Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers:	802.11b/g/n(HT20): 11 Channels
Channel Separation:	Channels with 5MHz step
Transmit Data Rate:	802.11b:1M/ 2M/ 5.5M/ 11M bps 802.11g:6M/ 9M/ 12M/ 18M/ 24M/ 36M/ 48M/ 54M bps 802.11n(HT20): up to MCS7(65Mbps)
Type of Modulation:	802.11b:DSSS(CCK,DQPSK,DBPSK) 802.11g:OFDM(64QAM, 16QAM, QPSK, BPSK) 802.11n(HT20): OFDM (64QAM, 16QAM,QPSK,BPSK)
Sample Type:	Portable production
Maximum conduction target average power:	802.11b: 17dBm(±1.5dB) 802.11g: 15dBm(±1.5dB) 802.11n(HT20): 14dBm(±1.5dB)
Test Software of EUT:	Provided by the manufacturer
Antenna Type	Chain 0: PIFA antenna Chain 1: PCB antenna

Antenna Gain:	Chain 0: 0.6 dBi gain (2400 ~ 2490 MHz) Chain 1: -1.7 dBi gain (2400 ~ 2490 MHz)
Normal Test voltage:	7.4Vdc for DC power or battery
Extreme Test voltage:	6.4~8.4Vdc for DC power (declared by the manufacturer)
Operating Temperature:	5℃ to +35℃ (declared by the manufacturer)
Software Version:	1-1.0-1.0.1
Hardware Version:	FAIPY_MB_V40

Operation Frequency each of channel(802.11b/g/n HT20)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz	N/A	

1.4 Description of Support Units

The EUT has been tested with associated equipment below.

1) Support equipment

Description	Brand	Model No.	Certification	Supplied by
Laptop	Dell	Inspiron 15 5000 series	FCC ID and DOC	UnionTrust

2) Cable

Cable No.	Description	Connector Type	Cable Type/Length	Supplied by
1	Antenna cable	SMA	0.2m(Shielded)	Client
2	Antenna cable	SMA	0.2m(Shielded)	Client
3	USB Cable	USB	1.2m(shielded)	UnionTrust

1.5 Test Location

All tests were performed at:

Compliance Certification Services (Shenzhen) Inc.

No.10-1 Mingkeda Logistics Park, No.18 Huanguan South RD. Guan lan Town, Baoan Distr, Shenzhen, Guangdong, China.

Compliance Certification Services (Shenzhen) Inc. has been accepted by the FCC, the FCC Registration Number is 441872.

Tested by: Darry Wu

1.6 Deviation from Standards

None.

1.7 Abnormalities from Standard Conditions

None.

1.8 Other Information Requested by the Customer

None.

1.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	±6.3 x 10^{-8}

2	RF power, conducted	±0.52 dB
3	Spurious emissions, radiated (Below 1GHz)	±5.3 dB
	Spurious emissions, radiated (Above 1GHz)	±5.1 dB
4	Conduction emission (9KHz~150KHz)	±3.8 dB
	Conduction emission (150KHz~30MHz)	±3.4 dB
5	Temperature	±0.64 °C
6	Humidity	±2.8 %
7	Supply voltages	±0.49 %

2 Test Summary

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 2013 version of ANSI C63.10

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	N/A[1]
Conducted Peak Output Power	47 CFR Part 15 Subpart C Section 15.247 (b)(3)	KDB 558074 D01 v03r05 Section 9.1.2	PASS
6dB Bandwidth	47 CFR Part 15 Subpart C Section 15.247 (a)(2)	KDB 558074 D01 v03r05 Section 8.1	PASS
Power Spectral Density	47 CFR Part 15 Subpart C Section 15.247 (e)	KDB 558074 D01 v03r05 Section 10.2	PASS
Conducted Out of Band Emission	47 CFR Part 15 Subpart C Section 15.247(d)	KDB 558074 D01 v03r05 Section 11	PASS
Radiated Spurious Emissions	47 CFR Part 15 Subpart C Section 15.205/15.209	KDB 558074 D01 v03r05 Section 12.1	PASS
Band Edge Measurements (Radiated)	47 CFR Part 15 Subpart C Section 15.205/15.209	KDB 558074 D01 v03r05 Section 12.1	PASS

Remark:
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.
RF: In this whole report RF means Radiated Frequency.
CH: In this whole report CH means channel.
N/A: Not application,

1. This EUT is powered by batteries, it need remove the battery from the EUT when charging, It doesn't transmitting while charging.

3 Equipment List

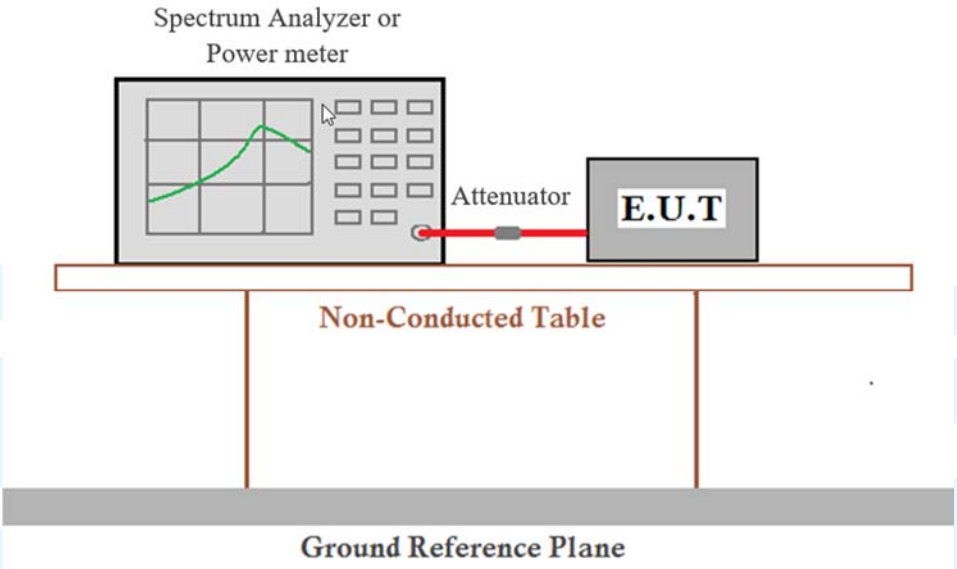
3m (Semi-Anechoic Chamber)					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal. Due date (mm-dd-yyyy)**	**Cal. Interval**
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	02-20-2017	1 Year
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Bilog Antenna	SCHAFFNER	CBL6143	5063	02-21-2017	1 Year
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02-20-2017	1 Year
Loop Antenna	COM-POWER	AL-130	121044	02-20-2017	1 Year
High Noise Amplifier	Agilent	8449B	3008A01838	02-21-2017	1 Year
Horn Antenna	Schwarzbeck	BBHA9120	D286	02-21-2017	1 Year
Temp. / Humidity Meter	Anymetre	JR913	N/A	02-21-2017	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Test S/W	FARAO	LZ-RF / CCS-SZ-3A2			

Conducted RF test					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal. Due date (mm-dd-yyyy)**	**Cal. Interval**
Spectrum Analyzer	Agilent	N9010A	MY52221469	02-21-2017	1 Year
Power Meter	Agilent	ML2495A	1204003	02-21-2017	1 Year

4 Test Requirement

4.1 Test setup

4.1.1 For Conducted test setup



4.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

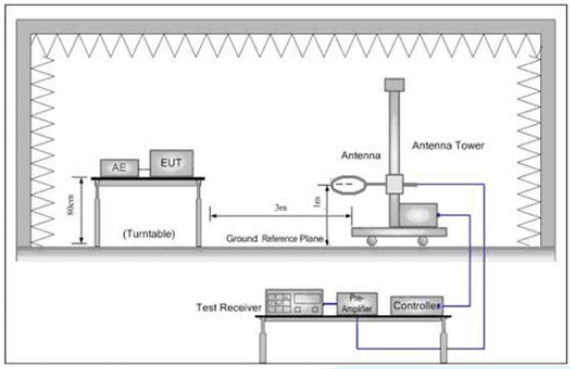


Figure 1. Below 30MHz

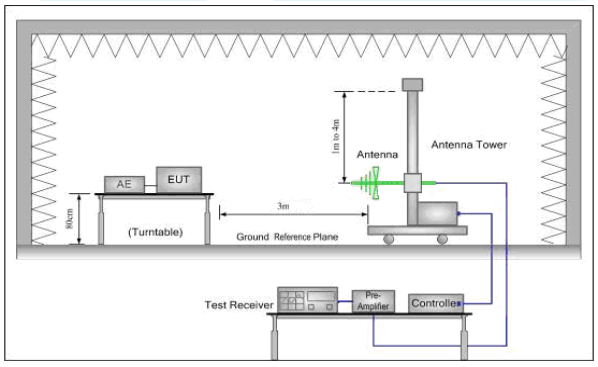


Figure 2. 30MHz to 1GHz

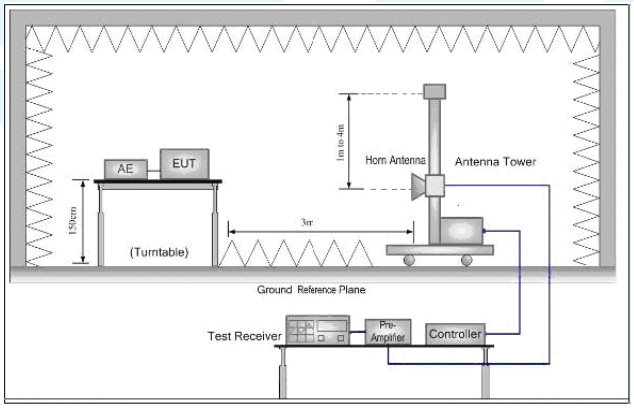


Figure 3. Above 1GHz

4.2 Test Environment

Operating Environment:	
Temperature:	25.8 °C
Humidity:	53 % RH
Atmospheric Pressure:	99.95mbar

4.3 System Test Configuration

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 7.4Vdc rechargeable LIPO battery(Model: ZB-380). Only the worst case data were recorded in this test report.

For STBC modes (2Tx), there are two transmission antennas. Both Chain 0 and Chain 1 used at the same time and antenna ports have uniform output powers. The Chain 0 and Chain 1 antenna ports cannot be used alone.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency Band	Mode	Antenna Port	Worst-case Orientation
2.4 **GHz**	1Tx SISO	N/A	N/A
		N/A	N/A
	2Tx STBC	Chain 0 + Chain 1	X-Portrait

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.4 Test Condition

4.4.1 Test channel

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
802.11b/g/n(HT20)	2412MHz ~2462 MHz	Channel 1	Channel 6	Channel 11
		2412MHz	2437MHz	2462MHz
Transmitting mode: Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.				

4.4.2 Test mode

Pre-scan under all rate at lowest channel

Channel/ Frequency (MHz)	Maximum Conducted Average Power (Measured Value) (dBm)							
Chain 0_802.11b								
Data Rate (Mbps)	**1**	2	5.5	11				
1(2412)	**16.69**	16.47	16.66	16.57				
Chain 0_802.11g								
Data Rate (Mbps)	**6**	9	12	18	24	36	48	54
1(2412)	**15.49**	15.41	15.3	15.42	15.19	14.89	14.07	12.95
Chain 0_802.11n(HT20)								
Data Rate (Mbps)	MCS 0	MCS 1	MCS 2	**MCS 3**	MCS 4	MCS 5	MCS 6	MCS 7
1(2412)	13.72	13.66	13.77	**13.97**	13.71	13.48	12.63	11.21

So, the worst-case data rates see table below:

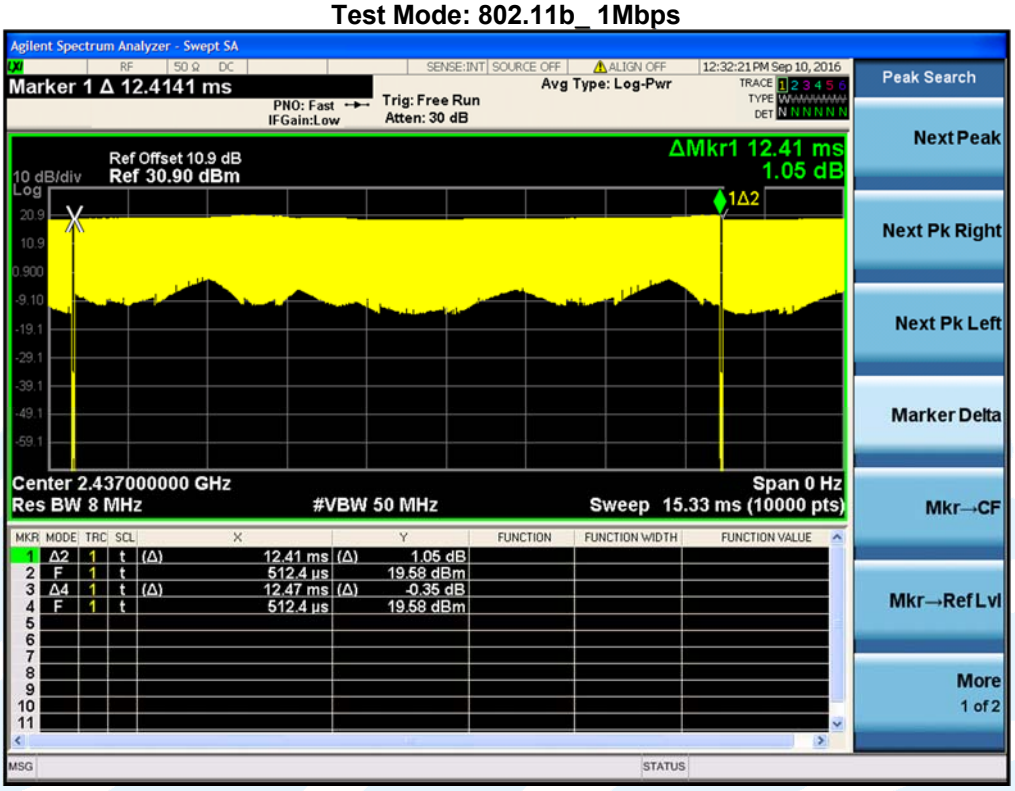
Mode	Worst-case data rates		
	SISO Mode		STBC Mode:
	Chain 0	Chain 1	Chain 0+1
802.11b	N/A	N/A	1 Mbps
802.11g	N/A	N/A	6 Mbps
802.11n HT20	N/A	N/A	MCS 3(26Mbps)

4.4.3 Duty Cycle

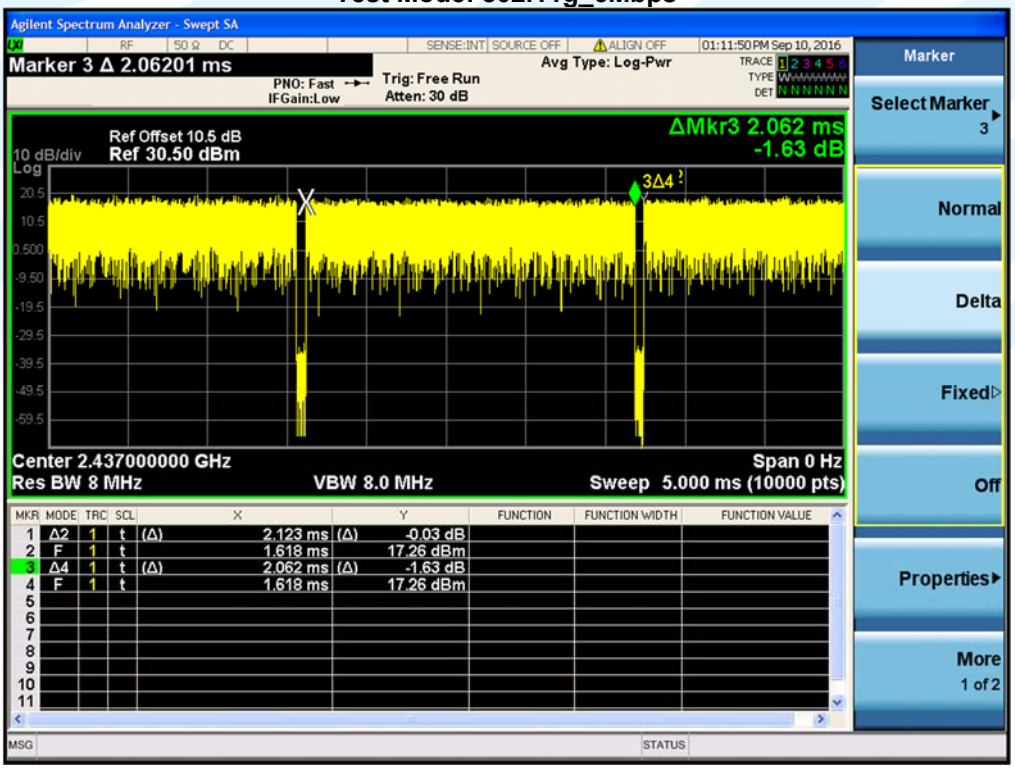
Mode	Data rates (Mbps)	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)
802.11b	1	12.410	12.470	1.00	99.52	0.00	0.01
802.11g	6	2.0620	2.1230	0.97	97.13	0.13	0.48
802.11n(HT20)	26	0.5069	0.5649	0.90	89.73	0.47	1.97
Remark: 1) Duty cycle= On Time/ Period 2) Duty Cycle factor = 10 * log(1/ Duty cycle)							

The test plot as follows:

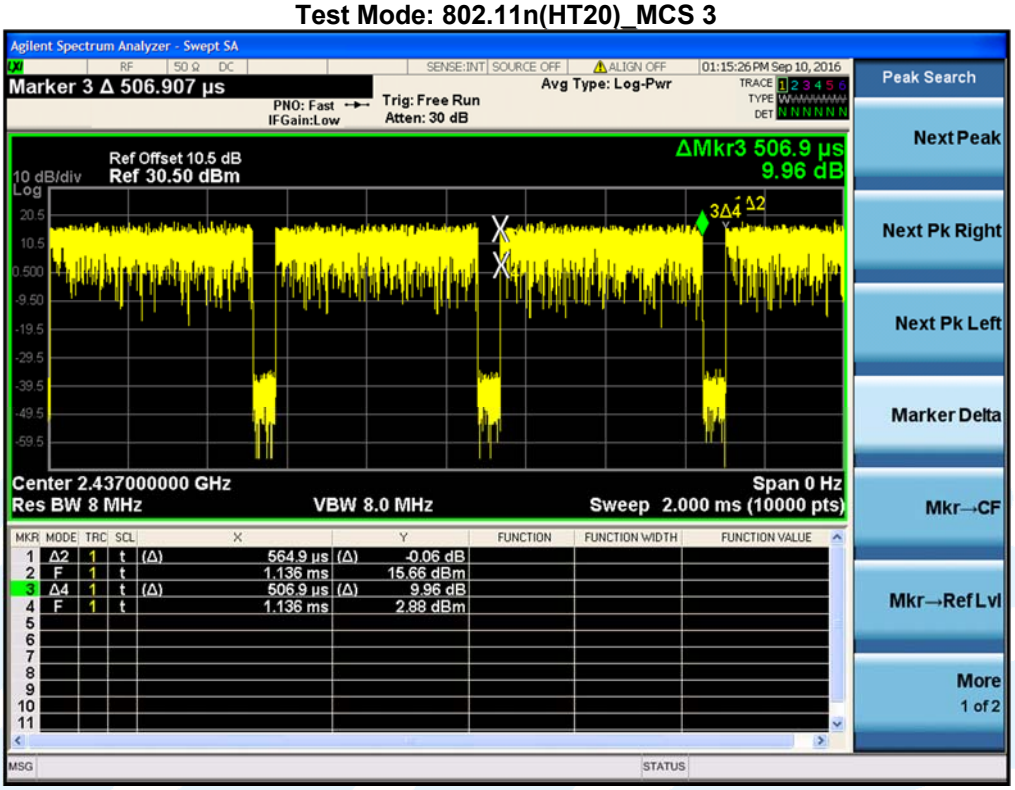
Test Mode: 802.11b_ 1Mbps



Test Mode: 802.11g_6Mbps



Test Mode: 802.11n(HT20)_MCS 3



5 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15C (2015)	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices
3	KDB 558074 D01 DTS Meas Guidance v03r05	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
4	KDB 662911 D01 Multiple Transmitter Output v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

5.1 Antenna Requirement

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:	
Both antenna in the interior of the equipment and no consideration of replacement. The Tx chains are correlated and the antenna gain is unequal among the chains and the best case directional gain of the antenna is 2.54dBi (See section 5.2).	

5.2 Conducted Peak Output Power

Test Requirement: 47 CFR Part 15 Subpart C Section15.247 (b)(3)

Test Method: KDB 558074 D01 v03r05 Section 9.1.2 & Section 9.2.3

Limit: For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Test Procedure:

1. The output from the transmitter was connected to an attenuator and then to the input of the the power meter.
2. Measure out each test modes' peak or average output power, record the power level.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

Maximum Conducted Power:

Mode	Channel/ Frequency (MHz)	Data Rate (Mbps)	Maximum Conducted Power (dBm)							
			Peak Power			Average Power				
						Measured Power		Power with Duty Factor		
			Chain 0	Chain 1	Total (Chain 0+1)	Chain 0	Chain 1	Chain 0	Chain 1	Total (Chain 0+1)
802.11b	1(2412)	1	19.25	20.50	22.93	16.69	18.08	16.69	18.08	20.45
	6(2437)		18.76	20.01	22.44	16.39	17.69	16.39	17.69	20.10
	11(2462)		18.31	17.48	20.93	15.82	14.84	15.82	14.84	18.37
802.11g	1(2412)	6	20.24	20.45	23.36	15.49	15.32	15.62	15.45	18.55
	6(2437)		20.02	20.24	23.14	15.53	15.55	15.66	15.68	18.68
	11(2462)		19.78	19.29	22.55	14.82	13.95	14.95	14.08	17.55
802.11n (HT20)	1(2412)	MCS3	21.27	22.02	**24.67**	13.97	15.33	14.44	15.8	18.18
	6(2437)		20.68	21.07	23.89	14.22	14.34	14.69	14.81	17.76
	11(2462)		20.47	20.19	23.34	13.41	12.42	13.88	12.89	16.42

Remark:

1. All the data attached was use the worst case data rate.
2. Total (Chain 0+1) = $10*\log[(10^{\text{Chain 0}/10})+(10^{\text{Chain 1}/10})]$
3. Power with Duty Factor = Measured Power + Duty Cycle Factor
4. Directional gain and the maximum conducted output power see table below:

Frequency	Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Correlated chains directional gain (dBi)	Peak Power Limits (dBm)
2.4GHz	0.6	-1.7	2.54	30
NOTE: The TX chains are correlated and the antenna gain is unequal among the chains. The directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi				

5.3 6dB Bandwidth

Test Requirement: 47 CFR Part 15 Subpart C Section 15.247 (a)(2)

Test Method: KDB 558074 D01 v03r05 Section 8.1

Limit: For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

Test Procedure: The output from the transmitter was connected to an attenuator and then to the input of the spectrum analyzer.

Use the following spectrum analyzer settings:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 x RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) 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 relative to the maximum level measured in the fundamental emission.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

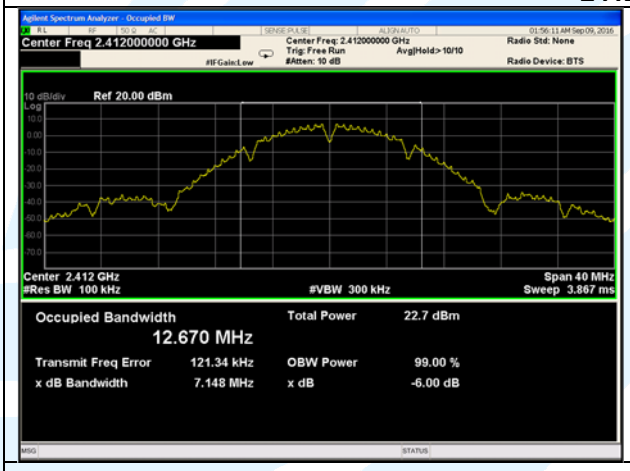
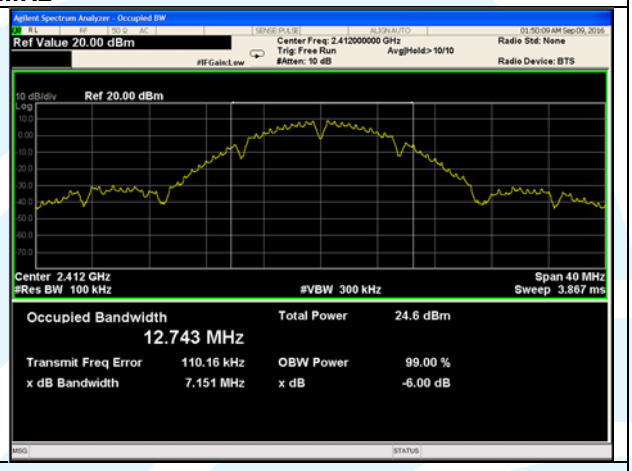
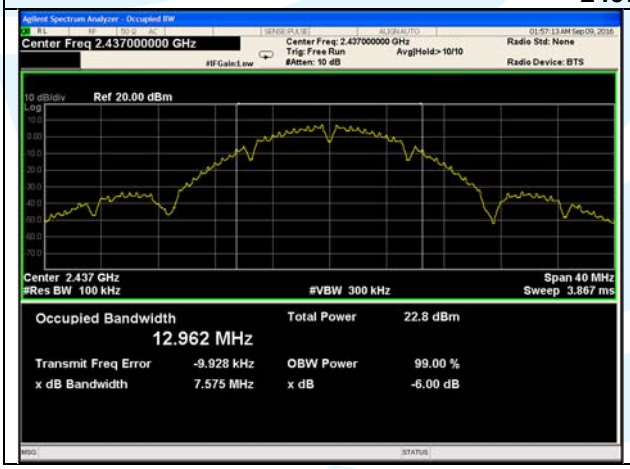
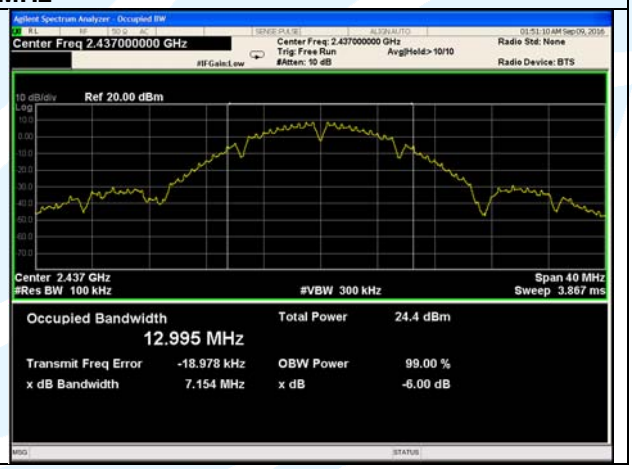
Occupied Bandwidth:

Mode	Channel Frequency (MHz)	Antenna Port	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limit	Result (Pass / Fail)
802.11b	1 (2412)	Chain 0	7.148	12.670	> 500 kHz	Pass
		Chain 1	7.151	12.743	> 500 kHz	Pass
	6 (2437)	Chain 0	7.575	12.962	> 500 kHz	Pass
		Chain 1	7.154	12.995	> 500 kHz	Pass
	11 (2462)	Chain 0	7.147	12.750	> 500 kHz	Pass
		Chain 1	7.144	12.295	> 500 kHz	Pass
802.11g	1 (2412)	Chain 0	16.05	16.558	> 500 kHz	Pass
		Chain 1	15.78	16.664	> 500 kHz	Pass
	6 (2437)	Chain 0	16.35	16.688	> 500 kHz	Pass
		Chain 1	16.37	16.567	> 500 kHz	Pass
	11 (2462)	Chain 0	16.34	16.528	> 500 kHz	Pass
		Chain 1	16.34	16.440	> 500 kHz	Pass
802.11n (HT20)	1 (2412)	Chain 0	17.60	17.651	> 500 kHz	Pass
		Chain 1	17.56	17.682	> 500 kHz	Pass

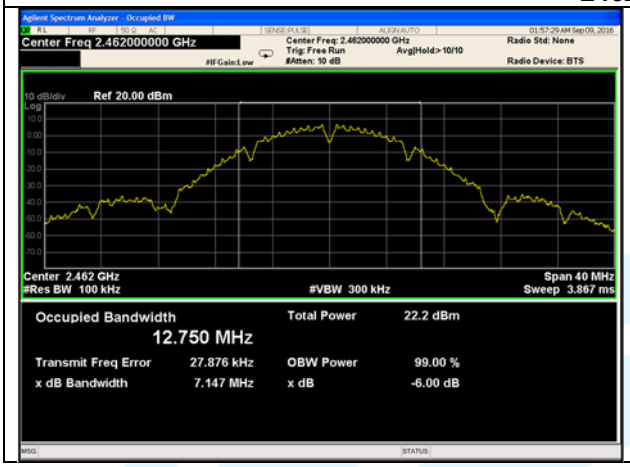
	6 (2437)	Chain 0	17.67	17.683	> 500 kHz	Pass
		Chain 1	17.64	17.694	> 500 kHz	Pass
	11 (2462)	Chain 0	17.65	17.637	> 500 kHz	Pass
		Chain 1	17.65	17.652	> 500 kHz	Pass
Remark: All the data attached was use the worst case data rate.						

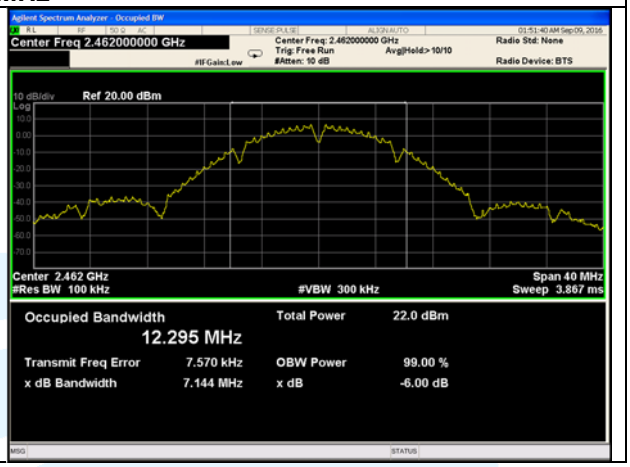
The test plot as follows:

Test Mode: 802.11b

Chain 0	Chain 1
2412MHz	
	
2437MHz	
	

2462MHz

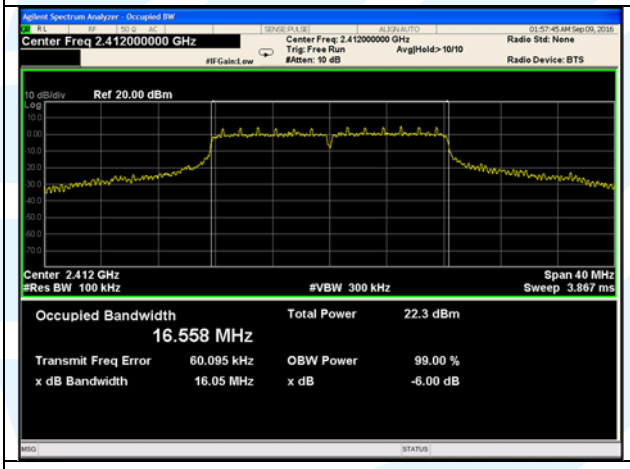


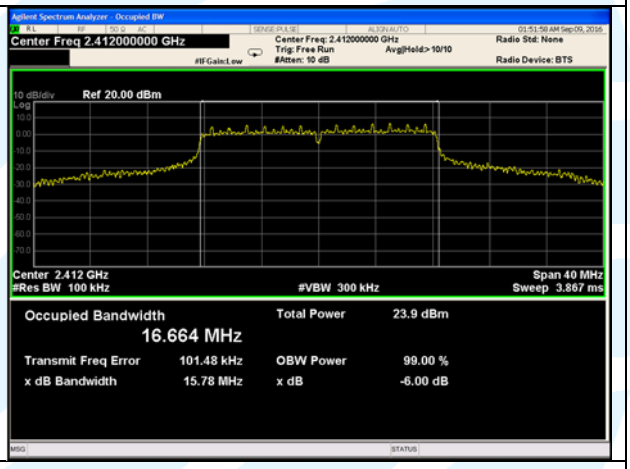


Test Mode: 802.11g

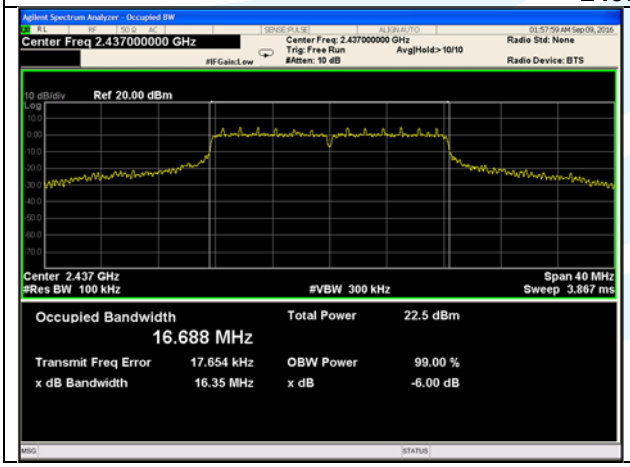
Chain 0	Chain 1

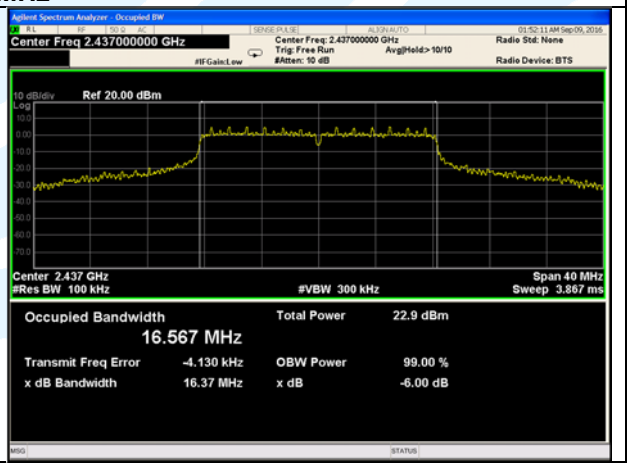
2412MHz



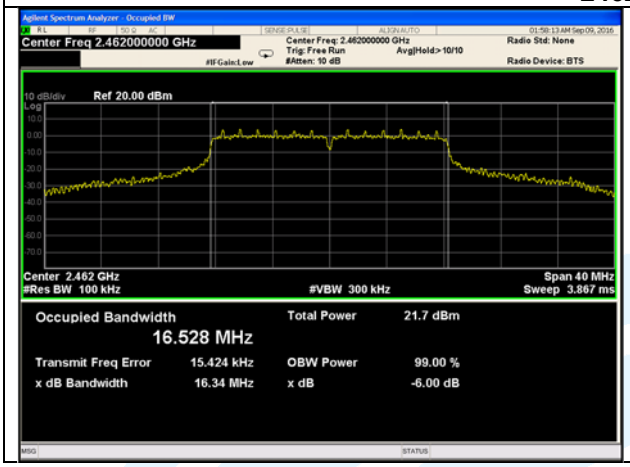


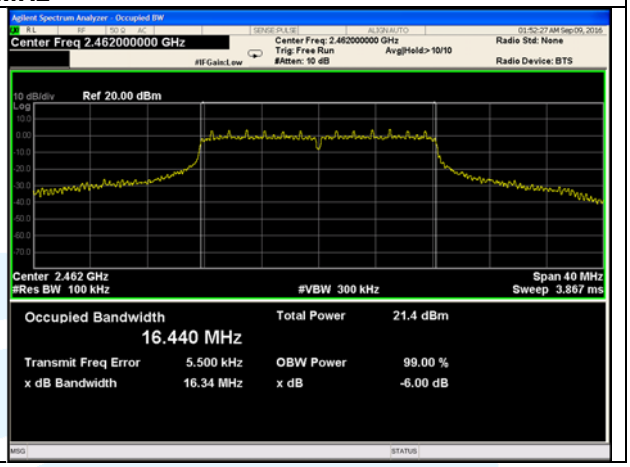
2437MHz





2462MHz

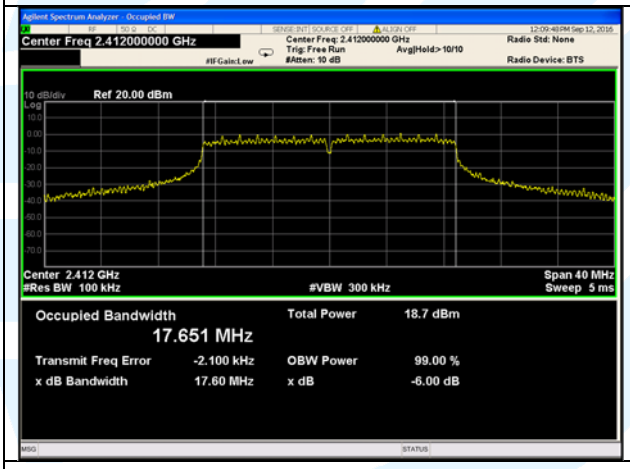


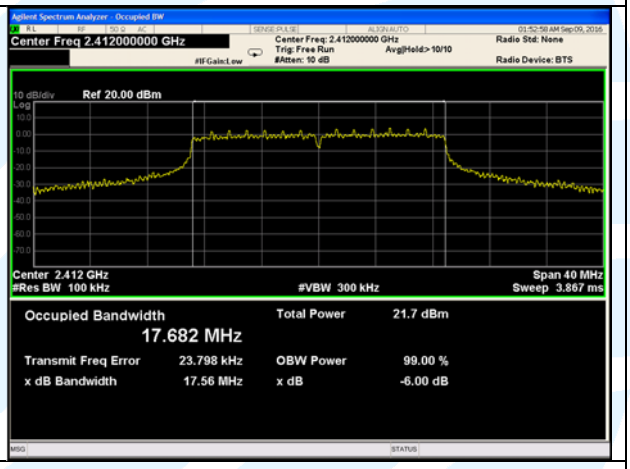


Test Mode: 802.11n(HT20)

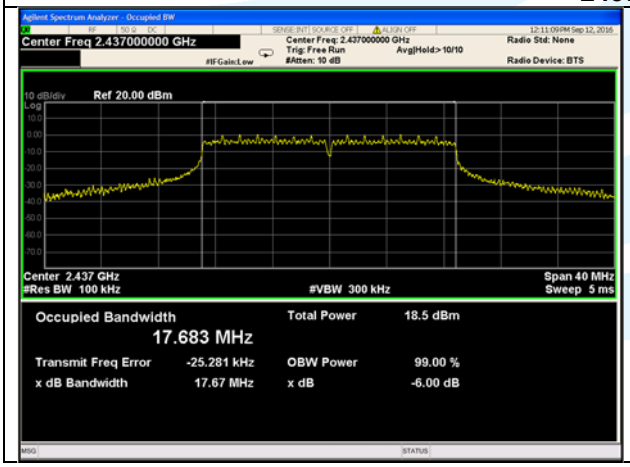
Chain 0	Chain 1

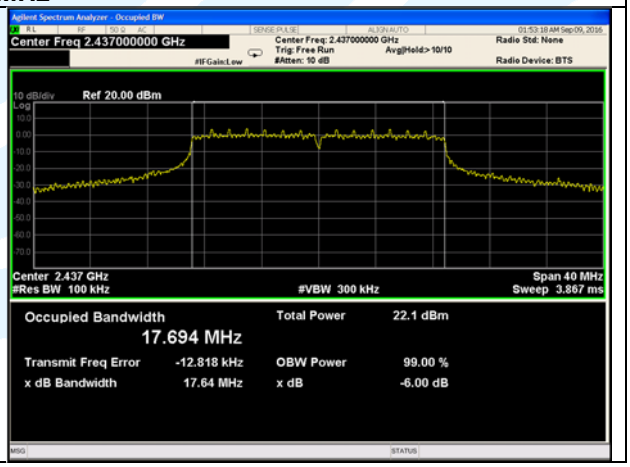
2412MHz



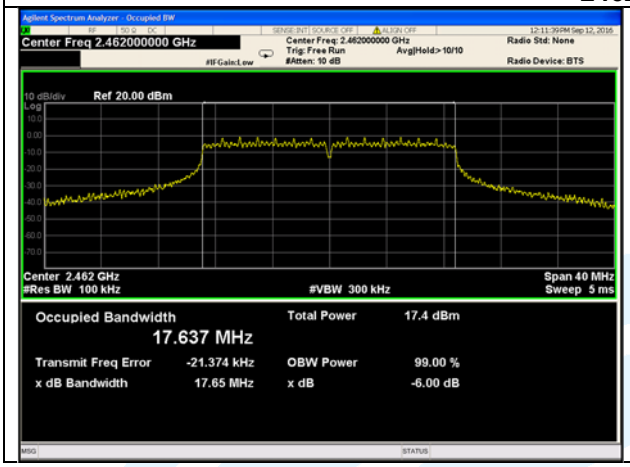


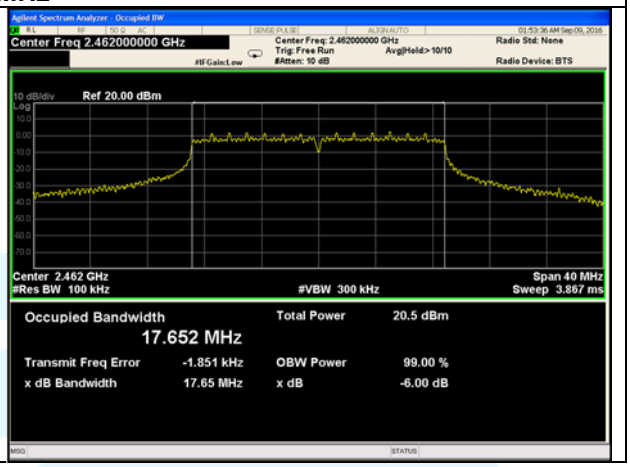
2437MHz





2462MHz


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.462000000 GHz
Center Freq: 2.462000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
10 dB/div
Ref 20.00 dBm
Center 2.462 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 40 MHz
Sweep 5 ms
Occupied Bandwidth
17.637 MHz
Total Power 17.4 dBm
Transmit Freq Error -21.374 kHz
OBW Power 99.00 %
x dB Bandwidth 17.65 MHz
x dB -6.00 dB


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.462000000 GHz
Center Freq: 2.462000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
10 dB/div
Ref 20.00 dBm
Center 2.462 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 40 MHz
Sweep 3.867 ms
Occupied Bandwidth
17.652 MHz
Total Power 20.5 dBm
Transmit Freq Error -1.851 kHz
OBW Power 99.00 %
x dB Bandwidth 17.65 MHz
x dB -6.00 dB

5.4 Power Spectral Density

Test Requirement: 47 CFR Part 15 Subpart C Section 15.247 (e)

Test Method: KDB 558074 D01 v03r05 Section 10.2

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

Test Procedure: The output from the transmitter was connected to an attenuator and then to the input of the spectrum analyzer.

Use the following spectrum analyzer settings:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

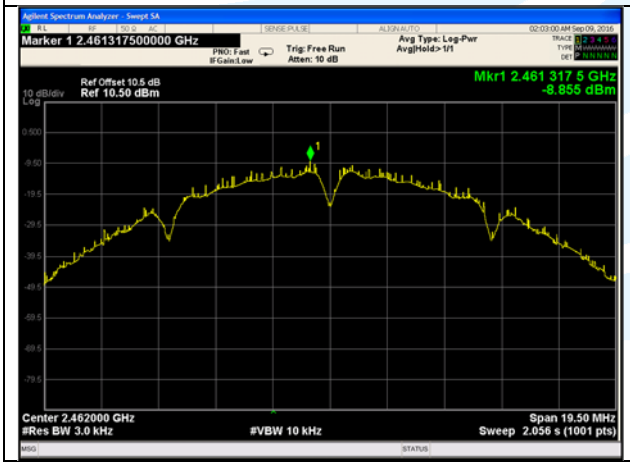
Mode	Channel/ Frequency (MHz)	PSD (dBm)			PSD Limit (dBm)	Result (Pass / Fail)
		Chain 0	Chain 1	Total (Chain 0+1)		
802.11b	1 (2412)	-8.360	-5.460	**-3.662**	8	Pass
	6 (2437)	-9.082	-8.338	-5.684	8	Pass
	11 (2462)	-8.855	-9.872	-6.324	8	Pass
802.11g	1 (2412)	-12.629	-11.069	-8.769	8	Pass
	6 (2437)	-12.060	-11.984	-9.012	8	Pass
	11 (2462)	-13.387	-14.237	-10.781	8	Pass
802.11n (HT20)	1 (2412)	-12.749	-12.514	-9.620	8	Pass
	6 (2437)	-13.353	-12.259	-9.761	8	Pass
	11 (2462)	-13.685	-14.385	-11.011	8	Pass

Remark:

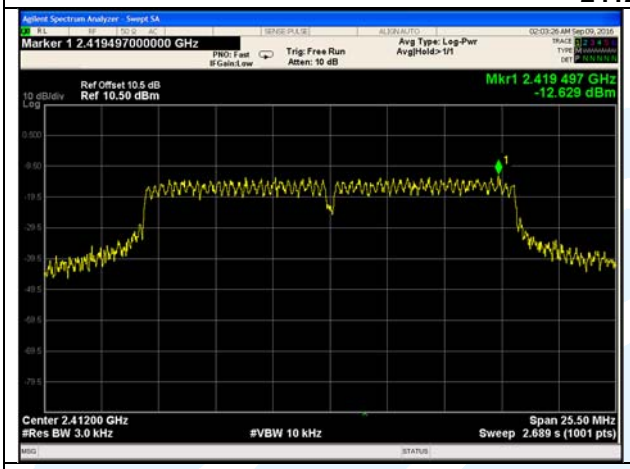
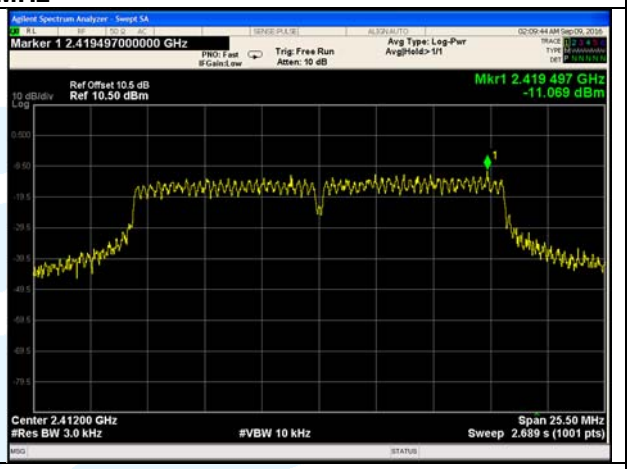
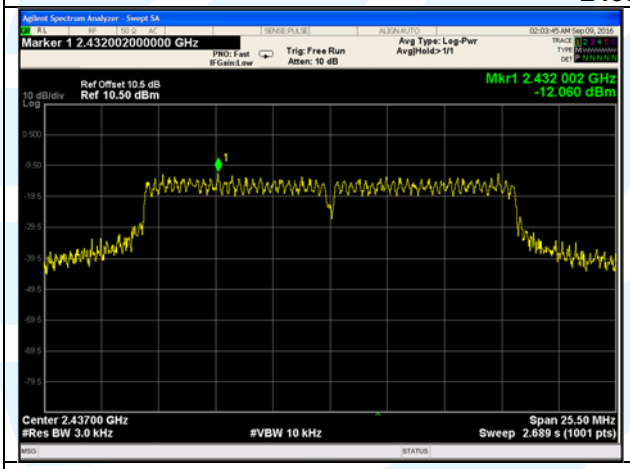
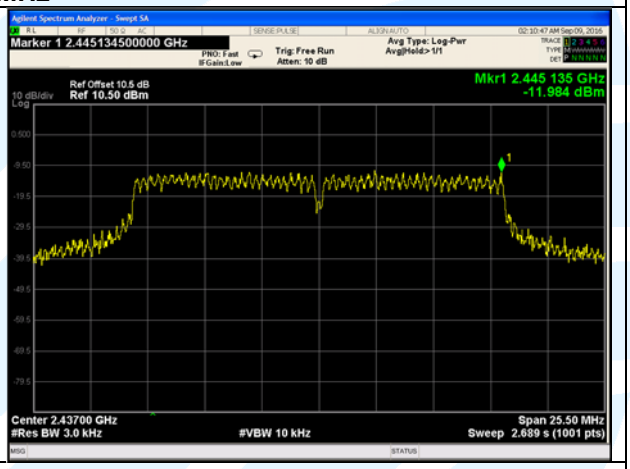
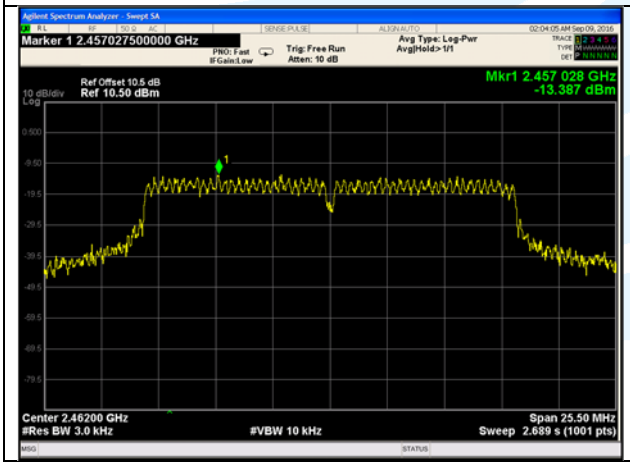
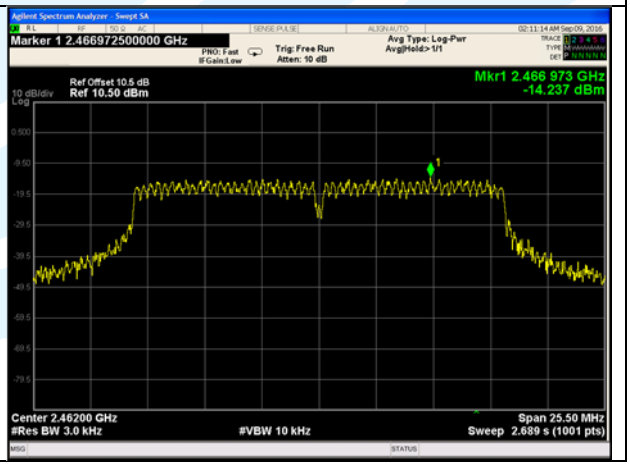
1. All the data attached was use the worst case data rate.
2. Total (Chain 0+1) = $10*\log[(10^{\text{Chain 0/10}})+(10^{\text{Chain 1/10}})]$.

The test plot as follows:

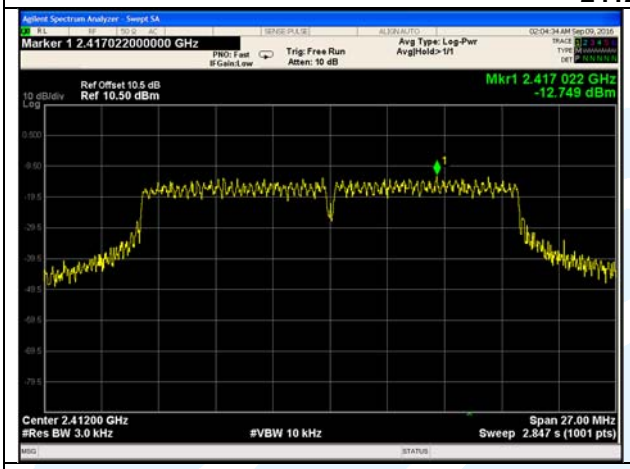
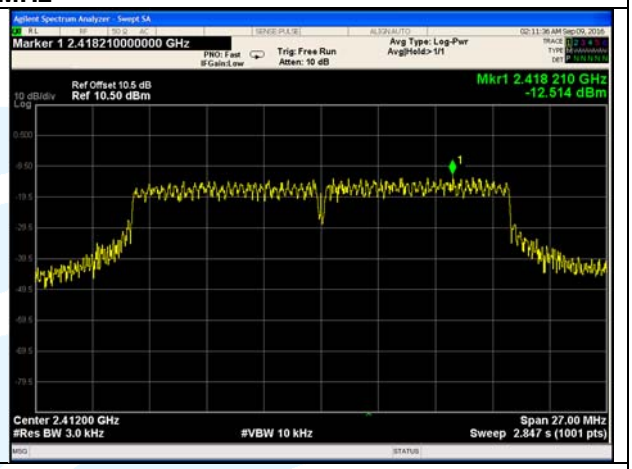
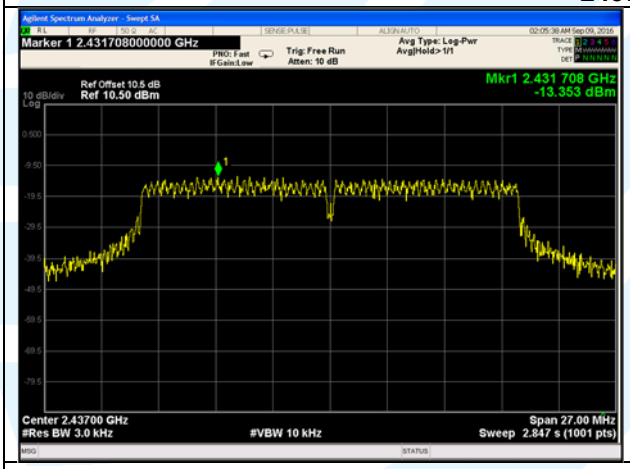
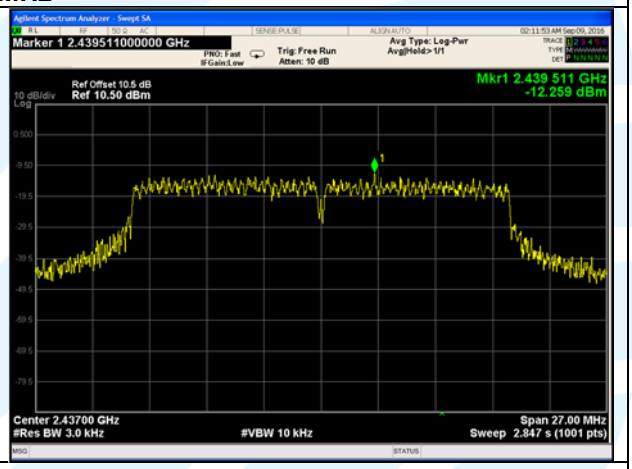
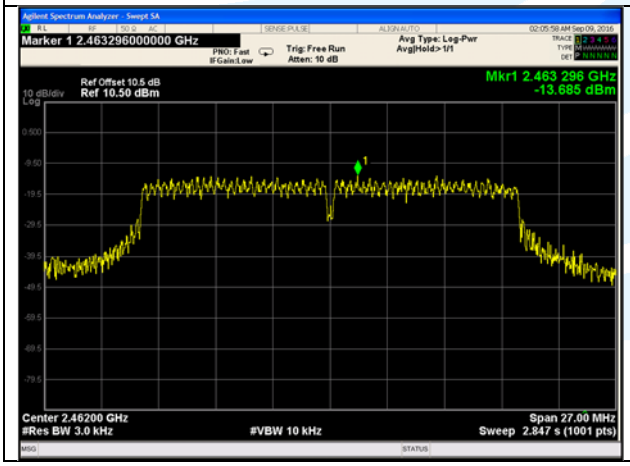
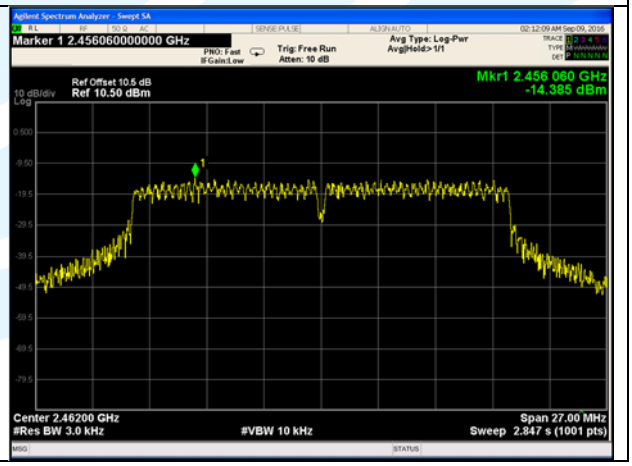
Test Mode: 802.11b

Chain 0	Chain 1
2412MHz	
	
2437MHz	
	
2462MHz	
	

Test Mode: 802.11g

Chain 0	Chain 1
2412MHz	
	
2437MHz	
	
2462MHz	
	

Test Mode: 802.11n(HT20)

Chain 0	Chain 1
2412MHz	
	
2437MHz	
	
2462MHz	
	

5.5 Conducted Out of Band Emission

Test Requirement: 47 CFR Part 15 Subpart C Section 15.247(d)

Test Method: KDB 558074 D01 v03r05 Section 11

Limit: In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

Test Procedure: The output from the transmitter was connected to an attenuator and then to the input of the spectrum analyzer.

Use the following spectrum analyzer settings:

Step 1:Measurement Procedure REF

a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.
j) Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Step 2:Measurement Procedure OOBE

a) Set RBW = 100 kHz.
b) Set VBW ≥ 300 kHz.
c) Detector = peak.
d) Sweep = auto couple.
e) Trace Mode = max hold.
f) Allow trace to fully stabilize.
g) Use the peak marker function to determine the maximum amplitude level.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1 for details.

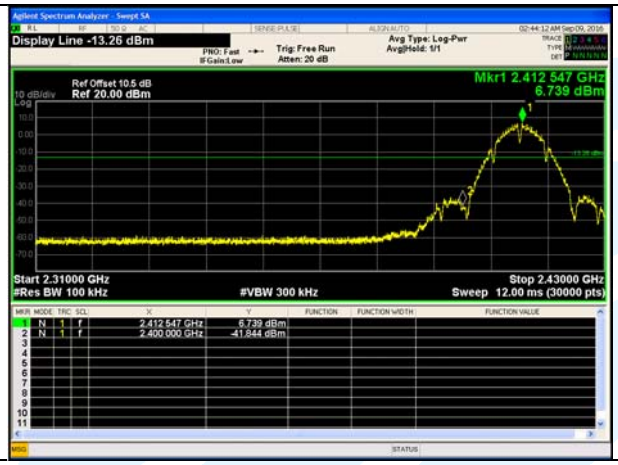
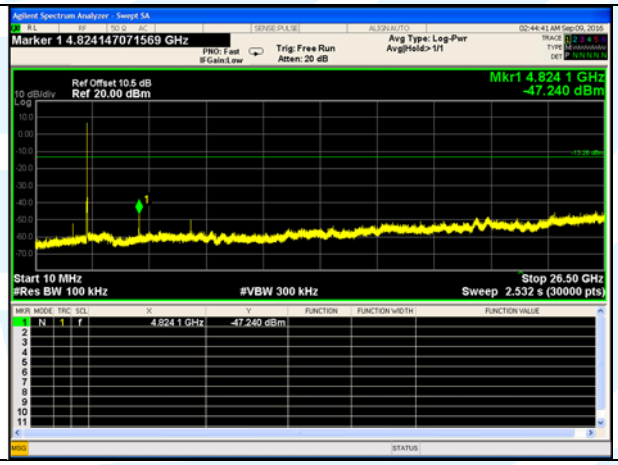
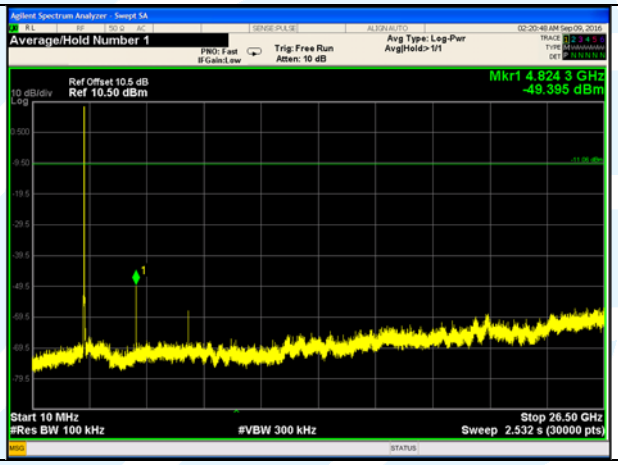
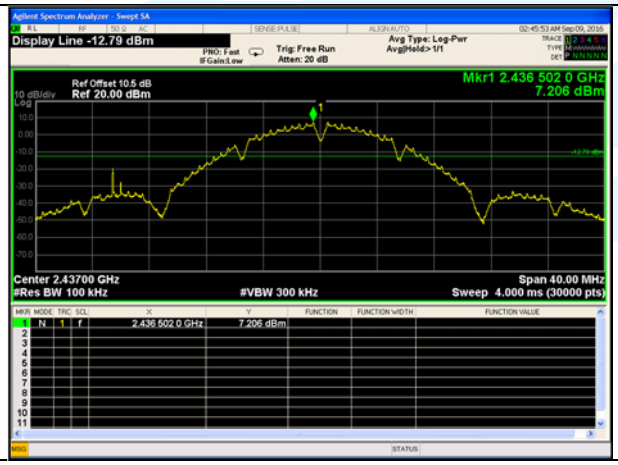
Instruments Used: Refer to section 3 for details

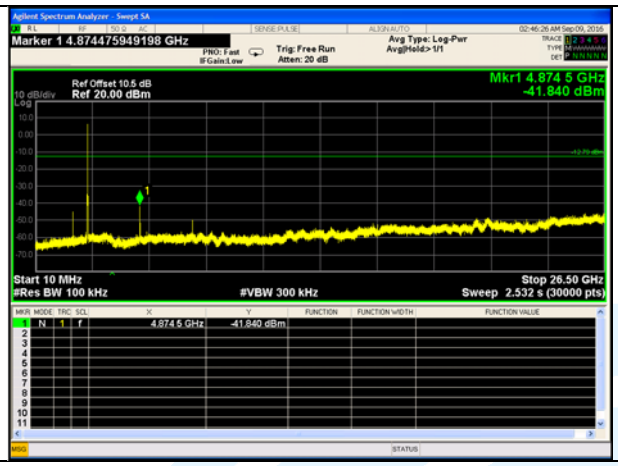
Test Mode: Transmitter mode

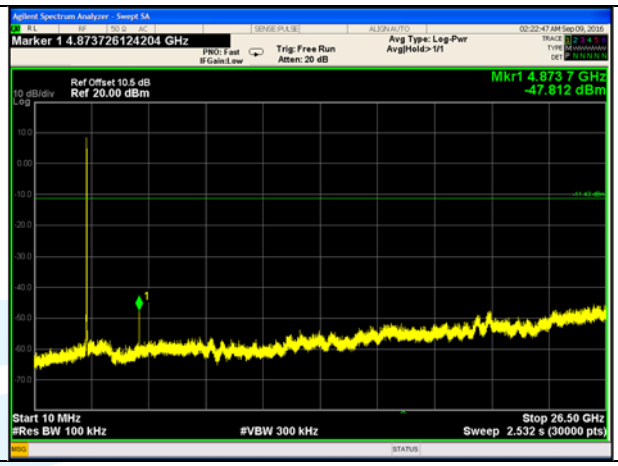
Test Results: Pass

The test plot as follows:

Test Mode: 802.11b

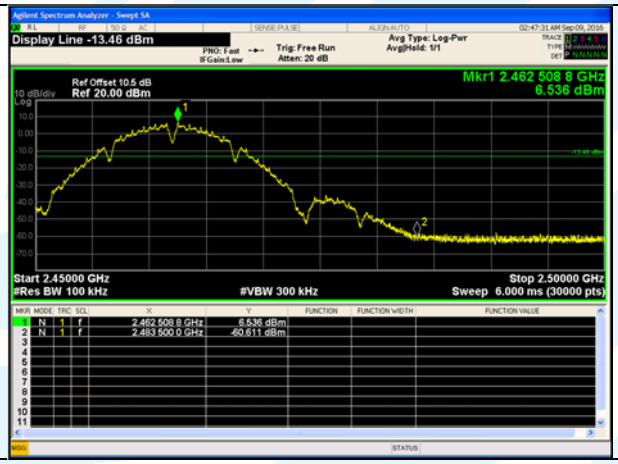
Chain 0	Chain 1
2412MHz	
In-Band Reference Level	
	
Out of Band	
	
2437MHz	
In-Band Reference Level	
	
Out of Band	



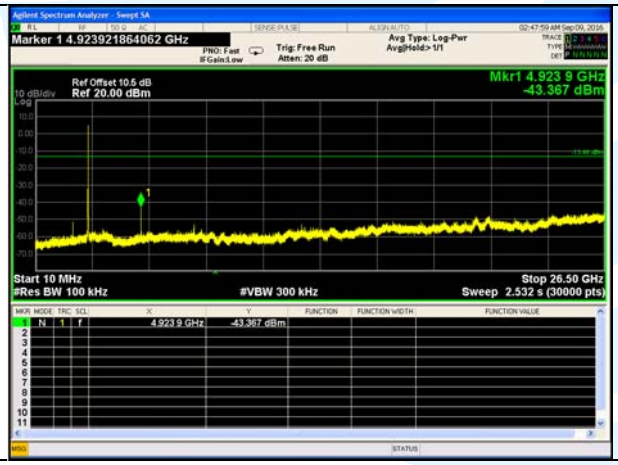


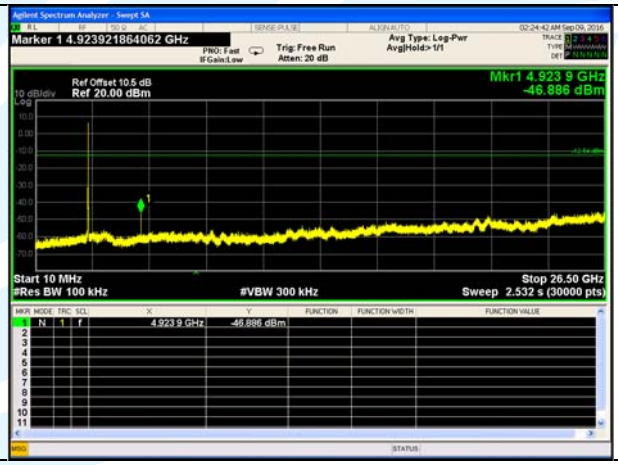
2462MHz

In-Band Reference Level

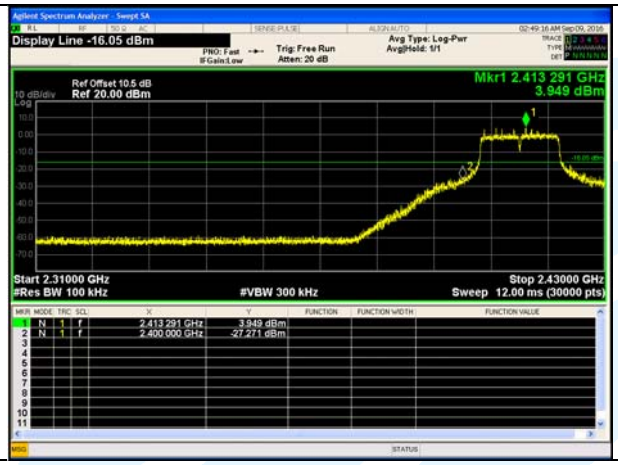
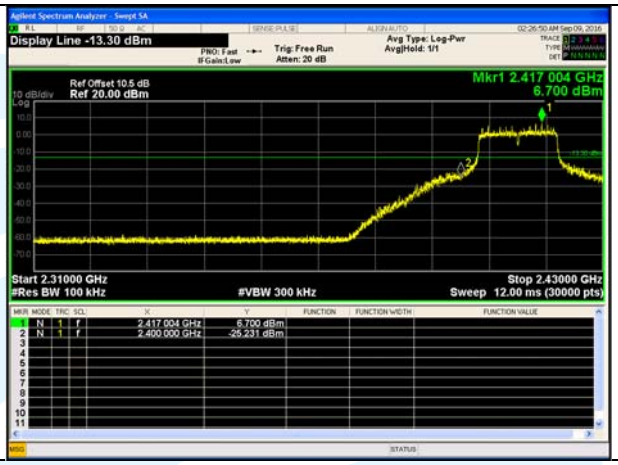
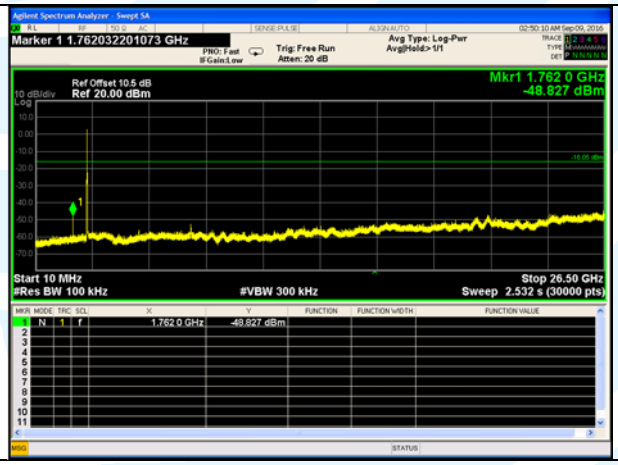
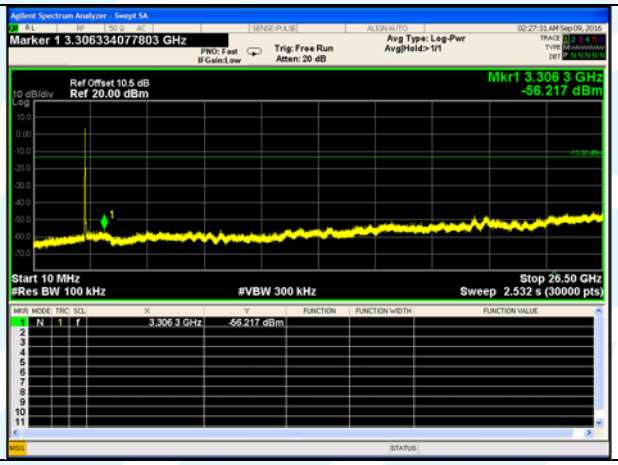
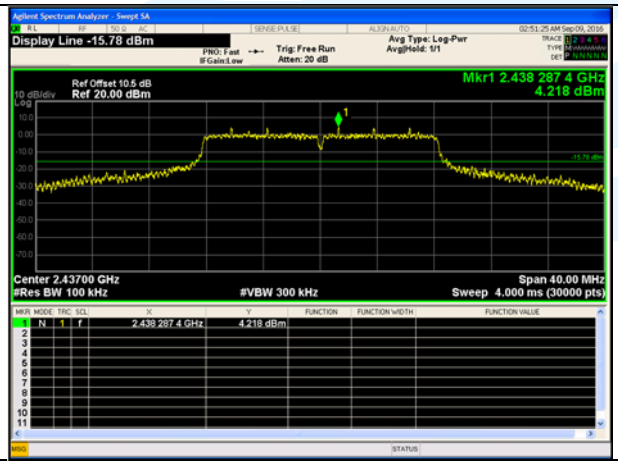
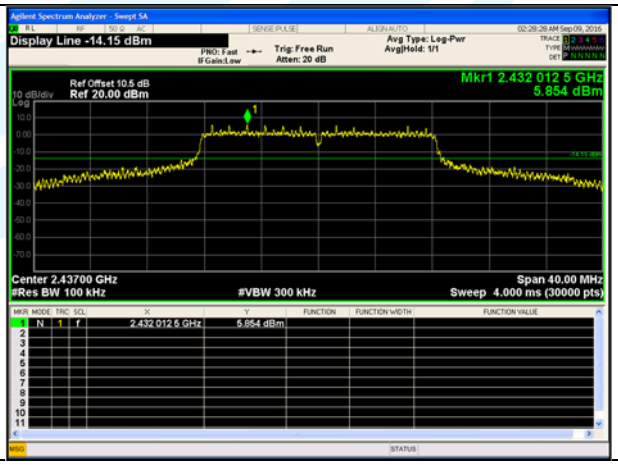


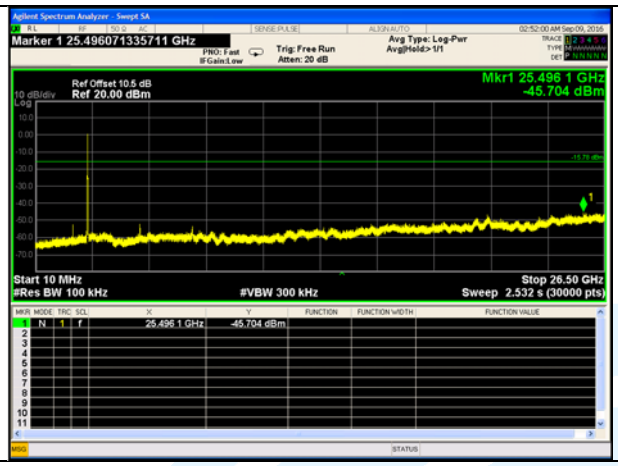
Out of Band

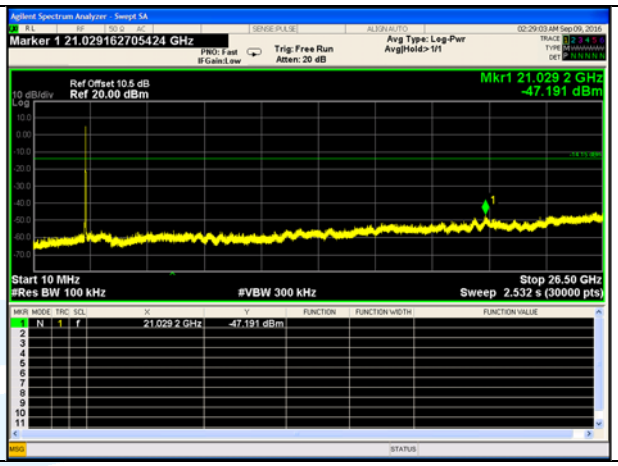




Test Mode: 802.11g

Chain 0	Chain 1
2412MHz	
In-Band Reference Level	
	
Out of Band	
	
2437MHz	
In-Band Reference Level	
	
Out of Band	

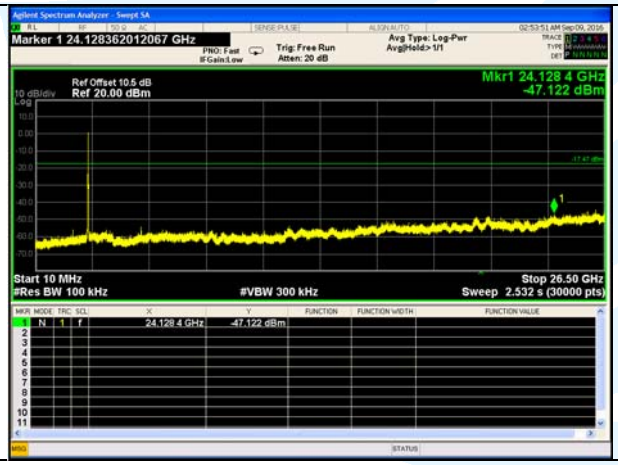


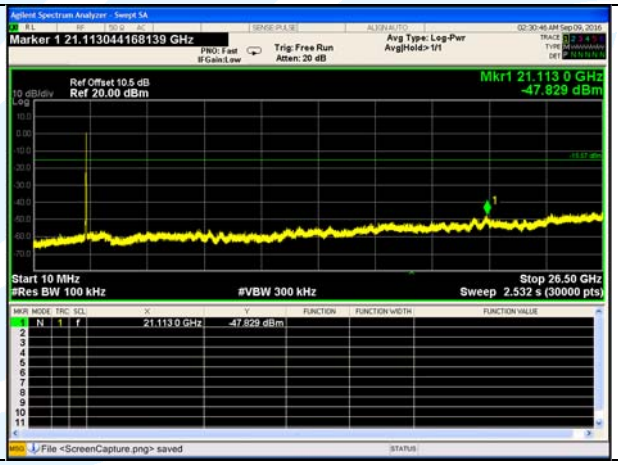


2462MHz

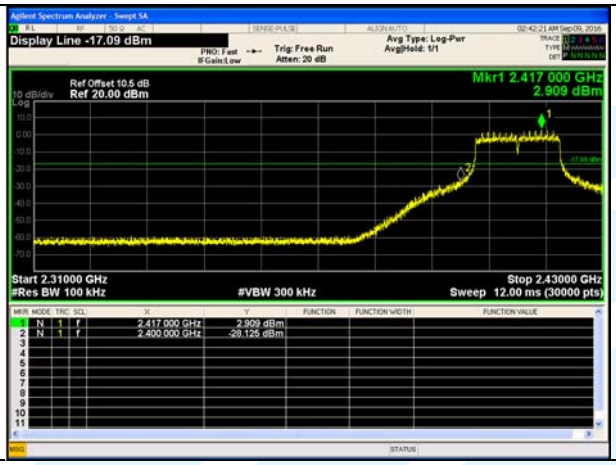
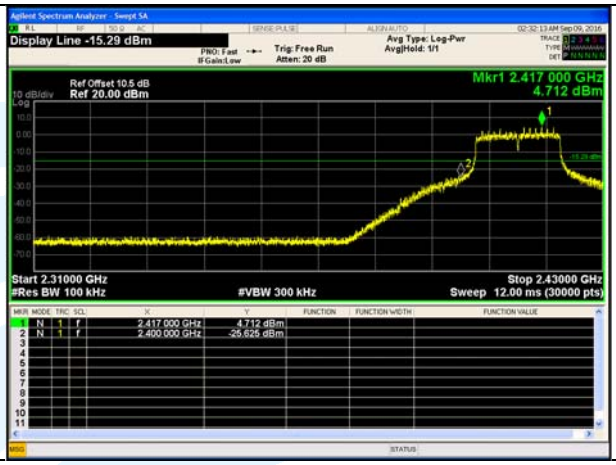
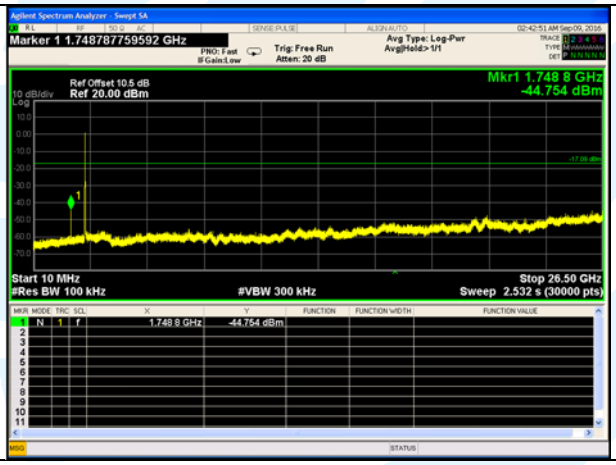
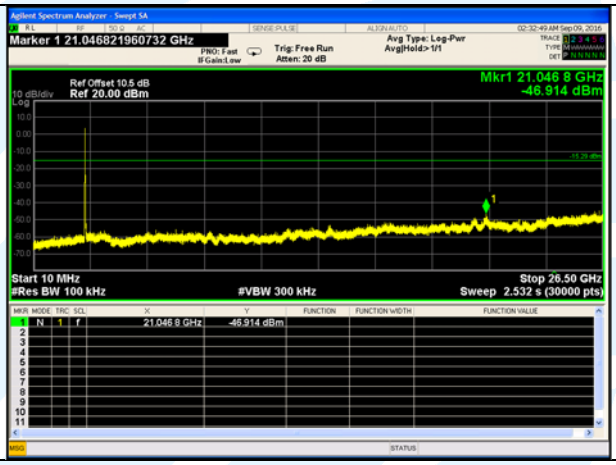
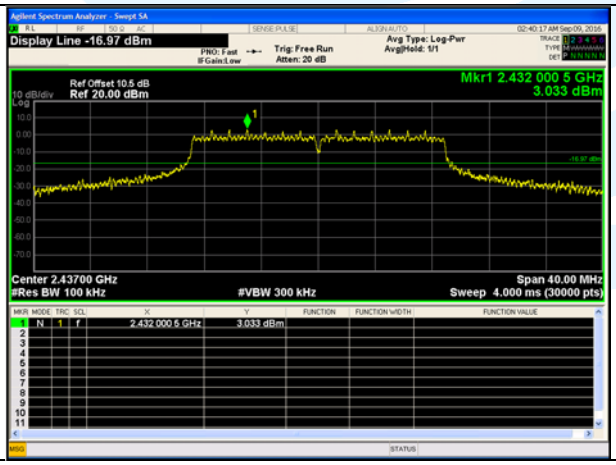
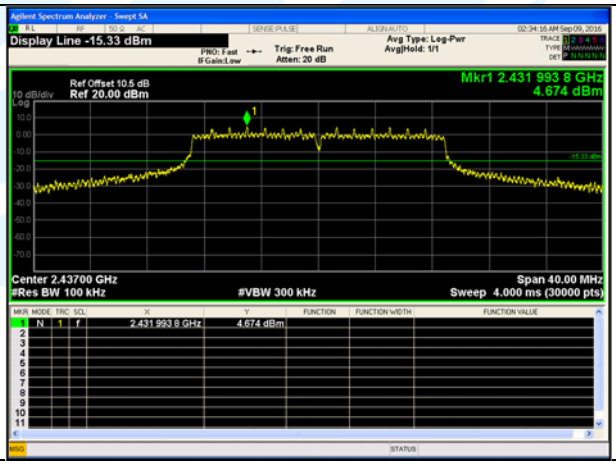
In-Band Reference Level

Out of Band

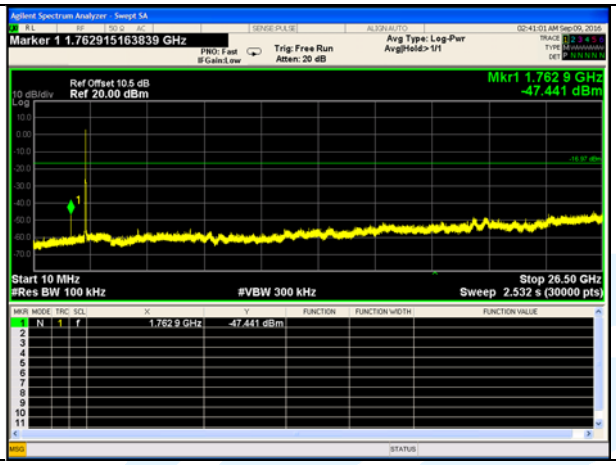


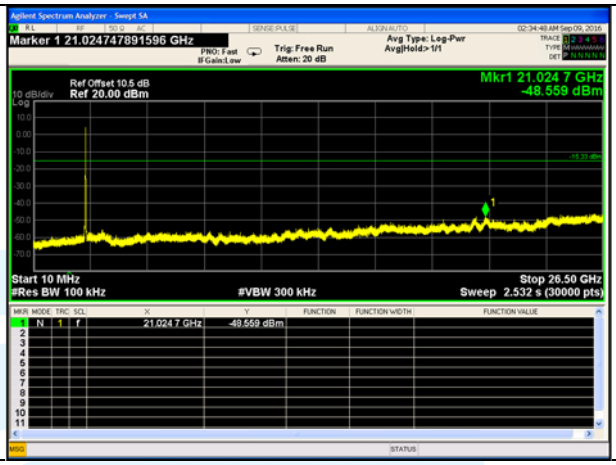


Test Mode: 802.11 n(HT20)

Chain 0	Chain 1
2412MHz	
In-Band Reference Level	
	
Out of Band	
	
2437MHz	
In-Band Reference Level	
	

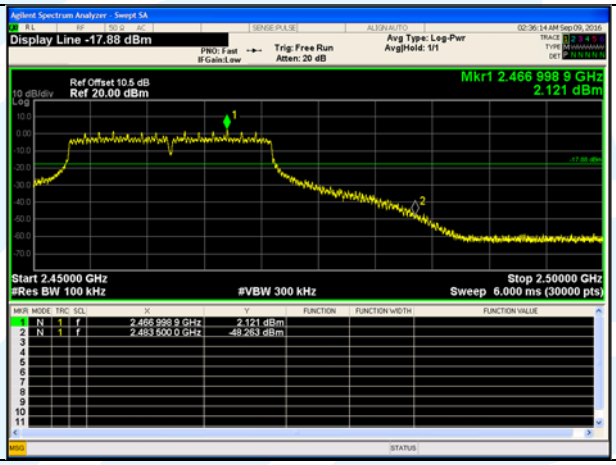
Out of Band



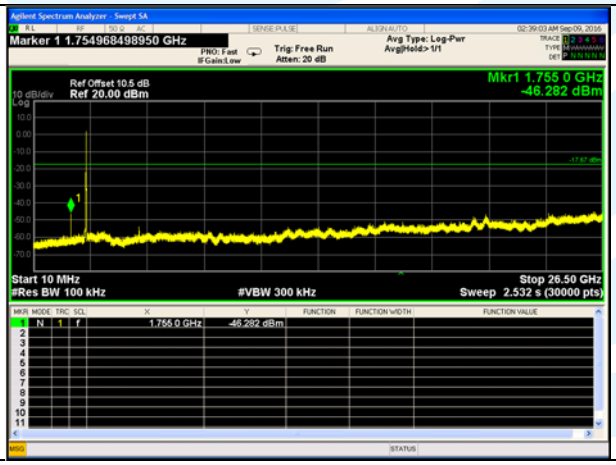


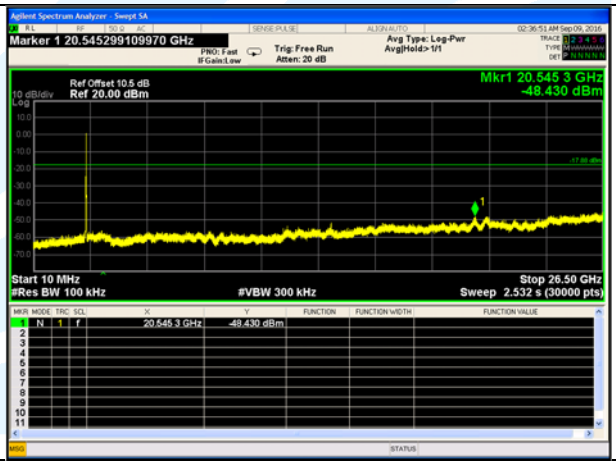
2462MHz

In-Band Reference Level



Out of Band





5.6 Radiated Spurious Emissions

Test Requirement: 47 CFR Part 15 Subpart C Section 15.205/15.209

Test Method: KDB 558074 D01 v03r05 Section 12.1

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

The emissions were measured using the following resolution bandwidths:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Harmonic and Spurious emissions that were identified as coming from the EUT were checked in Peak and in Average Mode. The high frequency, which started from 10 to26.5GHz, which above 10GHz are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured was not reported.

Peak measurements and average measurements are made. All emissions were determined to have a peak-to-average ratio of less than 20dB.

Test Procedure:

Below 1GHz test procedure as below:

a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.

e) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f) Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel

Above 1GHz test procedure as below:

g) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).

h) Test the EUT in the lowest channel , the Highest channel

i) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.

j) Repeat above procedures until all frequencies measured was complete.

Test Setup: Refer to section 4.1.2 for details.

Instruments Used: Refer to section 3 for details

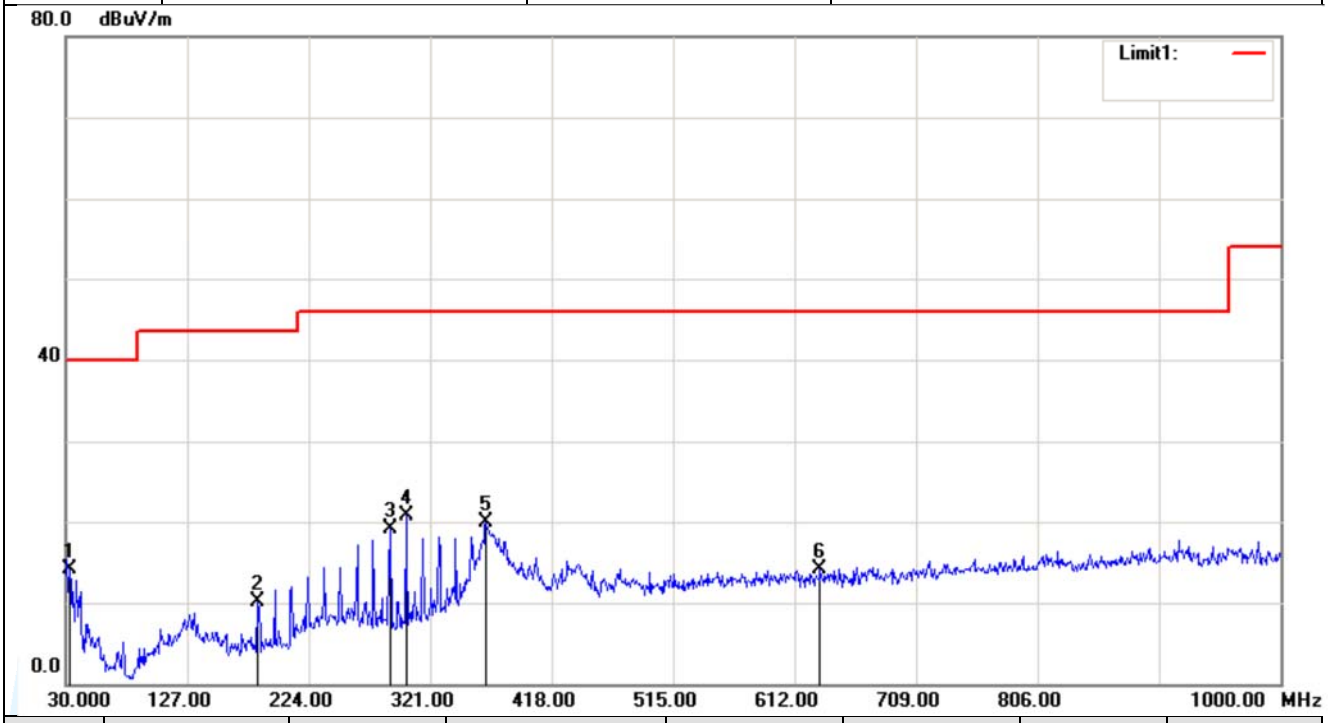
Test Mode: Transmitter mode

Test Results: Pass

Test Data:

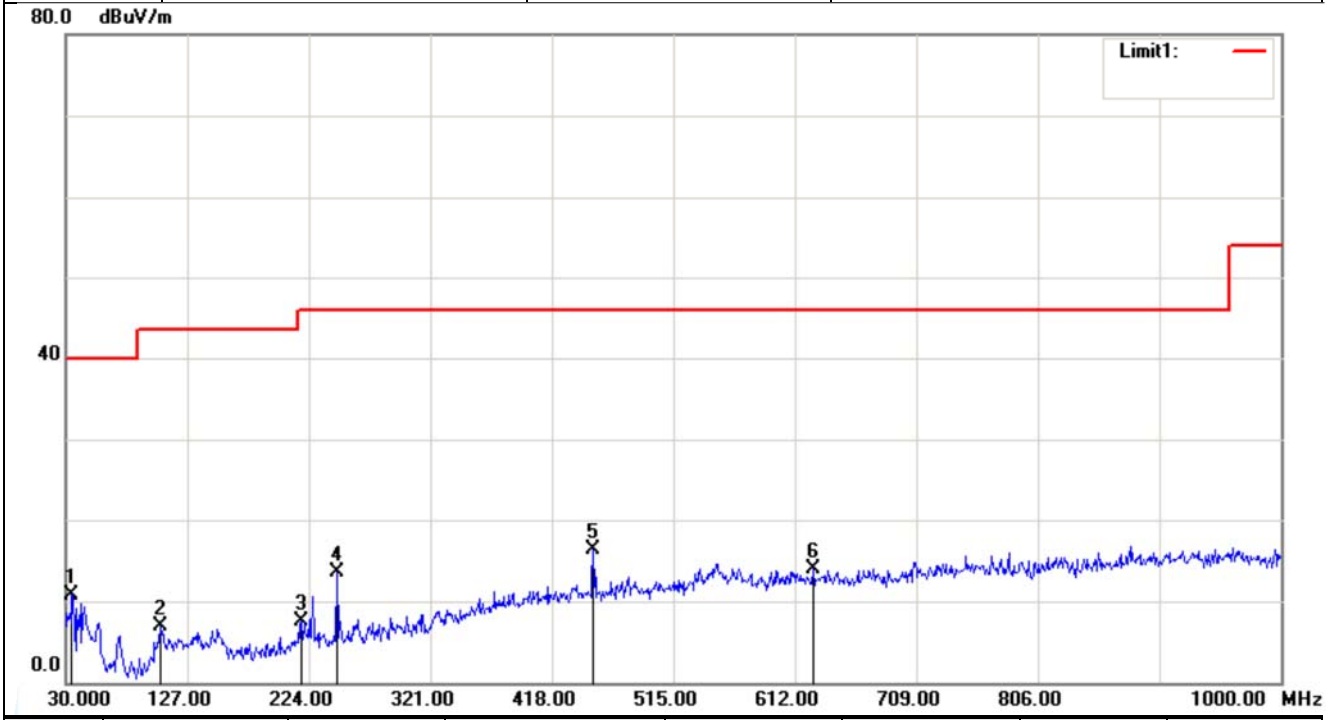
Radiated Emission Test Data (Below 1 GHz Worst Case):

Mode	802.11b	Antenna	Chain 0+1
Channel	1	Ant. Polar.	Horizontal



.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	32.9100	27.55	-13.43	14.12	40.00	-25.88	QP
2	183.2600	33.07	-22.92	10.15	43.50	-33.35	QP
3	288.9900	39.57	-20.46	19.11	46.00	-26.89	QP
4*	301.6000	40.14	-19.51	20.63	46.00	-25.37	QP
5	365.6200	37.19	-17.30	19.89	46.00	-26.11	QP
6	632.3700	26.60	-12.49	14.11	46.00	-31.89	QP

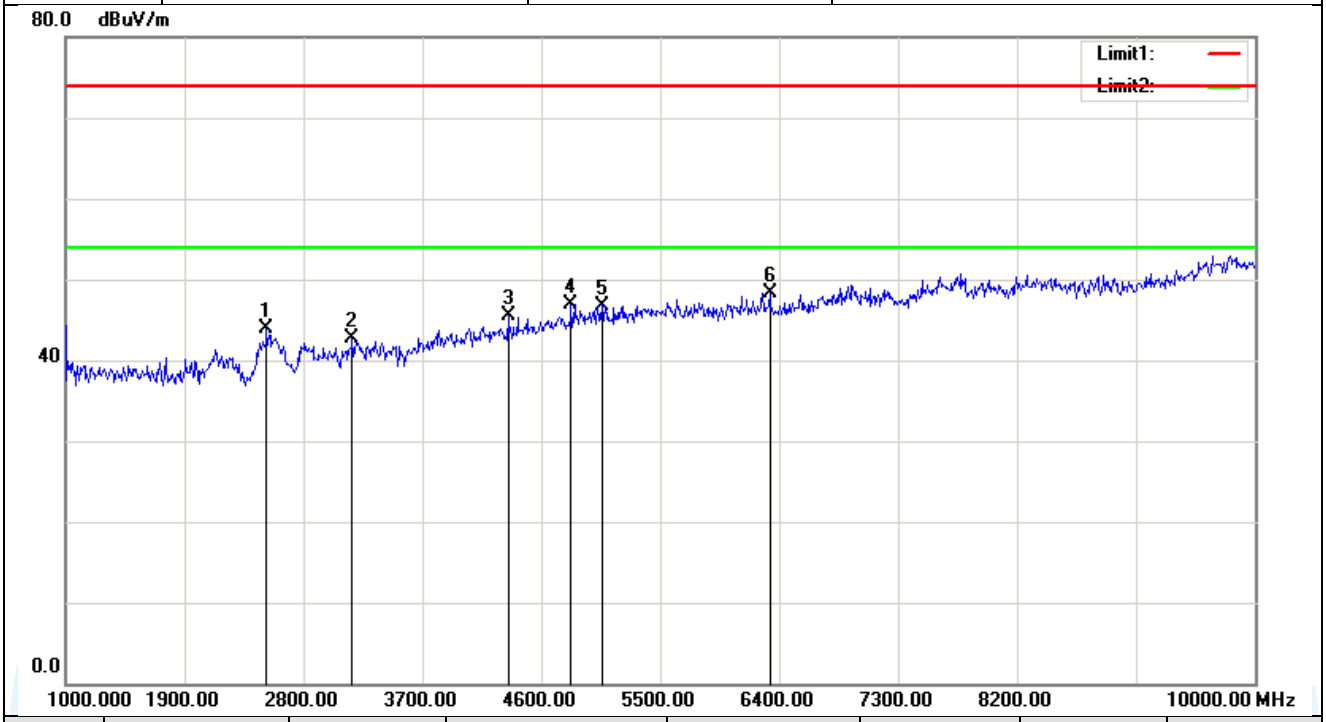
Mode	802.11b	Antenna	Chain 0+1
Channel	1	Ant. Polar.	Vertical



.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	34.8500	25.24	-14.50	10.74	40.00	-29.26	QP
2	105.6600	29.57	-22.63	6.94	43.50	-36.56	QP
3	218.1800	28.15	-20.56	7.59	46.00	-38.41	QP
4	246.3100	34.80	-21.23	13.57	46.00	-32.43	QP
5	450.9800	31.66	-15.43	16.23	46.00	-29.77	QP
6	626.5500	26.59	-12.65	13.94	46.00	-32.06	QP

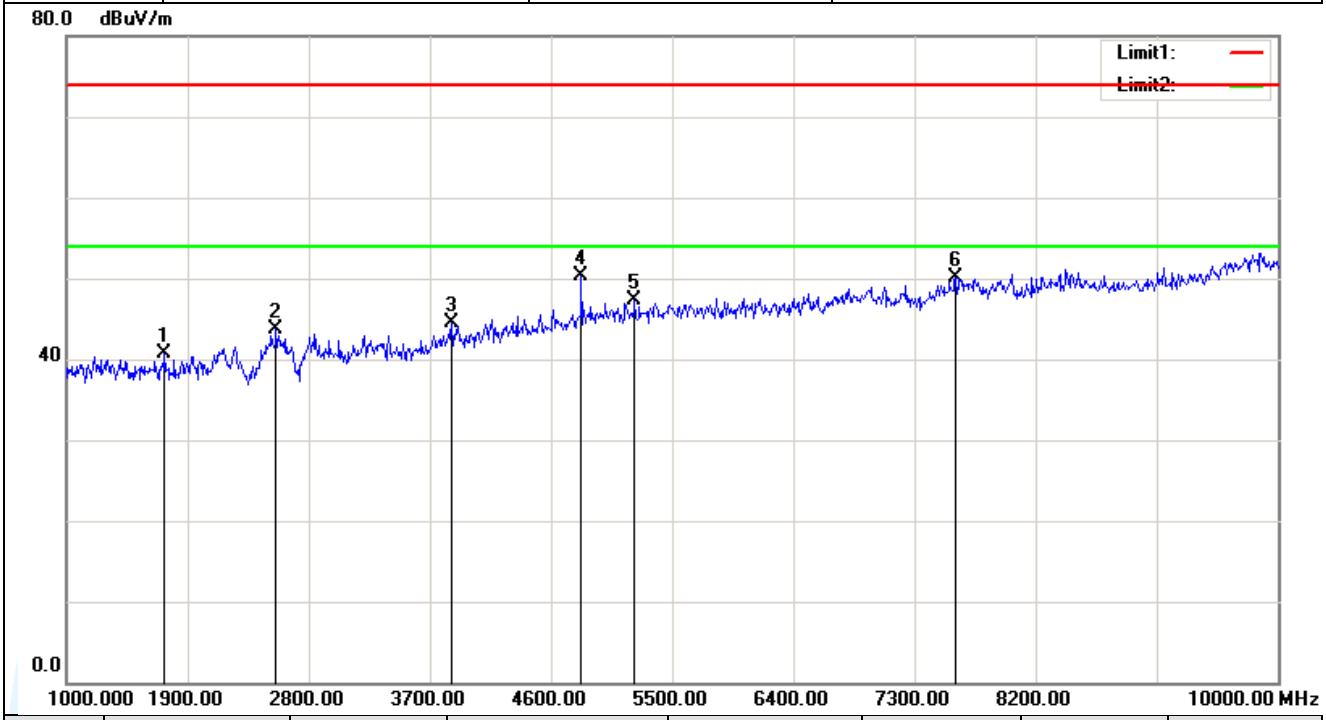
Radiated Emission Test Data (Above 1GHz):

Mode	802.11b	Antenna	Chain 0+1
Channel	1	Ant. Polar.	Horizontal



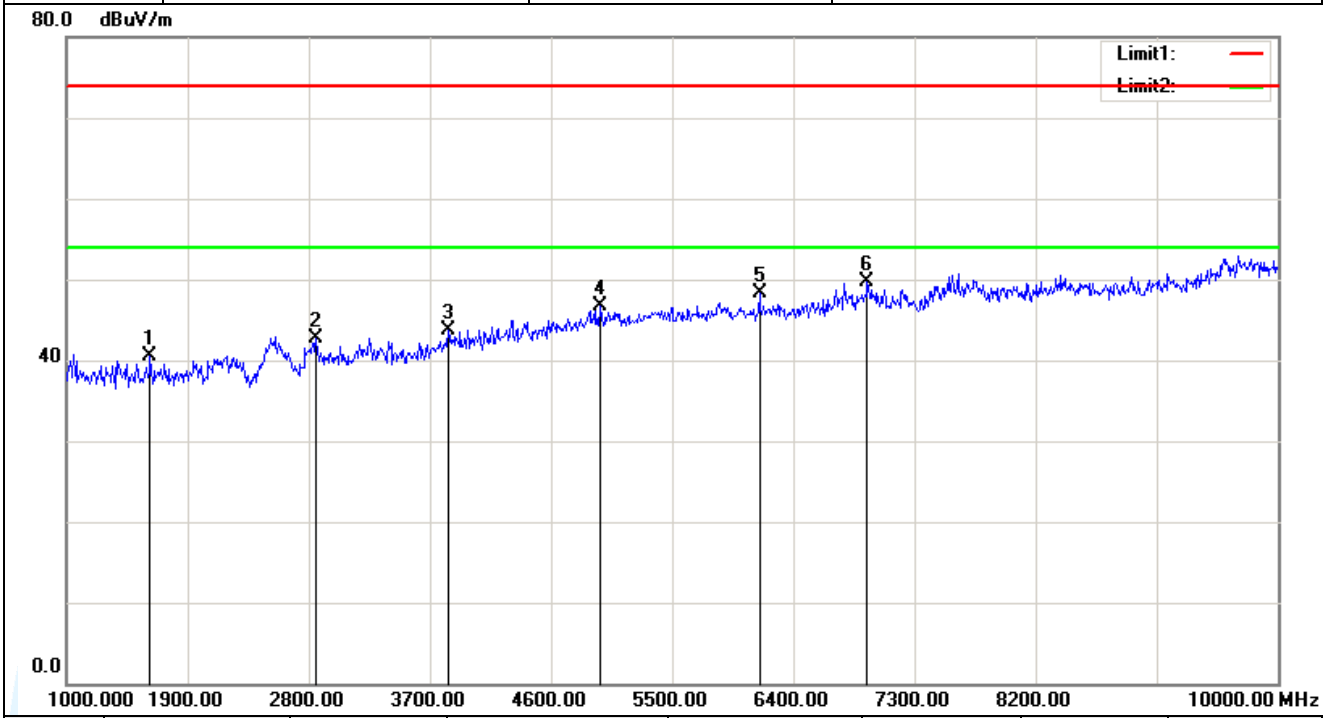
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2521.000	46.14	-2.22	43.92	74.00	-30.08	peak
2	3169.000	43.72	-1.08	42.64	74.00	-31.36	peak
3	4348.000	42.62	2.81	45.43	74.00	-28.57	peak
4	4825.000	42.45	4.41	46.86	74.00	-27.14	peak
5	5059.000	41.71	5.09	46.80	74.00	-27.20	peak
6*	6328.000	41.66	6.61	48.27	74.00	-25.73	peak

Mode	802.11b	Antenna	Chain 0+1
Channel	1	Ant. Polar.	Vertical



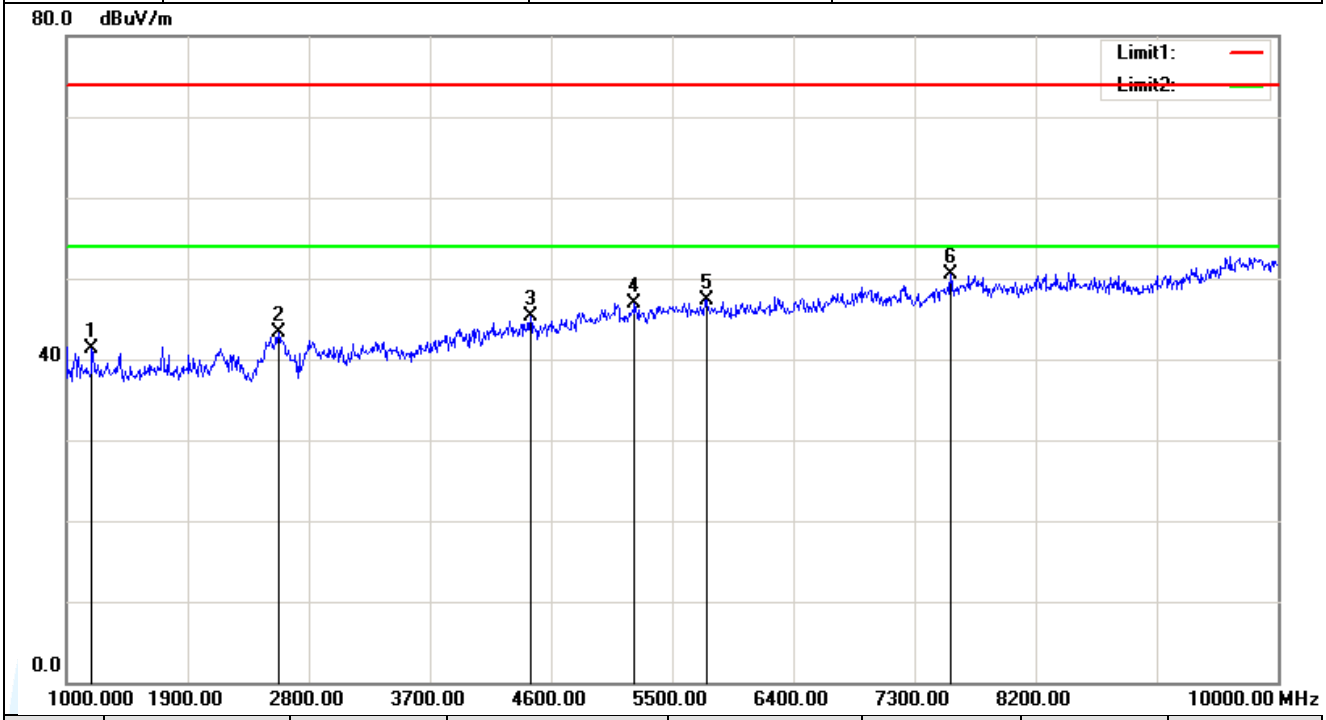
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1729.000	47.03	-6.42	40.61	74.00	-33.39	peak
2	2557.000	45.86	-2.16	43.70	74.00	-30.30	peak
3	3862.000	43.45	1.01	44.46	74.00	-29.54	peak
4*	4825.000	45.84	4.41	50.25	74.00	-23.75	peak
5	5221.000	41.97	5.37	47.34	74.00	-26.66	peak
6	7606.000	41.30	8.88	50.18	74.00	-23.82	peak

Mode	802.11b	Antenna	Chain 0+1
Channel	6	Ant. Polar.	Horizontal



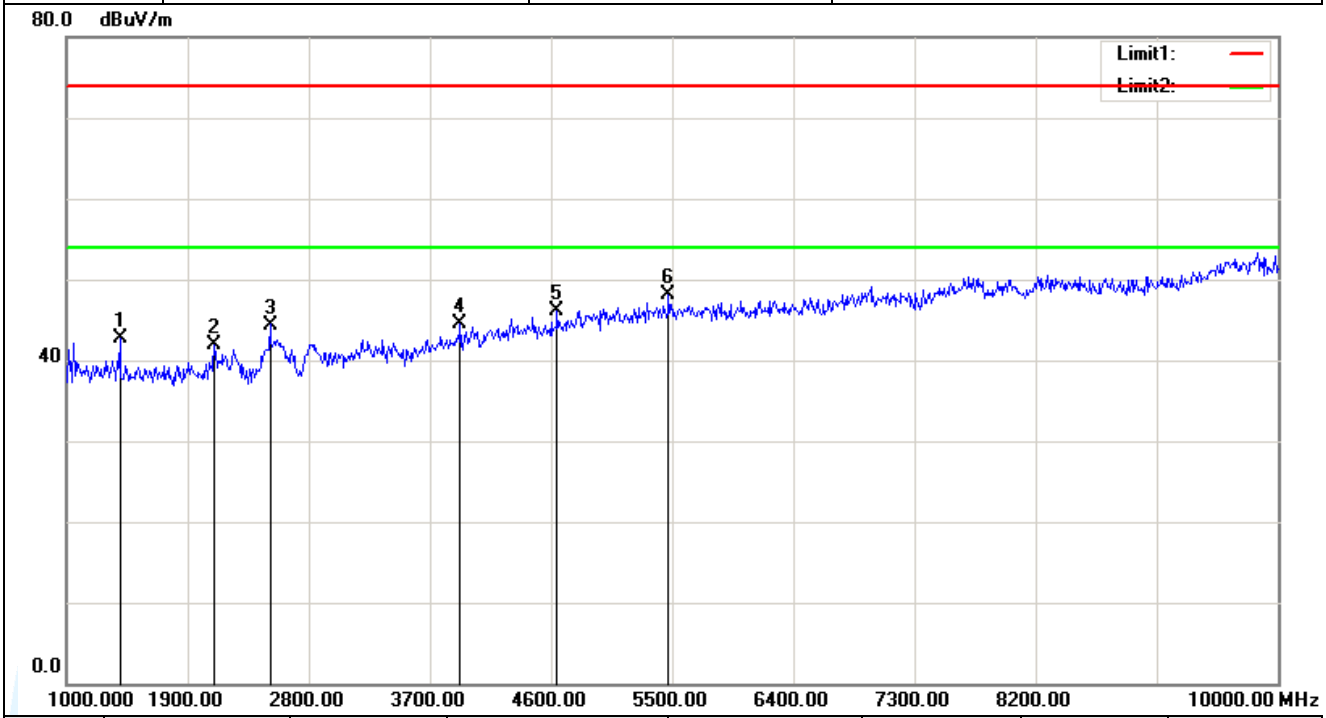
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1621.000	47.17	-6.65	40.52	74.00	-33.48	peak
2	2854.000	44.42	-1.62	42.80	74.00	-31.20	peak
3	3835.000	42.87	0.89	43.76	74.00	-30.24	peak
4	4969.000	41.84	4.88	46.72	74.00	-27.28	peak
5	6148.000	41.96	6.32	48.28	74.00	-25.72	peak
6*	6949.000	42.09	7.62	49.71	74.00	-24.29	peak

Mode	802.11b	Antenna	Chain 0+1
Channel	6	Ant. Polar.	Vertical



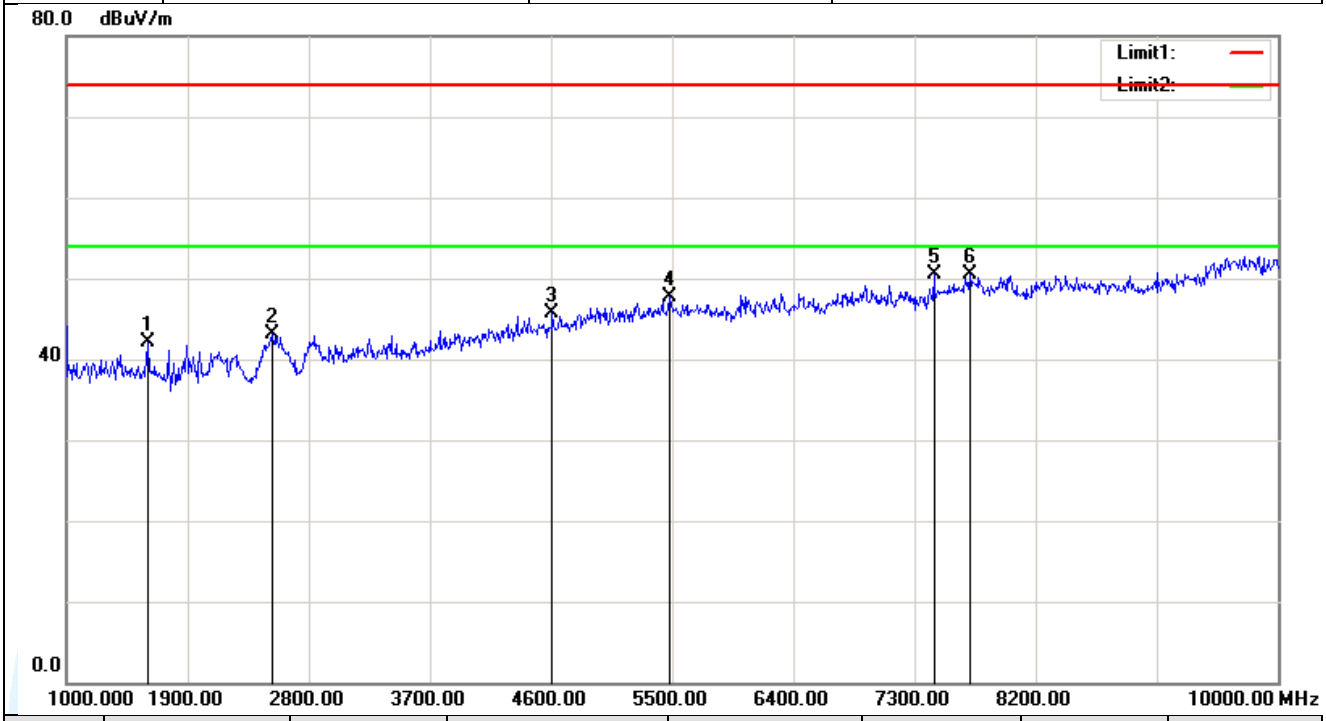
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1189.000	49.12	-7.83	41.29	74.00	-32.71	peak
2	2575.000	45.47	-2.12	43.35	74.00	-30.65	peak
3	4447.000	42.23	3.16	45.39	74.00	-28.61	peak
4	5221.000	41.54	5.37	46.91	74.00	-27.09	peak
5	5752.000	41.41	5.98	47.39	74.00	-26.61	peak
6*	7570.000	41.65	8.81	50.46	74.00	-23.54	peak

Mode	802.11b	Antenna	Chain 0+1
Channel	11	Ant. Polar.	Horizontal



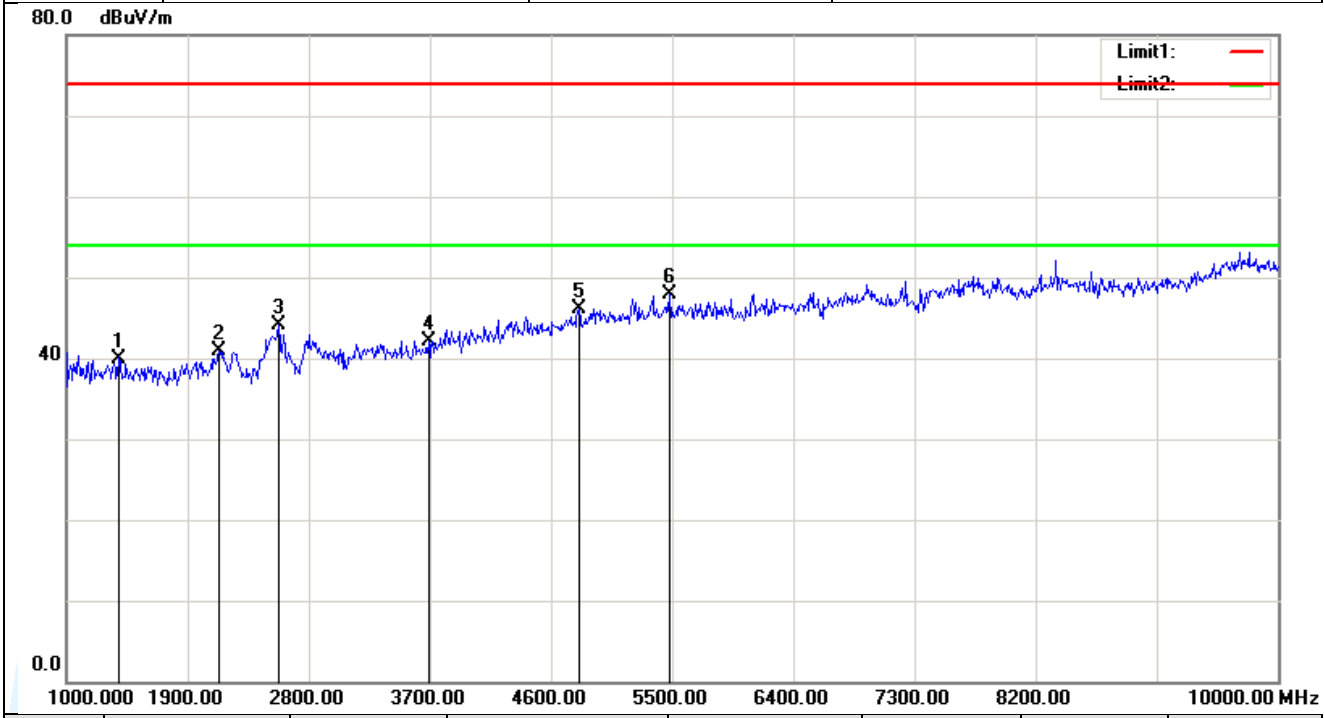
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1396.000	49.71	-7.07	42.64	74.00	-31.36	peak
2	2098.000	46.40	-4.46	41.94	74.00	-32.06	peak
3	2512.000	46.64	-2.24	44.40	74.00	-29.60	peak
4	3925.000	43.20	1.27	44.47	74.00	-29.53	peak
5	4645.000	42.31	3.82	46.13	74.00	-27.87	peak
6*	5473.000	42.29	5.82	48.11	74.00	-25.89	peak

Mode	802.11b	Antenna	Chain 0+1
Channel	11	Ant. Polar.	Vertical



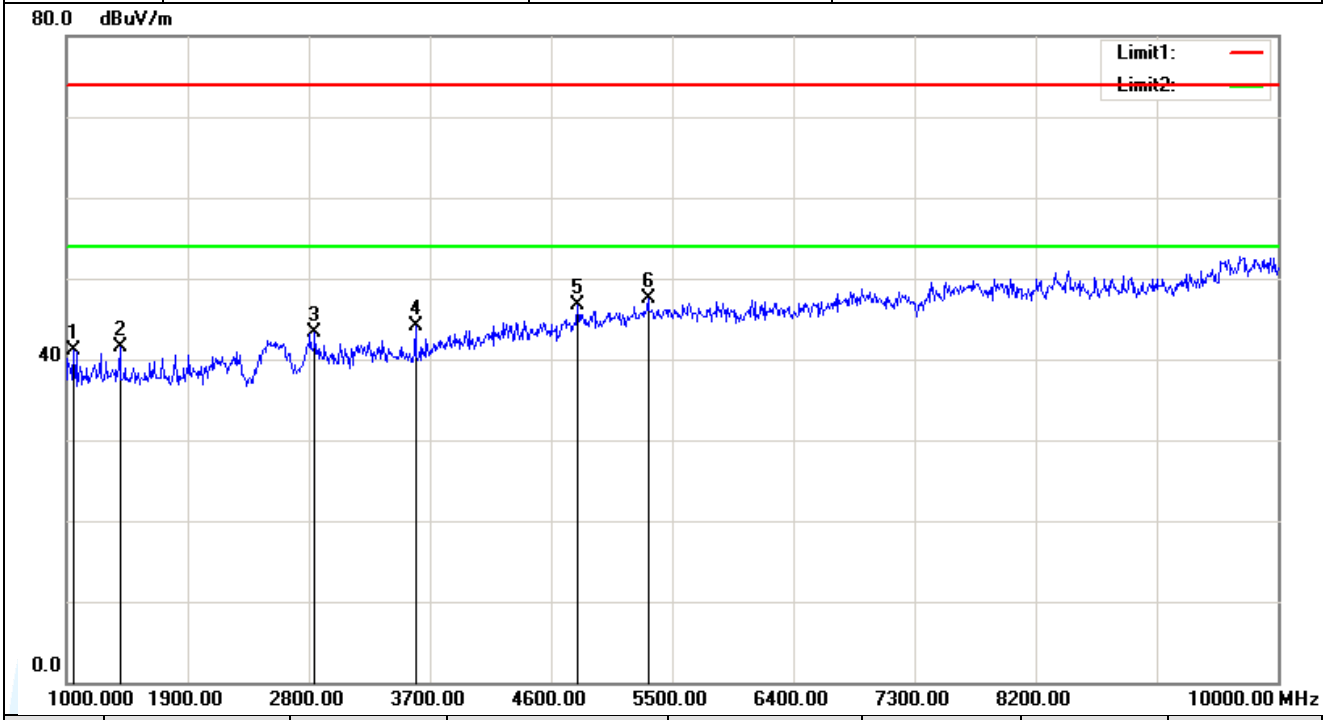
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1603.000	48.80	-6.69	42.11	74.00	-31.89	peak
2	2530.000	45.34	-2.21	43.13	74.00	-30.87	peak
3	4609.000	42.02	3.71	45.73	74.00	-28.27	peak
4	5482.000	41.93	5.84	47.77	74.00	-26.23	peak
5*	7444.000	41.99	8.57	50.56	74.00	-23.44	peak
6	7714.000	41.34	9.09	50.43	74.00	-23.57	peak

Mode	802.11g	Antenna	Chain 0+1
Channel	1	Ant. Polar.	Horizontal



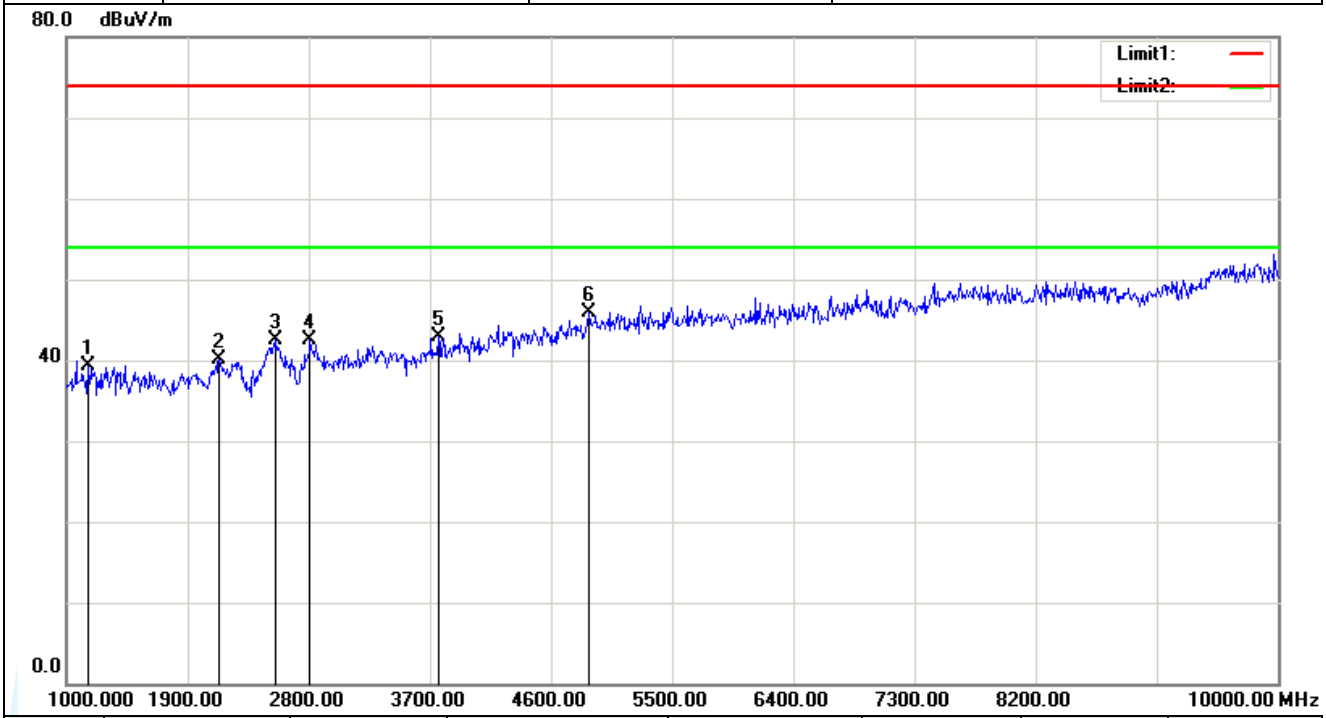
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1387.000	47.11	-7.11	40.00	74.00	-34.00	peak
2	2134.000	45.25	-4.27	40.98	74.00	-33.02	peak
3	2575.000	46.21	-2.12	44.09	74.00	-29.91	peak
4	3691.000	41.89	0.29	42.18	74.00	-31.82	peak
5	4807.000	41.75	4.35	46.10	74.00	-27.90	peak
6*	5482.000	41.98	5.84	47.82	74.00	-26.18	peak

Mode	802.11g	Antenna	Chain 0+1
Channel	1	Ant. Polar.	Vertical



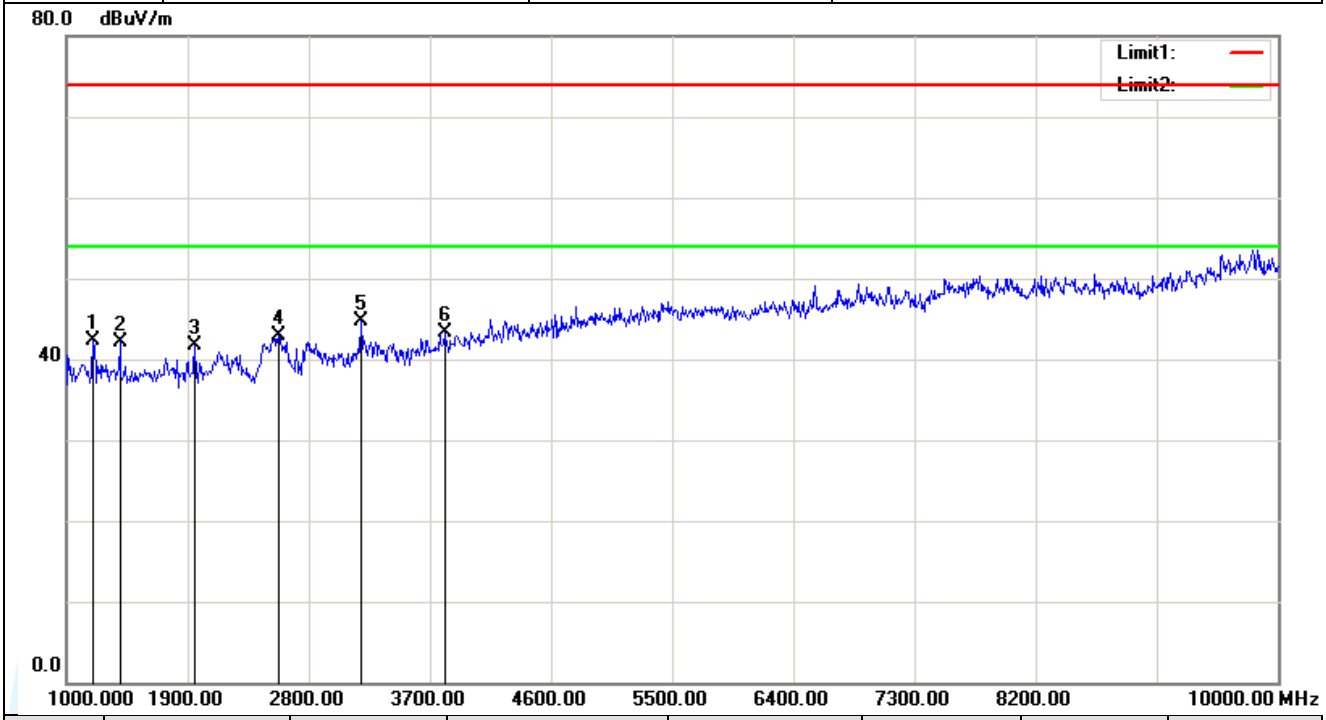
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1054.000	49.37	-8.35	41.02	74.00	-32.98	peak
2	1396.000	48.60	-7.07	41.53	74.00	-32.47	peak
3	2845.000	44.88	-1.64	43.24	74.00	-30.76	peak
4	3592.000	44.32	-0.13	44.19	74.00	-29.81	peak
5	4798.000	42.34	4.32	46.66	74.00	-27.34	peak
6*	5320.000	41.91	5.55	47.46	74.00	-26.54	peak

Mode	802.11g	Antenna	Chain 0+1
Channel	6	Ant. Polar.	Horizontal



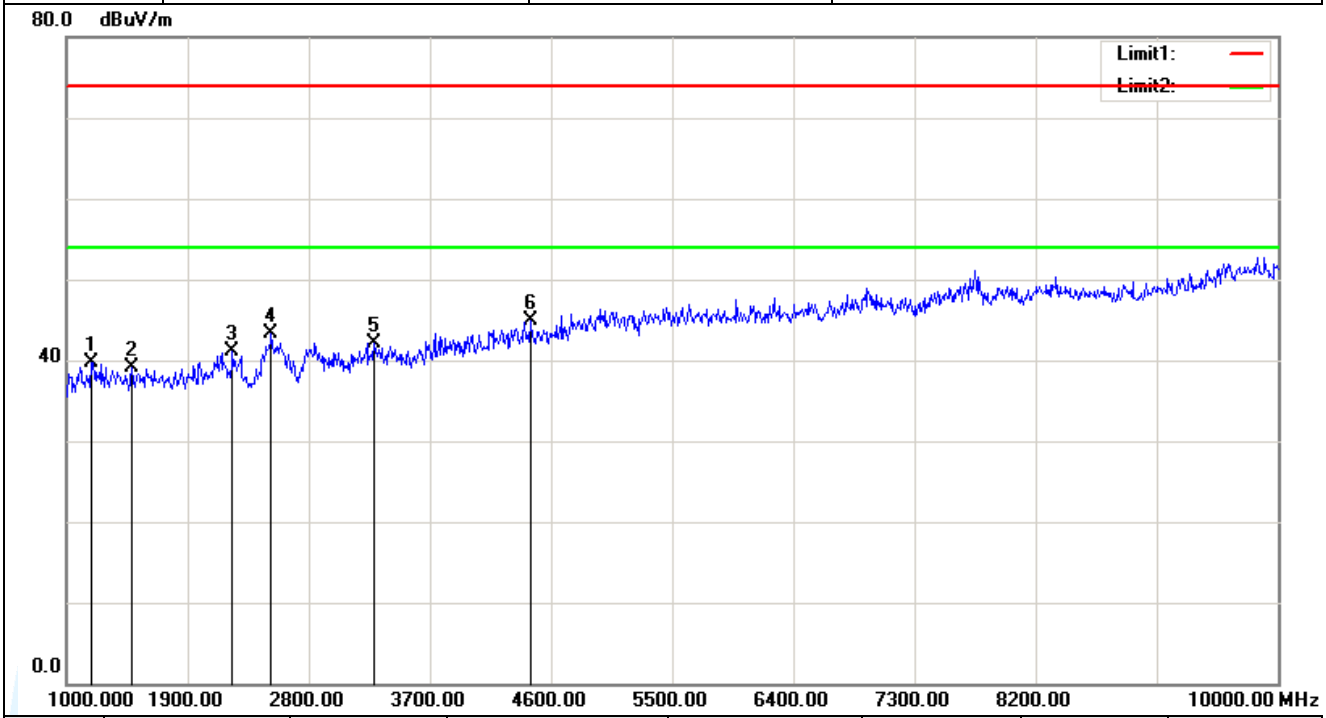
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1162.000	47.23	-7.94	39.29	74.00	-34.71	peak
2	2134.000	44.43	-4.27	40.16	74.00	-33.84	peak
3	2557.000	44.62	-2.16	42.46	74.00	-31.54	peak
4	2809.000	44.11	-1.70	42.41	74.00	-31.59	peak
5	3763.000	42.26	0.59	42.85	74.00	-31.15	peak
6*	4879.000	41.26	4.59	45.85	74.00	-28.15	peak

Mode	802.11g	Antenna	Chain 0+1
Channel	6	Ant. Polar.	Vertical



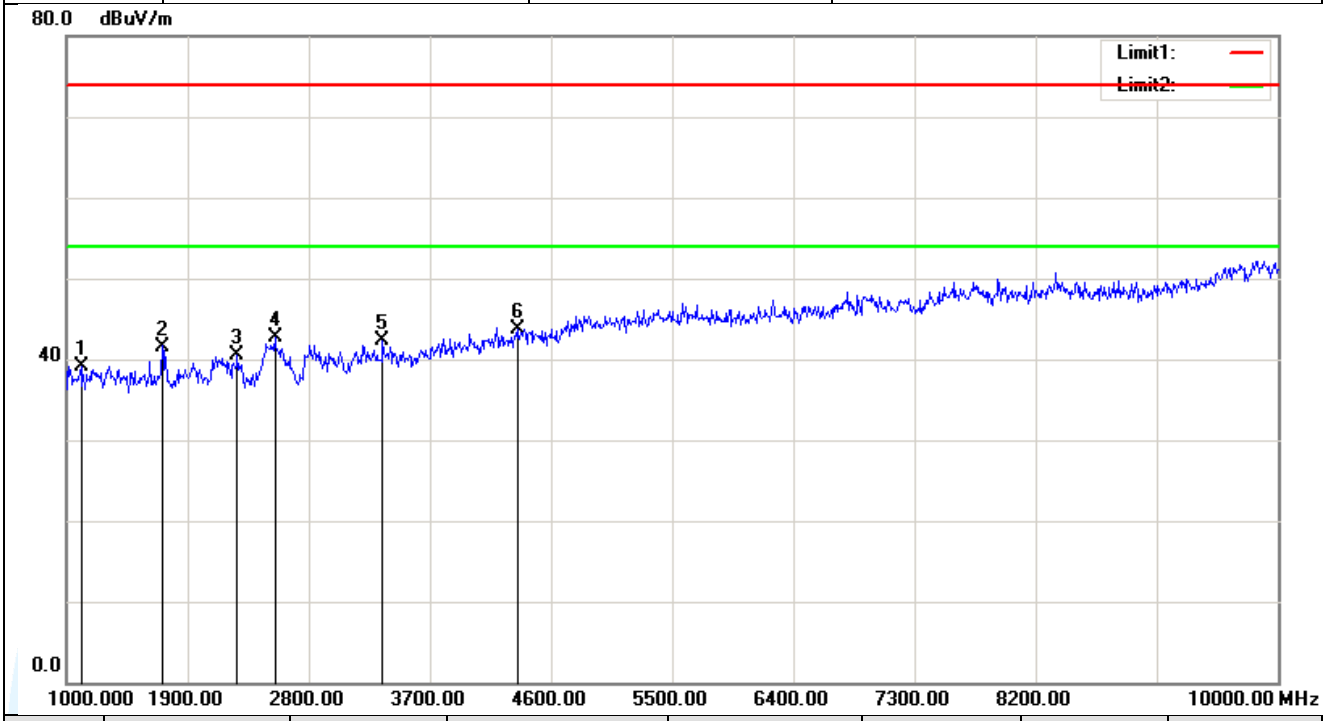
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1198.000	50.08	-7.80	42.28	74.00	-31.72	peak
2	1396.000	49.21	-7.07	42.14	74.00	-31.86	peak
3	1954.000	47.01	-5.29	41.72	74.00	-32.28	peak
4	2575.000	45.05	-2.12	42.93	74.00	-31.07	peak
5*	3187.000	45.82	-1.05	44.77	74.00	-29.23	peak
6	3808.000	42.48	0.78	43.26	74.00	-30.74	peak

Mode	802.11g	Antenna	Chain 0+1
Channel	11	Ant. Polar.	Horizontal



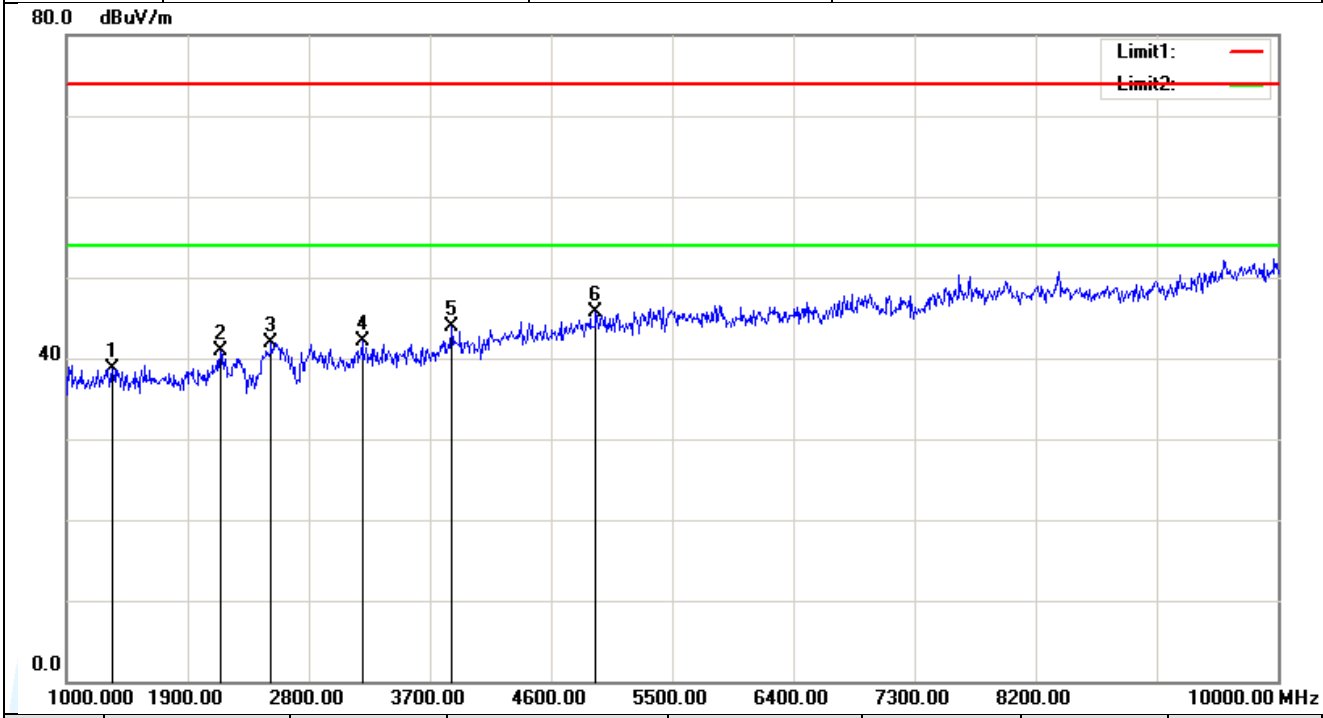
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1180.000	47.49	-7.87	39.62	74.00	-34.38	peak
2	1486.000	45.92	-6.91	39.01	74.00	-34.99	peak
3	2233.000	44.75	-3.72	41.03	74.00	-32.97	peak
4	2521.000	45.48	-2.22	43.26	74.00	-30.74	peak
5	3286.000	42.93	-0.88	42.05	74.00	-31.95	peak
6*	4447.000	41.80	3.16	44.96	74.00	-29.04	peak

Mode	802.11g	Antenna	Chain 0+1
Channel	11	Ant. Polar.	Vertical



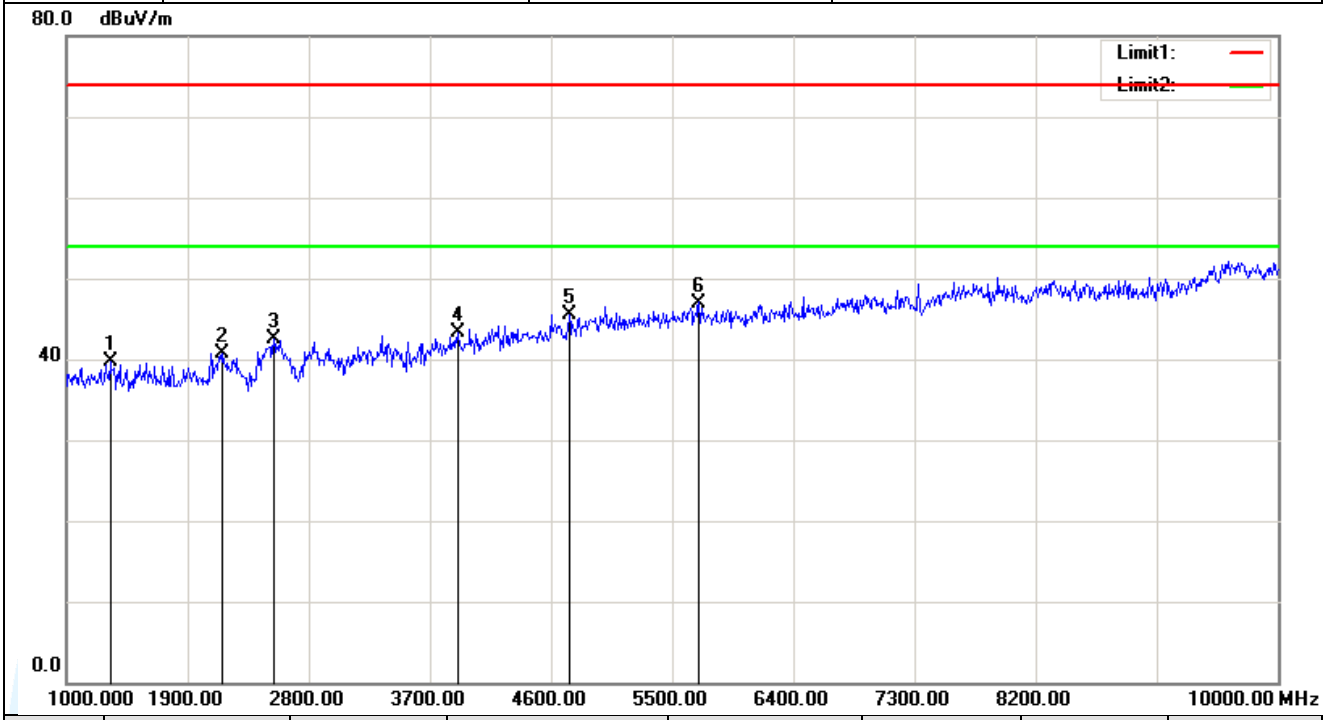
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1108.000	47.34	-8.14	39.20	74.00	-34.80	peak
2	1711.000	48.06	-6.46	41.60	74.00	-32.40	peak
3	2269.000	44.02	-3.53	40.49	74.00	-33.51	peak
4	2548.000	44.87	-2.17	42.70	74.00	-31.30	peak
5	3349.000	43.01	-0.77	42.24	74.00	-31.76	peak
6*	4348.000	40.99	2.81	43.80	74.00	-30.20	peak

Mode	802.11n(HT20)	Antenna	Chain 0+1
Channel	1	Ant. Polar.	Horizontal



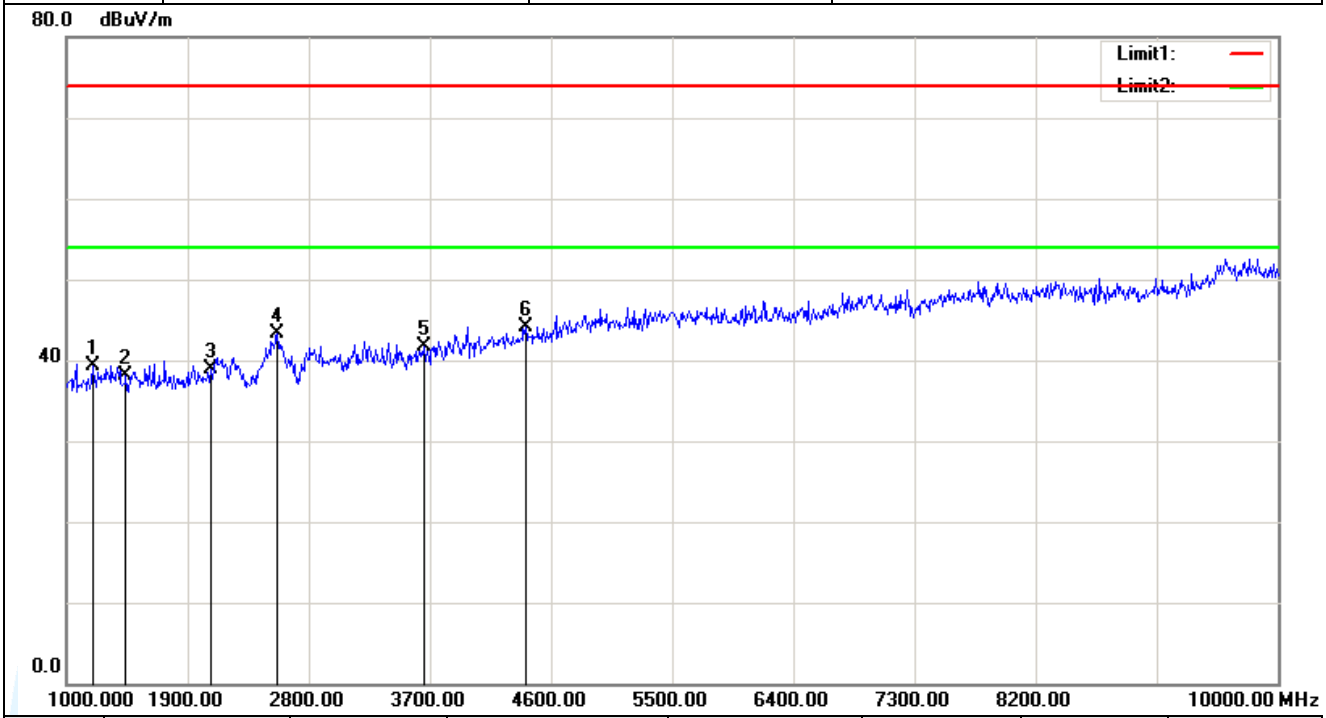
.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1342.000	45.97	-7.27	38.70	74.00	-35.30	peak
2	2143.000	45.09	-4.22	40.87	74.00	-33.13	peak
3	2521.000	44.21	-2.22	41.99	74.00	-32.01	peak
4	3196.000	43.08	-1.03	42.05	74.00	-31.95	peak
5	3862.000	42.86	1.01	43.87	74.00	-30.13	peak
6*	4933.000	41.00	4.76	45.76	74.00	-28.24	peak

Mode	802.11n(HT20)	Antenna	Chain 0+1
Channel	1	Ant. Polar.	Vertical



.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1324.000	47.09	-7.34	39.75	74.00	-34.25	peak
2	2161.000	44.80	-4.12	40.68	74.00	-33.32	peak
3	2539.000	44.65	-2.19	42.46	74.00	-31.54	peak
4	3907.000	42.03	1.20	43.23	74.00	-30.77	peak
5	4735.000	41.41	4.12	45.53	74.00	-28.47	peak
6*	5698.000	41.05	5.95	47.00	74.00	-27.00	peak

Mode	802.11n(HT20)	Antenna	Chain 0+1
Channel	6	Ant. Polar.	Horizontal



.No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1198.000	47.08	-7.80	39.28	74.00	-34.72	peak
2	1441.000	45.10	-6.99	38.11	74.00	-35.89	peak
3	2071.000	43.55	-4.61	38.94	74.00	-35.06	peak
4	2566.000	45.53	-2.14	43.39	74.00	-30.61	peak
5	3655.000	41.62	0.13	41.75	74.00	-32.25	peak
6*	4411.000	41.04	3.04	44.08	74.00	-29.92	peak