



# TEST REPORT

Report Reference No.....	TRE1708023401	R/C.....: 83245
FCC ID .....	OWI-KW6516	
Applicant's name .....	<b>Kasda Networks inc</b>	
Address.....	3/F, Building No.2, South No.2 Honghualing Industry Zone, Taoyuan Street, Nanshan, Shenzhen, China	
Manufacturer.....	Kasda Networks inc	
Address.....	3/F, Building No.2, South No.2 Honghualing Industry Zone, Taoyuan Street, Nanshan, Shenzhen, China	
Test item description .....	<b>AC 1200Mbps Dual Band Gigabit Wireless Router</b>	
Trade Mark .....		
Model/Type reference.....	KW6516	
Listed Model(s) .....	-	
Standard .....	<b>FCC CFR Title 47 Part 15 Subpart C Section 15.247</b>	
Date of receipt of test sample.....	Aug. 31, 2017	
Date of testing.....	Sep. 05, 2017~ Oct. 20, 2017	
Date of issue.....	Oct. 20, 2017	
Result.....	<b>PASS</b>	

Compiled by ( position+printedname+signature)....:	File administrators Becky Liang	
Supervised by (position+printedname+signature)....:	Project Engineer Jeff Sun	
Approved by (position+printedname+signature)....:	RF Manager Hans Hu	

Testing Laboratory Name .....	<b>Shenzhen Huatongwei International Inspection Co., Ltd.</b>
Address.....	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

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*The test report merely correspond to the test sample.*

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## **1. TEST STANDARDS AND REPORT VERSION**

### **1.1. Test Standards**

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10:2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB 558074 D01 DTS Meas Guidance v04](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under §15.247

[KDB662911 D01 Multiple Transmitter Output v02r01](#): Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)

[KDB662911 D02 MIMO with Cross-Polarized Antennas v01](#): MIMO with Cross-Polarized Antenna

### **1.2. Report Version**

Version No.	Date of issue	Description
00	Oct. 20, 2017	Original

## 2. TEST DESCRIPTION

Test Item	FCC Rule	Result	Test Engineer
Antenna requirement	15.203/15.247(c)	Pass	William Wang
Line Conducted Emissions (AC Main)	15.207	Pass	William Wang
Conducted Peak Output Power	15.247(b)(3)	Pass	William Wang
Power Spectral Density	15.247(e)	Pass	William Wang
6dB Bandwidth	15.247(a)(2)	Pass	William Wang
Restricted band	15.247(d)/15.205	Pass	William Wang
Spurious Emissions	15.247(d)/15.209	Pass	William Wang

Note: The measurement uncertainty is not included in the test result.

### 3. SUMMARY

#### 3.1. Client Information

Applicant:	Kasda Networks inc
Address:	3/F, Building No.2, South No.2 Honghualing Industry Zone, Taoyuan Street, Nanshan, Shenzhen, China
Manufacturer:	Kasda Networks inc
Address:	3/F, Building No.2, South No.2 Honghualing Industry Zone, Taoyuan Street, Nanshan, Shenzhen, China

#### 3.2. Product Description

Name of EUT:	AC 1200Mbps Dual Band Gigabit Wireless Router
Trade Mark:	
Model No.:	KW6516
Listed Model(s):	-
Power supply:	DC 12V, 1.5A
Adapter information:	Model No.: RD1201500-C55-24MG Input: AC 100-240V, 50/60Hz, 0.6A Max Output: DC 12V, 1.5A
Hardware version:	Rev1.1
Software version:	-
<b>WIFI</b>	
Supported type:	802.11b/802.11g/802.11n(HT20)/802.11n(HT40)
Modulation:	DSSS for 802.11b OFDM for 802.11g/802.11n(HT20)/802.11n(HT40)
Operation frequency:	2412MHz~2462MHz for 802.11b/802.11g/802.11n(HT20) 2422MHz~2452MHz for 802.11n(HT40)
Channel number:	11 for 802.11b/802.11g/802.11n(HT20) 7 for 802.11n(HT40)
Channel separation:	5MHz
Antenna number:	2 Transmit 2 Receive
Antenna gain:	5 dBi

Note: 802.11b/802.11g is SISO mode only

802.11n(HT20)/802.11n(HT40) is MIMO mode only

Directional gain of MIMO mode is  $5 + 10 \log 2 = 8$  dBi

### 3.3. Operation State

➤ **Test frequency list**

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

802.11b/g/n(HT20)		802.11n(HT40)	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	01	-
02	2417	02	-
03	2422	03	2422
04	2427	04	2427
05	2432	05	2432
06	2437	06	2437
07	2442	07	2442
08	2447	08	2447
09	2452	09	2452
10	2457	10	-
11	2462	11	-

➤ **Test mode**

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit (duty cycle>98%).
For AC power line conducted emissions:
The EUT was set to connect with the WLAN AP under large package sizes transmission.
For RF test axis
EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data Recorded in the report.

### 3.4. EUT Configuration

**The following peripheral devices and interface cables were connected during the measurement:**

- - supplied by the manufacturer
- - supplied by the lab

○	/	Manufacturer:	/
		Model No.:	/
○	/	Manufacturer:	/
		Model No.:	/

### 3.5. Modifications

No modifications were implemented to meet testing criteria.

## **4. TEST ENVIRONMENT**

### **4.1. Address of the test laboratory**

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

### **4.2. Test Facility**

#### **CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### **A2LA-Lab Cert. No.: 3902.01**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### **FCC-Registration No.: 762235**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files.

#### **IC-Registration No.: 5377B-1**

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No.: 5377B-1.

#### **ACA**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

### 4.3. Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

### 4.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors in calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd. quality system according to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Here after the best measurement capability for Shenzhen Huatongwei International Inspection Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.39 dB	(1)
Radiated Emissions 30~1000MHz	4.24 dB	(1)
Radiated Emissions 1~18GHz	5.16 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=1.96$ .

#### 4.5. Equipments Used during the Test

Line Conducted Emission (AC Main)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	R&S	ESCI	101247	2016/11/13
2	Artificial Mains	Shwarzbeck	NNLK 8121	573	2016/11/13
3	Pulse Limiter	R&S	ESH3-Z2	101488	2016/11/13
4	Test Software	R&S	ES-K1	N/A	N/A
5	Test cable	ENVIROFLEX	3651	1101902	2016/11/13

Maximum Peak Output Power / Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal
1	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	2016/11/13
2	Power Meter	Anritsu	ML2480B	100798	2016/11/13
3	Power Sensor	Anritsu	MA2411B	100258	2016/11/13
4	Test cable	FARPU	MCX-J	N/A	2016/11/13
5	Temporary antenna connector	D-LENP	NJ-SMAK	N/A	2016/11/13

NOTE: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	2016/11/13
2	RF Test Panel	Rohde&Schwarz	TS / RSP	335015/0017	N/A
3	EMI Test Software	Rohde&Schwarz	ESK1	N/A	N/A
4	Loop Antenna	Rohde&Schwarz	HZ-9	838622\013	2016/11/13
5	Ultra-Broadband Antenna	Shwarzbeck	VULB9163	538	2016/11/13
6	Horn Antenna	Shwarzbeck	9120D	1011	2016/11/13
7	Broadband Horn Antenna	Shwarzbeck	BBHA9170	BBHA917047 2	2016/11/13
8	Preamplifier	Shwarzbeck	BBV9742	9742-196	2016/11/13
9	Broadband Preamplifier	Shwarzbeck	BBV 9721	9721-102	2016/11/13
10	Broadband Preamplifier	Shwarzbeck	BBV 9718	9718-247	2016/11/13
11	Turn Table	MATURO	TT2.0	/	N/A
12	Antenna Mast	MATURO	TAM-4.0-P	/	N/A
13	EMI Test Software	Audix	E3	N/A	N/A
14	Test Software	R&S	ES-K1	N/A	N/A
15	Test cable	Siva Cables Italy	RG 58A/U	W14.02	2016/11/13

The Cal.Interval was one year.

## 5. TEST CONDITIONS AND RESULTS

### 5.1. Antenna Requirement

#### REQUIREMENT:

#### **FCC CFR Title 47 Part 15 Subpart C Section 15.203:**

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.

#### **FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):**

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

#### TEST RESULTS

Passed       Not Applicable

The directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



## 5.2. Conducted Emissions (AC Main)

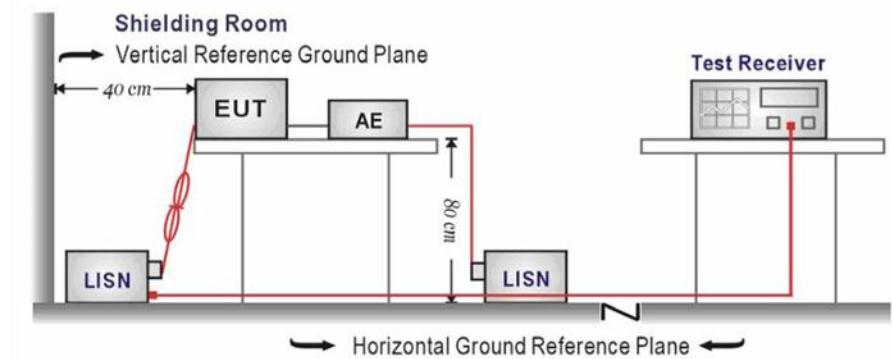
### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207:

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

\* Decreases with the logarithm of the frequency.

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

### TEST MODE:

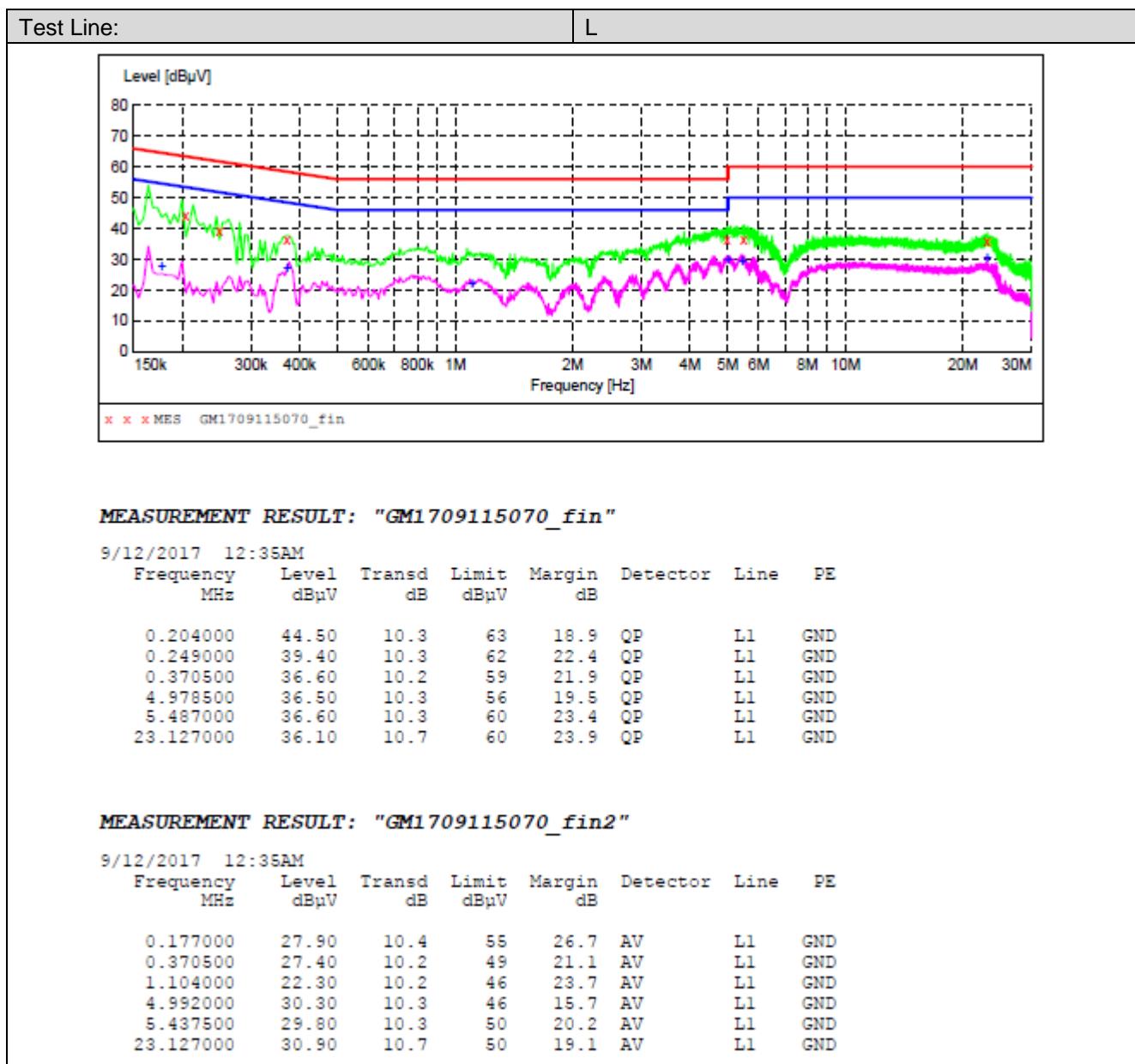
Please refer to the clause 3.3

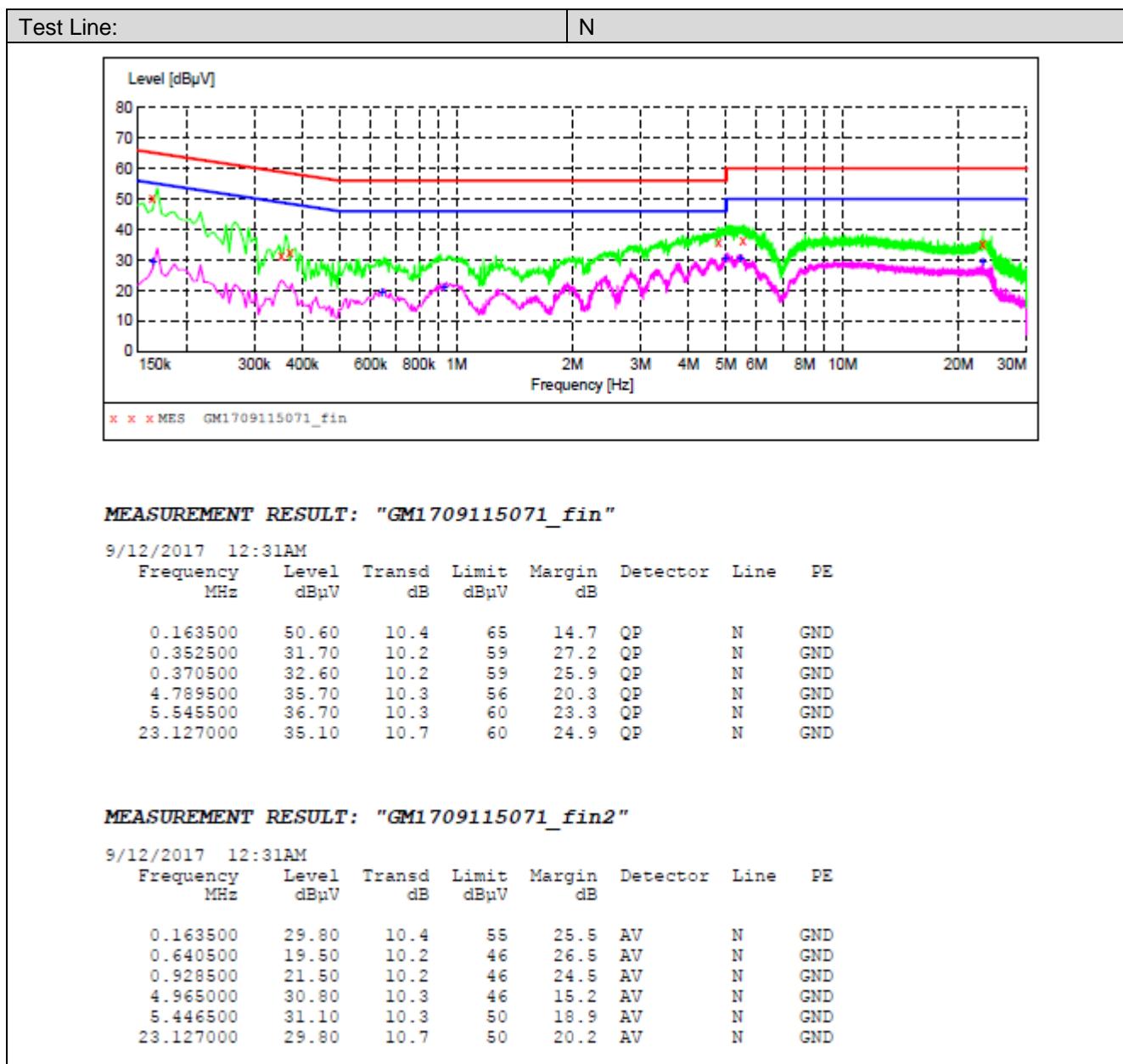
### TEST RESULTS

Passed       Not Applicable

Note:

- 1) Transd=Cable loss+ Pulse Limiter Factor + Artificial Mains Factor
- 2) Margin= Limit -Level



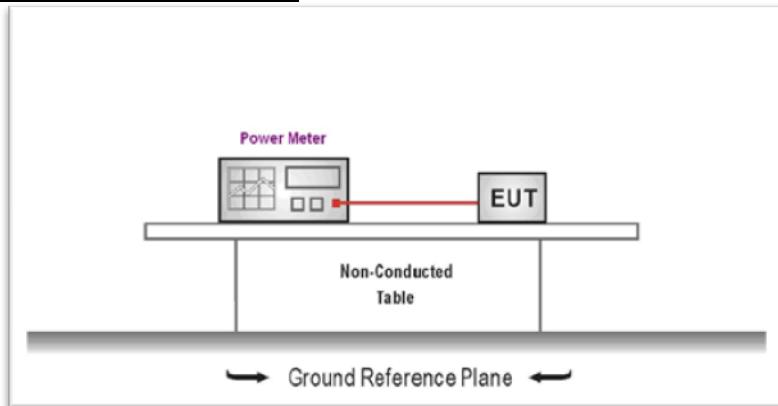


### 5.3. Conducted Peak Output Power

#### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): **30dBm**:

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10: 2013 and KDB 558074 D01 for compliance to FCC 47 CFR 15.247 requirements.
2. The maximum peak conducted output power may be measured using a broadband peak RF power meter.
3. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector
4. Record the measurement data.

#### TEST MODE:

Please refer to the clause 3.3

#### TEST RESULTS

Passed       Not Applicable

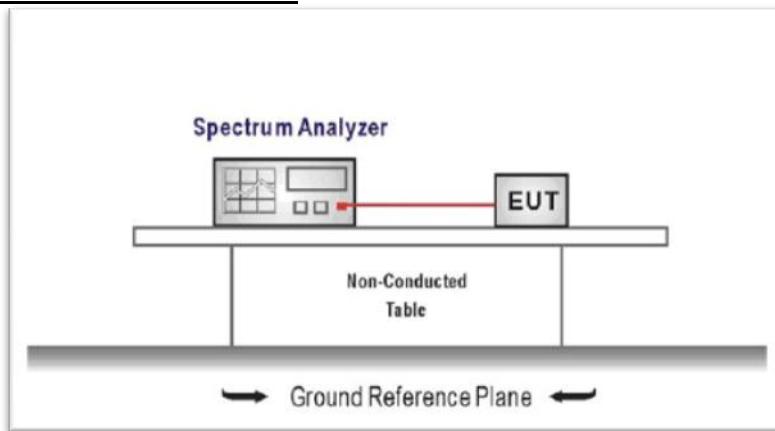
Type	Channel	Output power (dBm)		Total Power (dBm)	Limit (dBm)	Result
		Antenna 0	Antenna 1			
802.11b	01	19.66	20.78	/	≤30.00	Pass
	06	19.66	20.78	/		
	11	19.66	20.78	/		
802.11g	01	23.80	24.78	/	≤30.00	Pass
	06	23.80	24.78	/		
	11	23.80	24.78	/		
802.11n(HT20)	01	23.64	24.41	27.05	≤30.00	Pass
	06	22.80	25.05	27.08		
	11	23.62	25.02	27.39		
802.11n(HT40)	03	20.77	22.29	24.61	≤30.00	Pass
	06	20.59	22.55	24.69		
	09	21.00	24.63	26.19		

## 5.4. Power Spectral Density

### LIMIT

**FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e):** For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### TEST CONFIGURATION



### TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input,
2. Configure the spectrum analyzer as shown below:  
Center frequency=DTS channel center frequency  
Span =1.5 times the DTS bandwidth  
 $RBW = 3 \text{ kHz} \leq RBW \leq 100 \text{ kHz}$ ,  $VBW \geq 3 \times RBW$   
Sweep time = auto couple  
Detector = peak  
Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
4. Use the peak marker function to determine the maximum amplitude level within the RBW.
5. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### TEST MODE:

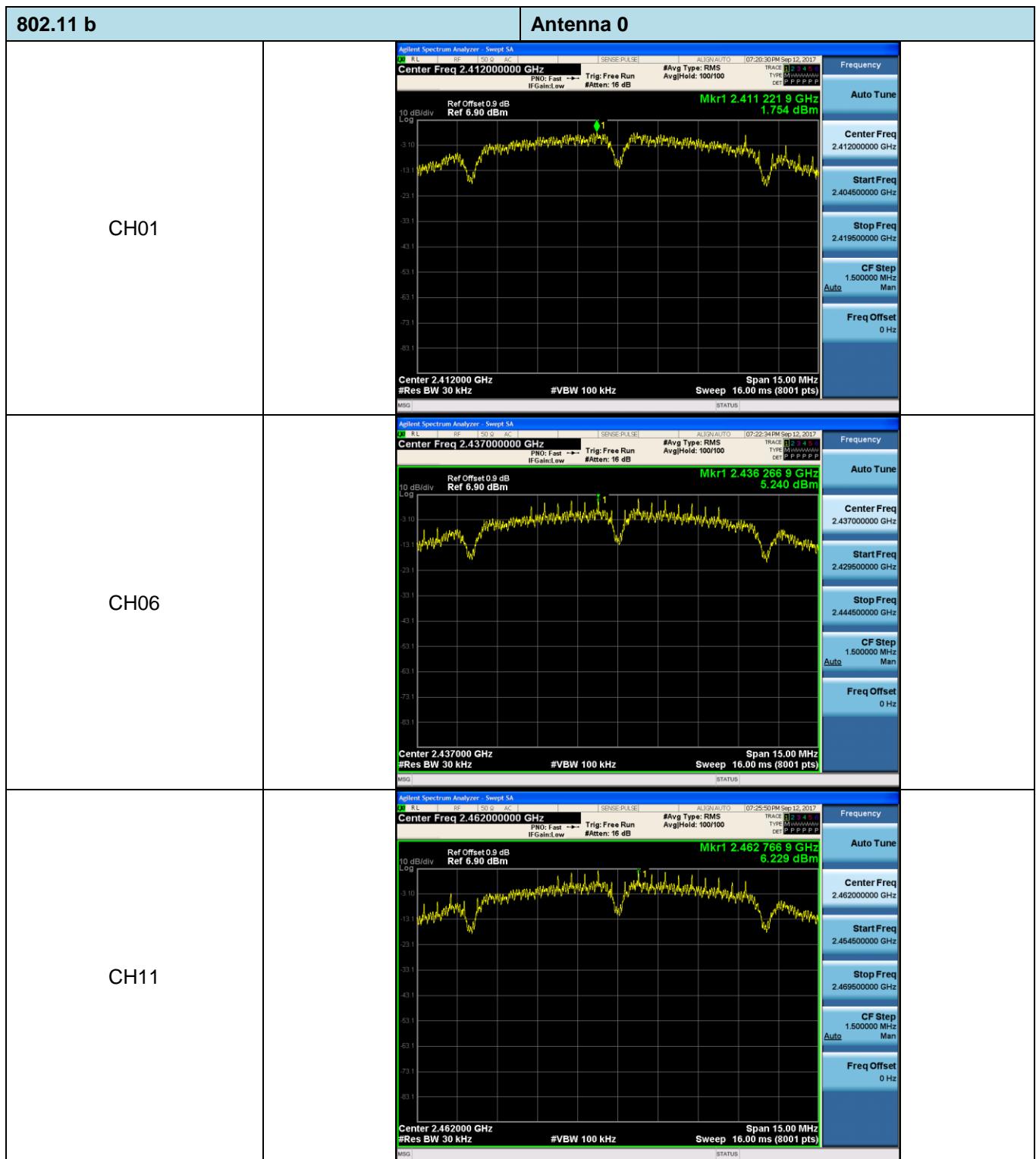
Please refer to the clause 3.3

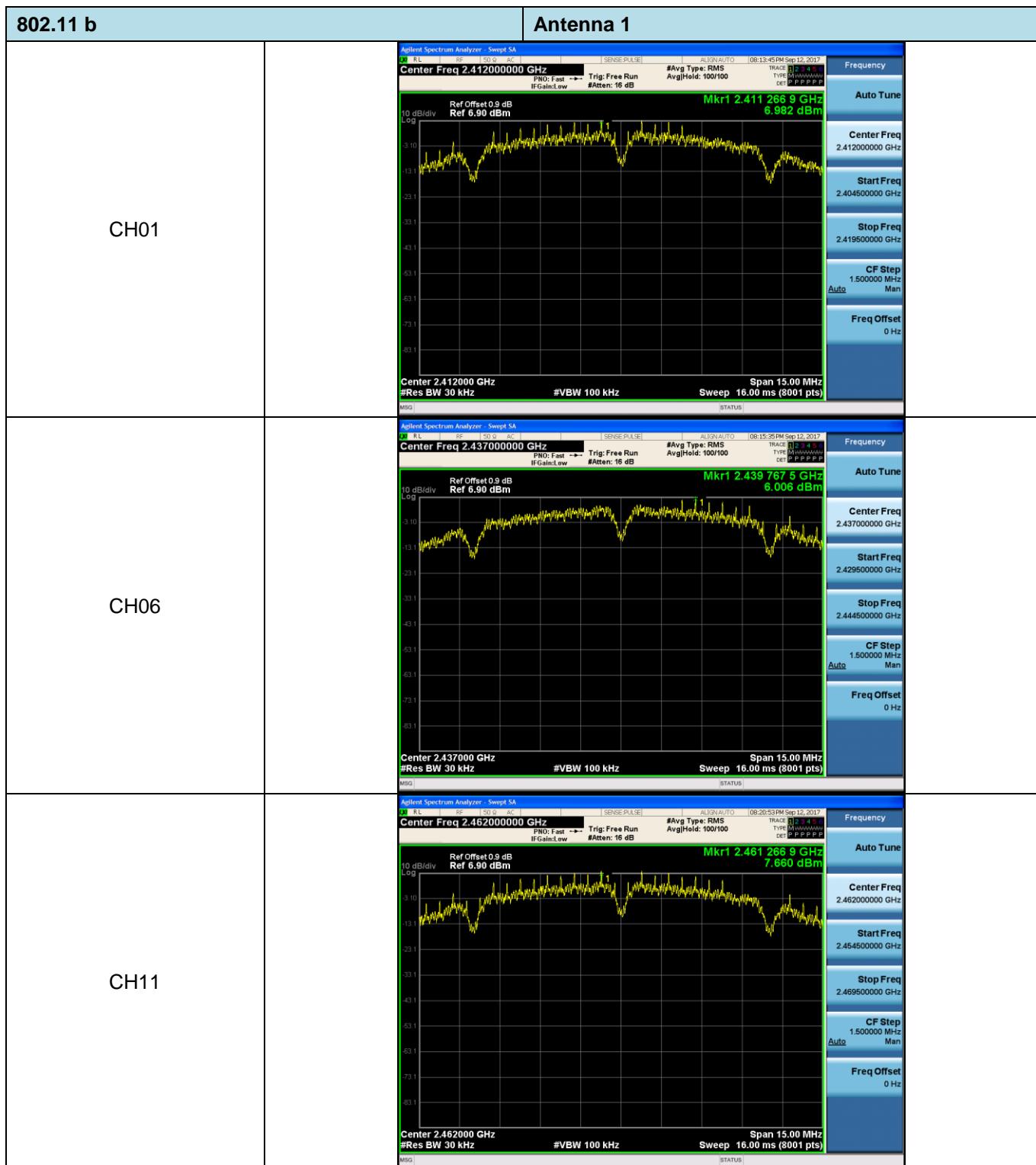
### TEST RESULTS

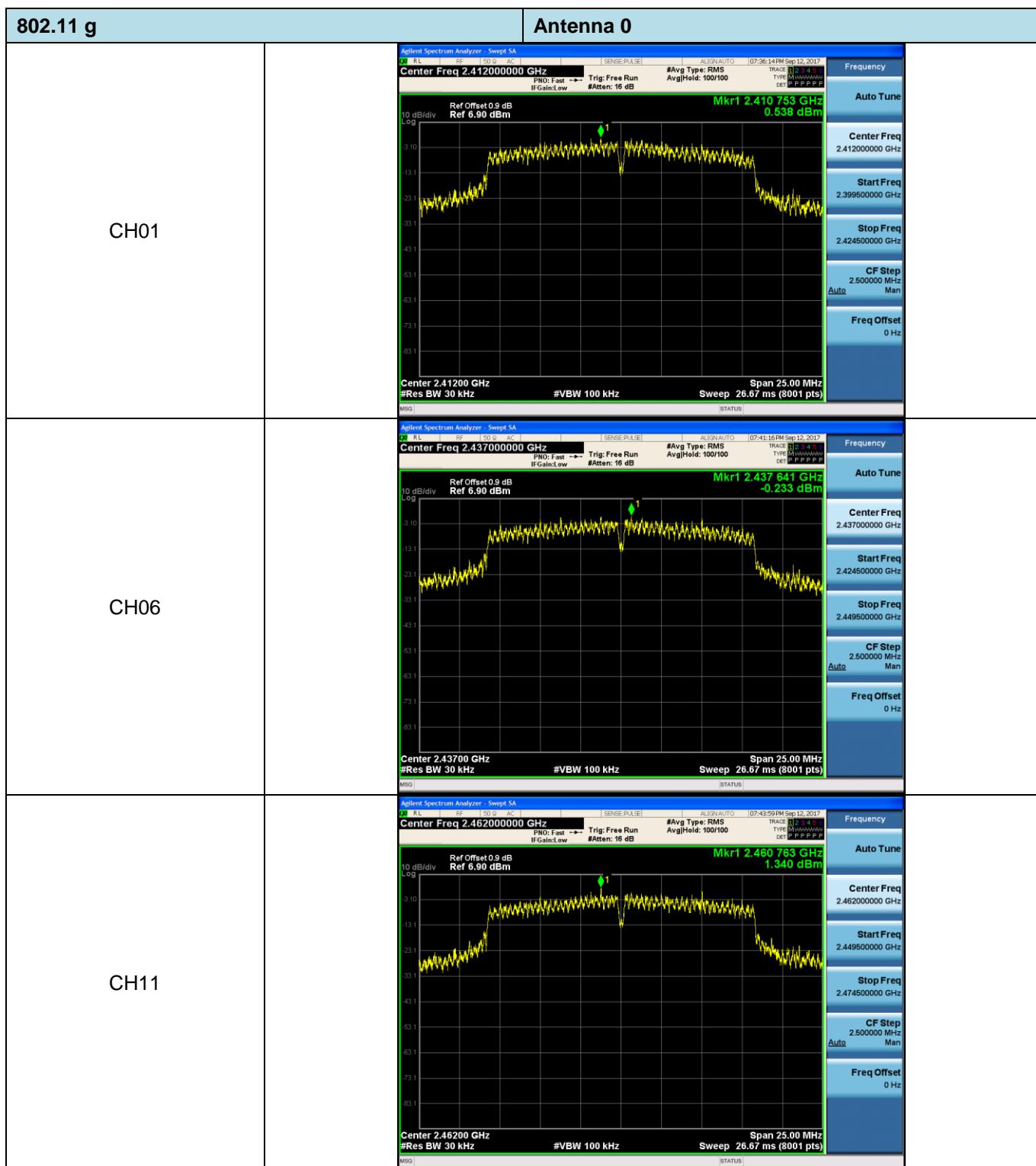
Passed       Not Applicable

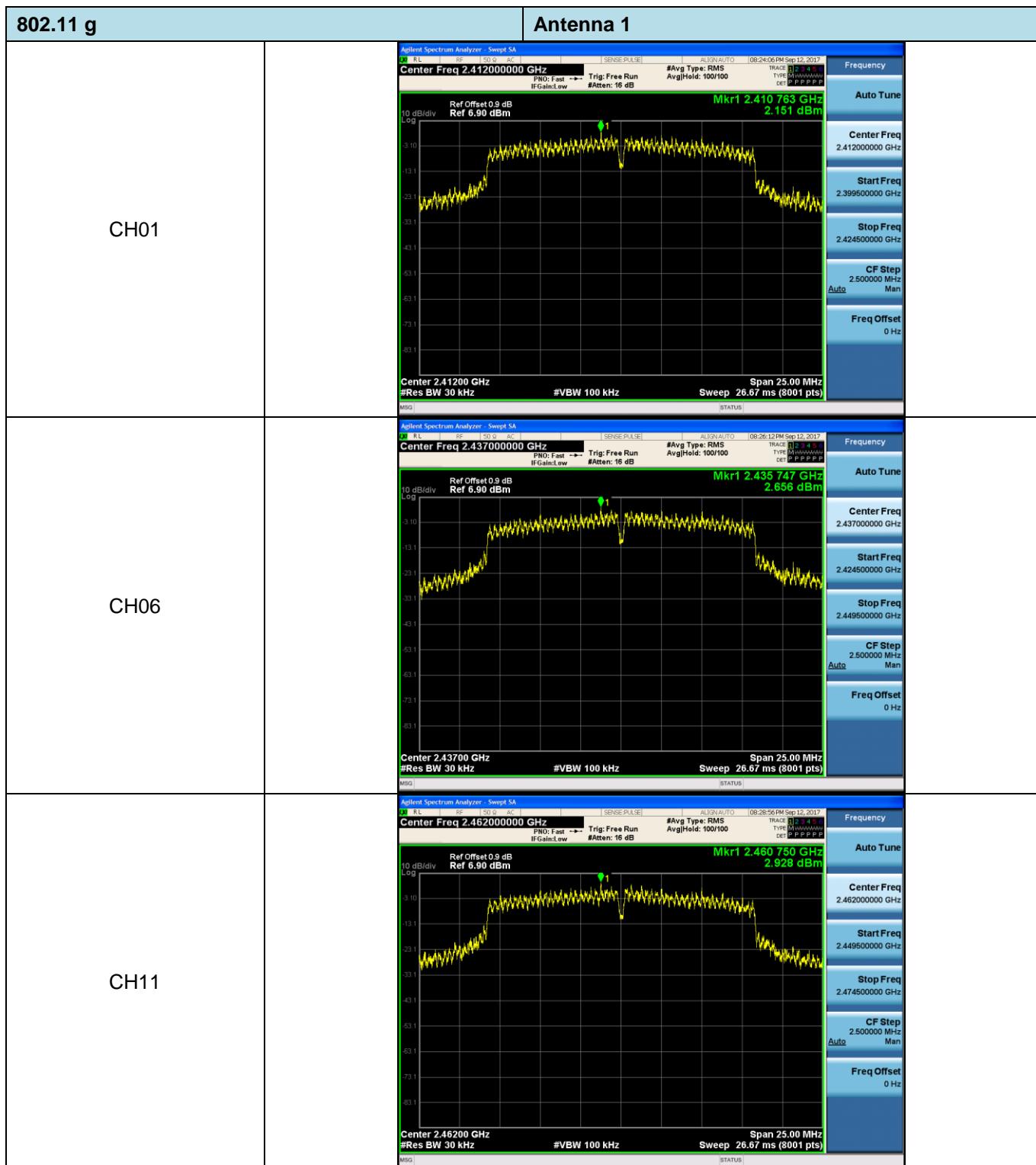
Type	Channel	Power Spectral Density (dBm/RBW)		Total Power Spectral Density (dBm/RBW)	Limit (dBm/3KHz)	Result
		Antenna 0	Antenna 1			
802.11b	01	1.754	6.982	/	≤8.00	Pass
	06	5.24	6.006	/		
	11	6.229	7.66	/		
802.11g	01	0.538	2.151	/	≤8.00	Pass
	06	-0.233	2.656	/		
	11	1.34	2.928	/		
802.11n(HT20)	01	1.283	2.529	4.961	≤8.00	Pass
	06	0.246	2.933	4.804		
	11	0.711	3.175	5.126		
802.11n(HT40)	03	-4.268	-3.223	-0.704	≤8.00	Pass
	06	-4.823	-3.099	-0.866		
	09	-4.778	-0.477	0.895		

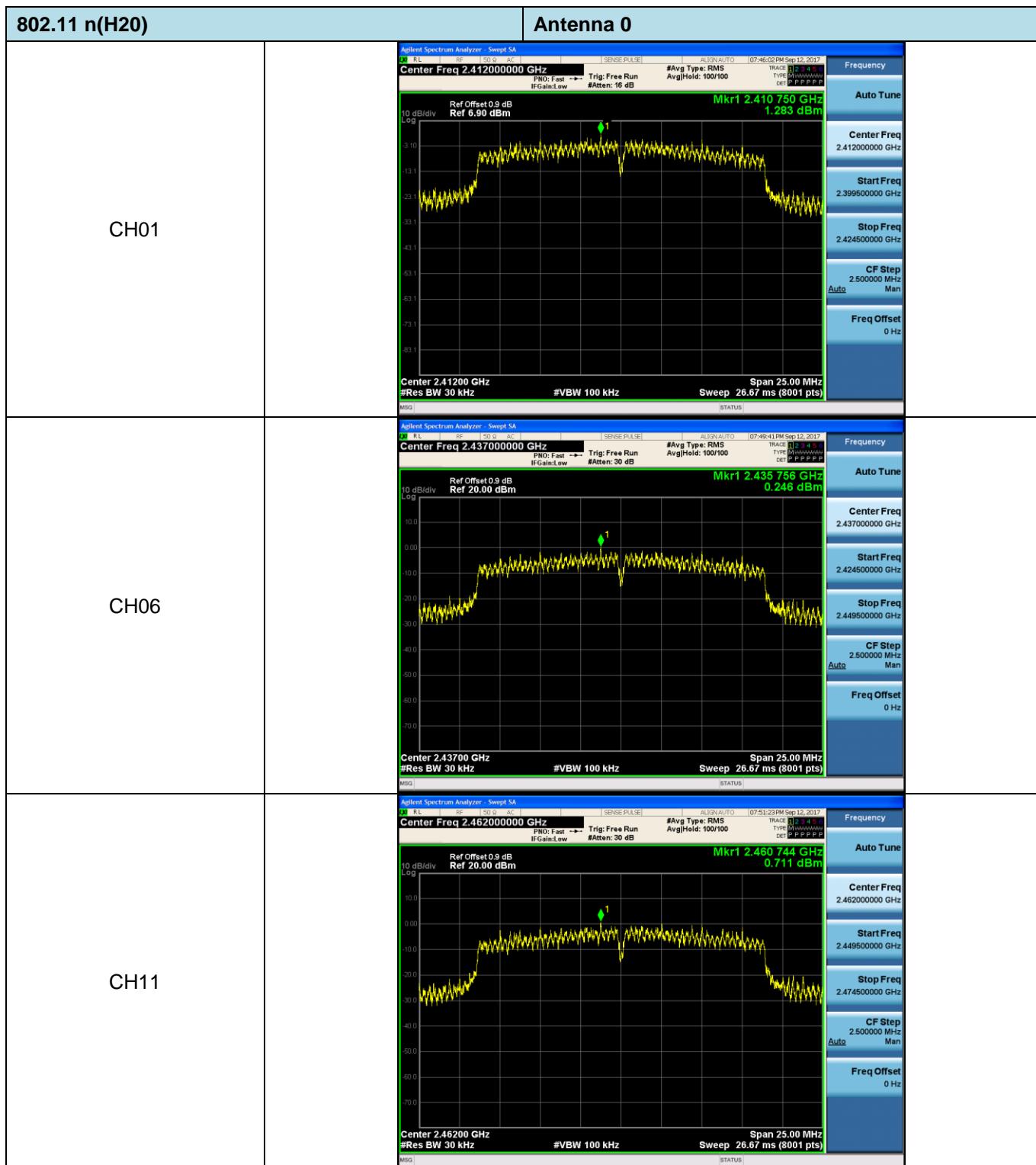
Test plot as follows:

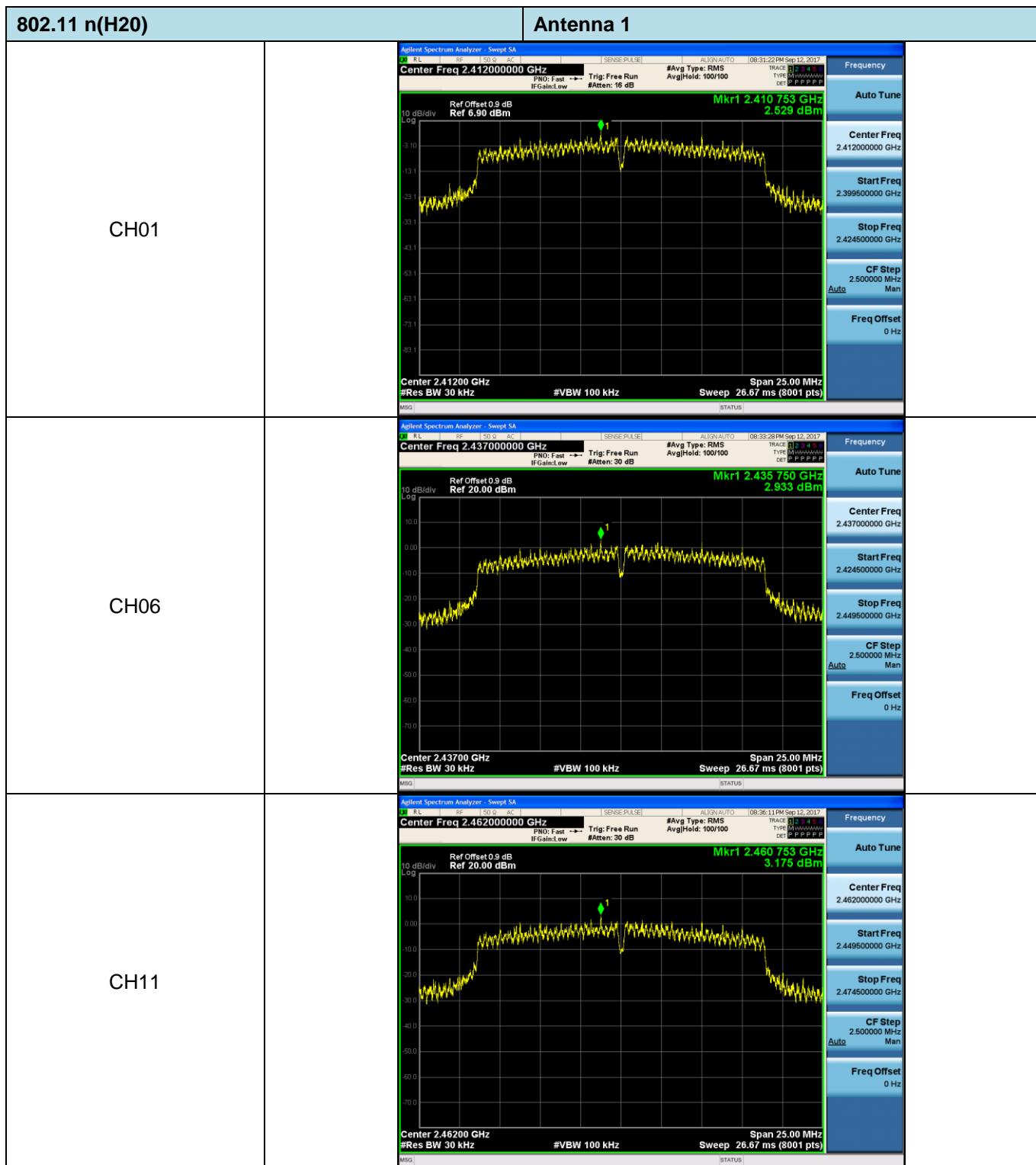


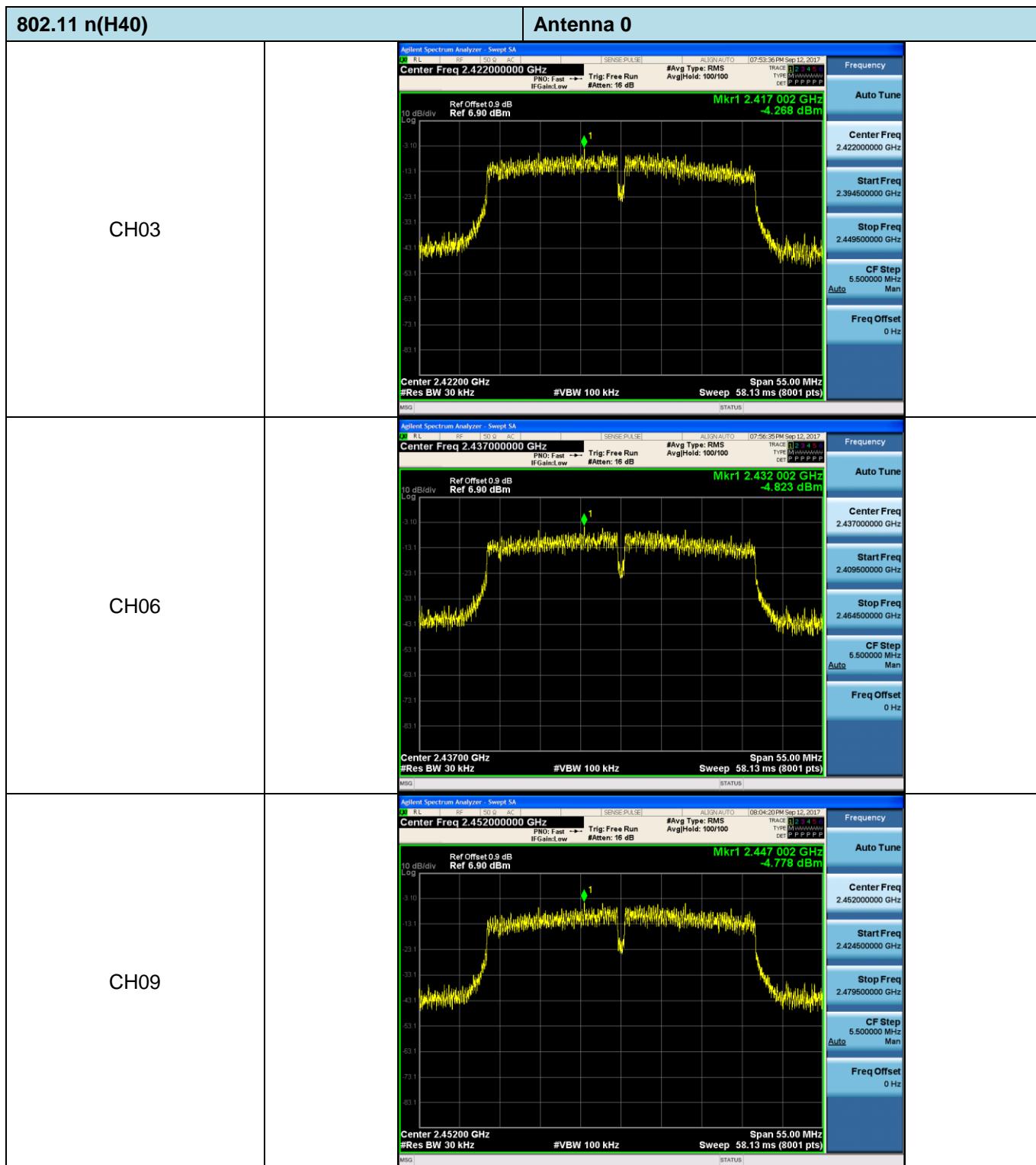


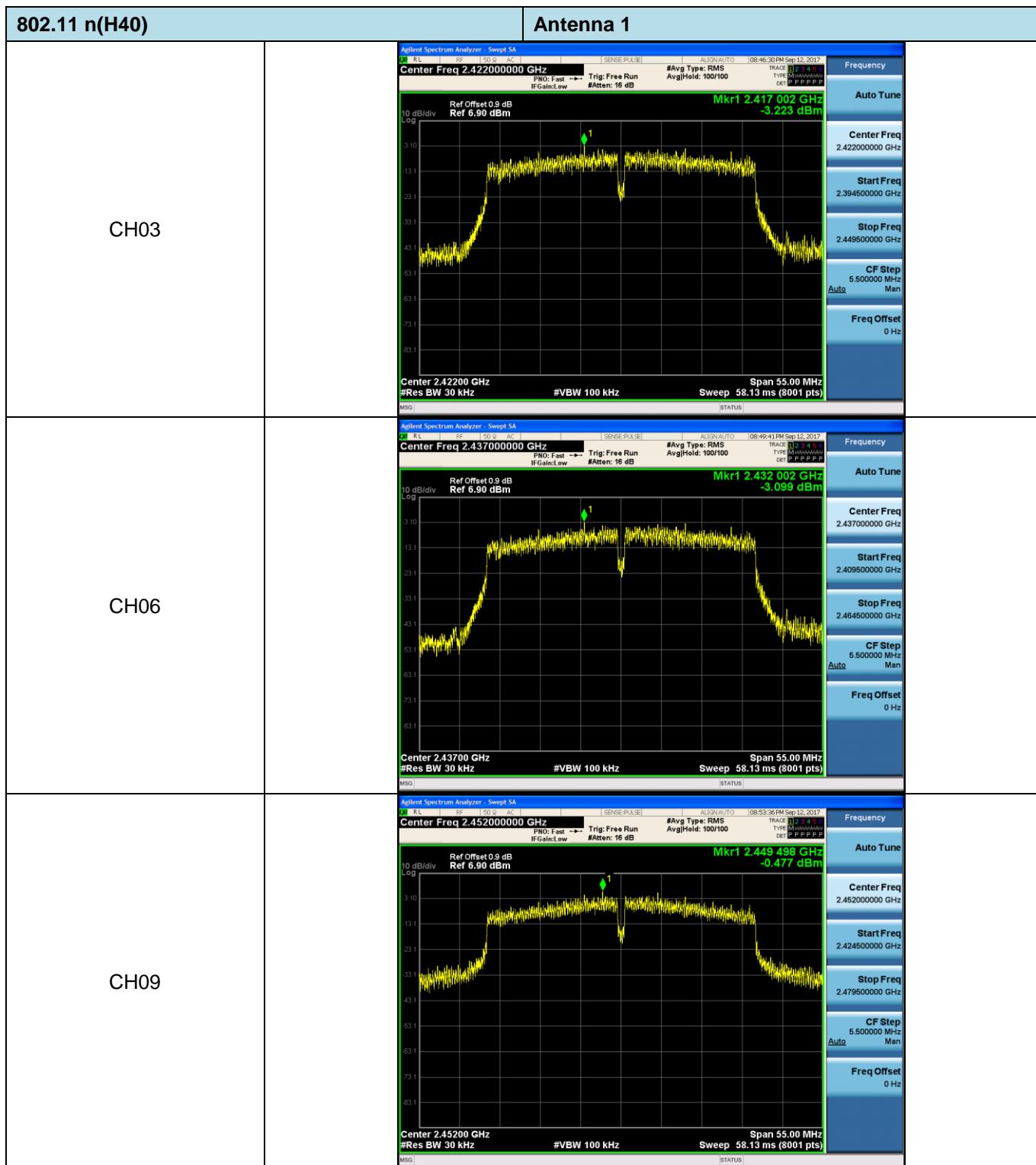










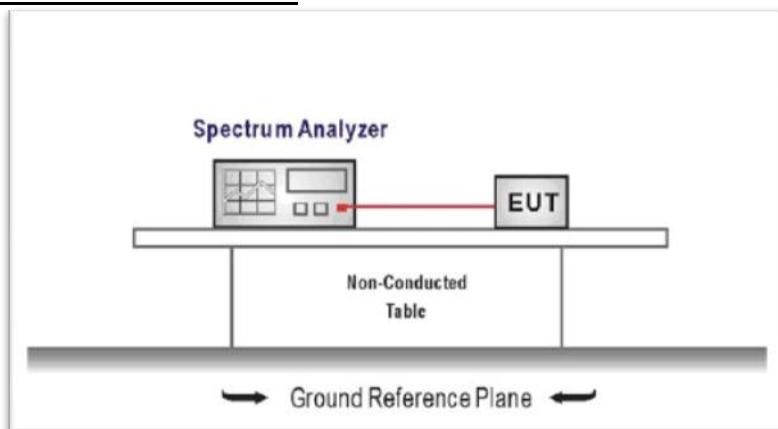


## 5.5. 6dB Bandwidth

### LIMIT

**FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2):** For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

### TEST CONFIGURATION



### TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).  
Center Frequency = DTS channel center frequency  
Span=2 x DTS bandwidth  
RBW = 100 kHz, VBW  $\geq 3 \times$  RBW  
Sweep time= auto couple  
Detector = Peak  
Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
4. 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, and record the pertinent measurements.

### TEST MODE:

Please refer to the clause 3.3

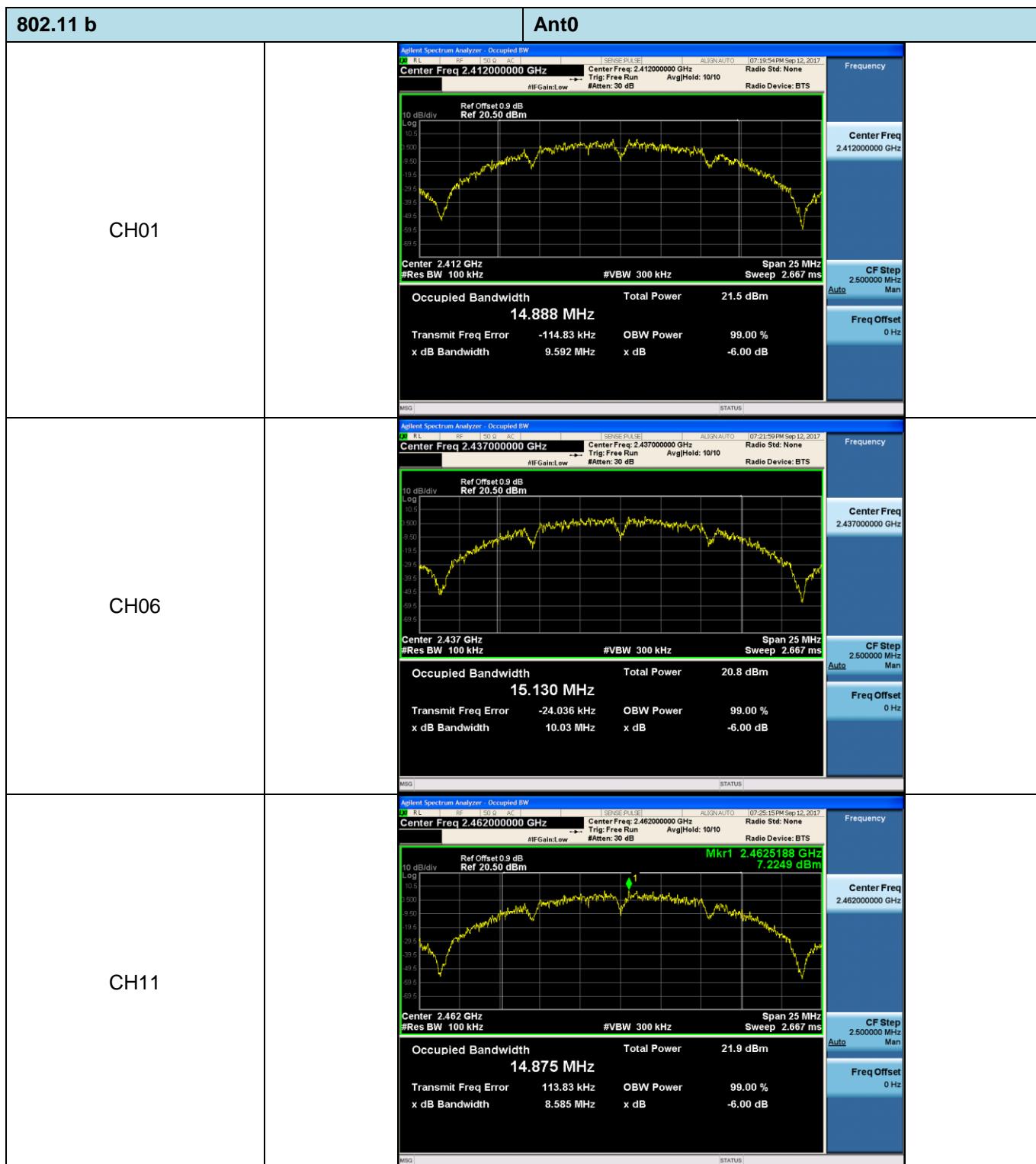
### TEST RESULTS

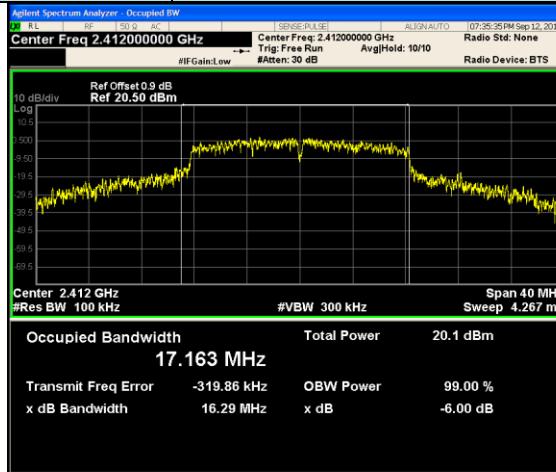
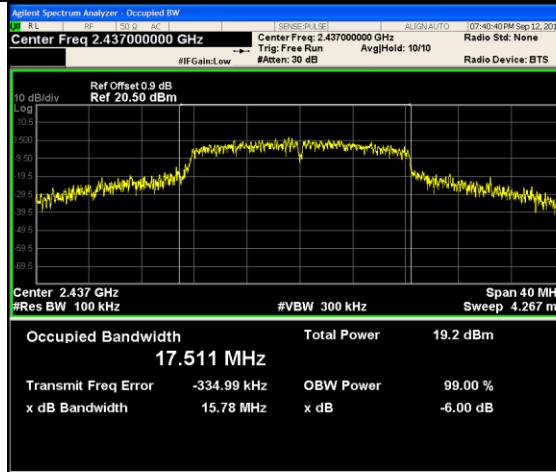
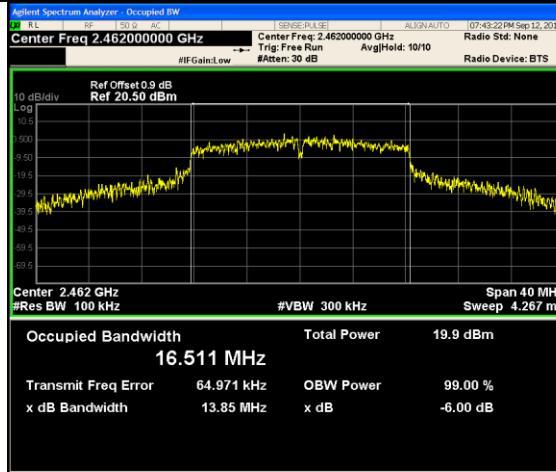
Passed       Not Applicable

Prescan Ant0 and Ant1, found Ant0 which it is worse case mode, so only show the Ant0 data.

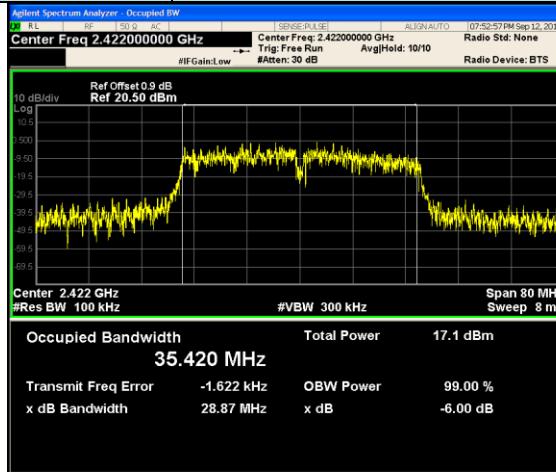
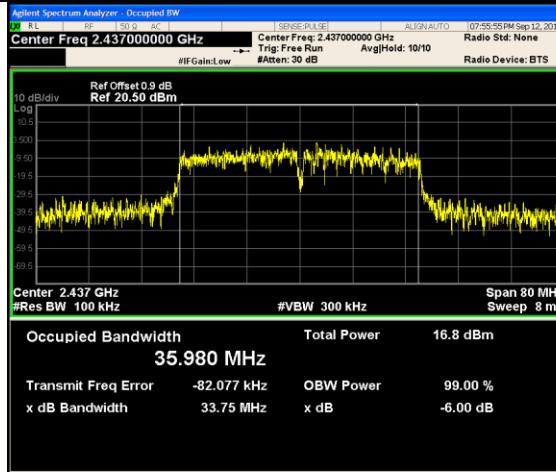
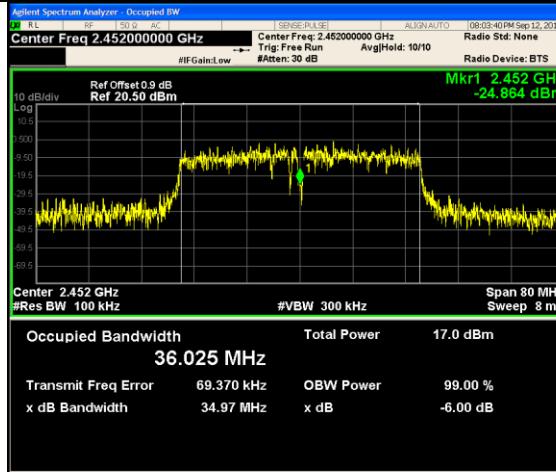
Type	Channel	6dB Bandwidth (MHz)	Limit (kHz)	Result
802.11b	01	9.592	≥500	Pass
	06	10.03		
	11	8.585		
802.11g	01	16.29	≥500	Pass
	06	15.78		
	11	13.85		
802.11n(HT20)	01	13.42	≥500	Pass
	06	13.02		
	11	16.97		
802.11n(HT40)	03	28.87	≥500	Pass
	06	33.75		
	09	34.97		

Test plot as follows:



802.11 g		Ant0
CH01	 <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.412000000 GHz</p> <p>Ref Offset 0.3 dB Ref 20.50 dBm</p> <p>10 dB/div</p> <p>Center 2.412 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 4.267 ms</p> <p>Occupied Bandwidth: 17.163 MHz</p> <p>Transmit Freq Error: -319.86 kHz OBW Power: 99.00 %</p> <p>x dB Bandwidth: 16.29 MHz x dB: -6.00 dB</p>	<p>Frequency</p> <p>Center Freq: 2.412000000 GHz</p> <p>CF Step: 4.000000 MHz Man</p> <p>Freq Offset: 0 Hz</p>
CH06	 <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.437000000 GHz</p> <p>Ref Offset 0.9 dB Ref 20.50 dBm</p> <p>10 dB/div</p> <p>Center 2.437 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 4.267 ms</p> <p>Occupied Bandwidth: 17.511 MHz</p> <p>Transmit Freq Error: -334.99 kHz OBW Power: 99.00 %</p> <p>x dB Bandwidth: 15.78 MHz x dB: -6.00 dB</p>	<p>Frequency</p> <p>Center Freq: 2.437000000 GHz</p> <p>CF Step: 4.000000 MHz Man</p> <p>Freq Offset: 0 Hz</p>
CH11	 <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.462000000 GHz</p> <p>Ref Offset 0.9 dB Ref 20.50 dBm</p> <p>10 dB/div</p> <p>Center 2.462 GHz #Res BW 100 kHz #VBW 300 kHz Span 40 MHz Sweep 4.267 ms</p> <p>Occupied Bandwidth: 16.511 MHz</p> <p>Transmit Freq Error: 64.971 kHz OBW Power: 99.00 %</p> <p>x dB Bandwidth: 13.85 MHz x dB: -6.00 dB</p>	<p>Frequency</p> <p>Center Freq: 2.462000000 GHz</p> <p>CF Step: 4.000000 MHz Man</p> <p>Freq Offset: 0 Hz</p>

802.11n(HT20)		Ant0
CH01		<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.412000000 GHz</p> <p>Ref Offset 0.8 dB Ref 20.50 dBm</p> <p>10 dB/div</p> <p>10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0</p> <p>Center 2.412 GHz #Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 40 MHz</p> <p>Sweep 4.267 ms</p> <p>Occupied Bandwidth 17.950 MHz</p> <p>Total Power 20.0 dBm</p> <p>Transmit Freq Error -129.48 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 13.42 MHz</p> <p>x dB -6.00 dB</p> <p>MSG</p> <p>STATUS</p>
CH06		<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.437000000 GHz</p> <p>Ref Offset 0.9 dB Ref 20.50 dBm</p> <p>10 dB/div</p> <p>10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0</p> <p>Center 2.437 GHz #Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 40 MHz</p> <p>Sweep 4.267 ms</p> <p>Occupied Bandwidth 18.200 MHz</p> <p>Total Power 19.2 dBm</p> <p>Transmit Freq Error -155.10 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 13.02 MHz</p> <p>x dB -6.00 dB</p> <p>MSG</p> <p>STATUS</p>
CH11		<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.462000000 GHz</p> <p>Ref Offset 0.9 dB Ref 20.50 dBm</p> <p>10 dB/div</p> <p>10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0</p> <p>Center 2.462 GHz #Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 40 MHz</p> <p>Sweep 4.267 ms</p> <p>Occupied Bandwidth 17.723 MHz</p> <p>Total Power 19.9 dBm</p> <p>Transmit Freq Error 51.150 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 16.97 MHz</p> <p>x dB -6.00 dB</p> <p>MSG</p> <p>STATUS</p>

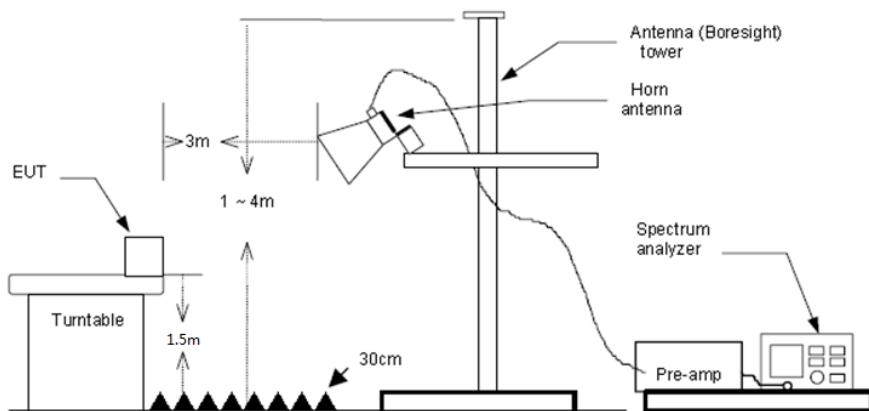
802.11n(HT40)		Ant0
CH03	 <p>Ref Offset 0.8 dB Ref 20.50 dBm</p> <p>Center Freq 2.422000000 GHz #Res BW 100 kHz #VBW 300 kHz Span 80 MHz Sweep 8 ms</p> <p>Occupied Bandwidth 35.420 MHz</p> <p>Transmit Freq Error -1.622 kHz x dB Bandwidth 28.87 MHz</p> <p>OBW Power 99.00 % x dB -6.00 dB</p>	<p>Frequency</p> <p>Center Freq 2.422000000 GHz</p> <p>CF Step 8.000000 MHz Auto</p> <p>Freq Offset 0 Hz</p>
CH06	 <p>Ref Offset 0.9 dB Ref 20.50 dBm</p> <p>Center Freq 2.437000000 GHz #Res BW 100 kHz #VBW 300 kHz Span 80 MHz Sweep 8 ms</p> <p>Occupied Bandwidth 35.980 MHz</p> <p>Transmit Freq Error -82.077 kHz x dB Bandwidth 33.75 MHz</p> <p>OBW Power 99.00 % x dB -6.00 dB</p>	<p>Frequency</p> <p>Center Freq 2.437000000 GHz</p> <p>CF Step 8.000000 MHz Auto</p> <p>Freq Offset 0 Hz</p>
CH09	 <p>Ref Offset 0.9 dB Ref 20.50 dBm</p> <p>Center Freq 2.452000000 GHz #Res BW 100 kHz #VBW 300 kHz Span 80 MHz Sweep 8 ms</p> <p>Occupied Bandwidth 36.025 MHz</p> <p>Transmit Freq Error 69.370 kHz x dB Bandwidth 34.97 MHz</p> <p>OBW Power 99.00 % x dB -6.00 dB</p>	<p>Frequency</p> <p>Center Freq 2.452000000 GHz</p> <p>CF Step 8.000000 MHz Auto</p> <p>Freq Offset 0 Hz</p>

## 5.6. Restricted Band

### LIMIT

**FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

### TEST CONFIGURATION



### TEST PROCEDURE

- 1) The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
- 2) The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3) The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4) The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- 5) The receiver set as follow:  
RBW=1MHz, VBW=3MHz PEAK detector for Peak value.  
RBW=1MHz, VBW=3MHz RMS detector for Average value.

### TEST MODE:

Please refer to the clause 3.3

### TEST RESULTS

Passed       Not Applicable

Note:

- 1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor

802.11b					CH01				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2310.00	13.51	28.05	6.62	0.00	48.18	74.00	-25.82	HORIZONTAL	Peak
2390.01	14.46	27.65	6.75	0.00	48.86	74.00	-25.14	HORIZONTAL	Peak
2310.00	14.16	28.05	6.62	0.00	48.83	74.00	-25.17	VERTICAL	Peak
2390.01	14.22	27.65	6.75	0.00	48.62	74.00	-25.38	VERTICAL	Peak
2310.00	11.56	28.05	6.62	0.00	46.23	54.00	-7.77	HORIZONTAL	Average
2390.01	13.82	27.65	6.75	0.00	48.22	54.00	-5.78	HORIZONTAL	Average
2310.00	11.54	28.05	6.62	0.00	46.21	54.00	-7.79	VERTICAL	Average
2390.01	13.80	27.65	6.75	0.00	48.20	54.00	-5.80	VERTICAL	Average

802.11b					CH11				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2483.49	14.86	27.26	6.83	0.00	48.95	74.00	-25.05	HORIZONTAL	Peak
2500.00	14.47	27.20	6.84	0.00	48.51	74.00	-25.49	HORIZONTAL	Peak
2483.49	21.87	27.26	6.83	0.00	55.96	74.00	-18.04	VERTICAL	Peak
2500.00	19.20	27.20	6.84	0.00	53.24	74.00	-20.76	VERTICAL	Peak
2483.49	15.23	27.26	6.83	0.00	49.32	54.00	-4.68	HORIZONTAL	Average
2500.00	12.13	27.20	6.84	0.00	46.17	54.00	-7.83	HORIZONTAL	Average
2483.49	16.56	27.26	6.83	0.00	50.65	54.00	-3.35	VERTICAL	Average
2500.00	15.66	27.20	6.84	0.00	49.70	54.00	-4.30	VERTICAL	Average

802.11g					CH01				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2310.00	14.24	28.05	6.62	0.00	48.91	74.00	-25.09	HORIZONTAL	Peak
2390.01	23.91	27.65	6.75	0.00	58.31	74.00	-15.69	HORIZONTAL	Peak
2310.00	15.47	28.05	6.62	0.00	50.14	74.00	-23.86	VERTICAL	Peak
2390.01	25.25	27.65	6.75	0.00	59.65	74.00	-14.35	VERTICAL	Peak
2310.00	11.39	28.05	6.62	0.00	46.06	54.00	-7.94	HORIZONTAL	Average
2390.01	16.75	27.65	6.75	0.00	51.15	54.00	-2.85	HORIZONTAL	Average
2310.00	11.98	28.05	6.62	0.00	46.65	54.00	-7.35	VERTICAL	Average
2390.01	17.76	27.65	6.75	0.00	52.16	54.00	-1.84	VERTICAL	Average

802.11g					CH11				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2483.49	23.86	27.26	6.83	0.00	57.95	74.00	-16.05	HORIZONTAL	Peak
2500.00	13.76	27.20	6.84	0.00	47.80	74.00	-26.20	HORIZONTAL	Peak
2483.49	24.23	27.26	6.83	0.00	58.32	74.00	-15.68	VERTICAL	Peak
2500.00	15.57	27.20	6.84	0.00	49.61	74.00	-24.39	VERTICAL	Peak
2483.49	16.16	27.26	6.83	0.00	50.25	54.00	-3.75	HORIZONTAL	Average
2500.00	11.15	27.20	6.84	0.00	45.19	54.00	-8.81	HORIZONTAL	Average
2483.49	17.31	27.26	6.83	0.00	51.40	54.00	-2.60	VERTICAL	Average
2500.00	12.86	27.20	6.84	0.00	46.90	54.00	-7.10	VERTICAL	Average

802.11n(HT20)					CH01				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2310.00	13.95	28.05	6.62	0.00	48.62	74.00	-25.38	HORIZONTAL	Peak
2390.01	22.02	27.65	6.75	0.00	56.42	74.00	-17.58	HORIZONTAL	Peak
2310.00	15.10	28.05	6.62	0.00	49.77	74.00	-24.23	VERTICAL	Peak
2390.01	21.98	27.65	6.75	0.00	56.38	74.00	-17.62	VERTICAL	Peak
2310.00	11.38	28.05	6.62	0.00	46.05	54.00	-7.95	HORIZONTAL	Average
2390.01	16.15	27.65	6.75	0.00	50.55	54.00	-3.45	HORIZONTAL	Average
2310.00	12.05	28.05	6.62	0.00	46.72	54.00	-7.28	VERTICAL	Average
2390.01	17.03	27.65	6.75	0.00	51.43	54.00	-2.57	VERTICAL	Average

802.11n(HT20)					CH11				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2483.49	22.50	27.26	6.83	0.00	56.59	74.00	-17.41	HORIZONTAL	Peak
2500.00	13.36	27.20	6.84	0.00	47.40	74.00	-26.60	HORIZONTAL	Peak
2483.49	23.13	27.26	6.83	0.00	57.22	74.00	-16.78	VERTICAL	Peak
2500.00	14.47	27.20	6.84	0.00	48.51	74.00	-25.49	VERTICAL	Peak
2483.49	17.54	27.26	6.83	0.00	51.63	54.00	-2.37	HORIZONTAL	Average
2500.00	11.49	27.20	6.84	0.00	45.53	54.00	-8.47	HORIZONTAL	Average
2483.49	18.50	27.26	6.83	0.00	52.59	54.00	-1.41	VERTICAL	Average
2500.00	12.68	27.20	6.84	0.00	46.72	54.00	-7.28	VERTICAL	Average

802.11n(HT40)					CH03				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2310.00	15.11	28.05	6.62	0.00	49.78	74.00	-24.22	HORIZONTAL	Peak
2389.99	24.33	27.65	6.75	0.00	58.73	74.00	-15.27	HORIZONTAL	Peak
2310.00	12.71	28.05	6.62	0.00	47.38	74.00	-26.62	VERTICAL	Peak
2389.99	21.59	27.65	6.75	0.00	55.99	74.00	-18.01	VERTICAL	Peak
2310.00	12.74	28.05	6.62	0.00	47.41	54.00	-6.59	HORIZONTAL	Average
2389.99	17.96	27.65	6.75	0.00	52.36	54.00	-1.64	HORIZONTAL	Average
2310.00	10.34	28.05	6.62	0.00	45.01	54.00	-8.99	VERTICAL	Average
2389.99	15.53	27.65	6.75	0.00	49.93	54.00	-4.07	VERTICAL	Average

802.11n(HT40)					CH09				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2483.50	23.27	27.26	6.83	0.00	57.36	74.00	-16.64	HORIZONTAL	Peak
2500.00	16.81	27.20	6.84	0.00	50.85	74.00	-23.15	HORIZONTAL	Peak
2483.50	22.75	27.26	6.83	0.00	56.84	74.00	-17.16	VERTICAL	Peak
2500.00	14.64	27.20	6.84	0.00	48.68	74.00	-25.32	VERTICAL	Peak
2483.50	18.64	27.26	6.83	0.00	52.73	54.00	-1.27	HORIZONTAL	Average
2500.00	13.65	27.20	6.84	0.00	47.69	54.00	-6.31	HORIZONTAL	Average
2483.50	16.01	27.26	6.83	0.00	50.10	54.00	-3.90	VERTICAL	Average
2500.00	12.80	27.20	6.84	0.00	46.84	54.00	-7.16	VERTICAL	Average

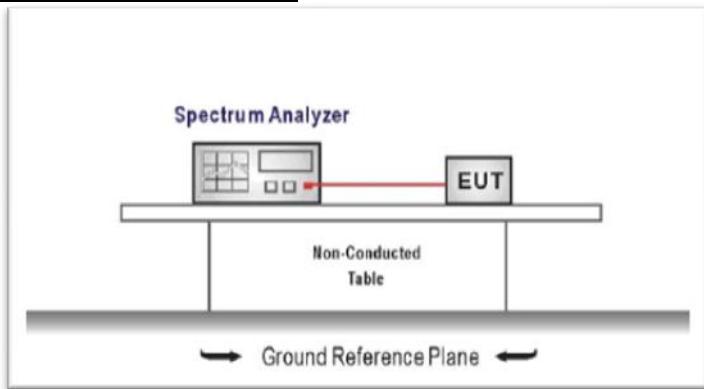
NOTE: 802.11b and 802.11g SISO mode have been tested, only worse case ANT 0 is reported  
 802.11n(HT20) and 802.11n(HT40) MIMO mode have been tested

## 5.7. Band Edge and Spurious Emissions (Conducted)

### LIMIT

**FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### TEST CONFIGURATION



### TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Establish a reference level by using the following procedure
 

Center frequency=DTS channel center frequency  
 The span = 1.5 times the DTS bandwidth.  
 RBW = 100 kHz, VBW  $\geq$  3 x RBW  
 Detector = peak, Sweep time = auto couple, Trace mode = max hold  
 Allow trace to fully stabilize  
 Use the peak marker function to determine the maximum PSD level

Note: the channel found to contain the maximum PSD level can be used to establish the reference level.
3. Emission level measurement
 

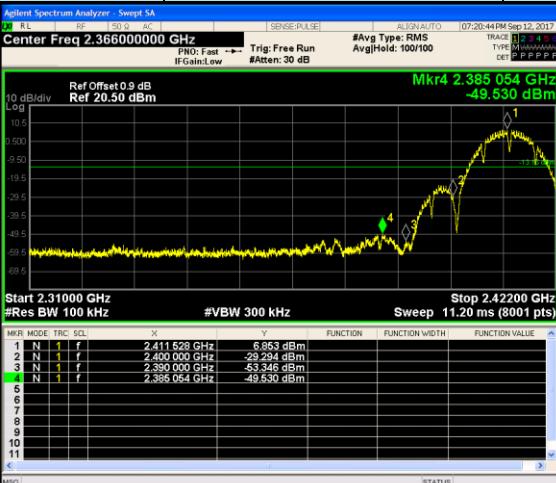
Set the center frequency and span to encompass frequency range to be measured  
 RBW = 100 kHz, VBW  $\geq$  3 x RBW  
 Detector = peak, Sweep time = auto couple, Trace mode = max hold  
 Allow trace to fully stabilize  
 Use the peak marker function to determine the maximum amplitude level.
4. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
5. Ensure that the amplitude of all unwanted emission outside of the authorized frequency band excluding restricted frequency bands) are attenuated by at least the minimum requirements specified (at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz). Report the three highest emission relative to the limit.

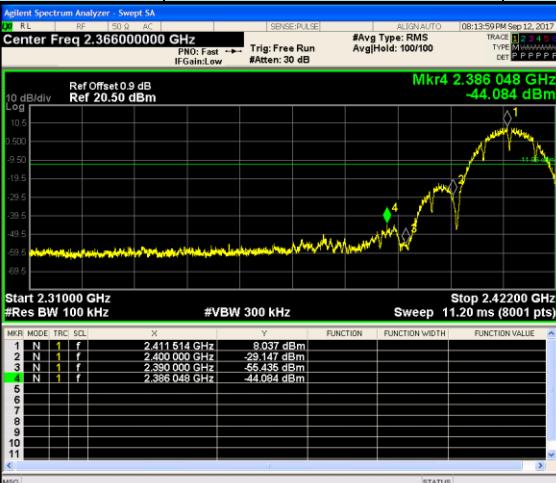
### TEST MODE:

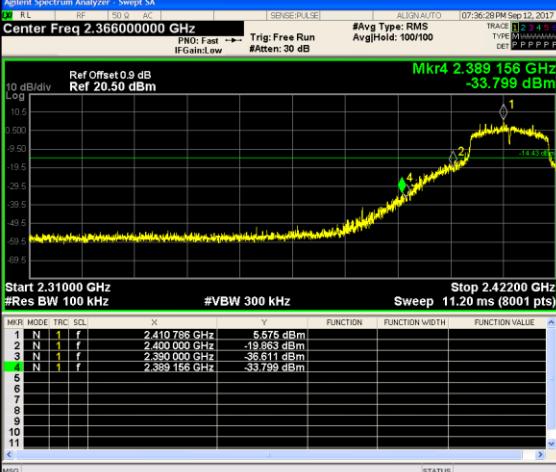
Please refer to the clause 3.3

### TEST RESULTS

Passed       Not Applicable

Test Item:	Bandedge	Type:	802.11 b / Ant0
CH01	 A screenshot of an Agilent Spectrum Analyzer software interface. The main window shows a spectrum plot with a yellow trace. The plot parameters are: Start 2.31000 GHz, Stop 2.42200 GHz, Sweep 11.20 ms (8001 pts), and #VBW 300 kHz. The center frequency is 2.366000000 GHz. The plot shows a primary peak at 2.385 GHz and several smaller peaks. A green marker labeled 'Mkr4' is placed on the primary peak. The right side of the interface contains a vertical stack of blue panels, each representing a different measurement or setting: Frequency (Auto Tune), Center Freq (2.36600000 GHz), Start Freq (2.31000000 GHz), Stop Freq (2.42200000 GHz), CF Step (11.200000 MHz Man Auto), and Freq Offset (0 Hz).   A screenshot of an Agilent Spectrum Analyzer software interface, similar to the one above but for channel CH11. The main window shows a spectrum plot with a yellow trace. The plot parameters are: Start 2.45200 GHz, Stop 2.50000 GHz, Sweep 4.800 ms (8001 pts), and #VBW 300 kHz. The center frequency is 2.476000000 GHz. The plot shows a primary peak at 2.488 GHz and several smaller peaks. A green marker labeled 'Mkr4' is placed on the primary peak. The right side of the interface contains a vertical stack of blue panels, each representing a different measurement or setting: Frequency (Auto Tune), Center Freq (2.47600000 GHz), Start Freq (2.45200000 GHz), Stop Freq (2.50000000 GHz), CF Step (4.800000 MHz Man Auto), and Freq Offset (0 Hz).		
CH11			

Test Item:	Bandedge	Type:	802.11 b / Ant1
CH01	 A screenshot of an Agilent Spectrum Analyzer software interface. The main window shows a spectrum plot with a single sharp peak labeled 'Mkr4 2.386 048 GHz -44.084 dBm'. The plot has a logarithmic y-axis from 10.5 to 69.5. The x-axis shows frequency from 2.31000000 GHz to 2.42200000 GHz. The 'Marker' table at the bottom lists the peak's frequency and power. The right side of the interface has a vertical stack of blue buttons for frequency, auto tune, center freq, start freq, stop freq, cf step, and freq offset, each with its current value.	 Marker Table for CH01: Mkr MODE: TRC SCL: X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE: 1 N 1 f 2.411 514 GHz 8.037 dBm 2 N 1 f 2.400 000 GHz -29.147 dBm 3 N 1 f 2.390 000 GHz -55.435 dBm 4 N 1 f 2.386 048 GHz -44.084 dBm 5 6 7 8 9 10 11	 Frequency: Auto Tune Center Freq: 2.36600000 GHz Start Freq: 2.31000000 GHz Stop Freq: 2.42200000 GHz CF Step: 11.200000 MHz Man Freq Offset: 0 Hz
CH11	 A screenshot of an Agilent Spectrum Analyzer software interface. The main window shows a spectrum plot with a single sharp peak labeled 'Mkr4 2.488 012 GHz -49.766 dBm'. The plot has a logarithmic y-axis from 10.5 to 69.5. The x-axis shows frequency from 2.45200000 GHz to 2.50000000 GHz. The 'Marker' table at the bottom lists the peak's frequency and power. The right side of the interface has a vertical stack of blue buttons for frequency, auto tune, center freq, start freq, stop freq, cf step, and freq offset, each with its current value.	 Marker Table for CH11: Mkr MODE: TRC SCL: X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE: 1 N 1 f 2.461 516 GHz 8.868 dBm 2 N 1 f 2.483 500 GHz -55.463 dBm 3 N 1 f 2.500 000 GHz -57.389 dBm 4 N 1 f 2.488 012 GHz -49.766 dBm 5 6 7 8 9 10 11	 Frequency: Auto Tune Center Freq: 2.47600000 GHz Start Freq: 2.45200000 GHz Stop Freq: 2.50000000 GHz CF Step: 4.800000 MHz Man Freq Offset: 0 Hz

Test Item:	Bandedge	Type:	802.11 g / Ant0
CH01	 A screenshot of an Agilent Spectrum Analyzer software interface. The main window shows a spectrum plot with a yellow trace. A green marker labeled 'Mkr4' is positioned at 2.389156 GHz with a power level of -33.799 dBm. The plot has a logarithmic y-axis from 10.5 to 69.5. The x-axis shows frequency markers at 2.410786 GHz, 2.400000 GHz, 2.390000 GHz, and 2.389156 GHz. The status bar at the bottom right shows 'Auto'.	 A vertical panel on the right side of the software interface containing various parameters for the measurement. The parameters listed are: Frequency (Auto Tune), Center Freq (2.36600000 GHz), Start Freq (2.31000000 GHz), Stop Freq (2.42200000 GHz), CF Step (11.200000 MHz Man Auto), Freq Offset (0 Hz), and a MSG status indicator.	
CH11	 A screenshot of an Agilent Spectrum Analyzer software interface. The main window shows a spectrum plot with a yellow trace. A green marker labeled 'Mkr4' is positioned at 2.483908 GHz with a power level of -35.147 dBm. The plot has a logarithmic y-axis from 10.5 to 69.5. The x-axis shows frequency markers at 2.463298 GHz, 2.483500 GHz, 2.500000 GHz, and 2.483908 GHz. The status bar at the bottom right shows 'Auto'.	 A vertical panel on the right side of the software interface containing various parameters for the measurement. The parameters listed are: Frequency (Auto Tune), Center Freq (2.47600000 GHz), Start Freq (2.46200000 GHz), Stop Freq (2.50000000 GHz), CF Step (4.800000 MHz Man Auto), Freq Offset (0 Hz), and a MSG status indicator.	