



# TEST REPORT

No. I21N00360-WLAN

for

**unitech Electronics Co., Ltd.**

**Wearable Computer**

**Model Name: WD200**

with

**Hardware Version: DVT2**

**Software Version: v117-0**

**FCC ID: HLEWD200BTNF**

**Issued Date: 2021-03-29**

**Designation Number: CN1210**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of SAICT.

**Test Laboratory:**

**SAICT, Shenzhen Academy of Information and Communications Technology**

Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518000.

Tel:+86(0)755-33322000, Fax:+86(0)755-33322001

Email: yewu@caict.ac.cn. www.saict.ac.cn



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## **1. Summary of Test Report**

### **1.1. Test Items**

Description	Wearable Computer
Model Name	WD200
Applicant's name	unitech Electronics Co., Ltd.
Manufacturer's Name	unitech Electronics Co., Ltd.

### **1.2. Test Standards**

FCC Part15-2019; ANSI C63.10-2013

### **1.3. Test Result**

#### **Pass**

Please refer to "5.2. Test Results"

### **1.4. Testing Location**

Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road,  
Futian District, Shenzhen, Guangdong, P. R. China

### **1.5. Project data**

Testing Start Date:	2021-02-16
Testing End Date:	2021-03-26

### **1.6. Signature**

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**Lin Zechuang**  
**(Prepared this test report)**

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**Tang Weisheng**  
**(Reviewed this test report)**

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**Zhang Bojun**  
**(Approved this test report)**



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: unitech Electronics Co., Ltd.  
Address: 5F., No. 136, Ln. 235, Baoqiao Rd., Xindian Dist., New Taipei City  
231, Taiwan, China  
Contact Person Ben Chiang  
E-Mail BenC@tw.ute.com  
Telephone: 886-2-8912-1122  
Fax: /

### **2.2. Manufacturer Information**

Company Name: unitech Electronics Co., Ltd.  
Address: 5F., No. 136, Ln. 235, Baoqiao Rd., Xindian Dist., New Taipei City  
231, Taiwan, China  
Contact Person Ben Chiang  
E-Mail BenC@tw.ute.com  
Telephone: 886-2-8912-1122  
Fax: /



### **3. Equipment Under Test (EUT) and Ancillary Equipment (AE)**

#### **3.1. About EUT**

Description	Wearable Computer
Model Name	WD200
RF Protocol	IEEE 802.11 b/g/n-HT20
Operating Frequency	2412MHz~2462MHz
Number of Channels	11
Antenna Type	Integrated
Antenna Gain	SISO: 0.88dBi MIMO: 0.00dBi
Power Supply	3.85V DC by Battery
FCC ID	HLEWD200BTNF
Condition of EUT as received	No abnormality in appearance

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Shenzhen Academy of Information and Communications Technology.

#### **3.2. Internal Identification of EUT**

<b>EUT ID*</b>	<b>IMEI</b>	<b>HW Version</b>	<b>SW Version</b>	<b>Receive Date</b>
UT04aa	950105210046	DVT2	v117-0	2021-02-07
UT05aa	950104210109	DVT2	v117-0	2021-02-05
UT06aa	950104210038	DVT2	v117-0	2021-02-05

\*EUT ID: is used to identify the test sample in the lab internally.

UT04aa is used for conduction test, UT05aa is used for radiation test, and UT06aa is used for AC Power line Conducted Emission test.

#### **3.3. Internal Identification of AE**

<b>AE ID*</b>	<b>Description</b>	<b>AE ID*</b>
AE1	Battery	/
AE2	Charger	/
AE3	Data Cable	/

##### AE1

Model	206546G
Manufacturer	Sichuan iGreen Technology Co.,Ltd
Capacity	2050mAh
Nominal Voltage	3.85V

##### AE2

Model	S018BYV1200150
Manufacturer	Ten Pao Industrial Co., Ltd

##### AE3

Model	USB 3.0 A TO C 1M
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Manufacturer JHEN VEI ELECTRONIC CO., LTD.

\*AE ID: is used to identify the test sample in the lab internally. AE2: just for testing.

### **3.4. General Description**

The Equipment under Test (EUT) is a model of Wearable Computer with integrated antenna and battery.

It consists of normal options: Lithium Battery and USB Cable.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.



## **4. Reference Documents**

### **4.1. Documents supplied by applicant**

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

### **4.2. Reference Documents for testing**

The following documents listed in this section are referred for testing.

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz	2019
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013



## 5. Test Results

### 5.1. Testing Environment

Normal Temperature: 15~35°C

Relative Humidity: 20~75%

### 5.2. Test Results

No	Test cases	Sub-clause of Part 15C	Verdict
0	Antenna Requirement	15.203	<b>P</b>
1	Maximum Output Power	15.247 (b)	<b>P</b>
2	Peak Power Spectral Density	15.247 (e)	<b>P</b>
3	6dB Bandwidth	15.247 (a)	<b>P</b>
4	Band Edges Compliance	15.247 (d)	<b>P</b>
5	Conducted Emission	15.247 (d)	<b>P</b>
6	Radiated Emission	15.247, 15.205, 15.209	<b>P</b>
7	AC Power line Conducted	15.207	<b>P</b>

See **ANNEX A** for details.

### 5.3. Statements

SAICT has evaluated the test cases requested by the applicant/manufacturer as listed in section 5.2 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2.

## 6. Test Equipments Utilized

### Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Vector Signal Analyzer	FSV40	100903	Rohde & Schwarz	2021-12-30	1 year
2	Power Sensor	U2021XA	MY55430013	Agilent	2022-01-13	1 year
3	Data Acquisiton	U2531A	TW55443507	Agilent	/	/
4	Test Receiver	ESCI	100701	Rohde & Schwarz	2021-08-09	1 year
5	LISN	ENV216	102067	Rohde & Schwarz	2021-07-16	1 year

### Radiated test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Loop Antenna	HLA6120	35779	TESEQ	2022-04-25	3 years
2	BiLog Antenna	3142E	00224831	ETS-Lindgren	2021-05-17	3 years
3	Horn Antenna	3117	00066577	ETS-Lindgren	2022-04-02	3 years
4	Horn Antenna	QSH-SL-18-26-S-20	17013	Q-par	2023-01-06	3 years
5	Horn Antenna	QSH-SL-8-26-40-K-20	17014	Q-par	2023-01-06	3 years
6	Test Receiver	ESR7	101676	Rohde & Schwarz	2021-11-25	1 year
7	Spectrum Analyser	FSV40	101192	Rohde & Schwarz	2022-01-13	1 year
8	Chamber	FACT3-2.0	1285	ETS-Lindgren	2021-07-19	2 years

### Test software

No.	Equipment	Manufacturer	Version
1	TechMgr Software	CAICT	2.1.1
2	EMC32	Rohde & Schwarz	10.50.40

EUT is engineering software provided by the customer to control the transmitting signal. The EUT was programmed to be in continuously transmitting mode.

### Anechoic Chamber

Fully anechoic Chamber by ETS-Lindgren.

## 7. Laboratory Environment

### Semi-anechoic chamber

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	< ± 4 dB, 3 m distance, from 30 to 1000 MHz

### Shielded room

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-1000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω

### Fully-anechoic chamber

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Voltage Standing Wave Ratio (VSWR)	≤ 6 dB, from 1 to 18 GHz, 3 m distance
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz



## 8. Measurement Uncertainty

Test Name	Uncertainty ( $k=2$ )	
1. RF Output Power - Conducted	1.32dB	
2. Power Spectral Density - Conducted	2.32dB	
3. Occupied channel bandwidth - Conducted	66Hz	
4. Transmitter Spurious Emission - Conducted	$30\text{MHz} \leq f < 1\text{GHz}$	1.41dB
	$1\text{GHz} \leq f < 7\text{GHz}$	1.92dB
	$7\text{GHz} \leq f < 13\text{GHz}$	2.31dB
	$13\text{GHz} \leq f \leq 26\text{GHz}$	2.61dB
5. Transmitter Spurious Emission - Radiated	$9\text{kHz} \leq f < 30\text{MHz}$	1.74dB
	$30\text{MHz} \leq f < 1\text{GHz}$	4.84dB
	$1\text{GHz} \leq f < 18\text{GHz}$	4.68dB
	$18\text{GHz} \leq f \leq 40\text{GHz}$	3.76dB
6. AC Power line Conducted Emission	$150\text{kHz} \leq f \leq 30\text{MHz}$	3.00dB

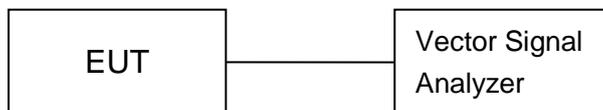
## ANNEX A: Detailed Test Results

### Test Configuration

The measurement is made according to ANSI C63.10.

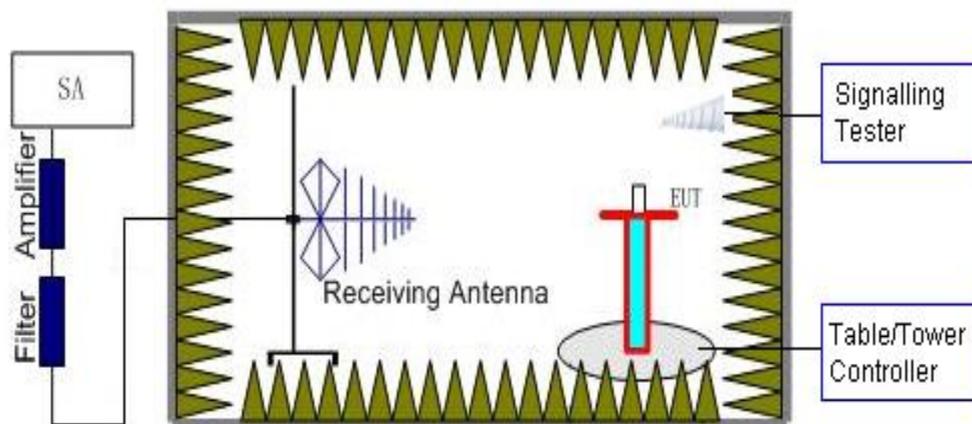
#### 1) Conducted Measurements

1. Connect the EUT to the test system correctly.
2. Set the EUT to the required work mode.
3. Set the EUT to the required channel.
4. Set the spectrum analyzer to start measurement.
5. Record the values.



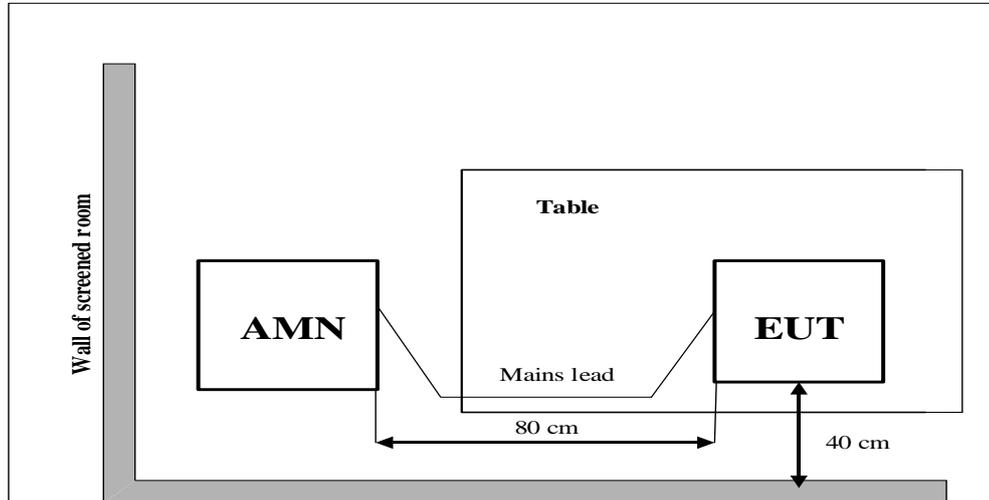
#### 2) Radiated Measurements

**Test setup:** EUT was placed on a 1.5 meter high non-conductive table at a 3 meter test distance from the receive antenna. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the receiving antenna polarization.



### 3) AC Power line Conducted Emission Measurement

For WLAN, the EUT is working under test mode. The EUT is commanded to operate at maximum transmitting power.





### A.0 Antenna requirement

#### Measurement Limit:

Standard	Requirement
FCC CRF Part 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

**Conclusion: The Directional gains of antenna used for transmitting: SISO: 0.88dBi;  
MIMO: 0.00dBi.**

**The RF transmitter uses an integrate antenna without connector.**



## A.1 Maximum Output Power

**Measurement of method: See ANSI C63.10-2013-Clause 11.9.2.3.2**

Method AVGPM-G is a measurement using a gated RF average power meter.

Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

**Measurement Limit:**

Standard	Limit (dBm)
FCC CRF Part 15.247(b)	< 30

**Measurement Results:**

**SISO:**

**Antenna 0:**

Mode	RF output power (dBm)		
	2412MHz (Ch1)	2437MHz (Ch6)	2462MHz (Ch11)
802.11b	16.34	16.47	16.56
802.11g	14.83	15.00	15.05
802.11n-HT20	13.79	13.89	13.94

**Antenna 1:**

Mode	RF output power (dBm)		
	2412MHz (Ch1)	2437MHz (Ch6)	2462MHz (Ch11)
802.11b	16.93	17.01	17.08
802.11g	15.41	15.35	15.49
802.11n-HT20	14.26	14.15	14.30

**MIMO:**

Mode	RF output power (dBm)								
	2412MHz (Ch1)			2437MHz (Ch6)			2462MHz (Ch11)		
	Ant0	Ant1	Sum	Ant0	Ant1	Sum	Ant0	Ant1	Sum
802.11n-HT20	13.69	14.06	16.89	13.84	14.02	16.94	13.86	14.01	16.95

**Note:**

The data rate 1Mbps (11b mode), 6Mbps (11g mode) and MCS0 (11n mode) are selected as the Worst-Case. And the Antenna 1 is selected as the worst condition (SISO). The following cases and test graphs are performed with this condition.

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

**Conclusion: PASS**



## A.2 Peak Power Spectral Density

### Measurement Limit:

Standard	Limit
FCC CRF Part 15.247(e)	< 8 dBm/3 kHz

### Measurement Results:

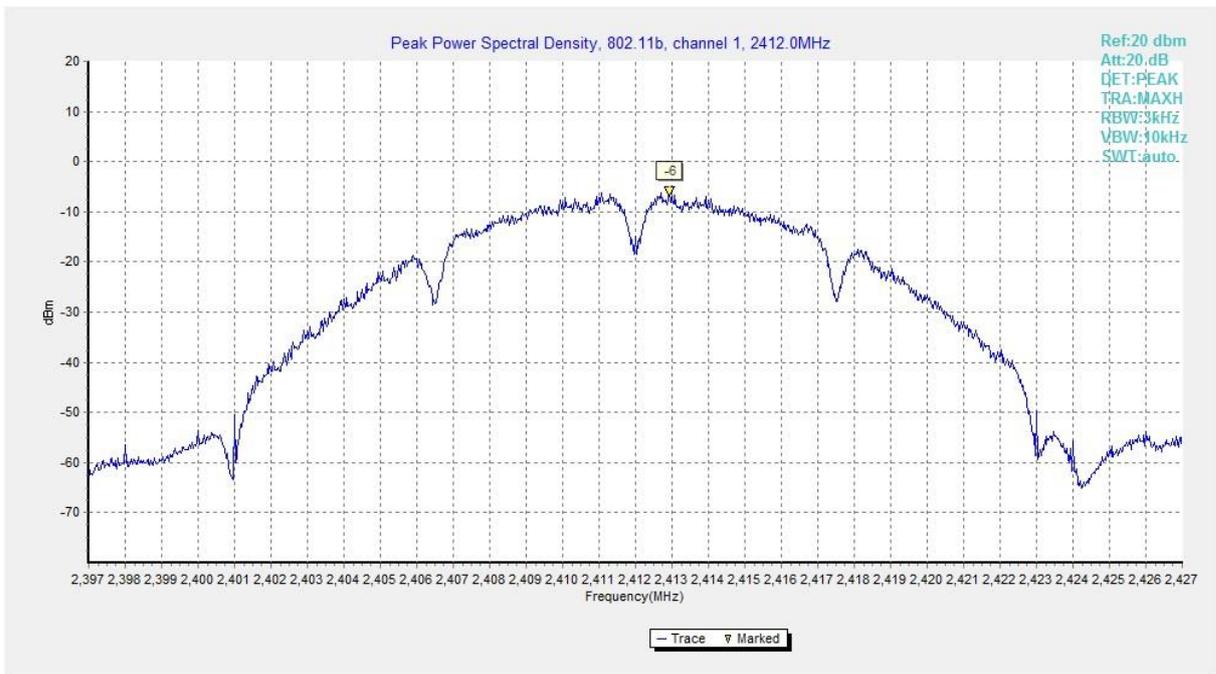
Mode	Channel	Frequency (MHz)	Test Results(dBm/3 kHz)		Conclusion
802.11b	CH 1	2412	Fig.1	-6.00	P
	CH 6	2437	Fig.2	-6.27	P
	CH 11	2462	Fig.3	-5.77	P
802.11g	CH 1	2412	Fig.4	-11.45	P
	CH 6	2437	Fig.5	-12.15	P
	CH 11	2462	Fig.6	-11.61	P
802.11n- HT20	CH 1	2412	Fig.7	-12.60	P
	CH 6	2437	Fig.8	-12.76	P
	CH 11	2462	Fig.9	-13.24	P

### MIMO:

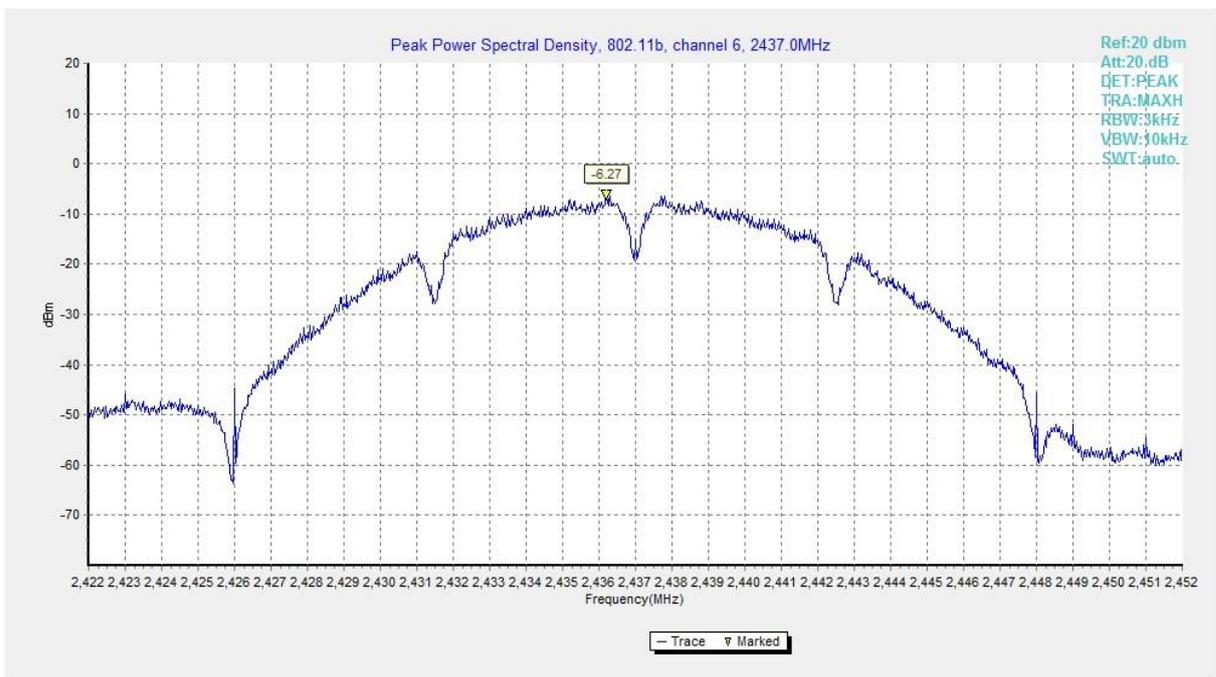
Mode	Channel	Frequency (MHz)	Test Results(dBm/3 kHz)			Conclusion
			Ant 0	Ant 1	Sum	
802.11n HT20	CH 1	2412	-11.90	-11.14	-8.49	P
	CH 6	2437	-11.85	-11.23	-8.52	P
	CH 11	2462	-11.98	-11.17	-8.55	P

See below for test graphs.

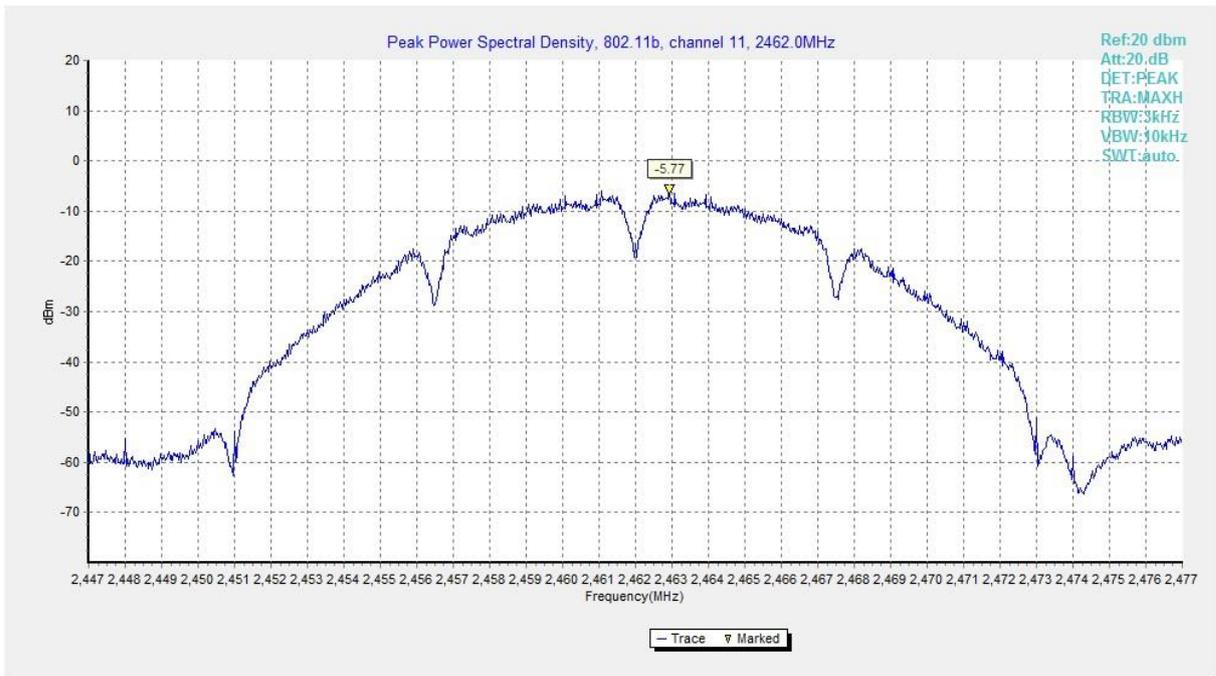
Conclusion: PASS



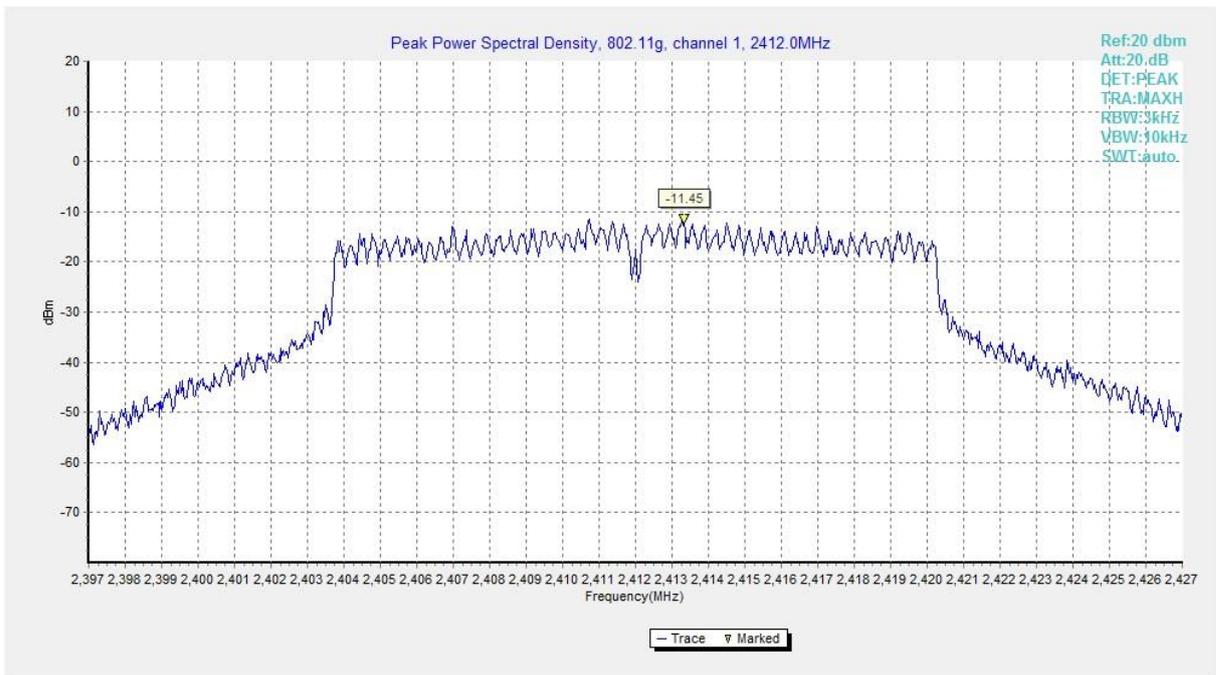
**Fig.1 Power Spectral Density (802.11b, CH 1)**



**Fig.2 Power Spectral Density (802.11b, CH 6)**



**Fig.3 Power Spectral Density (802.11b, CH 11)**



**Fig.4 Power Spectral Density (802.11g, CH 1)**

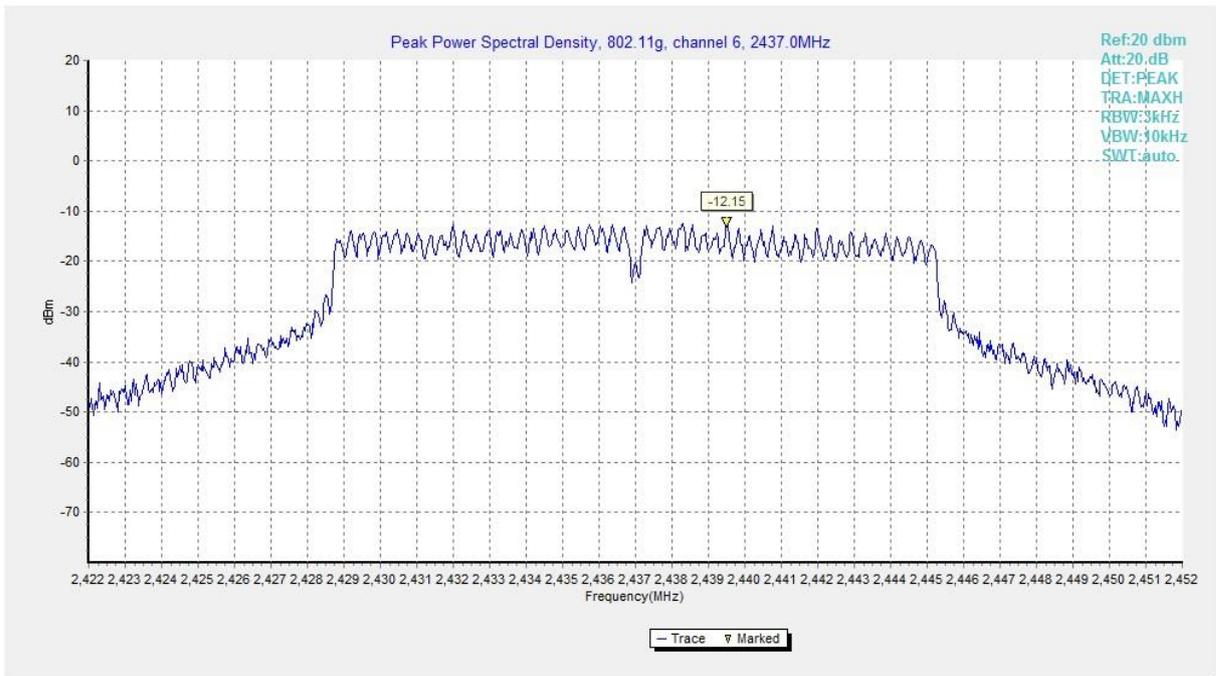


Fig.5 Power Spectral Density (802.11g, CH 6)

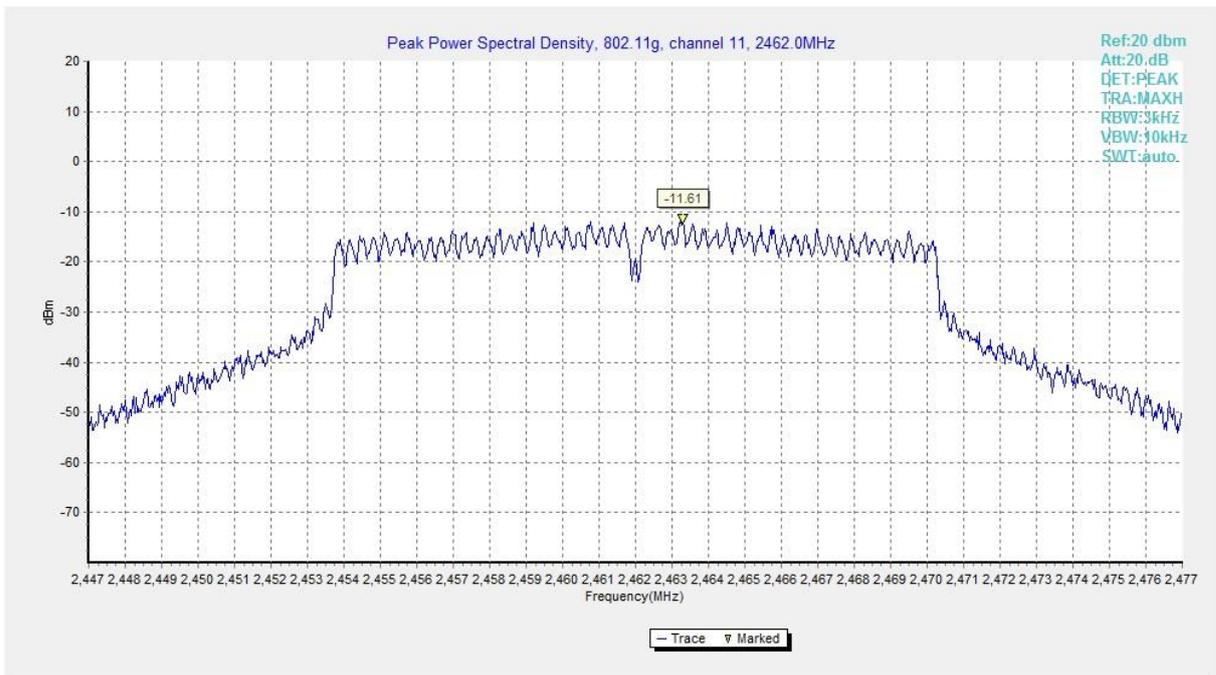


Fig.6 Power Spectral Density (802.11g, CH 11)

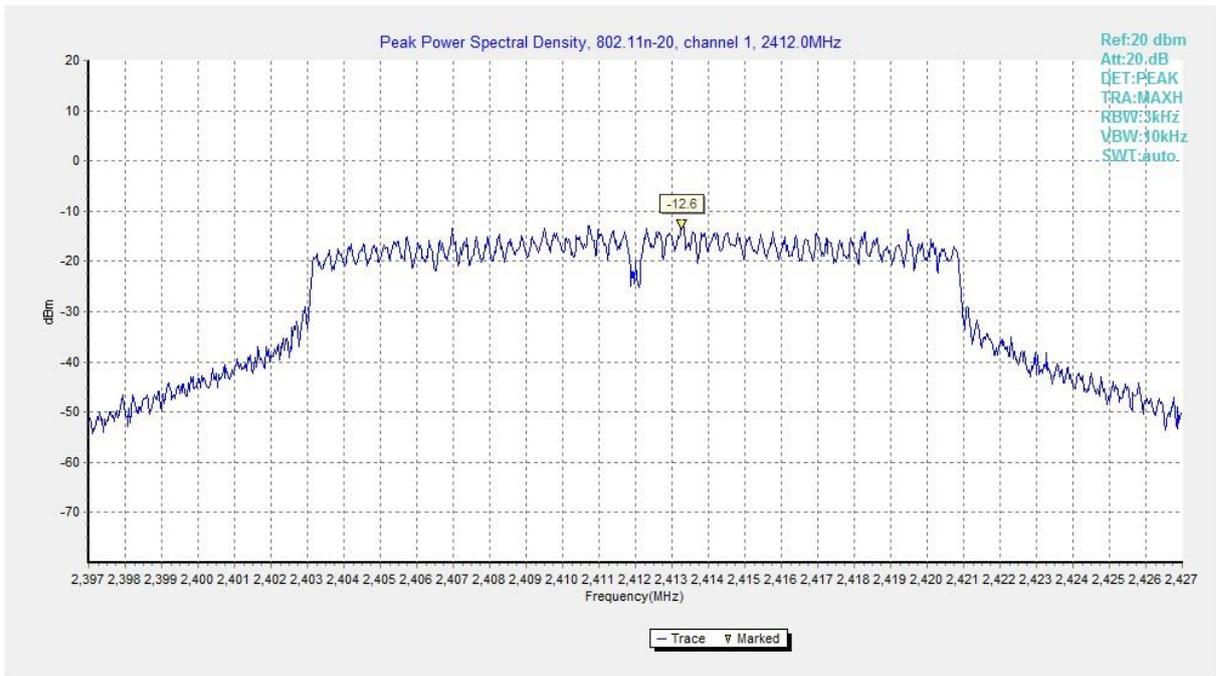


Fig.7 Power Spectral Density (802.11n-HT20, CH 1)

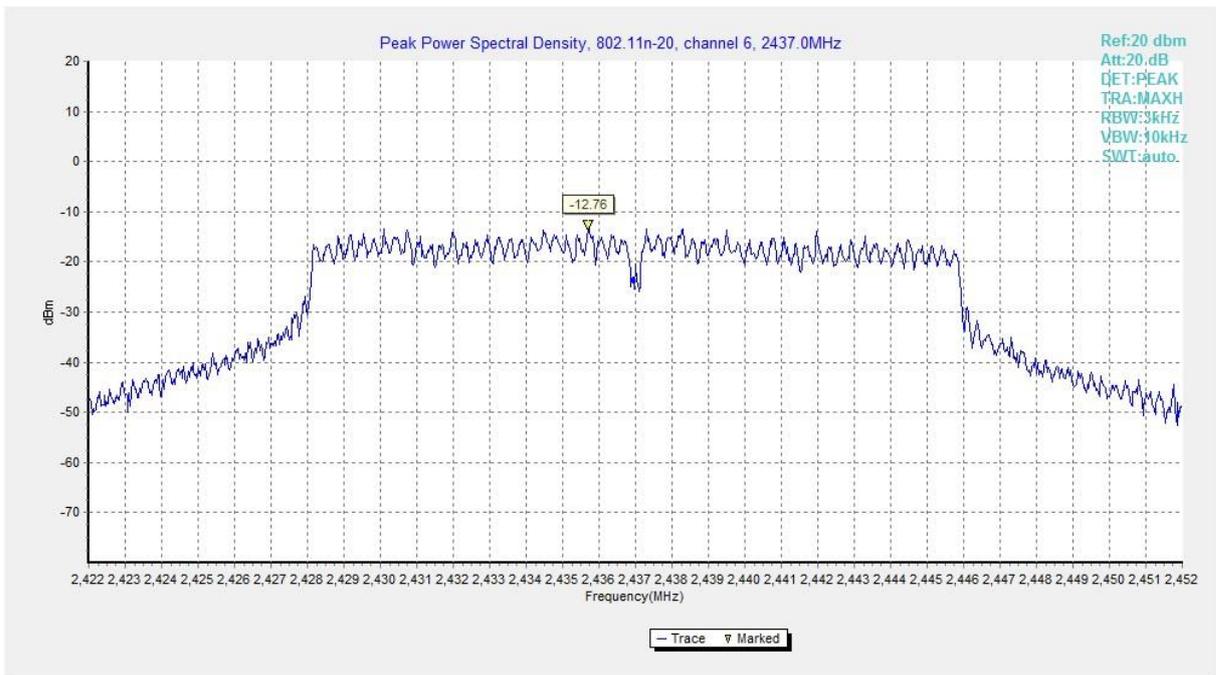
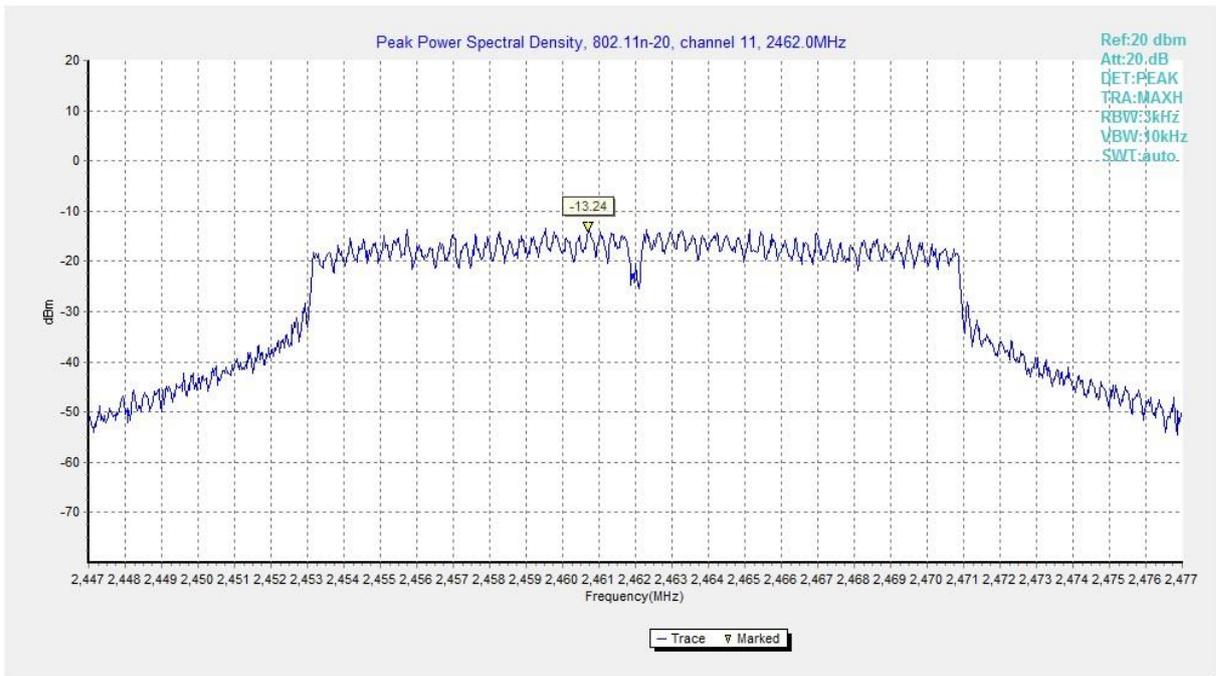


Fig.8 Power Spectral Density (802.11n-HT20, CH 6)



**Fig.9 Power Spectral Density (802.11n-HT20, CH 11)**



### A.3 6dB Bandwidth

**Measurement Limit:**

Standard	Limit (kHz)
FCC 47 CFR Part 15.247 (a)	≥ 500

**Measurement Result:**

Mode	Channel	Frequency (MHz)	Test Results ( kHz)		Conclusion
802.11b	CH 1	2412	Fig.10	8050	<b>P</b>
	CH 6	2437	Fig.11	8050	<b>P</b>
	CH 11	2462	Fig.12	8050	<b>P</b>
802.11g	CH 1	2412	Fig.13	14450	<b>P</b>
	CH 6	2437	Fig.14	15450	<b>P</b>
	CH 11	2462	Fig.15	15150	<b>P</b>
802.11n- HT20	CH 1	2412	Fig.16	15100	<b>P</b>
	CH 6	2437	Fig.17	16000	<b>P</b>
	CH 11	2462	Fig.18	15150	<b>P</b>

See below for test graphs.

**Conclusion: PASS**

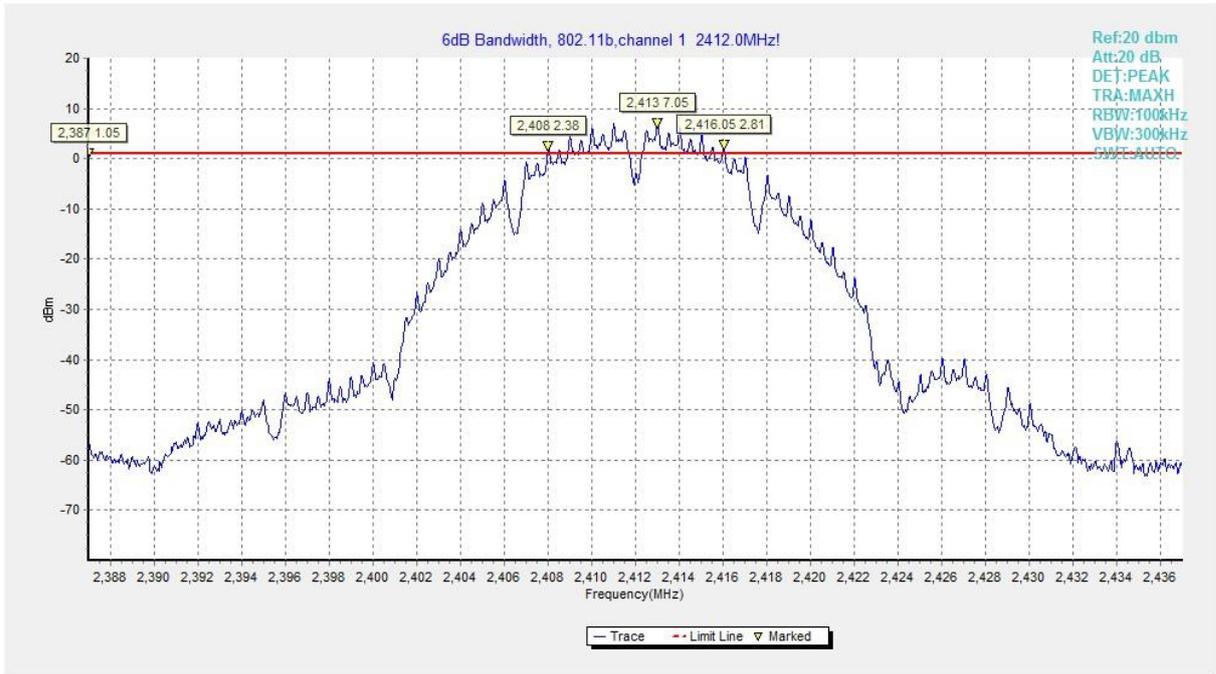


Fig.10 6dB Bandwidth (802.11b, CH 1)

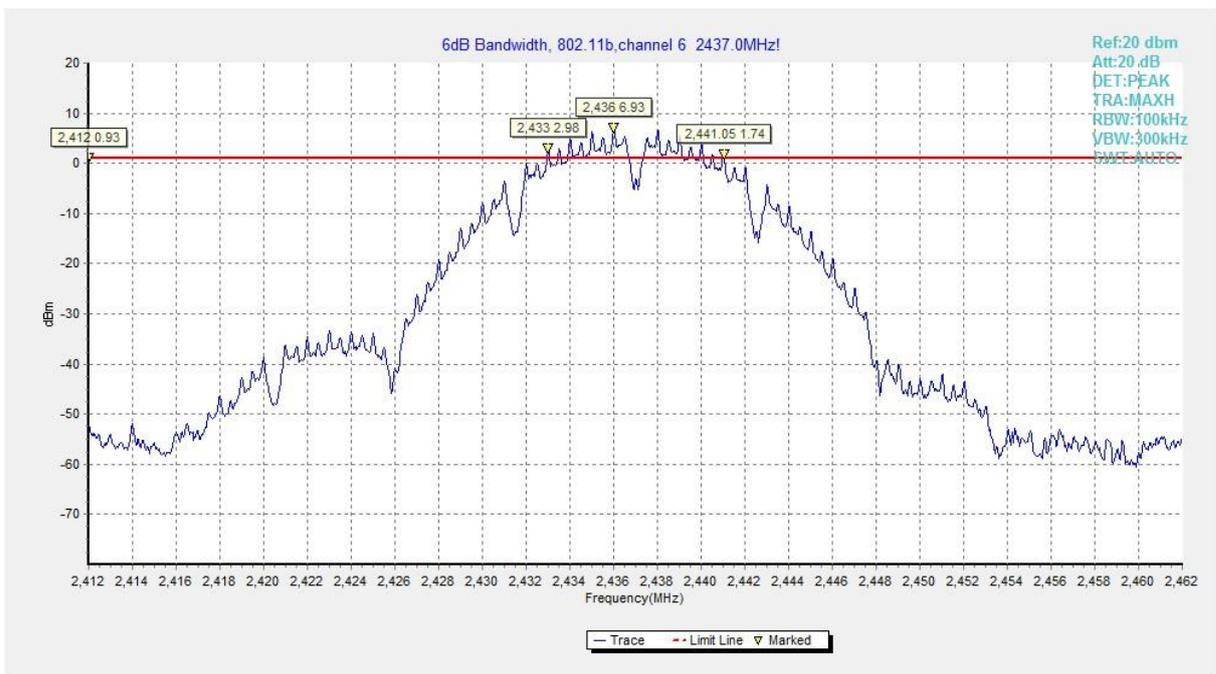
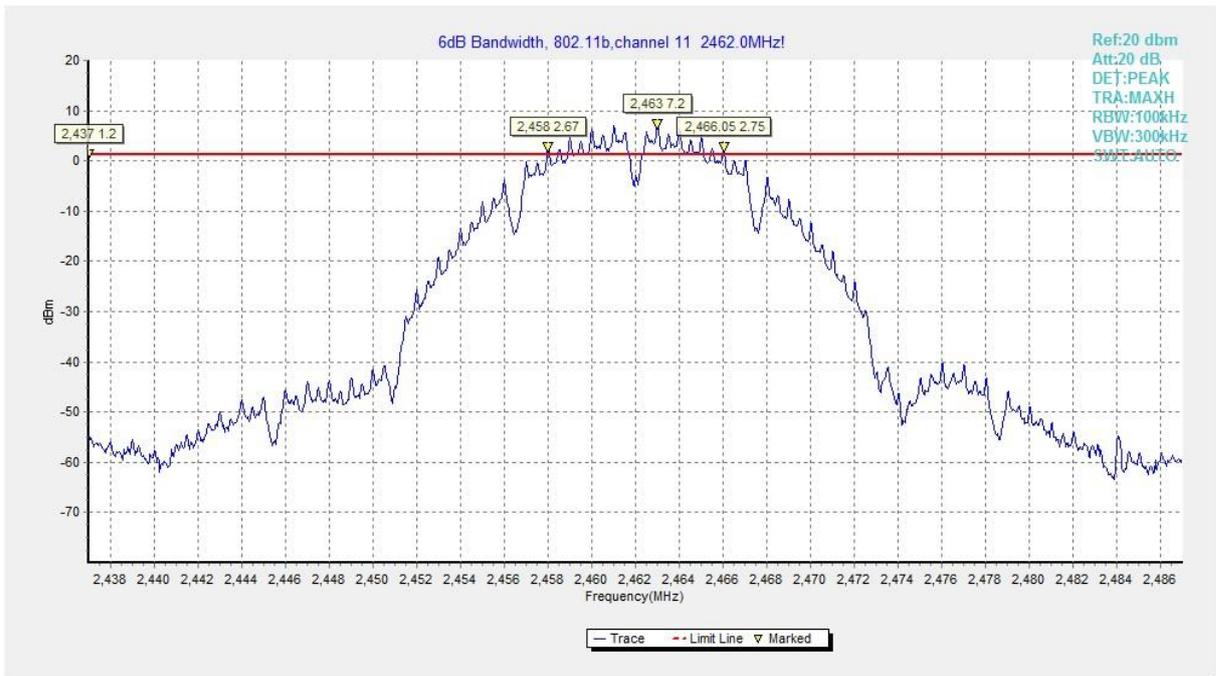
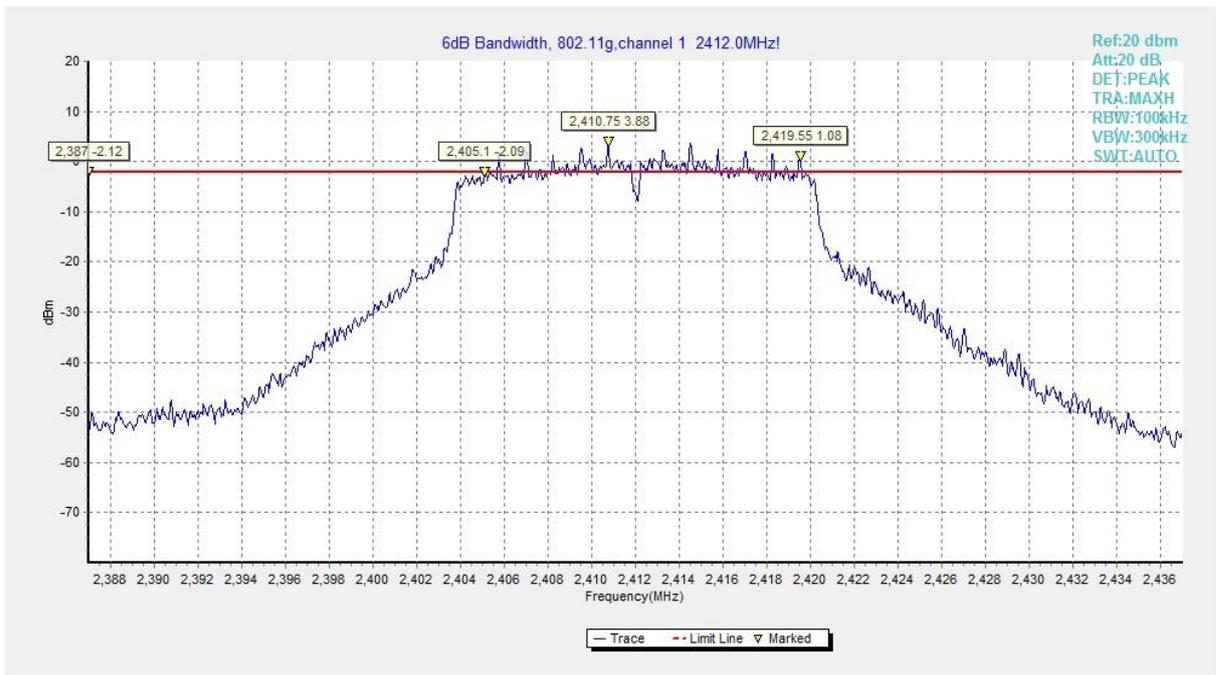


Fig.11 6dB Bandwidth (802.11b, CH 6)



**Fig.12 6dB Bandwidth (802.11b, CH 11)**



**Fig.13 6dB Bandwidth (802.11g, CH 1)**

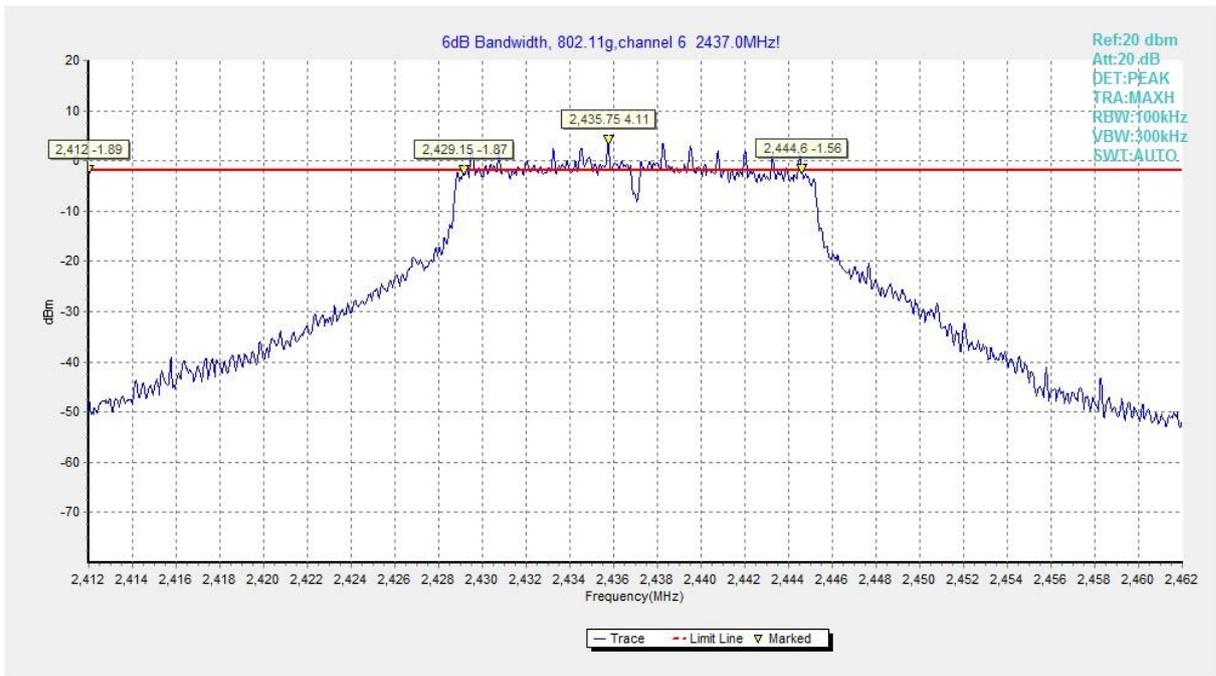


Fig.14 6dB Bandwidth (802.11g, CH 6)

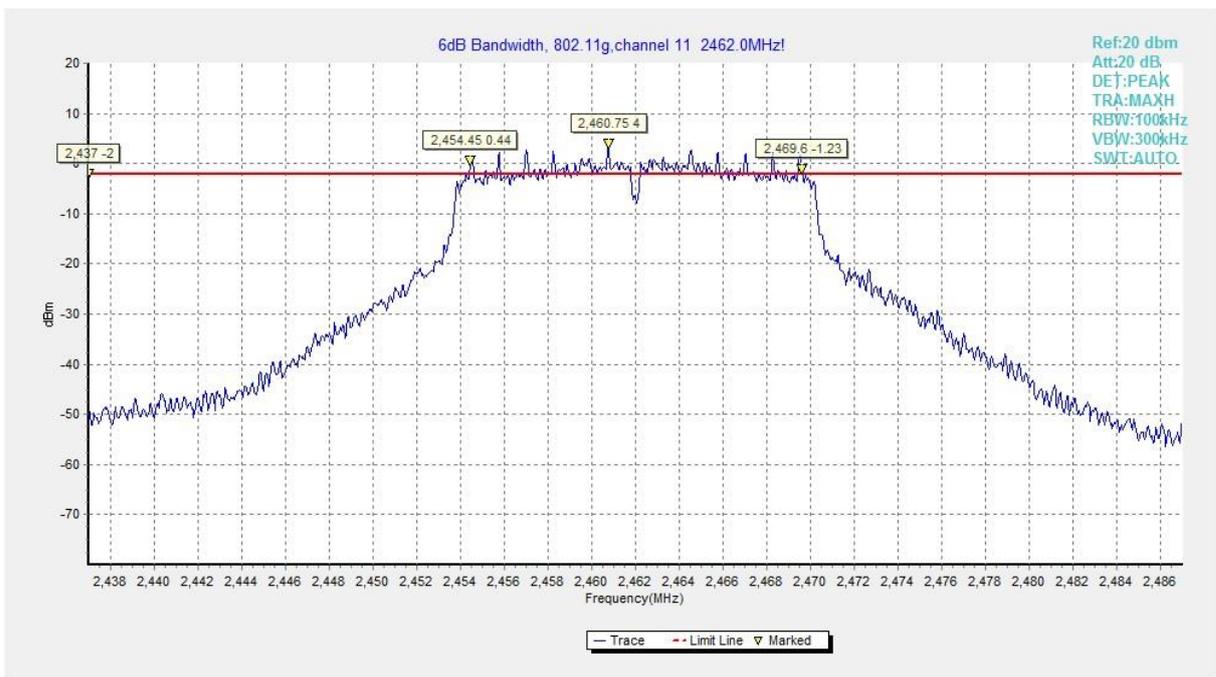


Fig.15 6dB Bandwidth (802.11g, CH 11)

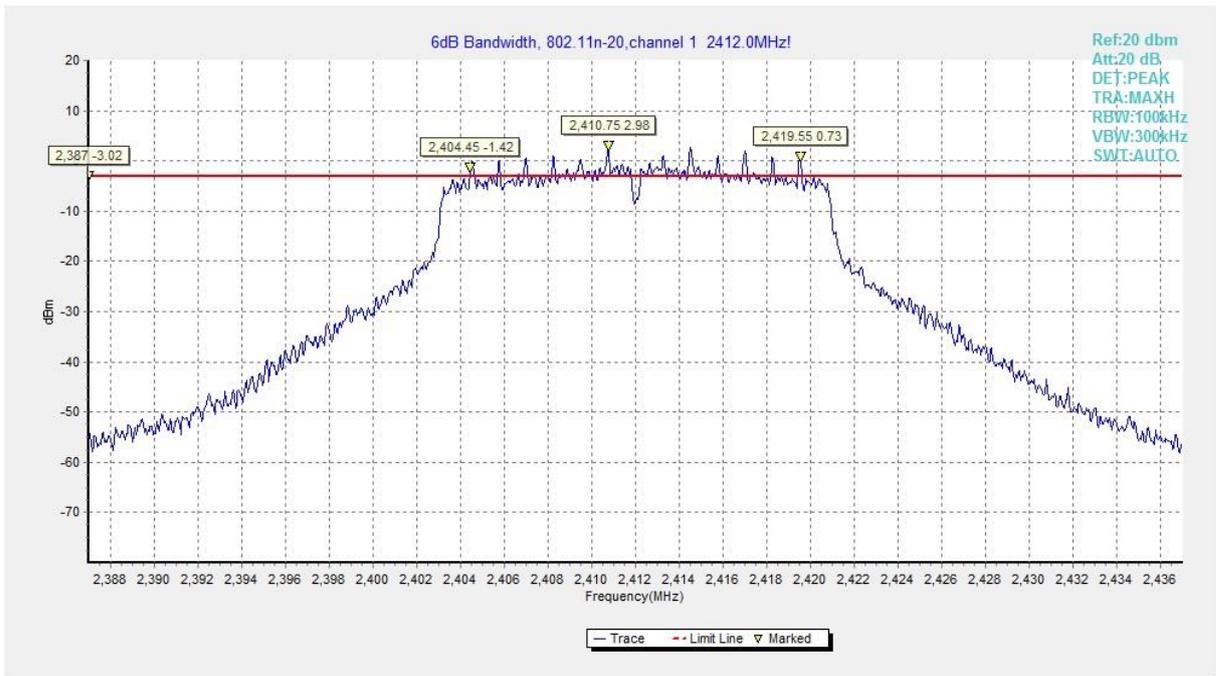


Fig.16 6dB Bandwidth (802.11n-HT20, CH 1)

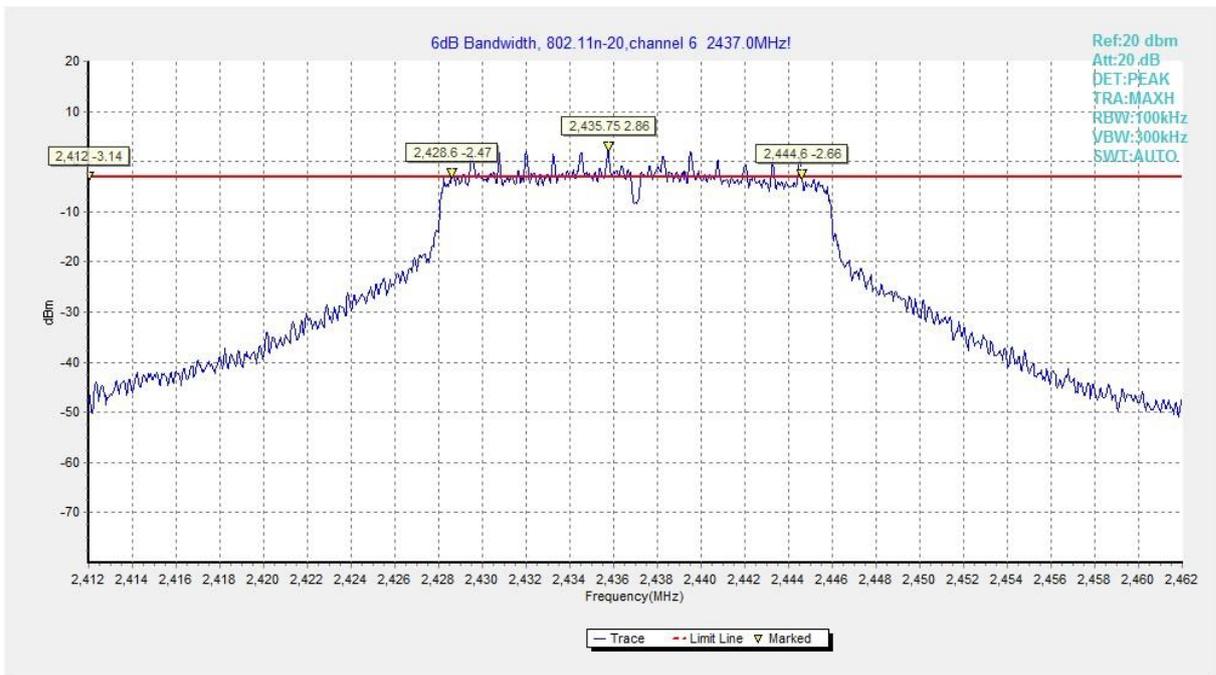


Fig.17 6dB Bandwidth (802.11n-HT20, CH 6)

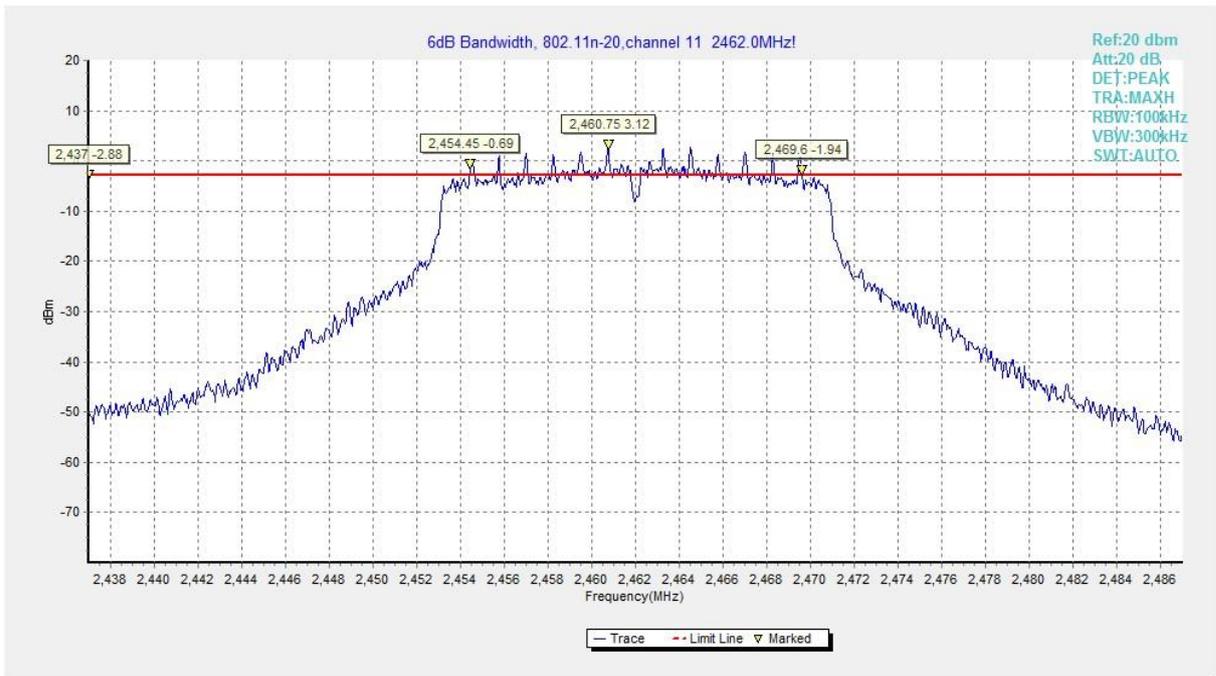


Fig.18 6dB Bandwidth (802.11n-HT20, CH 11)



### A.4 Band Edges Compliance

**Measurement Limit:**

Standard	Limit (dB)
FCC 47 CFR Part 15.247 (d)	> 20

**Measurement Result:**

Mode	Channel	Frequency (MHz)	Test Results (dBc)		Conclusion
			Fig.	Value	
802.11b	CH1	2412	Fig.19	48.96	<b>P</b>
	CH11	2462	Fig.20	66.02	<b>P</b>
802.11g	CH1	2412	Fig.21	35.13	<b>P</b>
	CH11	2462	Fig.22	53.03	<b>P</b>
802.11n- HT20	CH1	2412	Fig.23	32.21	<b>P</b>
	CH11	2462	Fig.24	52.36	<b>P</b>

See below for test graphs.

**Conclusion: PASS**

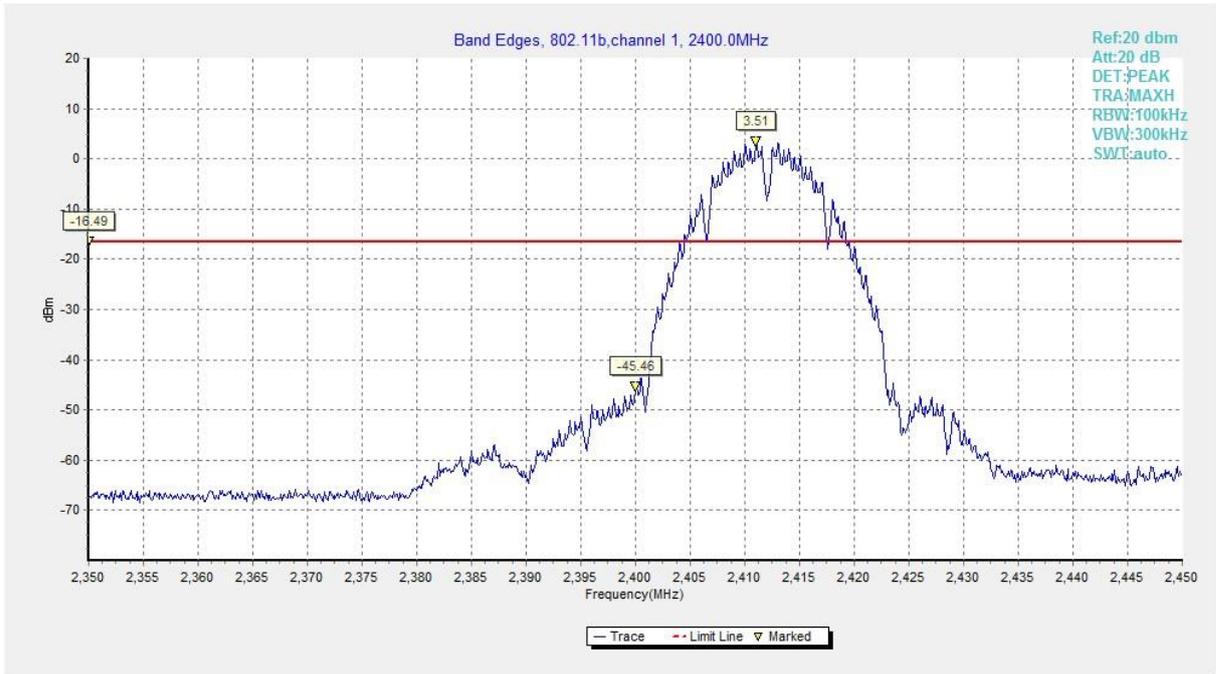


Fig.19 Band Edges (802.11b, CH 1)

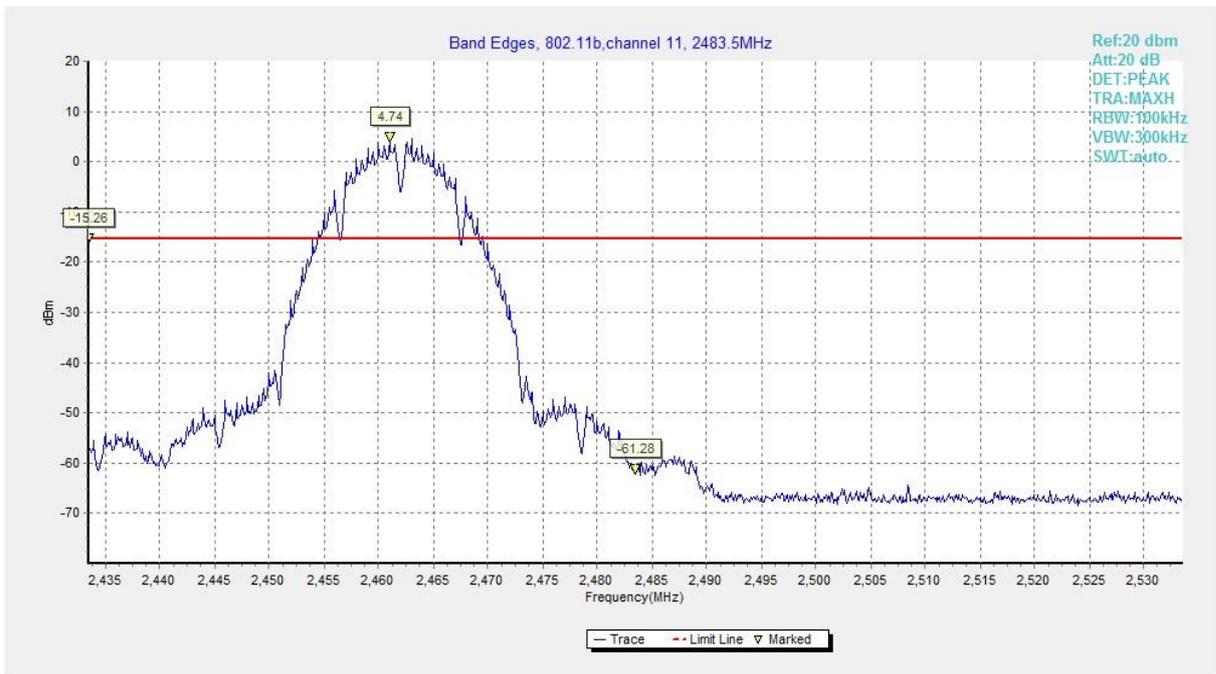


Fig.20 Band Edges (802.11b, CH 11)

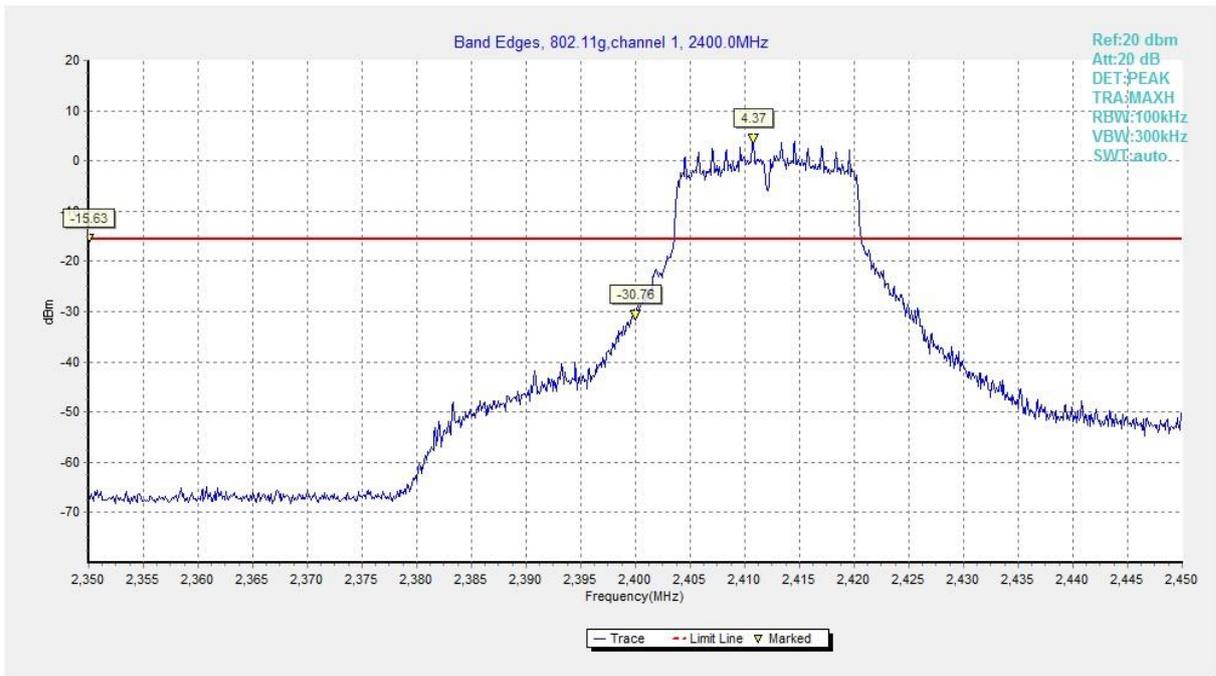


Fig.21 Band Edges (802.11g, CH 1)

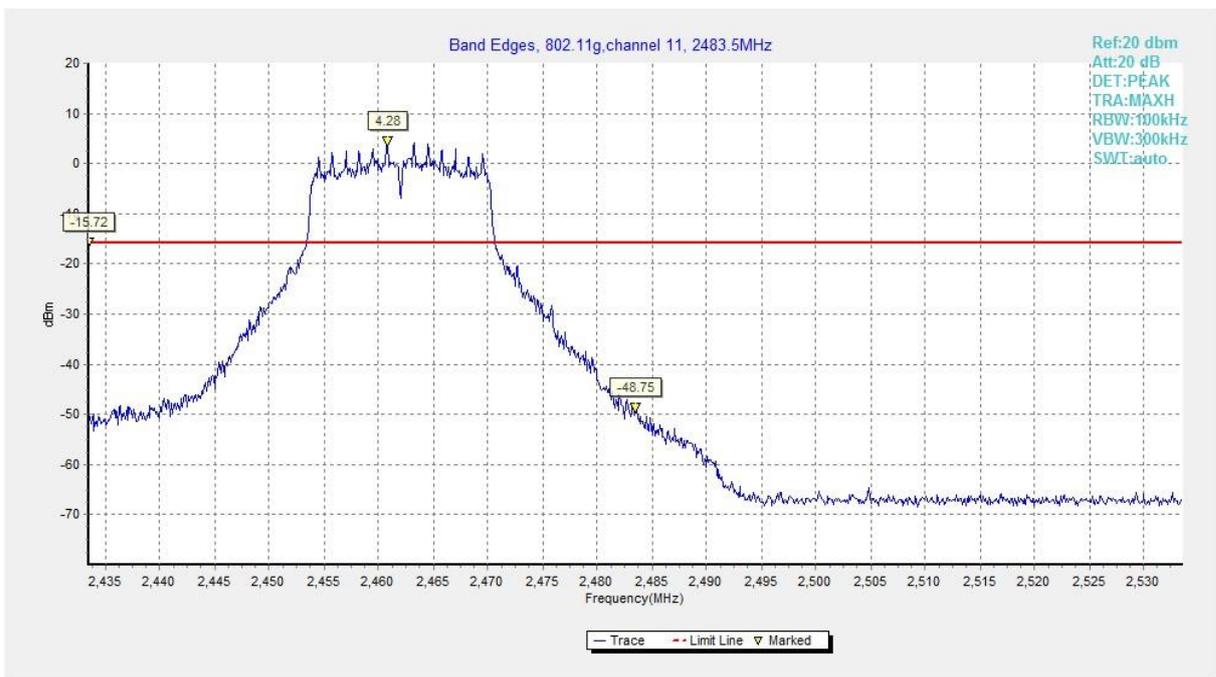
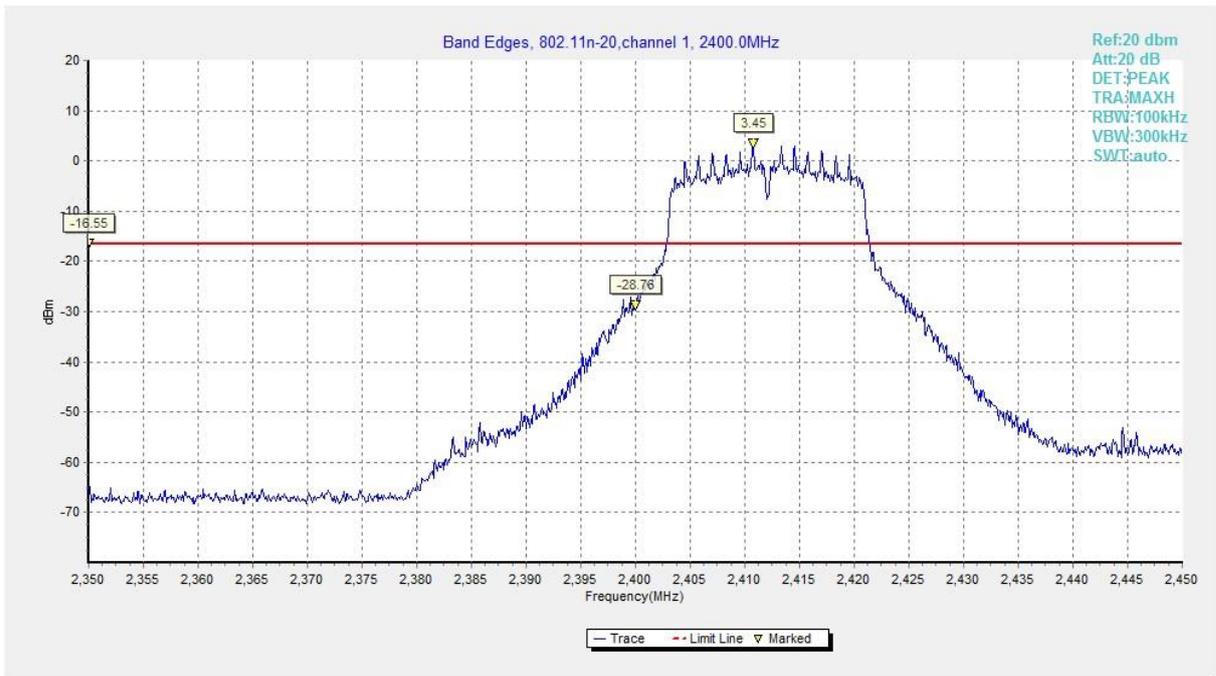
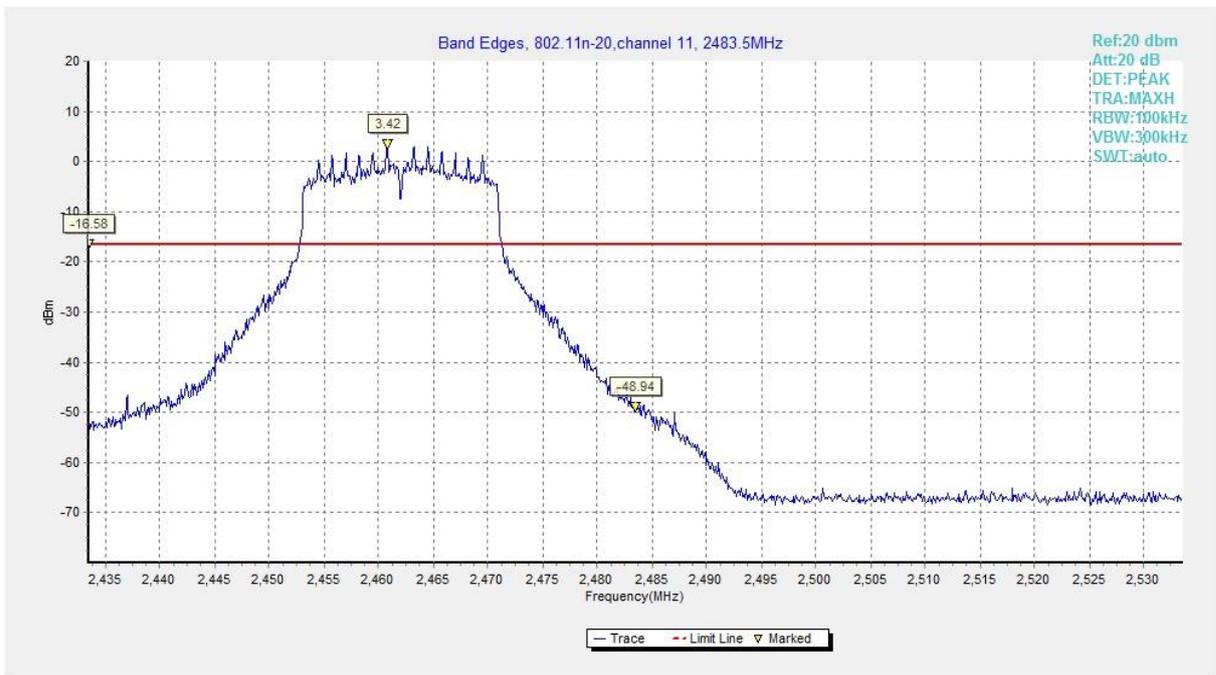


Fig.22 Band Edges (802.11g, CH 11)



**Fig.23 Band Edges (802.11n-HT20, CH 1)**



**Fig.24 Band Edges (802.11n-HT20, CH 11)**



### A.5 Conducted Emission

**Measurement Limit:**

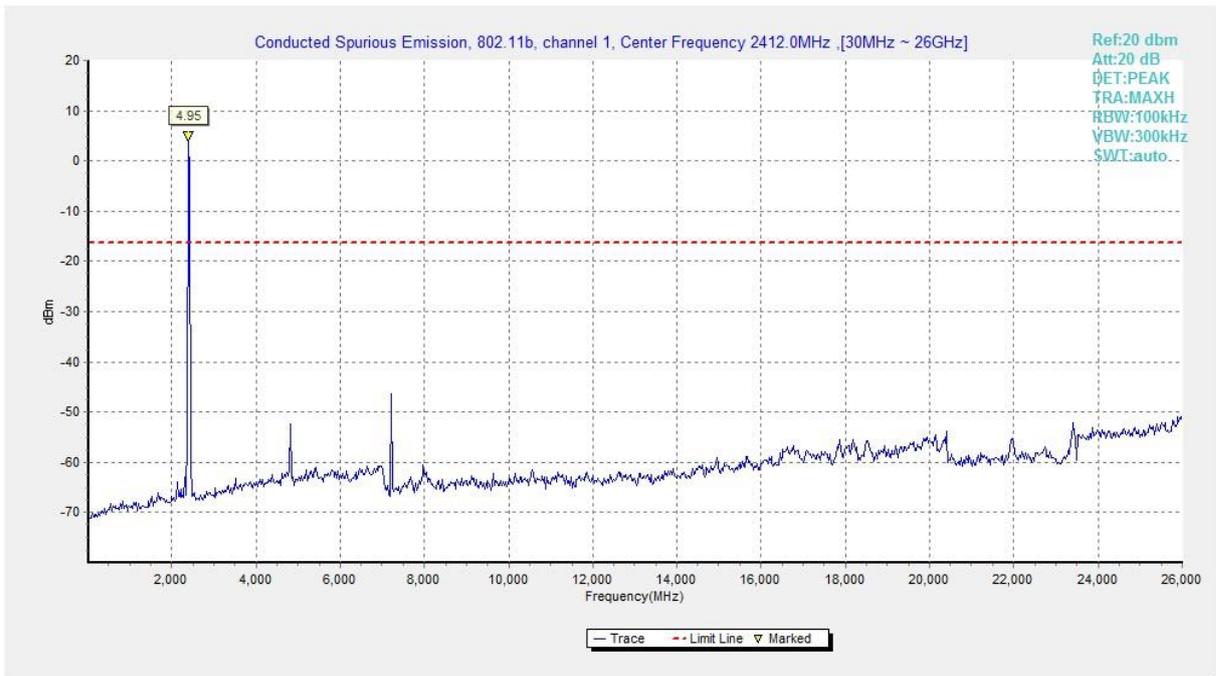
Standard	Limit
FCC 47 CFR Part 15.247 (d)	20dB below peak output power in 100 kHz bandwidth

**Measurement Results:**

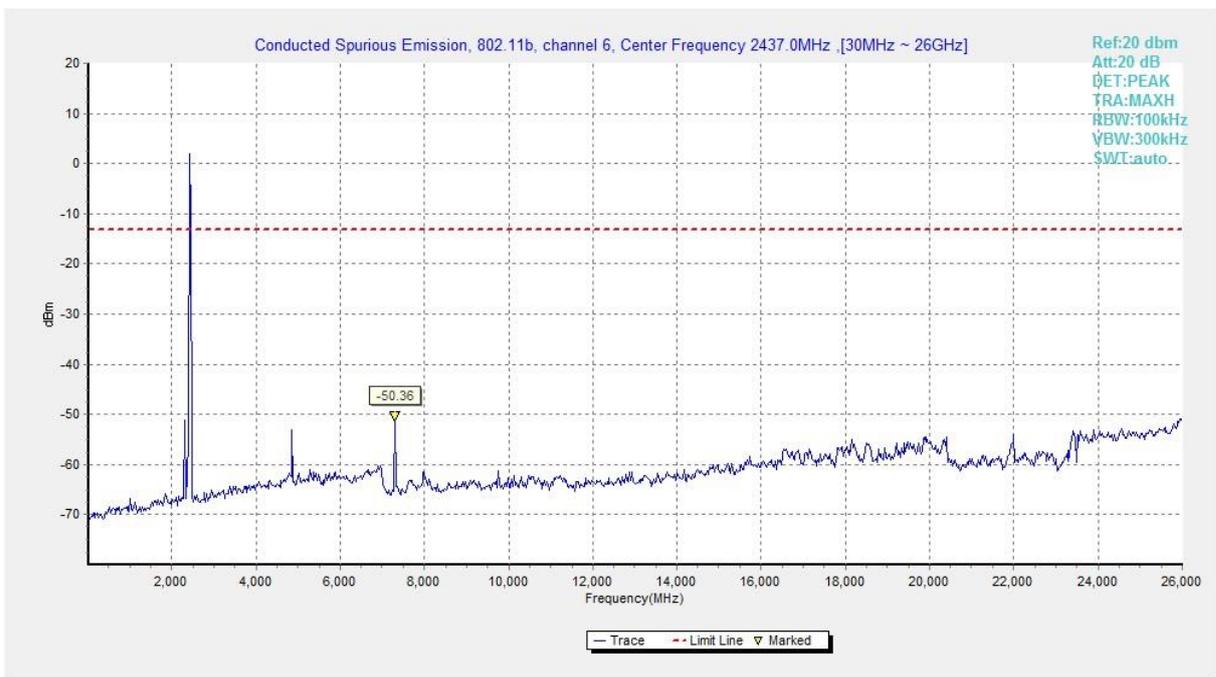
Mode	Channel	Frequency (MHz)	Frequency Range	Test Results	Conclusion
802.11b	CH 1	2412	30MHz-26GHz	Fig.25	<b>P</b>
	CH 6	2437	30MHz-26GHz	Fig.26	<b>P</b>
	CH 11	2462	30MHz-26GHz	Fig.27	<b>P</b>
802.11g	CH 1	2412	30MHz-26GHz	Fig.28	<b>P</b>
	CH 6	2437	30MHz-26GHz	Fig.29	<b>P</b>
	CH 11	2462	30MHz-26GHz	Fig.30	<b>P</b>
802.11n- HT20	CH 1	2412	30MHz-26GHz	Fig.31	<b>P</b>
	CH 6	2437	30MHz-26GHz	Fig.32	<b>P</b>
	CH 11	2462	30MHz-26GHz	Fig.33	<b>P</b>

See below for test graphs.

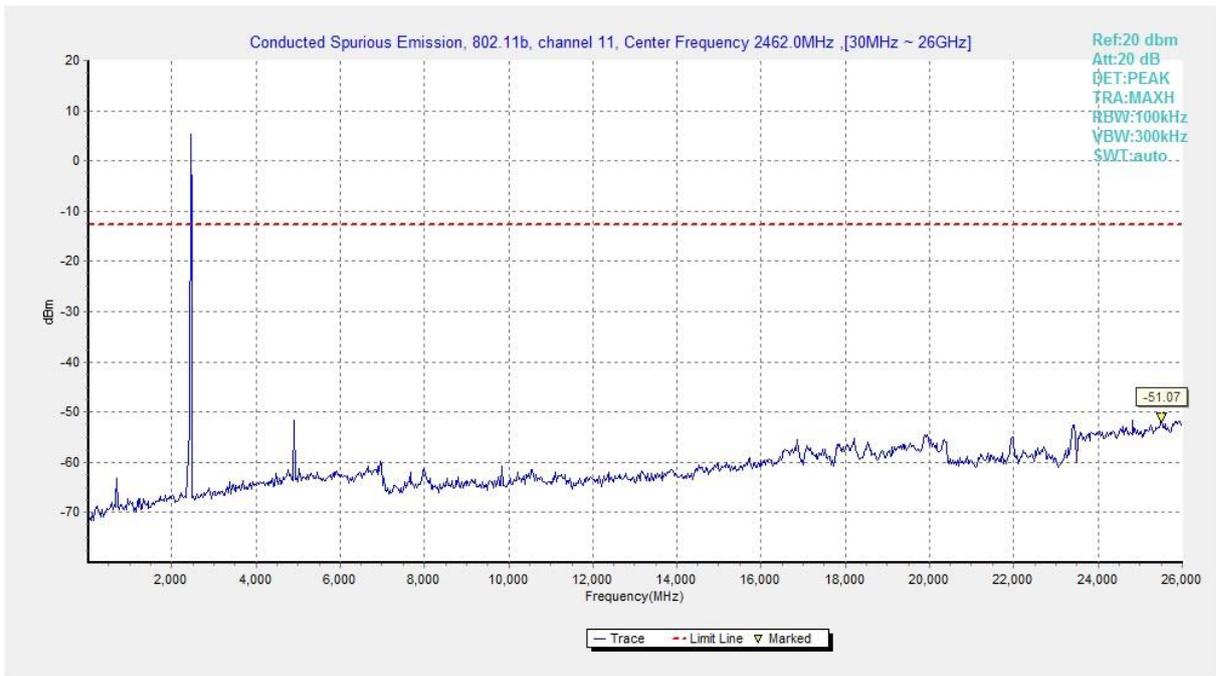
**Conclusion: PASS**



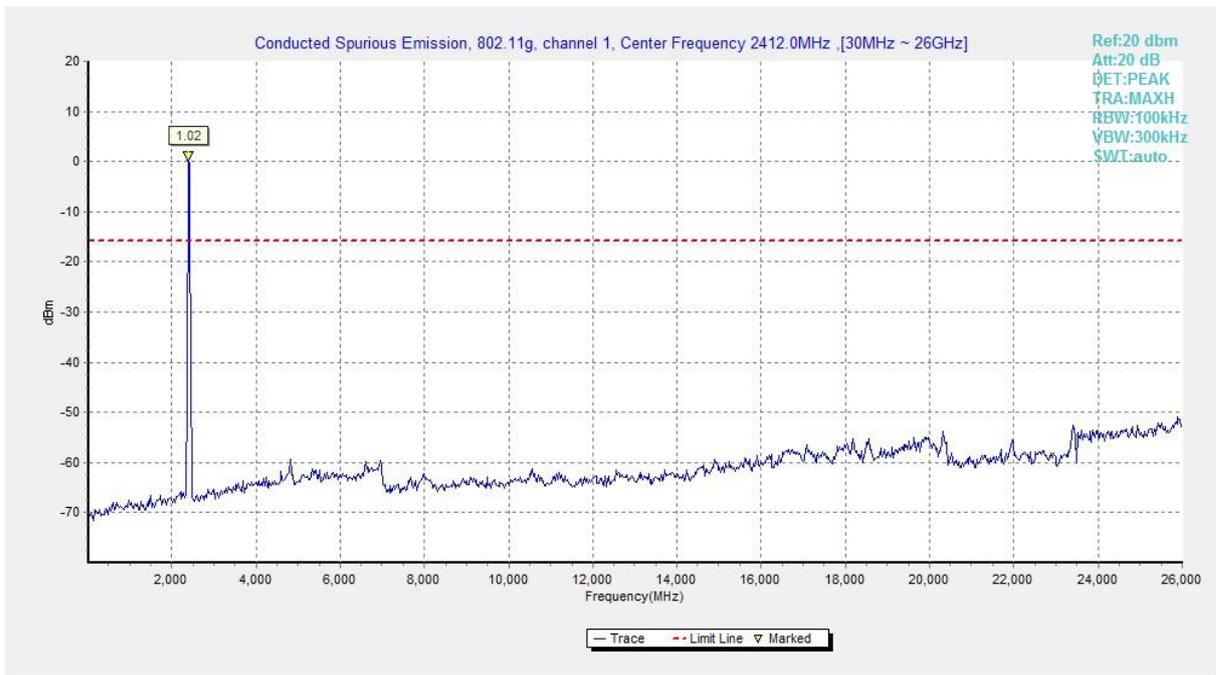
**Fig.25 Conducted Spurious Emission (802.11b, CH1)**



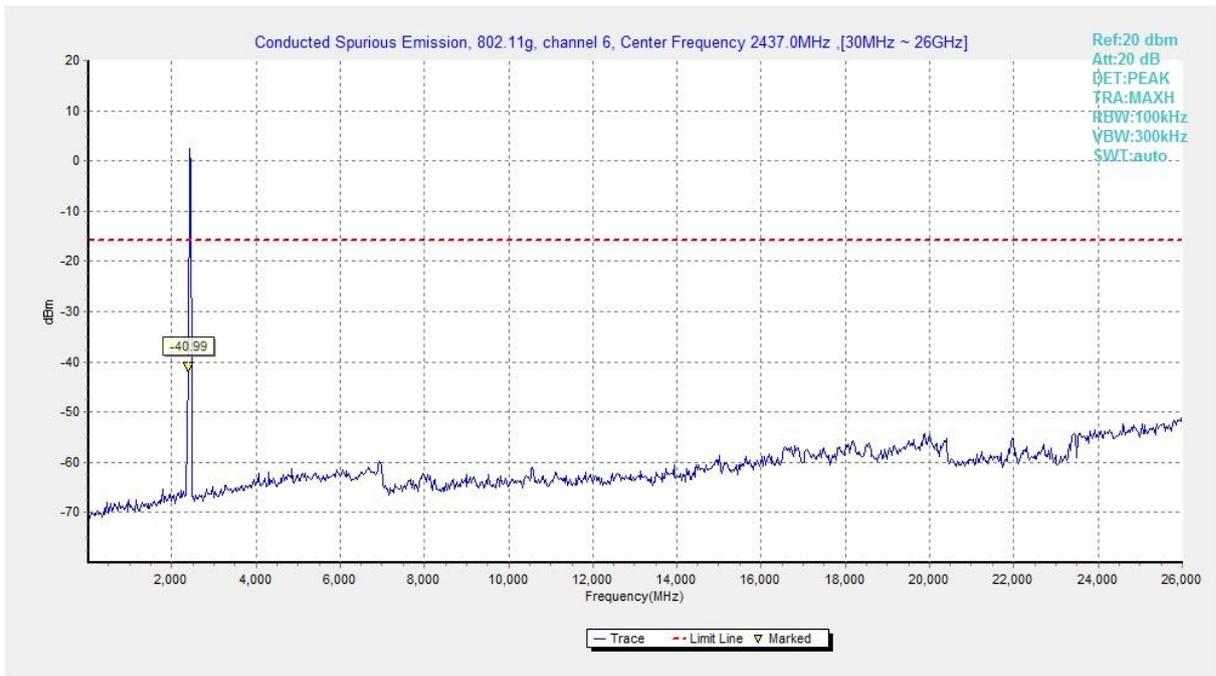
**Fig.26 Conducted Spurious Emission (802.11b, CH6)**



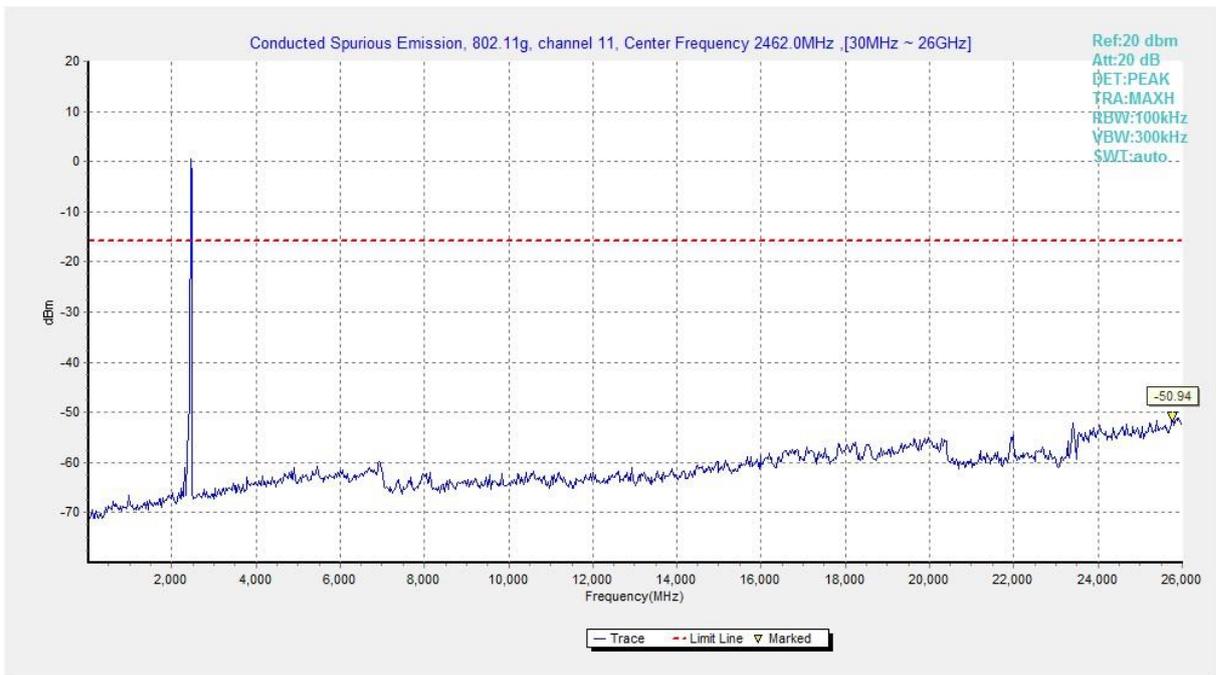
**Fig.27 Conducted Spurious Emission (802.11b, CH11)**



**Fig.28 Conducted Spurious Emission (802.11g, CH1)**



**Fig.29 Conducted Spurious Emission (802.11g, CH6)**



**Fig.30 Conducted Spurious Emission (802.11g, CH11)**

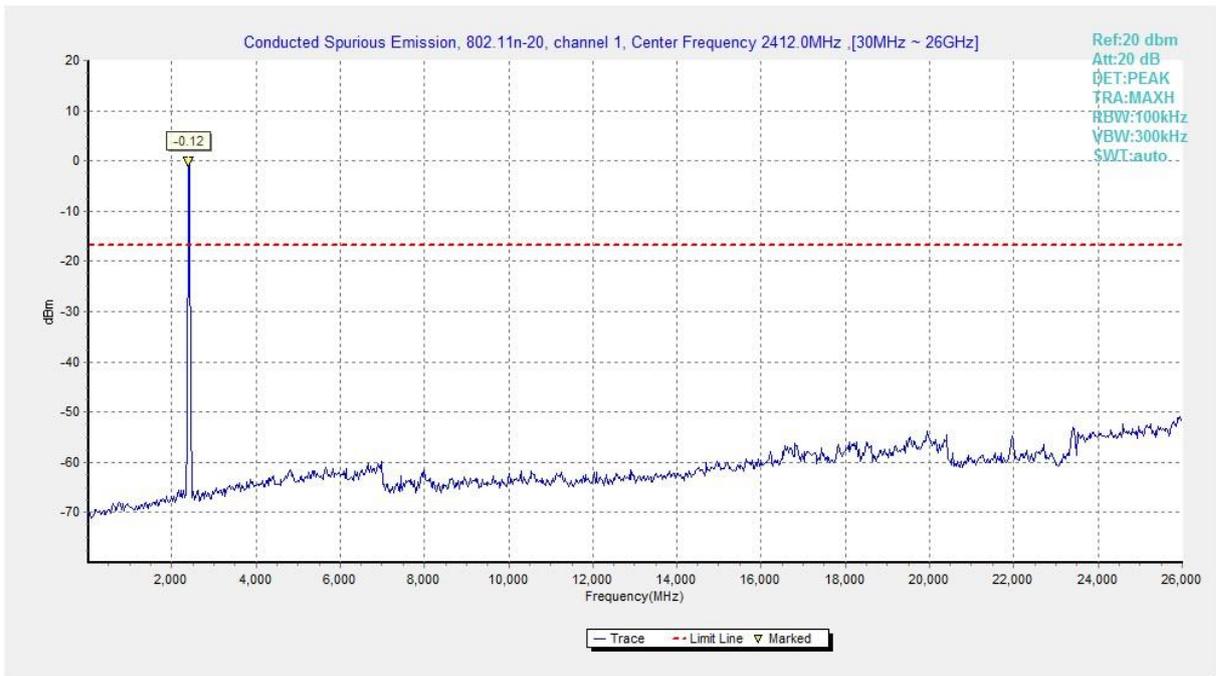


Fig.31 Conducted Spurious Emission (802.11n-HT20, CH1)

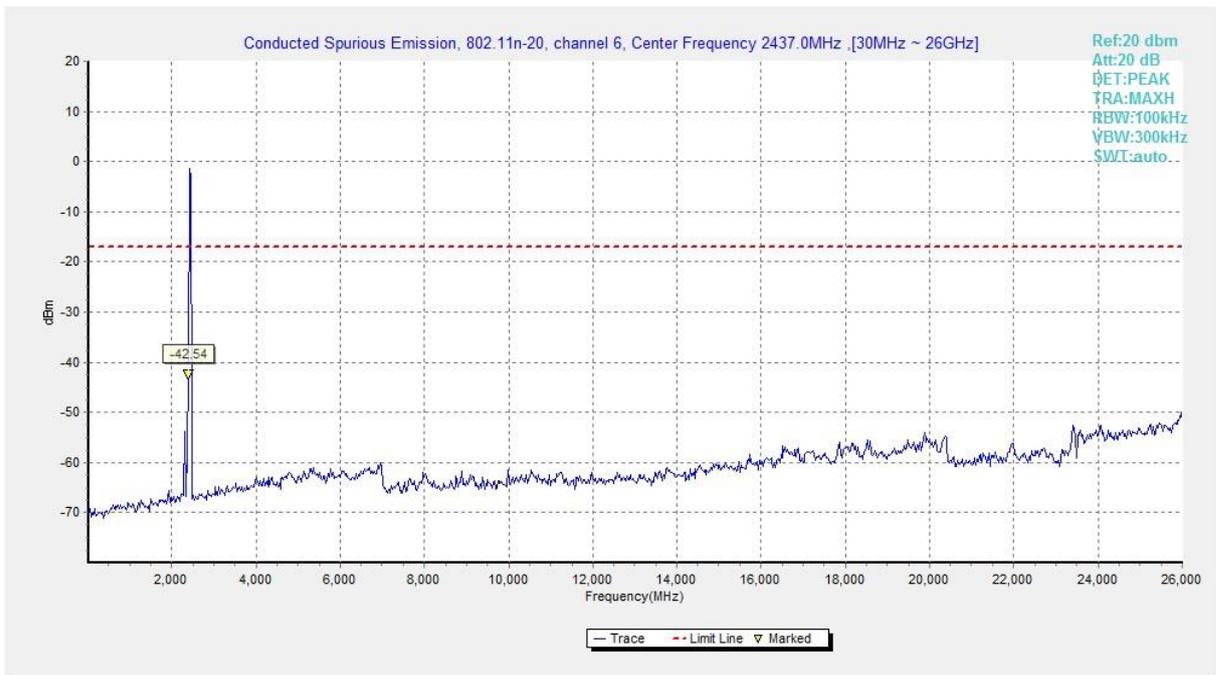


Fig.32 Conducted Spurious Emission (802.11n-HT20, CH6)

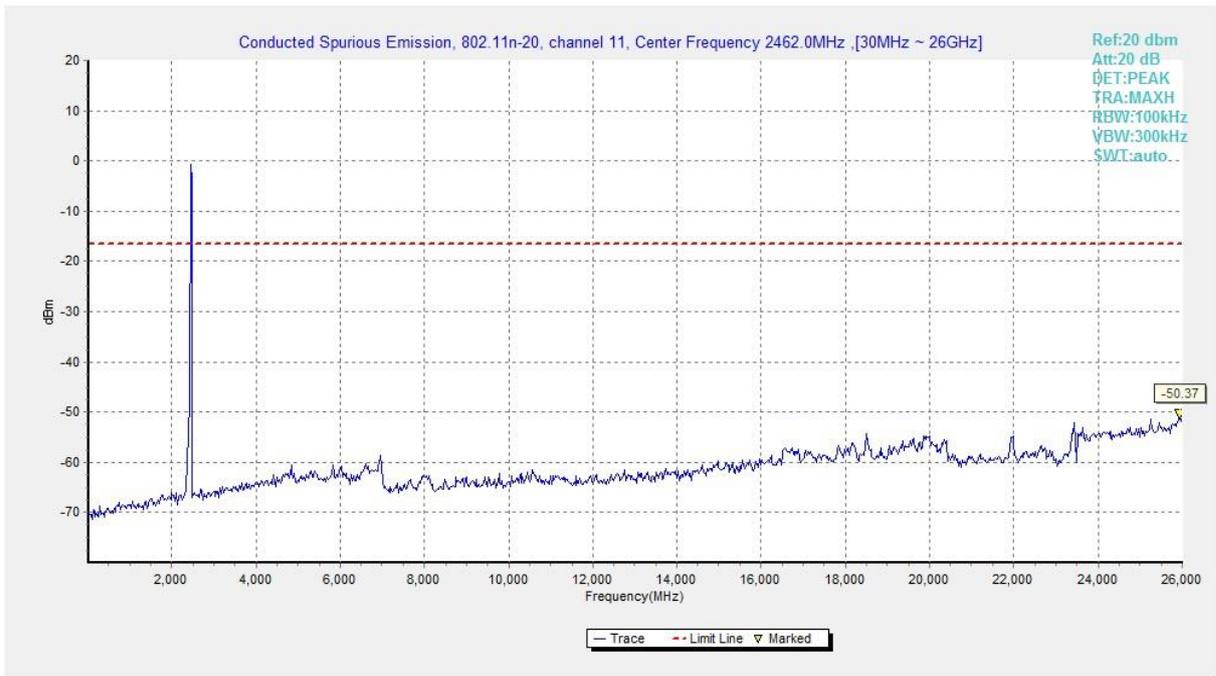


Fig.33 Conducted Spurious Emission (802.11n-HT20, CH11)

## A.6 Radiated Emission

### Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209	20dB below peak output power

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

### Limit in restricted band:

Frequency of emission (MHz)	Field strength( $\mu\text{V}/\text{m}$ )	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

### Test Condition:

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	120kHz/300kHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

### Note:

According to the performance evaluation, the radiated emission margin of EUT is over 20dB in the band below 30MHz. Therefore, the measurement starts from 30MHz to tenth harmonic. The measurement results include the horizontal polarization and vertical polarization measurements.

**Measurement Results:**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11b	CH 1	1 GHz ~18 GHz	Fig.34	<b>P</b>
	CH 6	1 GHz ~18 GHz	Fig.35	<b>P</b>
	CH 11	1 GHz ~18 GHz	Fig.36	<b>P</b>
	Restricted Band (CH1)	2.38 GHz ~ 2.45 GHz	Fig.37	<b>P</b>
	Restricted Band (CH11)	2.45 GHz ~ 2.5 GHz	Fig.38	<b>P</b>
802.11g	CH 1	1 GHz ~18 GHz	Fig.39	<b>P</b>
	CH 6	1 GHz ~18 GHz	Fig.40	<b>P</b>
	CH 11	1 GHz ~18 GHz	Fig.41	<b>P</b>
	Restricted Band (CH1)	2.38 GHz ~ 2.45 GHz	Fig.42	<b>P</b>
	Restricted Band (CH11)	2.45 GHz ~ 2.5 GHz	Fig.43	<b>P</b>
802.11n -HT20	CH 1	1 GHz ~18 GHz	Fig.44	<b>P</b>
	CH 6	1 GHz ~18 GHz	Fig.45	<b>P</b>
	CH 11	1 GHz ~18 GHz	Fig.46	<b>P</b>
	Restricted Band (CH1)	2.38 GHz ~ 2.45 GHz	Fig.47	<b>P</b>
	Restricted Band (CH11)	2.45 GHz ~ 2.5 GHz	Fig.48	<b>P</b>
/	All Channels	9 kHz ~30 MHz	Fig.49	<b>P</b>
		30 MHz ~1 GHz	Fig.50	<b>P</b>
		18 GHz ~26.5 GHz	Fig.51	<b>P</b>

**MIMO:**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n HT20	CH 1	1 GHz ~18 GHz	Fig.52	<b>P</b>
	CH 6	1 GHz ~18 GHz	Fig.53	<b>P</b>
	CH 11	1 GHz ~18 GHz	Fig.54	<b>P</b>
	Restricted Band (CH1)	2.38 GHz ~ 2.45 GHz	Fig.55	<b>P</b>
	Restricted Band (CH11)	2.45 GHz ~ 2.5 GHz	Fig.56	<b>P</b>
/	All Channels	9 kHz ~30 MHz	Fig.57	<b>P</b>
		30 MHz ~1 GHz	Fig.58	<b>P</b>
		18 GHz ~26.5 GHz	Fig.59	<b>P</b>



**Worst-Case Result:**

**SISO:**

**802.11b CH11 (1-18GHz)**

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
4924.000000	49.50	74.00	24.50	H	13.8
6203.500000	52.78	74.00	21.22	V	18.8
13583.000000	47.13	74.00	26.87	V	12.3
14522.312500	48.98	74.00	25.02	H	13.0
15743.812500	48.51	74.00	25.49	V	14.4
17502.125000	49.18	74.00	24.82	V	17.0

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
4924.000000	39.91	54.00	14.09	V	13.8
6236.500000	40.86	54.00	13.14	V	18.6
13563.750000	37.00	54.00	17.00	V	12.3
14489.937500	37.20	54.00	16.80	V	13.0
15774.437500	38.37	54.00	15.63	H	14.5
17382.250000	39.53	54.00	14.47	V	17.0

**802.11g CH11 (1GHz-18GHz)**

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
4467.000000	47.07	74.00	26.93	V	12.7
5487.000000	48.85	74.00	25.15	H	15.2
6236.500000	51.04	74.00	22.96	H	18.6
14423.437500	46.73	74.00	27.27	V	13.0
15781.875000	49.06	74.00	24.94	H	14.5
17318.812500	50.50	74.00	23.50	V	16.9

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
4605.000000	37.35	54.00	16.65	H	13.4
5503.000000	38.52	54.00	15.48	V	15.2
6198.000000	41.27	54.00	12.73	V	18.9
14419.062500	36.91	54.00	17.09	H	13.0
15725.875000	38.15	54.00	15.85	V	14.3
17006.000000	39.29	54.00	14.71	H	16.6



**802.11n-HT20 CH11 (1GHz-18GHz)**

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
4649.000000	47.13	74.00	26.87	H	13.4
5362.000000	49.30	74.00	24.70	V	15.2
6192.500000	50.81	74.00	23.19	H	18.9
14491.687500	47.30	74.00	26.70	H	13.0
15691.312500	48.68	74.00	25.32	V	14.2
17208.125000	49.42	74.00	24.58	V	17.0

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
4600.000000	37.47	54.00	16.53	H	13.4
5395.500000	38.47	54.00	15.53	H	15.3
6187.500000	41.03	54.00	12.97	H	18.9
14485.562500	36.99	54.00	17.01	V	13.0
15786.250000	38.52	54.00	15.48	V	14.6
17132.000000	39.46	54.00	14.54	V	17.0

**MIMO:**

**802.11n-HT20 CH11 (1GHz-18GHz)**

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
5046.500000	47.52	74.00	26.48	H	14.3
6194.500000	51.32	74.00	22.68	V	18.9
9848.037500	48.09	74.00	25.91	V	6.9
14360.000000	46.02	74.00	27.98	V	12.9
15669.000000	47.85	74.00	26.15	H	14.0
17004.250000	48.89	74.00	25.11	V	16.5

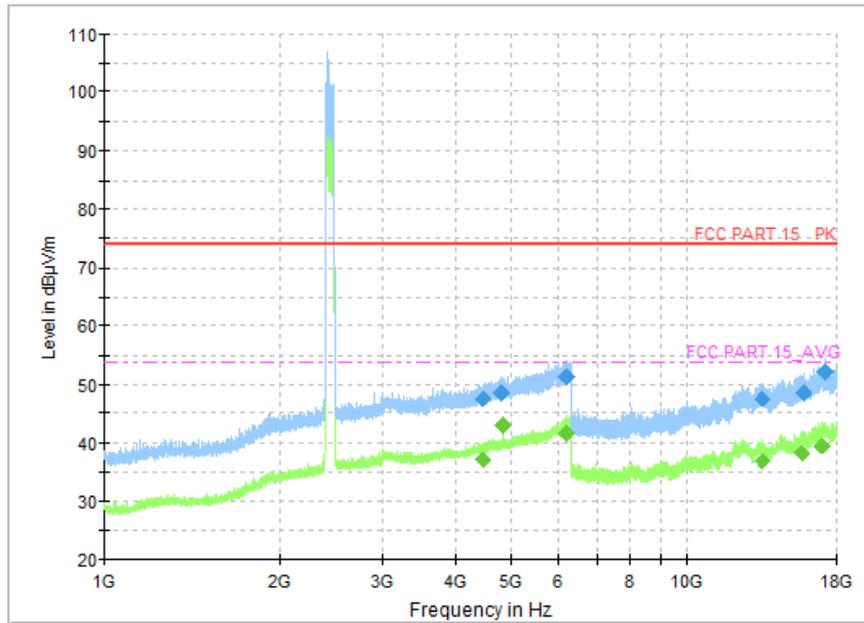
Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
5133.500000	38.02	54.00	15.98	H	14.6
6162.000000	41.08	54.00	12.92	V	18.6
9848.037500	43.17	54.00	10.83	V	6.9
14514.437500	37.03	54.00	16.97	H	13.0
15790.187500	38.39	54.00	15.61	V	14.6
17304.812500	39.41	54.00	14.59	V	16.9

**Note:** A "reference path loss" is established and the  $A_{Rpl}$  is the attenuation of "reference path loss", and Antenna Factor, the gain of the preamplifier, the cable loss.  $P_{Mea}$  is the field strength recorded from the instrument. The measurement results are obtained as described below:

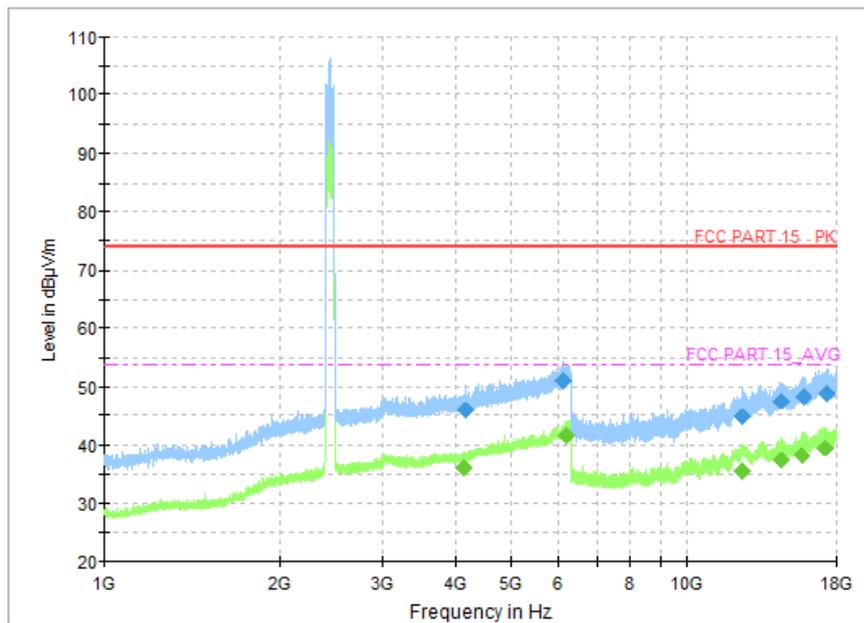
$$\text{Result} = P_{Mea} + \text{Cable Loss} + \text{Antenna Factor} - \text{Gain of the preamplifier.}$$

**See below for test graphs.**

**Conclusion: PASS**



**Fig.34 Radiated Spurious Emission (802.11b, CH1, 1 GHz-18GHz)**



**Fig.35 Radiated Spurious Emission (802.11b, CH6, 1 GHz-18GHz)**

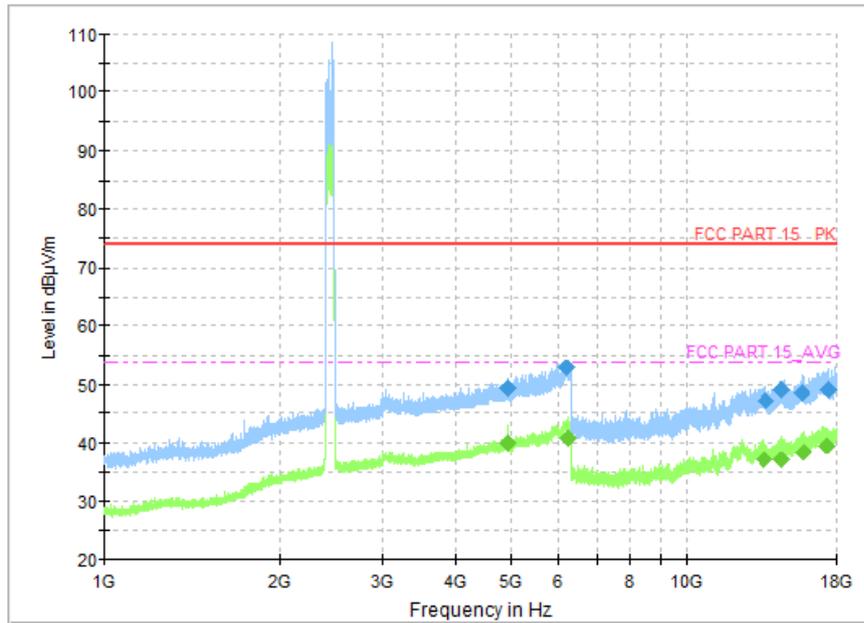


Fig.36 Radiated Spurious Emission (802.11b, CH11, 1 GHz-18GHz)

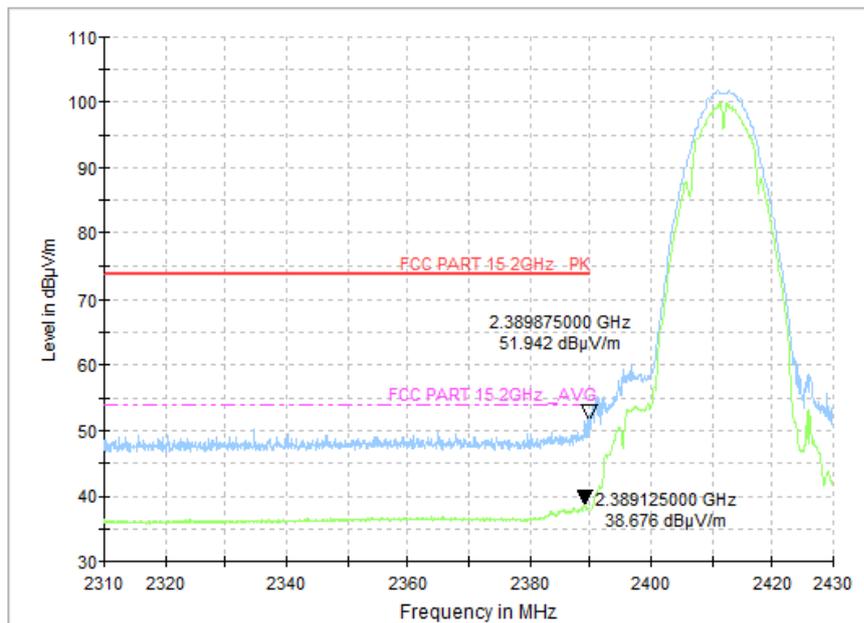


Fig.37 Radiated Restricted Band (802.11b, CH1, 2.38GHz~2.45GHz)

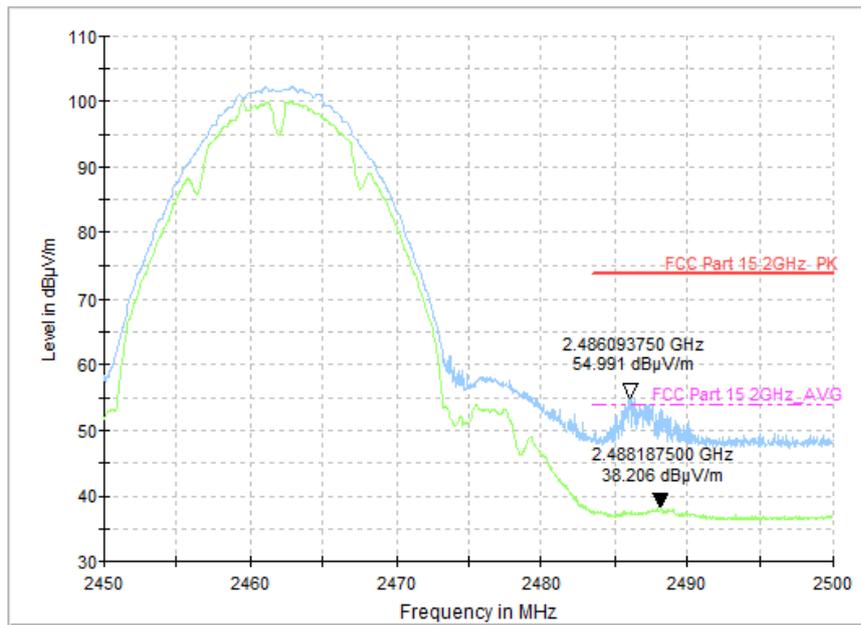


Fig.38 Radiated Restricted Band (802.11b, CH11, 2.45GHz~2.5GHz)

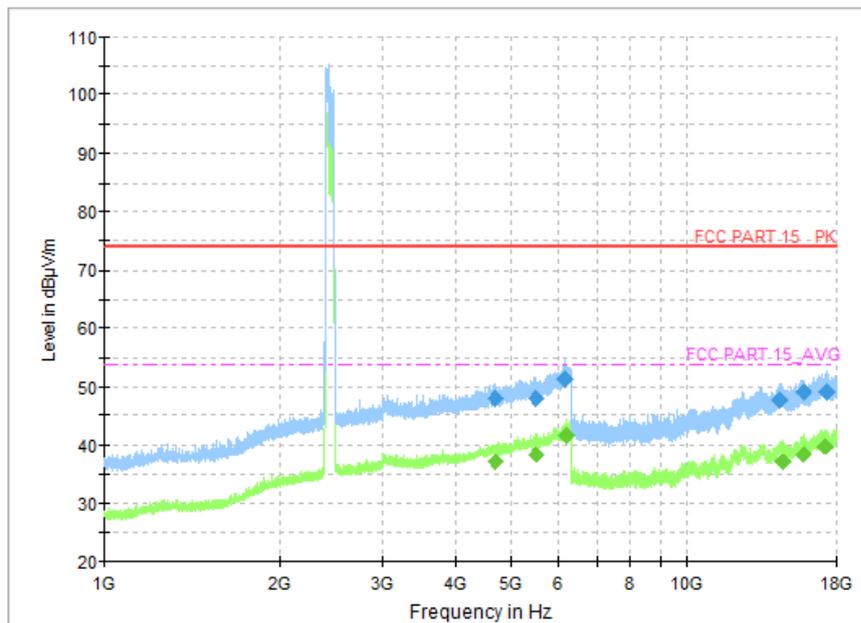
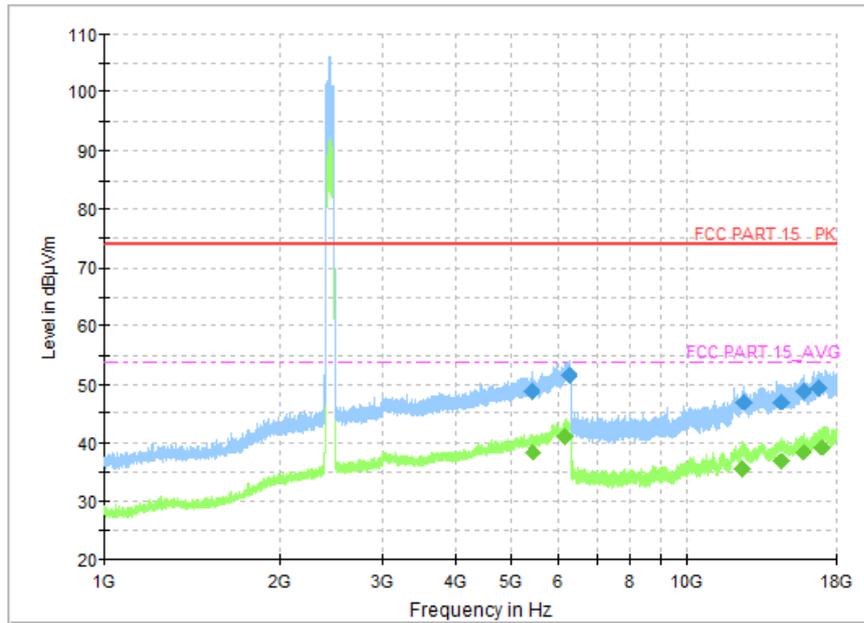
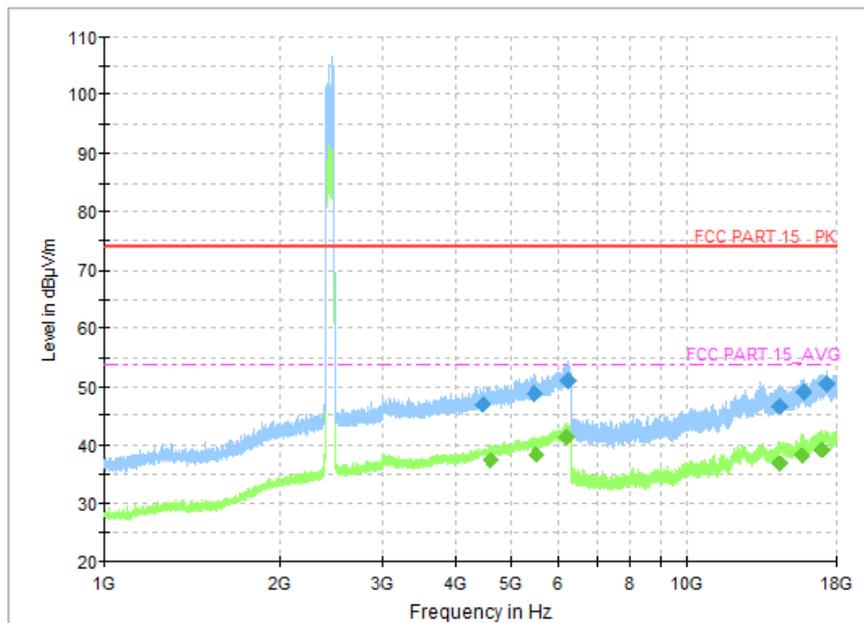


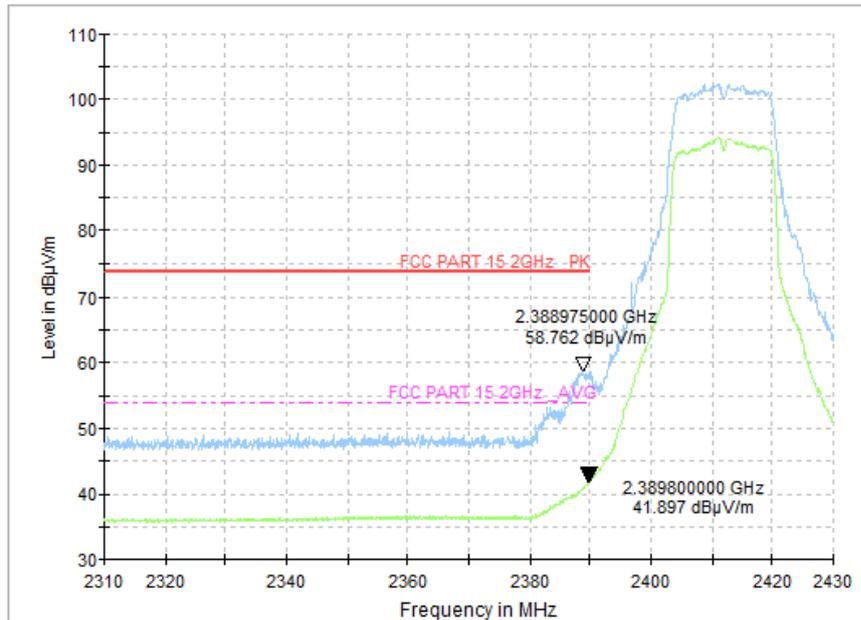
Fig.39 Radiated Spurious Emission (802.11g, CH1, 1 GHz-18 GHz)



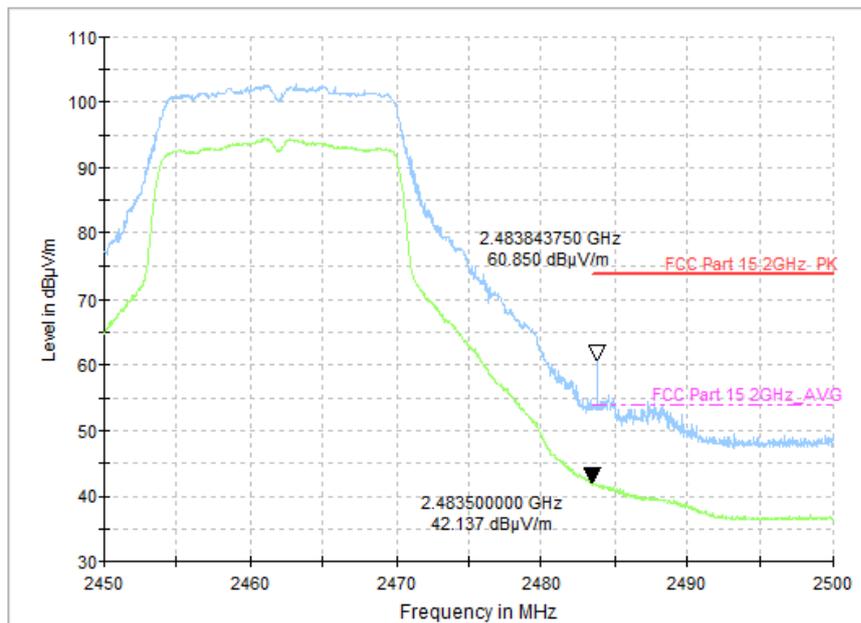
**Fig.40 Radiated Spurious Emission (802.11g, CH6, 1 GHz-18 GHz)**



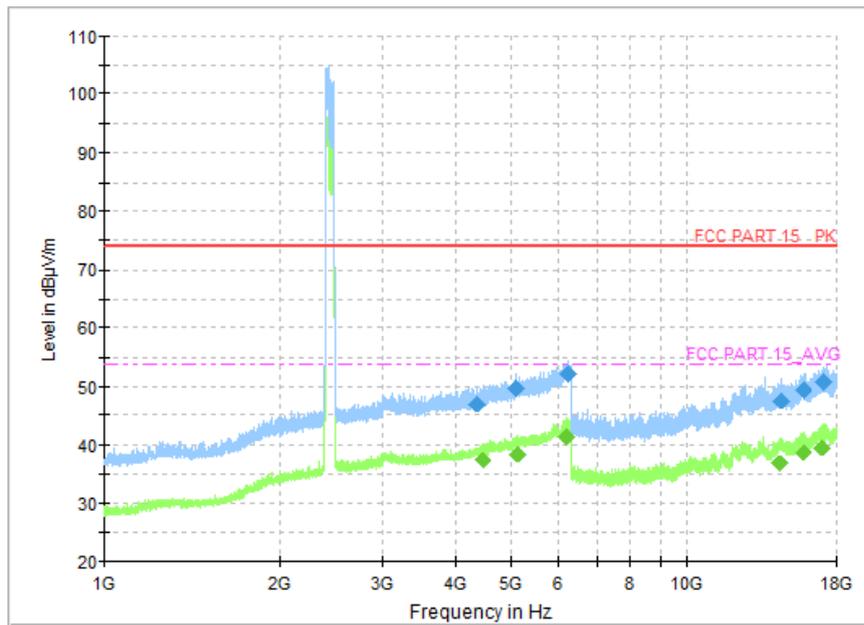
**Fig.41 Radiated Spurious Emission (802.11g, CH11, 1 GHz-18 GHz)**



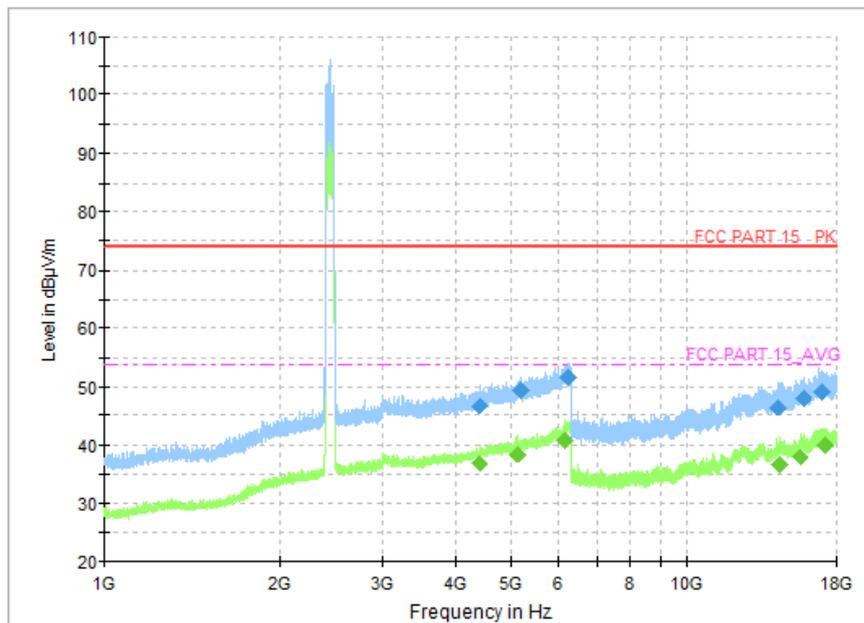
**Fig.42 Radiated Restricted Band (802.11g, CH1, 2.38GHz~2.45GHz)**



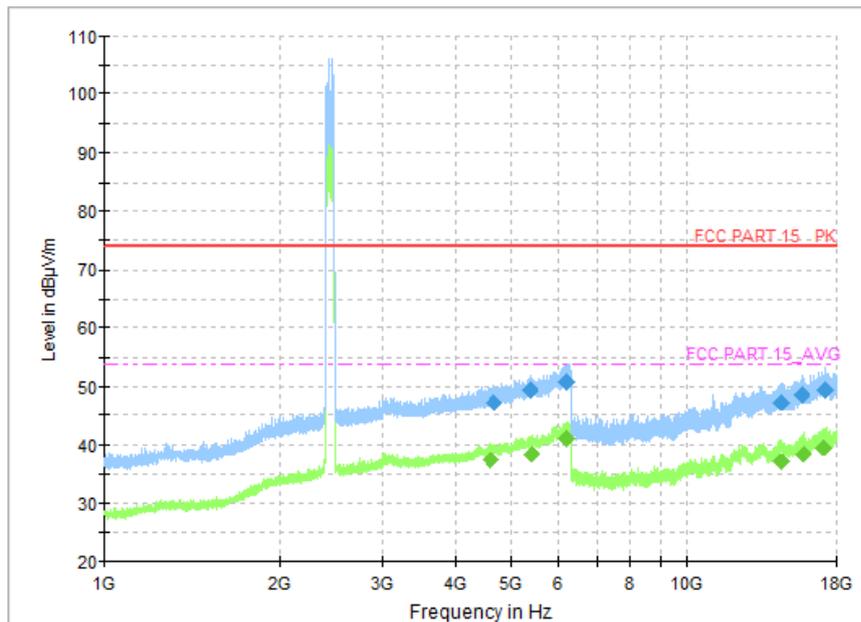
**Fig.43 Radiated Restricted Band (802.11g, CH11, 2.45GHz~2.5GHz)**



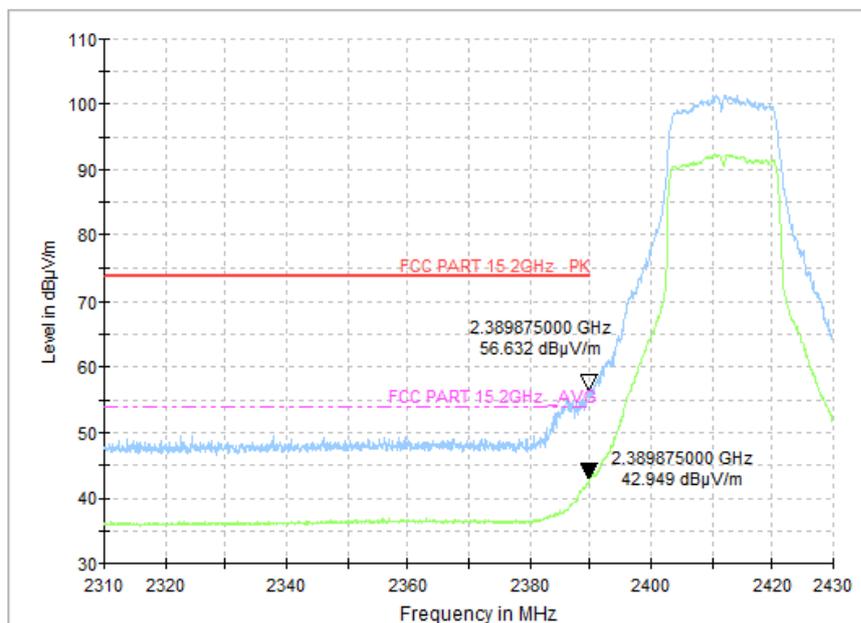
**Fig.44 Radiated Spurious Emission (802.11n-HT20, CH1, 1 GHz-18 GHz)**



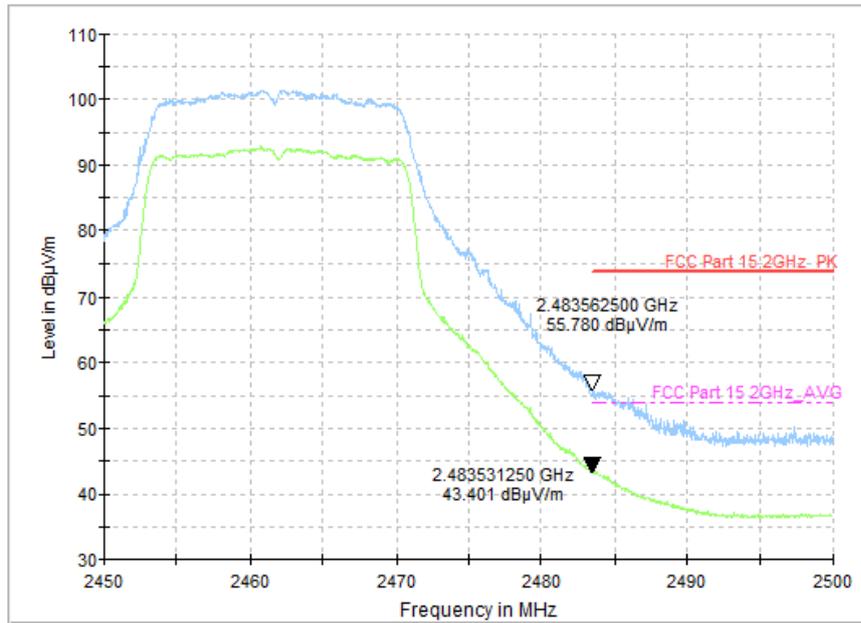
**Fig.45 Radiated Spurious Emission (802.11n-HT20, CH6, 1 GHz-18 GHz)**



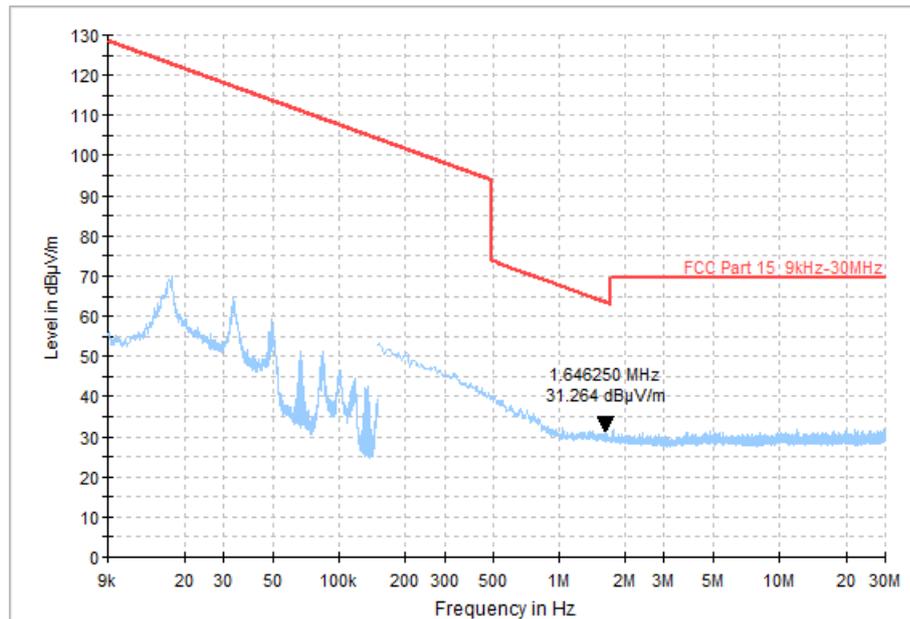
**Fig.46 Radiated Spurious Emission (802.11n-HT20, CH11, 1 GHz-18 GHz)**



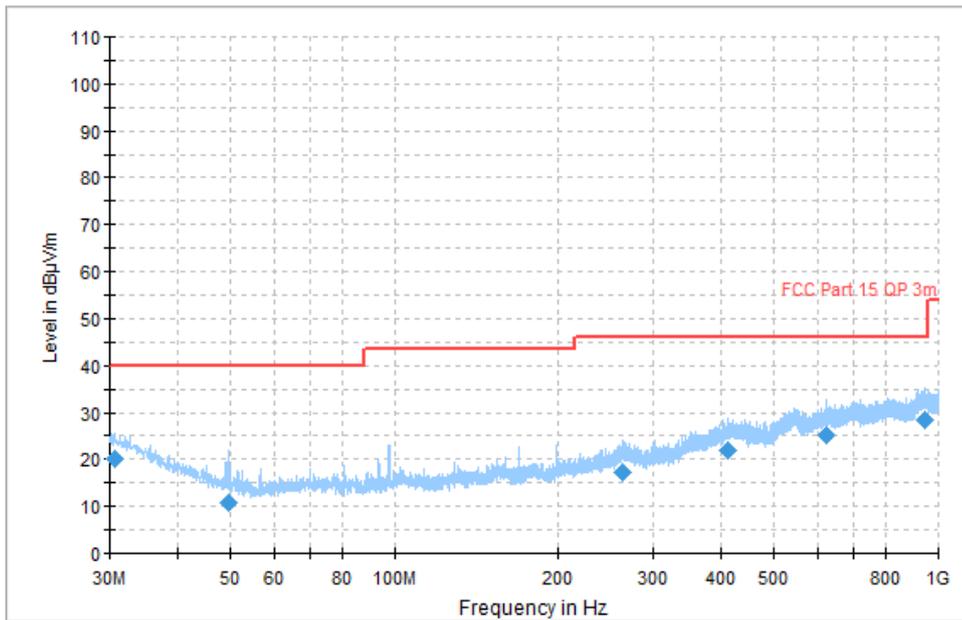
**Fig.47 Radiated Restricted Band (802.11n-HT20, CH1, 2.38GHz~2.45GHz)**



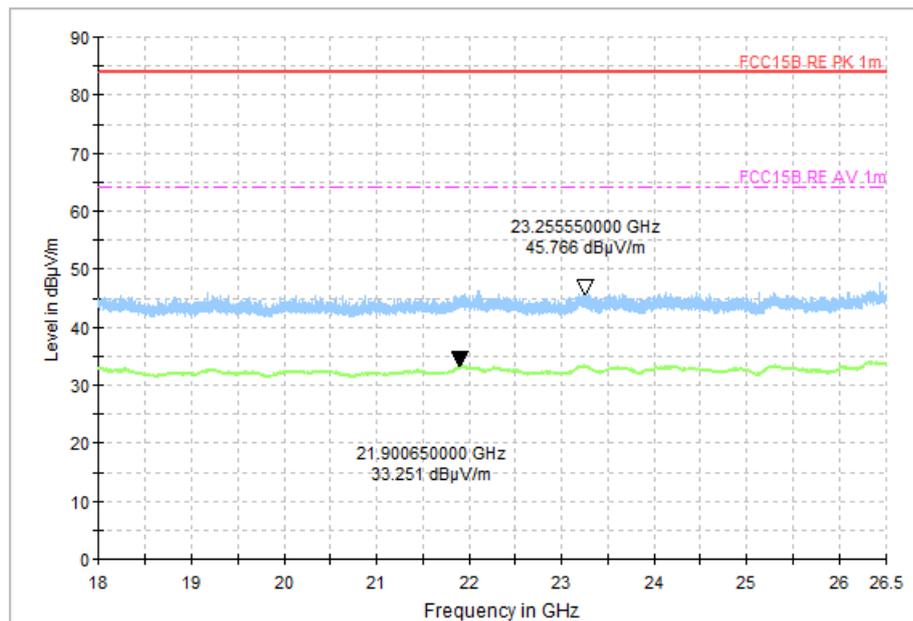
**Fig.48 Radiated Restricted Band (802.11n-HT20, CH11, 2.45GHz~2.5GHz)**



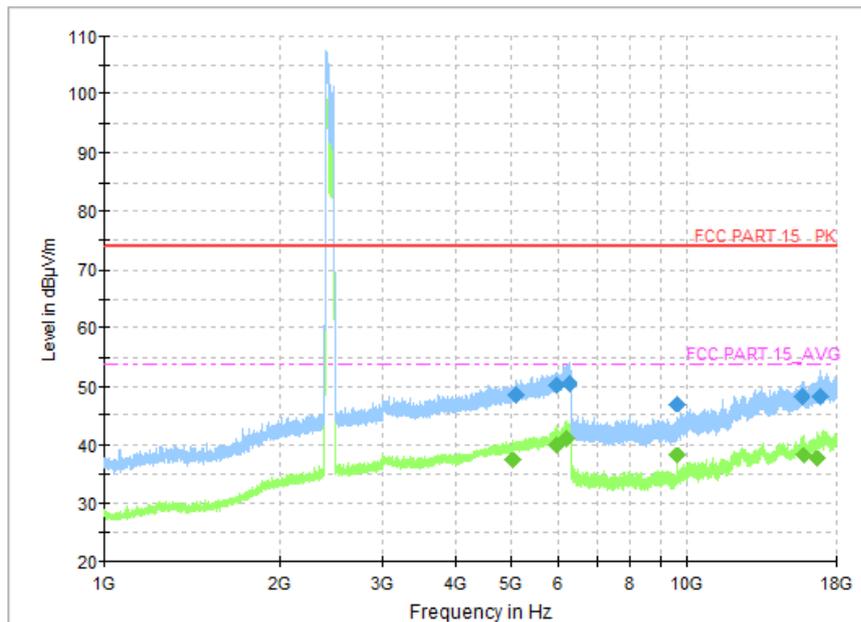
**Fig.49 Radiated Spurious Emission (All Channels, 9 kHz-30 MHz)**



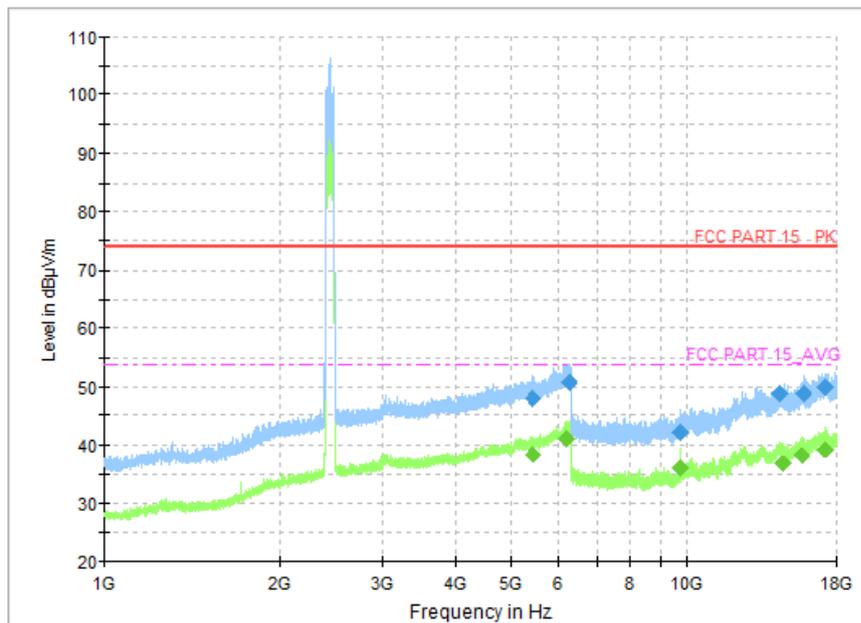
**Fig.50 Radiated Spurious Emission (All Channels, 30MHz-1 GHz)**



**Fig.51 Radiated Spurious Emission (All Channels, 18 GHz-26.5 GHz)**



**Fig.52 Radiated Spurious Emission (802.11n-HT20, CH1, 1 GHz-18 GHz), MIMO**



**Fig.53 Radiated Spurious Emission (802.11n-HT20, CH6, 1 GHz-18 GHz), MIMO**

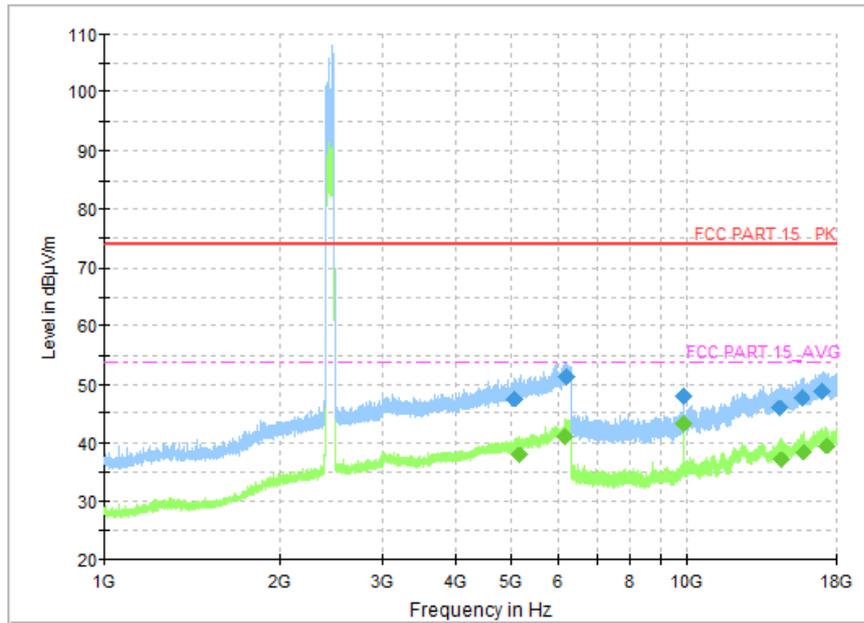


Fig.54 Radiated Spurious Emission (802.11n-HT20, CH11, 1 GHz-18 GHz), MIMO

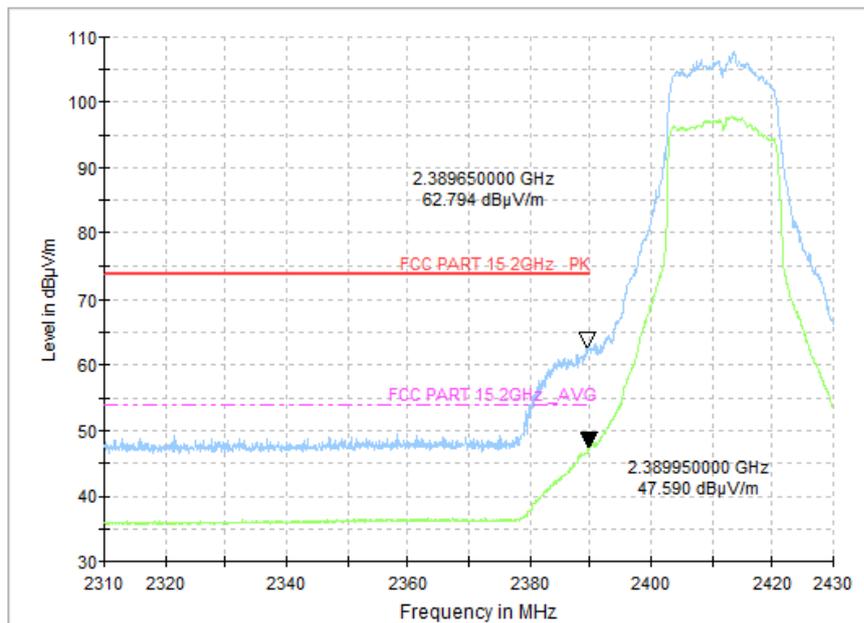
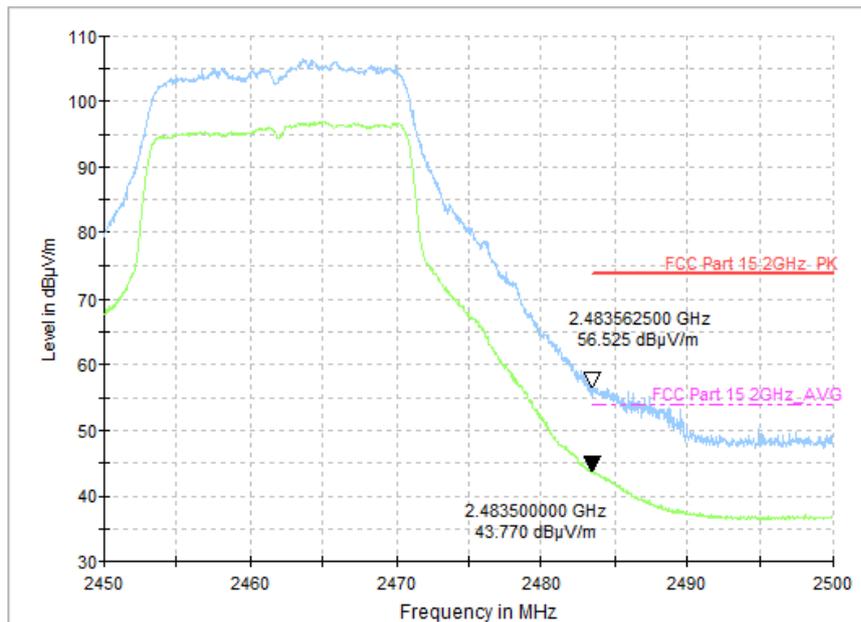
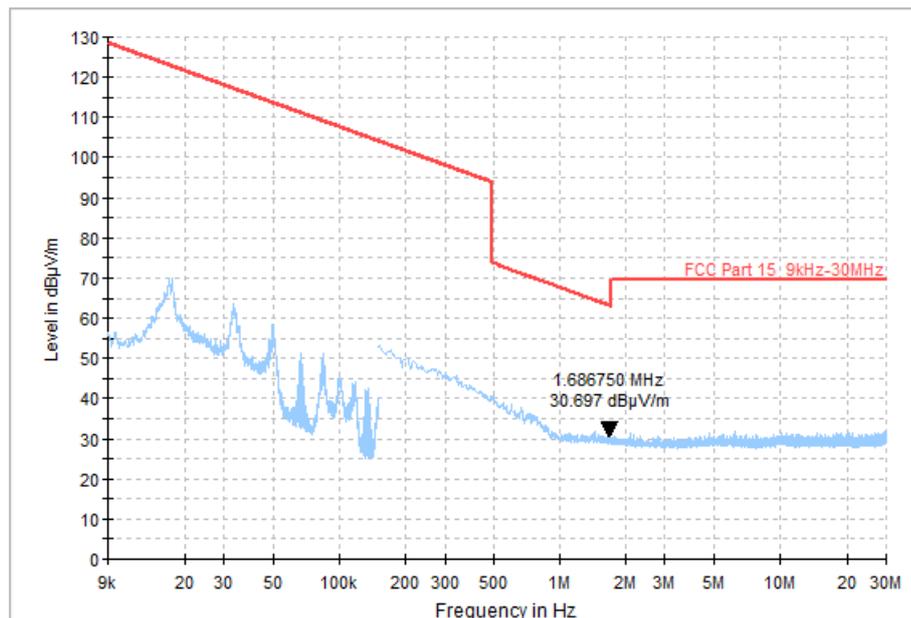


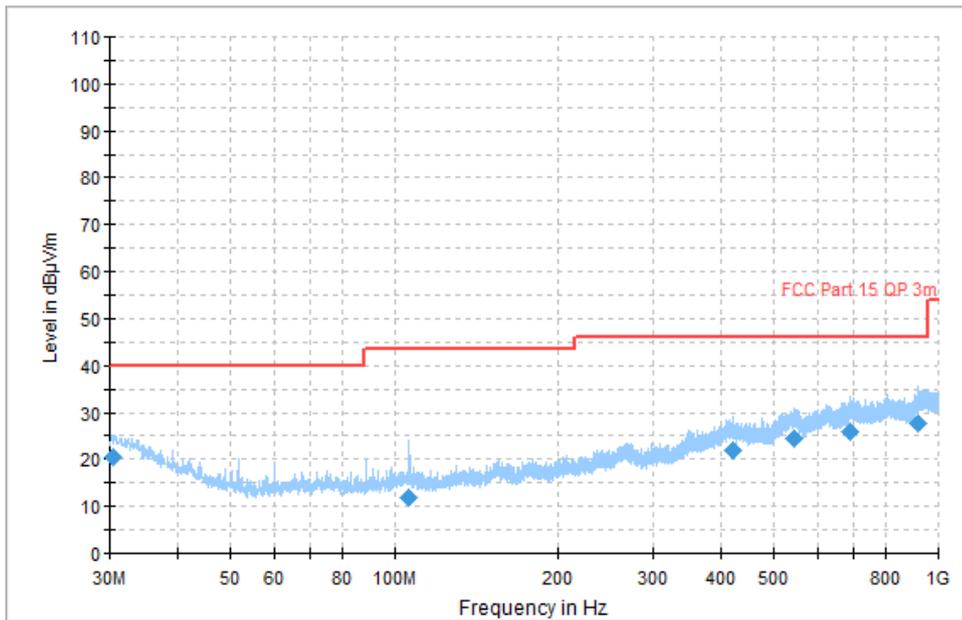
Fig.55 Radiated Restricted Band (802.11n-HT20, CH1, 2.38GHz~2.45GHz), MIMO



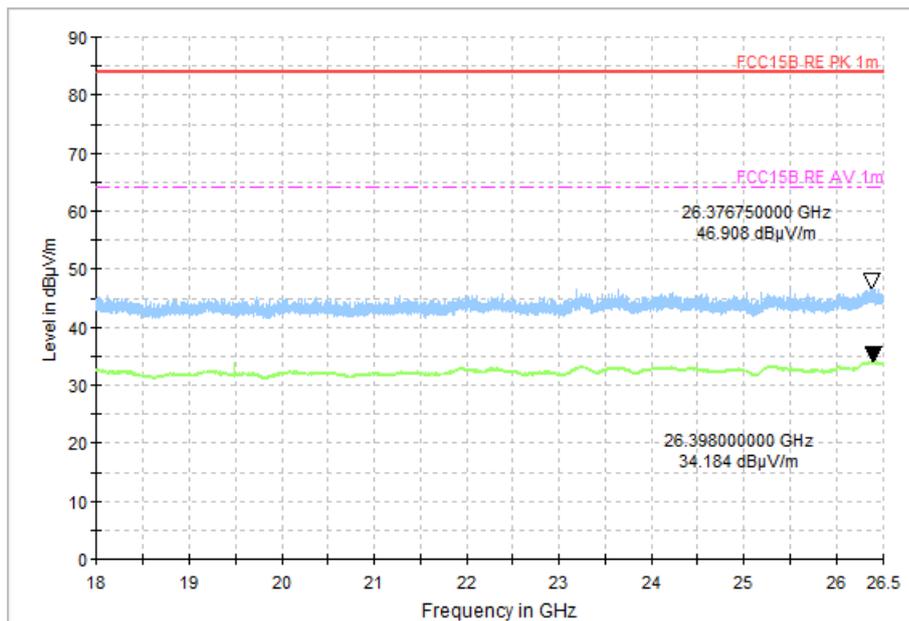
**Fig.56 Radiated Restricted Band (802.11n-HT20, CH11, 2.45GHz~2.5GHz), MIMO**



**Fig.57 Radiated Spurious Emission (All Channels, 9 kHz-30 MHz), MIMO**



**Fig.58 Radiated Spurious Emission (All Channels, 30MHz-1 GHz), MIMO**



**Fig.59 Radiated Spurious Emission (All Channels, 18 GHz-26.5 GHz), MIMO**



### A.7 AC Power line Conducted Emission

Test Condition:

Voltage (V)	Frequency (Hz)
120	60

Measurement Result and limit:

WLAN -AE2, AE3

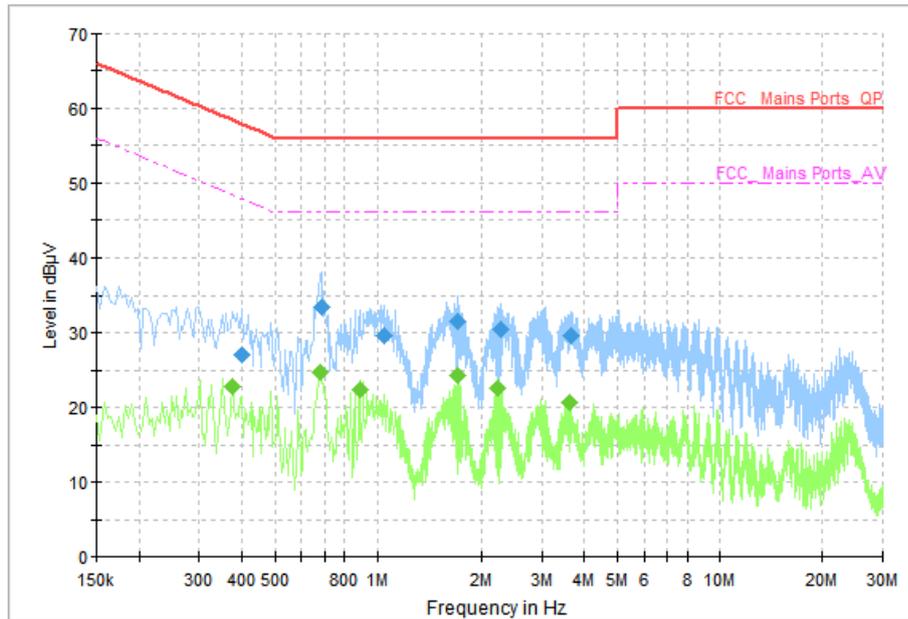
Frequency range (MHz)	Quasi-peak Limit (dB $\mu$ V)	Average-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)		Conclusion
			Traffic	Idle	
0.15 to 0.5	66 to 56	56 to 46	Fig.60	Fig.61	P
0.5 to 5	56	46			
5 to 30	60	50			

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

**Note:** The measurement results include the L1 and N measurements.

See below for test graphs.

Conclusion: **PASS**



**Fig.60 AC Power line Conducted Emission (Traffic)**

**Measurement Results: Quasi Peak**

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.402000	27.14	57.81	30.67	N	ON	10
0.686000	33.51	56.00	22.49	N	ON	10
1.046000	29.75	56.00	26.25	N	ON	10
1.694000	31.53	56.00	24.47	N	ON	10
2.282000	30.60	56.00	25.40	N	ON	10
3.650000	29.56	56.00	26.44	N	ON	10

**Measurement Results: Average**

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.374000	22.89	48.41	25.52	N	ON	10
0.678000	24.76	46.00	21.24	N	ON	10
0.886000	22.33	46.00	23.67	N	ON	10
1.694000	24.32	46.00	21.68	N	ON	10
2.230000	22.63	46.00	23.37	N	ON	10
3.622000	20.78	46.00	25.22	N	ON	10

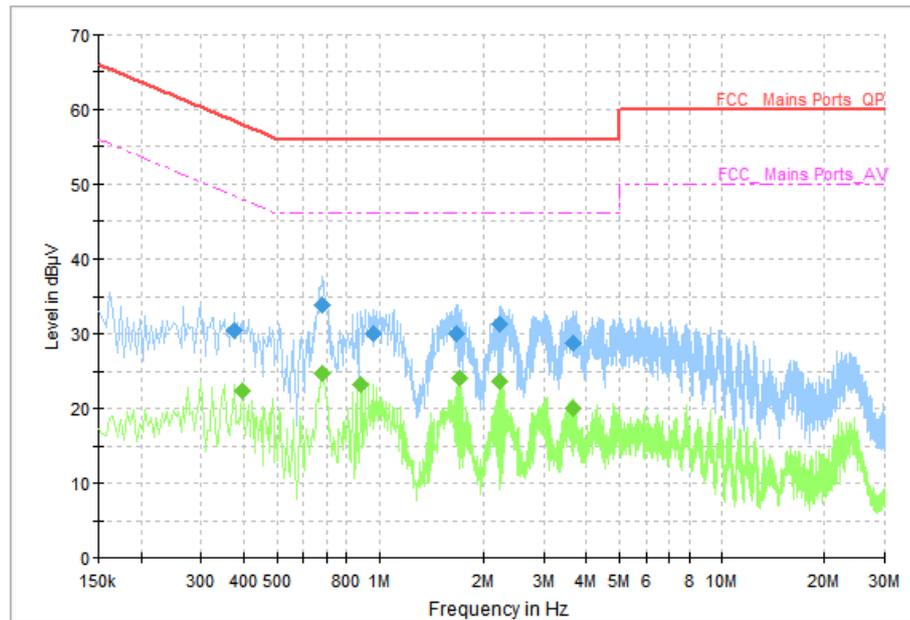


Fig.61 AC Power line Conducted Emission (Idle)

**Measurement Results: Quasi Peak**

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.374000	30.42	58.41	27.99	N	ON	10
0.682000	33.95	56.00	22.05	N	ON	10
0.958000	30.14	56.00	25.86	N	ON	10
1.662000	30.10	56.00	25.90	N	ON	10
2.226000	31.32	56.00	24.68	N	ON	10
3.670000	28.78	56.00	27.22	N	ON	10

**Measurement Results: Average**

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.398000	22.41	47.90	25.48	N	ON	10
0.682000	24.67	46.00	21.33	N	ON	10
0.882000	23.31	46.00	22.69	N	ON	10
1.694000	24.15	46.00	21.85	N	ON	10
2.226000	23.73	46.00	22.27	N	ON	10
3.646000	20.09	46.00	25.91	N	ON	10

\*\*\*END OF REPORT\*\*\*