



# TEST REPORT

No. I21N01157-RLAN

for

**Guangdong OPPO Mobile Telecommunications Corp., Ltd.**

**Mobile Phone**

**Model Name: CPH2269**

with

**Hardware Version: 11**

**Software Version: ColorOS V11.1**

**FCC ID: R9C-CPH2269**

**Issued Date: 2021-05-17**

**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.

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## 1. Summary of Test Report

### 1.1. Test Items

Description	Mobile Phone
Model Name	CPH2269
Applicant's name	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Manufacturer's Name	Guangdong OPPO Mobile Telecommunications Corp., Ltd.

### 1.2. Test Standards

FCC Part15-2019; ANSI C63.10-2013; KDB789033-V02r01

### 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:	2021-04-13
Testing End Date:	2021-05-14

### 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: Guangdong OPPO Mobile Telecommunications Corp., Ltd.  
Address: NO.18 Haibin Road, Wusha Village, Chang'an Town, Dongguan City,  
Guangdong, China  
Contact Person Mei XiLi  
E-Mail meixili@oppo.com  
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### **2.2. Manufacturer Information**

Company Name: Guangdong OPPO Mobile Telecommunications Corp., Ltd.  
Address: NO.18 Haibin Road, Wusha Village, Chang'an Town, Dongguan City,  
Guangdong, China  
Contact Person Mei XiLi  
E-Mail meixili@oppo.com  
Telephone: (86)76986076999  
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### 3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

#### 3.1. About EUT

Description	Mobile Phone
Model Name	CPH2269
RLAN Frequency Range	ISM Bands: 5150MHz~5250MHz; 5250MHz~5350MHz; 5470MHz~5725MHz; 5725MHz~5850MHz.
RLAN Protocol	IEEE 802.11a,802.11n-HT20/40,802.11ac-VHT20/40/80
Type of modulation	OFDM
Antenna Type	Integrated
Antenna Gain	-3.0dBi
Power Supply	3.87V DC by Battery
FCC ID	R9C-CPH2269
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

EUT ID*	IMEI	HW Version	SW Version	Receive Date
UT06aa	864849050019913	11	ColorOS V11.1	2021-04-12
	864849050019905			
UT02aa	864849050019772	11	ColorOS V11.1	2021-04-13
	864849050019764			
UT03aa	866223050028472	11	ColorOS V11.1	2021-04-13
	866223050028464			

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

UT06aa is used for conduction test, UT02aa is used for radiation test, and UT03aa is used for AC Power line Conducted Emission test.

#### 3.3. Internal Identification of AE

AE ID*	Description	AE ID*
AE1	Battery	/
AE2	Charger	/
AE3	USB Cable	/
AE4	Headset	/

#### AE1

Model	BLP805
Manufacturer	Sunwoda Electronic Co., Ltd.
Capacity	4980mAh



Nominal Voltage	3.87V
AE2	
Model	OP52JAUH
Manufacturer	HUIZHOU GOLDEN LAKE INDUSTRIAL CO., LTD
Specification	American Standard Charger
AE3	
Model	DL143
Manufacturer	Freeport Resources Enterprises (Jiangxi) CO.,LTD
AE4	
Model	MH156
Manufacturer	GuangDong Allwin Technology 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 Mobile Phone with integrated antenna and battery. It consists of normal options: Lithium Battery, Charger, USB Cable and Headset. 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 FCC CFR 47,Part 15,Subpart E	2019
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
KDB789033	GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E	V02r01

## 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 Part15E	Verdict
0	Maximum Output Power	15.407(a)	<b>P</b>
1	Power Spectral Density	15.407(a)	<b>P</b>
2	Occupied 26dB Bandwidth	15.403(i)	<b>/</b>
3	Occupied 6dB Bandwidth	15.407(e)	<b>P</b>
4	99% Occupied Bandwidth	15.403	<b>/</b>
5	Band edge compliance	15.209	<b>P</b>
6	Radiated Spurious Emissions	15.209	<b>P</b>
7	AC Power line Conducted	15.207	<b>P</b>
8	Transmit Power Control	15.407	<b>NA</b>

See **ANNEX A** for details.

Note: According to the definition of the application description, the device will automatically discontinue transmission in case of either absence of information to transmit or operational failure.

### 5.3. Statements

SAICT has evaluated the test cases requested by the applicant/manufacture 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	100702	Rohde & Schwarz	2022-01-13	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-18 -40-K-SG	15979	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 Qualcomm engineering software provided by the customer to control the transmitting signal.

### 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	> 2M $\Omega$
Ground system resistance	< 4 $\Omega$
Normalised site attenuation (NSA)	< $\pm 4$ 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	> 2M $\Omega$
Ground system resistance	< 4 $\Omega$

### **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	> 2M $\Omega$
Ground system resistance	< 4 $\Omega$
Voltage Standing Wave Ratio (VSWR)	$\leq 6$ 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

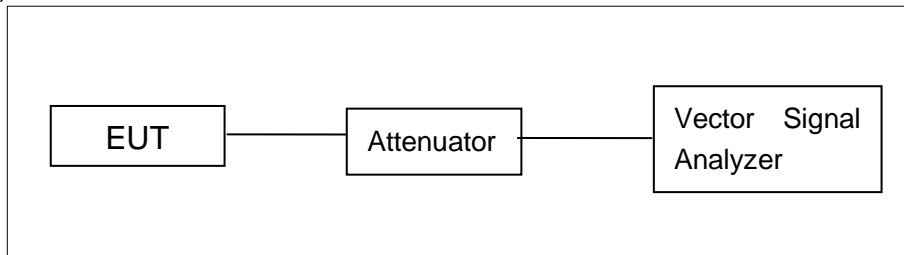
Test Name	Uncertainty ( $k=2$ )	
1. Maximum output Power	1.32dB	
2. Peak Power Spectral Density	2.32dB	
3. Occupied 26dB Bandwidth	66Hz	
4. Occupied 6dB Bandwidth	66Hz	
5. 99% Occupied Bandwidth	66Hz	
6. Band Edges Compliance	4.68dB	
7. Transmitter Spurious Emission - Radiated	$9\text{kHz} \leq f < 30\text{MHz}$	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
8. AC Power line Conducted Emission	$150\text{kHz} \leq f \leq 30\text{MHz}$	3.00dB

## **ANNEX A: Detailed Test Results**

### **A.1. Measurement Method**

#### **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.

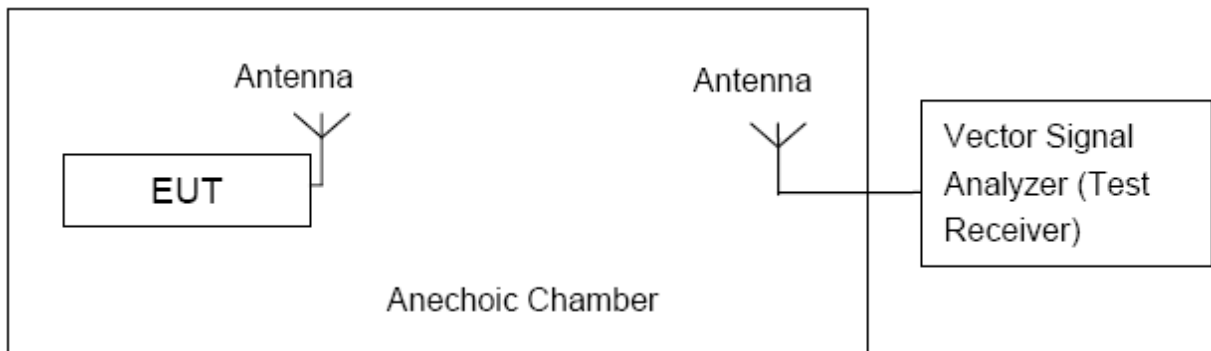


#### **Radiated Emission Measurements**

In the case of radiated emission, the used settings are as follows:

Sweep frequency from 30 MHz to 1 GHz, RBW = 100 KHz, VBW = 300 KHz;

Sweep frequency from 1 GHz to 26 GHz, RBW = 1 MHz, VBW = 10 Hz;



The measurement is made according to KDB 789033.

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

## A.2. Maximum output Power

### Measurement Limit and Method:

Standard	Frequency (MHz)	Limit (dBm)
FCC CRF Part 15.407(a)	5150MHz~5250MHz	24
	5250MHz~5350MHz	24 or 11+10logB
	5470MHz~5725MHz	24 or 11+10logB
	5725MHz~5850MHz	30

Limit use the less value, and B is the 26dB bandwidth.

### Measurement of method: See ANSI C63.10-2013-Clause 12.3.3.2

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

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 Results:

U-NII Band	Mode	Channel	Frequency (MHz)	RF output power (dBm)
5.2GHz Band (UNII-1)	802.11a	CH 36	5180	14.29
		CH 40	5200	14.40
		CH 48	5240	14.41
	802.11n-HT20	CH 36	5180	14.26
		CH 40	5200	14.31
		CH 48	5240	14.26
	802.11n-HT40	CH 38	5190	11.55
		CH 46	5230	14.22
	802.11ac-VHT20	CH 36	5180	14.21
		CH 40	5200	14.24
		CH 48	5240	14.32
	802.11ac-VHT40	CH 38	5190	11.48
		CH 46	5230	14.13
	802.11ac-VHT80	CH 42	5210	12.51

U-NII Band	Mode	Channel	Frequency (MHz)	RF output power (dBm)
5.3GHz Band (UNII-2A)	802.11a	CH 52	5260	14.25
		CH 56	5280	14.19
		CH 64	5320	13.15
	802.11n-HT20	CH 52	5260	14.17
		CH 56	5280	14.18
		CH 64	5320	13.10

	802.11n-HT40	CH 54	5270	14.15
		CH 62	5310	11.04
	802.11ac-VHT20	CH 52	5260	14.22
		CH 56	5280	14.11
		CH 64	5320	13.09
	802.11ac-VHT40	CH 54	5270	14.07
		CH 62	5310	11.06
	802.11ac-VHT80	CH 58	5290	12.40

U-NII Band	Mode	Channel	Frequency (MHz)	RF output power (dBm)
5.5GHz Band (UNII-2C)	802.11a	CH 100	5500	13.07
		CH 116	5580	14.17
		CH 140	5700	12.51
	802.11n-HT20	CH 100	5500	13.06
		CH 116	5580	14.07
		CH 140	5700	10.99
	802.11n-HT40	CH 102	5510	11.98
		CH 110	5550	14.00
		CH 134	5670	13.95
	802.11ac-VHT20	CH 100	5500	12.53
		CH 116	5580	14.10
		CH 140	5700	14.07
	802.11ac-VHT40	CH 102	5510	11.93
		CH 110	5550	13.99
		CH 134	5670	13.91
	802.11ac-VHT80	CH 106	5530	11.42
		CH 122	5610	13.88

U-NII Band	Mode	Channel	Frequency (MHz)	RF output power (dBm)
5.8GHz Band (UNII-3)	802.11a	CH 149	5745	14.12
		CH 157	5785	14.05
		CH 165	5825	13.99
	802.11n-HT20	CH 149	5745	14.03
		CH 157	5785	13.99
		CH 165	5825	13.95
	802.11n-HT40	CH 151	5755	13.91
		CH 159	5795	13.96
	802.11ac-VHT20	CH 149	5745	14.01
		CH 157	5785	14.04
		CH 165	5825	13.93
	802.11ac-VHT40	CH 151	5755	13.89



		CH 159	5795	13.87
	802.11ac-VHT80	CH 155	5775	13.81

**Note:**

The data rate 6Mbps (11a mode), MCS0 (11n mode) and MCS0 (11ac mode) are selected as the worst case. 802.11a, 802.11n-HT40 and 802.11ac-VHT80 are selected as the worst-case. The following cases and test graphs are mostly 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.3. Peak Power Spectral Density (conducted)

#### Measurement Limit:

Standard	Frequency (MHz)	Limit
FCC CRF Part 15.407(a)	5150MHz~5250MHz	11dBm/MHz(FCC)
		10dBm/MHz EIRP(IC)
	5250MHz~5350MHz	11dBm/MHz
	5470MHz~5725MHz	11dBm/MHz
	5725MHz~5850MHz	30dBm/500kHz

The PPSD measurement method SA-1 is made according to KDB 789033.

#### Measurement Results:

#### 5.2GHz Band (UNII-1) & 5.3GHz Band (UNII-2A) & 5.5GHz Band (UNII-2C):

Mode	Channel	Power Spectral Density (dBm/MHz)	Conclusion
802.11a	5180MHz(Ch36)	0.98	P
	5200MHz(Ch40)	1.14	P
	5240MHz(Ch48)	1.06	P
	5260MHz(Ch52)	0.67	P
	5280MHz(Ch56)	0.98	P
	5320MHz(Ch64)	-0.11	P
	5500MHz(Ch100)	-0.01	P
	5580MHz(Ch116)	0.54	P
	5700MHz(Ch140)	-0.70	P
802.11n-HT40	5190MHz(Ch38)	-4.78	P
	5230MHz(Ch46)	-2.03	P
	5270MHz(Ch54)	-2.01	P
	5310MHz(Ch62)	-5.71	P
	5510MHz(Ch102)	-4.15	P
	5550MHz(Ch110)	-2.77	P
	5670MHz(Ch134)	-2.82	P
802.11ac-VHT80	5210MHz(Ch42)	-6.89	P
	5290MHz(Ch58)	-7.04	P
	5530MHz(Ch106)	-8.95	P
	5610MHz(Ch122)	-5.58	P

#### 5.8GHz Band (UNII-3):

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11a	5745MHz(CH149)	-1.40	P
	5785MHz(CH157)	-2.25	P
	5825MHz(CH165)	-2.00	P
802.11n-HT40	5755MHz(CH151)	-4.61	P





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	5795MHz(CH159)	-4.73	<b>P</b>
802.11ac-VHT80	5775MHz(CH155)	-9.68	<b>P</b>

**Conclusion: PASS**

#### A.4. Occupied 26dB Bandwidth (conducted)

##### Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.403 (i)	/

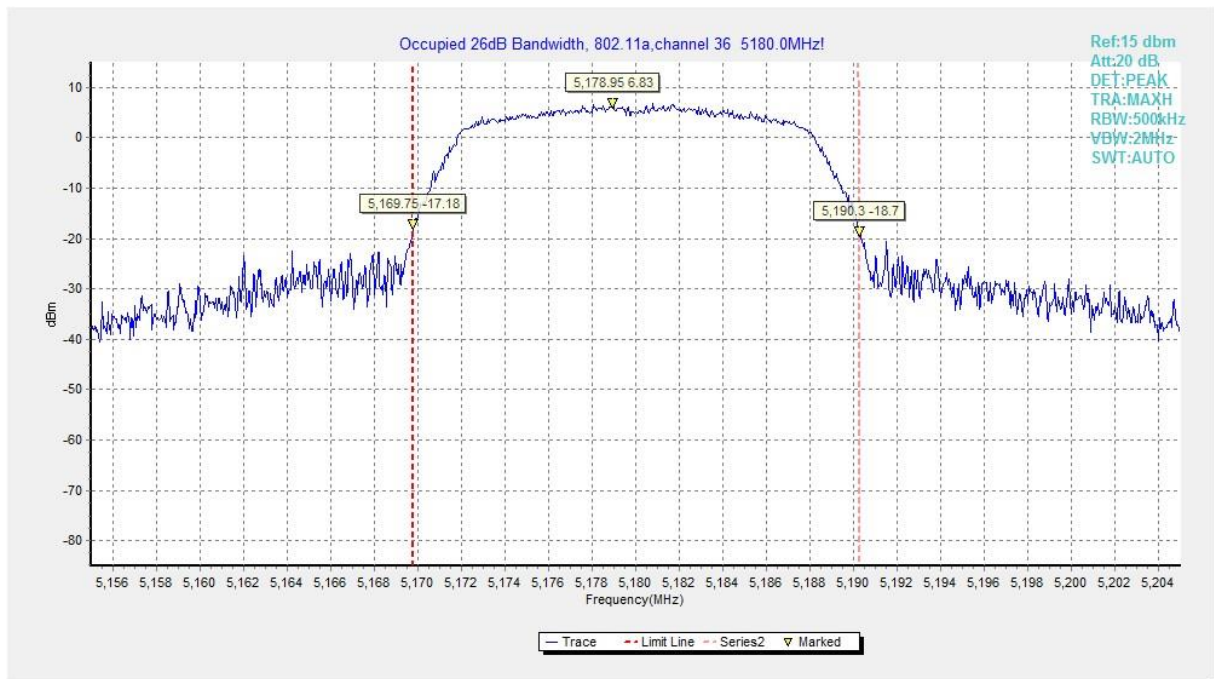
The measurement is made according to KDB 789033

##### Measurement Result:

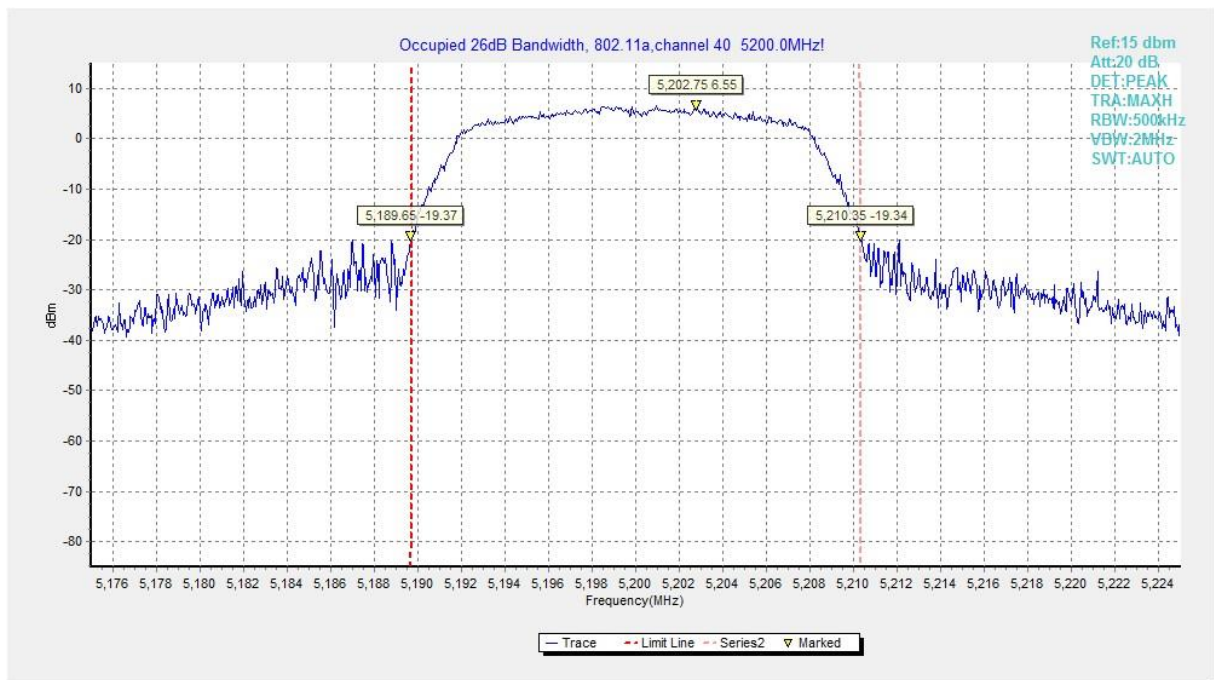
Mode	Channel	Occupied 26dB Bandwidth( MHz)		Conclusion
802.11a	5180MHz(Ch36)	Fig.1	20.55	/
	5200MHz(Ch40)	Fig.2	20.70	/
	5240MHz(Ch48)	Fig.3	20.60	/
	5260MHz(Ch52)	Fig.4	20.55	/
	5280MHz(Ch56)	Fig.5	20.55	/
	5320MHz(Ch64)	Fig.6	20.65	/
	5500MHz(Ch100)	Fig.7	20.40	/
	5580MHz(Ch116)	Fig.8	20.50	/
802.11n-HT40	5700MHz(Ch140)	Fig.9	20.55	/
	5190MHz(Ch38)	Fig.10	40.80	/
	5230MHz(Ch46)	Fig.11	40.80	/
	5270MHz(Ch54)	Fig.12	41.04	/
	5310MHz(Ch62)	Fig.13	41.44	/
	5510MHz(Ch102)	Fig.14	40.80	/
	5550MHz(Ch110)	Fig.15	41.28	/
802.11 ac-VHT80	5670MHz(Ch134)	Fig.16	41.04	/
	5210MHz(Ch42)	Fig.17	80.96	/
	5290MHz(Ch58)	Fig.18	81.28	/
	5530MHz(Ch106)	Fig.19	81.44	/
	5610MHz(Ch122)	Fig.20	81.28	/

See below for test graphs.

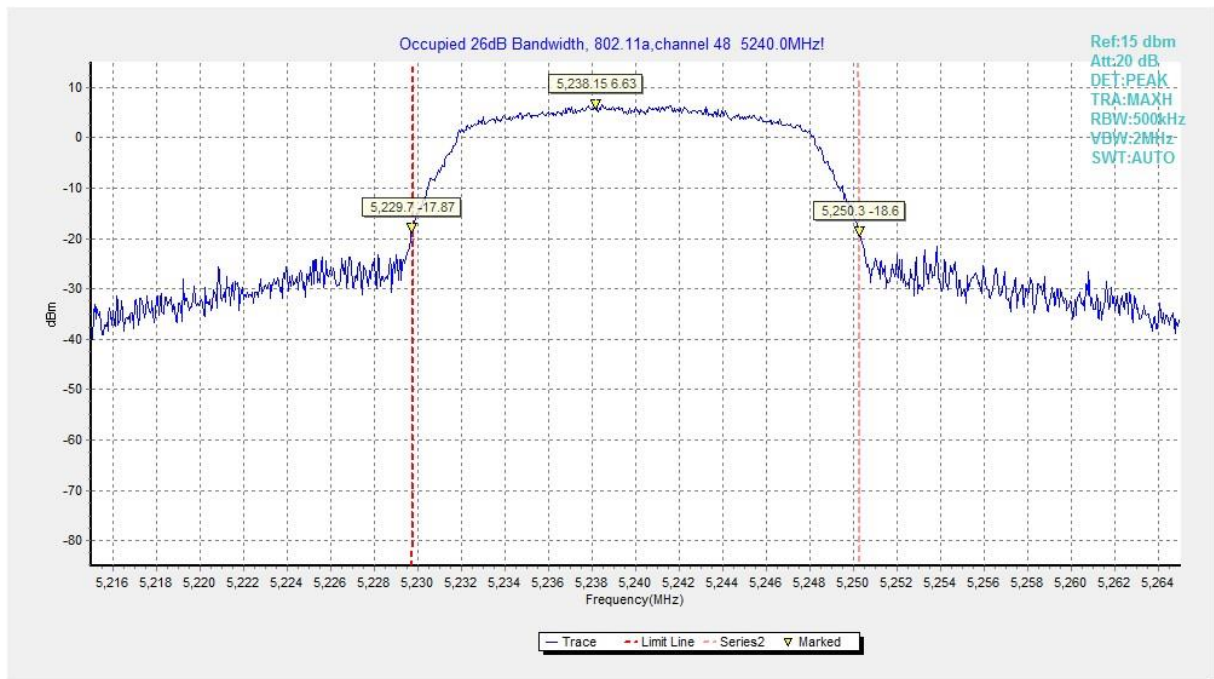
**Conclusion: PASS**



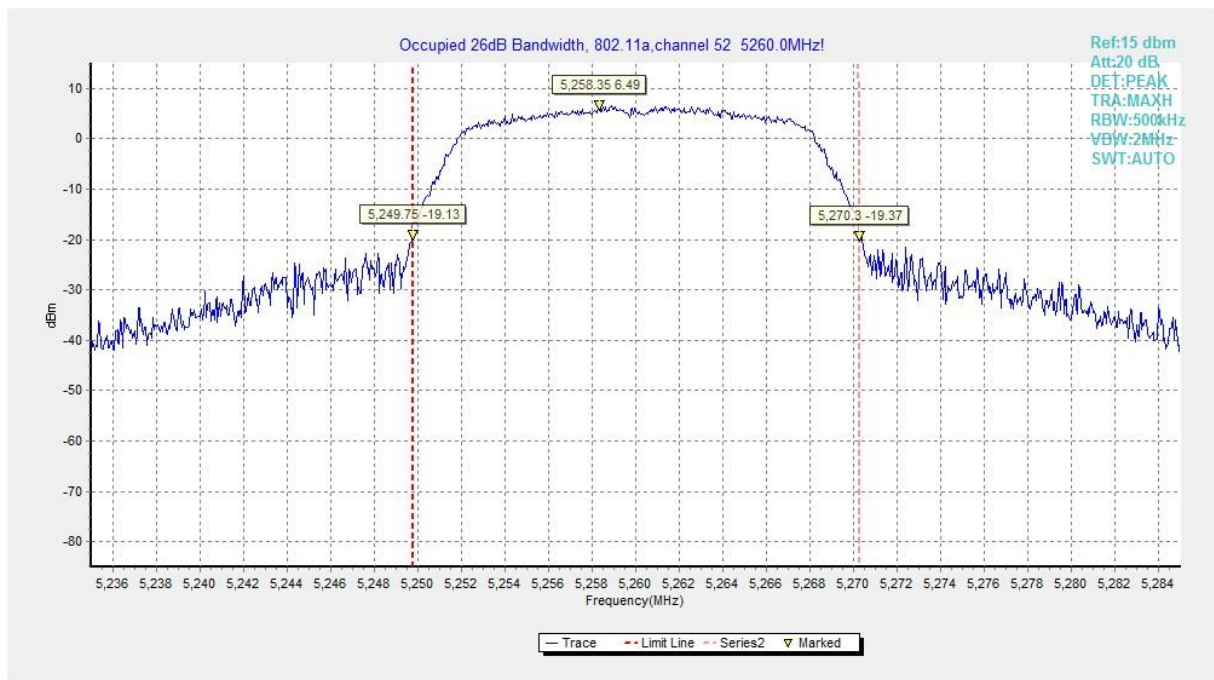
**Fig. 1 Occupied 26dB Bandwidth (802.11a, 5180MHz)**



**Fig. 2 Occupied 26dB Bandwidth (802.11a, 5200MHz)**



**Fig. 3 Occupied 26dB Bandwidth (802.11a, 5240MHz)**



**Fig. 4 Occupied 26dB Bandwidth (802.11a, 5260MHz)**

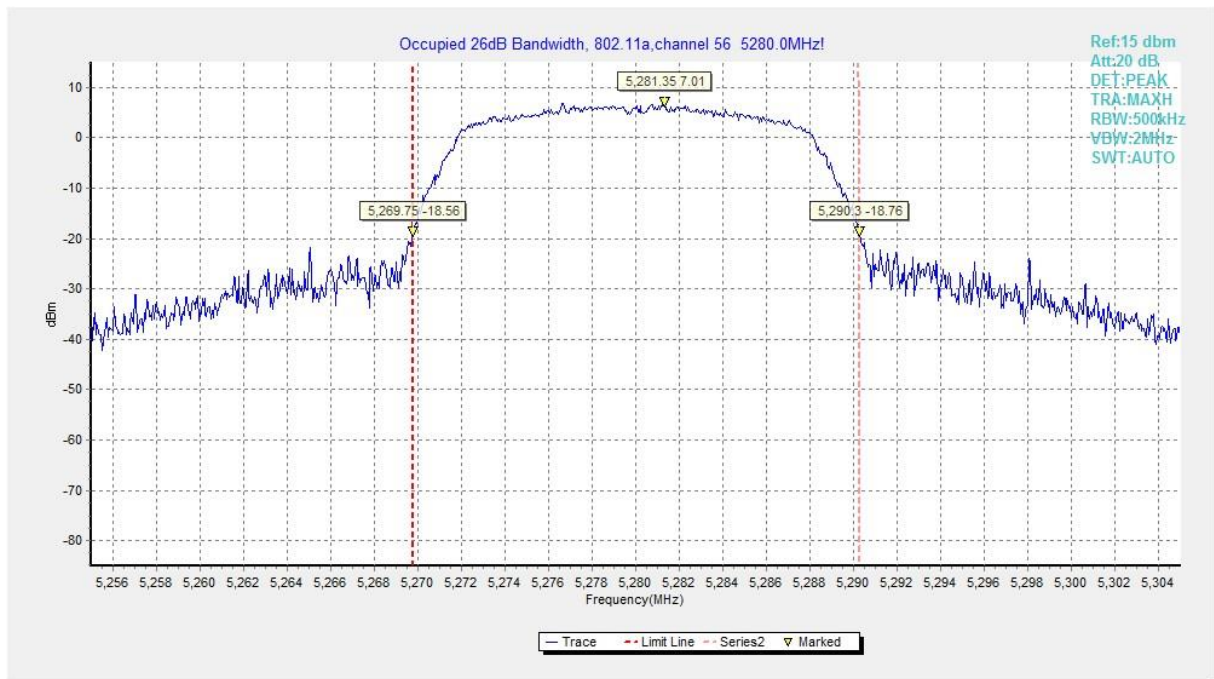


Fig. 5 Occupied 26dB Bandwidth (802.11a, 5280MHz)

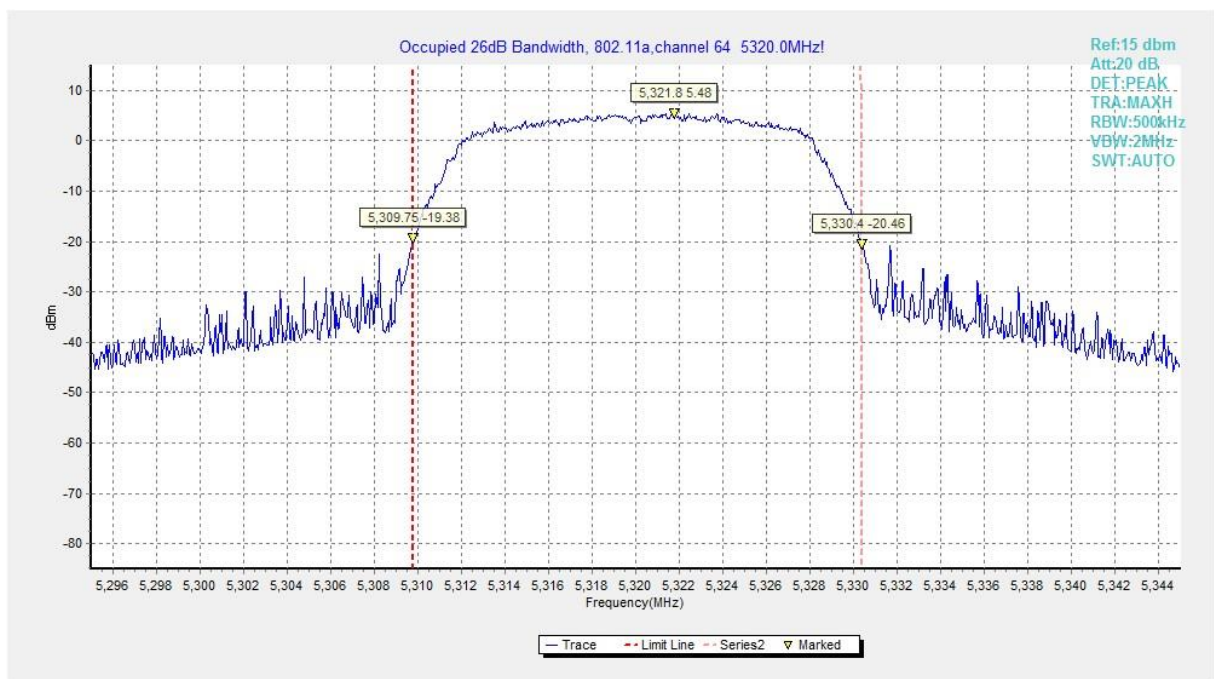


Fig. 6 Occupied 26dB Bandwidth (802.11a, 5320MHz)



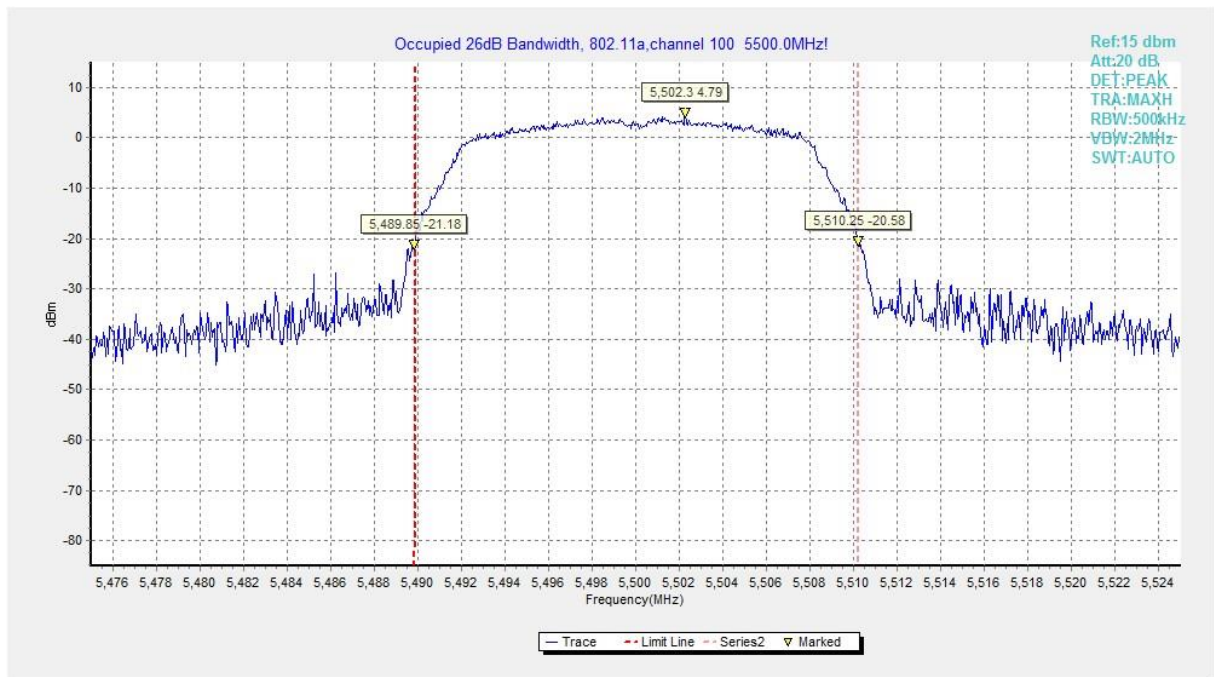


Fig. 7 Occupied 26dB Bandwidth (802.11a, 5500MHz)

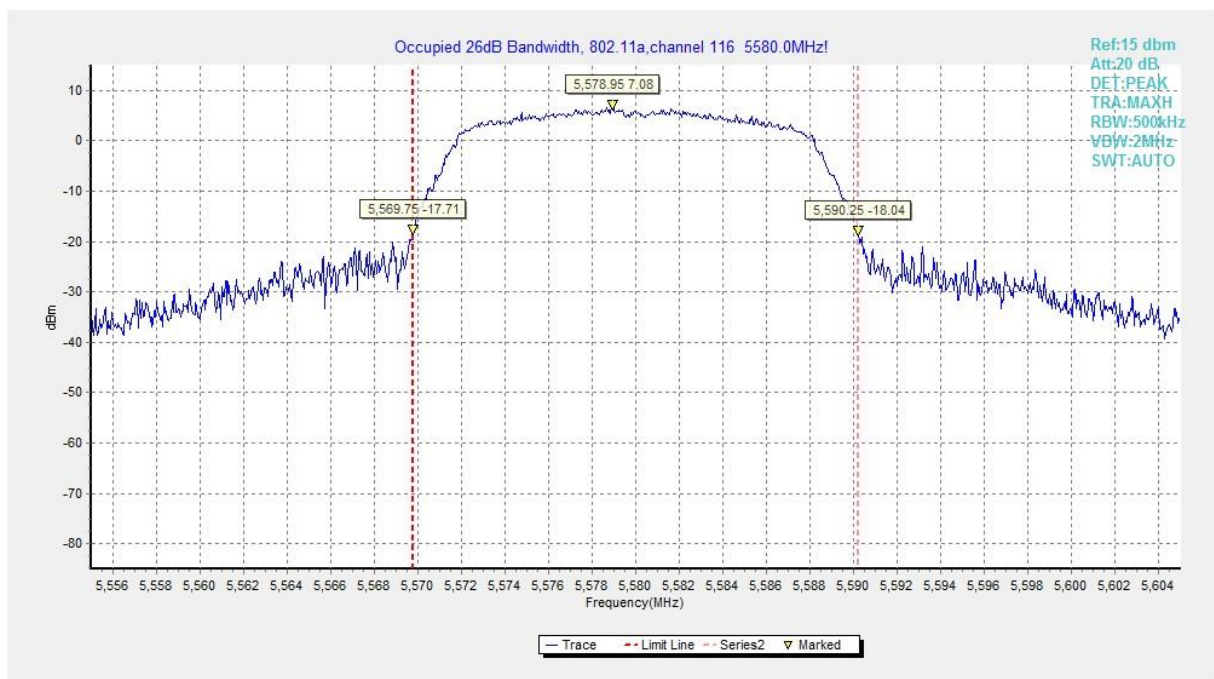
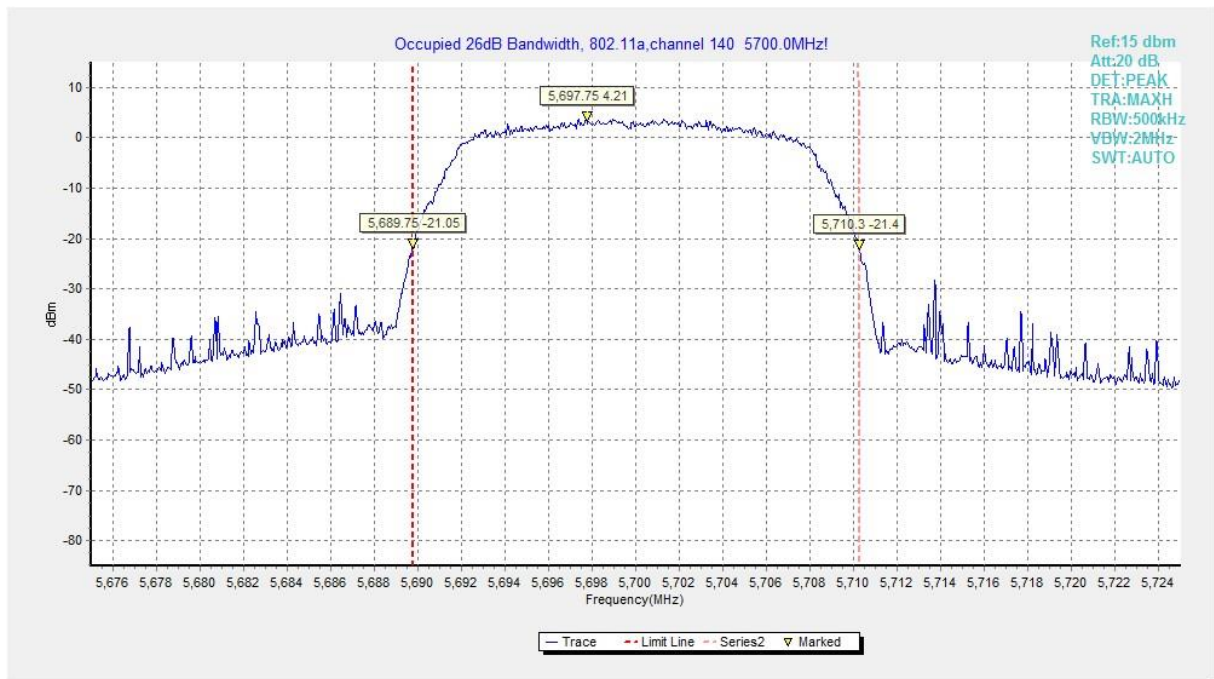
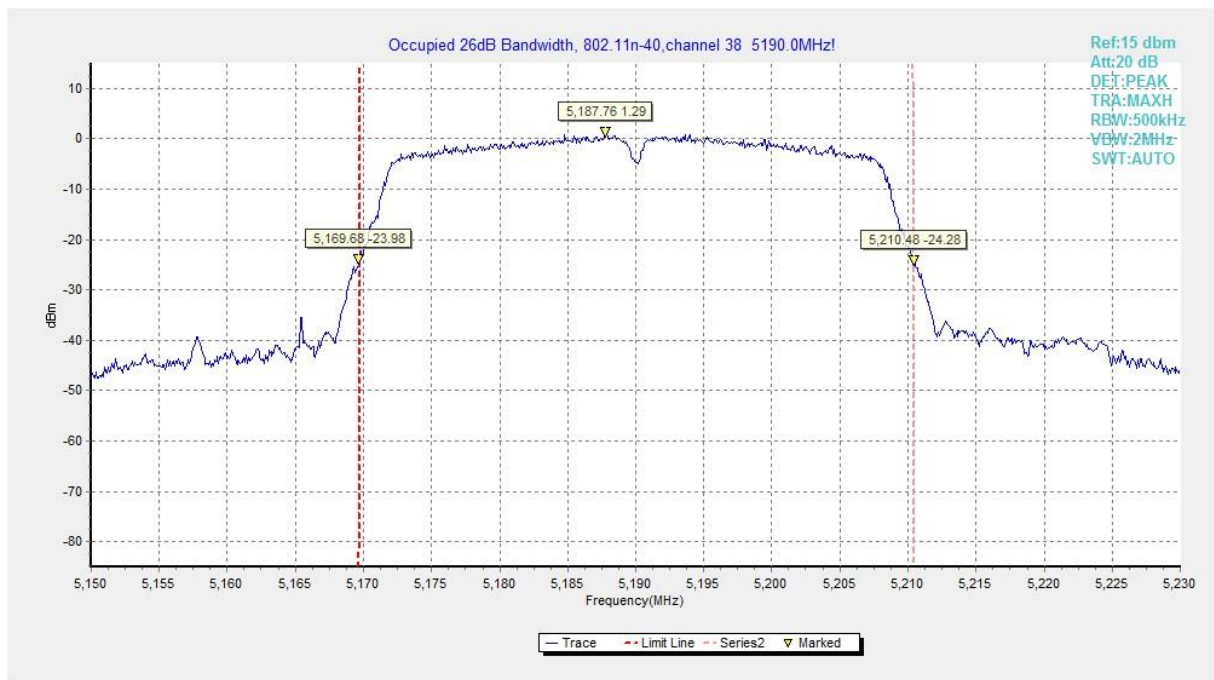


Fig. 8 Occupied 26dB Bandwidth (802.11a, 5580MHz)



**Fig. 9 Occupied 26dB Bandwidth (802.11a, 5700MHz)**



**Fig. 10 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)**



Fig. 11 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)

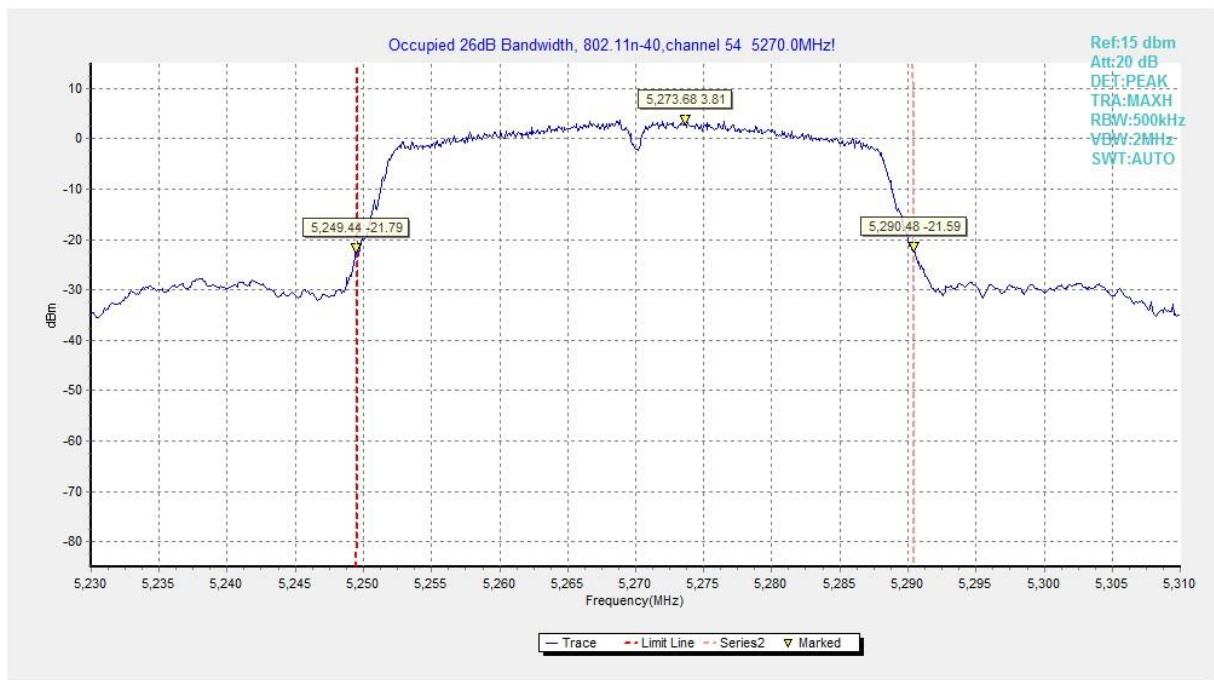


Fig. 12 Occupied 26dB Bandwidth (802.11n-HT40, 5270MHz)



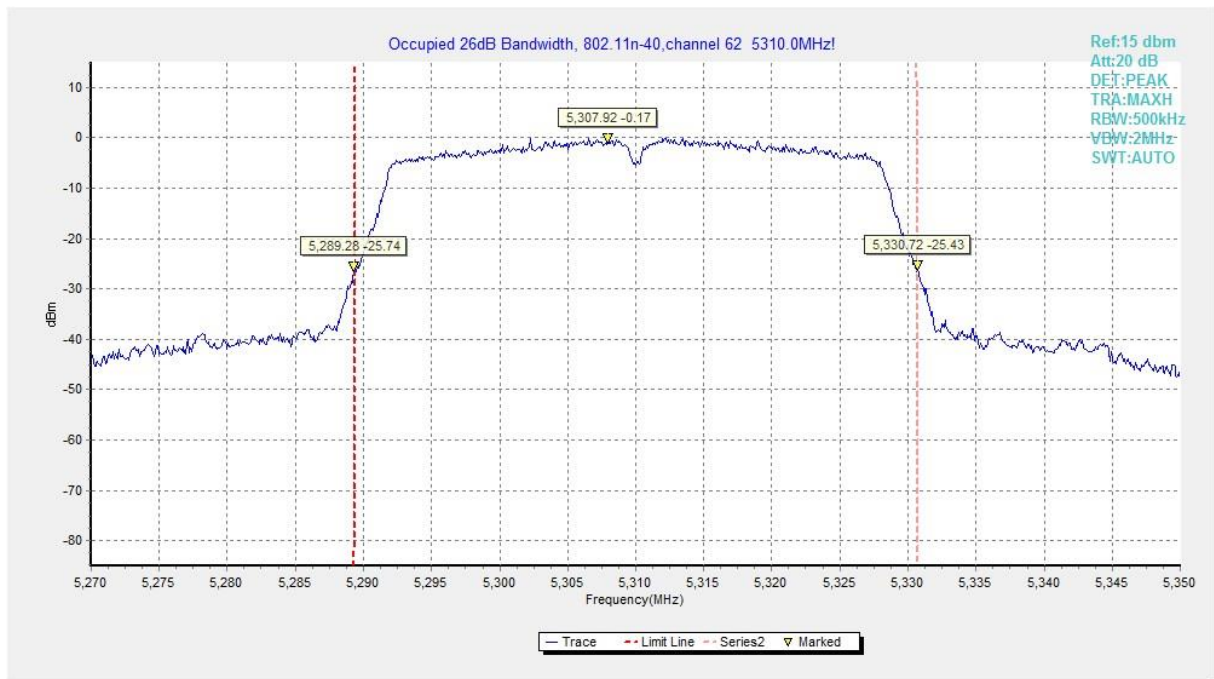


Fig. 13 Occupied 26dB Bandwidth (802.11n-HT40, 5310MHz)

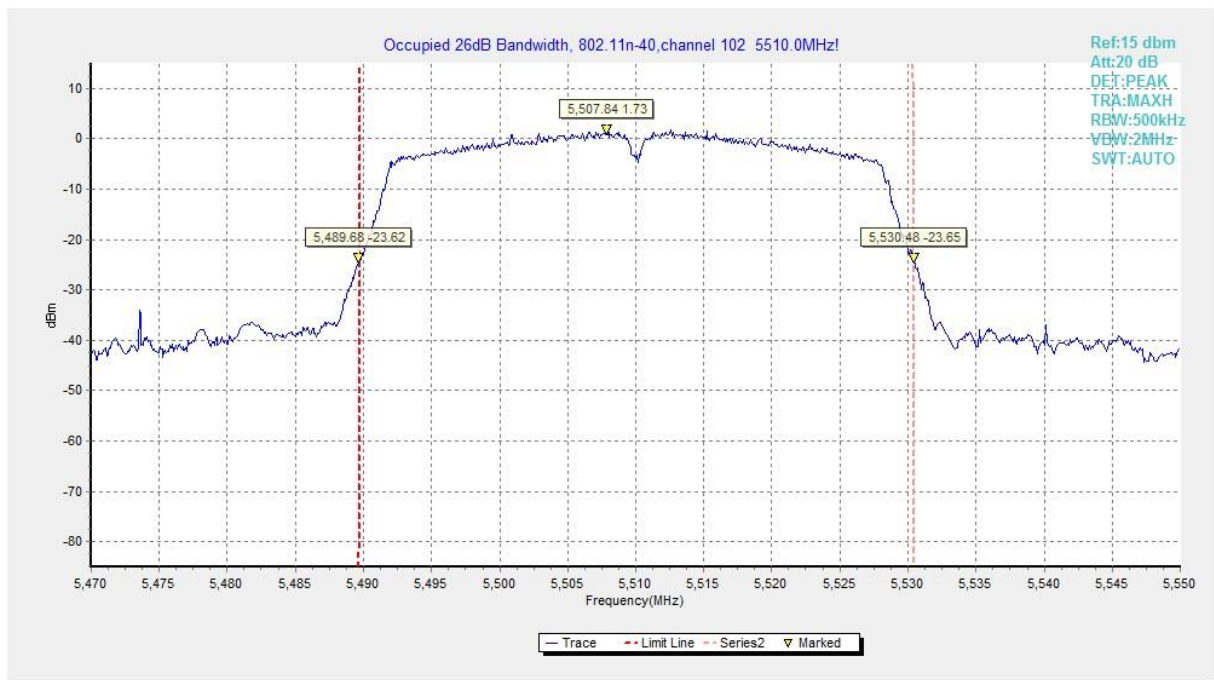


Fig. 14 Occupied 26dB Bandwidth (802.11n-HT40, 5510MHz)

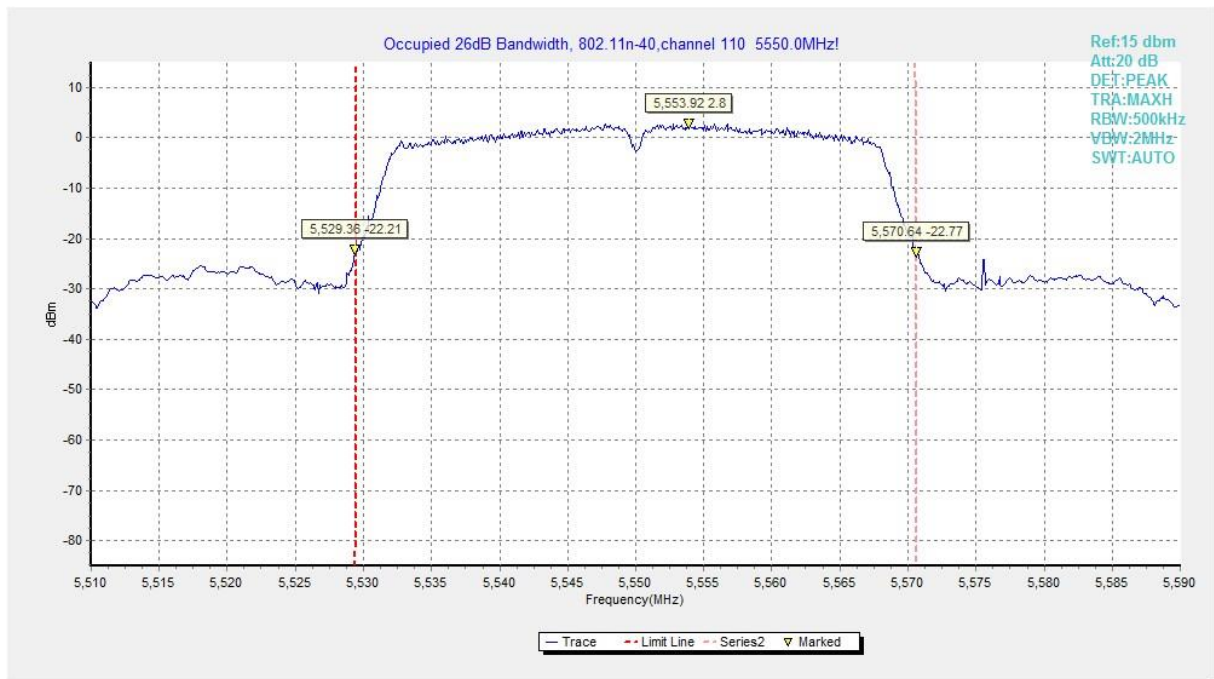


Fig. 15 Occupied 26dB Bandwidth (802.11n-HT40, 5550MHz)

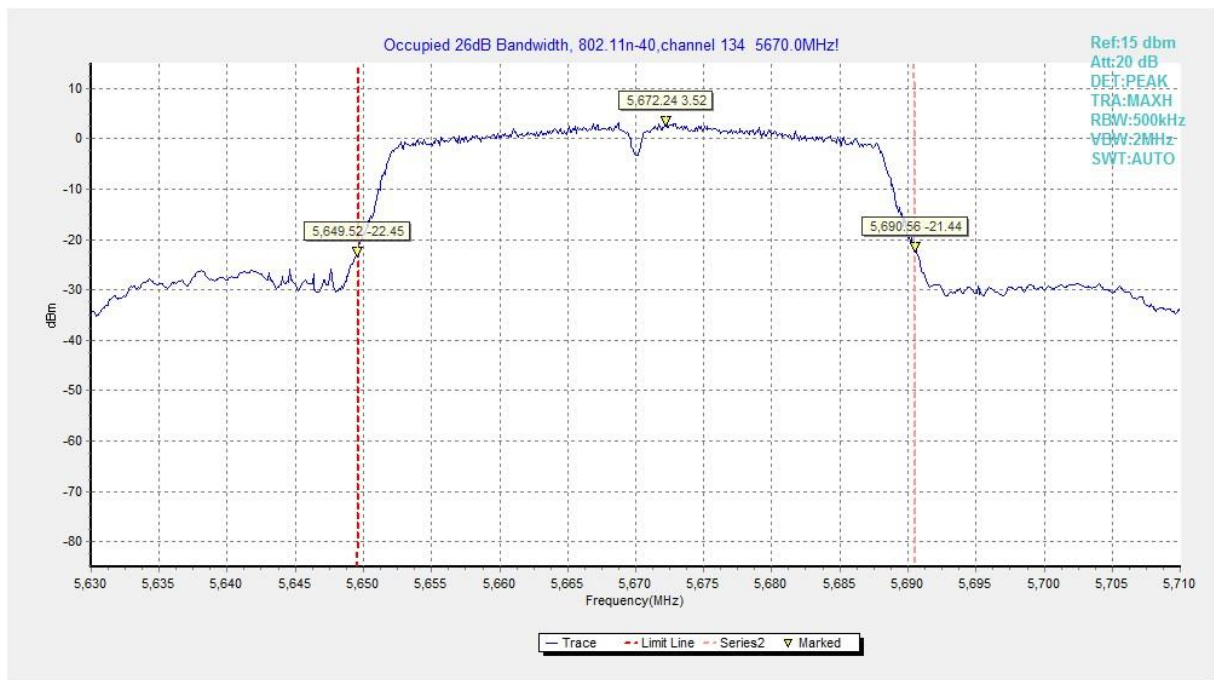


Fig. 16 Occupied 26dB Bandwidth (802.11n-HT40, 5670MHz)

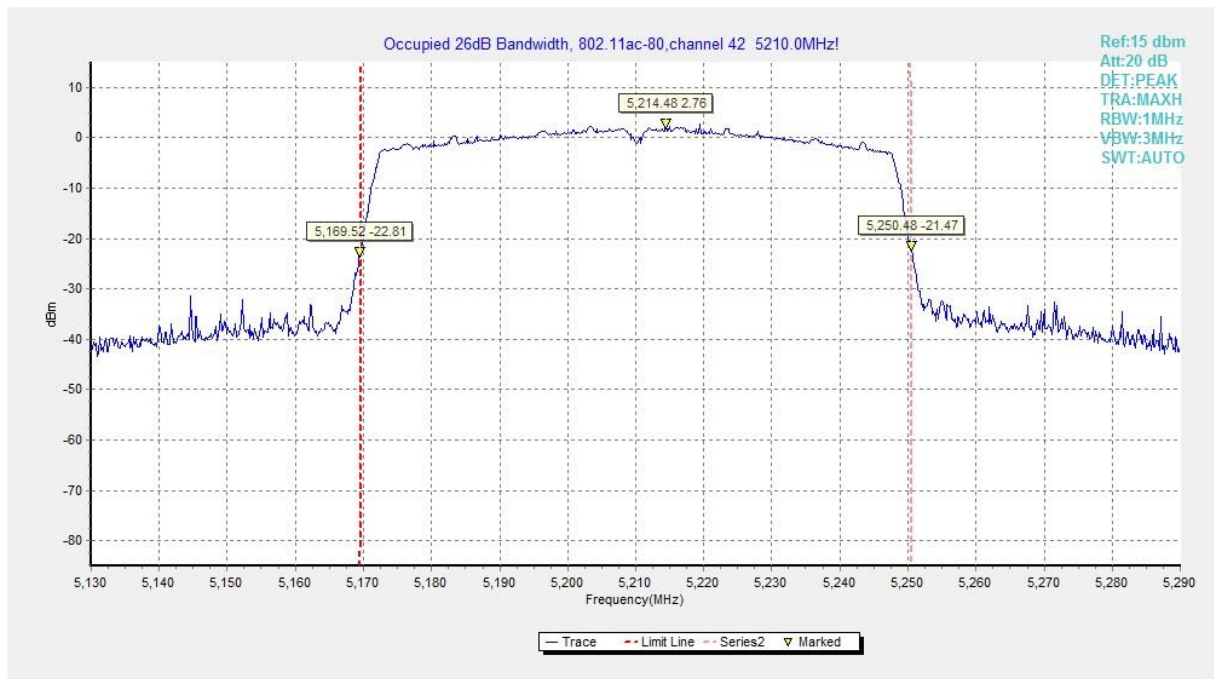


Fig. 17 Occupied 26dB Bandwidth (802.11ac-VHT80, 5210MHz)

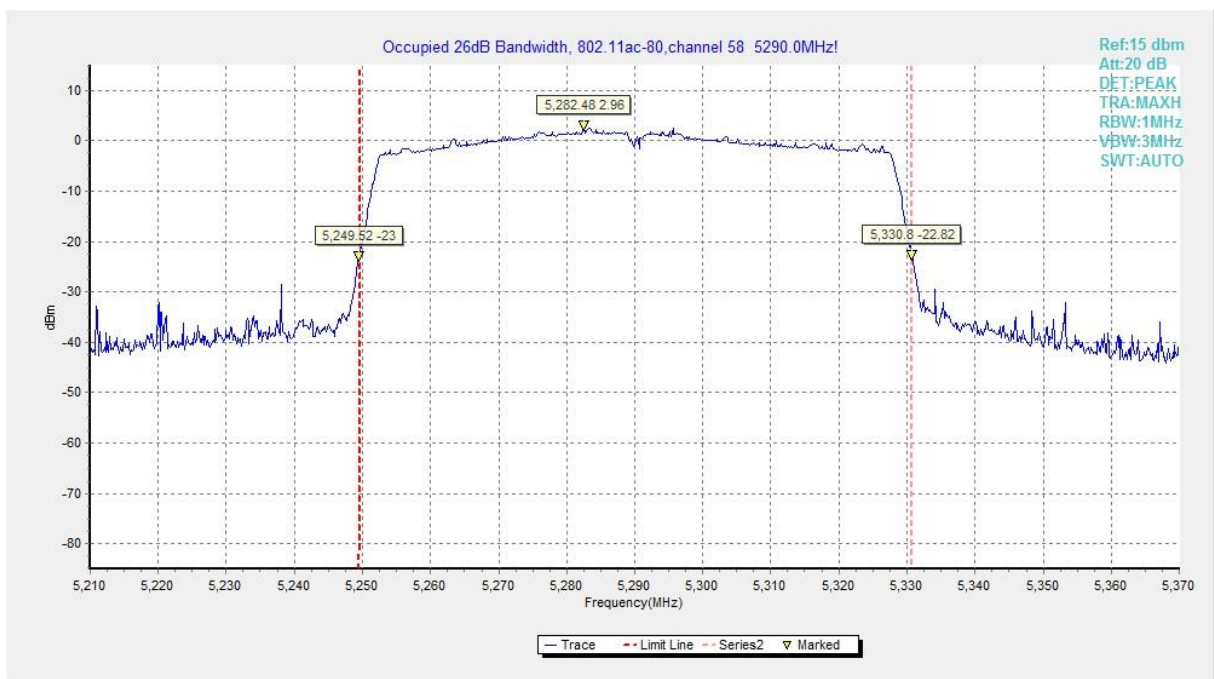


Fig. 18 Occupied 26dB Bandwidth (802.11ac-VHT80, 5290MHz)

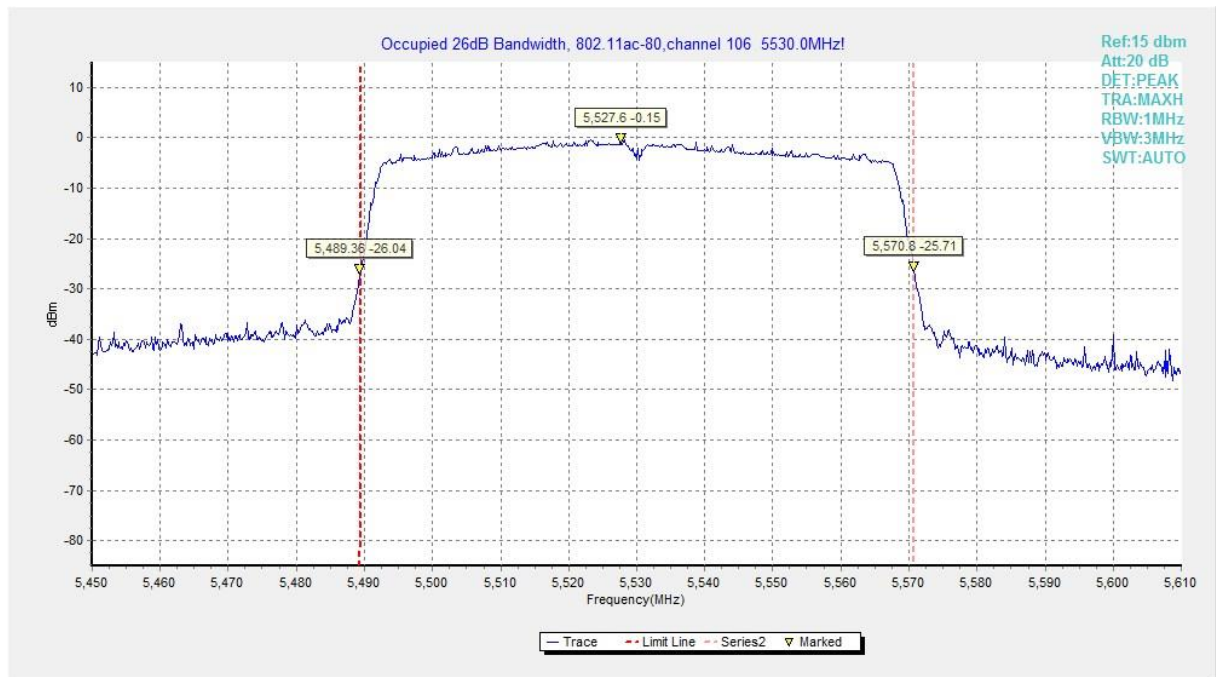


Fig. 19 Occupied 26dB Bandwidth (802.11ac-VHT80, 5530MHz)

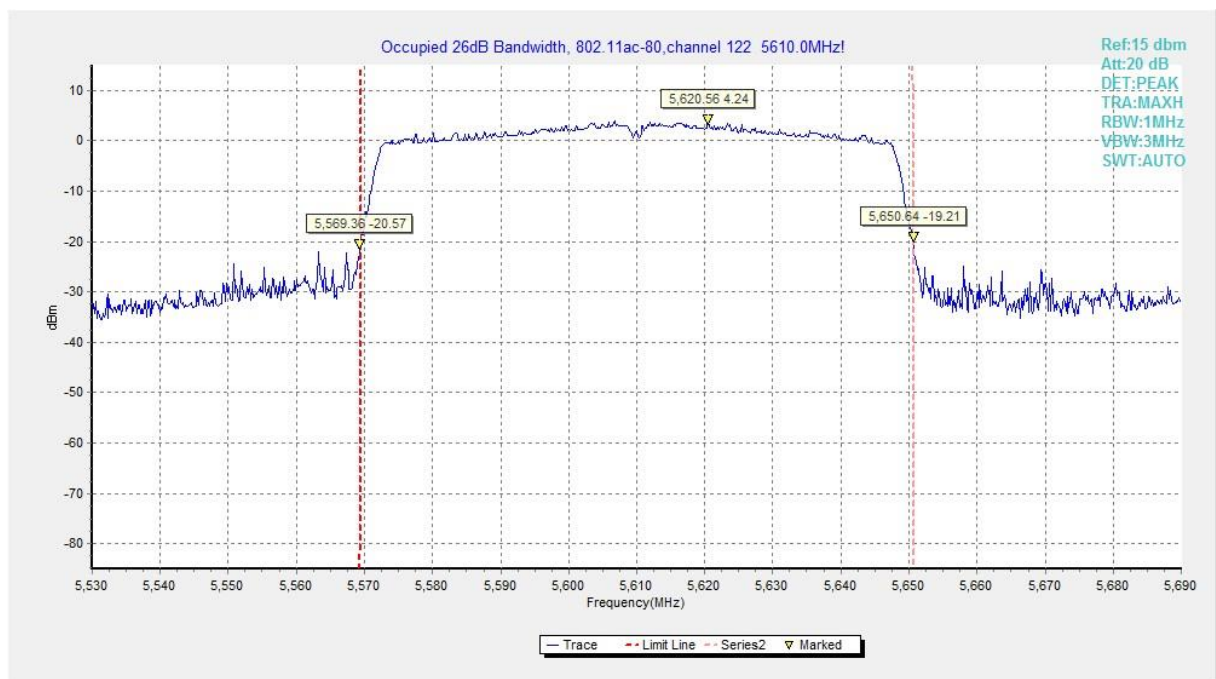


Fig. 20 Occupied 26dB Bandwidth (802.11ac-VHT80, 5610MHz)



### A.5. Occupied 6dB Bandwidth (conducted)

#### Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.407 (e)	$\geq 0.5$

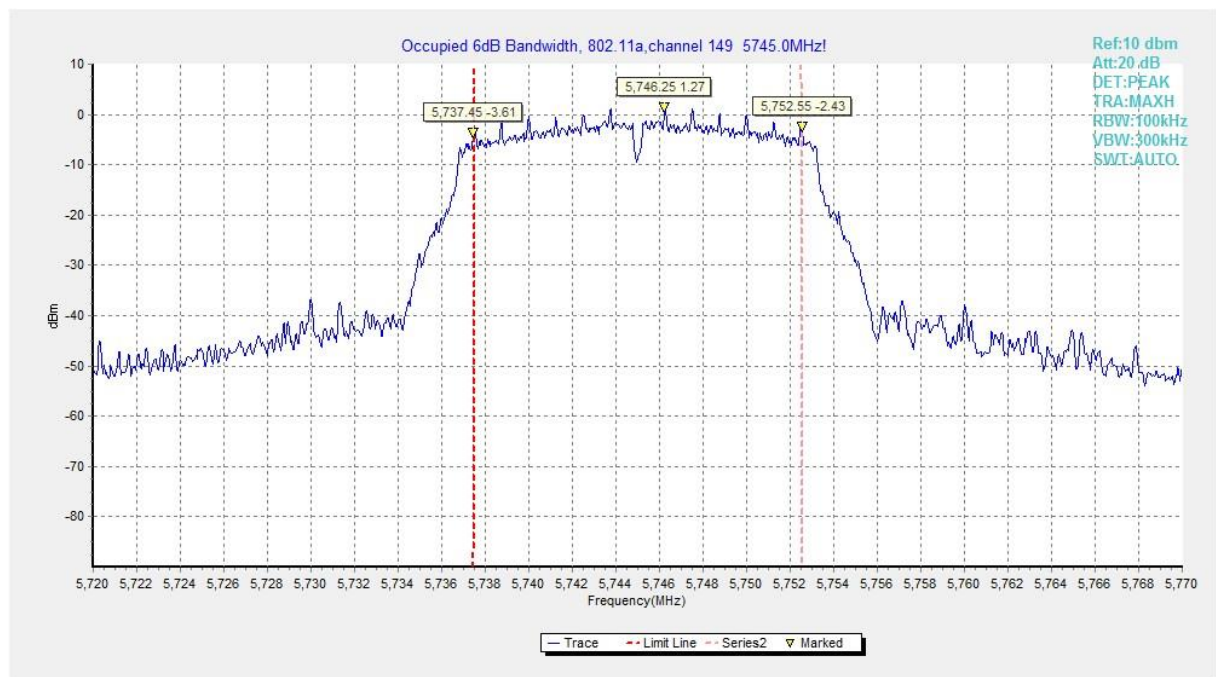
The measurement is made according to KDB 789033

#### Measurement Result:

Mode	Channel	Occupied 6dB Bandwidth( MHz)	Conclusion
802.11a	5745MHz(Ch149)	Fig.21	15.10
	5785MHz(Ch157)	Fig.22	15.45
	5825MHz(Ch165)	Fig.23	15.10
802.11n-HT40	5755MHz(Ch151)	Fig.24	35.04
	5795MHz(Ch159)	Fig.25	33.92
802.11ac-VHT80	5775MHz(Ch155)	Fig.26	75.20

See below for test graphs.

**Conclusion: PASS**



**Fig. 21 Occupied 6dB Bandwidth (802.11a, 5745MHz)**

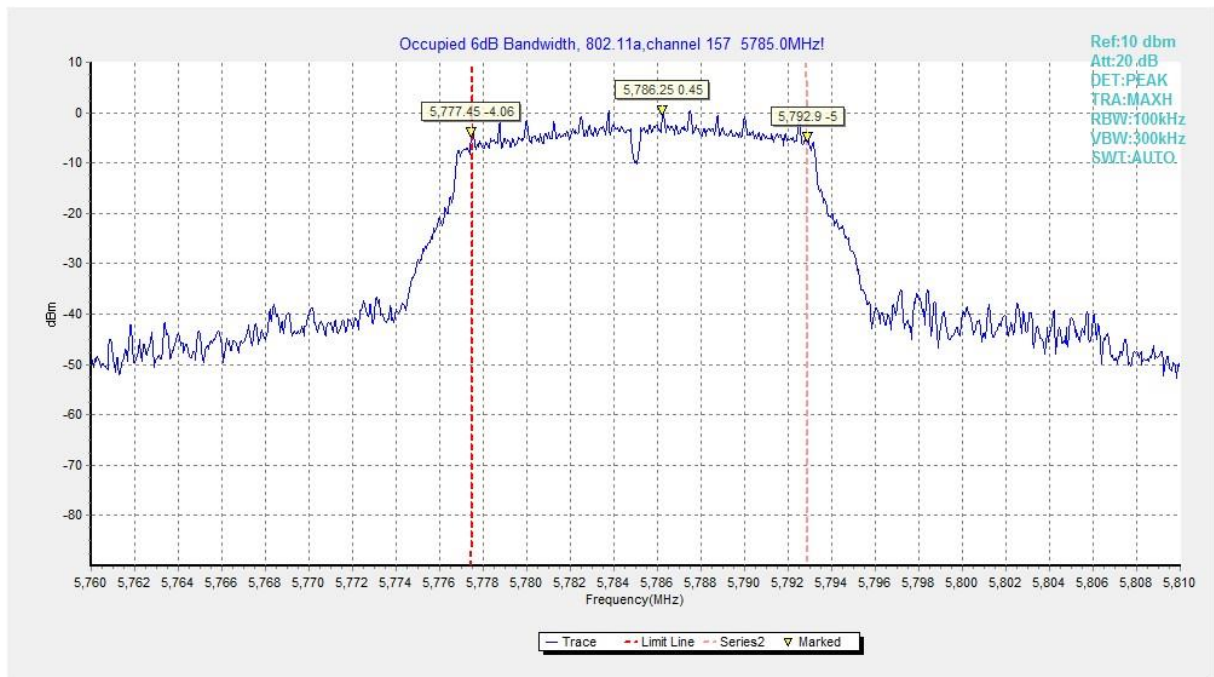


Fig. 22 Occupied 6dB Bandwidth (802.11a, 5785MHz)

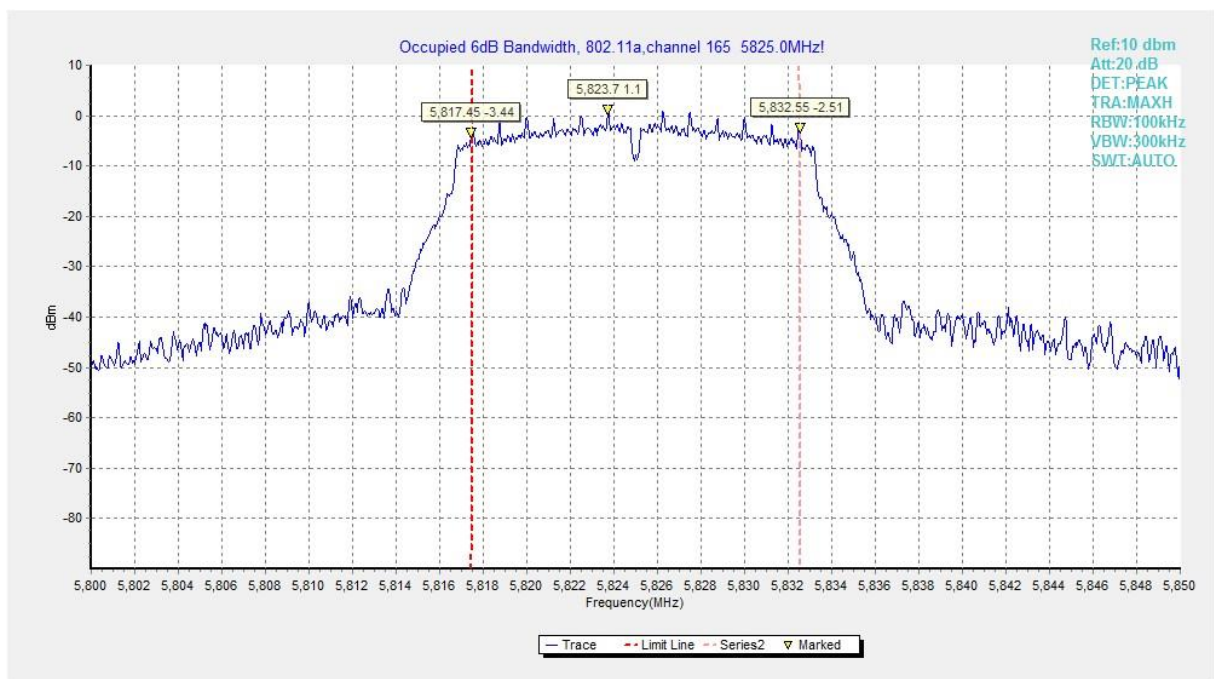


Fig. 23 Occupied 6dB Bandwidth (802.11a, 5825MHz)

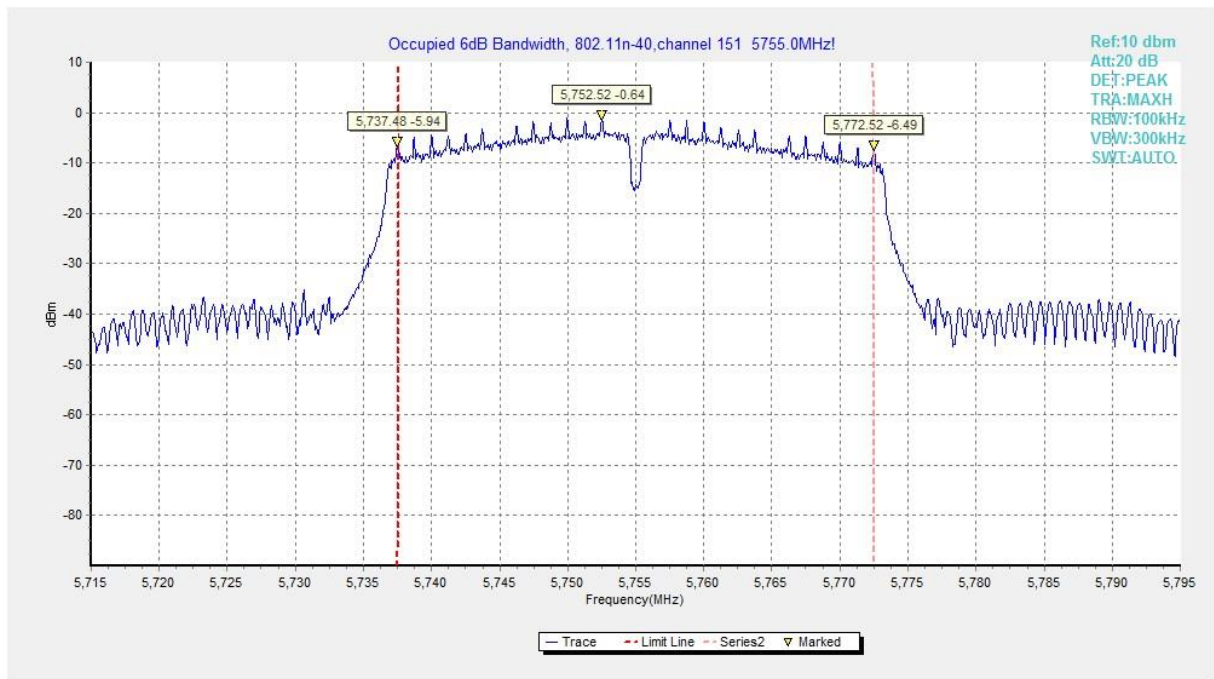


Fig. 24 Occupied 6dB Bandwidth (802.11n-HT40, 5755MHz)

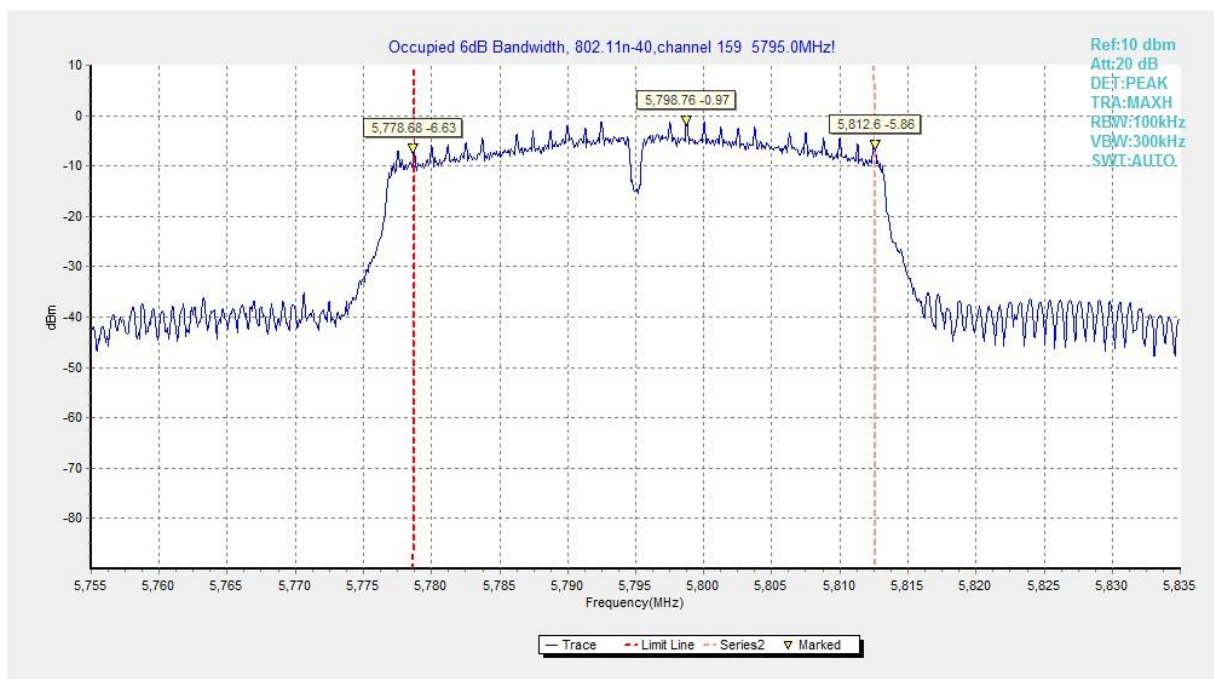


Fig. 25 Occupied 6dB Bandwidth (802.11n-HT40, 5795MHz)

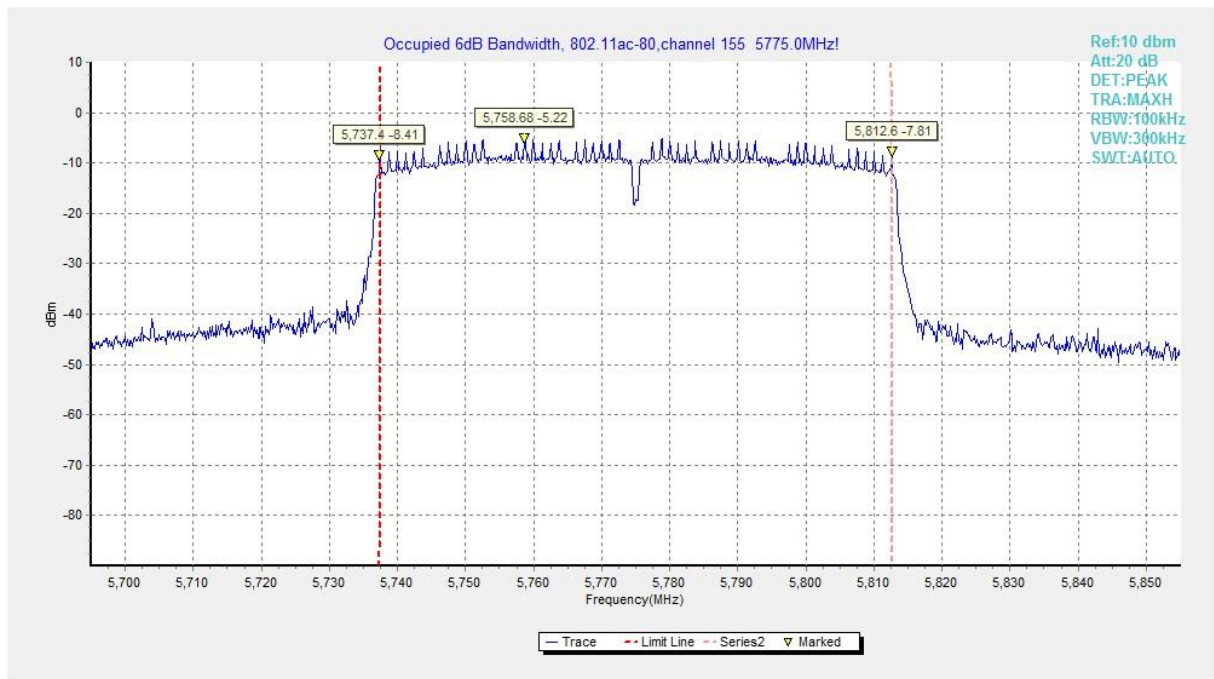


Fig. 26 Occupied 6dB Bandwidth (802.11ac-VHT80, 5775MHz)



### A.6. 99% Occupied Bandwidth (conducted)

#### Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.403	/

The measurement is made according to KDB 789033

#### Measurement Result:

Mode	Channel	99% Occupied Bandwidth(MHz)		Conclusion
802.11a	5180MHz(Ch36)	Fig.27	17.22	/
	5200MHz(Ch40)	Fig.28	17.30	/
	5240MHz(Ch48)	Fig.29	17.26	/
	5260MHz(Ch52)	Fig.30	17.26	/
	5280MHz(Ch56)	Fig.31	17.18	/
	5320MHz(Ch64)	Fig.32	17.22	/
	5500MHz(Ch100)	Fig.33	17.22	/
	5580MHz(Ch116)	Fig.34	17.30	/
802.11n-HT40	5700MHz(Ch140)	Fig.35	17.22	/
	5190MHz(Ch38)	Fig.36	36.12	/
	5230MHz(Ch46)	Fig.37	36.12	/
	5270MHz(Ch54)	Fig.38	36.04	/
	5310MHz(Ch62)	Fig.39	36.28	/
	5510MHz(Ch102)	Fig.40	36.04	/
	5550MHz(Ch110)	Fig.41	36.28	/
802.11 ac-VHT80	5670MHz(Ch134)	Fig.42	36.36	/
	5210MHz(Ch42)	Fig.43	75.12	/
	5290MHz(Ch58)	Fig.44	75.12	/
	5530MHz(Ch106)	Fig.45	75.28	/
	5610MHz(Ch122)	Fig.46	75.28	/

See below for test graphs.

**Conclusion: PASS**

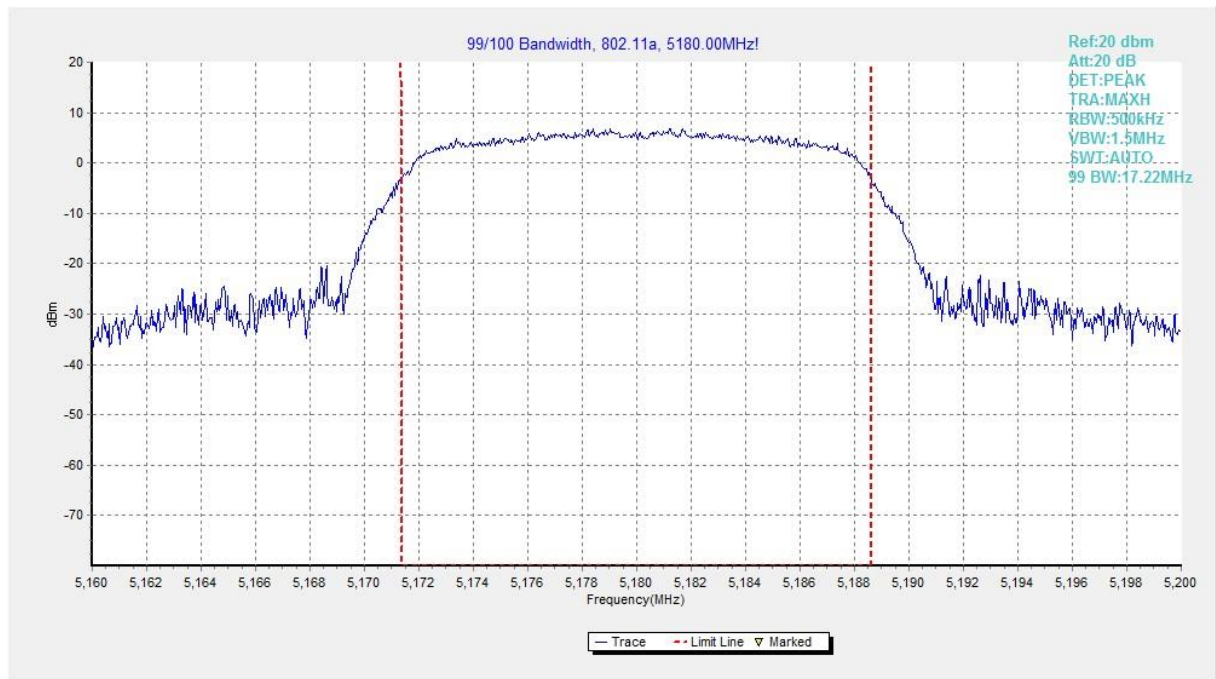


Fig. 27 99% Occupied Bandwidth (802.11a, 5180MHz)

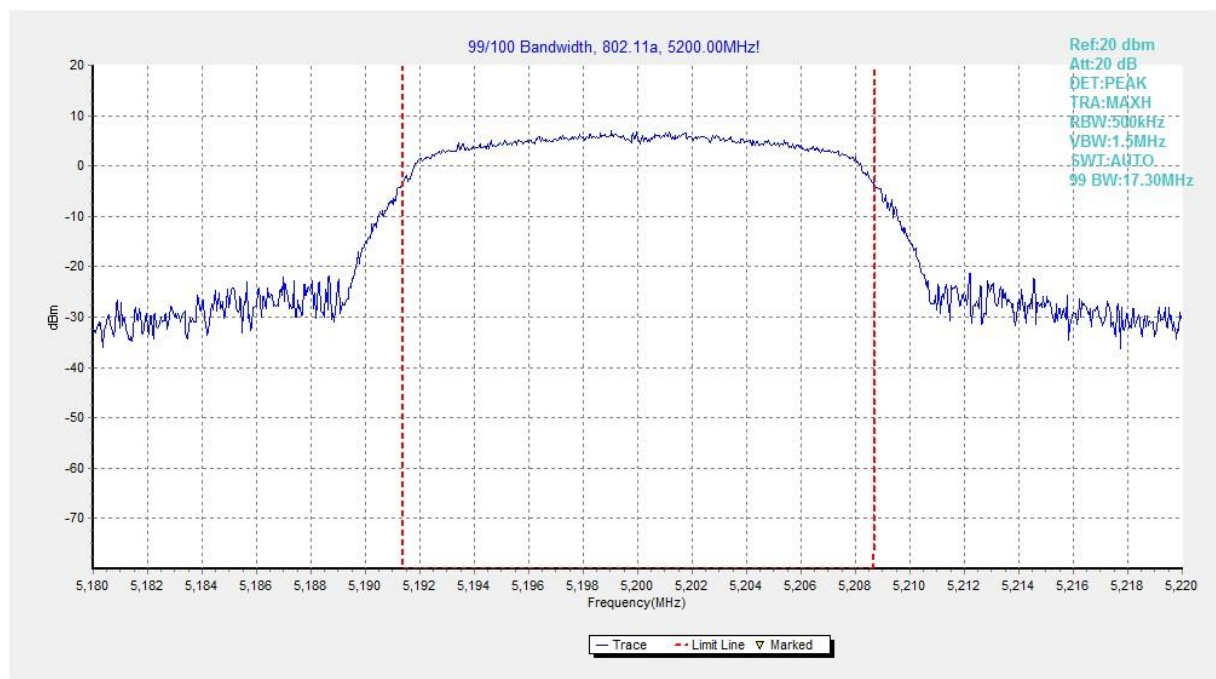


Fig. 28 99% Occupied Bandwidth (802.11a, 5200MHz)

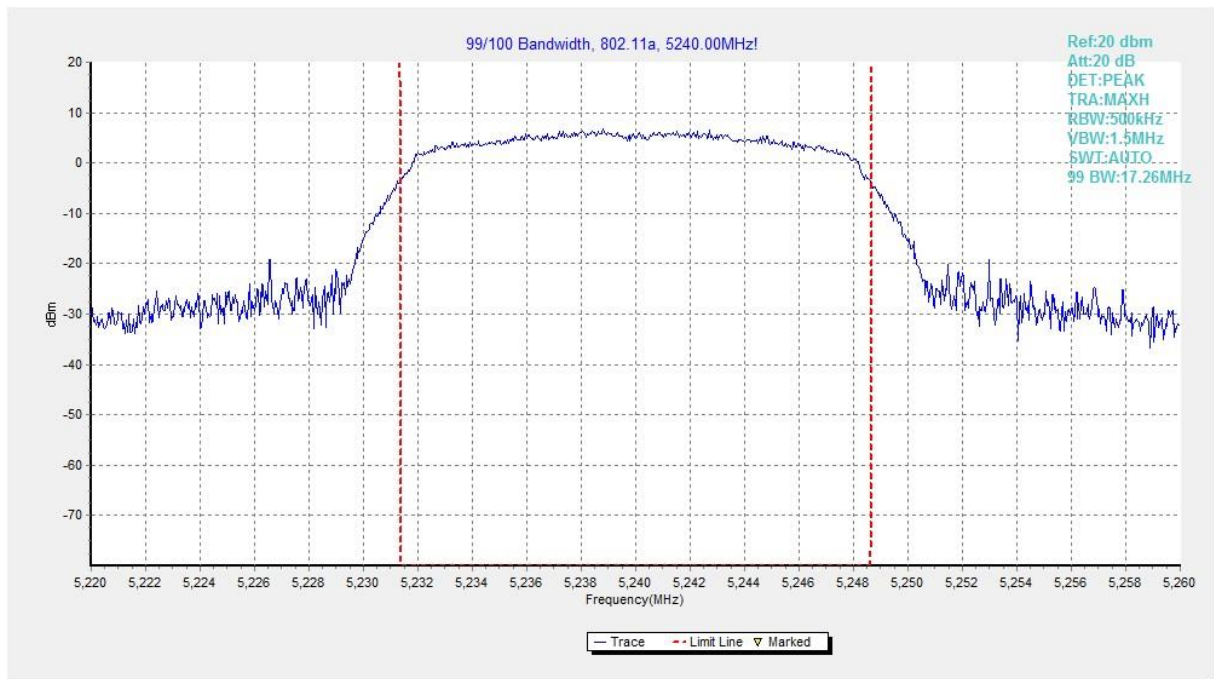


Fig. 29 99% Occupied Bandwidth (802.11a, 5240MHz)

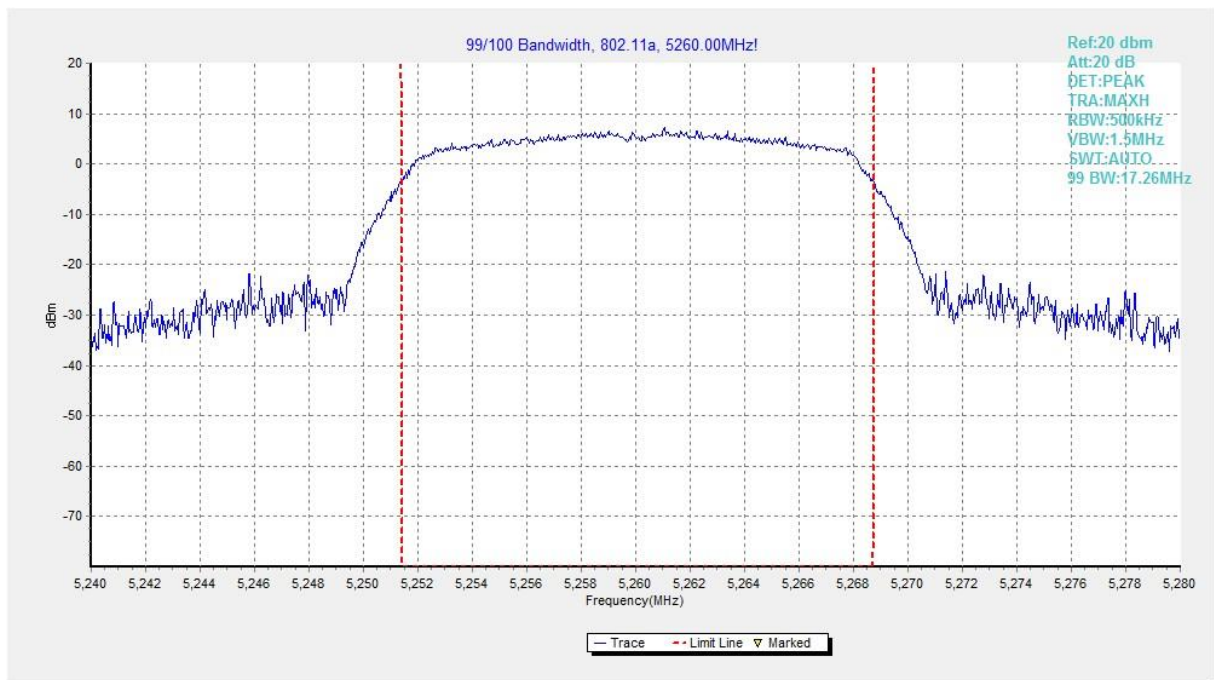


Fig. 30 99% Occupied Bandwidth (802.11a, 5260MHz)

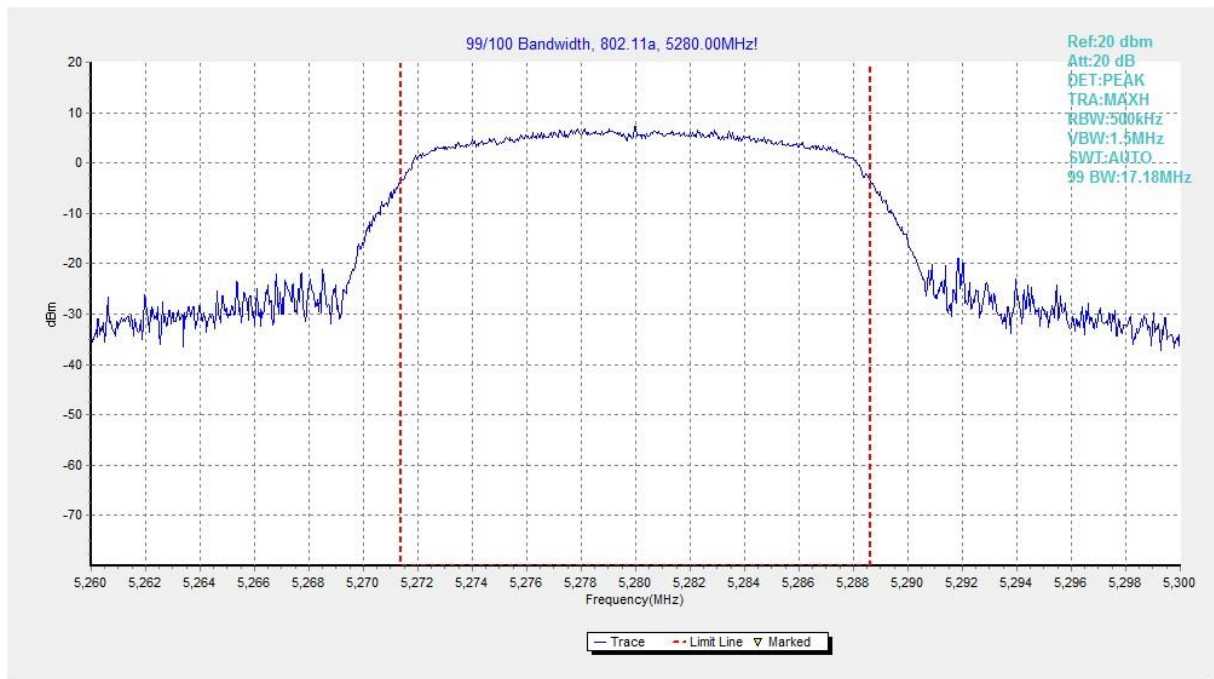


Fig. 31 99% Occupied Bandwidth (802.11a, 5280MHz)

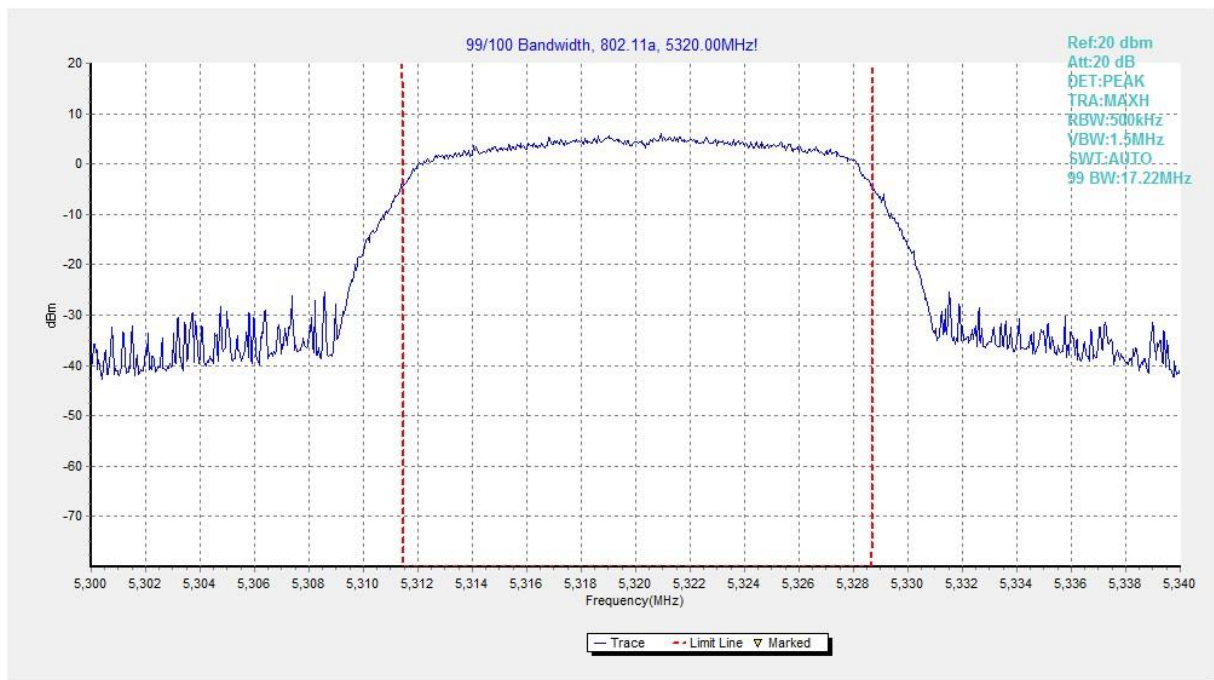


Fig. 32 99% Occupied Bandwidth (802.11a, 5320MHz)



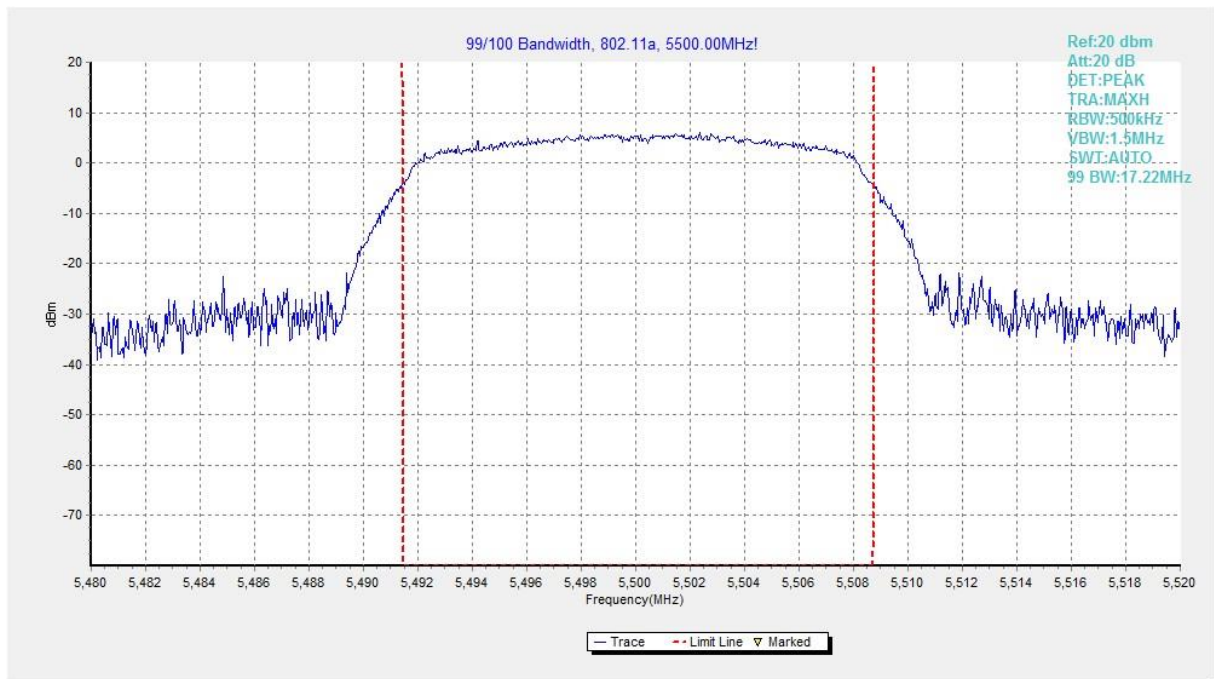


Fig. 33 99% Occupied Bandwidth (802.11a, 5500MHz)

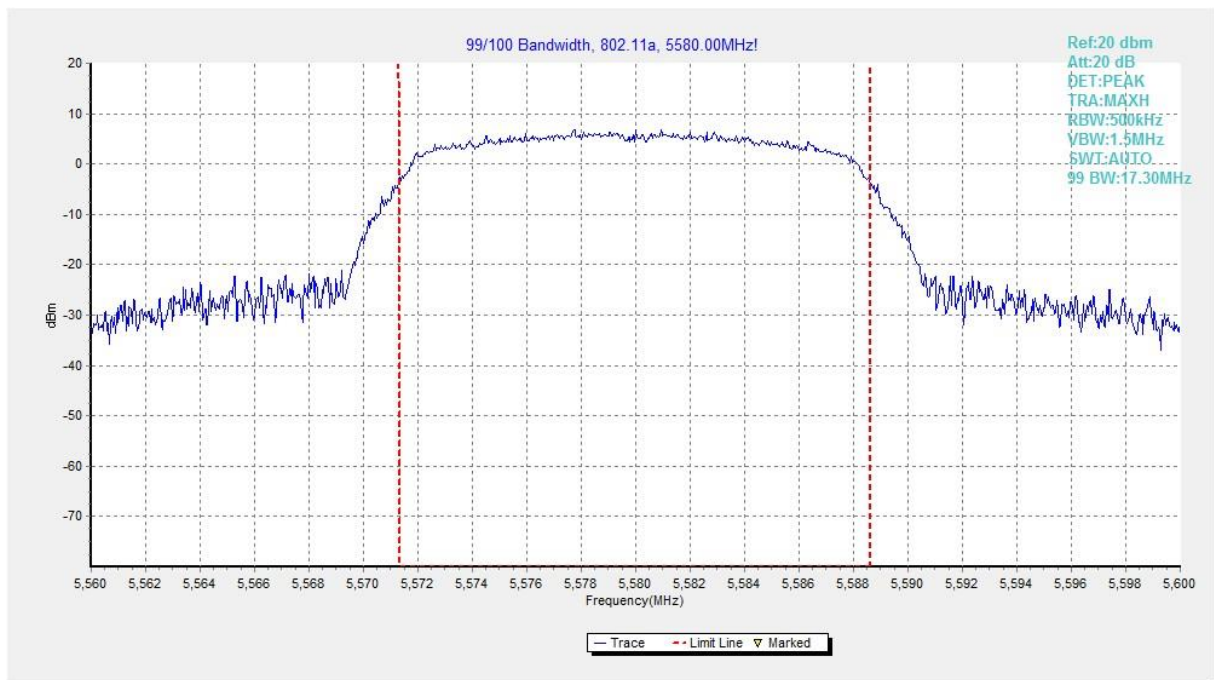


Fig. 34 99% Occupied Bandwidth (802.11a, 5580MHz)

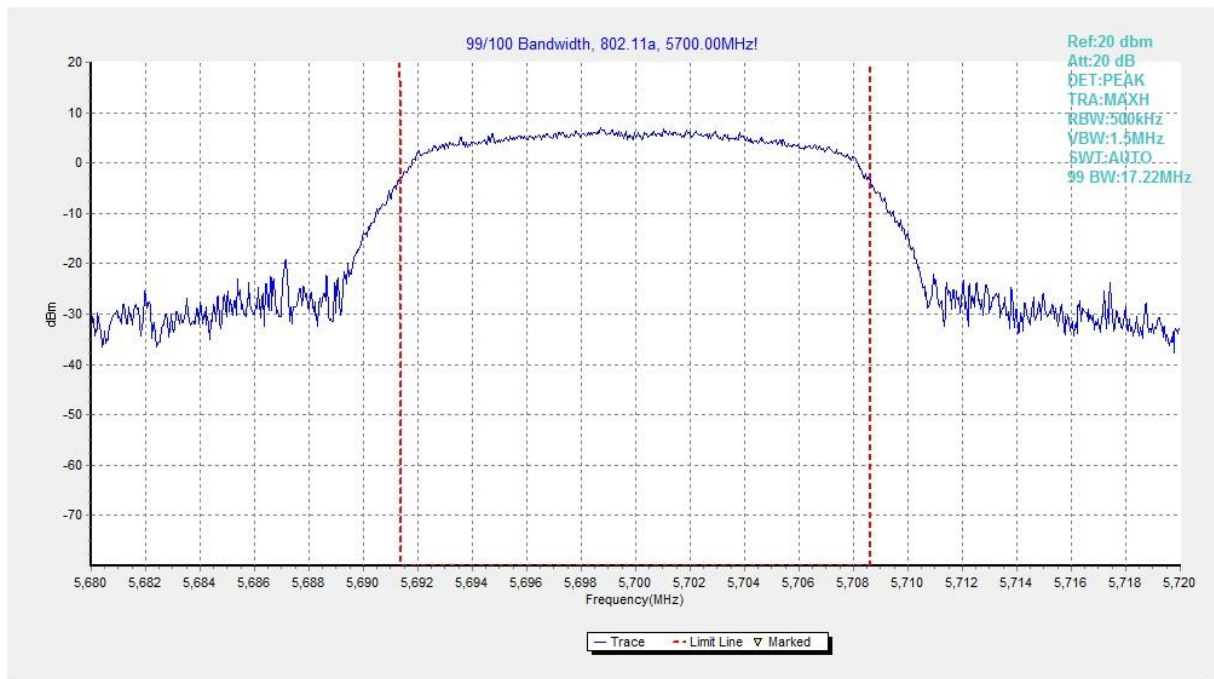


Fig. 35 99% Occupied Bandwidth (802.11a, 5700MHz)

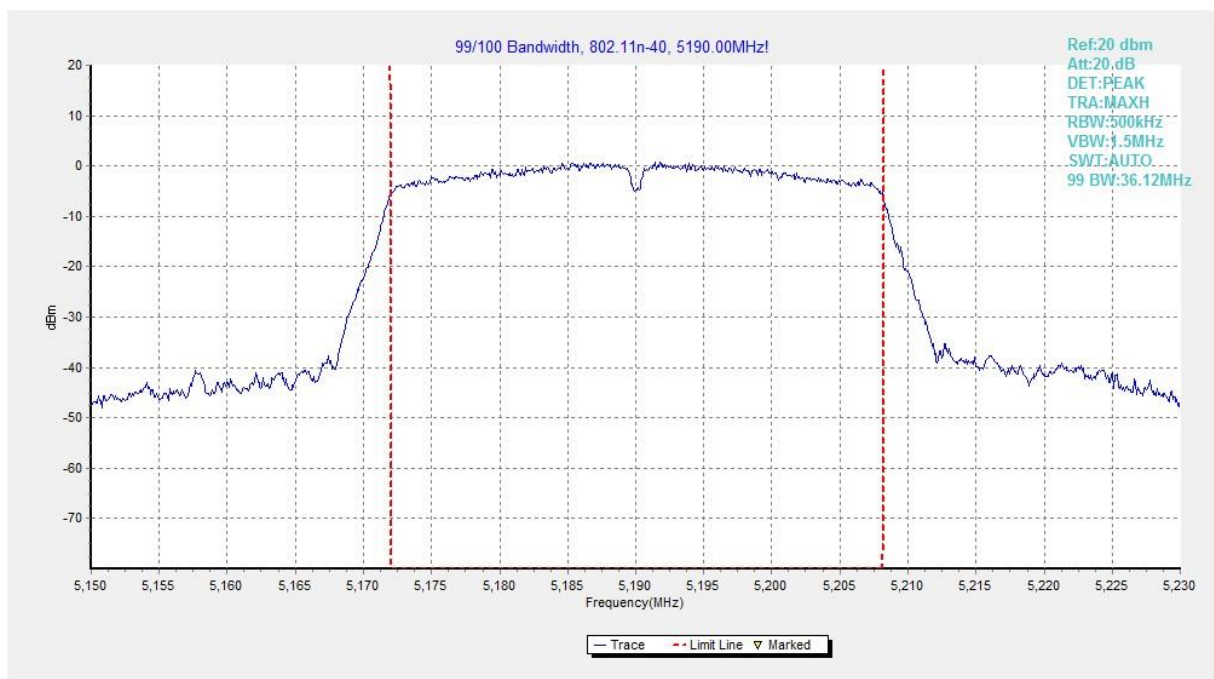


Fig. 36 99% Occupied Bandwidth (802.11n-HT40, 5190MHz)

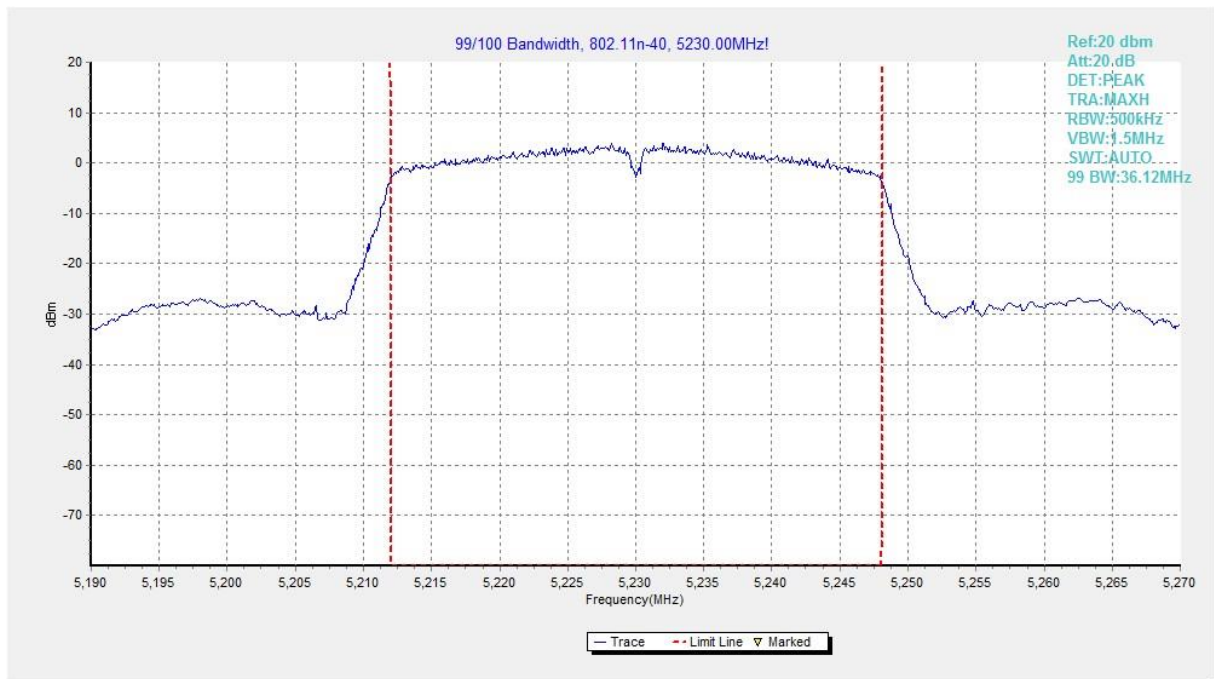


Fig. 37 99% Occupied Bandwidth (802.11n-HT40, 5230MHz)

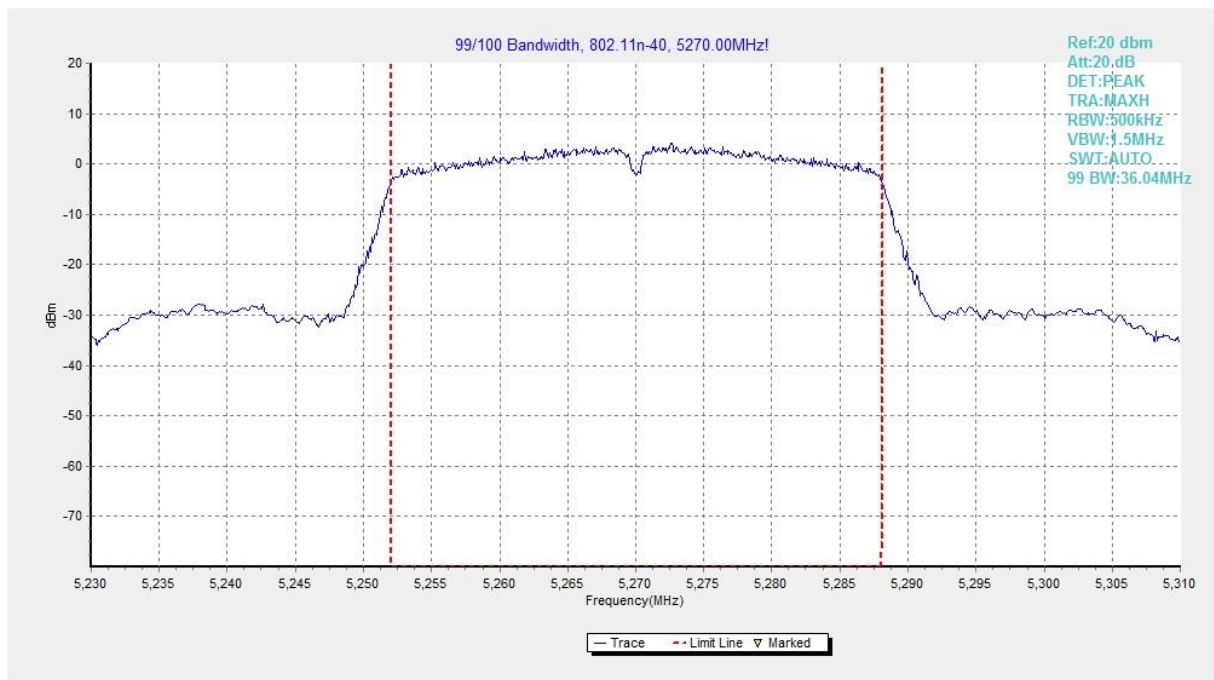


Fig. 38 99% Occupied Bandwidth (802.11n-HT40, 5270MHz)

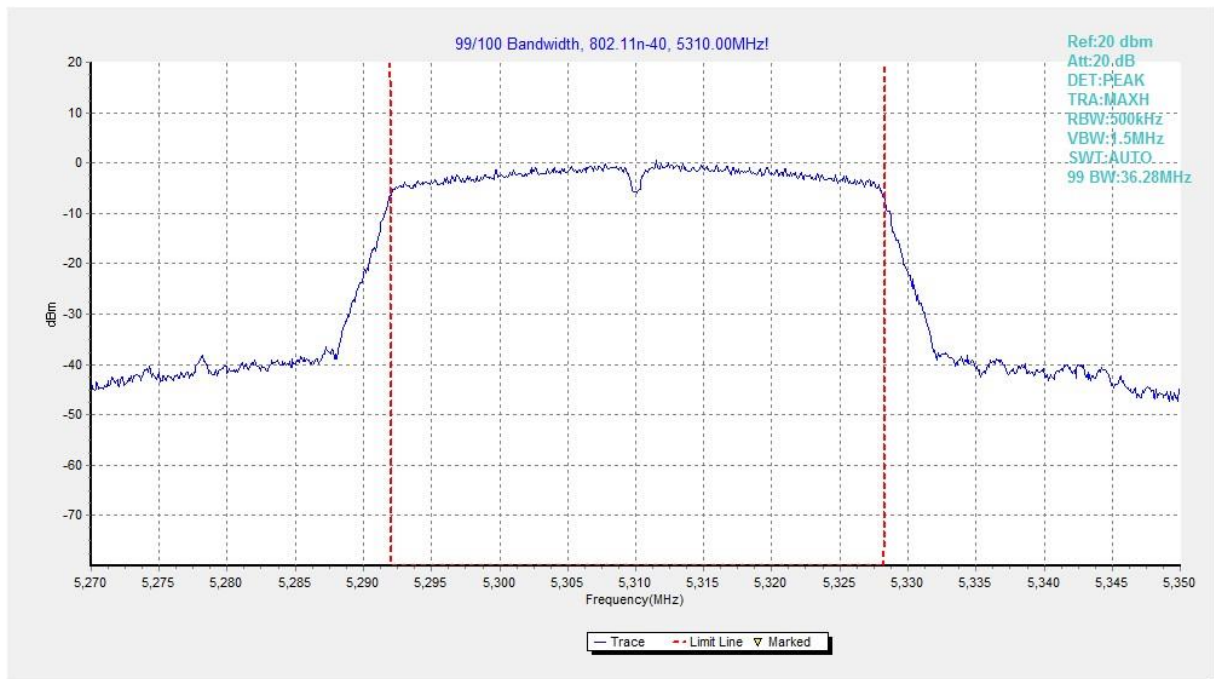


Fig. 39 99% Occupied Bandwidth (802.11n-HT40, 5310MHz)

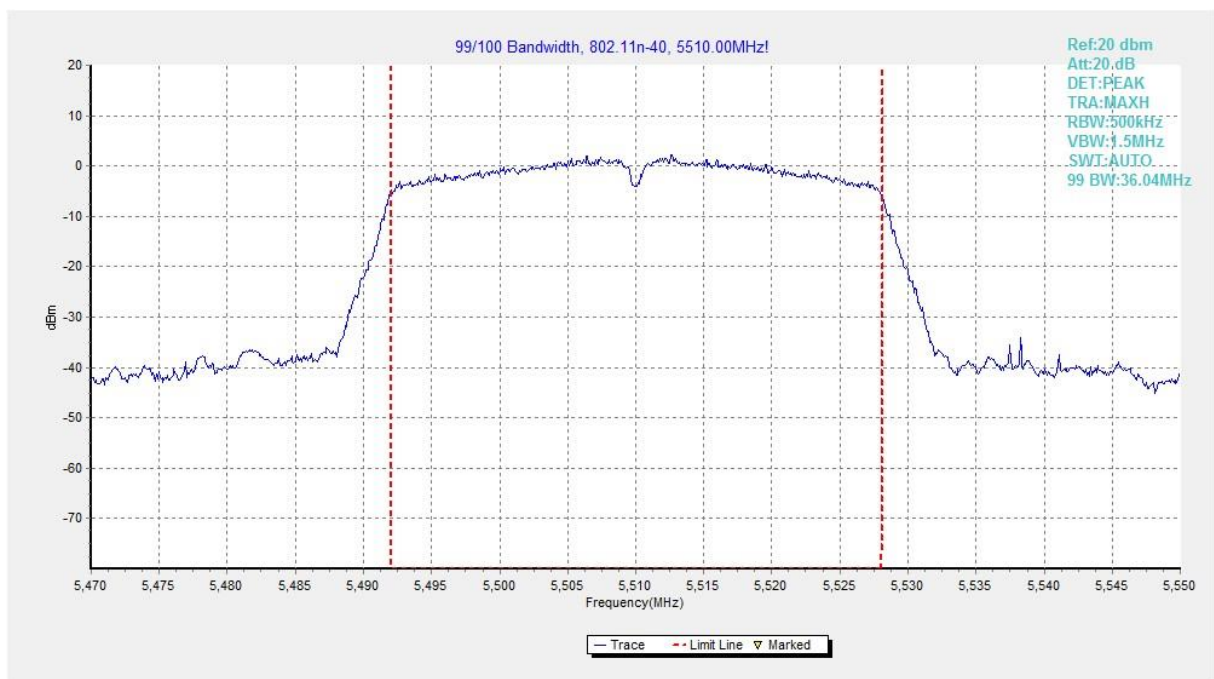


Fig. 40 99% Occupied Bandwidth (802.11n-HT40, 5510MHz)



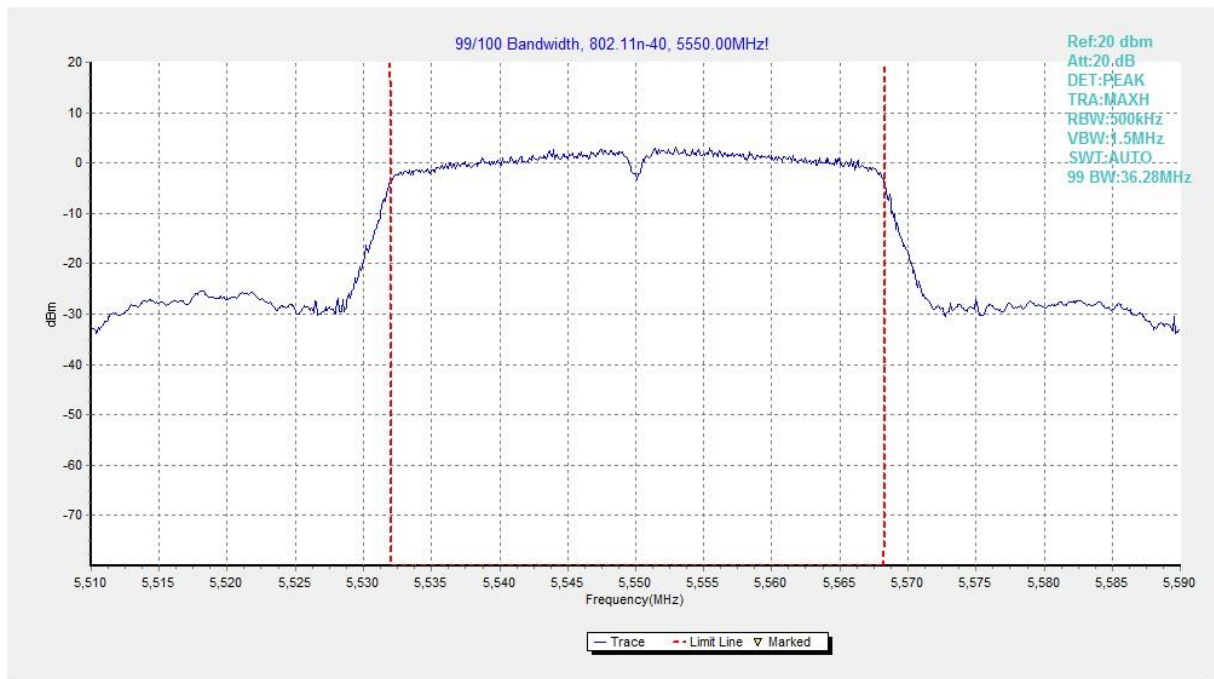


Fig. 41 99% Occupied Bandwidth (802.11n-HT40, 5550MHz)

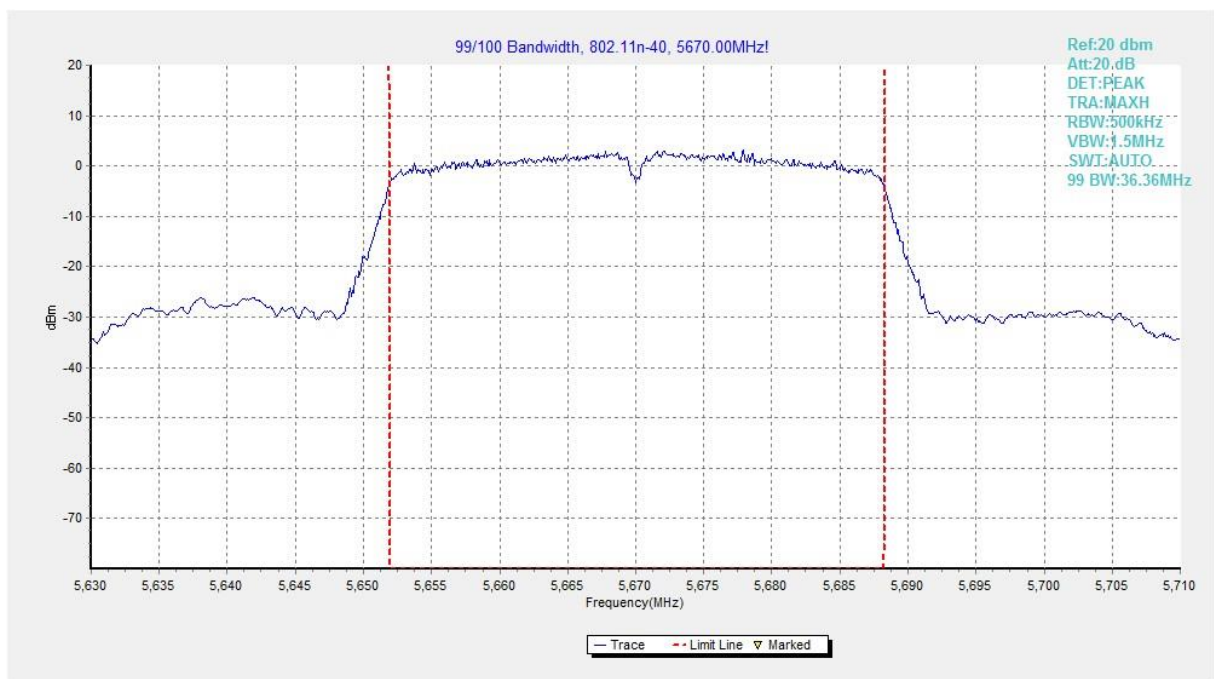


Fig. 42 99% Occupied Bandwidth (802.11n-HT40, 5670MHz)

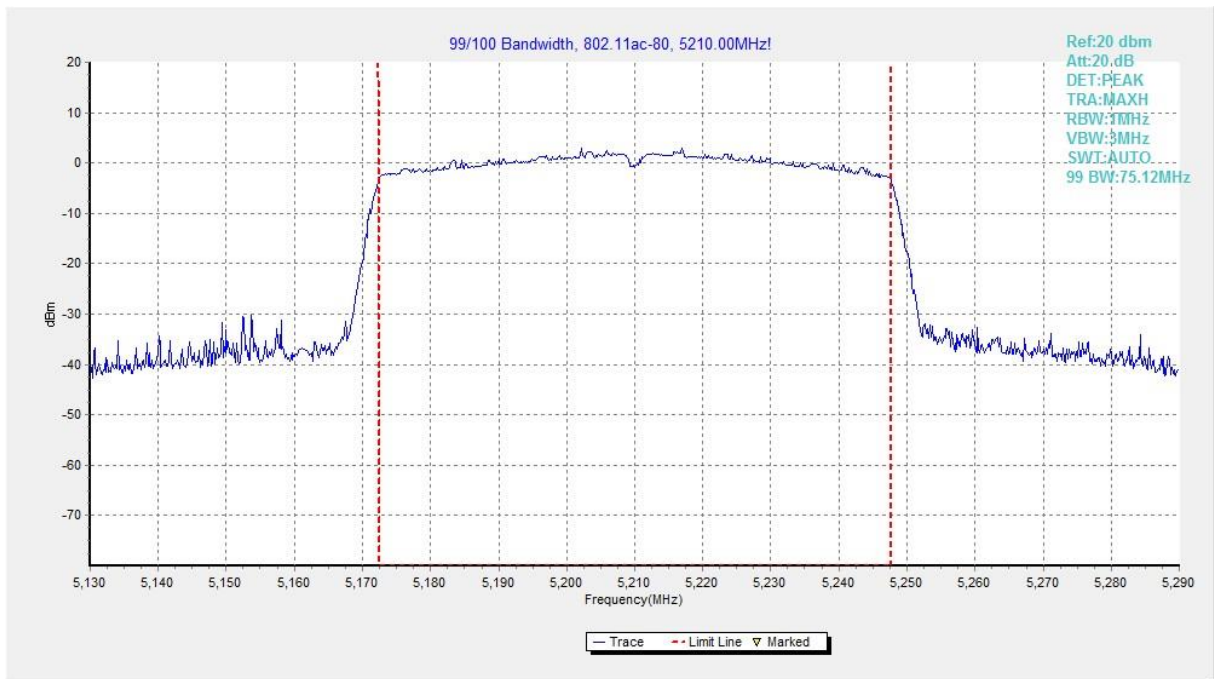


Fig. 43 99% Occupied Bandwidth (802.11ac-VHT80, 5210MHz)

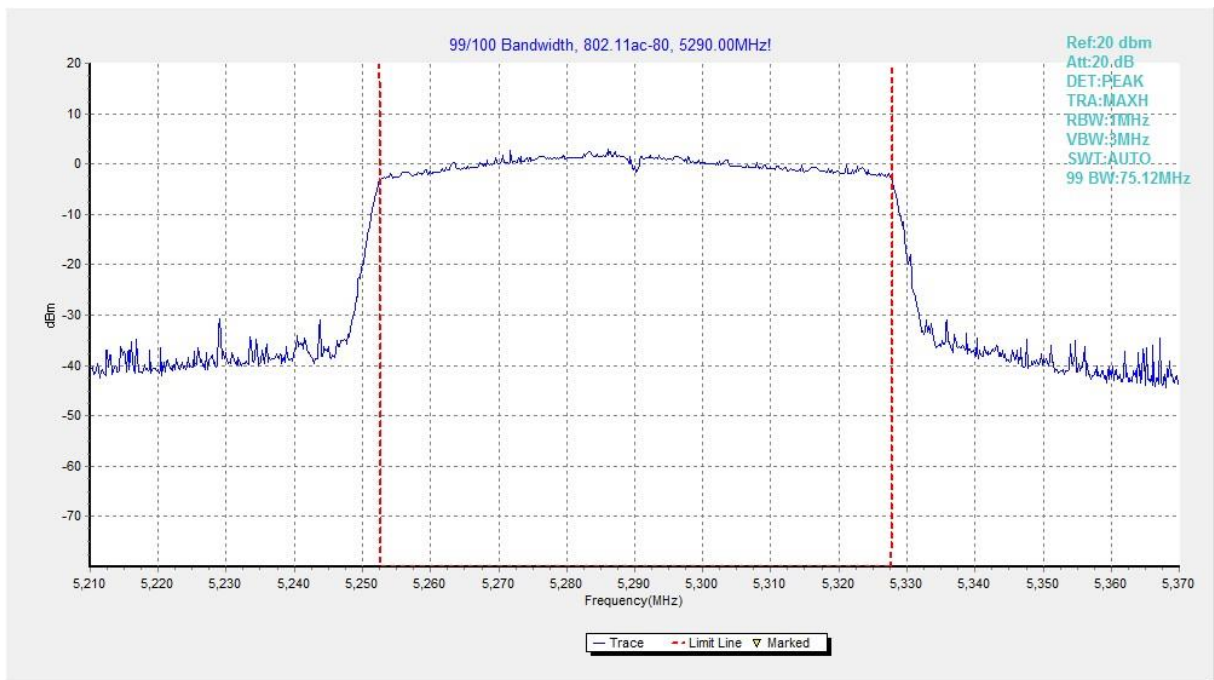


Fig. 44 99% Occupied Bandwidth (802.11ac-VHT80, 5290MHz)

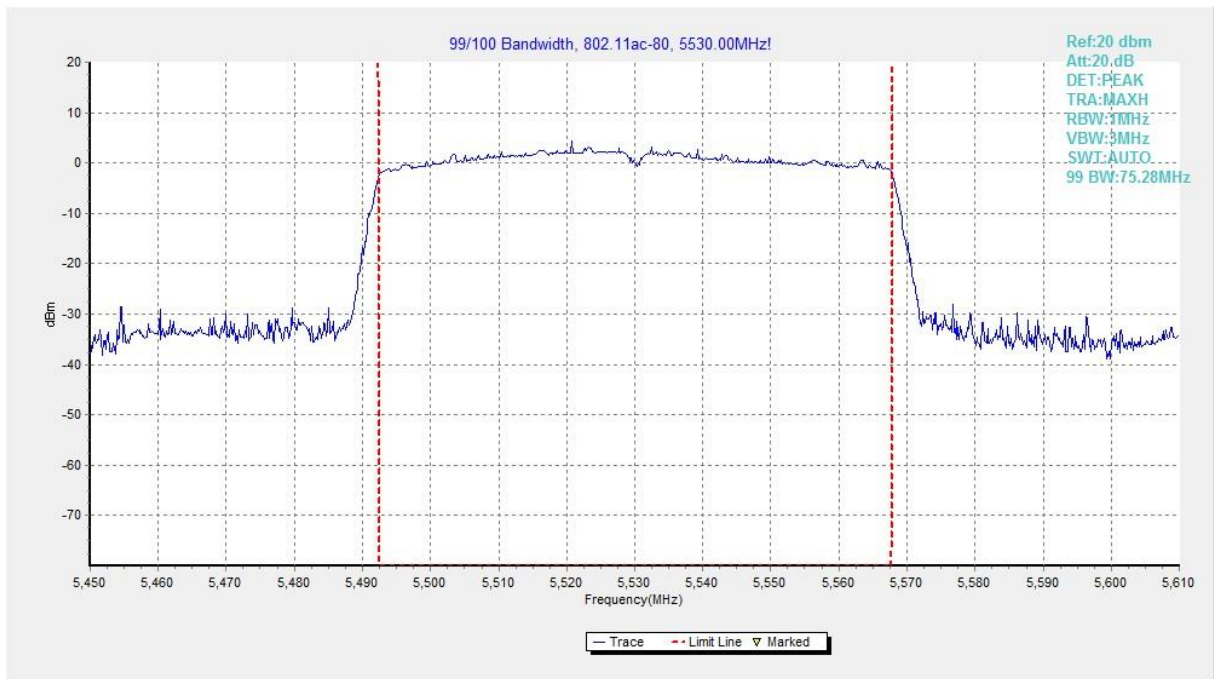


Fig. 45 99% Occupied Bandwidth (802.11ac-VHT80, 5530MHz)

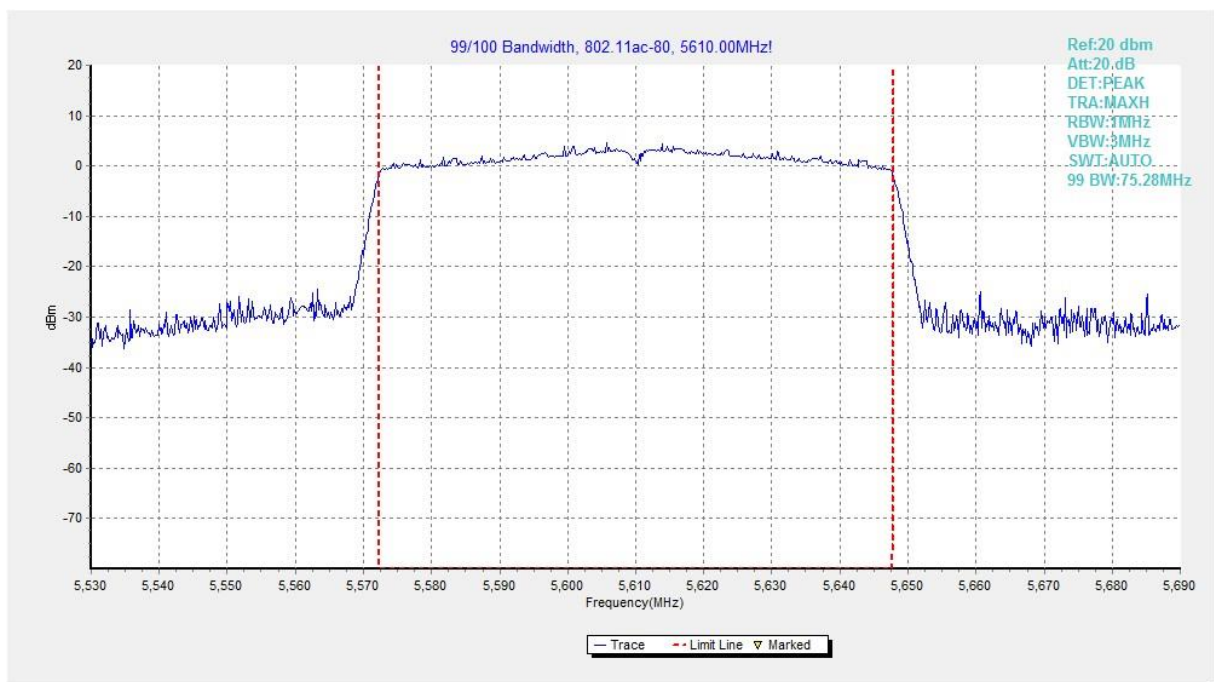


Fig. 46 99% Occupied Bandwidth (802.11ac-VHT80, 5610MHz)

## A.7. Band Edges Compliance

### Measurement Limit:

Standard	Limit (dBuV/m)	
FCC 47 CFR Part 15.209	Peak	74
	Average	54

The measurement is made according to KDB 789033

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)).

### Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5180 MHz(CH36)	Fig.47	P
	5320 MHz(CH64)	Fig.48	P
	5500 MHz(CH100)	Fig.49	P
	5700 MHz(CH140)	Fig.50	P
	5745 MHz(CH149)	Fig.51	P
	5825 MHz(CH165)	Fig.52	P
802.11n-HT40	5190 MHz(CH38)	Fig.53	P
	5310 MHz(CH62)	Fig.54	P
	5510 MHz(CH102)	Fig.55	P
	5670 MHz(CH134)	Fig.56	P
	5755 MHz(CH151)	Fig.57	P
	5795 MHz(CH159)	Fig.58	P
802.11ac-VHT80	5210 MHz(CH42)	Fig.59	P
	5290 MHz(CH58)	Fig.60	P
	5530 MHz(CH106)	Fig.61	P
	5775 MHz(CH155)	Fig.62	P

See below for test graphs.

**Conclusion: PASS**

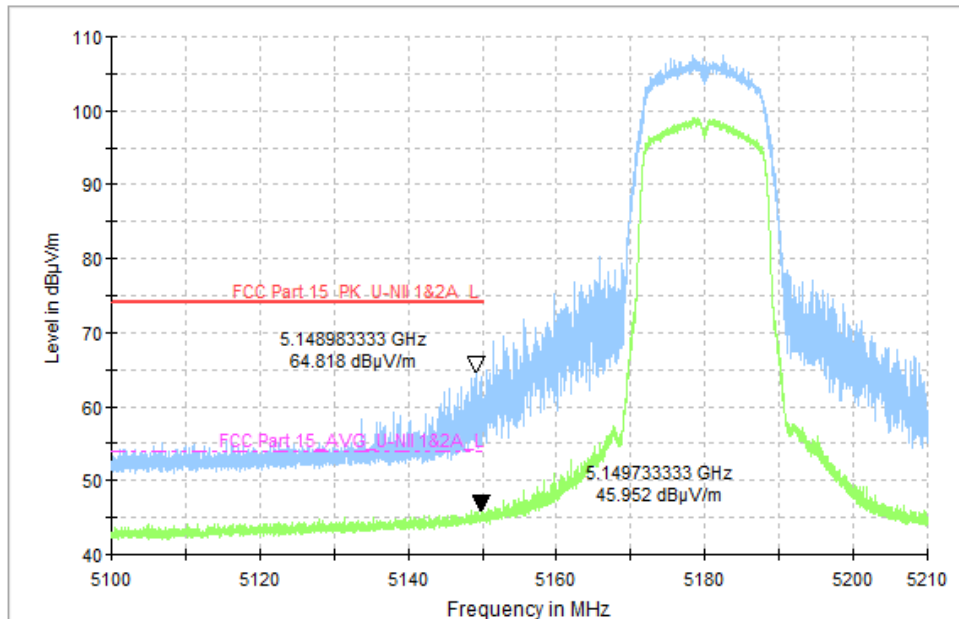


Fig. 47 Band Edges (802.11a, CH36 5180MHz)

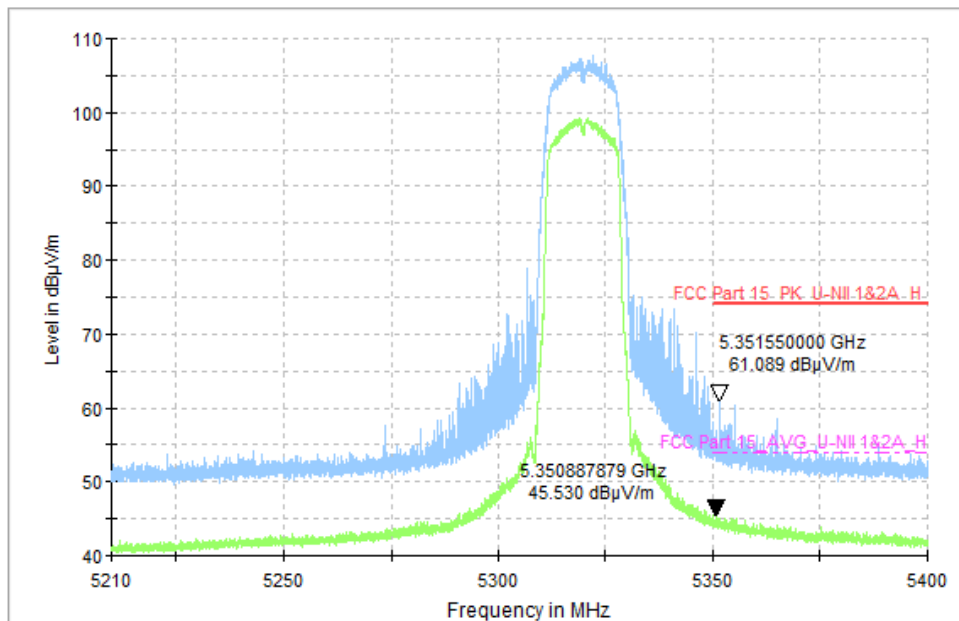


Fig. 48 Band Edges (802.11a, CH64 5320MHz)

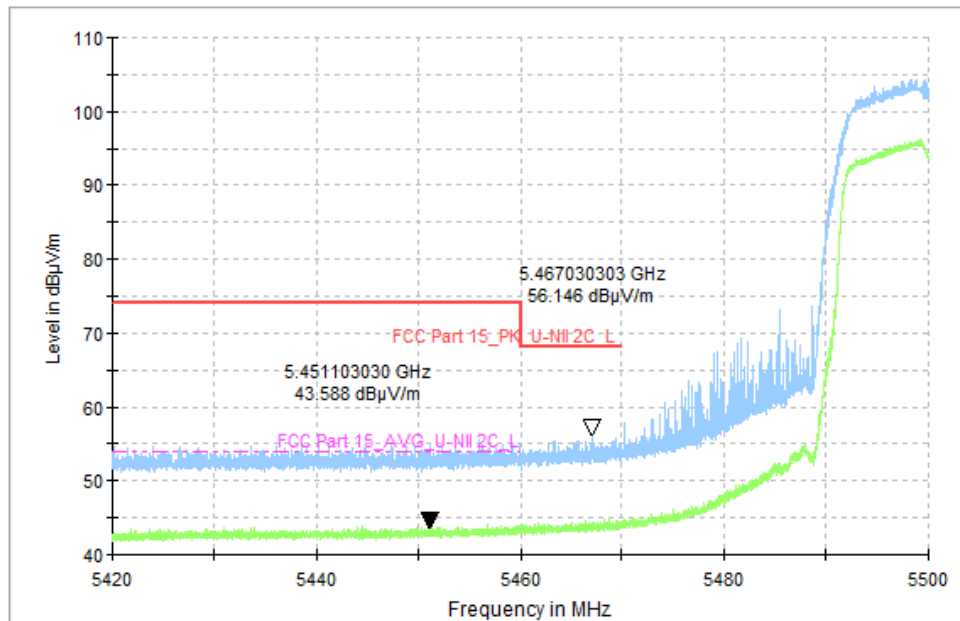


Fig. 49 Band Edges (802.11a, CH100 5500MHz)

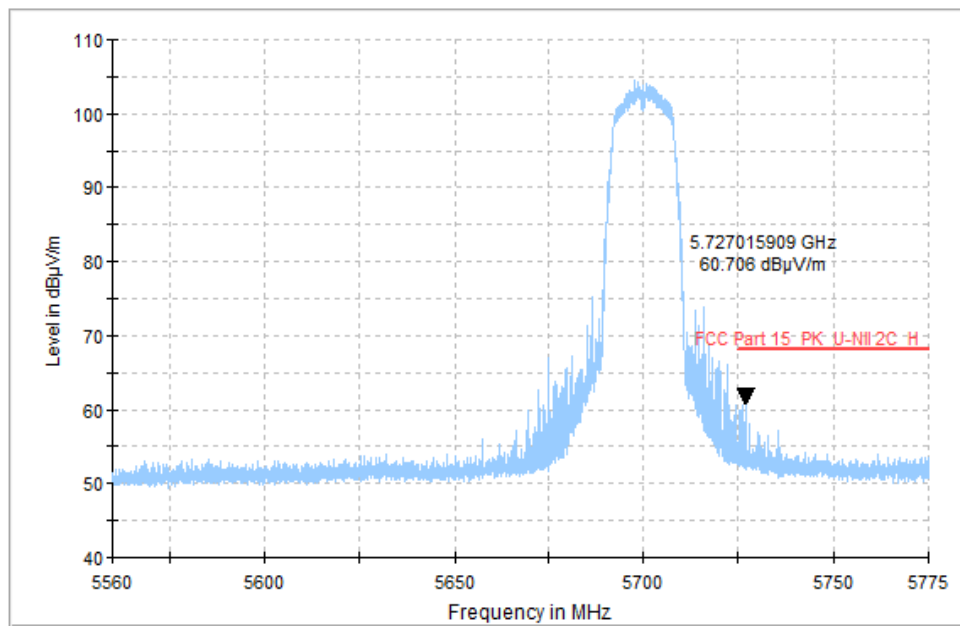
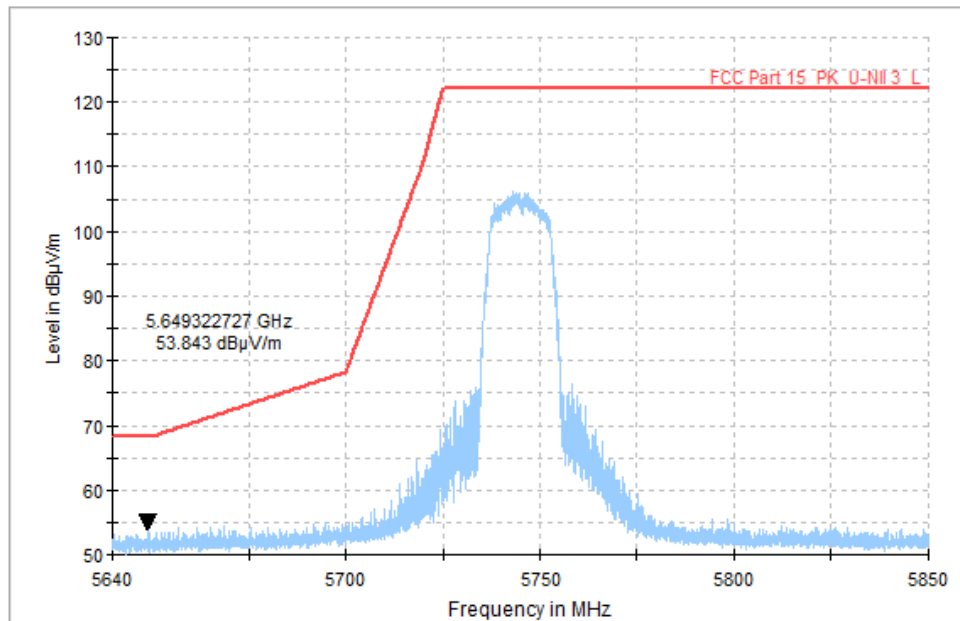
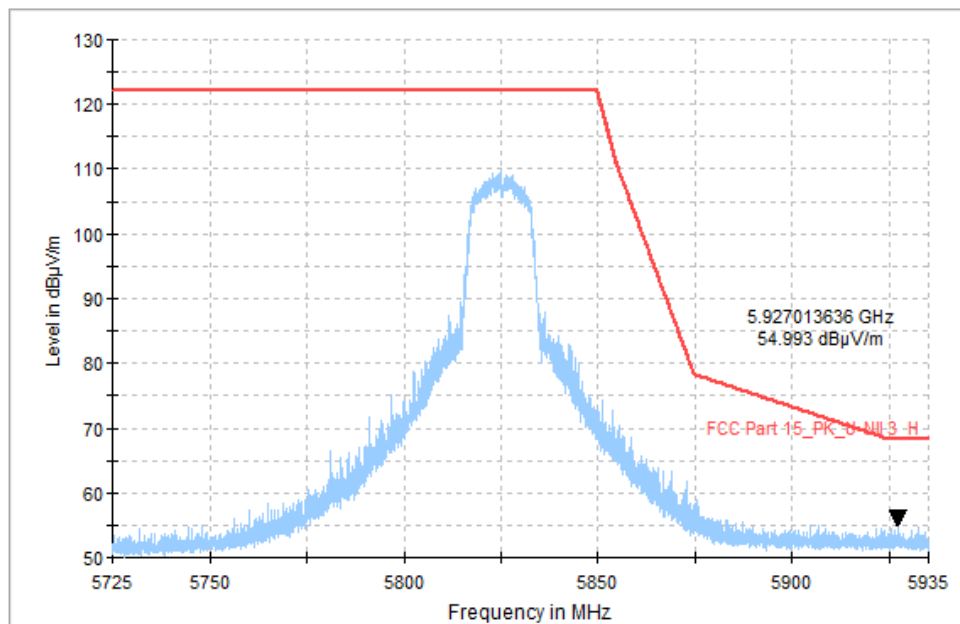


Fig. 50 Band Edges (802.11a, CH140 5700MHz)

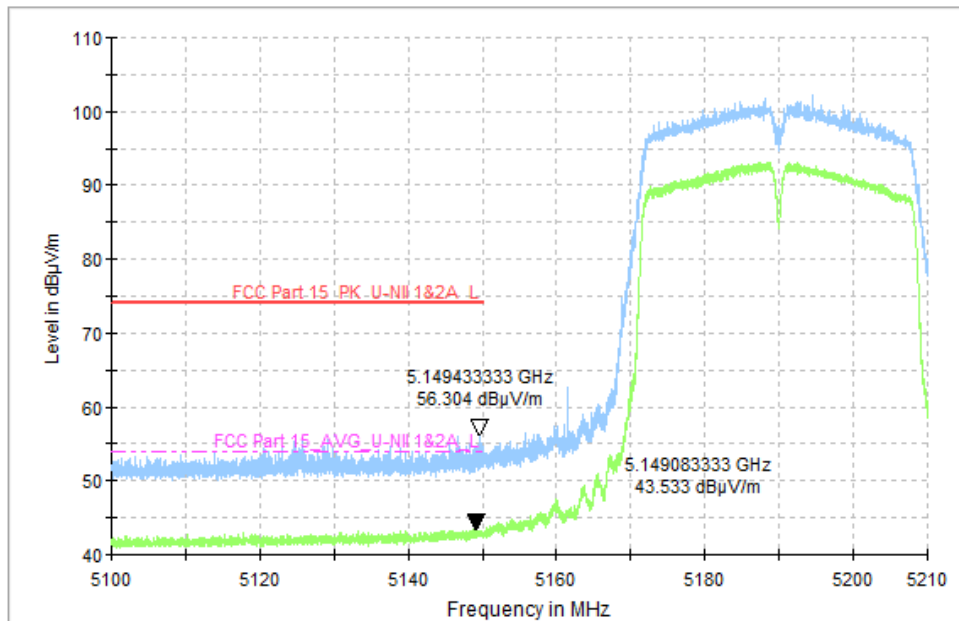




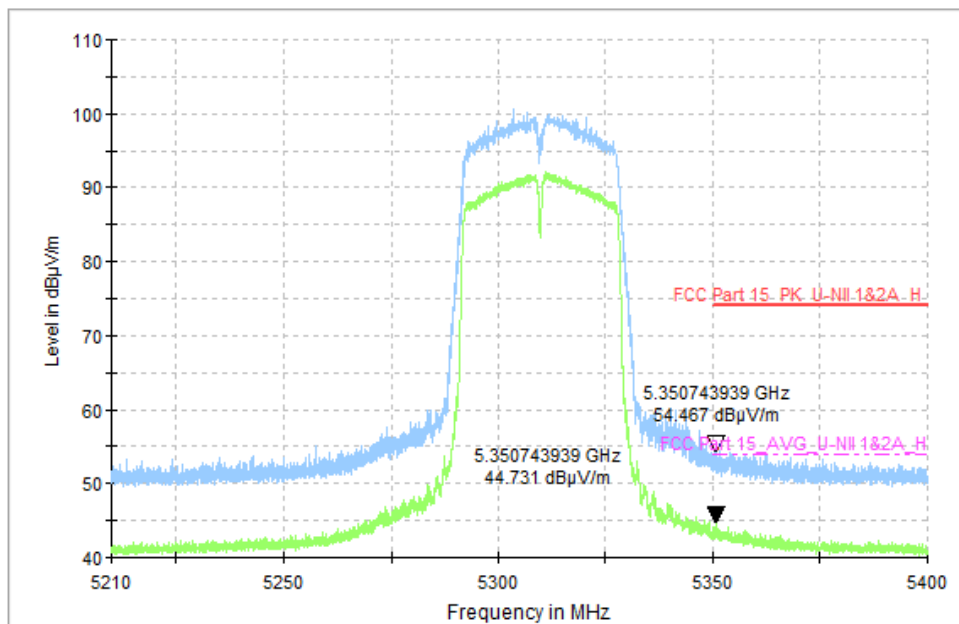
**Fig. 51 Band Edges (802.11a, CH149 5745MHz)**



**Fig. 52 Band Edges (802.11a, CH165 5825MHz)**



**Fig. 53 Band Edges (802.11n-HT40, CH38 5190MHz)**



**Fig. 54 Band Edges (802.11n-HT40, CH62 5310MHz)**



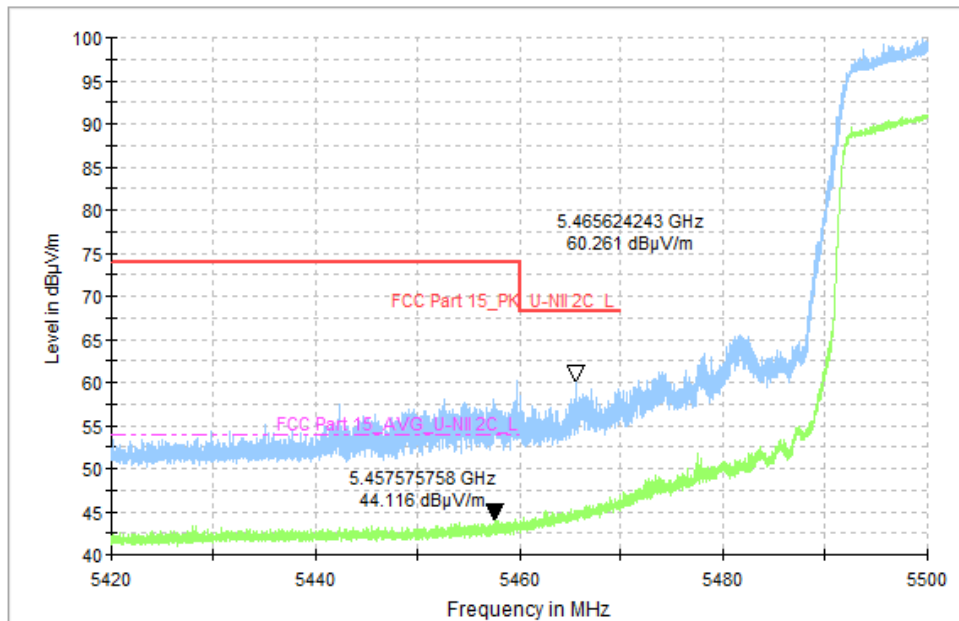


Fig. 55 Band Edges (802.11n-HT40, CH102 5510MHz)

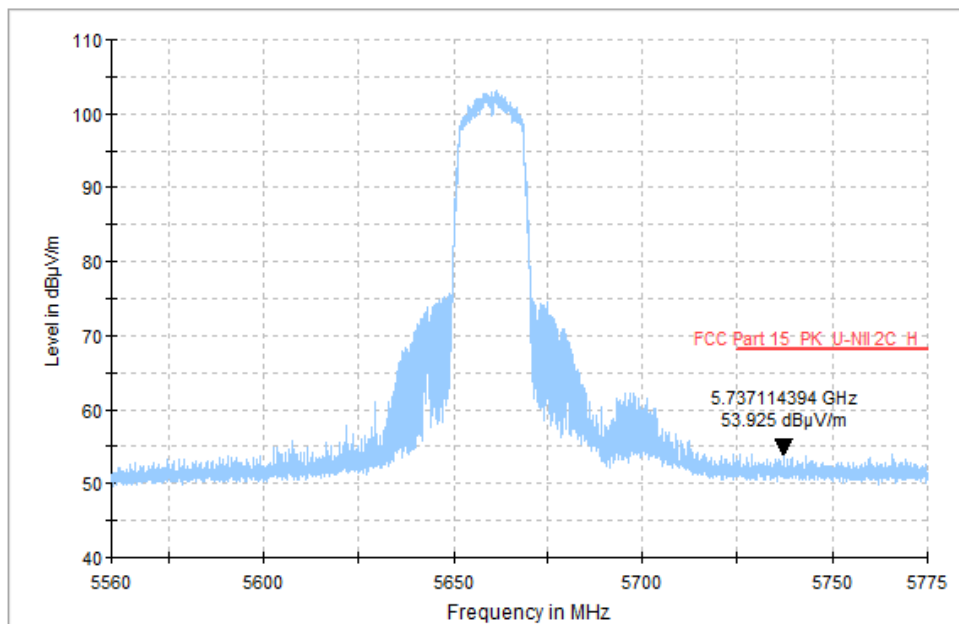
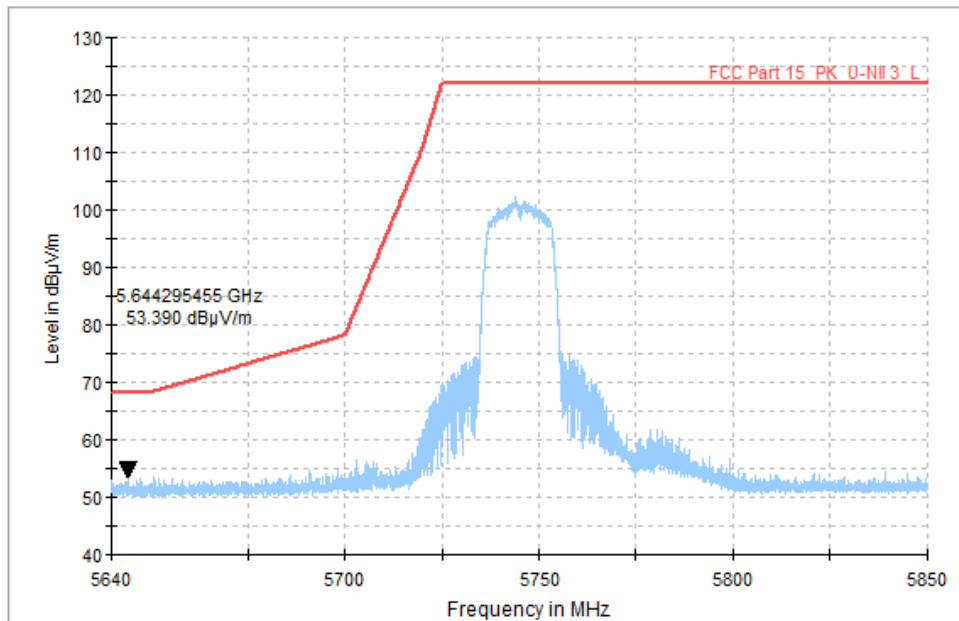
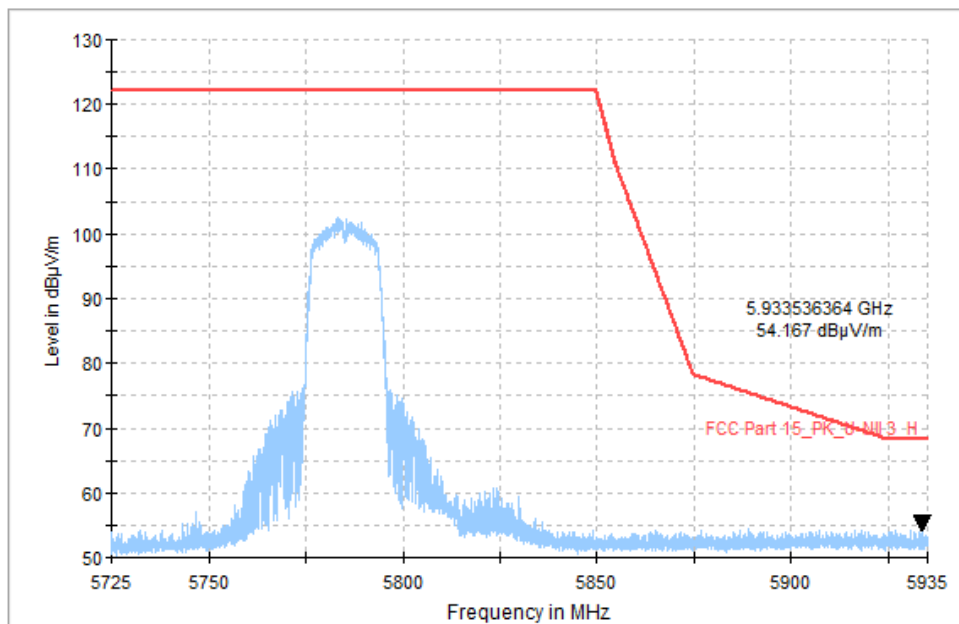


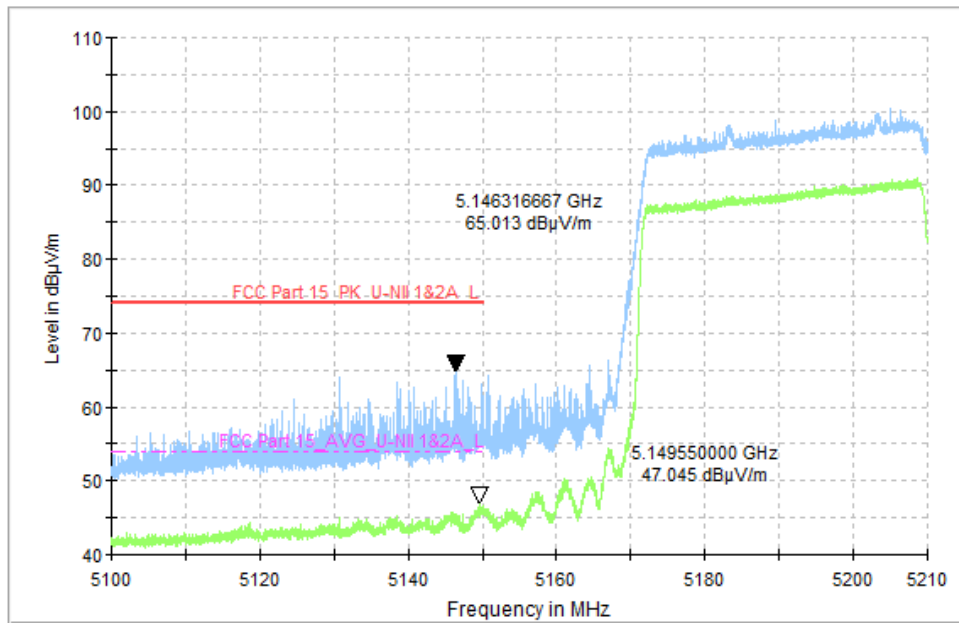
Fig. 56 Band Edges (802.11n-HT40, CH134 5670MHz)



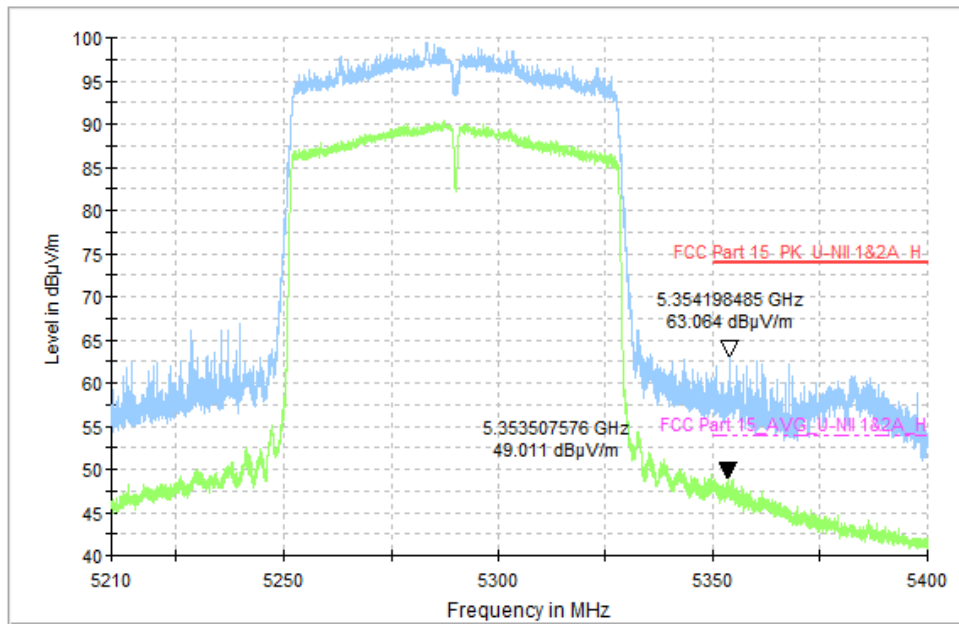
**Fig. 57 Band Edges (802.11n-HT40, CH151 5755MHz)**



**Fig. 58 Band Edges (802.11n-HT40, CH159 5795MHz)**



**Fig. 59 Band Edges (802.11ac-VHT80, CH42 5210MHz)**



**Fig. 60 Band Edges (802.11ac-VHT80, CH58 5290MHz)**

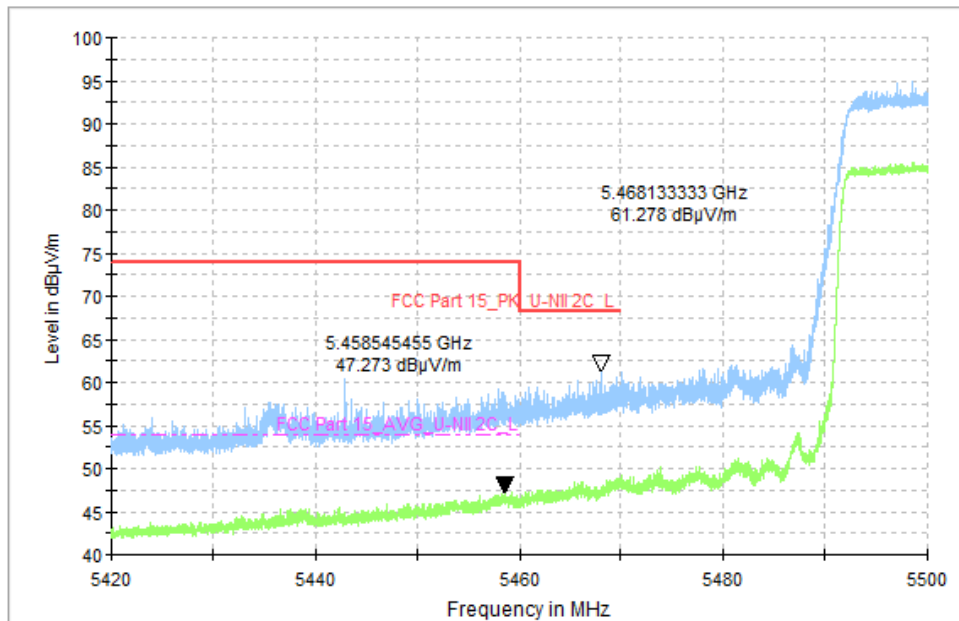


Fig. 61 Band Edges (802.11ac-VHT80, CH106 5530MHz)

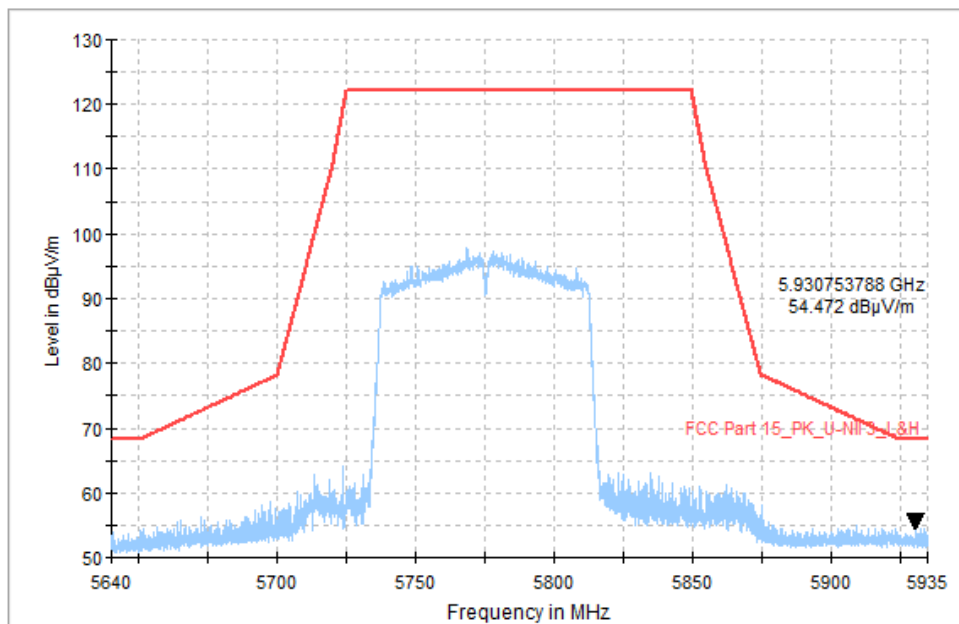


Fig. 62 Band Edges (802.11ac-VHT80, CH155 5775MHz)

## A.8. Transmitter Spurious Emission

### Measurement Limit:

Standard	Limit (dBuV/m)	
FCC 47 CFR Part 15.209	Peak	74
	Average	54

The measurement is made according to KDB 789033.

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 (dBμV/m)	Measurement distance (m)
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

Note: For frequency range below 960MHz, the limit in 15.209 is defined in 10m test distance. The limit used above is calculated from 10m to 3m.

### Measurement Result:

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11a	5180MHz(Ch36)	1 GHz ~18 GHz	Fig.63	P
	5200MHz(Ch40)	1 GHz ~18 GHz	Fig.64	P
	5240MHz(Ch48)	1 GHz ~18 GHz	Fig.65	P
	5260MHz(Ch52)	1 GHz ~18 GHz	Fig.66	P
	5280MHz(Ch56)	1 GHz ~18 GHz	Fig.67	P
	5320MHz(Ch64)	1 GHz ~18 GHz	Fig.68	P
	5500MHz(Ch100)	1 GHz ~18 GHz	Fig.69	P
	5600MHz(Ch120)	1 GHz ~18 GHz	Fig.70	P
	5700MHz(Ch140)	1 GHz ~18 GHz	Fig.71	P
	5745MHz(Ch149)	1 GHz ~18 GHz	Fig.72	P
	5785MHz(Ch157)	1 GHz ~18 GHz	Fig.73	P
	5825MHz(Ch165)	1 GHz ~18 GHz	Fig.74	P
802.11n-HT40	5190MHz(Ch38)	1 GHz ~18 GHz	Fig.75	P
	5230MHz(Ch46)	1 GHz ~18 GHz	Fig.76	P
	5270MHz(Ch54)	1 GHz ~18 GHz	Fig.77	P
	5310MHz(Ch62)	1 GHz ~18 GHz	Fig.78	P
	5510MHz(Ch102)	1 GHz ~18 GHz	Fig.79	P
	5580MHz(Ch118)	1 GHz ~18 GHz	Fig.80	P
	5670MHz(Ch134)	1 GHz ~18 GHz	Fig.81	P
	5755MHz(Ch151)	1 GHz ~18 GHz	Fig.82	P
	5795MHz(Ch159)	1 GHz ~18 GHz	Fig.83	P

802.11ac -VHT80	5210MHz(Ch42)	1 GHz ~18 GHz	Fig.84	<b>P</b>
	5290MHz(Ch58)	1 GHz ~18 GHz	Fig.85	<b>P</b>
	5530MHz(Ch106)	1 GHz ~18 GHz	Fig.86	<b>P</b>
	5610MHz(Ch122)	1 GHz ~18 GHz	Fig.87	<b>P</b>
	5775MHz(Ch155)	1 GHz ~18 GHz	Fig.88	<b>P</b>
All channels		30 MHz ~1 GHz	Fig.89	<b>P</b>
		18 GHz ~26.5 GHz	Fig.90	<b>P</b>
		26.5GHz~40GHz	Fig.91	<b>P</b>

### Worst Case Result

#### 802.11a CH48

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6280.000000	54.34	68.20	13.86	V	18.9
8383.887500	50.06	74.00	23.94	V	5.8
10481.212500	47.35	68.20	20.85	H	7.5
13840.687500	49.29	68.20	18.91	V	12.0
15712.750000	54.81	74.00	19.19	V	14.2
16995.937500	52.07	68.20	16.13	V	16.5

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
7432.512500	34.57	54.00	19.43	H	5.2
8383.887500	47.16	54.00	6.84	V	5.8
11106.862500	37.92	54.00	16.08	H	8.5
12029.212500	39.52	54.00	14.48	H	10.6
15712.750000	43.46	54.00	10.54	V	14.3
17858.687500	43.27	54.00	10.73	V	16.6

#### 802.11n-HT40 CH54

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6269.000000	53.75	68.20	14.45	V	18.9
7869.500000	43.13	68.20	25.07	H	5.6
8431.725000	49.80	74.00	24.20	V	5.7
10536.575000	49.87	68.20	18.33	V	7.6
15805.062500	52.92	74.00	21.08	V	14.6
17117.125000	50.71	68.20	17.49	V	17.0

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
7562.587500	34.14	54.00	19.86	V	5.4
8431.725000	46.22	54.00	7.78	V	5.7
11168.675000	36.82	54.00	17.18	H	8.5
12118.437500	38.47	54.00	15.53	H	11.0
15809.000000	40.75	54.00	13.25	V	14.7
17947.062500	42.59	54.00	11.41	V	16.5

#### 802.11ac-VHT80 CH122

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6170.000000	52.57	68.20	15.63	H	18.7
8975.675000	50.18	68.20	18.02	H	5.7
10038.312500	44.16	68.20	24.04	V	7.1
13702.875000	48.82	68.20	19.38	V	12.1
15215.312500	48.94	68.20	19.26	H	13.0
16827.500000	53.26	68.20	14.94	V	16.0

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
7473.362500	33.74	54.00	20.26	V	5.2
8356.475000	34.38	54.00	19.62	H	5.9
11241.775000	39.84	54.00	14.16	V	8.7
12280.225000	38.35	54.00	15.65	H	11.4
15753.000000	41.45	54.00	12.55	H	14.4
17938.312500	42.23	54.00	11.77	V	16.6

#### Note:

A "reference path loss" is established and the  $A_{Rpl}$  is the attenuation of "reference path loss", and including the gain of receive antenna, 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:

Result =  $P_{Mea} + A_{Rpl} = P_{Mea} + \text{Cable Loss} + \text{Antenna Factor}$

See below for test graphs.

Conclusion: PASS

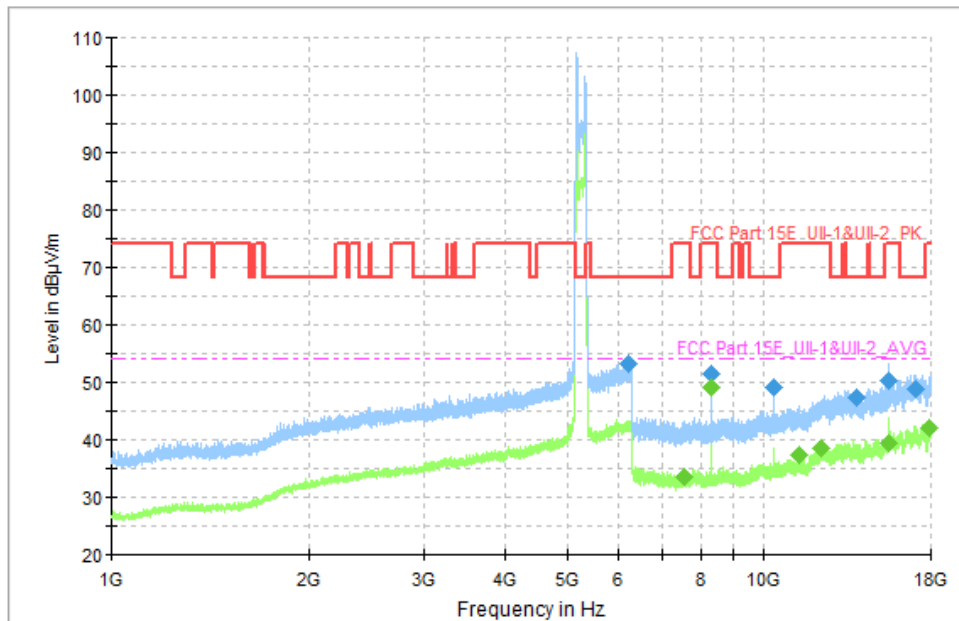


Fig. 63 Transmitter Spurious Emission (802.11a, CH36 5180MHz, 1 GHz-18 GHz)

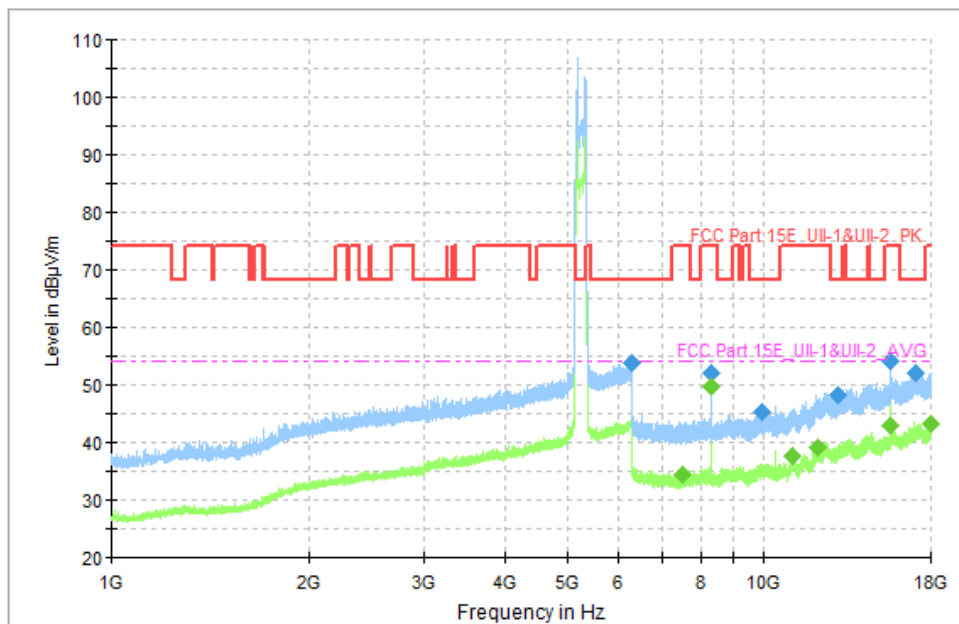


Fig. 64 Transmitter Spurious Emission (802.11a, CH40 5200MHz, 1 GHz-18 GHz)



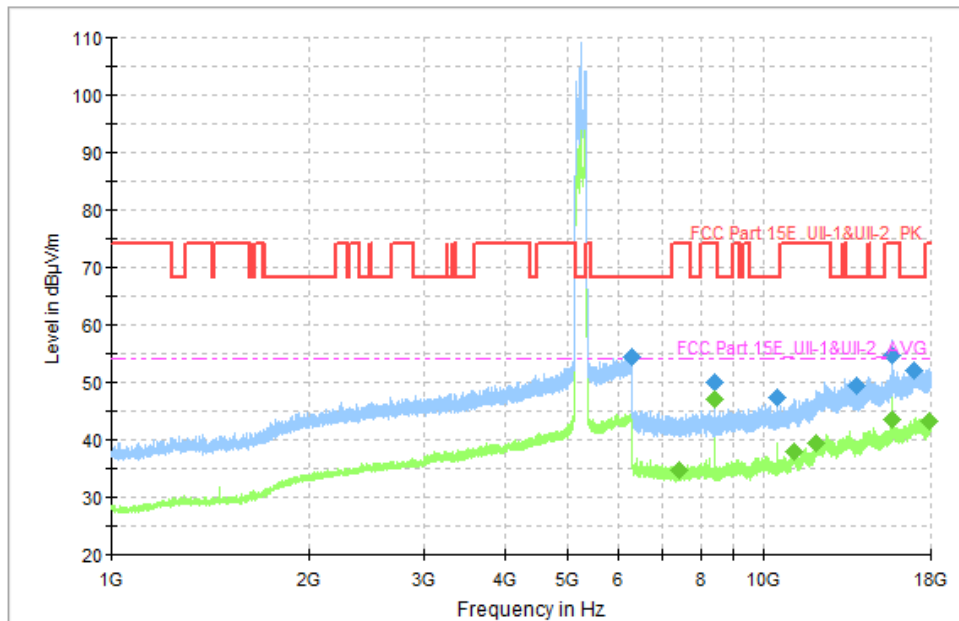


Fig. 65 Transmitter Spurious Emission (802.11a, CH48 5240MHz, 1 GHz-18 GHz)

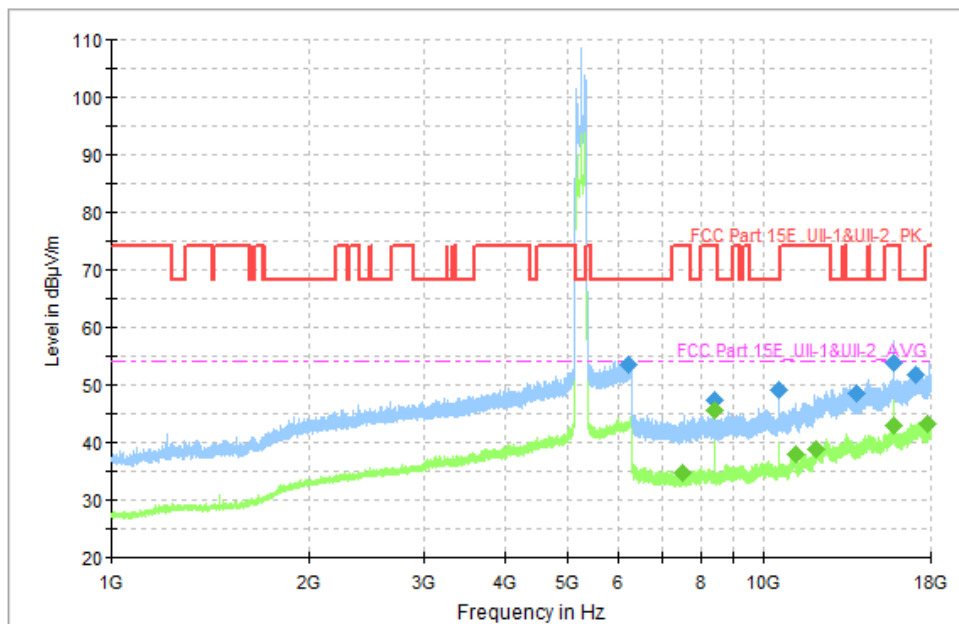
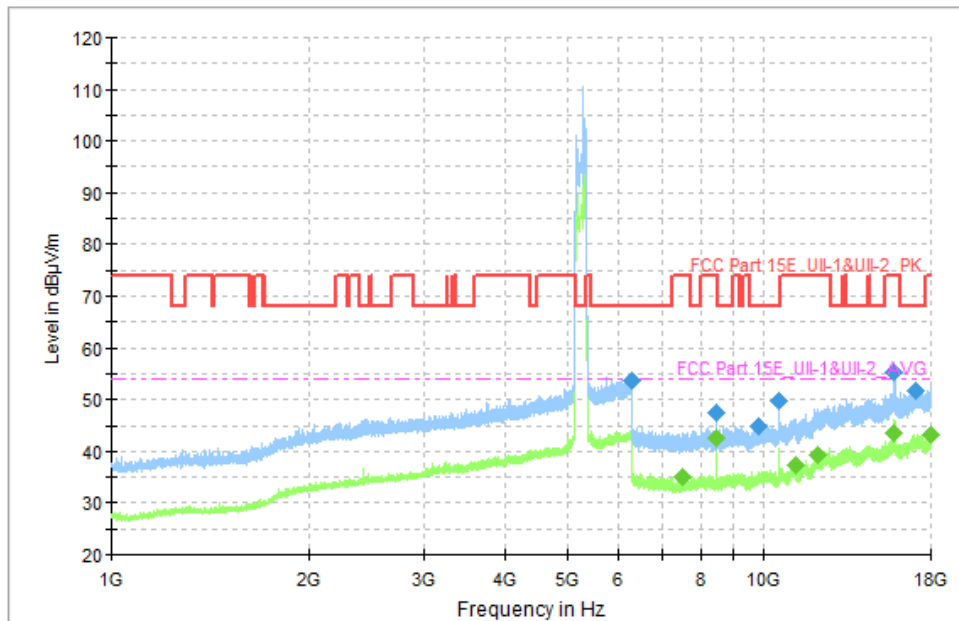
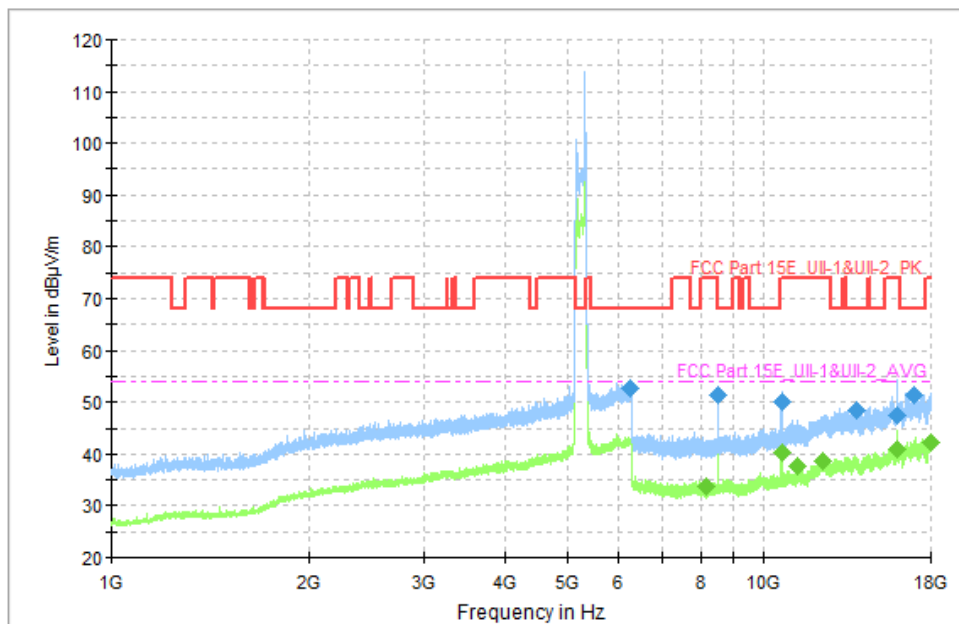


Fig. 66 Transmitter Spurious Emission (802.11a, CH52 5260MHz, 1 GHz-18 GHz)



**Fig. 67 Transmitter Spurious Emission (802.11a, CH56 5280MHz, 1 GHz-18 GHz)**



**Fig. 68 Transmitter Spurious Emission (802.11a, CH64 5320MHz, 1 GHz-18 GHz)**

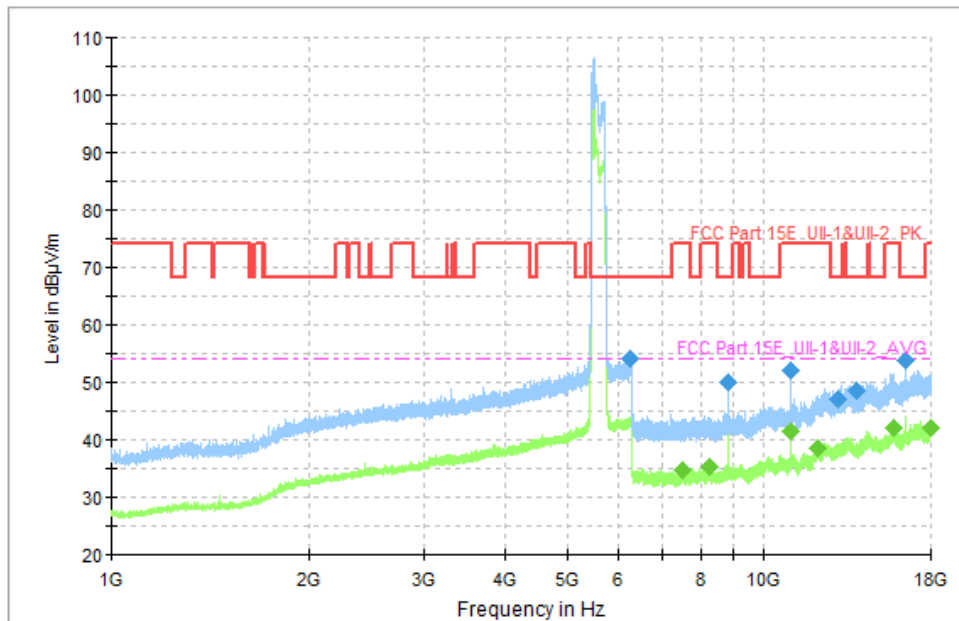


Fig. 69 Transmitter Spurious Emission (802.11a, CH100 5500MHz, 1 GHz-18 GHz)

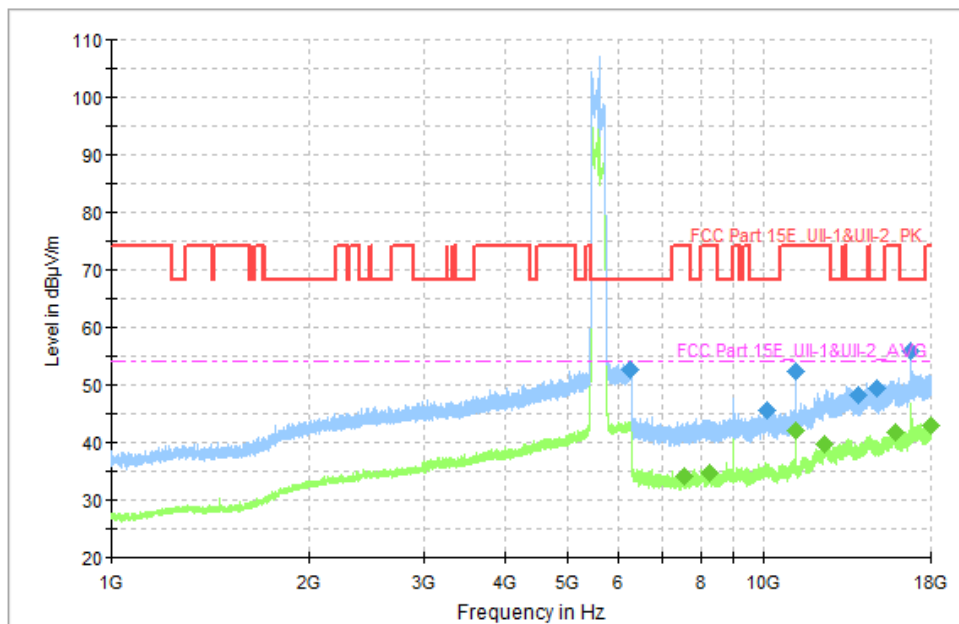


Fig. 70 Transmitter Spurious Emission (802.11a, CH120 5600MHz, 1 GHz-18 GHz)

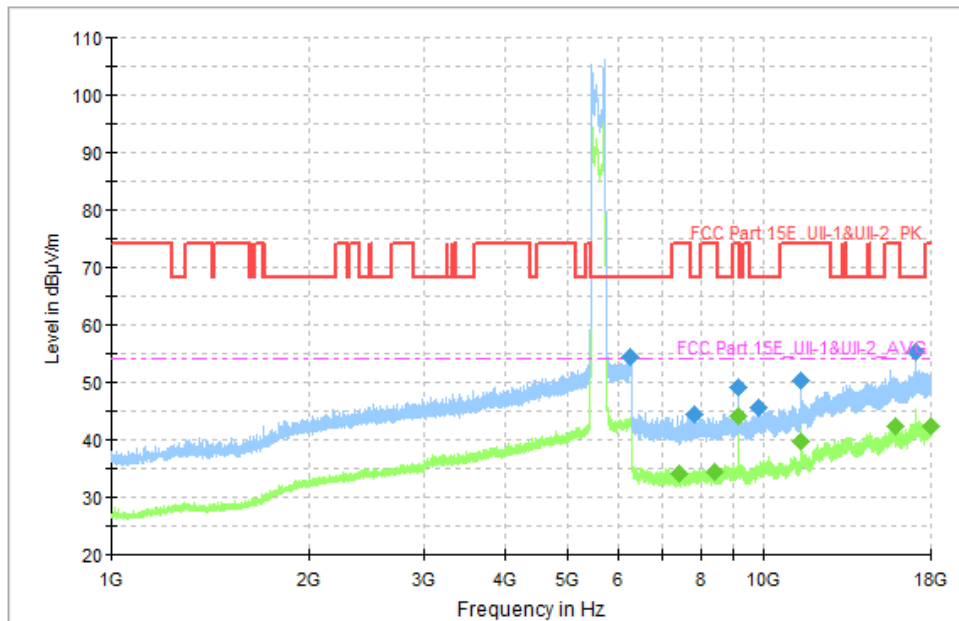


Fig. 71 Transmitter Spurious Emission (802.11a, CH140 5700MHz, 1 GHz-18 GHz)

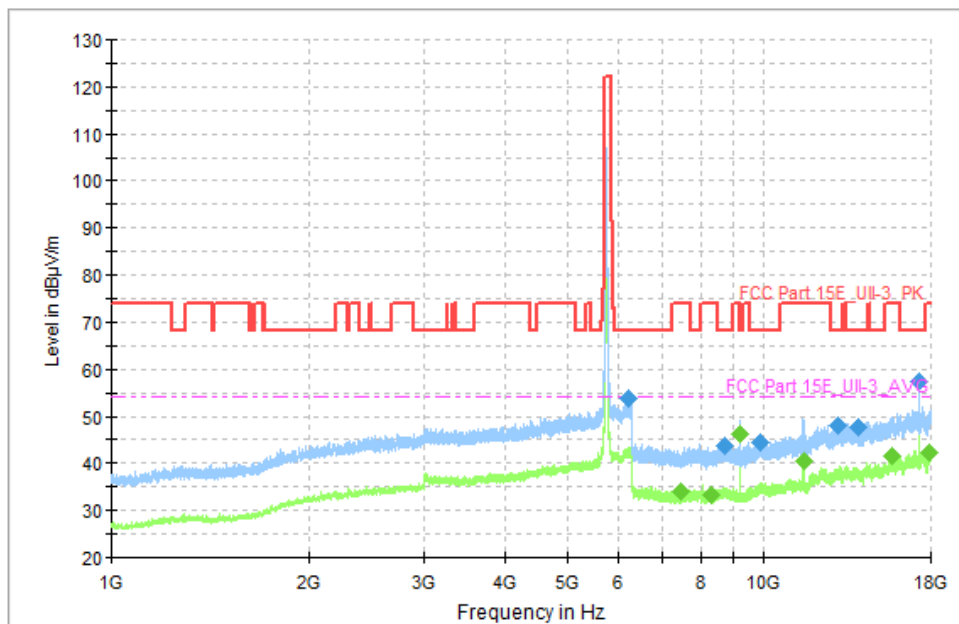


Fig. 72 Transmitter Spurious Emission (802.11a, CH149 5745MHz, 1 GHz-18 GHz)

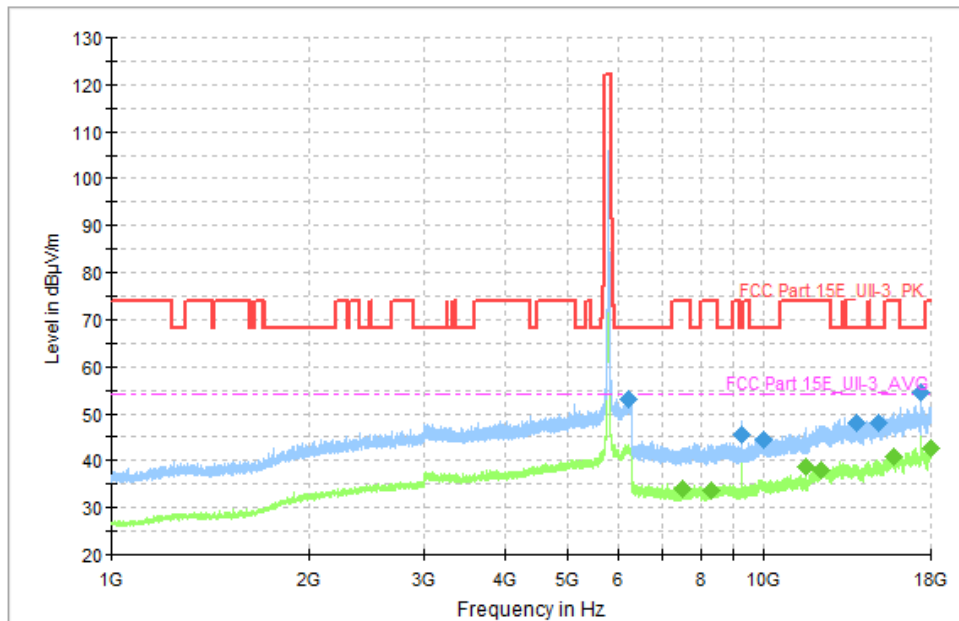


Fig. 73 Transmitter Spurious Emission (802.11a, CH157 5785MHz, 1 GHz-18 GHz)

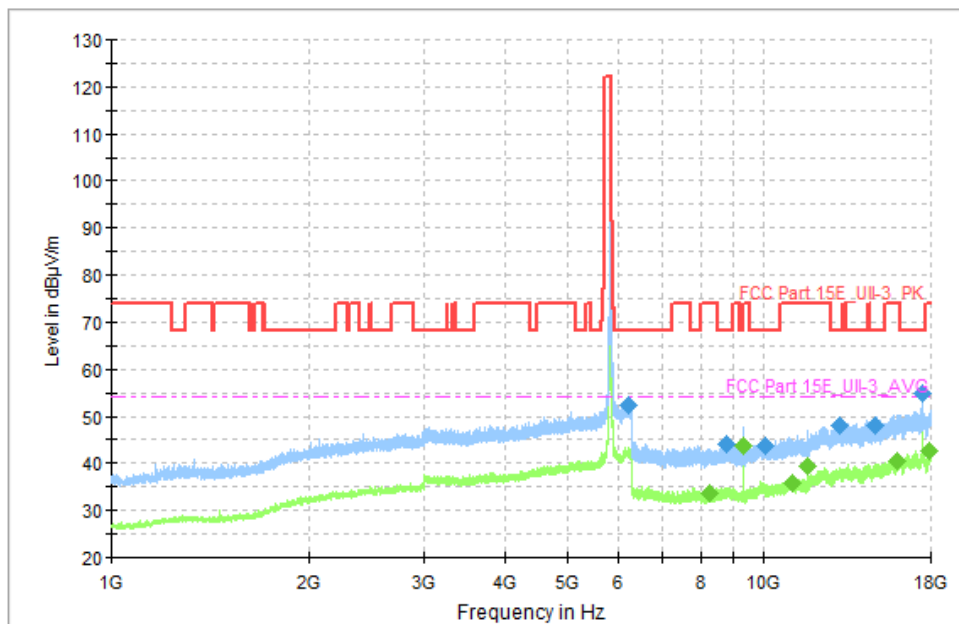


Fig. 74 Transmitter Spurious Emission (802.11a, CH165 5825MHz, 1 GHz-18 GHz)

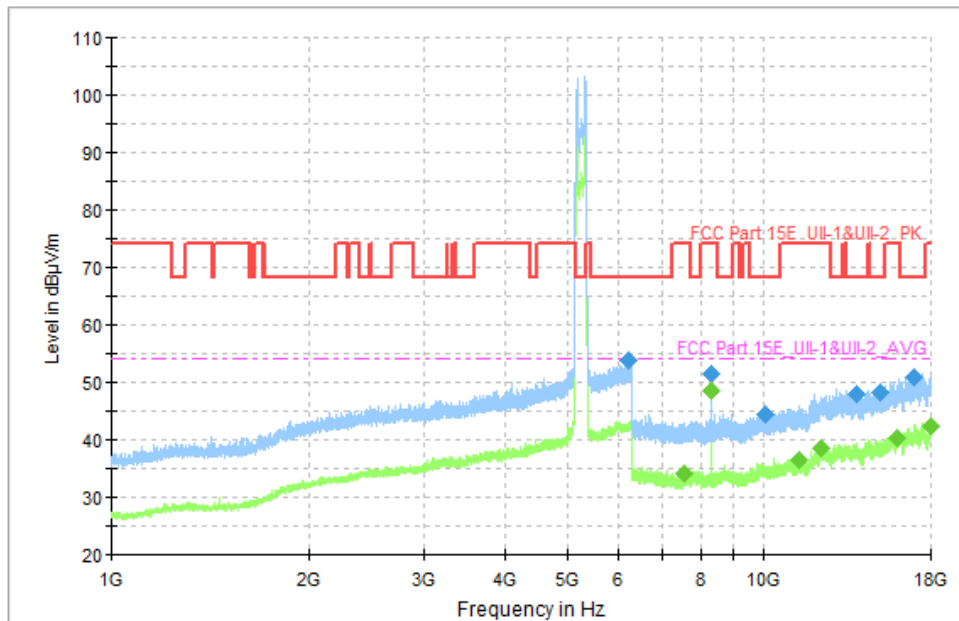


Fig. 75 Transmitter Spurious Emission (802.11n-HT40, CH38 5190MHz, 1 GHz-18 GHz)

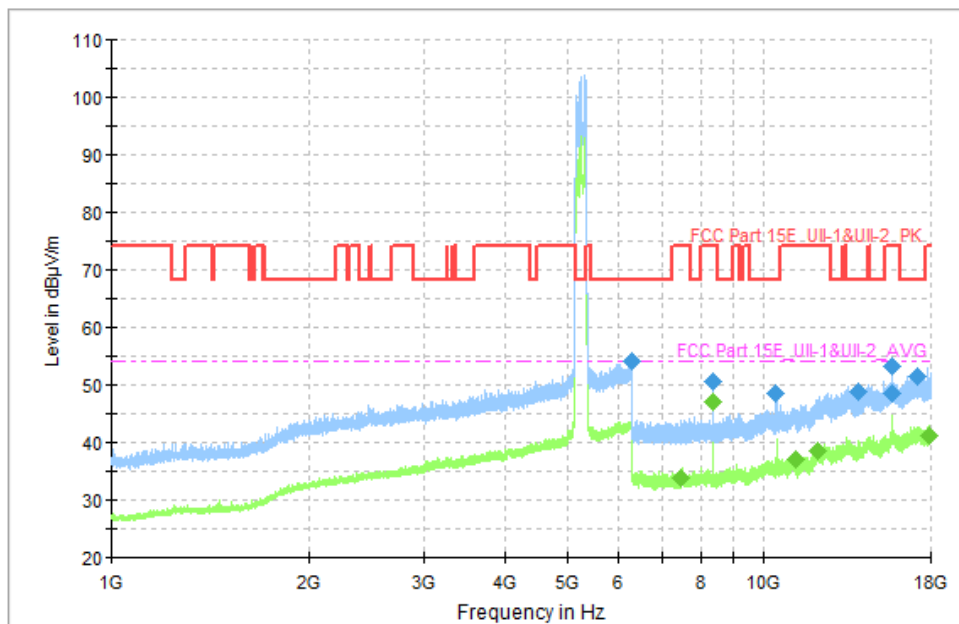


Fig. 76 Transmitter Spurious Emission (802.11n-HT40, CH46 5230MHz, 1 GHz-18 GHz)



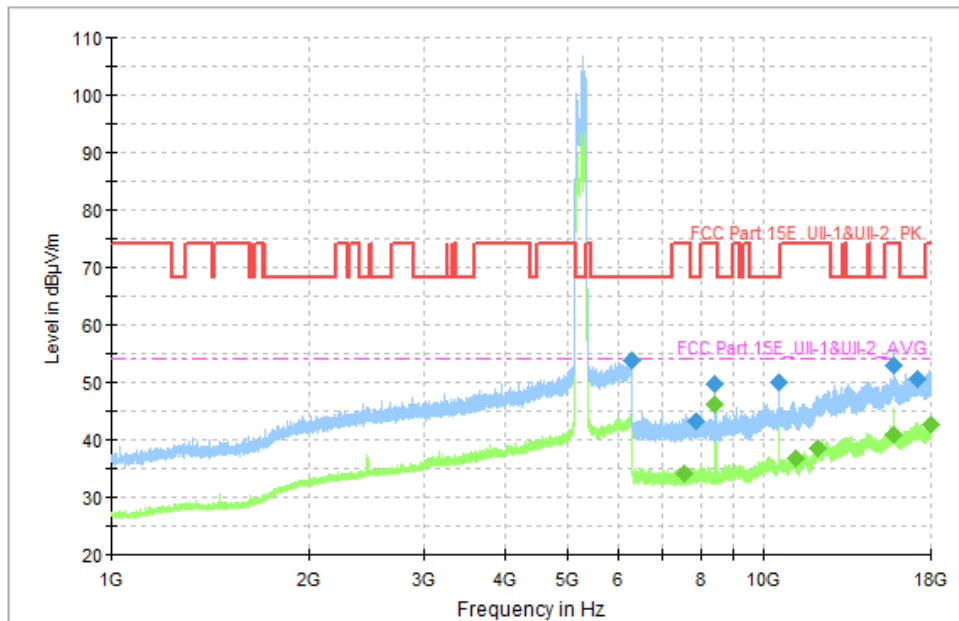


Fig. 77 Transmitter Spurious Emission (802.11n-HT40, CH54 5270MHz, 1 GHz-18 GHz)

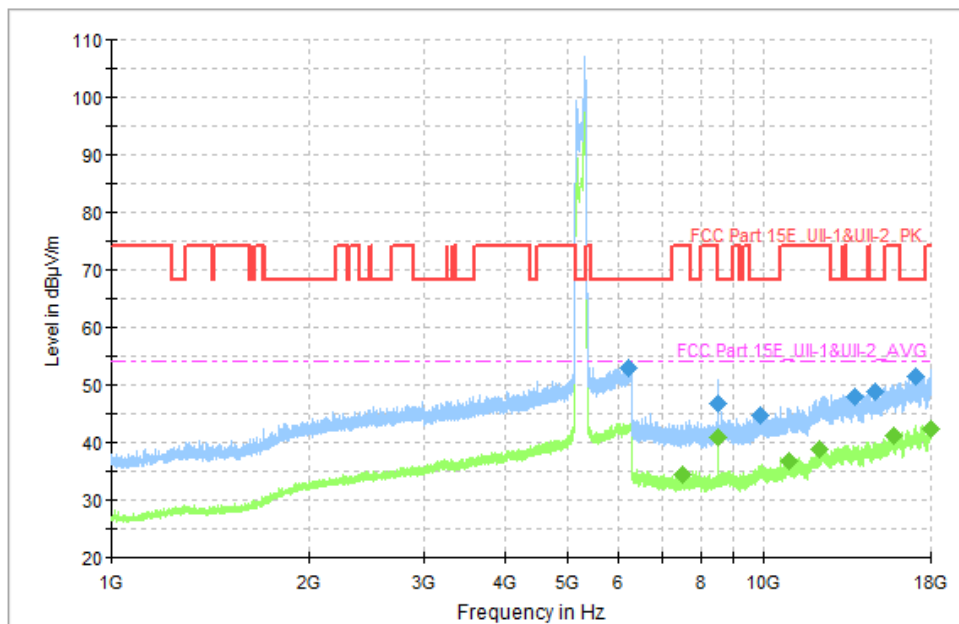
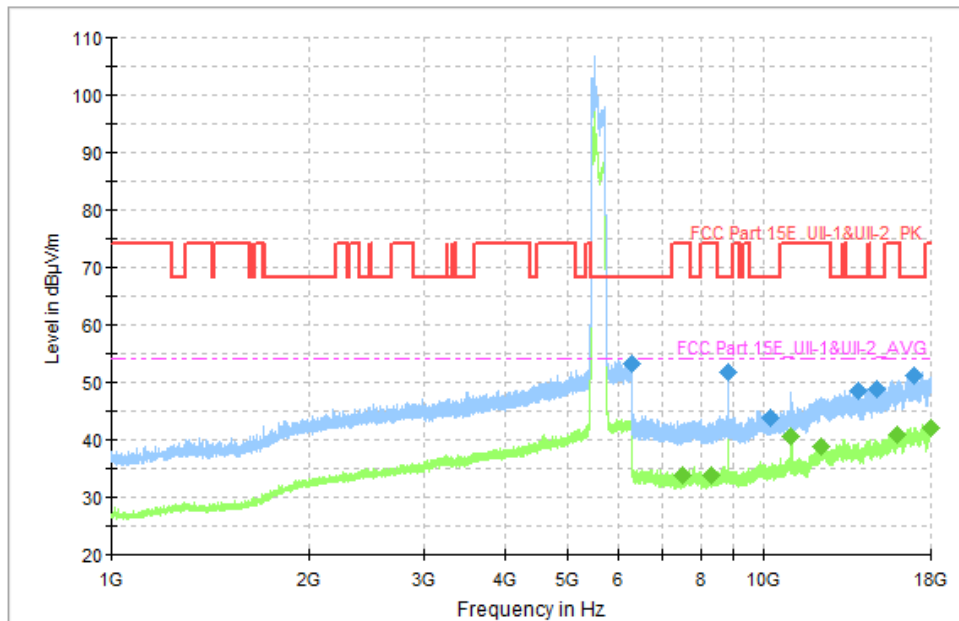
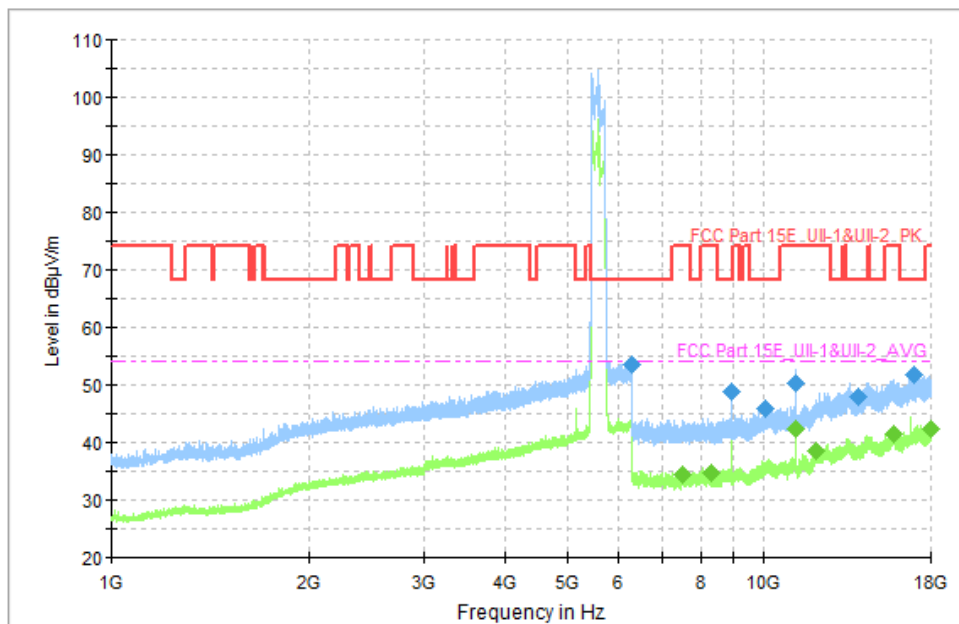


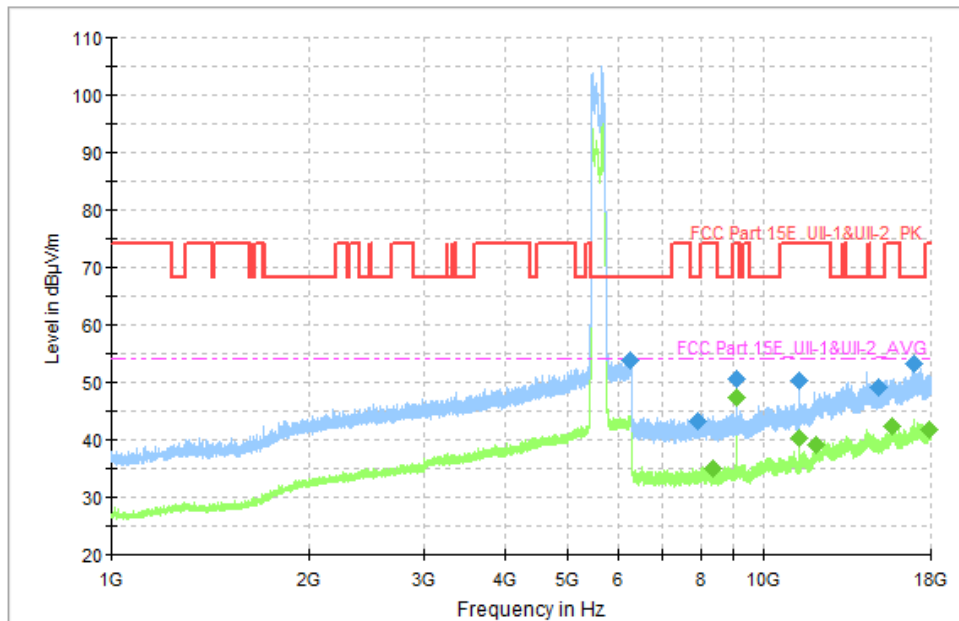
Fig. 78 Transmitter Spurious Emission (802.11n-HT40, CH62 5310MHz, 1 GHz-18 GHz)



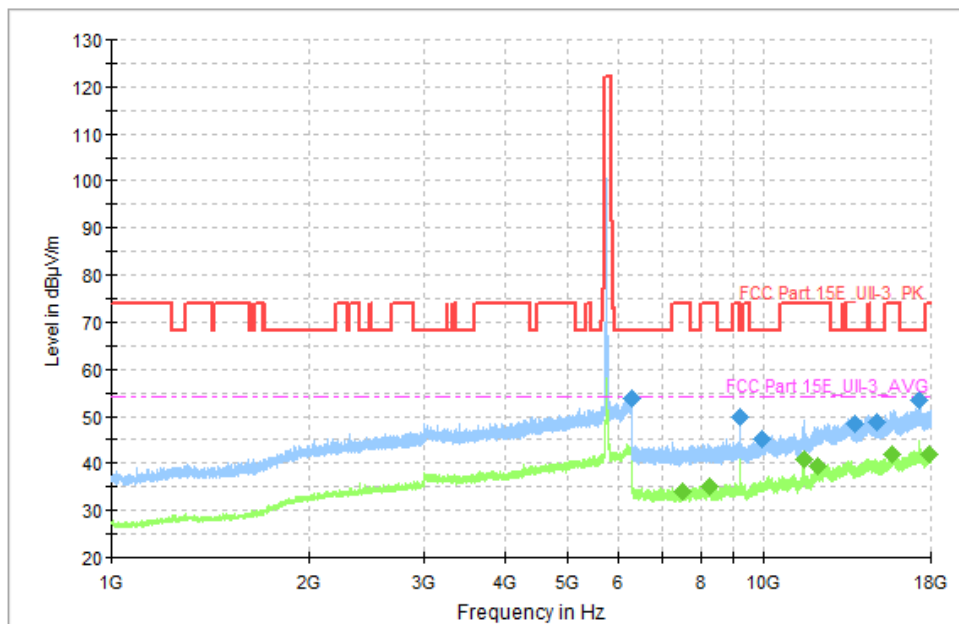
**Fig. 79 Transmitter Spurious Emission (802.11n-HT40, CH102 5510MHz, 1 GHz-18 GHz)**



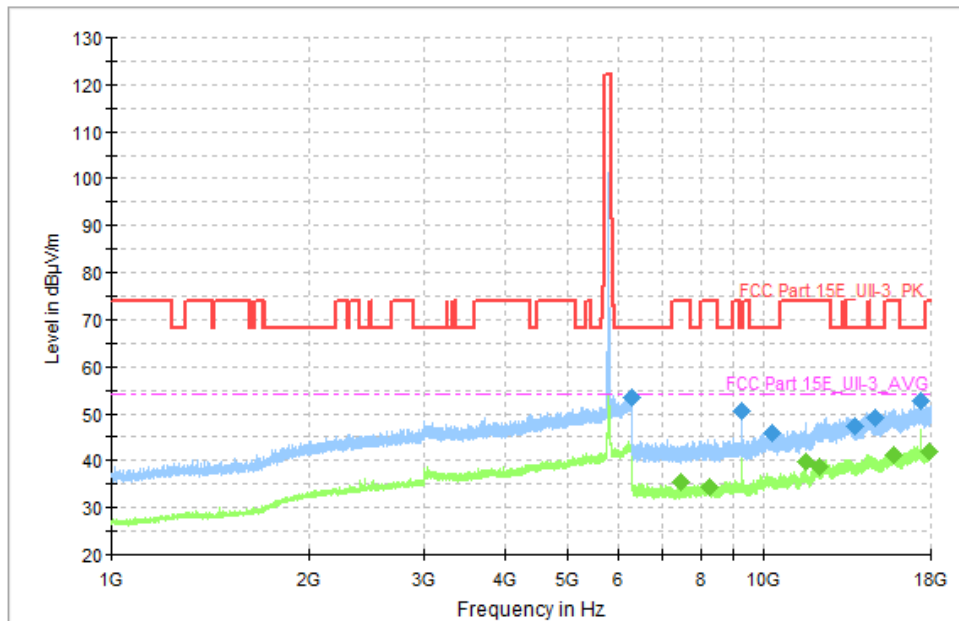
**Fig. 80 Transmitter Spurious Emission (802.11n-HT40, CH118 5580MHz, 1 GHz-18 GHz)**



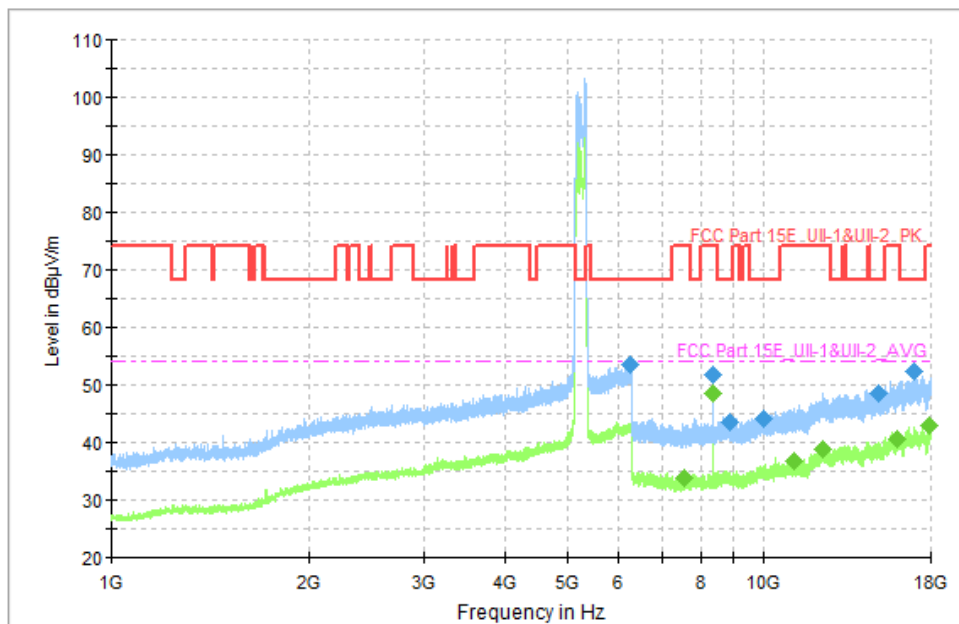
**Fig. 81 Transmitter Spurious Emission (802.11n-HT40, CH134 5670MHz, 1 GHz-18 GHz)**



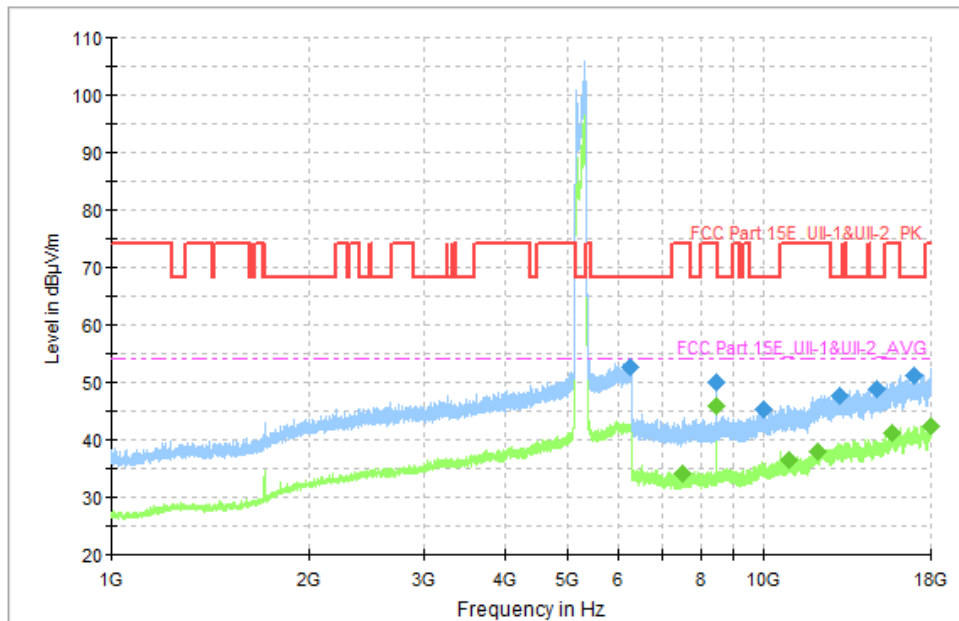
**Fig. 82 Transmitter Spurious Emission (802.11n-HT40, CH151 5755MHz, 1 GHz-18 GHz)**



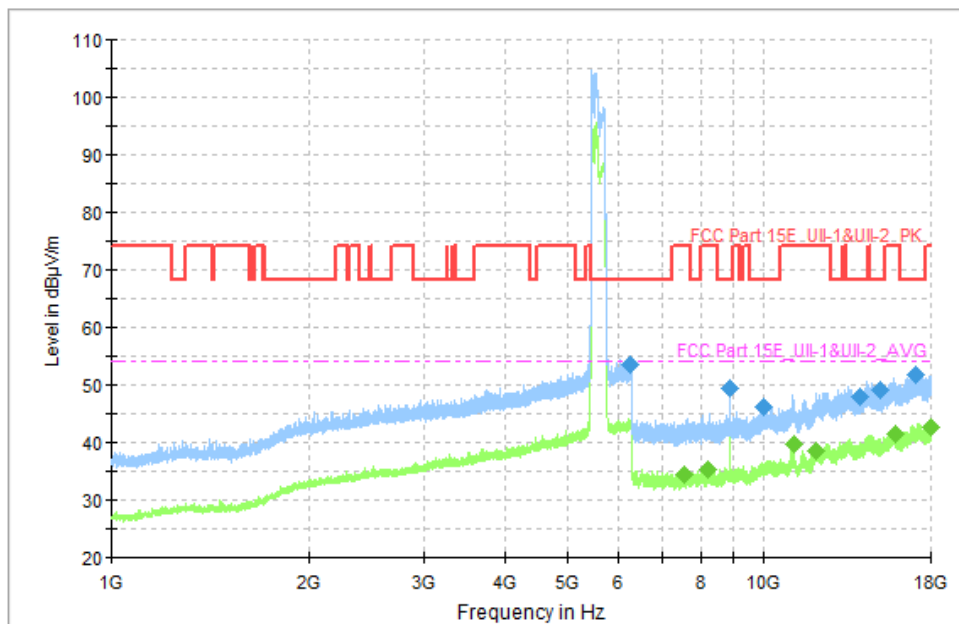
**Fig. 83 Transmitter Spurious Emission (802.11n-HT40, CH159 5795MHz, 1 GHz-18 GHz)**



**Fig. 84 Transmitter Spurious Emission (802.11ac-VHT80, CH42 5210MHz, 1 GHz-18 GHz)**



**Fig. 85 Transmitter Spurious Emission (802.11ac-VHT80, CH58 5290MHz, 1 GHz-18 GHz)**



**Fig. 86 Transmitter Spurious Emission (802.11ac-VHT80, CH106 5530MHz, 1 GHz-18 GHz)**

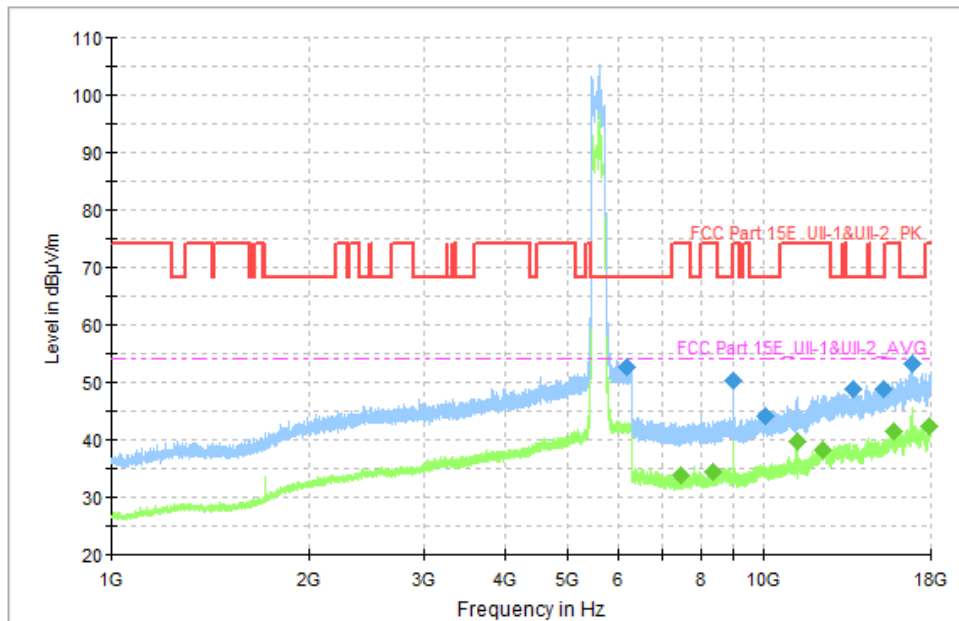


Fig. 87 Transmitter Spurious Emission (802.11ac-VHT80, CH122 5610MHz, 1 GHz-18 GHz)

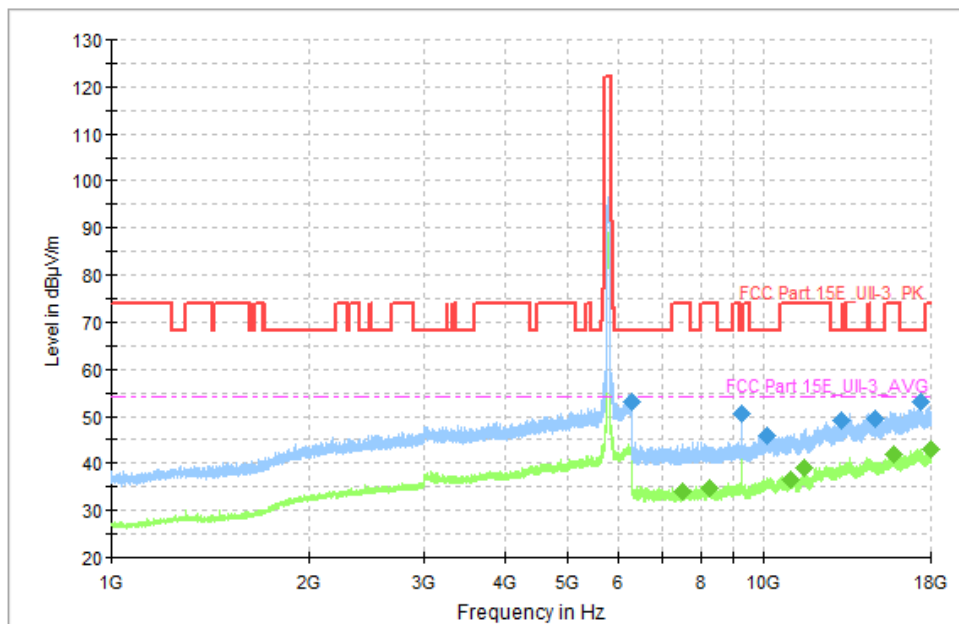
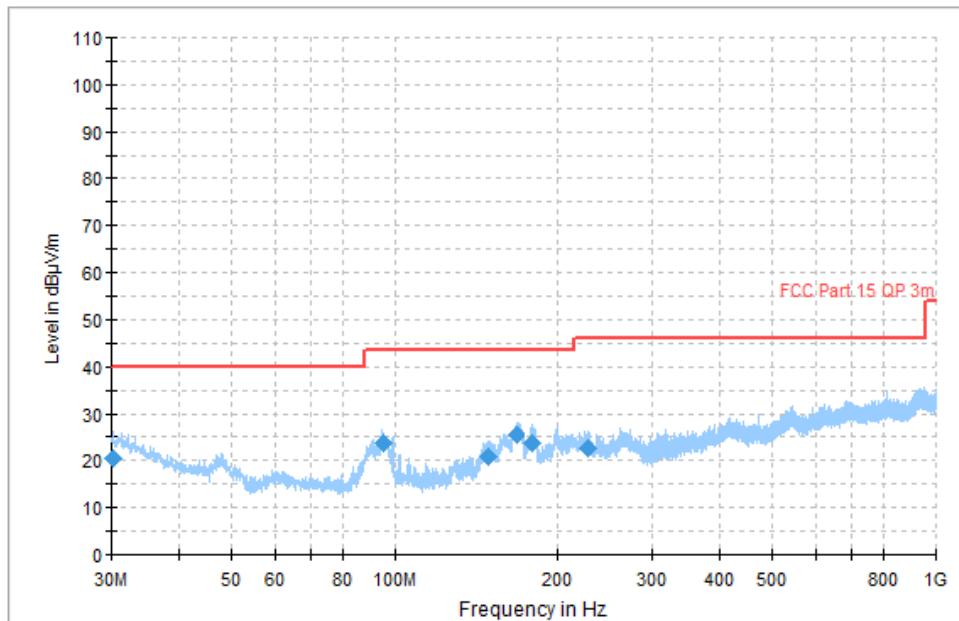
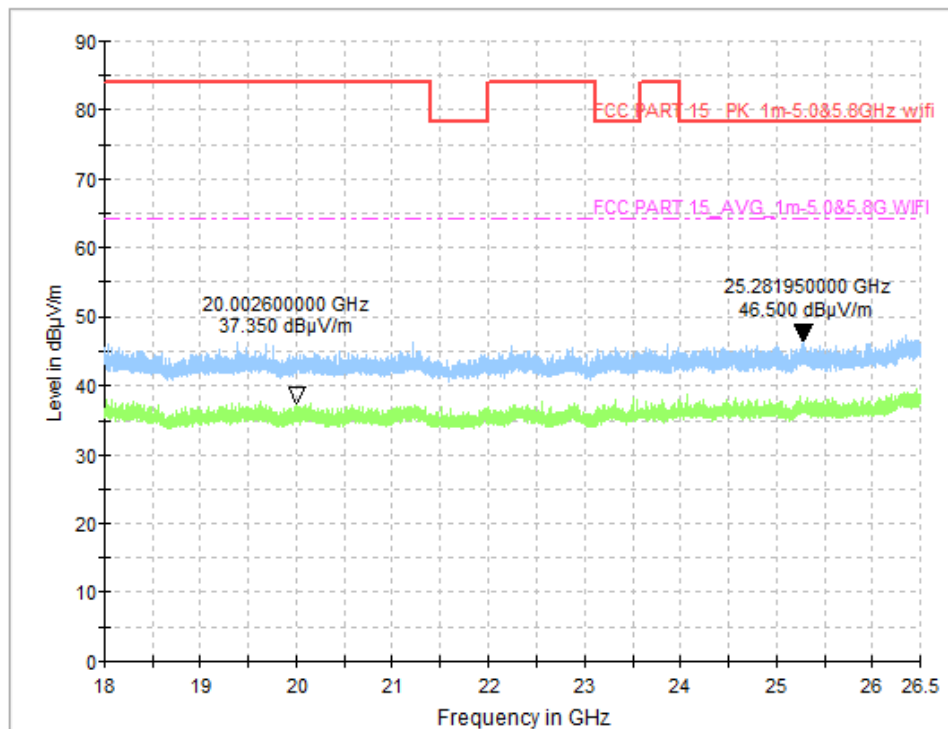


Fig. 88 Transmitter Spurious Emission (802.11ac-VHT80, CH155 5775MHz, 1 GHz-18 GHz)





**Fig. 89 Transmitter Spurious Emission (All channel, 30MHz~1GHz)**



**Fig. 90 Transmitter Spurious Emission (All channel, 18GHz~26.5GHz)**

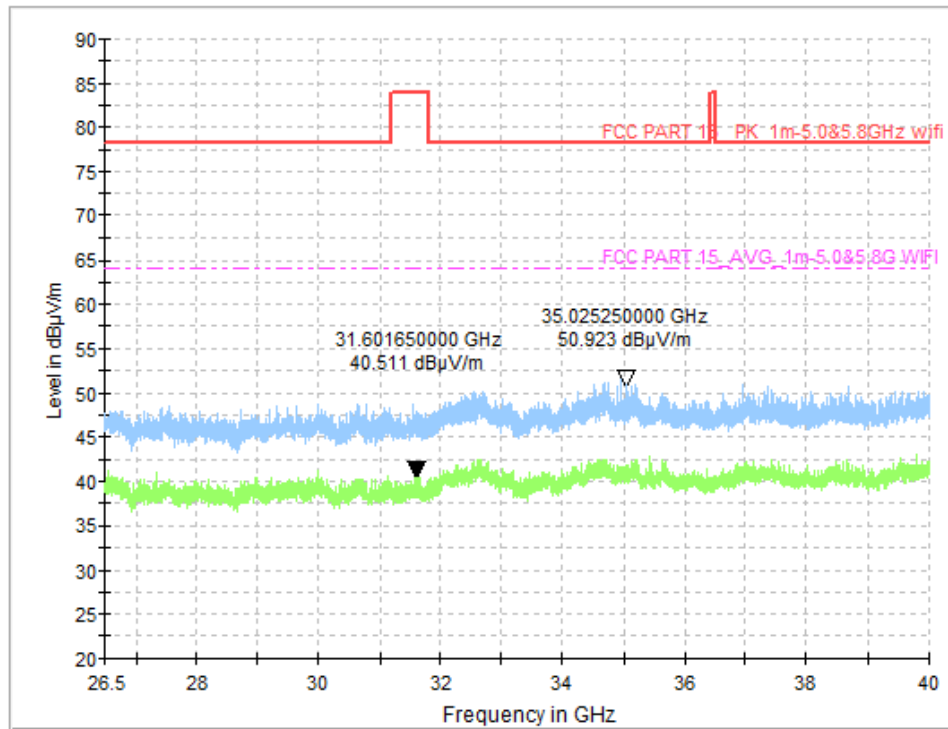


Fig. 91 Transmitter Spurious Emission (All channel, 26.5GHz~40GHz)

### A.9. Radiated Spurious Emissions < 30MHz

Measurement Limit (15.209, 9 kHz-30MHz):

Frequency (MHz)	Field strength ( $\mu\text{V/m}$ )	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

The measurement is made according to KDB 789033.

Note: The measurement distance during the test is 3m. The limit used in plots recalculated based on the extrapolation factor of 40 dB/decade.

Measurement Result (Worst case):

Mode	Frequency Range	Test Results	Conclusion
All Channel	9 kHz ~30 MHz	Fig.92	P

See below for test graphs.

Conclusion: PASS

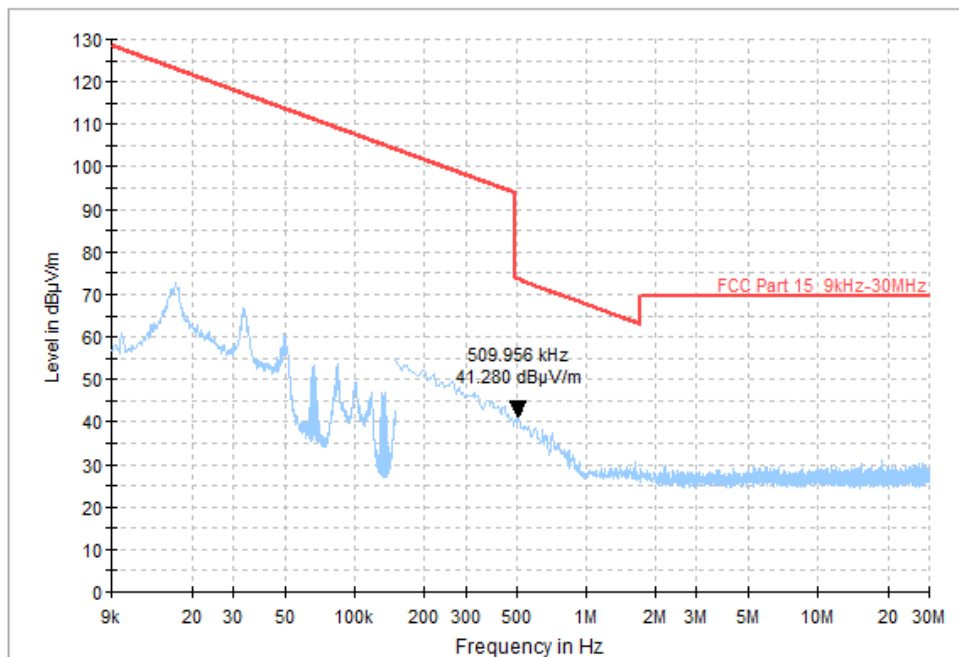


Fig. 92 Radiated Spurious Emission (All Channel, 9 kHz ~30 MHz)

## A.10. AC Power Line Conducted Emission

Test Condition:

Voltage (V)	Frequency (Hz)
120	60

Measurement Result and limit:

RLAN- A2, A3

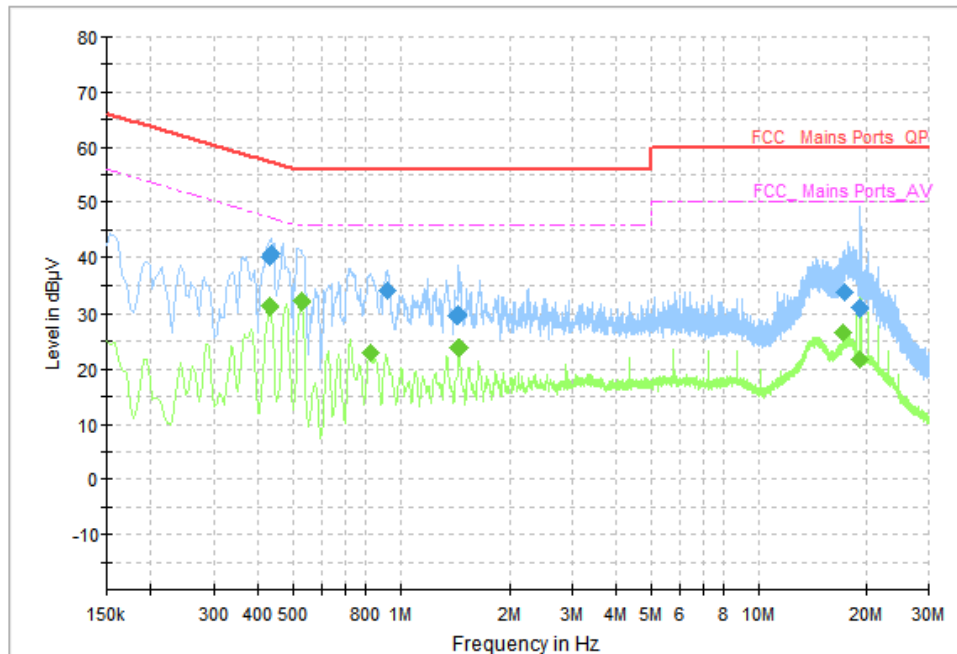
Frequency range (MHz)	Quasi-peak Limit (dB $\mu$ V)	Average-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)		Conclusion
			Traffic	Idle	
0.15 to 0.5	66 to 56	56 to 46	Fig.93	Fig.94	<b>P</b>
0.5 to 5	56	46			
5 to 30	60	50			

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. 93 AC Power line Conducted Emission (Traffic)**

**Measurement Result: Quasi Peak**

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.430000	40.18	57.25	17.07	L1	ON	10
0.434000	40.78	57.18	16.40	L1	ON	10
0.918000	34.04	56.00	21.96	L1	ON	10
1.442000	29.81	56.00	26.19	L1	ON	10
17.410000	33.65	60.00	26.35	L1	ON	10
19.230000	30.91	60.00	29.09	L1	ON	10

**Measurement Result: Average**

Frequency (MHz)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.430000	31.12	47.25	16.13	L1	ON	10
0.526000	32.19	46.00	13.81	L1	ON	10
0.826000	23.08	46.00	22.92	L1	ON	10
1.446000	23.86	46.00	22.14	L1	ON	10
17.338000	26.56	50.00	23.44	L1	ON	10
19.234000	21.89	50.00	28.11	L1	ON	10

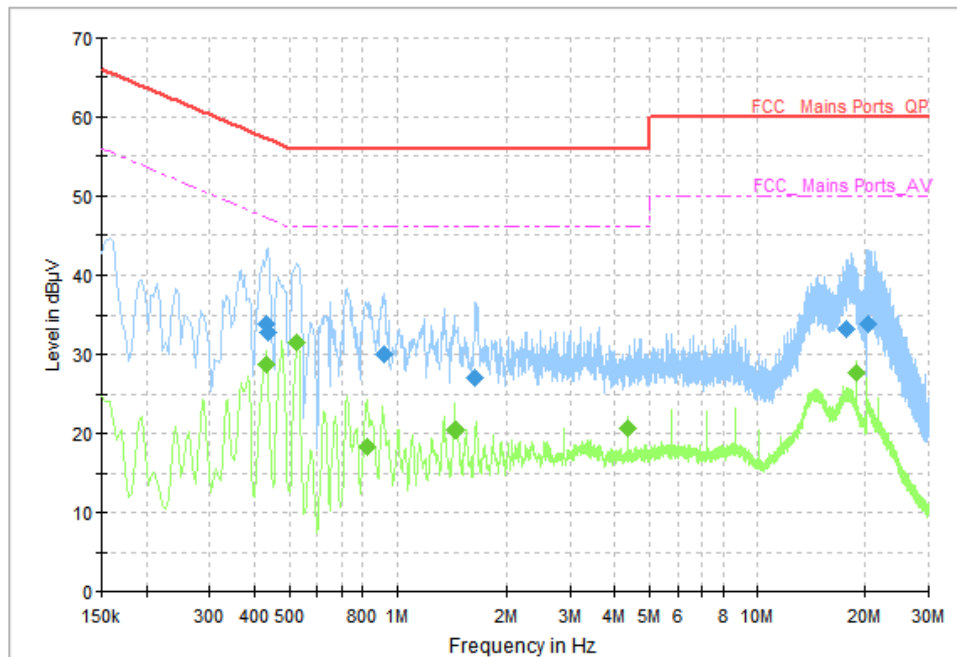


Fig. 94 AC Power line Conducted Emission (Idle)

#### Measurement Result: Quasi Peak

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.430000	34.03	57.25	23.22	L1	ON	10
0.438000	32.84	57.10	24.26	L1	ON	10
0.918000	30.08	56.00	25.92	L1	ON	10
1.630000	27.13	56.00	28.87	L1	ON	10
17.626000	33.36	60.00	26.64	L1	ON	10
20.390000	33.84	60.00	26.16	L1	ON	10

#### Measurement Result: Average

Frequency (MHz)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.430000	28.86	47.25	12.40	L1	ON	10
0.526000	31.52	46.00	14.48	L1	ON	10
0.822000	18.39	46.00	27.61	L1	ON	10
1.446000	20.58	46.00	25.42	L1	ON	10
4.334000	20.65	46.00	25.35	L1	ON	10
18.786000	27.79	50.00	22.21	L1	ON	10



#### **A.11. Power control**

A Transmission Power Control mechanism is not required for systems with an e.i.r.p. of less than 27dBm (500mW).

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