



# FCC PART 15 TEST REPORT No.I21Z62451-IOT16

for

**HMD Global Oy**

**Smart Phone**

**N151DL**

**With**

**FCC ID: 2AJOTTA-1510**

**Hardware Version: V1.0**

**Software Version: 02US\_0\_060**

**Issued Date: 2022-02-18**

**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 CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

**Test Laboratory:**

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I21Z62451-IOT16	Rev.0	1st edition	2022-02-18

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## 1. TEST LABORATORY

### 1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (ISED#: 24849). The detail accreditation scope can be found on NVLAP website.

### 1.2. Testing Location

Testing Location: CTTL(Huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing,  
P. R. China100191

### 1.3. Testing Environment

Normal Temperature: 15-35°C

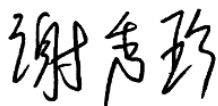
Relative Humidity: 20-75%

### 1.4. Project date

Testing Start Date: 2021-11-29

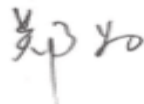
Testing End Date: 2022-02-18

### 1.5. ature



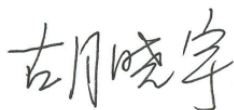
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**Xie Xiuzhen**  
( Prepared this test report )



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**Zheng Wei**  
(Reviewed this test report)



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**Hu Xiaoyu**  
(Approved this test report)



## **2. CLIENT INFORMATION**

### **2.1 Applicant Information**

Company Name: HMD Global Oy  
Address: Bertel Jungin aukio 9, 02600 Espoo, Finland  
City: Espoo  
Postal Code: /  
Country: Finland  
Telephone: +491735287964  
Fax: /

### **2.2 Manufacturer Information**

Company Name: HMD Global Oy  
Address: Bertel Jungin aukio 9, 02600 Espoo, Finland  
City: Espoo  
Postal Code: /  
Country: Finland  
Telephone: +491735287964  
Fax: /

### 3. EQUIPMENT UNDER TEST (EUT) AND

#### ANCILLARY EQUIPMENT (AE)

##### 3.1. About EUT

Description	Smart Phone
Model name	N151DL
FCC ID	2AJOTTA-1510
WLAN Frequency Band	ISM Bands: -5150MHz~5250MHz -5250MHz~5350MHz -5470MHz~5725MHz
Type of modulation	OFDM
Antenna	Integral Antenna
Voltage	3.85V

##### 3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	350819780021001/01	V1.0	02US_0_060
EUT2	350819780013495	V1.0	02US_0_060

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

##### 3.3. Internal Identification of AE used during the test

AE ID*	Description	SN
AE1	Charger1	CH011

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

##### 3.4. General Description

The Equipment under Test (EUT) is a model of Smart Phone with integrated antenna and inbuilt battery.

It has Bluetooth (EDR) function.

It consists of normal options: travel charger, USB cable.

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

Samples undergoing test were selected by the client.

### 3.5. Interpretation of the Test Environment

For the test methods, the test environment uncertainty figures correspond to an expansion factor  $k=2$ .

#### Measurement Uncertainty

Parameter	Uncertainty
temperature	0.48°C
humidity	2 %
DC voltages	0.003V

## 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.

FCC Part15	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices	2018
ANSI C63.10	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2013
UNII: KDB 789033 D02	General U-NII Test Procedures New Rules v02r01	2017-12

## 5. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.



## 6. SUMMARY OF TEST RESULTS

### 6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15E	Sub-clause of IC	Verdict
Maximum Output Power	15.407	/	P
Peak Power Spectral Density	15.407	/	P
Occupied 26dB Bandwidth	15.403	/	P
Band edge compliance (Radiated)	15.209	/	P
Transmitter spurious emissions (Radiated)	15.407	/	P
AC Powerline Conducted Emission (150kHz- 30MHz)	15.407	/	P
Frequency Stability	15.407	/	P
99% Occupied bandwidth	/	/	P
Transmit Power Control	15.407	/	NA

Please refer to **ANNEX A** for detail.

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NM	Not measured, The test was not measured by CTTL
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard

### 6.2. Statements

CTTL has evaluated the test cases requested by the client/matrix manufacturer as listed in section 6.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.1.

This report only deals with the WLAN function among the features described in section 3.

### 6.3. Test Conditions

For this report, all the test cases are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

Temperature	26°C
Voltage	3.85V
Humidity	44%

## 7. TEST EQUIPMENTS UTILIZED

### Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	1 year	2022-05-24
2	LISN	ENV216	101200	R&S	1 year	2022-05-30
3	Test Receiver	ESCI	100344	R&S	1 year	2022-02-23
4	Shielding Room	S81	/	ETS-Lindgren	/	/

### Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESW44	103023	R&S	1 year	2022-10-28
2	BiLog Antenna	VULB916 3	9163-1223	Schwarzbeck	1 year	2022-03-22
3	EMI Antenna	3115	0016725	ETS-Lindgren	1 year	2022-07-01

## 8. Measurement Uncertainty

### 8.1 Transmitter Output Power

Measurement Uncertainty: 0.387dB,k=1.96

### 8.2 Peak Power Spectral Density

Measurement Uncertainty: 0.705dB,k=1.96

### 8.3 Occupied Channel Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

### 8.4 Band Edges Compliance

Measurement Uncertainty : 0.62dB,k=1.96

### 8.5 Spurious Emissions

#### Conducted (k=1.96)

Frequency Range	Uncertainty(dB)
$30\text{MHz} \leq f \leq 2\text{GHz}$	1.22
$2\text{GHz} \leq f \leq 3.6\text{GHz}$	1.22
$3.6\text{GHz} \leq f \leq 8\text{GHz}$	1.22
$8\text{GHz} \leq f \leq 12.75\text{GHz}$	1.51
$12.75\text{GHz} \leq f \leq 26\text{GHz}$	1.51
$26\text{GHz} \leq f \leq 40\text{GHz}$	1.59

#### Radiated (k=2)

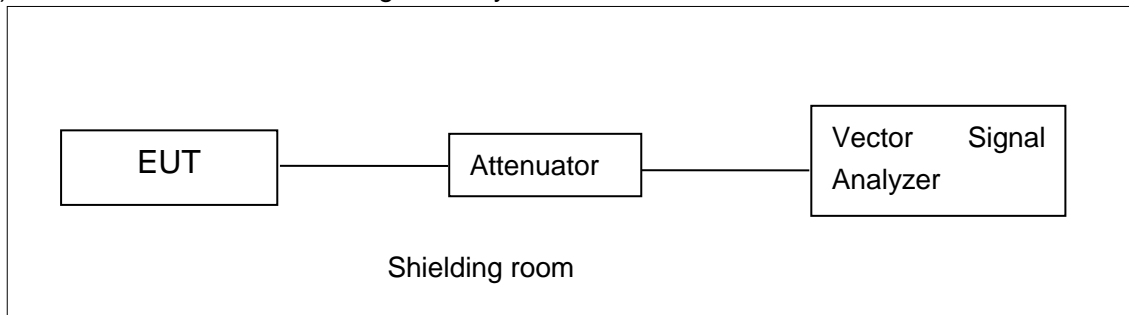
Frequency Range	Uncertainty(dB)
9kHz-30MHz	/
$30\text{MHz} \leq f \leq 1\text{GHz}$	5.40
$1\text{GHz} \leq f \leq 18\text{GHz}$	4.32
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.26

## ANNEX A: MEASUREMENT RESULTS

### A.1. Measurement Method

#### A.1.1. 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. Vector Signal Analyzer

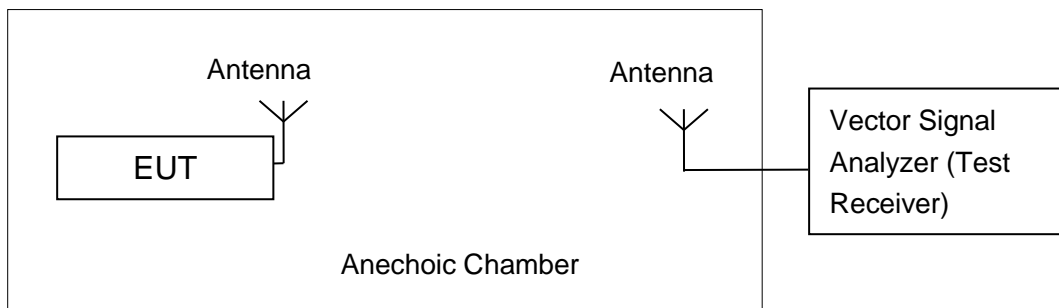


#### A.1.2. Radiated Emission Measurements

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

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

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



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	24dBm
	5250MHz~5350MHz	24dBm or 11+10logB
	5470MHz~5725MHz	24dBm or 11+10logB

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

The measurement method SA-2 is made according to KDB 789033

Note:

For straddle channel 20MHz Bandwidth 5720MHz, Conducted Output Power Limit:

802.11a=11+10\*log(B)=24.46, B=34.40/2+5=22.20MHz,

802.11n-HT20=11+10\*log(B)=24.67, B=36.55/2+5=23.275MHz,

802.11ac-VHT20=11+10\*log(B)=24.24, B=32.20/2+5=21.10MHz,

For straddle channel 40/80MHz Bandwidth, conducted output power limit=24 dBm

802.11n-HT40: B=52.00/2+15=41.00MHz,

802.11ac-VHT40: B=51.28/2+15=40.64MHz,

802.11ac-VHT80: B=91.52/2+35=80.76MHz,

### Measurement Results:

#### 802.11a mode

Mode	Frequency	Test Result (dBm)							
		Data Rate (Mbps)							
		6	9	12	18	24	36	48	54
802.11a	5180MHz	17.72	/	/	/	/	/	/	/
	5200MHz	17.89	/	/	/	/	/	/	/
	5240MHz	17.87	/	/	/	/	/	/	/
	5260MHz	17.77	/	/	/	/	/	/	/
	5280MHz	17.75	/	/	/	/	/	/	/
	5320MHz	17.95	/	/	/	/	/	/	/
	5500MHz	16.39	/	/	/	/	/	/	/
	5580MHz	17.29	/	/	/	/	/	/	/
	5700MHz	14.27	/	/	/	/	/	/	/
	5720MHz	17.18	/	/	/	/	/	/	/

The data rate 6Mbps is selected as worse condition, and the following cases are performed with this condition.

#### 802.11n-HT20 mode

Mode	Frequency	Test Result (dBm)							
		Data Rate							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n (HT20)	5180MHz	17.47	/	/	/	/	/	/	/
	5200MHz	17.67	/	/	/	/	/	/	/

	5240MHz	17.51	/	/	/	/	/	/	/
	5260MHz	17.62	/	/	/	/	/	/	/
	5280MHz	17.65	/	/	/	/	/	/	/
	5320MHz	17.61	/	/	/	/	/	/	/
	5500MHz	15.35	/	/	/	/	/	/	/
	5580MHz	17.25	/	/	/	/	/	/	/
	5700MHz	13.11	/	/	/	/	/	/	/
	5720MHz	17.05	/	/	/	/	/	/	/

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

#### 802.11ac-HT20 mode

Mode	Frequency	Test Result (dBm)								
		Data Rate								
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
802.11ac (HT20)	5180MHz	17.67	/	/	/	/	/	/	/	/
	5200MHz	17.55	/	/	/	/	/	/	/	/
	5240MHz	17.65	/	/	/	/	/	/	/	/
	5260MHz	17.46	/	/	/	/	/	/	/	/
	5280MHz	17.37	/	/	/	/	/	/	/	/
	5320MHz	17.16	/	/	/	/	/	/	/	/
	5500MHz	15.17	/	/	/	/	/	/	/	/
	5580MHz	17.28	/	/	/	/	/	/	/	/
	5700MHz	13.09	/	/	/	/	/	/	/	/
	5720MHz	17.13	/	/	/	/	/	/	/	/

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

#### 802.11n-HT40 mode

Mode	Frequency	Test Result (dBm)							
		Data Rate							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n (HT40)	5190MHz	15.68	/	/	/	/	/	/	/
	5230MHz	17.48	/	/	/	/	/	/	/
	5270MHz	17.11	/	/	/	/	/	/	/
	5310MHz	15.05	/	/	/	/	/	/	/
	5510MHz	12.11	/	/	/	/	/	/	/
	5550MHz	17.18	/	/	/	/	/	/	/
	5670MHz	16.91	/	/	/	/	/	/	/
	5710MHz	16.86	/	/	/	/	/	/	/

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

#### 802.11ac-HT40 mode

Mode	Frequency	Test Result (dBm)									
		Data Rate									
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
802.11ac (HT40)	5190MHz	15.58	/	/	/	/	/	/	/	/	/
	5230MHz	17.47	/	/	/	/	/	/	/	/	/
	5270MHz	17.58	/	/	/	/	/	/	/	/	/
	5310MHz	15.12	/	/	/	/	/	/	/	/	/
	5510MHz	12.13	/	/	/	/	/	/	/	/	/
	5550MHz	16.92	/	/	/	/	/	/	/	/	/
	5670MHz	16.80	/	/	/	/	/	/	/	/	/
	5710MHz	16.83	/	/	/	/	/	/	/	/	/

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

#### 802.11ac-HT80 mode

Mode	Frequency	Test Result (dBm)									
		Data Rate									
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
802.11ac (HT80)	5210MHz	14.45	/	/	/	/	/	/	/	/	/
	5290MHz	14.65	/	/	/	/	/	/	/	/	/
	5530MHz	12.61	/	/	/	/	/	/	/	/	/
	5610MHz	16.94	/	/	/	/	/	/	/	/	/
	5610MHz	16.61	/	/	/	/	/	/	/	/	/

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

The duty cycle of all mode are 100%.

### A.3. Peak Power Spectral Density (conducted)

#### Measurement Limit:

Standard	Frequency (MHz)	Limit (dBm/MHz)
FCC CRF Part 15.407(a)	5150MHz~5250MHz	11
	5250MHz~5350MHz	11
	5470MHz~5725MHz	11

The output power measurement method Section F is made according to KDB 789033

#### Measurement Results:

Mode	Frequency	Power Spectral Density (dBm/MHz)	Conclusion
802.11a	5180 MHz	8.00	P
	5200 MHz	8.03	P
	5240 MHz	8.27	P
	5260 MHz	8.11	P
	5280 MHz	8.29	P
	5320 MHz	8.27	P
	5500 MHz	6.89	P
	5580 MHz	7.66	P
	5700 MHz	4.73	P
	5720 MHz	7.11	P
802.11n HT20	5180 MHz	8.02	P
	5200 MHz	7.89	P
	5240 MHz	8.15	P
	5260 MHz	8.01	P
	5280 MHz	8.27	P
	5320 MHz	7.95	P
	5500 MHz	5.58	P
	5580 MHz	7.63	P
	5700 MHz	3.39	P
	5720 MHz	6.35	
802.11n HT40	5190 MHz	2.35	P
	5230 MHz	4.94	P
	5270 MHz	5.03	P
	5310 MHz	2.68	P
	5510 MHz	-0.14	P
	5550 MHz	4.76	P
	5670 MHz	4.66	P
	5710 MHz	4.61	
802.11ac	5210MHz	-1.81	P



HT80	5290MHz	-1.56	P
	5530MHz	-3.46	P
	5610MHz	0.74	P
	5690MHz	0.26	

**Conclusion: PASS**

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

**Measurement Limit:**

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

The measurement is made according to KDB 789033

**Measurement Uncertainty:**

Measurement Uncertainty	60.80Hz
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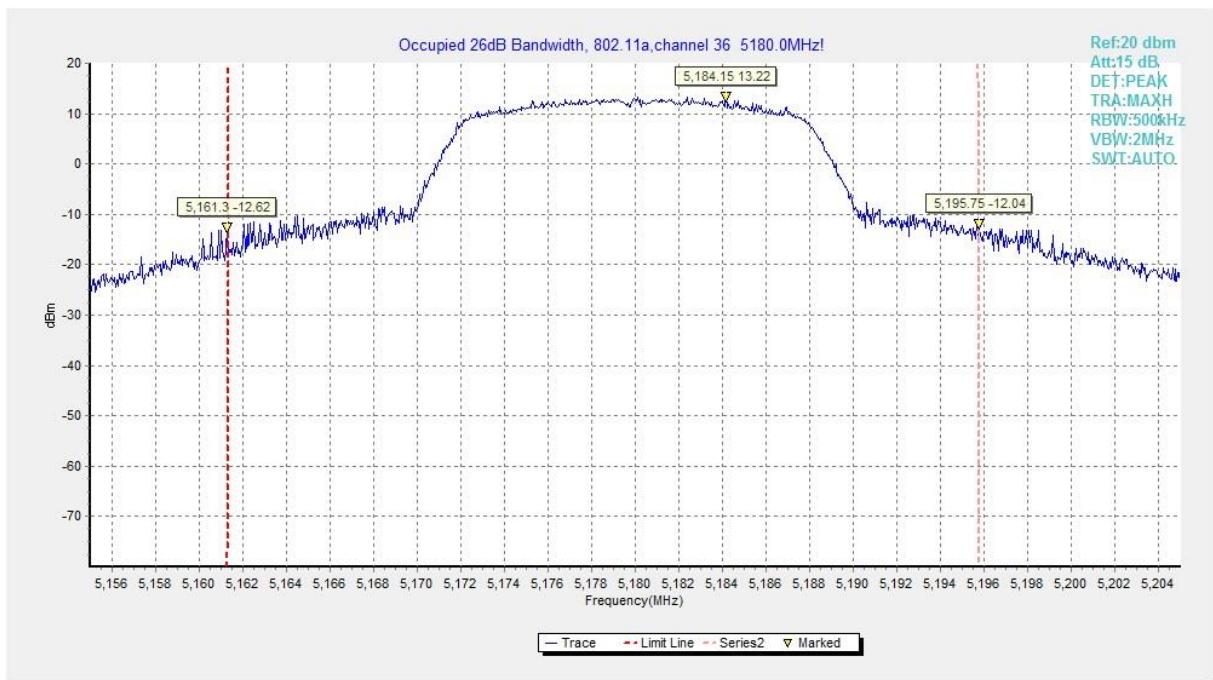
**Measurement Result:**

Mode	Frequency	Occupied 26dB Bandwidth ( MHz)		conclusion
		Fig.	Value	
802.11a	5180 MHz	Fig.1	34.45	P
	5200 MHz	Fig.2	37.85	P
	5240 MHz	Fig.3	34.55	P
	5260 MHz	Fig.4	37.50	P
	5280 MHz	Fig.5	36.80	P
	5320 MHz	Fig.6	38.80	P
	5500 MHz	Fig.7	37.15	P
	5580 MHz	Fig.8	33.65	P
	5700 MHz	Fig.9	36.65	P
	5720 MHz	Fig.10	34.40	
802.11n HT20	5180 MHz	Fig.11	38.45	P
	5200 MHz	Fig.12	35.65	P
	5240 MHz	Fig.13	33.90	P
	5260 MHz	Fig.14	34.70	P
	5280 MHz	Fig.15	37.30	P
	5320 MHz	Fig.16	30.70	P
	5500 MHz	Fig.17	37.85	P
	5580 MHz	Fig.18	35.20	P
	5700 MHz	Fig.19	33.80	P
	5720 MHz	Fig.20	36.55	
802.11n HT40	5190 MHz	Fig.21	59.44	P
	5230 MHz	Fig.22	54.72	P
	5270 MHz	Fig.23	57.52	P

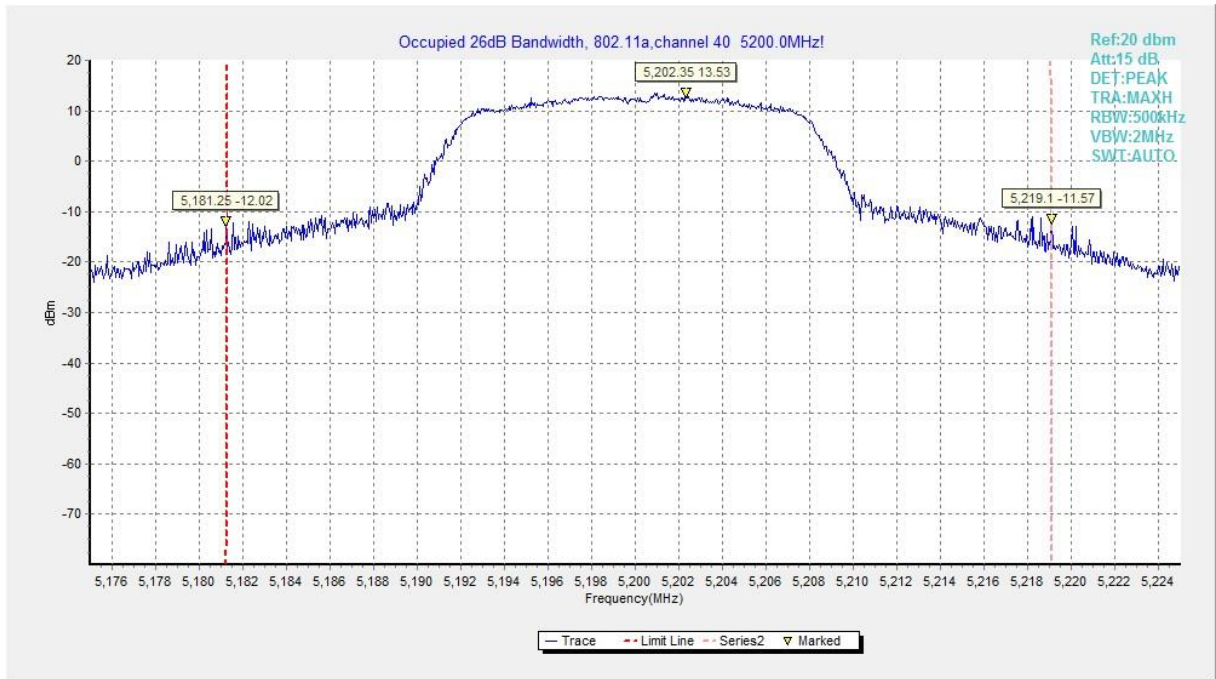
	5310 MHz	Fig.24	57.20	P
	5510 MHz	Fig.25	58.88	P
	5550 MHz	Fig.26	61.36	P
	5670 MHz	Fig.27	54.32	P
	5710 MHz	Fig.28	52.00	
802.11ac HT80	5210MHz	Fig.29	97.76	P
	5290MHz	Fig.30	101.92	P
	5530MHz	Fig.31	128.32	P
	5610MHz	Fig.32	118.72	P
	5690MHz	Fig.33	91.52	

**Conclusion: PASS**

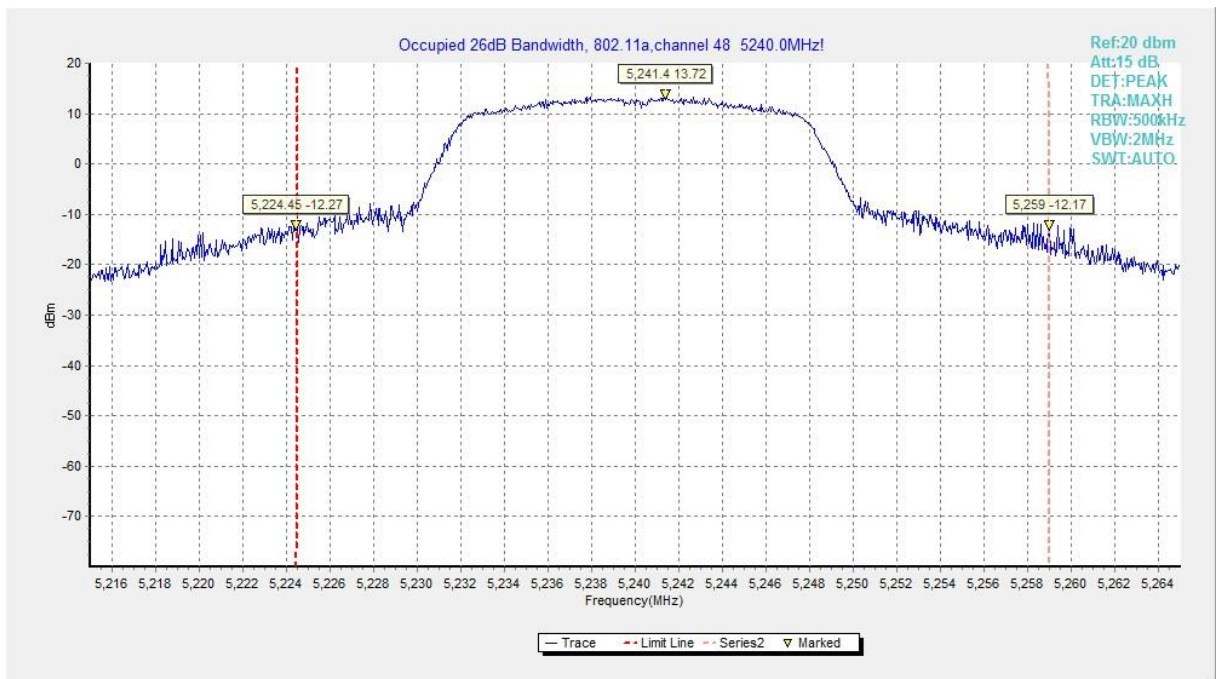
**Test graphs as below:**



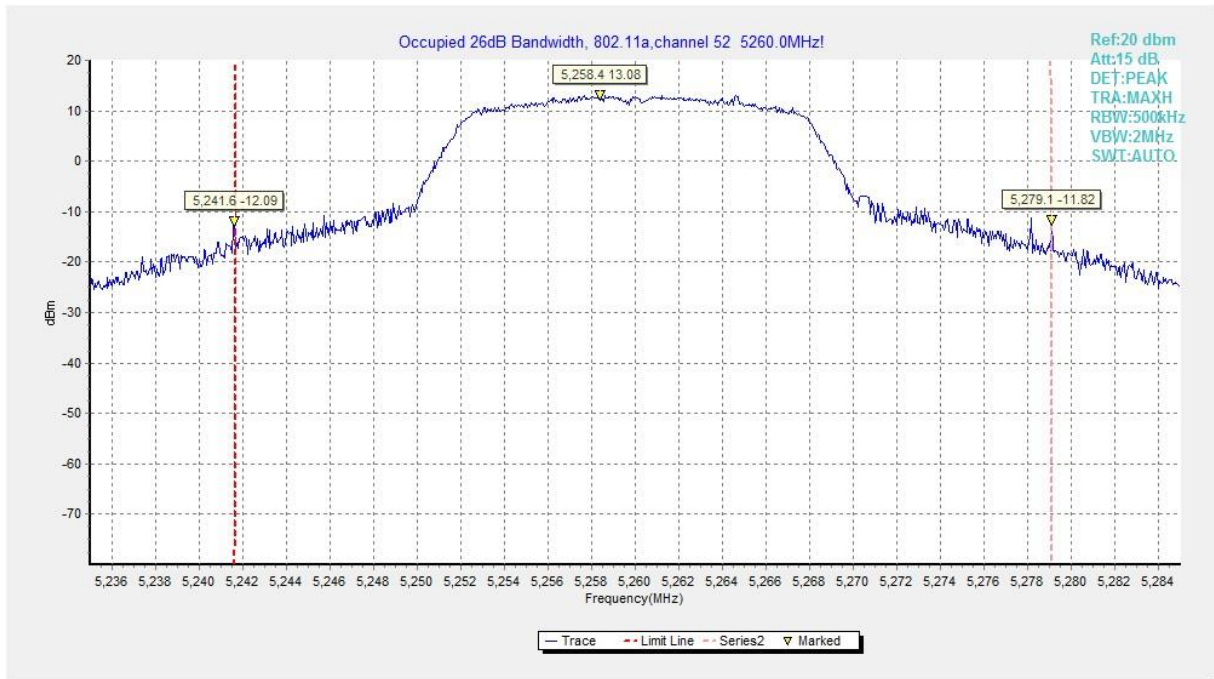
**Fig.1 Occupied 26dB Bandwidth (802.11a, 5180MHz)**



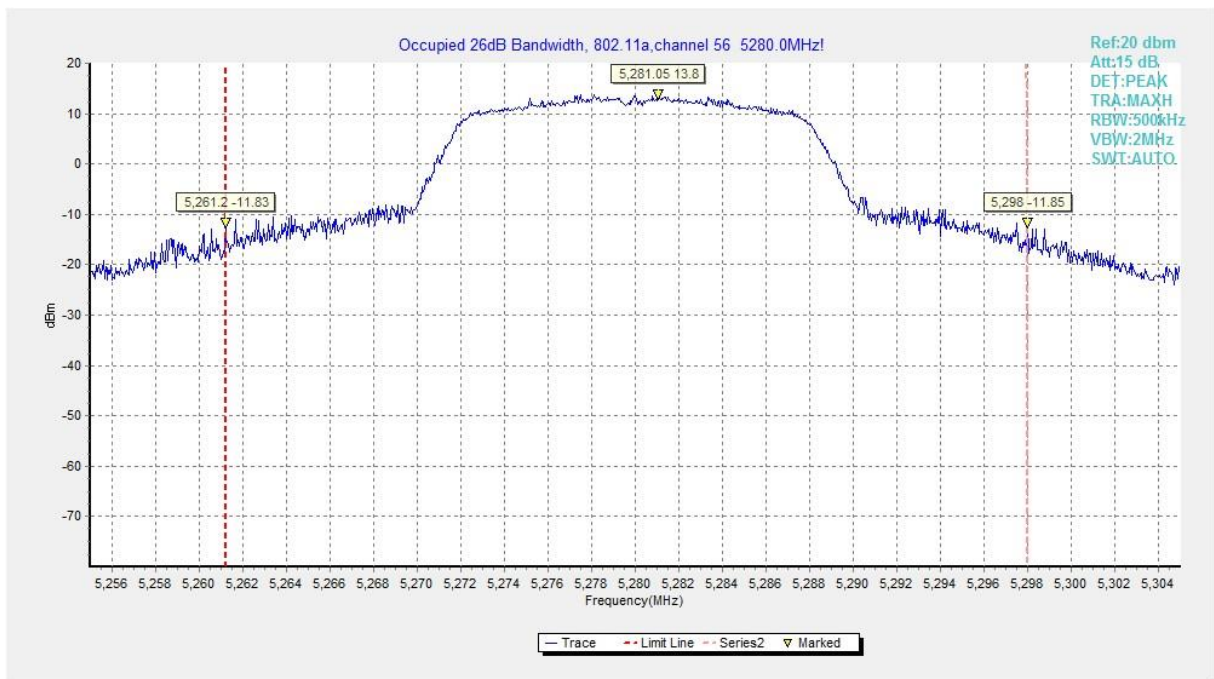
**Fig.2 Occupied 26dB Bandwidth (802.11a, 5200MHz)**



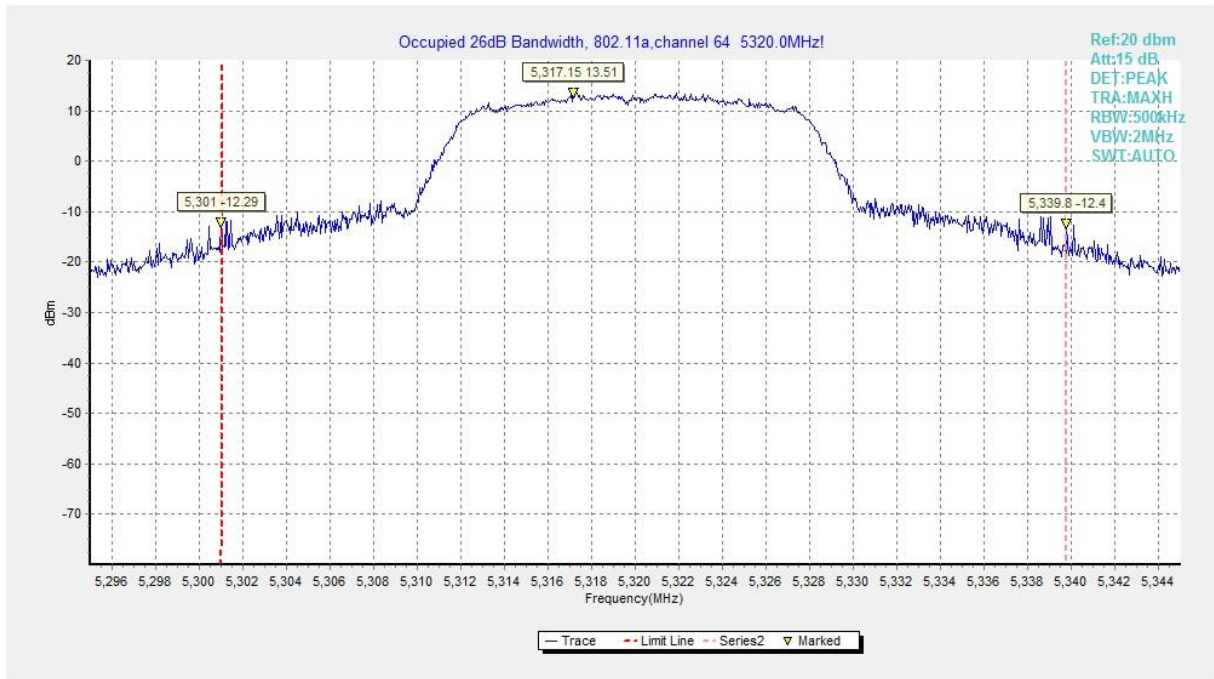
**Fig.3 Occupied 26dB Bandwidth (802.11a, 5240MHz)**



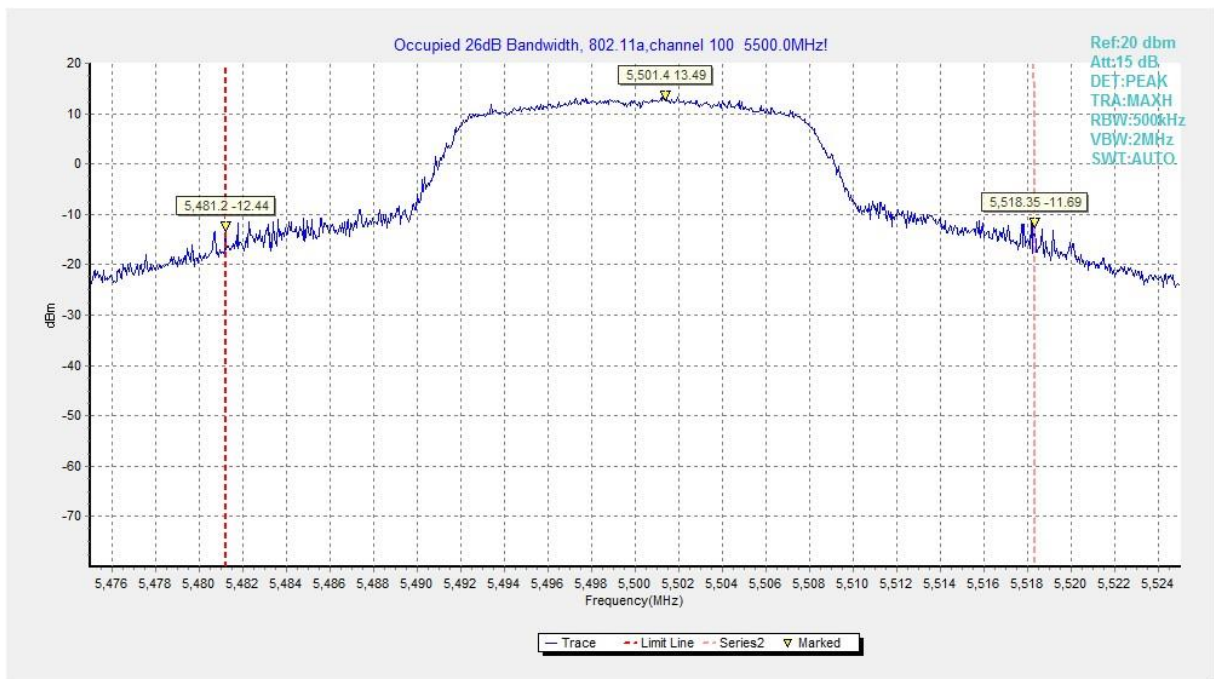
**Fig.4 Occupied 26dB Bandwidth (802.11a, 5260MHz)**



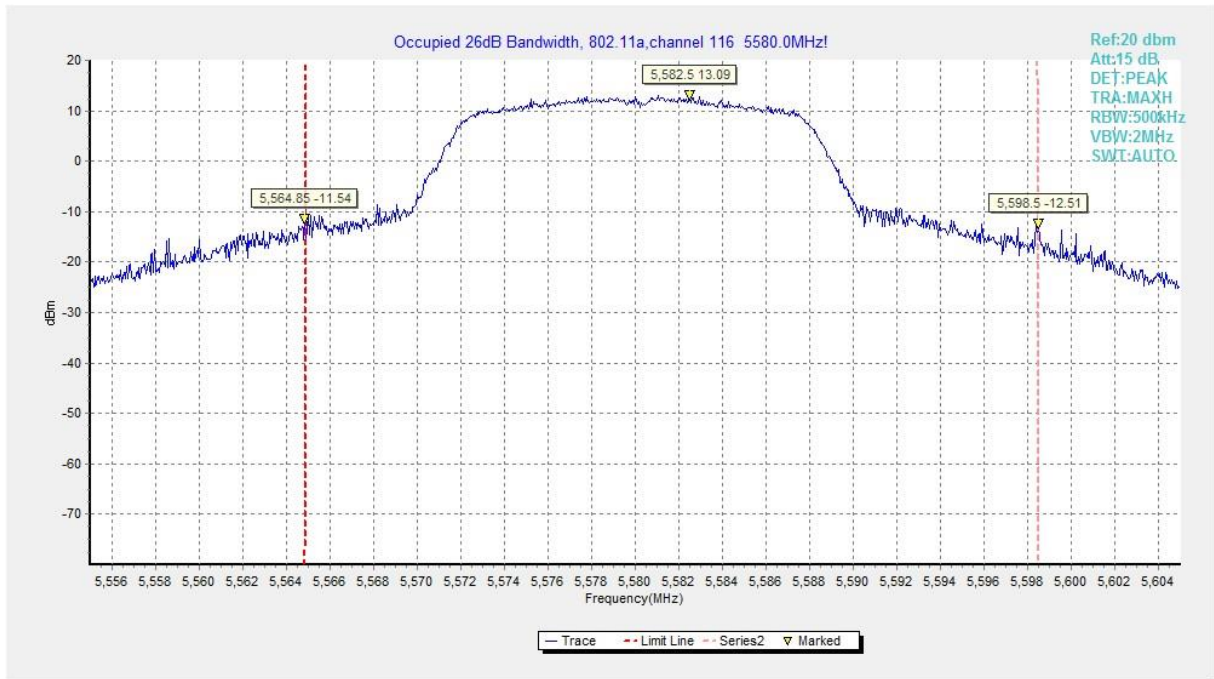
**Fig.5 Occupied 26dB Bandwidth (802.11a, 5280MHz)**



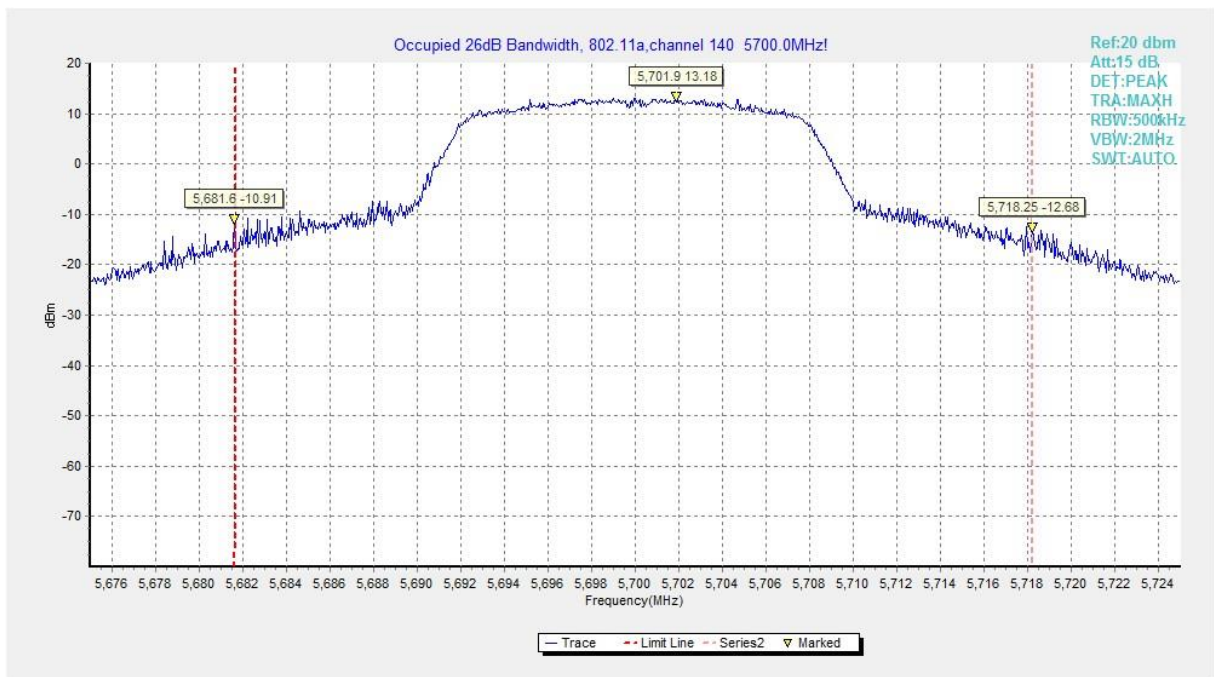
**Fig.6 Occupied 26dB Bandwidth (802.11a, 5320MHz)**



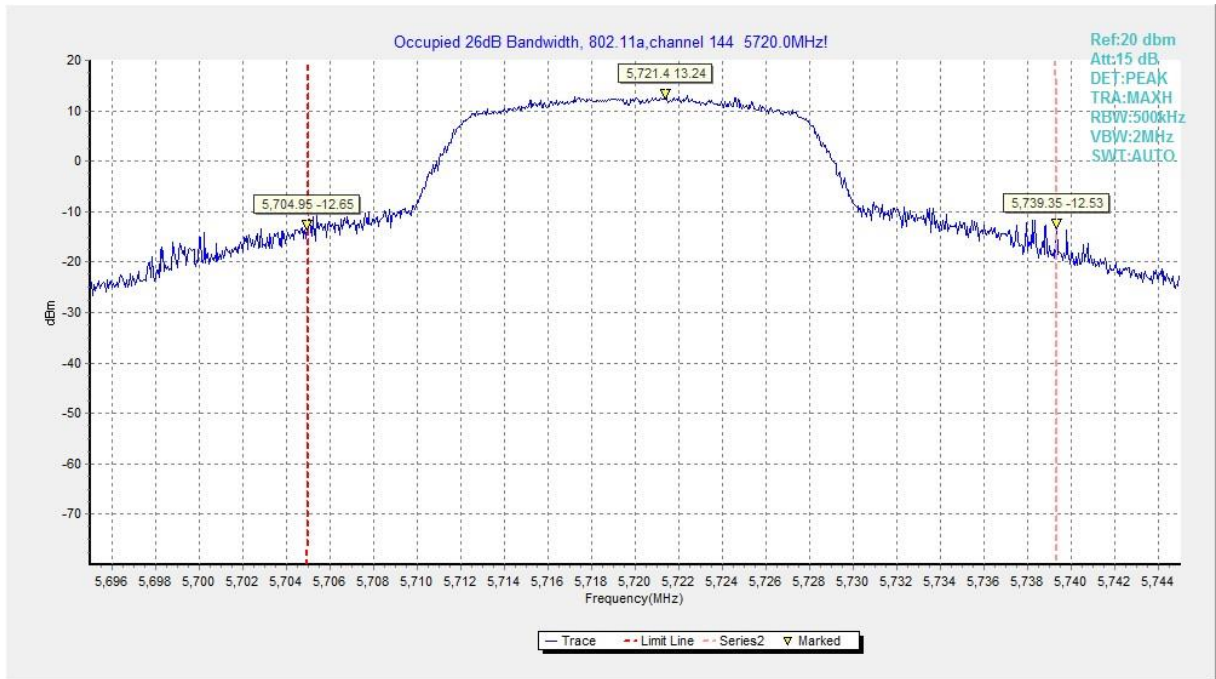
**Fig.7 Occupied 26dB Bandwidth (802.11a, 5500MHz)**



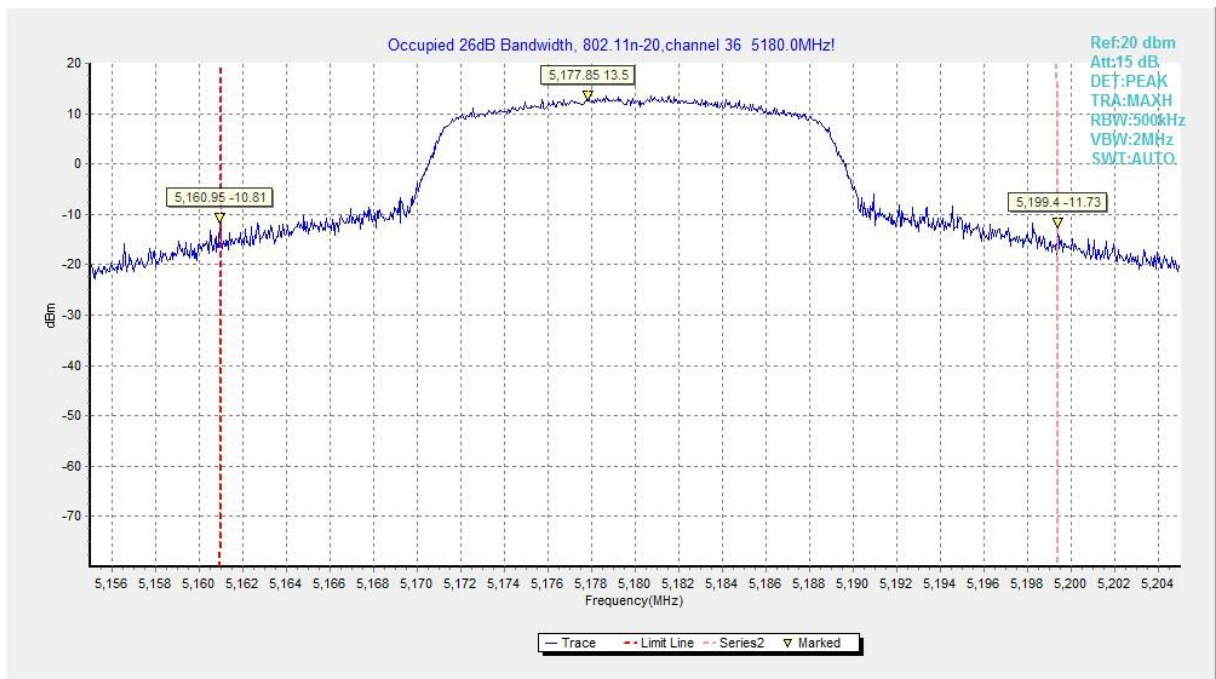
**Fig.8 Occupied 26dB Bandwidth (802.11a, 5580MHz)**



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



**Fig.10 Occupied 26dB Bandwidth (802.11a, 5720MHz)**



**Fig.11 Occupied 26dB Bandwidth (802.11n-HT20, 51800MHz)**

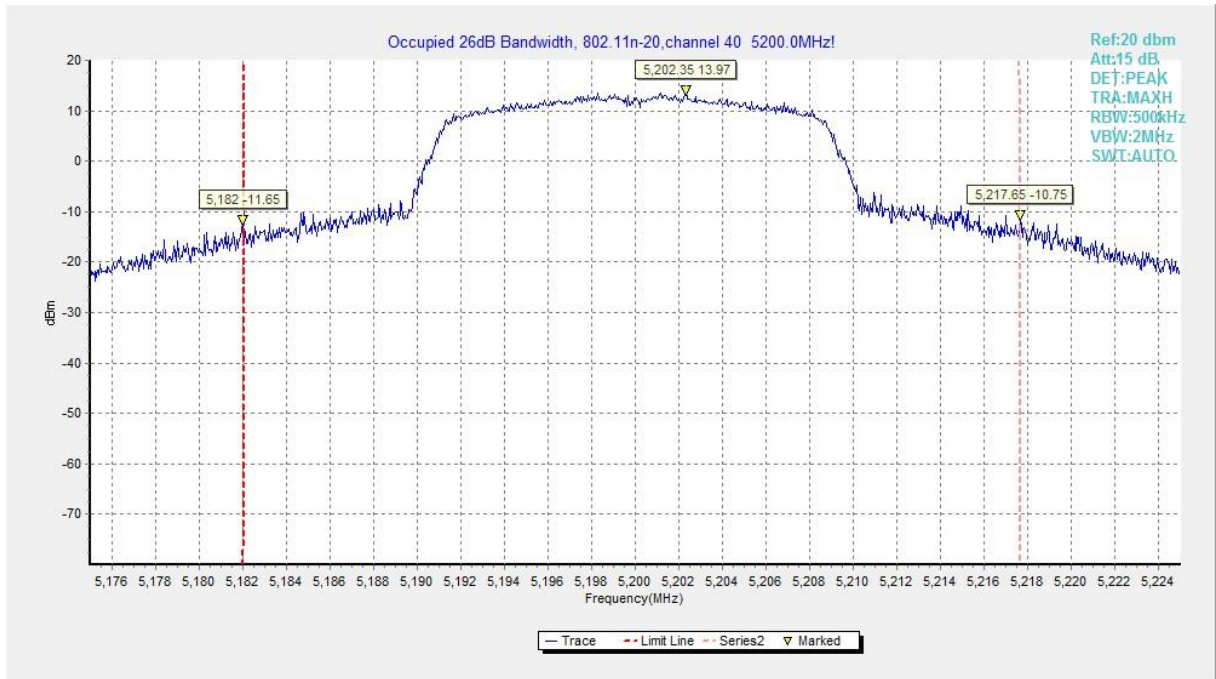


Fig.12 Occupied 26dB Bandwidth (802.11n-HT20, 5200MHz)

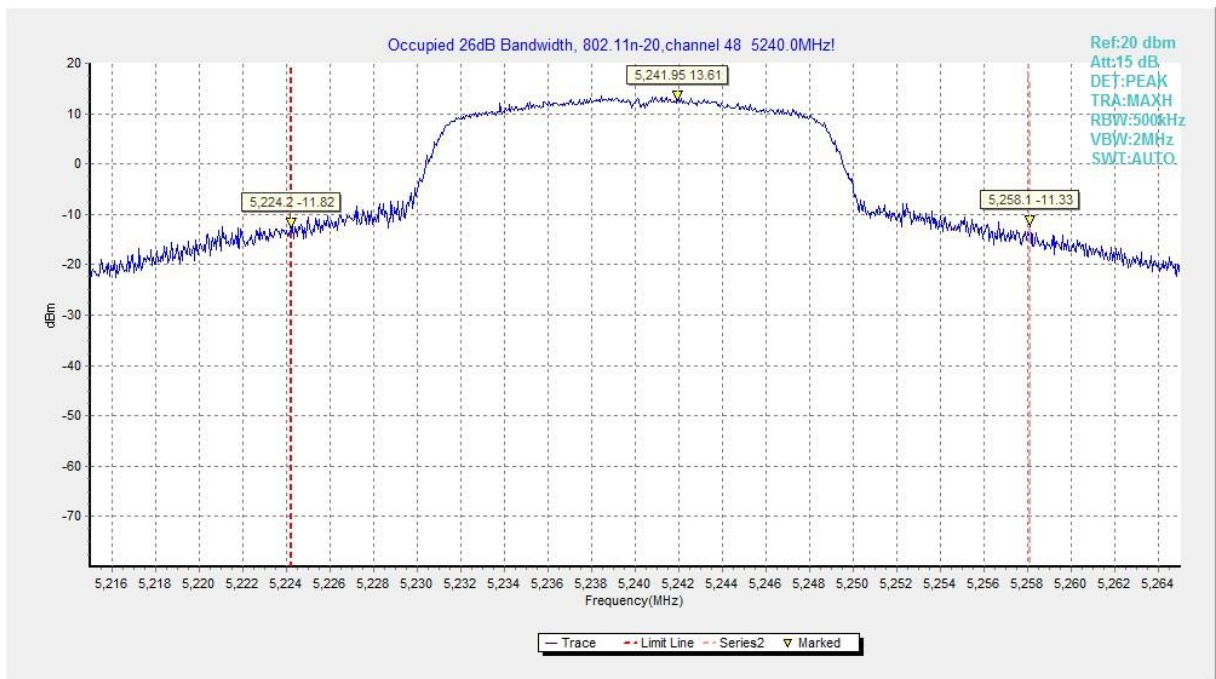


Fig.13 Occupied 26dB Bandwidth (802.11n-HT20, 5240MHz)



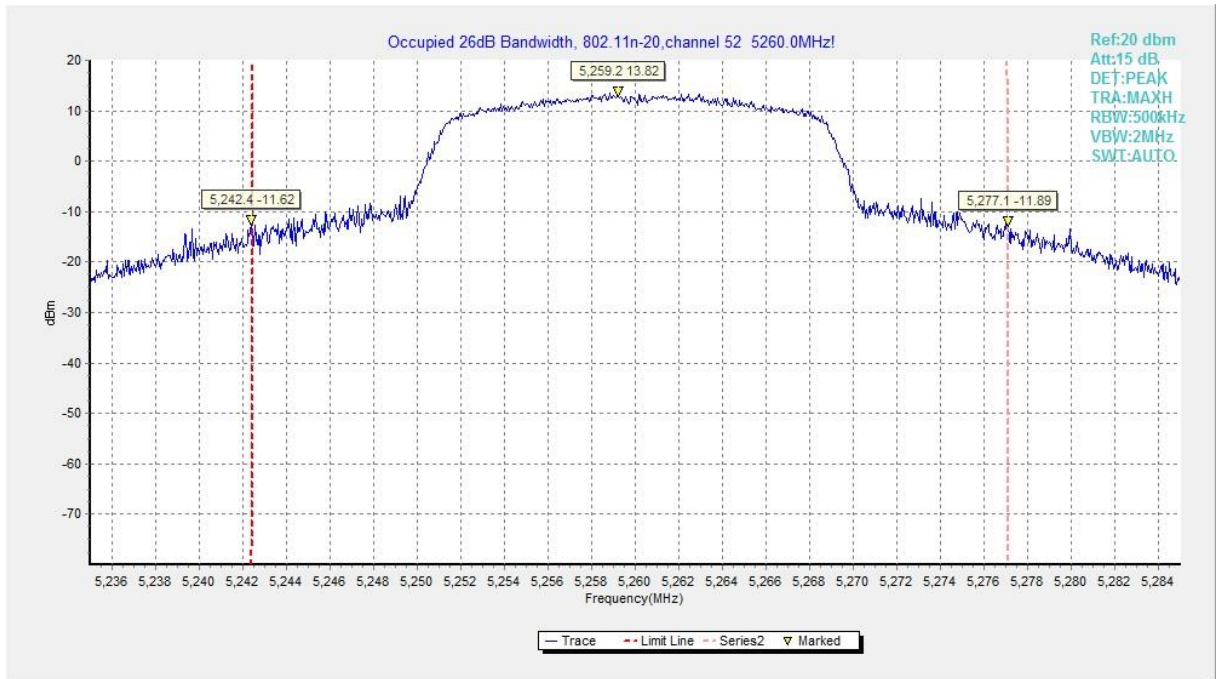


Fig.14 Occupied 26dB Bandwidth (802.11n-HT20, 5260MHz)

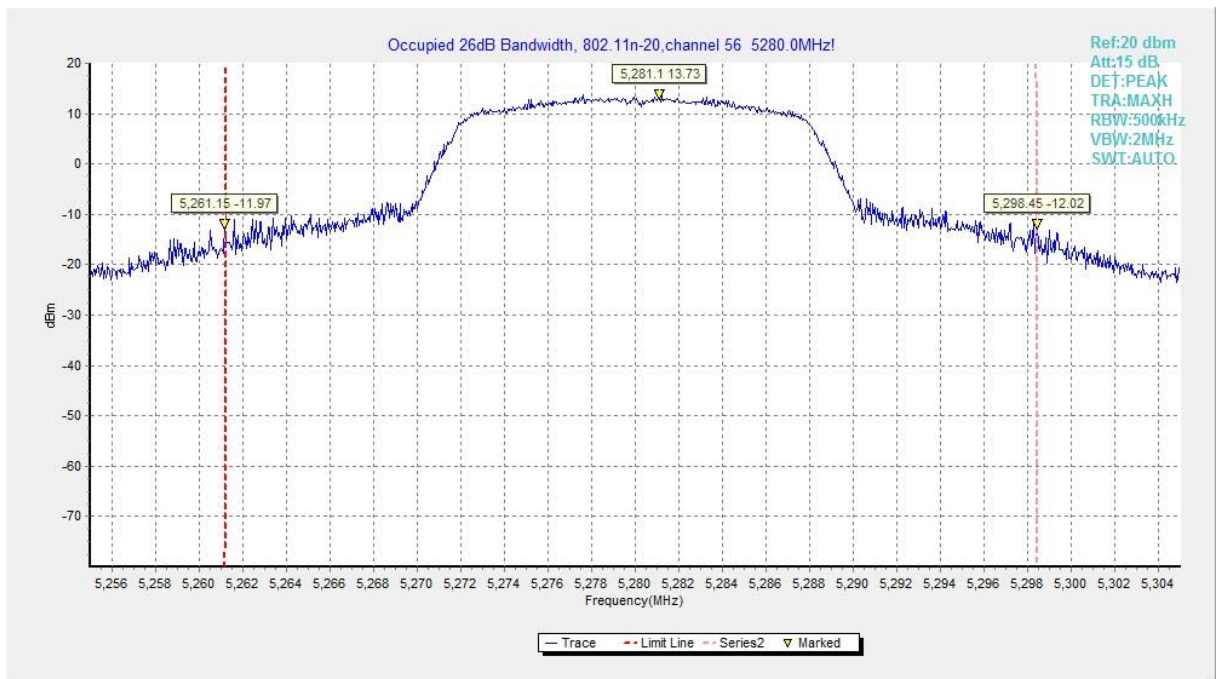


Fig.15 Occupied 26dB Bandwidth (802.11n-HT20, 5280MHz)

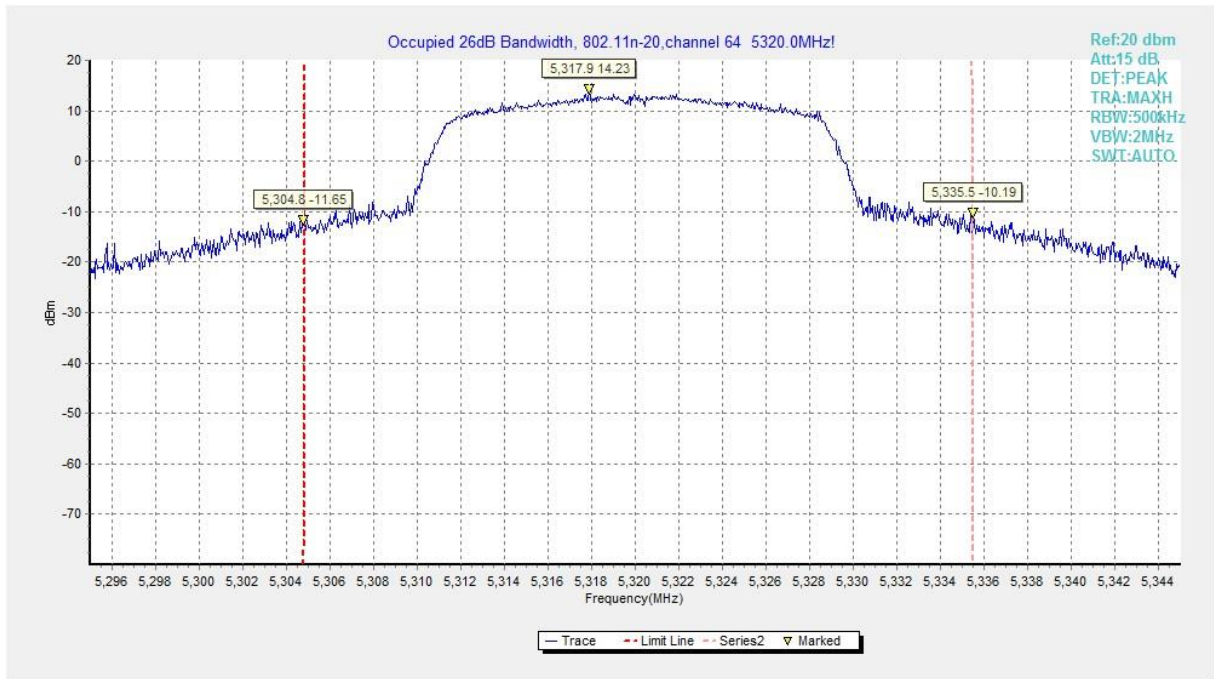


Fig.16 Occupied 26dB Bandwidth (802.11n-HT20, 5320MHz)

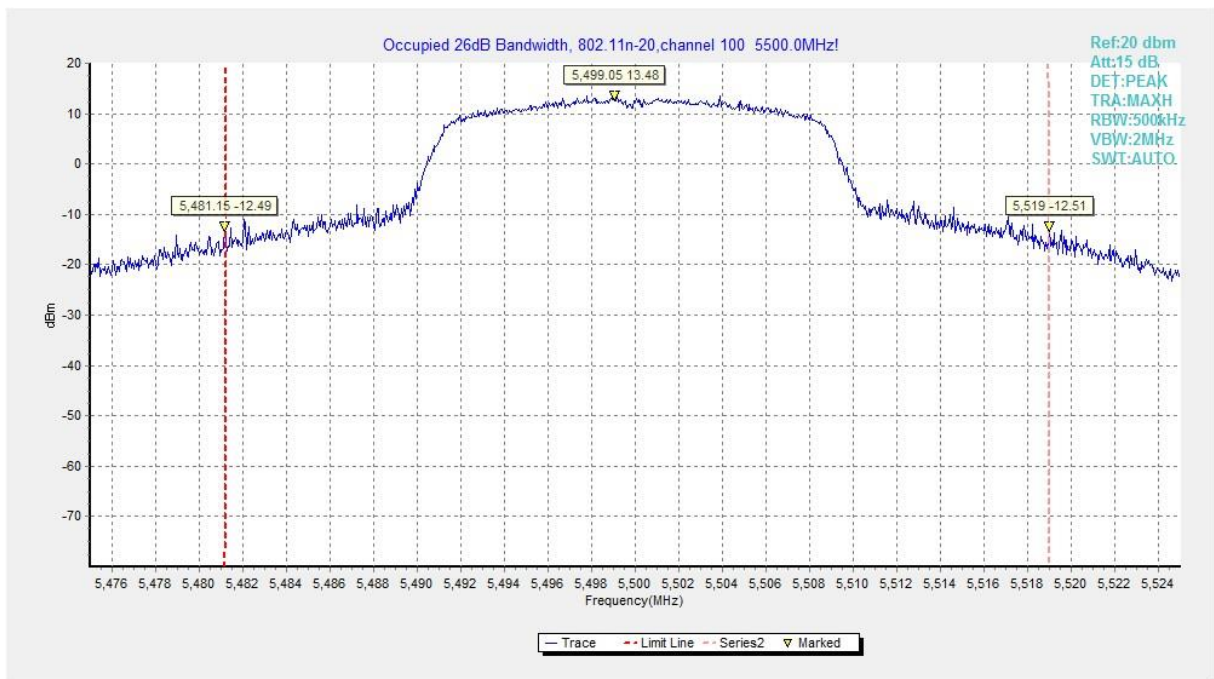


Fig.17 Occupied 26dB Bandwidth (802.11n-HT20, 5500MHz)

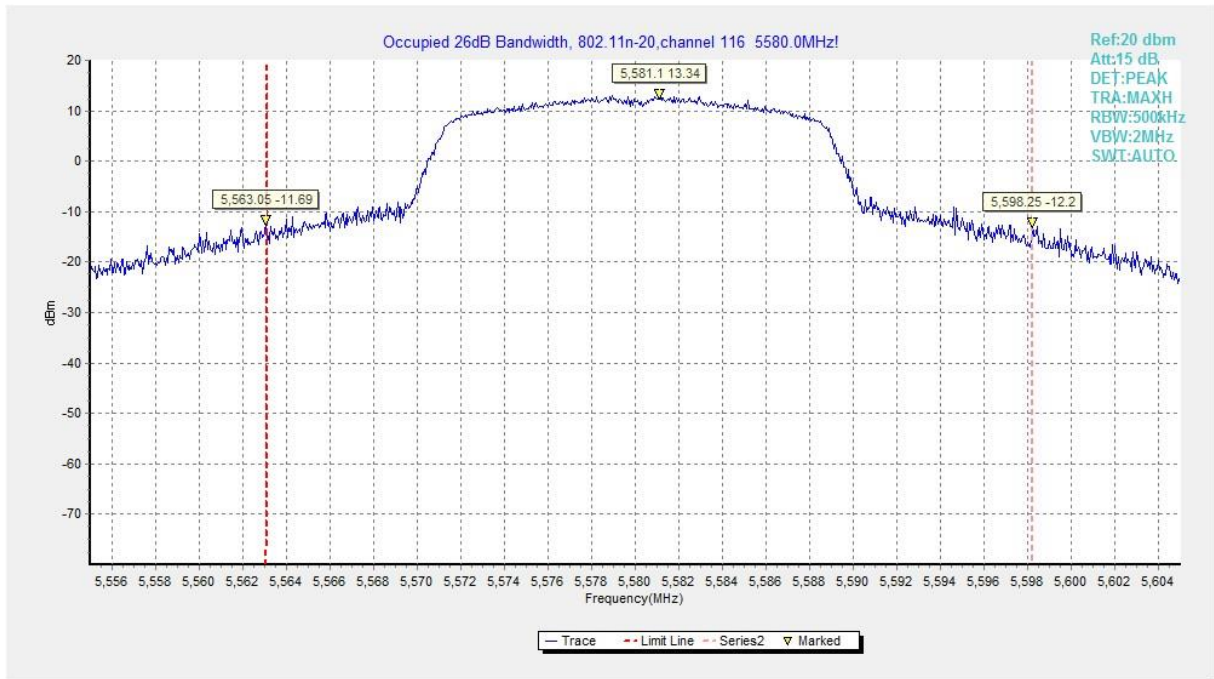


Fig.18 Occupied 26dB Bandwidth (802. 11n-HT20, 5580MHz)

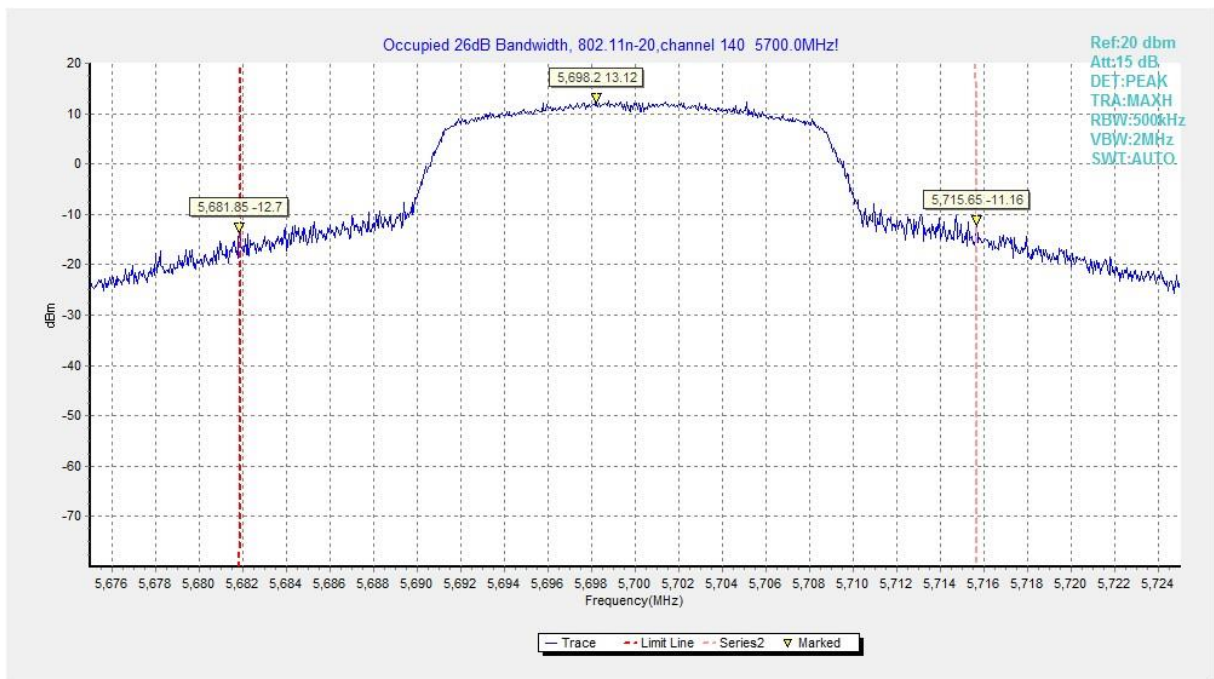
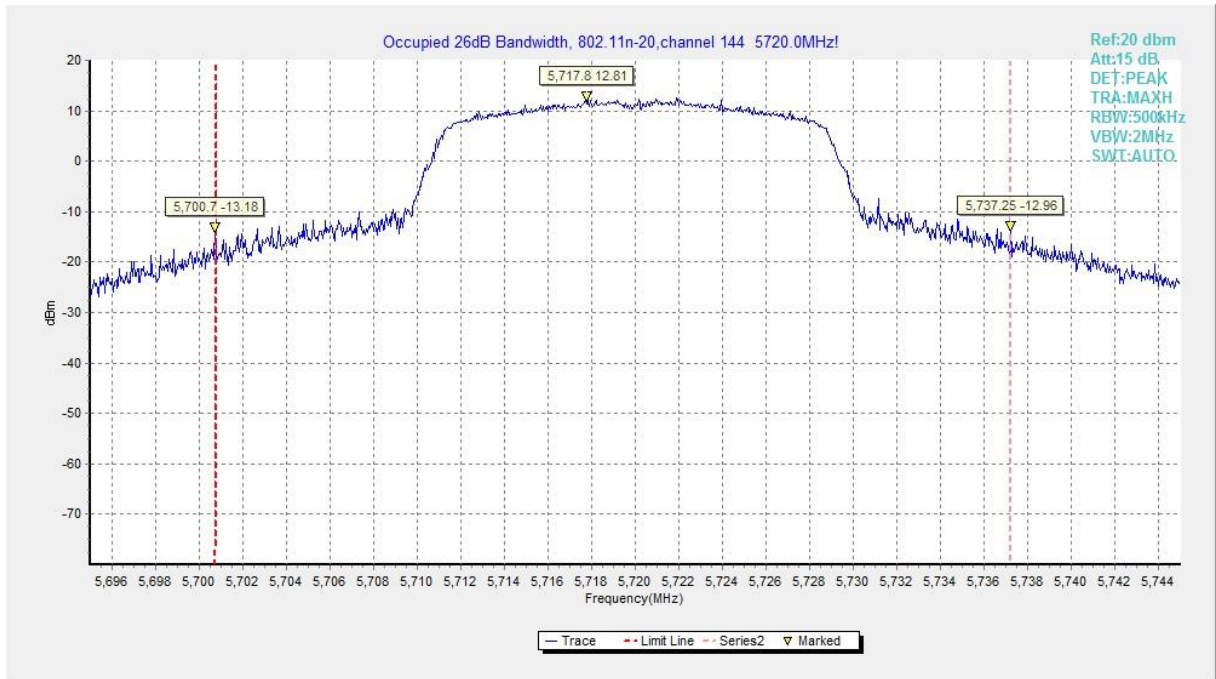
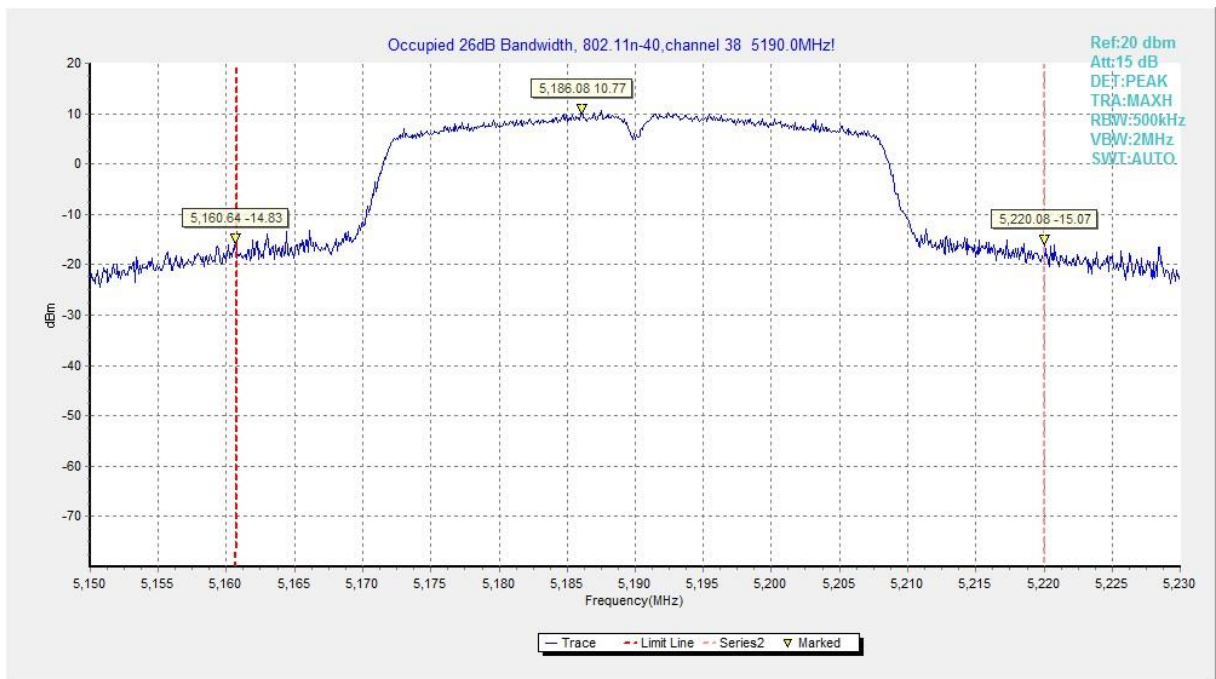


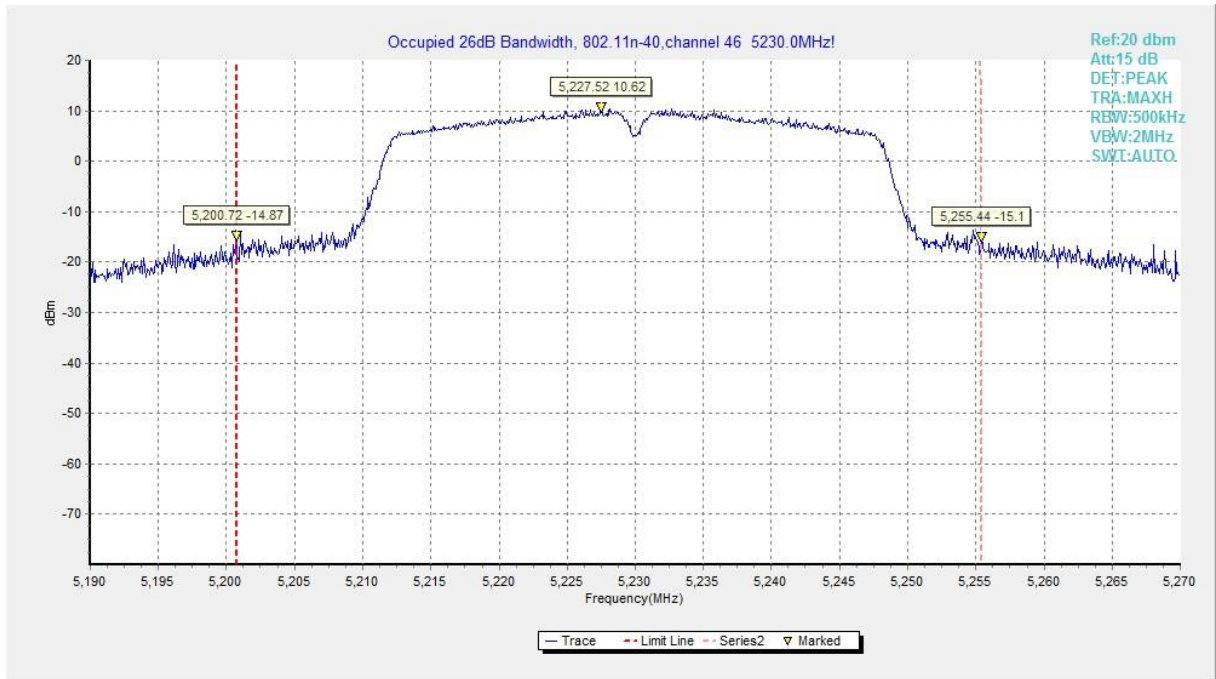
Fig.19 Occupied 26dB Bandwidth (802. 11n-HT20, 5700MHz)



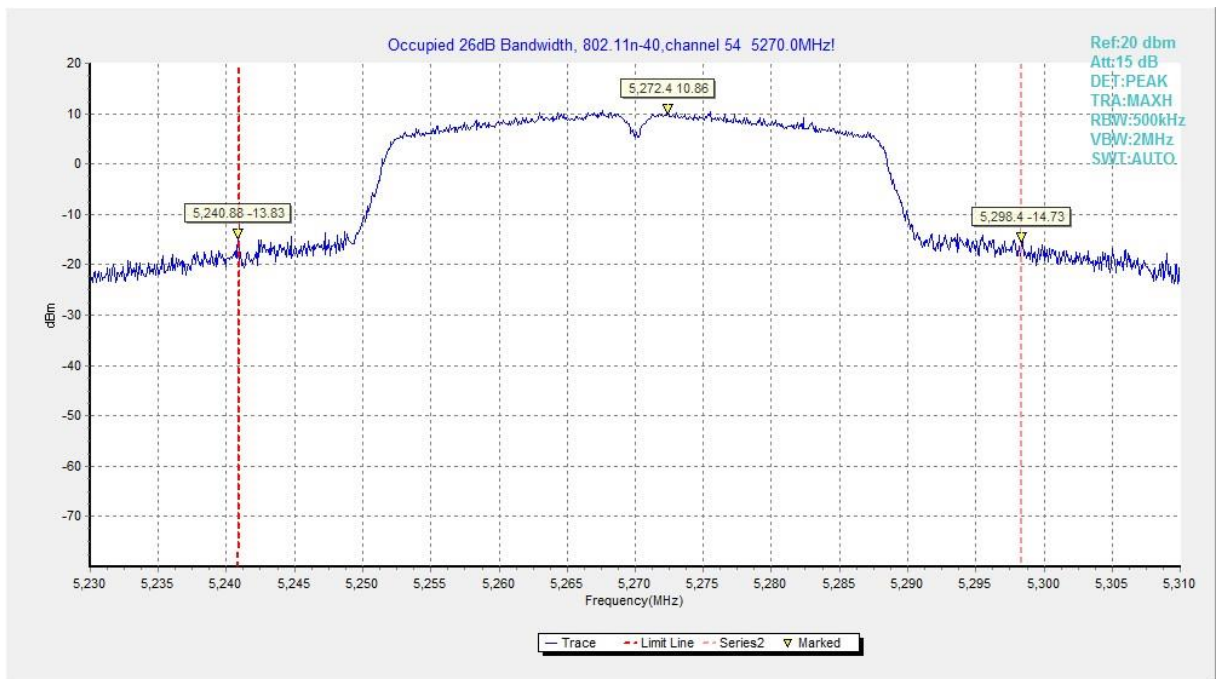
**Fig.20 Occupied 26dB Bandwidth (802.11n-HT20, 5720MHz)**



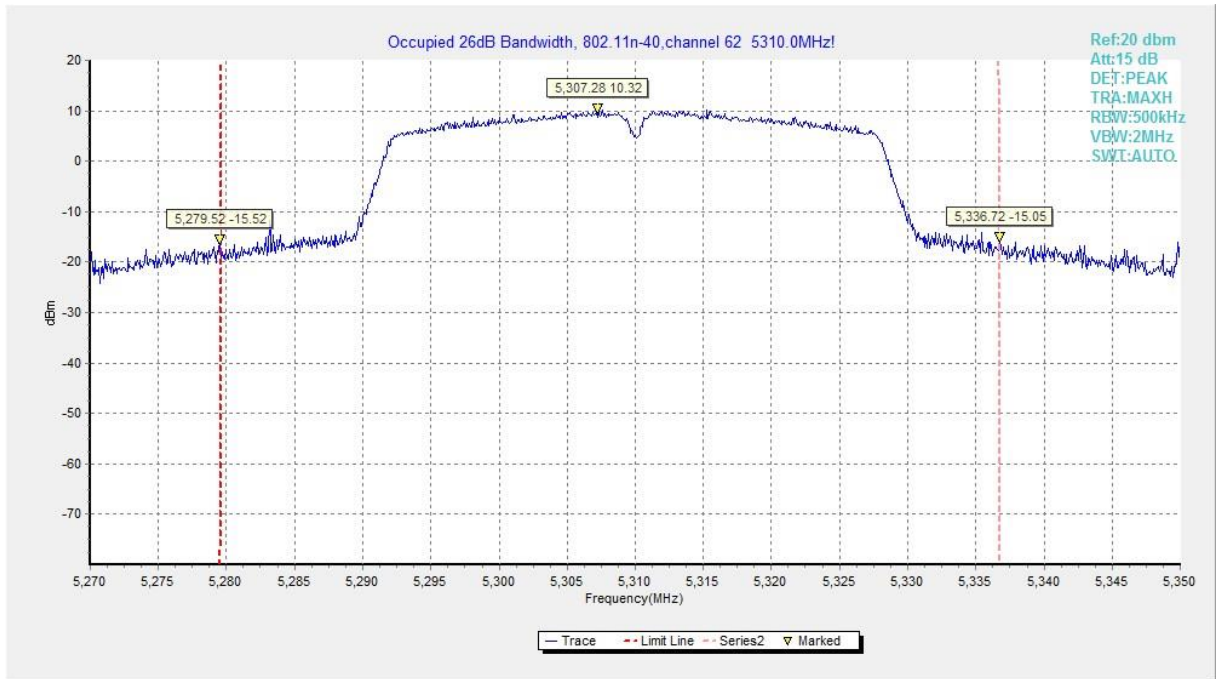
**Fig.21 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)**



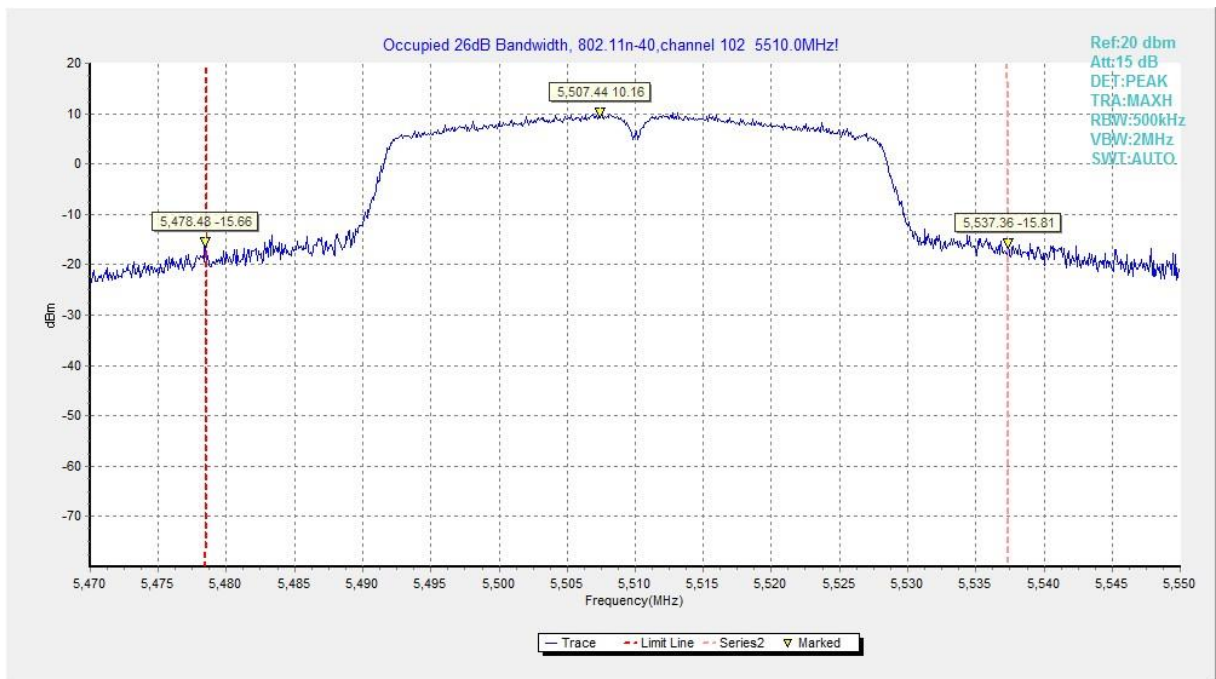
**Fig.22 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)**



**Fig.23 Occupied 26dB Bandwidth (802.11n-HT40, 5270MHz)**



**Fig.24 Occupied 26dB Bandwidth (802.11n-HT40, 5310MHz)**



**Fig.25 Occupied 26dB Bandwidth (802.11n-HT40, 5510MHz)**

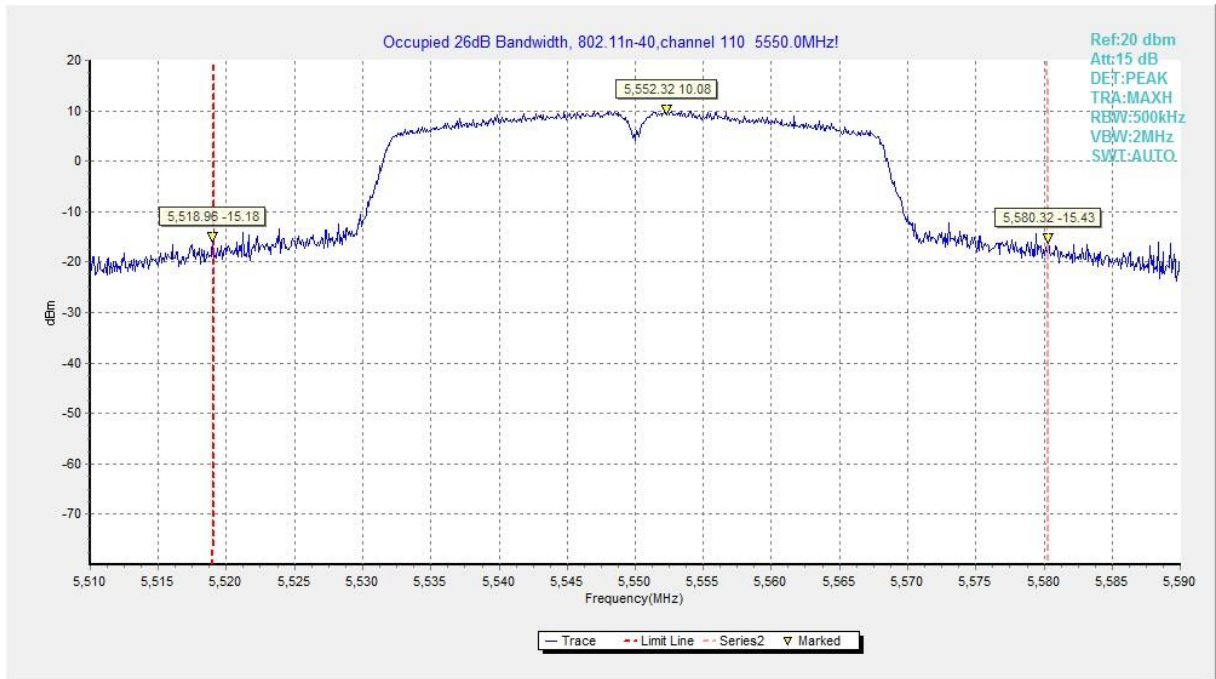


Fig.26 Occupied 26dB Bandwidth (802. 11n-HT40, 5550MHz)

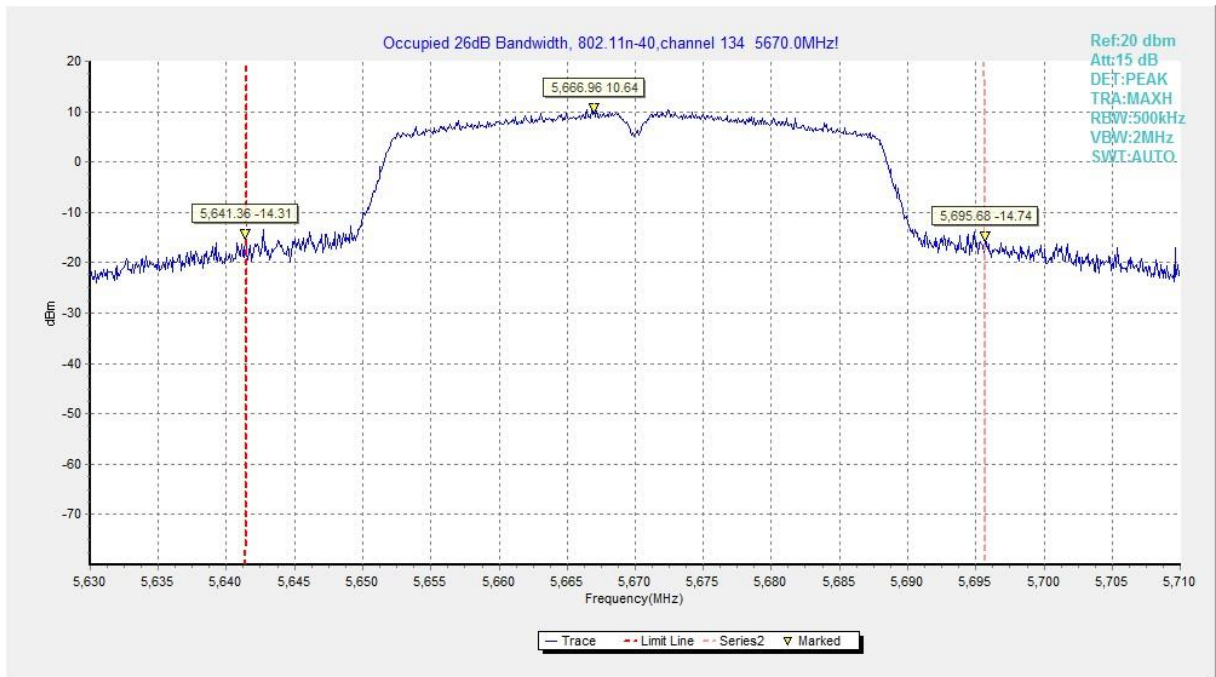


Fig.27 Occupied 26dB Bandwidth (802. 11n-HT40, 5670MHz)

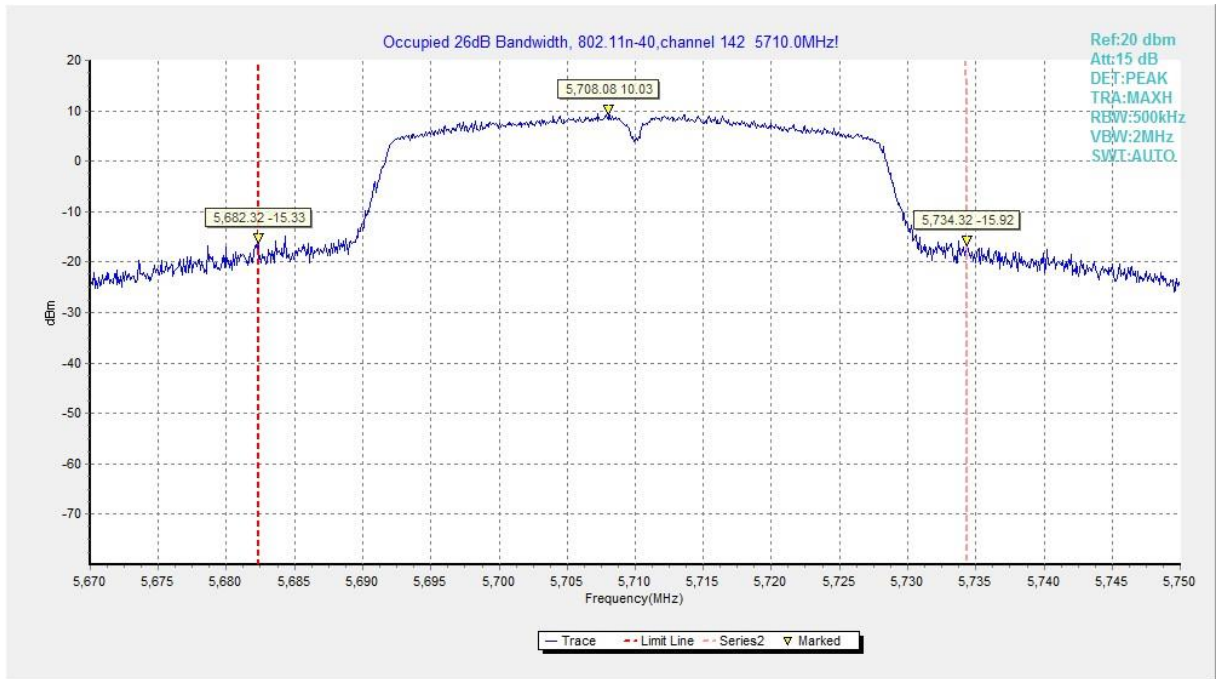


Fig.28 Occupied 26dB Bandwidth (802.11n-HT40, 5710MHz)

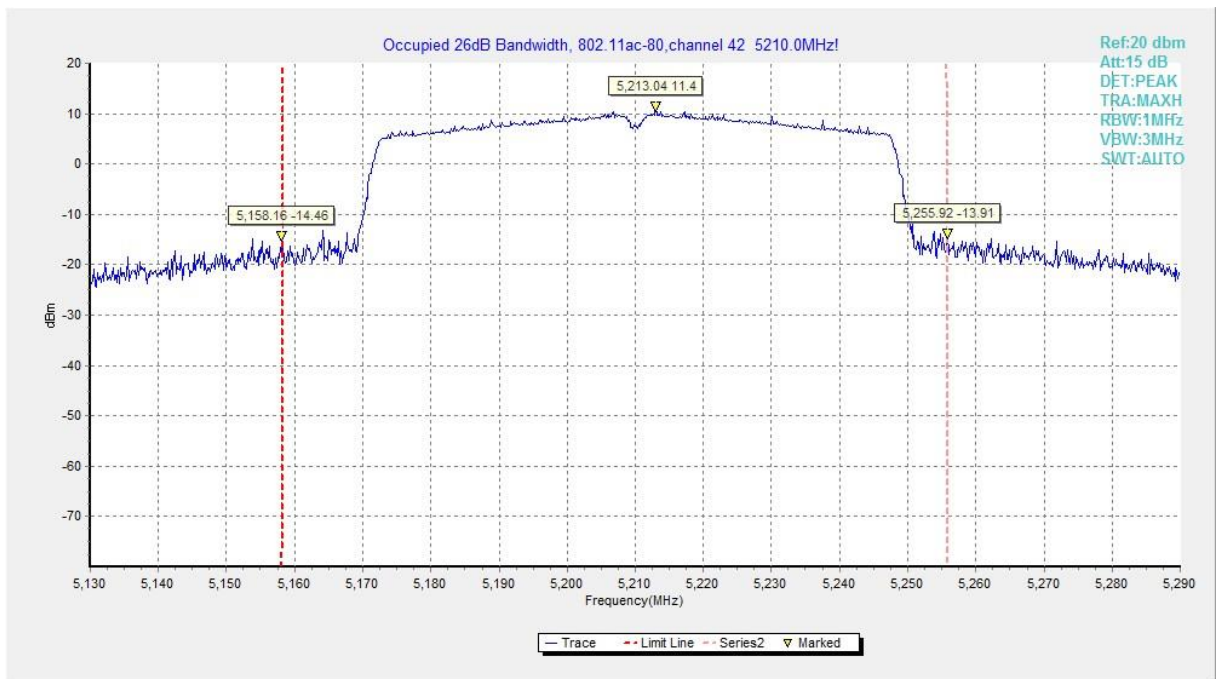
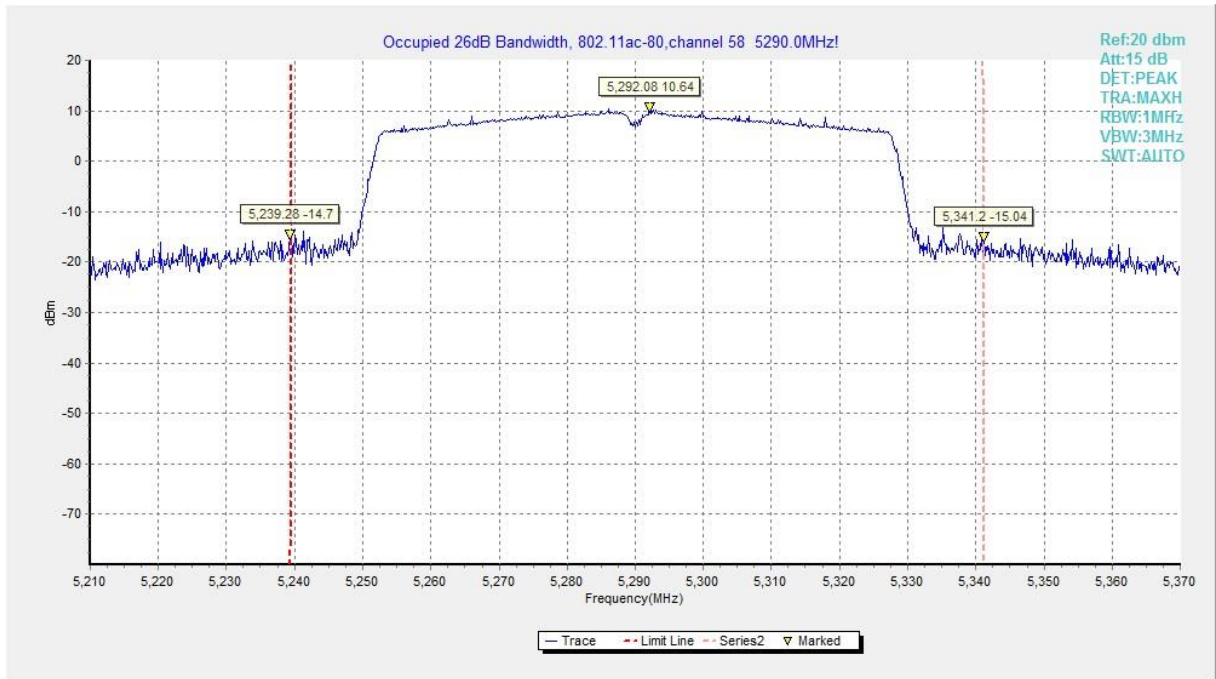
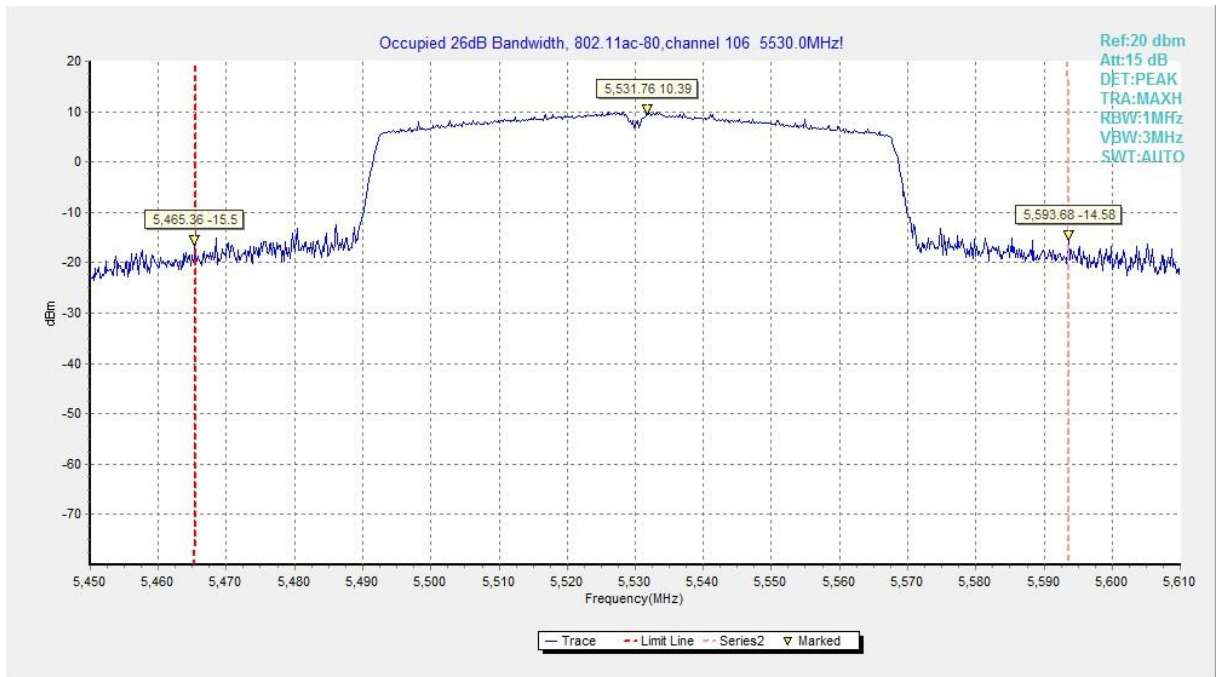


Fig.29 Occupied 26dB Bandwidth (802.11ac-HT80, 5210MHz)





**Fig.30 Occupied 26dB Bandwidth (802. 11ac-HT80, 5290MHz)**



**Fig.31 Occupied 26dB Bandwidth (802. 11ac-HT80, 5530MHz)**

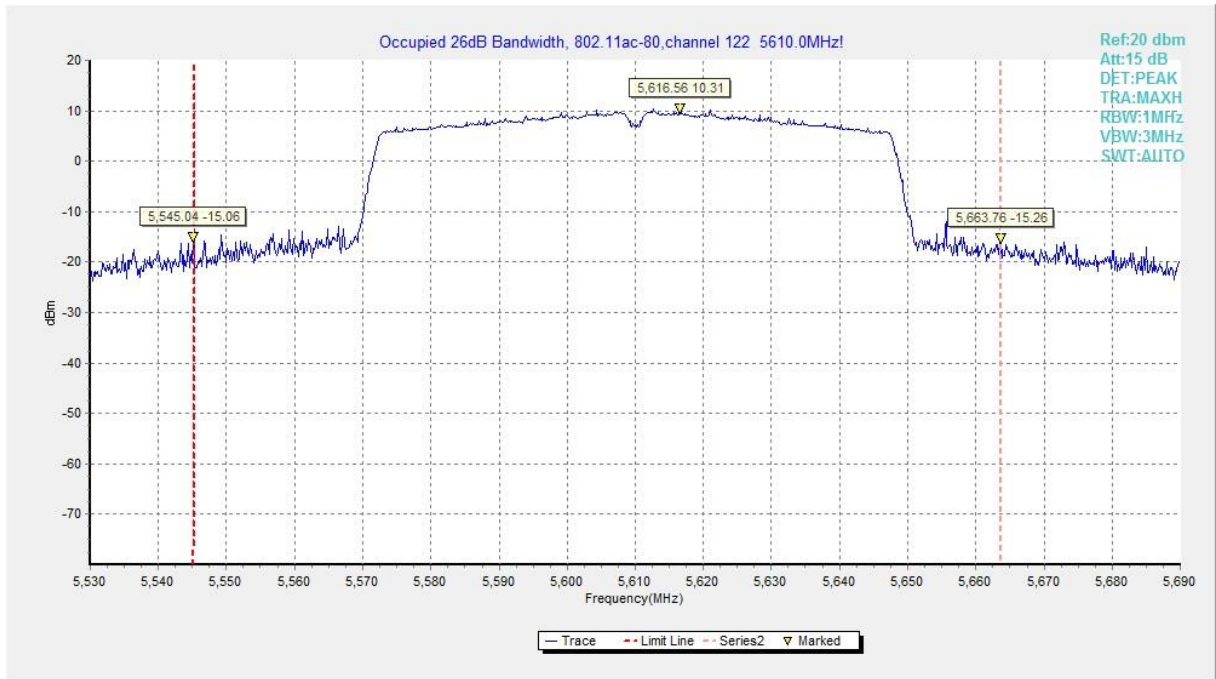


Fig.32 Occupied 26dB Bandwidth (802.11ac-HT80, 5610MHz)

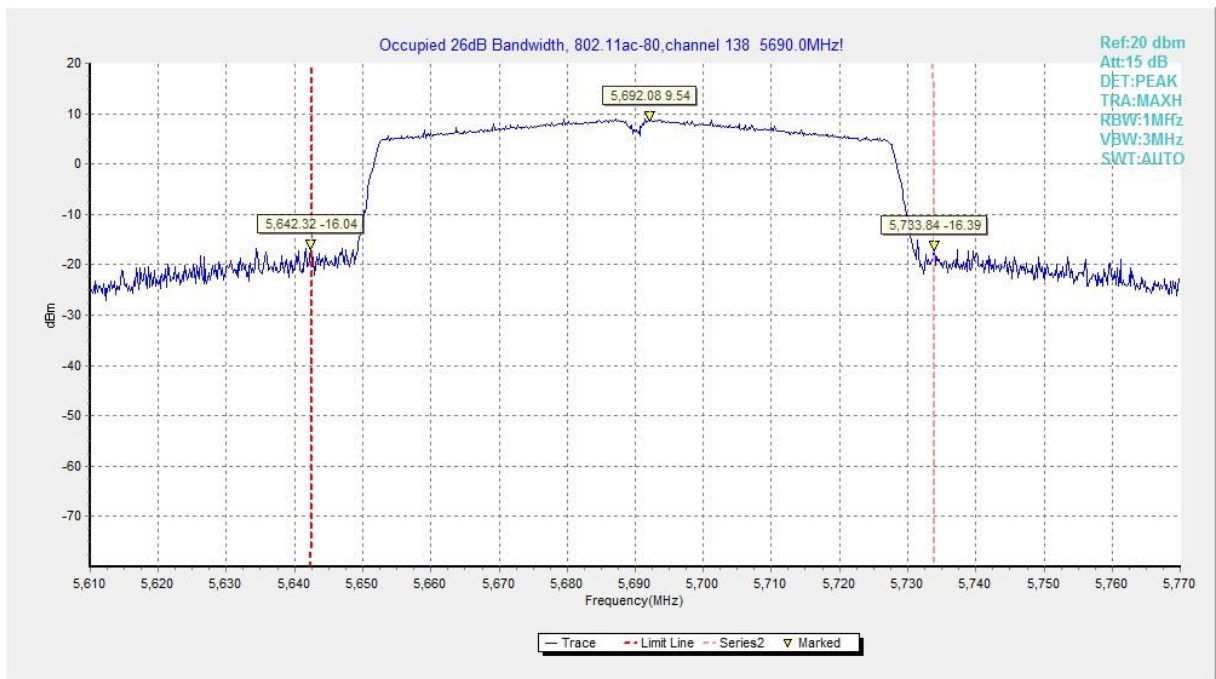


Fig.33 Occupied 26dB Bandwidth (802.11ac-HT80, 5690MHz)

## A.5. Band Edges Compliance

### A5.1 Band Edges - Radiated

#### Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.407	-27 dBm/MHz

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(uV/m)	Field strength(dBuV/m)	Measurement distance(m)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

The measurement is made according to ANSI C63.10-2013 and KDB 789033

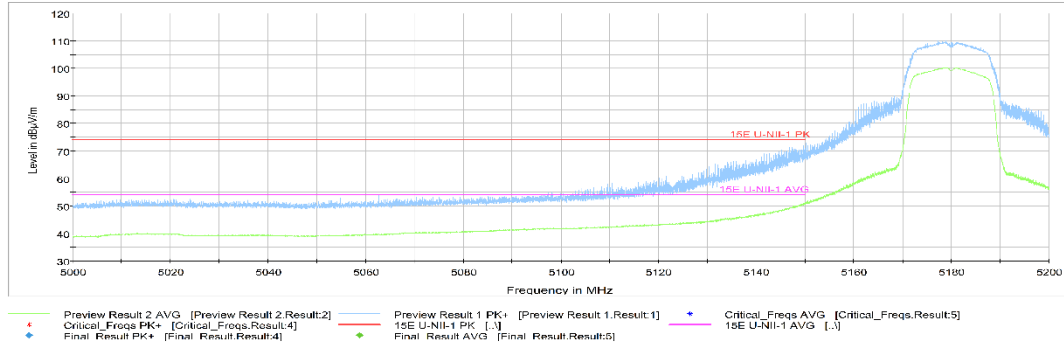
#### Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5180 MHz	Fig.34	P
	5320 MHz	Fig.35	P
	5500 MHz	Fig.36	P
	5700 MHz	Fig.37	P
802.11n HT20	5180 MHz	Fig.38	P
	5320 MHz	Fig.39	P
	5500 MHz	Fig.40	P
	5700 MHz	Fig.41	P
802.11ac HT20	5180 MHz	Fig.42	P
	5320 MHz	Fig.43	P
	5500 MHz	Fig.44	P
	5700 MHz	Fig.45	P
802.11n HT40	5190 MHz	Fig.46	P
	5310 MHz	Fig.47	P
	5510 MHz	Fig.48	P
	5670 MHz	Fig.49	P
802.11ac HT40	5190 MHz	Fig.50	P
	5310 MHz	Fig.51	P
	5510 MHz	Fig.52	P
	5670 MHz	Fig.53	P
802.11ac HT80	5210MHz	Fig.54	P
	5290MHz	Fig.55	P
	5530MHz	Fig.56	P

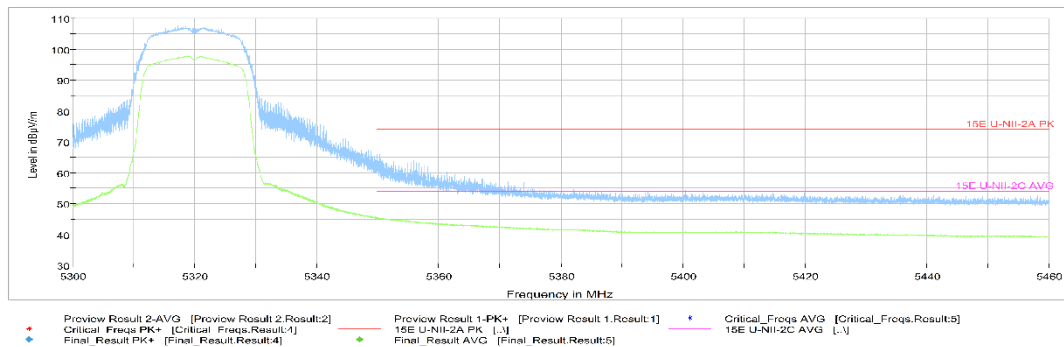
	5610MHz	Fig.57	P
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**Conclusion: PASS**

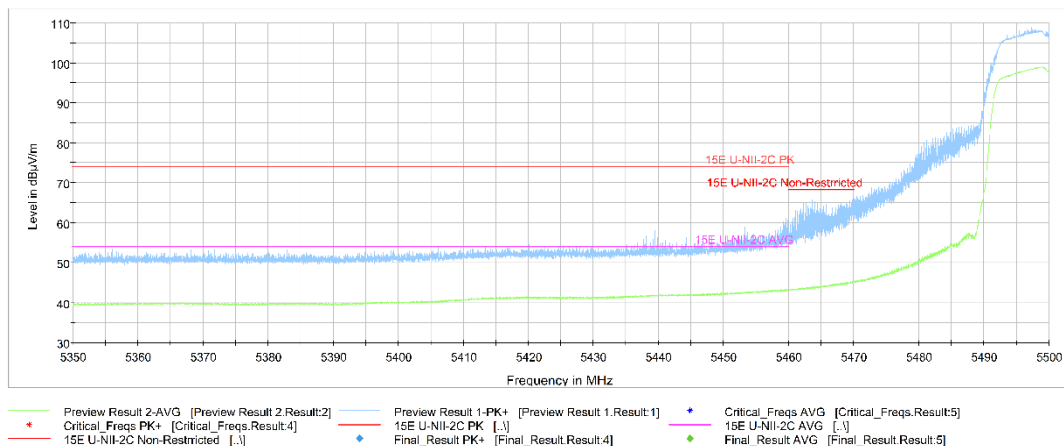
**Test graphs as below:**



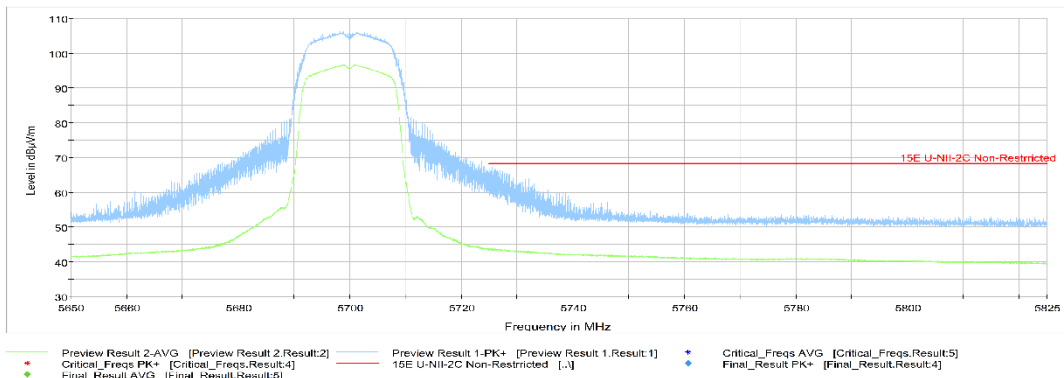
**Fig.34 Band Edges (802.11a Ch36, 5180MHz)**



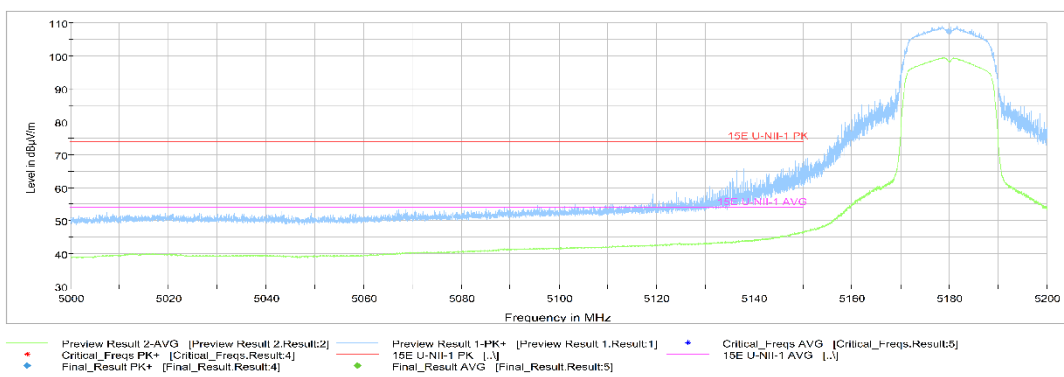
**Fig.35 Band Edges (802.11a Ch64, 5320MHz)**



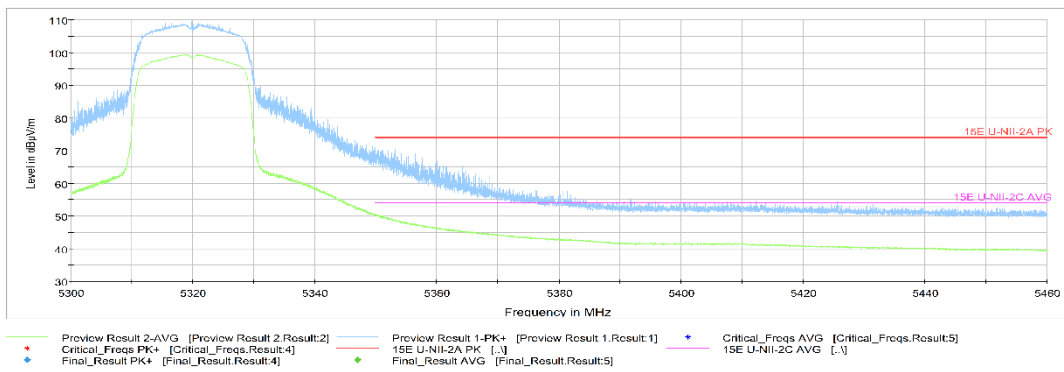
**Fig.36 Band Edges (802.11a Ch100, 5500MHz)**



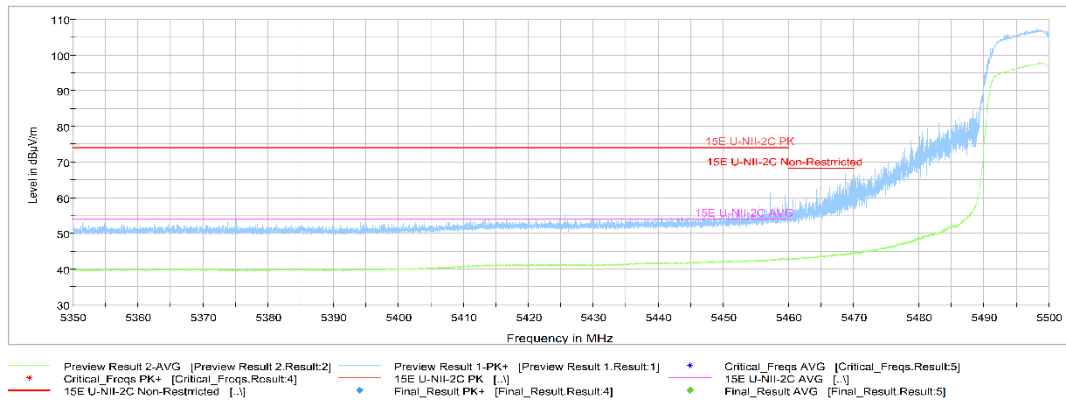
**Fig.37 Band Edges (802.11a Ch140, 5700MHz)**



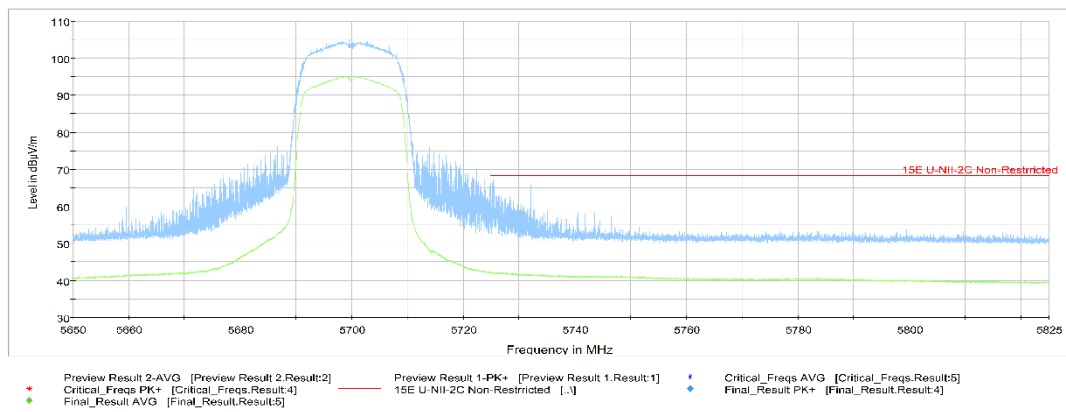
**Fig.38 Band Edges (802.11n-HT20 Ch36, 5180MHz)**



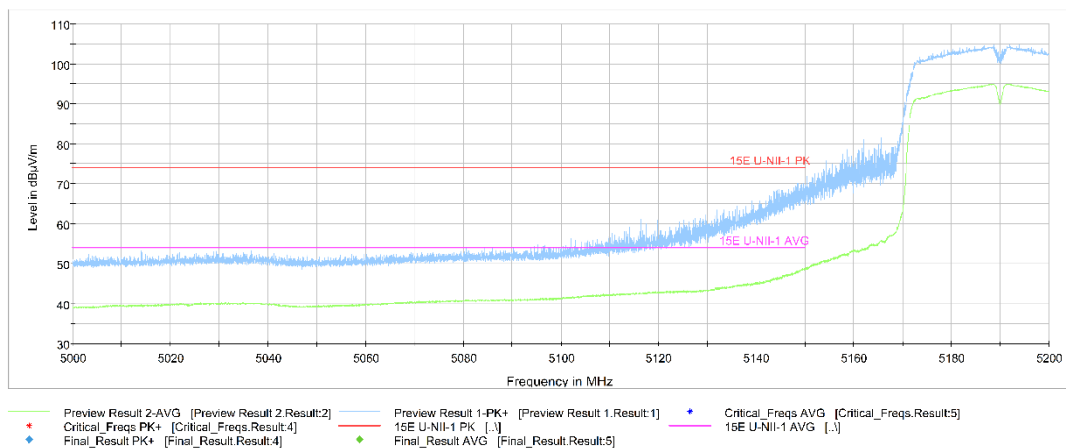
**Fig.39 Band Edges (802.11n-HT20 Ch64, 5320MHz)**



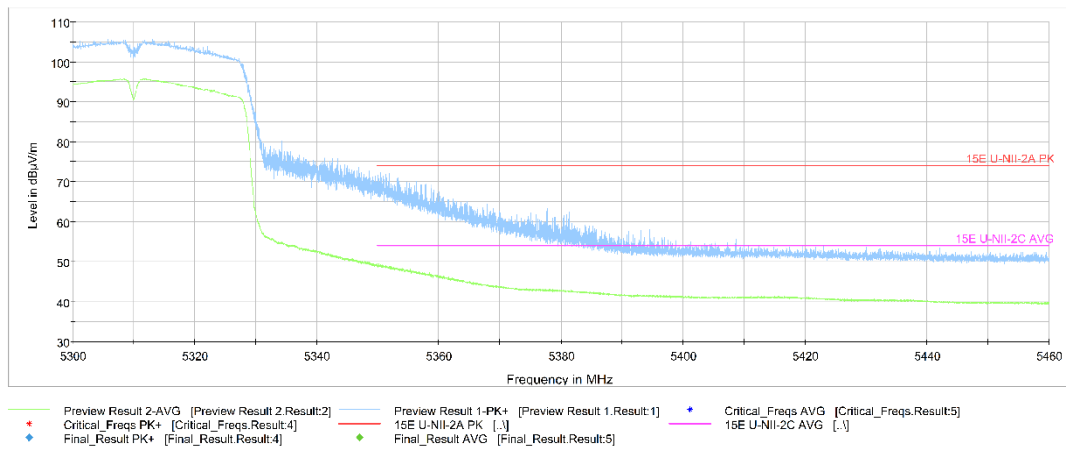
**Fig.40 Band Edges (802.11n-HT20 Ch100, 5500MHz)**



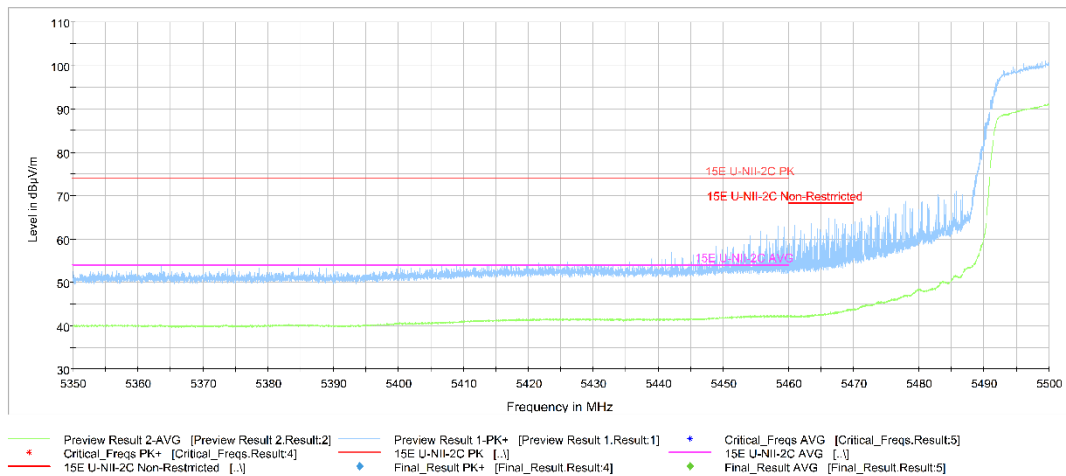
**Fig.41 Band Edges (802.11n-HT20 Ch140, 5700MHz)**



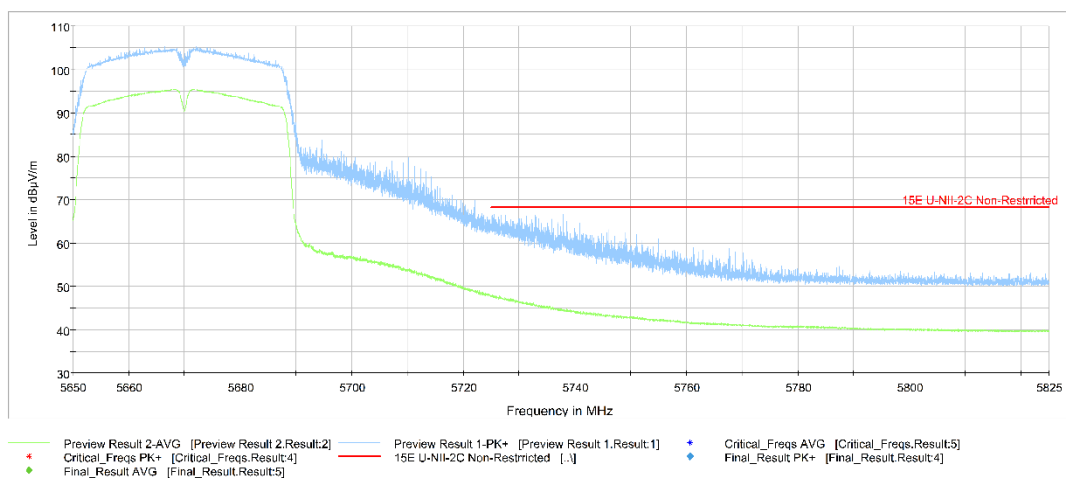
**Fig.42 Band Edges (802.11n-HT40 Ch38, 5190MHz)**



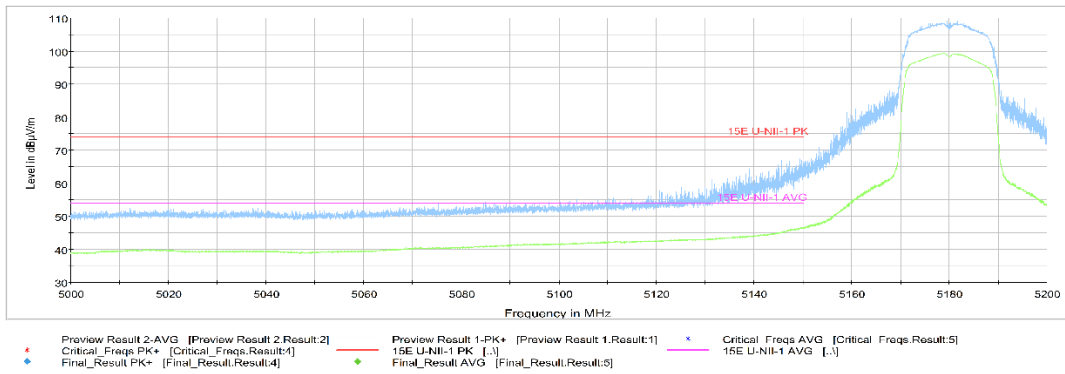
**Fig.43 Band Edges (802.11n-HT40 Ch62, 5310MHz)**



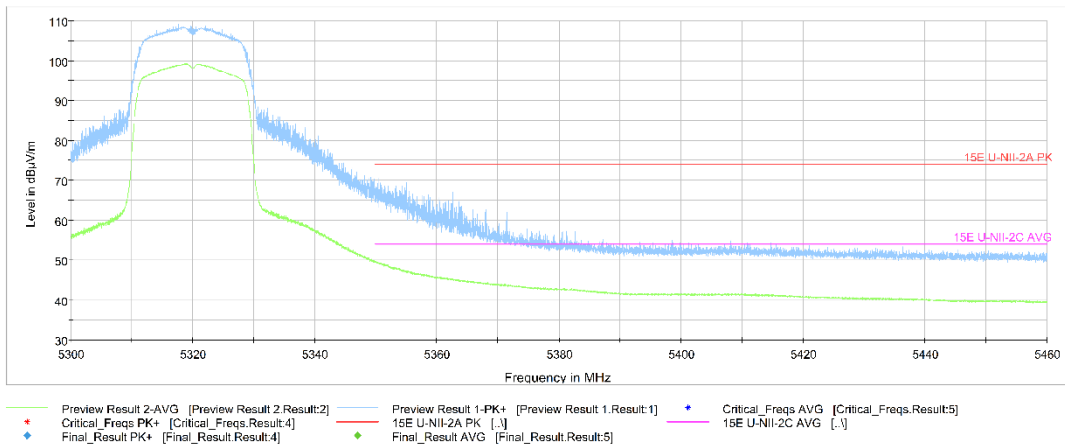
**Fig.44 Band Edges (802.11n-HT40 Ch102, 5510MHz)**



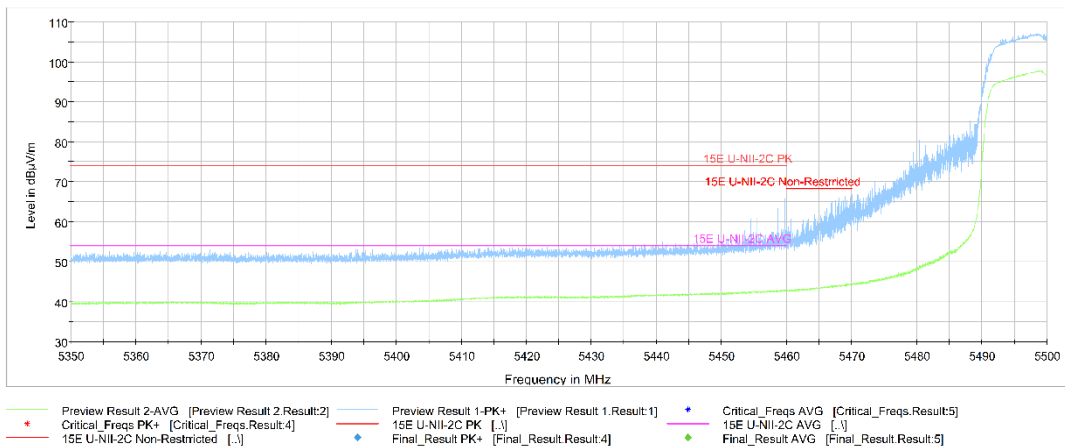
**Fig.45 Band Edges (802.11n-HT40 Ch134, 5670MHz)**



**Fig.46 Band Edges (802.11ac-HT20 Ch36, 5180MHz)**

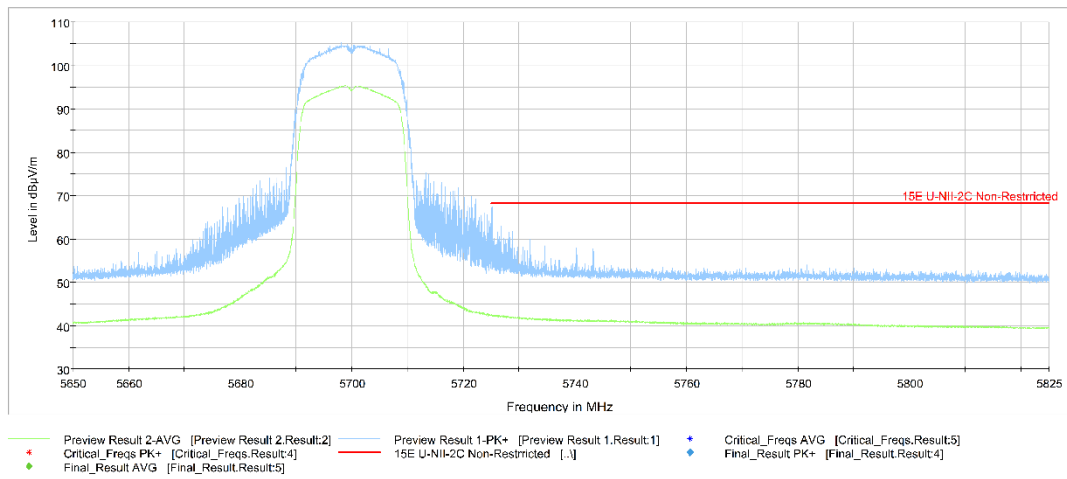


**Fig.47 Band Edges (802.11ac-HT20 Ch64, 5320MHz)**

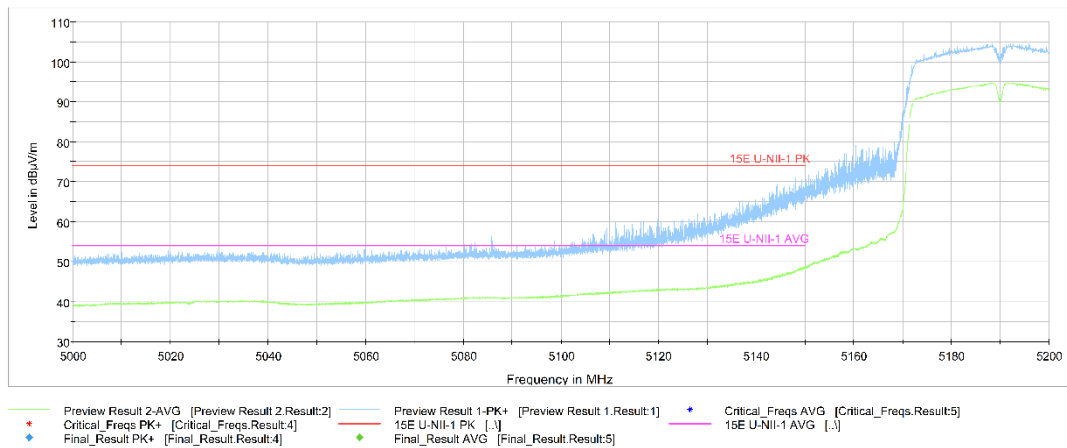


**Fig.48 Band Edges (802.11ac-HT20 Ch100, 5500MHz)**

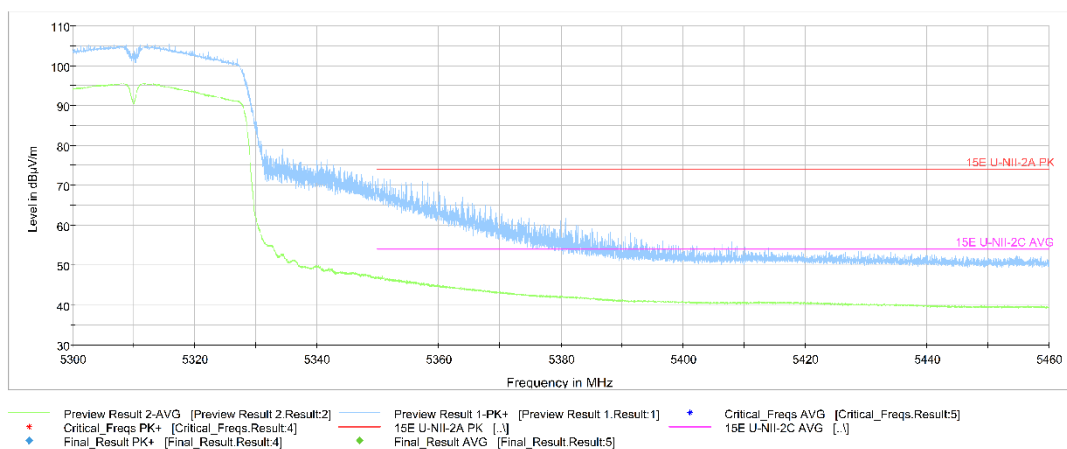




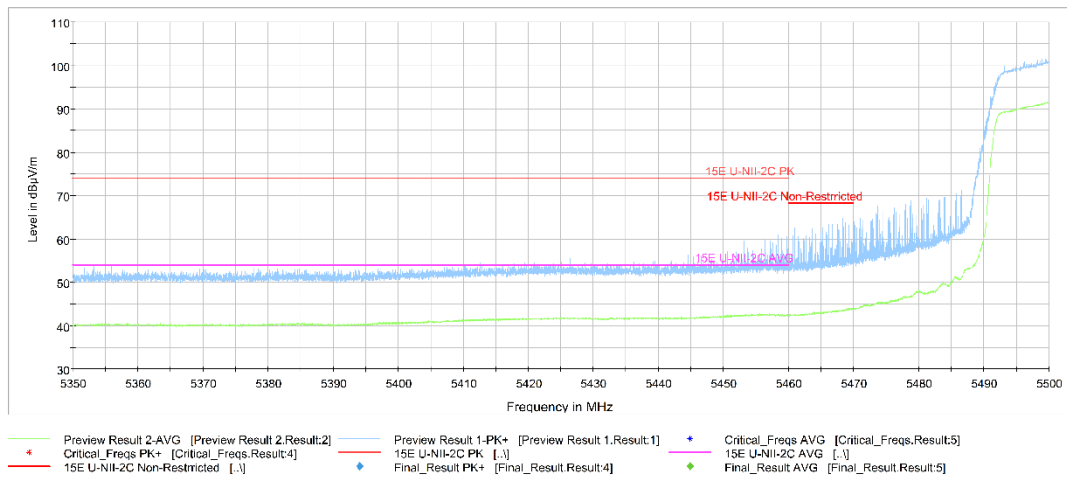
**Fig.49 Band Edges (802.11ac-HT20 Ch140, 5700MHz)**



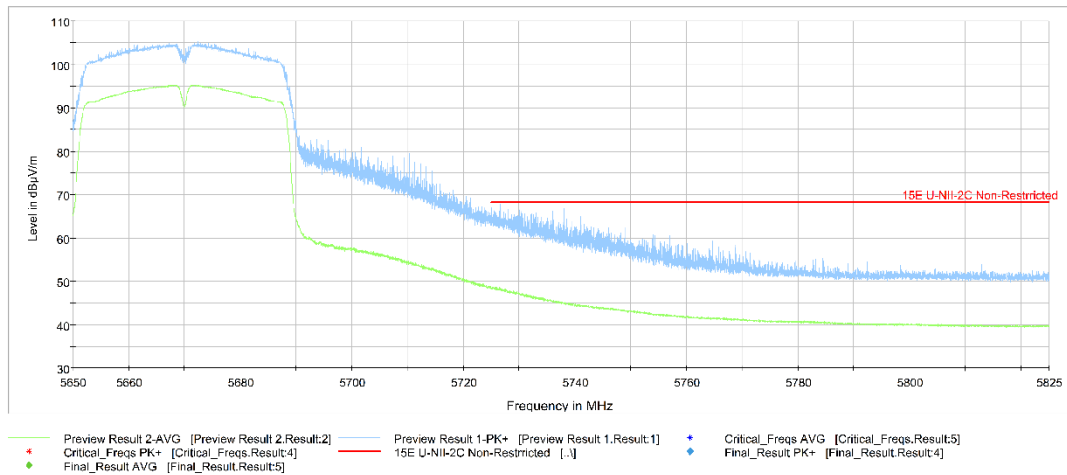
**Fig.50 Band Edges (802.11ac-HT40 Ch38, 5190MHz)**



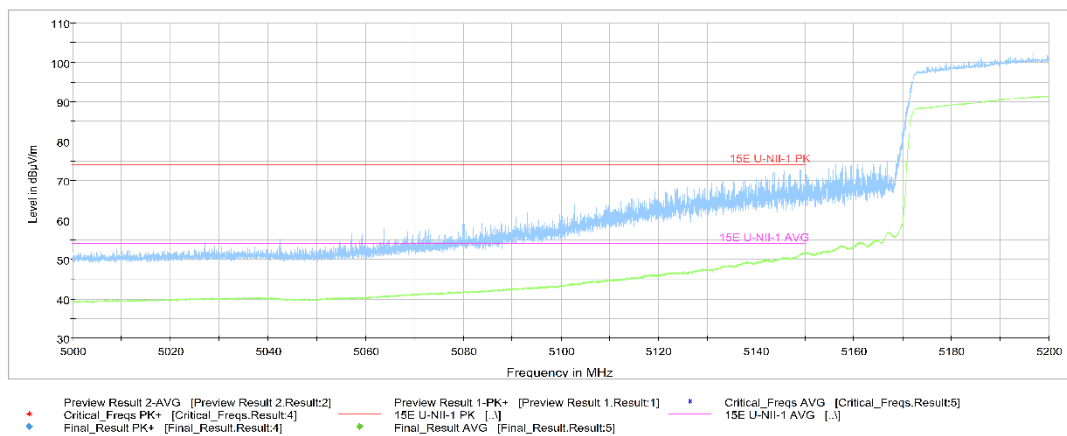
**Fig.51 Band Edges (802.11ac-HT40 Ch62, 5310MHz)**



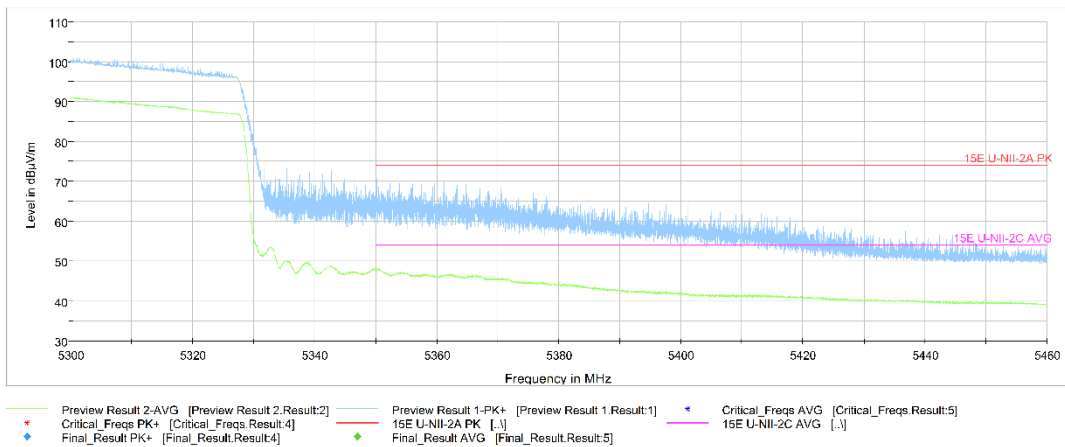
**Fig.52 Band Edges (802.11ac-HT40 Ch102, 5510MHz)**



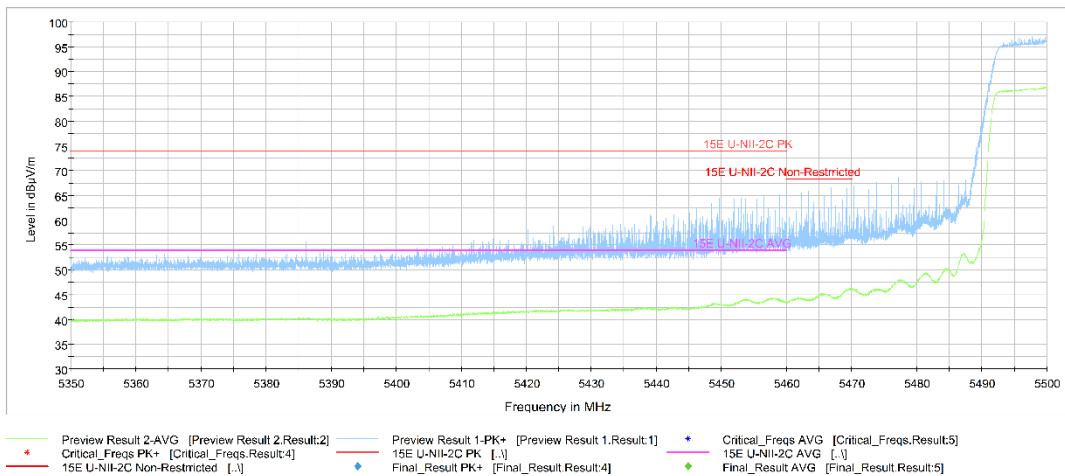
**Fig.53 Band Edges (802.11ac-HT40 Ch134, 5670MHz)**



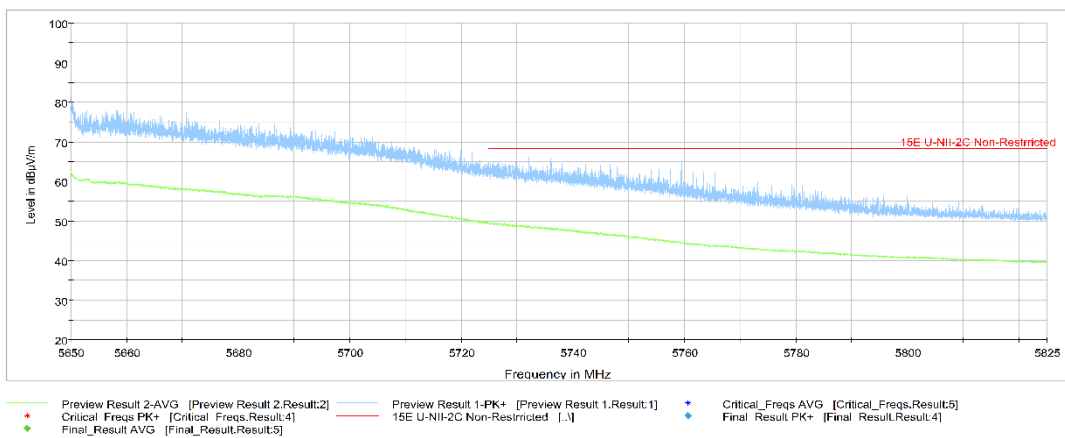
**Fig.54 Band Edges (802.11ac-HT80 Ch42 , 5210MHz)**



**Fig.55 Band Edges (802.11ac-HT80 Ch58, 5290MHz)**



**Fig.56 Band Edges (802.11ac-HT80 Ch106, 5530MHz)**



**Fig.57 Band Edges (802.11ac-HT80 Ch122, 5610MHz)**

## A.6. Transmitter Spurious Emission

### Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.407	-27 dBm/MHz

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(uV/m)	Field strength(dBuV/m)	Measurement distance(m)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

The measurement is made according to ANSI C63.10-2013 and KDB 789033

### Measurement Results:

**802.11a mode**

Mode	Channel	Frequency Range	Test Results	Conclusion	
802.11a	36(5180MHz)	1 GHz ~ 3 GHz	---	P	
		3 GHz ~ 7 GHz	---	P	
		7 GHz ~ 18 GHz	---	P	
	40(5200MHz)	40(5200MHz)	30 MHz ~1 GHz	---	P
			1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
			18 GHz ~ 26.5 GHz	---	P
			26.5 GHz ~ 40 GHz	---	P
	48(5240MHz)	48(5240MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
	52(5260MHz)	52(5260MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
	56(5280MHz)	56(5280MHz)	30 MHz ~1 GHz	---	P
			1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
			18 GHz ~ 26.5 GHz	---	P
			26.5 GHz ~ 40 GHz	---	P
	64(5320MHz)	64(5320MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
	100(5500MHz)	100(5500MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
	120(5600MHz)	120(5600MHz)	30 MHz ~1 GHz	---	P
			1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
			18 GHz ~ 26.5 GHz	---	P
			26.5 GHz ~ 40 GHz	---	P
	140(5700MHz)	140(5700MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P

**802.11n-HT20 mode**

Mode	Channel	Frequency Range	Test Results	Conclusion	
802.11n -HT20	36(5180MHz)	1 GHz ~ 3 GHz	---	P	
		3 GHz ~ 7 GHz	---	P	
		7 GHz ~ 18 GHz	---	P	
	40(5200MHz)	40(5200MHz)	30 MHz ~1 GHz	---	P
			1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
			18 GHz ~ 26.5 GHz	---	P
			26.5 GHz ~ 40 GHz	---	P
	48(5240MHz)	48(5240MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
	52(5260MHz)	52(5260MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
	56(5280MHz)	56(5280MHz)	30 MHz ~1 GHz	---	P
			1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
			18 GHz ~ 26.5 GHz	---	P
			26.5 GHz ~ 40 GHz	---	P
	64(5320MHz)	64(5320MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
	100(5500MHz)	100(5500MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
	120(5600MHz)	120(5600MHz)	30 MHz ~1 GHz	---	P
			1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P
			18 GHz ~ 26.5 GHz	---	P
			26.5 GHz ~ 40 GHz	---	P
	140(5700MHz)	140(5700MHz)	1 GHz ~ 3 GHz	---	P
			3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---	P

**802.11n-HT40 mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n HT40	38(5190MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	46(5230MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	54(5270MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	62(5310MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	102(5510MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	118(5590MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
134(5670MHz)	30 MHz ~1 GHz	---	P	
	1 GHz ~ 3 GHz	---	P	
	3 GHz ~ 7 GHz	---	P	
	7 GHz ~ 18 GHz	---	P	
	18 GHz ~ 26.5 GHz	---	P	
	26.5 GHz ~ 40 GHz	---	P	

**802.11ac-HT20 mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11ac -HT20	36(5180MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	40(5200MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
		48(5240MHz)	1 GHz ~ 3 GHz	---
	3 GHz ~ 7 GHz		---	P
	7 GHz ~ 18 GHz		---	P
	52(5260MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	56(5280MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	64(5320MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	100(5500MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	120(5600MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	140(5700MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P



**802.11ac-HT40 mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11ac HT40	38(5190MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	46(5230MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	54(5270MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	62(5310MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	102(5510MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz ~ 40 GHz	---	P
	118(5590MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
134(5670MHz)	30 MHz ~1 GHz	---	P	
	1 GHz ~ 3 GHz	---	P	
	3 GHz ~ 7 GHz	---	P	
	7 GHz ~ 18 GHz	---	P	
	18 GHz ~ 26.5 GHz	---	P	
	26.5 GHz ~ 40 GHz	---	P	

**802.11ac-HT80 mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11ac -HT80	42(5210MHz)	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	58(5290MHz)	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
	106(5530MHz)	26.5 GHz ~ 40 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
	122(5610MHz)	7 GHz ~ 18 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---

**Conclusion: PASS**

**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:

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