



# FCC PART 15 TEST REPORT No.I22Z70189-IOT04

for

**Samsung Electronics Co., Ltd.**

**Multi-band GSM/WCDMA/LTE Tablet with Bluetooth, WLAN**

**SM-T509**

**With**

**FCC ID: ZCASMT509**

**Hardware Version: REV 1.0**

**Software Version: T509.001**

**Issued Date: 2022-08-16**

**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.

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I22Z70189-IOT04	Rev.0	1st edition	2022-08-16

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## **1. TEST LATORATORY**

### **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**

Conducted testing Location: CTTL(Huayuan North Road)

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

Radiated 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: 2022-07-11

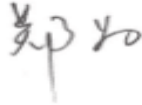
Testing End Date: 2022-08-16

### 1.5. Signature

谢秀珍

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Xie Xiuzhen  
( Prepared this test report )



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Zheng Wei  
(Reviewed this test report)

胡晓宇

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Hu Xiaoyu  
(Approved this test report)



## **2. CLIENT INFORMATION**

### **2.1 Applicant Information**

Company Name: SAMSUNG Electronics Co., Ltd.  
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City: NJ  
Postal Code: 07058  
Country: America  
Email: j1.chun@samsung.com  
Telephone: +1-201-937-4203  
Fax: /

### **2.2 Manufacturer Information**

Company Name: SAMSUNG Electronics Co., Ltd.  
Address: Samsung R5, Maetan dong 129, Samsung ro  
Youngtong gu, Suwon city 443 742, Korea  
City: Suwon  
Postal Code: 443742  
Country: Korea  
Email: ggobi.cho@samsung.com  
Telephone: +82-10-2722-4159  
Fax: /

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

#### ANCILLARY EQUIPMENT(AE)

##### 3.1. About EUT

Description	Multi-band GSM/WCDMA/LTE Tablet with Bluetooth, WLAN
Model name	SM-T509
FCC ID	ZCASMT509
WLAN Frequency Band	ISM Bands: -5150MHz~5250MHz -5250MHz~5350MHz -5470MHz~5725MHz
Type of modulation	OFDM
Antenna	Integral Antenna
Voltage	3.8V

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

EUT ID*	SN or IMEI	HW Version	SW Version
UT10a	2270189UT10a	REV 1.0	T509.001
UT08a	2270189UT08a	REV 1.0	T509.001

\*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	Remark
AE1	Adapter1	/
AE2	Adapter 2	/
AE3	Adapter 3	/
AE4	Adapter 4	/
AE5	Adapter 5	/
AE6	USB cable1	/
AE7	USB cable2	/
AE8	USB cable3	/
AE9	Headset1	/
AE10	Headset2	/
AE11	Battery	/
AE1		
Model	EP-TA50JWE	
Manufacturer	HAEM Co.,Ltd	
Length of cable	/	
AE2		
Model	EP-TA50EWE	
Manufacturer	HAEM Co.,Ltd	



Length of cable	/
AE3	
Model	EP-TA50JWE
Manufacturer	RFTECH Co., Ltd
Length of cable	/
AE4	
Model	EP-TA50EWE
Manufacturer	RFTECH Co., Ltd
Length of cable	/
AE5	
Model	EP-TA50UWE
Manufacturer	HAEM Co.,Ltd
Length of cable	/
AE6	
Model	EP-DT725BWE
Manufacturer	RFTECH Co., Ltd.
Length of cable	/
AE7	
Model	EP-DT725BWE
Manufacturer	DONGGUAN KSD CO.,LTD
Length of cable	/
AE8	
Model	EP-DR140AWE
Manufacturer	CRESYN HANOI Co., Ltd
Length of cable	/
AE9	
Model	EHS64AVFWE
Manufacturer	DONGGUAN YOUNGBO ELECTRONICS CO.,LTD
Length of cable	/
AE10	
Model	EHS61ASFWE
Manufacturer	DONGGUAN YOUNGBO ELECTRONICS CO.,LTD
Length of cable	/

\*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 Multi-band GSM/WCDMA/LTE Tablet with Bluetooth, WLAN 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	/	<b>P</b>
Peak Power Spectral Density	15.407	/	<b>P</b>
Occupied 26dB Bandwidth	15.403	/	<b>P</b>
Band edge compliance (Radiated)	15.209	/	<b>P</b>
Transmitter spurious emissions (Radiated)	15.407	/	<b>P</b>
AC Powerline Conducted Emission (150kHz- 30MHz)	15.407	/	<b>P</b>
Frequency Stability	15.407	/	<b>P</b>
99% Occupied bandwidth	/	/	<b>P</b>
Transmit Power Control	15.407	/	<b>NA</b>

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/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	3.8V
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	2023-05-15
2	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2023-03-21
3	LISN	ENV216	101200	Rohde & Schwarz	1 year	2023-06-29
4	Shielding Room	S81	/	ETS-Lindgren	/	/

### Radiated emission test system

No.	Equipment	Model	Manufacturer	Serial Number	Calibration Period	Calibration Due date
1	Test Receiver	ESW44	R&S	103023	1 year	2022-10-18
2	Test Receiver	ESW44	R&S	103015	1 year	2022-09-02
3	Test Receiver	ESU 26	R&S	100235	1 year	2023-03-08
4	EMI Antenna	VULB 9163	SCHWARZBECK	483	1 year	2022-08-24
5	EMI Antenna	3115	ETS-Lindgren	00167250	1 year	2023-06-20
6	EMI Antenna	3116	ETS-Lindgren	2663	1 year	2022-08-11
7	Loop Antenna	HFH2-Z2	R&S	829324/007	1 year	2022-12-22

Note: the EMI Antenna which Serial Number is 2663 was before Calibration Due date when used.

### AC Power Line Conducted Emission

No.	Equipment	Model	Manufacturer	Serial Number	Calibration Period	Calibration Due date
1	LISN	ENV216	R&S	101200	1 year	2023-06-29
2	Test Receiver	ESCI	R&S	100344	1 year	2023-03-21

## 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	/
$30\text{MHz} \leq f \leq 1\text{GHz}$	5.15
$1\text{GHz} \leq f \leq 18\text{GHz}$	5.54
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.26

### 8.6 AC Power-line Conducted Emission

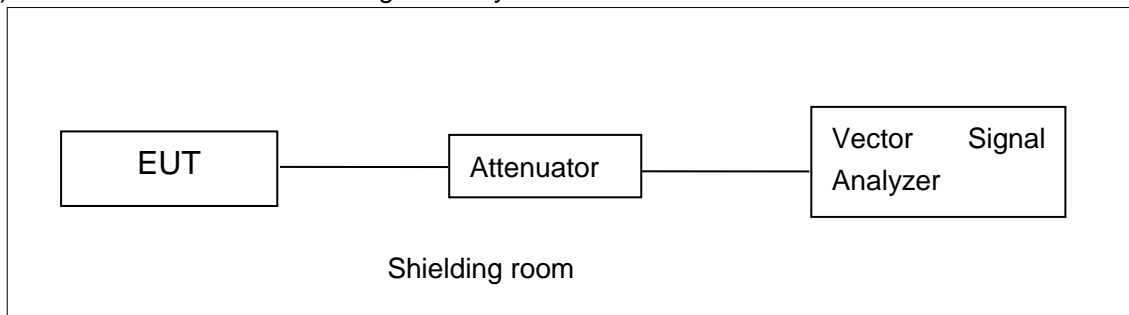
Measurement Uncertainty : 3.08,k=2

## 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

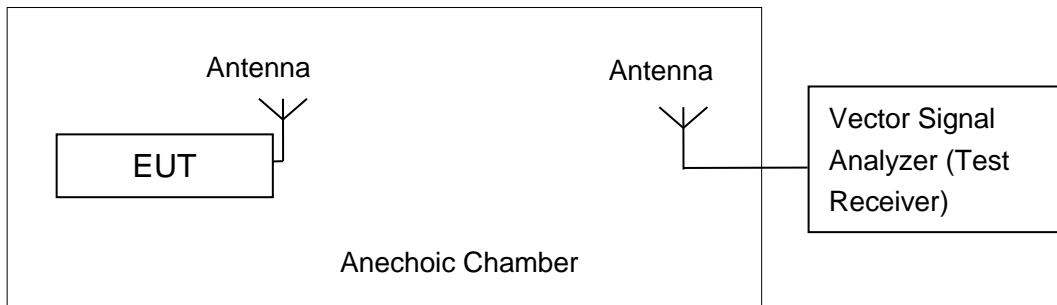


#### A.1.2. Radiated Emission Measurements

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

### Measurement Results:

#### 802.11a mode

Mode	Frequency	Test Result (dBm)							
		Data Rate (Mbps)							
		6	9	12	18	24	36	48	54
802.11a	5180MHz	16.77	/	/	/	/	/	/	/
	5200MHz	16.65	/	/	/	/	/	/	/
	5240MHz	16.22	/	/	/	/	/	/	/
	5260MHz	16.52	/	/	/	/	/	/	/
	5280MHz	16.95	/	/	/	/	/	/	/
	5320MHz	17.18	17.14	16.20	15.80	14.81	14.54	13.50	13.23
	5500MHz	17.36	/	/	/	/	/	/	/
	5580MHz	16.79	/	/	/	/	/	/	/
	5700MHz	12.89	/	/	/	/	/	/	/

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	15.77	15.76	15.78	15.80	14.52	14.53	13.73	13.77
	5200MHz	15.85	/	/	/	/	/	/	/
	5240MHz	16.04	/	/	/	/	/	/	/
	5260MHz	16.20	/	/	/	/	/	/	/
	5280MHz	16.30	/	/	/	/	/	/	/
	5320MHz	16.05	/	/	/	/	/	/	/
	5500MHz	15.00	/	/	/	/	/	/	/
	5580MHz	15.47	/	/	/	/	/	/	/
	5700MHz	7.44	/	/	/	/	/	/	/

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	15.79	14.87	14.04	13.53	12.68	12.77	12.84	11.76	11.76
	5200MHz	15.97	/	/	/	/	/	/	/	/
	5240MHz	15.16	/	/	/	/	/	/	/	/
	5260MHz	16.31	/	/	/	/	/	/	/	/
	5280MHz	16.37	/	/	/	/	/	/	/	/
	5320MHz	16.17	/	/	/	/	/	/	/	/
	5500MHz	15.19	/	/	/	/	/	/	/	/
	5580MHz	15.66	/	/	/	/	/	/	/	/
	5700MHz	7.59	/	/	/	/	/	/	/	/

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	14.47	15.55	15.49	14.07	14.12	13.44	13.48	13.47
	5230MHz	/	15.80	/	/	/	/	/	/
	5270MHz	/	16.07	/	/	/	/	/	/
	5310MHz	/	16.03	/	/	/	/	/	/
	5510MHz	/	15.57	/	/	/	/	/	/
	5550MHz	/	15.71	/	/	/	/	/	/
	5670MHz	/	15.23	/	/	/	/	/	/

The data rate MCS1 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	13.86	14.81	13.92	13.69	12.78	12.77	12.87	11.90	11.91	10.96
	5230MHz	/	14.75	/	/	/	/	/	/	/	/
	5270MHz	/	15.27	/	/	/	/	/	/	/	/
	5310MHz	/	15.21	/	/	/	/	/	/	/	/
	5510MHz	/	13.99	/	/	/	/	/	/	/	/
	5550MHz	/	13.79	/	/	/	/	/	/	/	/
	5670MHz	/	14.34	/	/	/	/	/	/	/	/



The data rate MCS1 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	15.97	16.05	14.81	15.00	13.89	13.95	13.93	12.93	12.99	13.00
	5290MHz	/	16.17	/	/	/	/	/	/	/	/
	5530MHz	/	15.15	/	/	/	/	/	/	/	/
	5610MHz	/	15.34	/	/	/	/	/	/	/	/

The data rate MCS1 is selected as worse condition, and the following cases are performed with this condition.

**Duty Cycle**

Mode	11a	11n20	11ac20	11n40	11ac40	11ac80
Duty Cycle	98%	97%	99%	99%	99%	98%

### 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	5.01	P
	5200 MHz	5.19	P
	5240 MHz	5.26	P
	5260 MHz	5.47	P
	5280 MHz	5.50	P
	5320 MHz	5.42	P
	5500 MHz	4.47	P
	5580 MHz	4.88	P
802.11ac HT20	5180 MHz	4.27	P
	5200 MHz	4.43	P
	5240 MHz	4.59	P
	5260 MHz	3.74	P
	5280 MHz	4.75	P
	5320 MHz	4.68	P
	5500 MHz	3.72	P
	5580 MHz	3.49	P
802.11n HT40	5190 MHz	1.26	P
	5230 MHz	1.46	P
	5270 MHz	1.60	P
	5310 MHz	1.45	P
	5510 MHz	-0.01	P
	5550 MHz	0.68	P
	5670 MHz	1.20	P
802.11ac HT80	5210MHz	-2.46	P
	5290MHz	-2.50	P
	5530MHz	-2.46	P
	5610MHz	-3.22	P

**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
802.11a	5180 MHz	Fig.1	30.65	P
	5200 MHz	Fig.2	30.55	P
	5240 MHz	Fig.3	32.55	P
	5260 MHz	Fig.4	30.50	P
	5280 MHz	Fig.5	28.50	P
	5320 MHz	Fig.6	34.25	P
	5500 MHz	Fig.7	28.65	P
	5580 MHz	Fig.8	28.25	P
	5700 MHz	Fig.9	30.10	P

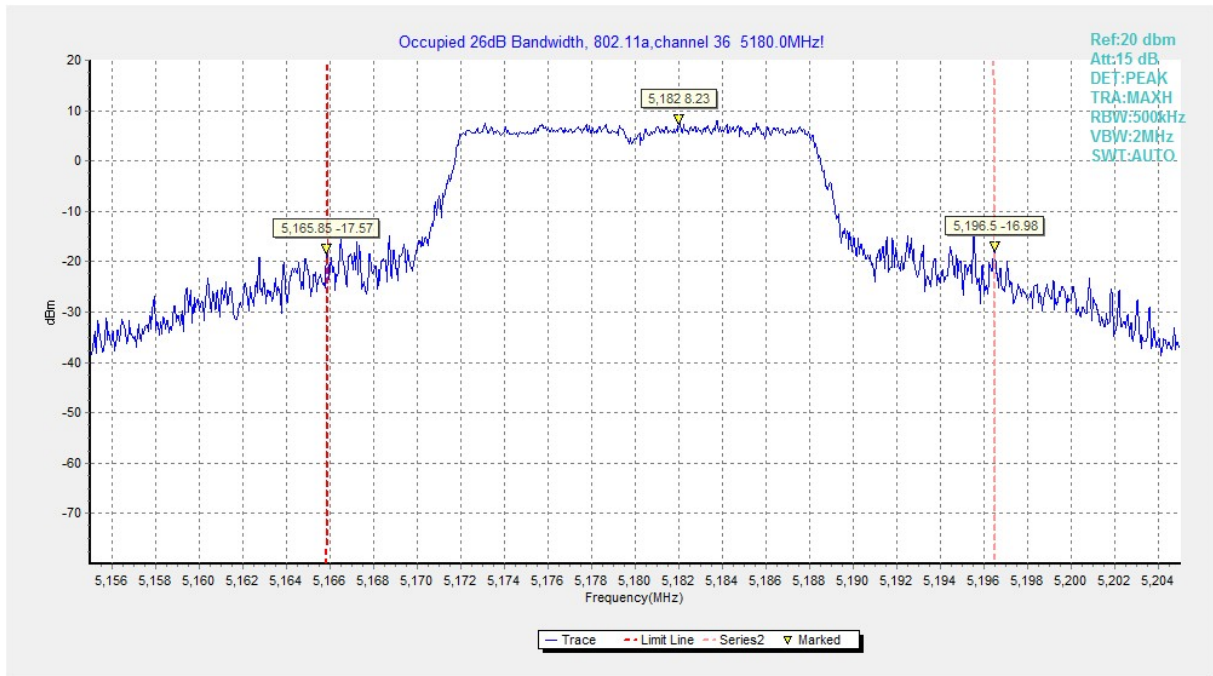
802.11ac HT20	5180 MHz	Fig.10	27.50	P
	5200 MHz	Fig.11	36.00	P
	5240 MHz	Fig.12	30.10	P
	5260 MHz	Fig.13	26.30	P
	5280 MHz	Fig.14	21.70	P
	5320 MHz	Fig.15	27.75	P
	5500 MHz	Fig.16	23.65	P
	5580 MHz	Fig.17	30.35	P
		5700 MHz	Fig.18	24.25

802.11n HT40	5190 MHz	Fig.19	39.36	P
	5230 MHz	Fig.20	40.48	P
	5270 MHz	Fig.21	39.60	P
	5310 MHz	Fig.22	39.20	P
	5510 MHz	Fig.23	39.44	P
		5550 MHz	Fig.24	39.60

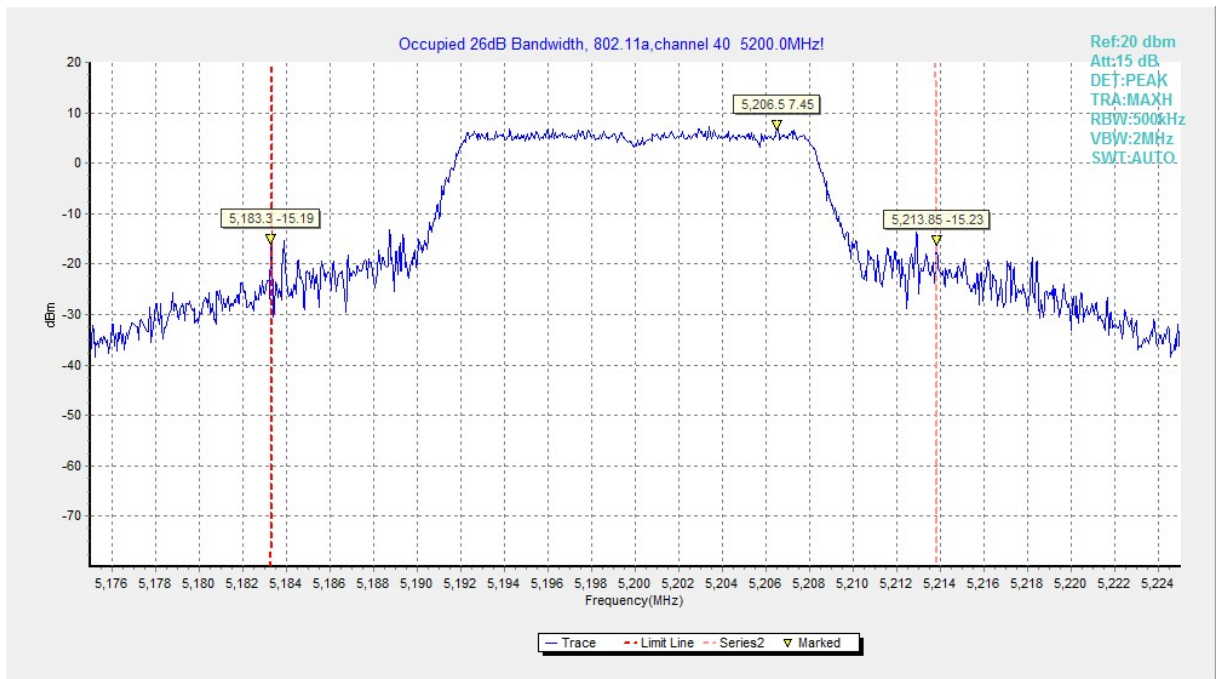
	5670 MHz	Fig.25	40.48	P
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802.11ac HT80	5210MHz	Fig.26	83.36	P
	5290MHz	Fig.27	79.20	P
	5530MHz	Fig.28	84.96	P
	5610MHz	Fig.29	82.40	P

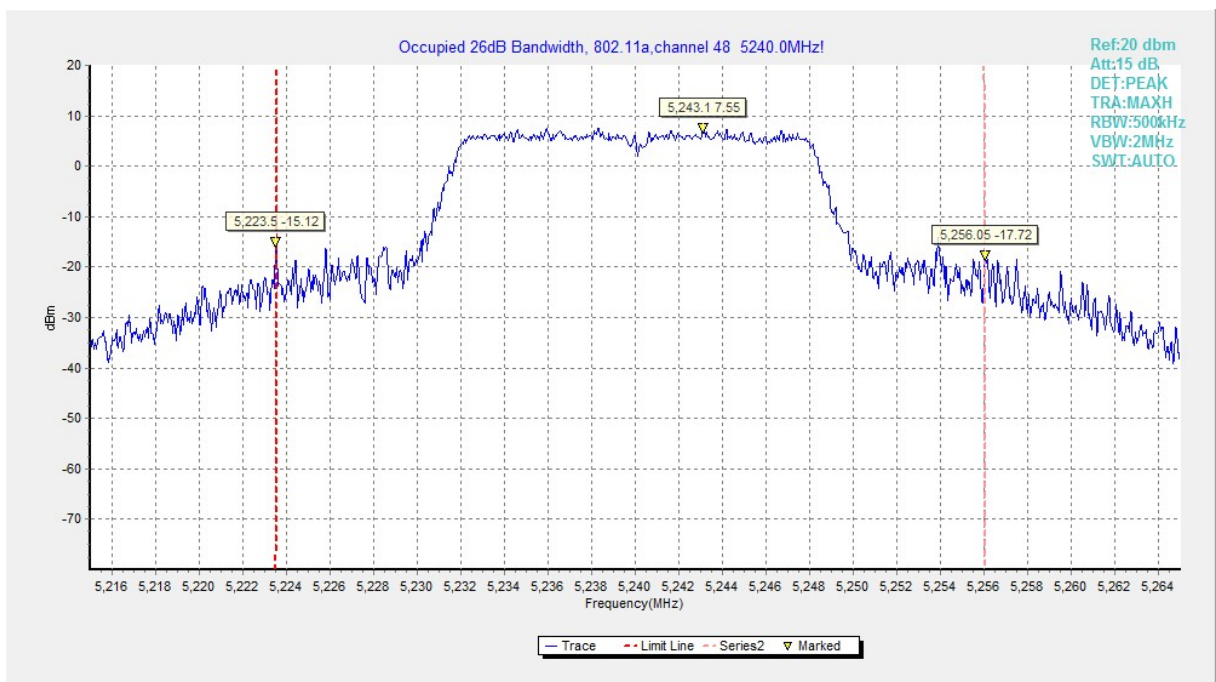
**Conclusion: PASS**  
**Test graphs as below:**



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



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



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

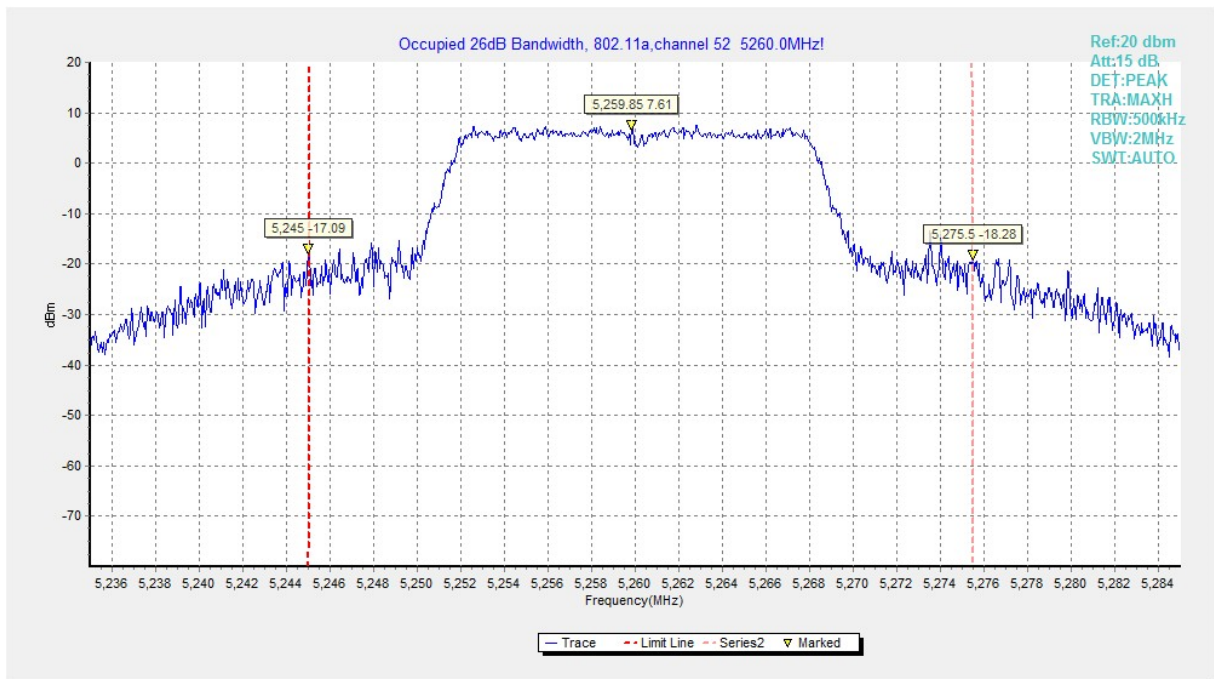


Fig.4 Occupied 26dB Bandwidth (802.11a, 5260MHz)

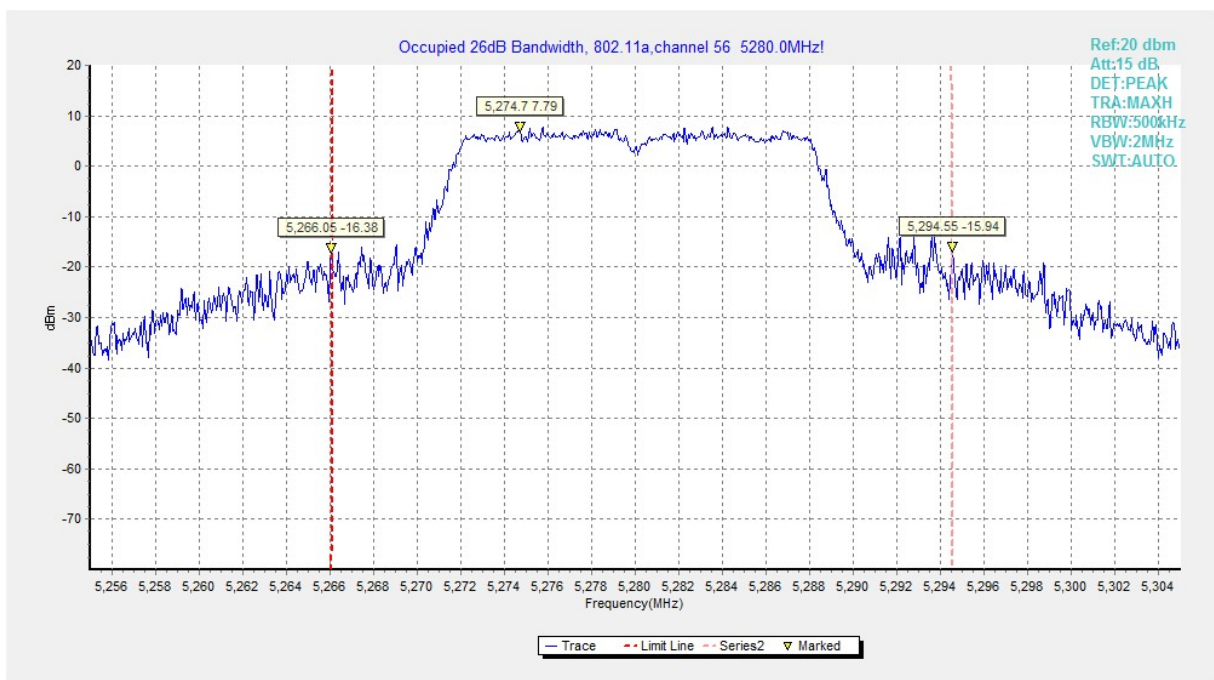


Fig.5 Occupied 26dB Bandwidth (802.11a, 5280MHz)

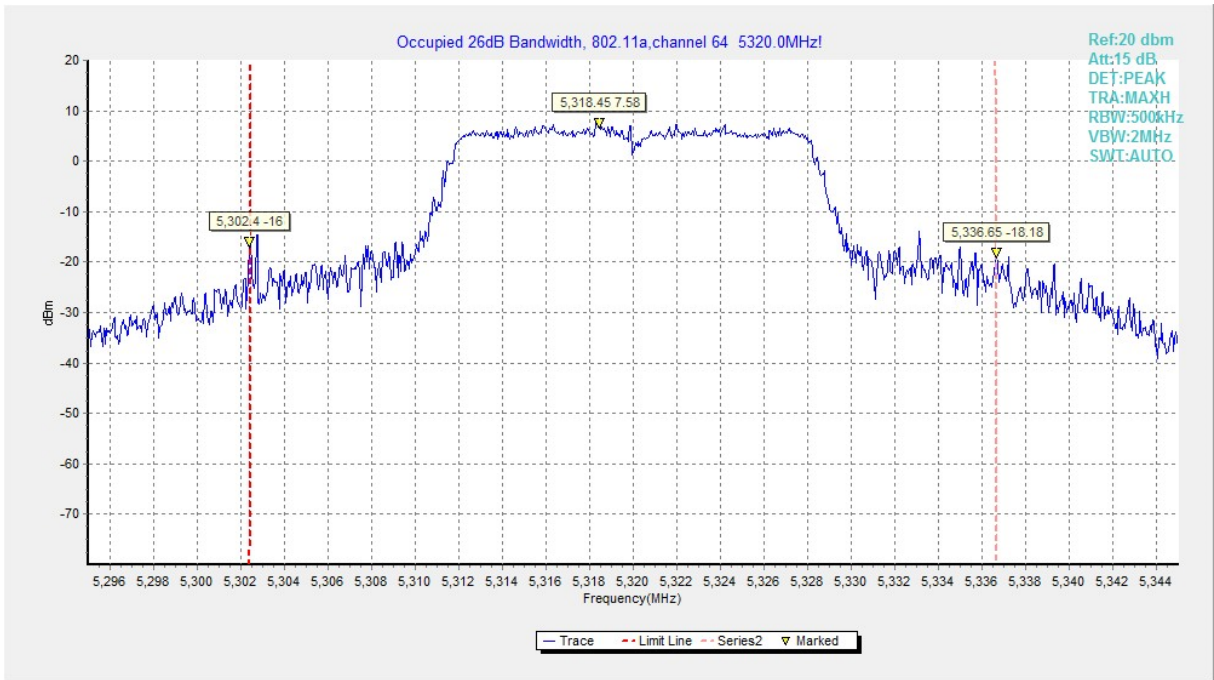


Fig.6 Occupied 26dB Bandwidth (802.11a, 5320MHz)

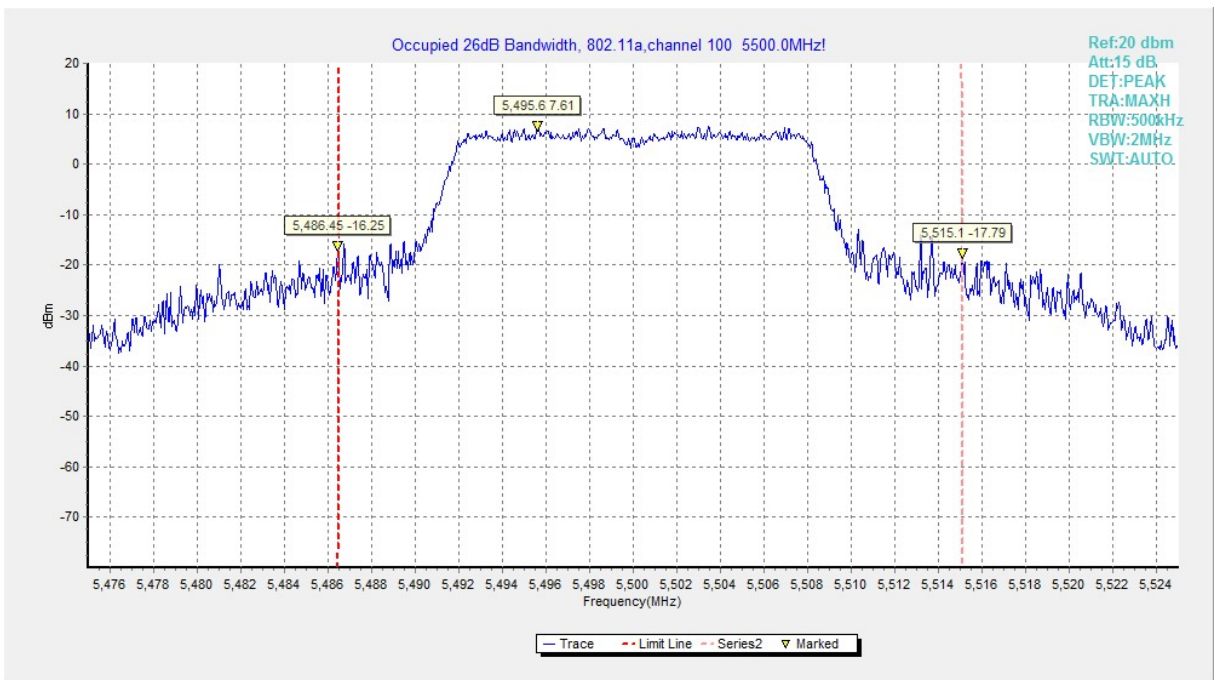
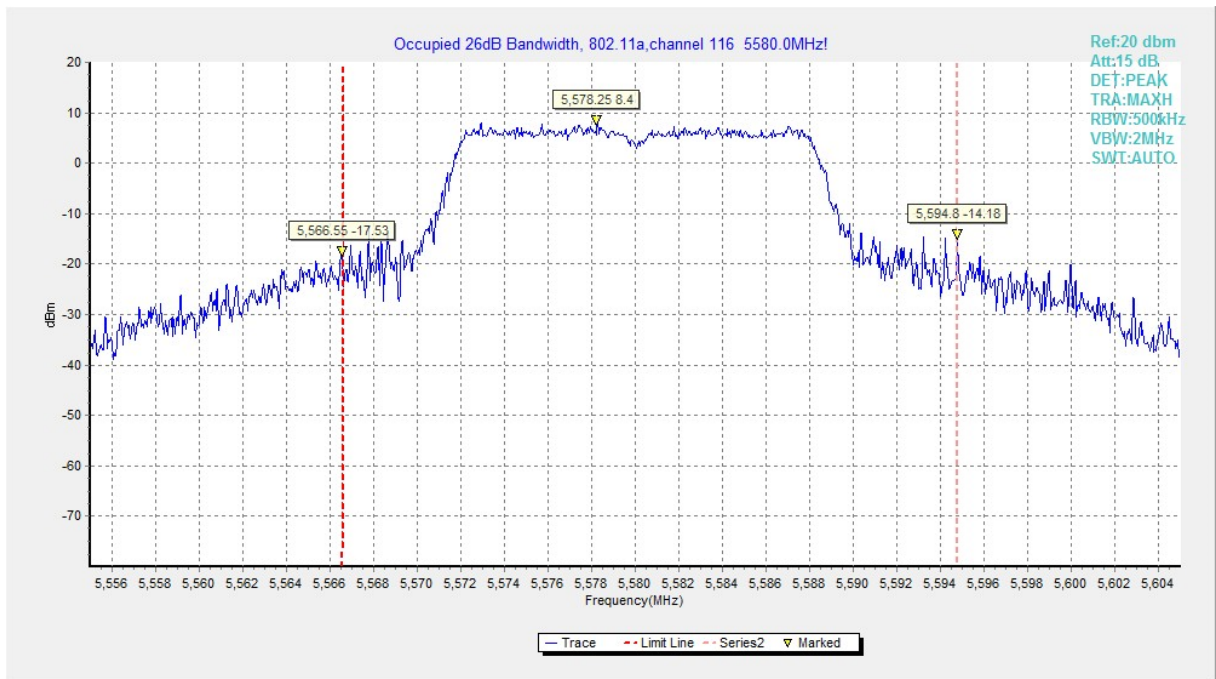
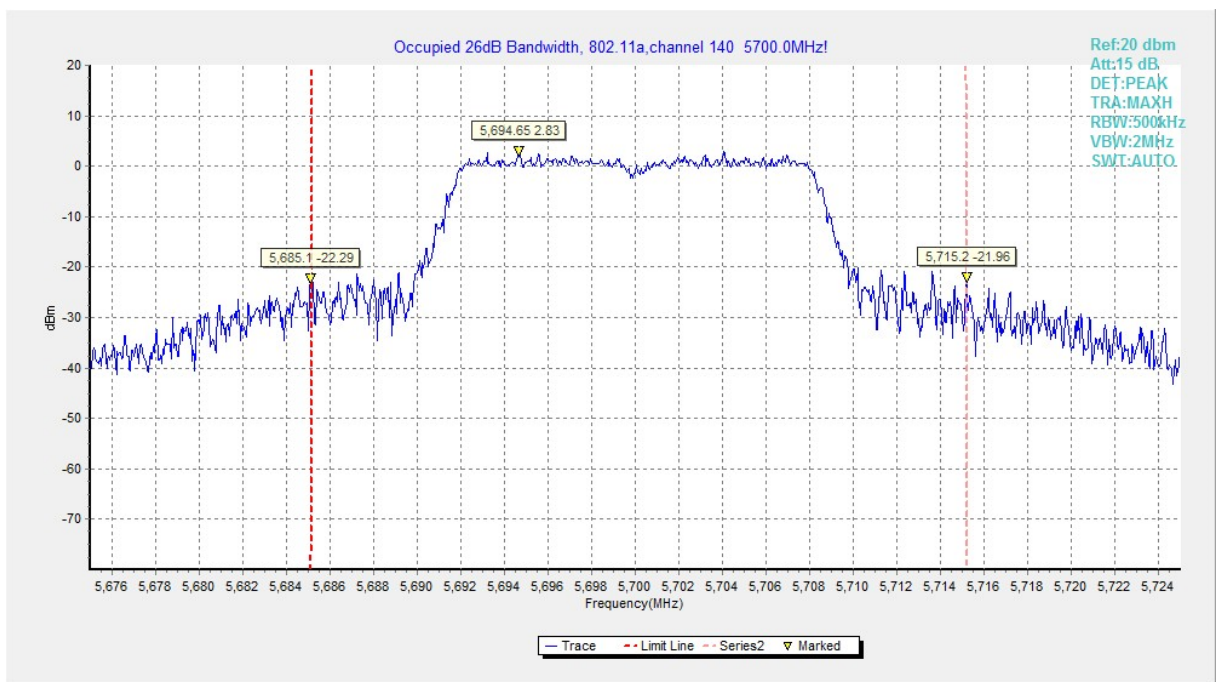


Fig.7 Occupied 26dB Bandwidth (802.11a, 5500MHz)



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



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



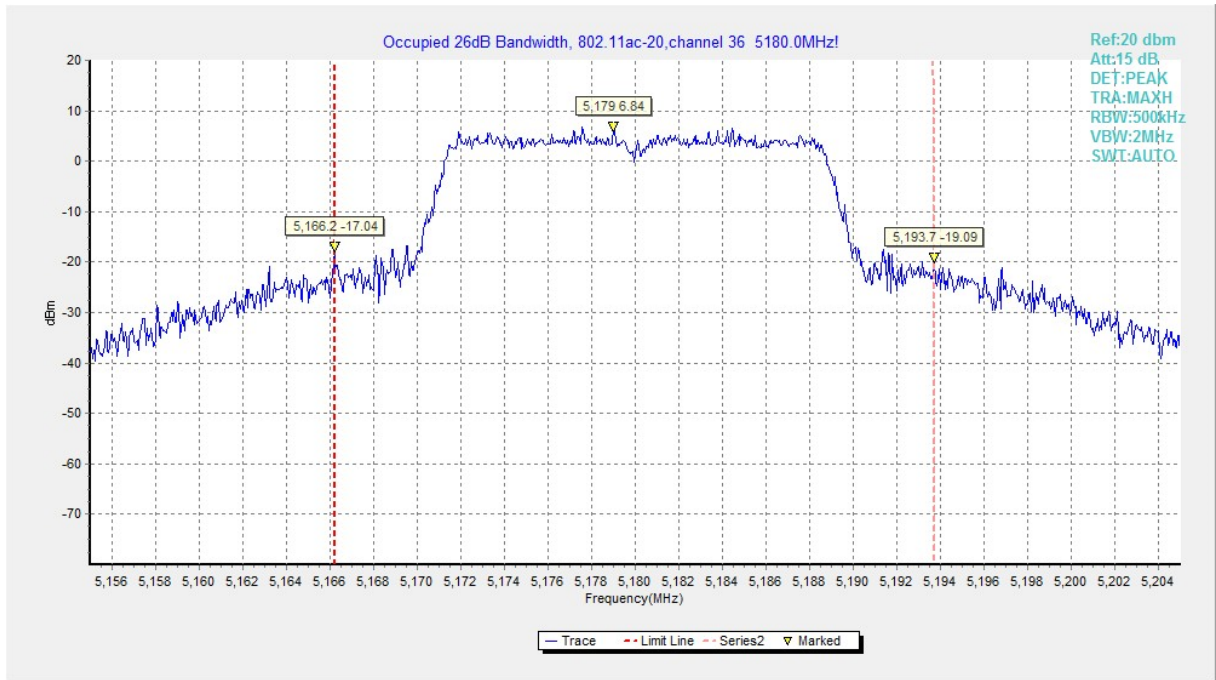


Fig.10 Occupied 26dB Bandwidth (802.11ac-HT20, 5180MHz)

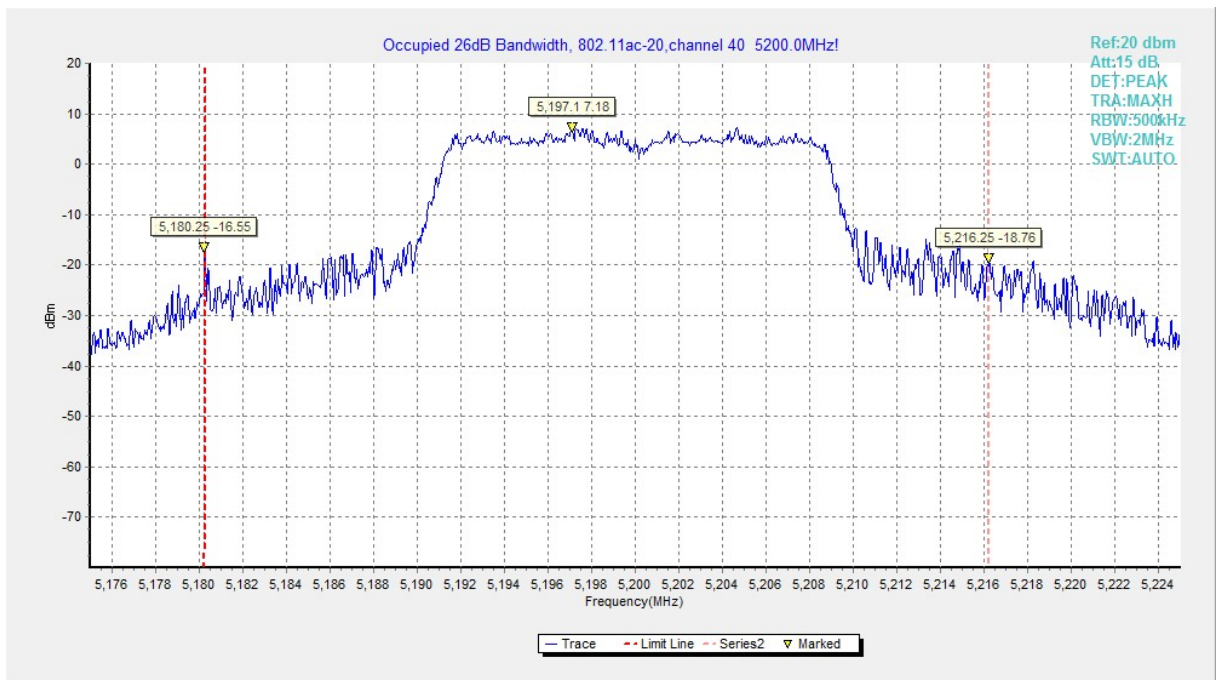
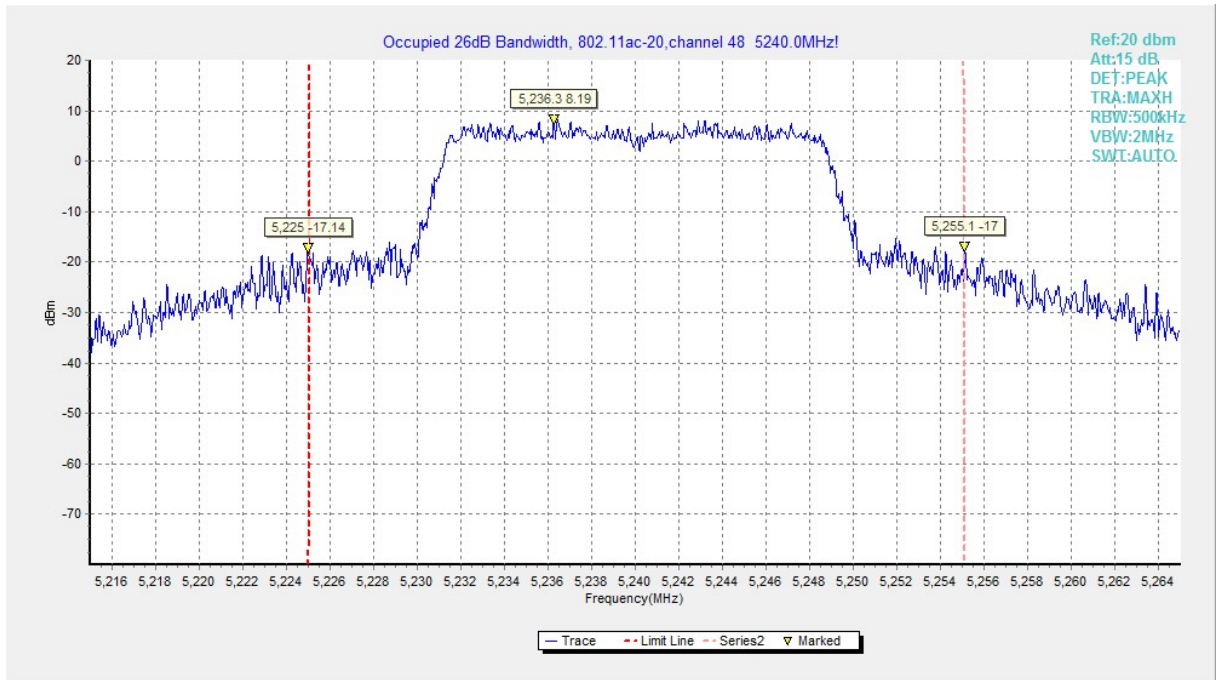
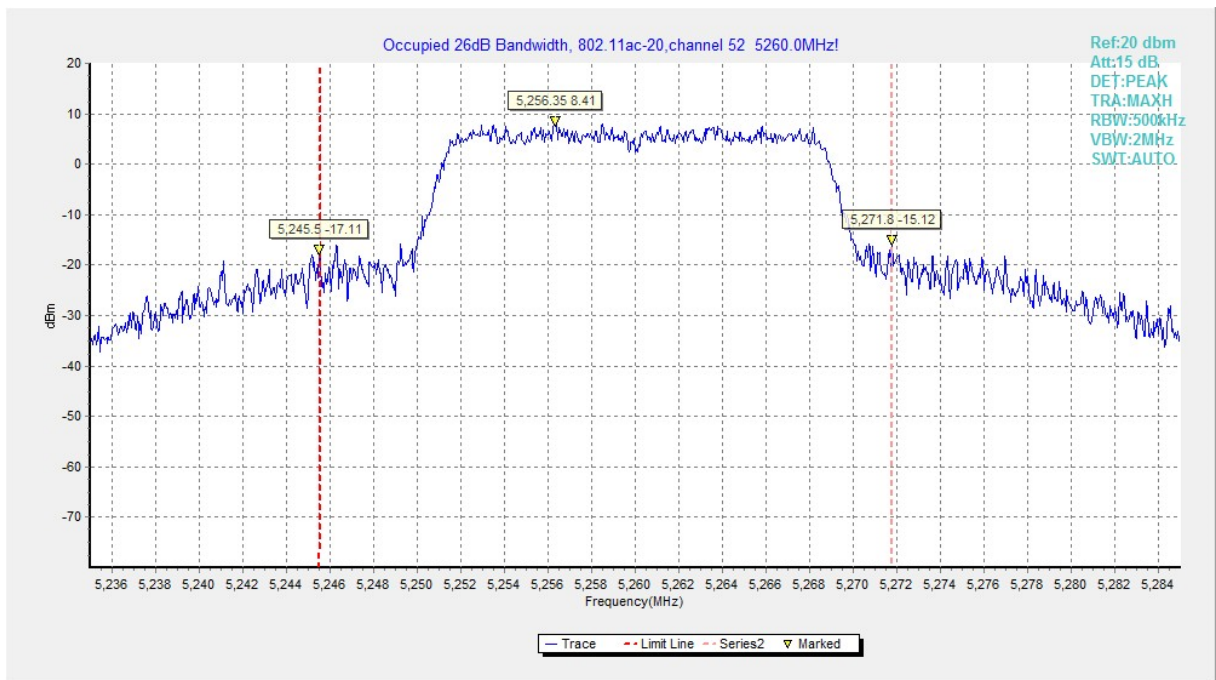


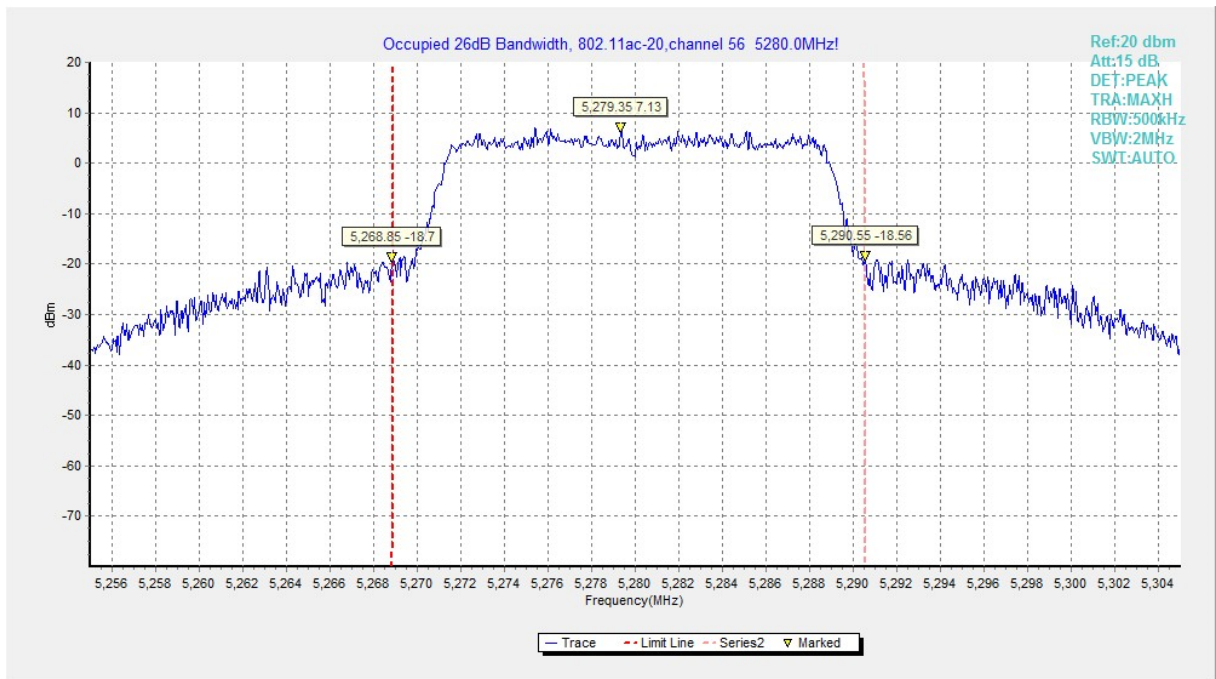
Fig.11 Occupied 26dB Bandwidth (802.11ac-HT20, 5200MHz)



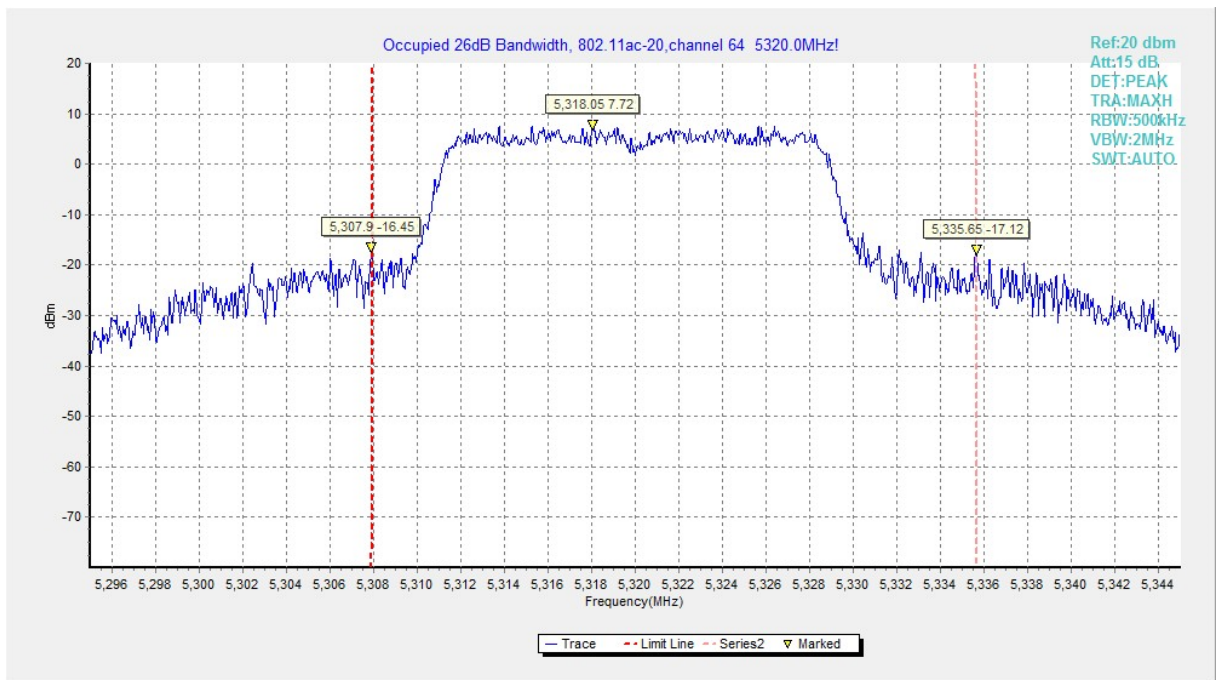
**Fig.12 Occupied 26dB Bandwidth (802.11ac-HT20, 5240MHz)**



**Fig.13 Occupied 26dB Bandwidth (802.11ac-HT20, 5260MHz)**



**Fig.14 Occupied 26dB Bandwidth (802.11ac-HT20, 5280MHz)**



**Fig.15 Occupied 26dB Bandwidth (802.11ac-HT20, 5320MHz)**

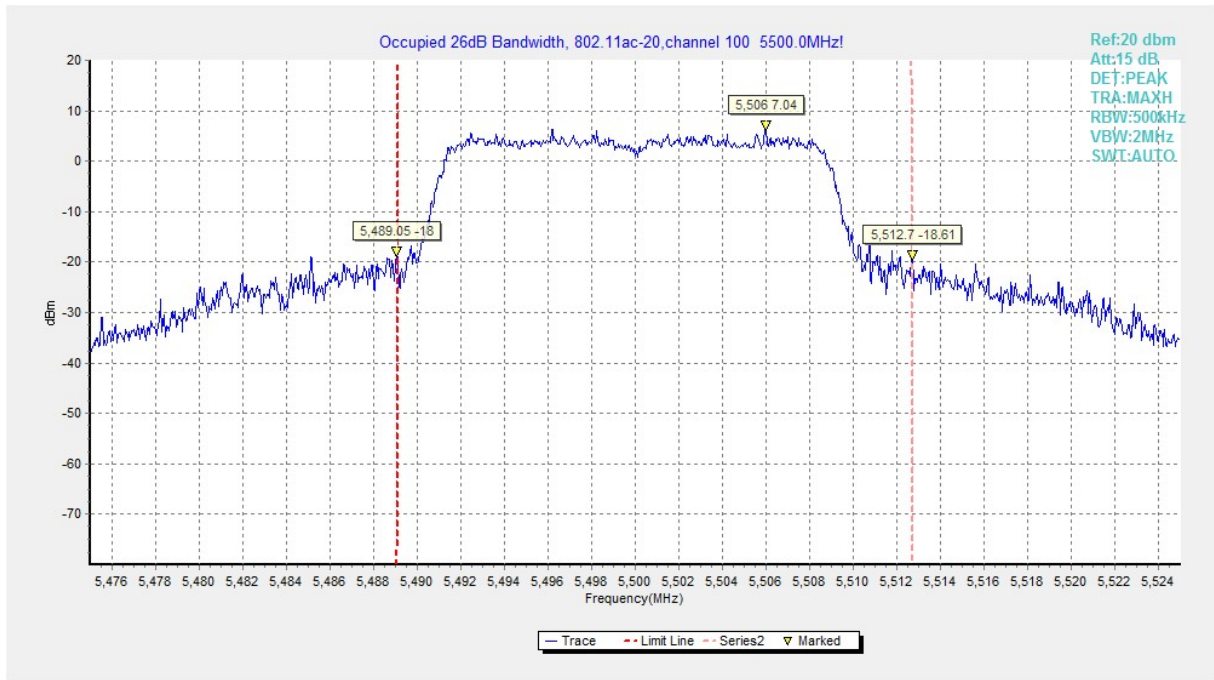


Fig.16 Occupied 26dB Bandwidth (802. 11ac-HT20, 5500MHz)

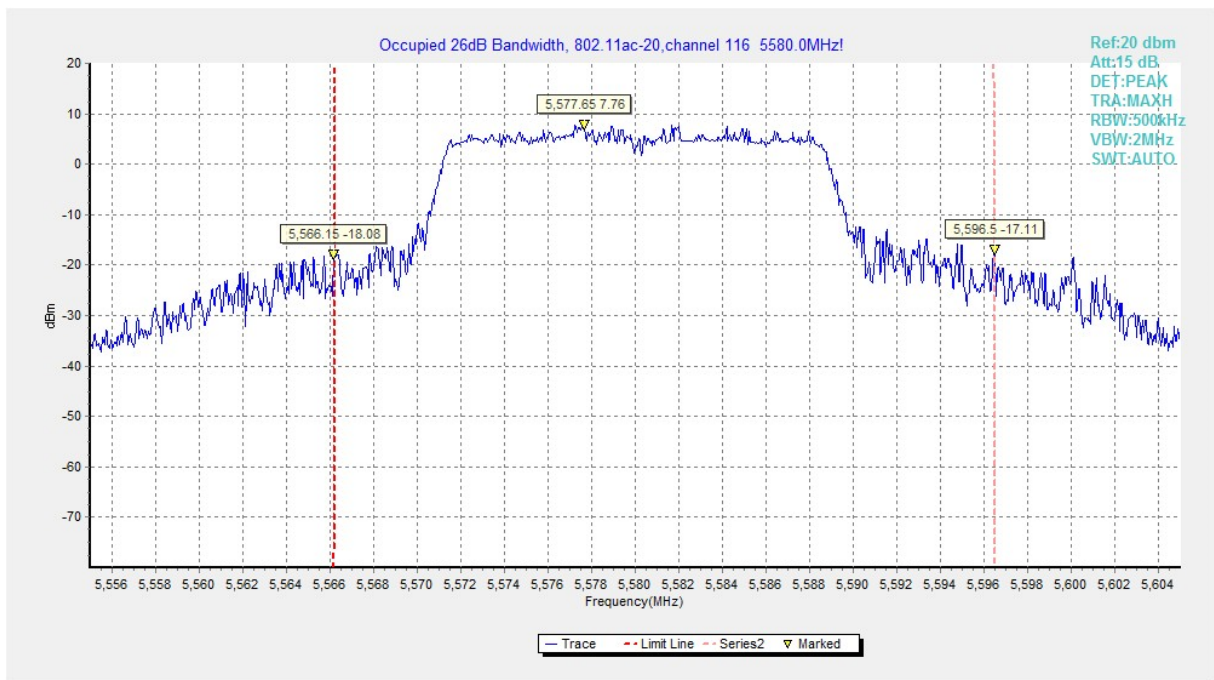
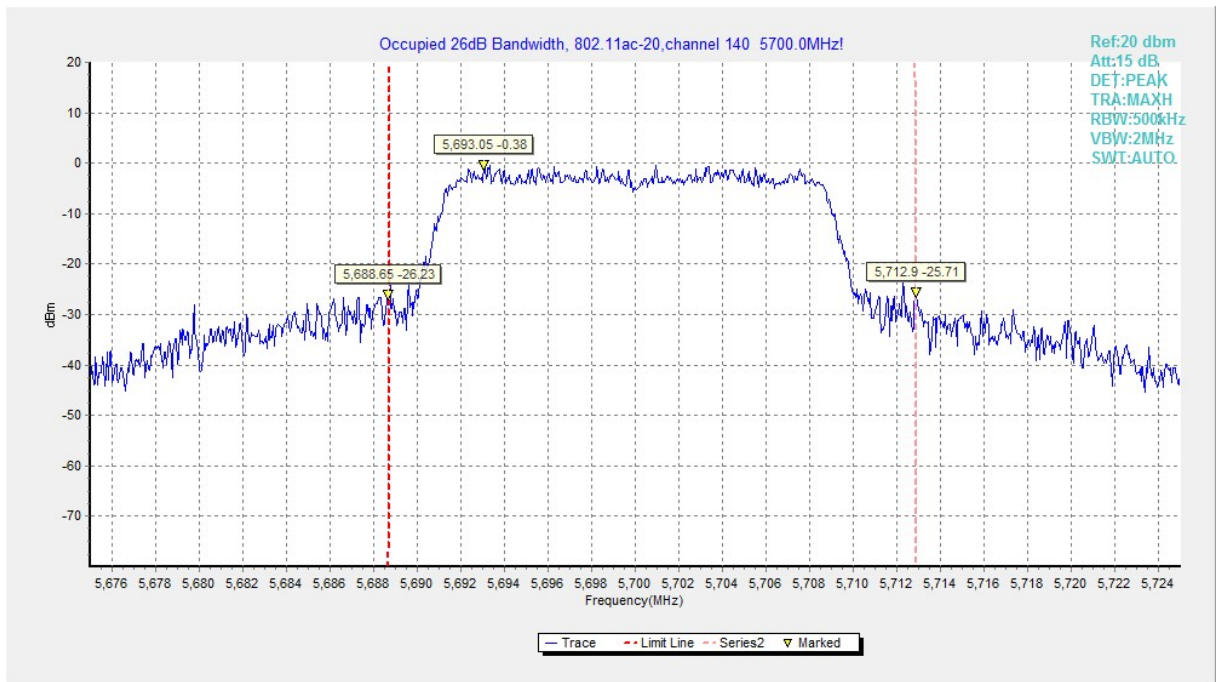
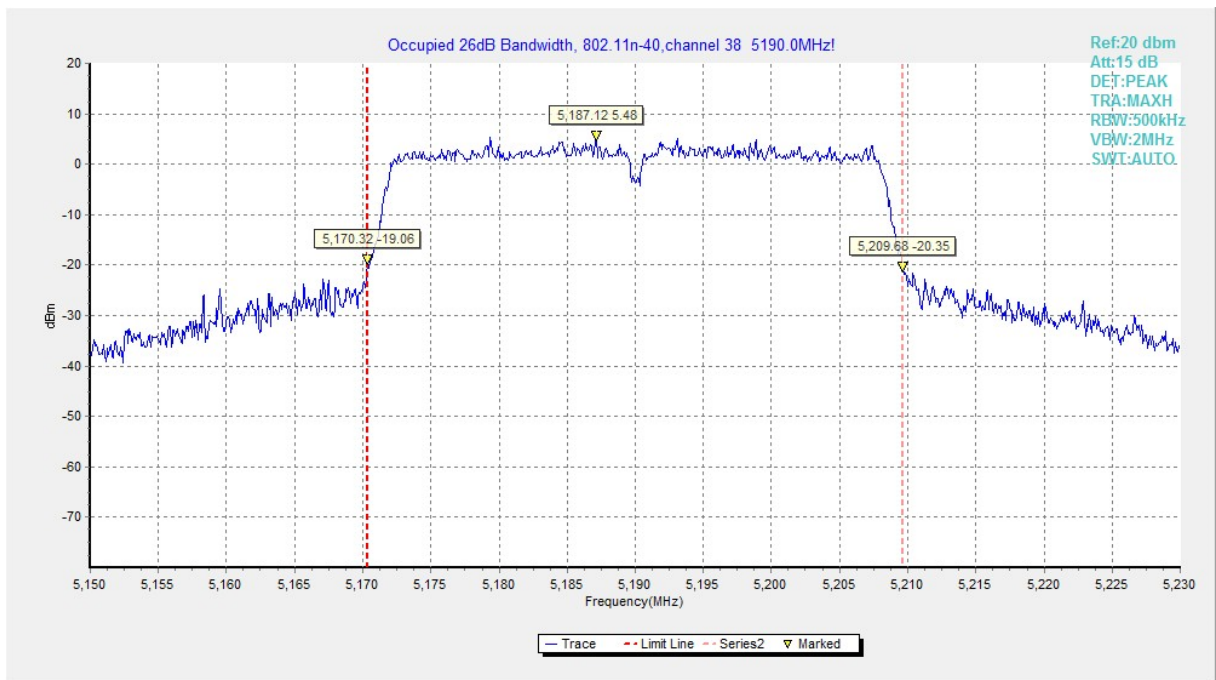


Fig.17 Occupied 26dB Bandwidth (802. 11ac-HT20, 5580MHz)



**Fig.18 Occupied 26dB Bandwidth (802. 11ac-HT20, 5700MHz)**



**Fig.19 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)**