



FCC PART 15 TEST REPORT No.I22Z70093-IOT04

for

Samsung Electronics Co., Ltd.

Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN

SM-A045F/DS, SM-A045F

With

FCC ID: ZCASMA045F

Hardware Version: REV1.0

Software Version: A045F.001

Issued Date: 2022-06-30

Note:

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REPORT HISTORY

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CONTENTS

CONTENTS	3
1. TEST LATORATORY.....	5
1.1. INTRODUCTION & ACCREDITATION	5
1.2. TESTING LOCATION	5
1.3. TESTING ENVIRONMENT.....	5
1.4. PROJECT DATE	5
1.5. SIGNATURE	6
2. CLIENT INFORMATION.....	7
2.1 APPLICANT INFORMATION	7
2.2 MANUFACTURER INFORMATION	7
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARYEQUIPMENT(AE)	8
3.1. ABOUT EUT	8
3.2. INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST	8
3.3. INTERNAL IDENTIFICATION OF AE USED DURING THE TEST	8
4.1. GENERAL DESCRIPTION.....	9
4.2. INTERPRETATION OF THE TEST ENVIRONMENT.....	9
5. REFERENCE DOCUMENTS	10
5.1. DOCUMENTS SUPPLIED BY APPLICANT	10
5.2. REFERENCE DOCUMENTS FOR TESTING.....	10
6. LABORATORY ENVIRONMENT.....	10
7. SUMMARY OF TEST RESULTS	10
7.1. SUMMARY OF TEST RESULTS.....	10
7.2. STATEMENTS.....	11
7.3. TEST CONDITIONS	11
8. TEST EQUIPMENTS UTILIZED	11
9. MEASUREMENT UNCERTAINTY	12
8.1 TRANSMITTER OUTPUT POWER.....	12
8.2 PEAK POWER SPECTRAL DENSITY	12
8.3 OCCUPIED CHANNEL BANDWIDTH	12
8.4 BAND EDGES COMPLIANCE	12
8.5 SPURIOUS EMISSIONS	12
8.6 AC POWER-LINE CONDUCTED EMISSION	12
ANNEX A: MEASUREMENT RESULTS.....	13
A.1. MEASUREMENT METHOD	13
A.2. MAXIMUM OUTPUT POWER	14

A.3. PEAK POWER SPECTRAL DENSITY (CONDUCTED).....	17
A.4. OCCUPIED 26dB BANDWIDTH(CONDUCTED).....	18
A.5. BAND EDGES COMPLIANCE	36
A5.1 BAND EDGES - RADIATED.....	36
A.6. TRANSMITTER SPURIOUS EMISSION	51
FIG. 34 BAND EDGES (802.11A CH149,5745MHz).....	53
FIG. 35 BAND EDGES (802.11A CH165, 5825MHz).....	53
FIG. 36 BAND EDGES (802.11N-HT20 CH149, 5745MHz).....	54
FIG. 37 BAND EDGES (802.11N-HT20 CH165, 5825MHz).....	54
FIG. 38 BAND EDGES (802.11N-HT40 CH151, 5755MHz).....	55
FIG. 39 BAND EDGES (802.11N-HT40 CH159, 5795MHz).....	55
FIG. 40 BAND EDGES (802.11AC-HT20 CH149, 5745MHz).....	56
FIG. 41 BAND EDGES (802.11AC-HT20 CH165, 5825MHz).....	56
FIG. 42 BAND EDGES (802.11AC-HT40 CH151, 5755MHz).....	57
FIG. 43 BAND EDGES (802.11AC-HT40 CH159, 5795MHz).....	57
FIG. 44 BAND EDGES (802.11AC-HT80 CH155, 5775MHz).....	58
FIG. 45 BAND EDGES (802.11AC-HT80 CH155, 5775MHz).....	58
A.7. AC POWERLINE CONDUCTED EMISSION (150kHz- 30MHz).....	59
FIG. 46 AC POWER LINE CONDUCTED EMISSION-802.11A	61
FIG. 47 AC POWER LINE CONDUCTED EMISSION-IDLE.....	62
A.8. 99% OCCUPIED BANDWIDTH	63
A.9. POWER CONTROL	68
ANNEX B: EUT PARAMETERS.....	68
ANNEX C: ACCREDITATION CERTIFICATE	69

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(BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology
Development Area, Beijing, P. R. China 100176

1.3. Testing Environment

Normal Temperature: 15-35℃

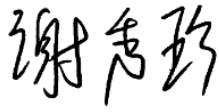
Relative Humidity: 20-75%

1.4. Project date

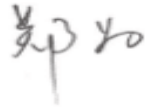
Testing Start Date: 2022-04-11

Testing End Date: 2022-06-29

1.5. Signature



Xie Xiuzhen
(Prepared this test report)



Zheng Wei
(Reviewed this test report)



Hu Xiaoyu
(Approved this test report)

2. CLIENT INFORMATION

2.1 Applicant Information

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2.2 Manufacturer Information

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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 phone with Bluetooth, WLAN
Model name	SM-A045F/DS, SM-A045F
FCC ID	ZCasma045F
WLAN Frequency Band	ISM Bands: -5150MHz~5250MHz -5250MHz~5350MHz -5470MHz~5725MHz
Type of modulation	OFDM
Antenna Gain	-1.26dBi
Voltage	3.85V

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
UT17a	2270093UT17a	REV1.0	A045F.001
UT22a	2270093UT22a	REV1.0	A045F.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
4. AE1	Adapter1	/
AE2	Adapter2	/
AE3	Adapter3	/
AE4	Data Cable1	/
AE5	Data Cable2	/
AE6	Headset1	/
AE7	Headset2	
AE8	Battery	/
AE1		
Model		EP-TA200JWE
Manufacturer		HAEM Co.,Ltd
Length of cable		/
AE2		
Model		EP-TA200JWE
Manufacturer		SoluM Co.,Ltd.
Length of cable		/
AE3		
Model		EP-TA200JWE

Manufacturer	RFTECH Co., Ltd.
Length of cable	/
AE4	
Model	EP-DR140AWE
Manufacturer	DONGGUAN KSD CO.,LTD
Length of cable	/
AE5	
Model	EP-DR140AWE
Manufacturer	CRESYN HANOI Co., Ltd
Length of cable	/
AE6	
Model	EHS61ASFWE
Manufacturer	DONGGUAN YOUNGBO ELECTRONICS CO.,LTD
Length of cable	/
AE7	
Model	EHS61ASFWE
Manufacturer	Shenzhen Grandsound Electronics Co.,Ltd
Length of cable	/
AE8	
Model	/
Manufacturer	/
Length of cable	/

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

4.1. General Description

The Equipment under Test (EUT) is a model of Multi-band GSM/WCDMA/LTE phone 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.

4.2. 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

5. REFERENCE DOCUMENTS

5.1. Documents supplied by applicant

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

5.2. 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

6. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

7. SUMMARY OF TEST RESULTS

7.1. 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
--	----------

7.2. Statements

CTTL has evaluated the test cases requested by the client/manufacture 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.

7.3. 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℃
Voltage	3.85V
Humidity	44%

8. 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	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100376	R&S	1 year	2022-09-15
2	Test Receiver	ESW44	103015	R&S	1 year	2022-09-02
3	EMI Antenna	VULB9163	01176	Schwarzbeck	1 year	2022-11-15
4	EMI Antenna	3117	00139065	ETS-Lindgren	1 year	2022-09-13
5	EMI Antenna	3115	00146404	ETS-Lindgren	1 year	2023-02-23
6	EMI Antenna	LB-180400-25-C-KF	J211060826	A-INFO	1 year	2023-02-27
7	Loop Antenna	HFH2-Z2	829324/007	R&S	1 year	2022-12-22

AC Power Line Conducted Emission

No.	Equipment	Model	Manufacturer	Serial Number	Calibration Period	Calibration Due date
1	LISN	ENV216	101459	R&S	1 year	2023-03-26
2	Test Receiver	ESCI	100766	R&S	1 year	2023-03-02

9. 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	/
$30\text{MHz} \leq f \leq 1\text{GHz}$	5.73
$1\text{GHz} \leq f \leq 18\text{GHz}$	5.58
$18\text{GHz} \leq f \leq 40\text{GHz}$	3.37

8.6 AC Power-line Conducted Emission

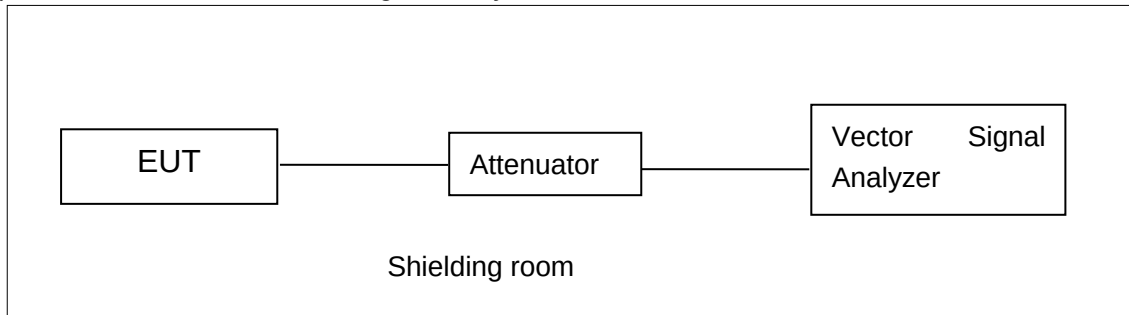
Measurement Uncertainty: 3.10dB, k=2

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

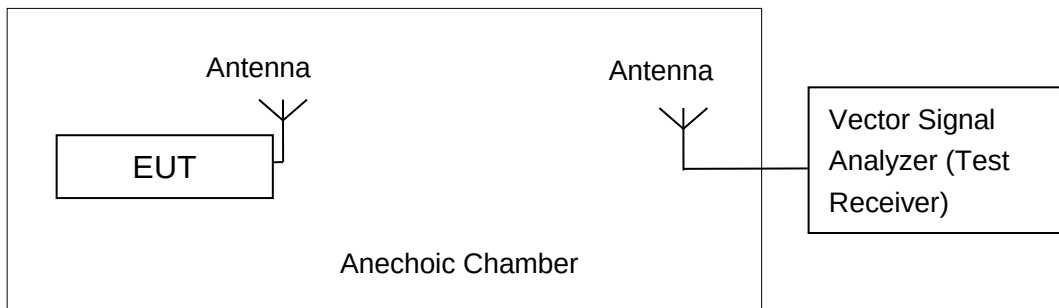


A.1.2. Radiated Emission Measurements

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

Note:

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

802.11a=11+10*log(B)=22.76, B=20.00/2+5=15.00MHz,

802.11n-HT20=11+10*log(B)=22.82, B=20.40/2+5=15.20MHz,

802.11ac-VHT20=11+10*log(B)=22.83, B=20.45/2+5=15.225MHz,

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

802.11n-HT40: B=40.40/2+15=35.20MHz,

802.11ac-VHT40: B=40.40/2+15=35.20MHz,

802.11ac-VHT80: B=80.00/2+35=75.00MHz

Measurement Results:

802.11a mode

Mode	Frequency	Test Result (dBm)							
		Data Rate (Mbps)							
		6	9	12	18	24	36	48	54
802.11a	5180MHz	13.81	/	/	/	/	/	/	/
	5200MHz	13.64	/	/	/	/	/	/	/
	5240MHz	13.82	/	/	/	/	/	/	/
	5260MHz	13.83	/	/	/	/	/	/	/
	5280MHz	14.23	/	/	/	/	/	/	/
	5320MHz	14.37	13.85	13.65	13.68	13.68	13.66	13.63	13.51
	5500MHz	14.19	/	/	/	/	/	/	/
	5580MHz	14.21	/	/	/	/	/	/	/
	5700MHz	11.61	/	/	/	/	/	/	/
	5720MHz	14.88	/	/	/	/	/	/	/

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	5180MHz	14.36	13.75	13.66	13.64	13.62	13.65	13.63	13.59

(HT20)	5200MHz	14.25	/	/	/	/	/	/	/
	5240MHz	14.23	/	/	/	/	/	/	/
	5260MHz	14.31	/	/	/	/	/	/	/
	5280MHz	14.10	/	/	/	/	/	/	/
	5320MHz	14.12	/	/	/	/	/	/	/
	5500MHz	13.81	/	/	/	/	/	/	/
	5580MHz	14.01	/	/	/	/	/	/	/
	5700MHz	10.85	/	/	/	/	/	/	/
	5720MHz	13.98	/	/	/	/	/	/	/

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	13.58	13.05	13.03	12.94	12.91	12.93	12.88	11.95	11.36
	5200MHz	13.90	/	/	/	/	/	/	/	/
	5240MHz	13.71	/	/	/	/	/	/	/	/
	5260MHz	13.81	/	/	/	/	/	/	/	/
	5280MHz	13.69	/	/	/	/	/	/	/	/
	5320MHz	13.66	/	/	/	/	/	/	/	/
	5500MHz	13.40	/	/	/	/	/	/	/	/
	5580MHz	13.52	/	/	/	/	/	/	/	/
	5700MHz	10.43	/	/	/	/	/	/	/	/
	5720MHz	13.42	/	/	/	/	/	/	/	/

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	14.73	13.90	13.88	13.91	13.83	13.85	13.69	12.77
	5230MHz	14.66	/	/	/	/	/	/	/
	5270MHz	14.46	/	/	/	/	/	/	/
	5310MHz	14.32	/	/	/	/	/	/	/
	5510MHz	14.21	/	/	/	/	/	/	/
	5550MHz	14.16	/	/	/	/	/	/	/
	5670MHz	14.22	/	/	/	/	/	/	/
	5710MHz	14.25	/	/	/	/	/	/	/

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	14.55	14.01	13.82	13.76	13.73	13.78	13.74	12.79	12.25	12.11
	5230MHz	14.72	/	/	/	/	/	/	/	/	/
	5270MHz	14.43	/	/	/	/	/	/	/	/	/
	5310MHz	14.54	/	/	/	/	/	/	/	/	/
	5510MHz	14.11	/	/	/	/	/	/	/	/	/
	5550MHz	14.09	/	/	/	/	/	/	/	/	/
	5670MHz	14.22	/	/	/	/	/	/	/	/	/
	5710MHz	14.17	/	/	/	/	/	/	/	/	/

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	14.02	13.85	13.73	13.68	13.74	13.69	13.66	12.72	12.21	12.10
	5290MHz	13.75	/	/	/	/	/	/	/	/	/
	5530MHz	14.24	/	/	/	/	/	/	/	/	/
	5610MHz	14.28	/	/	/	/	/	/	/	/	/
	5690MHz	14.18	/	/	/	/	/	/	/	/	/

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%.

Conclusion: PASS

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	4.19	P
	5200 MHz	4.37	P
	5240 MHz	4.54	P
	5260 MHz	4.33	P
	5280 MHz	4.27	P
	5320 MHz	4.21	P
	5500 MHz	4.08	P
	5580 MHz	4.11	P
	5700 MHz	1.34	P
	5720 MHz	3.91	P
802.11n HT20	5180 MHz	4.04	P
	5200 MHz	4.04	P
	5240 MHz	3.99	P
	5260 MHz	4.01	P
	5280 MHz	3.97	P
	5320 MHz	3.87	P
	5500 MHz	3.99	P
	5580 MHz	3.79	P
	5700 MHz	0.51	P
	5720 MHz	3.61	P
802.11n HT40	5190 MHz	0.99	P
	5230 MHz	0.93	P
	5270 MHz	0.78	P
	5310 MHz	0.56	P
	5510 MHz	0.4	P
	5550 MHz	0.26	P
	5670 MHz	0.31	P
	5710 MHz	0.22	P
802.11ac HT80	5210MHz	-3.05	P
	5290MHz	-3.21	P
	5530MHz	-2.96	P

	5610MHz	-2.66	P
	5690MHz	-3.01	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
-------------------------	---------

Measurement Result:

Mode	Frequency	Occupied 26dB Bandwidth (MHz)		conclusion
802.11a	5180 MHz	Fig.1	20.20	P
	5200 MHz	Fig.2	20.05	P
	5240 MHz	Fig.3	20.00	P
	5260 MHz	Fig.4	20.15	P
	5280 MHz	Fig.5	20.25	P
	5320 MHz	Fig.6	20.35	P
	5500 MHz	Fig.7	20.05	P
	5580 MHz	Fig.8	20.35	P
	5700 MHz	Fig.9	20.35	P
	5720 MHz	Fig.10	20.00	P
802.11n HT20	5180 MHz	Fig.11	20.65	P
	5200 MHz	Fig.12	20.65	P
	5240 MHz	Fig.13	20.55	P
	5260 MHz	Fig.14	20.45	P
	5280 MHz	Fig.15	20.50	P
	5320 MHz	Fig.16	20.50	P
	5500 MHz	Fig.17	20.55	P
	5580 MHz	Fig.18	20.55	P
	5700 MHz	Fig.19	20.30	P
	5720 MHz	Fig.20	20.40	P
802.11n HT40	5190 MHz	Fig.21	40.00	P
	5230 MHz	Fig.22	40.16	P
	5270 MHz	Fig.23	40.16	P
	5310 MHz	Fig.24	40.48	P
	5510 MHz	Fig.25	40.80	P

	5550 MHz	Fig.26	40.08	P
	5670 MHz	Fig.27	40.16	P
	5710 MHz	Fig.28	40.40	P
802.11ac HT80	5210MHz	Fig.29	81.44	P
	5290MHz	Fig.30	80.80	P
	5530MHz	Fig.31	80.00	P
	5610MHz	Fig.32	80.00	P
	5690MHz	Fig.33	80.00	P

Conclusion: PASS

Test graphs as below:

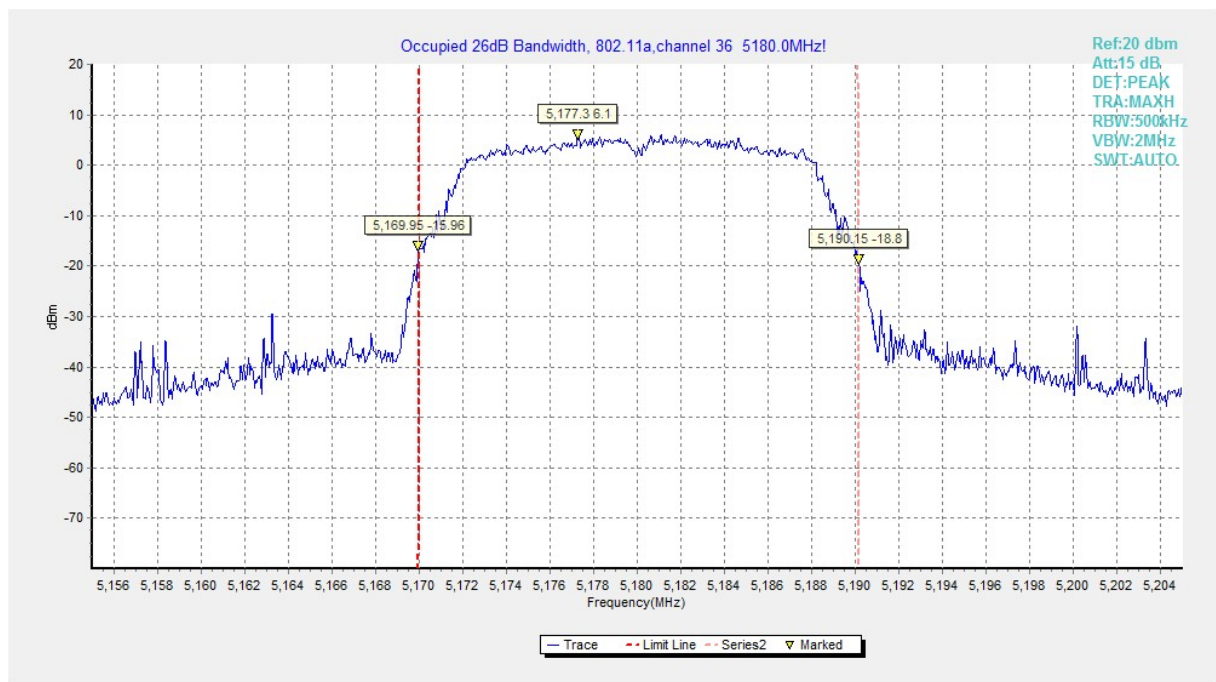


Fig.1 Occupied 26dB Bandwidth (802.11a, 5180MHz)

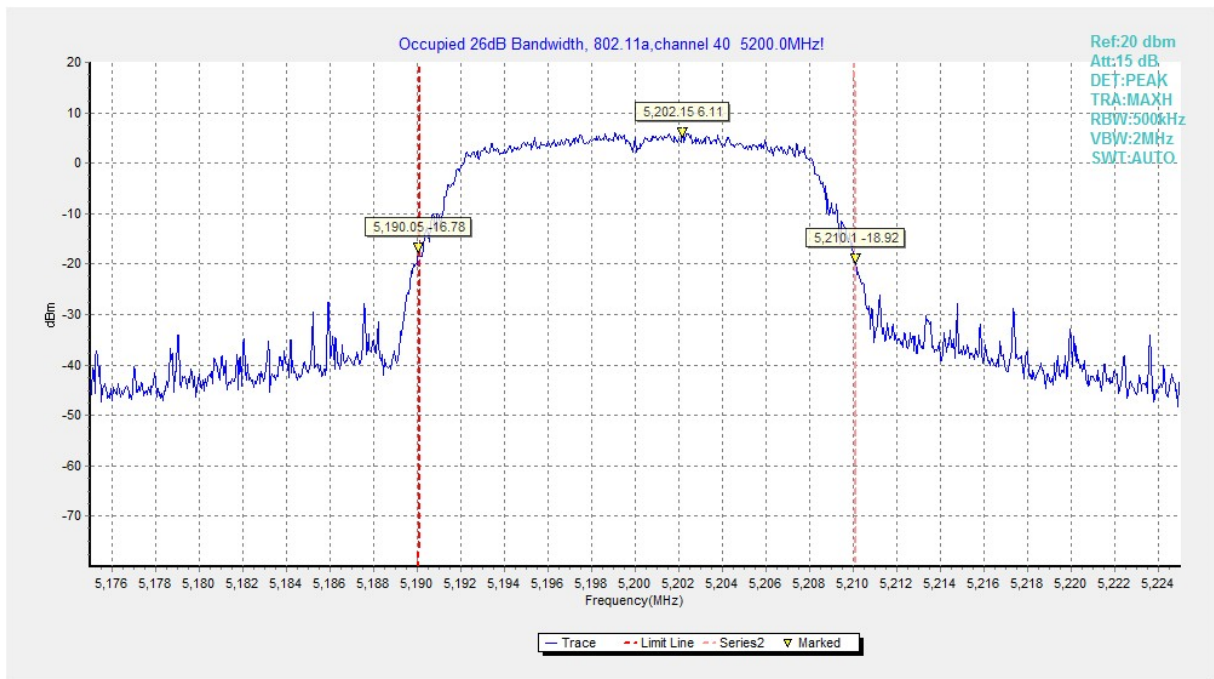


Fig.2 Occupied 26dB Bandwidth (802.11a, 5200MHz)

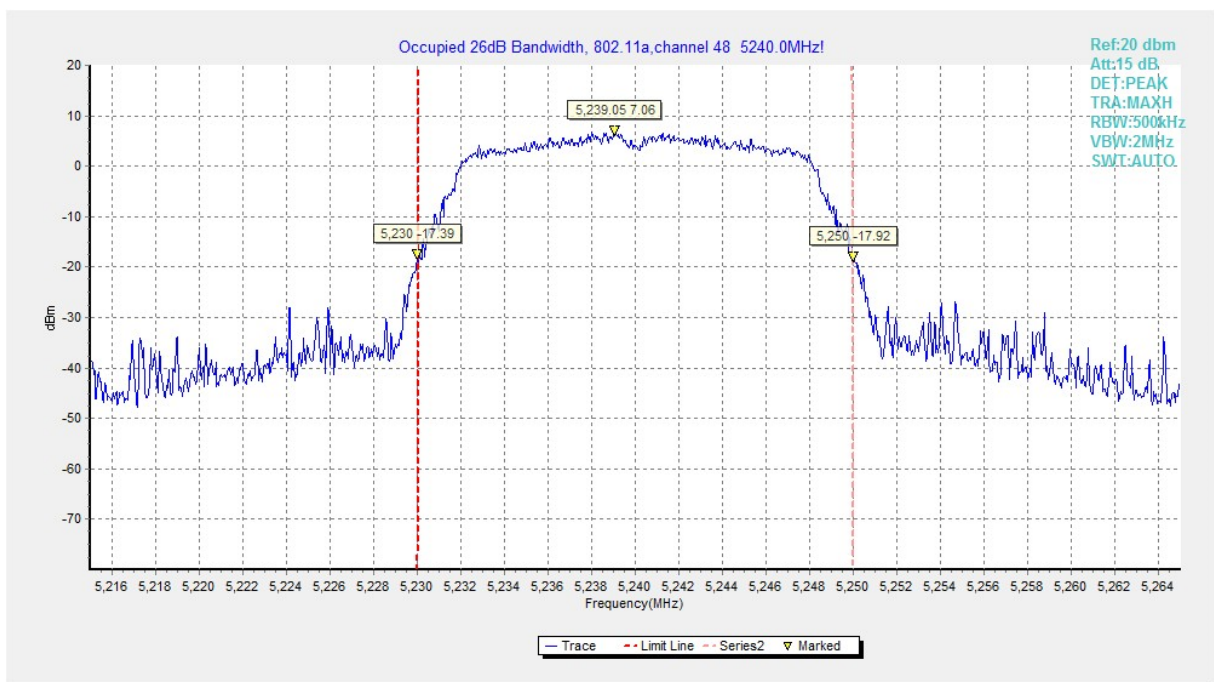


Fig.3 Occupied 26dB Bandwidth (802.11a, 5240MHz)

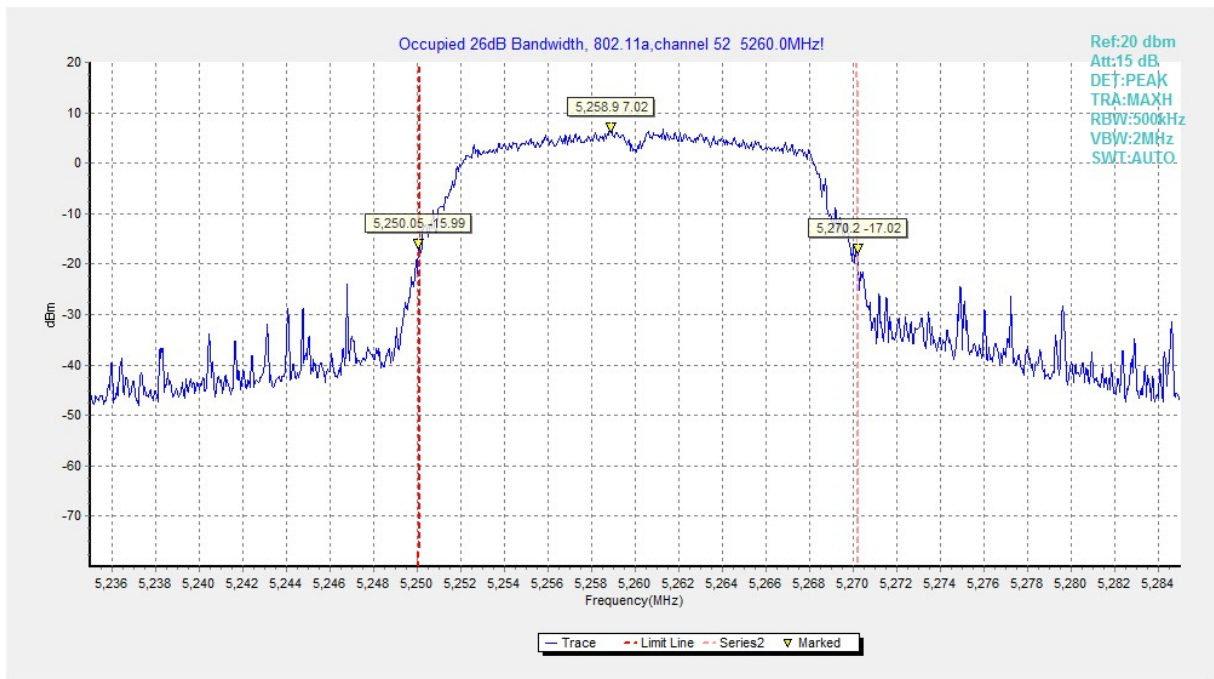


Fig.4 Occupied 26dB Bandwidth (802.11a, 5260MHz)

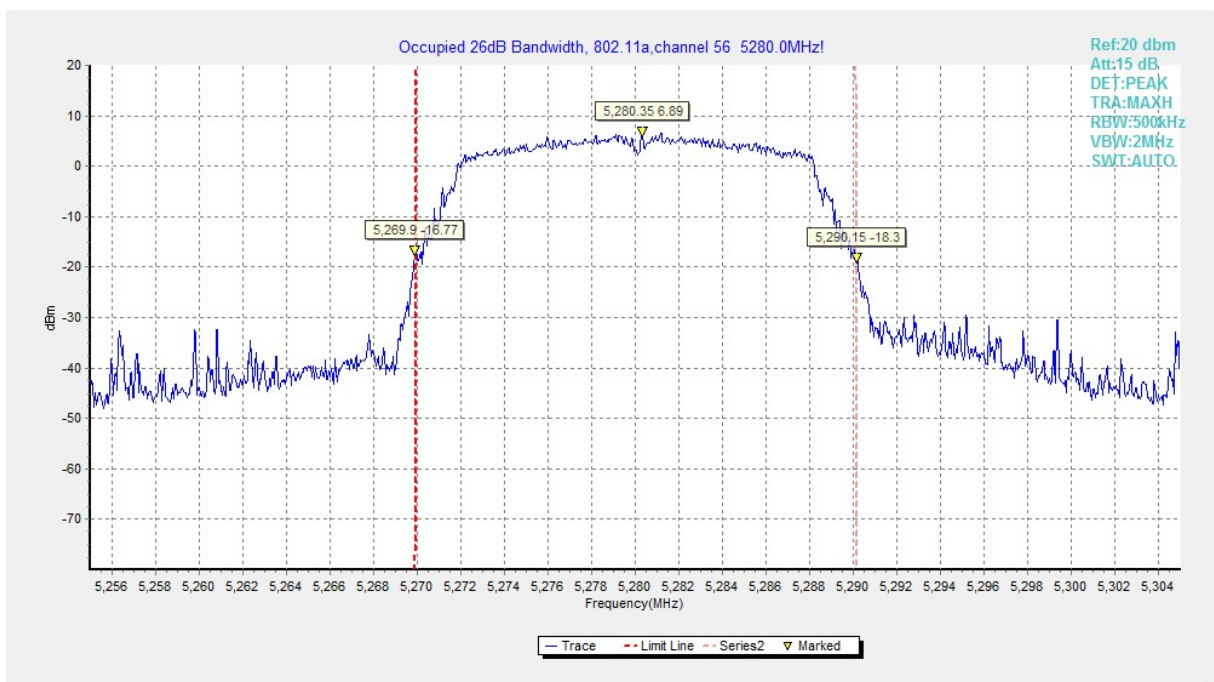


Fig.5 Occupied 26dB Bandwidth (802.11a, 5280MHz)

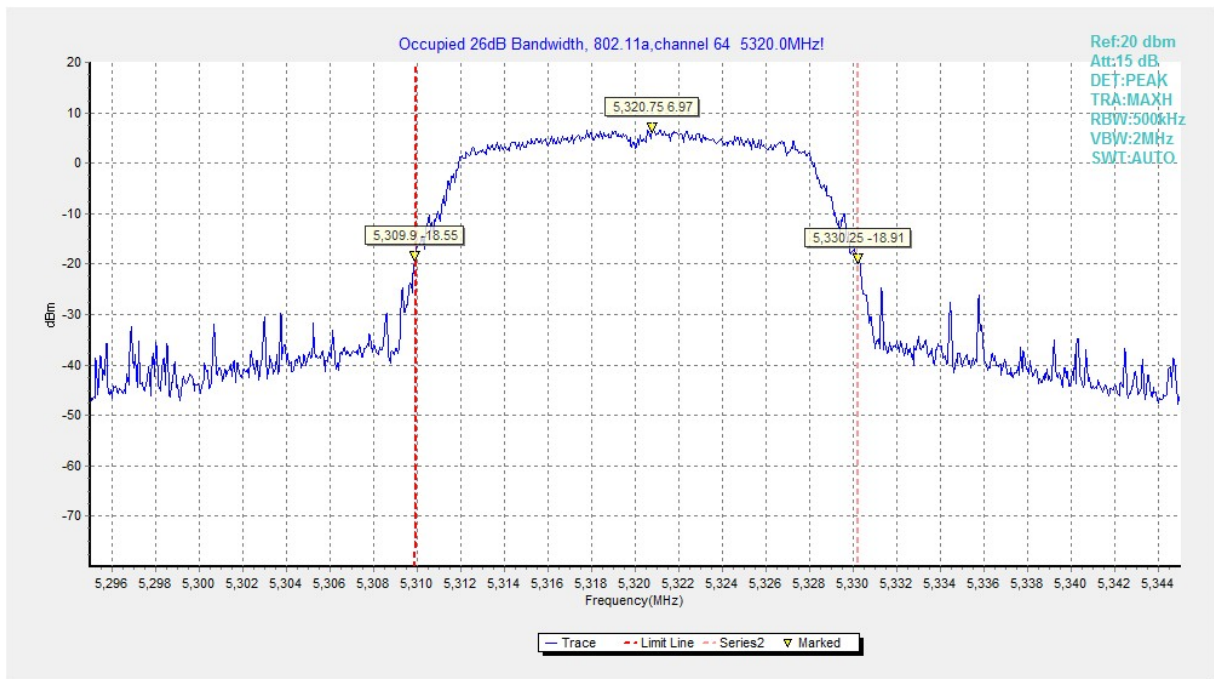


Fig.6 Occupied 26dB Bandwidth (802.11a, 5320MHz)

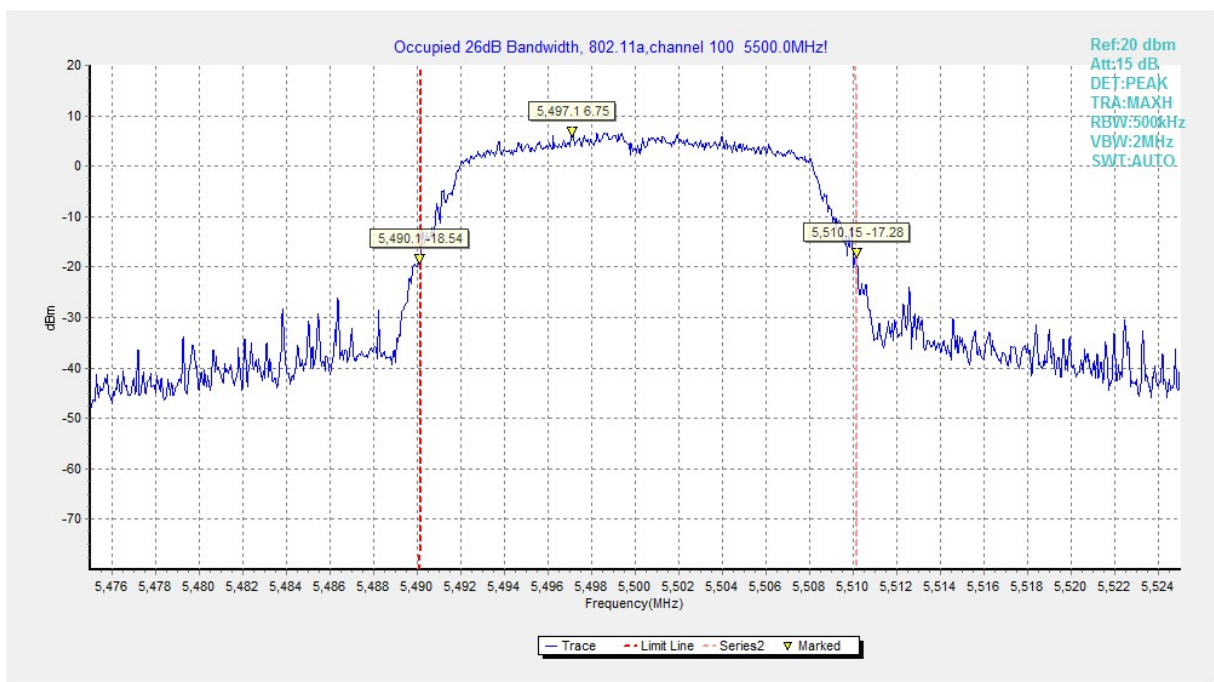


Fig.7 Occupied 26dB Bandwidth (802.11a, 5500MHz)

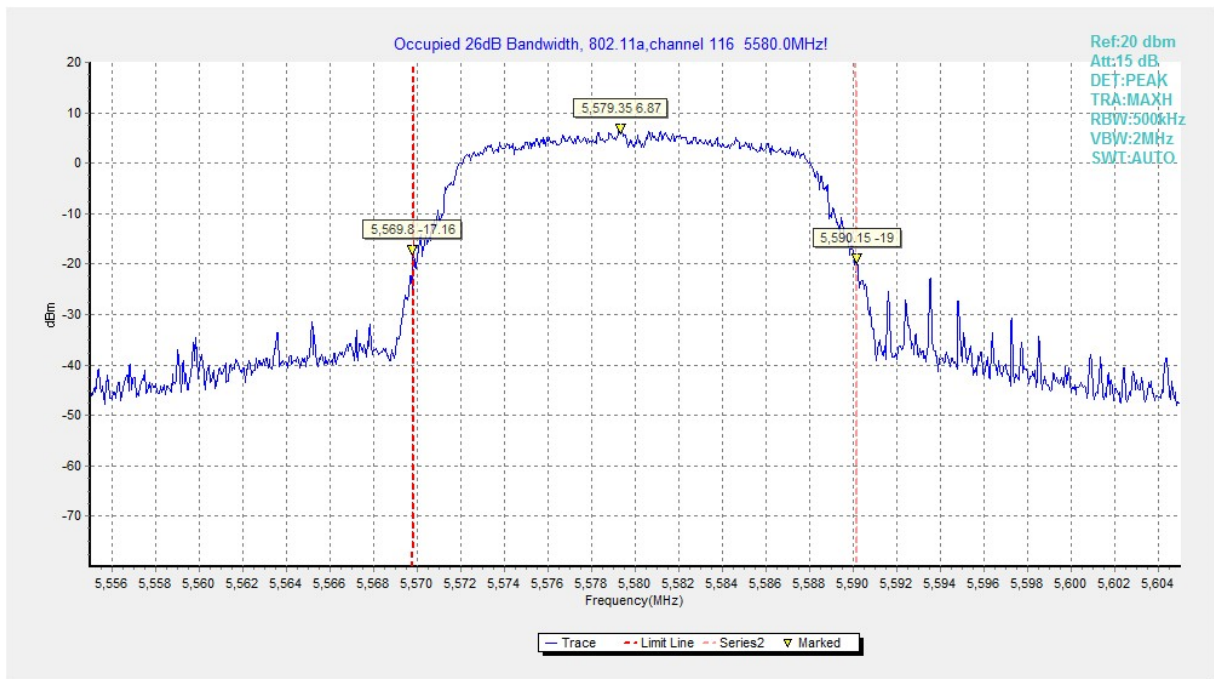


Fig.8 Occupied 26dB Bandwidth (802.11a, 5580MHz)

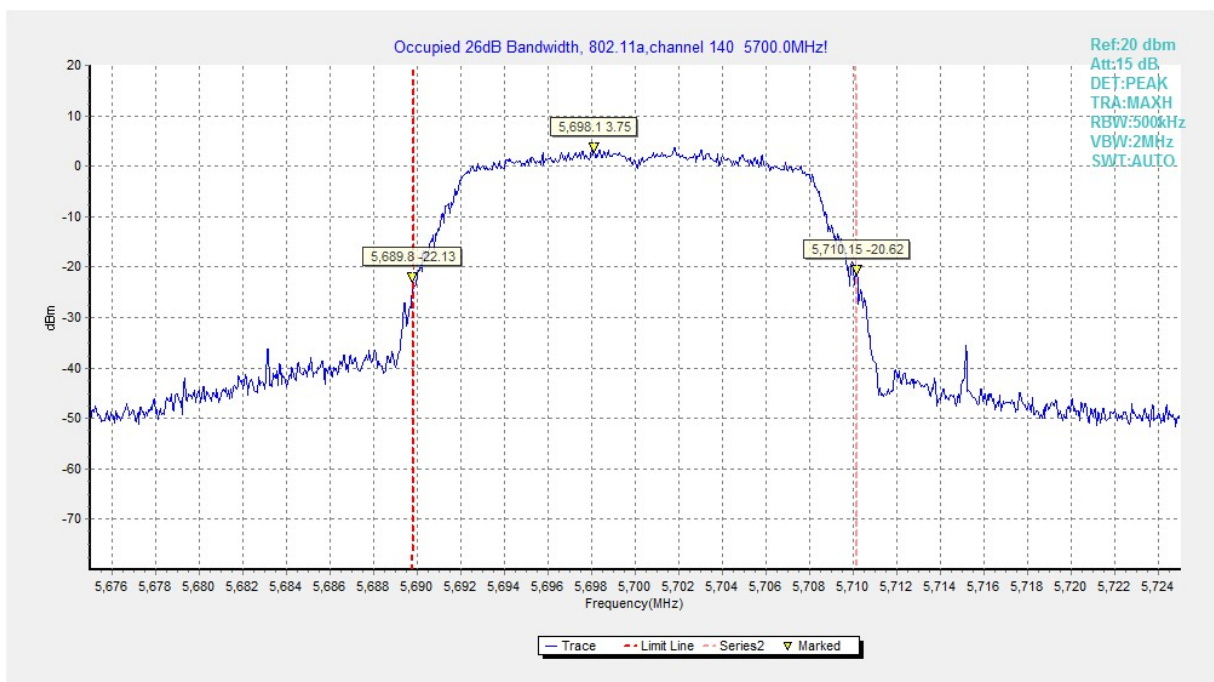


Fig.9 Occupied 26dB Bandwidth (802.11a, 5700MHz)

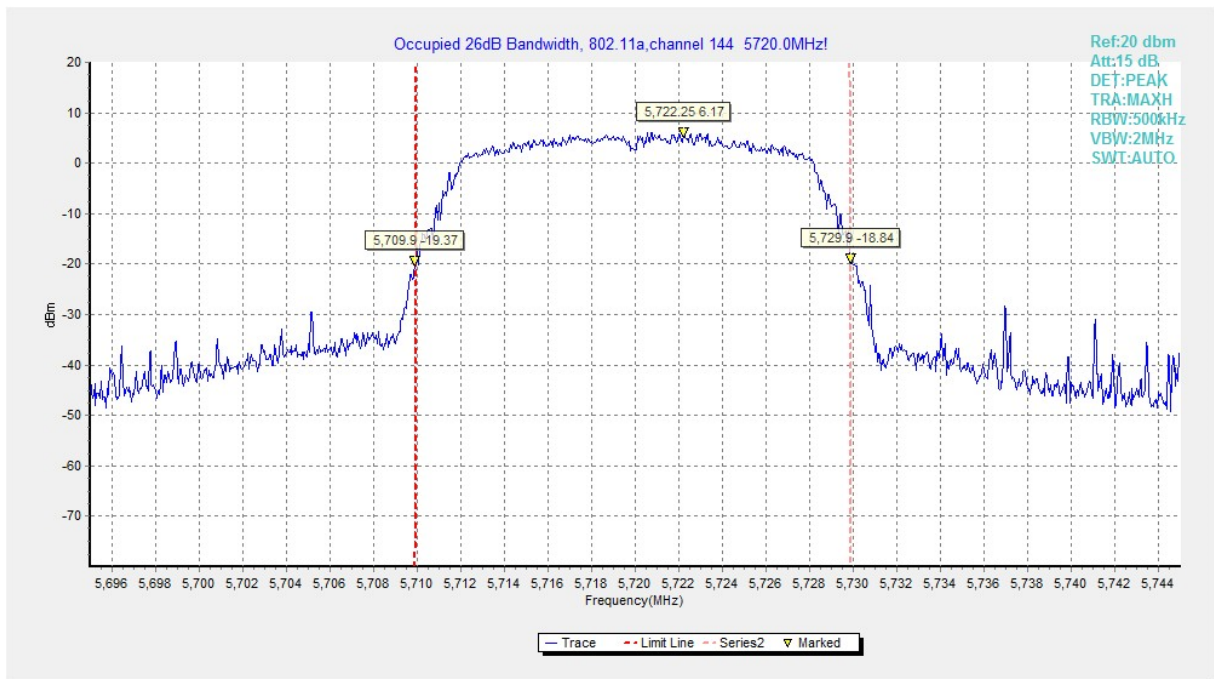


Fig.10 Occupied 26dB Bandwidth (802.11a, 5720MHz)

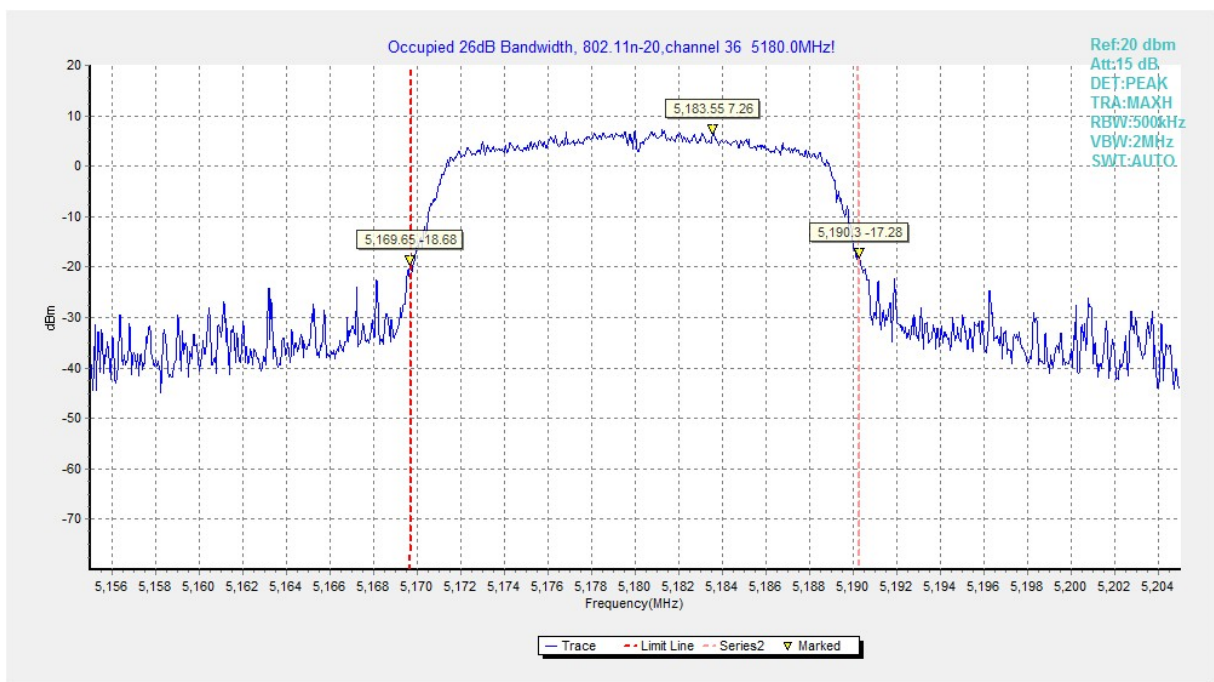


Fig.11 Occupied 26dB Bandwidth (802.11n-HT20, 5180MHz)

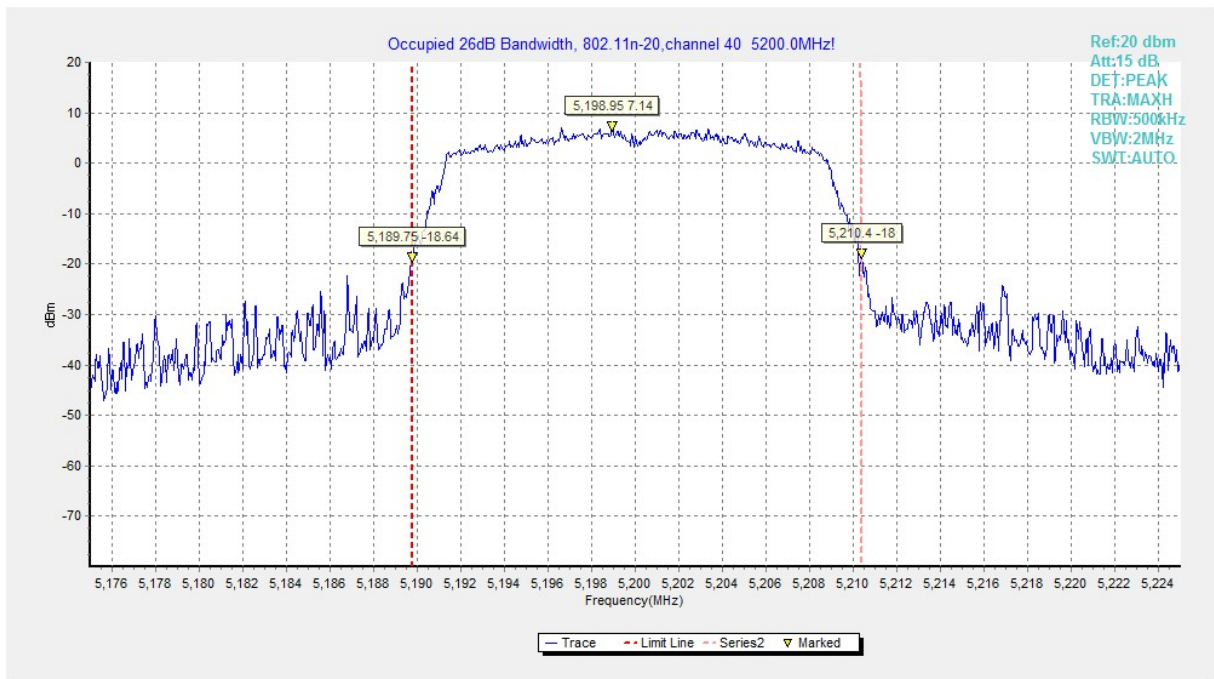


Fig.12 Occupied 26dB Bandwidth (802.11n-HT20, 5200MHz)

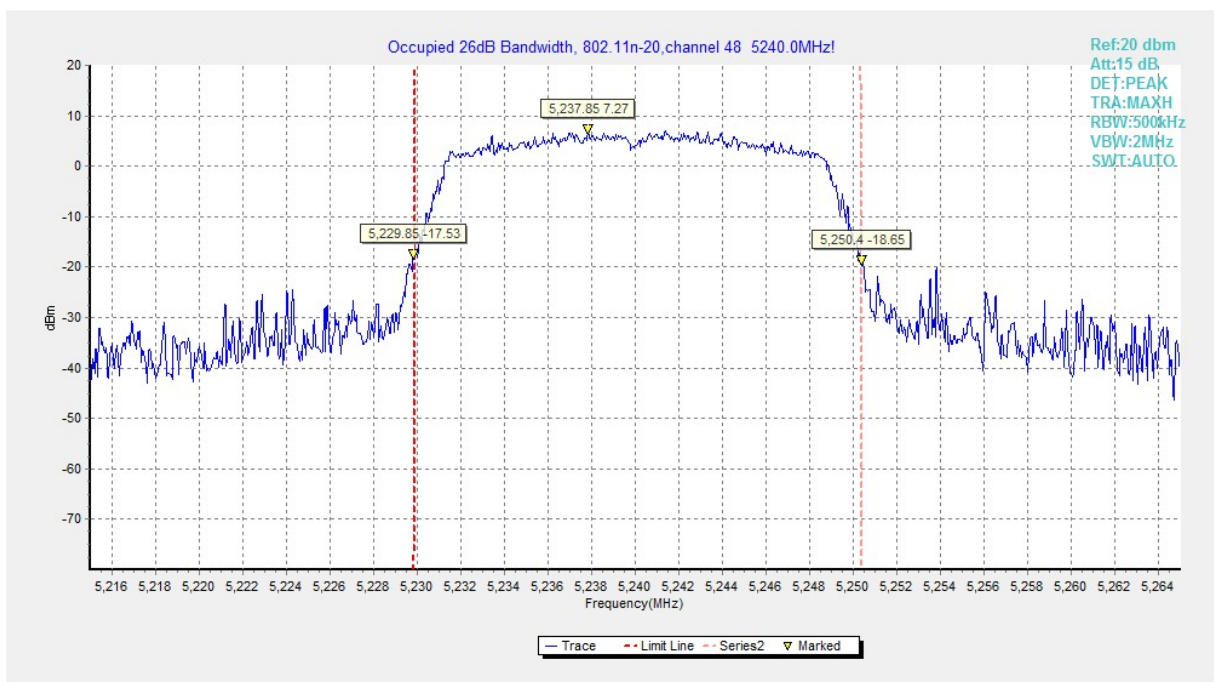


Fig.13 Occupied 26dB Bandwidth (802.11n-HT20, 5240MHz)

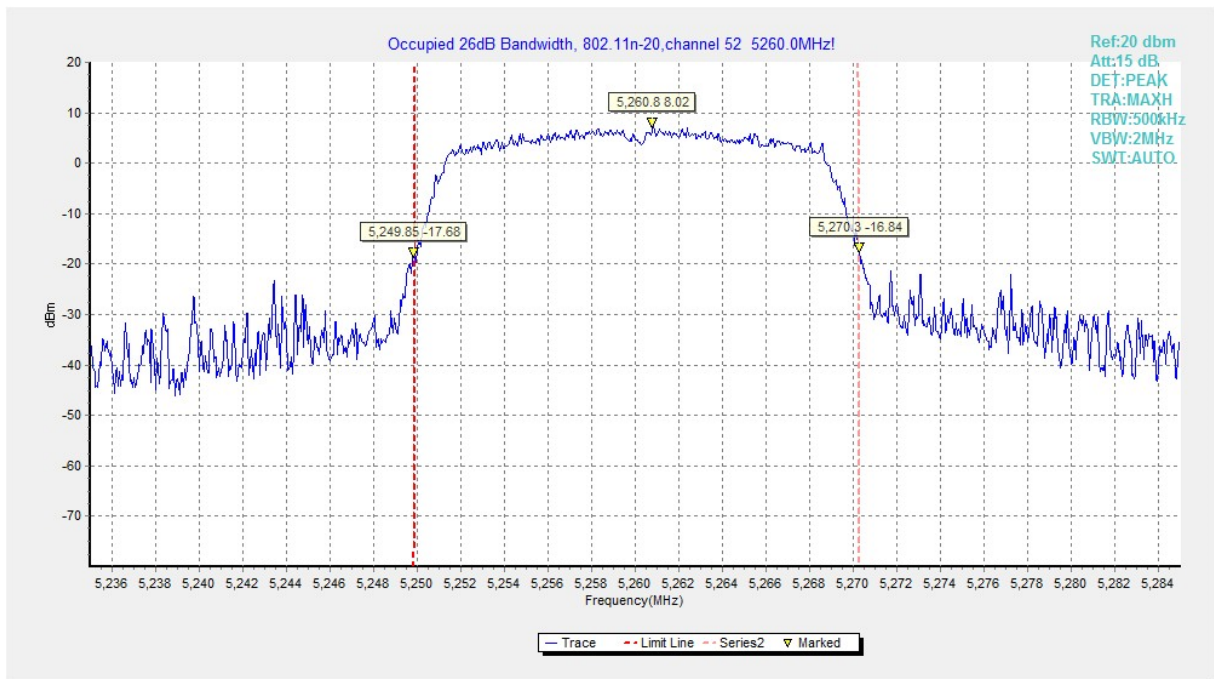


Fig.14 Occupied 26dB Bandwidth (802.11n-HT20, 5260MHz)

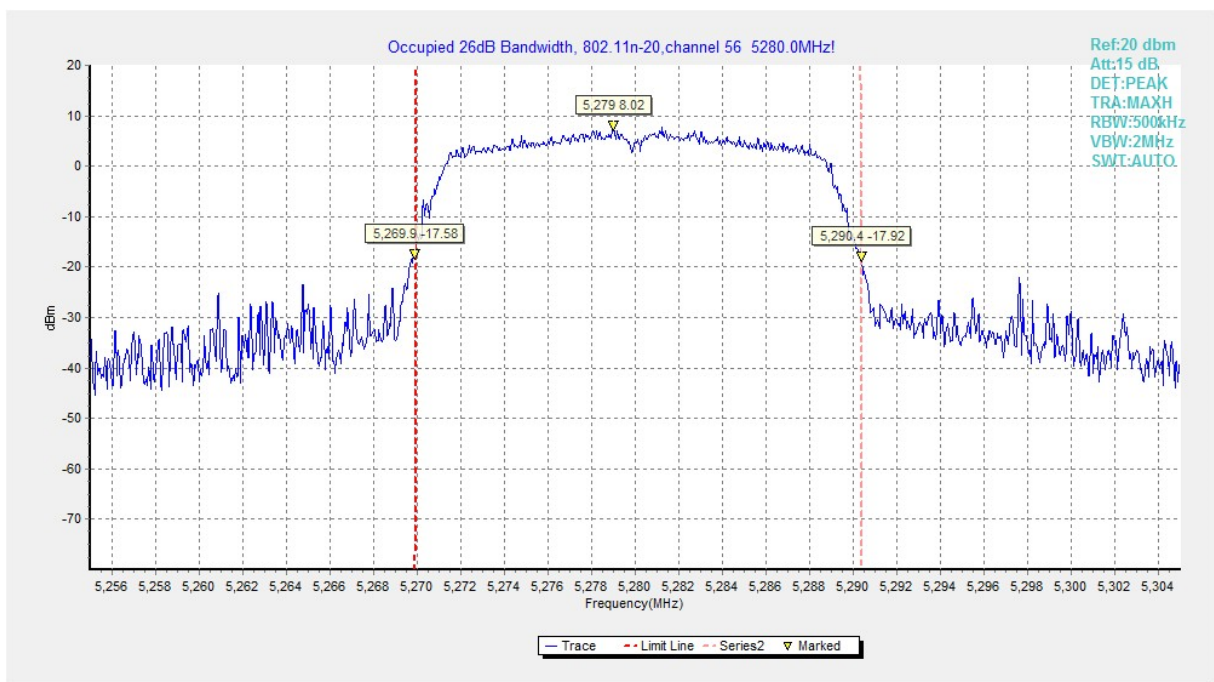


Fig.15 Occupied 26dB Bandwidth (802.11n-HT20, 5280MHz)

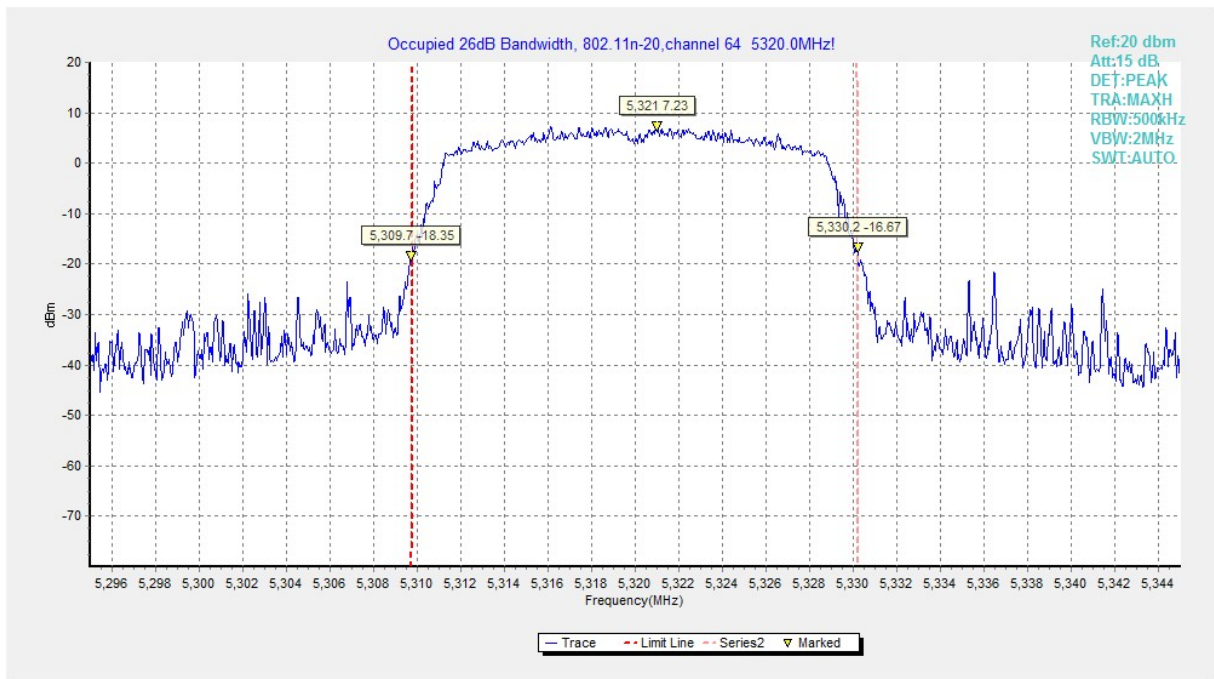


Fig.16 Occupied 26dB Bandwidth (802.11n-HT20, 5320MHz)

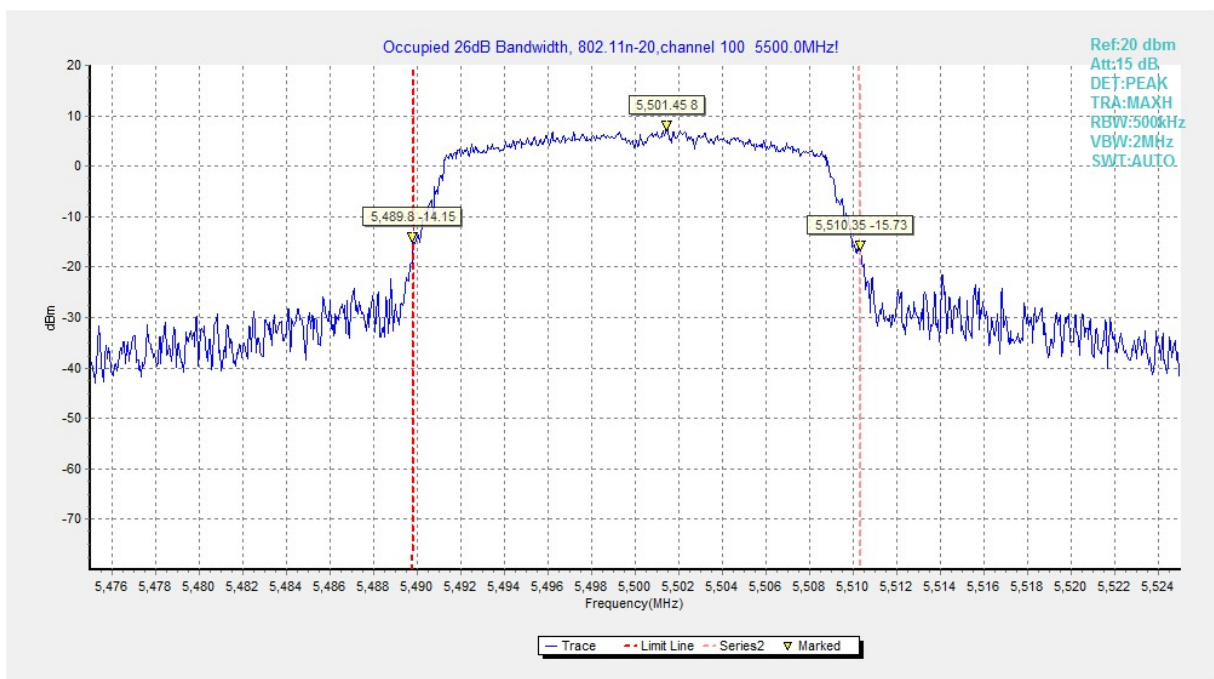


Fig.17 Occupied 26dB Bandwidth (802. 11n-HT20, 5500MHz)