FCC PART 15
TEST REPORT
No.I20Z70029-IOT02

for

Client name: Samsung Electronics. Co., Ltd.

Product name: Mobile phone

Model name: SM-A015T1

With

FCC ID: ZCASMA015T1

Hardware Version: REV3.0

Software Version: A015T1.001 (A015T1UVE1ATC1)

Issued Date: 2020-03-16

Note:

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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

Report Number	Revision	Description	Issue Date
I20Z70029-IOT02	Rev.0	1st edition	2020-03-16
I20Z70029-IOT02	Rev.1	2nd edition	2020-03-16

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1. TEST LATORATORY

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 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 (CN0066). 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: 2019-10-18

Testing End Date: 2020-01-13

1.5. Signature

Xie Xiuzhen

(Prepared this test report)

Zheng Wei

(Reviewed this test report)

Hu Xiaoyu

(Approved this test report)

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2. CLIENT INFORMATION

2.1 Applicant Information

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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
Contact:	JP KIM
Email:	jp426.kim@samsung.com
Telephone:	+82-10-4376-0326
Fax:	/

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3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARYEQUIPMENT(AE)

3.1. About EUT

Description	Mobile phone
Model name	SM-A015T1
FCC ID	ZCASMA015T1
WLAN Frequency Range	ISM Bands: -5150MHz~5250MHz -5250MHz~5350MHz -5470MHz~5725MHz
Type of modulation	OFDM
Antenna	Integral Antenna
Voltage	3.85V

Note: Photographs of EUT are shown in ANNEX C of this test report. Components list, please refer to documents of the manufacturer.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	/	REV3.0	A015T1.001(A015T1UVE1ATC1)
EUT2	/	REV3.0	A015T1.001(A015T1UVE1ATC1)
EUT3	/	REV3.0	A015T1.001(A015T1UVE1ATC1)

*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	Type	SN
AE1	Battery	/	Inbuilt
AE3	Charger	/	/
AE6	USB Cable	/	/

AE1

Model	QL1695
Manufacturer	Ningde Amperex Technology Limited
Capacitance	/
Nominal voltage	3.85 V

AE3

Model	EP-TA50JWE
Manufacturer	DongYang E&P Inc.
Length of cable	/

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AE6

Model	ECB-DU68WE
Manufacturer	SHENGHUA
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 Mobile 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

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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
KDB 558074 D01	Federal Communications Commission Office of Engineering and Technology Laboratory Division GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES	2019

5. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

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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	/	**BR**
Peak Power Spectral Density	15.407	/	**BR**
Occupied 26dB Bandwidth	15.403	/	**BR**
Band edge compliance (Radiated)	15.209	/	**BR**
Transmitter spurious emissions (Radiated)	15.407	/	**BR**
AC Powerline Conducted Emission (150kHz- 30MHz)	15.407	/	**BR**
Frequency Stability	15.407	/	**BR**
99% Occupied bandwidth	/	/	**BR**
Transmit Power Control	15.407	/	**BR**

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
BR	Re-use test data from basic model report.
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. Explanation of re-use of test data

The Equipment Under Test (EUT) model SM-A015T1 (FCC ID: ZCASMA015T1) is a variant product of SM-A015V (FCC ID: ZCASMA015V), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements were performed on this device, all the test results are derived from test report No.I19Z70303-IOT06.

For detail differences between two models please refer the Declaration of Changes document.

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%

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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	2020-05-15
2	LISN	ENV216	101200	Rohde & Schwarz	1 year	2020-03-14
3	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2020-02-14
4	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100235	Rohde & Schwarz	1 year	2020-03-01
2	BiLog Antenna	VULB9163	1222	Schwarzbeck	1 year	2020-03-14
3	Dual-Ridge Waveguide Horn Antenna	3115	6914	ETS-Lindgren	1 year	2021-01-03
4	EMI Antenna	3116	2661	ETS-Lindgren	1 Year	2020-10-14
5	Vector Signal Analyzer	FSV40	101047	Rohde & Schwarz	1 year	2020-05-16

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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)
30MHz ≤ f ≤ 2GHz	1.22
2GHz ≤ f ≤3.6GHz	1.22
3.6GHz ≤ f ≤8GHz	1.22
8GHz ≤ f ≤12.75GHz	1.51
12.75GHz ≤ f ≤26GHz	1.51
26GHz ≤ f ≤40GHz	1.59

Radiated (k=2)

Frequency Range	Uncertainty(dB)
9kHz-30MHz	/
30MHz ≤ f ≤ 1GHz	5.40
1GHz ≤ f ≤18GHz	4.32
18GHz ≤ f ≤40GHz	5.26

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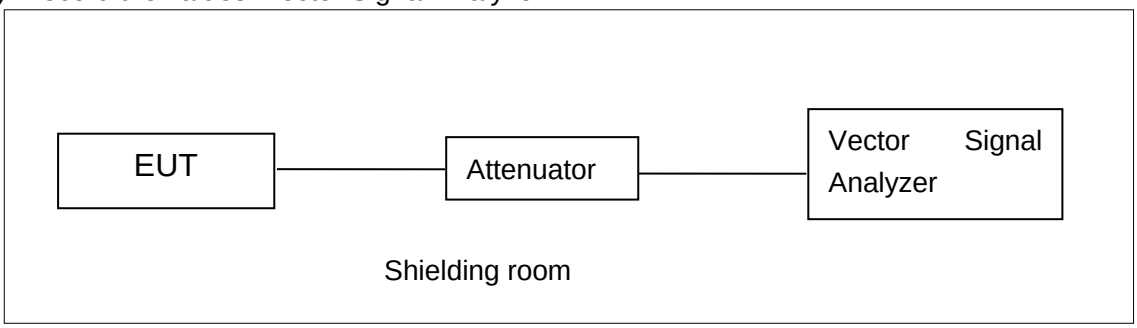
ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

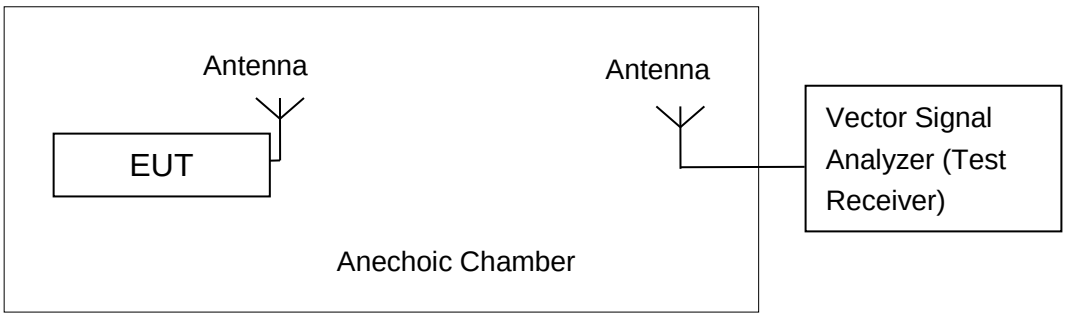
A.1.1. Conducted Measurements

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.

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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 measurementmethod SA-2 is made according to KDB 789033

Duty Cycle

802.11a	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
	99%	99%	99%	99%	99%	98%	97%	97%
802.11n(HT20)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
	99%	99%	99%	98%	98%	97%	97%	97%
802.11n(HT40)	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
	100%	96%	95%	93%	90%	86%	86%	85%

Measurement Results:

802.11a mode

Mode	Frequency	Test Result (dBm)							
		Data Rate (Mbps)							
		6	9	12	18	24	36	48	54
802.11a	5180MHz	17.57	17.55	16.14	15.76	15.72	15.30	14.83	14.84
	5200MHz	17.55	/	/	/	/	/	/	/
	5240MHz	17.62	/	/	/	/	/	/	/
	5260MHz	17.46	/	/	/	/	/	/	/
	5280MHz	17.43	/	/	/	/	/	/	/
	5320MHz	17.40	/	/	/	/	/	/	/
	5500MHz	17.68	/	/	/	/	/	/	/
	5580MHz	17.11	/	/	/	/	/	/	/
	5700MHz	17.28	/	/	/	/	/	/	/
	5720MHz	17.20	/	/	/	/	/	/	/

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

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802.11n-HT20 mode

Mode	Frequency	Test Result (dBm)							
		Data Rate							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n (HT20)	5180MHz	17.46	17.58	16.18	15.72	15.28	14.82	13.95	13.95
	5200MHz	/	17.63	/	/	/	/	/	/
	5240MHz	/	17.57	/	/	/	/	/	/
	5260MHz	/	17.56	/	/	/	/	/	/
	5280MHz	/	17.43	/	/	/	/	/	/
	5320MHz	/	17.40	/	/	/	/	/	/
	5500MHz	/	17.78	/	/	/	/	/	/
	5580MHz	/	17.23	/	/	/	/	/	/
	5700MHz	/	17.36	/	/	/	/	/	/
	5720MHz	/	17.28	/	/	/	/	/	/

The data rate MCS1 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	17.90	/	/	/	/	/	/	/
	5230MHz	17.96	17.61	17.21	16.21	15.39	15.04	14.61	14.15
	5270MHz	17.93	/	/	/	/	/	/	/
	5310MHz	17.69	/	/	/	/	/	/	/
	5510MHz	17.45	/	/	/	/	/	/	/
	5550MHz	17.55	/	/	/	/	/	/	/
	5670MHz	18.23	/	/	/	/	/	/	/
	5710MHz	18.11	/	/	/	/	/	/	/

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

The spot check is 17.48(802.11n-HT40 ch142 MCS0).

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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	7.57	P
	5200 MHz	7.73	P
	5240 MHz	7.49	P
	5260 MHz	7.81	P
	5280 MHz	7.63	P
	5320 MHz	7.42	P
	5500 MHz	7.61	P
	5580 MHz	7.58	P
	5700 MHz	7.11	P
	5720 MHz	7.45	P
802.11n HT20	5180 MHz	7.67	P
	5200 MHz	7.66	P
	5240 MHz	7.35	P
	5260 MHz	7.69	P
	5280 MHz	7.53	P
	5320 MHz	7.59	P
	5500 MHz	7.73	P
	5580 MHz	7.30	P
	5700 MHz	7.27	P
	5720 MHz	7.14	P
802.11n HT40	5190 MHz	5.24	P
	5230 MHz	5.58	P
	5270 MHz	5.11	P
	5310 MHz	4.59	P
	5510 MHz	4.74	P
	5550 MHz	4.42	P
	5670 MHz	5.06	P
	5710 MHz	4.65	P

Conclusion: PASS

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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	39.90	P
	5200 MHz	Fig.2	38.60	P
	5240 MHz	Fig.3	35.95	P
	5260 MHz	Fig.4	37.60	P
	5280 MHz	Fig.5	37.80	P
	5320 MHz	Fig.6	38.55	P
	5500 MHz	Fig.7	38.45	P
	5580 MHz	Fig.8	36.85	P
	5700 MHz	Fig.9	35.80	P
	5720 MHz	Fig.10	37.65	P
802.11n HT20	5180 MHz	Fig.11	36.85	P
	5200 MHz	Fig.12	32.95	P
	5240 MHz	Fig.13	35.40	P
	5260 MHz	Fig.14	34.55	P
	5280 MHz	Fig.15	35.65	P
	5320 MHz	Fig.16	38.05	P
	5500 MHz	Fig.17	35.80	P
	5580 MHz	Fig.18	33.95	P
	5700 MHz	Fig.19	33.50	P
	5720 MHz	Fig.20	33.00	P
802.11n HT40	5190 MHz	Fig.21	73.12	P
	5230 MHz	Fig.22	71.04	P
	5270 MHz	Fig.23	64.80	P
	5310 MHz	Fig.24	64.08	P
	5510 MHz	Fig.25	63.44	P
	5550 MHz	Fig.26	65.76	P
	5670 MHz	Fig.27	69.52	P
	5710 MHz	Fig.28	61.44	P

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Conclusion: PASS

Test graphs as below:

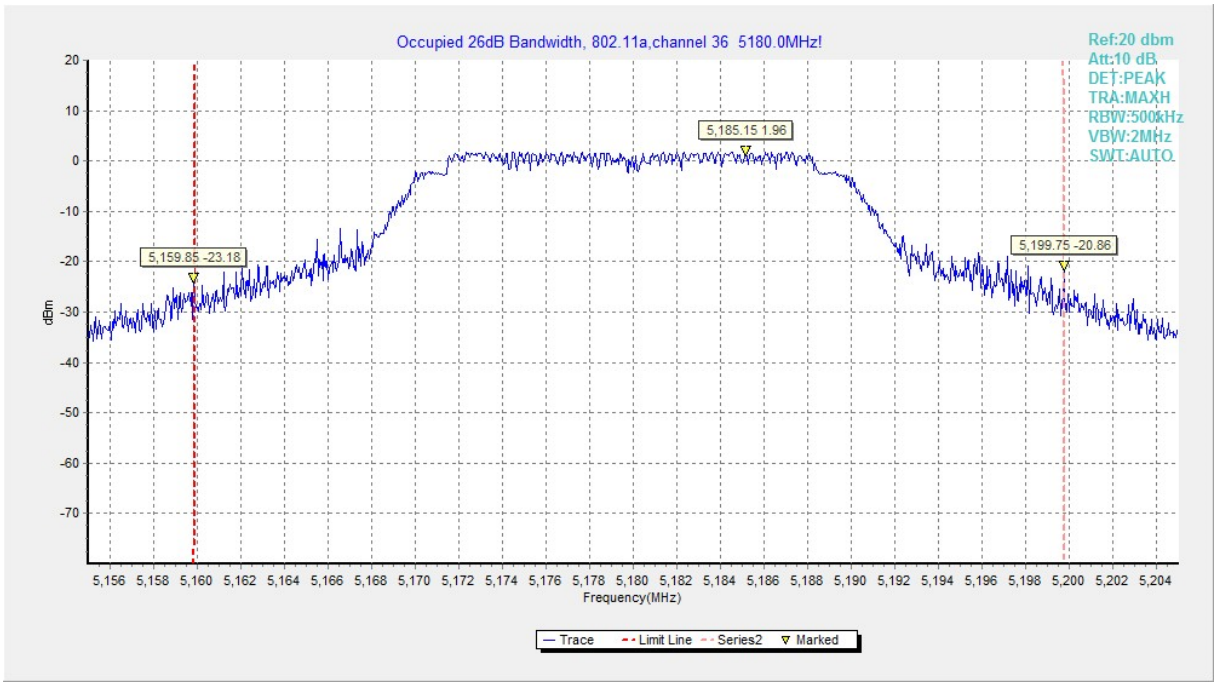

Fig.1 Occupied 26dB Bandwidth (802.11a, 5180MHz)

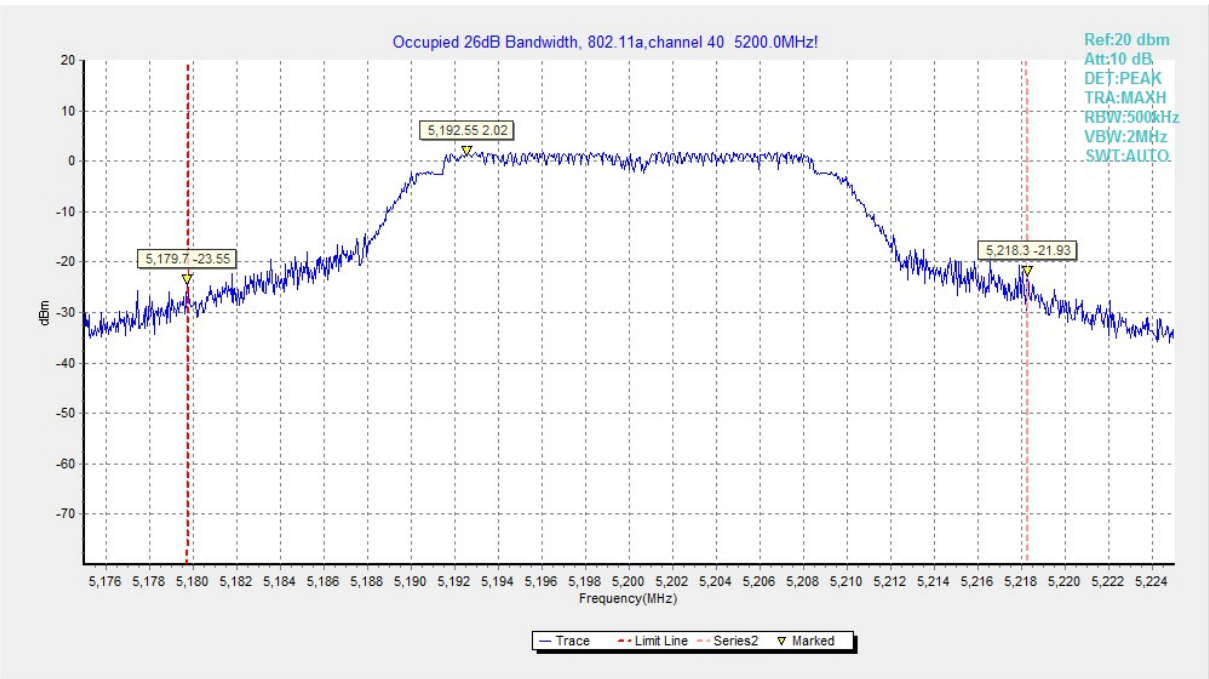

Fig.2 Occupied 26dB Bandwidth (802.11a, 5200MHz)

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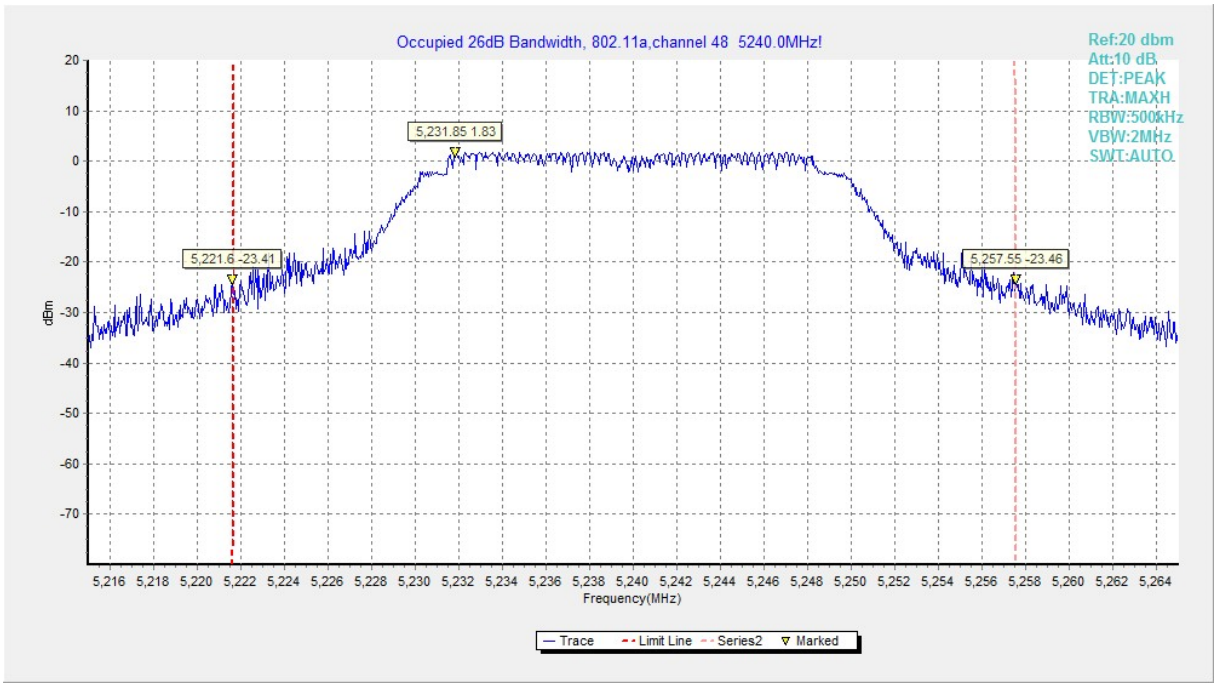

Fig.3 Occupied 26dB Bandwidth (802.11a, 5240MHz)

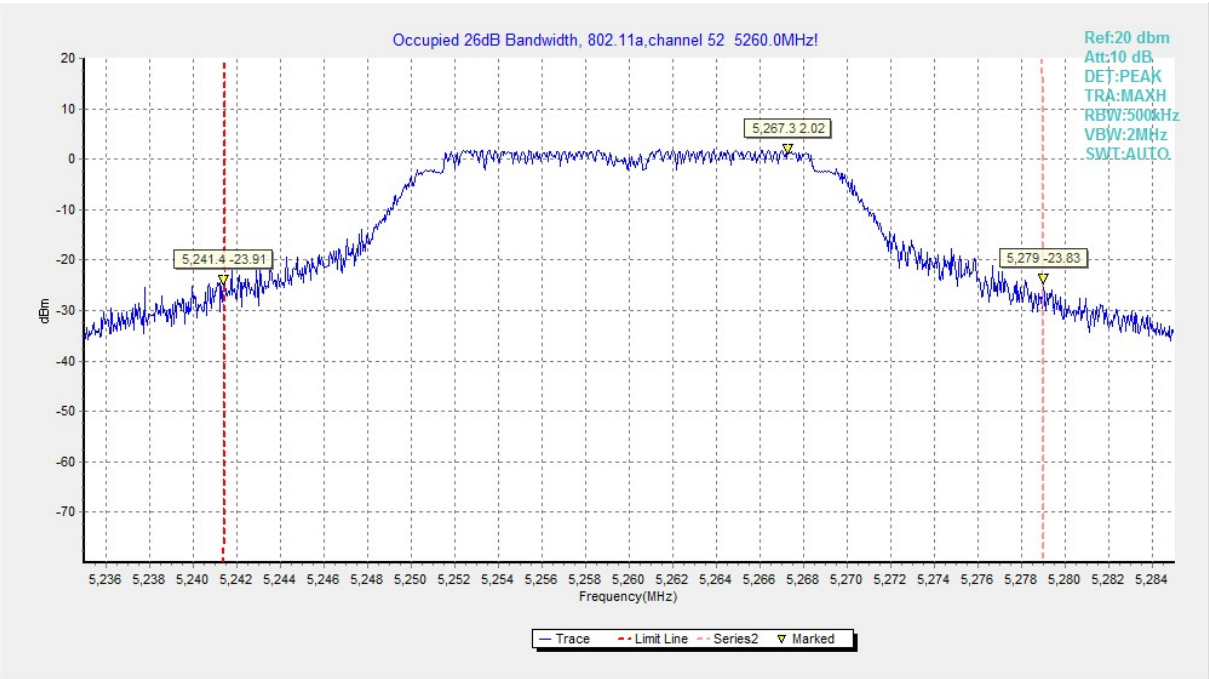

Fig.4 Occupied 26dB Bandwidth (802.11a, 5260MHz)

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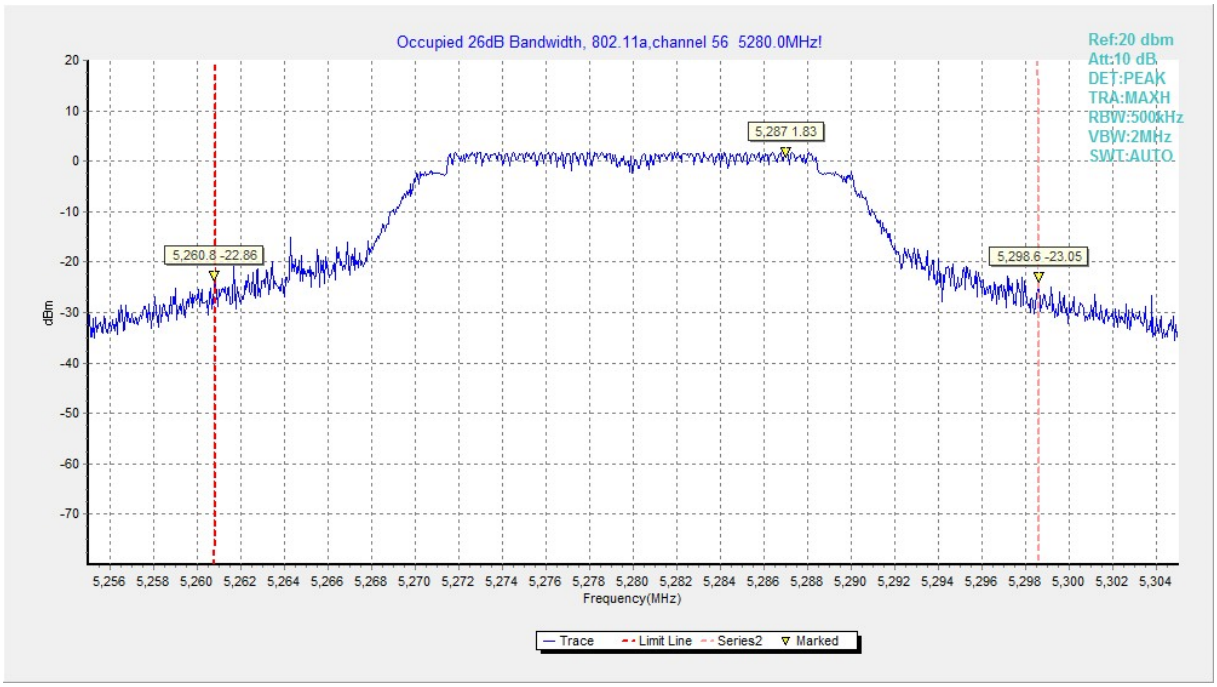

Fig.5 Occupied 26dB Bandwidth (802.11a, 5280MHz)

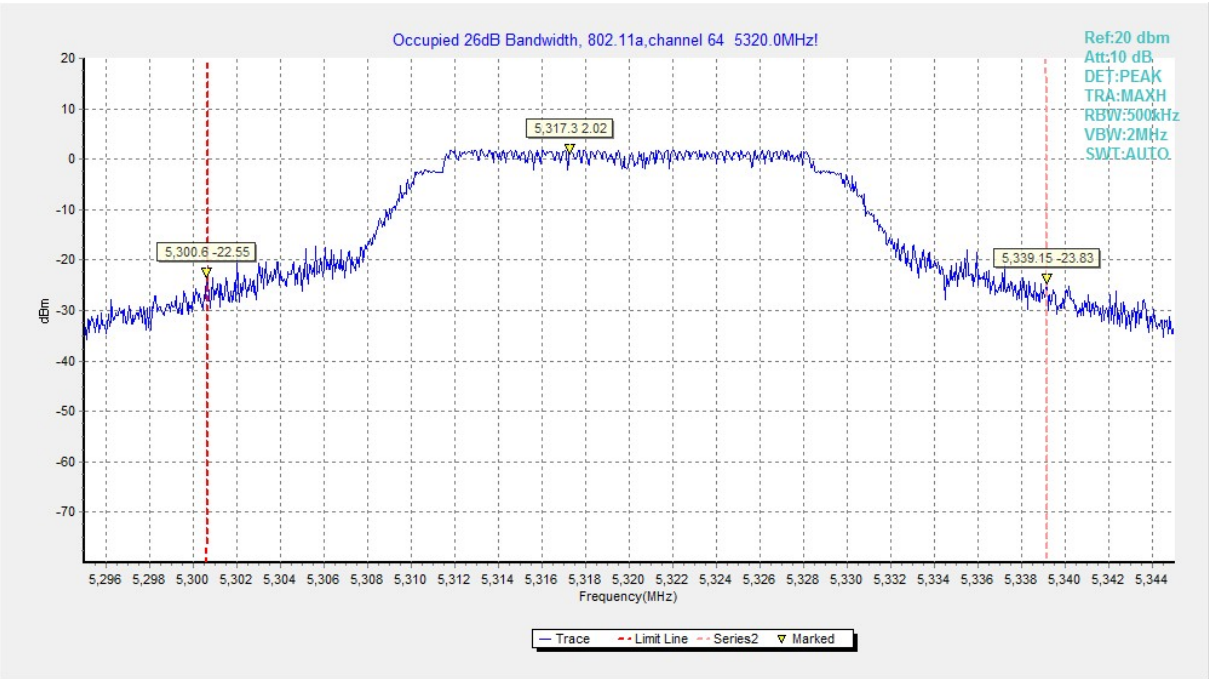

Fig.6 Occupied 26dB Bandwidth (802.11a, 5320MHz)

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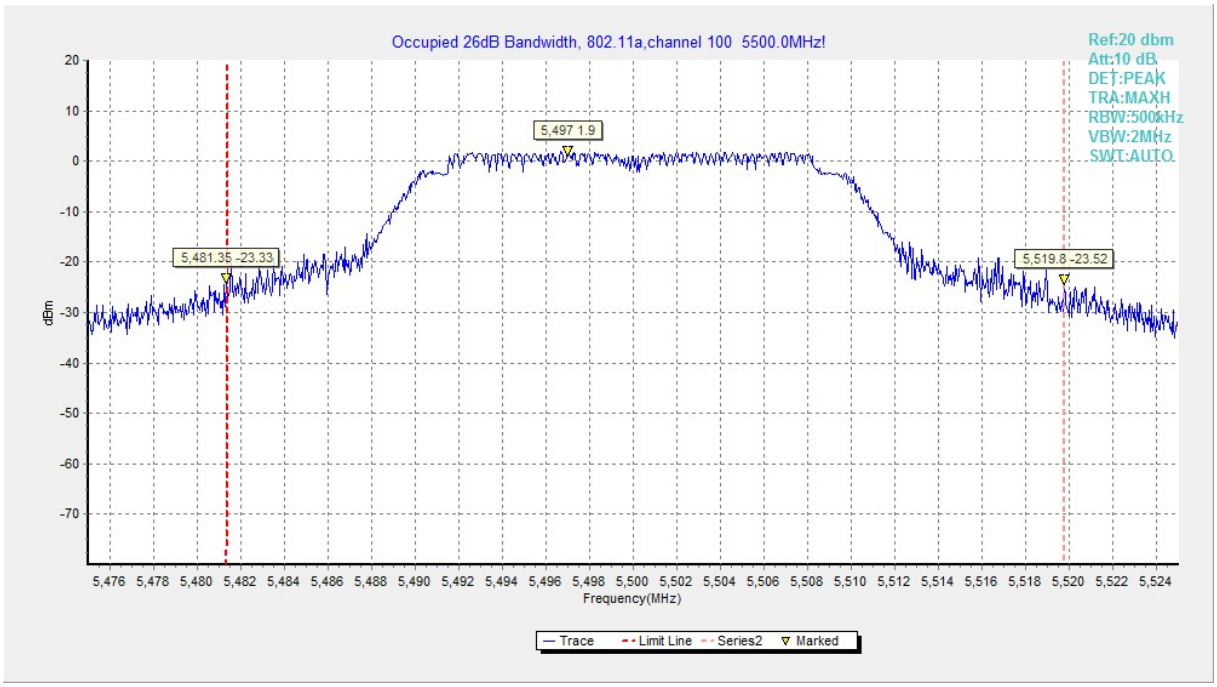

Fig.7 Occupied 26dB Bandwidth (802.11a, 5500MHz)

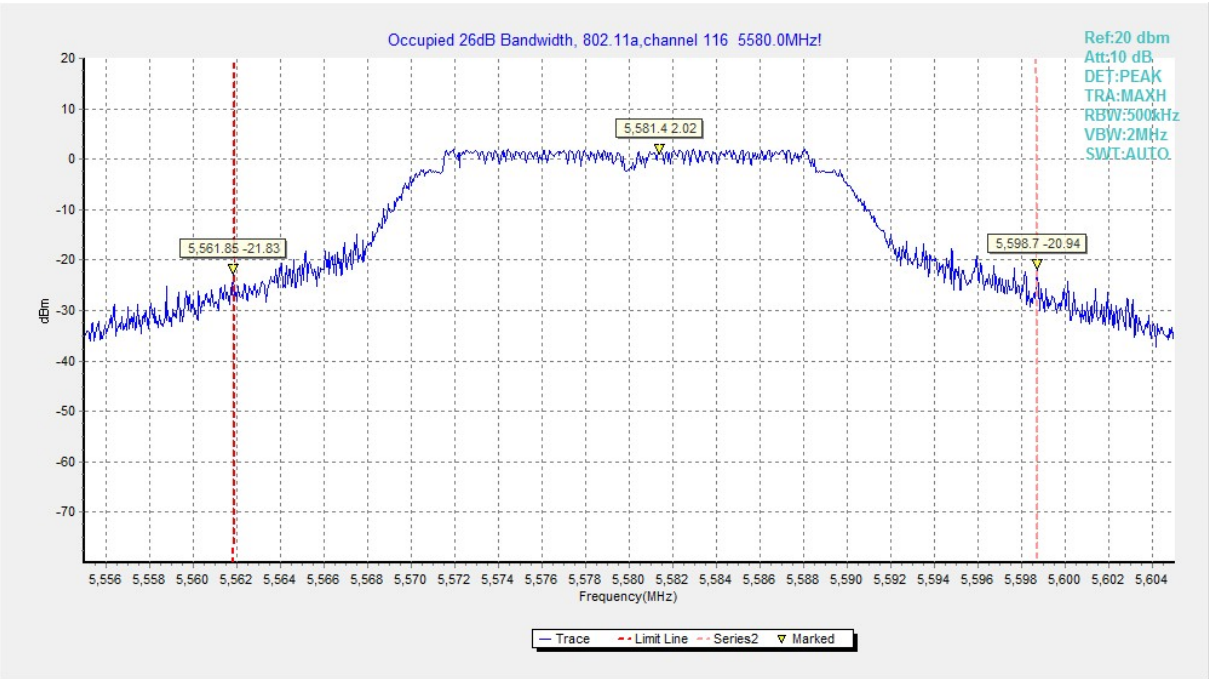

Fig.8 Occupied 26dB Bandwidth (802.11a, 5580MHz)

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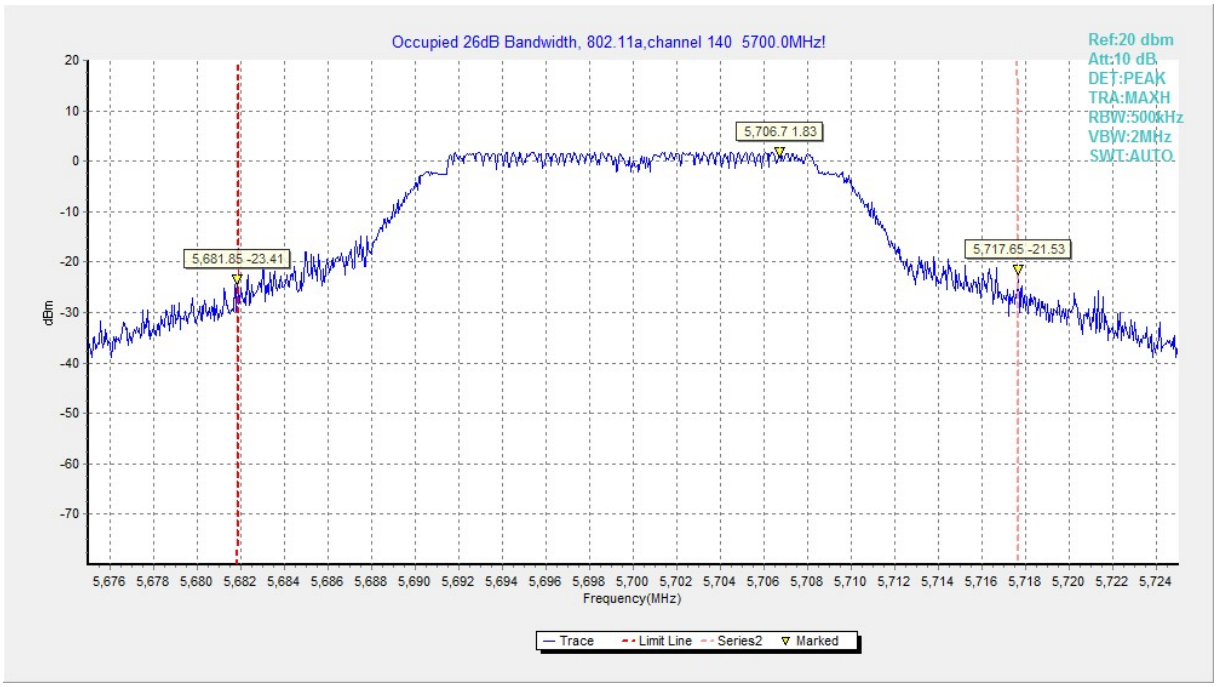

Fig.9 Occupied 26dB Bandwidth (802.11a, 5700MHz)

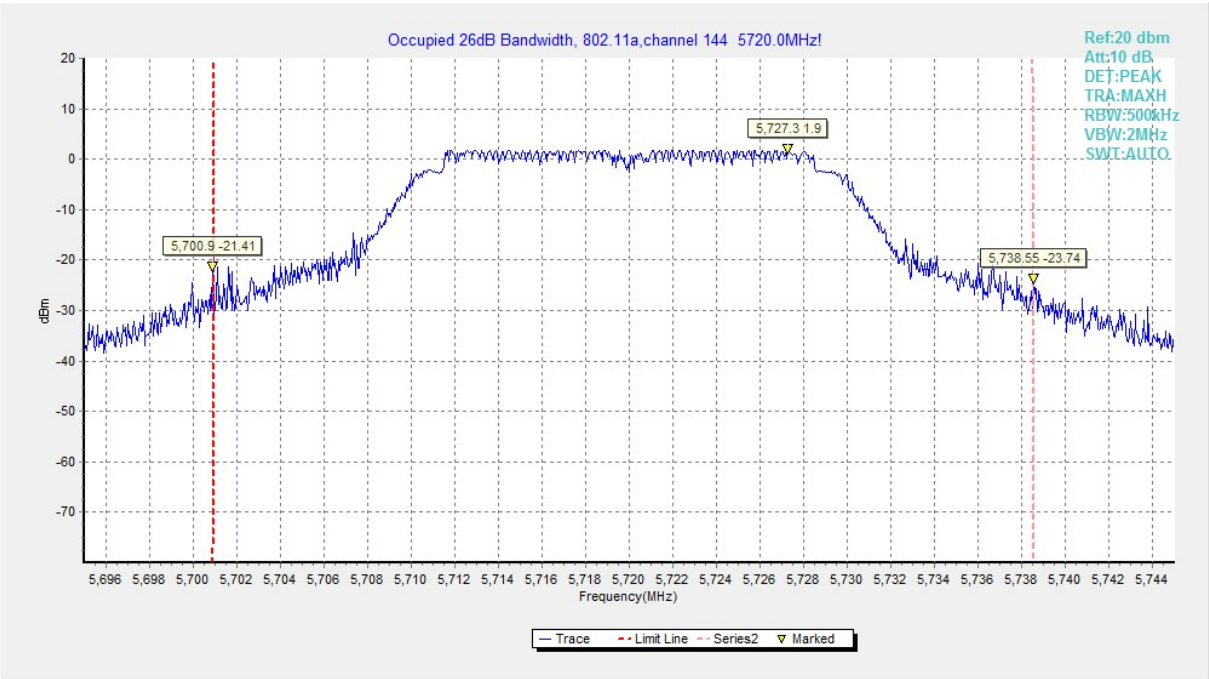

Fig.10 Occupied 26dB Bandwidth (802.11a, 5720MHz)

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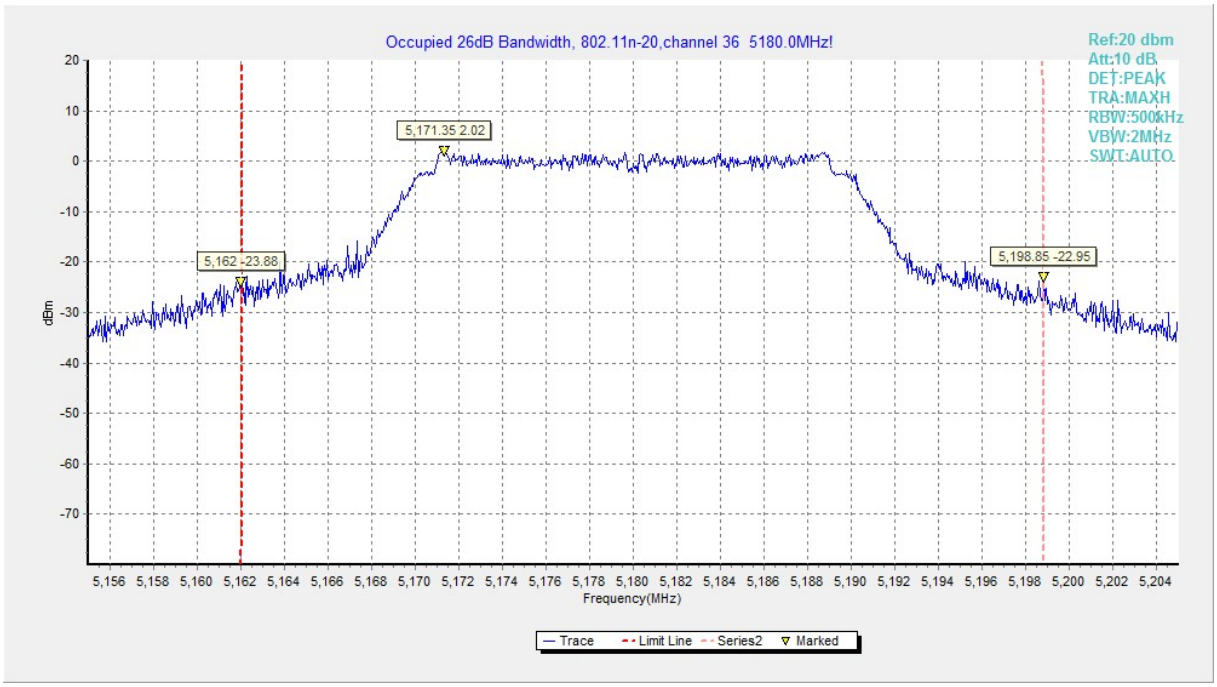

Fig.11 Occupied 26dB Bandwidth (802.11n-HT20, 5180MHz)

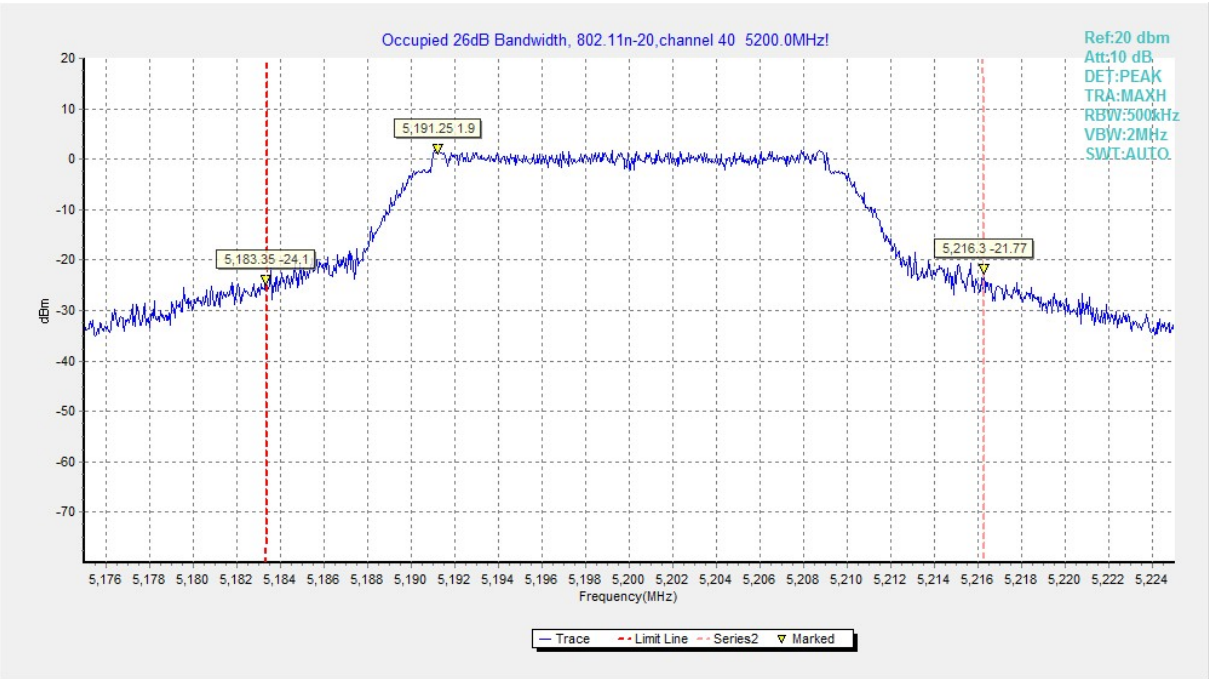

Fig.12 Occupied 26dB Bandwidth (802.11n-HT20, 5200MHz)

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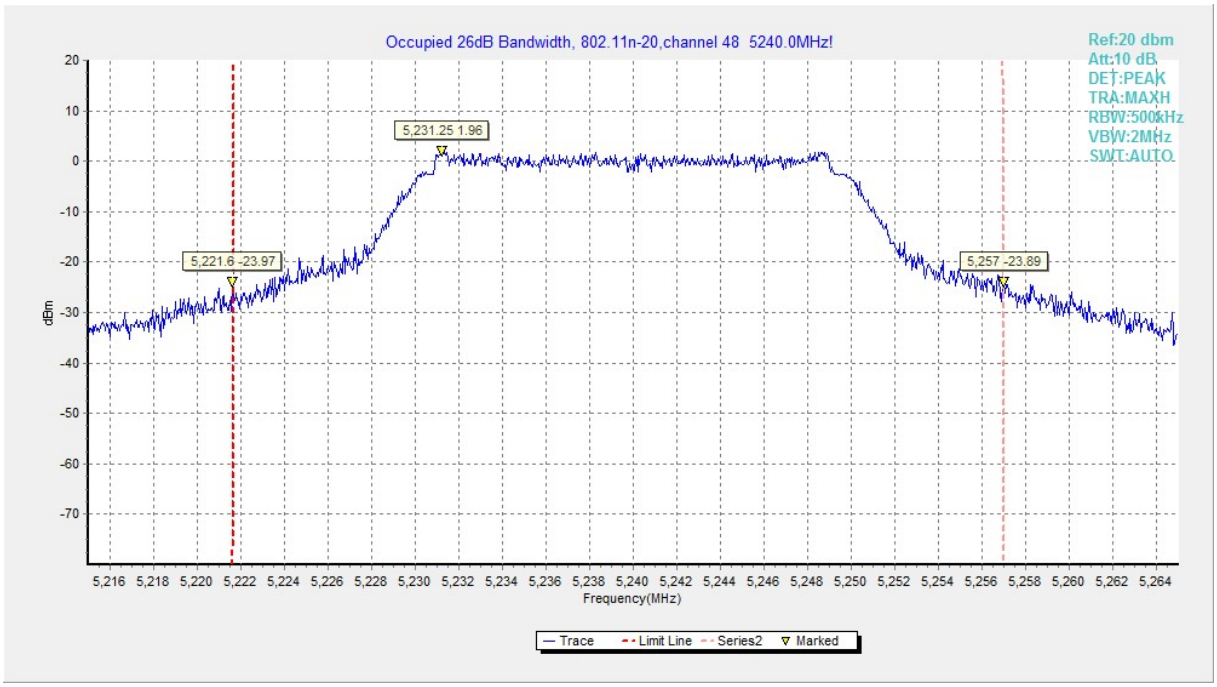

Fig.13 Occupied 26dB Bandwidth (802.11n-HT20, 5240MHz)

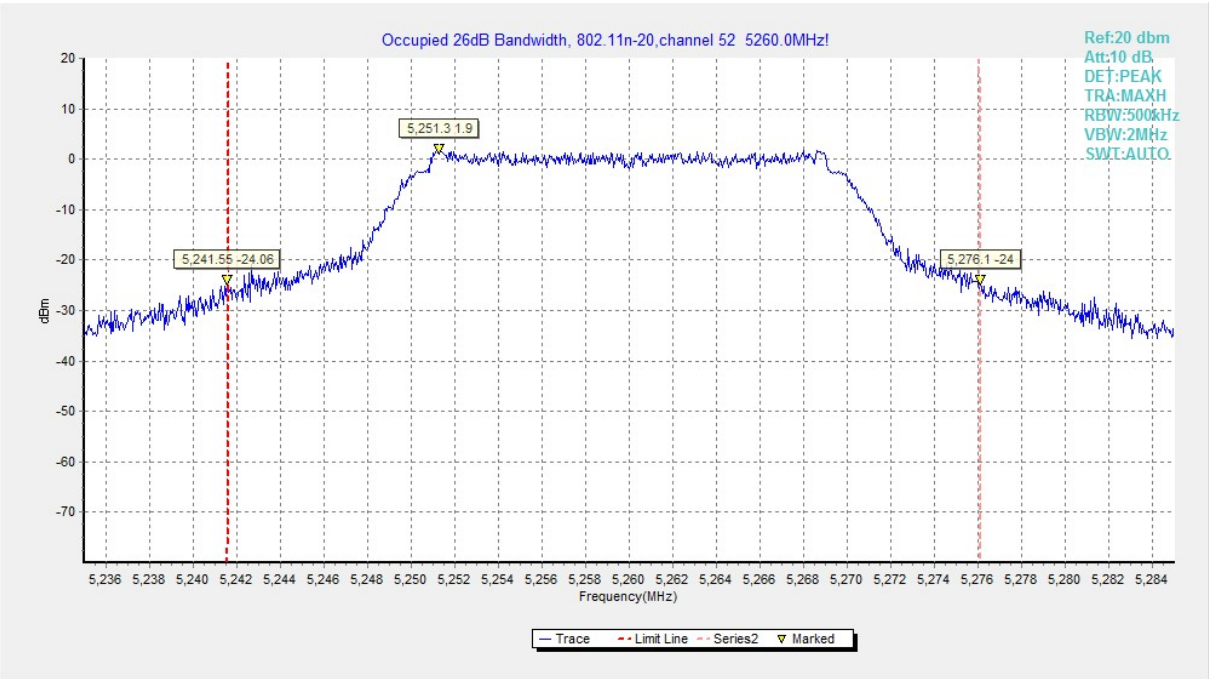

Fig.14 Occupied 26dB Bandwidth (802.11n-HT20, 5260MHz)

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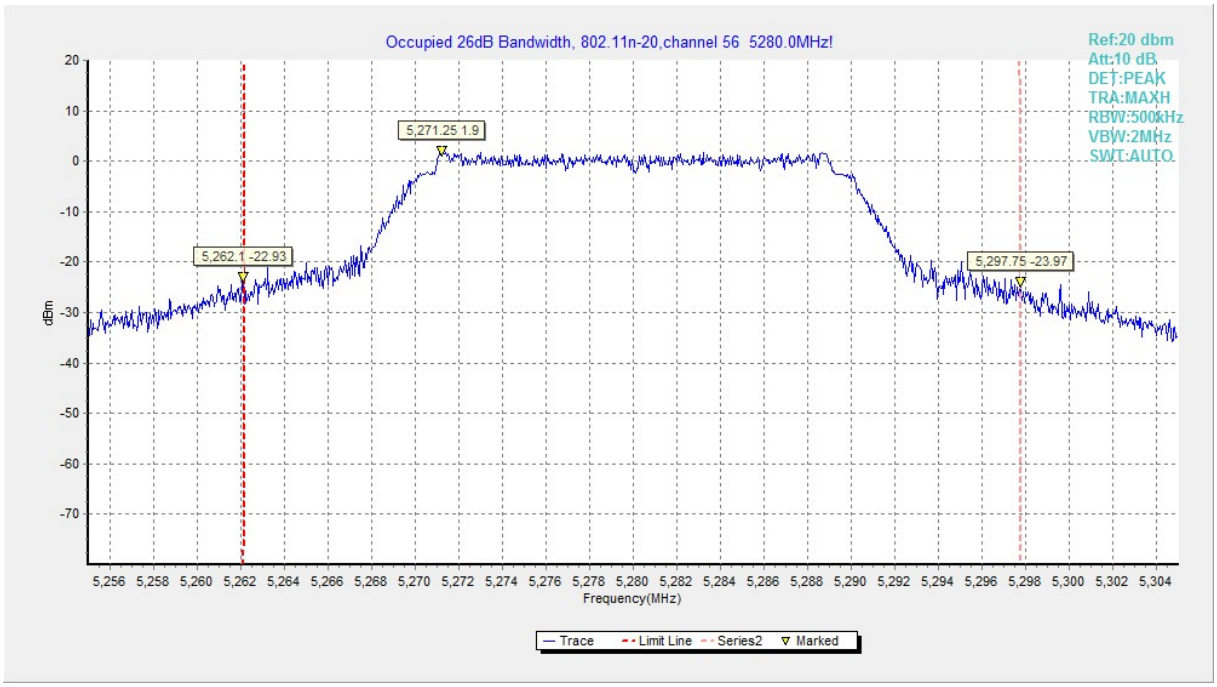

Fig.15 Occupied 26dB Bandwidth (802.11n-HT20, 5280MHz)

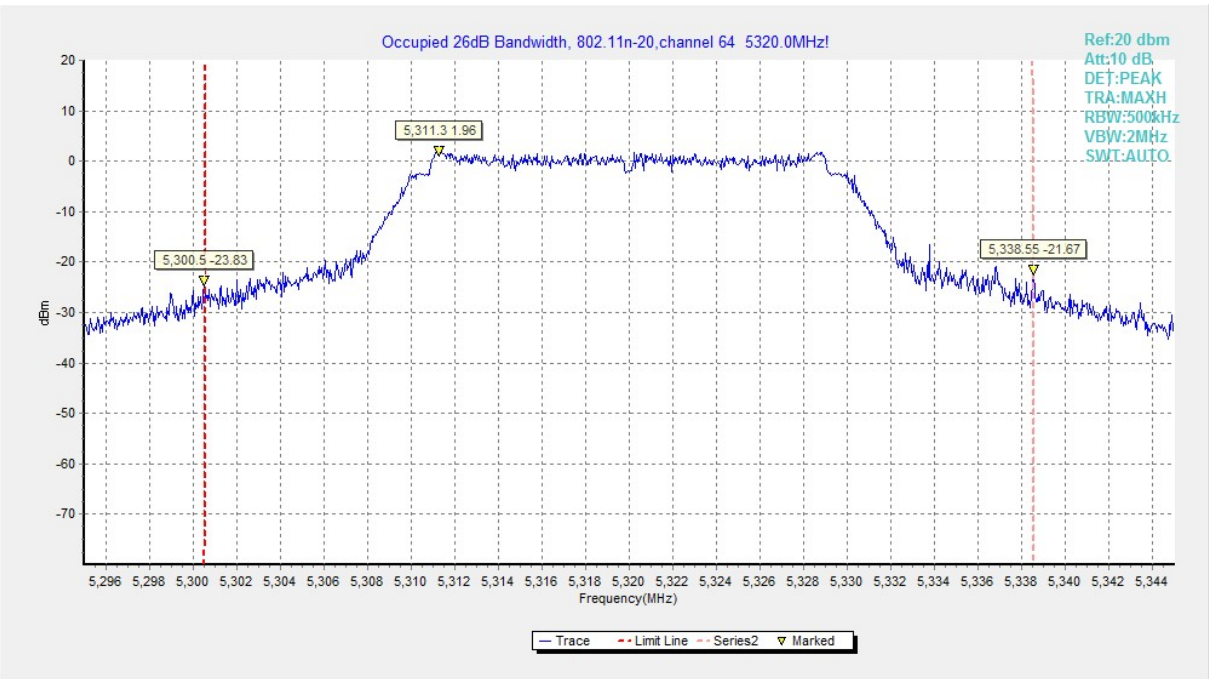

Fig.16 Occupied 26dB Bandwidth (802.11n-HT20, 5320MHz)

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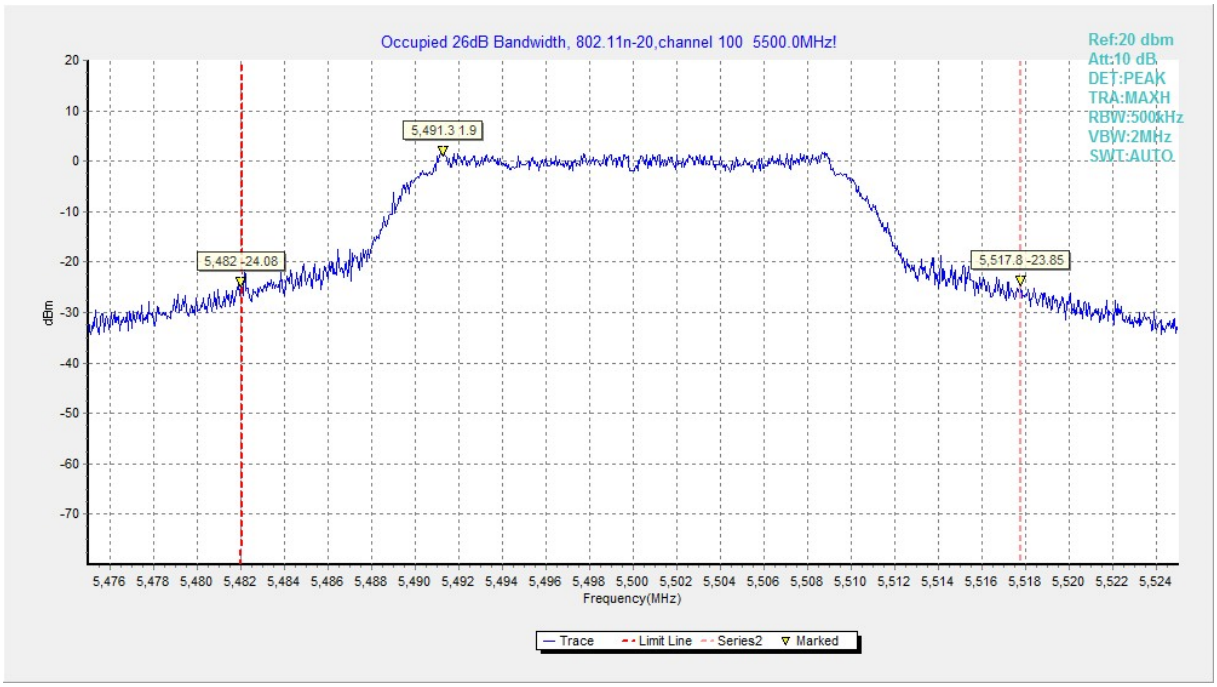

Fig.17 Occupied 26dB Bandwidth (802. 11n-HT20, 5500MHz)

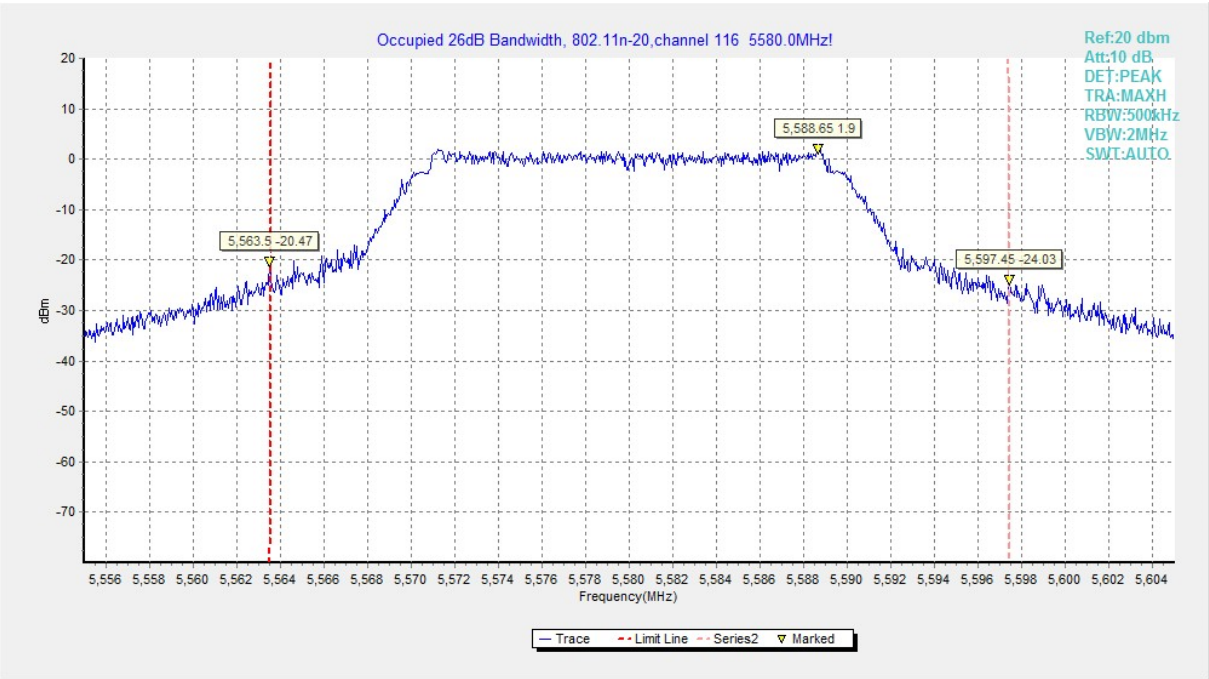

Fig.18 Occupied 26dB Bandwidth (802. 11n-HT20, 5580MHz)

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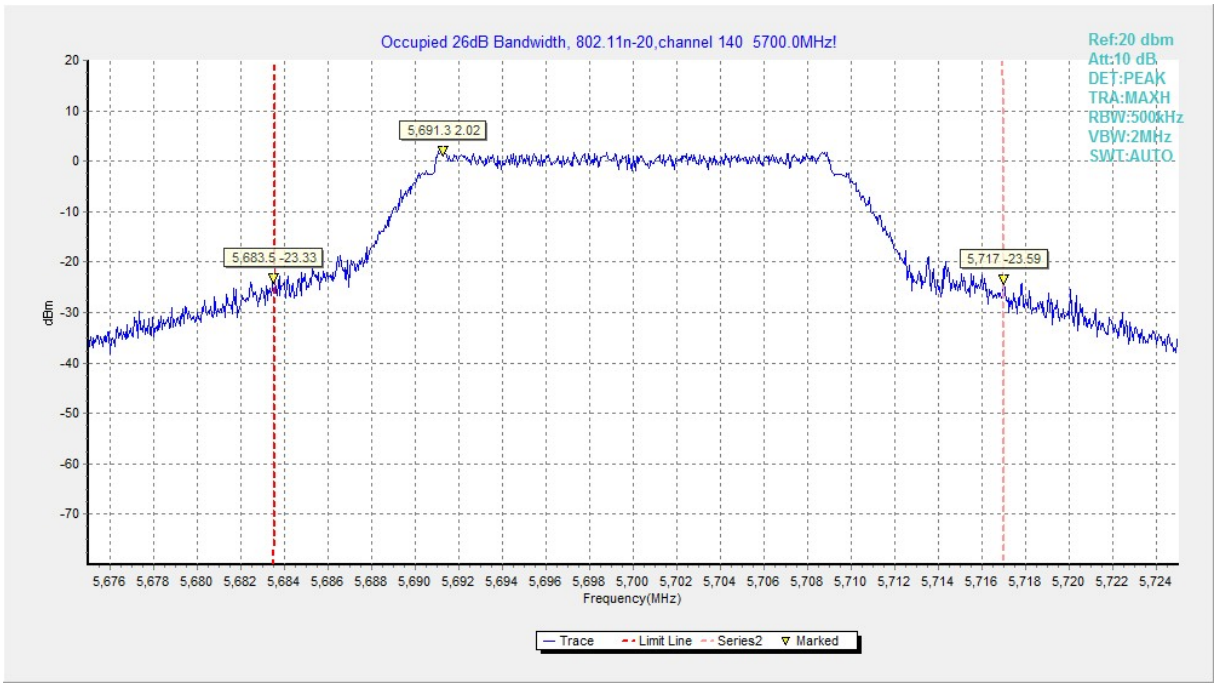

Fig.19 Occupied 26dB Bandwidth (802. 11n-HT20, 5700MHz)

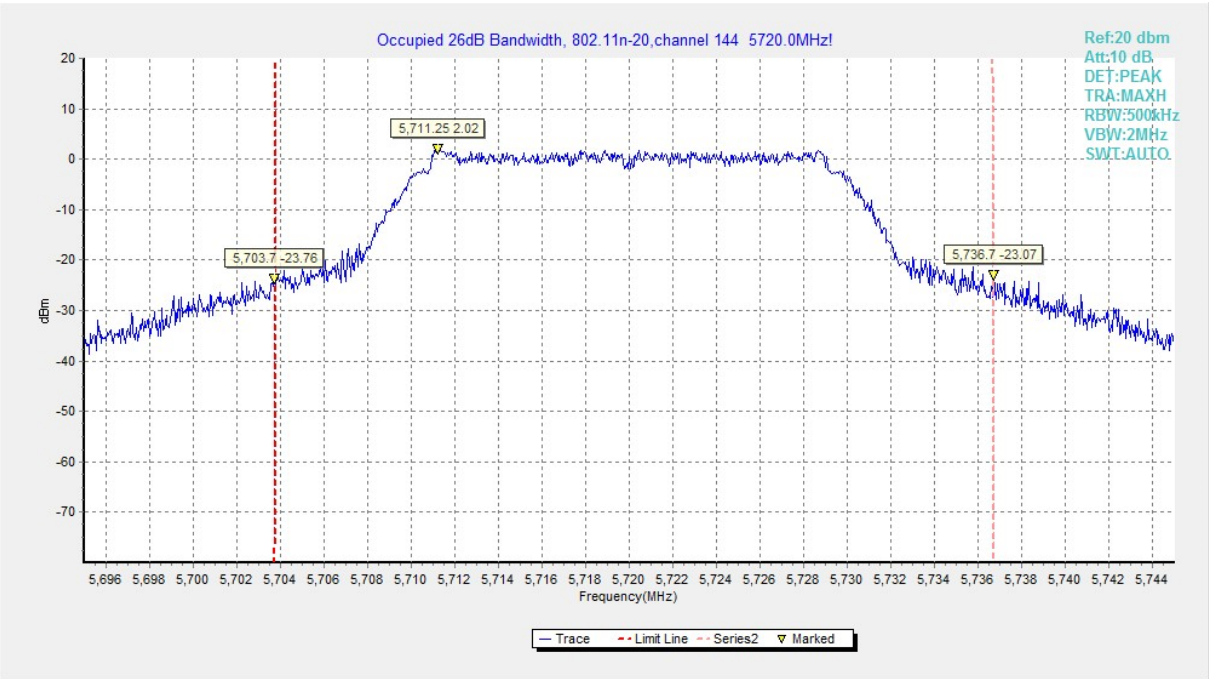

Fig.20 Occupied 26dB Bandwidth (802. 11n-HT20, 5720MHz)

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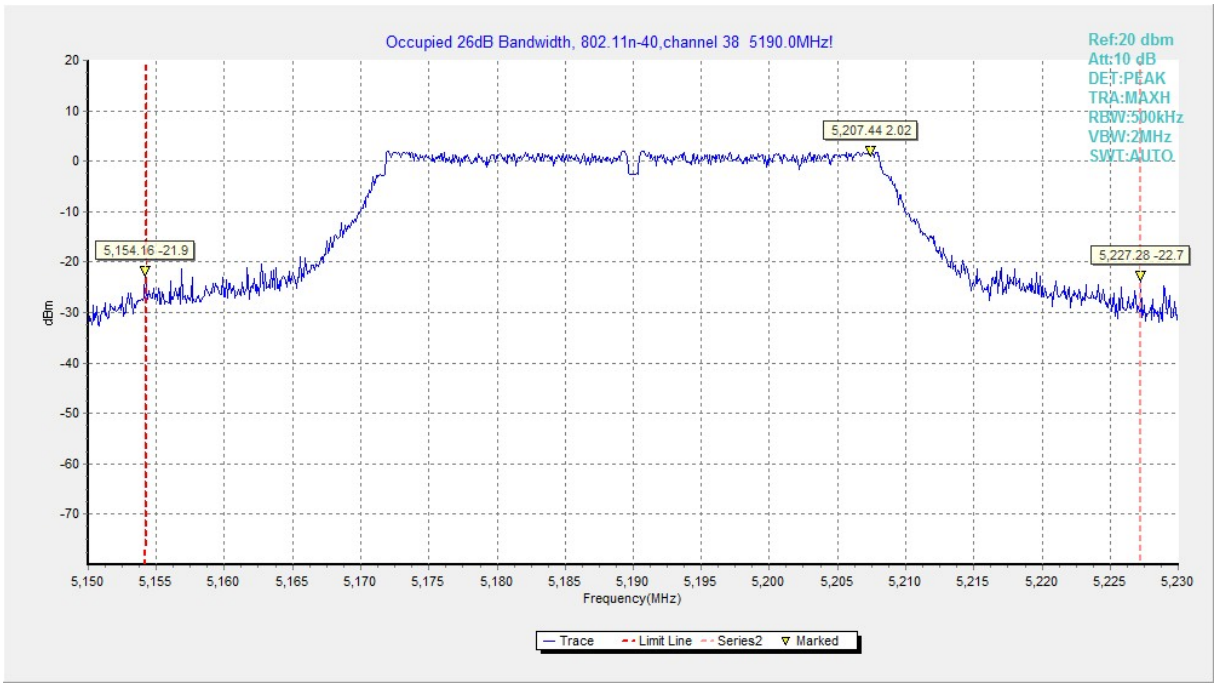

Fig.21 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)

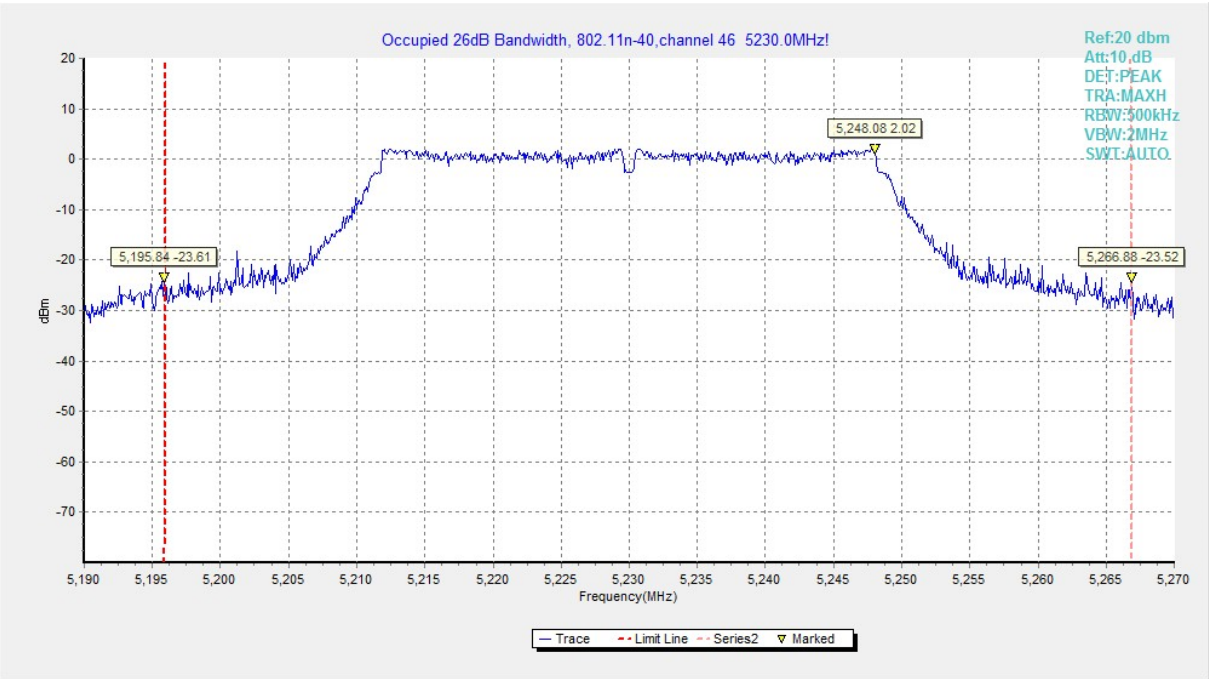

Fig.22 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)

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