

Shenzhen Academy of Information and Communications Technology

FCC PART 15C TEST REPORT No. B17N01624-RLAN

for

Roam Data Inc.

POS Tablet

Moby/M70

with

Hardware Version: 9888C

Software Version: M70

FCC ID: 2ABY6-M70

Issued Date: 2017-11-27

Designation Number: CN1210

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of SAICT.

Test Laboratory:

Shenzhen Academy of Information and Communications Technology
Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen,
Guangdong, P. R. China 518026.

Tel: +86(0)755-33322000, Fax: +86(0)755-33322001, Email:yewu@caict.ac.cn.www.csxit.com

REPORT HISTORY

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1. TEST LATORATORY

1.1. Testing Location

Location: Shenzhen Academy of Information and Communications Technology
Address: Building G, Shenzhen International Innovation Center, No.1006
Shennan Road, Futian District, Shenzhen, Guangdong Province ,China
Postal Code: 518026
Telephone: +86(0)755-33322000
Fax: +86(0)755-33322001

1.2. Testing Environment

Normal Temperature: 15-35°C
Relative Humidity: 20-75%

1.3. Project data

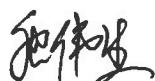
Testing Start Date: 2017-11-06
Testing End Date: 2017-11-24

1.4. Signature



An Ran

(Prepared this test report)



Tang Weisheng

(Reviewed this test report)



Zhang Bojun

(Approved this test report)

2. CLIENT INFORMATION

2.1. Applicant Information

Company Name: Roam Data Inc.
Address: 101 Federal Street, Suite 700, Boston, MA 02110 USA
Contact Person Christopher Rotsaert
Telephone: 857-350-7418
Fax: /
E-Mail christopher.rotsaert@ingenico.com

2.2. Manufacturer Information

Company Name: Roam Data Inc.
Address: 101 Federal Street, Suite 700, Boston, MA 02110 USA
Contact Person Christopher Rotsaert
Telephone: 857-350-7418
Fax: /
E-Mail christopher.rotsaert@ingenico.com

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	POS Tablet
Model Name	Moby/M70
Market Name	/
RLAN Frequency Range	ISM Bands: -5150MHz~5250MHz -5250MHz~5350MHz -5470MHz~5725MHz -5725MHz~5850MHz
RLAN Protocol	IEEE 802.11a,802.11n-HT20/40,802.11ac-VHT20/40/80
Type of modulation	OFDM
Antenna Type	Integrated
Antenna Gain	2.1dBi
Power Supply	3.7V DC by Battery
FCC ID	2ABY6-M70

Note: Components list, please refer to documents of the manufacturer

3.2. Internal Identification of EUT

EUT ID*	IMEI	HW Version	SW Version	Receive Date
EUT1	/	9888C	M70	2017-10-26

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

3.3. Internal Identification of AE

AE ID*	Description	Mode	Manufacturer
AE1	Adapter	/	/
AE2	Battery	/	/

*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 Tablet with integrated antenna and inbuilt battery. 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. 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.

Reference	Title	Version
FCC Part15	FCC CFR 47,Part 15,Subpart C	2016
	FCC CFR 47,Part 15,Subpart E	
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013

Note: DFS is a separate report.

5. SUMMARY OF TEST RESULTS

5.1. Summary of Test Results

No.	Test cases	Sub-clause of Part15E	Verdict
0	Maximum Output Power	15.407(a)	P
1	Power Spectral Density	15.407(a)	P
2	Occupied 26dB Bandwidth	15.407(a)	P
3	Occupied 6dB Bandwidth	15.407(e)	P
4	99% Occupied Bandwidth	15.407	P
5	Band edge compliance	15.407	P
6	Radiated Spurious Emissions	15.407	P
7	AC Power line Conducted	15.207	P
8	Frequency Stability	15.407	P
9	Transmit Power Control	15.407	NA

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

5.2. Statements

CTTL has evaluated the test cases requested by the applicant/manufacturer as listed in section 5.1 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2

5.3. Terms used in the result table

Terms used in Verdict column

P	Pass
NA	Not Available
F	Fail

Abbreviations

AC	Alternating Current
AFH	Adaptive Frequency Hopping
BW	Band Width
E.I.R.P.	equivalent isotropic radiated power
ISM	Industrial, Scientific and Medical
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
Tx	Transmitter

6. TEST EQUIPMENTS UTILIZED

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Vector Signal Analyzer	FSV40	100903	Rohde & Schwarz	2018-01-18	1 year
2	Power Sensor	U2021XA	MY55430013	Agilent	2018-01-18	1 year

Radiated test system

NO.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	LISN	ESH2-Z5	100196	Rohde & Schwarz	2018-01-05	1 year
2	Test Receiver	ESCI	100702	Rohde & Schwarz	2018-06-25	1 year
3	Loop Antenna	HLA6120	35779	TESEQ	2019-05-02	3 years
4	BiLog Antenna	VULB9163	9163 329	Schwarzbeck	2020-02-27	3 years
5	Horn Antenna	3117	00066585	ETS-Lindgren	2019-03-05	3 years
6	Test Receiver	ESR7	101676	Rohde & Schwarz	2018-11-29	1 year
7	Spectrum Analyser	FSV40	101192	Rohde & Schwarz	2018-05-22	1 year
8	Chamber	FACT5-2.0	4166	ETS-Lindgren	2018-05-13	3 years
9	Antenna	3160-09	LM4214/ 00118383	ETS-Lindgren	2018-07-14	3 years

Test software

No.	Equipment	Manufacturer	Version
1	TechMgr Software	CAICT	2.1.1
2	EMC32	Rohde & Schwarz	8.53.0
3	EMC32	Rohde & Schwarz	10.01.00

EUT is MTK engineering software provided by the customer to control the transmitting signal.

Anechoic chamber

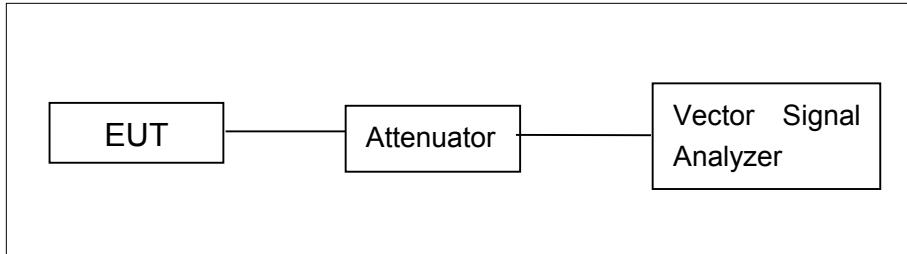
Fully anechoic chamber by ETS-Lindgren

ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

Conducted Measurements

- 1). Connect the EUT to the test system correctly.
- 2). Set the EUT to the required work mode.
- 3). Set the EUT to the required channel.
- 4). Set the spectrum analyzer to start measurement.
- 5). Record the values.

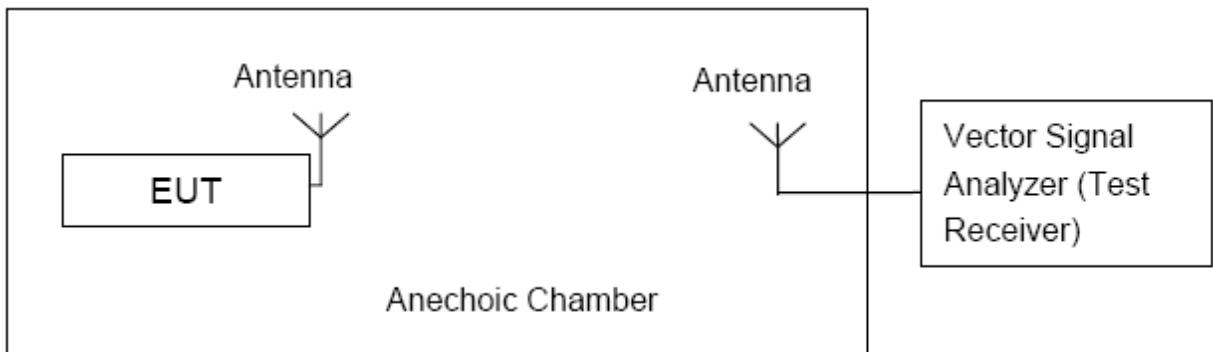


Radiated Emission Measurements

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

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

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



The measurement is made according to KDB 789033.

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

A.2. Maximum output Power

Measurement Limit and Method:

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

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

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

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

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Measurement Results:

U-NII Band	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Conclusion
5.2GHz Band (UNII-1)	802.11a	CH 36	5180	6Mbps	12.95	P
		CH 40	5200		12.86	P
		CH 48	5240		12.89	P
	802.11n-HT20	CH 36	5180	MCS0	12.67	P
		CH 40	5200		12.56	P
		CH 48	5240		12.52	P
	802.11n-HT40	CH 38	5190	MCS0	12.32	P
		CH 46	5230		12.25	P
	802.11ac-VHT20	CH 36	5180	MCS0	12.46	P
		CH 40	5200		12.42	P
		CH 48	5240		12.55	P
	802.11ac-VHT40	CH 38	5190	MCS0	12.17	P
		CH 46	5230		12.21	P
	802.11ac-VHT80	CH 42	5210	MCS0	11.85	P

U-NII Band	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Conclusion
5.3GHz Band (UNII-2A)	802.11a	CH 52	5260	6Mbps	12.76	P
		CH 56	5280		12.83	P
		CH 64	5320		12.85	P
	802.11n-HT20	CH 52	5260	MCS0	12.45	P
		CH 56	5280		12.39	P
		CH 64	5320		12.45	P
	802.11n-HT40	CH 54	5270	MCS0	12.21	P
		CH 62	5310		12.15	P
	802.11ac-VHT20	CH 52	5260	MCS0	12.36	P
		CH 56	5280		12.41	P
		CH 64	5320		12.34	P
	802.11ac-VHT40	CH 54	5270	MCS0	12.10	P
		CH 62	5310		12.18	P
	802.11ac-VHT80	CH 58	5290	MCS0	11.78	P

U-NII Band	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Conclusion
5.5GHz Band (UNII-2C)	802.11a	CH 100	5500	6Mbps	12.76	P
		CH 116	5580		12.67	P
		CH 140	5700		12.72	P
	802.11n-HT20	CH 100	5500	MCS0	12.23	P
		CH 116	5580		12.15	P
		CH 140	5700		12.27	P
	802.11n-HT40	CH 102	5510	MCS0	12.05	P
		CH 110	5550		12.03	P
		CH 134	5670		11.74	P
	802.11ac-VHT20	CH 100	5500	MCS0	12.25	P
		CH 116	5580		12.04	P
		CH 140	5700		12.14	P
	802.11ac-VHT40	CH 102	5510	MCS0	12.02	P
		CH 110	5550		11.92	P
		CH 134	5670		11.87	P
	802.11ac-VHT80	CH 106	5530	MCS0	11.78	P
		CH 122	5610		11.65	P
		CH 138	5690		11.58	P

U-NII Band	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Conclusion
5.8GHz Band (UNII-3)	802.11a	CH 149	5745	6Mbps	12.63	P
		CH 157	5785		12.65	P
		CH 165	5825		12.73	P
	802.11n-HT20	CH 149	5745	MCS0	12.35	P
		CH 157	5785		12.15	P
		CH 165	5825		12.26	P
	802.11n-HT40	CH 151	5755	MCS0	12.02	P
		CH 159	5795		11.93	P
	802.11ac-VHT20	CH 149	5745	MCS0	12.11	P
		CH 157	5785		12.34	P
		CH 165	5825		12.21	P
	802.11ac-VHT40	CH 151	5755	MCS0	11.96	P
		CH 159	5795		11.89	P
	802.11ac-VHT80	CH 155	5775	MCS0	11.66	P

Note:

Worst-case data rates as provided by the client were: 6Mbps (802.11a), MCS0 (802.11n/ac).

802.11a, 802.11n-HT40 and 802.11ac-VHT80 modes are selected as the worst-case

The following cases and test graphs are performed with this condition.

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

A.3. Peak Power Spectral Density (conducted)

Measurement Limit:

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

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

Measurement Results:

Mode	Channel	Power Spectral Density (dBm/MHz)	Conclusion
802.11n HT20	5180MHz(Ch36)	6.10	P
	5200MHz(Ch40)	6.29	P
	5240MHz(Ch48)	6.39	P
	5260MHz(Ch52)	6.89	P
	5280MHz(Ch56)	6.32	P
	5320MHz(Ch64)	6.43	P
	5500MHz(Ch100)	5.91	P
	5580MHz(Ch116)	5.84	P
	5700MHz(Ch140)	5.35	P

Mode	Channel	Power Spectral Density (dBm/MHz)	Conclusion
802.11n HT40	5190MHz(Ch38)	2.72	P
	5230MHz(Ch46)	3.06	P
	5270MHz(Ch54)	2.49	P
	5310MHz(Ch62)	2.49	P
	5510MHz(Ch102)	2.65	P
	5550MHz(Ch110)	2.06	P
	5670MHz(Ch134)	2.91	P

Mode	Channel	Power Spectral Density (dBm/MHz)	Conclusion
802.11ac VHT80	5210MHz(Ch42)	-1.11	P
	5290MHz(Ch58)	-1.74	P
	5530MHz(Ch106)	-1.86	P
	5610MHz(Ch122)	-1.95	P

5.8GHz Band (UNII-3)

U-NII Band	Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/500kHz)	Conclusion
5.8GHz Band (UNII-3)	802.11a	CH 149	5745	7.84	P
		CH 157	5785	7.91	P
		CH 165	5825	8.29	P
	802.11n-HT40	CH 151	5755	4.90	P
		CH 159	5795	4.32	P
	802.11ac-VHT80	CH 155	5775	1.69	P

Conclusion: PASS

A.4. Occupied 26dB Bandwidth(conducted)

Measurement Limit:

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

The measurement is made according to KDB 789033

Measurement Result:

Mode	Channel	Occupied 26dB Bandwidth(MHz)	Conclusion
802.11a	5180MHz(Ch36)	Fig.1	23.10
	5200MHz(Ch40)	Fig.2	23.50
	5240MHz(Ch48)	Fig.3	22.95
	5260MHz(Ch52)	Fig.4	23.85
	5280MHz(Ch56)	Fig.5	23.45
	5320MHz(Ch64)	Fig.6	23.35
	5500MHz(Ch100)	Fig.7	23.35
	5580MHz(Ch116)	Fig.8	23.29
	5700MHz(Ch140)	Fig.9	25.20
802.11n HT40	5190MHz(Ch38)	Fig.10	44.08
	5230MHz(Ch46)	Fig.11	43.92
	5270MHz(Ch54)	Fig.12	44.56
	5310MHz(Ch62)	Fig.13	44.48
	5510MHz(Ch102)	Fig.14	44.48
	5550MHz(Ch110)	Fig.15	44.32
	5670MHz(Ch134)	Fig.16	43.44
802.11 ac VHT80	5210MHz(Ch42)	Fig.17	85.12
	5290MHz(Ch58)	Fig.18	85.44
	5530MHz(Ch106)	Fig.19	84.64
	5610MHz(Ch122)	Fig.20	85.44

Conclusion: PASS

Test graphs as below:

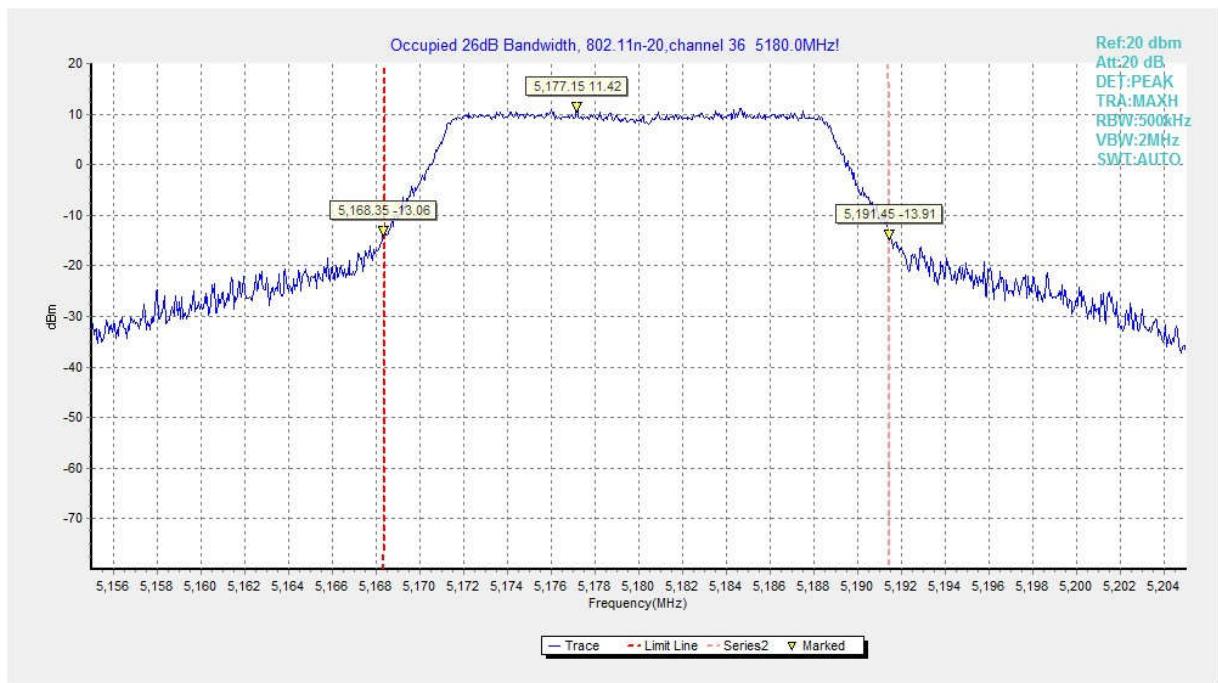


Fig. 1 Occupied 26dB Bandwidth (802.11n-HT20, 5180MHz)

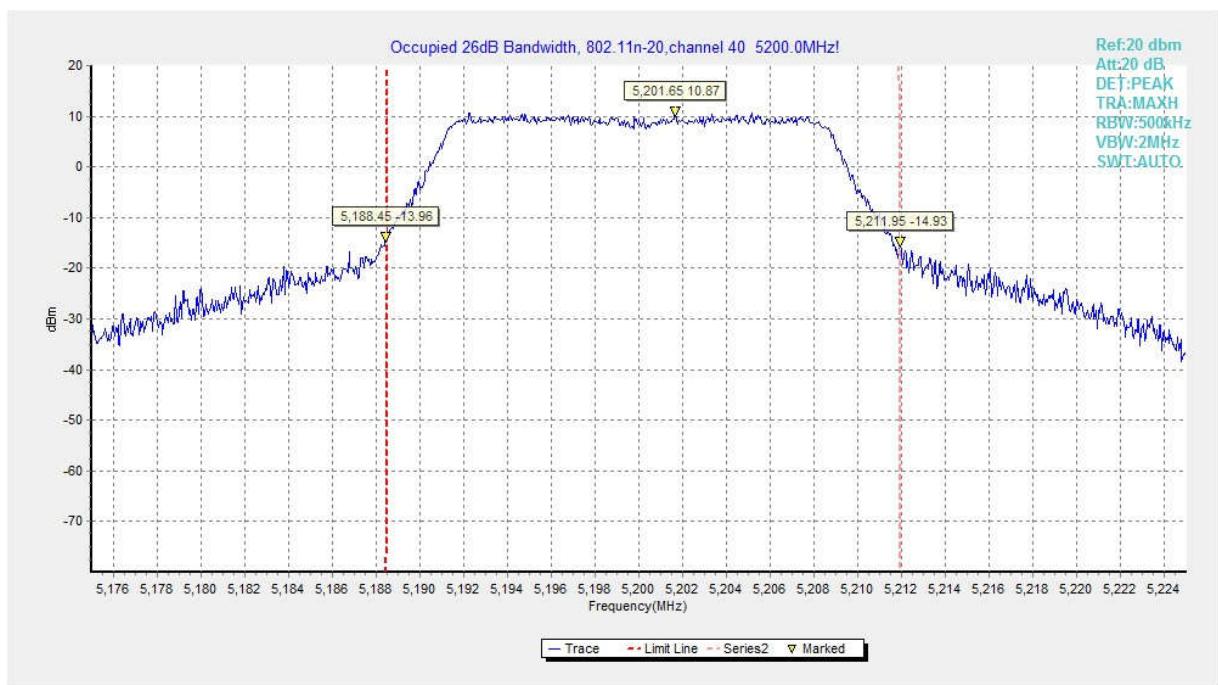


Fig. 2 Occupied 26dB Bandwidth (802.11n-HT20, 5200MHz)

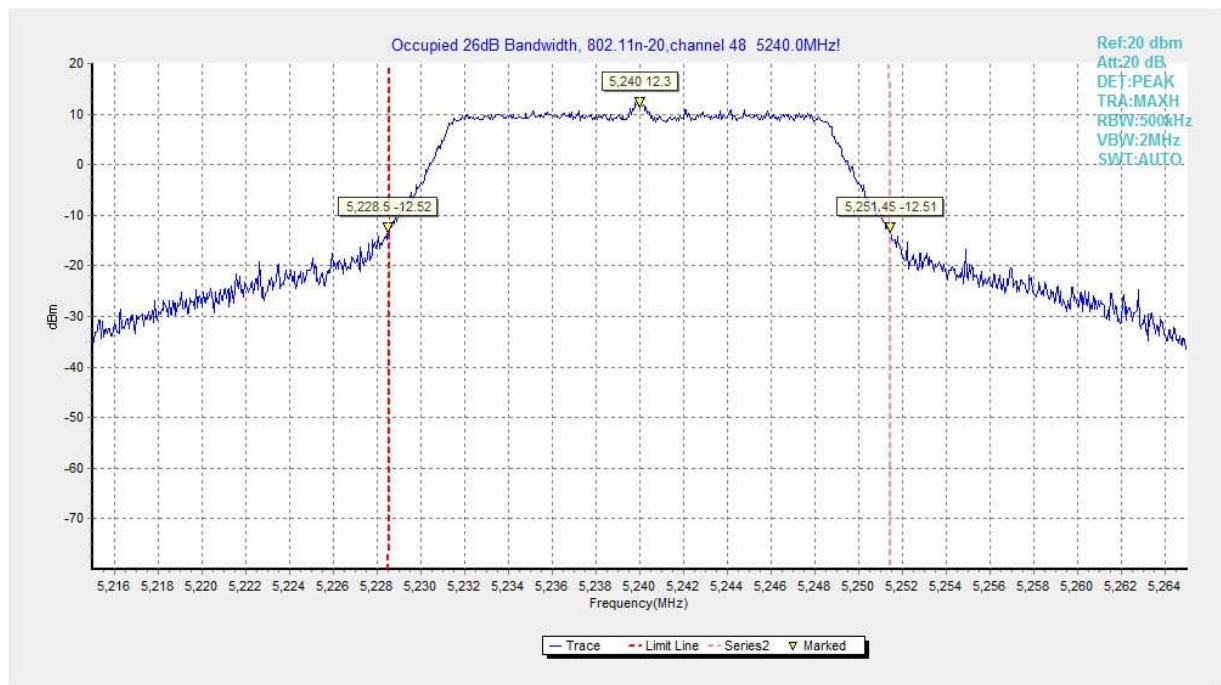


Fig. 3 Occupied 26dB Bandwidth (802.11n-HT20, 5240MHz)

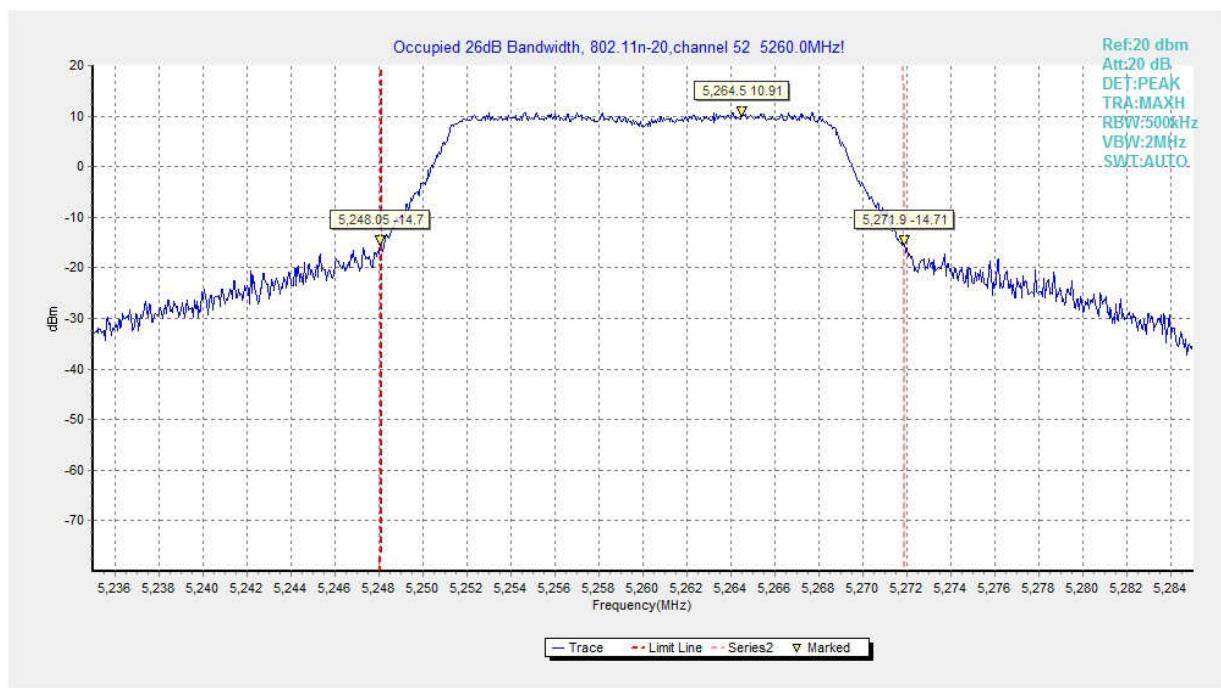


Fig. 4 Occupied 26dB Bandwidth (802.11n-HT20, 5260MHz)

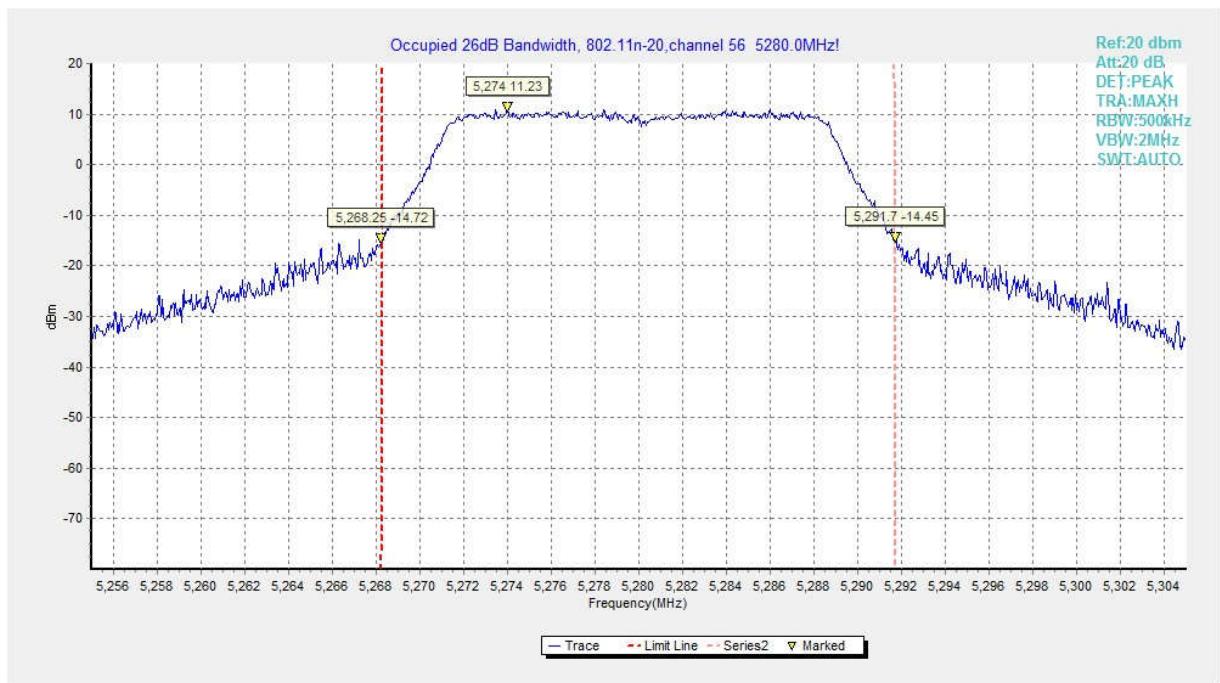


Fig. 5 Occupied 26dB Bandwidth (802.11n-HT20, 5280MHz)

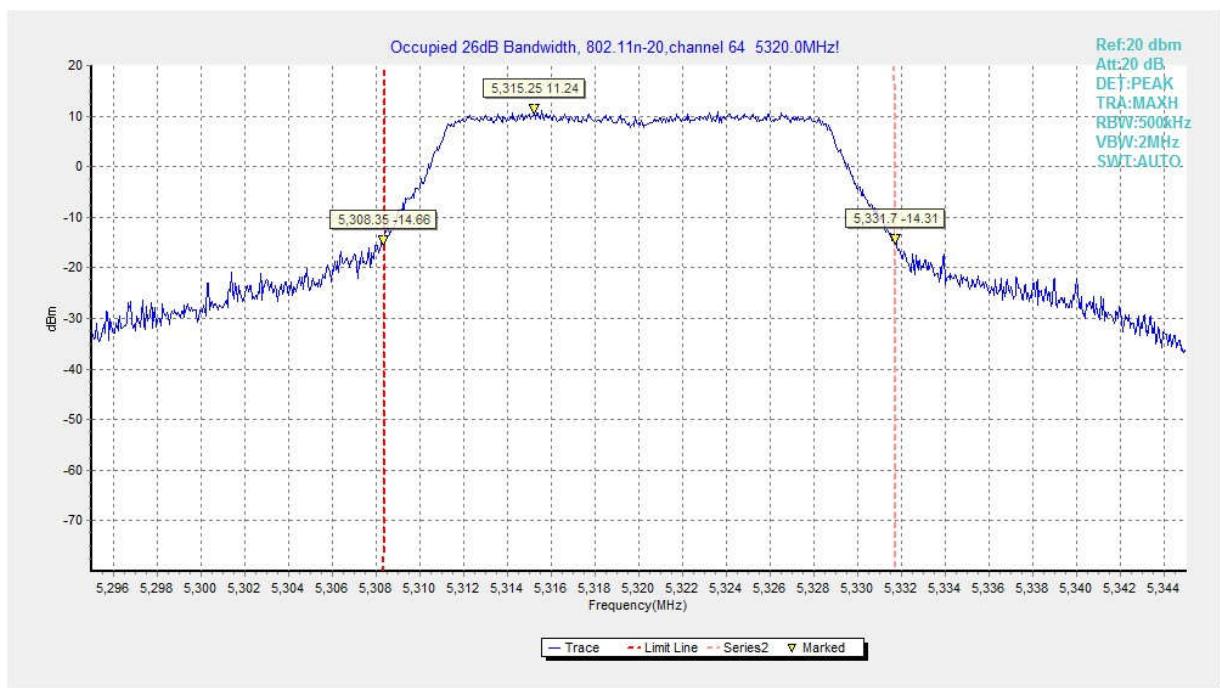


Fig. 6 Occupied 26dB Bandwidth (802.11n-HT20, 5320MHz)

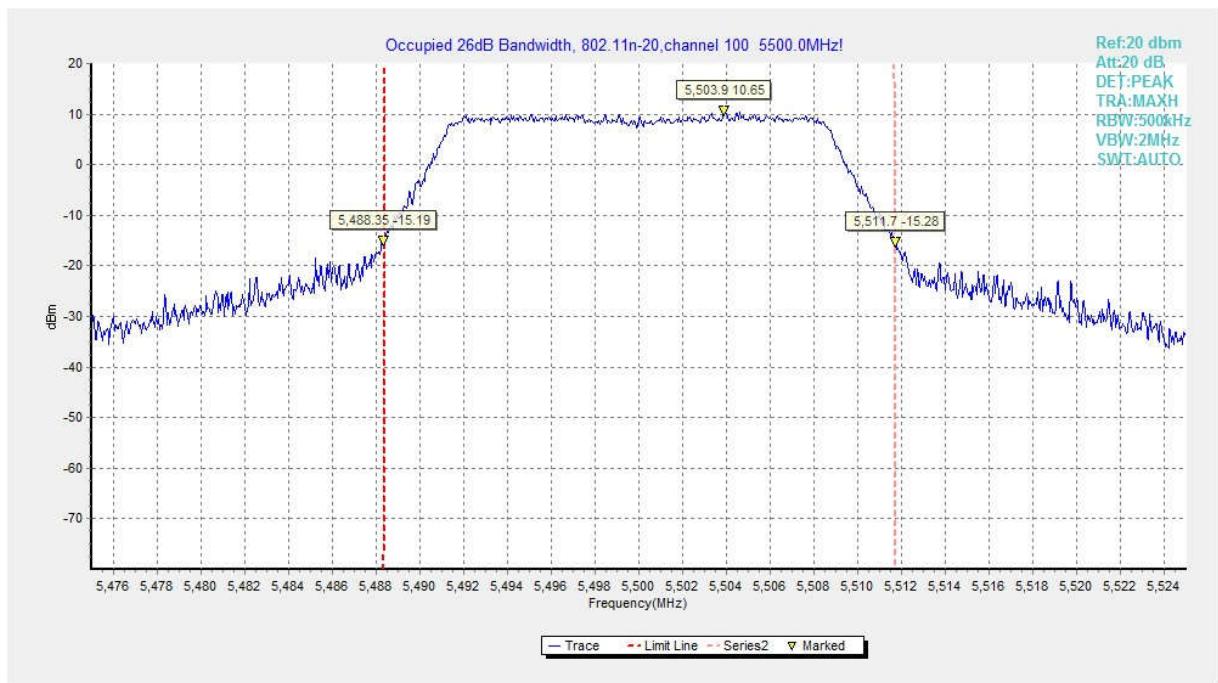


Fig. 7 Occupied 26dB Bandwidth (802. 11n-HT20, 5500MHz)

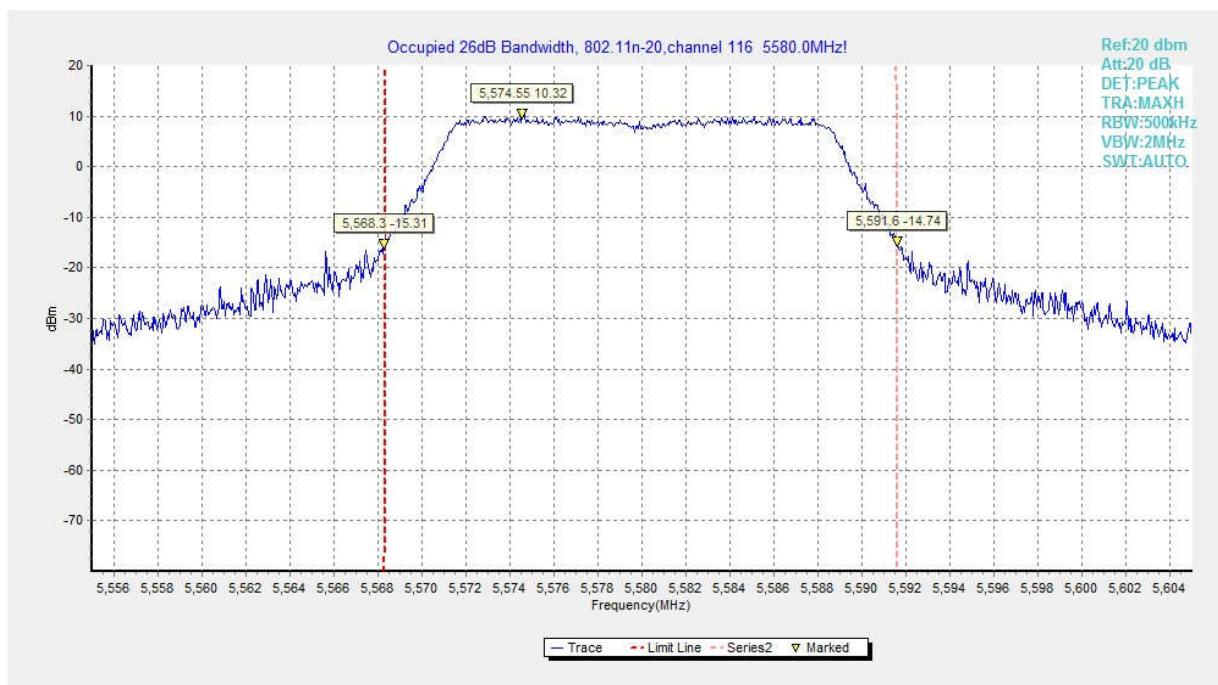


Fig. 8 Occupied 26dB Bandwidth (802. 11n-HT20, 5600MHz)

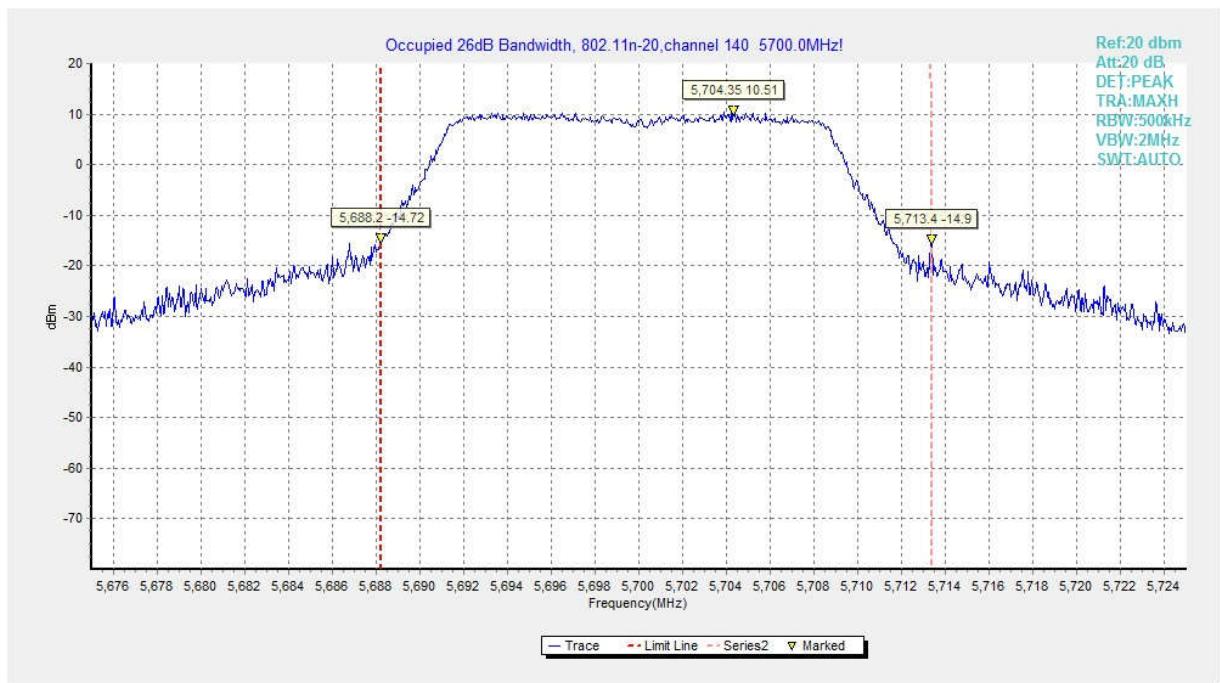


Fig. 9 Occupied 26dB Bandwidth (802. 11n-HT20, 5700MHz)

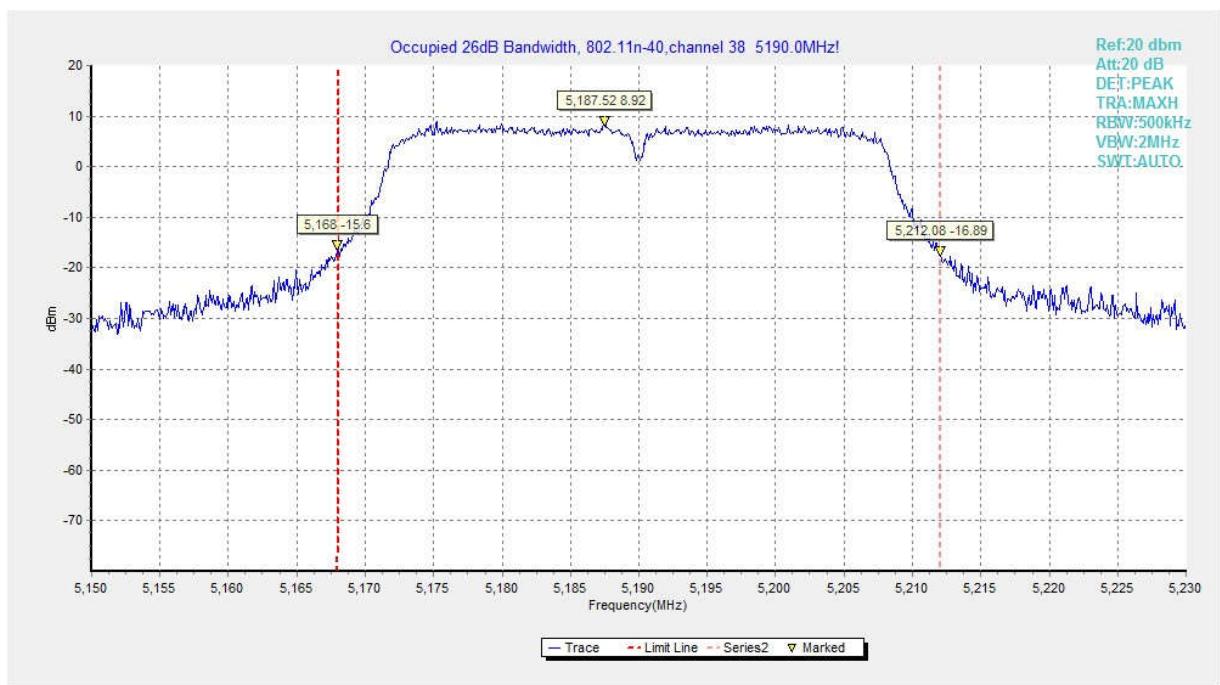


Fig. 10 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)

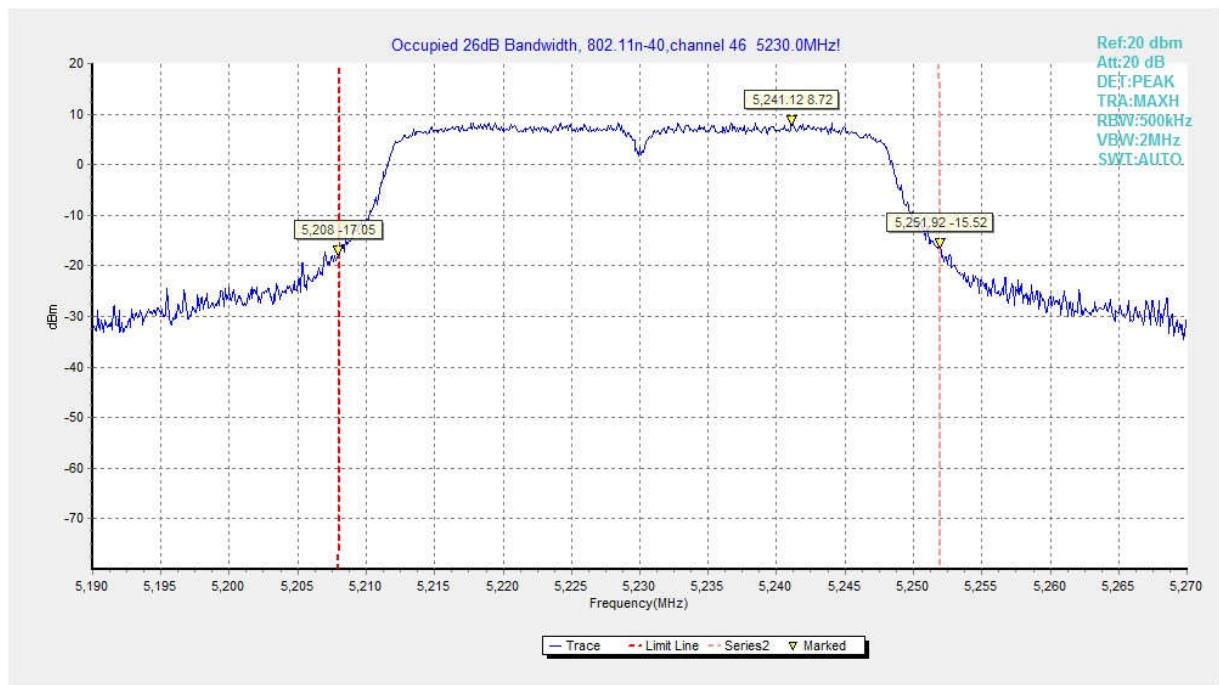


Fig. 11 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)

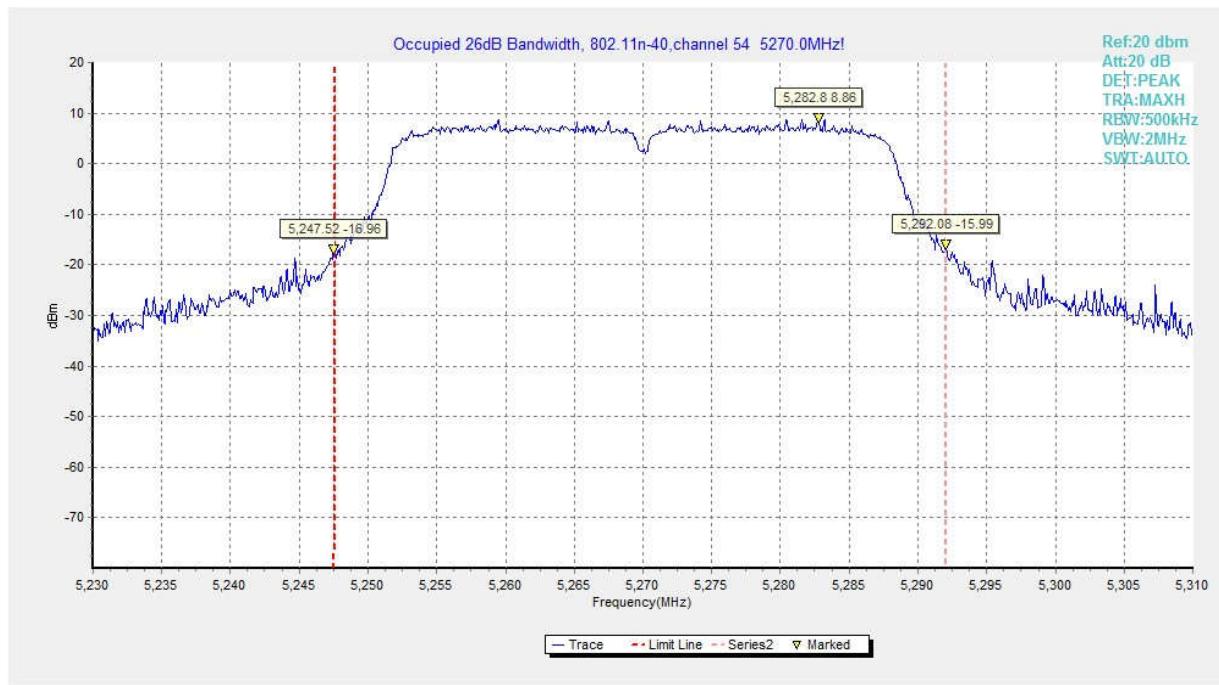


Fig. 12 Occupied 26dB Bandwidth (802.11n-HT40, 5270MHz)

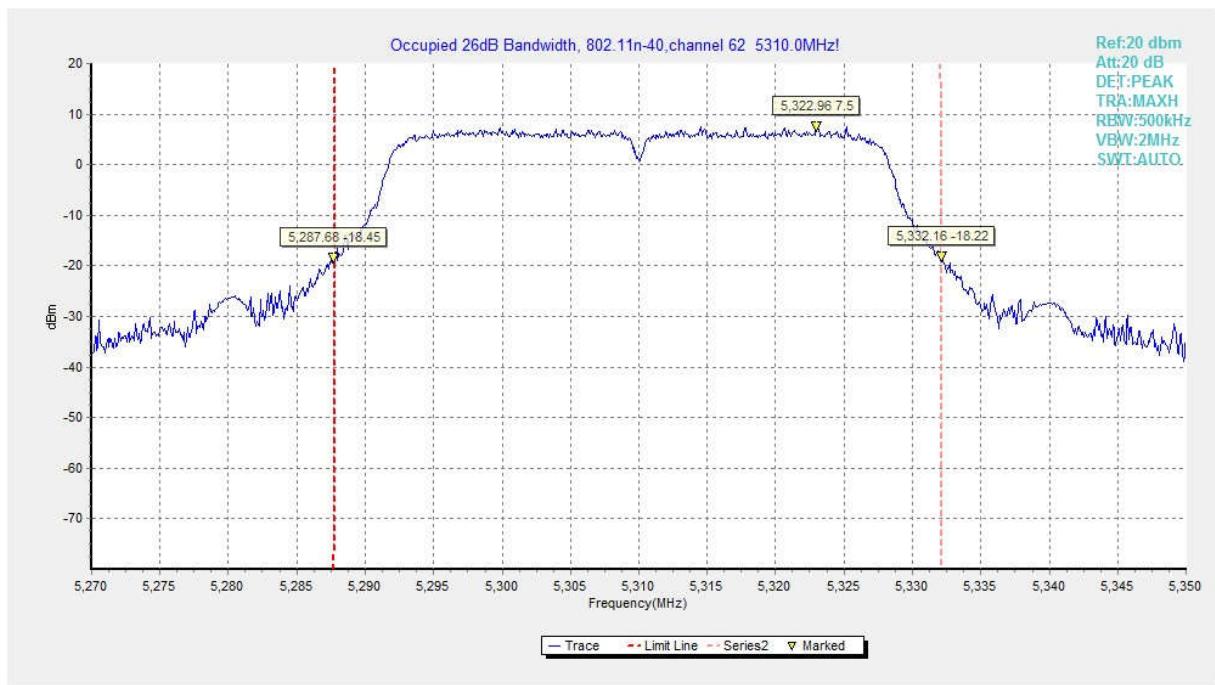


Fig. 13 Occupied 26dB Bandwidth (802.11n-HT40, 5310MHz)

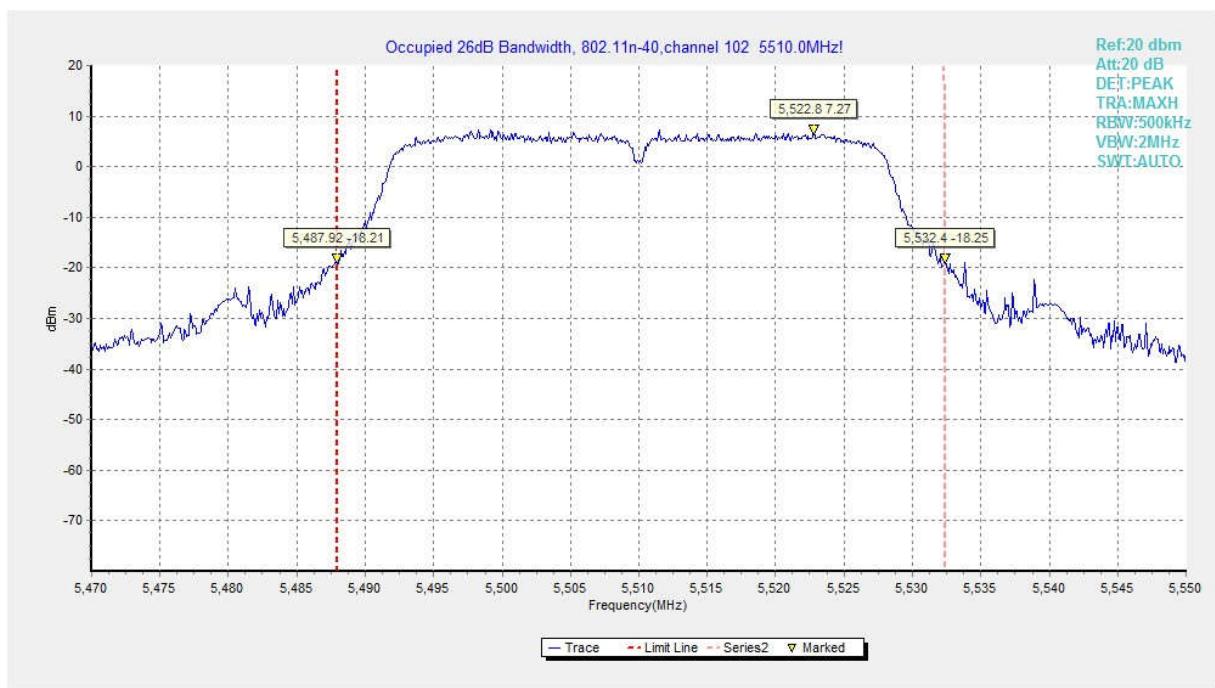


Fig. 14 Occupied 26dB Bandwidth (802.11n-HT40, 5510MHz)

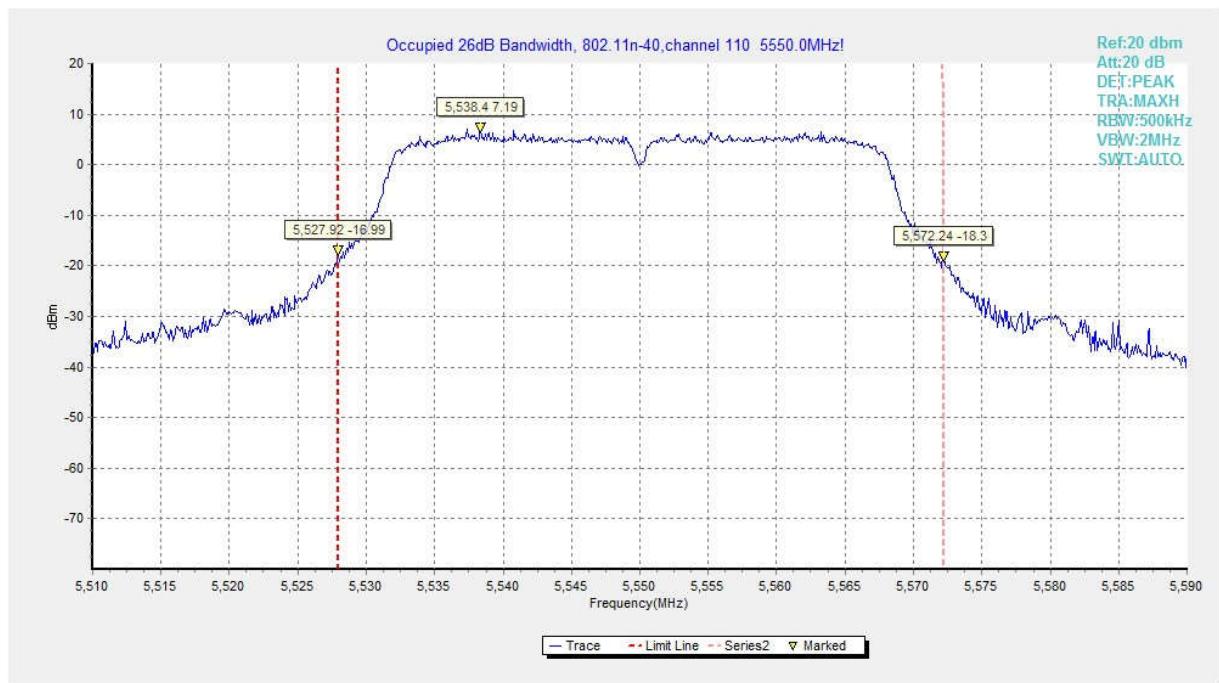


Fig. 15 Occupied 26dB Bandwidth (802. 11n-HT40, 5590MHz)

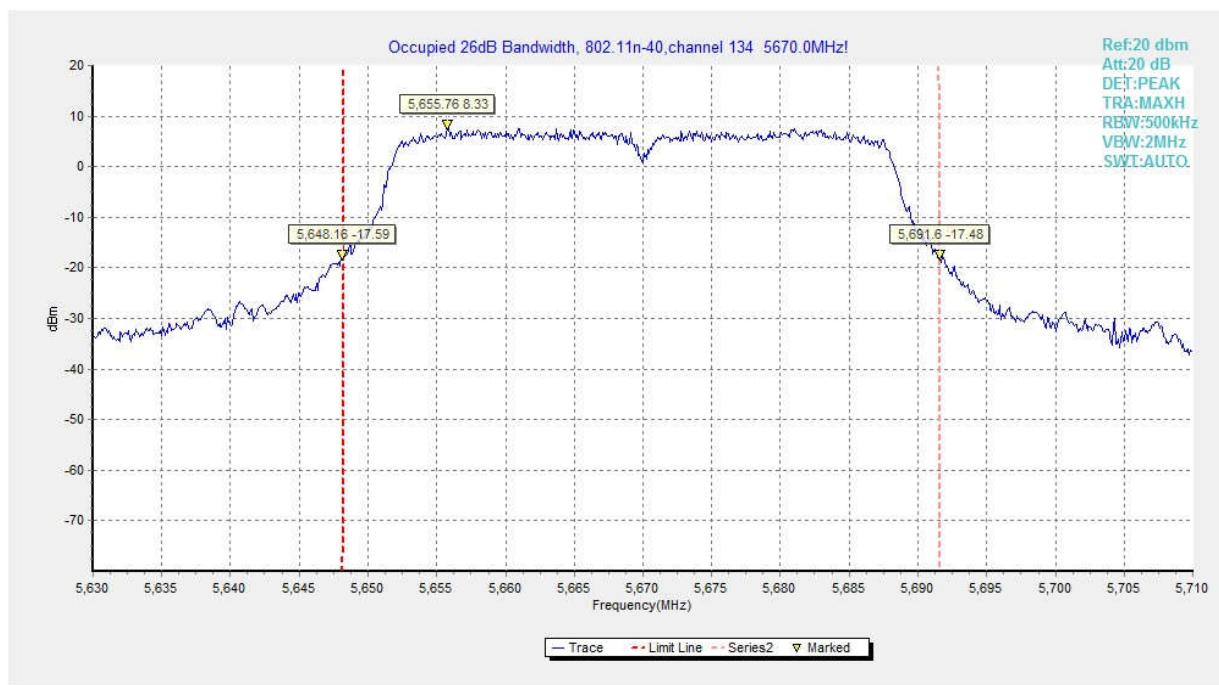


Fig. 16 Occupied 26dB Bandwidth (802. 11n-HT40, 5670MHz)

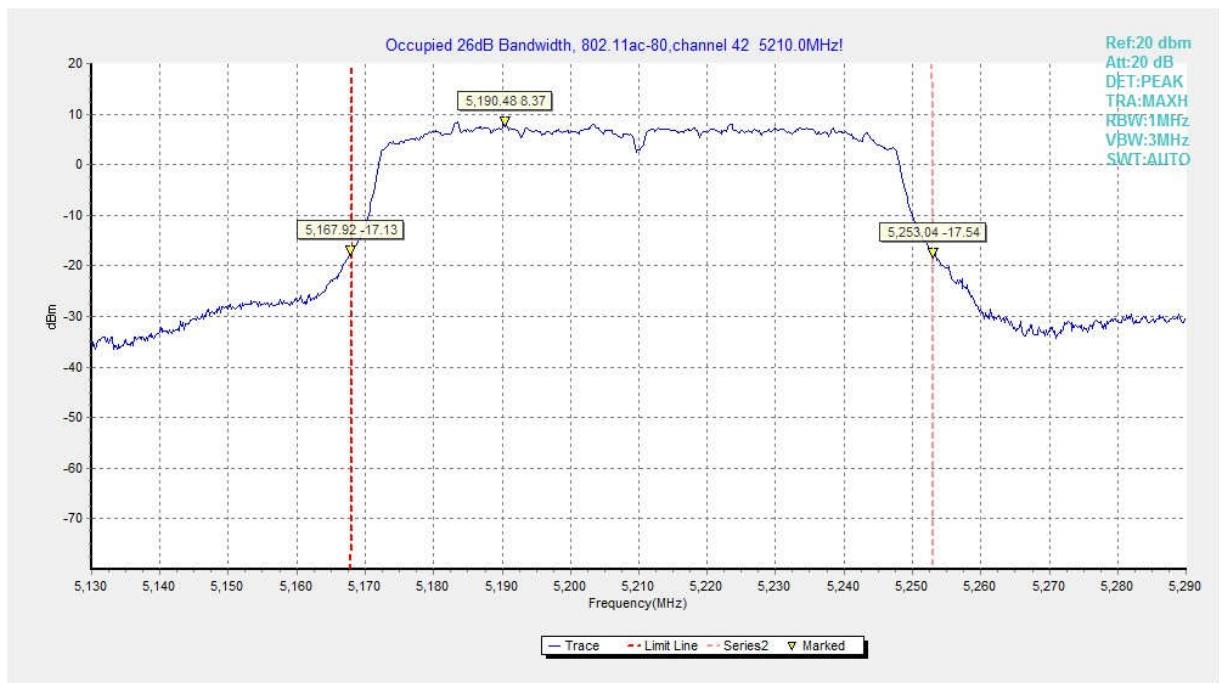


Fig. 17 Occupied 26dB Bandwidth (802. 11ac-VHT80, 5210MHz)

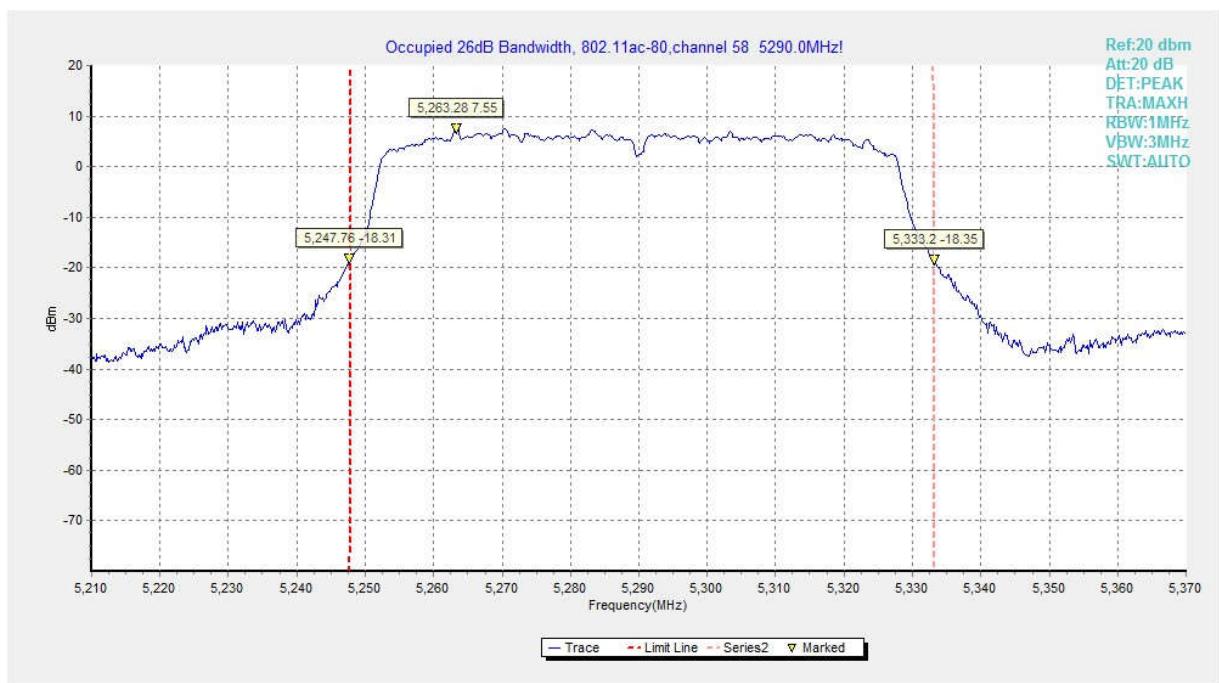


Fig. 18 Occupied 26dB Bandwidth (802. 11ac-VHT80, 5290MHz)

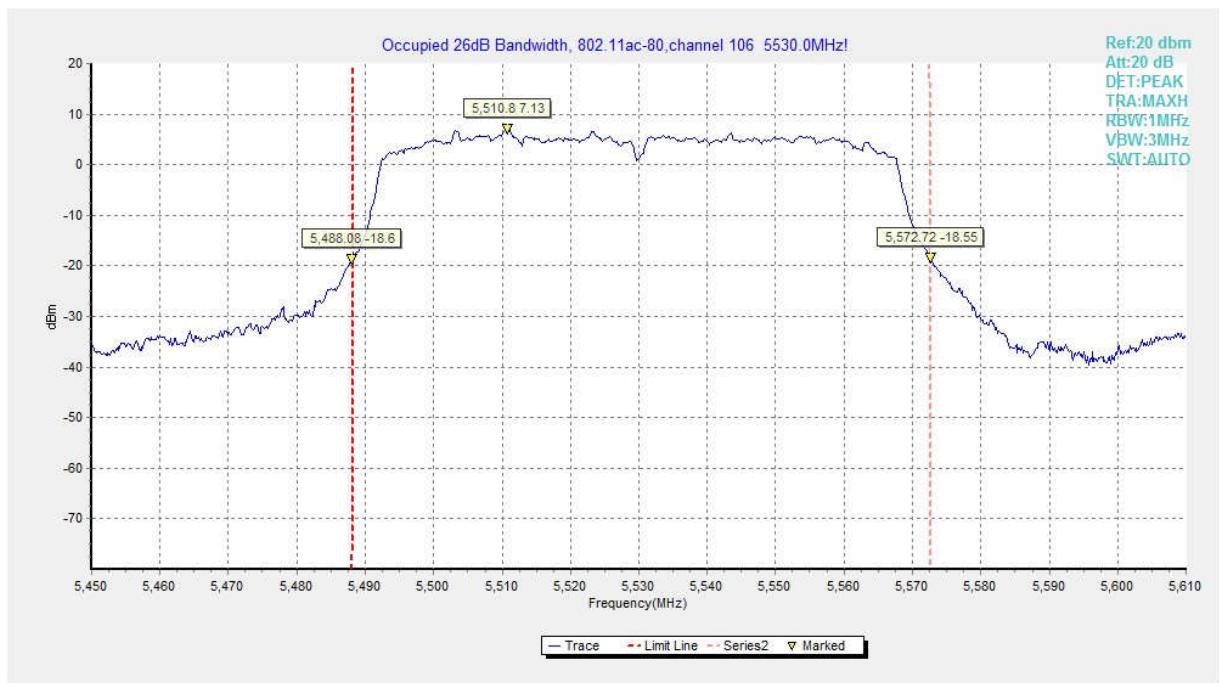


Fig. 19 Occupied 26dB Bandwidth (802. 11ac-VHT80, 5530MHz)

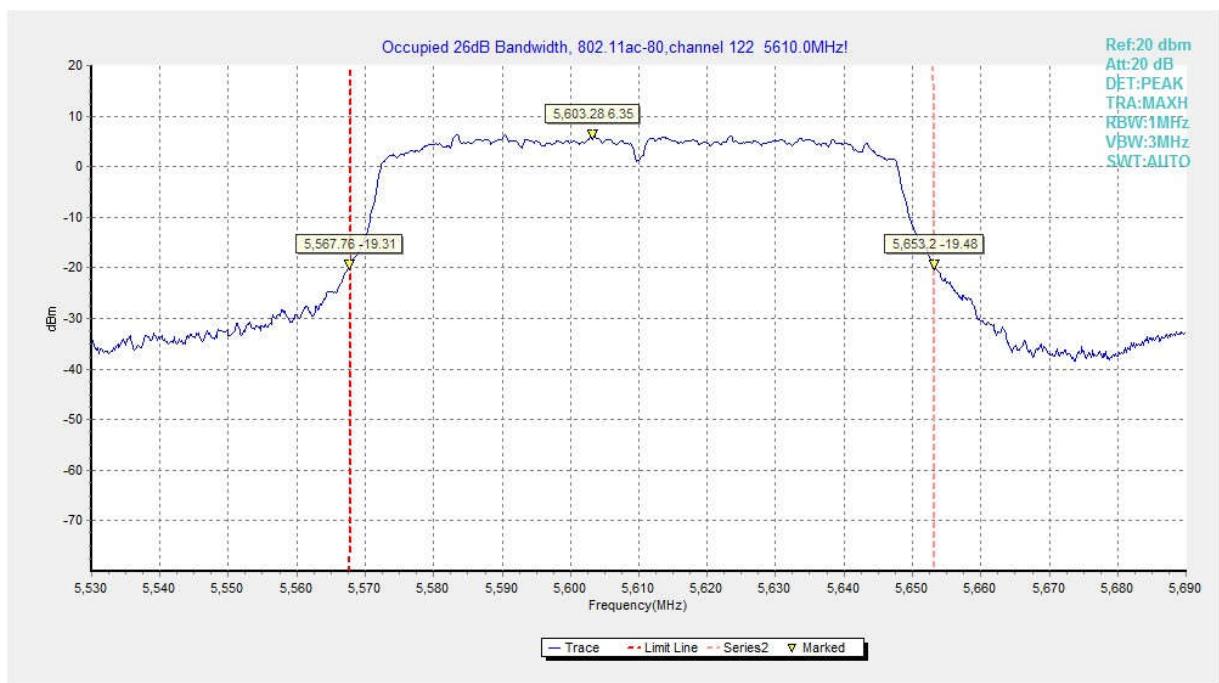


Fig. 20 Occupied 26dB Bandwidth (802. 11ac-VHT80, 5610MHz)

A.5. Occupied 6dB Bandwidth(conducted)

Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.407 (e)	≥ 0.5

The measurement is made according to KDB 789033

Measurement Result:

Mode	Channel	Occupied 6dB Bandwidth(MHz)	Conclusion
802.11a	5745MHz(Ch149)	Fig.21	17.60
	5785MHz(Ch157)	Fig.22	17.55
	5825MHz(Ch165)	Fig.23	17.60
802.11n HT40	5755MHz(Ch151)	Fig.24	35.44
	5795MHz(Ch159)	Fig.25	35.52
802.11ac VHT80	5775MHz(Ch155)	Fig.26	75.20

Conclusion: PASS

Test graphs as below:

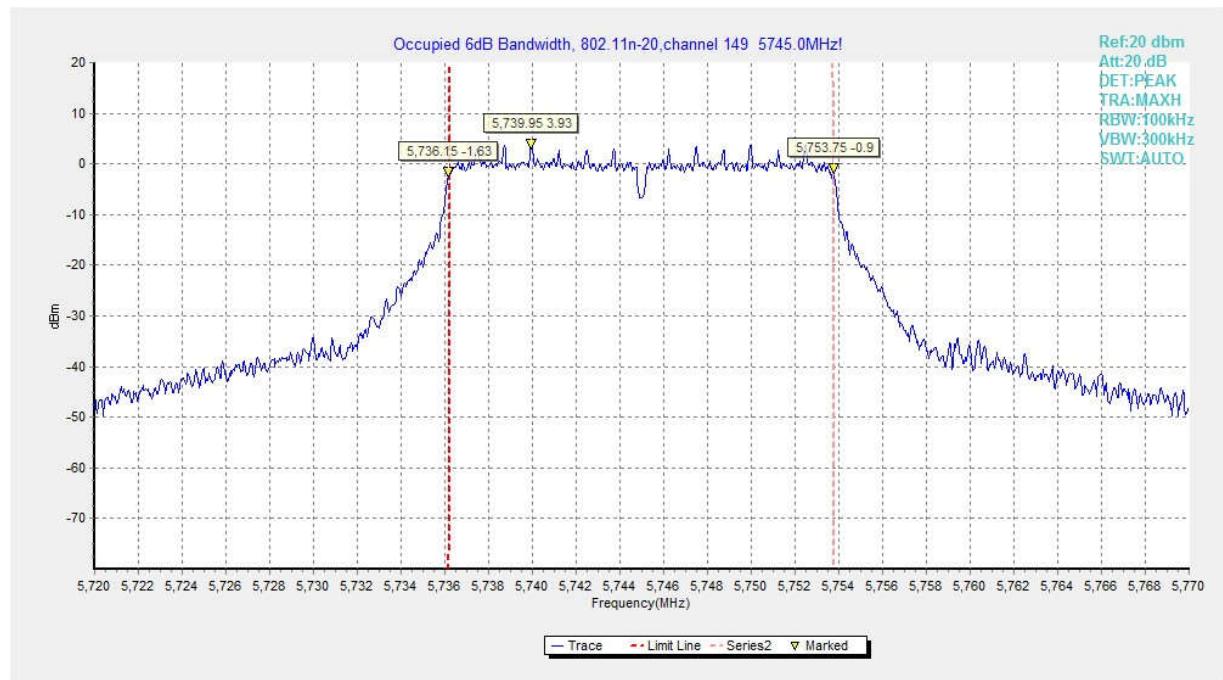


Fig. 21 Occupied 6dB Bandwidth (802.11n-HT20, 5745MHz)

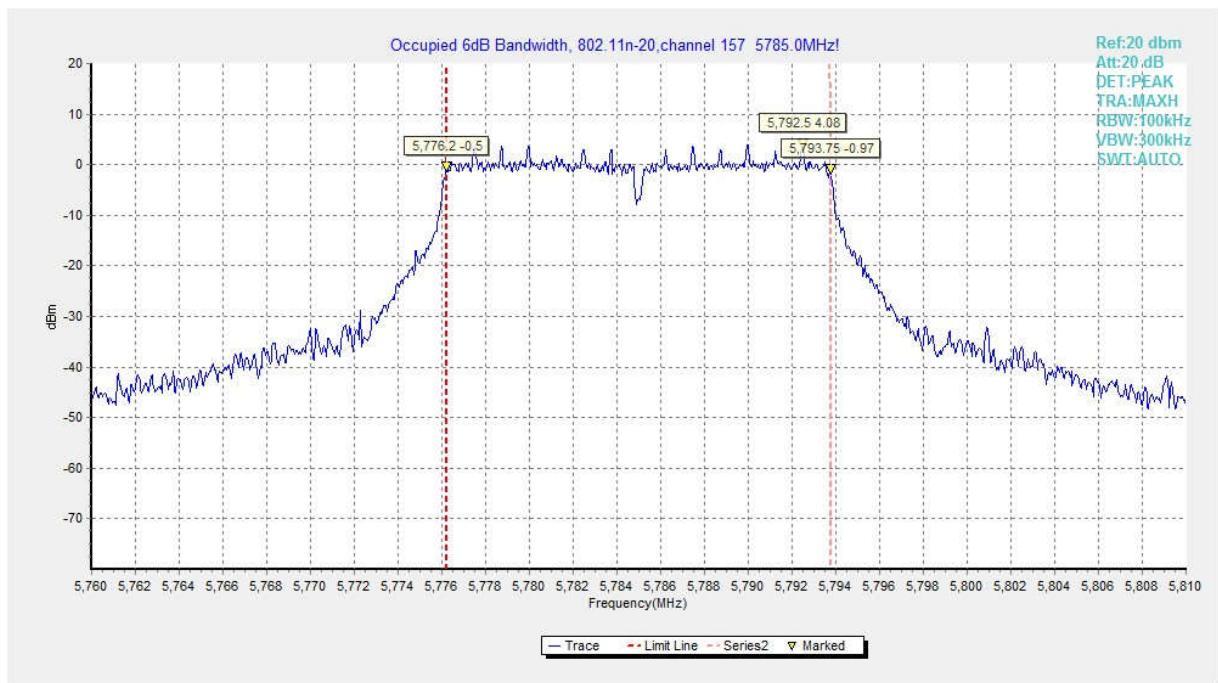


Fig. 22 Occupied 6dB Bandwidth (802.11n-HT20, 5785MHz)

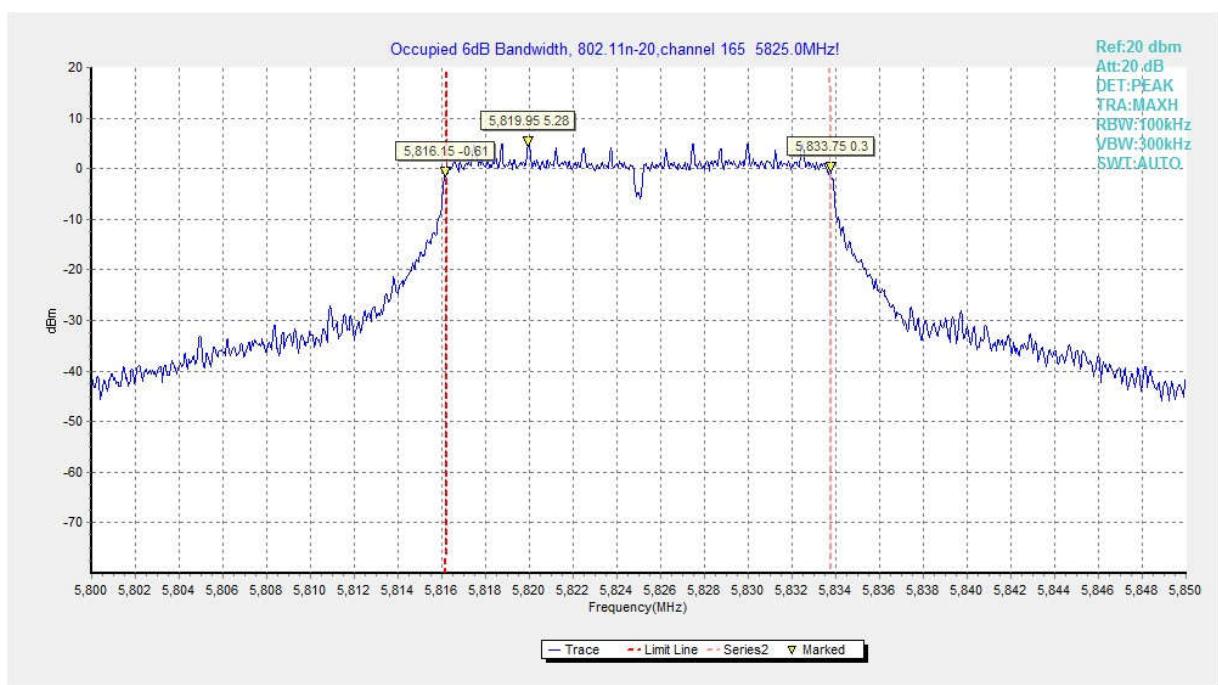


Fig. 23 Occupied 6dB Bandwidth (802.11n-HT20, 5825MHz)

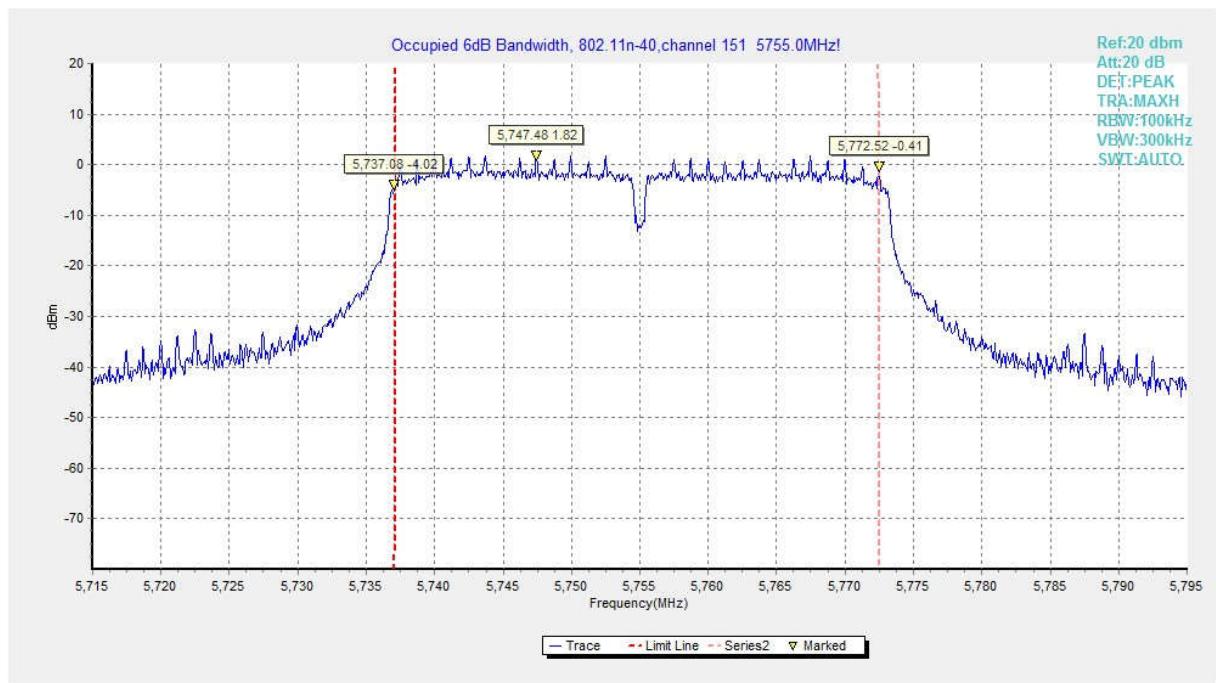


Fig. 24 Occupied 6dB Bandwidth (802.11n-HT40, 5755MHz)

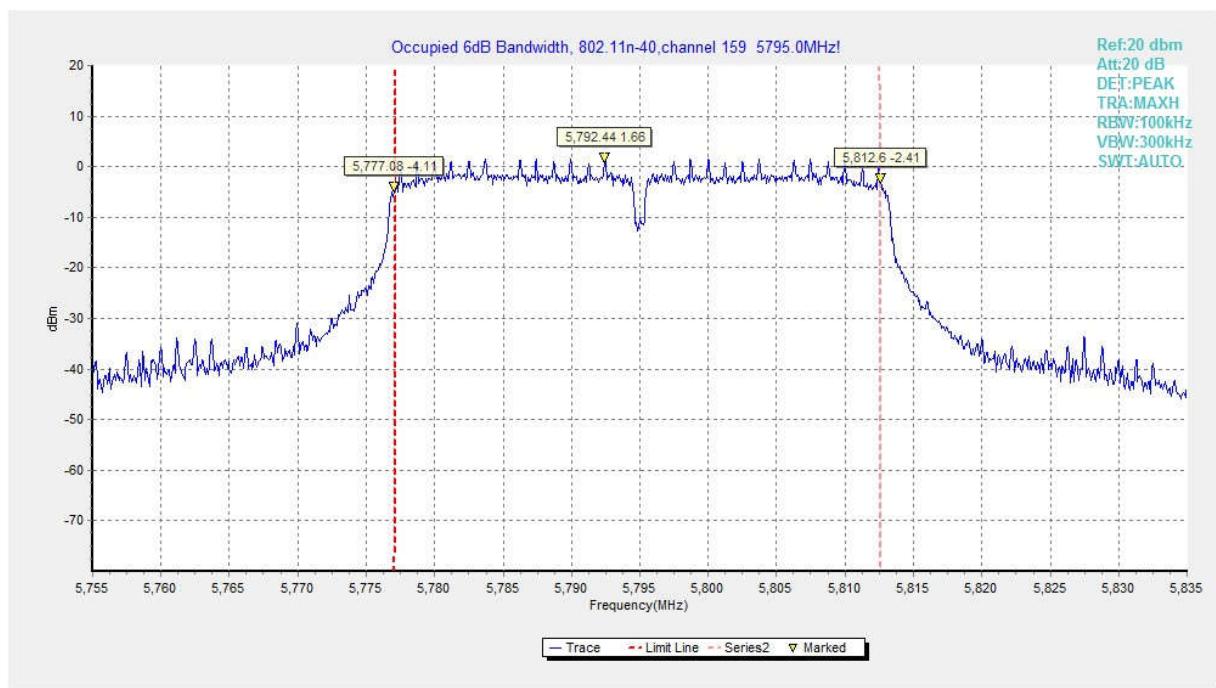


Fig. 25 Occupied 6dB Bandwidth (802.11n-HT40, 5795MHz)

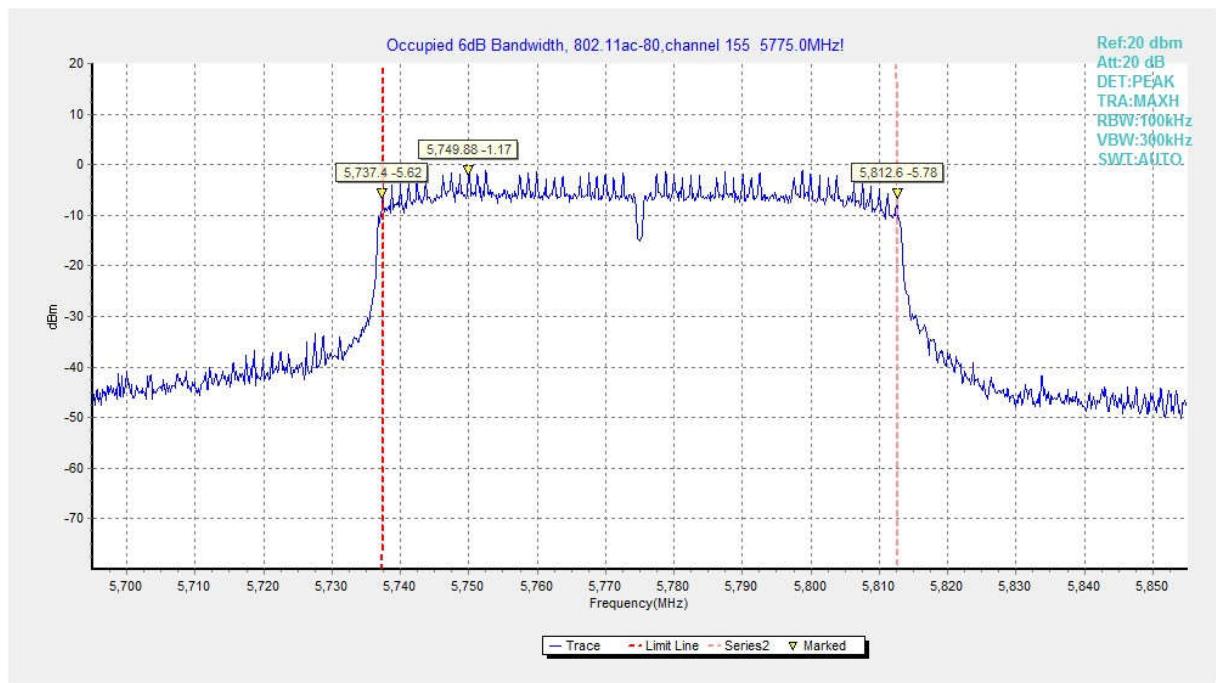


Fig. 26 Occupied 6dB Bandwidth (802.11ac-VHT80, 5775MHz)

A.6. 99% Occupied Bandwidth(conducted)

Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.403	/

The measurement is made according to KDB 789033

Measurement Result:

Mode	Channel	99% Occupied Bandwidth(MHz)	Conclusion
802.11a	5180MHz(Ch36)	Fig.27	18.78
	5200MHz(Ch40)	Fig.28	18.78
	5240MHz(Ch48)	Fig.29	18.70
	5260MHz(Ch52)	Fig.30	18.78
	5280MHz(Ch56)	Fig.31	18.82
	5320MHz(Ch64)	Fig.32	18.82
	5500MHz(Ch100)	Fig.33	18.74
	5580MHz(Ch116)	Fig.34	18.78
	5700MHz(Ch140)	Fig.35	18.78
802.11n HT40	5190MHz(Ch38)	Fig.36	36.44
	5230MHz(Ch46)	Fig.37	36.44
	5270MHz(Ch54)	Fig.38	36.44
	5310MHz(Ch62)	Fig.39	36.44
	5510MHz(Ch102)	Fig.40	36.44
	5550MHz(Ch110)	Fig.41	36.44
	5670MHz(Ch134)	Fig.42	36.28
802.11 ac VHT80	5210MHz(Ch42)	Fig.43	74.97
	5290MHz(Ch58)	Fig.44	74.97
	5530MHz(Ch106)	Fig.45	74.97
	5610MHz(Ch122)	Fig.46	74.97

Conclusion: PASS

Test graphs as below:

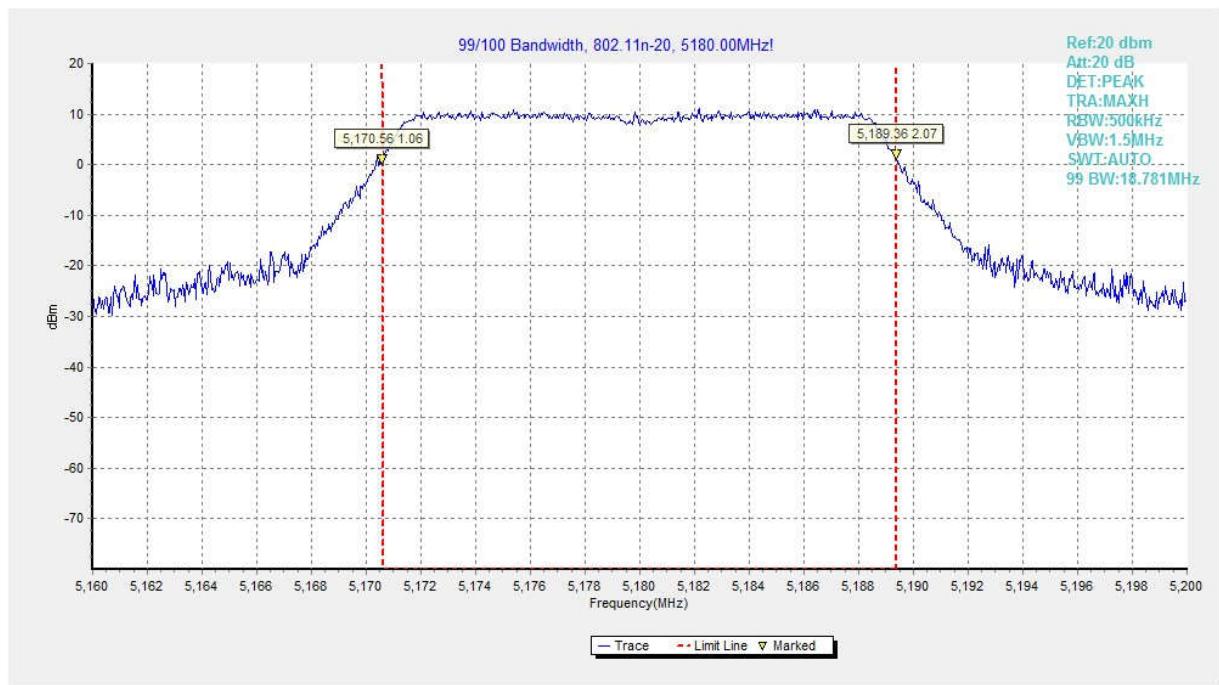


Fig. 27 99% Occupied Bandwidth (802.11n-HT20, 5180MHz)

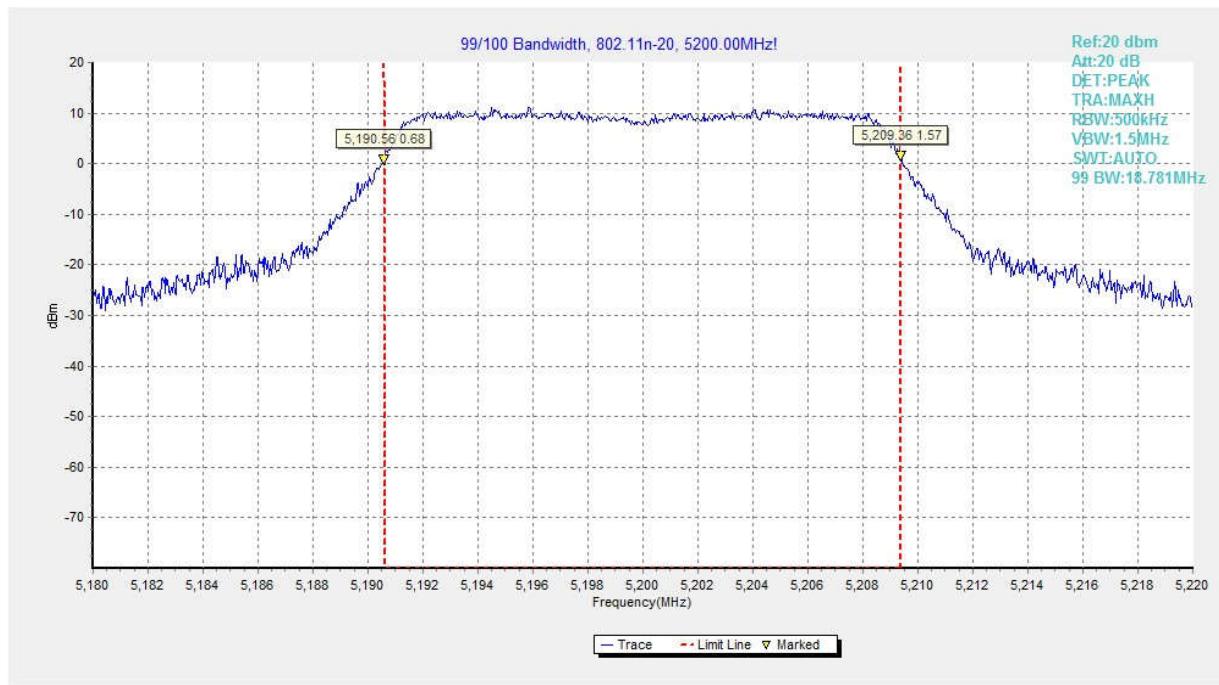


Fig. 28 99% Occupied Bandwidth (802.11n-HT20, 5200MHz)

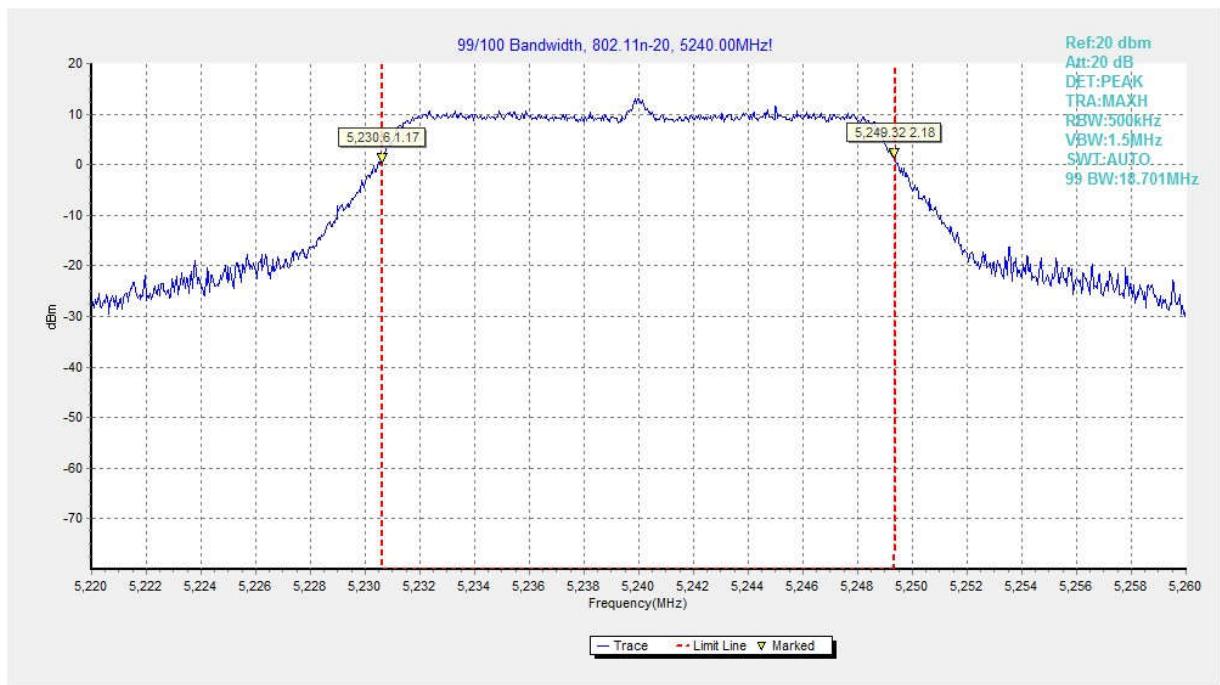


Fig. 29 99% Occupied Bandwidth (802.11n-HT20, 5240MHz)

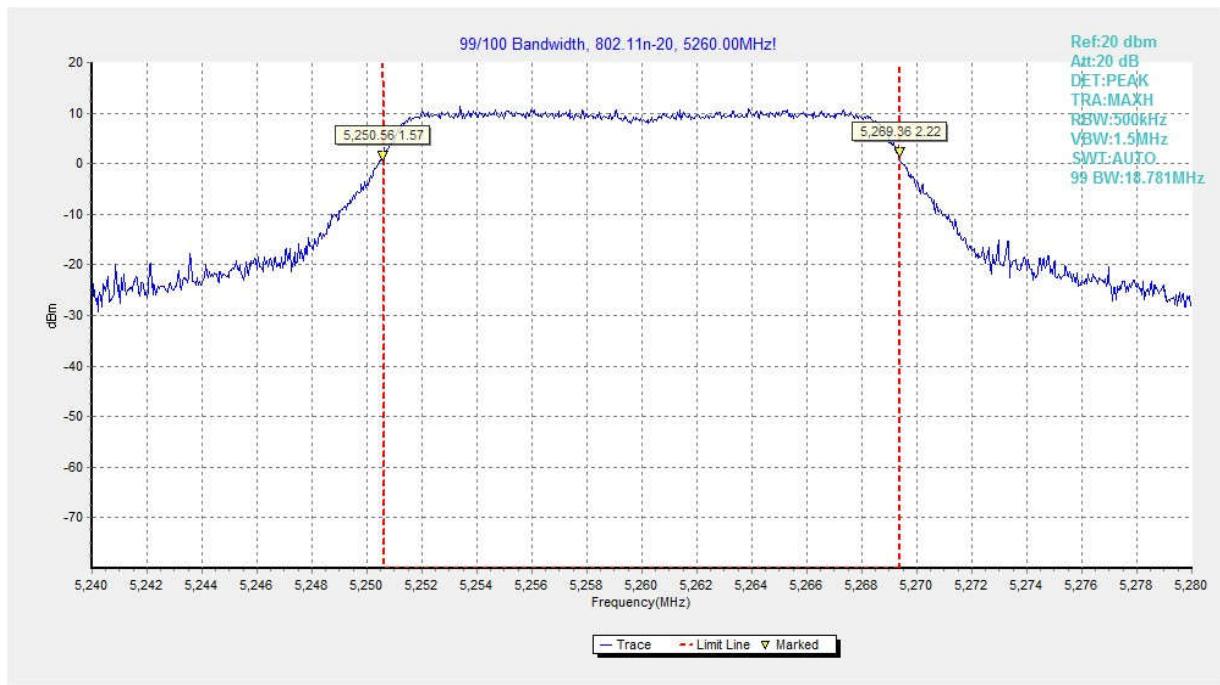


Fig. 30 99% Occupied Bandwidth (802.11n-HT20, 5260MHz)

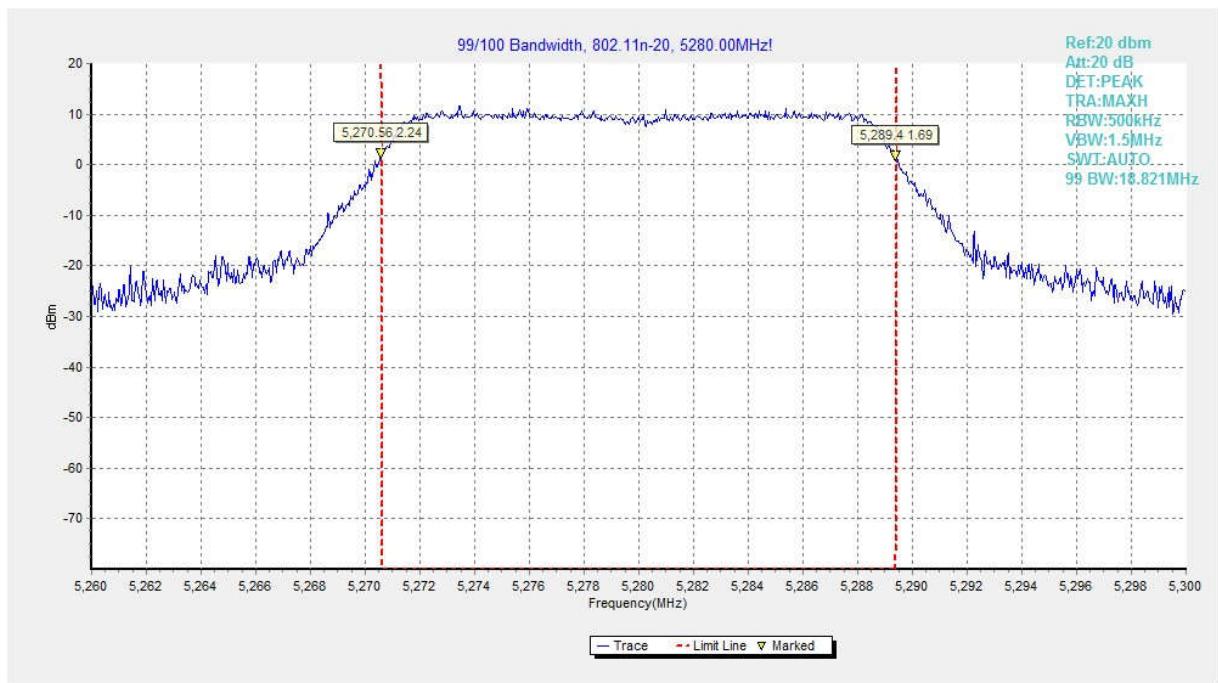


Fig. 31 99% Occupied Bandwidth (802.11n-HT20, 5280MHz)

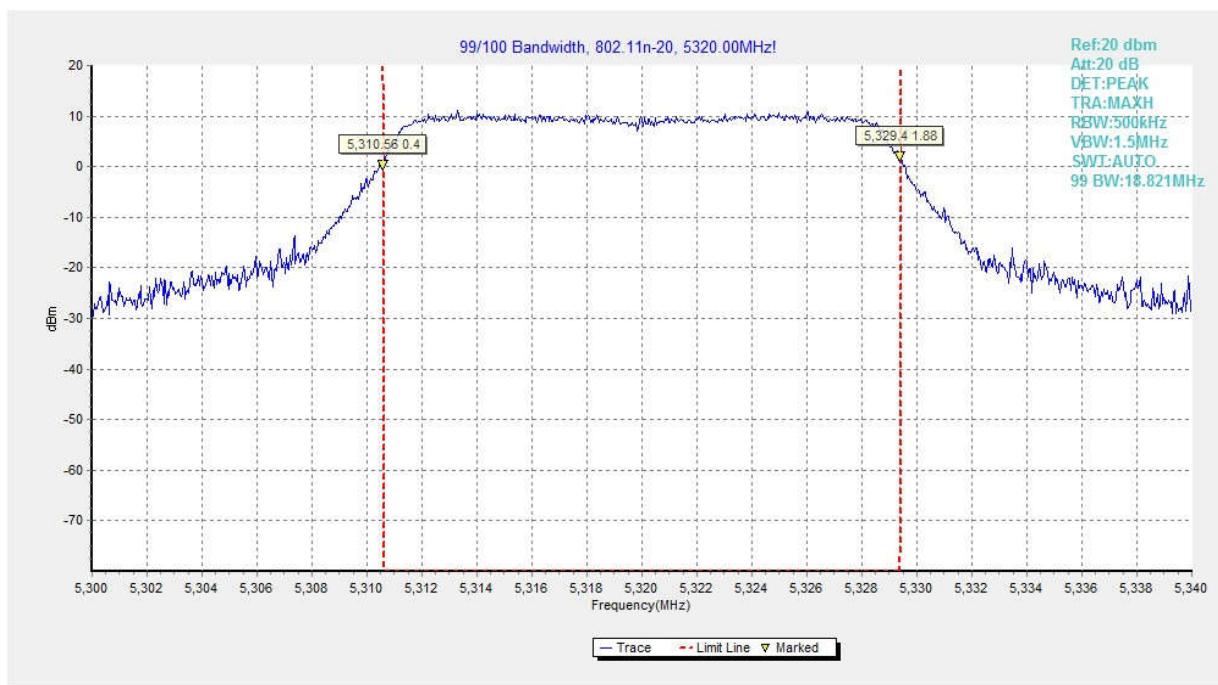


Fig. 32 99% Occupied Bandwidth (802.11n-HT20, 5320MHz)

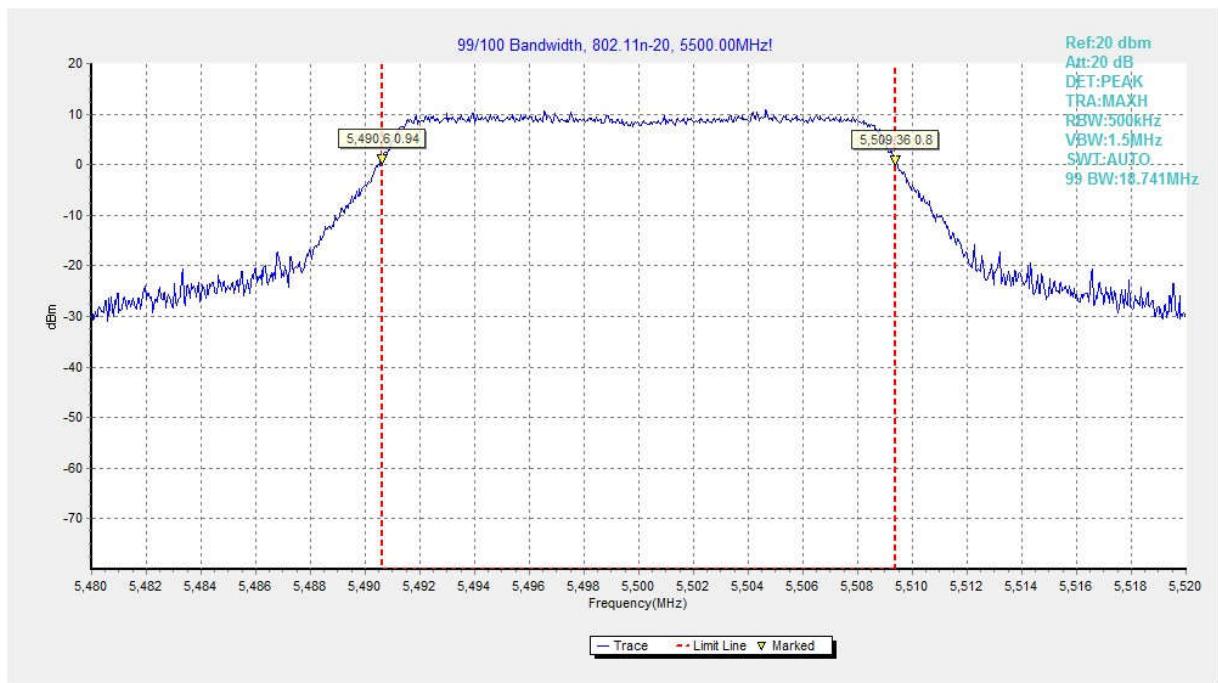


Fig. 33 99% Occupied Bandwidth (802. 11n-HT20, 5500MHz)



Fig. 34 99% Occupied Bandwidth (802. 11n-HT20, 5600MHz)

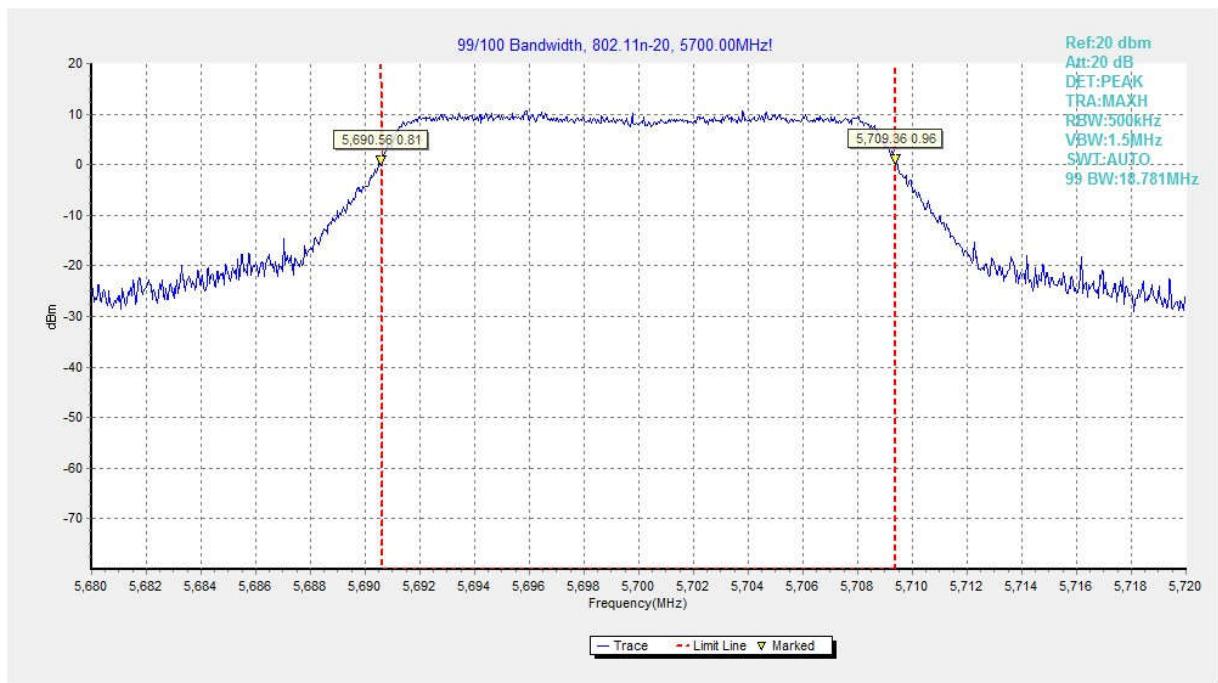


Fig. 35 99% Occupied Bandwidth (802.11n-HT20, 5700MHz)

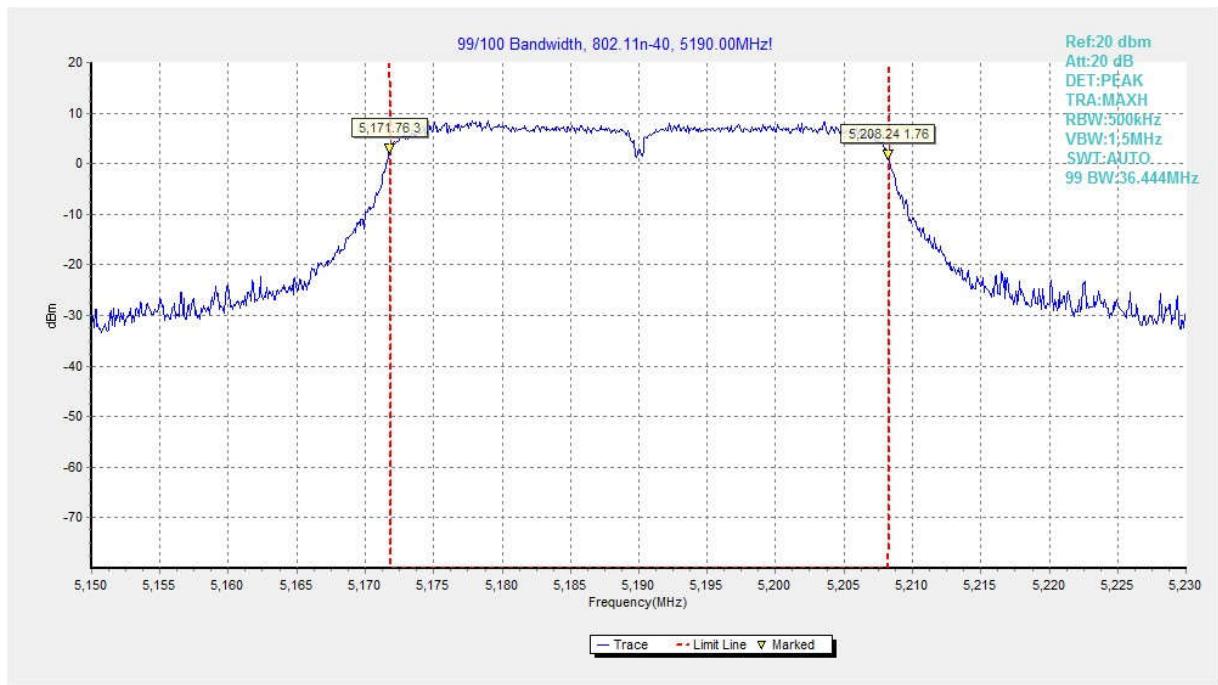


Fig. 36 99% Occupied Bandwidth (802.11n-HT40, 5190MHz)

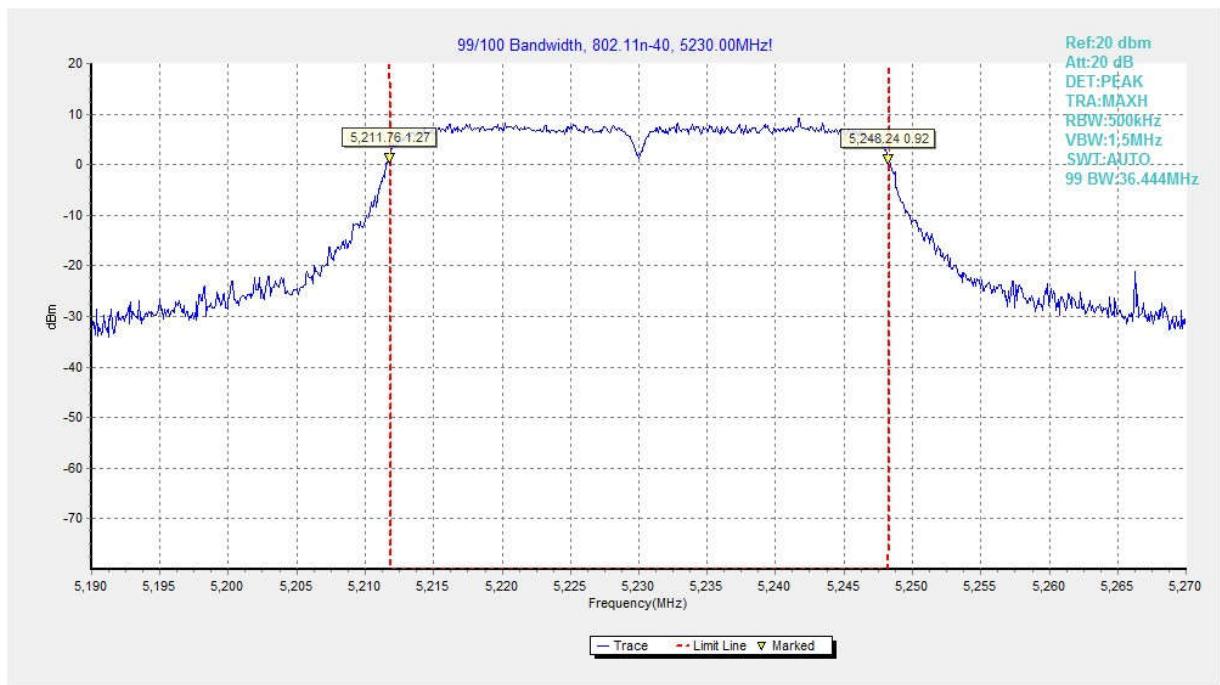


Fig. 37 99% Occupied Bandwidth (802.11n-HT40, 5230MHz)

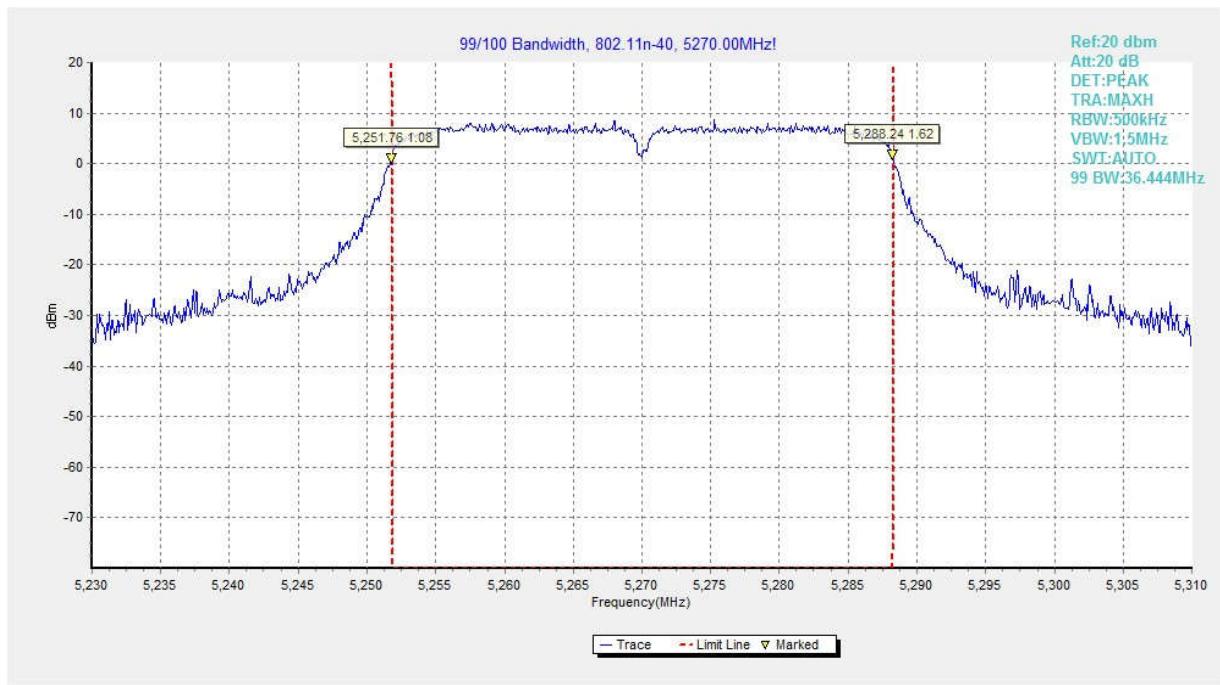


Fig. 38 99% Occupied Bandwidth (802.11n-HT40, 5270MHz)

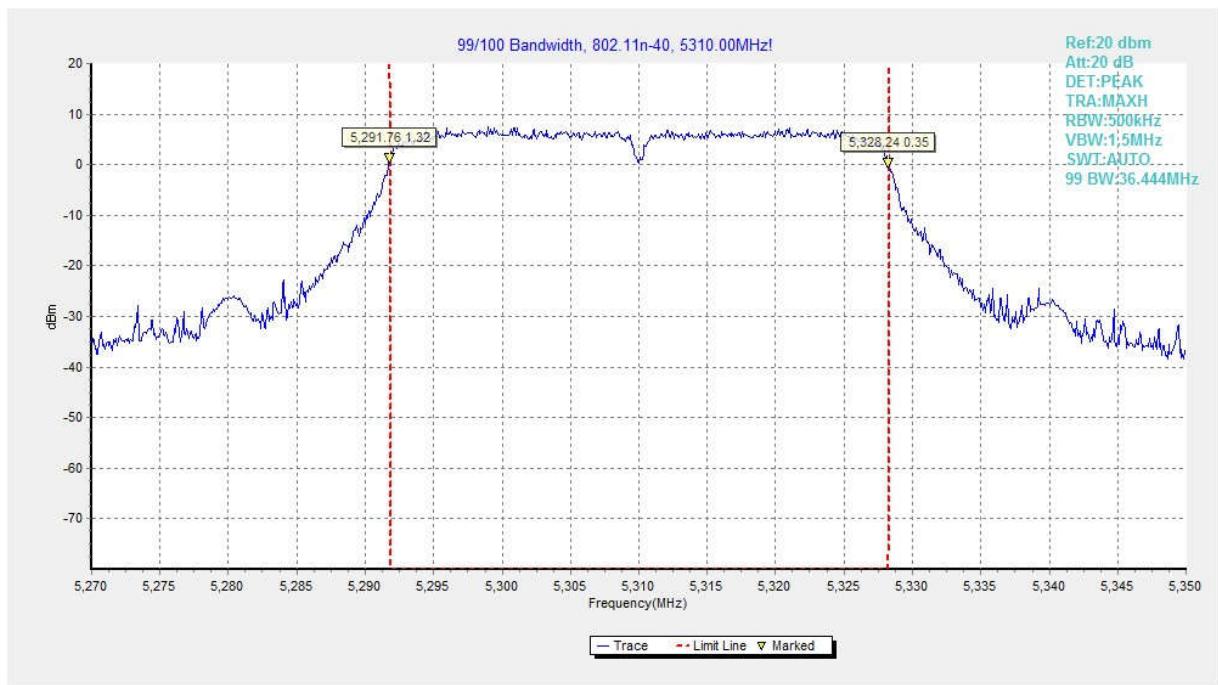


Fig. 39 99% Occupied Bandwidth (802.11n-HT40, 5310MHz)

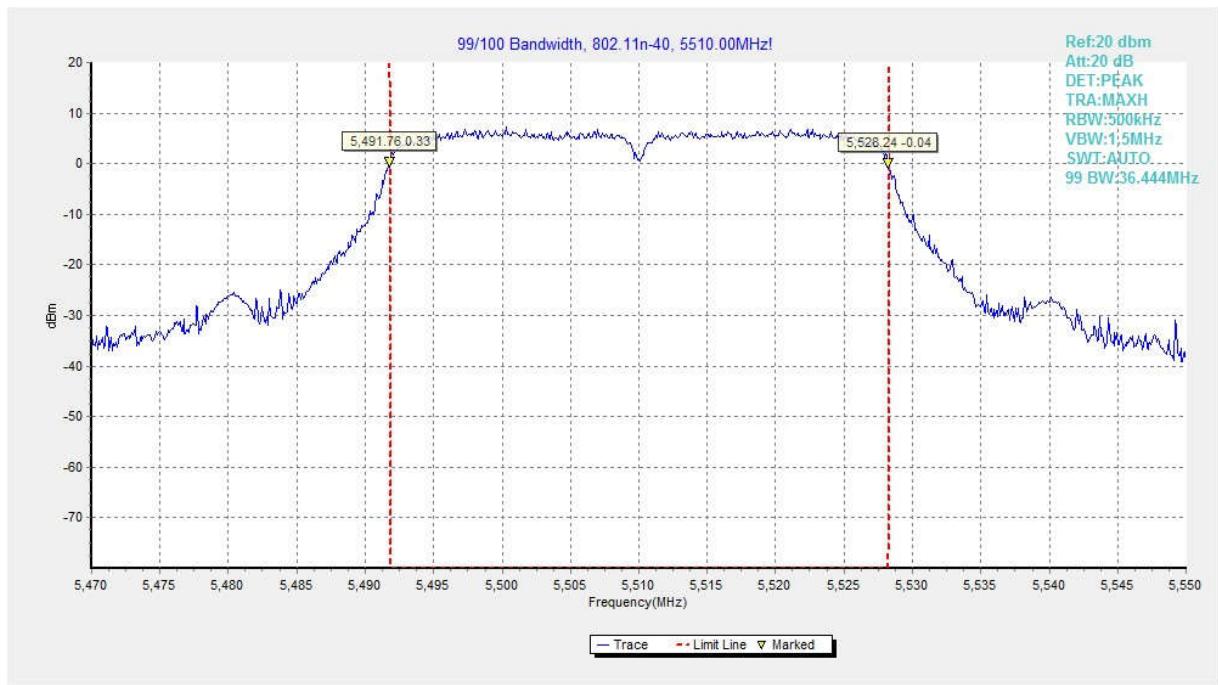


Fig. 40 99% Occupied Bandwidth (802.11n-HT40, 5510MHz)

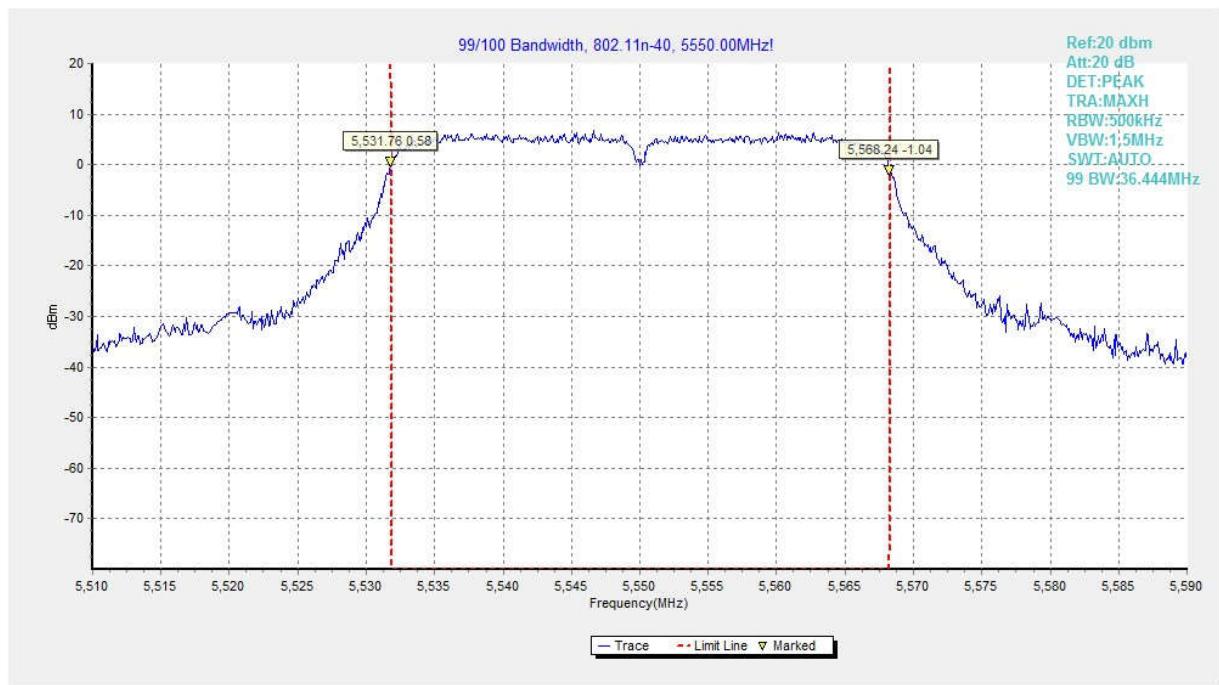


Fig. 41 99% Occupied Bandwidth (802. 11n-HT40, 5590MHz)

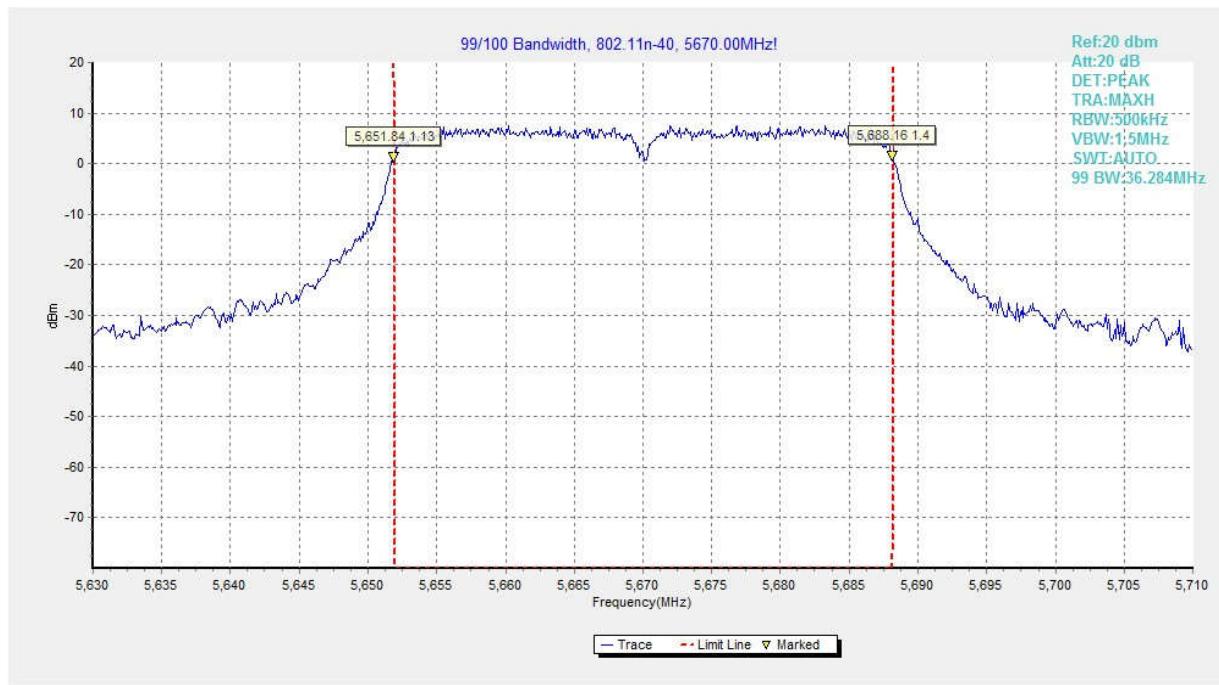


Fig. 42 99% Occupied Bandwidth (802. 11n-HT40, 5670MHz)

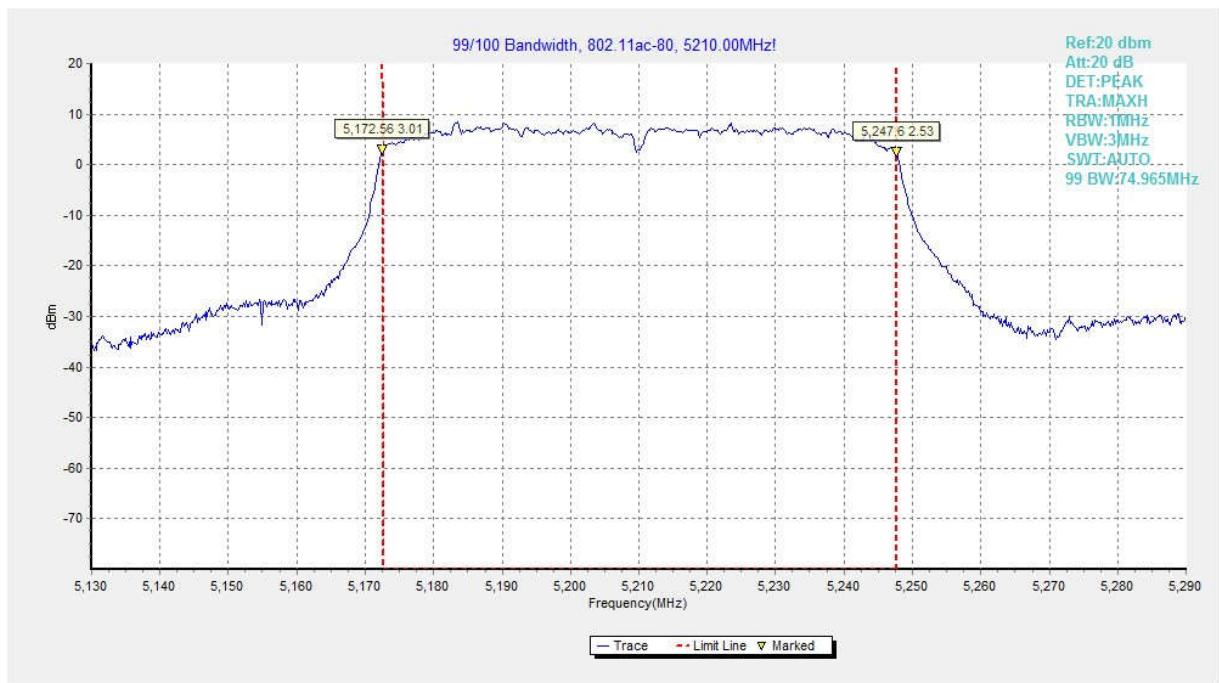


Fig. 43 99% Occupied Bandwidth (802. 11ac-VHT80, 5210MHz)

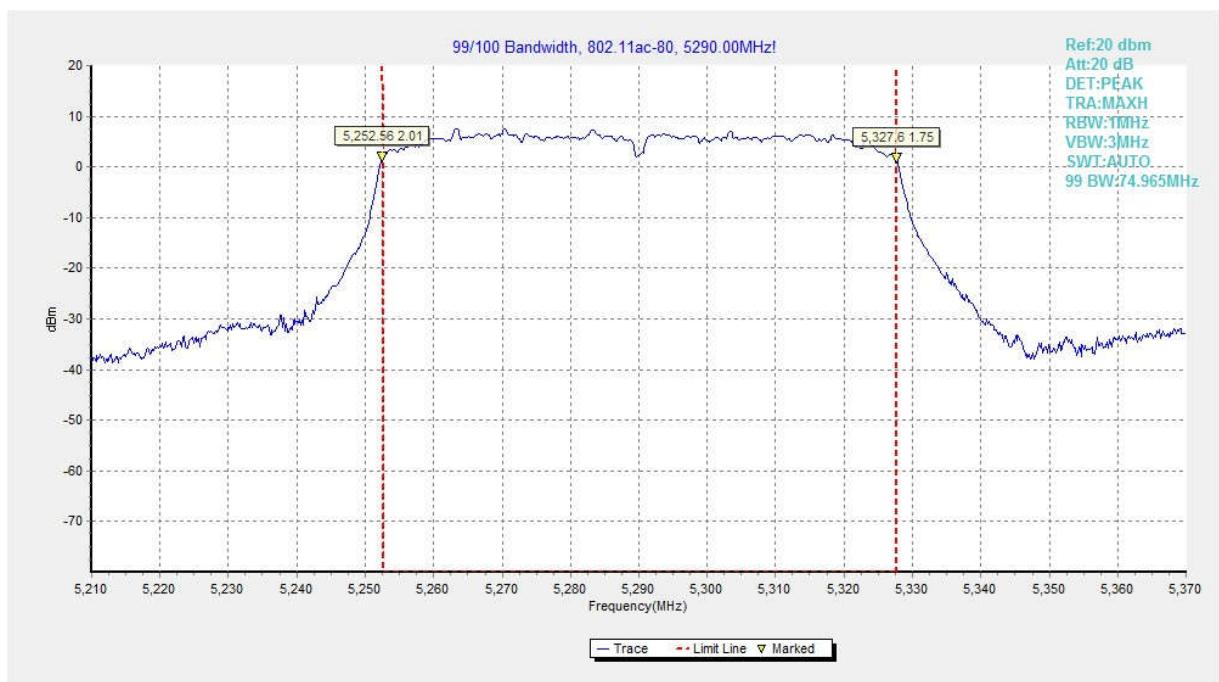


Fig. 44 99% Occupied Bandwidth (802. 11ac-VHT80, 5290MHz)

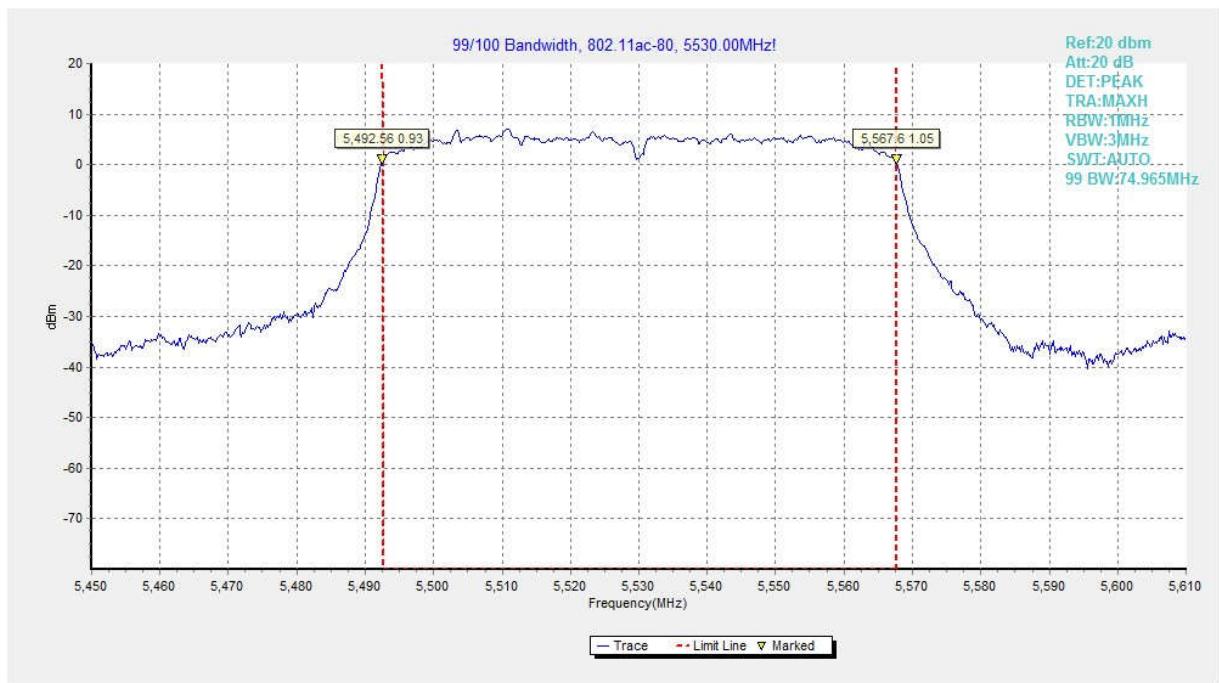


Fig. 45 99% Occupied Bandwidth (802. 11ac-VHT80, 5530MHz)

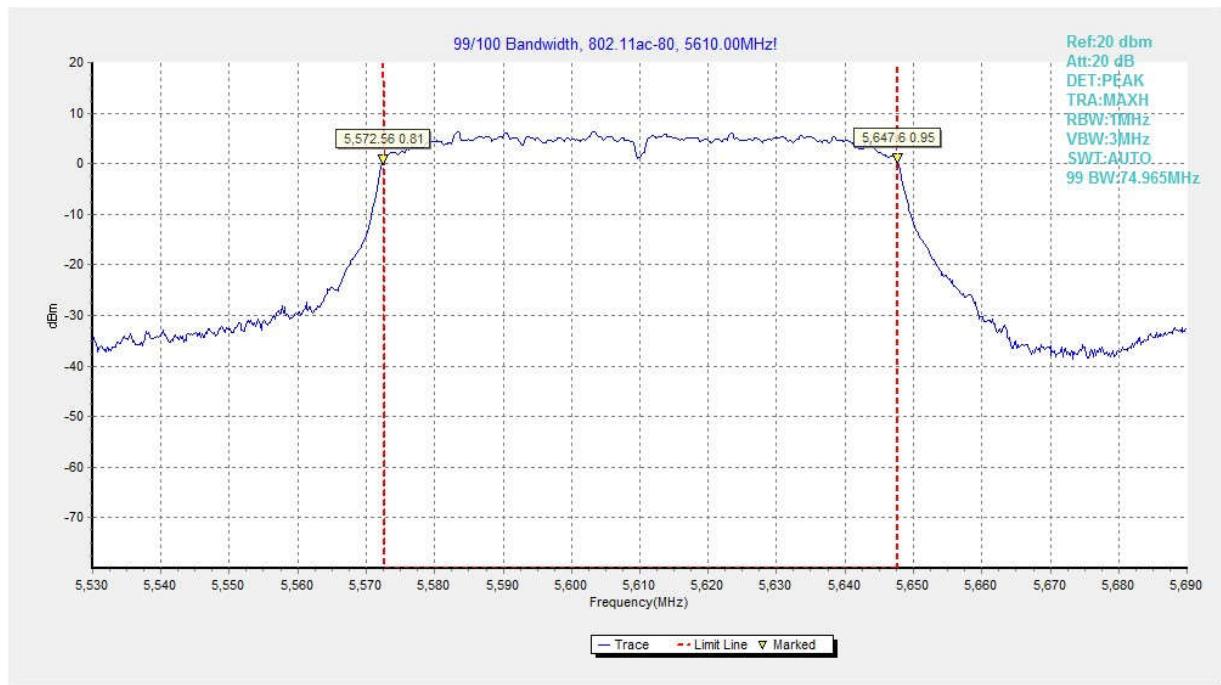


Fig. 46 99% Occupied Bandwidth (802. 11ac-VHT80, 5610MHz)

A.7. Band Edges Compliance

Measurement Limit:

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

The measurement is made according to KDB 789033

Measurement Result:

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

Conclusion: PASS

Test graphs as below:

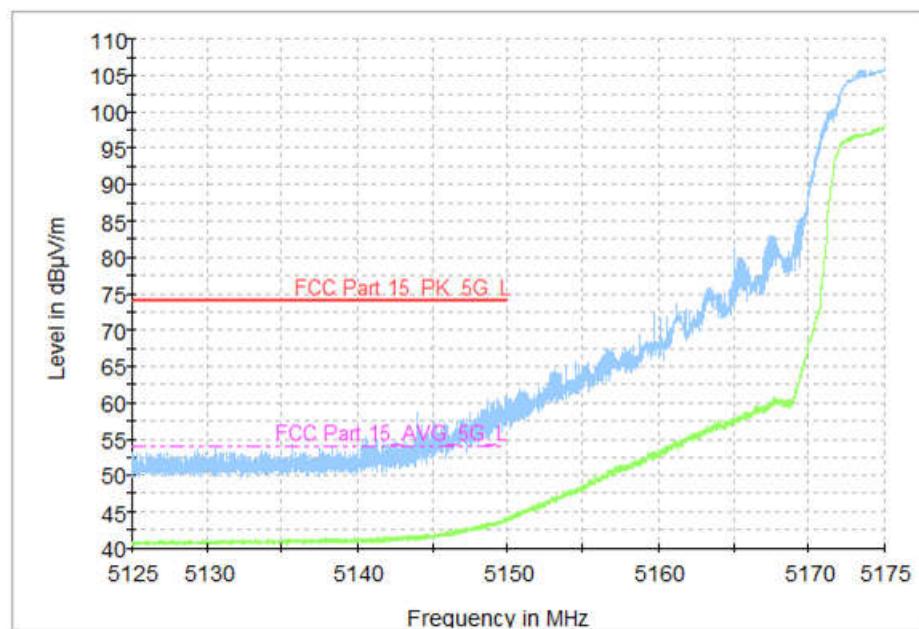


Fig. 47 Band Edges (802.11a, CH36 5180MHz)

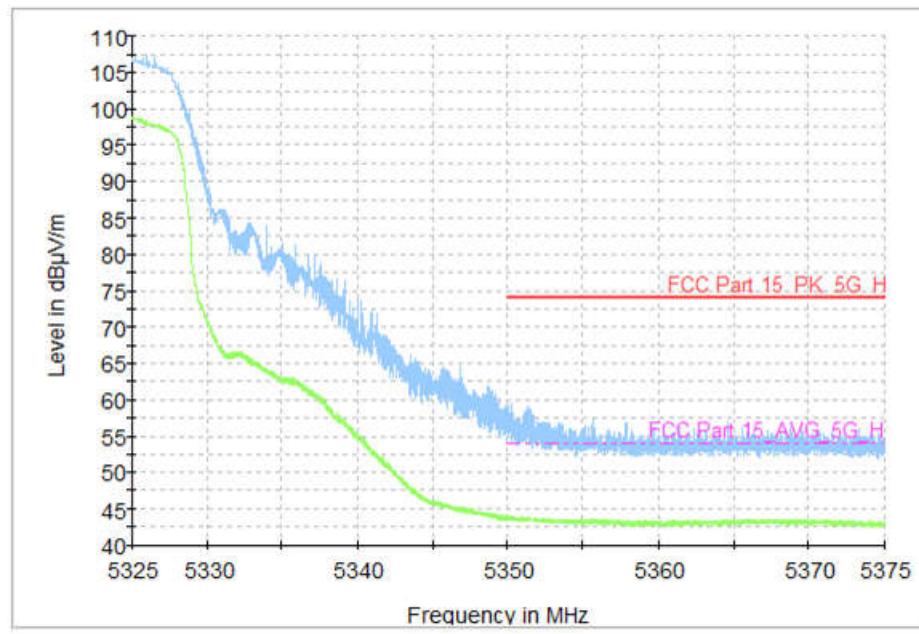


Fig. 48 Band Edges (802.11a, CH64 5320MHz)

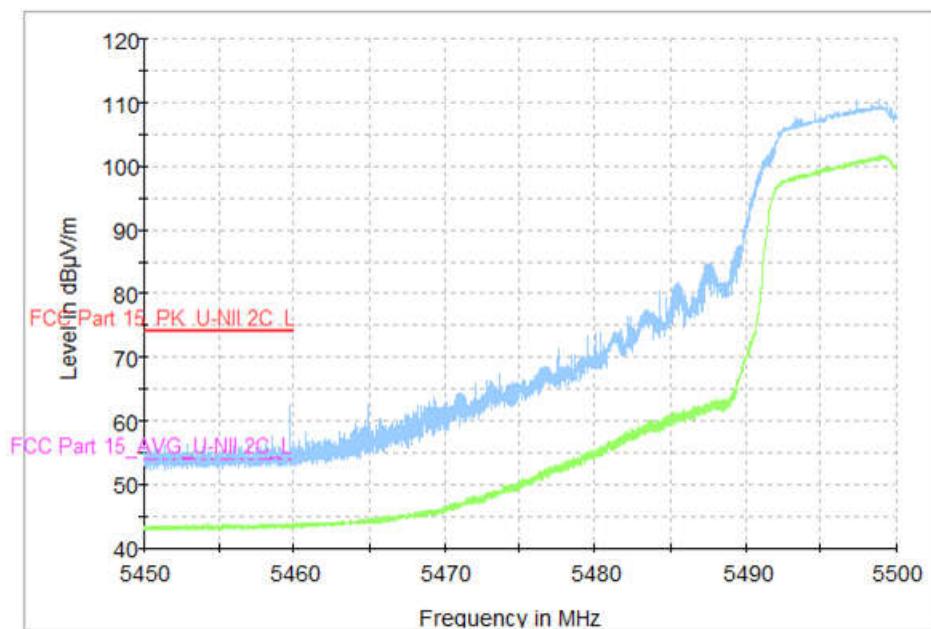


Fig. 49 Band Edges (802.11a, CH100 5500MHz)

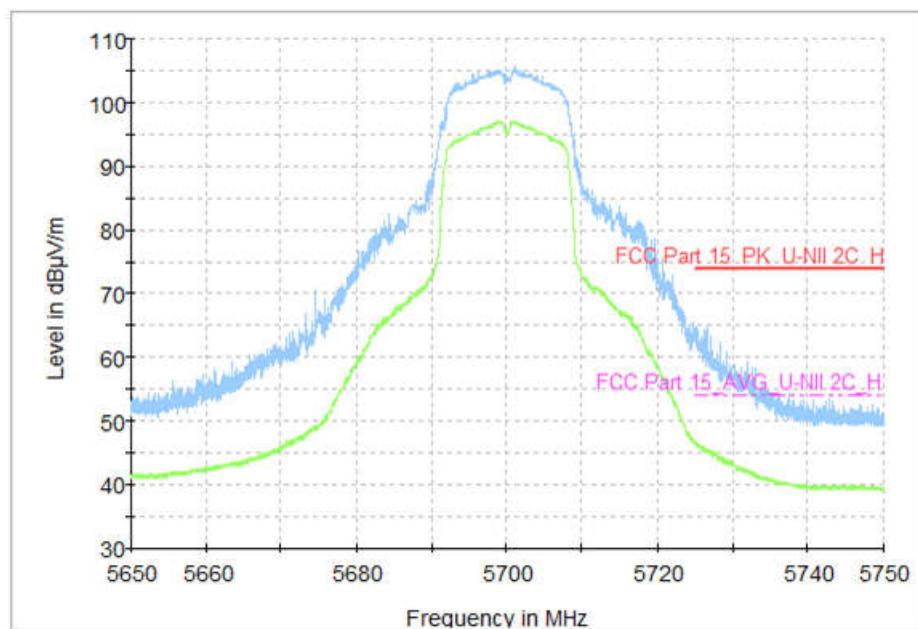


Fig. 50 Band Edges (802.11a, CH140 5700MHz)

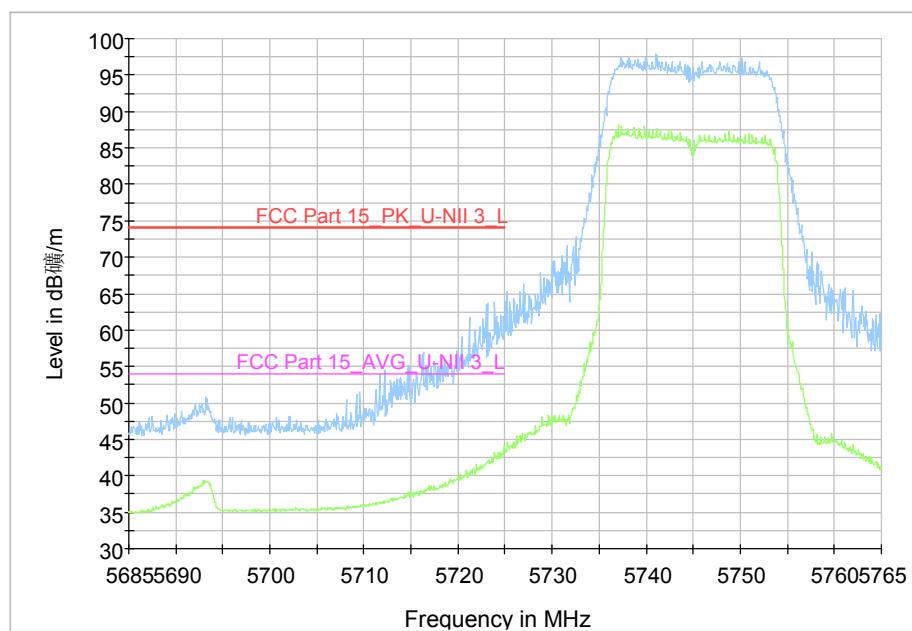


Fig. 51 Band Edges (802.11a, CH149 5745MHz)

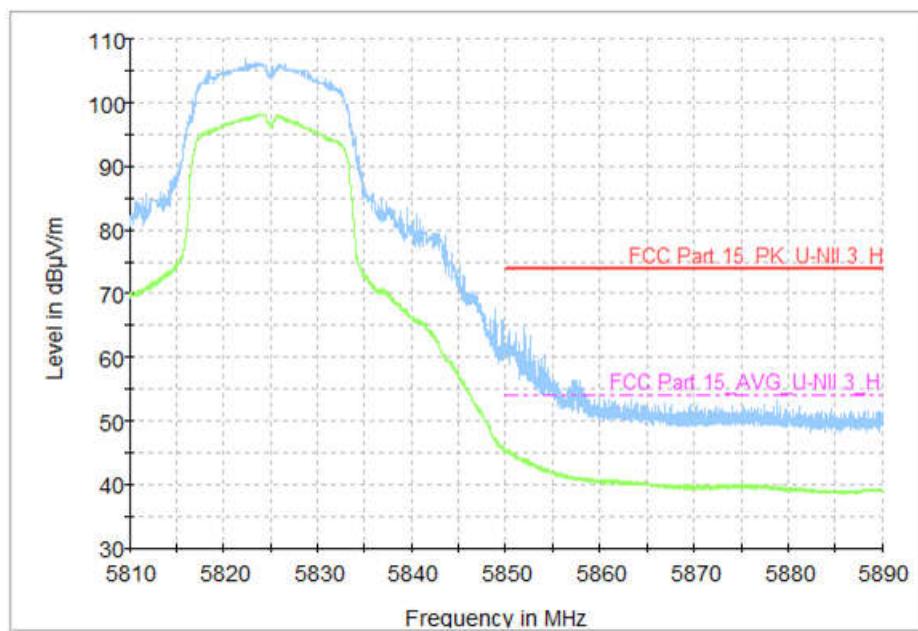


Fig. 52 Band Edges (802.11a, CH165 5825MHz)

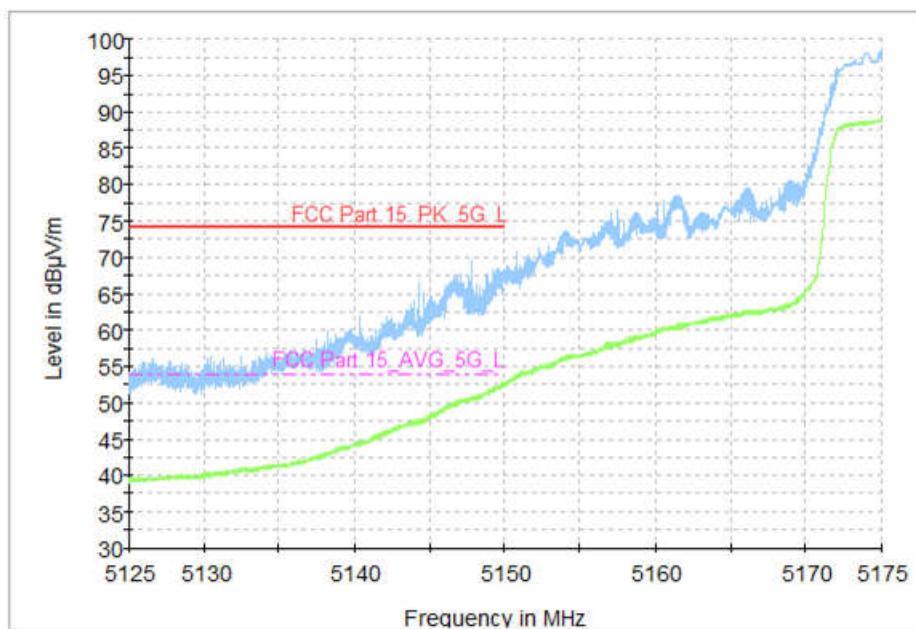


Fig. 53 Band Edges (802.11n-HT40, CH38 5190MHz)

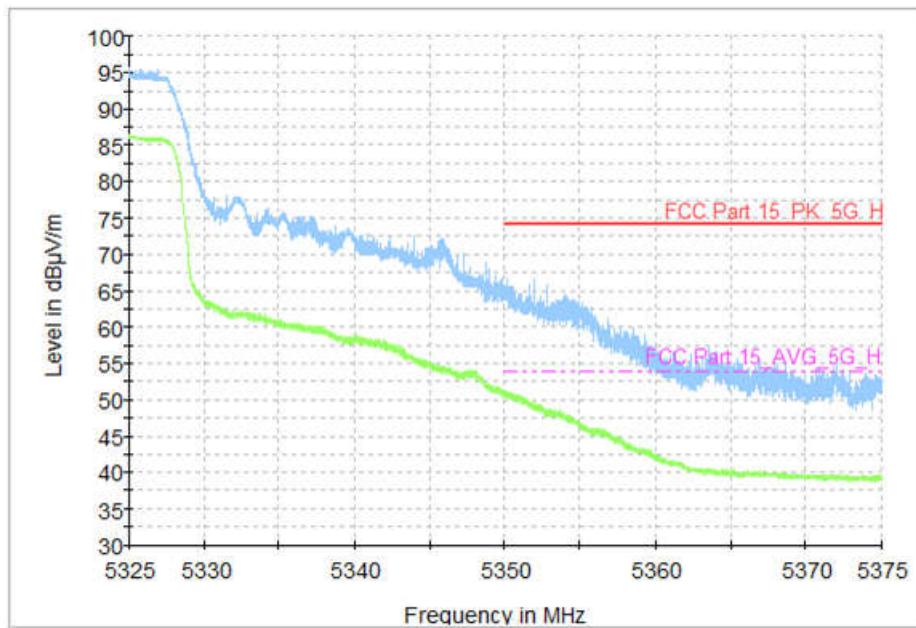


Fig. 54 Band Edges (802.11n-HT40, CH62 5310MHz)

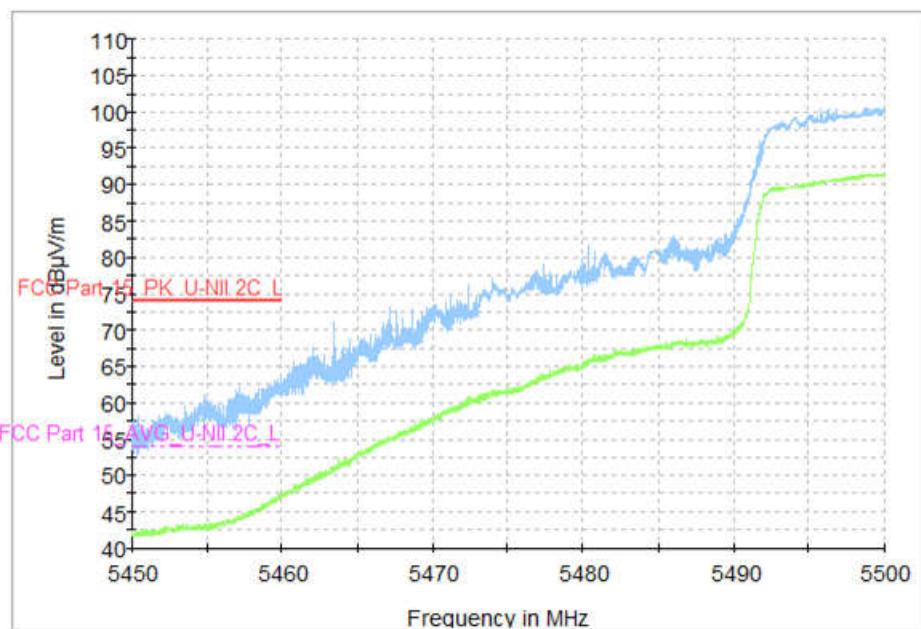


Fig. 55 Band Edges (802.11n-HT40, CH102 5510MHz)

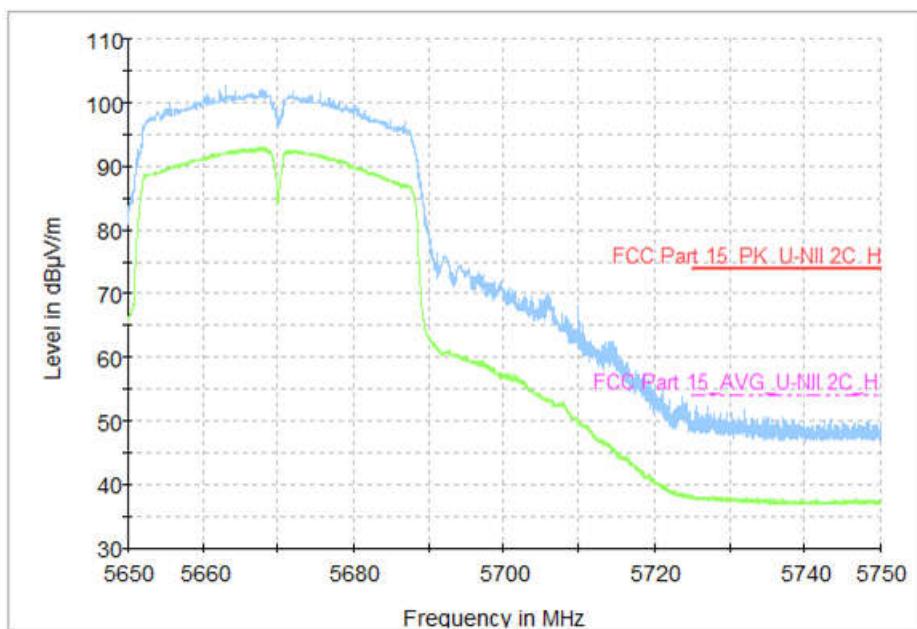


Fig. 56 Band Edges (802.11n-HT40, CH134 5670MHz)

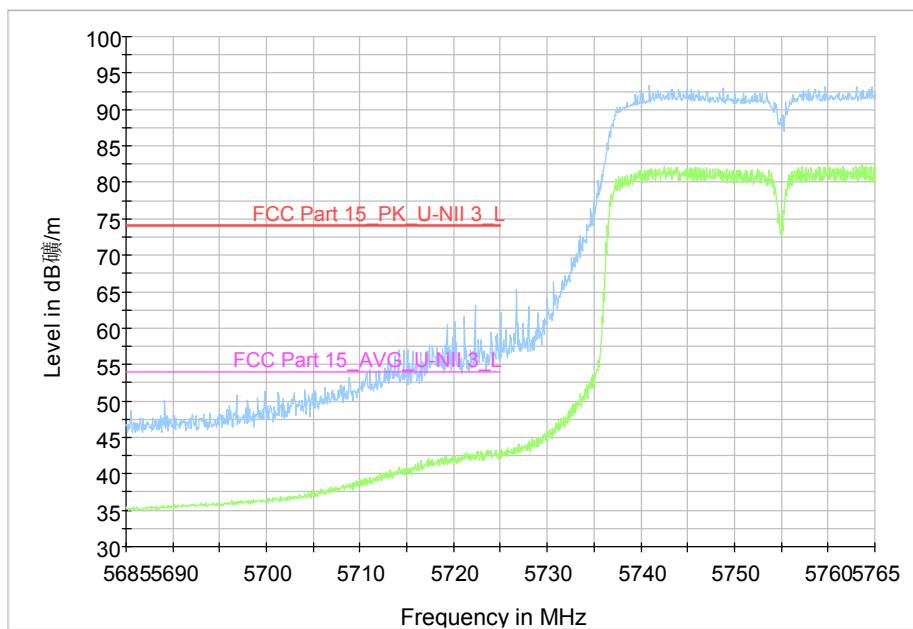


Fig. 57 Band Edges (802.11n-HT40, CH151 5755MHz)

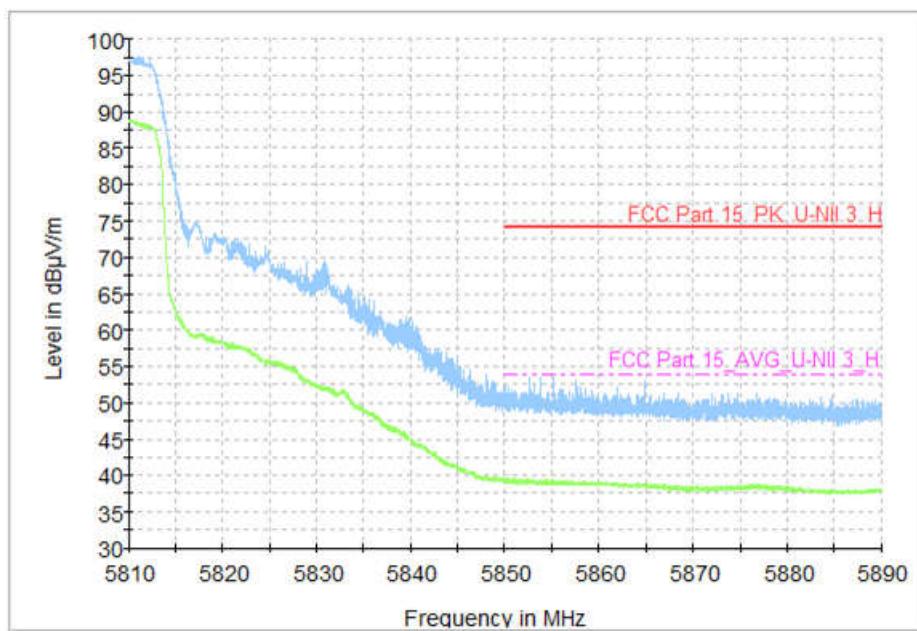


Fig. 58 Band Edges (802.11n-HT40, CH159 5795MHz)

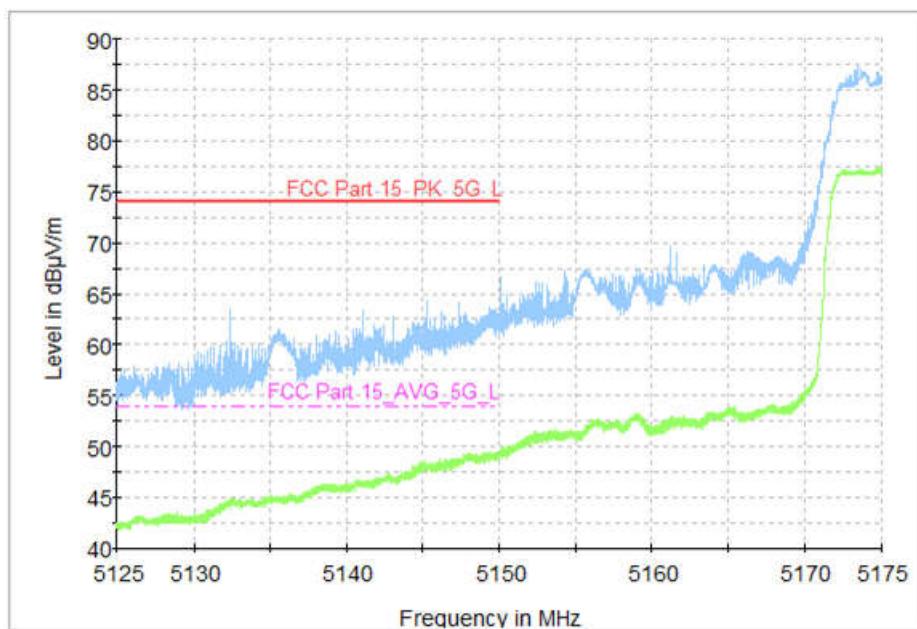


Fig. 59 Band Edges (802.11ac-VHT80, CH42 5210MHz)

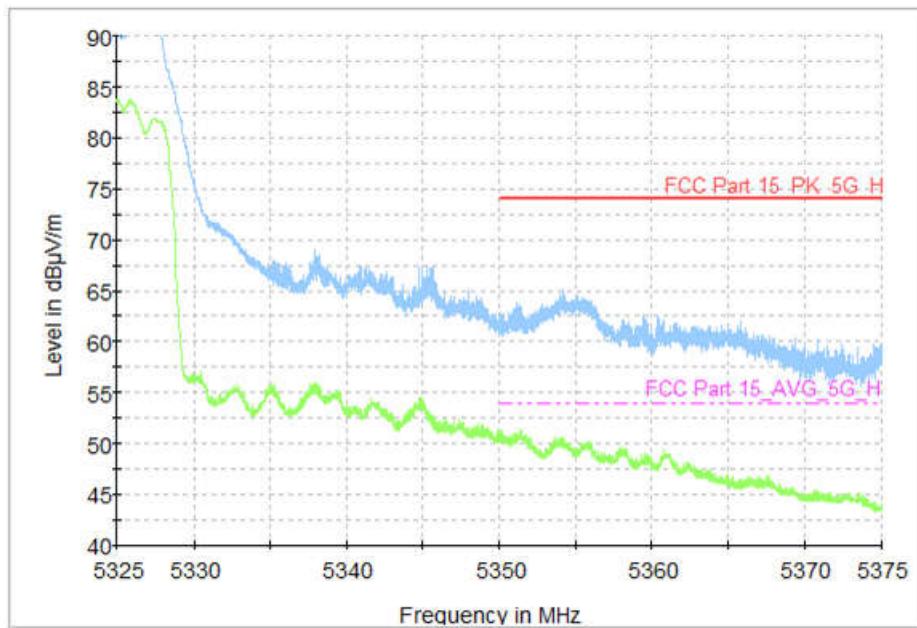


Fig. 60 Band Edges (802.11ac-VHT80, CH58 5290MHz)

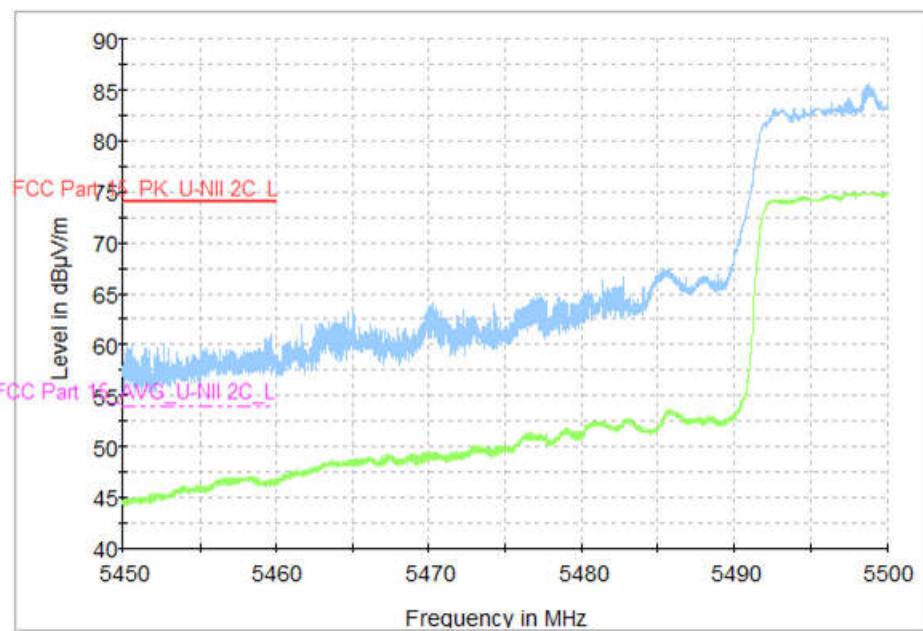


Fig. 61 Band Edges (802.11ac-VHT80, CH106 5530MHz)

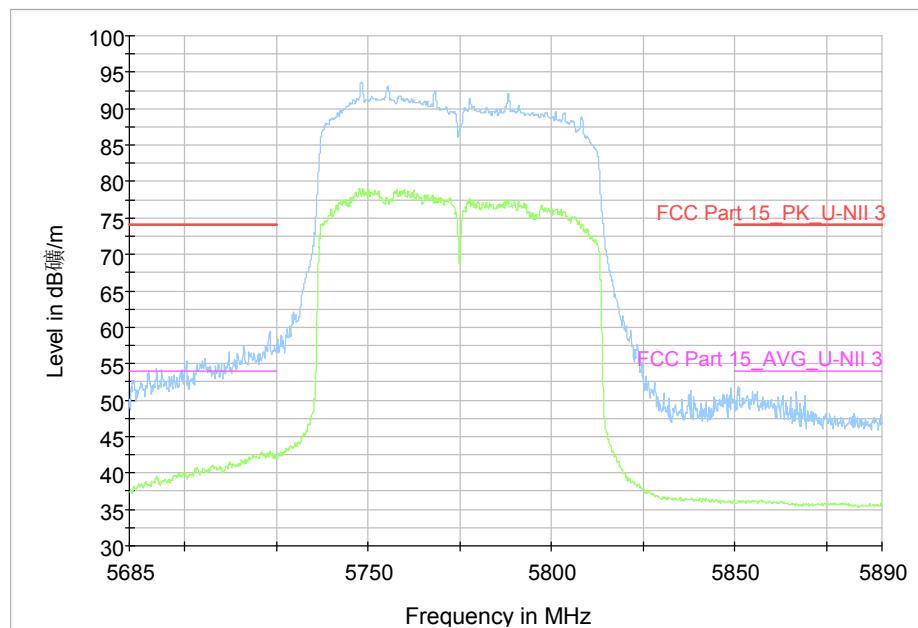


Fig. 62 Band Edges (802.11ac-VHT80, 5775MHz)

A.8. Transmitter Spurious Emission

Measurement Limit:

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

The measurement is made according to KDB 789033.

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Limit in restricted band:

Frequency of emission (MHz)	Field strength (dB μ V/m)	Measurement distance (m)
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

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

Measurement Result:

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11a	5180MHz(Ch36)	1 GHz ~18 GHz	Fig.63	P
	5200MHz(Ch40)	1 GHz ~18 GHz	Fig.64	P
	5240MHz(Ch48)	1 GHz ~18 GHz	Fig.65	P
	5260MHz(Ch52)	1 GHz ~18 GHz	Fig.66	P
	5280MHz(Ch56)	1 GHz ~18 GHz	Fig.67	P
	5320MHz(Ch64)	1 GHz ~18 GHz	Fig.68	P
	5500MHz(Ch100)	1 GHz ~18 GHz	Fig.69	P
	5580MHz(Ch116)	1 GHz ~18 GHz	Fig.70	P
	5700MHz(Ch140)	1 GHz ~18 GHz	Fig.71	P
	5745MHz(Ch149)	1 GHz ~18 GHz	Fig.72	P
	5785MHz(Ch157)	1 GHz ~18 GHz	Fig.73	P
802.11n HT40	5825MHz(Ch165)	1 GHz ~18 GHz	Fig.74	P
	5190MHz(Ch38)	1 GHz ~18 GHz	Fig.75	P
	5230MHz(Ch46)	1 GHz ~18 GHz	Fig.76	P
	5270MHz(Ch54)	1 GHz ~18 GHz	Fig.77	P
	5310MHz(Ch62)	1 GHz ~18 GHz	Fig.78	P
	5510MHz(Ch102)	1 GHz ~18 GHz	Fig.79	P
	5550MHz(Ch110)	1 GHz ~18 GHz	Fig.80	P
	5670MHz(Ch134)	1 GHz ~18 GHz	Fig.81	P
	5755MHz(Ch151)	1 GHz ~18 GHz	Fig.82	P
	5795MHz(Ch159)	1 GHz ~18 GHz	Fig.83	P

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

Conclusion: PASS

Test graphs as below:

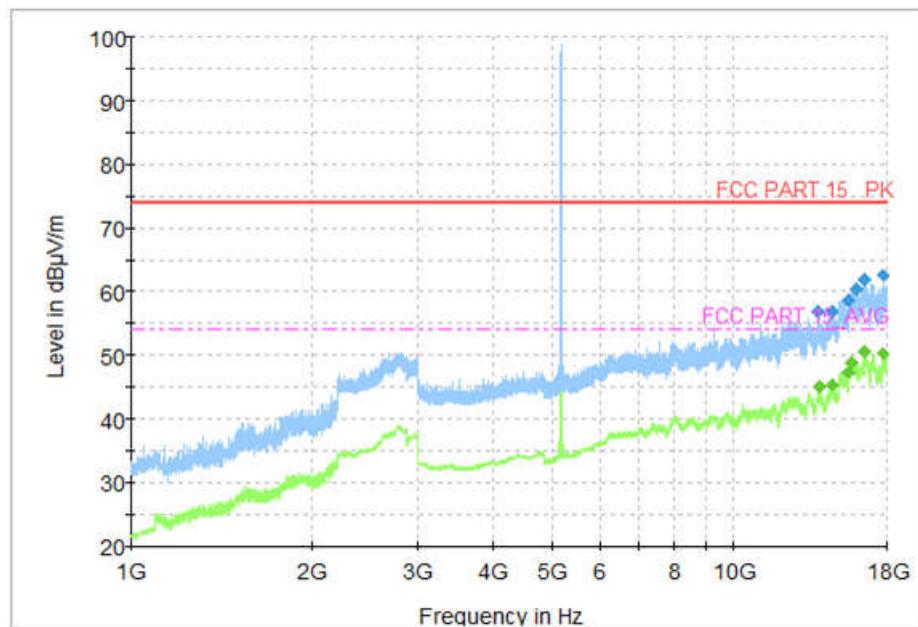


Fig. 63 Transmitter Spurious Emission (802.11n-HT20, 5180MHz)

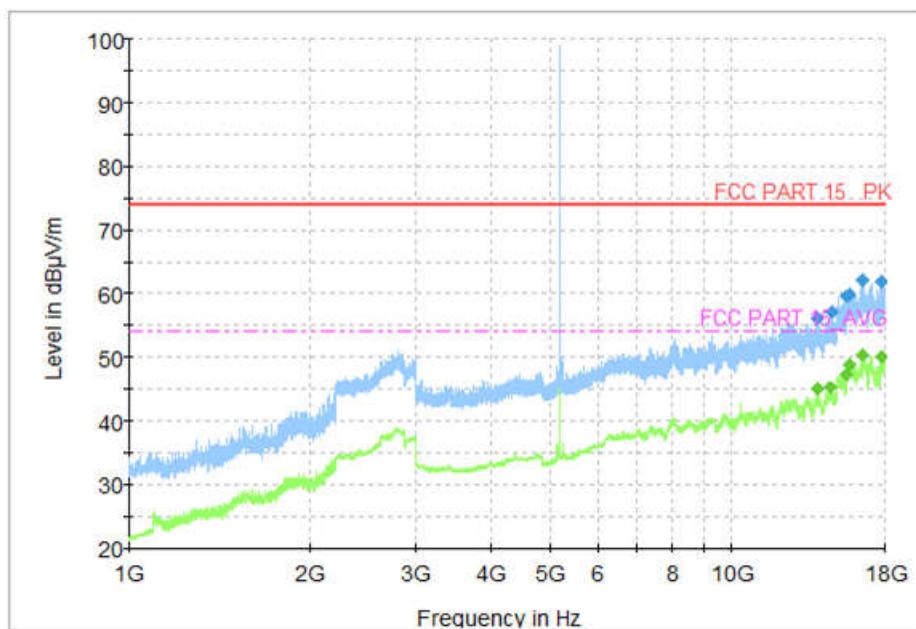


Fig. 64 Transmitter Spurious Emission (802.11n-HT20, 5200MHz)

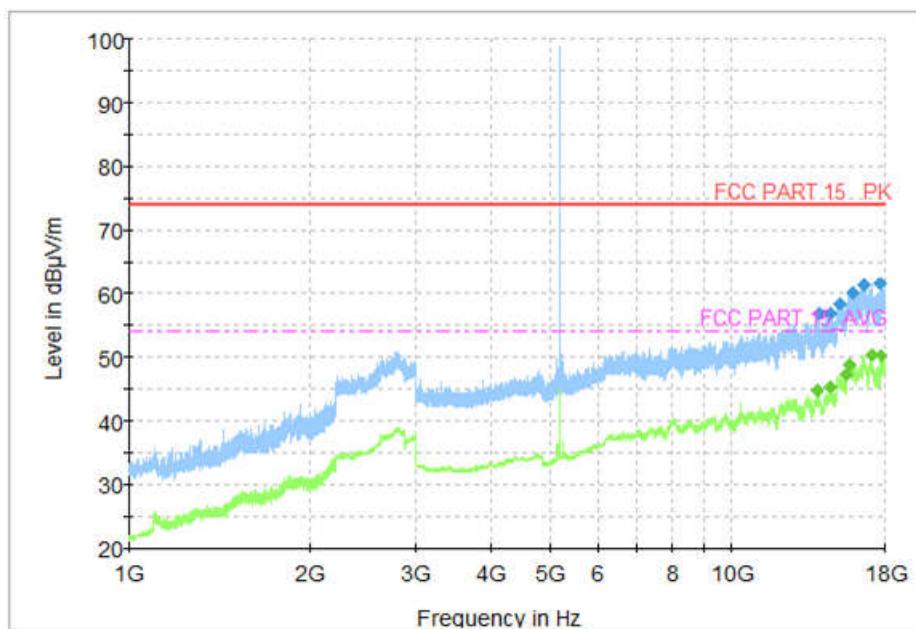


Fig. 65 Transmitter Spurious Emission (802.11n-HT20, 5240MHz)

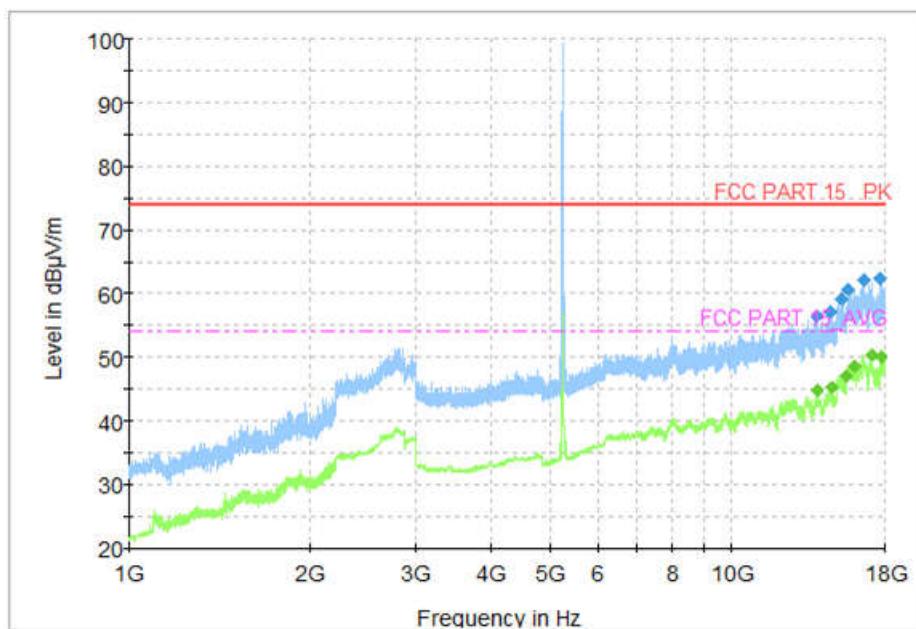


Fig. 66 Transmitter Spurious Emission (802.11n-HT20, 5260MHz)

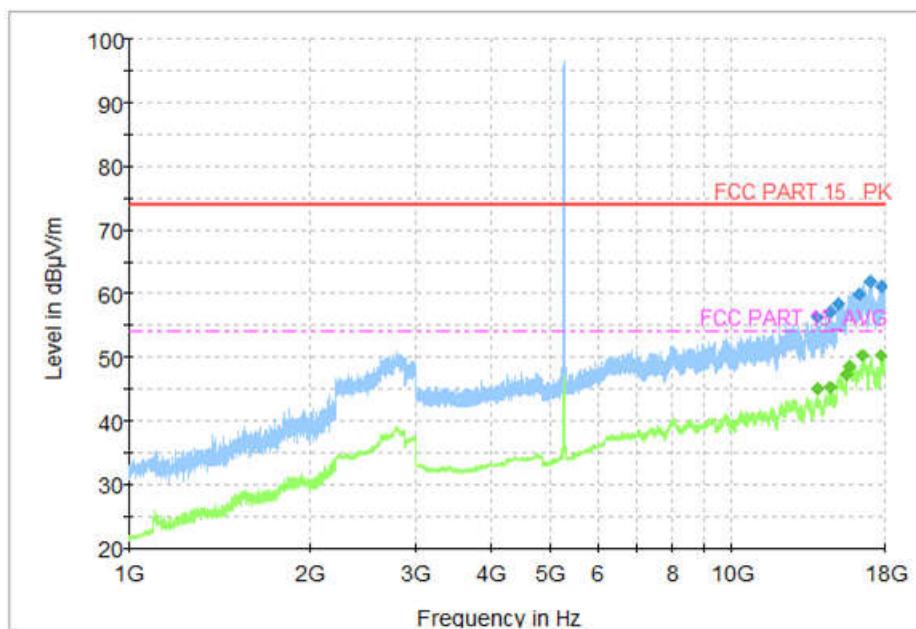


Fig. 67 Transmitter Spurious Emission (802.11n-HT20, 5280MHz)

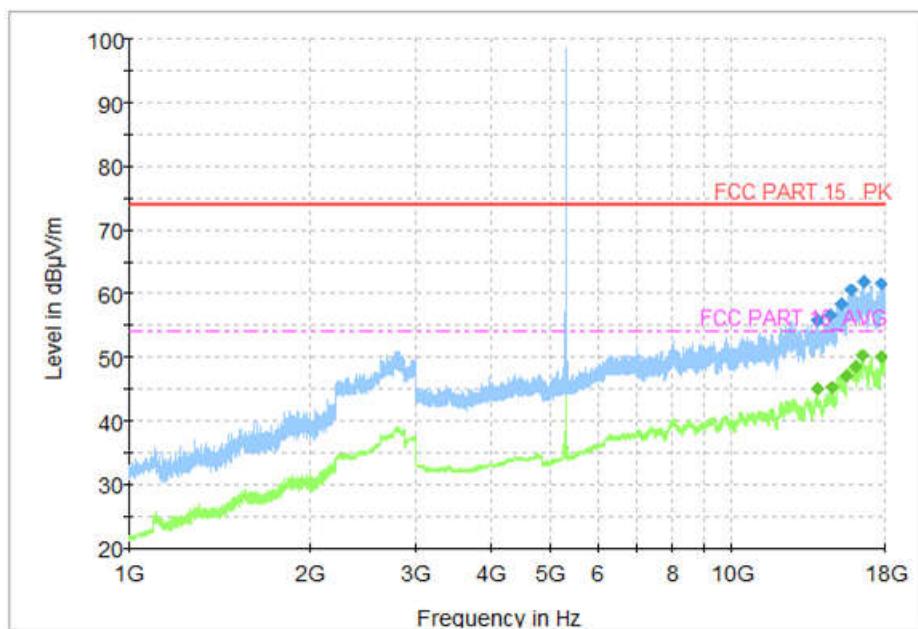


Fig. 68 Transmitter Spurious Emission (802.11n-HT20, 5320MHz)

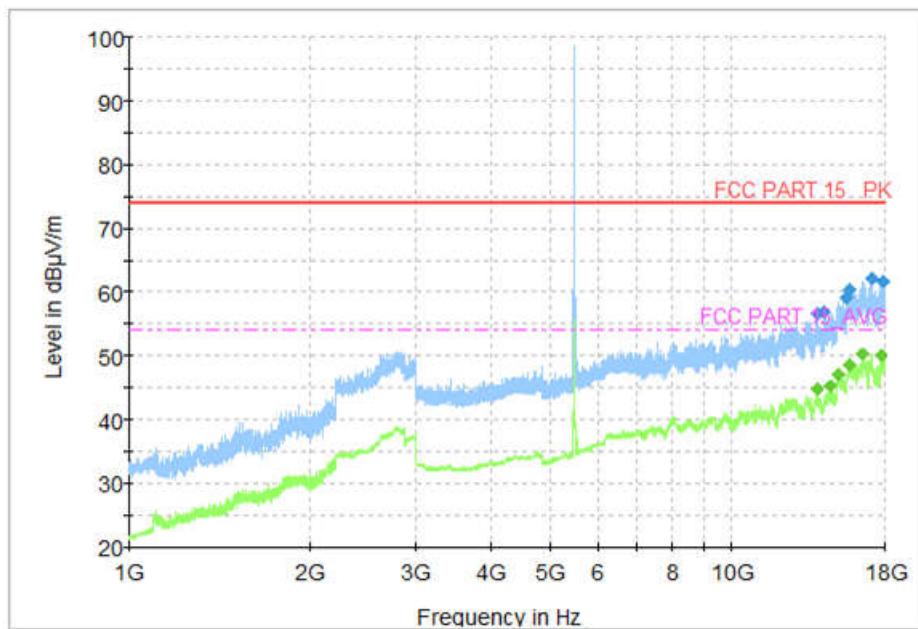


Fig. 69 Transmitter Spurious Emission (802.11n-HT20, 5500MHz)

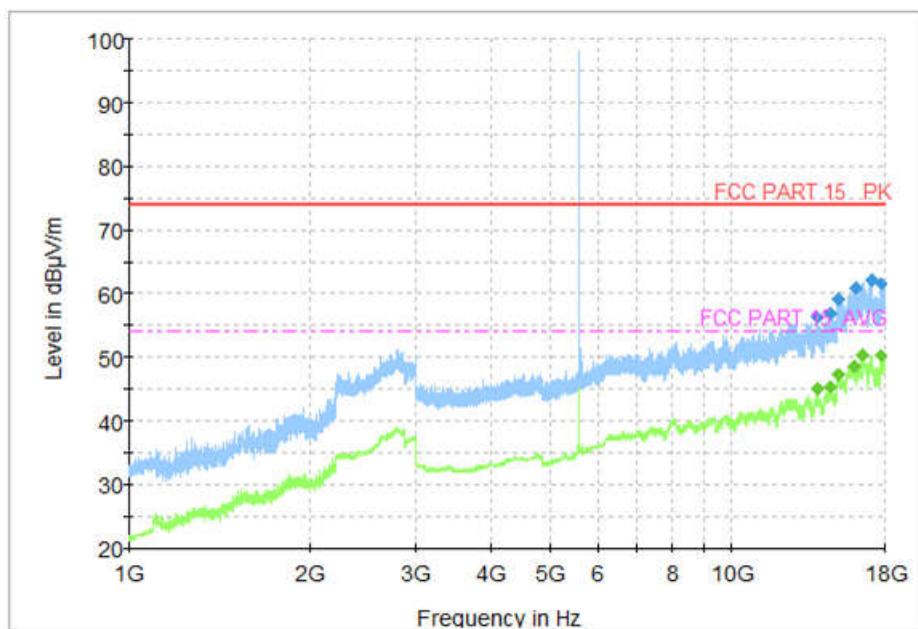


Fig. 70 Transmitter Spurious Emission (802. 11n-HT20, 5600MHz)

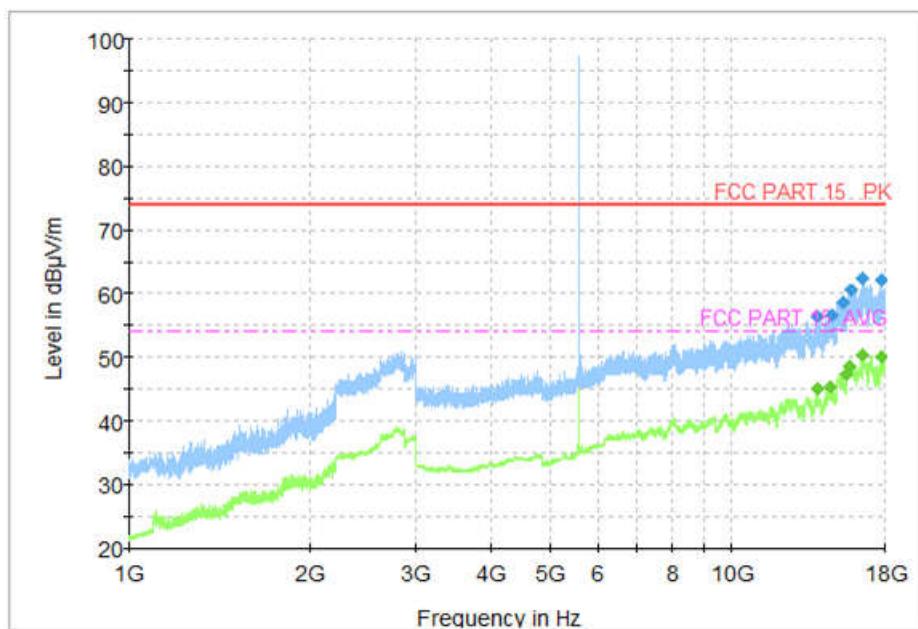


Fig. 71 Transmitter Spurious Emission (802. 11n-HT20, 5700MHz)

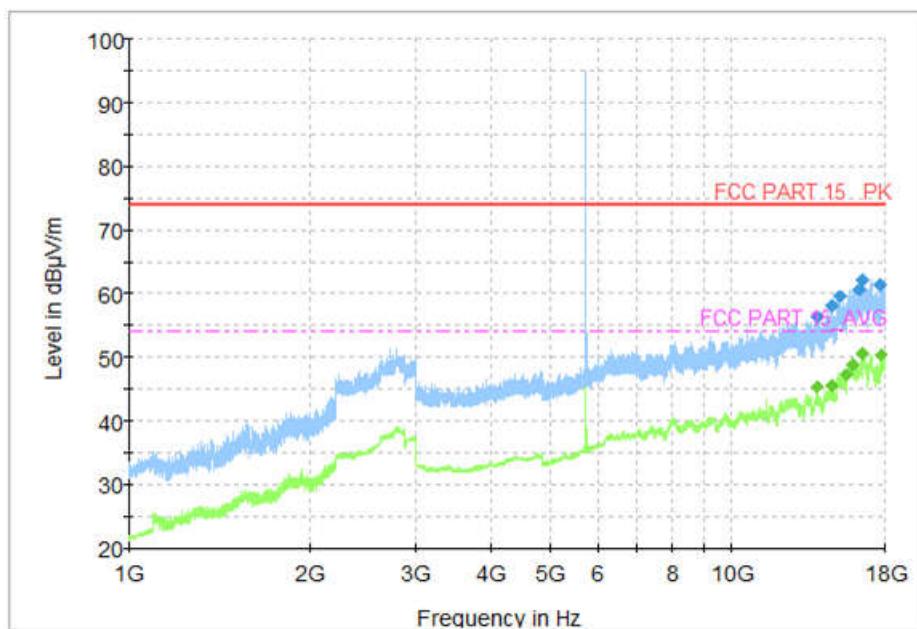


Fig. 72 Transmitter Spurious Emission (802.11n-HT20, 5745MHz)

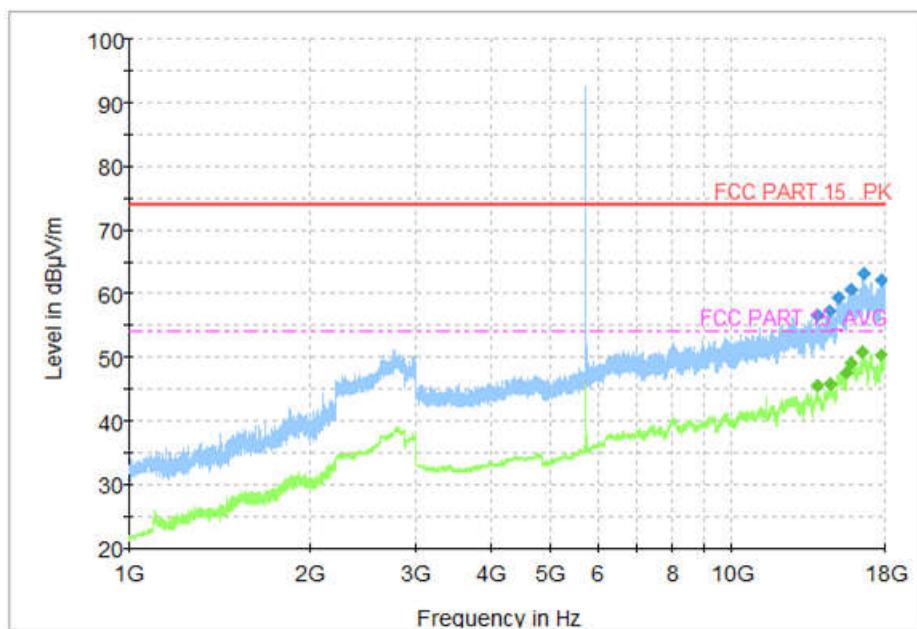


Fig. 73 Transmitter Spurious Emission (802.11n-HT20, 5785MHz)

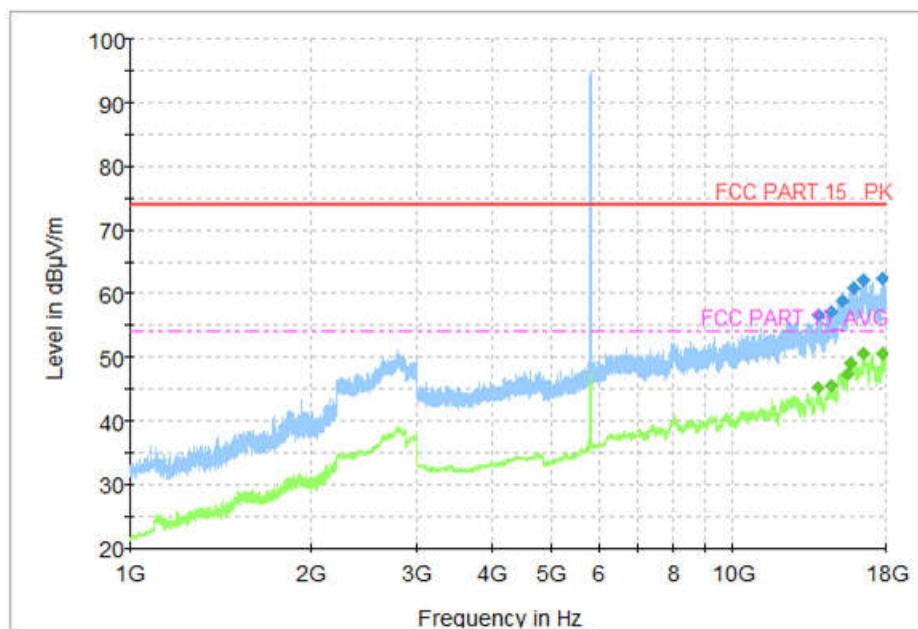


Fig. 74 Transmitter Spurious Emission (802.11n-HT20, 5825MHz)

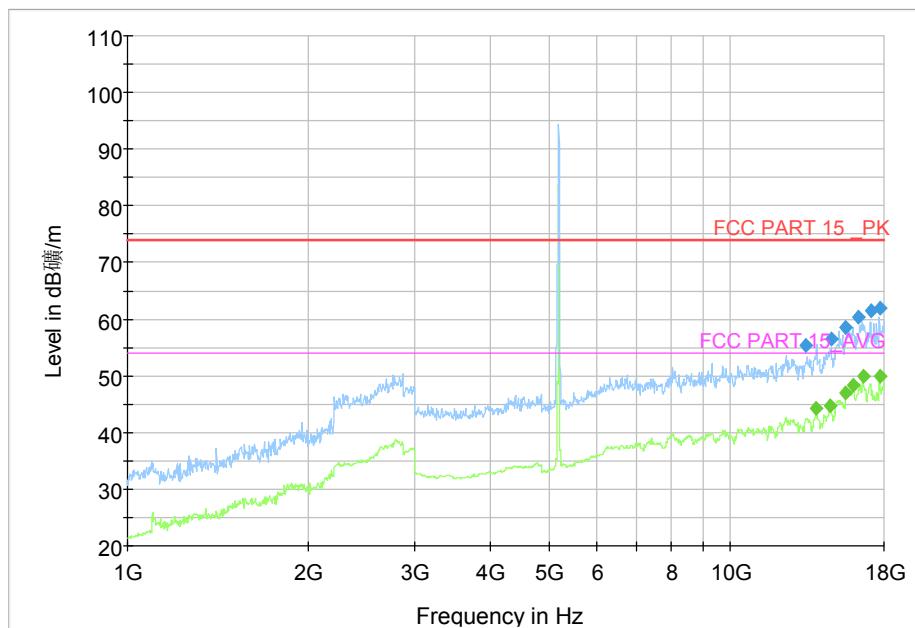


Fig. 75 Transmitter Spurious Emission (802.11n-HT40, 5190MHz)

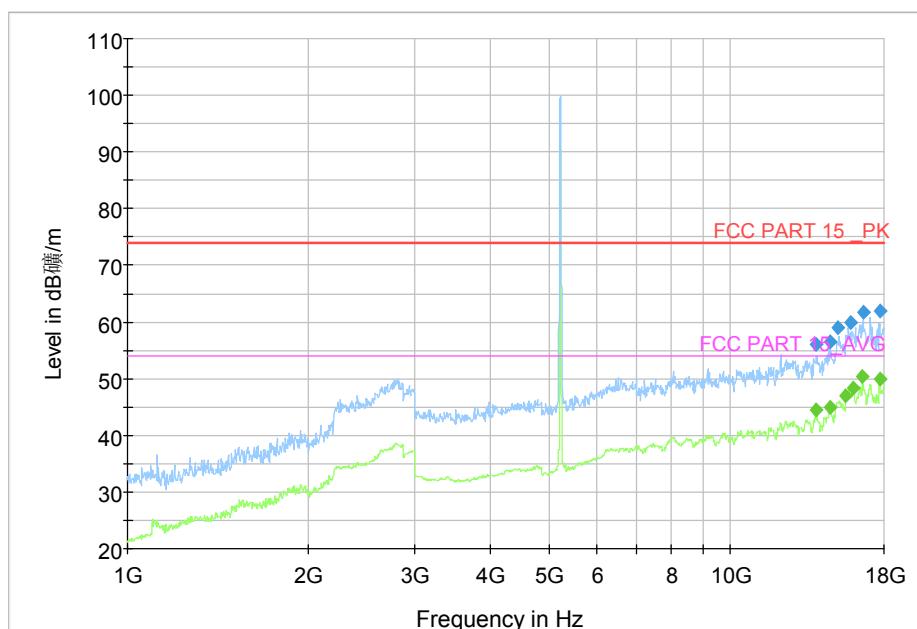


Fig. 76 Transmitter Spurious Emission (802.11n-HT40, 5230MHz)

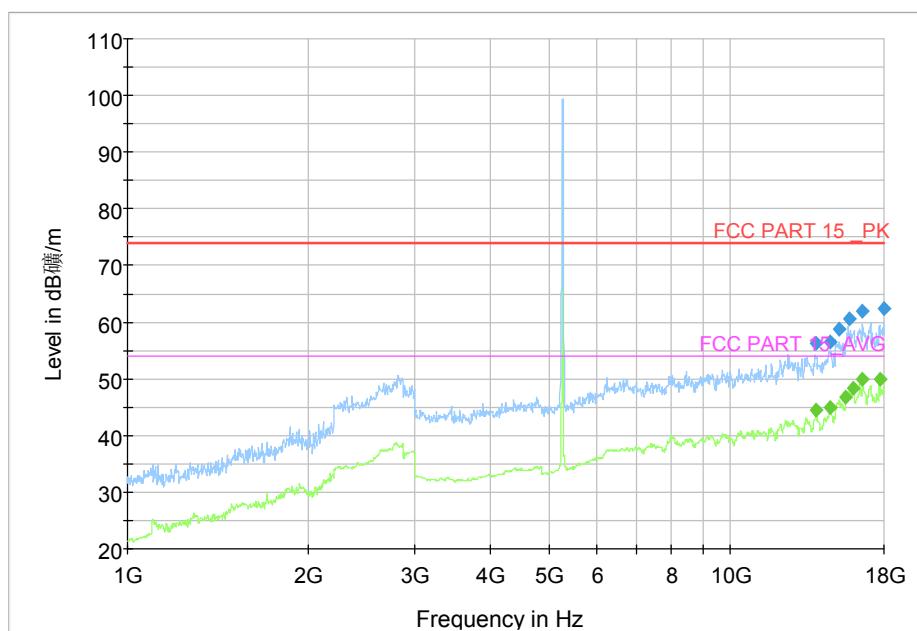


Fig. 77 Transmitter Spurious Emission (802.11n-HT40, 5270MHz)

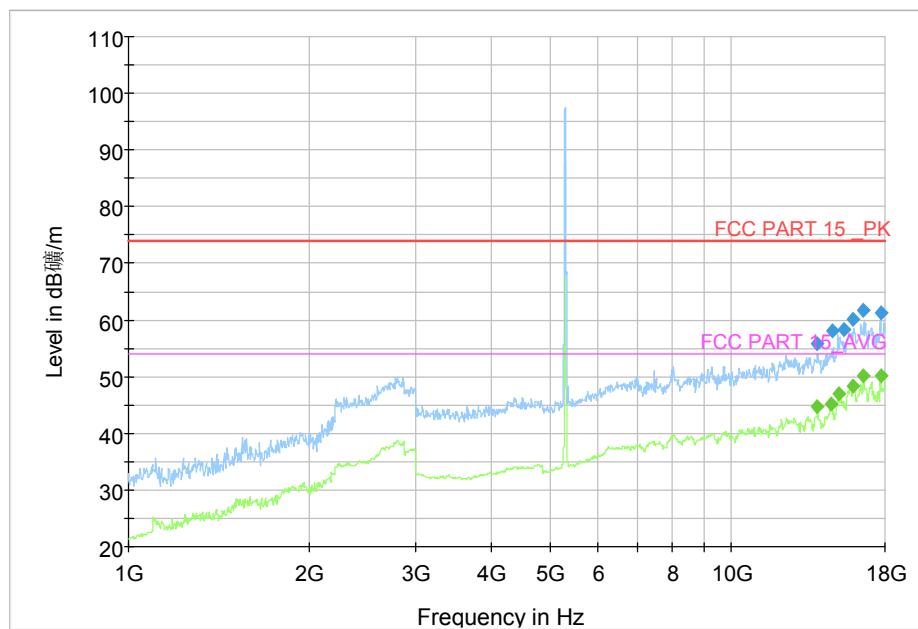


Fig. 78 Transmitter Spurious Emission (802.11n-HT40, 5310MHz)

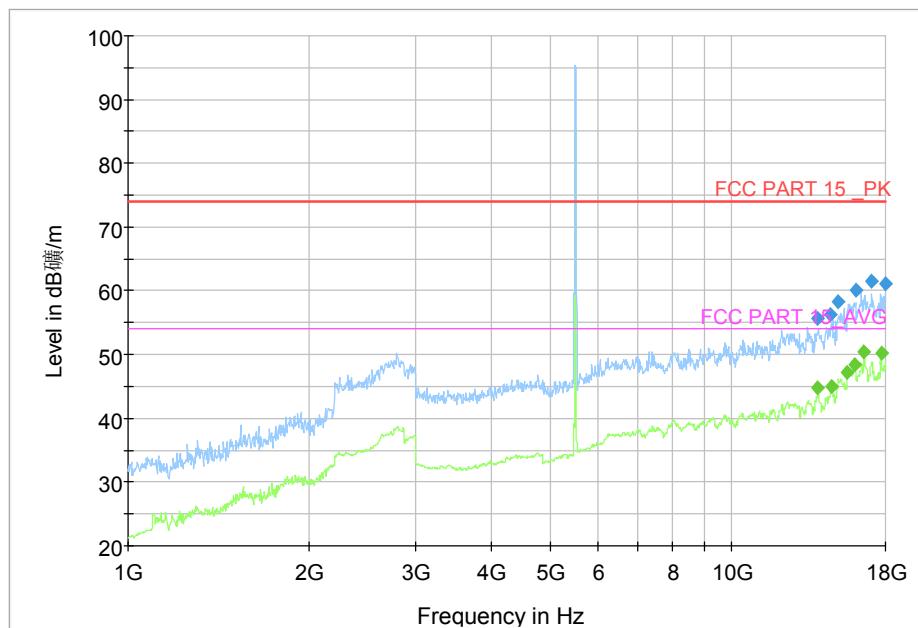


Fig. 79 Transmitter Spurious Emission (802.11n-HT40, 5510MHz)

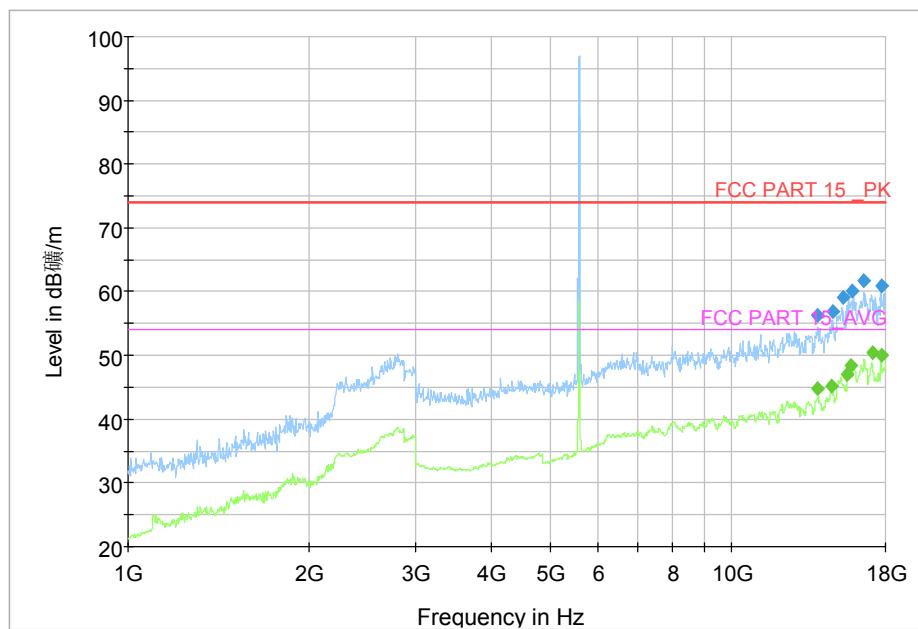


Fig. 80 Transmitter Spurious Emission (802.11n-HT40, 5590MHz)

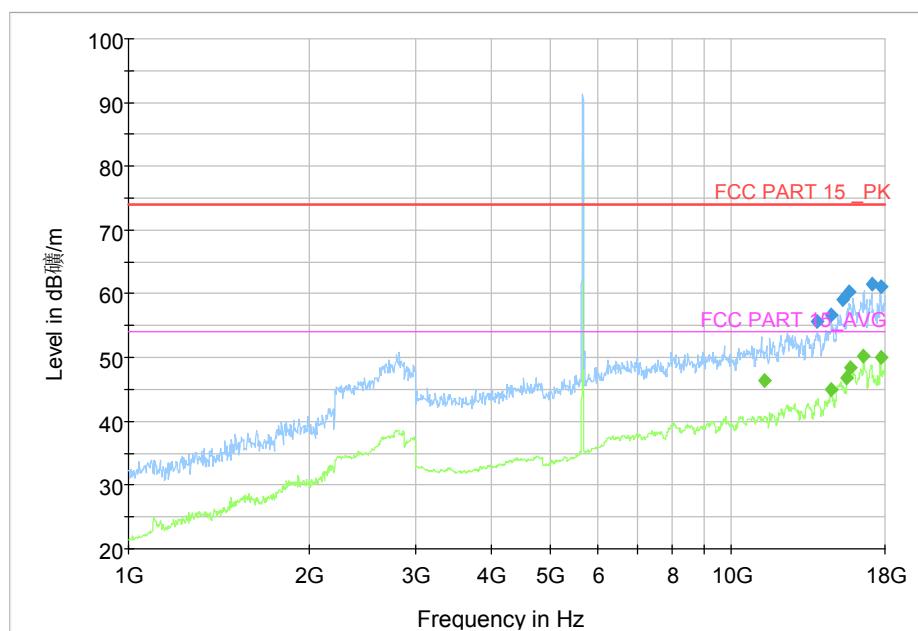


Fig. 81 Transmitter Spurious Emission (802.11n-HT40, 5670MHz)

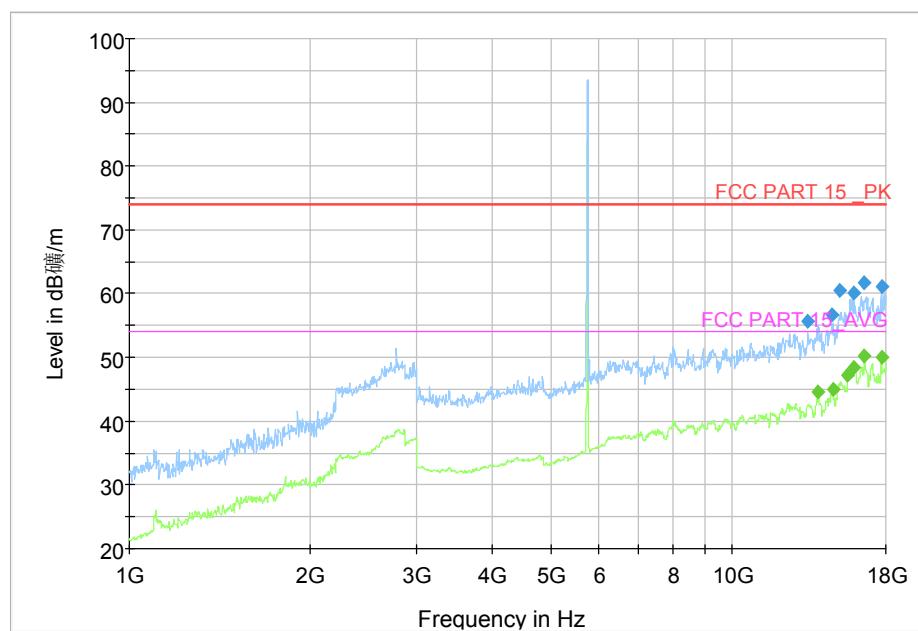


Fig. 82 Transmitter Spurious Emission (802.11n-HT40, 5755MHz)

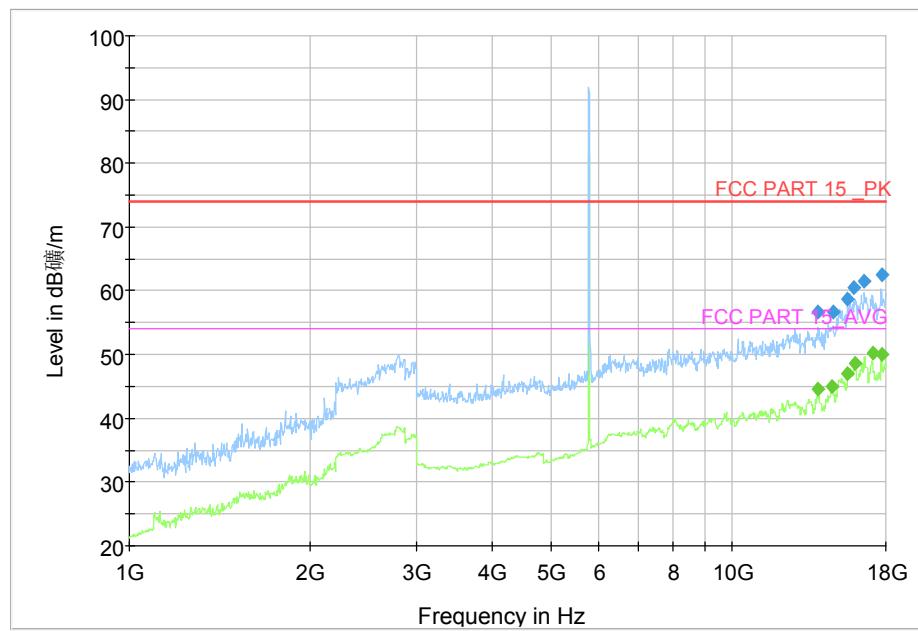


Fig. 83 Transmitter Spurious Emission (802.11n-HT40, 5795MHz)

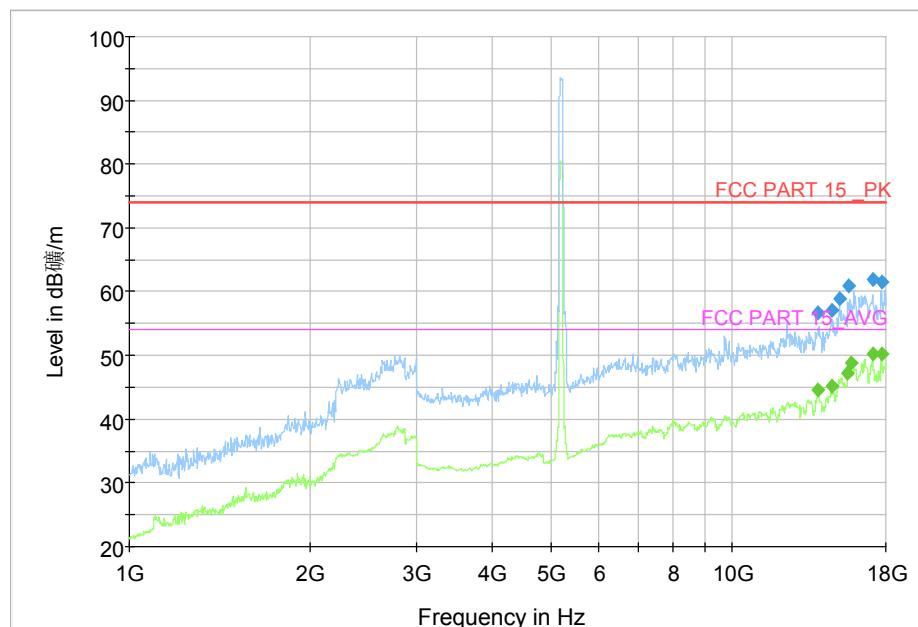


Fig. 84 Transmitter Spurious Emission (802.11ac-VHT80, 5210MHz)

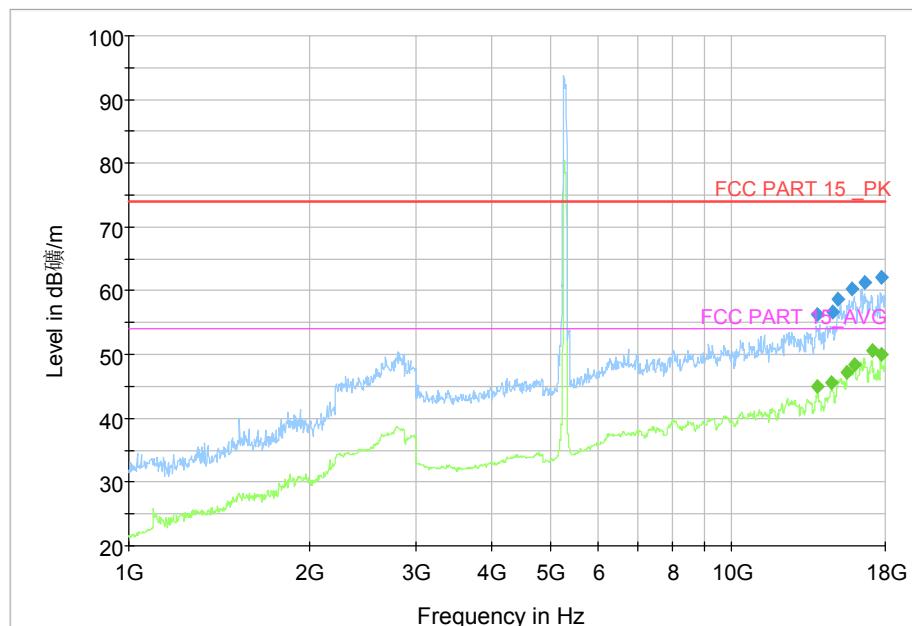


Fig. 85 Transmitter Spurious Emission (802.11ac-VHT80, 5290MHz)

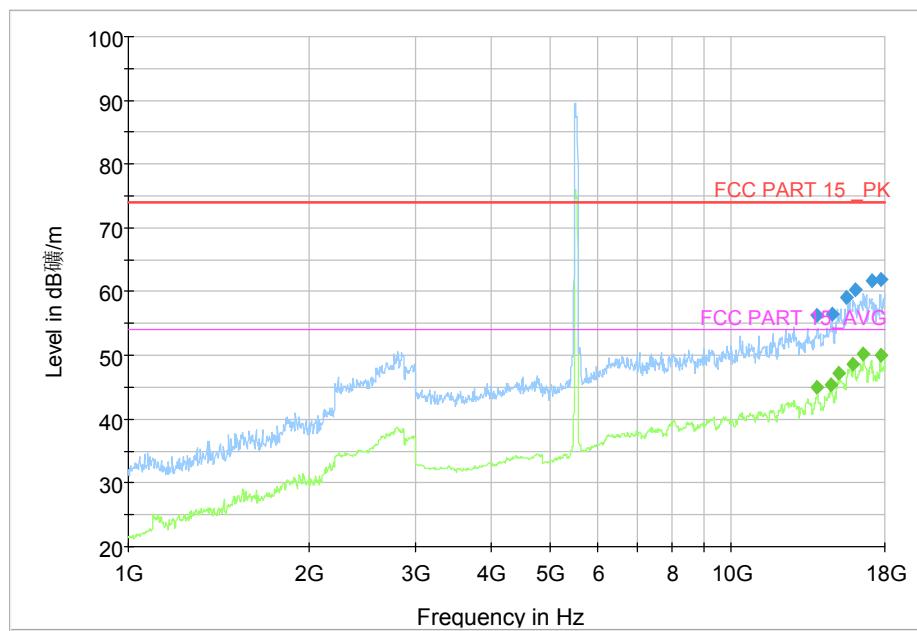


Fig. 86 Transmitter Spurious Emission (802.11ac-VHT80, 5530MHz)

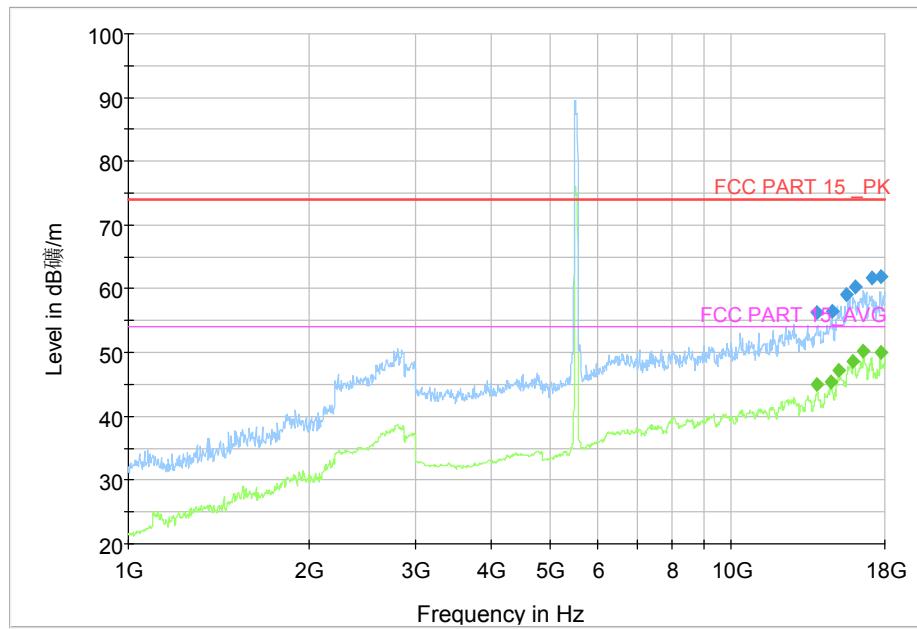


Fig. 87 Transmitter Spurious Emission (802.11ac-VHT80, 5610MHz)

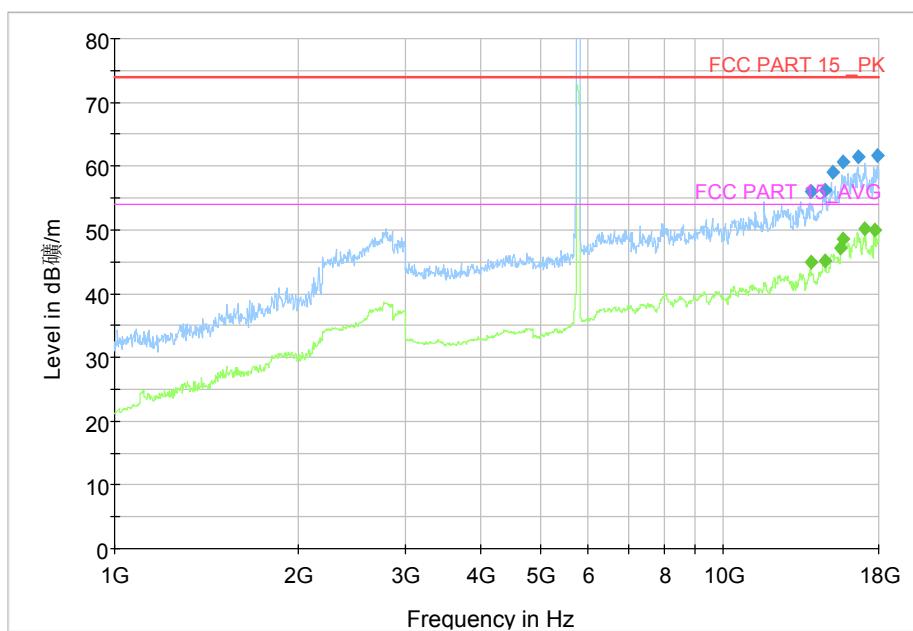


Fig. 88 Transmitter Spurious Emission (802.11ac-VHT80, 5775MHz)

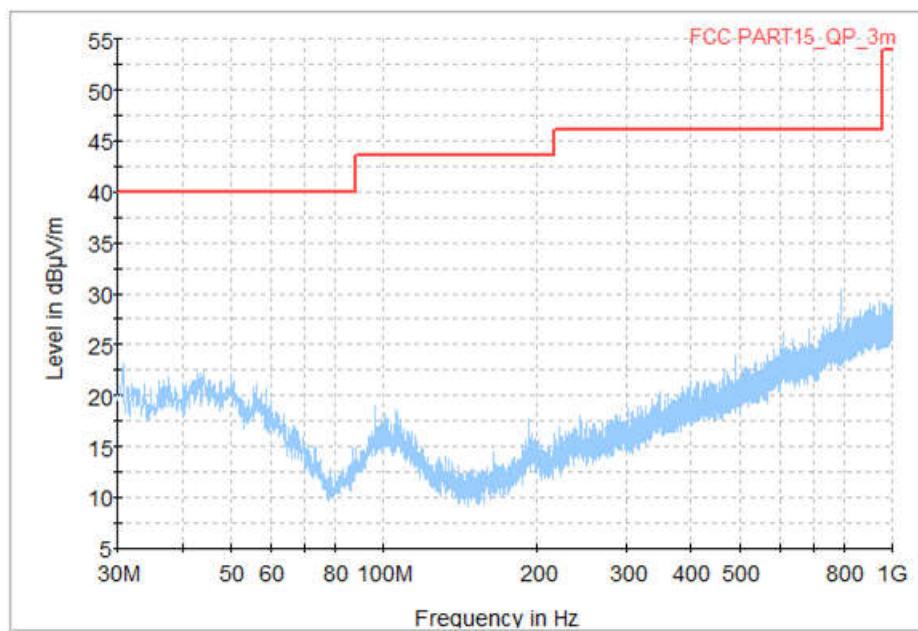


Fig. 89 Transmitter Spurious Emission (All channel, 30MHz~1GHz)

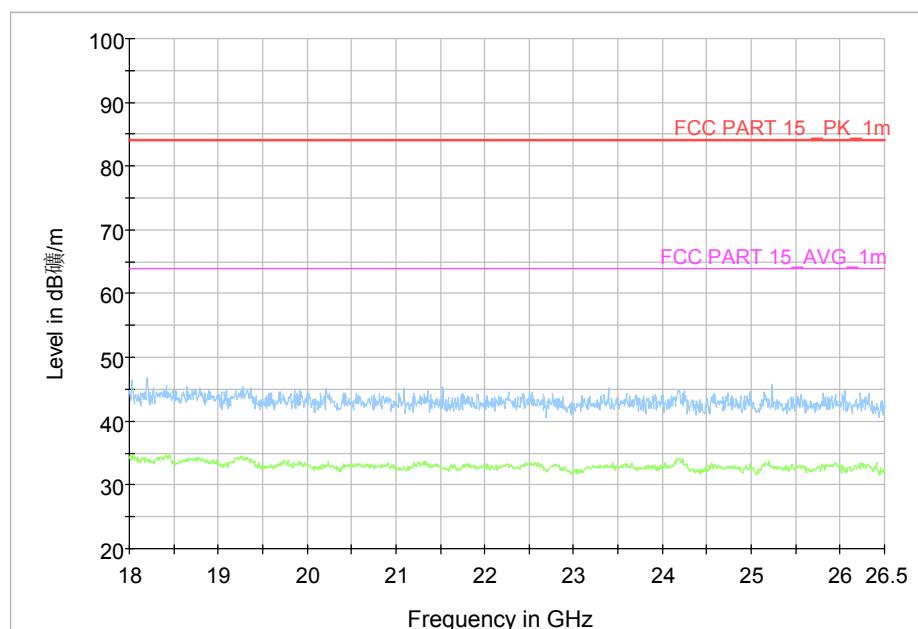


Fig. 90 Transmitter Spurious Emission (All channel, 18GHz~26.5GHz)

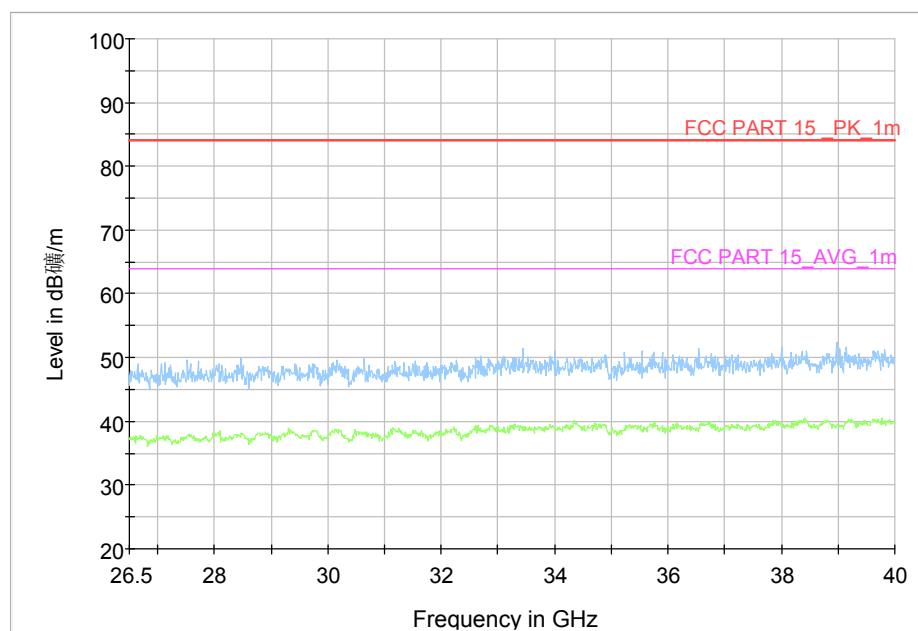


Fig. 91 Transmitter Spurious Emission (All channel, 26.5GHz~40GHz)

Worst Case Result

802.11a CH36

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13908.000000	54.76	74.00	19.24	H	21.0
14619.500000	55.28	74.00	18.72	H	21.7
15040.500000	59.94	74.00	14.06	H	22.5
15646.000000	61.39	74.00	12.61	H	23.7
17113.000000	62.10	74.00	11.90	H	26.2
17707.500000	61.69	74.00	12.31	H	27.6

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
7137.000000	43.24	54.00	10.76	V	13.1
14642.500000	43.35	54.00	10.65	V	21.3
15575.000000	48.10	54.00	5.90	V	23.7
15939.000000	49.46	54.00	4.54	V	24.9
16583.000000	50.31	54.00	3.69	V	26.4
17708.500000	49.99	54.00	4.01	H	27.6

802.11a CH64

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13895.000000	54.10	74.00	19.90	V	20.3
14608.000000	55.19	74.00	18.81	V	21.4
15006.500000	59.53	74.00	14.47	V	22.4
15928.500000	61.53	74.00	12.47	H	24.8
17140.500000	61.82	74.00	12.18	V	26.7
17878.500000	61.57	74.00	12.43	V	28.0

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13911.000000	42.82	54.00	11.18	V	21.1
14660.000000	43.45	54.00	10.55	V	21.3
15574.500000	48.14	54.00	5.86	V	23.7
15925.000000	49.43	54.00	4.57	H	24.7
16589.000000	50.45	54.00	3.55	V	26.3
17717.000000	50.06	54.00	3.94	V	27.7

802.11a CH100

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13403.000000	54.40	74.00	19.60	V	19.8
14651.000000	55.17	74.00	18.83	H	21.2
15523.000000	60.15	74.00	13.85	V	22.9
15943.000000	61.25	74.00	12.75	V	24.9
16583.000000	61.99	74.00	12.01	V	26.4
17717.000000	62.61	74.00	11.39	H	27.7

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
7136.500000	43.18	54.00	10.82	V	13.1
14646.500000	43.46	54.00	10.54	V	21.3
15571.000000	48.03	54.00	5.97	V	23.6
15935.000000	49.44	54.00	4.56	V	24.9
16596.000000	50.46	54.00	3.54	H	26.3
17705.000000	50.35	54.00	3.65	H	27.6

802.11a CH165

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
12346.500000	55.35	74.00	18.65	H	19.3
14674.500000	56.34	74.00	17.66	V	21.3
15553.000000	60.57	74.00	13.43	H	23.3
16241.000000	61.82	74.00	12.18	H	25.1
17113.500000	63.10	74.00	10.90	V	26.2
17693.000000	62.19	74.00	11.81	H	27.0

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13911.000000	44.24	54.00	9.76	V	21.1
14681.000000	44.66	54.00	9.34	V	21.5
15568.500000	48.67	54.00	5.33	H	23.5
15966.500000	50.00	54.00	4.00	H	25.5
16584.000000	50.90	54.00	3.10	H	26.4
17714.000000	50.68	54.00	3.32	H	27.7

802.11n HT40 CH38

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13916.000000	54.43	74.00	19.57	H	20.7
14668.000000	55.18	74.00	18.82	V	21.3
15469.500000	60.32	74.00	13.68	V	23.0
16034.000000	61.70	74.00	12.30	V	24.8
16627.000000	61.96	74.00	12.04	V	26.1
17711.000000	61.82	74.00	12.18	H	27.7

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13911.000000	43.34	54.00	10.66	H	21.1
14663.500000	43.64	54.00	10.36	V	21.3
15574.000000	48.22	54.00	5.78	H	23.7
15925.000000	49.63	54.00	4.37	H	24.7
16593.500000	50.45	54.00	3.55	V	26.3
17711.000000	50.08	54.00	3.92	V	27.7

802.11n HT40 CH54

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13907.500000	54.63	74.00	19.37	V	21.0
14365.000000	56.15	74.00	17.85	V	21.1
15576.000000	59.54	74.00	14.46	H	23.8
15967.500000	61.77	74.00	12.23	V	25.6
17106.500000	62.14	74.00	11.86	V	25.9
17715.500000	61.98	74.00	12.02	H	27.7

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
2379.000000	43.14	54.00	10.86	V	10.7
14681.000000	43.78	54.00	10.22	V	21.5
15571.500000	48.31	54.00	5.69	V	23.6
15926.000000	49.55	54.00	4.45	H	24.7
16589.000000	50.66	54.00	3.34	V	26.3
17707.500000	50.14	54.00	3.86	V	27.6

802.11n HT40 CH102

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13905.500000	54.29	74.00	19.71	H	20.9
14361.000000	55.36	74.00	18.64	H	21.3
15324.500000	59.98	74.00	14.02	V	22.7
15939.000000	61.88	74.00	12.12	V	24.9
16661.500000	62.32	74.00	11.68	V	25.5
17720.000000	61.81	74.00	12.19	V	27.7

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
2379.000000	43.99	54.00	10.01	V	10.7
14670.500000	43.73	54.00	10.27	V	21.3
15574.500000	48.34	54.00	5.66	H	23.7
15929.000000	49.53	54.00	4.47	V	24.8
17109.500000	50.53	54.00	3.47	V	26.2
17714.500000	50.16	54.00	3.84	V	27.7

802.11n HT40 CH151

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13910.500000	54.32	74.00	19.68	H	21.1
14670.500000	55.93	74.00	18.07	H	21.3
15554.500000	59.83	74.00	14.17	V	23.3
15962.000000	61.64	74.00	12.36	H	25.4
17116.000000	62.12	74.00	11.88	V	26.2
17703.000000	61.93	74.00	12.07	V	27.5

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13911.500000	43.03	54.00	10.97	H	21.0
14645.500000	43.63	54.00	10.37	V	21.3
15574.000000	48.24	54.00	5.76	V	23.7
15939.000000	49.71	54.00	4.29	H	24.9
16585.000000	50.47	54.00	3.53	V	26.4
17705.500000	50.15	54.00	3.85	V	27.6

802.11ac VHT80 CH42

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13958.500000	54.80	74.00	19.20	V	20.0
14589.500000	55.49	74.00	18.51	V	21.3
15576.500000	60.91	74.00	13.09	H	23.8
15969.500000	61.16	74.00	12.84	H	25.6
16595.500000	62.38	74.00	11.62	V	26.3
17994.500000	61.67	74.00	12.33	H	27.5

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13910.500000	43.15	54.00	10.85	H	21.1
14685.000000	43.68	54.00	10.32	V	21.5
15573.500000	48.25	54.00	5.75	V	23.7
15935.500000	49.80	54.00	4.20	V	24.9
16593.000000	50.60	54.00	3.40	V	26.3
17712.000000	50.29	54.00	3.71	H	27.7

802.11ac VHT80 CH106

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
12306.500000	54.92	74.00	19.08	V	18.9
14624.500000	55.57	74.00	18.43	V	21.6
15529.500000	60.38	74.00	13.62	H	23.0
15669.500000	61.31	74.00	12.69	H	23.5
16592.500000	62.08	74.00	11.92	H	26.3
17882.000000	61.90	74.00	12.10	H	28.1

Frequency (MHz)	Max Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Pol	Corr. (dB)
13910.500000	43.12	54.00	10.88	H	21.1
14688.000000	43.81	54.00	10.19	H	21.6
15570.500000	48.32	54.00	5.68	H	23.6
15939.000000	49.65	54.00	4.35	V	24.9
16596.500000	50.52	54.00	3.48	V	26.3
17705.500000	50.19	54.00	3.81	H	27.6

Note:

A "reference path loss" is established and the A_{Rpl} is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss. P_{Mea} is the field strength recorded from the instrument. The measurement results are obtained as described below:
 Result = $P_{Mea} + A_{Rpl} = P_{Mea} + \text{Cable Loss} + \text{Antenna Factor}$

A.9. Radiated Spurious Emissions < 30MHz

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

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

The measurement is made according to KDB 789033.

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

Measurement Result(Worst case):

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

Conclusion: PASS

Test graphs as below:

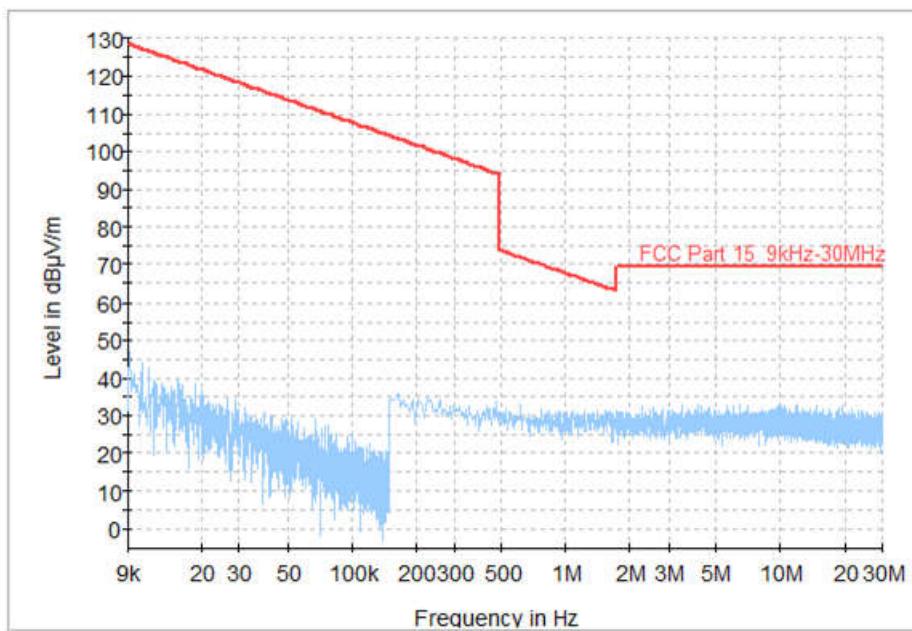


Fig. 92 Radiated Spurious Emission (All Channel, 9 kHz ~30 MHz)

A.10. AC Power Line Conducted Emission

Test Condition:

Voltage (V)	Frequency (Hz)
120	60

Measurement Result and limit:

RLAN (Quasi-peak Limit)-AE1

Frequency range (MHz)	Quasi-peak Limit (dB μ V)	Result (dB μ V)		Conclusion
		Traffic	Idle	
0.15 to 0.5	66 to 56	Fig.93	Fig.94	P
0.5 to 5	56			
5 to 30	60			

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

RLAN (Average Limit)-AE1

Frequency range (MHz)	Average-peak Limit (dB μ V)	Result (dB μ V)		Conclusion
		Traffic	Idle	
0.15 to 0.5	56 to 46	Fig 93	Fig 94	P
0.5 to 5	46			
5 to 30	50			

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

Note: The measurement results include the L1 and N measurements.

Conclusion: PASS

Test graphs as below:

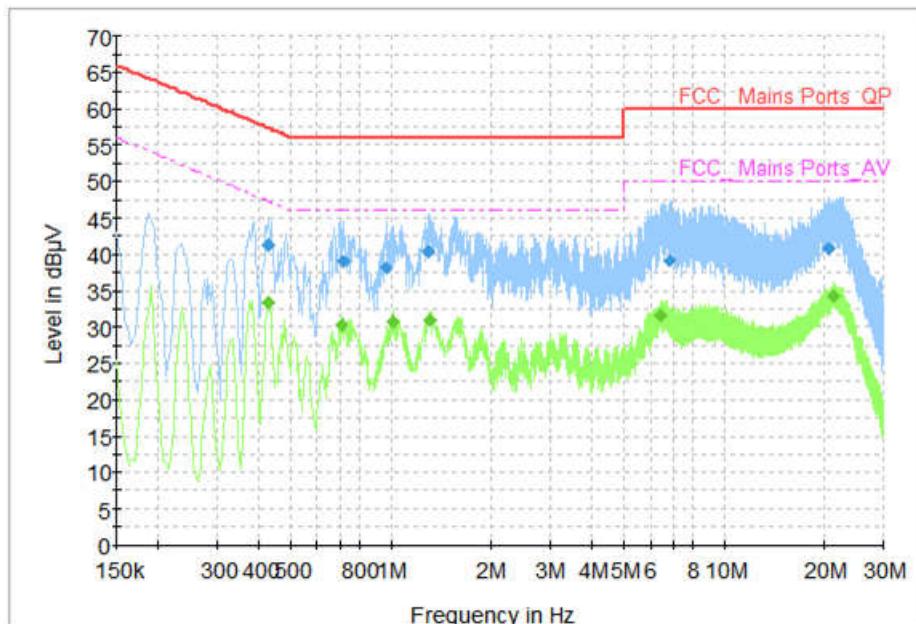


Fig. 93 AC Powerline Conducted Emission (802.11n, AE1, 120V)

Measurement Result: Quasi Peak

Frequency (MHz)	Quasi Peak (dB μ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.426000	41.26	57.33	16.08	N	ON	9.7
0.718000	38.97	56.00	17.03	N	ON	9.7
0.962000	38.09	56.00	17.91	N	ON	9.7
1.294000	40.35	56.00	15.65	N	ON	9.7
6.846000	39.17	60.00	20.83	N	ON	9.8
20.442000	40.68	60.00	19.32	N	ON	10.4

Measurement Result: Average

Frequency (MHz)	Average (dB μ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.426000	33.30	47.33	14.03	N	ON	9.7
0.710000	30.25	46.00	15.75	N	ON	9.7
1.010000	30.76	46.00	15.24	N	ON	9.7
1.302000	31.10	46.00	14.90	N	ON	9.7
6.398000	31.52	50.00	18.48	N	ON	9.8
21.206000	34.27	50.00	15.73	N	ON	10.4

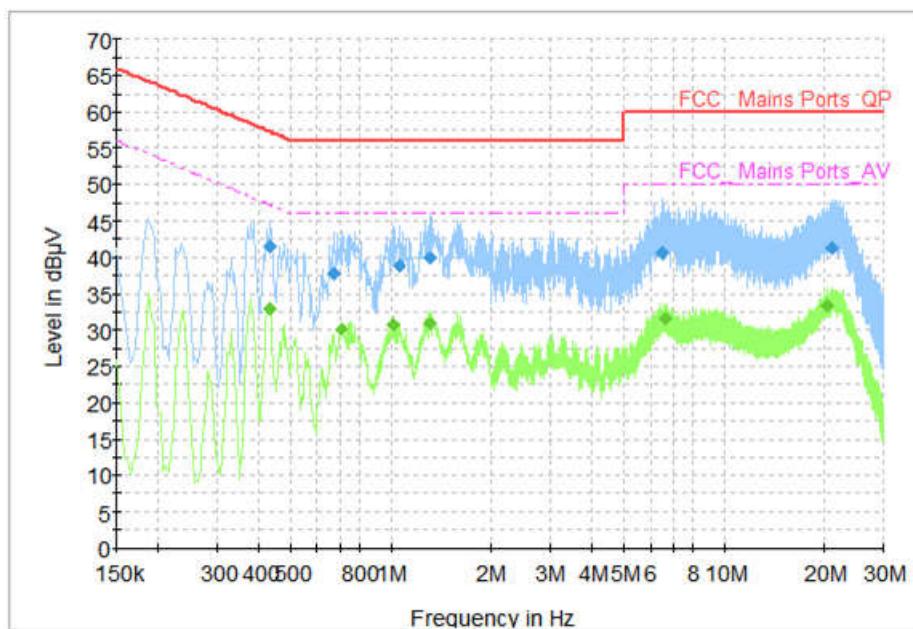


Fig. 94 AC Powerline Conducted Emission (Idle, AE1, 120V)

Measurement Result: Quasi Peak

Frequency (MHz)	QuasiPeak (dB μ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.430000	41.45	57.25	15.81	N	ON	9.7
0.670000	37.65	56.00	18.35	N	ON	9.7
1.058000	38.86	56.00	17.14	N	ON	9.7
1.306000	39.84	56.00	16.16	N	ON	9.7
6.494000	40.59	60.00	19.41	N	ON	9.8
21.102000	41.33	60.00	18.67	N	ON	10.4

Measurement Result: Average

Frequency (MHz)	Average (dB μ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.430000	32.95	47.25	14.30	N	ON	9.7
0.706000	30.21	46.00	15.79	N	ON	9.7
1.014000	30.75	46.00	15.25	N	ON	9.7
1.306000	30.87	46.00	15.13	N	ON	9.7
6.674000	31.64	50.00	18.36	N	ON	9.8
20.330000	33.24	50.00	16.76	N	ON	10.4

A.10. Frequency Stability

Manufacturers ensured the EUT meet the requirement of frequency stability, such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Measurement Result:

Mode	Channel	Condition		Frequency	Conclusion
802.11a	5180 MHz (CH36)	T nom	V nom	5179.9823	P
		T max	V nom	5179.9742	P
		T min	V nom	5179.9734	P
		T nom	V max	5179.9883	P
		T nom	V min	5179.9734	P
802.11n HT40	5550 MHz (CH110)	T nom	V nom	5549.9153	P
		T max	V nom	5549.9573	P
		T min	V nom	5549.9734	P
		T nom	V max	5549.9674	P
		T nom	V min	5549.9667	P
802.11ac VHT80	5690 MHz (CH138)	T nom	V nom	5689.9883	P
		T max	V nom	5689.9684	P
		T min	V nom	5689.9765	P
		T nom	V max	5689.9773	P
		T nom	V min	5689.9678	P

A.11. Power control

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

*** END OF REPORT BODY ***