



TEST REPORT

No. I20N01406-RLAN

TCL Communication Ltd

Tablet PC

Model Name: 9032T

with

Hardware Version: PIO

Software Version: 1A57

FCC ID: 2ACCJB130

Issued Date: 2020-07-09

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:

SAICT, 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.saict.ac.cn

CONTENTS

CONTENTS	2
1. SUMMARY OF TEST REPORT.....	3
1.1. TEST ITEMS.....	3
1.2. TEST STANDARDS	3
1.3. TEST RESULT	3
1.4. TESTING LOCATION	3
1.5. PROJECT DATA	3
1.6. SIGNATURE	3
2. CLIENT INFORMATION.....	4
2.1. APPLICANT INFORMATION	4
2.2. MANUFACTURER INFORMATION	4
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE)	5
3.1. ABOUT EUT	5
3.2. INTERNAL IDENTIFICATION OF EUT	5
3.3. INTERNAL IDENTIFICATION OF AE.....	5
3.4. GENERAL DESCRIPTION.....	6
4. REFERENCE DOCUMENTS.....	7
4.1. DOCUMENTS SUPPLIED BY APPLICANT	7
4.2. REFERENCE DOCUMENTS FOR TESTING.....	7
5. TEST RESULTS	8
5.1. TESTING ENVIRONMENT.....	8
5.2. TEST RESULTS	8
5.3. STATEMENTS.....	8
6. TEST EQUIPMENTS UTILIZED	9
7. LABORATORY ENVIRONMENT.....	10
8. MEASUREMENT UNCERTAINTY	11
ANNEX A: DETAILED TEST RESULTS.....	12
A.1. MEASUREMENT METHOD	12
A.2. MAXIMUM OUTPUT POWER	13
A.3. PEAK POWER SPECTRAL DENSITY (CONDUCTED).....	15
A.4. OCCUPIED 26dB BANDWIDTH(CONDUCTED).....	16
A.5. OCCUPIED 6dB BANDWIDTH(CONDUCTED).....	23
A.6. 99% OCCUPIED BANDWIDTH(CONDUCTED)	27
A.7. BAND EDGES COMPLIANCE	34
A.8. TRANSMITTER SPURIOUS EMISSION	41
A.9. RADIATED SPURIOUS EMISSIONS < 30MHZ.....	58
A.10. AC POWER LINE CONDUCTED EMISSION.....	59
A.11. POWER CONTROL	62

1. Summary of Test Report

1.1. Test Items

Description	Tablet PC
Model Name	9032T
Applicant's name	TCL Communication Ltd
Manufacturer's Name	TCL Communication Ltd

1.2. Test Standards

FCC Part15-2019; ANSI C63.10-2013; KDB789033-V02r01

1.3. Test Result

Pass

1.4. Testing Location

Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road,
Futian District, Shenzhen, Guangdong, P. R. China

1.5. Project data

Testing Start Date:	2020-05-25
Testing End Date:	2020-07-08

1.6. Signature



Lin Zechuang

(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:	TCL Communication Ltd
Address:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
Contact Person	Gong Zhizhou
E-Mail	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd
Address:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
Contact Person	Gong Zhizhou
E-Mail	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

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

3.1. About EUT

Description	Tablet PC
Model Name	9032T
Brand Name	alcatel
RLAN Frequency Range	ISM Bands: -5150MHz~5250MHz -5250MHz~5350MHz -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	0.83dBi
Power Supply	3.85V DC by Battery
FCC ID	2ACCJB130
Condition of EUT as received	No abnormality in appearance

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Shenzhen Academy of Information and Communications Technology.

3.2. Internal Identification of EUT

EUT ID*	IMEI	HW Version	SW Version	Receive Date
UT06aa	350583090000101	PIO	1A57	2020-05-27
UT03aa	350583090000119	PIO	1A57	2020-05-25

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

3.3. Internal Identification of AE

AE ID*	Description	AE ID*
AE1	Battery	/
AE2	Charger	Aa01a,Aa02a,Ab01a,Ab02a
AE3	Data Cable	Ca01a, Ca02a, Cb01a, Cb02a

AE1

Model	TLp040M7
Manufacturer	VEKEN
Capacity	4000mAh
Nominal Voltage	3.85v

AE2-1

Model	UC11US(CBA0058AGAC5)
Manufacturer	PUAN

AE2-2

Model	UC11US(CBA0058AGAC7)
Manufacturer	Chenyang



AE3-1

Model	CDA0000123C2
Manufacturer	SHENGHUA

AE3-2

Model	CDA0000123C1
Manufacturer	JUWEI

*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 PC with integrated antenna and battery.

It consists of normal options: Lithium Battery, Charger and 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 FCC CFR 47,Part 15,Subpart E	2019
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
KDB789033	GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E	V02r01

5. Test Results

5.1. Testing Environment

Normal Temperature: 15~35°C

Relative Humidity: 20~75%

5.2. 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)	I
3	Occupied 6dB Bandwidth	15.407(e)	P
4	99% Occupied Bandwidth	15.407	I
5	Band edge compliance	15.407	P
6	Radiated Spurious Emissions	15.407	P
7	AC Power line Conducted	15.207	P
8	Transmit Power Control	15.407	NA

See **ANNEX A** for details.

Note: According to the definition of the application description, the device will automatically discontinue transmission in case of either absence of information to transmit or operational failure.

5.3. Statements

SAICT has evaluated the test cases requested by the applicant/manufacture as listed in section 5.2 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2

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	2021-01-15	1 year
2	Power Sensor	U2021XA	MY55430013	Agilent	2021-01-15	1 year
3	Test Receiver	ESCI	100701	Rohde & Schwarz	2020-08-10	1 year
4	LISN	ENV216	102067	Rohde & Schwarz	2020-07-17	1 year

Radiated test system

NO.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Loop Antenna	HLA6120	35779	TESEQ	2022-04-25	3 years
2	BiLog Antenna	3142E	00224831	ETS-Lindgren	2021-05-17	3 years
3	Horn Antenna	3117	00066577	ETS-Lindgren	2022-04-02	3 years
4	Test Receiver	ESR7	101676	Rohde & Schwarz	2020-11-27	1 year
5	Spectrum Analyser	FSV40	101192	Rohde & Schwarz	2021-01-14	1 year
6	Chamber	FACT3-2.0	1285	ETS-Lindgren	2021-07-19	2 years
7	Horn Antenna	QSH-SL-18-26-S-20	17013	Q-par	2023-01-06	3 years
8	Horn Antenna	QSH-SL-18-40-K-SG	15979	Q-par	2023-01-06	3 years

Test software

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

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

Anechoic chamber

Fully anechoic chamber by ETS-Lindgren

7. Laboratory Environment

Semi-anechoic chambe

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	< ±4 dB, 3 m distance, from 30 to 1000 MHz

Shielded room

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-1000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω

Fully-anechoic chamber

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Voltage Standing Wave Ratio (VSWR)	≤ 6 dB, from 1 to 18 GHz, 3 m distance
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

8. Measurement Uncertainty

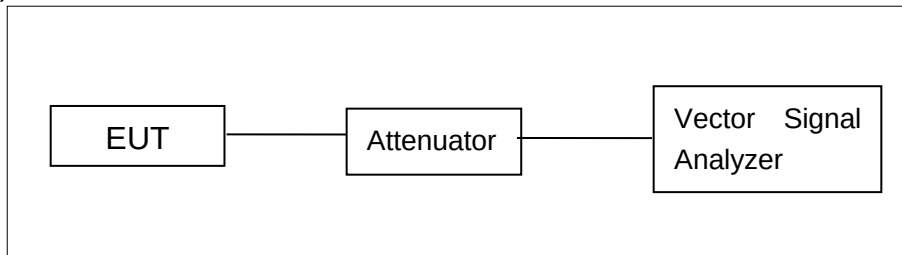
Test Name	Uncertainty ($k=2$)	
1. RF Output Power - Conducted	1.32dB	
2.Power Spectral Density - Conducted	2.32dB	
3.Occupied channel bandwidth - Conducted	$\pm 66\text{Hz}$	
4 Transmitter Spurious Emission - Conducted	$30\text{MHz} \leq f \leq 1\text{GHz}$	1.41dB
	$1\text{GHz} \leq f \leq 7\text{GHz}$	1.92dB
	$7\text{GHz} \leq f \leq 13\text{GHz}$	2.31dB
	$13\text{GHz} \leq f \leq 26\text{GHz}$	2.61dB
5. Transmitter Spurious Emission - Radiated	$9\text{kHz} \leq f \leq 30\text{MHz}$	1.70dB
	$30\text{MHz} \leq f \leq 1\text{GHz}$	4.90dB
	$1\text{GHz} \leq f \leq 18\text{GHz}$	4.60dB
	$18\text{GHz} \leq f \leq 40\text{GHz}$	4.10dB
6. AC Power line Conducted Emission	$150\text{kHz} \leq f \leq 30\text{MHz}$	3.00dB

ANNEX A: Detailed Test 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.

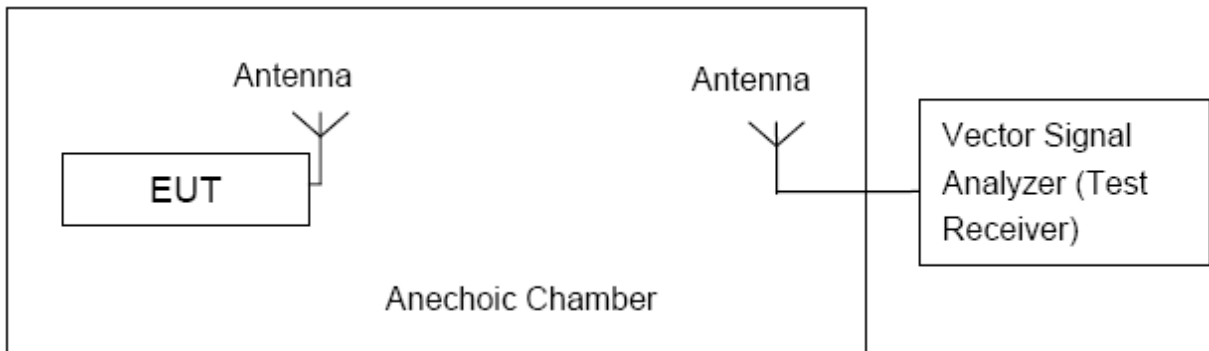


Radiated Emission Measurements

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+10logB
	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)	Average power (dBm)	Conclusion
5.2GHz Band (UNII-1)	802.11a	CH 36	5180	8.70	P
		CH 40	5200	8.79	P
		CH 48	5240	8.88	P
	802.11n-HT20	CH 36	5180	8.62	P
		CH 40	5200	8.58	P
		CH 48	5240	8.70	P
	802.11n-HT40	CH 38	5190	8.40	P
		CH 46	5230	8.52	P
	802.11ac-VHT20	CH 36	5180	8.64	P
		CH 40	5200	8.59	P
		CH 48	5240	8.67	P
	802.11ac-VHT40	CH 38	5190	8.41	P
		CH 46	5230	8.54	P
	802.11ac-VHT80	CH 42	5210	8.29	P

U-NII Band	Mode	Channel	Frequency (MHz)	Average power (dBm)	Conclusion
5.3GHz Band (UNII-2A)	802.11a	CH 52	5260	8.87	P
		CH 56	5280	8.97	P
		CH 64	5320	9.17	P
	802.11n-HT20	CH 52	5260	8.74	P
		CH 56	5280	8.86	P
		CH 64	5320	8.96	P
	802.11n-HT40	CH 54	5270	8.61	P
		CH 62	5310	8.69	P
	802.11ac-VHT20	CH 52	5260	8.79	P
		CH 56	5280	8.88	P
		CH 64	5320	8.97	P
	802.11ac-VHT40	CH 54	5270	8.62	P
		CH 62	5310	8.66	P
	802.11ac-VHT80	CH 58	5290	8.39	P

U-NII Band	Mode	Channel	Frequency (MHz)	Average power (dBm)	Conclusion
5.8GHz Band (UNII-3)	802.11a	CH 149	5745	7.69	P
		CH 157	5785	7.62	P
		CH 165	5825	7.71	P
	802.11n-HT20	CH 149	5745	7.55	P
		CH 157	5785	7.48	P
		CH 165	5825	7.57	P
	802.11n-HT40	CH 151	5755	7.41	P
		CH 159	5795	7.43	P
	802.11ac-VHT20	CH 149	5745	7.53	P
		CH 157	5785	7.47	P
		CH 165	5825	7.56	P
	802.11ac-VHT40	CH 151	5755	7.40	P
		CH 159	5795	7.43	P
	802.11ac-VHT80	CH 155	5775	7.00	P

Note:

Worst-case data rates as provided by the client were: 6Mbps (802.11a), MCS0 (802.11n), MCS0 (802.11ac). 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(FCC)
		10dBm/MHz EIRP(IC)
	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:

5.2GHz Band (UNII-1) & 5.3GHz Band (UNII-2A)

Mode	Channel	Power Spectral Density (dBm/MHz)	Conclusion
802.11a	5180MHz(Ch36)	2.79	P
	5200MHz(Ch40)	2.67	P
	5240MHz(Ch48)	2.51	P
	5260MHz(Ch52)	2.27	P
	5280MHz(Ch56)	2.64	P
	5320MHz(Ch64)	2.57	P
802.11n-HT40	5190MHz(Ch38)	-0.20	P
	5230MHz(Ch46)	-0.72	P
	5270MHz(Ch54)	-0.43	P
	5310MHz(Ch62)	-0.20	P
802.11ac-VHT80	5210MHz(Ch42)	-3.38	P
	5290MHz(Ch58)	-3.69	P

5.8GHz Band (UNII-3)

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11a	5745MHz(Ch149)	-0.55	P
	5785MHz(Ch157)	-0.82	P
	5825MHz(Ch165)	-0.78	P
802.11n-HT40	5755MHz(Ch151)	-4.40	P
	5795MHz(Ch159)	-3.92	P
802.11ac-VHT80	5775MHz(Ch155)	-7.12	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	20.55	/
	5200MHz(Ch40)	Fig.2	20.40	/
	5240MHz(Ch48)	Fig.3	20.55	/
	5260MHz(Ch52)	Fig.4	20.40	/
	5280MHz(Ch56)	Fig.5	20.45	/
	5320MHz(Ch64)	Fig.6	20.65	/
802.11n-HT40	5190MHz(Ch38)	Fig.7	40.96	/
	5230MHz(Ch46)	Fig.8	40.72	/
	5270MHz(Ch54)	Fig.9	40.56	/
	5310MHz(Ch62)	Fig.10	41.04	/
802.11 ac-VHT80	5210MHz(Ch42)	Fig.11	81.28	/
	5290MHz(Ch58)	Fig.12	81.12	/

Conclusion: PASS

Test graphs as below:

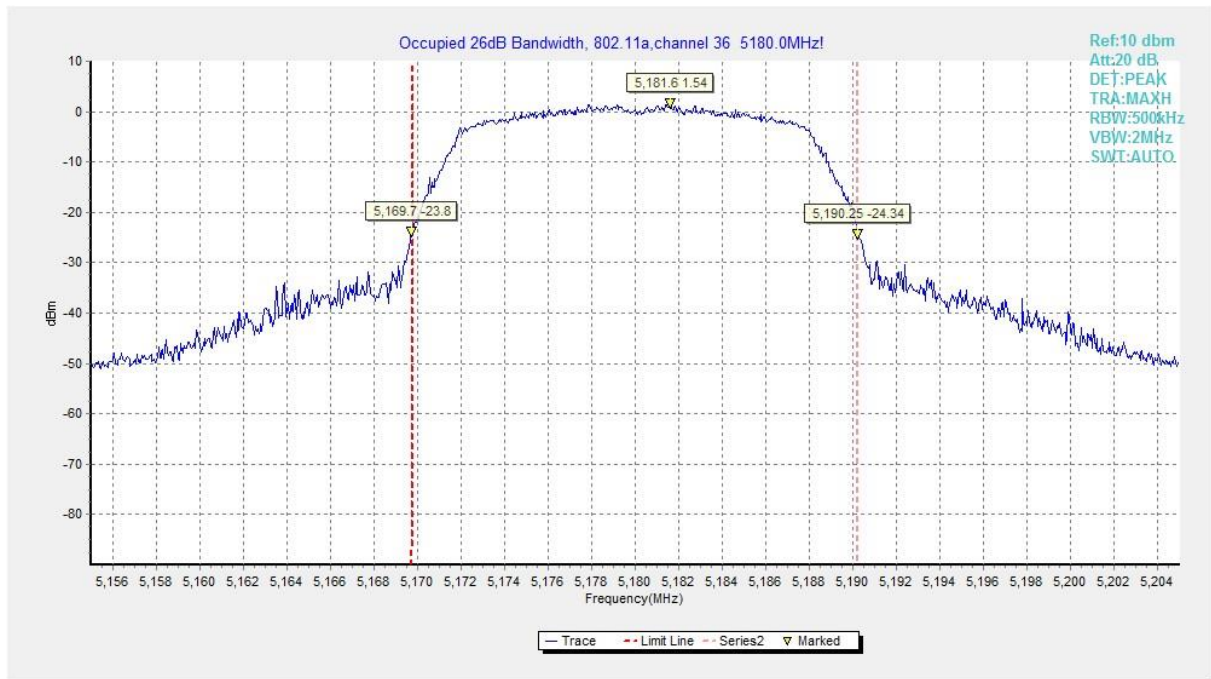


Fig. 1 Occupied 26dB Bandwidth (802.11a, 5180MHz)

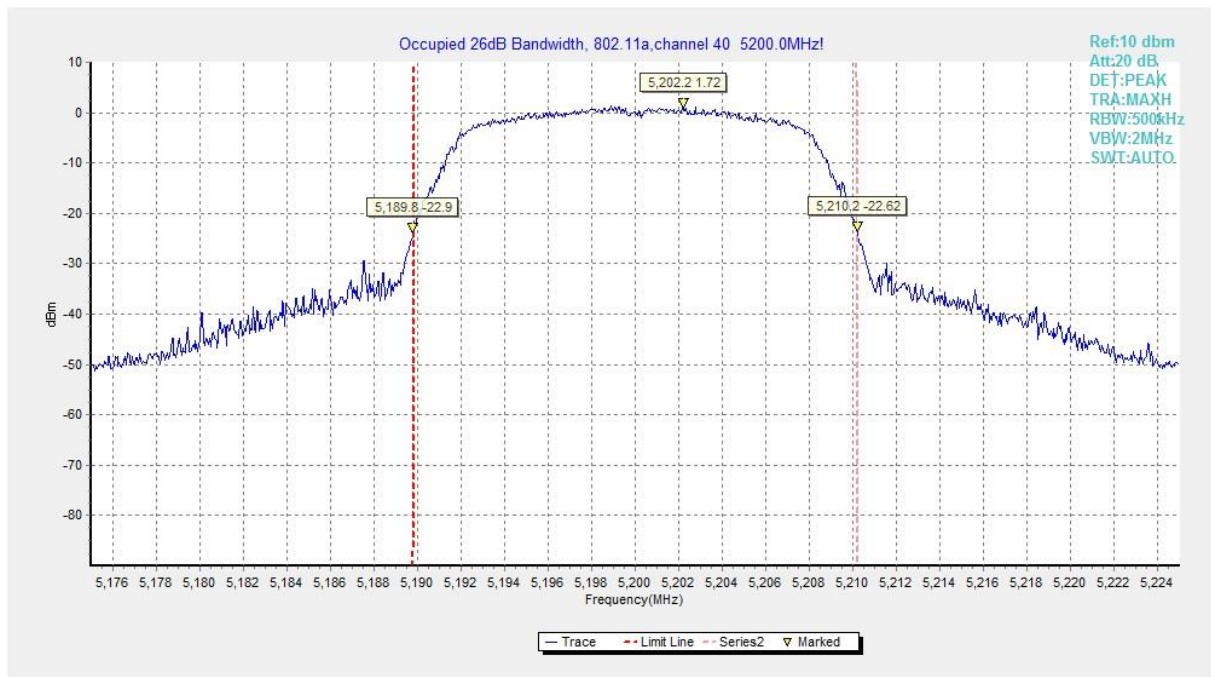


Fig. 2 Occupied 26dB Bandwidth (802.11a, 5200MHz)

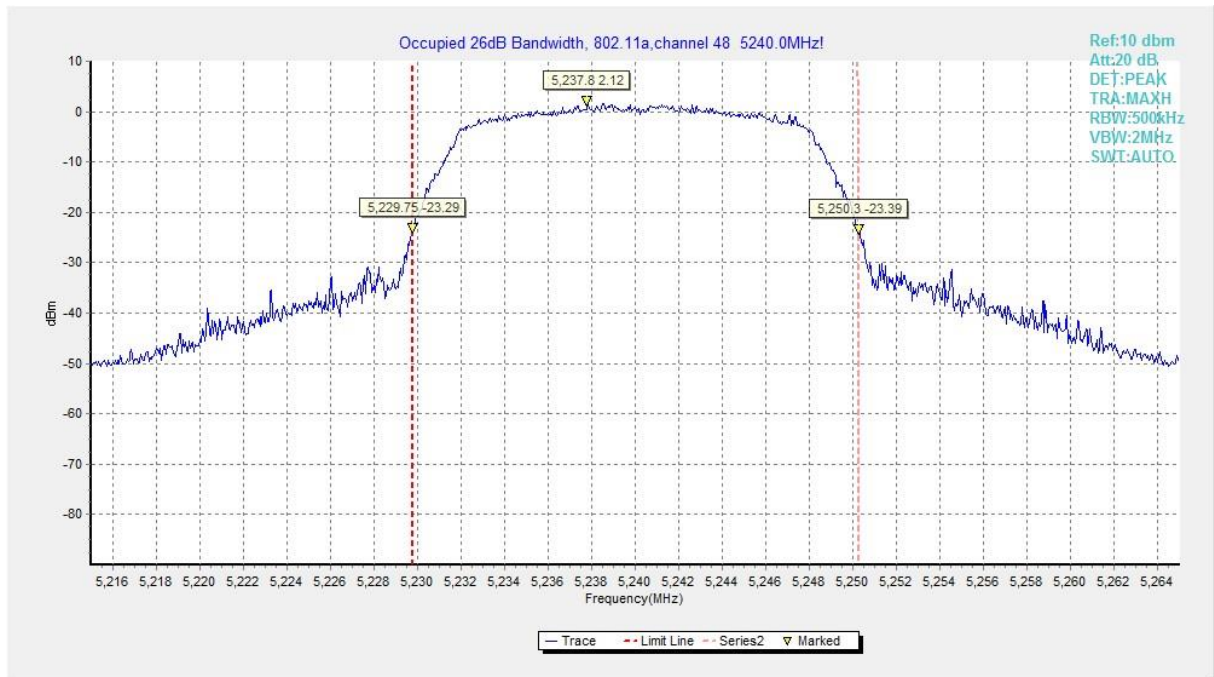


Fig. 3 Occupied 26dB Bandwidth (802.11a, 5240MHz)

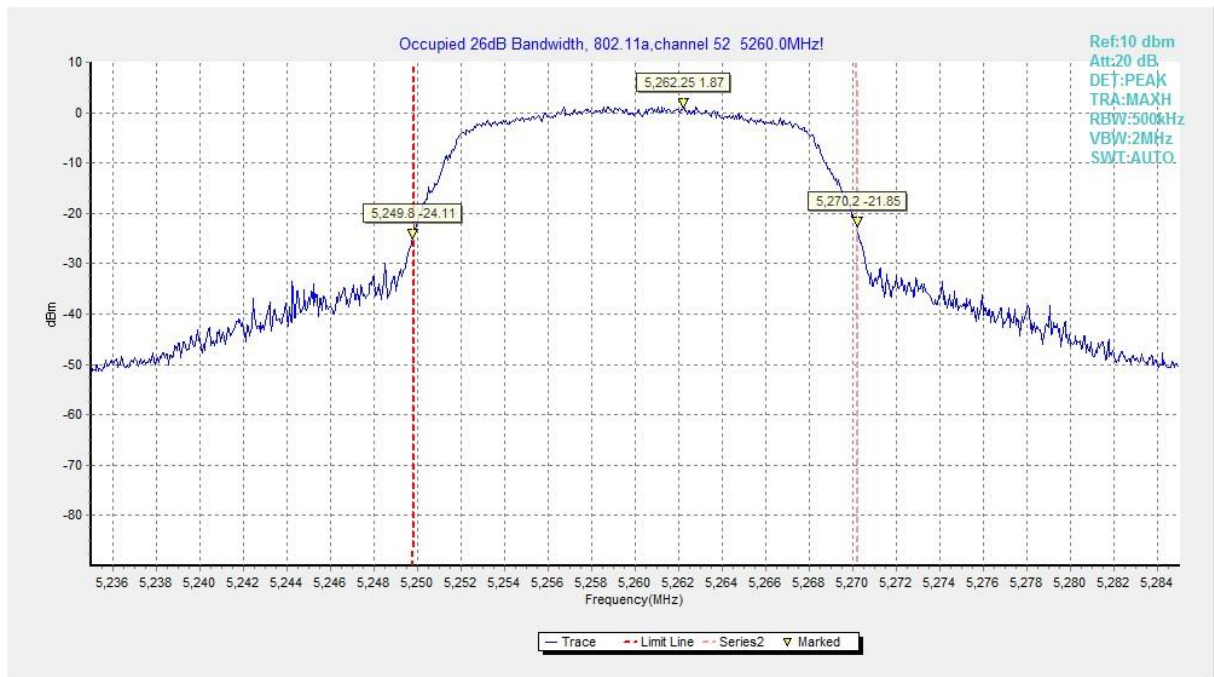


Fig. 4 Occupied 26dB Bandwidth (802.11a, 5260MHz)

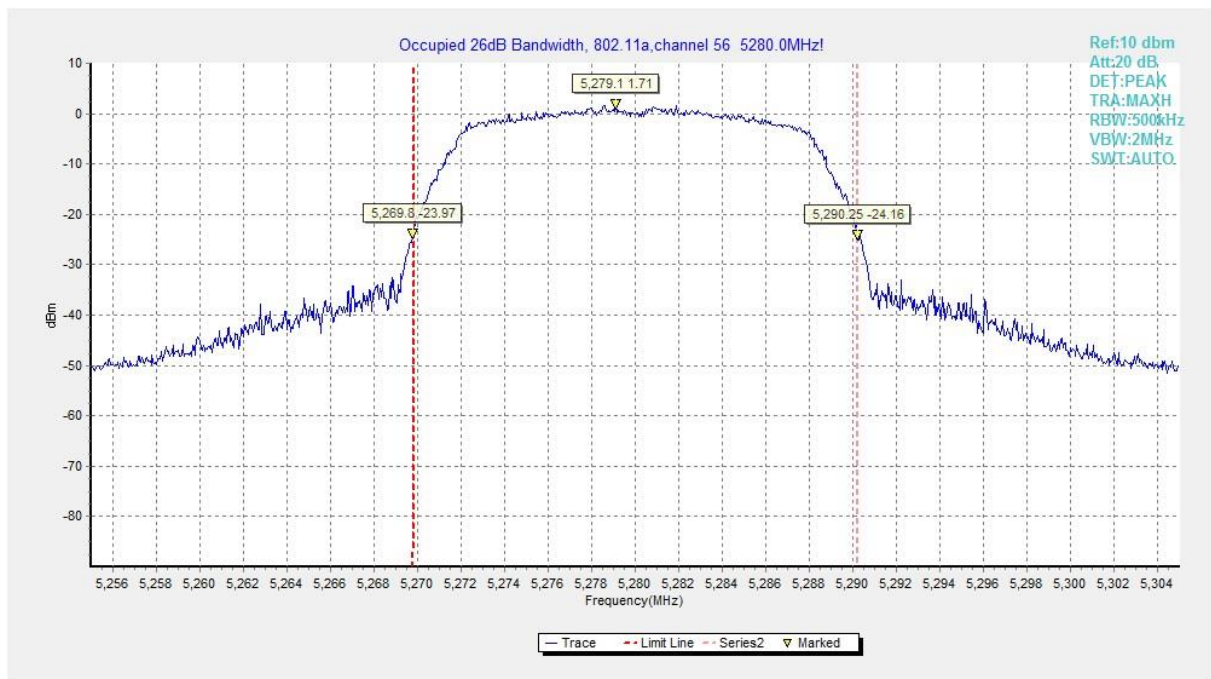


Fig. 5 Occupied 26dB Bandwidth (802.11a, 5280MHz)

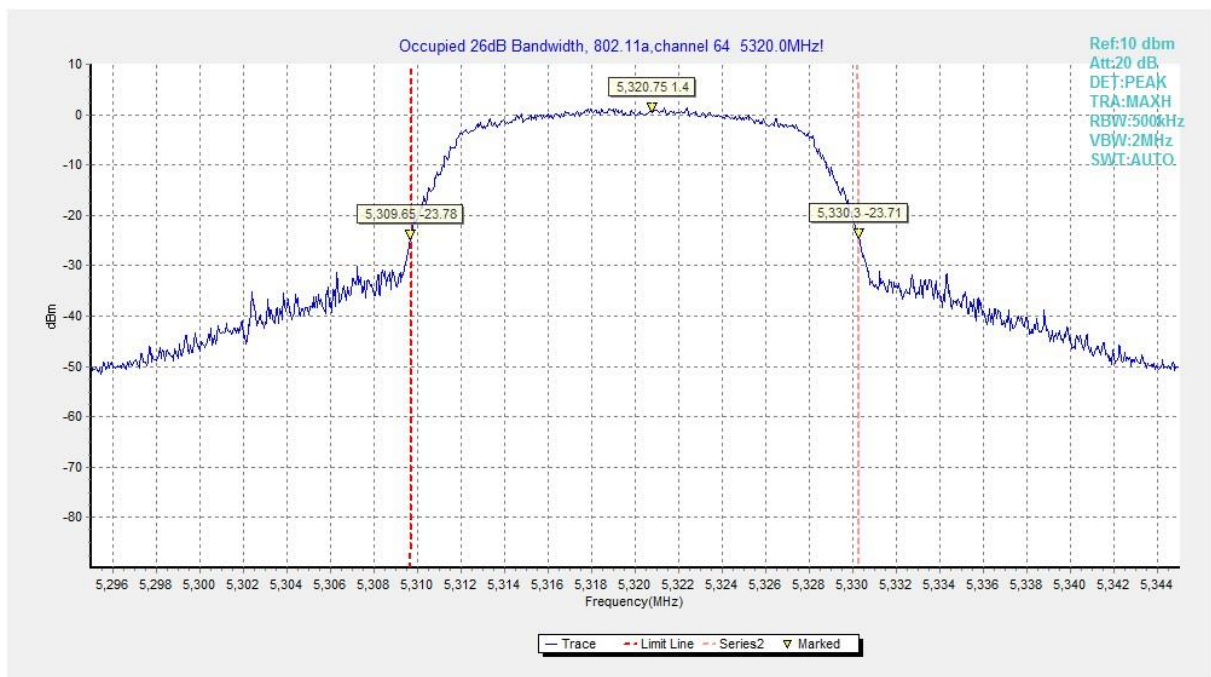


Fig. 6 Occupied 26dB Bandwidth (802.11a, 5320MHz)

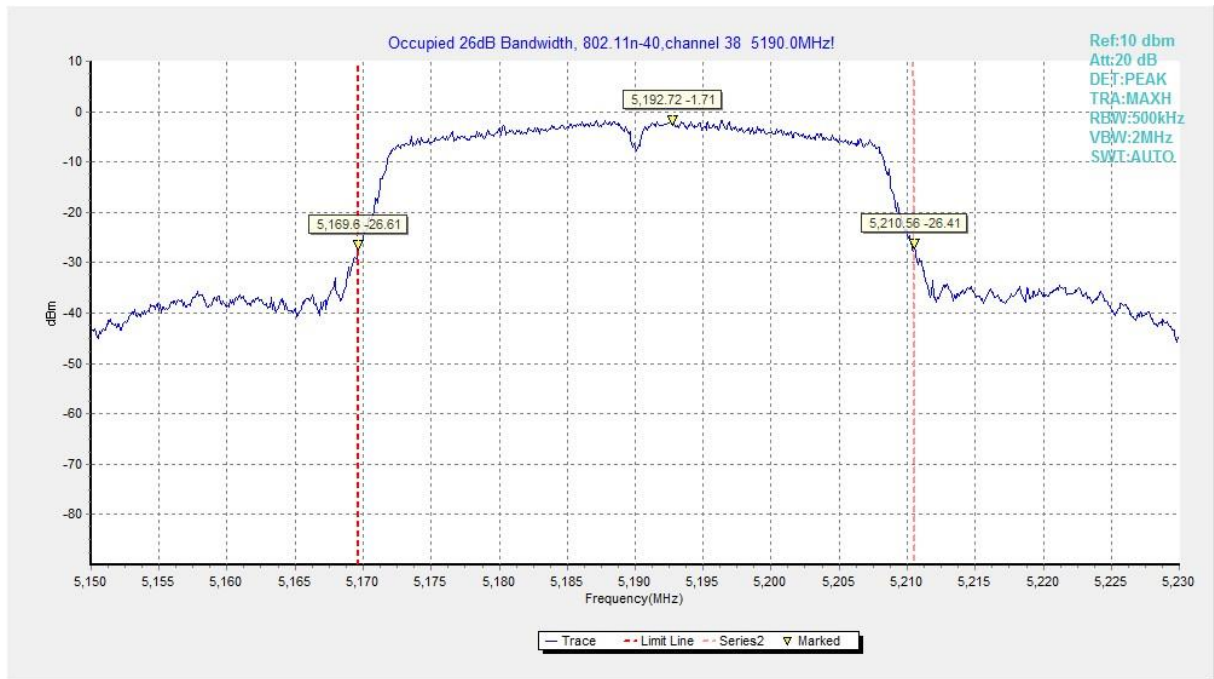


Fig. 7 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)

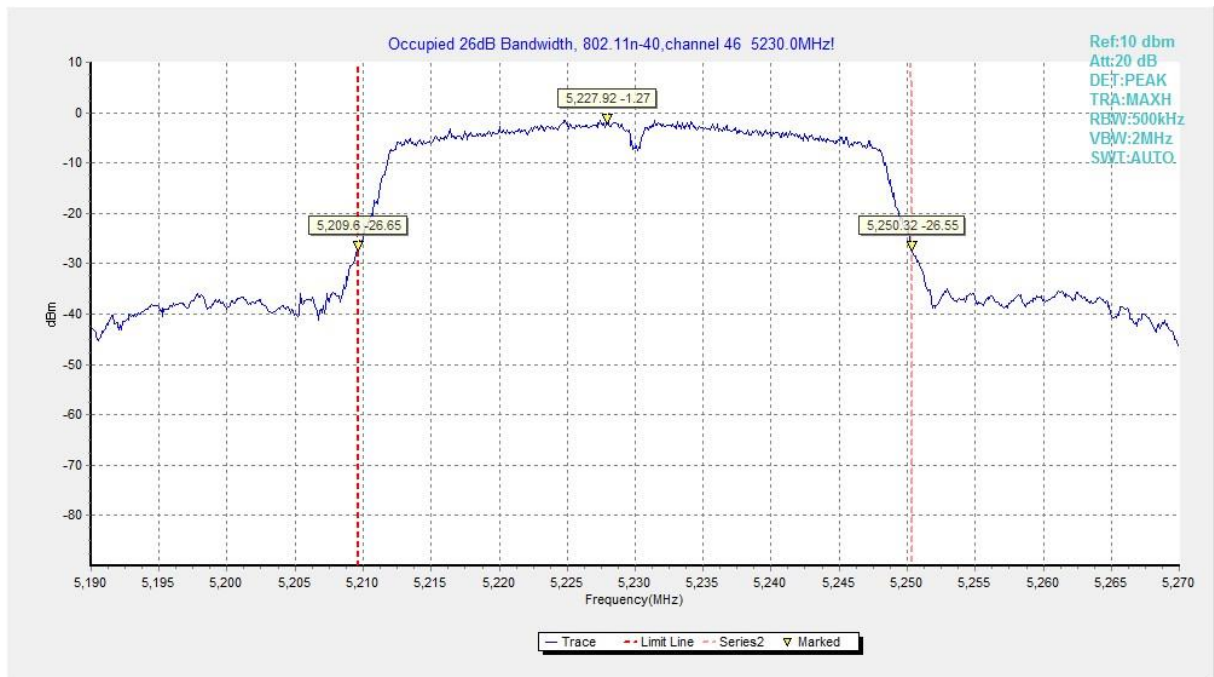


Fig. 8 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)

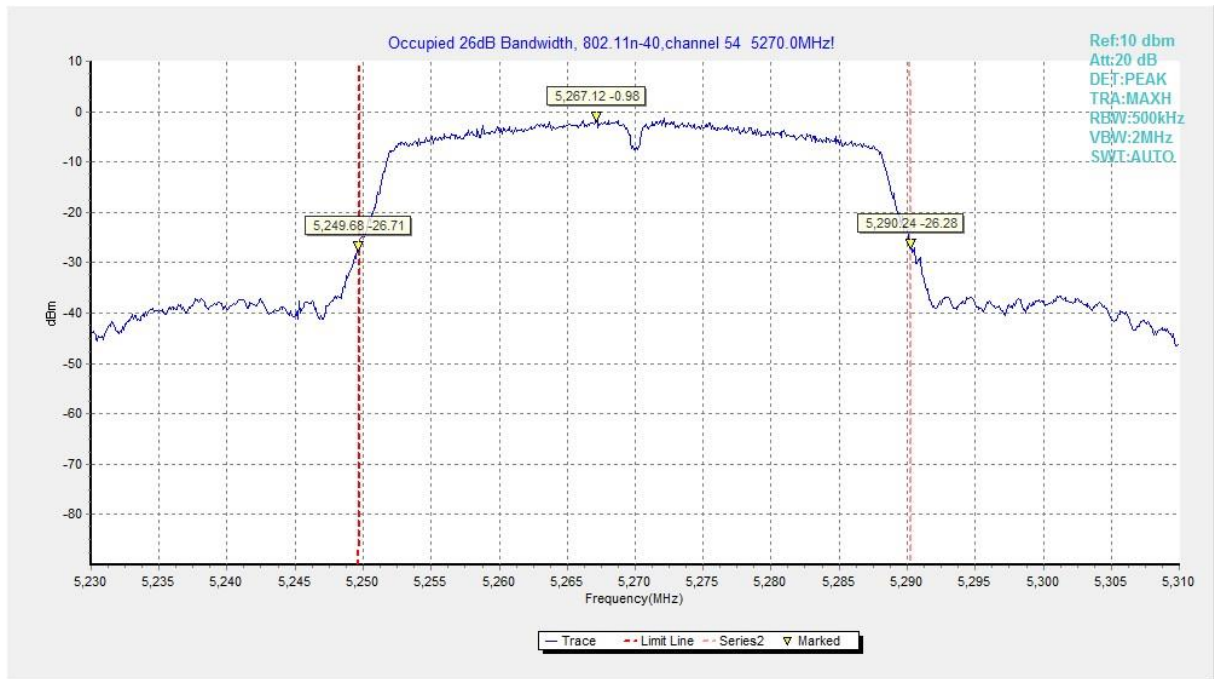


Fig. 9 Occupied 26dB Bandwidth (802.11n-HT40, 5270MHz)

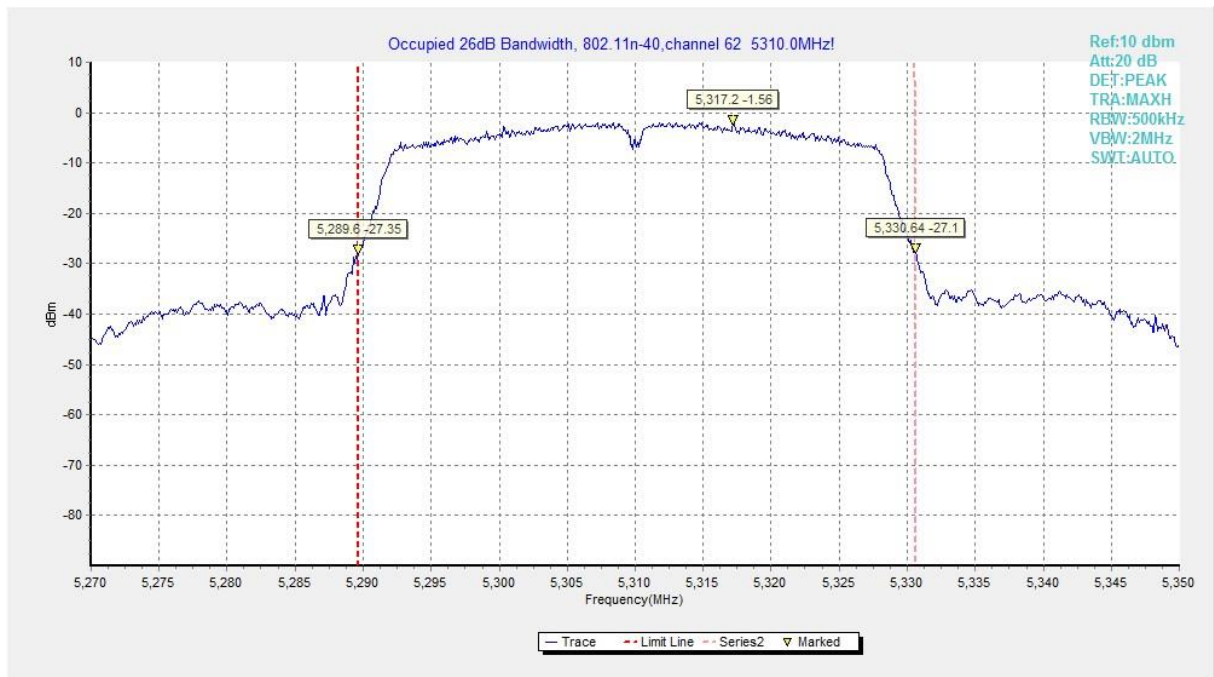


Fig. 10 Occupied 26dB Bandwidth (802.11n-HT40, 5310MHz)

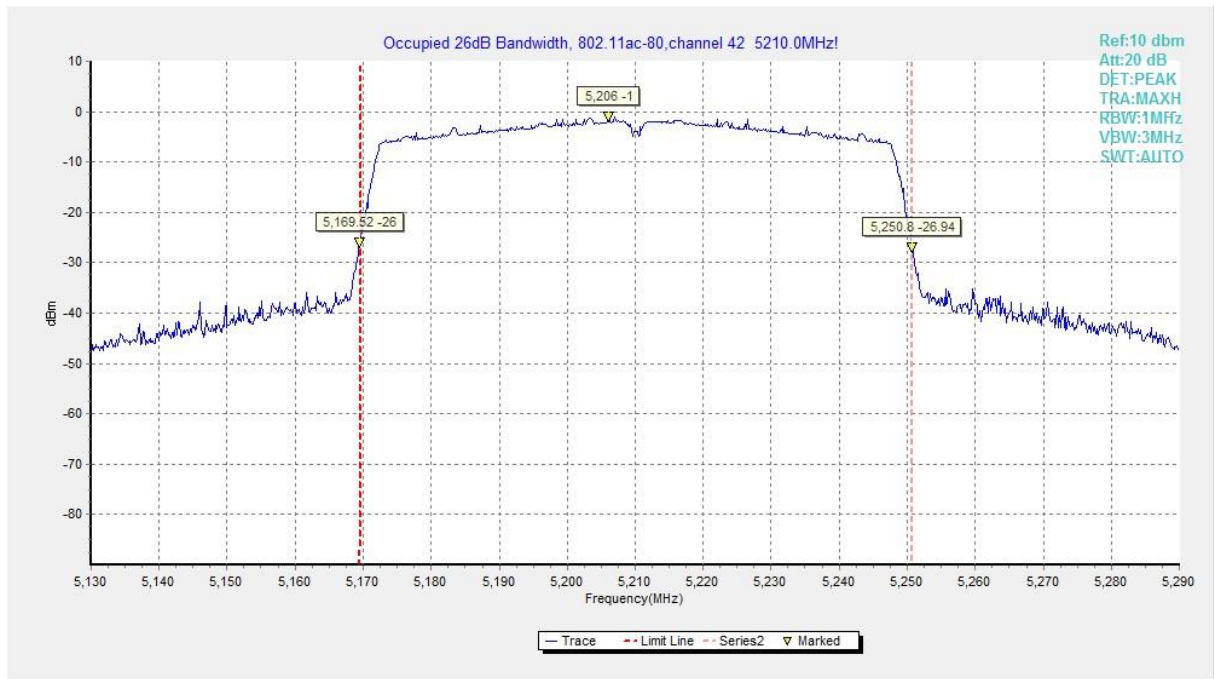


Fig. 11 Occupied 26dB Bandwidth (802. 11ac-VHT80, 5210MHz)

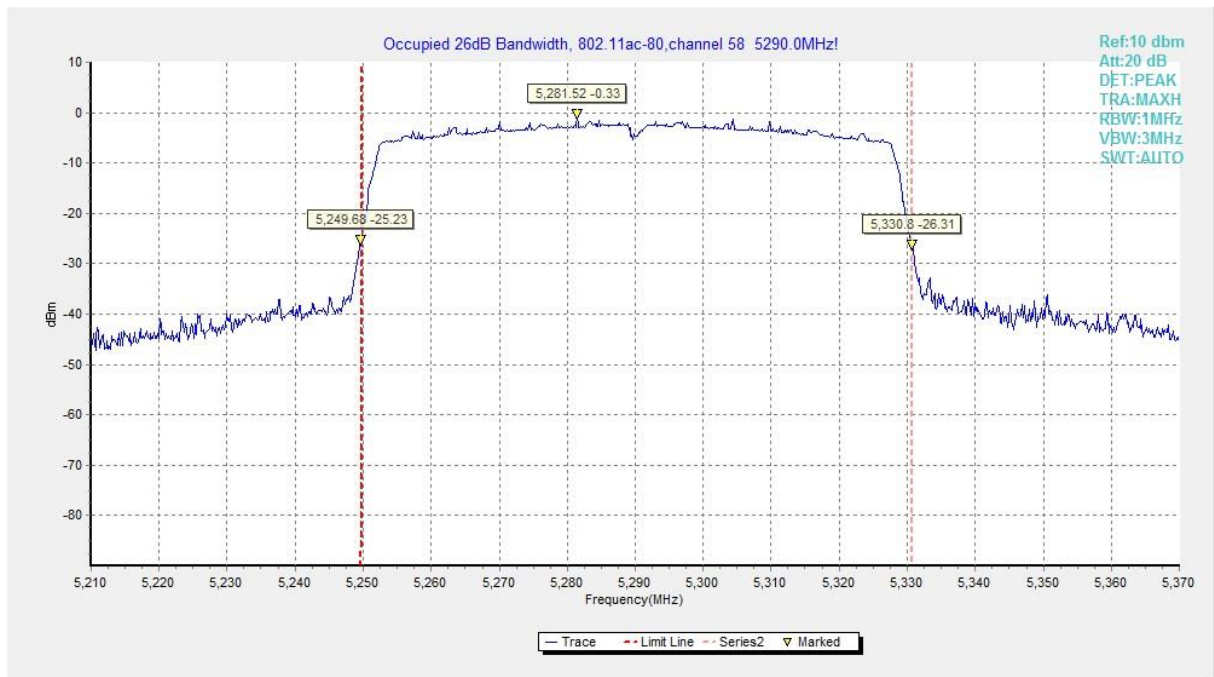


Fig. 12 Occupied 26dB Bandwidth (802. 11ac-VHT80, 5290MHz)

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.13	15.10	P
	5785MHz(Ch157)	Fig.14	15.10	P
	5825MHz(Ch165)	Fig.15	15.10	P
802.11n-HT40	5755MHz(Ch151)	Fig.16	35.12	P
	5795MHz(Ch159)	Fig.17	35.12	P
802.11ac-VHT80	5775MHz(Ch155)	Fig.18	75.20	P

Conclusion: PASS

Test graphs as below:

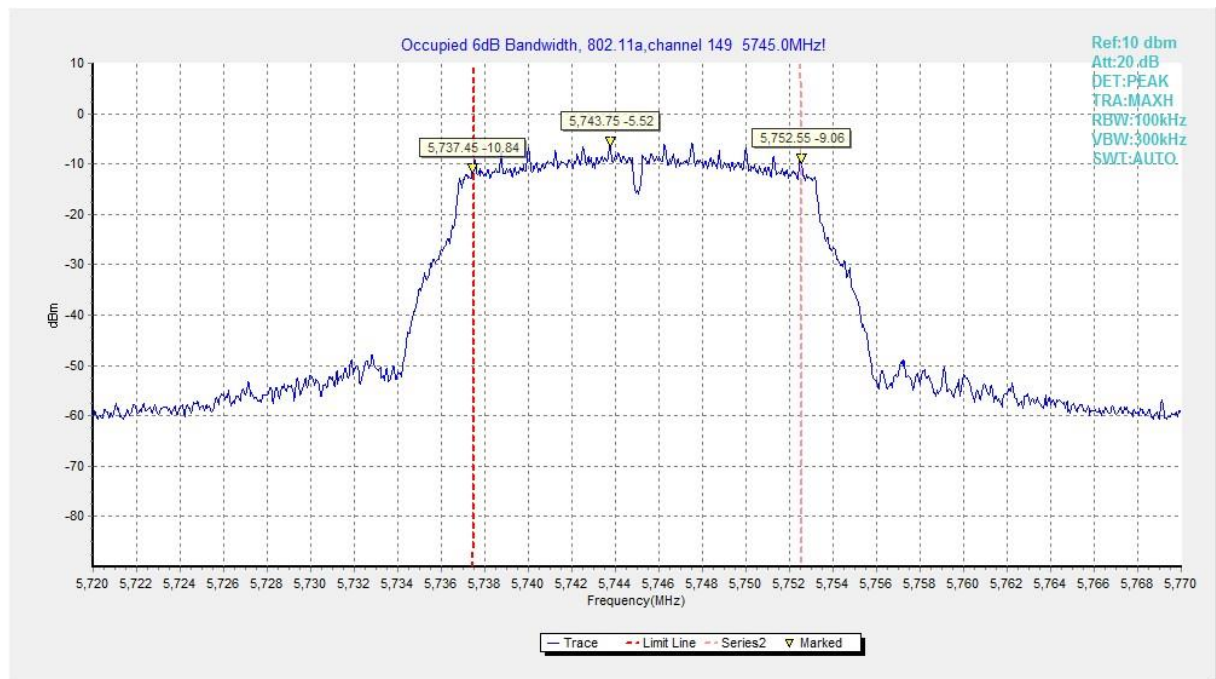


Fig. 13 Occupied 6dB Bandwidth (802.11a, 5745MHz)

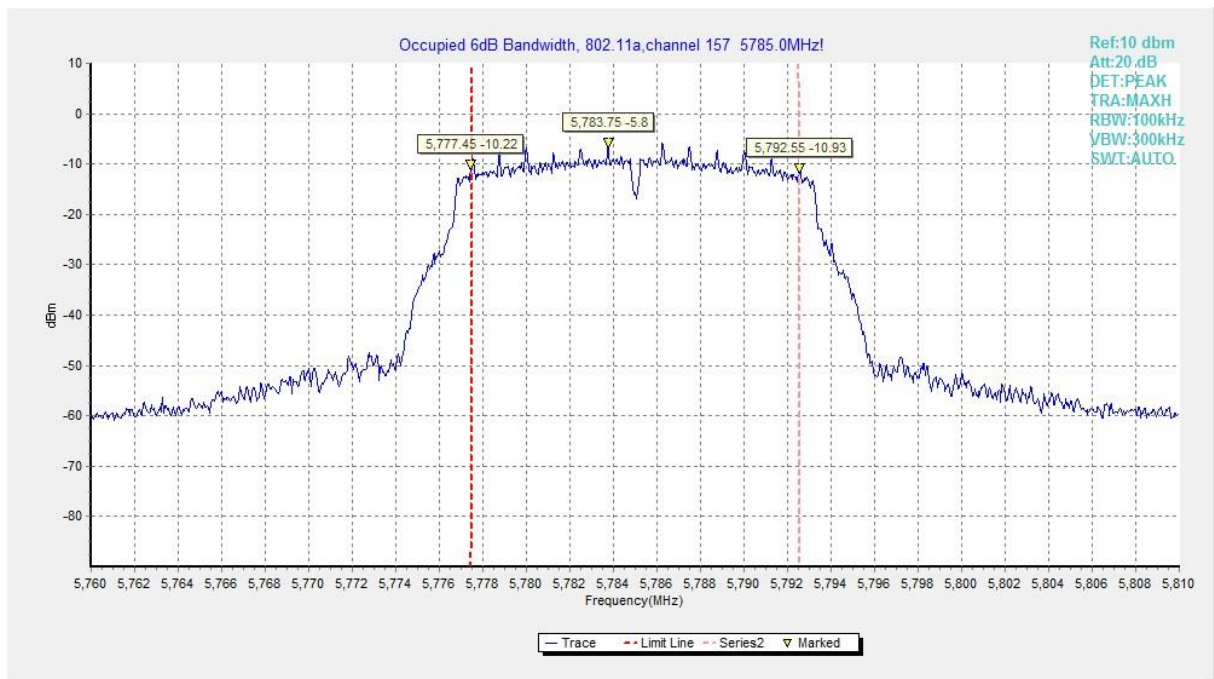


Fig. 14 Occupied 6dB Bandwidth (802.11a, 5785MHz)

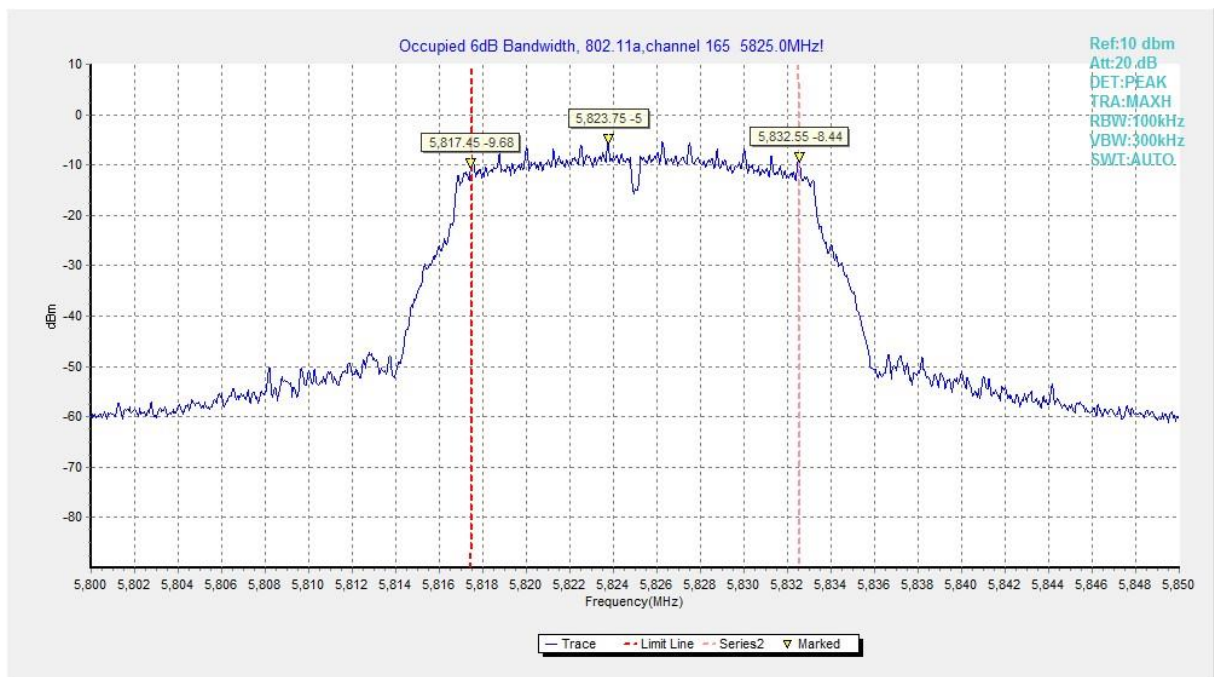


Fig. 15 Occupied 6dB Bandwidth (802.11a, 5825MHz)

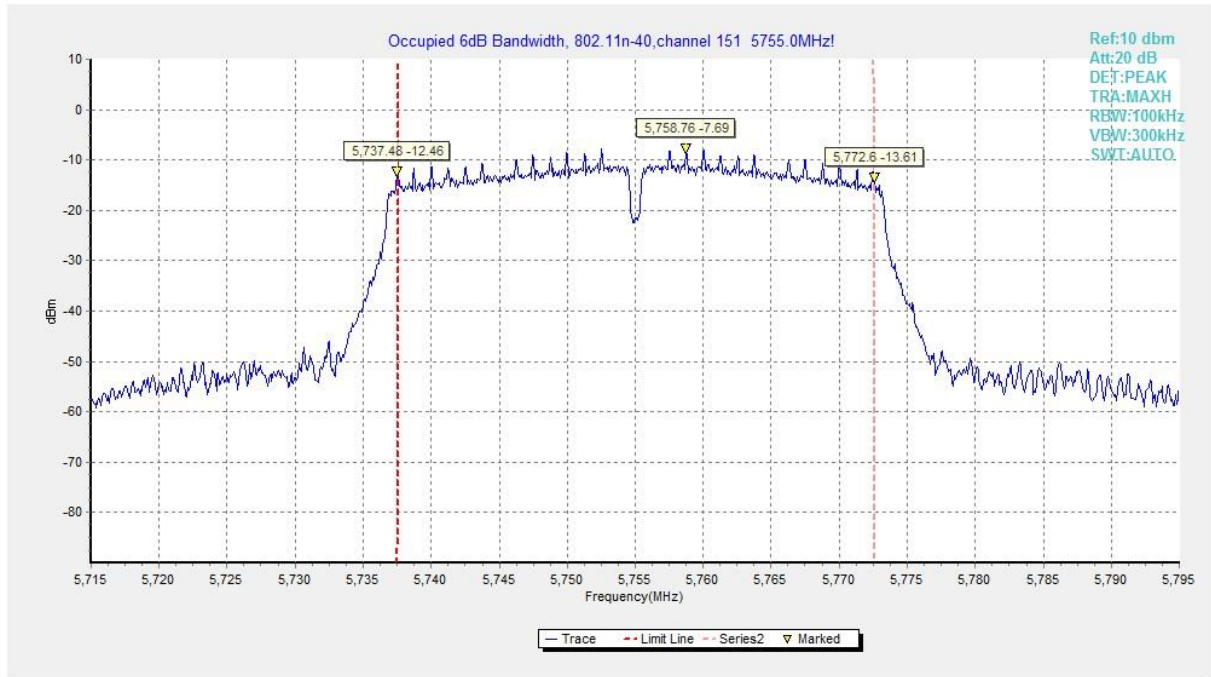


Fig. 16 Occupied 6dB Bandwidth (802.11n-HT40, 5755MHz)

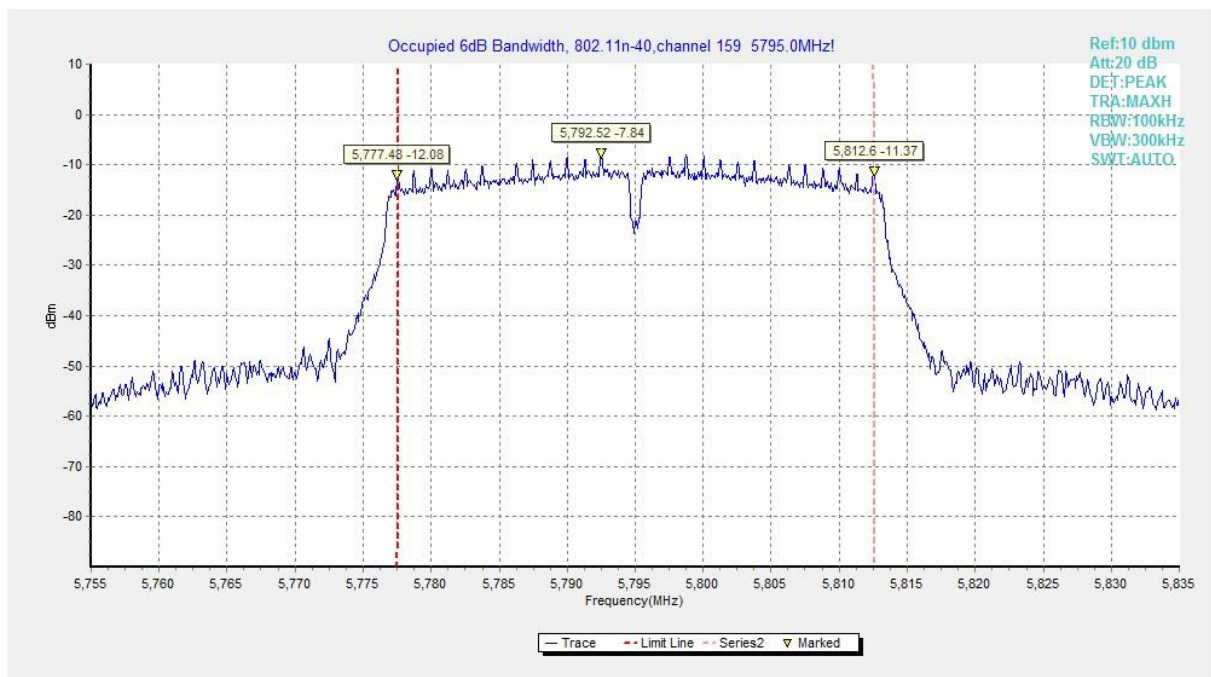


Fig. 17 Occupied 6dB Bandwidth (802.11n-HT40, 5795MHz)

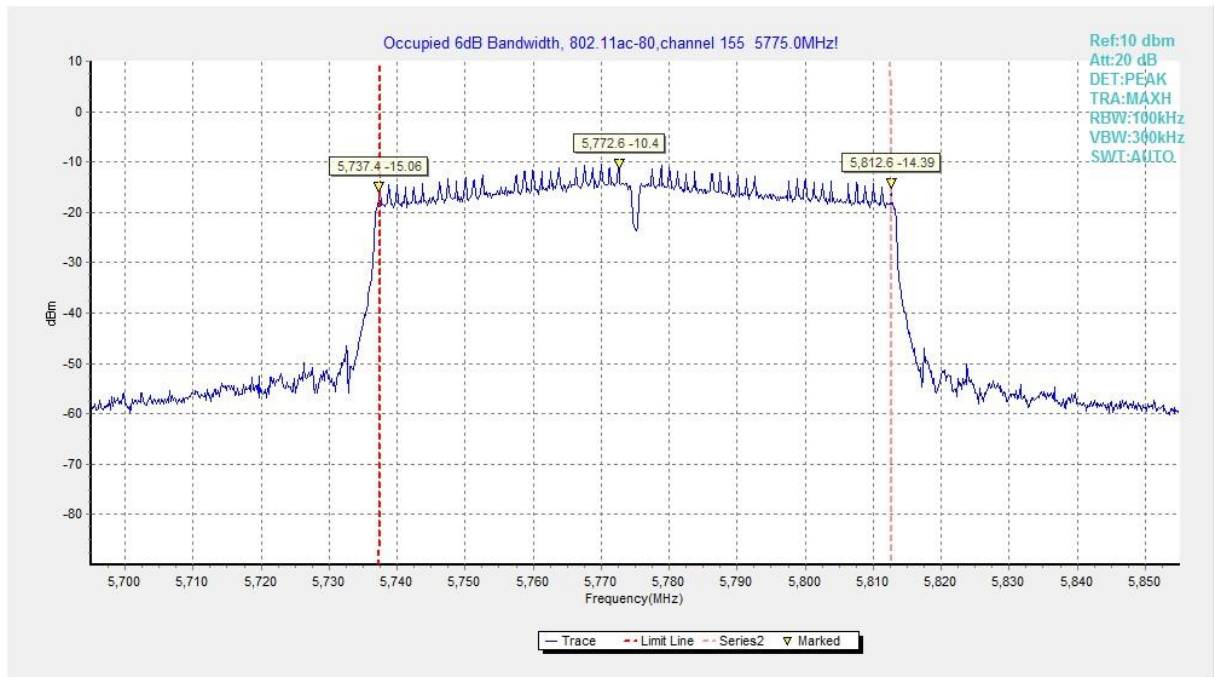


Fig. 18 Occupied 6dB Bandwidth (802.11ac-VHT80, 5775MHz)

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.19	17.14	/
	5200MHz(Ch40)	Fig.20	17.18	/
	5240MHz(Ch48)	Fig.21	17.18	/
	5260MHz(Ch52)	Fig.22	17.18	/
	5280MHz(Ch56)	Fig.23	17.18	/
	5320MHz(Ch64)	Fig.24	17.22	/
802.11n-HT40	5190MHz(Ch38)	Fig.25	36.20	/
	5230MHz(Ch46)	Fig.26	36.20	/
	5270MHz(Ch54)	Fig.27	36.12	/
	5310MHz(Ch62)	Fig.28	36.04	/
802.11 ac-VHT80	5210MHz(Ch42)	Fig.29	75.28	/
	5290MHz(Ch58)	Fig.30	75.28	/

Conclusion: PASS

Test graphs as below:

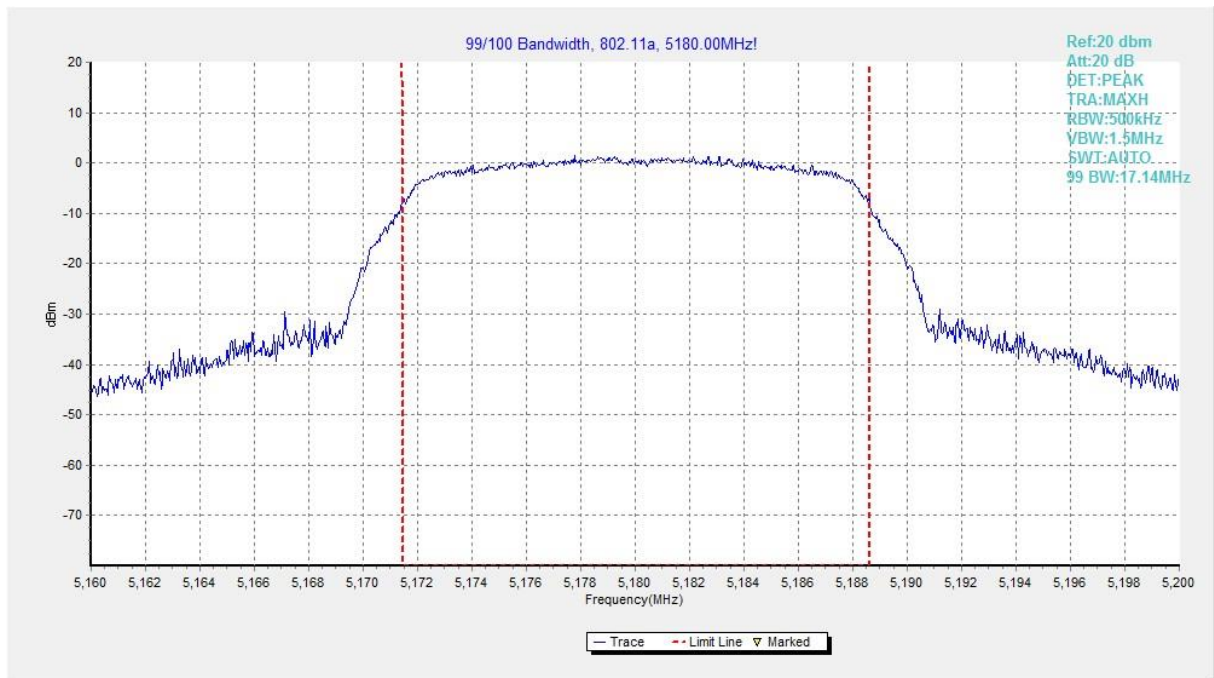


Fig. 19 99% Occupied Bandwidth (802.11a, 5180MHz)

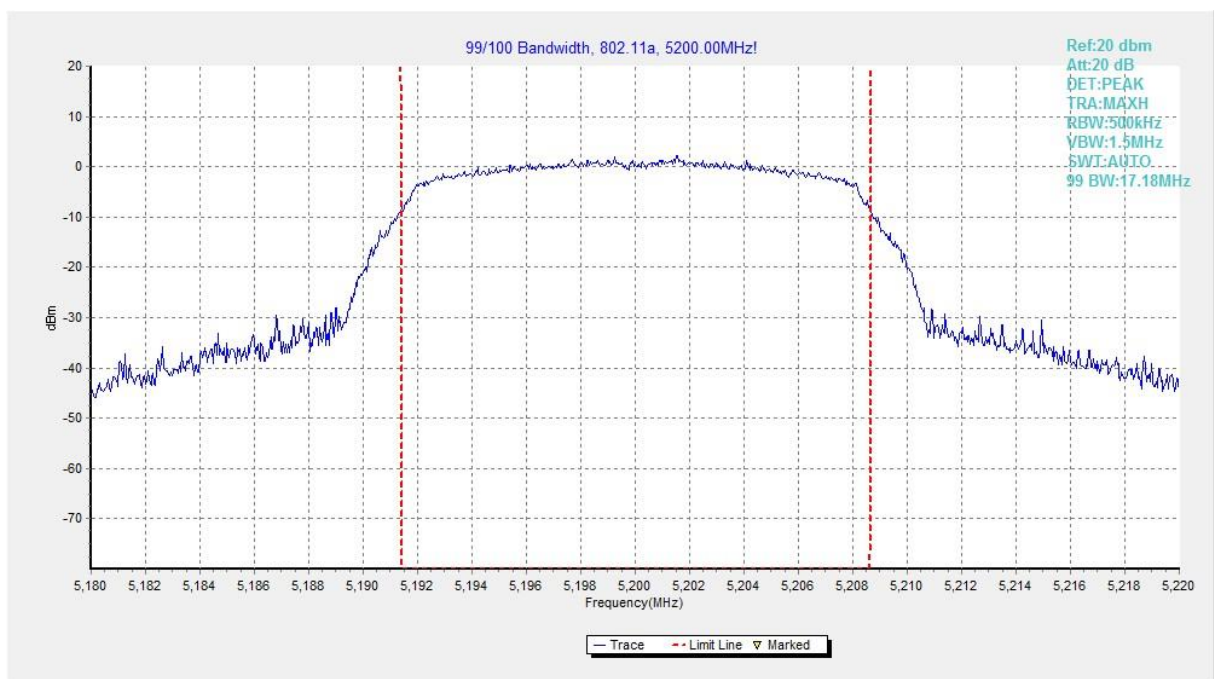


Fig. 20 99% Occupied Bandwidth (802.11a, 5200MHz)

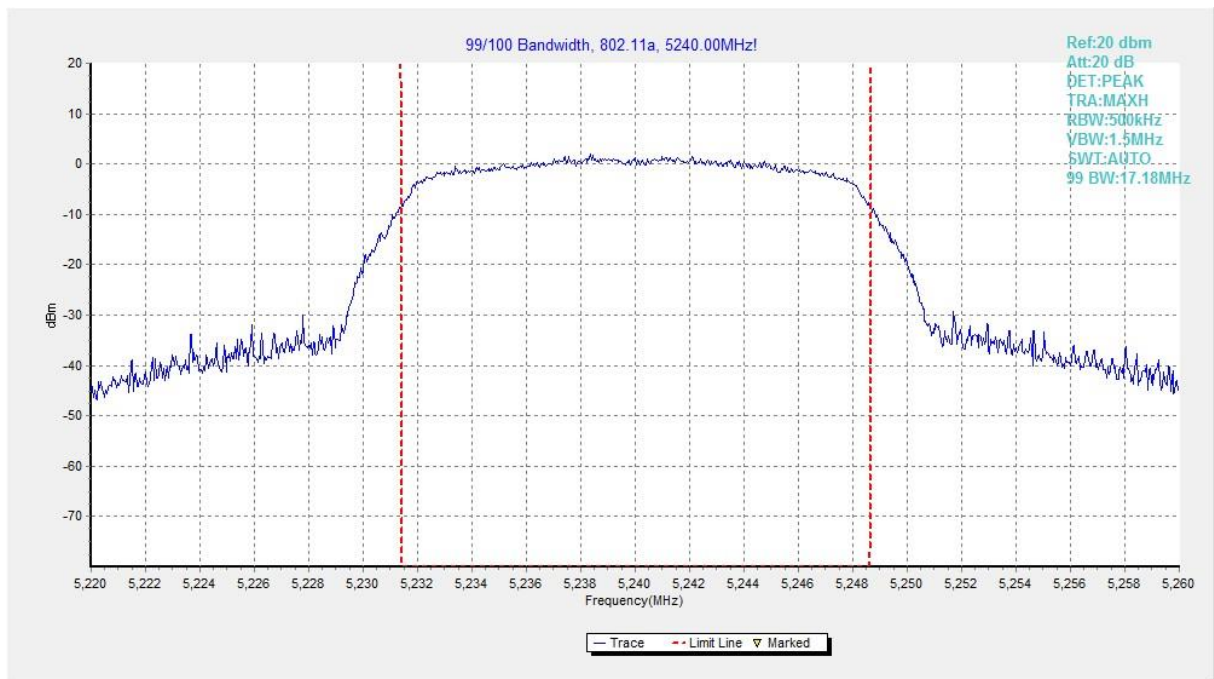


Fig. 21 99% Occupied Bandwidth (802.11a, 5240MHz)

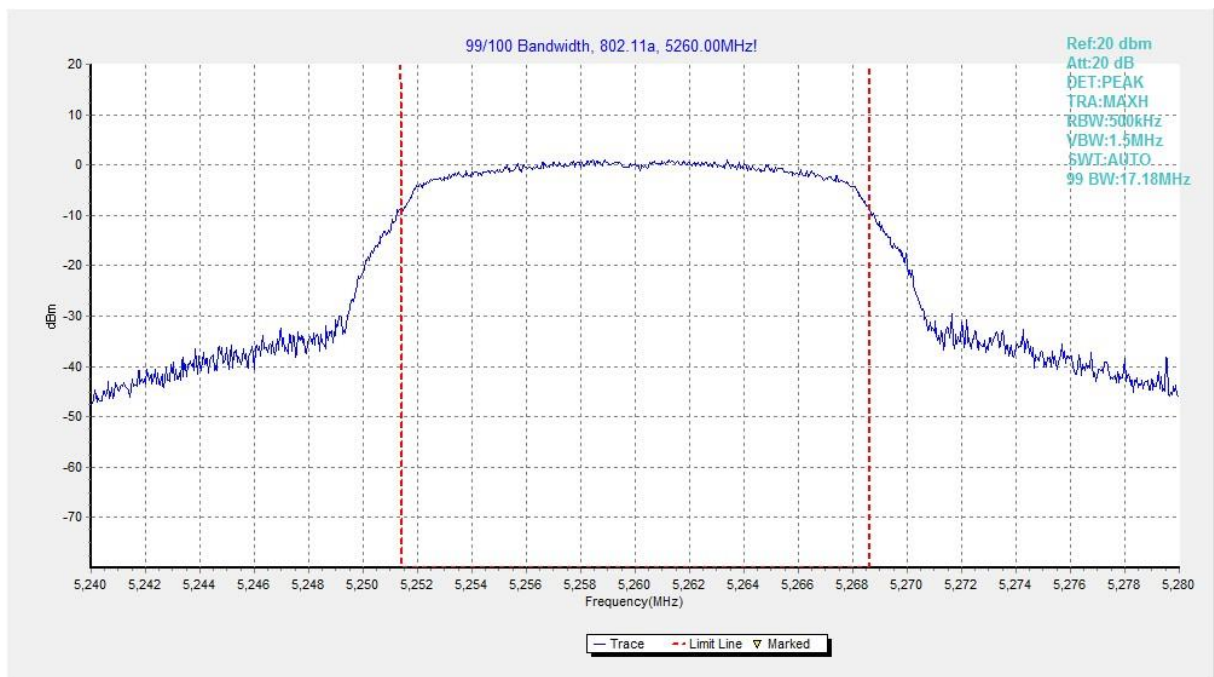


Fig. 22 99% Occupied Bandwidth (802.11a, 5260MHz)

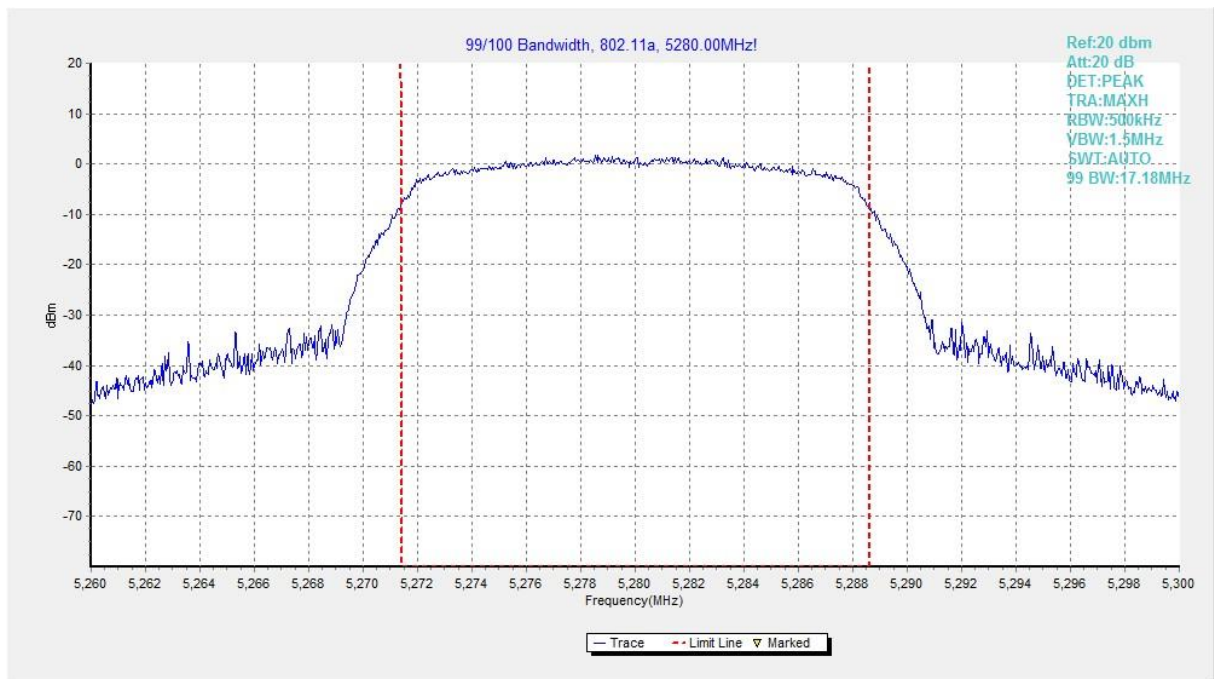


Fig. 23 99% Occupied Bandwidth (802.11a, 5280MHz)

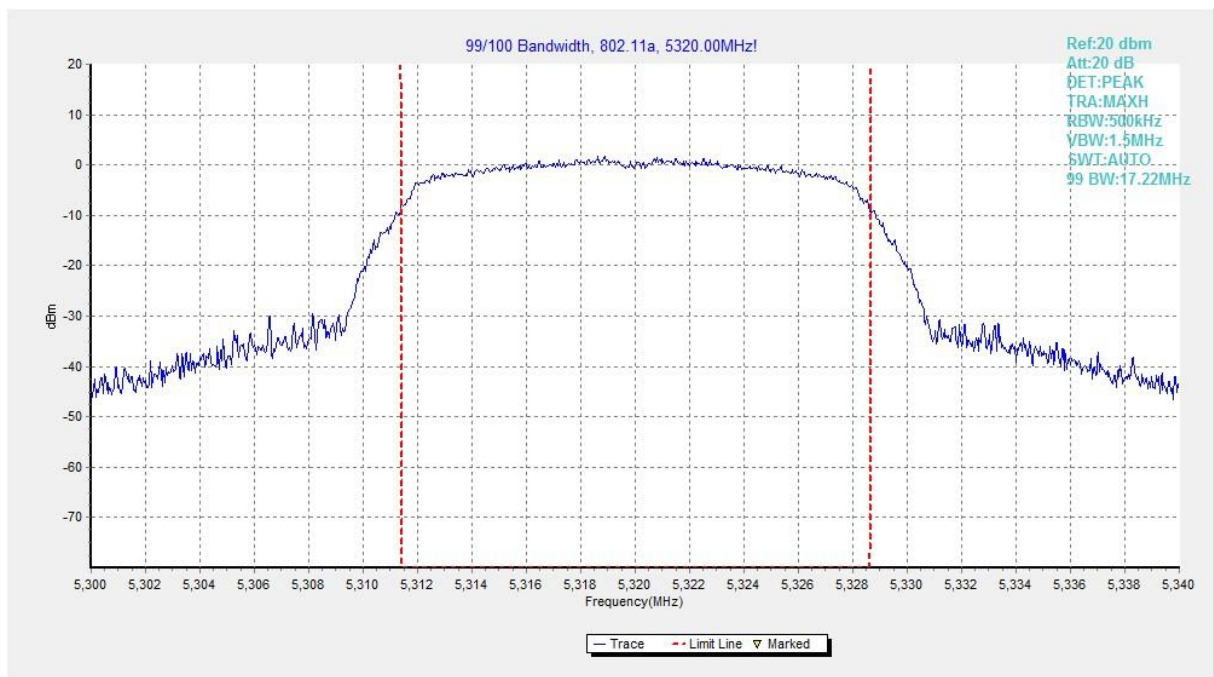


Fig. 24 99% Occupied Bandwidth (802.11a, 5320MHz)

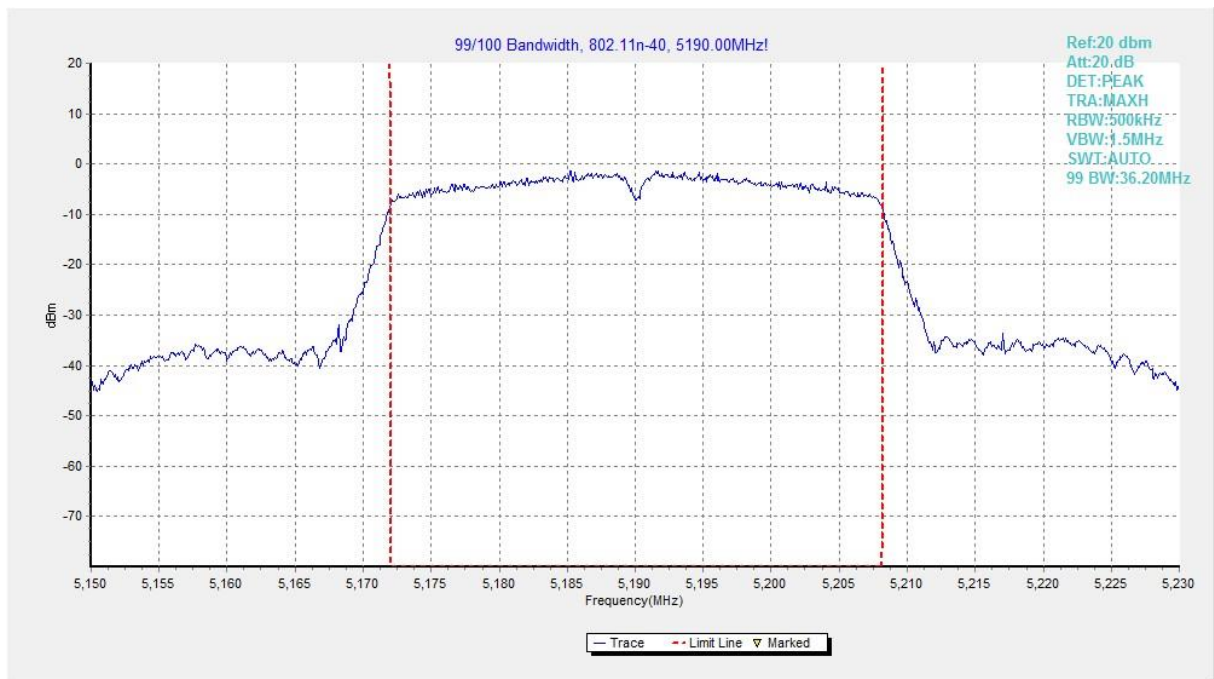


Fig. 25 99% Occupied Bandwidth (802.11n-HT40, 5190MHz)

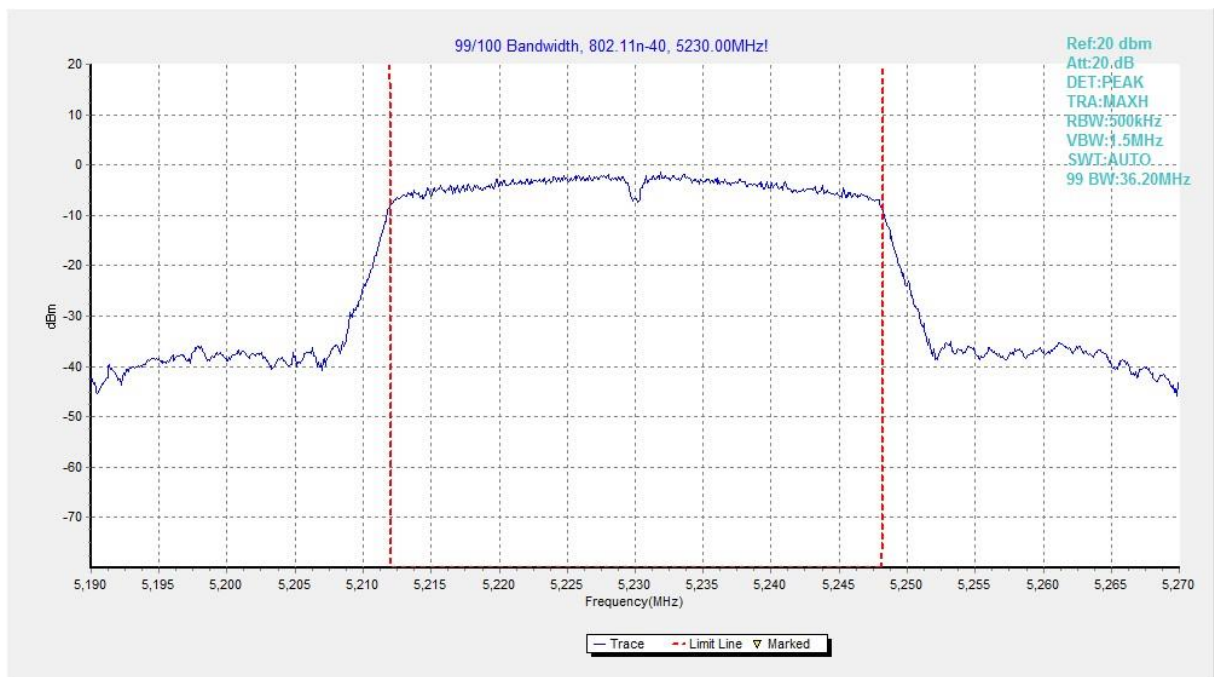


Fig. 26 99% Occupied Bandwidth (802.11n-HT40, 5230MHz)

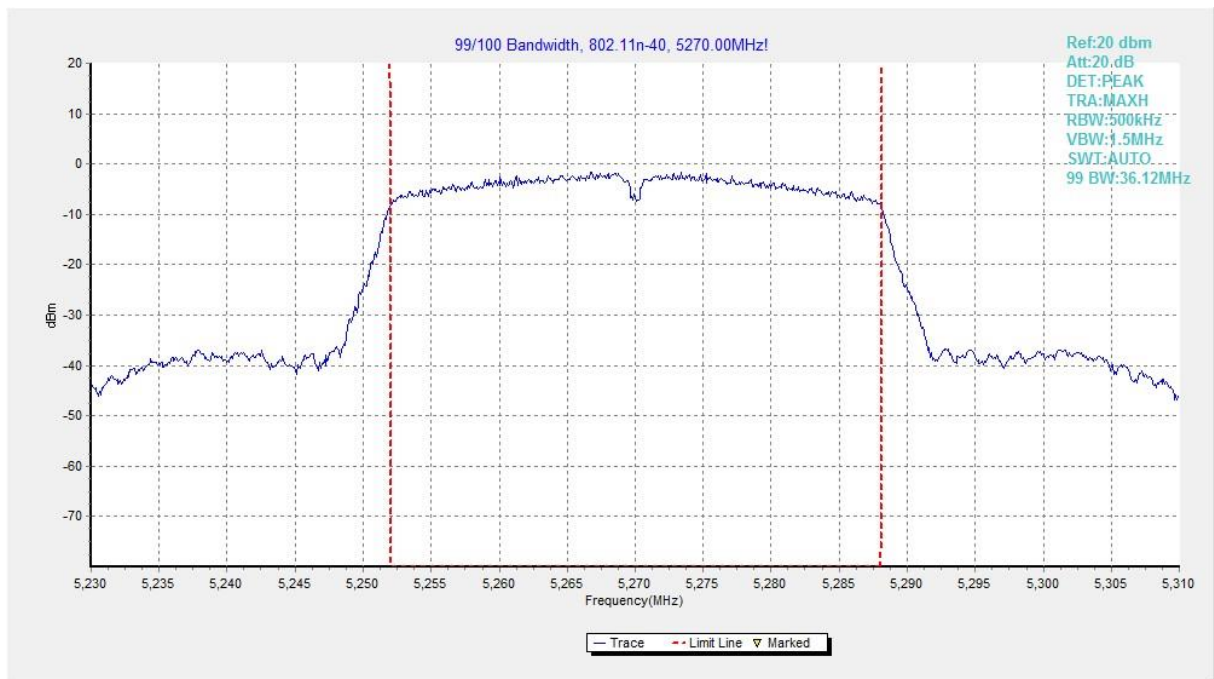


Fig. 27 99% Occupied Bandwidth (802.11n-HT40, 5270MHz)

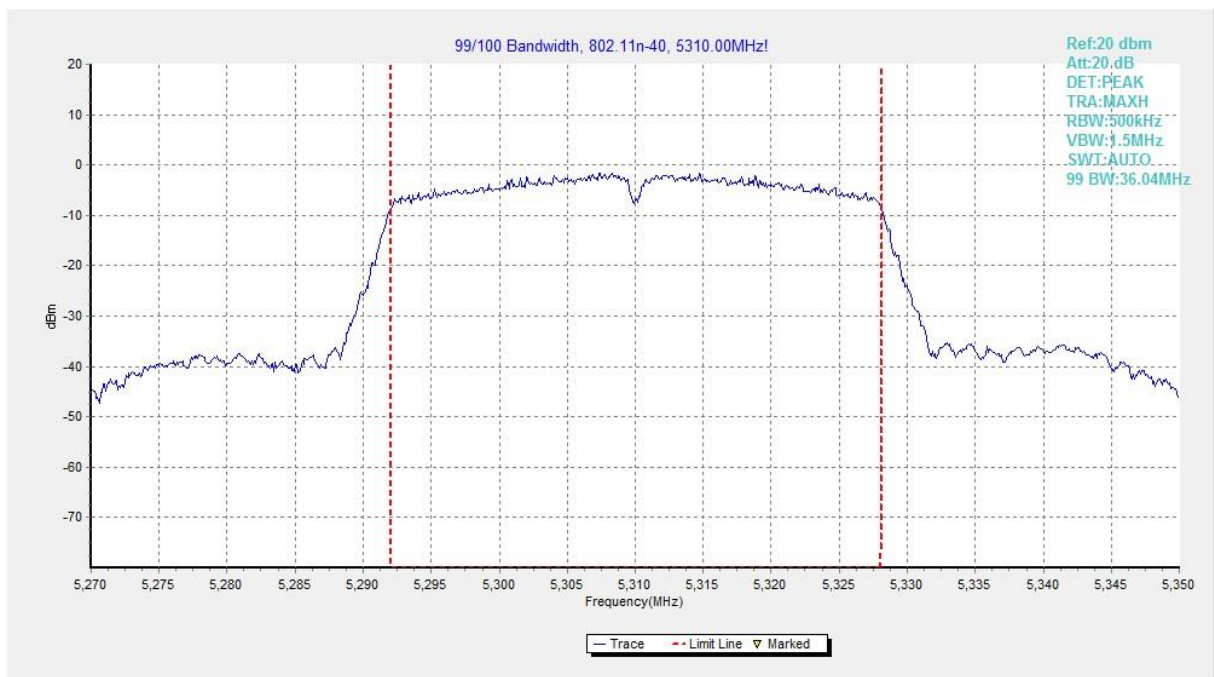


Fig. 28 99% Occupied Bandwidth (802.11n-HT40, 5310MHz)

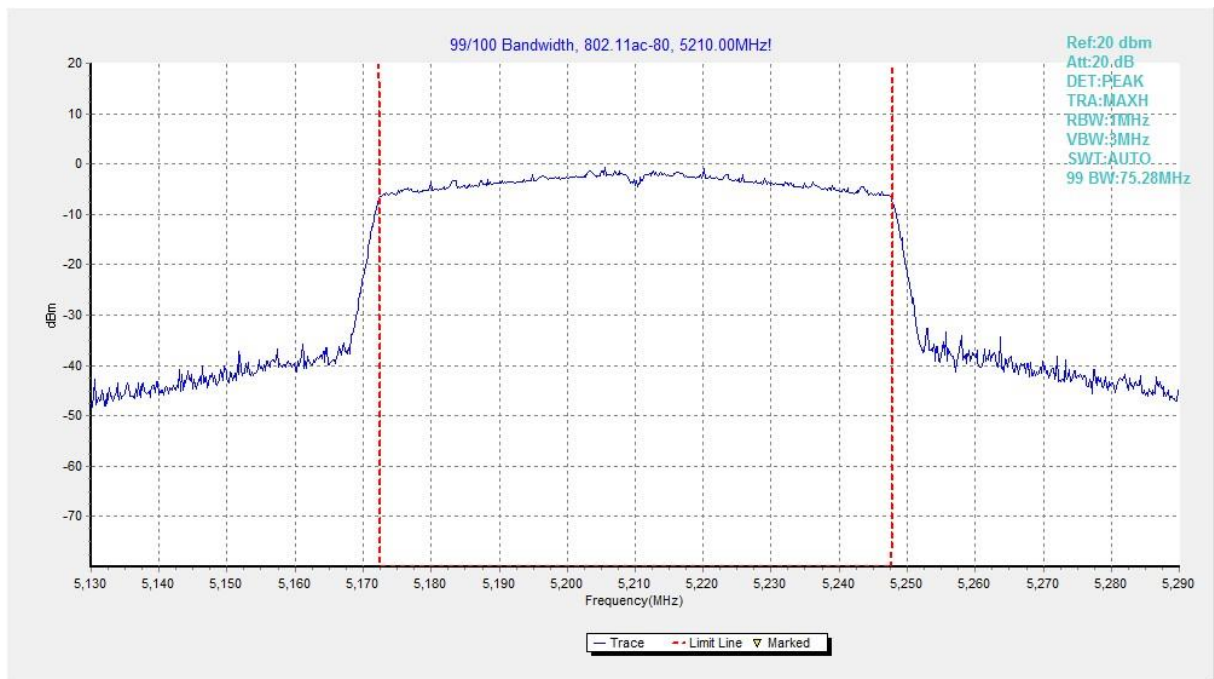


Fig. 29 99% Occupied Bandwidth (802.11ac-VHT80, 5210MHz)

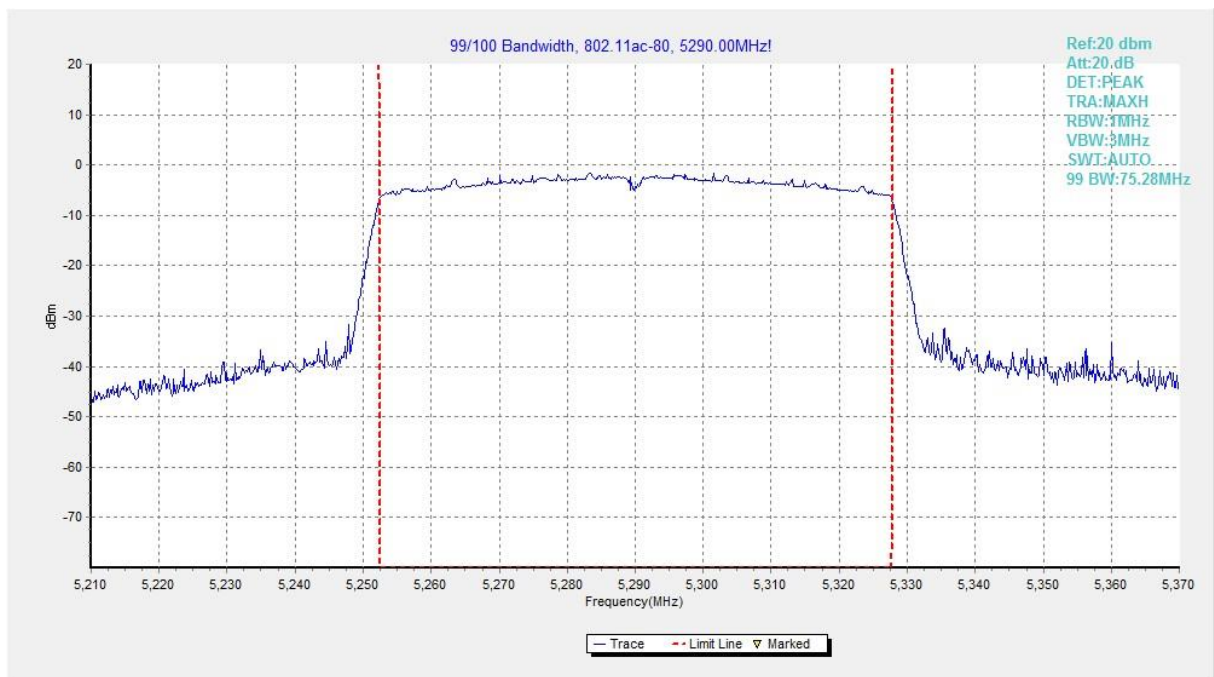


Fig. 30 99% Occupied Bandwidth (802.11ac-VHT80, 5290MHz)

A.7. Band Edges Compliance

Measurement Limit:

Standard	Frequency (MHz)	Limit (dBm/MHz)
FCC 47 CFR Part 15.407	5150MHz~5250MHz; 5250MHz~5350MHz; 5470MHz~5725MHz	< -27

Standard	Frequency (MHz)	Limit (dBuV/m)	
FCC 47 CFR Part 15.209	5725MHz~5850MHz	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.31	P
	5320 MHz(CH64)	Fig.32	P
	5745 MHz(CH149)	Fig.33	P
	5825 MHz(CH165)	Fig.34	P
802.11n-HT40	5190 MHz(CH38)	Fig.35	P
	5310 MHz(CH62)	Fig.36	P
	5755 MHz(CH151)	Fig.37	P
	5795 MHz(CH159)	Fig.38	P
802.11ac-VHT80	5210 MHz(CH42)	Fig.39	P
	5290 MHz(CH58)	Fig.40	P
	5775 MHz(CH155)	Fig.41	P

Conclusion: PASS

Test graphs as below:

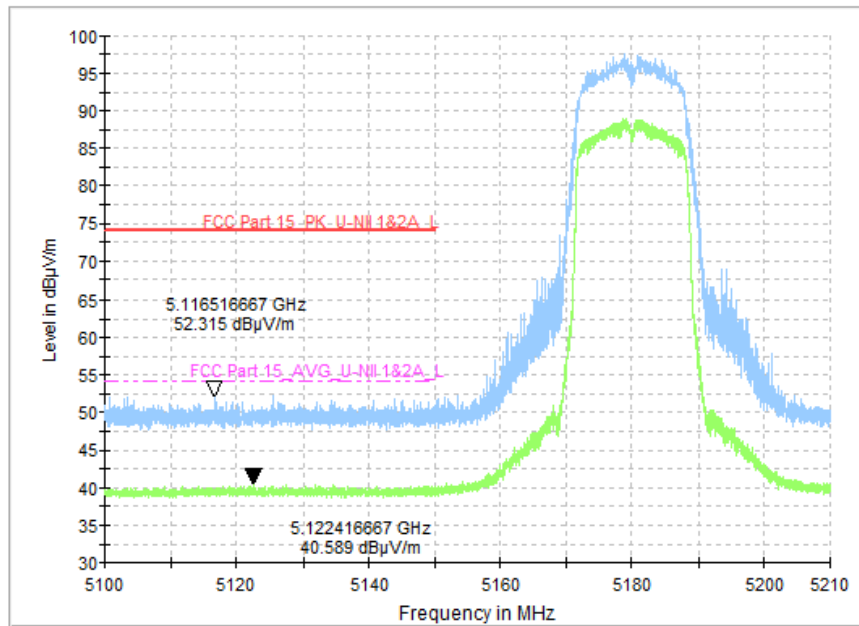


Fig. 31 Band Edges (802.11a, CH36 5180MHz)

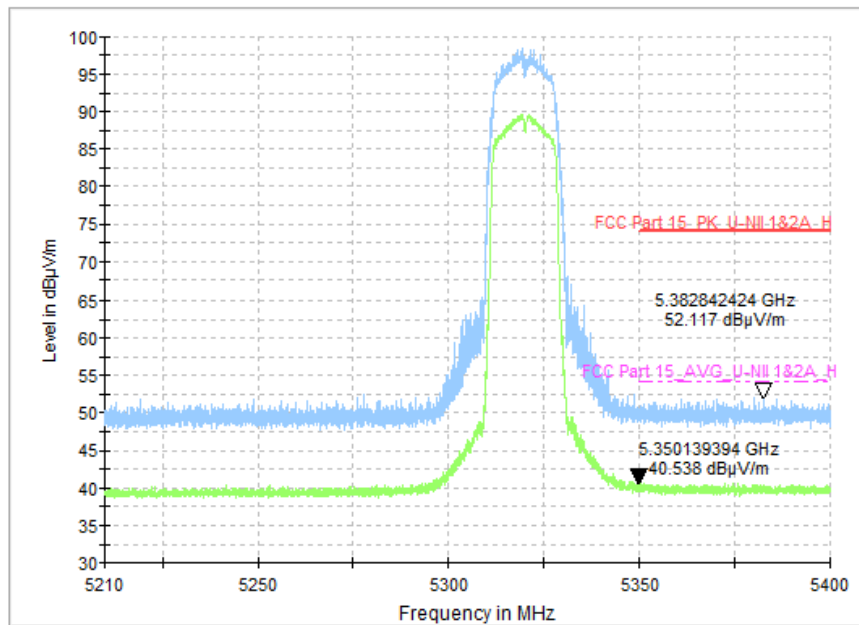


Fig. 32 Band Edges (802.11a, CH64 5320MHz)

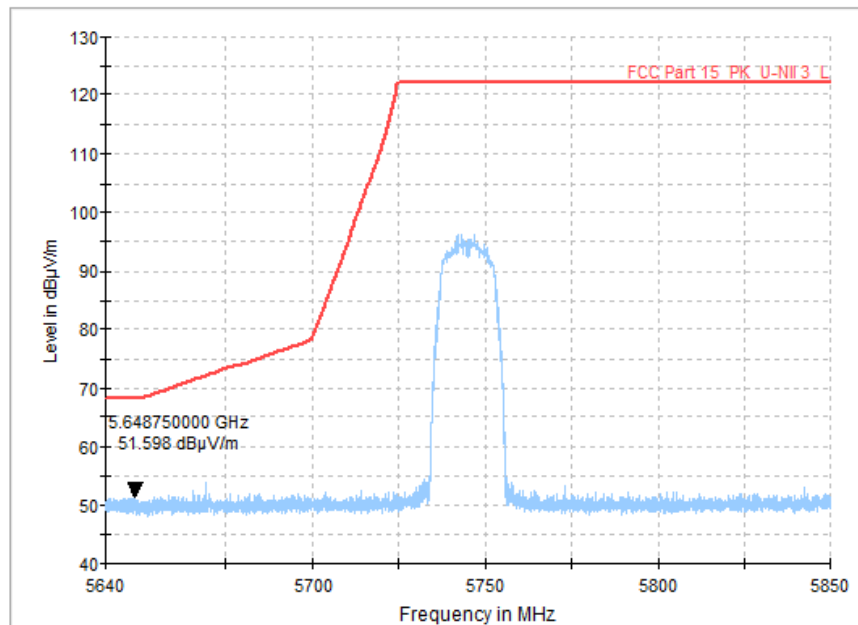


Fig. 33 Band Edges (802.11a, CH149 5745MHz)

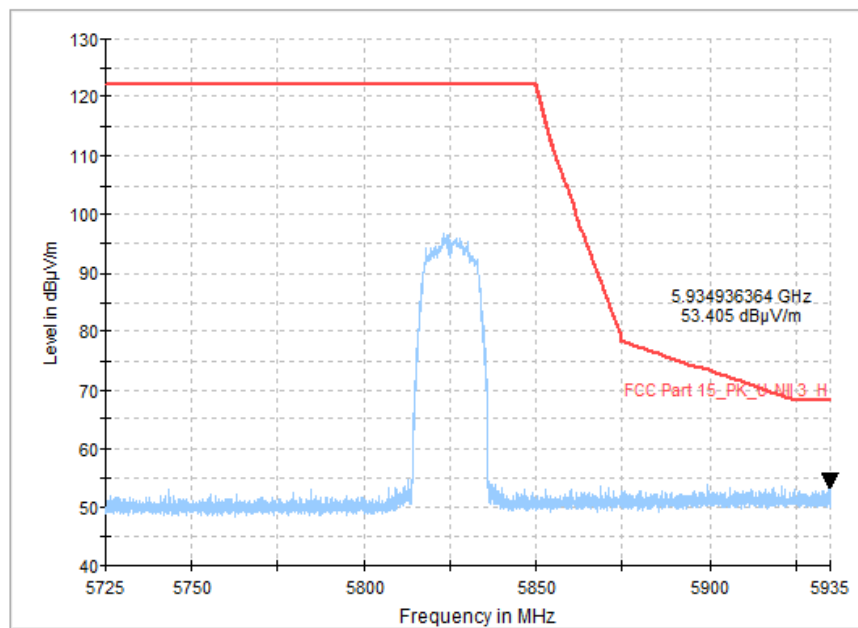


Fig. 34 Band Edges (802.11a, CH165 5825MHz)

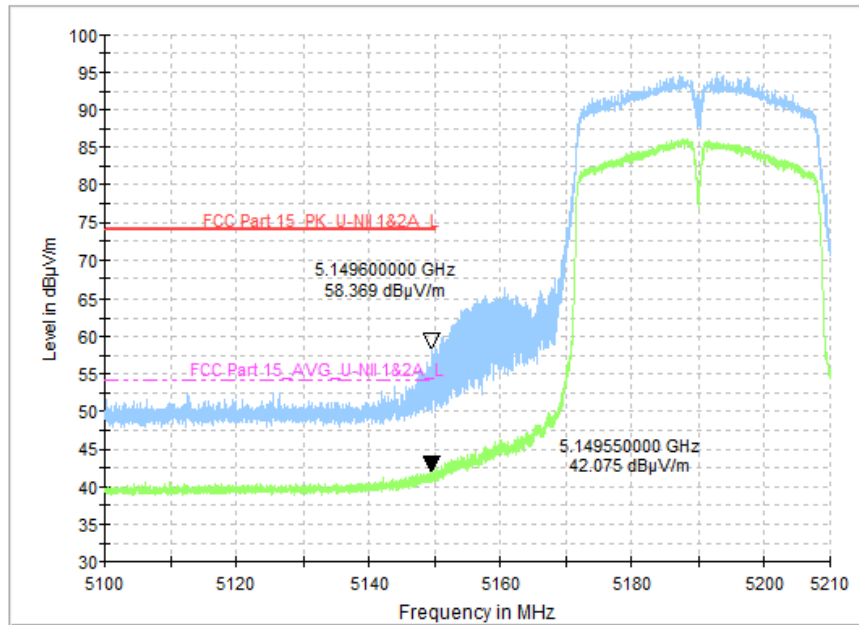


Fig. 35 Band Edges (802.11n-HT40, CH38 5190MHz)

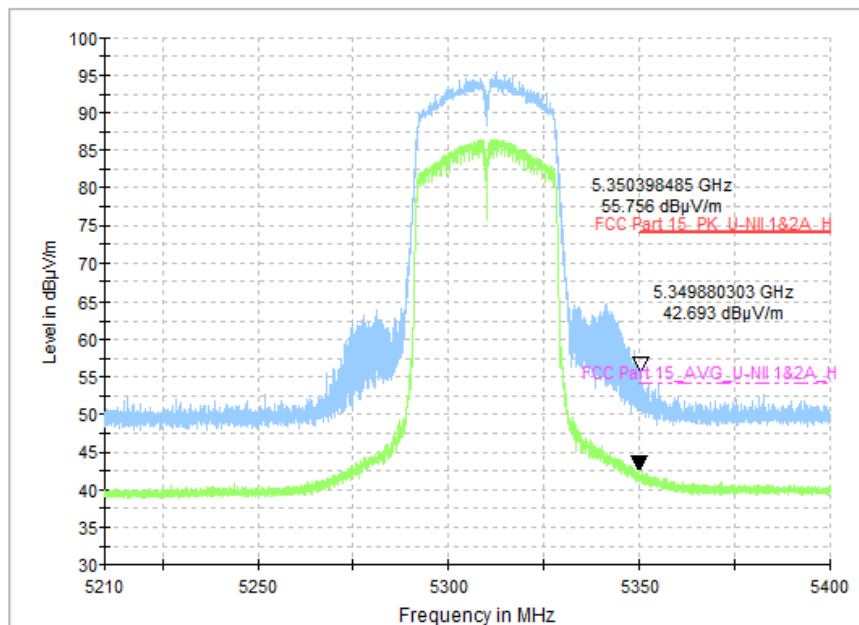


Fig. 36 Band Edges (802.11n-HT40, CH62 5310MHz)

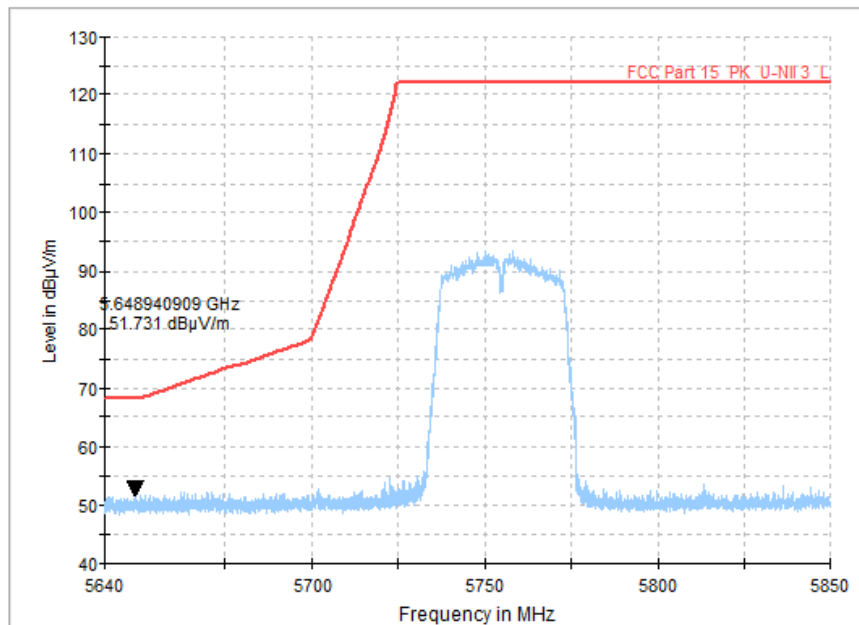


Fig. 37 Band Edges (802.11n-HT40, CH151 5755MHz)

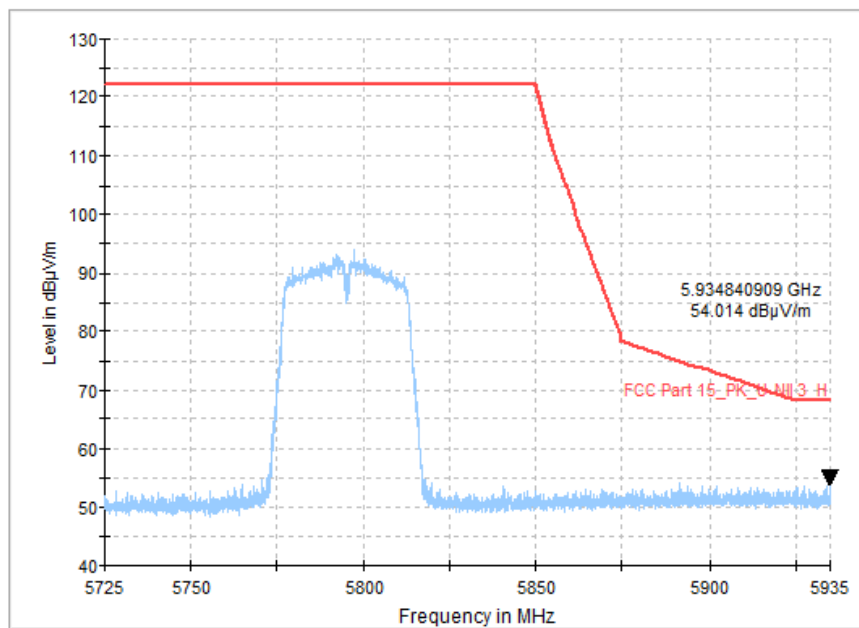


Fig. 38 Band Edges (802.11n-HT40, CH159 5795MHz)

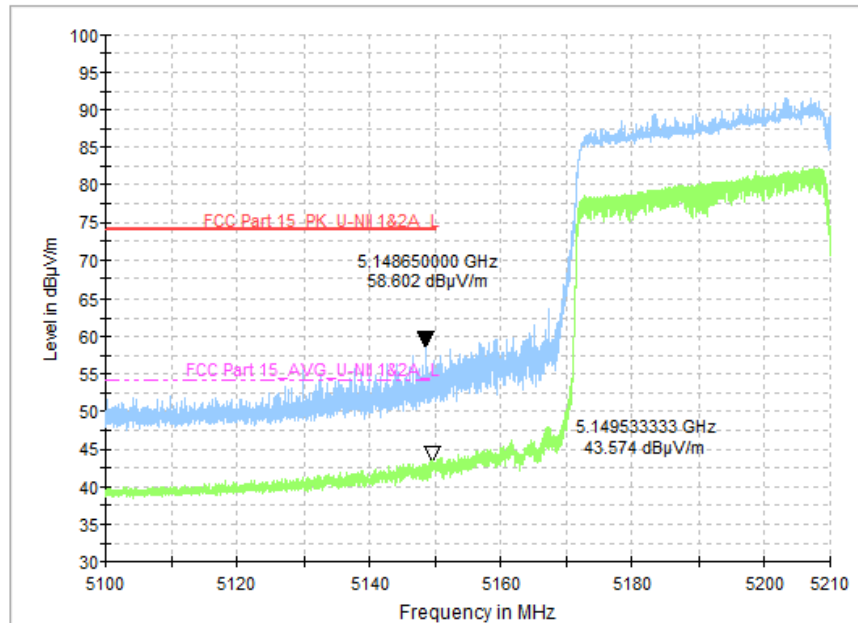


Fig. 39 Band Edges (802.11ac-VHT80, CH42 5210MHz)

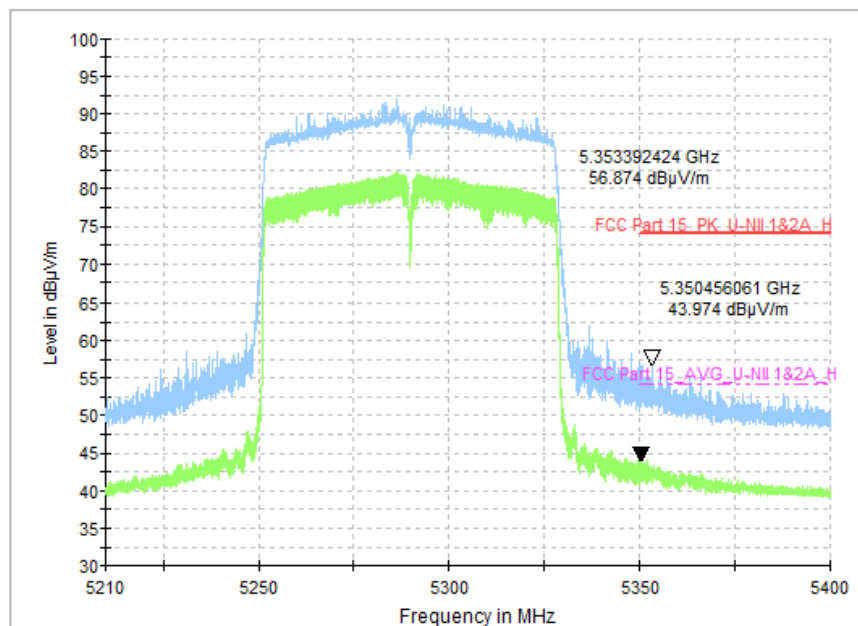


Fig. 40 Band Edges (802.11ac-VHT80, CH58 5290MHz)

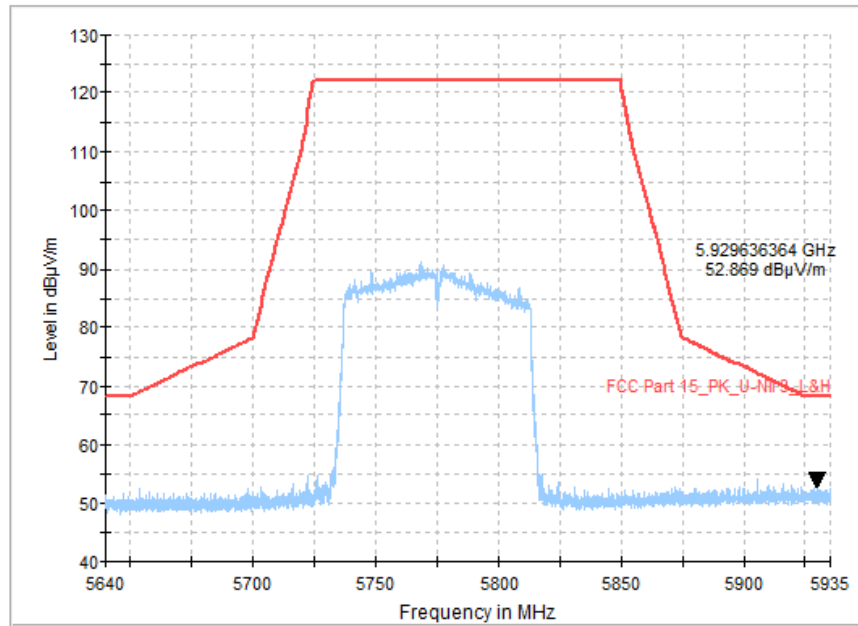


Fig. 41 Band Edges (802.11ac-VHT80, CH155 5775MHz)

A.8. Transmitter Spurious Emission

Measurement Limit:

Standard	Frequency (MHz)	Limit (dBm/MHz)
FCC 47 CFR Part 15.407	5150MHz~5250MHz; 5250MHz~5350MHz; 5470MHz~5725MHz	< -27

Standard	Frequency (MHz)	Limit (dBuV/m)	
FCC 47 CFR Part 15.209	5725MHz~5850MHz	Peak	74
		Average	54

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 (dBμV/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.42	P
	5200MHz(Ch40)	1 GHz ~18 GHz	Fig.43	P
	5240MHz(Ch48)	1 GHz ~18 GHz	Fig.44	P
	5260MHz(Ch52)	1 GHz ~18 GHz	Fig.45	P
	5280MHz(Ch56)	1 GHz ~18 GHz	Fig.46	P
	5320MHz(Ch64)	1 GHz ~18 GHz	Fig.47	P
	5745MHz(Ch149)	1 GHz ~18 GHz	Fig.48	P
	5785MHz(Ch157)	1 GHz ~18 GHz	Fig.49	P
	5825MHz(Ch165)	1 GHz ~18 GHz	Fig.50	P
802.11n- HT40	5190MHz(Ch38)	1 GHz ~18 GHz	Fig.51	P
	5230MHz(Ch46)	1 GHz ~18 GHz	Fig.52	P
	5270MHz(Ch54)	1 GHz ~18 GHz	Fig.53	P
	5310MHz(Ch62)	1 GHz ~18 GHz	Fig.54	P
	5755MHz(Ch151)	1 GHz ~18 GHz	Fig.55	P
	5795MHz(Ch159)	1 GHz ~18 GHz	Fig.56	P

802.11a-VHT80	5210MHz(Ch42)	1 GHz ~18 GHz	Fig.57	P
	5290MHz(Ch58)	1 GHz ~18 GHz	Fig.58	P
	5775MHz(Ch155)	1 GHz ~18 GHz	Fig.59	P
All channels		30 MHz ~1 GHz	Fig.60	P
		18 GHz ~26.5 GHz	Fig.61	P
		26.5GHz~40GHz	Fig.62	P

Worst Case Result

802.11a CH40

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6247.500000	52.50	68.20	15.70	V	18.0
10053.362500	45.89	68.20	22.31	H	7.0
14360.437500	49.30	68.20	18.90	H	12.4
15281.375000	49.73	68.20	18.47	V	12.7
16863.375000	52.23	68.20	15.97	V	16.3
17209.437500	52.00	68.20	16.20	H	16.7

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
8319.925000	48.19	54.00	5.81	V	5.6
11516.975000	34.20	54.00	19.80	H	8.8
12106.612500	35.70	54.00	18.30	V	10.4
12523.175000	36.43	54.00	17.57	V	11.1
15846.187500	39.45	54.00	14.55	H	15.3
17951.875000	40.75	54.00	13.25	H	16.9

802.11a CH64

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6262.000000	52.72	68.20	15.48	H	17.9
8511.812500	53.54	68.20	14.66	V	5.4
13780.312500	49.55	68.20	18.65	V	11.5
15304.562500	49.96	68.20	18.24	H	12.8
16777.625000	51.90	68.20	16.30	V	16.3
17192.375000	51.29	68.20	16.91	V	16.7

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
11454.625000	34.28	54.00	19.72	V	8.7
12035.662500	35.52	54.00	18.48	V	10.1
12429.112500	36.33	54.00	17.67	H	11.0
15787.562500	39.67	54.00	14.33	H	15.0
15957.750000	39.42	54.00	14.58	H	14.9
17953.625000	40.41	54.00	13.59	H	16.9

802.11a CH165

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6298.000000	53.28	68.20	14.92	V	17.0
10065.725000	45.63	68.20	22.57	H	7.0
14317.125000	49.80	68.20	18.40	H	12.3
15198.687500	48.99	68.20	19.21	V	12.7
16605.250000	51.73	68.20	16.47	V	16.1
17387.062500	52.05	68.20	16.15	V	16.6

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
11379.912500	35.36	54.00	18.64	V	8.6
12046.950000	35.50	54.00	18.50	H	10.2
12531.237500	36.18	54.00	17.82	V	11.1
15792.812500	39.70	54.00	14.30	V	15.0
15966.937500	38.87	54.00	15.13	V	14.8
17982.937500	40.40	54.00	13.60	H	17.0

802.11n HT40 CH46

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6269.500000	52.86	68.20	15.34	H	17.9
12790.250000	48.22	68.20	19.98	H	11.5
13425.500000	48.82	68.20	19.38	V	12.0
14552.062500	49.59	68.20	18.61	H	12.7
16810.437500	52.15	68.20	16.05	V	16.3
17040.562500	52.11	68.20	16.09	V	16.5

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
8367.762500	49.73	54.00	4.27	V	5.5
11464.837500	34.38	54.00	19.62	H	8.7
12058.237500	35.75	54.00	18.25	V	10.2
12376.437500	36.41	54.00	17.59	H	11.0
15819.062500	39.48	54.00	14.52	H	15.2
17972.000000	40.59	54.00	13.41	H	17.0

802.11n HT40 CH62

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
5965.000000	53.19	68.20	15.01	V	17.2
10079.700000	46.16	68.20	22.04	H	7.0
13580.375000	49.16	68.20	19.04	H	11.7
16651.187500	52.58	68.20	15.62	H	16.1
17022.187500	51.91	68.20	16.29	H	16.5
17270.687500	51.60	68.20	16.60	V	16.6

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
7453.475000	31.87	54.00	22.13	H	5.3
8495.687500	49.80	54.00	4.20	V	5.4
11472.362500	34.69	54.00	19.31	H	8.7
12097.475000	35.66	54.00	18.34	V	10.4
12533.925000	36.52	54.00	17.48	H	11.1
17982.062500	40.25	54.00	13.75	H	17.0

802.11n HT40 CH159

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6248.000000	53.78	68.20	14.42	V	17.4
9886.737500	45.91	68.20	22.29	V	6.6
13553.687500	49.16	68.20	19.04	H	11.8
14592.750000	49.95	68.20	18.25	H	12.7
16900.125000	51.77	68.20	16.43	H	16.3
17359.937500	52.14	68.20	16.06	V	16.6

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
7556.675000	32.30	54.00	21.70	H	5.4
11068.162500	34.48	54.00	19.52	H	7.7
11462.687500	34.49	54.00	19.51	V	8.7
12134.562500	35.86	54.00	18.14	H	10.5
15852.750000	39.47	54.00	14.53	H	15.3
17993.000000	40.60	54.00	13.40	V	17.0

802.11ac VHT80 CH58

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6222.500000	53.30	68.20	14.90	V	17.9
9988.325000	46.16	68.20	22.04	V	6.9
13495.937500	49.10	68.20	19.10	V	11.9
14544.625000	49.64	68.20	18.56	H	12.7
16697.562500	51.55	68.20	16.65	H	16.2
17010.812500	52.32	68.20	15.88	H	16.5

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
8463.975000	48.48	54.00	5.52	V	5.4
11063.862500	34.71	54.00	19.29	V	7.7
12047.487500	35.89	54.00	18.11	H	10.2
12423.200000	36.59	54.00	17.41	V	11.0
15803.750000	39.49	54.00	14.51	H	15.1
17964.562500	40.99	54.00	13.01	V	17.0

802.11ac VHT80 CH155

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
6208.000000	52.87	68.20	15.33	V	17.7
9240.125000	44.05	68.20	24.15	V	5.7
10237.187500	45.77	68.20	22.43	V	6.6
14383.187500	49.75	68.20	18.45	V	12.4
16820.937500	52.49	68.20	15.71	V	16.3
17074.250000	51.73	68.20	16.47	V	16.6

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
8086.112500	32.96	54.00	21.04	V	5.5
11100.950000	34.57	54.00	19.43	H	7.8
12051.250000	35.77	54.00	18.23	H	10.2
12444.700000	36.92	54.00	17.08	V	11.0
15730.687500	39.51	54.00	14.49	H	14.6
17954.062500	40.89	54.00	13.11	H	16.9

Note:

A "reference path loss" is established and the A_{Rpl} is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss. P_{Mea} is the field strength recorded from the instrument. The measurement results are obtained as described below:

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

Conclusion: PASS

Test graphs as below:

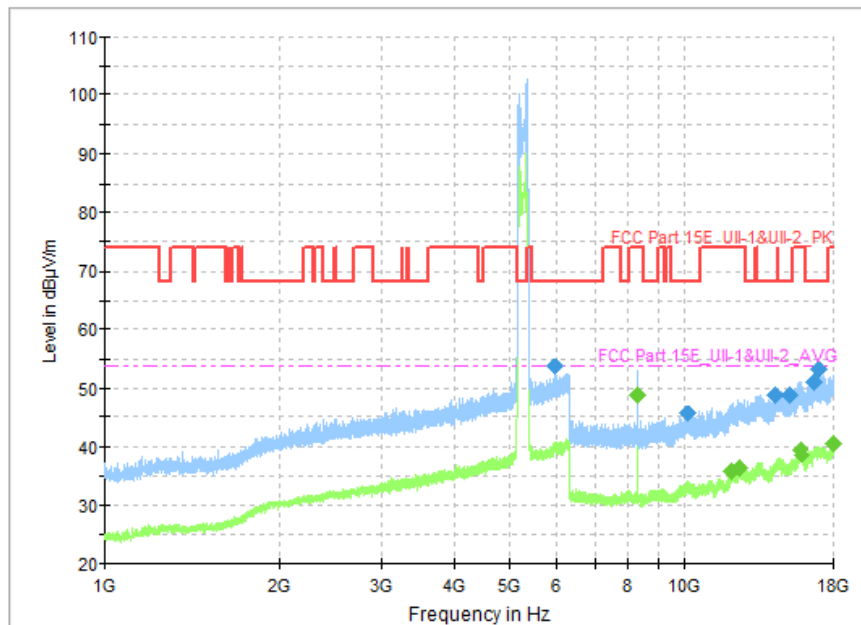


Fig. 42 Transmitter Spurious Emission (802.11a, CH36 5180MHz, 1 GHz-18 GHz)

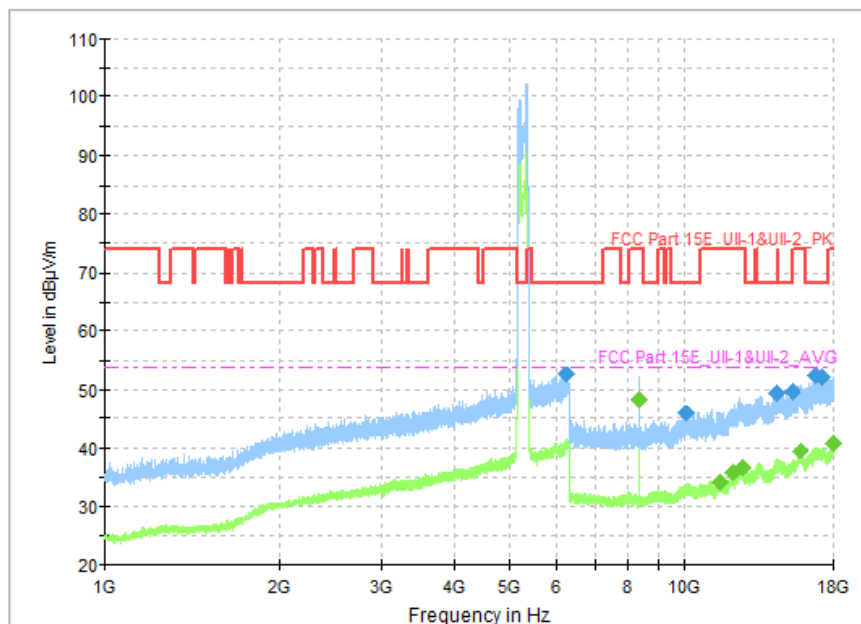


Fig. 43 Transmitter Spurious Emission (802.11a, CH40 5200MHz, 1 GHz-18 GHz)

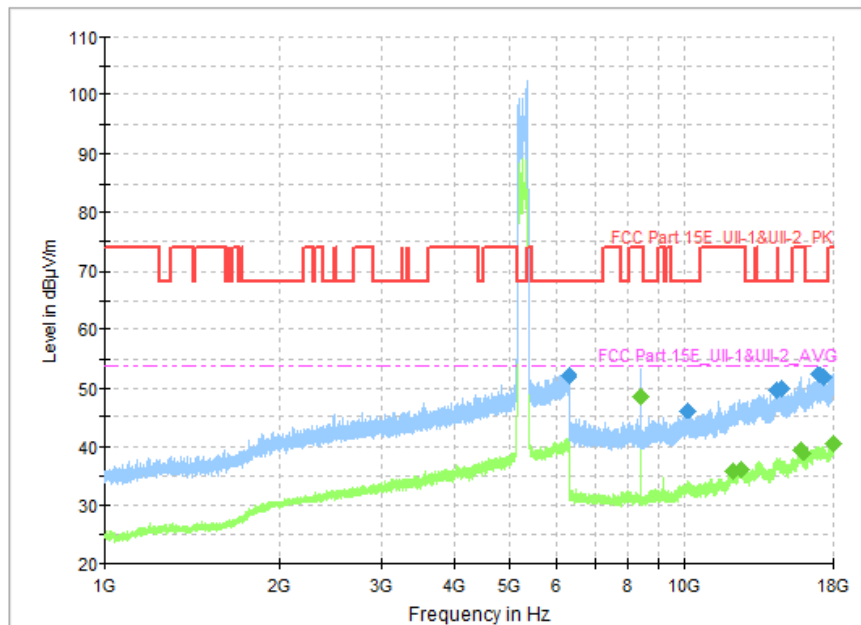


Fig. 44 Transmitter Spurious Emission (802.11a, CH48 5240MHz, 1 GHz-18 GHz)

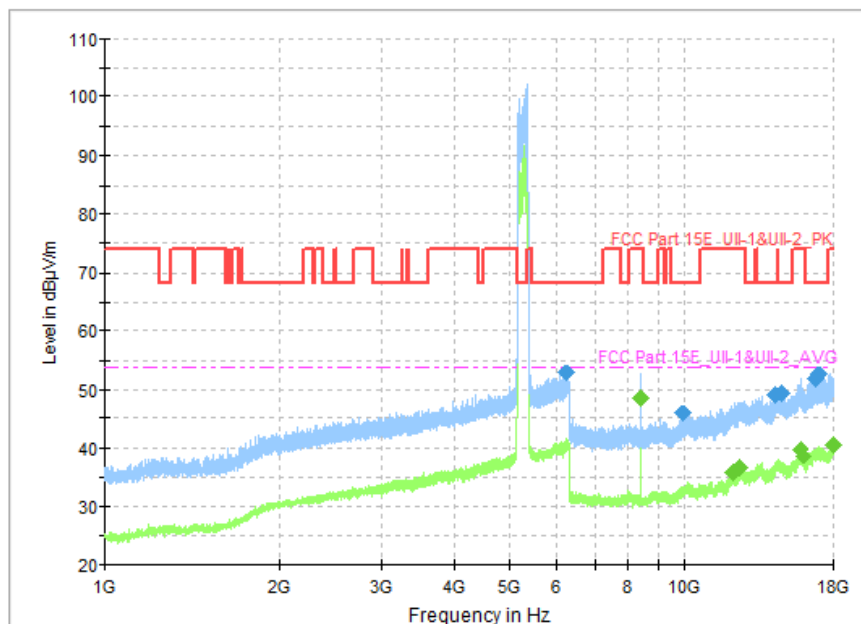


Fig. 45 Transmitter Spurious Emission (802.11a, CH52 5260MHz, 1 GHz-18 GHz)

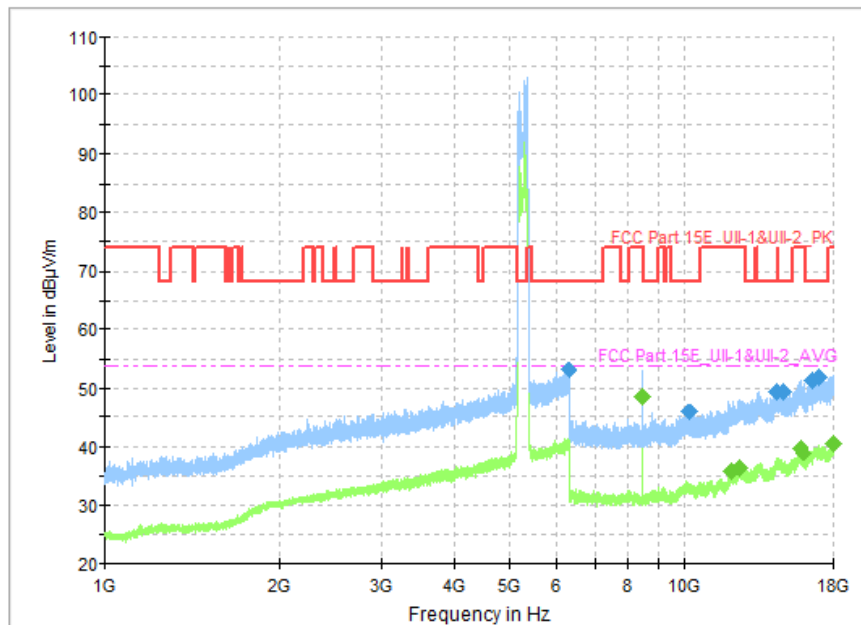


Fig. 46 Transmitter Spurious Emission (802.11a, CH56 5280MHz, 1 GHz-18 GHz)

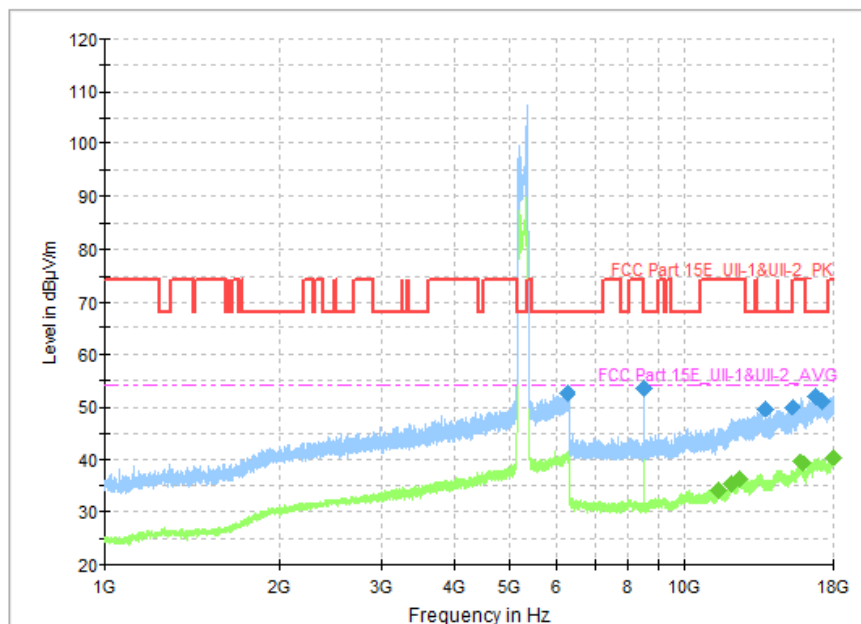


Fig. 47 Transmitter Spurious Emission (802.11a, CH64 5320MHz, 1 GHz-18 GHz)

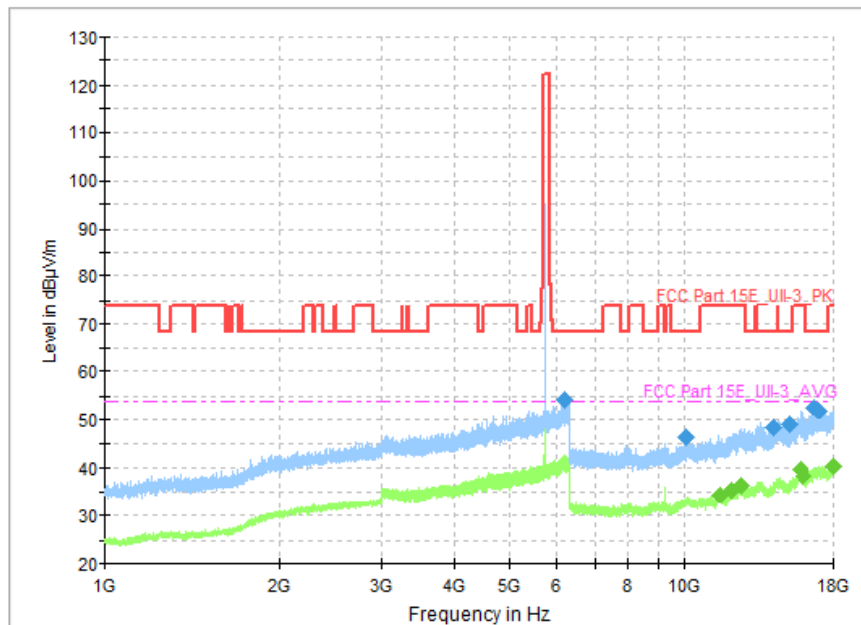


Fig. 48 Transmitter Spurious Emission (802. 11a, CH149 5745MHz, 1 GHz-18 GHz)

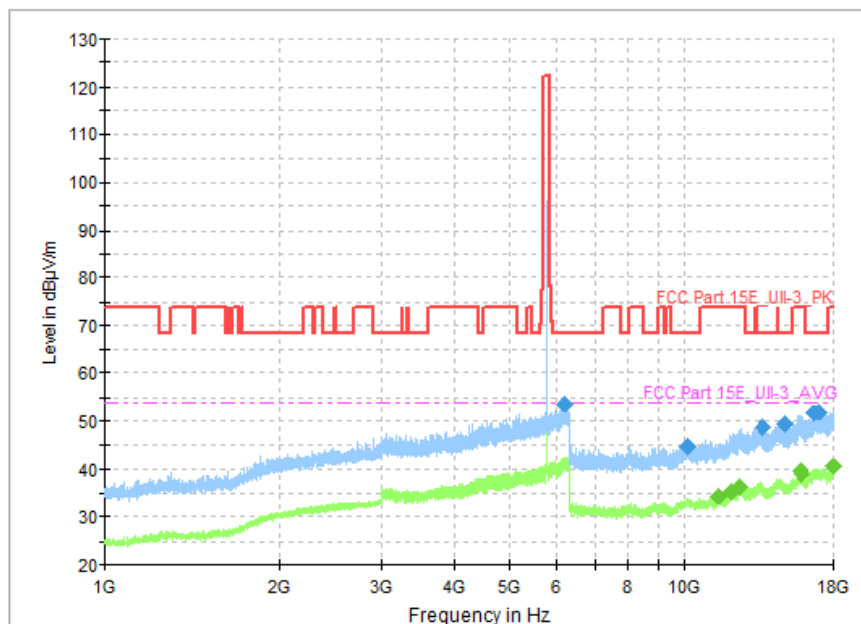


Fig. 49 Transmitter Spurious Emission (802. 11a, CH157 5785MHz, 1 GHz-18 GHz)

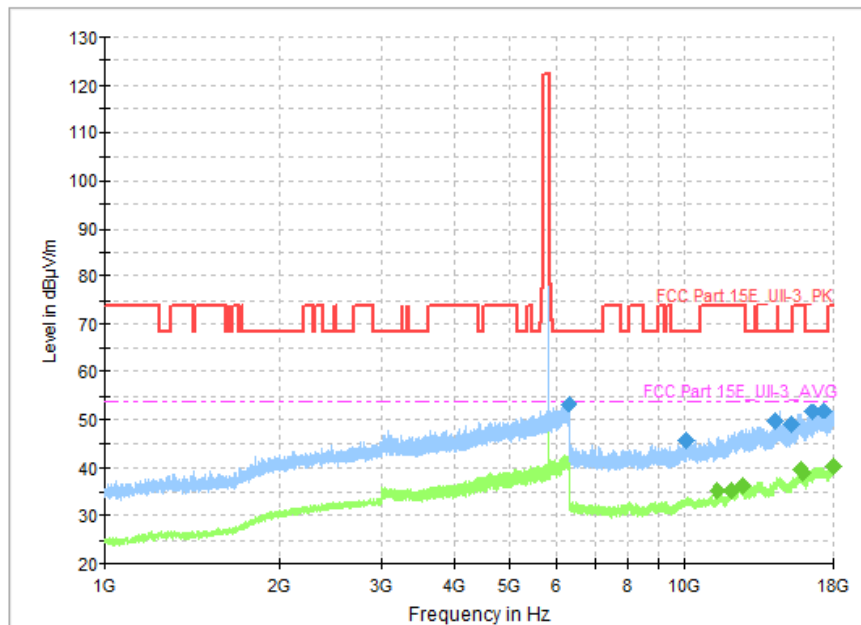


Fig. 50 Transmitter Spurious Emission (802.11a, CH165 5825MHz, 1 GHz-18 GHz)

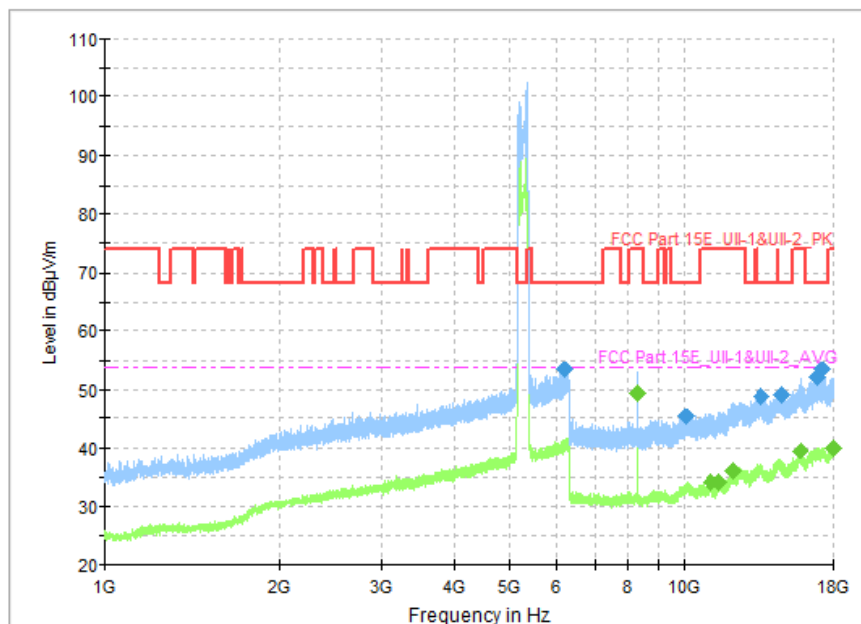


Fig. 51 Transmitter Spurious Emission (802.11n-HT40, CH38 5190MHz, 1 GHz-18 GHz)

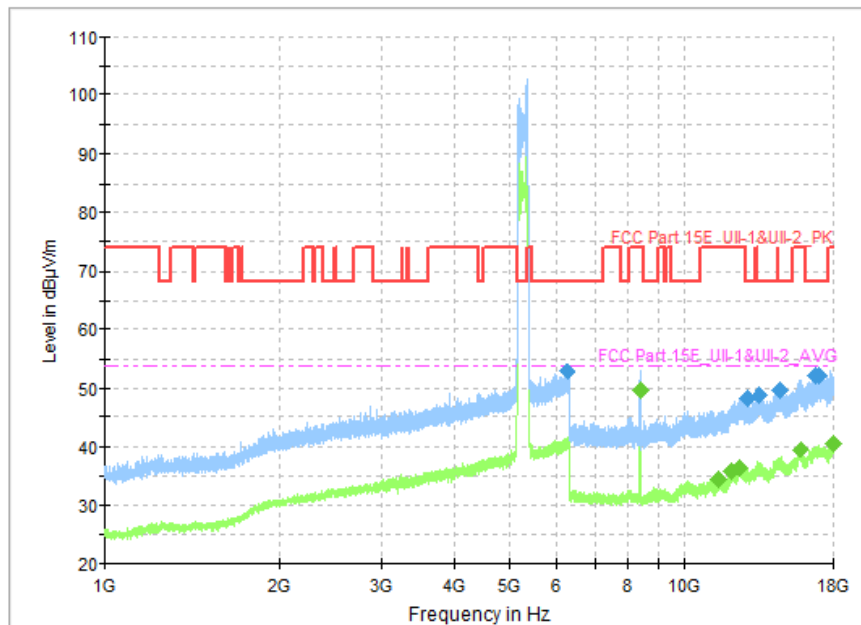


Fig. 52 Transmitter Spurious Emission (802.11n-HT40, CH46 5230MHz, 1 GHz-18 GHz)

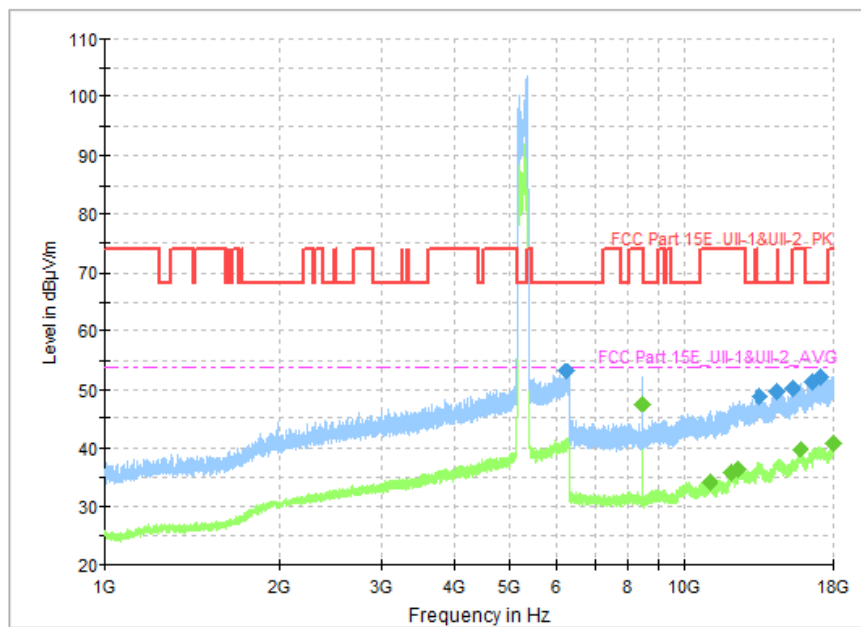


Fig. 53 Transmitter Spurious Emission (802.11n-HT40, CH54 5270MHz, 1 GHz-18 GHz)

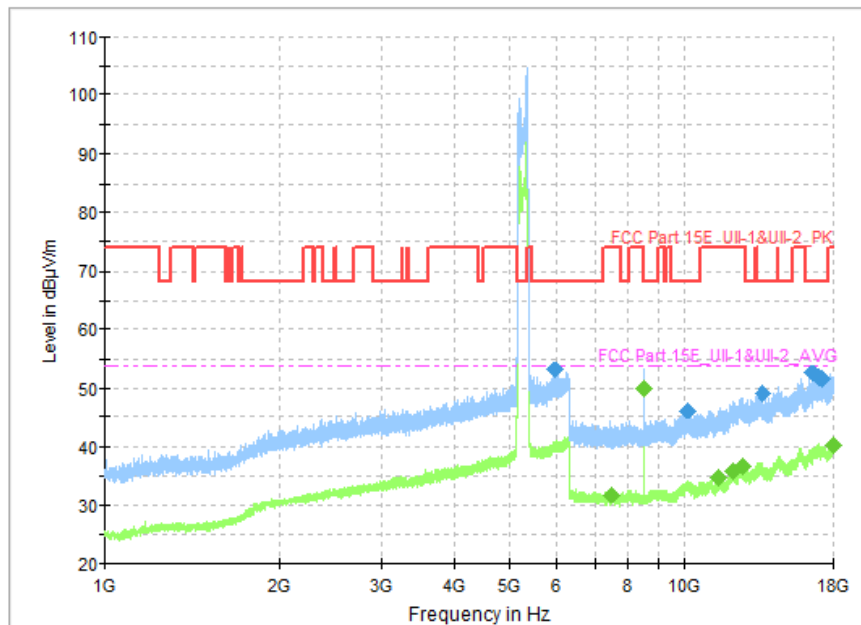


Fig. 54 Transmitter Spurious Emission (802.11n-HT40, CH62 5310MHz, 1 GHz-18 GHz)

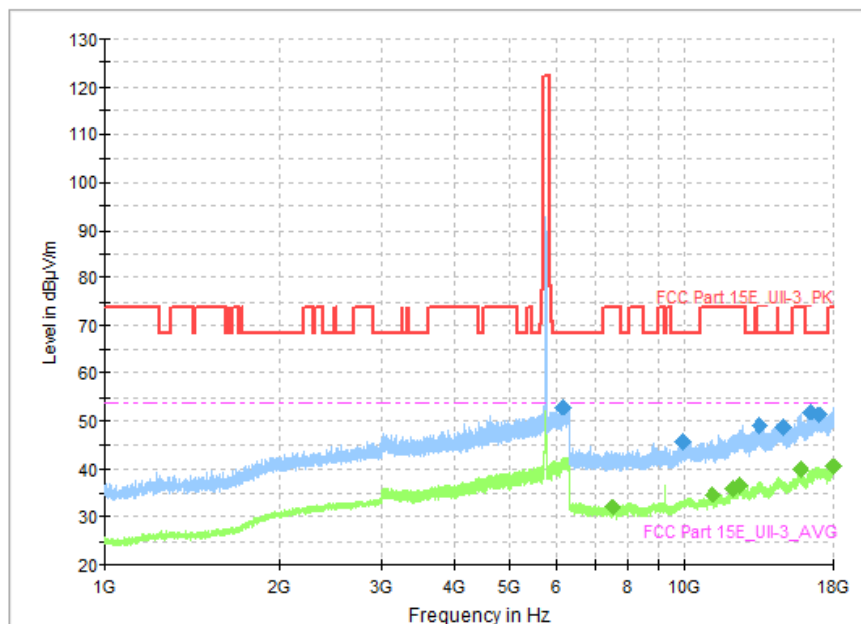


Fig. 55 Transmitter Spurious Emission (802.11n-HT40, CH151 5755MHz, 1 GHz-18 GHz)

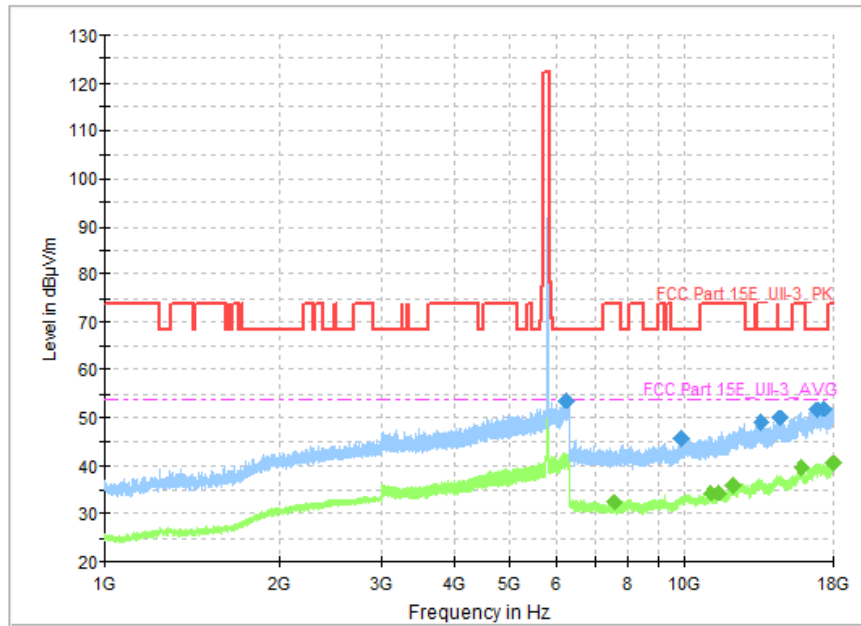


Fig. 56 Transmitter Spurious Emission (802.11n-HT40, CH159 5795MHz, 1 GHz-18 GHz)

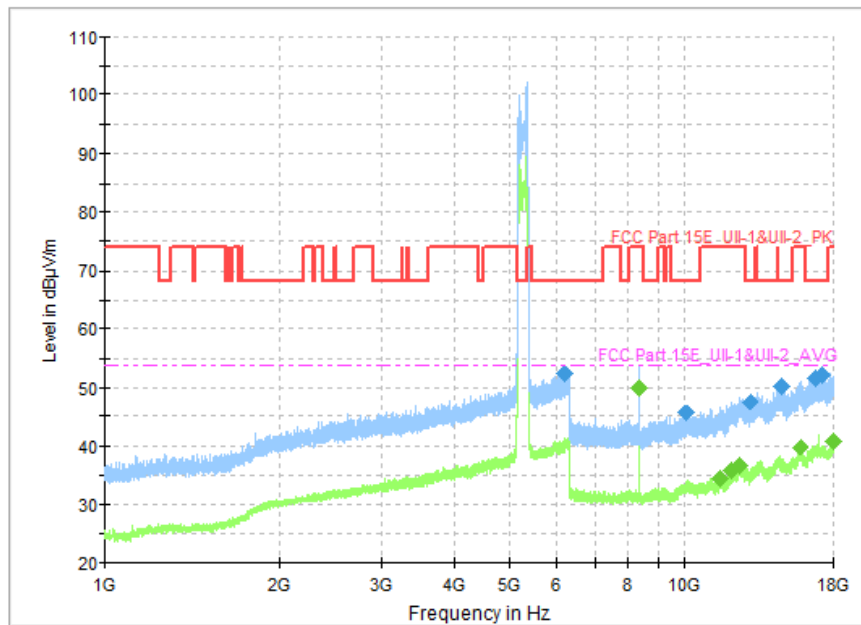


Fig. 57 Transmitter Spurious Emission (802.11ac-VHT80, CH42 5210MHz, 1 GHz-18 GHz)

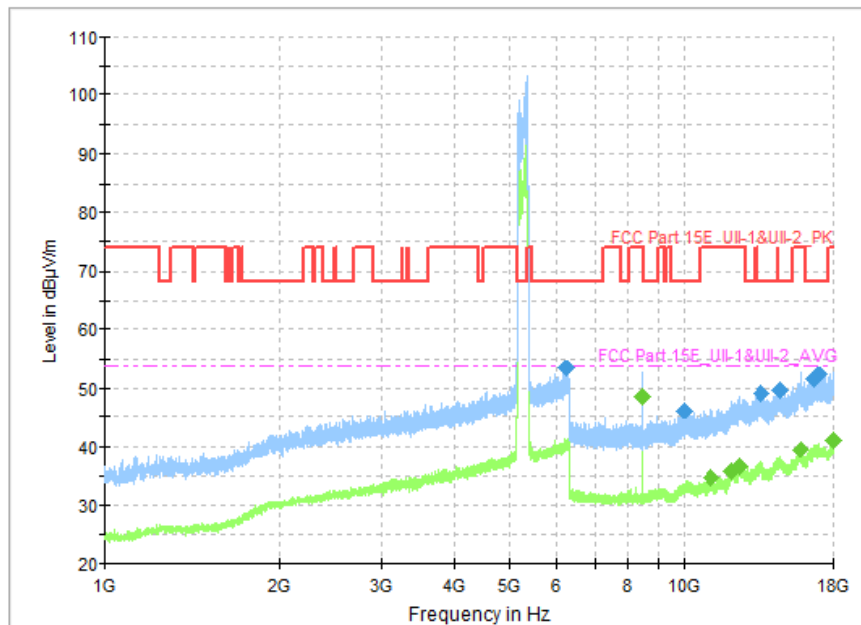


Fig. 58 Transmitter Spurious Emission (802.11ac-VHT80, CH58 5290MHz, 1 GHz-18 GHz)

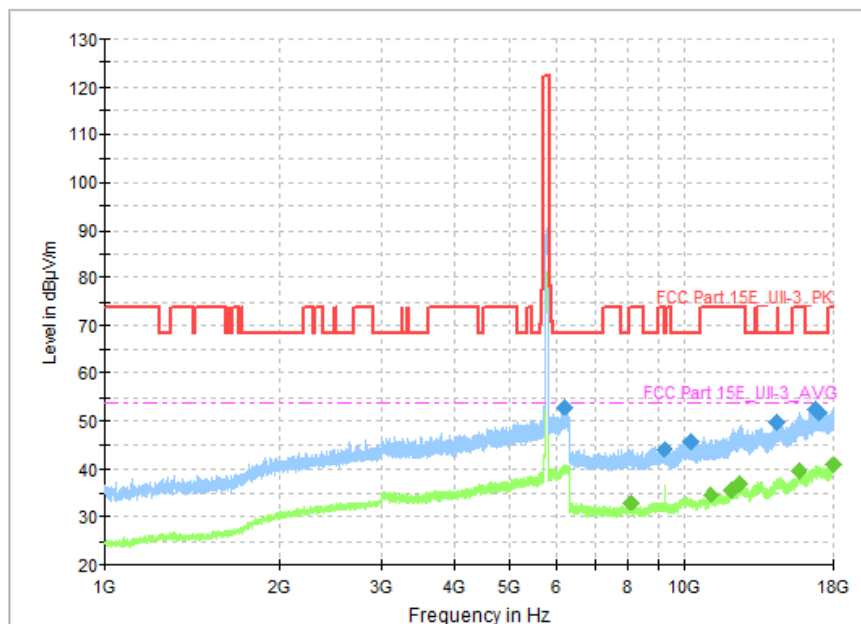


Fig. 59 Transmitter Spurious Emission (802.11ac-VHT80, CH155 5775MHz, 1 GHz-18 GHz)

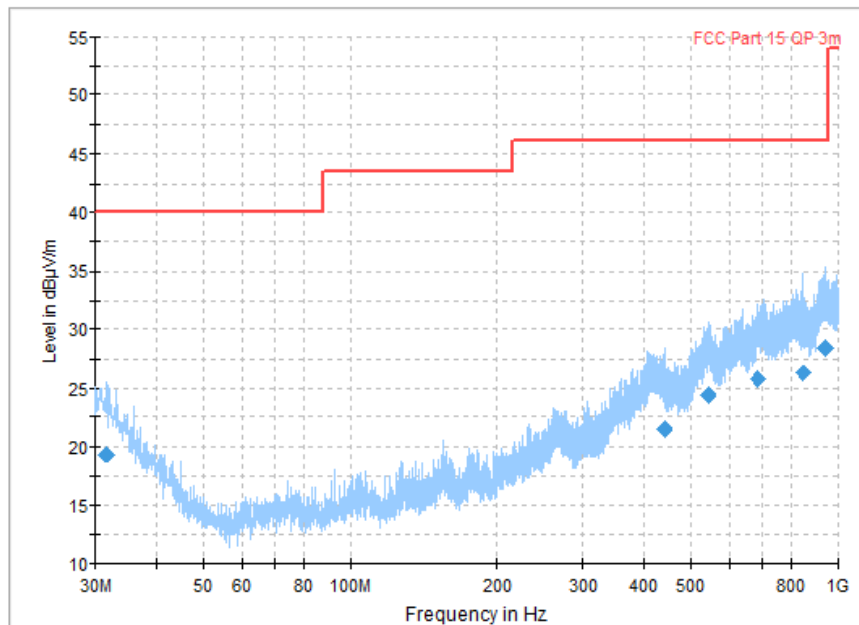


Fig. 60 Transmitter Spurious Emission (All channel, 30MHz~1GHz)

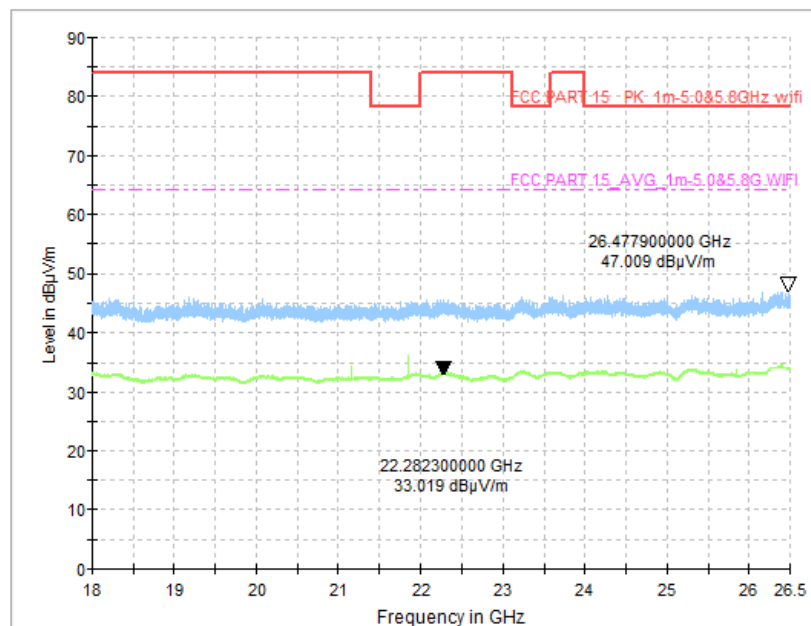


Fig. 61 Transmitter Spurious Emission (All channel, 18GHz~26.5GHz)

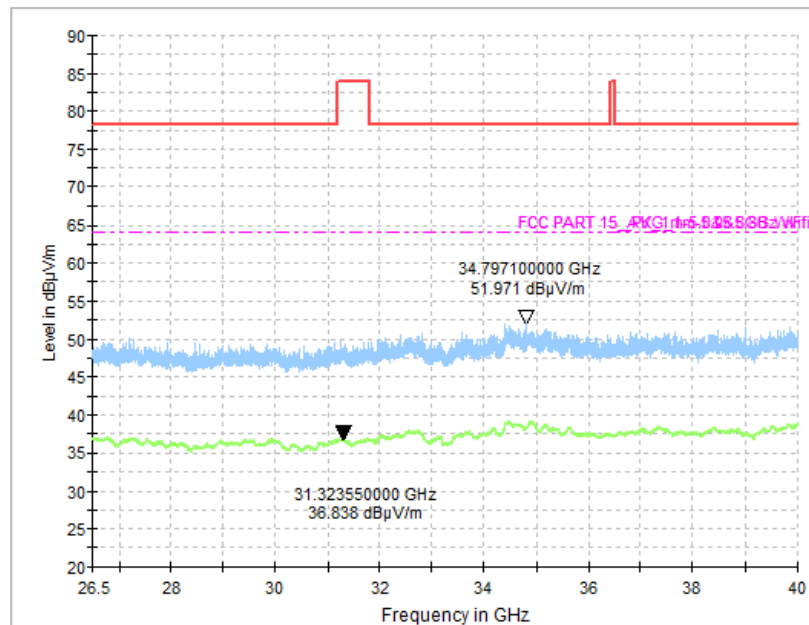


Fig. 62 Transmitter Spurious Emission (All channel, 26.5GHz~40GHz)

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(kHz)	300
0.490 – 1.705	24000/F(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.63	P

Conclusion: PASS

Test graphs as below:

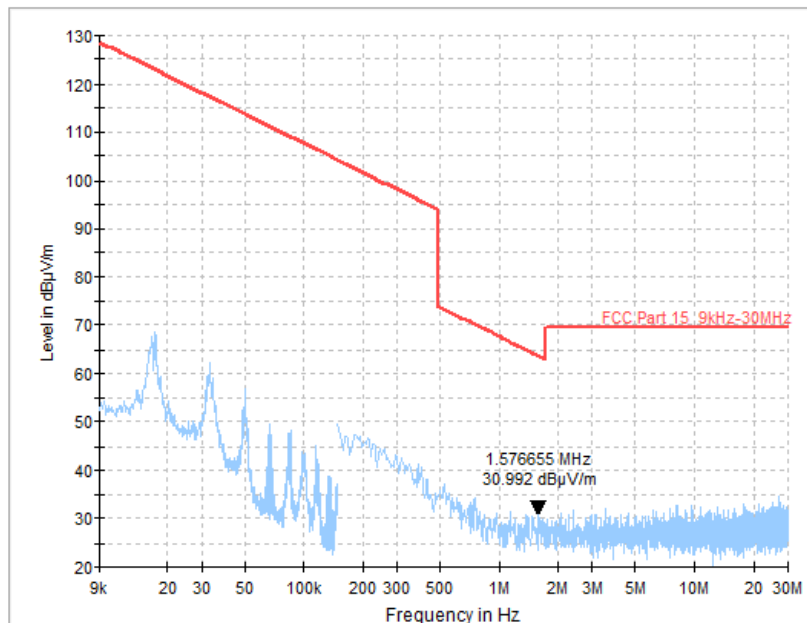


Fig. 63 Radiated Spurious Emission (All Channel, 9 kHz ~30 MHz)

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.64	Fig.65	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.64	Fig.65	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:

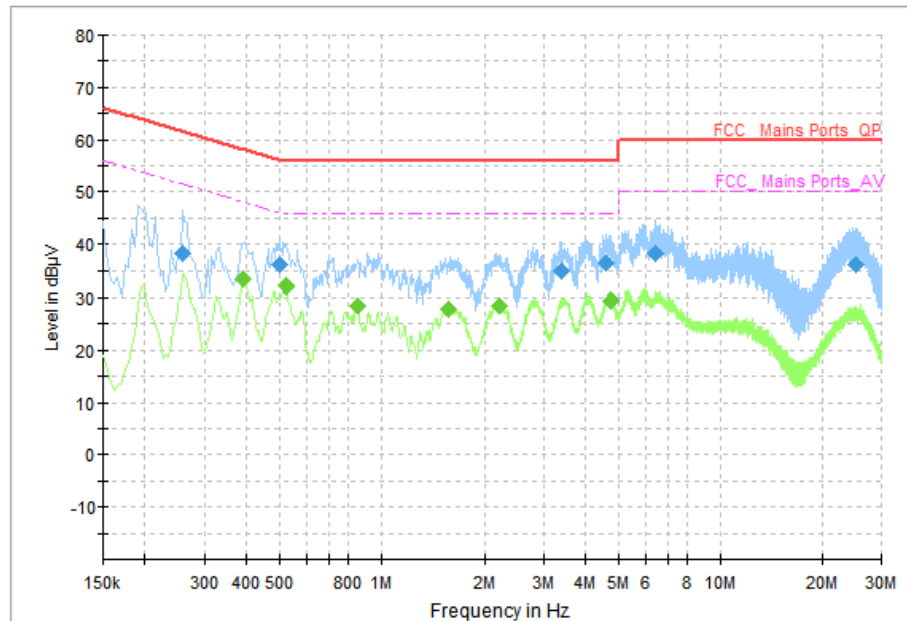


Fig. 64 AC Power line Conducted Emission (802.11n, AE1, 120V)

Measurement Result: Quasi Peak

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.258000	38.18	61.50	23.31	N	ON	9.6
0.498000	36.07	56.03	19.96	N	ON	9.7
3.366000	34.85	56.00	21.15	N	ON	9.7
4.562000	36.42	56.00	19.58	N	ON	9.7
6.394000	38.09	60.00	21.91	N	ON	9.8
25.110000	36.00	60.00	24.00	N	ON	10.2

Measurement Result: Average

Frequency (MHz)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.390000	33.24	48.06	14.82	N	ON	9.6
0.522000	32.20	46.00	13.80	N	ON	9.7
0.850000	28.43	46.00	17.57	N	ON	9.7
1.566000	27.91	46.00	18.09	N	ON	9.7
2.222000	28.36	46.00	17.64	N	ON	9.7
4.738000	29.53	46.00	16.47	N	ON	9.7

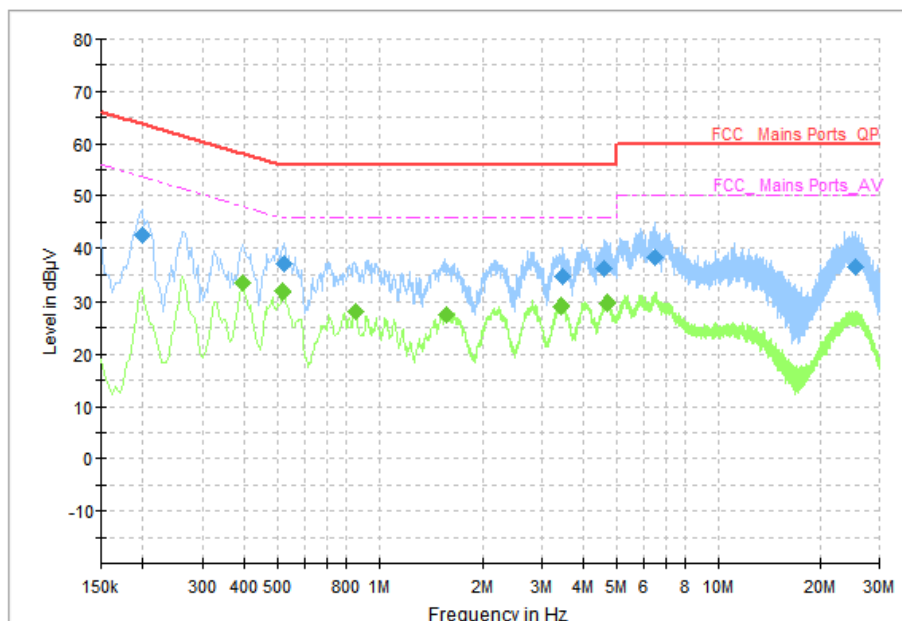


Fig. 65 AC Power line Conducted Emission (Idle, AE1, 120V)

Measurement Result: Quasi Peak

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.198000	42.65	63.69	21.05	N	ON	9.6
0.522000	36.94	56.00	19.06	N	ON	9.7
3.474000	34.61	56.00	21.39	N	ON	9.7
4.586000	35.99	56.00	20.01	N	ON	9.7
6.482000	38.35	60.00	21.65	N	ON	9.8
25.462000	36.31	60.00	23.69	N	ON	10.2

Measurement Result: Average

Frequency (MHz)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.394000	33.32	47.98	14.66	N	ON	9.6
0.518000	31.85	46.00	14.15	N	ON	9.7
0.850000	28.23	46.00	17.77	N	ON	9.7
1.566000	27.63	46.00	18.37	N	ON	9.7
3.426000	29.08	46.00	16.92	N	ON	9.7
4.682000	29.75	46.00	16.25	N	ON	9.7



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*****