TEST REPORT

No. I20N00568-RLAN

TCL Communication Ltd.

Whole Home WiFi Mesh System

MS1G

with

Hardware Version: 2.0

Software Version: MS1G_00_01_00_01

FCC ID: 2ACCJB123

Issued Date: 2020-06-30

Note:

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1. Summary of Test Report

1.1. Test Items

Description	Whole Home WiFi Mesh System
Model Name	MS1G
Applicant's name	TCL Communication Ltd.
Manufacturer's Name	TCL Communication Ltd.

1.2. Test Standards

FCC Part15-2019; ANSI C63.10-2013; KDB 789033-v02r01; KDB 662911-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:	2020-04-21
Testing End Date:	2020-05-12

1.6. Signature

Lin Kanfeng

(Prepared this test report)

Tang Weisheng

(Reviewed this test report)

Zhang Bojun

(Approved this test report)

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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

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

3.1. About EUT

Description	Whole Home WiFi Mesh System
Model Name	MS1G
Brand Name	Alcatel
RLAN Frequency Range	ISM Bands: 5150MHz~5250MHz 5725MHz~5850MHz
RLAN Protocol	IEEE 802.11a/n20/n40/ac20/ac40/ac80
Type of modulation	OFDM
Antenna Type	Integrated
Antenna Gain	Antenna 1 = 4.2 dBi; Antenna 2 = 4.2 dBi.
Power Supply	12V DC
FCC ID	2ACCJB123
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*	SN or IMEI	HW Version	SW Version	Receive Date
EUT1	E82520100103000323	2.0	MS1G_00_01_00_01	2020-04-20
EUT2	E82520100103000078	2.0	MS1G_00_01_00_01	2020-04-20

*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	Switching Power Supply	/
AE2	Switching Adapter	/

AE1

Model	S012CDU1200100
Manufacturer	Ten Pao Industrial Co., Ltd

AE2

Model	BN073-A12012U
Manufacturer	SHENZHEN HEWEISHUN NETWORK TECHNOLOGY CO., LTD

*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 Whole Home WiFi Mesh System with integrated antenna.

It consists of normal options: Switching Power Supply and Switching Adapter.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

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4. REFERENCE DOCUMENTS

4.1. Documents supplied by applicant

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

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

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
KDB 789033	GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E	v02r01
KDB 662911	Emissions Testing of Transmitters with Multiple Outputs in the Same Band	v02r01

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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
1	Maximum Output Power	15.407	**P**
2	Power Spectral Density	15.407	**P**
3	Occupied 26dB Bandwidth	15.403	**P**
4	Occupied 6dB Bandwidth	15.407	**P**
5	99% Occupied Bandwidth	15.403	**P**
6	Band Edge Compliance	15.209	**P**
7	Transmitter Spurious Emission	15.407, 15.205	**P**
8	AC Power Line Conducted Emission	15.107, 15.207	**P**
9	Frequency Stability	15.407	**P**
10	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/manufacturer 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.

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6. Test Equipments Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration 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	Data Acquisiton	U2531A	TW55443507	Agilent	/	/
4	Climate chamber	SU-242	93008165	ESPEC	2021-03-25	1 year
5	DC Power Supply	ZUP60-14	6MY-847Z13-0001	TDK-Lambda	2021-02-26	1 year

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Date	Calibration Period
1	LISN	ESH2-Z5	100196	R&S	2021-01-02	1 year
2	Test Receiver	ESCI	100701	R&S	2020-08-06	1 year
3	Loop Antenna	HLA6120	35779	TESEQ	2022-05-01	3 year
4	BiLog Antenna	VULB9163	9163 329	Schwarzbeck	2021-02-16	3 year
5	Horn Antenna	3117	00066585	ETS-Lindgren	2022-03-04	3 year
6	Test Receiver	ESR7	101675	R&S	2020-07-18	1 year
7	Spectrum Analyzer	FSP 40	100378	R&S	2020-12-12	1 year
8	Chamber	FACT5-2.0	4166	ETS-Lindgren	2021-05-12	3 year
9	Antenna	QSH-SL-18-26-S-20	17013	Q-par	2021-01-14	3 year
10	Antenna	QSH-SL-26-40-K-20	17014	Q-par	2021-01-10	3 year

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 engineering software provided by the customer to control the transmitting signal.
The EUT was programmed to be in continuously transmitting mode.

Anechoic chamber

Fully anechoic chamber by ETS-Lindgren

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7. Laboratory Environment

Semi-anechoic chambe

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, 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 ℃, Max. = 35 ℃
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 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, 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

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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	66Hz	
4. Transmitter Spurious Emission - Conducted	30MHz≤f≤1GHz	1.41dB
	1GHz≤f≤7GHz	1.92dB
	7GHz≤f≤13GHz	2.31dB
	13GHz≤f≤26GHz	2.61dB
5. Transmitter Spurious Emission - Radiated	9kHz≤f≤30MHz	1.70dB
	30MHz≤f≤1GHz	4.90dB
	1GHz≤f≤18GHz	4.60dB
	18GHz≤f≤40GHz	4.10dB
6. AC Power line Conducted Emission	150kHz≤f≤30MHz	3.00dB

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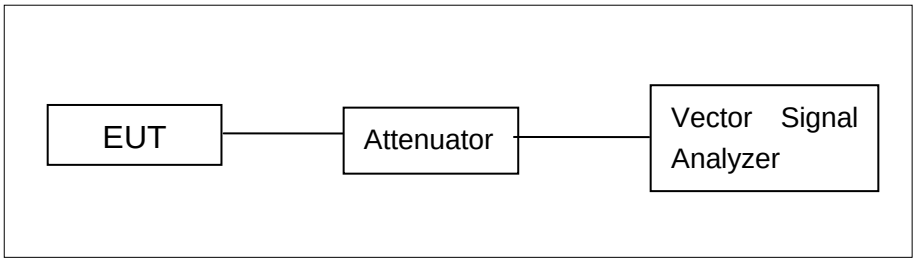
ANNEX A: Detailed Test Results

A.1. Measurement Method

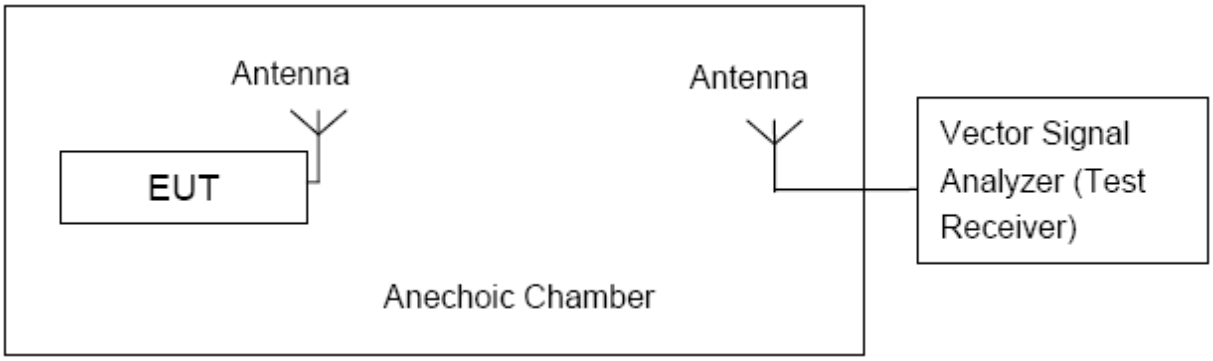
Conducted Measurements

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.

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A.2. Maximum Output Power

Measurement Limit and Method:

Standard	Frequency (MHz)	Limit (dBm)
FCC CRF Part 15.407	5150MHz~5250MHz	24
	5725MHz~5850MHz	30

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

Note: The device support beamforming mode. According to KDB 662911, Directional gain = G_{ANT} + 10 log(N_{ANT}) dBi = 4.2 + 10 log(2) = 7.2dBi. The power limit was reduce 1.2dBi.

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)	Output Power (dBm)	
				Ant 1	Ant 2
5.2GHz Band (UNII-1)	802.11a	CH 36	5180	12.90	10.65
		CH 40	5200	12.87	10.91
		CH 44	5220	12.98	11.18
		CH 48	5240	13.35	11.71
	802.11n-HT20	CH 36	5180	12.31	10.49
		CH 40	5200	12.58	10.82
		CH 44	5220	12.90	11.14
		CH 48	5240	13.26	11.65
	802.11n-HT40	CH 38	5190	11.89	10.09
		CH 46	5230	12.55	10.74
	802.11ac-VHT20	CH 36	5180	12.45	10.08
		CH 40	5200	12.68	10.33
		CH 44	5220	12.87	10.72
		CH 48	5240	13.22	11.16
	802.11ac-VHT40	CH 38	5190	12.18	10.37
		CH 46	5230	12.70	10.98
	802.11ac-VHT80	CH 42	5210	12.17	10.05
5.8GHz Band (UNII-3)	802.11a	CH 149	5745	13.68	11.38
		CH 157	5785	13.56	11.32
		CH 165	5825	13.94	11.85
	802.11n-HT20	CH 149	5745	13.56	11.25
		CH 157	5785	13.44	11.18
		CH 165	5825	13.88	11.76

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	802.11n-HT40	CH 151	5755	13.36	11.30
		CH 159	5795	13.02	11.04
	802.11ac-VHT20	CH 149	5745	13.51	11.27
		CH 157	5785	13.45	11.20
		CH 165	5825	13.81	11.53
	802.11ac-VHT40	CH 151	5755	13.45	11.25
		CH 159	5795	13.11	11.40
	802.11ac-VHT80	CH 155	5775	13.25	11.05

MIMO:

U–NII Band	Mode	Channel	Frequency (MHz)	Output Power (dBm)		
				Ant A	Ant B	Sum
5.2GHz Band (UNII-1)	802.11n-HT20	CH 36	5180	12.10	9.68	14.07
		CH 40	5200	12.26	9.98	14.28
		CH 44	5220	12.53	10.33	14.58
		CH 48	5240	12.85	10.72	14.92
	802.11n-HT40	CH 38	5190	11.68	9.77	13.84
		CH 46	5230	12.27	10.56	14.51
	802.11ac-VHT20	CH 36	5180	12.12	9.68	14.08
		CH 40	5200	12.37	9.81	14.29
		CH 44	5220	12.48	10.17	14.49
		CH 48	5240	12.75	10.55	14.80
	802.11ac-VHT40	CH 38	5190	11.92	10.03	14.09
		CH 46	5230	12.47	10.57	14.63
	802.11ac-VHT80	CH 42	5210	11.90	9.80	13.99
5.8GHz Band (UNII-3)	802.11n-HT20	CH 149	5745	13.16	10.73	15.12
		CH 157	5785	13.04	10.66	15.02
		CH 165	5825	13.40	11.15	15.43
	802.11n-HT40	CH 151	5755	13.08	11.12	15.22
		CH 159	5795	12.76	10.78	14.89
	802.11ac-VHT20	CH 149	5745	12.97	11.03	15.12
		CH 157	5785	12.82	10.86	14.96
		CH 165	5825	13.23	11.25	15.36
	802.11ac-VHT40	CH 151	5755	13.24	11.18	15.34
		CH 159	5795	12.86	10.89	15.00
	802.11ac-VHT80	CH 155	5775	13.12	10.85	15.14

Conclusion: PASS

Note:

Worst-case data rates as provided by the client were: 6Mbps (802.11a), MCS0 (802.11n), MCS0 (802.11ac). 802.11a, 802.11ac-VHT40 and 802.11ac-VHT80 modes are selected as the worst case. Antenna 1 is selected as the worst condition (SISO). 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%.

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A.3. Peak Power Spectral Density

Measurement Limit:

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

The PPSD measurement method SA-1 is made according to KDB 789033, KDB 662911.

Measurement Results:

U–NII Band	Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/MHz)
5.2GHz Band (UNII-1)	802.11a	CH 36	5180	8.14
		CH 40	5200	8.27
		CH 44	5220	8.48
		CH 48	5240	9.03
	802.11ac-VHT40	CH 38	5190	5.78
		CH 46	5230	6.56
	802.11ac-VHT80	CH 42	5210	3.73

U–NII Band	Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/500kHz)
5.8GHz Band (UNII-3)	802.11a	CH 149	5745	7.40
		CH 157	5785	7.94
		CH 165	5825	7.91
	802.11ac-VHT40	CH 151	5755	4.93
		CH 159	5795	5.36
	802.11ac-VHT80	CH 155	5775	4.01

Conclusion: PASS

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A.4. Occupied 26dB Bandwidth

Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.403	/

The measurement is made according to KDB 789033, KDB 662911.

Measurement Result:

Mode	Channel	Occupied 26dB Bandwidth (MHz)		Conclusion
802.11a	5180MHz (Ch36)	Fig.1	21.55	**P**
	5200MHz (Ch40)	Fig.2	21.65	**P**
	5220MHz (Ch44)	Fig.3	21.45	**P**
	5240MHz (Ch48)	Fig.4	21.45	**P**
802.11ac-VHT40	5190MHz (Ch38)	Fig.5	42.40	**P**
	5230MHz (Ch46)	Fig.6	42.40	**P**
802.11ac VHT80	5210MHz (Ch42)	Fig.7	82.40	**P**

Conclusion: PASS

Test graphs as below:

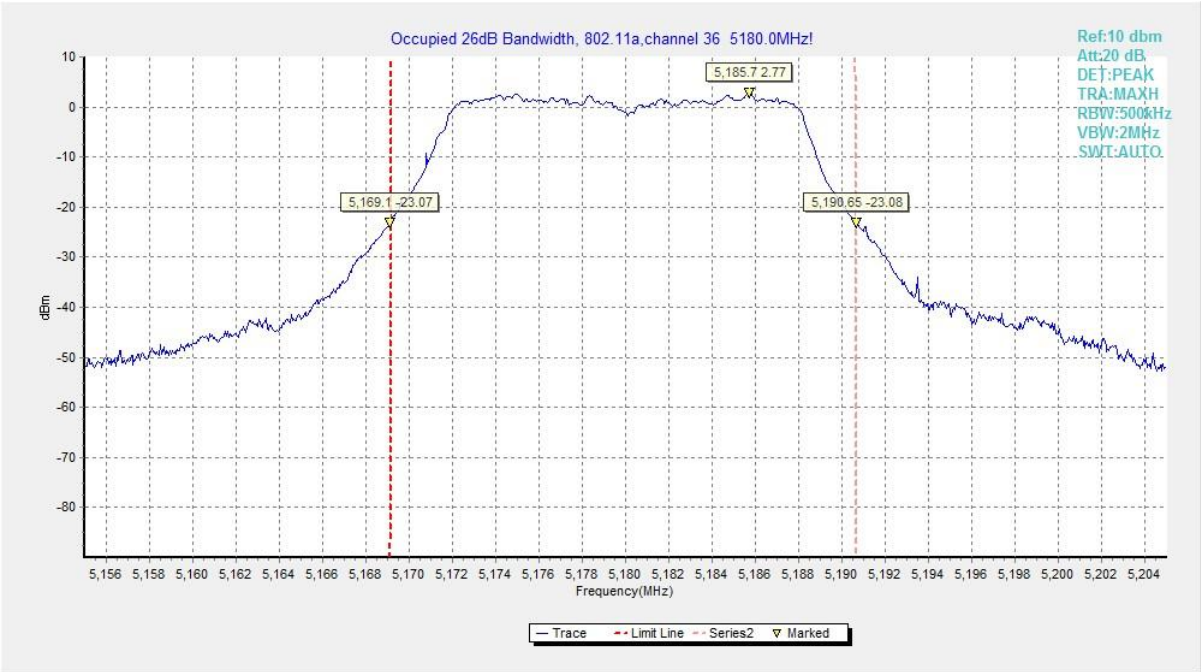

Fig. 1 Occupied 26dB Bandwidth (802.11a, 5180MHz)

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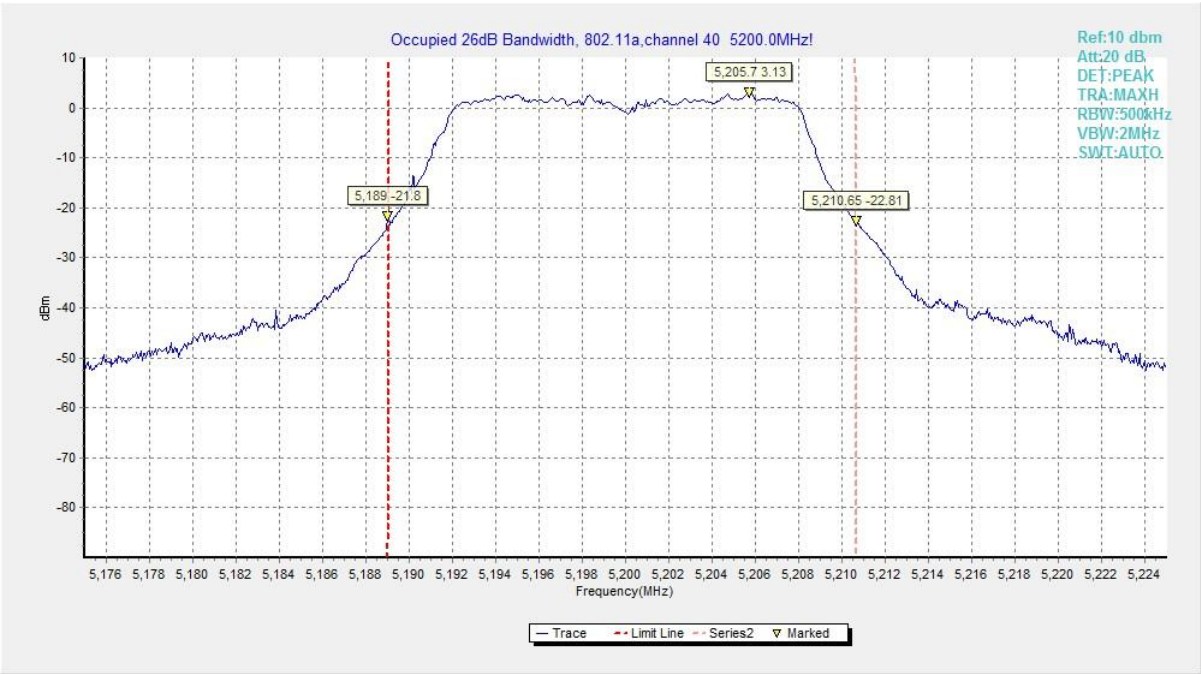

Fig. 2 Occupied 26dB Bandwidth (802.11a, 5200MHz)

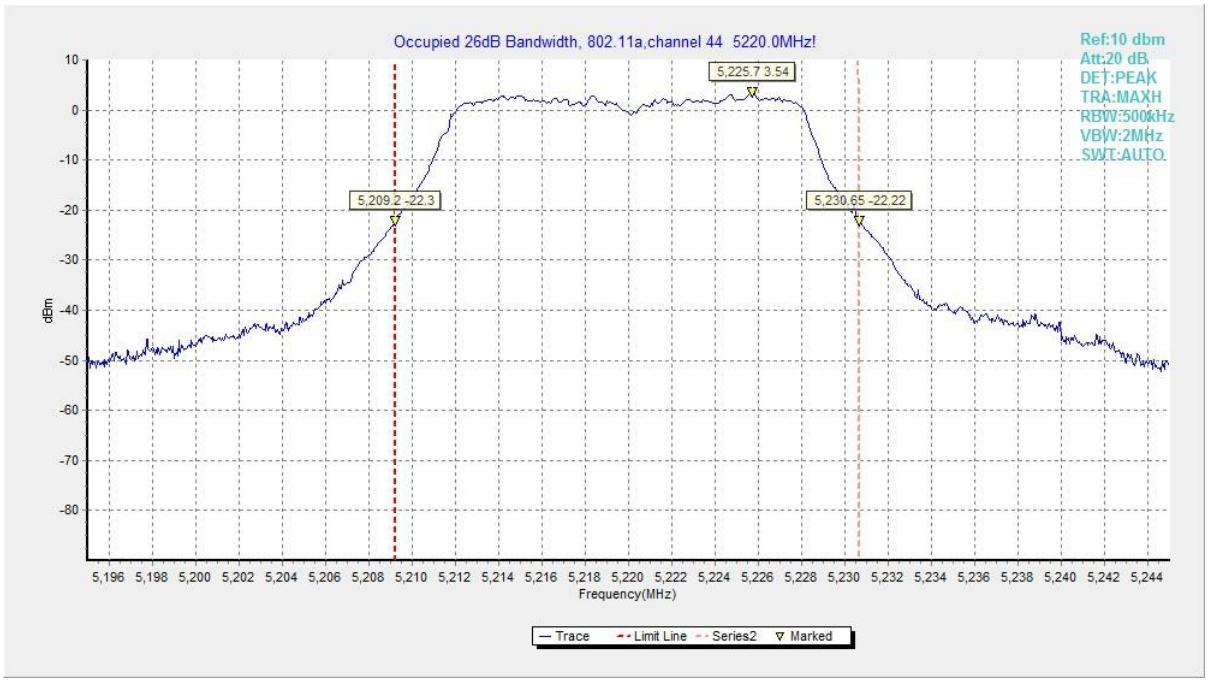

Fig. 3 Occupied 26dB Bandwidth (802.11a, 5220MHz)

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Fig. 4 Occupied 26dB Bandwidth (802.11a, 5240MHz)

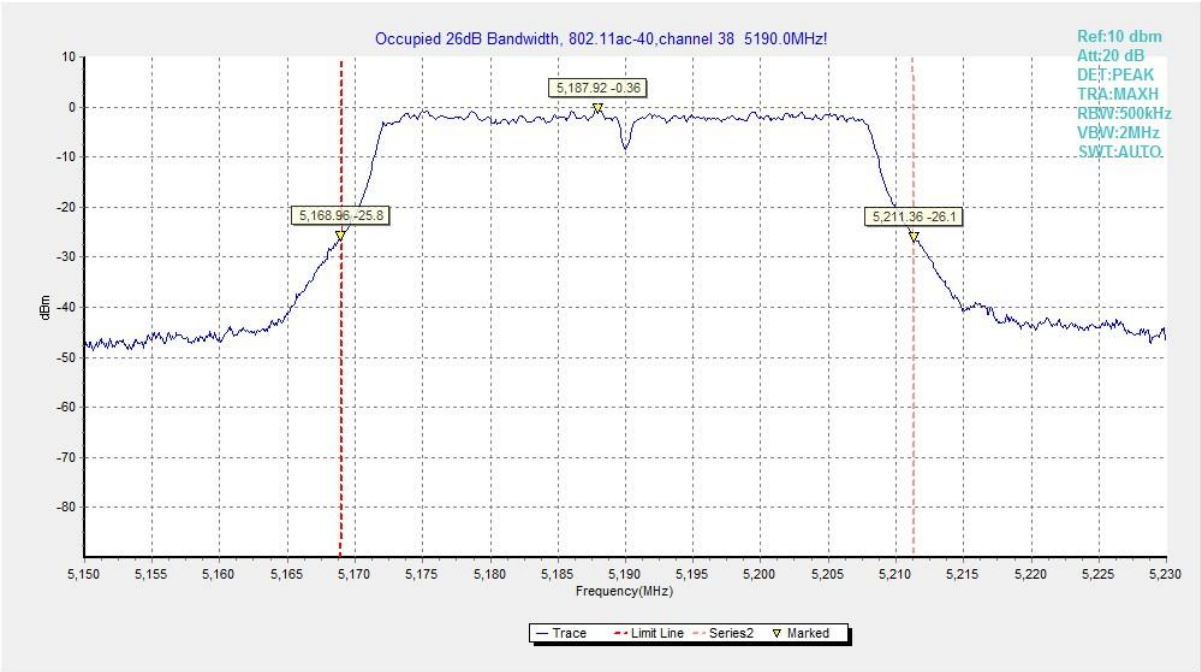

Fig. 5 Occupied 26dB Bandwidth (802.11ac-VHT40, 5190MHz)

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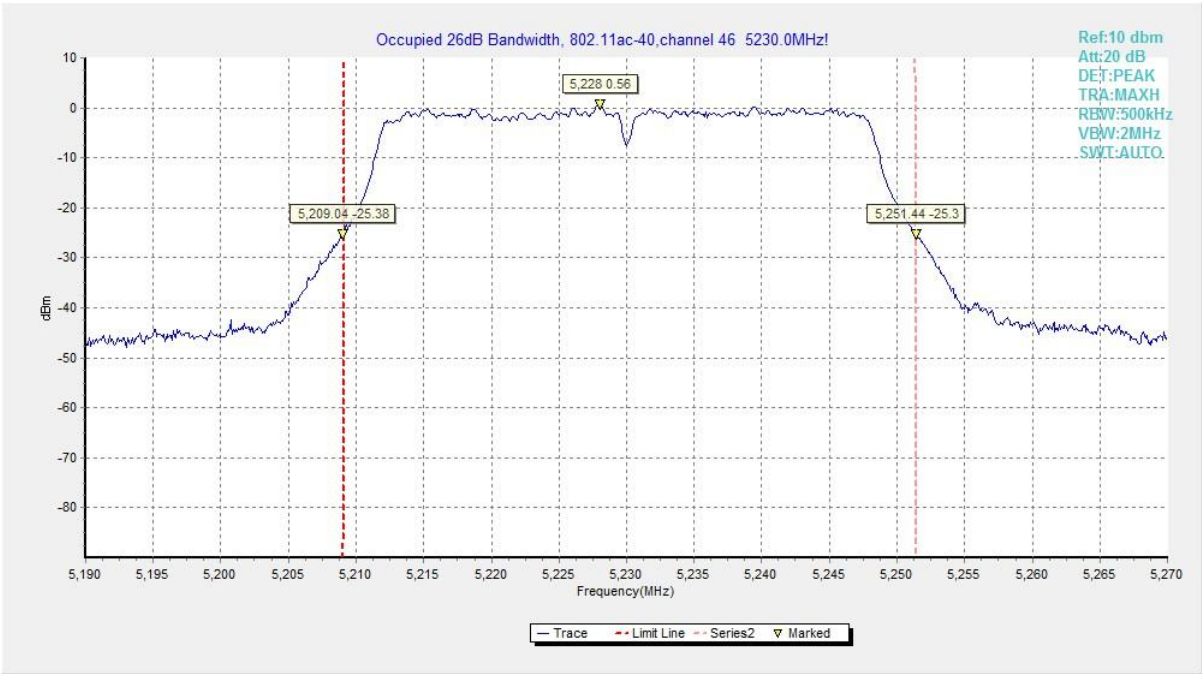

Fig. 6 Occupied 26dB Bandwidth (802.11ac-VHT40, 5230MHz)

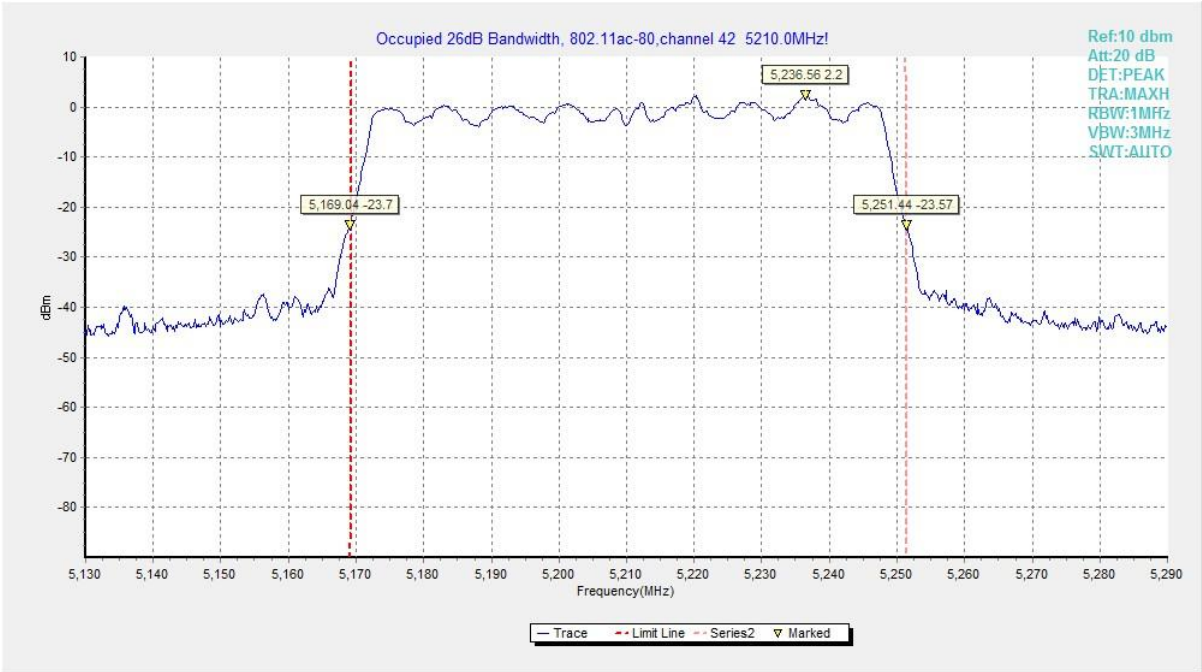

Fig. 7 Occupied 26dB Bandwidth (802. 11ac-VHT80, 5210MHz)

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A.5. Occupied 6dB Bandwidth

Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.407	⩾0.5

The measurement is made according to KDB 789033, KDB 662911.

Measurement Result:

Mode	Channel	Occupied 6dB Bandwidth (MHz)		Conclusion
802.11a	5745MHz (Ch149)	Fig.8	16.30	**P**
	5785MHz (Ch157)	Fig.9	16.10	**P**
	5825MHz (Ch165)	Fig.10	16.30	**P**
802.11ac VHT40	5755MHz (Ch151)	Fig.11	36.08	**P**
	5795MHz (Ch159)	Fig.12	35.84	**P**
802.11ac VHT80	5775MHz (Ch155)	Fig.13	75.20	**P**

Conclusion: PASS

Test graphs as below:

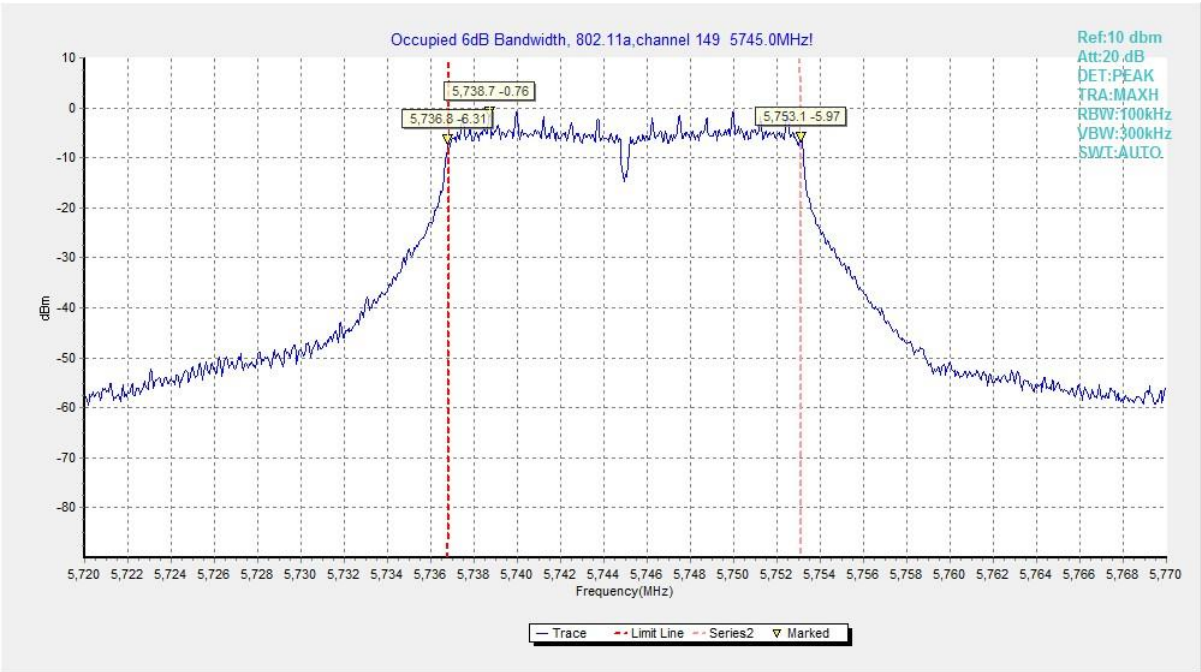

Fig. 8 Occupied 6dB Bandwidth (802.11a, 5745MHz)

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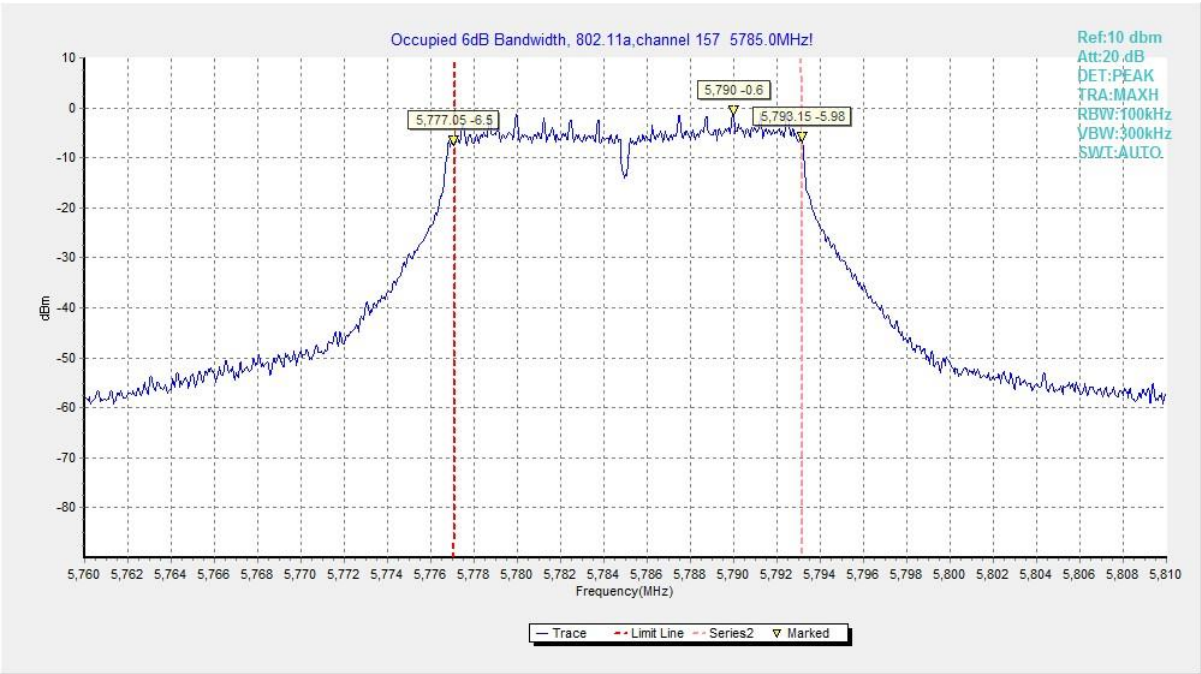

Fig. 9 Occupied 6dB Bandwidth (802.11a, 5785MHz)

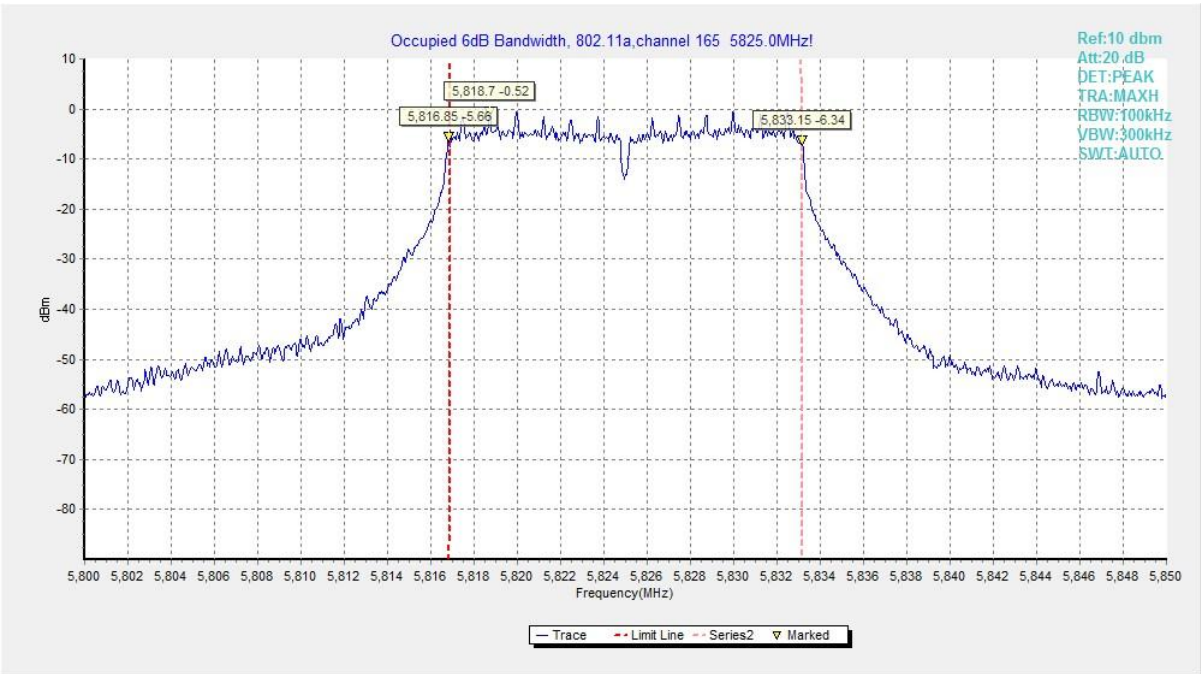

Fig. 10 Occupied 6dB Bandwidth (802.11a, 5825MHz)

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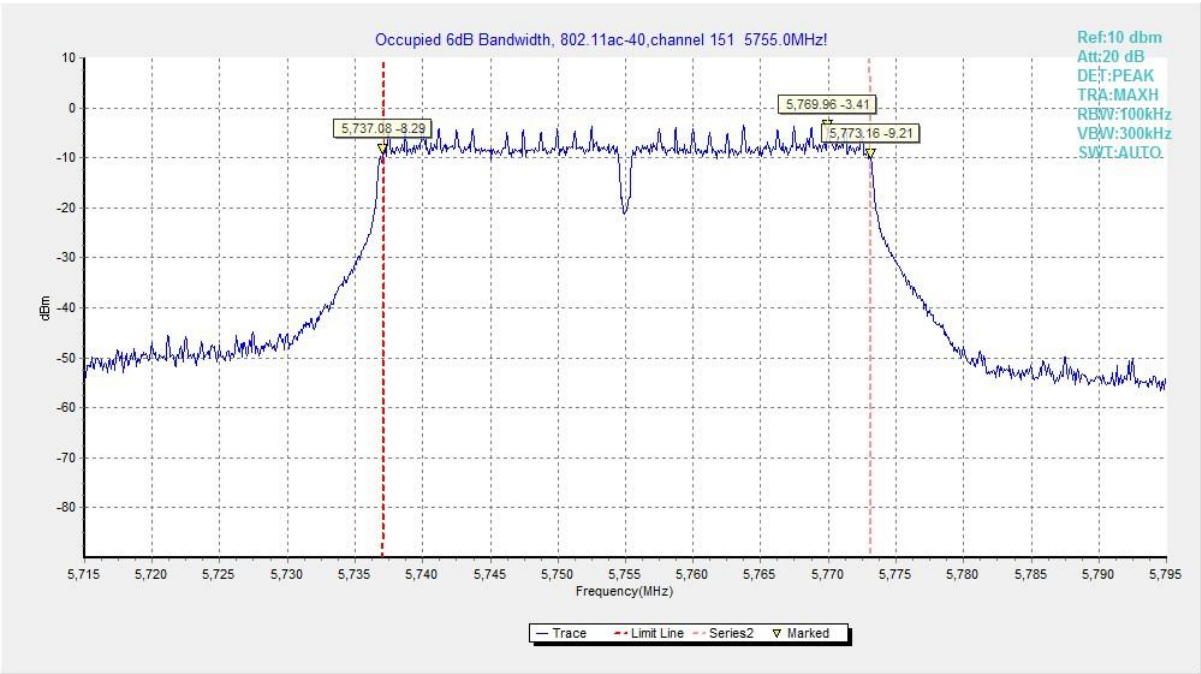

Fig. 11 Occupied 6dB Bandwidth (802.11ac-VHT40, 5755MHz)

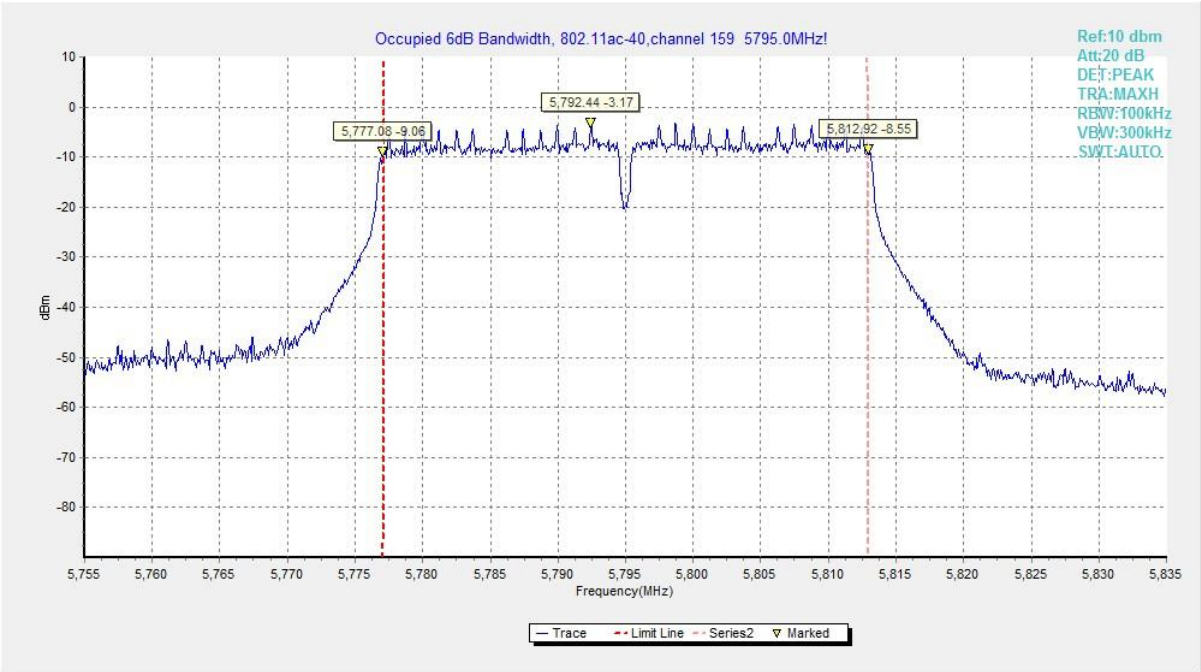

Fig. 12 Occupied 6dB Bandwidth (802.11ac-VHT40, 5795MHz)

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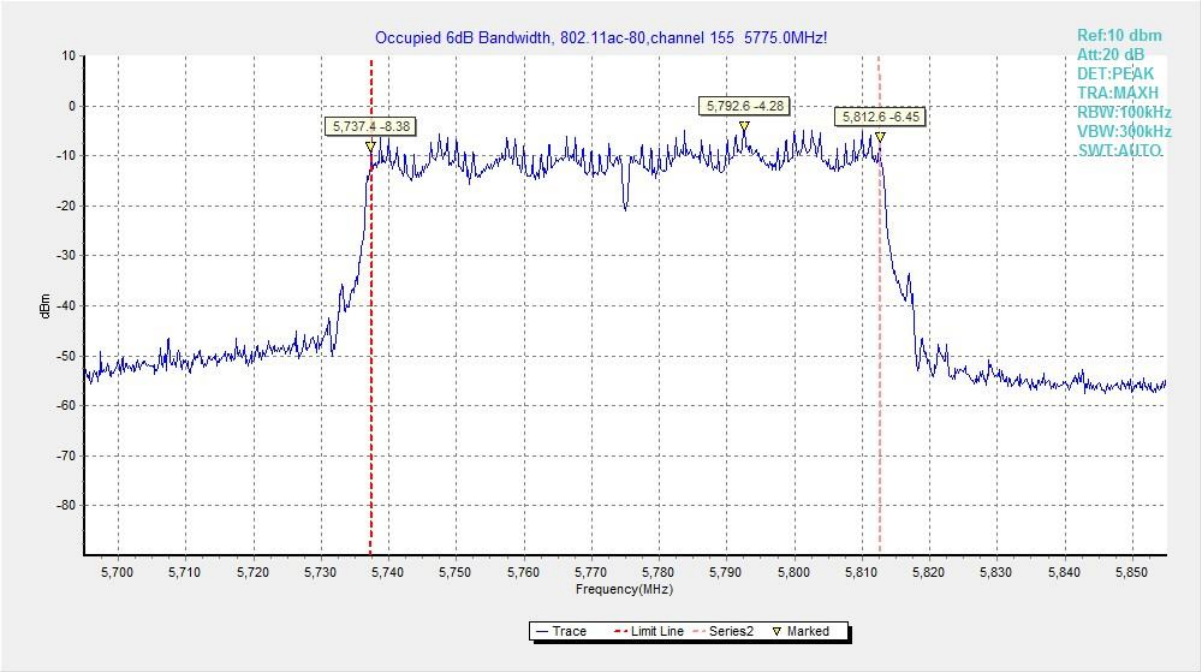

Fig. 13 Occupied 6dB Bandwidth (802.11ac-VHT80, 5775MHz)

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A.6. 99% Occupied Bandwidth

Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.403	/

The measurement is made according to KDB 789033, KDB 662911.

Measurement Result:

Mode	Channel	99% Occupied Bandwidth (MHz)		Conclusion
802.11a	5180MHz (Ch36)	Fig.14	17.14	**P**
	5200MHz (Ch40)	Fig.15	17.18	**P**
	5220MHz (Ch44)	Fig.16	17.18	**P**
	5240MHz (Ch48)	Fig.17	17.14	**P**
802.11ac-VHT40	5190MHz (Ch38)	Fig.18	36.44	**P**
	5230MHz (Ch46)	Fig.19	36.36	**P**
802.11ac-VHT80	5210MHz (Ch42)	Fig.20	75.60	**P**

Conclusion: PASS

Test graphs as below:

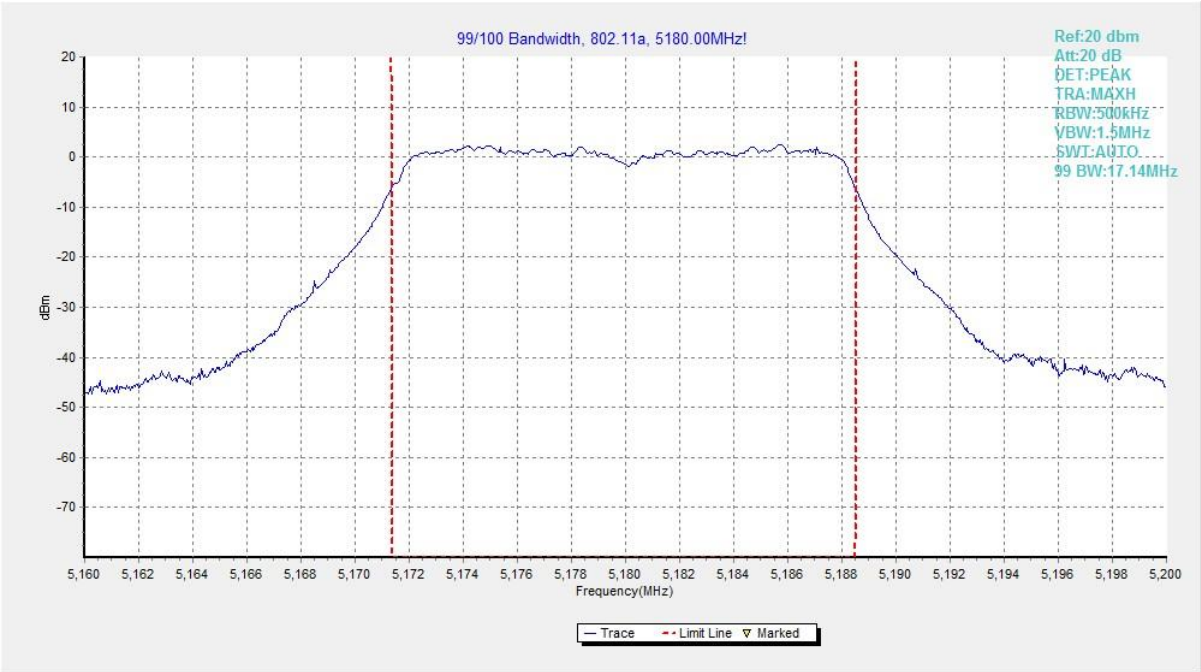

Fig. 14 99% Occupied Bandwidth (802.11a, 5180MHz)

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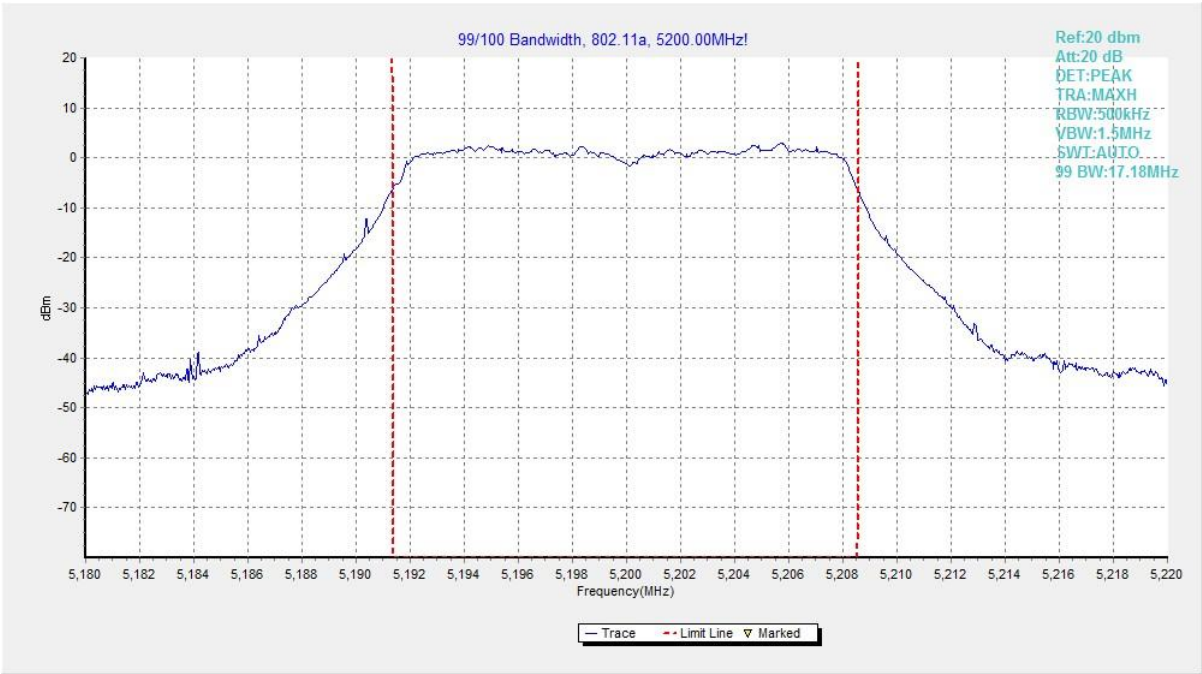

Fig. 15 99% Occupied Bandwidth (802.11a, 5200MHz)

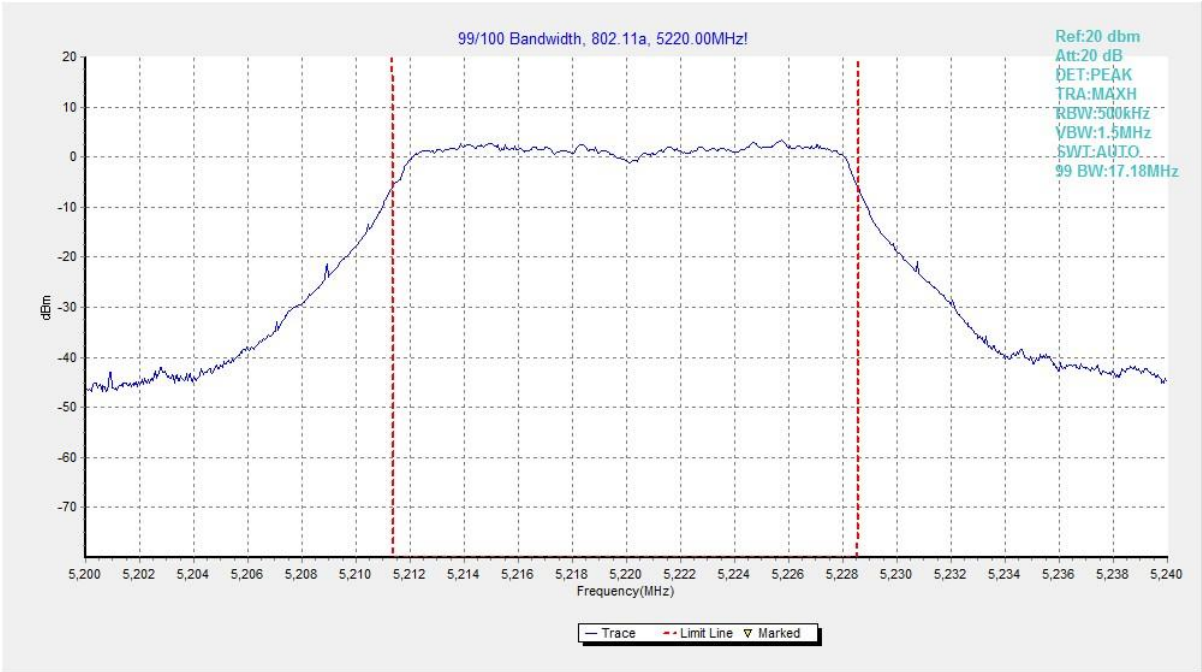

Fig. 16 99% Occupied Bandwidth (802.11a, 5220MHz)

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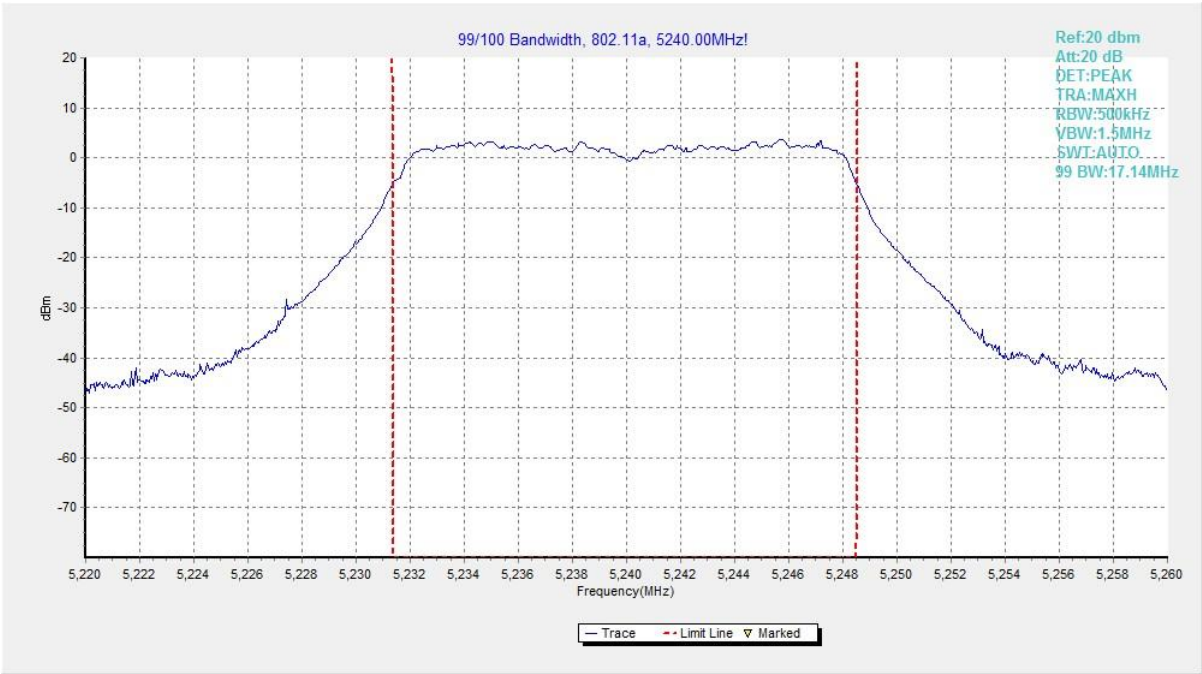

Fig. 17 99% Occupied Bandwidth (802.11a, 5240MHz)

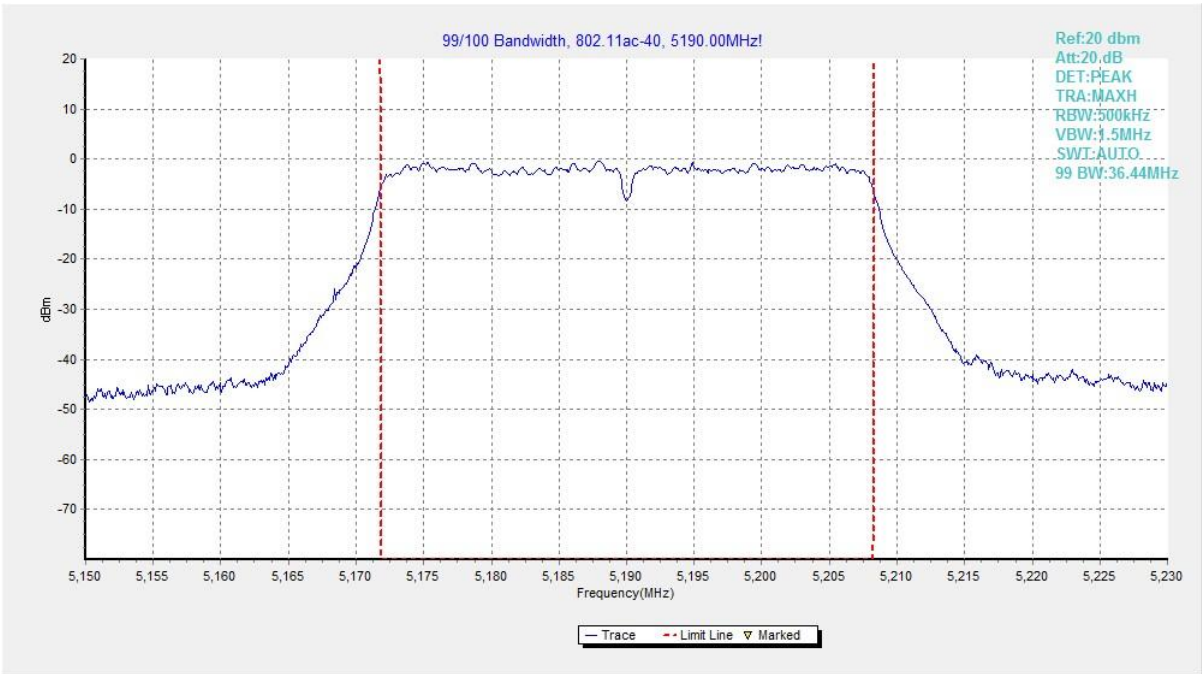

Fig. 18 99% Occupied Bandwidth (802.11ac-VHT40, 5190MHz)

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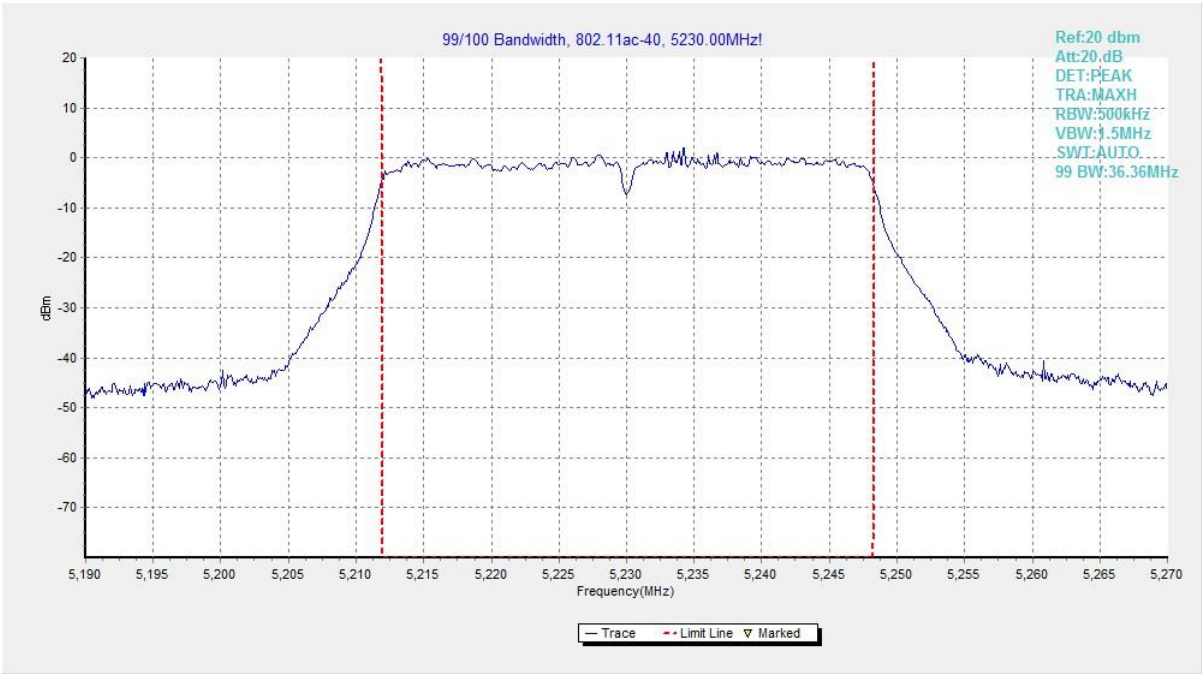

Fig. 19 99% Occupied Bandwidth (802.11ac-VHT40, 5230MHz)

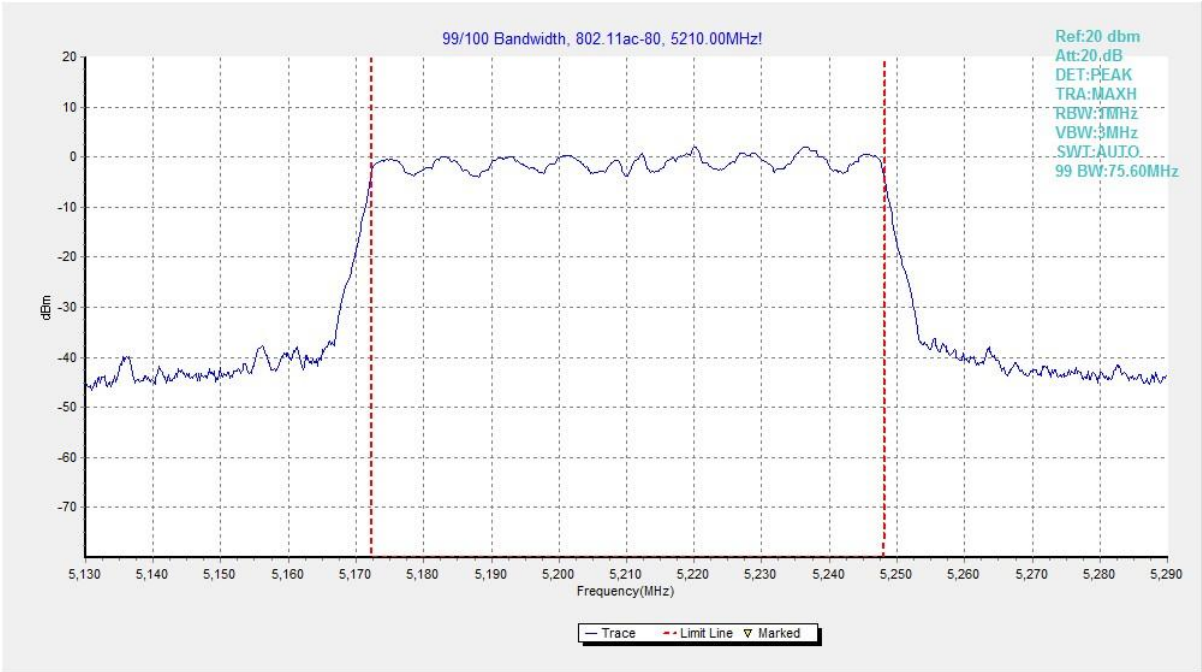

Fig. 20 99% Occupied Bandwidth (802. 11ac-VHT80, 5210MHz)

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A.7. Band Edge 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, KDB 662911.

Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5180 MHz (CH36)	Fig.21	**P**
	5745 MHz (CH149)	Fig.22	**P**
	5825 MHz (CH165)	Fig.23	**P**
802.11ac-VHT40	5190 MHz (CH38)	Fig.24	**P**
	5755 MHz (CH151)	Fig.25	**P**
	5795 MHz (CH159)	Fig.26	**P**
802.11ac-VHT80	5210 MHz (CH42)	Fig.27	**P**
	5775 MHz (CH155)	Fig.28	**P**

Conclusion: PASS

Test graphs as below:

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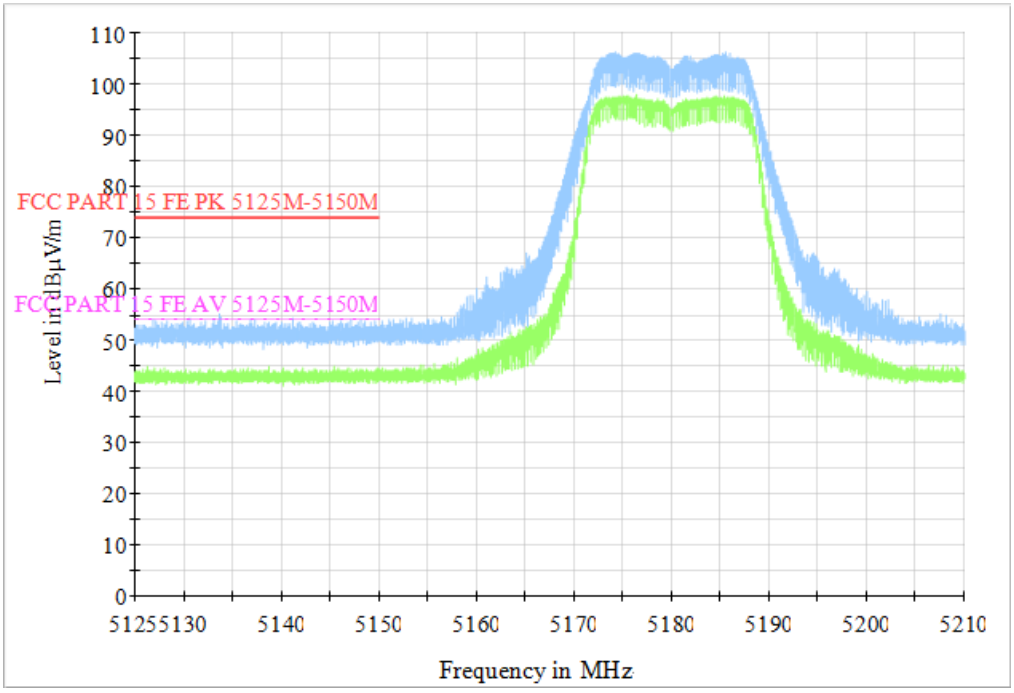

Fig. 21 Band Edges (802.11a, CH36 5180MHz)

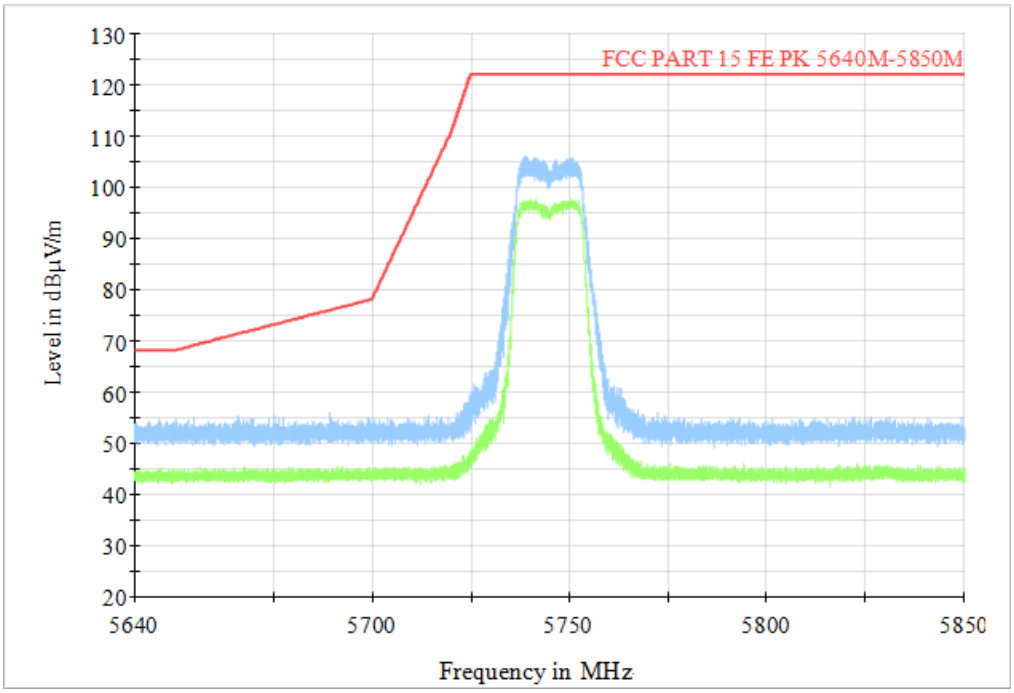

Fig. 22 Band Edges (802.11a, CH149 5745MHz)

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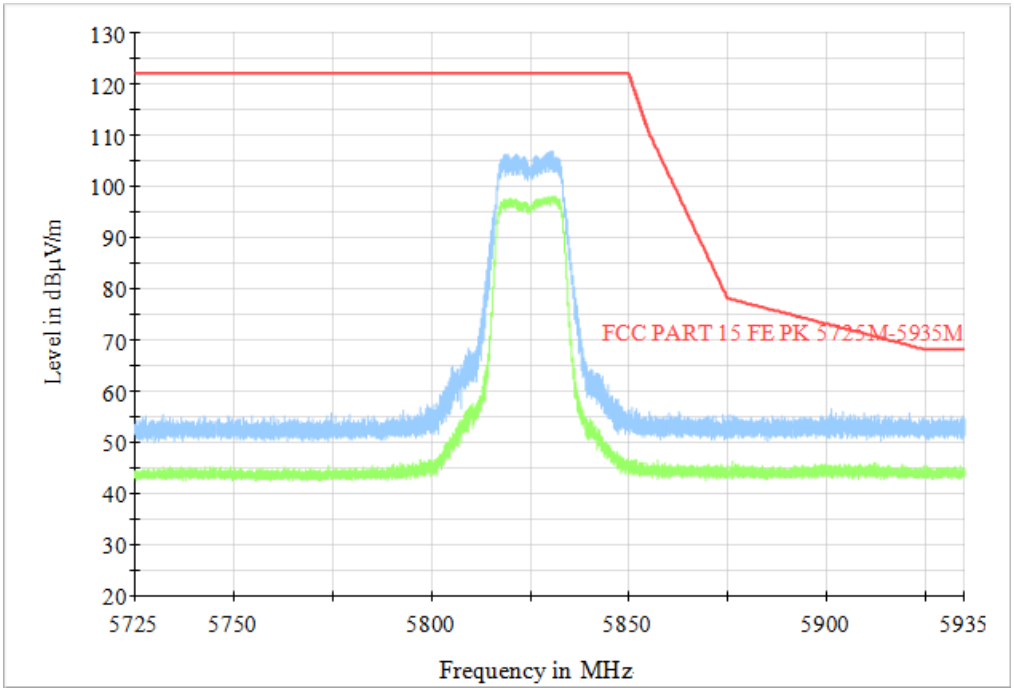

Fig. 23 Band Edges (802.11a, CH165 5825MHz)

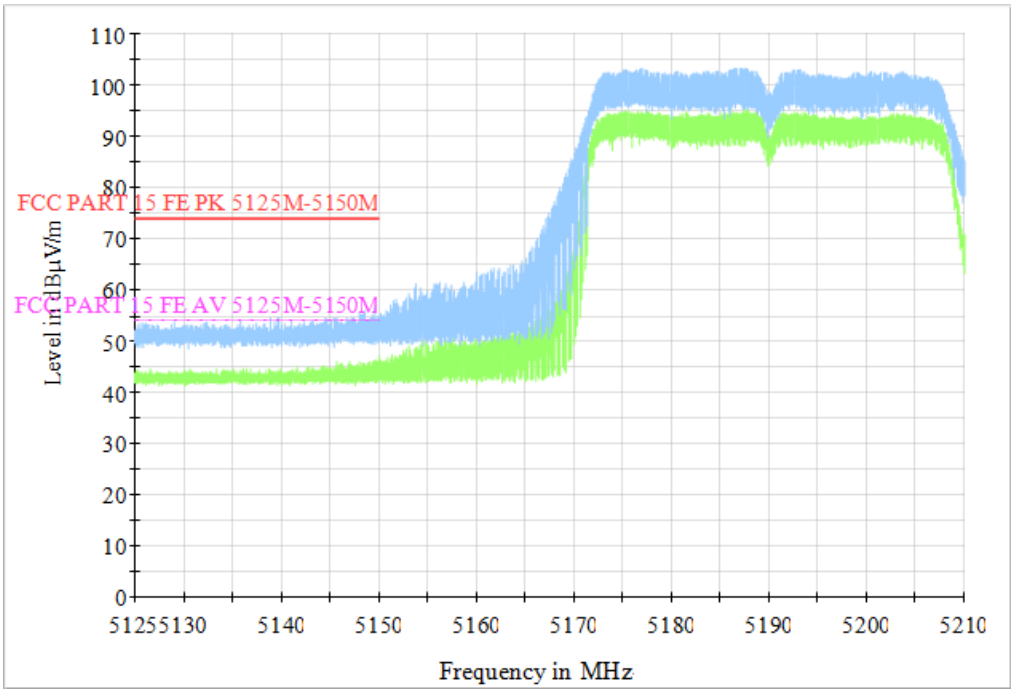

Fig. 24 Band Edges (802.11ac-VHT40, CH38 5190MHz)

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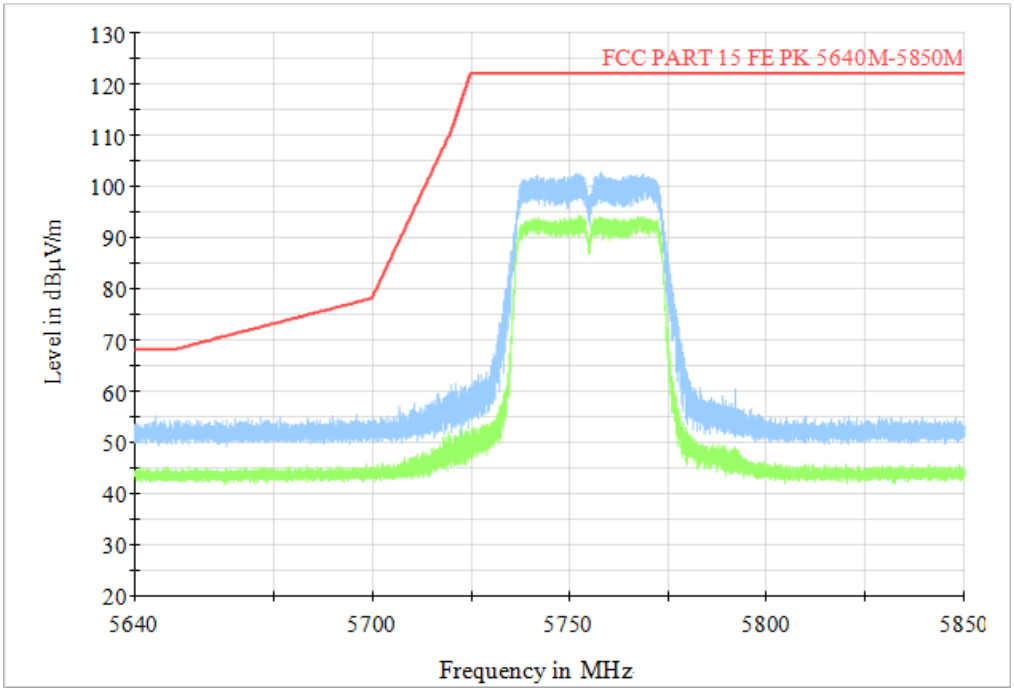

Fig. 25 Band Edges (802.11ac-VHT40, CH151 5755MHz)

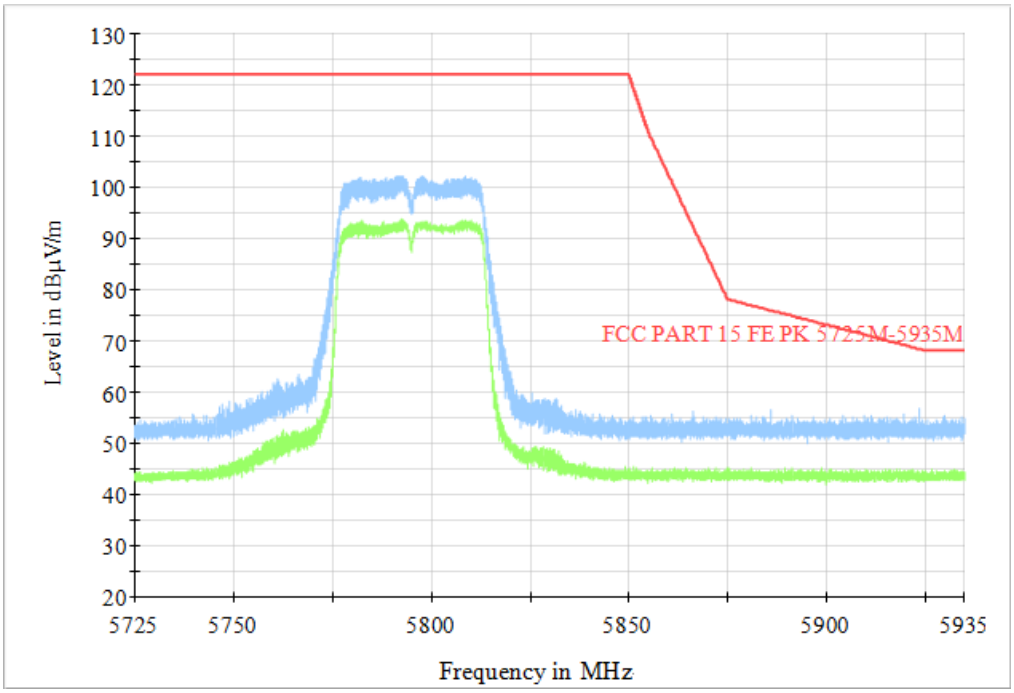

Fig. 26 Band Edges (802.11ac-VHT40, CH159 5795MHz)

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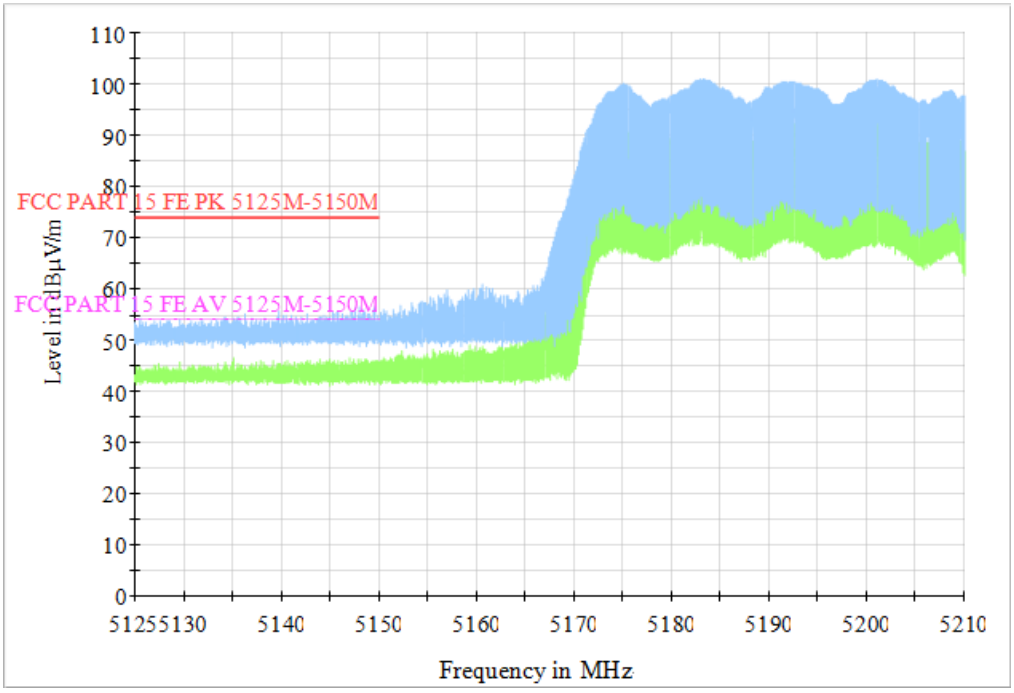

Fig. 27 Band Edges (802.11ac-VHT80, CH42 5210MHz)

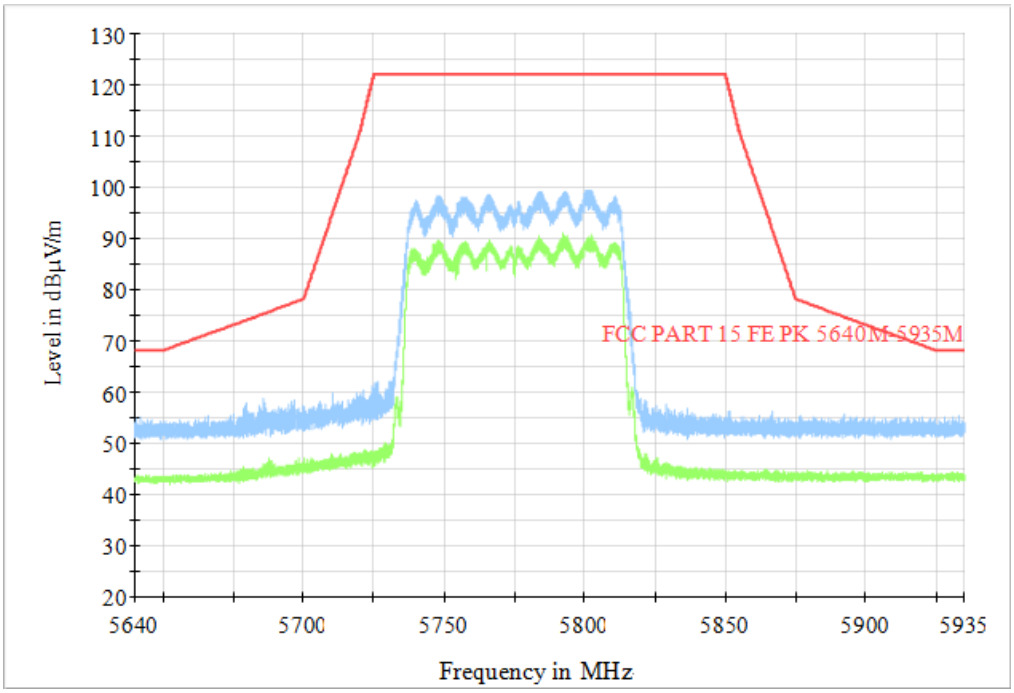

Fig. 28 Band Edges (802.11ac-VHT80, CH155 5775MHz)

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A.8. Transmitter Spurious Emission

Measurement Limit:

Standard	Limit (dBm/MHz)
FCC 47 CFR Part 15.407, 15.205	< -27

The measurement is made according to KDB 789033, KDB 662911.

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)	3 GHz ~ 7 GHz	Fig.29	**P**
		7 GHz ~ 18 GHz	Fig.30	**P**
	5200MHz (Ch40)	3 GHz ~ 7 GHz	Fig.31	**P**
		7 GHz ~ 18 GHz	Fig.32	**P**
	5240MHz (Ch48)	3 GHz ~ 7 GHz	Fig.33	**P**
		7 GHz ~ 18 GHz	Fig.34	**P**
	5745MHz (Ch149)	3 GHz ~ 7 GHz	Fig.35	**P**
		7 GHz ~ 18 GHz	Fig.36	**P**
	5785MHz (Ch157)	3 GHz ~ 7 GHz	Fig.37	**P**
		7 GHz ~ 18 GHz	Fig.38	**P**
	5825MHz (Ch165)	3 GHz ~ 7 GHz	Fig.39	**P**
		7 GHz ~ 18 GHz	Fig.40	**P**
802.11ac VHT40	5190MHz (Ch38)	3 GHz ~ 7 GHz	Fig.41	**P**
		7 GHz ~ 18 GHz	Fig.42	**P**
	5230MHz (Ch46)	3 GHz ~ 7 GHz	Fig.43	**P**
		7 GHz ~ 18 GHz	Fig.44	**P**
	5755MHz (Ch151)	3 GHz ~ 7 GHz	Fig.45	**P**
		7 GHz ~ 18 GHz	Fig.46	**P**
	5795MHz (Ch159)	3 GHz ~ 7 GHz	Fig.47	**P**
		7 GHz ~ 18 GHz	Fig.48	**P**
802.11ac VHT80	5210MHz (Ch42)	3 GHz ~ 7 GHz	Fig.49	**P**
		7 GHz ~ 18 GHz	Fig.50	**P**

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	5775MHz (Ch155)	3 GHz ~ 7 GHz	Fig.51	**P**
		7 GHz ~ 18 GHz	Fig.52	**P**
All channels		30 MHz ~ 1 GHz	Fig.53	**P**
		1 GHz ~ 3 GHz	Fig.54	**P**
		18 GHz ~ 26.5 GHz	Fig.55	**P**
		26.5 GHz ~ 40 GHz	Fig.56	**P**

Conclusion: PASS

Test graphs as below:

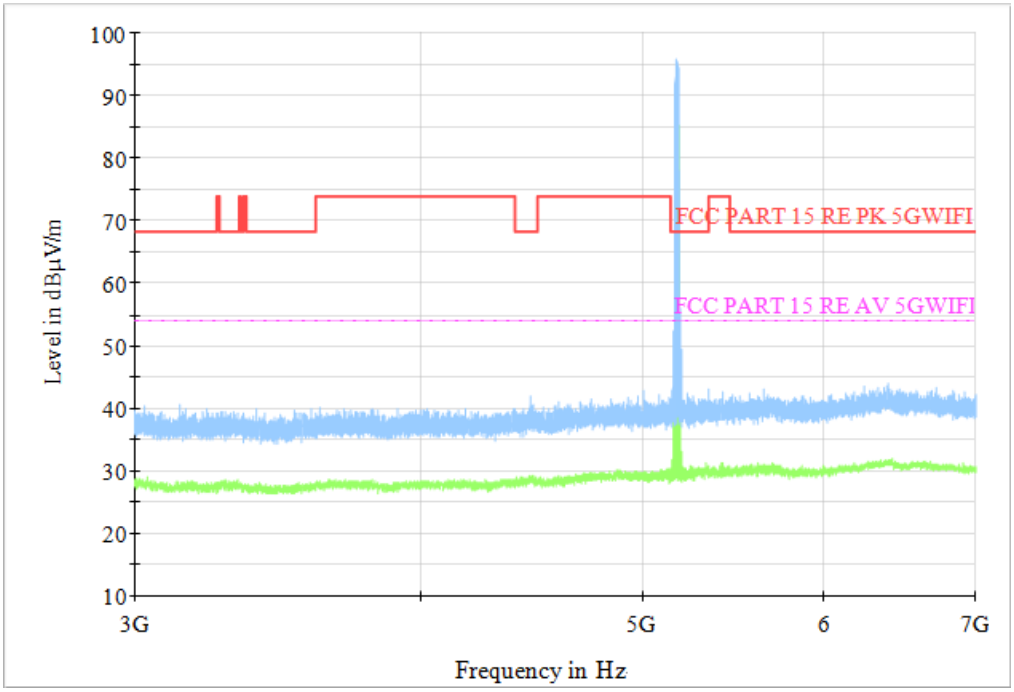

Fig. 29 Transmitter Spurious Emission (802.11a, CH36, 3 GHz ~ 7 GHz)

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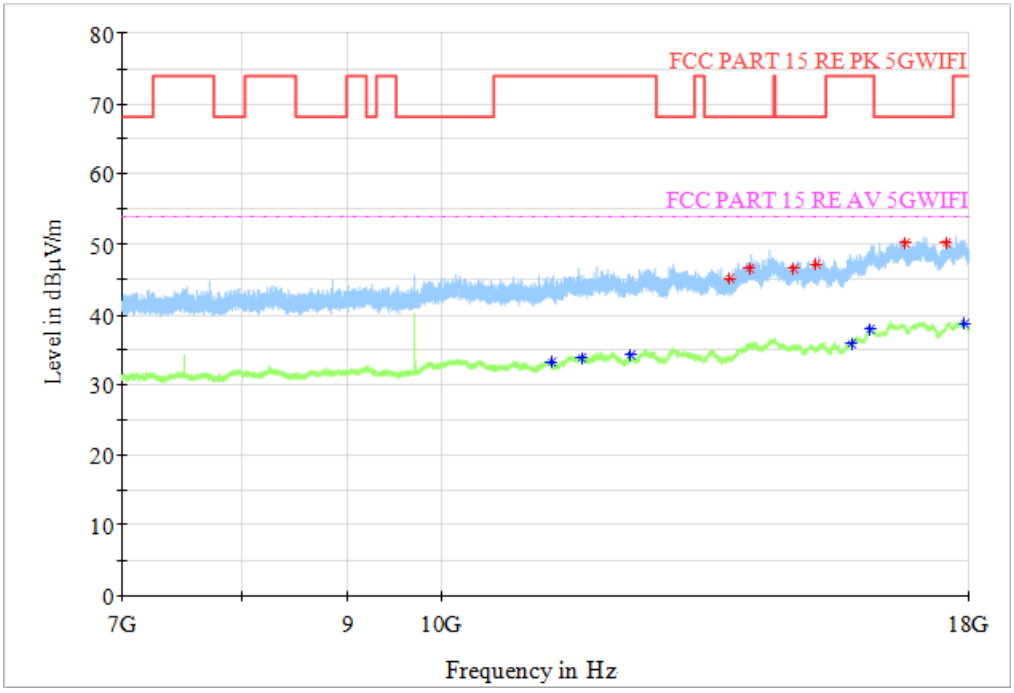

Fig. 30 Transmitter Spurious Emission (802.11a, CH36, 7 GHz ~ 18 GHz)

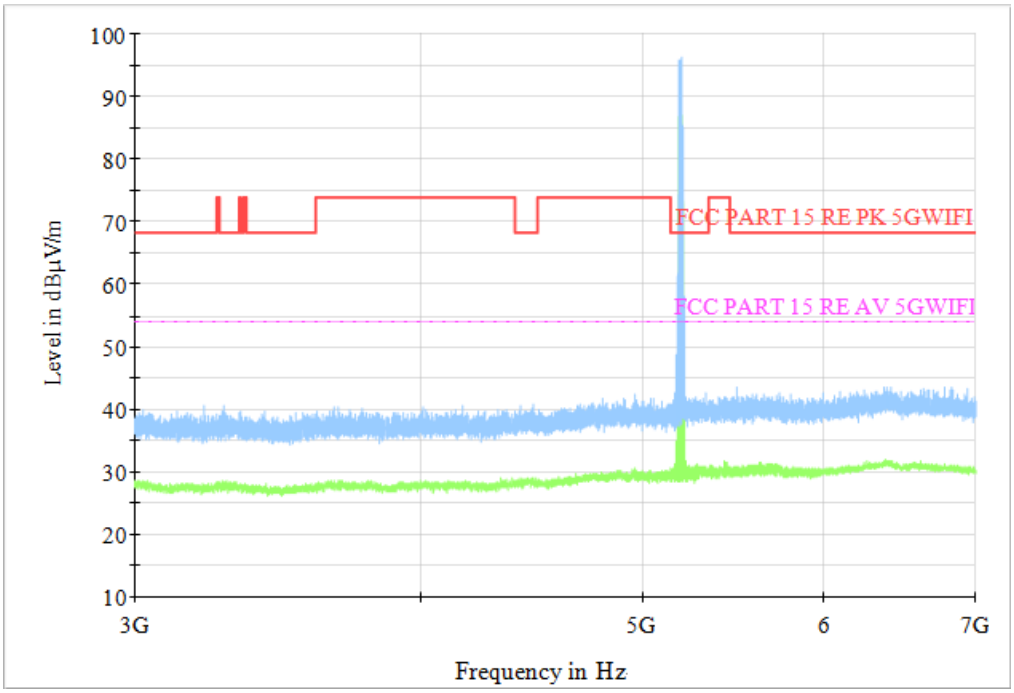

Fig. 31 Transmitter Spurious Emission (802.11a, CH40, 3 GHz ~ 7 GHz)

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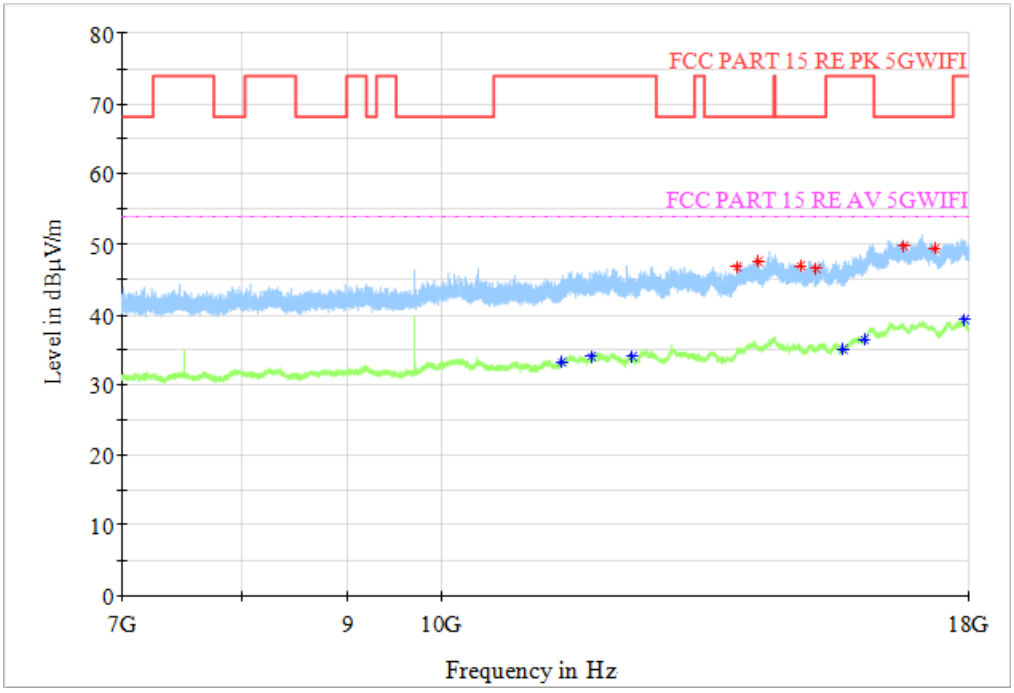

Fig. 32 Transmitter Spurious Emission (802.11a, CH40, 7 GHz ~ 18 GHz)

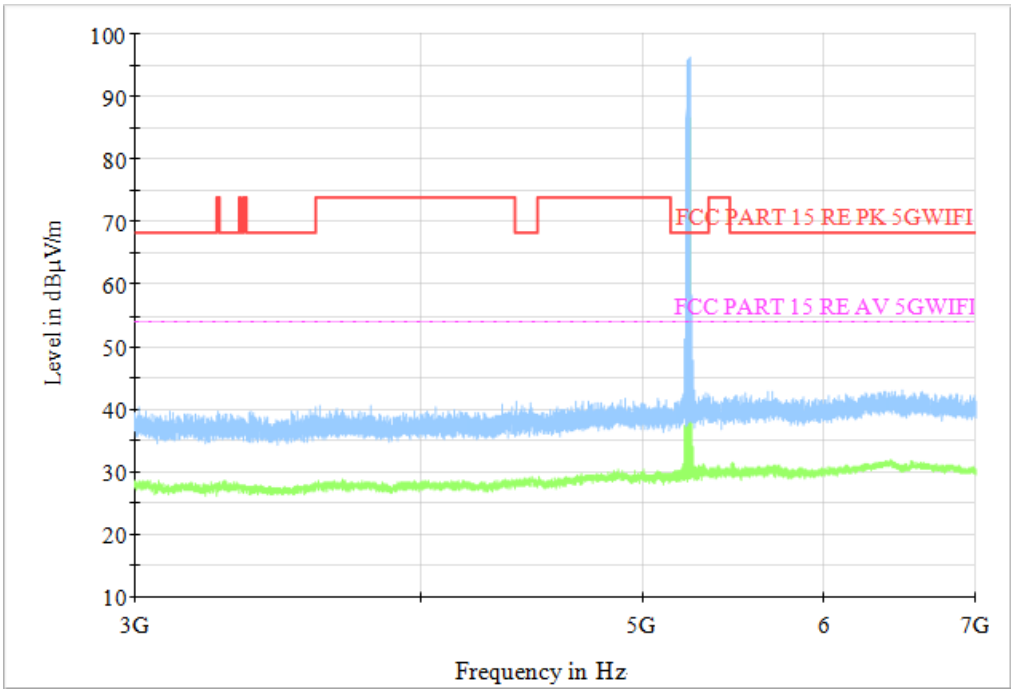

Fig. 33 Transmitter Spurious Emission (802.11a, CH48, 3 GHz ~ 7 GHz)

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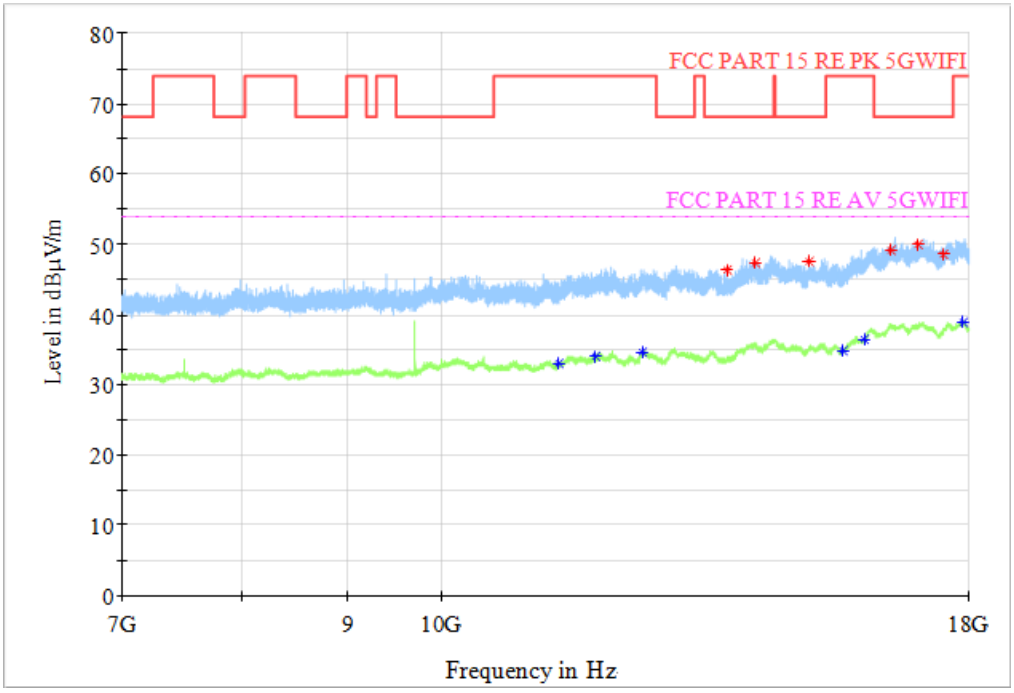

Fig. 34 Transmitter Spurious Emission (802.11a, CH48, 7 GHz ~ 18 GHz)

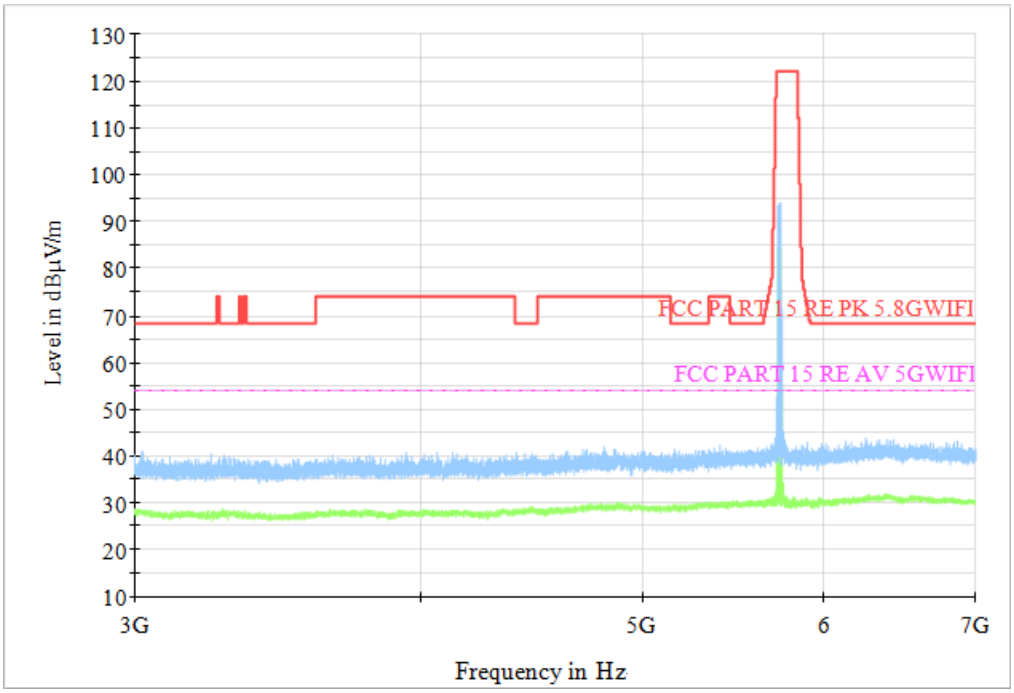

Fig. 35 Transmitter Spurious Emission (802.11a, CH149, 3 GHz ~ 7 GHz)

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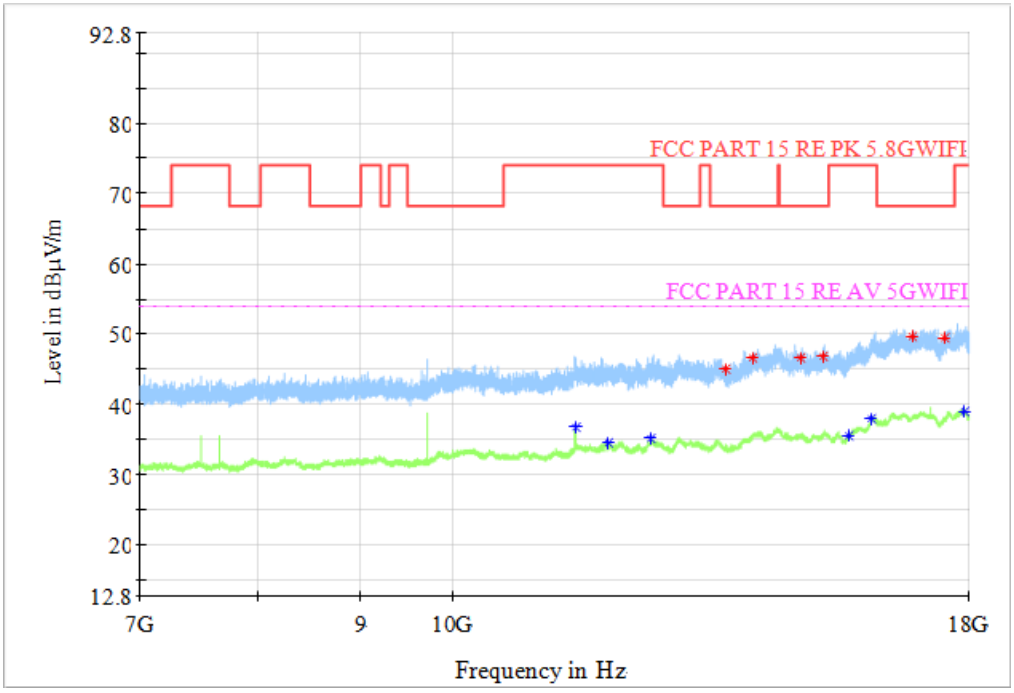

Fig. 36 Transmitter Spurious Emission (802.11a, CH149, 7 GHz ~ 18 GHz)

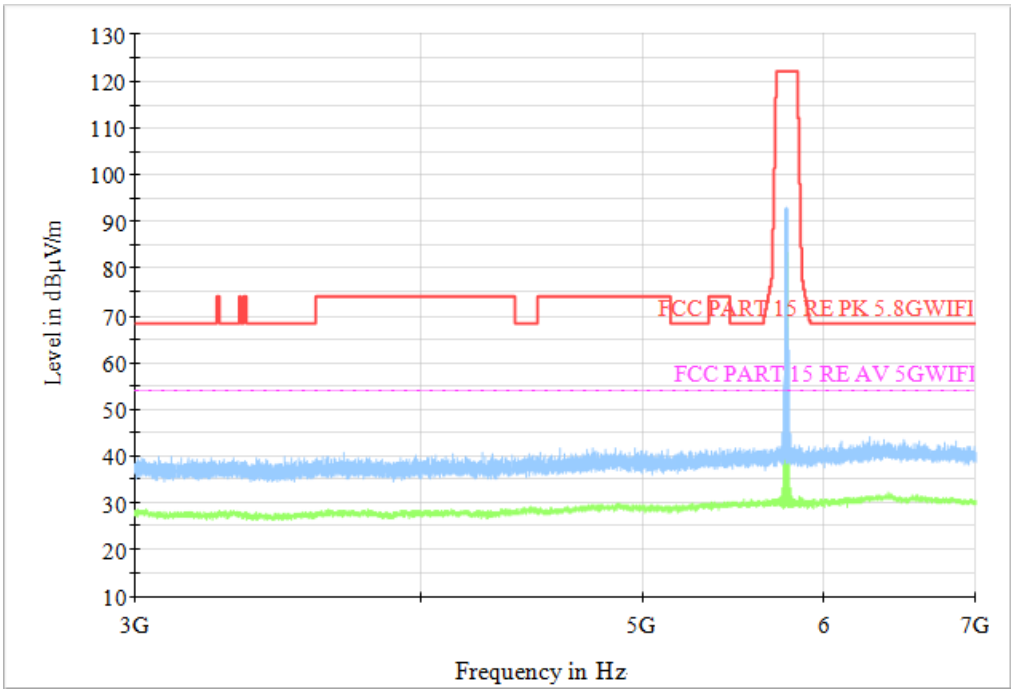

Fig. 37 Transmitter Spurious Emission (802.11a, CH157, 3 GHz ~ 7 GHz)

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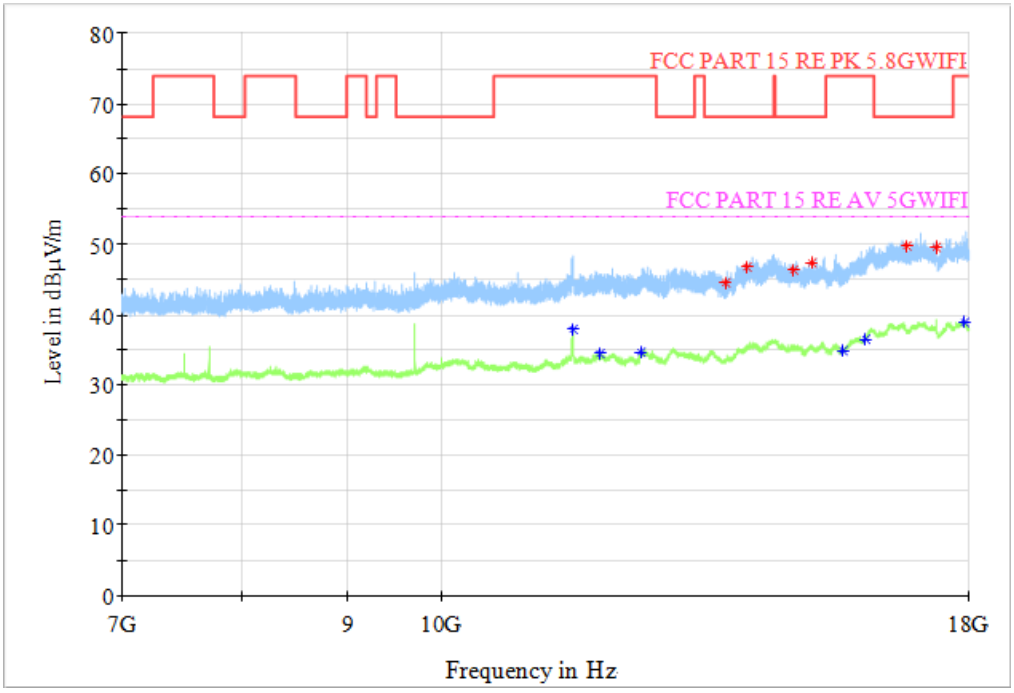

Fig. 38 Transmitter Spurious Emission (802.11a, CH157, 7 GHz ~ 18 GHz)

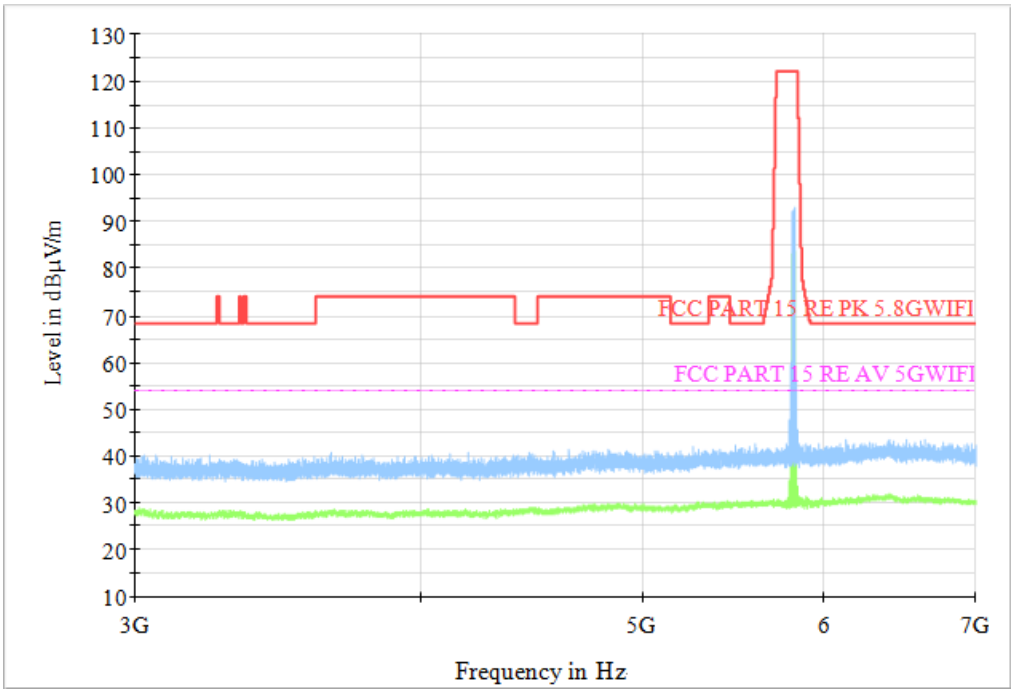

Fig. 39 Transmitter Spurious Emission (802.11a, CH165, 3 GHz ~ 7 GHz)

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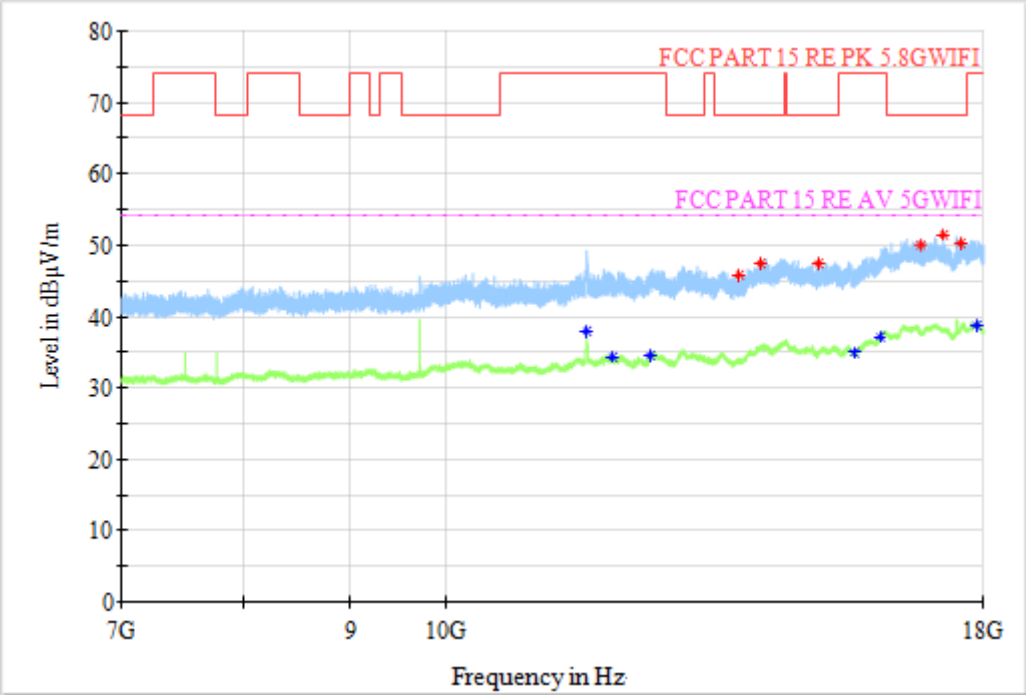

Fig. 40 Transmitter Spurious Emission (802.11a, CH165, 7 GHz ~ 18 GHz)

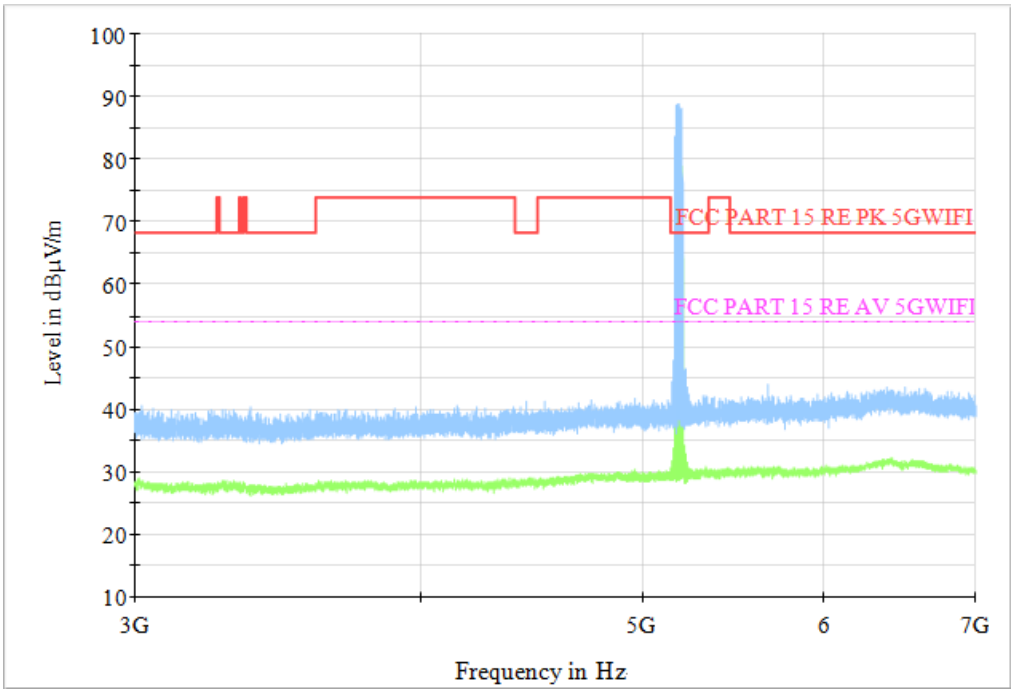

Fig. 41 Transmitter Spurious Emission (802.11ac-VHT40, CH38, 3 GHz ~ 7 GHz)

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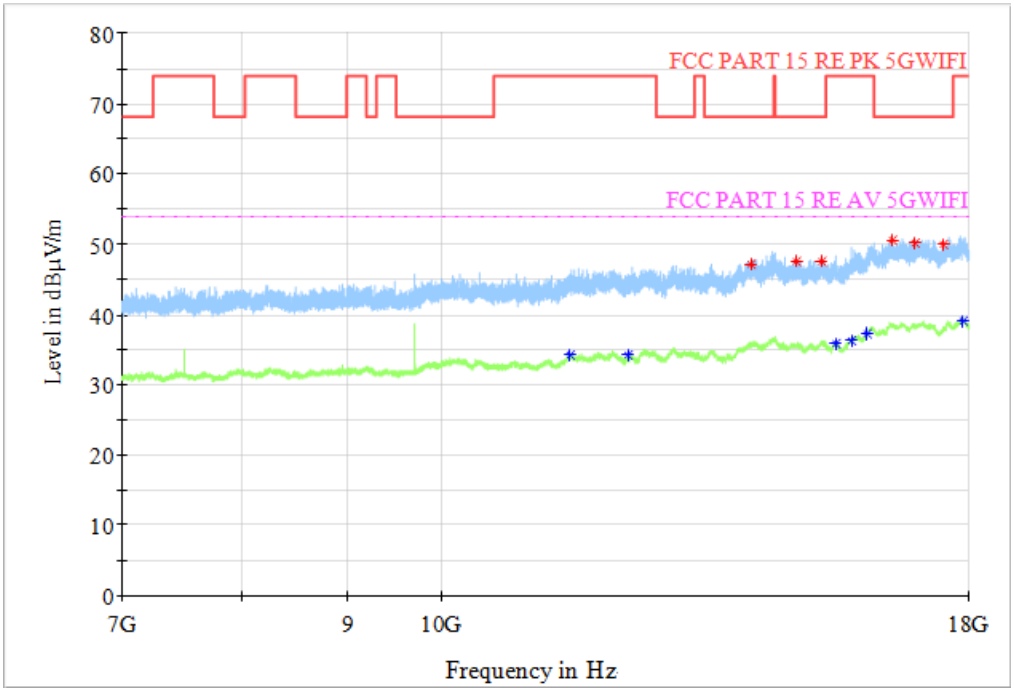

Fig. 42 Transmitter Spurious Emission (802.11ac-VHT40, CH38, 7 GHz ~ 18 GHz)

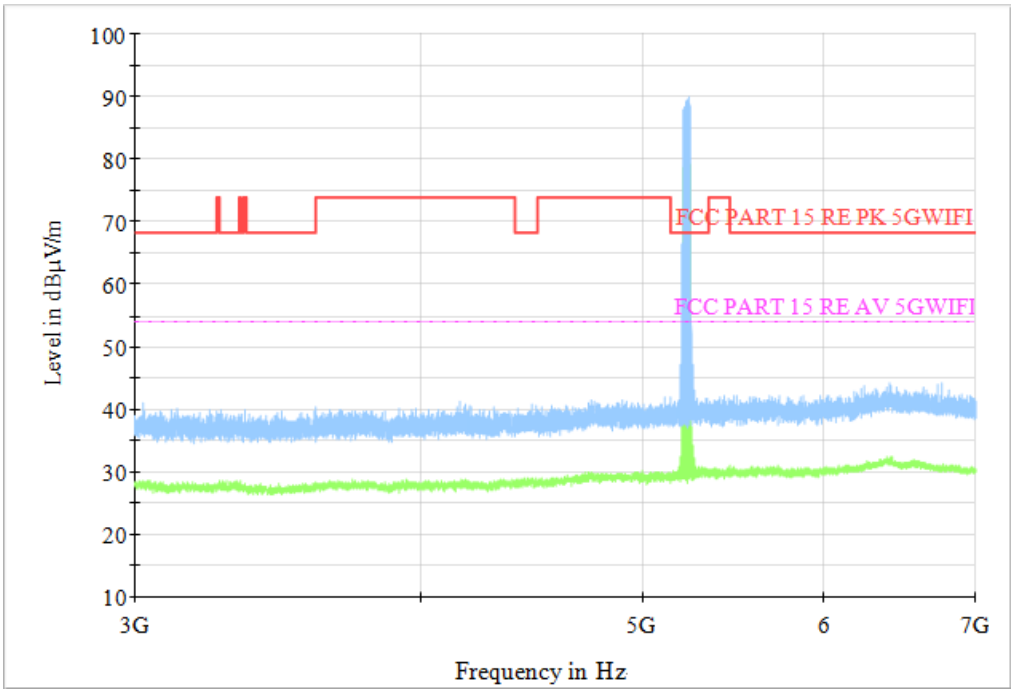

Fig. 43 Transmitter Spurious Emission (802.11ac-VHT40, CH46, 3 GHz ~ 7 GHz)

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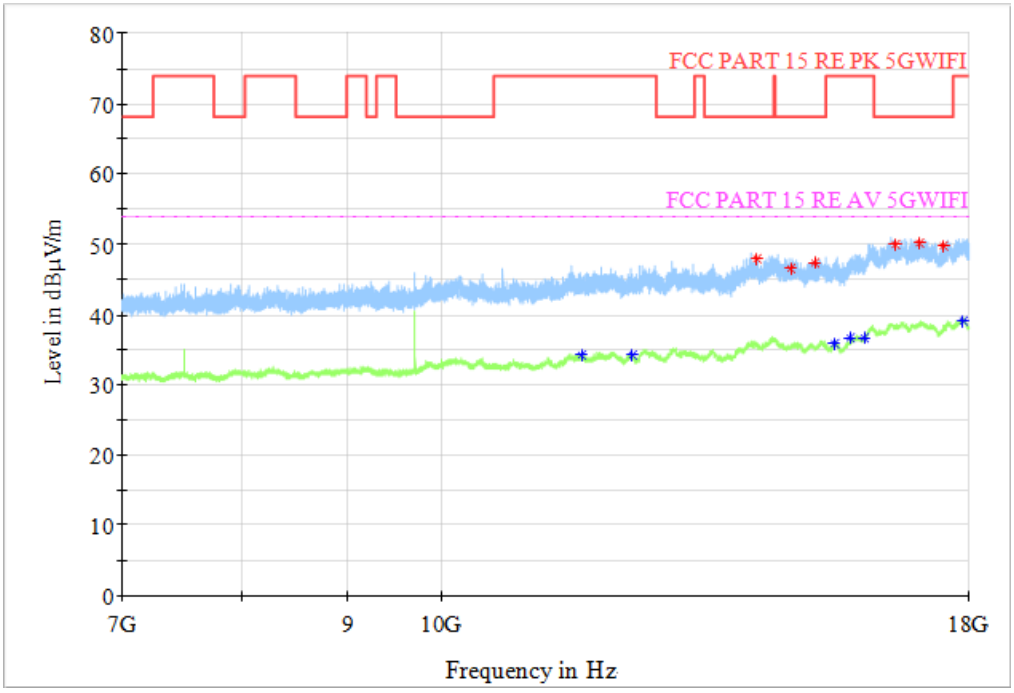

Fig. 44 Transmitter Spurious Emission (802.11ac-VHT40, CH46, 7 GHz ~ 18 GHz)

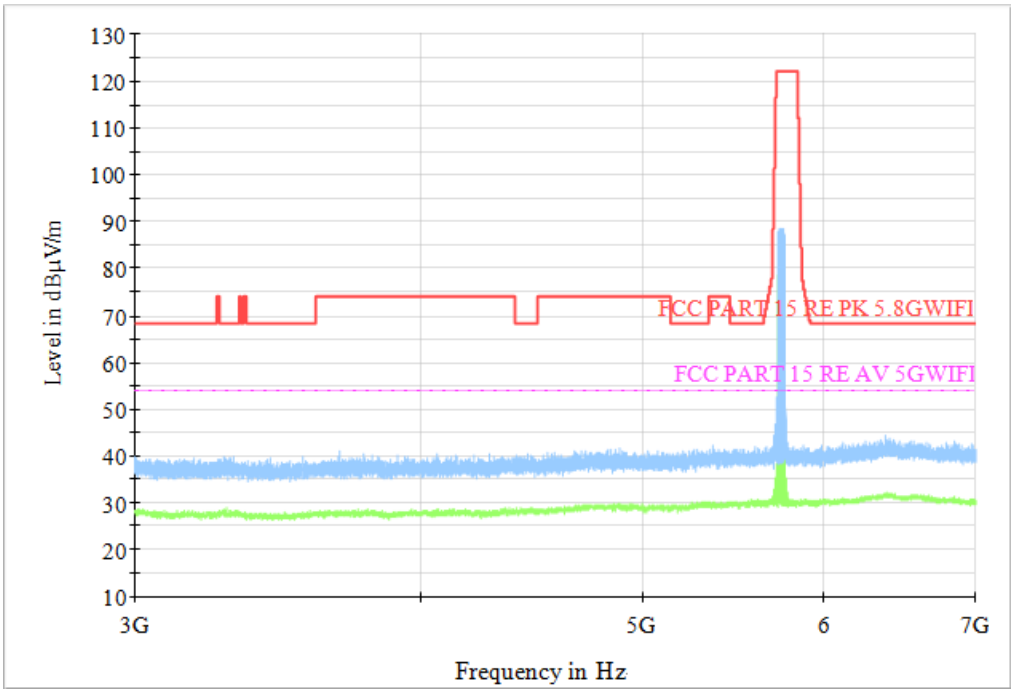

Fig. 45 Transmitter Spurious Emission (802.11ac-VHT40, CH151, 3 GHz ~ 7 GHz)

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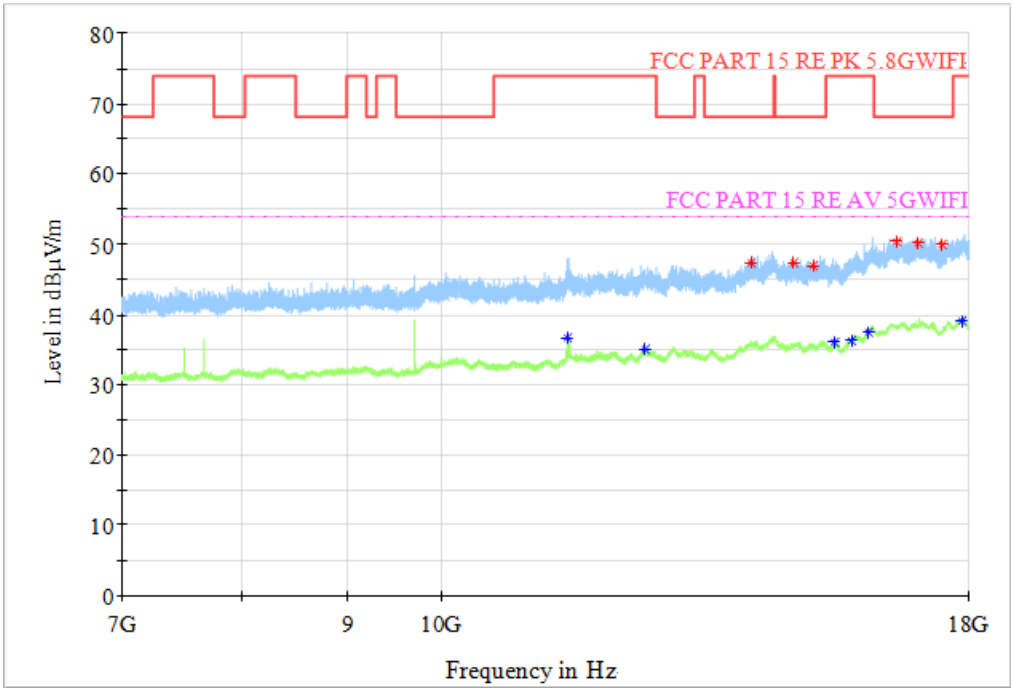

Fig. 46 Transmitter Spurious Emission (802.11ac-VHT40, CH151, 7 GHz ~ 18 GHz)

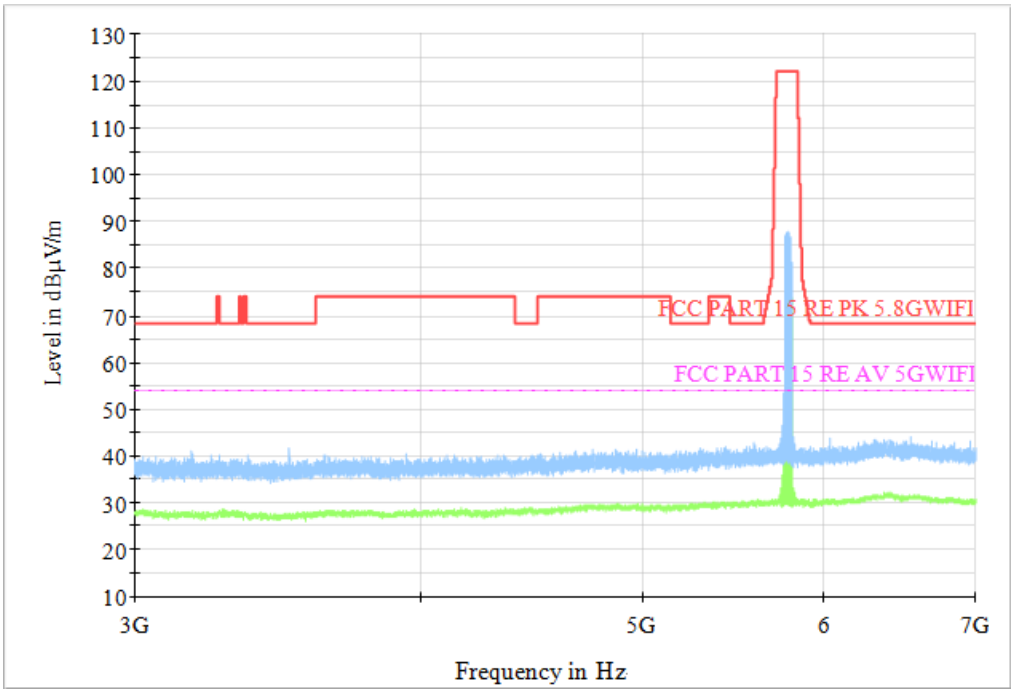

Fig. 47 Transmitter Spurious Emission (802.11ac-VHT40, CH159, 3 GHz ~ 7 GHz)

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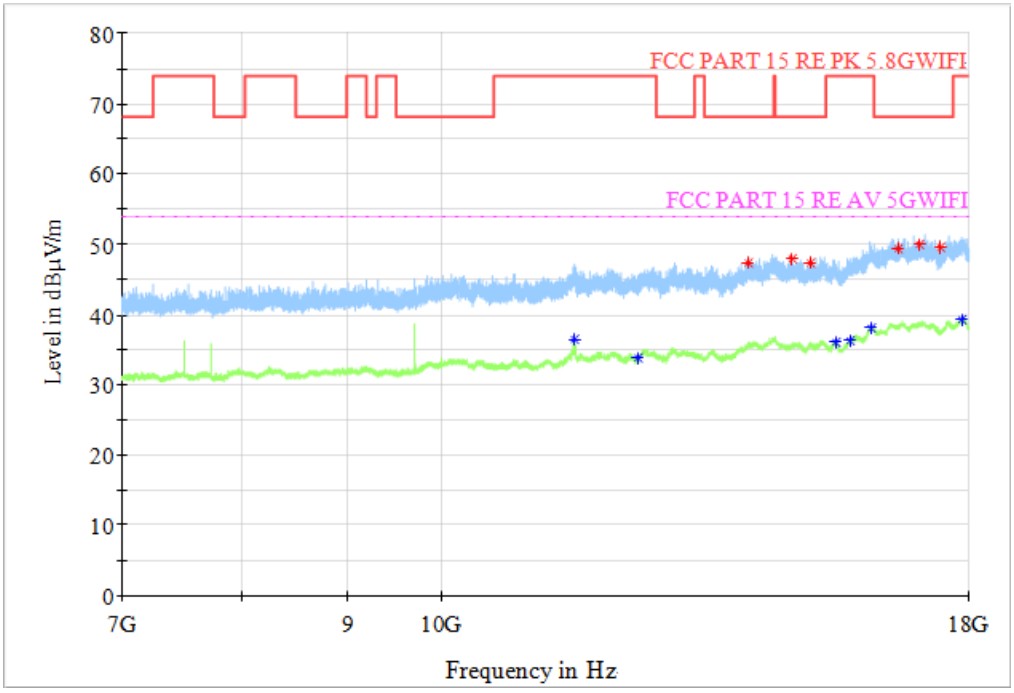

Fig. 48 Transmitter Spurious Emission (802.11ac-VHT40, CH159, 7 GHz ~ 18 GHz)

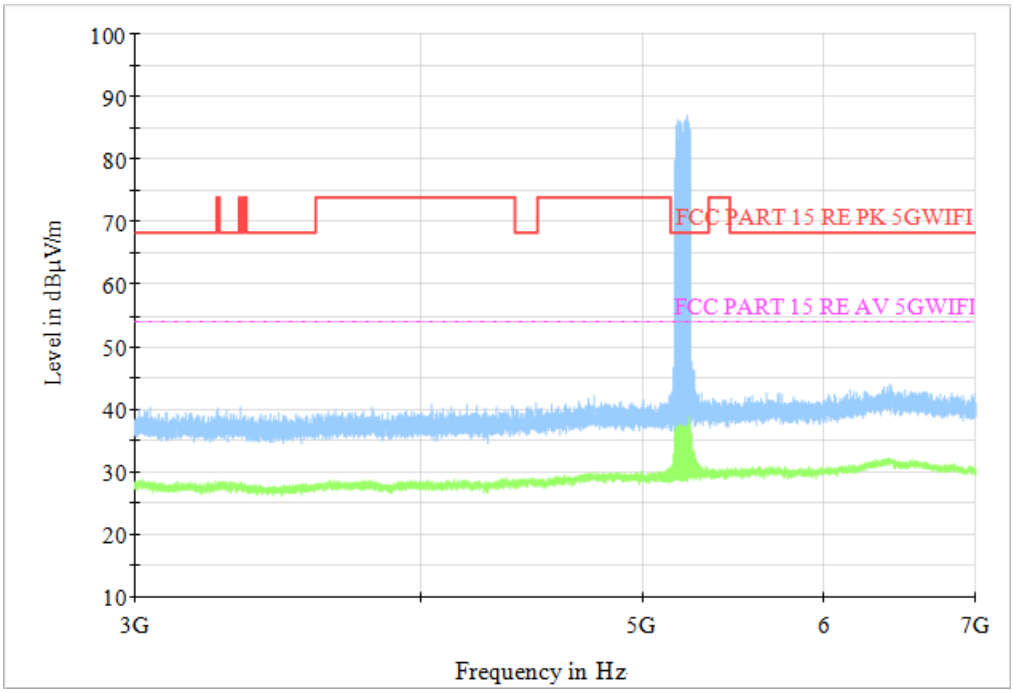

Fig. 49 Transmitter Spurious Emission (802.11ac-VHT80, CH42, 3 GHz ~ 7 GHz)

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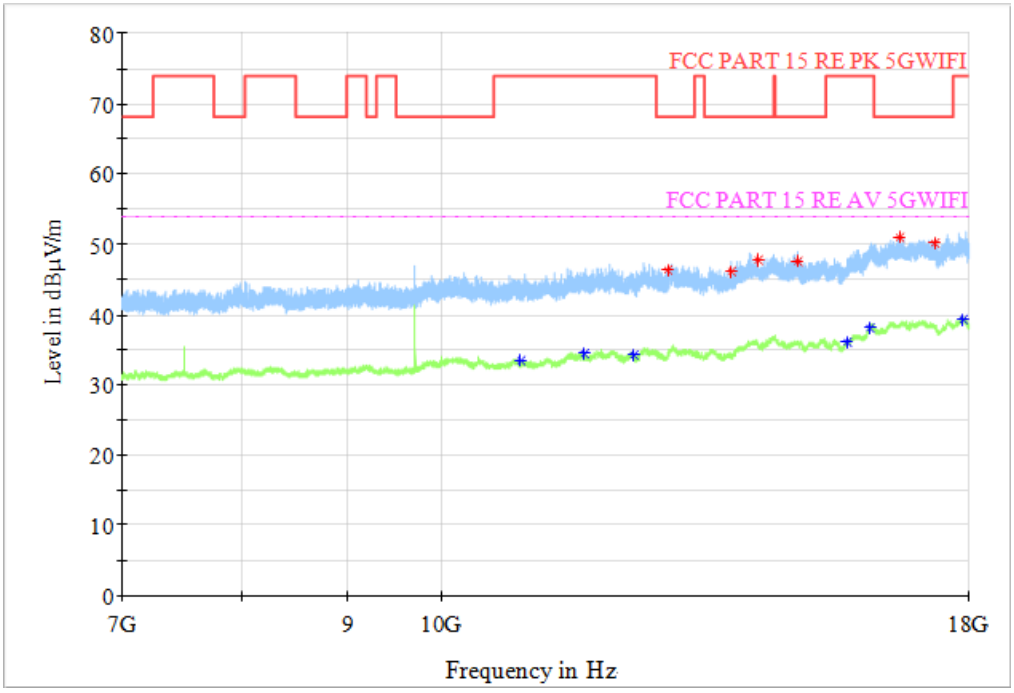

Fig. 50 Transmitter Spurious Emission (802.11ac-VHT80, CH42, 7 GHz ~ 18 GHz)

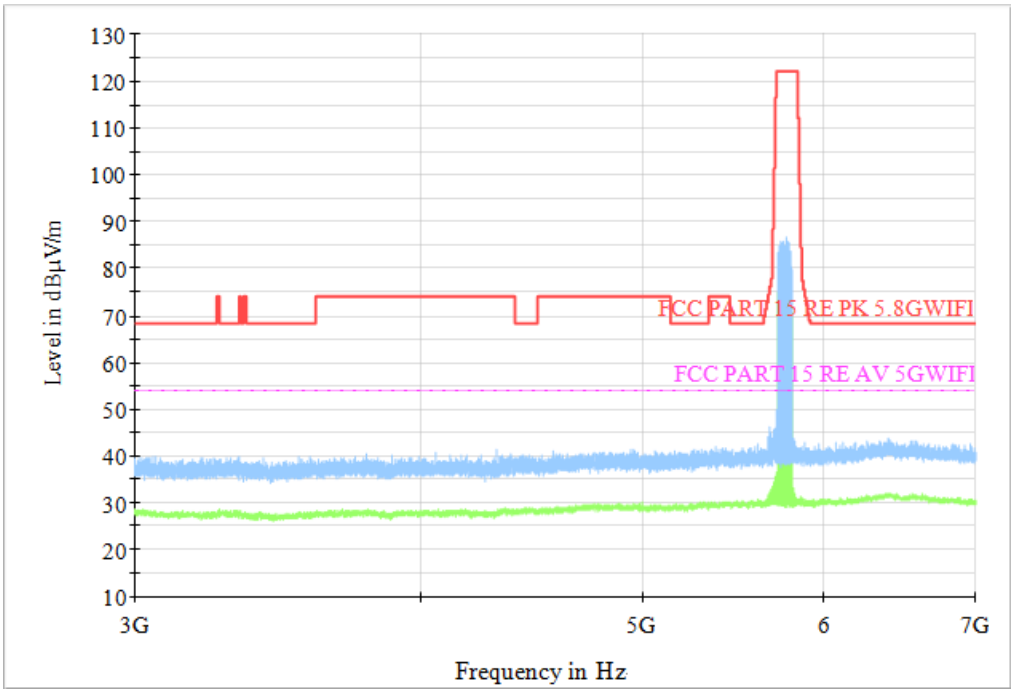

Fig. 51 Transmitter Spurious Emission (802.11ac-VHT80, CH155, 3 GHz ~ 7 GHz)

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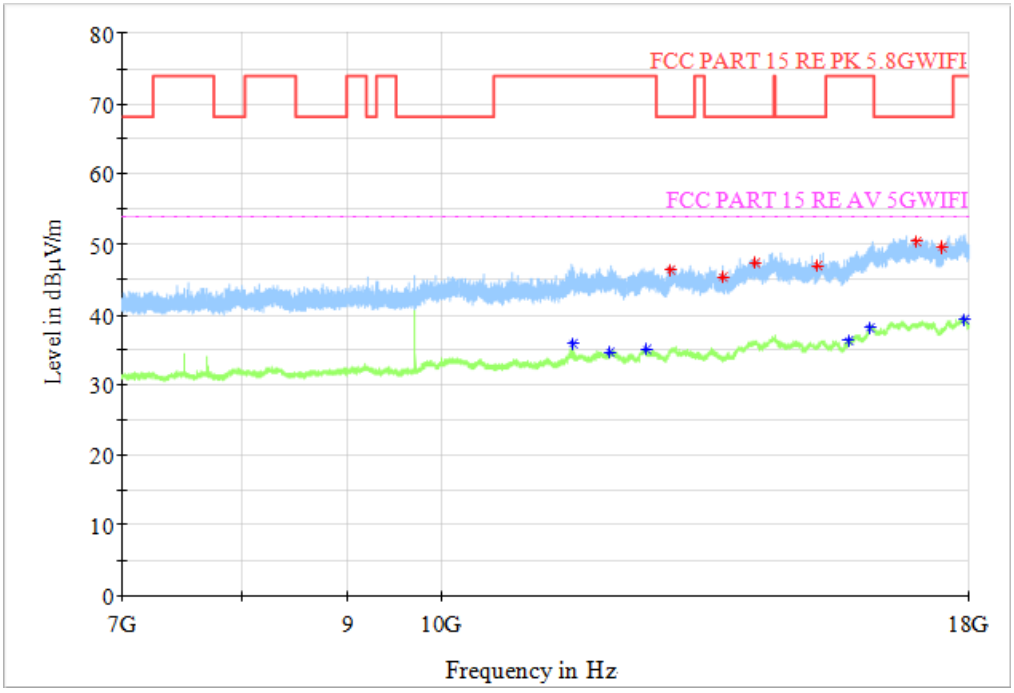

Fig. 52 Transmitter Spurious Emission (802.11ac-VHT80, CH156, 7 GHz ~ 18 GHz)

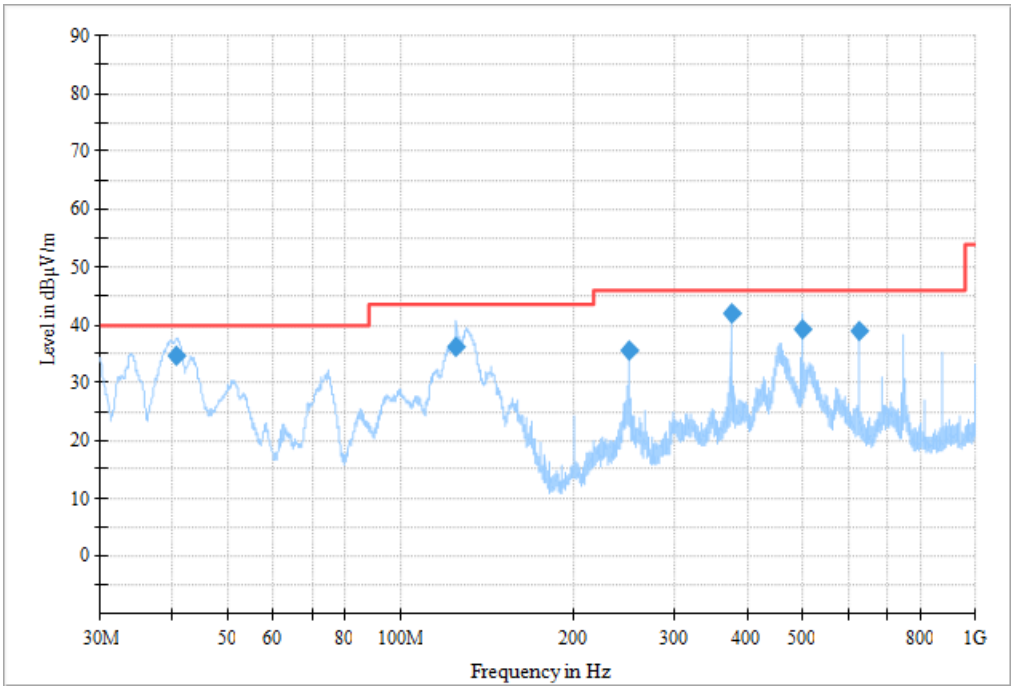

Fig. 53 Transmitter Spurious Emission (All channel, 30 MHz ~ 1 GHz)

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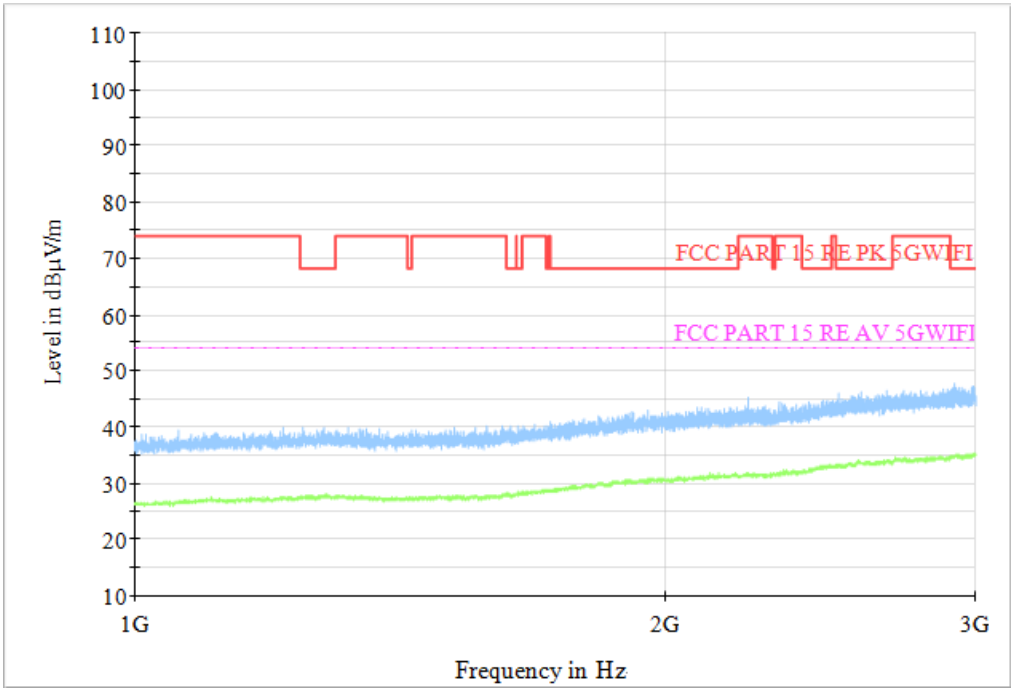

Fig. 54 Transmitter Spurious Emission (All channel, 1 GHz ~ 3 GHz)

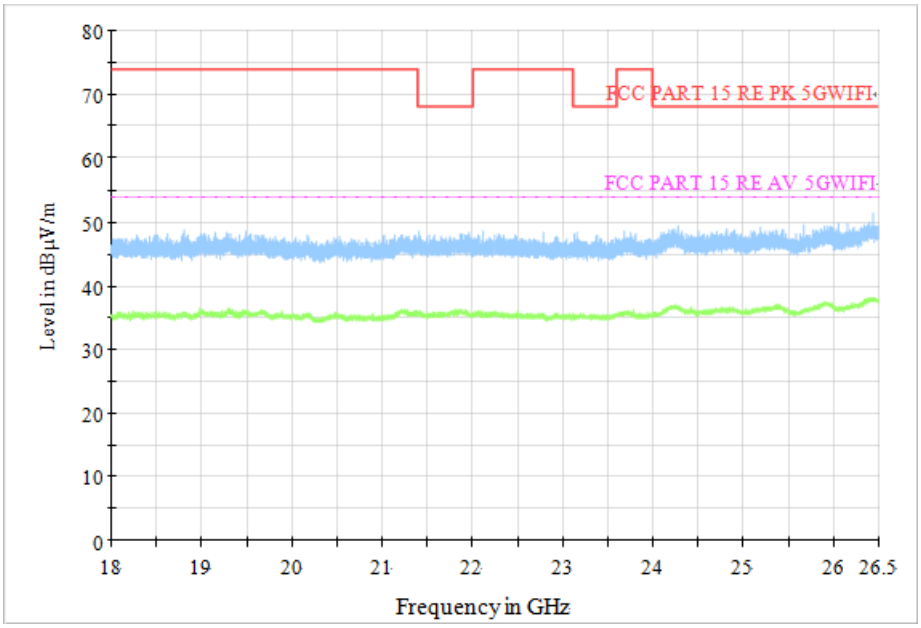

Fig. 55 Transmitter Spurious Emission (All channel, 18 GHz ~ 26.5 GHz)

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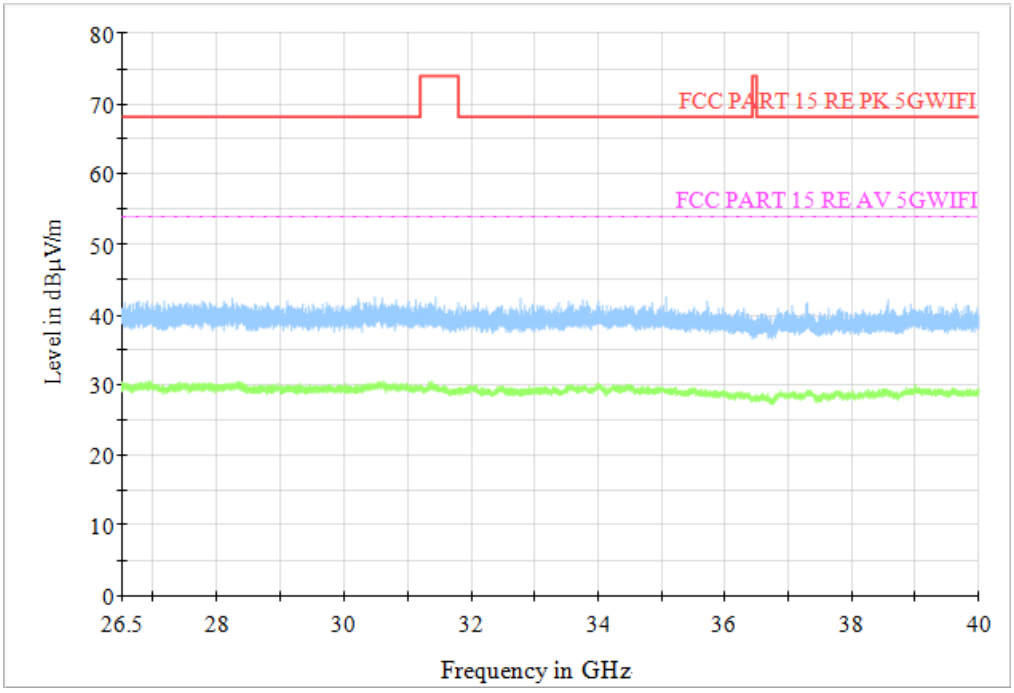

Fig. 56 Transmitter Spurious Emission (All channel, 26.5 GHz ~ 40 GHz)

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Worst Case Result

802.11a CH48

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
13735.300000	46.40	68.20	21.80	H	8.7
14180.433333	47.44	68.20	20.76	H	10.8
15064.100000	47.52	68.20	20.68	V	11.1
16511.700000	49.20	68.20	19.00	V	14.8
16994.966667	49.95	68.20	18.25	V	14.8
17499.866667	48.54	68.20	19.66	H	14.9

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
11398.533333	33.08	54.00	20.92	H	5.6
11872.266667	34.04	54.00	19.96	H	6.7
12500.000000	34.60	54.00	19.40	H	8.0
15637.200000	34.78	54.00	19.22	H	12.0
16018.533333	36.39	54.00	17.61	V	13.5
17876.800000	38.80	54.00	15.20	V	16.3

802.11a CH165

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
13775.266667	45.78	68.20	22.42	V	8.6
14103.066667	47.38	68.20	20.82	V	10.2
15023.033333	47.39	68.20	20.81	V	10.9
16792.566667	49.98	68.20	18.22	H	14.7
17220.100000	51.30	68.20	16.90	V	14.8
17563.666667	50.22	68.20	17.98	H	15.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
11649.700000	37.97	54.00	16.03	V	6.9
11986.300000	34.18	54.00	19.82	V	7.1
12478.000000	34.42	54.00	19.58	H	7.9
15621.800000	34.81	54.00	19.19	V	11.8
16063.266667	37.03	54.00	16.97	H	13.8
17860.300000	38.71	54.00	15.29	H	16.1

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802.11ac VHT40 CH46

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
14197.666667	47.90	68.20	20.30	H	10.9
14767.100000	46.63	68.20	21.57	H	10.7
15164.200000	47.44	68.20	20.76	V	10.9
16590.166667	49.89	68.20	18.31	H	14.8
17025.033333	50.18	68.20	18.02	H	15.0
17485.200000	49.87	68.20	18.33	V	14.9

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
11687.100000	34.20	54.00	19.80	V	7.1
12363.966667	34.22	54.00	19.78	V	7.4
15499.333333	35.92	54.00	18.08	V	11.9
15769.200000	36.72	54.00	17.28	V	12.7
16014.500000	36.59	54.00	17.41	V	13.4
17877.166667	39.12	54.00	14.88	H	16.3

802.11ac VHT40 CH151

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
14123.966667	47.43	68.20	20.77	H	10.4
14811.833333	47.31	68.20	20.89	H	10.7
15139.266667	46.92	68.20	21.28	V	11.1
16603.733333	50.39	68.20	17.81	H	14.8
17001.566667	50.09	68.20	18.11	H	14.9
17462.833333	50.04	68.20	18.16	V	14.8

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
11510.366667	36.72	54.00	17.28	V	6.2
12539.600000	35.12	54.00	18.88	H	8.0
15498.600000	35.98	54.00	18.02	H	11.9
15788.633333	36.35	54.00	17.65	H	12.7
16086.366667	37.40	54.00	16.60	V	13.9
17861.400000	39.02	54.00	14.98	V	16.1

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802.11ac VHT80 CH42

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
12871.433333	46.38	68.20	21.82	H	8.3
13802.766667	46.15	68.20	22.05	H	8.6
14225.900000	47.68	68.20	20.52	V	11.0
14871.233333	47.64	68.20	20.56	V	10.9
16665.333333	50.94	68.20	17.26	H	14.9
17345.133333	50.20	68.20	18.00	H	14.7

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
10924.800000	33.37	54.00	20.63	H	5.2
11716.433333	34.46	54.00	19.54	H	6.9
12390.000000	34.27	54.00	19.73	V	7.3
15706.500000	36.14	54.00	17.86	V	12.3
16117.533333	38.11	54.00	15.89	H	14.1
17876.800000	39.27	54.00	14.73	V	16.3

802.11ac VHT80 CH155

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
12912.866667	46.33	68.20	21.87	V	8.6
13682.133333	45.39	68.20	22.81	V	8.6
14175.300000	47.42	68.20	20.78	V	10.8
15209.666667	46.99	68.20	21.21	H	11.0
16975.900000	50.39	68.20	17.81	H	14.8
17476.766667	49.59	68.20	18.61	H	14.8

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
11566.833333	35.80	54.00	18.20	V	6.5
12062.933333	34.68	54.00	19.32	V	7.3
12563.800000	34.99	54.00	19.01	H	7.9
15736.933333	36.19	54.00	17.81	H	12.5
16110.933333	38.00	54.00	16.00	H	14.0
17921.166667	39.24	54.00	14.76	V	16.2

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} + Cable Loss + Antenna Factor

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A.9. Radiated Spurious Emissions < 30MHz

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

Frequency (MHz)	Field strength (μV/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, KDB 662911.

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:

Channel	Frequency Range	Test Results	Conclusion
All Channel	9 kHz ~ 30 MHz	Fig.57	**P**

Conclusion: PASS

Test graphs as below:

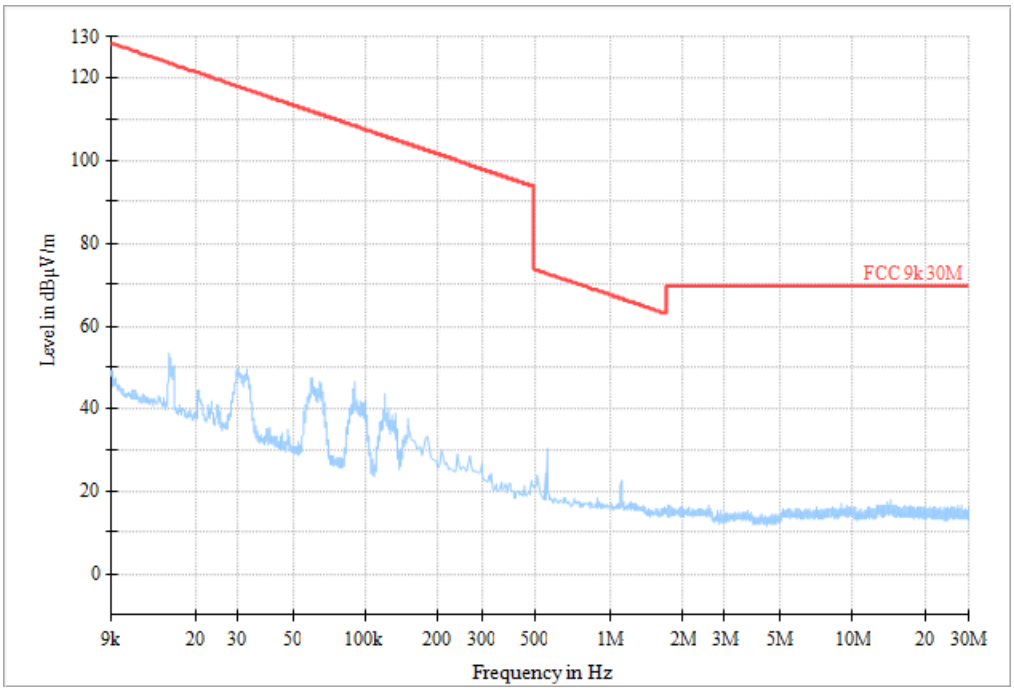

Fig. 57 Radiated Spurious Emission (All Channel, 9 kHz ~30 MHz)

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A.10. AC Power Line Conducted Emission

Test Condition:

Voltage(V)	Frequency(Hz)
120	60

Measurement Result and limit:

RLAN (Quasi-peak Limit)-AE2

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		Traffic	Idle	
0.15 to 0.5	66 to 56	Fig.58	Fig.59	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)-AE2

Frequency range (MHz)	Average-peak Limit (dBμV)	Result (dBμV)		Conclusion
		Traffic	Idle	
0.15 to 0.5	56 to 46	Fig.58	Fig.59	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:

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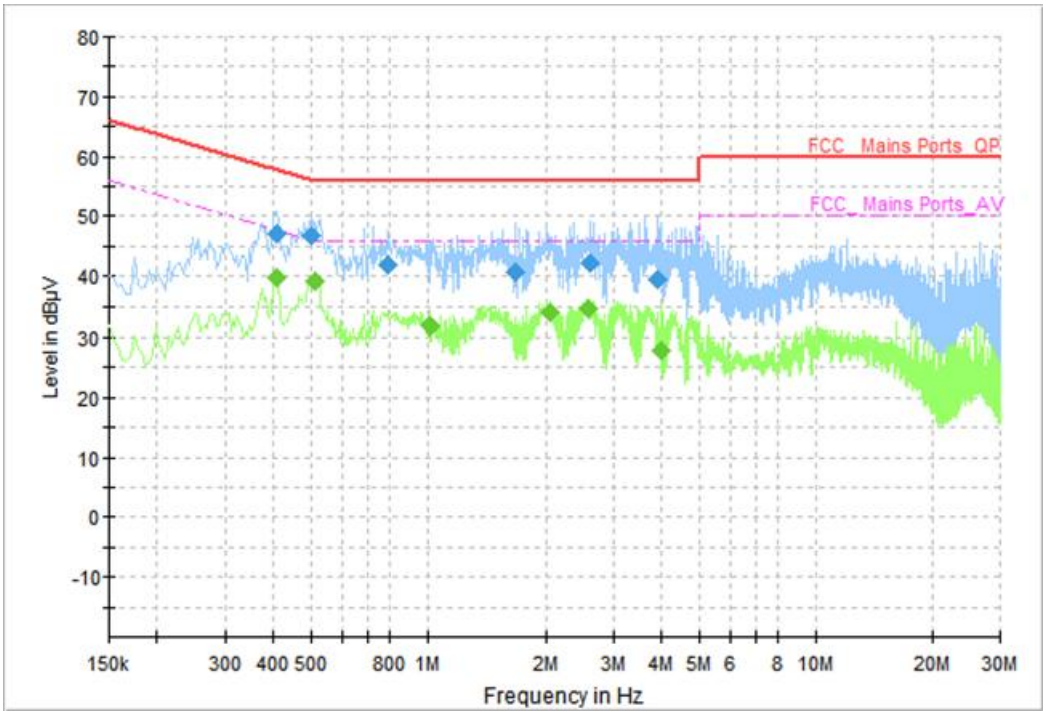

Fig. 58 AC Power line Conducted Emission (Traffic)

Measurement Result: Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.406000	47.11	57.73	10.62	N	ON	9.7
0.498000	46.62	56.03	9.41	N	ON	9.7
0.794000	41.89	56.00	14.11	N	ON	9.7
1.666000	40.59	56.00	15.41	N	ON	9.7
2.618000	42.18	56.00	13.82	N	ON	9.7
3.914000	39.57	56.00	16.43	N	ON	9.7

Measurement Result: Average

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.406000	39.68	47.73	8.05	N	ON	9.7
0.510000	39.13	46.00	6.87	L1	ON	9.7
1.010000	31.98	46.00	14.02	N	ON	9.7
2.046000	34.00	46.00	12.00	N	ON	9.7
2.582000	34.58	46.00	11.42	N	ON	9.7
3.990000	27.81	46.00	18.19	N	ON	9.7

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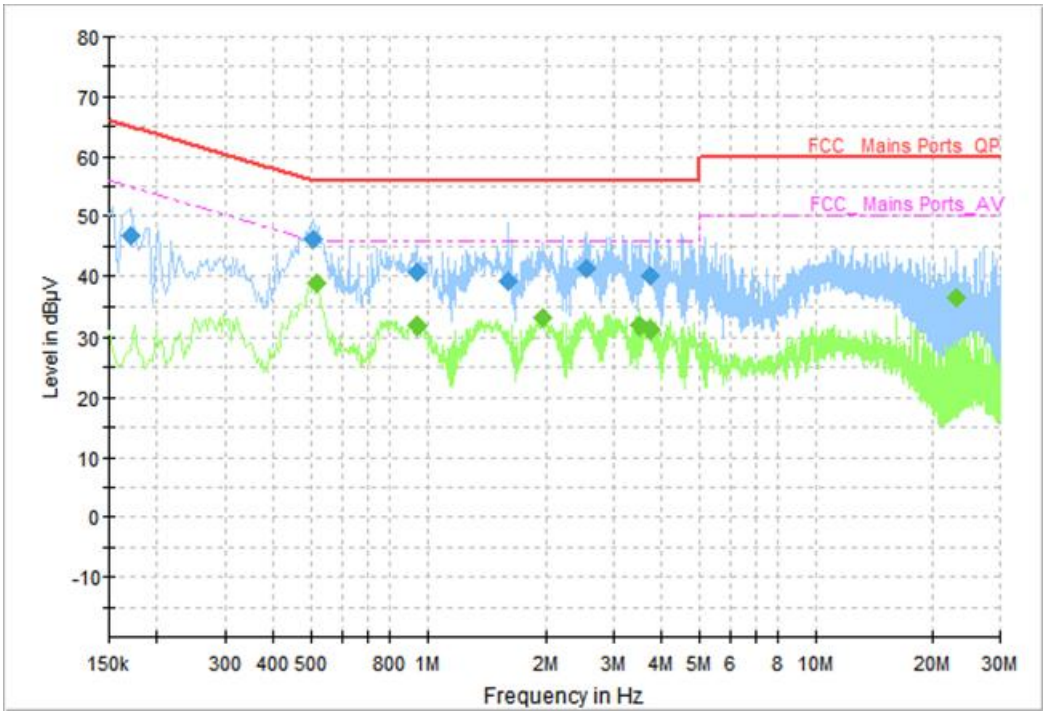

Fig. 59 AC Power line Conducted Emission (Idle)

Measurement Result: Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.170000	46.77	64.96	18.19	L1	ON	9.7
0.506000	46.23	56.00	9.77	N	ON	9.7
0.938000	40.54	56.00	15.46	N	ON	9.7
1.602000	39.09	56.00	16.91	N	ON	9.7
2.558000	41.41	56.00	14.59	N	ON	9.7
3.734000	40.13	56.00	15.87	N	ON	9.7

Measurement Result: Average

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.518000	38.70	46.00	7.30	L1	ON	9.7
0.942000	31.96	46.00	14.04	N	ON	9.7
1.958000	33.14	46.00	12.86	N	ON	9.7
3.514000	31.95	46.00	14.05	N	ON	9.7
3.734000	31.08	46.00	14.92	N	ON	9.7
23.130000	36.25	50.00	13.75	N	ON	10.3

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A.11. 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 Condition:

T min = -10˚C T nom = 25˚C T max = 45˚C

V min = 5V V nom = 12V V max = 18V

Measurement Result:

Mode	Channel	Condition		Frequency	Conclusion
802.11a	5180 MHz (CH36)	T nom	V nom	5179.9831	**P**
		T max	V nom	5179.9853	**P**
		T min	V nom	5179.9845	**P**
		T nom	V max	5179.9831	**P**
		T nom	V min	5179.9773	**P**
802.11ac VHT40	5190 MHz (CH38)	T nom	V nom	5189.9131	**P**
		T max	V nom	5189.9638	**P**
		T min	V nom	5189.9684	**P**
		T nom	V max	5189.9658	**P**
		T nom	V min	5189.9652	**P**
802.11ac VHT80	5210 MHz (CH42)	T nom	V nom	5209.9831	**P**
		T max	V nom	5209.9752	**P**
		T min	V nom	5209.9754	**P**
		T nom	V max	5209.9842	**P**
		T nom	V min	5209.9753	**P**

A.12. 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** ***

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