



TEST REPORT

No. I21N03152-RLAN

for

IDEMIA Identity and Security France

ID Screen 60

Model Name: MPH-MB004A

with

Hardware Version: V02

Software Version: IDEMIA_WM38_V01_211023

FCC ID: ZBW-MPHMB004

Issued Date: 2021-12-24

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.

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1. Summary of Test Report

1.1. Test Items

Description	ID Screen 60
Model Name	MPH-MB004A
Applicant's name	IDEMIA Identity and Security France
Manufacturer's Name	IDEMIA Identity and Security France

1.2. Test Standards

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

1.3. Test Result

Pass

Please refer to "5.2. Test Results"

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:	2021-11-08
Testing End Date:	2021-12-24

1.6. Signature

Lin Zechuang
(Prepared this test report)

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(Reviewed this test report)

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2. Client Information

2.1. Applicant Information

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2.2. Manufacturer Information

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

3.1. About EUT

Description	ID Screen 60
Model Name	MPH-MB004A
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	Dedicated antenna
Supply Voltage	DC 3.85V
Power source	Battery
FCC ID	ZBW-MPHMB004
Device Type (DFS)	Client without radar detection(only support client mode)
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
UT03aa	351935780004224	V02	IDEMIA_WM38_V01_211023	2021-11-12
UT04aa	351935780003408	V02	IDEMIA_WM38_V01_211023	2021-11-12

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

UT03aa is used for conduction test, UT04aa used for radiation test and AC Power line Conducted Emission test.

3.3. Internal Identification of AE

AE ID*	Description	Model	Manufacturer
AE1	Battery	293780548	SCUD (Fujian) Electronics Co., Ltd.
AE2	Charger	A839-200150C-US1	Shenzhen Aoda Power 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 ID Screen 60 with dedicated antenna.

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
KDB 789033	GUIDELINES FOR COMPLIANCE TESTING OF UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) DEVICES PART 15, SUBPART E	V02r01
KDB 905462	Compliance Measurement Procedures for Unlicensed-national Information Infrastructure Devices Operating in the 5250-5350 MHz and 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection	D02

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(a)	P
2	Power Spectral Density	15.407(a)	P
3	Occupied 26dB Bandwidth	15.403(i)	/
4	Occupied 6dB Bandwidth	15.407(e)	P
5	99% Occupied Bandwidth	15.403	/
6	Band edge compliance	15.209	P
7	Radiated Spurious Emissions	15.209	P
8	AC Power line Conducted	15.207	P
9	Transmit Power Control	15.407	NA
10	Dynamic Frequency Selection	15.407(h)	P

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

Disclaimer:

A. After confirmation with the customer, the sample information provided by the customer may affect the validity of the measurement results in this report, and the impact and consequences arising therefrom shall be borne by the customer.

B. The samples in this report are provided by the customer, and the test results are only applicable to the samples received.

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	2021-12-30	1 year
2	Power Sensor	U2021XA	MY55430013	Keysight	2022-01-13	1 year
3	Data Acquisition	U2531A	TW55443507	Keysight	/	/
4	Vector Signal General	SMU200A	104096	Rohde & Schwarz	2021-12-30	1 year
5	Test Receiver	ESCI	100701	Rohde & Schwarz	2022-08-08	1 year
6	LISN	ENV216	102067	Rohde & Schwarz	2022-07-15	1 year
No.	Equipment	Model	FCC ID	Manufacturer	Calibration Due date	Calibration Period
7	Master AP	RT-AC960 0R	MSQ-RTG03 H	ASUS	/	/

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	2024-05-27	3 years
3	Horn Antenna	3117	00066577	ETS-Lindgren	2022-04-02	3 years
4	Horn Antenna	QSH-SL-18 -26-S-20	17013	Q-par	2023-01-06	3 years
5	Horn Antenna	QSH-SL-8- 26-40-K-20	17014	Q-par	2023-01-06	3 years
6	Test Receiver	ESR7	101676	Rohde & Schwarz	2022-11-24	1 year
7	Spectrum Analyser	FSV40	101192	Rohde & Schwarz	2022-01-13	1 year
8	Chamber	FACT3-2.0	1285	ETS-Lindgren	2023-05-29	2 years

Test software

No.	Equipment	Manufacturer	Version
1	TechMgr Software	CAICT	2.1.1
2	EMC32	Rohde & Schwarz	10.50.40

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 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	> 2M Ω
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	> 2M Ω
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	> 2M Ω
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	$30\text{MHz} \leq f < 1\text{GHz}$	1.41dB
	$1\text{GHz} \leq f < 7\text{GHz}$	1.92dB
	$7\text{GHz} \leq f < 13\text{GHz}$	2.31dB
	$13\text{GHz} \leq f \leq 26\text{GHz}$	2.61dB
5. Transmitter Spurious Emission - Radiated	$9\text{kHz} \leq f < 30\text{MHz}$	1.74dB
	$30\text{MHz} \leq f < 1\text{GHz}$	4.84dB
	$1\text{GHz} \leq f < 18\text{GHz}$	4.68dB
	$18\text{GHz} \leq f \leq 40\text{GHz}$	3.76dB
6. AC Power line Conducted Emission	$150\text{kHz} \leq f \leq 30\text{MHz}$	3.00dB

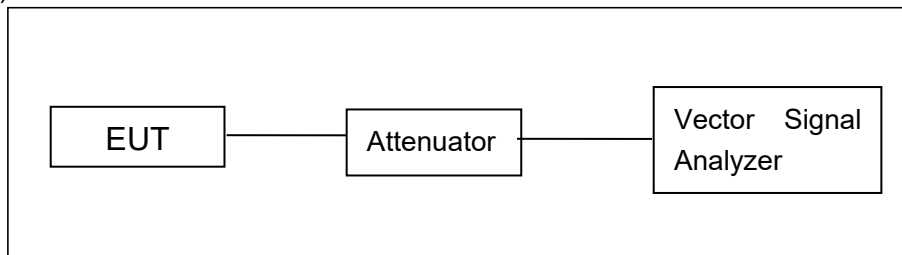
ANNEX A: Detailed Test Results

Test Configuration:

The measurement is made according to ANSI C63.10.

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.

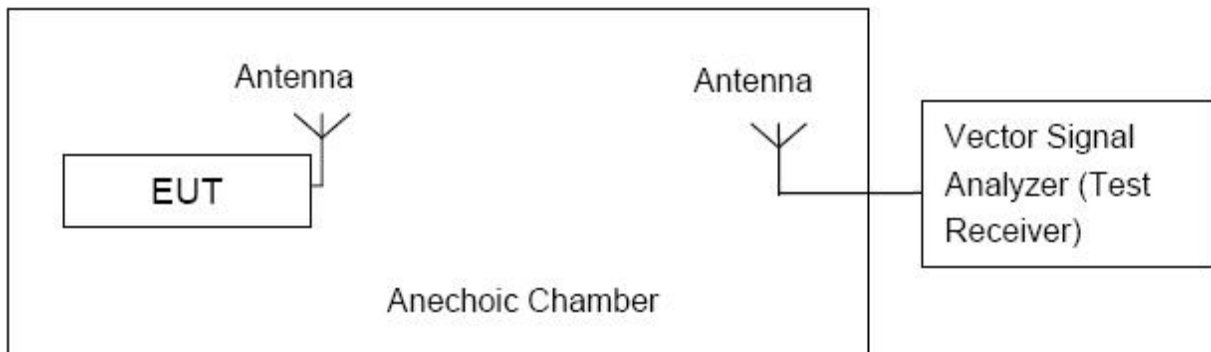


Radiated Emission Measurements

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.0 Antenna requirement

Measurement Limit:

Standard	Requirement
FCC CRF Part 15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

**Conclusion: The Directional gains of antenna used for transmitting: -1.0dBi;
The RF transmitter uses an integrate antenna without connector.**

A.1. 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
	5470MHz~5725MHz	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)	RF output power (dBm)
5.2GHz Band (UNII-1)	802.11a	CH 36	5180	15.43
		CH 40	5220	15.67
		CH 48	5240	15.48
	802.11n-HT20	CH 36	5180	13.68
		CH 40	5220	13.47
		CH 48	5240	13.38
	802.11n-HT40	CH 38	5190	12.54
		CH 46	5230	12.36
	802.11ac-VHT20	CH 36	5180	14.20
		CH 40	5220	14.50
		CH 48	5240	14.65
	802.11ac-VHT40	CH 38	5190	12.56
		CH 46	5230	12.59
	802.11ac-VHT80	CH 42	5210	9.75

U–NII Band	Mode	Channel	Frequency (MHz)	RF output power (dBm)
5.3GHz Band (UNII-2A)	802.11a	CH 52	5260	15.54
		CH 56	5280	15.30
		CH 64	5320	15.22
	802.11n-HT20	CH 52	5260	13.07
		CH 56	5280	13.42
		CH 64	5320	13.33
	802.11n-HT40	CH 54	5270	12.50
		CH 62	5310	12.47
	802.11ac-VHT20	CH 52	5260	14.24
		CH 56	5280	14.66
		CH 64	5320	13.96
	802.11ac-VHT40	CH 54	5270	12.70
		CH 62	5310	12.65
	802.11ac-VHT80	CH 58	5290	9.54

U–NII Band	Mode	Channel	Frequency (MHz)	RF output power (dBm)
5.5GHz Band (UNII-2C)	802.11a	CH 100	5500	14.94
		CH 120	5580	15.30
		CH 140	5700	14.32
	802.11n-HT20	CH 100	5500	12.96
		CH 120	5580	12.71
		CH 140	5700	12.80
	802.11n-HT40	CH 102	5510	11.93
		CH 118	5590	12.37
		CH 134	5670	11.96
	802.11ac-VHT20	CH 100	5500	13.96
		CH 120	5580	14.55
		CH 140	5700	13.83
	802.11ac-VHT40	CH 102	5510	11.89
		CH 118	5590	12.35
		CH 134	5670	11.89
	802.11ac-VHT80	CH 106	5530	9.09
		CH 122	5610	8.83

U-NII Band	Mode	Channel	Frequency (MHz)	RF output power (dBm)
5.8GHz Band (UNII-3)	802.11a	CH 149	5745	12.93
		CH 157	5785	13.05
		CH 165	5825	13.19
	802.11n-HT20	CH 149	5745	12.97
		CH 157	5785	13.11
		CH 165	5825	13.07
	802.11n-HT40	CH 151	5755	12.64
		CH 159	5795	12.77
	802.11ac-VHT20	CH 149	5745	12.96
		CH 157	5785	13.11
		CH 165	5825	13.09
	802.11ac-VHT40	CH 151	5755	12.82
		CH 159	5795	12.71
	802.11ac-VHT80	CH 155	5775	12.36

Note:

The data rate 6Mbps (11a mode), MCS0 (11n mode) and MCS0 (11ac mode) are selected as the worst case. 802.11a, 802.11n-HT40 and 802.11ac-VHT80 are selected as the worst-case. The following cases and test graphs are mostly performed with this condition.

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

Conclusion: PASS

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) & 5.5GHz Band (UNII-2C):

Mode	Channel	Power Spectral Density (dBm/MHz)	Conclusion
802.11a	5180MHz(Ch36)	-0.96	P
	5220MHz(Ch44)	-1.12	P
	5240MHz(Ch48)	-1.20	P
	5260MHz(Ch52)	-1.05	P
	5280MHz(Ch56)	-2.50	P
	5320MHz(Ch64)	-2.27	P
	5500MHz(Ch100)	-2.38	P
	5580MHz(Ch116)	-1.69	P
	5700MHz(Ch140)	-1.24	P
802.11n-HT40	5190MHz(Ch38)	-3.99	P
	5230MHz(Ch46)	-3.86	P
	5270MHz(Ch54)	-8.55	P
	5310MHz(Ch62)	-8.41	P
	5510MHz(Ch102)	-6.41	P
	5550MHz(Ch110)	-7.00	P
	5670MHz(Ch134)	-7.00	P
802.11ac-VHT80	5210MHz(Ch42)	-9.25	P
	5290MHz(Ch58)	-10.97	P
	5530MHz(Ch106)	-9.12	P
	5610MHz(Ch122)	-9.33	P

**5.8GHz Band (UNII-3):**

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11a	5745MHz(CH149)	-8.81	P
	5785MHz(CH157)	-8.85	P
	5825MHz(CH165)	-8.94	P
802.11n HT40	5755MHz(CH151)	-12.22	P
	5795MHz(CH159)	-12.03	P
802.11ac-VHT80	5775MHz(CH155)	-15.82	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	23.56	/
	5200MHz(Ch40)	Fig.2	22.95	/
	5240MHz(Ch48)	Fig.3	23.52	/
	5260MHz(Ch52)	Fig.4	23.52	/
	5280MHz(Ch56)	Fig.5	23.30	/
	5320MHz(Ch64)	Fig.6	23.71	/
	5500MHz(Ch100)	Fig.7	23.60	/
	5600MHz(Ch120)	Fig.8	23.69	/
802.11n-HT40	5700MHz(Ch140)	Fig.9	24.66	/
	5190MHz(Ch38)	Fig.10	41.30	/
	5230MHz(Ch46)	Fig.11	41.26	/
	5270MHz(Ch54)	Fig.12	40.79	/
	5310MHz(Ch62)	Fig.13	41.17	/
	5510MHz(Ch102)	Fig.14	41.57	/
	5550MHz(Ch110)	Fig.15	40.89	/
802.11 ac-VHT80	5670MHz(Ch134)	Fig.16	40.81	/
	5210MHz(Ch42)	Fig.17	83.09	/
	5290MHz(Ch58)	Fig.18	82.76	/
	5530MHz(Ch106)	Fig.19	83.68	/
	5610MHz(Ch122)	Fig.20	83.68	/

See below for test graphs.

Conclusion: PASS

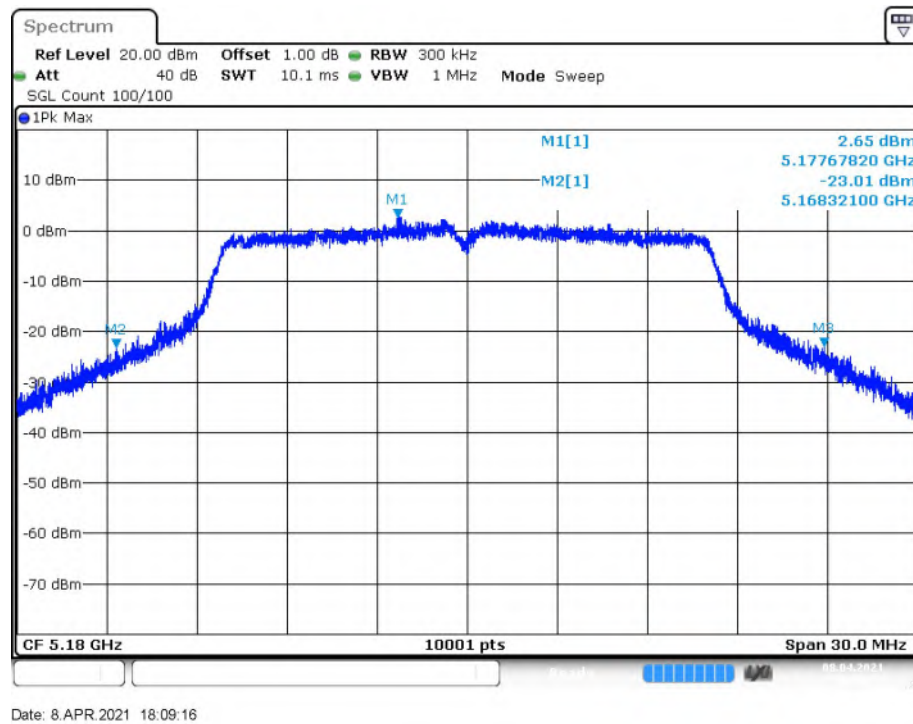


Fig. 1 Occupied 26dB Bandwidth (802.11a, 5180MHz)

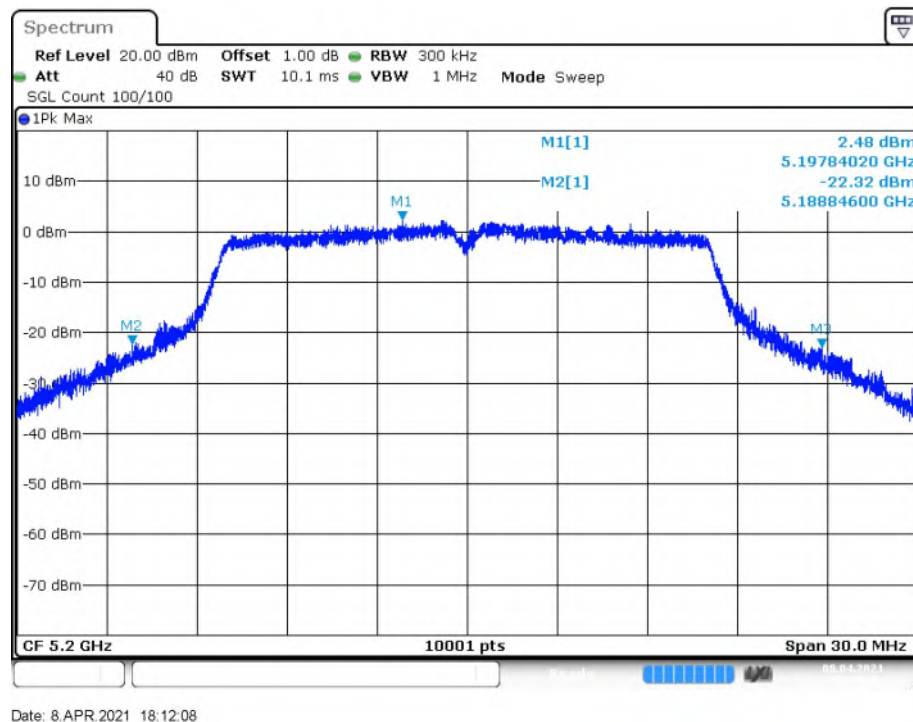


Fig. 2 Occupied 26dB Bandwidth (802.11a, 5200MHz)

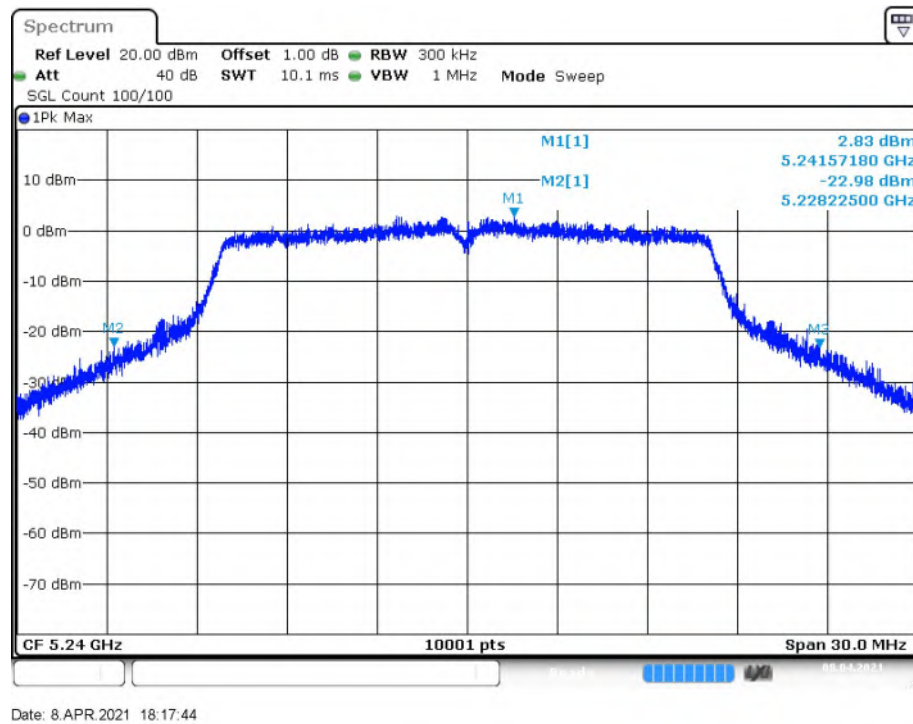


Fig. 3 Occupied 26dB Bandwidth (802.11a, 5240MHz)

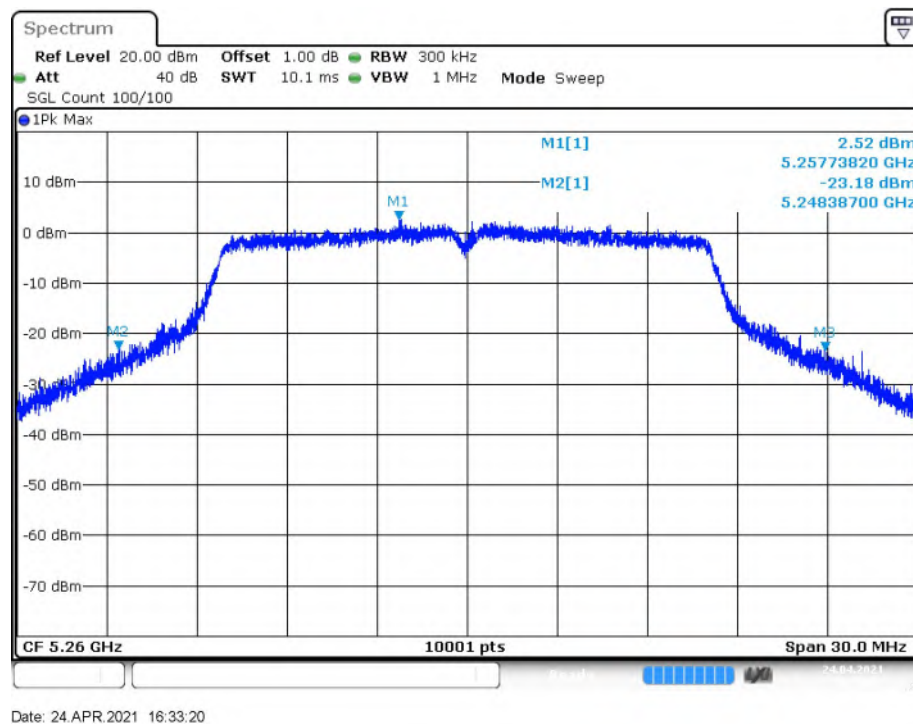


Fig. 4 Occupied 26dB Bandwidth (802.11a, 5260MHz)

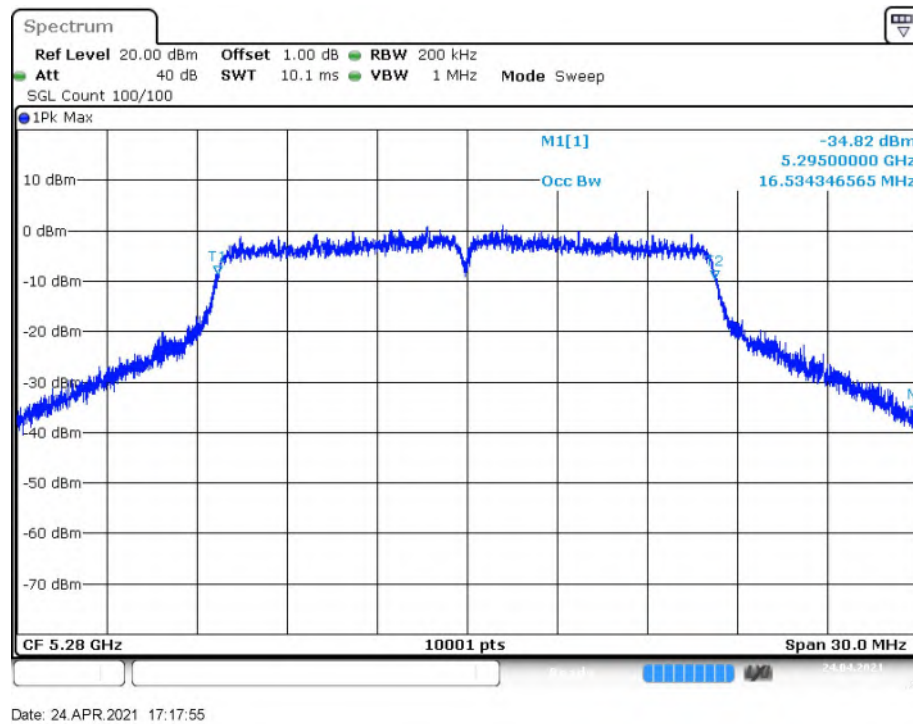


Fig. 5 Occupied 26dB Bandwidth (802.11a, 5280MHz)

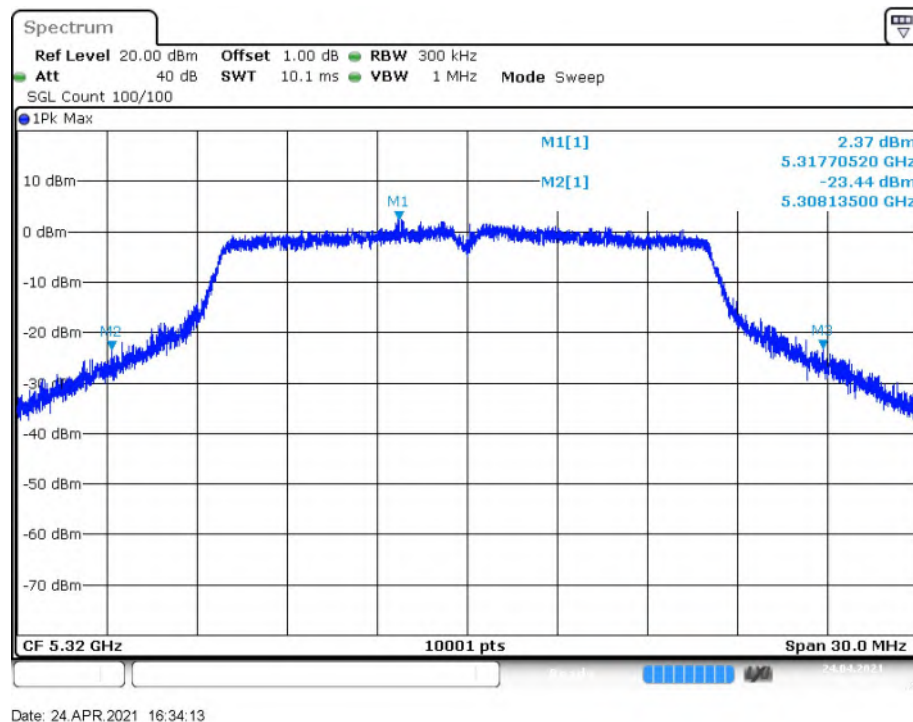


Fig. 6 Occupied 26dB Bandwidth (802.11a, 5320MHz)

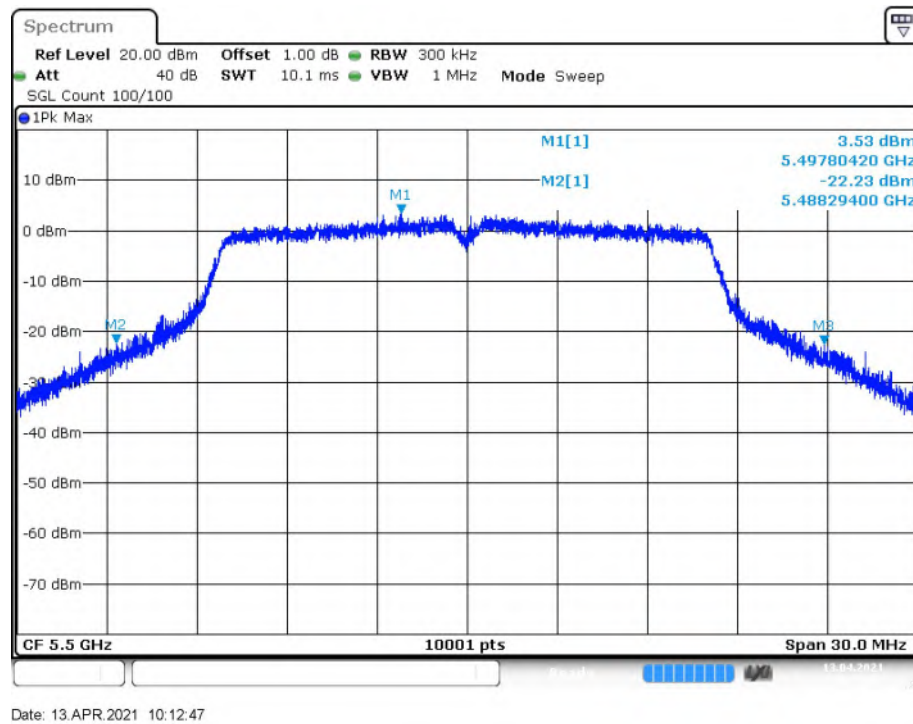


Fig. 7 Occupied 26dB Bandwidth (802.11a, 5500MHz)

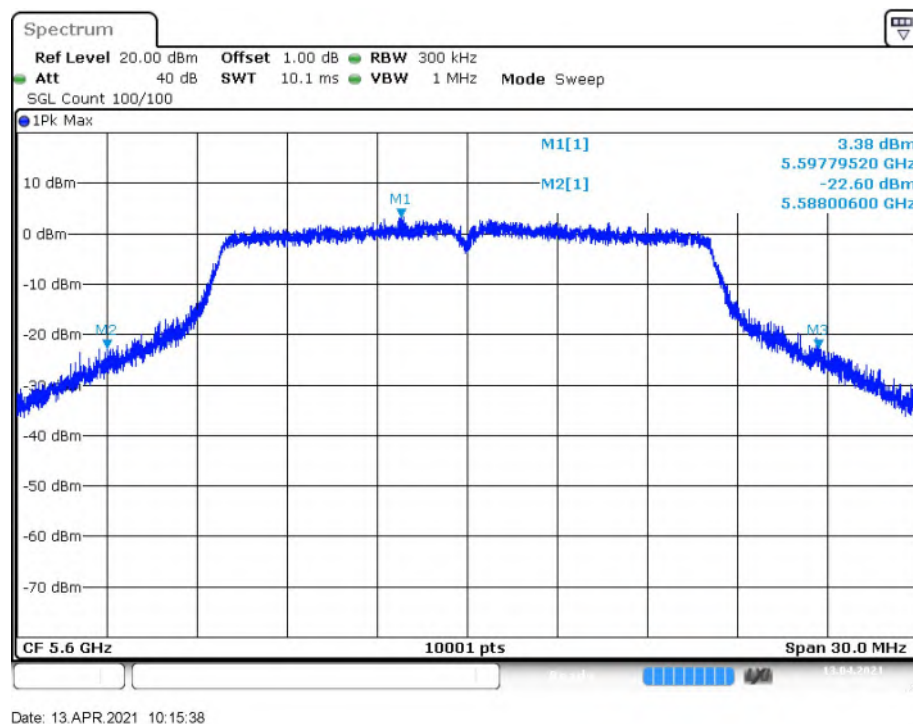


Fig. 8 Occupied 26dB Bandwidth (802.11a, 5600MHz)

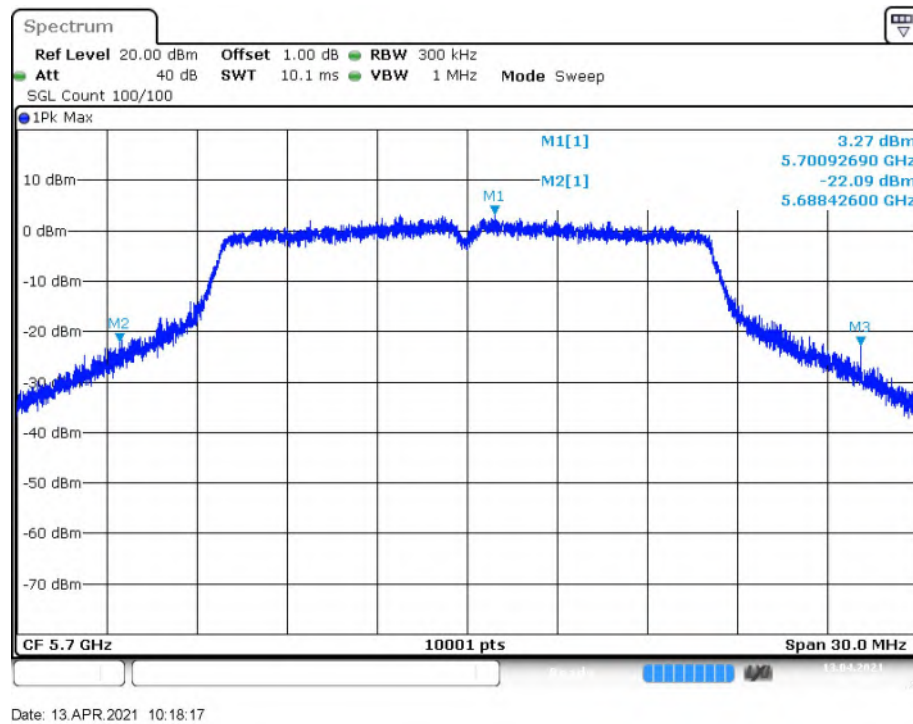


Fig. 9 Occupied 26dB Bandwidth (802.11a, 5700MHz)

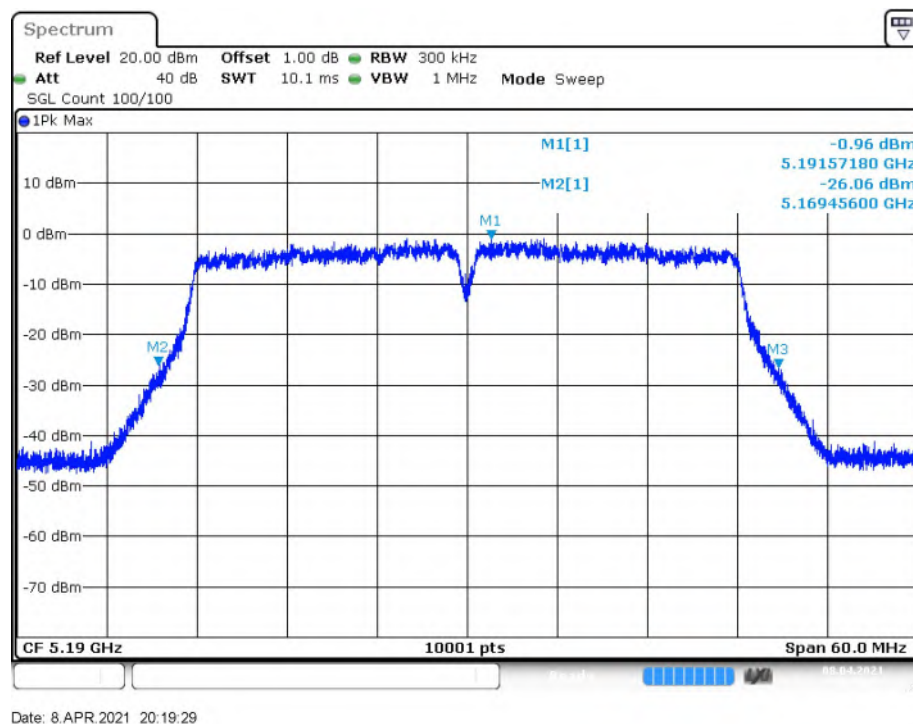


Fig. 10 Occupied 26dB Bandwidth (802.11n-HT40, 5190MHz)

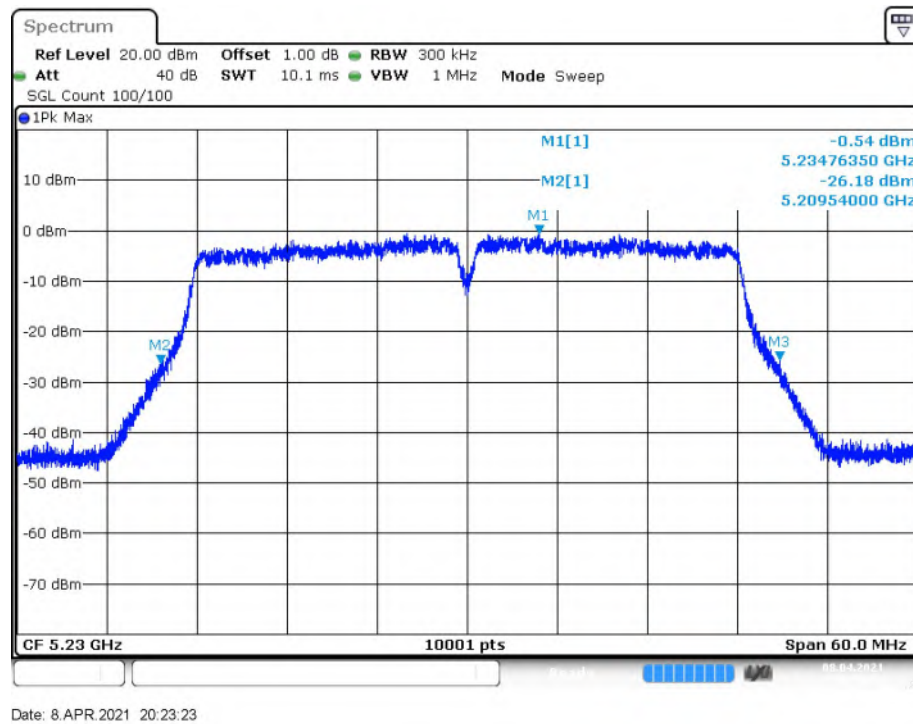


Fig. 11 Occupied 26dB Bandwidth (802.11n-HT40, 5230MHz)

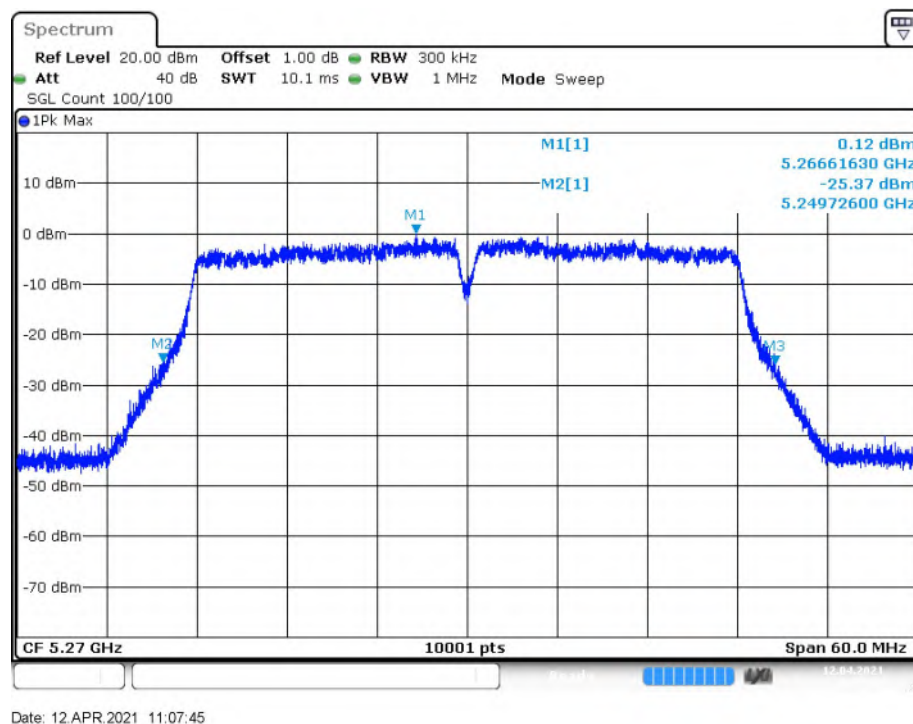


Fig. 12 Occupied 26dB Bandwidth (802.11n-HT40, 5270MHz)

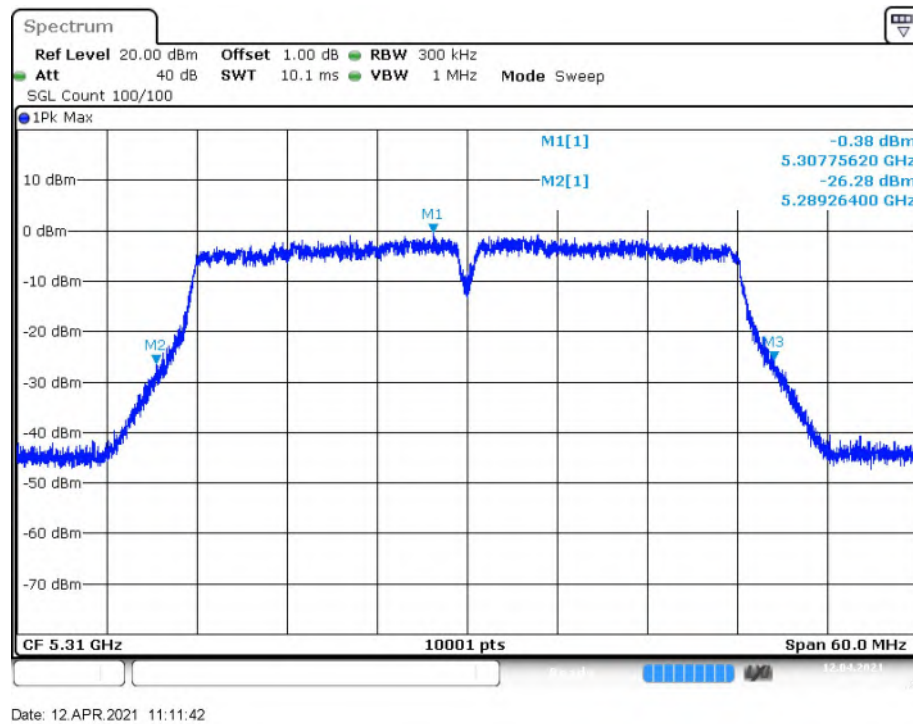


Fig. 13 Occupied 26dB Bandwidth (802.11n-HT40, 5310MHz)

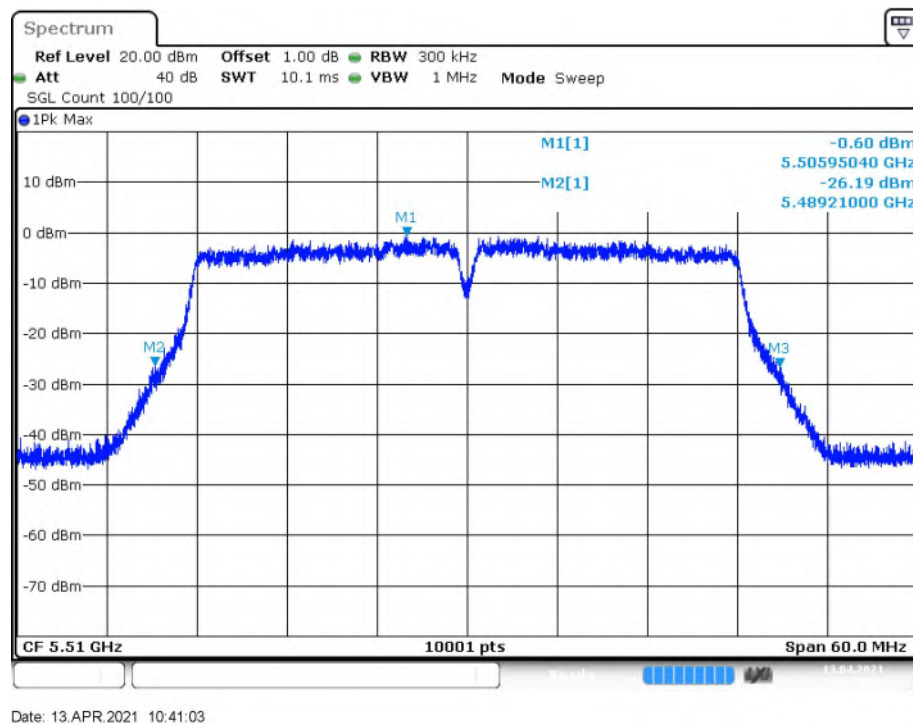


Fig. 14 Occupied 26dB Bandwidth (802.11n-HT40, 5510MHz)

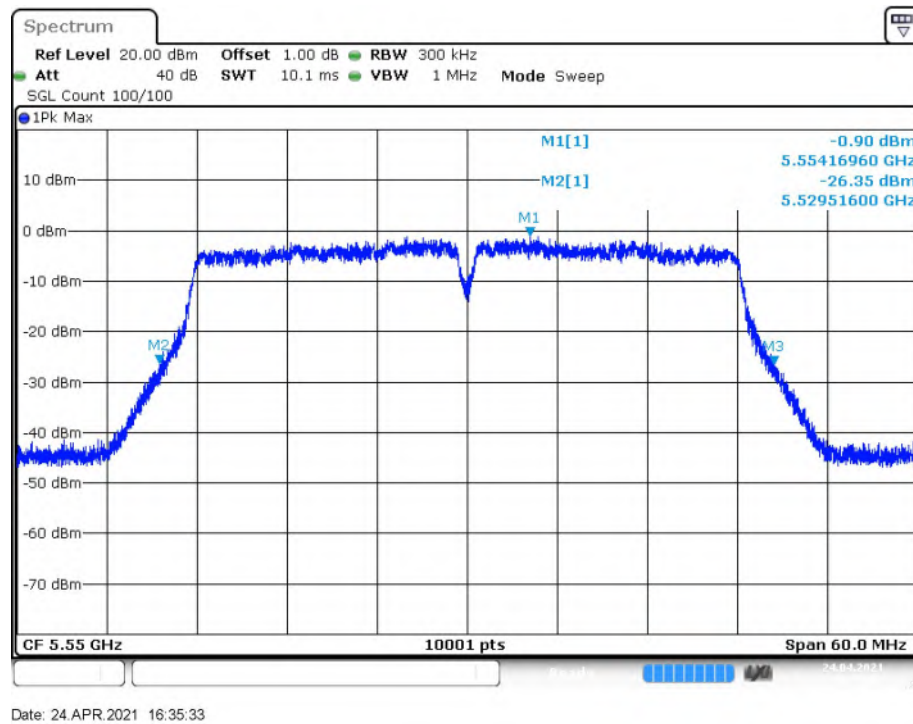


Fig. 15 Occupied 26dB Bandwidth (802.11n-HT40, 5550MHz)

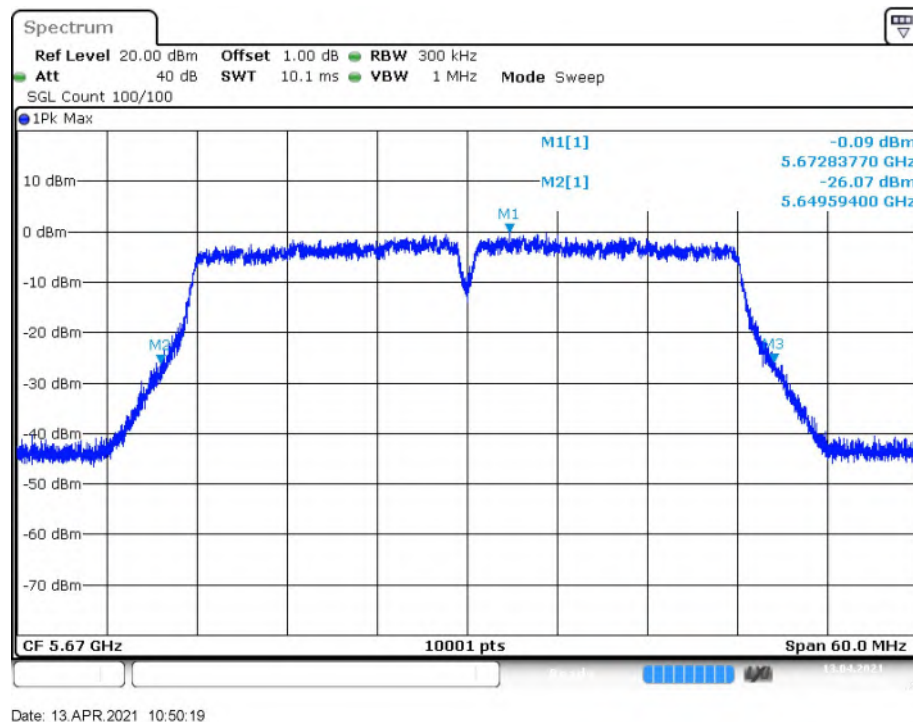


Fig. 16 Occupied 26dB Bandwidth (802.11n-HT40, 5670MHz)

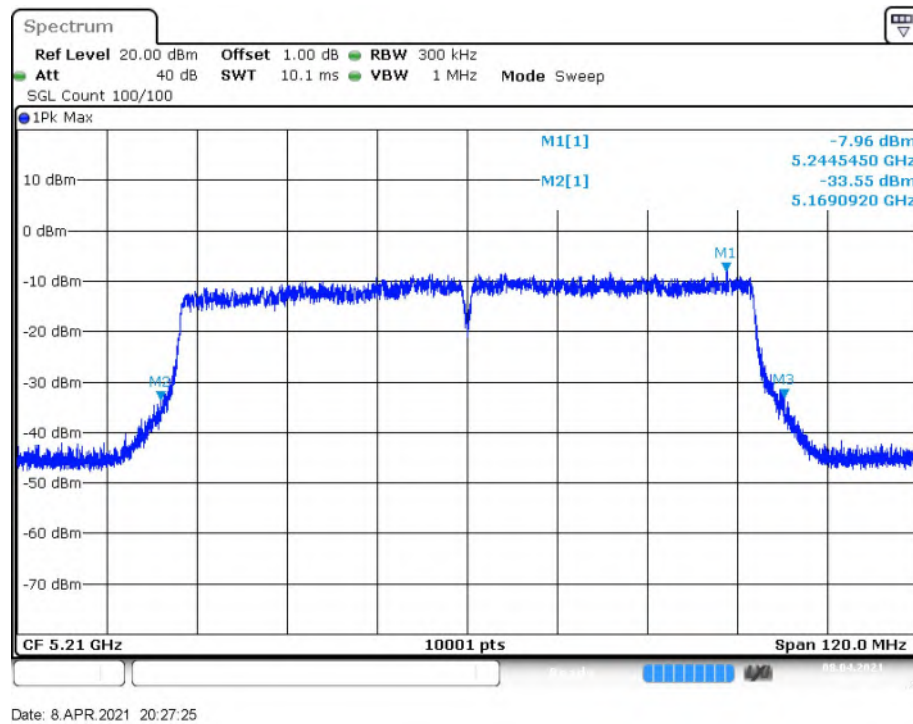


Fig. 17 Occupied 26dB Bandwidth (802.11ac-VHT80, 5210MHz)

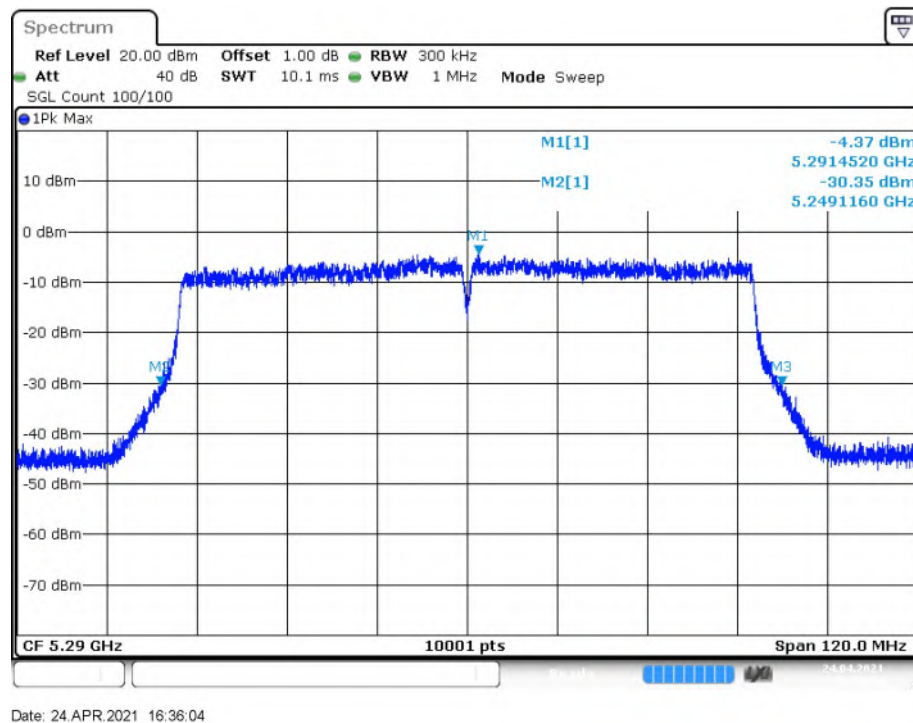


Fig. 18 Occupied 26dB Bandwidth (802.11ac-VHT80, 5290MHz)

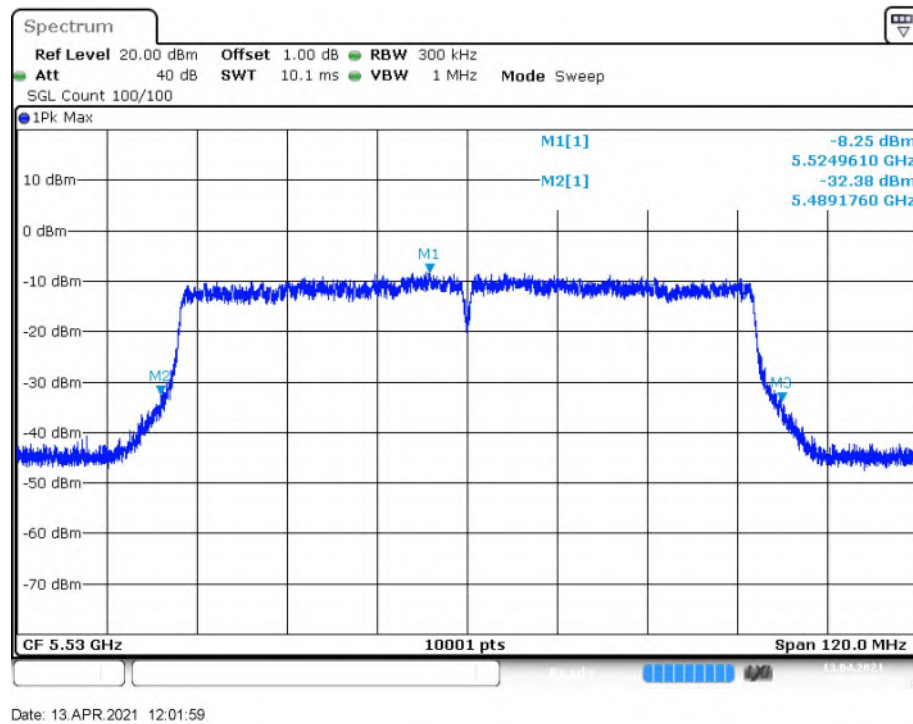


Fig. 19 Occupied 26dB Bandwidth (802.11ac-VHT80, 5530MHz)

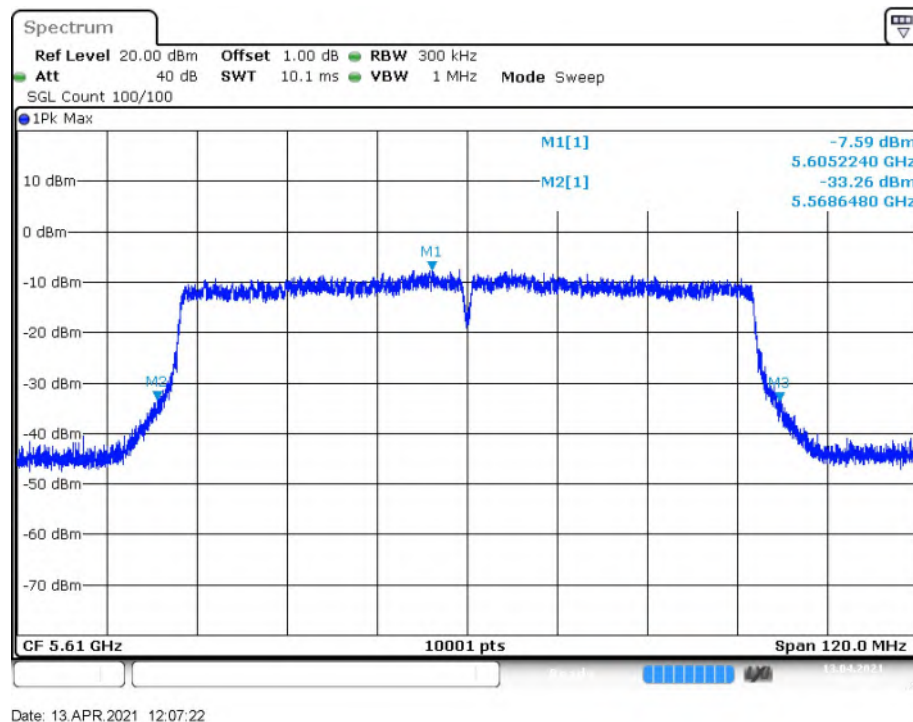


Fig. 20 Occupied 26dB Bandwidth (802.11ac-VHT80, 5610MHz)



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	16.85	P
	5785MHz(Ch157)	Fig.22	16.85	P
	5825MHz(Ch165)	Fig.23	16.85	P
802.11n-HT40	5755MHz(Ch151)	Fig.24	35.86	P
	5795MHz(Ch159)	Fig.25	35.95	P
802.11ac-VHT80	5775MHz(Ch155)	Fig.26	78.22	P

See below for test graphs.

Conclusion: PASS

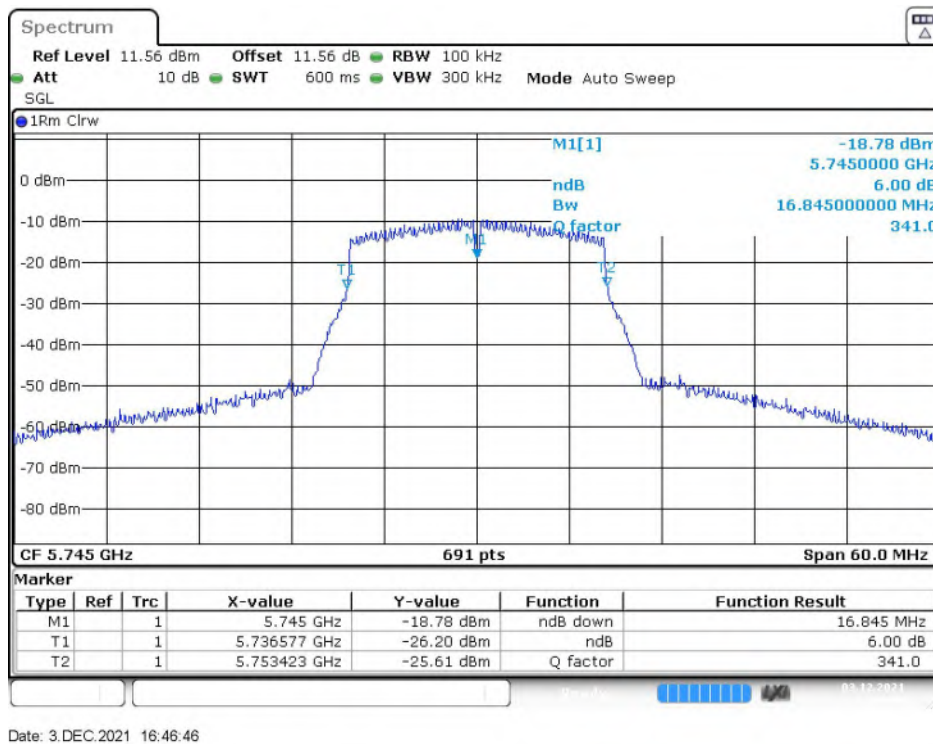


Fig. 21 Occupied 6dB Bandwidth (802.11a, 5745MHz)

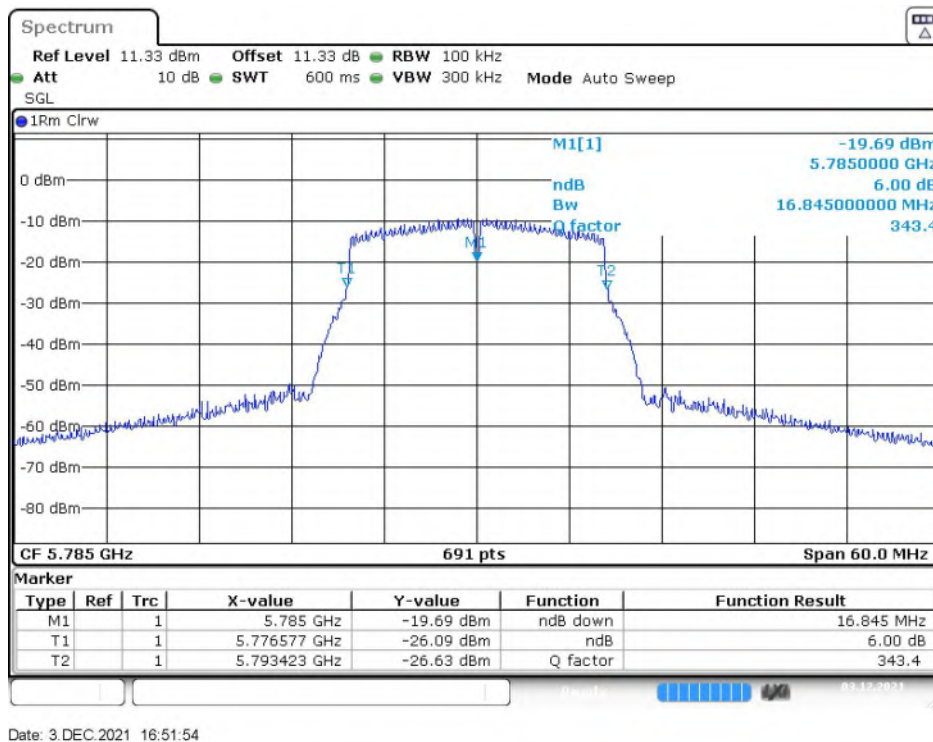


Fig. 22 Occupied 6dB Bandwidth (802.11a, 5785MHz)

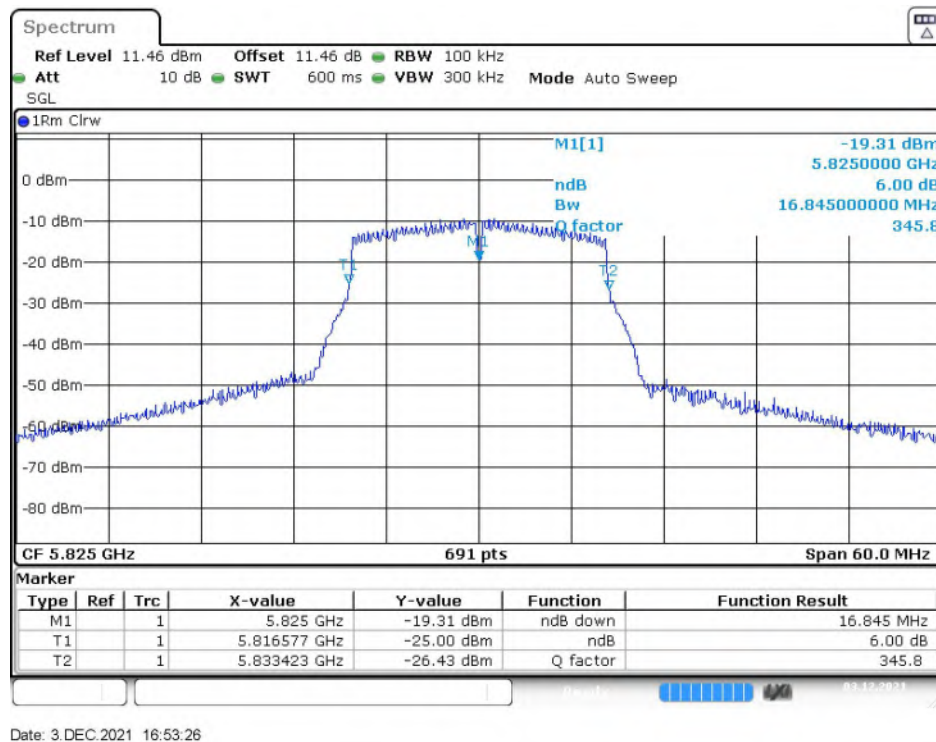


Fig. 23 Occupied 6dB Bandwidth (802.11a, 5825MHz)

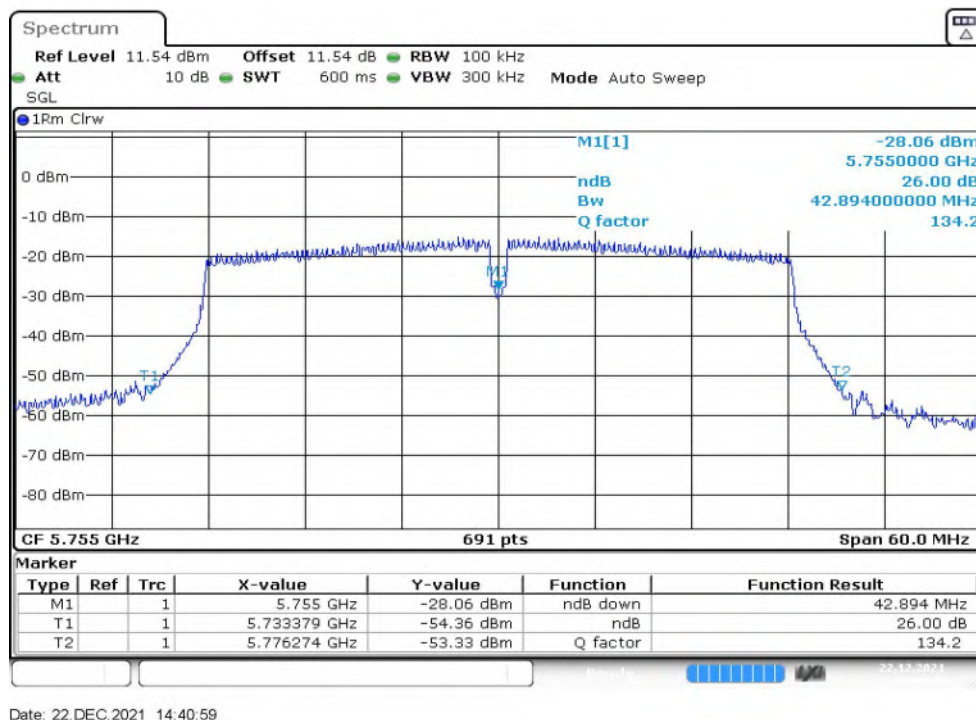


Fig. 24 Occupied 6dB Bandwidth (802.11n-HT40, 5755MHz)

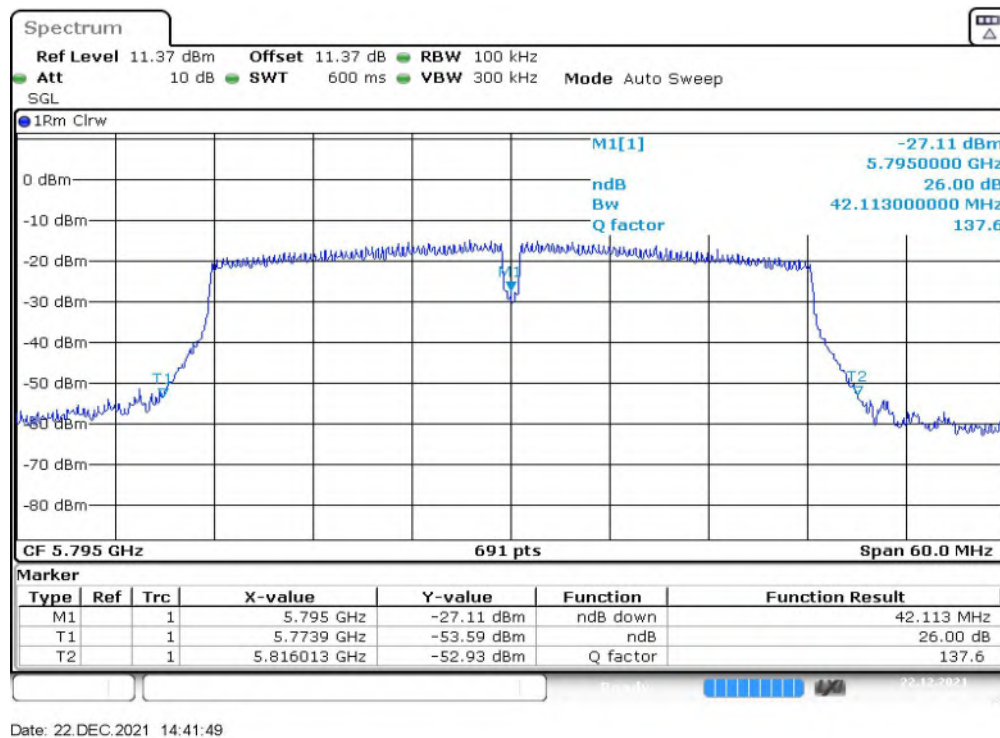


Fig. 25 Occupied 6dB Bandwidth (802.11n-HT40, 5795MHz)

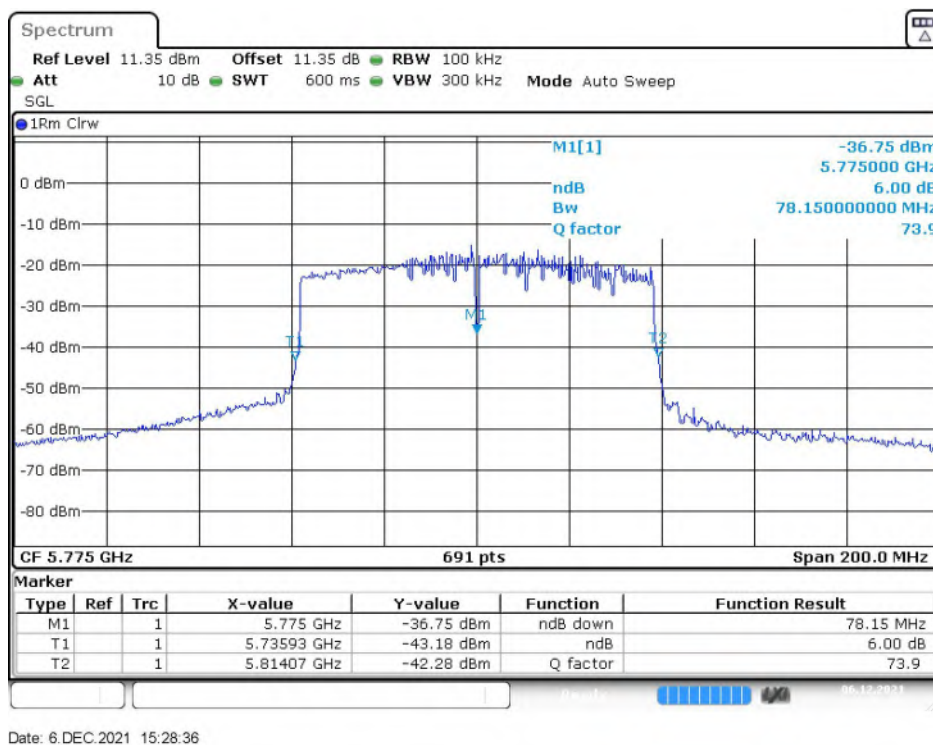


Fig. 26 Occupied 6dB Bandwidth (802.11ac-VHT80, 5775MHz)

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	19.71	/
	5220MHz(Ch44)	Fig.28	19.80	/
	5240MHz(Ch48)	Fig.29	19.71	/
	5260MHz(Ch52)	Fig.30	19.80	/
	5280MHz(Ch56)	Fig.31	19.80	/
	5320MHz(Ch64)	Fig.32	19.88	/
	5500MHz(Ch100)	Fig.33	19.88	/
	5580MHz(Ch116)	Fig.34	19.80	/
	5700MHz(Ch140)	Fig.35	19.80	/
802.11n-HT40	5190MHz(Ch38)	Fig.36	40.67	/
	5230MHz(Ch46)	Fig.37	40.81	/
	5270MHz(Ch54)	Fig.38	40.96	/
	5310MHz(Ch62)	Fig.39	40.96	/
	5510MHz(Ch102)	Fig.40	40.81	/
	5550MHz(Ch110)	Fig.41	40.81	/
	5670MHz(Ch134)	Fig.42	40.81	/
802.11 ac-VHT80	5210MHz(Ch42)	Fig.43	80.17	/
	5290MHz(Ch58)	Fig.44	80.75	/
	5530MHz(Ch106)	Fig.45	80.46	/
	5610MHz(Ch122)	Fig.46	80.46	/

See below for test graphs.

Conclusion: PASS

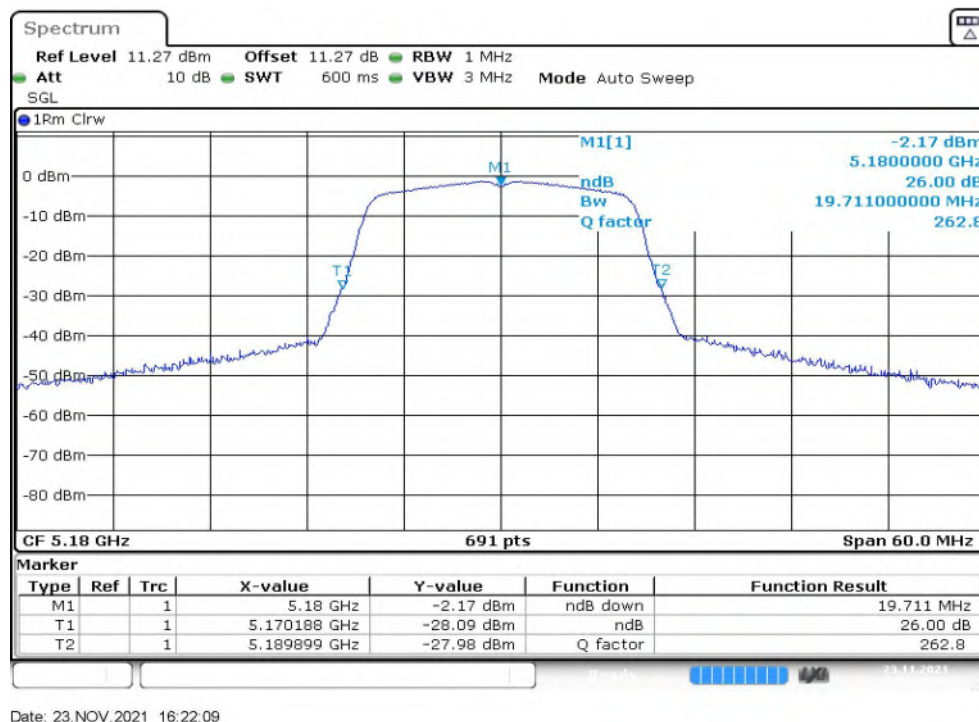


Fig. 27 99% Occupied Bandwidth (802.11a, 5180MHz)

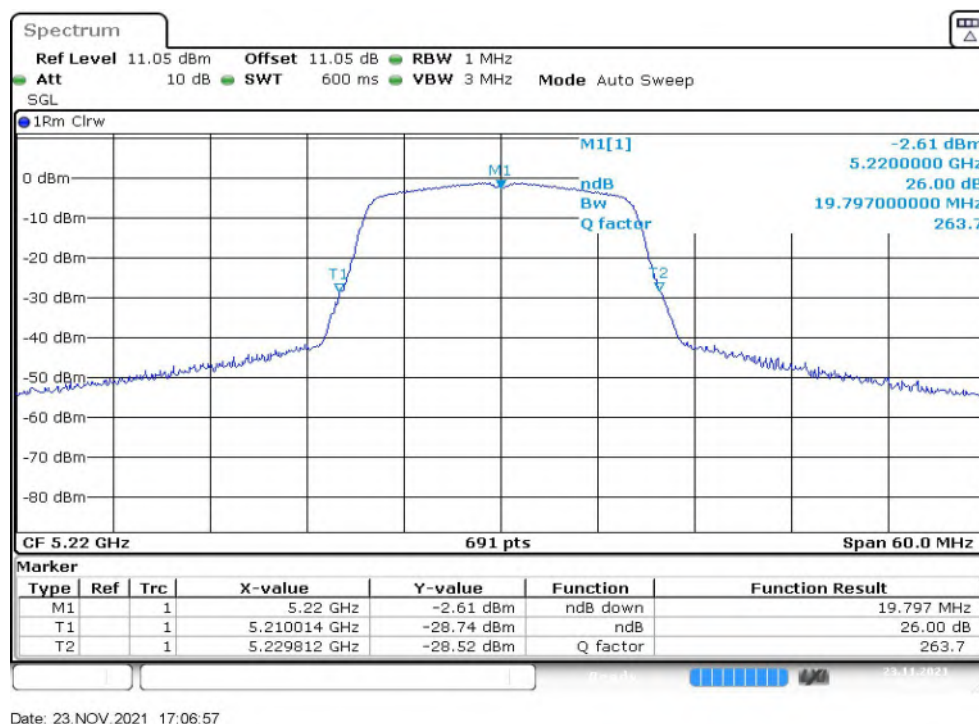


Fig. 28 99% Occupied Bandwidth (802.11a, 5220MHz)

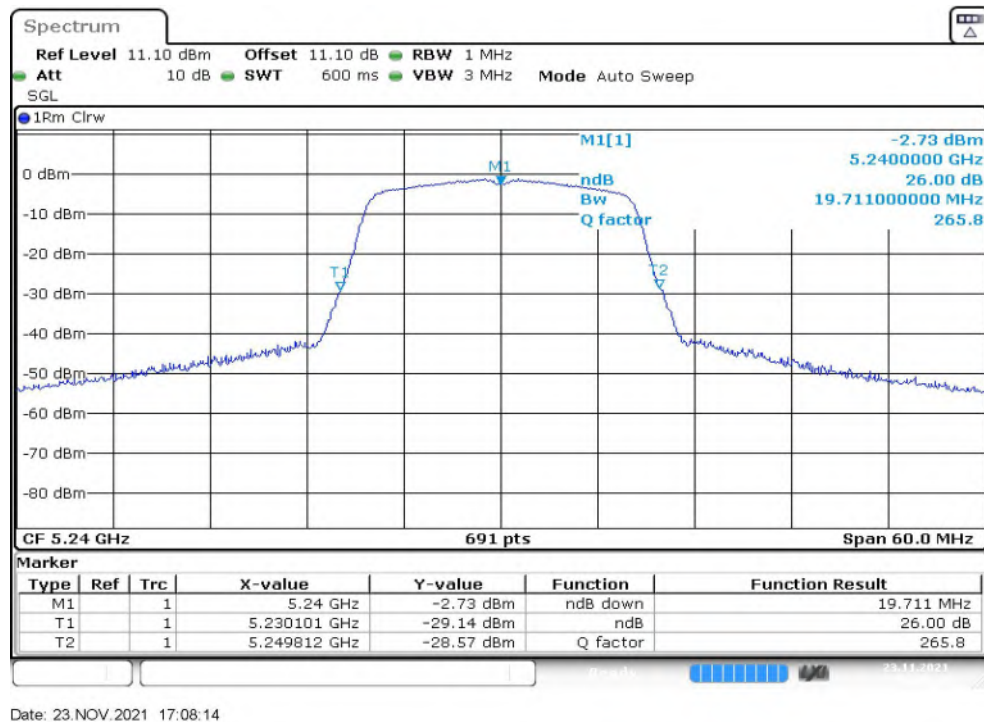


Fig. 29 99% Occupied Bandwidth (802.11a, 5240MHz)

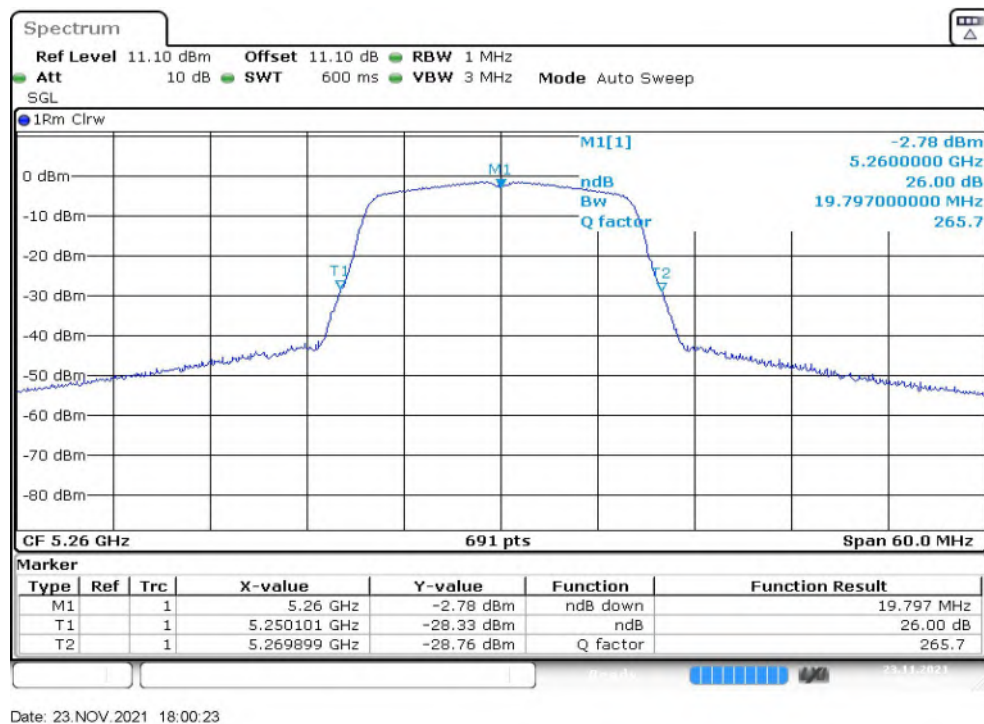


Fig. 30 99% Occupied Bandwidth (802.11a, 5260MHz)

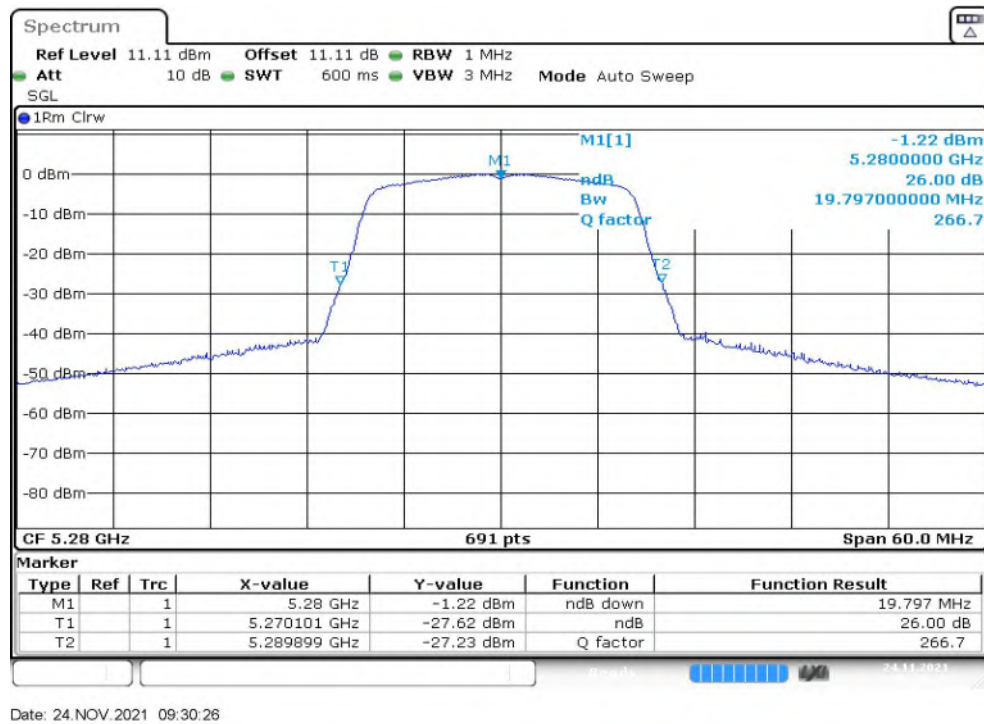


Fig. 31 99% Occupied Bandwidth (802.11a, 5280MHz)

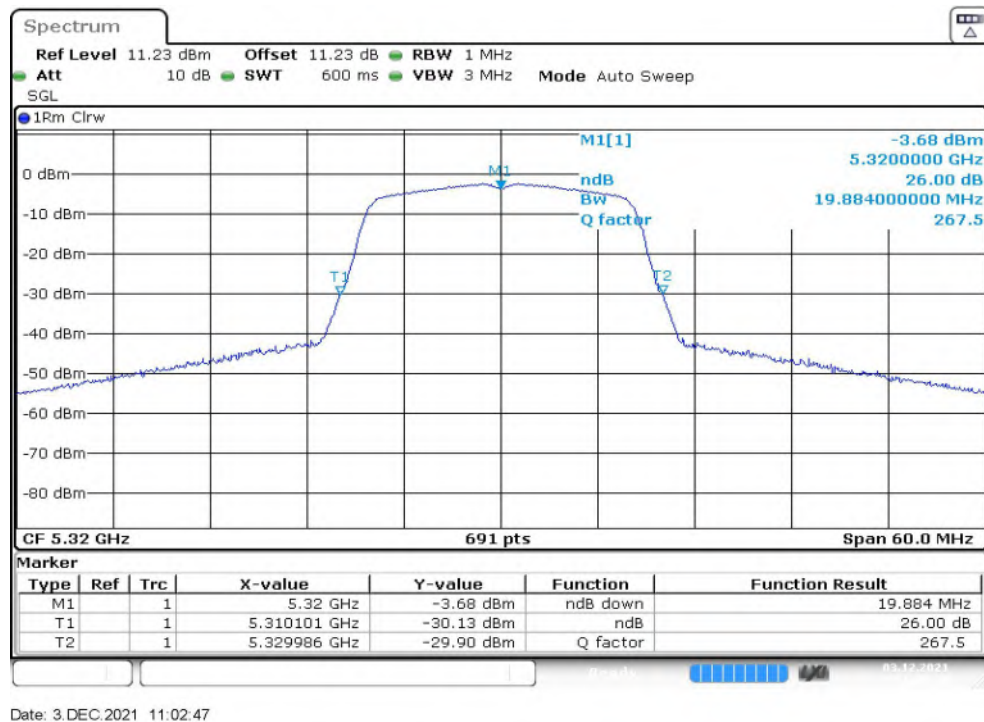


Fig. 32 99% Occupied Bandwidth (802.11a, 5320MHz)

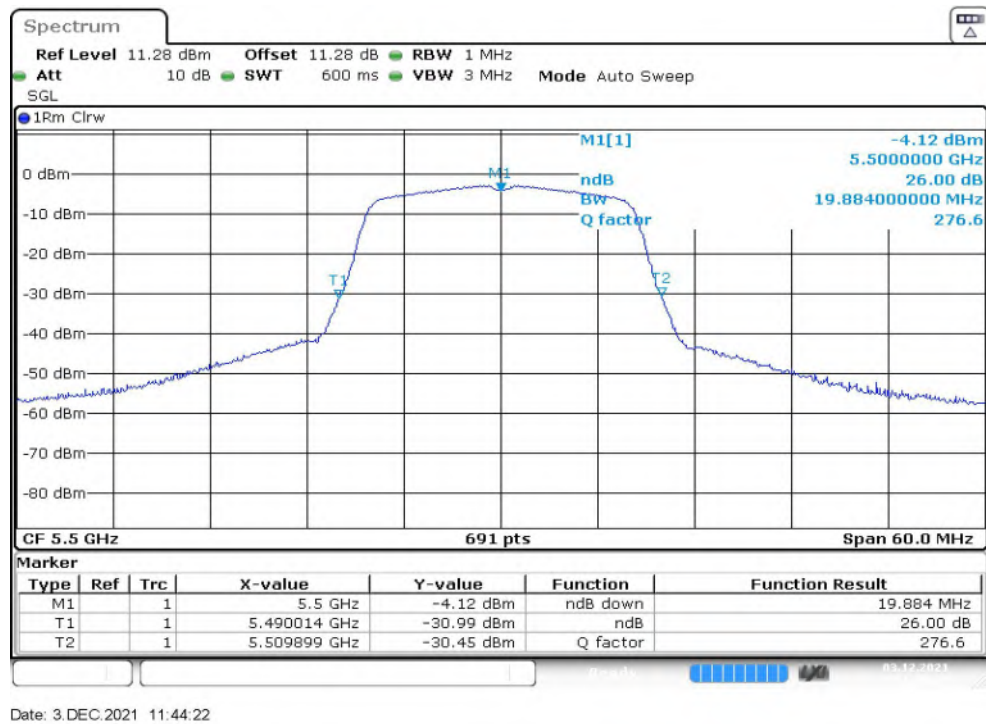


Fig. 33 99% Occupied Bandwidth (802.11a, 5500MHz)

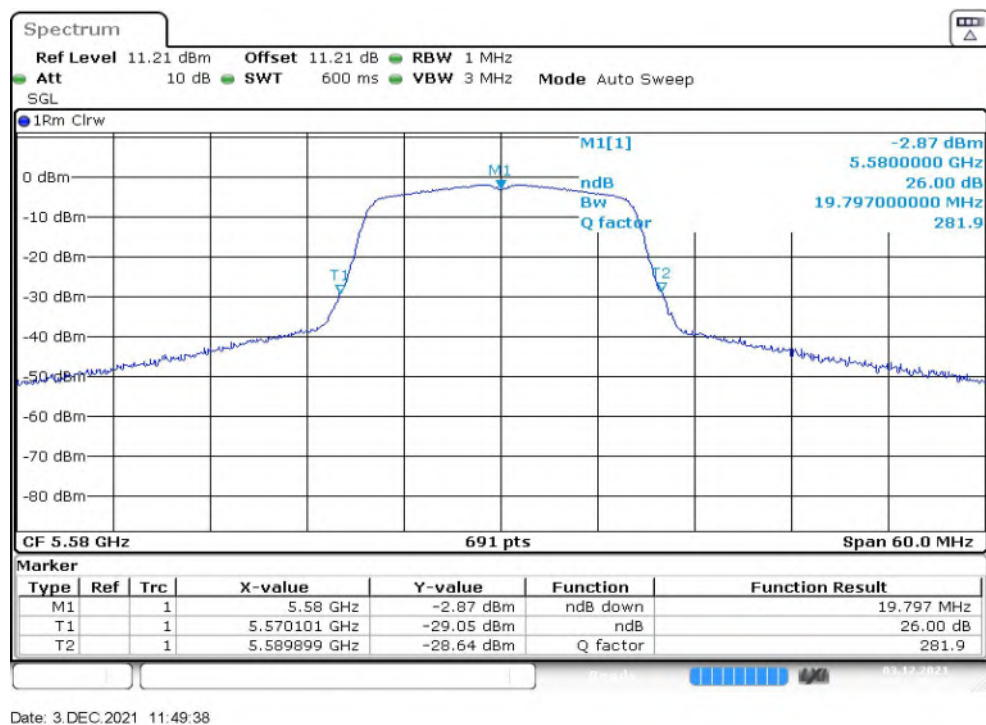


Fig. 34 99% Occupied Bandwidth (802.11a, 5600MHz)

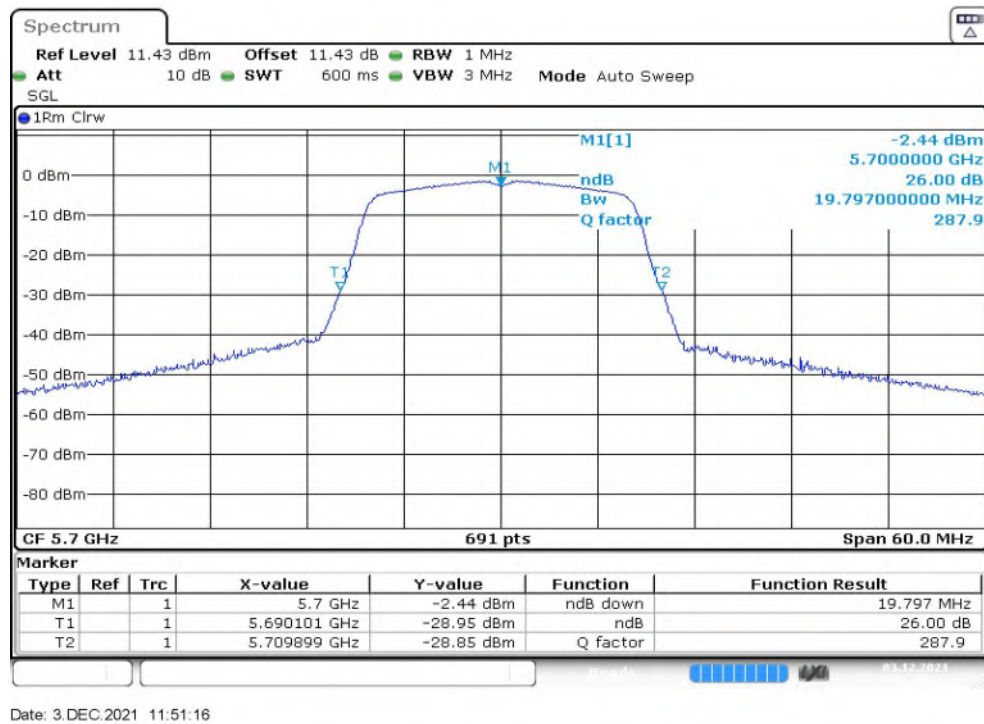


Fig. 35 99% Occupied Bandwidth (802.11a, 5700MHz)

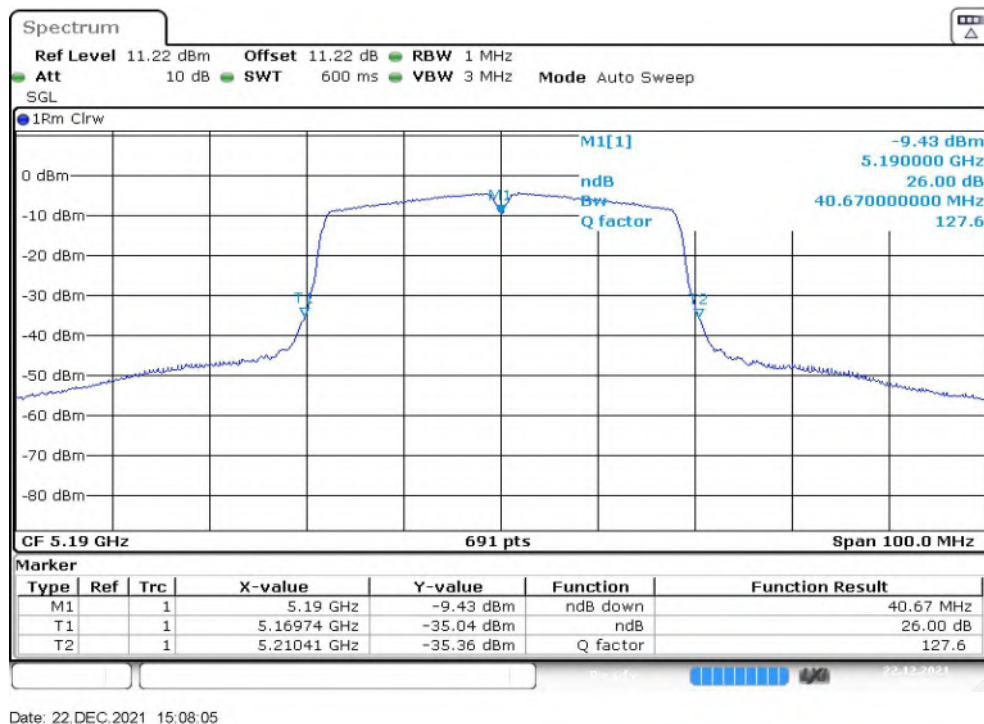


Fig. 36 99% Occupied Bandwidth (802.11n-HT40, 5190MHz)

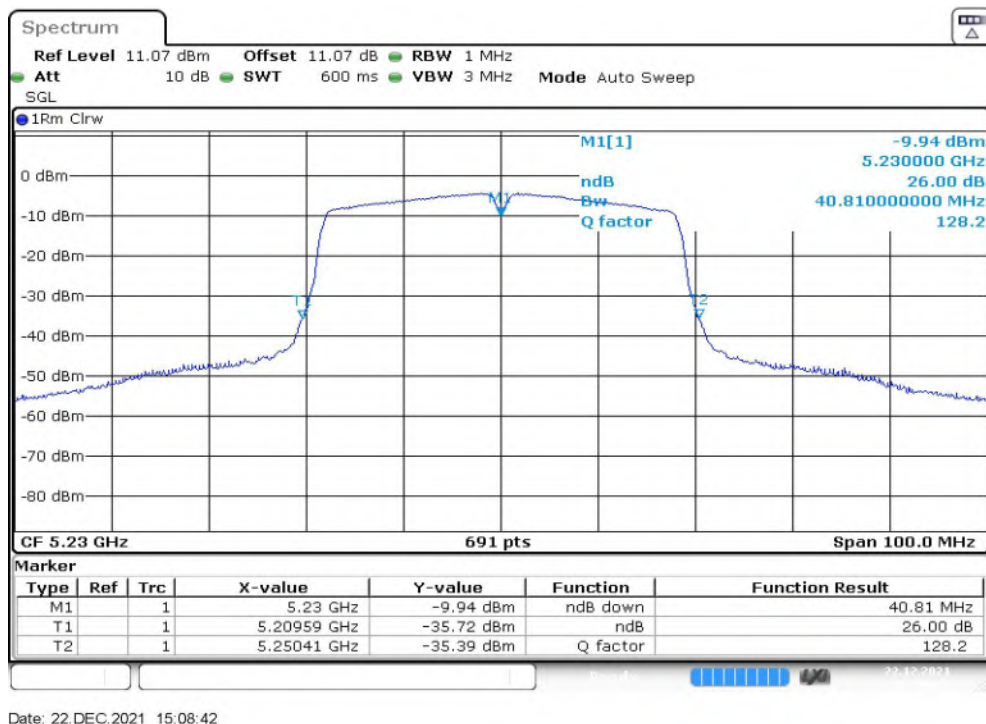


Fig. 37 99% Occupied Bandwidth (802.11n-HT40, 5230MHz)

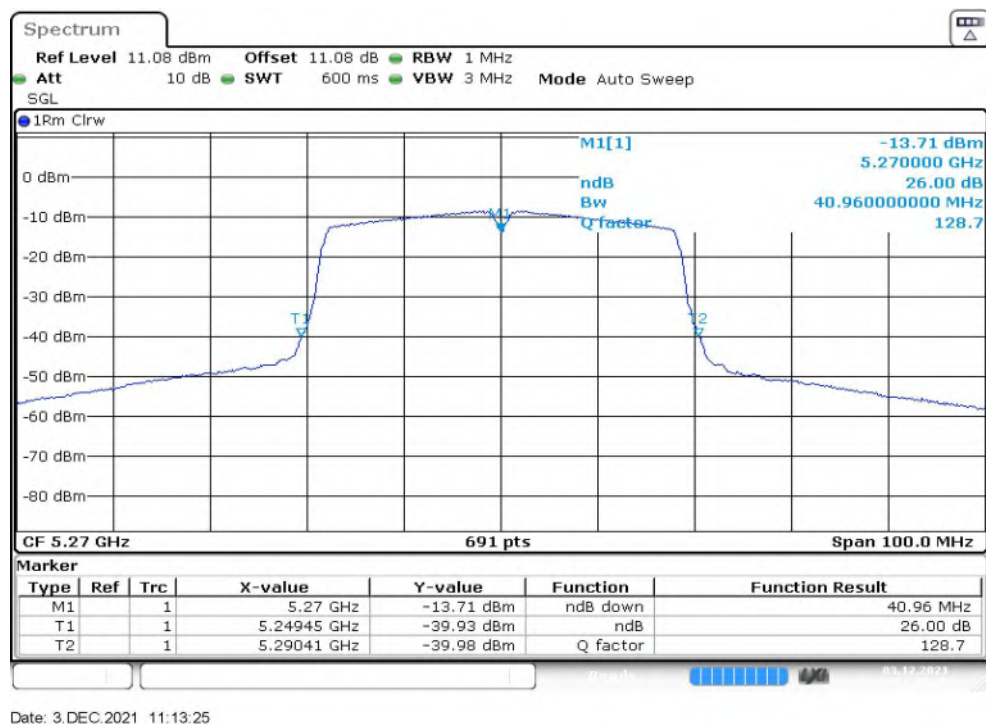


Fig. 38 99% Occupied Bandwidth (802.11n-HT40, 5270MHz)

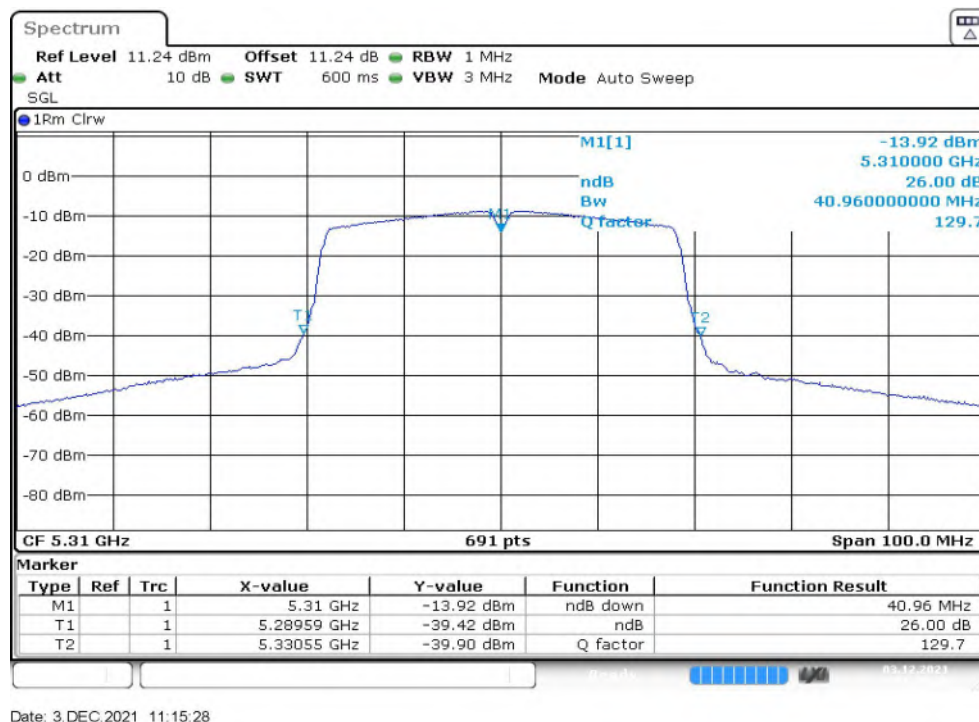


Fig. 39 99% Occupied Bandwidth (802.11n-HT40, 5310MHz)

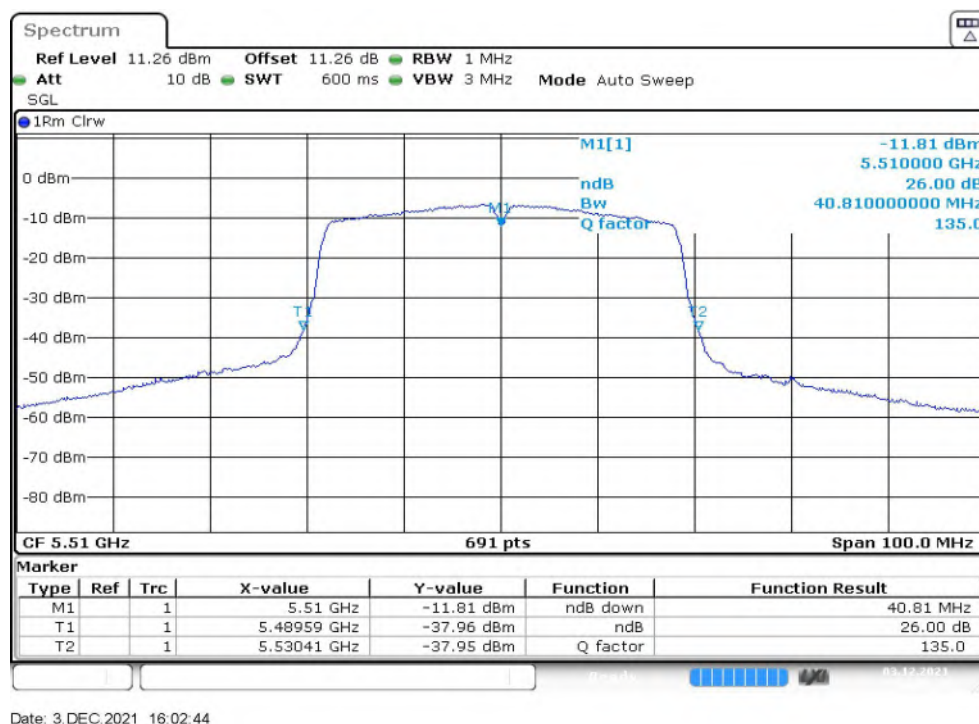


Fig. 40 99% Occupied Bandwidth (802.11n-HT40, 5510MHz)

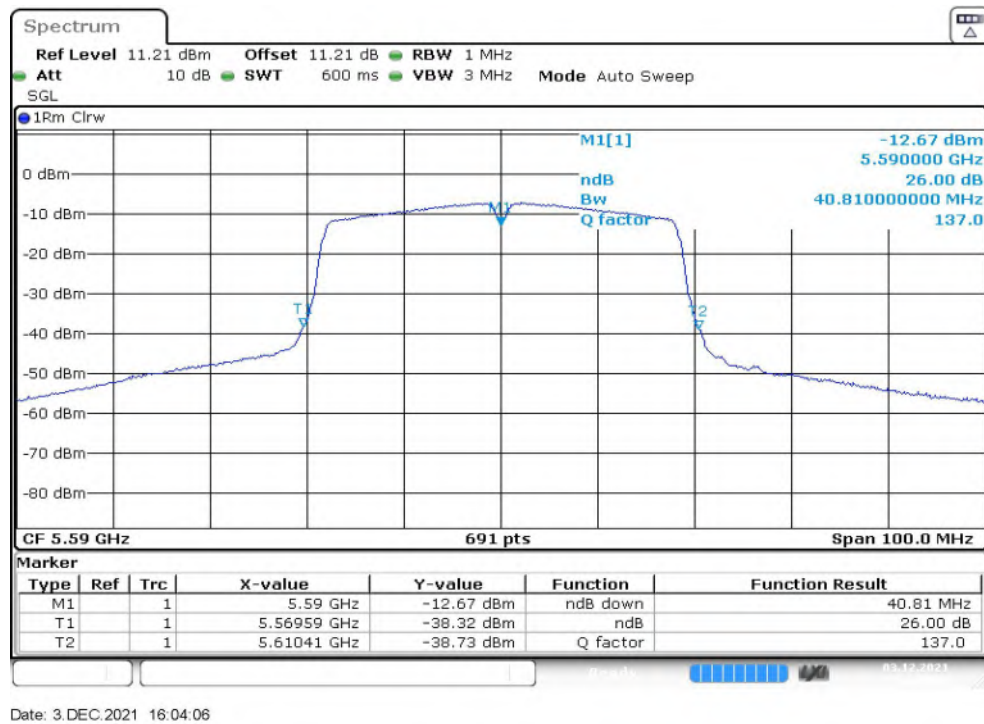


Fig. 41 99% Occupied Bandwidth (802.11n-HT40, 5550MHz)

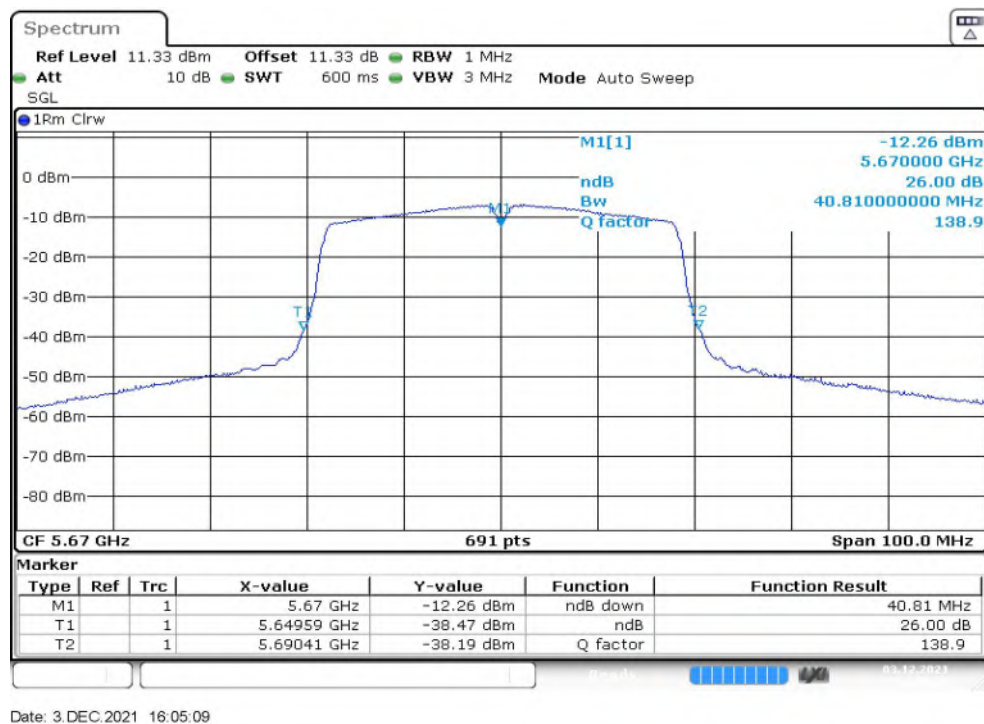


Fig. 42 99% Occupied Bandwidth (802.11n-HT40, 5670MHz)

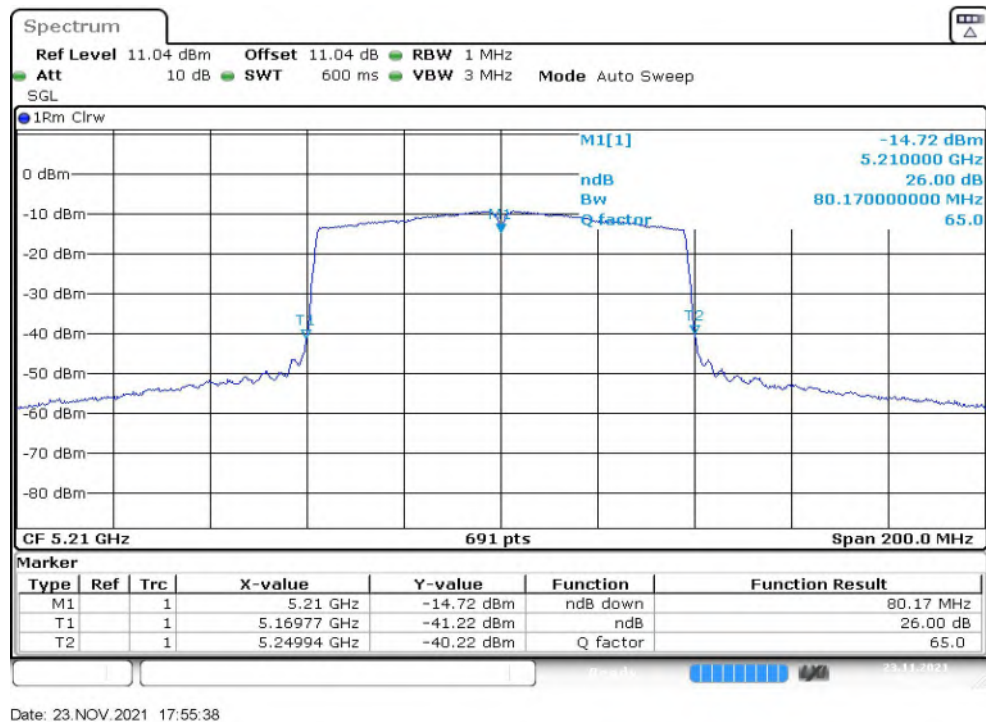


Fig. 43 99% Occupied Bandwidth (802.11ac-VHT80, 5210MHz)

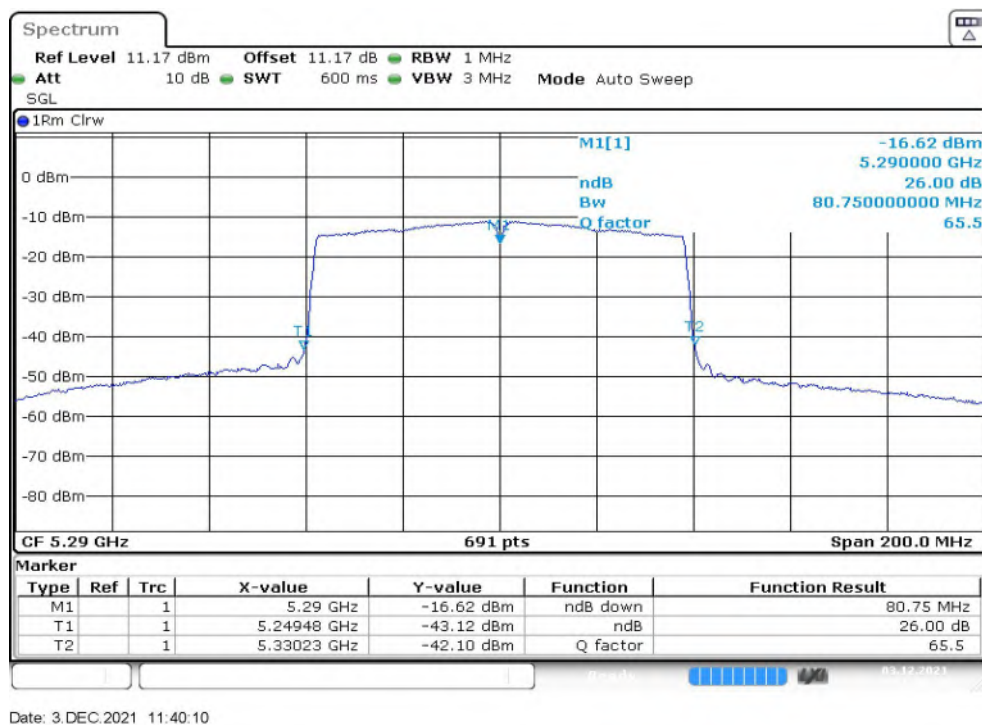


Fig. 44 99% Occupied Bandwidth (802.11ac-VHT80, 5290MHz)

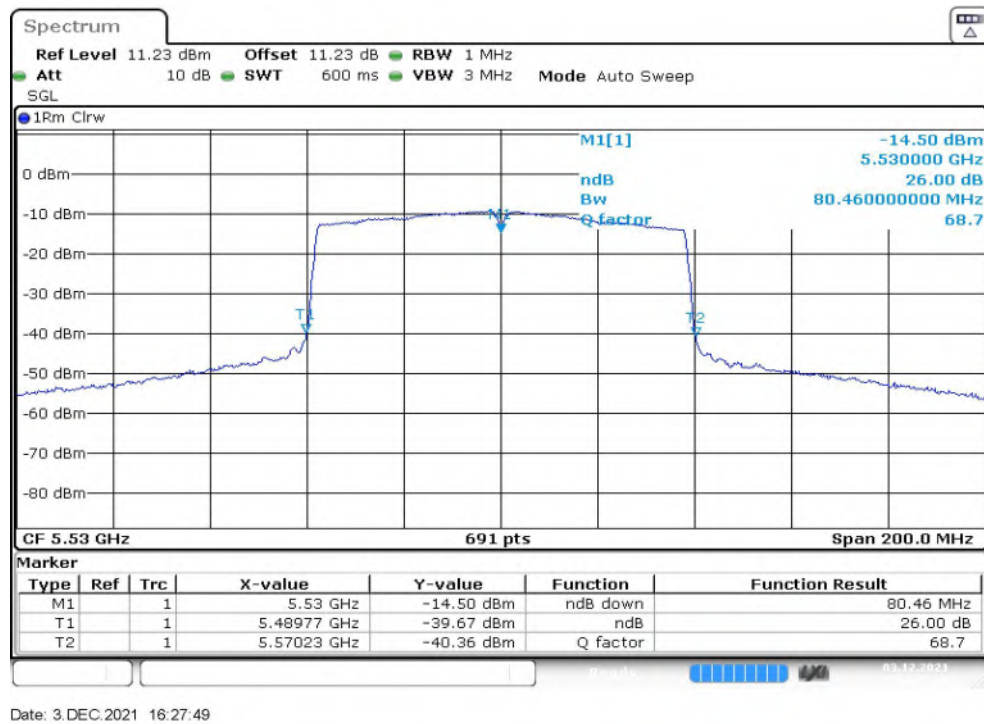


Fig. 45 99% Occupied Bandwidth (802.11ac-VHT80, 5530MHz)

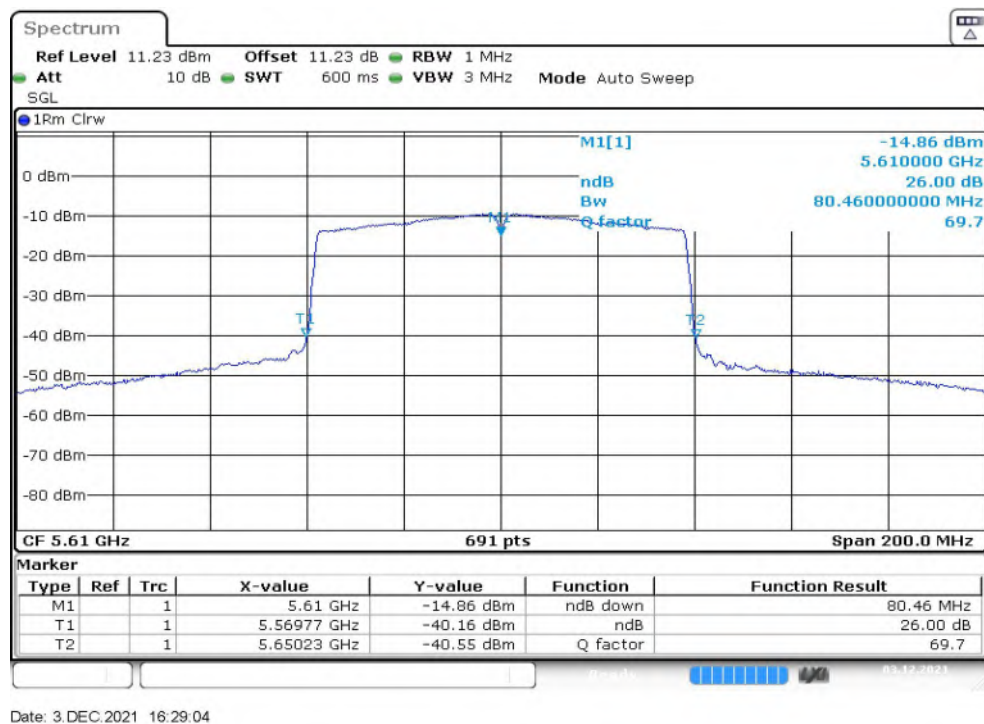


Fig. 46 99% Occupied Bandwidth (802.11ac-VHT80, 5610MHz)

A.7. Dynamic Frequency Selection

Measurement Limit:

Standard	Test Items	Limit
FCC 47 CFR Part 15.407 (h)	Channel Move Time	< 10 s
	Channel Closing Transmission Time	< 200 ms + 60 ms

The measurement is made according to KDB 905462.

1). Parameters of DFS test signal:

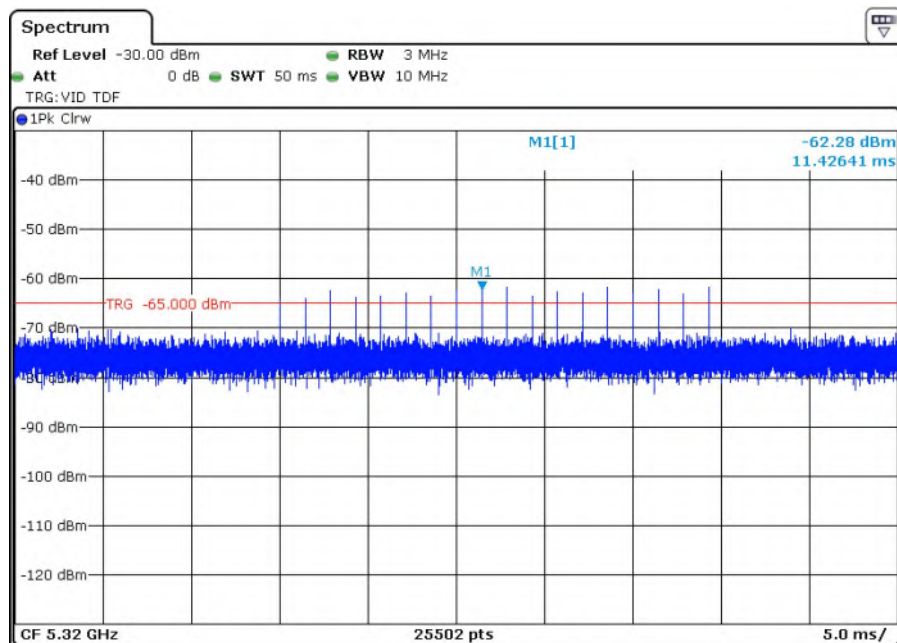
Interference threshold values, master or client incorporation in service monitoring. For device Power less than 23dBm (E.I.R.P.), the threshold level is -62 dBm at the antenna port after Correction for antenna gain and procedural adjustments.

Because of conducted measurement performed, the calibration power from radar signal generator to antenna port of DFS test equipment is -62 dBm.

Maximum Transmit Power	Value
> 200 mW	-64 dBm
< 200 mW	-62 dBm

2). Parameters of the reference DFS test signal:

Pulse width W (μs)	Pulse repetition frequency PRF (PPS)	Pulses per burst (PPB)
1	700	18



Radar Signal (Type 0)

**Measurement Results:****Channel Move Time & Channel Closing Transmission Time:**

Mode	Channel	Test Results	Conclusion
802.11a	5320MHz(Ch64)	Fig.47	P
802.11ac-VHT80	5530MHz(Ch106)	Fig.48	P

Non-Occupancy Period:

Mode	Channel	Test Results	Conclusion
802.11a	5320MHz(Ch64)	Fig.49	P
802.11ac-VHT80	5530MHz(Ch106)	Fig.50	P

See below for test graphs.

Conclusion: PASS

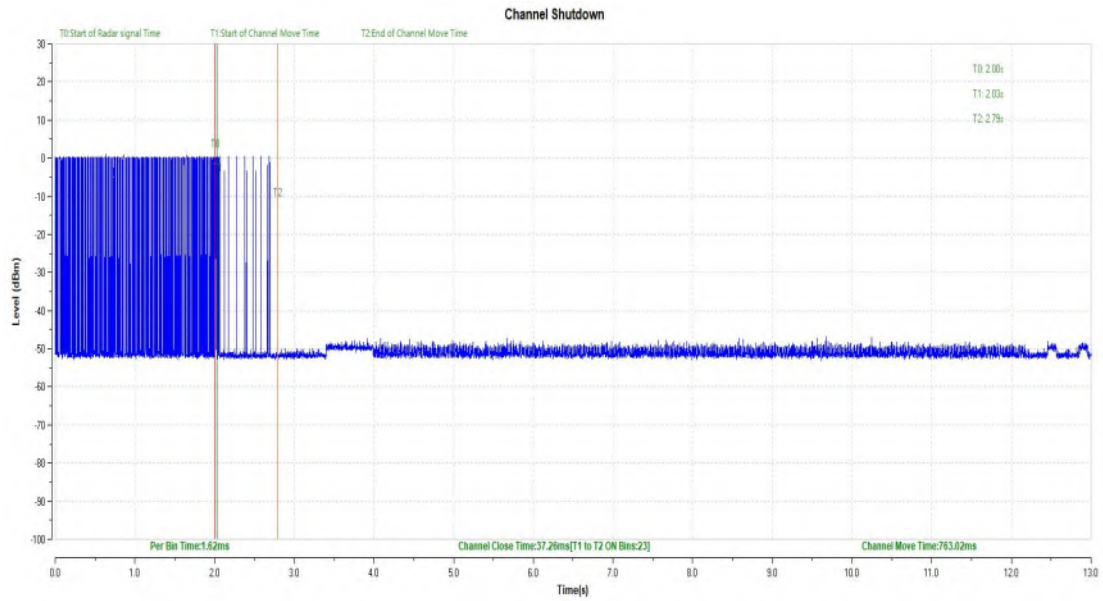


Fig. 47 Channel Move Time & Channel Closing Transmission Time (802.11a Frequency Band: 5250MHz ~ 5350MHz)

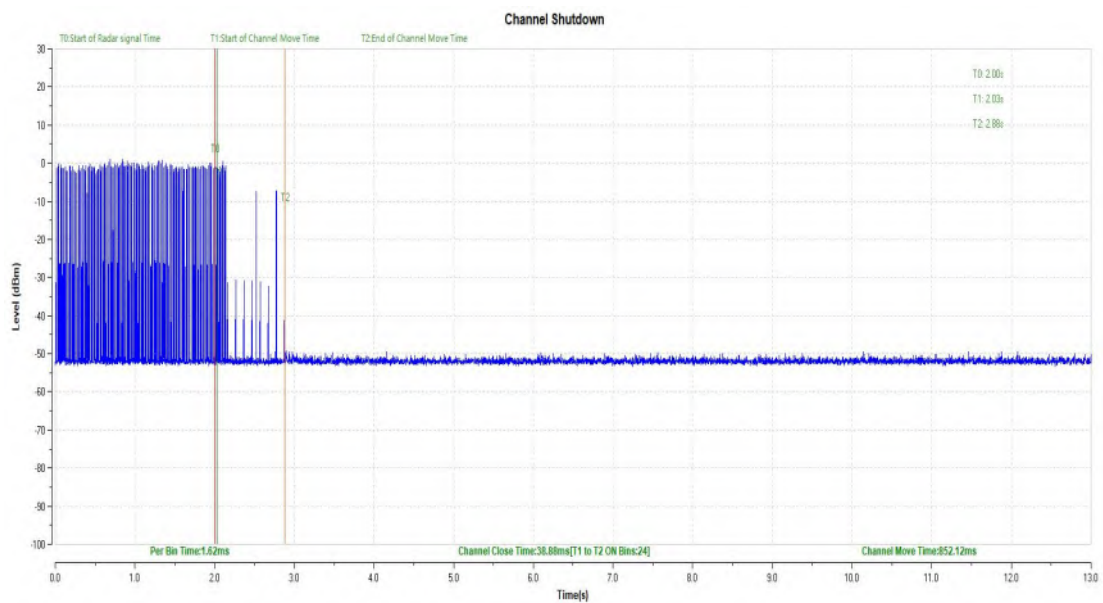


Fig. 48 Channel Move Time & Channel Closing Transmission Time (802.11ac-VHT80 Frequency Band: 5470MHz~5725MHz)

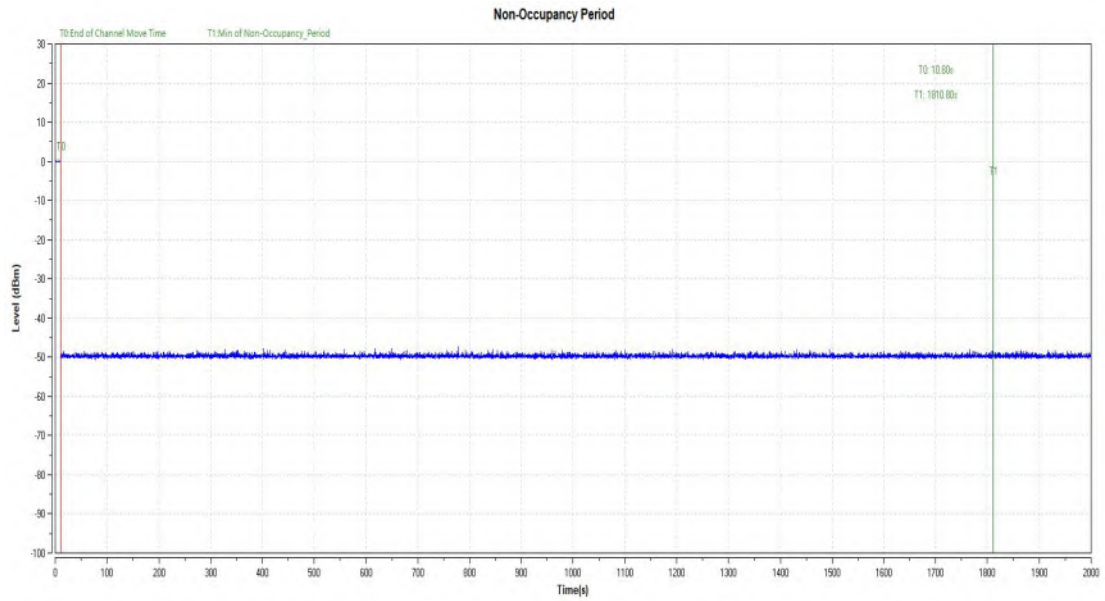


Fig. 49 Non-Occupancy Period (802.11a Frequency Band: 5250MHz ~ 5350MHz)

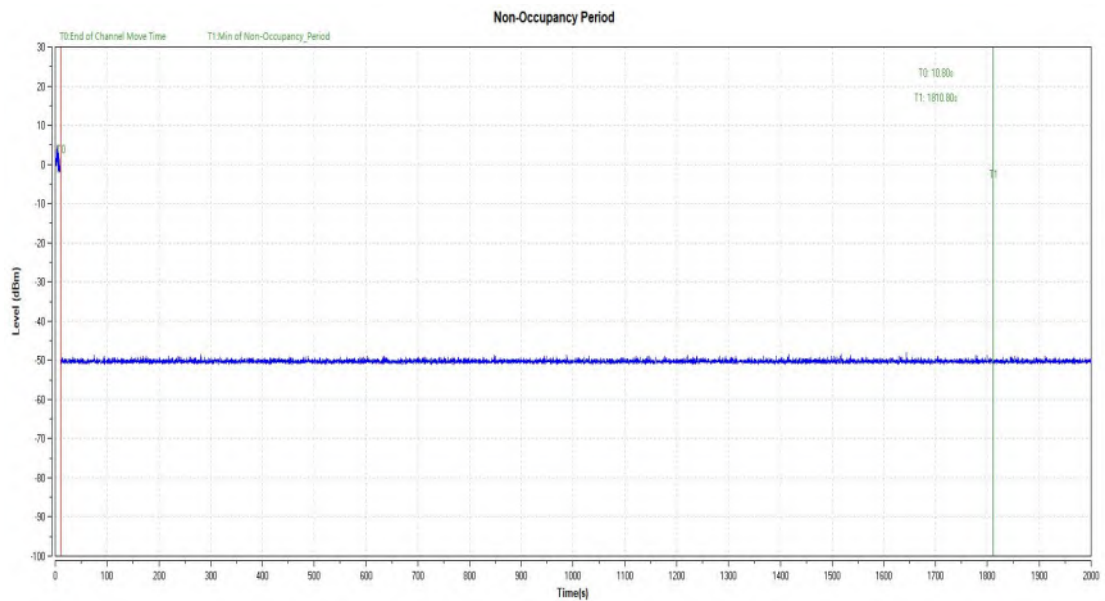


Fig. 50 Non-Occupancy Period (802.11ac-VHT80 Frequency Band: 5470MHz~5725MHz)

A.8. 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

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)).

Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5180 MHz(CH36)	Fig.51	P
	5320 MHz(CH64)	Fig.52	P
	5500 MHz(CH100)	Fig.53	P
	5700 MHz(CH140)	Fig.54	P
	5745 MHz(CH149)	Fig.55	P
	5825 MHz(CH165)	Fig.56	P
802.11n-HT40	5190 MHz(CH38)	Fig.57	P
	5310 MHz(CH62)	Fig.58	P
	5510 MHz(CH102)	Fig.59	P
	5670 MHz(CH134)	Fig.60	P
	5755 MHz(CH151)	Fig.61	P
	5795 MHz(CH159)	Fig.62	P
802.11ac-VHT80	5210 MHz(CH42)	Fig.63	P
	5290 MHz(CH58)	Fig.64	P
	5530 MHz(CH106)	Fig.65	P
	5775 MHz(CH155)	Fig.66	P

See below for test graphs.

Conclusion: PASS

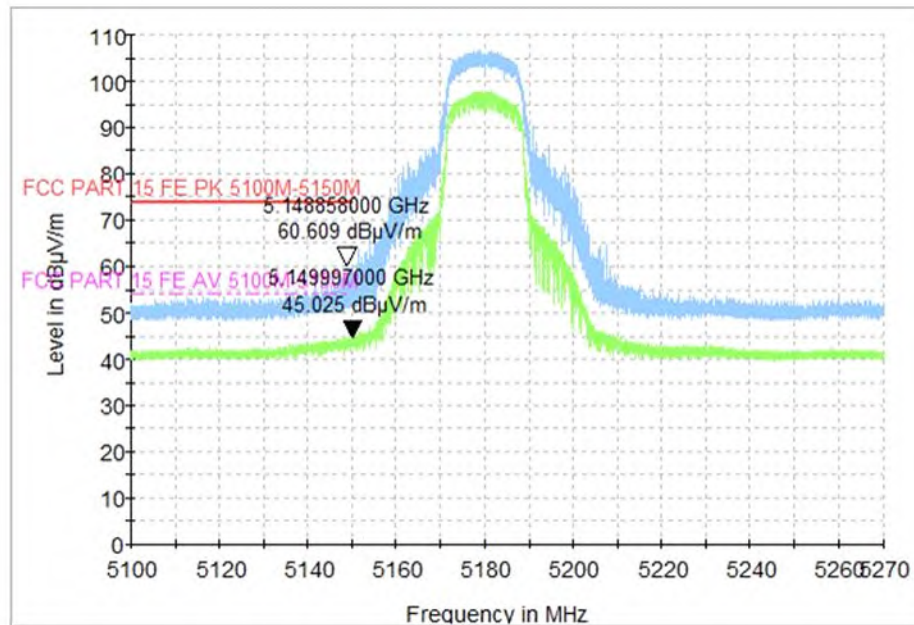


Fig. 51 Band Edges (802.11a, CH36 5180MHz)

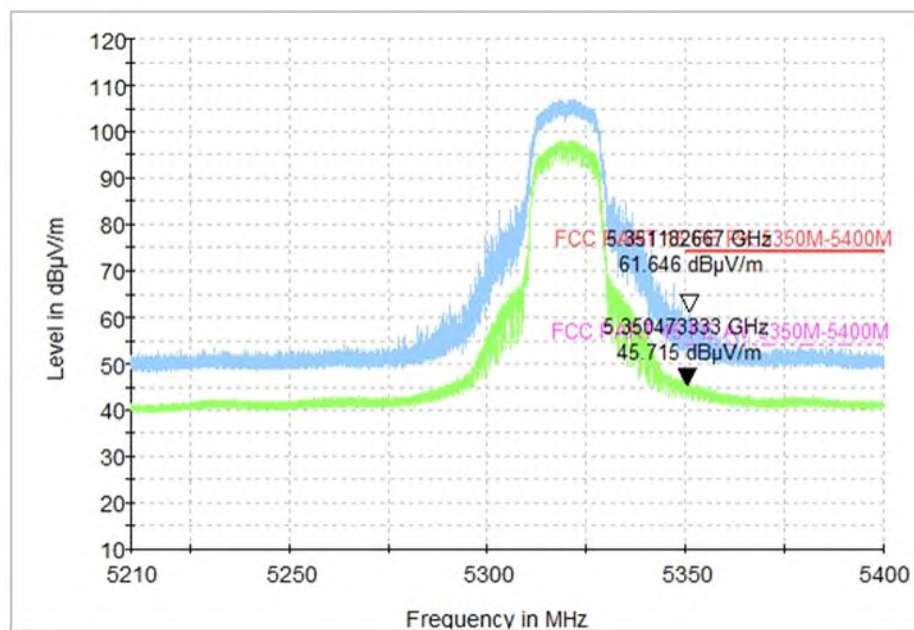


Fig. 52 Band Edges (802.11a, CH64 5320MHz)

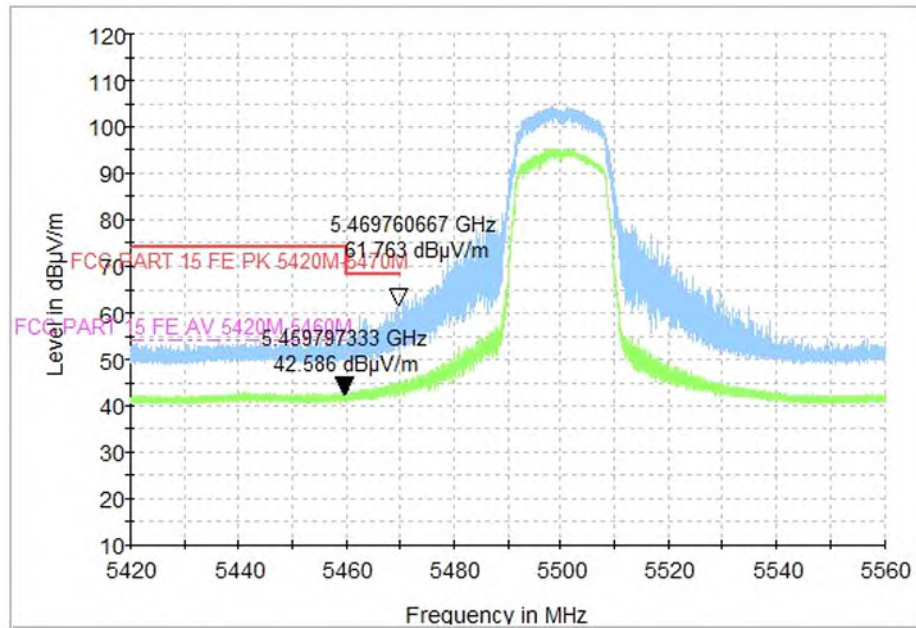


Fig. 53 Band Edges (802.11a, CH100 5500MHz)

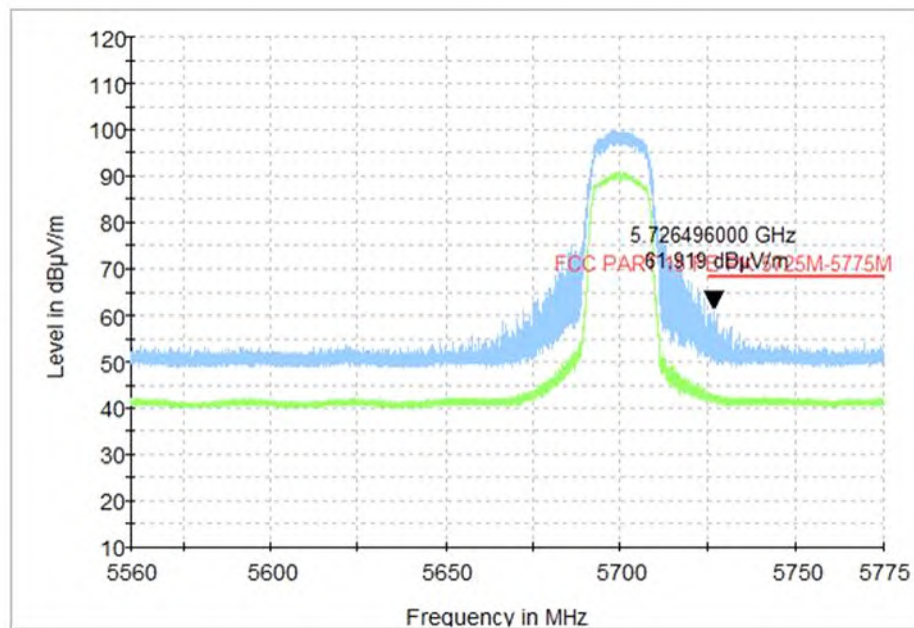


Fig. 54 Band Edges (802.11a, CH140 5700MHz)

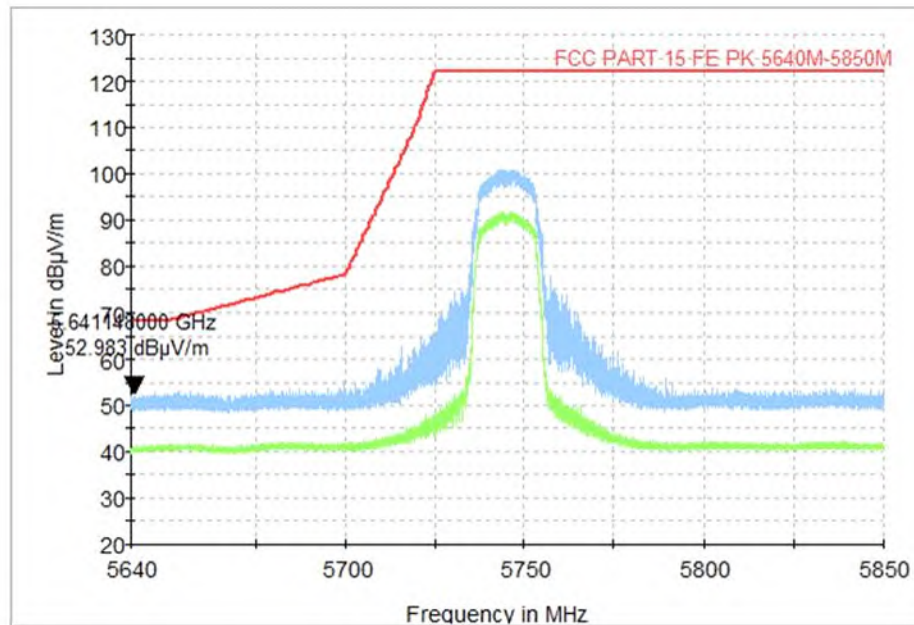


Fig. 55 Band Edges (802.11a, CH149 5745MHz)

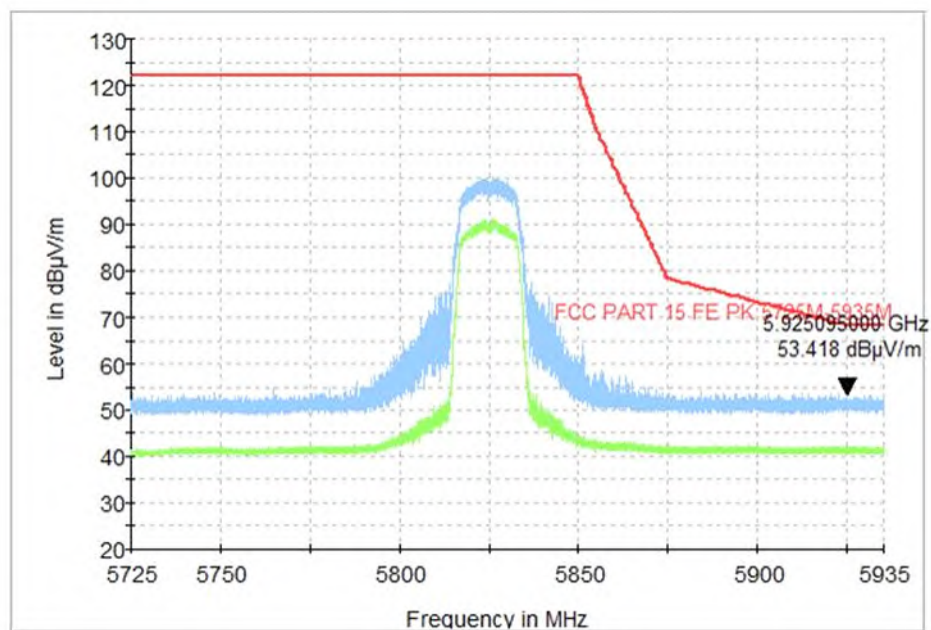


Fig. 56 Band Edges (802.11a, CH165 5825MHz)

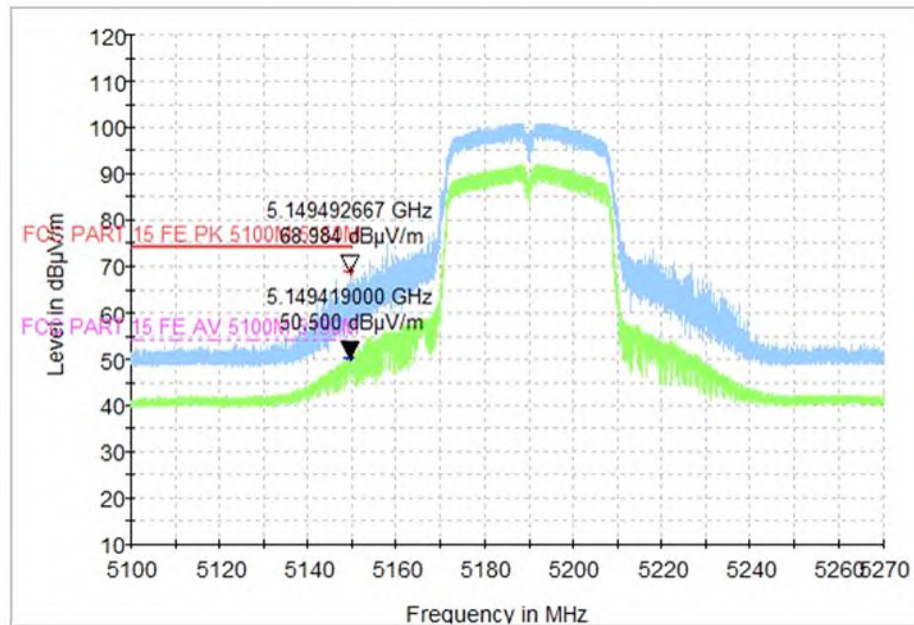


Fig. 57 Band Edges (802.11n-HT40, CH38 5190MHz)

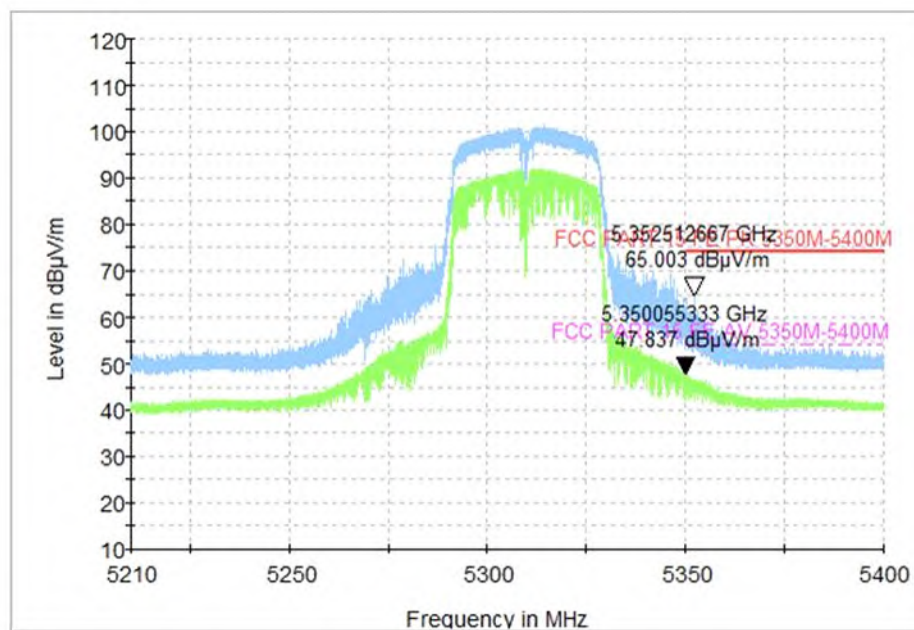


Fig. 58 Band Edges (802.11n-HT40, CH62 5310MHz)

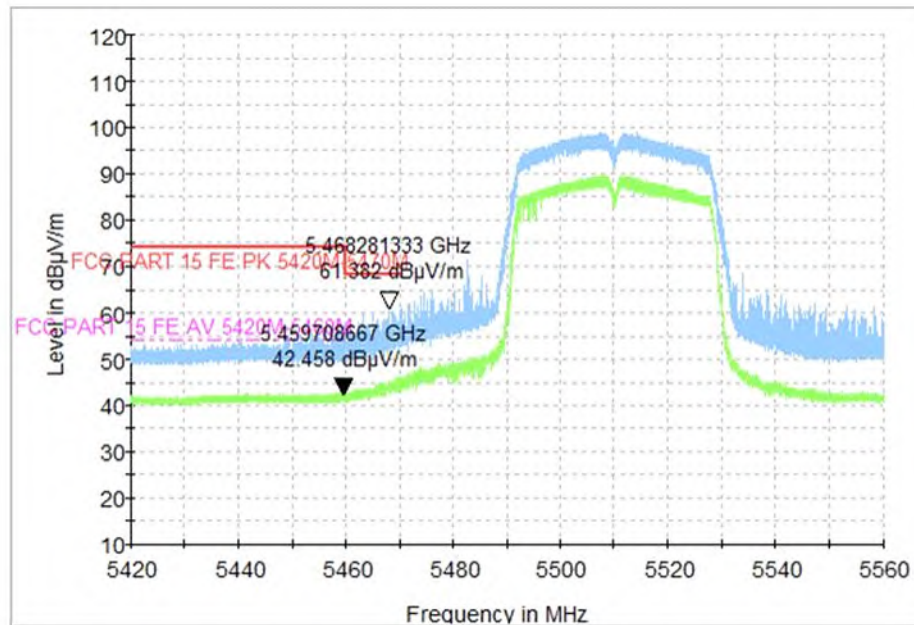


Fig. 59 Band Edges (802.11n-HT40, CH102 5510MHz)

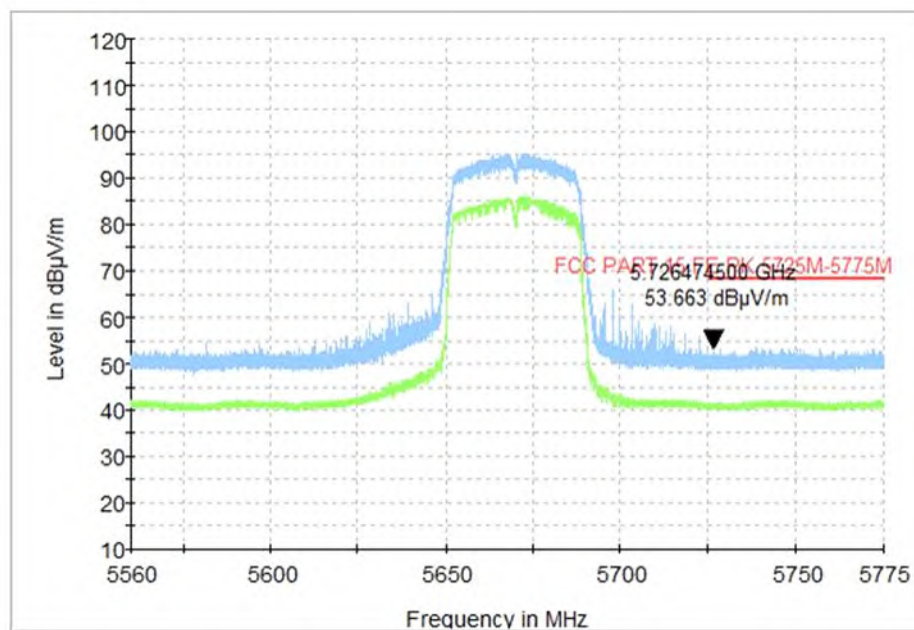


Fig. 60 Band Edges (802.11n-HT40, CH134 5670MHz)

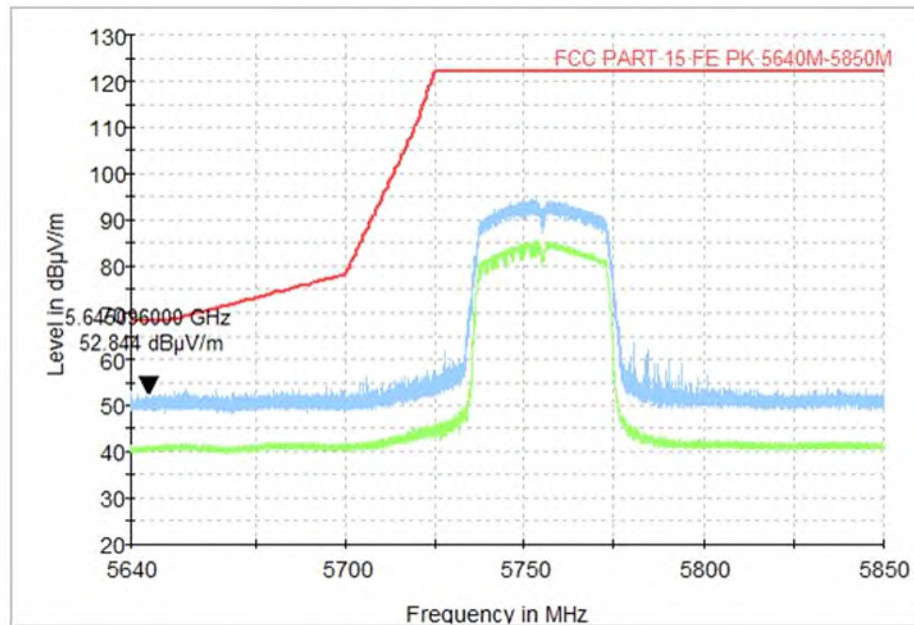


Fig. 61 Band Edges (802.11n-HT40, CH151 5755MHz)

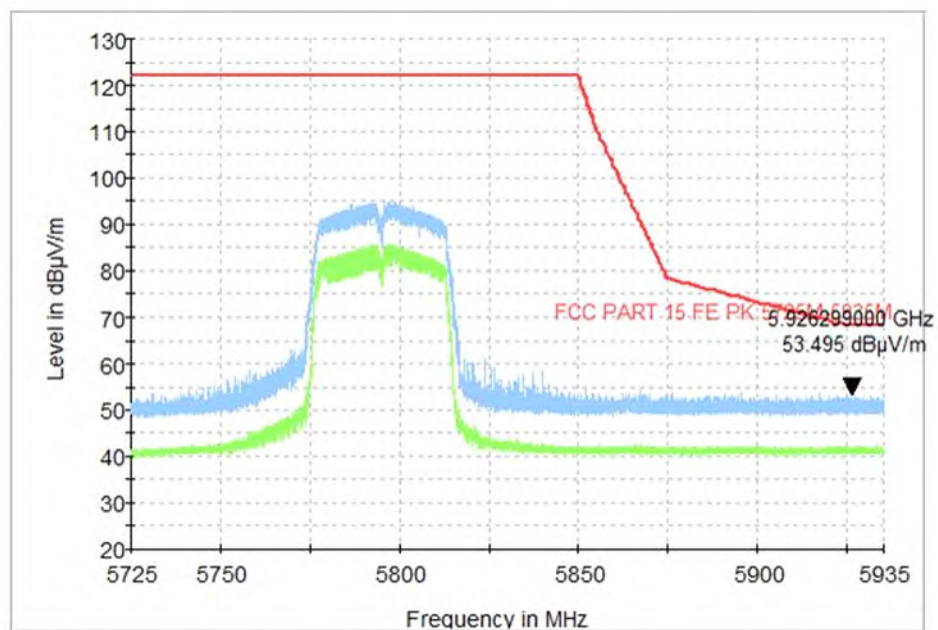


Fig. 62 Band Edges (802.11n-HT40, CH159 5795MHz)

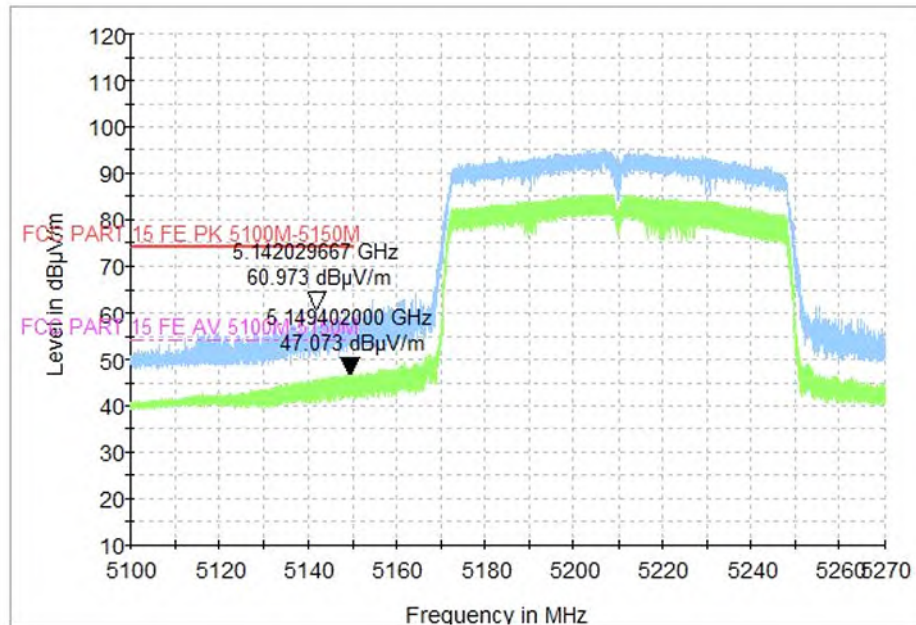


Fig. 63 Band Edges (802.11ac-VHT80, CH42 5210MHz)

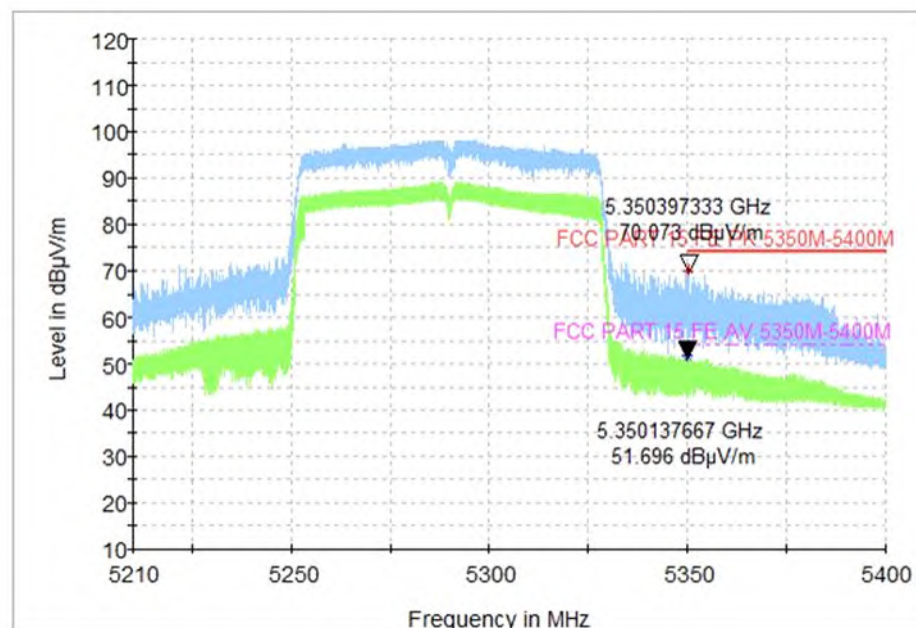


Fig. 64 Band Edges (802.11ac-VHT80, CH58 5290MHz)

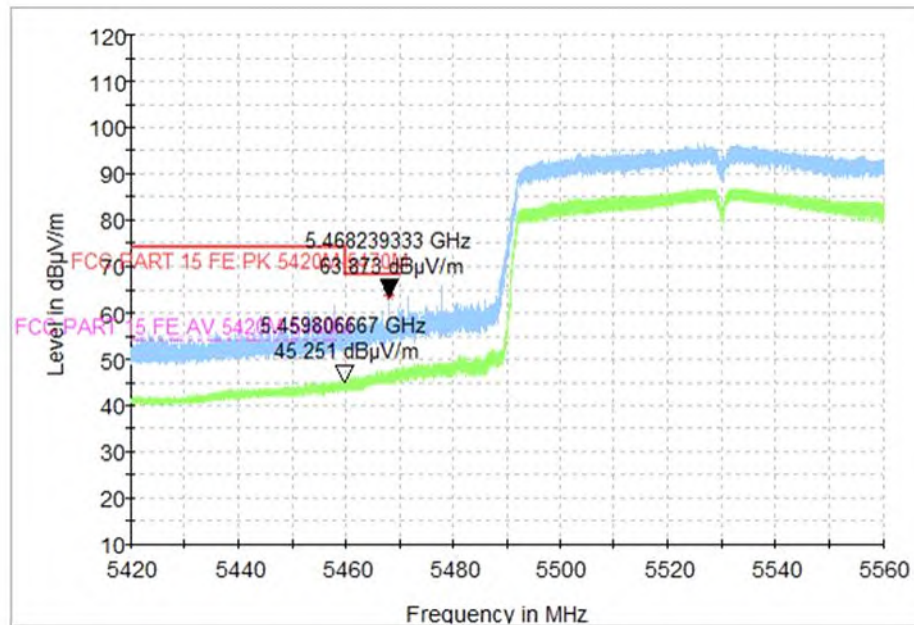


Fig. 65 Band Edges (802.11ac-VHT80, CH106 5530MHz)

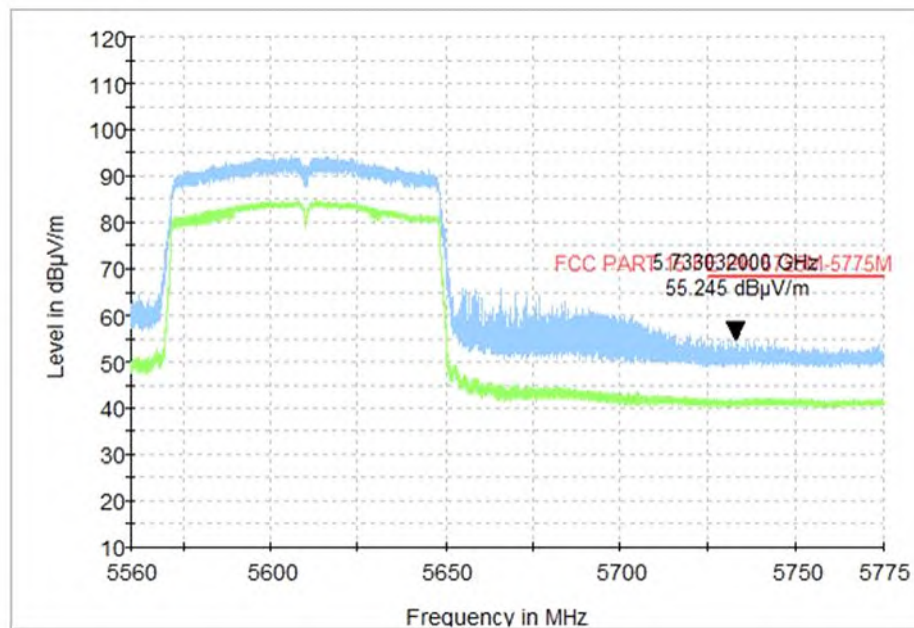


Fig. 66 Band Edges (802.11ac-VHT80, CH155 5775MHz)

A.9. Transmitter Spurious Emission

Measurement Limit:

Standard	Limit (dBuV/m)	
FCC 47 CFR Part 15.209	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.

All modes have been evaluated and tested, the worst results of **11a**, **11n-HT40** and **11ac-VHT80** mode were selected and showed in this test case.

Measurement Result:

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11a	5180MHz(Ch36)	7 GHz ~18 GHz	Fig.67	P
	5200MHz(Ch40)	7 GHz ~18 GHz	Fig.68	P
	5240MHz(Ch48)	7 GHz ~18 GHz	Fig.69	P
	5260MHz(Ch52)	7 GHz ~18 GHz	Fig.70	P
	5280MHz(Ch56)	7 GHz ~18 GHz	Fig.71	P
	5320MHz(Ch64)	7 GHz ~18 GHz	Fig.72	P
	5500MHz(Ch100)	7 GHz ~18 GHz	Fig.73	P
	5600MHz(Ch120)	7 GHz ~18 GHz	Fig.74	P
	5700MHz(Ch140)	7 GHz ~18 GHz	Fig.75	P
	5745MHz(Ch149)	7 GHz ~18 GHz	Fig.76	P
	5785MHz(Ch157)	7 GHz ~18 GHz	Fig.77	P
	5825MHz(Ch165)	7 GHz ~18 GHz	Fig.78	P
802.11n- HT40	5190MHz(Ch38)	7 GHz ~18 GHz	Fig.79	P
	5230MHz(Ch46)	7 GHz ~18 GHz	Fig.80	P
	5270MHz(Ch54)	7 GHz ~18 GHz	Fig.81	P
	5310MHz(Ch62)	7 GHz ~18 GHz	Fig.82	P
	5510MHz(Ch102)	7 GHz ~18 GHz	Fig.83	P
	5580MHz(Ch118)	7 GHz ~18 GHz	Fig.84	P
	5670MHz(Ch134)	7 GHz ~18 GHz	Fig.85	P
	5755MHz(Ch151)	7 GHz ~18 GHz	Fig.86	P
	5795MHz(Ch159)	7 GHz ~18 GHz	Fig.87	P
802.11ac -VHT80	5210MHz(Ch42)	7 GHz ~18 GHz	Fig.88	P
	5290MHz(Ch58)	7 GHz ~18 GHz	Fig.89	P
	5530MHz(Ch106)	7 GHz ~18 GHz	Fig.90	P
	5610MHz(Ch122)	7 GHz ~18 GHz	Fig.91	P
	5775MHz(Ch155)	7 GHz ~18 GHz	Fig.92	P
All channels		30 MHz ~1 GHz	Fig.93	P
		1 GHz ~3 GHz	Fig.94	P
		3 GHz ~7 GHz	Fig.95	P
		18 GHz ~26.5 GHz	Fig.96	P
		26.5GHz~40GHz	Fig.97	P

802.11a CH40

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
12949.533333	47.66	68.20	20.54	V	9.2
14186.300000	48.93	68.20	19.27	V	11.6
15208.566667	49.28	68.20	18.92	H	11.6
16880.933333	52.04	68.20	16.16	V	16.1
17454.033333	51.40	68.20	16.80	H	16.0
17978.733333	51.75	74.00	22.25	V	16.9

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
10979.066667	34.49	54.00	19.51	V	6.4
11849.533333	35.68	54.00	18.32	V	8.0
12498.166667	36.01	54.00	17.99	V	8.6
13331.233333	36.02	54.00	17.98	V	9.6
15901.200000	38.52	54.00	15.48	H	14.2
17949.766667	40.20	54.00	13.80	V	17.2

802.11n-HT40 CH54

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
13126.633333	48.22	68.20	19.98	V	9.8
14239.100000	49.41	68.20	18.79	V	11.7
15281.900000	49.36	68.20	18.84	V	12.0
16907.700000	51.48	68.20	16.72	V	15.9
17503.533333	51.49	68.20	16.71	H	16.2
17995.966667	51.30	74.00	22.70	V	16.9

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
10790.966667	34.55	54.00	19.45	V	6.4
11525.400000	35.26	54.00	18.74	V	6.9
12194.566667	35.88	54.00	18.12	V	8.4
13311.800000	36.08	54.00	17.92	H	9.7
15930.533333	38.43	54.00	15.57	H	14.5
17950.500000	40.18	54.00	13.82	H	17.2

802.11ac-VHT80 CH155

Frequency (MHz)	Max Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
13124.066667	48.38	68.20	19.82	H	9.8
14211.966667	49.38	68.20	18.82	V	11.6
15318.566667	48.70	68.20	19.50	H	12.1
16869.200000	51.86	68.20	16.34	V	15.8
17311.033333	52.12	68.20	16.08	H	15.8
17957.466667	51.44	74.00	22.56	H	17.0

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
10785.833333	34.70	54.00	19.30	V	6.3
11552.166667	35.19	54.00	18.81	H	7.1
12214.000000	35.72	54.00	18.28	V	8.6
13319.133333	35.66	54.00	18.34	H	9.5
15891.666667	38.28	54.00	15.72	V	13.8
17984.600000	40.06	54.00	13.94	V	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:

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

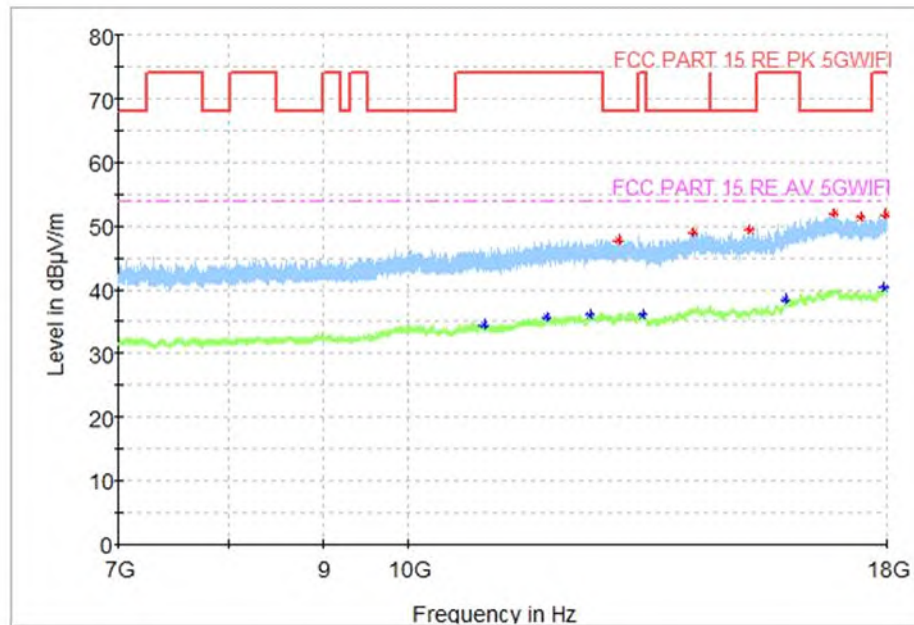


Fig. 67 Transmitter Spurious Emission (802.11a, CH36 5180MHz, 7 GHz-18 GHz)

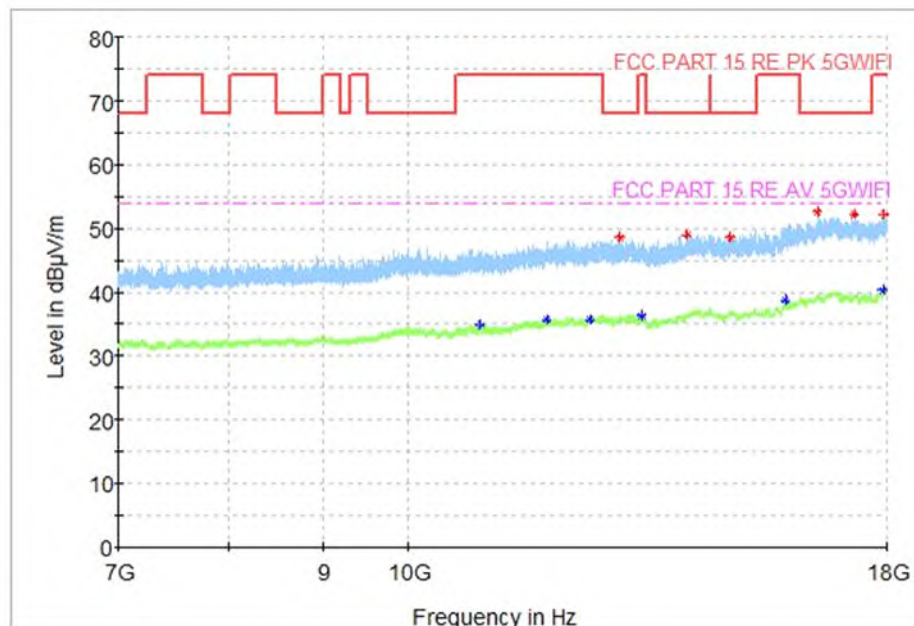


Fig. 68 Transmitter Spurious Emission (802.11a, CH40 5200MHz, 7 GHz-18 GHz)

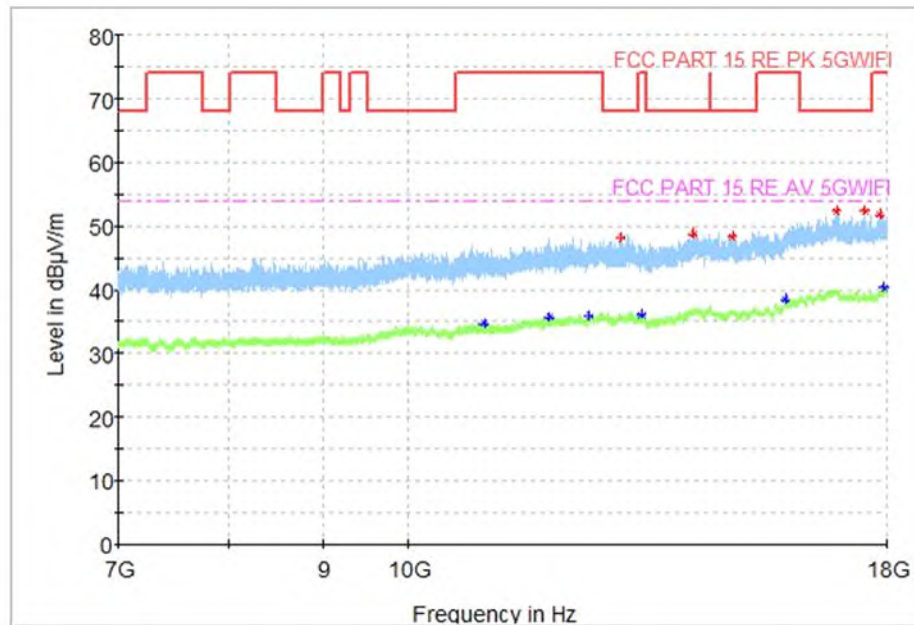


Fig. 69 Transmitter Spurious Emission (802.11a, CH48 5240MHz, 7 GHz-18 GHz)

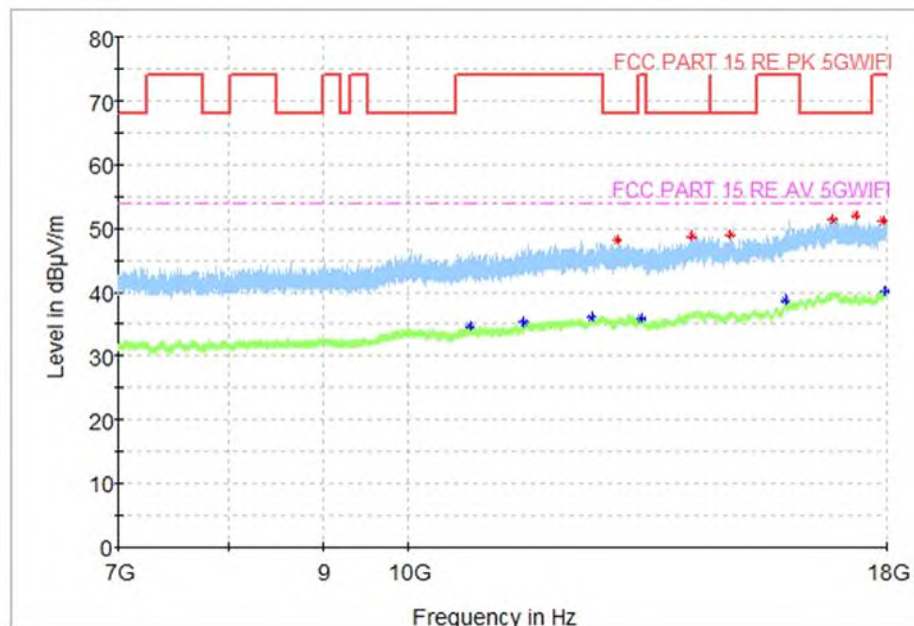


Fig. 70 Transmitter Spurious Emission (802.11a, CH52 5260MHz, 7 GHz-18 GHz)

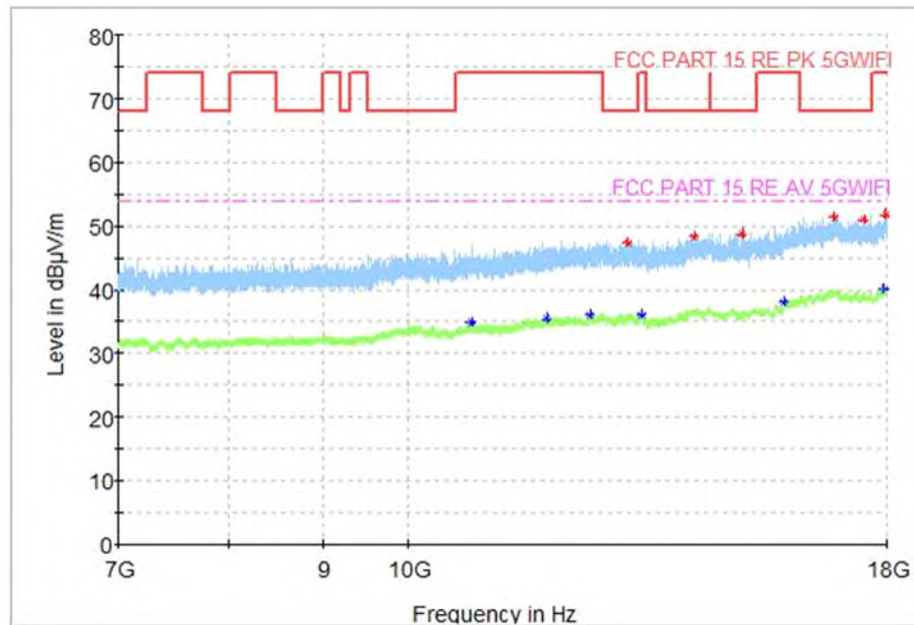


Fig. 71 Transmitter Spurious Emission (802.11a, CH56 5280MHz, 7 GHz-18 GHz)

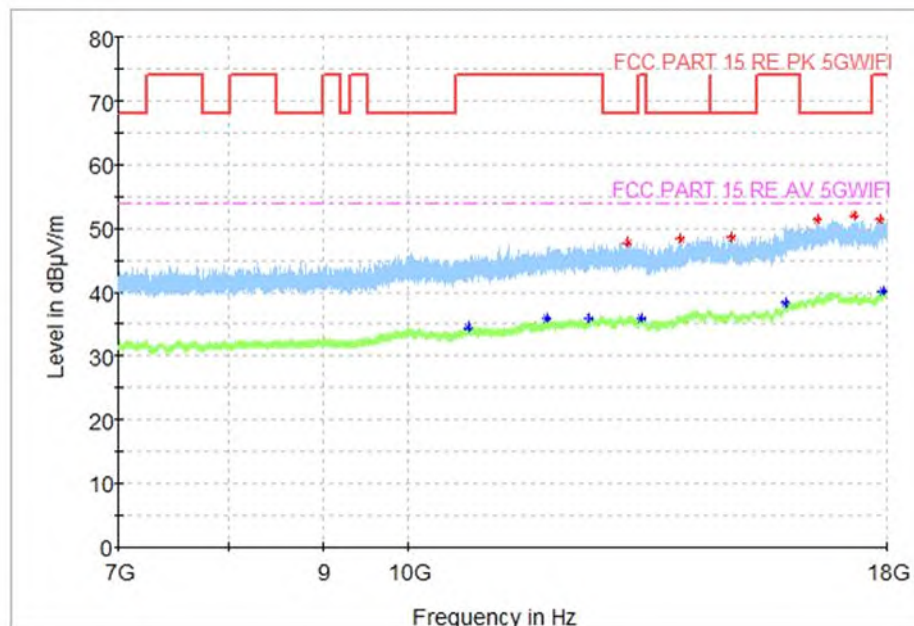


Fig. 72 Transmitter Spurious Emission (802.11a, CH64 5320MHz, 7 GHz-18 GHz)

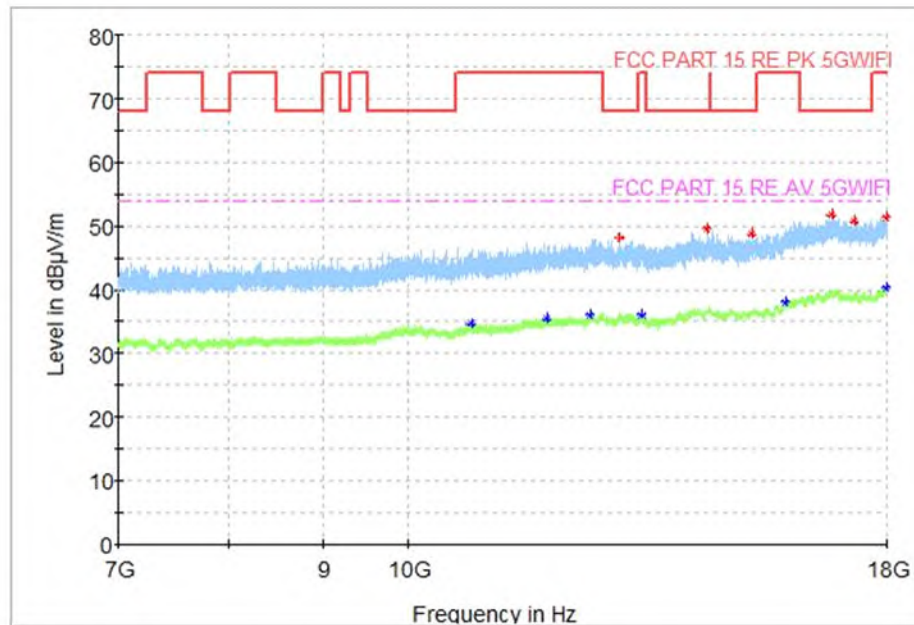


Fig. 73 Transmitter Spurious Emission (802.11a, CH100 5500MHz, 7 GHz-18 GHz)

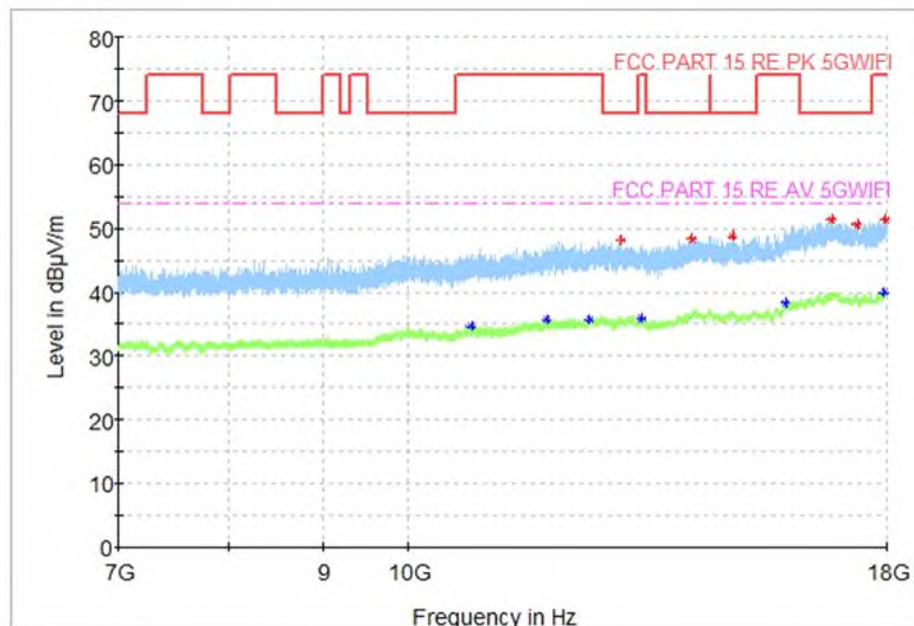


Fig. 74 Transmitter Spurious Emission (802.11a, CH120 5600MHz, 7 GHz-18 GHz)

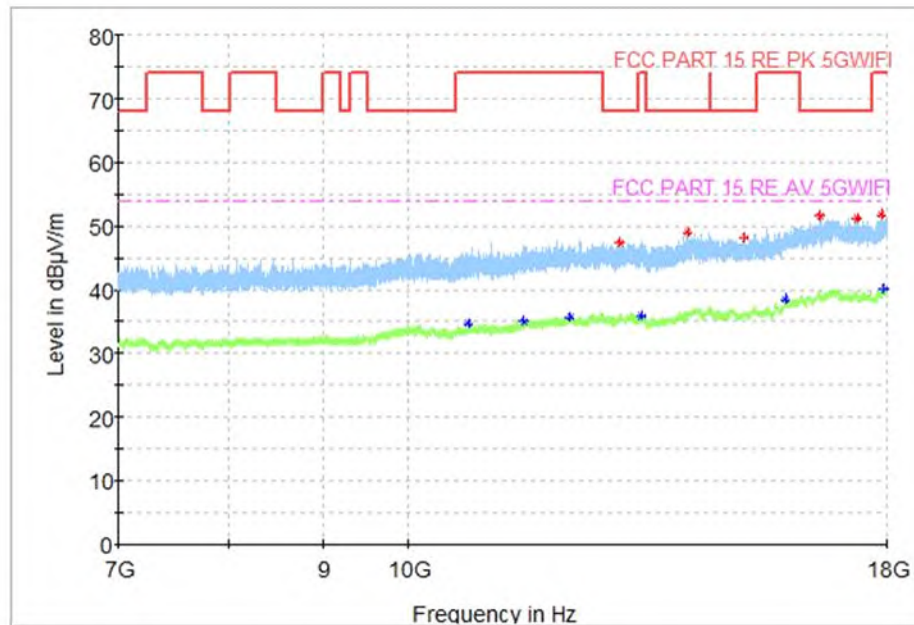


Fig. 75 Transmitter Spurious Emission (802.11a, CH140 5700MHz, 7 GHz-18 GHz)

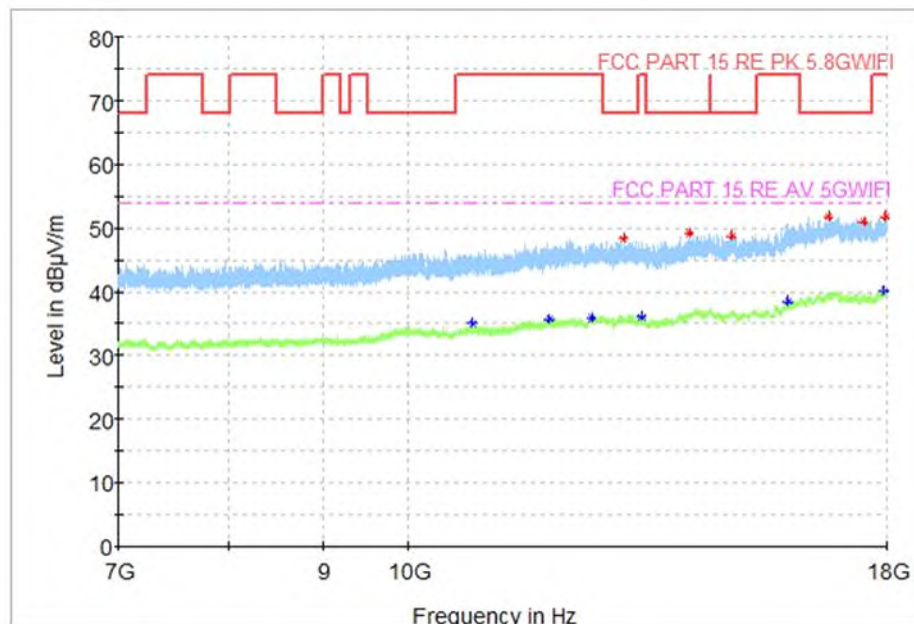


Fig. 76 Transmitter Spurious Emission (802.11a, CH149 5745MHz, 7 GHz-18 GHz)

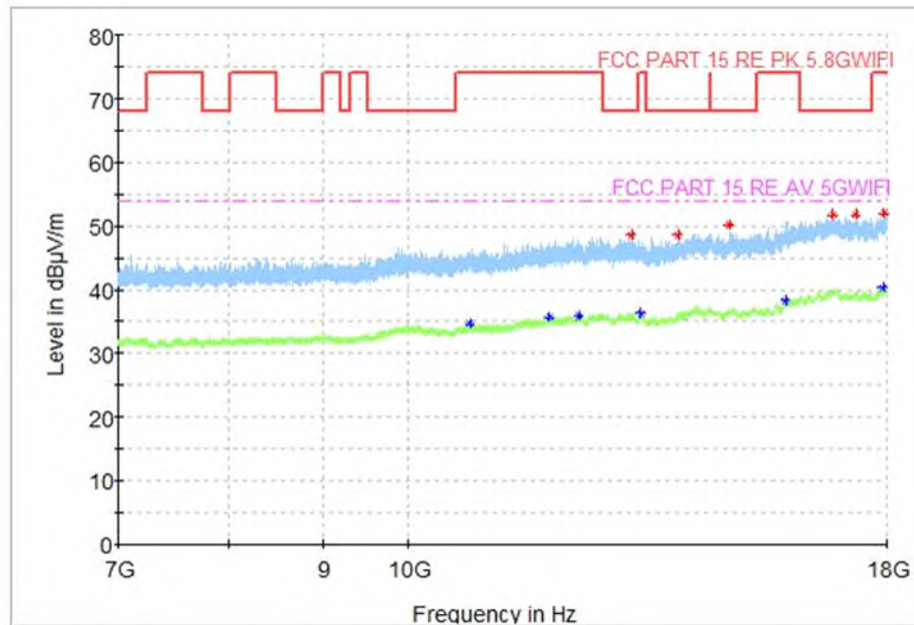


Fig. 77 Transmitter Spurious Emission (802.11a, CH157 5785MHz, 7 GHz-18 GHz)

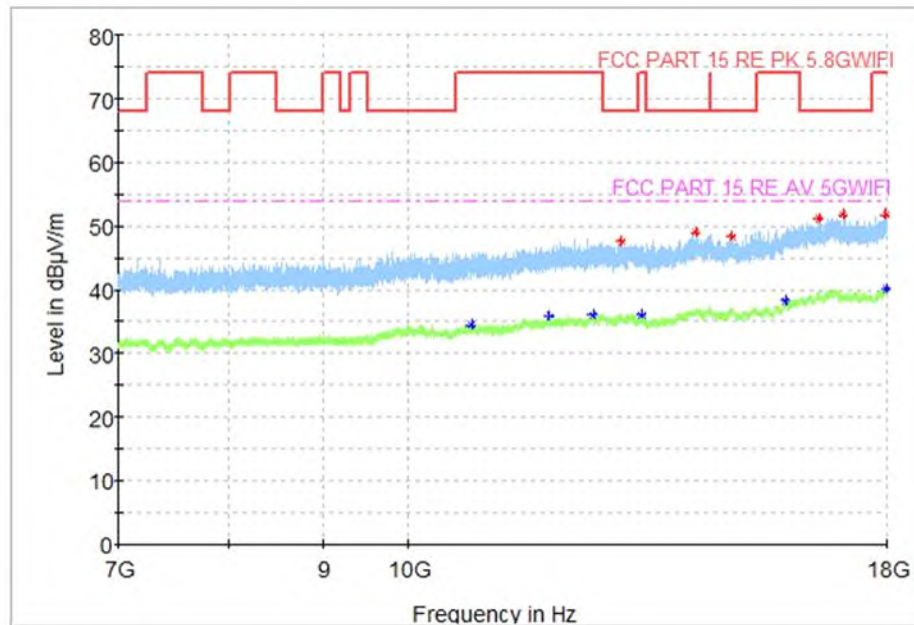


Fig. 78 Transmitter Spurious Emission (802.11a, CH165 5825MHz, 7 GHz-18 GHz)

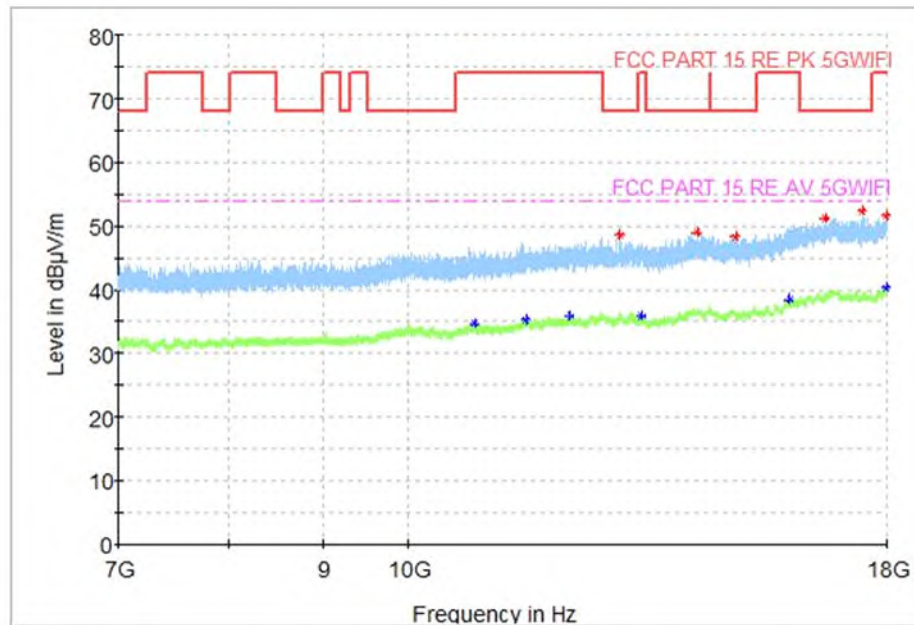


Fig. 79 Transmitter Spurious Emission (802.11n-HT40, CH38 5190MHz, 7 GHz-18 GHz)

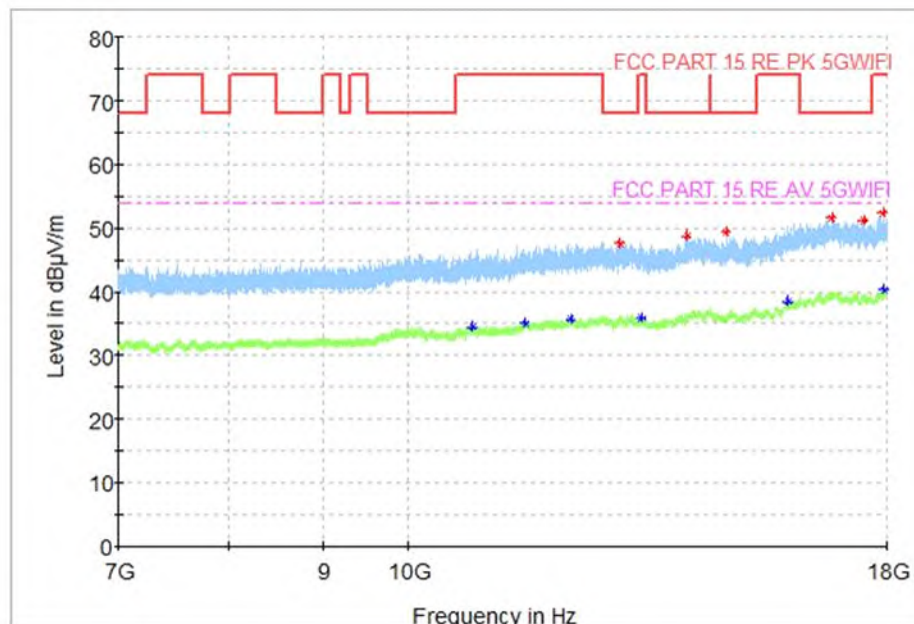


Fig. 80 Transmitter Spurious Emission (802.11n-HT40, CH46 5230MHz, 7 GHz-18 GHz)

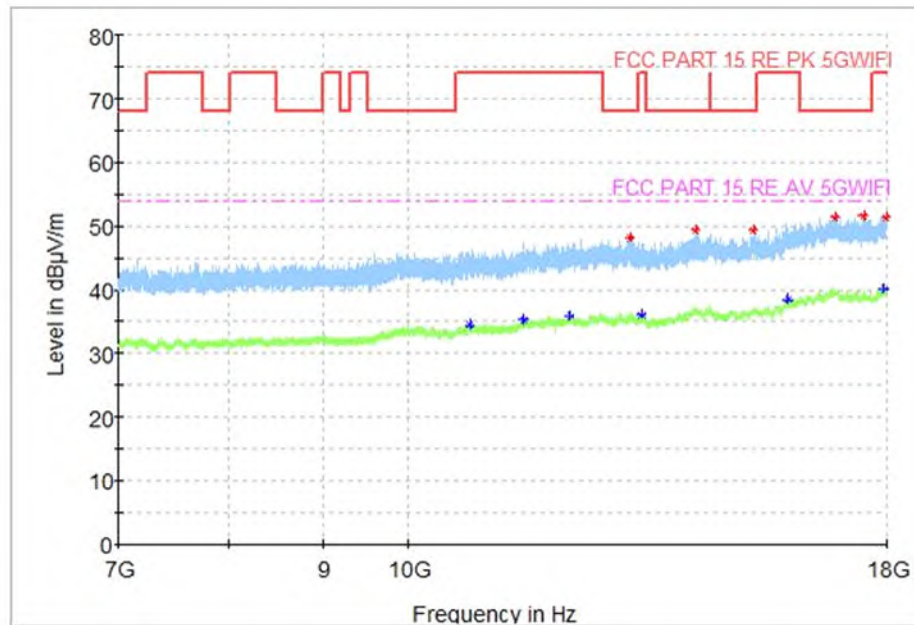


Fig. 81 Transmitter Spurious Emission (802.11n-HT40, CH54 5270MHz, 7 GHz-18 GHz)

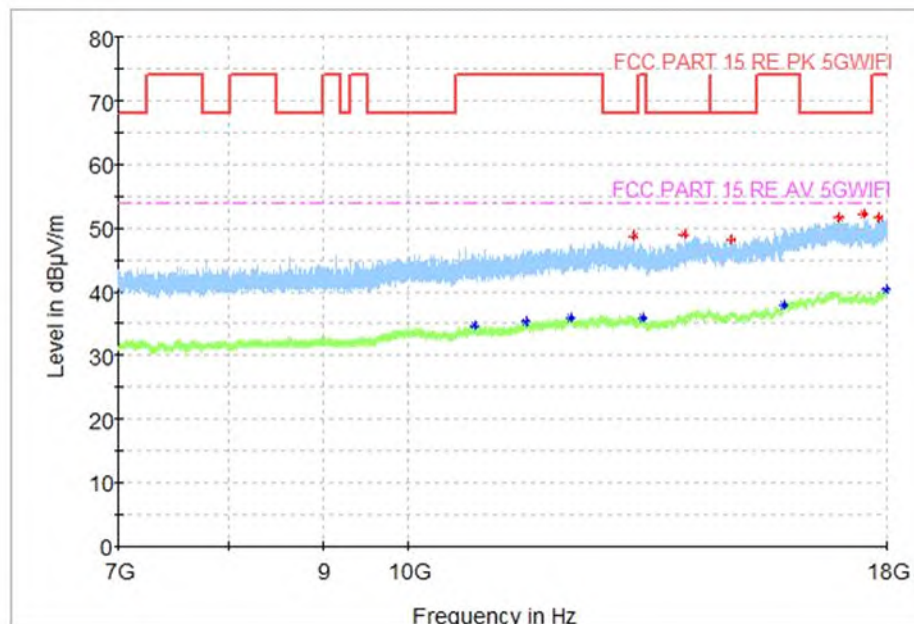


Fig. 82 Transmitter Spurious Emission (802.11n-HT40, CH62 5310MHz, 7 GHz-18 GHz)

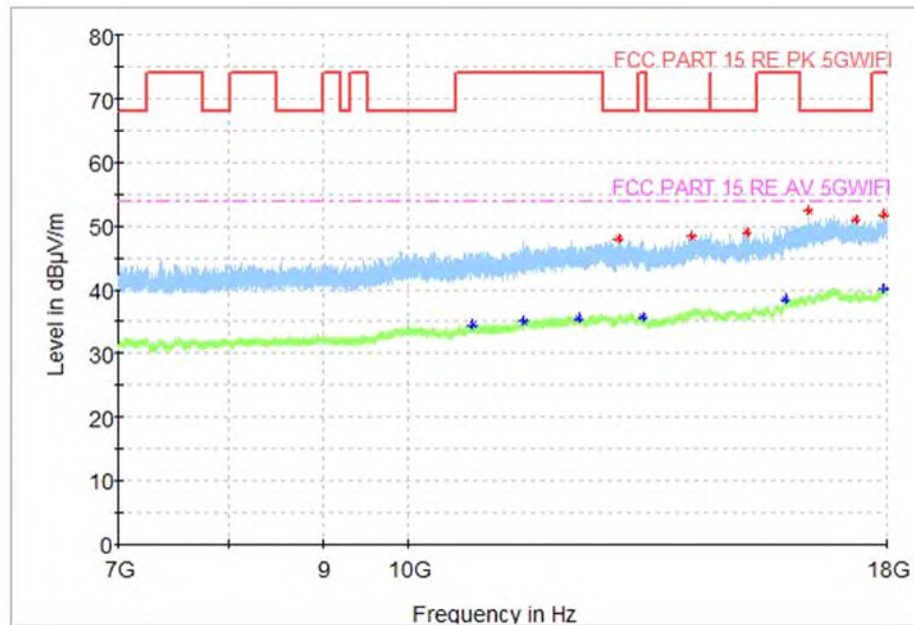


Fig. 83 Transmitter Spurious Emission (802.11n-HT40, CH102 5510MHz, 7 GHz-18 GHz)

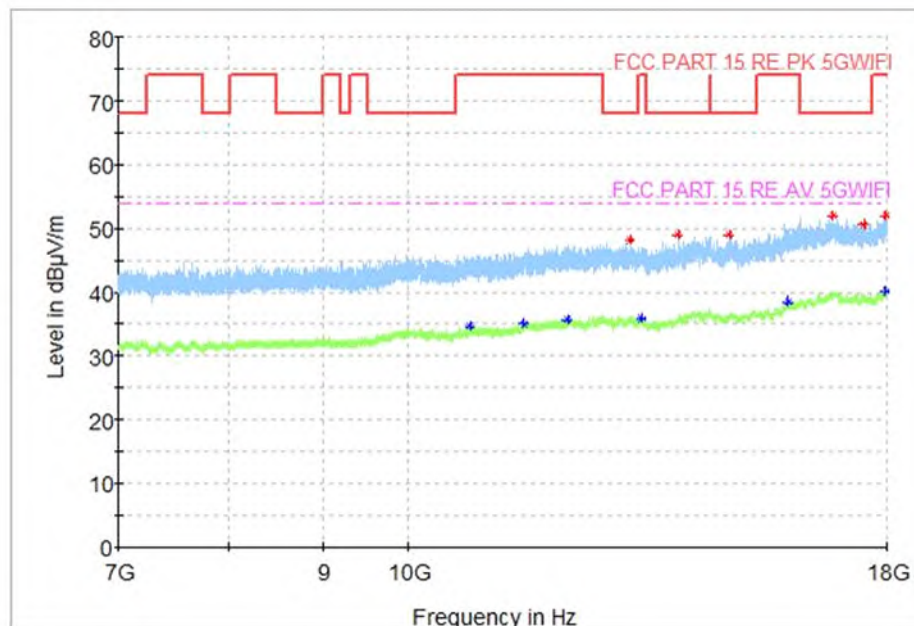


Fig. 84 Transmitter Spurious Emission (802.11n-HT40, CH118 5580MHz, 7 GHz-18 GHz)

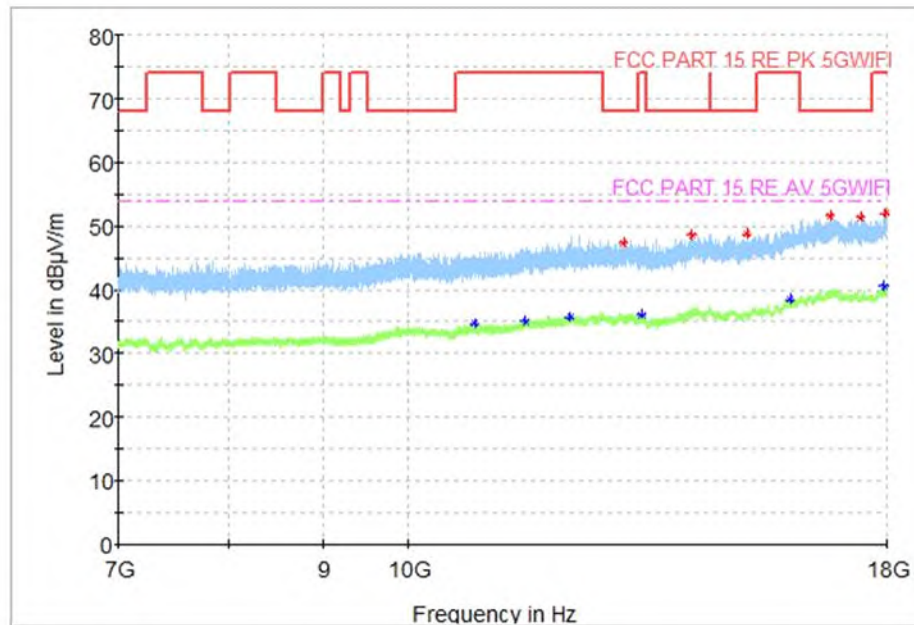


Fig. 85 Transmitter Spurious Emission (802.11n-HT40, CH134 5670MHz, 7 GHz-18 GHz)

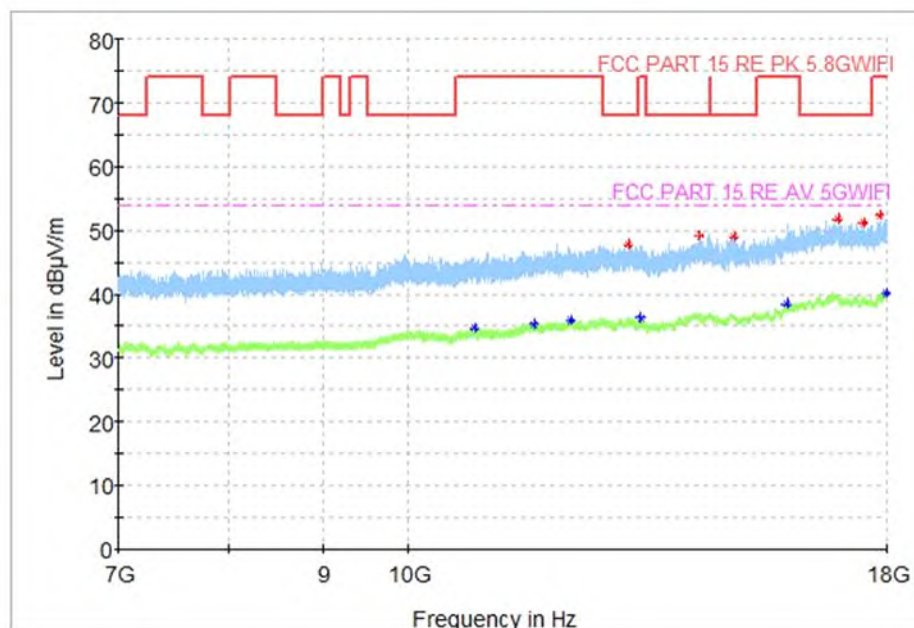


Fig. 86 Transmitter Spurious Emission (802.11n-HT40, CH151 5755MHz, 7 GHz-18 GHz)

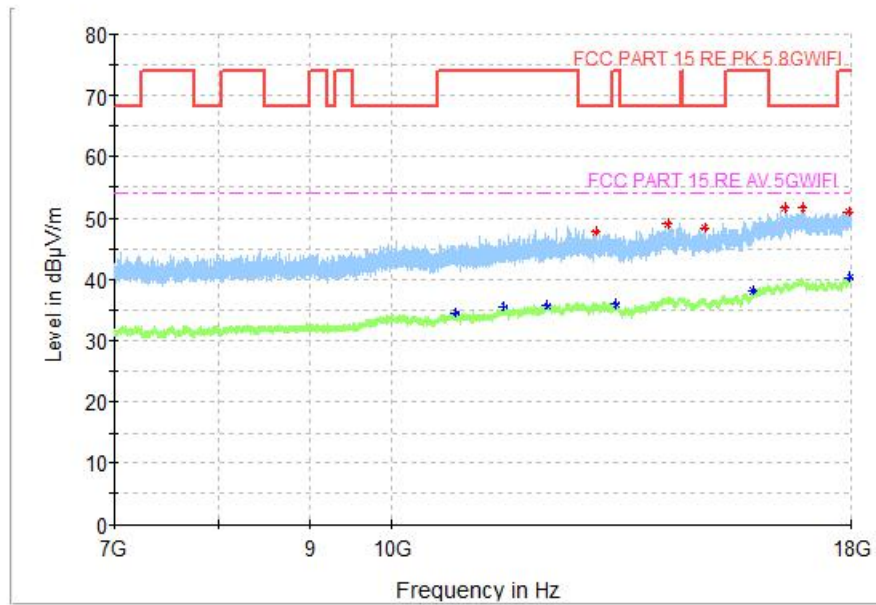


Fig. 87 Transmitter Spurious Emission (802.11n-HT40, CH159 5795MHz, 7 GHz-18 GHz)

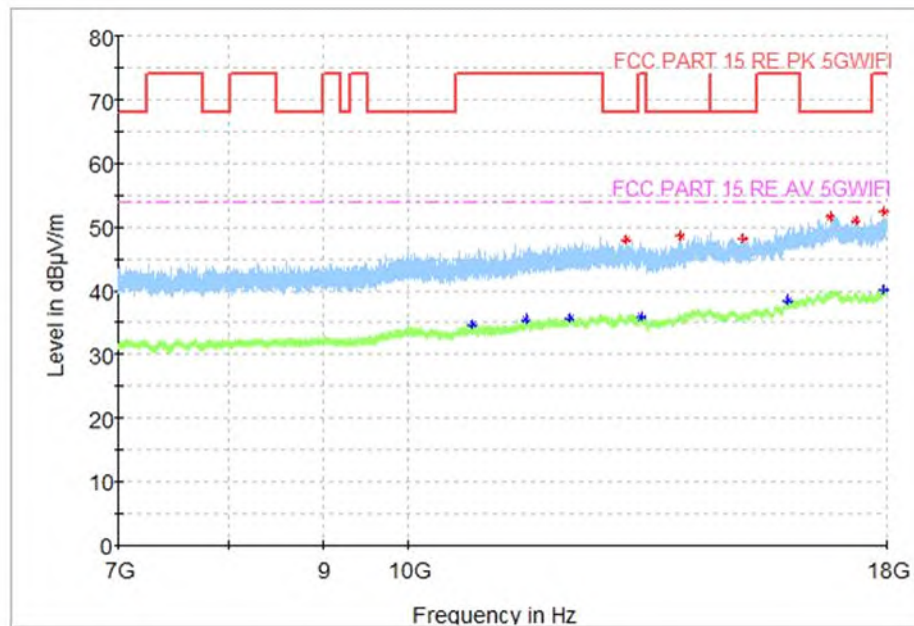


Fig. 88 Transmitter Spurious Emission (802.11ac-VHT80, CH42 5210MHz, 7 GHz-18 GHz)

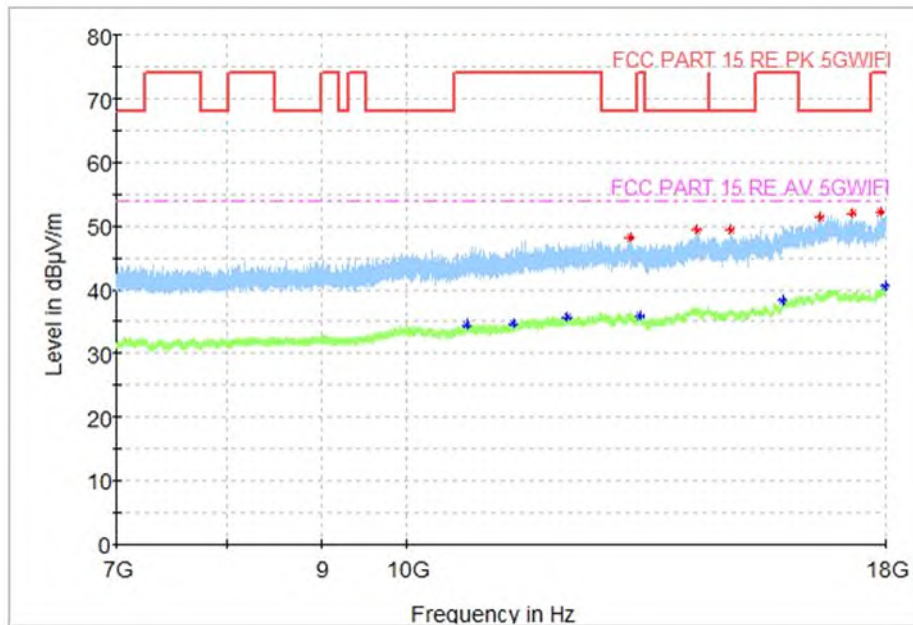


Fig. 89 Transmitter Spurious Emission (802.11ac-VHT80, CH58 5290MHz, 7 GHz-18 GHz)

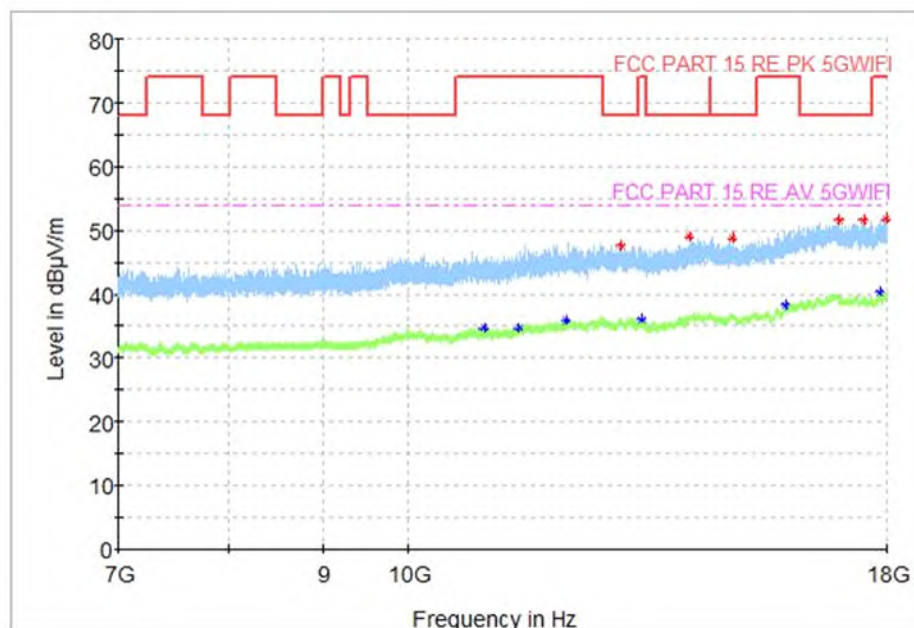


Fig. 90 Transmitter Spurious Emission (802.11ac-VHT80, CH106 5530MHz, 7 GHz-18 GHz)

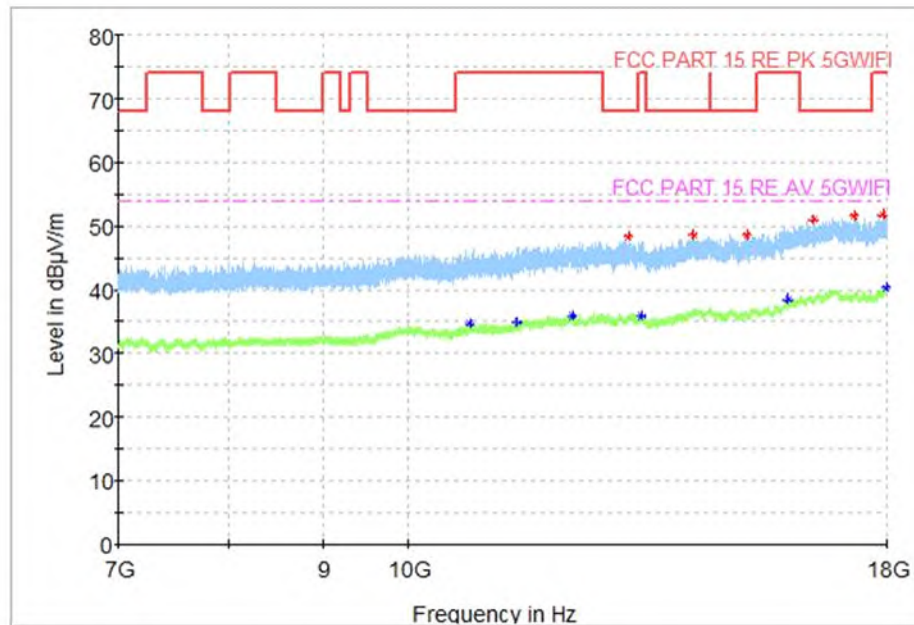


Fig. 91 Transmitter Spurious Emission (802.11ac-VHT80, CH122 5610MHz, 7 GHz-18 GHz)

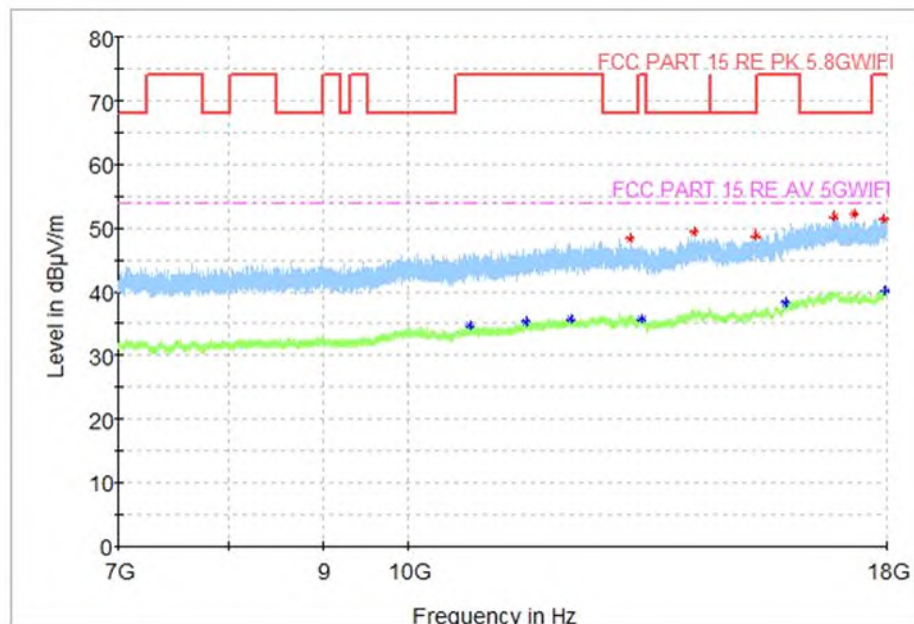


Fig. 92 Transmitter Spurious Emission (802.11ac-VHT80, CH155 5775MHz, 7 GHz-18 GHz)

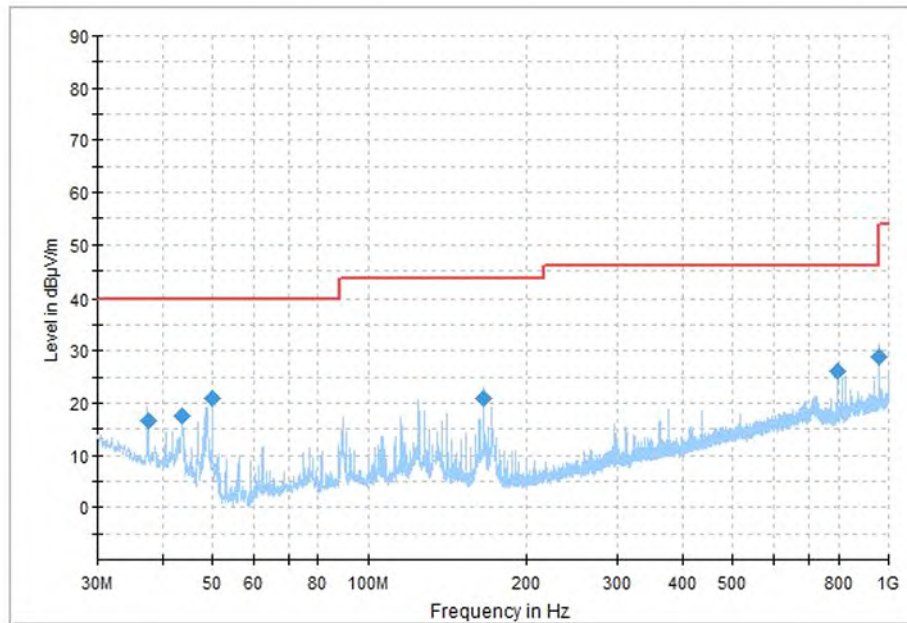


Fig. 93 Transmitter Spurious Emission (All channel, 30MHz~1GHz)

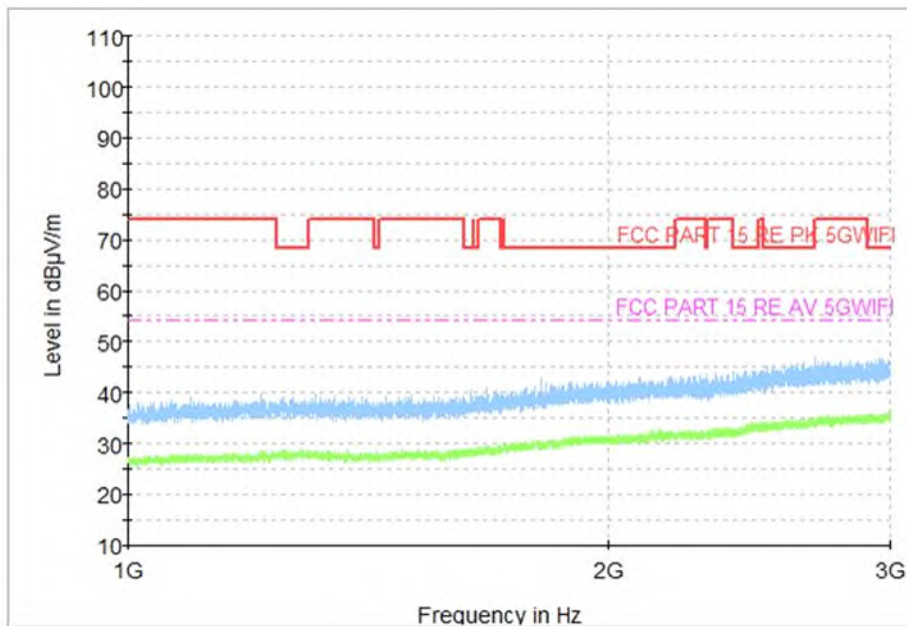


Fig. 94 Transmitter Spurious Emission (All channel, 1GHz~3GHz)

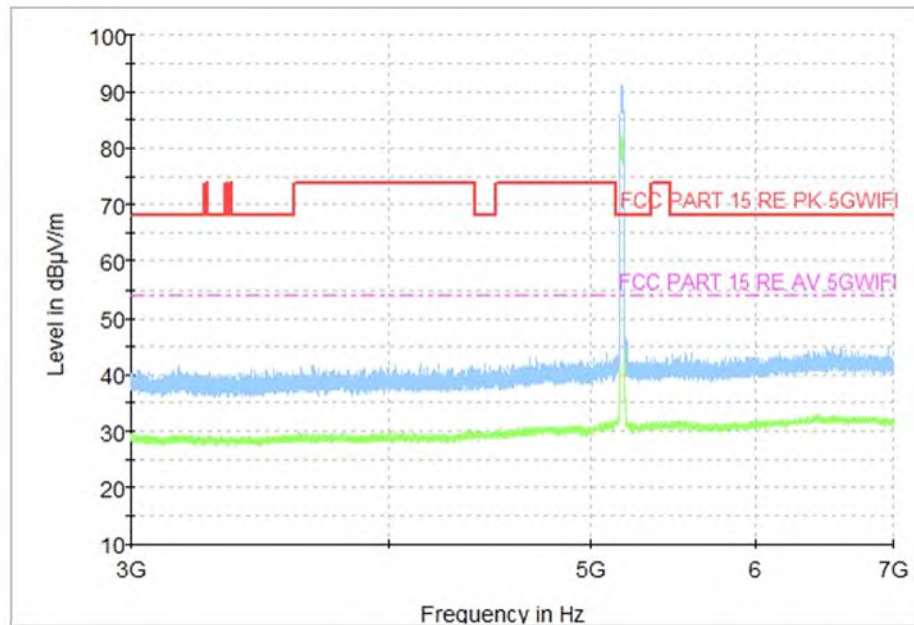


Fig. 95 Transmitter Spurious Emission (All channel, 3GHz~7GHz)

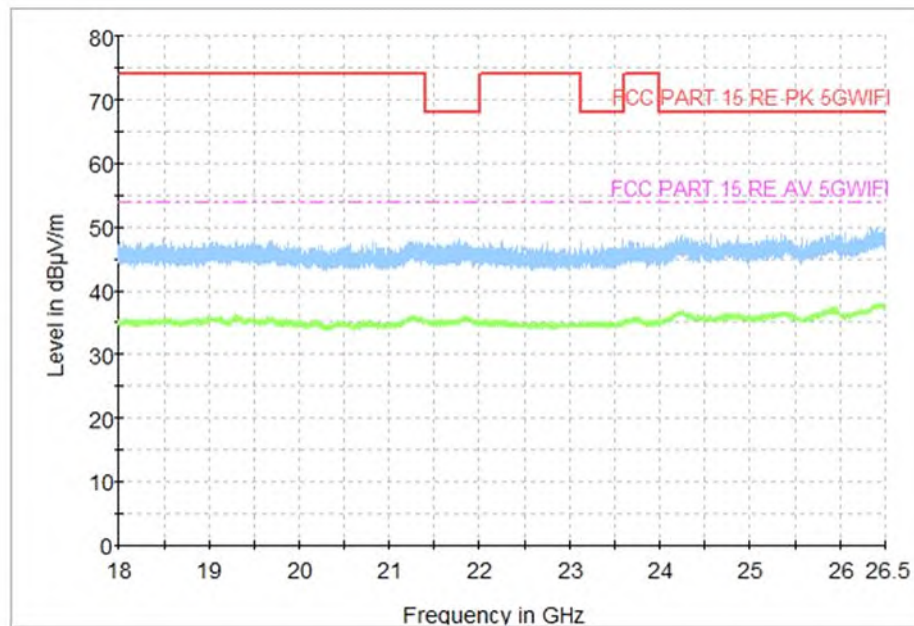


Fig. 96 Transmitter Spurious Emission (All channel, 18GHz~26.5GHz)

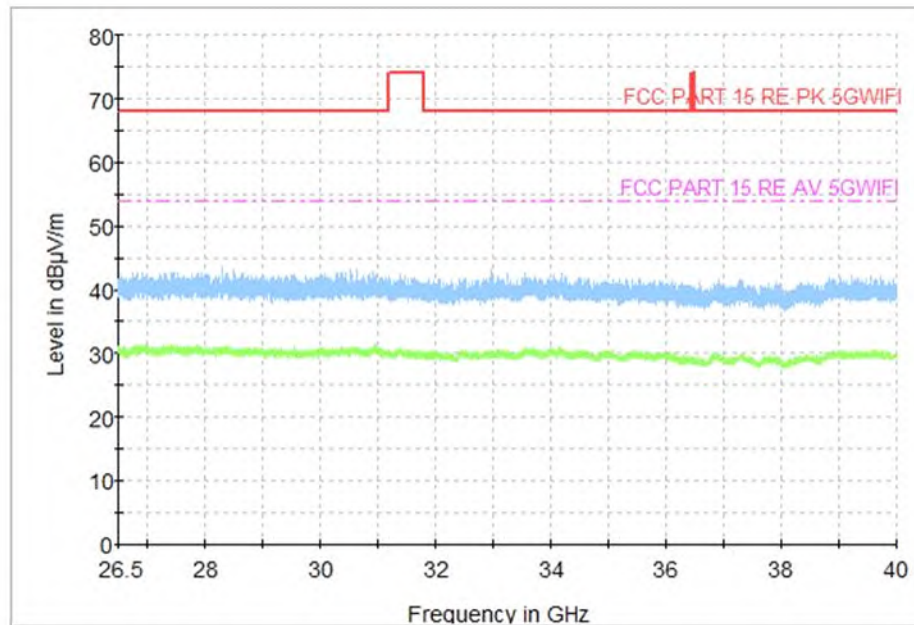


Fig. 97 Transmitter Spurious Emission (All channel, 26.5GHz~40GHz)

A.10. Radiated Spurious Emissions < 30MHz

Measurement Limit (15.209, 9 kHz-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.98	P

See below for test graphs.

Conclusion: PASS

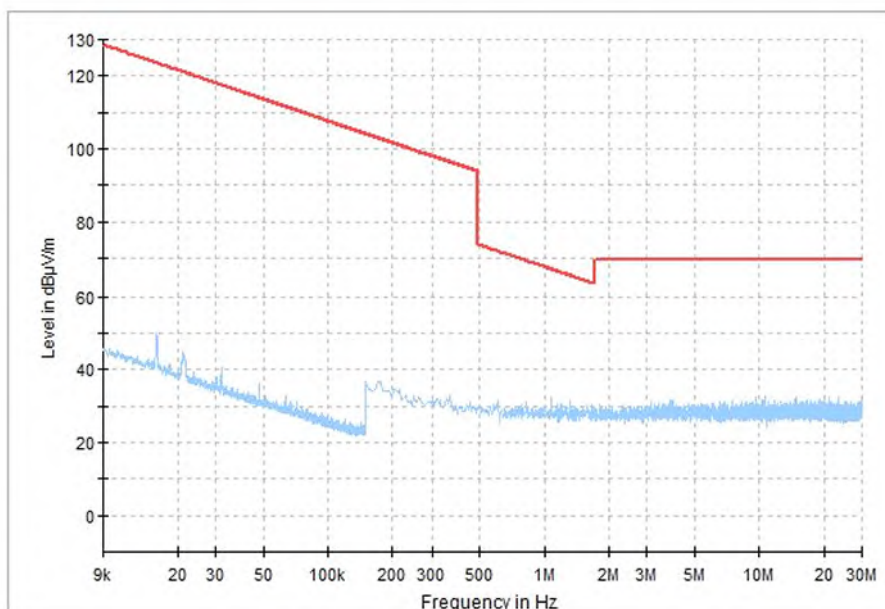


Fig. 98 Radiated Spurious Emission (All Channel, 9 kHz ~30 MHz)

**A.11. AC Power Line Conducted Emission****Test Condition:**

Voltage (V)	Frequency (Hz)
120	60

Measurement Result and limit:**RLAN- A2, A3**

Frequency range (MHz)	Quasi-peak Limit (dB μ V)	Average-peak Limit (dB μ V)	Result (dB μ V)		Conclusion
			Traffic	Idle	
0.15 to 0.5	66 to 56	56 to 46	Fig.99	Fig.100	P
0.5 to 5	56	46			
5 to 30	60	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.

See below for test graphs.

Conclusion: PASS

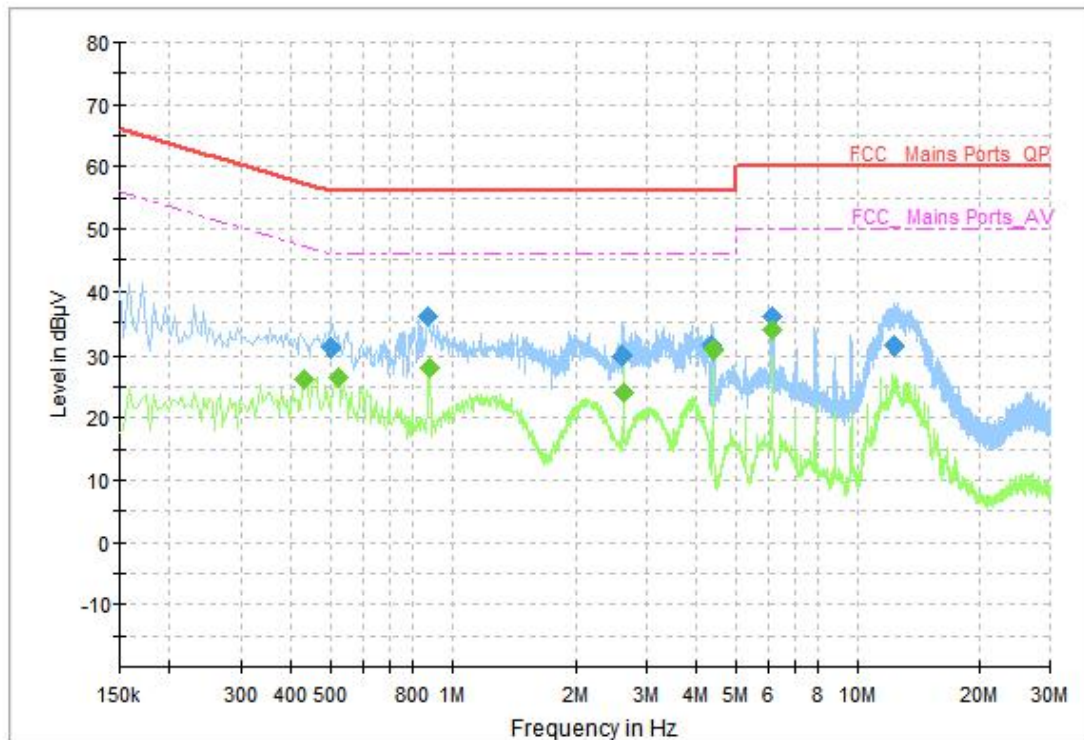


Fig. 99 AC Power line Conducted Emission (Traffic)

Measurement Result: Quasi Peak

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.498000	31.12	56.03	24.91	N	ON	10
0.874000	35.86	56.00	20.14	N	ON	10
2.618000	29.79	56.00	26.21	N	ON	10
4.350000	31.42	56.00	24.58	L1	ON	10
6.146000	36.01	60.00	23.99	L1	ON	10
12.354000	31.43	60.00	28.57	N	ON	10

Measurement Result: Average

Frequency (MHz)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.430000	26.15	47.25	21.10	N	ON	10
0.522000	26.55	46.00	20.45	N	ON	10
0.878000	28.07	46.00	17.93	N	ON	10
2.638000	23.98	46.00	22.02	N	ON	10
4.390000	30.72	46.00	15.28	L1	ON	10
6.146000	33.71	50.00	16.29	L1	ON	10

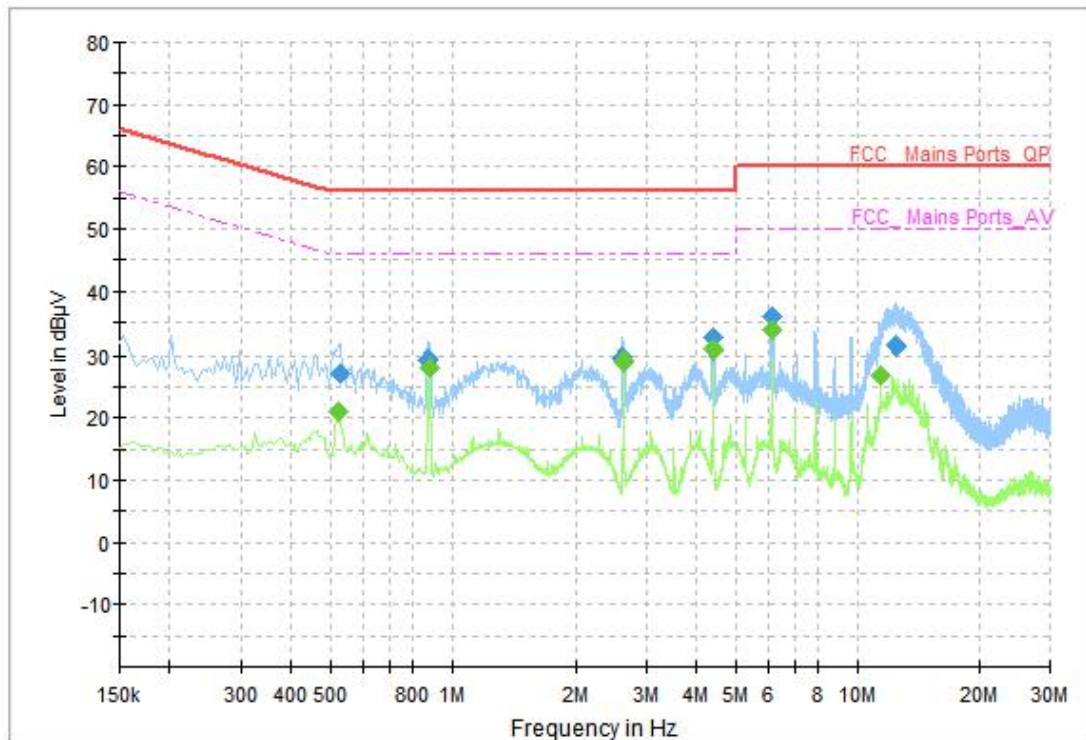


Fig. 100 AC Power line Conducted Emission (Idle)

Measurement Result: Quasi Peak

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.526000	26.99	56.00	29.01	N	ON	10
0.870000	29.10	56.00	26.90	L1	ON	10
2.610000	29.69	56.00	26.31	N	ON	10
4.390000	32.66	56.00	23.34	L1	ON	10
6.146000	35.95	60.00	24.05	L1	ON	10
12.482000	31.35	60.00	28.65	N	ON	10

Measurement Result: Average

Frequency (MHz)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.522000	20.92	46.00	25.08	L1	ON	10
0.878000	28.02	46.00	17.98	N	ON	10
2.634000	28.93	46.00	17.07	L1	ON	10
4.390000	30.66	46.00	15.34	L1	ON	10
6.146000	33.72	50.00	16.28	L1	ON	10
11.414000	26.74	50.00	23.26	N	ON	10



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*****