



FCC PART 15C TEST REPORT No.I23Z61566-IOT03

for

Wingtech Group (Hong Kong) Limited

4G Mobile Hotspot

ATTCKTHS02

FCC ID:2APXW-ATTCKTHS02

with

Hardware Version: 80177_1_11

Software Version: ATTCKTHS02_0.00.010

Issued Date: 2023-10-11

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 CTTL.

Test Laboratory:

CTTL-Telecommunication Technology Labs, CAICT

No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504

Email: ctl_terminals@caict.ac.cn, website: www.caict.ac.cn



No.I23Z61566-IOT03

REPORT HISTORY

Report Number	Revision	Description	Issue Date
I23Z61566-IOT03	Rev.0	1st edition	2023-10-11

Note: the latest revision of the test report supersedes all previous version.

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1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under American Association for Laboratory Accreditation (A2LA) with lab code 7049.01, and is also an FCC accredited test laboratory (CN1349), and ISED accredited test laboratory (CAB identifier:CN0066). The detail accreditation scope can be found on A2LA website.

1.2. Testing Location

Conducted testing Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing,
P. R. China100191

Radiated testing Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing,
P. R. China100191

1.3. TestingEnvironment

Normal Temperature: 15-35°C

Relative Humidity: 20-75%

1.4. Project date

Testing Start Date: 2023-08-30

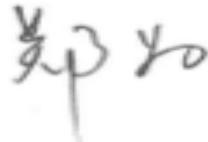
Testing End Date: 2023-10-11

1.5. Signature



Yao Xingyu

(Prepared this test report)



Zheng Wei

(Reviewed this test report)



Pang Shuai

(Approved this test report)



2. Client Information

2.1. Applicant Information

Company Name: Wingtech Group (Hong Kong) Limited
Address: Flat/RM 1903 19/F, Podium Plaza, 5 Hanoi Road, Tsim Sha Tsui, KL,
HK
City: Hong Kong
Postal Code: /
Country: China
Telephone: +86-21-53529900
Fax: /

2.2. Manufacturer Information

Company Name: Wingtech Group (Hong Kong) Limited
Address: Flat/RM 1903 19/F, Podium Plaza, 5 Hanoi Road, Tsim Sha Tsui, KL,
HK
City: Hong Kong
Postal Code: /
Country: China
Telephone: +86-21-53529900
Fax: /

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

3.1. About EUT

Description	4G Mobile Hotspot
Model name	ATTCKTHS02
FCC ID	2APXW-ATTCKTHS02
WLAN Frequency Band	ISM Band: 5725MHz~5850MHz
Type of modulation	OFDM
Nominal Voltage	3.8V
Extreme High Voltage	4.4V
Extreme Low Voltage	3.6V

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version	Date of receipt
UT24a	864747070000451	80177_1_11	ATTCKTHS02_0.00.010	2023-08-24
UT53a	864747070000022	80177_1_11	ATTCKTHS02_0.00.010	2023-09-11

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

UT24a is used for Conduction test, UT53a is used for Radiation test.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Type	SN
AE1	Battery	/	/
AE2	Charger	/	/
AE3	USB Cable	/	/
AE1			
	Model	MF02	
	Manufacturer	Jiade Energy Technology (Zhuhai) Co., Ltd.	
	Capacity	3000mAh	
	Nominal Voltage	3.85V	
AE2			
	Model	PA-US5V2A-036	
	Manufacturer	HUIZHOU PUAN ELECTRONICS Co., Ltd.	
	Length of cable	/	
AE3			
	Model	HX-WT-54	
	Manufacturer	HEXIN	
	Length of cable	/	

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

3.4. General Description

Equipment Under Test (EUT) is a model of 4G Mobile Hotspot with integrated antenna. It consists of normal options: Battery and Charger.

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.

FCC Part15	FCC CFR 47, Part 15, Subpart C and E: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.407 General technical requirements	2021
ANSI C63.10	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2013
UNII: KDB 789033 D02	General U-NII Test Procedures New Rules v02r01	2017-12

5. Laboratory Environment

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

6. Test Results

6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.407 (a)	/	P
Peak Power Spectral Density	15.407 (a)	/	P
Occupied 6dB Bandwidth	15.407 (e)	/	P
Band Edges Compliance - Conducted& Radiated	15.407 (b)	/	P
Transmitter Spurious Emission - Radiated	15.407, 15.205, 15.209	/	P
AC Powerline Conducted Emission	15.107, 15.207	/	P

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

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NM	Not measured, The test was not measured by CTTL
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard

6.2. Statements

CTTL has evaluated the test cases as listed in section 6.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.

This report only deals with the WLAN function among the features described in section 3.

6.3. Test Conditions

For this report, all the test cases are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

Temperature	26°C
Voltage	3.8V
Humidity	44%

7. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	1 year	2024-07-04
2	LISN	ENV216	101200	R&S	1 year	2024-06-05
3	Test Receiver	ESCI	100344	R&S	1 year	2024-02-21
4	Attenuator	10dB/2W	/	Rosenberger	/	/
5	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESW44	103144	R&S	1 year	2023-10-25
2	EMI Antenna	VULB 9163	01222	SCHWARZBE CK	1 year	2024-02-28
3	EMI Antenna	3115	6914	ETS-Lindgren	1 year	2024-04-25
4	EMI Antenna	3116	2661	ETS-Lindgren	1 year	2024-01-30

8. Measurement Uncertainty

8.1. Transmitter Output Power

Measurement Uncertainty: 0.387dB,k=1.96

8.2. Peak Power Spectral Density

Measurement Uncertainty: 0.705dB,k=1.96

8.3. 6dB Emission Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

8.4. Band Edges Compliance

Measurement Uncertainty : 0.62dB,k=1.96

8.5. Spurious Emissions

Conducted (k=1.96)

Frequency Range	Uncertainty(dB)
$30\text{MHz} \leq f \leq 2\text{GHz}$	1.22
$2\text{GHz} \leq f \leq 3.6\text{GHz}$	1.22
$3.6\text{GHz} \leq f \leq 8\text{GHz}$	1.22
$8\text{GHz} \leq f \leq 12.75\text{GHz}$	1.51
$12.75\text{GHz} \leq f \leq 26\text{GHz}$	1.51
$26\text{GHz} \leq f \leq 40\text{GHz}$	1.59

Radiated (k=2)

Frequency Range	Uncertainty(dB)
9kHz-30MHz	/
$30\text{MHz} \leq f \leq 1\text{GHz}$	4.72
$1\text{GHz} \leq f \leq 18\text{GHz}$	4.84
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.12

8.6. AC Power-line Conducted Emission

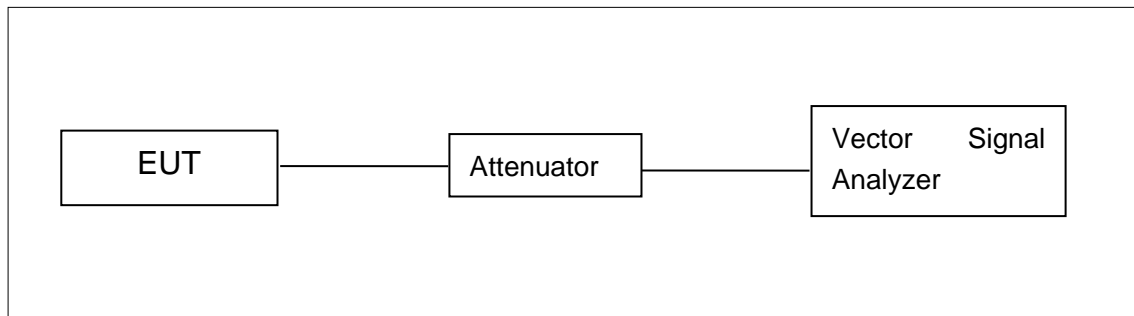
Measurement Uncertainty : 3.08dB,k=2

ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

A.1.1. Conducted Measurements

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

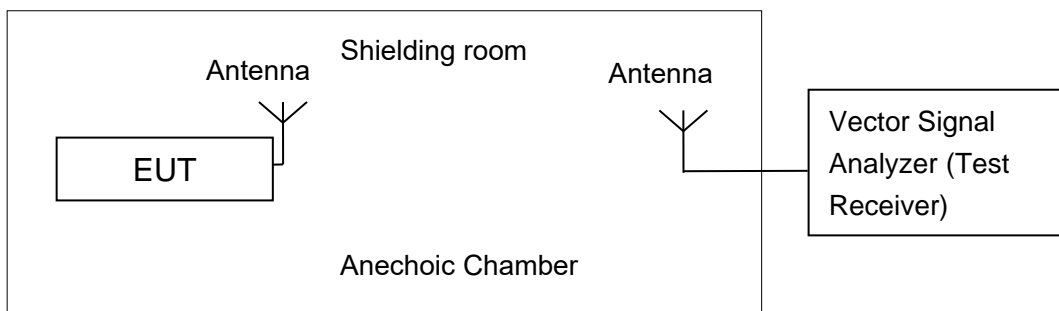


A.1.2. Radiated Emission Measurements

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

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

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 3MHz;



The measurement is made according to ANSI C63.10.

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

A.2. Maximum Peak Output Power

Measurement Limit and Method:

Standard	Limit (dBm)
FCC CRF Part 15.407(a)	< 30

Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.

Set RBW = 1 MHz.

Set VBW \geq 3 MHz.

Number of points in sweep $\geq 2 \times$ span / RBW.

Sweep time = auto.

Detector = power averaging (rms)

Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.

Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal. Add 10 log (1/x), where x is the duty cycle

A.2.1 Antenna Gain

Antenna gain is 1.9dBi and the value is supplied by the applicant or manufacturer.

A.2.2. Maximum Average Output Power-Conducted

EUT ID: UT24a

Measurement Results:

802.11a mode

Mode	Data Rate (Mbps)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11a	6	18.70	18.71	18.68
	9	/	/	/
	12	/	/	/
	18	/	/	/
	24	/	/	/
	36	/	/	/
	48	/	/	/
	54	/	/	/

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

802.11n-HT20 mode

Mode	Data Rate (Index)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11n (20MHz)	MCS0	18.45	18.48	18.42
	MCS1	/	/	/
	MCS2	/	/	/
	MCS3	/	/	/
	MCS4	/	/	/
	MCS5	/	/	/
	MCS6	/	/	/
	MCS7	/	/	/

The data rate MSC0 is selected as worst condition, and the following cases are performed with this condition.

802.11ac-HT20 mode

Mode	Data Rate (Index)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11ac (20MHz)	MCS0	18.42	18.47	17.91
	MCS1	/	/	/
	MCS2	/	/	/
	MCS3	/	/	/
	MCS4	/	/	/
	MCS5	/	/	/
	MCS6	/	/	/
	MCS7	/	/	/
	MCS8	/	/	/

The data rate MSC0 is selected as worst condition, and the following cases are performed with this condition.

802.11n-HT40 mode

Mode	Data Rate (Index)	Test Result (dBm)	
		5755MHz (Ch151)	5795MHz (Ch159)
802.11n (40MHz)	MCS0	18.72	18.75
	MCS1	/	/
	MCS2	/	/
	MCS3	/	/
	MCS4	/	/
	MCS5	/	/
	MCS6	/	/
	MCS7	/	/

The data rate MSC0 is selected as worst condition, and the following cases are performed with this condition.

802.11ac-HT40 mode

Mode	Data Rate (Index)	Test Result (dBm)	
		5755MHz (Ch151)	5795MHz (Ch159)
802.11ac (40MHz)	MCS0	18.72	18.73
	MCS1	/	/
	MCS2	/	/
	MCS3	/	/
	MCS4	/	/
	MCS5	/	/
	MCS6	/	/
	MCS7	/	/
	MCS8	/	/
	MCS9	/	/

The data rate MSC0 is selected as worst condition, and the following cases are performed with this condition.

802.11ac-HT80 mode

Mode	Data Rate (Index)	Test Result (dBm)
		5775MHz (Ch155)
802.11ac (80MHz)	MCS0	18.12
	MCS1	/
	MCS2	/
	MCS3	/
	MCS4	/
	MCS5	/
	MCS6	/
	MCS7	/
	MCS8	/
	MCS9	/

The data rate MSC0 is selected as worst condition, and the following cases are performed with this condition.

Duty Cycle

Mode	802.11a	802.11n20	802.11n40	802.11ac20	802.11ac40	802.11ac80
Duty Cycle	99%	99%	98%	99%	98%	98%



Maximum output Power

Conclusion: PASS

A.3. Peak Power Spectral Density

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.407(a)	< 30 dBm/500 kHz

Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.

Set RBW = 500 kHz.

Set VBW \geq 3 MHz.

Number of points in sweep $\geq 2 \times$ span / RBW.

Sweep time = auto.

Detector = power averaging (rms)

Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter. Use the peak search function on the instrument to find the peak of the spectrum and record its value. Add $10 \log (1/x)$, where x is the duty cycle.

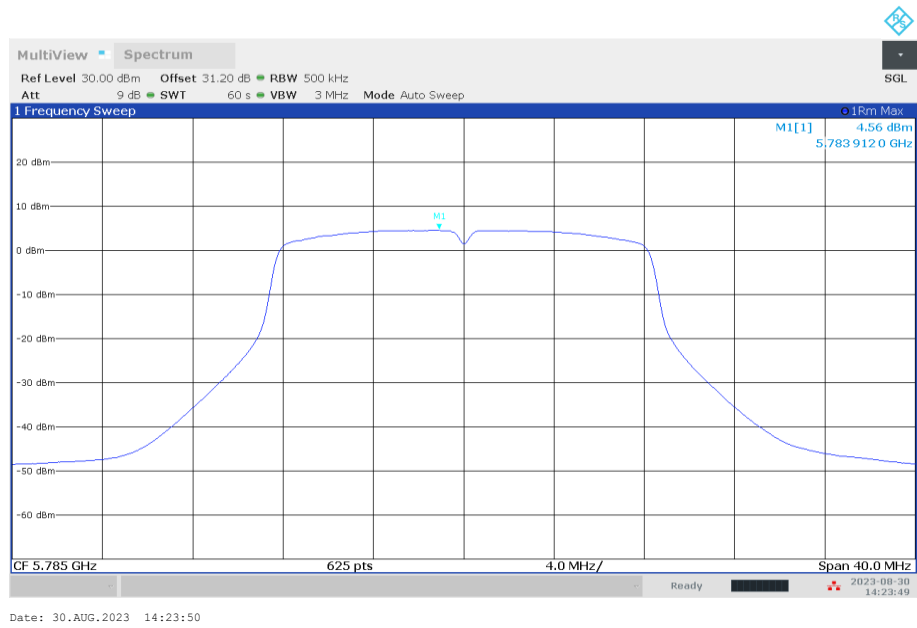
Measurement Uncertainty:

Measurement Uncertainty	0.75dB
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EUT ID: UT24a

Measurement Results:

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11a	149	4.50	P
	157	4.56	P
	165	4.52	P
802.11n HT20	149	4.13	P
	157	4.16	P
	165	4.10	P
802.11n HT40	151	1.45	P
	159	1.46	P
802.11ac HT80	155	-2.19	P



Peak Power Spectral Density

Conclusion: PASS

A.4. 6dB Emission Bandwidth

Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.407 (e)	≥ 500

Set RBW = 100 kHz.

Set the video bandwidth (VBW) ≥ 3 × RBW.

Detector = Peak.

Trace mode = max hold.

Sweep = auto couple.

Allow the trace to stabilize.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Measurement Uncertainty:

Measurement Uncertainty	60.80Hz
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EUT ID: UT24a

Measurement Result:

Mode	Channel	6dB Emission Bandwidth (MHz)		conclusion
		Fig.	Value	
802.11a	149	Fig.1	15.62	P
	157	Fig.2	15.32	P
	165	Fig.3	15.44	P
802.11n HT20	149	Fig.4	15.12	P
	157	Fig.5	15.12	P
	165	Fig.6	15.12	P
802.11n HT40	151	Fig.7	35.10	P
	159	Fig.8	35.09	P
802.11ac (VHT80)	155	Fig.9	75.07	P

Test graphs as below:

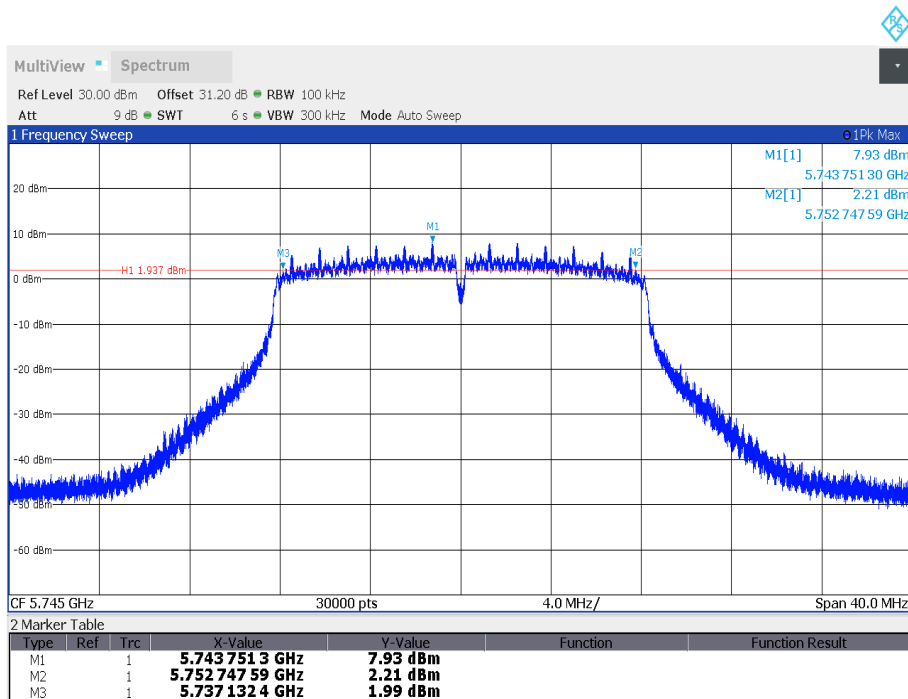


Fig. 1 6dB Emission Bandwidth (802.11a, Ch 149)

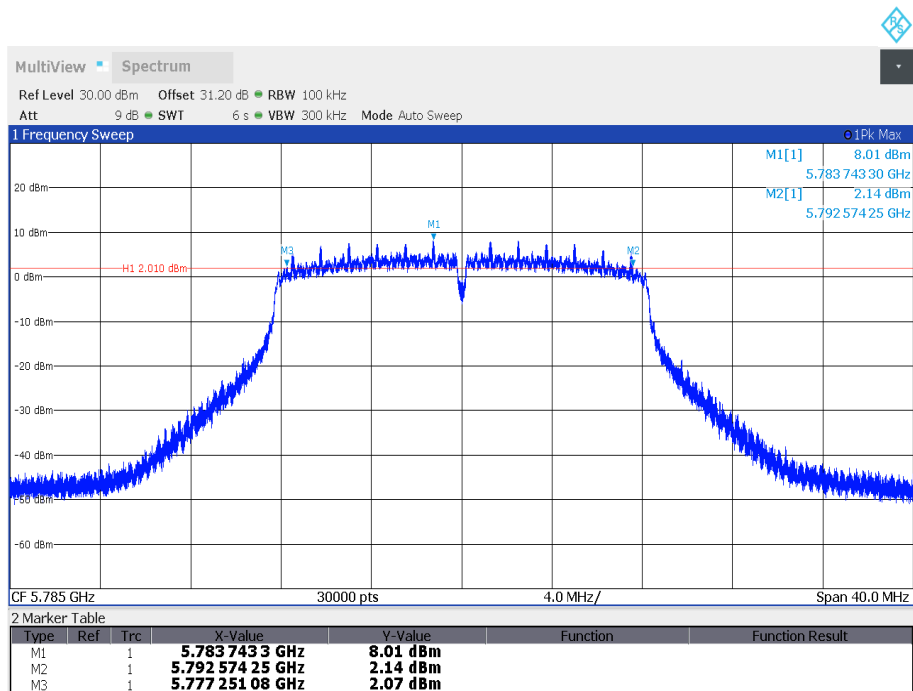


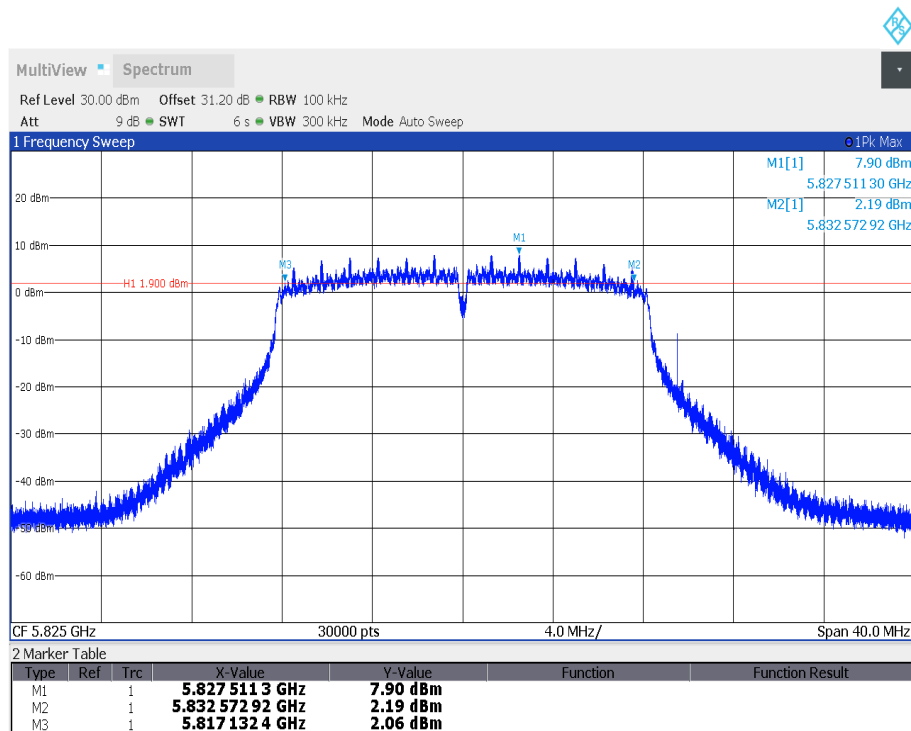
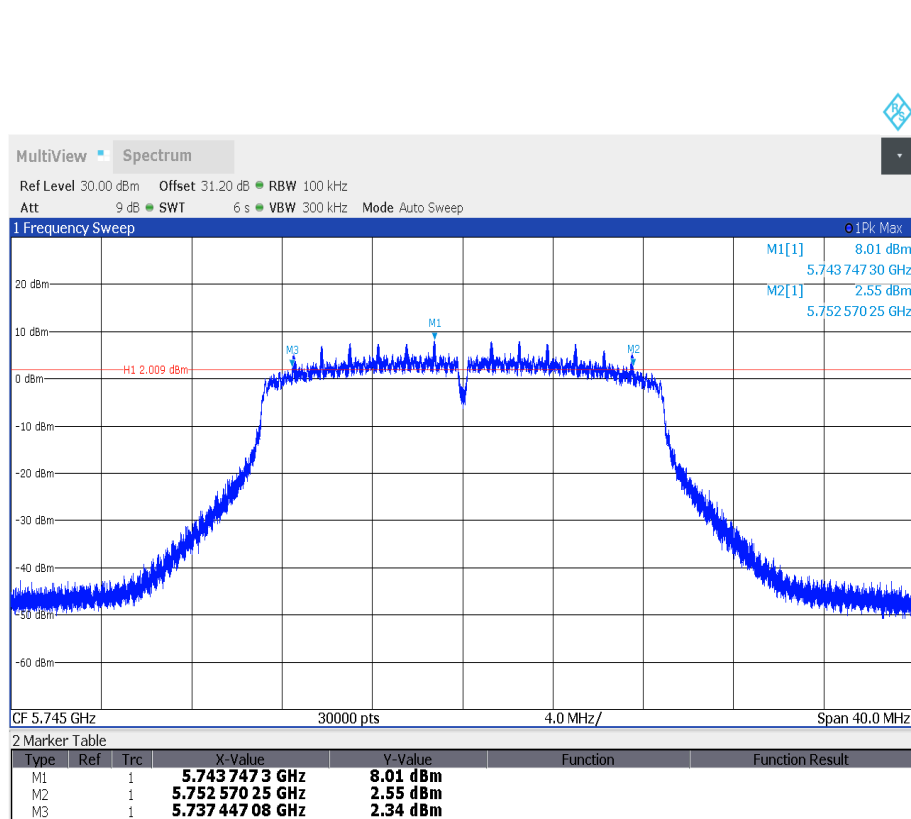
Fig. 2 6dB Emission Bandwidth (802.11a, Ch 157)

Fig. 3 6dB Emission Bandwidth (802.11a, Ch 165)


Fig. 4 6dB Emission Bandwidth (802.11n-HT20, Ch 149)

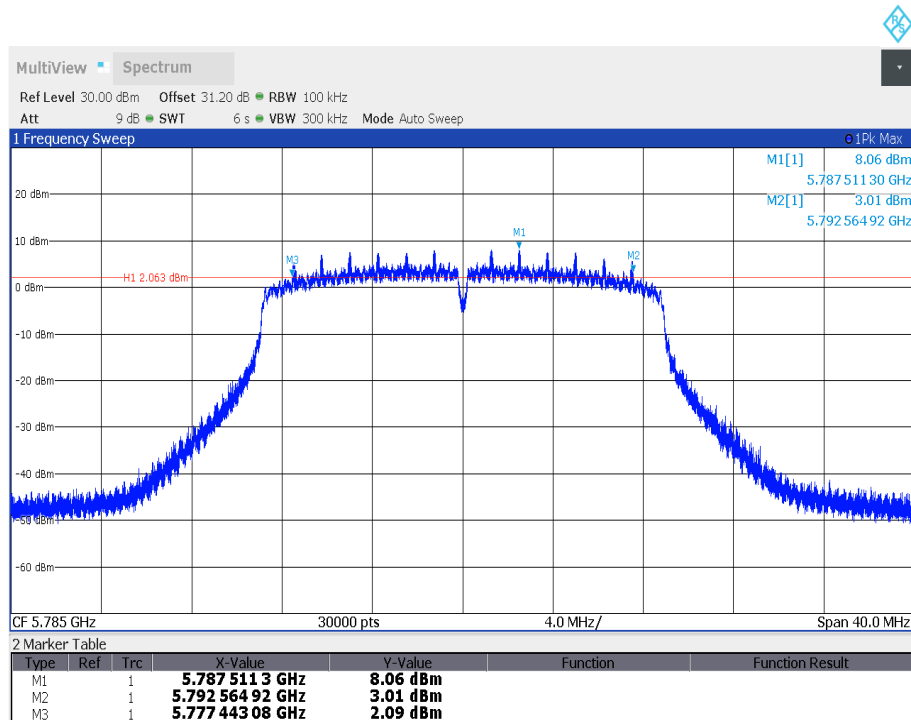


Fig. 5 6dB Emission Bandwidth (802.11n-HT20, Ch 157)

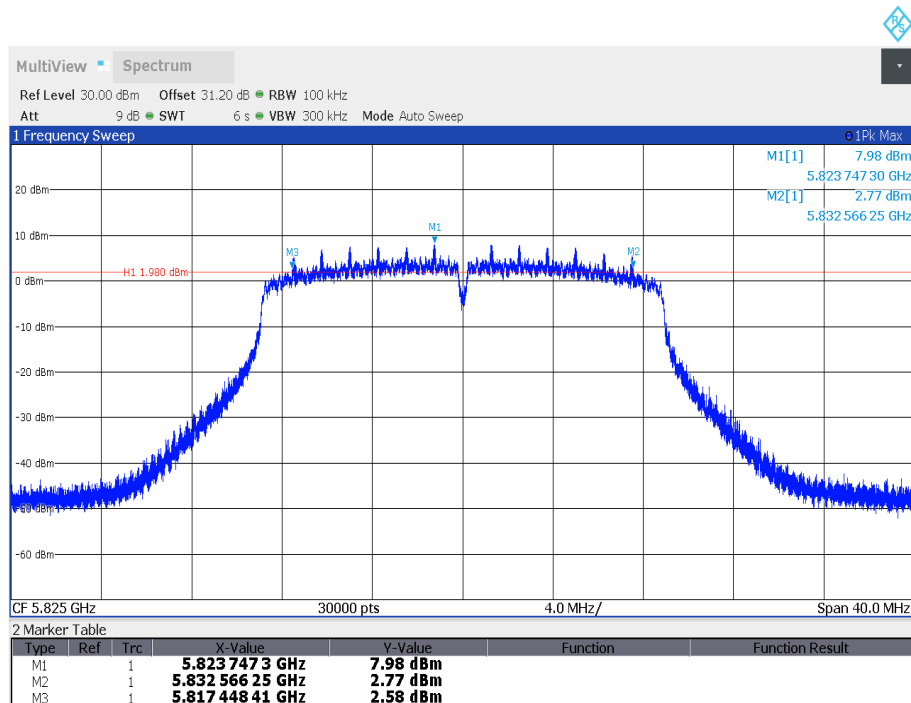


Fig. 6 6dB Emission Bandwidth (802.11n-HT20, Ch 165)

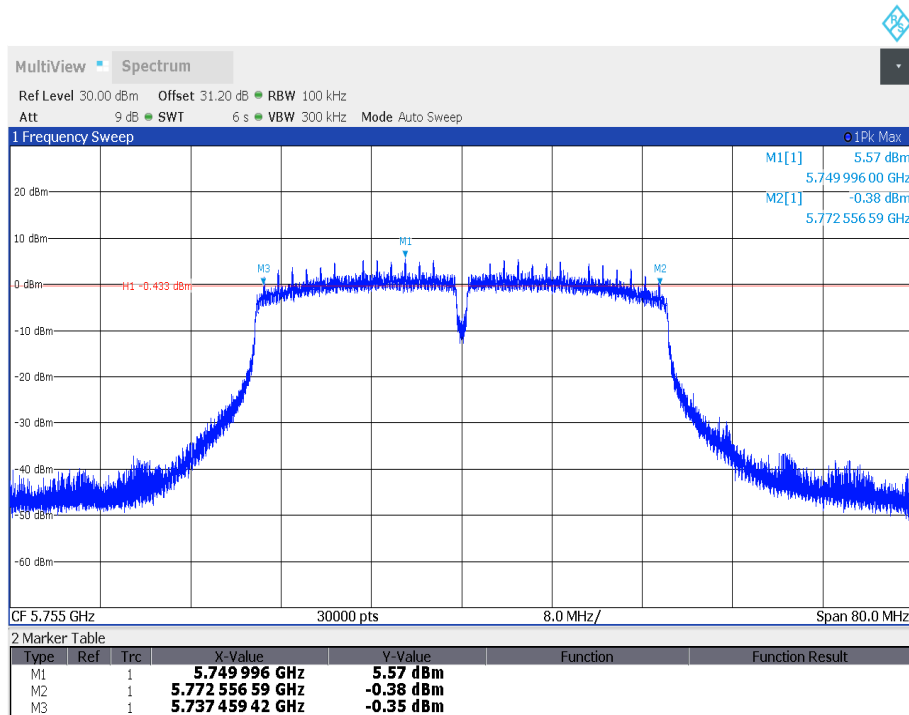


Fig. 7 6dB Emission Bandwidth (802.11n-HT40, Ch 151)

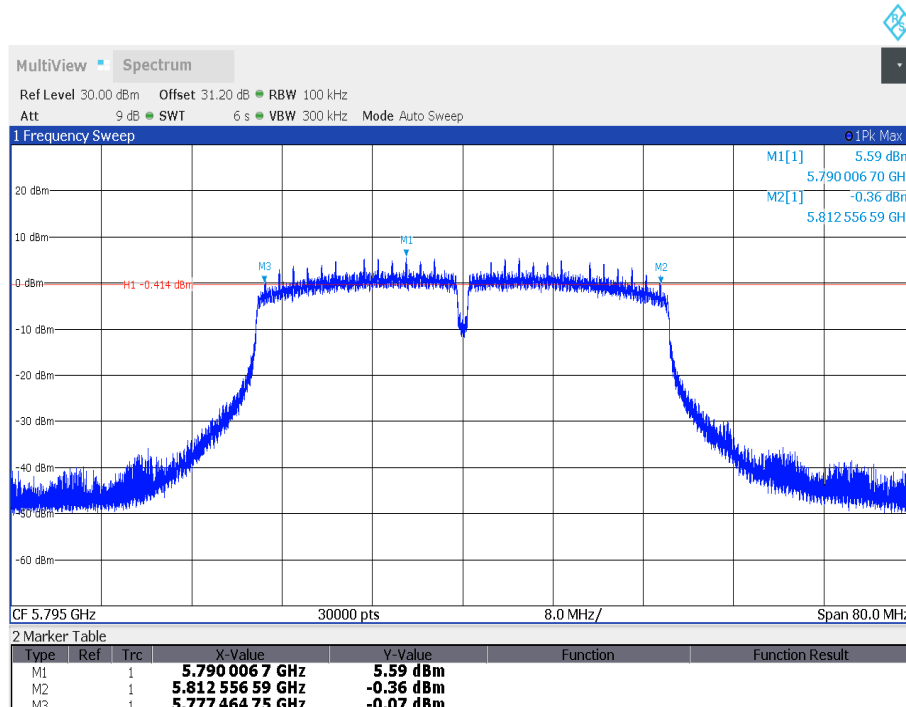


Fig. 8 6dB Emission Bandwidth (802.11n-HT40, Ch 159)

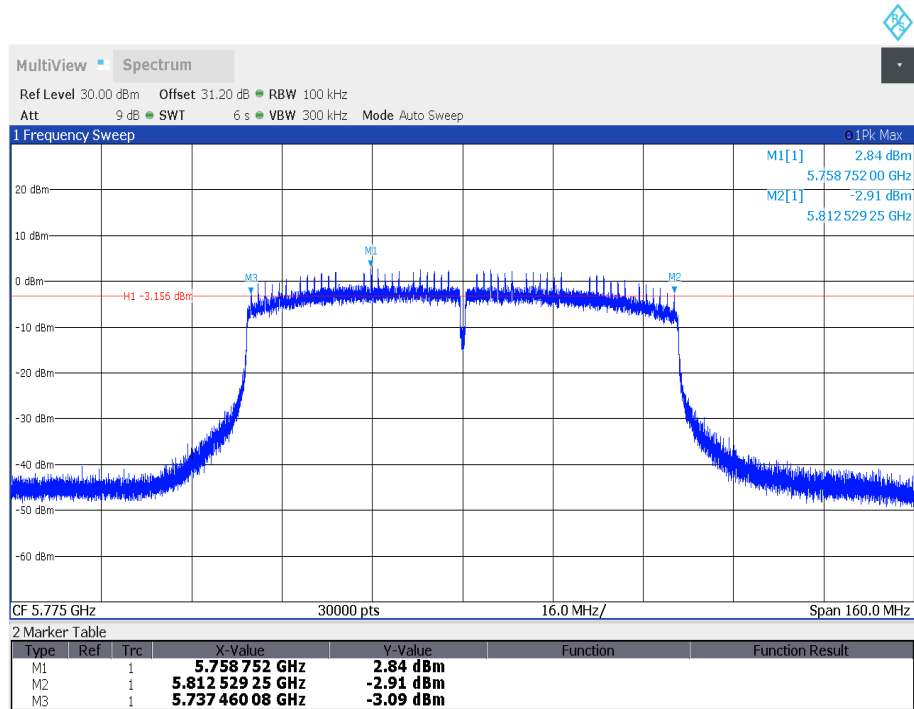


Fig. 9 6dB Emission Bandwidth (802.11ac-VHT80, Ch 155)

Conclusion: PASS

A.5. Transmitter Spurious Emission

A.5.1 Transmitter Spurious Emission - Radiated

Measurement Limit:

Standard	Frequency (MHz)	Limit (dBm/MHz)
FCC 47 CFR Part 15.407	5725MHz~5850MHz	< -27

The measurement is made according to ANSI C63.10 .

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 (uV/m)	Field strength (dBµV/m)	Measurement distance(m)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Measurement Results:

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.

Average Results:
802.11a

Channel 149

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17969.200	43.46	-29.59	45.95	27.10	54.00	10.54	V
17973.600	43.28	-29.59	45.95	26.92	54.00	10.72	V
14499.800	38.27	-29.56	41.90	25.93	54.00	15.73	V
14490.450	38.00	-29.56	41.90	25.66	54.00	16.00	V
11792.700	34.97	-32.09	39.20	27.86	54.00	19.03	V
11889.500	34.92	-32.53	39.10	28.35	54.00	19.08	H

Channel 157

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17962.600	43.45	-29.59	45.95	27.09	54.00	10.55	H
17964.250	43.17	-29.59	45.95	26.81	54.00	10.83	H
14499.800	38.44	-29.56	41.90	26.10	54.00	15.56	V
14491.550	38.12	-29.56	41.90	25.78	54.00	15.88	H
11900.500	35.24	-32.53	39.10	28.67	54.00	18.76	H
11891.700	35.05	-32.53	39.10	28.48	54.00	18.95	V

Channel 165

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17949.400	43.32	-29.59	45.95	26.96	54.00	10.68	V
17971.950	43.29	-29.59	45.95	26.93	54.00	10.71	V
14499.800	38.27	-29.56	41.90	25.93	54.00	15.73	V
14495.400	38.12	-29.56	41.90	25.78	54.00	15.88	V
11785.550	35.42	-32.09	39.20	28.31	54.00	18.58	V
11781.700	35.28	-32.71	39.20	28.79	54.00	18.72	V

802.11n-HT20

Channel 149

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17990.650	43.33	-29.59	45.95	26.97	54.00	10.67	H
17997.250	43.25	-29.59	45.95	26.89	54.00	10.75	V
14497.600	37.90	-29.56	41.90	25.56	54.00	16.10	V
14492.650	37.89	-29.56	41.90	25.55	54.00	16.11	H
11787.200	35.16	-32.09	39.20	28.05	54.00	18.84	V
11888.950	35.03	-32.53	39.10	28.46	54.00	18.97	H

Channel 157

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17974.150	43.22	-29.59	45.95	26.86	54.00	10.78	V
17943.900	43.14	-29.59	45.95	26.78	54.00	10.86	H
14497.050	38.32	-29.56	41.90	25.98	54.00	15.68	V
14494.300	38.24	-29.56	41.90	25.90	54.00	15.76	V
11892.250	35.25	-32.53	39.10	28.68	54.00	18.75	V
11870.800	35.23	-32.73	39.15	28.81	54.00	18.77	V

Channel 165

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17977.450	43.42	-29.59	45.95	27.06	54.00	10.58	V
17959.300	43.20	-29.59	45.95	26.84	54.00	10.80	V
14497.600	38.35	-29.56	41.90	26.01	54.00	15.65	V
14481.100	38.25	-29.56	41.90	25.91	54.00	15.75	H
11782.800	35.89	-32.09	39.20	28.78	54.00	18.11	V
11878.500	35.39	-32.73	39.15	28.97	54.00	18.61	V

802.11n-HT40

Channel 151

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17970.300	43.96	-29.59	45.95	27.60	54.00	10.04	H
17976.350	43.51	-29.59	45.95	27.15	54.00	10.49	H
14493.750	38.52	-29.56	41.90	26.18	54.00	15.48	V
14486.050	38.04	-29.56	41.90	25.70	54.00	15.96	V
11902.150	35.48	-32.53	39.10	28.91	54.00	18.52	H
11779.500	35.43	-32.71	39.20	28.94	54.00	18.57	H

Channel 159

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17961.500	43.70	-29.59	45.95	27.34	54.00	10.30	V
17948.300	43.37	-29.59	45.95	27.01	54.00	10.63	V
14499.250	38.56	-29.56	41.90	26.22	54.00	15.44	V
14495.950	38.39	-29.56	41.90	26.05	54.00	15.61	V
11785.550	35.44	-32.09	39.20	28.33	54.00	18.56	V
11868.600	35.42	-32.73	39.15	29.00	54.00	18.58	H

802.11ac-HT20

Channel 149

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17974.150	43.29	-29.59	45.95	26.93	54.00	10.71	H
17975.800	43.28	-29.59	45.95	26.92	54.00	10.72	H
14495.950	37.94	-29.56	41.90	25.60	54.00	16.06	H
14484.400	37.83	-29.56	41.90	25.49	54.00	16.17	V
11892.250	35.17	-32.53	39.10	28.60	54.00	18.83	H
11801.500	35.12	-32.09	39.20	28.01	54.00	18.88	V

Channel 157

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17978.000	43.21	-29.59	45.95	26.85	54.00	10.79	V
17975.250	43.17	-29.59	45.95	26.81	54.00	10.83	V
14490.450	38.19	-29.56	41.90	25.85	54.00	15.81	V
14492.100	38.05	-29.56	41.90	25.71	54.00	15.95	V
11782.800	35.19	-32.09	39.20	28.08	54.00	18.81	H
11889.500	35.14	-32.53	39.10	28.57	54.00	18.86	H

Channel 165

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17969.750	43.31	-29.59	45.95	26.95	54.00	10.69	V
17957.100	43.24	-29.59	45.95	26.88	54.00	10.76	V
14498.700	38.06	-29.56	41.90	25.72	54.00	15.94	V
14499.250	38.04	-29.56	41.90	25.70	54.00	15.96	V
11893.900	35.51	-32.53	39.10	28.94	54.00	18.49	H
11864.750	35.33	-32.73	39.15	28.91	54.00	18.67	V

802.11ac-HT40

Channel 151

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17971.400	43.23	-29.59	45.95	26.87	54.00	10.77	H
17975.250	43.22	-29.59	45.95	26.86	54.00	10.78	V
14498.700	38.54	-29.56	41.90	26.20	54.00	15.46	V
14483.850	38.51	-29.56	41.90	26.17	54.00	15.49	V
11784.450	35.42	-32.09	39.20	28.31	54.00	18.58	V
11893.350	35.33	-32.53	39.10	28.76	54.00	18.67	H

Channel 159

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17978.000	43.58	-29.59	45.95	27.22	54.00	10.42	V
17878.450	43.24	-29.59	45.95	26.88	54.00	10.76	V
14497.600	38.38	-29.56	41.90	26.04	54.00	15.62	H
14477.250	38.33	-29.56	41.90	25.99	54.00	15.67	H
11792.150	35.50	-32.09	39.20	28.39	54.00	18.50	V
11892.250	35.44	-32.53	39.10	28.87	54.00	18.56	H

802.11ac-HT80

Channel 155

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17969.200	43.40	-29.59	45.95	27.04	54.00	10.60	V
17977.450	43.37	-29.59	45.95	27.01	54.00	10.63	V
14499.250	38.53	-29.56	41.90	26.19	54.00	15.47	V
14499.800	38.35	-29.56	41.90	26.01	54.00	15.65	H
11891.150	35.59	-32.53	39.10	29.02	54.00	18.41	V
11878.500	35.55	-32.73	39.15	29.13	54.00	18.45	V

Peak Results:
802.11a

Channel 149

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17974.700	54.55	-29.59	45.95	38.19	74.00	19.45	V
17903.200	54.38	-29.59	45.95	38.02	74.00	19.62	H
14605.950	50.26	-30.67	41.70	39.23	68.20	17.94	H
14593.300	50.00	-29.14	41.90	37.24	68.20	18.20	V
11914.800	45.94	-32.53	39.10	39.37	74.00	28.06	V
11796.550	45.73	-32.09	39.20	38.62	74.00	28.27	H

Channel 157

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17892.200	54.68	-29.59	45.95	38.32	74.00	19.32	V
17970.850	54.33	-29.59	45.95	37.97	74.00	19.67	V
14592.750	50.75	-29.14	41.90	37.99	68.20	17.45	H
14689.000	50.49	-30.04	41.50	39.03	68.20	17.71	V
11754.750	46.52	-32.71	39.20	40.03	74.00	27.48	V
11896.100	46.19	-32.53	39.10	39.62	74.00	27.81	H

Channel 165

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17957.100	55.13	-29.59	45.95	38.77	74.00	18.87	H
17984.050	55.09	-29.59	45.95	38.73	74.00	18.91	V
14605.950	50.40	-30.67	41.70	39.37	68.20	17.80	H
14610.900	49.96	-30.67	41.70	38.93	68.20	18.24	V
11918.650	46.76	-32.53	39.10	40.19	74.00	27.24	V
11875.200	46.46	-32.73	39.15	40.04	74.00	27.54	H

802.11n-HT20

Channel 149

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17935.100	54.09	-29.59	45.95	37.73	74.00	19.91	V
17934.550	53.83	-29.59	45.95	37.47	74.00	20.17	H
14521.250	50.05	-30.55	41.90	38.70	68.20	18.15	H
14664.250	49.97	-30.04	41.50	38.51	68.20	18.23	V
11903.250	45.89	-32.53	39.10	39.32	74.00	28.11	H
11904.900	45.72	-32.53	39.10	39.15	74.00	28.28	V

Channel 157

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17902.650	54.11	-29.59	45.95	37.75	74.00	19.89	H
17997.800	53.93	-29.59	45.95	37.57	74.00	20.07	V
14199.500	50.37	-30.42	41.70	39.09	68.20	17.83	H
14569.100	50.20	-29.14	41.90	37.44	68.20	18.00	H
11880.700	46.65	-32.73	39.15	40.23	74.00	27.35	V
11780.600	46.24	-32.71	39.20	39.75	74.00	27.76	H

Channel 165

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17996.700	54.41	-29.59	45.95	38.05	74.00	19.59	V
17890.550	54.10	-29.59	45.95	37.74	74.00	19.90	V
14575.700	50.41	-29.14	41.90	37.65	68.20	17.79	V
14484.950	50.16	-29.56	41.90	37.82	74.00	23.84	V
11778.950	46.85	-32.71	39.20	40.36	74.00	27.15	H
11782.250	46.20	-32.09	39.20	39.09	74.00	27.80	H

802.11n-HT40

Channel 151

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17953.250	54.22	-29.59	45.95	37.86	74.00	19.78	H
17956.000	54.01	-29.59	45.95	37.65	74.00	19.99	V
14512.450	50.84	-30.55	41.90	39.49	68.20	17.36	V
14590.550	50.49	-29.14	41.90	37.73	68.20	17.71	H
11253.700	46.29	-32.99	38.65	40.63	74.00	27.71	V
11797.650	46.04	-32.09	39.20	38.93	74.00	27.96	V

Channel 159

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17951.600	54.94	-29.59	45.95	38.58	74.00	19.06	V
17917.500	54.13	-29.59	45.95	37.77	74.00	19.87	V
14521.250	50.45	-30.55	41.90	39.10	68.20	17.75	H
14596.050	50.42	-29.14	41.90	37.66	68.20	17.78	H
11855.400	46.41	-32.73	39.15	39.99	74.00	27.59	H
11785.550	46.18	-32.09	39.20	39.07	74.00	27.82	V

802.11ac-HT20

Channel 149

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17923.000	53.76	-29.59	45.95	37.40	74.00	20.24	V
17961.500	53.74	-29.59	45.95	37.38	74.00	20.26	H
14692.850	50.53	-30.04	41.50	39.07	68.20	17.67	V
14692.300	50.31	-30.04	41.50	38.85	68.20	17.89	V
11884.000	46.27	-32.53	39.10	39.70	74.00	27.73	H
11796.550	46.04	-32.09	39.20	38.93	74.00	27.96	V

Channel 157

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17964.800	55.23	-29.59	45.95	38.87	74.00	18.77	H
17881.750	54.91	-29.59	45.95	38.55	74.00	19.09	H
14584.500	50.77	-29.14	41.90	38.01	68.20	17.43	H
14597.150	50.47	-29.14	41.90	37.71	68.20	17.73	V
11783.350	46.83	-32.09	39.20	39.72	74.00	27.17	H
11786.650	46.57	-32.09	39.20	39.46	74.00	27.43	V

Channel 165

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17943.350	54.57	-29.59	45.95	38.21	74.00	19.43	H
17921.350	54.07	-29.59	45.95	37.71	74.00	19.93	V
14598.800	50.12	-29.14	41.90	37.36	68.20	18.08	V
14178.600	50.11	-30.42	41.70	38.83	68.20	18.09	V
11398.350	46.49	-32.58	39.00	40.07	74.00	27.51	V
11858.700	46.43	-32.73	39.15	40.01	74.00	27.57	V

802.11ac-HT40

Channel 151

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17959.300	54.44	-29.59	45.95	38.08	74.00	19.56	V
17926.850	53.94	-29.59	45.95	37.58	74.00	20.06	H
14609.800	50.05	-30.67	41.70	39.02	68.20	18.15	V
13735.850	49.91	-31.18	41.10	39.99	68.20	18.29	V
11903.250	46.38	-32.53	39.10	39.81	74.00	27.62	V
11819.650	46.37	-32.09	39.20	39.26	74.00	27.63	V

Channel 159

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17975.250	54.42	-29.59	45.95	38.06	74.00	19.58	H
17968.100	54.20	-29.59	45.95	37.84	74.00	19.80	V
14701.100	51.12	-30.04	41.50	39.66	68.20	17.08	H
14552.600	50.43	-30.55	41.90	39.08	68.20	17.77	V
11908.200	47.19	-32.53	39.10	40.62	74.00	26.81	V
11797.650	46.77	-32.09	39.20	39.66	74.00	27.23	H

802.11ac-HT80

Channel 155

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17964.800	53.98	-29.59	45.95	37.62	74.00	20.02	V
17979.650	53.83	-29.59	45.95	37.47	74.00	20.17	H
14190.700	50.77	-30.42	41.70	39.49	68.20	17.43	V
14511.900	50.48	-30.55	41.90	39.13	68.20	17.72	V
11788.850	46.28	-32.09	39.20	39.17	74.00	27.72	V
11907.100	46.27	-32.53	39.10	39.70	74.00	27.73	H

Conclusion: PASS

A.6. Band Edges Compliance

A6.1 Band Edges - Radiated

Measurement Limit:

Standard	Limit (dBm/MHz)	
FCC 47 CFR Part 15.407	at the band edge	27
	at 5 MHz above or below the band edge	15.6
	at 25 MHz above or below the band edge	10
	at 75 MHz or more above or below the band edge	-27
	Note: increasing linearly from point to point.	

The measurement is made according to KDB 789033 D02

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	5745 MHz	Fig.10	P
	5825 MHz	Fig.11	P
802.11n HT20	5745 MHz	Fig.12	P
	5825 MHz	Fig.13	P
802.11n HT40	5755 MHz	Fig.14	P
	5795 MHz	Fig.15	P
802.11ac HT20	5745 MHz	Fig.16	P
	5825 MHz	Fig.17	P
802.11ac HT40	5755 MHz	Fig.18	P
	5795 MHz	Fig.19	P
802.11ac HT80	5775 MHz	Fig.20 Fig.21	P

Conclusion: PASS

Test graphs as below:

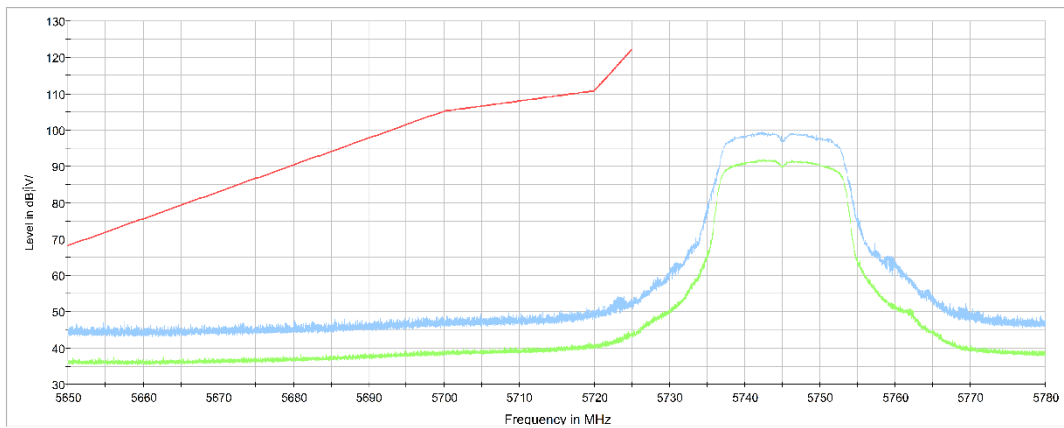


Fig. 10 Band Edges (802.11a Ch149,5745MHz)

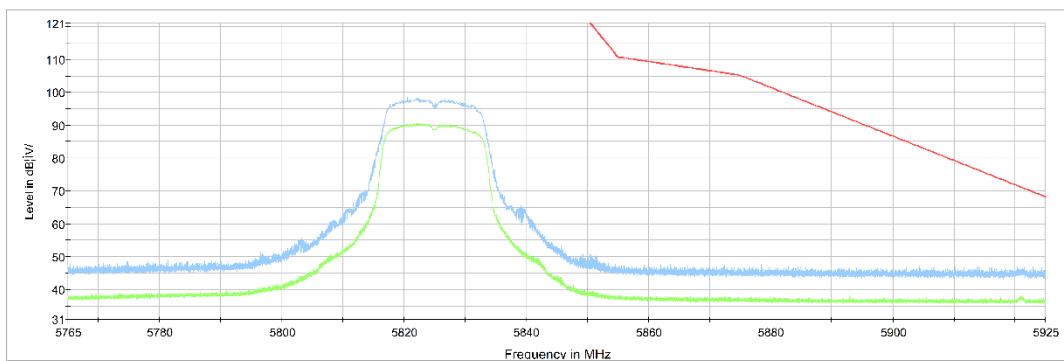


Fig. 11 Band Edges (802.11a Ch165, 5825MHz)

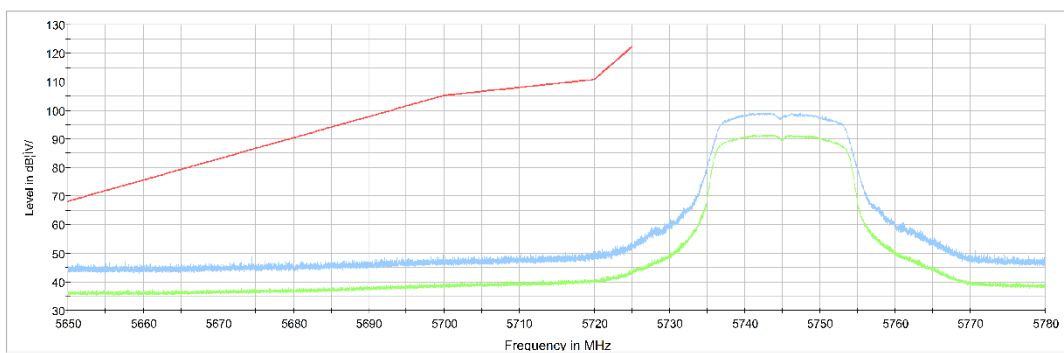


Fig. 12 Band Edges (802.11n-HT20 Ch149, 5745MHz)

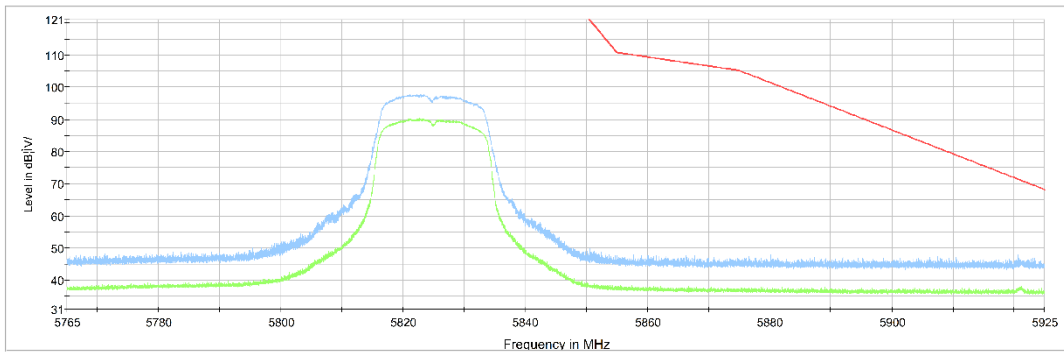


Fig. 13 Band Edges (802.11n-HT20 Ch165, 5825MHz)

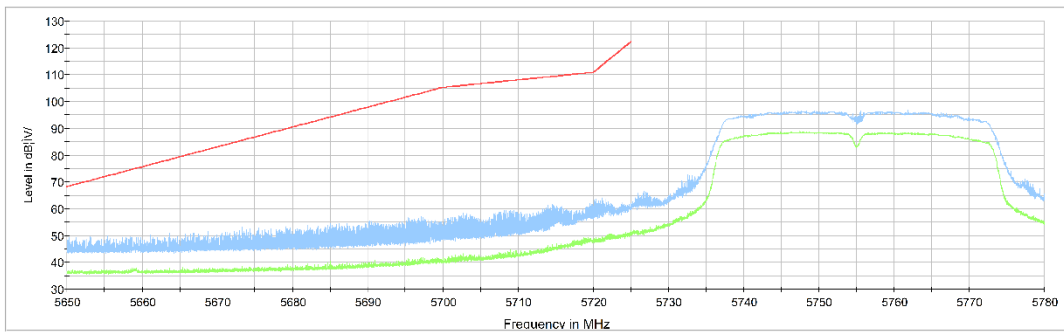


Fig. 14 Band Edges (802.11n-HT40 Ch151, 5755MHz)

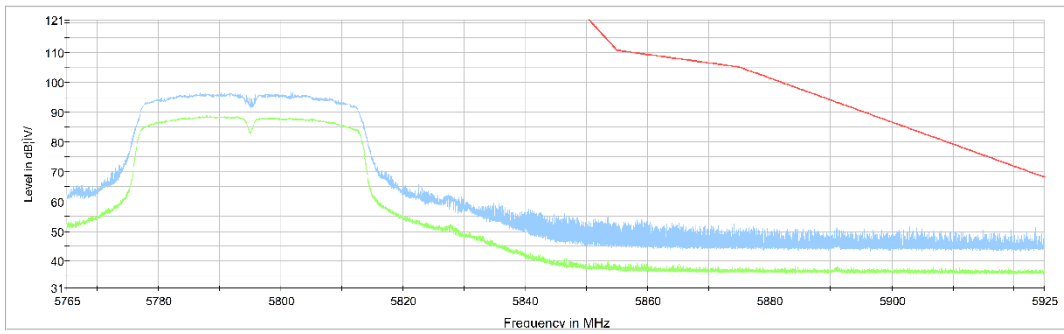


Fig. 15 Band Edges (802.11n-HT40 Ch159, 5795MHz)

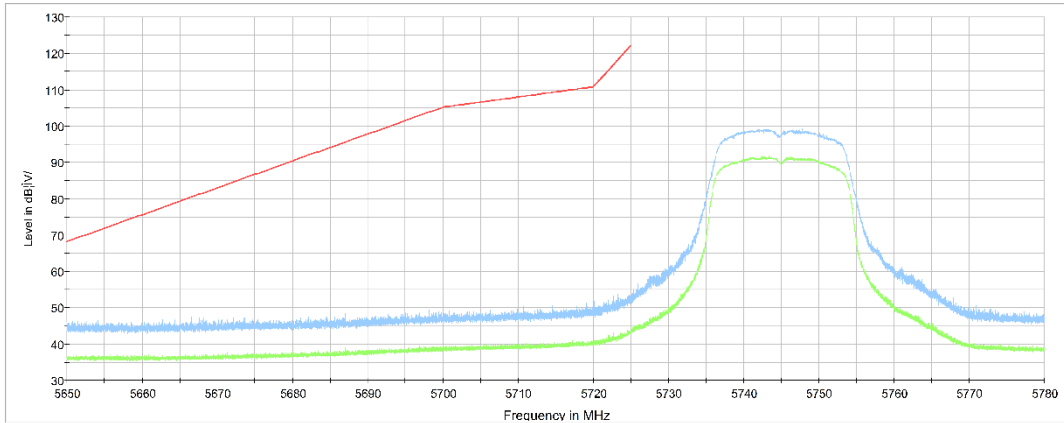


Fig. 16 Band Edges (802.11ac-HT20 Ch149, 5745MHz)

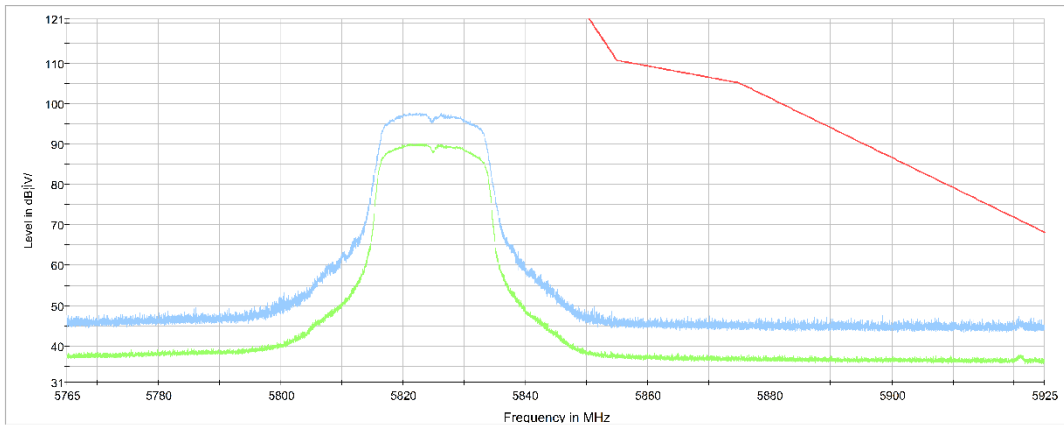


Fig. 17 Band Edges (802.11ac-HT20 Ch165, 5825MHz)

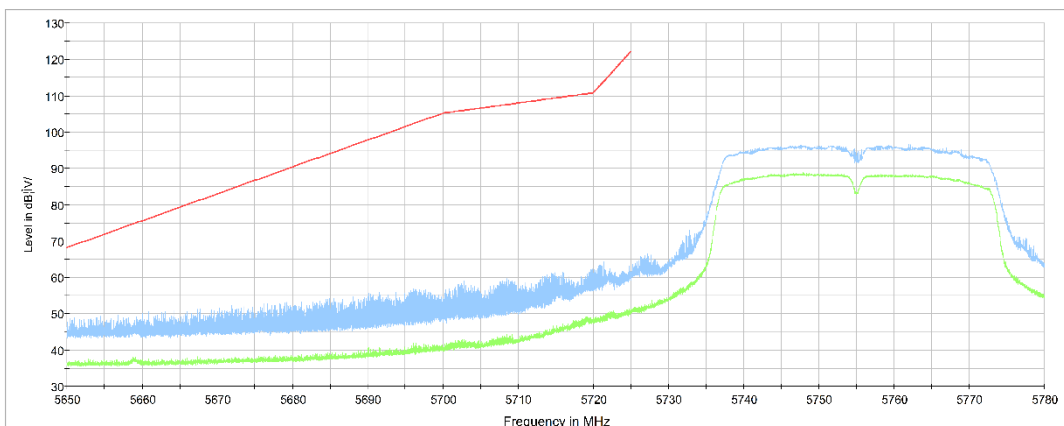


Fig. 18 Band Edges (802.11ac-HT40 Ch151, 5755MHz)

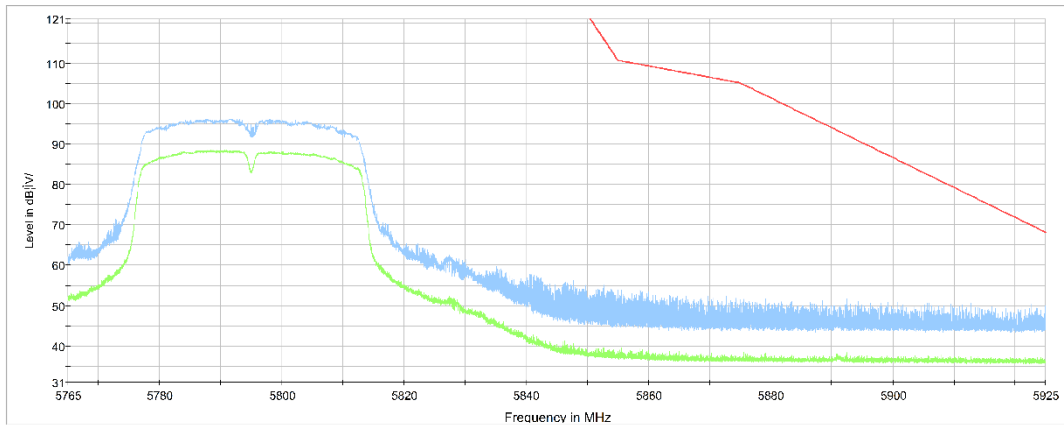


Fig. 19 Band Edges (802.11ac-HT40 Ch159, 5795MHz)

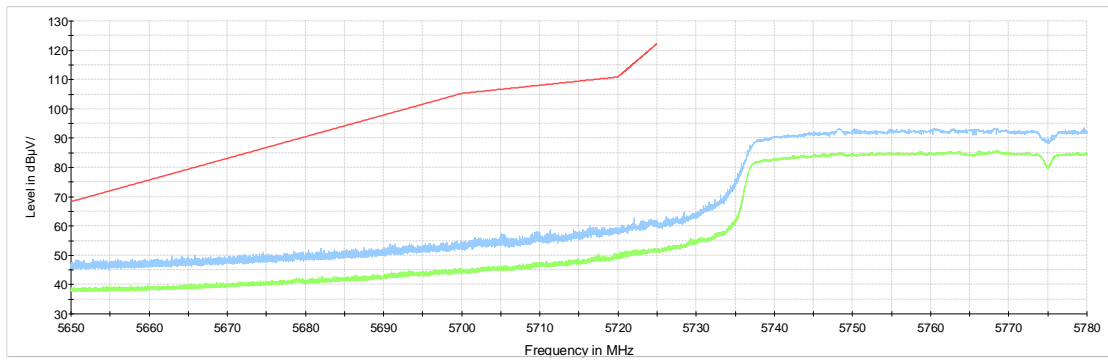


Fig. 20 Band Edges (802.11ac-HT80 Ch155, 5775MHz)

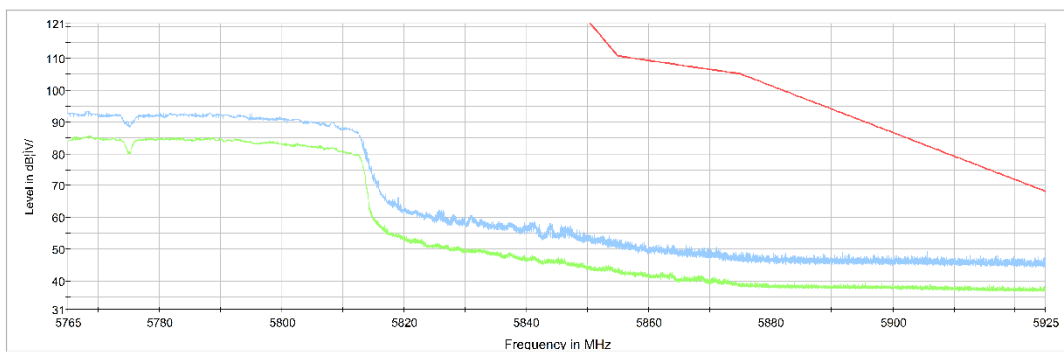


Fig. 21 Band Edges (802.11ac-HT80, 5775MHz)

A.7. AC Powerline Conducted Emission

Test Condition:

Voltage (V)	Frequency (Hz)
110	60

Measurement uncertainty:

Expanded measurement uncertainty for this test item is $U = 3.2\text{dB}$, $k=2$.

Measurement Result and limit:

WLAN (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dB μ V)	Result (dB μ V)		Conclusion
		With charger		
		802.11a	Idle	
0.15 to 0.5	66 to 56	Fig.22	Fig.23	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.

WLAN (Average Limit)

Frequency range (MHz)	Average Limit (dB μ V)	Result (dB μ V)		Conclusion
		With charger		
		802.11a	Idle	
0.15 to 0.5	56 to 46	Fig.22	Fig.23	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.

The measurement is made according to ANSI C63.10 .

Conclusion: PASS

Test graphs as below:

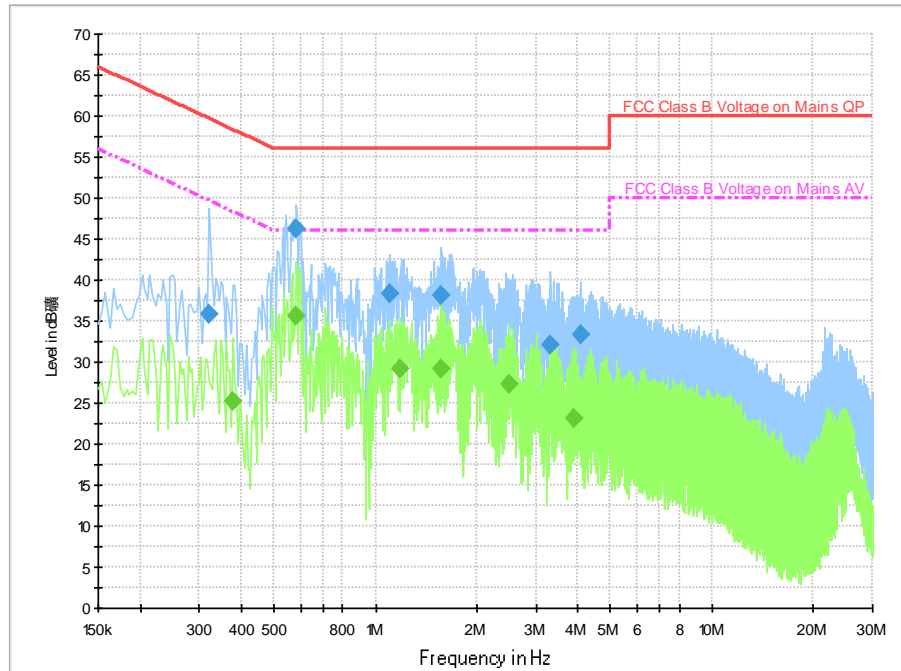


Fig. 22 AC Power line Conducted Emission-802.11a

Note1: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.322000	35.8	2000.	9.000	On	L1	19.7	23.9	59.7	
0.582000	46.2	2000.	9.000	On	L1	19.7	9.8	56.0	
1.098000	38.3	2000.	9.000	On	L1	19.6	17.7	56.0	
1.562000	38.2	2000.	9.000	On	L1	19.6	17.8	56.0	
3.322000	32.0	2000.	9.000	On	L1	19.6	24.0	56.0	
4.058000	33.3	2000.	9.000	On	L1	19.6	22.7	56.0	

Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.378000	25.2	2000.	9.000	On	N	19.7	23.1	48.3	
0.582000	35.7	2000.	9.000	On	L1	19.7	10.3	46.0	
1.178000	29.1	2000.	9.000	On	L1	19.7	16.9	46.0	
1.562000	29.1	2000.	9.000	On	L1	19.6	16.9	46.0	
2.506000	27.3	2000.	9.000	On	L1	19.6	18.7	46.0	
3.870000	23.2	2000.	9.000	On	L1	19.6	22.8	46.0	

Note2: The measurement results showed here are worst cases of the combinations of different cables and chargers

Idle:

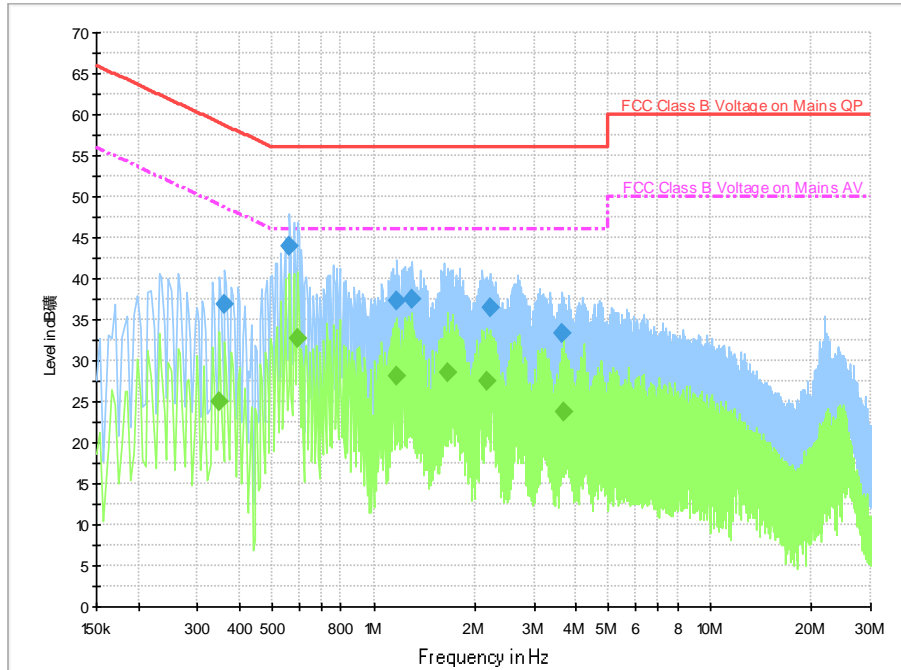


Fig. 23 AC Power line Conducted Emission-Idle

Note1: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.362000	36.8	2000.	9.000	On	L1	19.7	21.8	58.7	
0.562000	43.9	2000.	9.000	On	N	19.7	12.1	56.0	
1.174000	37.2	2000.	9.000	On	L1	19.7	18.8	56.0	
1.306000	37.5	2000.	9.000	On	L1	19.6	18.5	56.0	
2.222000	36.5	2000.	9.000	On	L1	19.6	19.5	56.0	
3.630000	33.3	2000.	9.000	On	N	19.6	22.7	56.0	

Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.346000	25.0	2000.0	9.000	On	N	19.7	24.0	49.1	
0.594000	32.7	2000.0	9.000	On	L1	19.7	13.3	46.0	
1.174000	28.1	2000.0	9.000	On	L1	19.7	17.9	46.0	
1.658000	28.5	2000.0	9.000	On	L1	19.6	17.5	46.0	
2.182000	27.5	2000.0	9.000	On	N	19.6	18.5	46.0	
3.674000	23.8	2000.0	9.000	On	L1	19.6	22.2	46.0	

Note2: The measurement results showed here are worst cases of the combinations of different cables and chargers

ANNEX B: EUT parameters

Disclaimer: The antenna gain and worse case provided by the client may affect the validity of the measurement results in this report, and the client shall bear the impact and consequences arising therefrom.

ANNEX C: Accreditation Certificate



Accredited Laboratory

A2LA has accredited

TELECOMMUNICATION TECHNOLOGY LABS, CAICT
Beijing, People's Republic of China

for technical competence in the field of
Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 26th day of June 2023.



Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2024

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

***** END OF REPORT BODY *****