FCC PART 15C
TEST REPORT
No.I20Z61117-IOT03

for

Wingtech Group (Hongkong) Limited

Multi-band WCDMA/LTE MIFI with WLAN

CT2MHS01

With

FCC ID: 2APXW-CT2MHS01

Hardware Version: 89323_1_21

Software Version: CT2MHS01_0.01.41

Issued Date: 2020-09-11

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.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

CTTL-Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I20Z61117-IOT03	Rev.0	1st edition	2020-09-11

CONTENTS

1. TEST LATORATORY

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Location: CTTL(huayuan North Road)

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

1.3. TestingEnvironment

Normal Temperature: 15-35℃

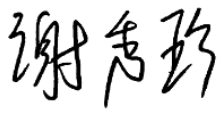
Relative Humidity: 20-75%

1.4. Project date

Testing Start Date: 2020-07-29

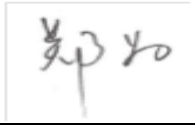
Testing End Date: 2020-09-11

1.5. Signature



Xie Xiuzhen

(Prepared this test report)



Zheng Wei

(Reviewed this test report)

Hu Xiaoyu

(Approved this test report)

2. CLIENT INFORMATION

2.1. Applicant Information

Company Name:	Wingtech Group (Hongkong) Limited
Address:	Flat/RM 1903 ,19/F, Podium Plaza, 5 Hanoi Road, Tsim Sha Tsui, Kowloon, Hongkong.
City:	Hongkong.
Postal Code:	/
Country:	China
Telephone:	+86-13917939276
Fax:	/

2.2. Manufacturer Information

Company Name:	Wingtech Group (Hongkong) Limited
Address:	Flat/RM 1903 ,19/F, Podium Plaza, 5 Hanoi Road, Tsim Sha Tsui, Kowloon, Hongkong.
City:	Hongkong.
Postal Code:	/
Country:	China
Telephone:	+86-13917939276
Fax:	/

3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT(AE)

3.1. About EUT

Description	Multi-band WCDMA/LTE MIFI with WLAN
Model name	CT2MHS01
FCC ID	2APXW-CT2MHS01
WLAN Frequency Band	ISM Band: 5725MHz~5850MHz
Type of modulation	OFDM
Voltage	3.85V

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT1	353929580015637	89323_1_21	CT2MHS01_0.01.41
EUT2	353929580002510	89323_1_21	CT2MHS01_0.01.41

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

3.3. Internal Identification of AE used during the test

AE ID*	Description	SN	Remarks
AE1	Battery	/	/
AE2	charger	/	/
AE3	USB cable	/	/
AE4	USB cable	/	/

AE1

Type	MF01
Manufacturer	Jiade Energy Technology（Zhuhai）Co.,Ltd.
Capacity	/
Nominal Voltage	/

AE2

Model	PA-US5V2A-036
Manufacturer	Huizhou puan electronics co., ltd
Length of cable	/

AE3

Type	USB TYPE A to C 2.0 Cable (1.0m)
Manufacturer	Huizhou Washin Electronics Co.,Ltd
Length of cable	/

AE4

Type	USB TYPE A to C 2.0 Cable (1.0m)
Manufacturer	Shenzhen BRL Technology Co.,Ltd.
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 Multi-band WCDMA/LTE MIFI with WLAN 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	2018
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
KDB 558074 D01	Federal Communications Commission Office of Engineering and Technology Laboratory Division GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES	2019

5. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

6. SUMMARY OF 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 - 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 requested by the client/manufacturer 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 4.1.

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℃
Voltage	3.85V
Humidity	44%

7. TEST EQUIPMENTS 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	2021-05-06
2	LISN	ENV216	101200	R&S	1 year	2021-02-26
3	Test Receiver	ESCI	100344	R&S	1 year	2021-05-19
4	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100235	Rohde & Schwarz	1 year	2021-03-03
2	BiLog Antenna	VULB9163	9163-483	Schwarzbeck	1 year	2020-09-17
3	Dual-Ridge Waveguide Horn Antenna	3115	6914	ETS-Lindgren	1 year	2021-01-14
4	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	1 year	2020-10-08

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. Occupied 6dB 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)
30MHz ≤ f ≤ 2GHz	1.22
2GHz ≤ f ≤3.6GHz	1.22
3.6GHz ≤ f ≤8GHz	1.22
8GHz ≤ f ≤12.75GHz	1.51
12.75GHz ≤ f ≤26GHz	1.51
26GHz ≤ f ≤40GHz	1.59

Radiated (k=2)

Frequency Range	Uncertainty(dB)
9kHz-30MHz	/
30MHz ≤ f ≤ 1GHz	5.16
1GHz ≤ f ≤18GHz	5.44
18GHz ≤ f ≤40GHz	5.28

8.6. AC Power-line Conducted Emission

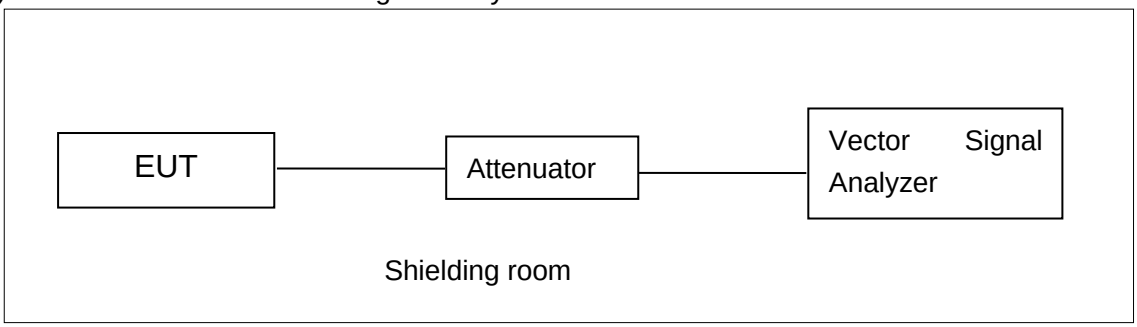
Measurement Uncertainty : 3.08dB,k=2

ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

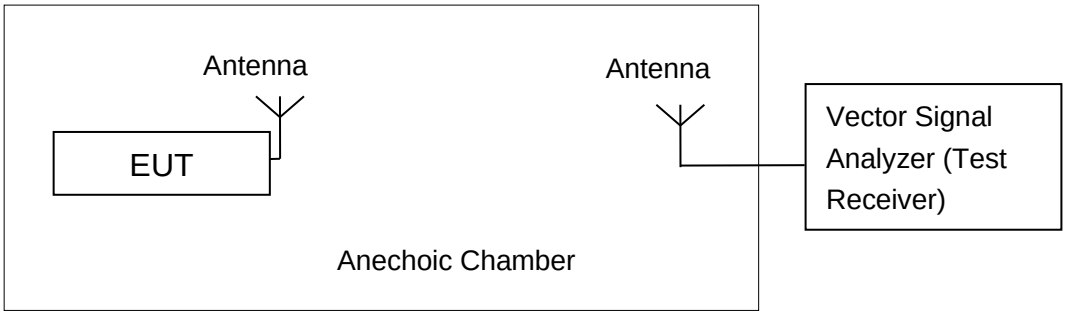
A.1.1. Conducted Measurements

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 = 10Hz;



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

A.2.1 Antenna Gain

Antenna gain is -0.61dBi and the value is supplied by the applicant or manufacturer.

A.2.2. Maximum Average Output Power-Conducted

Measurement Results:

802.11a mode

Mode	Data Rate (Mbps)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11a	6	17.92	17.56	17.24

The data rate 6Mbps is selected as worse 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	16.38	16.16	15.97

The data rate MCS0 is selected as worse 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	16.47	16.15	15.98

The data rate MCS0 is selected as worse 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	16.34	16.25

The data rate MCS0 is selected as worse 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	16.33	16.26

The data rate MCS0 is selected as worse 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	15.66

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

Conclusion: PASS

A.3. Peak Power Spectral Density

Measurement Limit:

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

The measurement is made according to ANSI C63.10 and KDB789033 D02

Measurement Uncertainty:

Measurement Uncertainty	0.75dB

Measurement Results:

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11a	149	3.17	P
	157	2.93	P
	165	2.80	P
802.11n HT20	149	2.69	P
	157	1.63	P
	165	2.38	P
802.11ac HT20	149	2.71	P
	157	2.51	P
	165	2.36	P
802.11n HT40	151	-0.84	P
	159	-0.92	P
802.11ac HT40	151	-0.83	P
	159	-0.91	P
802.11ac HT80	155	-4.32	P

Conclusion: PASS

A.4. Occupied 6dB Bandwidth

Measurement Limit:

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

The measurement is made according to KDB789033 D02 .

Measurement Uncertainty:

Measurement Uncertainty	60.80Hz

Measurement Result:

Mode	Channel	Occupied 6dB Bandwidth (MHz)		conclusion
802.11a	149	Fig.1	15.30	P
	157	Fig.2	15.30	P
	165	Fig.3	15.30	P
802.11n HT20	149	Fig.4	15.10	P
	157	Fig.5	15.10	P
	165	Fig.6	15.10	P
802.11ac HT20	149	Fig.7	15.10	P
	157	Fig.8	15.10	P
	165	Fig.9	15.10	P
802.11n HT40	151	Fig.10	35.12	P
	159	Fig.11	35.12	P
802.11ac HT40	151	Fig.12	35.04	P
	159	Fig.13	35.12	P
802.11ac HT80	155	Fig.14	75.04	P

Conclusion: PASS

Test graphs as below:

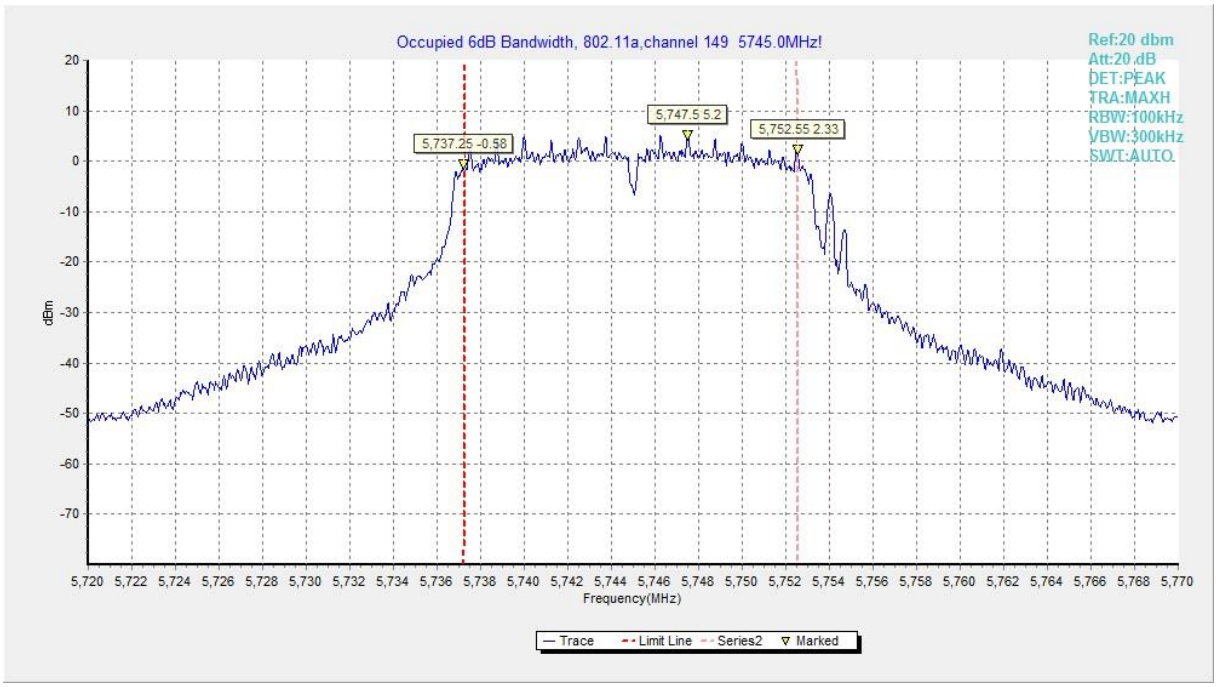


Fig. 1 Occupied 6dB Bandwidth (802.11a, Ch 149)

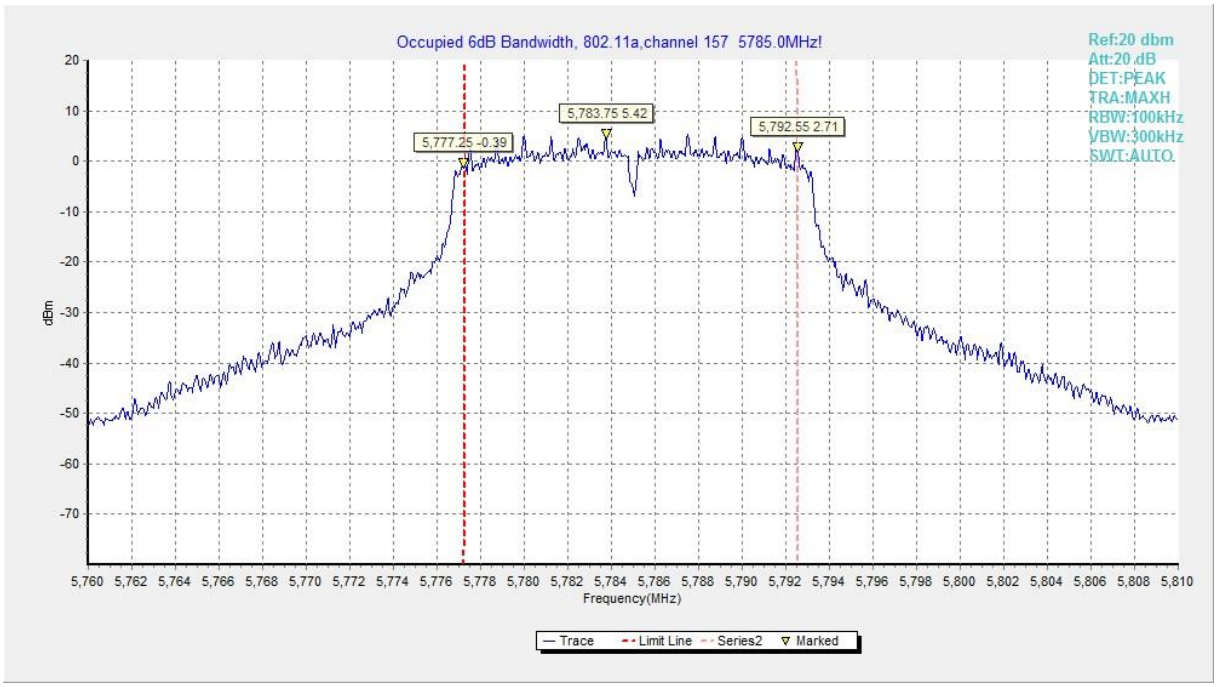


Fig. 2 Occupied 6dB Bandwidth (802.11a, Ch 157)

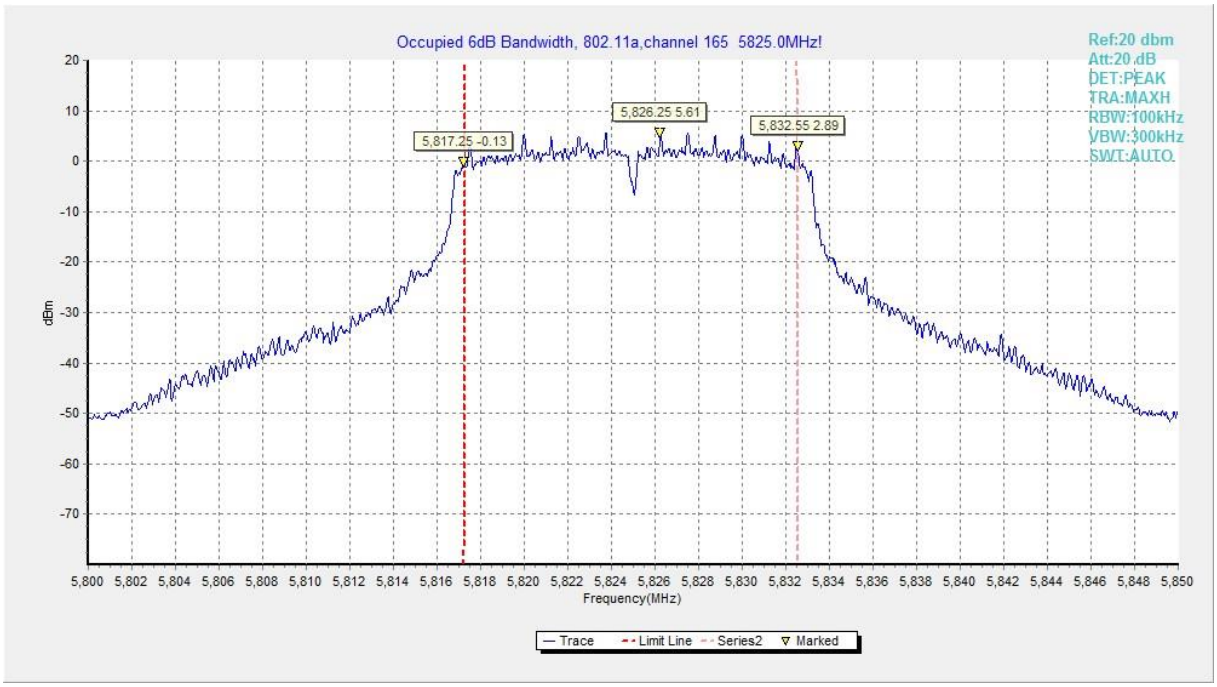


Fig. 3 Occupied 6dB Bandwidth (802.11a, Ch 165)

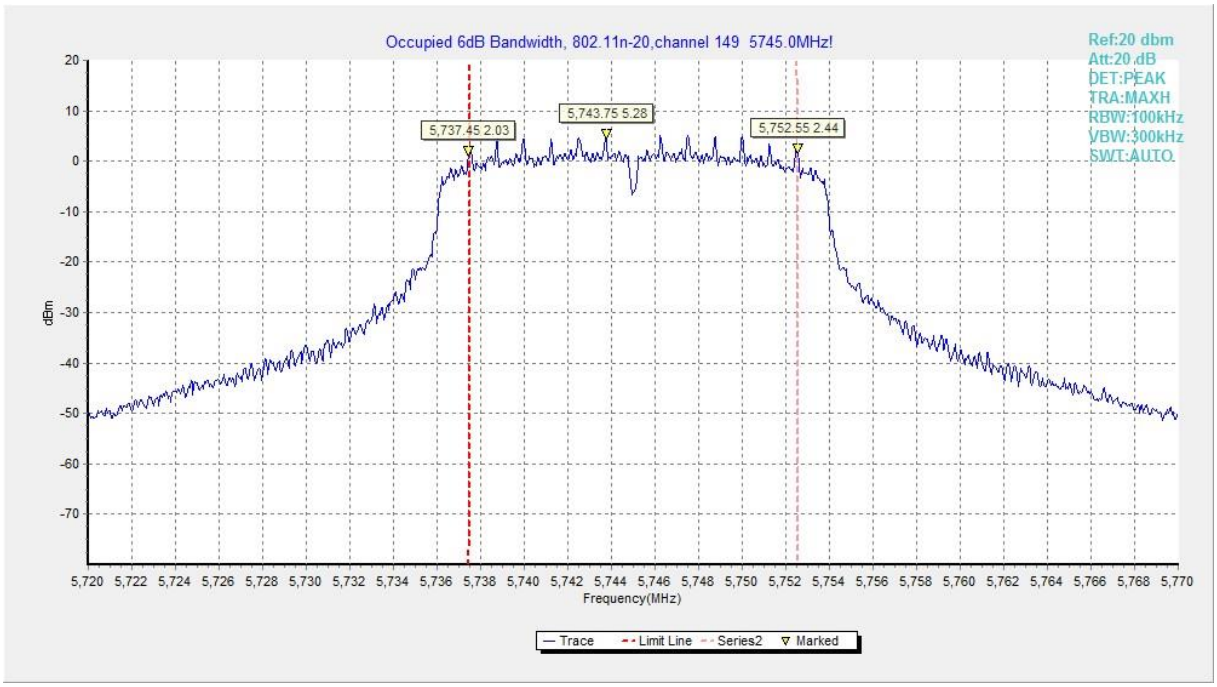


Fig. 4 Occupied 6dB Bandwidth (802.11n-HT20, Ch 149)

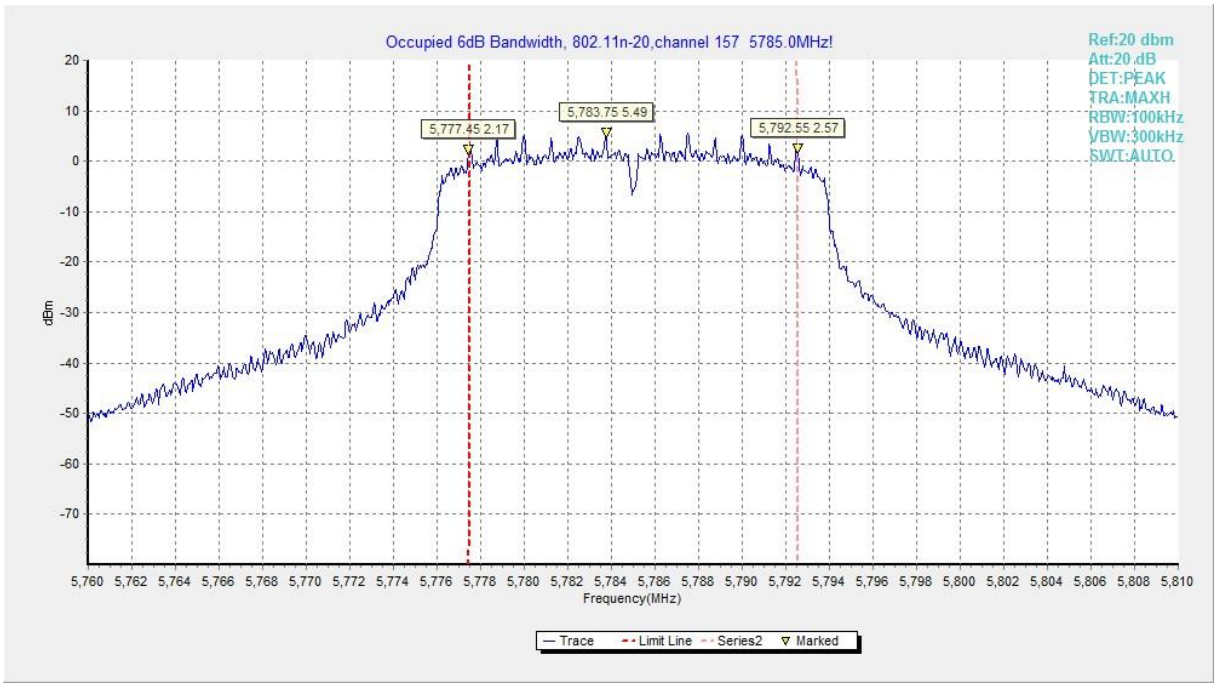


Fig. 5 Occupied 6dB Bandwidth (802.11n-HT20, Ch 157)

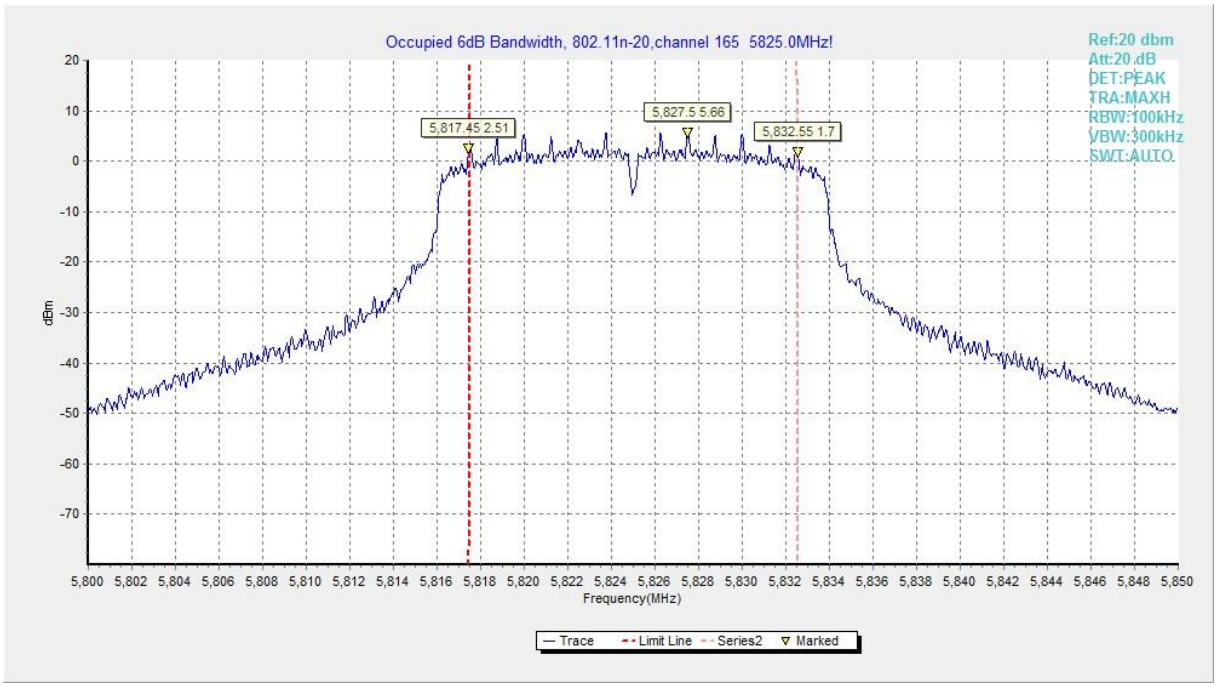


Fig. 6 Occupied 6dB Bandwidth (802.11n-HT20, Ch 165)

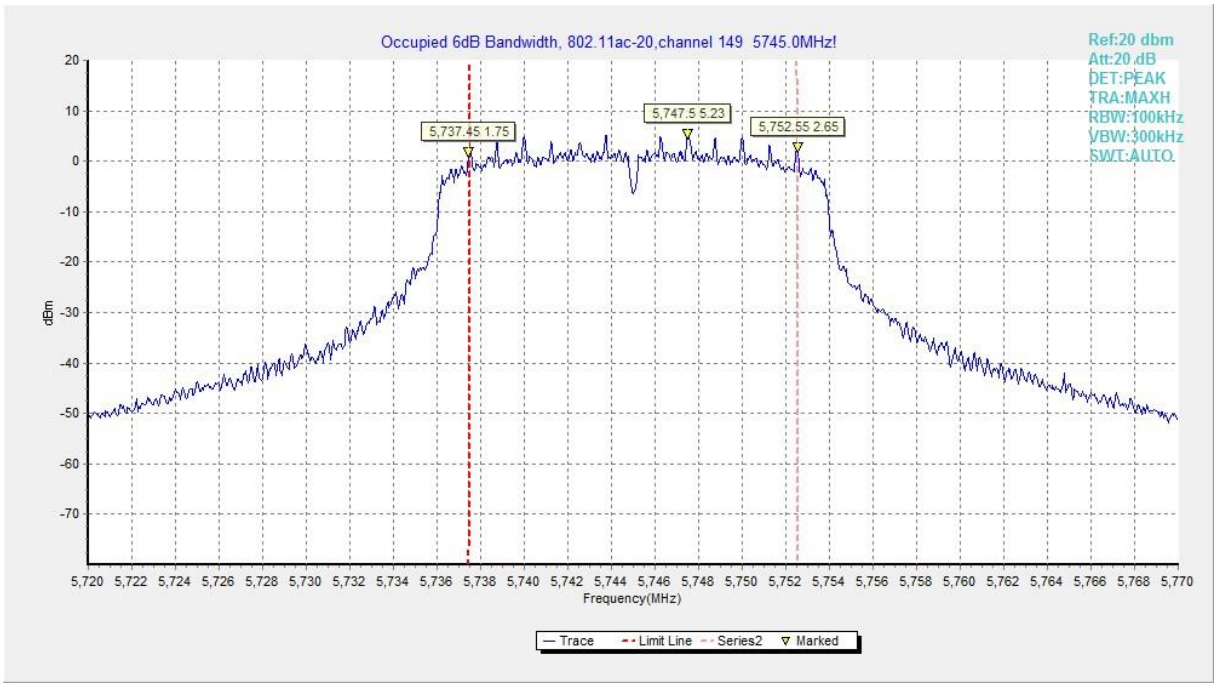


Fig. 7 Occupied 6dB Bandwidth (802.11ac-HT20, Ch 149)

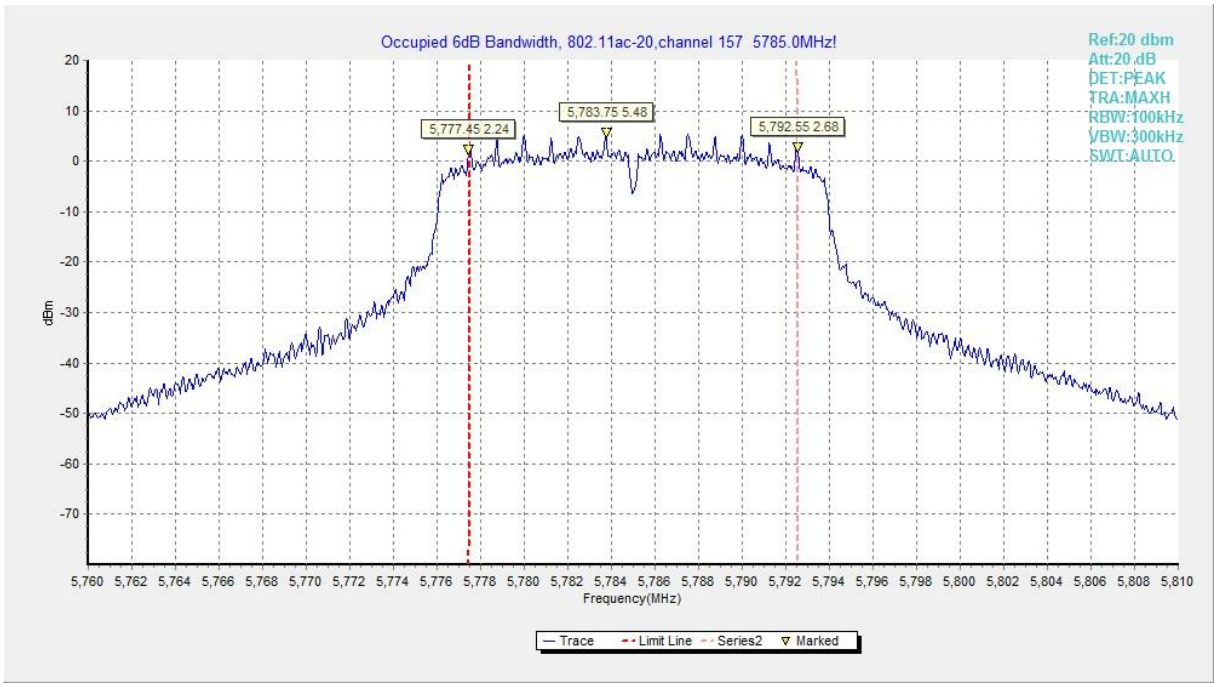


Fig. 8 Occupied 6dB Bandwidth (802.11ac-HT20, Ch 157)

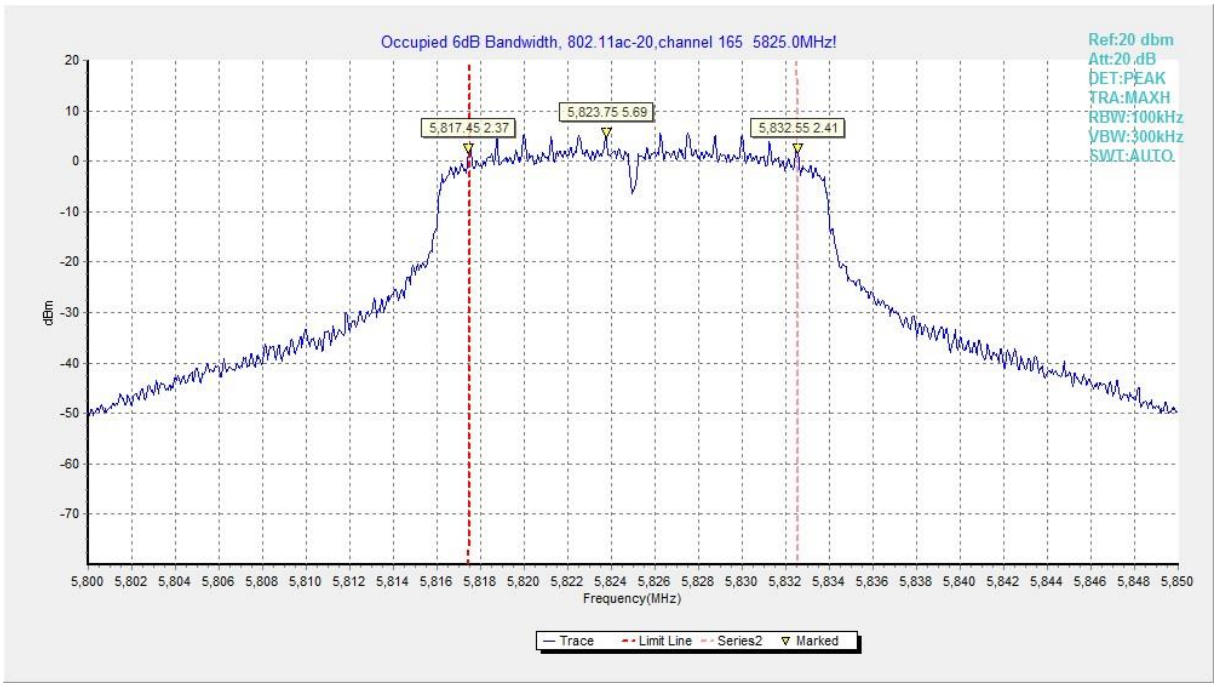


Fig. 9 Occupied 6dB Bandwidth (802.11ac-HT20, Ch 165)

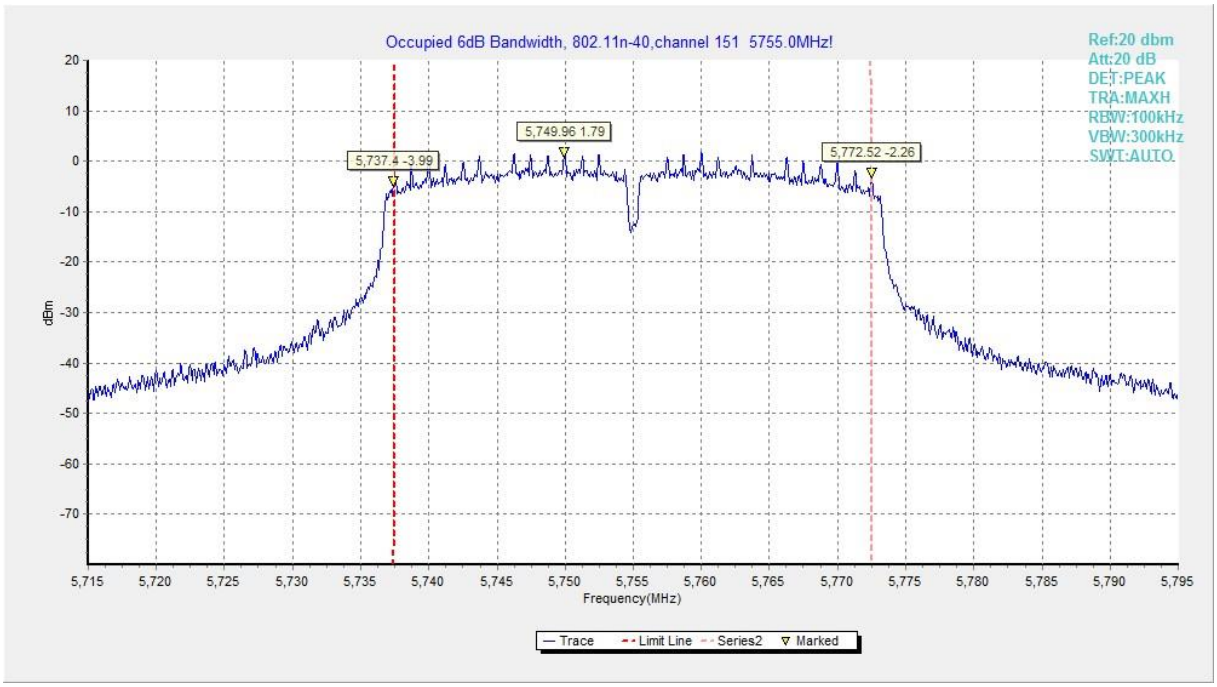


Fig. 10 Occupied 6dB Bandwidth (802.11n-HT40, Ch 151)

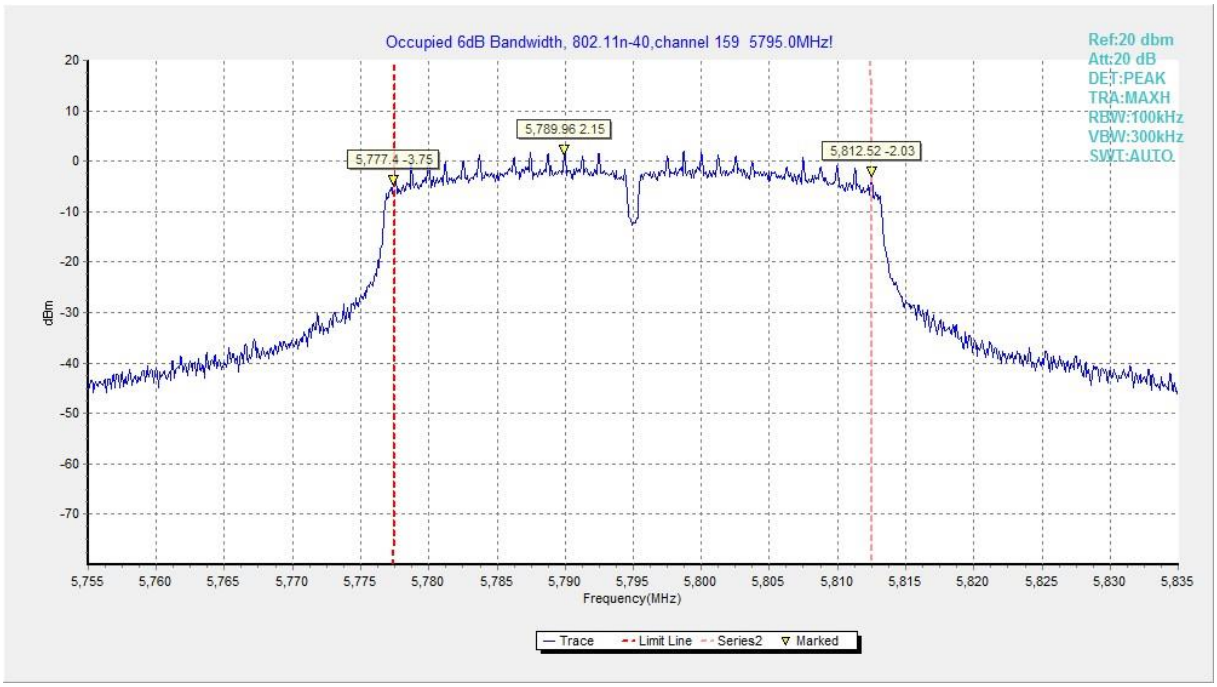


Fig. 11 Occupied 6dB Bandwidth (802.11n-HT40, Ch 159)

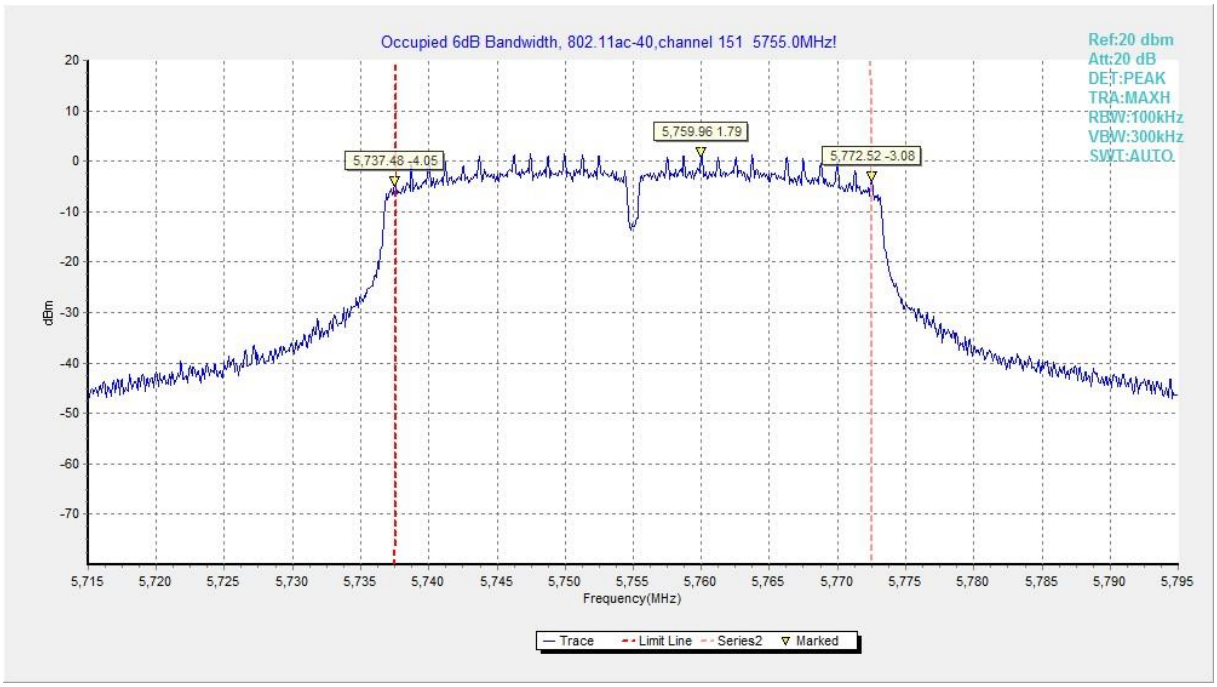


Fig. 12 Occupied 6dB Bandwidth (802.11ac-HT40, Ch 151)

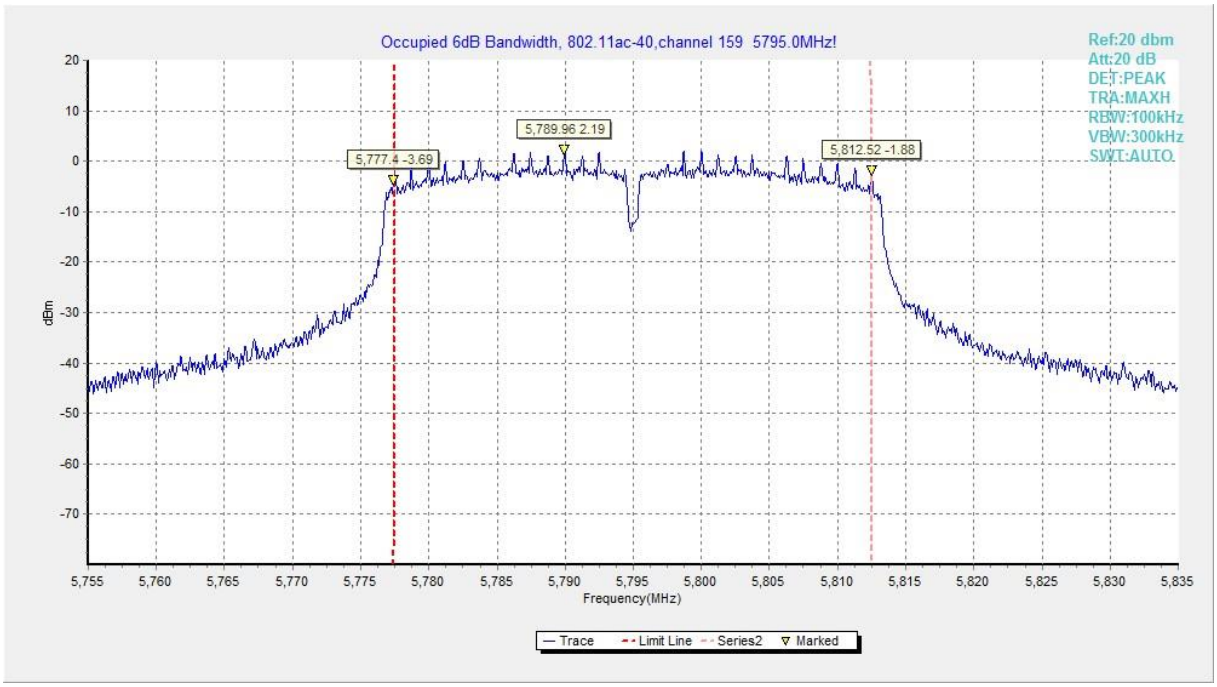


Fig. 13 Occupied 6dB Bandwidth (802.11ac-HT40, Ch 159)

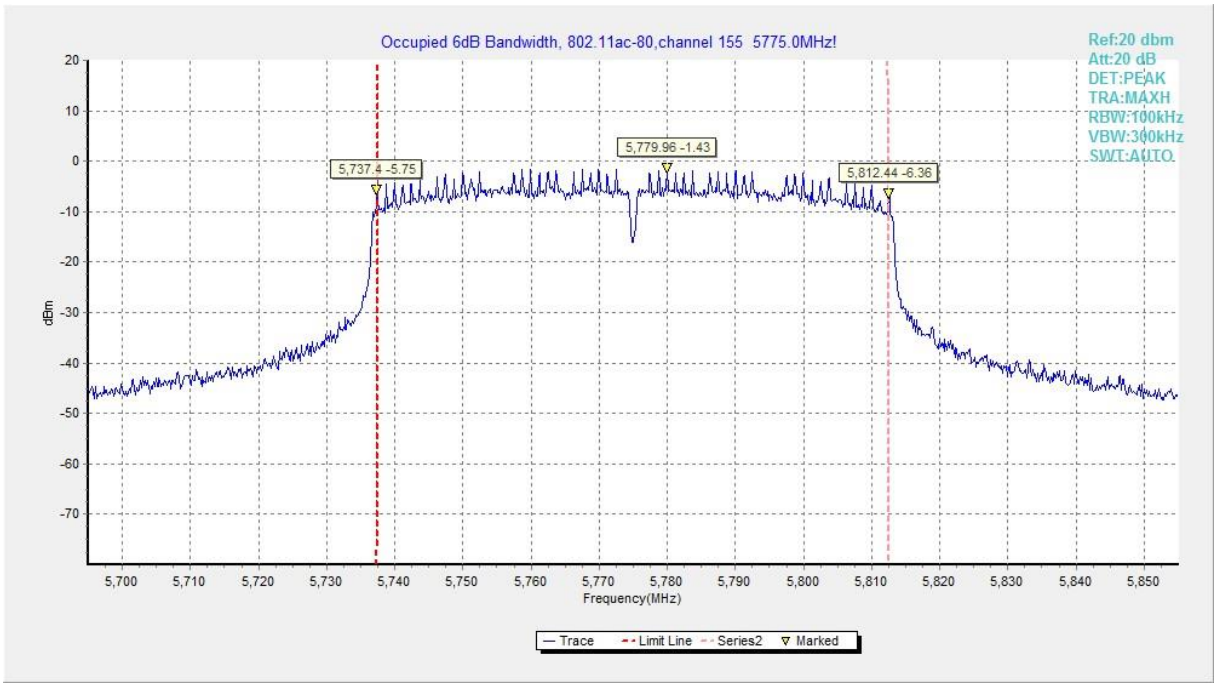


Fig. 14 Occupied 6dB Bandwidth (802.11ac-HT80, Ch 155)

A.5. Transmitter Spurious Emission

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)).

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Measurement Uncertainty:

Frequency Range	Uncertainty(dB)
30MHz ≤ f ≤ 2GHz	0.63
2GHz ≤ f ≤3.6GHz	0.82
3.6GHz ≤ f ≤8GHz	1.55
8GHz ≤ f ≤20GHz	1.86
20GHz ≤ f ≤22GHz	1.90
22GHz ≤ f ≤26GHz	2.20

A.5.1 Transmitter Spurious Emission - 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

Frequency Range	Uncertainty(dB)
30MHz ≤ f ≤ 1GHz	5.40
1GHz ≤ f ≤18GHz	4.32
18GHz ≤ f ≤40GHz	5.26

Measurement Results:

802.11a mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11a	149	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	157	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz~ 40 GHz	---	P
	165	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P

802.11n-HT20 mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n (HT20)	149	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	157	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz~ 40 GHz	---	P
	165	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P

802.11n-HT40 mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n (HT40)	151	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz~ 40 GHz	---	P
	159	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P

802.11ac-HT20 mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n (HT20)	149	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
	157	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz~ 40 GHz	---	P
	165	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P

802.11ac-HT40 mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n (HT40)	151	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz~ 40 GHz	---	P
	159	1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P

802.11ac-HT80 mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n (HT80)	155	30 MHz ~1 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
		7 GHz ~ 18 GHz	---	P
		18 GHz ~ 26.5 GHz	---	P
		26.5 GHz~ 40 GHz	---	P

Conclusion: PASS

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

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17976.9	47.1	-25.5	46.7	25.9	54	6.9	H
17970.3	47	-25.5	46.7	25.8	54	7	V
17981.3	47	-25.5	46.7	25.8	54	7	H
17987.3	47	-25.5	46.7	25.8	54	7	H
17990.1	47	-25.5	46.7	25.8	54	7	H
5724.8	44.7	-16.3	34.3	26.7	54	9.3	V

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17987.3	47.3	-25.5	46.7	26.1	54	6.7	V
17991.2	47.3	-25.5	46.7	26.1	54	6.7	V
17945.5	47.2	-25.5	46.7	26	54	6.8	V
17963.2	47.2	-25.5	46.7	26	54	6.8	V
17993.4	47.2	-25.5	46.7	26	54	6.8	V
17958.8	47.1	-25.5	46.7	25.9	54	6.9	H

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17995	47.4	-25.5	46.7	26.2	54	6.6	H
17973.6	47.3	-25.5	46.7	26.1	54	6.7	V
17974.2	47.2	-25.5	46.7	26	54	6.8	V
17983	47.2	-25.5	46.7	26	54	6.8	V
17965.3	47.1	-25.5	46.7	25.9	54	6.9	V
5850.6	41.1	-16.2	34.4	23	54	12.9	V

802.11n-HT20

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17986.8	47.4	-25.5	46.7	26.2	54	6.6	V
17962.6	47.3	-25.5	46.7	26.1	54	6.7	V
17966.5	47.3	-25.5	46.7	26.1	54	6.7	H
17975.8	47.3	-25.5	46.7	26.1	54	6.7	V
17981.8	47.2	-25.5	46.7	26	54	6.8	V
5725	45.6	-16.3	34.3	27.6	54	8.4	V

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17956	47.1	-25.5	46.7	25.9	54	6.9	H
17959.3	47.1	-25.5	46.7	25.9	54	6.9	H
17968.1	47.1	-25.5	46.7	25.9	54	6.9	H
17991.8	47.1	-25.5	46.7	25.9	54	6.9	H
17959.8	47	-25.5	46.7	25.8	54	7	V
17973	47	-25.5	46.7	25.8	54	7	V

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17979.1	47.1	-25.5	46.7	25.9	54	6.9	V
17995.6	47.1	-25.5	46.7	25.9	54	6.9	H
17946.7	47	-25.5	46.7	25.8	54	7	H
17972.5	47	-25.5	46.7	25.8	54	7	V
17974.2	47	-25.5	46.7	25.8	54	7	H
5850.1	40.9	-16.2	34.4	22.8	54	13.1	V

802.11n-HT40

Ch151

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17988.5	47.3	-25.5	46.7	26.1	54	6.7	V
17996.2	47.3	-25.5	46.7	26.1	54	6.7	H
17943.9	47.1	-25.5	46.7	25.9	54	6.9	H
17969.2	47	-25.5	46.7	25.8	54	7	H
17978	47	-25.5	46.7	25.8	54	7	H
5724.9	48.7	-16.3	34.3	30.7	54	5.3	V

Ch159

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17978.5	47.1	-25.5	46.7	25.9	54	6.9	V
17979.1	47.1	-25.5	46.7	25.9	54	6.9	V
17950.5	47	-25.5	46.7	25.8	54	7	V
17960.4	47	-25.5	46.7	25.8	54	7	V
17971.4	47	-25.5	46.7	25.8	54	7	H
5850.2	40.2	-16.2	34.4	22.1	54	13.8	V

802.11ac-HT20

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17956	47	-25.5	46.7	25.8	54	7	V
17974.2	47	-25.5	46.7	25.8	54	7	V
17972	46.9	-25.5	46.7	25.7	54	7.1	H
17973.6	46.9	-25.5	46.7	25.7	54	7.1	V
17975.2	46.9	-25.5	46.7	25.7	54	7.1	H
5724.9	45.7	-16.3	34.3	27.7	54	8.3	V

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17959.8	47.3	-25.5	46.7	26.1	54	6.7	V
17991.2	47.2	-25.5	46.7	26	54	6.8	V
17993.4	47.2	-25.5	46.7	26	54	6.8	H
17967	47.1	-25.5	46.7	25.9	54	6.9	V
17986.8	47.1	-25.5	46.7	25.9	54	6.9	H
17988.5	47.1	-25.5	46.7	25.9	54	6.9	V

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17976.9	47.1	-25.5	46.7	25.9	54	6.9	V
17984	47.1	-25.5	46.7	25.9	54	6.9	V
17956.5	47	-25.5	46.7	25.8	54	7	H
17970.8	47	-25.5	46.7	25.8	54	7	H
17993.4	47	-25.5	46.7	25.8	54	7	H
5850	41	-16.2	34.4	22.9	54	13	V

802.11ac-HT40

Ch151

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17956	47.1	-25.5	46.7	25.9	54	6.9	V
17962	47.1	-25.5	46.7	25.9	54	6.9	H
17975.2	47.1	-25.5	46.7	25.9	54	6.9	H
17997.8	47.1	-25.5	46.7	25.9	54	6.9	V
17963.7	47	-25.5	46.7	25.8	54	7	H
5724.1	48.7	-16.3	34.3	30.7	54	5.3	V

Ch159

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17966.5	47.2	-25.5	46.7	26	54	6.8	V
17962.6	47.1	-25.5	46.7	25.9	54	6.9	V
17967	47.1	-25.5	46.7	25.9	54	6.9	V
17981.8	47.1	-25.5	46.7	25.9	54	6.9	V
17984.6	47	-25.5	46.7	25.8	54	7	H
5850.4	40.2	-16.2	34.4	22.1	54	13.8	V

802.11ac-HT80

Ch155

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17988.5	47.4	-25.5	46.7	26.2	54	6.6	H
17979.1	47.1	-25.5	46.7	25.9	54	6.9	V
17994	47.1	-25.5	46.7	25.9	54	6.9	V
17985.7	47	-25.5	46.7	25.8	54	7	H
17997.8	47	-25.5	46.7	25.8	54	7	H
17964.8	46.9	-25.5	46.7	25.7	54	7.1	H

Peak Results：

802.11a

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17970.8	58.7	-25.5	46.7	37.5	74	15.3	H
17991.8	58.7	-25.5	46.7	37.5	74	15.3	V
17946.7	58.5	-25.5	46.7	37.3	74	15.5	V
17948.3	58.2	-25.5	46.7	37	74	15.8	V
17955.5	58.2	-25.5	46.7	37	74	15.8	V
5724.8	57.5	-16.3	34.3	39.5	121.7	64.2	V

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17974.2	59.1	-25.5	46.7	37.9	74	14.9	H
17984.6	59.1	-25.5	46.7	37.9	74	14.9	V
17986.2	58.6	-25.5	46.7	37.4	74	15.4	V
17994	58.5	-25.5	46.7	37.3	74	15.5	V
17956.5	58.4	-25.5	46.7	37.2	74	15.6	H
17975.8	58.4	-25.5	46.7	37.2	74	15.6	V

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17991.8	59.2	-25.5	46.7	38	74	14.8	V
17937.3	58.7	-25.5	46.7	37.5	74	15.3	H
17963.2	58.3	-25.5	46.7	37.1	74	15.7	H
17998.3	58.3	-25.5	46.7	37.1	74	15.7	V
17934	58.2	-25.5	46.7	37	74	15.8	V
5856.4	52.6	-16.2	34.4	34.5	105.6	53	V

802.11n-HT20

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17988.5	59.1	-25.5	46.7	37.9	74	14.9	V
17992.8	58.6	-25.5	46.7	37.4	74	15.4	V
17997.2	58.4	-25.5	46.7	37.2	74	15.6	V
17946.1	58.3	-25.5	46.7	37.1	74	15.7	H
17962.6	58.3	-25.5	46.7	37.1	74	15.7	V
5725	58.3	-16.3	34.3	40.3	122.2	63.9	V

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17971.4	58.9	-25.5	46.7	37.7	74	15.1	H
17974.2	58.7	-25.5	46.7	37.5	74	15.3	H
17946.1	58.6	-25.5	46.7	37.4	74	15.4	H
17948.3	58.3	-25.5	46.7	37.1	74	15.7	H
17973.6	58.2	-25.5	46.7	37	74	15.8	V
17978.5	58	-25.5	46.7	36.8	74	16	V

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17951	59	-25.5	46.7	37.8	74	15	V
17996.2	58.5	-25.5	46.7	37.3	74	15.5	H
17885	58.3	-25.5	46.7	37.1	74	15.7	H
17957.7	58.3	-25.5	46.7	37.1	74	15.7	H
17973.6	58.3	-25.5	46.7	37.1	74	15.7	H
5861.8	53.3	-16.2	34.4	35.2	106.7	53.4	V

802.11n-HT40

Ch151

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17875.7	58.8	-25.5	46.7	37.6	74	15.2	V
17596.8	58.4	-25.7	46	38.2	74	15.6	H
17970.3	58.4	-25.5	46.7	37.2	74	15.6	H
17978	58.4	-25.5	46.7	37.2	74	15.6	H
17881.2	58.3	-25.5	46.7	37.1	74	15.7	V
5719.9	64.4	-16.3	34.3	46.4	110.5	46.1	V

Ch159

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17984	59	-25.5	46.7	37.8	74	15	H
17971.4	58.8	-25.5	46.7	37.6	74	15.2	H
17979.7	58.8	-25.5	46.7	37.6	74	15.2	V
17996.7	58.8	-25.5	46.7	37.6	74	15.2	V
17978.5	58.7	-25.5	46.7	37.5	74	15.3	V
5856.7	57.2	-16.2	34.4	39.1	105.7	48.5	V

802.11ac-HT20

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17996.7	58.9	-25.5	46.7	37.7	74	15.1	V
17977.5	58.8	-25.5	46.7	37.6	74	15.2	V
17995	58.7	-25.5	46.7	37.5	74	15.3	V
17934	58.5	-25.5	46.7	37.3	74	15.5	H
17946.1	58.4	-25.5	46.7	37.2	74	15.6	V
5724.9	57.8	-16.3	34.3	39.8	121.9	64.1	V

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17954.9	58.4	-25.5	46.7	37.2	74	15.6	H
17978.5	58.4	-25.5	46.7	37.2	74	15.6	H
17899.9	58.2	-25.5	46.7	37	74	15.8	H
17958.8	58.1	-25.5	46.7	36.9	74	15.9	H
17984.6	58.1	-25.5	46.7	36.9	74	15.9	H
17973	58	-25.5	46.7	36.8	74	16	V

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17941.2	58.5	-25.5	46.7	37.3	74	15.5	H
17970.3	58.5	-25.5	46.7	37.3	74	15.5	V
17993.4	58.4	-25.5	46.7	37.2	74	15.6	H
17895.5	58.3	-25.5	46.7	37.1	74	15.7	V
17991.8	58.3	-25.5	46.7	37.1	74	15.7	H
5852.5	52.9	-16.2	34.4	34.8	86.7	33.8	V

802.11ac-HT40

Ch151

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17975.2	58.6	-25.5	46.7	37.4	74	15.4	H
17970.8	58.4	-25.5	46.7	37.2	74	15.6	H
17992.8	58.4	-25.5	46.7	37.2	74	15.6	V
17976.3	58.3	-25.5	46.7	37.1	74	15.7	V
17993.4	58.3	-25.5	46.7	37.1	74	15.7	H
5720.1	63.2	-16.3	34.3	45.2	110.85	47.65	V

Ch159

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17970.8	58.9	-25.5	46.7	37.7	74	15.1	V
17899.3	58.6	-25.5	46.7	37.4	74	15.4	V
17951.6	58.6	-25.5	46.7	37.4	74	15.4	H
17969.2	58.5	-25.5	46.7	37.3	74	15.5	H
17973	58.4	-25.5	46.7	37.2	74	15.6	H
5853.5	58.1	-16.2	34.4	40	94.1	36	V

802.11ac-HT80

Ch155

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17974.2	59	-25.5	46.7	37.8	74	15	V
17970.8	58.5	-25.5	46.7	37.3	74	15.5	V
17945	58.4	-25.5	46.7	37.2	74	15.6	H
17985.7	58.4	-25.5	46.7	37.2	74	15.6	H
17965.9	58.3	-25.5	46.7	37.1	74	15.7	V
17981.8	58.3	-25.5	46.7	37.1	74	15.7	H

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.	

Measurement Uncertainty:

Measurement Uncertainty	0.75dB

Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5745 MHz	Fig.15	P
	5825 MHz	Fig.16	P
802.11n HT20	5745 MHz	Fig.17	P
	5825 MHz	Fig.18	P
802.11n HT40	5755 MHz	Fig.19	P
	5795 MHz	Fig.20	P
802.11ac HT20	5745 MHz	Fig.21	P
	5825 MHz	Fig.22	P
802.11ac HT40	5755 MHz	Fig.23	P
	5795 MHz	Fig.24	P
802.11ac HT80	5775 MHz	Fig.25 Fig.26	P

Conclusion: PASS

Test graphs as below:

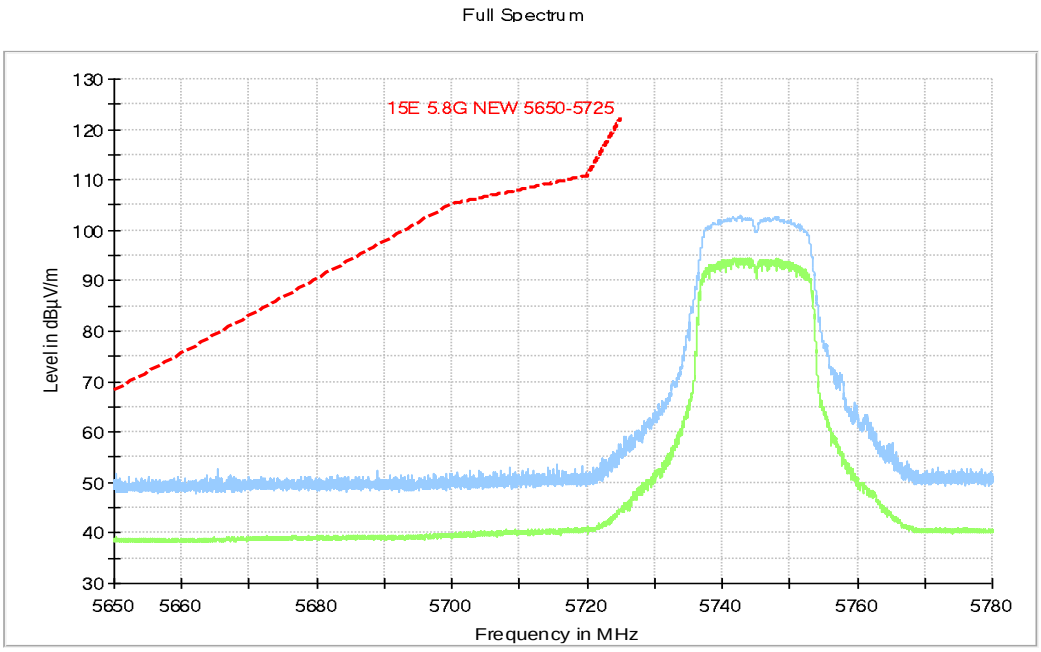


Fig. 15 Band Edges (802.11a, 5745MHz)

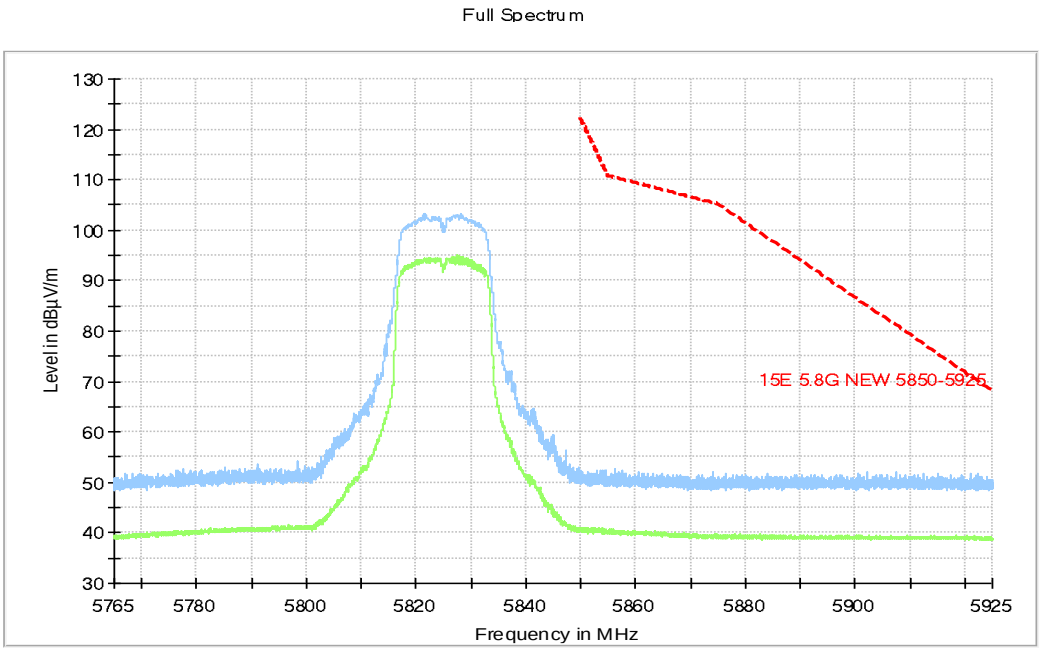


Fig. 16 Band Edges (802.11a, 5825MHz)

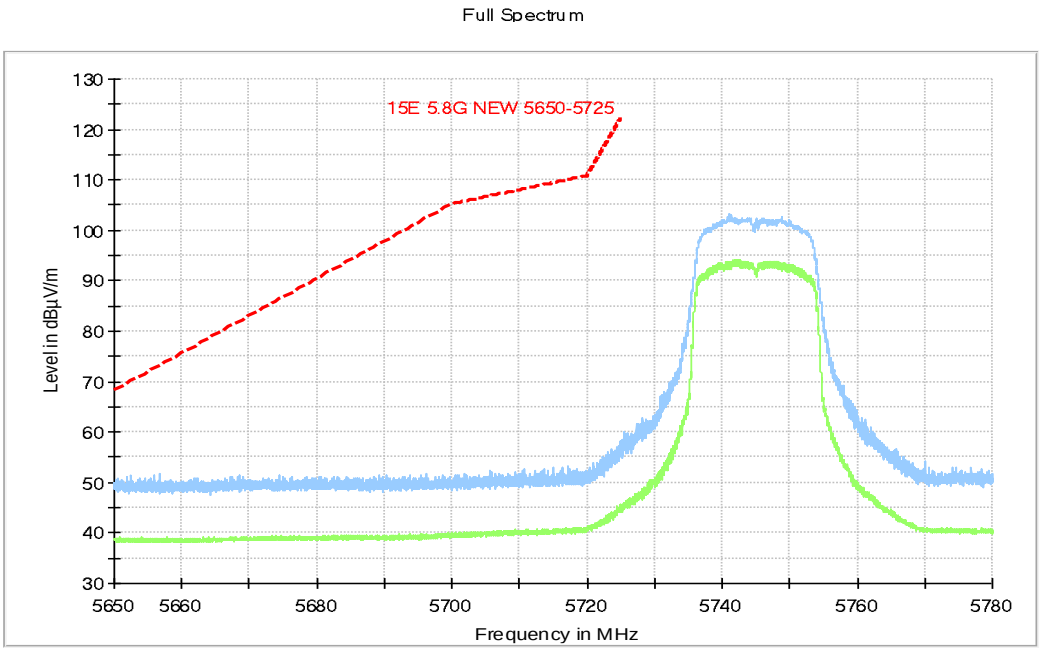


Fig. 17 Band Edges (802.11n-HT20, 5745MHz)

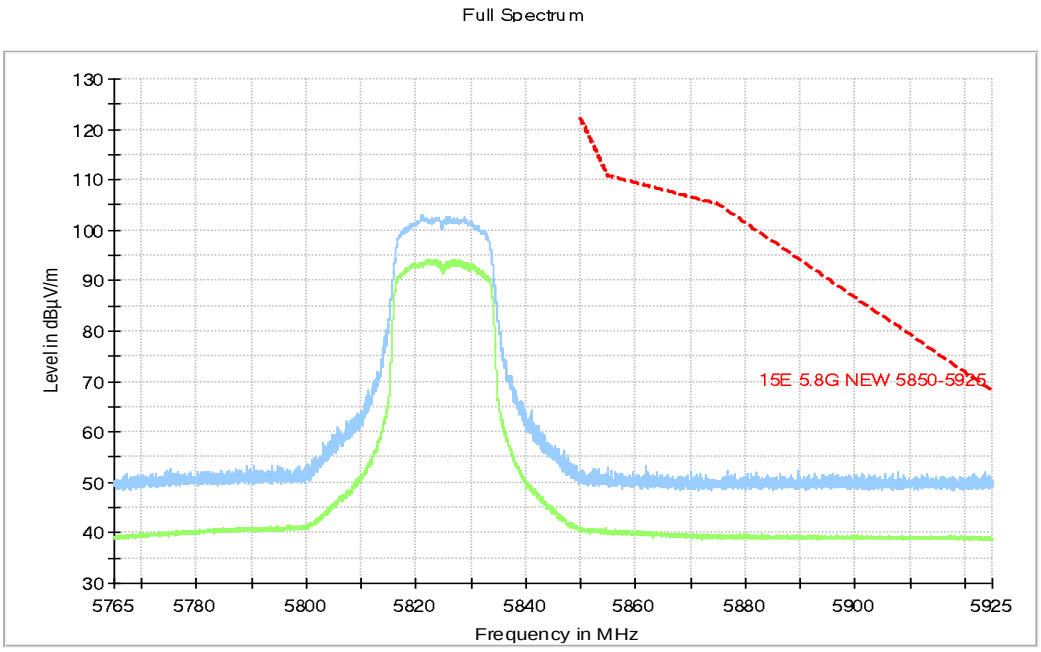


Fig. 18 Band Edges (802.11n-HT20, 5825MHz)

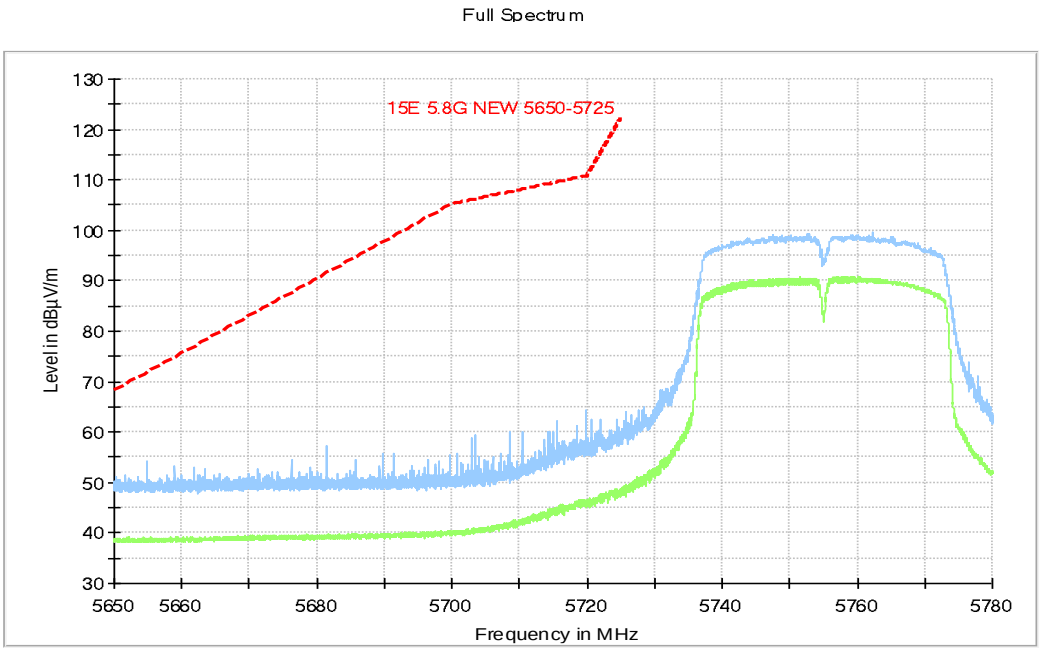


Fig. 19 Band Edges (802.11n-HT40, 5755MHz)

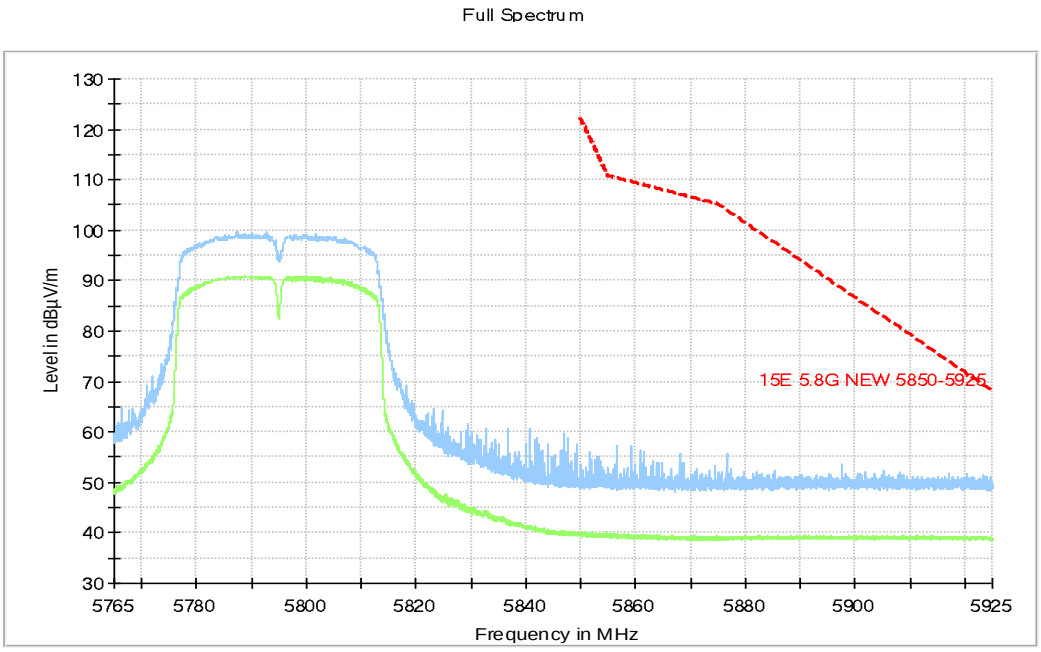


Fig. 20 Band Edges (802.11n-HT40, 5795MHz)

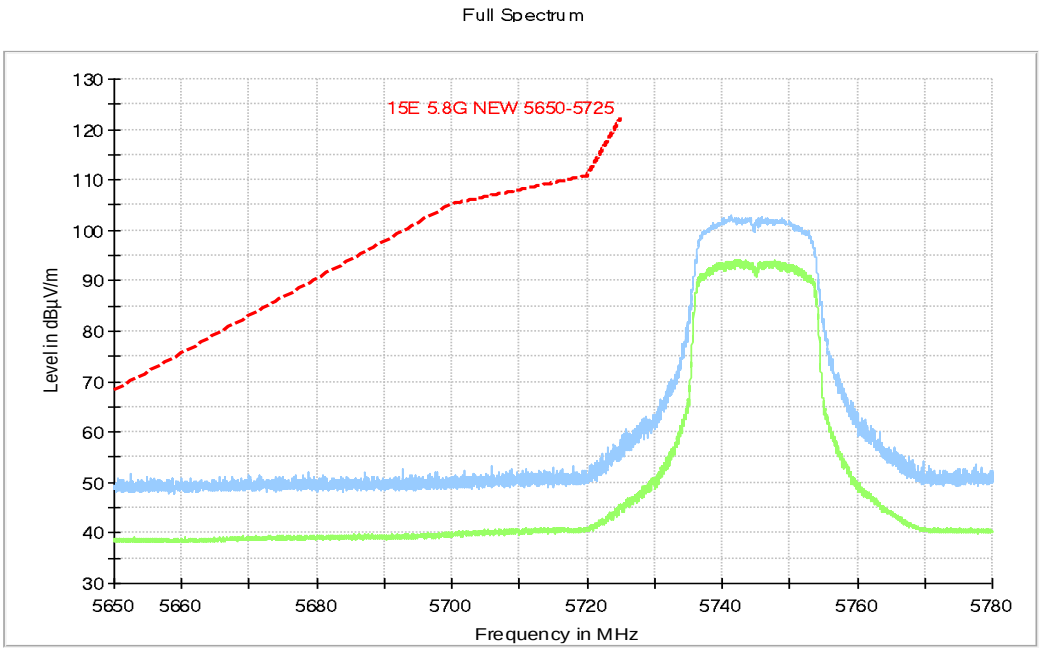


Fig. 21 Band Edges (802.11ac-HT20, 5745MHz)

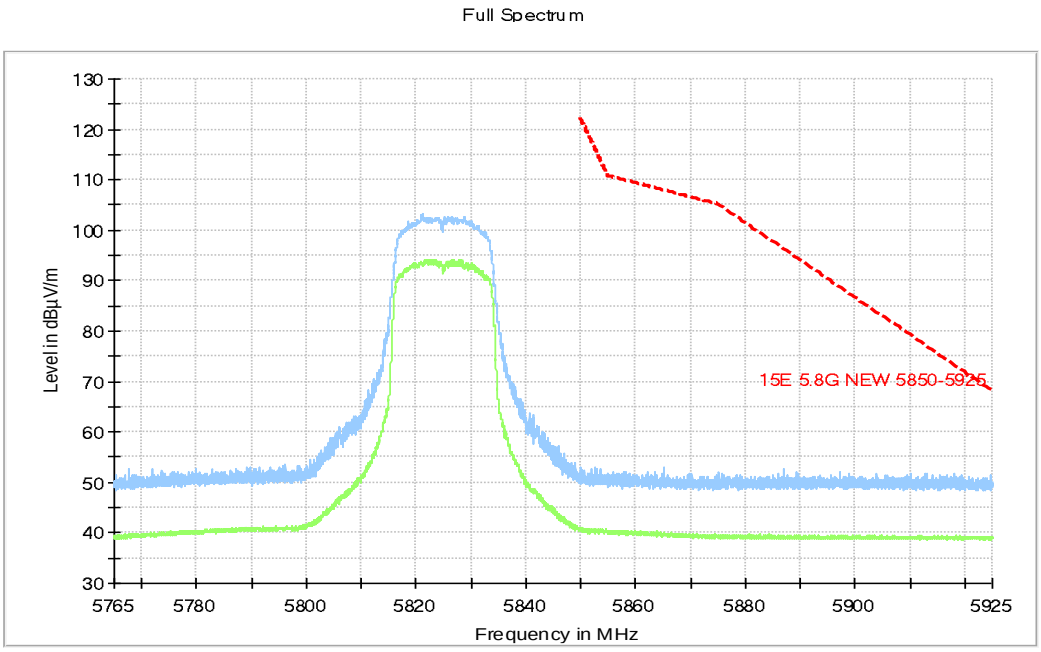


Fig. 22 Band Edges (802.11ac-HT20, 5825MHz)

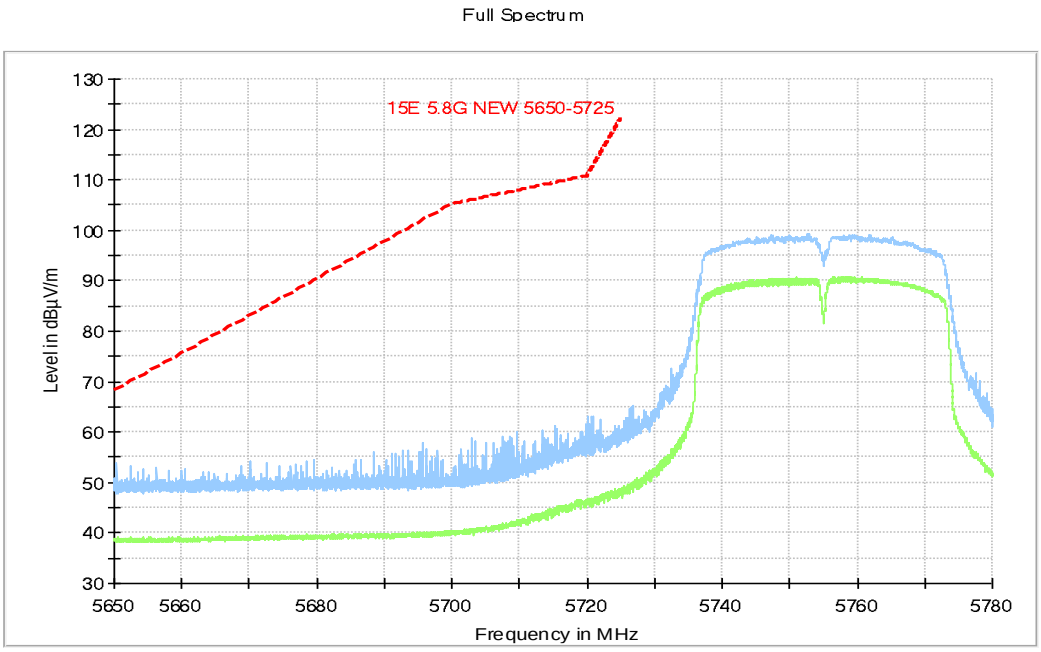


Fig. 23 Band Edges (802.11ac-HT40, 5755MHz)

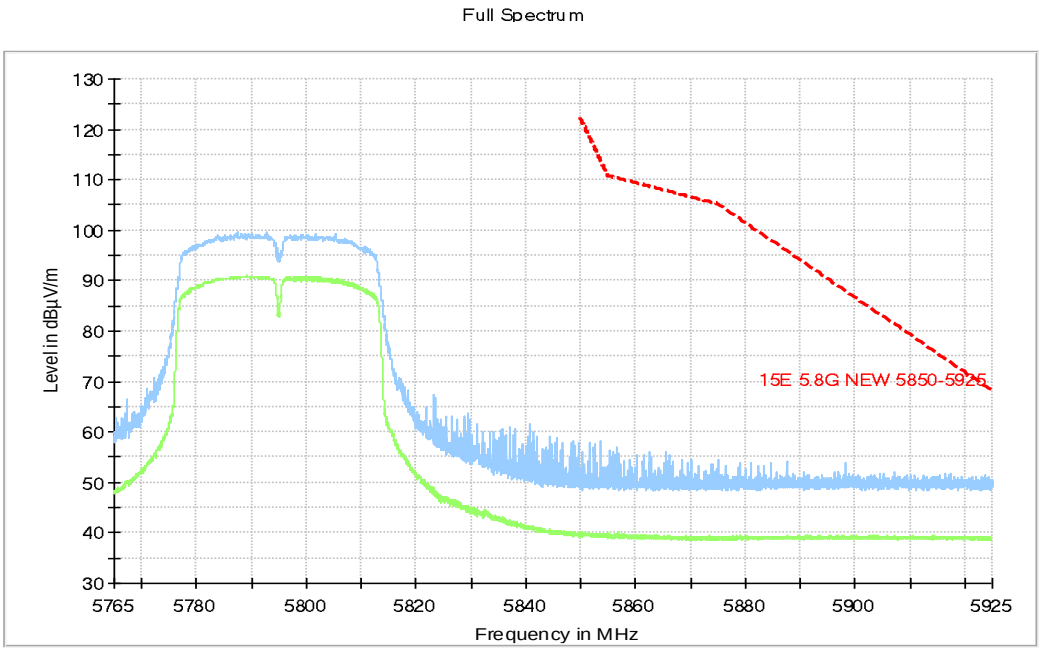


Fig. 24 Band Edges (802.11ac-HT40, 5795MHz)

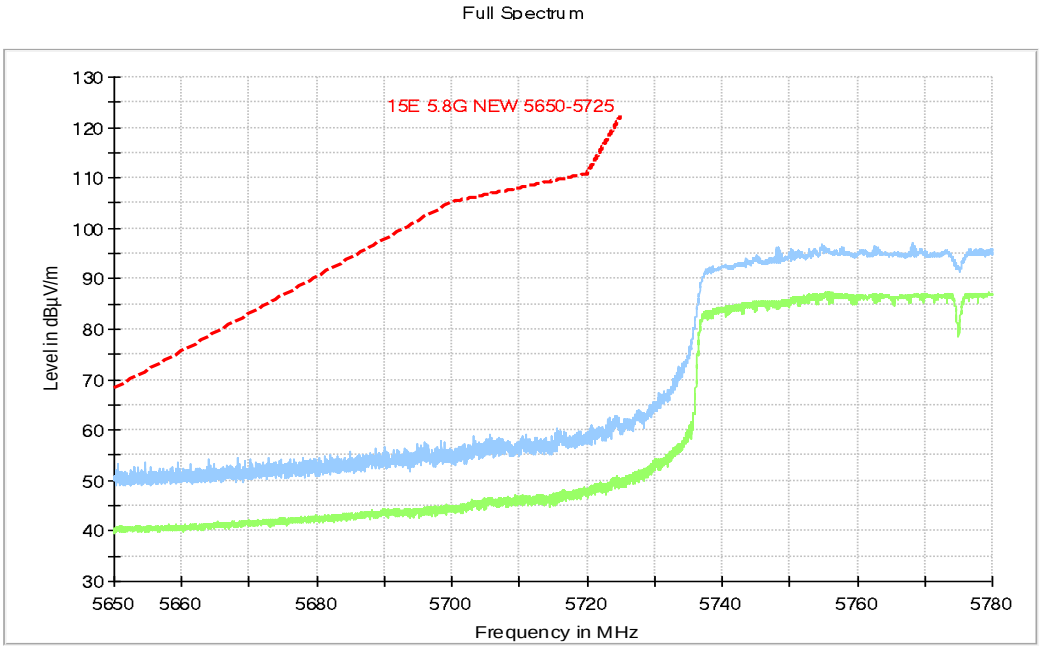


Fig. 25 Band Edges (802.11ac-HT80, 5775MHz)

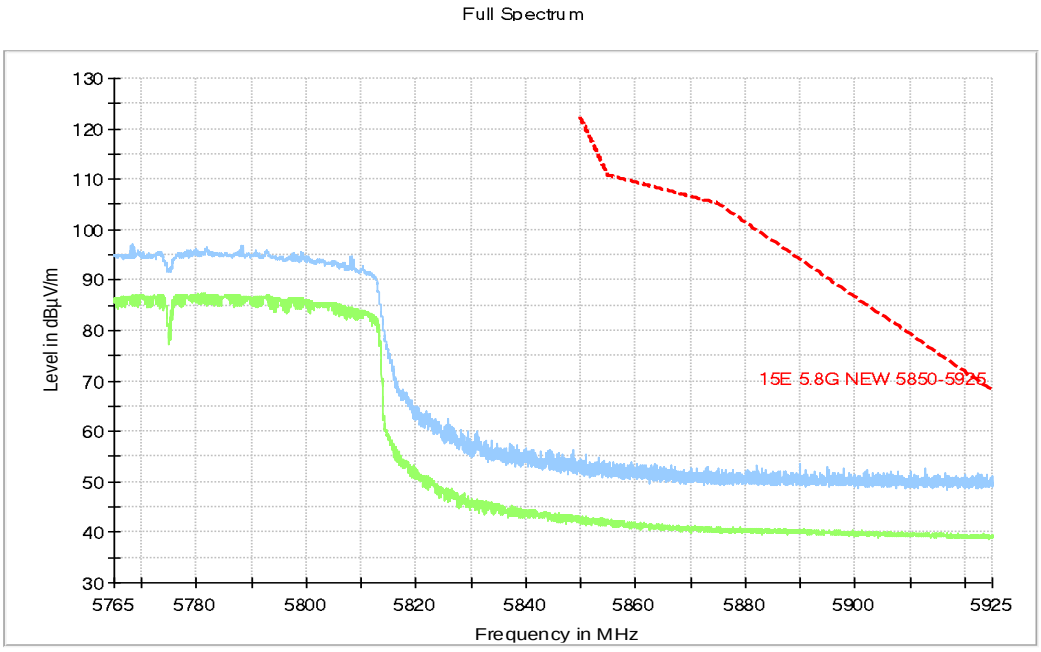


Fig. 26 Band Edges (802.11ac-HT80, 5775MHz)

A.7. AC Powerline Conducted Emission

Test Condition:

Voltage（V）	Frequency（Hz）
120	60

Measurement uncertainty:

Expanded measurement uncertainty for this test item is U =3.10dB, k=2.

Measurement Result and limit:

WLAN (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		802.11a	Idle	
0.15 to 0.5	66 to 56	Fig.27	Fig.28	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 (dBμV)	Result (dBμV)		Conclusion
		With charger		
		802.11a	Idle	
0.15 to 0.5	56 to 46	Fig.27	Fig.28	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:

Traffic:

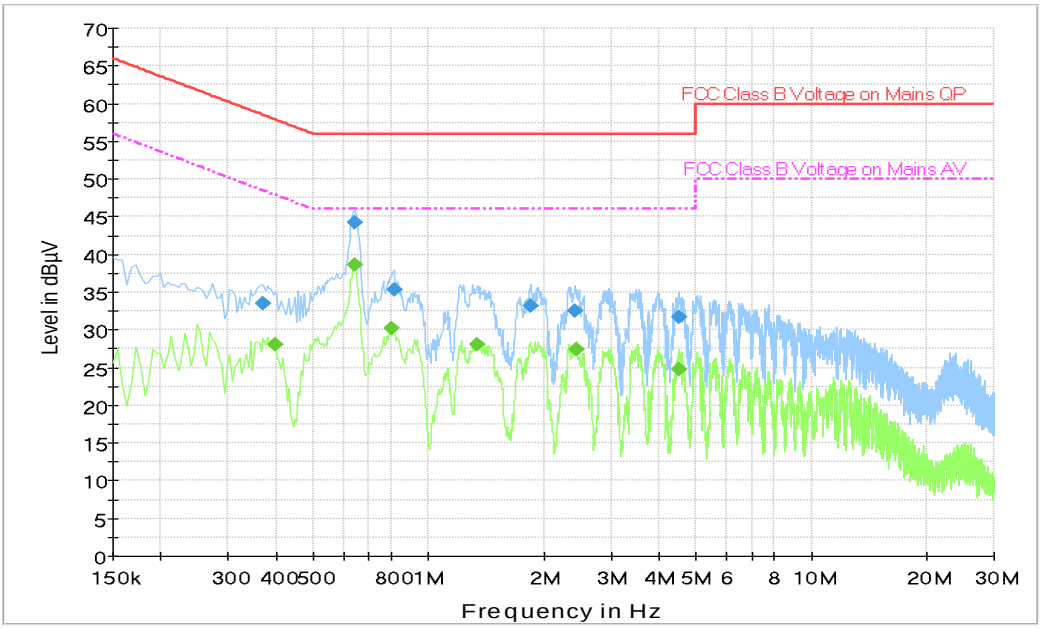


Fig. 27 AC Power line Conducted Emission-802.11a

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 (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.370500	33.5	1000.0	9.000	N	19.9	25.0	58.5
0.640500	44.2	1000.0	9.000	N	19.9	11.8	56.0
0.811500	35.3	1000.0	9.000	N	19.8	20.7	56.0
1.851000	33.2	1000.0	9.000	N	19.8	22.8	56.0
2.409000	32.6	1000.0	9.000	N	19.8	23.4	56.0
4.524000	31.7	1000.0	9.000	N	19.8	24.3	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.397500	28.1	1000.0	9.000	N	19.9	19.8	47.9
0.640500	38.6	1000.0	9.000	N	19.9	7.4	46.0
0.798000	30.3	1000.0	9.000	N	19.8	15.7	46.0
1.338000	28.1	1000.0	9.000	N	19.8	17.9	46.0
2.440500	27.3	1000.0	9.000	N	19.8	18.7	46.0
4.492500	24.8	1000.0	9.000	N	19.8	21.2	46.0

Note2: The measurement results showed here are worst case of the combinations of different cables

Idle:

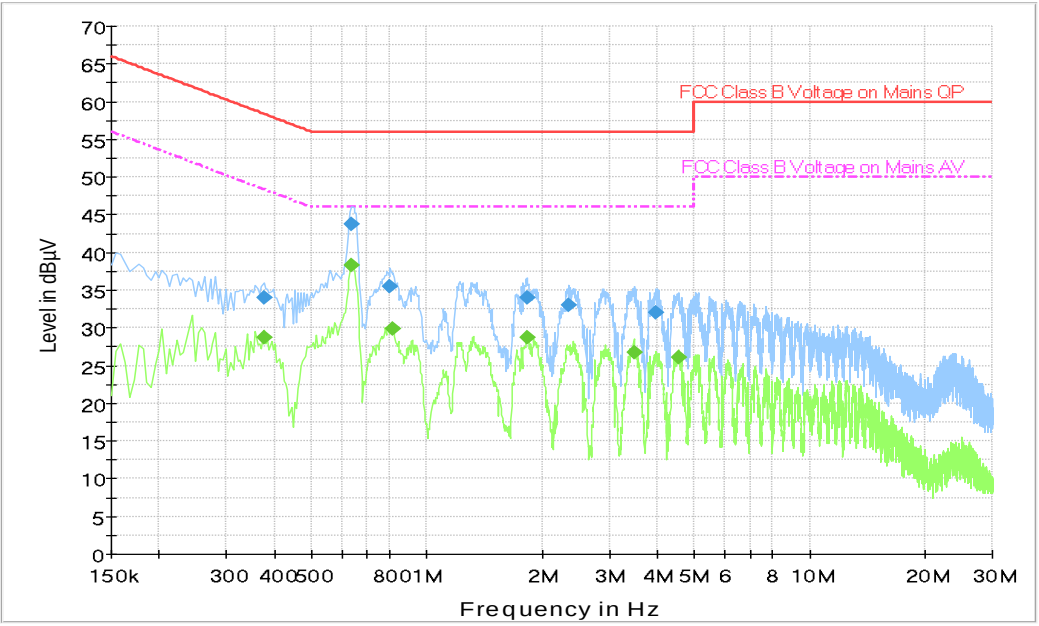


Fig. 28 AC Power line Conducted Emission-Idle

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 (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.375000	34.0	1000.0	9.000	N	19.9	24.4	58.4
0.636000	43.8	1000.0	9.000	N	19.9	12.2	56.0
0.802500	35.4	1000.0	9.000	N	19.8	20.6	56.0
1.824000	33.9	1000.0	9.000	N	19.8	22.1	56.0
2.341500	33.1	1000.0	9.000	N	19.8	22.9	56.0
3.966000	32.0	1000.0	9.000	N	19.8	24.0	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.375000	28.7	1000.0	9.000	N	19.9	19.7	48.4
0.636000	38.3	1000.0	9.000	N	19.9	7.7	46.0
0.811500	29.8	1000.0	9.000	N	19.8	16.2	46.0
1.833000	28.7	1000.0	9.000	N	19.8	17.3	46.0
3.471000	26.8	1000.0	9.000	N	19.8	19.2	46.0
4.546500	26.1	1000.0	9.000	N	19.8	19.9	46.0

Note2: The measurement results showed here are worst case of the combinations of different cables

ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2019-09-26 through 2020-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

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