



FCC PART 15C TEST REPORT No.I22Z60036-IOT05

for

HMD Global Oy

Smart Phone

N150DL

With

FCC ID: 2AJOTTA-1500

Hardware Version: V1.0

Software Version: 02US_0_076

Issued Date: 2022-03-10

Note:

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REPORT HISTORY

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CONTENTS

CONTENTS	3
1. TEST LATORATORY.....	5
1.1. INTRODUCTION & ACCREDITATION	5
1.2. TESTING LOCATION	5
1.3. TESTINGENVIRONMENT	5
1.4. PROJECT DATE	5
1.5. SIGNATURE	5
2. CLIENT INFORMATION.....	6
2.1. APPLICANT INFORMATION	6
2.2. MANUFACTURER INFORMATION	6
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT(AE)	7
3.1. ABOUT EUT	7
3.2. INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST	7
3.3. INTERNAL IDENTIFICATION OF AE USED DURING THE TEST	7
3.4. GENERAL DESCRIPTION.....	8
4. REFERENCE DOCUMENTS	8
4.1. DOCUMENTS SUPPLIED BY APPLICANT	8
4.2. REFERENCE DOCUMENTS FOR TESTING.....	8
5. LABORATORY ENVIRONMENT.....	8
6. SUMMARY OF TEST RESULTS	9
6.1. SUMMARY OF TEST RESULTS.....	9
6.2. STATEMENTS.....	9
6.3. TEST CONDITIONS	9
7. TEST EQUIPMENTS UTILIZED	10
8. MEASUREMENT UNCERTAINTY	11
8.1. TRANSMITTER OUTPUT POWER.....	11
8.2. PEAK POWER SPECTRAL DENSITY	11
8.3. OCCUPIED 6dB BANDWIDTH.....	11
8.4. BAND EDGES COMPLIANCE	11
8.5. SPURIOUS EMISSIONS	11
8.6. AC POWER-LINE CONDUCTED EMISSION	11
ANNEX A: MEASUREMENT RESULTS.....	12
A.1. MEASUREMENT METHOD	12
A.2. MAXIMUM PEAK OUTPUT POWER	13
A.2.1 ANTENNA GAIN.....	13
A.2.2. MAXIMUM AVERAGE OUTPUT POWER-CONDUCTED	13

A.3. PEAK POWER SPECTRAL DENSITY	15
A.4. OCCUPIED 6DB BANDWIDTH	16
A.5. TRANSMITTER SPURIOUS EMISSION	21
A.5.1 TRANSMITTER SPURIOUS EMISSION - RADIATED	21
A.6. BAND EDGES COMPLIANCE	34
A6.1 BAND EDGES - RADIATED	34
FIG. 10 BAND EDGES (802.11A CH149,5745MHz).....	35
FIG. 11 BAND EDGES (802.11A CH165, 5825MHz).....	35
FIG. 12 BAND EDGES (802.11N-HT20 CH149, 5745MHz)	35
FIG. 13 BAND EDGES (802.11N-HT20 CH165, 5825MHz)	36
FIG. 14 BAND EDGES (802.11N-HT40 CH151, 5755MHz)	36
FIG. 15 BAND EDGES (802.11N-HT40 CH159, 5795MHz)	36
FIG. 16 BAND EDGES (802.11AC-HT20 CH149, 5745MHz)	37
FIG. 17 BAND EDGES (802.11AC-HT20 CH165, 5825MHz)	37
FIG. 18 BAND EDGES (802.11AC-HT40 CH151, 5755MHz)	37
FIG. 19 BAND EDGES (802.11AC-HT40 CH159, 5795MHz)	38
FIG. 20 BAND EDGES (802.11AC-HT80 CH155, 5775MHz)	38
FIG. 21 BAND EDGES (802.11AC-HT80, 5775MHz).....	38
A.7. AC POWERLINE CONDUCTED EMISSION	39
FIG. 22 AC POWER LINE CONDUCTED EMISSION-802.11A	40
FIG. 23 AC POWER LINE CONDUCTED EMISSION-IDLE.....	41
ANNEX B: EUT PARAMETERS.....	42
ANNEX C: ACCREDITATION CERTIFICATE	42

1. TEST LATORATORY

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 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 (ISED#: 24849). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

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

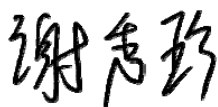
Relative Humidity: 20-75%

1.4. Project date

Testing Start Date: 2022-01-11

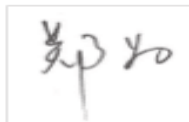
Testing End Date: 2022-03-10

1.5. Signature



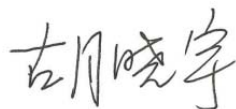
Xie Xiuzhen

(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: HMD Global Oy
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City: Espoo
Postal Code: /
Country: Finland
Contact: Reza Serafat
Email: reza.serafat@hmdglobal.com

2.2. Manufacturer Information

Company Name: HMD Global Oy
Address: Bertel Jungin aukio 9, 02600 Espoo, Finland
City: Espoo
Postal Code: /
Country: Finland
Contact: Reza Serafat
Email: reza.serafat@hmdglobal.com

3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY

EQUIPMENT(AE)

3.1. About EUT

Description	Smart Phone
Model name	N150DL
FCC ID	2AJOTTA-1500
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
UT41a	351116900017392	V1.0	02US_0_076
UT16a	351116900005454	V1.0	02US_0_076

*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
AE1	Battery	/
AE2	USB Cable	/
AE3	Charger	/

AE1

Model	TN-BP5000N1
Manufacturer	Guangdong Fenghua new energy co.,ltd.
Capacity	5000mAh
Nominal Voltage	3.85V

AE2

Model	TN-TC2A1MFB
Manufacturer	Saibao(Jiangxi) Communication Industrial Co., Ltd
Length of cable	/

AE3

Model	1-CHUSQ302-097
Manufacturer	HUIZHOU PUAN ELECTRONICS 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 Smart Phone 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;	2018
	15.209 Radiated emission limits, general requirements;	
	15.407 General technical requirements	
ANSI C63.10	Methods of Measurement of Radio-Noise Emissions from	2013
	Low-Voltage Electrical and Electronic Equipment in the	
	Range of 9 kHz to 40 GHz	
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. 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 - Conducted& Radiated	15.407 (b)	/	P
Transmitter Spurious Emission - Conducted	15.407	/	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/manufacture 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°C
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	2022-05-24
2	Test Receiver	ESCI	100766	R&S	1 year	2022-04-09
3	LISN	ENV216	101200	R&S	1 year	2022-05-30
4	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESW44	103015	R&S	1 year	2022-09-03
2	EMI Antenna	VULB 9163	01223	SCHWARZBECK	1 year	2022-03-22
3	EMI Antenna	3117	00058889	ETS-Lindgren	1 year	2022-11-19

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)
$30\text{MHz} \leq f \leq 2\text{GHz}$	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	/
$30\text{MHz} \leq f \leq 1\text{GHz}$	5.16
$1\text{GHz} \leq f \leq 18\text{GHz}$	5.44
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.28

8.6. AC Power-line Conducted Emission

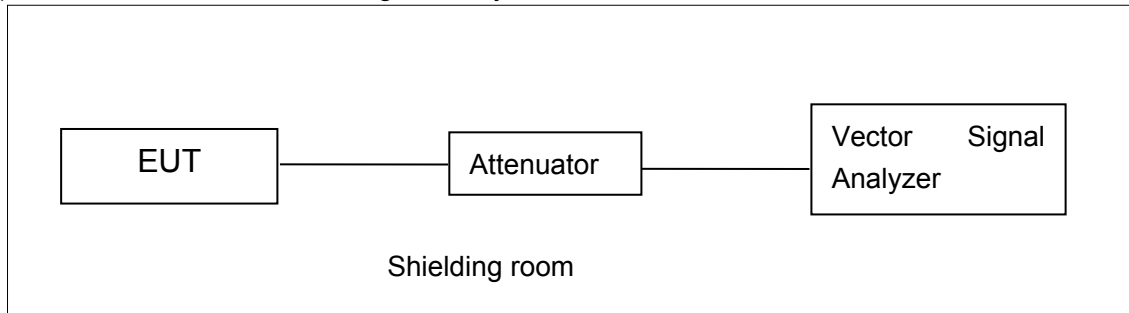
Measurement Uncertainty : 3.08dB,k=2

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

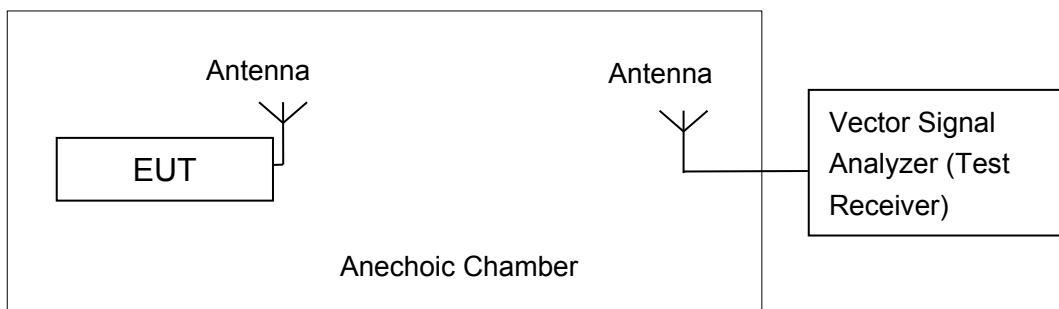


A.1.2. Radiated Emission Measurements

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 -0.85dBi 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	17.23	18.01	18.13

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	17.10	17.07	16.92

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	15.71	15.45	15.24

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	15.14	14.81

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	12.79	12.70

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	11.96

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
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Measurement Results:

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11a	149	3.26	P
	157	3.18	P
	165	3.09	P
802.11n HT20	149	2.80	P
	157	2.74	P
	165	2.60	P
802.11n HT40	151	-0.05	P
	159	-0.24	P
802.11ac HT80	155	-8.29	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
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Measurement Result:

Mode	Channel	Occupied 6dB Bandwidth (MHz)		conclusion
802.11a	149	Fig.1	15.15	P
	157	Fig.2	15.05	P
	165	Fig.3	15.10	P
802.11n HT20	149	Fig.4	15.05	P
	157	Fig.5	15.95	P
	165	Fig.6	15.10	P
802.11n HT40	151	Fig.7	35.68	P
	159	Fig.8	35.12	P
802.11ac HT80	155	Fig.9	75.20	P

Conclusion: PASS

Test graphs as below:

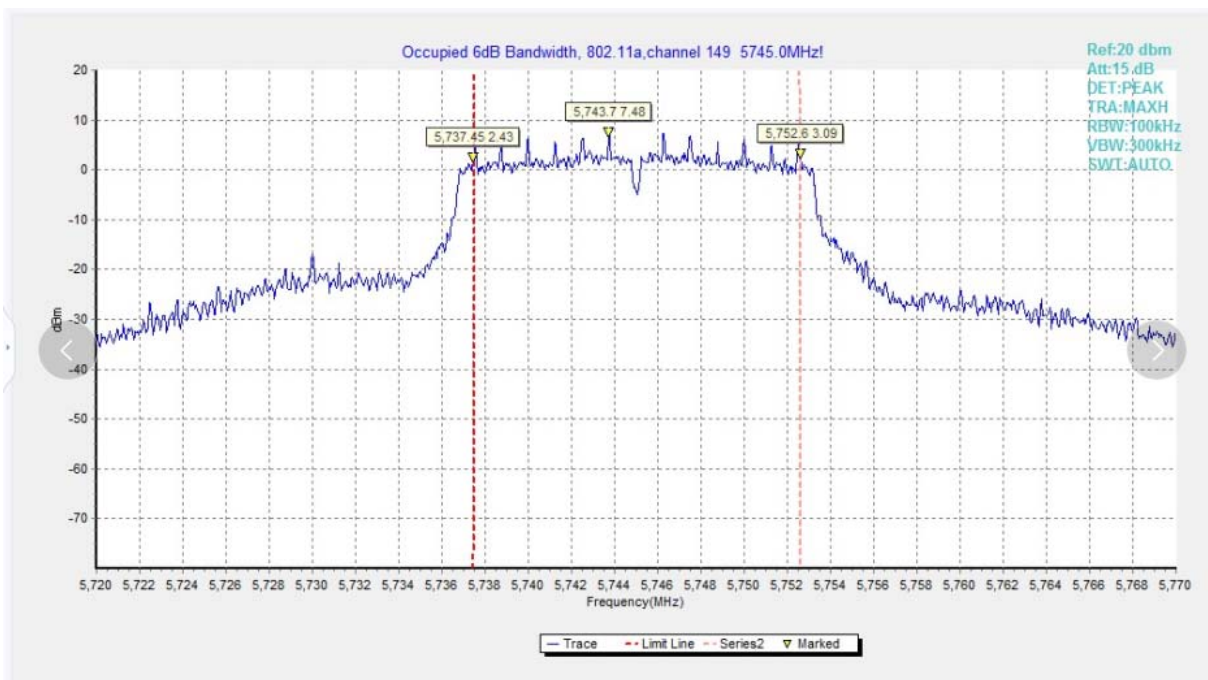


Fig. 1 Occupied 6dB Bandwidth (802.11a, Ch 149)

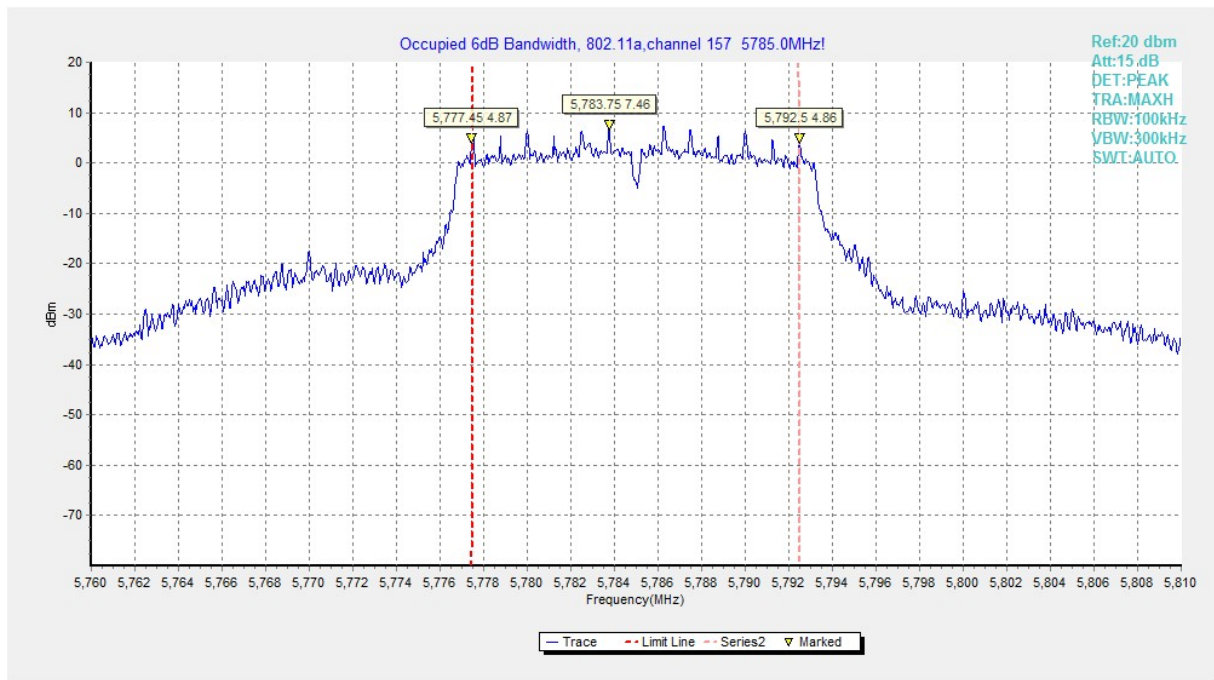


Fig. 2 Occupied 6dB Bandwidth (802.11a, Ch 157)

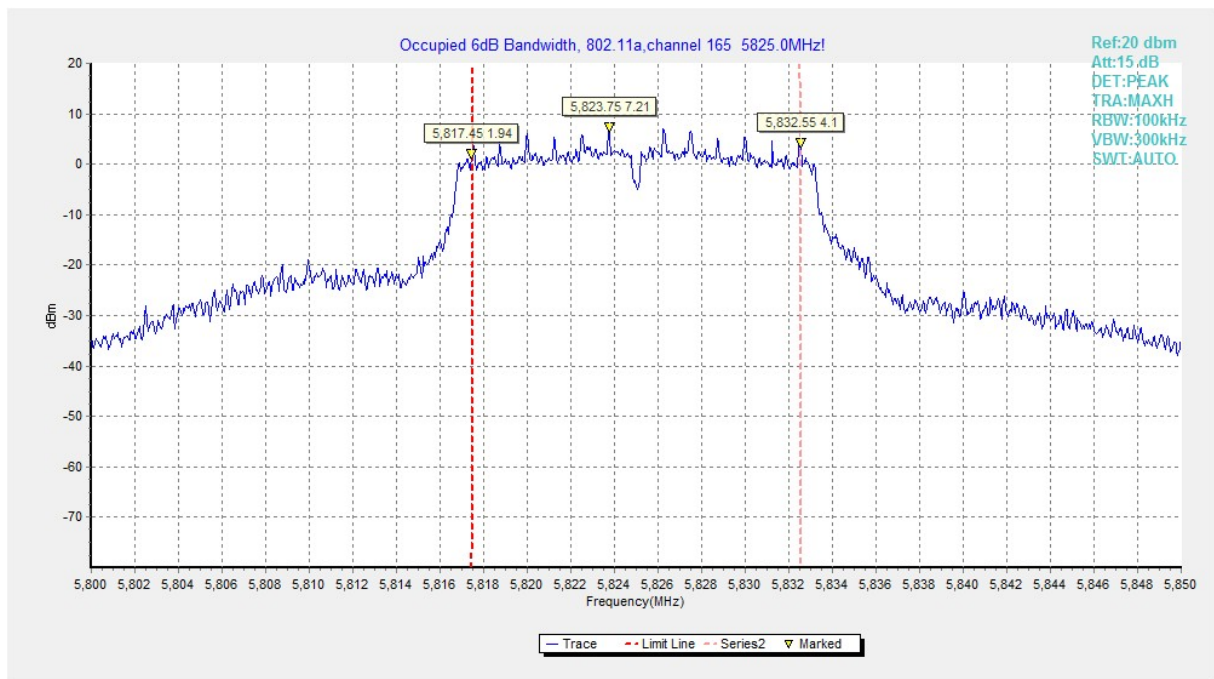


Fig. 3 Occupied 6dB Bandwidth (802.11a, Ch 165)

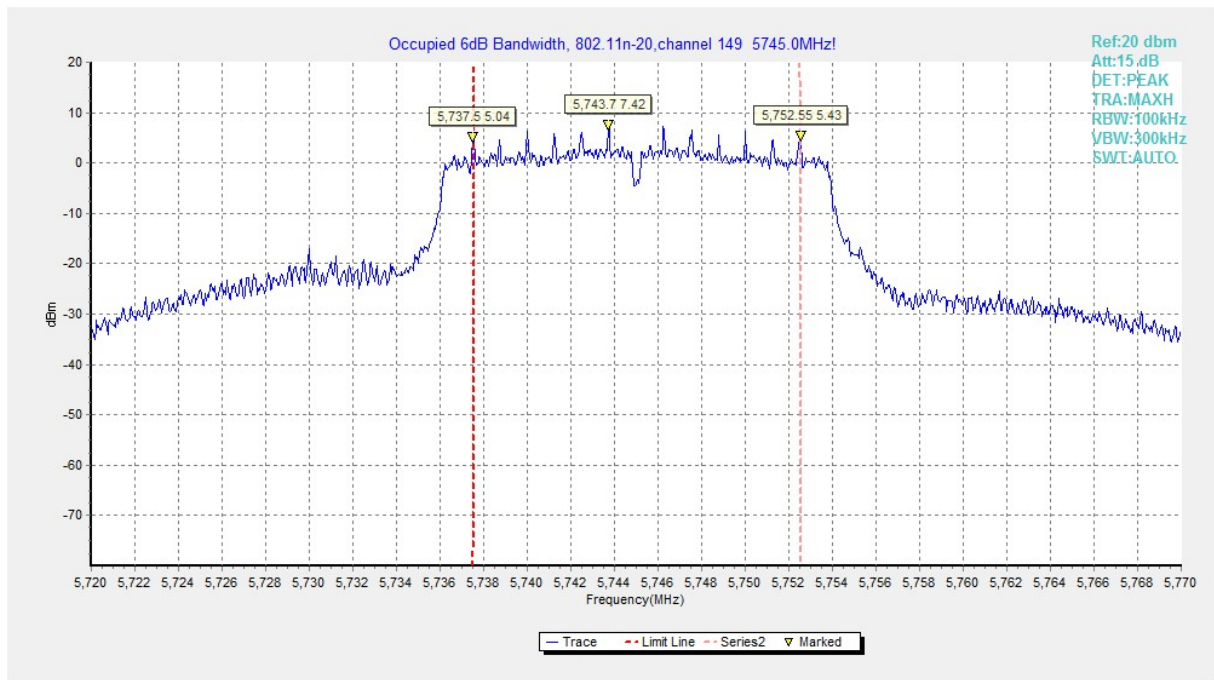


Fig. 4 Occupied 6dB Bandwidth (802.11n-HT20, Ch 149)

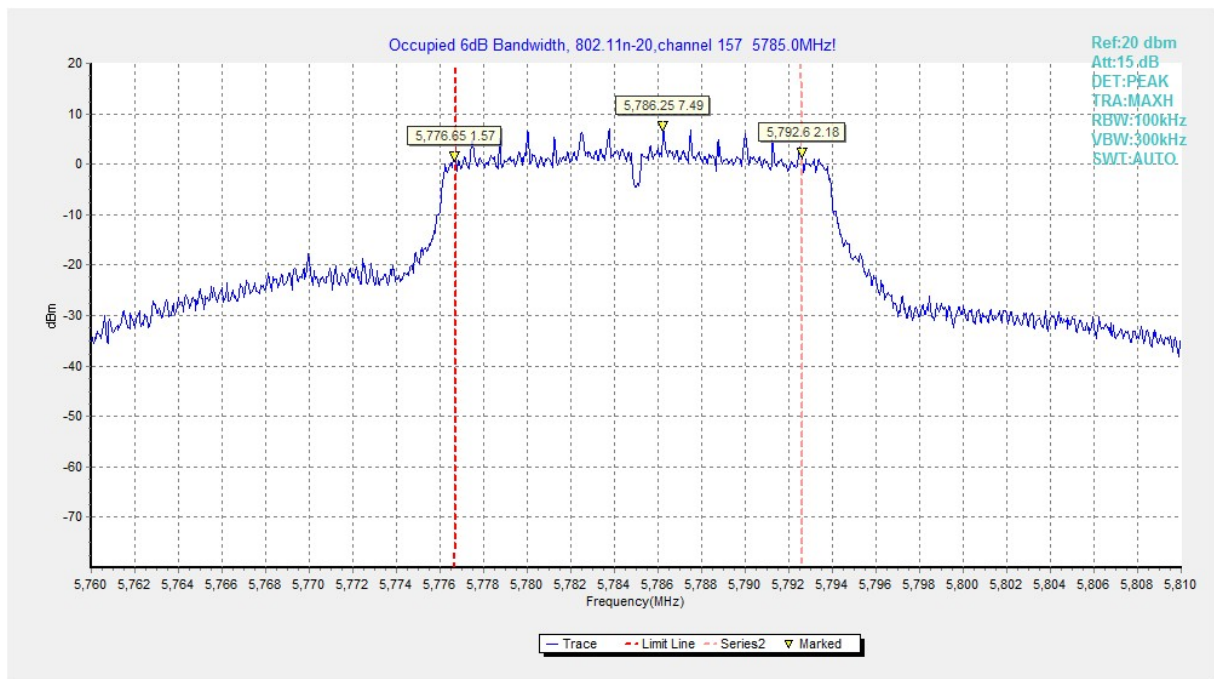


Fig. 5 Occupied 6dB Bandwidth (802.11n-HT20, Ch 157)

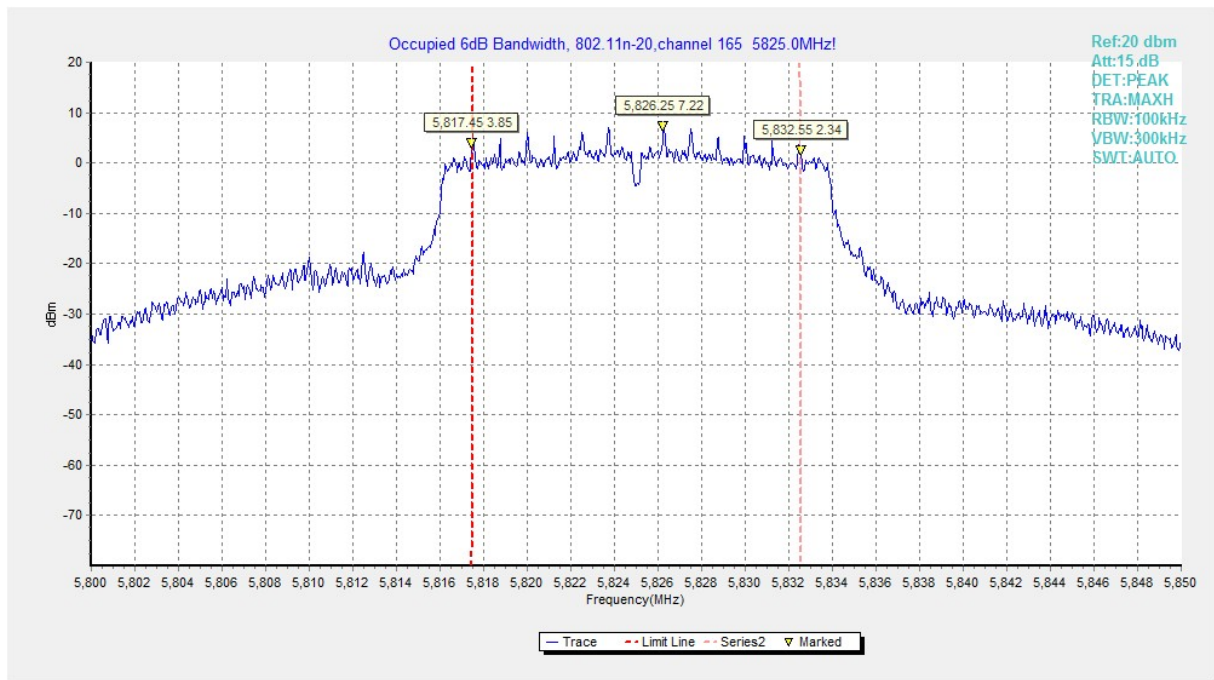


Fig. 6 Occupied 6dB Bandwidth (802.11n-HT20, Ch 165)

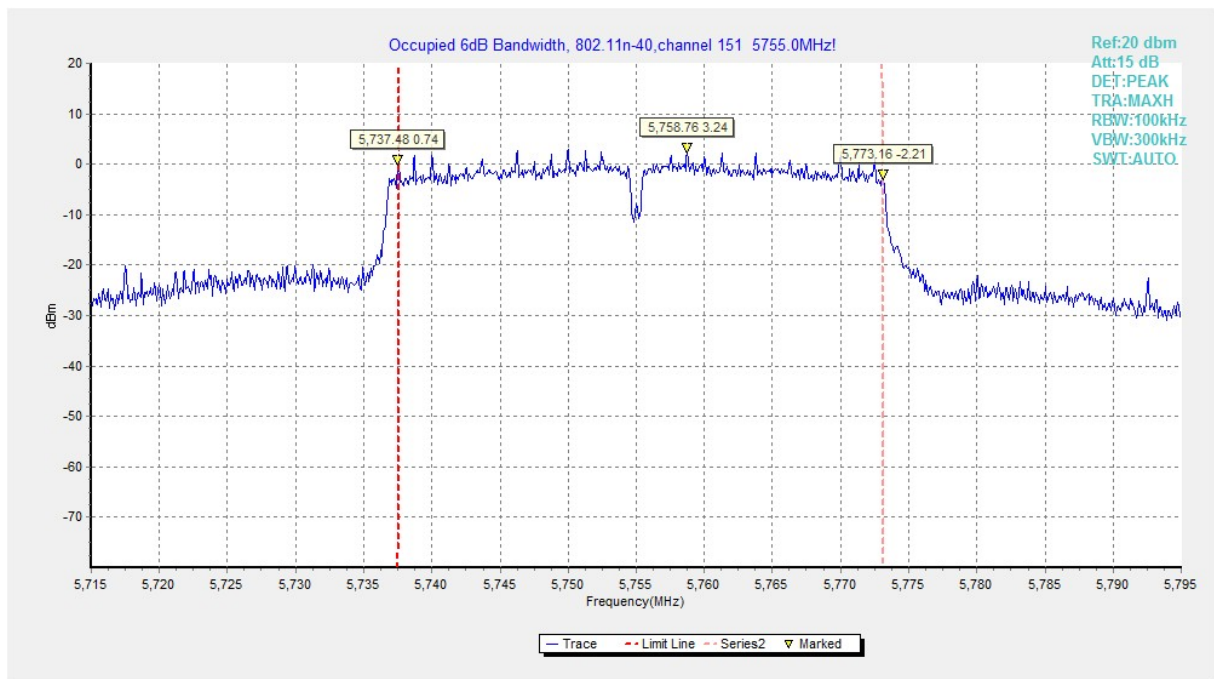


Fig. 7 Occupied 6dB Bandwidth (802.11n-HT40, Ch 151)

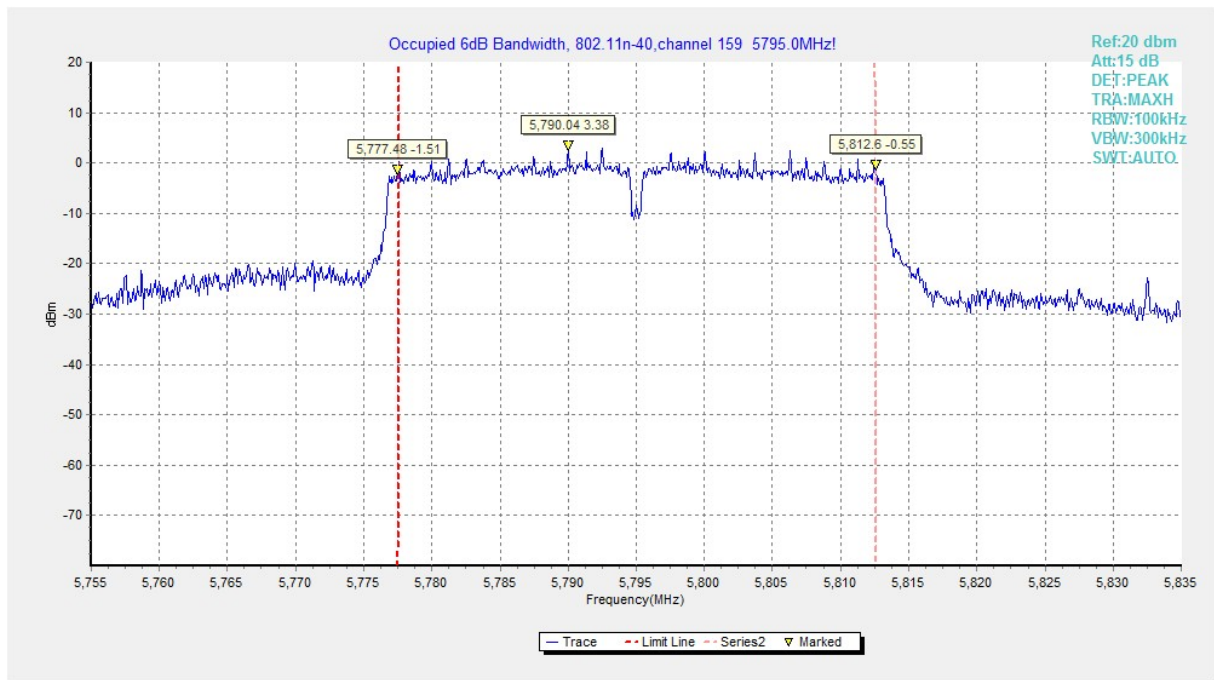


Fig. 8 Occupied 6dB Bandwidth (802.11n-HT40, Ch 159)

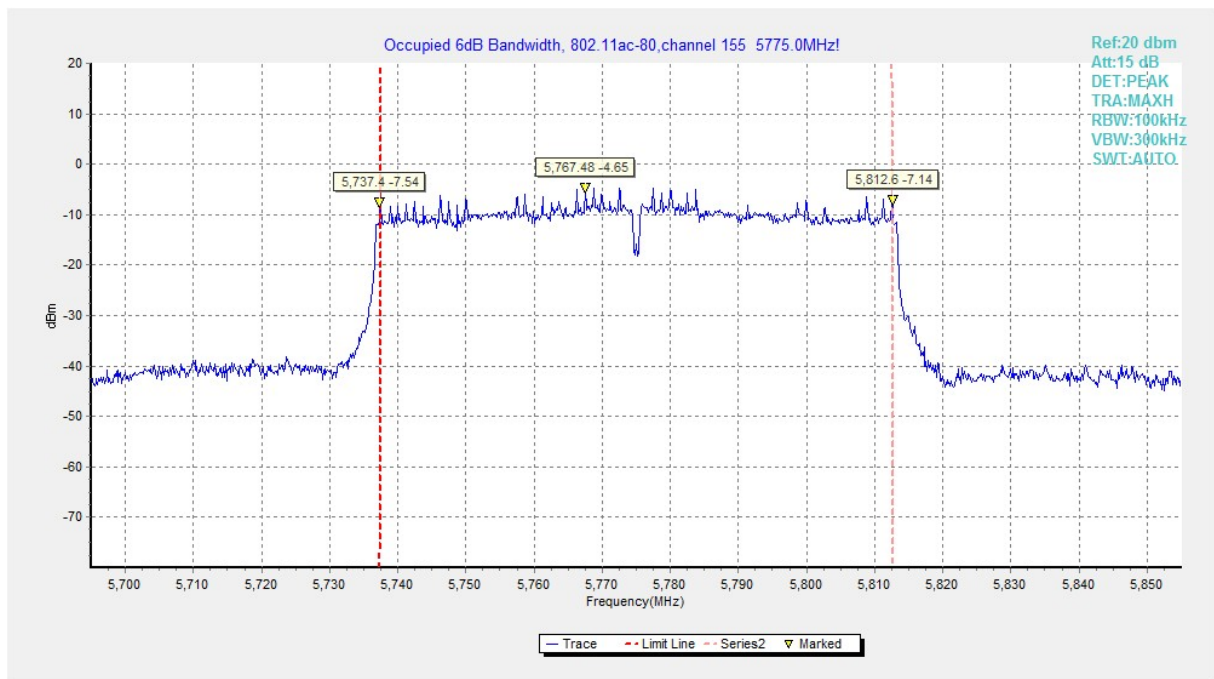


Fig. 9 Occupied 6dB Bandwidth (802.11ac-HT80, Ch 155)

A.5. Transmitter Spurious Emission

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

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
802.11ac (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
802.11ac (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
802.11ac (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

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)
17981.300	42.19	-25.50	46.66	21.03	54.00	11.81	V
17987.300	42.10	-25.50	46.66	20.94	54.00	11.90	V
15900.100	39.56	-27.35	38.54	28.37	54.00	14.44	H
15921.000	39.50	-27.35	38.54	28.31	54.00	14.50	H
11612.300	37.20	-32.31	38.91	30.61	54.00	16.80	V
11446.800	37.17	-32.42	38.79	30.80	54.00	16.83	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)
17996.700	41.97	-25.50	46.66	20.81	54.00	12.03	H
17998.300	41.78	-25.50	46.66	20.62	54.00	12.22	H
15946.900	39.70	-27.35	38.54	28.51	54.00	14.30	V
15902.300	39.68	-27.35	38.54	28.49	54.00	14.32	H
11830.600	37.40	-31.85	39.05	30.20	54.00	16.60	V
11825.700	37.06	-31.85	39.05	29.86	54.00	16.94	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)
17998.900	42.66	-25.50	46.66	21.50	54.00	11.34	V
17985.700	41.91	-25.50	46.66	20.75	54.00	12.09	H
15944.600	39.65	-27.35	38.54	28.46	54.00	14.35	H
15898.500	39.62	-27.35	38.54	28.43	54.00	14.38	H
11830.100	37.41	-31.85	39.05	30.21	54.00	16.59	V
11855.400	37.12	-31.85	39.05	29.92	54.00	16.88	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)
17997.800	42.03	-25.50	46.66	20.87	54.00	11.97	V
17983.000	41.97	-25.50	46.66	20.81	54.00	12.03	H
15901.800	39.57	-27.35	38.54	28.38	54.00	14.43	H
15943.000	39.29	-27.35	38.54	28.10	54.00	14.71	H
11403.900	37.31	-32.42	38.79	30.94	54.00	16.69	H
11413.800	37.10	-32.42	38.79	30.73	54.00	16.90	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)
17980.800	42.26	-25.50	46.66	21.10	54.00	11.74	H
17997.200	42.08	-25.50	46.66	20.92	54.00	11.92	V
15926.500	39.68	-27.35	38.54	28.49	54.00	14.32	H
15928.100	39.44	-27.35	38.54	28.25	54.00	14.56	H
11419.800	37.25	-32.42	38.79	30.88	54.00	16.75	H
11430.800	37.04	-32.42	38.79	30.67	54.00	16.96	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)
17998.900	42.11	-25.50	46.66	20.95	54.00	11.89	V
17991.800	42.06	-25.50	46.66	20.90	54.00	11.94	V
15900.100	39.55	-27.35	38.54	28.36	54.00	14.45	H
15906.100	39.46	-27.35	38.54	28.27	54.00	14.54	V
11603.500	36.94	-32.31	38.91	30.35	54.00	17.06	H
11605.700	36.94	-32.31	38.91	30.35	54.00	17.06	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)
17998.300	42.77	-25.50	46.66	21.61	54.00	11.23	H
17997.200	42.21	-25.50	46.66	21.05	54.00	11.79	V
15944.600	39.75	-27.35	38.54	28.56	54.00	14.25	V
15924.900	39.62	-27.35	38.54	28.43	54.00	14.38	V
11413.800	37.09	-32.42	38.79	30.72	54.00	16.91	H
11430.200	37.09	-32.42	38.79	30.72	54.00	16.91	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)
17983.000	42.40	-25.50	46.66	21.24	54.00	11.60	H
17967.000	42.33	-25.50	46.66	21.17	54.00	11.67	H
15901.200	39.55	-27.35	38.54	28.36	54.00	14.45	H
15922.600	39.41	-27.35	38.54	28.22	54.00	14.59	H
11824.000	37.42	-31.85	39.05	30.22	54.00	16.58	H
11611.800	37.27	-32.31	38.91	30.68	54.00	16.73	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)
17981.300	42.05	-25.50	46.66	20.89	54.00	11.95	H
17998.900	41.93	-25.50	46.66	20.77	54.00	12.07	H
15898.500	39.46	-27.35	38.54	28.27	54.00	14.54	H
15899.000	39.41	-27.35	38.54	28.22	54.00	14.59	V
11446.800	37.16	-32.42	38.79	30.79	54.00	16.84	H
11984.100	36.96	-31.48	39.09	29.35	54.00	17.04	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)
17981.300	42.03	-25.50	46.66	20.87	54.00	11.97	V
17978.500	41.76	-25.50	46.66	20.60	54.00	12.24	V
15922.100	39.47	-27.35	38.54	28.28	54.00	14.53	H
15897.400	39.35	-26.97	38.48	27.84	54.00	14.65	V
11406.600	37.12	-32.42	38.79	30.75	54.00	16.88	V
11508.900	37.02	-32.26	38.84	30.45	54.00	16.98	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)
17987.300	42.17	-25.50	46.66	21.01	54.00	11.83	H
17983.500	41.89	-25.50	46.66	20.73	54.00	12.11	H
15902.900	39.74	-27.35	38.54	28.55	54.00	14.26	V
15930.400	39.52	-27.35	38.54	28.33	54.00	14.48	V
11829.000	37.44	-31.85	39.05	30.24	54.00	16.56	H
11431.900	37.27	-32.42	38.79	30.90	54.00	16.73	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)
17998.300	42.22	-25.50	46.66	21.06	54.00	11.78	V
17970.300	42.10	-25.50	46.66	20.94	54.00	11.90	H
15941.900	39.68	-27.35	38.54	28.49	54.00	14.32	H
15897.400	39.54	-26.97	38.48	28.03	54.00	14.46	V
11417.600	37.19	-32.42	38.79	30.82	54.00	16.81	H
11826.800	37.06	-31.85	39.05	29.86	54.00	16.94	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)
17996.700	42.36	-25.50	46.66	21.20	54.00	11.64	V
17978.500	42.24	-25.50	46.66	21.08	54.00	11.76	H
15939.700	39.71	-27.35	38.54	28.52	54.00	14.29	H
15944.100	39.71	-27.35	38.54	28.52	54.00	14.29	V
11405.500	37.14	-32.42	38.79	30.77	54.00	16.86	H
11863.100	37.03	-31.85	39.05	29.83	54.00	16.97	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)
17998.300	42.38	-25.50	46.66	21.22	54.00	11.62	H
17983.500	42.17	-25.50	46.66	21.01	54.00	11.83	H
15945.200	39.60	-27.35	38.54	28.41	54.00	14.40	H
15897.400	39.48	-26.97	38.48	27.97	54.00	14.52	V
11829.000	37.20	-31.85	39.05	30.00	54.00	16.80	V
11617.800	37.17	-32.31	38.91	30.58	54.00	16.83	H

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)
17386.200	52.82	-25.95	44.35	34.41	68.30	15.48	H
17981.300	52.77	-25.50	46.66	31.61	74.00	21.23	V
16846.100	51.98	-26.62	41.49	37.11	68.30	16.32	H
16972.600	51.34	-26.32	42.36	35.29	68.30	16.96	V
11997.900	47.79	-31.48	39.09	40.18	74.00	26.21	V
11436.300	47.69	-32.42	38.79	41.32	74.00	26.31	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)
17970.300	52.79	-25.50	46.66	31.63	74.00	21.21	V
17979.700	52.53	-25.50	46.66	31.37	74.00	21.47	V
16803.800	51.65	-26.62	41.49	36.78	68.30	16.65	H
16982.000	51.17	-26.32	42.36	35.12	68.30	17.13	H
11826.200	47.89	-31.85	39.05	40.69	74.00	26.11	H
11370.300	47.77	-32.42	38.79	41.40	74.00	26.23	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)
17411.500	52.47	-26.85	45.25	34.07	68.30	15.83	V
17985.700	52.42	-25.50	46.66	31.26	74.00	21.58	H
16798.200	51.42	-26.62	41.49	36.55	68.30	16.88	V
16821.900	51.14	-26.62	41.49	36.27	68.30	17.16	H
11852.600	47.63	-31.85	39.05	40.43	74.00	26.37	V
11638.100	47.61	-32.31	38.91	41.02	74.00	26.39	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)
17985.200	54.20	-25.50	46.66	33.04	74.00	19.80	V
17491.200	52.69	-26.85	45.25	34.29	68.30	15.61	H
16807.000	51.62	-26.62	41.49	36.75	68.30	16.68	H
16771.300	51.07	-26.62	41.49	36.20	68.30	17.23	V
11607.900	48.81	-32.31	38.91	42.22	74.00	25.19	H
11449.000	47.85	-32.26	38.84	41.28	74.00	26.15	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)
17391.700	52.44	-26.85	45.25	34.04	68.30	15.86	H
17964.800	52.31	-25.50	46.66	31.15	74.00	21.69	H
16798.800	51.63	-26.62	41.49	36.76	68.30	16.67	V
16350.500	51.56	-27.10	39.31	39.35	68.30	16.74	H
11298.200	48.57	-32.36	38.77	42.17	74.00	25.43	H
11470.400	48.10	-32.26	38.84	41.53	74.00	25.90	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)
17981.800	52.96	-25.50	46.66	31.80	74.00	21.04	V
17971.400	52.70	-25.50	46.66	31.54	74.00	21.30	V
16861.000	51.13	-26.62	41.49	36.26	68.30	17.17	H
16365.400	51.11	-27.10	39.31	38.90	68.30	17.19	V
11803.700	48.59	-31.85	39.05	41.39	74.00	25.41	V
11556.200	47.94	-32.26	38.84	41.37	74.00	26.06	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)
17376.300	53.49	-25.95	44.35	35.08	68.30	14.81	H
17987.900	52.75	-25.50	46.66	31.59	74.00	21.25	V
16800.500	51.18	-26.62	41.49	36.31	68.30	17.12	H
16898.900	51.03	-26.32	42.36	34.98	68.30	17.27	H
11391.200	48.40	-32.42	38.79	42.03	74.00	25.60	V
11826.200	47.78	-31.85	39.05	40.58	74.00	26.22	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)
17431.300	52.98	-26.85	45.25	34.58	68.30	15.32	V
17983.000	52.86	-25.50	46.66	31.70	74.00	21.14	H
16760.300	51.52	-26.62	41.49	36.65	68.30	16.78	V
16562.300	51.40	-26.87	40.65	37.62	68.30	16.90	H
11582.600	47.98	-32.31	38.91	41.39	74.00	26.02	H
11440.700	47.86	-32.42	38.79	41.49	74.00	26.14	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)
17415.300	52.86	-26.85	45.25	34.46	68.30	15.44	H
17985.200	52.75	-25.50	46.66	31.59	74.00	21.25	V
16830.200	51.53	-26.62	41.49	36.66	68.30	16.77	V
16760.800	51.36	-26.62	41.49	36.49	68.30	16.94	H
11888.400	48.37	-31.85	39.05	41.17	74.00	25.63	V
10560.100	48.02	-32.99	38.27	42.73	68.30	20.28	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)
17991.200	53.12	-25.50	46.66	31.96	74.00	20.88	V
17980.200	52.86	-25.50	46.66	31.70	74.00	21.14	V
16771.300	51.32	-26.62	41.49	36.45	68.30	16.98	V
16811.500	51.23	-26.62	41.49	36.36	68.30	17.07	V
11649.700	47.73	-32.31	38.91	41.14	74.00	26.27	V
11995.600	47.73	-31.48	39.09	40.12	74.00	26.27	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)
17384.000	53.04	-25.95	44.35	34.63	68.30	15.26	V
17448.900	52.36	-26.85	45.25	33.96	68.30	15.94	H
16968.800	51.41	-26.32	42.36	35.36	68.30	16.89	V
16807.600	51.34	-26.62	41.49	36.47	68.30	16.96	H
11576.500	48.41	-32.31	38.91	41.82	74.00	25.59	V
11645.900	48.04	-32.31	38.91	41.45	74.00	25.96	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)
17998.900	52.48	-25.50	46.66	31.32	74.00	21.52	H
17980.800	52.46	-25.50	46.66	31.30	74.00	21.54	V
16789.500	51.40	-26.62	41.49	36.53	68.30	16.90	V
16795.500	51.25	-26.62	41.49	36.38	68.30	17.05	H
10598.100	48.32	-32.76	38.38	42.70	68.30	19.98	H
11639.200	47.96	-32.31	38.91	41.37	74.00	26.04	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)
17980.800	53.06	-25.50	46.66	31.90	74.00	20.94	V
17477.000	52.87	-26.85	45.25	34.47	68.30	15.43	H
16940.200	51.03	-26.32	42.36	34.98	68.30	17.27	V
16774.000	50.99	-26.62	41.49	36.12	68.30	17.31	V
11051.900	48.23	-32.49	38.72	41.99	74.00	25.77	V
10603.000	48.22	-32.76	38.38	42.60	74.00	25.78	V

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)
17391.700	53.02	-26.85	45.25	34.62	68.30	15.28	H
17560.000	52.90	-26.85	45.25	34.50	68.30	15.40	H
16349.500	51.45	-27.10	39.31	39.24	68.30	16.85	V
16971.500	51.36	-26.32	42.36	35.31	68.30	16.94	H
11378.500	47.83	-32.42	38.79	41.46	74.00	26.17	H
11818.500	47.83	-31.85	39.05	40.63	74.00	26.17	V

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 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:

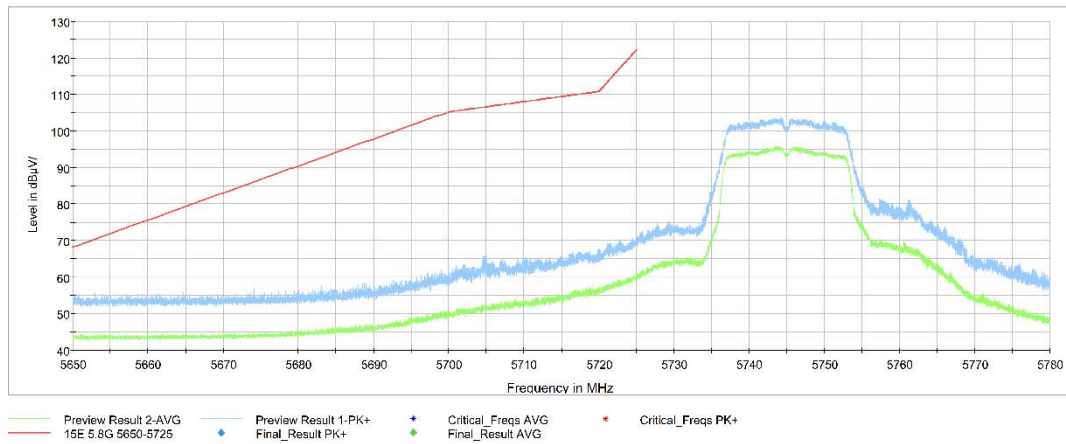


Fig. 10 Band Edges (802.11a Ch149,5745MHz)

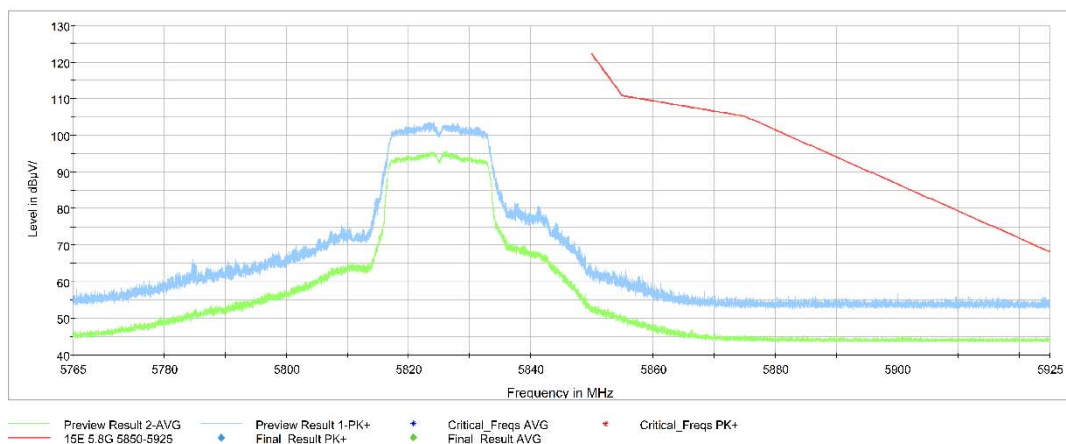


Fig. 11 Band Edges (802.11a Ch165, 5825MHz)

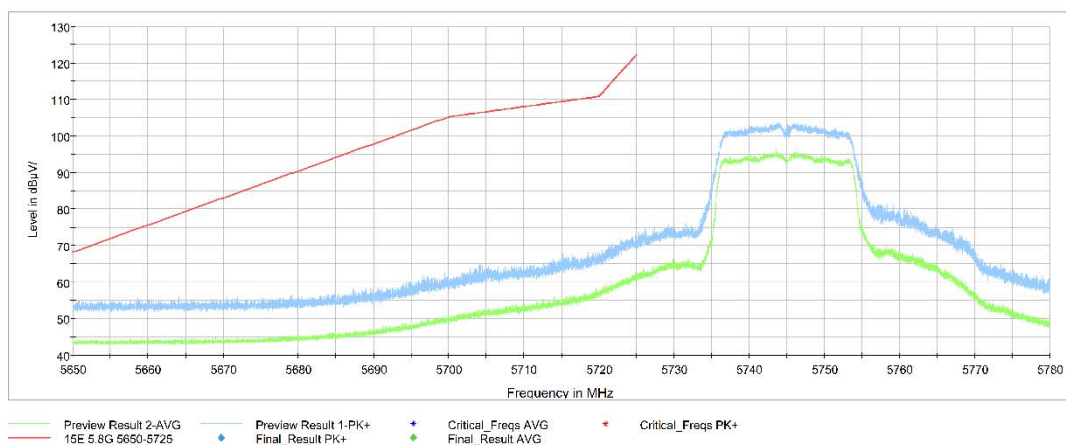


Fig. 12 Band Edges (802.11n-HT20 Ch149, 5745MHz)

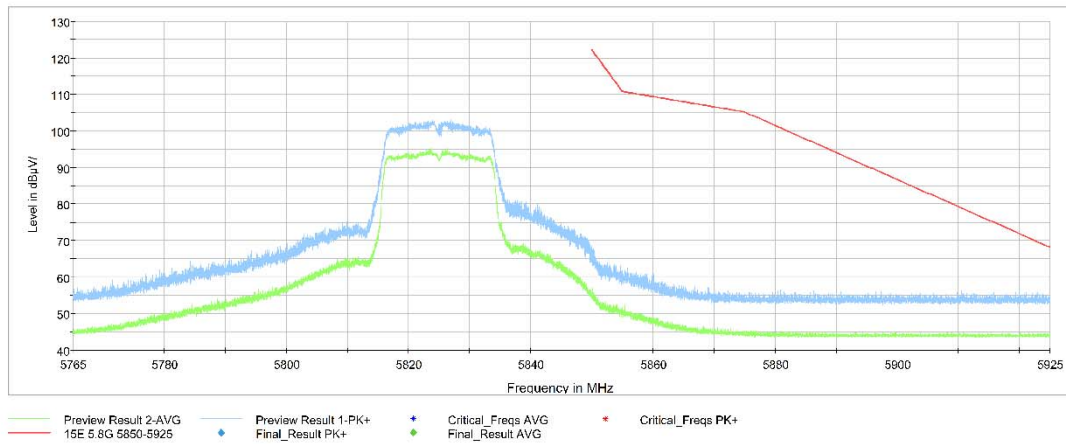


Fig. 13 Band Edges (802.11n-HT20 Ch165, 5825MHz)

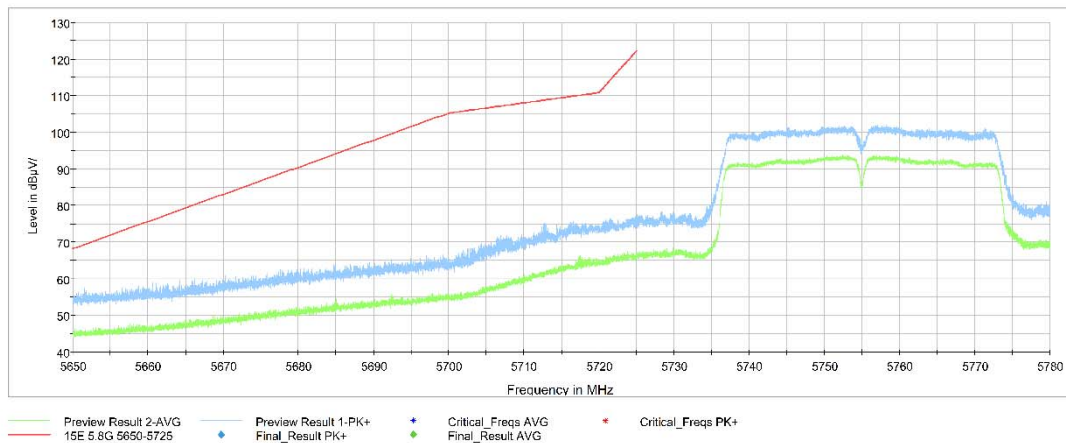


Fig. 14 Band Edges (802.11n-HT40 Ch151, 5755MHz)

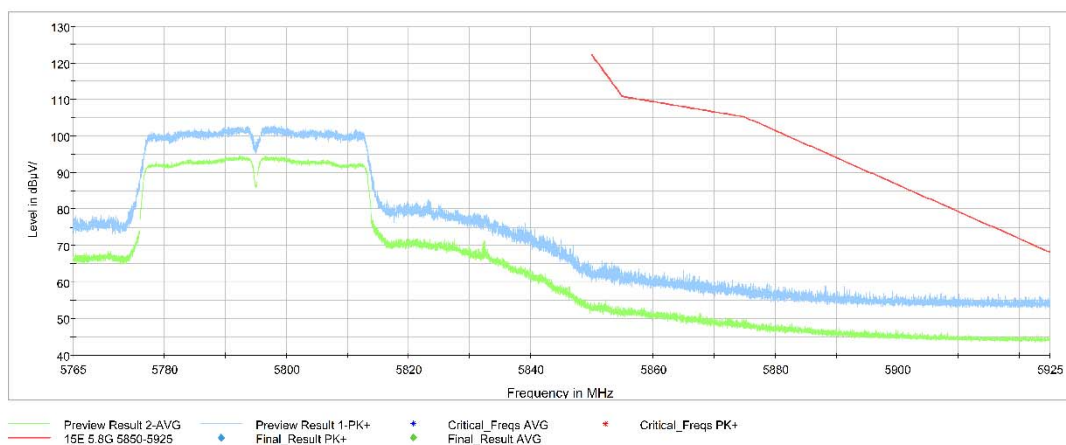


Fig. 15 Band Edges (802.11n-HT40 Ch159, 5795MHz)

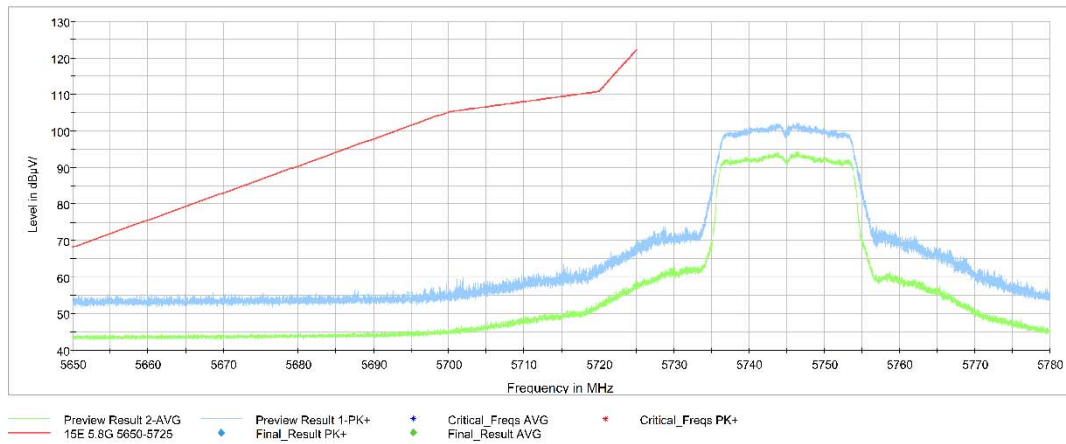


Fig. 16 Band Edges (802.11ac-HT20 Ch149, 5745MHz)

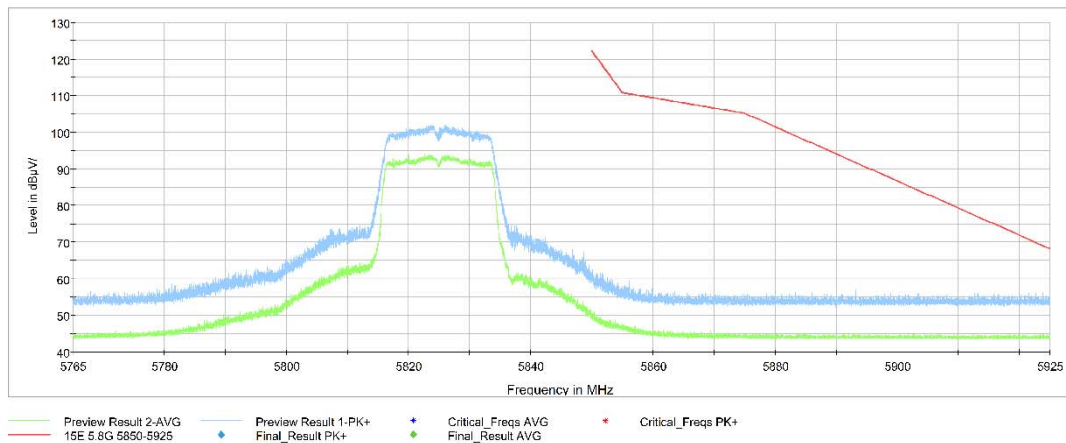


Fig. 17 Band Edges (802.11ac-HT20 Ch165, 5825MHz)

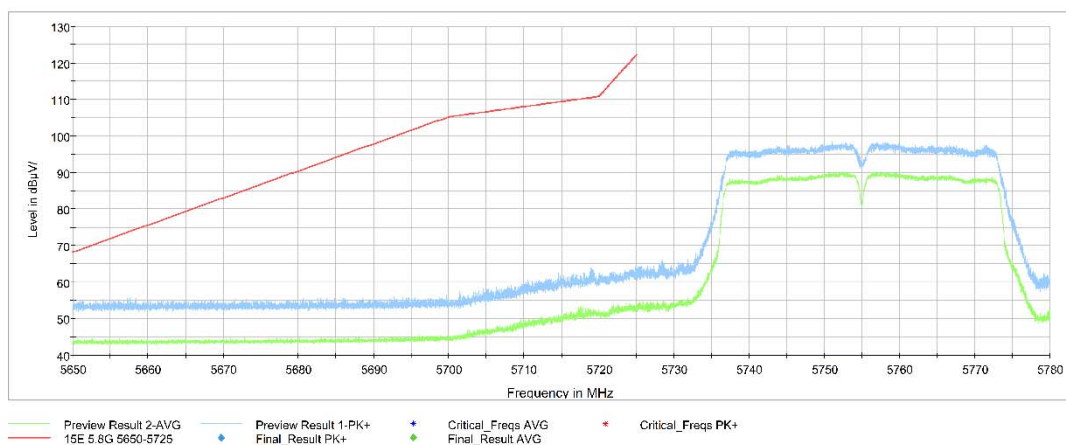


Fig. 18 Band Edges (802.11ac-HT40 Ch151, 5755MHz)

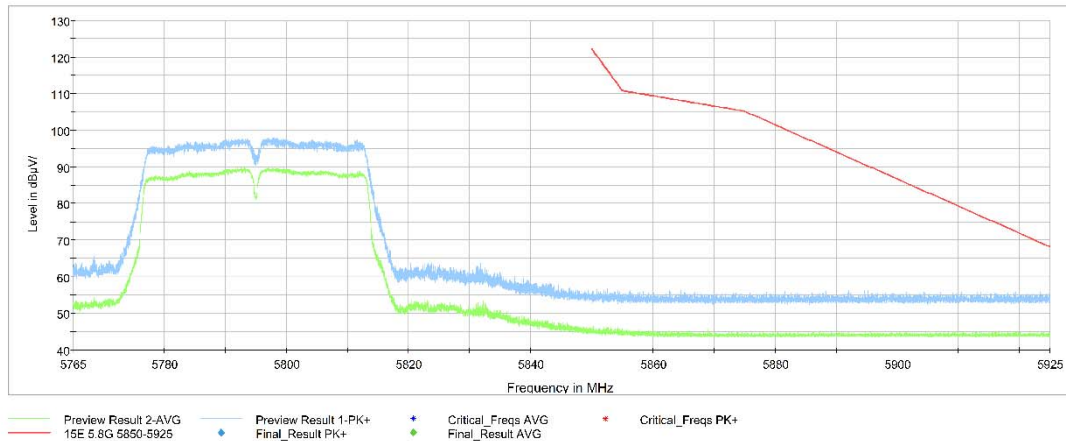


Fig. 19 Band Edges (802.11ac-HT40 Ch159, 5795MHz)

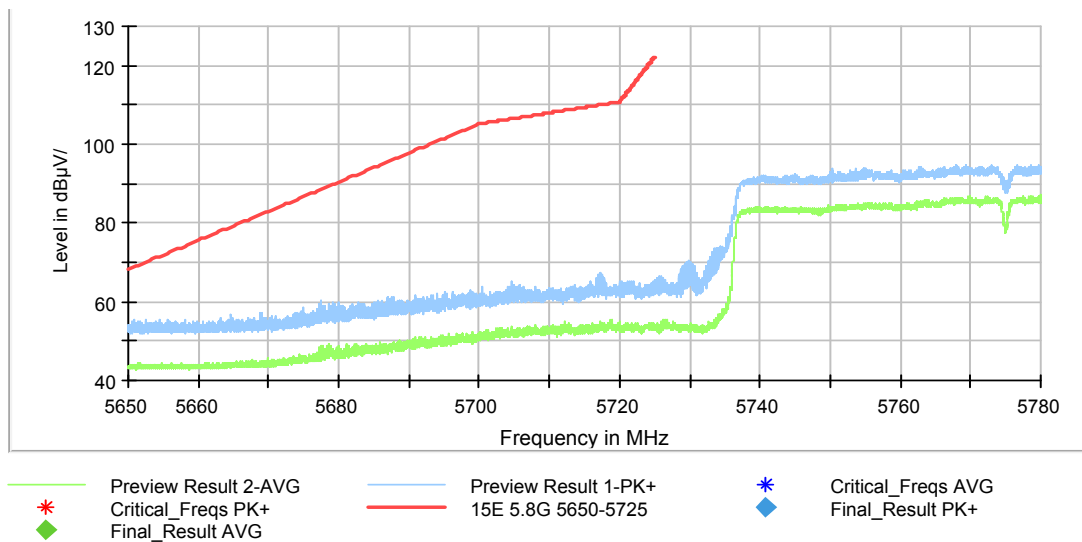


Fig. 20 Band Edges (802.11ac-HT80 Ch155, 5775MHz)

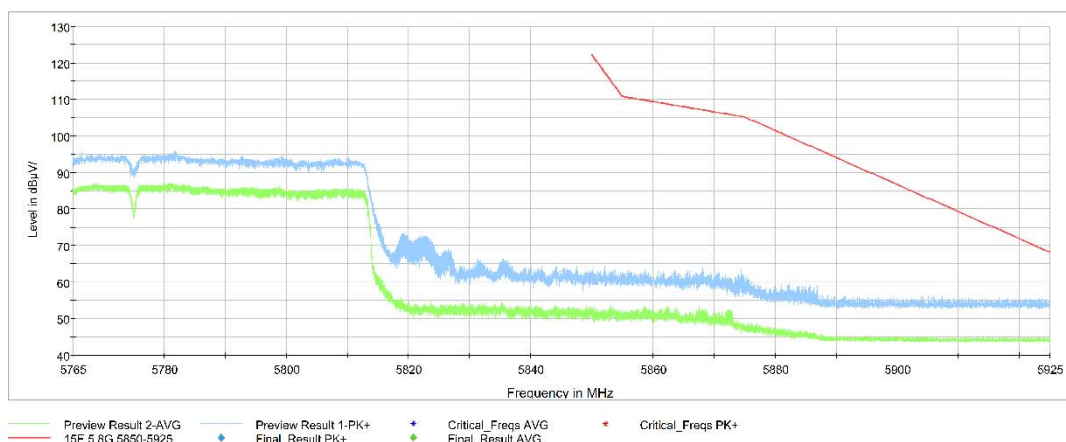


Fig. 21 Band Edges (802.11ac-HT80, 5775MHz)

A.7. AC Powerline Conducted Emission

Test Condition:

Voltage (V)	Frequency (Hz)
120	60

Measurement uncertainty:

Expanded measurement uncertainty for this test item is $U = 3.08\text{dB}$, $k=2$.

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.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 (dBμV)	Result (dBμV)		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:

Traffic:

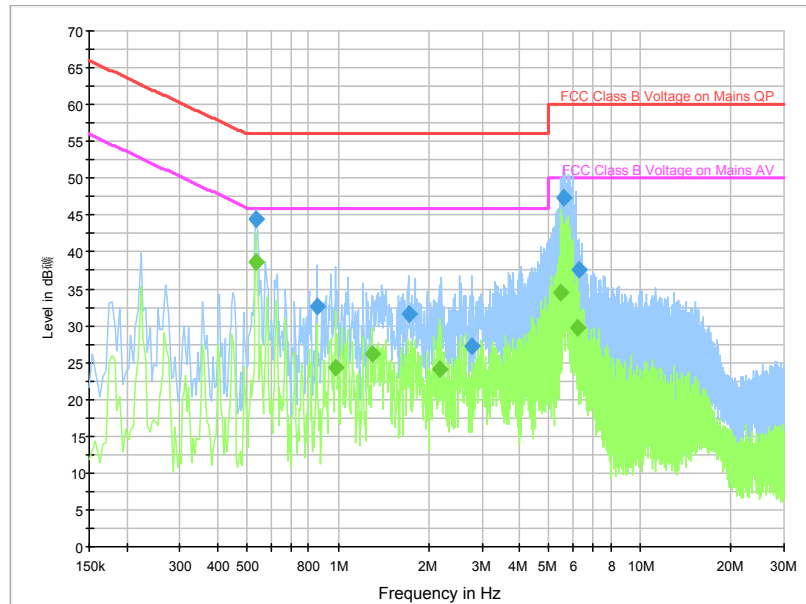


Fig. 22 AC Power line Conducted Emission-802.11a

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
0.538000	44.5	5000.	9.000	On	N	19.9	11.5	56.0	
0.850000	32.6	5000.	9.000	On	N	19.8	23.4	56.0	
1.710000	31.5	5000.	9.000	On	N	19.7	24.5	56.0	
2.790000	27.2	5000.	9.000	On	N	19.7	28.8	56.0	
5.566000	47.4	5000.	9.000	On	L1	19.5	12.6	60.0	
6.314000	37.5	5000.	9.000	On	L1	19.6	22.5	60.0	

Final Result 2

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.538000	38.5	5000.	9.000	On	N	19.9	7.5	46.0	
0.982000	24.3	5000.	9.000	On	N	19.8	21.7	46.0	
1.294000	26.2	5000.	9.000	On	L1	19.5	19.8	46.0	
2.162000	24.1	5000.	9.000	On	N	19.7	21.9	46.0	
5.466000	34.5	5000.	9.000	On	L1	19.6	15.5	50.0	
6.226000	29.6	5000.	9.000	On	L1	19.6	20.4	50.0	

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

Idle:

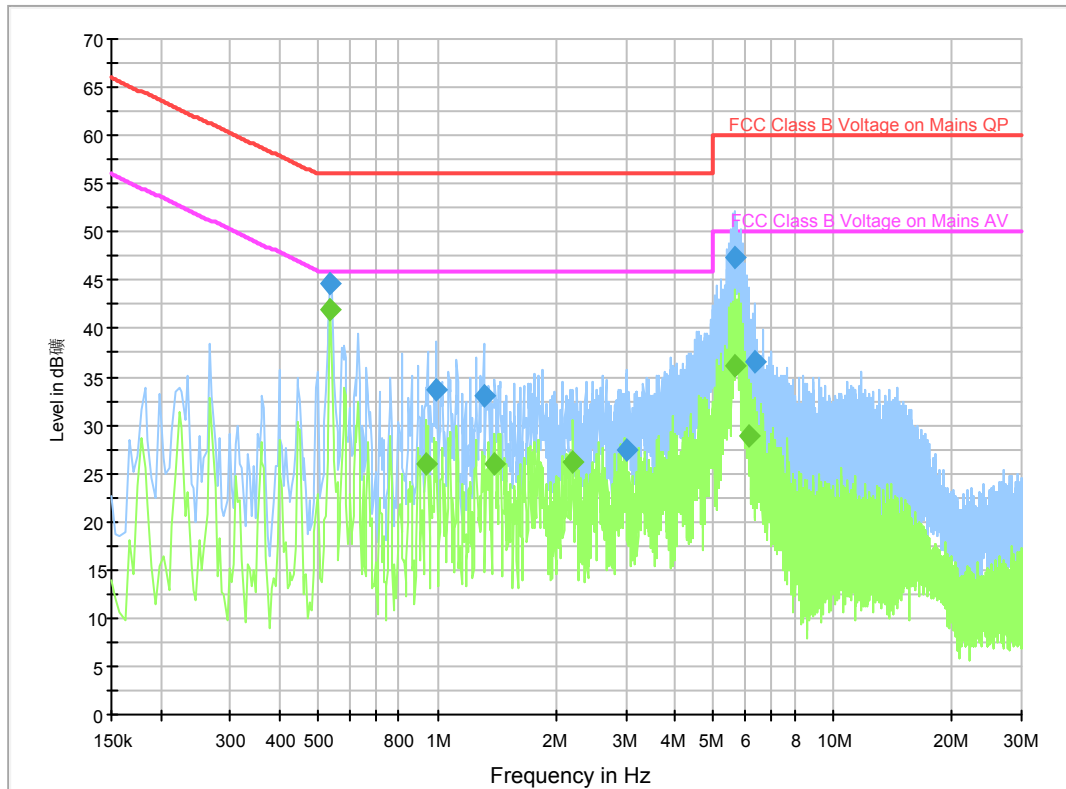


Fig. 23 AC Power line Conducted Emission-Idle

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
0.538000	44.6	5000.	9.000	On	L1	19.9	11.4	56.0	
0.994000	33.7	5000.	9.000	On	N	19.8	22.3	56.0	
1.310000	33.1	5000.	9.000	On	N	19.8	22.9	56.0	
3.002000	27.4	5000.	9.000	On	N	19.7	28.6	56.0	
5.646000	47.4	5000.	9.000	On	L1	19.5	12.6	60.0	
6.366000	36.5	5000.	9.000	On	L1	19.6	23.5	60.0	

Final Result 2

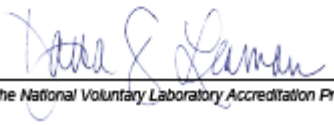
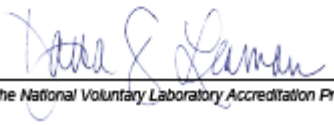
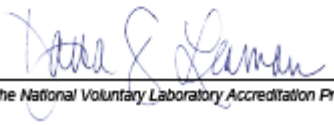
Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.538000	41.9	5000.0	9.000	On	L1	19.9	4.1	46.0	
0.938000	26.0	5000.0	9.000	On	L1	19.6	20.0	46.0	
1.394000	26.0	5000.0	9.000	On	N	19.8	20.0	46.0	
2.206000	26.2	5000.0	9.000	On	L1	19.5	19.8	46.0	
5.634000	36.1	5000.0	9.000	On	L1	19.5	13.9	50.0	
6.162000	29.0	5000.0	9.000	On	L1	19.6	21.0	50.0	

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

United States Department of Commerce National Institute of Standards and Technology NVLAP®  Certificate of Accreditation to ISO/IEC 17025:2017 NVLAP LAB CODE: 600118-0 Telecommunication Technology Labs, CAICT Beijing China <i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i> Electromagnetic Compatibility & Telecommunications <i>This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. 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 January 2009).</i> <table><tr><td> 2021-09-29 through 2022-09-30 <i>Effective Dates</i> </td><td></td><td>  <i>For the National Voluntary Laboratory Accreditation Program</i> </td></tr></table>		2021-09-29 through 2022-09-30 <i>Effective Dates</i>		 <i>For the National Voluntary Laboratory Accreditation Program</i>
2021-09-29 through 2022-09-30 <i>Effective Dates</i>		 <i>For the National Voluntary Laboratory Accreditation Program</i>		

*** END OF REPORT BODY ***