



FCC PART 15C TEST REPORT No.I22Z62357-IOT08

for

HMD Global Oy

Smartphone

TA-1486

With

FCC ID: 2AJOTTA-1486

Hardware Version: V1.00

Software Version: 00WW_1_010_C01

Issued Date: 2023-02-23

Note:

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No.I22Z62357-IOT08

REPORT HISTORY

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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

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,
100191, P. R. China

1.3. TestingEnvironment

Normal Temperature: 15-35°C

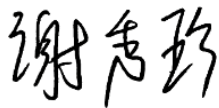
Relative Humidity: 20-75%

1.4. Project date

Testing Start Date: 2022-12-05

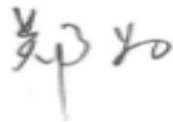
Testing End Date: 2023-02-23

1.5. Signature



Xie Xiuzhen

(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: HMD Global Oy
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2.2. Manufacturer Information

Company Name: HMD Global Oy
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City: Espoo
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Country: Finland
Email: reza.serafat@hmdglobal.com
Telephone: +491735287964
Fax: /

3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY

EQUIPMENT(AE)

3.1. About EUT

Description	Smartphone
Model name	TA-1486
FCC ID	2AJOTTA-1486
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
UT20a	352739200032339/	V1.00	00WW_1_010_C01
	352739200032347		
UT21a	352739200030655/	V1.00	00WW_1_010_C01
	352739200030663		
UT71a	352739200038971/	V1.00	00WW_1_010_C01
	352739200038989		

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

UT20a and UT21a is used for Conduction test, UT71a is used for Radiation test.

3.3. Internal Identification of AE used during the test

AE ID*	Name	Model	Manufacturer
AE1	Battery	LPN388463	Highpower
AE2-1	Charger	AD-030E	Jiangxi Jian Aohai Technology Co.,Ltd.
AE2-2	Charger	AD-030A	Jiangxi Jian Aohai Technology Co.,Ltd.
AE2-3	Charger	AD-030U	Jiangxi Jian Aohai Technology Co.,Ltd.
AE2-4	Charger	AD-030X	Jiangxi Jian Aohai Technology Co.,Ltd.
AE2-5	Charger	AD-030N	Jiangxi Jian Aohai Technology Co.,Ltd.
AE2-6	Charger	AD-030B	Jiangxi Jian Aohai Technology Co.,Ltd.
AE3	USB cable	CC-3A	Saibao (Jiangxi) Communication Industrial Co.,Ltd
AE4	Headset	NLD-EM301K-17SF	HUIZHOU NEW LEADER INDUSTRY CO., LTD

*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 Smartphone 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. 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/matrix 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°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	2023-05-15
2	LISN	ENV216	101200	Rohde & Schwarz	1 year	2023-06-29
3	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2023-03-21
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	103144	Rohde & Schwarz	1 year	2023-10-25
2	BiLog Antenna	VULB9163	9163-235	Schwarzbeck	1 year	2023-04-19
3	EMI Antenna	3115	00167250	ETS-Lindgren	1 year	2023-06-20
4	EMI Antenna*	3116	2661	ETS-Lindgren	1 year	2023-02-08

Note*: The EMI Antenna which Serial Number is 2661 is in Calibration Due when used.

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	4.92
$30\text{MHz} \leq f \leq 1\text{GHz}$	5.18
$1\text{GHz} \leq f \leq 18\text{GHz}$	5.54
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.26

8.6. AC Power-line Conducted Emission

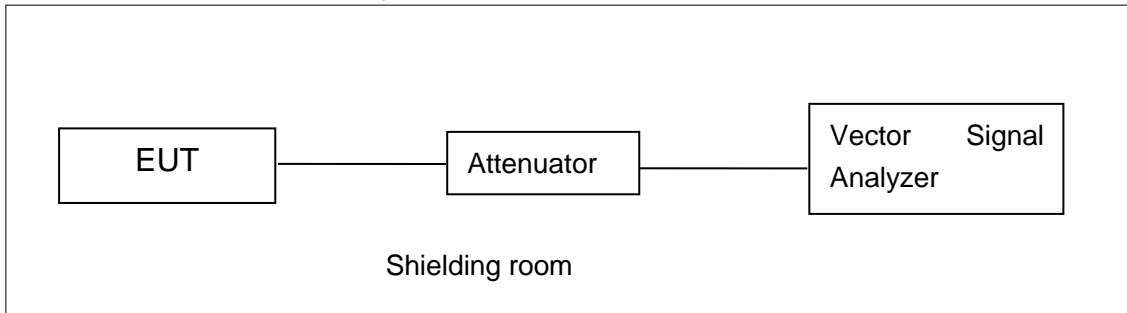
Measurement Uncertainty: 3.08dB, k=2

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

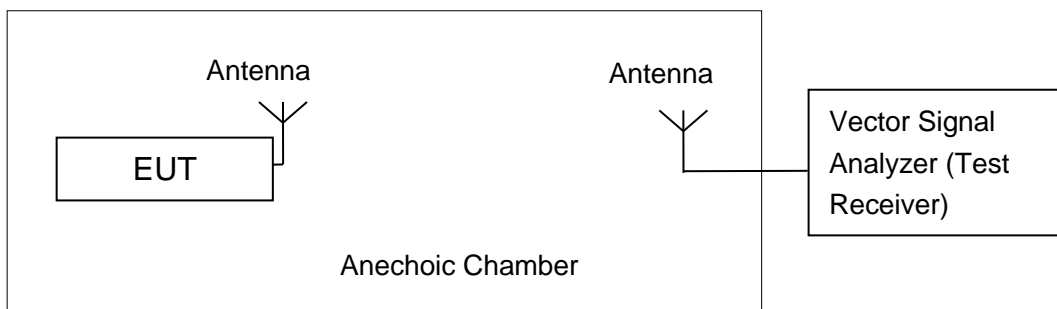


A.1.2. Radiated Emission Measurements

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 1.0dBi 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	11.67	11.28	11.23

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	11.55	11.09	11.07

The data rate MCS0 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	11.67	11.10	11.07

The data rate MCS0 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	11.99	11.56

The data rate MCS0 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	11.98	11.56

The data rate MCS0 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	11.98

The data rate MCS0 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	98%	98%	97%	98%	97%	97%

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	-3.41	P
	157	-3.42	P
	165	-3.75	P
802.11ac HT20	149	-3.94	P
	157	-3.89	P
	165	-4.24	P
802.11n HT40	151	-6.81	P
	159	-6.70	P
802.11ac VHT80	155	-9.91	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
		Fig.	Value	
802.11a	149	Fig.1	15.55	P
	157	Fig.2	15.55	P
	165	Fig.3	15.50	P
802.11ac HT20	149	Fig.4	16.00	P
	157	Fig.5	16.55	P
	165	Fig.6	16.05	P
802.11n HT40	151	Fig.7	35.12	P
	159	Fig.8	35.20	P
802.11ac VHT80	155	Fig.9	75.20	P

Conclusion: PASS

Test graphs as below:

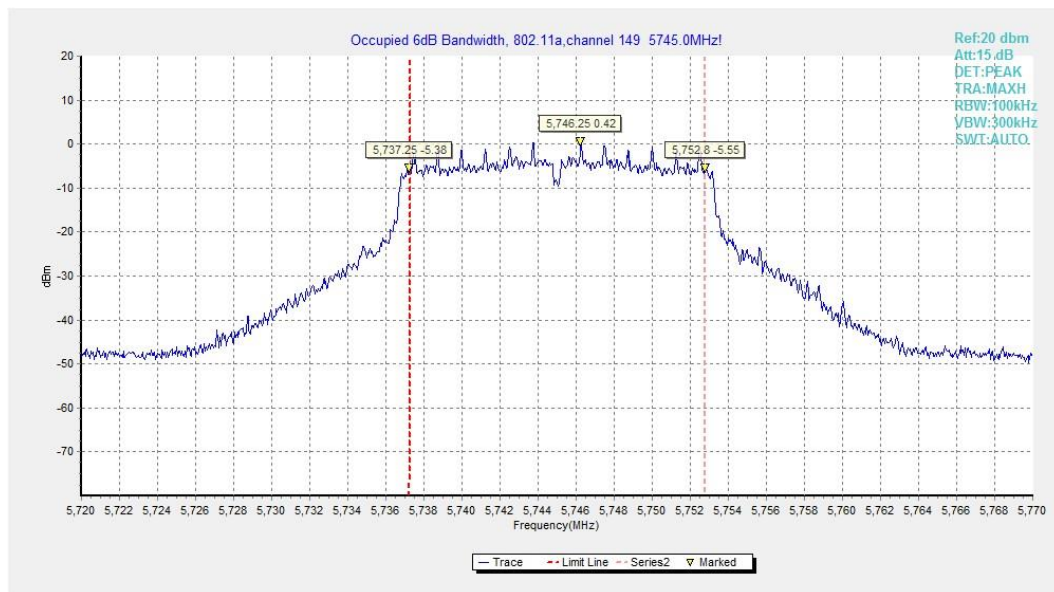


Fig. 1 Occupied 6dB Bandwidth (802.11a, Ch 149)

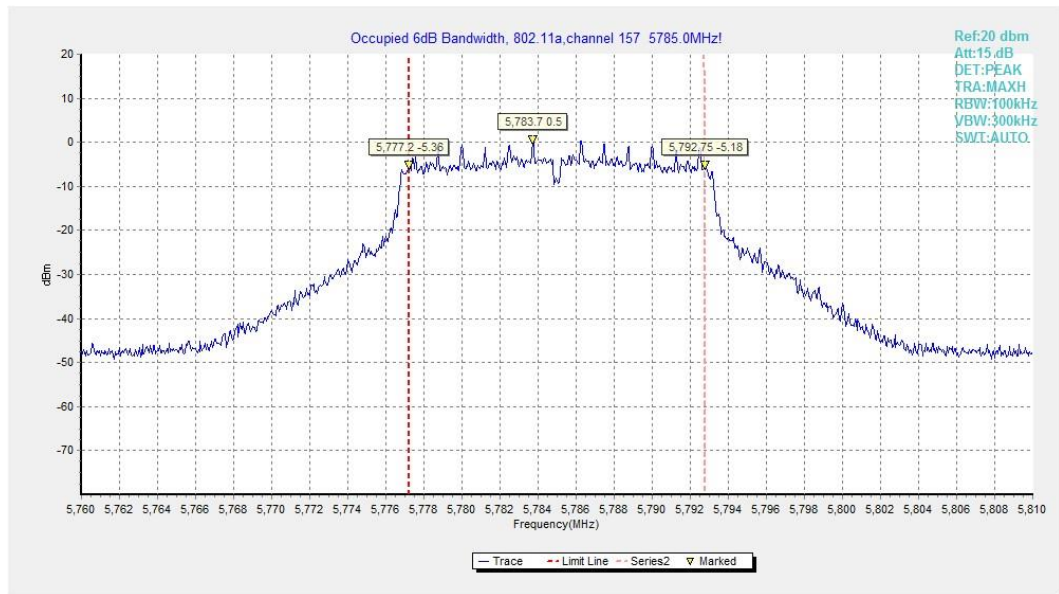


Fig. 2 Occupied 6dB Bandwidth (802.11a, Ch 157)

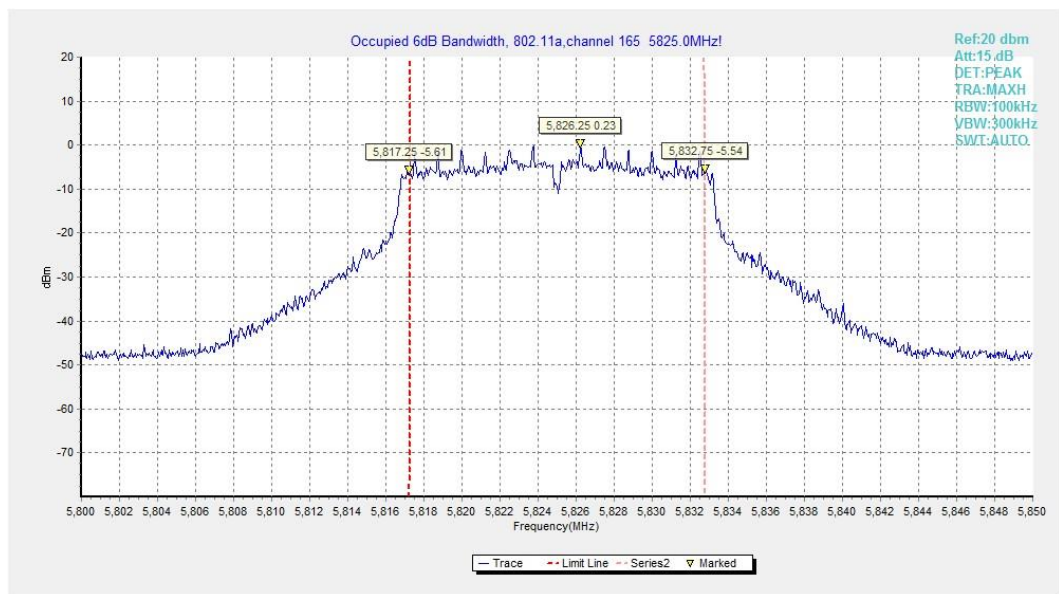


Fig. 3 Occupied 6dB Bandwidth (802.11a, Ch 165)

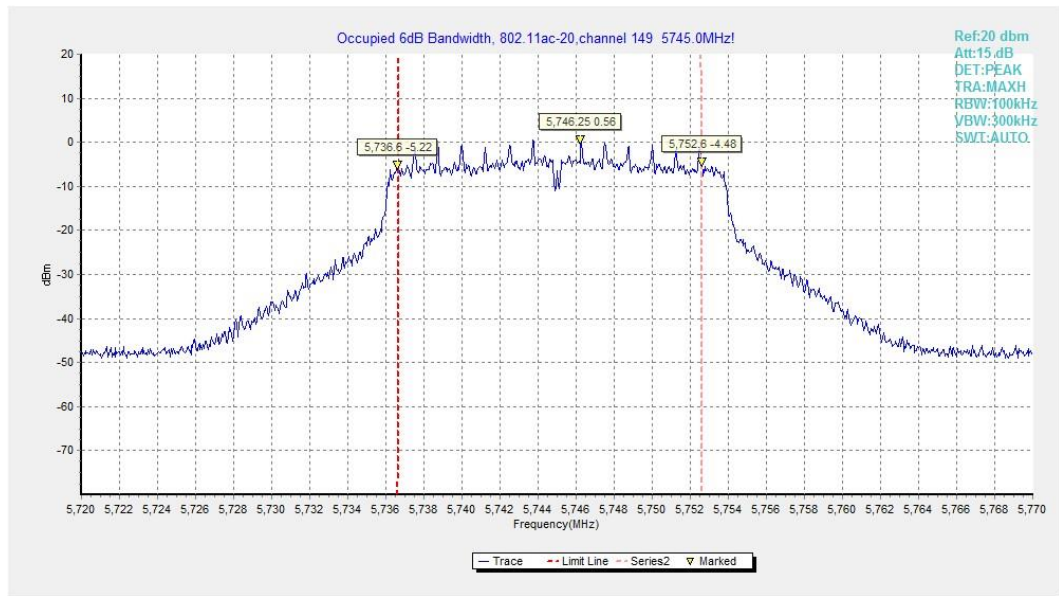


Fig. 4 Occupied 6dB Bandwidth (802.11ac-HT20, Ch 149)

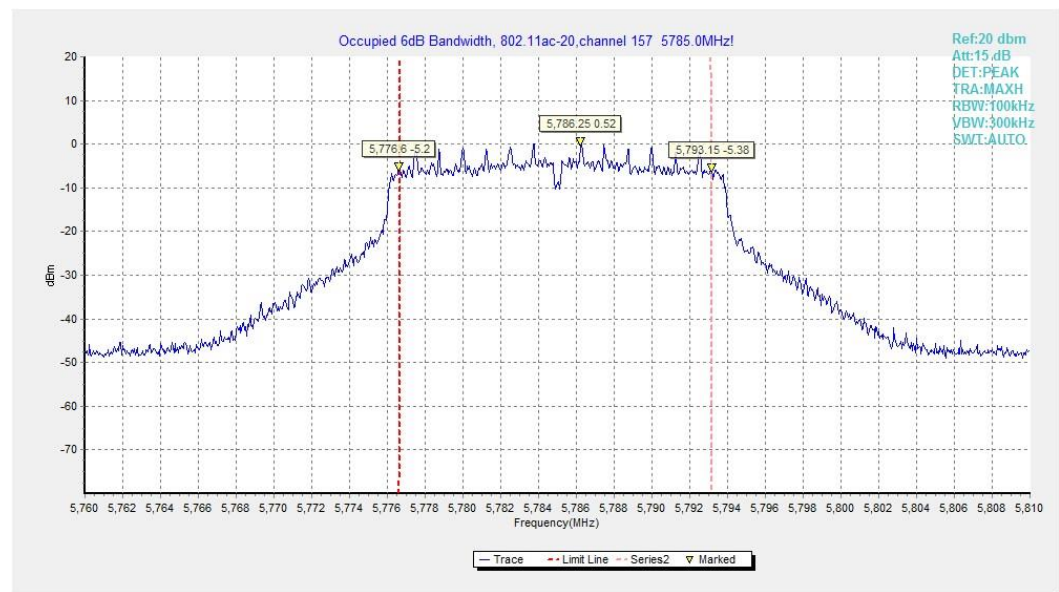


Fig. 5 Occupied 6dB Bandwidth (802.11ac-HT20, Ch 157)

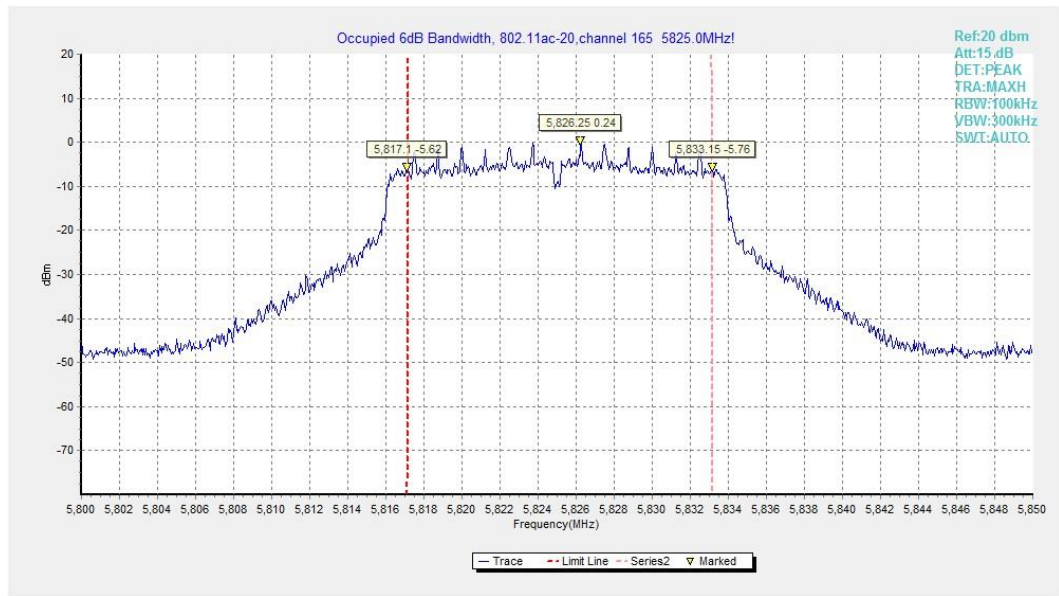


Fig. 6 Occupied 6dB Bandwidth (802.11ac-HT20, Ch 165)

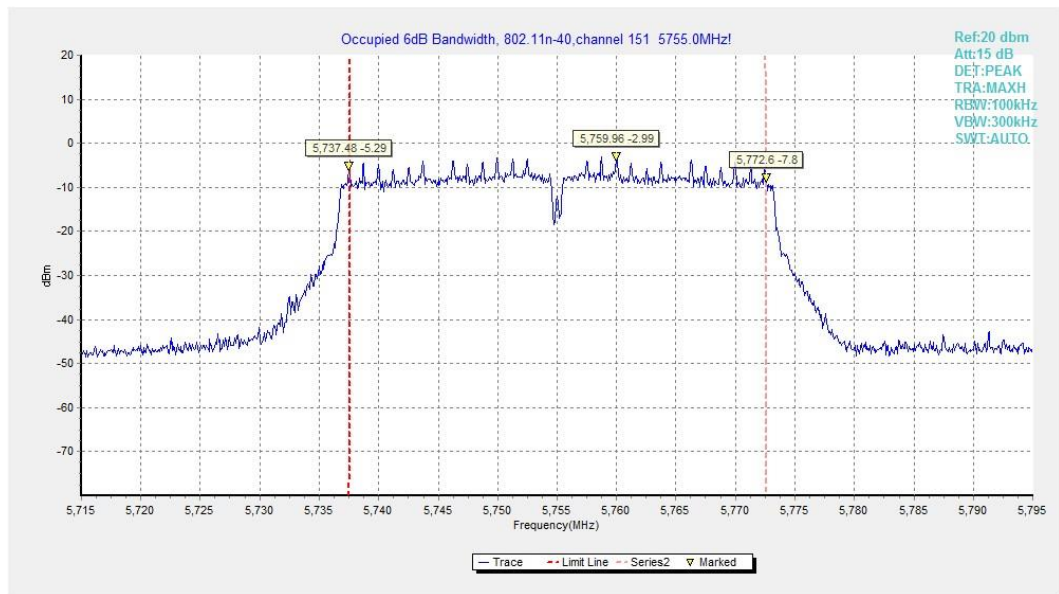


Fig. 7 Occupied 6dB Bandwidth (802.11n-HT40, Ch 151)

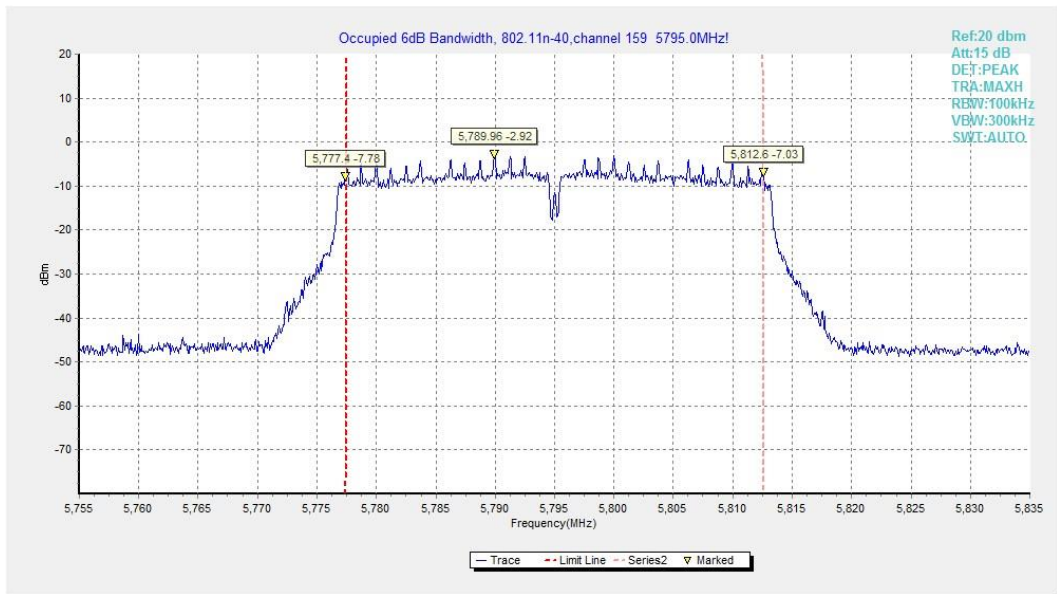


Fig. 8 Occupied 6dB Bandwidth (802.11n-HT40, Ch 159)

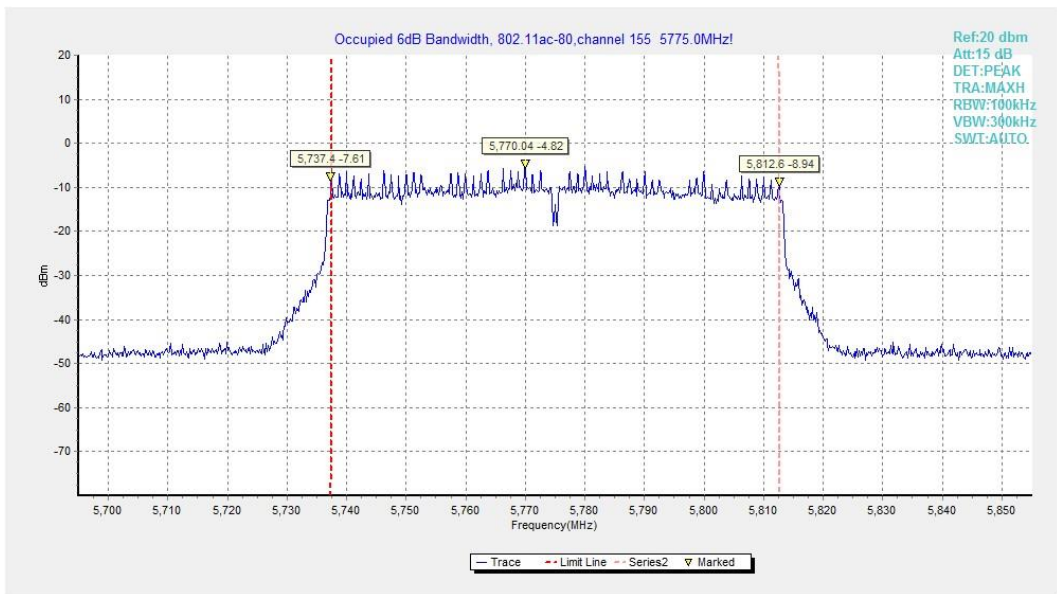


Fig. 9 Occupied 6dB Bandwidth (802.11ac-HT80, Ch 155)

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

EUT ID: UT71a

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
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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	---
	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)
17943.350	39.54	-25.50	46.66	18.38	54.00	14.46	H
17960.950	39.49	-25.50	46.66	18.33	54.00	14.51	V
14481.100	36.60	-28.59	42.46	22.73	54.00	17.40	V
14499.250	36.27	-28.59	42.46	22.40	54.00	17.73	V
11789.400	35.46	-31.99	38.98	28.47	54.00	18.54	H
11858.700	35.37	-31.85	39.05	28.17	54.00	18.63	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)
17945.550	39.89	-25.50	46.66	18.73	54.00	14.11	V
17940.600	39.41	-25.50	46.66	18.25	54.00	14.59	H
14499.800	36.41	-28.59	42.46	22.54	54.00	17.59	H
14491.550	36.17	-28.59	42.46	22.30	54.00	17.83	H
11779.500	35.63	-31.99	38.98	28.64	54.00	18.37	V
11765.200	35.59	-31.99	38.98	28.60	54.00	18.41	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	39.40	-25.50	46.66	18.24	54.00	14.60	V
17947.750	39.30	-25.50	46.66	18.14	54.00	14.70	V
14483.850	36.57	-28.59	42.46	22.70	54.00	17.43	H
14477.800	36.44	-28.59	42.46	22.57	54.00	17.56	V
11770.700	35.50	-31.99	38.98	28.51	54.00	18.50	V
11758.600	35.46	-31.99	38.98	28.47	54.00	18.54	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)
17951.050	39.30	-25.50	46.66	18.14	54.00	14.70	H
17952.700	39.19	-25.50	46.66	18.03	54.00	14.81	V
13311.800	36.32	-29.49	39.71	26.10	54.00	17.68	V
14492.100	36.27	-28.59	42.46	22.40	54.00	17.73	V
11804.250	35.49	-31.85	39.05	28.29	54.00	18.51	V
11774.550	35.43	-31.99	38.98	28.44	54.00	18.57	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)
17936.200	39.68	-25.50	46.66	18.52	54.00	14.32	V
17962.050	39.64	-25.50	46.66	18.48	54.00	14.36	H
14475.600	36.72	-28.59	42.46	22.85	54.00	17.28	V
14499.800	36.34	-28.59	42.46	22.47	54.00	17.66	V
11750.350	35.55	-31.99	38.98	28.56	54.00	18.45	V
11890.600	35.55	-31.85	39.05	28.35	54.00	18.45	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)
17947.200	39.39	-25.50	46.66	18.23	54.00	14.61	V
17936.200	39.35	-25.50	46.66	18.19	54.00	14.65	V
13330.500	36.35	-29.49	39.71	26.13	54.00	17.65	V
13329.400	36.27	-29.49	39.71	26.05	54.00	17.73	V
11745.400	35.62	-31.99	38.98	28.63	54.00	18.38	V
11870.800	35.46	-31.85	39.05	28.26	54.00	18.54	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)
17939.500	39.49	-25.50	46.66	18.33	54.00	14.51	V
17931.250	39.38	-25.50	46.66	18.22	54.00	14.62	H
14498.700	36.32	-28.59	42.46	22.45	54.00	17.68	H
14497.050	36.10	-28.59	42.46	22.23	54.00	17.90	V
11841.100	35.47	-31.85	39.05	28.27	54.00	18.53	V
11780.050	35.30	-31.99	38.98	28.31	54.00	18.70	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)
17949.400	39.60	-25.50	46.66	18.44	54.00	14.40	H
17936.200	39.44	-25.50	46.66	18.28	54.00	14.56	H
13296.400	36.27	-29.49	39.71	26.05	54.00	17.73	V
13289.800	36.17	-29.67	39.55	26.29	54.00	17.83	H
11783.350	35.64	-31.99	38.98	28.65	54.00	18.36	V
11775.650	35.40	-31.99	38.98	28.41	54.00	18.60	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)
17971.400	39.49	-25.50	46.66	18.33	54.00	14.51	H
17935.100	39.21	-25.50	46.66	18.05	54.00	14.79	V
14470.100	36.43	-28.59	42.46	22.56	54.00	17.57	V
14487.700	36.26	-28.59	42.46	22.39	54.00	17.74	V
11793.800	35.33	-31.99	38.98	28.34	54.00	18.67	V
11258.650	35.28	-32.36	38.77	28.88	54.00	18.72	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)
17934.550	39.38	-25.50	46.66	18.22	54.00	14.62	V
17916.400	39.31	-25.50	46.66	18.15	54.00	14.69	V
14474.500	36.32	-28.59	42.46	22.45	54.00	17.68	V
13334.350	36.16	-29.49	39.71	25.94	54.00	17.84	V
11859.800	35.58	-31.85	39.05	28.38	54.00	18.42	V
11747.600	35.51	-31.99	38.98	28.52	54.00	18.49	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)
17986.250	39.42	-25.50	46.66	18.26	54.00	14.58	H
17926.300	39.14	-25.50	46.66	17.98	54.00	14.86	H
14478.900	36.30	-28.59	42.46	22.43	54.00	17.70	V
13259.000	36.27	-29.67	39.55	26.39	54.00	17.73	H
11797.100	35.33	-31.85	39.05	28.13	54.00	18.67	V
11779.500	35.27	-31.99	38.98	28.28	54.00	18.73	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)
17987.350	40.19	-25.50	46.66	19.03	54.00	13.81	V
17960.400	39.60	-25.50	46.66	18.44	54.00	14.40	H
14486.600	36.61	-28.59	42.46	22.74	54.00	17.39	V
14486.050	36.51	-28.59	42.46	22.64	54.00	17.49	V
11772.350	35.60	-31.99	38.98	28.61	54.00	18.40	H
11791.050	35.56	-31.99	38.98	28.57	54.00	18.44	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)
17963.700	39.80	-25.50	46.66	18.64	54.00	14.20	H
17937.850	39.52	-25.50	46.66	18.36	54.00	14.48	V
14497.600	36.50	-28.59	42.46	22.63	54.00	17.50	H
13296.950	36.37	-29.49	39.71	26.15	54.00	17.63	V
11773.450	35.55	-31.99	38.98	28.56	54.00	18.45	V
11800.400	35.36	-31.85	39.05	28.16	54.00	18.64	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)
17992.850	39.95	-25.50	46.66	18.79	54.00	14.05	H
17998.900	39.95	-25.50	46.66	18.79	54.00	14.05	H
13294.200	36.77	-29.49	39.71	26.55	54.00	17.23	V
14483.850	36.62	-28.59	42.46	22.75	54.00	17.38	H
11774.550	36.38	-31.99	38.98	29.39	54.00	17.62	H
11747.600	35.61	-31.99	38.98	28.62	54.00	18.39	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)
17556.150	50.85	-26.85	45.25	32.45	68.20	17.35	V
17349.350	50.44	-25.95	44.35	32.03	68.20	17.76	H
14615.850	48.53	-27.29	41.90	33.92	68.20	19.67	V
14601.000	48.24	-27.29	41.90	33.63	68.20	19.96	H
11797.650	46.47	-31.85	39.05	39.27	74.00	27.53	V
11882.350	46.37	-31.85	39.05	39.17	74.00	27.63	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)
17555.050	50.96	-26.85	45.25	32.56	68.20	17.24	H
17237.150	50.79	-25.95	44.35	32.38	68.20	17.41	H
13717.150	48.41	-29.10	40.86	36.64	68.20	19.79	H
14585.600	48.39	-27.29	41.90	33.78	68.20	19.81	H
11904.350	46.37	-31.85	39.05	39.17	74.00	27.63	V
11791.600	46.19	-31.99	38.98	39.20	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)
17352.100	50.07	-25.95	44.35	31.66	68.20	18.13	V
17535.800	50.02	-26.85	45.25	31.62	68.20	18.18	V
14102.700	49.39	-29.44	41.66	37.17	68.20	18.81	H
14132.950	48.27	-28.99	42.00	35.25	68.20	19.93	V
11732.750	46.40	-31.99	38.98	39.41	74.00	27.60	V
11743.750	46.23	-31.99	38.98	39.24	74.00	27.77	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)
17427.450	50.30	-26.85	45.25	31.90	68.20	17.90	V
17557.250	50.30	-26.85	45.25	31.90	68.20	17.90	H
13712.750	48.90	-29.10	40.86	37.13	68.20	19.30	V
13726.500	48.32	-29.10	40.86	36.55	68.20	19.88	V
11753.100	46.07	-31.99	38.98	39.08	74.00	27.93	V
11846.600	45.98	-31.85	39.05	38.78	74.00	28.02	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)
17960.950	50.89	-25.50	46.66	29.73	74.00	23.11	V
17345.500	50.27	-25.95	44.35	31.86	68.20	17.93	H
14094.450	49.38	-29.44	41.66	37.16	68.20	18.82	H
13639.600	48.10	-29.50	40.43	37.17	68.20	20.10	V
11416.500	46.23	-32.42	38.79	39.86	74.00	27.77	V
11770.150	46.04	-31.99	38.98	39.05	74.00	27.96	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)
17445.600	50.72	-26.85	45.25	32.32	68.20	17.48	V
17861.400	50.32	-25.50	46.66	29.16	74.00	23.68	H
13617.050	48.37	-29.50	40.43	37.44	68.20	19.83	V
14535.000	48.27	-28.59	42.46	34.40	68.20	19.93	V
11848.250	46.86	-31.85	39.05	39.66	74.00	27.14	V
11751.450	46.57	-31.99	38.98	39.58	74.00	27.43	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)
16938.500	50.04	-26.32	42.36	33.99	68.20	18.16	H
17824.550	49.90	-25.50	46.66	28.74	74.00	24.10	H
14093.350	48.08	-29.44	41.66	35.86	68.20	20.12	H
13636.300	48.02	-29.50	40.43	37.09	68.20	20.18	H
11864.200	47.10	-31.85	39.05	39.90	74.00	26.90	H
10466.100	46.12	-33.22	38.19	41.15	68.20	22.08	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)
17235.500	50.53	-25.95	44.35	32.12	68.20	17.67	V
17431.850	50.08	-26.85	45.25	31.68	68.20	18.12	H
13653.900	48.76	-29.50	40.43	37.83	68.20	19.44	V
13705.050	48.16	-29.10	40.86	36.39	68.20	20.04	V
11672.800	46.15	-32.31	38.91	39.56	74.00	27.85	V
11204.750	46.10	-32.60	38.75	39.96	74.00	27.90	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)
17949.950	50.95	-25.50	46.66	29.79	74.00	23.05	H
17554.500	50.14	-26.85	45.25	31.74	68.20	18.06	V
13745.750	48.62	-29.10	40.86	36.85	68.20	19.58	V
13551.600	48.44	-29.56	39.99	38.01	68.20	19.76	V
11403.300	46.47	-32.42	38.79	40.10	74.00	27.53	V
11937.900	46.08	-31.48	39.09	38.47	74.00	27.92	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)
17990.650	50.02	-25.50	46.66	28.86	74.00	23.98	H
17349.900	49.96	-25.95	44.35	31.55	68.20	18.24	H
13609.900	48.08	-29.50	40.43	37.15	68.20	20.12	V
13641.250	47.75	-29.50	40.43	36.82	68.20	20.45	V
11800.400	46.54	-31.85	39.05	39.34	74.00	27.46	V
11734.400	46.20	-31.99	38.98	39.21	74.00	27.80	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)
17920.800	50.39	-25.50	46.66	29.23	74.00	23.61	V
17470.350	50.00	-26.85	45.25	31.60	68.20	18.20	V
13733.650	48.36	-29.10	40.86	36.59	68.20	19.84	H
13642.900	48.30	-29.50	40.43	37.37	68.20	19.90	H
11797.650	46.30	-31.85	39.05	39.10	74.00	27.70	V
10469.400	46.23	-32.99	38.27	40.94	68.20	21.97	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)
17363.650	50.91	-25.95	44.35	32.50	68.20	17.29	V
17965.350	50.68	-25.50	46.66	29.52	74.00	23.32	V
13717.700	48.36	-29.10	40.86	36.59	68.20	19.84	H
13739.700	48.16	-29.10	40.86	36.39	68.20	20.04	V
11398.900	46.99	-32.42	38.79	40.62	74.00	27.01	H
11842.750	46.51	-31.85	39.05	39.31	74.00	27.49	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)
17901.000	50.81	-25.50	46.66	29.65	74.00	23.19	H
17559.450	50.46	-26.85	45.25	32.06	68.20	17.74	H
14695.050	48.55	-28.32	41.35	35.53	68.20	19.65	V
13712.200	48.39	-29.10	40.86	36.62	68.20	19.81	H
11806.450	46.30	-31.85	39.05	39.10	74.00	27.70	H
11841.650	46.29	-31.85	39.05	39.09	74.00	27.71	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)
17346.600	51.21	-25.95	44.35	32.80	68.20	16.99	V
17352.650	50.77	-25.95	44.35	32.36	68.20	17.43	V
14070.800	48.89	-29.44	41.66	36.67	68.20	19.31	V
13678.100	48.50	-29.50	40.43	37.57	68.20	19.70	H
11351.050	46.72	-32.42	38.79	40.35	74.00	27.28	H
11880.700	46.36	-31.85	39.05	39.16	74.00	27.64	V

Conclusion: PASS

Sample calculation: 17346.600MHz

$$\text{Peak ERP(dBm)} = P_{\text{Mea}}(32.80\text{dBuV/m}) + \text{Cable Loss}(-25.95) + \text{Antenna Factor}(44.35) = 51.21 \text{ dBuV/m}$$

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.	

EUT ID: UT71a

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:

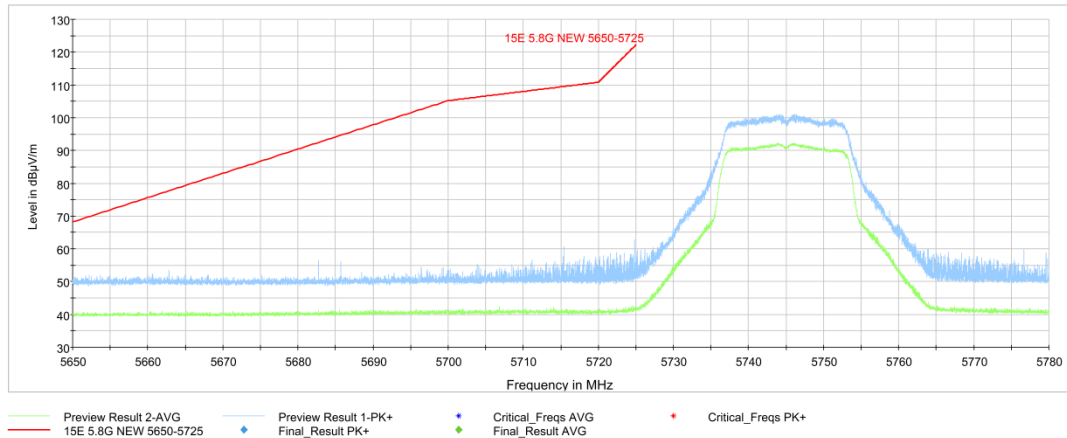


Fig. 10 Band Edges (802.11a Ch149,5745MHz)

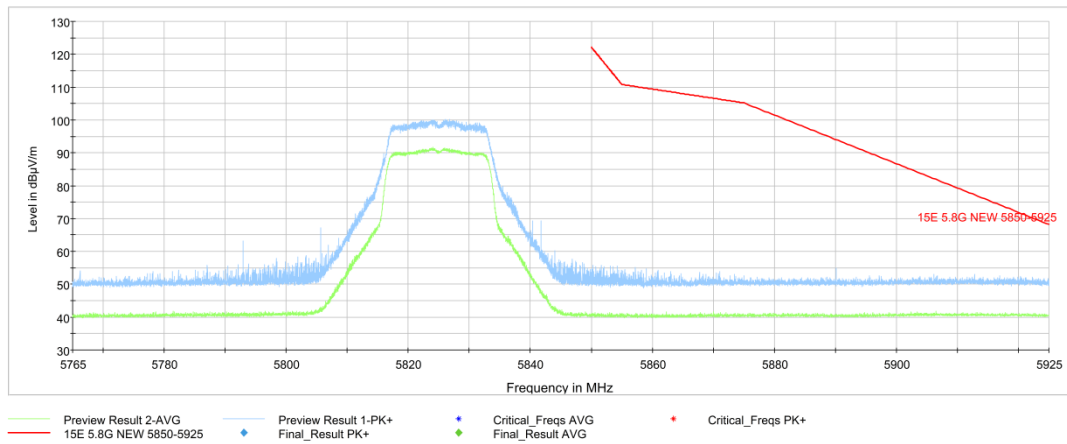


Fig. 11 Band Edges (802.11a Ch165, 5825MHz)

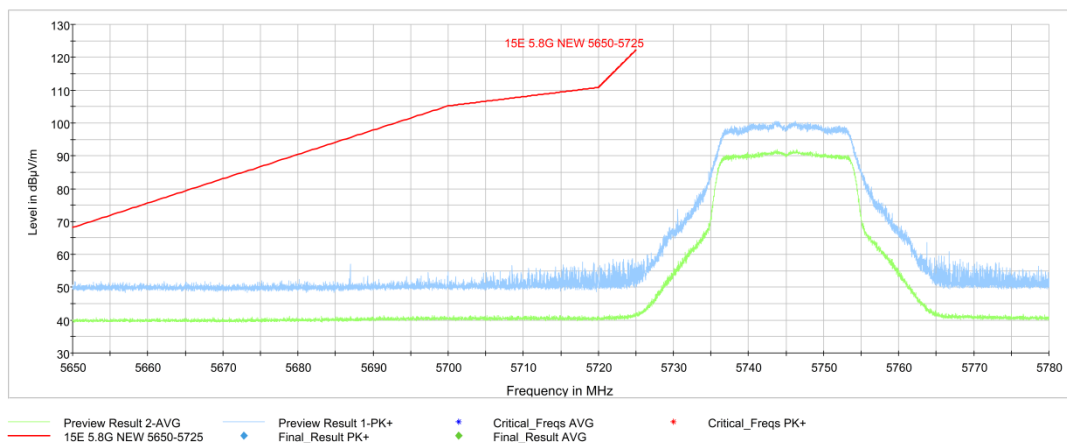


Fig. 12 Band Edges (802.11n-HT20 Ch149, 5745MHz)

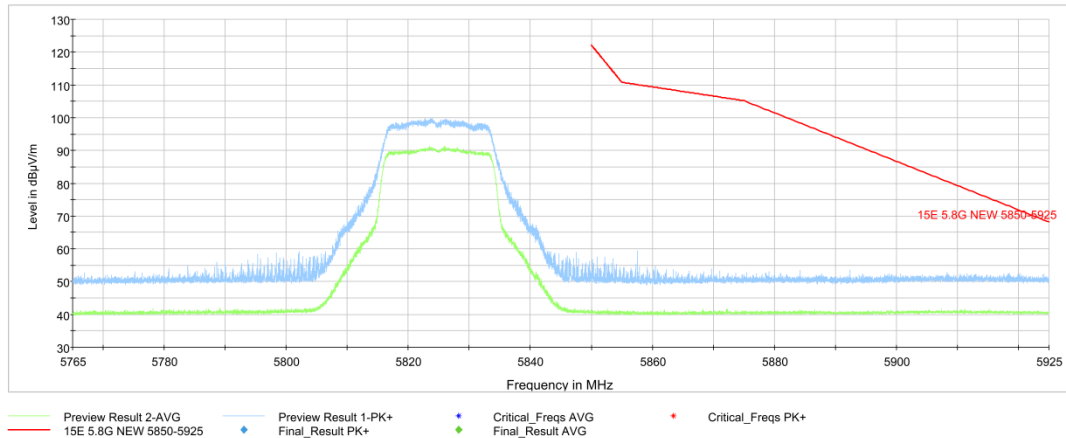


Fig. 13 Band Edges (802.11n-HT20 Ch165, 5825MHz)

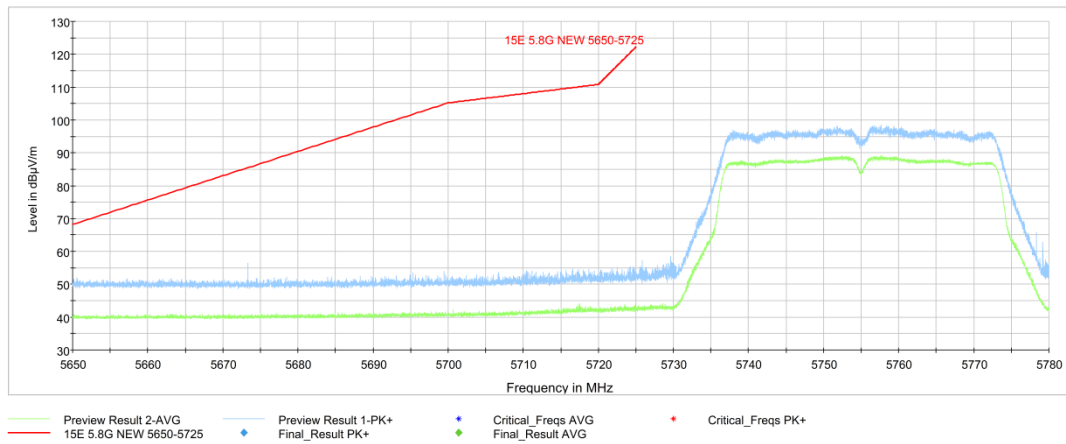


Fig. 14 Band Edges (802.11n-HT40 Ch151, 5755MHz)

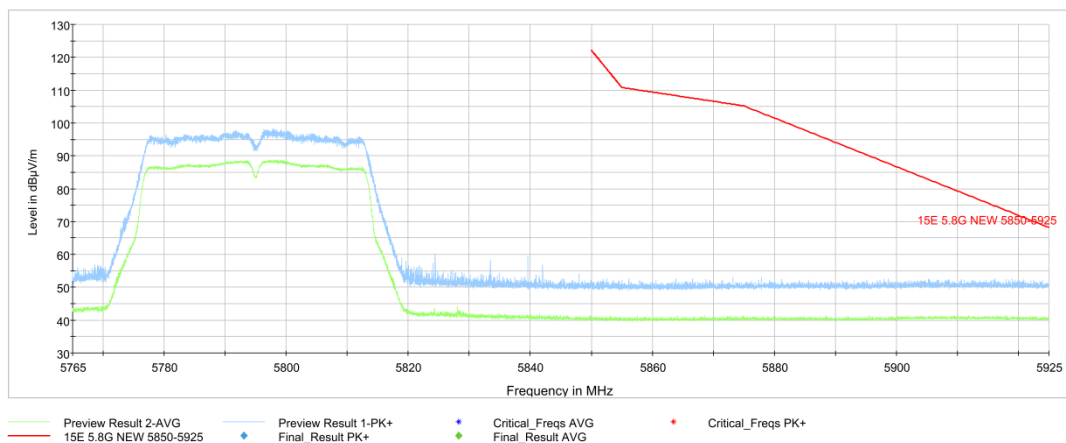


Fig. 15 Band Edges (802.11n-HT40 Ch159, 5795MHz)

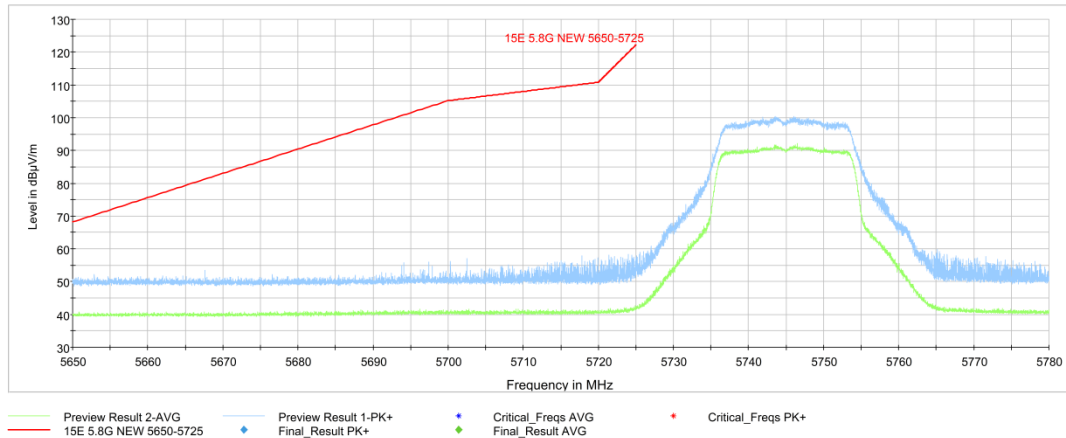


Fig. 16 Band Edges (802.11ac-HT20 Ch149, 5745MHz)

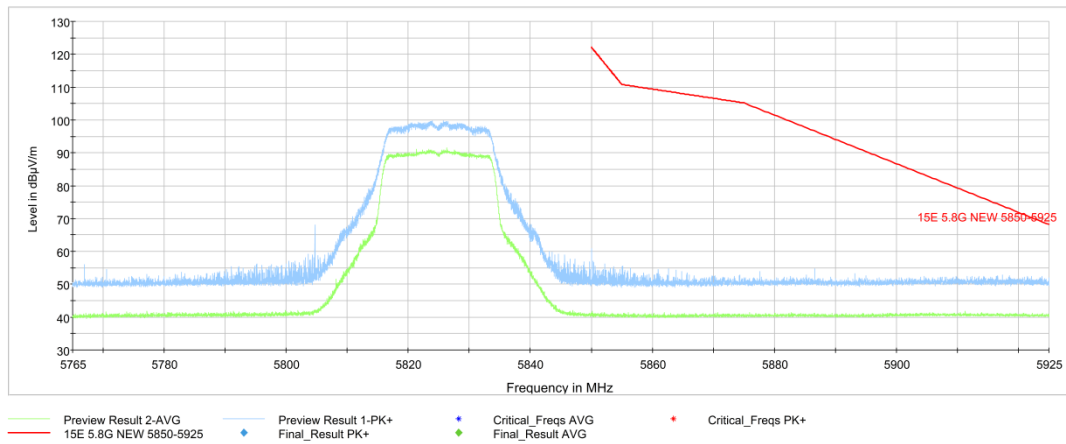


Fig. 17 Band Edges (802.11ac-HT20 Ch165, 5825MHz)

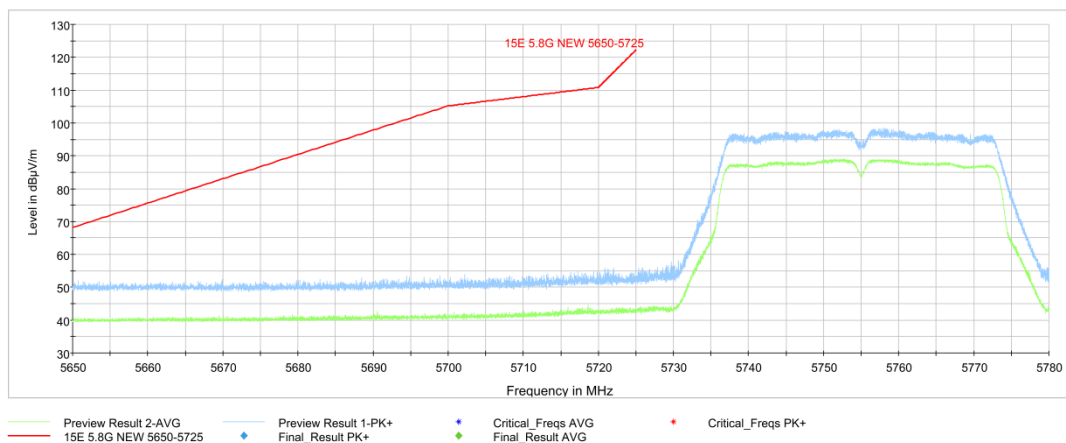


Fig. 18 Band Edges (802.11ac-HT40 Ch151, 5755MHz)

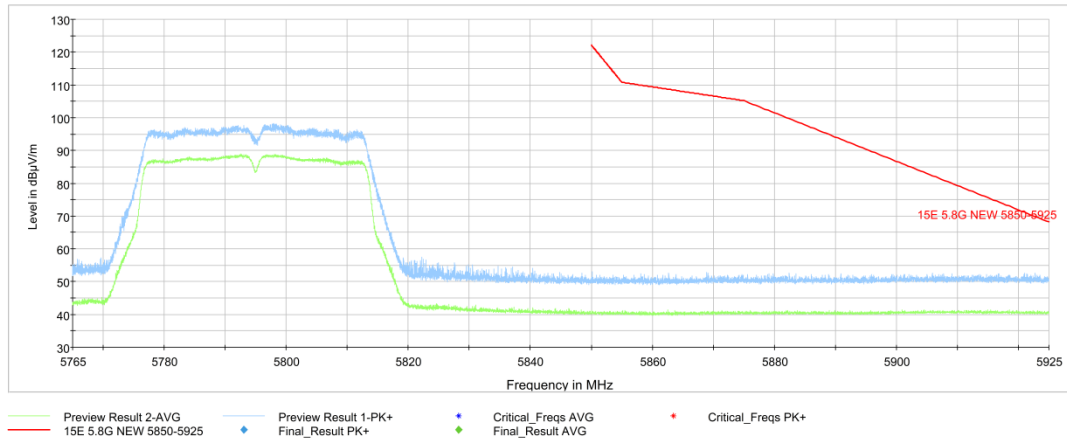


Fig. 19 Band Edges (802.11ac-HT40 Ch159, 5795MHz)

Full Spectrum

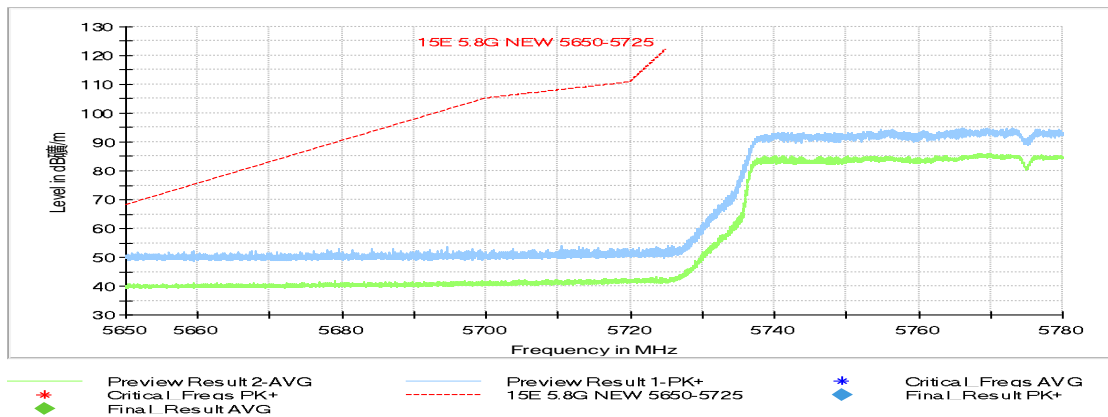


Fig. 20 Band Edges (802.11ac-HT80 Ch155, 5775MHz)

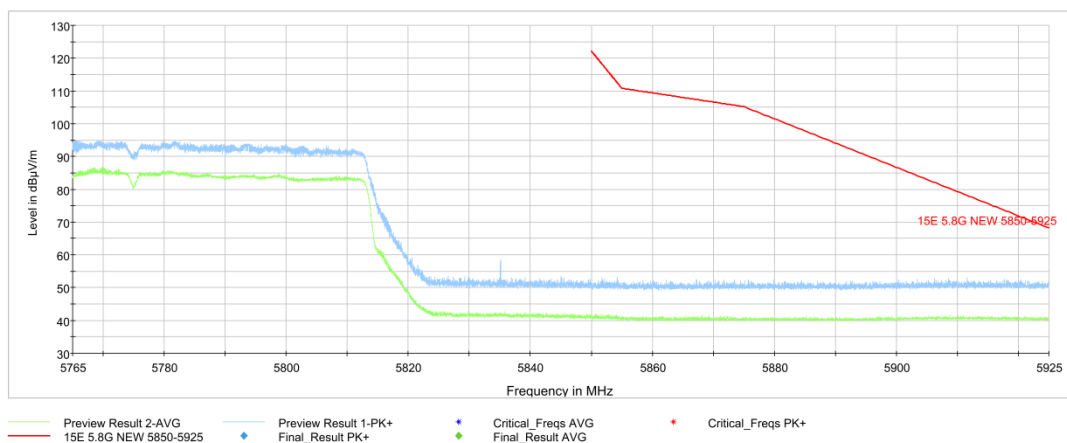


Fig. 21 Band Edges (802.11ac-HT80, 5775MHz)

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 .

EUT ID: UT71a

Conclusion: PASS

Test graphs as below:

Traffic:

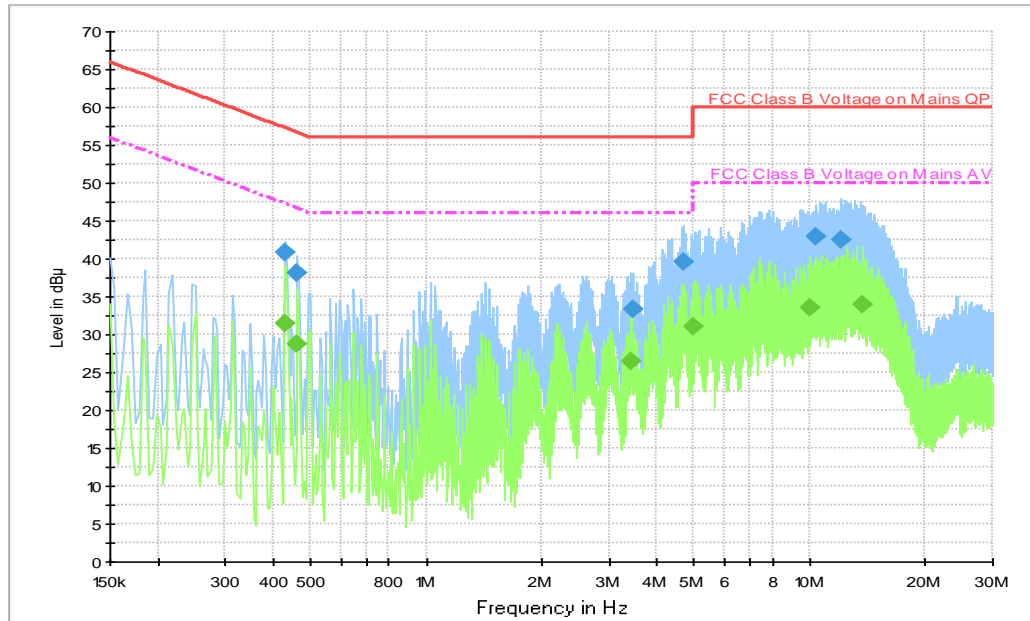


Fig. 22 AC Power line Conducted Emission-802.11a

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)
0.430000	40.8	2000.	9.000	On	L1	19.7	16.5	57.3
0.462000	38.1	2000.	9.000	On	L1	19.7	18.5	56.7
3.470000	33.3	2000.	9.000	On	L1	19.6	22.7	56.0
4.690000	39.6	2000.	9.000	On	L1	19.6	16.4	56.0
10.334000	42.8	2000.	9.000	On	L1	19.7	17.2	60.0
12.118000	42.4	2000.	9.000	On	L1	19.7	17.6	60.0

Final Result 2

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.430000	31.4	2000.	9.000	On	L1	19.7	15.8	47.3
0.462000	28.7	2000.	9.000	On	L1	19.7	17.9	46.7
3.414000	26.4	2000.	9.000	On	L1	19.6	19.6	46.0
4.998000	31.0	2000.	9.000	On	L1	19.6	15.0	46.0
10.074000	33.5	2000.	9.000	On	L1	19.7	16.5	50.0
13.650000	34.0	2000.	9.000	On	L1	19.7	16.0	50.0

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

Idle:

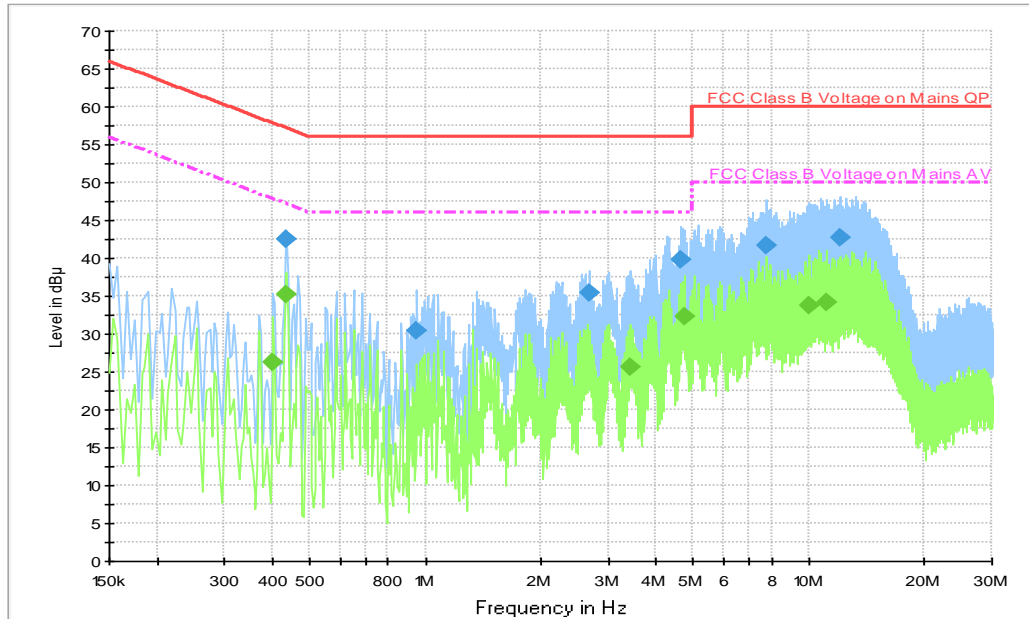


Fig. 23 AC Power line Conducted Emission-Idle

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)
0.434000	42.5	2000.	9.000	On	L1	19.7	14.7	57.2
0.950000	30.5	2000.	9.000	On	L1	19.7	25.5	56.0
2.670000	35.3	2000.	9.000	On	L1	19.6	20.7	56.0
4.650000	39.7	2000.	9.000	On	L1	19.6	16.3	56.0
7.782000	41.7	2000.	9.000	On	L1	19.7	18.3	60.0
12.010000	42.6	2000.	9.000	On	L1	19.7	17.4	60.0

Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.402000	26.3	2000.0	9.000	On	L1	19.7	21.5	47.8
0.434000	35.2	2000.0	9.000	On	L1	19.7	12.0	47.2
3.430000	25.6	2000.0	9.000	On	L1	19.6	20.4	46.0
4.722000	32.2	2000.0	9.000	On	L1	19.6	13.8	46.0
10.030000	33.8	2000.0	9.000	On	L1	19.7	16.2	50.0
11.074000	34.1	2000.0	9.000	On	L1	19.7	15.9	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

<p>United States Department of Commerce National Institute of Standards and Technology</p> <div style="display: flex; justify-content: space-around; align-items: center;"><div style="font-size: 2em; font-weight: bold; letter-spacing: 0.5em;">NVLAP[®]</div><div style="text-align: center;"></div></div> <hr/> <p style="font-size: 1.2em; font-weight: bold; text-align: center;">Certificate of Accreditation to ISO/IEC 17025:2017</p> <hr/> <p style="text-align: center;">NVLAP LAB CODE: 600118-0</p> <p style="text-align: center; font-weight: bold;">Telecommunication Technology Labs, CAICT</p> <p style="text-align: center;">Beijing China</p> <p style="text-align: center; font-size: 0.8em;"><i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i></p> <p style="text-align: center; font-weight: bold; font-size: 1.1em;">Electromagnetic Compatibility & Telecommunications</p> <p style="text-align: center; font-size: 0.8em;"><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 Communique dated January 2009).</i></p> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 20px;"><div style="text-align: center;"><hr/><p style="font-size: 0.8em;">2022-10-01 through 2023-09-30 <i>Effective Dates</i></p></div><div style="text-align: center;"></div><div style="text-align: center;"><hr/><p style="font-size: 0.8em;"><i>For the National Voluntary Laboratory Accreditation Program</i></p></div></div>	
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