



FCC PART 15C TEST REPORT No.I21Z62451-IOT17

for

HMD Global Oy

Smart Phone

N151DL

With

FCC ID: 2AJOTTA-1510

Hardware Version: V1.0

Software Version: 02US_0_060

Issued Date: 2022-02-18

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. TESTING ENVIRONMENT	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.....	7
4. REFERENCE DOCUMENTS	7
4.1. DOCUMENTS SUPPLIED BY APPLICANT	7
4.2. REFERENCE DOCUMENTS FOR TESTING.....	7
5. LABORATORY ENVIRONMENT.....	8
6. SUMMARY OF TEST RESULTS	8
6.1. SUMMARY OF TEST RESULTS	8
6.2. STATEMENTS.....	8
6.3. TEST CONDITIONS	8
7. TEST EQUIPMENTS UTILIZED	9
8. MEASUREMENT UNCERTAINTY	10
8.1. TRANSMITTER OUTPUT POWER	10
8.2. PEAK POWER SPECTRAL DENSITY	10
8.3. OCCUPIED 6DB BANDWIDTH.....	10
8.4. BAND EDGES COMPLIANCE	10
8.5. SPURIOUS EMISSIONS	10
8.6. AC POWER-LINE CONDUCTED EMISSION	10
ANNEX A: MEASUREMENT RESULTS.....	11
A.1. MEASUREMENT METHOD	11
A.2. MAXIMUM PEAK OUTPUT POWER	12
A.2.1 ANTENNA GAIN	12
A.2.2. MAXIMUM AVERAGE OUTPUT POWER-CONDUCTED	12

A.3. PEAK POWER SPECTRAL DENSITY	14
A.4. OCCUPIED 6DB BANDWIDTH	15
A.5. TRANSMITTER SPURIOUS EMISSION	20
A.5.1 TRANSMITTER SPURIOUS EMISSION - RADIATED	20
A.6. BAND EDGES COMPLIANCE	33
A6.1 BAND EDGES - RADIATED	33
FIG. 10 BAND EDGES (802.11A CH149,5745MHZ).....	34
FIG. 11 BAND EDGES (802.11A CH165, 5825MHZ).....	34
FIG. 12 BAND EDGES (802.11N-HT20 CH149, 5745MHZ)	34
FIG. 13 BAND EDGES (802.11N-HT20 CH165, 5825MHZ)	35
FIG. 14 BAND EDGES (802.11N-HT40 CH151, 5755MHZ)	35
FIG. 15 BAND EDGES (802.11N-HT40 CH159, 5795MHZ)	35
FIG. 16 BAND EDGES (802.11AC-HT20 CH149, 5745MHZ)	36
FIG. 17 BAND EDGES (802.11AC-HT20 CH165, 5825MHZ)	36
FIG. 18 BAND EDGES (802.11AC-HT40 CH151, 5755MHZ)	36
FIG. 19 BAND EDGES (802.11AC-HT40 CH159, 5795MHZ)	37
FIG. 20 BAND EDGES (802.11AC-HT80 CH155, 5775MHZ)	37
FIG. 21 BAND EDGES (802.11AC-HT80, 5775MHZ).....	37
A.7. AC POWERLINE CONDUCTED EMISSION	38
FIG. 22 AC POWER LINE CONDUCTED EMISSION-802.11A	39
FIG. 23 AC POWER LINE CONDUCTED EMISSION-IDLE.....	40
ANNEX B: EUT PARAMETERS.....	41
ANNEX C: ACCREDITATION CERTIFICATE	41

1. TEST LABORATORY

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. Testing Environment

Normal Temperature: 15-35°C

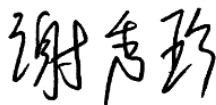
Relative Humidity: 20-75%

1.4. Project date

Testing Start Date: 2021-11-29

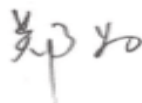
Testing End Date: 2022-02-18

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

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City: Espoo
Postal Code: /
Country: Finland
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Fax: /

2.2. Manufacturer Information

Company Name: HMD Global Oy
Address: Bertel Jungin aukio 9, 02600 Espoo, Finland
City: Espoo
Postal Code: /
Country: Finland
Telephone: +491735287964
Fax: /

3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY

EQUIPMENT(AE)

3.1. About EUT

Description	Smart Phone
Model name	N151DL
FCC ID	2AJOTTA-1510
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	350819780021001/01	V1.0	02US_0_060
EUT2	350819780013495	V1.0	02US_0_060

*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	Type	SN
AE1	Charger1	/	CH011

*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; 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

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/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	2022-05-24
2	LISN	ENV216	101200	R&S	1 year	2022-05-30
3	Test Receiver	ESCI	100344	R&S	1 year	2022-02-23
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	103023	R&S	1 year	2022-10-28
2	BiLog Antenna	VULB916 3	9163-122 3	Schwarzbeck	1 year	2022-03-22
3	EMI Antenna	3115	0016725	ETS-Lindgren	1 year	2022-07-01

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

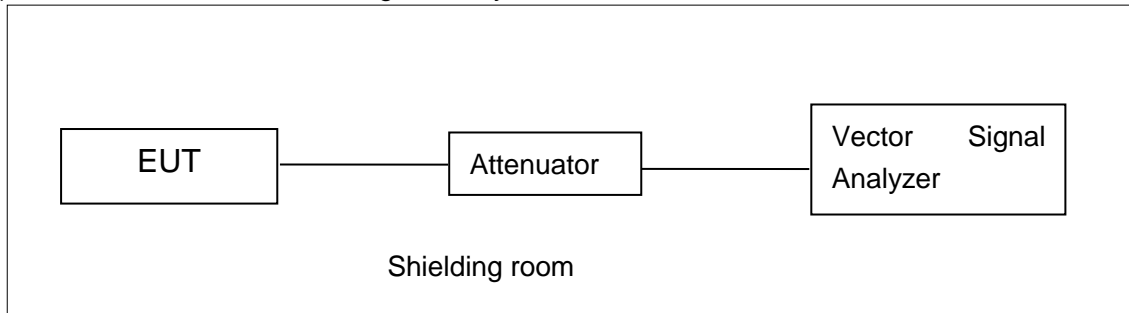
Measurement Uncertainty : 3.08dB,k=2

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

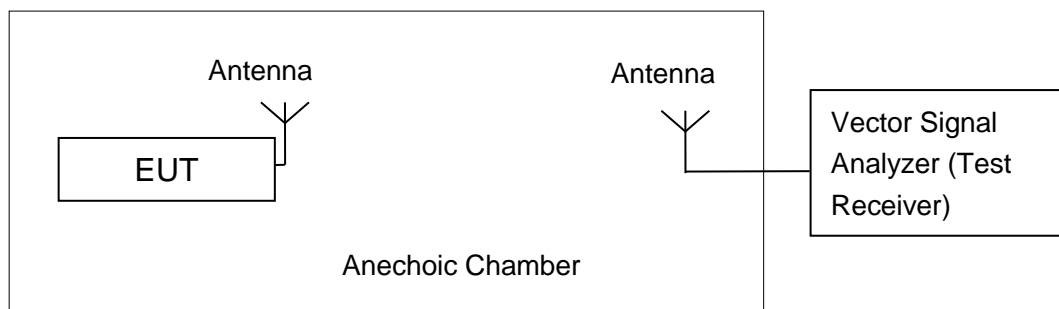


A.1.2. Radiated Emission Measurements

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 -4.1dBi 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	17.19	17.15	17.25

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	17.08	17.05	16.86

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	17.02	16.98	17.02

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	16.81	17.08

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	16.88	16.85

The data rate 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	16.56

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

The duty cycle of all mode are 100%.

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	4.85	P
	157	4.93	P
	165	4.91	P
802.11n HT20	149	4.70	P
	157	4.56	P
	165	4.47	P
802.11n HT40	151	1.60	P
	159	1.82	P
802.11ac HT80	155	-2.70	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	16.35	P
	157	Fig.2	16.30	P
	165	Fig.3	16.35	P
802.11n HT20	149	Fig.4	17.60	P
	157	Fig.5	17.60	P
	165	Fig.6	17.60	P
802.11n HT40	151	Fig.7	36.08	P
	159	Fig.8	36.32	P
802.11ac HT80	155	Fig.9	76.48	P

Conclusion: PASS

Test graphs as below:

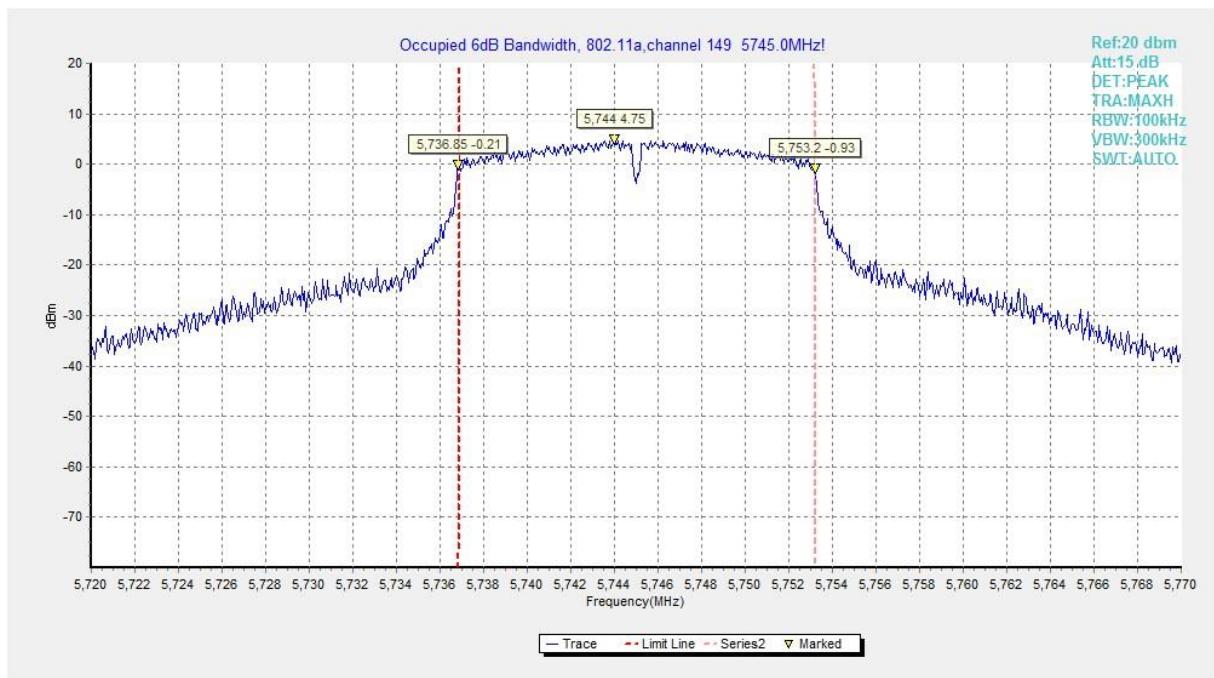


Fig. 1 Occupied 6dB Bandwidth (802.11a, Ch 149)

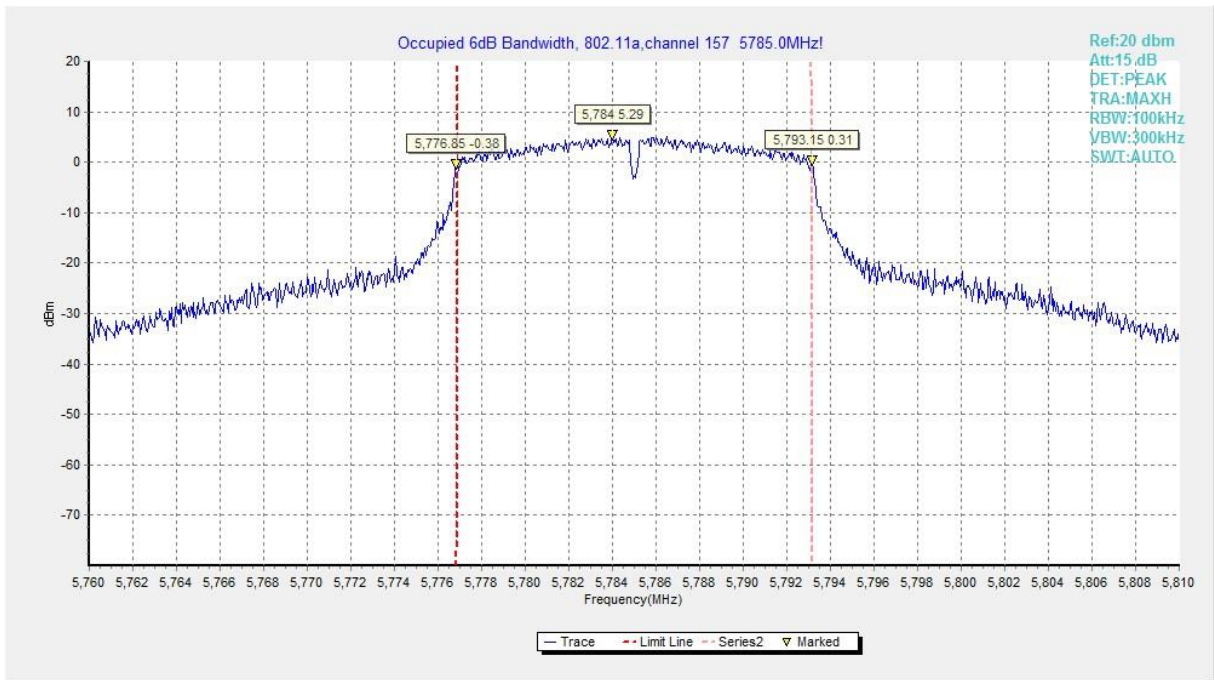


Fig. 2 Occupied 6dB Bandwidth (802.11a, Ch 157)

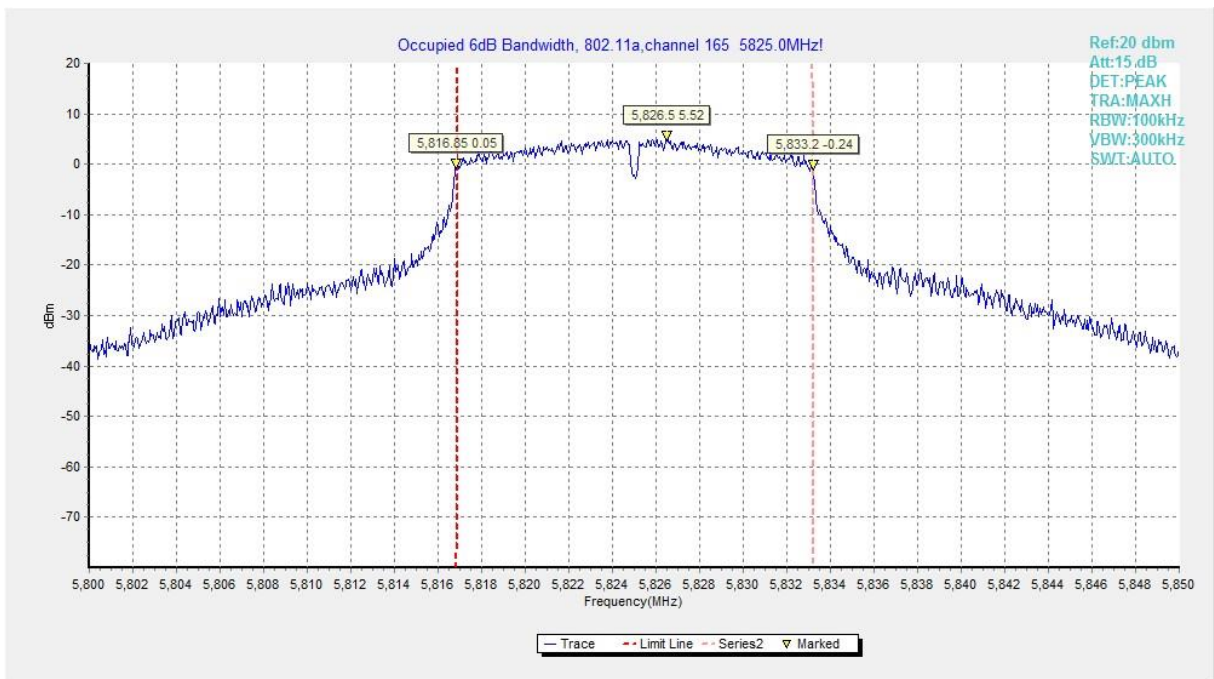


Fig. 3 Occupied 6dB Bandwidth (802.11a, Ch 165)

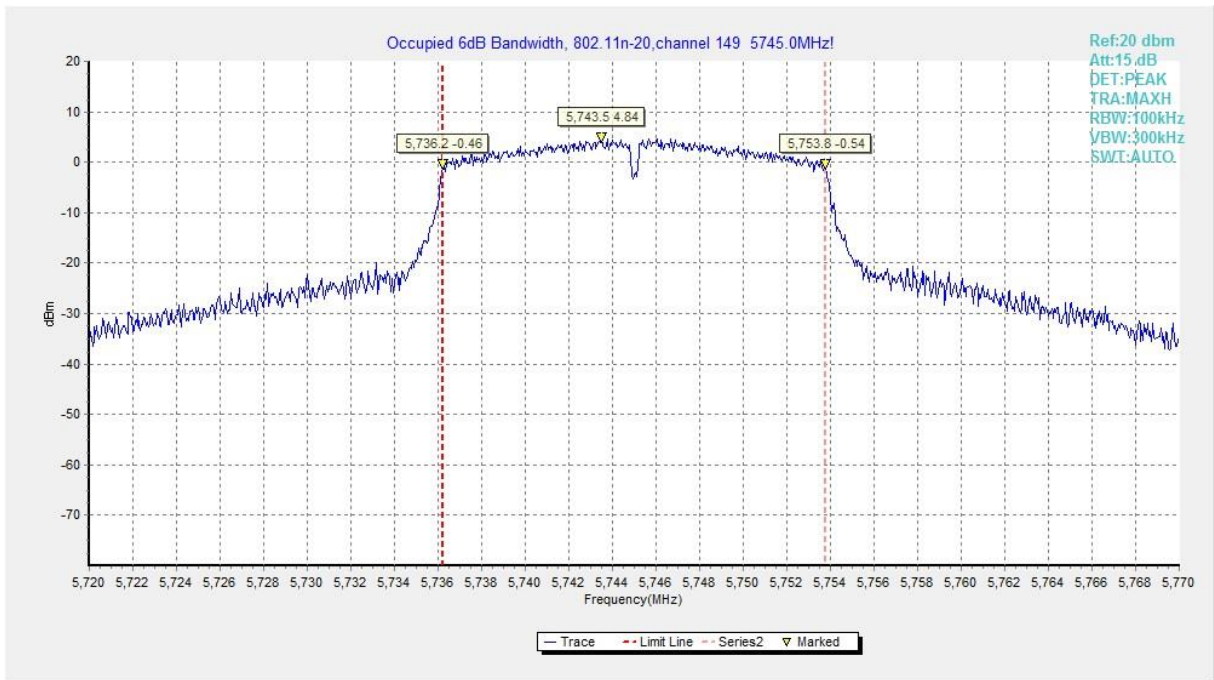


Fig. 4 Occupied 6dB Bandwidth (802.11n-HT20, Ch 149)

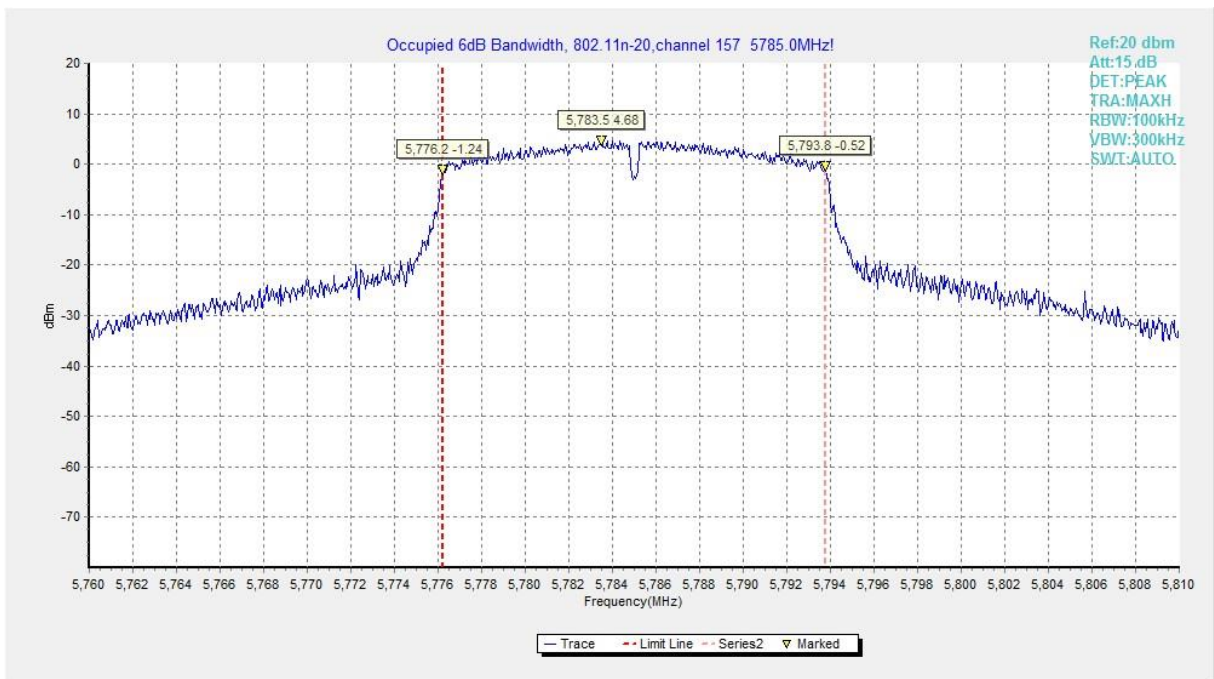


Fig. 5 Occupied 6dB Bandwidth (802.11n-HT20, Ch 157)

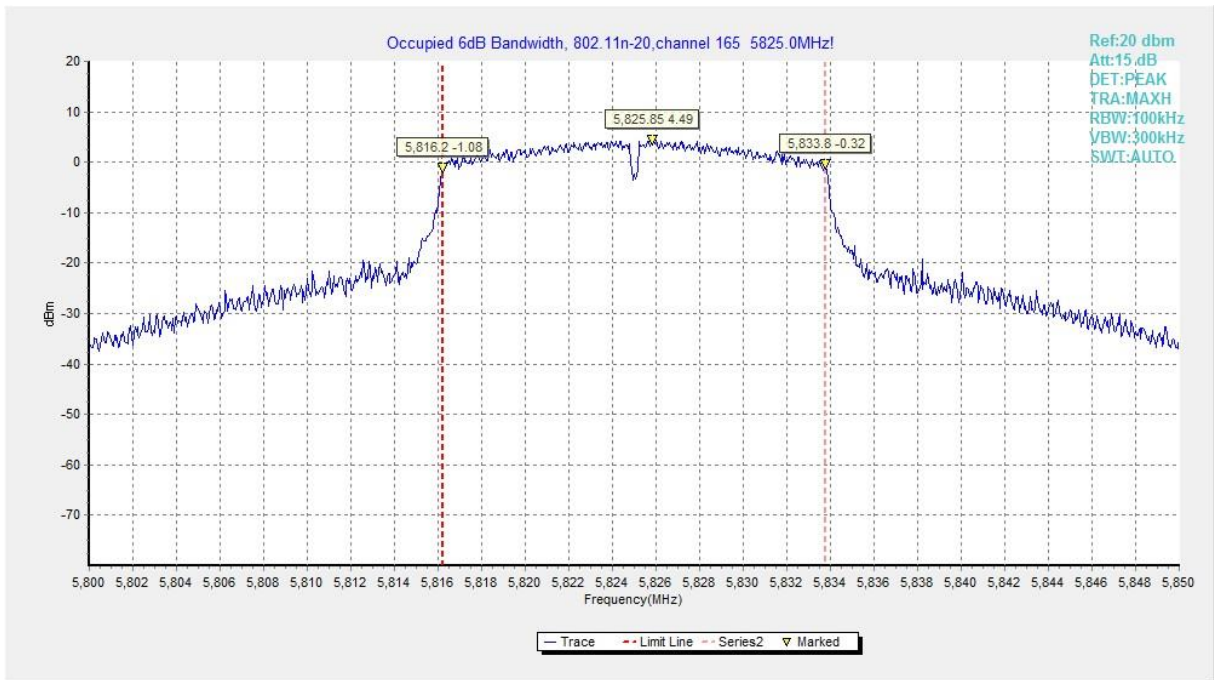


Fig. 6 Occupied 6dB Bandwidth (802.11n-HT20, Ch 165)

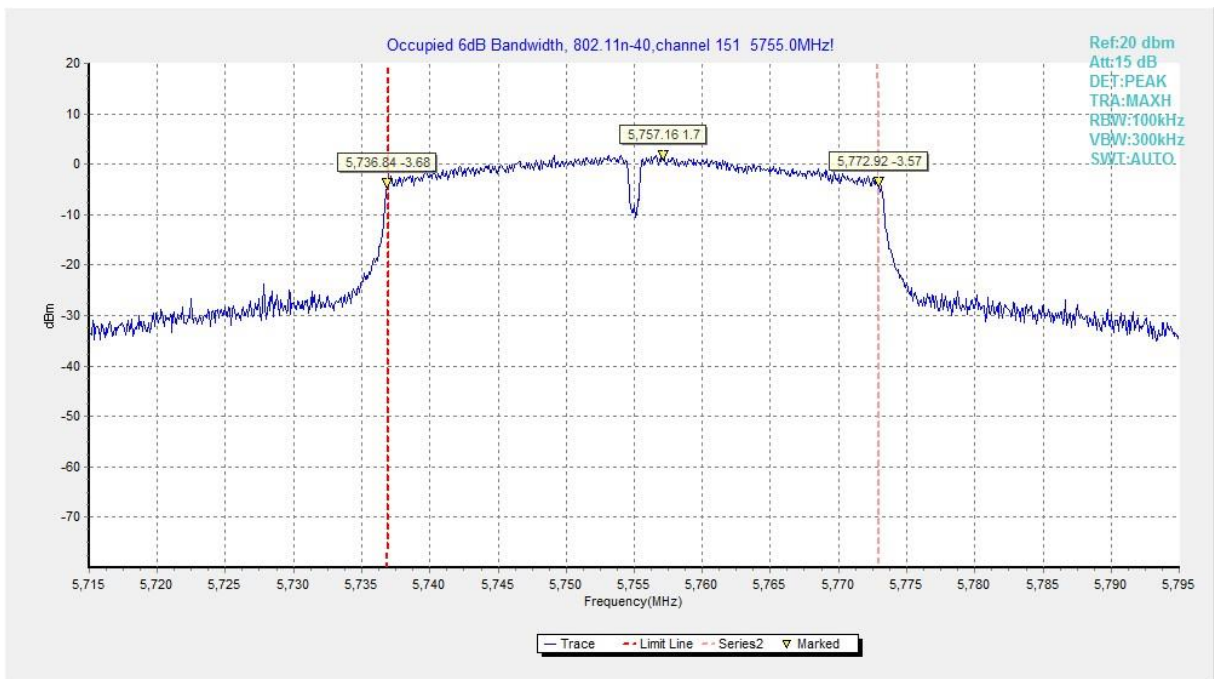


Fig. 7 Occupied 6dB Bandwidth (802.11n-HT40, Ch 151)

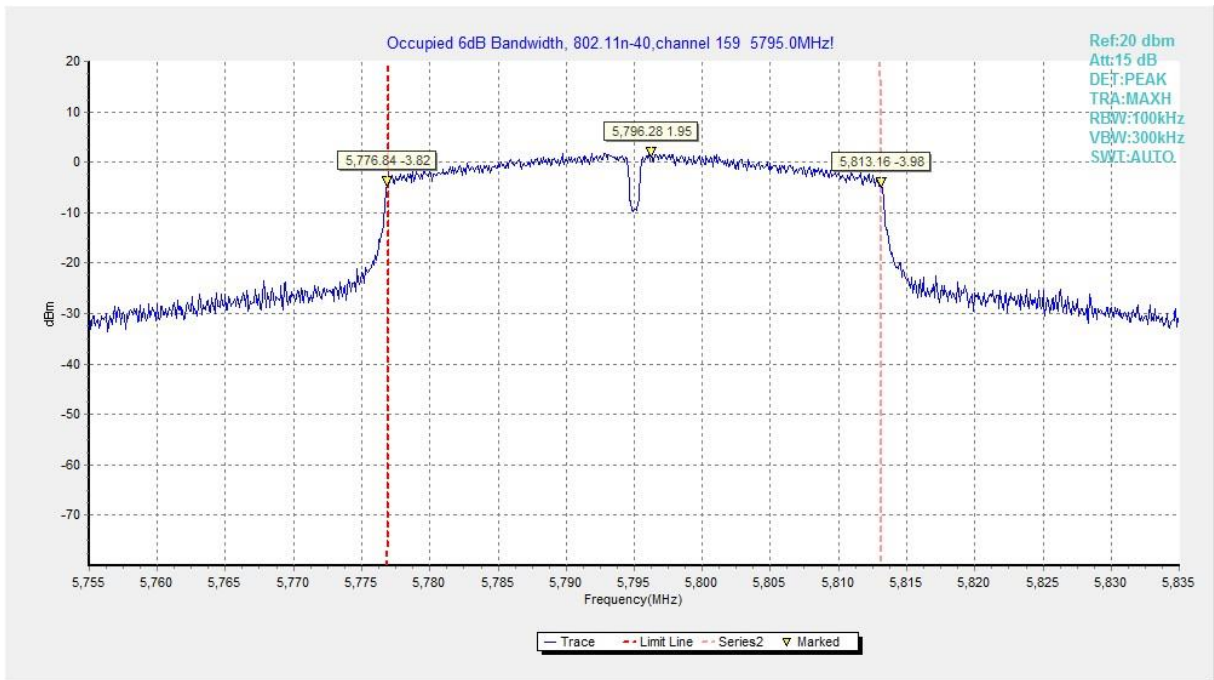


Fig. 8 Occupied 6dB Bandwidth (802.11n-HT40, Ch 159)

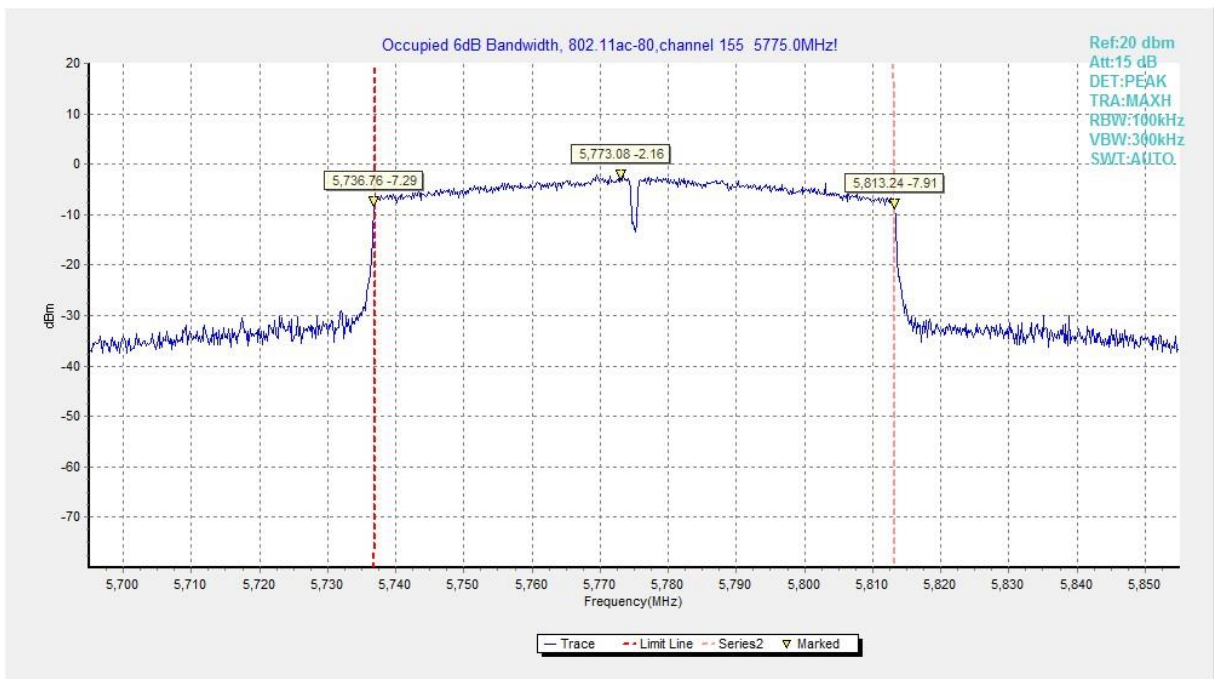


Fig. 9 Occupied 6dB Bandwidth (802.11ac-HT80, Ch 155)

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
	165	26.5 GHz~ 40 GHz	---	P
		1 GHz ~ 3 GHz	---	P
		3 GHz ~ 7 GHz	---	P
			7 GHz ~ 18 GHz	---

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
	165	26.5 GHz~ 40 GHz	---	P
		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
	165	26.5 GHz~ 40 GHz	---	P
		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_{Rp} 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)
17963.20	42.50	-25.50	46.66	21.34	54.00	11.50	V
17988.50	42.49	-25.50	46.66	21.33	54.00	11.51	V
16051.90	37.84	-27.35	38.54	26.65	54.00	16.16	V
16043.60	37.81	-27.35	38.54	26.62	54.00	16.19	V
11858.10	36.22	-31.85	39.05	29.02	54.00	17.78	V
11493.00	36.20	-32.26	38.84	29.63	54.00	17.80	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)
17991.80	42.49	-25.50	46.66	21.33	54.00	11.51	V
17973.60	42.12	-25.50	46.66	20.96	54.00	11.88	V
13338.80	37.72	-29.49	39.71	27.50	54.00	16.28	H
13256.80	37.63	-29.67	39.55	27.75	54.00	16.37	V
11862.00	36.28	-31.85	39.05	29.08	54.00	17.72	V
11877.40	36.27	-31.85	39.05	29.07	54.00	17.73	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)
17983.50	42.23	-25.50	46.66	21.07	54.00	11.77	H
17980.20	42.17	-25.50	46.66	21.01	54.00	11.83	H
15650.40	37.93	-27.23	38.61	26.55	54.00	16.07	V
13256.80	37.84	-29.67	39.55	27.96	54.00	16.16	H
11863.10	36.58	-31.85	39.05	29.38	54.00	17.42	V
11852.10	36.13	-31.85	39.05	28.93	54.00	17.87	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)
17969.20	42.24	-25.50	46.66	21.08	54.00	11.76	V
17987.90	42.23	-25.50	46.66	21.07	54.00	11.77	H
16036.00	37.74	-27.35	38.54	26.55	54.00	16.26	H
16131.10	37.71	-26.77	38.93	25.55	54.00	16.29	V
11886.80	36.27	-31.85	39.05	29.07	54.00	17.73	V
11790.50	36.25	-31.99	38.98	29.26	54.00	17.75	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)
17963.20	42.37	-25.50	46.66	21.21	54.00	11.63	H
17986.20	42.32	-25.50	46.66	21.16	54.00	11.68	V
16052.50	37.58	-27.35	38.54	26.39	54.00	16.42	H
16051.40	37.55	-27.35	38.54	26.36	54.00	16.45	H
11865.90	36.10	-31.85	39.05	28.90	54.00	17.90	V
11851.50	36.09	-31.85	39.05	28.89	54.00	17.91	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)
17984.00	42.25	-25.50	46.66	21.09	54.00	11.75	H
17945.00	42.14	-25.50	46.66	20.98	54.00	11.86	H
13343.70	37.72	-29.49	39.71	27.50	54.00	16.28	V
16051.40	37.62	-27.35	38.54	26.43	54.00	16.38	H
11997.90	36.17	-31.48	39.09	28.56	54.00	17.83	V
11804.80	36.09	-31.85	39.05	28.89	54.00	17.91	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)
17958.20	42.27	-25.50	46.66	21.11	54.00	11.73	H
17977.50	42.24	-25.50	46.66	21.08	54.00	11.76	H
13335.50	37.79	-29.49	39.71	27.57	54.00	16.21	H
16041.50	37.64	-27.35	38.54	26.45	54.00	16.36	H
11866.40	36.21	-31.85	39.05	29.01	54.00	17.79	H
11875.20	36.17	-31.85	39.05	28.97	54.00	17.83	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)
17970.80	42.17	-25.50	46.66	21.01	54.00	11.83	H
17942.20	42.11	-25.50	46.66	20.95	54.00	11.89	H
13262.30	37.83	-29.67	39.55	27.95	54.00	16.17	V
13261.80	37.67	-29.67	39.55	27.79	54.00	16.33	H
11519.40	36.38	-32.26	38.84	29.81	54.00	17.62	H
11800.40	36.15	-31.85	39.05	28.95	54.00	17.85	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)
17986.20	42.49	-25.50	46.66	21.33	54.00	11.51	H
17966.50	42.44	-25.50	46.66	21.28	54.00	11.56	V
13253.00	37.77	-29.67	39.55	27.89	54.00	16.23	V
13339.30	37.65	-29.49	39.71	27.43	54.00	16.35	H
11873.50	36.19	-31.85	39.05	28.99	54.00	17.81	V
11818.50	36.18	-31.85	39.05	28.98	54.00	17.82	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)
17982.40	42.43	-25.50	46.66	21.27	54.00	11.57	V
17941.20	42.21	-25.50	46.66	21.05	54.00	11.79	H
13342.60	37.64	-29.49	39.71	27.42	54.00	16.36	V
13328.30	37.59	-29.49	39.71	27.37	54.00	16.41	V
11859.20	36.34	-31.85	39.05	29.14	54.00	17.66	V
11805.90	36.17	-31.85	39.05	28.97	54.00	17.83	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)
17956.00	42.30	-25.50	46.66	21.14	54.00	11.70	H
17959.30	42.15	-25.50	46.66	20.99	54.00	11.85	H
15654.20	37.62	-27.23	38.61	26.24	54.00	16.38	V
13350.30	37.57	-29.49	39.71	27.35	54.00	16.43	V
11853.80	36.26	-31.85	39.05	29.06	54.00	17.74	V
11851.00	36.12	-31.85	39.05	28.92	54.00	17.88	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)
17973.00	42.46	-25.50	46.66	21.30	54.00	11.54	V
17969.20	42.23	-25.50	46.66	21.07	54.00	11.77	H
13338.80	37.46	-29.49	39.71	27.24	54.00	16.54	V
16050.80	37.45	-27.35	38.54	26.26	54.00	16.55	V
11602.40	36.58	-32.31	38.91	29.99	54.00	17.42	V
11606.20	36.56	-32.31	38.91	29.97	54.00	17.44	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)
17980.80	42.19	-25.50	46.66	21.03	54.00	11.81	H
17928.50	42.15	-25.50	46.66	20.99	54.00	11.85	H
13333.80	37.76	-29.49	39.71	27.54	54.00	16.24	H
13273.30	37.65	-29.67	39.55	27.77	54.00	16.35	V
11596.40	36.59	-32.31	38.91	30.00	54.00	17.41	V
11593.00	36.47	-32.31	38.91	29.88	54.00	17.53	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)
17983.00	42.43	-25.50	46.66	21.27	54.00	11.57	H
17980.80	42.38	-25.50	46.66	21.22	54.00	11.62	H
13349.80	37.99	-29.49	39.71	27.77	54.00	16.01	H
16050.20	37.86	-27.35	38.54	26.67	54.00	16.14	V
11853.80	36.25	-31.85	39.05	29.05	54.00	17.75	V
11793.20	36.11	-31.99	38.98	29.12	54.00	17.89	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)
17826.80	53.61	-25.50	46.66	32.45	74.00	20.39	H
17704.10	53.40	-25.74	45.95	33.19	74.00	20.60	V
16475.40	51.66	-26.96	39.82	38.80	68.30	16.64	H
16524.30	51.41	-26.96	39.82	38.55	68.30	16.89	V
10949.50	48.14	-32.82	38.70	42.26	74.00	25.86	V
11786.10	48.07	-31.99	38.98	41.08	74.00	25.93	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)
17901.00	53.71	-25.50	46.66	32.55	74.00	20.29	V
17911.50	53.59	-25.50	46.66	32.43	74.00	20.41	V
16477.00	51.72	-26.96	39.82	38.86	68.30	16.58	V
16484.80	51.37	-26.96	39.82	38.51	68.30	16.93	H
11937.40	48.31	-31.48	39.09	40.70	74.00	25.69	H
11869.10	48.01	-31.85	39.05	40.81	74.00	25.99	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)
17919.70	54.13	-25.50	46.66	32.97	74.00	19.87	V
17943.90	53.70	-25.50	46.66	32.54	74.00	20.30	V
16628.30	51.74	-26.87	40.65	37.96	68.30	16.56	H
16660.20	51.10	-26.87	40.65	37.32	68.30	17.20	H
11783.40	47.80	-31.99	38.98	40.81	74.00	26.20	V
11934.00	47.63	-31.48	39.09	40.02	74.00	26.37	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)
17965.90	54.46	-25.50	46.66	33.30	74.00	19.54	V
17948.30	53.95	-25.50	46.66	32.79	74.00	20.05	H
16525.50	51.36	-26.96	39.82	38.50	68.30	16.94	V
16598.00	51.35	-26.87	40.65	37.57	68.30	16.95	V
11708.00	48.59	-31.99	38.98	41.60	74.00	25.41	H
11932.40	48.40	-31.48	39.09	40.79	74.00	25.60	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)
17994.50	54.29	-25.50	46.66	33.13	74.00	19.71	V
17940.00	53.98	-25.50	46.66	32.82	74.00	20.02	H
16589.20	51.38	-26.87	40.65	37.60	68.30	16.92	H
16741.60	51.20	-26.62	41.49	36.33	68.30	17.10	H
11726.10	47.69	-31.99	38.98	40.70	74.00	26.31	V
9102.60	47.68	-33.76	38.13	43.31	74.00	26.32	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)
17976.30	53.93	-25.50	46.66	32.77	74.00	20.07	H
17978.50	53.45	-25.50	46.66	32.29	74.00	20.55	H
16550.20	50.98	-26.87	40.65	37.20	68.30	17.32	V
16538.10	50.95	-26.96	39.82	38.09	68.30	17.35	H
9196.70	48.22	-33.85	38.08	43.99	74.00	25.78	V
11991.80	48.16	-31.48	39.09	40.55	74.00	25.84	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)
17907.60	53.90	-25.50	46.66	32.74	74.00	20.10	H
17912.00	53.66	-25.50	46.66	32.50	74.00	20.34	V
16562.80	51.22	-26.87	40.65	37.44	68.30	17.08	H
16449.00	51.18	-26.96	39.82	38.32	68.30	17.12	H
11837.80	47.86	-31.85	39.05	40.66	74.00	26.14	H
10917.10	47.67	-32.82	38.70	41.79	74.00	26.33	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)
17921.30	53.74	-25.50	46.66	32.58	74.00	20.26	V
17958.20	53.54	-25.50	46.66	32.38	74.00	20.46	V
16592.50	51.62	-26.87	40.65	37.84	68.30	16.68	V
16427.00	51.41	-26.96	39.82	38.55	68.30	16.89	H
11937.40	49.00	-31.48	39.09	41.39	74.00	25.00	H
11511.60	48.30	-32.26	38.84	41.73	74.00	25.70	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)
17984.60	53.71	-25.50	46.66	32.55	74.00	20.29	V
17620.50	53.45	-25.74	45.95	33.24	68.30	14.85	V
16553.00	52.04	-26.87	40.65	38.26	68.30	16.26	H
16554.60	51.35	-26.87	40.65	37.57	68.30	16.95	H
11832.30	47.84	-31.85	39.05	40.64	74.00	26.16	H
11819.60	47.78	-31.85	39.05	40.58	74.00	26.22	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)
17949.40	53.83	-25.50	46.66	32.67	74.00	20.17	H
17937.30	53.52	-25.50	46.66	32.36	74.00	20.48	V
16537.00	51.43	-26.96	39.82	38.57	68.30	16.87	H
16468.20	51.23	-26.96	39.82	38.37	68.30	17.07	V
11848.20	47.57	-31.85	39.05	40.37	74.00	26.43	H
11340.00	47.52	-32.42	38.79	41.15	74.00	26.48	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)
17359.80	53.58	-25.95	44.35	35.17	68.30	14.72	V
17957.10	53.58	-25.50	46.66	32.42	74.00	20.42	V
13729.80	51.36	-29.10	40.86	39.59	68.30	16.94	H
16482.00	51.26	-26.96	39.82	38.40	68.30	17.04	H
11646.40	48.46	-32.31	38.91	41.87	74.00	25.54	H
11780.00	48.18	-31.99	38.98	41.19	74.00	25.82	H

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)
17942.80	54.62	-25.50	46.66	33.46	74.00	19.38	H
17934.00	54.07	-25.50	46.66	32.91	74.00	19.93	V
16522.20	50.84	-26.96	39.82	37.98	68.30	17.46	H
16524.30	50.83	-26.96	39.82	37.97	68.30	17.47	V
11022.70	48.59	-32.49	38.72	42.35	74.00	25.41	V
11768.50	48.32	-31.99	38.98	41.33	74.00	25.68	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)
17947.20	53.72	-25.50	46.66	32.56	74.00	20.28	H
17816.30	53.64	-25.50	46.66	32.48	74.00	20.36	H
16426.50	51.35	-26.96	39.82	38.49	68.30	16.95	H
16523.20	51.32	-26.96	39.82	38.46	68.30	16.98	V
11853.20	48.07	-31.85	39.05	40.87	74.00	25.93	V
11908.20	47.93	-31.85	39.05	40.73	74.00	26.07	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)
17617.80	54.42	-25.74	45.95	34.21	68.30	13.88	V
17940.00	53.94	-25.50	46.66	32.78	74.00	20.06	V
16648.70	52.30	-26.87	40.65	38.52	68.30	16.00	V
16768.50	51.73	-26.62	41.49	36.86	68.30	16.57	V
11780.60	48.64	-31.99	38.98	41.65	74.00	25.36	V
11703.60	48.13	-31.99	38.98	41.14	74.00	25.87	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 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:

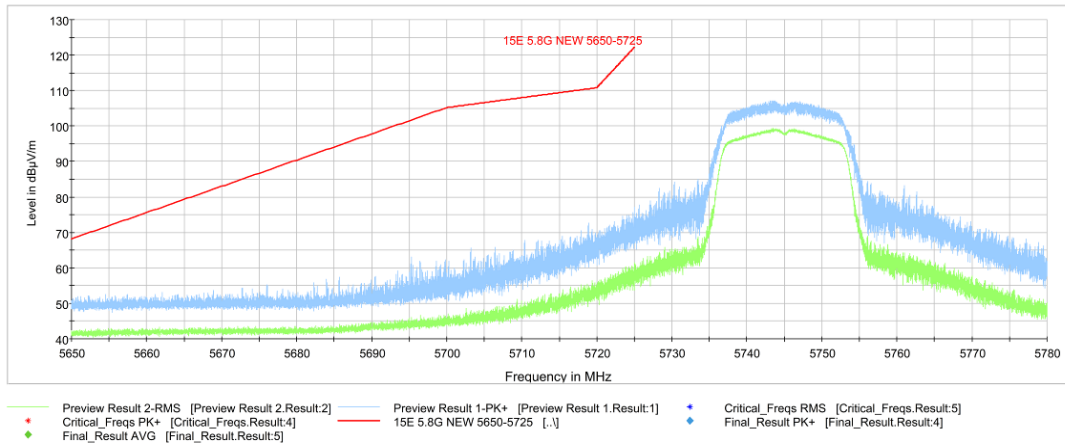


Fig. 10 Band Edges (802.11a Ch149,5745MHz)

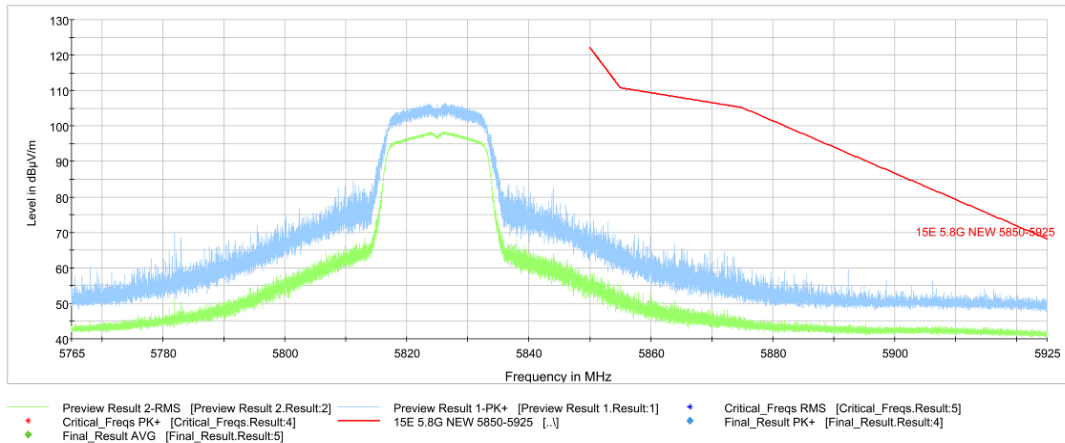


Fig. 11 Band Edges (802.11a Ch165, 5825MHz)

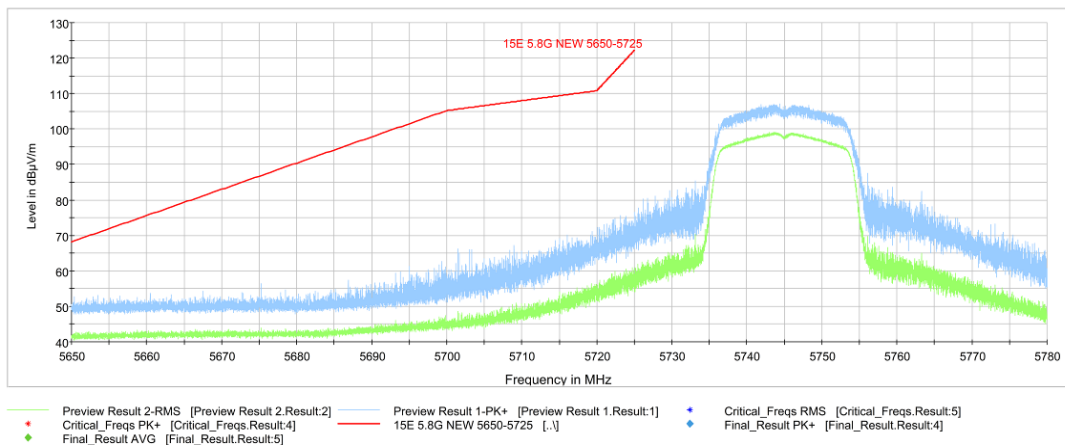


Fig. 12 Band Edges (802.11n-HT20 Ch149, 5745MHz)

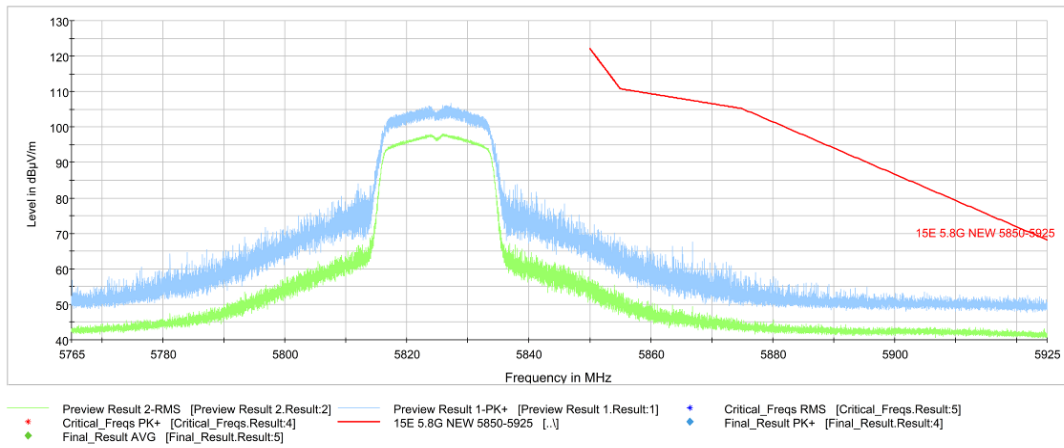


Fig. 13 Band Edges (802.11n-HT20 Ch165, 5825MHz)

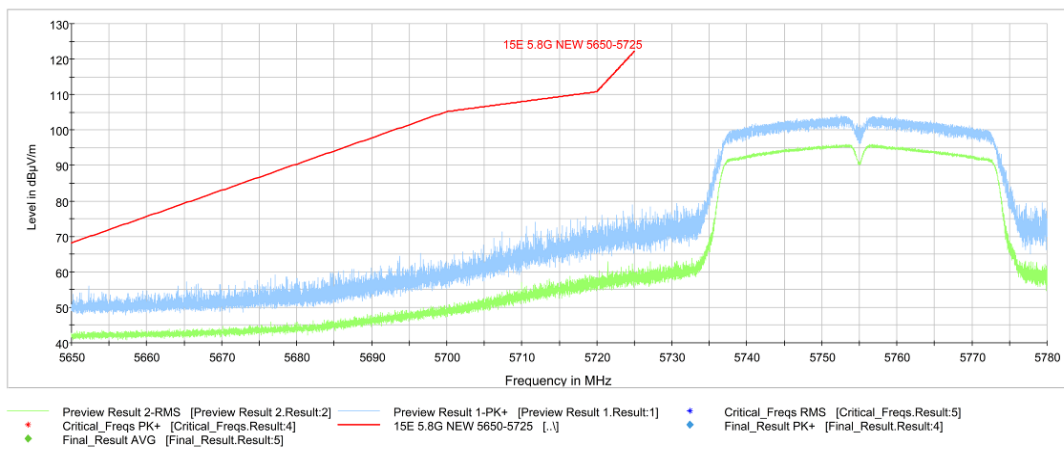


Fig. 14 Band Edges (802.11n-HT40 Ch151, 5755MHz)

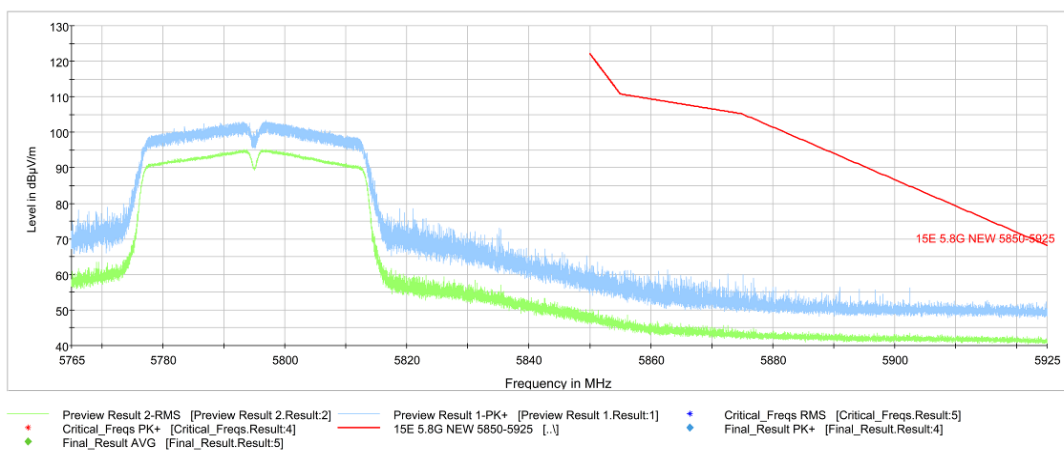


Fig. 15 Band Edges (802.11n-HT40 Ch159, 5795MHz)

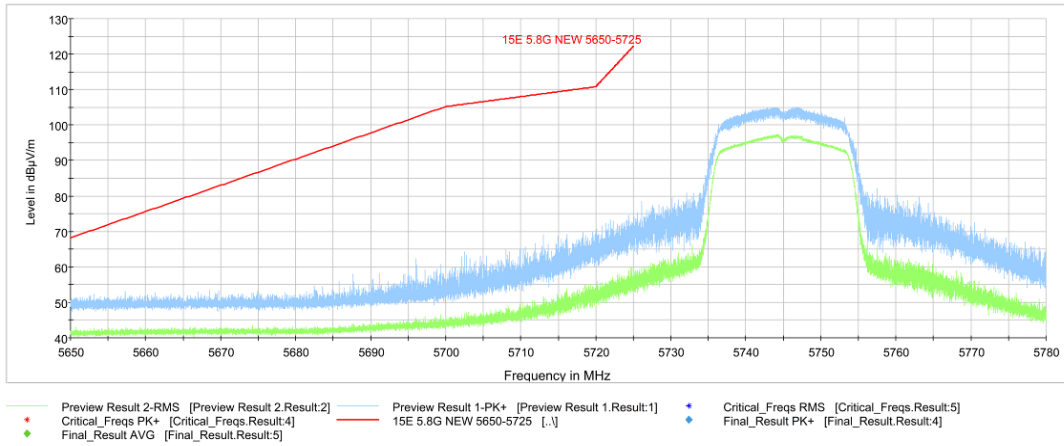


Fig. 16 Band Edges (802.11ac-HT20 Ch149, 5745MHz)

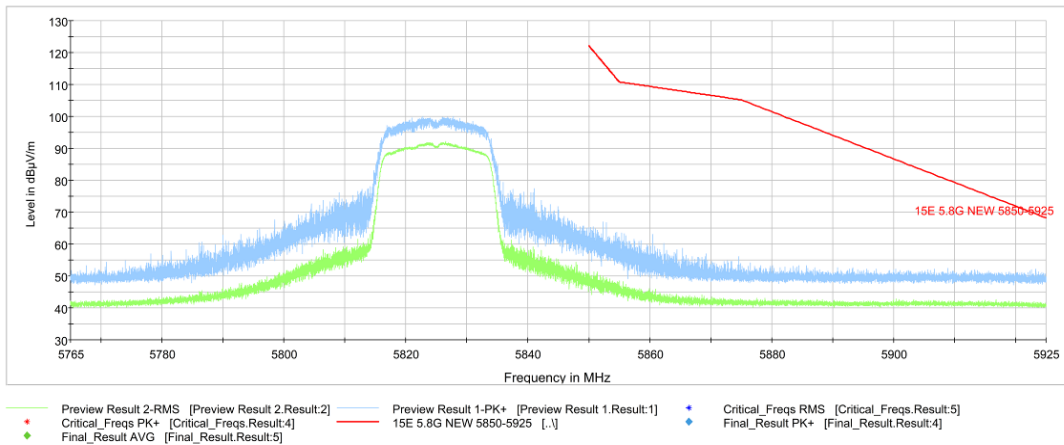


Fig. 17 Band Edges (802.11ac-HT20 Ch165, 5825MHz)

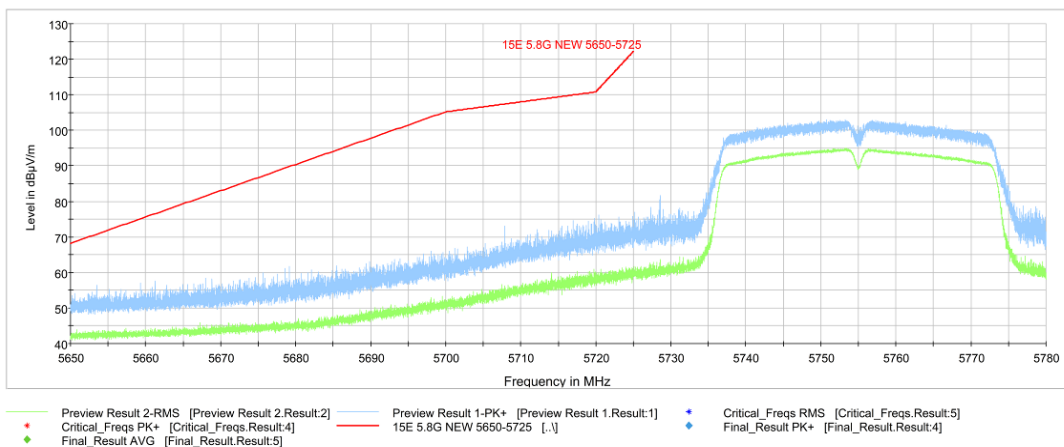


Fig. 18 Band Edges (802.11ac-HT40 Ch151, 5755MHz)

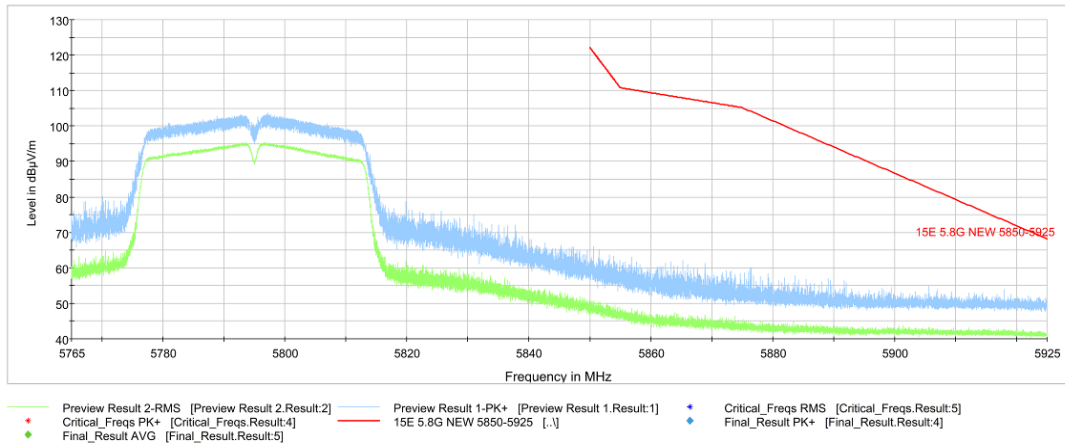


Fig. 19 Band Edges (802.11ac-HT40 Ch159, 5795MHz)

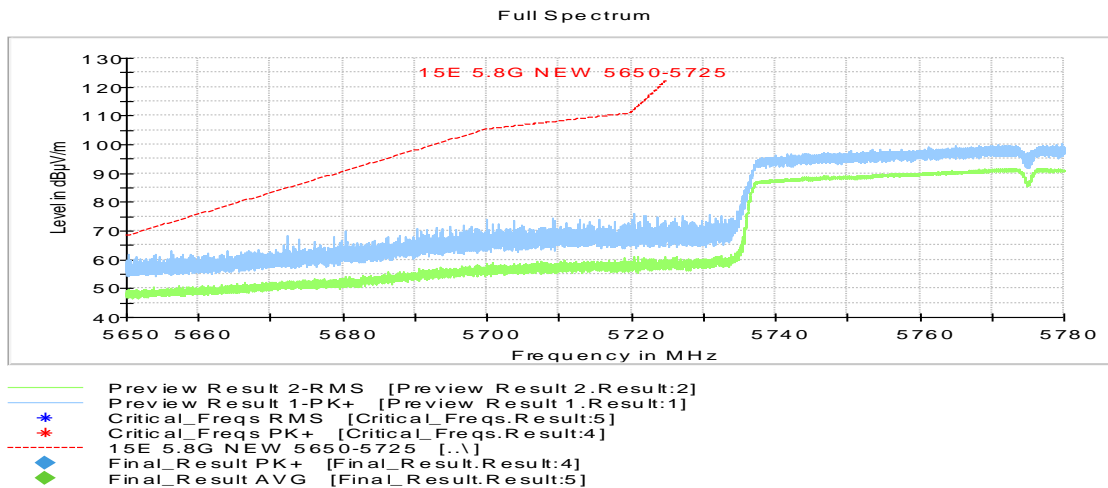


Fig. 20 Band Edges (802.11ac-HT80 Ch155, 5775MHz)

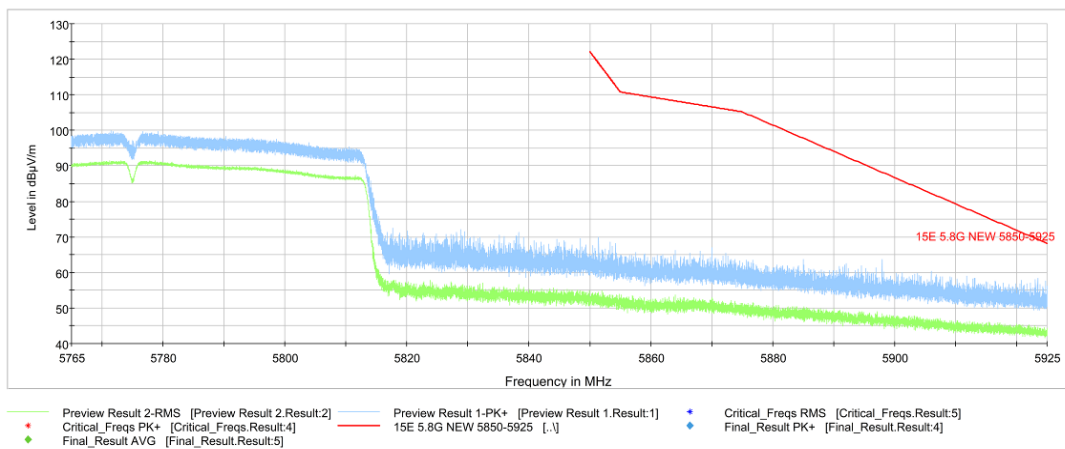


Fig. 21 Band Edges (802.11ac-HT80, 5775MHz)

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 (dB μ V)	Result (dB μ V)		Conclusion
		With charger AE1		
		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 AE1		
		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:

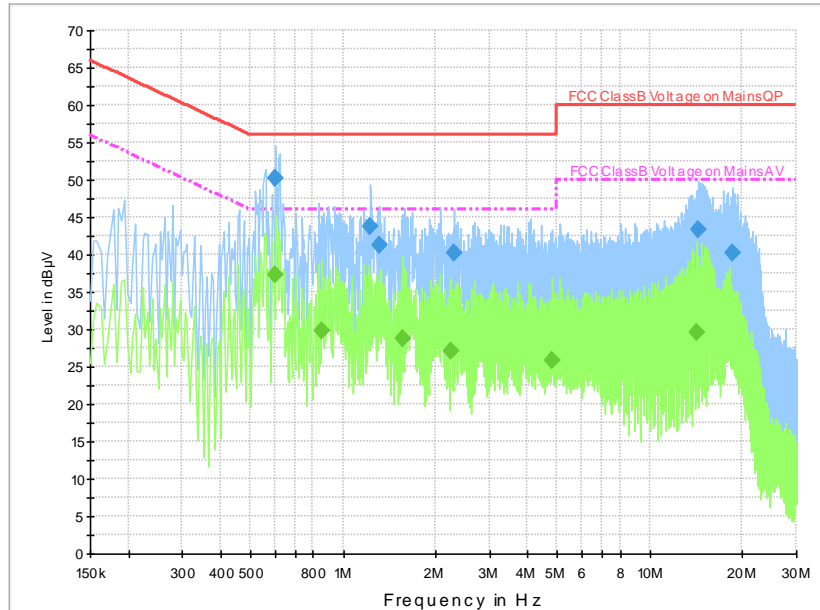


Fig. 22 AC Power line Conducted Emission-802.11a

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)
0.602000	50.3	5000.	9.000	On	L1	19.8	5.7	56.0
1.230000	43.7	5000.	9.000	On	L1	19.5	12.3	56.0
1.318000	41.3	5000.	9.000	On	L1	19.5	14.7	56.0
2.294000	40.2	5000.	9.000	On	L1	19.5	15.8	56.0
14.418000	43.4	5000.	9.000	On	L1	19.8	16.6	60.0
18.558000	40.2	5000.	9.000	On	N	19.9	19.8	60.0

Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.602000	37.3	5000.	9.000	On	L1	19.8	8.7	46.0
0.850000	29.9	5000.	9.000	On	L1	19.6	16.1	46.0
1.566000	28.8	5000.	9.000	On	L1	19.5	17.2	46.0
2.238000	27.2	5000.	9.000	On	L1	19.5	18.8	46.0
4.798000	25.8	5000.	9.000	On	L1	19.6	20.2	46.0
14.222000	29.5	5000.	9.000	On	L1	19.8	20.5	50.0

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

Idle:

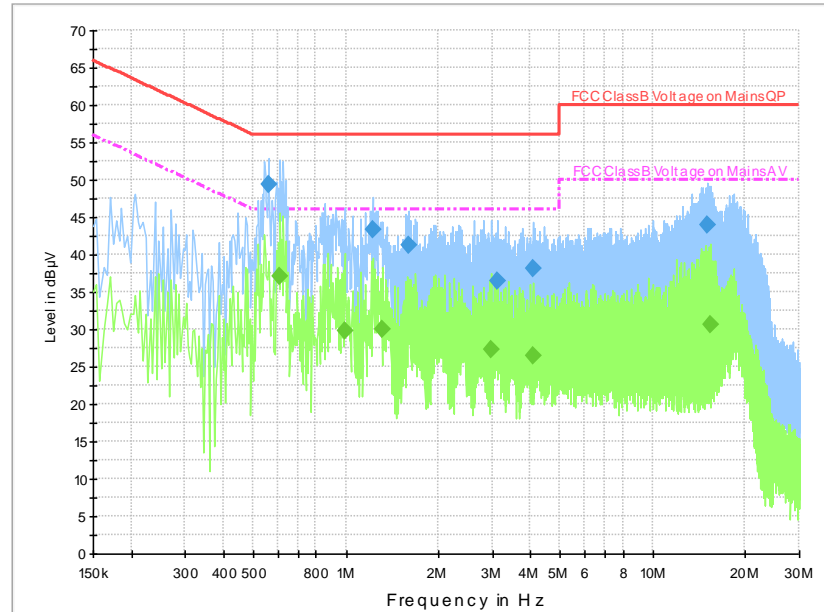


Fig. 23 AC Power line Conducted Emission-Idle

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)
0.558000	49.4	5000.	9.000	On	L1	19.9	6.6	56.0
1.222000	43.3	5000.	9.000	On	L1	19.5	12.7	56.0
1.602000	41.3	5000.	9.000	On	L1	19.5	14.7	56.0
3.122000	36.6	5000.	9.000	On	N	19.7	19.4	56.0
4.058000	38.1	5000.	9.000	On	L1	19.6	17.9	56.0
15.042000	44.0	5000.	9.000	On	L1	19.9	16.0	60.0

Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.610000	37.0	5000.0	9.000	On	L1	19.7	9.0	46.0
0.990000	29.8	5000.0	9.000	On	L1	19.6	16.2	46.0
1.322000	29.9	5000.0	9.000	On	L1	19.5	16.1	46.0
2.986000	27.2	5000.0	9.000	On	L1	19.5	18.8	46.0
4.058000	26.4	5000.0	9.000	On	L1	19.6	19.6	46.0
15.338000	30.6	5000.0	9.000	On	L1	19.9	19.4	50.0

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

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	
	
<hr/> Certificate of Accreditation to ISO/IEC 17025:2017 <hr/>	
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>	
<hr/> 2021-09-29 through 2022-09-30 Effective Dates	
	 For the National Voluntary Laboratory Accreditation Program

*** END OF REPORT BODY ***