



FCC PART 15C TEST REPORT No.I21Z70218-IOT12

for

SAMSUNG Electronics Co., Ltd.

Multi-band GSM/WCDMA/LTE/5GNR Phone with Bluetooth,WLAN

SM-A226BR/DSN,SM-A226BR/N

With

FCC ID: ZCASMA226BRN

Hardware Version: REV1.0

Software Version: A226BR.001

Issued Date: 2021-07-05

Note:

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REPORT HISTORY

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1. TEST LABORATORY

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under 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(Gaolizhang Road)

Address: Cuihu Cloud Center, No.1, Gaolizhang Road, Wenquan,
Haidian District, Beijing, China

Radiated 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: 2021-05-19

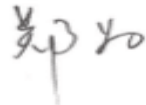
Testing End Date: 2021-07-05

1.5. Signature

谢秀珍


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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2.2. Manufacturer Information

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Telephone: +82-10-2722-4159
Fax: /

3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY

EQUIPMENT(AE)

3.1. About EUT

Description	Multi-band GSM/WCDMA/LTE/5G NR Phone with Bluetooth,WLAN
Model name	SM-A226BR/DSN,SM-A226BR/N
FCC ID	ZCASMA226BRN
WLAN Frequency Band	ISM Band: 5725MHz~5850MHz
Type of modulation	OFDM
Antenna Gain	-2.466dBi
Voltage	3.85V

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
UT03a	2170218UT03a	REV1.0	A226BR.001
UT06a	2170218UT06a	REV1.0	A226BR.001

*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	Charger1	/
AE2	Charger2	/
AE3	Charger3	/
AE4	USB cable1	/
AE5	USB cable1	/
AE6	USB cable1	/
AE7	USB cable1	/
AE8	battery	/

AE1

Model	EP-TA200
Manufacturer	RFTECH
Length of cable	/

AE2

Model	EP-TA200
Manufacturer	Dongwon
Length of cable	/

AE3

Model	EP-TA200
Manufacturer	SOLUM
Length of cable	/

AE4

Model	EP-DR140AWE
Manufacturer	RFTECH Co., Ltd.
Length of cable	/

AE5

Model	EP-DR140AWE
Manufacturer	Ningbo Broad Telecommunication Co., Ltd
Length of cable	/

AE6

Model	EP-DR140AWE
Manufacturer	DONGGUAN KSD CO.,LTD
Length of cable	/

AE7

Model	EP-DR140AWE
Manufacturer	CRESYN HANOI Co.,Ltd
Length of cable	/

AE8

Model	SCUD-WT-W1
Manufacturer	SCUD(Fujian)Electronic Co.,Ltd.
Capacitance	4900mAh
Nominal voltage	3.85V

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

3.4. General Description

Equipment Under Test (EUT) is a model of Multi-band GSM/WCDMA/LTE/5G NR Phone with Bluetooth, WLAN with integrated antenna. It consists of normal options: Battery and Charger.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the Client.

4. REFERENCE DOCUMENTS

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

FCC Part15	FCC CFR 47, Part 15, Subpart C and E: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.407 General technical requirements	2018
ANSI C63.10	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2013
UNII: KDB 789033 D02	General U-NII Test Procedures New Rules v02r01	2017-12
KDB 558074 D01	Federal Communications Commission Office of Engineering and Technology Laboratory Division GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES	2019

5. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

6. SUMMARY OF TEST RESULTS

6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.407 (a)	/	P
Peak Power Spectral Density	15.407 (a)	/	P
Occupied 6dB Bandwidth	15.407 (e)	/	P
Band Edges Compliance - 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	ENH3-Z5	825562/028	Rohde & Schwarz	1 year	2021-10-15
3	Test Receiver	ESCI	100344	Rohde & Schwarz	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	ESU 26	100376	Rohde & Schwarz	1 year	2022-02-23
2	Dual-Ridge Waveguide Horn Antenna	VULB 9163	9163-483	Schwarzbeck	1 year	2021-08-27
3	Dual-Ridge Waveguide Horn Antenna	3115	6914	ETS-Lindgren	1 year	2022-02-03

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

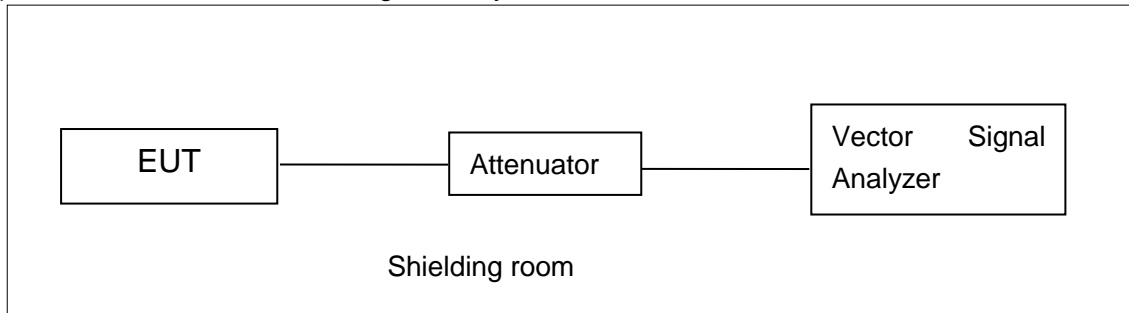
Measurement Uncertainty : 3.08dB,k=2

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

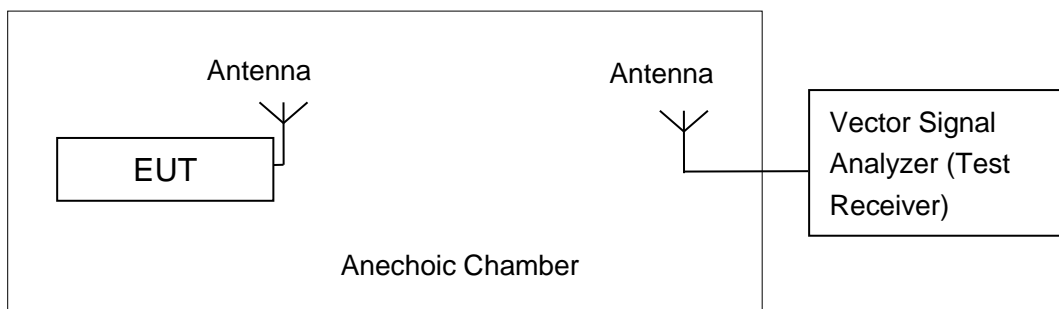


A.1.2. Radiated Emission Measurements

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 -2.466dBi 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	17.21	17.08	17.03
	9	16.63	/	/
	12	16.57	/	/
	18	16.42	/	/
	24	16.08	/	/
	36	15.47	/	/
	48	15.59	/	/
	54	14.80	/	/

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	17.12	17.03	16.93
	MCS1	16.77	/	/
	MCS2	16.62	/	/
	MCS3	16.13	/	/
	MCS4	15.72	/	/
	MCS5	15.35	/	/
	MCS6	15.44	/	/
	MCS7	15.08	/	/

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	17.05	17.04	16.86
	MCS1	17.02	/	/
	MCS2	15.76	/	/
	MCS3	15.89	/	/
	MCS4	14.80	/	/
	MCS5	14.68	/	/
	MCS6	13.58	/	/
	MCS7	13.70	/	/
	MCS8	13.68	/	/

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	17.07	17.01
	MCS1	15.72	/
	MCS2	16.05	/
	MCS3	14.77	/
	MCS4	15.22	/
	MCS5	14.10	/
	MCS6	13.60	/
	MCS7	13.11	/

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	17.06	16.67
	MCS1	16.88	/
	MCS2	15.74	/
	MCS3	14.85	/
	MCS4	14.42	/
	MCS5	14.50	/
	MCS6	13.53	/
	MCS7	13.86	/

	MCS8	13.59	/
	MCS9	12.88	/

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	17.68
	MCS1	16.87
	MCS2	16.64
	MCS3	15.91
	MCS4	15.05
	MCS5	13.49
	MCS6	13.25
	MCS7	12.16
	MCS8	10.61
	MCS9	9.59

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	3.64	P
	157	3.71	P
	165	3.12	P
802.11n HT20	149	3.47	P
	157	3.51	P
	165	3.04	P
802.11n HT40	151	0.63	P
	159	0.33	P
802.11ac HT80	155	-2.76	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	16.35	P
	157	Fig.2	16.35	P
	165	Fig.3	16.30	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	36.00	P
	159	Fig.8	36.08	P
802.11ac HT80	155	Fig.9	76.16	P

Conclusion: PASS

Test graphs as below:

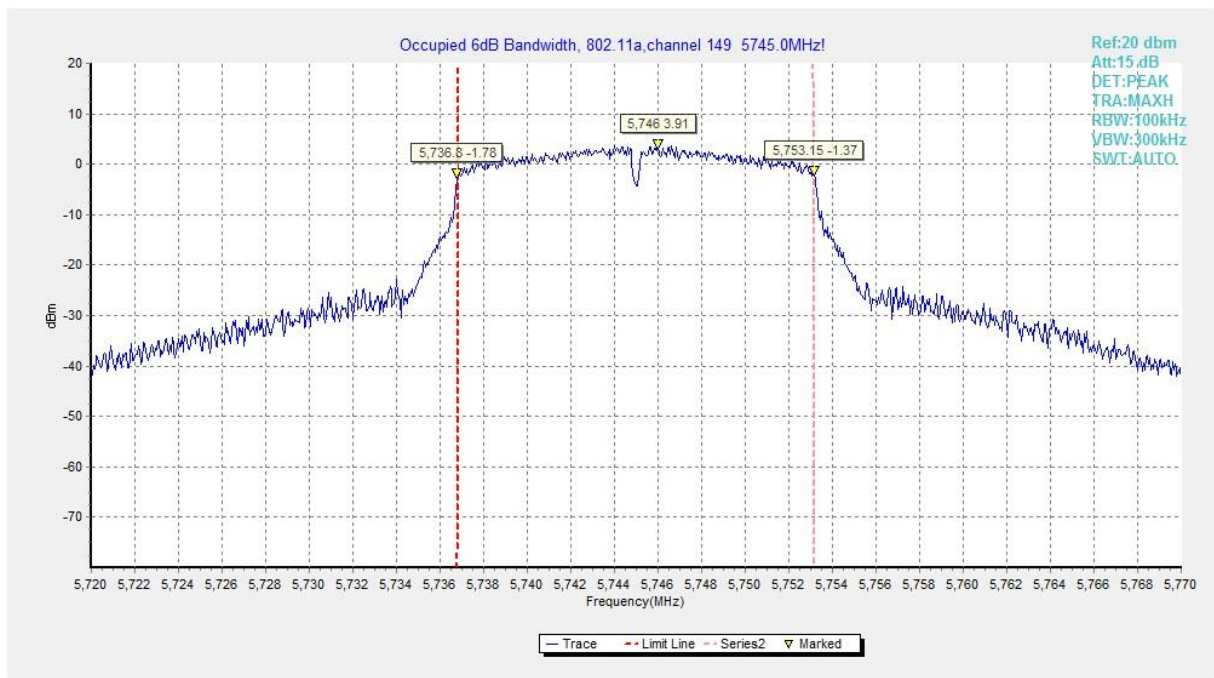


Fig. 1 Occupied 6dB Bandwidth (802.11a, Ch 149)

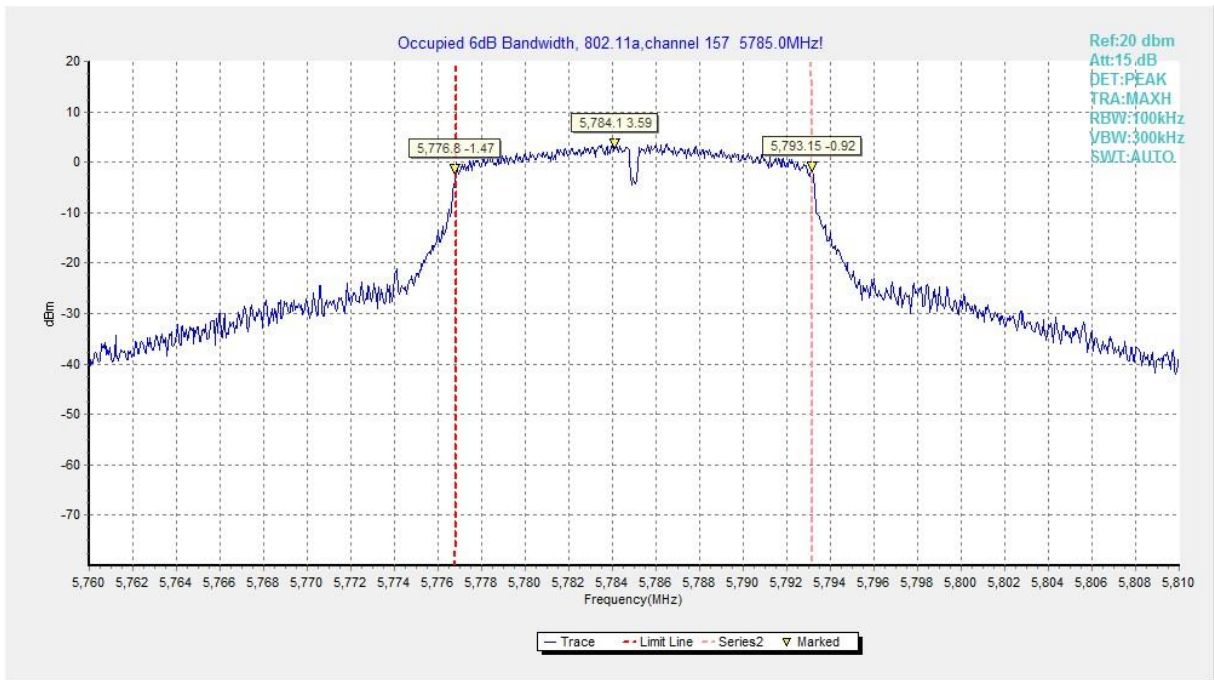


Fig. 2 Occupied 6dB Bandwidth (802.11a, Ch 157)

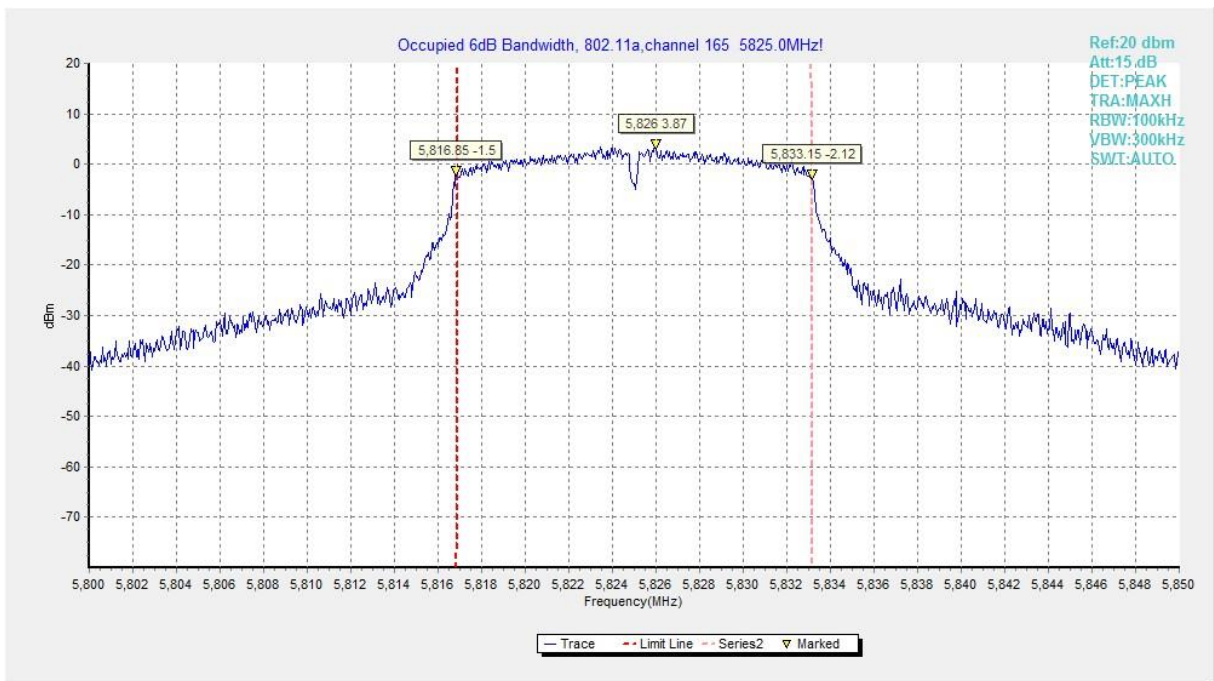


Fig. 3 Occupied 6dB Bandwidth (802.11a, Ch 165)

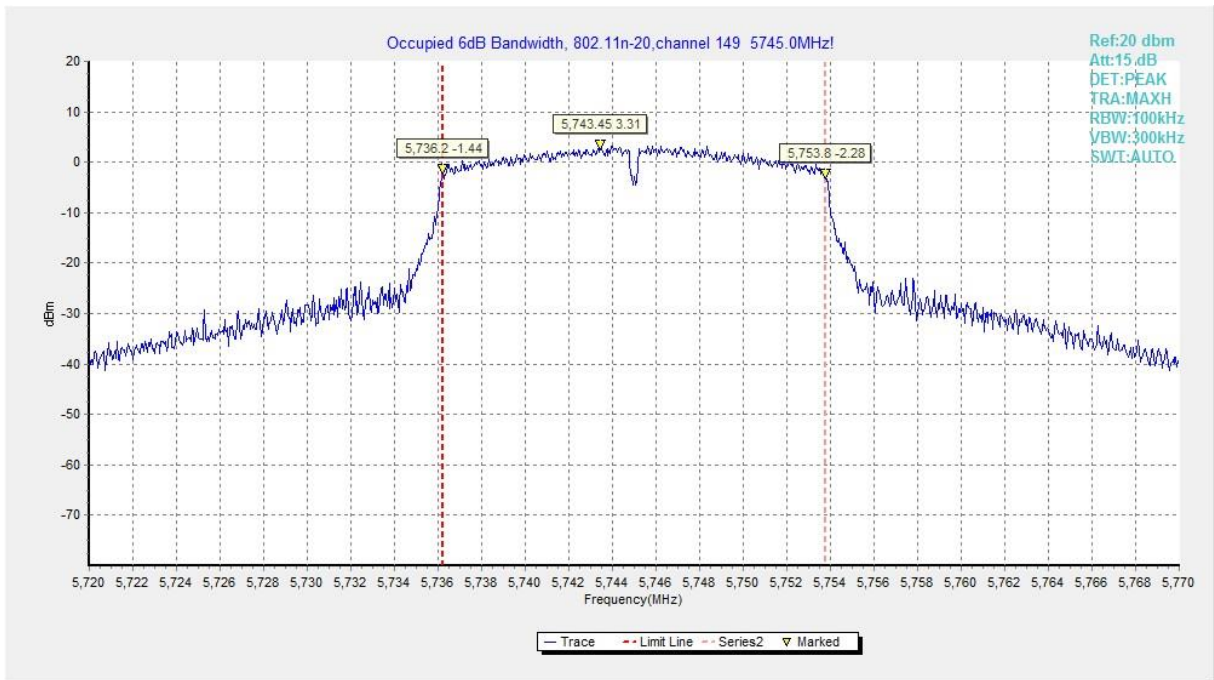


Fig. 4 Occupied 6dB Bandwidth (802.11n-HT20, Ch 149)

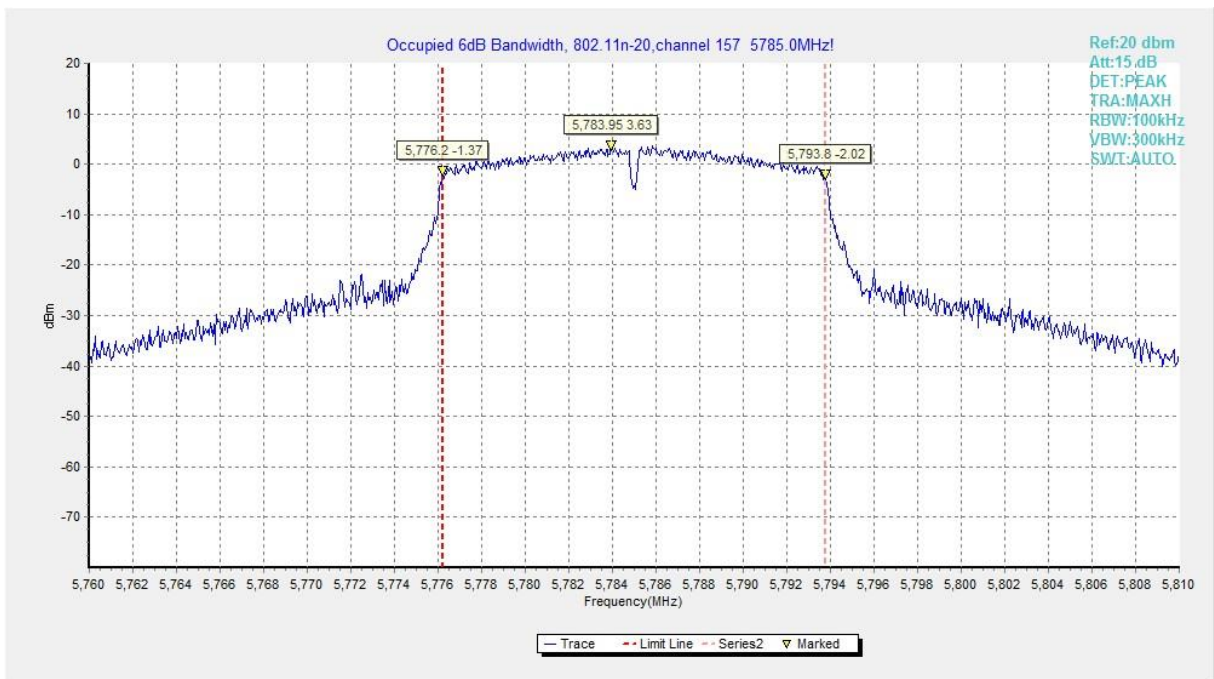


Fig. 5 Occupied 6dB Bandwidth (802.11n-HT20, Ch 157)

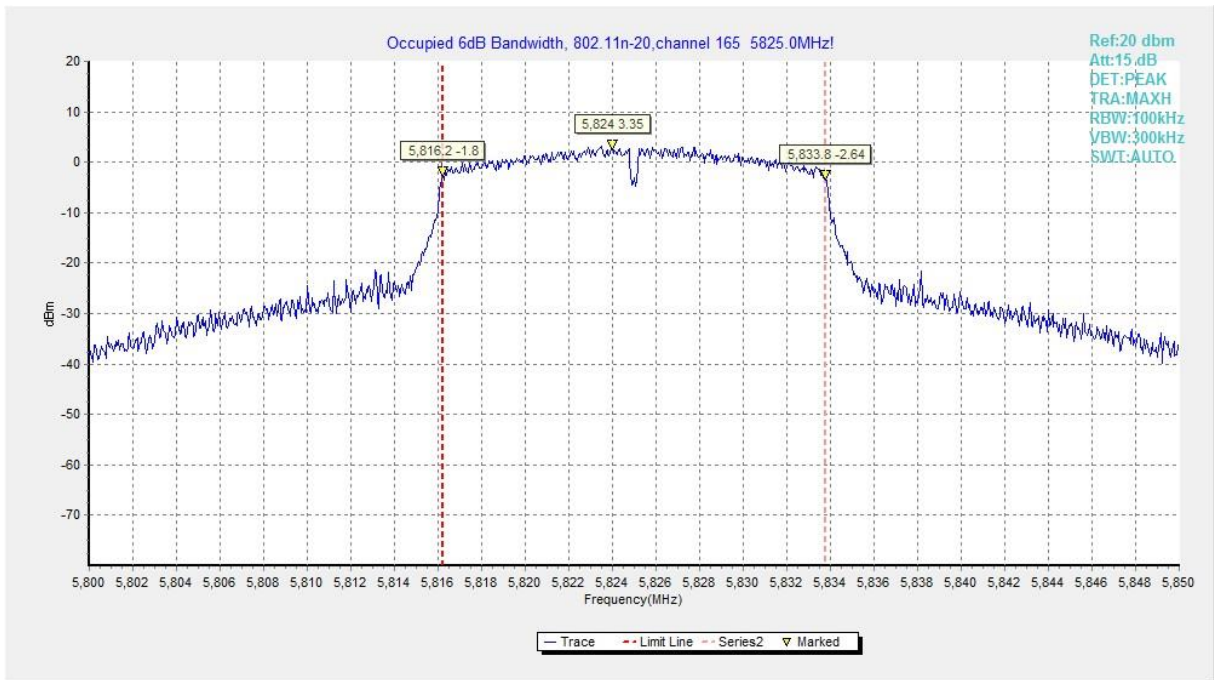


Fig. 6 Occupied 6dB Bandwidth (802.11n-HT20, Ch 165)

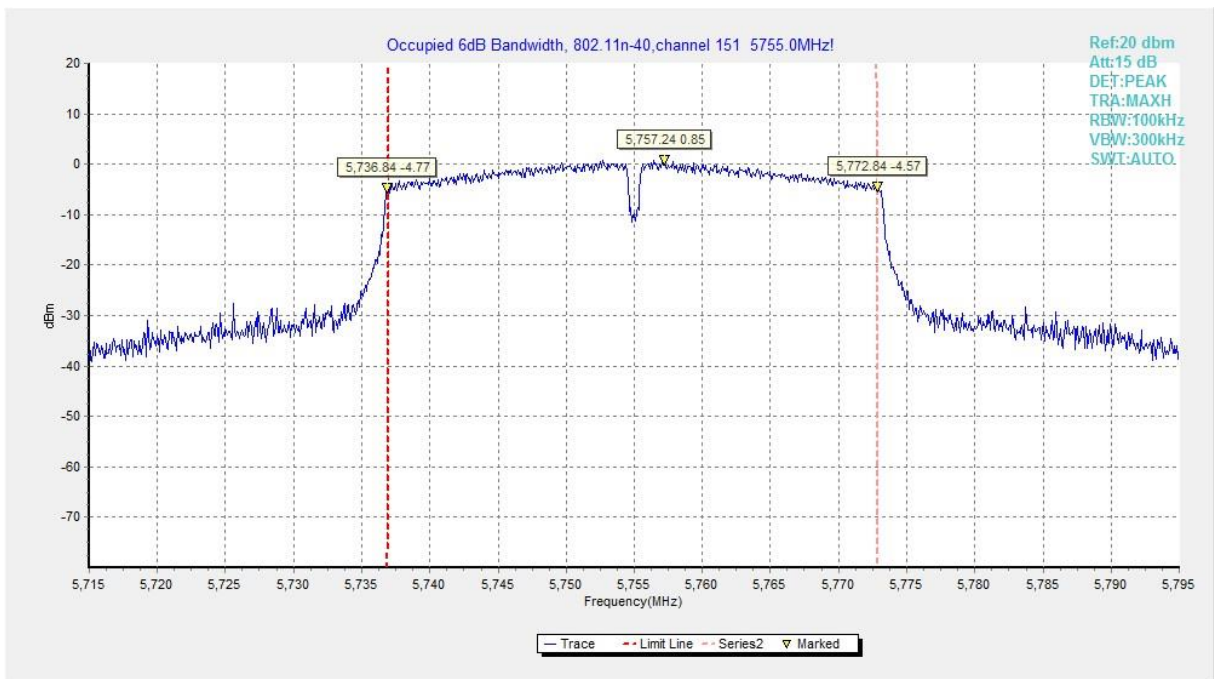


Fig. 7 Occupied 6dB Bandwidth (802.11n-HT40, Ch 151)

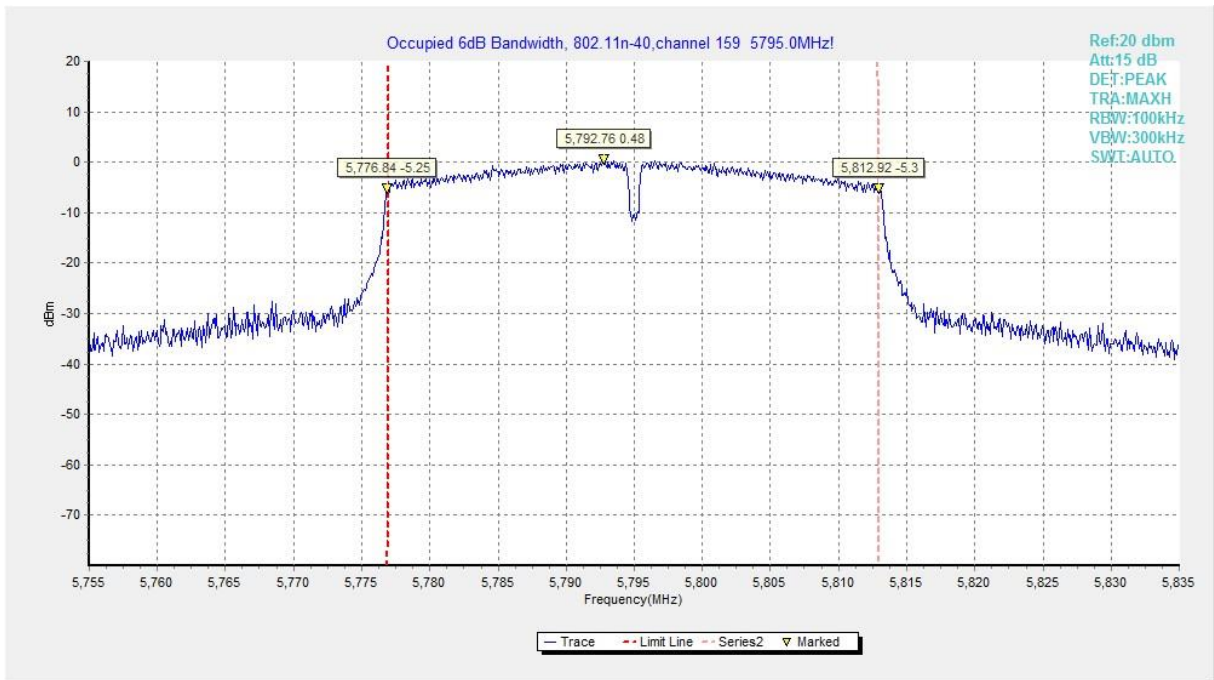


Fig. 8 Occupied 6dB Bandwidth (802.11n-HT40, Ch 159)

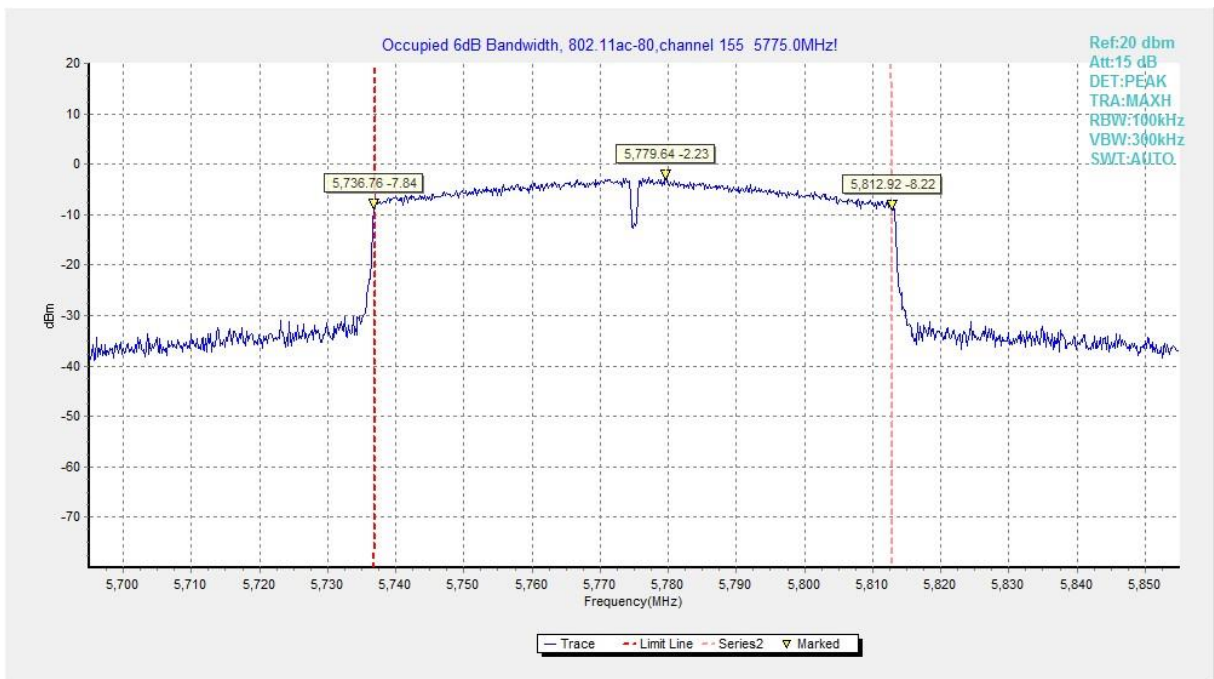


Fig. 9 Occupied 6dB Bandwidth (802.11ac-HT80, Ch 155)

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	---	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
	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
		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)
17995.000	45.84	-25.50	46.66	24.68	54.00	8.16	H
17986.800	45.44	-25.50	46.66	24.28	54.00	8.56	H
14494.300	38.42	-28.59	42.46	24.55	54.00	15.58	H
14491.500	38.38	-28.59	42.46	24.51	54.00	15.62	H
11837.800	33.67	-31.85	39.05	26.47	54.00	20.33	V
11819.100	33.47	-31.85	39.05	26.27	54.00	20.53	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)
17996.200	45.64	-25.50	46.66	24.48	54.00	8.36	V
17986.800	45.44	-25.50	46.66	24.28	54.00	8.56	V
14490.500	38.45	-28.59	42.46	24.58	54.00	15.55	H
14476.100	38.30	-28.59	42.46	24.43	54.00	15.70	V
11813.600	33.41	-31.85	39.05	26.21	54.00	20.59	V
11829.500	33.41	-31.85	39.05	26.21	54.00	20.59	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	45.40	-25.50	46.66	24.24	54.00	8.60	H
17986.800	45.40	-25.50	46.66	24.24	54.00	8.60	H
14497.000	38.54	-28.59	42.46	24.67	54.00	15.46	V
14493.800	38.45	-28.59	42.46	24.58	54.00	15.55	V
11835.600	33.54	-31.85	39.05	26.34	54.00	20.46	H
11840.000	33.49	-31.85	39.05	26.29	54.00	20.51	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)
17985.200	45.64	-25.50	46.66	24.48	54.00	8.36	V
17998.900	45.54	-25.50	46.66	24.38	54.00	8.46	H
14481.100	38.48	-28.59	42.46	24.61	54.00	15.52	H
14496.000	38.35	-28.59	42.46	24.48	54.00	15.65	V
11827.400	33.71	-31.85	39.05	26.51	54.00	20.29	H
11815.800	33.69	-31.85	39.05	26.49	54.00	20.31	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)
17994.000	45.56	-25.50	46.66	24.40	54.00	8.44	H
17981.300	45.36	-25.50	46.66	24.20	54.00	8.64	V
14485.500	38.23	-28.59	42.46	24.36	54.00	15.77	V
14489.400	38.22	-28.59	42.46	24.35	54.00	15.78	V
11812.500	33.78	-31.85	39.05	26.58	54.00	20.22	V
11942.300	33.52	-31.48	39.09	25.91	54.00	20.48	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)
17995.000	45.64	-25.50	46.66	24.48	54.00	8.36	V
17994.000	45.55	-25.50	46.66	24.39	54.00	8.45	H
14496.000	38.38	-28.59	42.46	24.51	54.00	15.62	H
14480.500	38.27	-28.59	42.46	24.40	54.00	15.73	H
11818.500	33.75	-31.85	39.05	26.55	54.00	20.25	V
12000.000	33.47	-31.48	39.09	25.86	54.00	20.53	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)
17975.200	47.05	-25.50	46.66	25.89	54.00	6.95	H
17976.900	47.04	-25.50	46.66	25.88	54.00	6.96	H
14497.600	40.68	-28.59	42.46	26.81	54.00	13.32	V
14476.100	40.64	-28.59	42.46	26.77	54.00	13.36	V
11996.800	35.80	-31.48	39.09	28.19	54.00	18.20	V
11907.100	35.70	-31.85	39.05	28.50	54.00	18.30	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)
17984.000	47.13	-25.50	46.66	25.97	54.00	6.87	V
17997.800	46.99	-25.50	46.66	25.83	54.00	7.01	H
14483.900	40.77	-28.59	42.46	26.90	54.00	13.23	V
14481.600	40.62	-28.59	42.46	26.75	54.00	13.38	V
11891.100	35.58	-31.85	39.05	28.38	54.00	18.42	H
11883.500	35.54	-31.85	39.05	28.34	54.00	18.46	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)
17996.200	45.44	-25.50	46.66	24.28	54.00	8.56	H
17984.600	45.39	-25.50	46.66	24.23	54.00	8.61	V
14499.200	38.23	-28.59	42.46	24.36	54.00	15.77	H
14491.500	38.22	-28.59	42.46	24.35	54.00	15.78	H
11813.600	33.46	-31.85	39.05	26.26	54.00	20.54	V
11824.600	33.37	-31.85	39.05	26.17	54.00	20.63	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)
17998.900	45.61	-25.50	46.66	24.45	54.00	8.39	H
17997.800	45.38	-25.50	46.66	24.22	54.00	8.62	H
14497.600	38.39	-28.59	42.46	24.52	54.00	15.61	V
14478.900	38.37	-28.59	42.46	24.50	54.00	15.63	H
11831.800	33.55	-31.85	39.05	26.35	54.00	20.45	H
11835.600	33.51	-31.85	39.05	26.31	54.00	20.49	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)
17998.300	45.36	-25.50	46.66	24.20	54.00	8.64	H
17986.200	45.34	-25.50	46.66	24.18	54.00	8.66	V
14483.900	38.31	-28.59	42.46	24.44	54.00	15.69	V
14494.900	38.29	-28.59	42.46	24.42	54.00	15.71	V
11820.200	33.51	-31.85	39.05	26.31	54.00	20.49	V
11843.300	33.49	-31.85	39.05	26.29	54.00	20.51	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)
17984.000	45.79	-25.50	46.66	24.63	54.00	8.21	H
17986.800	45.76	-25.50	46.66	24.60	54.00	8.24	H
14478.900	39.20	-28.59	42.46	25.33	54.00	14.80	H
14482.800	39.15	-28.59	42.46	25.28	54.00	14.85	H
11817.500	34.64	-31.85	39.05	27.44	54.00	19.36	V
11813.600	34.55	-31.85	39.05	27.35	54.00	19.45	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)
17997.200	45.92	-25.50	46.66	24.76	54.00	8.08	H
17989.000	45.81	-25.50	46.66	24.65	54.00	8.19	H
14480.500	39.04	-28.59	42.46	25.17	54.00	14.96	H
14496.000	38.92	-28.59	42.46	25.05	54.00	15.08	H
11909.900	34.66	-31.85	39.05	27.46	54.00	19.34	V
11831.800	34.59	-31.85	39.05	27.39	54.00	19.41	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)
17994.500	46.14	-25.50	46.66	24.98	54.00	7.86	V
17997.200	45.99	-25.50	46.66	24.83	54.00	8.01	V
14474.000	39.03	-28.59	42.46	25.16	54.00	14.97	V
14499.800	39.01	-28.59	42.46	25.14	54.00	14.99	H
11825.100	34.60	-31.85	39.05	27.40	54.00	19.40	H
11830.100	34.53	-31.85	39.05	27.33	54.00	19.47	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)
17996.200	57.48	-25.50	46.66	36.32	74.00	16.52	H
17987.900	56.78	-25.50	46.66	35.62	74.00	17.22	H
14602.100	50.50	-27.29	41.90	35.89	68.30	17.80	V
14293.500	50.20	-28.42	42.34	36.28	68.30	18.10	V
11445.600	45.18	-32.42	38.79	38.81	74.00	28.82	H
11612.300	45.09	-32.31	38.91	38.50	74.00	28.91	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)
17967.000	57.06	-25.50	46.66	35.90	74.00	16.94	V
17980.800	56.58	-25.50	46.66	35.42	74.00	17.42	V
14598.200	50.13	-27.29	41.90	35.52	68.30	18.17	V
14058.100	49.94	-29.44	41.66	37.72	68.30	18.36	V
11836.100	45.09	-31.85	39.05	37.89	74.00	28.91	H
11727.800	45.01	-31.99	38.98	38.02	74.00	28.99	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)
17970.800	57.02	-25.50	46.66	35.86	74.00	16.98	H
17981.800	56.88	-25.50	46.66	35.72	74.00	17.12	H
14368.400	50.66	-28.42	42.34	36.74	68.30	17.64	V
14482.200	50.45	-28.59	42.46	36.58	74.00	23.55	H
11643.100	45.15	-32.31	38.91	38.56	74.00	28.85	H
11913.100	45.07	-31.48	39.09	37.46	74.00	28.93	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)
17969.200	57.21	-25.50	46.66	36.05	74.00	16.79	H
17992.800	56.84	-25.50	46.66	35.68	74.00	17.16	H
14936.000	50.28	-28.59	40.79	38.08	68.30	18.02	V
14305.600	50.20	-28.42	42.34	36.28	68.30	18.10	H
11615.000	45.17	-32.31	38.91	38.58	74.00	28.83	H
11814.700	45.01	-31.85	39.05	37.81	74.00	28.99	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)
17994.500	57.40	-25.50	46.66	36.24	74.00	16.60	V
17981.300	56.74	-25.50	46.66	35.58	74.00	17.26	V
14383.800	51.86	-28.42	42.34	37.94	68.30	16.44	V
14383.200	50.68	-28.42	42.34	36.76	68.30	17.62	H
11765.800	45.86	-31.99	38.98	38.87	74.00	28.14	H
11914.800	45.46	-31.48	39.09	37.85	74.00	28.54	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)
17974.200	56.85	-25.50	46.66	35.69	74.00	17.15	H
17978.500	56.76	-25.50	46.66	35.60	74.00	17.24	V
14379.900	50.43	-28.42	42.34	36.51	68.30	17.87	H
14506.400	50.42	-28.59	42.46	36.55	68.30	17.88	H
11819.600	45.51	-31.85	39.05	38.31	74.00	28.49	V
11897.200	45.37	-31.85	39.05	38.17	74.00	28.63	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)
17968.100	58.67	-25.5	46.66	37.51	74.00	15.33	V
17964.800	58.57	-25.5	46.66	37.41	74.00	15.43	V
14497.000	53.37	-28.59	42.46	39.50	74.00	20.63	H
16969.300	52.79	-26.32	42.36	36.74	68.30	15.51	V
11990.100	47.69	-31.48	39.09	40.08	74.00	26.31	H
11841.100	47.38	-31.85	39.05	40.18	74.00	26.62	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)
17967.000	54.45	-25.50	46.66	33.29	74.00	19.55	H
17968.700	54.00	-25.50	46.66	32.84	74.00	20.00	V
16923.700	51.58	-26.32	42.36	35.53	68.30	16.72	V
16977.000	51.39	-26.32	42.36	35.34	68.30	16.91	H
11072.800	47.06	-32.49	38.72	40.82	74.00	26.94	H
11002.400	46.89	-32.49	38.72	40.65	74.00	27.11	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)
17995.600	56.65	-25.50	46.66	35.49	74.00	17.35	V
17994.000	56.54	-25.50	46.66	35.38	74.00	17.46	H
14300.700	51.31	-28.42	42.34	37.39	68.30	16.99	V
14383.800	51.27	-28.42	42.34	37.35	68.30	17.03	V
11891.100	45.21	-31.85	39.05	38.01	74.00	28.79	H
11981.400	45.21	-31.48	39.09	37.60	74.00	28.79	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)
17997.800	57.21	-25.50	46.66	36.05	74.00	16.79	H
17974.700	56.81	-25.50	46.66	35.65	74.00	17.19	H
14412.900	51.13	-28.59	42.46	37.26	68.30	17.17	V
14711.000	50.39	-28.32	41.35	37.37	68.30	17.91	H
11810.300	44.87	-31.85	39.05	37.67	74.00	29.13	H
11493.500	44.81	-32.26	38.84	38.24	74.00	29.19	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)
17964.800	57.42	-25.50	46.66	36.26	74.00	16.58	H
17988.500	56.51	-25.50	46.66	35.35	74.00	17.49	H
14479.500	50.41	-28.59	42.46	36.54	74.00	23.59	V
14184.100	50.28	-28.99	42.00	37.26	68.30	18.02	H
11960.500	45.44	-31.48	39.09	37.83	74.00	28.56	H
11616.100	45.28	-32.31	38.91	38.69	74.00	28.72	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)
17849.300	57.22	-25.50	46.66	36.06	74.00	16.78	H
17968.100	56.92	-25.50	46.66	35.76	74.00	17.08	H
14471.800	50.81	-28.59	42.46	36.94	74.00	23.19	H
14294.600	50.74	-28.42	42.34	36.82	68.30	17.56	H
11824.600	46.68	-31.85	39.05	39.48	74.00	27.32	V
11788.300	46.55	-31.99	38.98	39.56	74.00	27.45	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)
17970.300	57.67	-25.50	46.66	36.51	74.00	16.33	H
17881.200	57.43	-25.50	46.66	36.27	74.00	16.57	V
14513.500	51.38	-28.59	42.46	37.51	68.30	16.92	H
14383.800	50.94	-28.42	42.34	37.02	68.30	17.36	V
11177.800	46.21	-32.60	38.75	40.07	74.00	27.79	H
11841.600	46.21	-31.85	39.05	39.01	74.00	27.79	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)
17970.800	57.58	-25.50	46.66	36.42	74.00	16.42	V
17988.500	57.46	-25.50	46.66	36.30	74.00	16.54	H
14881.500	51.49	-28.59	40.79	39.29	68.30	16.81	V
14409.600	51.22	-28.59	42.46	37.35	68.30	17.08	V
11611.800	46.66	-32.31	38.91	40.07	74.00	27.34	V
11856.500	46.56	-31.85	39.05	39.36	74.00	27.44	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:

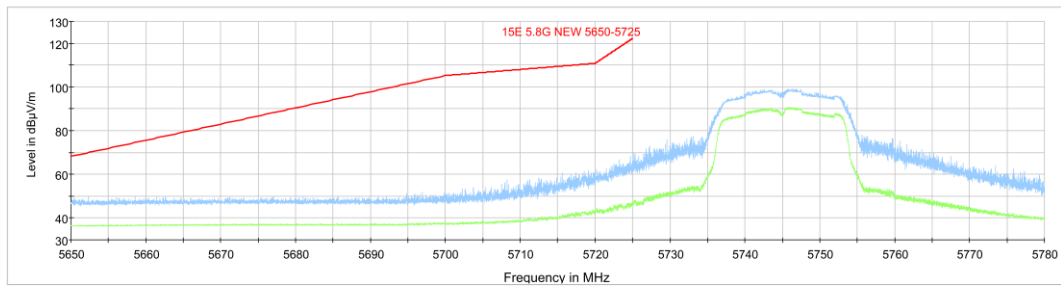


Fig. 10 Band Edges (802.11a Ch149,5745MHz)

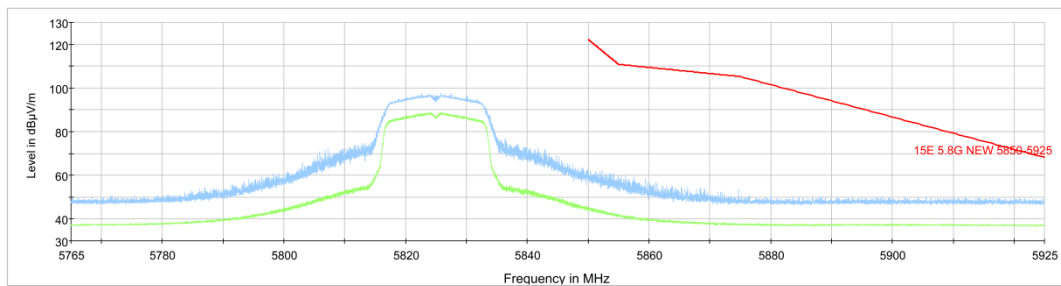


Fig. 11 Band Edges (802.11a Ch165, 5825MHz)

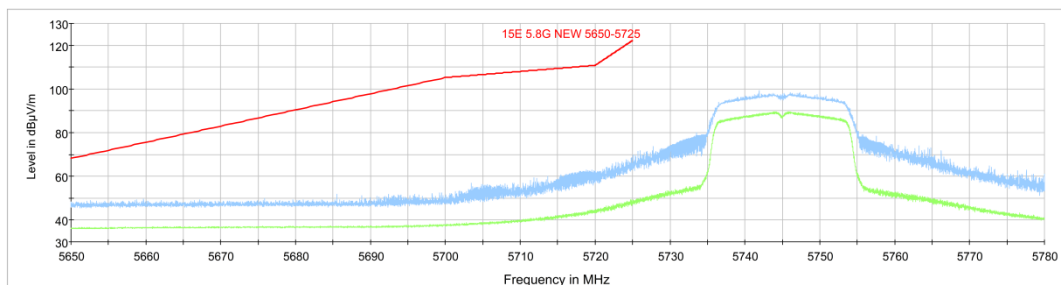


Fig. 12 Band Edges (802.11n-HT20 Ch149, 5745MHz)

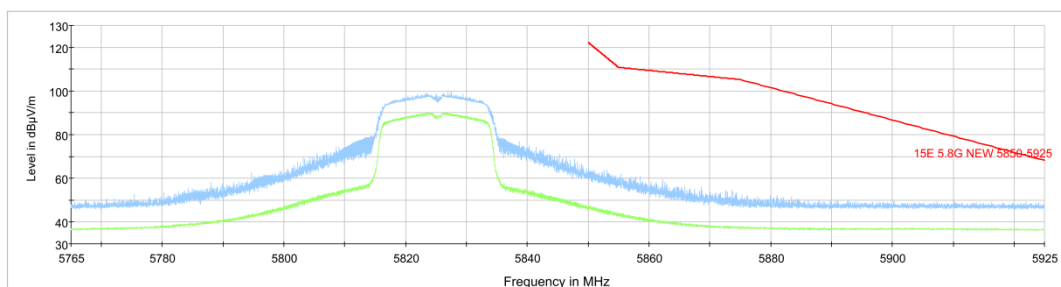


Fig. 13 Band Edges (802.11n-HT20 Ch165, 5825MHz)

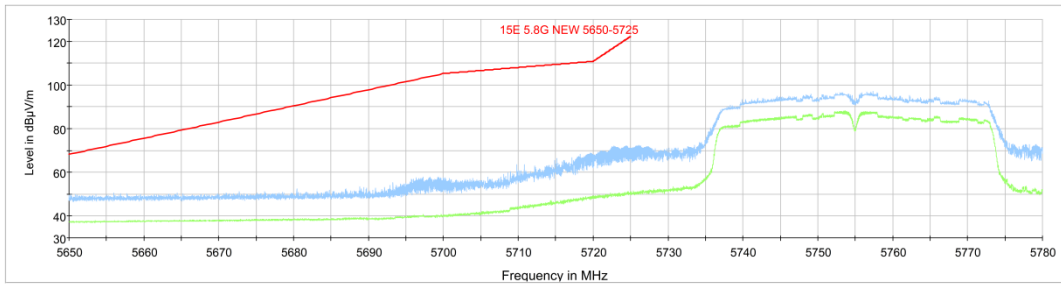


Fig. 14 Band Edges (802.11n-HT40 Ch151, 5755MHz)

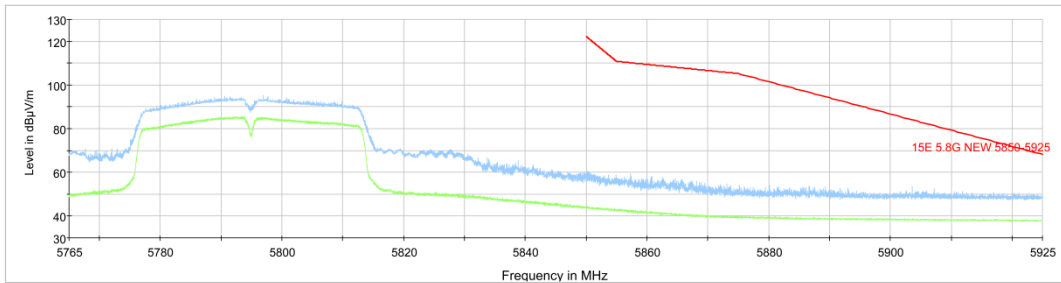


Fig. 15 Band Edges (802.11n-HT40 Ch159, 5795MHz)

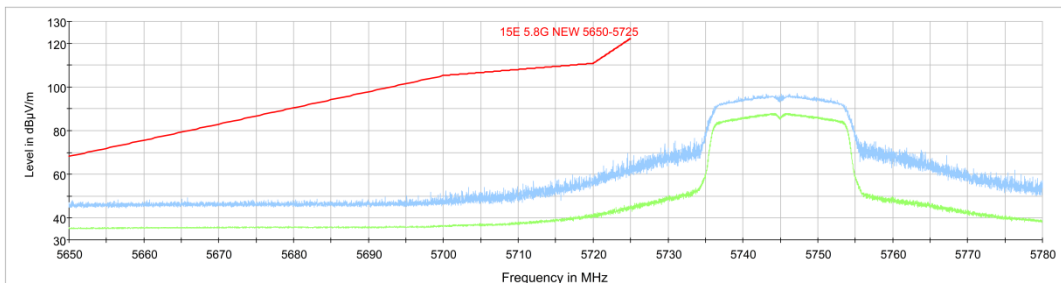


Fig. 16 Band Edges (802.11ac-HT20 Ch149, 5745MHz)

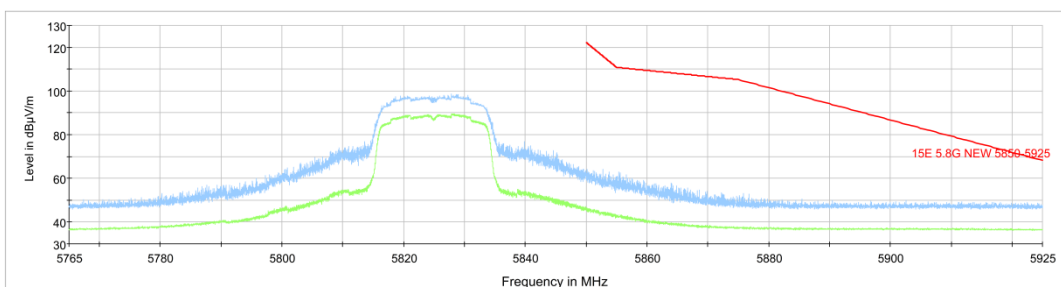


Fig. 17 Band Edges (802.11ac-HT20 Ch165, 5825MHz)

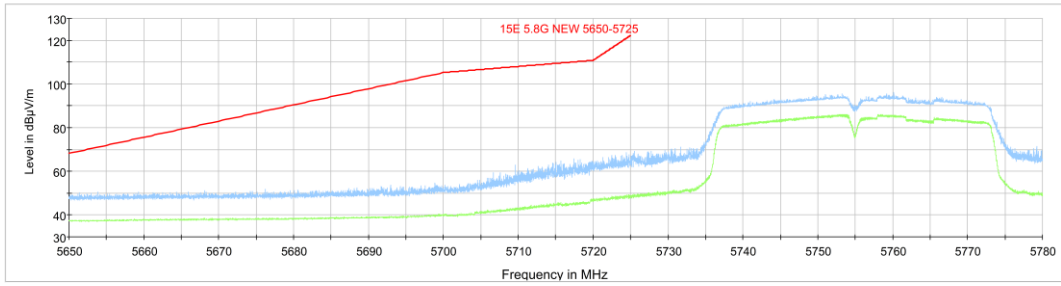


Fig. 18 Band Edges (802.11ac-HT40 Ch151, 5755MHz)

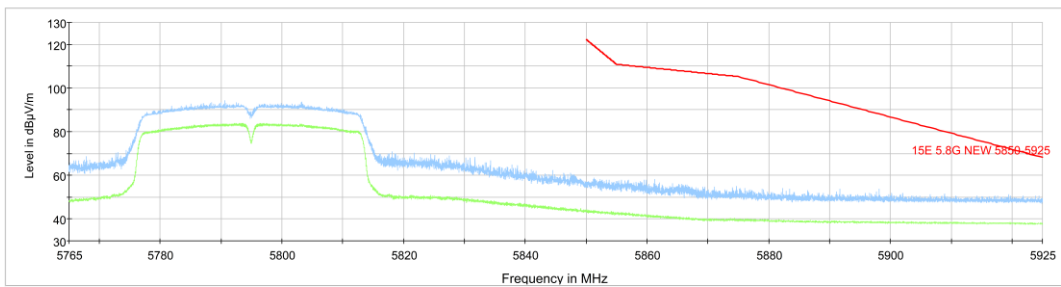


Fig. 19 Band Edges (802.11ac-HT40 Ch159, 5795MHz)

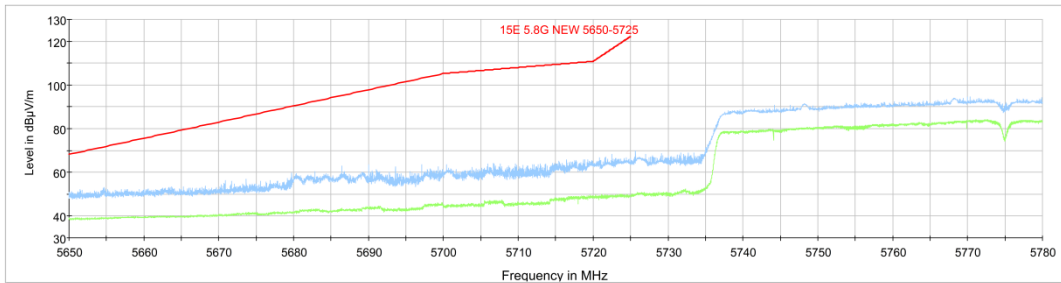


Fig. 20 Band Edges (802.11ac-HT80 Ch155, 5775MHz)

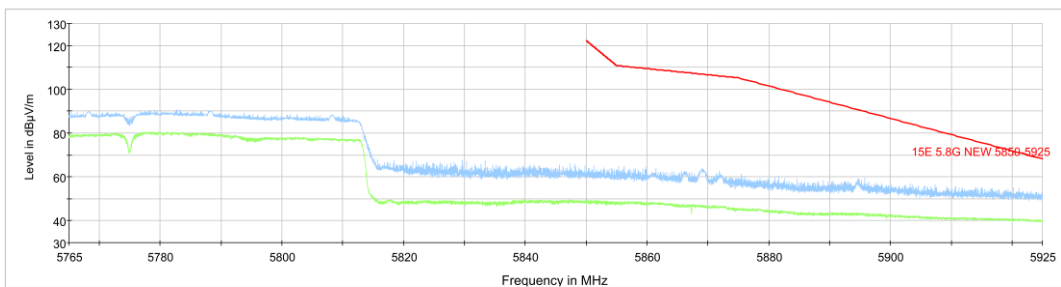


Fig. 21 Band Edges (802.11ac-HT80, 5775MHz)

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		
		802.11a	Idle	
0.15 to 0.5	66 to 56	Fig.22	Fig.23	P
0.5 to 5	56			
5 to 30	60			

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

WLAN (Average Limit)

Frequency range (MHz)	Average Limit (dB μ V)	Result (dB μ V)		Conclusion
		With charger		
		802.11a	Idle	
0.15 to 0.5	56 to 46	Fig.22	Fig.23	P
0.5 to 5	46			
5 to 30	50			

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

The measurement is made according to ANSI C63.10 .

Conclusion: PASS

Test graphs as below:

Traffic:

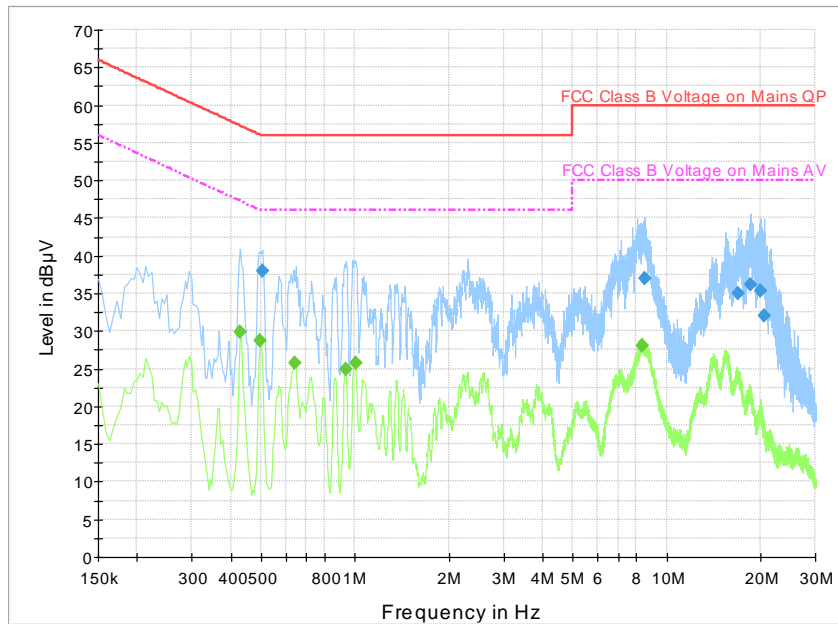


Fig. 22 AC Power line Conducted Emission-802.11a

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)	Line	Margin (dB)	Limit (dBµV)
0.505500	38.0	N	18.0	56.0
8.502000	37.0	N	23.0	60.0
16.993500	35.0	L1	25.0	60.0
18.663000	36.2	L1	23.8	60.0
20.044500	35.3	L1	24.7	60.0
20.526000	32.0	L1	28.0	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Line	Margin (dB)	Limit (dBµV)
0.429000	29.9	N	17.3	47.3
0.496500	28.8	N	17.3	46.1
0.640500	25.7	N	20.3	46.0
0.933000	24.9	L1	21.1	46.0
1.005000	25.7	L1	20.3	46.0
8.376000	28.1	L1	21.9	50.0

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

Idle:

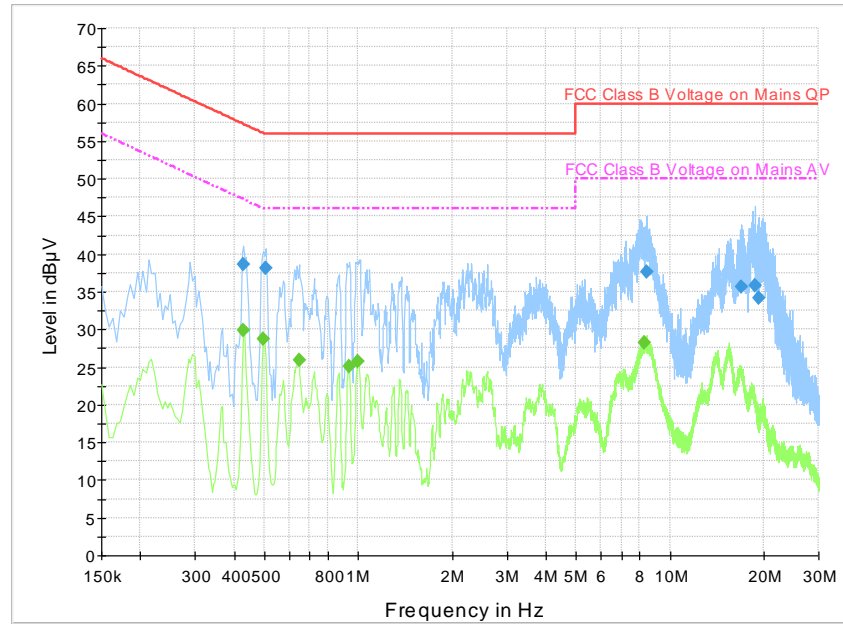


Fig. 23 AC Power line Conducted Emission-Idle

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)	Line	Margin (dB)	Limit (dBµV)
0.429000	38.6	L1	18.6	57.3
0.505500	38.2	L1	17.8	56.0
8.407500	37.6	N	22.4	60.0
16.966500	35.6	L1	24.4	60.0
18.717000	35.9	N	24.1	60.0
19.284000	34.1	N	25.9	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Line	Margin (dB)	Limit (dBµV)
0.429000	30.0	N	17.3	47.3
0.496500	28.8	L1	17.3	46.1
0.645000	25.9	N	20.1	46.0
0.933000	25.0	L1	21.0	46.0
0.996000	25.7	L1	20.3	46.0
8.313000	28.2	L1	21.8	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 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



Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 600118-0

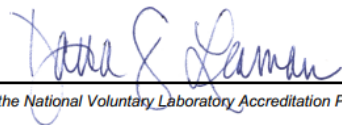

Telecommunication Technology Labs, CAICT
Beijing
China

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

Electromagnetic Compatibility & Telecommunications

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
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).*

2020-09-29 through 2021-09-30
Effective Dates



For the National Voluntary Laboratory Accreditation Program

*** END OF REPORT BODY ***