FCC PART 15C
TEST REPORT
No.I22Z60452-IOT05

for

HMD Global Oy

Smart Phone

N1530DL

With

FCC ID: 2AJOTTA-1530

Hardware Version: v1.0

Software Version: 02US_1_110

Issued Date: 2022-06-24

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

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

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I22Z60452-IOT05	Rev.0	1st edition	2022-06-01
I22Z60452-IOT05	Rev.1	Add the spot check result.	2022-06-24

CONTENTS

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(BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology Development Area, Beijing, P. R. China 100176

1.3. TestingEnvironment

Normal Temperature: 15-35℃

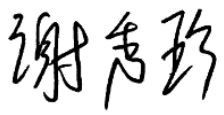
Relative Humidity: 20-75%

1.4. Project date

Testing Start Date: 2022-03-09

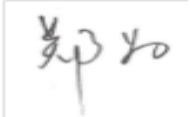
Testing End Date: 2022-05-17

1.5. Signature



Xie Xiuzhen

(Prepared this test report)



Zheng Wei

(Reviewed this test report)

Hu Xiaoyu

(Approved this test report)

2. CLIENT INFORMATION

2.1. Applicant Information

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

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

3.1. About EUT

Description	Smart Phone
Model name	N1530DL
FCC ID	2AJOTTA-1530
WLAN Frequency Band	ISM Band: 5725MHz~5850MHz
Type of modulation	OFDM
Voltage	3.8V

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT4	/	v1.0	02US_1_110
EUT1	/	v1.0	02US_1_110

*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
AE1	Battery
AE2	Battery
AE3	Charger
AE4	USB Cable
AE5	Headset

AE1

Model	HQ610
Manufacturer	Ningde Amperex Technology Limited
Capacity	4900mAh
Voltage	3.87V

AE2

Model	HQ610
Manufacturer	GUANGDONG FENGHUA NEW ENERGY CO., LTD
Capacity	4900mAh
Voltage	3.87V

AE3

Model	Charger-AD-020US
Manufacturer	Aohai

AE4

Model	USB-SHQ-A119A
Manufacturer	Saibao(Jiangxi)communlcation Industrial Co.,Ltd

AE5

Model	JWEP239-H17H
Manufacturer	JUWEI ELECTRONICS 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 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	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/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.

The Equipment Under Test (EUT) model N1530DL (FCC ID: 2AJOTTA-1530) is a variant product of TA-1448 (FCC ID: 2AJOTTA-1448), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements (output power) were performed on this device, all the test results are derived from test report No.I22Z60412-IOT03. For detail differences between two models please refer the Declaration of Changes document.

6.3. Test Conditions

For this report, all the test cases are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

Temperature	26℃
Voltage	3.8V
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	101459	R&S	1 year	2023-03-10
3	Test Receiver	ESCI 7	100766	R&S	1 year	2023-03-02
4	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100376	R&S	1 year	2022-09-15
2	BiLog Antenna	VULB9163	482	Schwarzbeck	1 year	2022-11-16
3	Dual-Ridge Waveguide Horn Antenna	3115	00167252	ETS-Lindgren	1 year	2022-12-26
4	Horn Antenna	LB-7180-NF	J2030013000005	A-INFO	1 year	2023-02-27
5	Spectrum Analyzer	FSV40	101047	Rohde & Schwarz	1 year	2022-06-03

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)
30MHz ≤ f ≤ 2GHz	1.22
2GHz ≤ f ≤3.6GHz	1.22
3.6GHz ≤ f ≤8GHz	1.22
8GHz ≤ f ≤12.75GHz	1.51
12.75GHz ≤ f ≤26GHz	1.51
26GHz ≤ f ≤40GHz	1.59

Radiated (k=2)

Frequency Range	Uncertainty(dB)
f ≤ 1GHz	5.73
1GHz ≤ f ≤18GHz	5.58
18GHz ≤ f ≤40GHz	3.37

8.6. AC Power-line Conducted Emission

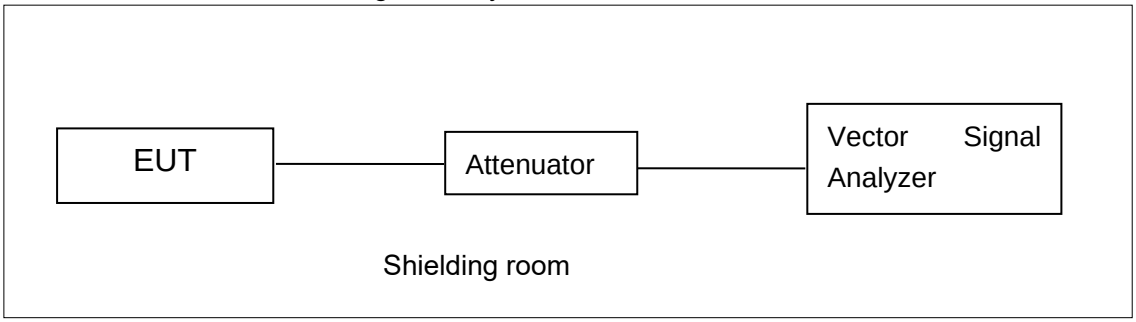
Measurement Uncertainty : 3.10dB,k=2

ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

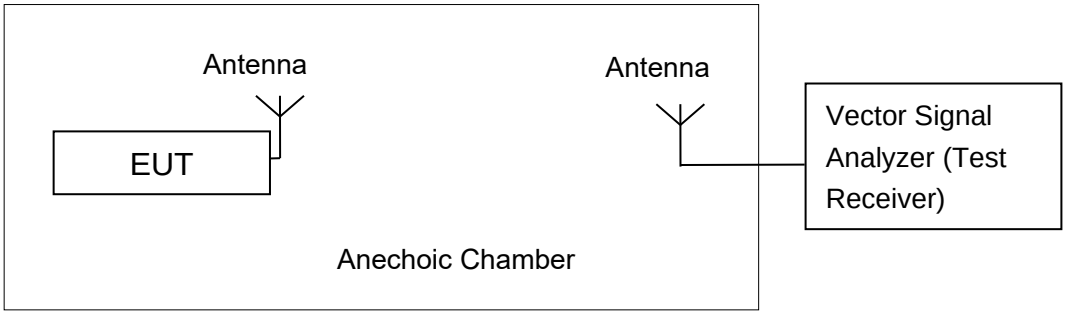
A.1.1. Conducted Measurements

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 -1.23 dBi and the value is supplied by the applicant or manufacturer.

A.2.2. Maximum Peak Output Power-conducted

Measurement Results:

802.11a mode

Mode	Data Rate (Mbps)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11a	6	15.06	15.70	16.47

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	15.54	15.95	16.06

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	14.15	14.60	14.68

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	14.03	14.43

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

802.11ac-HT40 mode

Mode	Data Rate (Index)	Test Result (dBm)	
		5755MHz (Ch151)	5795MHz (Ch159)
802.11ac (40MHz)	MCS0	12.79	13.16

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	10.69

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%.

The spot check result of average output power is 16.61dBm (802.11n20 6Mbps ch165 prototype result: 16.47dBm).

Conclusion: PASS

A.3. Peak Power Spectral Density

Measurement Limit:

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

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

Measurement Uncertainty:

Measurement Uncertainty	0.75dB

Measurement Results:

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11a	149	1.74	P
	157	2.25	P
	165	2.48	P
802.11n HT20	149	1.30	P
	157	1.80	P
	165	2.07	P
802.11n HT40	151	-3.28	P
	159	-2.83	P
802.11ac HT80	155	-9.8	P

Conclusion: PASS

A.4. Occupied 6dB Bandwidth

Measurement Limit:

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

The measurement is made according to KDB789033 D02 .

Measurement Uncertainty:

Measurement Uncertainty	60.80Hz

Measurement Result:

Mode	Channel	Occupied 6dB Bandwidth (MHz)		conclusion
802.11a	149	Fig.1	15.70	P
	157	Fig.2	16.05	P
	165	Fig.3	16.25	P
802.11n HT20	149	Fig.4	16.25	P
	157	Fig.5	16.00	P
	165	Fig.6	16.25	P
802.11n HT40	151	Fig.7	35.68	P
	159	Fig.8	36.08	P
802.11ac HT80	155	Fig.9	75.68	P

Conclusion: PASS

Test graphs as below:

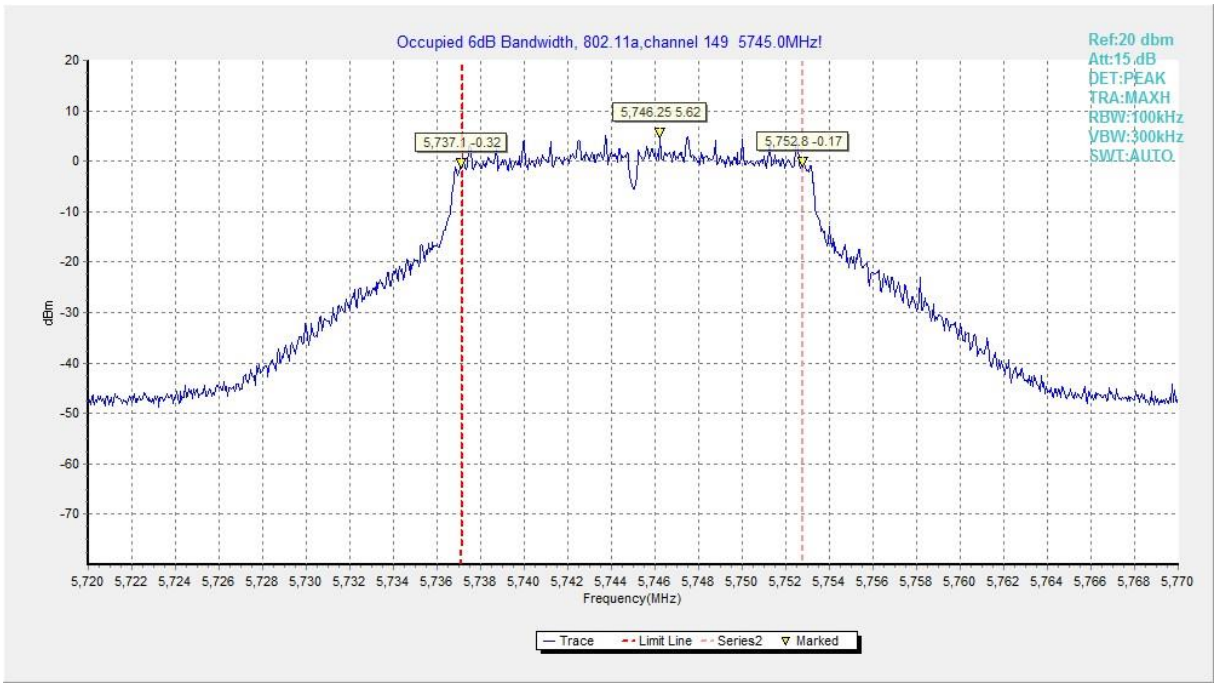


Fig. 1 Occupied 6dB Bandwidth (802.11a, Ch 149)

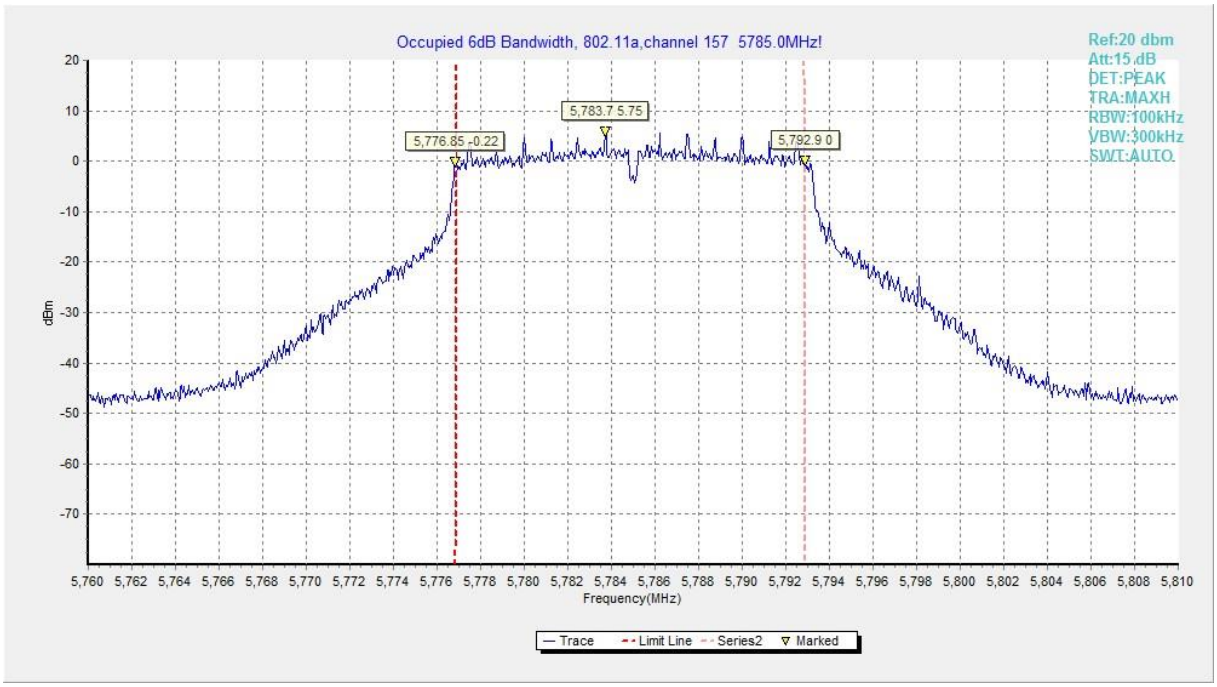


Fig. 2 Occupied 6dB Bandwidth (802.11a, Ch 157)

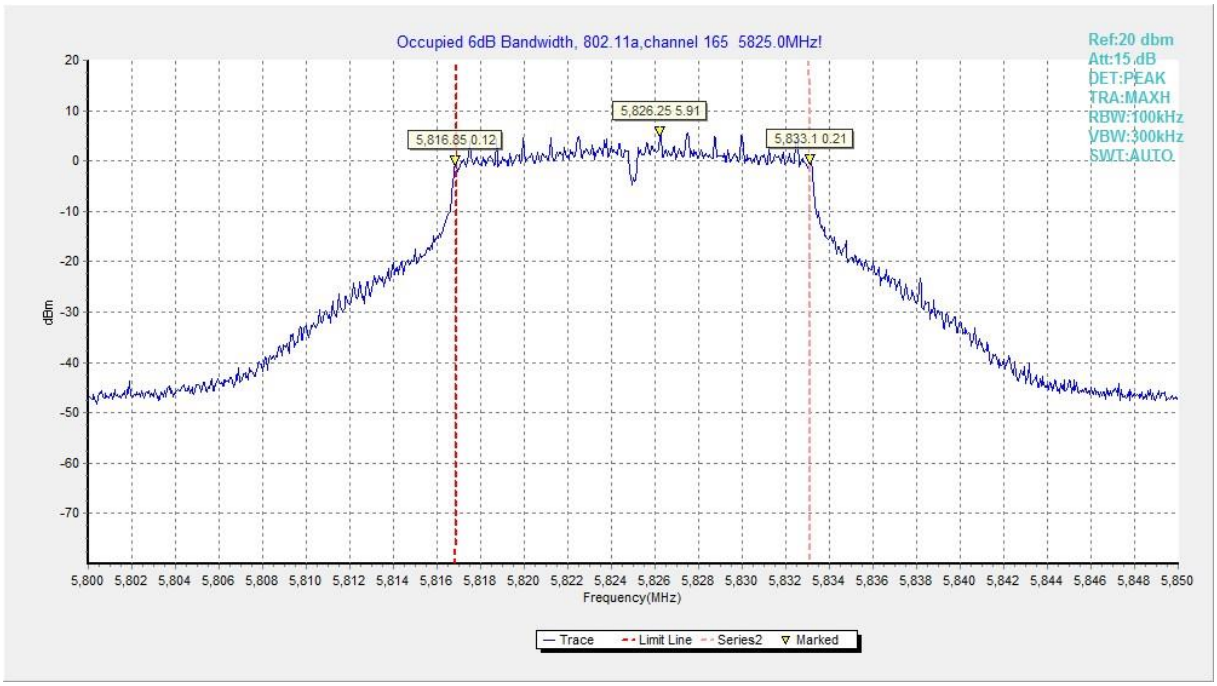


Fig. 3 Occupied 6dB Bandwidth (802.11a, Ch 165)

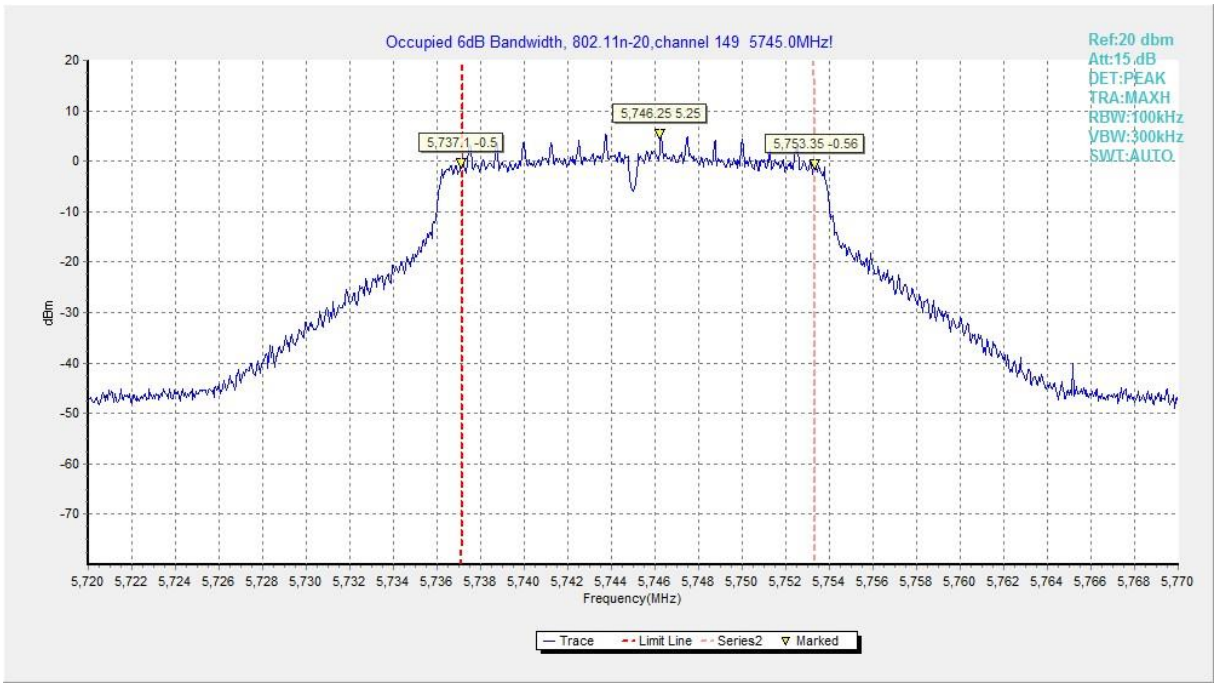


Fig. 4 Occupied 6dB Bandwidth (802.11n-HT20, Ch 149)

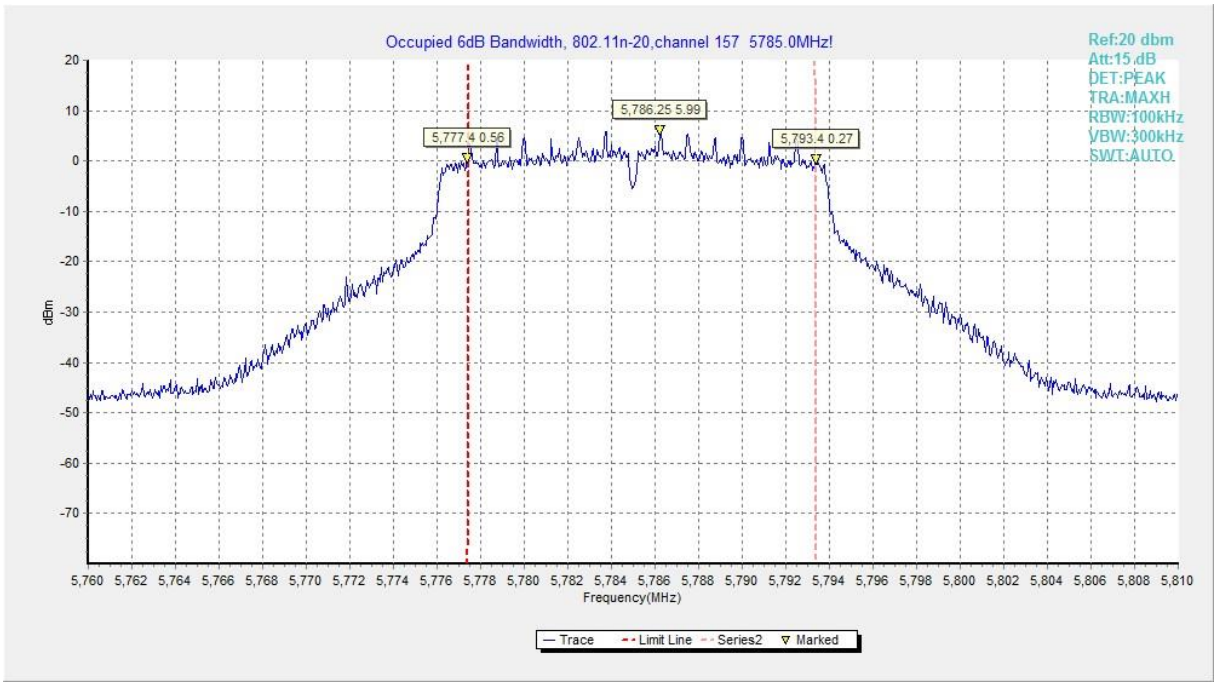


Fig. 5 Occupied 6dB Bandwidth (802.11n-HT20, Ch 157)

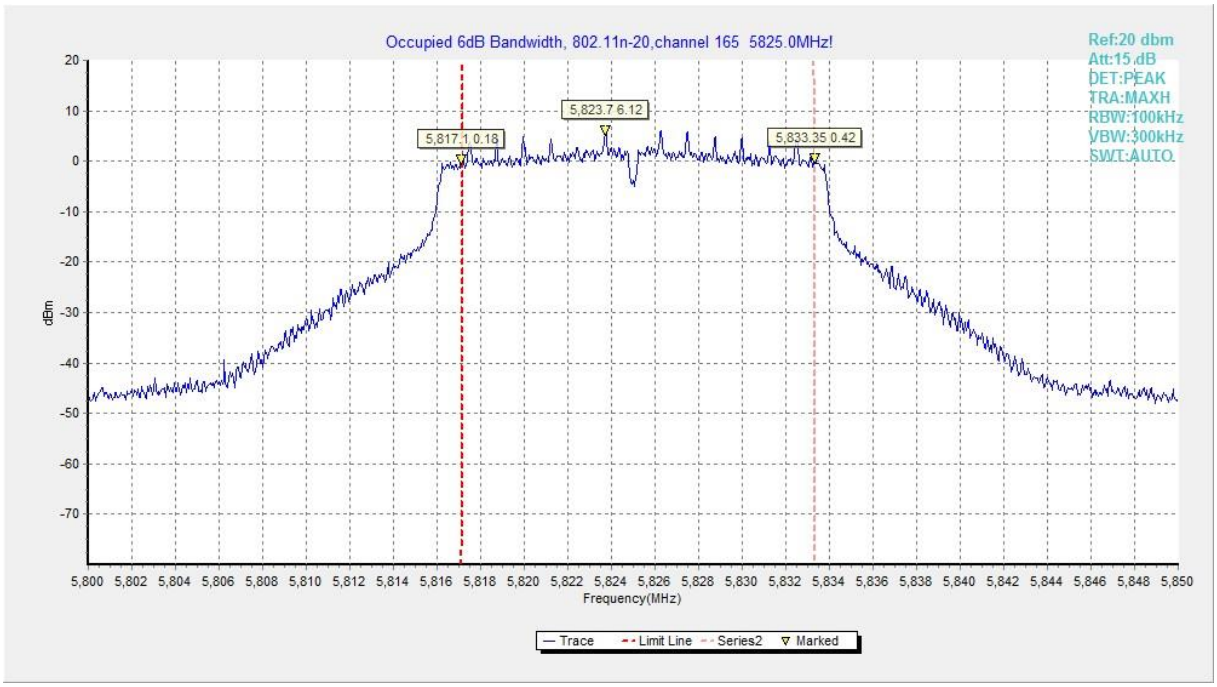


Fig. 6 Occupied 6dB Bandwidth (802.11n-HT20, Ch 165)

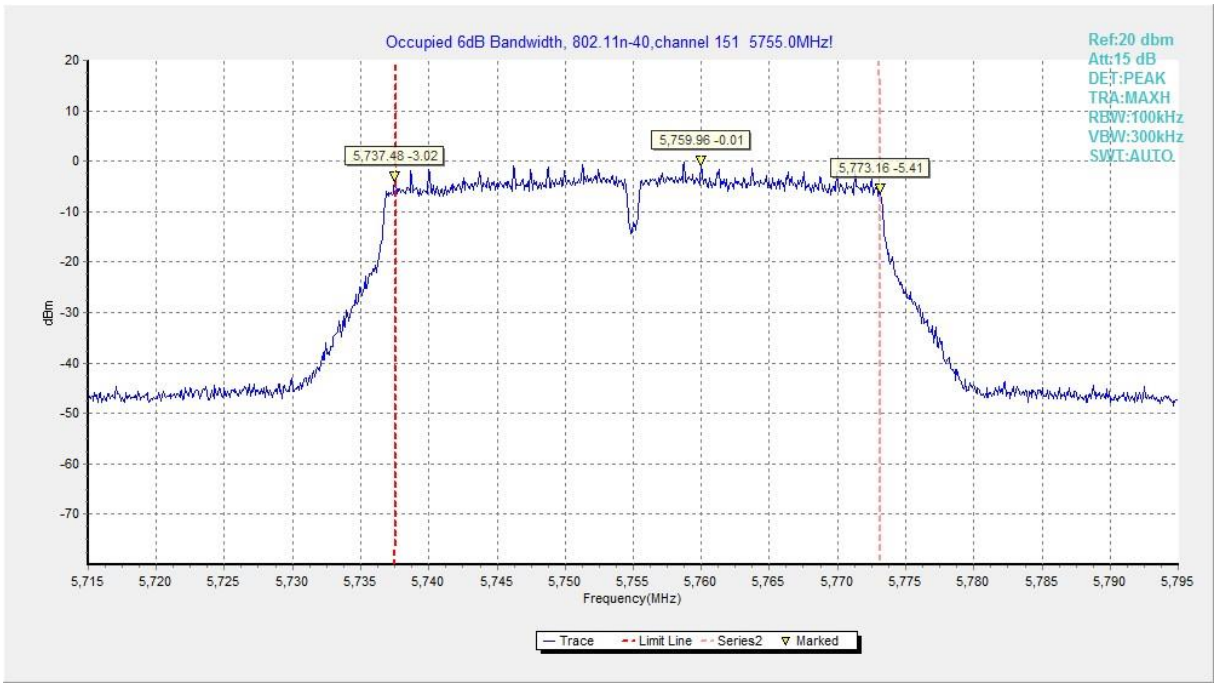


Fig. 7 Occupied 6dB Bandwidth (802.11n-HT40, Ch 151)

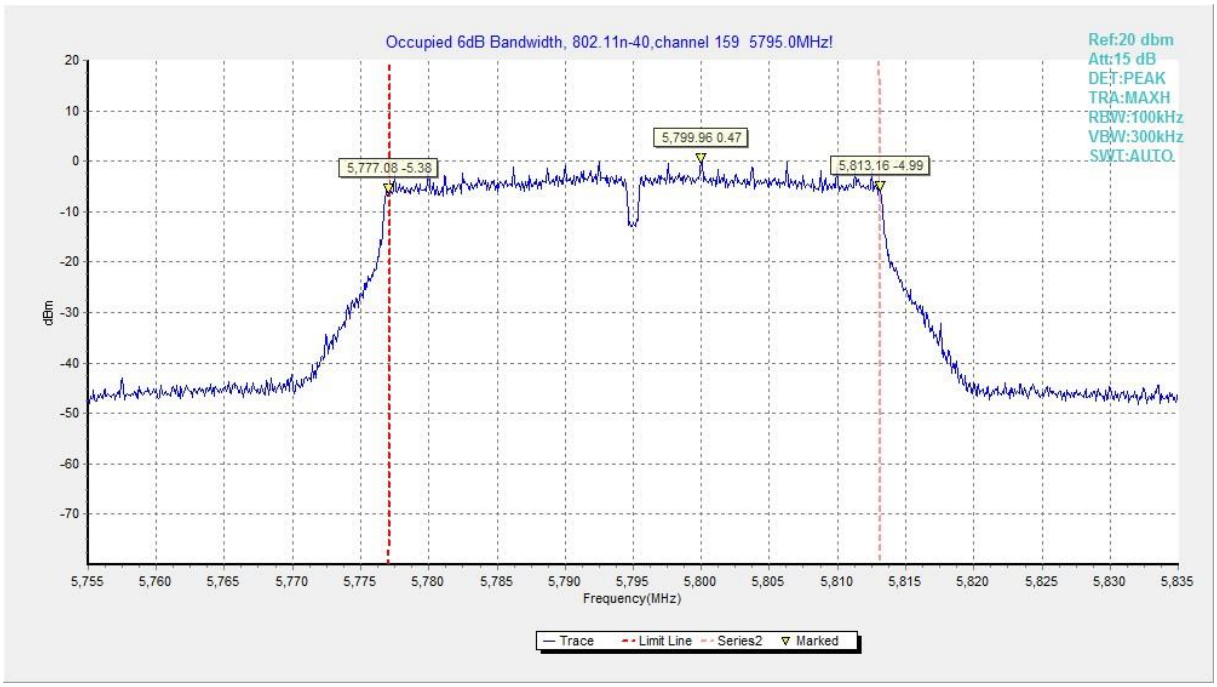


Fig. 8 Occupied 6dB Bandwidth (802.11n-HT40, Ch 159)

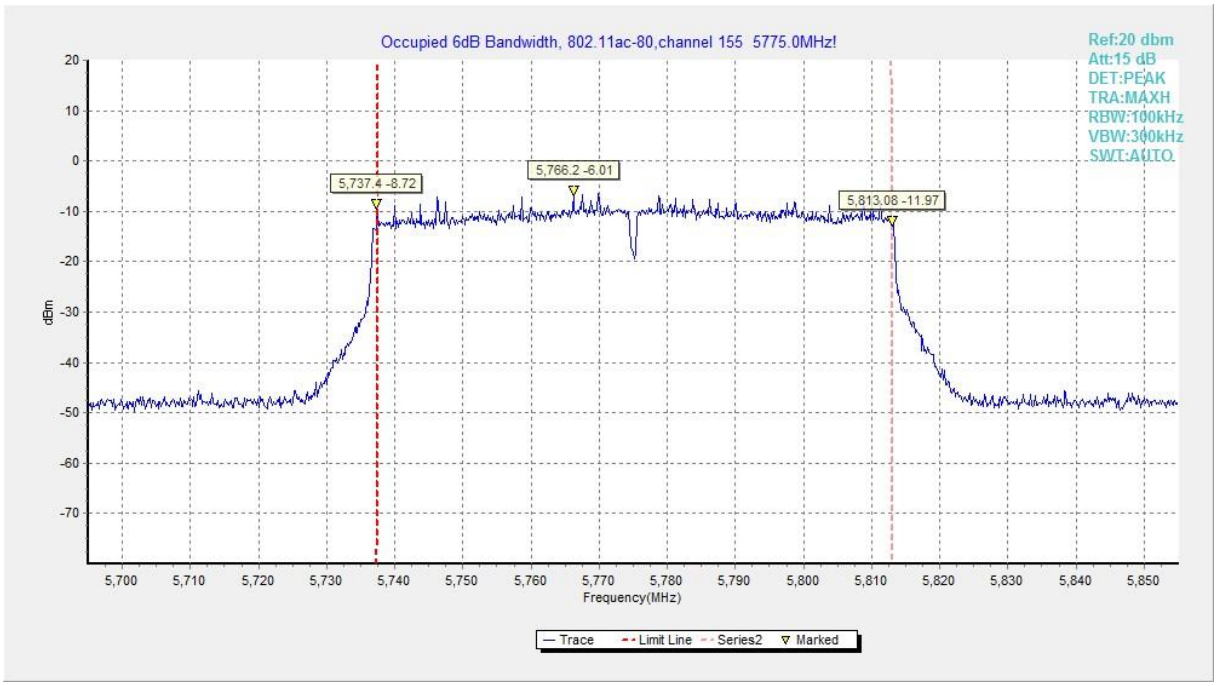


Fig. 9 Occupied 6dB Bandwidth (802.11ac-HT80, Ch 155)

A.5. Transmitter Spurious Emission

A.5.1 Transmitter Spurious Emission - Radiated

Method of Measurement: See ANSI C63.10-2013-clause 6.4 &6.5 & 6.6

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209	20dB below peak output power

radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Limit in restricted band:

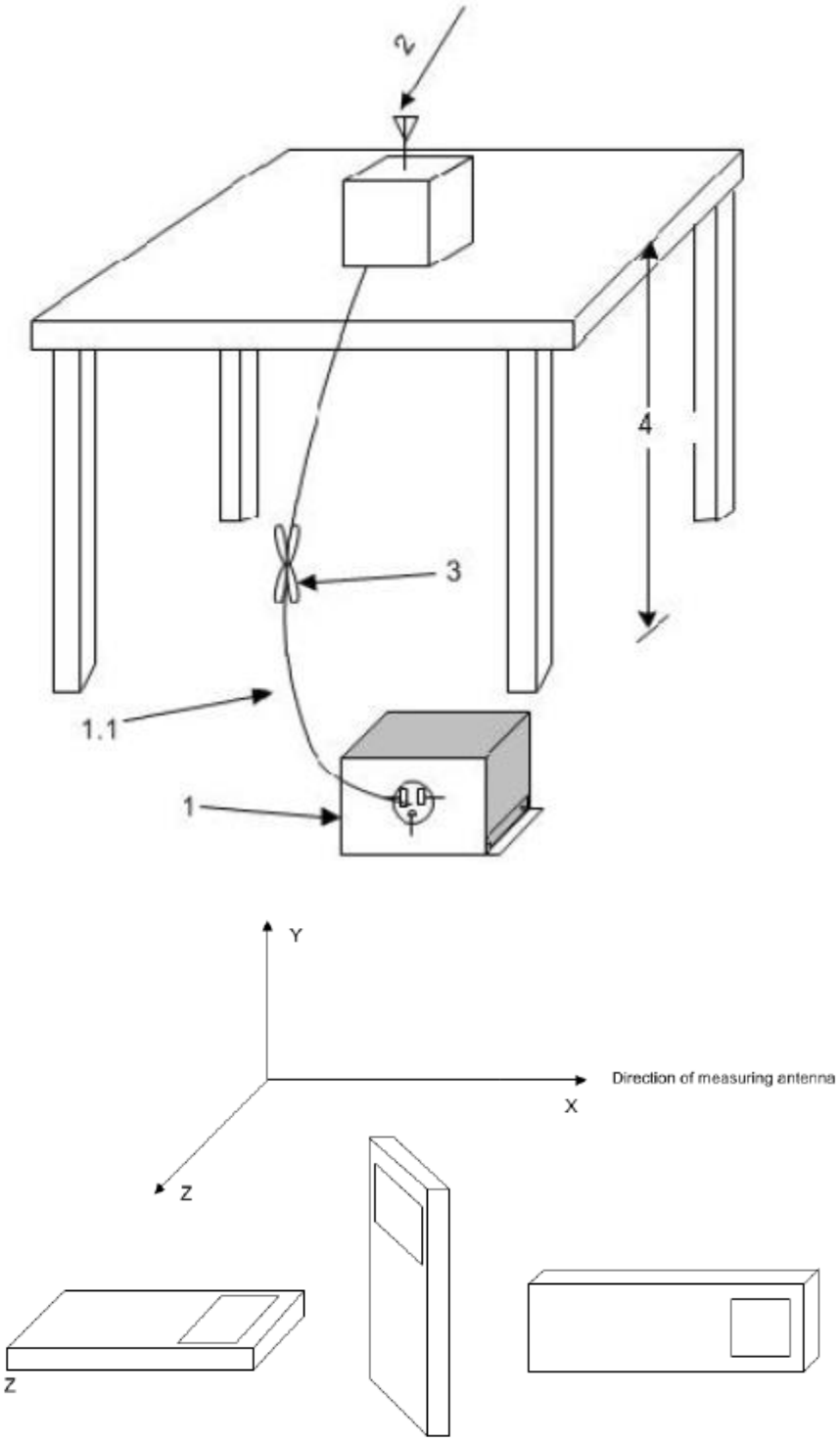
Frequency (MHz)	Field strength(μV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

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

Set up:

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m

The EUT and transmitting antenna shall be centered on the turntable.



Test Condition

The EUT shall be tested 1 near top, 1 near middle, and 1 near bottom. Set the unlicensed wireless device to operate in continuous transmit mode. For unlicensed wireless devices unable to be configured for 100% duty cycle even in test mode, configure the system for the maximum duty cycle supported.

When required for unlicensed wireless devices, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the

nominal rated supply voltage.

Exploratory radiated emissions measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. The frequencies of maximum emission may be determined by manually positioning the antenna close to the EUT, and then moving the antenna over all sides of the EUT while observing a spectral display. It is advantageous to have prior knowledge of the frequencies of emissions, although this may be determined from such a near-field scan. The near-field scan shall only be used to determine the frequency but not the amplitude of the emissions. Where exploratory measurements are not adequate to determine the worst-case operating modes and are used only to identify the frequencies of the highest emissions, additional preliminary tests can be required.

For emissions from the EUT, the maximum level shall be determined by rotating the EUT and its antenna through 0° to 360°. For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of test. If either antenna height or EUT azimuth are not fully measured during exploratory testing, then complete testing can be required at the OATS or semi-anechoic chamber when the final full spectrum testing is performed.

Final radiated emissions measurements

The final measurements are using the orientation and equipment arrangement of the EUT based on the measurement results found during the preliminary (exploratory) measurements, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement.

For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.

For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable), as well as the frequency and amplitude of the six highest spurious emissions relative to the limit. Emissions more than 20 dB below the limit do not need to be reported.

This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The receiver references:

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	100KHz/300KHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-40000	1MHz/3MHz	20

P_{Mea} is the field strength recorded from the instrument.
The measurement results are obtained as described below:
Result= P_{Mea} + Cable Loss + Antenna Factor
Where:

P_{Mea} field strength recorded from the instrument

Conclusion: PASS

EUT ID: EUT4
Average Results：
802.11a
Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5450.200	36.8	-29.4	34.6	31.65	54.0	17.2	H
5458.800	36.8	-29.3	34.6	31.61	54.0	17.2	H
11492.400	38.5	-32.5	38.2	32.84	54.0	15.5	H
16139.900	36.9	-28.1	40.8	24.17	54.0	17.1	H
17851.500	38.3	-26.3	41.2	23.43	54.0	15.7	V
17959.300	38.4	-26.1	41.3	23.22	54.0	15.6	H

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5446.400	36.8	-29.4	34.5	31.61	54.0	17.2	H
5453.400	36.8	-29.4	34.6	31.62	54.0	17.2	V
11570.500	39.0	-32.3	38.3	32.98	54.0	15.0	V
15947.400	37.4	-27.7	40.6	24.44	54.0	16.6	V
17851.500	38.2	-26.3	41.2	23.37	54.0	15.8	H
17953.800	38.5	-26.1	41.3	23.33	54.0	15.5	V

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5453.000	36.9	-29.4	34.6	31.68	54.0	17.1	H
5457.200	36.8	-29.3	34.6	31.61	54.0	17.2	H
11649.700	38.6	-32.1	38.4	32.31	54.0	15.4	H
15944.100	37.4	-27.7	40.6	24.46	54.0	16.6	V
17957.100	38.5	-26.1	41.3	23.30	54.0	15.5	V
17850.400	38.3	-26.3	41.2	23.46	54.0	15.7	V

802.11n-HT20

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5449.000	36.7	-29.4	34.6	31.58	54.0	17.3	H
5455.200	36.8	-29.4	34.6	31.62	54.0	17.2	H
11492.400	38.0	-32.5	38.2	32.31	54.0	16.0	H
15946.300	37.4	-27.7	40.6	24.45	54.0	16.6	H
17849.300	38.3	-26.3	41.2	23.44	54.0	15.7	V
17949.400	38.3	-26.1	41.3	23.17	54.0	15.7	H

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5448.000	36.7	-29.4	34.6	31.56	54.0	17.3	H
5453.200	36.8	-29.4	34.6	31.65	54.0	17.2	V
11569.400	37.7	-32.3	38.3	31.76	54.0	16.3	H
15949.600	37.4	-27.7	40.6	24.44	54.0	16.6	V
17761.300	38.2	-26.5	41.1	23.60	54.0	15.8	H
17951.600	38.4	-26.1	41.3	23.28	54.0	15.6	H

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5450.000	36.7	-29.4	34.6	31.58	54.0	17.3	H
5457.600	36.8	-29.3	34.6	31.59	54.0	17.2	V
11648.600	39.1	-32.1	38.4	32.84	54.0	14.9	V
15952.900	37.4	-27.7	40.6	24.47	54.0	16.6	H
17848.200	38.2	-26.4	41.2	23.36	54.0	15.8	H
17947.200	38.3	-26.1	41.3	23.13	54.0	15.7	V

802.11n-HT40

Ch151

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5452.600	36.9	-29.4	34.6	31.69	54.0	17.1	V
5457.400	36.7	-29.3	34.6	31.49	54.0	17.3	H
11510.000	33.8	-32.5	38.2	28.09	54.0	20.2	V
17741.500	38.0	-26.5	41.1	23.43	54.0	16.0	H
17858.100	38.4	-26.3	41.2	23.59	54.0	15.6	V
17960.400	38.4	-26.1	41.3	23.26	54.0	15.6	H

Ch159

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5453.800	36.8	-29.4	34.6	31.60	54.0	17.2	H
5458.800	36.8	-29.3	34.6	31.59	54.0	17.2	V
11590.300	34.1	-32.2	38.3	28.04	54.0	19.9	V
17769.000	38.0	-26.5	41.1	23.40	54.0	16.0	H
17875.700	38.4	-26.3	41.2	23.53	54.0	15.6	V
17956.000	38.4	-26.1	41.3	23.25	54.0	15.6	V

802.11ac-HT20

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5457.800	36.3	-29.3	34.6	31.03	54.0	17.7	H
5458.800	36.3	-29.3	34.6	31.08	54.0	17.7	H
12442.800	34.7	-31.1	38.9	26.97	54.0	19.3	H
15956.200	37.2	-27.7	40.6	24.27	54.0	16.8	H
17755.800	38.0	-26.5	41.1	23.42	54.0	16.0	V
17983.500	38.4	-26.0	41.3	23.17	54.0	15.6	H

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5451.400	36.7	-29.4	34.6	31.53	54.0	17.3	H
5457.200	36.7	-29.3	34.6	31.52	54.0	17.3	H
11569.400	34.7	-32.3	38.3	28.76	54.0	19.3	V
15947.400	37.3	-27.7	40.6	24.33	54.0	16.7	H
17764.600	38.1	-26.5	41.1	23.48	54.0	15.9	V
17954.900	38.4	-26.1	41.3	23.27	54.0	15.6	H

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5449.200	36.7	-29.4	34.6	31.56	54.0	17.3	H
5451.600	36.8	-29.4	34.6	31.58	54.0	17.2	V
11647.500	35.2	-32.1	38.4	28.94	54.0	18.8	V
15943.000	37.3	-27.7	40.6	24.41	54.0	16.7	V
17760.200	38.2	-26.5	41.1	23.56	54.0	15.8	H
17948.300	38.2	-26.1	41.3	23.10	54.0	15.8	H

802.11ac-HT40

Ch151

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5451.000	36.8	-29.4	34.6	31.62	54.0	17.2	V
5457.800	36.8	-29.3	34.6	31.59	54.0	17.2	V
11510.000	33.5	-32.5	38.2	27.75	54.0	20.5	V
15956.200	37.3	-27.7	40.6	24.30	54.0	16.7	V
17765.700	38.1	-26.5	41.1	23.47	54.0	15.9	H
17927.400	38.1	-26.2	41.2	23.04	54.0	15.9	H

Ch159

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5450.200	36.7	-29.4	34.6	31.53	54.0	17.3	V
5455.600	36.8	-29.4	34.6	31.59	54.0	17.2	V
11590.300	33.8	-32.2	38.3	27.72	54.0	20.2	H
17744.800	38.0	-26.5	41.1	23.45	54.0	16.0	V
17857.000	38.5	-26.3	41.2	23.61	54.0	15.5	H
17984.600	38.5	-26.0	41.3	23.26	54.0	15.5	V

802.11ac-HT80

Ch155

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5453.400	36.1	-29.4	34.6	30.87	54.0	17.9	V
5458.400	36.1	-29.3	34.6	30.84	54.0	17.9	H
11549.600	33.5	-32.4	38.3	27.55	54.0	20.6	H
15947.400	37.4	-27.7	40.6	24.49	54.0	16.6	H
17763.500	38.2	-26.5	41.1	23.56	54.0	15.8	V
17959.300	38.4	-26.1	41.3	23.22	54.0	15.6	V

Peak Results：

802.11a

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5650.242	51.0	-28.8	34.8	44.97	68.4	17.4	V
5650.437	51.2	-28.8	34.8	45.18	68.5	17.4	V
11485.250	53.3	-32.5	38.2	47.65	74.0	20.7	H
16942.350	52.3	-27.1	41.6	37.82	68.3	16.0	H
17234.950	50.7	-26.9	41.3	36.25	68.3	17.6	V
17124.950	52.2	-26.9	41.5	37.61	68.3	16.1	H

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5751.400	57.7	-28.8	34.9	51.64	68.3	10.6	V
5822.000	59.4	-28.9	34.9	53.41	68.3	8.9	V
11569.950	53.9	-32.3	38.3	47.95	74.0	20.1	H
16669.000	51.5	-27.5	41.4	37.66	68.3	16.8	V
17049.050	51.8	-27.0	41.6	37.23	68.3	16.5	H
17353.750	50.0	-26.8	41.1	35.68	68.3	18.3	H

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5924.592	51.8	-29.2	35.0	45.99	68.5	16.7	V
5924.799	50.9	-29.2	35.0	45.07	68.3	17.5	V
11651.900	52.6	-32.1	38.4	46.33	74.0	21.4	H
16252.650	52.6	-27.6	41.0	39.31	68.3	15.7	H
17052.350	52.7	-27.0	41.6	38.11	68.3	15.6	V
17476.400	49.8	-26.7	40.9	35.57	68.3	18.5	H

802.11n-HT20

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5650.184	51.3	-28.8	34.8	45.31	68.3	17.0	V
5650.345	51.2	-28.8	34.8	45.24	68.5	17.2	V
11489.650	52.3	-32.5	38.2	46.68	74.0	21.7	V
16862.050	52.4	-27.2	41.6	38.09	68.3	15.9	V
17226.150	52.3	-26.9	41.3	37.90	68.3	16.0	V
17234.950	49.8	-26.9	41.3	35.37	68.3	18.5	H

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5731.600	54.1	-28.8	34.8	48.10	68.3	14.2	V
5847.400	55.9	-29.1	35.0	50.05	68.3	12.4	V
11566.650	52.0	-32.3	38.3	46.03	74.0	22.0	H
16846.650	51.7	-27.2	41.5	37.36	68.3	16.6	V
17121.100	51.9	-26.9	41.5	37.31	68.3	16.4	H
17355.400	50.3	-26.8	41.1	36.05	68.3	18.0	V

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5924.465	51.0	-29.2	35.0	45.17	68.6	17.6	V
5924.805	52.1	-29.2	35.0	46.32	68.3	16.2	V
11654.100	53.9	-32.1	38.4	47.66	74.0	20.1	H
16933.000	52.1	-27.1	41.6	37.62	68.3	16.2	V
17081.500	52.2	-27.0	41.6	37.60	68.3	16.1	V
17475.300	50.0	-26.7	40.9	35.84	68.3	18.3	V

802.11n-HT40

Ch151

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5650.437	51.6	-28.8	34.8	45.63	68.5	16.9	V
5650.799	51.2	-28.8	34.8	45.25	68.8	17.6	V
11510.000	45.8	-32.5	38.2	40.09	74.0	28.2	V
16328.550	51.4	-27.5	41.0	37.94	68.3	16.9	V
17067.750	52.6	-27.0	41.6	38.03	68.3	15.7	H
17265.200	48.8	-26.9	41.3	34.45	68.3	19.5	H

Ch159

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5924.304	51.0	-29.2	35.0	45.15	68.7	17.8	V
5924.483	50.8	-29.2	35.0	44.95	68.6	17.8	V
11589.750	46.8	-32.2	38.3	40.68	74.0	27.2	H
16788.900	52.2	-27.3	41.5	38.00	68.3	16.1	H
17034.200	52.1	-27.0	41.6	37.54	68.3	16.2	V
17385.100	49.1	-26.8	41.1	34.82	68.3	19.2	H

802.11ac-HT20

Ch149

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5650.282	51.1	-28.8	34.8	45.15	68.4	17.3	V
5650.615	51.3	-28.8	34.8	45.34	68.7	17.3	V
11490.200	46.9	-32.5	38.2	41.28	74.0	27.1	H
16622.250	51.4	-27.6	41.3	37.68	68.3	16.9	H
17234.400	50.6	-26.9	41.3	36.16	68.3	17.7	V
17484.100	51.1	-26.7	40.9	36.91	68.3	17.2	H

Ch157

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5715.800	52.0	-28.8	34.8	45.99	68.3	16.3	V
5848.800	52.6	-29.1	35.0	46.67	68.3	15.7	V
11569.950	46.1	-32.3	38.3	40.14	74.0	27.9	H
17053.450	53.2	-27.0	41.6	38.56	68.3	15.1	V
17154.100	53.0	-26.9	41.5	38.44	68.3	15.3	H
17354.850	49.8	-26.8	41.1	35.51	68.3	18.5	V

Ch165

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5924.632	50.8	-29.2	35.0	44.97	68.5	17.7	V
5924.810	51.0	-29.2	35.0	45.22	68.3	17.3	V
11650.250	48.3	-32.1	38.4	42.06	74.0	25.7	V
16675.600	51.9	-27.5	41.4	37.98	68.3	16.4	V
17168.400	51.8	-26.9	41.4	37.29	68.3	16.5	V
17474.750	49.6	-26.7	40.9	35.41	68.3	18.7	V

802.11ac-HT40

Ch151

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5650.201	51.1	-28.8	34.8	45.15	68.3	17.2	V
5650.270	51.0	-28.8	34.8	44.99	68.4	17.4	V
11509.450	45.8	-32.5	38.2	40.06	74.0	28.2	H
16566.150	51.2	-27.6	41.3	37.55	68.3	17.1	V
17032.550	51.4	-27.0	41.6	36.79	68.3	16.9	V
17266.300	50.7	-26.9	41.3	36.28	68.3	17.6	H

Ch159

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5924.598	50.3	-29.2	35.0	44.46	68.5	18.2	V
5924.747	50.1	-29.2	35.0	44.31	68.4	18.3	V
11589.750	45.5	-32.2	38.3	39.38	74.0	28.5	V
16649.200	51.3	-27.5	41.4	37.46	68.3	17.0	V
16957.200	52.7	-27.1	41.7	38.17	68.3	15.6	V
17385.100	50.1	-26.8	41.1	35.82	68.3	18.2	V

802.11ac-HT80

Ch155

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
5650.380	51.0	-28.8	34.8	45.06	68.5	17.4	V
5650.788	51.0	-28.8	34.8	45.00	68.8	17.8	V
11550.150	46.2	-32.4	38.3	40.31	74.0	27.8	H
17324.050	50.8	-26.9	41.2	36.48	68.3	17.5	H
17508.300	51.4	-26.7	40.9	37.26	68.3	16.9	H
17648.550	52.6	-26.6	41.0	38.28	68.3	15.7	V

Sample calculation: 802.11ac 80MHz CH155–Peak, 5650.380MHz

Peak ERP = P_{Mea}(45.06dBuV/m) + Cable Loss(-28.8dB) + Antenna Factor(34.8dB/m) = 51.0 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.	

The measurement is made according to KDB 789033 D02
In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

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
802.11ac HT20	5745 MHz	Fig.14	P
	5825 MHz	Fig.15	P
802.11n HT40	5755 MHz	Fig.16	P
	5795 MHz	Fig.17	P
802.11ac HT40	5755 MHz	Fig.18	P
	5795 MHz	Fig.19	P
802.11ac HT80	5775 MHz	Fig.20	P
	5775 MHz	Fig.21	P

EUT ID: EUT4

Conclusion: PASS
Test graphs as below:
Note: The plot above is the combination results of both vertical and horizontal polarizations.

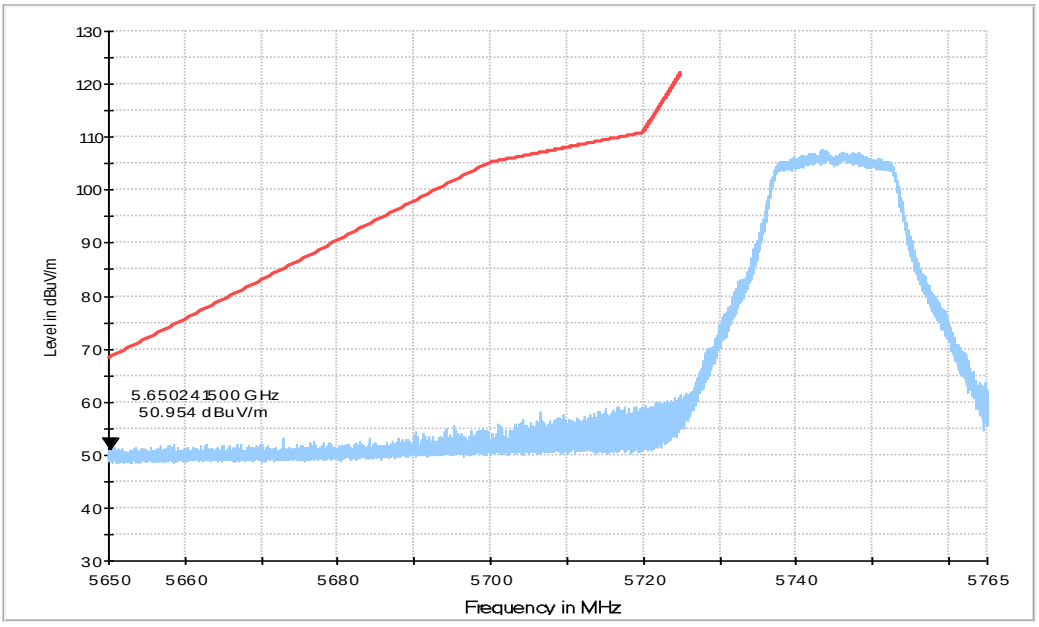


Fig. 10 Band Edges (802.11a, 5745MHz)

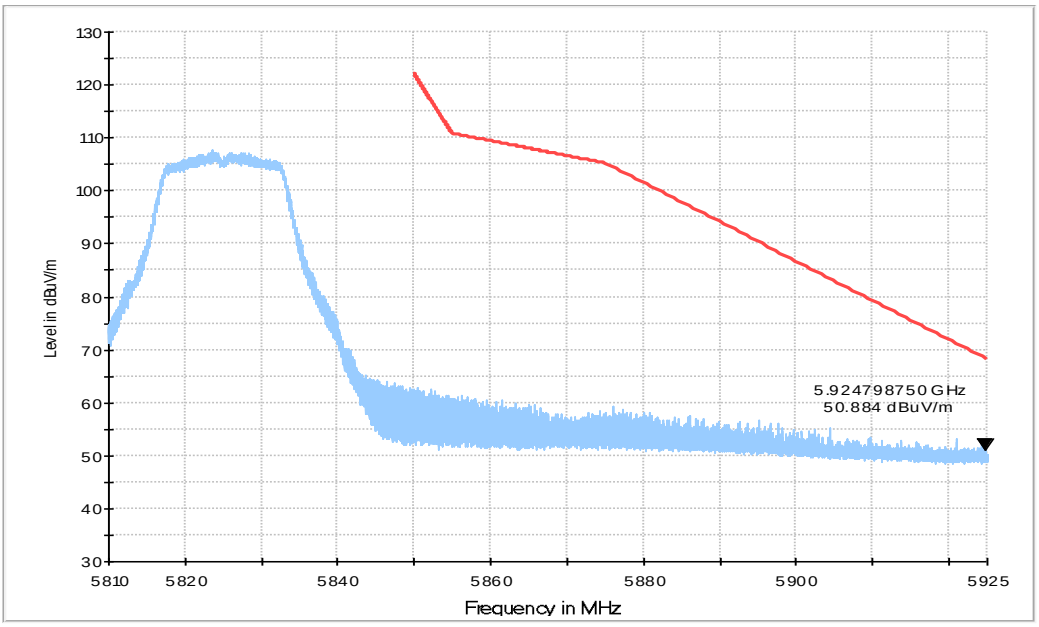


Fig. 11 Band Edges (802.11a, 5825MHz)

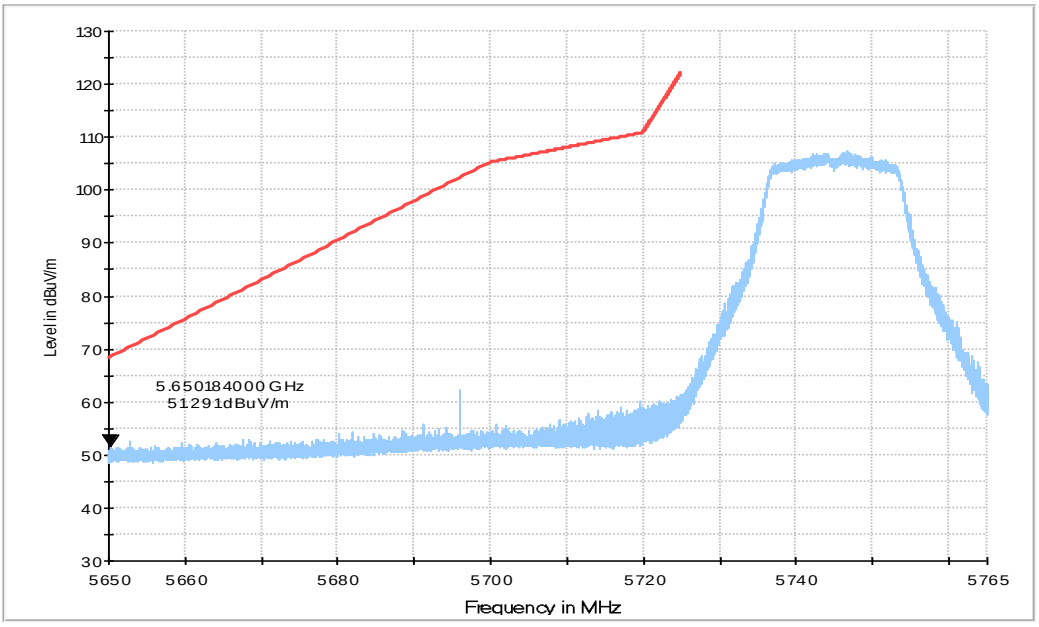


Fig. 12 Band Edges (802.11n-HT20, 5745MHz)

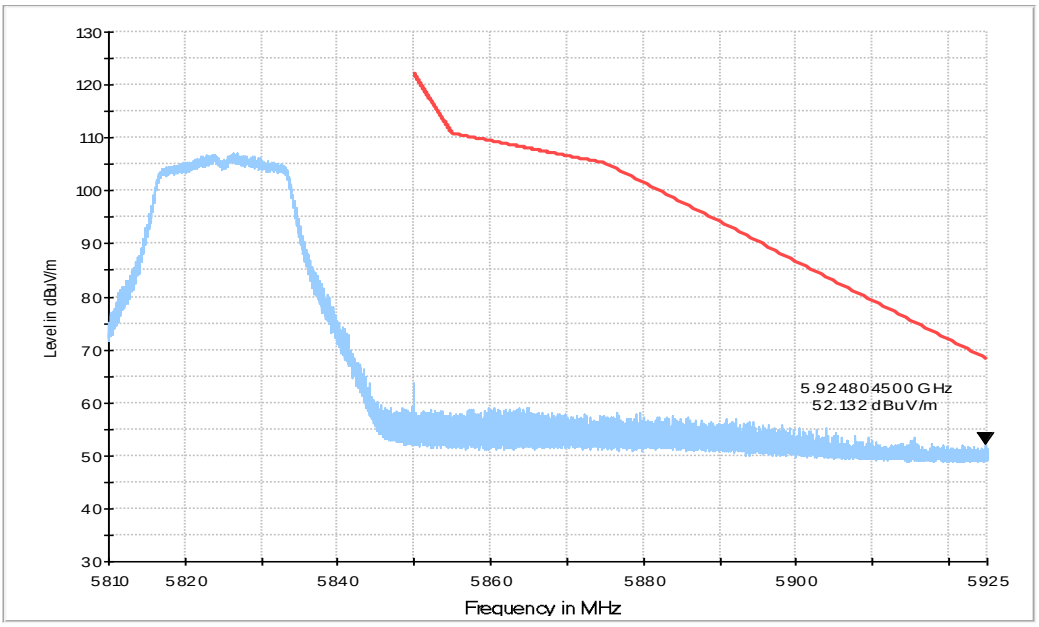


Fig. 13 Band Edges (802.11n-HT20, 5825MHz)

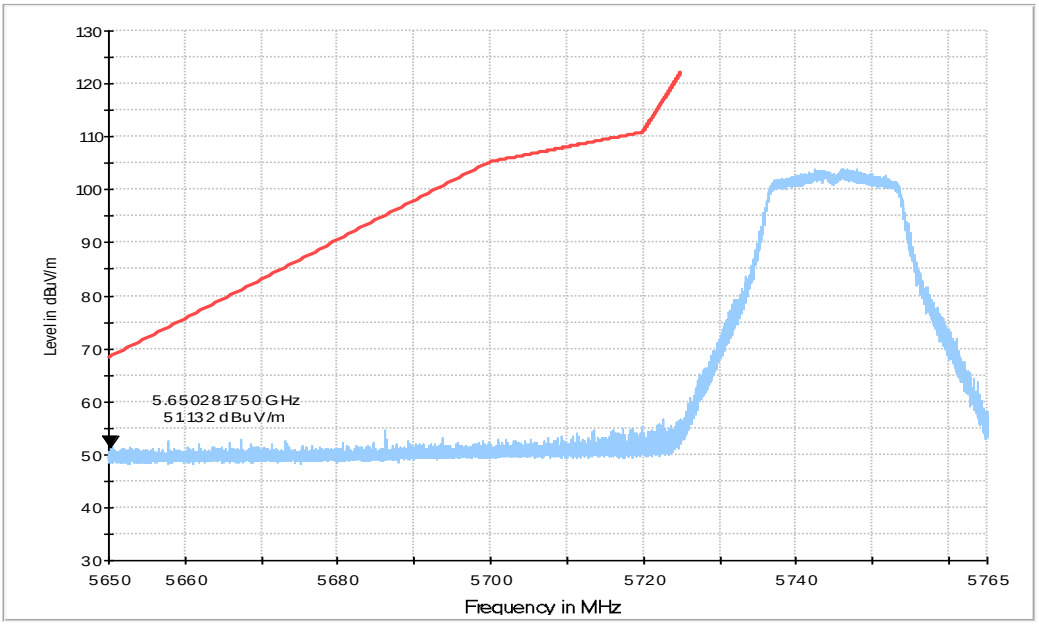


Fig. 14 Band Edges (802.11ac-HT20, 5745MHz)

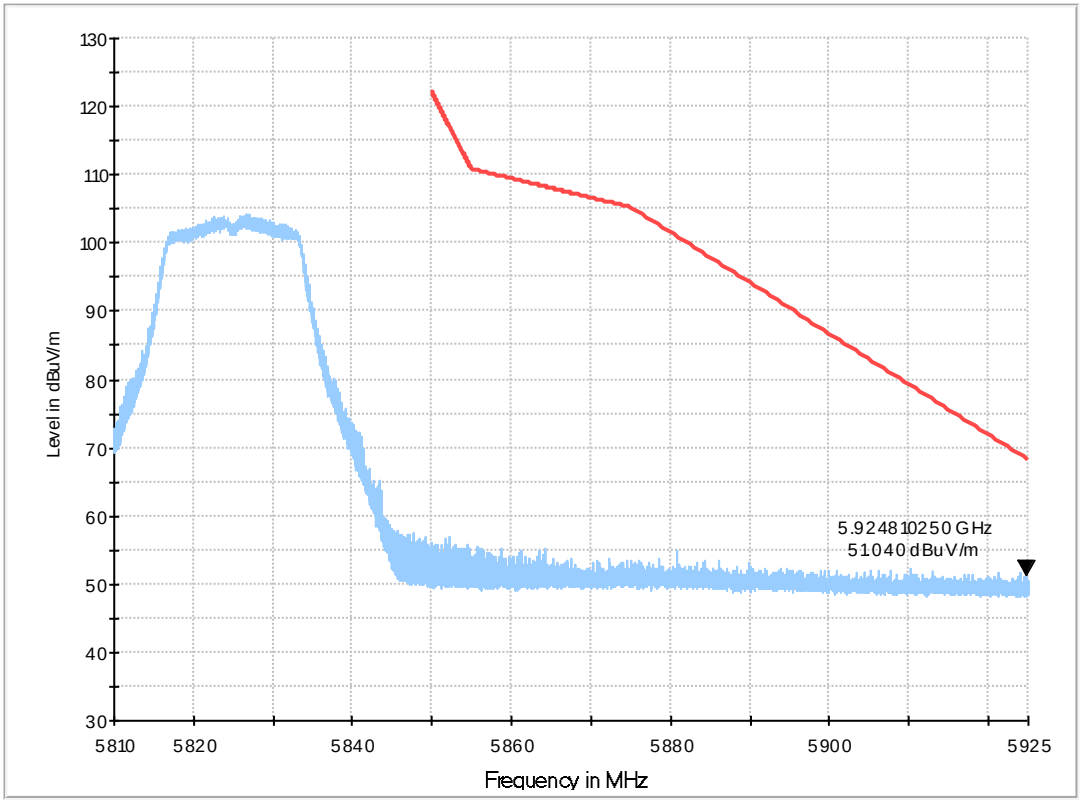


Fig. 15 Band Edges (802.11ac-HT20, 5825MHz)

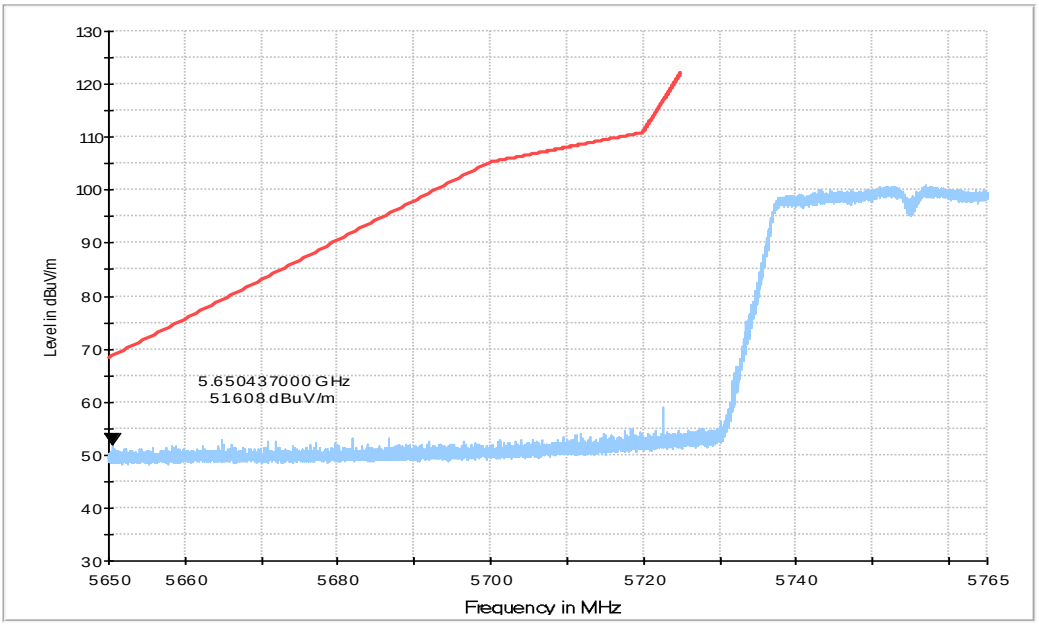


Fig. 16 Band Edges (802.11n-HT40, 5755MHz)

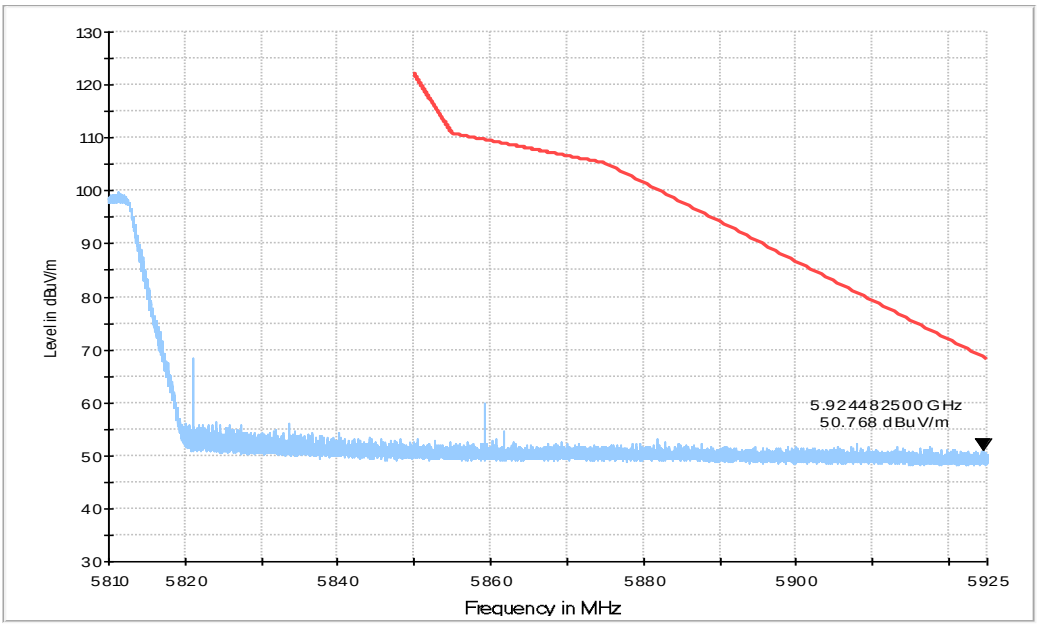


Fig. 17 Band Edges (802.11n-HT40, 5795MHz)

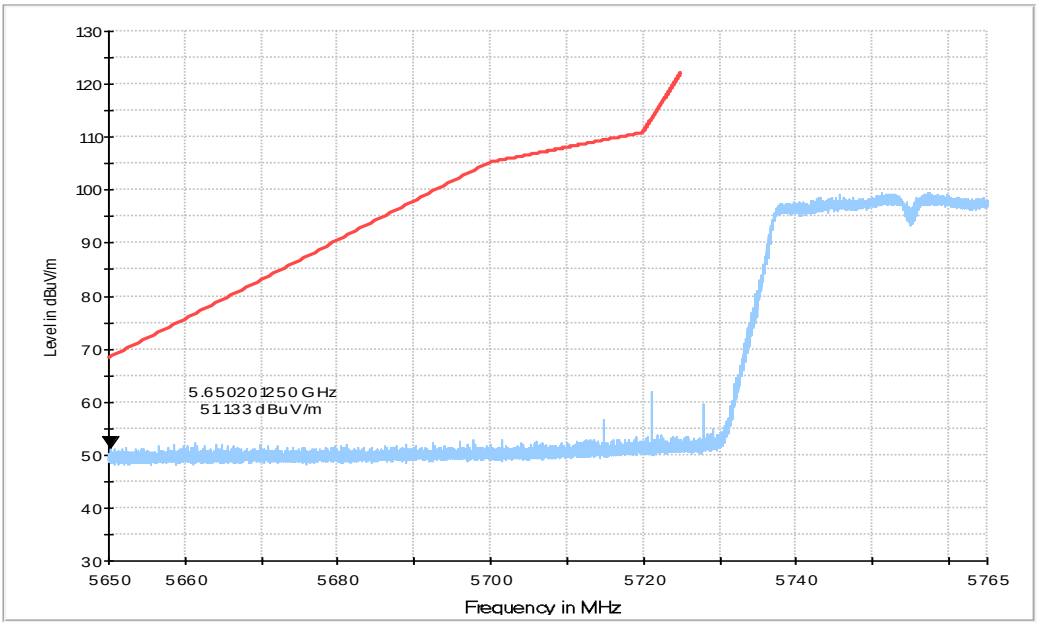


Fig. 18 Band Edges (802.11ac-HT40, 5755MHz)

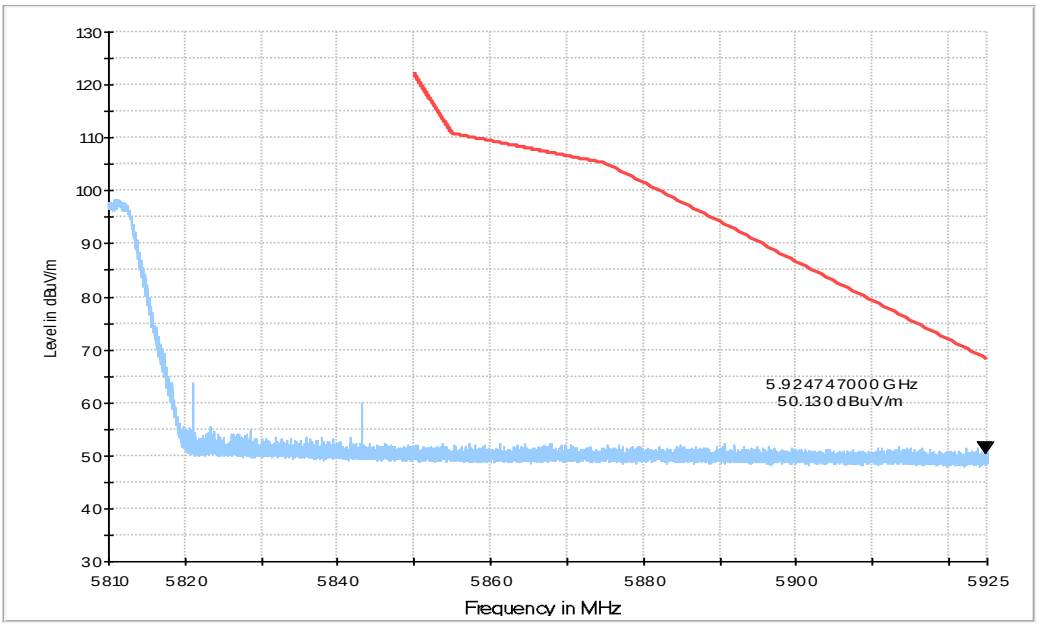


Fig. 19 Band Edges (802.11ac-HT40, 5795MHz)

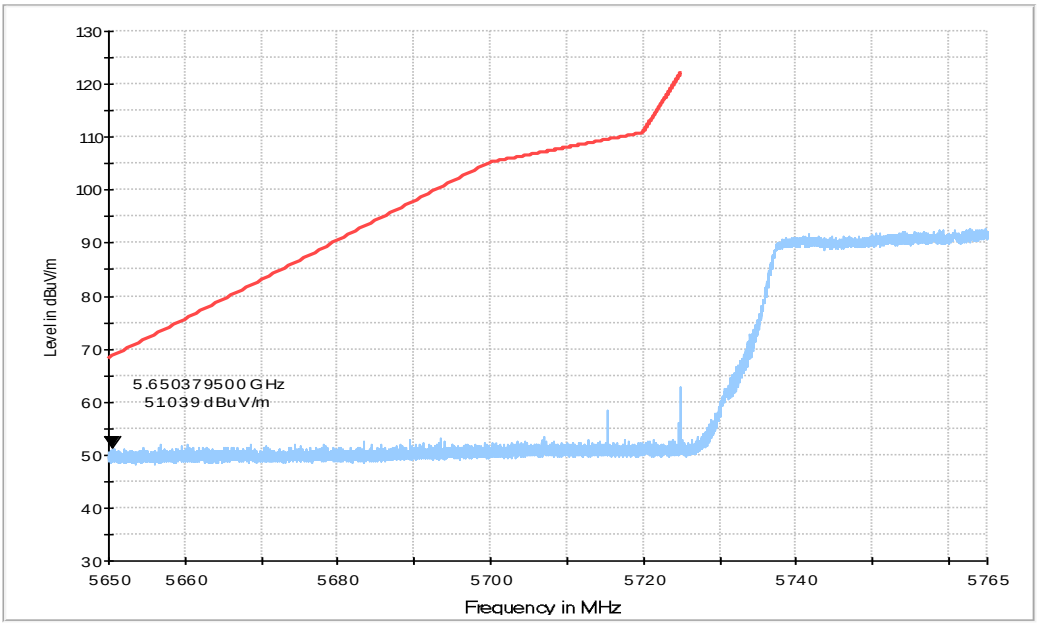


Fig. 20 Band Edges (802.11ac-HT80, 5775MHz)

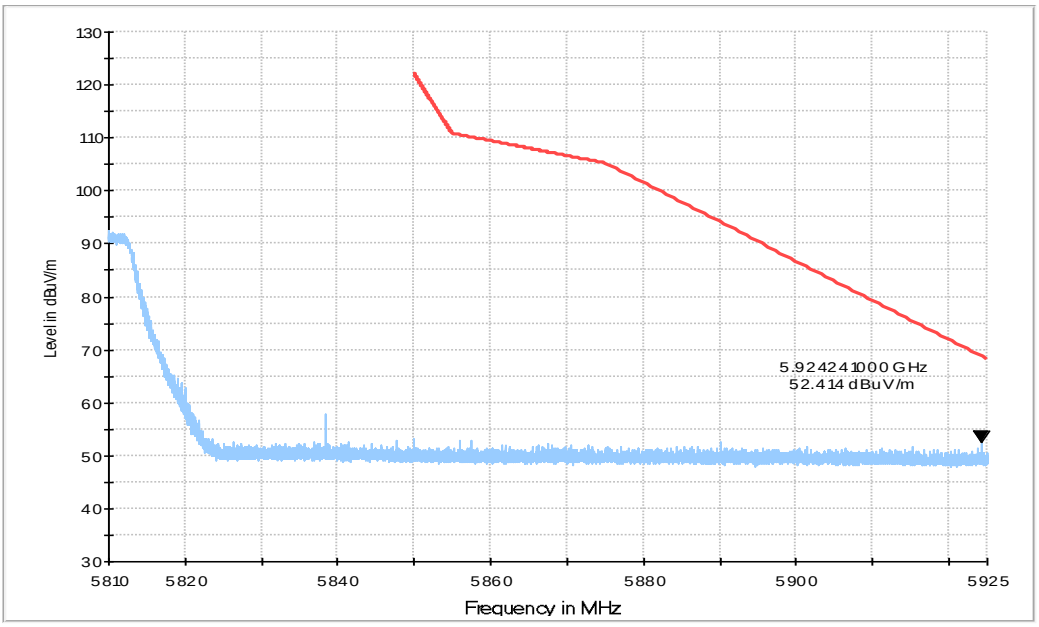


Fig. 21 Band Edges (802.11ac-HT80, 5775MHz)

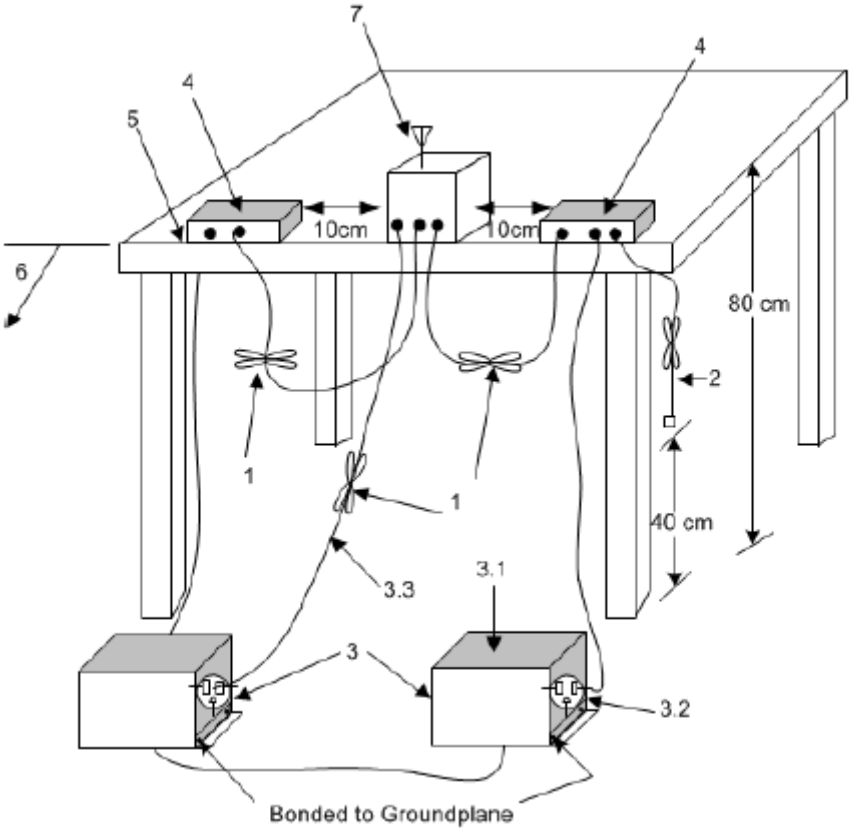
A.7. AC Powerline Conducted Emission

Method of Measurement: See ANSI C63.10-clause 6.2

Setup:

A stand-alone EUT shall be placed in the center along the back edge of the tabletop. For multiunit tabletop systems, the EUT shall be centered laterally (left to right facing the tabletop) on the tabletop and its rear shall be flush with the rear of the table.

Accessories that are part of an EUT system tested on a tabletop shall be placed in a test arrangement on one or both sides of the host with a 10 cm separation between the nearest points of the cabinets. The rear of the host and accessories shall be flush with the back of the supporting tabletop unless that would not be typical of normal use. If more than two accessories are present, then an equipment test arrangement shall be chosen that maintains 10 cm spacing between cabinets unless the equipment is normally located closer together.



Exploratory ac power-line conducted emission measurements

Exploratory measurements shall be used to identify the frequency of the emission that has the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable positions, and with a typical system equipment configuration and arrangement. For each mode of operation and for each ac power current-carrying conductor, cable manipulation shall be performed within the range of likely configurations. For this measurement or series of measurements, the frequency spectrum of interest shall be monitored looking for the emission that has the highest amplitude relative to the limit. Once that emission is found for each current-carrying conductor of each power cord associated with the EUT (but not the cords associated with non-EUT equipment in the overall system), the one configuration and arrangement and mode of operation that produces the emission closest to the limit over all of the

measured conductors shall be recorded.

Final ac power-line conducted emission measurements

Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement, while applying the appropriate modulating signal to the EUT. If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without further variation of the EUT arrangement, cable positions, or EUT mode of operation. If the EUT is composed of equipment units that have their own separate ac power connections (e.g., floor-standing equipment with independent power cords for each shelf that are able to connect directly to the ac power network), then each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be measured separately. If a power strip is provided by the manufacturer, to supply all of the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.

Test Condition:

Voltage（V）	Frequency（Hz）
120	60

Measurement Result and limit:

EUT ID:EUT4

WLAN (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		802.11a	Idle	
0.15 to 0.5	66 to 56	Fig.22	Fig.23	P
0.5 to 5	56			
5 to 30	60			
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

WLAN (Average Limit)

Frequency range (MHz)	Average Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		802.11a	Idle	
0.15 to 0.5	56 to 46	Fig.22	Fig.23	P
0.5 to 5	46			
5 to 30	50			
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Conclusion: PASS

Test graphs as below:

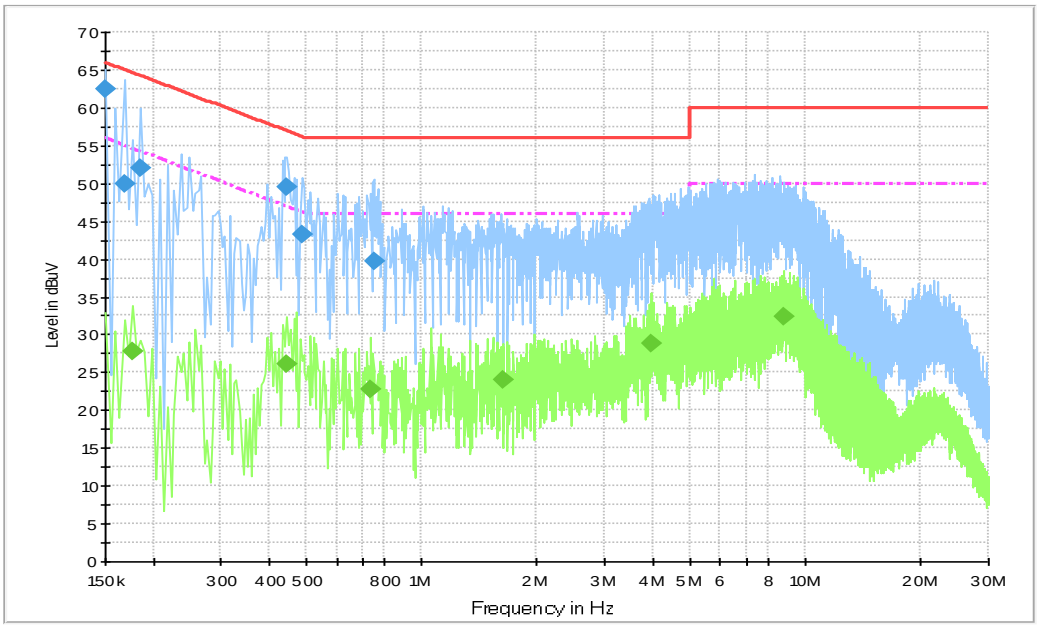


Fig. 22 AC Powerline Conducted Emission-802.11a

Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	62.5	L1	28.6	3.5	66.0
0.168000	50.0	N	25.2	15.1	65.1
0.186000	52.1	L1	22.0	12.1	64.2
0.447000	49.5	L1	19.8	7.4	56.9
0.487500	43.2	N	19.8	13.0	56.2
0.753000	39.6	N	19.7	16.4	56.0

Final Result 2

Frequency (MHz)	Average (dBuV)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.177000	27.8	L1	23.5	26.8	54.6
0.447000	26.2	L1	19.8	20.7	46.9
0.739500	22.7	N	19.7	23.3	46.0
1.621500	24.0	L1	19.6	22.0	46.0
3.970500	28.9	L1	19.6	17.1	46.0
8.749500	32.3	L1	19.7	17.7	50.0

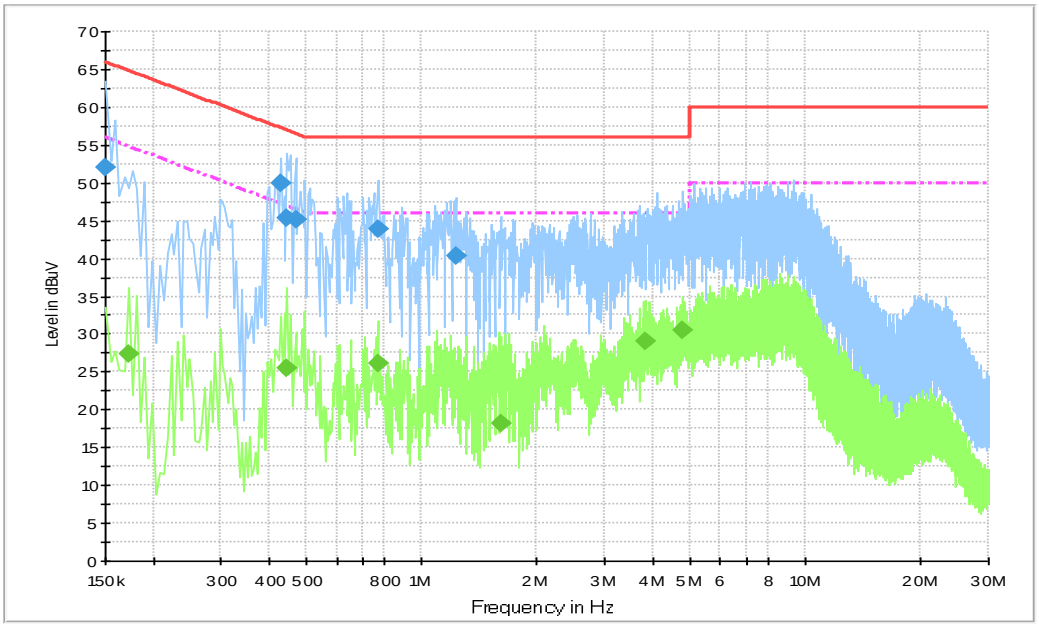


Fig. 23 AC Powerline Conducted Emission-Idle

Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	52.1	N	28.6	13.9	66.0
0.429000	49.9	L1	19.8	7.4	57.3
0.447000	45.3	N	19.8	11.6	56.9
0.469500	45.1	N	19.8	11.4	56.5
0.771000	43.9	L1	19.7	12.1	56.0
1.225500	40.3	L1	19.6	15.7	56.0

Final Result 2

Frequency (MHz)	Average (dBuV)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.172500	27.3	N	24.3	27.5	54.8
0.447000	25.5	L1	19.8	21.4	46.9
0.771000	26.1	L1	19.7	19.9	46.0
1.603500	18.2	N	19.6	27.8	46.0
3.849000	29.0	L1	19.6	17.0	46.0
4.798500	30.5	L1	19.7	15.5	46.0

ANNEX B: EUT parameters

Disclaimer: The antenna gain and worse case provided by the client may affect the validity of the measurement results in this report, and the client shall bear the impact and consequences arising therefrom.

ANNEX C: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP® ilac-MRA

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).

2021-09-29 through 2022-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

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