FCC PART 15E
TEST REPORT
No.23T04Z80846-13

for

TCL Communication Ltd.

GSM/UMTS/LTE/NR Mobile phone

T613P

FCC ID:2ACCJH182

with

Hardware Version: 05

Software Version: 6FSE

Issued Date: 2024-02-20

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.

Test Laboratory:

CTTL-Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
23T04Z80846-13	Rev.0	1st edition	2024-02-06
23T04Z80846-13	Rev.1	Update the 802.11ac mode to VHT.	2024-02-20

Note: the latest revision of the test report supersedes all previous version.

CONTENTS

1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under American Association for Laboratory Accreditation (A2LA) with lab code 7049.01, and is also an FCC accredited test laboratory (CN1349), and ISED accredited test laboratory (CAB identifier:CN0066). The detail accreditation scope can be found on A2LA website.

1.2. Testing Location

Conducted testing Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191

Radiated testing Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, 100191, P. R. China

1.3. TestingEnvironment

Normal Temperature: 15-35°C

Relative Humidity: 20-75%

1.4. Project date

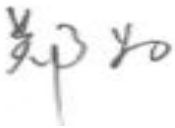
Testing Start Date: 2023-12-15

Testing End Date: 2024-02-06

1.5. Signature

Yao Xingyu

(Prepared this test report)



Zheng Wei

(Reviewed this test report)

Pang Shuai

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
City:	Hong Kong
Postal Code:	/
Country:	China
Telephone:	+86 755 3661 1621
Fax:	+86 755 3661 2000-81722

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
City:	Hong Kong
Postal Code:	/
Country:	China
Telephone:	+86 755 3661 1621
Fax:	+86 755 3661 2000-81722

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	GSM/UMTS/LTE/NR Mobile phone
Model name	T613P
FCC ID	2ACCJH182
WLAN Frequency Band	ISM Band: 5725MHz~5850MHz
Type of modulation	OFDM
Nominal Voltage	3.87V
Extreme High Voltage	4.45V
Extreme Low Voltage	3.6V

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version	Date of receipt
EUT2(UT23a)	356497200001582/ 356497200001681	05	6FSE	2023-12-19
EUT1(UT18a)	356497200001855/ 356497200001954	05	6FSE	2024-01-08

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

EUT2(UT23a) is used for Conduction test, EUT1(UT18a) is used for Radiation test.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Type	SN
AE1	Charger	805A-018A-1A	/
AE2	Charger	HJ-FC001K7-US	/

*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 GSM/UMTS/LTE/NR Mobile 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. Test Results

6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15E	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
Radiated Unwanted Emission	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 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.

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	3.87V
Humidity	44%

7. Test Facilities 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	2024-07-04
2	Vector Signal Analyzer	FSW67	104051	Rohde & Schwarz	1 year	2024-03-06
3	LISN	ENV216	101200	Rohde & Schwarz	1 year	2024-06-05
4	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2024-02-21
5	Attenuator	10dB/2W	/	Rosenberger	/	/
6	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESW44	103144	Rohde & Schwarz	1 year	2024-07-08
2	EMI Antenna	VULB9163	01222	Schwarzbeck	1 year	2024-02-28
3	EMI Antenna	3115	6914	ETS-Lindgren	1 year	2024-04-25

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. 6dB Emission 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

8.6. Radiated Unwanted Emission

Frequency Range	Uncertainty(dB)
9kHz-30MHz	/
30MHz ≤ f ≤ 1GHz	4.72
1GHz ≤ f ≤18GHz	4.84
18GHz ≤ f ≤40GHz	5.12

8.7. AC Power-line Conducted Emission

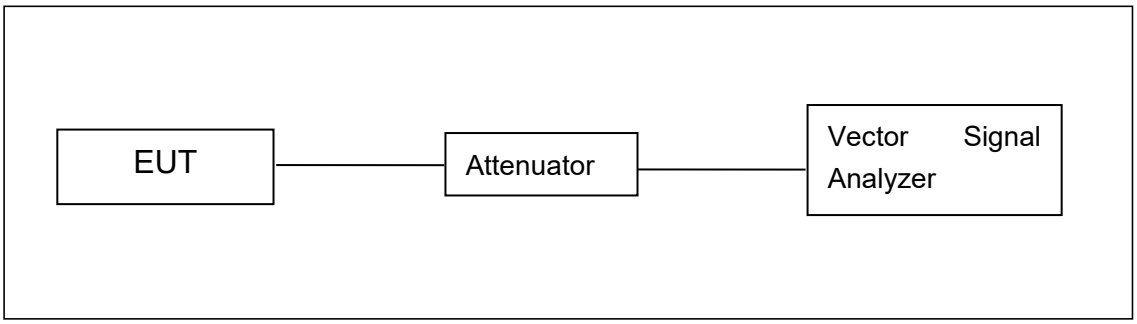
Measurement Uncertainty : 3.08dB,k=2

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

Measurement performed according to Clause 6.4, 6.5, 6.6 in ANSI C63.10-2013 and II.G.4, II.G.5, II.G.6 in KDB 789033.

The radiated emission test is performed in semi-anechoic chamber. The EUT was placed on a non-conductive table with 80cm above the ground plane for measurement below 1GHz and 1.5m above the ground plane for measurement above 1GHz. The measurement antenna was placed at a distance of 3 meters from the EUT. 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 from 0° to 360°and the measurement antenna is moved from 1m to 4m to get the maximization result. The maximization process was repeated with the EUT positioned in each of its three orthogonal orientations

A.2. Maximum Peak Output Power

Measurement Limit and Method:

Standard	Limit (dBm)
FCC CRF Part 15.407(a)	< 30

Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
Set RBW = 1 MHz.
Set VBW ≥ 3 MHz.
Number of points in sweep ≥ 2 × span / RBW.
Sweep time = auto.
Detector = power averaging (rms)
Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal. Add 10 log (1/x), where x is the duty cycle

A.2.1 Antenna Gain

Antenna gain is -3.0dBi and the value is supplied by the applicant or manufacturer.

A.2.2. Maximum Average Output Power-Conducted

EUT ID: EUT2

Measurement Results:

802.11a mode

Mode	Data Rate (Mbps)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11a	6	13.88	13.37	14.01

The data rate 6Mbps is selected as worst condition, and the following cases are performed with this condition.

802.11n-HT20 mode

Mode	Data Rate (Index)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11n (20MHz)	MCS0	12.76	12.61	12.62

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

this condition.

802.11ac-VHT20 mode

Mode	Data Rate (Index)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11ac (20MHz)	MCS0	11.60	11.69	11.65

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

802.11n-HT40 mode

Mode	Data Rate (Index)	Test Result (dBm)	
		5755MHz (Ch151)	5795MHz (Ch159)
802.11n (40MHz)	MCS0	12.76	12.67

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

802.11ac-VHT40 mode

Mode	Data Rate (Index)	Test Result (dBm)	
		5755MHz (Ch151)	5795MHz (Ch159)
802.11ac (40MHz)	MCS0	10.66	10.64

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

802.11ac-VHT80 mode

Mode	Data Rate (Index)	Test Result (dBm)
		5775MHz (Ch155)
802.11ac (80MHz)	MCS0	9.17

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

The duty cycle of all mode are 100%

18:18:16 24.01.2024

Maximum output Power：11a CH165

Conclusion: PASS

A.3. Peak Power Spectral Density

Measurement Limit:

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

Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
Set RBW = 500 kHz.
Set VBW ≥ 3 MHz.
Number of points in sweep ≥ 2 × span / RBW.
Sweep time = auto.
Detector = power averaging (rms)
Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter. Use the peak search function on the instrument to find the peak of the spectrum and record its value. Add 10 log (1/x), where x is the duty cycle.

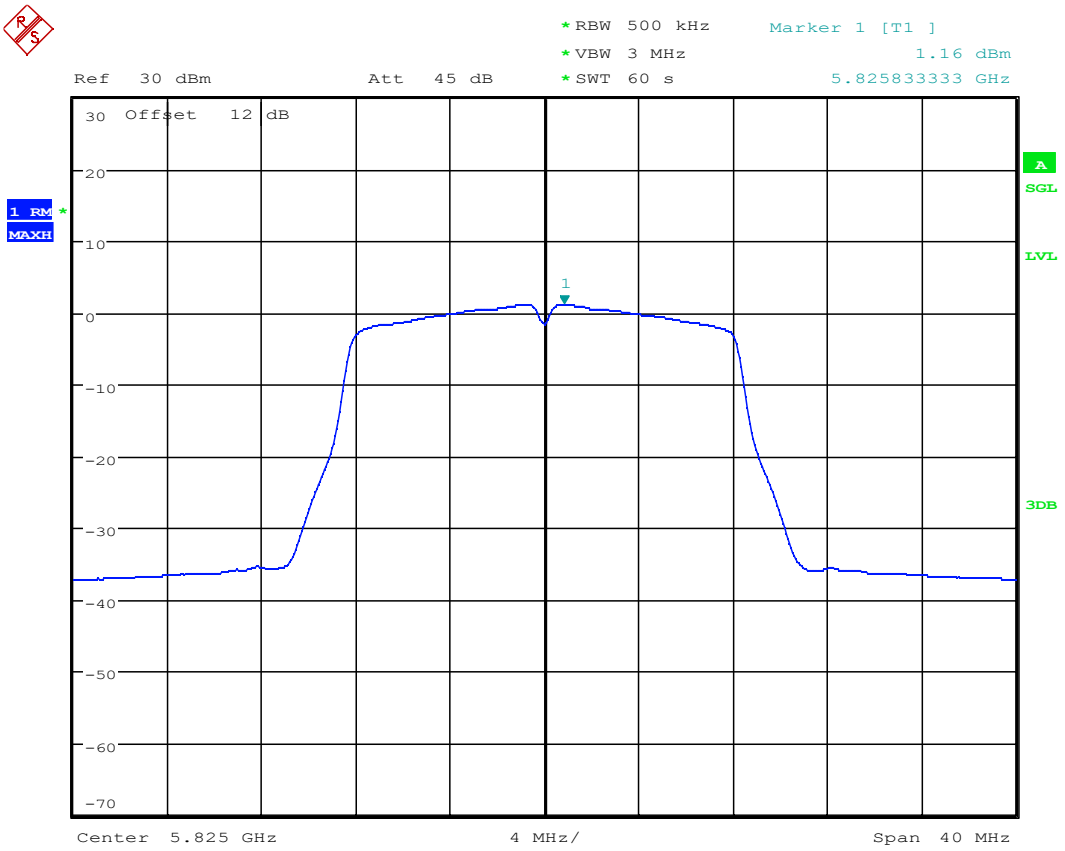
Measurement Uncertainty:

Measurement Uncertainty	0.75dB

EUT ID: EUT2

Measurement Results:

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11a	149	1.07	P
	157	1.05	P
	165	1.16	P
802.11n HT20	149	-0.53	P
	157	-0.38	P
	165	-0.28	P
802.11n HT40	151	-3.32	P
	159	-3.16	P
802.11ac VHT80	155	-9.91	P



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Peak Power Spectral Density:11a CH165

Conclusion: PASS

A.4. 6dB Emission Bandwidth

Measurement Limit:

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

Set RBW = 100 kHz.

Set the video bandwidth (VBW) ≥ 3 × RBW.

Detector = Peak.

Trace mode = max hold.

Sweep = auto couple.

Allow the trace to stabilize.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Measurement Uncertainty:

Measurement Uncertainty	60.80Hz

EUT ID: EUT2

Measurement Result:

Mode	Channel	6dB Emission Bandwidth (MHz)		conclusion
802.11a	149	Fig.1	16.30	P
	157	Fig.2	16.30	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	36.32	P
	159	Fig.8	36.32	P
802.11ac (VHT80)	155	Fig.9	76.48	P

Test graphs as below:

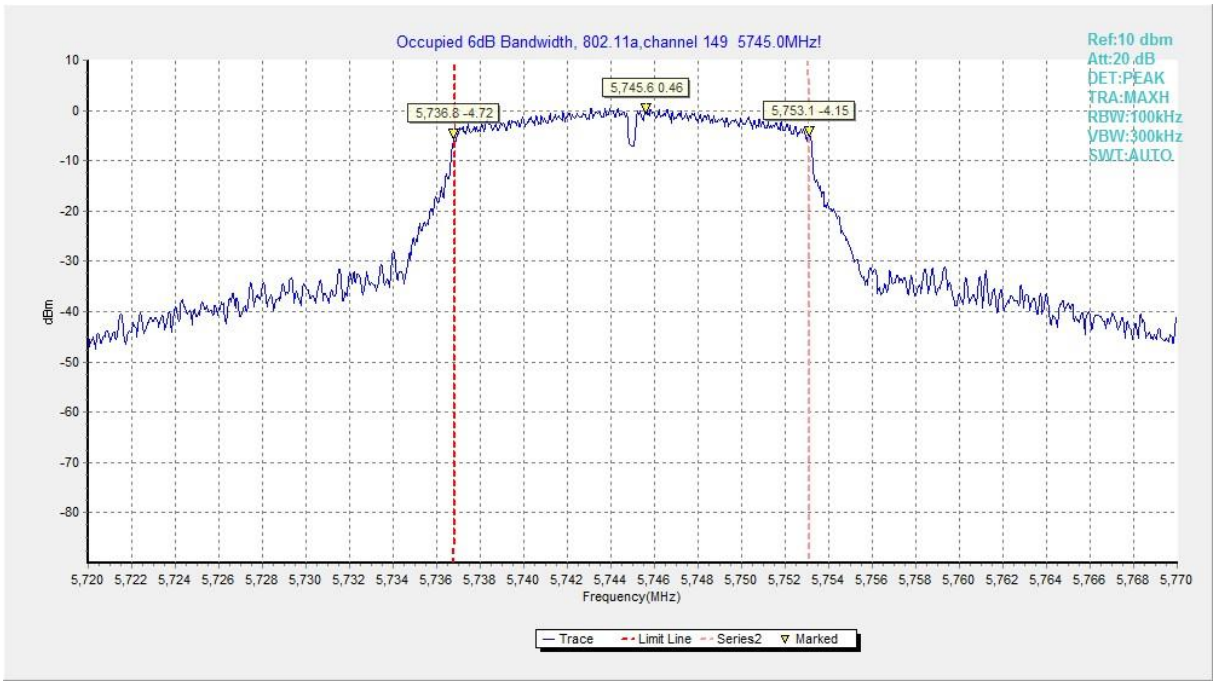


Fig. 1 6dB Emission Bandwidth (802.11a, Ch 149)

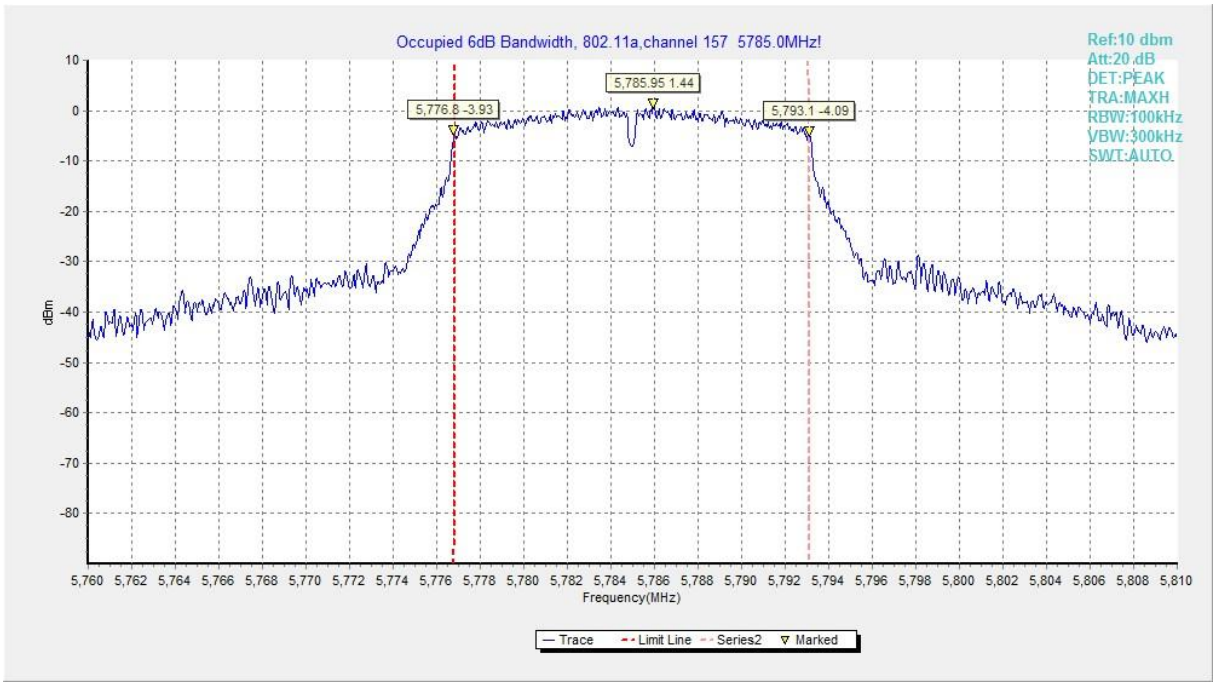


Fig. 2 6dB Emission Bandwidth (802.11a, Ch 157)

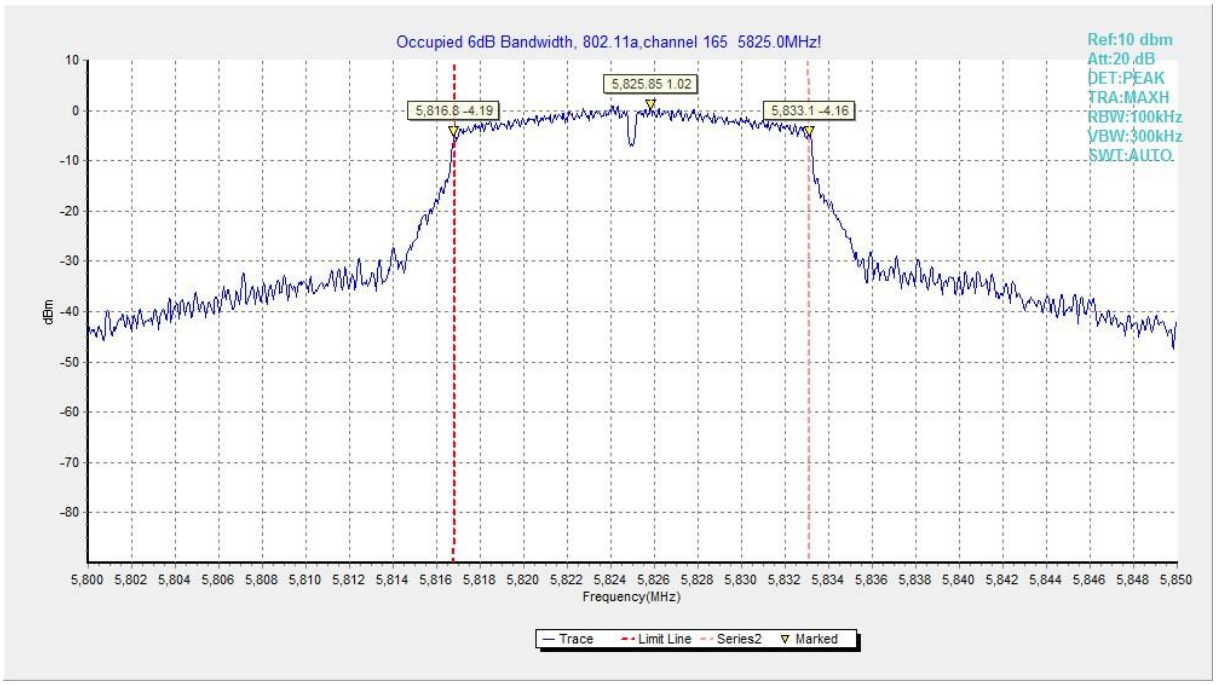


Fig. 3 6dB Emission Bandwidth (802.11a, Ch 165)

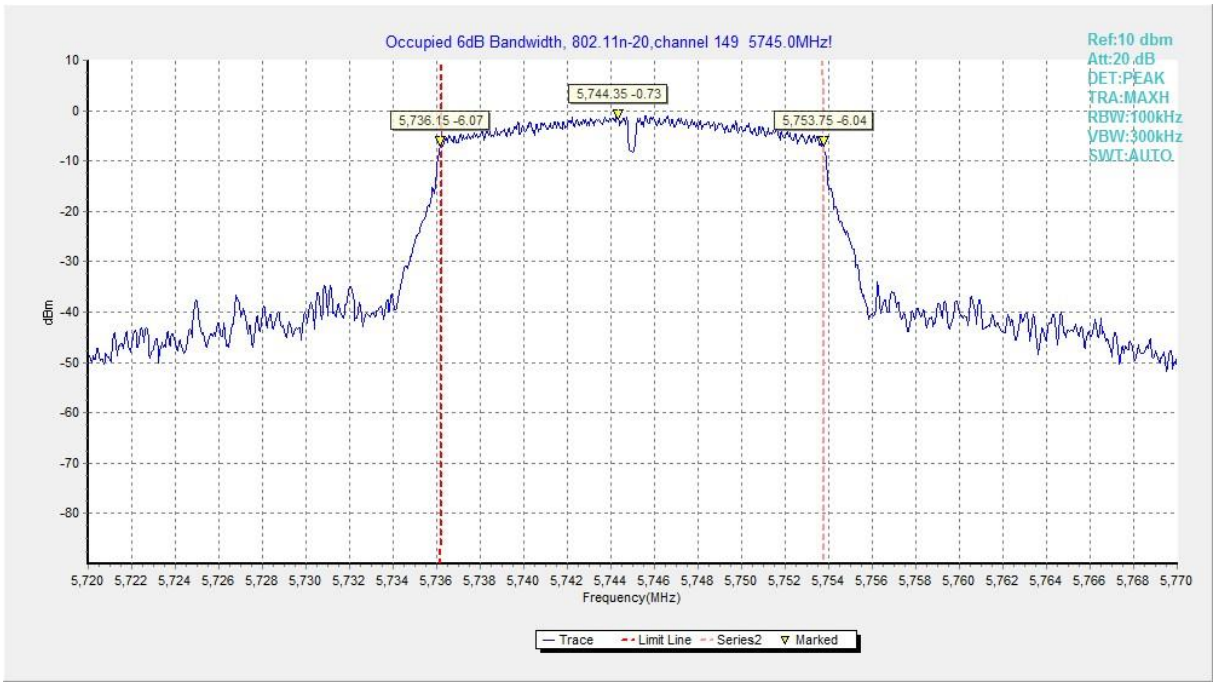


Fig. 4 6dB Emission Bandwidth (802.11n-HT20, Ch 149)

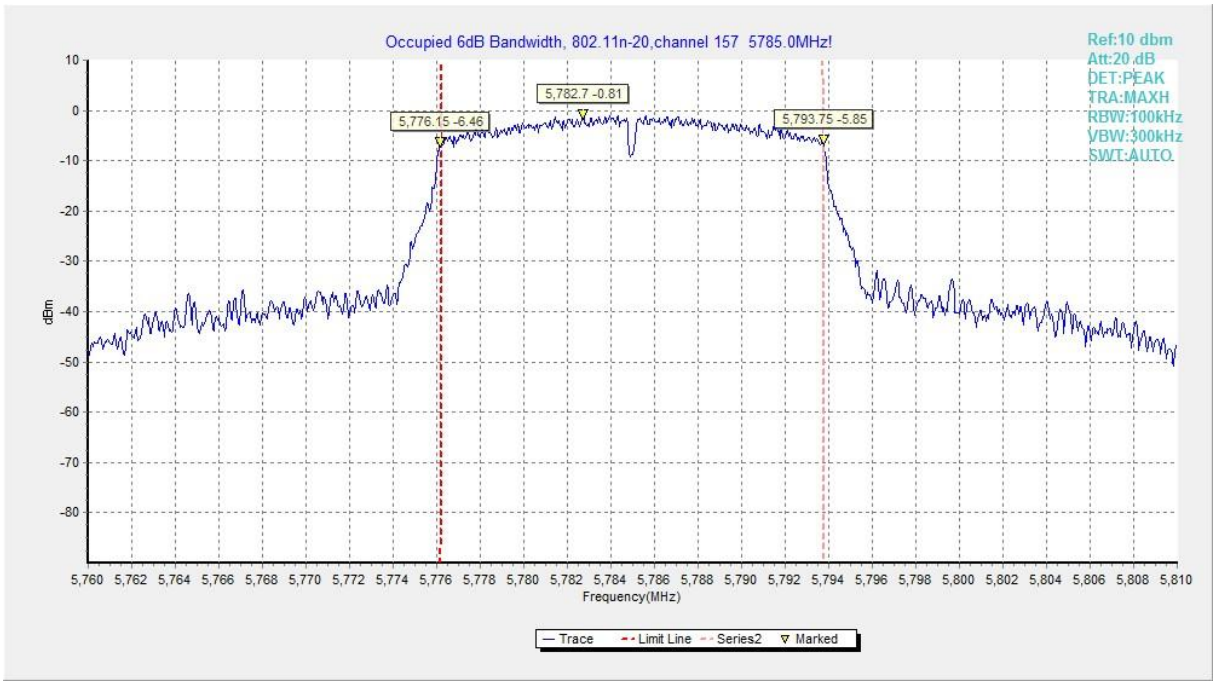


Fig. 5 6dB Emission Bandwidth (802.11n-HT20, Ch 157)

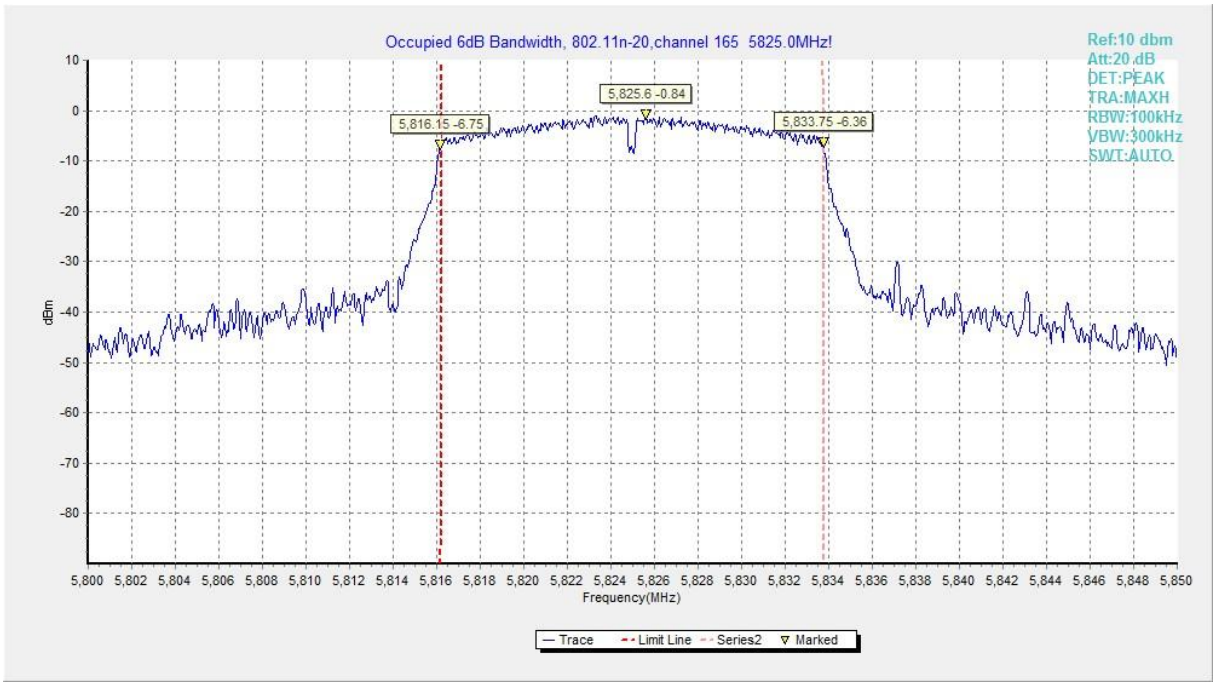


Fig. 6 6dB Emission Bandwidth (802.11n-HT20, Ch 165)

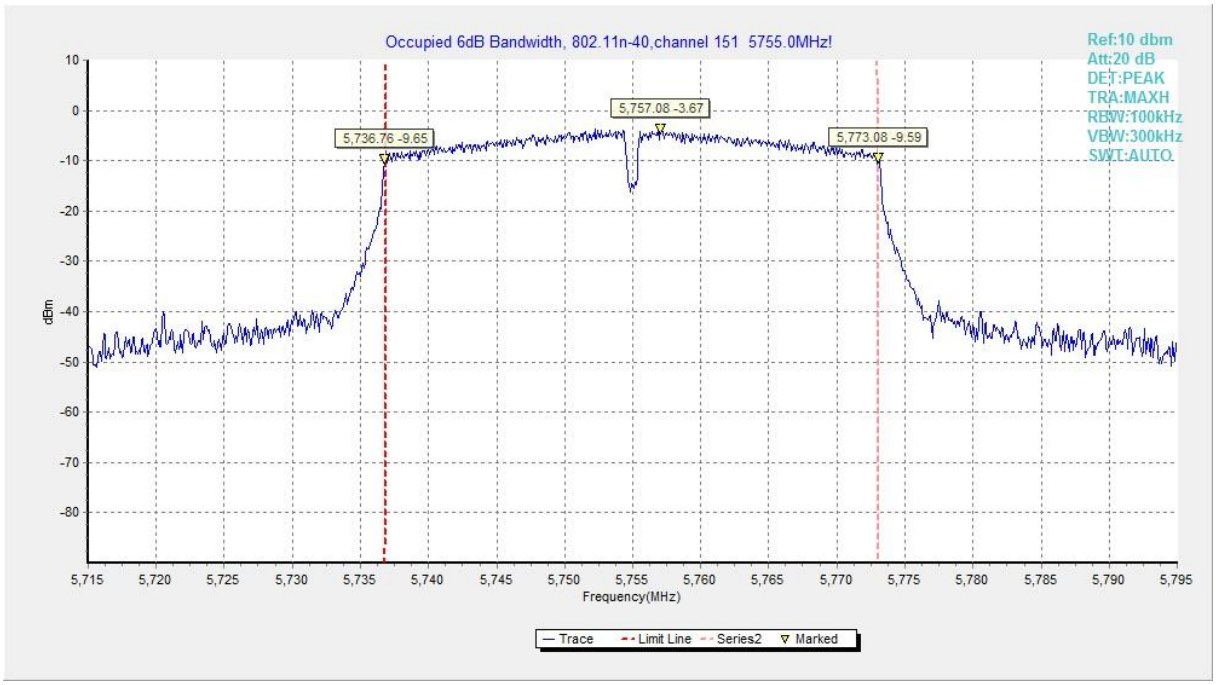


Fig. 7 6dB Emission Bandwidth (802.11n-HT40, Ch 151)

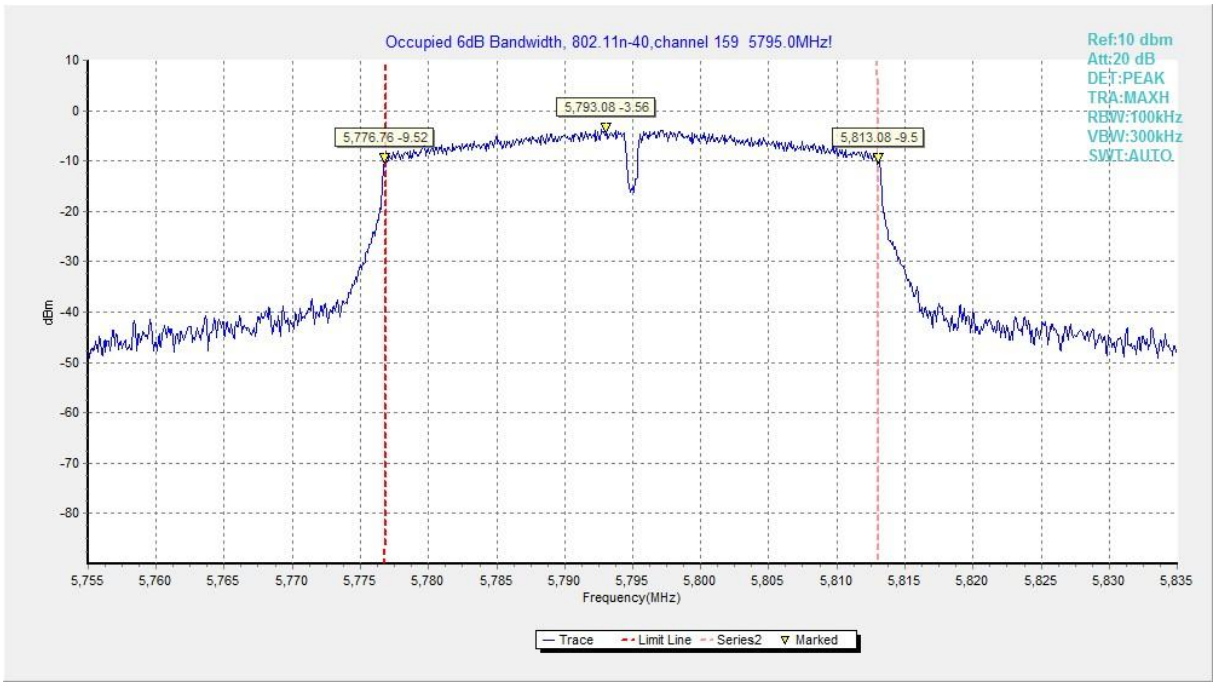


Fig. 8 6dB Emission Bandwidth (802.11n-HT40, Ch 159)

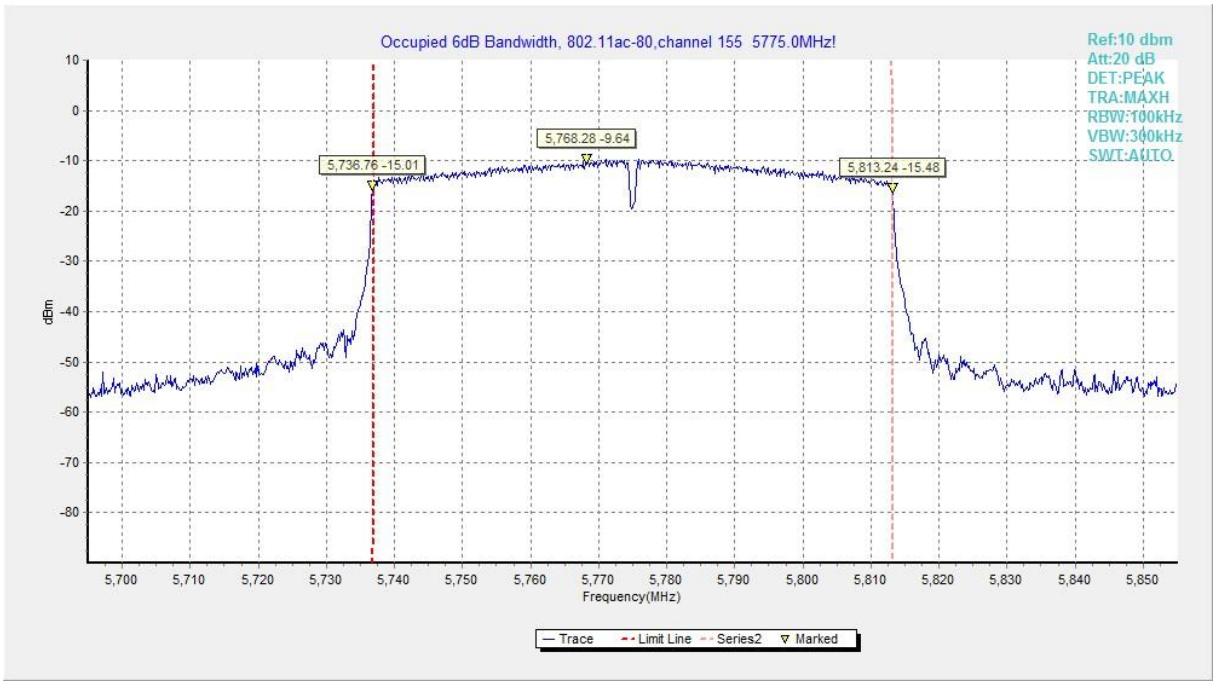


Fig. 9 6dB Emission Bandwidth (802.11ac-VHT80, Ch 155)

Conclusion: PASS

A.5. Radiated Unwanted Emission

A.5.1 Limits

Unwanted Emissions in the unrestricted bands shall not exceed the limits that shown in 15.407:

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.	

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))

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)	Measurement distance (m)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Note: When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor (as defined in KDB 789033 II.G.2.d).

A.5.2 Test setup

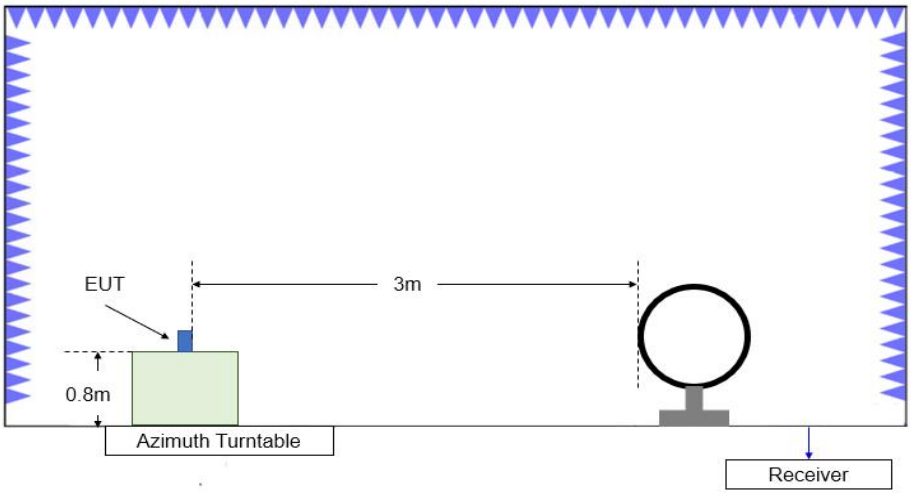


Figure A.5.2.1 Test Site Diagram (9kHz-30MHz)

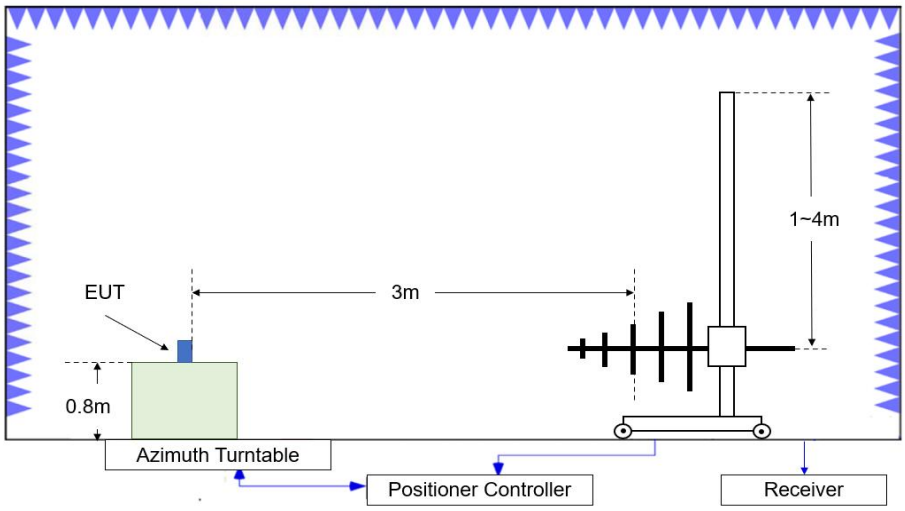


Figure A.5.2.2 Test Site Diagram (30MHz-1GHz)

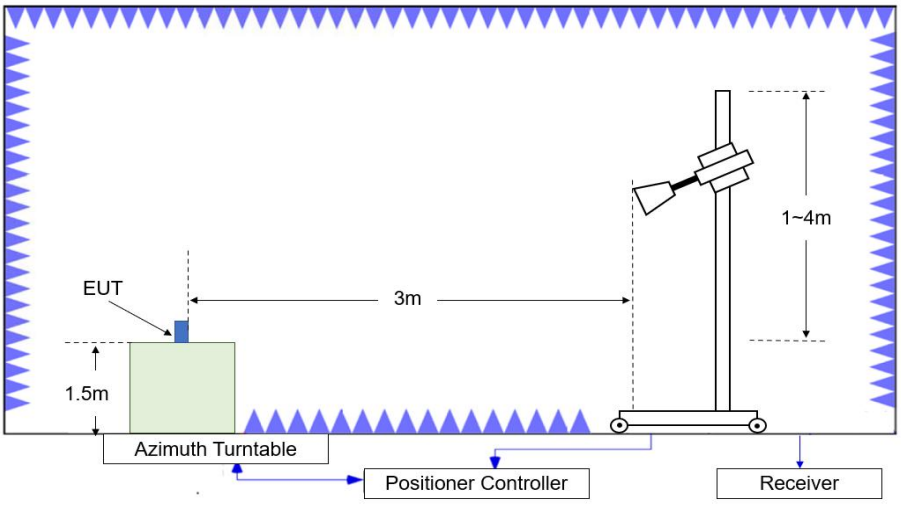


Figure A.5.2.3 Test Site Diagram (1GHz-40GHz)

A.5.3 Test Procedures

Radiated unwanted emissions from the EUT were measured according to ANSI C63.10and KDB 789033 D02 v02r01.

Test setting

Frequency of emission (MHz)	RBW/VBW
30-1000	100kHz/300kHz
1000-4000	1MHz/3MHz
4000-18000	1MHz/3MHz
18000-26500	1MHz/3MHz
26500-40000	1MHz/3MHz

A.5.4 Calculation

1. The measurement results reported below is calculated by:

Measurement Results (dBμV/m) = $P_{measurement}$ (dBμV) + Cable Loss(dB) + Antenna Factor (dB/m)

Where: $P_{measurement}$ is the field strength recorded from the instrument

2. Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

E=EIRP- 20log (*D)* +104.77

Where:

E is the field strength in dBμV/m

D is the measurement distance in meters

EIRP is the equivalent isotropically radiated power in dBm

Test note

1. The EUT is operating at its maximum duty cycle and its maximum power control level.
2. Investigation has been done on all modes and modulations/data rates. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.
3. Spurious emissions for all channels were investigated and almost the same below 1GHz. According to FCC 47 CFR §15.31, emission levels are not report much lower than the limit by over 20dB
4. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept.
5. EUT in each of three orthogonal axis emissions had been tested out only the worst case (axis data) recorded in the report.
6. Measurement frequencies were performed from 9 kHz to the 10^{th} harmonic of highest fundamental frequency or 40GHz, whichever is lower.
7. No spurious emissions were detected within 20dBof the limit below 30MHz. OFS and semi-chamber comparison testing had been performed and the result came out very similar. (KDB 414788)

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.

Conclusion: PASS

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)
17951.600	40.32	-29.59	45.95	23.96	54.00	13.68	H
17945.000	40.19	-29.59	45.95	23.83	54.00	13.81	H
14496.000	35.11	-29.56	41.90	22.77	54.00	18.89	V
14476.700	34.93	-29.56	41.90	22.59	54.00	19.07	V
11867.000	33.28	-32.73	39.15	26.86	54.00	20.72	V
11853.800	33.25	-32.73	39.15	26.83	54.00	20.75	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)
17959.300	40.18	-29.59	45.95	23.82	54.00	13.82	H
17951.000	40.15	-29.59	45.95	23.79	54.00	13.85	V
14471.200	35.30	-29.56	41.90	22.96	54.00	18.70	V
14481.100	35.30	-29.56	41.90	22.96	54.00	18.70	V
11915.900	33.58	-32.53	39.10	27.01	54.00	20.42	V
11397.200	33.37	-32.58	39.00	26.95	54.00	20.63	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)
17948.800	40.39	-29.59	45.95	24.03	54.00	13.61	H
17948.300	40.28	-29.59	45.95	23.92	54.00	13.72	V
14490.500	35.14	-29.56	41.90	22.80	54.00	18.86	V
13308.500	35.12	-31.40	40.60	25.92	54.00	18.88	V
11857.600	33.51	-32.73	39.15	27.09	54.00	20.49	V
11908.200	33.45	-32.53	39.10	26.88	54.00	20.55	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)
17932.300	40.38	-29.59	45.95	24.02	54.00	13.62	H
17952.700	40.28	-29.59	45.95	23.92	54.00	13.72	V
14498.100	35.25	-29.56	41.90	22.91	54.00	18.75	H
14477.200	35.18	-29.56	41.90	22.84	54.00	18.82	V
11903.200	33.37	-32.53	39.10	26.80	54.00	20.63	H
11897.200	33.30	-32.53	39.10	26.73	54.00	20.70	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)
17946.700	40.23	-29.59	45.95	23.87	54.00	13.77	V
17939.000	40.15	-29.59	45.95	23.79	54.00	13.85	V
14472.300	35.39	-29.56	41.90	23.05	54.00	18.61	V
14487.100	35.36	-29.56	41.90	23.02	54.00	18.64	H
11599.600	33.46	-32.72	39.20	26.98	54.00	20.54	V
11875.200	33.46	-32.73	39.15	27.04	54.00	20.54	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)
17974.700	40.57	-29.59	45.95	24.21	54.00	13.43	V
17942.200	40.11	-29.59	45.95	23.75	54.00	13.89	V
14481.600	35.08	-29.56	41.90	22.74	54.00	18.92	V
14478.900	35.06	-29.56	41.90	22.72	54.00	18.94	V
11884.500	34.04	-32.53	39.10	27.47	54.00	19.96	V
11908.800	33.57	-32.53	39.10	27.00	54.00	20.43	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)
17960.400	40.42	-29.59	45.95	24.06	54.00	13.58	V
17940.000	40.09	-29.59	45.95	23.73	54.00	13.91	V
14478.900	35.34	-29.56	41.90	23.00	54.00	18.66	H
14482.200	35.34	-29.56	41.90	23.00	54.00	18.66	H
11907.100	33.58	-32.53	39.10	27.01	54.00	20.42	V
11934.000	33.38	-32.42	39.05	26.75	54.00	20.62	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)
17948.8	40.31	-29.59	45.95	23.95	54	13.69	V
17941.7	40.11	-29.59	45.95	23.75	54	13.89	V
14478.9	35.32	-29.56	41.9	22.98	54	18.68	V
14475.6	35.26	-29.56	41.9	22.92	54	18.74	H
11872.5	33.74	-32.73	39.15	27.32	54	20.26	V
11895.5	33.51	-32.53	39.1	26.94	54	20.49	V

802.11ac-VHT20

Channel 149

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17943.900	40.35	-29.59	45.95	23.99	54.00	13.65	V
17967.500	40.15	-29.59	45.95	23.79	54.00	13.85	V
14474.500	35.42	-29.56	41.90	23.08	54.00	18.58	H
14479.500	35.39	-29.56	41.90	23.05	54.00	18.61	V
11892.200	33.67	-32.53	39.10	27.10	54.00	20.33	V
11912.000	33.57	-32.53	39.10	27.00	54.00	20.43	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)
17954.900	40.43	-29.59	45.95	24.07	54.00	13.57	V
17957.700	40.42	-29.59	45.95	24.06	54.00	13.58	H
14473.400	35.33	-29.56	41.90	22.99	54.00	18.67	V
13305.800	35.28	-31.40	40.60	26.08	54.00	18.72	V
11402.800	33.54	-32.58	39.00	27.12	54.00	20.46	V
11918.600	33.52	-32.53	39.10	26.95	54.00	20.48	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)
17969.200	40.66	-29.59	45.95	24.30	54.00	13.34	H
17930.700	40.46	-29.59	45.95	24.10	54.00	13.54	V
14475.600	35.48	-29.56	41.90	23.14	54.00	18.52	H
14483.300	35.35	-29.56	41.90	23.01	54.00	18.65	H
11860.900	33.42	-32.73	39.15	27.00	54.00	20.58	V
11862.000	33.41	-32.73	39.15	26.99	54.00	20.59	V

802.11ac-VHT40

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)
17958.800	40.17	-29.59	45.95	23.81	54.00	13.83	H
17966.500	40.15	-29.59	45.95	23.79	54.00	13.85	V
14471.800	35.44	-29.56	41.90	23.10	54.00	18.56	V
14499.800	35.22	-29.56	41.90	22.88	54.00	18.78	H
11420.400	33.52	-32.58	39.00	27.10	54.00	20.48	V
11853.800	33.40	-32.73	39.15	26.98	54.00	20.60	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)
17955.5	40.86	-29.59	45.95	24.5	54	13.14	V
17948.8	40.51	-29.59	45.95	24.15	54	13.49	H
14472.9	35.45	-29.56	41.9	23.11	54	18.55	V
14491.5	35.41	-29.56	41.9	23.07	54	18.59	H
11923	33.52	-32.53	39.1	26.95	54	20.48	V
11406.6	33.51	-32.58	39	27.09	54	20.49	V

802.11ac-VHT80

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)
17885.600	40.38	-29.59	45.95	24.02	54.00	13.62	V
17950.500	40.32	-29.59	45.95	23.96	54.00	13.68	H
13309.600	35.63	-31.40	40.60	26.43	54.00	18.37	V
14470.100	35.29	-29.56	41.90	22.95	54.00	18.71	V
11821.900	33.41	-32.09	39.20	26.30	54.00	20.59	V
11891.700	33.23	-32.53	39.10	26.66	54.00	20.77	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)
17961.500	50.40	-29.59	45.95	34.04	74.00	23.60	V
17945.000	50.19	-29.59	45.95	33.83	74.00	23.81	H
14699.500	47.31	-30.04	41.50	35.85	68.30	20.99	V
14700.000	47.07	-30.04	41.50	35.61	68.30	21.23	V
11395.600	43.90	-32.58	39.00	37.48	74.00	30.10	V
11414.900	43.81	-32.58	39.00	37.39	74.00	30.19	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)
17996.200	51.15	-29.59	45.95	34.79	74.00	22.85	V
17962.600	50.75	-29.59	45.95	34.39	74.00	23.25	H
14715.400	47.62	-30.13	41.35	36.40	68.30	20.68	H
13983.900	47.09	-30.64	41.50	36.23	68.30	21.21	H
11834.500	44.47	-32.73	39.15	38.05	74.00	29.53	V
11855.400	44.05	-32.73	39.15	37.63	74.00	29.95	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)
17990.700	51.57	-29.59	45.95	35.21	74.00	22.43	V
17948.800	50.67	-29.59	45.95	34.31	74.00	23.33	H
14663.700	48.21	-30.04	41.50	36.75	68.30	20.09	H
14690.600	47.31	-30.04	41.50	35.85	68.30	20.99	H
11890.600	44.61	-32.53	39.10	38.04	74.00	29.39	H
11518.800	44.33	-32.80	39.10	38.03	74.00	29.67	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)
17958.800	50.94	-29.59	45.95	34.58	74.00	23.06	H
17908.200	50.53	-29.59	45.95	34.17	74.00	23.47	V
14681.300	47.28	-30.04	41.50	35.82	68.30	21.02	H
14577.900	46.95	-29.14	41.90	34.19	68.30	21.35	V
11906.500	44.56	-32.53	39.10	37.99	74.00	29.44	H
11419.200	44.24	-32.58	39.00	37.82	74.00	29.76	V

Channel 157

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17934.000	51.17	-29.59	45.95	34.81	74.00	22.83	V
17941.700	51.06	-29.59	45.95	34.70	74.00	22.94	V
14703.300	47.72	-30.13	41.35	36.50	68.30	20.58	H
14606.000	46.89	-30.67	41.70	35.86	68.30	21.41	H
11380.800	44.59	-33.31	38.85	39.05	74.00	29.41	H
11593.000	44.32	-32.72	39.20	37.84	74.00	29.68	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)
17958.200	51.89	-29.59	45.95	35.53	74.00	22.11	V
17948.300	51.30	-29.59	45.95	34.94	74.00	22.70	H
14683.500	47.59	-30.04	41.50	36.13	68.30	20.71	H
14687.400	47.32	-30.04	41.50	35.86	68.30	20.98	V
11887.300	44.85	-32.53	39.10	38.28	74.00	29.15	V
11428.000	44.81	-32.58	39.00	38.39	74.00	29.19	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)
17953.800	50.65	-29.59	45.95	34.29	74.00	23.35	V
17970.800	50.63	-29.59	45.95	34.27	74.00	23.37	H
14170.900	46.93	-30.42	41.70	35.65	68.30	21.37	V
14599.900	46.69	-29.14	41.90	33.93	68.30	21.61	V
11905.500	44.31	-32.53	39.10	37.74	74.00	29.69	H
11425.300	44.26	-32.58	39.00	37.84	74.00	29.74	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)
17962	50.78	-29.59	45.95	34.42	74	23.22	V
17958.2	50.63	-29.59	45.95	34.27	74	23.37	H
13917.4	47.4	-30.81	41.4	36.81	68.3	20.9	V
14708.2	47.39	-30.13	41.35	36.17	68.3	20.91	H
11900	44.01	-32.53	39.1	37.44	74	29.99	V
11876.9	43.92	-32.73	39.15	37.5	74	30.08	H

802.11ac-VHT20

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)
17957.700	51.34	-29.59	45.95	34.98	74.00	22.66	V
17959.300	50.82	-29.59	45.95	34.46	74.00	23.18	H
14831.500	47.17	-30.04	41.05	36.16	68.30	21.13	V
14557.500	47.05	-29.14	41.90	34.29	68.30	21.25	V
11850.500	44.26	-32.73	39.15	37.84	74.00	29.74	V
11909.300	44.22	-32.53	39.10	37.65	74.00	29.78	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)
17950.000	50.97	-29.59	45.95	34.61	74.00	23.03	V
17953.800	50.66	-29.59	45.95	34.30	74.00	23.34	H
14590.000	47.32	-29.14	41.90	34.56	68.30	20.98	V
14558.100	47.07	-29.14	41.90	34.31	68.30	21.23	H
11391.800	44.23	-32.58	39.00	37.81	74.00	29.77	V
11902.100	44.22	-32.53	39.10	37.65	74.00	29.78	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)
17937.300	51.21	-29.59	45.95	34.85	74.00	22.79	H
17961.000	50.66	-29.59	45.95	34.30	74.00	23.34	H
14686.800	48.10	-30.04	41.50	36.64	68.30	20.20	H
14684.600	47.31	-30.04	41.50	35.85	68.30	20.99	H
11885.600	45.07	-32.53	39.10	38.50	74.00	28.93	V
11623.300	44.42	-32.72	39.20	37.94	74.00	29.58	V

802.11ac-VHT40

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)
17973.600	51.29	-29.59	45.95	34.93	74.00	22.71	H
17941.700	50.81	-29.59	45.95	34.45	74.00	23.19	V
14698.400	47.90	-30.04	41.50	36.44	68.30	20.40	H
14145.600	47.46	-30.93	41.70	36.68	68.30	20.84	H
11601.300	44.12	-32.72	39.20	37.64	74.00	29.88	V
11919.200	43.88	-32.53	39.10	37.31	74.00	30.12	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)
17957.7	51.04	-29.59	45.95	34.68	74	22.96	H
17948.3	50.75	-29.59	45.95	34.39	74	23.25	V
14711.5	47.91	-30.13	41.35	36.69	68.3	20.39	V
14695.6	47.5	-30.04	41.5	36.04	68.3	20.8	V
11889.5	43.9	-32.53	39.1	37.33	74	30.1	H
11411	43.86	-32.58	39	37.44	74	30.14	V

802.11ac-VHT80

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)
17871.300	50.80	-29.59	45.95	34.44	74.00	23.20	V
17944.500	50.68	-29.59	45.95	34.32	74.00	23.32	V
14686.200	46.98	-30.04	41.50	35.52	68.30	21.32	V
14692.300	46.95	-30.04	41.50	35.49	68.30	21.35	V
11616.700	44.78	-32.72	39.20	38.30	74.00	29.22	V
11391.200	43.92	-32.58	39.00	37.50	74.00	30.08	V

Band edge compliance

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 VHT20	5745 MHz	Fig.16	P
	5825 MHz	Fig.17	P
802.11ac VHT40	5755 MHz	Fig.18	P
	5795 MHz	Fig.19	P
802.11ac VHT80	5775 MHz	Fig.20 Fig.21	P

Conclusion: PASS

Test graphs as below:

Conclusion: PASS

Test graphs as below:

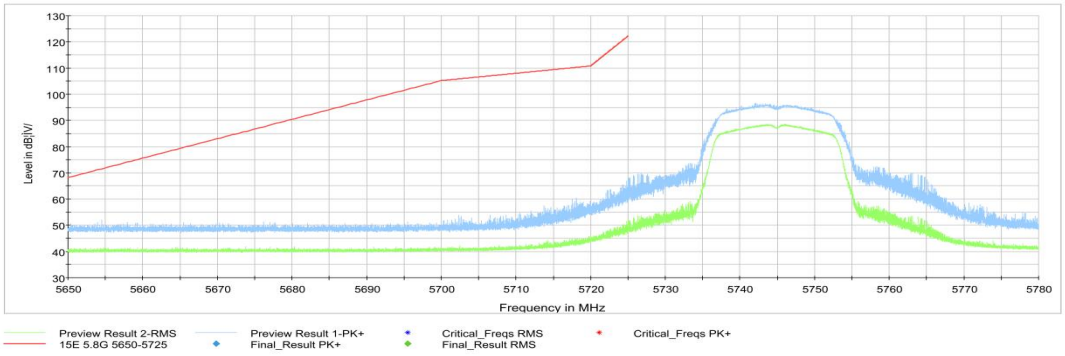


Fig. 10 Band Edges (802.11a Ch149,5745MHz)

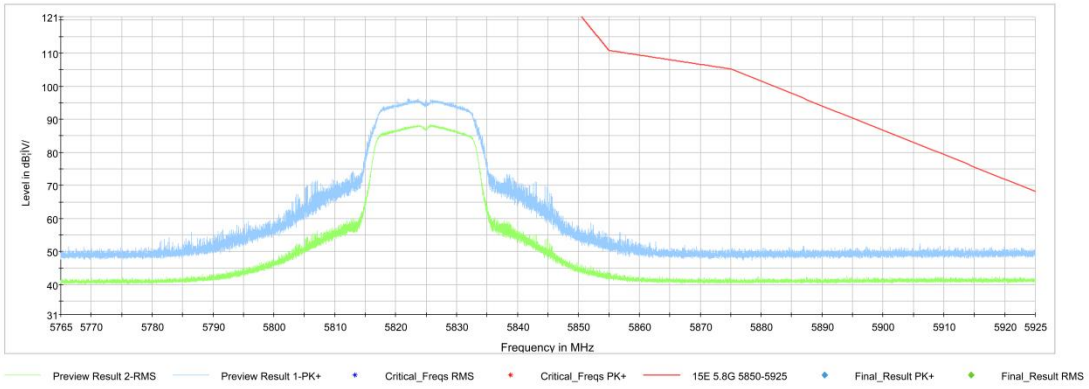


Fig. 11 Band Edges (802.11a Ch165, 5825MHz)

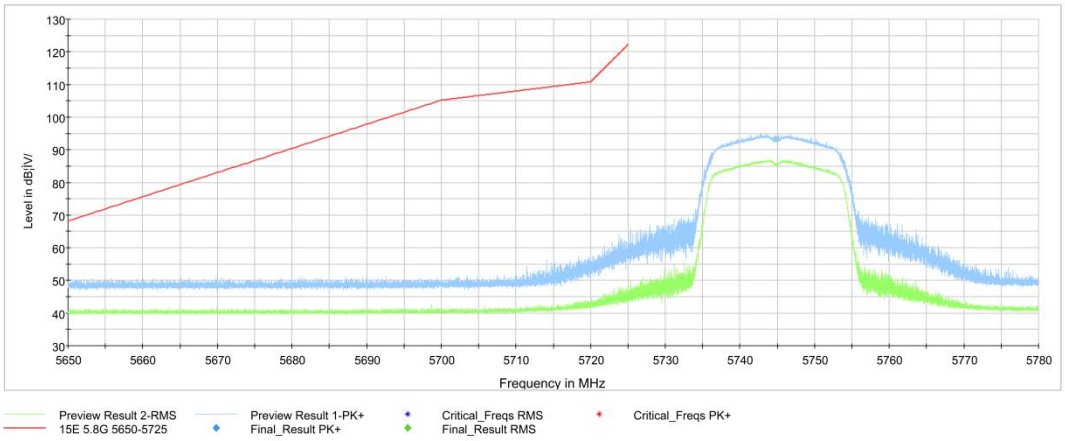


Fig. 12 Band Edges (802.11n-HT20 Ch149, 5745MHz)

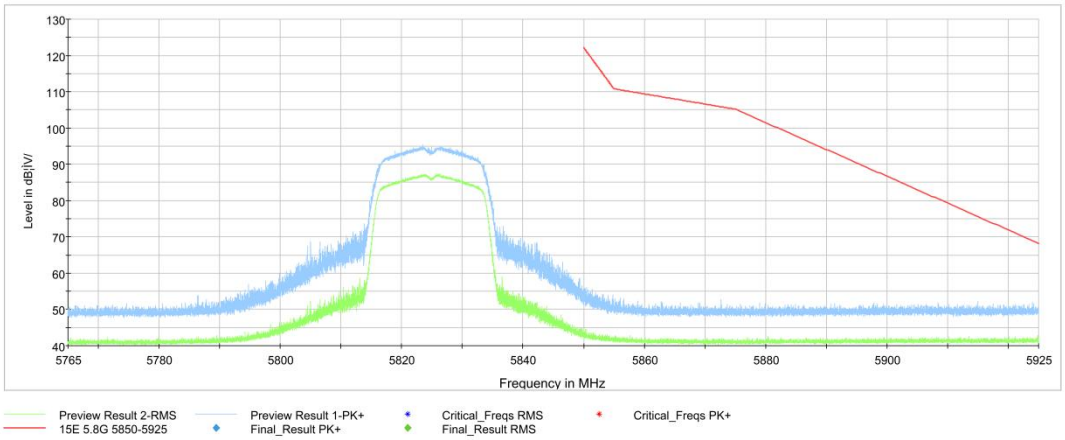


Fig. 13 Band Edges (802.11n-HT20 Ch165, 5825MHz)

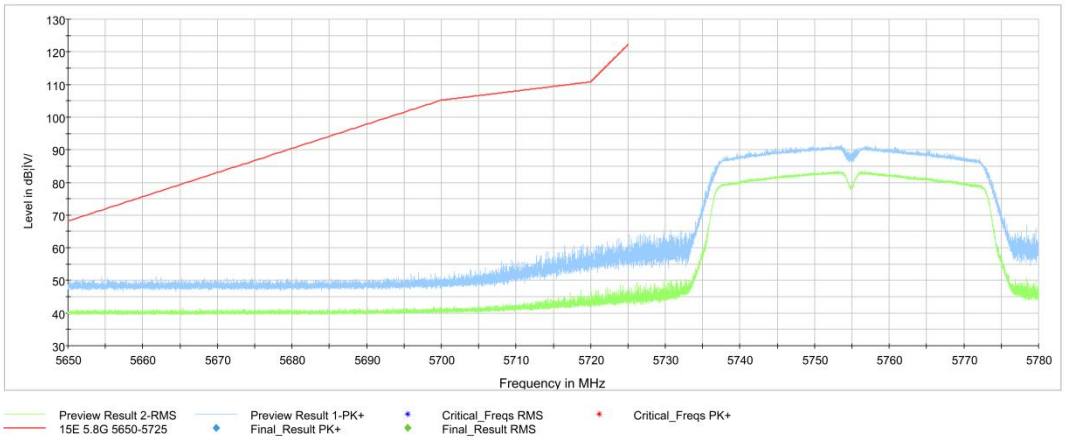


Fig. 14 Band Edges (802.11n-HT40 Ch151, 5755MHz)

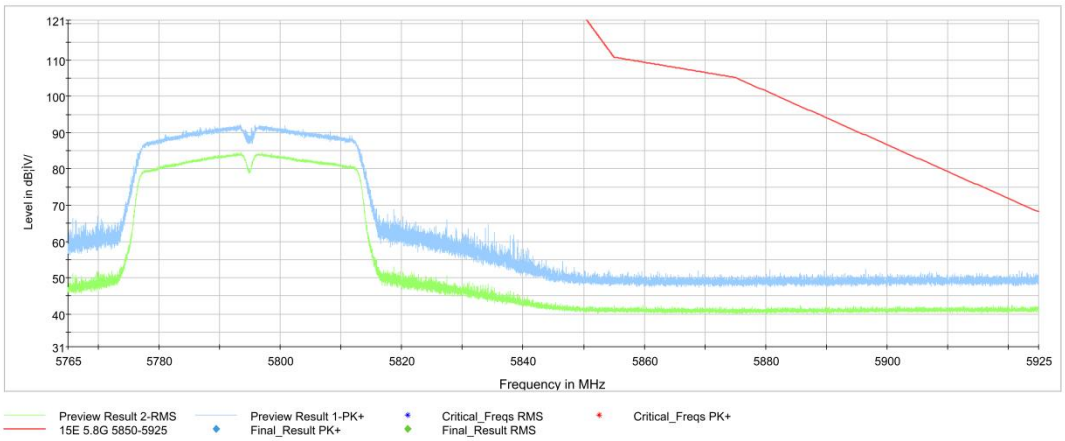


Fig. 15 Band Edges (802.11n-HT40 Ch159, 5795MHz)

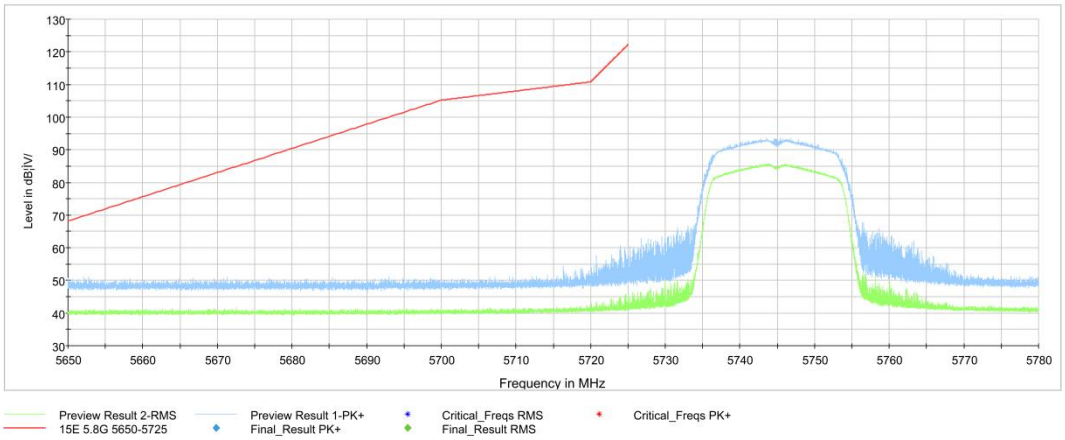


Fig. 16 Band Edges (802.11ac-VHT20 Ch149, 5745MHz)

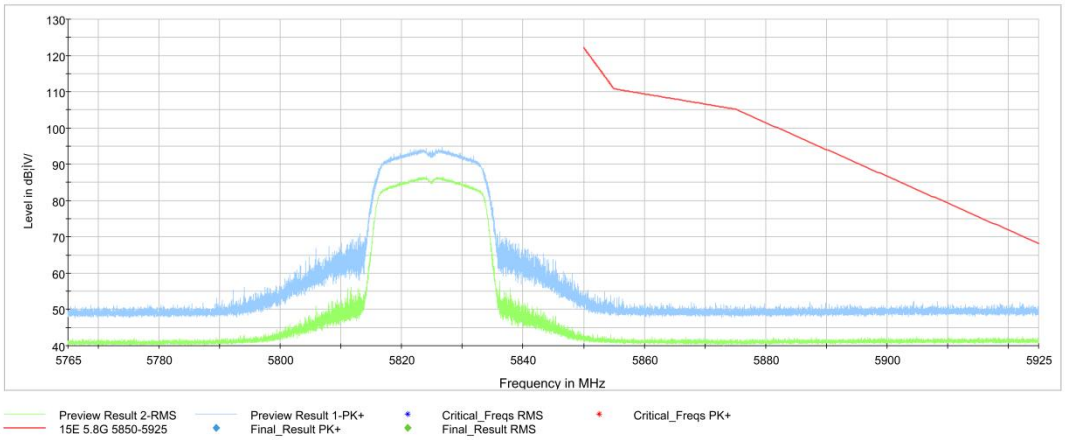


Fig. 17 Band Edges (802.11ac-VHT20 Ch165, 5825MHz)

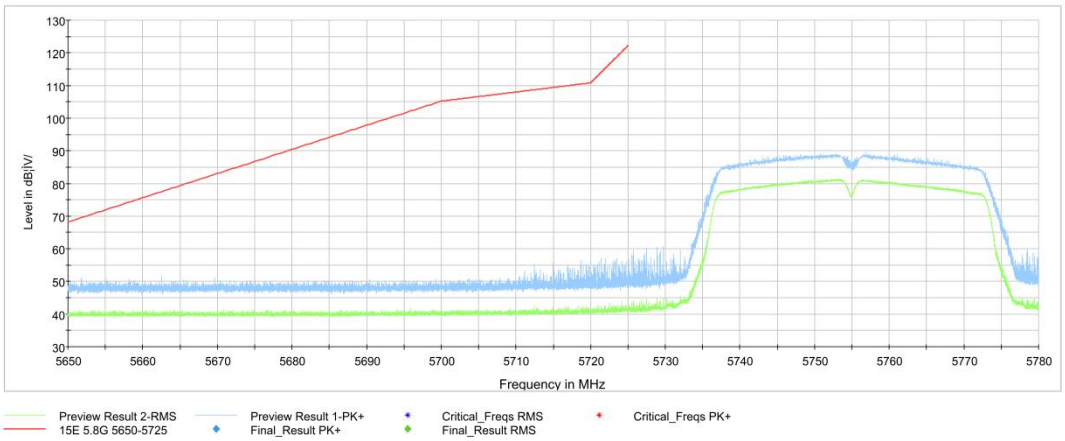


Fig. 18 Band Edges (802.11ac-VHT40 Ch151, 5755MHz)

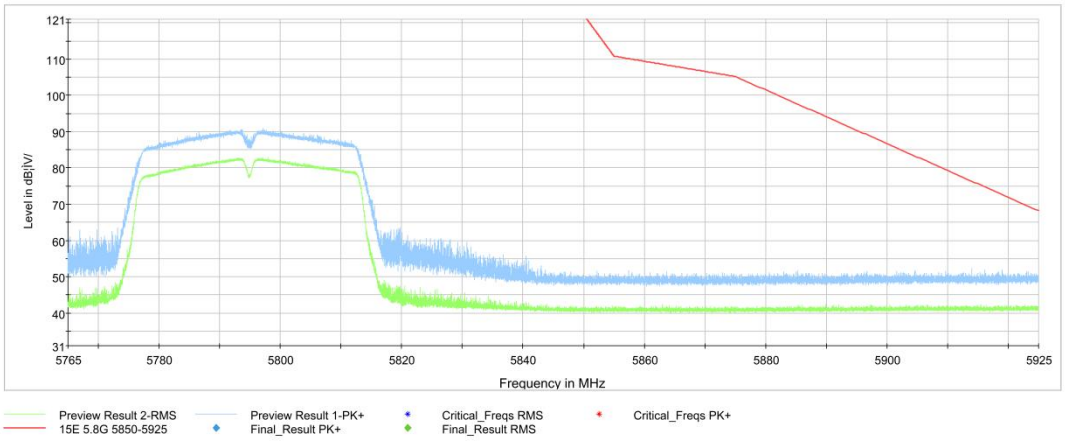


Fig. 19 Band Edges (802.11ac-VHT40 Ch159, 5795MHz)

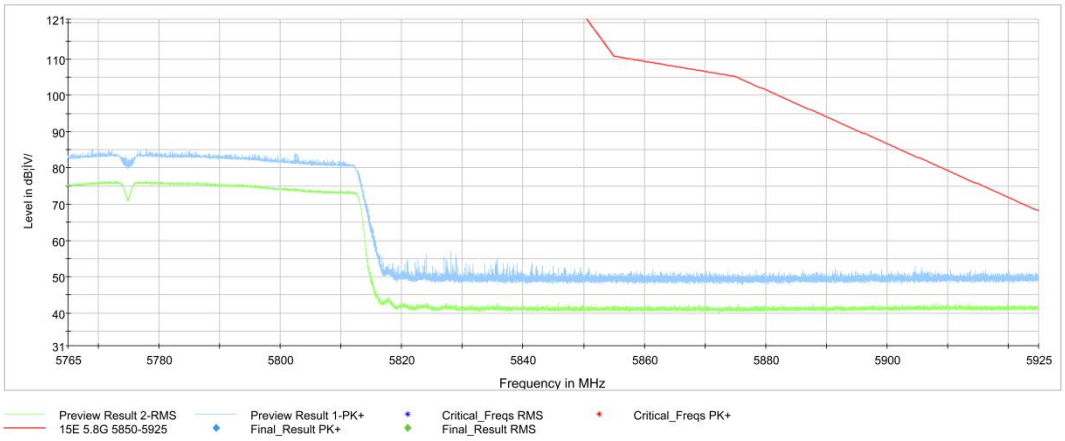


Fig. 20 Band Edges (802.11ac-VHT80 Ch155, 5775MHz)

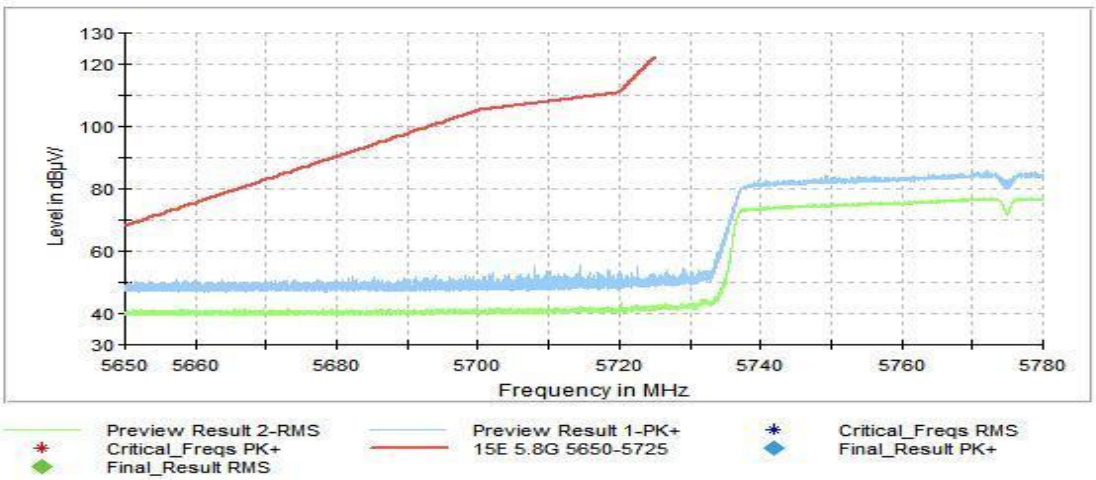


Fig. 21 Band Edges (802.11ac-VHT80, 5775MHz)

A.6. AC Powerline Conducted Emission

A.6.1 Summary

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section

A.6.2 Method of Measurement

See Clause 6.2 of ANSI C63.10 specifically.

See Clause 4 and Clause 5 of ANSI C63.10 generally.

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detector of the test receiver: Quasi-Peak / Average Detector.

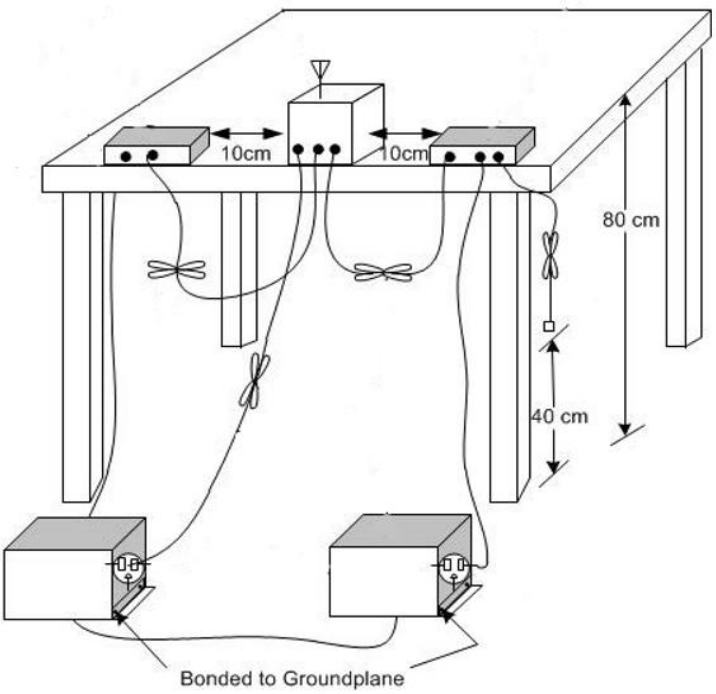
The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/IF bandwidth
0.15-30	9kHz

A.6.3 Test Condition

Voltage（V）	Frequency（Hz）
120	60

A.6.4 Test setup



A.6.5 Measurement Result and limit

Wi-Fi (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		Wi-Fi	Idle	
0.15 to 0.5	66 to 56	Fig.A.6.1	Fig. A.6.2	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.				

Wi-Fi (Average Limit)

Frequency range (MHz)	Average Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		Wi-Fi	Idle	
0.15 to 0.5	56 to 46	Fig.A.6.1	Fig. A.6.2	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:

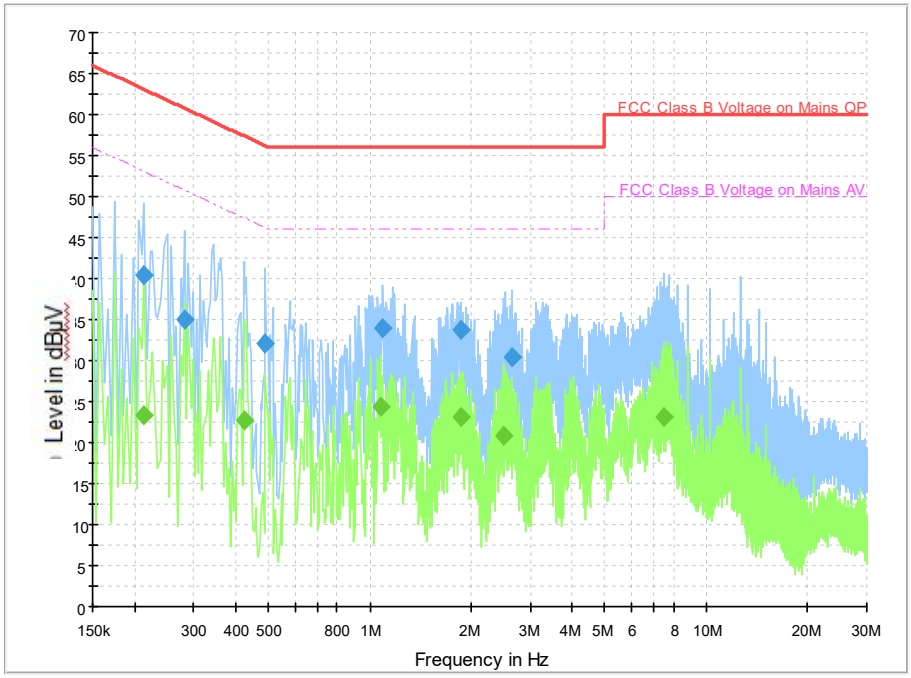


Fig.A.6.1. AC Powerline Conducted Emission-TX

Measurement Result 1:

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.214000	40.5	2000.0	9.000	On	N	19.7	22.5	63.0
0.282000	35.0	2000.0	9.000	On	N	19.7	25.7	60.8
0.490000	32.2	2000.0	9.000	On	L1	19.7	24.0	56.2
1.090000	34.0	2000.0	9.000	On	L1	19.7	22.0	56.0
1.866000	33.8	2000.0	9.000	On	L1	19.6	22.2	56.0
2.638000	30.4	2000.0	9.000	On	L1	19.6	25.6	56.0

Measurement Result 2:

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.214000	23.4	2000.0	9.000	On	N	19.7	29.7	53.0
0.422000	22.7	2000.0	9.000	On	L1	19.7	24.7	47.4
1.074000	24.3	2000.0	9.000	On	L1	19.7	21.7	46.0
1.866000	23.1	2000.0	9.000	On	L1	19.6	22.9	46.0
2.506000	20.9	2000.0	9.000	On	L1	19.6	25.1	46.0
7.490000	23.1	2000.0	9.000	On	L1	19.7	26.9	50.0

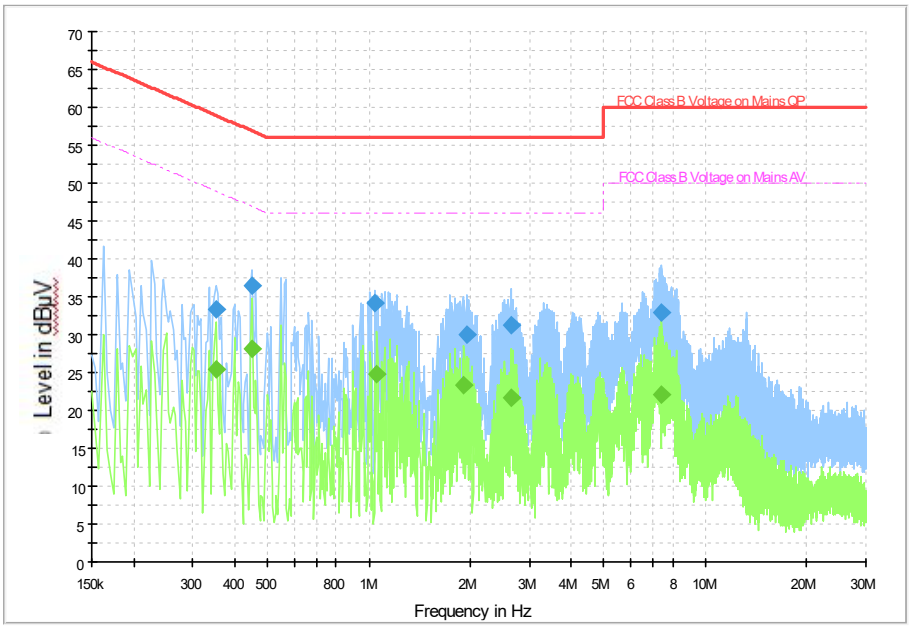


Fig.A.6.2. AC Powerline Conducted Emission-Idle

Measurement Result 1:

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.350000	33.3	2000.0	9.000	On	L1	19.7	25.7	59.0
0.450000	36.4	2000.0	9.000	On	L1	19.7	20.4	56.9
1.046000	34.1	2000.0	9.000	On	L1	19.7	21.9	56.0
1.950000	29.9	2000.0	9.000	On	L1	19.6	26.1	56.0
2.642000	31.3	2000.0	9.000	On	L1	19.6	24.7	56.0
7.434000	32.9	2000.0	9.000	On	L1	19.7	27.1	60.0

Measurement Result 2:

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.350000	25.4	2000.0	9.000	On	L1	19.7	23.6	49.0
0.450000	28.1	2000.0	9.000	On	L1	19.7	18.8	46.9
1.058000	24.8	2000.0	9.000	On	L1	19.7	21.2	46.0
1.918000	23.3	2000.0	9.000	On	L1	19.6	22.7	46.0
2.642000	21.7	2000.0	9.000	On	L1	19.6	24.3	46.0
7.434000	22.1	2000.0	9.000	On	L1	19.7	27.9	50.0

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

Accredited Laboratory

A2LA has accredited

TELECOMMUNICATION TECHNOLOGY LABS, CAICT

Beijing, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. 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 April 2017*).

Presented this 26th day of June 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2024

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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