



FCC PART 15C TEST REPORT No.23T04Z80421-29

for

TCL Communication Ltd.

GSM/UMTS/LTE/NR Mobile phone

T614SP

FCC ID: 2ACCJH179

with

Hardware Version: 06

Software Version: 2BSH

Issued Date: 2023-12-25

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
23T04Z80421-29	Rev.0	1st edition	2023-12-25

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

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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 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: 2023-11-02

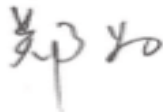
Testing End Date: 2023-12-22

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	T614SP
FCC ID	2ACCJH179
WLAN Frequency Band	ISM Band: 5725MHz~5850MHz
Type of modulation	OFDM
Nominal Voltage	3.85V
Extreme High Voltage	4.4V
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
UT15a	/	06	2BSH	2023-12-08
UT14a	/	06	2BSH	2023-11-01

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

UT15a is used for Conduction test, UT14a is used for Radiation test.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Model	Manufacture
AE1	Battery1	TLp049FA	TMB
AE2	Battery2	TLp049F7	Veken
AE3	Charger1	QC13US	JUWEI
AE4	USB Cable1	CDA0000256C1	JUWEI
AE5	USB Cable2	CDA0000256C2	SHENGHUA

*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;	2021
	15.209 Radiated emission limits, general requirements;	
	15.407 General technical requirements	
ANSI C63.10	Methods of Measurement of Radio-Noise Emissions from	
	Low-Voltage Electrical and Electronic Equipment in the	2013
	Range of 9 kHz to 40 GHz	
UNII: KDB 789033	General U-NII Test Procedures New Rules v02r01	2017-12
D02		

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 Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.407 (a)	/	BR
Peak Power Spectral Density	15.407 (a)	/	BR
Occupied 6dB Bandwidth	15.407 (e)	/	BR
Band Edges Compliance - Conducted& Radiated	15.407 (b)	/	BR
Transmitter Spurious Emission - Radiated	15.407, 15.205, 15.209	/	BR
AC Powerline Conducted Emission	15.107, 15.207	/	BR

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
BR	BR Re-use test data from basic model report

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.

The Equipment Under Test (EUT) model T614SP (FCC ID: 2ACCJH179) is a variant product of T614D (FCC ID: 2ACCJH179), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, all results are derived from test report

No.23T04Z80421-06.

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°C
Voltage	3.85V
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	LISN	ENV216	101200	Rohde & Schwarz	1 year	2024-06-05
3	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2024-02-21
4	Attenuator	10dB/2W	/	Rosenberger	/	/
5	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESW44	103023	R&S	13 Months	2024-07-08
2	EMI Antenna	VULB 9163	01222	SCHWARZBECK	13 Months	2024-02-28
3	EMI Antenna	3115	6914	ETS-Lindgren	13 Months	2024-04-25
4	EMI Antenna	3116	2661	ETS-Lindgren	13 Months	2024-01-30

Test Software

Test Item	Test Software and Version	Software Vendor
Radiated Continuous Emission	EMC32 V10.60.20	R&S
Conducted Emission	EMC32 V8.53.0	R&S

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)
$30\text{MHz} \leq f \leq 2\text{GHz}$	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

8.6. Radiated Unwanted Emission

Frequency Range	Uncertainty(dB)
9kHz-30MHz	4.92
$30\text{MHz} \leq f \leq 1\text{GHz}$	4.72
$1\text{GHz} \leq f \leq 18\text{GHz}$	4.84
$18\text{GHz} \leq f \leq 40\text{GHz}$	5.12

8.7. AC Power-line Conducted Emission

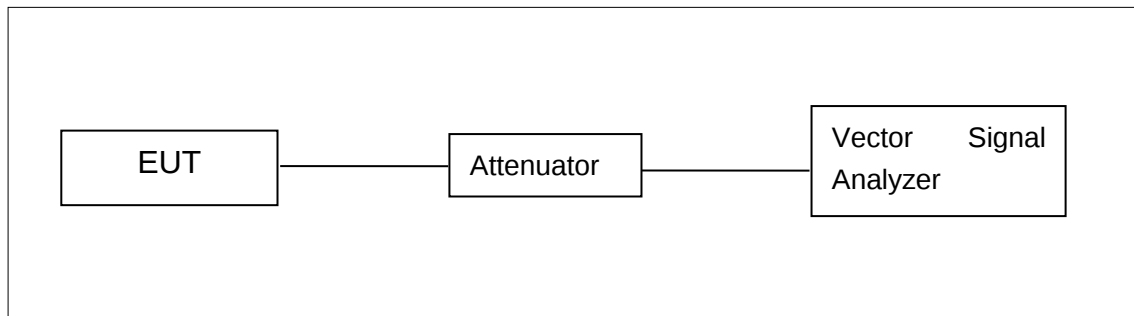
Measurement Uncertainty : 3.08dB,k=2

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 -4.88dBi and the value is supplied by the applicant or manufacturer.

A.2.2. Maximum Average Output Power-Conducted

EUT ID: UT15a

Measurement Results:

802.11a mode

Mode	Data Rate (Mbps)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11a	6	17.03	17.04	17.23

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

802.11n-HT20 mode

Mode	Data Rate (Index)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11n (20MHz)	MCS0	17.92	17.98	17.87

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

this condition.

802.11ac-HT20 mode

Mode	Data Rate (Index)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11ac (20MHz)	MCS0	17.96	17.99	17.83

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	14.96	14.89

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

802.11ac-HT40 mode

Mode	Data Rate (Index)	Test Result (dBm)	
		5755MHz (Ch151)	5795MHz (Ch159)
802.11ac (40MHz)	MCS0	14.97	14.98

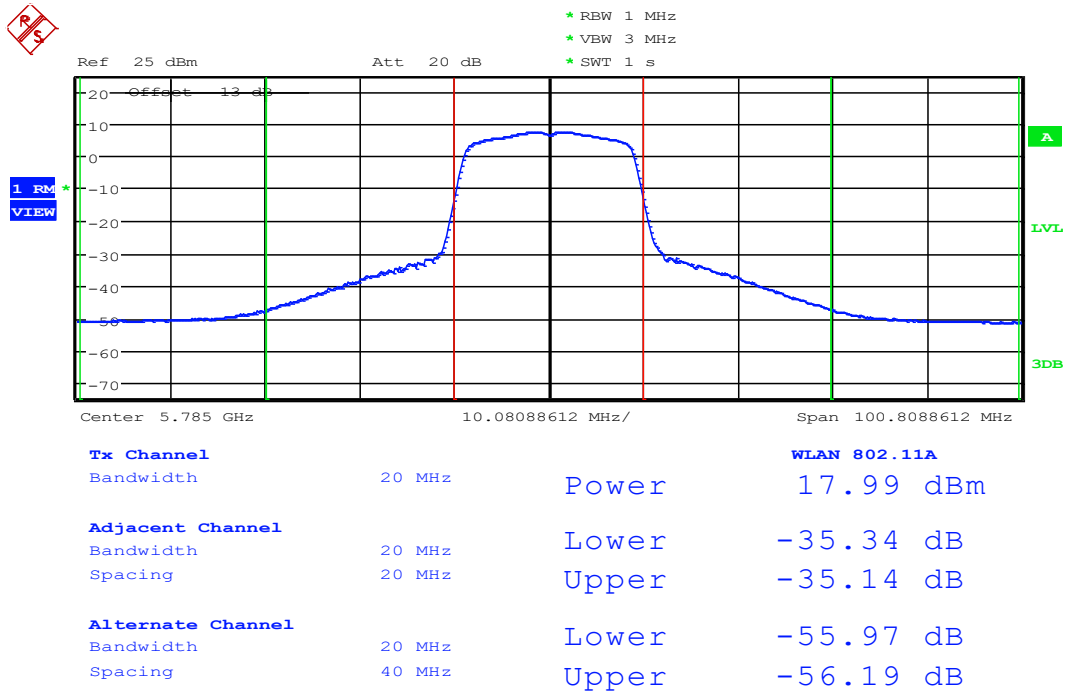
The data rate MCS0 is selected as worst condition, and the following cases are performed with this condition.

802.11ac-HT80 mode

Mode	Data Rate (Index)	Test Result (dBm)
		5775MHz (Ch155)
802.11ac (80MHz)	MCS0	14.68

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%



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Maximum output Power: 11ac20 CH157

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.

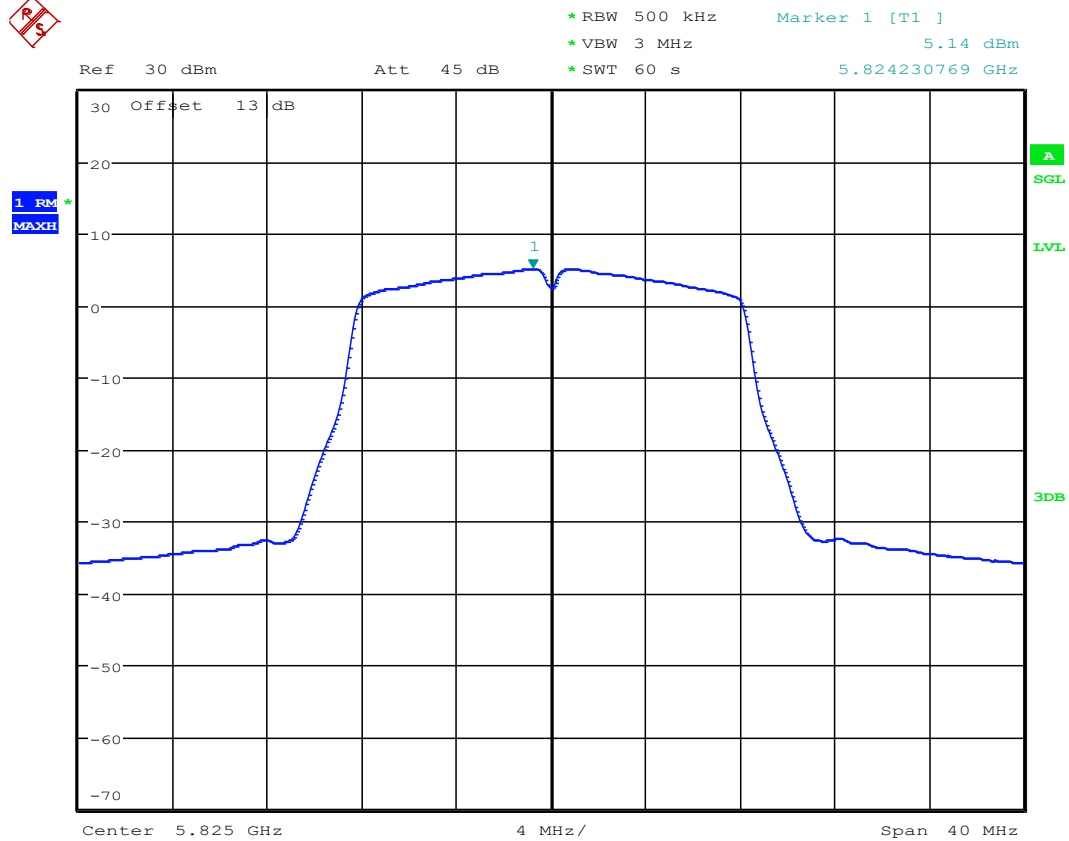
Measurement Uncertainty:

Measurement Uncertainty	0.75dB
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EUT ID: UT15a

Measurement Results:

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
802.11a	149	4.98	P
	157	5.12	P
	165	5.14	P
802.11ac HT20	149	4.91	P
	157	4.89	P
	165	4.82	P
802.11ac HT40	151	-1.14	P
	159	-1.22	P
802.11ac HT80	155	-5.10	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) $\geq 3 \times$ 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:

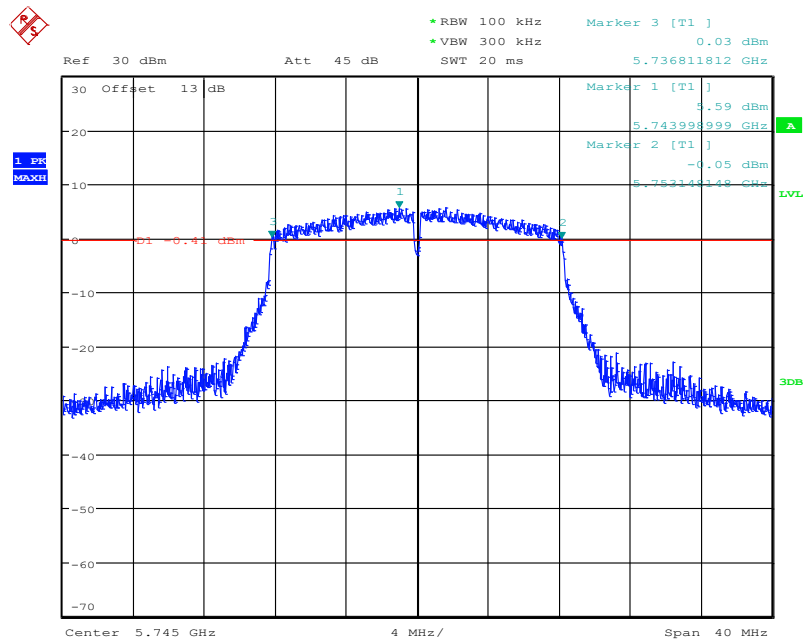
Measurement Uncertainty	60.80Hz
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EUT ID: UT15a

Measurement Result:

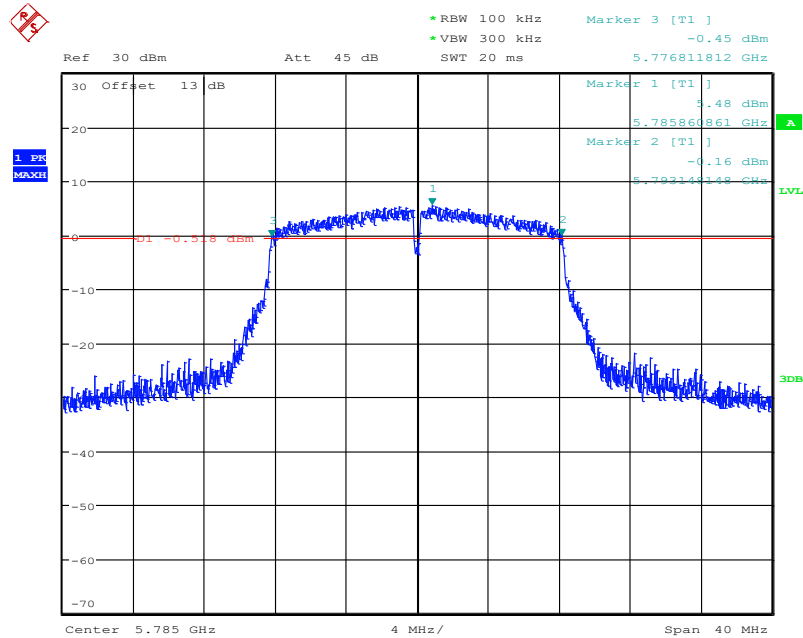
Mode	Channel	6dB Emission Bandwidth (MHz)		conclusion
802.11a	149	Fig.1	16.34	P
	157	Fig.2	16.34	P
	165	Fig.3	16.32	P
802.11ac (VHT20)	149	Fig.4	17.58	P
	157	Fig.5	17.58	P
	165	Fig.6	17.56	P
802.11ac (VHT40)	151	Fig.7	35.80	P
	159	Fig.8	36.08	P
802.11ac (VHT80)	155	Fig.9	76.32	P

Test graphs as below:



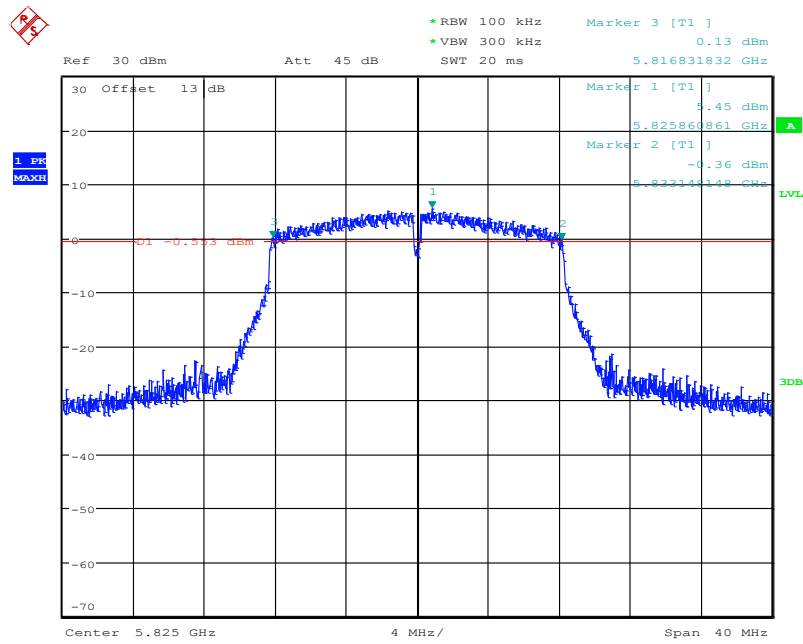
Date: 15.DEC.2023 15:35:01

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



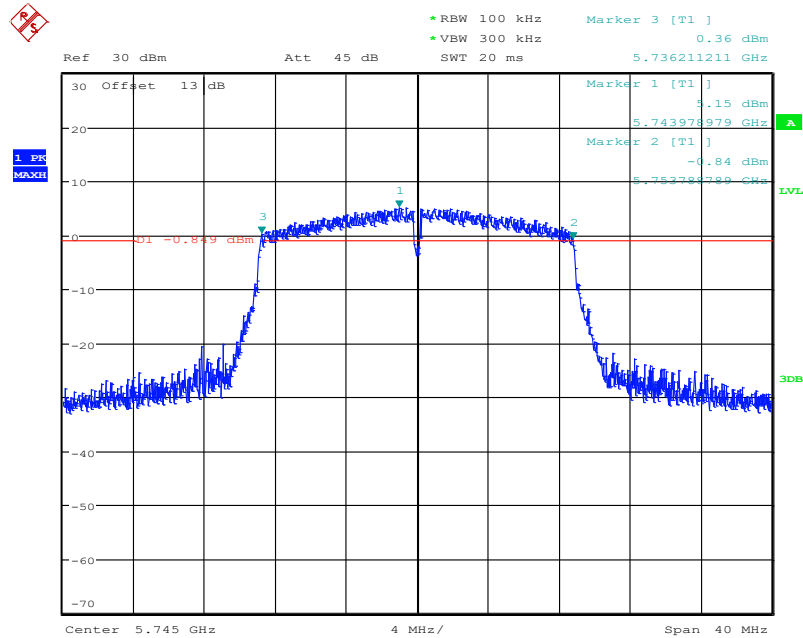
Date: 15.DEC.2023 15:35:45

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



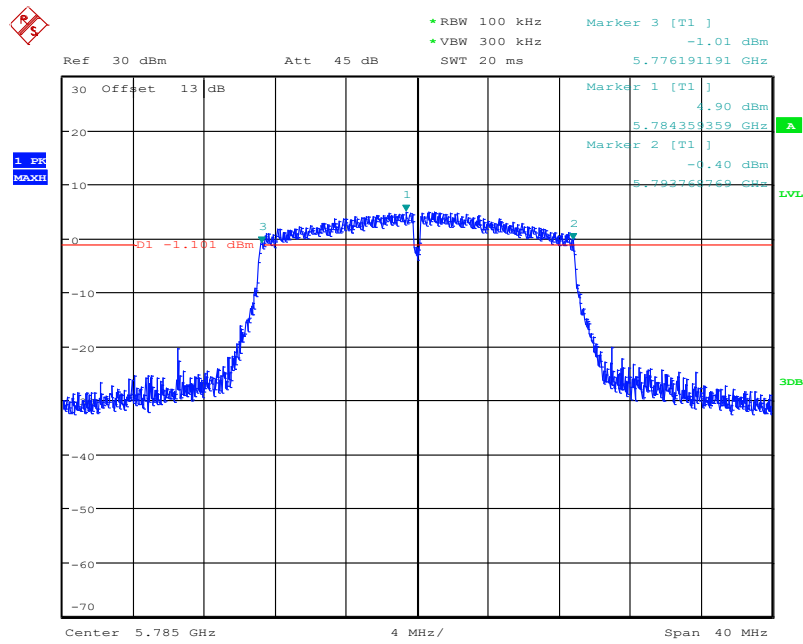
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Fig. 3 6dB Emission Bandwidth (802.11a, Ch 165)



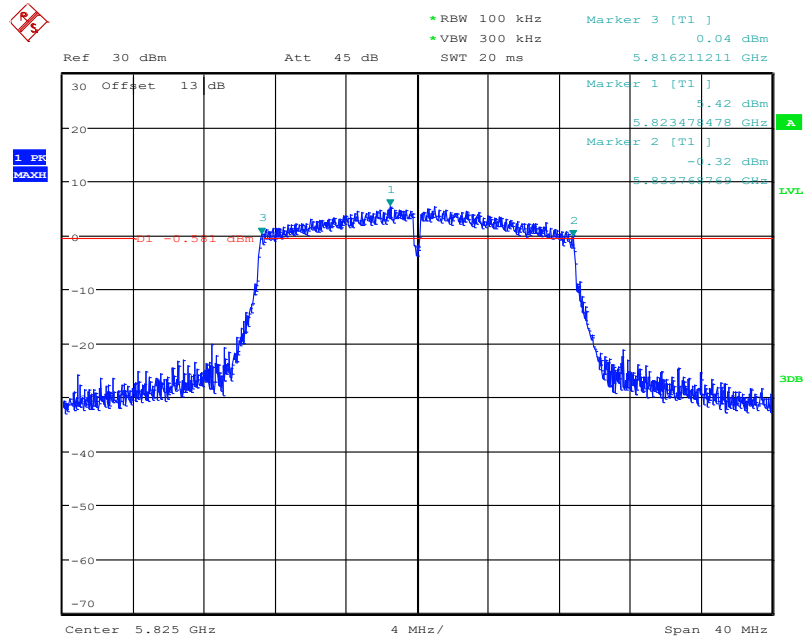
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Fig. 4 6dB Emission Bandwidth (802.11ac-VHT20, Ch 149)



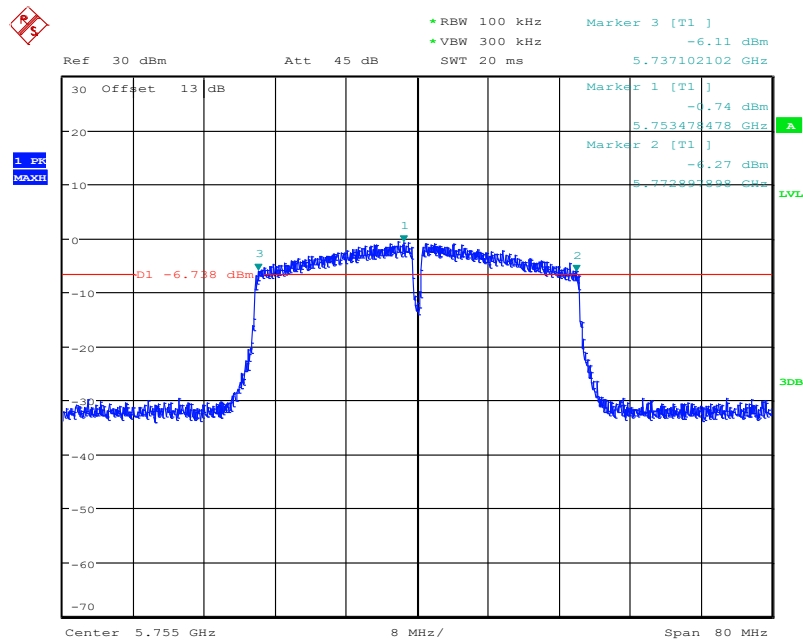
Date: 15.DEC.2023 15:39:38

Fig. 5 6dB Emission Bandwidth (802.11ac-VHT20, Ch 157)



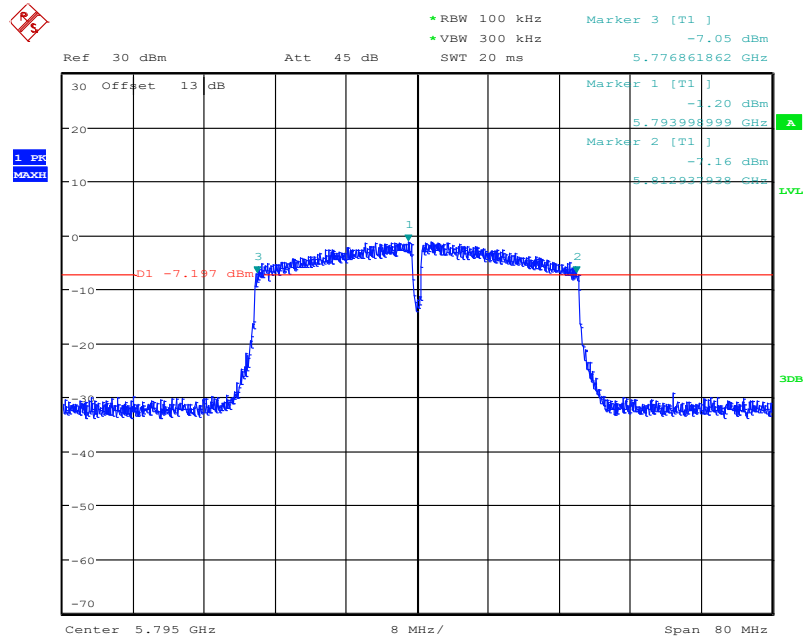
Date: 15.DEC.2023 15:40:11

Fig. 6 6dB Emission Bandwidth (802.11ac-VHT20, Ch 165)



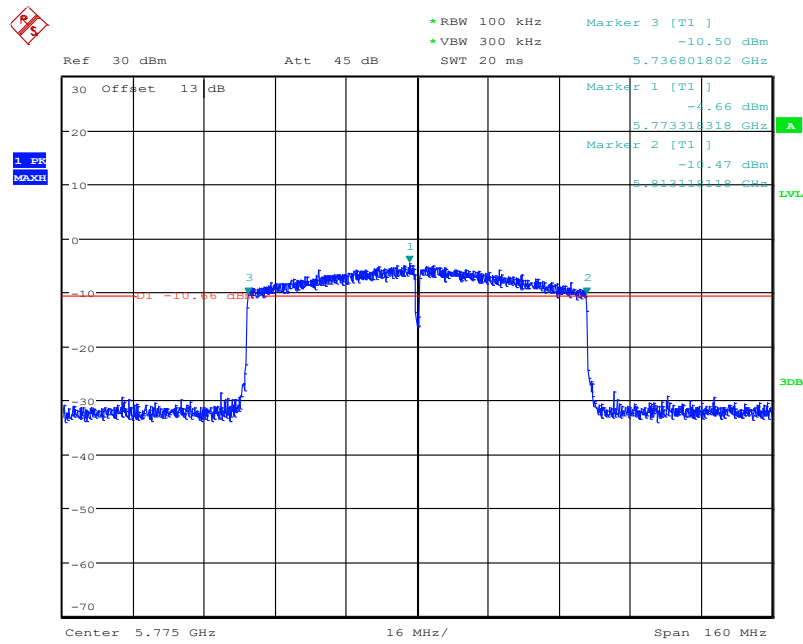
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Fig. 7 6dB Emission Bandwidth (802.11ac-VHT40, Ch 151)



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Fig. 8 6dB Emission Bandwidth (802.11ac-VHT40, Ch 159)



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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(μ V/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 (μ V/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

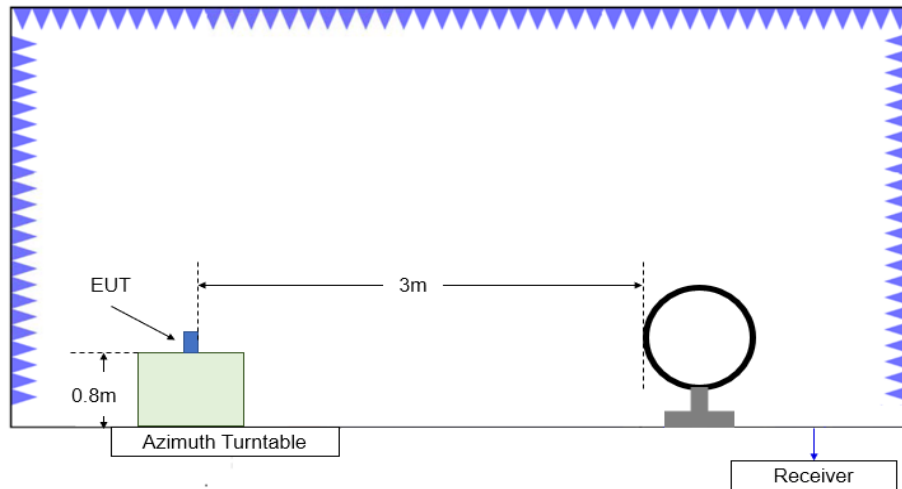


Figure A.5.1. Test Site Diagram (9kHz-30MHz)

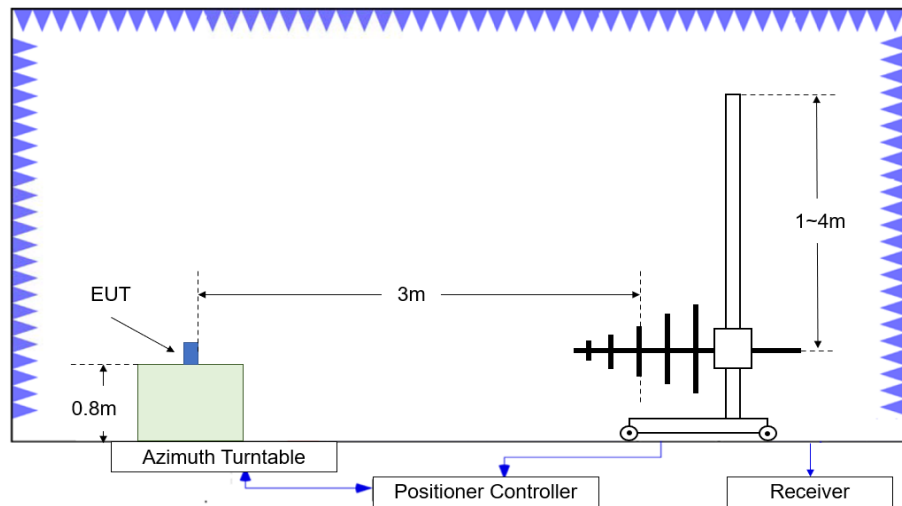


Figure A.5.2. Test Site Diagram (30MHz-1GHz)

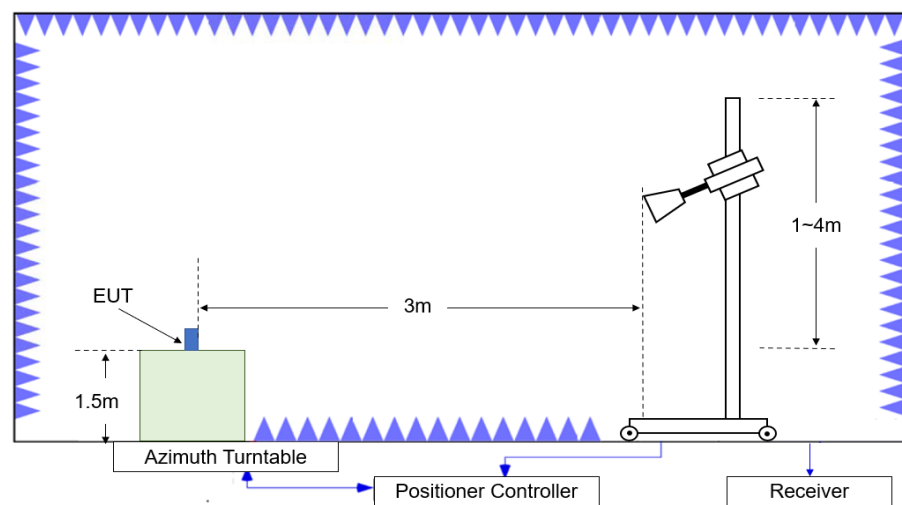


Figure A.5.3. Test Site Diagram (1GHz-40GHz)

A.5.3 Test Procedures

Radiated unwanted emissions from the EUT were measured according to ANSI C63.10 and 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 (dB μ V/m) = $P_{\text{measurement}}$ (dB μ V) + Cable Loss(dB) + Antenna Factor (dB/m)

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

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

$$E = \text{EIRP} - 20 \log(D) + 104.77$$

Where:

E is the field strength in dB μ V/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 10th harmonic of highest fundamental frequency or 40GHz, whichever is lower.
7. No spurious emissions were detected within 20dB of 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)
17981.300	42.91	-29.59	45.95	26.55	54.00	11.09	V
17992.850	42.90	-29.59	45.95	26.54	54.00	11.10	V
14481.100	38.73	-29.56	41.90	26.39	54.00	15.27	V
14489.350	38.58	-29.56	41.90	26.24	54.00	15.42	H
11744.850	36.05	-32.71	39.20	29.56	54.00	17.95	V
11764.650	36.04	-32.71	39.20	29.55	54.00	17.96	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)
17967.550	42.15	-29.59	45.95	25.79	54.00	11.85	H
17992.850	42.15	-29.59	45.95	25.79	54.00	11.85	V
14493.200	36.41	-29.56	41.90	24.07	54.00	17.59	H
14470.100	36.40	-29.56	41.90	24.06	54.00	17.60	H
11886.750	33.39	-32.53	39.10	26.82	54.00	20.61	V
11907.100	33.32	-32.53	39.10	26.75	54.00	20.68	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)
17982.950	42.20	-29.59	45.95	25.84	54.00	11.80	H
17974.700	42.08	-29.59	45.95	25.72	54.00	11.92	V
14490.450	36.99	-29.56	41.90	24.65	54.00	17.01	V
14493.200	36.94	-29.56	41.90	24.60	54.00	17.06	V
11782.800	34.18	-32.09	39.20	27.07	54.00	19.82	H
11769.600	34.02	-32.71	39.20	27.53	54.00	19.98	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)
17994.500	43.18	-29.59	45.95	26.82	54.00	10.82	H
17969.200	42.96	-29.59	45.95	26.60	54.00	11.04	V
14494.850	38.51	-29.56	41.90	26.17	54.00	15.49	H
14481.650	38.43	-29.56	41.90	26.09	54.00	15.57	V
11794.350	36.03	-32.09	39.20	28.92	54.00	17.97	V
11902.700	36.03	-32.53	39.10	29.46	54.00	17.97	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)
17960.400	42.35	-29.59	45.95	25.99	54.00	11.65	H
17993.950	42.19	-29.59	45.95	25.83	54.00	11.81	V
14493.750	36.77	-29.56	41.90	24.43	54.00	17.23	V
14482.750	36.67	-29.56	41.90	24.33	54.00	17.33	H
11880.700	33.68	-32.73	39.15	27.26	54.00	20.32	V
11905.450	33.54	-32.53	39.10	26.97	54.00	20.46	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)
17942.800	42.13	-29.59	45.95	25.77	54.00	11.87	H
17995.600	42.11	-29.59	45.95	25.75	54.00	11.89	H
14491.550	36.64	-29.56	41.90	24.30	54.00	17.36	H
14493.200	36.62	-29.56	41.90	24.28	54.00	17.38	H
11774.000	34.06	-32.71	39.20	27.57	54.00	19.94	H
11776.200	34.04	-32.71	39.20	27.55	54.00	19.96	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)
17997.250	44.34	-29.59	45.95	27.98	54.00	9.66	V
17954.900	44.27	-29.59	45.95	27.91	54.00	9.73	V
14498.150	39.51	-29.56	41.90	27.17	54.00	14.49	H
14495.950	39.24	-29.56	41.90	26.90	54.00	14.76	H
11884.000	37.37	-32.53	39.10	30.80	54.00	16.63	V
11821.300	36.77	-32.09	39.20	29.66	54.00	17.23	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)
17959.850	43.29	-29.59	45.95	26.93	54.00	10.71	V
17989.000	43.27	-29.59	45.95	26.91	54.00	10.73	H
14495.950	38.81	-29.56	41.90	26.47	54.00	15.19	H
14493.750	38.61	-29.56	41.90	26.27	54.00	15.39	H
11887.300	36.07	-32.53	39.10	29.50	54.00	17.93	H
11900.500	35.97	-32.53	39.10	29.40	54.00	18.03	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)
17960.400	43.29	-29.59	45.95	26.93	54.00	10.71	H
17960.950	43.11	-29.59	45.95	26.75	54.00	10.89	H
14490.450	38.66	-29.56	41.90	26.32	54.00	15.34	V
14498.700	38.57	-29.56	41.90	26.23	54.00	15.43	V
11877.950	36.12	-32.73	39.15	29.70	54.00	17.88	V
11887.300	36.11	-32.53	39.10	29.54	54.00	17.89	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)
17966.450	42.27	-29.59	45.95	25.91	54.00	11.73	V
17990.100	42.20	-29.59	45.95	25.84	54.00	11.80	V
14493.750	36.74	-29.56	41.90	24.40	54.00	17.26	H
14488.250	36.62	-29.56	41.90	24.28	54.00	17.38	V
11787.200	33.80	-32.09	39.20	26.69	54.00	20.20	V
11798.200	33.80	-32.09	39.20	26.69	54.00	20.20	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)
17989.000	42.46	-29.59	45.95	26.10	54.00	11.54	H
17992.300	42.44	-29.59	45.95	26.08	54.00	11.56	H
14493.200	37.00	-29.56	41.90	24.66	54.00	17.00	H
14484.400	36.91	-29.56	41.90	24.57	54.00	17.09	V
11879.600	33.93	-32.73	39.15	27.51	54.00	20.07	V
11873.000	33.88	-32.73	39.15	27.46	54.00	20.12	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)
17985.150	42.68	-29.59	45.95	26.32	54.00	11.32	V
17958.200	42.56	-29.59	45.95	26.20	54.00	11.44	V
14494.850	38.78	-29.56	41.90	26.44	54.00	15.22	H
14492.650	38.33	-29.56	41.90	25.99	54.00	15.67	H
11877.400	35.66	-32.73	39.15	29.24	54.00	18.34	V
11788.850	35.64	-32.09	39.20	28.53	54.00	18.36	V

Channel 159

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17970.850	42.93	-29.59	45.95	26.57	54.00	11.07	H
17960.400	42.59	-29.59	45.95	26.23	54.00	11.41	H
14481.650	38.41	-29.56	41.90	26.07	54.00	15.59	V
14498.700	38.13	-29.56	41.90	25.79	54.00	15.87	H
11898.850	35.83	-32.53	39.10	29.26	54.00	18.17	V
11787.200	35.74	-32.09	39.20	28.63	54.00	18.26	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)
17979.100	42.69	-29.59	45.95	26.33	54.00	11.31	V
17956.550	42.50	-29.59	45.95	26.14	54.00	11.50	H
14492.100	38.23	-29.56	41.90	25.89	54.00	15.77	V
14499.250	38.08	-29.56	41.90	25.74	54.00	15.92	H
11905.450	35.58	-32.53	39.10	29.01	54.00	18.42	V
11867.500	35.56	-32.73	39.15	29.14	54.00	18.44	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)
17980.200	54.18	-29.59	45.95	37.82	74.00	19.82	H
17924.100	53.58	-29.59	45.95	37.22	74.00	20.42	V
14596.600	51.47	-29.14	41.90	38.71	68.20	16.73	V
14583.400	50.70	-29.14	41.90	37.94	68.20	17.50	V
11760.800	46.99	-32.71	39.20	40.50	74.00	27.01	H
11862.550	46.78	-32.73	39.15	40.36	74.00	27.22	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)
17986.800	52.88	-29.59	45.95	36.52	74.00	21.12	V
17945.550	52.68	-29.59	45.95	36.32	74.00	21.32	V
14579.550	48.66	-29.14	41.90	35.90	68.20	19.54	H
14592.200	48.64	-29.14	41.90	35.88	68.20	19.56	H
11774.000	44.06	-32.71	39.20	37.57	74.00	29.94	V
11790.500	44.01	-32.09	39.20	36.90	74.00	29.99	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)
17906.500	53.03	-29.59	45.95	36.67	74.00	20.97	V
17960.400	52.91	-29.59	45.95	36.55	74.00	21.09	V
14704.950	49.74	-30.13	41.35	38.52	68.20	18.46	H
14575.150	49.67	-29.14	41.90	36.91	68.20	18.53	H
11261.950	45.09	-32.99	38.65	39.43	74.00	28.91	H
11865.300	44.73	-32.73	39.15	38.31	74.00	29.27	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)
17947.750	53.74	-29.59	45.95	37.38	74.00	20.26	V
17996.150	53.62	-29.59	45.95	37.26	74.00	20.38	V
14683.500	50.44	-30.04	41.50	38.98	68.20	17.76	H
14525.650	50.25	-30.55	41.90	38.90	68.20	17.95	V
11854.850	46.90	-32.73	39.15	40.48	74.00	27.10	V
11784.450	46.69	-32.09	39.20	39.58	74.00	27.31	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)
17792.650	52.93	-29.59	45.95	36.57	74.00	21.07	V
17992.300	52.88	-29.59	45.95	36.52	74.00	21.12	V
14577.900	48.95	-29.14	41.90	36.19	68.20	19.25	V
14678.000	48.88	-30.04	41.50	37.42	68.20	19.32	V
11792.150	45.00	-32.09	39.20	37.89	74.00	29.00	H
11793.250	44.68	-32.09	39.20	37.57	74.00	29.32	V

Channel 165

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17970.850	53.46	-29.59	45.95	37.10	74.00	20.54	V
17958.750	53.16	-29.59	45.95	36.80	74.00	20.84	H
14599.350	49.96	-29.14	41.90	37.20	68.20	18.24	V
14082.350	48.65	-30.20	41.70	37.15	68.20	19.55	H
11819.100	45.51	-32.09	39.20	38.40	74.00	28.49	H
11896.100	45.15	-32.53	39.10	38.58	74.00	28.85	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)
17995.600	55.42	-29.59	45.95	39.06	74.00	18.58	H
17962.600	55.25	-29.59	45.95	38.89	74.00	18.75	V
14586.150	51.31	-29.14	41.90	38.55	68.20	16.89	H
14204.450	51.28	-30.42	41.70	40.00	68.20	16.92	H
11905.450	48.24	-32.53	39.10	41.67	74.00	25.76	V
11915.900	47.87	-32.53	39.10	41.30	74.00	26.13	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)
17945.000	55.88	-29.59	45.95	39.52	74.00	18.12	H
17982.400	54.16	-29.59	45.95	37.80	74.00	19.84	V
14597.700	50.95	-29.14	41.90	38.19	68.20	17.25	H
14709.350	50.69	-30.13	41.35	39.47	68.20	17.51	H
11794.900	48.14	-32.09	39.20	41.03	74.00	25.86	H
11890.600	47.45	-32.53	39.10	40.88	74.00	26.55	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)
17984.600	53.62	-29.59	45.95	37.26	74.00	20.38	V
17973.600	53.57	-29.59	45.95	37.21	74.00	20.43	H
14212.150	50.94	-30.75	41.75	39.94	68.20	17.26	V
14580.100	50.04	-29.14	41.90	37.28	68.20	18.16	H
11912.600	47.22	-32.53	39.10	40.65	74.00	26.78	H
11875.750	46.93	-32.73	39.15	40.51	74.00	27.07	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)
17958.200	53.97	-29.59	45.95	37.61	74.00	20.03	H
17947.750	52.80	-29.59	45.95	36.44	74.00	21.20	H
14603.200	48.89	-29.14	41.90	36.13	68.20	19.31	V
14197.300	48.49	-30.42	41.70	37.21	68.20	19.71	V
11774.550	44.87	-32.71	39.20	38.38	74.00	29.13	V
11854.300	44.35	-32.73	39.15	37.93	74.00	29.65	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)
17951.600	53.07	-29.59	45.95	36.71	74.00	20.93	V
17991.750	53.01	-29.59	45.95	36.65	74.00	20.99	V
14614.750	48.93	-30.67	41.70	37.90	68.20	19.27	V
14087.300	48.77	-30.20	41.70	37.27	68.20	19.43	H
11755.300	45.27	-32.71	39.20	38.78	74.00	28.73	H
11808.650	44.95	-32.09	39.20	37.84	74.00	29.05	V

802.11ac-HT40

Channel 151

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17976.900	54.24	-29.59	45.95	37.88	74.00	19.76	H
17982.950	53.65	-29.59	45.95	37.29	74.00	20.35	H
14667.000	50.85	-30.04	41.50	39.39	68.20	17.35	V
14211.600	49.90	-30.75	41.75	38.90	68.20	18.30	H
11747.050	46.83	-32.71	39.20	40.34	74.00	27.17	V
11886.200	46.78	-32.53	39.10	40.21	74.00	27.22	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)
17992.300	54.61	-29.59	45.95	38.25	74.00	19.39	V
17912.550	53.37	-29.59	45.95	37.01	74.00	20.63	H
14590.550	50.25	-29.14	41.90	37.49	68.20	17.95	V
14696.700	50.19	-30.04	41.50	38.73	68.20	18.01	V
11908.200	47.59	-32.53	39.10	41.02	74.00	26.41	V
11792.700	46.45	-32.09	39.20	39.34	74.00	27.55	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)
17975.250	53.89	-29.59	45.95	37.53	74.00	20.11	V
17928.500	53.11	-29.59	45.95	36.75	74.00	20.89	V
14476.150	50.58	-29.56	41.90	38.24	74.00	23.42	V
14696.150	50.33	-30.04	41.50	38.87	68.20	17.87	H
11788.300	46.91	-32.09	39.20	39.80	74.00	27.09	V
11931.850	46.53	-32.42	39.05	39.90	74.00	27.47	H

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 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:

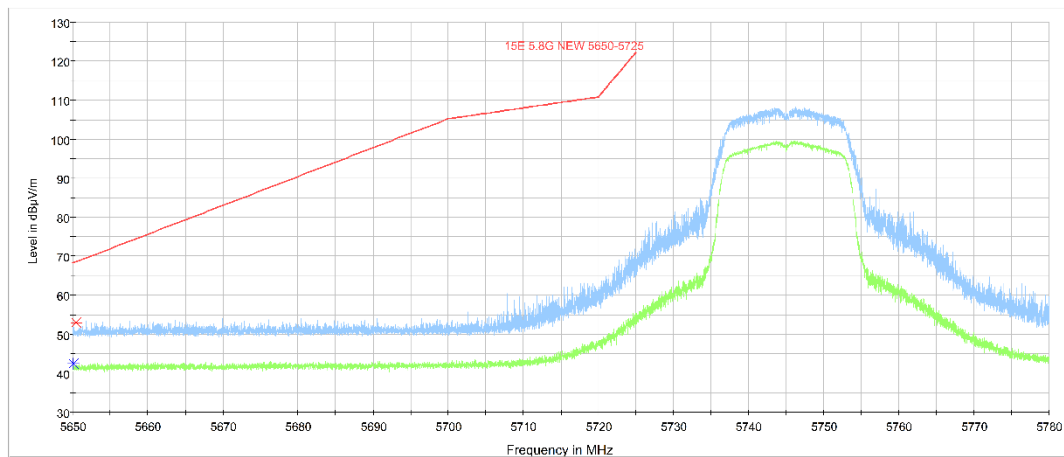


Fig. 10 Band Edges (802.11a Ch149,5745MHz)

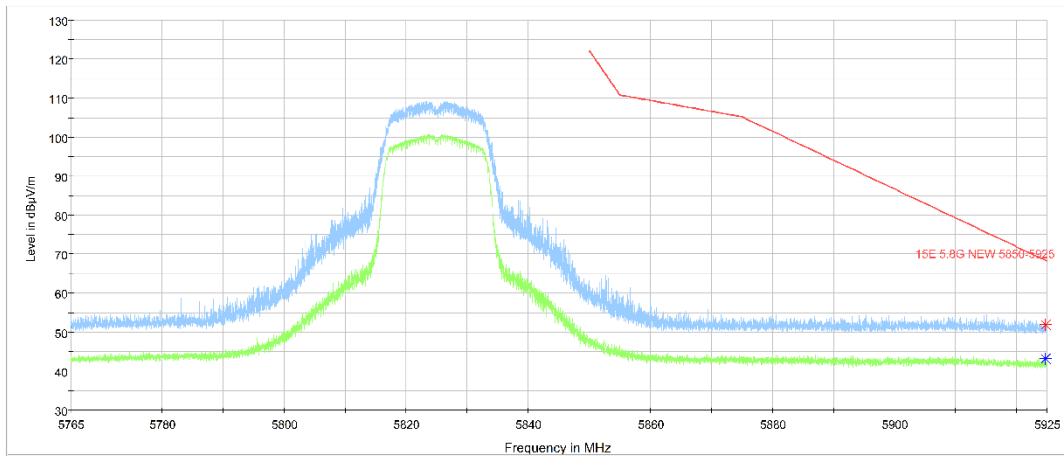


Fig. 11 Band Edges (802.11a Ch165, 5825MHz)

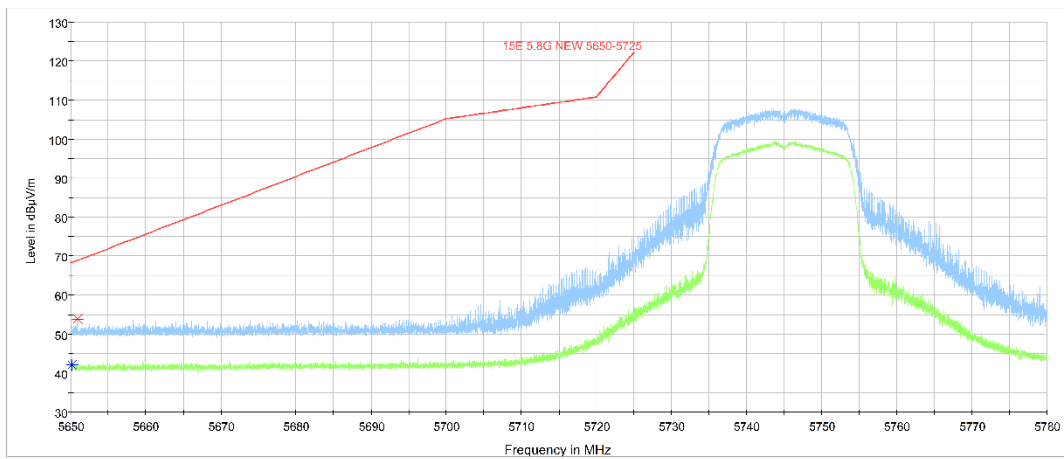


Fig. 12 Band Edges (802.11n-HT20 Ch149, 5745MHz)

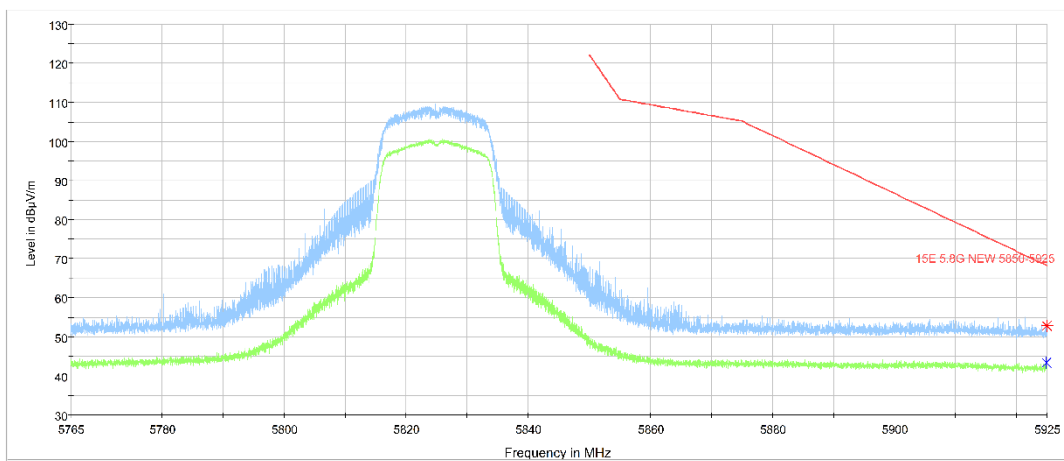


Fig. 13 Band Edges (802.11n-HT20 Ch165, 5825MHz)

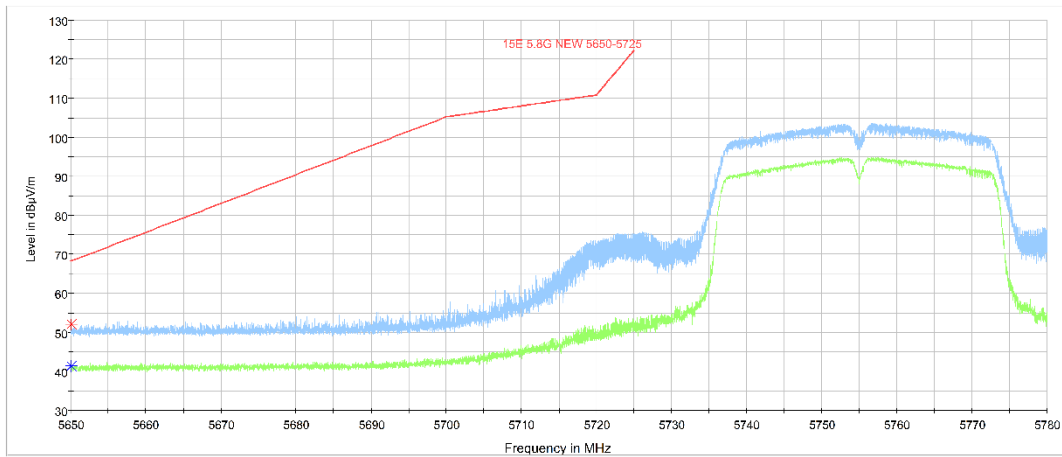


Fig. 14 Band Edges (802.11n-HT40 Ch151, 5755MHz)

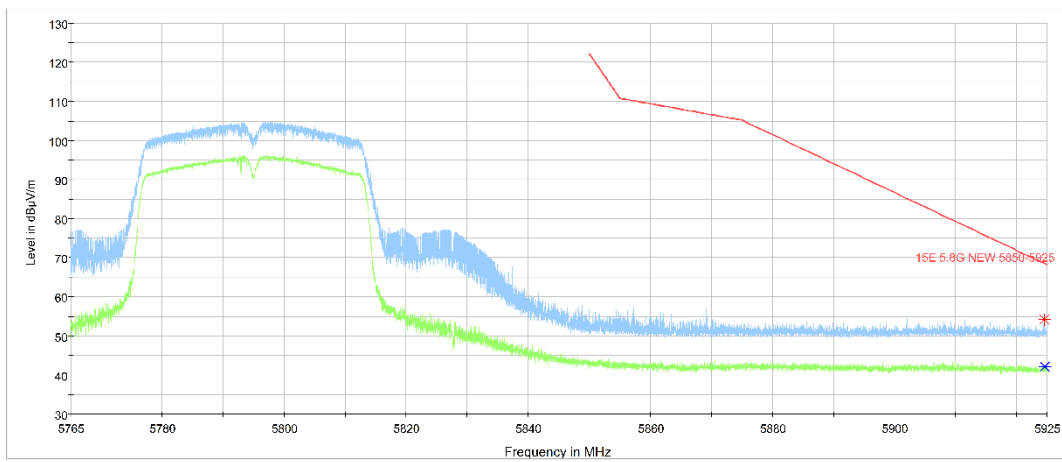


Fig. 15 Band Edges (802.11n-HT40 Ch159, 5795MHz)

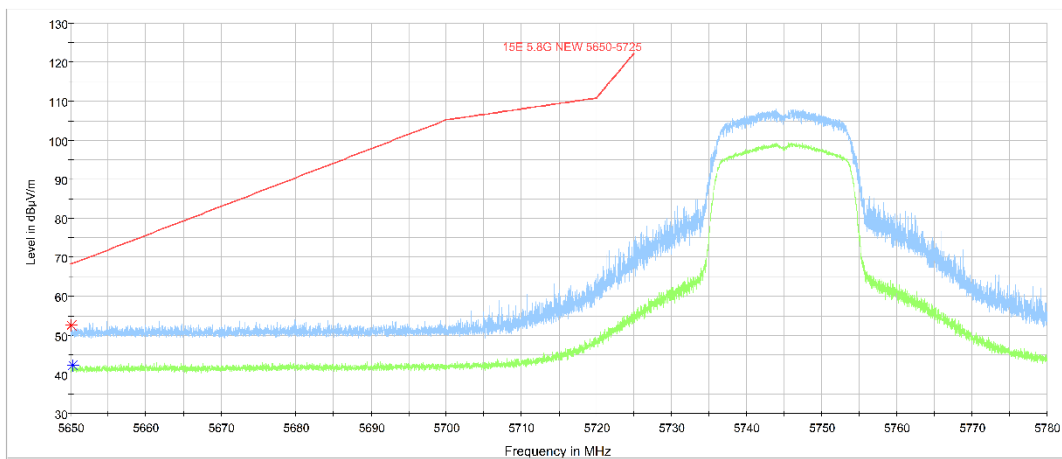


Fig. 16 Band Edges (802.11ac-HT20 Ch149, 5745MHz)

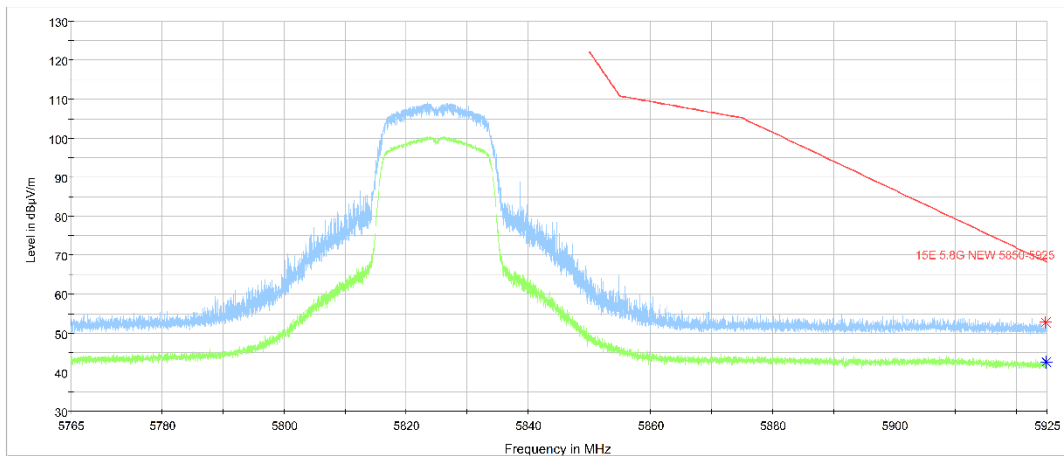


Fig. 17 Band Edges (802.11ac-HT20 Ch165, 5825MHz)

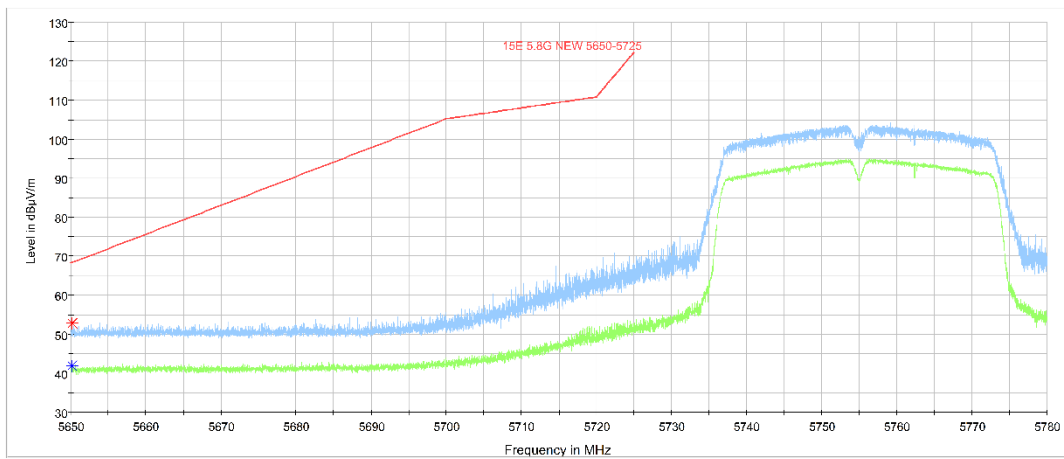


Fig. 18 Band Edges (802.11ac-HT40 Ch151, 5755MHz)

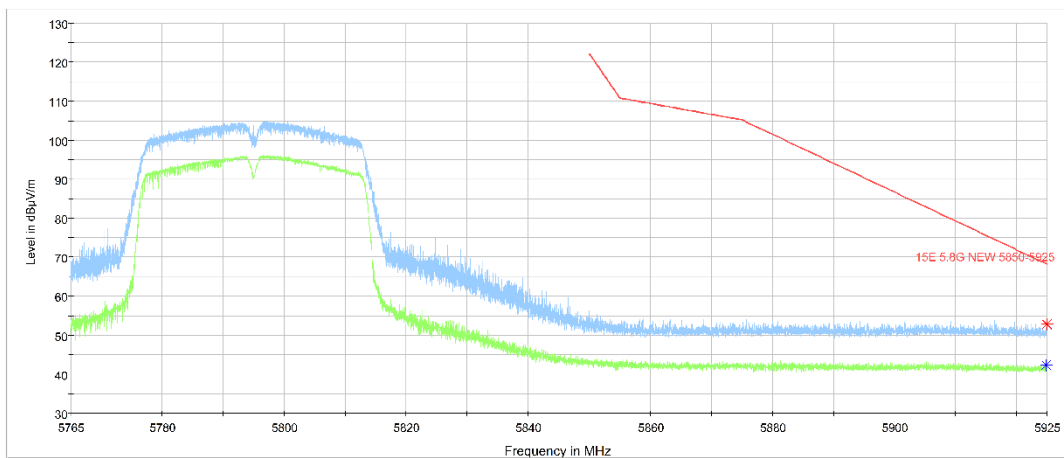


Fig. 19 Band Edges (802.11ac-HT40 Ch159, 5795MHz)

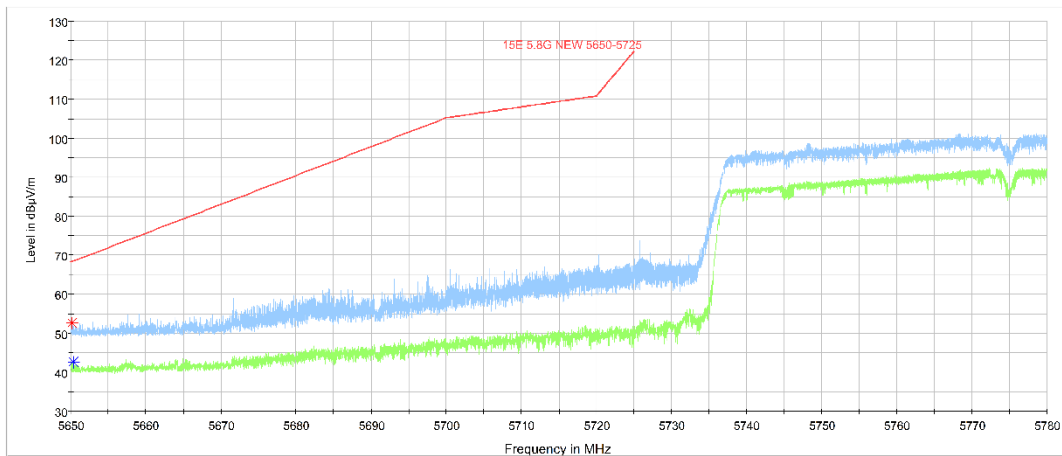


Fig. 20 Band Edges (802.11ac-HT80 Ch155, 5775MHz)

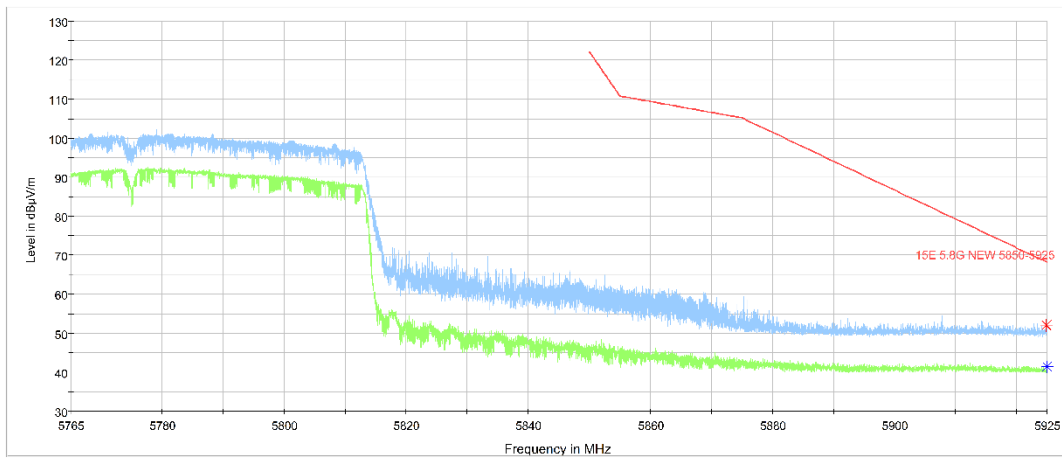


Fig. 21 Band Edges (802.11ac-HT80, 5775MHz)

A.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.

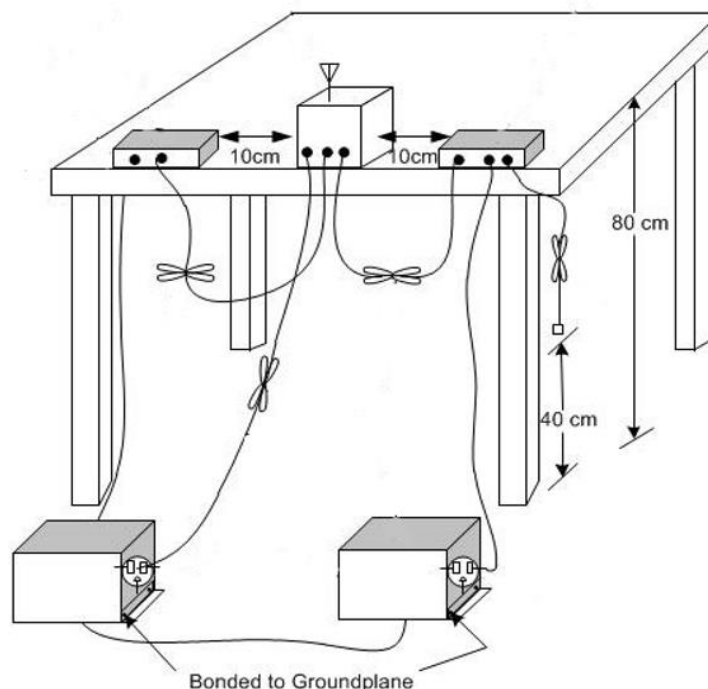
The measurement bandwidth is:

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:

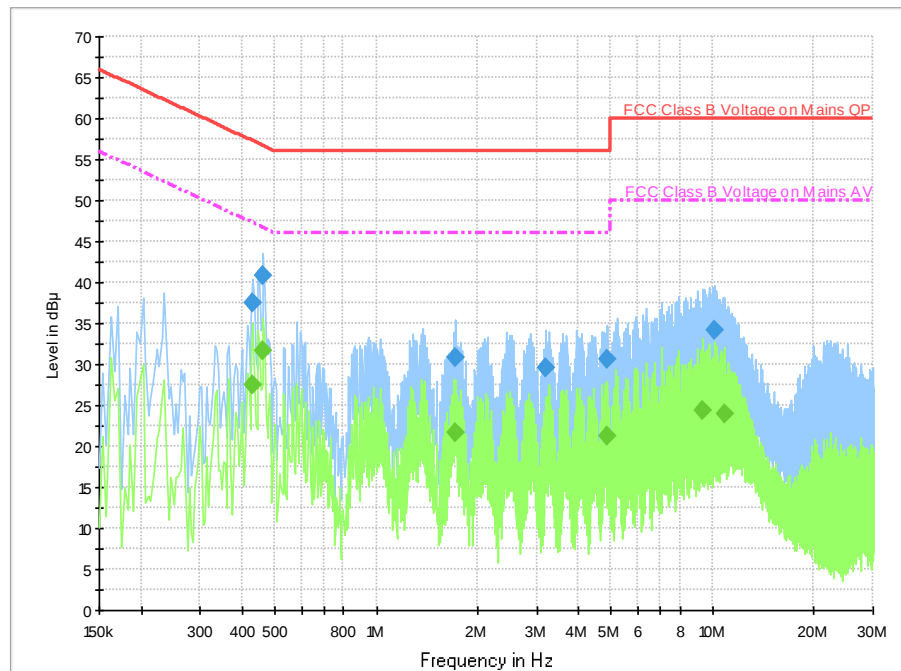


Fig.A.6.1. AC Powerline Conducted Emission(802.11a, Ch149, TX)

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.430000	37.4	2000.0	9.000	On	L1	19.7	19.8	57.3	
0.462000	40.8	2000.0	9.000	On	L1	19.7	15.8	56.7	
1.722000	30.7	2000.0	9.000	On	L1	19.6	25.3	56.0	
3.202000	29.5	2000.0	9.000	On	L1	19.6	26.5	56.0	
4.830000	30.5	2000.0	9.000	On	L1	19.6	25.5	56.0	
10.130000	34.2	2000.0	9.000	On	L1	19.7	25.8	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.430000	27.5	2000.0	9.000	On	L1	19.7	19.7	47.3	
0.462000	31.6	2000.0	9.000	On	L1	19.7	15.0	46.7	
1.722000	21.6	2000.0	9.000	On	L1	19.6	24.4	46.0	
4.830000	21.2	2000.0	9.000	On	L1	19.6	24.8	46.0	
9.354000	24.3	2000.0	9.000	On	L1	19.7	25.7	50.0	
10.910000	24.0	2000.0	9.000	On	L1	19.7	26.0	50.0	

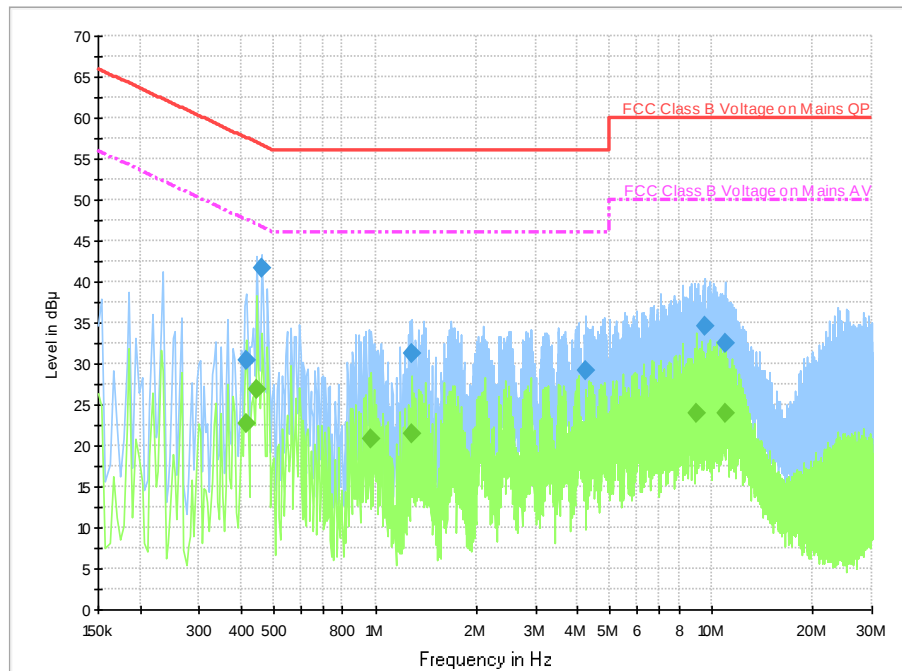


Fig.A.6.2. AC Powerline Conducted Emission-Idle

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.414000	30.4	2000.0	9.000	On	L1	19.7	27.1	57.6	
0.462000	41.6	2000.0	9.000	On	L1	19.7	15.1	56.7	
1.290000	31.2	2000.0	9.000	On	L1	19.7	24.8	56.0	
4.242000	29.1	2000.0	9.000	On	L1	19.6	26.9	56.0	
9.510000	34.6	2000.0	9.000	On	L1	19.7	25.4	60.0	
10.934000	32.5	2000.0	9.000	On	L1	19.7	27.5	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.414000	22.7	2000.0	9.000	On	L1	19.7	24.8	47.6	
0.446000	26.9	2000.0	9.000	On	L1	19.7	20.1	46.9	
0.974000	20.9	2000.0	9.000	On	L1	19.7	25.1	46.0	
1.290000	21.5	2000.0	9.000	On	L1	19.7	24.5	46.0	
8.990000	24.0	2000.0	9.000	On	L1	19.7	26.0	50.0	
11.034000	23.9	2000.0	9.000	On	L1	19.7	26.1	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 McInturf, 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 *****