

EMC TEST REPORT

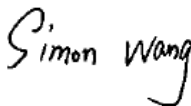
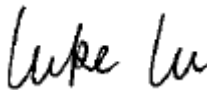
Applicant:	Thundercomm Technology Co., Ltd.
Address:	No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122

Manufacturer or Supplier:	Thundercomm Technology Co., Ltd.
Address:	No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122
Product:	Edge AI Station
Brand Name:	Thundercomm
Model Name:	EB5S
FCC ID:	2AOHHEB5S
Date of tests:	Sep. 09, 2023 ~ Oct. 31, 2023

The submitted sample of the above equipment has been tested for according to the requirements of the following standards:

- ☐ FCC Part 15, Subpart B, Class A
☒ FCC Part 15, Subpart B, Class B
☒ ANSI C63.4:2014

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Prepared by Simon Wang Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
 Date: Oct. 31, 2023	 Date: Aug. 25, 2023

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

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Test Report No.: W7L-P23070010EM01

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
W7L-P23070010EM01	Original release	Oct. 31, 2023

1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Edge AI Station	
BRAND NAME	Thundercomm	
MODEL NAME	EB5S	
NOMINAL VOLTAGE	19Vdc(adapter)	
MODULATION TYPE	WLAN	DSSS, OFDM, OFDMA
	WCDMA	QPSK, BPSK
	LTE	QPSK/16QAM/64QAM/256QAM
	5G NR	DFT-s-OFDM($\pi/2$ BPSK, QPSK, 16QAM, 64QAM, 256QAM); CP-OFDM(QPSK, 16QAM, 64QAM, 256QAM);
OPERATING FREQUENCY	WLAN	2412 ~ 2462MHz for 11b/g/n(HT20/40)/ax(20/40) 5180 ~ 5240MHz, 5260 ~ 5320 MHz, 5500 ~ 5720MHz, 5745 ~ 5825 MHz for 11a/ n(HT20)/ n(HT40) / ac(VHT20)/ ac(VHT40) / ac(VHT80)/ ax(20/40/80)
	WCDMA	1852.4MHz ~ 1907.6MHz(FOR WCDMA Band 2) 1712.4MHz ~ 1752.6MHz(FOR WCDMA Band 4) 826.4MHz ~ 846.6MHz (FOR WCDMA Band 5)
	LTE	1850.7MHz ~ 1909.3MHz (FOR LTE Band2) 1710.7MHz ~ 1754.3MHz (FOR LTE Band4) 824.7MHz ~ 848.3MHz (FOR LTE Band5) 2502.5MHz ~ 2567.5MHz (FOR LTE Band7) 699.7MHz ~ 715.3MHz (FOR LTE Band12) 779.5MHz ~ 784.5MHz (FOR LTE Band13) 790.5MHz ~ 795.5MHz (FOR LTE Band14) 706.5MHz ~ 713.5MHz (FOR LTE Band17) 1850.7MHz ~ 1914.3MHz (FOR LTE Band25) 814.7MHz ~ 848.3MHz (FOR LTE Band26) 2307.5MHz ~ 2312.5MHz (FOR LTE Band30) 2572.5MHz ~ 2617.5MHz (FOR LTE Band38) 2498.5MHz ~2687.5MHz (FOR LTE Band41) 3452.5MHz ~3547.5MHz (FOR LTE Band42) 3602.5MHz ~3697.5MHz (FOR LTE Band43) 3552.5MHz ~3697.5MHz (FOR LTE Band48) 1710.7MHz ~ 1779.3MHz (FOR LTE Band66) 665.5MHz ~ 695.5MHz (FOR LTE Band71) 825.6MHz ~ 847.4MHz (FOR LTE Band5B)

OPERATING FREQUENCY		1853.3MHz ~ 1906.7MHz (FOR LTE Band2C) 2505.5MHz ~ 2564.7MHz (FOR LTE Band7C) 2577.5MHz ~ 2612.5MHz (FOR LTE Band38C) 2499.3MHz ~2686.7MHz (FOR LTE Band41C) 3453.3MHz ~3546.7MHz (FOR LTE Band42C) 3703.3MHz ~3796.7MHz (FOR LTE Band43C) 3553.3MHz ~3696.7MHz (FOR LTE Band48C) 1712.5MHz ~1777.5MHz (FOR LTE Band66B) 1713.3MHz ~1776.7MHz (FOR LTE Band66C) CA: UL CA_2A-4A; UL CA_2A-5A; UL CA_2A-7A; UL CA_2A-12A; UL CA_2A-13A; UL CA_2A-30A; UL CA_2A-66A;UL CA_4A-5A; UL CA_4A-7A; UL CA_4A-12A; UL CA_4A-13A; UL CA_4A-30A; UL CA_5A-7A; UL CA_5A-30A; UL CA_5A-66A;UL CA_12A-30A; UL CA_12A-66A; UL CA_13A-66A; UL CA_14A-30A
	5G NR	SA: n2 (1852.5MHz ~1907.5MHz) n5(826.5MHz ~ 846.5MHz) n7(2502.5MHz ~ 2567.5MHz) n12(701.5MHz ~ 713.5MHz) n13(779.5MHz ~ 784.5MHz) n14(790.5MHz ~ 795.5MHz) n25(1852.5MHz ~ 1912.5MHz) n26(816.5MHz ~ 846.5MHz) n30(2307.5MHz ~ 2312.5MHz) n38/n38 HPUE (2575MHz ~ 2615MHz) n41/n41 HPUE (2506.02 ~ 2679.99MHz) n48(3555 ~ 3694.98MHz) n66(1712.5 ~ 1777.5MHz) n70(1697.5 ~ 1707.5MHz) n71(665.5 ~ 695.5MHz) n77(Part27Q)(3455.01 ~ 3544.98MHz) n77(Part27O)(3705 ~ 3975MHz) n78(Part27Q)(3455.01 ~ 3544.98MHz) n78(Part27O)(3705 ~ 3795MHz) ENDC:DC_13A_n66A;DC_5A_n2A;DC_14A_n2A; DC_30A_n2A;DC_2A_n5A;DC_30A_n5A;DC_66A _n5A;DC_2A_n12A;DC_66A_n12A;DC_2A_n66A; DC_5A_n66A;DC_12A_n66A;DC_14A_n66A;DC_ 30A_n66A;DC_12A_n2A;DC_66A_n2A;DC_71A_n 2A;DC_12A_n41A;DC_71A_n66A;DC_2A_n71A; DC_66A_n71A;DC_66A_n25A;DC_25A_n41A;DC _12A_n78A;DC_13A_n78A;DC_25A_n78A;DC_12 A_n77A;DC_13A_n77A;DC_14A_n77A;DC_26A_n 78A;DC_2A_n78A;DC_26A_n41A;DC_2A_n41A;D C_7A_n5A;DC_38A_n78A;DC_7A_n71A;DC_41A

		_n78A;DC_5A_n7A;DC_12A_n7A;DC_66A_n7A; DC_13A_n2A;DC_48A_n5A;DC_48A_n66A;DC_7 A_n66A;DC_2A_n48A;DC_5A_n48A;DC_13A_n48 A;DC_66A_n48A;DC_4A_n78A;DC_20A_n77A;DC _5A_n78A;DC_4A_n41A;DC_66A_n38A;DC_2A_n 38A;DC_12A_n38A;DC_4A_n38A;DC_5A_n38A;D C_66A_n78A;DC_12A_n25A;DC_25A_n77A;DC_ 2A_n77A;DC_71A_n78A;DC_71A_n38A;DC_13A_ n7A;DC_5A_n41A;DC_66A_n41A;DC_2A_n7A;DC _7A_n2A;DC_5A_n40A;DC_30A_n77A;DC_41A_n 77A;DC_7A_n78A;DC_48A_n25A;DC_66A_n28A; DC_71A_n41A;DC_28A_n66A;DC_30A_n12A;DC _2A_n14A;DC_30A_n14A;DC_66A_n14A;DC_2A_ n30A;DC_5A_n30A;DC_12A_n30A;DC_14A_n30A ;DC_66A_n30A;DC_71A_n7A;DC_7A_n12A;DC_5 A_n77A;DC_66A_n77A;DC_71A_n77A;DC_4A_n2 A;DC_7A_n25A;DC_71A_n25A;DC_5A_n25A;DC_ 26A_n25A;DC_4A_n7A;DC_13A_n25A;DC_7A_n7 7A; DC_48A_n71A; DC_48A_n12A
HW VERSION	Turbox EB5S-IO-BOARD V03	
SW VERSION	R.5S.LA.2.20231030	
I/O PORTS	Refer to user's manual	
CABLE SUPPLIED	N/A	

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in the test report.

List of Accessory:

ACCESSORIES	BRAND	MANUFACTURER	MODEL	SPECIFICATION
AC Adapter	Huntkey	Shenzhen Huntkey Electric Co. Ltd.	HKA09019047-6U	I/P: 100-240Vac, 1.5A, O/P: 19Vdc, 3.15A

1.2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart B		
Standard Section	Test Item	Result
FCC Part 15, Subpart B, Class B ANSI C63.4:2014	Conducted Test	Compliance
	Radiated Emission Test (30MHz ~ 1GHz)	Compliance
	Radiated Emission Test (Above 1GHz)	Compliance

1.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	150kHz ~ 30MHz	±2.70dB
Radiated emissions	30MHz~1GHz	±4.98dB
	1GHz ~6GHz	±4.70dB
	6GHz ~18GHz	±4.60dB
	18GHz ~40GHz	±4.12dB

1.4 DESCRIPTION OF TEST MODES

Test Mode	Test Condition
Radiated emission test	
1	LTE B7 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
2	LTE B12 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
3	LTE B13 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
4	LTE B14 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
5	LTE B25 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
6	LTE B26 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
7	LTE B30 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
8	LTE B41 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
9	LTE B42 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
10	LTE B43 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
11	LTE B48 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
12	LTE B66 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
13	LTE B71 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
14	N7 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
15	N12 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
16	N13 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
17	N14 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
18	N25 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
19	N26 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
20	N30 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
21	N41 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
22	N48 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
23	N66 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
24	N70 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
25	N71 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
26	N77 idle+USB Cable+adapter+Data Transmission+EUT to Notebook+LAN+HDMI+SIM+SD
27	N78 idle+USB Cable+adapter+Data Transmission+Notebook to EUT+LAN+HDMI+SIM+SD

Conducted emission test	
1	LTE B7 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
2	LTE B12 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
3	LTE B13 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
4	LTE B14 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
5	LTE B25 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
6	LTE B26 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
7	LTE B30 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
8	LTE B41 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
9	LTE B42 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
10	LTE B43 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
11	LTE B48 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
12	LTE B66 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
13	LTE B71 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
14	N7 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
15	N12 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
16	N13 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
17	N14 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
18	N25 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
19	N26 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
20	N30 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
21	N41 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
22	N48 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
23	N66 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
24	N70 idle+USB Cable+adapter+wifi 5G idle+LAN+HDMI+SIM+SD
25	N71 idle+USB Cable+adapter+wifi 2.4G idle+LAN+HDMI+SIM+SD
26	N77dle+USB Cable+adapter+Data Transmission+EUT to Notebook+LAN+HDMI+SIM+SD
27	N78 idle+USB Cable+adapter+Data Transmission+Notebook to EUT+LAN+HDMI+SIM+SD

NOTE:

1. For conducted emission test, Pre-scan all mode, mode 1 was the worst case and only this mode was presented in this report.
2. For radiated emission test, Pre-scan all mode, test mode 26 was the worst case and only this mode was presented in this report.

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

FOR ALL TESTS

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Laptop	Lenovo	Thinkpad L440	R90FTFKP	N/A
2	Universal radio communication tester	Rohde&Schwarz	CMW500	N/A	N/A
3	Laptop	Lenovo	T450	PC0494WJ	N/A
4	SD	San Disk	Ultra	N/A	N/A
5	Flat Panel Monitor	DELL	U2417H	CN-02DH76-74445-722-BRML-A03	N/A
6	Keyboard	Lenovo	KU-0225	8155807	N/A
7	Mouse	M90	M-U0026	1817HS07Y798	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	RJ45 Line: unshielded, Detachable 1.5m;
2	RJ45 Line: unshielded, Detachable 1.5m;
3	USB Cable Line: unshielded, Detachable 1.5m;
4	N/A

2 EMISSION TEST

2.1 CONDUCTED EMISSION MEASUREMENT

2.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

TEST STANDARD: FCC PART 15, SUBPART B (SECTION: 15.107 A CLASS B)

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

TEST STANDARD: FCC PART 15, SUBPART B (SECTION: 15.107 B CLASS A)

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

NOTE: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

2.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
WIDEBANDRADIO COMMUNICATION TESTER	Rohde&Schwarz	CMW500	169399	Jun.27,22	Jun.26,24
EMI Test Receiver	Rohde&Schwarz	ESR3	102749	Feb.25,22	Feb.24,24
ELEKTRA test software	Rohde&Schwarz	ELEKTRA	NA	N/A	N/A
LISN network	Rohde&Schwarz	ENV216	102640	Feb.17,22	Feb.16,24
CABLE	Rohde&Schwarz	W61.01	N/A	Apr.28,23	Oct.27,23
CABLE	Rohde&Schwarz	W61.01	N/A	Oct.27,23	Apr.26,24
CABLE	Rohde&Schwarz	W601	N/A	Apr.28,23	Oct.27,23
CABLE	Rohde&Schwarz	W601	N/A	Oct.27,23	Apr.26,24

NOTE: 1. The test was performed in CE shielded room.

2.1.3 TEST PROCEDURES

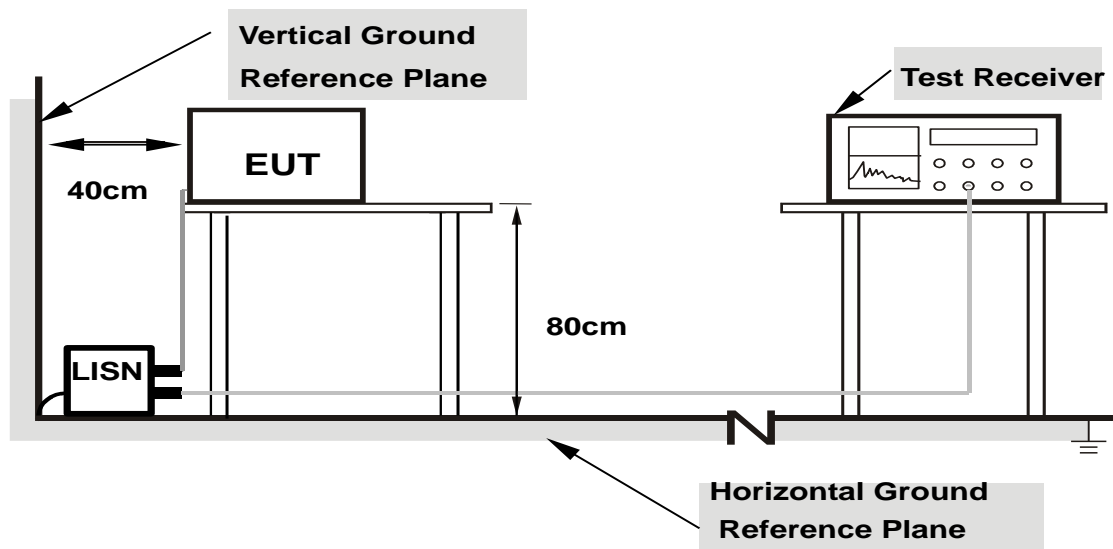
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

2.1.4 DEVIATION FROM TEST STANDARD

No deviation.

2.1.5 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

2.1.6 EUT OPERATING CONDITIONS

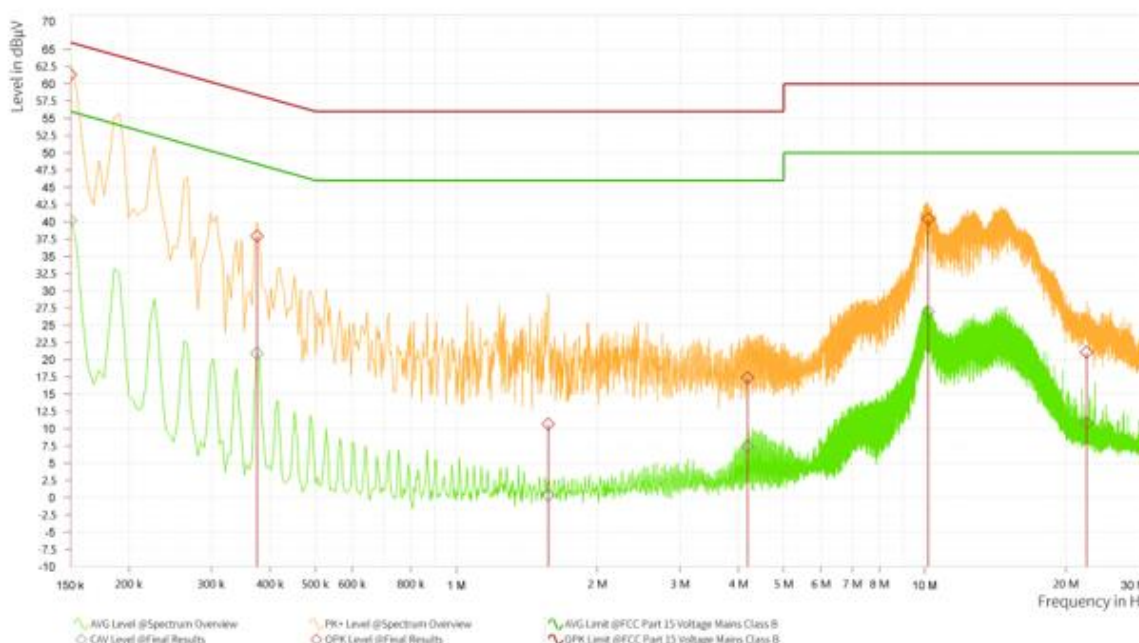
- a. Turned on the power and connected of all equipment.
- b. EUT was operated according to the use type described in the manufacturer's specifications or the user's manual.

2.1.7 TEST RESULTS

TEST VOLTAGE	Input 120 Vac, 60 Hz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 51%RH	TESTED BY	Carl xie

Ref	Frequency [MHz]	QPK Level [dBuV]	QPK Limit [dBuV]	QPK Margin [dB]	CAV Level [dBuV]	CAV: AVG Limit [dBuV]	CAV Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]
1	0.150	61.35	66.00	4.65	40.21	56.00	15.79	12.57	L1	9.000
1	0.375	37.92	58.39	20.47	20.91	48.39	27.48	11.77	L1	9.000
1	1.572	10.65	56.00	45.35	0.35	46.00	45.65	11.76	L1	9.000
1	4.187	17.40	56.00	38.60	7.48	46.00	38.52	11.79	L1	9.000
1	10.172	40.41	60.00	19.59	26.97	50.00	23.03	11.83	L1	9.000
1	22.155	21.09	60.00	38.91	10.79	50.00	39.21	11.88	L1	9.000

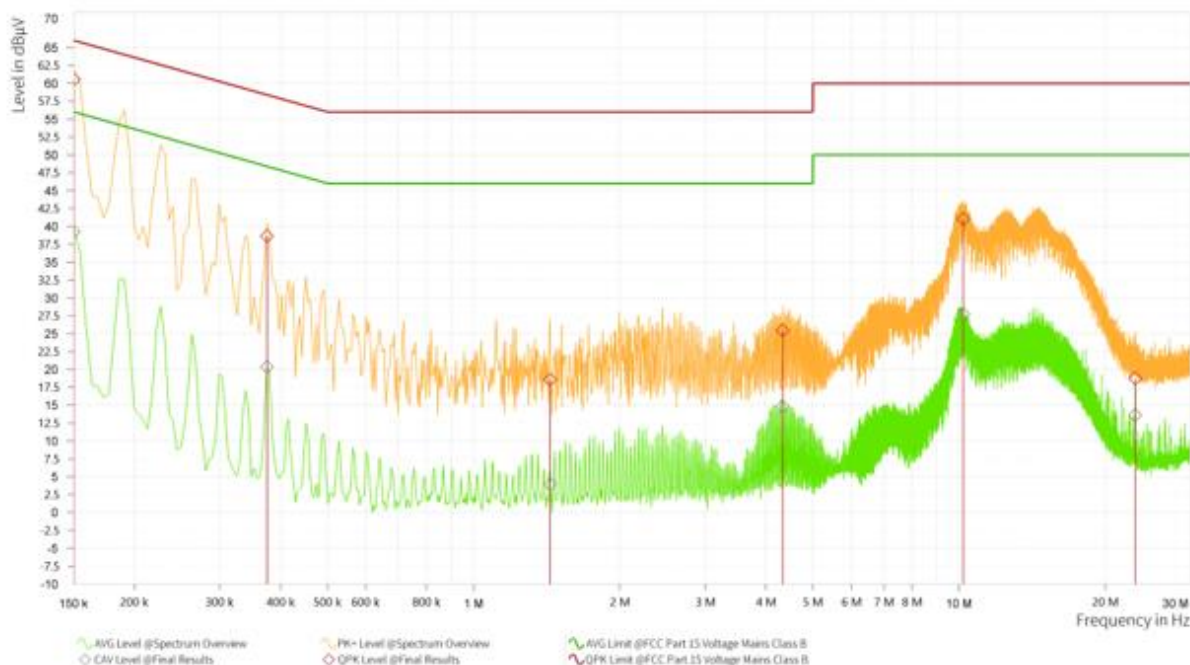
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Limit value - Emission level
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



TEST VOLTAGE	Input 120 Vac, 60 Hz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 51%RH	TESTED BY	Carl xie

Ref	Frequency [MHz]	QPK Level [dBuV]	QPK Limit [dBuV]	QPK Margin [dB]	CAV Level [dBuV]	CAV: AVG Limit [dBuV]	CAV Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]
1	0.150	60.54	66.00	5.46	39.25	56.00	16.75	12.13	N	9.000
1	0.375	38.63	58.39	19.76	20.36	48.39	28.03	12.83	N	9.000
1	1.437	18.59	56.00	37.41	3.96	46.00	42.04	12.74	N	9.000
1	4.335	25.47	56.00	30.53	14.80	46.00	31.20	12.76	N	9.000
1	10.212	41.07	60.00	18.93	27.74	50.00	22.26	12.79	N	9.000
1	23.069	18.73	60.00	41.27	13.62	50.00	36.38	12.87	N	9.000

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Limit value - Emission level
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



2.2 RADIATED EMISSION MEASUREMENT

2.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: FCC PART 15, SUBPART B (SECTION: 15.109)

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 3 meters (dB μ V/m)		
Frequencies (MHz)	FCC 15B, Class A	FCC 15B, Class B
30-88	49	40
88-216	53.5	43.5
216-960	56	46
960-1000	59.5	54
Above 1000	Avg: 59.5 Peak: 79.5	Avg: 54 Peak: 74

Frequency Range (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5 th harmonic of the highest frequency or 40GHz, whichever is lower

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
 3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
 4. QP detector shall be applied if not specified.

2.2.2 TEST INSTRUMENTS

Frequency range below 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
WIDEBANDRADIO COMMUNICATION TESTER	Rohde&Schwarz	CMW500	169399	Jun.27,22	Jun.26,24
3m Semi-anechoic Chamber	TDK	9m*6m*6m	HRSW-SZ-EMC-02Chamber	Nov.24,22	Nov.23,25
Bilog Antenna	SCHWARZBECK	VULB 9163	1264	Feb.28,22	Feb.27,24
EMI Test Receiver	R&S	ESW44	101973	Feb.25,22	Feb.24,24
Measurement Software	R&S	ELEKTRA	N/A	N/A	N/A
6DB attenuator	Tonscend Technology Co., Ltd	N/A	23062787	N/A	N/A
Pre-Amplifier	R&S	SCU08F1	101028	Sep.16,22	Sep.15,24
CABLE	R&S	W13.01	N/A	Apr.28,23	Oct.27,23
CABLE	R&S	W13.01	N/A	Oct.27,23	Apr.26,24
CABLE	R&S	W13.02	N/A	Apr.28,23	Oct.27,23
CABLE	R&S	W13.02	N/A	Oct.27,23	Apr.26,24
CABLE	R&S	W12.14	N/A	Apr.28,23	Oct.27,23
CABLE	R&S	W12.14	N/A	Oct.27,23	Apr.26,24

Frequency range above 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
WIDEBANDRADIO COMMUNICATION TESTER	Rohde&Schwarz	CMW500	169399	Jun.27,22	Jun.26,24
3m Fully-anechoic Chamber	TDK	9m*6m*6m	HRSW-SZ-EMC-01Chamber	Nov.24,22	Nov.23,25
Horn Antenna	ETS-LINDGREN	3117	227836	Aug.22,22	Aug.21,24
EMI Test Receiver	R&S	ESW44	101973	Feb.25,22	Feb.24,24
Pre-Amplifier	R&S	SCU08F1	101028	Sep.16,22	Sep.15,24
Measurement Software	R&S	ELEKTRA	N/A	N/A	N/A
CABLE	R&S	W13.01	N/A	Apr.28,23	Oct.27,23
CABLE	R&S	W13.01	N/A	Oct.27,23	Apr.26,24
CABLE	R&S	W13.02	N/A	Apr.28,23	Oct.27,23
CABLE	R&S	W13.02	N/A	Oct.27,23	Apr.26,24
CABLE	R&S	W12.14	N/A	Apr.28,23	Oct.27,23
CABLE	R&S	W12.14	N/A	Oct.27,23	Apr.26,24

NOTE: 1. The test was performed in 3m chamber.
2. The FCC Site Registration No. is 434559; The Designation No. is CN1325.

2.2.3 TEST PROCEDURE

<Frequency Range below 1GHz>

The basic test procedure was in accordance with ANSI C63.4:2014 (section 12).

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
3. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$ (if the raw value not contains the amplifier);
4. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$ (if the raw value contains the amplifier).
5. $\text{Margin value} = \text{Limit value} - \text{Emission level}$.

<Frequency Range above 1GHz>

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter fully-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. The bore sight should be used during the test above 1GHz.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz

NOTE:

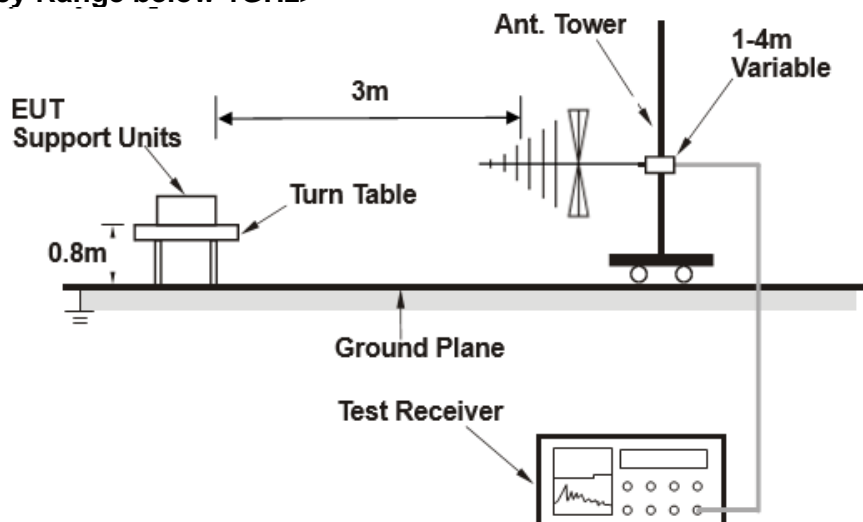
- The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth of test receiver/spectrum analyzer is 1Hz for Average detection (AV) at frequency above 1GHz.
- For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
- $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
- $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$ (if the raw value not contains the amplifier);
- $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$ (if the raw value contains the amplifier)
- $\text{Margin value} = \text{Limit value} - \text{Emission level.}$

2.2.4 DEVIATION FROM TEST STANDARD

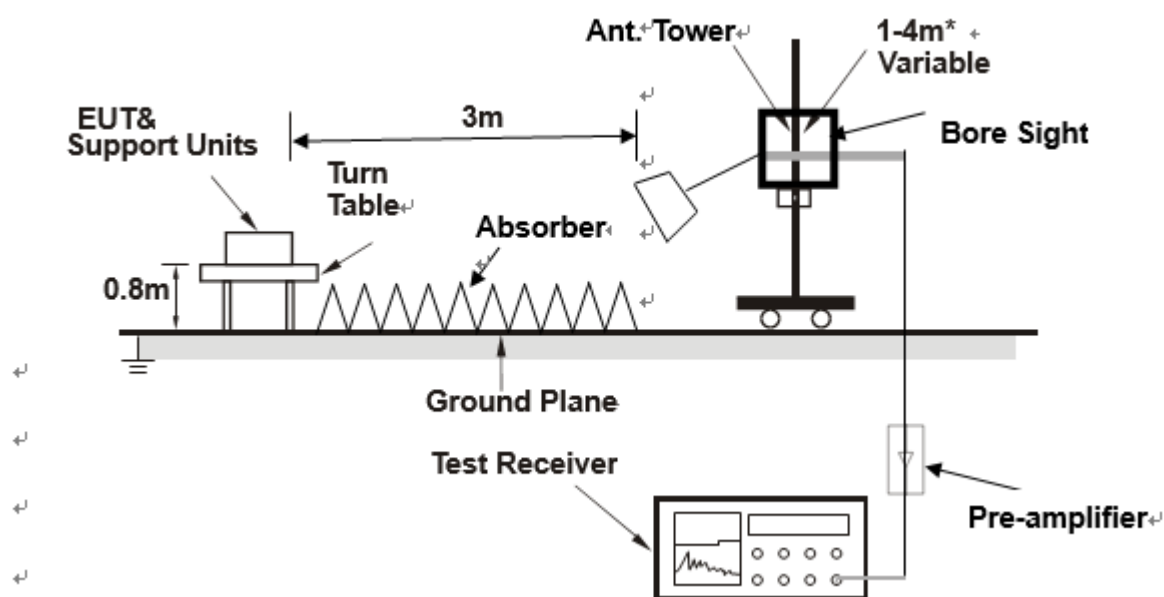
No deviation.

2.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



Note: Above 1G is a directional antenna

depends on the EUT height and the antenna 3dB bandwidth both, refer to section 7.3 of CISPR 16-2-3.

2.2.6 EUT OPERATING CONDITIONS

Same as item 2.1.6.

2.2.7 TEST RESULTS

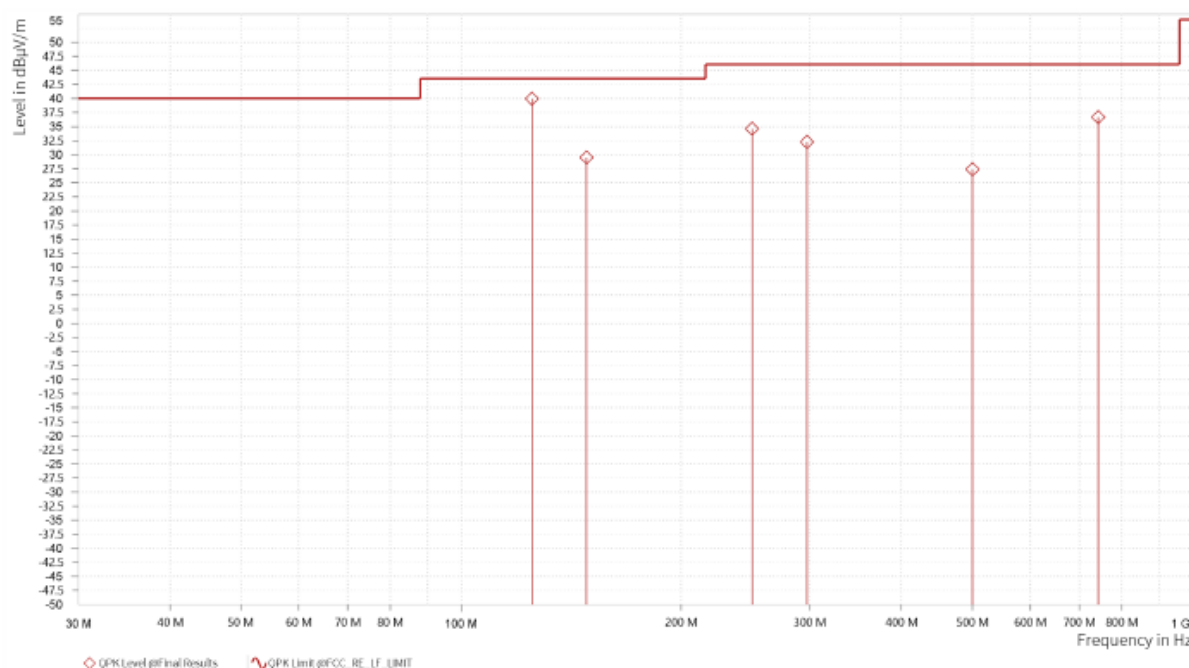
Acceleromete alternative worst case:

TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120 kHz
TESTED BY	Jace Hu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

Rg	Frequency [MHz]	QPK Level [dBμV/m]	QPK Limit [dBμV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]
1	124.972	39.94	43.50	3.56	-15.01	H	0.9	2	120.000
1	148.472	29.47	43.50	14.03	-15.44	H	271.9	1	120.000
1	249.970	34.56	46.00	11.44	-9.02	H	359	1	120.000
1	297.015	32.26	46.00	13.74	-7.21	H	1	1	120.000
1	499.965	27.35	46.00	18.65	-4.57	H	225.6	2	120.000
1	742.509	36.64	46.00	9.36	-1.13	H	4.3	1	120.000

- REMARKS:**
1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)- Amplifier Gain
 3. The other emission levels were very low against the limit.
 4. Margin value = Limit value – Emission level.

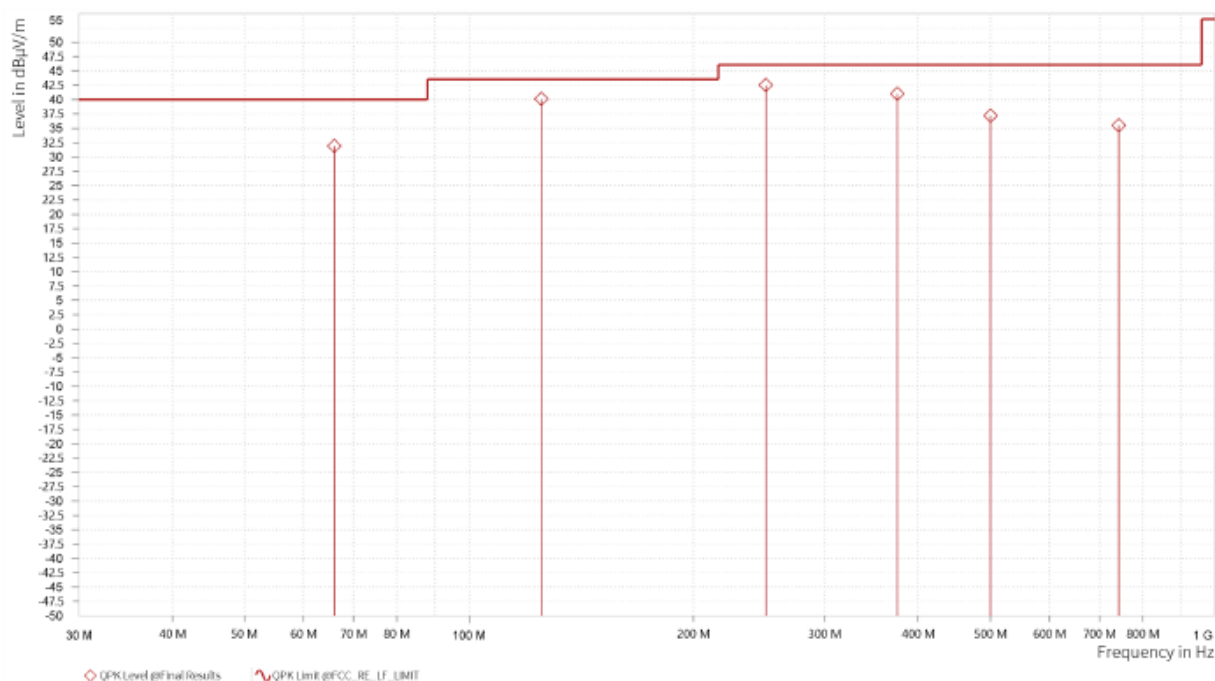


TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70% RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak , 120 kHz
TESTED BY	Jace Hu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	QPK Level [dBμV/m]	QPK Limit [dBμV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]
1	65.978	31.86	40.00	8.14	-12.87	V	1	1	120.000
1	124.972	40.09	43.50	3.41	-15.01	V	4.4	1	120.000
1	249.970	42.50	46.00	3.50	-9.02	V	4.4	1	120.000
1	375.011	41.00	46.00	5.00	-5.52	V	4.4	1	120.000
1	500.009	37.14	46.00	8.86	-4.57	V	0.9	2	120.000
1	742.509	35.48	46.00	10.52	-1.13	V	79.8	2	120.000

- REMARKS:**
1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) -Amplifier Gain
 3. The other emission levels were very low against the limit.
 4. Margin value = Limit value – Emission level.

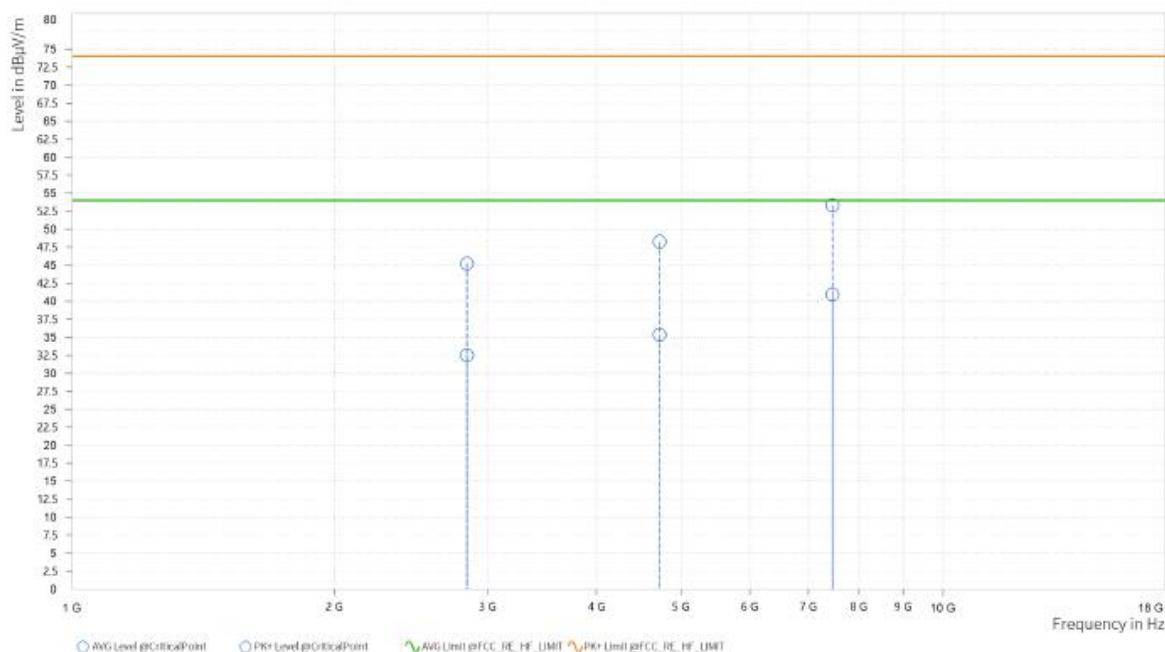


TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Jace Hu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1	2,838.500	45.24	74.00	28.76	32.51	54.00	21.49	8.12	H	0.9	2
1	4,727.000	48.26	74.00	25.74	35.35	54.00	18.65	11.62	H	59.5	2
1	7,465.000	53.32	74.00	20.68	40.92	54.00	13.08	16.91	H	192.2	2

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
 2. Negative sign (-) in the margin column signify levels below the limit.
 3. Frequency range scanned: 1GHz to 5th harmonic of the highest frequency or 40GHz, whichever is lower .For frequency above 18GHz, the emission was tested 20db below the limit so the data not recorded in the sheet.
 4. Only emissions significantly above equipment noise floor are reported.

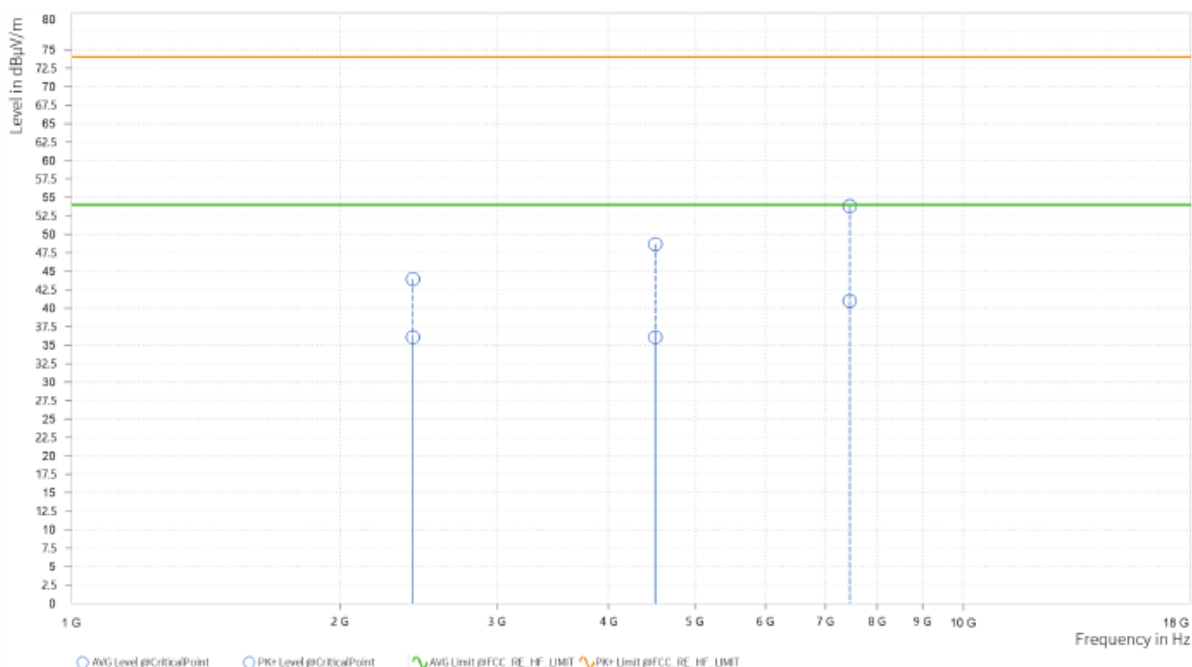


TEST VOLTAGE	Input 120 Vac, 60 Hz	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Jace Hu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

Rg	Frequency [MHz]	PK+ Level [dBμV/m]	PK+ Limit [dBμV/m]	PK+ Margin [dB]	AVG Level [dBμV/m]	AVG Limit [dBμV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1	2,413.000	43.92	74.00	30.08	36.06	54.00	17.94	7.19	V	355.8	2
1	4,514.500	48.67	74.00	25.33	36.08	54.00	17.92	11.89	V	0.9	2
1	7,456.000	53.81	74.00	20.19	40.99	54.00	13.01	16.90	V	355.8	2

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
 2. Negative sign (-) in the margin column signify levels below the limit.
 3. Frequency range scanned: 1GHz to 5th harmonic of the highest frequency or 40GHz, whichever is lower .For frequency above 18GHz, the emission was tested 20db below the limit so the data not recorded in the sheet.
 4. Only emissions significantly above equipment noise floor are reported.



3 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---