

Massimo MotorSports, LLC

TEST REPORT

Report Type:

FCC Part 15B EMC report

Model:

MCS-50Pro

REPORT NUMBER:

230801044SHA-001

ISSUE DATE:

October 18, 2023

DOCUMENT CONTROL NUMBER:

TTRF15b_V2 © 2021 Intertek



Applicant: Massimo MotorSports, LLC
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FCC ID: 2BBH3Y4900WIFI

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2021): Radio Frequency Devices (Subpart B)

ANSI C63.4 (2014)+A1(2017): American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

PREPARED BY:**REVIEWED BY:**

Project Engineer
Sky Yang

Reviewer
Eric Li

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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
230801044SHA-001	Rev. 01	Initial issue of report	October 18, 2023

Measurement result summary

TEST ITEM	FCC REFERENCE	RESULT
Power line conducted emission	15.107	Pass
Radiated emission	15.109	Pass

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	EV Charging Station
Type/Model:	MCS-50Pro
Description of EUT:	The EUT is an EV charger. It contains a certified WIFI module, the FCC ID is 2AHMR-BW16. We test it and list the results in the report.
Rating:	120/240VAC, 60Hz, Max 50A
Category of EUT:	Class B
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	September 19, 2023
Date of test:	September 20, 2023 ~ October 13, 2023

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1.2 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier: CN0014
	VCCI Registration Lab Member No.: 3598 (Registration No.: R-14243, G-10845, C-14723, T-12252)
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2021)

ANSI C63.4 (2014)+A1(2017)

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency are specified if used.

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	SKET Auto EMC Test Software	Keleto	V3.0
Radiated emission	SKET Auto EMC Test Software	Keleto	V3.0

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Resistor Load	-	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Power line conducted emission	22°C	53% RH
Radiated Emissions	22°C	55% RH

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2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
☒	Shielded room	Zhongyu	-	EC 2838	2024-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-24
☒	TRILOG broadband Antenna	Schwarzbeck	VULB9168	EC 6402	2024-02-14
☒	Horn antenna	Tonscend	bha9120d	EC 6432-2	2024-02-15
☒	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2023-12-07
☒	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2024-07-28
☐	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2024-07-16
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2024-07-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-24
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5199	2024-03-13
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2024-08-16

2.7 Measurement uncertainty

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

Test item	Measurement uncertainty
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Power line conducted emission	$\pm 3.19\text{dB}$

3 Radiated Emissions

Test result: Pass

3.1 Limit

3.1.1 Limits for radiated disturbance of class A device

FCC

Frequency (MHz)	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 10m	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 3m
30 – 88	39	49.5
88 – 216	43.5	54.0
216 – 960	46.4	56.9
Above 960	49.5	60.0

Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

3.1.2 Limits for radiated disturbance of class B device

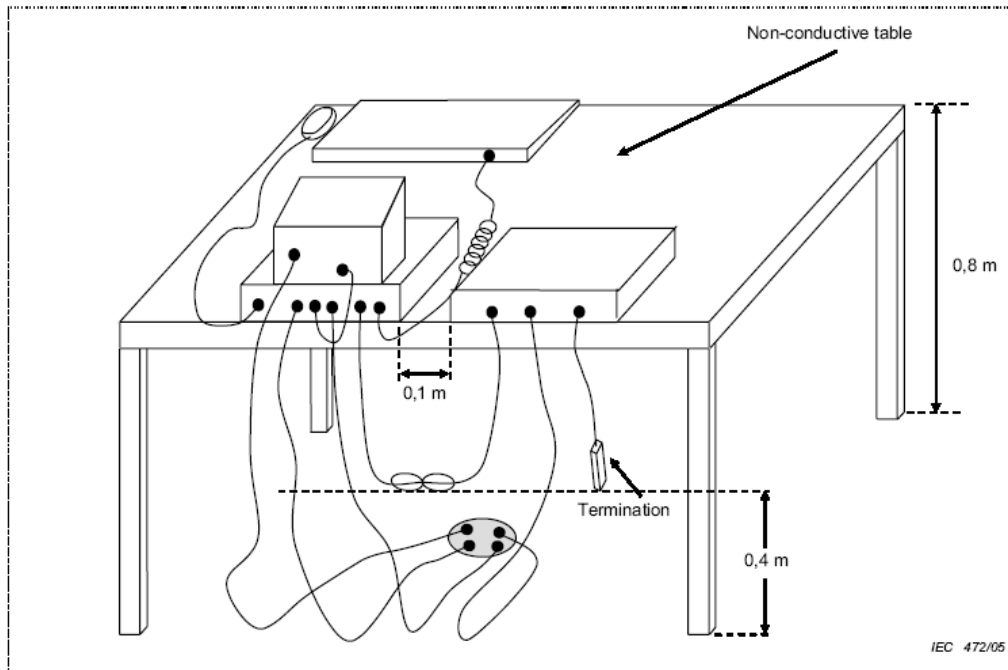
FCC

Frequency (MHz)	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 10m	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 3m
30 – 88	29.5	40.0
88 – 216	33.0	43.5
216 – 960	35.5	46.0
Above 960	43.5	54.0

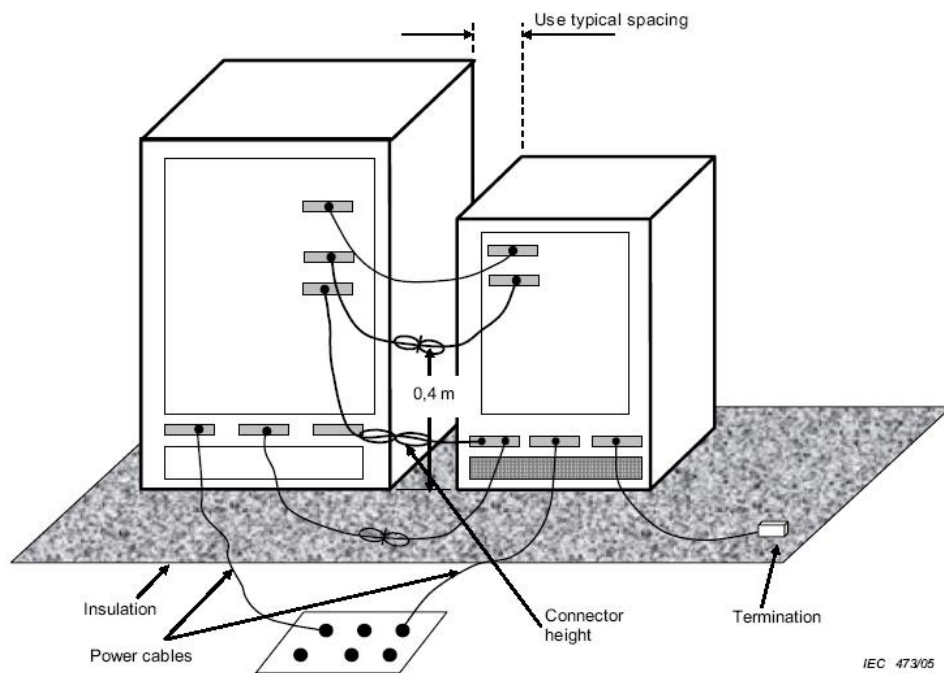
Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

3.2 Block diagram and test set up

For table top equipment



For floor standing equipment



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3.3 Measurement Procedure

The measurement was performed in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, the pre-amplifier (and high pass filter if necessary) is equipped just at the output terminal of the antenna.

The distance from EUT to receiving antenna is 3 meters.

Measurement was performed according to clause 4 and clause 5 of ANSI 63.4.

Test procedure was according to clause 8.3 of ANSI 63.4.

EUT arrangement and operate condition were according to clause 6 and clause 8 of ANSI 63.4.

The radiated emission was measured using the test receiver with the resolutions bandwidth set as:

RBW = 100kHz, VBW = 300kHz (30MHz~1GHz)

RBW = 1MHz, VBW = 3MHz (>1GHz for PK)

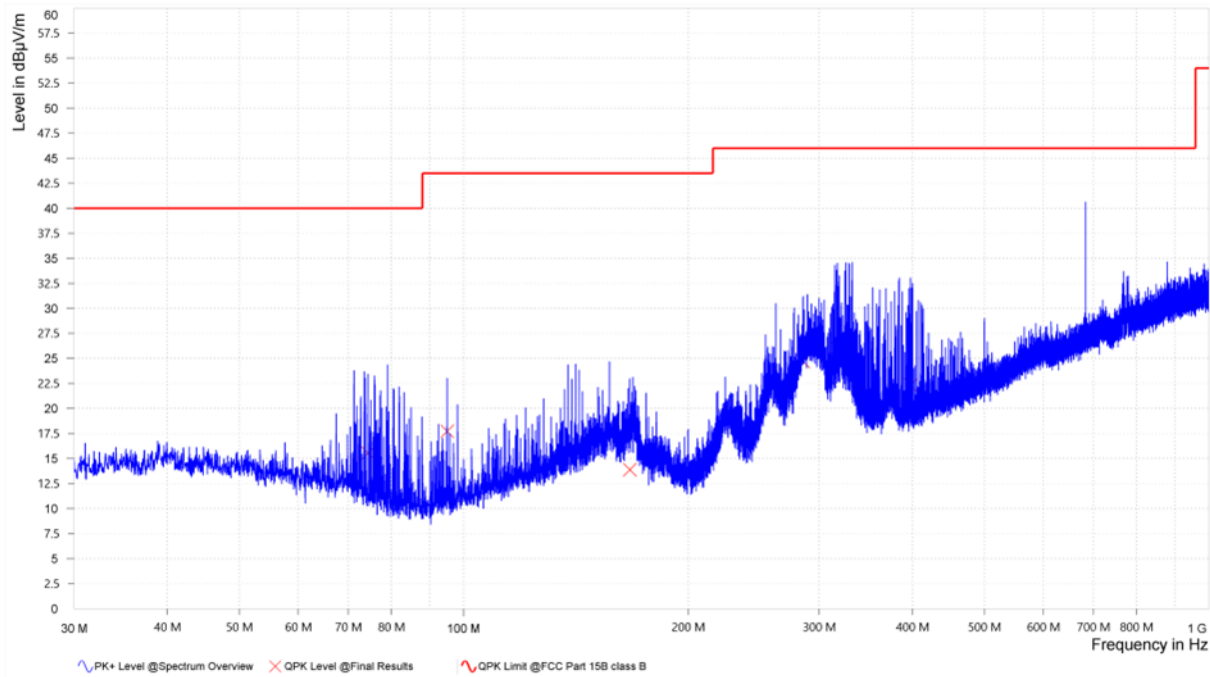
Highest internal frequency (F _x)	Highest measured frequency F _M for radiated measurement	Measured Bandwidth
F _x ≤ 108 MHz	1 GHz	120kHz
108 MHz < F _x ≤ 500 MHz	2 GHz	1MHz
500 MHz < F _x ≤ 1 GHz	5 GHz	1MHz
F _x > 1 GHz	5 × F _x up to a maximum of 40 GHz	1MHz
Note: 1. F _x is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.		

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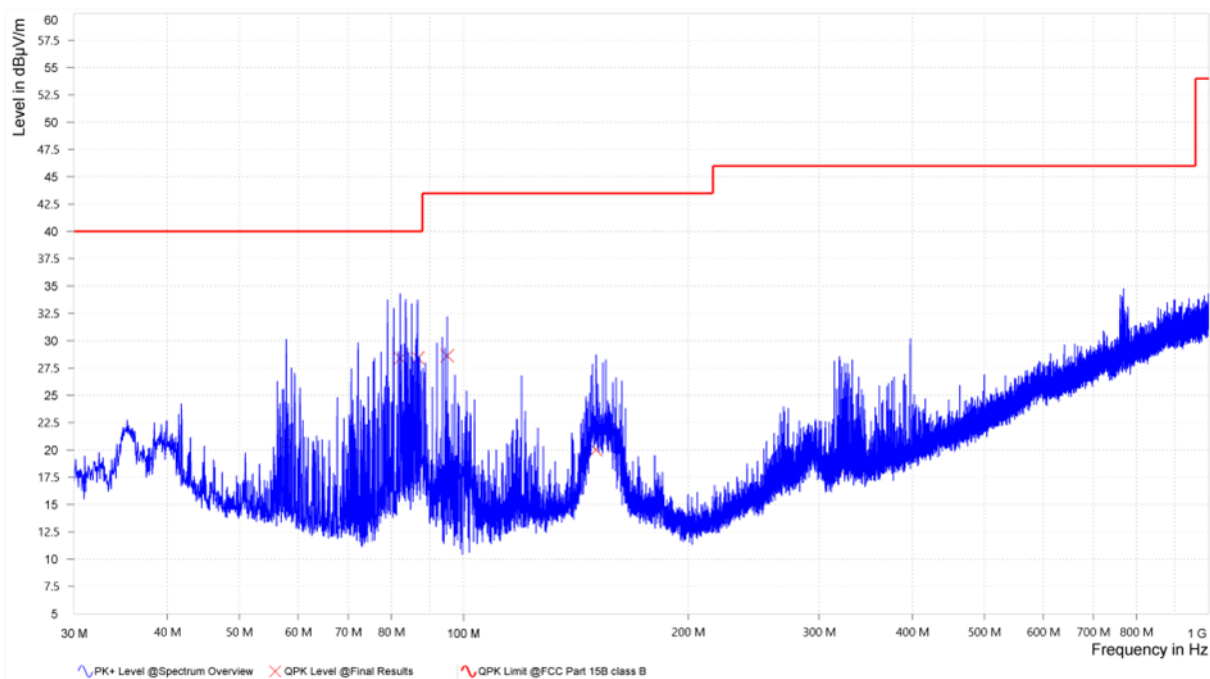
3.4 Test Results of Radiated Emissions

Test Curve:

Horizontal

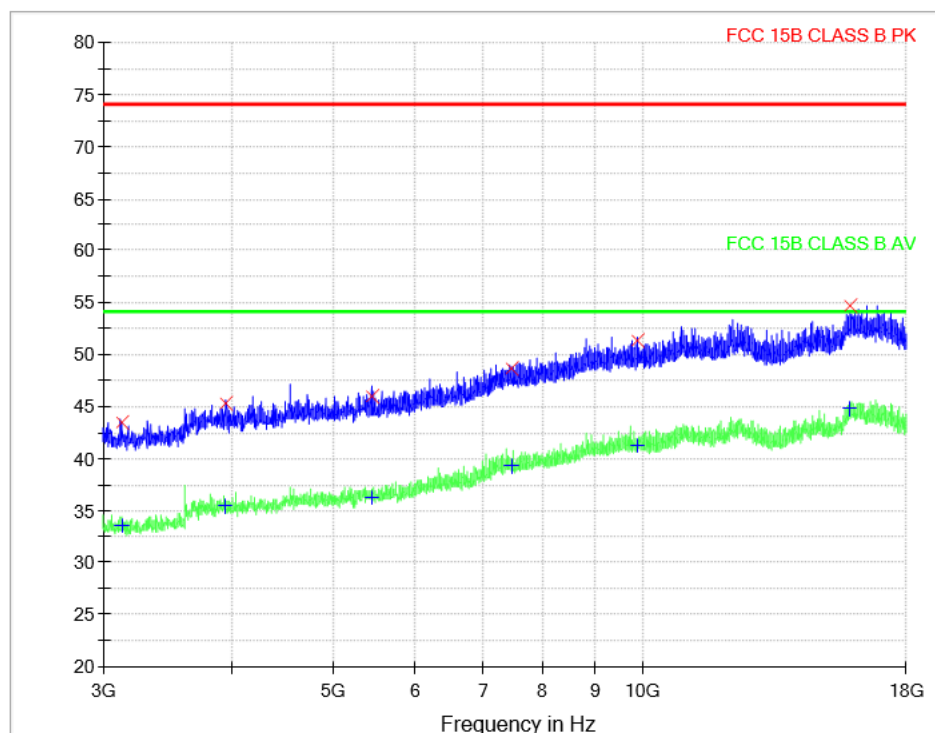
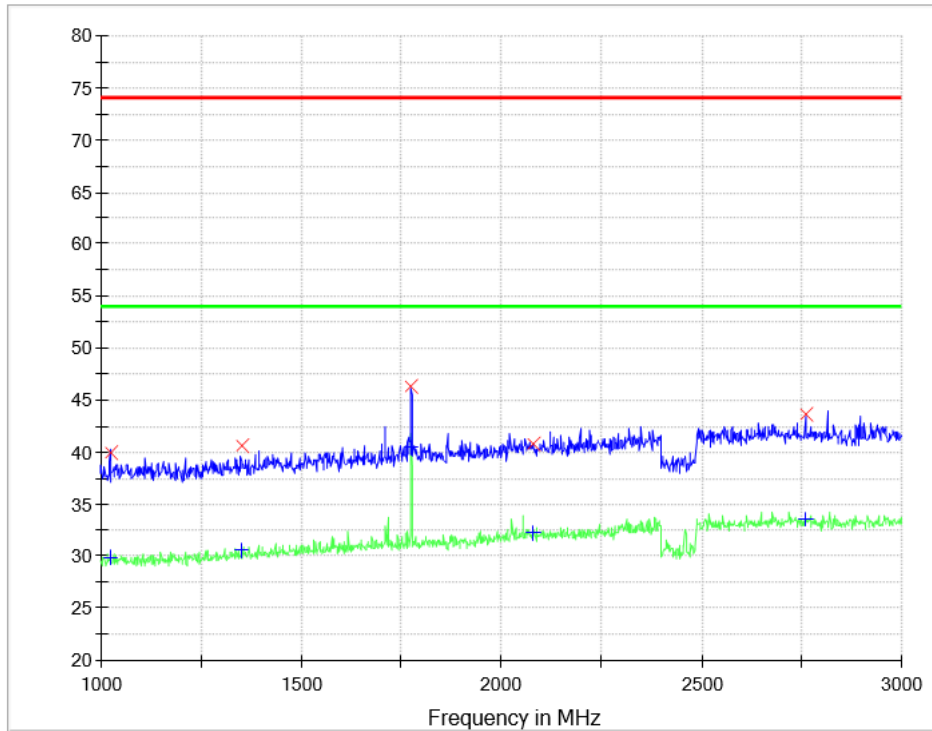


Vertical

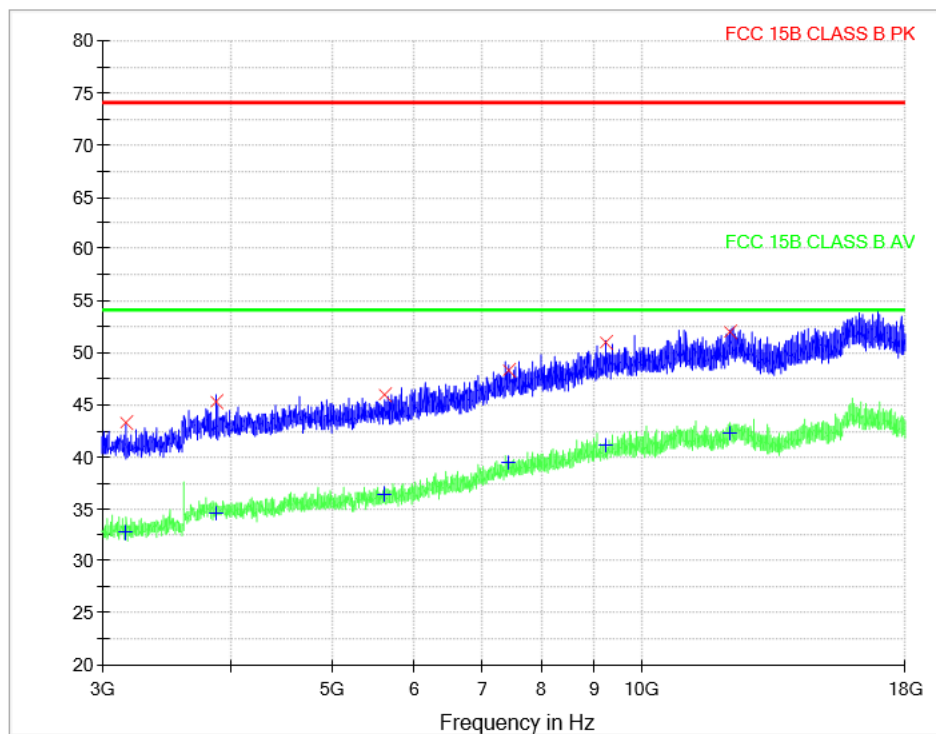
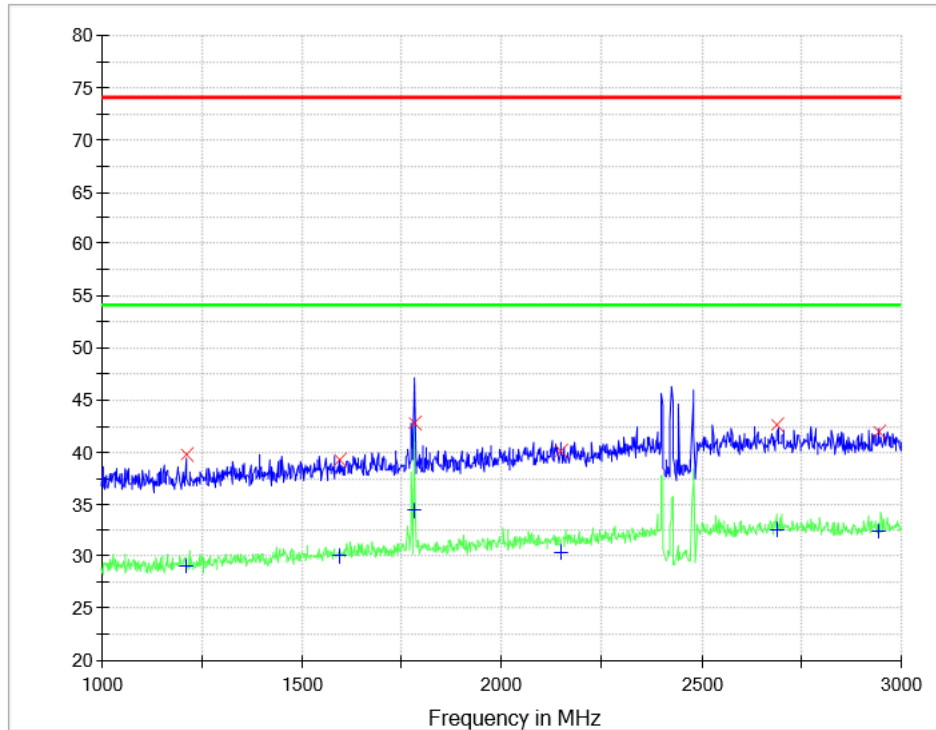


Above 1GHz:

Horizontal



Vertical



Test data:

Polarization	Frequency	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detector
Horizontal	74.35MHz	15.55	40.00	24.45	QP
	95.00MHz	17.72	43.50	25.78	QP
	167.10MHz	13.89	43.50	29.61	QP
	285.45MHz	24.69	46.00	21.31	QP
	317.55MHz	26.05	46.00	19.95	QP
	397.70MHz	22.30	46.00	23.70	QP
	1-25GHz	54.00	<44.00	>10	AV
	1-25GHz	74.00	<64.00	>10	PK
Vertical	57.80MHz	20.59	40.00	19.41	QP
	82.15MHz	28.38	40.00	11.62	QP
	86.70MHz	28.41	40.00	11.59	QP
	95.00MHz	28.62	43.50	14.88	QP
	150.55MHz	20.01	43.50	23.49	QP
	319.20MHz	18.25	46.00	27.75	QP
	1-25GHz	54.00	<44.00	>10	AV
	1-25GHz	74.00	<64.00	>10	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Corrected Reading - Limit
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 10.20dBuV/m - 40.00dBuV/m = -29.80dB.

4 Power line conducted emission

Test result: Pass

4.1 Limit

4.1.1 Limits for conducted disturbance voltage at the mains ports of class A device

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

4.1.2 Limits for conducted disturbance voltage at the mains ports of class B device

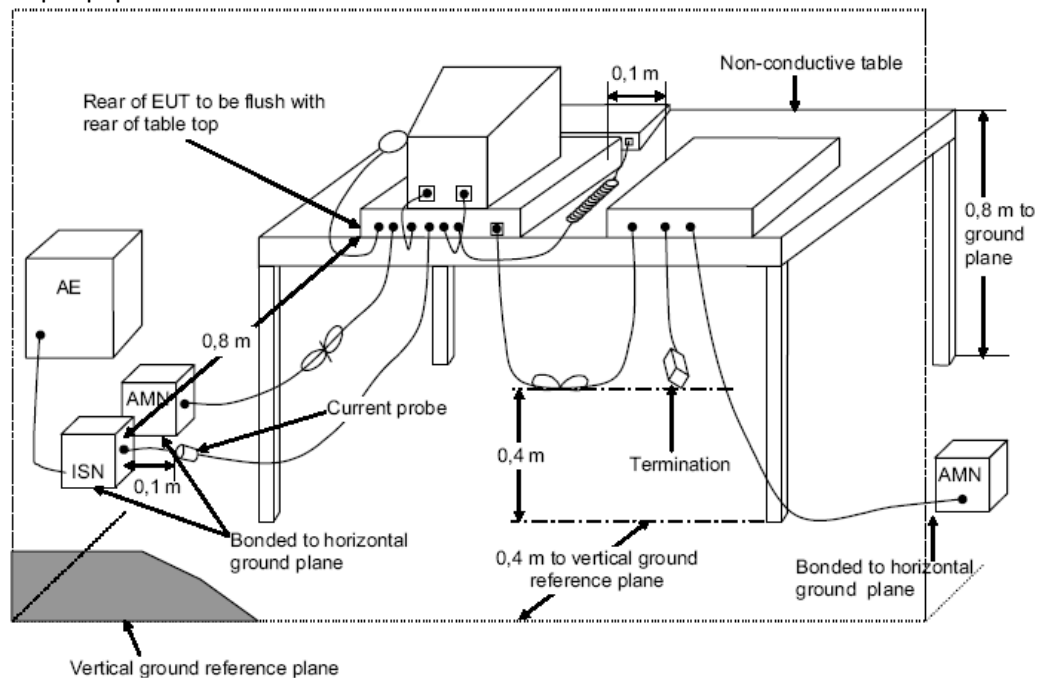
Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz
2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

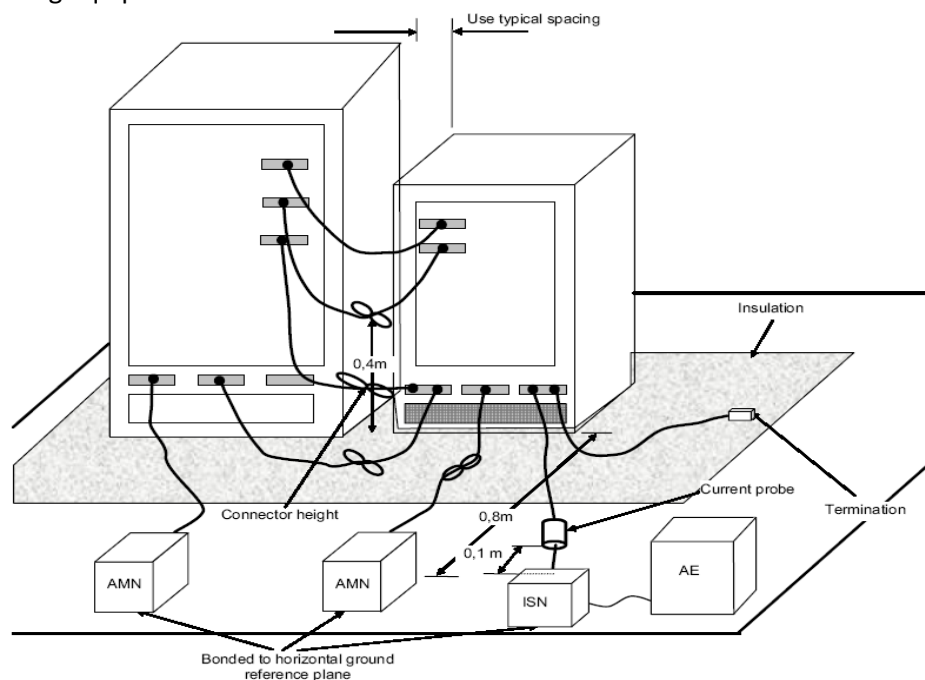
TEST REPORT

4.2 Block diagram and test set up

For table top equipment



For floor standing equipment



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Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground Plane. The vertical conducting Plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-Plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

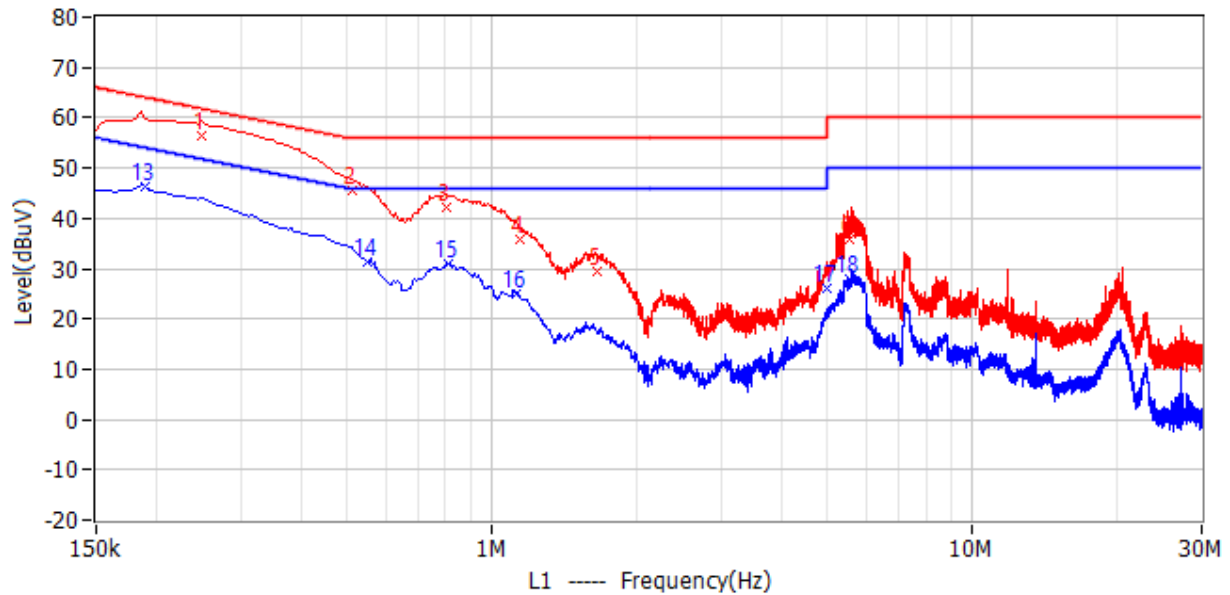
The bandwidth of the test receiver is set at 9 kHz.

TEST REPORT

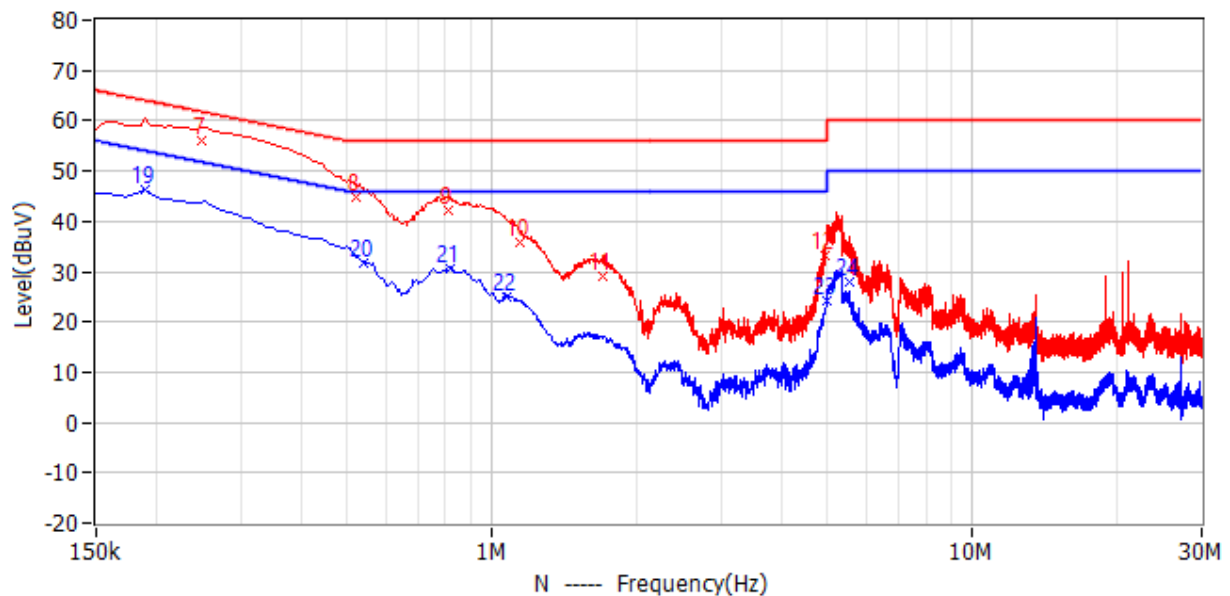
4.4 Test Results of Power line conducted emission

Test Curve:

L1 Line



L2 Line



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Test Data:

No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Detector	Phase
1	249.000kHz	61.8	56.5	-5.3	QP	L1
2	510.000kHz	56.0	45.5	-10.5	QP	L1
3	802.500kHz	56.0	42.2	-13.8	QP	L1
4	1.140MHz	56.0	35.9	-20.1	QP	L1
5	1.653MHz	56.0	29.4	-26.6	QP	L1
6	5.541MHz	60.0	35.9	-24.1	QP	L1
7	249.000kHz	61.8	56.1	-5.7	QP	L2
8	523.500kHz	56.0	44.9	-11.1	QP	L2
9	811.500kHz	56.0	42.2	-13.8	QP	L2
10	1.145MHz	56.0	35.8	-20.2	QP	L2
11	1.694MHz	56.0	29.2	-26.8	QP	L2
12	4.952MHz	56.0	33.1	-22.9	QP	L2
13	190.500kHz	54.0	46.2	-7.8	CAV	L1
14	550.500kHz	46.0	31.2	-14.8	CAV	L1
15	811.500kHz	46.0	30.8	-15.2	CAV	L1
16	1.122MHz	46.0	25.1	-20.9	CAV	L1
17	4.970MHz	46.0	25.9	-20.1	CAV	L1
18	5.559MHz	50.0	27.9	-22.1	CAV	L1
19	190.500kHz	54.0	46.4	-7.6	CAV	L2
20	541.500kHz	46.0	31.6	-14.4	CAV	L2
21	820.500kHz	46.0	30.4	-15.6	CAV	L2
22	1.073MHz	46.0	24.9	-21.1	CAV	L2
23	4.961MHz	46.0	24.1	-21.9	CAV	L2
24	5.528MHz	50.0	27.8	-22.2	CAV	L2

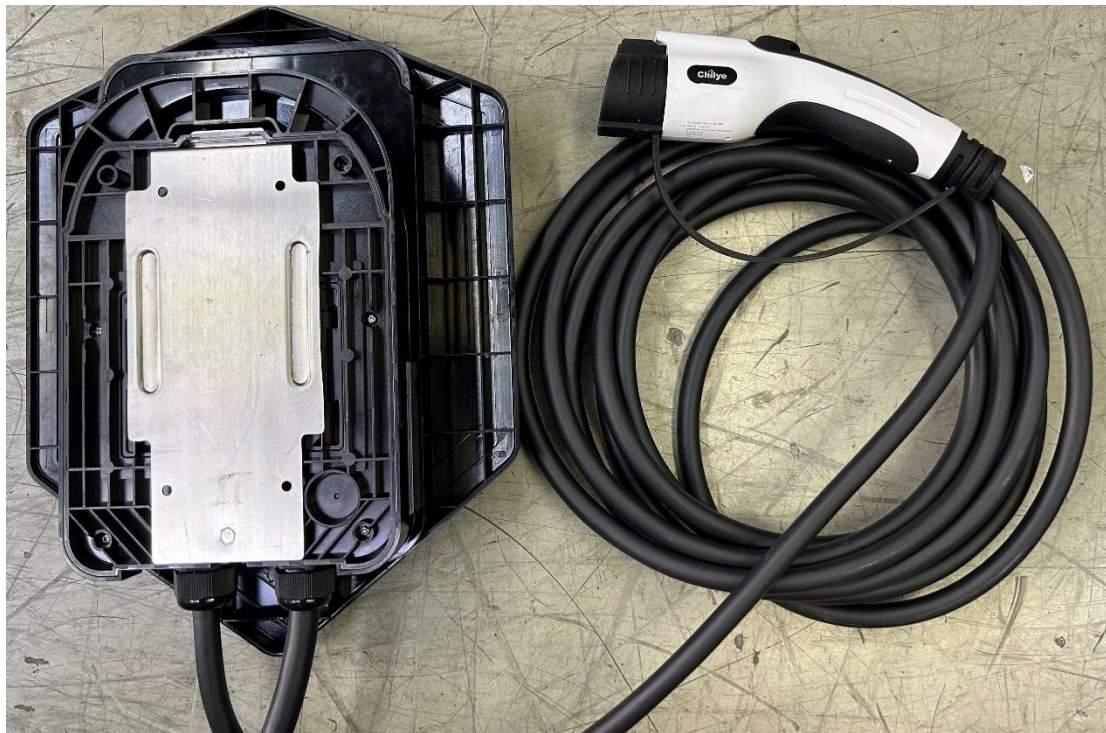
Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

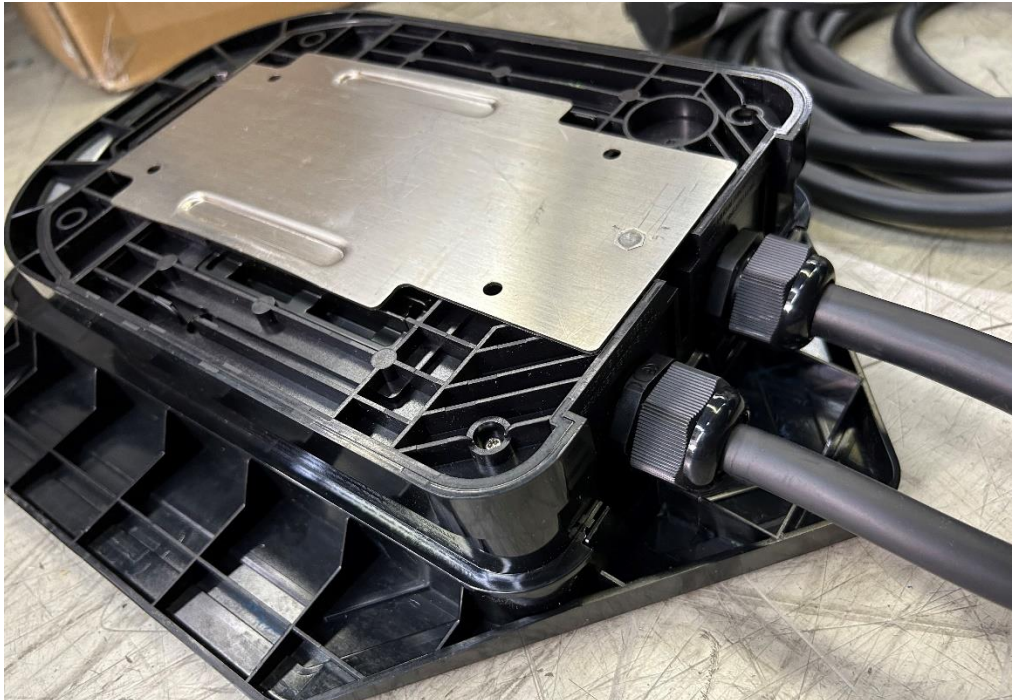
2. Level = Original Receiver Reading + Factor

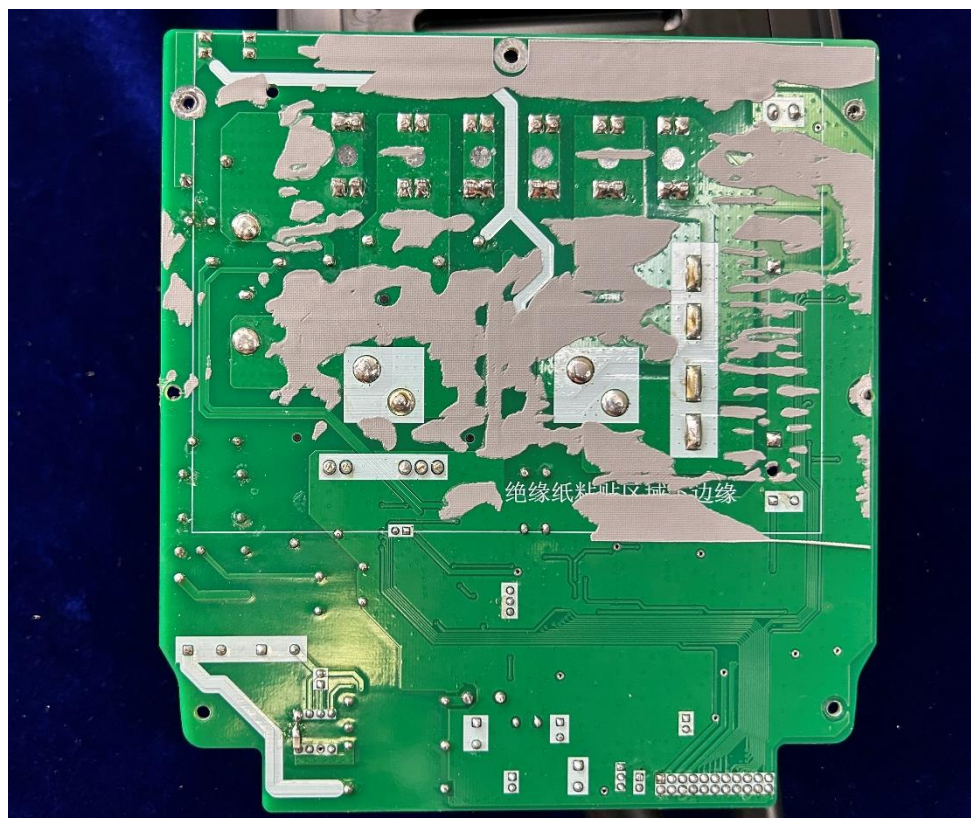
3. Delta = Level - Limit

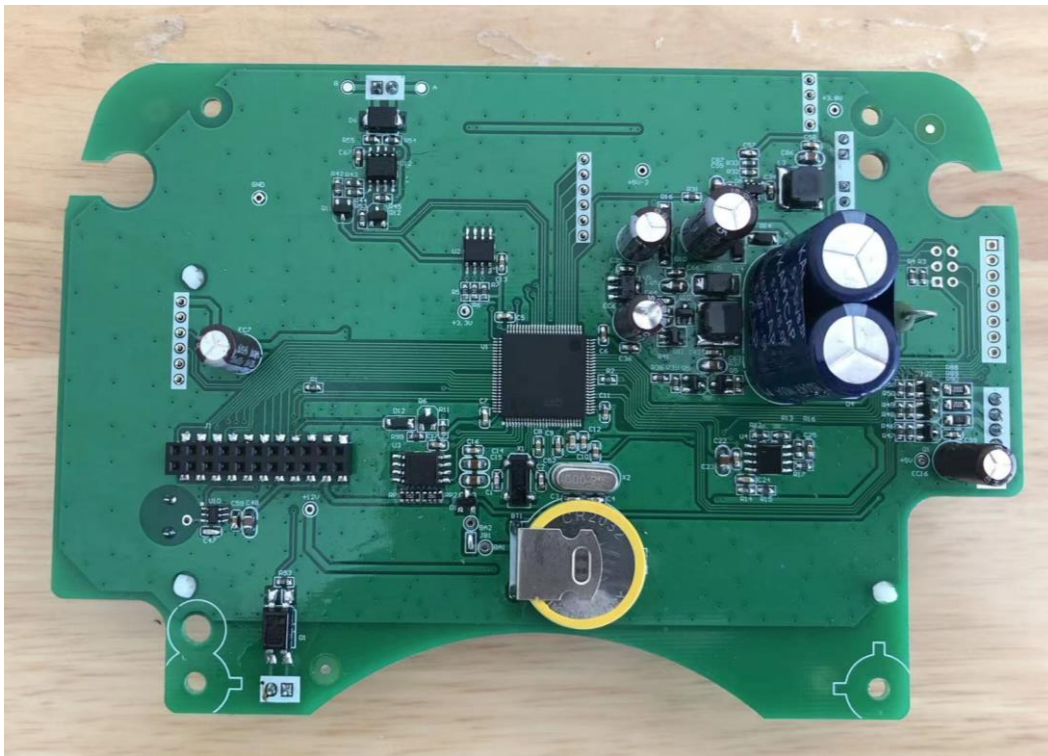
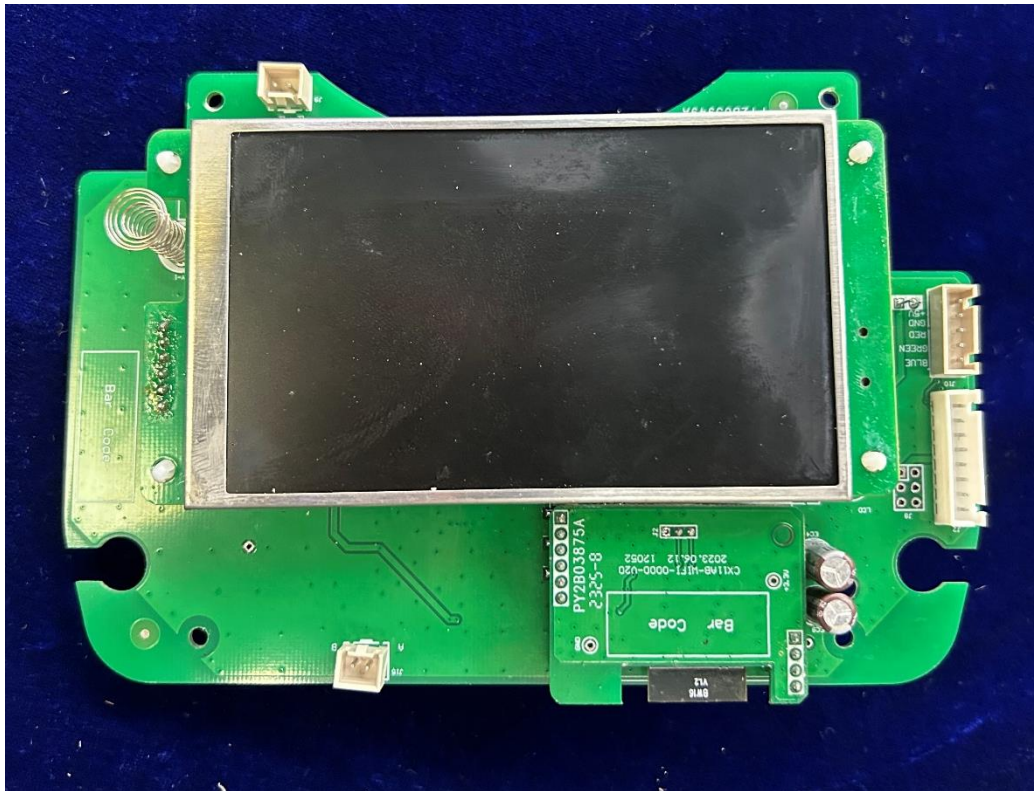
Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
Then Factor = 10.00 + 2.00 = 12.00dB;
Level = 10dBuV + 12.00dB = 22.00dBuV;
Delta = 22.00dBuV - 66.00dBuV = -44.00dB.

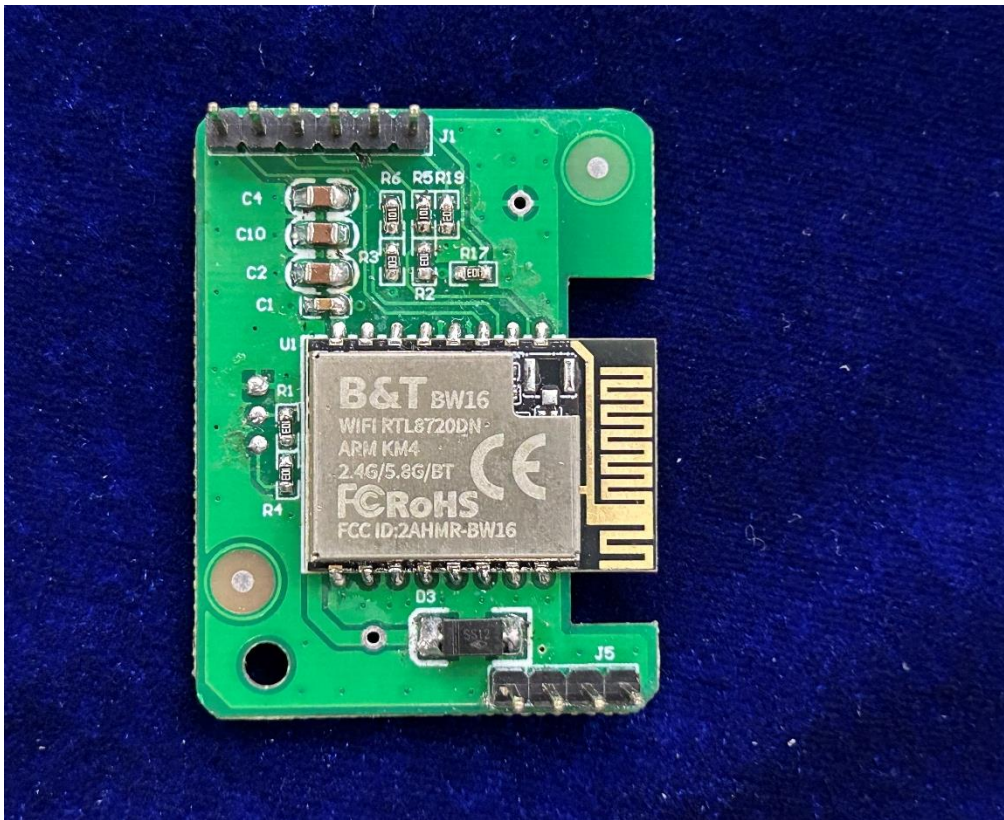
Appendix I: Photograph of equipment under test











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