Massimo MotorSports, LLC

TEST REPORT

Report Type:
FCC Part 15B EMC report

Model:
MCS-50Pro

REPORT NUMBER:
230801043SHA-001

ISSUE DATE:
October 26, 2023

DOCUMENT CONTROL NUMBER:
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Total Quality. Assured.

TEST REPORT

Report no.: 230801043SHA-001

Applicant:	Massimo MotorSports, LLC 3101 W Miller Rd Garland, TX 75041
Manufacturer:	Hangzhou sunhope electric Technology Co.,LTD. Building 4, No.1099 Cangxing Road, Cangqian Street, Yuhang District, Hangzhou, Zhejiang, China
Factory:	Hangzhou sunhope electric Technology Co.,LTD. Building 4, No.1099 Cangxing Road, Cangqian Street, Yuhang District, Hangzhou, Zhejiang, China
FCC ID:	2BBH3Y49004G

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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Content

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Revision History

Report No.	Version	Description	Issued Date
230801043SHA-001	Rev. 01	Initial issue of report	October 26, 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 LTE module, the FCC ID is XMR2023EG800QNA. 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

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	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Power line conducted emission	± 3.19dB

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 dBμV/m (Quasi-peak) of Measurement Distance 10m	Permitted limit in dBμV/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 dBμV/m (Quasi-peak) of Measurement Distance 10m	Permitted limit in dBμV/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.		

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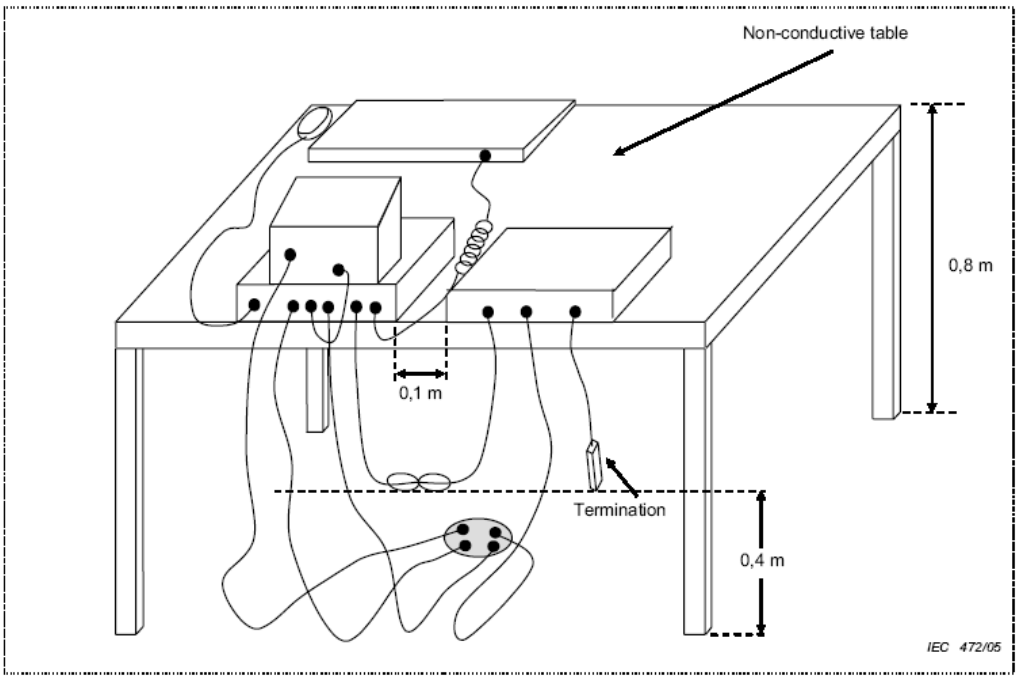
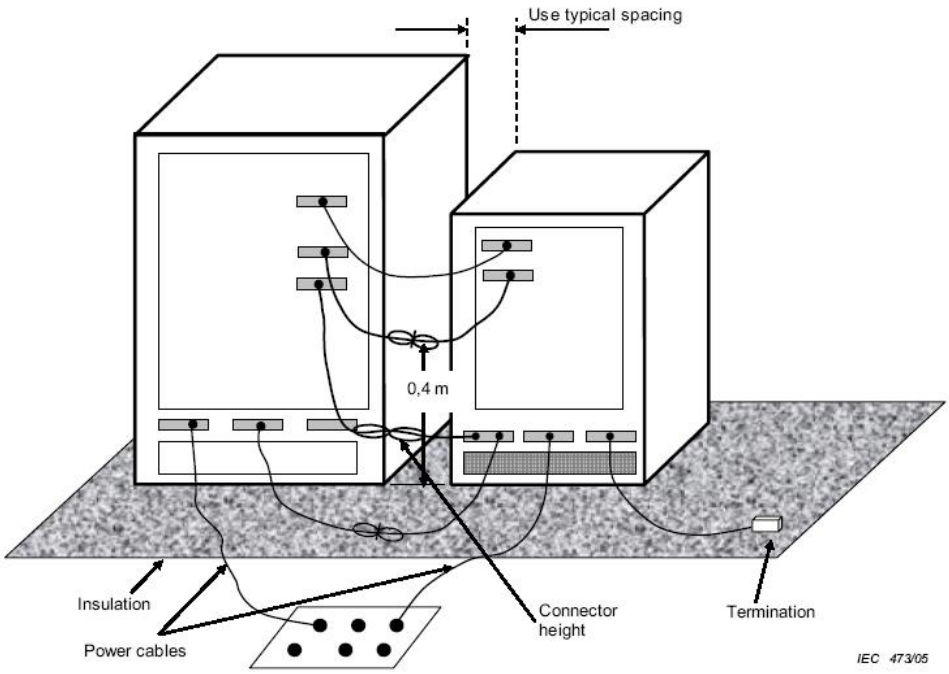
3.2 Block diagram and test set up

For table top equipment



For floor standing equipment



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:

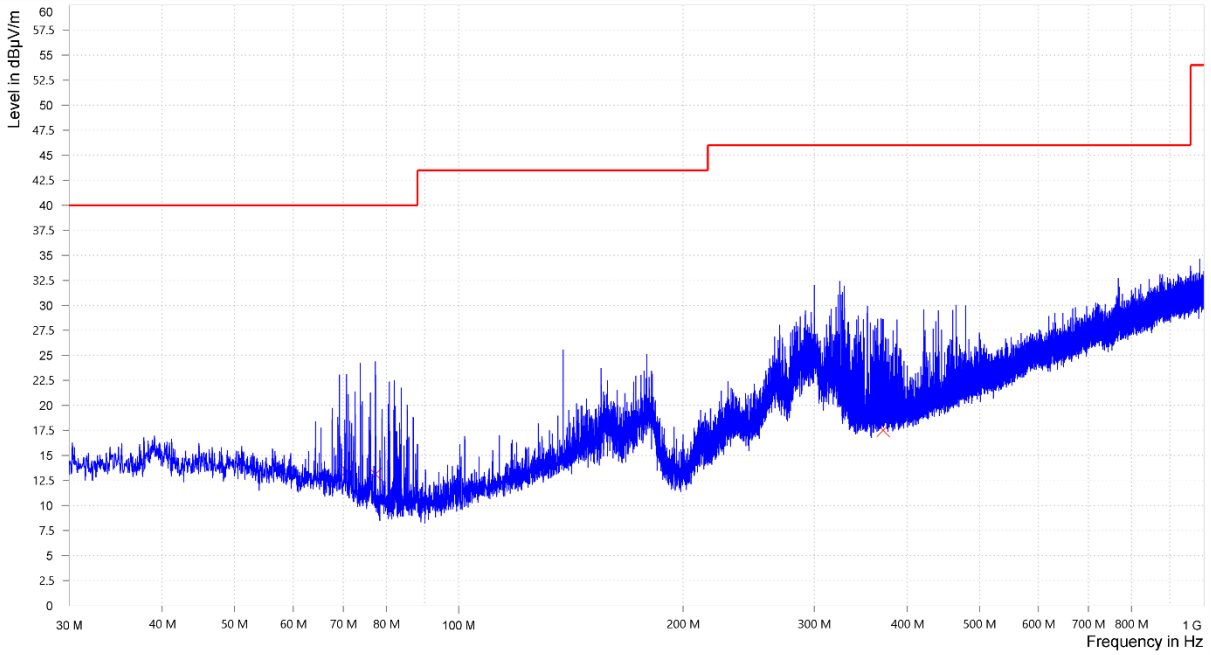
RBW = 100kHz, VBW = 300kHz (30MHz~1GHz)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK)

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

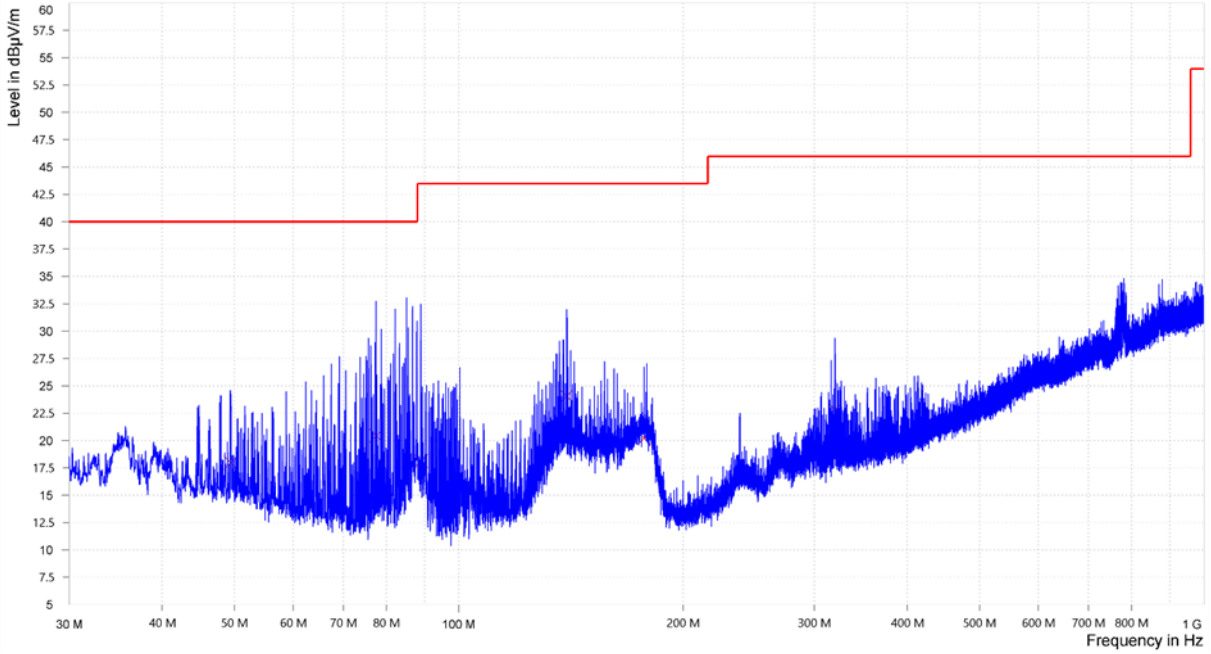
3.4 Test Results of Radiated Emissions

Test Curve:

Horizontal



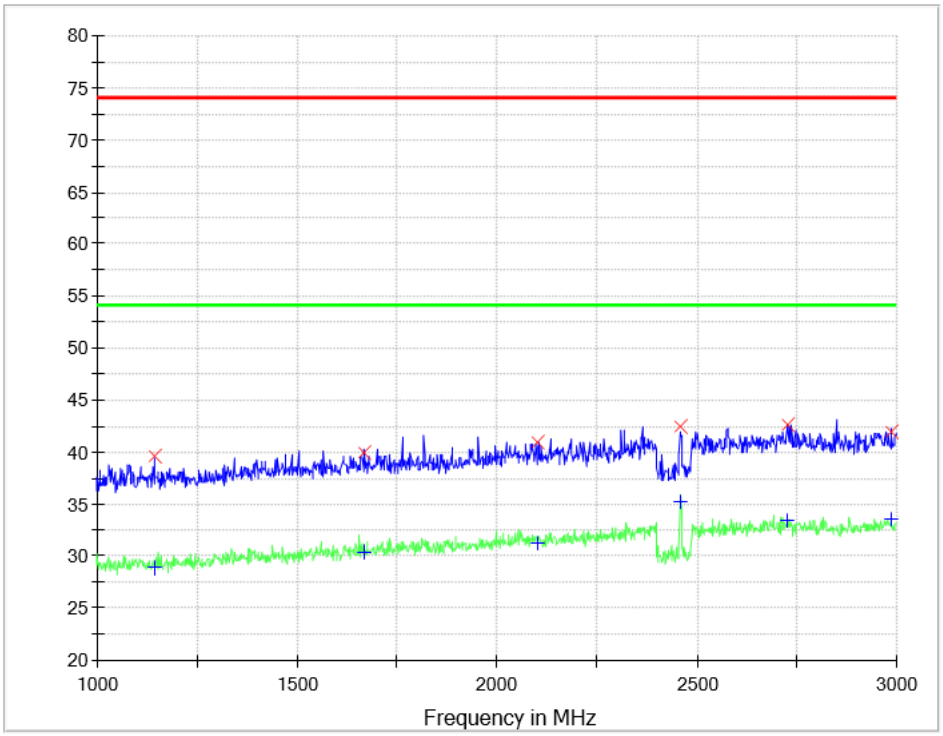
Vertical

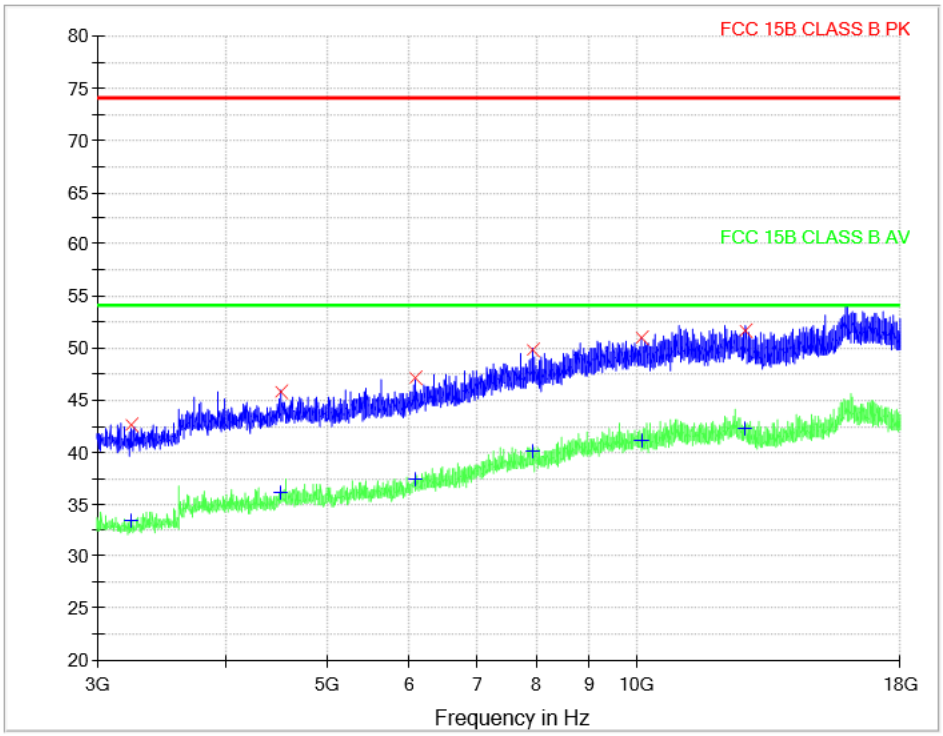


TEST REPORT

Above 1GHz:

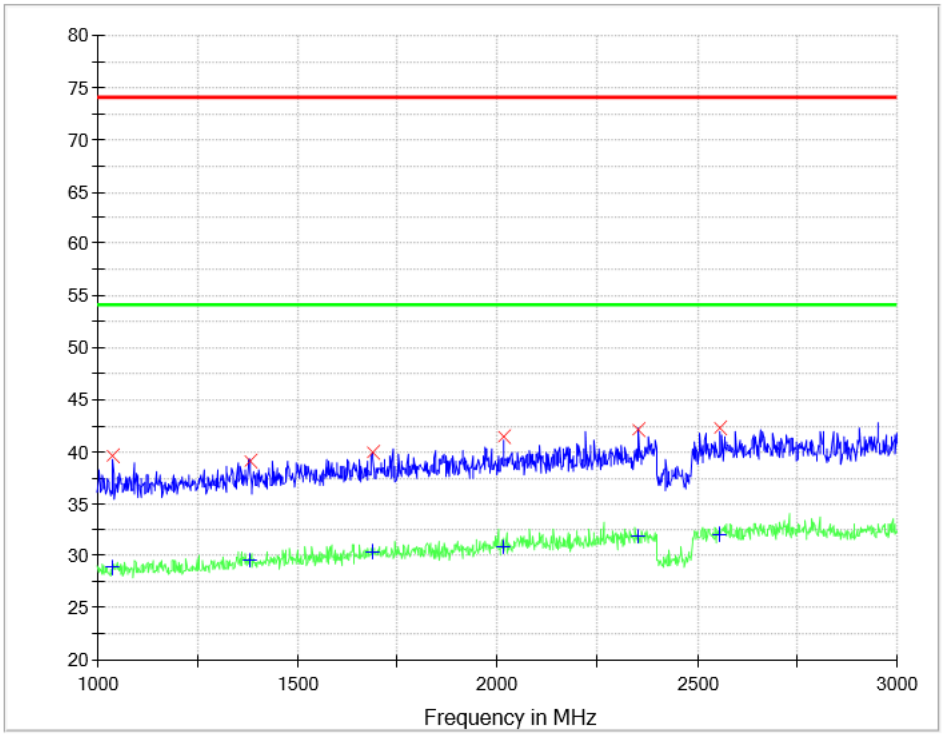
Horizontal

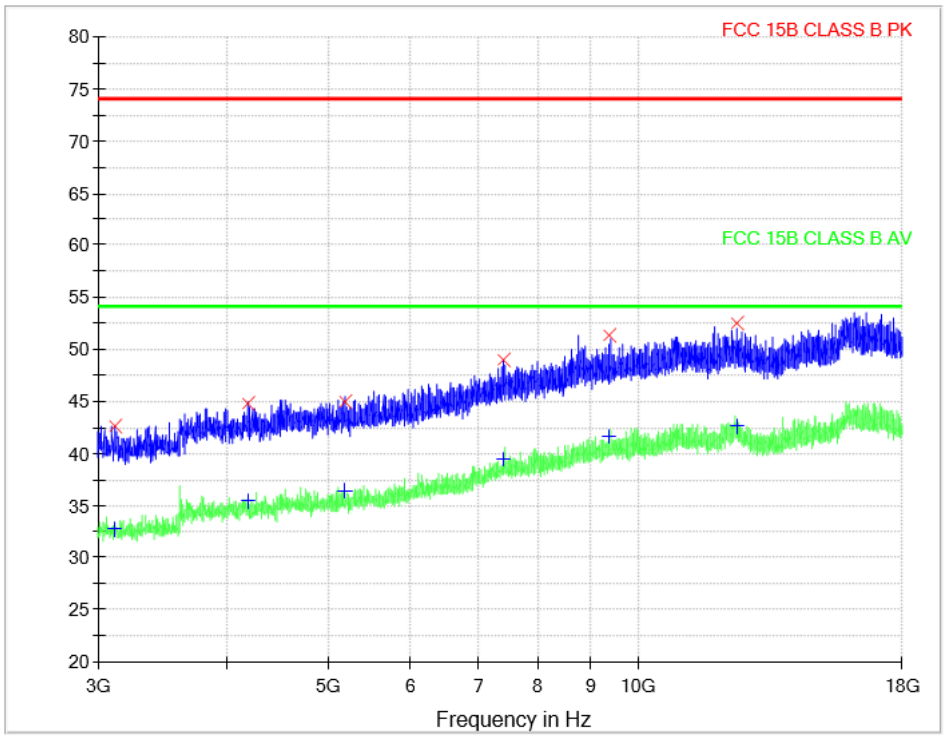




TEST REPORT

Vertical





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Test data:

Polarization	Frequency	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Detector
Horizontal	70.70MHz	13.49	40.00	26.51	QP
	77.30MHz	13.12	40.00	26.88	QP
	178.85MHz	18.95	43.50	24.55	QP
	300.00MHz	25.79	46.00	20.21	QP
	371.35MHz	17.50	46.00	28.50	QP
	464.95MHz	21.24	46.00	24.76	QP
	1-25GHz	54.00	<44.00	>10	AV
	1-25GHz	74.00	<64.00	>10	PK
Vertical	49.40MHz	17.97	40.00	22.03	QP
	77.45MHz	20.43	40.00	19.57	QP
	88.95MHz	18.14	43.50	25.36	QP
	139.70MHz	24.05	43.50	19.45	QP
	177.30MHz	20.19	43.50	23.31	QP
	320.00MHz	22.84	46.00	23.16	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

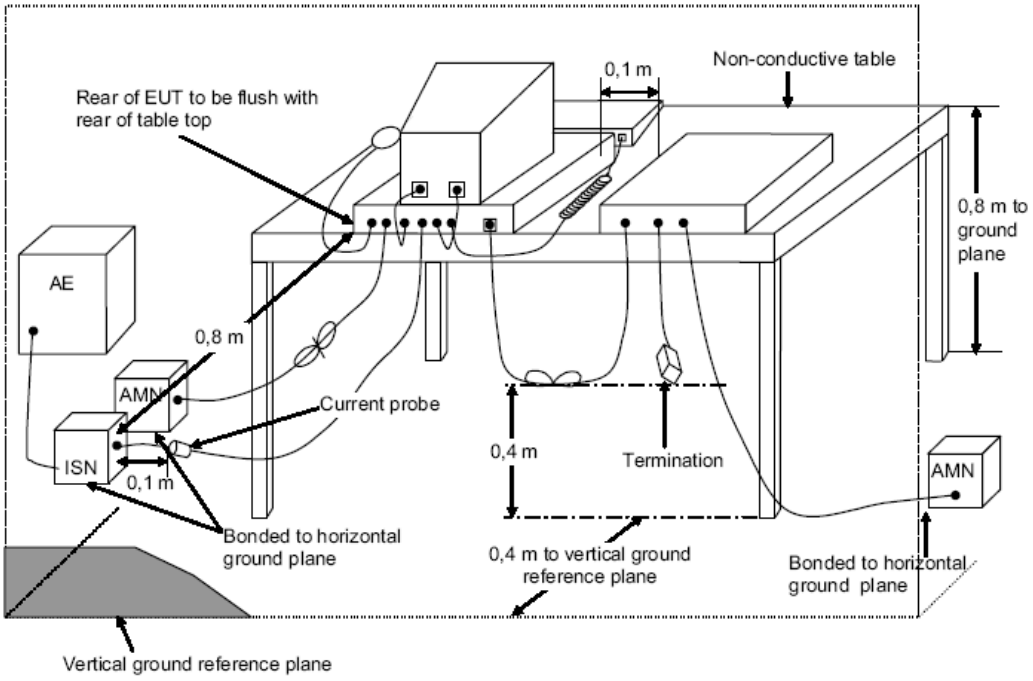
Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the 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

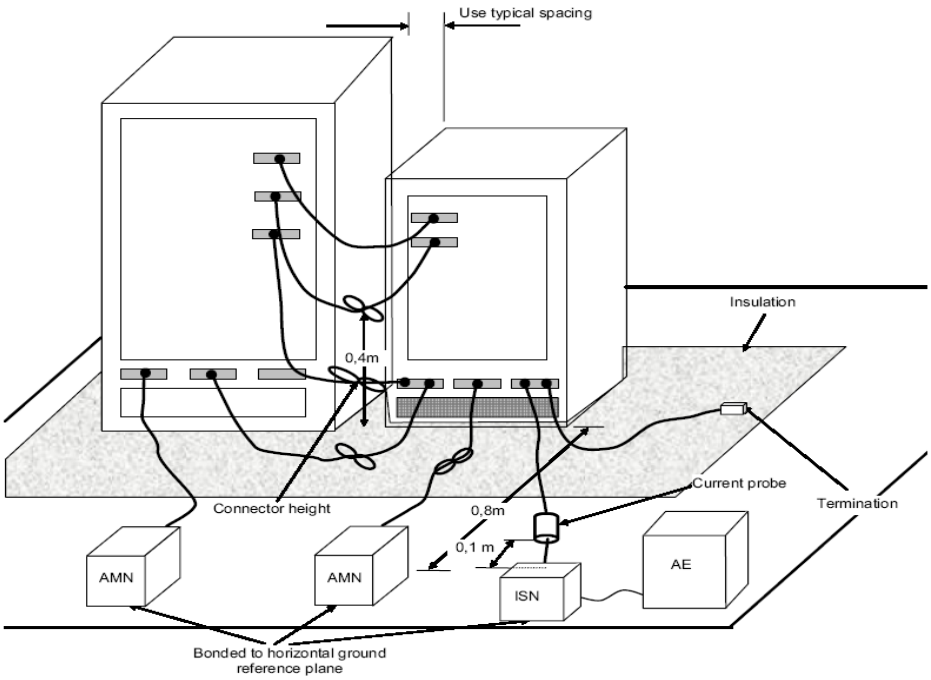
Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50
Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz 2. If the limit for the measurement with the average detector is met when 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.		

4.2 Block diagram and test set up

For table top equipment



For floor standing equipment



4.3 Measurement Procedure

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.

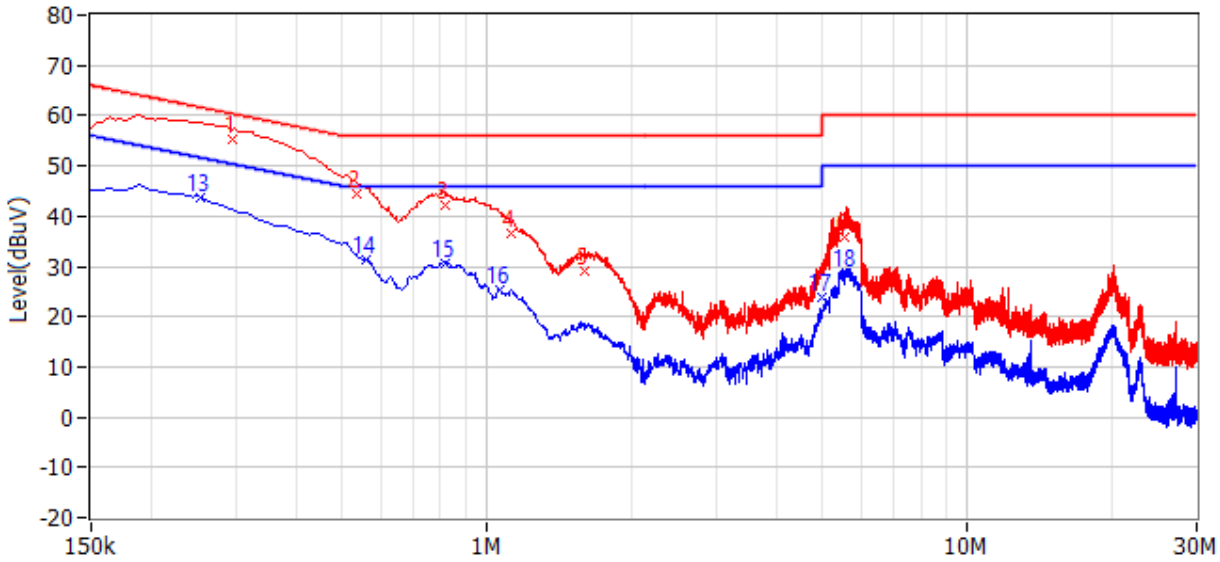
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground Plane. The vertical conducting Plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on 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.

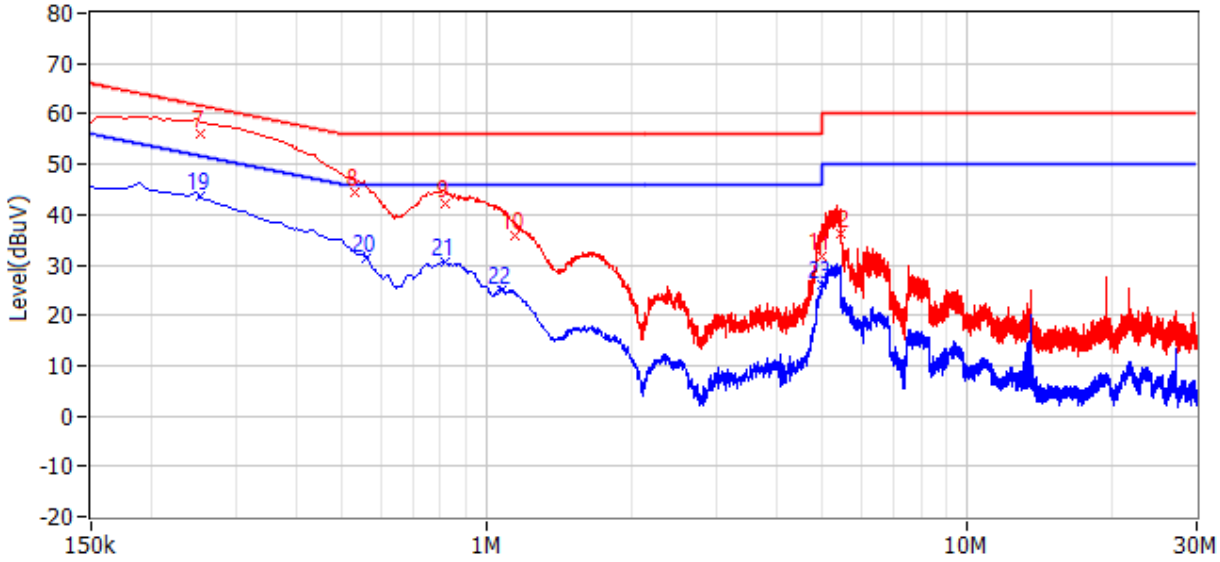
4.4 Test Results of Power line conducted emission

Test Curve:

L1 Line



L2 Line



TEST REPORT

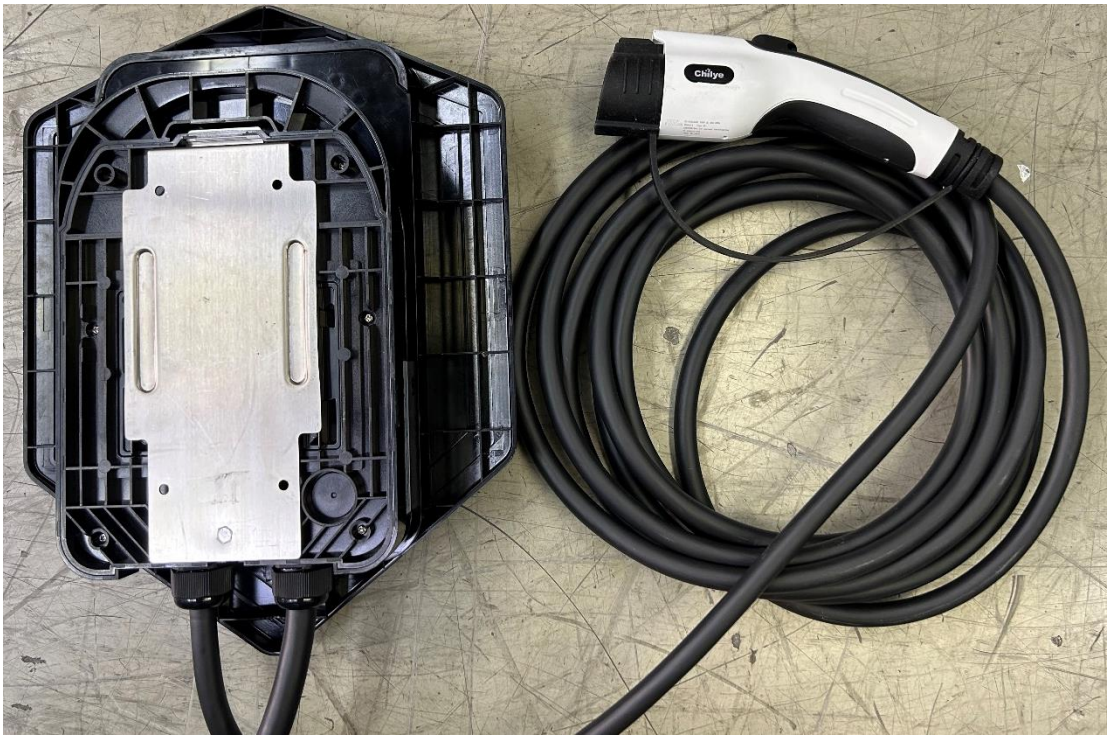
Test Data:

No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Detector	Phase
1	294.000kHz	60.4	55.2	-5.2	QP	L1
2	537.000kHz	56.0	44.3	-11.7	QP	L1
3	816.000kHz	56.0	42.2	-13.8	QP	L1
4	1.127MHz	56.0	36.4	-19.6	QP	L1
5	1.590MHz	56.0	29.2	-26.8	QP	L1
6	5.568MHz	60.0	35.9	-24.1	QP	L1
7	253.500kHz	61.6	56.0	-5.6	QP	L2
8	532.500kHz	56.0	44.5	-11.5	QP	L2
9	820.500kHz	56.0	42.1	-13.9	QP	L2
10	1.145MHz	56.0	35.8	-20.2	QP	L2
11	4.979MHz	56.0	31.5	-24.5	QP	L2
12	5.424MHz	60.0	36.1	-23.9	QP	L2
13	253.500kHz	51.6	43.4	-8.2	CAV	L1
14	559.500kHz	46.0	31.4	-14.6	CAV	L1
15	820.500kHz	46.0	30.6	-15.4	CAV	L1
16	1.064MHz	46.0	25.2	-20.8	CAV	L1
17	4.983MHz	46.0	23.7	-22.3	CAV	L1
18	5.595MHz	50.0	28.7	-21.3	CAV	L1
19	253.500kHz	51.6	43.5	-8.1	CAV	L2
20	559.500kHz	46.0	31.3	-14.7	CAV	L2
21	816.000kHz	46.0	30.5	-15.5	CAV	L2
22	1.073MHz	46.0	25.0	-21.0	CAV	L2
23	4.997MHz	46.0	26.1	-19.9	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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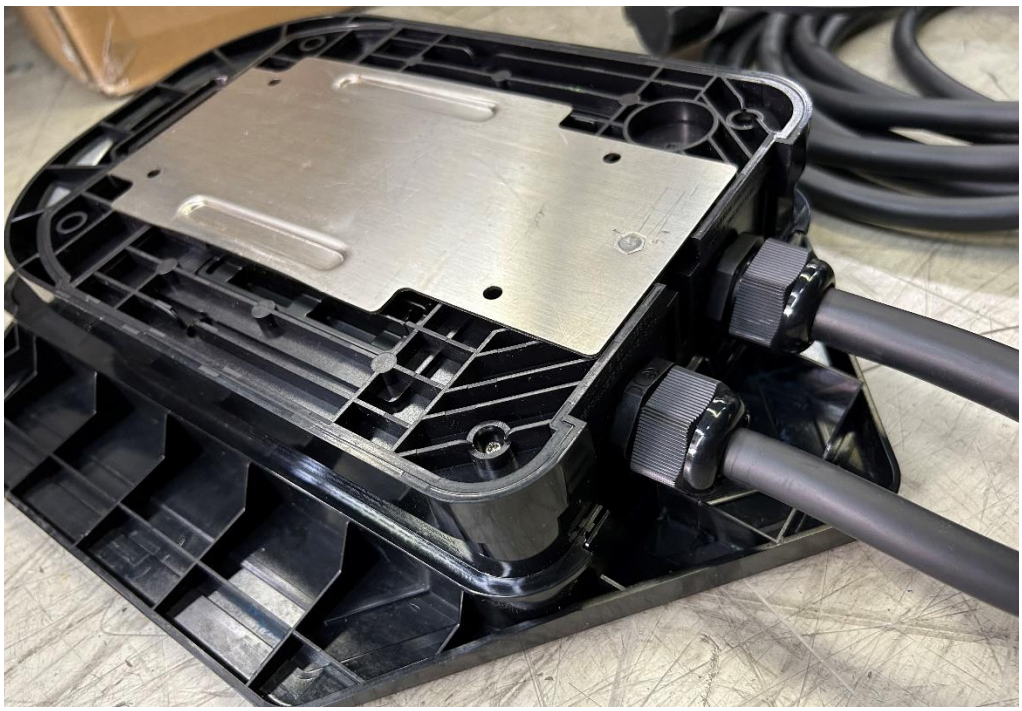

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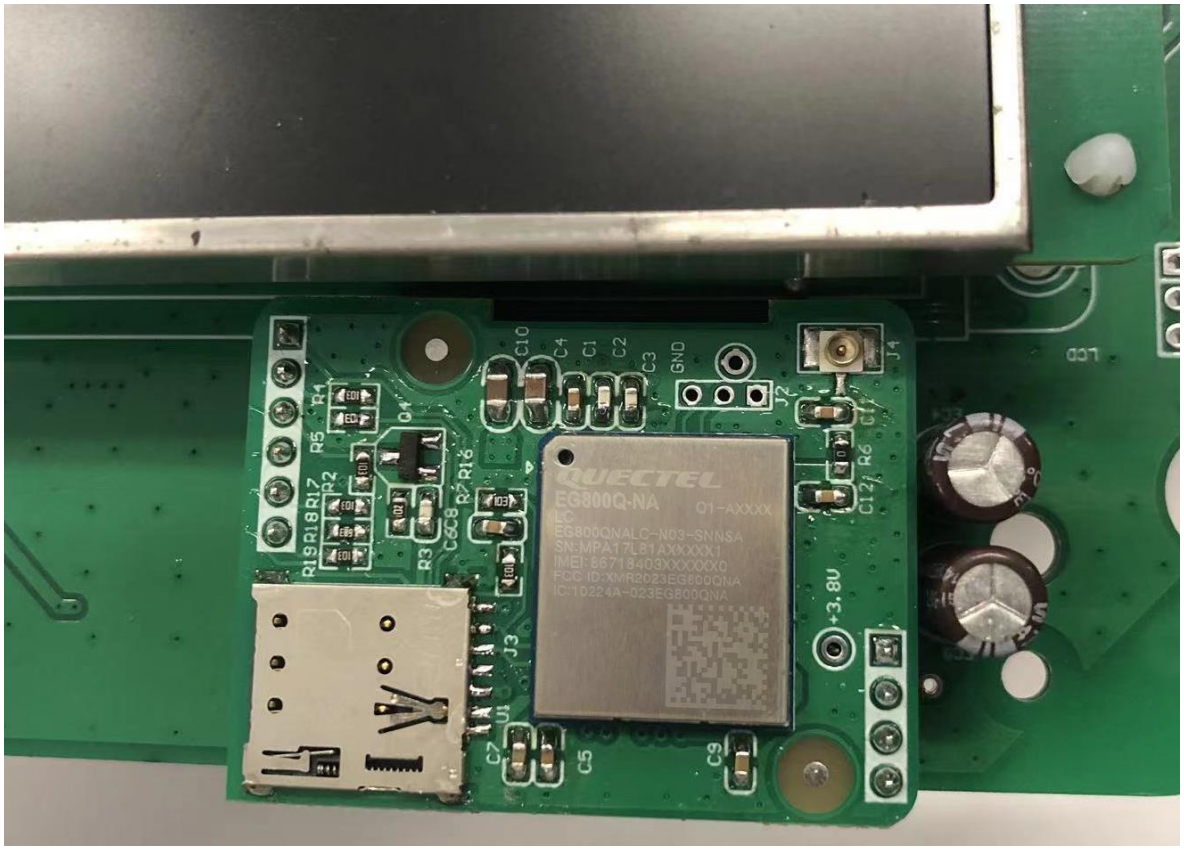

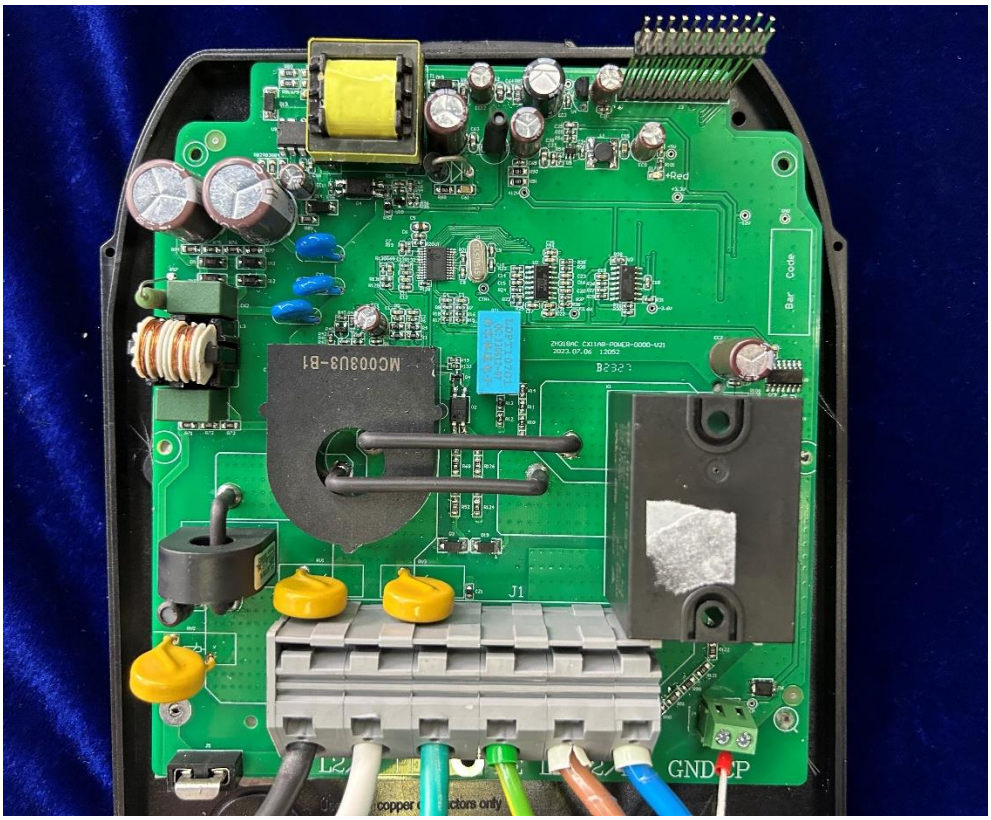

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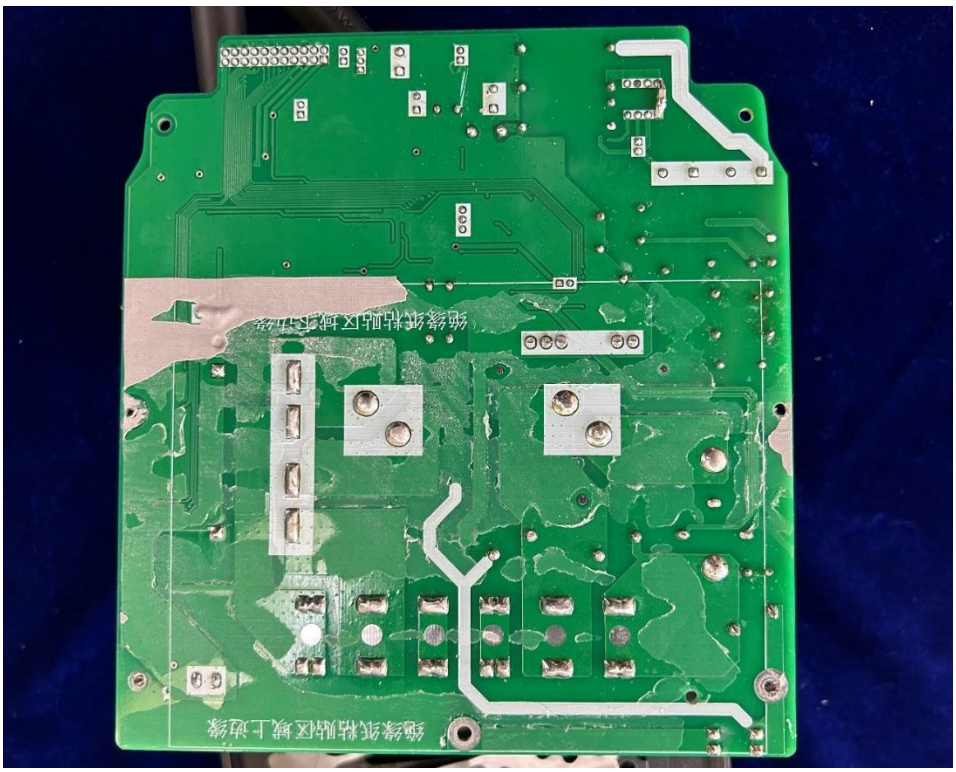

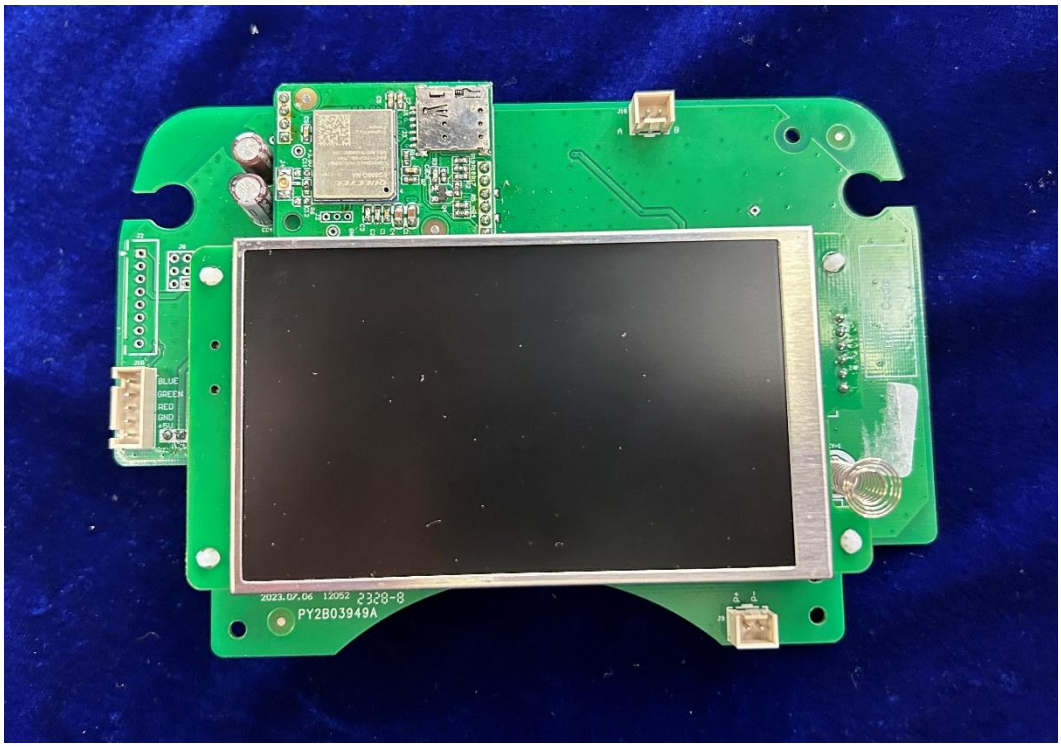

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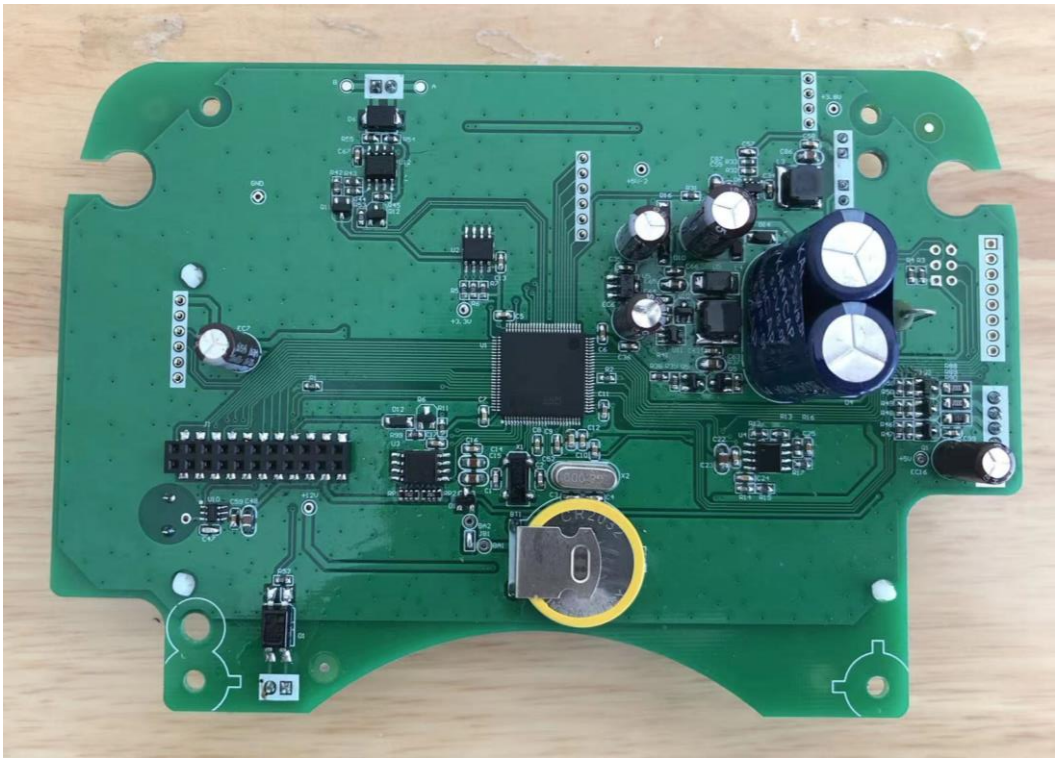

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