

FCC Test Report

Client Name : JIANGSU HUAKONG INTELLIGENT TECHNOLOGY CO., LTD.

Address : Intersection of Xuhai Road and Minsheng Road, Xuzhuang Town, Xuzhou City, Jiangsu Province

Product Name : Permanent magnet synchronous controller

Date : May 15, 2023

Shenzhen Anbotek Compliance Laboratory Limited

Contents

1. General Information	4
1.1. Client Information	4
1.2. Description of Device (EUT)	4
1.3. Auxiliary Equipment Used During Test	5
1.4. Description of Test Mode	5
1.5. Test Summary	5
1.6. Test Equipment List	6
1.7. Description of Test Facility	7
1.8. Measurement Uncertainty	7
2. Power Line Conducted Emission Test	8
2.1. Test Standard and Limit	8
2.2. Test Setup	8
2.3. EUT Configuration on Measurement	8
2.4. Operating Condition of EUT	8
2.5. Test Procedure	9
2.6. Test Results	9
3. Radiated Emission Test	10
3.1. Test Standard and Limit	10
3.2. Test Setup	11
3.3. EUT Configuration on Measurement	12
3.4. Operating Condition of EUT	12
3.5. Test Procedure	12
3.6. Test Results	12
APPENDIX I -- TEST SETUP PHOTOGRAPH	21
APPENDIX II -- EXTERNAL PHOTOGRAPH	22
APPENDIX III -- INTERNAL PHOTOGRAPH	26



TEST REPORT

Applicant : JIANGSU HUAKONG INTELLIGENT TECHNOLOGY CO., LTD
Manufacturer : Intersection of Xuhai Road and Minsheng Road, Xuzhuang Town, Xuzhou
City, Jiangsu Province
Product Name : Permanent magnet synchronous controller
Model No. : 60 MOSFET Controller, KTZ00X00XXX, YCK000000X
Trade Mark : HUAKONG INTELLIGENT
Rating(s) : Rated input voltage range DC 24-144V
Maximum input current range 0-300 A
Rated power 3-10.5kw
Maximum power 6-21kw

Test Standard(s) : FCC Rules and Regulations Part 15 Subpart B
Test Method(s) : ANSI C63.4-2014

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited To determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart B Class B limits both radiated and conducted emissions. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full responsibility for the accuracy and completeness of these measurements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited


Date of Receipt

May 08, 2023

Date of Test

May 08~May 015, 2023

Prepared By



(Ella Liang)

Approved & Authorized Signer



(Kingkong Jin)

1. General Information

1.1. Client Information

Applicant	:	JIANGSU HUAKONG INTELLIGENT TECHNOLOGY CO., LTD
Address	:	Intersection of Xuhai Road and Minsheng Road, Xuzhuang Town, Xuzhou City, Jiangsu Province
Manufacturer	:	JIANGSU HUAKONG INTELLIGENT TECHNOLOGY CO., LTD
Address	:	Intersection of Xuhai Road and Minsheng Road, Xuzhuang Town, Xuzhou City, Jiangsu Province
Factory	:	JIANGSU HUAKONG INTELLIGENT TECHNOLOGY CO., LTD
Address	:	Intersection of Xuhai Road and Minsheng Road, Xuzhuang Town, Xuzhou City, Jiangsu Province

1.2. Description of Device (EUT)

Product Name	:	Permanent magnet synchronous controller	
Model No.	:	60 MOSFET Controller, KTZ00X00XXX, YCK000000X	
Trade Mark	:	HUAKONG INTELLIGENT	
Test Power Supply	:	Rated input voltage range DC 24-144V Maximum input current range 0-300 A Rated power 3-10.5kw Maximum power 6-21kw	
Test Sample No.	:	1-2-1(Normal Sample)	
Product Description	:	Adapter:	N/A
Remark: (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

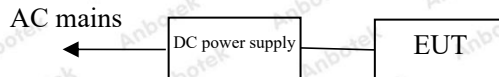
1.3. Auxiliary Equipment Used During Test

N/A

1.4. Description of Test Mode

Pretest Mode	Description
Mode 1	On Mode

For Mode 1 Block Diagram of Test Setup



1.5. Test Summary

Standard Section	Test Items	Test Mode	Status
§15.107	Power Line Conducted Emission Test	Mode 1	N
§15.109	Radiated Emission Test (Below 1 GHz)	Mode 1	P
§15.109	Radiated Emission Test (Above 1GHz)	Mode 1	P
P) Indicates "PASS". F) Indicates "Fail". N) Indicates "Not applicable".			

1.6. Test Equipment List

Power Line Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Oct. 23, 2022	1 Year
2.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040D T001	Jul. 05, 2022	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 13, 2022	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2022	1 Year
5.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A

Radiated Emission Test (Below 1 GHz)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 23, 2022	1 Year
2.	Pre-amplifier	SONOMA	310N	186860	Oct. 23, 2022	1 Year
3.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 23, 2022	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A

Radiated Emission Test (Above 1GHz)

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 23, 2022	1 Year
2.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A
3.	EMI Preamplifier	SKET Electronic	LNPA-0118G- 45	SKET-PA-0 02	Oct. 13, 2022	1 Year
4.	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D	02555	Oct. 16, 2022	3 Year

1.7. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518128

1.8. Measurement Uncertainty

Radiation Uncertainty(30MHz-1GHz)	:	Ur = 4.46 dB (Horizontal)
	:	Ur = 5.04 dB (Vertical)
Radiation Uncertainty(1GHz-6GHz)	:	Ur = 4.92 dB (Horizontal)
	:	Ur = 4.92 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB
Disturbance Uncertainty	:	Ud = 3.4 dB

2. Power Line Conducted Emission Test

2.1. Test Standard and Limit

Test Standard	FCC Part 15 Subpart B
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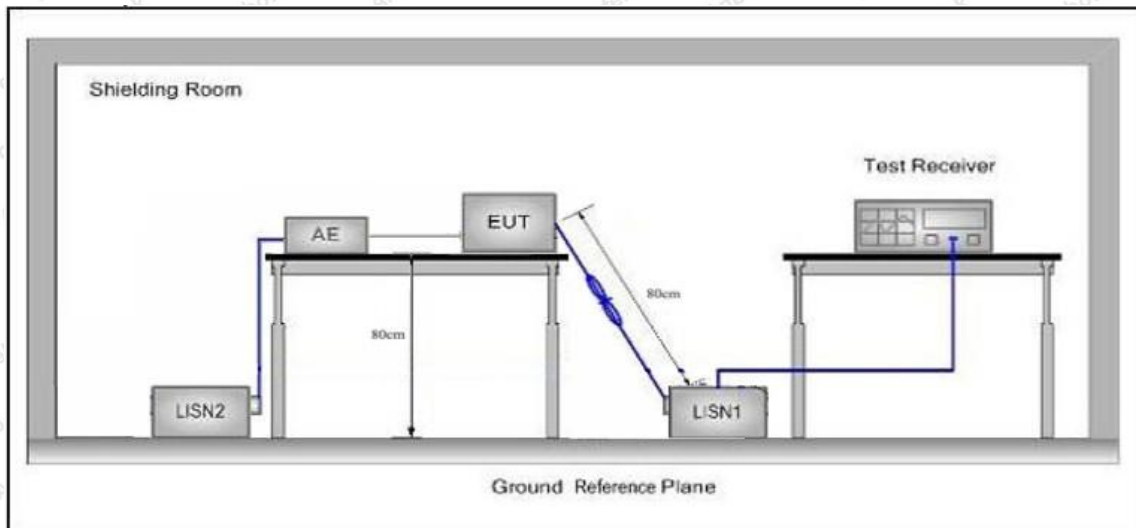
Power Line Conducted Emission Measurement Limits (FCC Part 15 Class B)

Test Limit	Frequency (MHz)	At mains terminals (dB μ V)	
		Quasi-peak Level	Average Level
	0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
	0.50 ~ 5.00	56	46
	5.00 ~ 30.00	60	50

Remark: (1) The lower limit shall apply at the transition frequencies.

(2) * Decreasing linearly with logarithm of frequency.

2.2. Test Setup



2.3. EUT Configuration on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

2.4. Operating Condition of EUT

2.4.1. Setup the EUT as shown in Section 2.2.

2.4.2. Turn on the power of all equipments.

2.4.3. Let the EUT work in test mode and measure it.

2.5. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.4-2014 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9KHz.

The frequency range from 150KHz to 30MHz is checked.

All the test results are listed in Section 2.6.

2.6. Test Results

EUT supplies power to DC This project is not applicable



3. Radiated Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part 15 Subpart B
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Radiated Emission Test Limit (Subpart B Class B)

	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
Test Limit	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

3.2. Test Setup

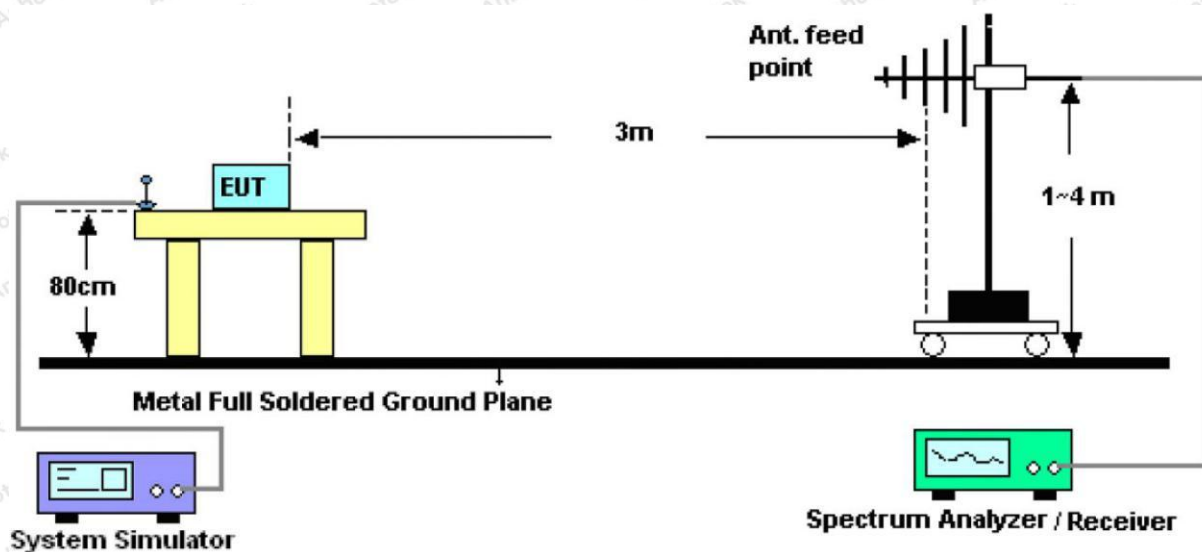


Figure 1. 30MHz to 1GHz

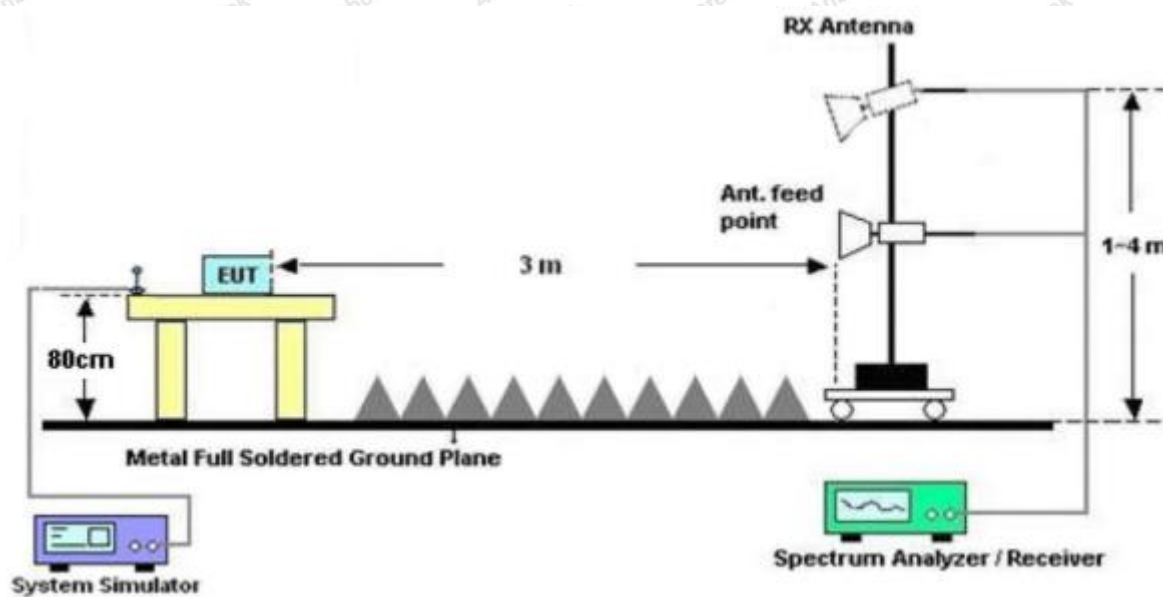


Figure 2. Above 1 GHz

3.3. EUT Configuration on Measurement

The following equipments are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

3.4. Operating Condition of EUT

3.4.1. Setup the EUT as shown in Section 3.2.

3.4.2. Turn on the power of all equipments.

3.4.3. Let the EUT work in test mode and measure it.

3.5. Test Procedure

EUT and its simulators are placed on a turn table, which is 0.8 meter high above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Bilog antenna & Double Ridged Horn Antenna is used as a receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4-2014 on radiated emission measurement.

The bandwidth of the EMI test receiver (ESR26) is set at 120kHz.

The frequency range from 30MHz to 1000MHz is checked.

The bandwidth of the EMI test receiver (ESR26) is set at 1MHz.

The frequency range from 1000MHz to 6000MHz is checked.

The test results are listed in Section 3.6.

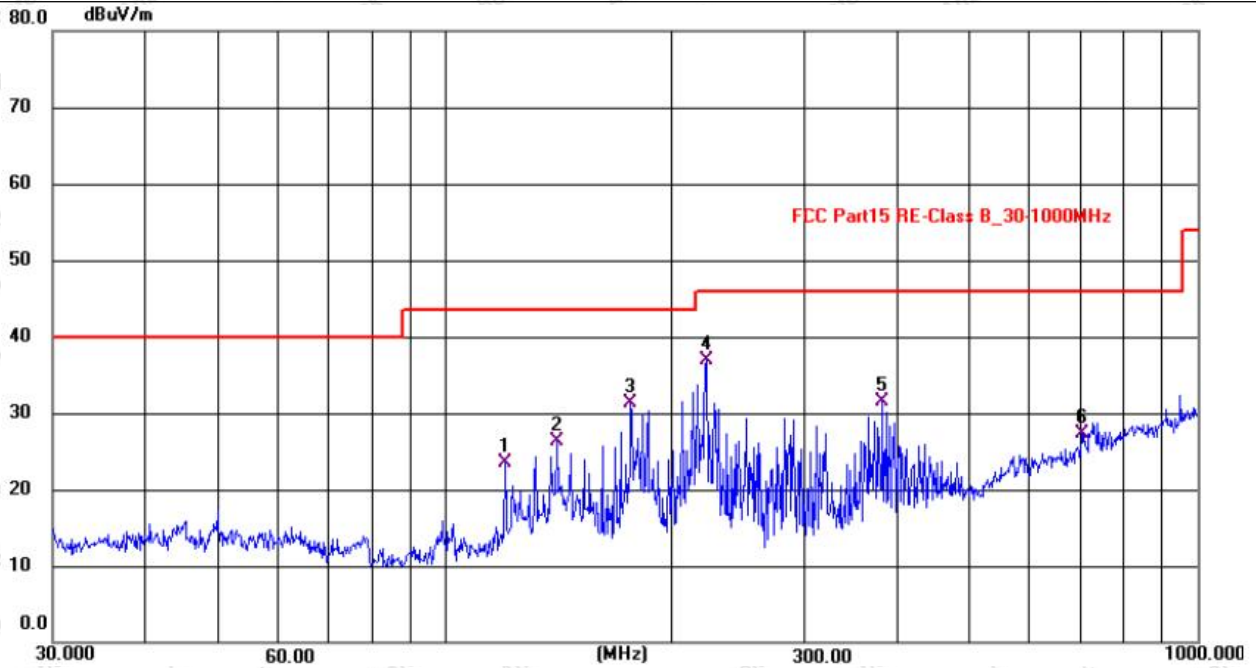
3.6. Test Results

PASS

Only the worst case data was showed in the report, please to see the following pages.

Test Results (30~1000MHz)

Test item:	Radiation Test	Polarization:	Horizontal
Standard:	(RE)FCC Part 15 Subpart B	Power Source:	DC 24V
Test Mode:	Mode 1	Temp.(°C)/Hum.(%RH):	24°C/60%RH

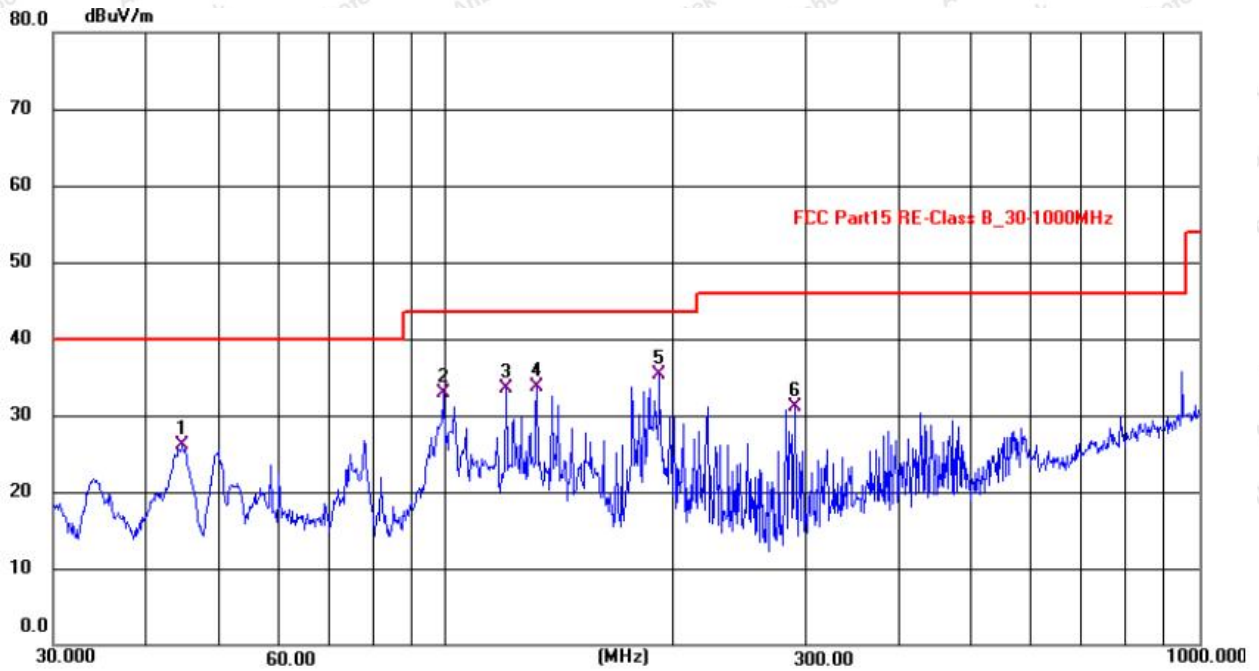


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	120.0659	40.66	-17.14	23.52	43.50	-19.98	QP
2	141.0821	41.84	-15.56	26.28	43.50	-17.22	QP
3	176.8878	47.67	-16.30	31.37	43.50	-12.13	QP
4 *	222.1697	55.48	-18.56	36.92	46.00	-9.08	QP
5	381.2485	44.54	-12.99	31.55	46.00	-14.45	QP
6	702.9924	33.57	-6.19	27.38	46.00	-18.62	QP

Note: Result=Reading+Factor Over Limit=Result-Limit

Test Results (30~1000MHz)

Test item: Radiation Test Polarization: Vertical
 Standard: (RE)FCC Part 15 Subpart B Power Source: DC 24V
 Test Mode: Mode 1 Temp.(°C)/Hum.(%RH): 22°C/45%RH

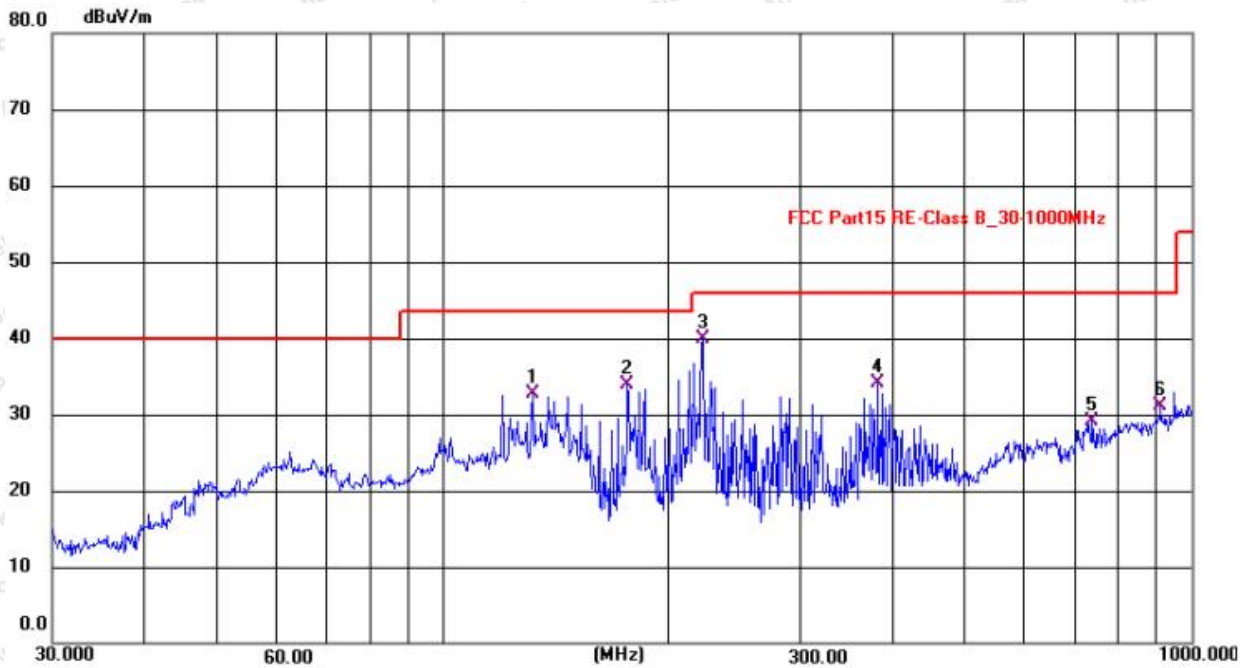


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	44.6651	40.83	-14.75	26.08	40.00	-13.92	QP
2	99.1797	52.24	-19.27	32.97	43.50	-10.53	QP
3	120.0659	50.70	-17.14	33.56	43.50	-9.94	QP
4	131.9889	49.78	-16.15	33.63	43.50	-9.87	QP
5 *	192.0815	53.86	-18.48	35.38	43.50	-8.12	QP
6	291.0360	46.90	-15.85	31.05	46.00	-14.95	QP

Note: Result=Reading+Factor Over Limit=Result-Limit

Test Results (30~1000MHz)

Test item: Radiation Test Polarization: Horizontal
 Standard: (RE)FCC Part 15 Subpart B Power Source: DC 144V
 Test Mode: Mode 1 Temp.(°C)/Hum.(%RH): 24°C/60%RH

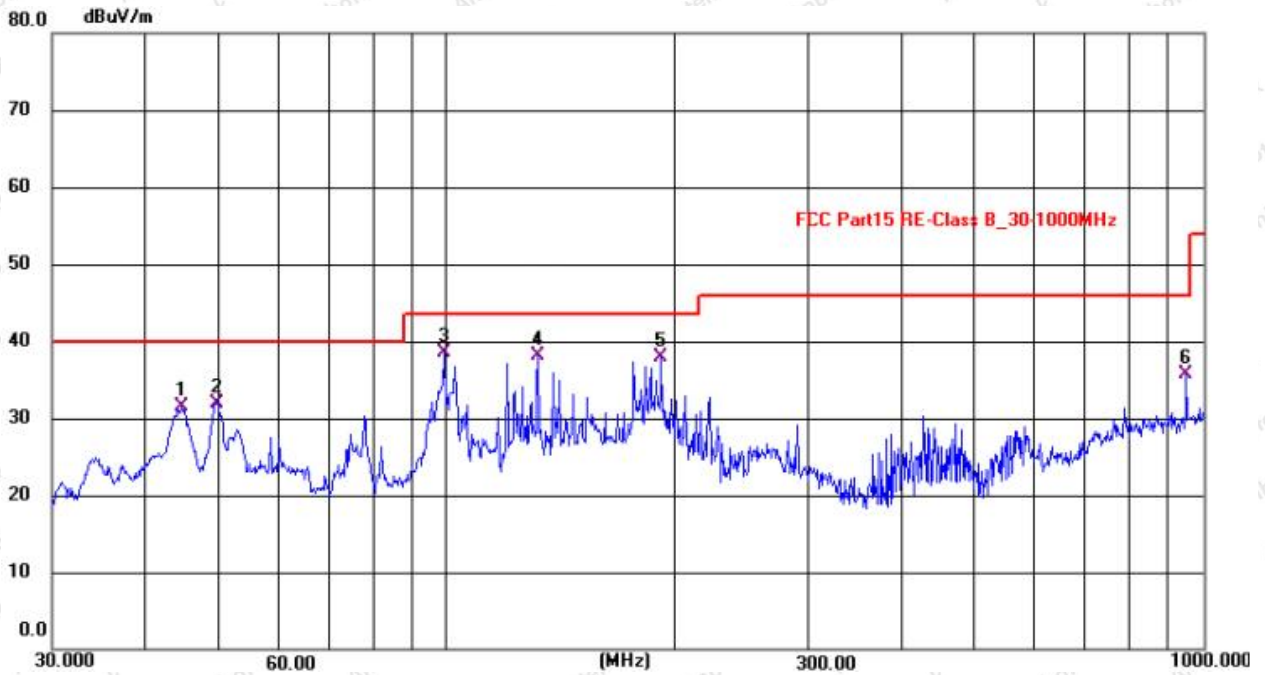


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	131.9889	48.92	-16.15	32.77	43.50	-10.73	QP
2	176.8876	50.17	-16.30	33.87	43.50	-9.63	QP
3 *	222.1697	58.48	-18.56	39.92	46.00	-6.08	QP
4	381.2485	47.04	-12.99	34.05	46.00	-11.95	QP
5	738.3646	34.45	-5.33	29.12	46.00	-16.88	QP
6	912.8618	34.10	-3.08	31.02	46.00	-14.98	QP

Note: Result=Reading+Factor Over Limit=Result-Limit

Test Results (30~1000MHz)

Test item: Radiation Test Polarization: Vertical
 Standard: (RE)FCC Part 15 Subpart B Power Source: DC 144V
 Test Mode: Mode 1 Temp.(°C)/Hum.(%RH): 22°C/45%RH

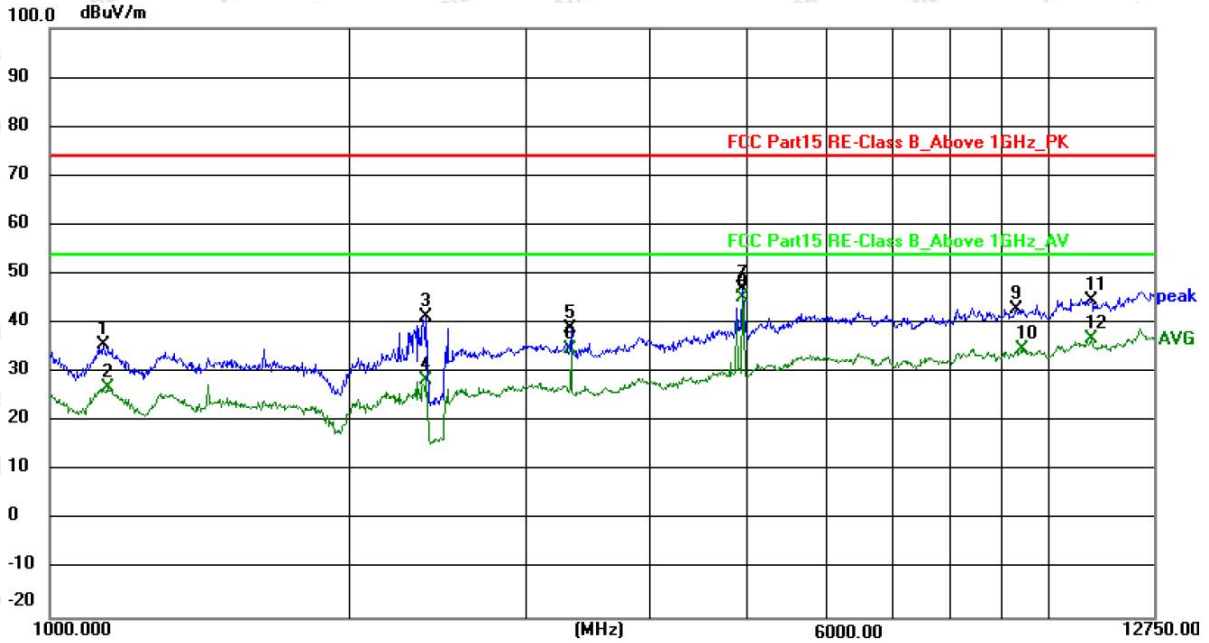


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	44.6649	46.33	-14.75	31.58	40.00	-8.42	QP
2	49.6197	47.15	-15.20	31.95	40.00	-8.05	QP
3 *	99.1795	57.74	-19.27	38.47	43.50	-5.03	QP
4	131.9889	54.28	-16.15	38.13	43.50	-5.37	QP
5	192.0815	56.36	-18.48	37.88	43.50	-5.62	QP
6	948.7608	37.54	-1.77	35.77	46.00	-10.23	QP

Note: Result=Reading+Factor Over Limit=Result-Limit

Test Results (1GHz-12.75GHz)

Test item:	Radiation Test	Polarization:	Horizontal
Standard:	(RE)FCC Part 15 Subpart B	Power Source:	DC 24V
Test Mode:	Mode 1	Temp.(°C)/Hum.(%RH):	22°C/45%RH

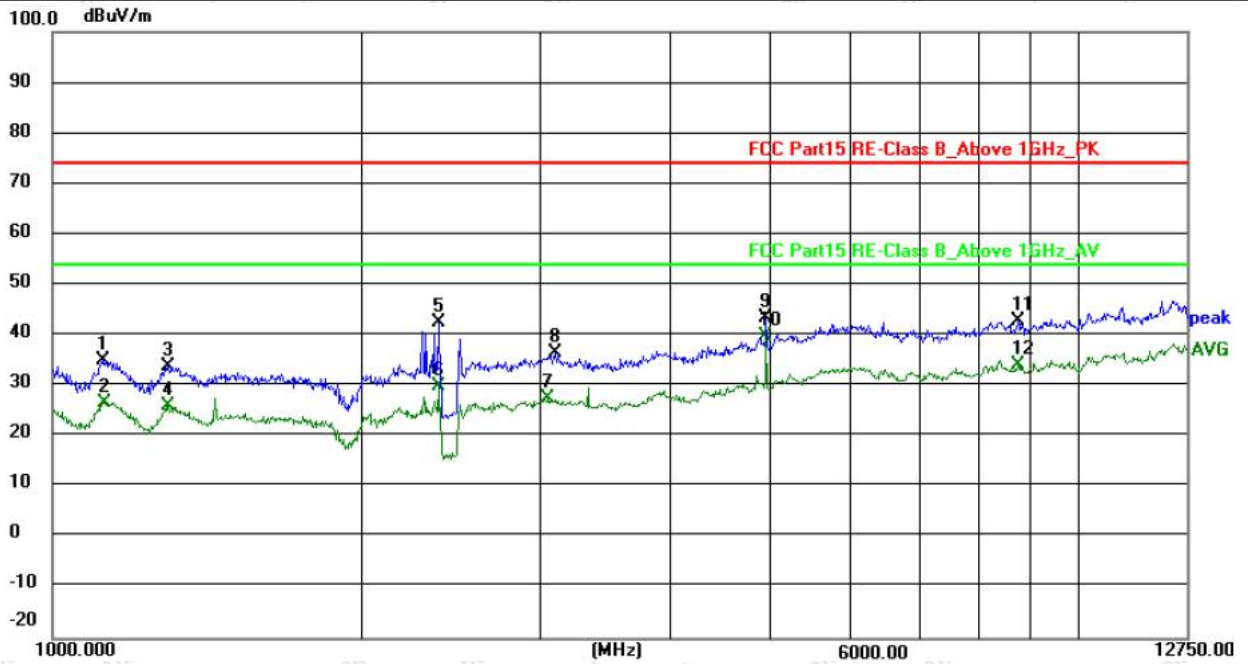


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1132.775	43.78	-7.99	35.79	74.00	-38.21	peak
2	1143.350	34.78	-7.95	26.83	54.00	-27.17	AVG
3	2385.912	43.96	-2.68	41.28	74.00	-32.72	peak
4	2385.912	31.12	-2.68	28.44	54.00	-25.56	AVG
5	3328.262	38.63	0.28	38.91	74.00	-35.09	peak
6	3328.262	34.45	0.28	34.73	54.00	-19.27	AVG
7	4940.363	41.21	5.90	47.11	74.00	-26.89	peak
8 *	4940.363	39.40	5.90	45.30	54.00	-8.70	AVG
9	9292.563	31.01	11.93	42.94	74.00	-31.06	peak
10	9417.700	22.52	12.11	34.63	54.00	-19.37	AVG
11	11046.250	29.86	14.76	44.62	74.00	-29.38	peak
12	11046.250	22.10	14.76	36.86	54.00	-17.14	AVG

Note: Result=Reading+Factor Over Limit=Result-Limit

Test Results (1GHz-12.75GHz)

Test item: Radiation Test Polarization: Vertical
 Standard: (RE)FCC Part 15 Subpart B Power Source: DC 24V
 Test Mode: Mode 1 Temp.(°C)/Hum.(%RH): 22°C/45%RH

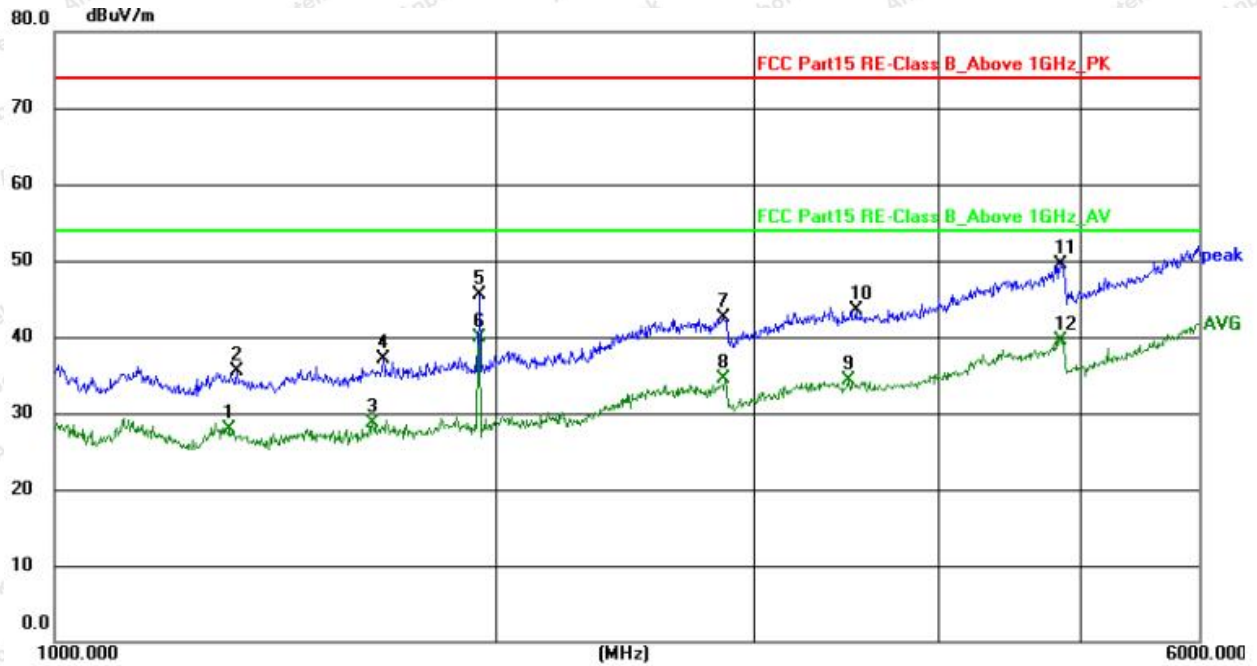


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1118.675	43.11	-8.03	35.08	74.00	-38.92	peak
2	1125.138	34.76	-8.01	26.75	54.00	-27.25	AVG
3	1297.275	41.30	-7.41	33.89	74.00	-40.11	peak
4	1297.275	33.58	-7.41	26.17	54.00	-27.83	AVG
5	2378.863	45.35	-2.70	42.65	74.00	-31.35	peak
6	2378.863	32.52	-2.70	29.82	54.00	-24.18	AVG
7	3046.850	27.65	-0.12	27.53	54.00	-26.47	AVG
8	3089.150	36.67	-0.06	36.61	74.00	-37.39	peak
9	4960.925	37.52	5.99	43.51	74.00	-30.49	peak
10 *	4960.925	33.81	5.99	39.80	54.00	-14.20	AVG
11	8728.563	31.46	11.25	42.71	74.00	-31.29	peak
12	8728.563	22.83	11.25	34.08	54.00	-19.92	AVG

Note: Result=Reading+Factor Over Limit=Result-Limit

Test Results (1GHz-12.75GHz)

Test item: Radiation Test Polarization: Horizontal
 Standard: (RE)FCC Part 15 Subpart B Power Source: DC 144V
 Test Mode: Mode 1 Temp.(°C)/Hum.(%RH): 22°C/45%RH

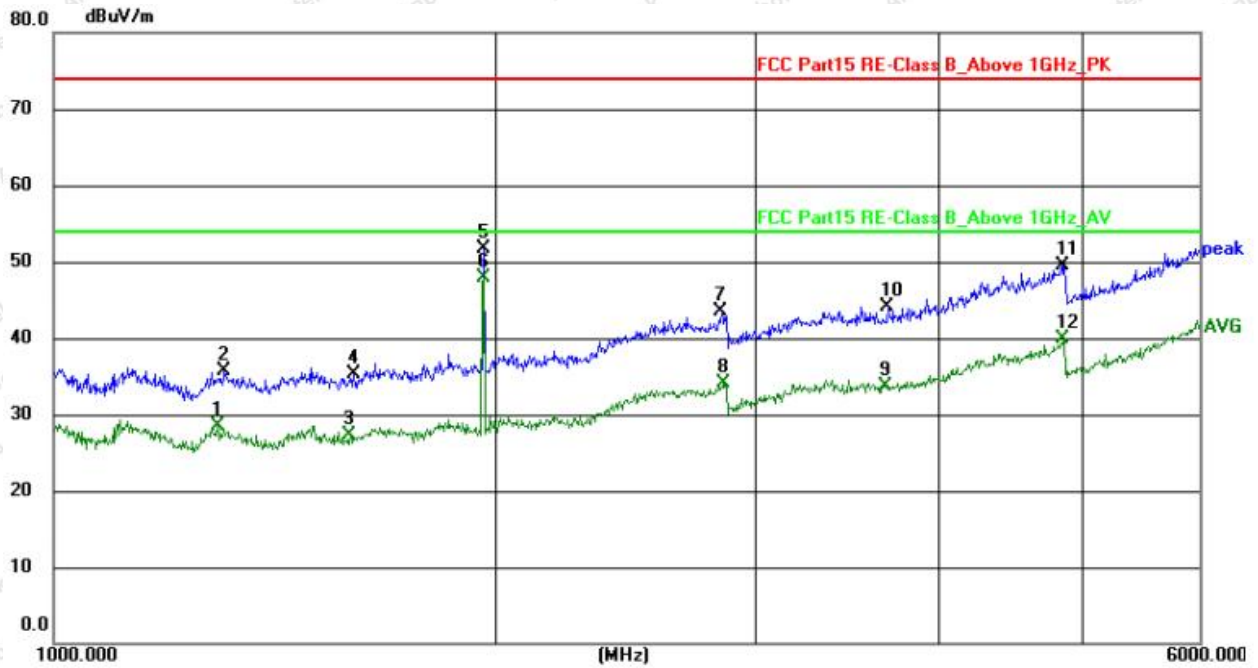


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1318.938	35.25	-7.33	27.92	54.00	-26.08	AVG
2	1332.358	42.73	-7.29	35.44	74.00	-38.56	peak
3	1647.820	34.78	-5.99	28.79	54.00	-25.21	AVG
4	1676.259	42.87	-5.86	37.01	74.00	-36.99	peak
5	1945.210	50.05	-4.58	45.47	74.00	-28.53	peak
6 *	1945.210	44.44	-4.58	39.86	54.00	-14.14	AVG
7	2855.009	43.29	-0.78	42.51	74.00	-31.49	peak
8	2859.873	35.30	-0.74	34.56	54.00	-19.44	AVG
9	3475.128	33.88	0.50	34.38	54.00	-19.62	AVG
10	3513.633	42.95	0.59	43.54	74.00	-30.46	peak
11	4833.129	44.04	5.47	49.51	74.00	-24.49	peak
12	4833.129	34.09	5.47	39.56	54.00	-14.44	AVG

Note: Result=Reading+Factor Over Limit=Result-Limit

Test Results (1GHz-12.75GHz)

Test item: Radiation Test Polarization: Vertical
 Standard: (RE)FCC Part 15 Subpart B Power Source: DC 144V
 Test Mode: Mode 1 Temp.(°C)/Hum.(%RH): 22°C/45%RH

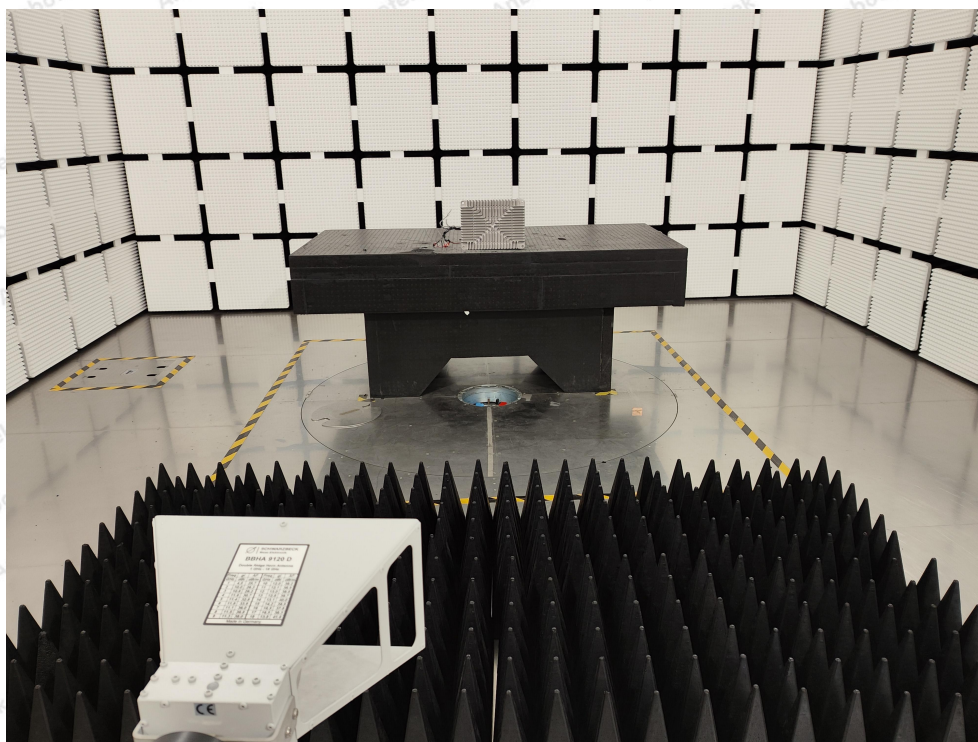
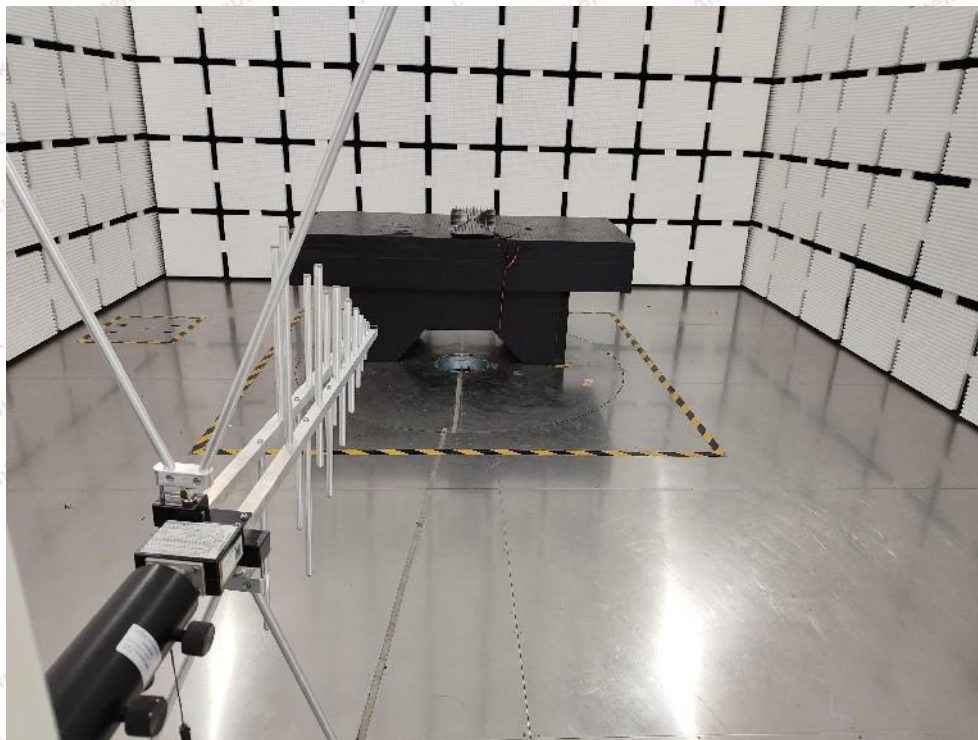


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1292.039	35.92	-7.43	28.49	54.00	-25.51	AVG
2	1306.004	42.99	-7.38	35.61	74.00	-38.39	peak
3	1590.527	33.61	-6.27	27.34	54.00	-26.66	AVG
4	1599.100	41.57	-6.22	35.35	74.00	-38.65	peak
5	1957.973	56.26	-4.52	51.74	74.00	-22.26	peak
6 *	1957.973	52.38	-4.52	47.86	54.00	-6.14	AVG
7	2842.249	44.24	-0.82	43.42	74.00	-30.58	peak
8	2852.453	34.90	-0.78	34.12	54.00	-19.88	AVG
9	3672.297	32.50	1.27	33.77	54.00	-20.23	AVG
10	3685.480	42.79	1.32	44.11	74.00	-29.89	peak
11	4847.873	43.90	5.51	49.41	74.00	-24.59	peak
12	4856.567	34.32	5.56	39.88	54.00	-14.12	AVG

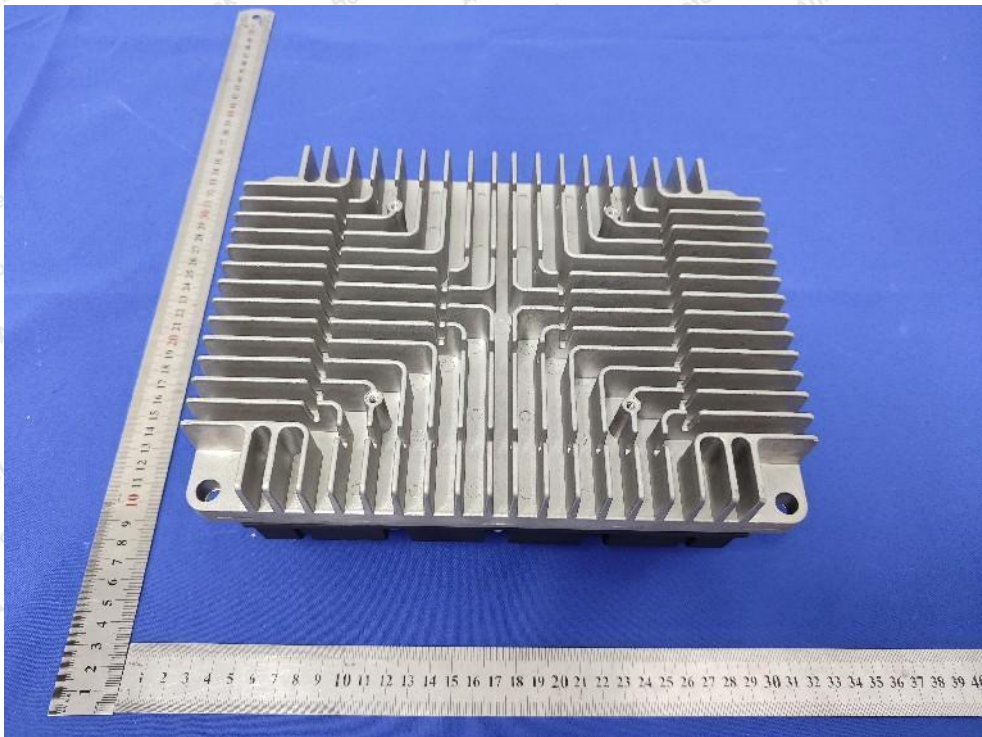
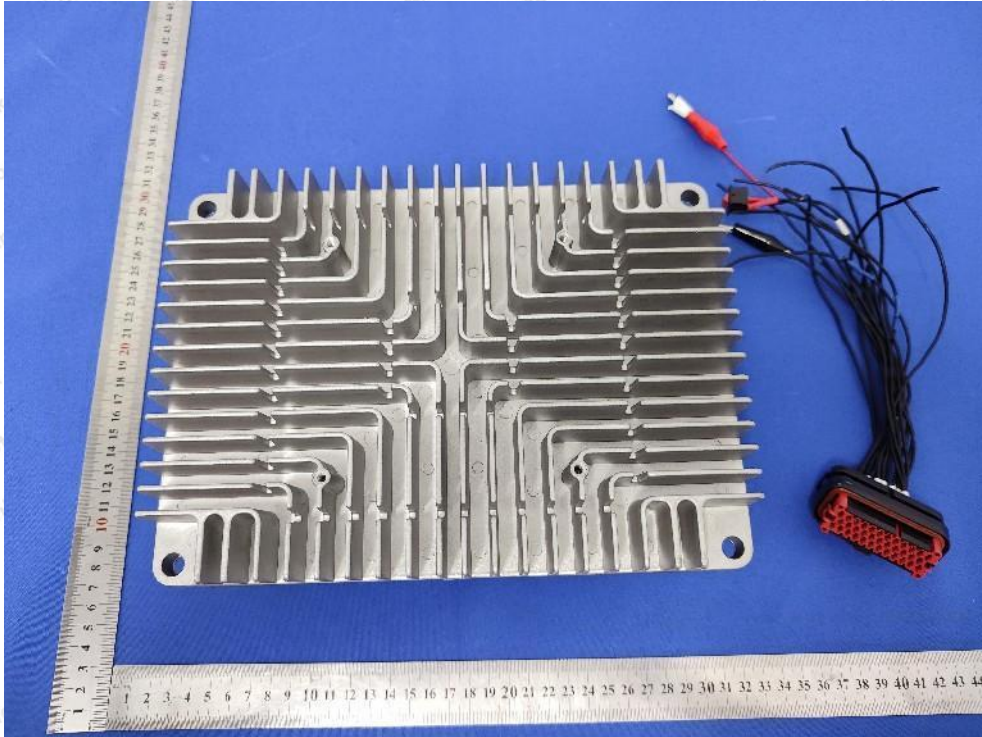
Note: Result=Reading+Factor Over Limit=Result-Limit

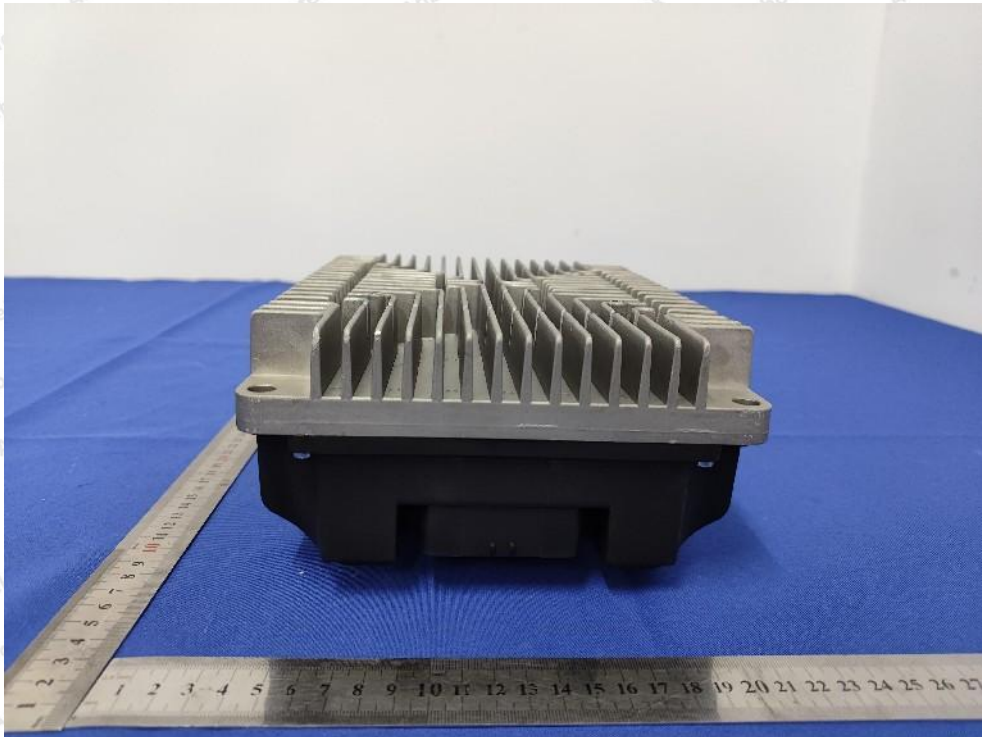
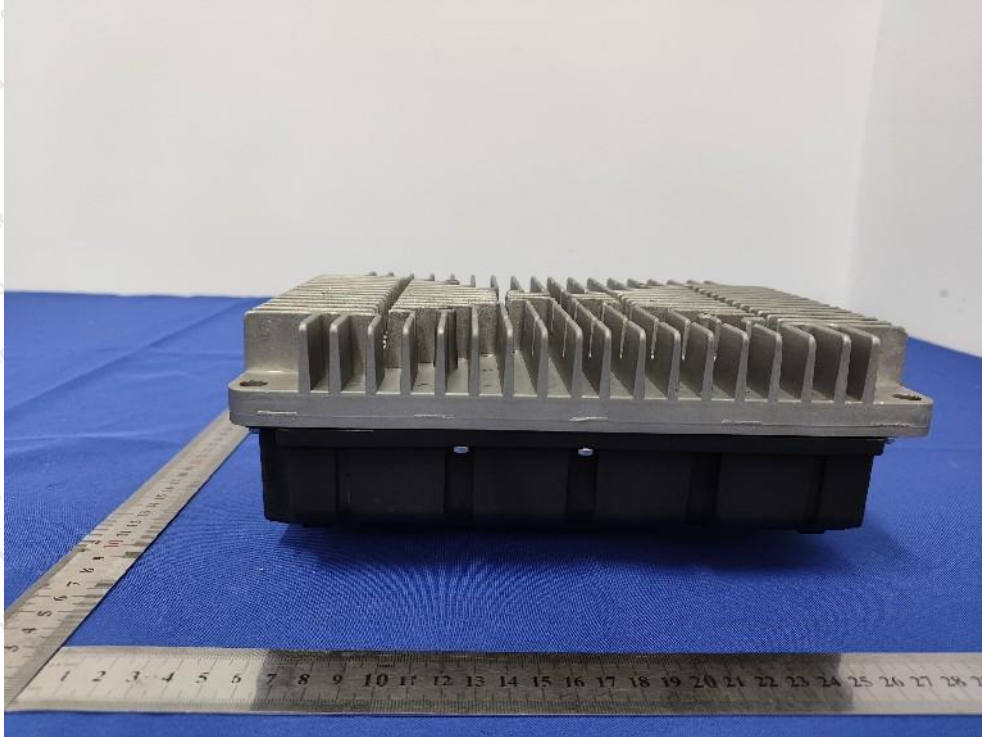
APPENDIX I -- TEST SETUP PHOTOGRAPH

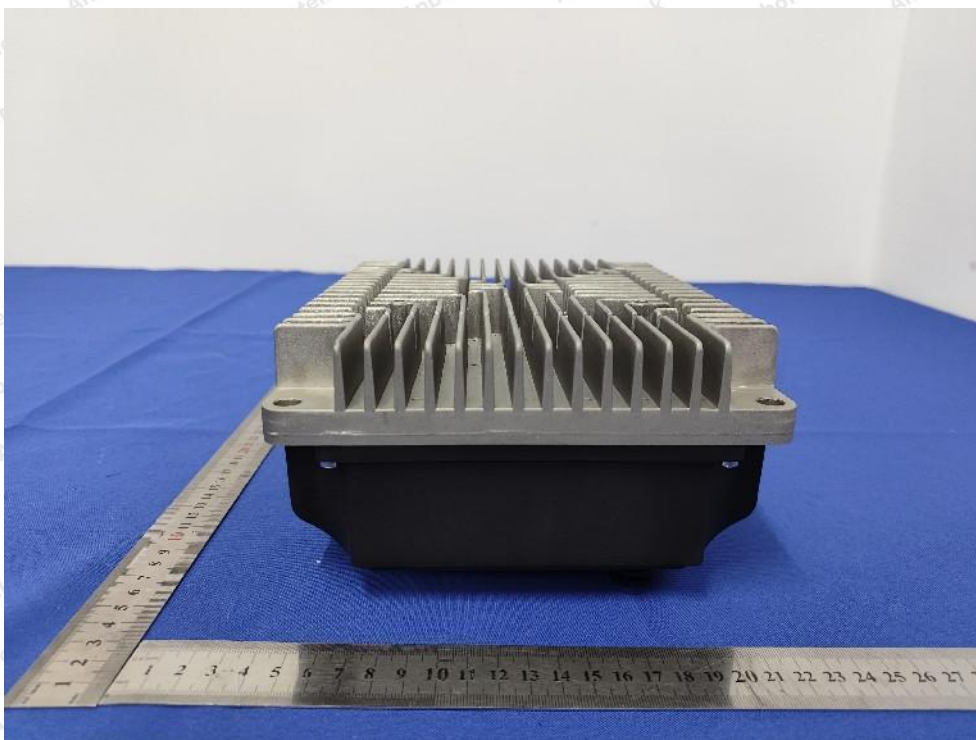
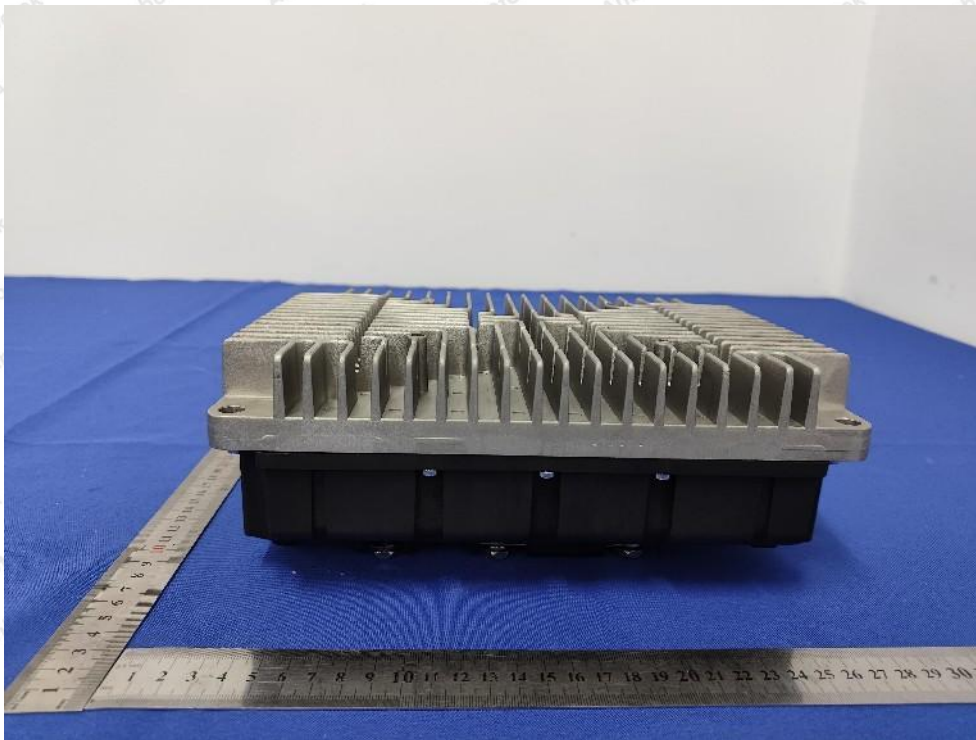
Photo of Radiation Emission Test

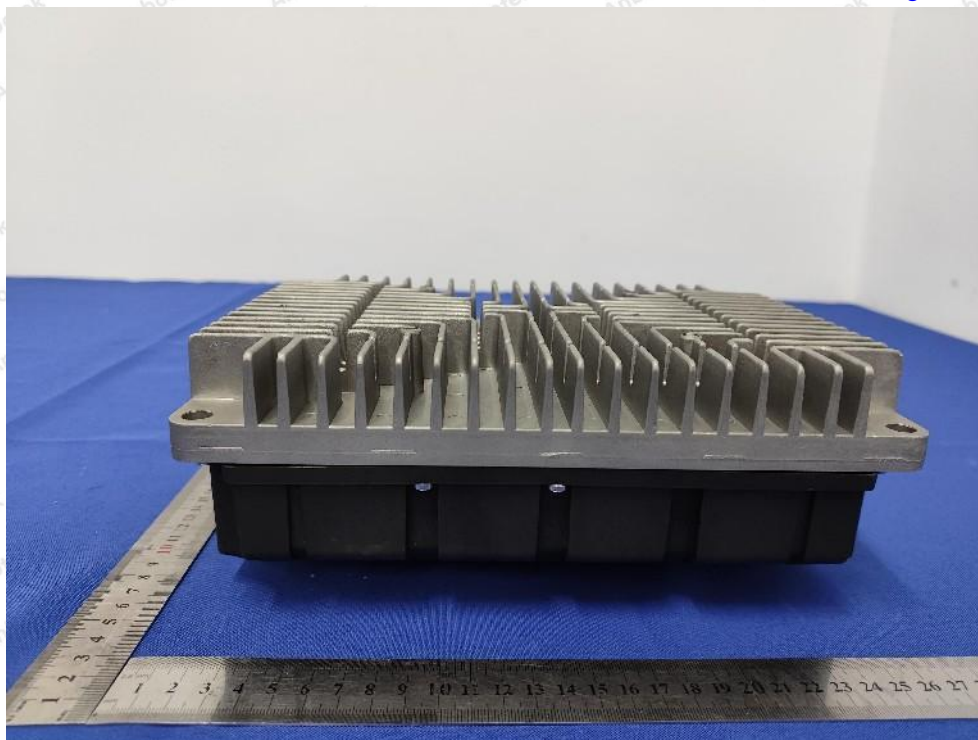


APPENDIX II -- EXTERNAL PHOTOGRAPH

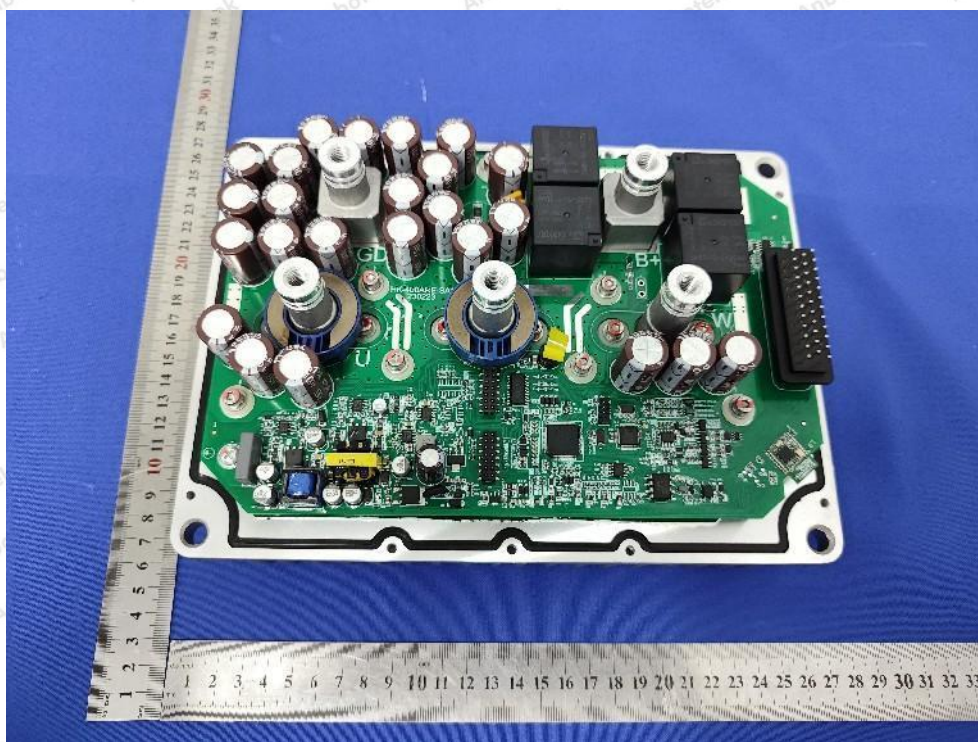
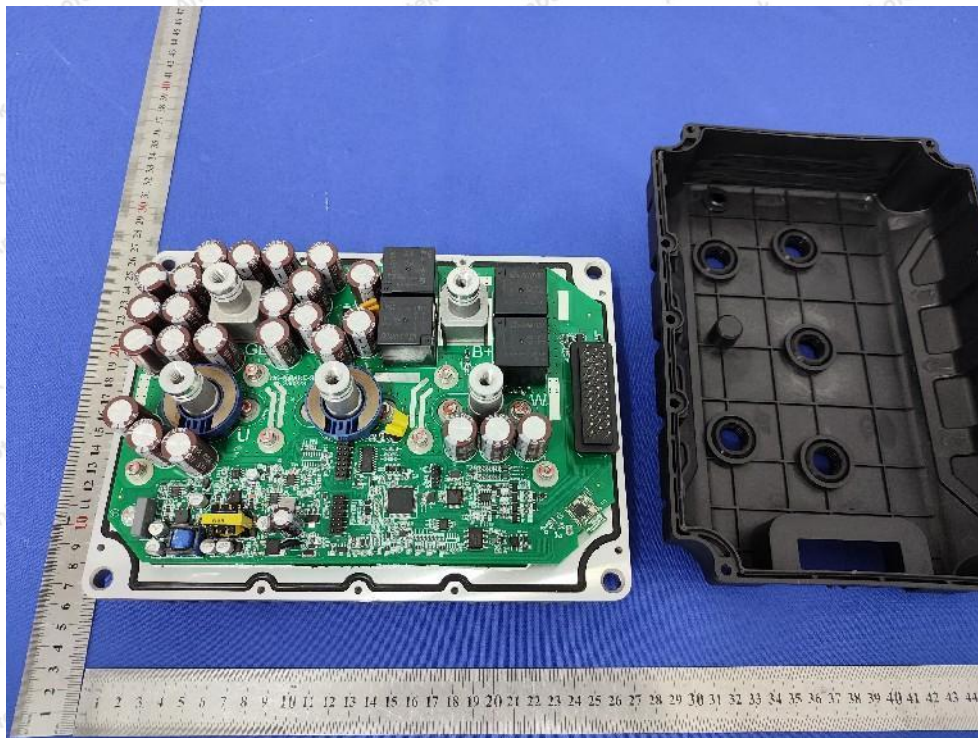


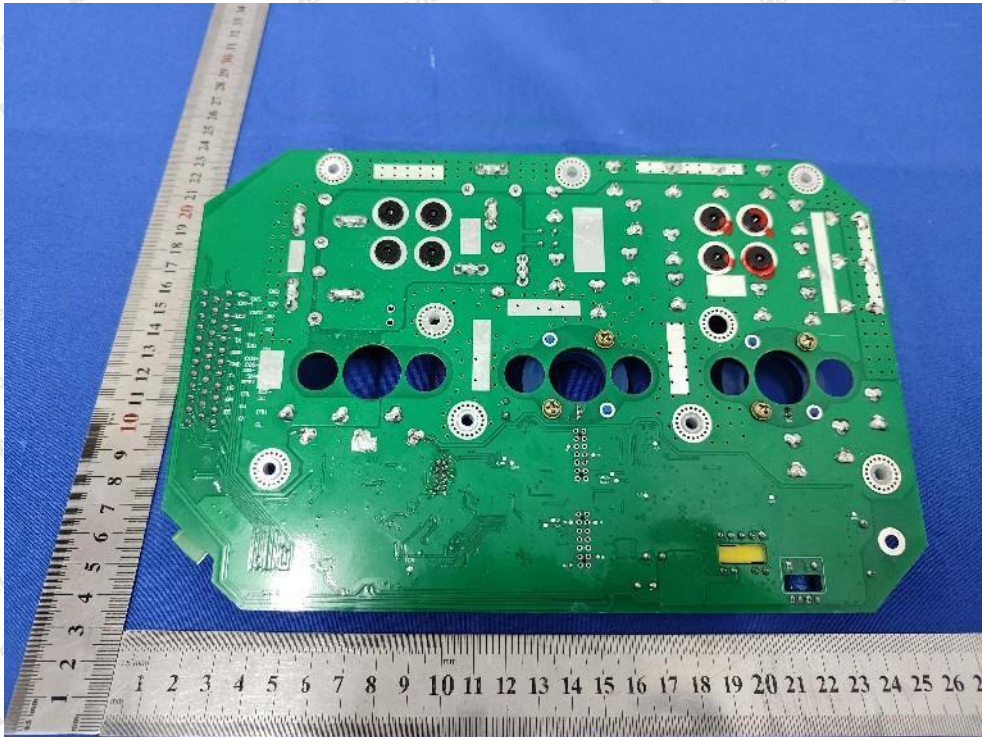
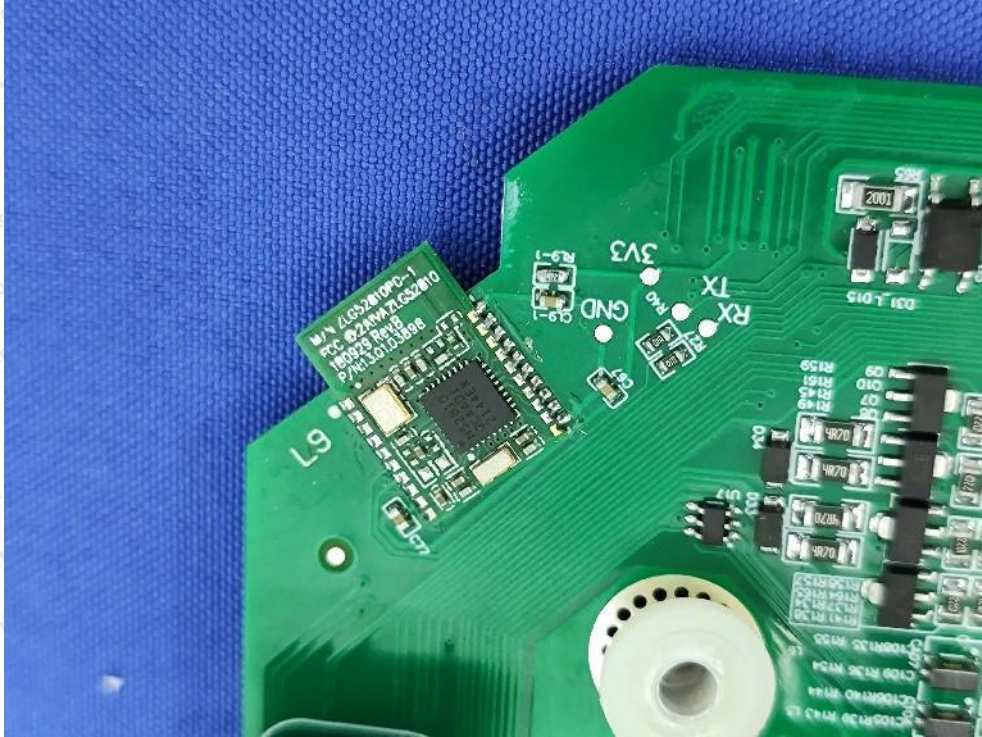






APPENDIX III -- INTERNAL PHOTOGRAPH





----- End of Report -----