

TEST REPORT

Applicant: Chongqing Huiye IoT Technology Co.,Ltd
Address: No.6-4,Zong bao Avenue, Shapingba District,
Chongqing City, P.R.China
Equipment Type: LED Display
Model Name: M04
Brand Name: Huiye
FCC ID: 2A5B3-M04
Test Standard: 47 CFR Part 15 Subpart B
ANSI C63.4-2014
Sample Arrival Date: Aug. 13, 2024
Test Date: Aug. 19, 2024
Date of Issue: Sep. 02, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Xiong Chong

Checked by: Xia Long

Approved by: Liao Jianming
(Technical Director)

Xiong Chong

Xia Long

Jim Liao

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Sep. 02, 2024</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☒ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Chongqing Huiye IoT Technology Co.,Ltd
Address	No.6-4,Zong bao Avenue, Shapingba District, Chongqing City, P.R.China

2.2 Manufacturer Information

Manufacturer	Chongqing Huiye IoT Technology Co.,Ltd
Address	No.6-4,Zong bao Avenue, Shapingba District, Chongqing City, P.R.China

2.3 General Description for Equipment under Test (EUT)

EUT Name	LED Display
Model Name Under Test	M04
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V1.01
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Ancillary Equipment

Note: Not applicable.

2.5 Technical Information

Network and Wireless connectivity	Bluetooth
Classification of equipment	Class B
The highest internal frequency of EUT	2480 MHz

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15 Subpart B	Unintentional Radiators
2	ANSI C63.4-2014	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

3.2 Verdict

No.	Description	FCC Rule	Test Verdict	Remark
1	Radiated Emission	15.109	Pass	--
2	Conducted Emission, AC Ports	15.107	Pass	--

3.3 Test Uncertainty

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	Value
Conducted emissions (9 kHz-30 MHz)	3.2 dB
Radiated emissions (30 MHz-1 GHz)-966#2	4.4 dB
Radiated emissions (1 GHz-18 GHz)-966#2	5.0 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Enclosure List

Description	Manufacturer	Model	Serial No.	Length	Description	Use
DC Power Supply	ITECH	IT6873A	800446020 747300002	N/A	N/A	☒

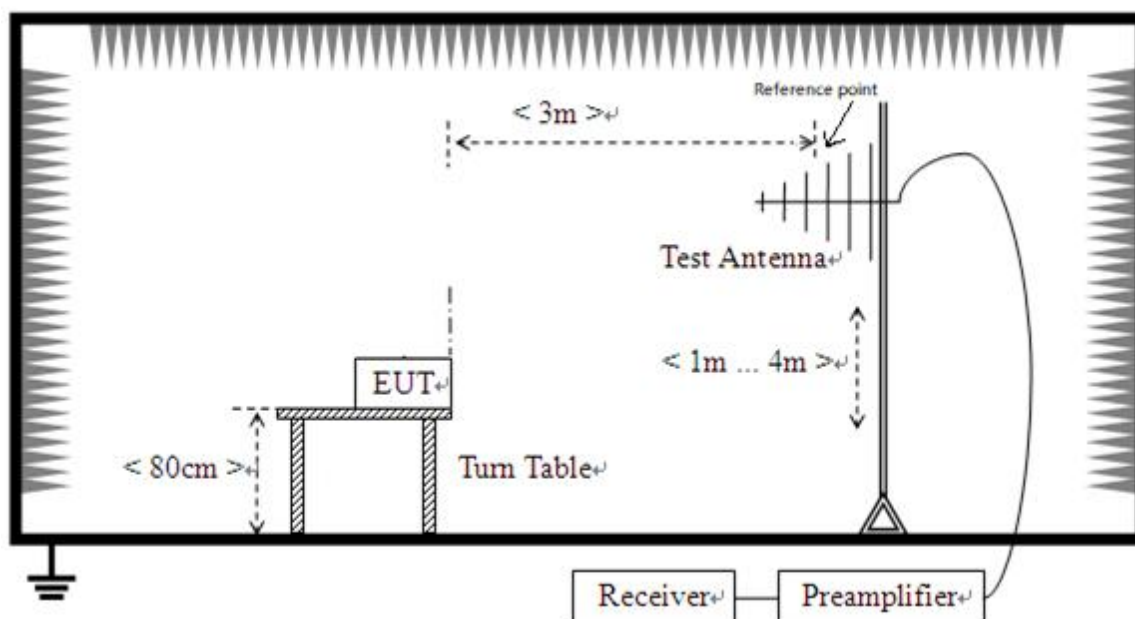
4.2 Test Configurations

All test modes of EUT are listed in the table below.

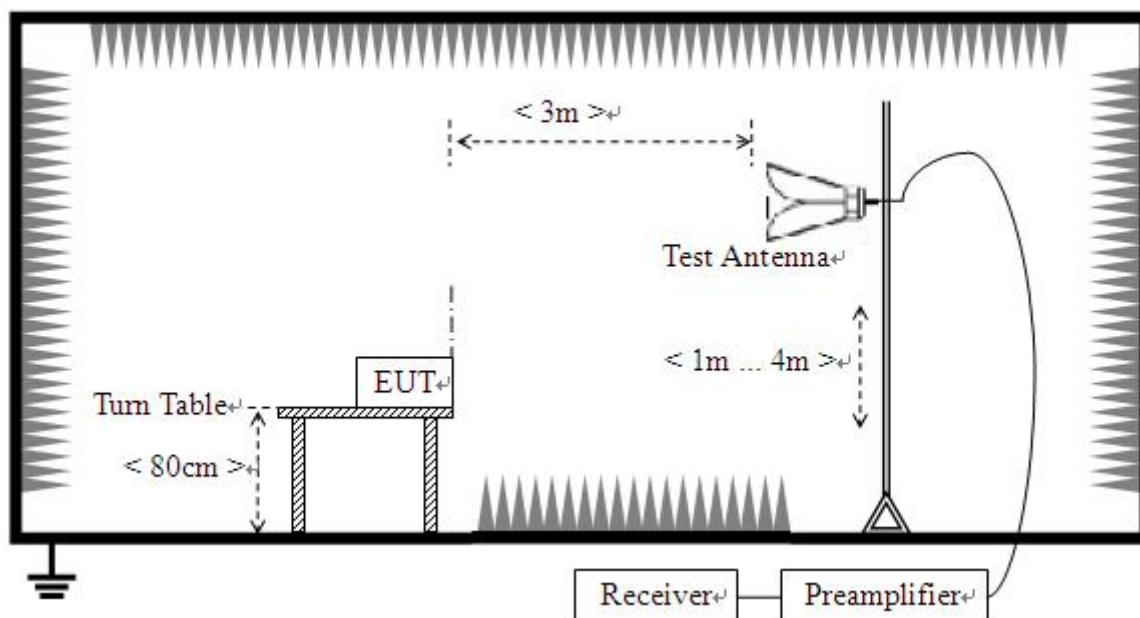
Test Mode Configuration	Description
Mode 1	<u>The Normal Working Test Mode</u> EUT +DC Power Supply

4.3 Test Setups

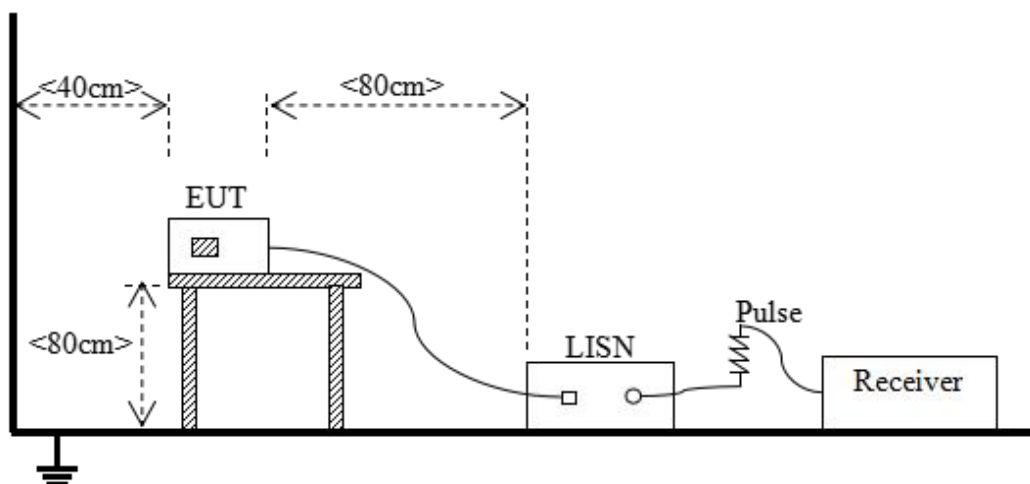
Test Setup 1



Radiated Emission (30 MHz-1 GHz)



Radiated Emission (above 1 GHz)

Test Setup 2

Conducted Emissions, AC Ports

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency range (MHz)	Class B (at 3 m)		Class A (at 3 m)
	Field Strength ($\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)
30 - 88	100	40	49.5
88 - 216	150	43.5	54
216 - 960	200	46	56.9
Above 960	500	54	60

NOTE:

- 1) Field Strength (dB $\mu\text{V/m}$) = $20 \cdot \log [\text{Field Strength } (\mu\text{V/m})]$.
- 2) In the emission tables above, the tighter limit applies at the band edges.
- 3) For 30 MHz to 1000 MHz, the CISPR quasi-peak is employed.

For above 1000 MHz, according to the requirements of FCC 15.35, unless otherwise specified, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

Frequency range (GHz)	Class B (at 3 m)			Class A (at 3 m)	
	Field Strength ($\mu\text{V/m}$)	Field Strength Average (dB $\mu\text{V/m}$)	Field Strength Peak (dB $\mu\text{V/m}$)	Field Strength Average (dB $\mu\text{V/m}$)	Field Strength Peak (dB $\mu\text{V/m}$)
1 - F_M	500	54	74	60	80

Note 1: The highest measurement frequency, F_M , in GHz, shall be determined as next Table.

Note 2: Average Class A limit at 3m L_{3m} is determined by the following conversion formula:

$$L_{3m} = L_{10m} + 20 \cdot \log(d_{10m}/d_{3m})$$

Where:

L_{3m} is Average Class A limit at 3m;

L_{10m} is Average Class A limit at 10m;

d_{10m} is Measurement distance in 10m;

d_{3m} is Measurement distance in 3m.

For this case: $L_{3m} = 49.5 + 20 \cdot \log(10/3) = 60$ (dB $\mu\text{V/m}$).

Highest internal frequency (F_X)	Highest measurement frequency (F_M)
$F_X \leq 108 \text{ MHz}$	1 GHz
$108 \text{ MHz} \leq F_X \leq 500 \text{ MHz}$	2 GHz
$500 \text{ MHz} \leq F_X \leq 1 \text{ GHz}$	5 GHz
$F_X \geq 1 \text{ GHz}$	$5 * F_X$ or 40 GHz, whichever is lower.
Note: F_X is Highest frequency generated or used in the device or on which the device operates or tunes.	

5.1.1.2 Test Setup

Refer to 4.3 section (test setup 1) for radiated emission test, the photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

All Radiated Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

The measurement frequency range is from 30 MHz to the 5th harmonic of the maximum frequency of the EUT internal source. The Turn Table is actuated to turn from 0° to 360° , and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1 \text{ GHz}$, 100 kHz for $f < 1 \text{ GHz}$

VBW $\geq$ RBW

Sweep = auto

Detector function = peak for $f < 1 \text{ GHz}$, peak & RMS Average for $f \geq 1 \text{ GHz}$

Trace = max hold

5.1.1.4 Test Result and Test Equipment List

Please refer to ANNEX A.1.

NOTE:

1. $\text{Results (dB}\mu\text{V/m)} = \text{Reading (dB}\mu\text{V)} + \text{Factor (dB/m)}$

The reading level is calculated by software which is not shown in the sheet

2. $\text{Factor (dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain (dB)}$

3. $\text{Margin} = \text{Limit} - \text{Results}$

5.1.2 Conducted Emission, AC Ports

5.1.2.1 Test Limit

Frequency range (MHz)	Class A	
	Quasi-peak (dB μ V)	Average (dB μ V)
0.15 - 0.50	79	66
0.50 - 30	73	60

Frequency range (MHz)	Class B	
	Quasi-peak (dB μ V)	Average (dB μ V)
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- 1) The lower limit shall apply at the band edges.
- 2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Refer to 4.3 section test (test setup 2) for conducted emission, the photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω /50 μ H of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

Use the following spectrum analyzer settings:

RBW = 9 kHz

VBW $\geq$ RBW

Sweep = 10ms

Detector function =peak & Average

Trace = max hold

5.1.2.4 Test Result and Test Equipment List

Please refer to ANNEX A.2.

NOTE:

1. Results (dB μ V) = Reading (dB μ V) + Factor (dB)

The reading level is calculated by software which is not shown in the sheet

2. Factor = Insertion loss + Cable loss

3. Margin = Limit - Results

ANNEX A TEST RESULTS

A.1 Radiated Emission

Note 1: The symbol of "--" in the table which means not application.

Note 2: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

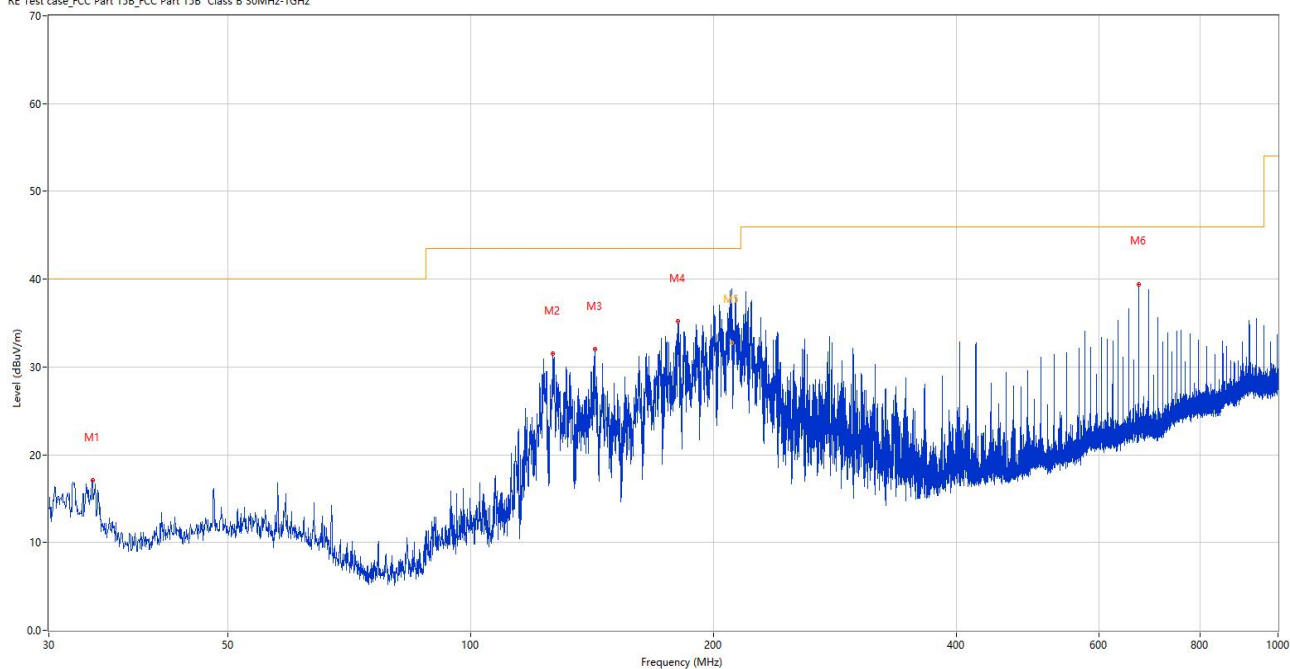
Note 3: When the EUT is on, it will automatically emit Bluetooth signal and cannot be turned off. So the marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth carrier frequencies.

Sample No.	SC-SH2480040-S03	Temperature	20.1℃
Humidity	57%RH	Pressure	101kPa
Test Engineer	He Shichang	Test Date	2024.8.19

Test Mode 1

1) Test Antenna Vertical, 30 MHz – 1 GHz

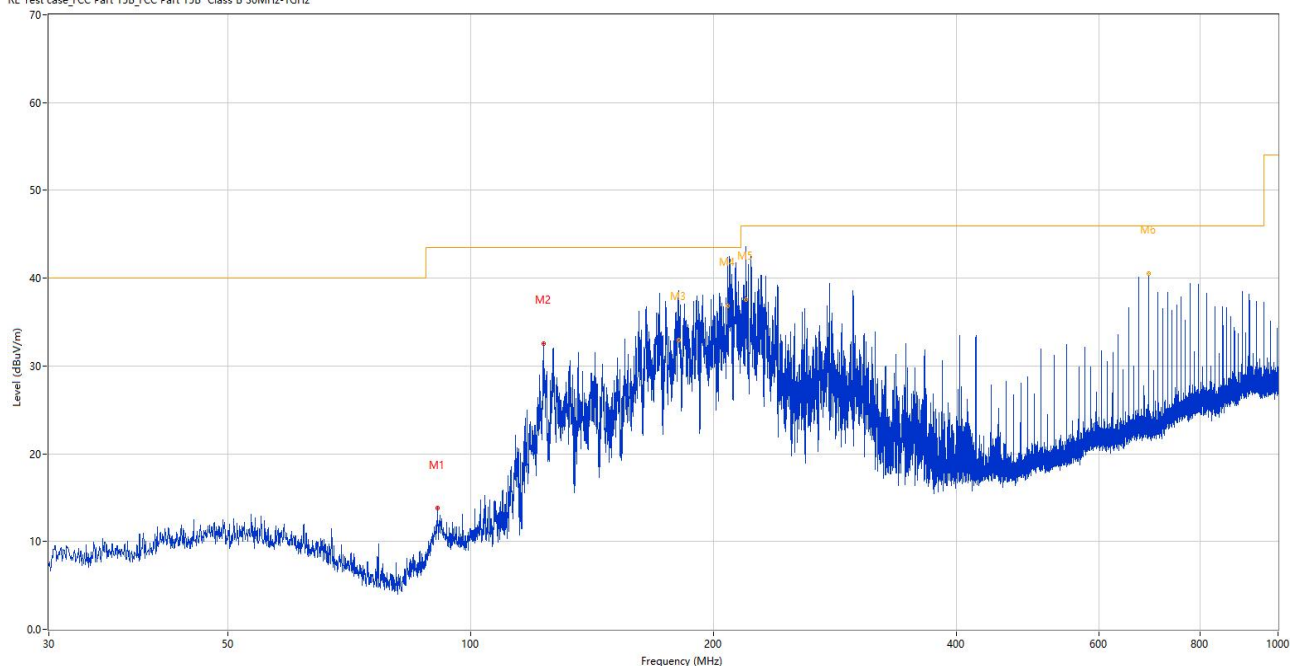
RE Test case_FCC Part 15B_FCC Part 15B Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	33.977	17.04	-29.38	40.0	22.96	Peak	82.00	100	Vertical	Pass
2	126.466	31.47	-29.62	43.5	12.03	Peak	292.00	100	Vertical	Pass
3	142.374	31.98	-30.27	43.5	11.52	Peak	92.00	100	Vertical	Pass
4	180.398	35.15	-28.50	43.5	8.35	Peak	0.00	100	Vertical	Pass
5	210.563	38.58	-27.05	43.5	4.92	Peak	0.00	101	Vertical	N/A
5*	210.563	32.74	-27.05	43.5	10.76	QP	0.00	101	Vertical	Pass
6	671.994	39.44	-14.46	46.0	6.56	Peak	163.00	100	Vertical	Pass

2) Test Antenna Horizontal, 30 MHz – 1 GHz

RE Test case_FCC Part 15B_FCC Part 15B Class B 30MHz-1GHz

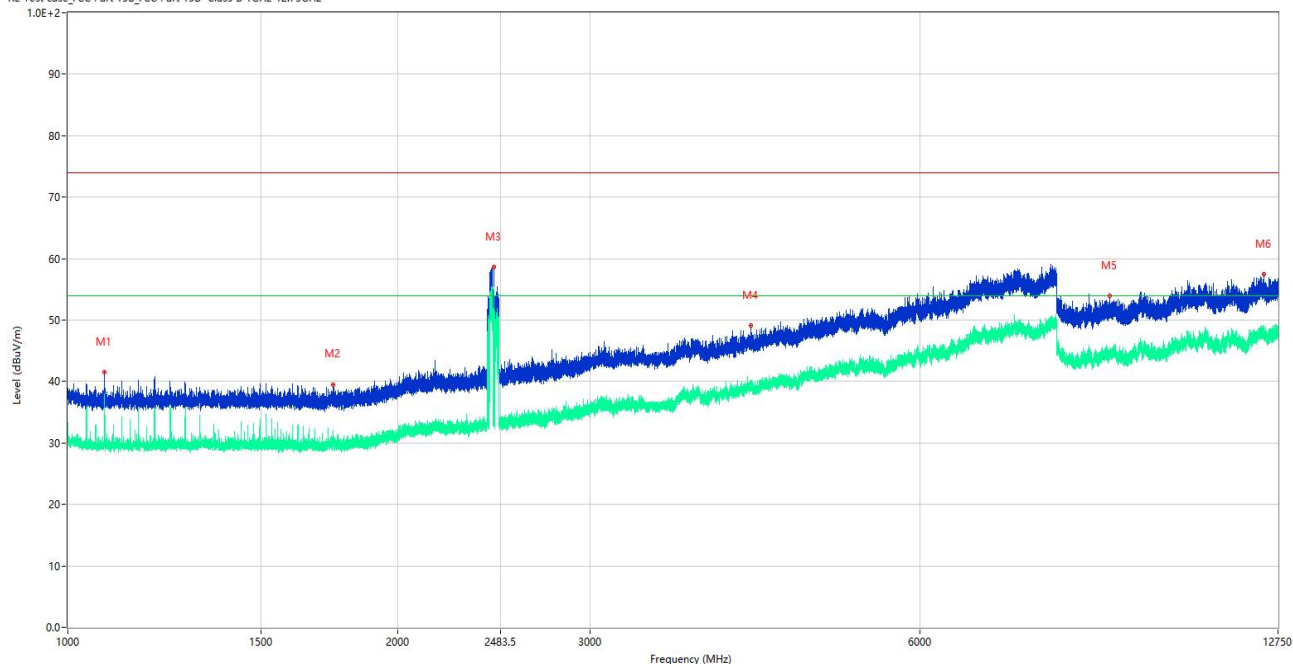


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	90.965	13.81	-28.67	43.5	29.69	Peak	140.00	200	Horizontal	Pass
2	123.120	32.55	-29.25	43.5	10.95	Peak	0.00	200	Horizontal	Pass
3	180.799	39.72	-28.46	43.5	3.78	Peak	151.00	117	Horizontal	N/A
3*	180.799	32.97	-28.46	43.5	10.53	QP	151.00	117	Horizontal	Pass
4	208.164	43.54	-27.14	43.5	-0.04	Peak	131.00	121	Horizontal	N/A
4*	208.164	36.87	-27.14	43.5	6.63	QP	131.00	121	Horizontal	Pass
5	219.198	44.57	-26.66	46.0	1.43	Peak	141.00	142	Horizontal	N/A
5*	219.198	37.60	-26.66	46.0	8.40	QP	141.00	142	Horizontal	Pass
6	691.196	40.84	-14.45	46.0	5.16	Peak	156.00	104	Horizontal	N/A
6*	691.196	40.49	-14.45	46.0	5.51	QP	156.00	104	Horizontal	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency Below 1 GHz						
EMI Receiver	Keysight	N9038A	MY55330120	2023.09.05	2024.09.04	☒
Amplifier (30MHz-1GHz)	COM-MV	ZT30-1000M	B2017119081	2023.12.05	2024.12.04	☒
Test Antenna- Bi-Log	SCHWARZB ECK	VULB 9168	9168-00867	2022.04.12	2025.04.11	☒
Anechoic Chamber (#2)	YiHeng	9m*6m*6m	142	2024.08.18	2027.08.17	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

3) Test Antenna Vertical, 1 GHz – 12.75 GHz

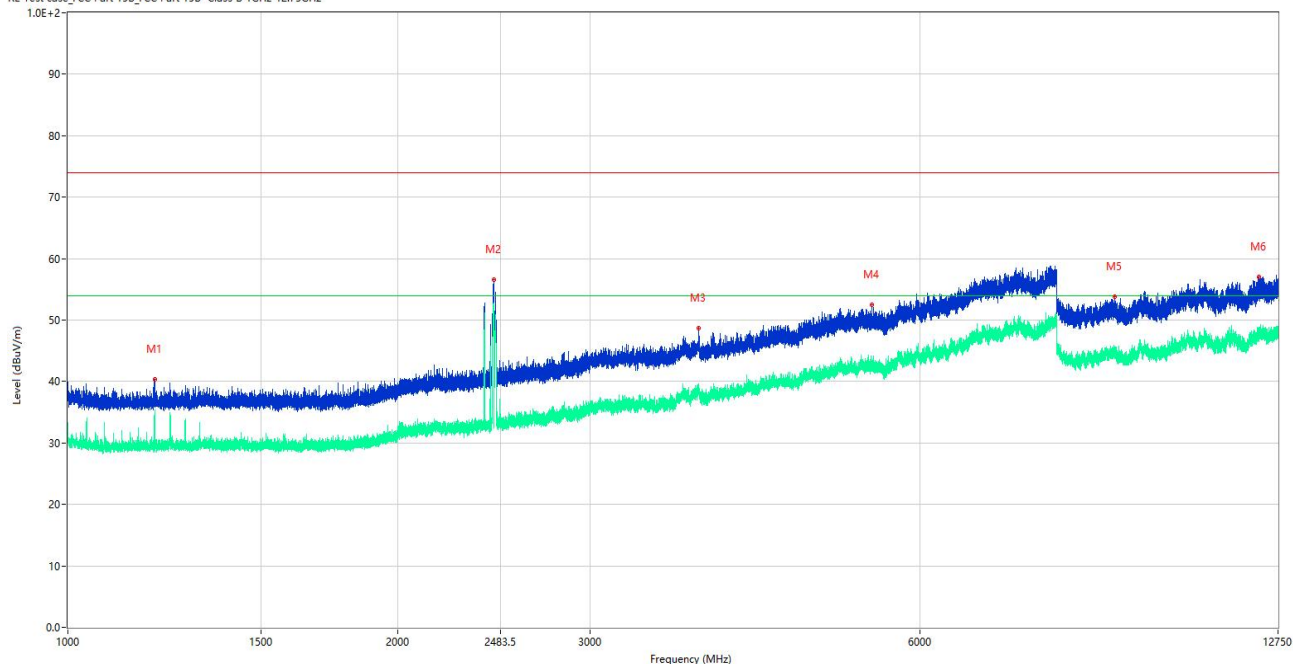
RE Test case_FCC Part 15B_FCC Part 15B Class B 1GHz-12.75GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1079.900	41.46	-15.94	74.0	32.54	Peak	132.00	100	Vertical	Pass
1**	1079.900	37.67	-15.94	54.0	16.33	AV	132.00	100	Vertical	Pass
2	1747.300	39.41	-16.04	74.0	34.59	Peak	358.00	100	Vertical	Pass
2**	1747.300	30.83	-16.04	54.0	23.17	AV	358.00	100	Vertical	Pass
3	2448.600	58.64	-11.82	74.0	15.36	Peak	249.00	100	Vertical	N/A
3**	2448.600	55.40	-11.82	54.0	-1.40	AV	249.00	100	Vertical	N/A
4	4210.000	49.09	-3.03	74.0	24.91	Peak	267.00	100	Vertical	Pass
4**	4210.000	39.01	-3.03	54.0	14.99	AV	267.00	100	Vertical	Pass
5	8949.287	53.99	2.11	74.0	20.01	Peak	243.00	100	Vertical	Pass
5**	8949.287	44.02	2.11	54.0	9.98	AV	243.00	100	Vertical	Pass
6	12380.450	57.40	5.13	74.0	16.60	Peak	139.00	100	Vertical	Pass
6**	12380.450	48.98	5.13	54.0	5.02	AV	139.00	100	Vertical	Pass

4) Test Antenna Horizontal, 1 GHz – 12.75 GHz

RE Test case_FCC Part 15B_FCC Part 15B Class B 1GHz-12.75GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1200.100	40.33	-16.03	74.0	33.67	Peak	75.00	100	Horizontal	Pass
1**	1200.100	35.37	-16.03	54.0	18.63	AV	75.00	100	Horizontal	Pass
2	2448.400	56.55	-11.82	74.0	17.45	Peak	231.00	100	Horizontal	N/A
2**	2448.400	52.82	-11.82	54.0	1.18	AV	231.00	100	Horizontal	N/A
3	3772.250	48.70	-3.53	74.0	25.30	Peak	113.00	100	Horizontal	Pass
3**	3772.250	38.02	-3.53	54.0	15.98	AV	113.00	100	Horizontal	Pass
4	5423.250	52.45	0.10	74.0	21.55	Peak	31.00	100	Horizontal	Pass
4**	5423.250	42.36	0.10	54.0	11.64	AV	31.00	100	Horizontal	Pass
5	9041.675	53.78	2.15	74.0	20.22	Peak	124.00	100	Horizontal	Pass
5**	9041.675	45.32	2.15	54.0	8.68	AV	124.00	100	Horizontal	Pass
6	12240.562	57.01	5.26	74.0	16.99	Peak	338.00	100	Horizontal	Pass
6**	12240.562	47.79	5.26	54.0	6.21	AV	338.00	100	Horizontal	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency Above 1 GHz						
EMI Receiver	Keysight	N9038A	MY55330120	2023.09.05	2024.09.04	☒
Amplifier (1-12GHz)	Advanced Microwave	WLA652A	1740103	2023.12.05	2024.12.04	☒
Amplifier (0.8-21GHz)	Mini-Circuits	ZVA-213-S+	619201336	2023.12.05	2024.12.04	☒
Test Antenna- Horn	SCHWARZB ECK	BBHA 9120D	1148	2022.04.12	2025.04.11	☒
Anechoic Chamber (#2)	YiHeng	9m*6m*6m	142	2024.08.18	2027.08.17	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

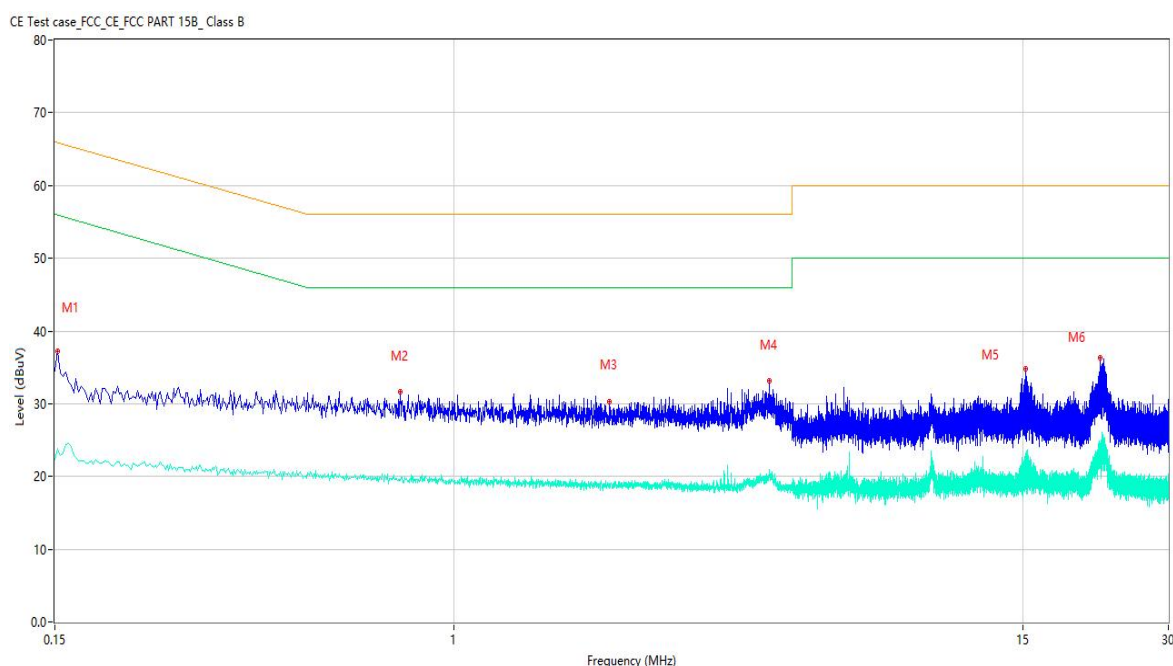
A.2 Conducted Emission, AC Ports

Note: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

Sample No.	SC-SH2480040-S03	Temperature	22.8℃
Humidity	61%RH	Pressure	101kPa
Test Engineer	Yang Yang	Test Date	2024..08.19

Test Mode 1

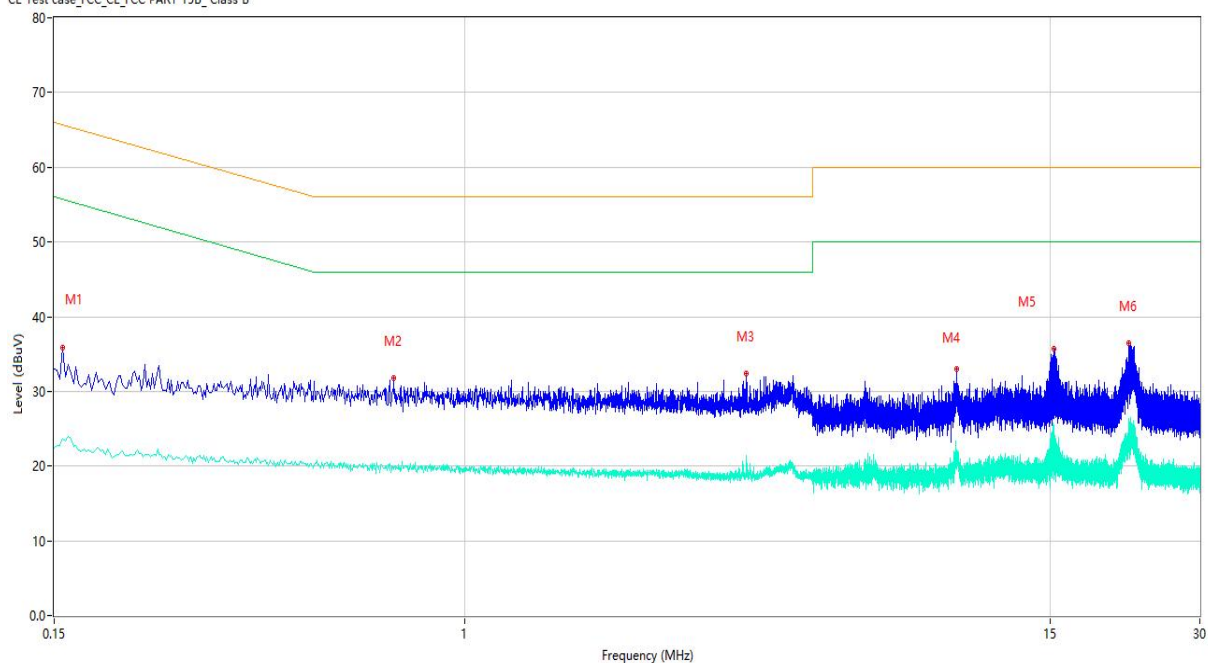
1) AC Ports - L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.152	37.19	9.75	65.89	28.70	Peak	L	Pass
1**	0.152	23.87	9.75	55.89	32.02	AV	L	Pass
2	0.776	31.61	9.72	56.00	24.39	Peak	L	Pass
2**	0.776	19.43	9.72	46.00	26.57	AV	L	Pass
3	2.096	30.34	9.68	56.00	25.66	Peak	L	Pass
3**	2.096	18.83	9.68	46.00	27.17	AV	L	Pass
4	4.502	33.07	9.65	56.00	22.93	Peak	L	Pass
4**	4.502	20.34	9.65	46.00	25.66	AV	L	Pass
5	15.230	34.80	9.24	60.00	25.20	Peak	L	Pass
5**	15.230	22.26	9.24	50.00	27.74	AV	L	Pass
6	21.674	36.30	8.90	60.00	23.70	Peak	L	Pass
6**	21.674	22.37	8.90	50.00	27.63	AV	L	Pass

2) AC Ports - N Phase

CE Test case_FCC_CE_FCC PART 15B_Class B



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.156	35.91	9.70	65.67	29.76	Peak	N	Pass
1**	0.156	23.71	9.70	55.67	31.96	AV	N	Pass
2	0.722	31.72	9.88	56.00	24.28	Peak	N	Pass
2**	0.722	19.94	9.88	46.00	26.06	AV	N	Pass
3	3.690	32.47	9.84	56.00	23.53	Peak	N	Pass
3**	3.690	20.67	9.84	46.00	25.33	AV	N	Pass
4	9.754	32.99	9.74	60.00	27.01	Peak	N	Pass
4**	9.754	22.18	9.74	50.00	27.82	AV	N	Pass
5	15.246	35.69	9.50	60.00	24.31	Peak	N	Pass
5**	15.246	25.44	9.50	50.00	24.56	AV	N	Pass
6	21.606	36.46	9.08	60.00	23.54	Peak	N	Pass
6**	21.606	26.35	9.08	50.00	23.65	AV	N	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2023.09.05	2024.09.04	☒
LISN	SCHWARZB ECK	NSLK 8127	8127-687	2024.05.09	2025.05.08	☒
Shielded Room	YiHeng Electronic Co., Ltd	3.5m*3.1m*2. 8m	112	2022.02.19	2025.02.18	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SH2480539-AE.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SH2480539-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SH2480539-AI.PDF”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
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--END OF REPORT--