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TESTING
CNAS L6791

TEST REPORT

Applicant: Jiangsu Niu Electric Technology Co., Ltd.
Address: No.387.ChangtingRd,WEZ,Wujin,Changzhou,Jiang
su Province.China
Equipment Type: Smart Central Controller
Model Name: V51A
Brand Name: NIU
FCC ID: 2AZ6G-V51A
Test Standard: 47 CFR Part 15 Subpart B
ANSI C63.4-2014
Sample Arrival Date: Nov. 15, 2024
Test Date: Dec. 03, 2024
Date of Issue: Jan. 13, 2025

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>Jan. 07, 2025</u>	<u>Initial Issue</u>
<u>Rev. 02</u>	<u>Jan. 13, 2025</u>	<u>Modify FCC ID</u>
		<u>The original report is invalid.</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	Jiangsu Niu Electric Technology Co., Ltd.
Address	No.387.ChangtingRd,WEZ,Wujin,Changzhou,Jiangsu Province.China

2.2 Manufacturer Information

Manufacturer	Jiangsu Niu Electric Technology Co., Ltd.
Address	No.387.ChangtingRd,WEZ,Wujin,Changzhou,Jiangsu Province.China

2.3 General Description for Equipment under Test (EUT)

EUT Name	Smart Central Controller
Model Name Under Test	V51A
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V0.2
Software Version	V5A01A29+V1Q02V01
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	Longtiger
	Model No.	18650
	Serial No.	N/A
	Capacity	2200 mAh
	Rated Voltage	3.7 V
	Limit Charge Voltage	4.2 V

2.5 Technical Information

Network and Wireless connectivity	3G Network HSDPA/HSUPA Band 2/4/5 4G Network FDD LTE Band2/4/12 GPS, GLONASS
Classification of equipment	Class B
The highest internal frequency of EUT	1910 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#4	4.4 dB
Radiated emissions (1 GHz-18 GHz)-966#4	5.0 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Enclosure List

Description	Manufacturer	Model	Serial No.	Length	Description	Use
DC Power Supply	Ou Han	ADE60-20G R	202104151 00V	N/A	Cal. Due 2025.02.22	☒

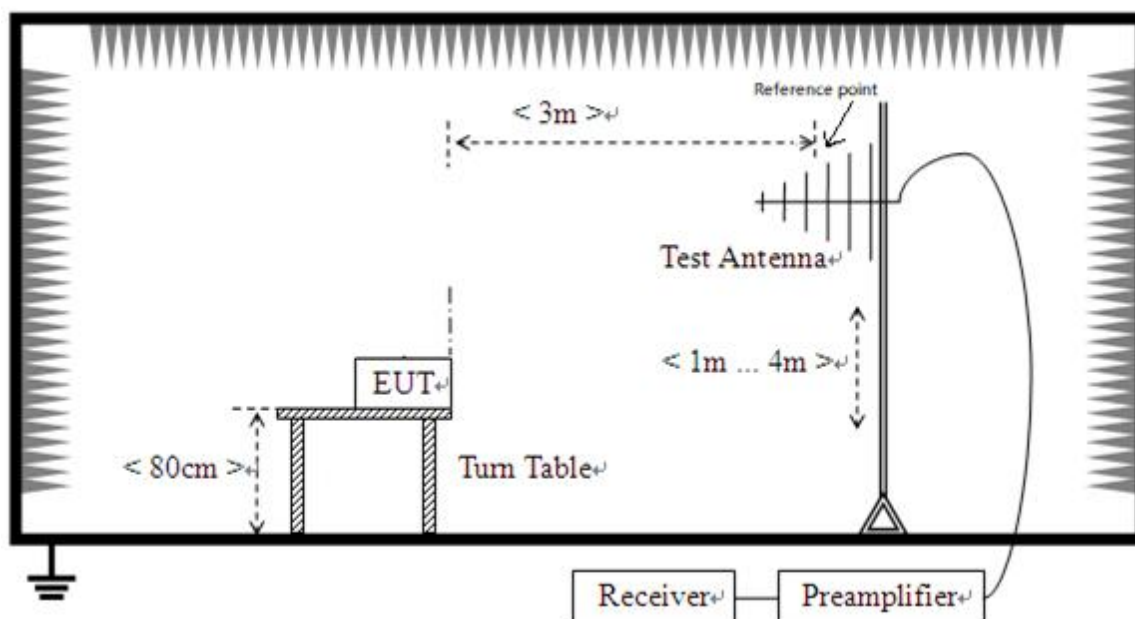
4.2 Test Configurations

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

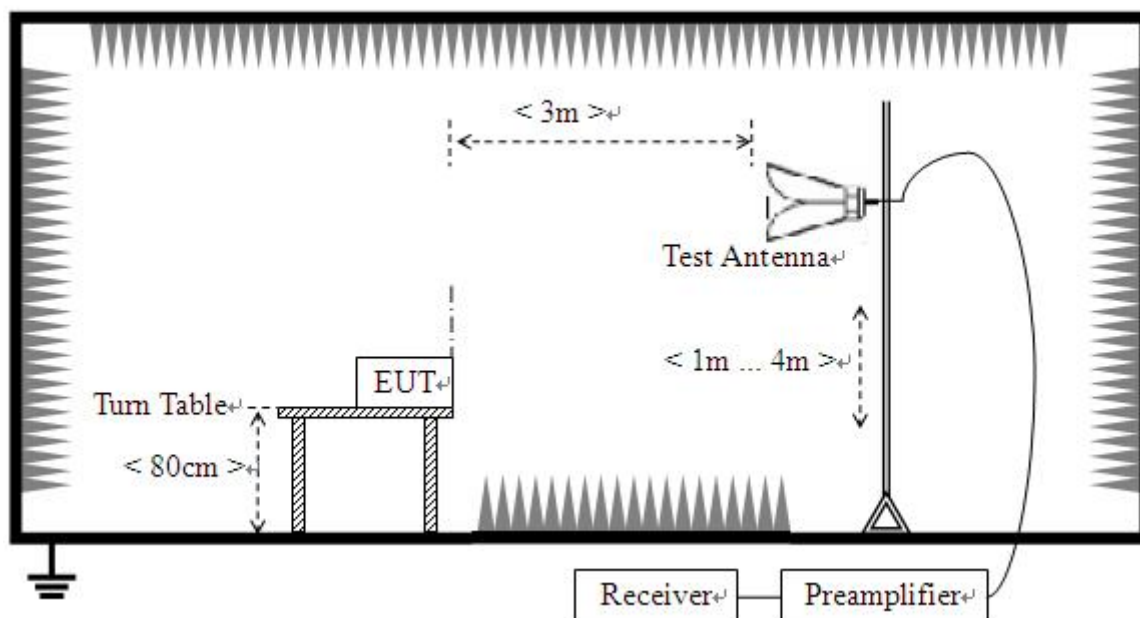
Test Mode Configuration	Description
Mode 1	<u>The Full System Test Mode</u> EUT + Battery + DC Power Supply

4.3 Test Setups

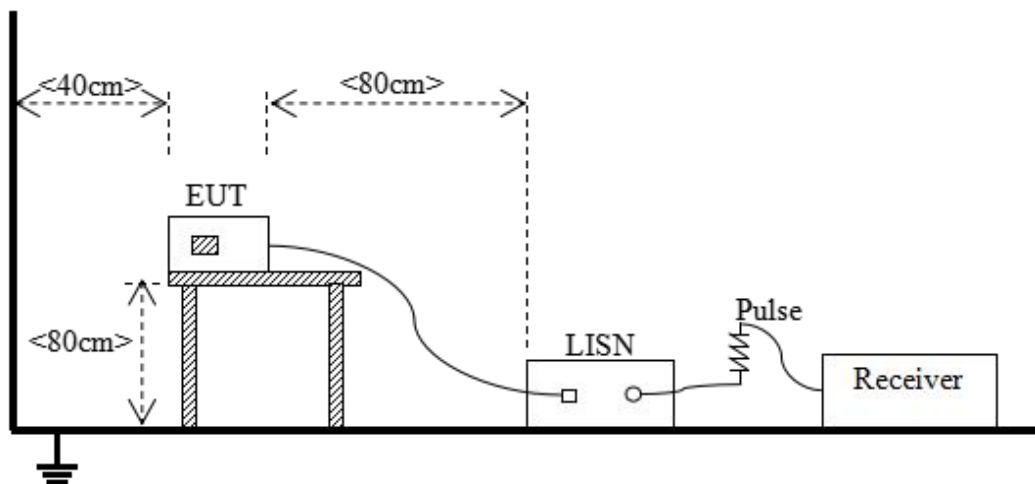
Test Setup 1



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.

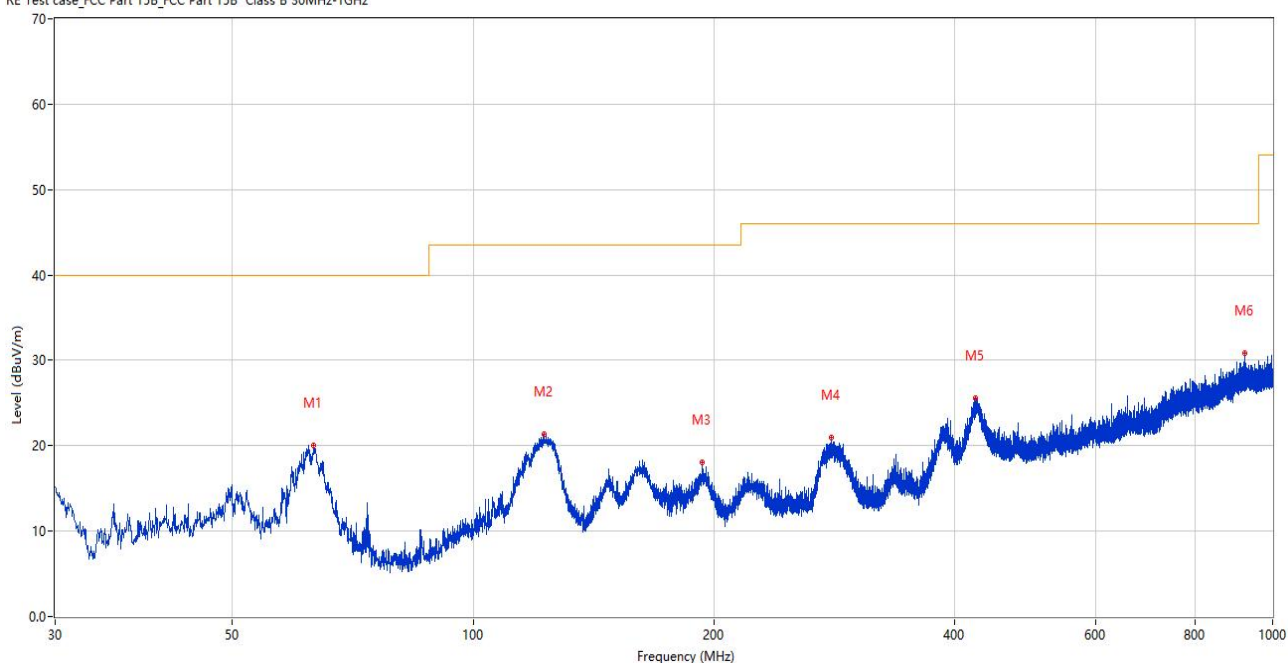
Note 2: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Sample No.	SC-SH2490071-S01	Temperature	21.2℃
Humidity	49%RH	Pressure	101kPa
Test Engineer	Xiao Tangqi	Test Date	2024.12.03

Test Mode 1

1) Test Antenna Vertical, 30 MHz – 1 GHz

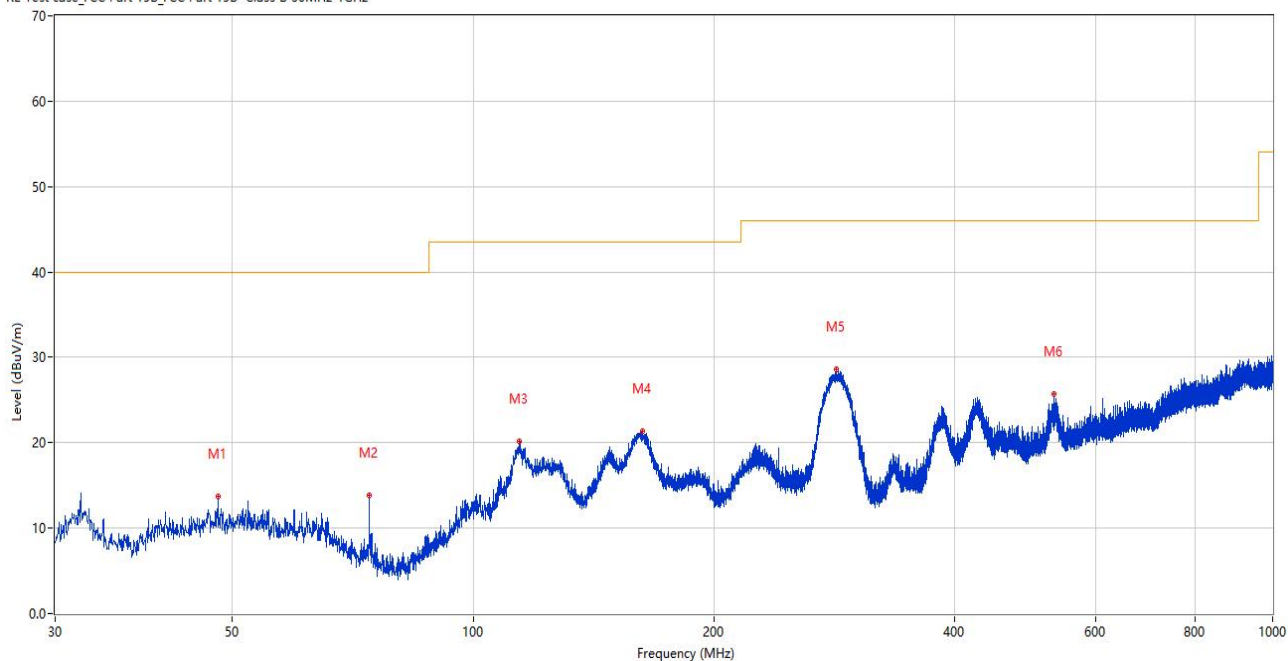
RE Test case_FCC Part 15B_FCC Part 15B Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	63.126	20.07	-27.40	40.0	19.93	Peak	27.00	100	Vertical	Pass
2	122.781	21.33	-29.19	43.5	22.17	Peak	73.00	100	Vertical	Pass
3	193.494	18.07	-26.62	43.5	25.43	Peak	287.00	100	Vertical	Pass
4	280.454	20.93	-24.45	46.0	25.07	Peak	347.00	100	Vertical	Pass
5	424.790	25.54	-20.21	46.0	20.46	Peak	268.00	200	Vertical	Pass
6	922.497	30.85	-9.17	46.0	15.15	Peak	21.00	200	Vertical	Pass

2) Test Antenna Horizontal, 30 MHz – 1 GHz

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

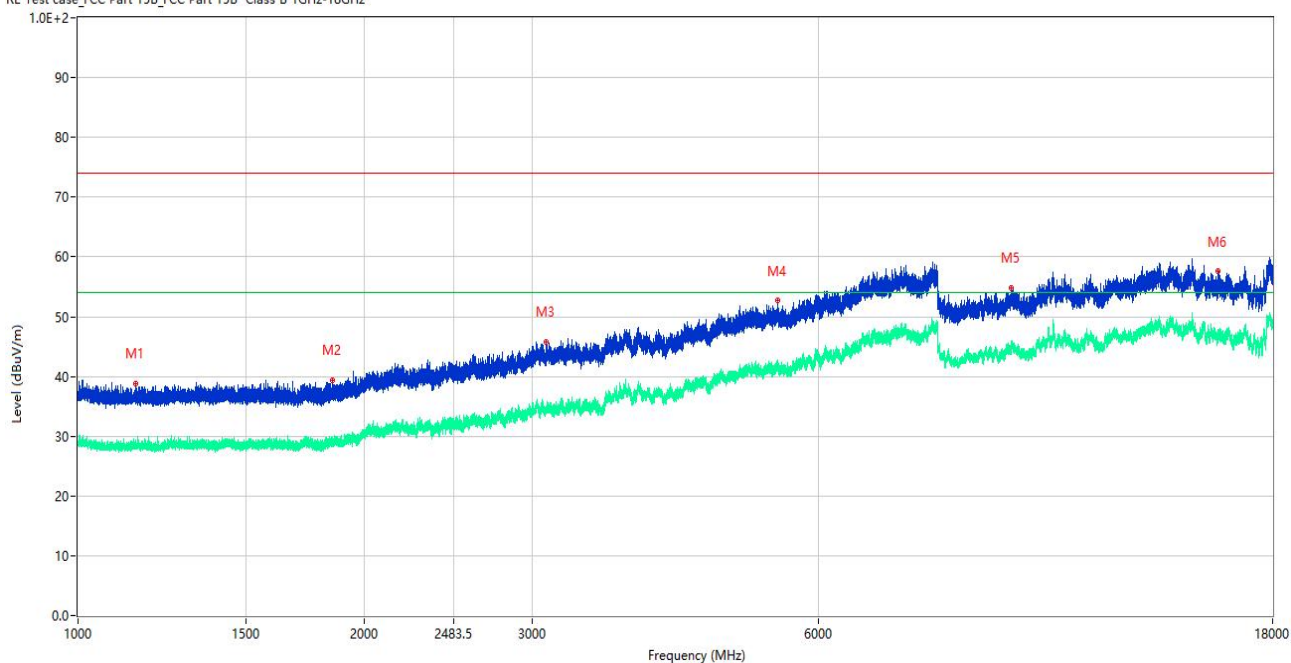


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	47.993	13.66	-25.74	40.0	26.34	Peak	30.00	200	Horizontal	Pass
2	74.087	13.79	-31.00	40.0	26.21	Peak	42.00	100	Horizontal	Pass
3	114.147	20.17	-27.92	43.5	23.33	Peak	186.00	200	Horizontal	Pass
4	162.939	21.31	-29.40	43.5	22.19	Peak	216.00	200	Horizontal	Pass
5	284.867	28.64	-24.35	46.0	17.36	Peak	284.00	100	Horizontal	Pass
6	533.284	25.71	-17.85	46.0	20.29	Peak	90.00	200	Horizontal	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency Below 1 GHz						
EMI Receiver	Keysight	N9038A	MY53220118	2024.08.01	2025.07.31	☒
Amplifier (30-1GHz)	COM-MV	ZT30-1000M	B2017119082	2023.12.05	2024.12.04	☒
Test Antenna- Bi-Log	SCHWARZB ECK	VULB 9163	9163-624	2024.07.06	2027.07.05	☒
Anechoic Chamber (#4)	ChangNing	9m*6m*6m	101	2023.03.04	2026.03.03	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

3) Test Antenna Vertical, 1 GHz – 18 GHz

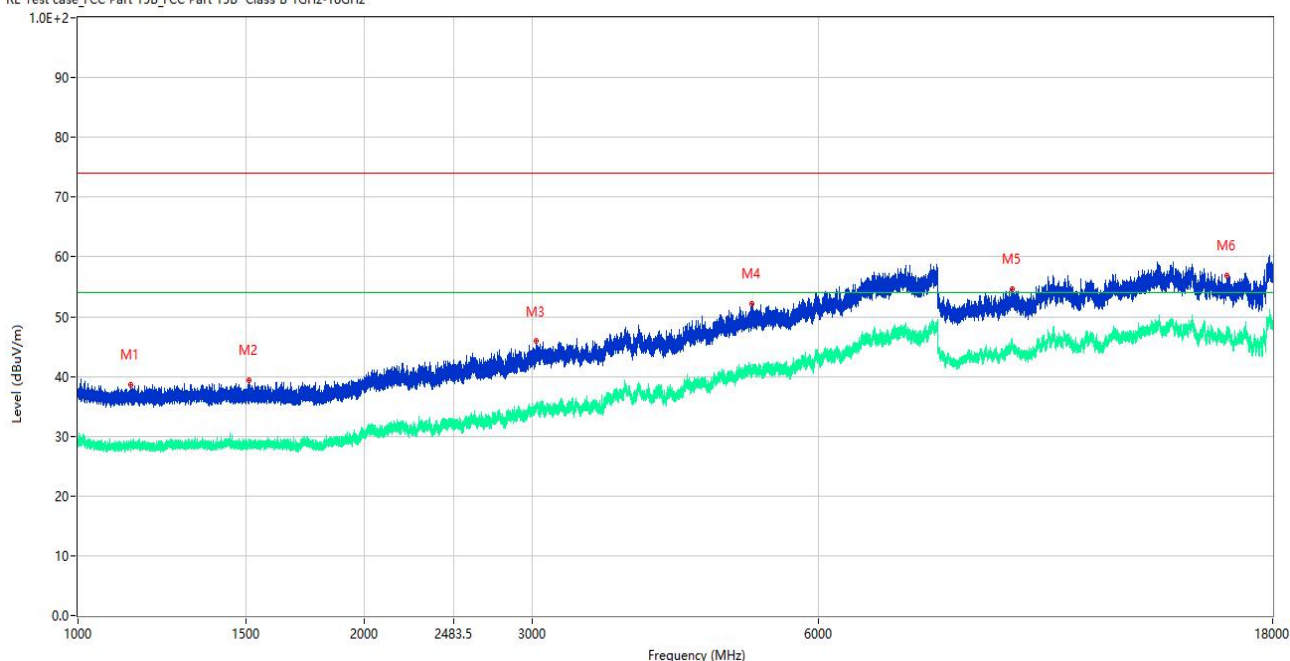
RE Test case_FCC Part 15B_FCC Part 15B Class B 1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1150.300	38.77	-15.87	74.0	35.23	Peak	116.00	100	Vertical	Pass
1**	1150.300	28.82	-15.87	54.0	25.18	AV	116.00	100	Vertical	Pass
2	1852.400	39.39	-15.79	74.0	34.61	Peak	8.00	100	Vertical	Pass
2**	1852.400	29.19	-15.79	54.0	24.81	AV	8.00	100	Vertical	Pass
3	3102.500	45.85	-7.36	74.0	28.15	Peak	55.00	100	Vertical	Pass
3**	3102.500	34.19	-7.36	54.0	19.81	AV	55.00	100	Vertical	Pass
4	5429.500	52.69	0.14	74.0	21.31	Peak	73.00	100	Vertical	Pass
4**	5429.500	41.46	0.14	54.0	12.54	AV	73.00	100	Vertical	Pass
5	9567.500	54.80	3.19	74.0	19.20	Peak	60.00	100	Vertical	Pass
5**	9567.500	45.18	3.19	54.0	8.82	AV	60.00	100	Vertical	Pass
6	15785.000	57.63	6.39	74.0	16.37	Peak	243.00	100	Vertical	Pass
6**	15785.000	47.26	6.39	54.0	6.74	AV	243.00	100	Vertical	Pass

4) Test Antenna Horizontal, 1 GHz – 18 GHz

RE Test case_FCC Part 15B_FCC Part 15B Class B 1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1136.900	38.56	-16.02	74.0	35.44	Peak	163.00	100	Horizontal	Pass
1**	1136.900	28.31	-16.02	54.0	25.69	AV	163.00	100	Horizontal	Pass
2	1512.500	39.42	-16.21	74.0	34.58	Peak	188.00	100	Horizontal	Pass
2**	1512.500	28.69	-16.21	54.0	25.31	AV	188.00	100	Horizontal	Pass
3	3033.500	45.98	-7.29	74.0	28.02	Peak	197.00	100	Horizontal	Pass
3**	3033.500	34.96	-7.29	54.0	19.04	AV	197.00	100	Horizontal	Pass
4	5109.000	52.19	-0.52	74.0	21.81	Peak	19.00	100	Horizontal	Pass
4**	5109.000	41.40	-0.52	54.0	12.60	AV	19.00	100	Horizontal	Pass
5	9585.000	54.59	3.06	74.0	19.41	Peak	20.00	100	Horizontal	Pass
5**	9585.000	45.35	3.06	54.0	8.65	AV	20.00	100	Horizontal	Pass
6	16123.000	56.93	6.08	74.0	17.07	Peak	252.00	100	Horizontal	Pass
6**	16123.000	47.91	6.08	54.0	6.09	AV	252.00	100	Horizontal	Pass

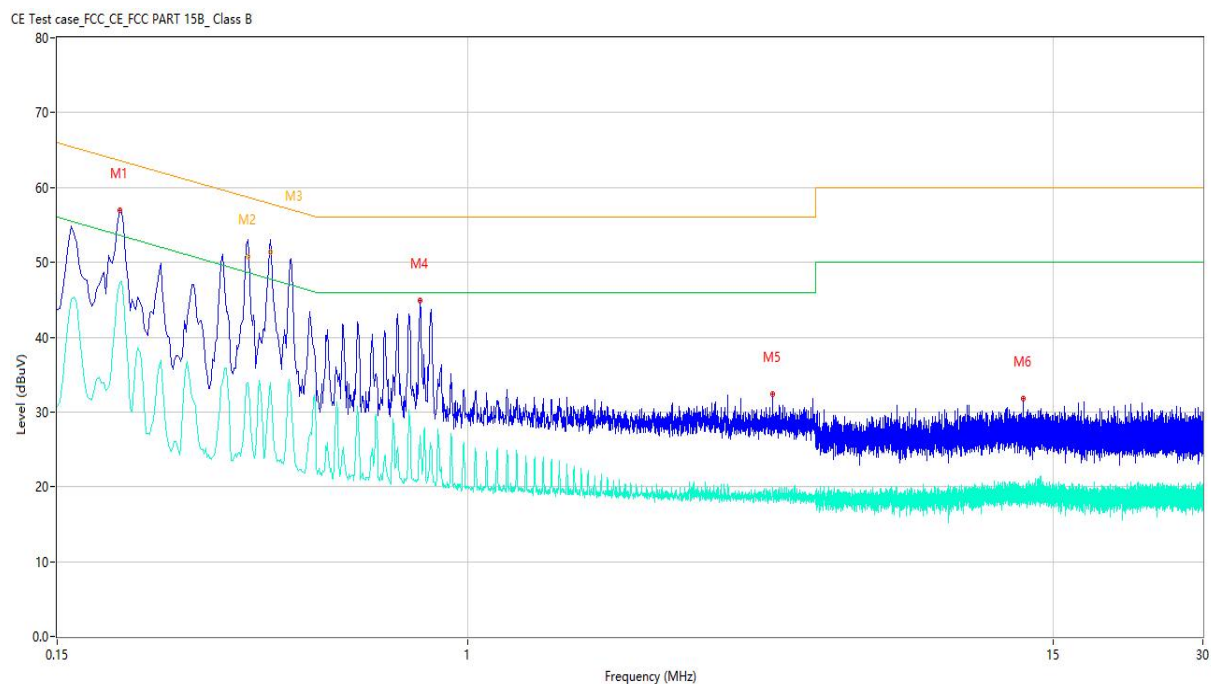
Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
Frequency Above 1 GHz						
EMI Receiver	Keysight	N9038A	MY53220118	2024.08.01	2025.07.31	☒
Amplifier (1-12GHz)	COM-MV	DLNAB-1000- 12000-002	18080279	2023.12.05	2024.12.04	☒
Test Antenna- Horn	SCHWARZB ECK	BBHA 9120D	1148	2022.04.12	2025.04.11	☒
Anechoic Chamber (#4)	ChangNing	9m*6m*6m	101	2022.04.12	2025.04.11	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

A.2 Conducted Emission, AC Ports

Sample No.	SC-SH2490071-S01	Temperature	22.0℃
Humidity	56%RH	Pressure	101kPa
Test Engineer	Yang Yang	Test Date	2024.12.03

Test Mode 1

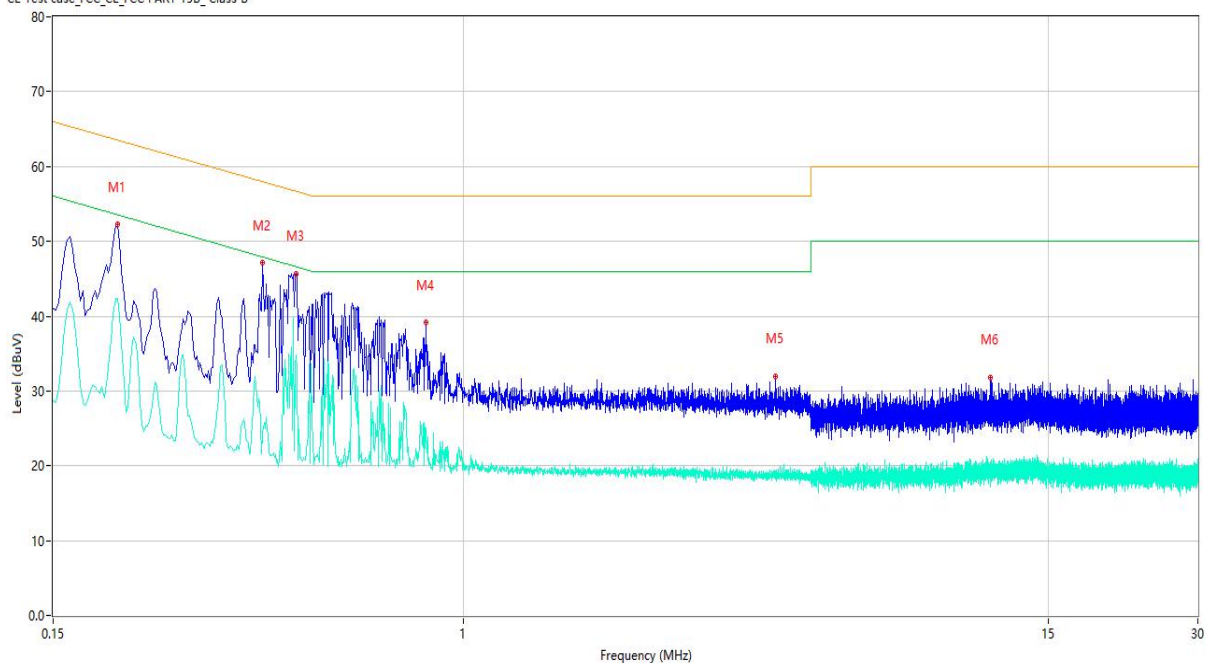
1) AC Ports - L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.200	56.99	9.75	63.61	6.62	Peak	L	Pass
1**	0.200	47.35	9.75	53.61	6.26	AV	L	Pass
2	0.362	52.81	9.74	58.68	5.87	Peak	L	N/A
2*	0.362	50.76	9.74	58.68	7.92	QP	L	Pass
2**	0.362	33.87	9.74	48.68	14.81	AV	L	Pass
3	0.402	52.91	9.74	57.81	4.90	Peak	L	N/A
3*	0.402	51.44	9.74	57.81	6.37	QP	L	Pass
3**	0.402	33.83	9.74	47.81	13.98	AV	L	Pass
4	0.804	44.90	9.71	56.00	11.10	Peak	L	Pass
4**	0.804	26.21	9.71	46.00	19.79	AV	L	Pass
5	4.104	32.41	9.66	56.00	23.59	Peak	L	Pass
5**	4.104	18.94	9.66	46.00	27.06	AV	L	Pass
6	13.066	31.76	9.34	60.00	28.24	Peak	L	Pass
6**	13.066	19.47	9.34	50.00	30.53	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	0.202	52.28	9.76	63.53	11.25	Peak	N	Pass
1**	0.202	42.28	9.76	53.53	11.25	AV	N	Pass
2	0.396	47.19	9.78	57.94	10.75	Peak	N	Pass
2**	0.396	24.46	9.78	47.94	23.48	AV	N	Pass
3	0.462	45.61	9.79	56.66	11.05	Peak	N	Pass
3**	0.462	34.82	9.79	46.66	11.84	AV	N	Pass
4	0.844	39.19	9.87	56.00	16.81	Peak	N	Pass
4**	0.844	25.07	9.87	46.00	20.93	AV	N	Pass
5	4.256	31.99	9.83	56.00	24.01	Peak	N	Pass
5**	4.256	18.80	9.83	46.00	27.20	AV	N	Pass
6	11.472	31.80	9.67	60.00	28.20	Peak	N	Pass
6**	11.472	19.76	9.67	50.00	30.24	AV	N	Pass

Equipment Information						
Equipment Name	Supplier	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2025.07.31	2025.07.31	☒
LISN	SCHWARZBECK	NSLK 8127	8127-687	2025.05.08	2025.05.08	☒
Shielded Room	YiHeng Electronic Co., Ltd	3.5m*3.1m*2.8m	112	2025.02.18	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-SH24B0860-AE.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SH24B0860-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SH24B0860-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.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--