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TESTING
CNAS L6791

TEST REPORT

Applicant: Hefei Invispower Co., Ltd
A3-15, Floor 14, Block A, Building J1, Phase II,
Innovation Industrial Park, No. 2800, Innovation
Avenue, High-Tech Zone, Hefei, China (Anhui) Pilot
Free Trade Zone

Address:

Equipment Type: NFCR-INTERNAL

Model Name: NFC-I-SX-21548

Brand Name: INVISPOWER

FCC ID: 2BBHHYGKJ-V216NFC
47 CFR Part 15 Subpart B

Test Standard: ICES-003 (Issue 7, October 15, 2020)
ANSI C63.4-2014

Sample Arrival Date: May 17, 2023

Test Date: May 29, 2023

Date of Issue: Jul. 18, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Sijie Zheng**Checked by:** Xia Long**Approved by:** Hanson Lin
(Vice General Manager)*Sijie Zheng**Xia Long**Hanson Lin*

Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Jul. 11, 2023</u>	<u>Initial Issue</u>
<u>Rev. 02</u>	<u>Jul. 18, 2023</u>	<u>Updated the model name.</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. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Hefei Invispower Co., Ltd
Address	A3-15, Floor 14, Block A, Building J1, Phase II, Innovation Industrial Park, No. 2800, Innovation Avenue, High-Tech Zone, Hefei, China (Anhui) Pilot Free Trade Zone

2.2 Manufacturer Information

Manufacturer	Hefei Invispower Co., Ltd
Address	A3-15, Floor 14, Block A, Building J1, Phase II, Innovation Industrial Park, No. 2800, Innovation Avenue, High-Tech Zone, Hefei, China (Anhui) Pilot Free Trade Zone

2.3 Factory Information

Factory	Jiangsu InvisPower Co., Ltd.
Address	No.100, Xinning Road, Chongchuan District, Nantong City, Jiangsu Province, P.R. China

2.4 General Description for Equipment under Test (EUT)

EUT Name	NFCR-INTERNAL
Model Name Under Test	NFC-I-SX-21548
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V2.1
Software Version	V2.1
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Network and Wireless connectivity	NFC
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The requirement for the following technical information of the EUT was tested in this report:

The Highest Speed of Processor	N/A
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3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15 Subpart B	Unintentional Radiators
2	ICES-003 (Issue 7, October 15, 2020)	Information Technology Equipment (Including Digital Apparatus)
3	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	ISED Rule	Test Verdict	Result
1	Radiated Emission	15.109	ICES-003, 3.2.2	Pass	Annex A .1
2	Conducted Emission, AC Ports	15.107	ICES-003, 3.2.1	N/A	Annex A .2
Note: The EUT is used in vehicle environment. So the Conducted Emission, AC Port test is not applicable					

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)	3.22 dB
Radiated emissions (30 MHz-1 GHz)-10m	4.80 dB
Radiated emissions (30 MHz-1 GHz)-3m	4.76 dB
Radiated emissions (1 GHz-18 GHz)-3m	4.88 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments, Test Date and Test Engineer

Test items	Voltage	Temperature	Relative Humidity	Ambient Pressure	Test Date	Test Engineer
Radiated Emission	DC 12V	24.4°C	46%	101kPa	May 29, 2023	Tian Hengzhao

4.2 Test Equipment List

Radiated Emission Test For Frequency Below 1 GHz (3m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	Agilent	N9038A	MY55330120	2022.09.09	2023.09.08	☒
Amplifier (30-1GHz)	COM-MV	ZT30-1000M	B2017119081	2022.09.09	2023.09.08	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-00867	2022.04.12	2025.04.11	☒
Anechoic Chamber	YiHeng	9m*6m*6m	966#2	2021.08.19	2024.08.18	☒
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		☒

4.3 Test Enclosure list

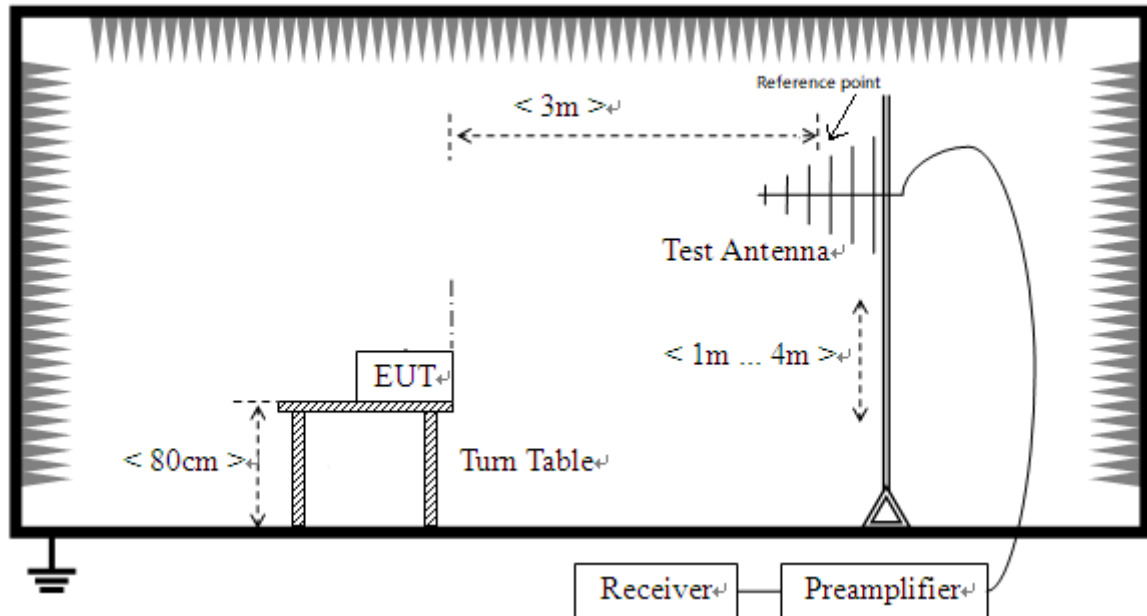
Description	Manufacturer	Model	Serial No.	Length	Description	Use
Vehicle Battery	N/A	N/A	N/A	N/A	N/A	☒
Clamp wire	N/A	N/A	N/A	N/A	N/A	☒

4.4 Test Configurations

Test Configurations (TC) No.	Description
TC01	<u>The Charge Test Mode</u> EUT + Clamp wire + Vehicle Battery

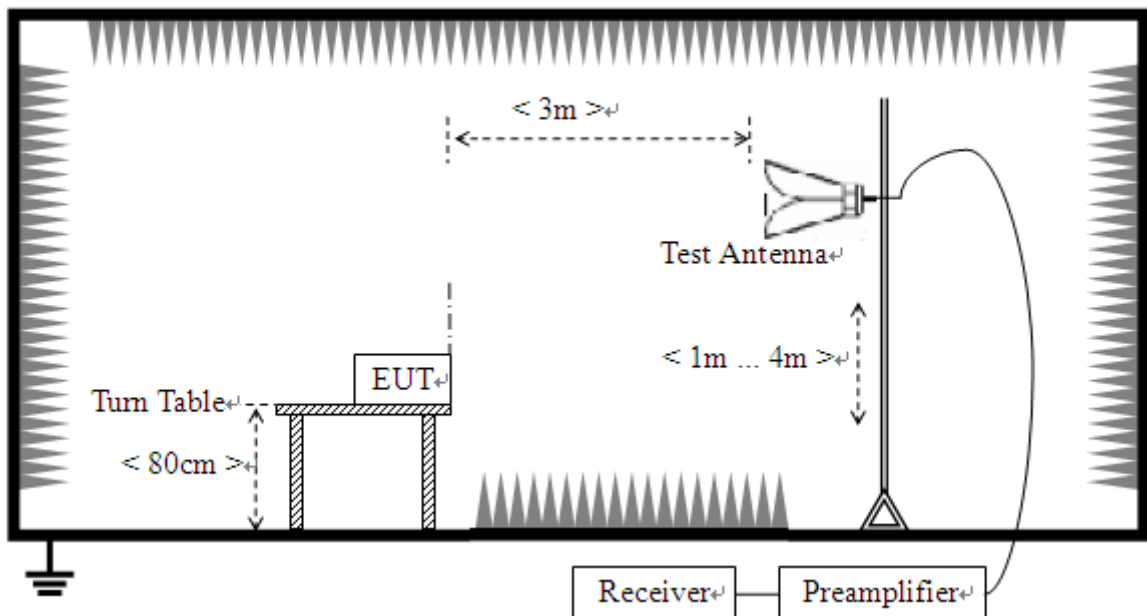
4.5 Test Setups

Test Setup 1

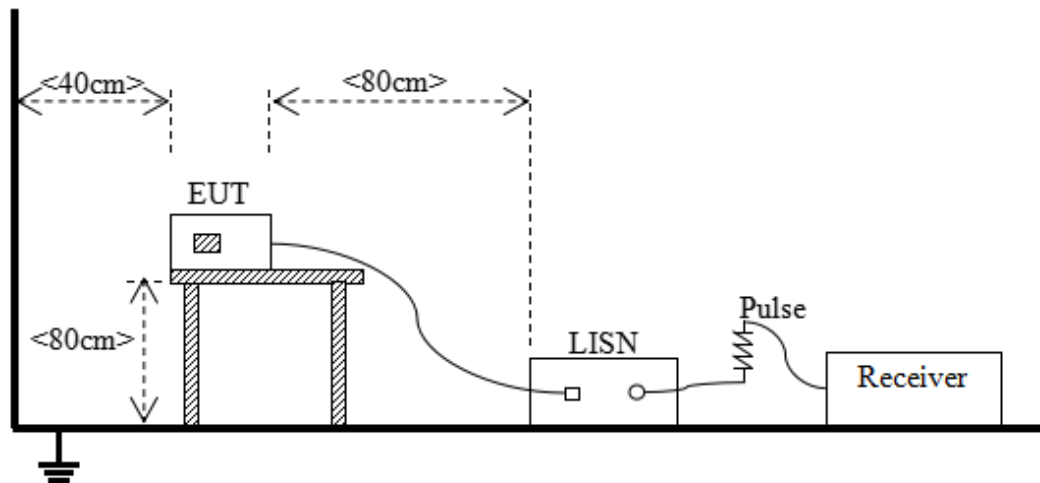


(For Radiated Emission Test (30 MHz-1 GHz))

Test Setup 2



(For Radiated Emission Test (above 1 GHz))

Test Setup 3

(For Conducted Emission, AC Ports Test)

4.6 Test Conditions

Test Case	Test Conditions	
Radiated Emission	Test Setup	Test Setup 1
	Test Configuration	TC01 ^{Note}

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

FCC:

Frequency range (MHz)	Class B (at 3 m)		Class B (at 10 m)	Class A (at 10 m)	
	Field Strength ($\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)	Field Strength ($\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)
30 - 88	100	40	30	90	39
88 - 216	150	43.5	33.5	150	43.5
216 - 960	200	46	36	210	46.4
Above 960	500	54	44	300	49.5

NOTE:

- 1) Field Strength (dB $\mu\text{V/m}$) = $20 \times \log [\text{Field Strength } (\mu\text{V/m})]$.
- 2) In the emission tables above, the tighter limit applies at the band edges.
- 3) The limits using ANSI C63.4.

IC:

Frequency range (MHz)	Class A (3 m) Quasi-peak (dB $\mu\text{V/m}$)	Class A (10 m) Quasi-peak (dB $\mu\text{V/m}$)	Class B (3 m) Quasi-peak (dB $\mu\text{V/m}$)	Class B (10m) Quasi-peak (dB $\mu\text{V/m}$)
30 - 88	50.0	40.0	40	30.0
88 - 216	54.0	43.5	43.5	33.1
216 - 230	56.9	46.4	46.0	35.6
230 - 960	57.0	47.0	47.0	37.0
960 - 1000	60.0	49.5	54.0	43.5

Note: The more stringent limit applies at transition frequencies.

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

Note:

1. The highest measurement frequency, F_M , in GHz, shall be determined as next Table.
2. The measurement bandwidth shall be 1 MHz or greater.
3. These limit levels apply for a measurement distance of 3 m. If using a different measurement distance, the measured levels shall be extrapolated to the 3 m limit distance using a factor of 20 dB per decade of distance. The measurement distance shall place the measurement

Frequency range (GHz)	Class A (3 m) Average (dB μ V/m)	Class A (3 m) Peak (dB μ V/m)	Class B (3 m) Average (dB μ V/m)	Class B (3 m) Peak (dB μ V/m)
antenna in the far field of the ITE or digital apparatus under test. 4. The test site shall have been validated at the distance used for radiated emission measurements on the ITE or digital apparatus under test				

Highest internal frequency (F_X)	Highest measurement frequency (F_M)
$F_X \leq 108 \text{ MHz}$	1GHz
$108 \text{ MHz} \leq F_X \leq 500 \text{ MHz}$	2GHz
$500 \text{ MHz} \leq F_X \leq 1 \text{ GHz}$	5GHz
$F_X \geq 1 \text{ GHz}$	$5 * F_X$ up to a maximum of 40 GHz
Note: F_X is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.	

5.1.1.2 Test Setup

Refer to 4.5 section (test setup 1 to test setup 2) for radiated emission test, the photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

The test employing the methods of measurement described in the publication referenced in Section 3(b) (ANSI C63.4);

All Spurious 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 $f < 1$ GHz, peak & RMS Average for $f \geq 1$ GHz

Trace = max hold

5.1.1.4 Test Result

Please refer to ANNEX A.1.

NOTE:

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

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

2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain (dB)

3. Over limit = Results – Limit.

5.1.2 Conducted Emission

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.
- 3) The limit using ANSI C63.4.

5.1.2.2 Test Setup

Refer to 4.5 section test (test setup 3) for conducted emission, the photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The test employing the methods of measurement described in the publication referenced in Section 3(b) (ANSI C63.4);

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

Please refer to ANNEX A.2.

NOTE:

1. Results (dBμV) = Reading (dBμV) + Factor (dB)

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

2. Factor = Insertion loss + Cable loss

3. Over limit = Results – Limit.

ANNEX A TEST RESULTS

A.1 Radiated Emission

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

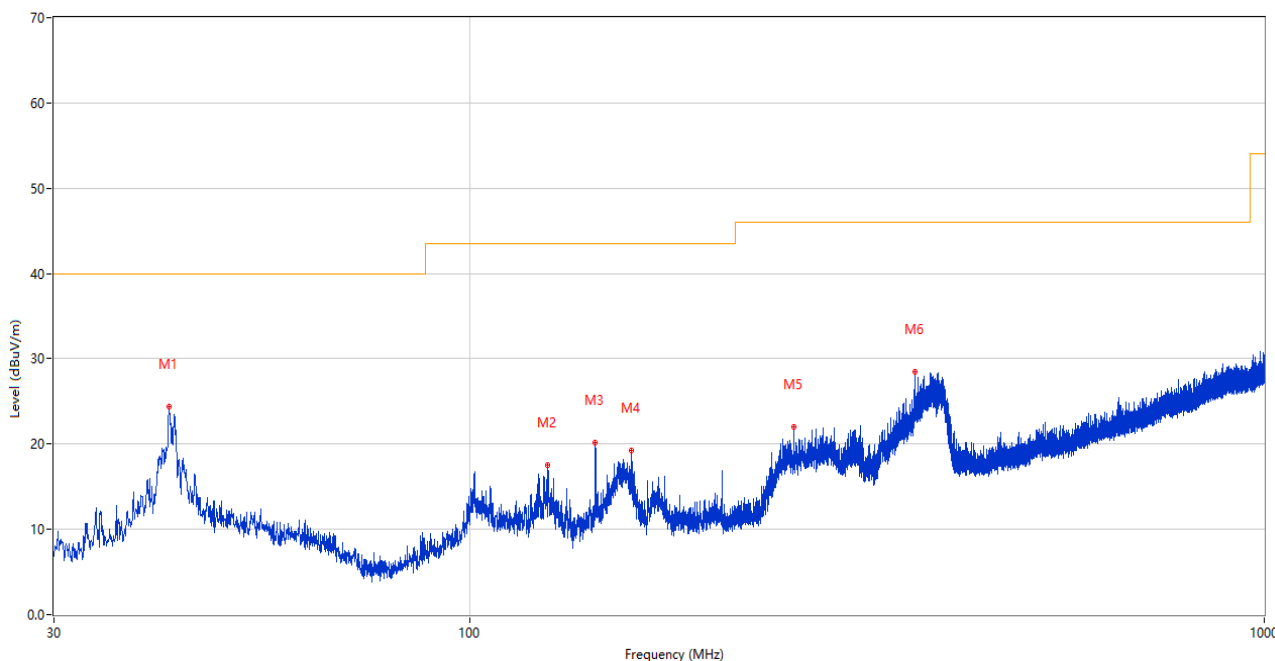
Note 2: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 3: The Radiated Emission from 18G-40G is noise only, do not show on the report.

Test Data and Plots

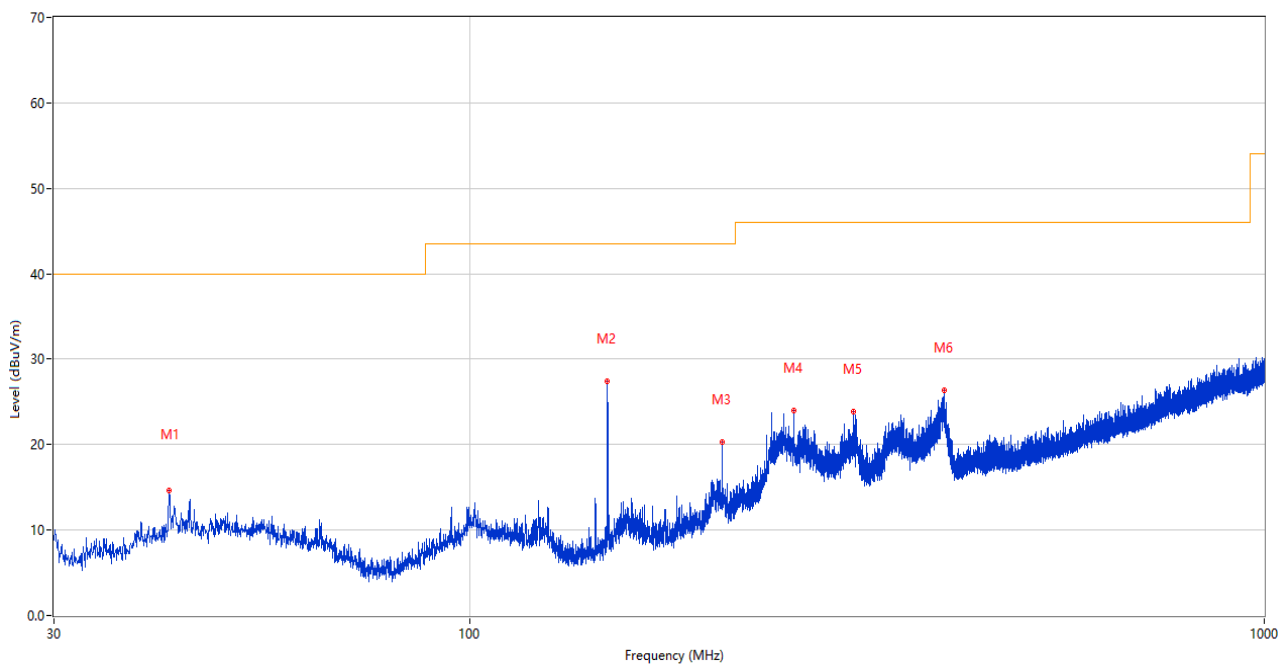
The Charge Test Mode

A.1.1 Test Antenna Vertical, 30 MHz – 1 GHz(FCC)



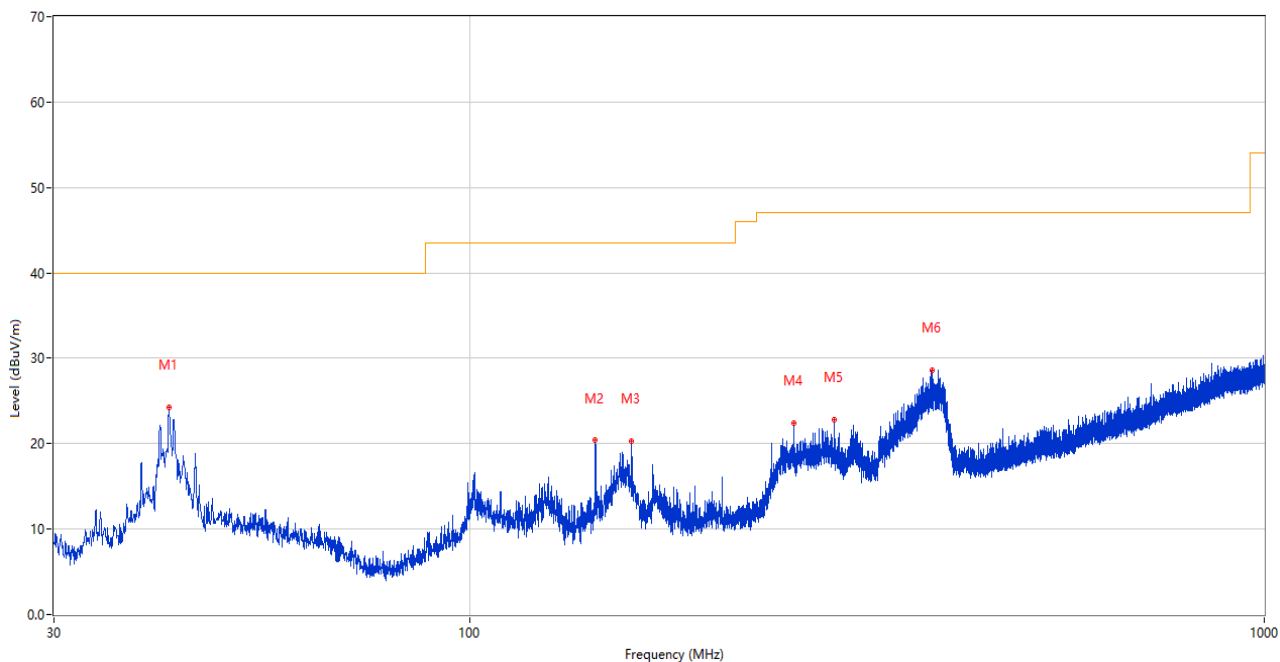
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	41.883	24.36	-25.98	40.0	15.64	Peak	216.00	100	Vertical	Pass
2	125.448	17.51	-29.44	43.5	25.99	Peak	201.00	100	Vertical	Pass
3	144.024	20.15	-30.24	43.5	23.35	Peak	260.00	100	Vertical	Pass
4	159.980	19.30	-29.57	43.5	24.20	Peak	343.00	100	Vertical	Pass
5	256.010	22.00	-24.62	46.0	24.00	Peak	164.00	100	Vertical	Pass
6	363.098	28.43	-21.89	46.0	17.57	Peak	344.00	200	Vertical	Pass

A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz(FCC)



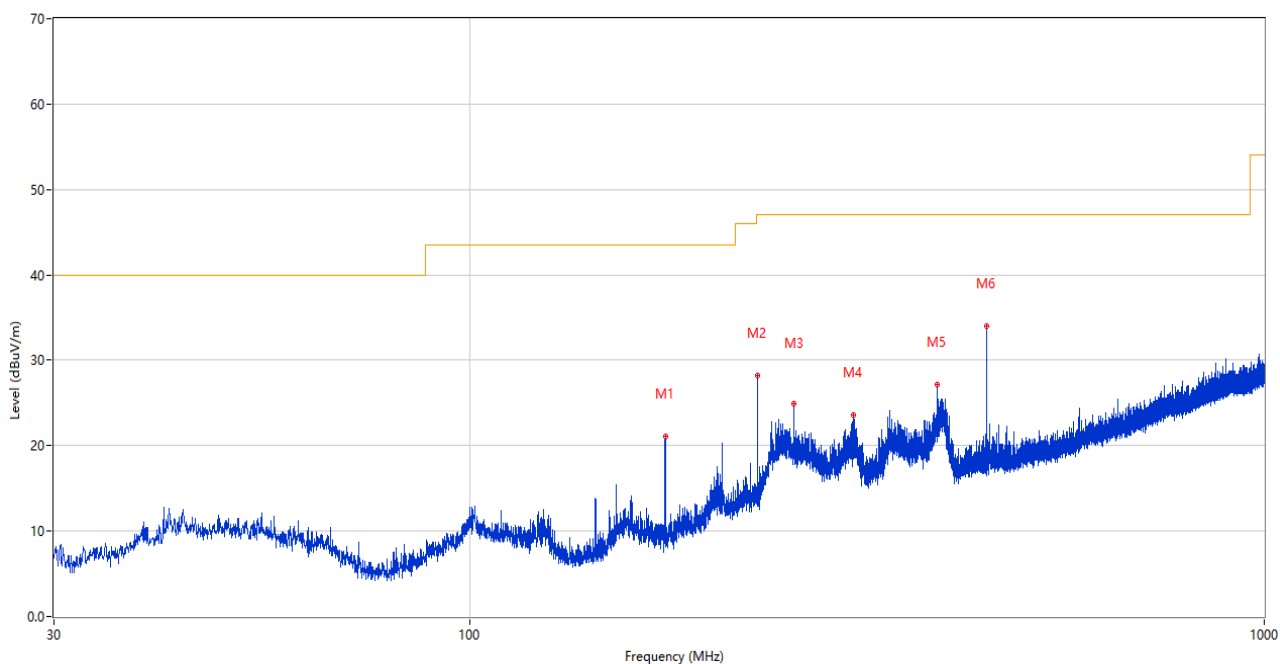
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	41.883	14.62	-25.98	40.0	25.38	Peak	47.00	100	Horizontal	Pass
2	149.165	27.46	-30.05	43.5	16.04	Peak	224.00	100	Horizontal	Pass
3	207.995	20.29	-26.66	43.5	23.21	Peak	288.00	200	Horizontal	Pass
4	256.010	24.04	-24.62	46.0	21.96	Peak	47.00	100	Horizontal	Pass
5	303.977	23.86	-23.64	46.0	22.14	Peak	216.00	100	Horizontal	Pass
6	395.884	26.31	-21.03	46.0	19.69	Peak	52.00	100	Horizontal	Pass

A.1.3 Test Antenna Vertical, 30 MHz – 1 GHz(IC)



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	41.931	24.23	-25.97	40.0	15.77	Peak	223.00	100	Vertical	Pass
2	144.024	20.37	-30.24	43.5	23.13	Peak	305.00	100	Vertical	Pass
3	160.028	20.31	-29.57	43.5	23.19	Peak	294.00	100	Vertical	Pass
4	256.010	22.46	-24.62	47.0	24.54	Peak	200.00	100	Vertical	Pass
5	288.020	22.82	-23.95	47.0	24.18	Peak	175.00	100	Vertical	Pass
6	381.916	28.67	-21.50	47.0	18.33	Peak	352.00	200	Vertical	Pass

A.1.4 Test Antenna Horizontal, 30 MHz – 1 GHz(IC)



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	176.276	21.04	-28.76	43.5	22.46	Peak	159.00	200	Horizontal	Pass
2	230.548	28.27	-25.52	47.0	18.73	Peak	42.00	200	Horizontal	Pass
3	256.010	24.87	-24.62	47.0	22.13	Peak	221.00	100	Horizontal	Pass
4	304.025	23.61	-23.64	47.0	23.39	Peak	176.00	100	Horizontal	Pass
5	387.542	27.20	-21.39	47.0	19.80	Peak	33.00	100	Horizontal	Pass
6	447.488	34.05	-20.00	47.0	12.95	Peak	0.00	200	Horizontal	Pass

A.2 Conducted Emission

Note: Not applicable.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2350688-AE-1.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2350688-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2350688-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.
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