TEST REPORT

Applicant:	Hefei Invispower Co., Ltd
Address:	2A, Yousi Tiancheng Industrial Park, No. 1800, Dabieshan Road, High-tech Zone, Hefei, P.R. China Summary of Activities
Equipment Type:	Wireless Charging module
Model Name:	PAH-3725200 (refer to section 2.3)
Brand Name:	BYD
FCC ID:	2BBHHYGKJ-21531WPC
Test Standard:	47 CFR Part 15 Subpart B ANSI C63.4-2014
Sample Arrival Date:	Dec. 08, 2023
Test Date:	Dec. 25, 2023
Date of Issue:	Jan. 29, 2024

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Zhang Guoxi **Checked by:** Zhenxiang Liu **Approved by:** Liao Jianming (Technical Director)

Revision History

Version	Issue Date	Revisions
Rev. 01	Jan. 29, 2024	Initial Issue

TABLE OF CONTENTS

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	Hefei Invispower Co., Ltd
Address	2A, Yousi Tiancheng Industrial Park, No. 1800, Dabieshan Road, High-tech Zone, Hefei, P.R. China Summary of Activities

2.2 Manufacturer Information

Manufacturer	Hefei Invispower Co., Ltd
Address	2A, Yousi Tiancheng Industrial Park, No. 1800, Dabieshan Road, High-tech Zone, Hefei, P.R. China Summary of Activities

2.3 General Description for Equipment under Test (EUT)

EUT Name	Wireless Charging module
Model Name Under Test	PAH-3725200
Series Model Name	PAH-3725200, STHXA-3725200, STHXB-3725200, MCH-3725200, SFHB-3725200, MREB-3725200, MREA-3725200, MRHD-3725400B, MRHD-3725400A, UXEA-3725200, UXEA-3725200A, EREA-3725200, SGH-3725200
Description of Model name differentiation	All models are same with circuit design, layout and internal wiring are identical, but only differ in appearance, location of DC fans, location of the power port, mounting options, hardware version and software version. (this information provided by the applicant)
Hardware Version	/
Software Version	/
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Ancillary Equipment

Note: Not applicable.

2.5 Technical Information

Network and Wireless connectivity	Qi
Classification of equipment	Class B
The highest internal frequency of EUT	40 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	N/A	Note
Note: The EUT is only used in vehicle environment.				

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
Radiated emissions (30 MHz-1 GHz)-966#2	4.8 dB
Radiated emissions (1 GHz-18 GHz)-966#2	4.9 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Enclosure List

Description	Manufacturer	Model	Serial No.	Length	Description	Use
Vehicle Battery	N.A	N.A	N.A	N.A	N.A	☒
Clip Wire	N.A	N.A	N.A	N.A	N.A	☒
Wireless charging load	N.A	N.A	N.A	N.A	N.A	☒
Iphone	Apple	XR	N.A	N.A	N.A	☒

4.2 Test Configurations

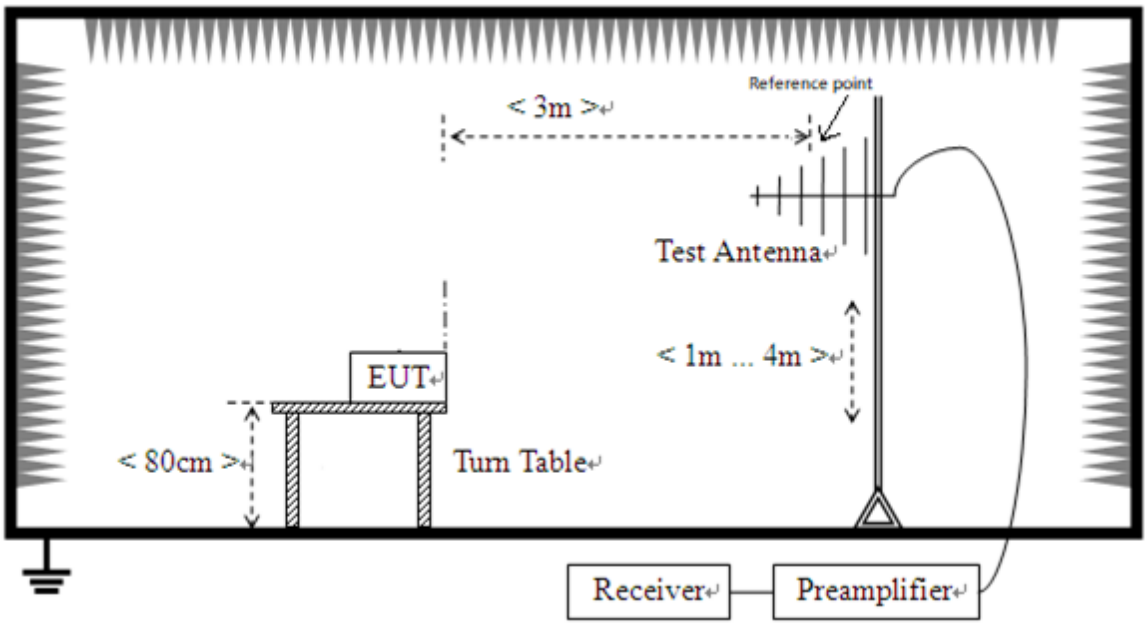
All test modes of EUT are listed in the table below.

Test Mode Configuration	Description
Mode 1	The Standby mode EUT + Vehicle Battery + Clip Wire
Mode 2	The Load Test Mode EUT + Vehicle Battery + Clip Wire + Load

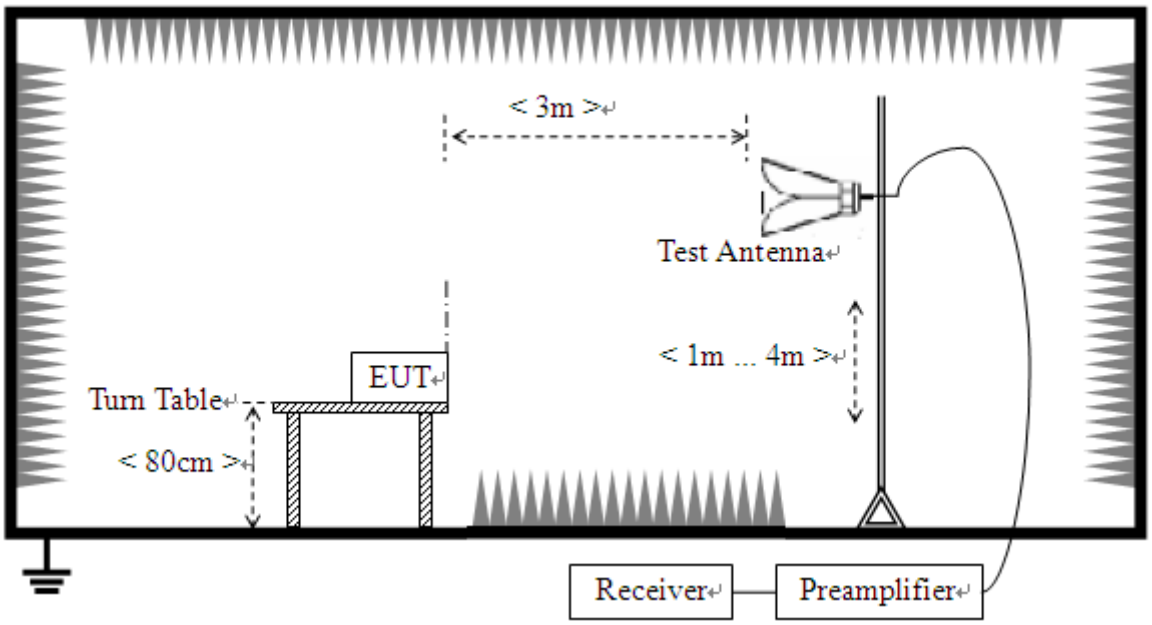
Test Case	Test Mode Configuration	Worst Mode
Radiated Emission	Mode 1~Mode 2	2

4.3 Test Setups

Test Setup 1

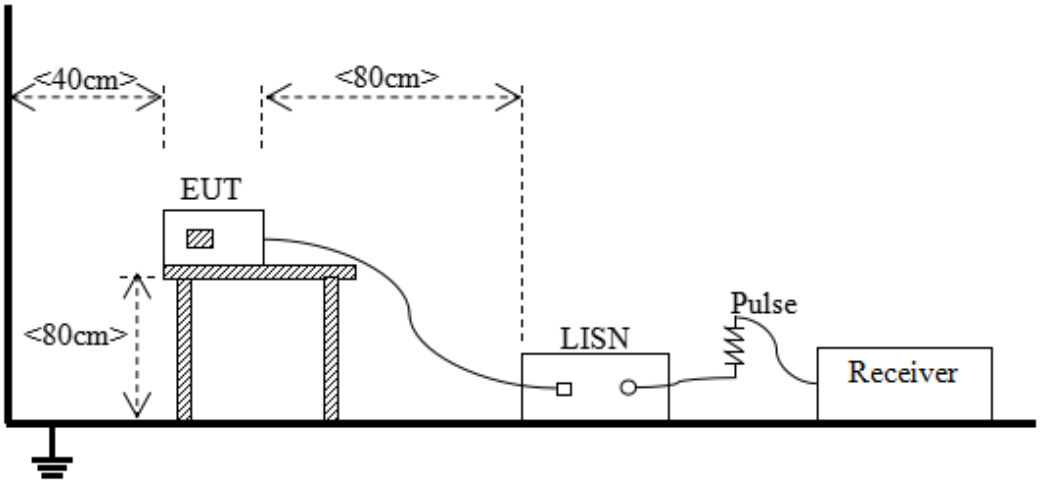


Radiated Emission (30 MHz-1 GHz)



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 (μV/m)	Field Strength (dBμV/m)	Field Strength (dBμV/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 (dBμV/m) = 20*log [Field Strength (μV/m)].
2) In the emission tables above, the tighter limit applies at the band edges.
3) The limits using ANSI C63.4.
4) 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 (μV/m)	Field Strength Average (dBμV/m)	Field Strength Peak (dBμV/m)	Field Strength Average (dBμV/m)	Field Strength Peak (dBμV/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:
$L_{3m} = L_{10m} + 20*\log(d_{10m}/d_{3m})$
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*log(10/3)=60 (dBμV/m).

Highest internal frequency (F_X)	Highest measurement frequency (F_M)
$F_X \leq 108$ MHz	1 GHz
108 MHz $\leq F_X \leq$ 500 MHz	2 GHz
500 MHz $\leq F_X \leq$ 1 GHz	5 GHz
$F_X \geq 1$ 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 ≥ 1 GHz, 100 kHz for f < 1 GHz

VBW ≥ RBW

Sweep = auto

Detector function = peak for f <1 GHz, peak & RMS Average for f ≥ 1 GHz

Trace = max hold

5.1.1.4 Test Result and Test Equipment List

Please refer to ANNEX A.1.

NOTE:

1. Results (dBμV/m) = Reading (dBμV/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, AC Ports

5.1.2.1 Test Limit

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

Frequency range (MHz)	Class B	
	Quasi-peak (dBμV)	Average (dBμV)
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 μH 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 ≥ 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 (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

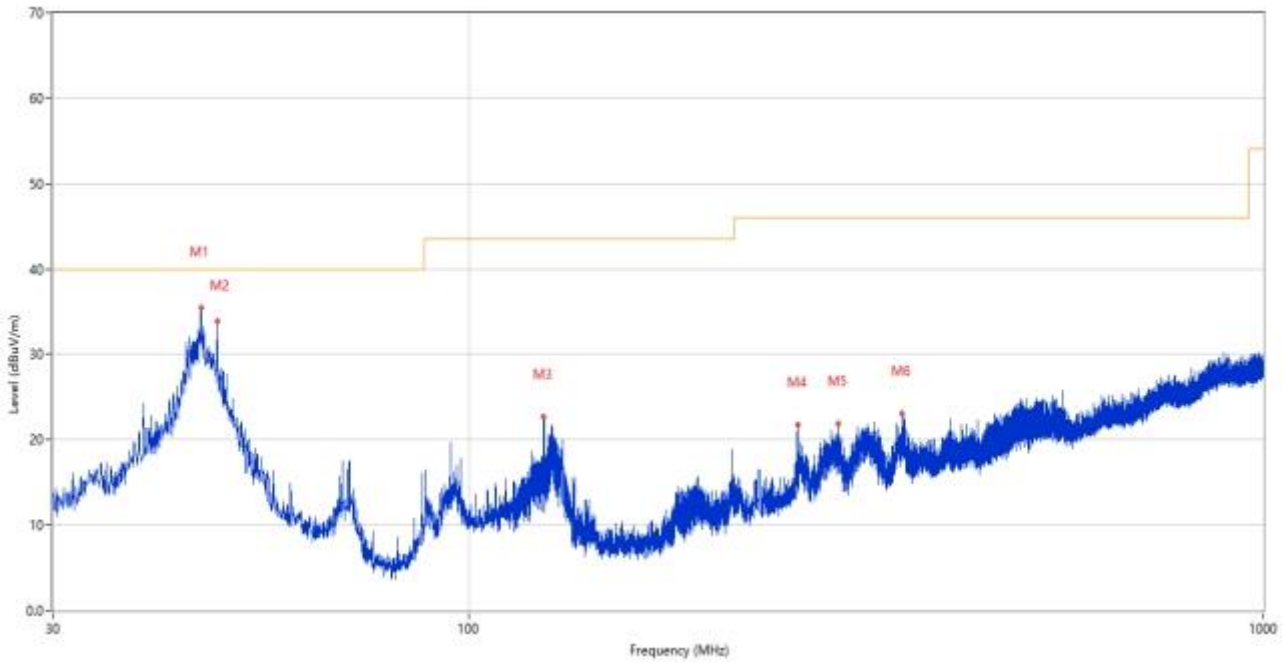
Note 1: The symbol of "--" in the table which means not application.

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.

Sample No.	S01	Temperature	23.1℃
Humidity	48%RH	Pressure	101kPa
Test Engineer	He Shichang	Test Date	2023.12.25

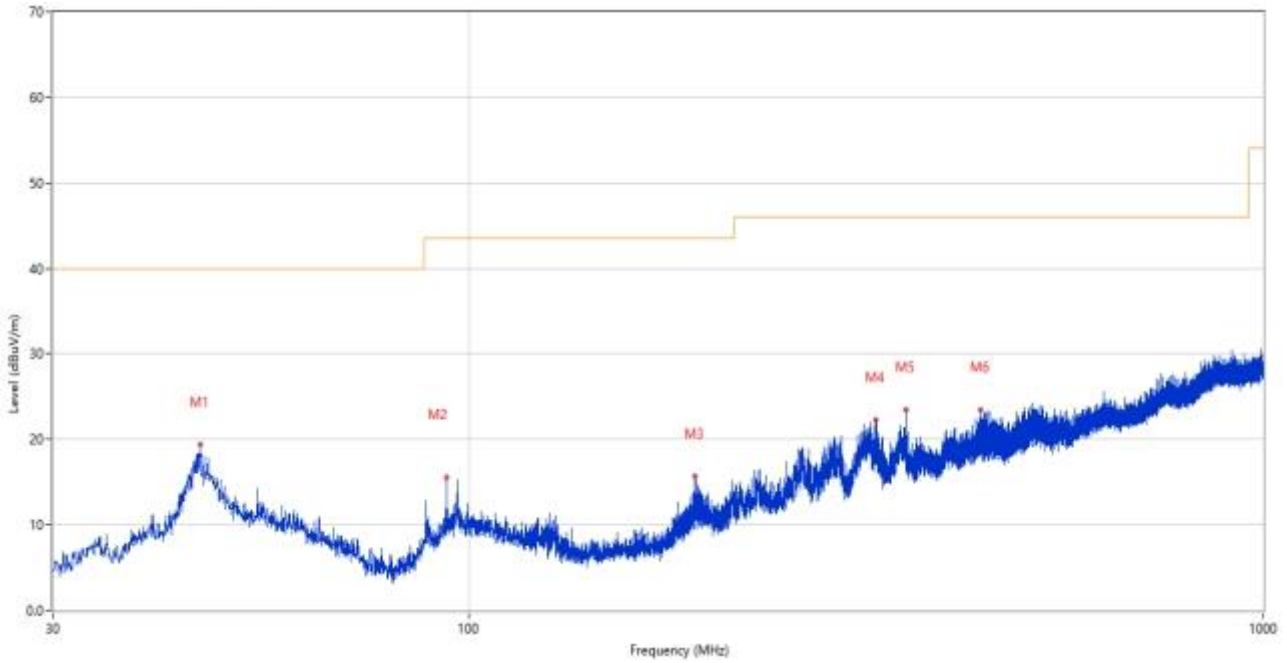
Test Mode 2

1) Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	46.053	35.45	-25.65	40.0	4.55	Peak	255.00	100	Vertical	Pass
2	48.333	33.87	-25.21	40.0	6.13	Peak	166.00	100	Vertical	Pass
3	124.429	22.66	-29.53	43.5	20.84	Peak	32.00	100	Vertical	Pass
4	259.357	21.74	-24.48	46.0	24.26	Peak	219.00	100	Vertical	Pass
5	291.803	21.91	-23.67	46.0	24.09	Peak	293.00	100	Vertical	Pass
6	351.070	23.11	-21.74	46.0	22.89	Peak	360.00	200	Vertical	Pass

2) Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	45.956	19.34	-25.66	40.0	20.66	Peak	113.00	100	Horizontal	Pass
2	93.777	15.58	-27.73	43.5	27.92	Peak	238.00	200	Horizontal	Pass
3	192.960	15.68	-26.33	43.5	27.82	Peak	103.00	100	Horizontal	Pass
4	325.753	22.30	-22.88	46.0	23.70	Peak	66.00	100	Horizontal	Pass
5	355.241	23.45	-22.04	46.0	22.55	Peak	93.00	100	Horizontal	Pass
6	440.504	23.46	-19.94	46.0	22.54	Peak	256.00	100	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 (30-1GHz)	COM-MV	ZT30-1000M	B2017119081	2023.12.05	2024.12.04	☒
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-00867	2022.04.12	2025.04.11	☒
Anechoic Chamber（#2）	YiHeng	9m*6m*6m	142	2021.08.19	2024.08.18	☒
Description	Supplier	Name	Version	/		Use
Test Software	BALUN	BL410-E	V22.930	/		☒

A.2 Conducted Emission, AC Ports

Note: Not applicable.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ23C0429-AE-1.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ23C0429-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ23C0429-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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--END OF REPORT--