

TEST REPORT

Applicant: Tianjin keepsens Information Technology Co., Ltd
Address: building 9, Xin'an Chuangye Plaza, No. 399,
Huixiang Road, Binhai high tech Zone, Tianjin
Equipment Type: Cargo sensor
Model Name: KP-CCXG700-CARGO
Brand Name: KEEPSSENS
FCC ID: 2A64JCCXG700CARGO
Test Standard: 47 CFR Part 15 Subpart B
Test Date: May 30, 2022 - May 31, 2022
Date of Issue: Jun. 24, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Xiong Chong**Checked by:** Xia Long**Approved by:** Liao Jianming
(Technical Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Jun. 24, 2022</u>	<u>Initial Issue</u>

TABLE OF CONTENTS

1 GENERAL INFORMATION.....	4
1.1 Identification of the Testing Laboratory	4
1.2 Identification of the Responsible Testing Location	4
2 PRODUCT INFORMATION	5
2.1 Applicant Information.....	5
2.2 Manufacturer Information	5
2.3 Factory Information	5
2.4 General Description for Equipment under Test (EUT)	5
2.5 Ancillary Equipment.....	6
2.6 Technical Information	6
3 SUMMARY OF TEST RESULTS.....	7
3.1 Test Standards	7
3.2 Verdict	7
3.3 Test Uncertainty	7
4 GENERAL TEST CONFIGURATIONS	8
4.1 Test Environments, Test Date and Test Engineer	8
4.2 Test Equipment List.....	9
4.3 Test Enclosure list	10
4.4 Test Configurations	11
4.5 Test Setups	12
4.6 Test Conditions	14
5 TEST ITEMS.....	15
5.1 Emission Tests	15
ANNEX A TEST RESULTS	19

A.1 Radiated Emission	19
A.2 Conducted Emission	24
ANNEX B TEST SETUP PHOTOS.....	25
ANNEX C EUT EXTERNAL PHOTOS.....	25
ANNEX D EUT INTERNAL PHOTOS.....	25

1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.
Description	All measurement facilities used to collect the measurement data are located at Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Tianjin keepsens Information Technology Co., Ltd
Address	building 9, Xin'an Chuangye Plaza, No. 399, Huixiang Road, Binhai high tech Zone, Tianjin

2.2 Manufacturer Information

Manufacturer	Tianjin keepsens Information Technology Co., Ltd
Address	building 9, Xin'an Chuangye Plaza, No. 399, Huixiang Road, Binhai high tech Zone, Tianjin

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Cargo sensor
Model Name Under Test	KP-CCXG700-CARGO
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V1.1
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	ER14505
	Serial No.	N/A
	Capacity	2700 mAh
	Rated Voltage	3.6 V
	Limit Charge Voltage	N/A

2.6 Technical Information

Network and Wireless connectivity	Bluetooth
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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	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	Result
1	Radiated Emission	15.109	Pass	Annex A .1
2	Conducted Emission, AC Ports	15.107	N/A	Annex A .2
Note: The EUT is only powered by battery. So the Conducted Emission, AC Ports 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	From battery	26.7℃ 23.6℃	58% 47%	101kPa	May 30, 2022 May 31, 2022	Tian Shuo Huang Zehuai

4.2 Test Equipment List

Radiated Emission Test For Frequency Below 1 GHz (10 m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2021.10.10	2022.10.09	☒
Amplifier (30-1GHz)	COM-MV	ZT30-1000M	B2018054558	2021.10.10	2022.10.09	☒
Test Antenna- Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2021.08.20	2024.08.19	☒
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60* 7.35m	N/A	2021.08.15	2024.08.14	☒
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V19.918		☒

Radiated Emission Test For Frequency Above 1 GHz (3m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	Agilent	N9038A	MY55330120	2021.10.20	2022.10.19	☒
Spectrum Analyzer	ROHDE & SCHWARZ	FSV40	101544	2022.01.04	2023.01.03	☐
Amplifier (1-12GHz)	Advanced Microwave	WLA652A	1740103	2021.10.20	2022.10.19	☒
Amplifier (0.8-21GHz)	Mini-Circuits	ZVA-213-S+	225321316	2021.10.20	2022.10.19	☒
Amplifier (18-40GHz)	COM-MV	KA_LNA18- 40G-01	18050001	2021.10.20	2022.10.19	☐
Test Antenna- Horn	SCHWARZBECK	BBHA 9120D	1917	2019.07.02	2022.07.01	☒
Test Antenna- Horn	A-INFOMW	LB- 180400KF	J211060273	2021.07.02	2024.07.01	☐
Anechoic Chamber	YIHENG	9m*6m*6m	N/A	2021.09.04	2024.09.03	☒
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V19.918		☒

4.3 Test Enclosure list

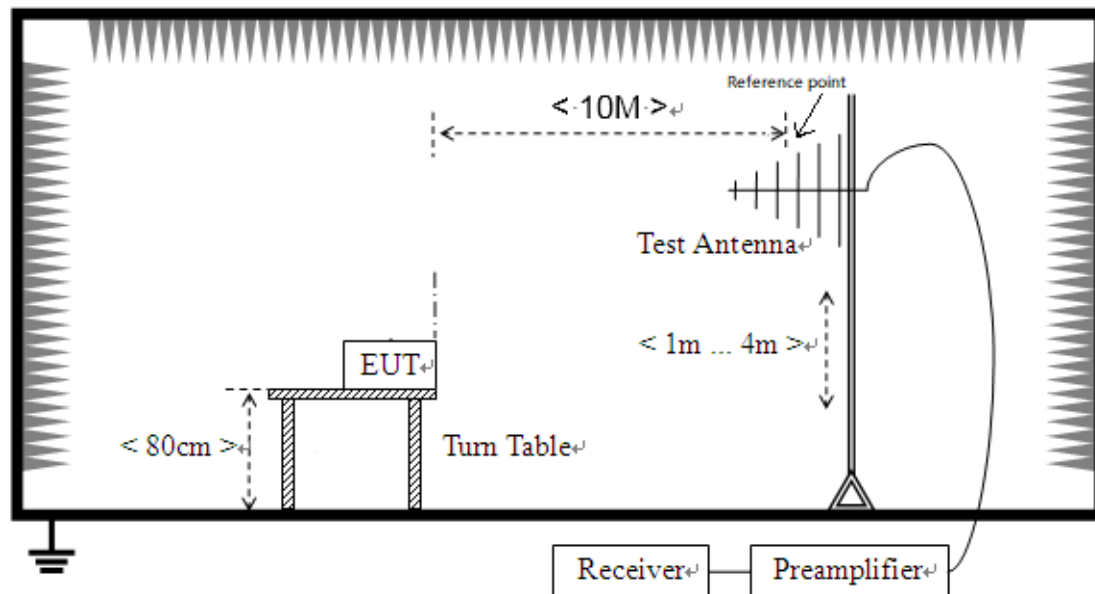
Note: Not applicable.

4.4 Test Configurations

Test Configurations (TC) No.	Description
TC01	<u>The Working Test Mode</u> EUT + Battery

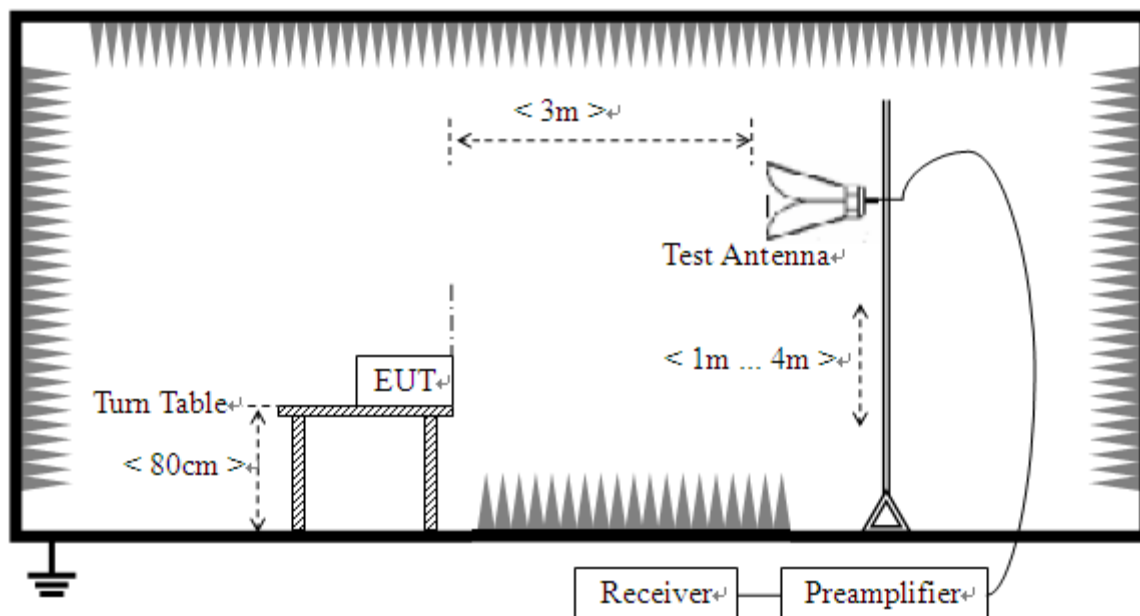
4.5 Test Setups

Test Setup 1

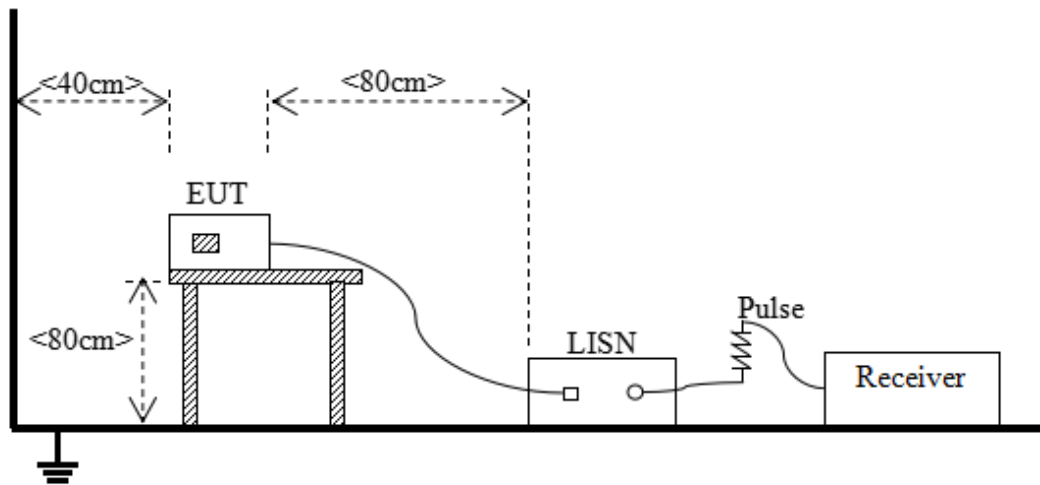


(For Radiated Emission Test (30 MHz-1 GHz))

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&2
	Test Configuration	TC01 Note
Note: Based on client request, all normal using modes of the normal function were tested but only the worst test data of the worst mode is reported by this report. The Working Test Mode is the worst mode in this report.		

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 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 $\mu\text{V/m}$) = $20 \cdot \log [\text{Field Strength } (\mu\text{V/m})]$.
- 2) In the emission tables above, the tighter limit applies at the band edges.

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

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

Trace = max hold

5.1.1.4 Test Result

Please refer to ANNEX A.1.

NOTE:

1. Results (dBuV/m) = Reading (dBuV/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.

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 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 (dBuV) = Reading (dBuV) + 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.

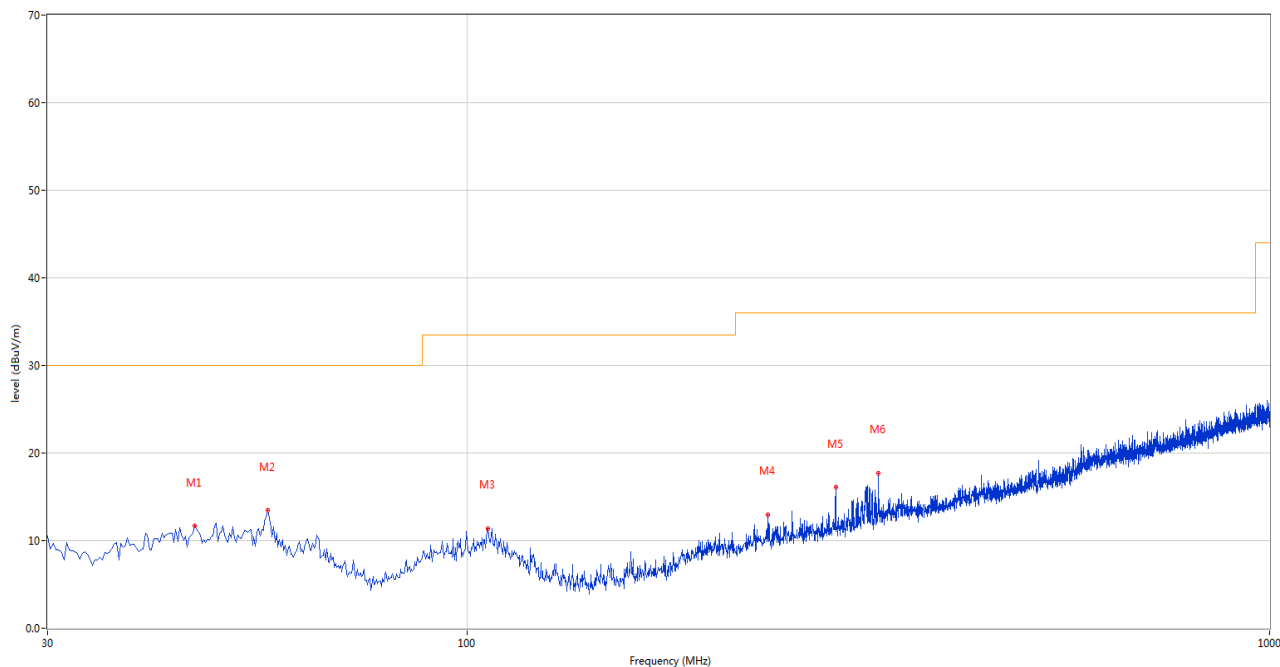
Note 3: All the configurations were pre tested, only the worst configuration has been reported in this report.

Note 4: The marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth carrier frequencies.

Test Data and Plots

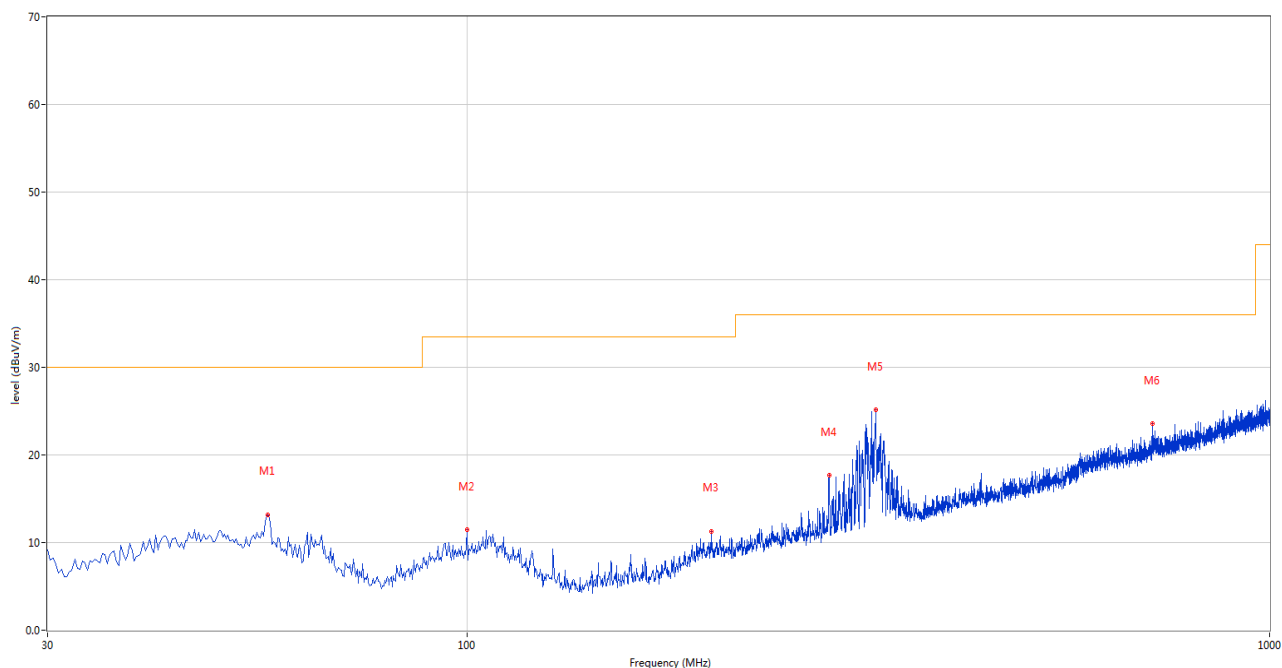
The Working Test Mode

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



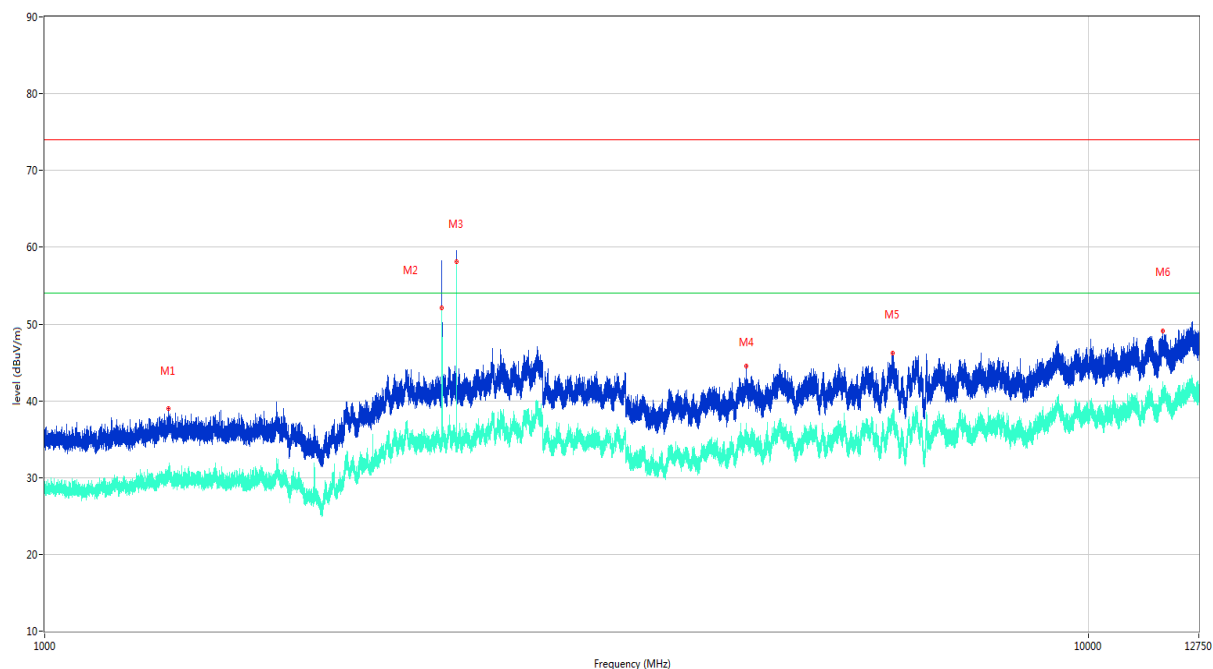
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	45.759	11.71	-26.20	30.0	-18.29	Peak	194.00	200	Vertical	Pass
2	56.426	13.44	-27.00	30.0	-16.56	Peak	360.00	200	Vertical	Pass
3	106.126	11.42	-27.88	33.5	-22.08	Peak	360.00	200	Vertical	Pass
4	236.801	12.99	-26.58	36.0	-23.01	Peak	360.00	100	Vertical	Pass
5	287.956	16.06	-25.38	36.0	-19.94	Peak	40.00	100	Vertical	Pass
6	325.291	17.69	-24.41	36.0	-18.31	Peak	360.00	200	Vertical	Pass

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



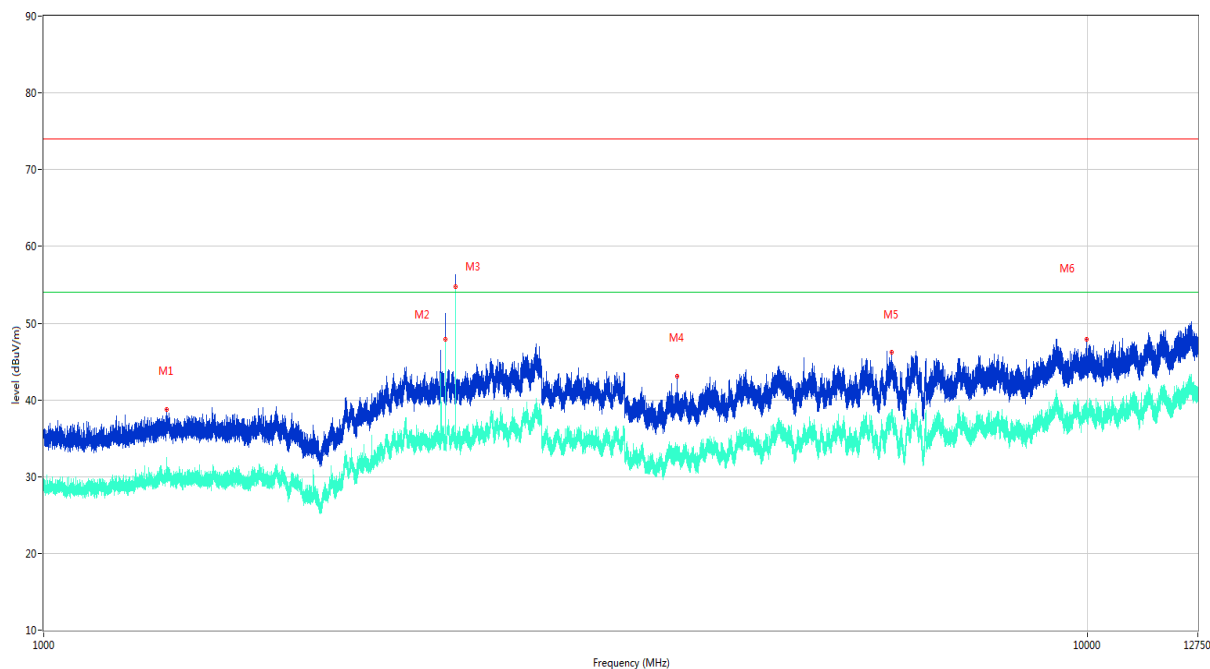
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	56.426	13.16	-27.00	30.0	-16.84	Peak	300.00	200	Horizontal	Pass
2	100.065	11.42	-27.99	33.5	-22.08	Peak	55.00	100	Horizontal	Pass
3	201.405	11.29	-27.75	33.5	-22.21	Peak	227.00	100	Horizontal	Pass
4	282.622	17.64	-25.48	36.0	-18.36	Peak	265.00	200	Horizontal	Pass
5	323.109	25.15	-24.60	36.0	-10.85	Peak	88.00	200	Horizontal	Pass
6	714.649	23.54	-16.09	36.0	-12.46	Peak	325.00	200	Horizontal	Pass

A.1.3 Test Antenna Vertical, 1 GHz – 12.75 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1313.000	39.04	-15.03	74.0	-34.96	Peak	217.20	100	Vertical	Pass
1**	1313.000	29.90	-15.03	54.0	-24.10	AV	217.20	100	Vertical	Pass
2	2401.200	58.18	-9.37	74.0	-15.82	Peak	89.40	200	Vertical	N/A
2**	2401.200	52.06	-9.37	54.0	-1.94	AV	89.40	200	Vertical	N/A
3	2480.000	57.94	-9.75	74.0	-16.06	Peak	191.20	200	Vertical	N/A
3**	2480.000	58.12	-9.75	54.0	4.12	AV	191.20	200	Vertical	N/A
4	4697.000	44.57	-3.99	74.0	-29.43	Peak	297.10	100	Vertical	Pass
4**	4697.000	34.93	-3.99	54.0	-19.07	AV	297.10	100	Vertical	Pass
5	6484.600	46.27	-2.41	74.0	-27.73	Peak	340.90	200	Vertical	Pass
5**	6484.600	37.28	-2.41	54.0	-16.72	AV	340.90	200	Vertical	Pass
6	11771.350	49.08	21.50	74.0	-24.92	Peak	193.60	100	Vertical	Pass
6**	11771.350	40.95	21.50	54.0	-13.05	AV	193.60	100	Vertical	Pass

A.1.4 Test Antenna Horizontal, 1 GHz – 12.75 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1310.900	38.79	-14.93	74.0	-35.21	Peak	95.80	100	Horizontal	Pass
1**	1310.900	30.02	-14.93	54.0	-23.98	AV	95.80	100	Horizontal	Pass
2	2426.800	51.25	-9.53	74.0	-22.75	Peak	216.60	100	Horizontal	N/A
2**	2426.800	47.92	-9.53	54.0	-6.08	AV	216.60	100	Horizontal	N/A
3	2480.000	55.48	-9.75	74.0	-18.52	Peak	127.70	100	Horizontal	N/A
3**	2480.000	54.76	-9.75	54.0	0.76	AV	127.70	100	Horizontal	N/A
4	4041.400	43.05	-6.26	74.0	-30.95	Peak	336.50	200	Horizontal	Pass
4**	4041.400	32.84	-6.26	54.0	-21.16	AV	336.50	200	Horizontal	Pass
5	6490.000	46.16	-2.32	74.0	-27.84	Peak	256.80	100	Horizontal	Pass
5**	6490.000	38.28	-2.32	54.0	-15.72	AV	256.80	100	Horizontal	Pass
6	9981.950	47.85	19.08	74.0	-26.15	Peak	10.00	200	Horizontal	Pass
6**	9981.950	38.24	19.08	54.0	-15.76	AV	10.00	200	Horizontal	Pass

A.2 Conducted Emission

Note: Not applicable.

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-EC2250673-AE.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-EC2250673-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-EC2250673-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.
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7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--