TEST REPORT

Applicant:	Zhongshan Hefeng Electronics Co., Ltd.
Address:	6/F, Building D, Ou Le Ya Industrial Park, No.19, Jinan Road, Minzhong Town, Zhongshan City Guangdong Province, China
Equipment Type:	Fan and Light Transmitter
Model Name:	RT39A
Brand Name:	HF
FCC ID:	2AWB7-RT39A
Test Standard:	47 CFR Part 15 Subpart C (refer to section 3.1)
Sample Arrival Date:	Sep. 25, 2023
Test Date:	Sep. 27, 2023
Date of Issue:	Oct. 25, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Li Ganming **Checked by:** Ye Hongji **Approved by:** Liao Jianming (Technical Director)

Revision History

Version	Issue Date	Revisions
Rev. 01	Oct. 20, 2023	Initial Issue
Rev. 02	Oct. 25, 2023	Page 24, corrected the test data.

TABLE OF CONTENTS

1 GENERAL INFORMATION 4

1.1 Test Laboratory 4

1.2 Test Location 4

2 PRODUCT INFORMATION 5

2.1 Applicant Information 5

2.2 Manufacturer Information 5

2.3 General Description for Equipment under Test (EUT) 5

2.4 Technical Information 6

3 SUMMARY OF TEST RESULTS 7

3.1 Test Standards 7

3.2 Test Verdict 7

4 GENERAL TEST CONFIGURATIONS 8

4.1 Test Environments 8

4.2 Test Equipment List 8

4.3 Measurement Uncertainty 8

4.4 Description of Test Setup 9

5 TEST ITEMS 11

5.1 Antenna Requirements 11

5.2 Conducted Emission 12

5.3 20 dB Bandwidth 13

5.4 Field Strength of Fundamental Emissions and Radiated Emissions 14

5.5 Transmitting Time 16

ANNEX A TEST RESULT 17

A.1 Conducted Emissions 17

A.2 20 dB Bandwidth 18
A.3 Duty cycle 19
A.4 Field Strength of Fundamental Emissions 21
A.5 Radiated Emission 22
A.6 Transmitter Time 26
ANNEX B TEST SETUP PHOTOS 27
ANNEX C EUT EXTERNAL PHOTOS 27
ANNEX D EUT INTERNAL PHOTOS 27

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	Zhongshan Hefeng Electronics Co., Ltd.
Address	6/F, Building D, Ou Le Ya Industrial Park, No.19, Jinan Road, Minzhong Town, Zhongshan City Guangdong Province, China

2.2 Manufacturer Information

Manufacturer	Zhongshan Hefeng Electronics Co., Ltd.
Address	6/F, Building D, Ou Le Ya Industrial Park, No.19, Jinan Road, Minzhong Town, Zhongshan City Guangdong Province, China

2.3 General Description for Equipment under Test (EUT)

EUT Name	Fan and Light Transmitter
Model Name Under Test	RT39A
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	315 MHz

The requirement for the following technical information of the EUT was tested in this report:

Modulation Type	ASK
Product Type	☐ Mobile ☒ Portable ☐ Fix Location
Operating Frequency	315 MHz
Antenna Type	PCB Antenna
Antenna Gain	0 dBi

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Test Verdict

No.	Description	FCC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	--	Pass Note 1
2	Conducted Emission	15.207	ANNEX A.1	N/A Note 2
3	20 dB Bandwidth	15.231(c)	ANNEX A.2	Pass
4	Duty Cycle	15.35	ANNEX A.3	Pass
5	Field Strength of Fundamental Emissions	15.231(b)	ANNEX A.4	Pass
6	Radiated Emissions	15.209 15.231(b)	ANNEX A.5	Pass
7	Transmitting Time	15.231(a)	ANNEX A.6	Pass

Note [1]: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.

Note [2]: The EUT only powered by battery, so the Conducted Emission test is not applicable.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	57%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+25.6℃
Working Voltage of the EUT	NV (Normal Voltage)	3 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	KEYSIGHT	N9020A	MY52510065	2023.09.05	2024.09.04
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	00884	2021.03.08	2024.03.07
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	01631	2022.02.03	2025.02.02
Anechoic Chamber	RAINFORD	9m*6m*6m	144	2022.02.19	2024.09.03
Amplifier	COM-MV	ZT30-1000M	18110850	2023.09.05	2024.09.04
Amplifier	COM-MV	LSCX_LNA1-12G-01	180602	2023.09.05	2024.09.04

4.3 Measurement Uncertainty

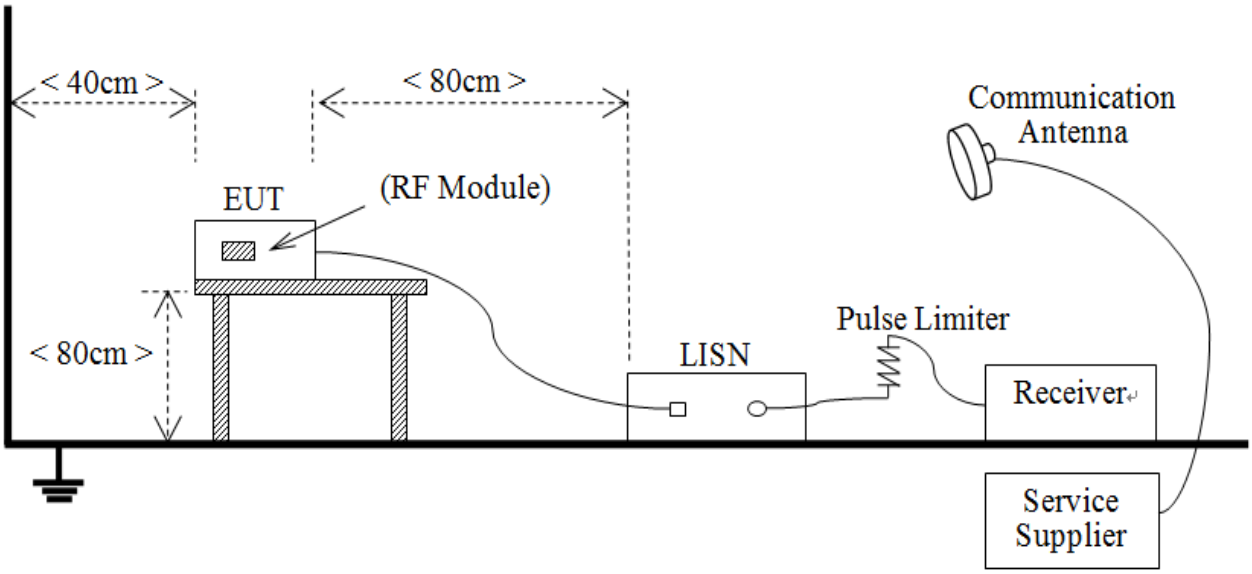
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Parameters	Uncertainty
Occupied Channel Bandwidth	2.8%
RF output power, conducted	1.28 dB
Power Spectral Density, conducted	1.30 dB
Unwanted Emissions, conducted	1.84 dB
All emissions, radiated	5.36 dB
Temperature	0.8°C
Humidity	4%

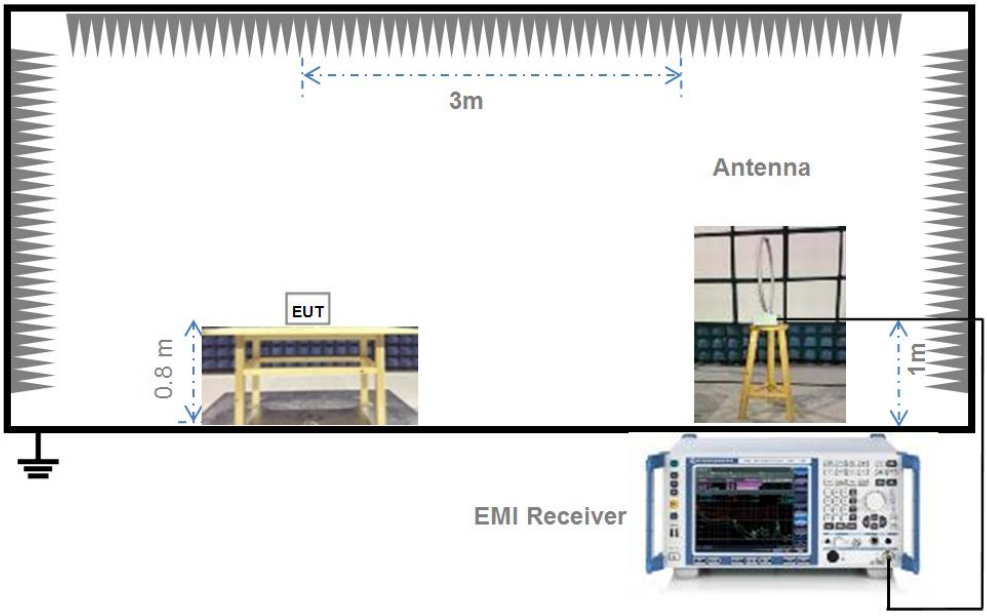
4.4 Description of Test Setup

4.4.1 For AC Power Supply Port Test



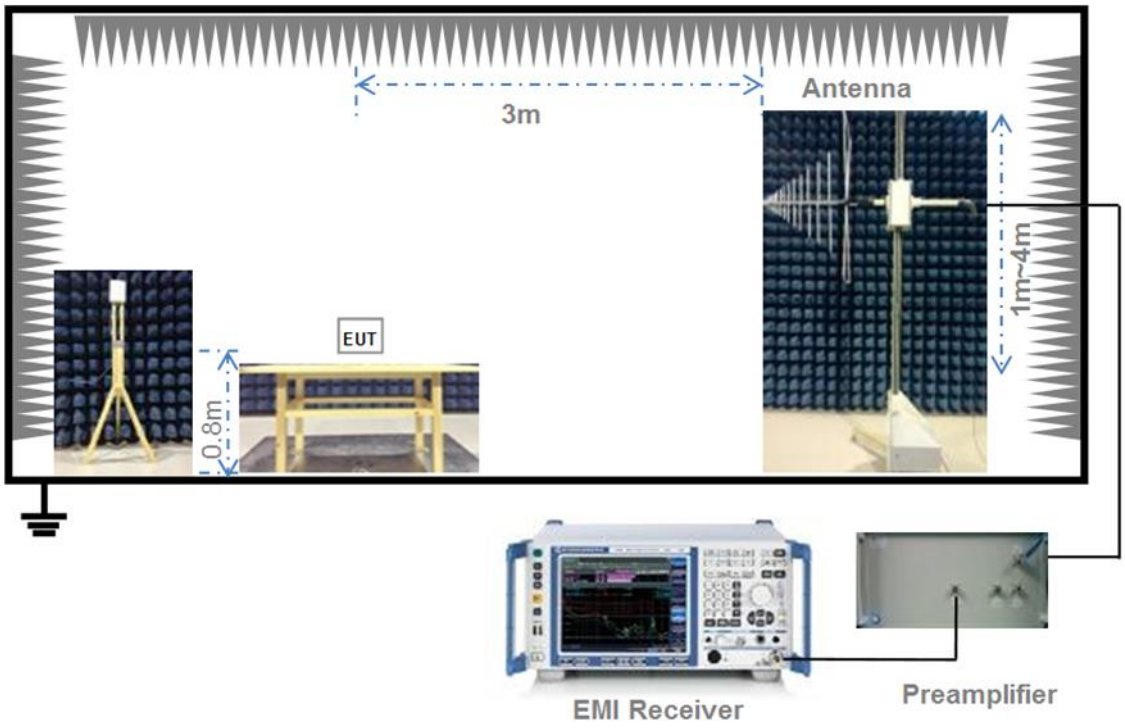
(Diagram 2)

4.4.2 For Radiated Test (Below 30 MHz)



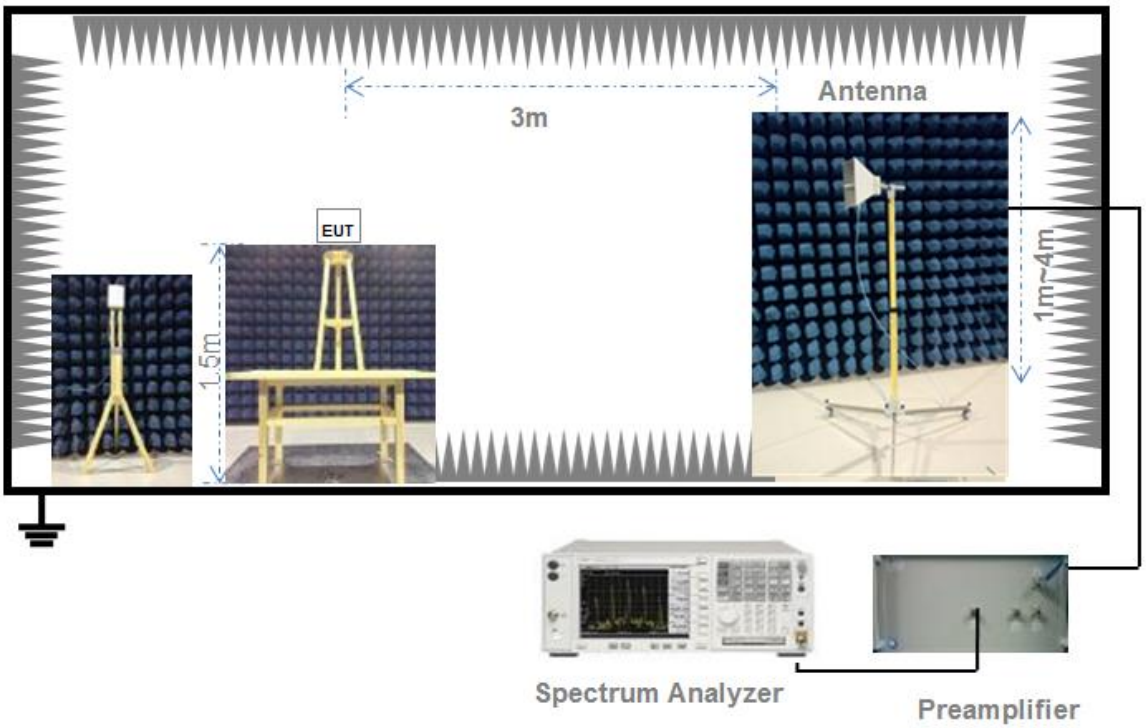
(Diagram 3)

4.4.3 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.4.4 For Radiated Test (Above 1 GHz)



(Diagram 5)

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §15.203 & 15.247(b); RSS -Gen 6.8
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product.	An embedded-in antenna design is used.

Reference Documents	Item
Photo	Please refer to the EUT Photo documents.

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 Conducted Emission

5.2.1 Limit

FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.2.2 Test Setup

See section 4.4.1 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels 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. Refer to recorded points and plots below.
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.

5.2.4 Test Result

Please refer to ANNEX A.1.

5.3 20 dB Bandwidth

5.3.1 Limit

FCC §15.231

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.3.2 Test Setup

See section 4.4.3 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

Use the following spectrum analyzer settings:

Span = two times and five times the OBW

RBW = 1% to 5% of the OBW

VBW ≥ three times RBW

Sweep = auto

Detector function = peak

Trace = max hold

5.3.4 Test Result

Please refer to ANNEX A.2.

5.4 Field Strength of Fundamental Emissions and Radiated Emissions

5.4.1 Limit

FCC §15.231 & §15.209

According to FCC section 15.231(b), In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	[1]1250 to 3750	125 to 375
174-260	3750	375
260-470	[1]3750 to 12500	375 to 1250
Above 470	12500	1250
[1]Linear interpolations.		

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)
0.009 - 0.490	2400/F(kHz)
0.490 - 1.705	24000/F(kHz)
1.705 - 30.0	30
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Note:

1. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

2. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.4.2 Test Setup

See section 4.4.2 to 4.4.4 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. 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. The power of the EUT transmitting frequency should be ignored.

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.

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
Trace = max hold

5.4.4 Test Result

Please refer to ANNEX A.4 & A.5.

5.5 Transmitting Time

5.5.1 Limit

FCC §15.231

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.5.2 Test Setup

See section 4.4.3 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

The EUT transmitter was activated, the spectrum analyzer single sweep was triggered while a command on the EUT was activated and plots were captured

5.5.4 Test Result

Please refer to ANNEX A.6.

ANNEX A TEST RESULT

A.1 Conducted Emissions

Note: Not applicant.

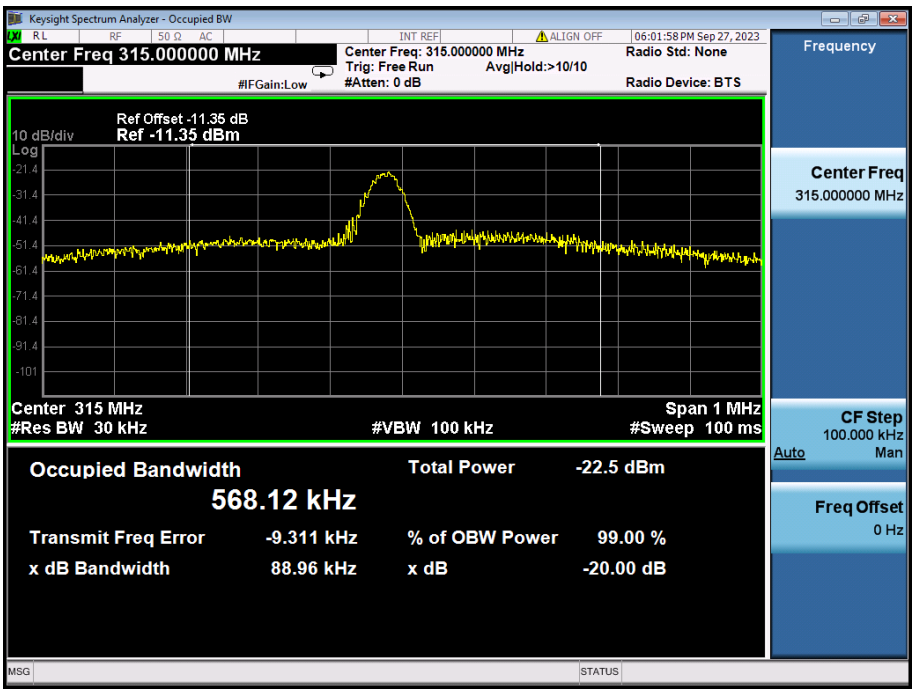
A.2 20 dB Bandwidth

Test Data

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Verdict
315.00	88.96	787.50	Pass

Test Plots

20 dB Bandwidth



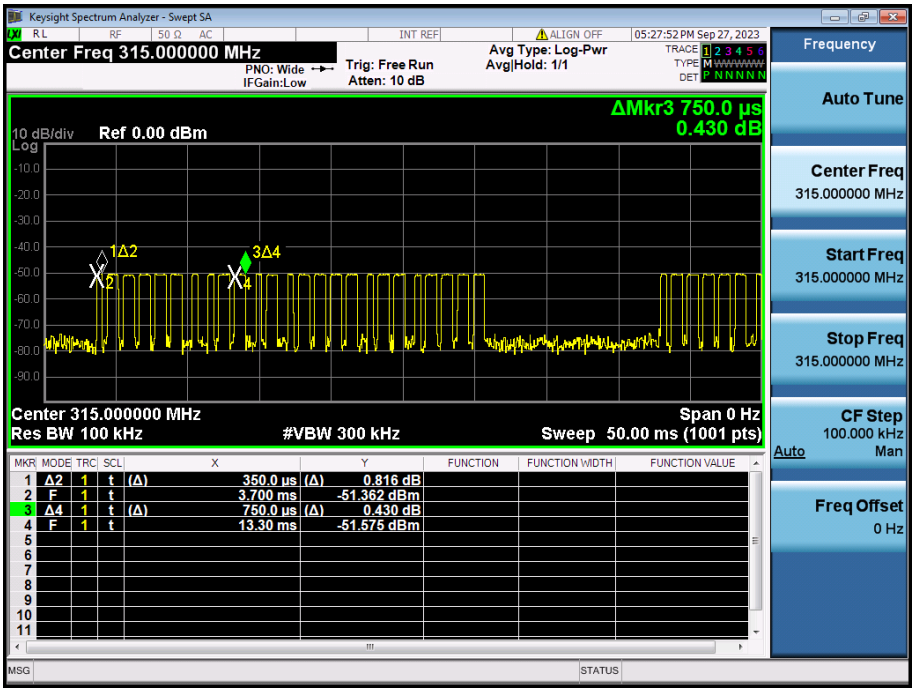
A.3 Duty cycle

Test Data

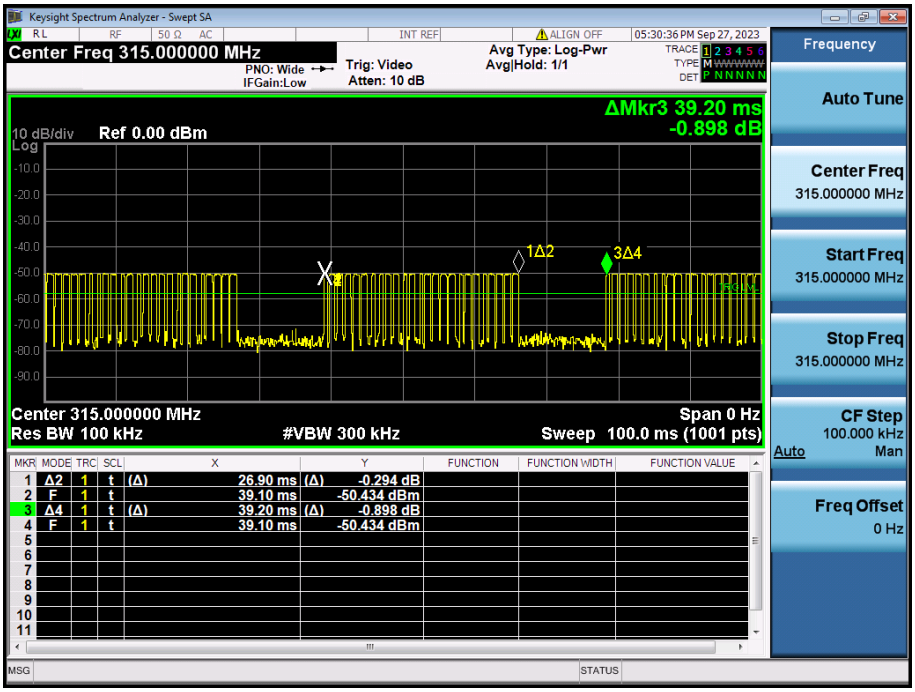
Data Transmissions		Number of pulses
Long pulse duration	0.750 ms	50
Short pulse duration	0.350 ms	20
On time within 100 msec	0.750*50+0.350*20=44.500 ms	
Duty cycle correction factor	20*log(44.5/100)=-7.03 dB	

Test Plots

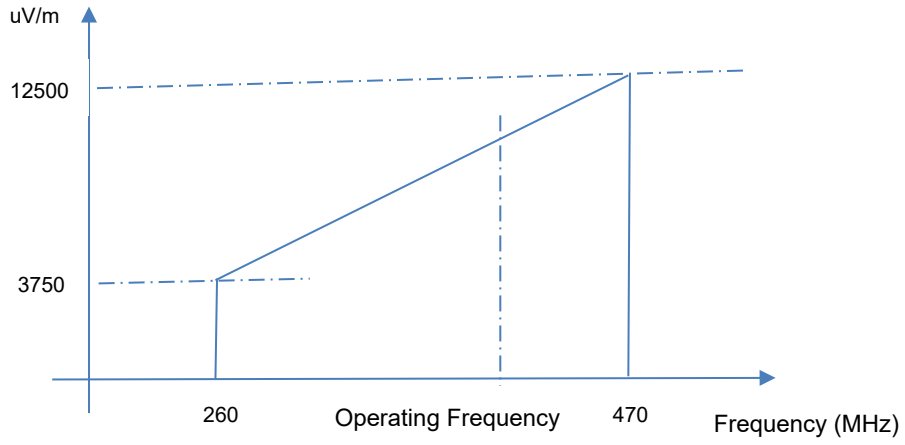
Long pulse duration&Short pulse duration



100ms



A.4 Field Strength of Fundamental Emissions



The Field Strength of Fundamental Emissions (Operating Frequency) is:
3750 uV/m = 20*log (3750) dBuV/m = 71.48 dBuV/m

12500 uV/m = 20*log (12500) dBuV/m = 81.94 dBuV/m

Test Data

Field Strength of Fundamental Emissions and Field strength of spurious emissions Value					
Operating Frequency (MHz)	Field Strength (dBuV/m)	Detector	Limit @3m (dBuV/m)	Margin (dB)	Antenna
315	79.20	PEAK	95.62	16.42	Horizontal
	62.57	PEAK	95.62	33.05	Vertical
	72.17	AVERAGE	75.62	3.45	Horizontal
	55.54	AVERAGE	75.62	20.08	Vertical
630	48.96	PEAK	75.62	26.66	Horizontal
	33.44	PEAK	75.62	42.18	Vertical
	41.93	AVERAGE	55.62	13.69	Horizontal
	26.41	AVERAGE	55.62	29.21	Vertical

A.5 Radiated Emission

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

Note [2]: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

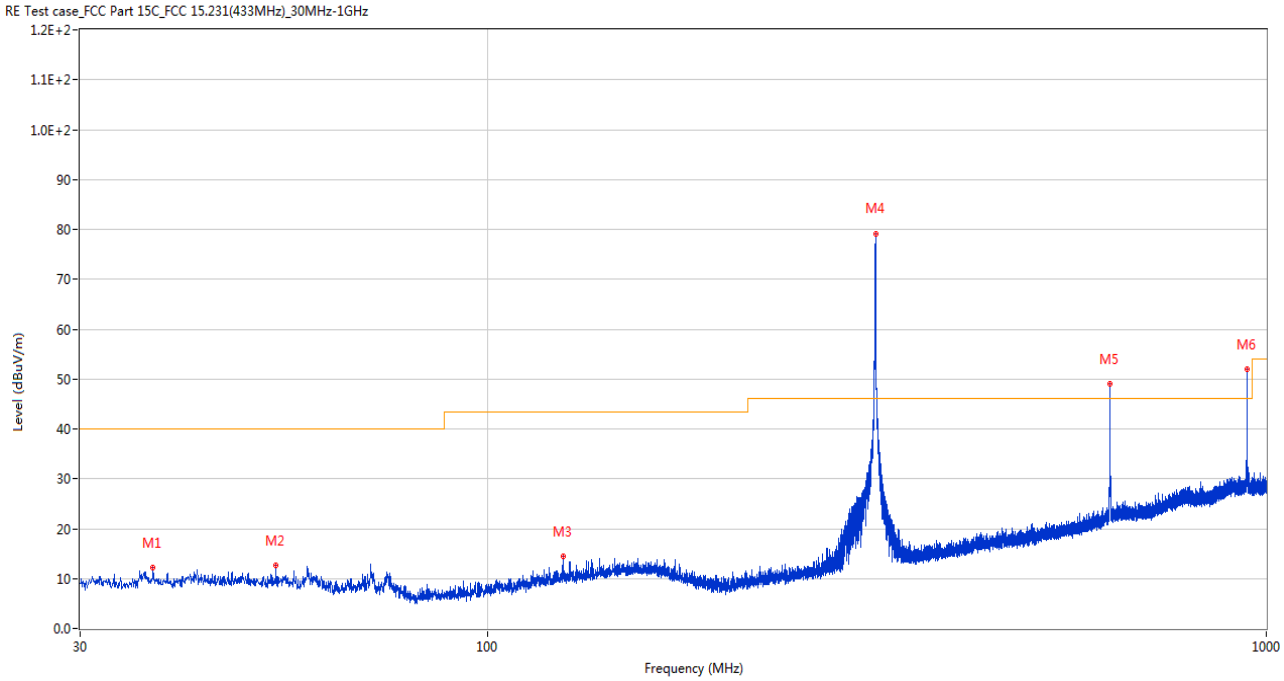
Note [4]: The verdict please refer to the A.3 field strength of fundamental emissions and field strength of spurious emissions value.

Note [5]: Limit field strength of fundamental: 20*log((12500-3750)/(470-260)+(fc-260)+3750)dBuV/m+20dB =95.62 dBuV/m@3m (PK)
Note [6]: Limit field strength of harmonics: 20*log((1250-375)/(470-260)+(fc-260)+375)dBuV/m+20dB

=75.62 dBuV/m@3m (PK)

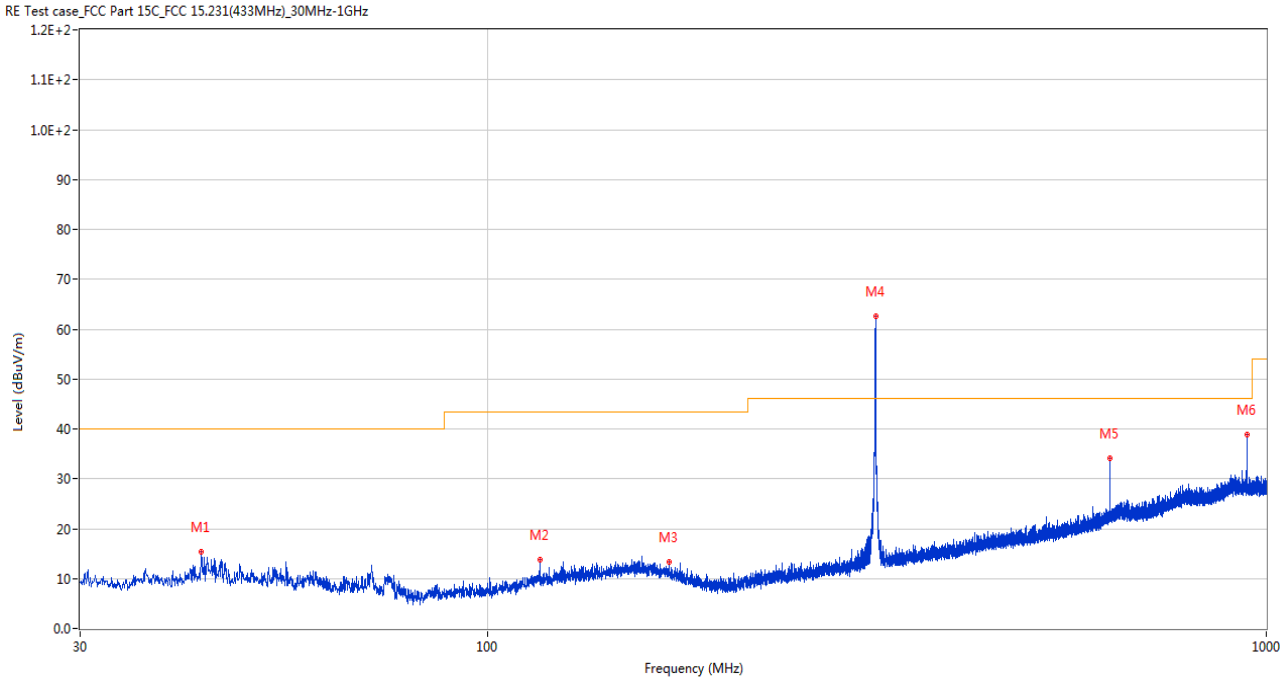
Test Data and Plots

30 MHz to 1 GHz, ANT H



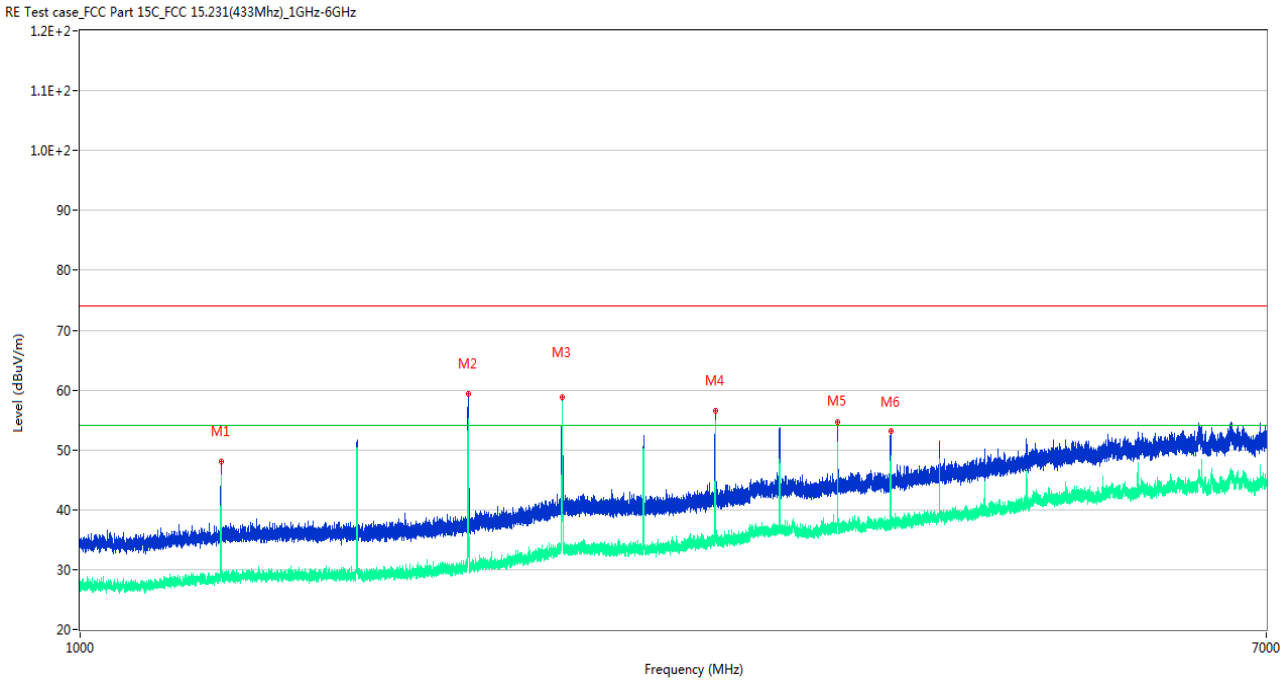
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	37.178	12.18	-26.23	40.0	27.82	Peak	27.00	150	Horizontal	Pass
2	53.523	12.68	-26.42	40.0	27.32	Peak	0.00	150	Horizontal	Pass
3	125.011	14.51	-26.17	43.5	28.99	Peak	281.00	100	Horizontal	Pass
4	314.986	79.20	-23.33	95.62	16.42	Peak	264.00	150	Horizontal	Pass
5	629.994	48.96	-13.65	75.62	26.66	Peak	263.00	100	Horizontal	Pass
6	944.953	52.01	-7.77	75.62	23.61	Peak	114.00	150	Horizontal	Pass

30 MHz to 1 GHz, ANT V



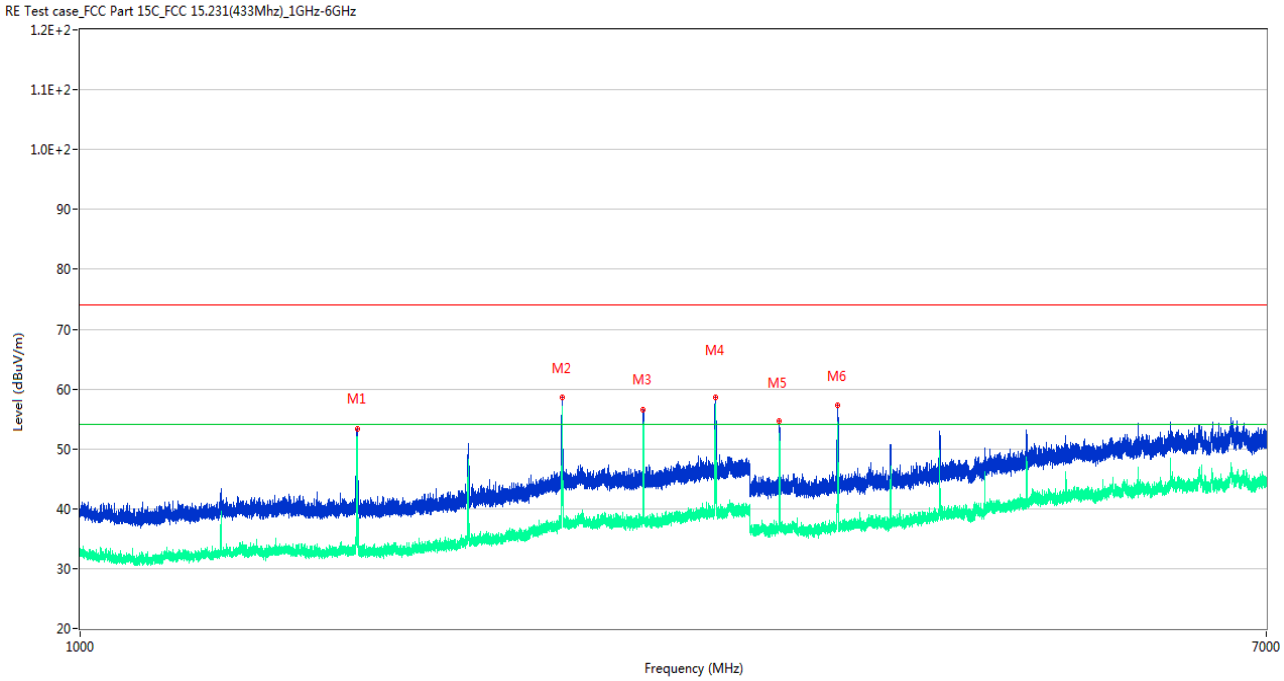
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	42.950	15.27	-26.07	40.0	24.73	Peak	215.00	150	Vertical	Pass
2	116.767	13.69	-26.61	43.5	29.81	Peak	94.00	150	Vertical	Pass
3	171.038	13.36	-25.21	43.5	30.14	Peak	327.00	150	Vertical	Pass
4	314.986	62.57	-23.33	95.62	33.05	Peak	183.00	150	Vertical	Pass
5	629.945	33.44	-13.66	75.62	42.18	Peak	347.00	150	Vertical	Pass
6	944.953	38.94	-7.77	75.62	36.68	Peak	87.00	100	Vertical	Pass

1 GHz to 7 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1260.2	48.14	-17.4	75.62	27.48	Peak	301.00	300	Horizontal	Pass
1**	1260.2	41.11	-17.4	55.62	14.51	AV	301.00	300	Horizontal	Pass
2	1890.6	59.45	-16.45	75.62	16.17	Peak	324.00	100	Horizontal	Pass
2**	1890.6	52.42	-16.45	55.62	3.20	AV	324.00	100	Horizontal	Pass
3	2206.0	59.27	-12.77	75.62	16.35	Peak	279.00	100	Horizontal	Pass
3**	2206.0	52.24	-12.77	55.62	3.38	AV	279.00	100	Horizontal	Pass
4	2834.6	56.54	-10.38	75.62	19.08	Peak	96.00	400	Horizontal	Pass
4**	2834.6	49.51	-10.38	55.62	6.11	AV	96.00	400	Horizontal	Pass
5	3466.2	54.67	-7.67	75.62	20.95	Peak	192.00	300	Horizontal	Pass
5**	3466.2	47.64	-7.67	55.62	7.98	AV	192.00	300	Horizontal	Pass
6	3780.8	53.05	-6.49	75.62	22.57	Peak	58.00	100	Horizontal	Pass
6**	3780.8	46.02	-6.49	55.62	9.60	AV	58.00	100	Horizontal	Pass

1 GHz to 7 GHz, ANT V



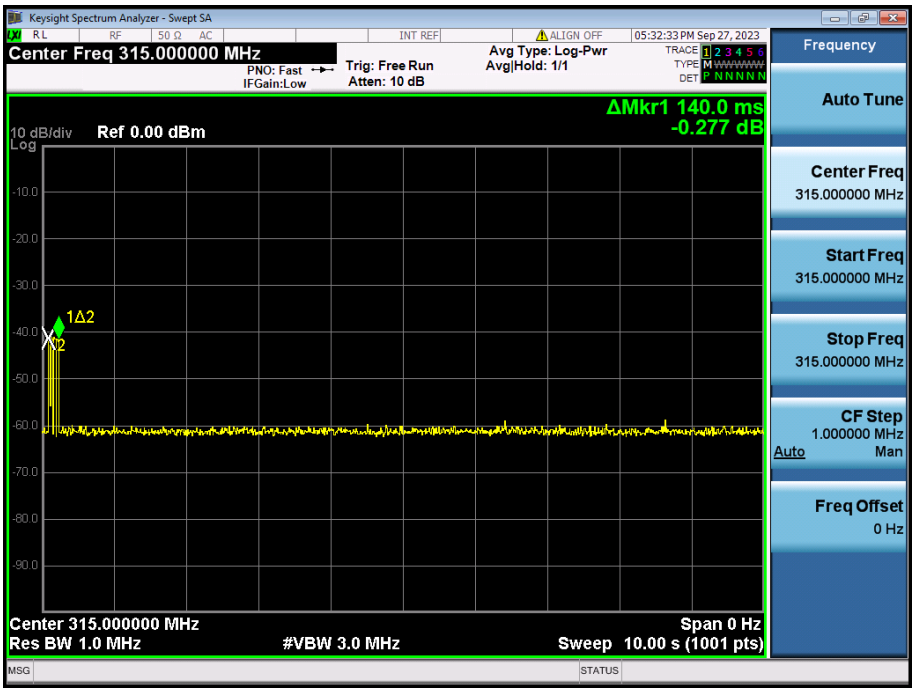
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1575.1	53.34	-13.6	75.62	22.28	Peak	360.00	400	Vertical	Pass
1**	1575.1	46.31	-13.6	55.62	9.31	AV	360.00	400	Vertical	Pass
2	2204.4	58.51	-8.55	75.62	17.11	Peak	250.00	200	Vertical	Pass
2**	2204.4	51.48	-8.55	55.62	4.14	AV	250.00	200	Vertical	Pass
3	2519.7	56.55	-8.06	75.62	19.07	Peak	59.00	100	Vertical	Pass
3**	2519.7	49.52	-8.06	55.62	6.10	AV	59.00	100	Vertical	Pass
4	2835.1	58.57	-5.88	75.62	17.05	Peak	192.00	100	Vertical	Pass
4**	2835.1	51.54	-5.88	55.62	4.08	AV	192.00	100	Vertical	Pass
5	3149.6	54.69	-8.77	75.62	20.93	Peak	228.00	200	Vertical	Pass
5**	3149.6	47.66	-8.77	55.62	7.96	AV	228.00	200	Vertical	Pass
6	3464.2	57.23	-7.47	75.62	18.39	Peak	184.00	200	Vertical	Pass
6**	3464.2	50.20	-7.47	55.62	5.42	AV	184.00	200	Vertical	Pass

A.6 Transmitter Time

Test Data and Plot

The active time is less than 5 seconds

Active time



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2391132-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2391132-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2391132-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--