

TEST REPORT

Product Name : IRONMAN SHUNT CAR
Model Number : ET-0473
FCC ID : 2ADM5-ET-0473

Prepared for : Zeeva International Limited
Address : Suite 1007B, 10th Floor, Exchange Tower, 33 Wang Chiu Road, Kowloon Bay, Hong Kong, China

Prepared by : EMTEK (DONGGUAN) CO., LTD.
Address : -1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology Research and Development Base, No.9, Xincheng Avenue, Songshanhu High-technology Industrial Development Zone, Dongguan, Guangdong, China

TEL: +86-0769-22807078
FAX: +86-0769-22807079

Report Number : EDG2304240162E00101R
Date(s) of Tests : April 24, 2023 to May 12, 2023
Date of issue : May 12, 2023

TEST REPORT DESCRIPTION

Applicant : Zeeva International Limited
Address : Suite 1007B, 10th Floor, Exchange Tower, 33 Wang Chiu Road, Kowloon Bay, Hong Kong, China
Manufacturer : Zeeva International Limited
Address : Suite 1007B, 10th Floor, Exchange Tower, 33 Wang Chiu Road, Kowloon Bay, Hong Kong, China
EUT : IRONMAN SHUNT CAR
Model Name : ET-0473
Trademark : N/A

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C	PASS

The above equipment was tested by EMTEK(DONGGUAN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.235.

Date of Test : April 24, 2023 to May 12, 2023

Prepared by : Xia Yang /Editor

Reviewer : Tim Dong/ Supervisor

Approved & Authorized Signer : Sam Lv / Manager

Modified Information

Version	Summary	Revision Date	Report No.
	Original Report	May 12, 2023	EDG2304240162E00101R



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1. GENERAL INFORMATION

1.1 Product Description

Characteristics	Description
Product Name	IRONMAN SHUNT CAR
Model number	ET-0473
SKU#	9083001
UPC#	1922344946020
Power Supply	DC 3V from Battery
Operating Frequency Range	49.86MHz
Number of Channels	1 channel
Max Field Strength	26.45 dBuV@3m
Antenna Type	Hose antenna
Antenna gain	0 dBi
Remark: The EUT continues to transmit while button is being pressed. Modulation by IC, and type is pulse modulation.	

Note: for more details, please refer to the User's manual of the EUT.

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** using **CISPR Quasi-Peak and average detector mode**.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013

2.4 Limitation

(1) Conducted Emission

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

(2) Radiated Emission

- The field strength of any emission within this band (section 15.235 frequency between 49.82MHz -49.90MHz) shall not exceed 10000 micro volts/meter at 3 meters. (80dB μ V at 3m) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.
- The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in section 15.209(Intentional Radiators general limit).as below.

Frequency (MHz)	Field strength μ V/m	Distance(m)	Field strength at 3m dB μ V/m
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

- Remark:
- Emission level in dBuV/m=20 log (uV/m)
 - Measurement was performed at an antenna to the closed point of EUT distance of meters.
 - Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205
 - Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ 15.205, then the general radiated emission limits in ξ 15.209 apply.

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

EUT

Table 2-1 Equipment Used in Tested System

Item	Equipment	Trademark	Model No.	FCC ID	Series No.	Note
1	IRONMAN SHUNT CAR	N/A	ET-0473	2ADM5-ET-0473	N/A	EUT

Note:

- (1) Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment.

3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	Conducted Emission	N/A
§15.235	Radiated Emission	Compliant
§15.235	Bandwidth Test	Compliant
§15.203	Antenna Requirement	Compliant



4. Description of test modes

The EUT (IRONMAN SHUNT CAR) has been tested under normal operating condition. The EUT stay in continuous transmitting mode. The Frequency 49.860MHz is chosen for testing.

For Radiated: The EUT's antenna was pre-tested under the following modes:

Test Mode	Description
Mode A	X-Y axis
Mode B	Y-Z axis
Mode C	X-Z axis

From the above modes, the worst case was found in Mode A. Therefore only the test data of the mode was recorded in this report.



5. Test Facility

Site Description
EMC Lab.

: Accredited by CNAS, 2020.08.27
The certificate is valid until 2024.07.05
The Laboratory has been assessed and proved to be in compliance with
CNAS/CL01:2018
The Certificate Registration Number is L3150

Accredited by FCC
Designation Number: CN1300
Test Firm Registration Number: 945551

Accredited by A2LA, April 05, 2021
The Certificate Registration Number is 4321.02

Accredited by Industry Canada
The Certificate Registration Number is CN0113

Name of Firm

: EMTEK (Dongguan) Co., Ltd.

Site Location

: -1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology Research and
Development Base, N.9, Xincheng Avenue, Songshanhu High-technology
Industrial Development Zone, Dongguan, Guangdong, China



6. TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Power Density	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

Measurement Uncertainty for a level of Confidence of 95%

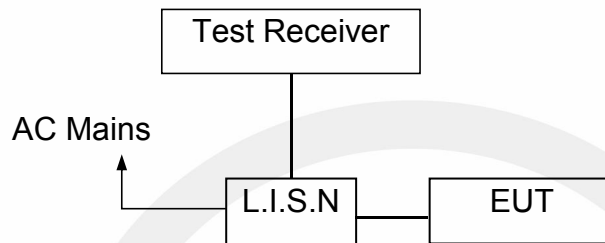


7. Conducted Emissions Test

7.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

7.2 Test SET-UP (Block Diagram of Configuration)



7.3 Measurement Equipment Used:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde&Schwarz	ESCS30	100018	2022/5/19	1 Year
2.	L.I.S.N.	Rohde&Schwarz	ENV216	100017	2022/5/19	1Year
3.	RF Switching Unit	CDS	RSU-M2	38401	2022/5/19	1Year

7.4 Measurement Result:

N/A.

7.5 Conducted Measurement Photos:

N/A

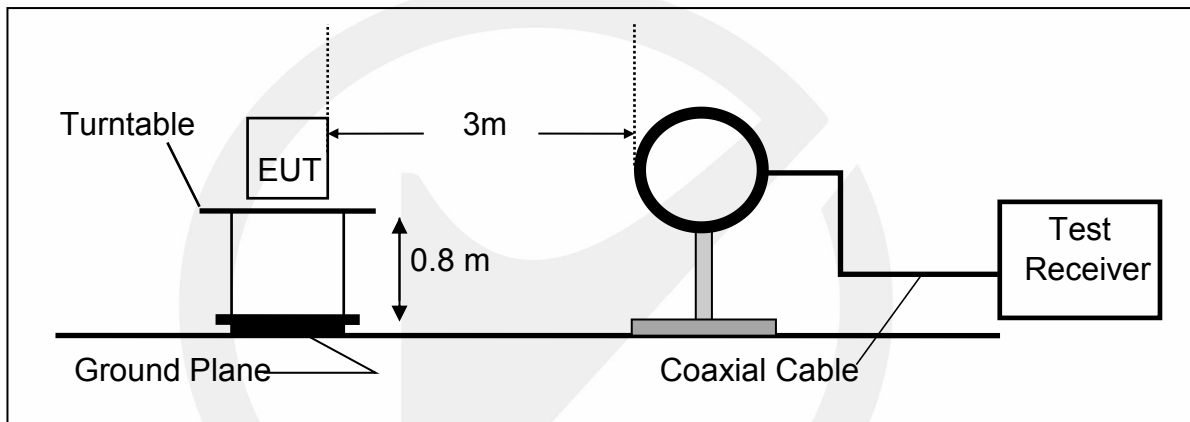
8. Radiated Emission Test

8.1 Measurement Procedure

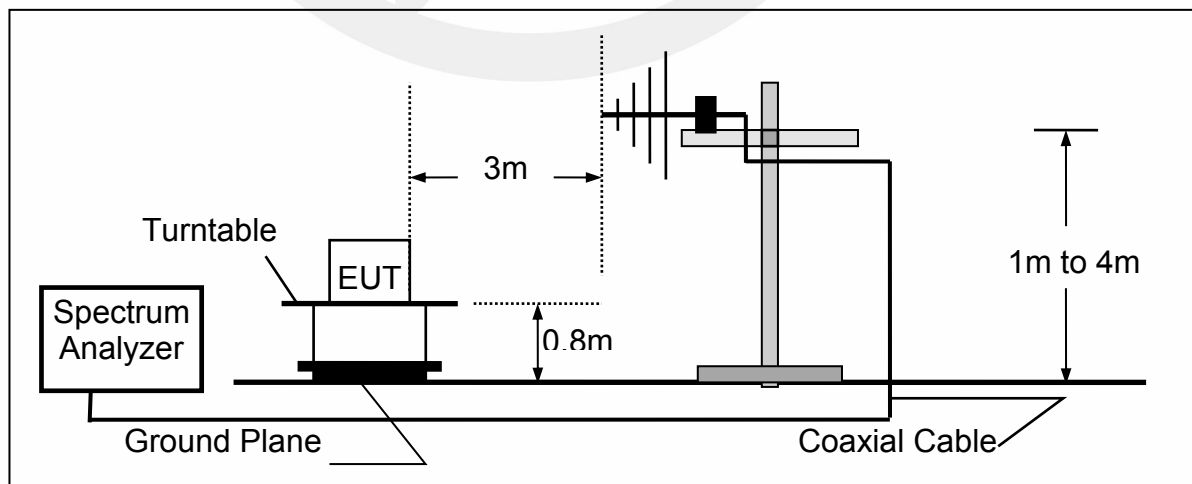
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

8.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Above 30MHz



8.3 Measurement Equipment Used:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	1166.5950.03	2022/5/19	1 Year
2.	Bilog Antenna	Schwarzbeck	VULB9163	000141	2022/5/19	1 Year
3.	Power Amplifier	CDS	RSU-M352	818	2022/5/19	1 Year
4.	Power Amplifier	HP	8447F	OPT H64	2022/5/19	1 Year
5.	Color Monitor	SUNSP0	SP-140A	N/A	2022/5/19	1 Year
6.	Single Line Filter	JIANLI	XL-3	N/A	2022/5/19	1 Year
7.	Single Phase Power Line Filter	JIANLI	DL-2X100B	N/A	2022/5/19	1 Year
8.	3 Phase Power Line Filter	JIANLI	DL-4X100B	N/A	2022/5/19	1 Year
9.	DC Power Filter	JIANLI	DL-2X50B	N/A	2022/5/19	1 Year
10.	Cable	Schwarzbeck	PLF-100	549489	2022/5/19	1 Year
11.	Cable	Rosenberger	CIL02	A0783566	2022/5/19	1 Year
12.	Cable	Rosenberger	RG 233/U	525178	2022/5/19	1 Year
13.	Signal Analyzer	Rohde & Schwarz	FSV30	103040	2022/5/19	1 Year
14.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1272	2022/5/19	1 Year
15.	Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	2022/5/19	1 Year
16.	Cable	H+S	CBL-26	N/A	2022/5/19	1 Year
17.	Cable	H+S	CBL-26	N/A	2022/5/19	1 Year
18.	Cable	H+S	CBL-26	N/A	2022/5/19	1 Year

8.4 Radiated Emission Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table15.209(a):

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Restricted bands of operation

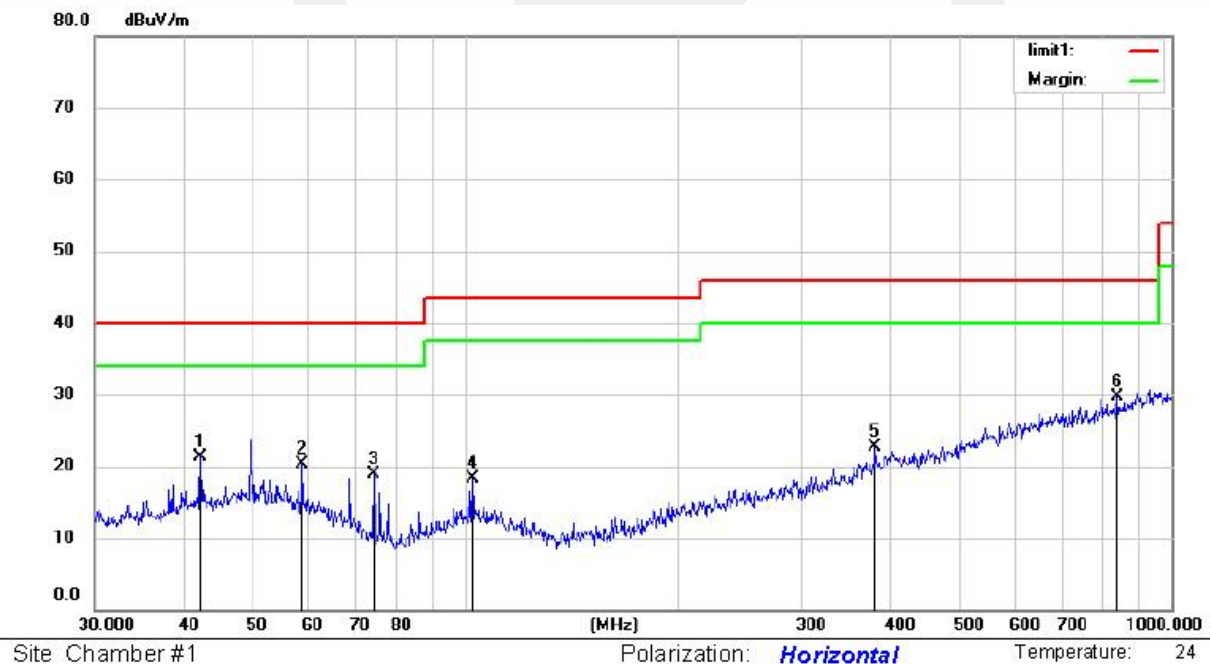
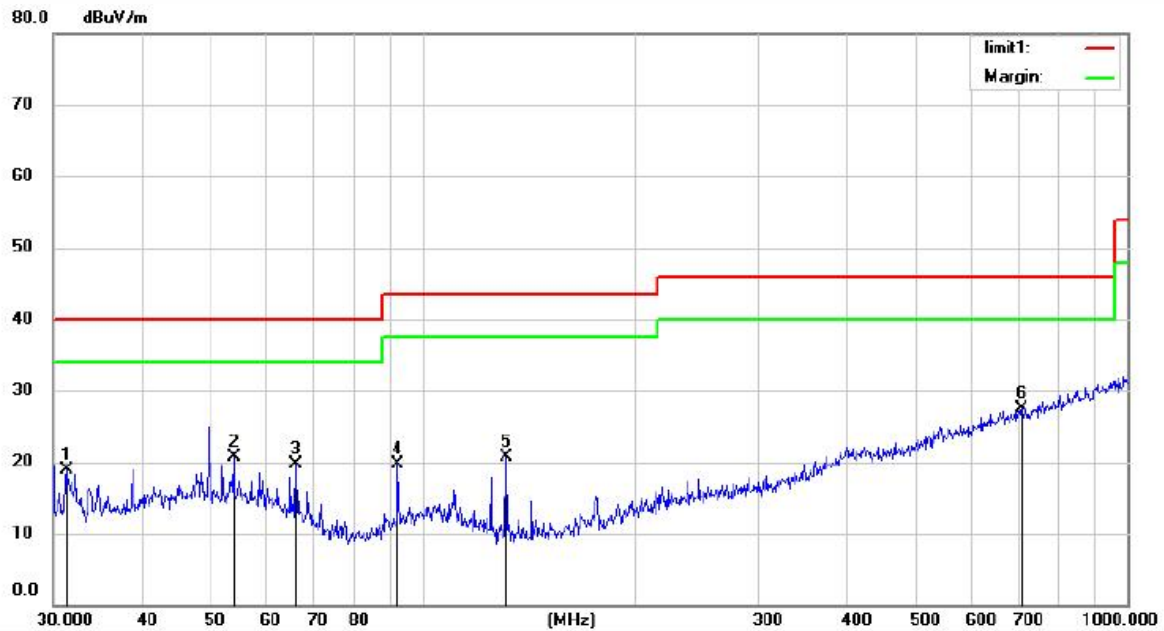
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

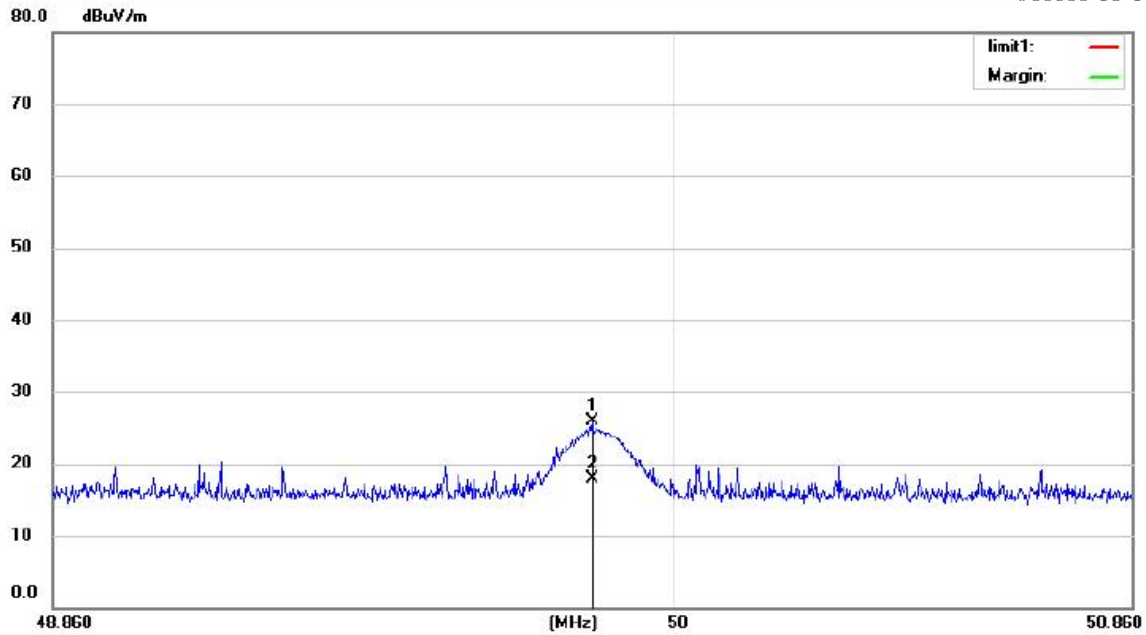
- Remark 1. Emission level in dBuV/m=20 log (uV/m)
: 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

Field Strength of the fundamental signal

FCC Part15 (15.235) , Subpart C		
Fundamental Frequency	Field Strength Of Fundamental	
49.86MHz	PK:100 dBuV/m at 3m distance	AV:80 dBuV/m at 3m distance

Measurement Results

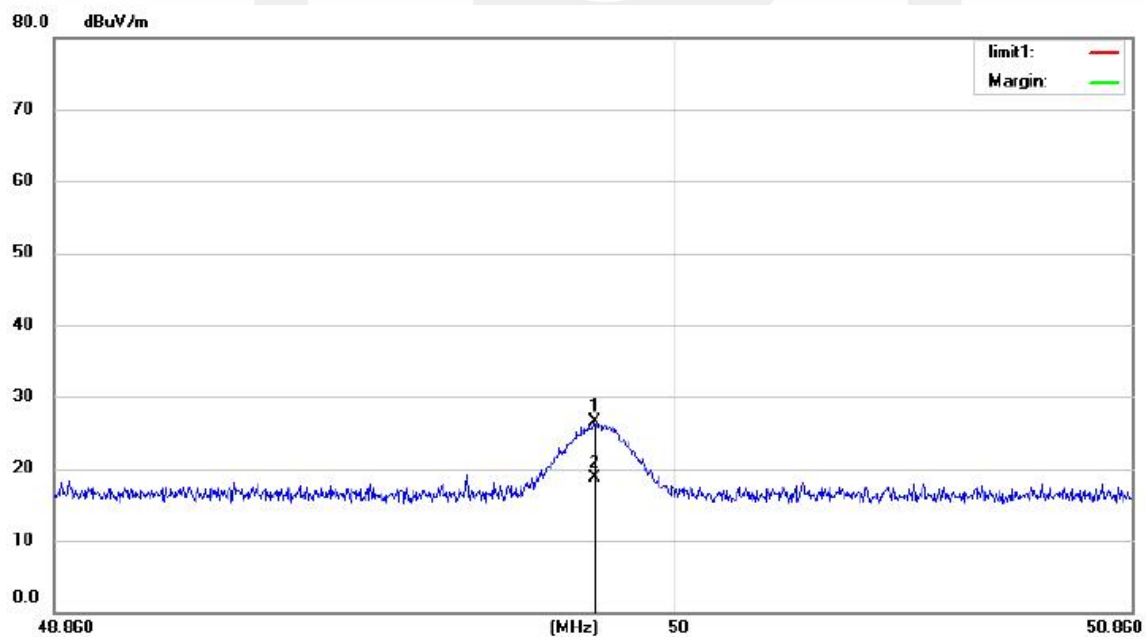




Site Chamber #1

Polarization: **Horizontal**

Temperature: 24



Site Chamber #1

Polarization: **Vertical**

Temperature: 24

Remark:

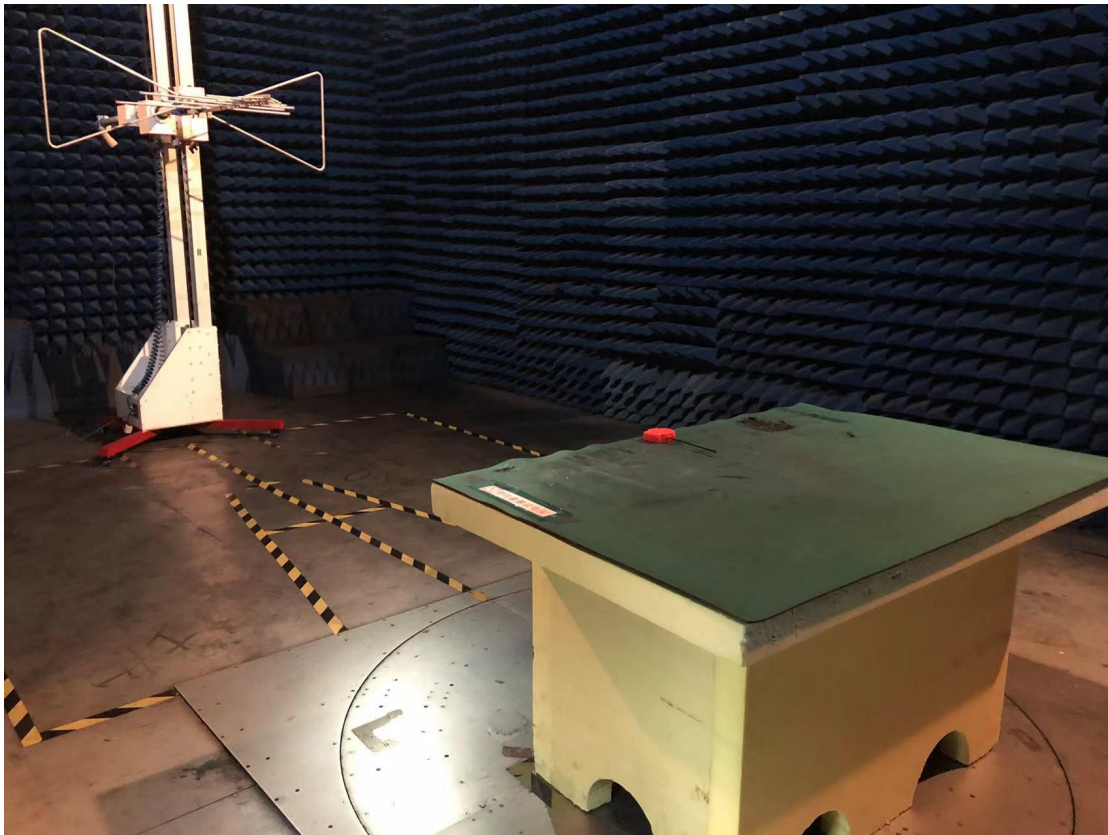
1. Measurement (dBμV/m) = Antenna Factor(dB) -Amp Factor(dB) +Cable Loss(dB) + Reading(dBμV/m)
2. Over (dB) = Measurement (dBμV/m) - Limit (dBμV/m)

Test Result: PASS Test By: Xia
Frequency Range: 30M-1GHz Fundamental Frequency: 49.860 MHz

Frequency (MHz)	Ant.Pol. (V/H)	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
49.86	H	25.84	100.00	-74.16	Peak
49.86	H	17.89	80.00	-62.11	AV
42.3022	H	21.38	40.00	-18.62	QP
59.0251	H	20.40	46.00	-25.60	QP
74.3955	H	18.84	46.00	-27.16	QP
102.7192	H	18.23	46.00	-27.77	QP
381.2485	H	22.67	46.00	-23.33	QP
49.86	V	26.45	100.00	-73.55	Peak
49.86	V	18.69	80.00	-61.31	AV
31.2892	V	18.98	46.00	-27.02	QP
54.0710	V	20.63	46.00	-25.37	QP
66.2661	V	19.78	46.00	-26.22	QP
92.4624	V	19.80	46.00	-26.20	QP
131.7577	V	20.64	46.00	-25.36	QP

No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.209.

8.5 Radiated Measurement Photos:

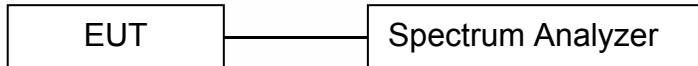


9. Occupied Bandwidth

9.1 Measurement Procedure

1. Set EUT as normal operation
2. Set SPA Center Frequency = fundamental frequency, RBW=300Hz,VBW= 1KHz
3. Set SPA Max hold. Mark peak.

9.2 Test SET-UP (Block Diagram of Configuration)



9.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSV30	1321.3008K	2022/5/19	1 year
Coaxial Cable	CDS	79254	46107086	2022/5/19	1 year

9.4 Measurement Requirements:

Pass.

Limits for 26dB Bandwidth of Fundamental Emission:

Frequency (MHz)	26dB Bandwidth (KHz)	Limits (MHz)
49.86	2.603	Within 49.82-49.90 MHz.

Refer to attached data chart.

10. Antenna Application

10.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203.

Systems operating in the 49.86MHz that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

10.2 Result

The EUT's antenna is permanent attached antenna, Hose antenna. The antenna is not replaceable or user serviceable. The requirement of FCC part 15C section 15.203 is met.

*** End of Report ***