

TEST REPORT

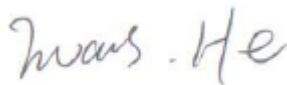
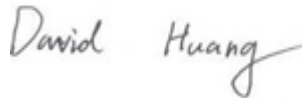
Applicant	Shantou Dreamhouse Toys Industrial Co., Ltd.
Address	2nd Floor of Zhaofeng Plastic Toy Factory, Chenghua Street, Chenghai District, Shantou City

Manufacturer or Supplier	Shantou Dreamhouse Toys Industrial Co., Ltd.
Address	2nd Floor of Zhaofeng Plastic Toy Factory, Chenghua Street, Chenghai District, Shantou City
Product	Toy RC Robot Jr
Brand Name	Blue Hat Toy Company, Sharper Image
Model	MXW2021A
Additional Model & Model Difference	1013113、1005538
Date of tests	Jan. 29, 2020 ~ Mar. 23, 2021

the tests have been carried out according to the requirements of the following standard:

☒ **FCC Part 15, Subpart C, Section 15.235**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Evans He Project Engineer / EMC Department	Approved by David Huang Supervisor / EMC Department
	
	Date: Mar. 25, 2021

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Test Report No.: RF2101WDG0353

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF2101WDG0353	Original release	Mar. 25, 2021



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.235)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
§15.207 (a)	Conducted Emission	N/A	EUT is powered by battery
§15.209 §15.235(a)	Radiated Emission	PASS	Compliant
§15.235(b) §15.215(c)	Measured Bandwidth	PASS	Compliant
§15.203	Antenna Requirement	PASS	No antenna connector is used

NOTE: Test Lab Information:

Lab: Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

Test Lab Address: Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao'an District Shenzhen, Guangdong, 518108, People's Republic of China

2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Radiated emissions	9KHz ~ 30MHz	2.16dB
	30MHz ~ 1GHz	3.74dB

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



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Toy RC Robot Jr
MODEL NO.	MXW2021A
ADDITIONAL MODELS	1013113、1005538
FCC ID	2AO8XMXW2021A49
NOMINAL VOLTAGE	DC 9V From Battery
MODULATION TYPE	FM
OPERATING FREQUENCY	49.86MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Wire Antenna, with 0dBi gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

NOTES:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 2102WDG0353) for detailed product photo.
4. Additional models (see about table) are identical with the test model MXW2021A except the color of the appearance、trade name and model name for trading purpose.



3.2 DESCRIPTION OF TEST MODES

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and packet type. The worst case was found when the EUT was positioned on Y axis for radiated emission. The EUT was tested under the following mode.

FREQUENCY	TEST MODE
49.86MHz	Transmitting

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C, 15.235

ANSI C63.10-2013

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit without any other necessary accessories or support units.



4 TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/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

According to §15.235(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Peak] [μV/m]	Field Strength of Fundamental Emission [Average] [μV/m]
49.82 – 49.90	100,000 (100 dBμV/m)	10,000 (80 dBμV/m)

NOTES:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESL6	1300.5001K06 -100262-eQ	Mar. 24, 21
Bilog Antenna	Sunol Sciences	JB6	A110712	Jul. 21, 21
Active Antenna	CMO-POWER	AL-130	121031	Jun. 30, 21
Signal Amplifier	HP	8447E	443008	Mar. 24, 21
Signal and Spectrum Analyzer	R&S	FSV40	101094	Mar. 19, 22
MXA signal analyzer	Agilent	N9020A	MY49100060	Mar. 24, 21
Horn Antenna	COM-POWER	AH-118	71259	Apr. 17, 21
Horn Antenna	COM-POWER	AH-118	71283	Jul. 21, 21
SHF-EHF Horn	Schwarzbeck	BBHA9170	BBHA9170147	May 10, 21
AMPLIFIER	EM Electornic Corporation	EM01G26G	60613	Mar. 24, 21
Pre-amplifier	Rohde&Schwarz	SCU40	100437	Oct. 16, 21
3m Semi-anechoic Chamber	SAEMC	9m*6m*6m	N/A	Oct. 17, 21
Test Software	EZ-EMC	ICP-03A1	N/A	N/A

NOTES:

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 749762.



4.1.3 TEST PROCEDURES

The basic test procedure was in accordance with ANSI C63.10 (section 6).

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters Semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
- g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using new battery. The turntable was rotated to maximize the emission level.

.NOTES:

1. The resolution bandwidth of test receiver/spectrum analyzer is 100kHz for peak detection (PK) at fundamental frequency below 1GHz; The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at radiated spurious emission frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
4. Margin value = Emission level – Limit value.
5. Fundamental AV value =PK Emission +AV factor.

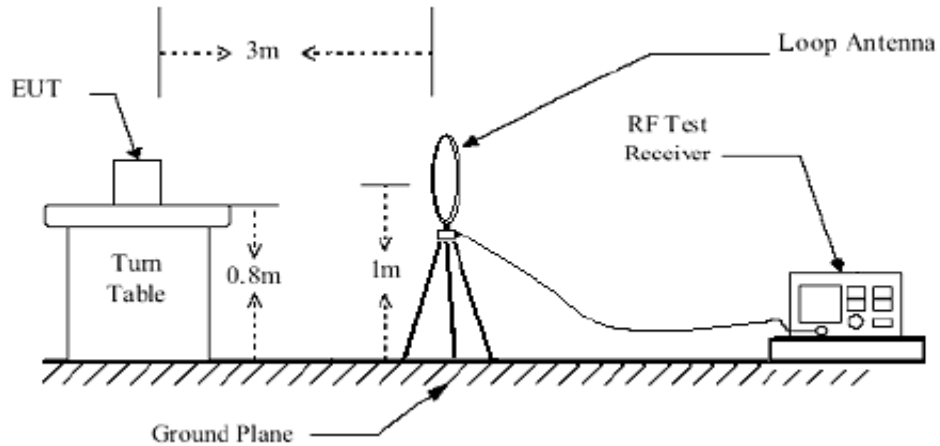
4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

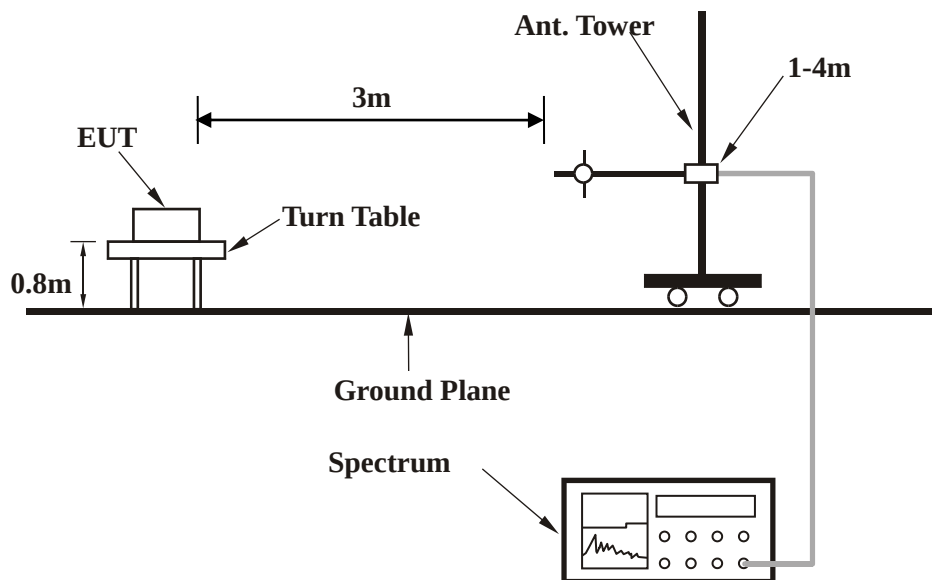


4.1.5 TEST SETUP

Below 30MHz



30MHz~1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).



4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power of equipment.
- b. Hold down the TX of button, and then the EUT was operating.
- c. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

4.1.7 TEST RESULTS

FIELD STRENGTH OF FUNDAMENTAL

No.	Freq. (MHz)	Antenna Polarization	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*	49.86(PK)	V	-13.13	75.29	62.16	100	-37.84
*	49.86(AV)	V	-	-	55.95	80	-24.05
*	49.86(PK)	H	-13.13	57.28	44.15	100	-55.85
*	49.86(AV)	H	-	-	37.94	80	-42.06

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The emission levels of other frequencies were greater than 20dB margin.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. The average value of fundamental frequency is: Average value = Peak value +AV factor, where the AV factor is calculated from following formula: AV factor=20 log (Duty cycle) = 20 log (48.94%) = -6.21.
 7. All three antenna orientation (parallel, perpendicular, and ground-parallel) testing. But the worst orientation showed in the report only.



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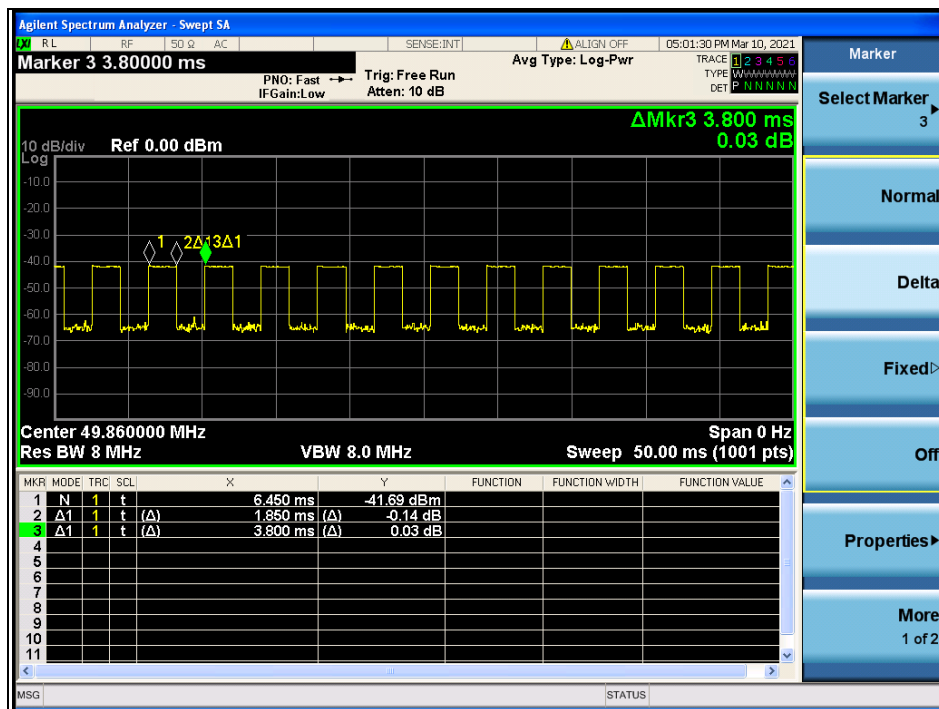
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$T_p = 3.800\text{ms}$

$T_{on} = 1.86\text{ms}$

Duty Cycle = $T_{on}/T_p = 1.86/3.8 = 48.94\%$

$T_p = 3.800\text{ms}$



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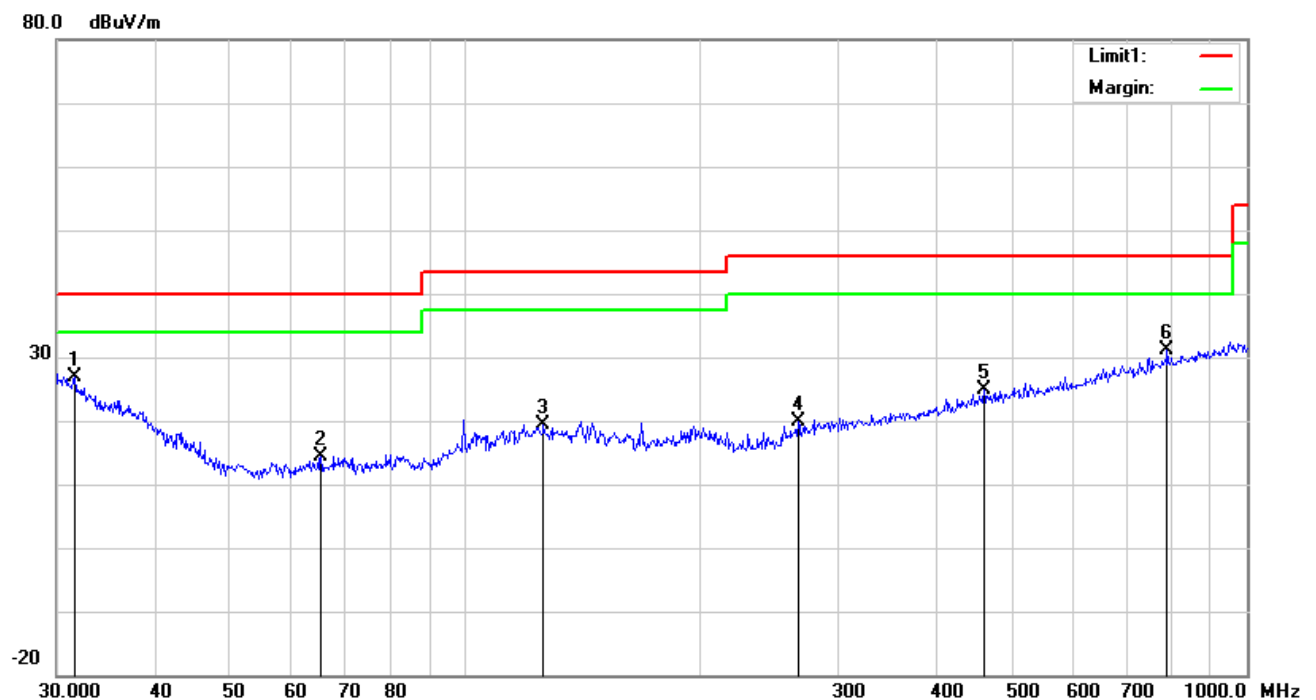


FREQUENCY RANGE	9KHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 m										
No.	Frequency (MHz)	Reading (dBuV/m)	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	31.6202	27.95	20.07	21.63	0.43	26.82	40.00	-13.18	100	309
2	65.3432	27.47	7.81	21.62	0.73	14.39	40.00	-25.61	100	353
3	125.8864	26.44	13.47	21.66	1.13	19.38	43.50	-24.12	200	314
4	266.6089	27.42	12.66	21.93	1.69	19.84	46.00	-26.16	100	119
5	460.7271	27.55	17.11	22.02	2.19	24.83	46.00	-21.17	100	91
6	790.6188	28.74	21.27	21.72	2.94	31.23	46.00	-14.77	200	125

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value.



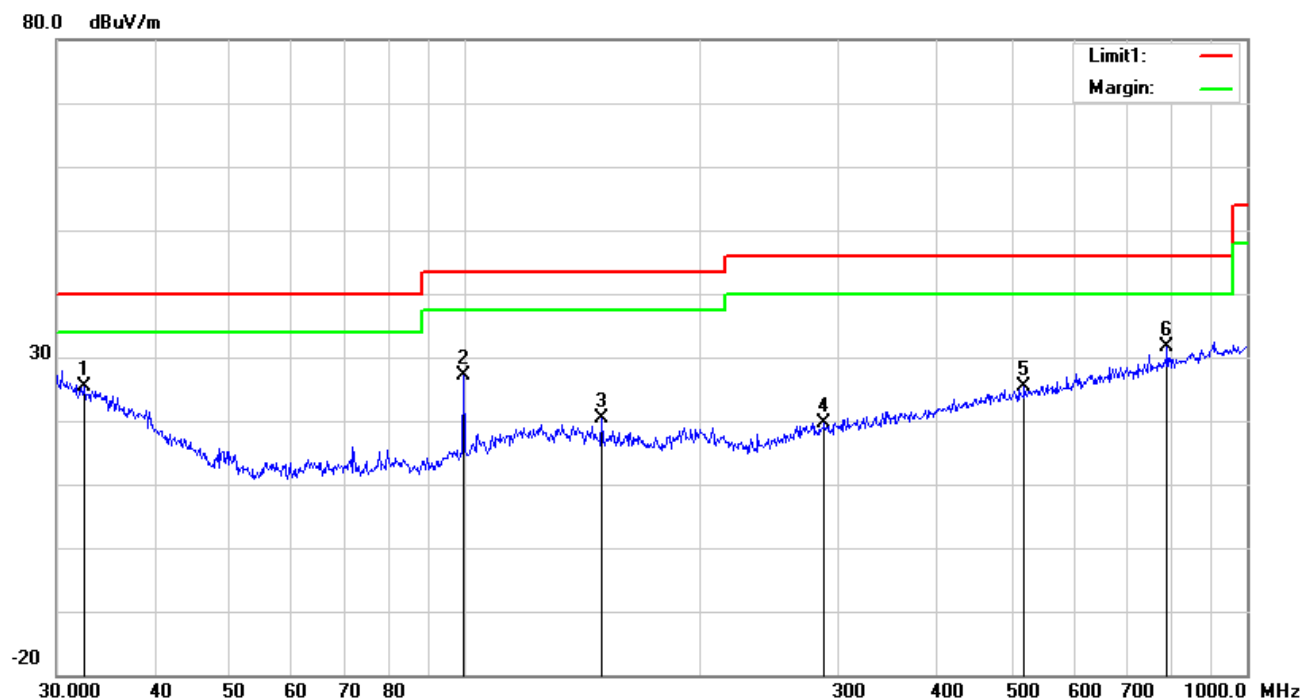


FREQUENCY RANGE	9KHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 m										
No.	Frequency	Reading	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBuV/m)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(°)
1	32.5198	27.12	19.44	21.62	0.44	25.38	40.00	-14.62	100	267
2	99.5281	37.69	10.07	21.61	1.03	27.18	43.50	-16.32	100	144
3	149.4857	28.12	12.62	21.70	1.23	20.27	43.50	-23.23	200	300
4	287.9904	26.43	13.46	21.97	1.77	19.69	46.00	-26.31	100	146
5	519.0649	27.27	17.85	22.03	2.32	25.41	46.00	-20.59	100	69
6	790.6188	29.04	21.27	21.72	2.94	31.53	46.00	-14.47	200	324

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value.





4.2 BANDWIDTH MEASUREMENT

4.2.1 LIMITS OF BANDWIDTH MEASUREMENT

The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in Section 15.209.

FREQUENCY (MHz)	Limits
	[MHz]
49.86	within 49.81~49.91

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
Wireless Connectivity Tester	R&S	CMW270	1201.0002K75	Dec. 26, 21
MXA VEXTOR SIGNAL	Agilent	n5182a	MY50140530	Mar. 24, 21
MXA signal analyzer	Agilent	n9020a	MY49100060	Mar. 24, 21
RF Control Unit	Tonscend	JS0806-2	188060112	Mar. 24, 21
Signal Generation	Agilent	E4421B	US40051152	Dec. 17, 21
DC Power Supply	Agilent	E3640A	MY40004013	Mar. 30, 21
Programmable Temperature & Humidity Chamber	Hongjin	HYC-TH-225 DH	DG-180746	Mar. 24, 21
Test System	Tonscend	JS 1120-3	N/A	N/A
Power Splitter	Weinschel	1580-1	TL177	Mar. 27, 21

NOTES:

1. The test was performed in RF Oven room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



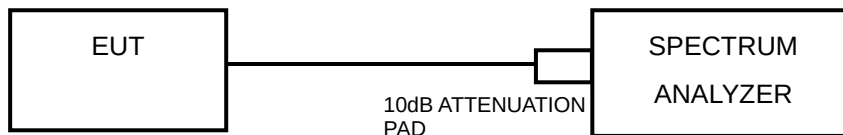
4.2.3 TEST PROCEDURE

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the frequency difference of two frequencies that were attenuated 26dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



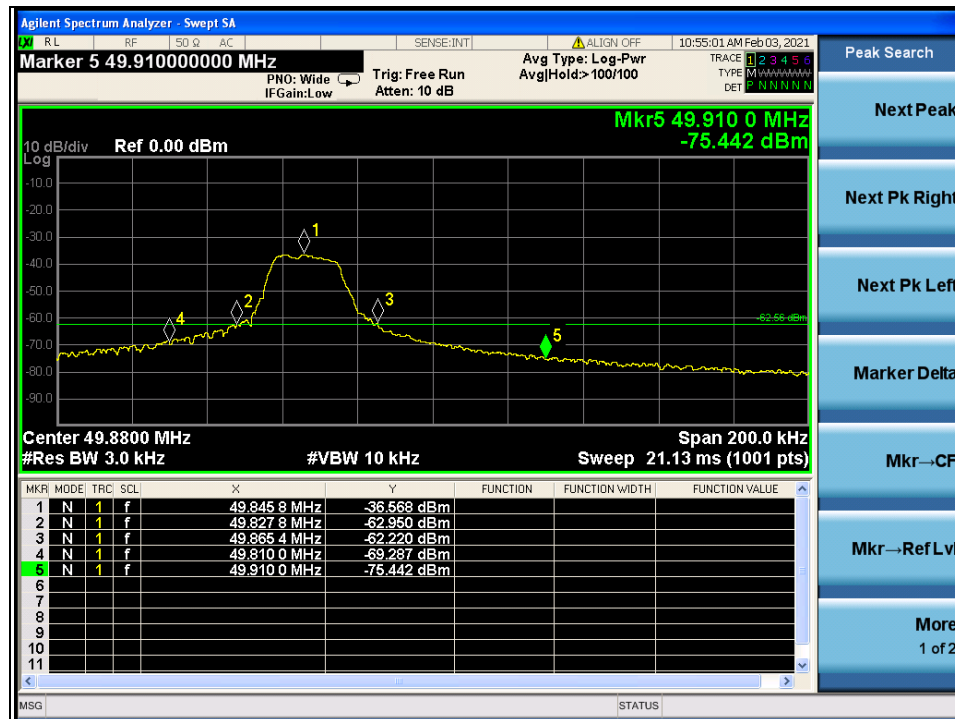
4.2.6 EUT OPERATING CONDITIONS

Same as item 4.1.6



4.2.7 TEST RESULTS

Lower & Upper Test Frequency Point (MHz)	Test Frequency (MHz)	P/F
Lower	49.8278	PASS
Upper	49.8654	PASS





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5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



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6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---