



Test Report No.:RF2203WDG0241



TEST REPORT



Applicant	Shantou Chenghai Huabo Smart Living Technology Co., Ltd
Address	Next to Chengjiang Road, Dutou Village, Shanghua County, Chenghai District, Shantou City, Guangdong, China

Manufacturer or Supplier	Shantou Chenghai Huabo Smart Living Technology Co., Ltd
Address	Next to Chengjiang Road, Dutou Village, Shanghua County, Chenghai District, Shantou City, Guangdong, China
Product	Toy RC Bumper Car Set Retro
Brand Name	FAO SCHWARZ
Model	1012930
Additional Model & Model Difference:	HB2022D, 101XXXX (where XXXX can be digits 0000-9999 which represent different customers); see item 3.1
Date of tests	Mar. 24, 2022 ~ Mar. 31, 2022

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

FCC Part 15, Subpart C, Section 15.227

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

Tested by Andy Zhu Supervisor / EMC Department	Approved by Glyn He Assistant Manager / EMC Department
	
	Date: Apr. 22, 2022

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Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

No. 96, Guantai Road (Houjie Section), Houjie
Town, Dongguan City, Guangdong Province.
523942. People's Republic of China.

Tel: +86 769 8998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@bureauveritas.com



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Test Report No.:RF2203WDG0241

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF2203WDG0241	Original release	Apr. 22, 2022

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C , SECTION 15.227(2015-10)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
§15.207 (a)	AC Power Conducted Emission	N/A	EUT is powered by battery
§15.209 §15.227	Radiated Emission	PASS	Compliant
§15.215(c)	20dB Bandwidth Test	PASS	Compliant
§15.203	Antenna Requirement	PASS	No antenna connector is used

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	2.66dB
	30MHz ~ 1GHz	4.06dB

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 Bumper Car Set Retro
MODEL NO.	1012930
ADDITIONAL MODEL	HB2022D, 101XXXX (where XXXX can be digits 0000-9999 which represent different customers)
FCC ID	2A4XIHB2022D27
NOMINAL VOLTAGE	Remote control: DC 3V(1.5V*AAA*2) from battery
MODULATION TYPE	AM
OPERATING FREQUENCY	27.145 MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Spring Antenna with 0dBi gain
I/O PORTS	Refer to user's manual

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.: 2203WDG0241) for detailed product photo.
4. Additional models (see above table) are identical with the test model 1012930 except the color of the appearance, trade name and model number 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 X&Y axis for radiated emission. The EUT was tested under the following mode.

FREQUENCY	TEST MODES
27.145 MHz	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, 15.227

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

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 §15.227(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]
26.96 – 27.28	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

For Below 30MHz

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101564	Jan. 18,23
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	1519B-045	May 21,22
Amplifier	Burgeon	BPA-530	100210	Mar. 09,23
Coaxial RF Cable	/	/	/	Aug. 03,22
Test Software	ADT	ADT_Radiated_V8.7.07	N/A	N/A

- NOTES:**
1. The test was performed in 10m Chamber (Baodun).
 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.
 3. The FCC Site Registration No. is 749762

For 30MHz ~1GHz

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
Spectrum Analyzer	Rohde&Schwarz	FSV40-N	101817	July 04, 22
Bilog Antenna	SCHWARZBECK	VULB 9168	01281	July 30, 22
Pre-Amplifier	Agilent	8447D	2944A10488	Aug.08, 22
3m Semi-anechoic Chamber	ETS-Lindgren	9m*6m*6m	D3040003DG-1	July 30, 24
Coaxial RF Cable	Joinfront	JFAA6-NMNM-8000	2100033742	Aug.08, 22
Coaxial RF Cable	Joinfront	JFAR-NMBNCM-2000	2100033742	Aug.08, 22
Coaxial RF Cable	Joinfront	JFAR-BNCMSMM-500	2100033742	Aug.08, 22
Test software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A
Horn Antenna	ETS-Lindgren	3117	00240041	July 22, 22
Horn Antenna	SCHWARZBECK	BBHA 9170	01024	Dec. 25, 22
Pre-Amplifier (1GHz-18GHz)	SCHWARZBECK	BBV 9718C	00142	Aug. 06, 22
Pre-Amplifier (18GHz-40GHz)	Rohde&Schwarz	SCU40	100437	Nov. 16, 22
Coaxial RF Cable	Joinfront	JFAA6-NMNM-8000	2100033742	Aug.08, 22
Coaxial RF Cable	Joinfront	JFAA6-NMSMM-2000	2100033742	Aug.08, 22
Coaxial RF Cable	Joinfront	JFAA6-NMSMM-800	2100033742	Aug.08, 22

- NOTES:**
1. The test was performed at 966 Chamber-3 (Baodun).
 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 above1GHz 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 3m chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. (Below 1000MHz)
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10m chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. (Below 30MHz)
- c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. 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.
- e. 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.
- f. 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.
- 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 Y, 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.
- h. 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.

NOTES:

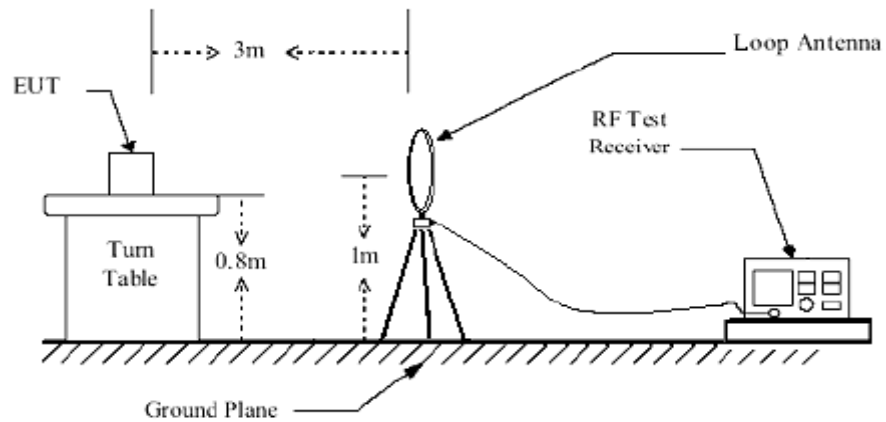
1. The resolution bandwidth of test receiver/spectrum analyzer is 200Hz for Quasi-peak detection (QP) at fundamental frequency 9K-150KHz;
2. The resolution bandwidth of test receiver/spectrum analyzer is 9KHz for Quasi-peak detection (QP) at fundamental frequency 150K-30MHz;
3. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at radiated spurious emission frequency 30MHz-1GHz.

4.1.4 DEVIATION FROM TEST STANDARD

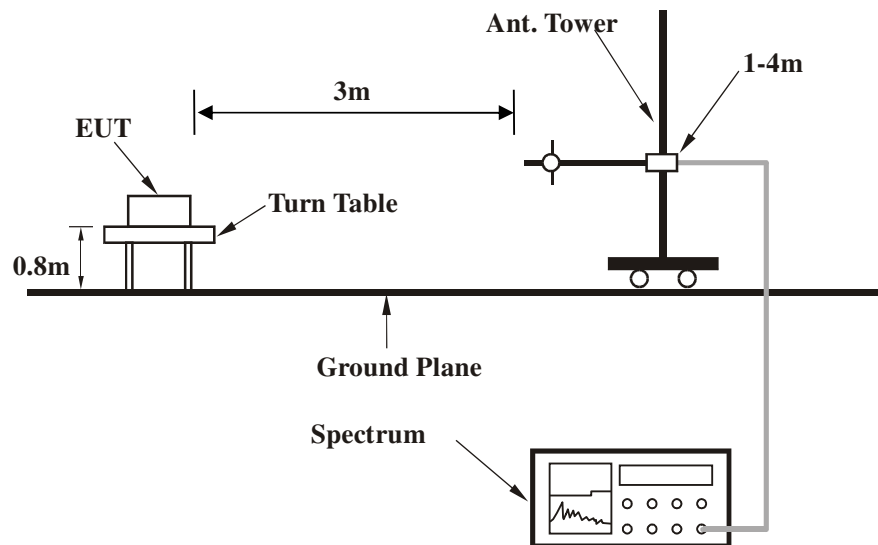
No deviation.

4.1.5 TEST SETUP

Below 30MHz test setup



Below 1GHz test setup



Note: 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, 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

Pre-Scan has been considered to determine the worst-case mode from all possible combinations between XYZ axis.

The worst case was found when the EUT was positioned on X axis for radiated emission.

FIELD STRENGTH OF FUNDAMENTAL

ANTENNA POLARITY (PARALLEL): 0°

No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*	27.15(PK)	-18.21	68.36	50.15	100	-49.85
*	27.15(AV)	-4.237	-	45.913	80	-34.087

ANTENNA POLARITY (PERPENDICULAR): 90°

No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*	27.14(PK)	-18.21	90.78	72.57	100	-27.43
*	27.14(AV)	-4.237	-	68.333	80	-11.667

- 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. Margin value = Emission level – Limit value.
 4. “ * “: Fundamental frequency.
 5. 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 (61.93%) = -4.237dB, Please see page 12~13 for plotted duty.
 6. all three antenna orientations(parallel, perpendicular, and ground-parallel) testing. But the worst orientation showed in report only.



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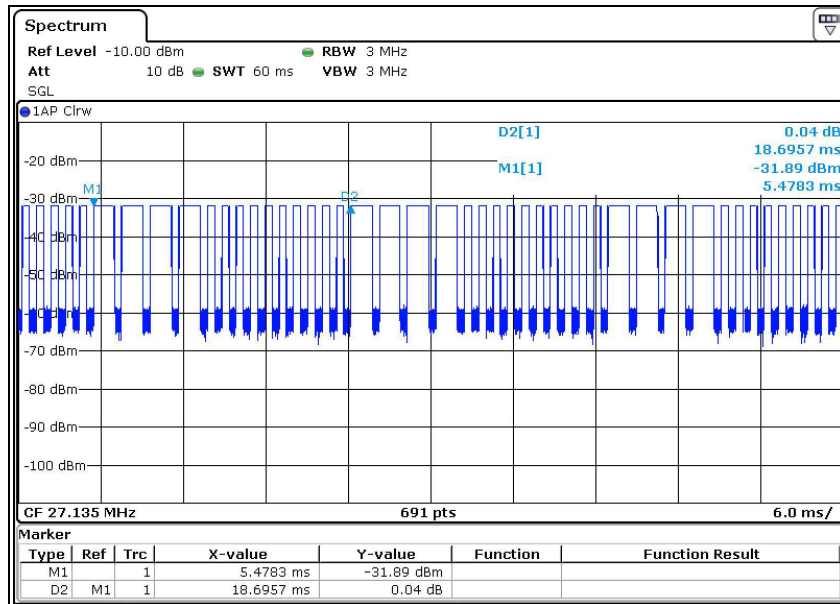
Duty Cycle:

$$T_p = 18.6957\text{ms}$$

$$T_{on} = T_{on1} * \text{Number} + T_{on2} * \text{Number} = 1.5652 * 4 + 0.5217 * 10 = 11.4778\text{ms}$$

$$\text{Duty Cycle} = T_{on} / T_p * 100\% = 11.4778 / 18.6957 * 100\% = 61.39\%$$

T_p = 18.6957ms

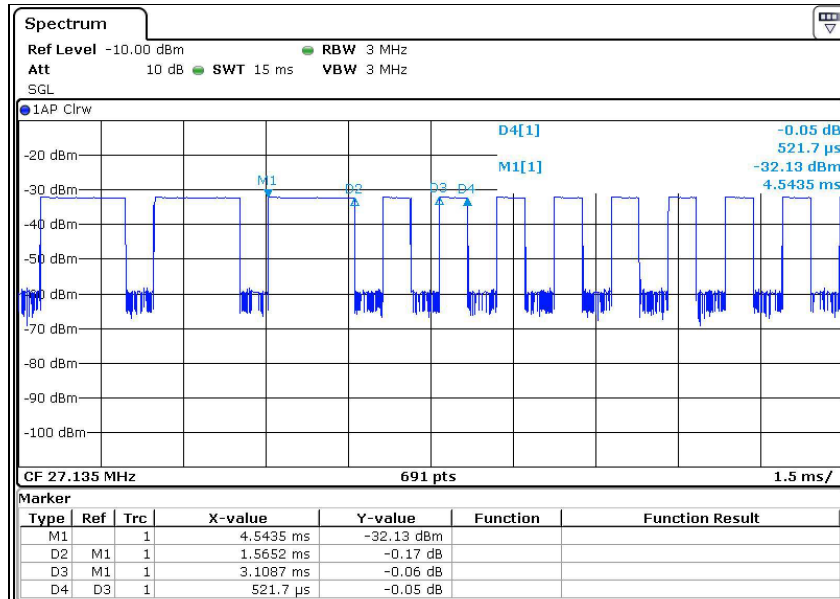




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Ton1=1.5652ms

Ton2=0.5217ms

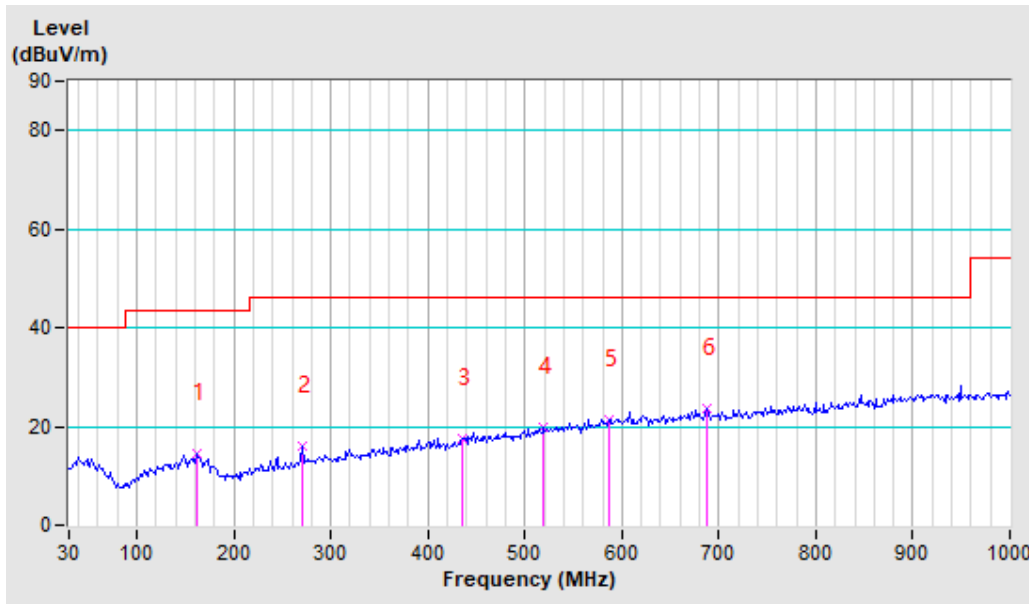


FREQUENCY RANGE	9KHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	162.13	14.46 QP	43.50	-29.04	2.00 H	197	-16.48	30.94
2	270.95	16.07 QP	46.00	-29.93	2.00 H	110	-16.31	32.38
3	435.72	17.43 QP	46.00	-28.57	2.00 H	270	-11.95	29.38
4	519.66	19.75 QP	46.00	-26.25	2.00 H	149	-9.77	29.52
5	586.51	21.24 QP	46.00	-24.76	2.00 H	194	-8.06	29.30
6	687.55	23.56 QP	46.00	-22.44	2.00 H	144	-6.67	30.23

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.

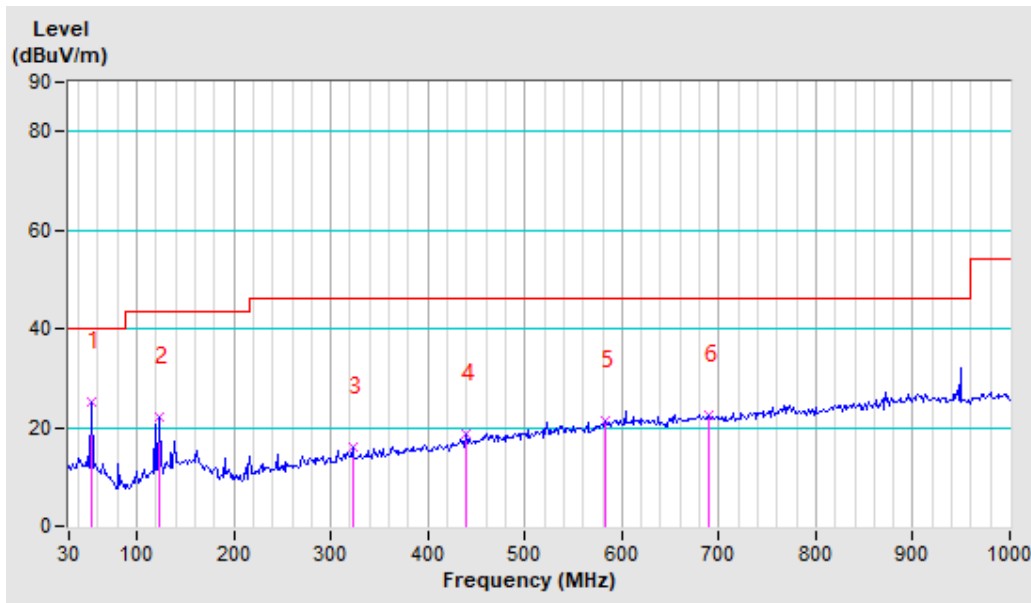


FREQUENCY RANGE	9KHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)
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ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	53.32	25.29 QP	40.00	-14.71	1.00 V	197	-17.63	42.92
2	123.27	22.24 QP	43.50	-21.26	1.00 V	110	-18.22	40.46
3	322.24	16.11 QP	46.00	-29.89	1.00 V	270	-14.90	31.01
4	438.83	18.81 QP	46.00	-27.19	1.00 V	149	-11.87	30.68
5	583.40	21.32 QP	46.00	-24.68	1.00 V	194	-8.14	29.46
6	689.10	22.44 QP	46.00	-23.56	1.00 V	144	-6.65	29.09

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 out of band shall be attenuated at least 20 dB below the level of the unmodulated carrier or to the general limits in Section 15.209.

FREQUENCY (MHz)	Limits
	[MHz]
27.145	within 26.96-27.28

4.2.2 TEST INSTRUMENTS

5	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
	Wireless Connectivity Tester	Rohde&Schwarz	CMW270	101601	Nov. 21, 22
	MXA signal analyzer	Agilent	N9020A	MY49100060	Apr. 06, 22
	Network Analyzer	Agilent	8753ES	US39173518	Mar. 28, 23
	Spectrum Analyzer	Rohde&Schwarz	FSV7	101574	July 04, 22
	Frequency Analyzer	Keysight	N9010B	MY60240432	Nov. 25, 22
	Programmable Temperature&Humidity Chamber	Hongjin	HYC-TH-225DH	DG-180746	Feb. 16, 23
	DC Source	Agilent	E3640A	MY40004013	Feb. 23, 23
	Test software	ADT	ADT_RF Test Software V6.6.5.3	N/A	N/A
	Test software	ADT	ADT_RF Test Software V6.6.5.4	N/A	N/A

NOTES:

1. The test was performed in RF Oven room (Baodun).
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.

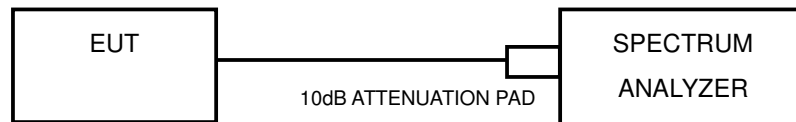
5.2.1 TEST PROCEDURE

- 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 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

5.2.2 DEVIATION FROM TEST STANDARD

No deviation.

5.2.3 TEST SETUP



5.2.4 EUT OPERATING CONDITIONS

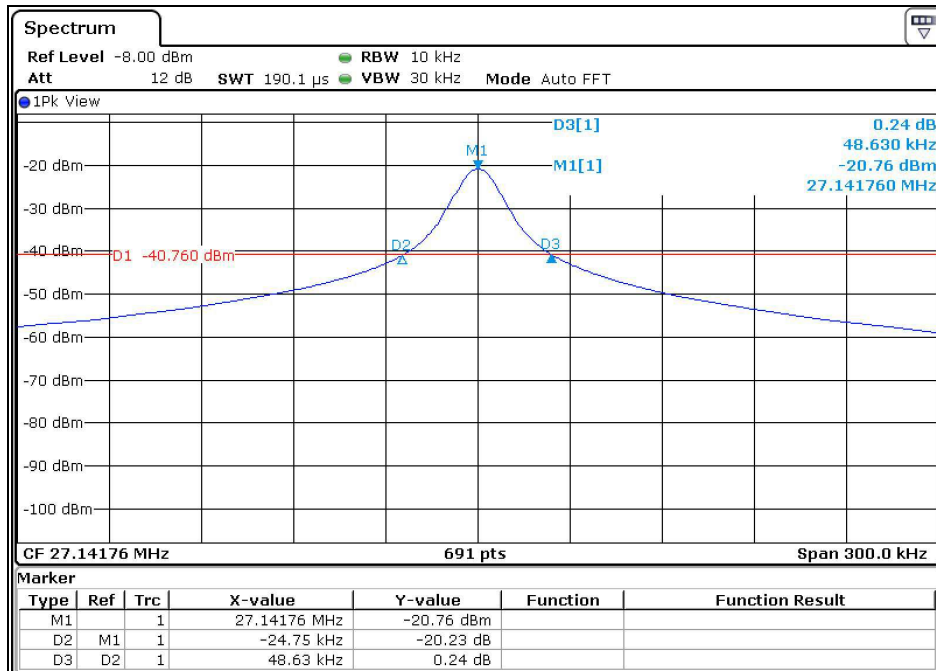
Same as item 4.1.6



5.2.5 TEST RESULTS

Lower & Upper Test Frequency Point (MHz)	Test Frequency (MHz)	P/F
Lower	27.16651	PASS
Upper	27.21514	PASS

Test Data:





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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---