

FCC Test Report

Report No.: AGC08446190701FE03

FCC ID : 2AT6KSWRC-009
APPLICATION PURPOSE : Original Equipment
PRODUCT DESIGNATION : Radio Control Toys
BRAND NAME : N/A
MODEL NAME : SW(RC)-009
APPLICANT : SHANTOU ZHIBO TOYS CO., LTD.
DATE OF ISSUE : Aug. 02, 2019
STANDARD(S) : FCC Part 15 Rules
TEST PROCEDURE(S)
REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Aug. 02, 2019	Valid	Initial Release



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1. VERIFICATION OF CONFORMITY

Applicant	SHANTOU ZHIBO TOYS CO., LTD.
Address	Fengxin Industrial Zone, Fengxiang Street, Chenghai District, Shantou City, Guangdong Province, China
Product Designation	Radio Control Toys
Brand Name	N/A
Test Model	SW(RC)-009
Date of test	Jul. 29, 2019 to Aug. 01, 2019
Deviation	None
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BR/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) 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 radiated emission limits of FCC Rules Part 15.249.

Tested By



NiNi Guo(Guo Lili)

Aug. 01, 2019

Reviewed By



Max Zhang(Zhang Yi)

Aug. 02, 2019

Approved By



Forrest Lei(Lei Yonggang)
Authorized Officer

Aug. 02, 2019



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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

A major technical description of EUT is described as following

Operation Frequency	2.416 GHz to 2.475GHz
Maximum field strength	81.02dBuV/m(Average)@3m
Modulation	GFSK
Number of channels	3
Antenna Gain	0dBi
Antenna Designation	Wired Antenna (Met 15.203 Antenna requirement)
Hardware Version	AT-809TX
Software Version	V1.0
Power Supply	DC 3V by Battery

2.2. TABLE OF CARRIER FREQUENCY

Channel Number	Frequency	Channel Number	Frequency	Channel Number	Frequency
1	2416MHz	2	2445MHz	3	2475MHz



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3. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI.

- Uncertainty of Conducted Emission, $U_c = \pm 3.2$ dB
- Uncertainty of Radiated Emission below 1GHz, $U_c = \pm 3.9$ dB
- Uncertainty of Radiated Emission above 1GHz, $U_c = \pm 4.8$ dB



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4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK
Note: 1. All the test modes can be supply by battery, only the result of the worst case was recorded in the report, if no other cases. 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.	



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5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM



5.2 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Radio Control Toys	SW(RC)-009	2AT6KSWRC-009	EUT

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.249&15.209	Radiated Emission	Compliant
§15.249	Band Edges	Compliant
§15.215	20dB bandwidth	Compliant
§15.207	Conducted Emission	N/A

Note: The conducted limits are not required for devices which only employ battery power for operation.



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6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun. 12, 2019	Jun. 11, 2020
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 20, 2018	Dec. 19, 2019
2.4GHz Fliter	EM Electronics	2400-2500MHz	N/A	Feb. 27, 2019	Feb. 26, 2020
Attenuator	ZHINAN	E-002	N/A	Aug. 28, 2018	Aug. 27, 2019
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 21, 2017	Sep. 20, 2020
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Jun. 14, 2018	Jun. 13, 2020
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May. 26, 2018	May. 25, 2020
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 25, 2018	Oct. 24, 2019
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep. 28, 2017	Sep. 27, 2019



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7. RADIATED EMISSION

7.1 TEST LIMIT

Standard FCC15.249

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
900-928MHz	50	500
2400-2483.5MHz	50	500
5725-5875MHz	50	500
24.0-24.25GHz	250	2500

Standard FCC 15.209

Frequency (MHz)	Distance Meters	Field Strengths Limit	
		μ V/m	dB(μ V)/m
0.009 ~ 0.490	300	2400/F(kHz)	---
0.490 ~ 1.705	30	24000/F(kHz)	---
1.705 ~ 30	30	30	---
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	Other:74.0 dB(μ V)/m (Peak) 54.0 dB(μ V)/m (Average)	

Remark:

- (1) Emission level dB μ V = 20 log Emission level μ V/m
- (2) The smaller limit shall apply at the cross point between two frequency bands.
- (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.



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7.2. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use minimum resolution bandwidth of 1 MHz. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.



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The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz RBW 2MHz/ VBW 6MHz for Peak, RBW 2MHz/1kHz for Average

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP



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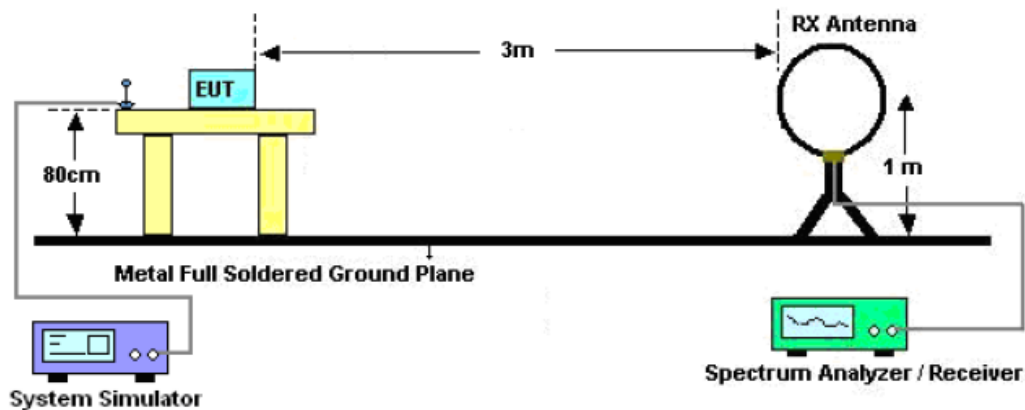
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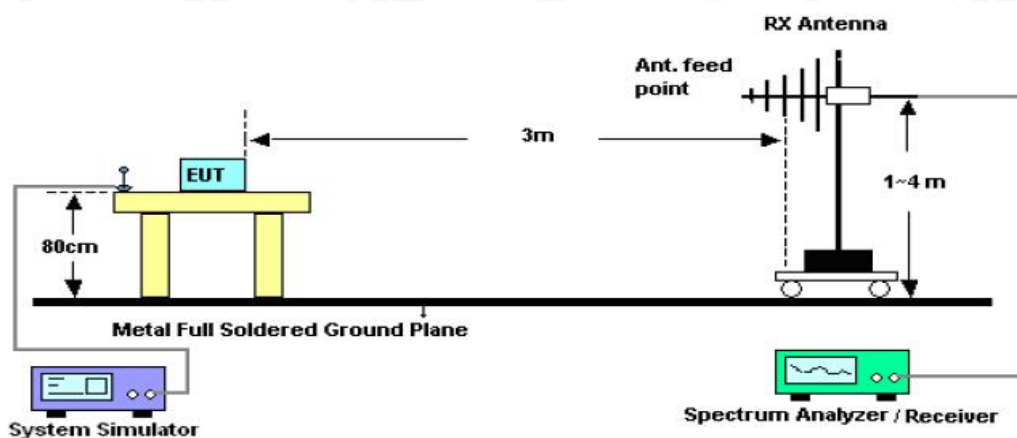
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7.3. TEST SETUP

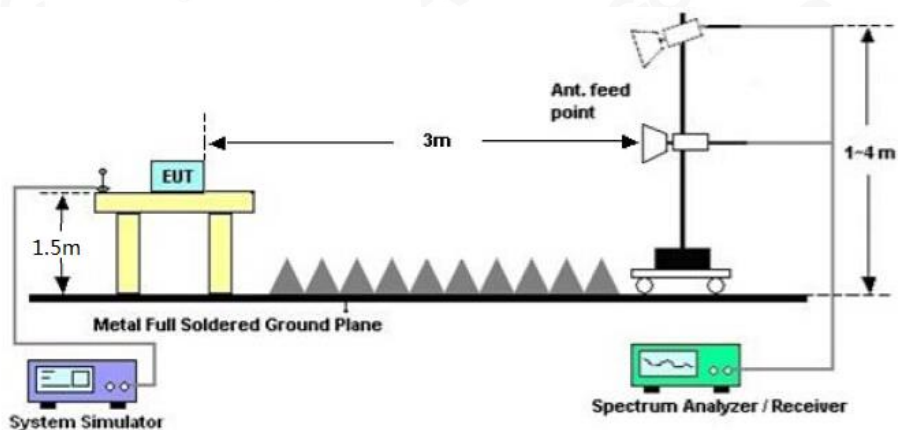
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



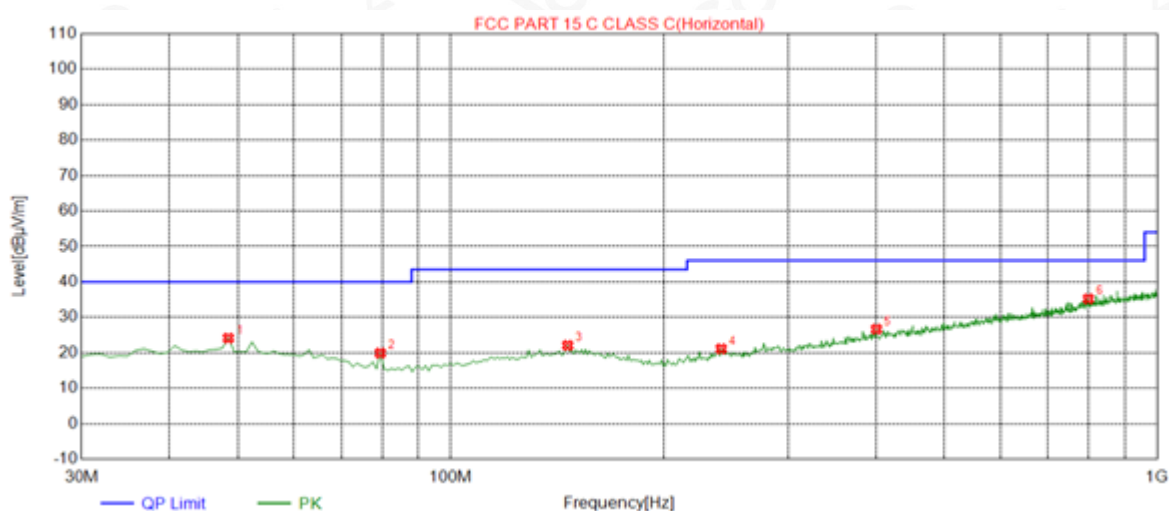
7.4. TEST RESULT

RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz.

RADIATED EMISSION 30MHZ- 1GHZ

EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	Mode 1	Polarization :	Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	48.4300	24.12	14.71	40.00	15.88	100	182	Horizontal
2	79.4700	19.91	10.26	40.00	20.09	100	1	Horizontal
3	146.4000	22.07	14.88	43.50	21.43	100	357	Horizontal
4	241.4600	21.10	14.83	46.00	24.90	150	164	Horizontal
5	400.5400	26.65	19.81	46.00	19.35	150	272	Horizontal
6	799.2100	35.21	28.49	46.00	10.79	100	164	Horizontal



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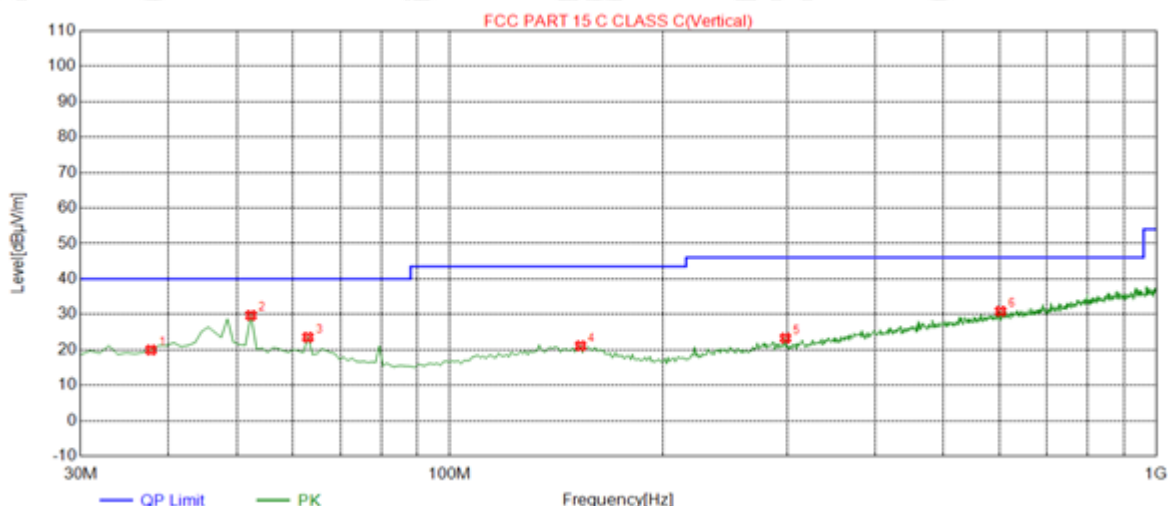
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EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	Mode 1	Polarization :	Vertical



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	37.7600	19.93	14.39	40.00	20.07	100	337	Vertical
2	52.3100	29.71	14.49	40.00	10.29	100	354	Vertical
3	62.9800	23.52	13.42	40.00	16.48	100	330	Vertical
4	153.1900	21.10	14.91	43.50	22.40	100	272	Vertical
5	298.6900	23.27	15.92	46.00	22.73	150	45	Vertical
6	602.3000	30.87	24.36	46.00	15.13	150	322	Vertical

RESULT: PASS

Note:

Factor=Antenna Factor + Cable loss, Margin=Result-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

The mode 1 is the worst case, and only the data of the worst case recorded in this test report.



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FIELD STRENGTH OF FUNDAMENTAL

EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Modulation :	GFSK	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
2416.031	94.89	-9.61	85.28	114.00	-28.72	peak
2416.031	90.63	-9.61	81.02	94.00	-12.98	AVG
2445.031	94.14	-9.28	84.86	114.00	-29.14	peak
2445.031	89.84	-9.28	80.56	94.00	-13.44	AVG
2475.031	94.07	-9.14	84.93	114.00	-29.07	peak
2475.031	89.63	-9.14	80.49	94.00	-13.51	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Modulation :	GFSK	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
2416.031	93.78	-9.61	84.17	114.00	-29.83	peak
2416.031	89.42	-9.61	79.81	94.00	-14.19	AVG
2445.031	93.21	-9.28	83.93	114.00	-30.07	peak
2445.031	88.89	-9.28	79.61	94.00	-14.39	AVG
2475.031	92.85	-9.14	83.71	114.00	-30.29	peak
2475.031	88.41	-9.14	79.27	94.00	-14.73	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.



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RADIATED EMISSION ABOVE 1GHZ

EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	Mode 1	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4832.062	49.53	3.76	53.29	74.00	-20.71	peak
4832.062	43.61	3.76	47.37	54.00	-6.63	AVG
7248.093	46.27	8.17	54.44	74.00	-19.56	peak
7248.093	40.13	8.17	48.30	54.00	-5.70	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	Mode 1	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4832.062	46.39	3.76	50.15	74.00	-22.45	peak
4832.062	43.29	3.76	47.05	54.00	-5.96	AVG
7248.093	44.01	8.17	52.18	74.00	-23.29	peak
7248.093	38.96	8.17	47.13	54.00	-9.74	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.



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EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	Mode 2	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4890.062	48.14	3.78	51.92	74.00	-22.08	peak
4890.062	45.29	3.78	49.07	54.00	-4.93	AVG
7335.093	46.21	8.23	54.44	74.00	-19.56	peak
7335.093	39.98	8.23	48.21	54.00	-5.79	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	Mode 2	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4890.062	48.47	3.78	52.25	74.00	-21.75	peak
4890.062	44.29	3.78	48.07	54.00	-5.93	AVG
7335.093	45.84	8.23	54.07	74.00	-19.93	peak
7335.093	38.11	8.23	46.34	54.00	-7.66	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						



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EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	Mode 3	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4950.062	50.62	3.81	54.43	74.00	-19.57	peak
4950.062	47.15	3.81	50.96	54.00	-3.04	AVG
7425.093	44.86	8.27	53.13	74.00	-20.87	peak
7425.093	40.17	8.27	48.44	54.00	-5.56	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	Mode 3	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4950.062	49.02	3.81	52.83	74.00	-21.17	peak
4950.062	43.63	3.81	47.44	54.00	-6.56	AVG
7425.093	46.78	8.27	55.05	74.00	-18.95	peak
7425.093	40.91	8.27	49.18	54.00	-4.82	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Note: Other emissions from 8G to 25 GHz are considered as ambient noise. No recording in the test report.
Factor=Antenna Factor + Cable loss - Amplifier gain, Margin=Measurement-Limit.
The “Factor” value can be calculated automatically by software of measurement system.
The GFSK modulation was the worst case and only the data of worst recorded in this report.



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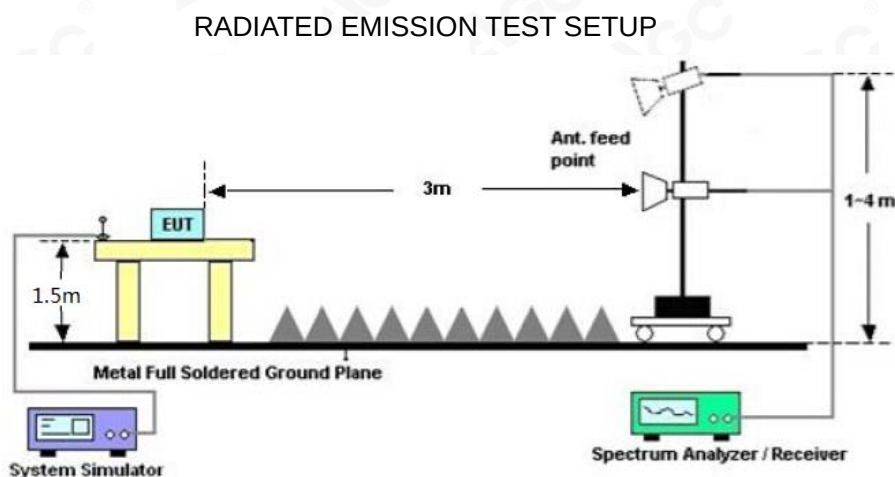
Tel: +86-755 2523 4088 E-mail: agc@agc-cert.com Service Hotline:400 089 2118

8. BAND EDGE EMISSION

8.1. MEASUREMENT PROCEDURE

1. The EUT operates at transmitting mode. The operate channel is tested to verify the largest transmission and spurious emissions power at the continuous transmission mode.
2. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission: (a) PEAK: RBW=1MHz, VBW=3MHz / Sweep=AUTO
(b) AVERAGE: RBW=1MHz ; VBW=1/on time(1KHz) / Sweep=AUTO
3. Other procedures refer to clause 7.2.

8.2 TEST SETUP



8.3 RADIATED TEST RESULT

Note:

1. Factor=Antenna Factor + Cable loss - Amplifier gain. Field Strength=Factor + Reading level
2. The factor had been edited in the "Input Correction" of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB(μ V) to represent the Amplitude. Use the F dB(μ V/m) to represent the Field Strength. So A=F.

EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Voltage :	DC 3V
Test Mode :	Mode 1	Polarization :	Horizontal

Peak Value



EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Voltage :	DC 3V
Test Mode :	Mode 1	Polarization :	Vertical

Peak Value



EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Voltage :	DC 3V
Test Mode :	Mode 3	Polarization :	Horizontal

Peak Value



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EUT :	Radio Control Toys	Model Name. :	SW(RC)-009
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Voltage :	DC 3V
Test Mode :	Mode 3	Polarization :	Vertical

Peak Value



Note: The value of the peak emission are less than the average limits, so the average value are deemed to comply with the average limits without test.



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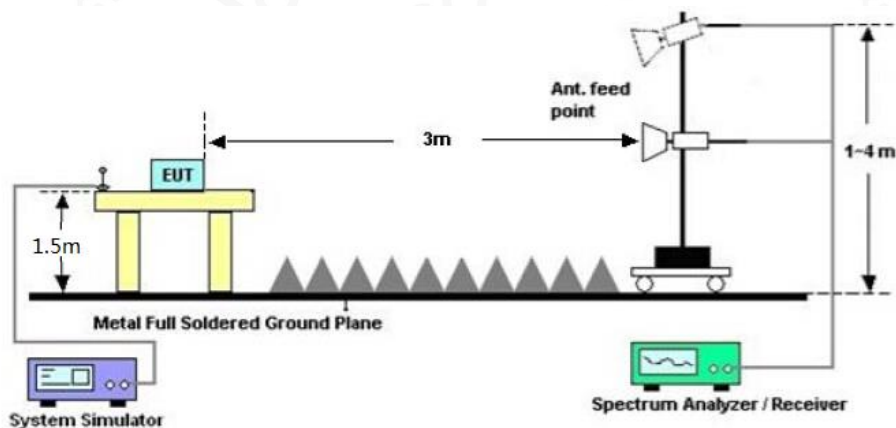
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9. 20DB BANDWIDTH

9.1. MEASUREMENT PROCEDURE

1. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
2. Set SPA Centre Frequency = Operation Frequency, RBW= 30 KHz, VBW $\geq 3 \times$ RBW.
3. Set SPA Trace 1 Max hold, then View.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

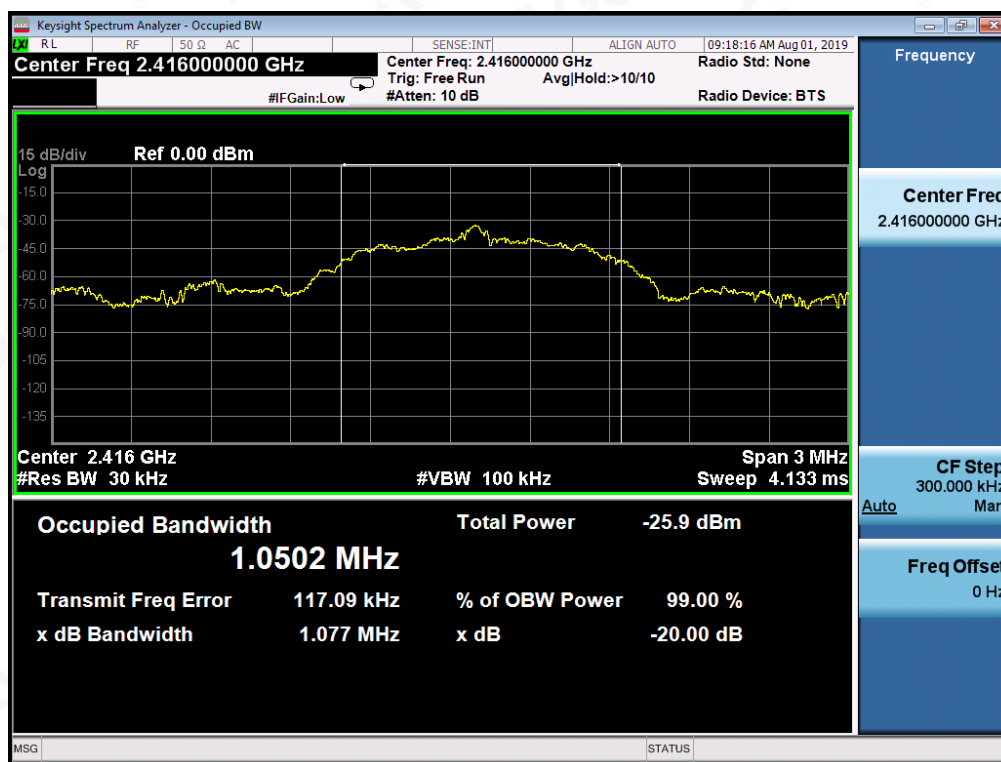


9.3. MEASUREMENT RESULTS

TEST ITEM	20DB BANDWIDTH
TEST MODULATION	GFSK

Test Data (MHz)		Criteria
Low Channel	1.077	PASS
Middle Channel	1.087	PASS
High Channel	1.062	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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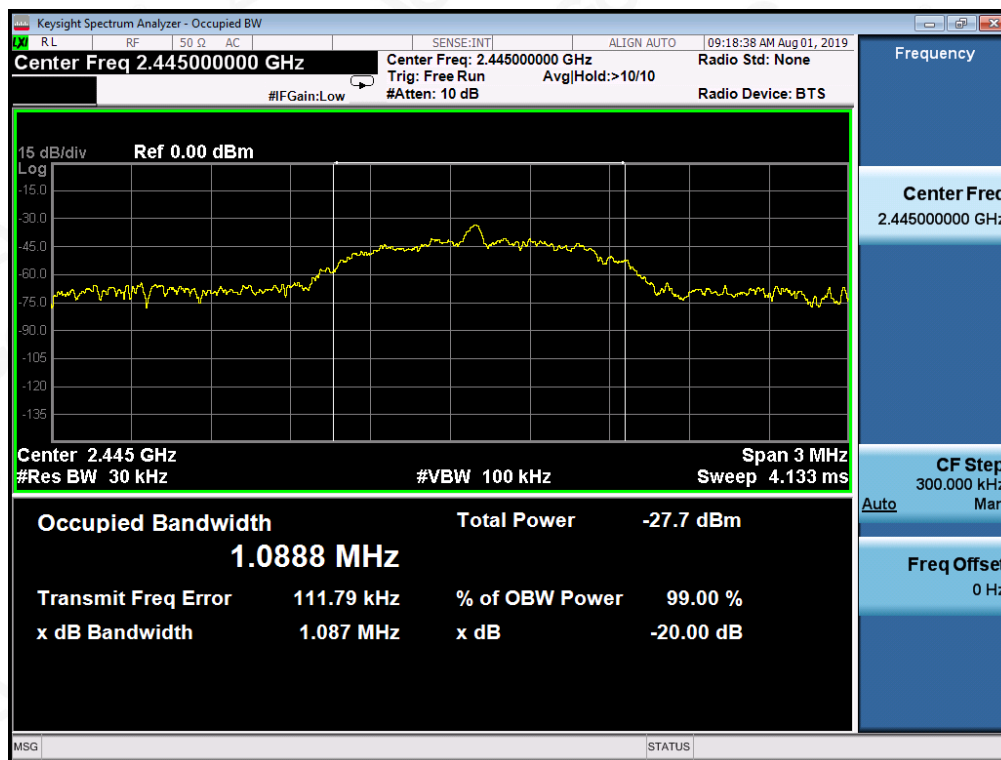
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TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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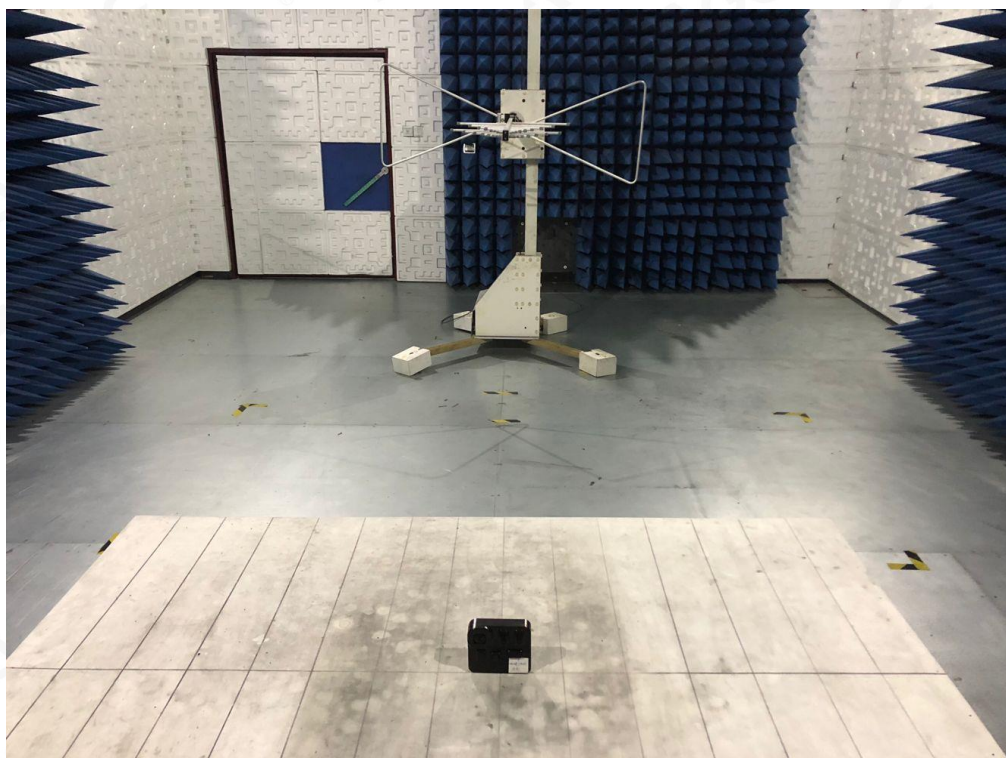
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APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC RADIATED EMISSION TEST SETUP BELOW 1GHZ



FCC RADIATED EMISSION TEST SETUP ABOVE 1GHZ



APPENDIX B: PHOTOGRAPHS OF THE EUT

TOP VIEW OF EUT



BOTTOM VIEW OF EUT



FRONT VIEW OF EUT



BACK VIEW OF EUT



LEFT VIEW OF EUT



RIGHT VIEW OF EUT



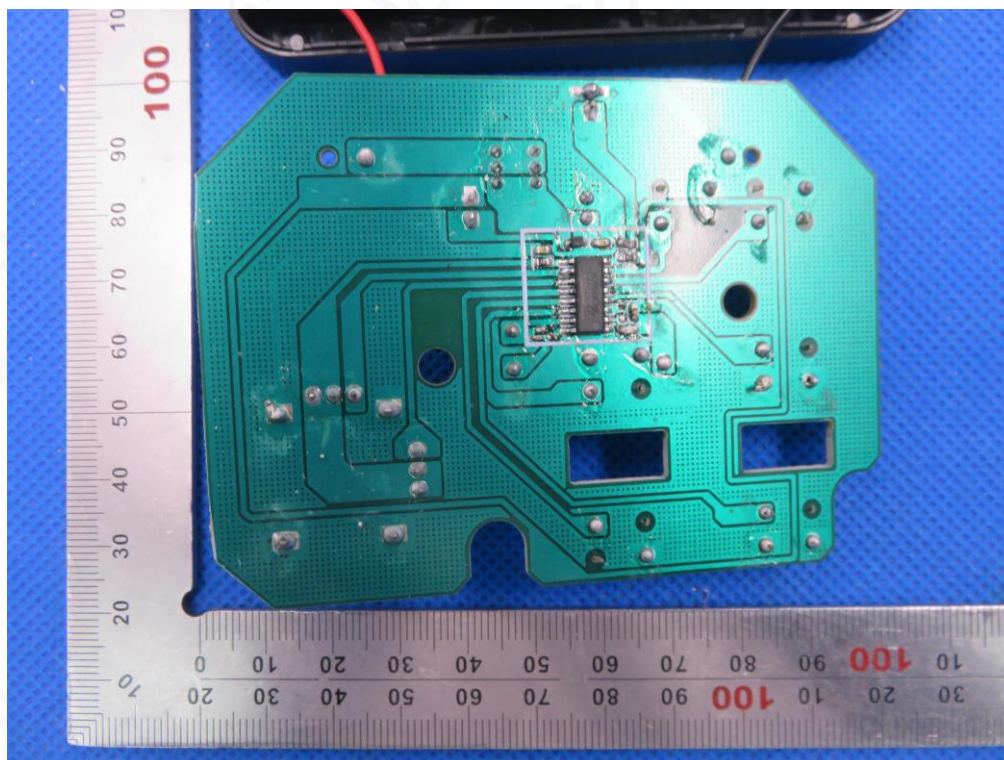
OPEN VIEW OF EUT-1



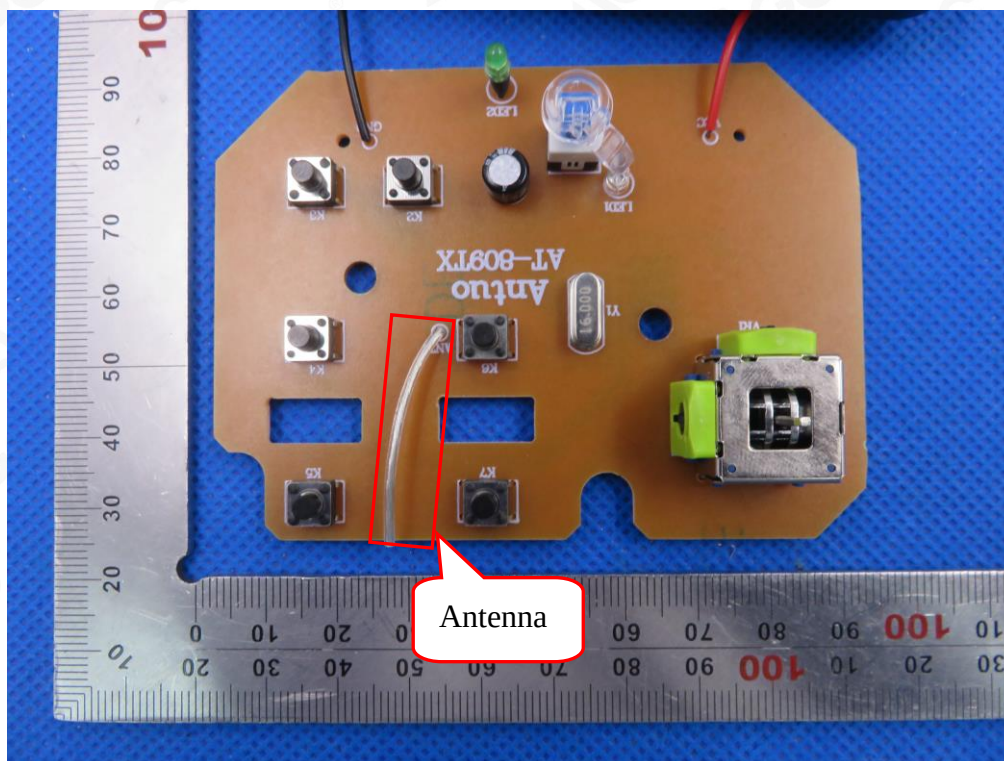
OPEN VIEW OF EUT-2



INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2



----END OF REPORT----