FCC Test Report

Report No.: AGC08279200703FE03

FCC ID	:	2AWUN707556BRS
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Brookstone Mini Land/Water RC Vehicle
BRAND NAME	:	N/A
MODEL NAME	:	707556BRS
APPLICANT	:	Innovative Designs, LLC
DATE OF ISSUE	:	Aug. 18, 2020
STANDARD(S) TEST PROCEDURE(S)	:	FCC Part 15 Rules
REPORT VERSION	:	V1.0

Attestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Aug. 18, 2020	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	Innovative Designs, LLC
Address	132 West 36th Street, Suite 800 New York, NY 10018
Manufacturer	HONG DI TOYS FACTORY
Address	Chenghai district, Shantou city, Guangdong province
Factory	HONG DI TOYS FACTORY
Address	Chenghai district, Shantou city, Guangdong province
Product Designation	Brookstone Mini Land/Water RC Vehicle
Brand Name	N/A
Test Model	707556BRS
Date of test	Jul. 28, 2020 to Aug. 18, 2020
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.

Prepared By	Erik Yang (Project Engineer)	Aug. 18, 2020
Reviewed By	Max Zhang (Reviewer)	Aug. 18, 2020
Approved By	Forrest Lei (Authorized Officer)	Aug. 18, 2020

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

A major technical description of EUT is described as following

Operation Frequency	2.410GHz - 2.473GHz
Maximum field strength	98.38dBuV/m(peak)@3m 86.63dBuV/m(Average)@3m
Modulation	GFSK
Number of channels	32
Antenna Gain	0dBi
Antenna Designation	Internal Antenna (Met 15.203 Antenna requirement)
Hardware Version	TS-779T
Software Version	V1.12.
Power Supply	DC 3V by battery

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2.2. TABLE OF CARRIER FREQUENCY

Frequency Band	Channel Number	Frequency(MHZ)	Channel Number	Frequency(MHZ)	Channel Number	Frequency(MHZ)
2400~2483.5MHZ	1	2410	13	2431	25	2458
	2	2414	14	2433	26	2462
	3	2415	15	2434	27	2464
	4	2416	16	2439	28	2465
	5	2417	17	2441	29	2466
	6	2418	18	2442	30	2467
	7	2419	19	2444	31	2469
	8	2421	20	2446	32	2473
	9	2426	21	2450		
	10	2428	22	2452		
	11	2429	23	2454		
	12	2430	24	2456		

2.3. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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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, Uc = ±3.1 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±4.0 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB

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4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	2410MHZ channel GFSK
2	2442MHZ channel GFSK
3	2473MHZ 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.
3. The EUT enters test modes by pressing keys of EUT.
4. The EUT use new battery during the test.

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5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

EUT

5.2 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Brookstone Mini Land/Water RC Vehicle	707556BRS	2AWUN707556BRS	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	May 15, 2020	May 14, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4GHz Fliter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 09, 2019	Sep. 08, 2020
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 09, 2019	Sep. 08, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00154520	Oct. 26, 2019	Oct. 25, 2021
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 15, 2019	Oct. 16, 2020
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 09, 2019	Jan. 08, 2021
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

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7. RADIATED EMISSION

7.1TEST 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(μV)/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(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Remark: (1) Emission level dBμ 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 2.4MHz/ VBW 8MHz for Peak, RBW 2.4MHz/10Hz 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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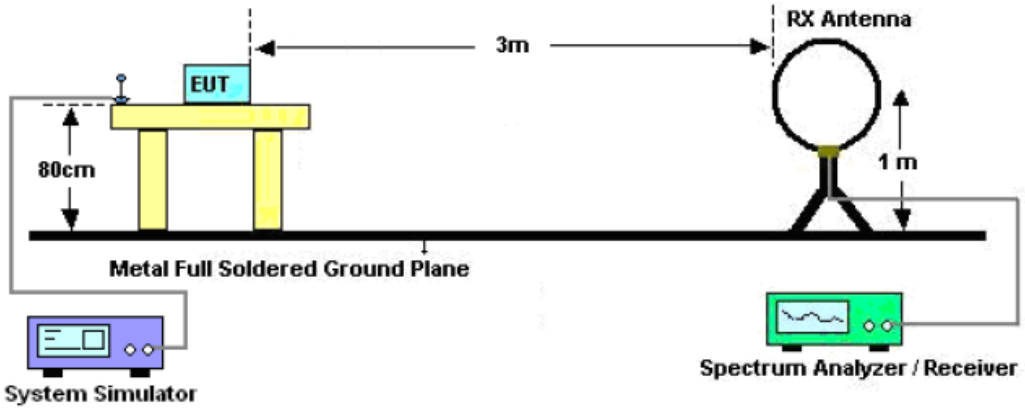
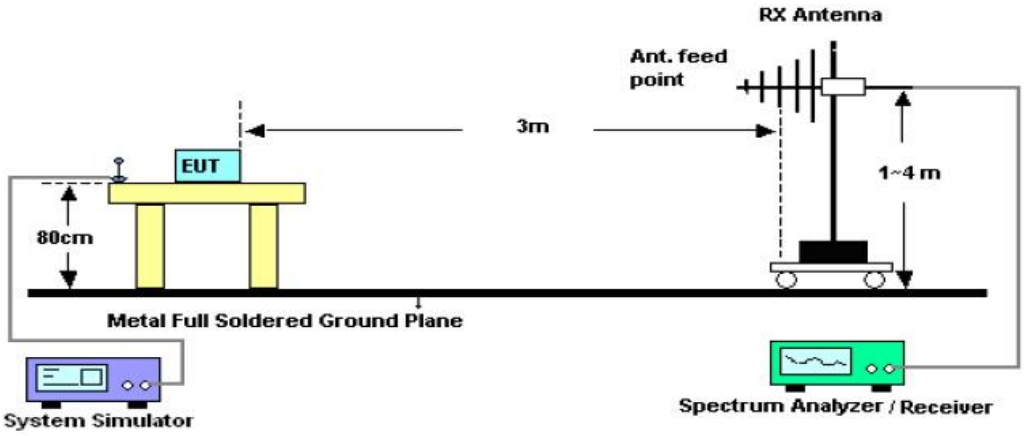
7.3. TEST SETUP

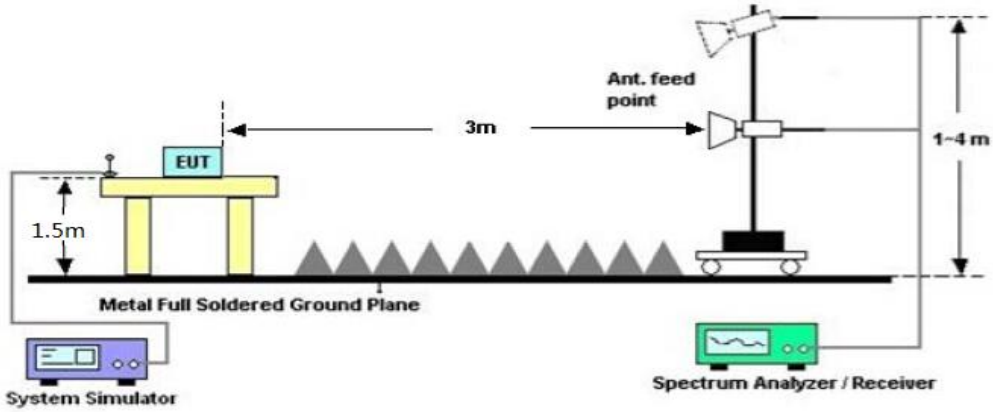
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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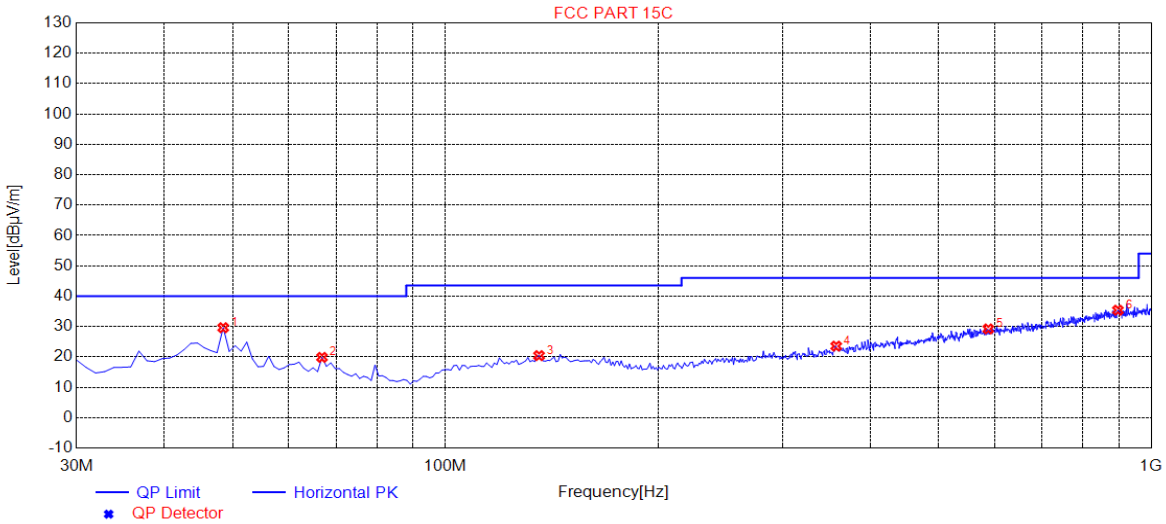
7.4. TEST RESULT

RADIATED EMISSION BELOW 30MHZ

The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

RADIATED EMISSION 30MHz- 1GHZ

EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	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	29.62	11.71	40.00	10.38	150	280	Horizontal
2	66.8600	19.85	9.76	40.00	20.15	150	250	Horizontal
3	135.7300	20.42	14.56	43.50	23.08	150	200	Horizontal
4	357.8600	23.55	18.13	46.00	22.45	150	330	Horizontal
5	587.7500	29.22	24.08	46.00	16.78	150	90	Horizontal
6	897.1800	35.38	30.08	46.00	10.62	150	30	Horizontal

RESULT: PASS

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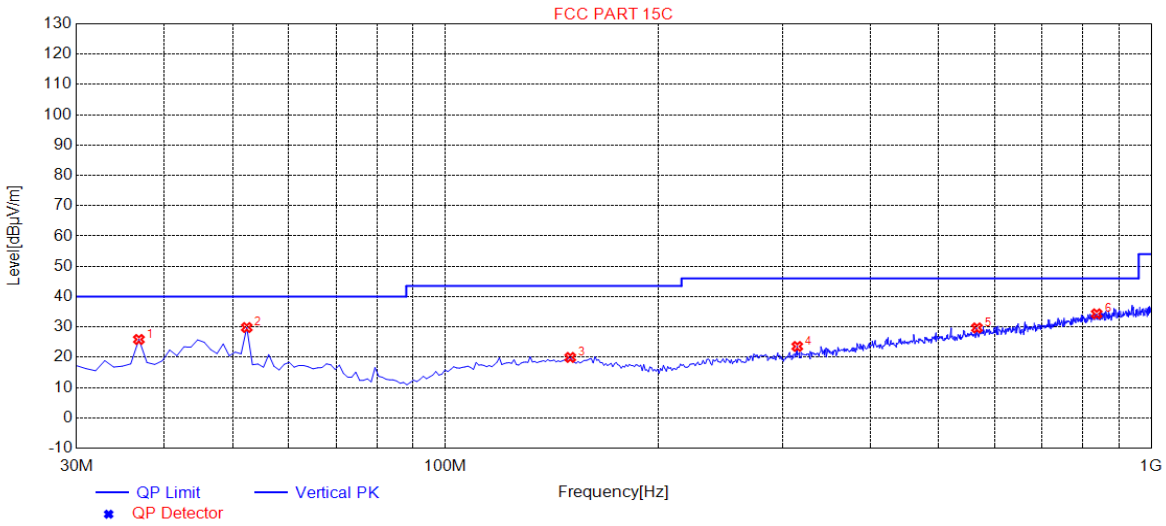
EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Mode	Mode 1	Polarization	Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7900	25.87	11.16	40.00	14.13	150	200	Vertical
2	52.3100	29.80	11.49	40.00	10.20	150	270	Vertical
3	150.2800	19.94	14.88	43.50	23.56	150	40	Vertical
4	315.1800	23.56	16.48	46.00	22.44	150	10	Vertical
5	566.4100	29.67	23.59	46.00	16.33	150	330	Vertical
6	837.0400	34.32	29.07	46.00	11.68	150	190	Vertical

RESULT: PASS

Note: Factor=Antenna Factor + Cable loss, Margin= Limit -Level.

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	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	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
2410	49.33	49.05	98.38	114.00	-15.62	peak
2410	36.00	49.05	85.05	94.00	-8.95	AVG
2442	48.03	49.12	97.15	114.00	-16.85	peak
2442	36.14	49.12	85.26	94.00	-8.74	AVG
2473	47.22	49.25	96.47	114.00	-17.53	peak
2473	37.38	49.25	86.63	94.00	-7.37	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	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
2410	45.18	49.05	94.23	114.00	-19.77	peak
2410	34.68	49.05	83.73	94.00	-10.27	AVG
2442	45.19	49.12	94.31	114.00	-19.69	peak
2442	35.14	49.12	84.26	94.00	-9.74	AVG
2473	45.17	49.25	94.42	114.00	-19.58	peak
2473	36.71	49.25	85.96	94.00	-8.04	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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RADIATED EMISSION ABOVE 1GHZ

EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Modulation	Mode 1	Polarization	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4820.044	56.12	0.08	56.20	74.00	-17.80	peak
4820.044	44.18	0.08	44.26	54.00	-9.74	AVG
7230.066	51.03	2.21	53.24	74.00	-20.76	peak
7230.066	40.22	2.21	42.43	54.00	-11.57	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Modulation	Mode 1	Polarization	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4820.044	58.13	0.08	58.21	74.00	-15.79	peak
4820.044	49.01	0.08	49.09	54.00	-4.91	AVG
7230.066	53.17	2.21	55.38	74.00	-18.62	peak
7230.066	42.86	2.21	45.07	54.00	-8.93	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Modulation	Mode 2	Polarization	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4884.044	58.19	0.14	58.33	74.00	-15.67	peak
4884.044	46.31	0.14	46.45	54.00	-7.55	AVG
7326.066	51.27	2.36	53.63	74.00	-20.37	peak
7326.066	40.15	2.36	42.51	54.00	-11.49	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Modulation	Mode 2	Polarization	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4884.044	56.27	0.14	56.41	74.00	-17.59	peak
4884.044	45.33	0.14	45.47	54.00	-8.53	AVG
7326.066	50.24	2.36	52.60	74.00	-21.40	peak
7326.066	39.98	2.36	42.34	54.00	-11.66	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Modulation	Mode 3	Polarization	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4946.044	58.46	0.22	58.68	74.00	-15.32	peak
4946.044	47.13	0.22	47.35	54.00	-6.65	AVG
7419.066	53.14	2.64	55.78	74.00	-18.22	peak
7419.066	42.58	2.64	45.22	54.00	-8.78	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Modulation	Mode 3	Polarization	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4946.044	58.47	0.22	58.69	74.00	-15.31	peak
4946.044	37.34	0.22	37.56	54.00	-16.44	AVG
7419.066	53.16	2.64	55.80	74.00	-18.20	peak
7419.066	42.55	2.64	45.19	54.00	-8.81	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Note: The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.

Factor=Antenna Factor + Cable loss - Amplifier gain, Margin=Measurement-Limit.

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

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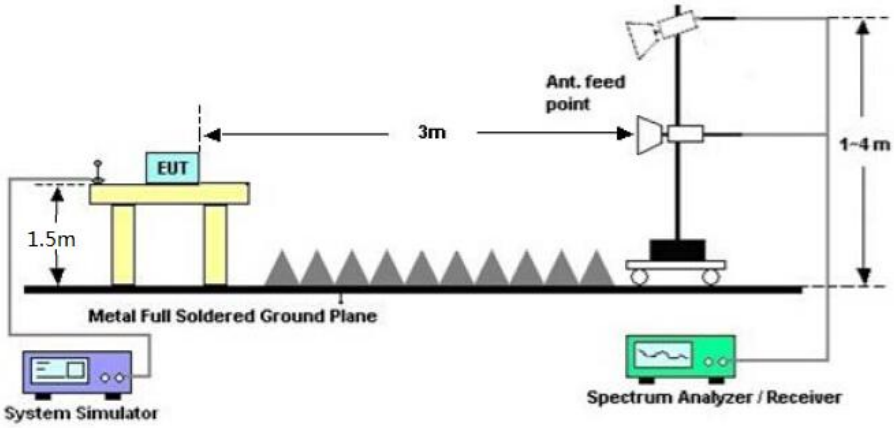
8. BAND EDGE EMISSION

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

RADIATED EMISSION 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(μV) to represent the Amplitude. Use the F dB(μV/m) to represent the Field Strength. So A=F.

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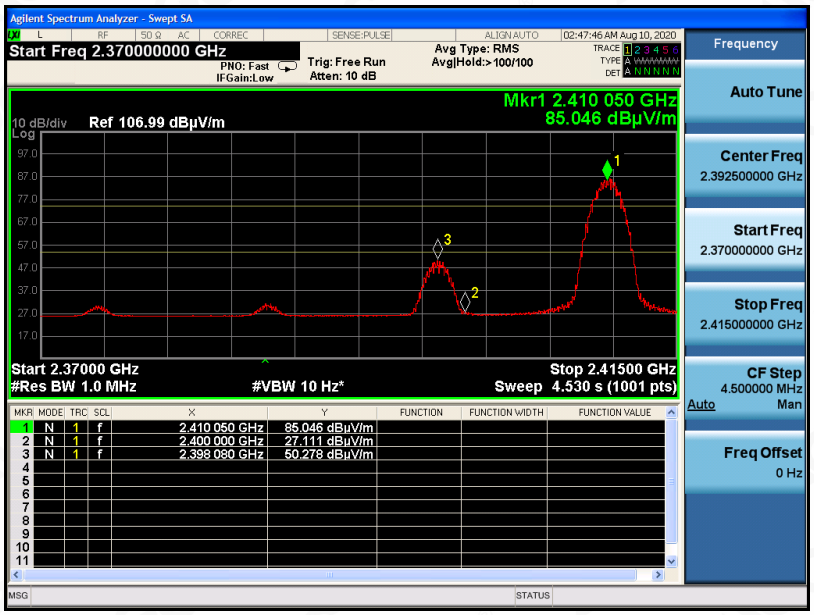
EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Mode	Mode 1	Polarization	Horizontal

Peak Value

Average Value



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EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Mode	Mode 1	Polarization	Vertical

Peak Value

Average Value

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EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Mode	Mode 3	Polarization	Horizontal

Peak Value

Average Value

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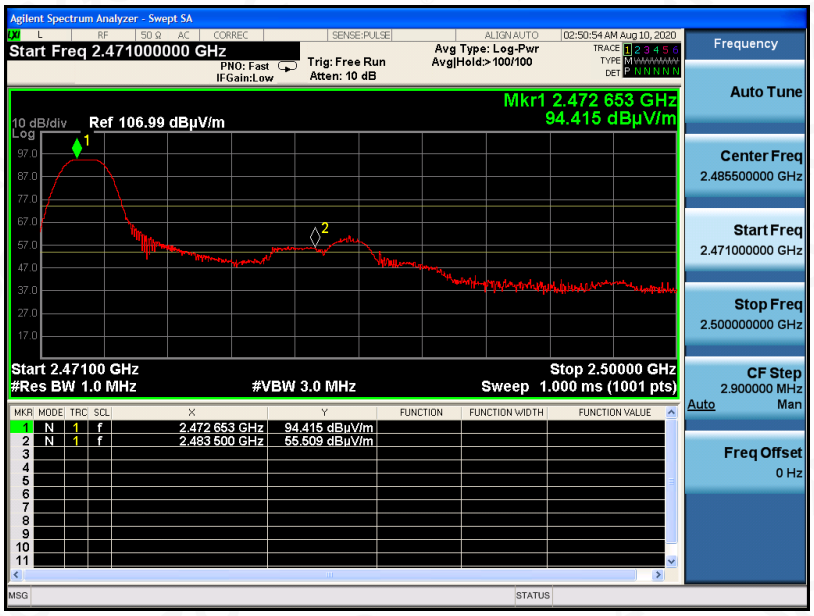
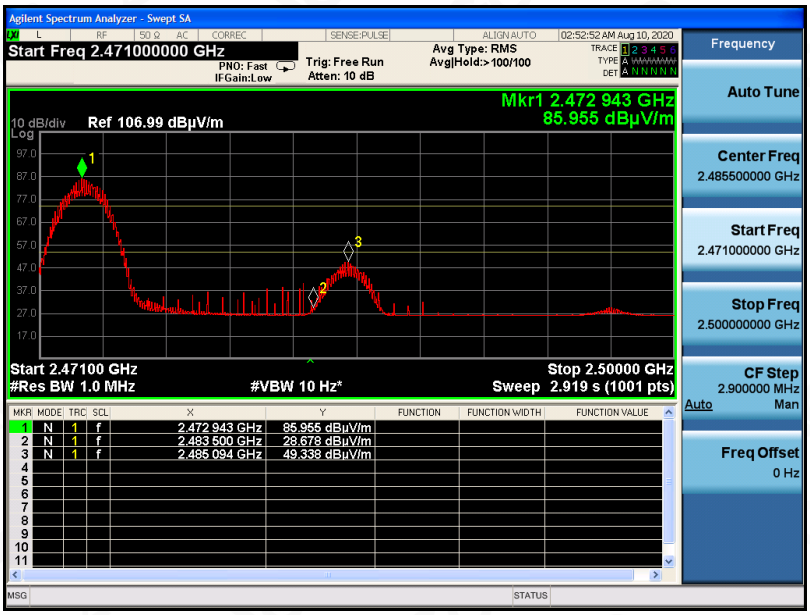
EUT	Brookstone Mini Land/Water RC Vehicle	Model Name	707556BRS
Temperature	20 ℃	Relative Humidity	48%
Pressure	1010 hPa	Test Voltage	DC 3V
Test Mode	Mode 3	Polarization	Vertical

Peak Value



Average Value



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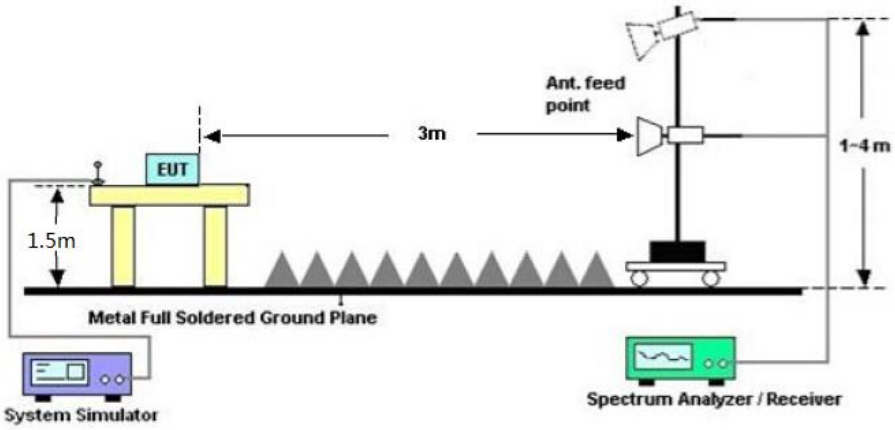
9. 20DB BANDWIDTH

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≥3×RBW.
3. Set SPA Trace 1 Max hold, then View.

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



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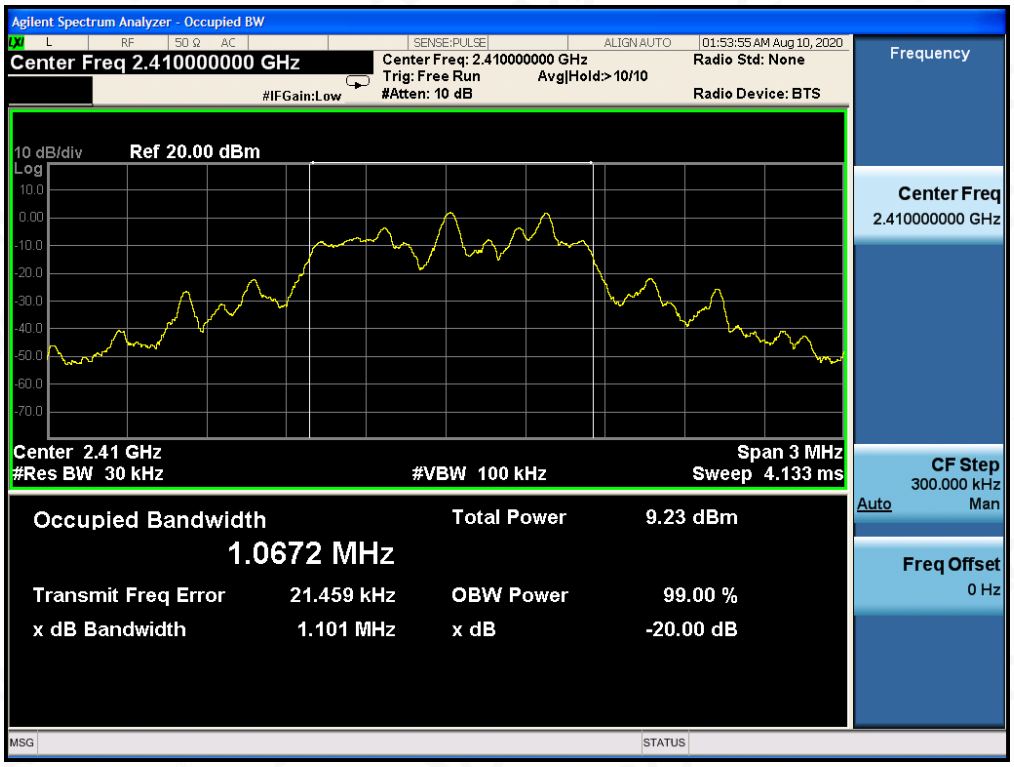
9.3. MEASUREMENT RESULTS

TEST ITEM	20DB BANDWIDTH
TEST MODULATION	GFSK

Test Data (MHz)		Criteria
Low Channel	1.101	PASS
Middle Channel	1.116	PASS
High Channel	1.125	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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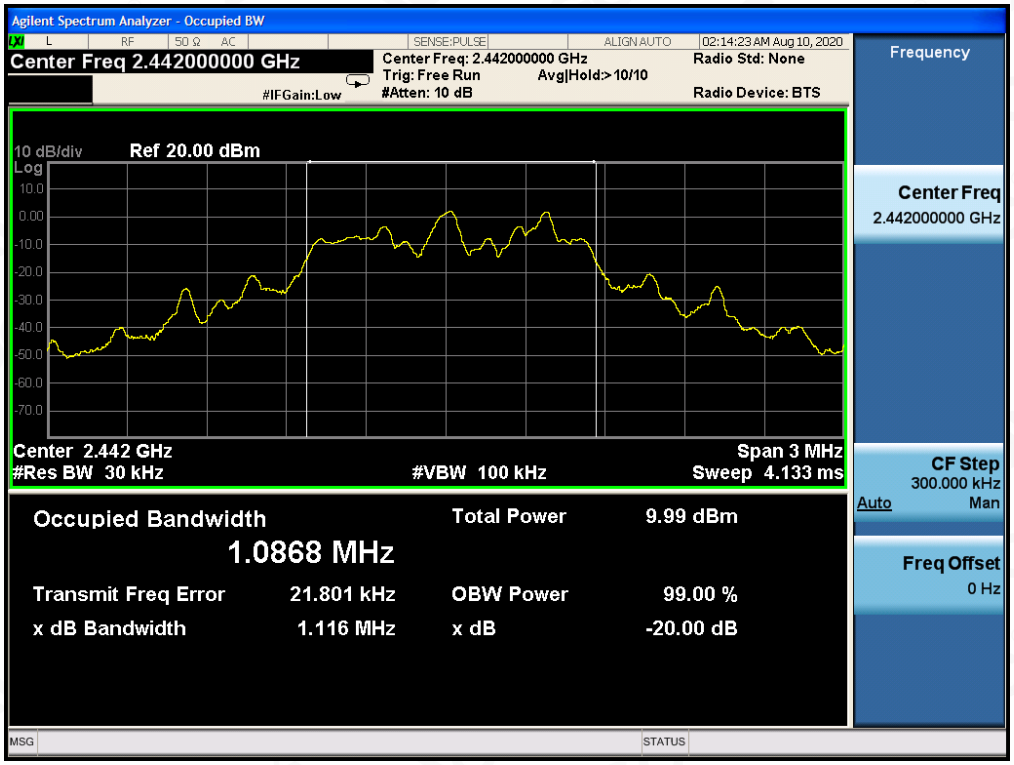
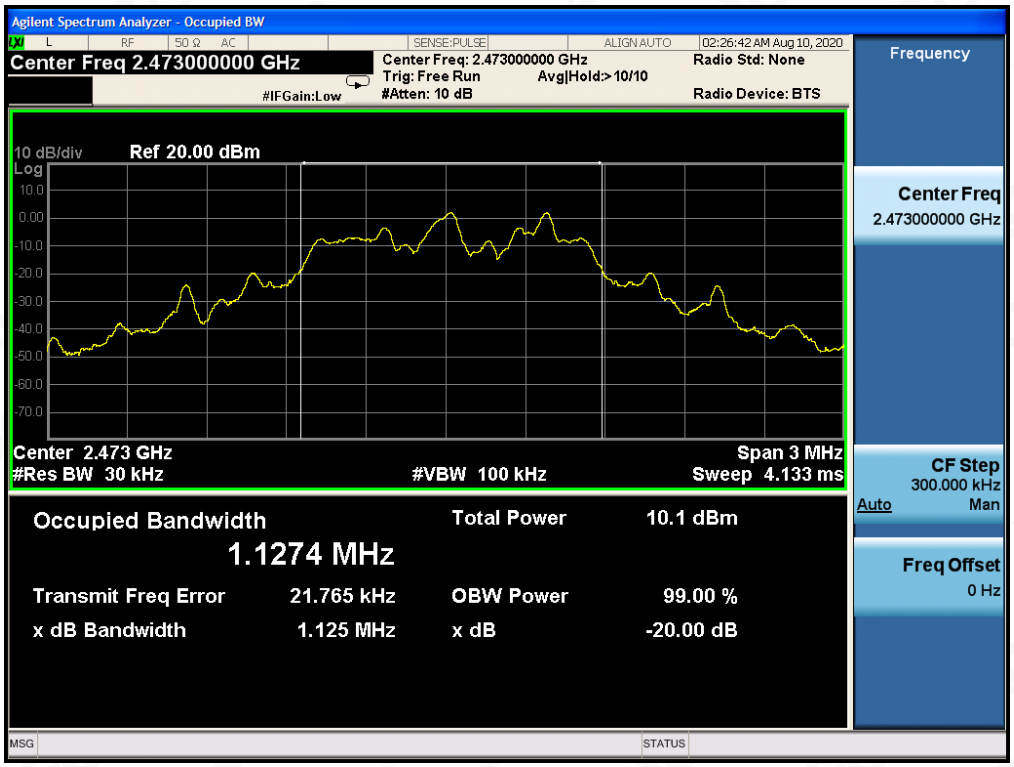
TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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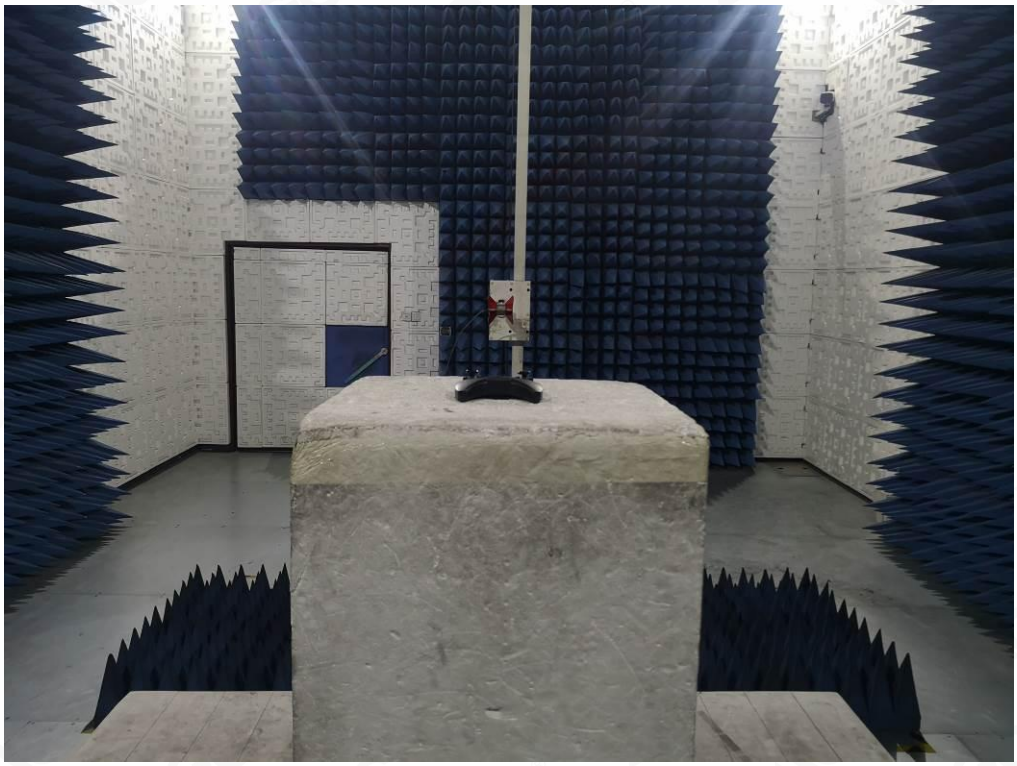
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC RADIATED EMISSION TEST SETUP BELOW 1GHZ

FCC RADIATED EMISSION TEST SETUP ABOVE 1GHZ



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APPENDIX B: PHOTOGRAPHS OF THE EUT

ALL VIEW OF EUT-1

TOP VIEW OF EUT

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BOTTOM VIEW OF EUT

FRONT VIEW OF EUT

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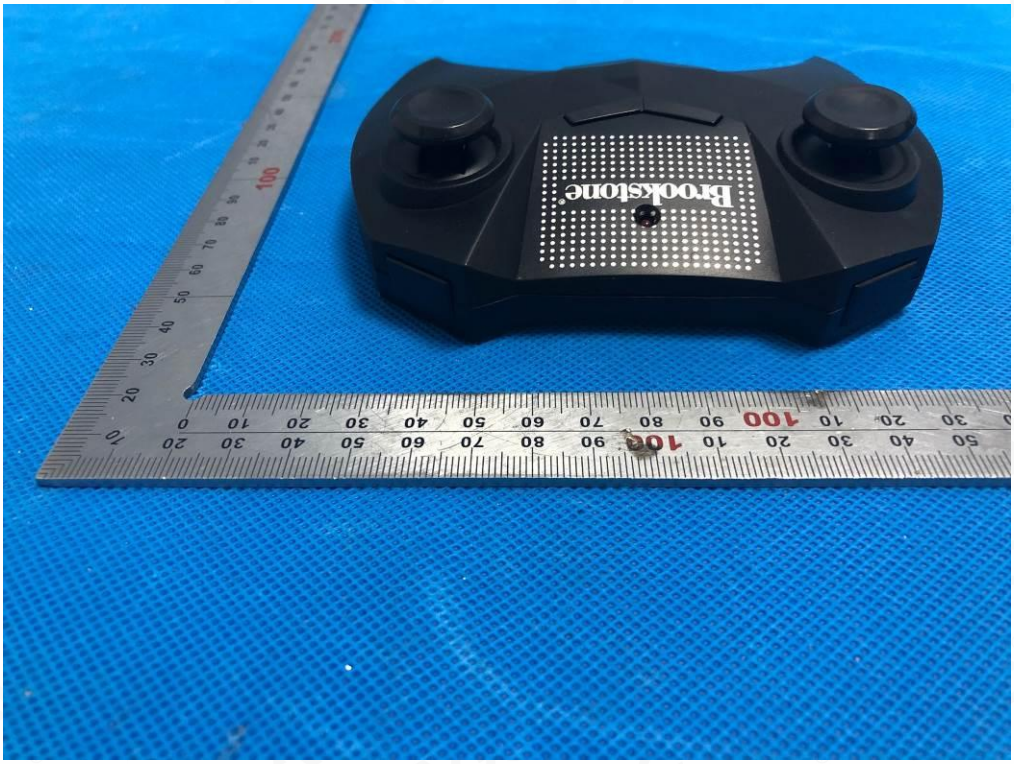
BACK VIEW OF EUT



LEFT VIEW OF EUT

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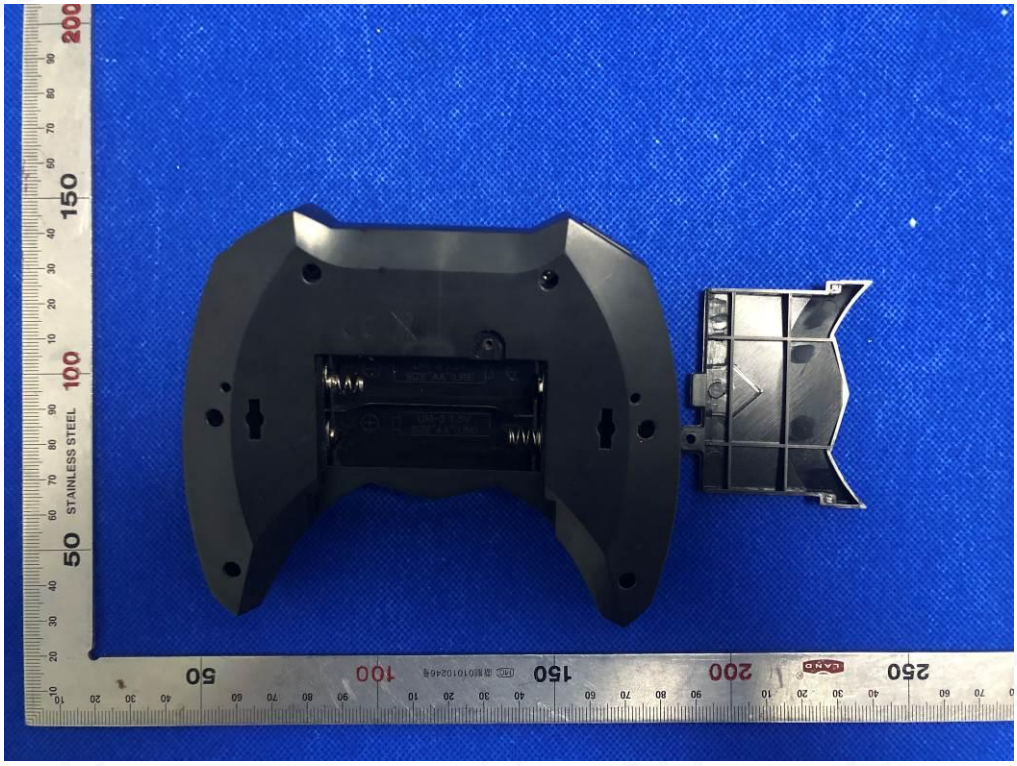
RIGHT VIEW OF EUT

OPEN VIEW OF EUT-1



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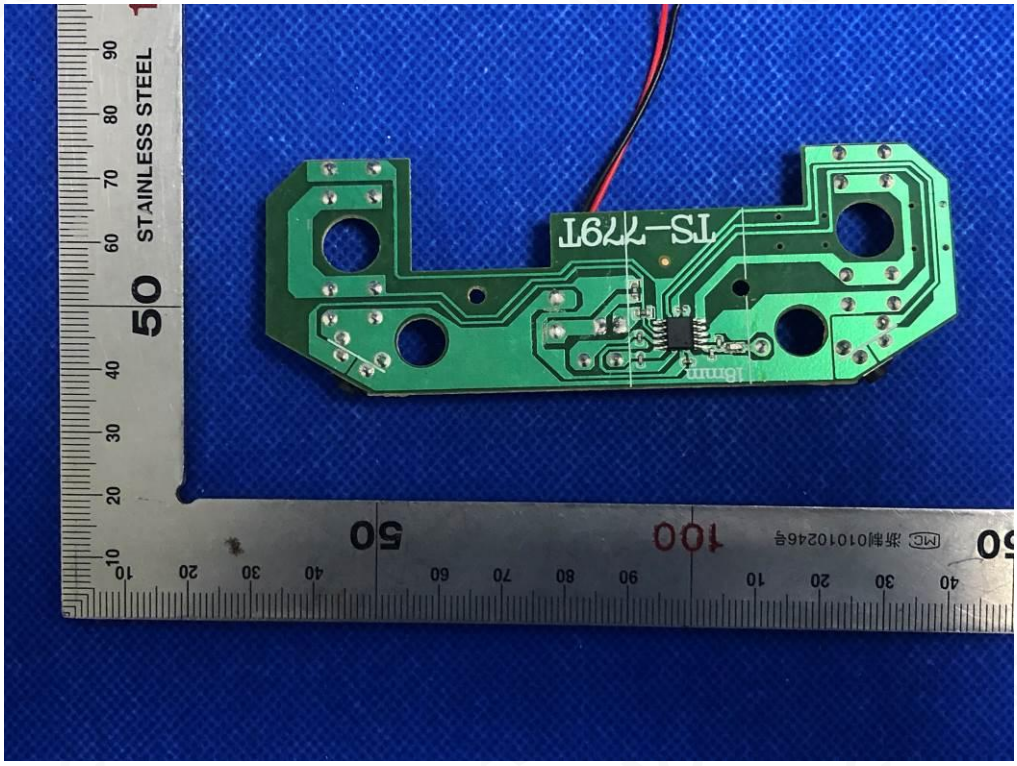
OPEN VIEW OF EUT-2

INTERNAL VIEW OF EUT-1



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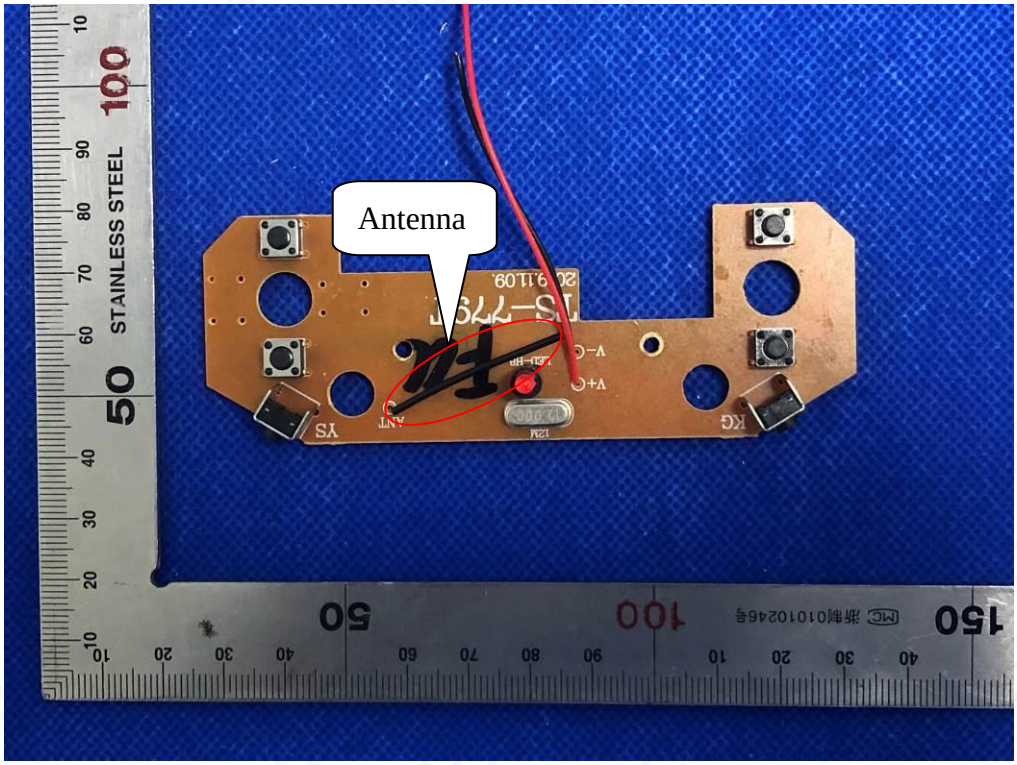
INTERNAL VIEW OF EUT-2



----END OF REPORT----

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