FCC TEST REPORT

FOR

HELIWAY TOYS

Remote Control

Test Model: 901H

Prepared for	:	HELIWAY TOYS
Address	:	WENGUAN ROAD,CHENGHAI DISTRICT,SHANTOU CITY GUANGDONG PROVINCE,CHINA
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd
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Date of receipt of test sample	:	June 12, 2017
Number of tested samples	:	1
Sample number	:	Prototype
Date of Test	:	June 12, 2017 – July 08,2017
Date of Report	:	July 10,2017

FCC TEST REPORT

FCC CFR 47 PART 15 C(15.249): 2015

Report Reference No.	**:**	**LCS170623055AE**
Date of Issue.....	:	July 10,2017
Testing Laboratory Name	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name	**:**	**HELIWAY TOYS**
Address.....	:	WENGUAN ROAD,CHENGHAI DISTRICT,SHANTOU CITY GUANGDONG PROVINCE,CHINA
Test Specification		
Standard	:	FCC CFR 47 PART 15 C(15.249): 2015 / ANSI C63.10: 2013
Test Report Form No.....	:	LCSEMC-1.0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2011-03

Test Item Description.	**:**	Remote Control
Trade Mark	:	
Test Model.....	:	901H
Ratings.....	:	DC 6.0V AA*4
**Result ..... **	**:**	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Kyle Yin/ File administrators	Dick Su/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : **LCS170623055AE**	July 10,2017 Date of issue

Test Model.....	:	901H
EUT.....	:	Remote Control
Applicant.....	:	**HELIWAY TOYS**
Address.....	:	WENGUAN ROAD,CHENGHAI DISTRICT,SHANTOU CITY GU ANGDONG PROVINCE,CHINA
Telephone.....	:	0754-85634835
Fax.....	:	0754-85635836
Manufacturer.....	:	**HELIWAY TOYS**
Address.....	:	WENGUAN ROAD,CHENGHAI DISTRICT,SHANTOU CITY GU ANGDONG PROVINCE,CHINA
Telephone.....	:	0754-85634835
Fax.....	:	0754-85635836
Factory.....	:	**HELIWAY TOYS**
Address.....	:	WENGUAN ROAD,CHENGHAI DISTRICT,SHANTOU CITY GU ANGDONG PROVINCE,CHINA
Telephone.....	:	0754-85634835
Fax.....	:	0754-85635836

Test Result	**Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
00	July 10,2017	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Remote Control
Test Model	:	901H
List Model No.	:	/
Model Declaration	:	/
2.4G	:	
Power Supply	:	operate voltage: DC 6.0V AA*4
Hardware Version	:	/
Software Version	:	/
Frequency Range	:	2415.00-2475.00 MHz
Modulation Type	:	GFSK
Antenna Description	:	Internal Antenna, 3.0dBi(Max.)

1.2. Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate
/	/	/	--	/

1.3. External I/O

I/O Port Description	Quantity	Cable
--	--	--

1.4. Description of Test Facility

CNAS Registration Number. is L4595.
FCC Registration Number. is 899208.
Industry Canada Registration Number. is 9642A-1.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001

1.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
		200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	4.00dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

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

1.7. Description Of Test Modes

The EUT operates in the unlicensed ISM band at 2.4GHz. The following operating modes were applied for the related test items.

All test modes were tested, only the result of the worst case was recorded in the report.
The EUT is considered a portable unit and was set to transmit at 100% duty cycle. It was pre-tested on the positioned of each 3 axis. The worst case was found positioned on X-plane.

Mode of Operations	Transmitting Frequency (MHz)
GFSK	2415
	2444
	2475
For Conducted Emission	
Test Mode	N/A
For Radiated Emission	
Test Mode	TX Mode

Worst-case mode and channel used for 150kHz-30 MHz power line conducted emissions was the mode and channel with the highest output power, that was determined to be TX-2415MHz.

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be TX-2415MHz.

***Note: Using a temporary antenna connector for the EUT when the conducted measurements are performed.

Channel List & Frequency:

Frequency Band	Type 1: Frequency(MHz)		
2404~2478MHz	2415	2444	2475

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10: 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd..

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 that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.249 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

According to the requirements in Section 6.2 of ANSI C63.10: 2013, AC power-line conducted emissions shall be measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table and the turntable 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 maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10: 2013

3. CONNECTION DIAGRAM OF TEST SYSTEM

3.1. Justification

The system was configured for testing in a continuous transmit condition. Continuous transmitting was pre-programmed. it'll keep transmitting with modulated signal at the lowest channel by installing the batter. when press the "A" button, it'll move to the next channel. Repeat press "A" button, it'll transmitting at each of the channel used.

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Power Line Conducted Emissions	Compliant
§15.205(a), §15.209(a), §15.249(a), §15.249(c)	Radiated Emissions Measurement	Compliant
§15.205	Band Edges Measurement	Compliant
§15.249	Conducted Emissions Measurement	N/A
§15.249, §15.215	20 dB Bandwidth	Compliant

5. SUMMARY OF TEST EQUIPMENT

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Cal Date	Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	June 18,2017	June 17,2018
EMC TEST SOFTWARE	AUDIX	E3	N/A	N/A	N/A	N/A
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	July 16,2016	July 15,2017
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	June 18,2017	June 17,2018
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	June 18,2017	June 17,2018
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	June 18,2017	June 17,2018
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	June 18,2017	June 17,2018
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-1GHz 3m	June 18,2017	June 17,2018
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHzz	June 18,2017	June 17,2018
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	July 16,2016	July 15,2017
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16,2016	July 15,2017
Spectrum Analyzer	Agilent	E4407B	MY41440292	9k-26.5GHz	July 16,2016	July 15,2017
MAX Signal Analyzer	Agilent	N9020A	MY50510140	20Hz~26.5GHz	Oct. 27, 2016	Oct. 26, 2017
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	June 18,2017	June 17,2018
By-log Antenna	SCHWARZBECK	VULB9163	9163-470	30MHz-1GHz	June 10,2017	June 09,2018
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	June 10,2017	June 09,2018
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz-40GHz	June 10,2017	June 09,2018
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	June 18,2017	June 17,2018
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	June 18,2017	June 17,2018
Power Meter	R&S	NRVS	100444	DC-40GHz	June 18,2017	June 17,2018
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	June 18,2017	June 17,2018
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	June 18,2017	June 17,2018
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	June 18,2017	June 17,2018
RF CABLE-2m	JYE Bao	RG142	CB035-2m	20MHz-1GHz	June 18,2017	June 17,2018
Note: All equipment through GRGT EST calibration						

6. ANTENNA REQUIREMENT

6.1. Standard Applicable

According to § 15.203, An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

6.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is 3.0dBi, and the antenna is connect to PCB board and no consideration of replacement. Please see EUT photo for details.

Result: Compliance.

7. RADIATED EMISSION MEASUREMENT

7.1. Standard Applicable

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) and 15.249 limit in the table below has to be followed.

Fundamental Frequency	Field Strength of fundamental (millivolts/meter)	Field Strength of harmonics (microvolts/meter)
902-928MHz	50	500
2400-2483.5MHz	50	500
5725-5875MHz	50	500
24.0-24.25GHz	250	2500

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

7.2. Instruments Setting

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

Spectrum Parameter	Setting
Attenuation	Auto
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

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1000KHz / 1000KHz for peak

7.3. Test Procedure

1) **Sequence of testing 9 kHz to 30 MHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) **Sequence of testing 30 MHz to 1 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) **Sequence of testing 1 GHz to 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height is 1.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum found antenna polarisation and turntable position of the premeasurement the software maximizes the peaks by rotating the turntable position (0° to 360°). This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps). This procedure is repeated for both antenna polarisations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) **Sequence of testing above 18 GHz**

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

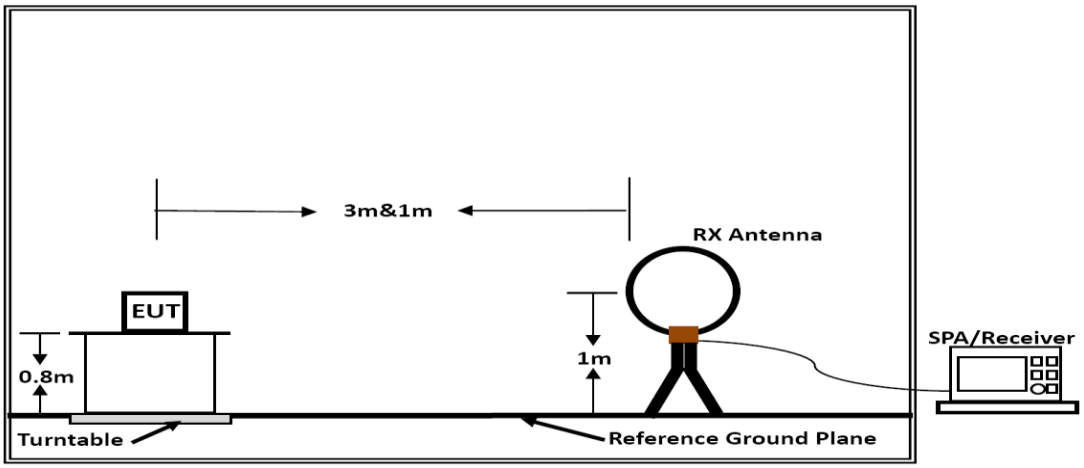
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

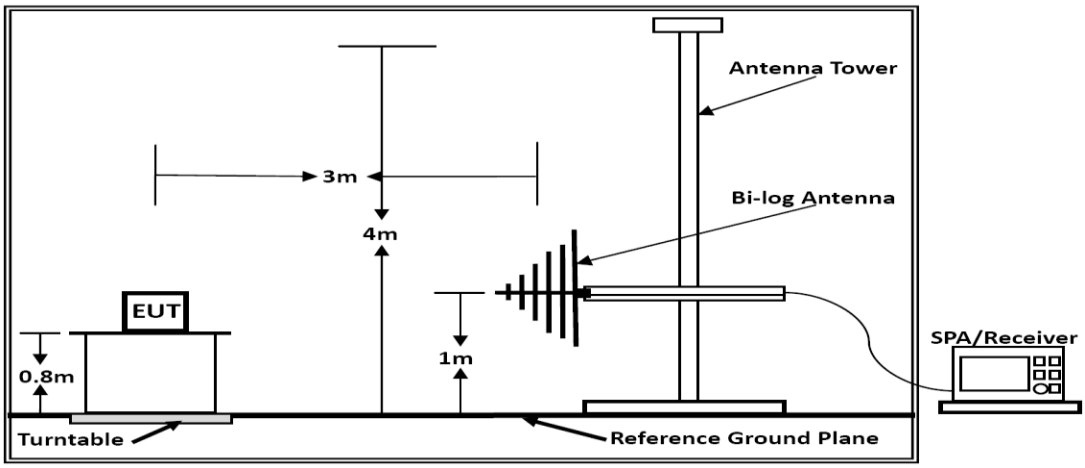
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and RMS detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

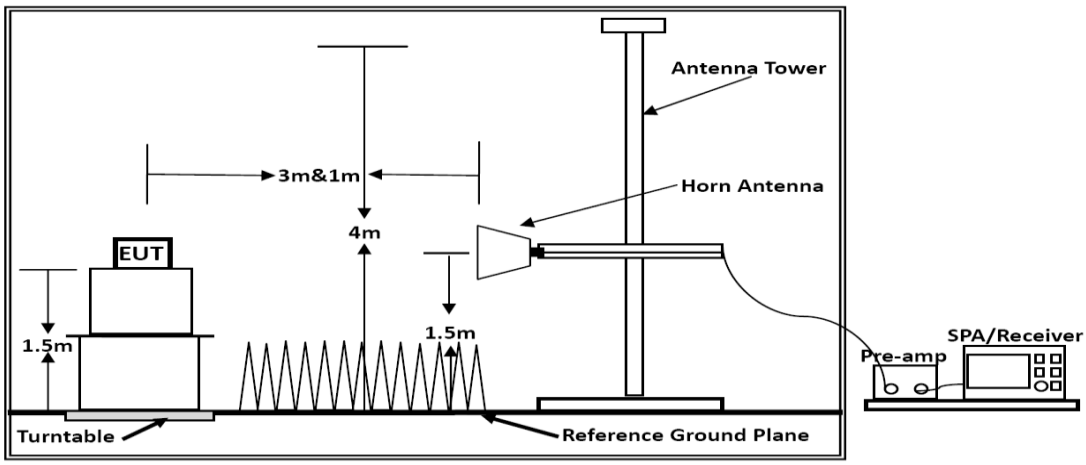
7.4. Block Diagram of Test Setup



Below 30MHz



Below 1GHz



Above 1GHz

7.5. Test Results

Results of Radiated Emissions (9kHz~30MHz)

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

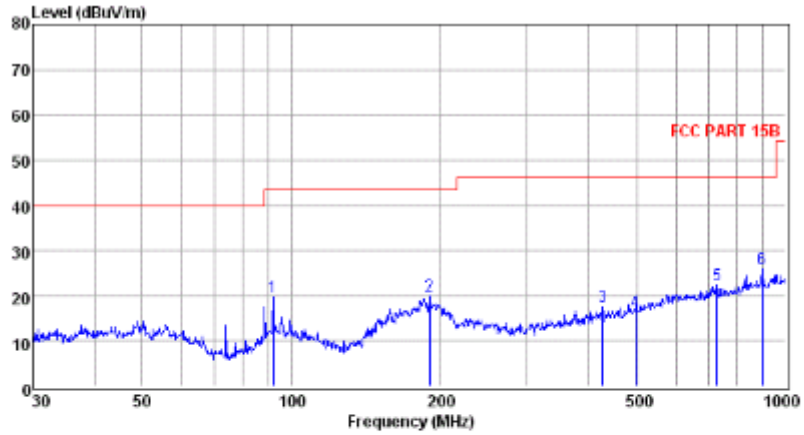
Note:

The radiated emissions from 9kHz to 30MHz are at least 20dB below the official limit and no need to report.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB); Limit line = specific limits (dBuV) + distance extrapolation factor.

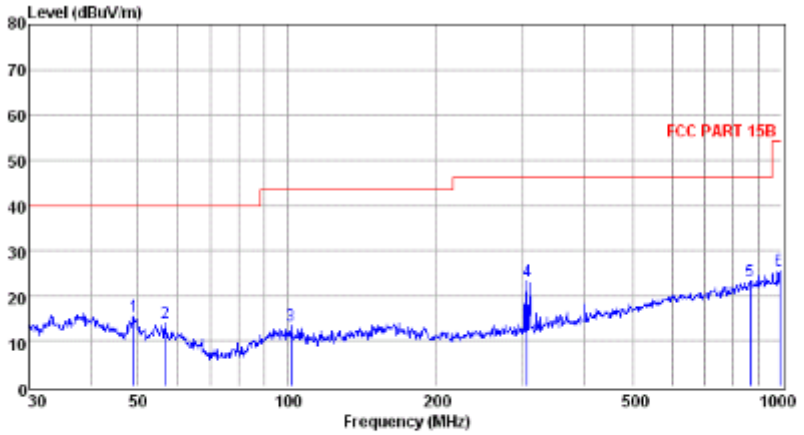
Results of Radiated Emissions (30MHz~1000MHz)

Temperature	25.6℃	Humidity	50.4%
Test Engineer	Kyle Yin	Test Date	July 07,2017
Test Mode	TX-2415MHz		



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	92.14	6.65	0.56	12.30	19.51	43.50	-23.99	QP
2	190.41	8.49	0.86	10.56	19.91	43.50	-23.59	QP
3	426.52	0.54	1.39	15.50	17.43	46.00	-28.57	QP
4	497.68	-1.45	1.34	16.52	16.41	46.00	-29.59	QP
5	726.81	1.47	1.70	19.15	22.32	46.00	-23.68	QP
6	897.00	2.92	1.97	21.06	25.95	46.00	-20.05	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported



1	49.01	1.80	0.35	13.31	15.46	40.00	-24.54	QP
2	56.59	0.57	0.47	12.91	13.95	40.00	-26.05	QP
3	101.64	-0.34	0.60	13.01	13.27	43.50	-30.23	QP
4	305.68	8.97	1.05	13.14	23.16	46.00	-22.84	QP
5	863.06	0.75	1.84	20.71	23.30	46.00	-22.70	QP
6	993.01	1.98	1.88	21.69	25.55	54.00	-28.45	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Notes: Only record the worst case.

7.6. Results for Radiated Emissions (Above 1GHz)

Field Strength Of Fundamental (TX-2415MHz)						
Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Result
2415.00	H	87.68	81.27	114	94	Pass
2415.00	V	83.89	78.45	114	94	Pass

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4830.00	43.64	33.18	35.27	4.11	54.28	74	-19.72	Peak	Horizontal
4830.00	35.36	33.18	35.27	4.11	41.36	54	-12.64	Average	Horizontal
12075.00	47.27	36.83	35.61	10.75	55.74	74	-18.26	Peak	Horizontal
12075.00	35.71	36.83	35.61	10.75	41.28	54	-12.72	Average	Horizontal
16905.00	54.08	36.75	35.89	12.39	56.58	74	-17.42	Peak	Horizontal
16905.00	40.57	36.75	35.89	12.39	45.18	54	-8.82	Average	Horizontal
24150.00	44.74	36.82	35.75	14.39	57.26	74	-16.74	Peak	Horizontal
24150.00	34.04	36.82	35.75	14.39	42.56	54	-11.44	Average	Horizontal
4830.00	44.32	33.18	35.27	4.11	56.47	74	-17.53	Peak	Vertical
4830.00	34.47	33.18	35.27	4.11	45.71	54	-8.29	Average	Vertical
12075.00	56.18	36.83	35.61	10.75	55.24	74	-18.76	Peak	Vertical
12075.00	40.61	36.83	35.61	10.75	41.69	54	-12.31	Average	Vertical
16905.00	44.12	36.75	35.89	12.39	56.21	74	-17.79	Peak	Vertical
16905.00	35.18	36.75	35.89	12.39	40.28	54	-13.72	Average	Vertical
24150.00	47.73	36.82	35.75	14.39	54.89	74	-19.11	Peak	Vertical
24150.00	36.36	36.82	35.75	14.39	39.77	54	-14.23	Average	Vertical

Field Strength Of Fundamental (TX-2444MHz)						
Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Result
2444.00	H	87.32	81.26	114	94	Pass
2444.00	V	82.88	76.79	114	94	Pass

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4888.00	43.65	33.16	35.15	3.96	56.74	74	-17.26	Peak	Horizontal
4888.00	35.83	33.16	35.15	3.96	41.53	54	-12.47	Average	Horizontal
12220.00	47.30	36.52	35.37	10.22	53.27	74	-20.73	Peak	Horizontal
12220.00	35.37	36.52	35.37	10.22	40.69	54	-13.31	Average	Horizontal
17108.00	53.00	36.60	35.53	12.20	54.78	74	-19.22	Peak	Horizontal
17108.00	40.58	36.60	35.53	12.20	40.69	54	-13.31	Average	Horizontal
24440.00	45.24	36.68	35.66	14.10	57.33	74	-16.67	Peak	Horizontal
24440.00	33.56	36.68	35.66	14.10	41.44	54	-12.56	Average	Horizontal
4888.00	46.15	33.16	35.15	3.96	50.79	74	-23.21	Peak	Vertical
4888.00	35.81	33.16	35.15	3.96	38.25	54	-15.75	Average	Vertical
12220.00	55.93	36.52	35.37	10.22	51.22	74	-22.78	Peak	Vertical
12220.00	40.04	36.52	35.37	10.22	40.67	54	-13.33	Average	Vertical
17108.00	44.46	36.60	35.53	12.20	52.47	74	-21.53	Peak	Vertical
17108.00	35.77	36.60	35.53	12.20	41.25	54	-12.75	Average	Vertical
24440.00	48.25	36.68	35.66	14.10	51.25	74	-22.75	Peak	Vertical
24440.00	35.07	36.68	35.66	14.10	40.67	54	-13.33	Average	Vertical

Field Strength Of Fundamental (TX-2475MHz)						
Frequency (MHz)	Pol.	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Result
2475.00	H	87.68	79.28	114	94	Pass
2475.00	V	83.59	77.88	114	94	Pass

Freq. MHz	Reading dBuv	Ant. Fac dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
4950.00	44.02	33.13	35.04	3.87	54.27	74	-19.73	Peak	Horizontal
4950.00	36.04	33.13	35.04	3.87	40.28	54	-13.72	Average	Horizontal
12375.00	48.02	36.34	35.25	10.13	51.23	74	-22.77	Peak	Horizontal
12375.00	36.14	36.34	35.25	10.13	39.67	54	-14.33	Average	Horizontal
17325.00	53.86	36.55	35.39	12.17	56.28	74	-17.72	Peak	Horizontal
17325.00	39.81	36.55	35.39	12.17	41.28	54	-12.72	Average	Horizontal
24750.00	44.88	36.56	35.58	14.14	52.08	74	-21.92	Peak	Horizontal
24750.00	32.98	36.56	35.58	14.14	42.22	54	-11.78	Average	Horizontal
4950.00	45.92	33.13	35.04	3.87	51.31	74	-22.69	Peak	Vertical
4950.00	34.93	33.13	35.04	3.87	40.69	54	-13.31	Average	Vertical
12375.00	55.78	36.34	35.25	10.13	54.21	74	-19.79	Peak	Vertical
12375.00	40.49	36.34	35.25	10.13	39.54	54	-14.46	Average	Vertical
17325.00	44.20	36.55	35.39	12.17	53.21	74	-20.79	Peak	Vertical
17325.00	35.15	36.55	35.39	12.17	38.37	54	-15.63	Average	Vertical
24750.00	48.38	36.56	35.58	14.14	54.17	74	-19.83	Peak	Vertical
24750.00	36.26	36.56	35.58	14.14	39.54	54	-14.46	Average	Vertical

Notes: Only record the worst case.

1. Measuring frequencies from 9k~10th harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30MHz.

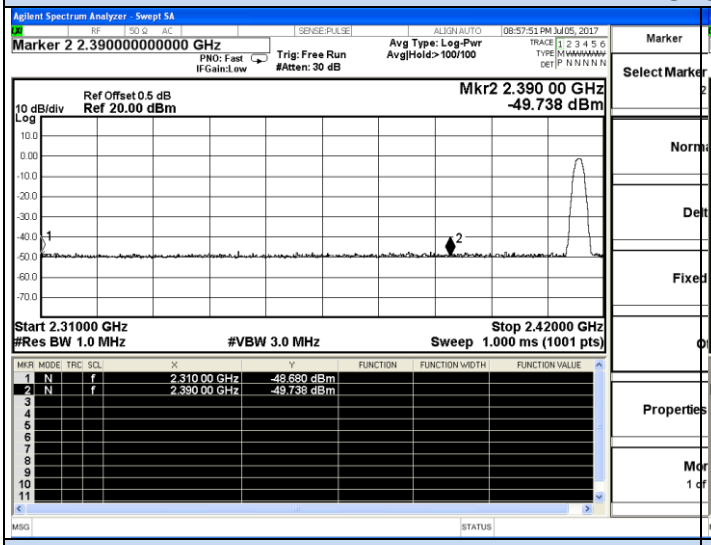
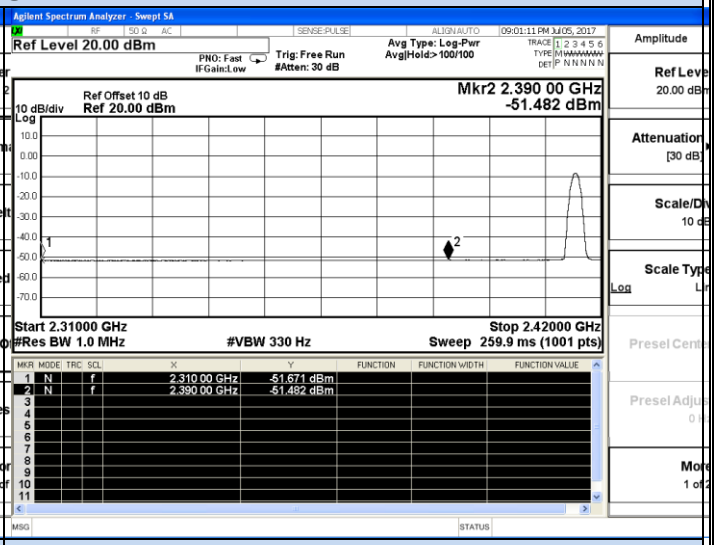
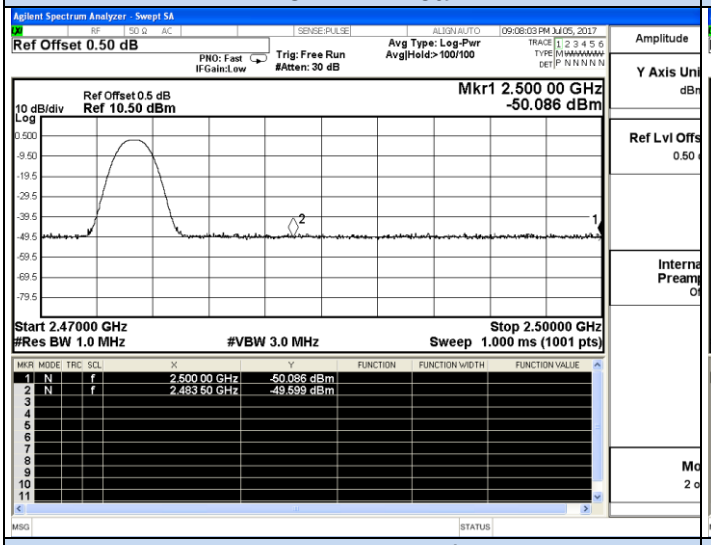
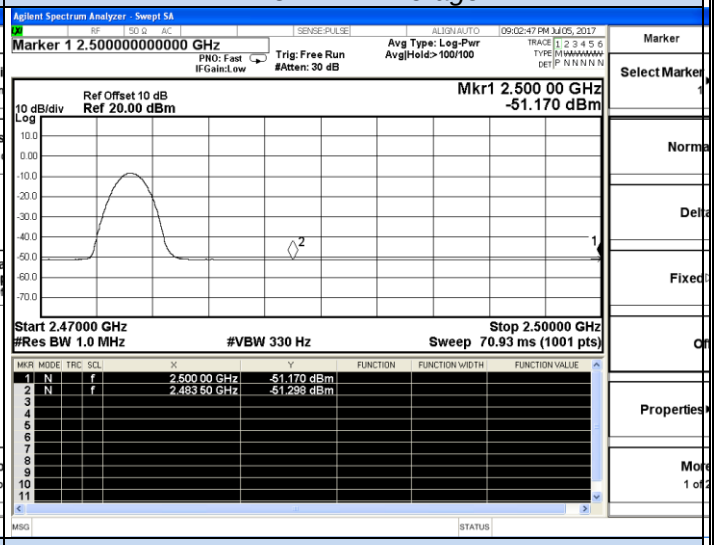
2. Radiated emissions measured in frequency range from 9k~10th harmonic (ex. 26GHz) were made with an instrument using Peak detector mode.

3. No emission was be recorded above 18GHz means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

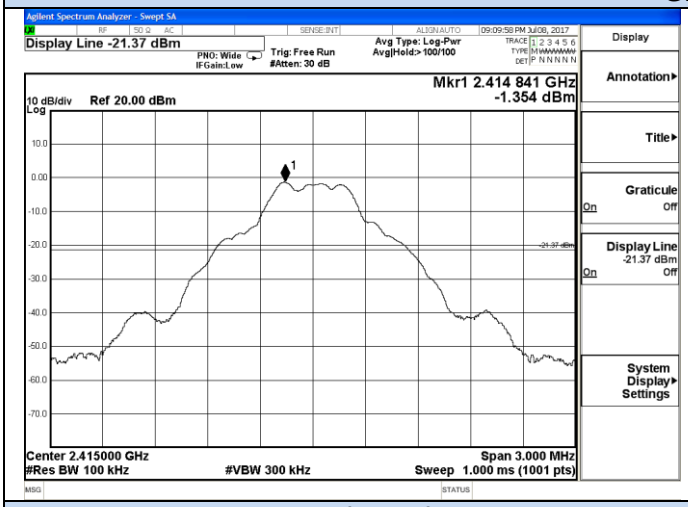
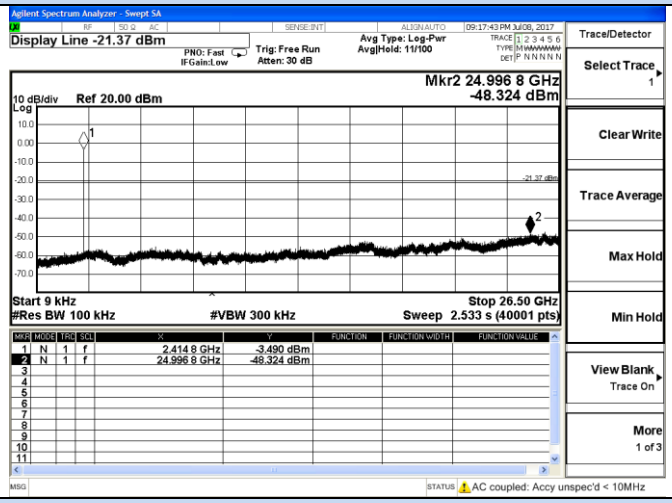
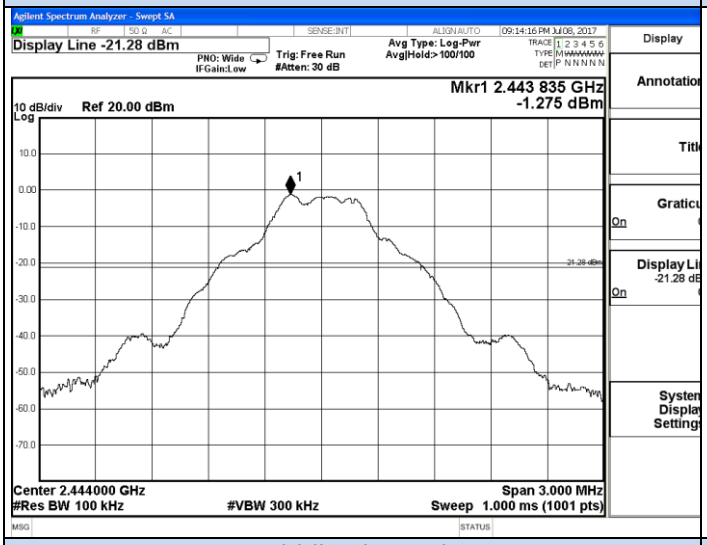
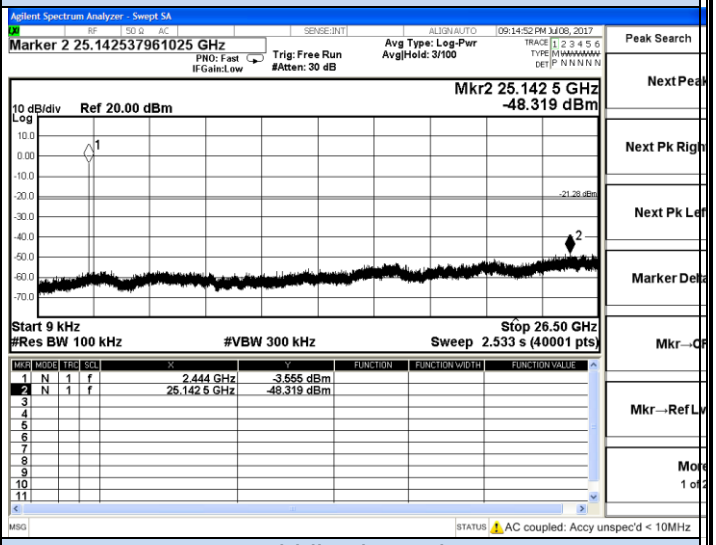
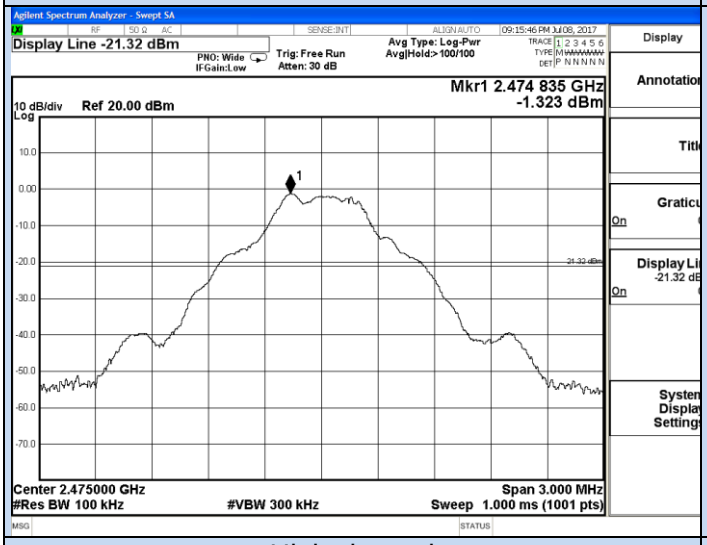
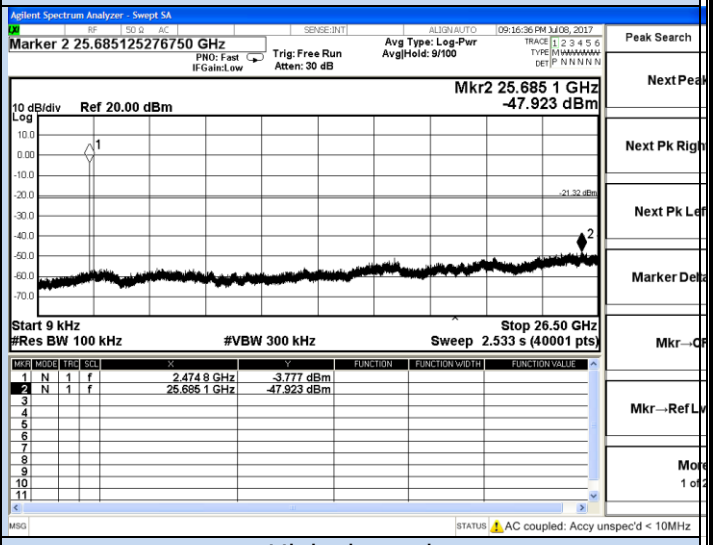
7.7. Results for Band edge Testing (Radiated)

Temperature	25.6℃	Humidity	50.4%
Test Engineer	Kyle Yin	Test Date	July 07,2017

Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	Ground Reflection Factor (dB)	Covert Radiated E Level At 3m (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
GFSK-Low channel							
2310.000	-48.680	3.0	0.0	49.52	Peak	74.00	PASS
2310.000	-51.671	3.0	0.0	46.53	AV	54.00	PASS
2390.000	-49.738	3.0	0.0	48.46	Peak	74.00	PASS
2390.000	-51.482	3.0	0.0	46.72	AV	54.00	PASS
GFSK-High channel							
2483.500	-49.599	3.0	0.0	48.60	Peak	74.00	PASS
2483.500	-51.298	3.0	0.0	46.90	AV	54.00	PASS
2500.000	-50.086	3.0	0.0	48.11	Peak	74.00	PASS
2500.000	-51.170	3.0	0.0	47.03	AV	54.00	PASS

Band-edge measurements for radiated emissions	
GFSK	
	
2415 MHz – Peak	*2415 MHz –Average*
	
2475 MHz – Peak	*2475 MHz –Average*

8. CONDUCTED EMISSION

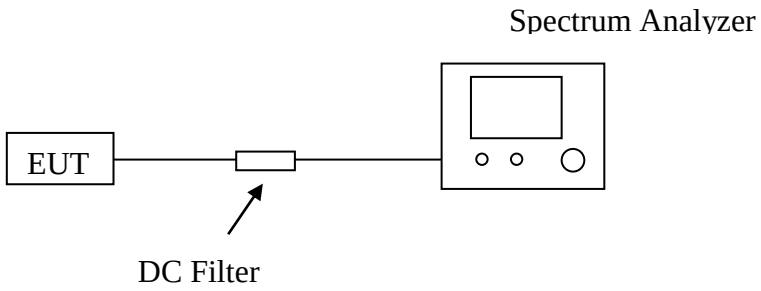
conducted emissions	
GFSK	
	
Low channel	Low channel
	
Middle channel	Middle channel
	
High channel	High channel

9. 20 DB BANDWIDTH MEASUREMENT

9.1. Standard Applicable

According to §15.215

9.2. Block Diagram of Test Setup



9.3. Test Procedure

Use the following spectrum analyzer settings:

Span = 3MHz

RBW = 30KHz

VBW = 100KHz

Sweep = auto

Detector function = peak

Trace = max hold

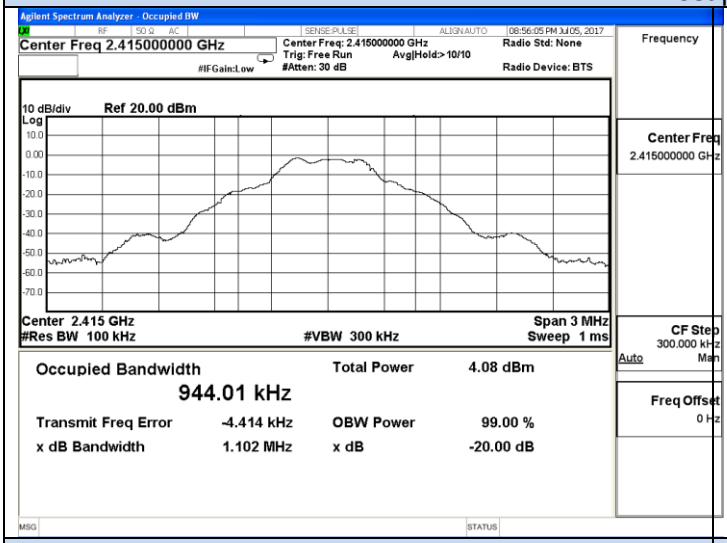
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

9.4. Test Results

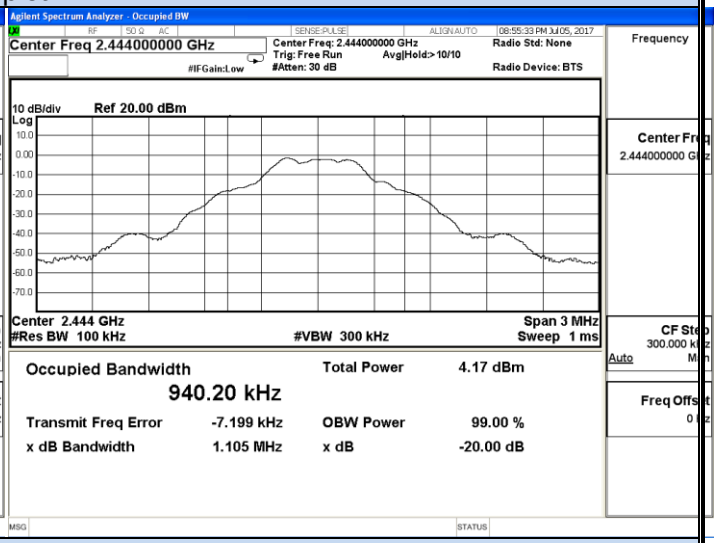
Temperature	25.6℃	Humidity	50.4%
Test Engineer	Kyle Yin	Test Date	June 13, 2017

Test Result Of 20dB Bandwidth Measurement		
Test Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)
2404	1.102	Non-Specified
2444	1.105	Non-Specified
2478	1.112	Non-Specified

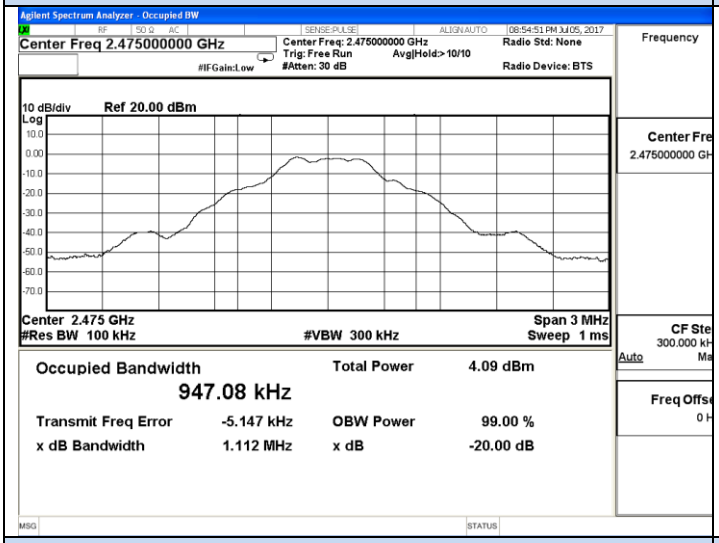
Test plot



Low channel



Middle channel



High channel

10. AC POWER LINE CONDUCTED EMISSIONS

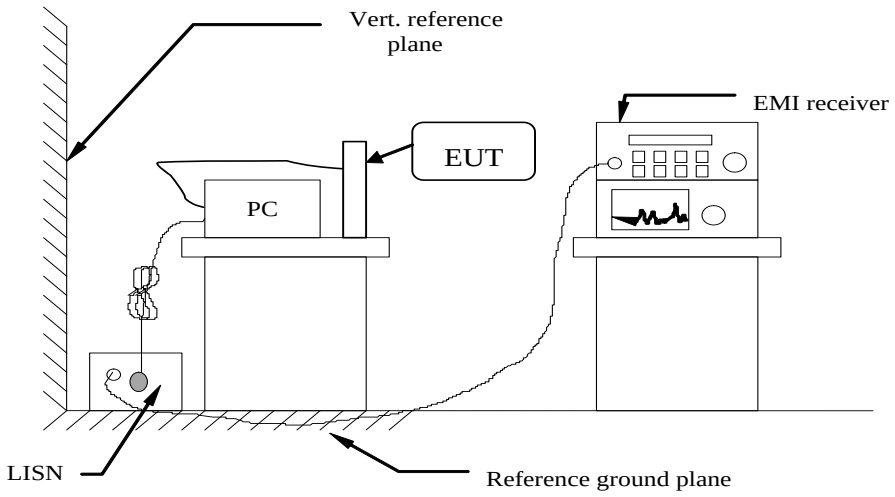
10.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	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

* Decreasing linearly with the logarithm of the frequency

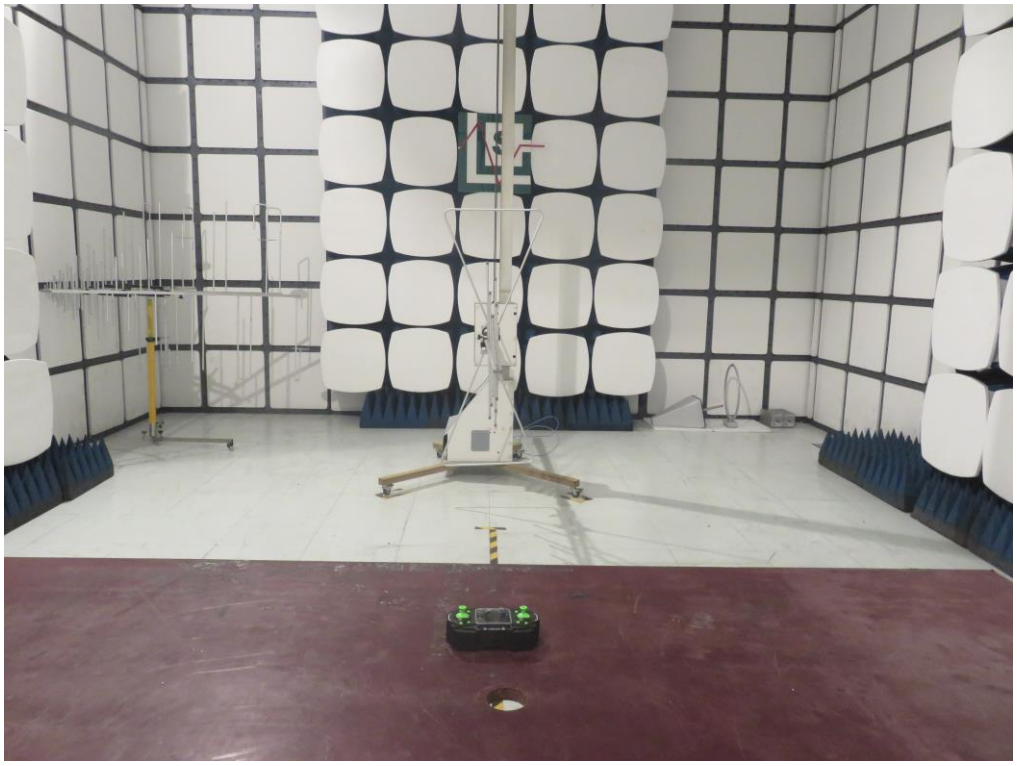
10.2 Block Diagram of Test Setup

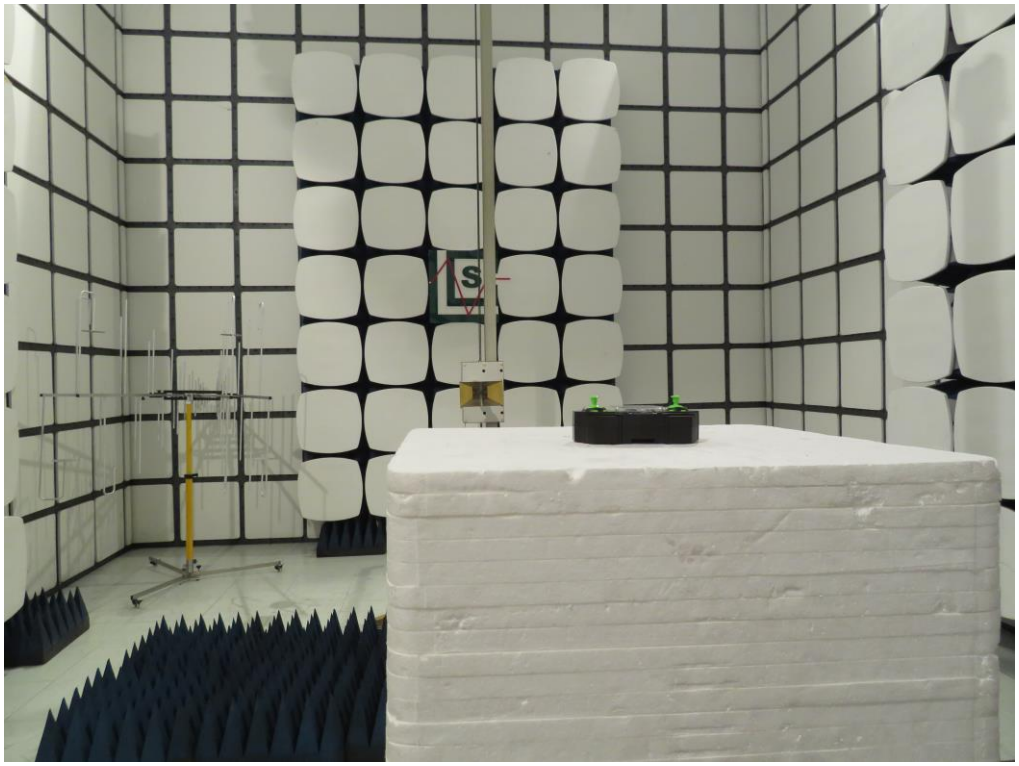


10.3 Test Results

The EUT under test is not applicable.

11. TEST SETUP PHOTOGRAPHS





12. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Fig. 1

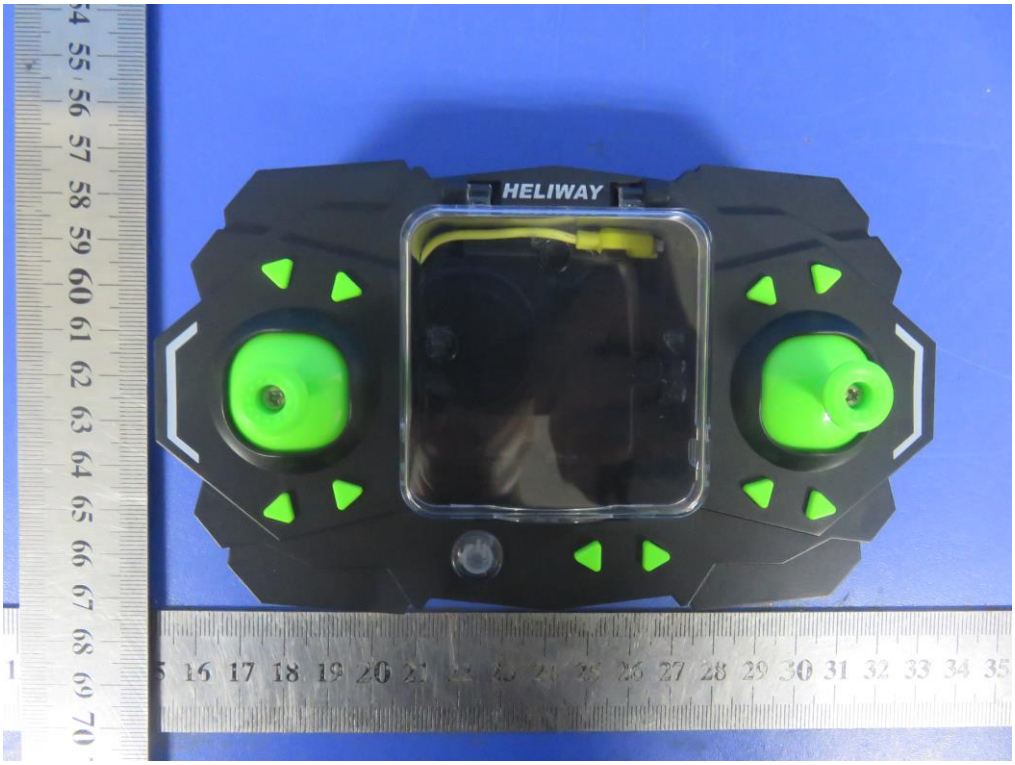


Fig. 2

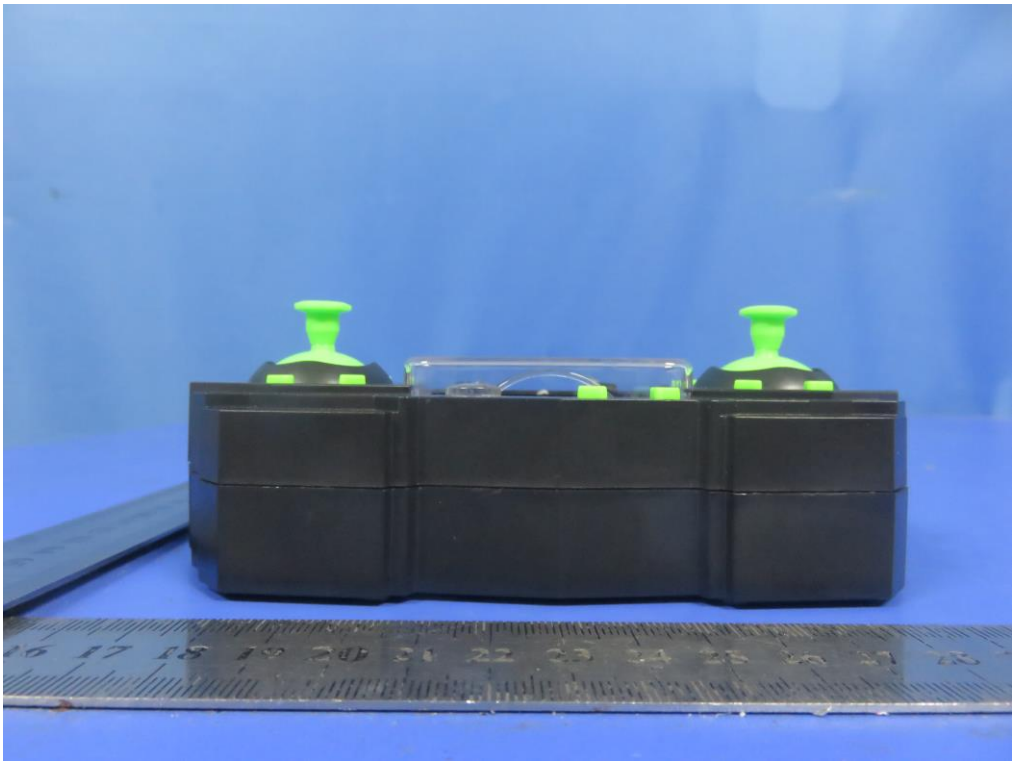


Fig. 3

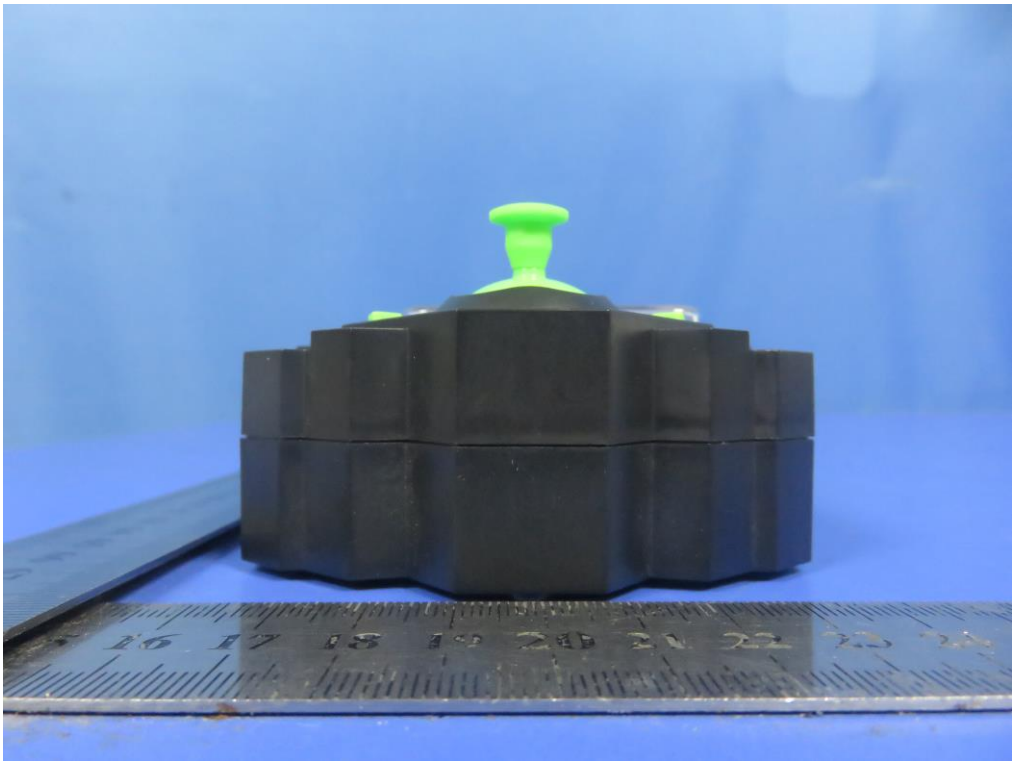


Fig. 4

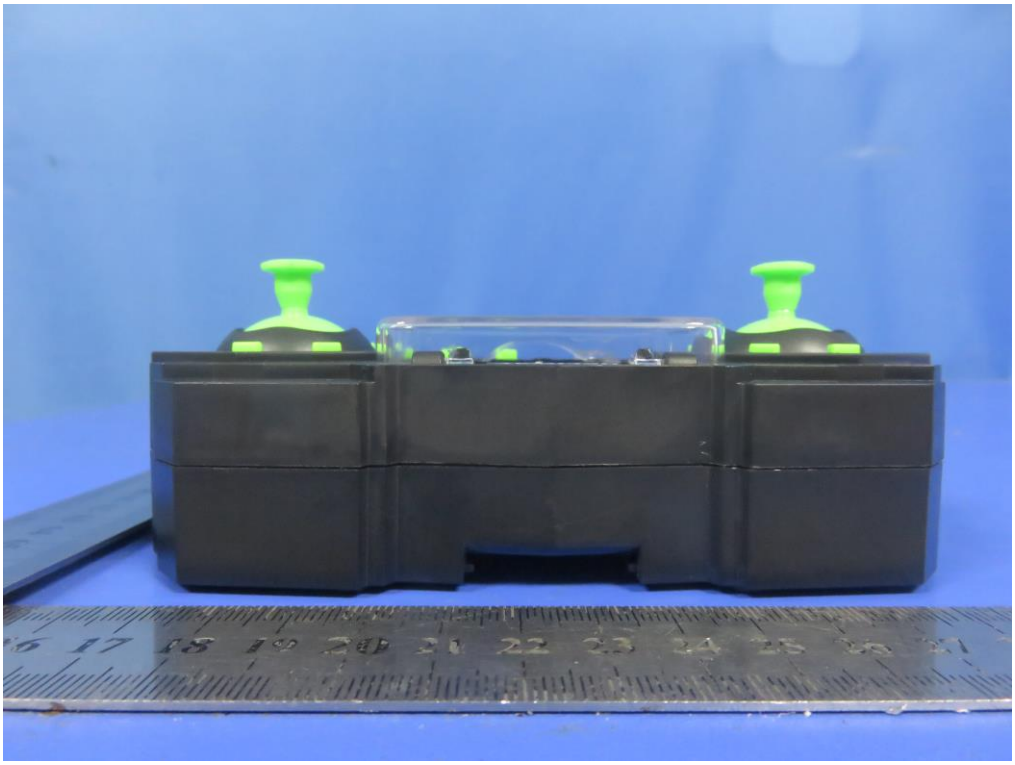


Fig. 5

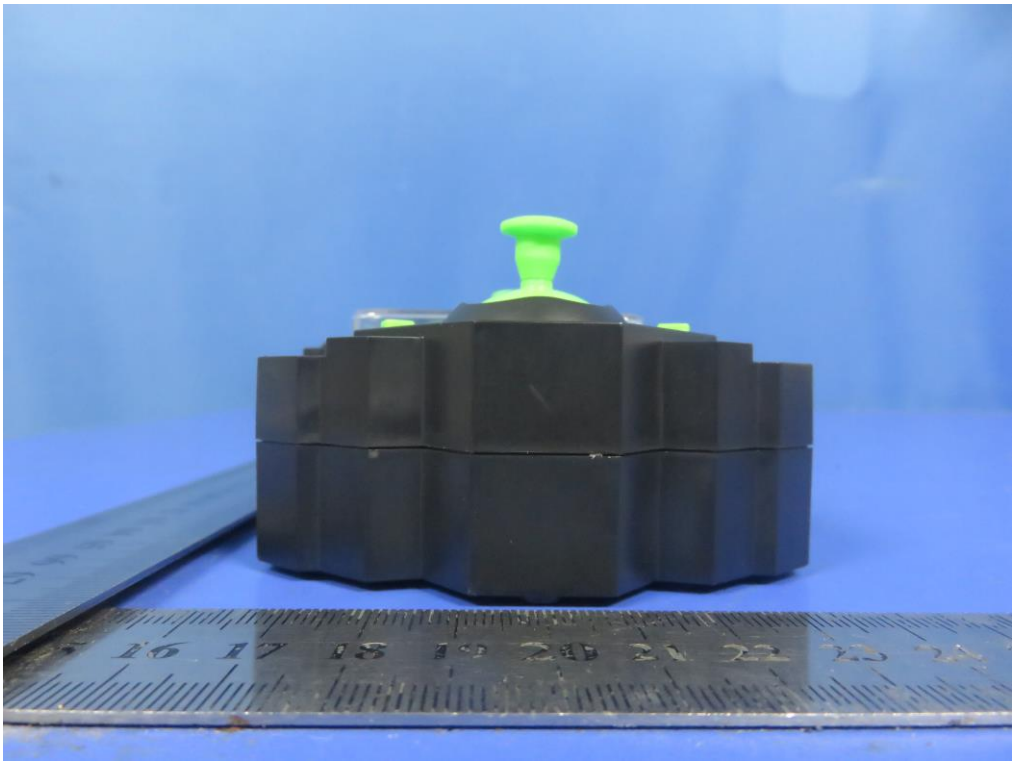


Fig. 6

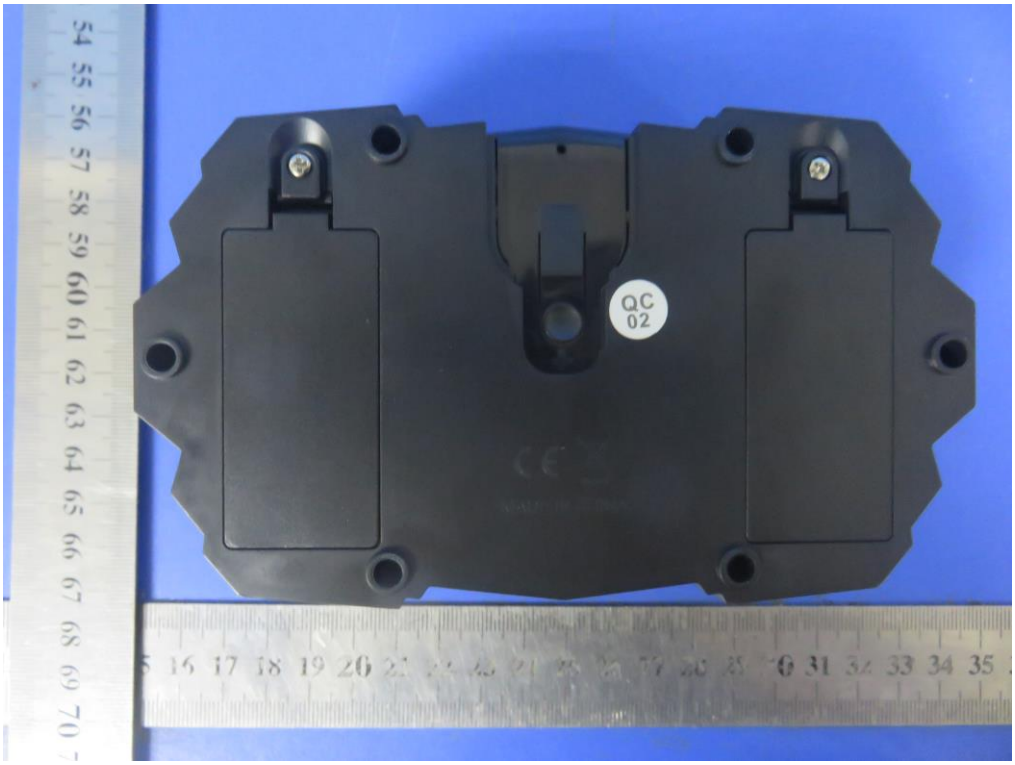


Fig. 7

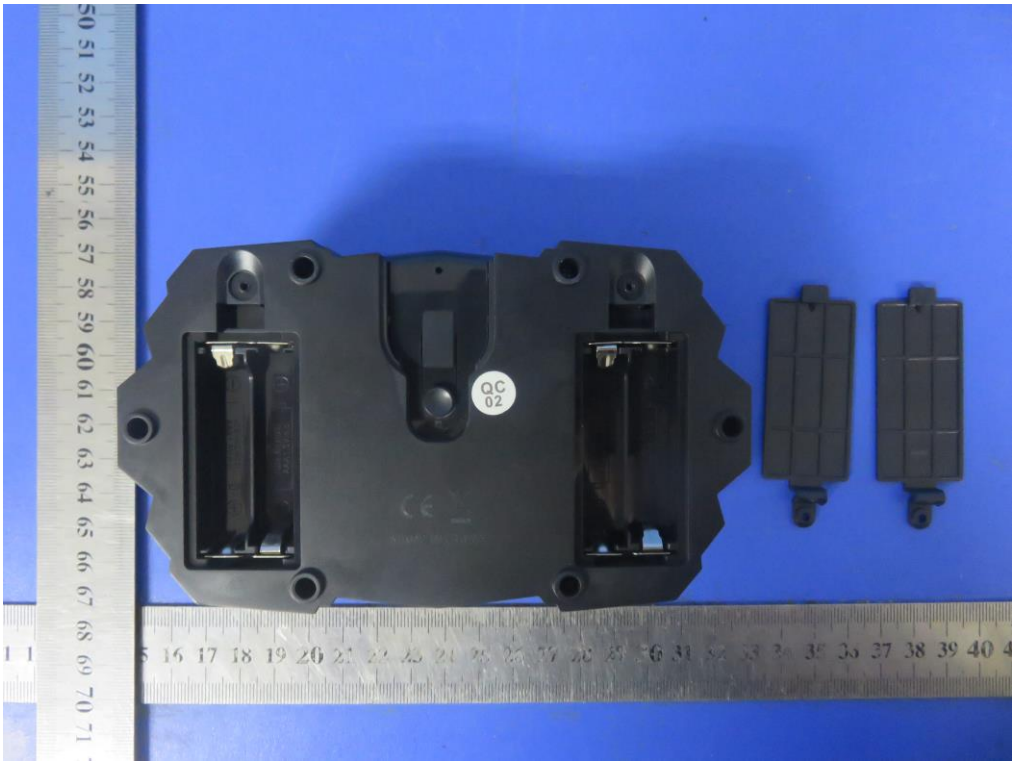


Fig. 8

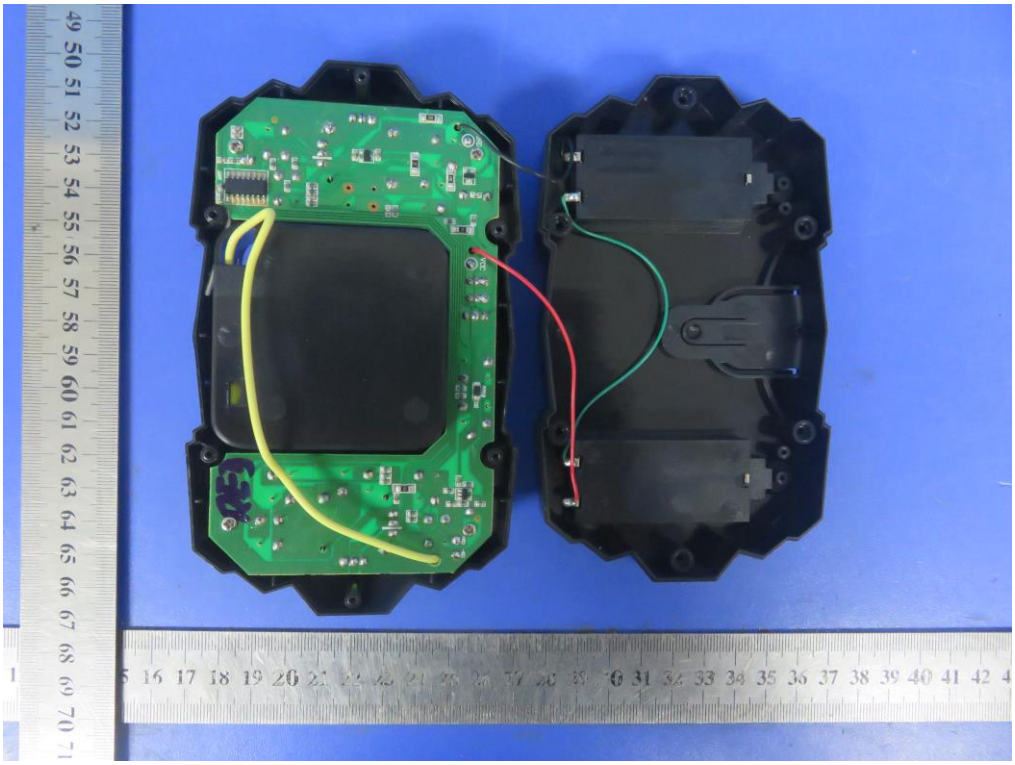


Fig. 9

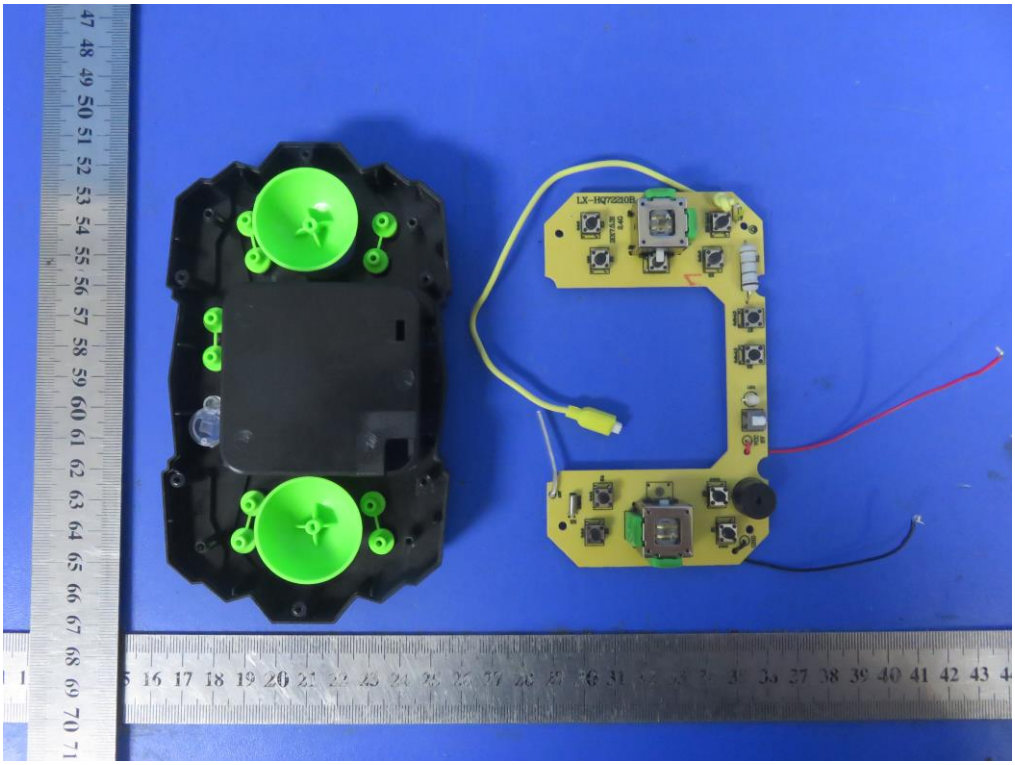


Fig. 10

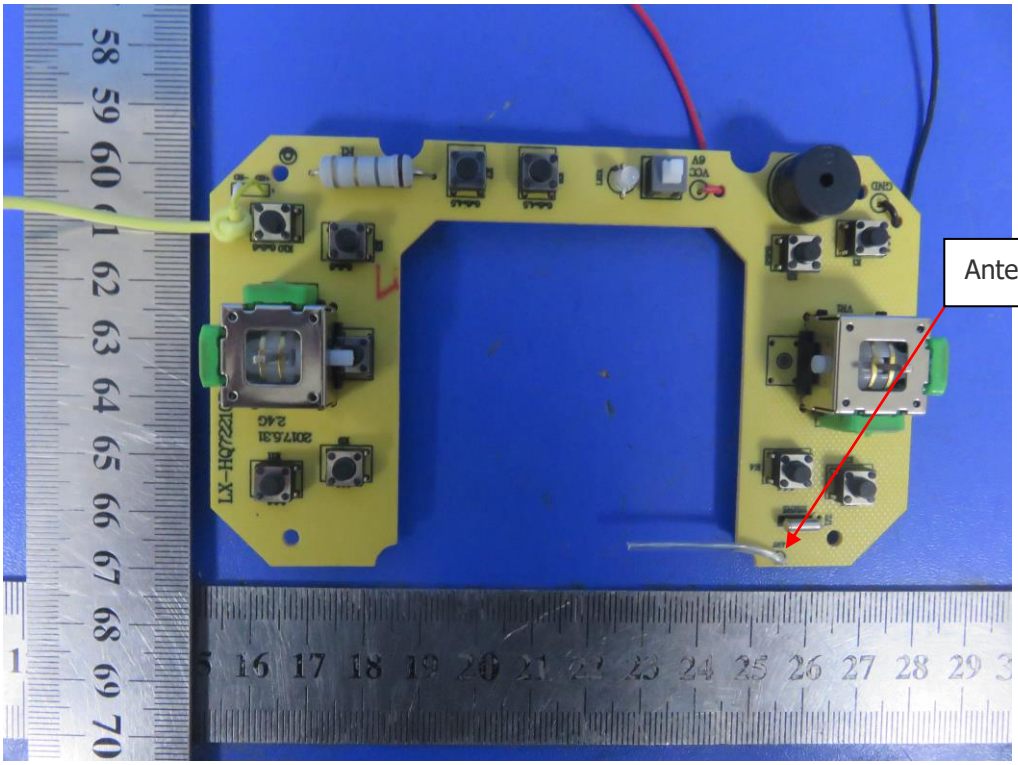
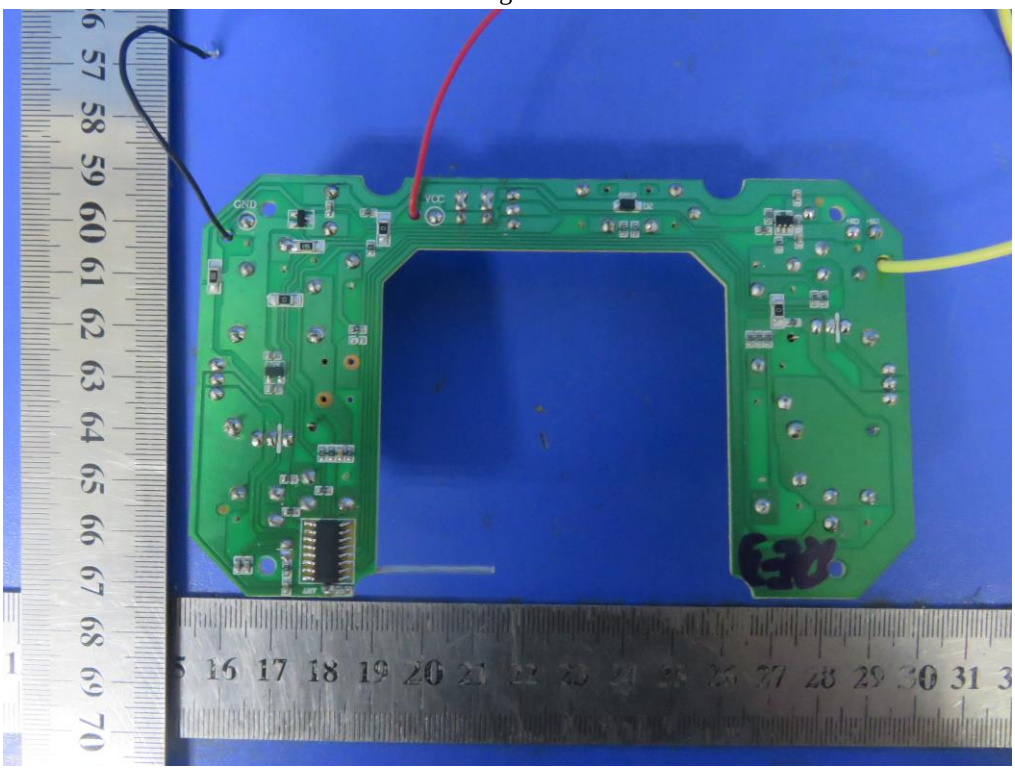


Fig. 11



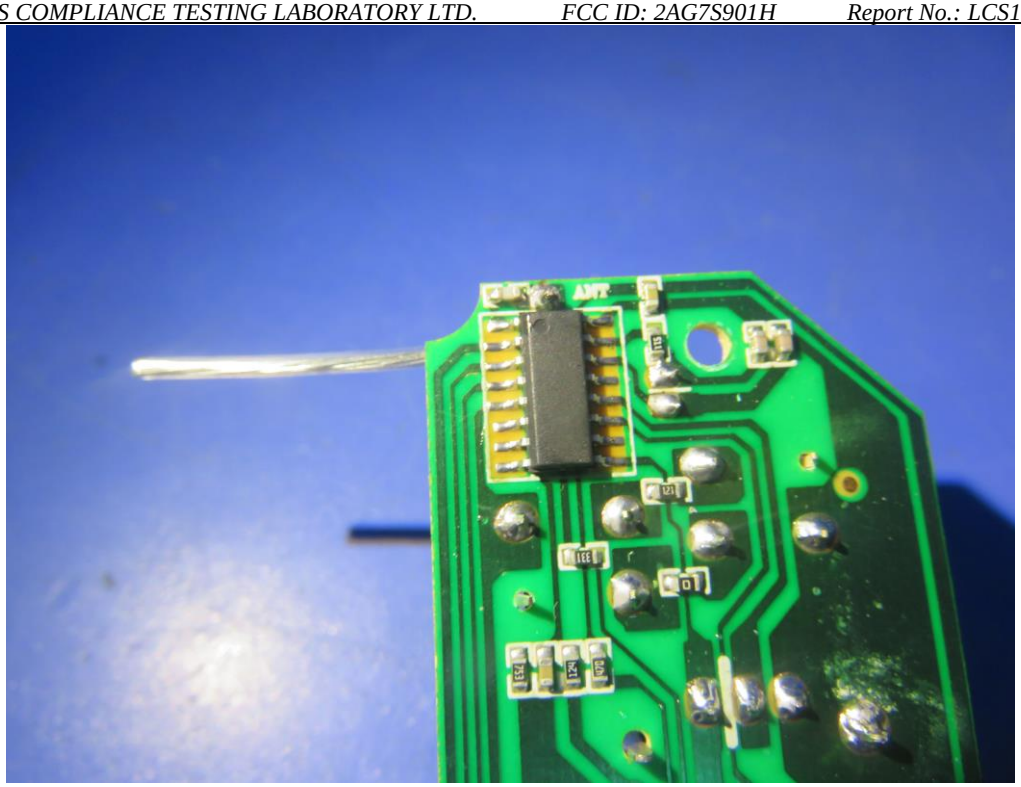


Fig. 12

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