TEST REPORT

FCC ID: 2AIRP8580022

Product Name	:	remote-control for Vigilante Helicopter
Model Name	:	US858270-5
Brand Name	:	N/A
Report No.	:	PTC18030909502E-FC01
Prepared for		
ALPHA GROUP CO., LTD.		
AULDEYIND. AREA, WENGUAN RD. (CENTRAL), CHENGHAI, SHANTOU,GUANGDONG, CHINA		
Prepared by		
DongGuan Precise testing &Certification Corp. Ltd		
Building D, Baoding Technology Park, Guangming Road 2, Guangming Community, Dongcheng District, Dongguan, Guangdong, China		

1TEST RESULT CERTIFICATION

Applicant's name	:	ALPHA GROUP CO., LTD.
Address	:	AULDEYIND. AREA, WENGUAN RD. (CENTRAL), CHENGHAI, SHANTOU,GUANGDONG, CHINA
Manufacture's name	:	ALPHA GROUP CO., LTD.
Address	:	AULDEYIND. AREA, WENGUAN RD. (CENTRAL), CHENGHAI, SHANTOU,GUANGDONG, CHINA
Product name	:	remote-control for Vigilante Helicopter
Model name	:	US858270-5
Brand Name	:	N/A
Standards	:	FCC CFR47 Part 15 Section 15.249
Test procedure	:	ANSI C63.10: 2013
Test Date	:	March 22, 2018 to April 17, 2018
Date of Issue	:	April 17, 2018
Test Result	:	Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the requirements. And it is applicable only to the tested sample identified in the report.
This report shall not be reproduced except in full, without the written approval of PTC, this document may be altered or revised by PTC, personal only, and shall be noted in the revision of the document.

Test Engineer:

Leo Yang

Leo Yang / Engineer

Technical Manager:

Chris Du / Manager

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2 Test Summary

Test Items	Test Requirement	Result
AC Power Conducted Emission	15.207	N/A (Note 1)
20dB Bandwidth	15.215(c)	PASS
Band edge	15.249 15.205 15.209	PASS
Field Strength of Fundamental Emissions	15.249(a) 15.249(c) 15.205(a) 15.209(a)	PASS
Radiated Spurious Emissions		PASS
Antenna Requirement	15.203	PASS

Note:

1. The EUT only powered by battery, no need to evaluate AC Power Conducted Emission.

2. The EUT is powered by new batteries during the test.

3 TEST FACILITY

DongGuan Precise testing &Certification Corp. Ltd

Building D,Baoding Technology Park,Guangming Road2, Dongcheng District, Dongguan, Guangdong, China, Dongguan, 523129

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1

4 General Information

4.1 General Description of E.U.T.

Product Name	:	remote-control for Vigilante Helicopter
Model Name	:	US858270-5
Operating frequency	:	2.410-2.465GHz
Numbers of Channel	:	56
Data Rate	:	1Mbps
Antenna Type	:	Internal Antenna
Antenna Gain	:	0dBi
Type of Modulation	:	GFSK
Power supply	:	DC 3*1.5V Battery
Hardware Version	:	V1.0
Software Version	:	V1.0

4.2 Test Mode

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.
For Radiated: The EUT's antenna was pre-tested under the following modes:

Test Mode	Description
Mode A	X-Y axis
Mode B	Y-Z axis
Mode C	X-Z axis

From the above modes, the worst case was found in Mode A, Therefore only the test data of the mode was recorded in this report.

Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**2410**	16	2425	31	2440	46	2455
2	2411	17	2426	32	2441	47	2456
3	2412	18	2427	33	2442	48	2457
4	2413	19	2428	34	2443	49	2458
5	2414	20	2429	35	2444	50	2459
6	2415	21	2430	36	2445	51	2460
7	2416	22	2431	37	2446	52	2461
8	2417	23	2432	38	2447	53	2462
9	2418	24	2433	39	2448	54	2463
10	2419	25	2434	40	2449	55	2464
11	2420	**26**	**2435**	41	2450	**56**	**2465**
12	2421	27	2436	42	2451		
13	2422	28	2437	43	2452		
14	2423	29	2438	44	2453		
15	2424	30	2439	45	2454		

The 3 channels of lower, middle and higher were chosen for test.

Channel	**Frequency(MHz)**
1	2410
26	2435
56	2465

5 Equipment During Test

5.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
MXG Signal Analyzer	Agilent	N9020A	MY56070279	10Hz-30GHz	Apr 07, 2019
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Oct 09, 2018

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions(9KHz-18GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep. 03, 2018
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Aug 31, 2018
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug 31, 2018
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep. 03, 2018
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Sep. 03, 2018
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Oct. 13, 2018
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 31, 2018
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Aug. 31, 2018
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Sep. 03, 2018

5.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%	

5.3 Description of Support Units

Equipment	Model No.	Series No.
N/A	N/A	N/A

6 Field Strength of Fundamental Emission and Radiated Spurious Emissions

Test Requirement: : FCC Part C section 15.205 & 15.209 & 15.249

Test Method: : ANSI C63.10: 2013

Test Result: : PASS

Measurement Distance: : 3m

Limit: : See the follow table

15.209 limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))}$ + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))}$ + 40
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)}$ + 40
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Note: 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

The field strength of emission from intentional radiators operated within these frequency bands shall comply with the following:

15.249(a) Limit:

Fundamental Frequency	Field strength of fundamental		Field strength of harmonics	
(MHz)	mV/m	dBuV/m	uV/m	dBuV/m
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54
24000-24250	250	108	2500	68

6.1 EUT Operation

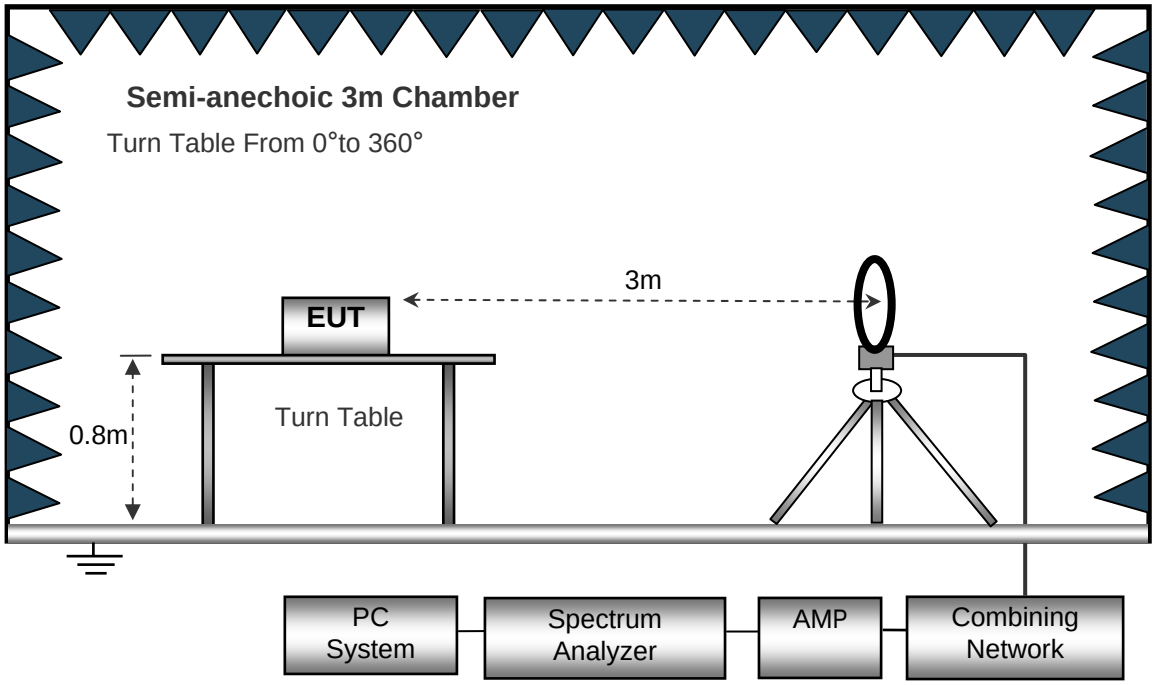
Operating Environment :

Temperature:	:	23.5 °C
Humidity:	:	51.1 % RH
Atmospheric Pressure:	:	101.2kPa
Test Voltage	:	DC 3*1.5V Battery

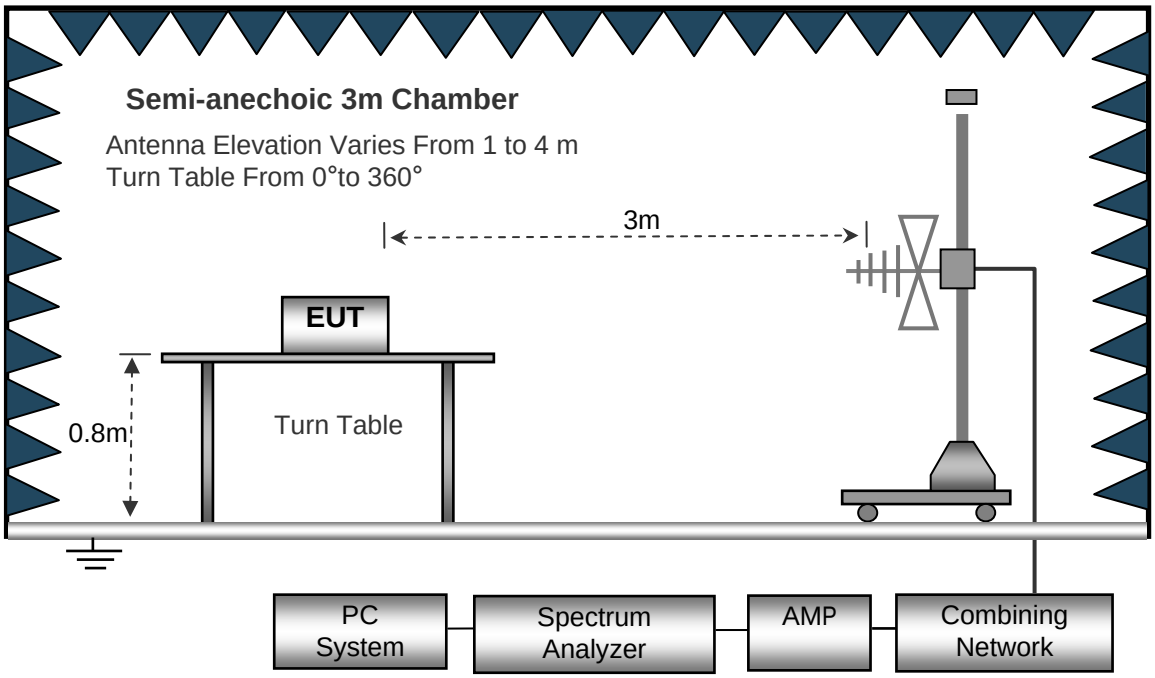
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

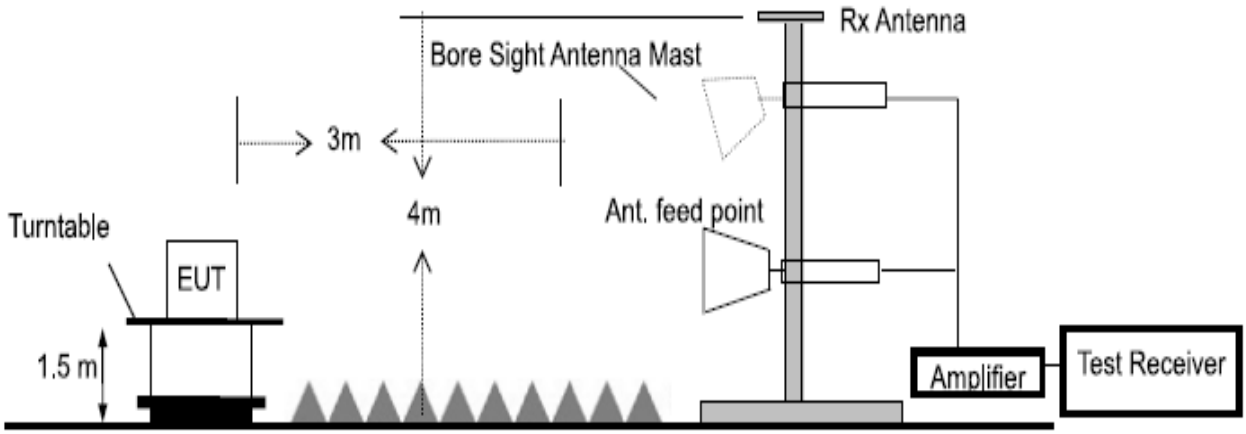
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



6.3 Spectrum Analyzer Setup

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

Receiver 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

6.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10: 2013.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.

5. Set to the maximum power setting and enable the EUT transmit continuously.

6. Test Procedure of measurement (For Above 1GHz): 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.

6.5 Summary of Test Results

Test Frequency: Below 30MHz

Operation Mode:	TX	Test Date :	March 30, 2018
Test Result:	PASS	Test By:	Leo Yang

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

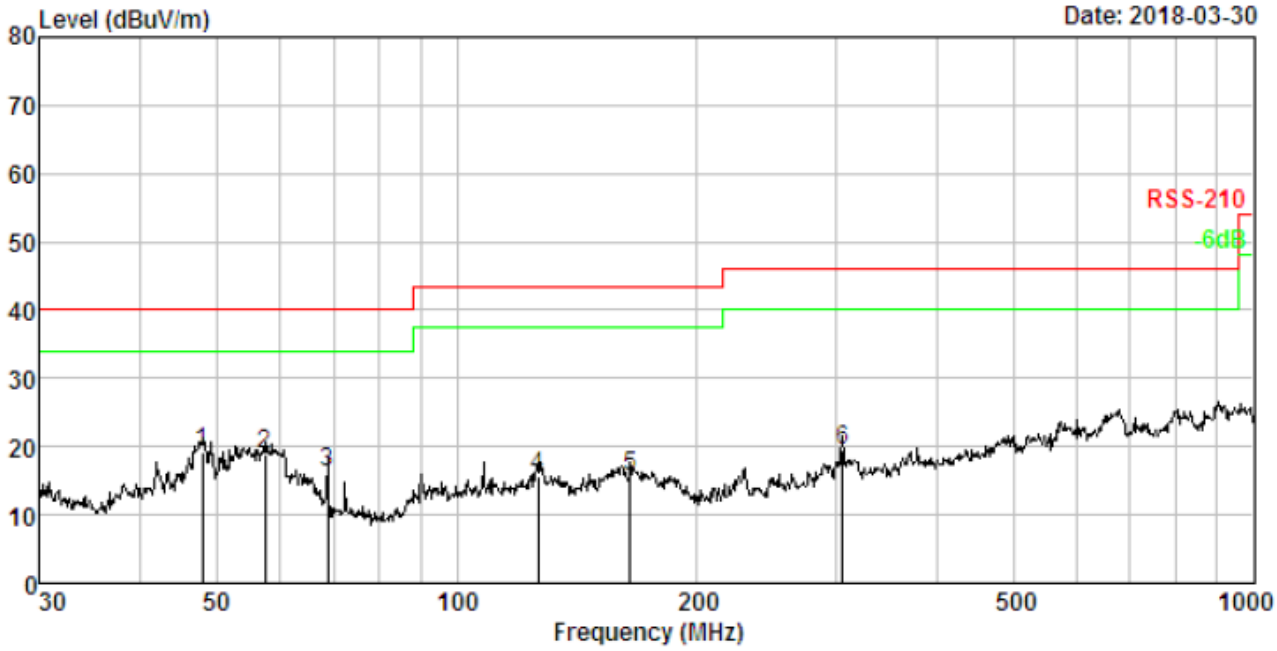
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Operation Mode:	TX	Test Date :	March 30, 2018
Test Result:	PASS	Test By:	Leo Yang

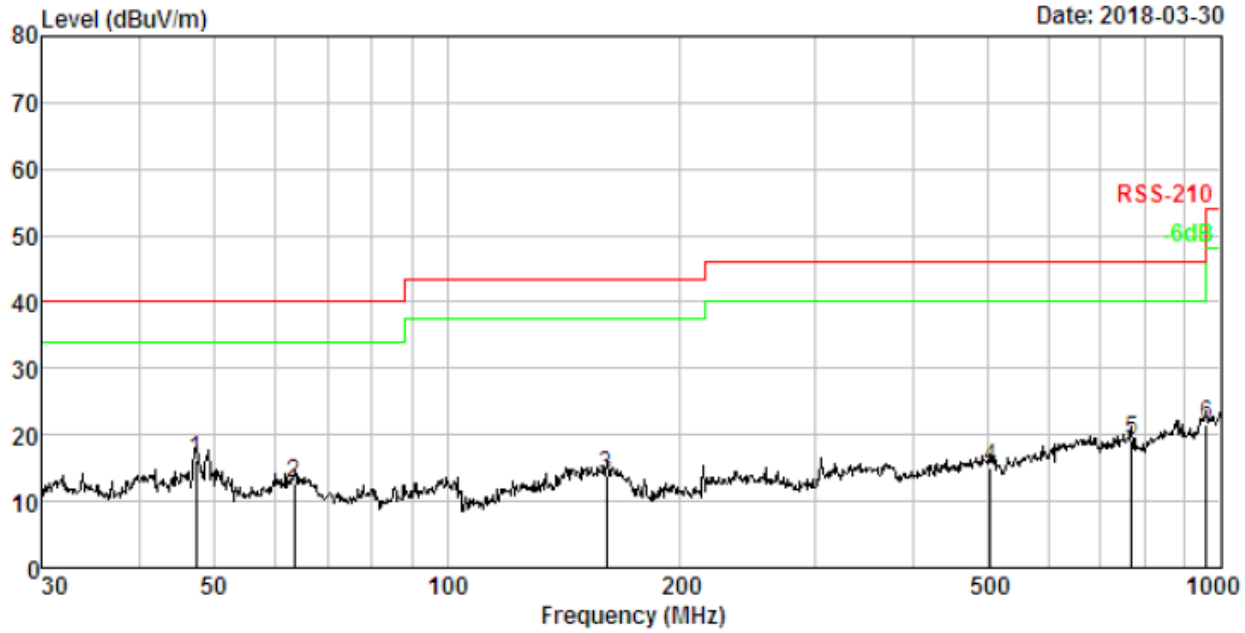
Remark: only the worst data were reported.

Test plot for Horizontal: 2410MHz



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	47.994	1.48	12.65	35.14	30.13	19.14	40.00	-20.86	QP
2.	57.392	1.64	12.03	35.28	30.20	18.75	40.00	-21.25	QP
3.	68.872	1.81	10.40	34.43	30.26	16.38	40.00	-23.62	QP
4.	126.329	2.36	12.42	31.40	30.47	15.71	43.50	-27.79	QP
5.	164.908	2.60	13.61	30.07	30.56	15.72	43.50	-27.78	QP
6.	304.610	3.15	13.30	33.84	30.78	19.51	46.00	-26.49	QP

Test plot for Vertical: 2410MHz



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	47.326	1.47	12.78	32.24	30.13	16.36	40.00	-23.64	QP
2.	63.536	1.73	11.93	29.24	30.23	12.67	40.00	-27.33	QP
3.	160.909	2.58	13.83	28.13	30.55	13.99	43.50	-29.51	QP
4.	504.706	3.61	17.12	25.29	30.95	15.07	46.00	-30.93	QP
5.	768.748	3.99	21.40	25.04	31.10	19.33	46.00	-26.67	QP
6.	958.794	4.19	23.43	25.26	31.18	21.70	46.00	-24.30	QP

Test Frequency 1GHz-18GHz:

Operation Mode:	GFSK (CH01: 2410MHz)	Test Date :	March 30, 2018
Test Result:	PASS	Test By:	Leo Yang

Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
2410(F)	V	90.15	81.42	114	94	-23.85	-12.58
4820	V	56.04	47.32	74	54	-17.96	-6.68
7230	V	54.28	43.18	74	54	-19.72	-10.82
9640	V	52.39	40.22	74	54	-21.61	-13.78
12050	V	50.14	38.48	74	54	-23.86	-15.52
14460	V	47.06	34.62	74	54	-26.94	-19.38
16870	V	44.25	30.48	74	54	-29.75	-23.52
2410(F)	H	94.32	80.29	114	94	-19.68	-13.71
4820	H	55.14	46.29	74	54	-18.86	-7.71
7230	H	51.48	44.18	74	54	-22.52	-9.82
9640	H	48.03	40.28	74	54	-25.97	-13.72
12050	H	44.27	36.27	74	54	-29.73	-17.73
14460	H	40.68	30.17	74	54	-33.32	-23.83
16870	H	38.09	27.46	74	54	-35.91	-26.54

Operation Mode:	GFSK (CH26: 2435MHz)	Test Date :	March 30, 2018
Test Result:	PASS	Test By:	Leo Yang

Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
2435(F)	V	88.74	82.42	114	94	-25.26	-11.58
4870	V	54.04	48.27	74	54	-19.96	-5.73
7305	V	51.29	44.19	74	54	-22.71	-9.81
9740	V	48.26	40.69	74	54	-25.74	-13.31
12175	V	45.72	37.48	74	54	-28.28	-16.52
14610	V	43.26	34.06	74	54	-30.74	-19.94
17045	V	40.19	30.6	74	54	-33.81	-23.4
2435(F)	H	87.69	81.75	114	94	-26.31	-12.25
4870	H	53.29	46.18	74	54	-20.71	-7.82
7305	H	50.05	42.65	74	54	-23.95	-11.35
9740	H	48.36	37.18	74	54	-25.64	-16.82
12175	H	45.26	34.92	74	54	-28.74	-19.08
14610	H	41.09	30.65	74	54	-32.91	-23.35
17045	H	38.96	27.58	74	54	-35.04	-26.42

Operation Mode:	GFSK (CH56: 2465MHz)	Test Date :	March 30, 2018
Test Result:	PASS	Test By:	Leo Yang

Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
2465(F)	V	90.12	84.29	114	94	-23.88	-9.71
4930	V	55.43	47.29	74	54	-18.57	-6.71
7395	V	50.22	45.06	74	54	-23.78	-8.94
9860	V	47.46	42.18	74	54	-26.54	-11.82
12325	V	44.33	38.04	74	54	-29.67	-15.96
14790	V	41.06	35.92	74	54	-32.94	-18.08
17255	V	38.29	30.16	74	54	-35.71	-23.84
2465(F)	H	91.56	80.49	114	94	-22.44	-13.51
4930	H	54.23	47.15	74	54	-19.77	-6.85
7395	H	50.69	41.48	74	54	-23.31	-12.52
9860	H	47.01	38.46	74	54	-26.99	-15.54
12325	H	44.65	32.29	74	54	-29.35	-21.71
14790	H	40.92	30.18	74	54	-33.08	-23.82
17255	H	36.57	29.64	74	54	-37.43	-24.36

7 BAND EDGE EMISSION

7.1 TEST PROCEDURE

The EUT was placed on a styrofoam table which is 1.5m above ground plane.

The measurement procedure at the ban edges was simplified by performing the measurement in just one plot. Both, the in-band-emission and the unwanted emission were be encompassed by the span. After trace stabilization, the maximum peak was be determined by a peak detector and the value was marked by an appropriate limit line. The second limit line, which is 20dB below the first, marks the limit for the emissions in the unrestricted band. A maximum-peak-detector marks the highest emission in the unrestricted band next to the band edge.

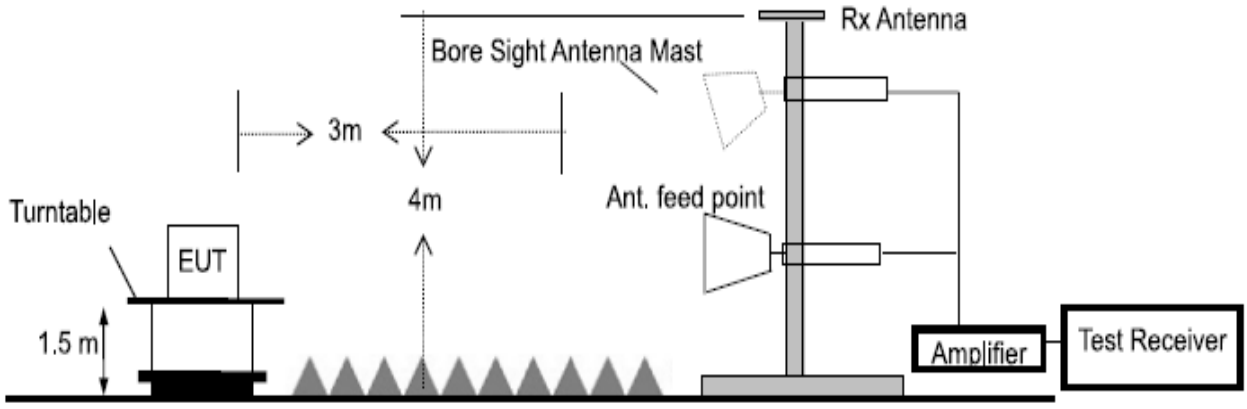
The measurements were performed at the lower end of the 2.4GHz band.

Use the following spectrum analyzer settings:

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

EMI Test Receiver	Setting
Attenuation	Auto
RBW	1MHz
VBW	3MHz
Detector	Peak
Trace	Max hold

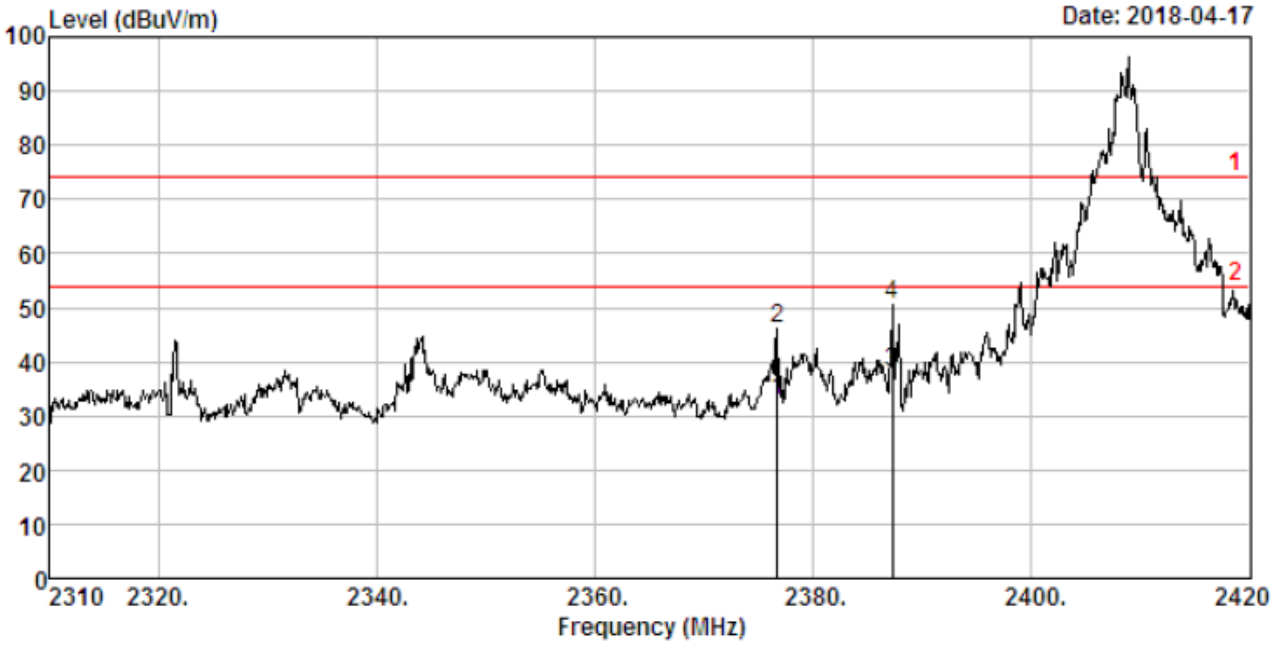
7.2 TEST SETUP



7.3 TEST RESULTS

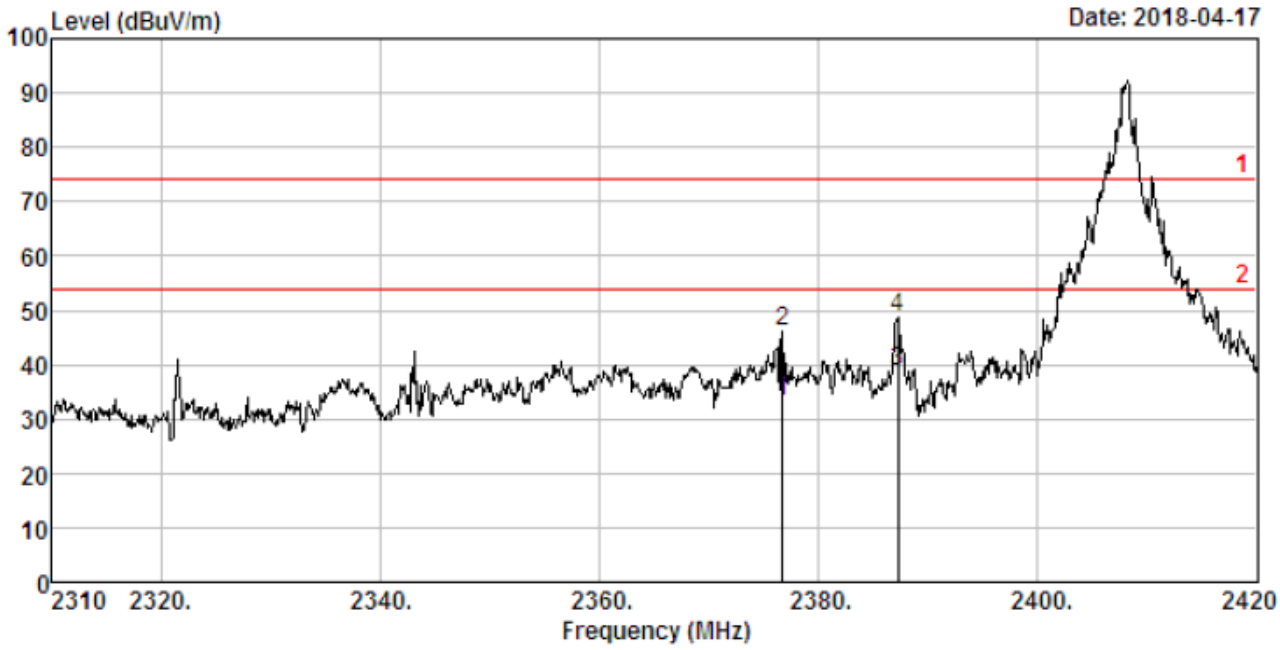
Operation Mode:	GFSK (CH01: 2410MHz)	Test Date :	April 17, 2018
Test Result:	PASS	Test By:	Leo Yang

Horizontal



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	2376.660	2.76	27.61	30.64	28.00	33.01	54.00	-20.99	Average
2.	2376.660	2.76	27.61	43.90	28.00	46.27	74.00	-27.73	Peak
3.	2387.220	2.77	27.65	35.56	28.00	37.98	54.00	-16.02	Average
4.	2387.220	2.77	27.65	48.12	28.00	50.54	74.00	-23.46	Peak

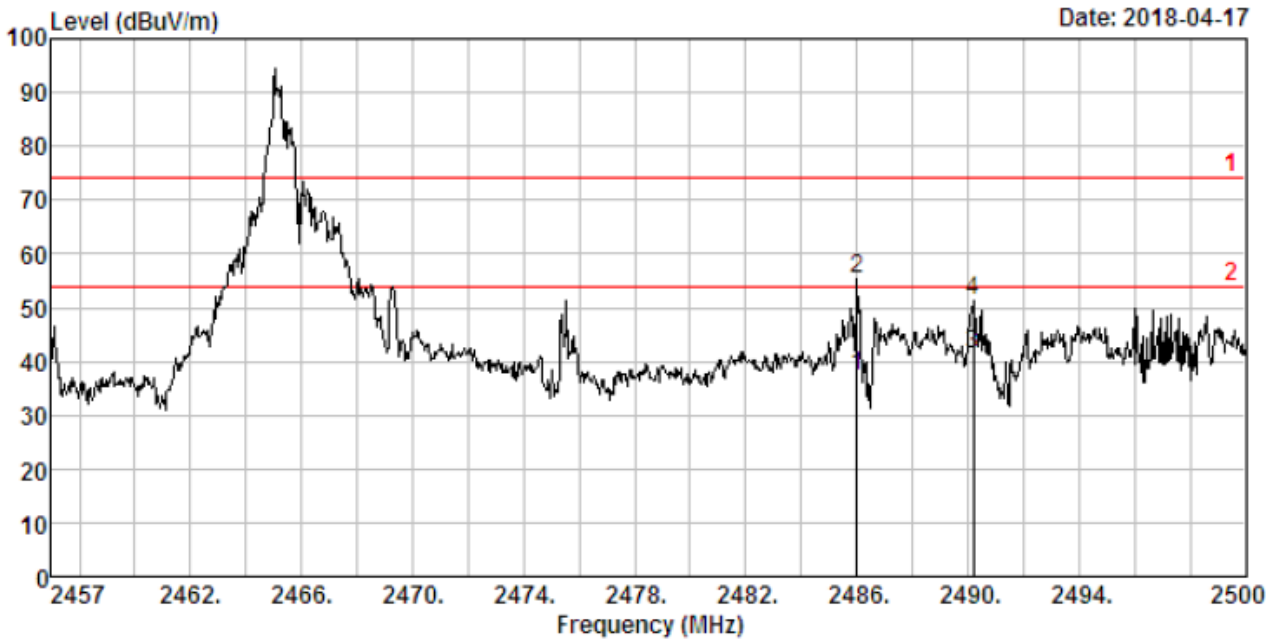
Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	2376.660	2.76	27.61	30.84	28.00	33.21	54.00	-20.79	Average
2.	2376.660	2.76	27.61	43.90	28.00	46.27	74.00	-27.73	Peak
3.	2387.220	2.77	27.65	36.45	28.00	38.87	54.00	-15.13	Average
4.	2387.220	2.77	27.65	46.12	28.00	48.54	74.00	-25.46	Peak

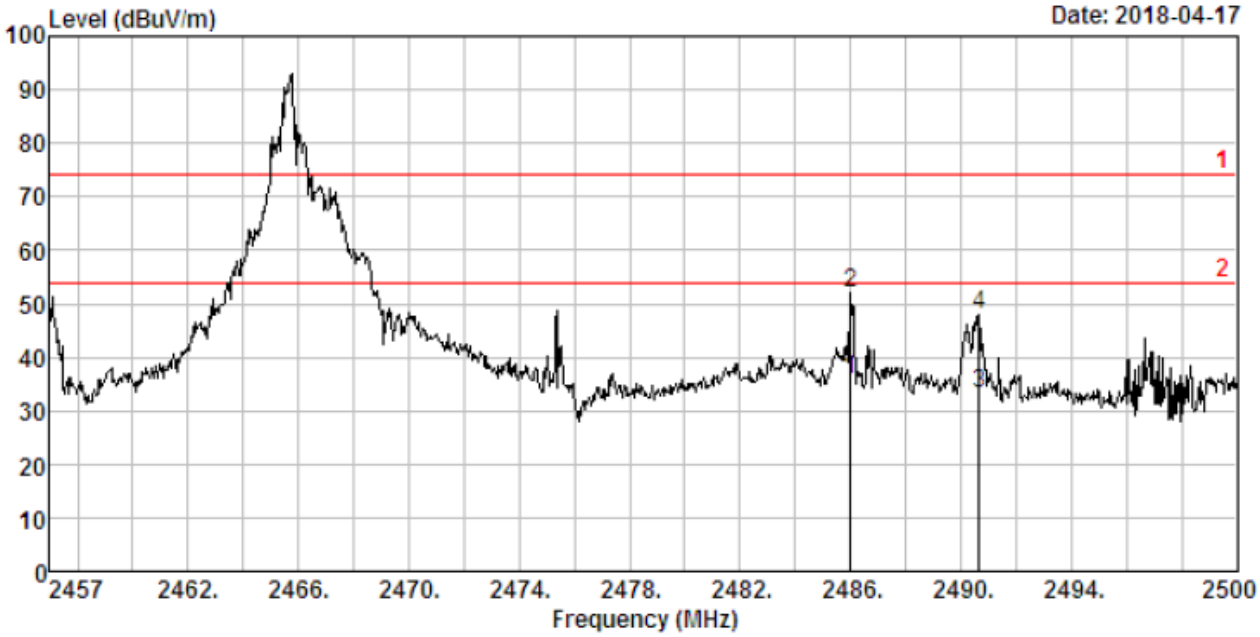
Operation Mode:	GFSK (CH56: 2465MHz)	Test Date :	April 17, 2018
Test Result:	PASS	Test By:	Leo Yang

Horizontal



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	2486.025	2.85	27.96	34.55	28.00	37.36	54.00	-16.64	Average
2.	2486.025	2.85	27.96	52.39	28.00	55.20	74.00	-18.80	Peak
3.	2490.196	2.85	27.97	38.56	28.00	41.38	54.00	-12.62	Average
4.	2490.196	2.85	27.97	48.48	28.00	51.30	74.00	-22.70	Peak

Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	2486.025	2.85	27.96	32.99	28.00	35.80	54.00	-18.20	Average
2.	2486.025	2.85	27.96	49.39	28.00	52.20	74.00	-21.80	Peak
3.	2490.669	2.85	27.97	30.56	28.00	33.38	54.00	-20.62	Average
4.	2490.669	2.85	27.97	45.32	28.00	48.14	74.00	-25.86	Peak

8 20 dB and 99% Bandwidth Measurement

Test Method : ANSI C63.10: 2013

8.1 Test Procedure

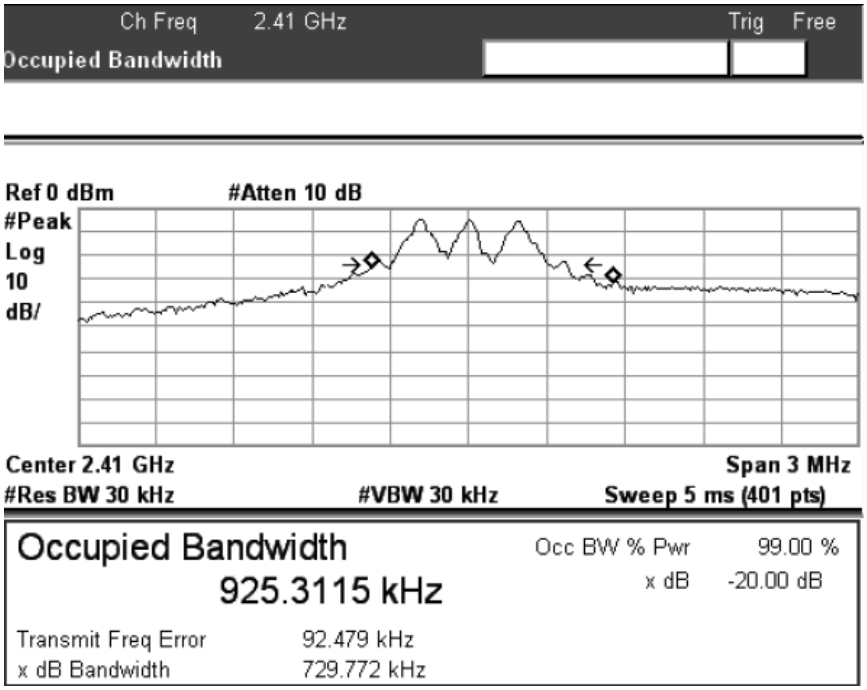
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

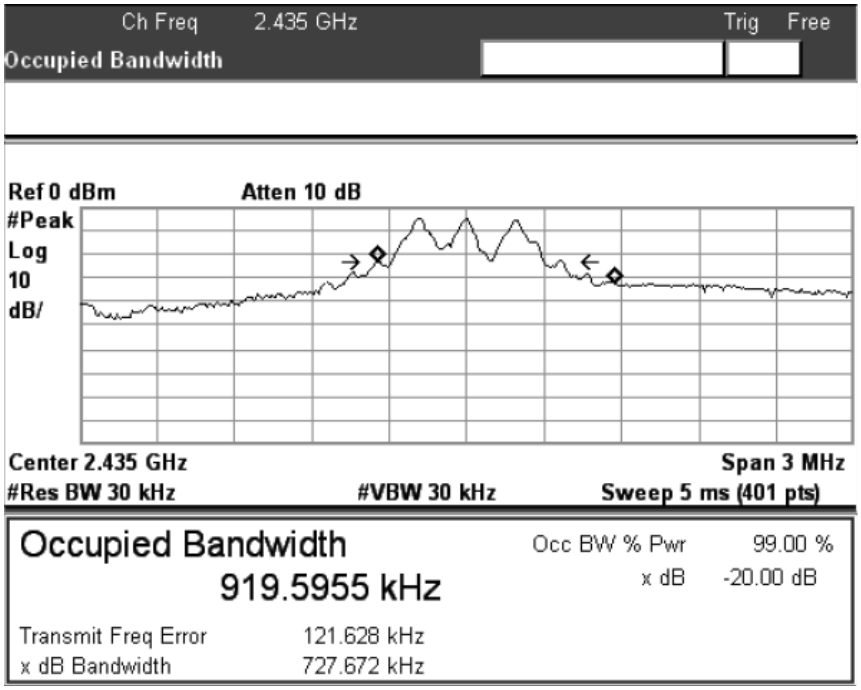
2. Set the spectrum analyzer: RBW = 30kHz, VBW = 30kHz

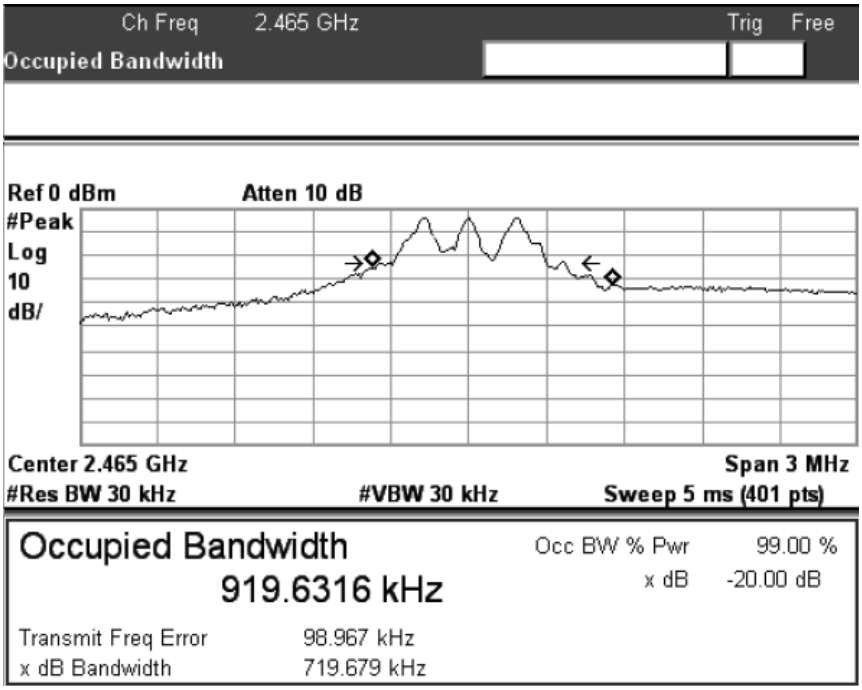
8.2 Test Result

Spectrum Detector:	PK	Test Date :	March 29, 2018
Test By:	Leo Yang	Test Result:	PASS
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	20dB Down BW(KHz)	99% Down BW(KHz)
01	2410	729.772	925.3115
26	2435	727.672	919.5955
56	2465	719.679	919.6316


Ch Freq 2.41 GHz
Trig Free
Occupied Bandwidth
Ref 0 dBm
#Atten 10 dB
#Peak
Log
10
dB/
Center 2.41 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 30 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
925.3115 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error 92.479 kHz
x dB Bandwidth 729.772 kHz

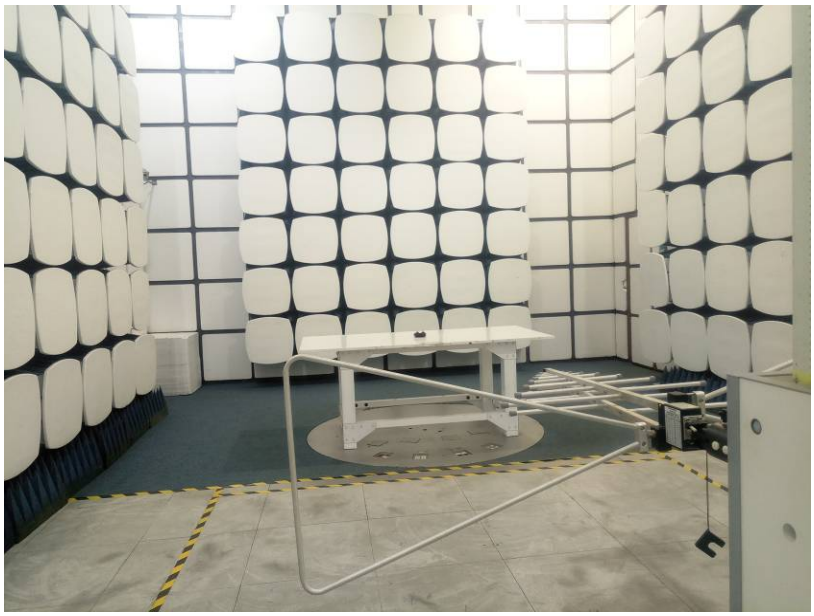

Ch Freq 2.435 GHz
Trig Free
Occupied Bandwidth
Ref 0 dBm
Atten 10 dB
#Peak
Log
10
dB/
Center 2.435 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 30 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
919.5955 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error 121.628 kHz
x dB Bandwidth 727.672 kHz

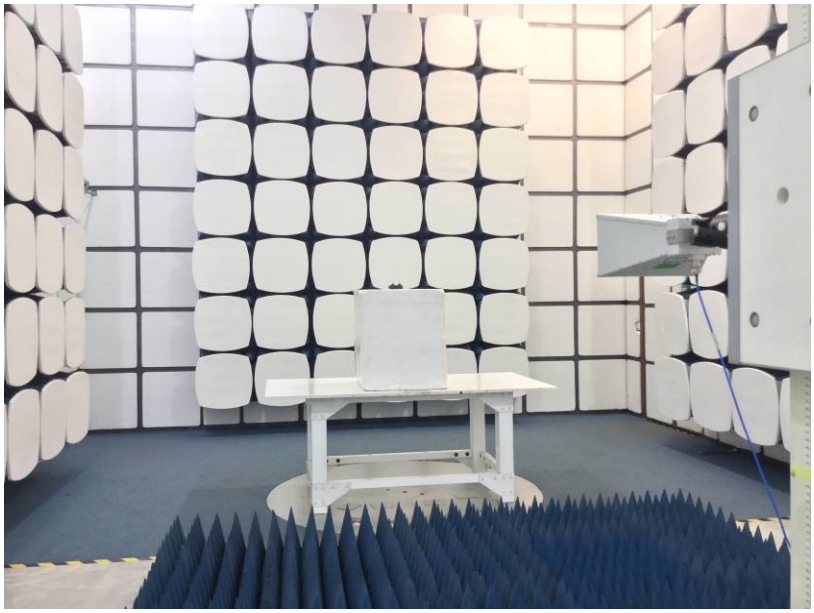

Ch Freq 2.465 GHz
Trig Free
Occupied Bandwidth
Ref 0 dBm
Atten 10 dB
#Peak
Log
10
dB/
Center 2.465 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 30 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
919.6316 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error 98.967 kHz
x dB Bandwidth 719.679 kHz

9 Antenna Requirement

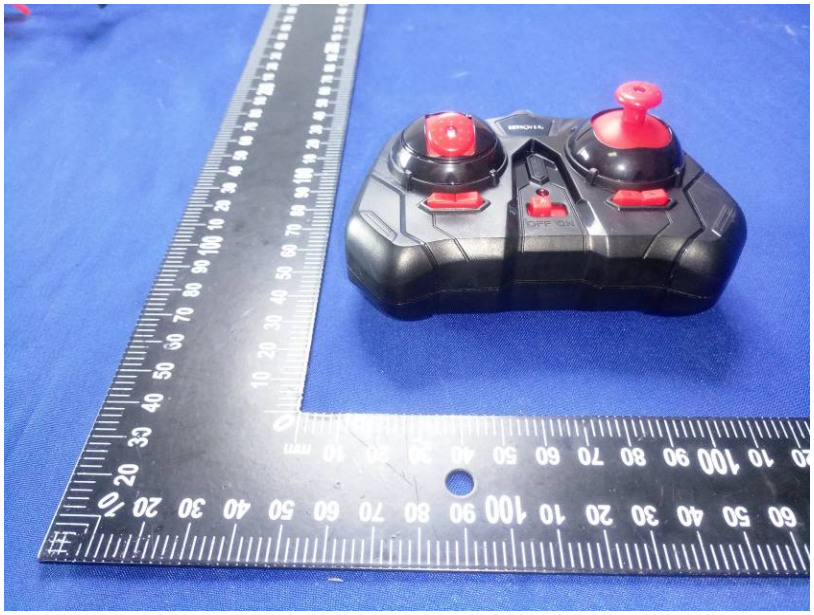
The antenna is permanently attached on PCB, no consideration of replacement. Please refer to internal Photos for details.

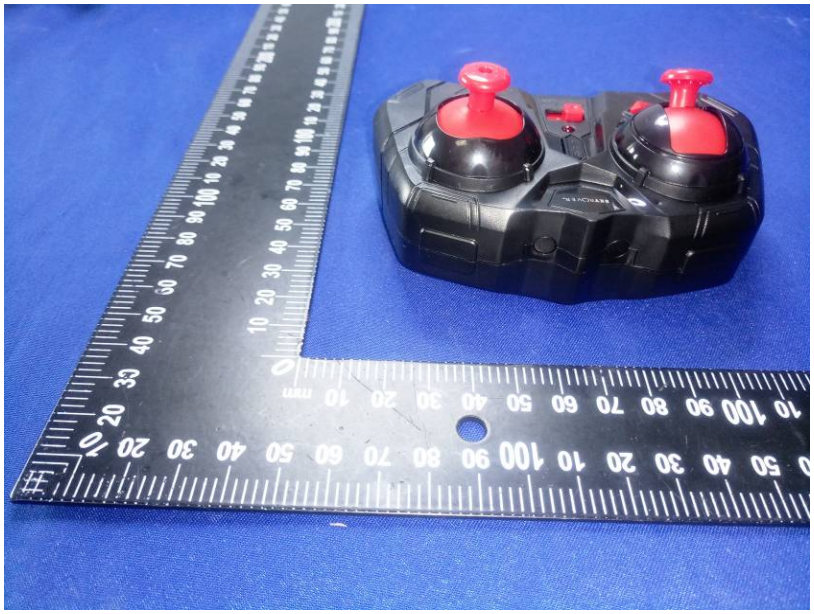
10 TEST PHOTOS

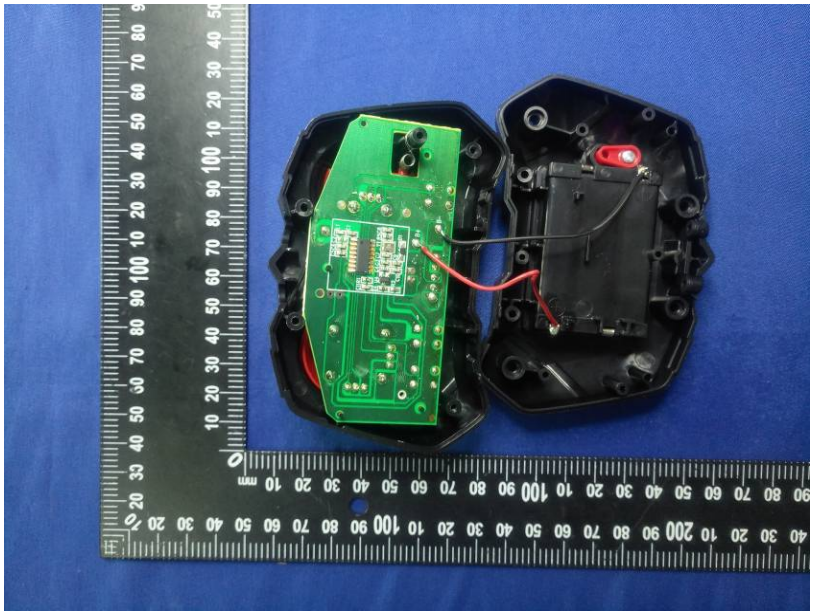


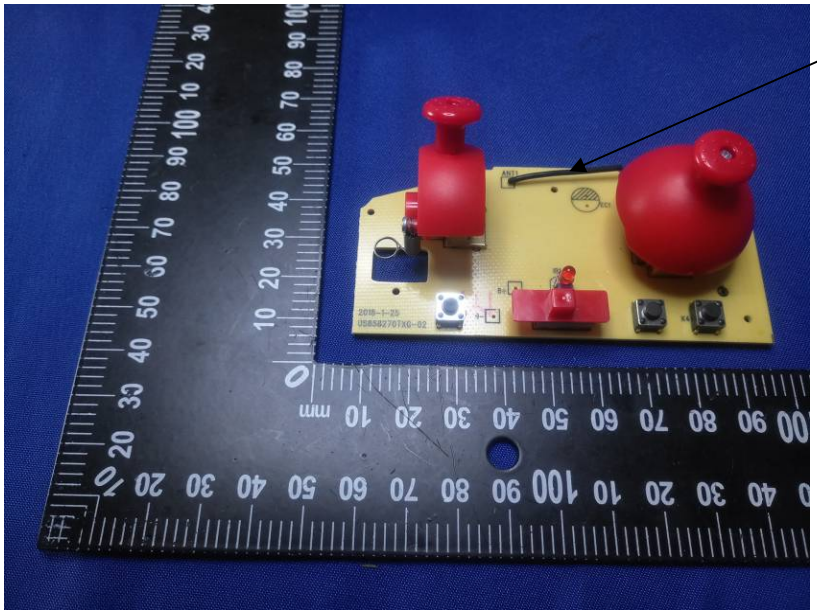


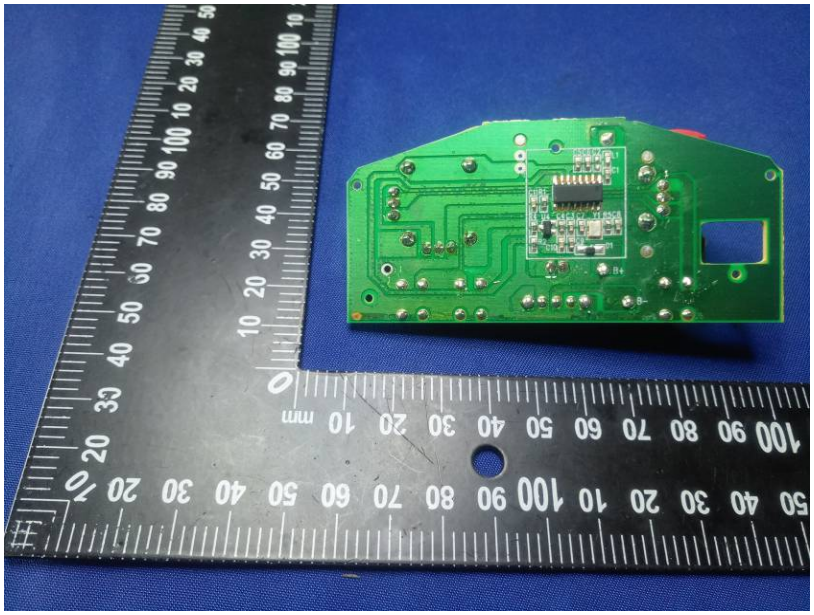
11 EUT PHOTOS








Antenna



******THE END REPORT******