

TEST REPORT

Reference No...... : WTS17S1092279-1E
FCC ID : 2AIRP8580021
Applicant..... : ALPHA GROUP CO., LTD.
Address..... : AULDEYIND. AREA, WENGUAN RD.(CENTRAL),CHENGHAI,
SHANTOU,GUANGDONG, CHINA
Manufacturer : ALPHA GROUP CO., LTD.
Address..... : AULDEYIND. AREA, WENGUAN RD.(CENTRAL),CHENGHAI,
SHANTOU,GUANGDONG, CHINA
Product..... : 2.4G remote control
Model(s) : US858250-2
Standards : FCC CFR Title 47 Chapter I Subchapter A Part 15 Subpart C Section
15.249 :2017
Date of Receipt sample : 2017-10-12
Date of Test : 2017-10-13 to 2017-10-20
Date of Issue..... : 2017-10-21
Test Result..... : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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1 Laboratories Introduction

Waltek Services Test Group Ltd. is one of the largest and the most comprehensive third party testing organizations in China, our headquarter located in Shenzhen (CNAS Registration No. L3110, A2LA Certificate Number: 4243.01) and have branches in Foshan (CNAS Registration No. L6478), Dongguan (CNAS Registration No. L9950), Zhongshan, Suzhou (CNAS Registration No. L7754), Ningbo and Hong Kong, Our test capability covered four large fields: safety test. Electronic Magnetic Compatibility(EMC), reliability and energy performance, Chemical test. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CPSC(Consumer Product Safety Commission), CEC(California energy efficiency), IC(Industry Canada) and ELI(Efficient Lighting Initiative). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as UL, Intertek(ETL-SEMKO), CSA, TÜV Rheinland, TÜV SÜD, etc. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

Waltek Services (Shenzhen) Co., Ltd.

A. Accreditations for Conformity Assessment (International)

Country/Region	Accreditation Body	Scope	Note
USA	CNAS (Registration No.: L3110) A2LA (Certificate No.: 4243.01)	FCC ID \ DOC \ VOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		International Services	WPC
Thailand	NTC		-
Singapore	IDA		-
Note: 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476. 2. IC Canada Registration No.: 7760A			

B. TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of ...	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

2 Contents

	Page
COVER PAGE.....	1
1 LABORATORIES INTRODUCTION.....	2
2 CONTENTS	3
3 REVISION HISTORY	4
4 GENERAL INFORMATION.....	5
4.1 GENERAL DESCRIPTION OF E.U.T.....	5
4.2 DETAILS OF E.U.T.....	5
4.3 CHANNEL LIST	5
4.4 TEST MODE	6
5 EQUIPMENT USED DURING TEST	7
5.1 EQUIPMENTS LIST	7
5.2 MEASUREMENT UNCERTAINTY.....	8
5.3 TEST EQUIPMENT CALIBRATION.....	8
5.4 SUBCONTRACTED.....	8
6 TEST SUMMARY	9
7 RADIATION EMISSION TEST	10
7.1 EUT OPERATION.....	10
7.2 TEST SETUP	11
7.3 SPECTRUM ANALYZER SETUP.....	12
7.4 TEST PROCEDURE.....	13
7.5 TEST RESULT	14
8 OUTSIDE OF BAND EMISSION.....	17
8.1 TEST PROCEDURE.....	17
8.2 TEST RESULT	17
9 BANDWIDTH MEASUREMENT	19
9.1 TEST PROCEDURE.....	19
9.2 TEST RESULT	19
10 ANTENNA REQUIREMENT	21
11 PHOTOGRAPHS- MODEL US858250-2 TEST SETUP PHOTOS	22
11.1 PHOTOGRAPH - RADIATION EMISSION	22

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS17S1092279-1E	2017-10-12	2017-10-13 to 2017-10-20	2017-10-21	original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product	: 2.4G remote control
Model(s)	:US858250-2
Model Differences	:N/A
Type of Modulation	:GFSK
Frequency Range	:2410MHz-2467MHz, 56 Channels in total
Antenna installation	: Internal Antenna
Antenna Gain	: 2.3dBi

4.2 Details of E.U.T.

Ratings	: DC 4.5V by 1.5V 3 (size “AAA”)
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4.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2410	15	2424	29	2438	43	2452
2	2411	16	2425	30	2439	44	2453
3	2412	17	2426	31	2440	45	2454
4	2413	18	2427	32	2441	46	2455
5	2414	19	2428	33	2442	47	2456
6	2415	20	2429	34	2443	48	2457
7	2416	21	2430	35	2444	49	2458
8	2417	22	2431	36	2445	50	2459
9	2418	23	2432	37	2446	51	2460
10	2419	24	2433	38	2447	52	2461
11	2420	25	2434	39	2448	53	2462
12	2421	26	2435	40	2449	54	2463
13	2422	27	2436	41	2450	55	2464
14	2423	28	2437	42	2451	56	2467

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Table 1 Tests carried out under FCC part 15.249

Test mode	Low channel	Middle channel	High channel
Transmitting	2410MHz	2440MHz	2467MHz

Table 2 Tests carried out under FCC part 15.209

Test Item	Test Mode
Radiation Emissions Test	Transmitting

Note: The EUT is powered by new batteries during the test.

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.

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions (Waltek Services (Shenzhen) Co., Ltd.)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP	100091	2017-04-29	2018-04-28
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2017-04-09	2018-04-08
3	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2017-04-09	2018-04-08
4	Amplifier	Agilent	8447D	2944A10178	2017-04-13	2018-04-12
5	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2017-04-13	2018-04-12
6	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	2017-04-13	2018-04-12
3m Semi-anechoic Chamber for Radiation Emissions (Waltek Services (Shenzhen) Co., Ltd.)						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2017-04-13	2018-04-12
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2017-04-13	2018-04-12
3	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2017-04-09	2018-04-08
4	Amplifier	ANRITSU	MH648A	M43381	2017-04-13	2018-04-12
5	Cable	HUBER+SUHNER	CBL2	525178	2017-04-13	2018-04-12
6	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2017-09-12	2018-09-11
10m Semi-anechoic Chamber for Radiation Emissions (Above18GHz) (Shenzhen Balun Technology Co.,Ltd.)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	Spectrum Analyzer	R&S	FSV-40	101544	2017-02-17	2018-02-16
2	Antenna-Horn (18-40 GHz)	A-INFO	LB-180400KF	J211060273	2017-01-07	2018-01-06
3	Amplifier	COM-MV	ZLNA-18-40G-021	1608001	2017-02-17	2018-02-16
4	Cable	Top	18-40GHz	-	2017-02-17	2018-02-16

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

5.4 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☒ Yes ☐ No

If Yes, list the related test items and lab information:

Test Lab: Shenzhen Balun Technology Co.,Ltd.

Lab address: Block B, FL1, Baisha Science and Technology Park,Shahe Xi Road, Nanshan District, ShenZhen, GuangDong Province, P. R. China

FCC Designation No.: CN1196. Test Firm Registration No.: 935607.

Test items: Radiated Spurious Emission(18GHz to 25GHz)

6 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	N/A*
Radiated Emission	15.249(a) 15.209 15.205(a)	Pass
Outside of Band Emission	15.249 15.205 15.209	Pass
20dB Bandwidth	15:215(c)	Pass
Antenna Requirement	15.203	Pass
Note: Pass=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable *: The EUT is only powered by battery, no need to evaluate AC Power Conducted Emission.		

7 Radiation Emission Test

Test Requirement: FCC CFR Title 47 Chapter I Subchapter A Part 15 Subpart C
Section 15.205&15.209&15.249

Test Method: ANSI C63.10: 2013

Measurement Distance: 3m

Test Result: PASS

15.249(a)Limit:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

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	$2400/F(\text{kHz})$	300	$10000 \cdot 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 \cdot 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
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: RF Voltage(dBuV)= $20 \log_{10}$ RF Voltage(uV)

7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

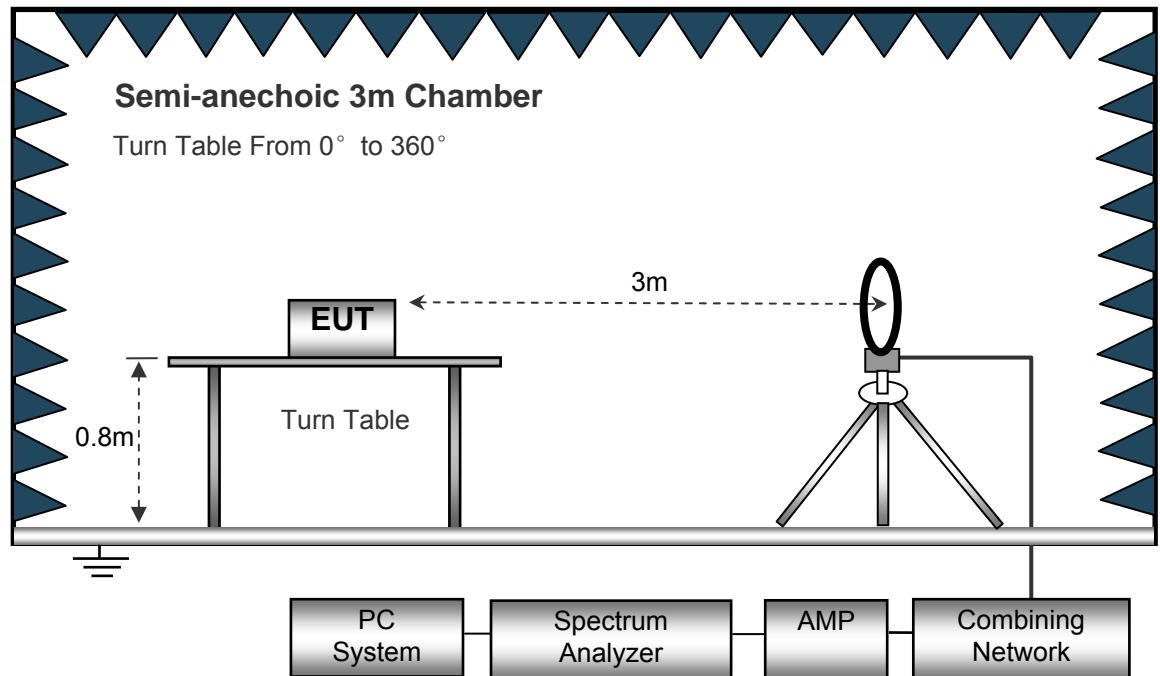
EUT Operation :

Refer to section 4.4.

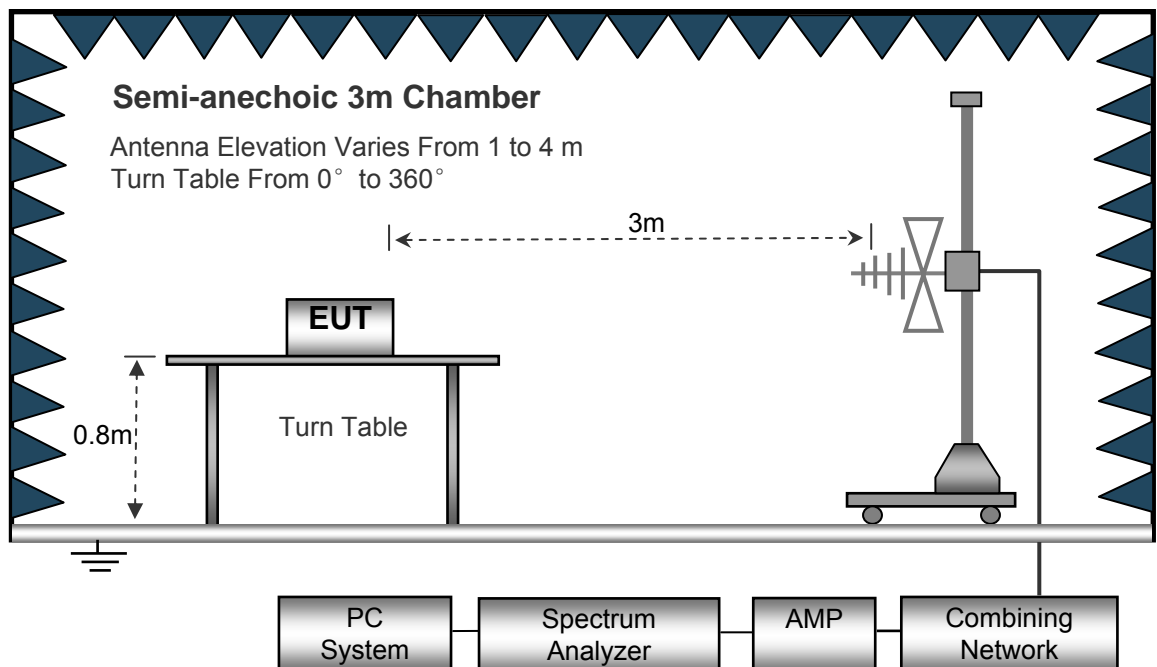
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

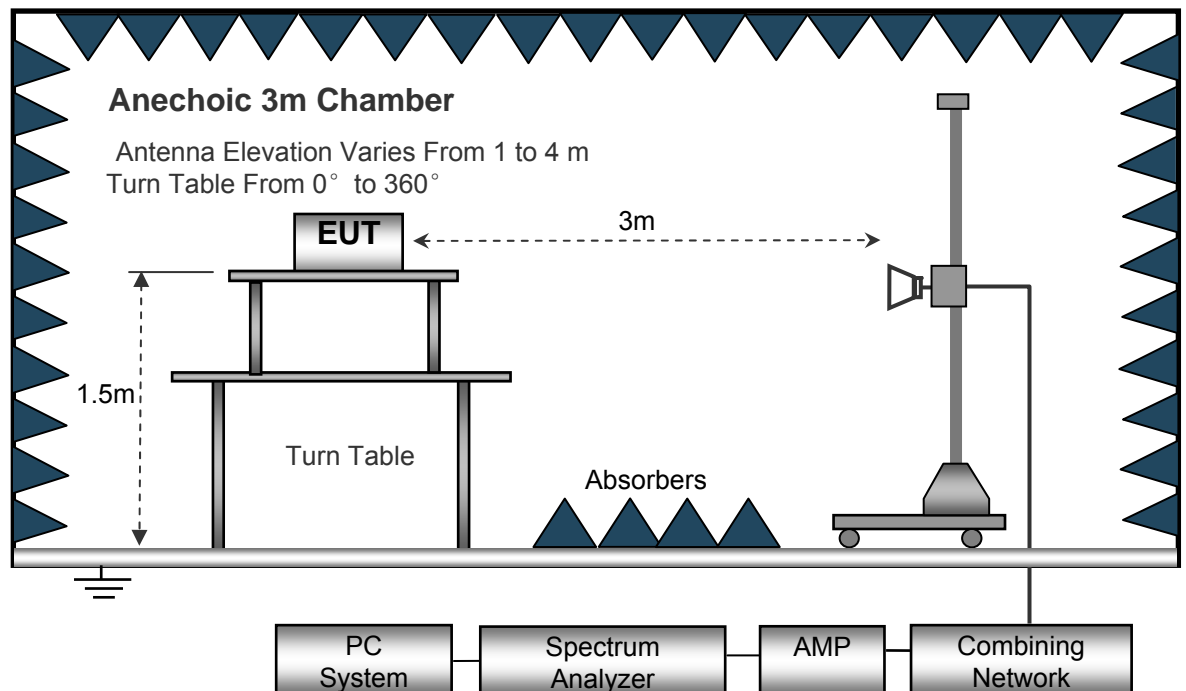
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep SpeedAuto
 IF Bandwidth.....10kHz
 Video Bandwidth10kHz
 Resolution Bandwidth10kHz

30MHz ~ 1GHz

Sweep SpeedAuto
 DetectorPK
 Resolution Bandwidth.....100kHz
 Video Bandwidth300kHz

Above 1GHz

Sweep SpeedAuto
 DetectorPK
 Resolution Bandwidth.....1MHz
 Video Bandwidth3MHz
 DetectorAve.
 Resolution Bandwidth.....1MHz
 Video Bandwidth10Hz

7.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above 1GHz, the EUT is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
8. For the radiated emission test 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.

7.5 Test Result

Test Frequency: 9 KHz ~ 30 MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel									
47.83	32.40	QP	153	1.5	H	-16.68	15.72	40.00	-24.28
47.83	32.35	QP	119	1.4	V	-16.68	15.67	40.00	-24.33
2410.00	96.91	PK	26	1.7	H	-11.84	85.07	114.00	-28.93
2410.00	83.76	Ave	26	1.7	H	-11.84	71.92	94.00	-22.08
4820.00	50.22	PK	292	1.5	H	-5.19	45.03	74.00	-28.97
4820.00	37.07	Ave	292	1.5	H	-5.19	31.88	54.00	-22.12
7230.00	39.75	PK	28	1.9	H	0.78	40.53	74.00	-33.47
7230.00	26.60	Ave	28	1.9	H	0.78	27.38	54.00	-26.62
2333.71	45.17	PK	41	1.7	V	-13.19	31.98	74.00	-42.02
2333.71	39.64	Ave	41	1.7	V	-13.19	26.45	54.00	-27.55
2372.50	42.57	PK	318	1.3	H	-13.14	29.43	74.00	-44.57
2372.50	36.22	Ave	318	1.3	H	-13.14	23.08	54.00	-30.92
2488.82	43.78	PK	313	1.1	V	-13.08	30.70	74.00	-43.30
2488.82	38.82	Ave	313	1.1	V	-13.08	25.74	54.00	-28.26

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Middle Channel									
47.83	32.57	QP	339	1.5	H	-16.68	15.89	40.00	-24.11
47.83	32.93	QP	124	1.1	V	-16.68	16.25	40.00	-23.75
2440.00	98.83	PK	107	2.0	H	-11.73	87.10	114.00	-26.90
2440.00	85.68	Ave	107	2.0	H	-11.73	73.95	94.00	-20.05
4880.00	53.32	PK	333	1.1	V	-5.02	48.30	74.00	-25.70
4880.00	40.17	Ave	333	1.1	V	-5.02	35.15	54.00	-18.85
7320.00	40.06	PK	352	1.2	V	1.01	41.07	74.00	-32.93
7320.00	26.91	Ave	352	1.2	V	1.01	27.92	54.00	-26.08
2333.64	46.50	PK	123	2.5	V	-13.19	33.31	74.00	-40.69
2333.64	39.62	Ave	123	2.5	V	-13.19	26.43	54.00	-27.57
2375.57	43.72	PK	171	1.2	H	-13.14	30.58	74.00	-43.42
2375.57	37.61	Ave	171	1.2	H	-13.14	24.47	54.00	-29.53
2496.94	42.43	PK	280	1.4	V	-13.08	29.35	74.00	-44.65
2496.94	36.50	Ave	280	1.4	V	-13.08	23.42	54.00	-30.58

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
GFSK High Channel									
47.83	32.08	QP	119	1.5	H	-16.68	15.40	40.00	-24.60
47.83	32.15	QP	227	1.9	V	-16.68	15.47	40.00	-24.53
2467.00	97.35	PK	308	1.3	V	-11.63	85.72	114.00	-28.28
2467.00	84.20	Ave	308	1.3	V	-11.63	72.57	94.00	-21.43
4934.00	51.66	PK	337	1.9	H	-4.87	46.79	74.00	-27.21
4934.00	38.51	Ave	337	1.9	H	-4.87	33.64	54.00	-20.36
7401.00	39.29	PK	265	1.4	H	1.23	40.52	74.00	-33.48
7401.00	26.14	Ave	265	1.4	H	1.23	27.37	54.00	-26.63
2336.13	46.00	PK	125	2.8	V	-13.19	32.81	74.00	-41.19
2336.13	38.97	Ave	125	2.8	V	-13.19	25.78	54.00	-28.22
2370.70	44.11	PK	218	1.9	H	-13.14	30.97	74.00	-43.03
2370.70	36.70	Ave	218	1.9	H	-13.14	23.56	54.00	-30.44
2486.55	43.53	PK	88	1.0	V	-13.08	30.45	74.00	-43.55
2486.55	38.10	Ave	88	1.0	V	-13.08	25.02	54.00	-28.98

Test Frequency: From 18GHz to 25GHz

The measurements were more than 20 dB below the limit and not reported.

8 Outside of Band Emission

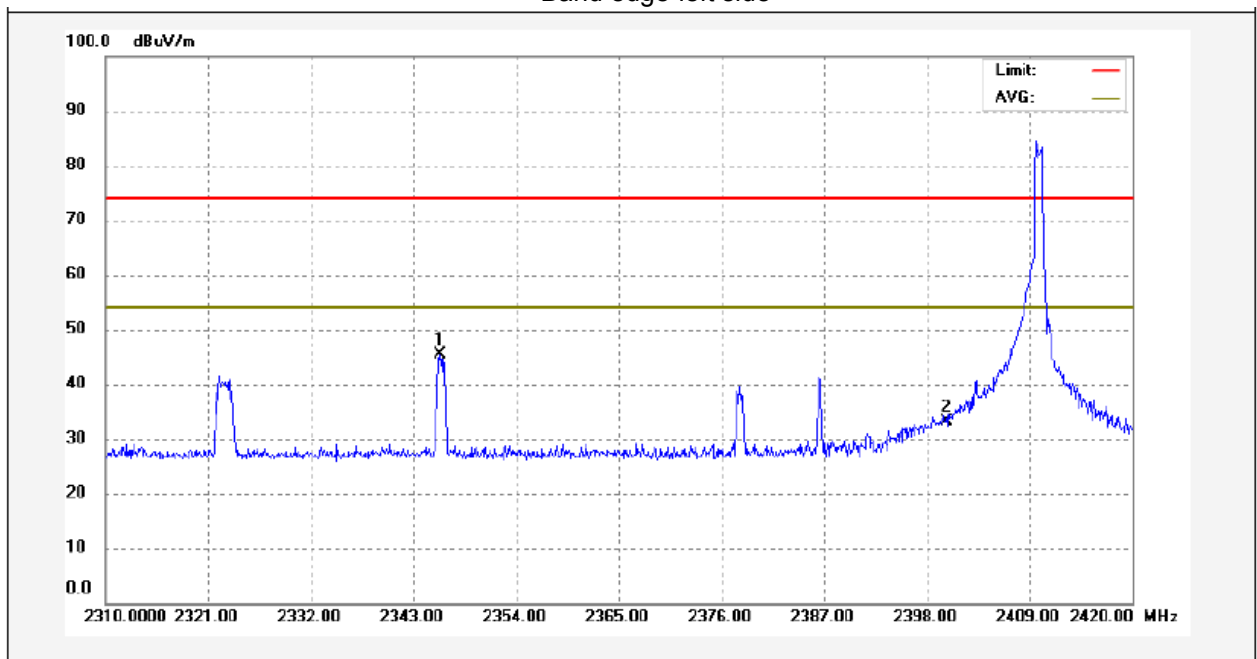
Test Requirement:	15.249(d):Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
Test Method:	ANSI C63.10:2013
Test Mode:	Transmitting

8.1 Test Procedure

Refer to section 7.4 of this test report.

8.2 Test Result

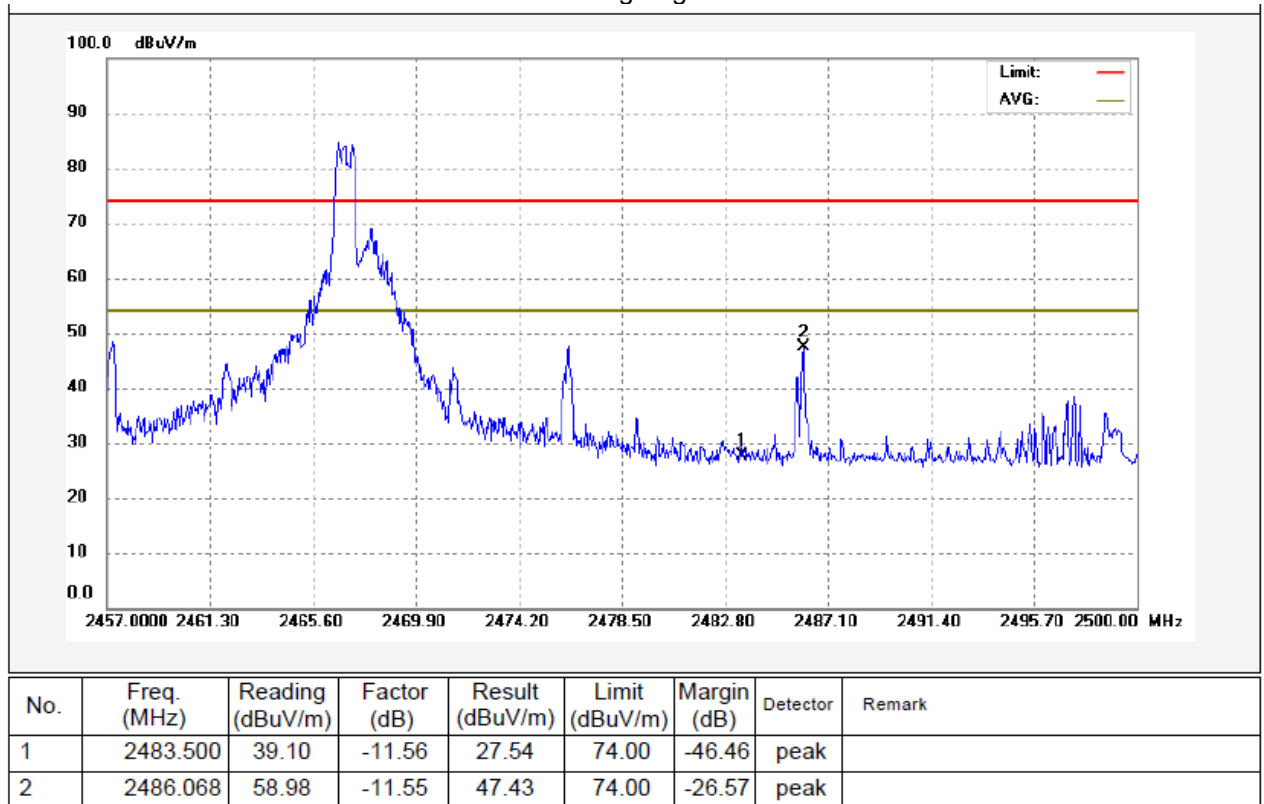
Band edge-left side



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2345.860	57.47	-12.08	45.39	74.00	-28.61	peak	
2	2400.000	45.04	-11.88	33.16	74.00	-40.84	peak	

Remark: The worst case (Horizontal) was recorded.

Band edge-right side



Remark: The worst case (Horizontal) was recorded.

9 Bandwidth Measurement

Test Requirement: FCC CFR Title 47 Chapter I Subchapter A Part 15 Subpart C Section 15.215(c)

Test Method: ANSI C63.10:2013

Test Mode: Transmitting

9.1 Test Procedure

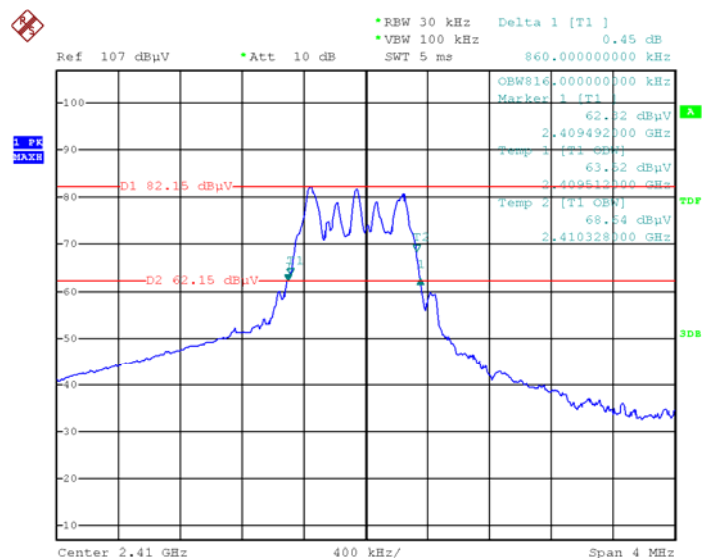
Refer to section 7.4 of this test report.

9.2 Test Result

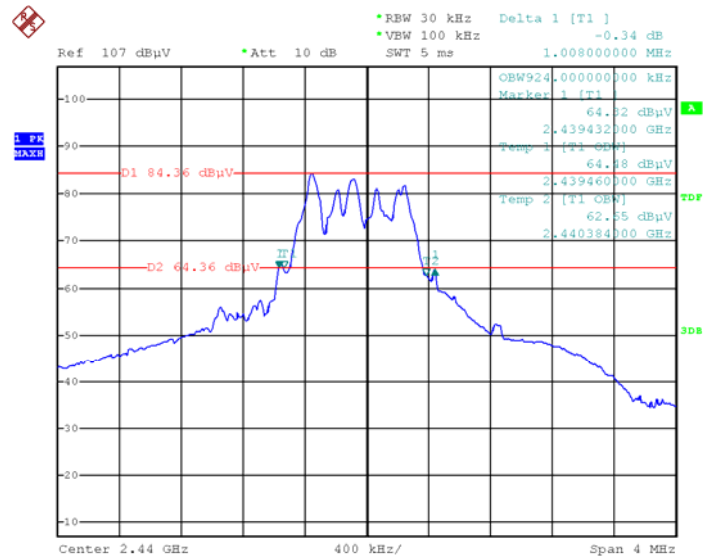
Operation mode	20dB Bandwidth (MHz)
Low channel	0.860
Middle channel	1.008
High channel	0.840

Test result plot as follows:

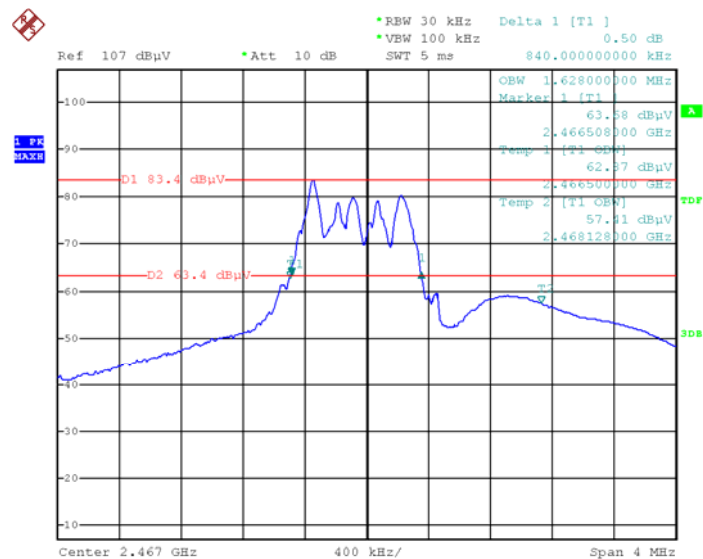
Mode: Low channel



Mode: Middle channel



Mode: High channel



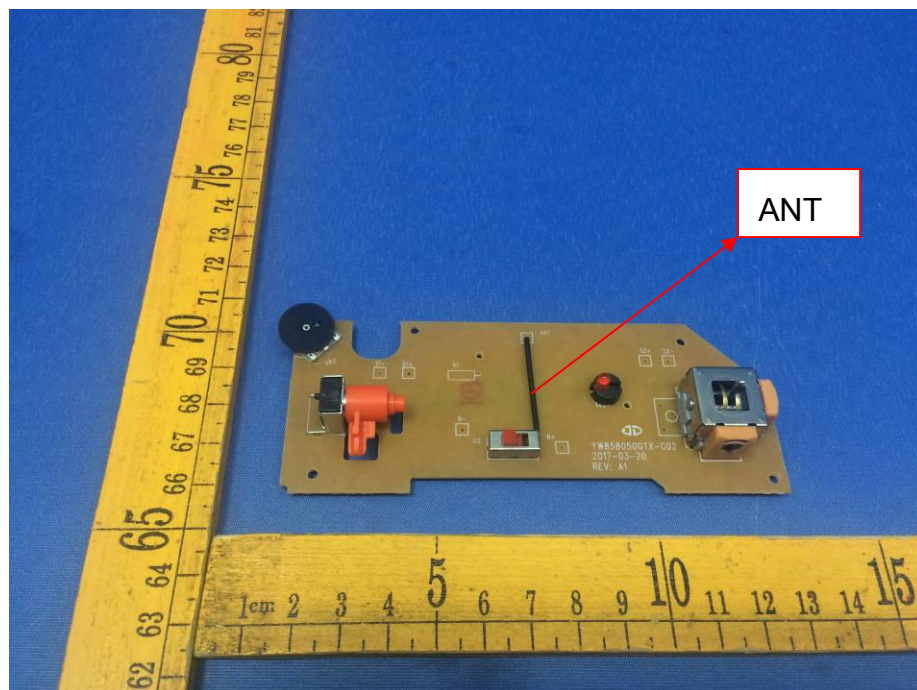
10 Antenna Requirement

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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC CFR Title 47 Chapter I Subchapter A Part 15 Subpart C Section 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.

Result:

The EUT has one Internal Antenna, the gain is 2.3 dBi. meets the requirements of FCC 15.203.



11 Photographs- Model US858250-2 Test Setup Photos

11.1 Photograph - Radiation Emission

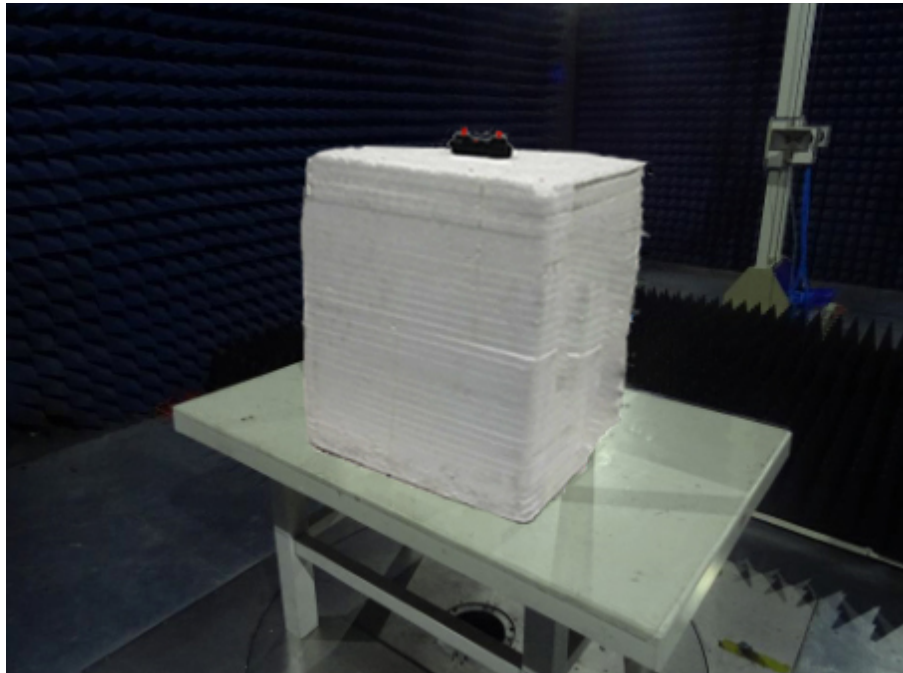
Test frequency from 9 KHz to 30MHz



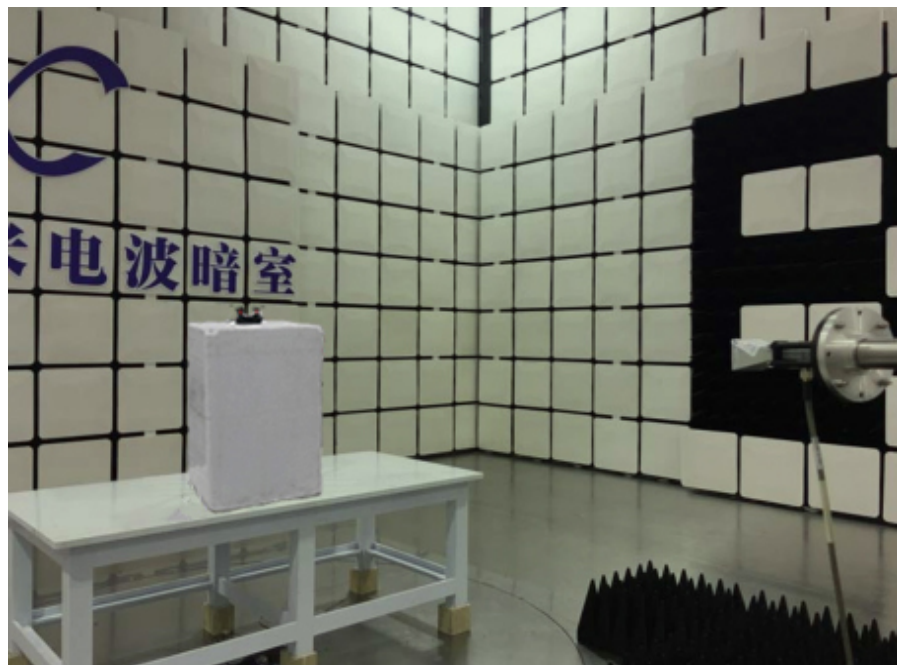
Test frequency from 30MHz to 1GHz



Test frequency from 1GHz to 18GHz



Test frequency from 18GHz to 25GHz



====End of Report====