

TEST REPORT

Reference No..... : WTF17S1195717-1E
FCC ID : XNZECX13008
Applicant..... : KATUMFEL INDUSTRY LIMITED(HK)
Address..... : FuCheng Industrial Town, HongTian, ShaJing, ShenZhen, Hong Kong
Manufacturer : KATUMFEL INDUSTRY LIMITED(HK)
Address..... : FuCheng Industrial Town, HongTian, ShaJing, ShenZhen, Hong Kong
Product..... : REPLACEMENT TRANSMITTER
Model(s) : ECX13008
Standards : FCC CFR47 Part 15 Section 15.249:2017
Date of Receipt sample ... : 2017-11-21
Date of Test : 2017-11-22 to 2017-12-11
Date of Issue..... : 2017-12-12
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:

Waltek Services (Shenzhen) Co., Ltd.

Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China

Tel :+86-755-83551033

Fax:+86-755-83552400

Compiled by:

Robin Zhou

Robin Zhou / Test Engineer

Approved by:



Philo Zhong

Philo Zhong / Manager

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.....	7
6 TEST SUMMARY	8
7 RADIATION EMISSION TEST	9
7.1 EUT OPERATION.....	9
7.2 TEST SETUP	10
7.3 SPECTRUM ANALYZER SETUP.....	11
7.4 TEST PROCEDURE.....	12
7.5 TEST RESULT	13
8 OUTSIDE OF BAND EMISSION.....	16
8.1 TEST PROCEDURE.....	16
8.2 TEST RESULT	16
9 BANDWIDTH MEASUREMENT	18
9.1 TEST PROCEDURE.....	18
9.2 TEST RESULT	18
10 ANTENNA REQUIREMENT	20
11 RF EXPOSURE.....	21
12 PHOTOGRAPHS- ECX13008 TEST SETUP PHOTOS.....	21
13 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS.....	21
13.1 PHOTOGRAPHS –MODEL ECX13008 EXTERNAL PHOTOS.....	21
13.2 PHOTOGRAPHS – MODEL ECX13008 INTERNAL PHOTOS	21

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTF17S1195717-1E	2017-11-21	2017-11-22 to 2017-12-11	2017-12-12	original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product	:REPLACEMENT TRANSMITTER
Model(s)	:ECX13008
Model Differences	:N/A
Type of Modulation	:GFSK
Frequency Range	:2405MHz-2478MHz, 74 Channels in total
Antenna installation	: Internal Integrated Antenna
Antenna Gain	:3.0dBi
Hardware Version	:KTH-90900-09 V2.0
Software Version	:V3 V1.0

4.2 Details of E.U.T.

Ratings	: Battery 4*1.5V AA 300mA
---------	---------------------------

4.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2405	2	2406	3	2407
4	2408	5	2409	6	2410
7	2411	8	2412	9	2413
10	2414	11	2415	12	2416
13	2417	14	2418	15	2419
16	2420	17	2421	18	2422
19	2423	20	2424	21	2425
22	2426	23	2427	24	2428
25	2429	26	2430	27	2431
28	2432	29	2433	30	2434
31	2435	32	2436	33	2437
34	2438	35	2439	36	2440
37	2441	38	2442	39	2443
40	2444	41	2445	42	2446
43	2447	44	2448	45	2449
46	2450	47	2451	48	2452
49	2453	50	2454	51	2455

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
52	2456	53	2457	54	2458
55	2459	56	2460	57	2461
58	2462	59	2463	60	2464
61	2465	62	2466	63	2467
64	2468	65	2469	66	2470
67	2471	68	2472	69	2473
70	2474	71	2475	72	2476
73	2477	74	2478	N/A	N/A

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&15.209&15.205

Test mode	Low channel	Middle channel	High channel
Transmitting	2405MHz	2441MHz	2478MHz

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP30	100091	2017-04-29	2018-04-28
2	Broad-band Horn Antenna(1-18GHz)	SCHWARZBECK	BBHA 9120 D	667	2017-04-09	2018-04-08
3	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2017-04-13	2018-04-12
4	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	2017-04-13	2018-04-12
5	Spectrum Analyzer	R&S	FSP40	100501	2017-10-20	2018-10-19
6	Broad-band Horn Antenna(18-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170651	2017-10-25	2018-10-24
7	Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	100472	2017-10-25	2018-10-24
8	Cable	Top	18-40GHz	-	2017-10-25	2018-10-24
3m Semi-anechoic Chamber for Radiation Emissions						
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
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP30	100091	2017-04-29	2018-04-28

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)

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
RF Exposure	1.1307(b)(1)	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 Part15 Paragraph 15.249&15.209&15.205

Test Method: ANSI 63.10:2010

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	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
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

Test Voltage: DC 6V by Batteries

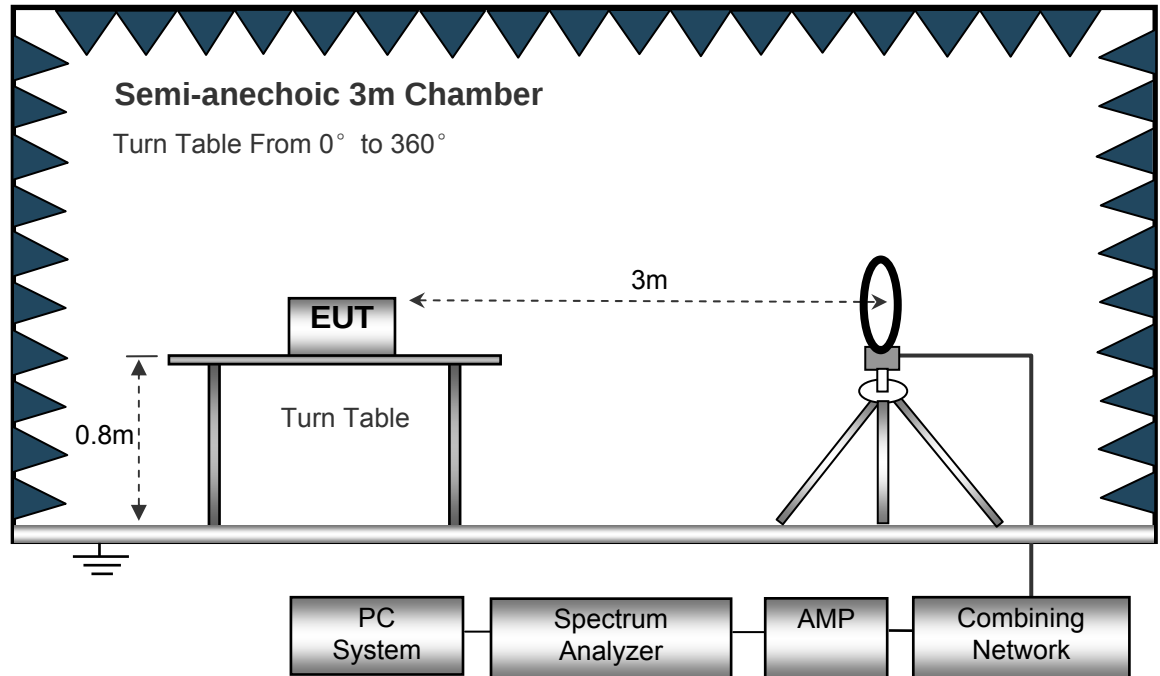
EUT Operation :

The test was performed in Transmitting mode.

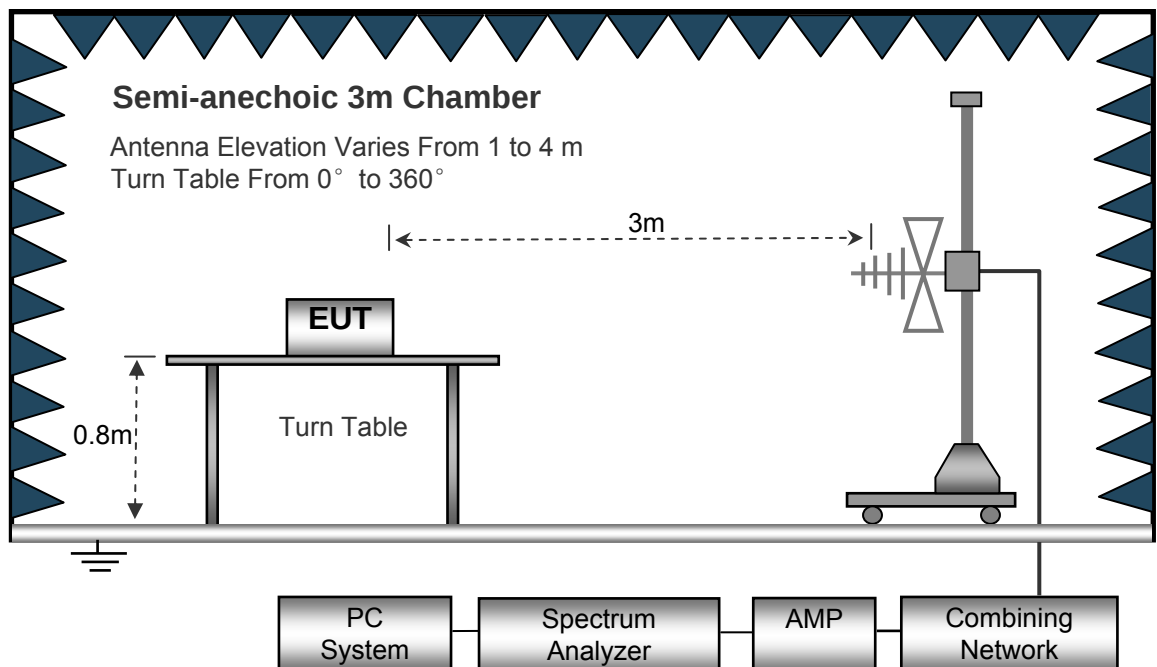
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI 63.10:2010.

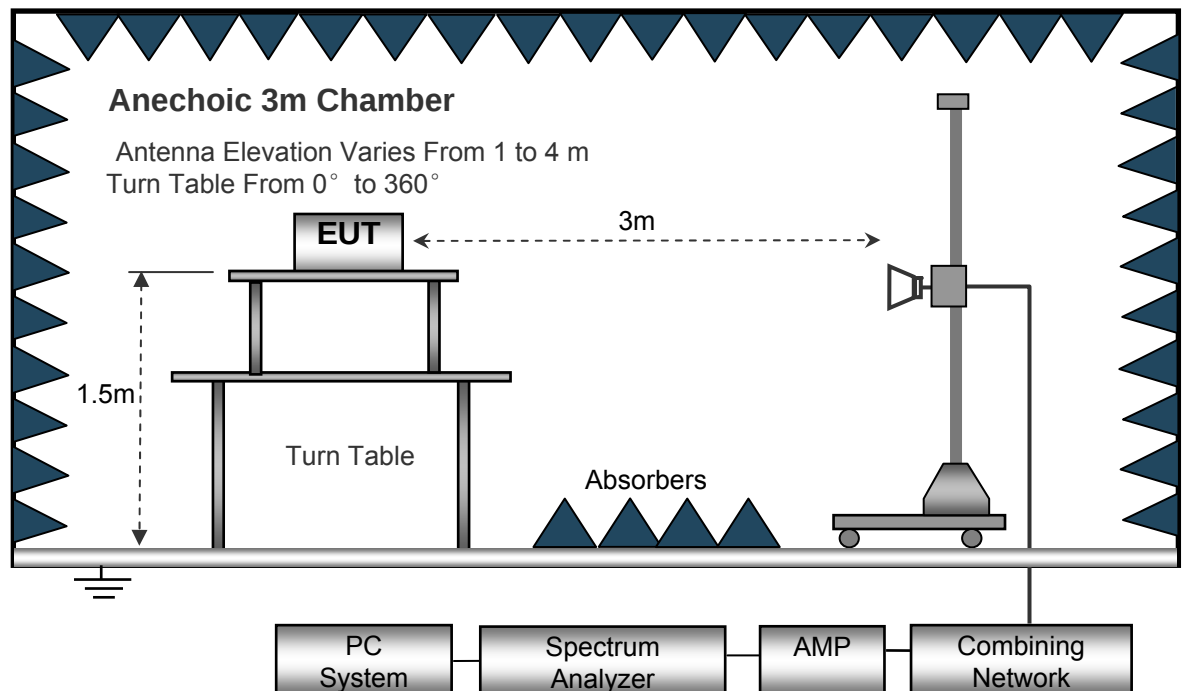
The test setup for emission measurement below 30MHz.



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.

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									
845.09	30.07	QP	149	1.2	H	-2.15	27.92	46.00	-18.08
845.09	27.42	QP	94	1.8	V	-2.15	25.27	46.00	-20.73
2405.00	111.13	PK	108	1.5	H	-11.86	99.27	114.00	-14.73
2405.00	86.07	Ave	108	1.5	H	-11.86	74.21	94.00	-19.79
4810.00	58.85	PK	114	1.0	H	-5.22	53.63	74.00	-20.37
4810.00	33.79	Ave	114	1.0	H	-5.22	28.57	54.00	-25.43
7215.00	61.02	PK	6	1.3	H	0.74	61.76	74.00	-12.24
7215.00	35.96	Ave	6	1.3	H	0.74	36.70	54.00	-17.30
2337.03	45.78	PK	6	1.3	V	-13.19	32.59	74.00	-41.41
2337.03	38.76	Ave	6	1.3	V	-13.19	25.57	54.00	-28.43
2381.29	43.75	PK	166	1.1	H	-13.14	30.61	74.00	-43.39
2381.29	37.69	Ave	166	1.1	H	-13.14	24.55	54.00	-29.45
2489.51	44.77	PK	28	1.6	V	-13.08	31.69	74.00	-42.31
2489.51	37.28	Ave	28	1.6	V	-13.08	24.20	54.00	-29.80

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									
845.09	30.70	QP	251	1.2	H	-2.15	28.55	46.00	-17.45
845.09	28.32	QP	99	1.6	V	-2.15	26.17	46.00	-19.83
2441.00	111.31	PK	111	1.8	V	-11.73	99.58	114.00	-14.42
2441.00	87.00	Ave	111	1.8	V	-11.73	75.27	94.00	-18.73
4882.00	59.37	PK	69	1.7	H	-5.00	54.37	74.00	-19.63
4882.00	35.06	Ave	69	1.7	H	-5.00	30.06	54.00	-23.94
7323.00	62.08	PK	286	1.2	H	1.03	63.11	74.00	-10.89
7323.00	37.77	Ave	286	1.2	H	1.03	38.80	54.00	-15.20
2318.05	45.81	PK	286	1.2	V	-13.19	32.62	74.00	-41.38
2318.05	37.58	Ave	286	1.2	V	-13.19	24.39	54.00	-29.61
2387.62	44.63	PK	172	1.4	H	-13.14	31.49	74.00	-42.51
2387.62	38.19	Ave	172	1.4	H	-13.14	25.05	54.00	-28.95
2498.69	43.46	PK	300	1.3	V	-13.08	30.38	74.00	-43.62
2498.69	36.63	Ave	300	1.3	V	-13.08	23.55	54.00	-30.45

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									
845.09	31.20	QP	80	1.7	H	-2.15	29.05	46.00	-16.95
845.09	27.24	QP	262	1.3	V	-2.15	25.09	46.00	-20.91
2478.00	110.97	PK	98	1.3	V	-11.59	99.38	114.00	-14.62
2478.00	87.36	Ave	98	1.3	V	-11.59	75.77	94.00	-18.23
4956.00	64.58	PK	183	1.9	H	-4.81	59.77	74.00	-14.23
4956.00	40.97	Ave	183	1.9	H	-4.81	36.16	54.00	-17.84
7434.00	53.60	PK	259	1.5	H	1.32	54.92	74.00	-19.08
7434.00	29.99	Ave	259	1.5	H	1.32	31.31	54.00	-22.69
2337.29	45.97	PK	259	1.5	V	-13.19	32.78	74.00	-41.22
2337.29	38.77	Ave	259	1.5	V	-13.19	25.58	54.00	-28.42
2388.79	43.93	PK	294	1.7	H	-13.14	30.79	74.00	-43.21
2388.79	36.07	Ave	294	1.7	H	-13.14	22.93	54.00	-31.07
2488.64	42.37	PK	239	1.4	V	-13.08	29.29	74.00	-44.71
2488.64	38.49	Ave	239	1.4	V	-13.08	25.41	54.00	-28.59

Test Frequency: From 18GHz to 25GHz

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

8 Outside of Band Emission

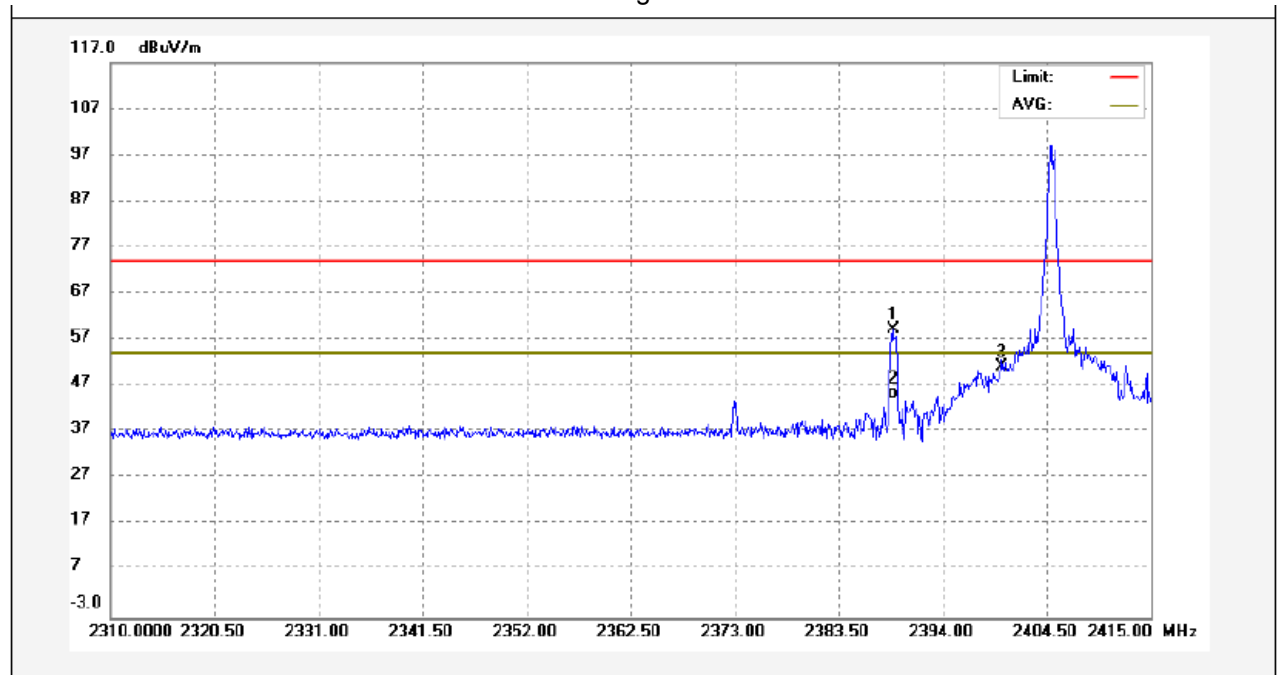
Test Requirement:	15.249(d):Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
Test Method:	ANSI 63.10:2010
Test Mode:	Transmitting

8.1 Test Procedure

Refer to section 7.4 of this test report.

8.2 Test Result

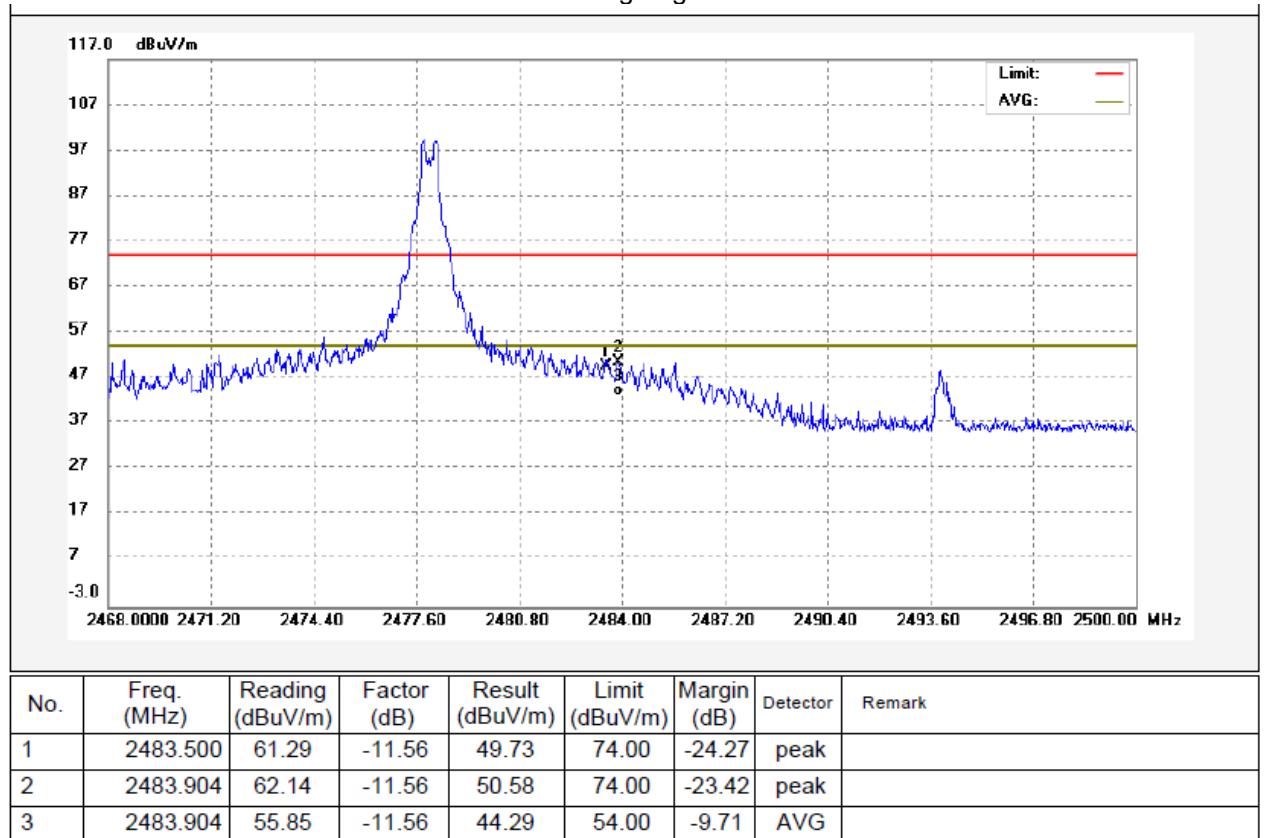
Band edge-left side



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2388.960	71.11	-11.93	59.18	74.00	-14.82	peak	
2	2388.960	57.26	-11.93	45.33	54.00	-8.67	AVG	
3	2400.000	63.18	-11.88	51.30	74.00	-22.70	peak	

Remark: The worst case (Vertical) was recorded.

Band edge-right side



Remark: The worst case (Vertical) was recorded.

9 Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.215(c)

Test Method:

ANSI C63.10:2010

Test Mode:

Transmitting

9.1 Test Procedure

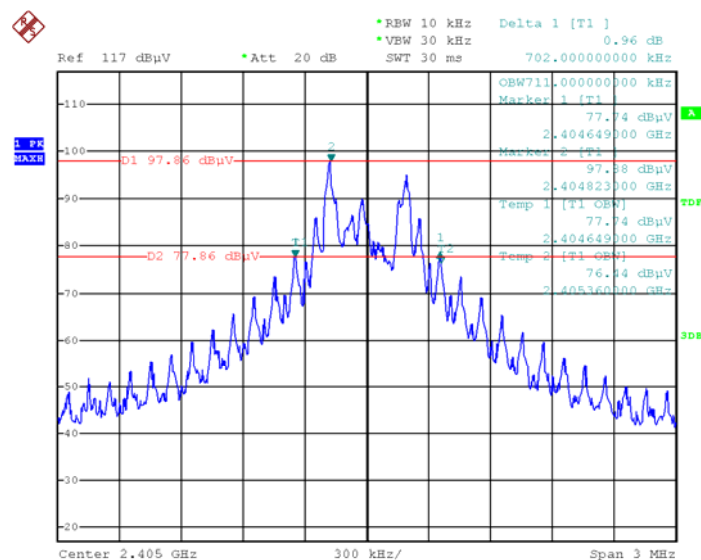
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 10 kHz, VBW = 30 kHz

9.2 Test Result

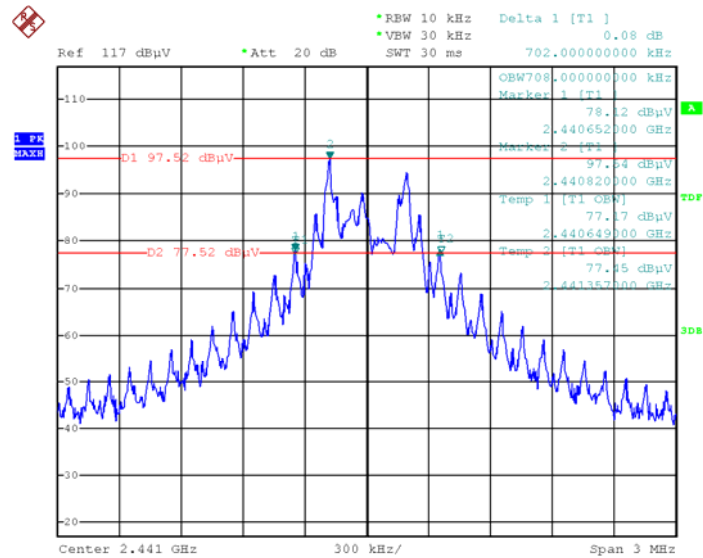
Operation mode	20dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low channel	702.00	711.00
Middle channel	702.00	708.00
High channel	702.00	717.00

Test result plot as follows:

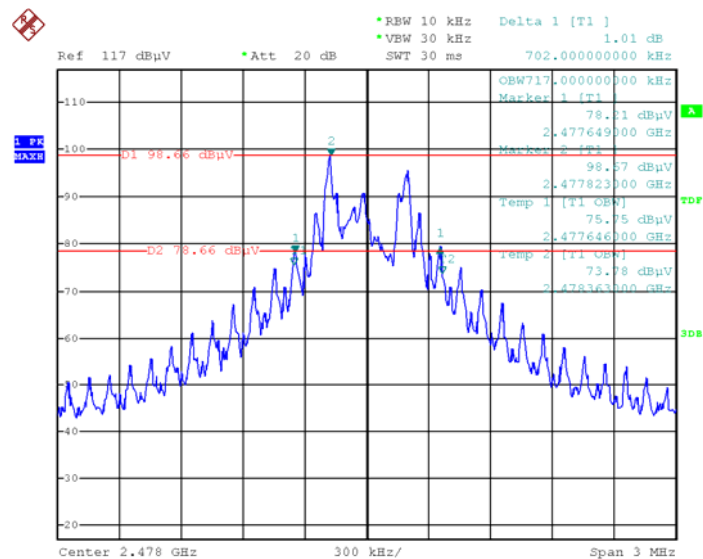
Mode: Low channel



Mode: Middle channel



Mode: High channel



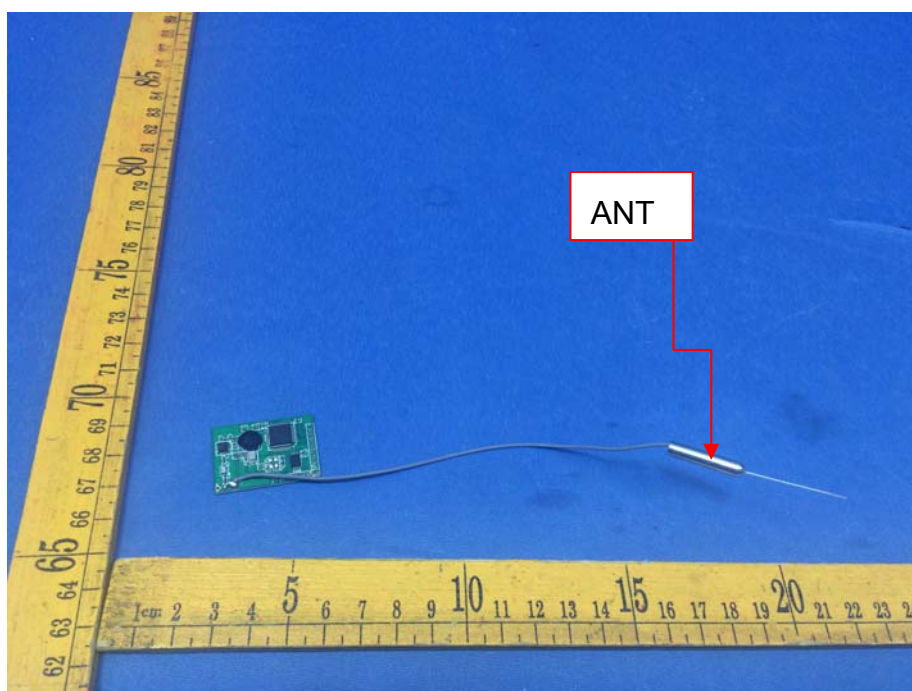
10 Antenna Requirement

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 47 CFR 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 Integrated Antenna, the gain is 3dBi. meets the requirements of FCC 15.203.



11 RF Exposure

Note: Please refer to RF Exposure test report: WTF17S1195717-2E.

12 Photographs- ECX13008 Test Setup Photos

Note: Please refer to RF Exposure test report: WTF17S1195717-3E.

13 Photographs - Constructional Details

13.1 Photographs –Model ECX13008 External Photos

Note: Please refer to RF Exposure test report: WTF17S1195717-3E.

13.2 Photographs – Model ECX13008 Internal Photos

Note: Please refer to RF Exposure test report: WTF17S1195717-3E.

=====End of Report=====