

CTC Laboratories, Inc.

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China Tel: +86-755-27521059 Fax: +86-755-27521011 http://www.sz-ctc.org.cn

Г	EST REPORT				
Report No. ······:	CTC20220788E01				
FCC ID	2AAVDG1357E6				
Applicant	Shenzhen Loyal Electronics Co., Ltd.				
Address	No.5, First Industry Park, Shanmen Songgang, Baoan, Shenzhen, Guangdong, China				
Manufacturer:	Shenzhen Loyal Electronics Co., Ltd.				
Address	No.5, First Industry Park, Shanmen Sc Shenzhen, Guangdong, China	onggang, Baoan,			
Product Name:	Wireless Mouse				
Trade Mark······:	/				
Model/Type reference······:	G1357E6				
Listed Model(s) ······	G1068E4				
Standard:	FCC CFR Title 47 Part 15 Subpart C Section 15.249 RSS-210 Issue 10				
Date of receipt of test sample:	Apr. 15, 2022				
Date of testing	Apr. 15, 2022 to Apr. 28, 2022				
Date of issue	Apr. 29, 2022				
Result:	PASS				
Compiled by:		T: Jinna			
(Printed name+signature)	Jim Jiang	Jim Jiang			
Supervised by:		Miller Ma			
(Printed name+signature)	Miller Ma				
		1 amas			
Approved by:		Jene			
(Printed name+signature)	Totti Zhao	/*			
Testing Laboratory Name:	ratory Name: CTC Laboratories, Inc.				
Address	1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China				
This test report may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client					

This test report may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CTC. The test results in the report only apply to the tested sample. The test report shall be invalid without all the signatures of testing engineers, reviewer and approver. Any objections must be raised to CTC within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit. The test report merely correspond to the test sample.



Table of Contents

Page

1.	TEST	SUMMARY	3
-	1.1.	Test Standards	3
-	1.2.	REPORT VERSION	
-	1.3.	TEST DESCRIPTION	3
-	1.4.	TEST FACILITY	
-	1.5.	MEASUREMENT UNCERTAINTY	4
-	1.6.	Environmental Conditions	5
2.	GENI	RAL INFORMATION	6
	2.1.	CLIENT INFORMATION	6
2	2.2.	GENERAL DESCRIPTION OF EUT	
2	2.3.	Accessory Equipment Information	
_	2.4.	OPERATION STATE	
2	2.5.	MEASUREMENT INSTRUMENTS LIST	
3.	TEST	ITEM AND RESULTS	11
3	3.1.	CONDUCTED EMISSION	11
3	3.2.	20 DB OCCUPIED BANDWIDTH	
3	3.3.	RADIATED FIELD STRENGTH OF THE FUNDAMENTAL SIGNAL	16
3	3.4.	RADIATED SPURIOUS EMISSIONS AND BANDEDGE EMISSION	23
3	3.5.	BAND EDGE EMISSIONS (RADIATED)	
3	3.6.	ANTENNA REQUIREMENT	



1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.

RSS-210: Licence-Exempt Radio Apparatus: Category I Equipment

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report Version

Revised No.	Date of issue	Description
01	Apr. 29, 2022	Original

1.3. Test Description

FCC Part 15 Subpart C (15.249) / RSS-210 Issue 10					
Test Item	Standard	Section	Result	Test Engineer	
iest item	FCC	IC	Result		
Antenna Requirement	15.203	/	Pass	Jim Jiang	
AC Power Line Conducted Emissions	15.207	RSS-Gen 8.8	N/A	N/A	
20dB Occupied Bandwidth	15.215/15.249	/	Pass	Jim Jiang	
Field strength of the Fundamental signal	15.249(a)	RSS-210 F.1.a	Pass	Jim Jiang	
Spurious Emissions	15.209/15.249(a)	RSS-210 F.1.e	Pass	Jim Jiang	
Band edge Emissions	15.205/15.249(d)	/	Pass	Jim Jiang	

Note:

1. The measurement uncertainty is not included in the test result.

2. N/A: means this test item is not applicable for this device according to the technology characteristic of device.



1.4. Test Facility

CTC Laboratories, Inc.

Add: 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for r the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained inour files. Registration 951311, Aug 26, 2017.

1.5. 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 TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties radio equipment characteristics; Part 2" and is documented in the CTC Laboratories, Inc. 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.

Below is the best measurement capability for CTC Laboratories, Inc.



Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)
Radiated Emissions 30~1000MHz	4.70 dB	(1)
Radiated Emissions 1~18GHz	5.00 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth		(1)

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

1.6. Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	21°C~27°C
Relative Humidity:	40%~60%
Atmospheric Pressure:	101kPa

2. GENERAL INFORMATION

2.1. Client Information

Applicant:	Shenzhen Loyal Electronics Co., Ltd.
Address: No.5, First Industry Park, Shanmen Songgang, Baoan, Shenzhen, Guangdong, China	
Manufacturer: Shenzhen Loyal Electronics Co., Ltd.	
Address:	No.5, First Industry Park, Shanmen Songgang, Baoan, Shenzhen, Guangdong, China

2.2. General Description of EUT

Product Name:	Wireless Mouse
Trade Mark:	/
Model/Type reference:	G1357E6
Listed Model(s):	G1068E4
Model Difference:	All these models are identical in the same PCB, layout and electrical circuit. The difference is the model and appearance, G1357E6 has two more buttons than G1068E4.
Power supply:	Input: DC1.5V 100mA
Serial number:	220500006
Hardware version:	V1.0
Software version:	V1.0
2.4GHz ISM Band	
Modulation:	GFSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Antenna type:	PCB Antenna
Antenna gain:	2.08dBi



EN

2.3. Accessory Equipment Information

Equipment Information						
Name	Model	S/N	Manufacturer			
Notebook	ThinkPad T460s	/	Lenovo			
Cable Information	Cable Information					
Name	Shielded Type	Ferrite Core	Length			
USB Cable	Unshielded	NO	100cm			
Test Software Information						
Name	Version	/	/			
FCC Test Tool	V1.6	/	/			



2.4. Operation State

The EUT has been tested under test mode condition. The Applicant provides software to control the EUT for staying in continuous transmitting and receiving mode for testing. Operation Frequency List:

Channel	Frequency (MHz)
01	2402
02	2403
÷	:
38	2439
39	2440
40	2441
:	:
78	2479
79	2480

Note: The display in grey were the channel selected for testing.

Test Mode:

For RF test items

The engineering test program was provided and enabled to make EUT continuous transmit. (duty cycle>98%).

For AC power line conducted emissions:

The EUT was set to connect with large package sizes transmission.

For Radiated spurious emissions test item:

The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.



EN

2.5. Measurement Instruments List

Tonsc	Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	
1	Spectrum Analyzer	Rohde & Schwarz	FSU26	100105	Dec. 23, 2022	
2	Spectrum Analyzer	Rohde & Schwarz	FUV40-N	101331	Mar. 15, 2023	
3	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 23, 2022	
4	Signal Generator	Agilent	E8257D	MY46521908	Dec. 23, 2022	
5	Power Sensor	Agilent	U2021XA	MY5365004	Mar. 15, 2023	
6	Power Sensor	Agilent	U2021XA	MY5365006	Mar. 15, 2023	
7	Simultaneous Sampling DAQ	Agilent	U2531A	TW54493510	Mar. 15, 2023	
8	Climate Chamber	TABAI	PR-4G	A8708055	Dec. 23, 2022	
9	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	116410	Dec. 23, 2022	
10	Climate Chamber	ESPEC	MT3065	/	Dec. 23, 2022	
11	300328 v2.2.2 test system	TONSCEND	v2.6	/	/	

Radia	Radiated emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-759	Nov. 09, 2022	
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 23, 2022	
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 23, 2022	
4	Broadband Premplifier	SCHWARZBECK	BBV9743B	259	Dec. 23, 2022	
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 23, 2022	
6	3m chamber 3	YIHENG	EE106	/	Sep. 09, 2023	



Condu	Conducted Emission										
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until						
1	LISN	R&S	ENV216	101112	Dec. 23, 2022						
2	LISN	R&S	ENV216	101113	Dec. 23, 2022						
3	EMI Test Receiver	R&S	ESCS30	100353	Dec. 23, 2022						
4	ISN CAT6	Schwarzbeck	NTFM 8158	CAT6-8158-0046	Dec. 23, 2022						
5	ISN CAT5	Schwarzbeck	NTFM 8158	CAT5-8158-0046	Dec. 23, 2022						

Note:

1. The Cal. Interval was one year.

2. The cable loss has calculated in test result which connection between each test instruments.

3. TEST ITEM AND RESULTS

3.1. Conducted Emission

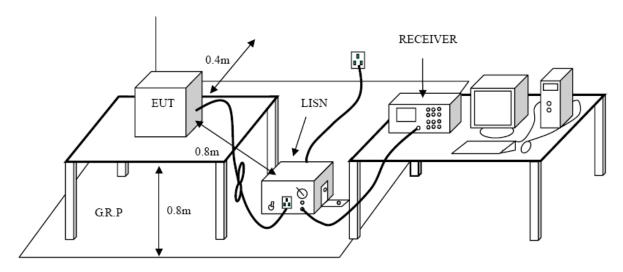
<u>Limit</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.207/ RSS - Gen 8.8

	Limit (d	BuV)
Frequency range (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Configuration



Test Procedure

1. The EUT was setup according to ANSI C63.10:2013 requirements.

2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.

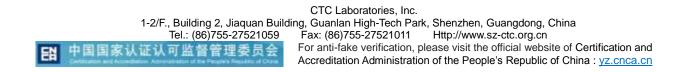
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)

4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

7. During the above scans, the emissions were maximized by cable manipulation.





Test Mode Please refer to the clause 2.4.

Test Results

Not applicable.

ΞN

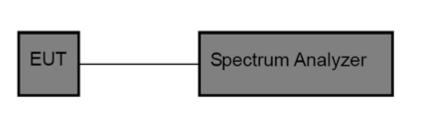


3.2. 20 dB Occupied Bandwidth

<u>Limit</u>

Operation frequency range 2400MHz~2483.5MHz.

Test Configuration



Test Procedure

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a test channel RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

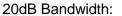
Test Mode

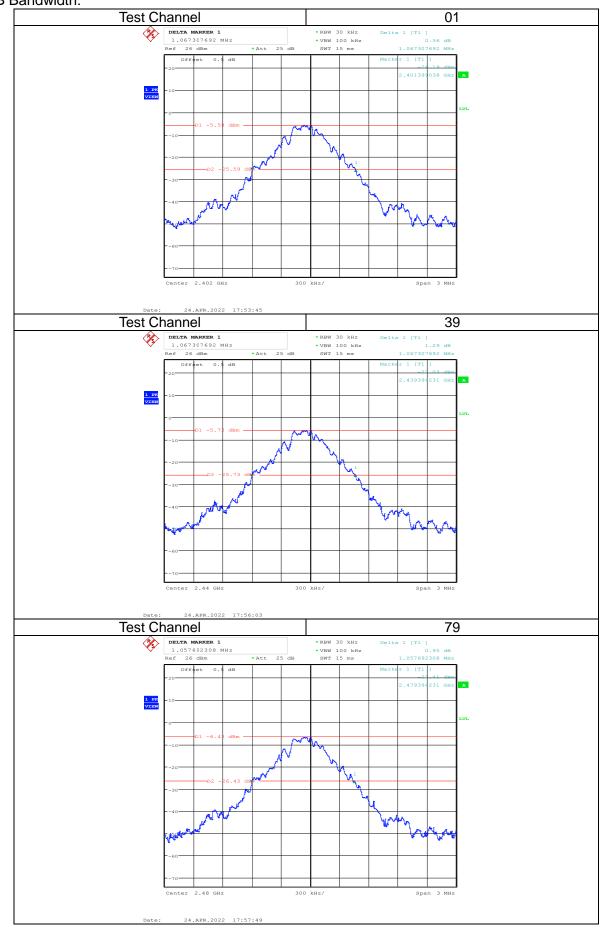
Please refer to the clause 2.4

Test Results

Channel	20dB Bandwidth (MHz)	99% Bandwidth (kHz)	Result
01	1.067	947.115	Pass
39	1.067	947.115	Pass
79	1.058	951.923	Pass

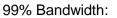


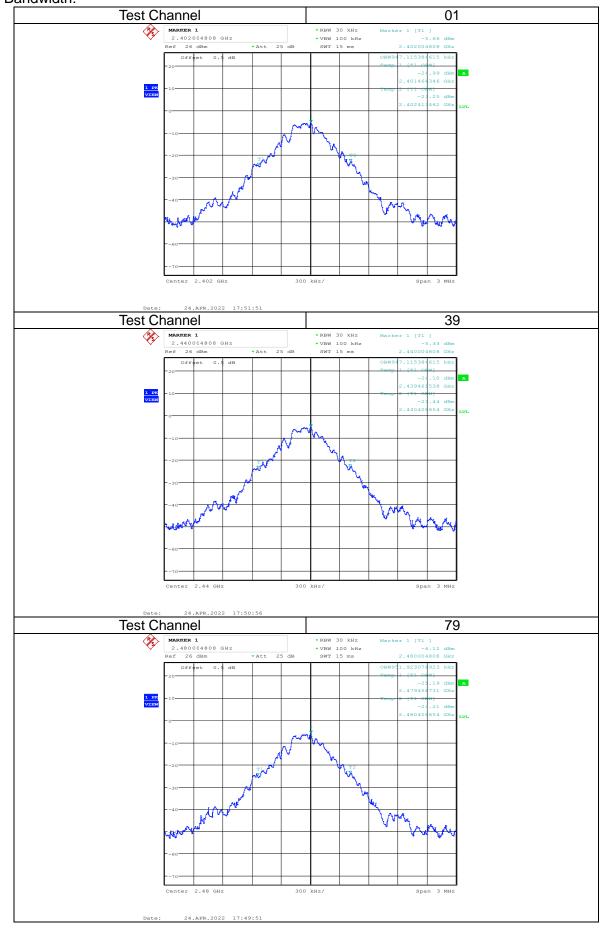












CTC Laboratories, Inc.



EN

1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China Tel.: (86)755-27521059 Fax: (86)755-27521011 Http://www.sz-ctc.org.cn For anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : yz.cnca.cn



3.3. Radiated field strength of the fundamental signal

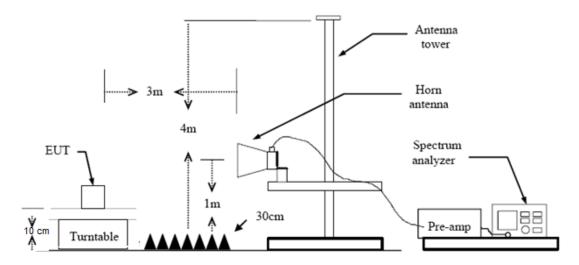
<u>Limit</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.249(a)/ RSS – 210 F.1.a

Fundamental frequency	Field strength of fundamental (millivolts/meter/ AVG)	Field strength of harmonics (microvolts/meter/AVG)
902-928 MHz	50 (94dBuV/m @3m)	500 (54dBuV/m @3m)
2400-2483.5 MHz	50 (94dBuV/m @3m)	500 (54dBuV/m @3m)
5725-5875 MHz	50 (94dBuV/m @3m)	500 (54dBuV/m @3m)
24.0-24.25 GHz	250 (108dBuV/m @3m)	2500 (68dBuV/m @3m)

Frequencies above 1000 MHz, the field strength limits are based on average limits

Test Configuration



Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
- 2. The EUT is placed on a turn table which is 0.1 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- 5. The receiver set as follow: RBW=1MHz, VBW=3MHz Peak detector for Peak value.

Test Mode

Please refer to the clause 2.4





Test Results

_	Pol.		Hori	zontal								
Fest	Mod	le:	TX (GFSK M	lode 2	402M⊦	z					
30.0	dBuV/	m						1				
											114 Margin -	dBuV/m C.dP
											margin -	
						1						
70												
10												
			-								and the second s	~~~~~
1 m	wy My Martin Law											
0.0	7.000 2	398.00	2399.00	2400.00	2401.0	0 2402	.00 240)3.00 2 [,]	404.00 2	2405.00	0	2407.00 MHz
		Frequ	ency	Fact		Readin	-	evel	Limi		Margin	Detector
No	0.	(MH	-	(dB/r	n)	(dBuV) (dB	uV/m)	(dBuV	111)	(dB)	1
	o. 1	-	lz)	(dB/r -3.6	-	(dBuV 91.52		uv/m) 7.85	(dBUV) 114.((dB) -26.15	peak
Rema	1 arks:	(MF 2401	Iz) .760	-3.6	57	91.52	8	7.85	114.(00		



Ant. Po	ol.	Verti	cal					
Test M	ode:	TX C	GFSK Mode	e 2402MHz				
130.0 dB	luV/m							
								dBuV/m
							Margin -	6 dB
				1				
				×				
					\sim			
70			- /		\rightarrow			
			automa and					
	and the second second	Alexandre and a second second						
diama -								
10.0								
	0 2398.00	2399.00	2400.00 24	01.00 2402.00	2403.00 2	404.00 2405.0	0	2407.00 MHz
	Frequ	iency	Factor	Reading	Level	Limit	Margin]
No.	(MI		(dB/m)	(dBuV)		(dBuV/m)	(dB)	Detector
1	2401	.747	-3.67	91.17	87.50	114.00	-26.50	peak
Remar	ks:							
		= Anten	na Factor (dB/m)+Cab	le Factor (dE	3)-Pre-ampli	fier Facto	or
			Limit value	, _ ,		,		



Ant. P	ol.	Ho	rizon	tal										
Test N	lode:	TX	GFS	K Mo	bde	2440	MHz							
130.0 d	lBu¥/m													_
													4dBu∀/m	
												Margin	-6 dB	
							1							
							Ť							
						/		\nearrow						
70					_/									-
					-									
Search and	manufation											manage manager		~
														1
														-
10.0														
2435.0	00 2436.00	2437.00	243	8.00	243	9.00	2440.00	244	1.00	2442.00	2443.0)0	2445.00	MHz
	Free	quency	F	acto	r	Rea	dina	Le	evel	Li	mit	Margir		. 1
No.		/Hz)		B/m		(dB			uV/m)		IV/m)		Deteo	ctor
1	24	39.783	-	3.50		91.	28	87	.78	11	4.00	-26.22	2 pea	ak
Rema 1.Fact	rks: tor (dB/m	a) = Ante	enna l	Facto	or (d	IB/m)-	+Cabl	e Far	tor (d	B)-Pre	-ampl	ifier Fac	tor	



Test Mode 30.0 dBuV/m	: T	X GFS										
30.0 dBuV/m			K Mode	2440N	lHz							
												_
											4dBu∀/m	1
										Margin	-6 dB	
												-
						\mathbf{i}						1
70			- 1		_							
												-
- ester and												
]
					_							1
												-
0.0												
2435.000 243	6.00 2437.0	00 2438	3.00 243	9.00 24	440.00	244	1.00 2	442.00	2443.0	10	2445.00	MHz
No.	Frequenc	-	actor IB/m)	Read (dBu	-		evel IV/m)	Lir (dBu'		Margin (dB)	Detec	tor
INO.	(MHz)	7 -	3.50	88.7	2	0.5	.22	114	00	-28.78	B pea	-



e:	TYC											
		JFSK	Mode	2480	MHz							
												_
											ldBu¥/m	1
										Margin	-6 dB	
					1							
					*							1
												1
				4								
-												
												1
												{
76.00 24	77.00	2478.0	0 247	79.00	2480.00	2481	.00 2	482.00	2483.0	0	2485.00	_ MH₂
Freque (MHz		1	ctor 3/m)		iding 3uV)		evel iV/m)		nit V/m)	Margin (dB)	Detec	:tor
	76.00 24	76.00 2477.00	76.00 2477.00 2478.0	76.00 2477.00 2478.00 247	76.00 2477.00 2478.00 2479.00	76.00 2477.00 2478.00 2479.00 2480.00						



EN

est Mo	•	Vert	ical										
30.0 dBuV	de:	TX (GFSK	Mode	2480	MHz							
	/m												_
												dBu¥/m	
											Margin ·	6 dB	
						1							1
70					/		$ \rightarrow $						
				Ľ									
													1
down where the second	and and a second a second and a second and a second as a second										and and a second second	Harrisonalager	~
													-
0.0 2475.000	0.170.00	477.00	2478.0		9.00	2480.00	0.40	1.00 2	482.00	2483.0		2485.00	_
2473.000	2470.UU 2	477.00	2470.1	10 247	3.00	2400.00	240	1.00 2	402.00	2403.0	U	2403.00	мп
No.	Freque (MH	-	1	actor 3/m)	Rea (dB	ding uV)		evel uV/m)	1	nit V/m)	Margin (dB)	Deteo	ctor
H	2480.	007	-3	3.33	88.	58	96	5.25	114	1.00	-28.75	pea	ək

CTC Laboratories, Inc. 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China Tel.: (86)755-27521059 中国国家认证认可监督管理委员会 不 anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : <u>vz.cnca.cn</u>

3.4. Radiated Spurious Emissions and Bandedge Emission

<u>Limit</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.209&15.249(a)/ RSS - 210 F.1.e

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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
960~1000	500	3

	dB(uV/m) (a	at 3 meters)
Frequency (MHz)	Peak	Average
Above 1000	74	54

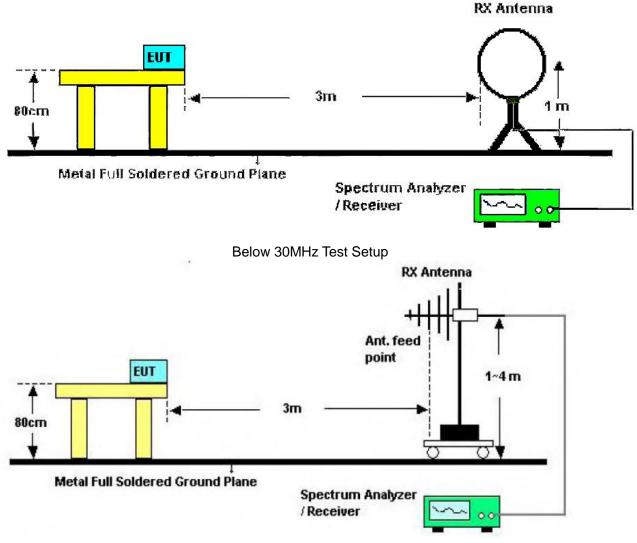
Note:

(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

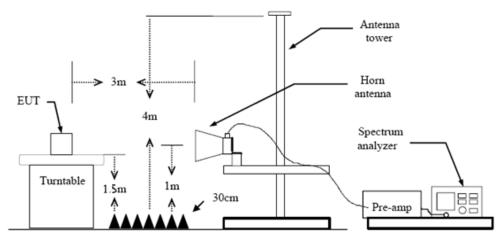
Test Configuration





30-1000MHz Test Setup





Above 1GHz Test Setup

Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013

2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for

above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level. 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.

For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower 4. (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) 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.

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

Use the following spectrum analyzer settings 6.

(1) Span shall wide enough to fully capture the emission being measured;

(2) Below 1 GHz:

RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;

If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

(3) From 1 GHz to 10th harmonic:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW=10Hz with Peak Detector for Average Value.

Test Mode

Please refer to the clause 2.4.

Test Result

9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

30MHz-1GHz

Ant.	Pol.	nt. Pol.		Horizontal							
Fest	t Mode	:		TX GFSK Mode 2402MHz							
Rem	nark:			Only v	worse	case is repo	orted				
90.0	dBuV/m	ĺ									
40							3	FCC Part15 RE-C	Marg	in -6 dB	
	mm	annyanna	WMM MMM	fthy wyerth	watta	w. Werter	Min Min Marine	www.and	norman la ser	Abbreverdensereten	
10					w nikk (will)						
10		М~щ,АуйМ _{ай} 0 50	60 70		kenter with	(MHz)		00 400			000.
10		o 50		80	actor B/m)	(MHz)	Level		500 600 3		000.
10	000 4	0 50 Frequ	60 70	80 F (d	actor	(MHz) Reading	Level	00 400	500 600 3	700 1 Detec	000.
10	000 4 No.	0 50 Frequ (M	60 70 Jency Hz)	80 F (d -1	actor B/m)	(MHz) Reading (dBuV)	Level (dBuV/m)	00 400 Limit (dBuV/m)	500 600 3	700 1 Detec	000.
10	000 4 No. 1	0 50 Frequ (M 131. 199.	60 70 Jency Hz) 2033	80 F (d -1 -1	actor B/m) 19.59	(MHz) Reading (dBuV) 41.81	Level (dBuV/m) 22.22	00 400 Limit (dBuV/m) 43.50	500 600 Margin (dB) -21.28	700 1 Detec QF QF	0000.
10	000 4 No. 1 2	o 50 Frequ (M 131. 199. 238.	60 70 Jency Hz) 2033 1031	80 (d -1 -1 -1	actor B/m) 19.59 16.16	(MHz) Reading (dBuV) 41.81 41.56	Level (dBuV/m) 22.22 25.40	00 400 Limit (dBuV/m) 43.50 43.50	500 600 Margin (dB) -21.28 -18.10	700 1 Detec QF QF	
10	000 4 No. 1 2 3	0 50 Frequ (M 131. 199. 238. 366.	60 70 Jency Hz) 2033 1031 8733	80 F (d -1 -1 -1 -1 -1	actor B/m) 19.59 16.16 14.96	(MHz) Reading (dBuV) 41.81 41.56 44.62	Level (dBuV/m) 22.22 25.40 29.66	Limit (dBuV/m) 43.50 43.50 46.00	500 600 Margin (dB) -21.28 -18.10 -16.34	700 1 Detec QF QF QF	0000.

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value



Ant. Pol.			Vertic	Vertical									
est Mode	:		TX G	FSK	Mod	e 2402M⊦	lz						
Remark:			Only worse case is reported										
90.0 dBuV/m	I								1				
40								3	15 RE-CI	4	Margi	in -6 c	5 >
www.ww	www.wulp	www	(Murayyaha)	1 hy/17/441	nuntur	and when the	Lungh mund	Aller	M Wards	wind wind	unuleek	www	
	munant	mumm	anna ann an ann an an an an an an an an	1 My297-/M4	nuthur	wanter for the set	a and a second sec	All the second	M www.words	and ^{all} d	un la	w/MVA	
10	₩₩₩₩₩₩ 0 50		146 againt 0 80	1 hy. 19-19-19-19	nathar	М ₉₁ М ₉ /М/(1/М//) (MH2)						w///// ^k	1000.
10		60 7	0 80	Facto	r f			00 Lir			500 7 rgin	700	
10 30.000 4	0 50 Frequ (Mi	60 7	0 80 F (C	acto	r F	(MHz) Reading	Level	00 Lir (dBu	400 ! nit	500 e Mar (dl	500 7 rgin	700 Det	1000.
10 30.000 4 No.	0 50 Frequ (MI 198.	⁶⁰ 7 Iency Hz)	0 80 F (C	Facto	r F) 3	(MH2) Reading (dBuV)	Level (dBuV/m)	00 Lir (dBu 43	400 ! mit V/m)	500 e Mar (dl	500 7 rgin B) '.69	700 Det	1000. tector
10 30.000 4 No. 1	0 50 Frequ (MI 198. 299.	60 7 iency Hz) 4566	0 80 F (C	Factor dB/m 16.2	r f) 3	(MHz) Reading (dBuV) 42.04	Level (dBuV/m) 25.81	00 Lir (dBu 43 46	400 ! mit V/m) 5.50	500 e Mar (dl -17	500 7 rgin B) 7.69 8.04	700 Det	1000. tector
10 30.000 4 No. 1 2	0 50 Frequ (Mi 198. 299. 366.	60 7 iency Hz) 4566 9832	0 80 F (C -	Facto 1B/m 16.2 13.5	r F) 3 4 9	(MH2) Reading (dBuV) 42.04 46.50	Level (dBuV/m) 25.81 32.96	00 Lir (dBu 43 46 46	400 ! mit V/m) 4.50	500 e Mar (dl -17 -13	rgin B) (.69 (.04	700 Det ((1000. tector QP QP
10 30.000 4 No. 1 2 3	0 50 Frequ (MI 198. 299. 366. 598.	60 7 lency Hz) 4566 9832 5900	0 80 F (C - -	Facto 1B/m 16.2 13.5 11.8	r F) 3 4 9	(MHz) Reading (dBuV) 42.04 46.50 47.68	Level (dBuV/m) 25.81 32.96 35.79	00 Lir (dBu 43 46 46 46	400 9 mit V/m) 5.50 5.00 5.00	Mar (dl -17 -13 -10	rgin B) 7.69 9.04 9.21	700 Def ((((1000. tector QP QP QP

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor



Ant. Pol.	Horizontal
Test Mode:	TX GFSK Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	4804.033	2.16	31.74	33.90	54.00	-20.10	AVG
2	4804.041	2.16	43.62	45.78	74.00	-28.22	peak

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

Ant. Pol.	Vertical
Test Mode:	TX GFSK Mode 2402MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	4804.136	2.16	44.45	46.61	74.00	-27.39	peak
2	4804.391	2.16	32.42	34.58	54.00	-19.42	AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX GFSK Mode 2440MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	4879.900	2.31	42.99	45.30	74.00	-28.70	peak
2	4880.005	2.31	31.55	33.86	54.00	-20.14	AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

Ant	. Pol. Vertical							
Tes	TX GFSK Mode 2440MHz							
Remark:			lo report for prescribed lin		n which moi	re than 20 d	B below	the
		Frequency	Factor	Reading	l evel	Limit	Margin	
	No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	No. 1							Delector

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value



Ant. Pol.	Horizontal
Test Mode:	TX GFSK Mode 2480MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	4960.210	2.48	31.52	34.00	54.00	-20.00	AVG
2	4960.237	2.48	44.21	46.69	74.00	-27.31	peak

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value

Ant. Pol.	Vertical
Test Mode:	TX GFSK Mode 2480MHz
Remark:	No report for the emission which more than 20 dB below the prescribed limit.

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	4959.785	2.48	31.15	33.63	54.00	-20.37	AVG
2	4960.060	2.48	43.41	45.89	74.00	-28.11	peak

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value



3.5. Band Edge Emissions (Radiated)

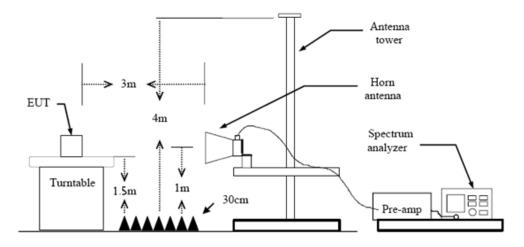
<u>Limit</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.205&15.249(d)

Restricted Frequency Band	/ Band (dBuV/m)(at 3m)				
(MHz)	Peak	Average			
2310 ~ 2390	74	54			
2483.5 ~ 2500	74	54			

Conducted band edge limit: The highest point of the operating frequency waveform down 20dB

Test Configuration



Test Procedure

- 1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
- 2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- 5. The receiver set as follow:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW see note 1 with Peak Detector for Average Value.

Note 1: For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements.

Test Mode

Please refer to the clause 2.4.

Test Results

CTC Laboratories, Inc. 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China Tel.: (86)755-27521059 中国国家认证认可监督管理委员会 中国国家认证认可监督管理委员会



Ant. Pol.			orizontal					
est Mod	e:	ТХ	GFSK Mo	ode 2402M⊦	lz			
20.0 dBuV/	m							
								٥
					FCC	Part15 RE-Class	B Above 1G I	PK
60						Part15 RE-Class	D Abarra 10	1
					FLL	Partio RE-Class	B ADOVE TG /	*
								2
or marketers	mandahan man			Marine Ma	*****	-white and the second second	*****	and h
0.0								
2257.250 2	272.25 2287.2	: 5 2,	302.25 231	7.25 2332.25	2347.25	2362.25 237	7.20	2407.25
2257.250 2	272.23 2207.2	<u>:5 2</u> .	302.25 231	7.23 2332.23	2347.25	2362.25 237	(.23	2407.25
2257.250 2								2407.25
No.	Frequen		Factor	Reading	Level	Limit	Margin	Detector
No.	Frequen (MHz)	су	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	Frequen	cy)0	Factor	Reading	Level	Limit	Margin	



Ant. Pol.			\	/ertica	l									
est	t Mode	:	1	TX GFSK Mode 2402MHz										
20.0	dBu¥/m													
									FCC	Part	15 RE-Class	B Above 1G I	PK	\square
60									FCC	Part	15 RE-Class	B Above 1G /	AV Å	
													2	
-			martmentet	wanne	www.	montra		yn,	han an a	m	~~~~		munk	*
).O														
22	56.500 22	71.50 228	36.50	2301.50) 231	6.50	2331.50	2346	.50	2361	.50 2370	6.50	2406.	50 MI
ſ	No.	Freque	-		ictor		ading	Lev			Limit	Margin	Detec	tor
		(MH	z)	(dE	3/m)	(dB	BuV)	(dBu\	V/m)	(dl	BuV/m)	(dB)		\rightarrow
	No.		z)	(dE		(dB	I		V/m)	(dl				\rightarrow



Ant. Pol.		Horiz	zontal								
Fest Mode	:	TX C	TX GFSK Mode 2480MHz								
20.0 dBuV/m	1										
					FCC	Part15 RE-Class	B Above 1G I	ж			
60 1 X					FCC	Part15 RE-Class	R Above 16 /	av l			
×											
3											
w want	han mar and the second	and an and the second	*************************	angoton methoda ang sana kana s	on the second	naf ween det en de saar weer en de se	ahara ay an ang ang ang ang ang ang ang ang ang	ukash-tomorrow			
).0 2475.500 24	90.50 2505.50) 252	0.50 253	5.50 2550.50	2565.50	2580.50 259	5.50	2625.50 MI			
	Frequence	v	Factor	Reading	Level	Limit	Margin				
No.	(MHz)		dB/m)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	Detector			
1	2483.50	0	31.24	25.14	56.38	74.00	-17.62	peak			
2	2483.50	0	31.24	6.60	37.84	54.00	-16.16	AVG			
L	1	I		1	1		1				
emarks:											
	IB/m) = Antei	nna Fa	actor (dB/	(m)+Cable F	actor (dB)-F	Pre-amplifie	r Factor				
	alue = Level			,	()						



Ant. Pol.	Vertica	I									
est Mode		TX GF	TX GFSK Mode 2480MHz								
20.0 dBuV/m											
						FCC	Part15 RE-Class	B Above 1G F	РК		
io 1						FCC	Part15 RE-Class	B Above 1G /	v		
2											
and Maragan	la anna an	adaqaada sagtaqatirdanda dahara	freedokaan karaa	and a monoral data in the second s	a for a factor of the	an a	the had the second sector and	ellen en la service de la sellen	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
.0											
2474.750 248	9.75 2504.7	75 2519.75	2534	1.75 2549.75	2564	.75	2579.75 2594	4.75	2624.75 M		
No.	Frequen (MHz)	-	ictor 3/m)	Reading (dBuV)	Lev (dBu)		Limit (dBuV/m)	Margin (dB)	Detector		
1	2483.50	00 31	.24	22.57	53.	81	74.00	-20.19	peak		
2	2483.50	00 31	.24	5.47	36.	71	54.00	-17.29	AVG		

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor 2.Margin value = Level -Limit value



3.6. Antenna Requirement

Requirement

FCC CFR Title 47 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. The use of a permanently attached antenna or of antenna that uses a unique coupling to the intentional radiator, 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.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Test Result

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.