

# FCC REPORT

**Applicant:** Shenzhen Hangshi Technology Co., Ltd.

**Address of Applicant:** Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China.

**Manufacturer/Factory:** Shenzhen Hangshi Technology Co., Ltd.

**Address of Manufacturer/Factory:** Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China.

**Equipment Under Test (EUT)**

Product Name: 2.4G Keyboard

Model No: HW197-3-G, HW197-2-G, HW198-3-G, HW198-2-G

**FCC ID:** 2AKHJHW197-3-G

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.249

**Date of sample receipt:** July 03, 2018

**Date of Test:** July 04-12, 2018

**Date of report issued:** July 13, 2018

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Li

Laboratory Manager

This 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.

## 2 Version

Version No.	Date	Description
00	July 13, 2018	Original

Prepared By:

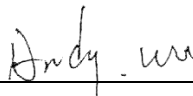


Date:

July 13, 2018

Project Engineer

Check By:



Date:

July 13, 2018

Reviewer

## 3 Contents

	Page
1 COVER PAGE.....	1
2 VERSION.....	2
3 CONTENTS .....	3
4 TEST SUMMARY .....	4
4.1 MEASUREMENT UNCERTAINTY .....	4
5 GENERAL INFORMATION.....	5
5.1 GENERAL DESCRIPTION OF EUT .....	5
5.2 TEST MODE .....	7
5.3 DESCRIPTION OF SUPPORT UNITS .....	7
5.4 TEST FACILITY.....	7
5.5 TEST LOCATION .....	7
5.6 OTHER INFORMATION REQUESTED BY THE CUSTOMER .....	7
5.7 ADDITIONAL INSTRUCTIONS.....	8
6 TEST INSTRUMENTS LIST .....	9
7 TEST RESULTS AND MEASUREMENT DATA.....	10
7.1 ANTENNA REQUIREMENT .....	10
7.2 RADIATED EMISSION METHOD.....	11
7.2.1 <i>Field Strength of The Fundamental Signal</i> .....	14
7.2.2 <i>Spurious emissions</i> .....	15
7.2.3 <i>Bandedge emissions</i> .....	20
7.3 20dB OCCUPY BANDWIDTH.....	21
8 TEST SETUP PHOTO .....	23
9 EUT CONSTRUCTIONAL DETAILS .....	24

## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	N/A
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

*Pass: The EUT complies with the essential requirements in the standard.*

*N/A: Not applicable.*

*Remark: Test according to ANSI C63.10: 2013 and ANSI C63.4: 2014.*

### 4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

## 5 General Information

### 5.1 General Description of EUT

Product Name:	2.4G Keyboard
Model No.:	HW197-3-G, HW197-2-G, HW198-3-G, HW198-2-G
Test Model No.:	HW197-3-G
Remark:	<i>All above models are identical in the same PCB layout, interior structure and electrical circuits. The only differences are the model name and appearance color for commercial purpose.</i>
Serial No.:	HSHW1973G00005
Test sample(s) ID:	GTS201807000082-1
Sample(s) Status	Engineer sample
Hardware:	V 1.0
Software:	V 1.0
Operation Frequency:	2405MHz~2470MHz
Channel numbers:	8
Modulation type:	GFSK
Antenna Type:	PCB antenna
Antenna gain:	-1.2dBi
Power supply:	DC 3.0V by 2*AAA batteries

Operation Frequency each of channel			
Channel	Frequency	Channel	Frequency
01	2405MHz	05	2440MHz
02	2413MHz	06	2450MHz
03	2422MHz	07	2460MHz
04	2430MHz	08	2470MHz

**Note:**

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2405MHz
The middle channel	2430MHz
The Highest channel	2470MHz

## 5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
<i>Remark: During the test, the dutycycle &gt;98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i>	

### Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	77.59	78.17	76.22

## 5.3 Description of Support Units

None.
-------

## 5.4 Test Facility

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

- **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen 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 in files. Registration 381383, January 08, 2018.

- **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016

## 5.5 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960

## 5.6 Other Information Requested by the Customer

None.
-------

## 5.7 Additional instructions

Software (Used for test) from client

Mode	Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.
------	--

Power level setup in software			
Test Software Name	N/A		
Test Software Version	N/A		
Support Units (Software installation media)	Description	Manufacturer	Model
	N/A	N/A	N/A
Mode	Channel	Frequency (MHz)	Soft Set
GFSK	CH01	2405	TX LEVEL: Default
	CH04	2430	
	CH08	2470	




## 6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 27 2018	June. 26 2019
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 27 2018	June. 26 2019
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 27 2018	June. 26 2019
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 27 2018	June. 26 2019
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 27 2018	June. 26 2019
9	Coaxial Cable	GTS	N/A	GTS211	June. 27 2018	June. 26 2019
10	Coaxial cable	GTS	N/A	GTS210	June. 27 2018	June. 26 2019
11	Coaxial Cable	GTS	N/A	GTS212	June. 27 2018	June. 26 2019
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 27 2018	June. 26 2019
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 27 2018	June. 26 2019
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 27 2018	June. 26 2019
15	Band filter	Amindeon	82346	GTS219	June. 27 2018	June. 26 2019
16	Power Meter	Anritsu	ML2495A	GTS540	June. 27 2018	June. 26 2019
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 27 2018	June. 26 2019
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 27 2018	June. 26 2019
19	Splitter	Agilent	11636B	GTS237	June. 27 2018	June. 26 2019
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 27 2018	June. 26 2019

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 27 2018	June. 26 2019
2	Barometer	ChangChun	DYM3	GTS255	June. 27 2018	June. 26 2019

## 7 Test results and Measurement Data

### 7.1 Antenna requirement

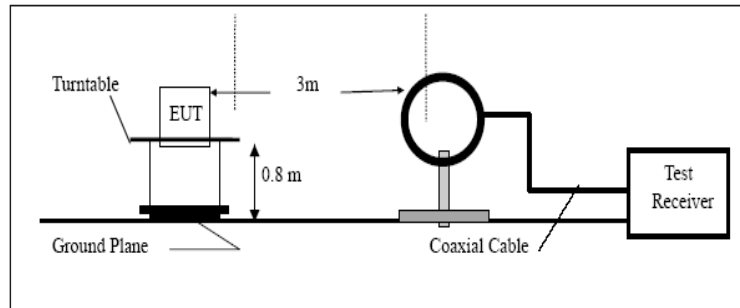
<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<b>15.203 requirement:</b>	
<p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.</p>	
<b>EUT Antenna:</b>	
<p><i>The antenna is PCB antenna, the best case gain of the antenna is -1.2dBi.</i></p> 	

## 7.2 Radiated Emission Method

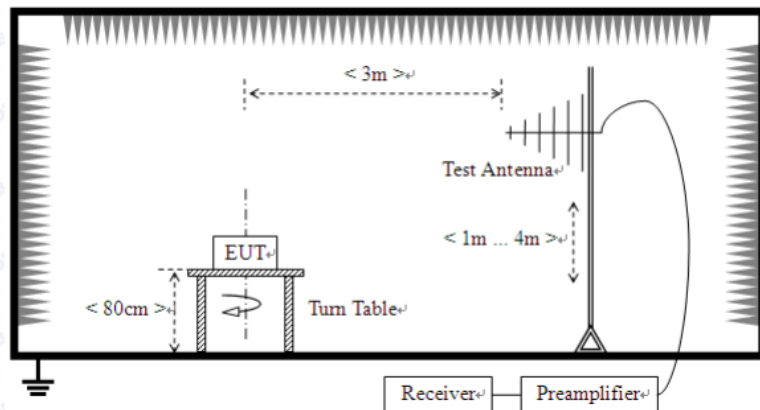
Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
Peak		1MHz	10Hz	Average	
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark	
	2400MHz-2483.5MHz	94.00		Average Value	
		114.00		Peak Value	
Limit: (Spurious Emissions)	Frequency	Limit (uV/m)	Value	Measurement Distance	
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m	
	0.490MHz-1.705MHz	24000/F(KHz)	QP	300m	
	1.705MHz-30MHz	30	QP	30m	
	30MHz-88MHz	100	QP	3m	
	88MHz-216MHz	150	QP		
	216MHz-960MHz	200	QP		
	960MHz-1GHz	500	QP		
	Above 1GHz	500	Average		
5000		Peak			
Limit: (band edge)	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 Section 15.209, whichever is the lesser attenuation.				

Test setup:

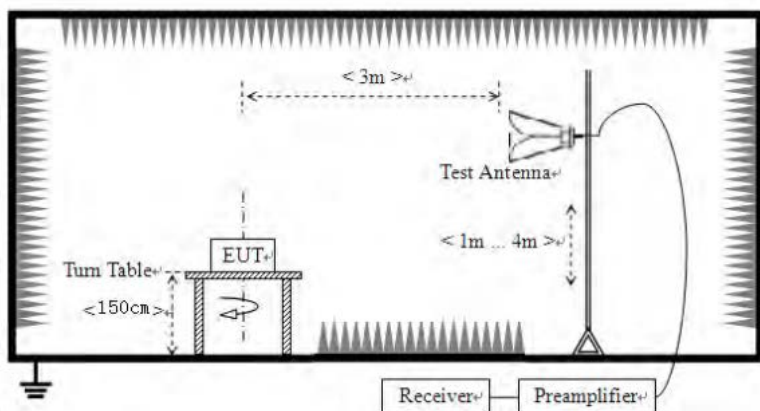
Below 30MHz



Below 1GHz



Above 1GHz



<p>Test Procedure:</p>	<ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li> </ol>
<p>Test Instruments:</p>	<p>Refer to section 6.0 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.2 for details</p>
<p>Test results:</p>	<p>Pass</p>

**Measurement data:**

## 7.2.1 Field Strength of The Fundamental Signal

### Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2405.00	80.98	27.15	3.65	36.12	75.66	114.00	-38.34	Vertical
2405.00	83.49	27.15	3.65	36.12	78.17	114.00	-35.83	Horizontal
2430.00	80.16	27.22	3.66	36.19	74.86	114.00	-39.14	Vertical
2430.00	82.74	27.22	3.66	36.19	77.44	114.00	-36.56	Horizontal
2470.00	78.94	27.32	3.67	36.29	73.64	114.00	-40.36	Vertical
2470.00	81.31	27.32	3.67	36.29	76.01	114.00	-37.99	Horizontal

### Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2405.00	79.01	27.15	3.65	36.12	73.69	94.00	-20.31	Vertical
2405.00	81.55	27.15	3.65	36.12	76.23	94.00	-17.77	Horizontal
2430.00	78.23	27.22	3.66	36.19	72.93	94.00	-21.07	Vertical
2430.00	80.57	27.22	3.66	36.19	75.27	94.00	-18.73	Horizontal
2470.00	77.76	27.32	3.67	36.29	72.46	94.00	-21.54	Vertical
2470.00	79.37	27.32	3.67	36.29	74.07	94.00	-19.93	Horizontal

## 7.2.2 Spurious emissions

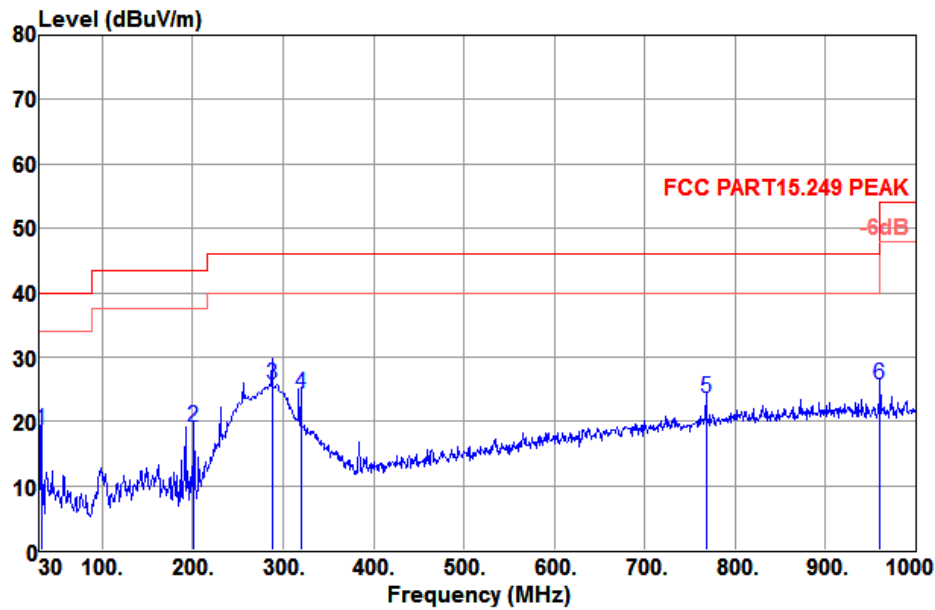
### ■ 9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

### ■ Below 1GHz

<b>Mode:</b>	<b>Transmitting mode</b>	<b>Test by:</b>	<b>Jason</b>
<b>Temp./Hum.(%RH):</b>	<b>26°C/56%RH</b>	<b>Polarization:</b>	<b>Horizontal</b>

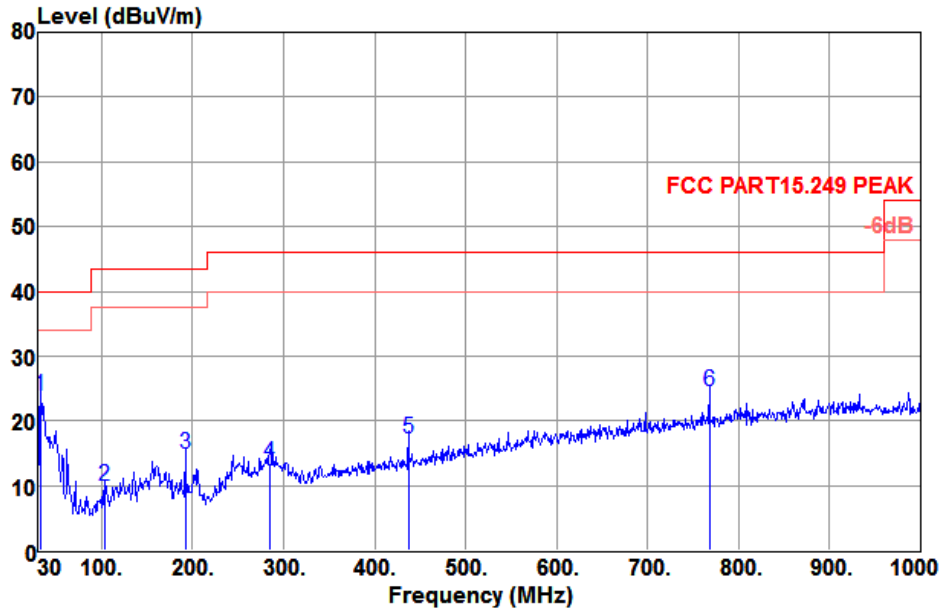
Data: 22



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
32.910	36.91	13.32	1.04	32.53	18.74	40.00	-21.26	QP
201.690	38.83	9.95	2.83	32.55	19.06	43.50	-24.44	QP
288.020	42.28	12.54	3.38	32.52	25.68	46.00	-20.32	QP
320.030	39.94	13.28	3.56	32.51	24.27	46.00	-21.73	QP
768.170	29.98	20.45	5.78	32.69	23.52	46.00	-22.48	QP
960.230	29.31	22.06	6.47	32.05	25.79	54.00	-28.21	QP

<b>Mode:</b>	<b>Transmitting mode</b>	<b>Test by:</b>	<b>Jason</b>
<b>Temp./Hum.(%H):</b>	<b>26°C/56%RH</b>	<b>Polarization:</b>	<b>Vertical</b>

Data: 21



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
32.910	41.97	13.32	1.04	32.53	23.80	40.00	-16.20	QP
103.720	29.75	10.57	1.99	32.45	9.86	43.50	-33.64	QP
191.990	34.27	10.38	2.78	32.54	14.89	43.50	-28.61	QP
285.110	30.29	12.45	3.36	32.52	13.58	46.00	-32.42	QP
437.400	30.14	15.44	4.22	32.50	17.30	46.00	-28.70	QP
768.170	30.90	20.45	5.78	32.69	24.44	46.00	-21.56	QP



■ Above 1GHz

Test channel:	Lowest channel
---------------	----------------

**Peak value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4810.00	56.66	31.24	5.44	36.27	57.07	74.00	-16.93	Vertical
7215.00	46.58	35.89	6.96	34.25	55.18	74.00	-18.82	Vertical
9620.00	*					74.00		Vertical
12025.00	*					74.00		Vertical
14430.00	*					74.00		Vertical
4810.00	57.38	31.24	5.44	36.27	57.79	74.00	-16.21	Horizontal
7215.00	41.87	35.89	6.96	34.25	50.47	74.00	-23.53	Horizontal
9620.00	*					74.00		Horizontal
12025.00	*					74.00		Horizontal
14430.00	*					74.00		Horizontal

**Average value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4810.00	47.03	31.24	5.44	36.27	47.44	54.00	-6.56	Vertical
7215.00	35.23	35.89	6.96	34.25	43.83	54.00	-10.17	Vertical
9620.00	*					54.00		Vertical
12025.00	*					54.00		Vertical
14430.00	*					54.00		Vertical
4810.00	48.34	31.24	5.44	36.27	48.75	54.00	-5.25	Horizontal
7215.00	30.78	35.89	6.96	34.25	39.38	54.00	-14.62	Horizontal
9620.00	*					54.00		Horizontal
12025.00	*					54.00		Horizontal
14430.00	*					54.00		Horizontal

**Remark:**

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor
2. “\*”, means this data is too weak instrument of signal is unable to test.

Test channel:	Middle
---------------	--------

**Peak value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4860.00	54.41	31.36	5.42	36.25	54.94	74.00	-19.06	Vertical
7290.00	46.43	36.07	7.18	34.33	55.35	74.00	-18.65	Vertical
9720.00	*					74.00		Vertical
12150.00	*					74.00		Vertical
14580.00	*					74.00		Vertical
4860.00	56.73	31.36	5.42	36.25	57.26	74.00	-16.74	Horizontal
7290.00	42.96	36.07	7.18	34.33	51.88	74.00	-22.12	Horizontal
9720.00	*					74.00		Horizontal
12150.00	*					74.00		Horizontal
14580.00	*					74.00		Horizontal

**Average value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4860.00	44.89	31.36	5.42	36.25	45.42	54.00	-8.58	Vertical
7290.00	35.07	36.07	7.18	34.33	43.99	54.00	-10.01	Vertical
9720.00	*					54.00		Vertical
12150.00	*					54.00		Vertical
14580.00	*					54.00		Vertical
4860.00	47.64	31.36	5.42	36.25	48.17	54.00	-5.83	Horizontal
7290.00	28.54	36.07	7.18	34.33	37.46	54.00	-16.54	Horizontal
9720.00	*					54.00		Horizontal
12150.00	*					54.00		Horizontal
14580.00	*					54.00		Horizontal

**Remark:**

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor
2. “\*”, means this data is too weak instrument of signal is unable to test.

Test channel:	Highest
---------------	---------

**Peak value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4940.00	53.96	31.56	5.37	36.22	54.67	74.00	-19.33	Vertical
7410.00	43.84	36.33	7.49	34.44	53.23	74.00	-20.77	Vertical
9880.00	*					74.00		Vertical
12350.00	*					74.00		Vertical
14820.00	*					74.00		Vertical
4940.00	58.81	31.56	5.37	36.22	59.52	74.00	-14.48	Horizontal
7410.00	42.74	36.35	7.49	34.44	52.13	74.00	-21.87	Horizontal
9880.00	*					74.00		Horizontal
12350.00	*					74.00		Horizontal
14820.00	*					74.00		Horizontal

**Average value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4940.00	44.07	31.56	5.37	36.22	44.78	54.00	-9.22	Vertical
7410.00	34.03	36.33	7.49	34.44	43.42	54.00	-10.58	Vertical
9880.00	*					54.00		Vertical
12350.00	*					54.00		Vertical
14820.00	*					54.00		Vertical
4940.00	49.48	31.56	5.37	36.22	50.19	54.00	-3.81	Horizontal
7410.00	32.33	36.35	7.49	34.44	41.72	54.00	-12.28	Horizontal
9880.00	*					54.00		Horizontal
12350.00	*					54.00		Horizontal
14820.00	*					54.00		Horizontal

*Remark:*

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor*
2. *“\*”*, means this data is the too weak instrument of signal is unable to test.
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

## 7.2.3 Bandedge emissions

All of the restriction bands were tested, and only the data of worst case was exhibited.

Test channel:	Lowest channel
---------------	----------------

### Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	41.48	26.91	3.56	35.87	36.08	74.00	-37.92	Horizontal
2390.00	39.98	27.11	3.64	36.08	34.65	74.00	-39.35	Horizontal
2310.00	41.02	26.91	3.56	35.87	35.62	74.00	-38.38	Vertical
2390.00	40.64	27.11	3.64	36.08	35.31	74.00	-38.69	Vertical

### Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	27.15	26.91	3.56	35.87	21.75	54.00	-32.25	Horizontal
2390.00	27.26	27.11	3.64	36.08	21.93	54.00	-32.07	Horizontal
2310.00	27.18	26.91	3.56	35.87	21.78	54.00	-32.22	Vertical
2390.00	26.97	27.11	3.64	36.08	21.64	54.00	-32.36	Vertical

Test channel:	Highest channel
---------------	-----------------

### Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	40.91	27.36	3.68	36.33	35.62	74	-38.38	Horizontal
2500.00	41.10	27.40	3.68	36.37	35.81	74	-38.19	Horizontal
2483.50	41.46	27.36	3.68	36.33	36.17	74	-37.83	Vertical
2500.00	41.24	27.40	3.68	36.37	35.95	74	-38.05	Vertical

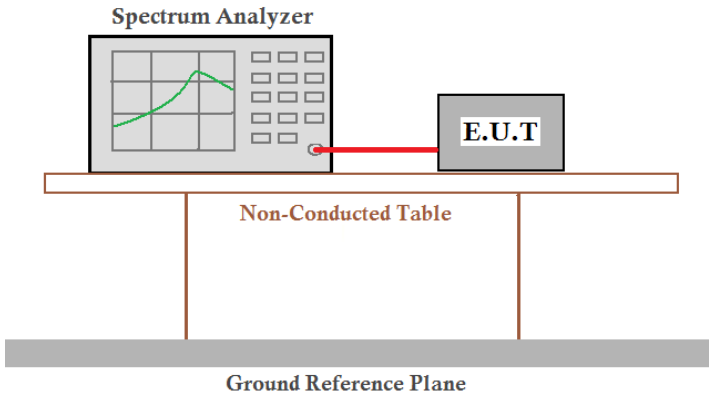
### Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	28.11	27.36	3.68	36.33	22.82	54	-31.18	Horizontal
2500.00	27.83	27.40	3.68	36.37	22.54	54	-31.46	Horizontal
2483.50	27.87	27.36	3.68	36.33	22.58	54	-31.42	Vertical
2500.00	27.73	27.40	3.68	36.37	22.44	54	-31.56	Vertical

### Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

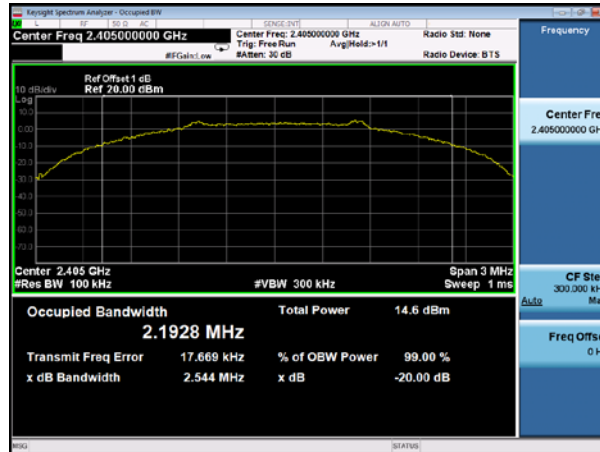
### 7.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2013
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by two legs. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

#### Measurement Data

Test channel	20dB bandwidth(MHz)	Result
Lowest	2.544	Pass
Middle	2.549	Pass
Highest	2.564	Pass

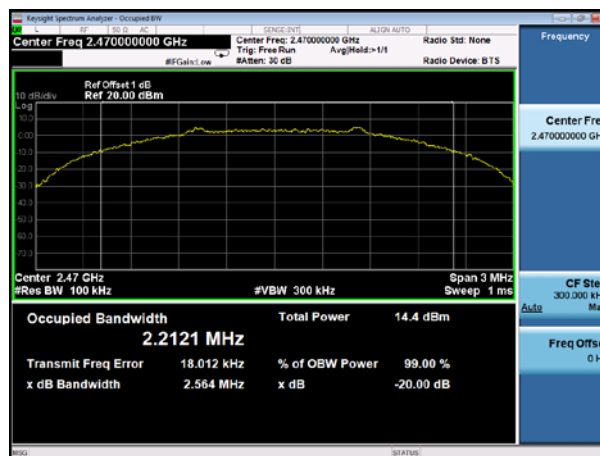
Test plot as follows:



Lowest channel



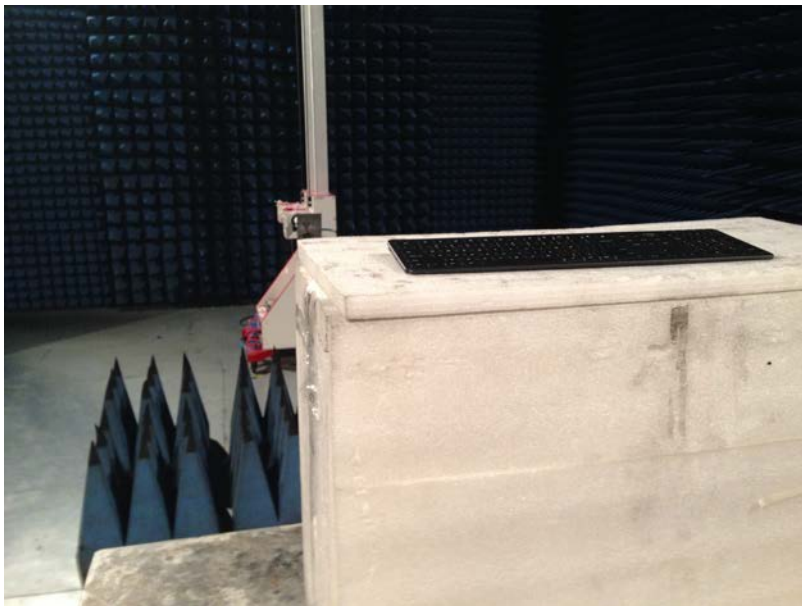
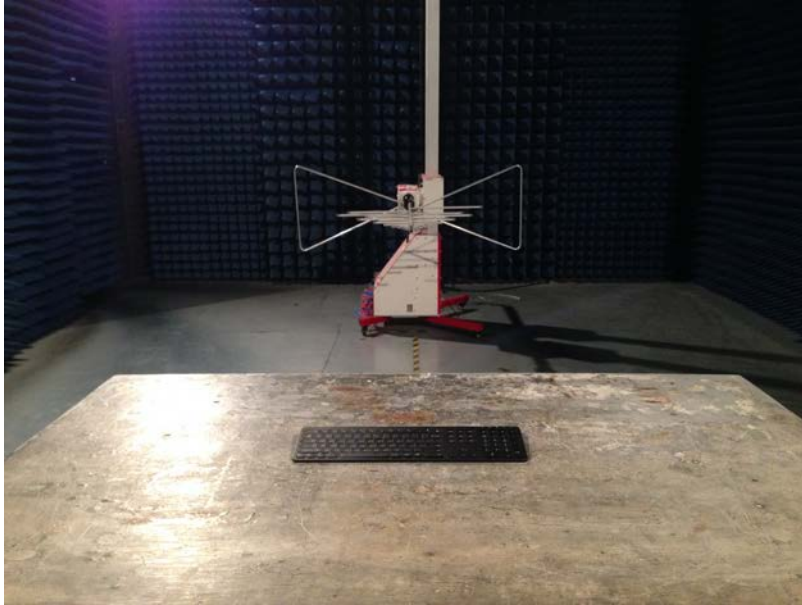
Middle channel



Highest channel

## 8 Test Setup Photo

Radiated Emission



## 9 EUT Constructional Details

Test Model No.: HW197-3-G





**Model No.: HW197-2-G**



**Model No.: HW198-2-G**

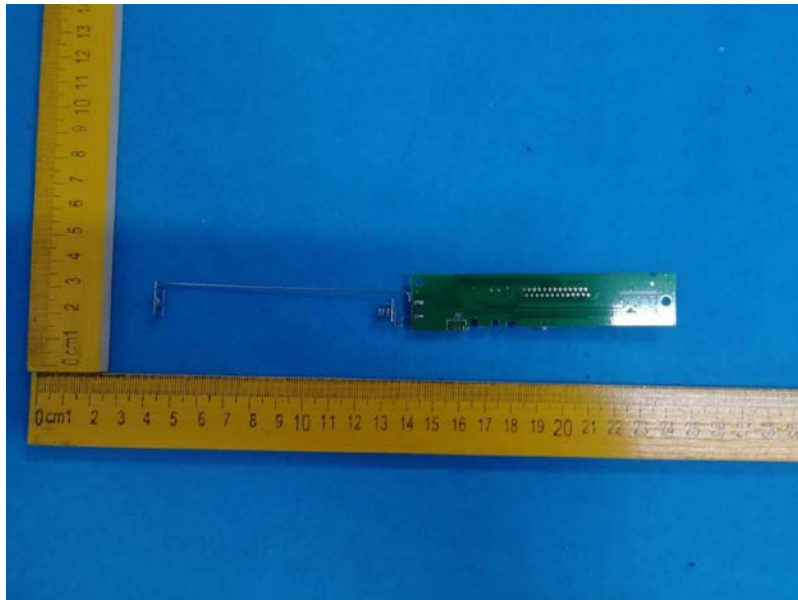


**Model No.: HW198-3-G**



Test Model No.: HW197-3-G





-----End-----