

TEST REPORT

FCC ID: 2AOE9-RK-8801

Product: 2.4G WIRELESS KEYBOARD

Model No.: RK-8801

RK-8802, RK-8803, RK-8805, RK-8806, RK-8808,
RK-8809, RK-8810, RK-8812, RK-8816, RK-8818, RK-8820, RK-8826, RK-8828

Trade Mark: N/M

Report No.: TCT171219E003

Issued Date: November 26, 2017

Issued for:

DONGGUAN HONGJIANXIN ELECTRONIC & TECHNOLOGY CO. LTD

490#, JIENAN RD, XIAOJIEJIAO, HUMEN TOWN,
DONGGUAN, GUANGDONG, CHINA

Issued By:

Shenzhen Tongce Testing Lab.

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Appendix A: Photographs of Test Setup**Appendix B: Photographs of EUT**

1. Test Certification

Product:	2.4G WIRELESS KEYBOARD
Model No.:	RK-8801
Additional Model:	RK-8802,RK-8803,RK-8805, RK-8806,RK-8808, RK-8809,RK-8810,RK-8812,RK-8816,RK-8818,RK-8820,RK-8826, RK-8828
Trade Mark:	N/M
Applicant:	DONGGUAN HONGJIANXIN ELECTRONIC & TECHNOLOGY CO. LTD
Address:	490#,JIENAN RD, XIAOJIEJIAO,HUMEN TOWN, DONGGUAN, GUANGDONG, CHINA
Manufacturer:	DONGGUAN HONGJIANXIN ELECTRONIC & TECHNOLOGY CO. LTD
Address:	490#,JIENAN RD, XIAOJIEJIAO,HUMEN TOWN, DONGGUAN, GUANGDONG, CHINA
Date of Test:	October 26, 2017 – November 23, 2017
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.249

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

Garen

Date: Nov. 23, 2017

Garen

Reviewed By:



Date: Nov. 25, 2017

Approved By:

Tomsin

Date: Nov. 25, 2017

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	N/A
Field Strength of Fundamental	§15.249 (a)	PASS
Spurious Emissions	§2.1053 §15.249 (a) (d)/ §15.209	PASS
Band Edge	§2.1053 §15.249 (d)/ §15.205	PASS
20dB Occupied Bandwidth	§2.1049 §15.215 (c)	PASS

Note:

1. Pass: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product:	2.4G WIRELESS KEYBOARD
Model No.:	RK-8801
Additional Model:	RK-8802, RK-8803, RK-8805, RK-8806, RK-8808, RK-8809, RK-8810, RK-8812, RK-8816, RK-8818, RK-8820, RK-8826, RK-8828
Trade Mark:	N/M
Operation Frequency:	2408MHz - 2474MHz
Number of Channel:	34
Modulation Technology:	FSK, KB deviation=250Khz
Antenna Type:	Integral PCB Antenna
Antenna Gain:	-0.61dBi
Power Supply:	VDD=3V (AAA 1.5V*2 Battery)

Operation Frequency Each of Channel

Operation Frequency each of channel								
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel
1	2408MHz	11	2428MHz	21	2448MHz	31	2468MHz	
2	2410MHz	12	2430MHz	22	2450MHz	32	2470MHz	
3	2412MHz	13	2432MHz	23	2452MHz	33	2472MHz	
4	2414MHz	14	2434MHz	24	2454MHz	34	2474MHz	
5	2416MHz	15	2436MHz	25	2456MHz			
6	2418MHz	16	2438MHz	26	2458MHz			
7	2420MHz	17	2440MHz	27	2460MHz			
8	2422MHz	18	2442MHz	28	2462MHz			
9	2424MHz	19	2444MHz	29	2464MHz			
10	2426MHz	20	2446MHz	30	2466MHz			

Remark: Channel 1, 17 and 34 are selected to perform the tests.

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	2408MHz
The middle channel	2440MHz
The Highest channel	2474MHz

4. General Information

4.1. Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel
<p>The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.</p>	

4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1GHz)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1GHz)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$

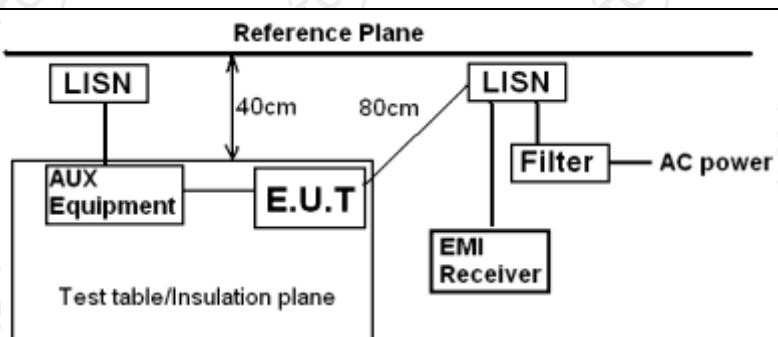
6. Test Results and Measurement Data

6.1. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 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, 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.	
E.U.T Antenna:	
The EUT antenna is an integral antenna which permanently attached, and the best case gain of the antenna is -0.61dBi.	

6.2. Conducted Emission

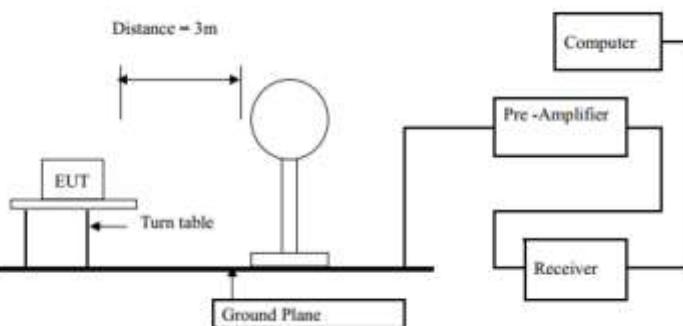
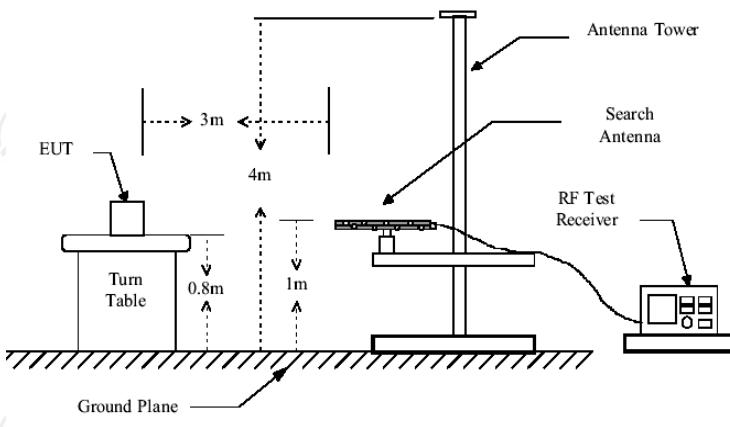
6.2.1. Test Specification

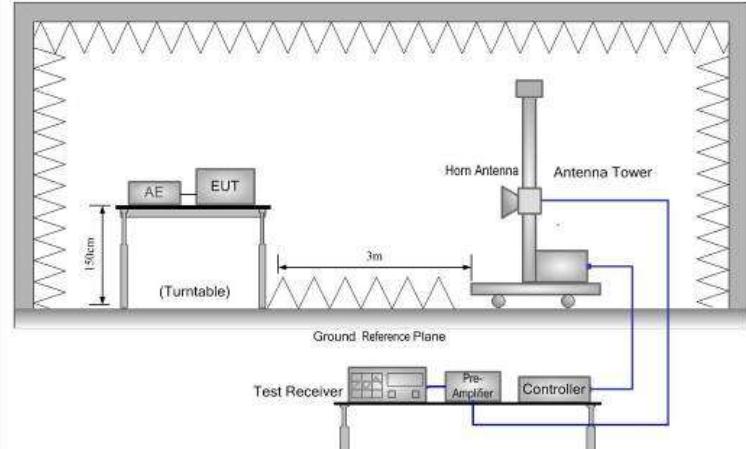
Test Requirement:	FCC Part15 C Section 15.207																	
Test Method:	ANSI C63.10:2013																	
Frequency Range:	150 kHz to 30 MHz																	
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto																	
Limits:	<table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th></th> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>			Frequency range (MHz)	Limit (dBuV)			Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)																	
	Quasi-peak	Average																
0.15-0.5	66 to 56*	56 to 46*																
0.5-5	56	46																
5-30	60	50																
Test Setup:	 <p><i>Remark:</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>																	
Test Mode:	Transmitting mode with modulation																	
Test Procedure:	<ol style="list-style-type: none"> 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement. 																	
Test Result:	N/A, Power supply is DC 3V from AAA 1.5V*2 Battery, so not applicable.																	

6.3. Radiated Emission Measurement

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209/ Part 2 J Section 2.1053								
Test Method:	ANSI C63.10:2013								
Frequency Range:	9 kHz to 25 GHz								
Measurement Distance:	3 m								
Antenna Polarization:	Horizontal & Vertical								
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark				
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value				
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value				
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value				
	Above 1GHz	Peak	1MHz	3MHz	Peak Value				
		Peak	1MHz	10Hz	Average Value				
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 (dBuV/m @3m)		Remark					
	0.009-0.490	2400/F(KHz)		Quasi-peak Value					
	0.490-1.705	24000/F(KHz)		Quasi-peak Value					
	1.705-30	30		Quasi-peak Value					
	30MHz-88MHz	40.0		Quasi-peak Value					
	88MHz-216MHz	43.5		Quasi-peak Value					
	216MHz-960MHz	46.0		Quasi-peak Value					
	960MHz-1GHz	54.0		Quasi-peak Value					
	Above 1GHz	54.0		Average Value					
		74.0		Peak Value					
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 Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber in below 1GHz, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation. 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. 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 								

	<p>the measurement.</p> <p>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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>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.</p>
<p>Test setup:</p>	<p>For radiated emissions below 30MHz</p>  <p>30MHz to 1GHz</p>  <p>Above 1GHz</p> <p>(The diagram below shows the test setup that is utilized to make the measurements for emission from 1GHz to the tenth harmonic of the highest fundamental frequency or to 40GHz emissions, whichever is lower.)</p>

	
Test results:	PASS

6.3.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHW ARZ	FSQ	200061	Sep. 27, 2018
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 27, 2018
Pre-amplifier	HP	8447D	2727A05017	Sep. 27, 2018
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBH 9170	582	Jun. 07, 2018
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 27, 2018
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test Data

Field Strength of Fundamental

Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal /Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2408	85.12	H	114/94	-28.88
2408	82.45	H	114/94	-11.55
2440	85.46	H	114/94	-28.54
2440	84.22	H	114/94	-9.78
2474	86.87	H	114/94	-27.13
2474	82.55	H	114/94	-11.45
2408	87.25	V	114/94	-26.75
2408	81.15	V	114/94	-12.85
2440	86.91	V	114/94	-27.09
2440	84.55	V	114/94	-9.45
2474	84.77	V	114/94	-29.23
2474	81.41	V	114/94	-12.59

Spurious Emissions

Frequency Range (9 kHz-30MHz)

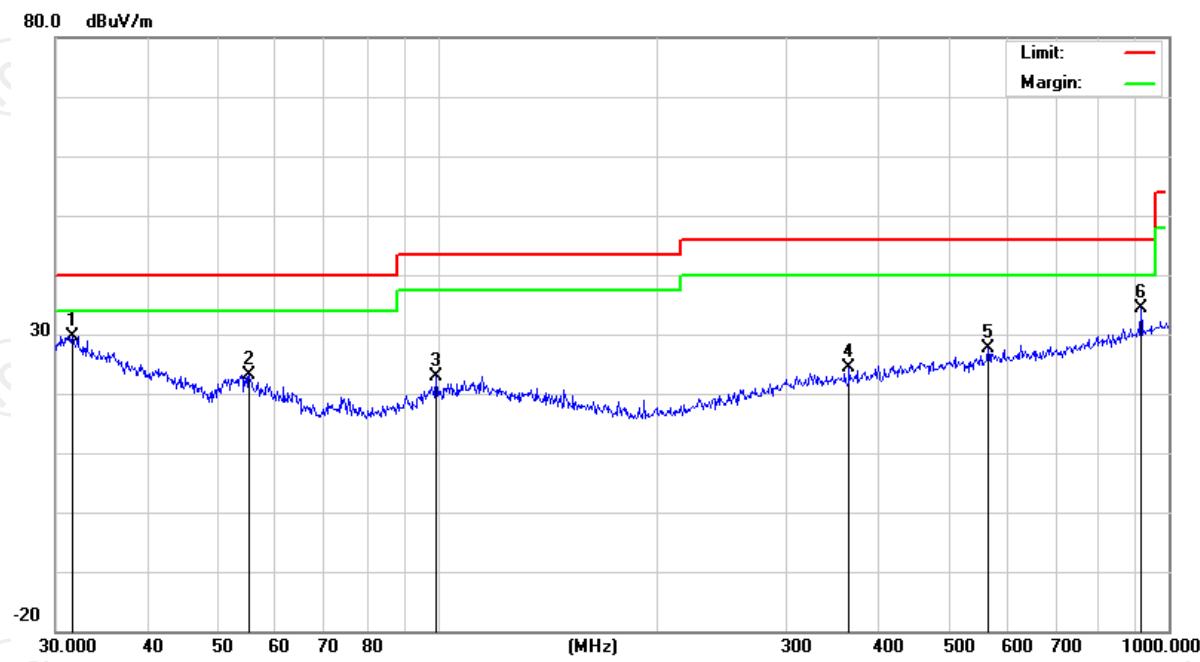
Frequency (MHz)	Level@3m (dB μ V/m)	Limit@3m (dB μ V/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

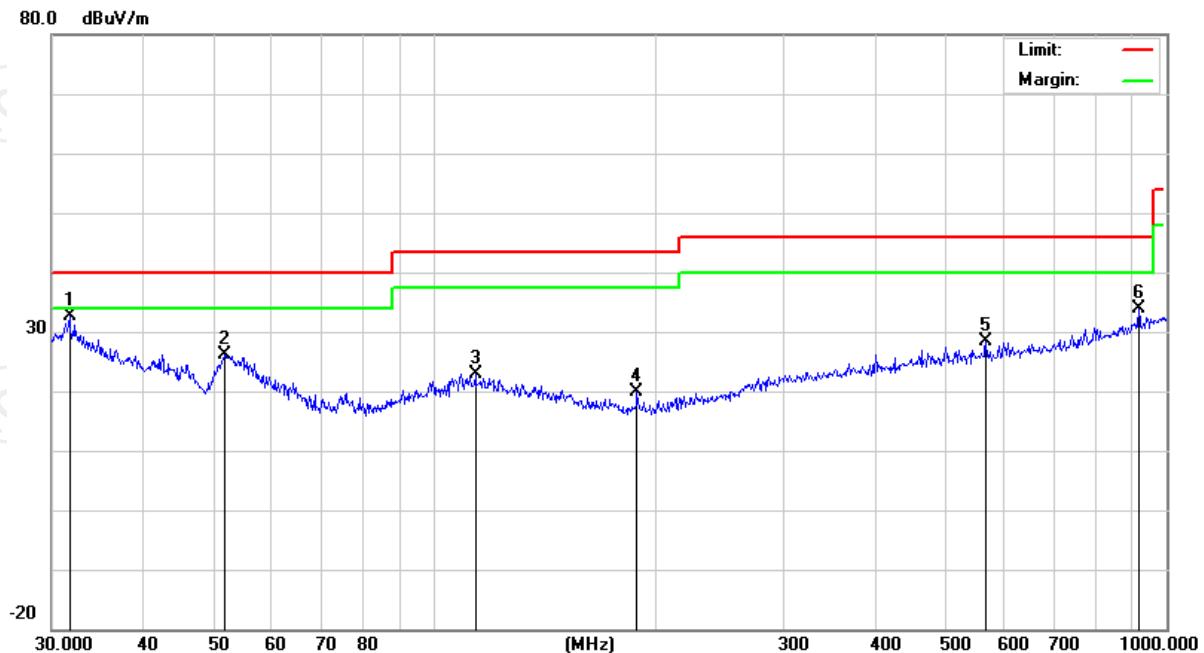
Frequency Range (30MHz-1GHz)

Horizontal:



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	31.6202	25.51	4.17	29.68	40.00	-10.32	peak
2		55.2207	28.89	-5.64	23.25	40.00	-16.75	peak
3		99.5281	26.86	-3.91	22.95	43.50	-20.55	peak
4		365.5391	26.01	-1.69	24.32	46.00	-21.68	peak
5		566.6223	27.06	0.49	27.55	46.00	-18.45	peak
6		916.0687	28.43	5.89	34.32	46.00	-11.68	peak

Vertical:



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	A
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	31.7313	28.42	4.13	32.55	40.00	-7.45	peak
2		51.6616	31.39	-5.22	26.17	40.00	-13.83	peak
3		113.7143	25.13	-2.23	22.90	43.50	-20.60	peak
4		189.0743	27.03	-7.18	19.85	43.50	-23.65	peak
5		566.6223	27.20	1.15	28.35	46.00	-17.65	peak
6		916.0687	27.93	5.89	33.82	46.00	-12.18	peak

Note: Measurements were conducted in all channels (high, middle, low), and the worst case (low channel) was submitted only.

Above 1GHz

Frequency (MHz)	Reading (dB μ V/m)	Correct Factor dB/m	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2408MHz							
4816	56.79	-1.29	55.50	74	-18.50	H	PK
4816	41.22	-1.29	39.93	54	-14.07	H	AV
7224	50.36	6.51	56.87	74	-17.13	H	PK
7224	30.47	6.51	36.98	54	-17.02	H	AV
Middle Channel-2440MHz							
4880	60.33	-0.98	59.35	74	-14.65	H	PK
4880	44.09	-0.98	43.11	54	-10.89	H	AV
7320	43.03	6.83	49.86	74	-24.14	H	PK
7320	31.21	6.83	38.04	54	-15.96	H	AV
High Channel-2474MHz							
4948	55.77	-0.8	54.97	74	-19.03	H	PK
4948	41.91	-0.8	41.11	54	-12.89	H	AV
7422	43.69	6.94	50.63	74	-23.37	H	PK
7422	32.89	6.94	39.83	54	-14.17	H	AV
4948	55.68	-0.8	54.88	74	-19.12	V	PK
4948	40.60	-0.8	39.80	54	-14.20	V	AV
7422	43.71	6.94	50.65	74	-23.35	V	PK
7422	32.97	6.94	39.91	54	-14.09	V	AV

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dB μ V/m)-Average limit (dB μ V/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown “--” in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

Band Edge Requirement

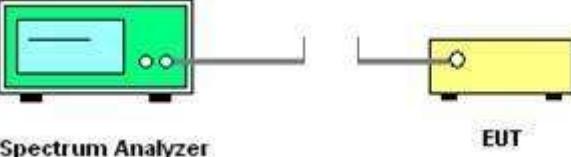
Frequency	Reading	Correct Factor	Emission Level	Limit	Margin	Polar	Detector
(MHz)	(dB μ V/m)	dB/m	(dB μ V/m)	(dB μ V/m)	(dB)	H/V	
Low Channel-2408MHz							
2390	68.76	-8.73	60.03	74	-13.97	H	PK
2390	47.32	-8.73	38.59	54	-15.41	H	AV
2390	68.73	-8.73	60.00	74	-14.00	V	PK
2390	46.26	-8.73	37.53	54	-16.47	V	AV
High Channel-2474MHz							
2483.5	67.07	-8.17	58.90	74	-15.10	H	PK
2483.5	49.98	-8.17	41.81	54	-12.19	H	AV
2483.5	67.38	-8.17	59.21	74	-14.79	V	PK
2483.5	48.30	-8.17	40.13	54	-13.87	V	AV

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak/Average)(dB μ V/m)-(Peak/Average) limit (dB μ V/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown “---” in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

6.4.20dB Occupied Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.215(c)/ Part 2 J Section 2.1049
Test Method:	ANSI C63.10: 2013
Limit:	N/A
	<ol style="list-style-type: none"> 1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW\geq1% of the 20 dB bandwidth; VBW\geqRBW; Sweep = auto; Detector function = peak; Trace = max hold. 4. Measure and record the results in the test report.
Test setup:	 <p>The diagram illustrates the test setup. A green 'Spectrum Analyzer' is connected to a yellow 'EUT' (Equipment Under Test) via a grey cable. The analyzer has a digital display screen and two control knobs. The EUT is a simple rectangular box.</p>
Test Mode:	Transmitting mode with modulation
Test results:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Oct. 13, 2018

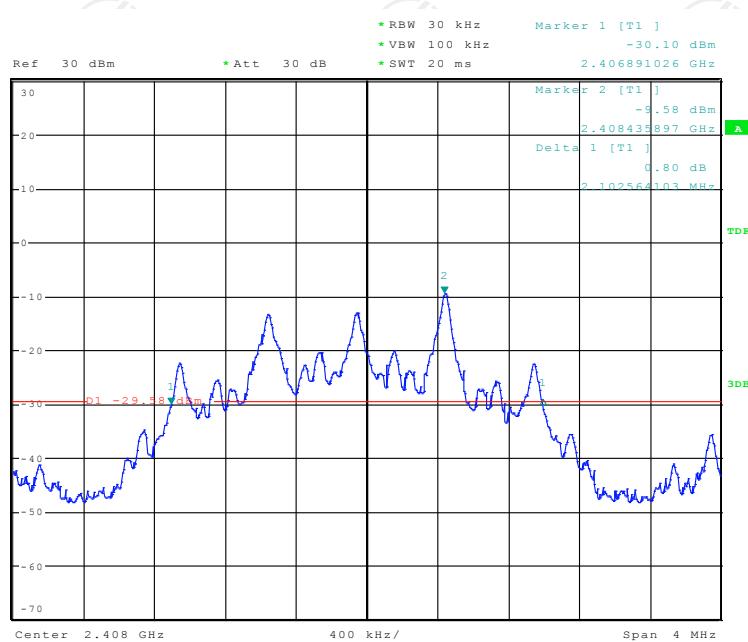
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.4.3. Test data

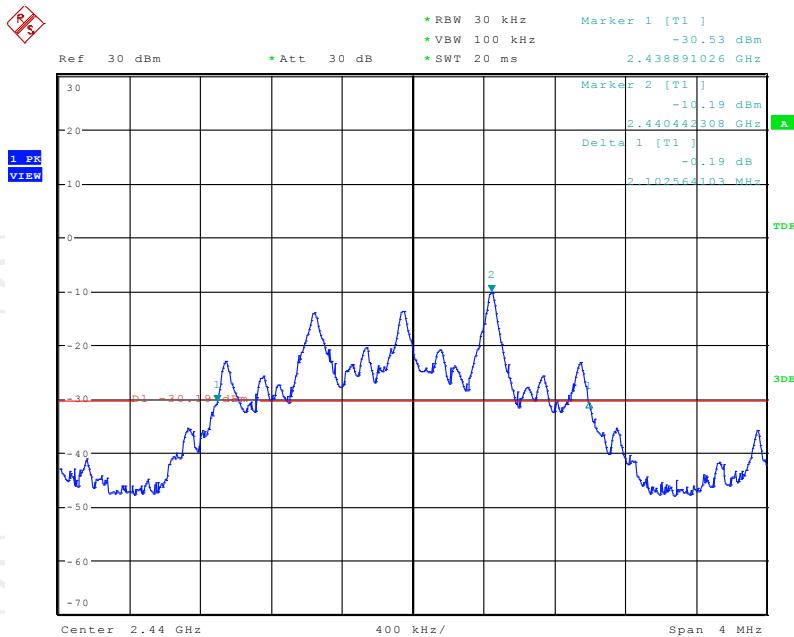
Test Channel	20dB Occupy Bandwidth (kHz)	Limit	Conclusion
Lowest	2102.56	---	PASS
Middle	2102.56	---	PASS
Highest	2108.97	---	PASS

Test plots as follows:

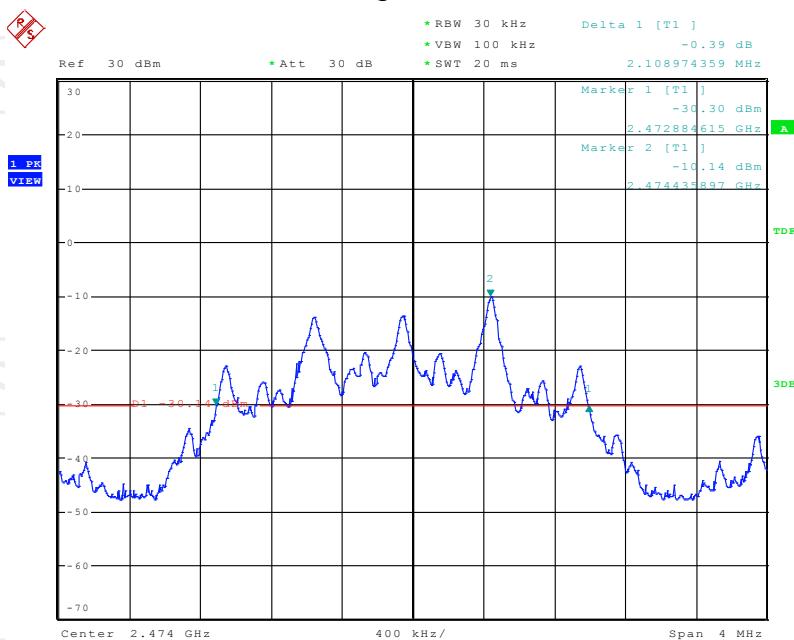
Lowest channel



Middle channel



Highest channel

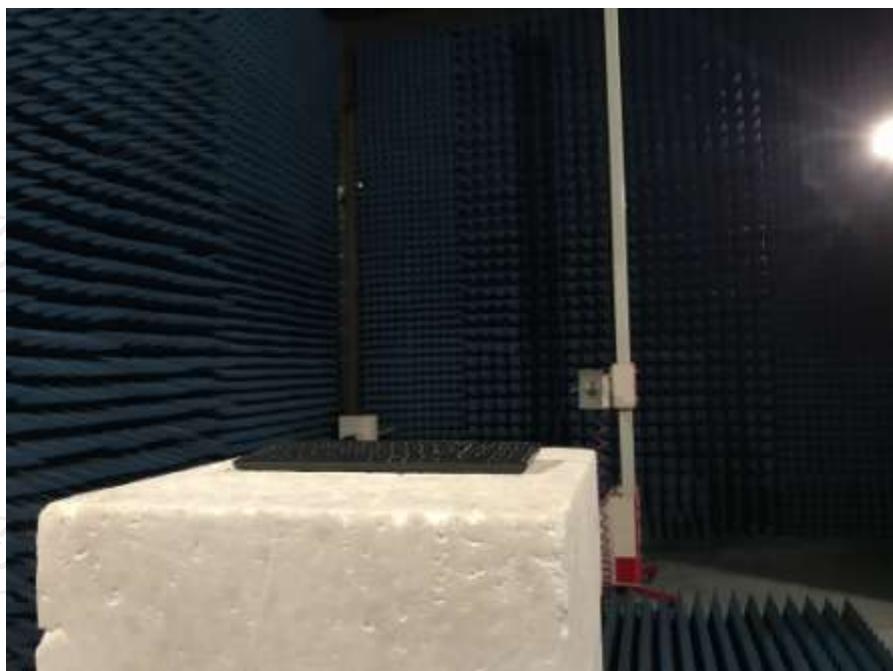
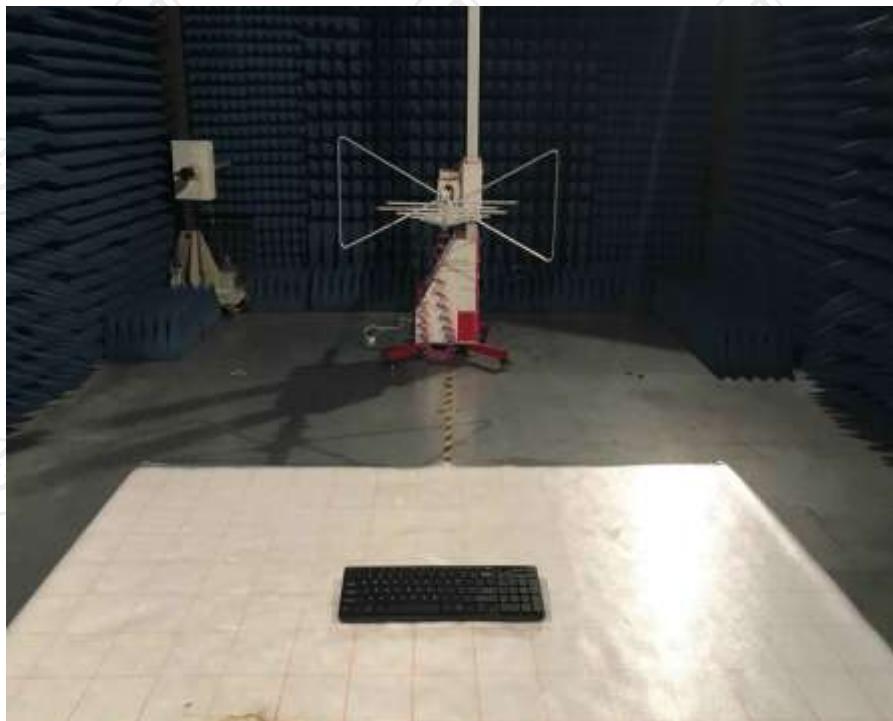


Appendix A: Photographs of Test Setup

Product: 2.4G WIRELESS KEYBOARD

Model: RK-8801

Radiated Emission



Appendix B: Photographs of EUT
Product: 2.4G WIRELESS KEYBOARD
Model: RK-8801
External Photos

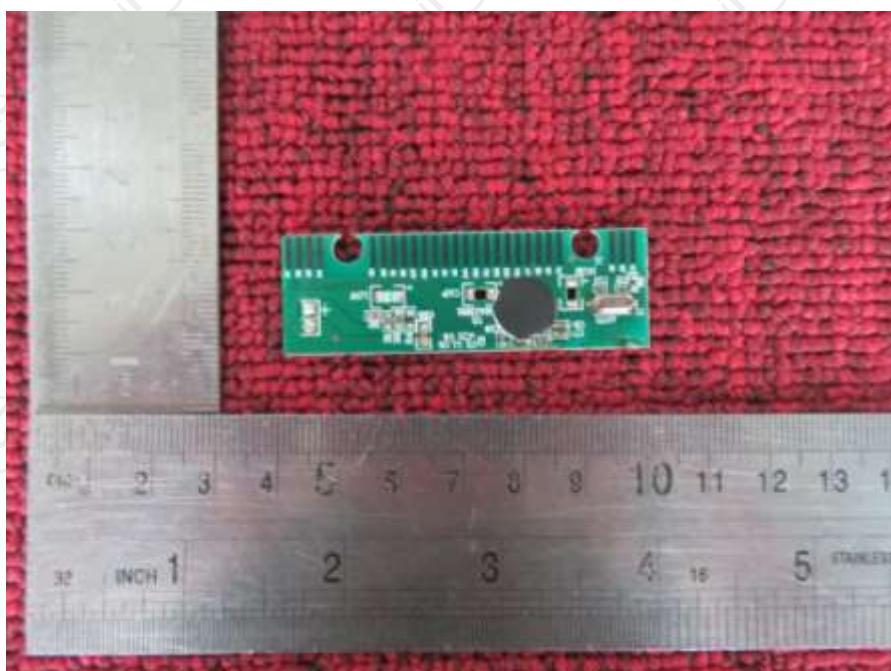
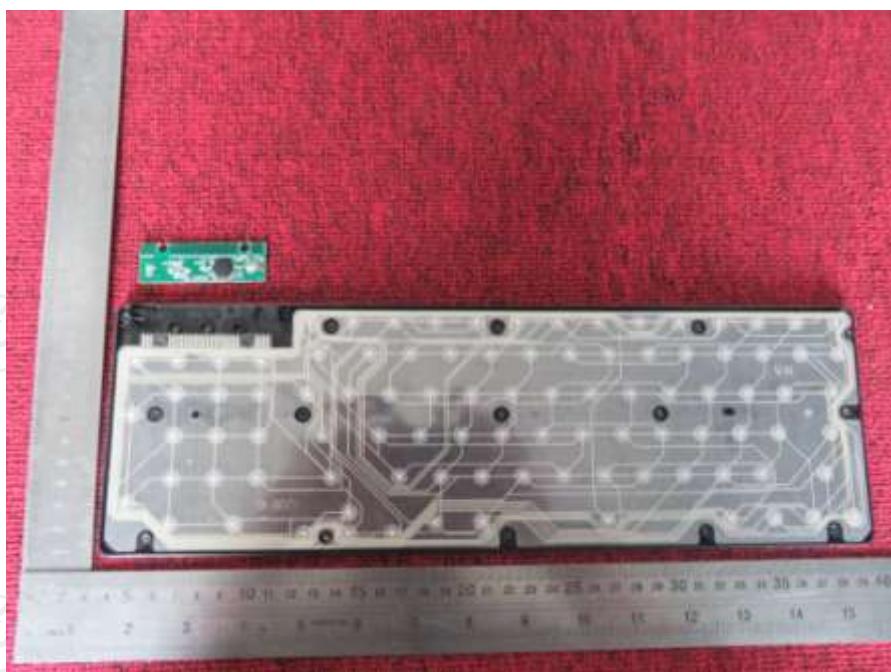






Appendix B: Photographs of EUT
Product: XXX
Model: XXX
Internal Photos







********END OF REPORT********