

Certificate of Test

August 2006

Sunrex Technology Corp.

Product Type : 2.4GHz Wireless Keyboard

Model Number : RK522A, RK509A

Test Report Number : 0607114 Rev. 1

Date of Test : August 19, 2006- August 23, 2006

This Product was tested to the following standards at the laboratory of Global EMC Standard Tech. Corp., and found Compliance.

Standards:

FCC Part 15 Subpart C Paragraph 15.249

ANSI C63.4: 2003

[http : //www.gestek.com.tw](http://www.gestek.com.tw)



Sharon Chang, President

GesTek EMC Lab

N0. 3, Pau-Tou-Tsuo Valley, Chia-Pau Tsuen,
Lin Kou Hsiang, Taipei County, Taiwan, R.O.C.
TEL:886-2-2603-5321
FAX:886-2-2603-5325

Date: August 25, 2006



200085-0





Sunrex Technology Corp.

**EUT:
2.4GHz Wireless Keyboard**

**Model Number:
RK522A, RK509A**

FCC ID: J750522A

Prepared for:

**Sunrex Technology Corp.
No. 188-1, Chung Cheng Road., Ta Ya Shiang, Taichung Hsien, Taiwan,
R.O.C.**

Report By :Global EMC Standard Tech. Corp.

**No.3 Pau-Tou-Tsuo Valley, Chia-Pau
Tsuen, Lin Kou Hsiang, Taipei County,
Taiwan, R.O.C.**

Tel : 886-2-2603-5321

Fax : 886-2-2603-5325

1. Test results given in this report only relate to the specimen(s) tested, measured.
2. This report is the property of GesTek, and shall not be reproduced, other than in full, without the written consent of GesTek.
3. The report must not be used by the client to claim product certification, approval, or endorsement by any agency of the federal government.
4. All data in this report are traceable to national standard or international standard.

TABLE OF CONTENTS

DESCRIPTION	PAGE
1. CERTIFICATION.....	3
2. GENERAL INFORMATION.....	4
2.1 PRODUCTION DESCRIPTION.....	4
2.2 OPERATIONAL DESCRIPTION	5
2.3 TEST MODES & EUT COMPONENTS DESCRIPTION	5
2.4 SUMMARY OF TEST PROCEDURE AND TEST RESULTS.....	5
2.5 CONFIGURATION OF THE TESTED SYSTEM	5
2.6 TEST FACILITY.....	6
2.7 TEST SETUP	7
2.8 EUT OPERATING CONDITIONS.....	7
3. RADIATION EMISSION DATA	8
3.1 TEST EQUIPMENT	8
3.2 OPEN TEST SITE SETUP DIAGRAM	8
3.3 RADIATED EMISSION LIMIT	9
3.4 EUT CONFIGURATION	10
3.5 OPERATING CONDITION OF EUT	10
3.6 RADIATED EMISSION DATA	10
3.7 RADIATED EMISSIONS MEASUREMENT RESULTS	11
4. BAND EDGE	21
4.1 TEST EQUIPMENT	21
4.2 BLOCK DIAGRAM OF TEST SETUP	21
4.3 BAND EDGE LIMIT	22
4.4 EUT CONFIGURATION	22
4.5 OPERATING CONDITION OF EUT	22
4.6 TEST RELULT.....	23
5. DUTY CYCLE.....	29
5.1 TEST EQUIPMENT	29
5.2 BLOCK DIAGRAM OF TEST SETUP	29
5.3 TEST RESULT	29
6. PHOTOGRAPHS FOR TEST.....	31
6.1 TEST PHOTOGRAPHS FOR RADIATION	31
7. PHOTOGRAPHS FOR PRODUCT	35
8. EMI REDUCTION METHOD DURING COMPLIANCE TESTING	60

1. CERTIFICATION

Applicant : Sunrex Technology Corp.

Applicant Address : No. 188-1, Chung Cheng Road., Ta Ya Shiang, Taichung Hsien, Taiwan, R.O.C

EUT Description : 2.4GHz Wireless Keyboard

Model Number : RK522A, RK509A

Serial Number : N/A

Brand Name : Sunrex

FCC ID : J750522A

Tested Power Supply : Battery DC 4.5V

Manufacturer : Sunrex Technology Corp.

Address : No. 188-1, Chung Cheng Road., Ta Ya Shiang, Taichung Hsien, Taiwan, R.O.C.

MEASUREMENT PROCEDURES USED:

- ☒ **CFR 47, Part 15** Radio Frequency Device Subpart C Intentional Radiators :2005
- ☒ **ANSI C63.4** Methods of Measurements of Radio-Noise Emissions from Low- Voltage Electrical and Electronic Equipment in the range of 9kHz To 40GHz. 2003

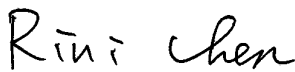
THE MEASUREMENT SHOWN IN THE ATTACHMENT WAS MADE IN ACCORDANCE WITH THE PROCEDURES INDICATED, AND THE MAXIMUM ENERGY EMITTED BY THE EQUIPMENT WAS FOUND TO BE WITHIN THE ABOVE LIMITS APPLICABLE.

Sample Received Date : **August 19, 2006**

Final Test Date : **August 23, 2006**

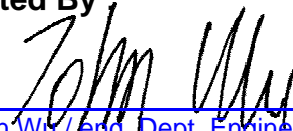
In order to ensure the quality and accuracy of this document, the contents have been thoroughly reviewed by the following qualified personnel from GesTek Lab.

Documented By :



Rini Chen / adm. Dept. Supervisor

Tested By :



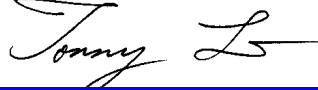
John Wu / eng. Dept. Engineer

Technical Reviewed By :



Shine Chang / eng. Dept. Supervisor

Approved By :



Tonny Lin / General Manager

This test data shown below is traceable to National or international standard such as NIST/USA, etc. The laboratory's NVLAP accreditation in no way constitutes or implies product certification, approval, or endorsement by NVLAP or the United States government.

2. GENERAL INFORMATION

2.1 PRODUCTION DESCRIPTION

Product Name : 2.4GHz Wireless Keyboard
Model Number : RK522A, RK509A
Serial Number : N/A
Brand Name : Sunrex
FCC ID : J750522A
Modulation Type : GFSK
Antenna Type : Printed on PCB
Frequency Range : 2420MHz
Channel Number : 1 Channel
Channel Control : N/A
Working Voltage : Battery DC 4.5V

Frequency of Each Channel:

Channel	Frequency (MHz)
1	2420

Note:

1. This device is a 2.4GHz Wireless Keyboard included wireless transmission of keyboard and receiver. This report is transmitter.
2. This device is 1 channel and perform the test, then record on this report.
3. The antenna of EUT is printer on PCB and conform to FCC 15.203.
4. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.249.
5. The device of receiver to accordance with Part 15 regulations and under Declaration of Conformity.
6. The EUT is with two model numbers and the diversity of these two model numbers is the appearance difference of EUT and PCB difference of trackball. Other parts is totally same.

2.2 OPERATIONAL DESCRIPTION

This device is a 2.4GHz Wireless Keyboard included wireless transmitter of keyboard and receiver. It is powered by Battery DC 4.5V.

This device is 1 channel with GFSK modulation.

The Receiver is USB interface and it is capable to receive signal from transmitter to control PC or notebook.

Another information please refer to users manual.

2.3 TEST MODES & EUT COMPONENTS DESCRIPTION

EUT: 2.4GHz Wireless Keyboard		
Test Mode	Mode 1 Continue Transmit	Mode 2 Continue Transmit
Model Number	RK522A	RK509A
Test Item	Radistion Emission	Radistion Emission
	Peak Power Output	
	Band Edge	
Diversity of EUT	appearance difference of EUT and PCB difference of trackball in EUT	

2.4 SUMMARY OF TEST PROCEDURE AND TEST RESULTS

Test Item	Applied Standard Section	Test Result
Radistion Emission	15.209, ANSI C63.4 Section 8	Pass (refer to section 3.7)
Peak Power Output	15.249(a), ANSI C63.4 Section 13 & Annex I	Pass (refer to section 3.7)
Band Edge	15.249(d) , ANSI C63.4 Section 13 & Annex I	Pass (refer to section 4.6)

2.5 CONFIGURATION OF THE TESTED SYSTEM

The FCC IDs/Types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

Non-Test Equipment

2.6 TEST FACILITY

Ambient conditions in the laboratory:

ITEMS	REQUIRED
TEMPERATURE (°C)	15-35
HUMIDITY (%RH)	30-60
BAROMETRIC PRESSURE (mbar)	860-1060
FCC SITE DESCRIPTION	Aug. 10, 1995 /Aug. 25, 1998 File on FCC Engineering Laboratory Federal Communication Commission 7435 Oakland Mills Road Columbia, MD 21046 Reference 31040/SIT1300F2
NVLAP LAB. CODE	200085-0 United States Department of commerce National Institute of Standards and Technology National Voluntary Laboratory Accreditation Program Accreditation on NVLAP effective through Sep. 30, 2006 For CISPR 22, FCC Method and AS/NZS CISPR 22 Measurement.
Chinese National Laboratory Accreditation Certificate R.O.C.	Recognized by the Council of Chinese National Laboratory Accreditation and confirmed to meet the requirements of ISO/IEC 17025 also has been registered for fifteen items, and meet the requirements of the Article 4 of Measures Governing the Recognition both Approval of Designated Laboratory for Commodities Inspection and has been registered for four items within the field of Electrical Testing. Registration No.: 1082 Registration on CNLA effective through April 30, 2006.

2.7 TEST SETUP

Mode 1



EUT:
2.4GHz Wireless Keyboard

Mode 2



EUT:
2.4GHz Wireless Keyboard

2.8 EUT OPERATING CONDITIONS

The EUT exercise program used during conducted testing was designed to exercise the EUT in a manner similar to a typical use. The exercise sequence is listed as below:

1. Setup the EUT and simulators as shown on 2.7.
2. Turn on the power of all equipments.
3. The transmitter will transmit the signal continue.
4. Confirm the receiver is receive signal continue.
5. Repeat the above steps.

3. RADIATION EMISSION DATA

3.1 TEST EQUIPMENT

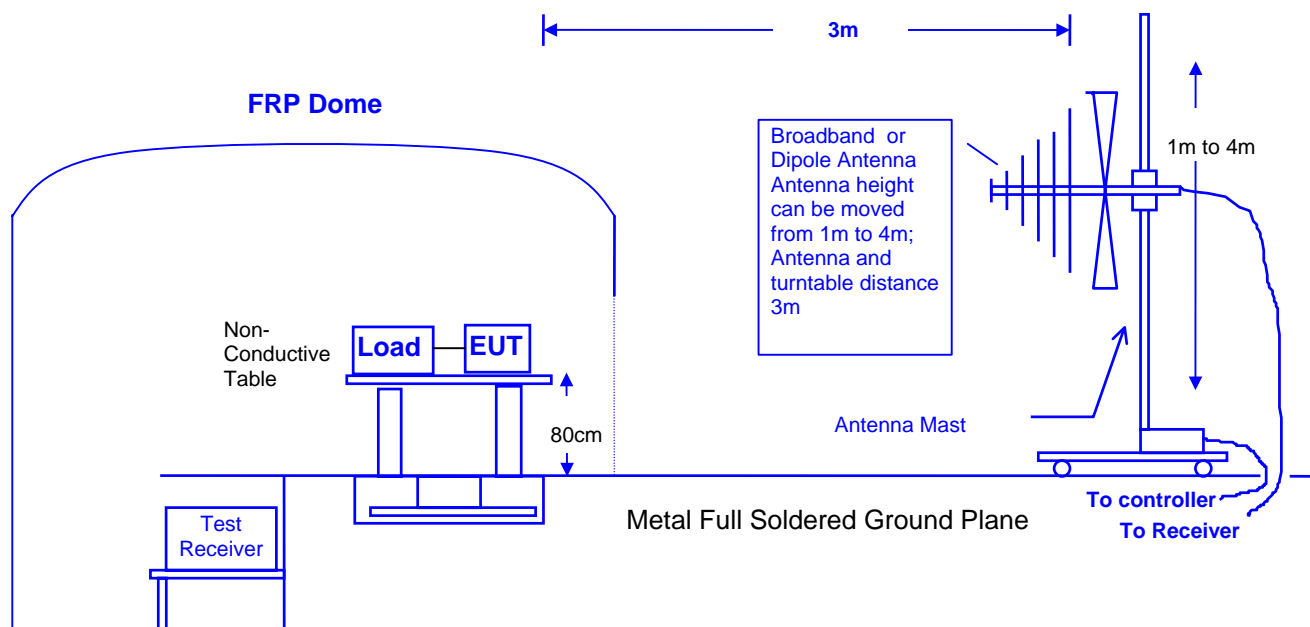
The following test equipments are used during the radiated emission tests:

Radiated test was performed on: ☐ Site #1 ☐ Site #2 ☒ Site #3 ☐ Site #4

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Test Receiver	Rohde & Schwarz	ESVS30	829007/014	01/19/06
2	Spectrum Analyzer	HP	E4407B	39240339	07/26/06
3	Power Meter	Rohde & Schwarz	NRVS	100666	04/07/06
4	Peak Power Sensor	Rohde & Schwarz	NRV-Z32	8360191058	04/07/06
5	Pre-Amplifier	HP	8449B	3008A01264	06/14/06
6	BILOG ANTENNA	SCHAFFNER	CBL6112B	2620	11/26/05
7	Horn Antenna	Schwarzbeck	BBHA 9120	D243	12/21/05
8	RF Cable	GesTek	N/A	GTK-E-A152-01	12/20/05
9	Open Site	GesTek	N/A	B1	11/22/05
10	Test Program Software	GesTek	N/A	GTK-E-S001-01	N/A

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

3.2 OPEN TEST SITE SETUP DIAGRAM



3.3 RADIATED EMISSION LIMIT

☒ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency	Distance	Field Strength	
MHz	Meter	$\mu\text{V/M}$	$\text{dB}\mu\text{V/M}$
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0

Remarks :

1. RF Voltage ($\text{dB}\mu\text{V/m}$) = $20 \log \text{RF Voltage } (\mu\text{V/m})$
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

☒ Fundamental and Harmonics Emission Limits

Frequency	Distance	Field Strength of Fundamental		Field Strength of Harmonics	
MHz	Meter	$\mu\text{V/M}$	$\text{dB}\mu\text{V/M}$	$\mu\text{V/M}$	$\text{dB}\mu\text{V/M}$
902-928	3	50	94	500	54
2400-2483.5	3	50	94	500	54
5725-5875	3	50	94	500	54

Remarks :

1. RF Voltage ($\text{dB}\mu\text{V/m}$) = $20 \log \text{RF Voltage } (\mu\text{V/m})$
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4 EUT CONFIGURATION

The equipment which is listed 2.6 are installed on Radiated Emission Test to meet the Commission requirement and operating in a manner which tends to maximize its emission characteristics in a normal application.

The device under test, installed in a representative system as described in section 3.2, was placed on a non-conductive table whose total height equaled 80 cm. This table can be rotated 360 degree. The measurement antenna was mounted to a non-conductive mast capable of moving the antenna vertically. Antenna height was varied from 1 meter to 4 meters and the system under test was rotated from 0 degree through 360 degrees relative to the antenna position and polarization (Horizontal and Vertical). [The EUT was rotated through three orthogonal axes to determine the attitude that maximizes the emission.](#) Also the I/O cable position was investigated to find the maximum emission condition.

3.5 OPERATING CONDITION OF EUT

Same as section 2.8.

3.6 RADIATED EMISSION DATA

The measurement range of radiated emission, which is from [30 MHz to 10 Harminics](#), was investigated. All readings below 1GHz are quasi-peak values with a resolution bandwidth of 120 KHz. Above 1GHz are peak and avg. values with a resolution bandwidth of 1MHz. The initial step in collecting radiated emission data is a spectrum analyzer peak scans of the measurement range for all the test modes and then use test receiver for final measurement. Then the worst modes were reported the following data pages.

3.7 RADIATED EMISSIONS MEASUREMENT RESULTS

3.7.1 HARMONIC RADIATED EMISSIONS

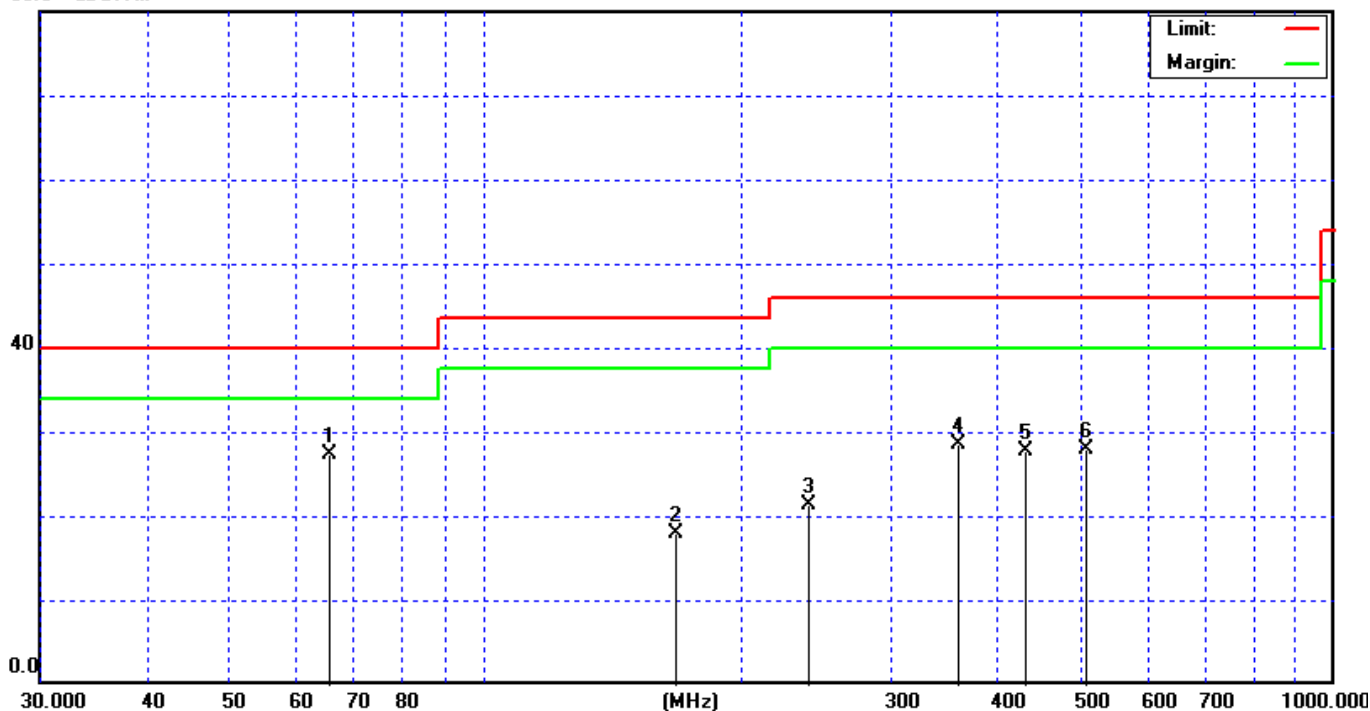
Date of Test	August 23, 2006	Temperature	25 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	59 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Horizontal	Frequency Range	30-1000MHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	65.5400	45.59	-18.37	27.22	40.00	-12.78	QP
2	168.0000	30.79	-12.98	17.81	43.50	-25.69	QP
3	240.0160	33.05	-11.75	21.30	46.00	-24.70	QP
4	360.0000	34.53	-6.05	28.48	46.00	-17.52	QP
5	432.0000	32.29	-4.53	27.76	46.00	-18.24	QP
6	506.7660	31.59	-3.69	27.90	46.00	-18.10	QP

Remarks:

1. All Readings below 1GHz are Quasi-Peak.
2. Measurement = Reading + Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
3. Over Limit (Margin Value)=Measurement level-Limit value.
4. The " " means this data is worst-case Measurement level.

80.0 dBuV/m



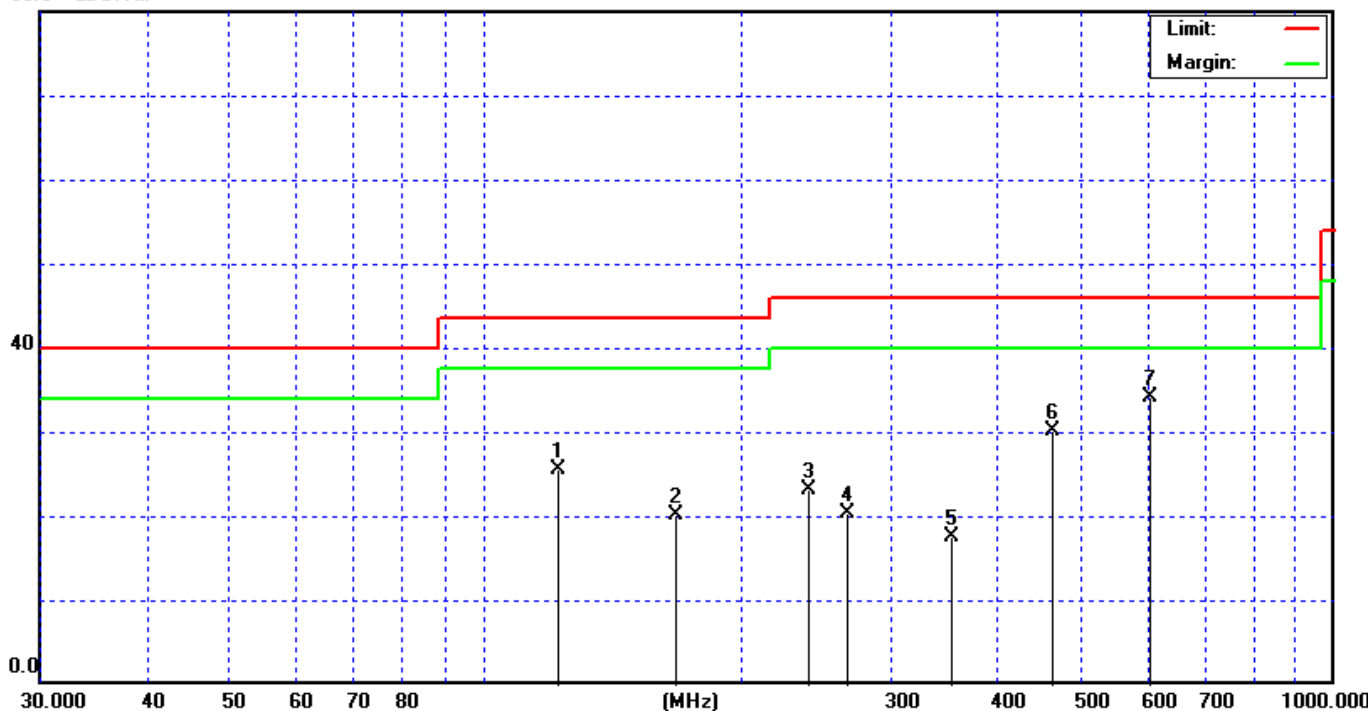
Date of Test	August 23, 2006	Temperature	25 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	59 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Vertical	Frequency Range	30-1000MHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	121.5120	36.90	-11.33	25.57	43.50	-17.93	QP
2	168.0000	33.15	-12.98	20.17	43.50	-23.33	QP
3	240.0060	34.79	-11.75	23.04	46.00	-22.96	QP
4	267.2800	30.41	-10.17	20.24	46.00	-25.76	QP
5	352.7880	23.72	-6.27	17.45	46.00	-28.55	QP
6	463.1800	34.27	-4.20	30.07	46.00	-15.93	QP
7	606.7760	35.96	-1.85	34.11	46.00	-11.89	QP

Remarks:

1. All Readings below 1GHz are Quasi-Peak.
2. Measurement = Reading + Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
3. Over Limit (Margin Value)=Measurement level-Limit value.
4. The " " means this data is worst-case Measurement level.

80.0 dBuV/m



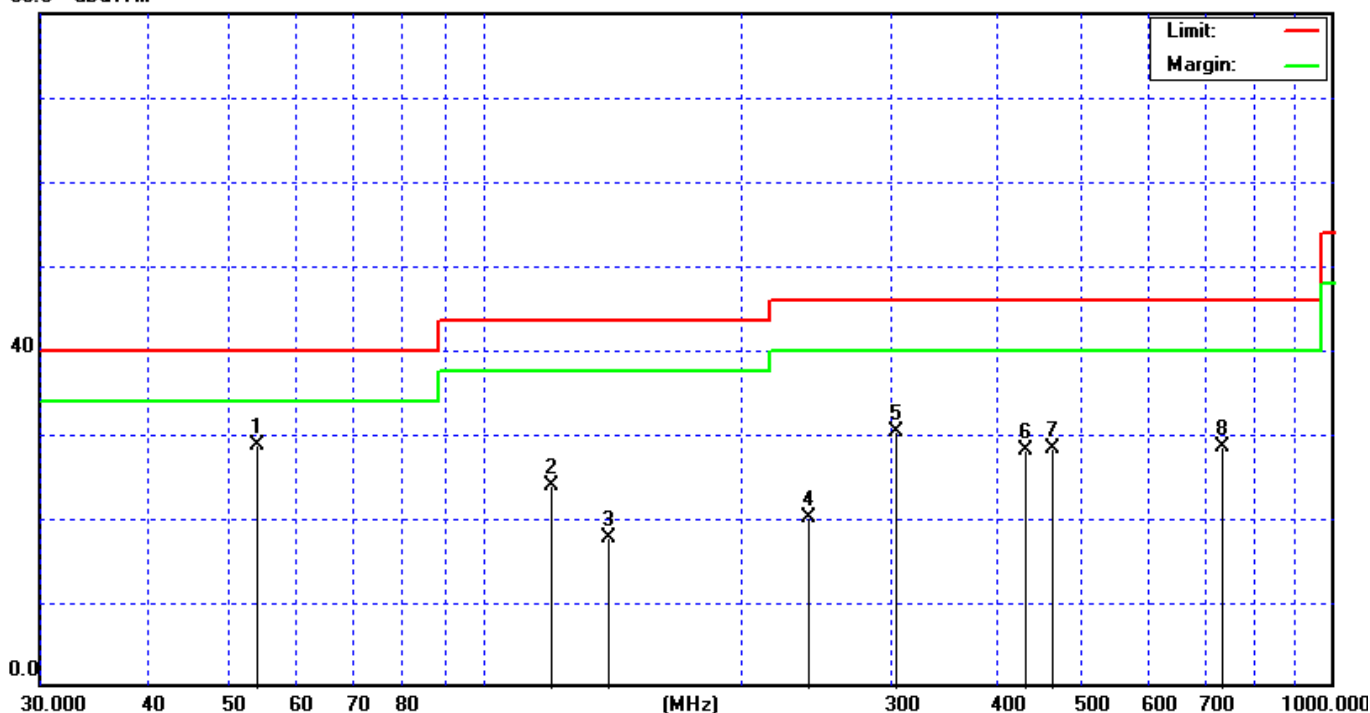
Date of Test	August 23, 2006	Temperature	25 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	59 %RH
Working Cond.	Mode 2		
Antenna distance	3m at Horizontal	Frequency Range	30-1000MHz

No.	Frequency MHz	Reading Level dBuV	Factor dB	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	54.0000	44.95	-16.22	28.73	40.00	-11.27	QP
2	120.0140	35.18	-11.33	23.85	43.50	-19.65	QP
3	140.0220	29.41	-11.66	17.75	43.50	-25.75	QP
4	240.0000	31.95	-11.75	20.20	46.00	-25.80	QP
5	305.4400	37.98	-7.68	30.30	46.00	-15.70	QP
6	432.0000	32.59	-4.53	28.06	46.00	-17.94	QP
7	463.1800	32.57	-4.20	28.37	46.00	-17.63	QP
8	734.8800	28.15	0.29	28.44	46.00	-17.56	QP

Remarks:

1. All Readings below 1GHz are Quasi-Peak.
2. Measurement = Reading + Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
3. Over Limit (Margin Value)=Measurement level-Limit value.
4. The " " means this data is worst-case Measurement level.

80.0 dBuV/m



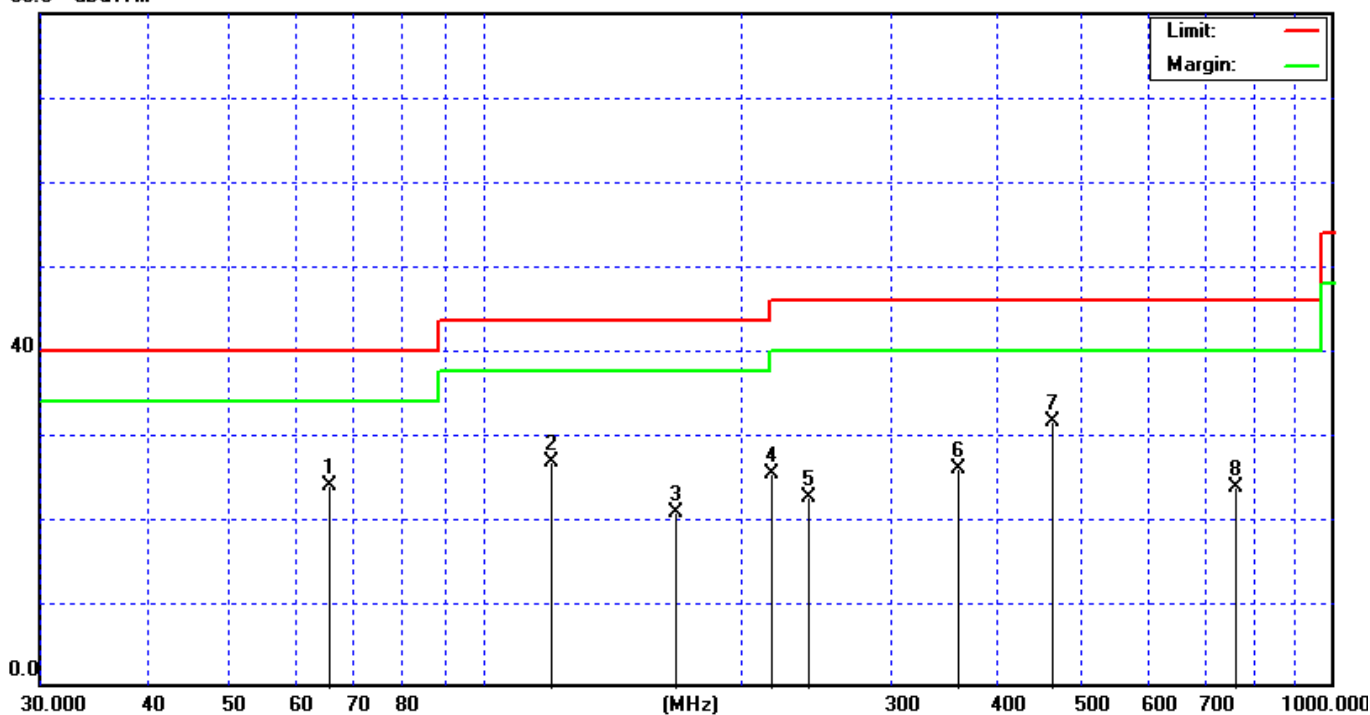
Date of Test	August 23, 2006	Temperature	25 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	59 %RH
Working Cond.	Mode 2		
Antenna distance	3m at Vertical	Frequency Range	30-1000MHz

No.	Frequency MHz	Reading Level dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over Limit dB	Detector
1	65.5400	42.22	-18.37	23.85	40.00	-16.15	QP
2	120.0000	37.98	-11.33	26.65	43.50	-16.85	QP
3	168.0000	33.59	-12.98	20.61	43.50	-22.89	QP
4	217.2400	37.88	-12.54	25.34	46.00	-20.66	QP
5	240.0000	34.33	-11.75	22.58	46.00	-23.42	QP
6	360.0000	32.03	-6.05	25.98	46.00	-20.02	QP
7	463.2000	35.70	-4.20	31.50	46.00	-14.50	QP
8	764.3200	23.00	0.71	23.71	46.00	-22.29	QP

Remarks:

1. All Readings below 1GHz are Quasi-Peak.
2. Measurement = Reading + Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
3. Over Limit (Margin Value)=Measurement level-Limit value.
4. The " " means this data is worst-case Measurement level.

80.0 dBuV/m



Date of Test	August 19, 2006	Temperature	25.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	63 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Horizontal	Frequency Range	Above 1GHz

Peak

No.	Frequency MHz	Reading Level dB μ V	Factor dB	Measurement dB μ V/m	Limit dB μ V/m	Over Limit dB	Detector
1	4840.5500	57.88	1.45	59.33	74.00	-14.67	peak
2	7259.6000	49.95	9.43	59.38	74.00	-14.62	peak
3	9680.5500	46.79	6.82	< 53.61	74.00	-20.39	peak
4	12100.2500	40.05	13.32	< 53.37	74.00	-20.63	peak
5	14520.1000	43.07	8.64	< 51.71	74.00	-22.29	peak

Average

No.	Frequency [MHz]	Peak Emission Level [dB(uV/m)]	Duty Cycle [dB]	Emission Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	4840.55	59.33	-20	39.33	54.00	-14.67
2	7259.60	59.38	-20	39.38	54.00	-14.62

Remark

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHz, Span=100MHz.
3. AVG Emission=Peak Emission + Duty Cycle(Log Scale).
4. Measurement = Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Margin Value=Emission level-Limit value.
7. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.
8. The Duty Cycle is refer to section 5.
9. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

Date of Test	August 19, 2006	Temperature	25.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	63 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Vertical	Frequency Range	Above 1GHz

Peak

No.	Frequency MHz	Reading Level dB μ V	Factor dB	Measurement dB μ V/m	Limit dB μ V/m	Over Limit dB	Detector
1	4840.4000	51.81	1.74	53.55	74.00	-20.45	peak
2	7259.4500	49.41	8.67	58.08	74.00	-15.92	peak
3	9679.3000	43.84	9.96	< 53.80	74.00	-20.20	peak
4	12099.1500	38.03	15.79	< 53.82	74.00	-20.18	peak
5	14519.0000	43.72	6.94	< 50.66	74.00	-23.34	peak

Average

No.	Frequency [MHz]	Peak Emission Level [dB(uV/m)]	Duty Cycle [dB]	Emission Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	7259.45	58.08	-20	38.08	54.00	-15.92

Remark

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. AVG Emission=Peak Emission + Duty Cycle(Log Scale).
4. Measurement = Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Margin Value=Emission level-Limit value.
7. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.
8. The Duty Cycle is refer to section 5.
9. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

Date of Test	August 19, 2006	Temperature	25.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	63 %RH
Working Cond.	Mode 2		
Antenna distance	3m at Horizontal	Frequency Range	Above 1GHz

Peak

No.	Frequency MHz	Reading Level dB μ V	Factor dB	Measurement dB μ V/m	Limit dB μ V/m	Over Limit dB	Detector
1	4840.3800	60.14	1.45	61.59	74.00	-12.41	peak
2	7259.7500	49.81	9.43	59.24	74.00	-14.76	peak
3	9679.6000	44.15	6.82	< 50.97	74.00	-23.03	peak
4	12099.4500	40.10	13.33	< 53.43	74.00	-20.57	peak
5	14519.3000	43.41	8.64	< 52.05	74.00	-21.95	peak

Average

No.	Frequency [MHz]	Peak Emission Level [dB(uV/m)]	Duty Cycle [dB]	Emission Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	4840.38	61.59	-20	41.59	54.00	-12.41
2	7259.75	59.24	-20	39.27	54.00	-14.76

Remark

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. AVG Emission=Peak Emission + Duty Cycle(Log Scale).
4. Measurement = Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Margin Value=Emission level-Limit value.
7. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.
8. The Duty Cycle is refer to section 5.
9. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

Date of Test	August 19, 2006	Temperature	25.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	63 %RH
Working Cond.	Mode 2		
Antenna distance	3m at Vertical	Frequency Range	Above 1GHz

Peak

No.	Frequency MHz	Reading Level dB μ V	Factor dB	Measurement dB μ V/m	Limit dB μ V/m	Over Limit dB	Detector
1	4840.3500	53.54	1.74	55.28	74.00	-18.72	peak
2	7259.7800	48.65	8.67	57.32	74.00	-16.68	peak
3	9679.6300	43.62	9.96	< 53.58	74.00	-20.42	peak
4	12099.4800	37.70	15.78	< 53.48	74.00	-20.52	peak
5	14519.3300	45.39	6.94	< 52.33	74.00	-21.67	peak

Average

No.	Frequency [MHz]	Peak Emission Level [dB(uV/m)]	Duty Cycle [dB]	Emission Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	4840.35	55.28	-20	35.28	54.00	-18.72
2	7259.78	57.32	-20	37.32	54.00	-16.68

Remark

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. AVG Emission=Peak Emission + Duty Cycle(Log Scale).
4. Measurement = Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Margin Value=Emission level-Limit value.
7. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.
8. The Duty Cycle is refer to section 5.
9. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

3.7.2 FUNDAMENTAL RADIATED EMISSIONS

Date of Test	August 19, 2006	Temperature	25.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	63 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Horizontal		

Peak

No.	Frequency MHz	Reading Level dB μ V	Factor dB	Measurement dB μ V/m	Limit dB μ V/m	Over Limit dB	Detector
1	2420.050	59.64	31.45	91.09	114.00	-22.91	peak

Average

No.	Frequency [MHz]	Peak Emission Level [dB(uV/m)]	Duty Cycle [dB]	Emission Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	2420.05	91.09	-20	71.09	94	-22.91

Remark

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. AVG Emission=Peak Emission + Duty Cycle(Log Scale).
4. Measurement = Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Margin Value=Emission level-Limit value.
7. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.
8. The Duty Cycle is refer to section 5.
9. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

Date of Test	August 19, 2006	Temperature	25.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	63 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Vertical		

Peak

No.	Frequency MHz	Reading Level dB μ V	Factor dB	Measurement dB μ V/m	Limit dB μ V/m	Over Limit dB	Detector
1	2419.930	46.85	24.31	71.16	114.00	-42.84	peak

Average

No.	Frequency [MHz]	Peak Emission Level [dB(uV/m)]	Duty Cycle [dB]	Emission Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	2419.93	71.16	-20	51.16	94	-42.84

Remark

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
3. AVG Emission=Peak Emission + Duty Cycle(Log Scale).
4. Measurement = Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
5. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor
6. Margin Value=Emission level-Limit value.
7. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.
8. The Duty Cycle is refer to section 5.
9. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

4. BAND EDGE

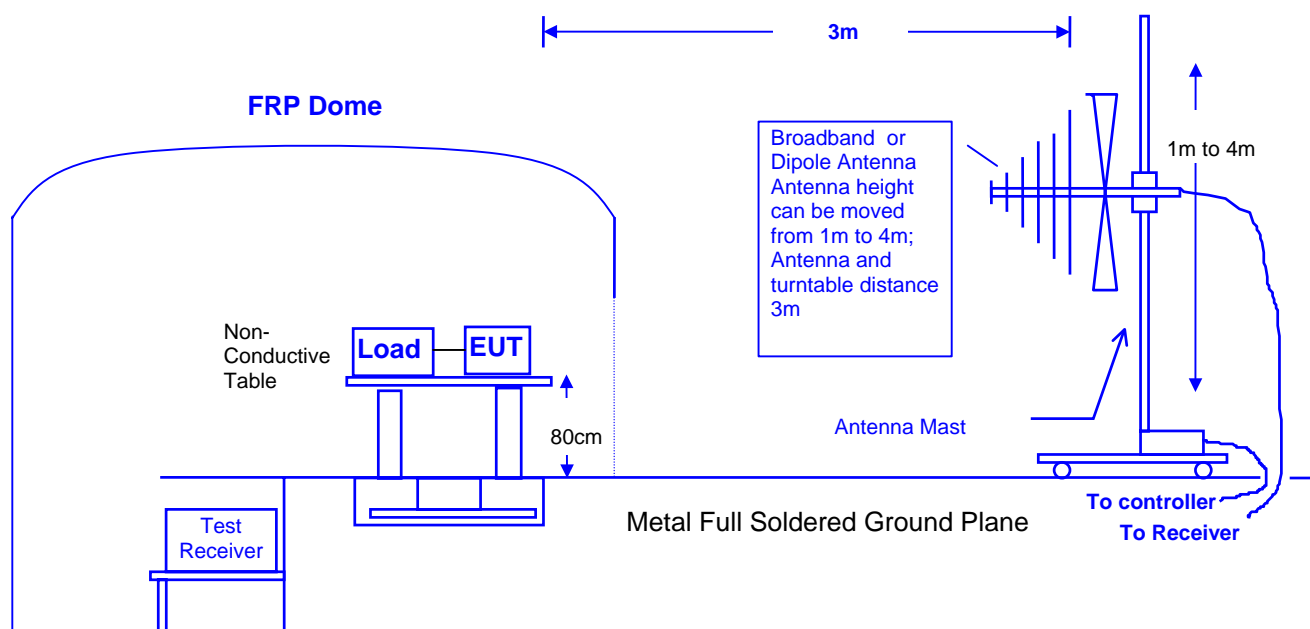
4.1 TEST EQUIPMENT

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Test Receiver	Rohde & Schwarz	ESVS30	829007/014	01/19/06
2	Spectrum Analyzer	Rohde & Schwarz	FSP40	100061	04/03/06
3	Spectrum Analyzer	HP	E4407B	39240339	07/26/06
4	Power Meter	Rohde & Schwarz	NRVS	100666	04/07/06
5	Peak Power Sensor	Rohde & Schwarz	NRV-Z32	8360191058	04/07/06
6	Pre-Amplifier	HP	8449B	3008A01264	06/14/06
7	BILOG ANTENNA	SCHAFFNER	CBL6112B	2620	11/26/05
8	Horn Antenna	Schwarzbeck	BBHA 9120	D243	12/21/05
9	RF Cable	GesTek	N/A	GTK-E-A152-01	12/20/05
10	Open Site	GesTek	N/A	B1	11/22/05
11	Test Program Software	GesTek	N/A	GTK-E-S001-01	N/A

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

4.2 BLOCK DIAGRAM OF TEST SETUP

⊙ RF Radiated Measurement: ⊙



4.3 BAND EDGE LIMIT

In any 100KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 50dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209 (a) (see Section 15.205(c)).

4.4 EUT CONFIGURATION

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2000 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter is 120KHz, above 1GHz are 1MHz.

4.5 OPERATING CONDITION OF EUT

Same as section 2.8.

4.6 TEST RELULT

Date of Test	Augsut 21, 2006	Temperature	27.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	51 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Horizontal	Test Band	Lower

Radiation Emission of Fundamental Peak

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2420.05	59.64	31.45	91.09

Remark:

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ.
3. Emission Level= Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
4. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor

TEST Result

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (29.26)dB delta between carry power and maximum emission in restrict band 2329 MHz.

The above tables are list of fundamental emission test result.

Therefore, peak field strength of 2329 MHz is 91.09 dBuV/m – 29.26 dB = 61.83 dBuV/m which is under 74dBuV/m.

Average filed strength = Peak filed strength x Duty Cycle

(20logAVG = 20logPeak + 20logDuty Cycle)

20logDuty Cycle = (-33.506)dB

Average field strength of (2329)MHz is

(61.83) dBuV/m + (-20)dB = (41.83)dBuV/m which is under 54dBuV/m.

Remark:

If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

Date of Test	August 21, 2006	Temperature	27.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	51 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Vertical	Test Band	Lower

Radiation Emission of Fundamental Peak

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2419.93	46.85	24.31	71.16

Remark:

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ.
3. Emission Level= Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
4. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor

TEST Result

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (29.26)dB delta between carry power and maximum emission in restrict band 2329 MHz.

The above tables are list of fundamental emission test result.

Therefore, peak field strength of 2329 MHz is 71.16 dBuV/m – 29.26 dB = 41.9 dBuV/m which is under 74dBuV/m.

Average filed strength = Peak filed strength × Duty Cycle

(20logAVG = 20logPeak + 20logDuty Cycle)

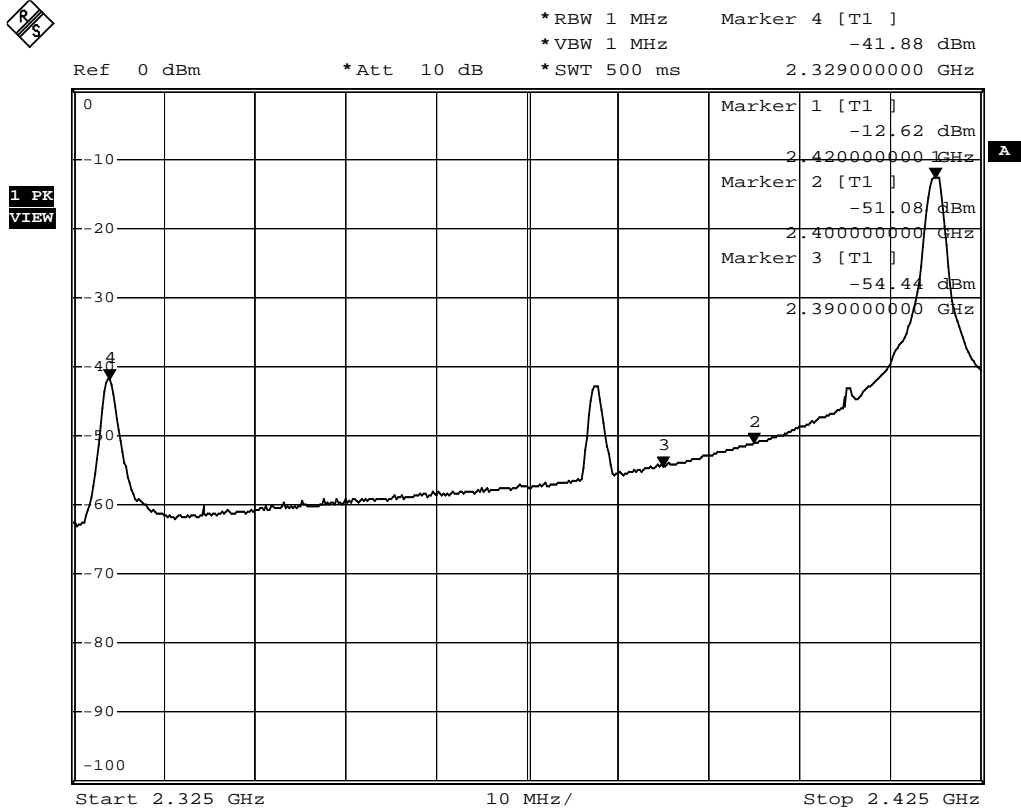
20logDuty Cycle = (-33.506)dB

Average field strength of (2329)MHz is

(41.9) dBuV/m + (-20)dB = (21.9)dBuV/m which is under 54dBuV/m.

Remark:

If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.



Date: 21.AUG.2006 13:00:19

Date of Test	August 21, 2006	Temperature	27.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	51 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Horizontal	Test Band	Higher

Radiation Emission of Fundamental Peak

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2420.05	59.64	31.45	91.09

Remark:

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHz.
3. Emission Level= Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
4. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor

TEST Result

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (51.87)dB delta between carry power and maximum emission in restrict band 2483.8 MHz.

The above tables are list of fundamental emission test result.

Therefore, peak field strength of 2483.8 MHz is 91.09 dBuV/m – 51.87 dB = 39.22 dBuV/m which is under 74dBuV/m.

Average filed strength = Peak filed strength x Duty Cycle

(20logAVG = 20logPeak + 20logDuty Cycle)

20logDuty Cycle = (-33.506)dB

Average field strength of (2483.8)MHz is

(39.22) dBuV/m + (-20)dB = (19.22)dBuV/m which is under 54dBuV/m.

Remark:

If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

Date of Test	August 21, 2006	Temperature	27.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	51 %RH
Working Cond.	Mode 1		
Antenna distance	3m at Vertical	Test Band	Higher

Radiation Emission of Fundamental Peak

Frequency [MHz]	Reading Level [dB(uV)]	Correction Factor [dB/m]	Emission Level [dB(uV/m)]
2419.93	46.85	24.31	71.16

Remark:

1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
2. Spectrum Analyzer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ.
3. Emission Level= Reading + Correction Factor (Could have ± 0.01 tolerance due to computer automatically round off calculation).
4. Correction Factor= Antenna Factor + Cable Loss – Amplifier Factor

TEST Result

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (51.87)dB delta between carry power and maximum emission in restrict band 2483.8 MHz.

The above tables are list of fundamental emission test result.

Therefore, peak field strength of 2483.8 MHz is 71.16 dBuV/m – 51.87 dB = 19.29 dBuV/m which is under 74dBuV/m.

Average filed strength = Peak filed strength x Duty Cycle

(20logAVG = 20logPeak + 20logDuty Cycle)

Remark:

If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.

The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

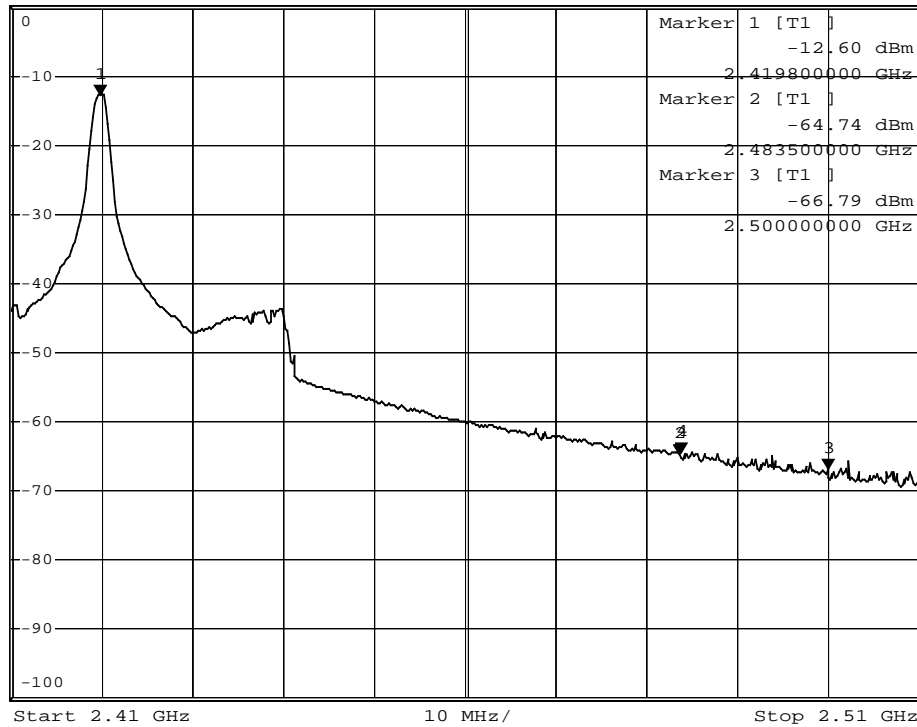


*RBW 1 MHz Marker 4 [T1]
 *VBW 1 MHz -64.47 dBm
 *SWT 500 ms 2.483800000 GHz

Ref 0 dBm

*Att 10 dB

1 PK
VIEW



Date: 21.AUG.2006 14:22:13

5. DUTY CYCLE

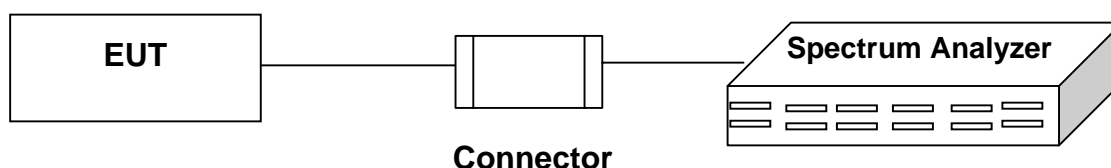
5.1 TEST EQUIPMENT

The following test equipments are used during the radiated emission tests:

Item	Instrument	Manufacturer	Model	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde & Schwarz	FSP40	100061	04/03/06
2	Spectrum Analyzer	HP	E4407B	39240339	07/26/06

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

5.2 BLOCK DIAGRAM OF TEST SETUP



5.3 TEST RESULT

Date of Test	Augsut 21, 2006	Temperature	27.6 deg/C
EUT	2.4GHz Wireless Keyboard	Humidity	51 %RH
Working Cond.	Mode 1		

Duty Cycle = Time on of 100msec / 100msec

Frequency 2420 MHz

Time on of one slot length = 528 (μs) = 0.528 (msec)

Time on of one period = 76.2 (msec)

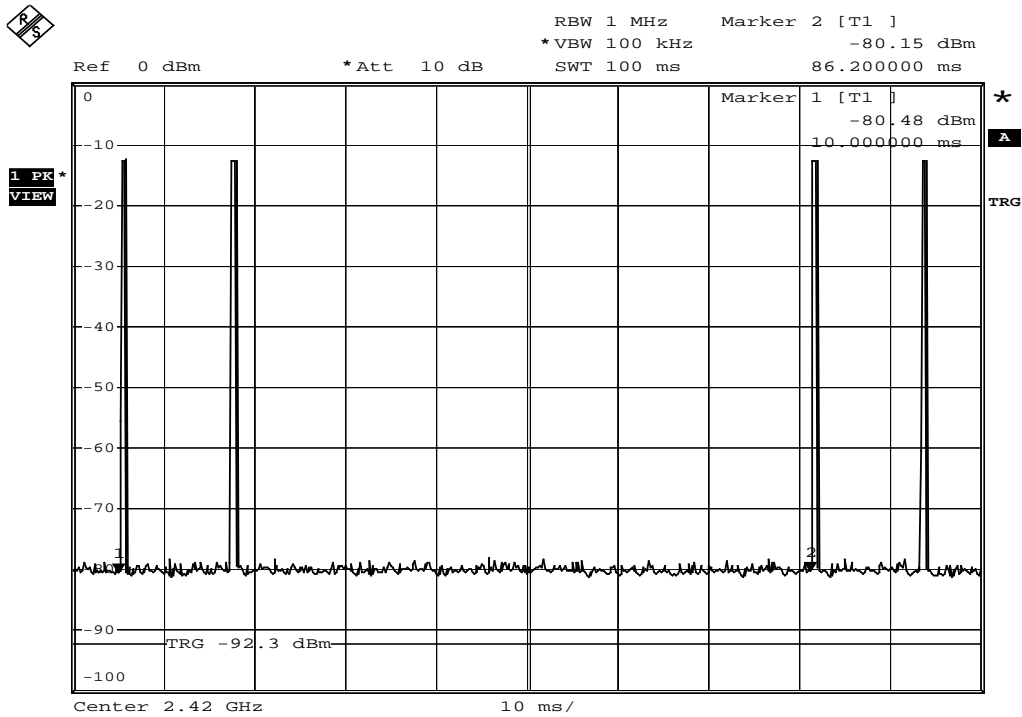
Totally time of 100 msec = 2.112 (msec)

Duty Cycle = 2.112 / 100 = 0.02112

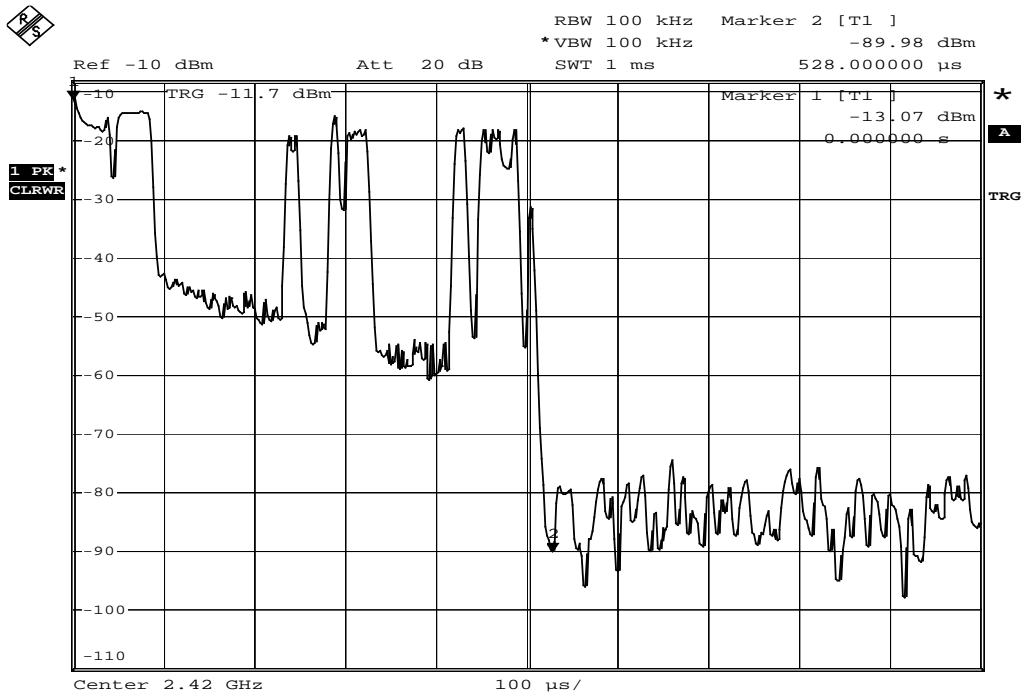
20 log 0.02112 = -33.506 dB

Remark:

If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.



Date: 22.AUG.2006 09:46:30



Date: 21.AUG.2006 10:32:40

6. PHOTOGRAPHS FOR TEST

6.1 TEST PHOTOGRAPHS FOR RADIATION

30-1000MHz (Mode 1)



30-1000MHz (Mode 2)

Above 1GHz (Mode 1)

Above 1GHz (Mode 2)

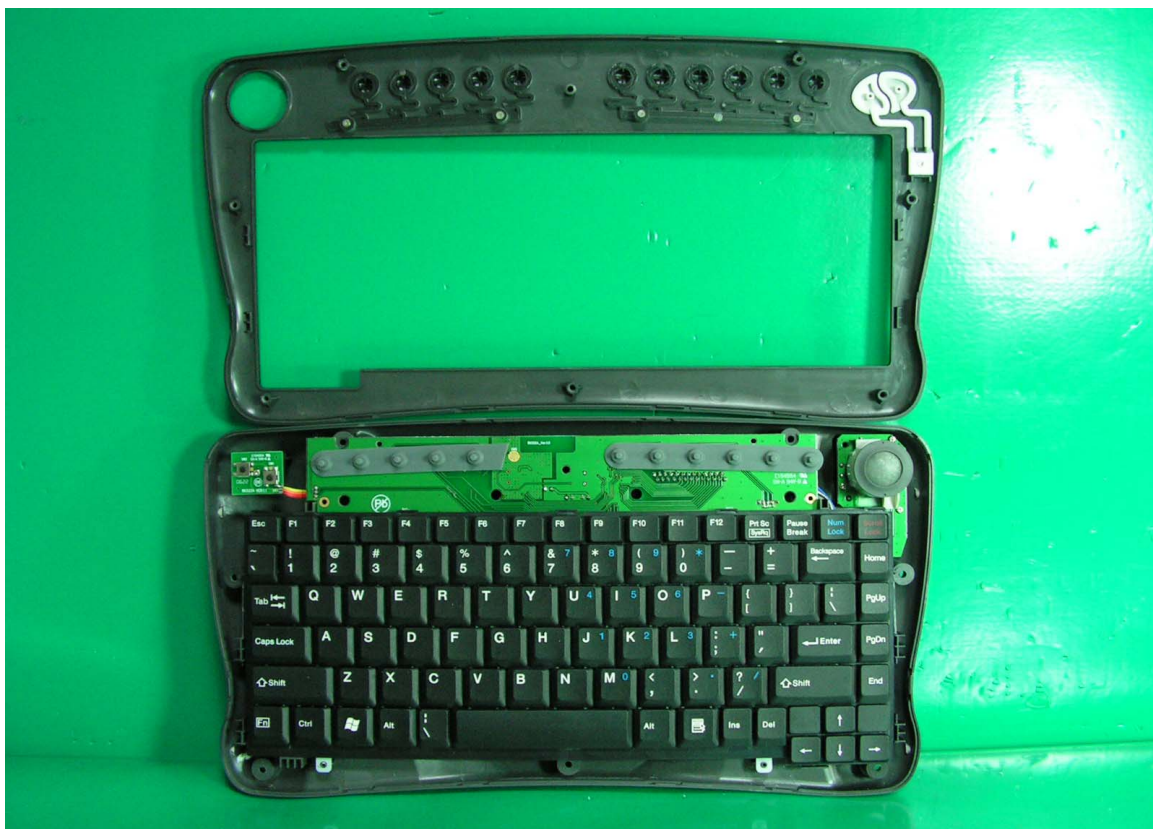
7. PHOTOGRAPHS FOR PRODUCT

1. Front View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)
2. Back View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)



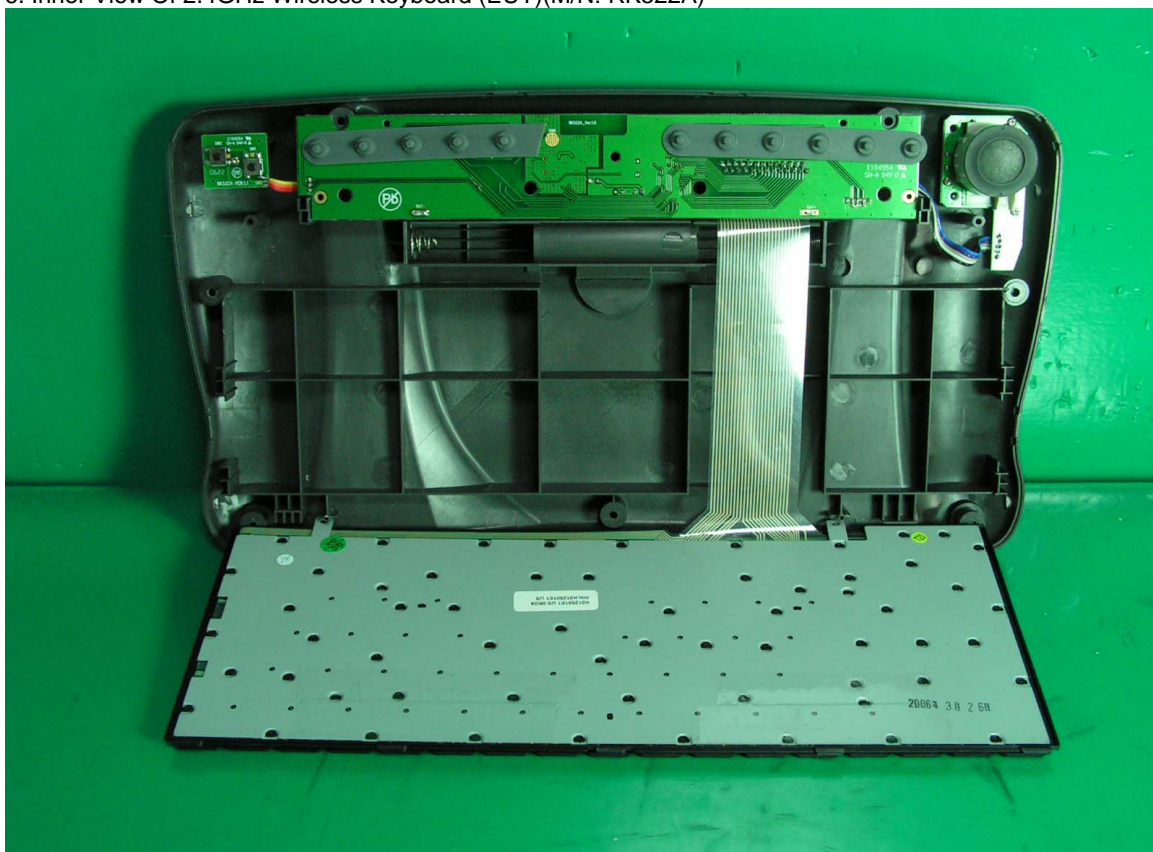
3. Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)

4. Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)

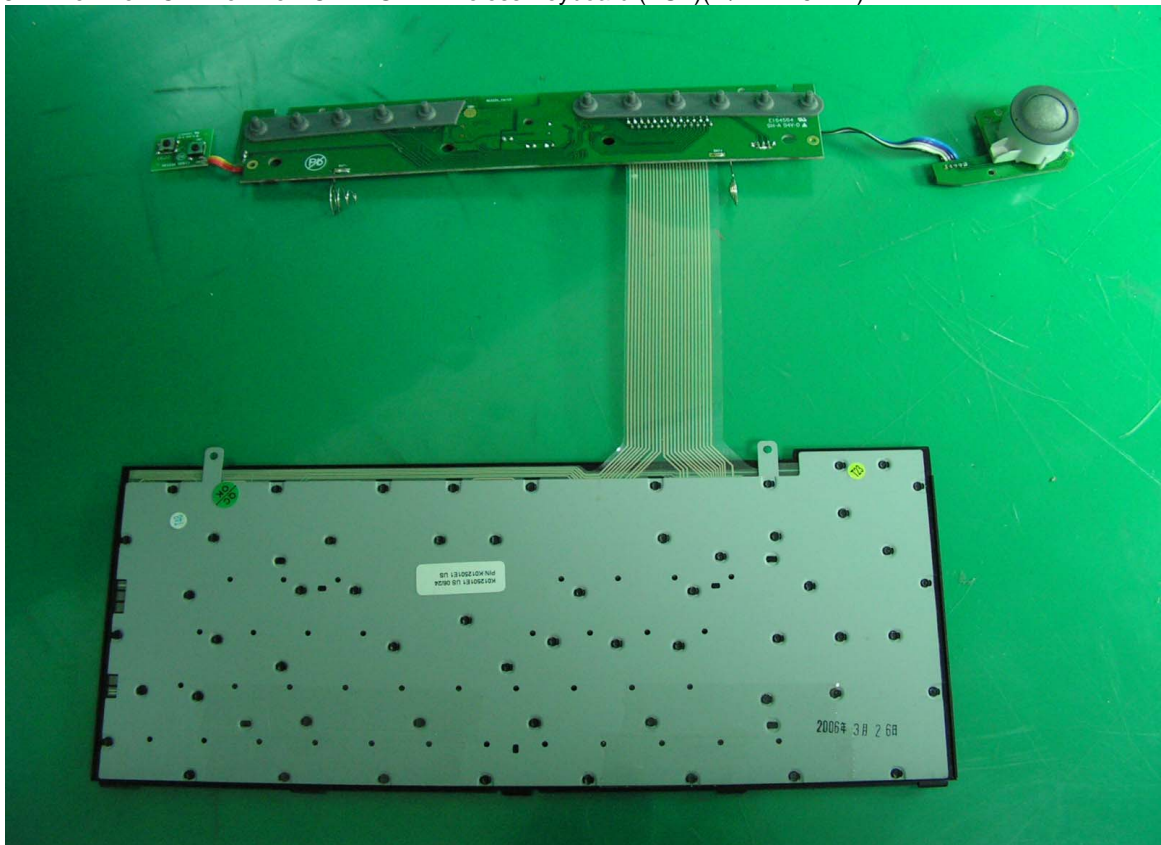


5. Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)

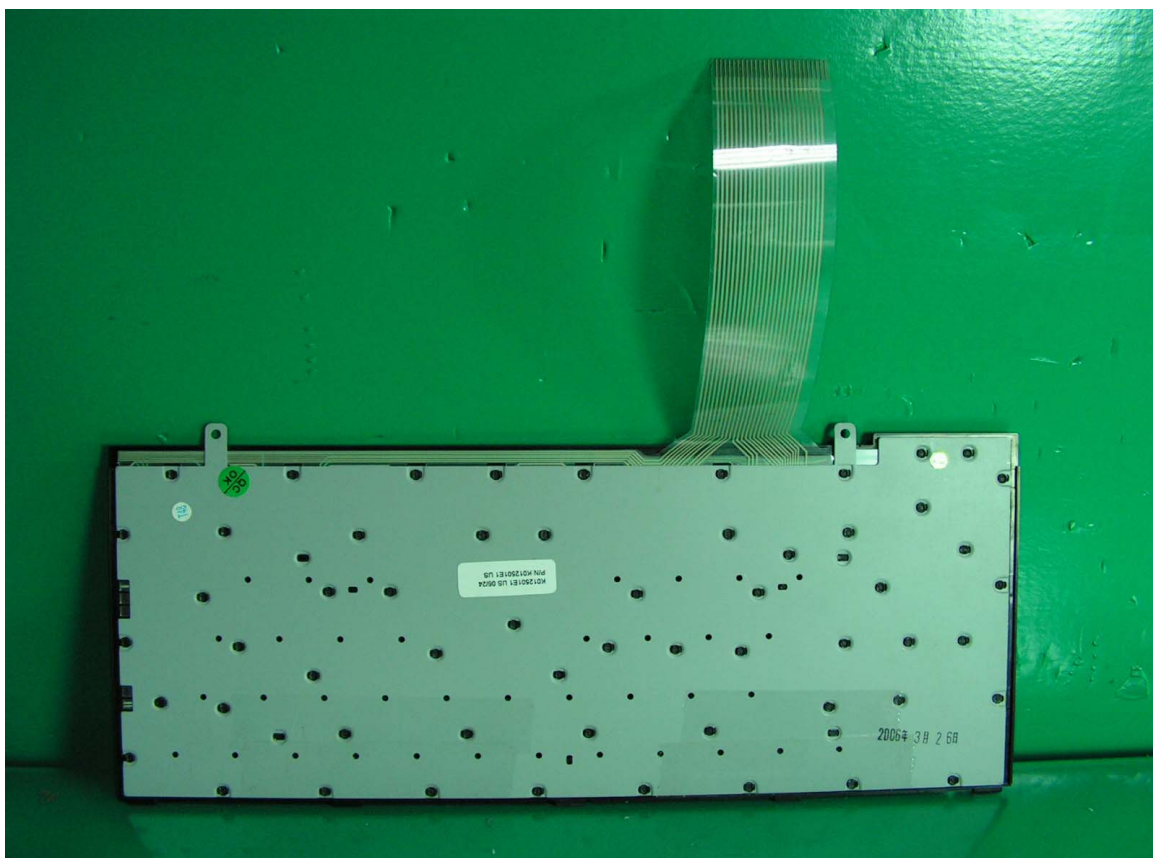
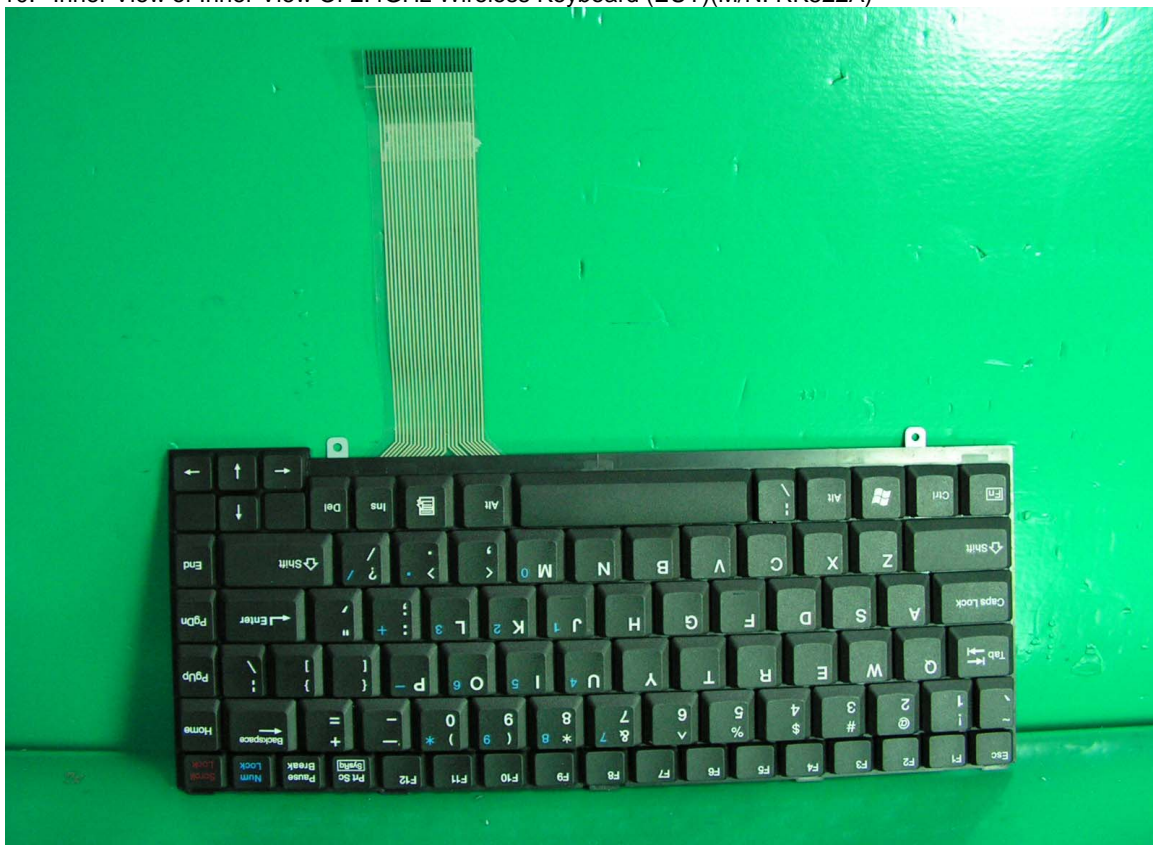
6. Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)



7. Inner View Of Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)
8. Inner View Of Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)

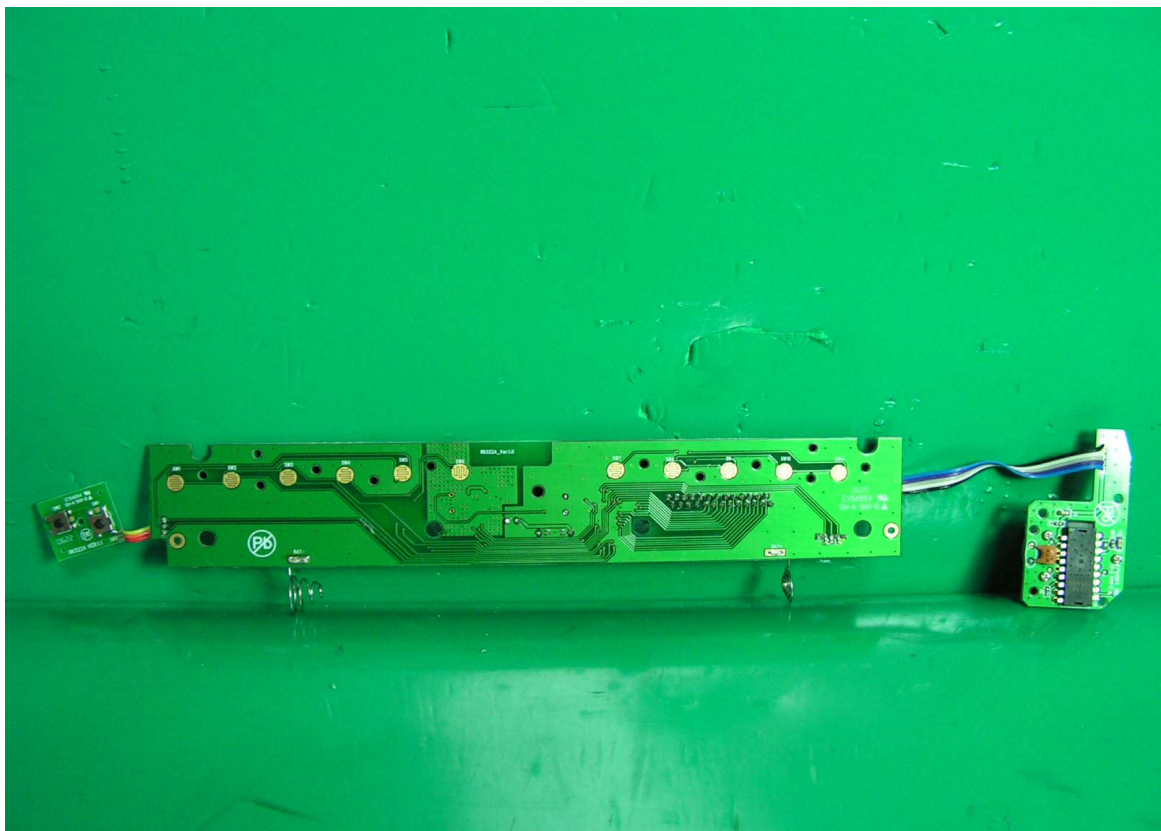
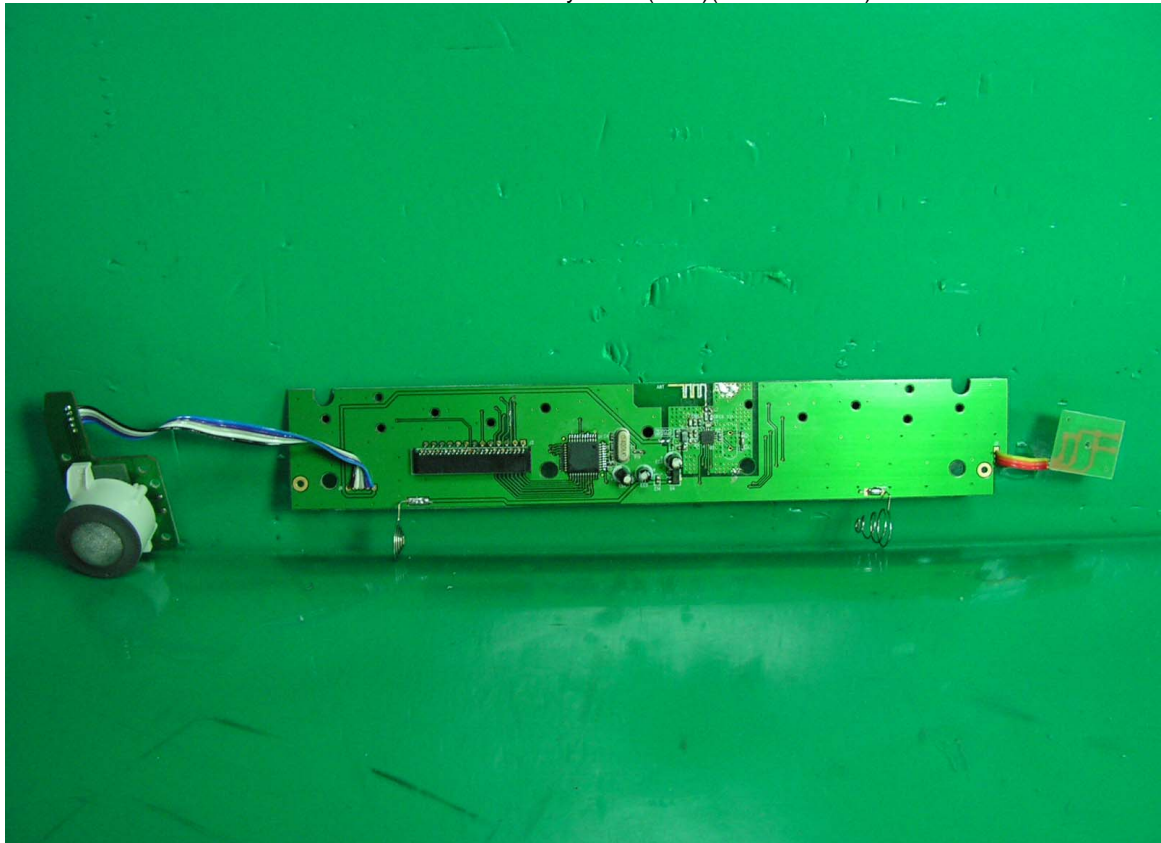


9. Inner View of Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)
10. Inner View of Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)



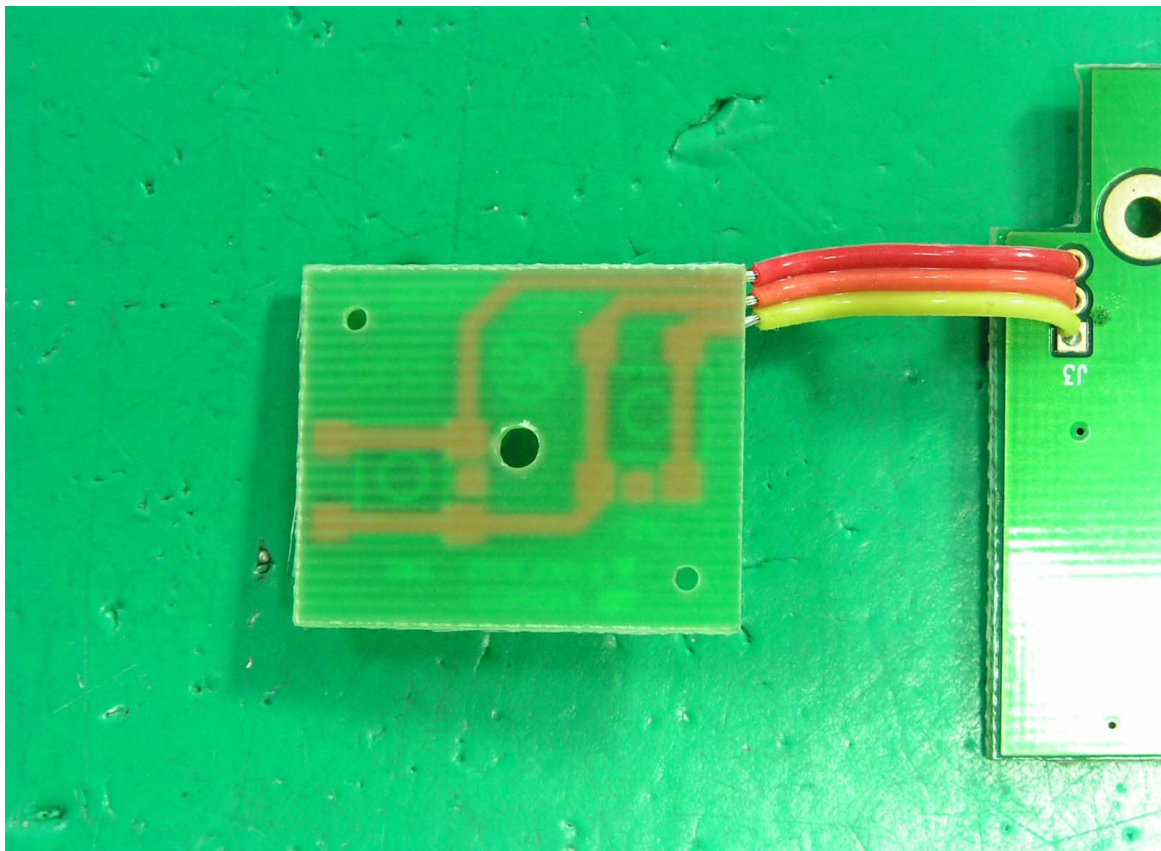
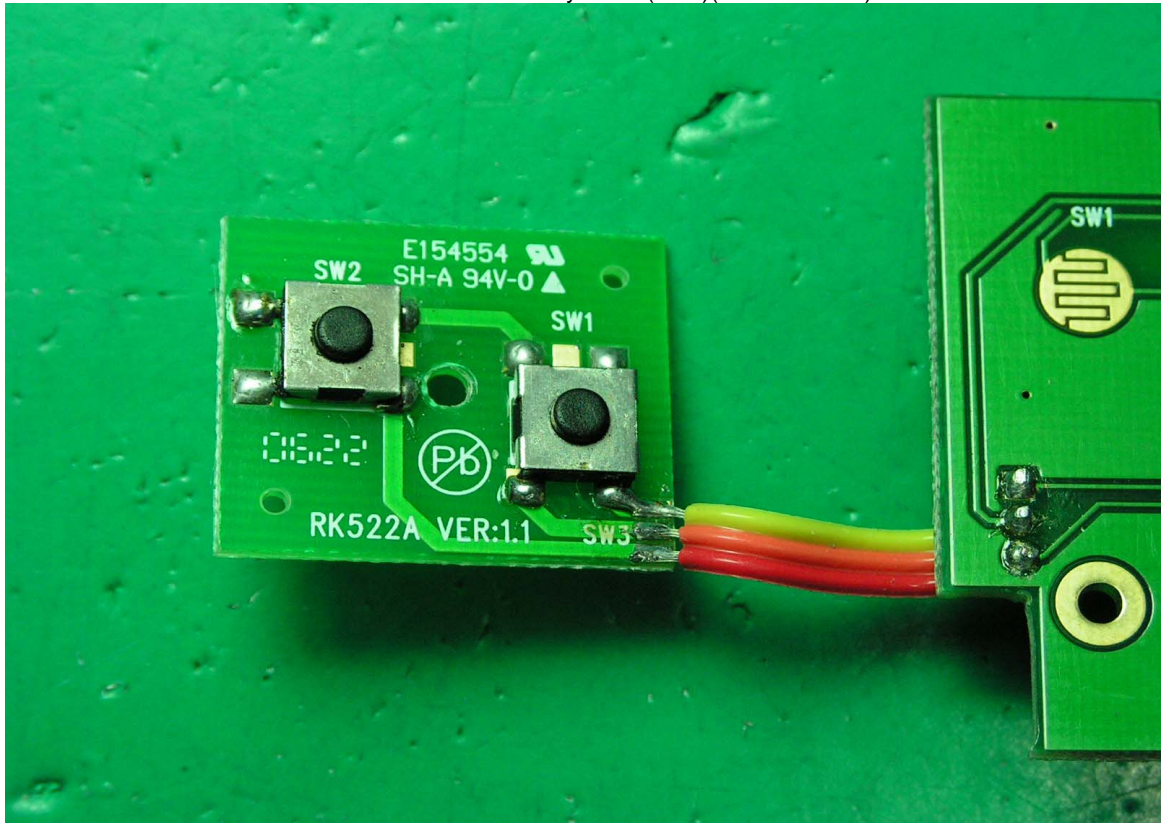
11. Inner View of Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)

12. Inner View of Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)



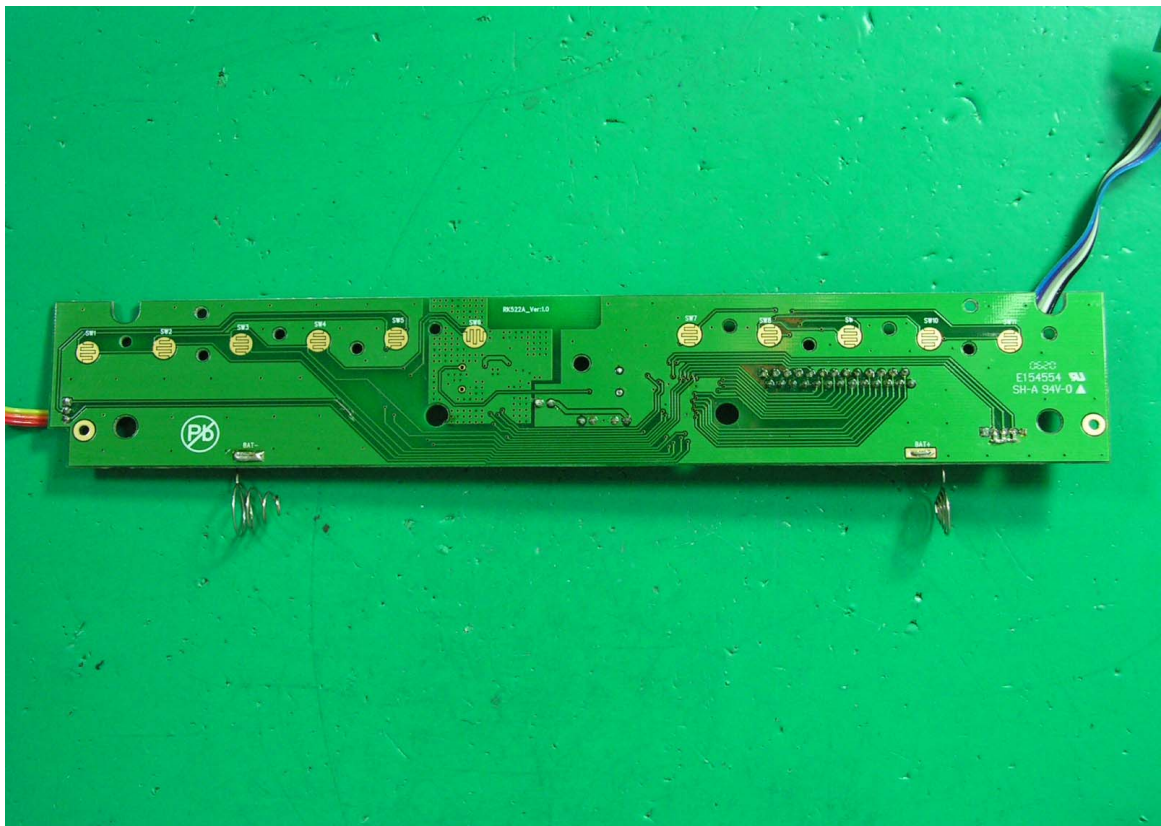
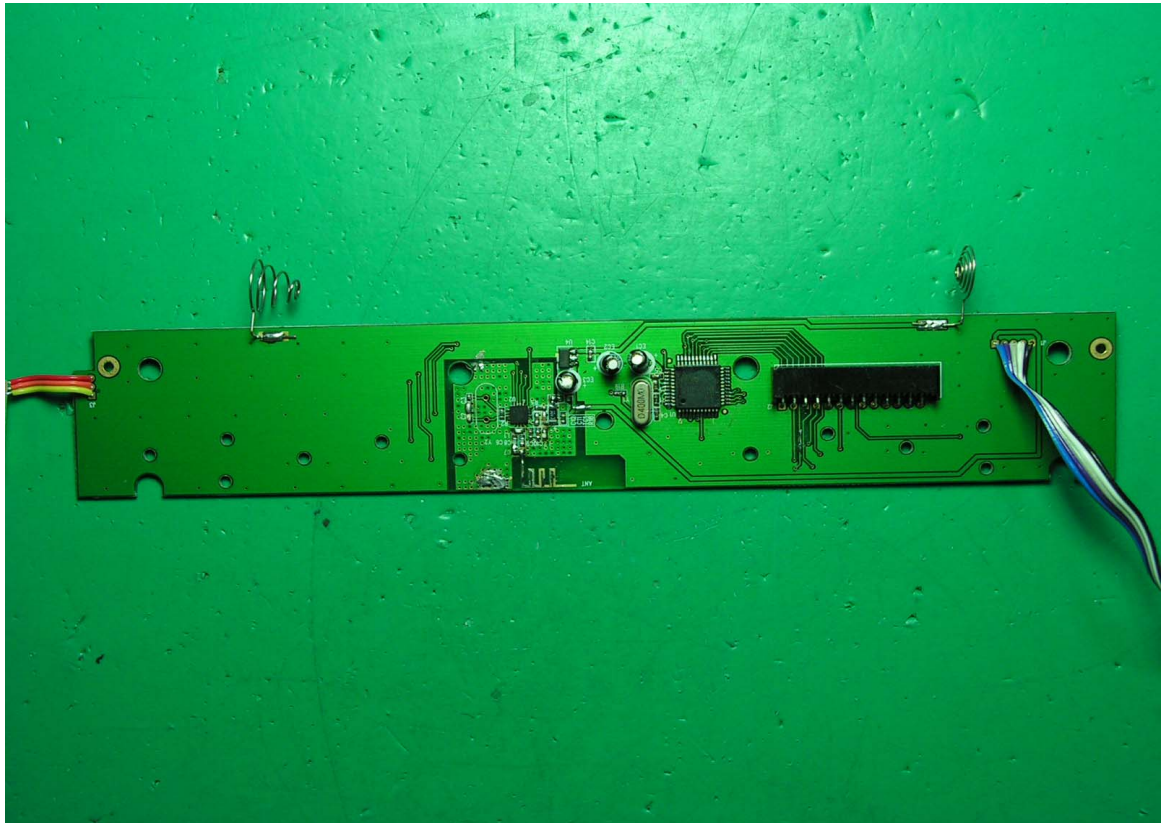
13. Inner View of Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)

14. Inner View of Inner View Of 2.4GHz Wireless Keyboard (EUT)(M/N: RK522A)



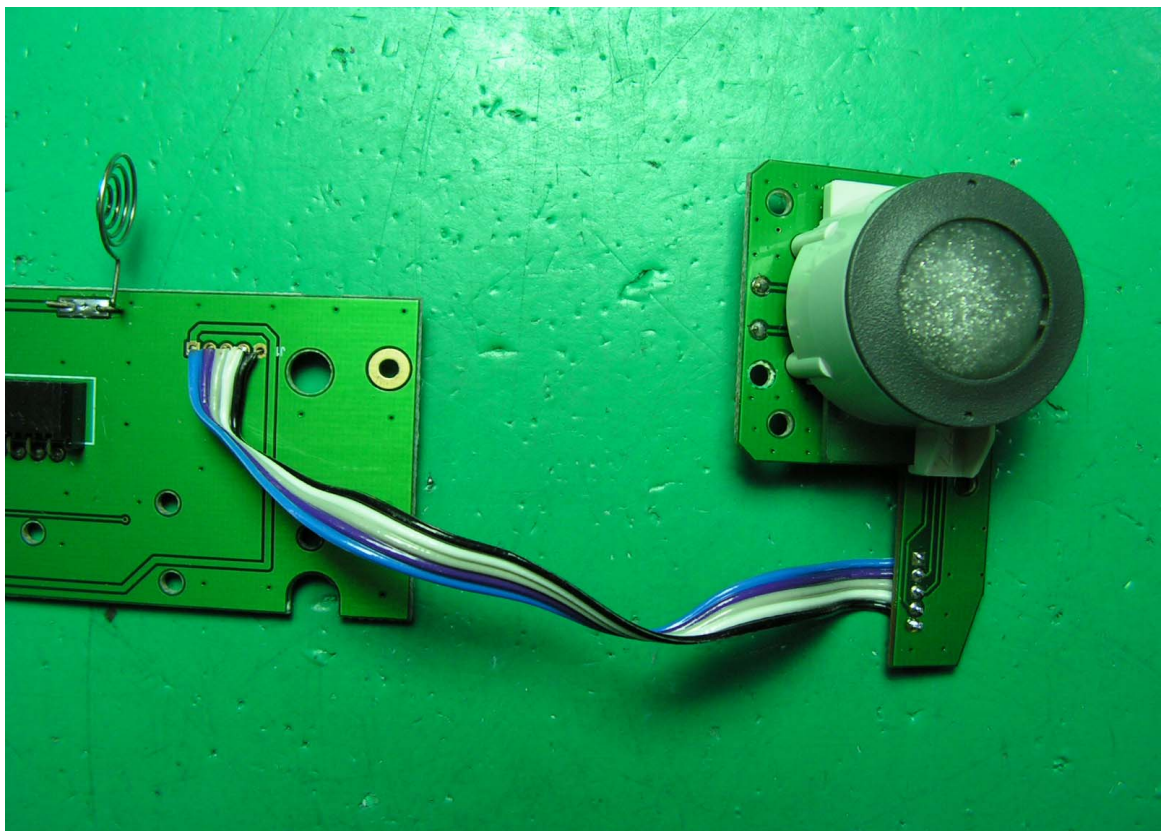
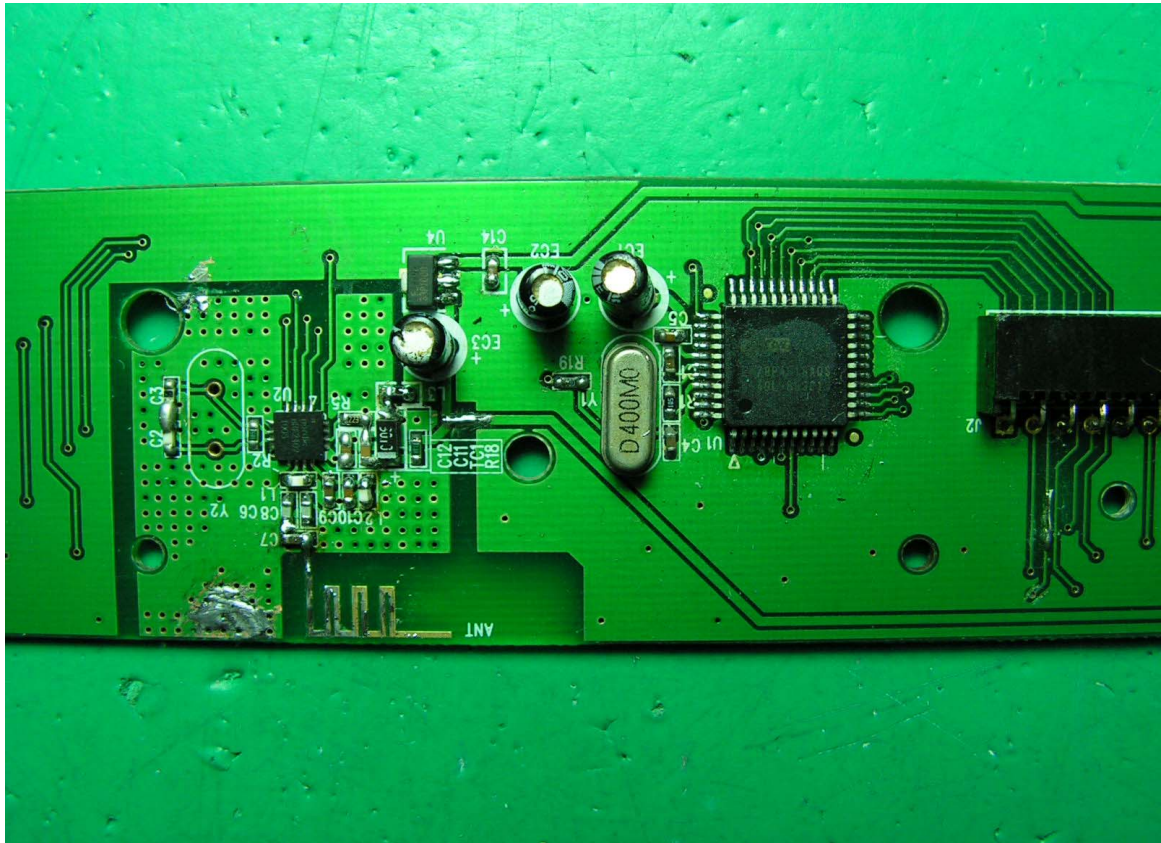
15. Inner View of Main Board

16. Inner View of Main Board



17. Inner View of Main Chip

18. Trackball



19. Trackball

20. PCB of Trackball

