Test Report

Product Name: Wireless Keyboard
Model No.: F8E830-KBD,K105
FCC ID.: K7SF8E830-KBD

Applicant : Darfon Electronics Corp.
Address : 6, Feng-Shu Tsuen, Gueishan, Taoyuan 333, Taiwan, R.O.C.

Date of Receipt : Nov. 07, 2003
Date of Test : Nov. 12, 2003
Report No. : 03BL046FI

The Test Results relate only to the samples tested.
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This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Test Report Certification

Test Date : Nov. 12, 2003
Report No. : 03BL046FI

QuieTek Corporation
Accredited by NIST (NVLAP)
NVLAP Lab Code: 200347-0

Product Name	:	Wireless Keyboard
Applicant	:	Darfon Electronics Corp.
Address	:	6, Feng-Shu Tsuen, Gueishan, Taoyuan 333, Taiwan, R.O.C.
Manufacturer	:	Darfon Electronics Corp.
Model No.	:	F8E830-KBD,K105
FCC ID.	:	K7SF8E830-KBD
Rated Voltage	:	DC 3V(Power by Battery)
Trade Name	:	Belkin, BenQ
Measurement Standard	:	FCC Part 15 Intentional Radiators for Subpart C Paragraph 15.227
Measurement Procedure	:	ANSI C63.4:1992
Test Result	:	Complied

NVLAP
NVLAP Lab Code : 200347-0

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Approved By : Gene Chang
(Gene Chang)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	:	Wireless Keyboard
Trade Name	:	Belkin, BenQ
FCC ID.	:	K7SF8E830-KBD
Model No.	:	F8E830-KBD,K105
EUT Voltage	:	DC 3V(Power by Battery)
Frequency Range	:	27.095MHz~27.145MHz
Type of Modulation	:	FSK
Type of antenna	:	Loop Antenna
Channel Number	:	2
Channel Control	:	Auto

Frequency of Each Channel:

Channel	Frequency	Channel	Frequency
Channel 1:	27.095 MHz	Channel 2:	27.145 MHz

Note:

1. The EUT is a Wireless Keyboard intends to use in household and office PC system or related application.
2. The EUT is including two model numbers, it's different is listed as below

Model No.	Trade Name
F8E830-KBD	Belkin
K105	BenQ

3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.227.
4. The variation of model number is for different color of outlook and Hard Key. The circuit of each model is identical.

1.2. Operation Description

The EUT is a 27MHz Wireless Keyboard intends to use in household and office PC system.
The device adapts FSK modulation. The antenna Loop Antenna Provides diversity function to improve the transmitting function.
The super generation type receiver was used. An external excitation was used when the test of receiver was performed.

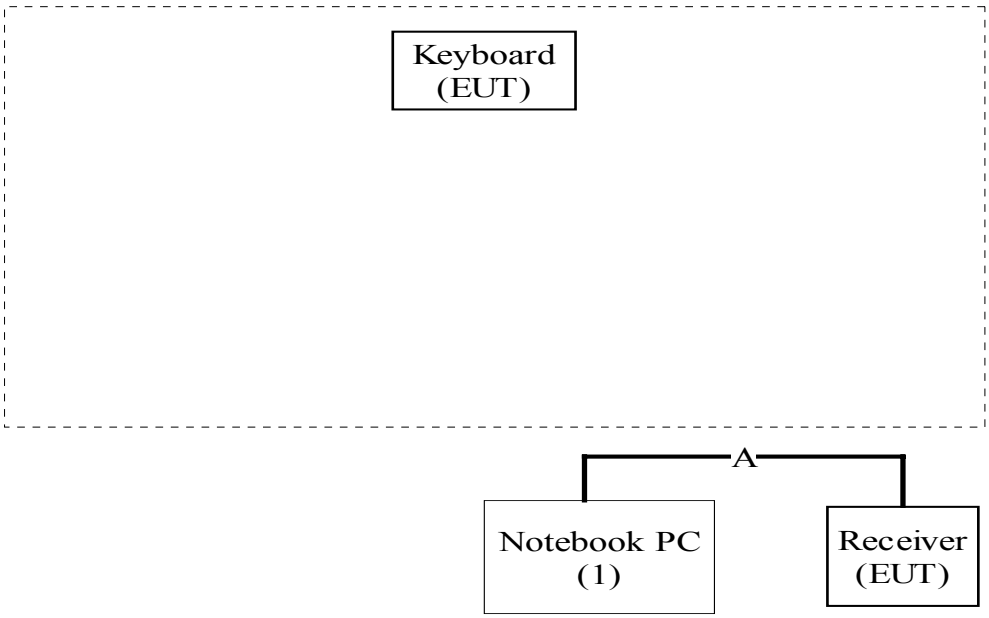
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	FCC ID
(1)	Notebook PC	DELL	PP01L	N/A	Non-Shielded, 1.8m

Signal Cable Type		Signal cable Description
A.	Receiver Cable	Shielded, 1.3m

1.4. Configuration of tested System



1.5. EUT Exercise Software

(1) Setup the EUT and simulators as shown on 1.4.

(2) Enable RF signal and confirm EUT active.

(3) Modulate output capacity of EUT up to specification.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

Site Description: June 22, 2001 File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Reference 31040/SIT1300F2

July 03, 2001 Accreditation on NVLAP
NVLAP Lab Code: 200533-0

0914
ILAC MRA

Site Name: Quietek Corporation

Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

NVLAP Lab Code: 200533-0

2. Conducted Emission

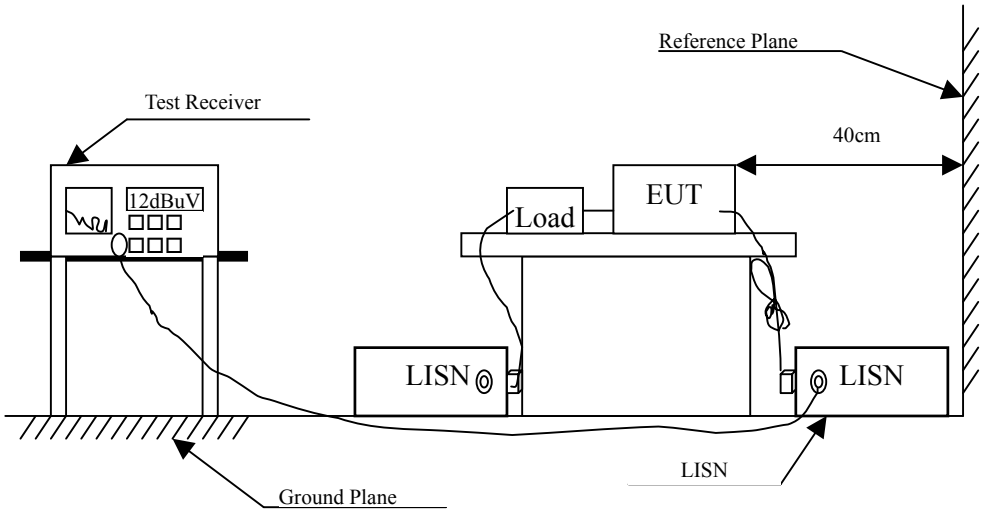
2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2003	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2003	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2003	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2003	
5	No.4 Shielded Room			N/A	

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks : In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

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 C63.4:1992 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Test Data of Conducted Emission

Owing to the DC operation of EUT, this test item is not performed.

3. Radiated Emission

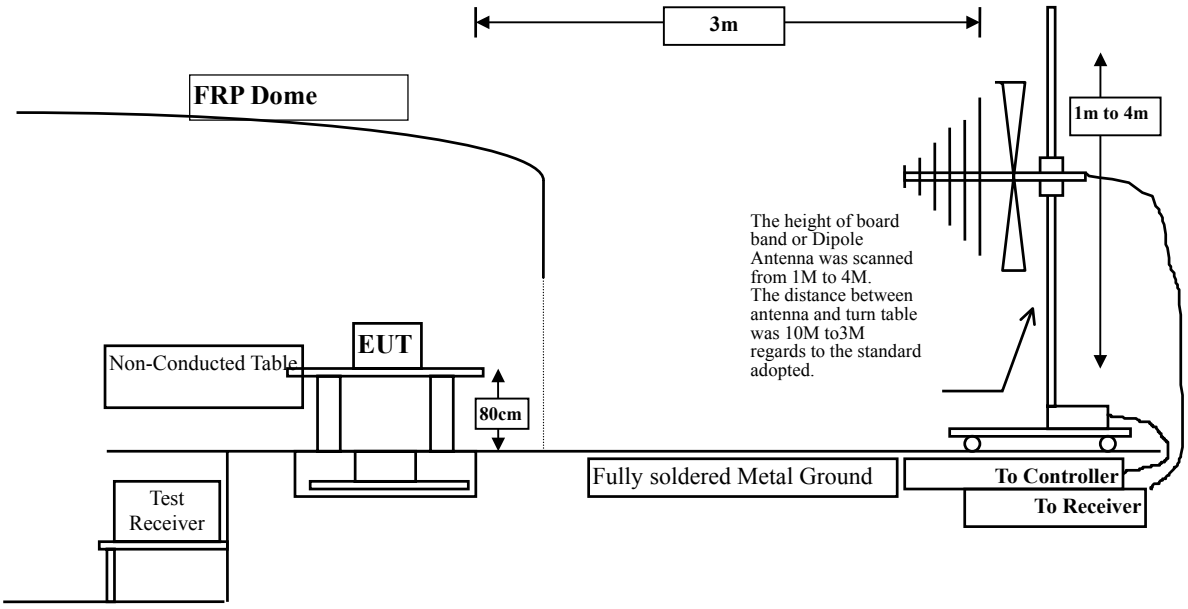
3.1. Test Equipment

The following test equipment are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 1		Test Receiver	R & S	ESCS 30 / 825442/14	May, 2003
		Spectrum Analyzer	Advantest	R3261C / 71720140	May, 2003
		Pre-Amplifier	HP	8447D/3307A01812	May, 2003
		Bilog Antenna	Chase	CBL6112B / 12452	Sep., 2002
		Horn Antenna	EM	EM6917 / 103325	May, 2003
Site # 2		Test Receiver	R & S	ESCS 30 / 825442/17	May, 2003
		Spectrum Analyzer	Advantest	R3261C / 71720609	May, 2003
		Pre-Amplifier	HP	8447D/3307A01814	May, 2003
		Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2003
		Horn Antenna	EM	EM6917 / 103325	May, 2003
Site # 3	X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2003
	X	Spectrum Analyzer	Advantest	3162 / 100803480	May, 2003
	X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2003
	X	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2003
	X	Horn Antenna	ETS	3115 / 0005-6160	Jul., 2003
	X	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	Jul., 2003

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

3.2. Test Setup



3.3. Limits

➢ FCC Part 15 Subpart C Paragraph 15.227 Limit

FCC Part 15 Subpart C Paragraph 15.227 Limits		
Fundamental Frequency MHz	Field strength of fundamental	
	uV/m	dBuV/m
26.96-27.28	10000	80.0

Remarks :

1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
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. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

➢ Frequencies in restricted band are complied to limits on Paragraph 15.209.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
0.009-0.490	2400/F(kHz)	128.5-93.5
0.490-1.705	24000/F(kHz)	73.5-62.5
1.705-30.0	30	69.5
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks : 1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/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.

3.4. Test Procedure

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 C63.4:1992 on radiated measurement.
Radiated emissions were invested over the frequency range from 30MHz to1GHz using a receiver bandwidth of 120kHz. Radiated was performed at an antenna to EUT distance of 3 meters.
The frequency range from 30MHz to 10th harminics is checked.

3.5. Test Data of Radiated Emission

Product : Wireless Keyboard
Test Item : Fundamental Radiated Emission
Test Site : No.1 OATS
Test Voltage : DC 3V(Power by Battery)
Test Mode : Channel 1

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal							
Peak Detector:							
27.150	0.17	-1.02	22.58	71.61	48.18	51.82	100.00
Vertical							
Peak Detector:							
27.150	0.17	3.98	22.58	63.83	45.40	37.67	100.00

Note:

1. All Readings are Peak value.
2. Emission Level = Reading Level + Probe Factor + Cable loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless Keyboard
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test Voltage : DC 3V(Power by Battery)
Test Mode : Channel 1

	Frequency MHz	Cable Loss dB	Probe Factor dB/m	PreAMP dB	Reading Level dBuV	Emission Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal:								
*	32.420	0.88	17.19	0.00	17.11	35.18	4.82	40.00
	204.450	1.77	8.48	0.00	23.46	33.71	9.79	43.50
	236.100	1.93	10.05	0.00	16.65	28.63	17.37	46.00
	362.230	2.58	13.60	0.00	12.43	28.61	17.39	46.00
	384.050	2.69	14.01	0.00	11.90	28.60	17.40	46.00
	398.600	2.77	14.62	0.00	10.41	27.80	18.20	46.00
Vertical:								
	32.420	0.88	17.49	0.00	8.93	27.30	12.70	40.00
	49.400	0.97	6.90	0.00	16.04	23.91	16.09	40.00
	204.600	1.77	8.56	0.00	20.91	31.24	12.26	43.50
*	209.450	1.79	8.75	0.00	22.33	32.87	10.63	43.50
	287.120	2.19	12.07	0.00	9.56	23.83	22.17	46.00
	801.230	4.85	19.26	0.00	5.44	29.55	16.45	46.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss.

4. Band Edge

4.1. Test Equipment

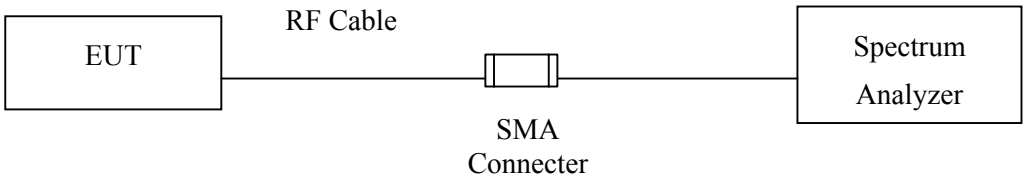
The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Advantest	R3272 / 72421194	May, 2003
X	Test Receiver	R & S	ESCS 30 / 825442/14	May, 2003
X	Spectrum Analyzer	Advantest	R3261C / 71720140	May, 2003
X	Pre-Amplifier	HP	8447D/3307A01812	May, 2003
X	Bilog Antenna	Chase	CBL6112B / 12452	Sep., 2003
X	Horn Antenna	EM	EM6917 / 103325	May, 2003

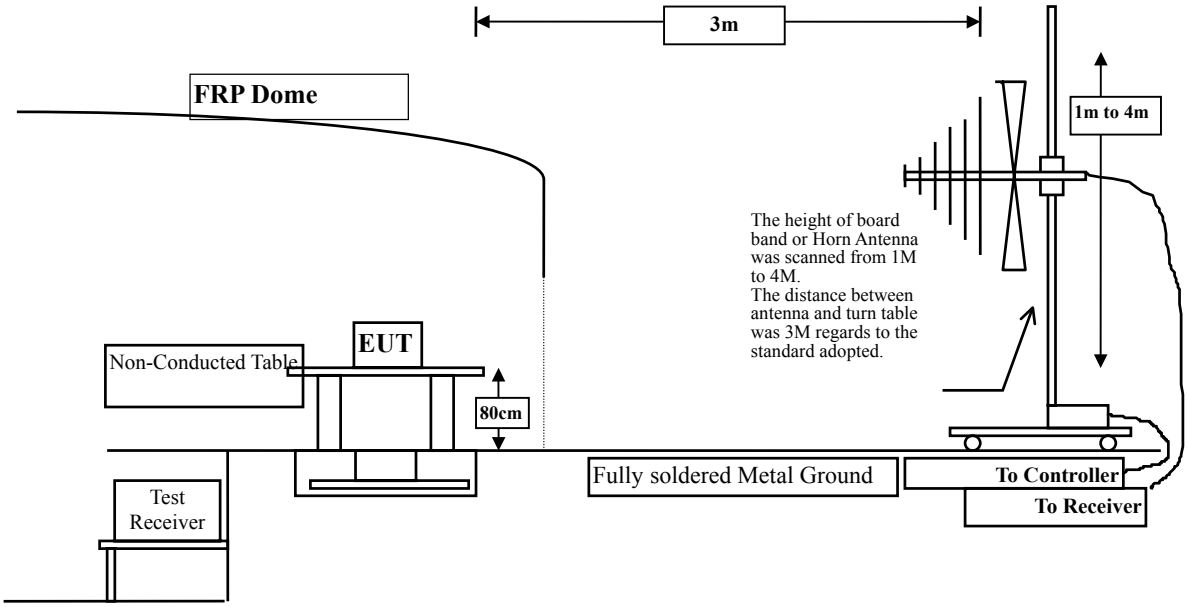
Note: 1. All equipments that need to calibrate are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

4.2. Test Setup

RF Conducted Measurement:



RF Radiated Measurement:



4.3. Limit

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. Test Procedure

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 C63.4:1992 on radiated measurement.
The additional latch filter below 1GHz was used to measure the level of harmonics radiated emission during field dtrength of harmonics measurement.
The bandwidth below 30MHz setting on the field strength meter is 10 kHz, above 1GHz are 1 MHz.

4.5. Test Result of Band Edge

Product : Wireless Keyboard
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Channel 1

RF Radiated Measurement: (Peak Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
1 (Horizontal)	27.095	53.08	-1.02	0.13	22.8	29.39	100	Pass
1 (Vertical)	27.095	45.26	3.98	0.13	22.8	26.57	100	Pass

Figure Channel 1: (Horizontal)

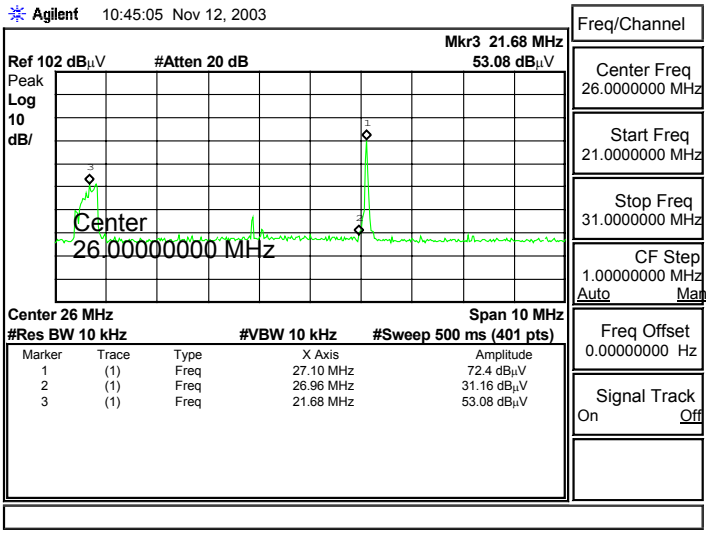
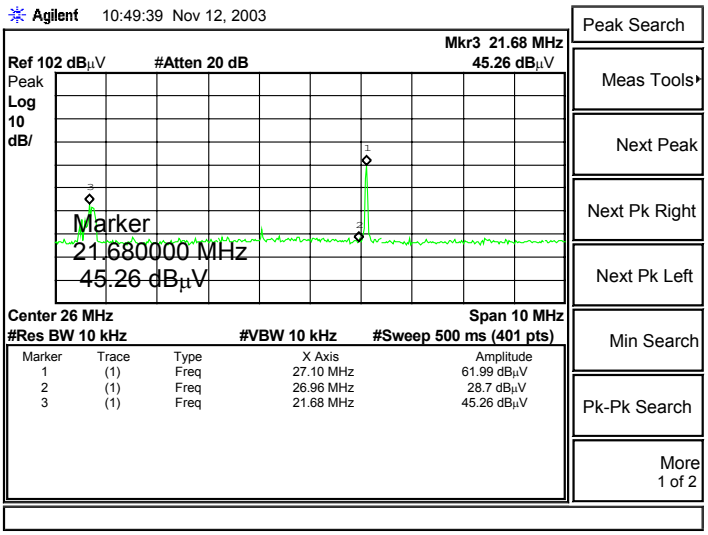


Figure Channel 1: (Vertical)



Note:
1. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Wireless Keyboard
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Channel 2

RF Radiated Measurement: (Peak Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
2 (Horizontal)	27.30	34.28	-1.02	0.17	22.57	10.86	69.5	Pass
2 (Vertical)	27.33	21.23	3.98	0.17	22.57	2.81	69.5	Pass

Figure Channel 2: (Horizontal)

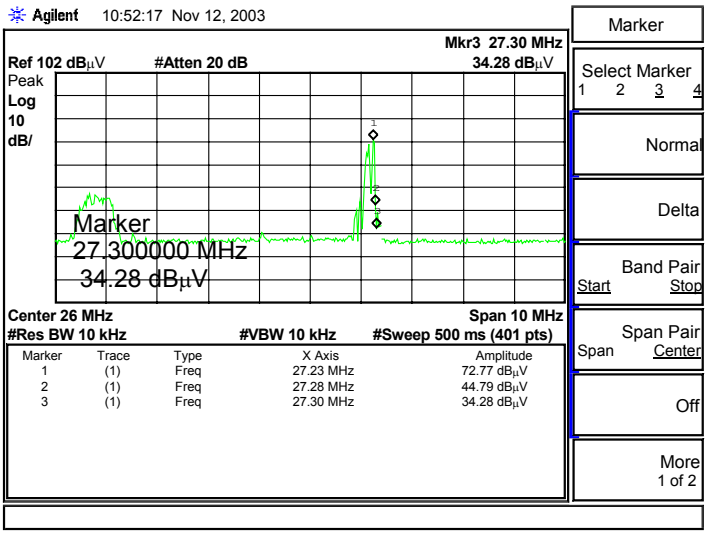
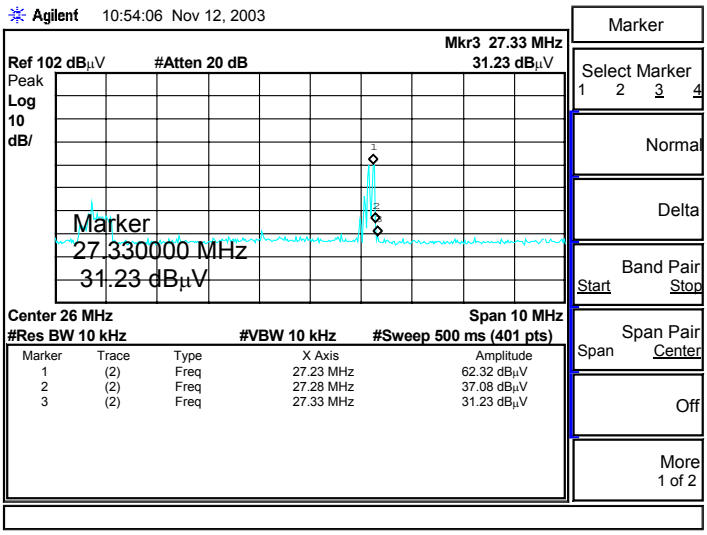


Figure Channel 2: (Vertical)



Note:

1. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

5. Occupied Bandwidth

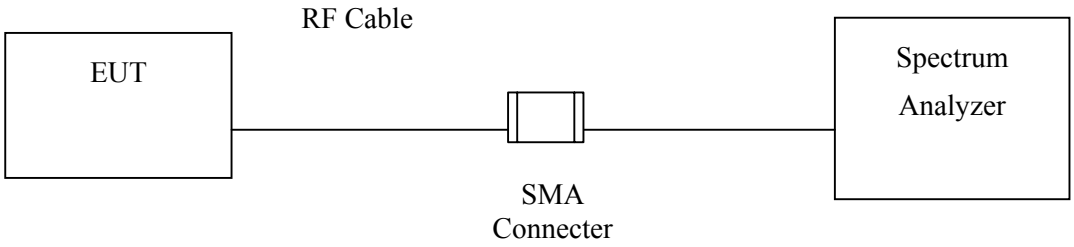
5.1. Test Equipment

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

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	HP	E4407B	May, 2003

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

5.2. Test Setup

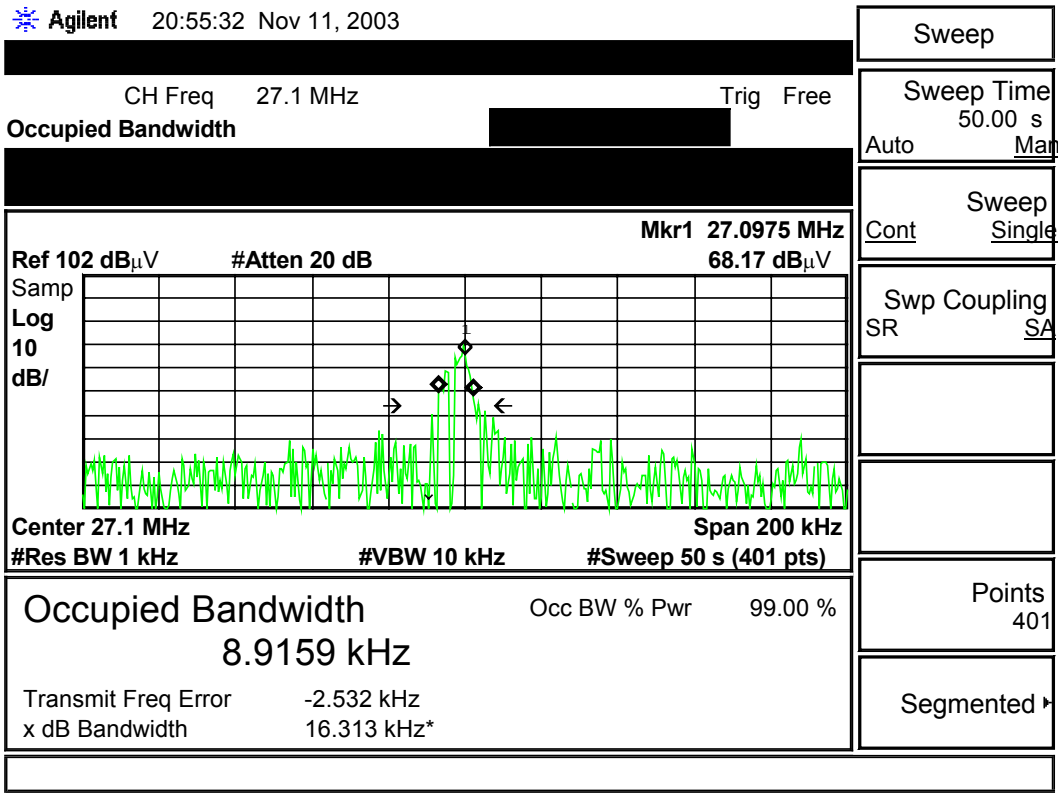


5.3. Test Result of Occupied Bandwidth

Product : Wireless Keyboard
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Channel 1

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	27.0975	8.9159	10	Pass

Figure Channel 1:



6. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 1: EUT Test Setup Photographs

Front View of Radiated Test

Back View of Radiated Test

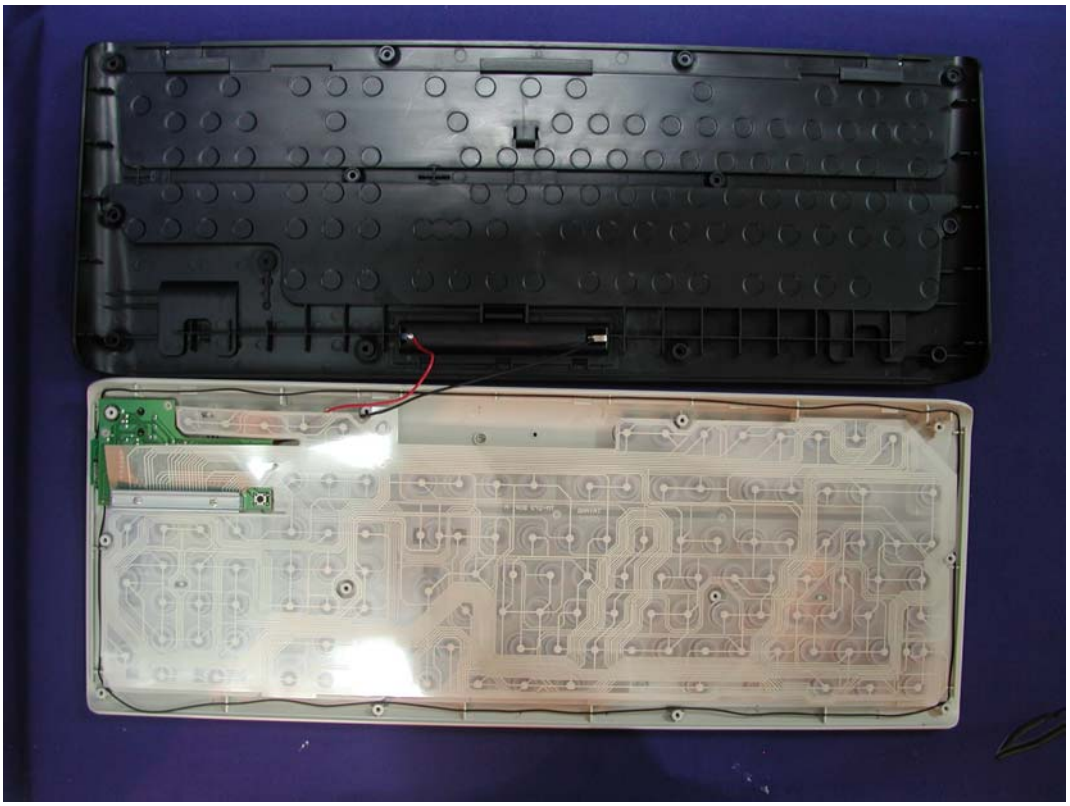
Attachment 2: EUT Detailed Photographs

Attachment 2 : EUT Detailed Photographs

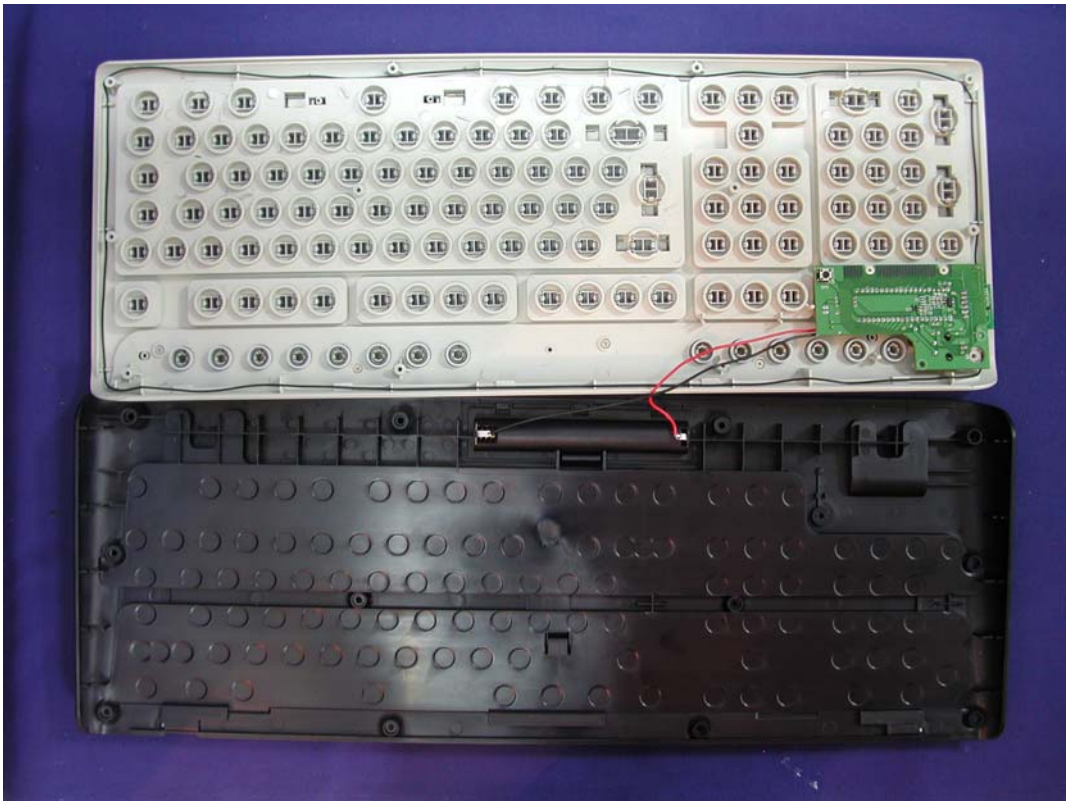
(1) EUT Photo

(2) EUT Photo

(3) EUT Photo



(4) EUT Photo



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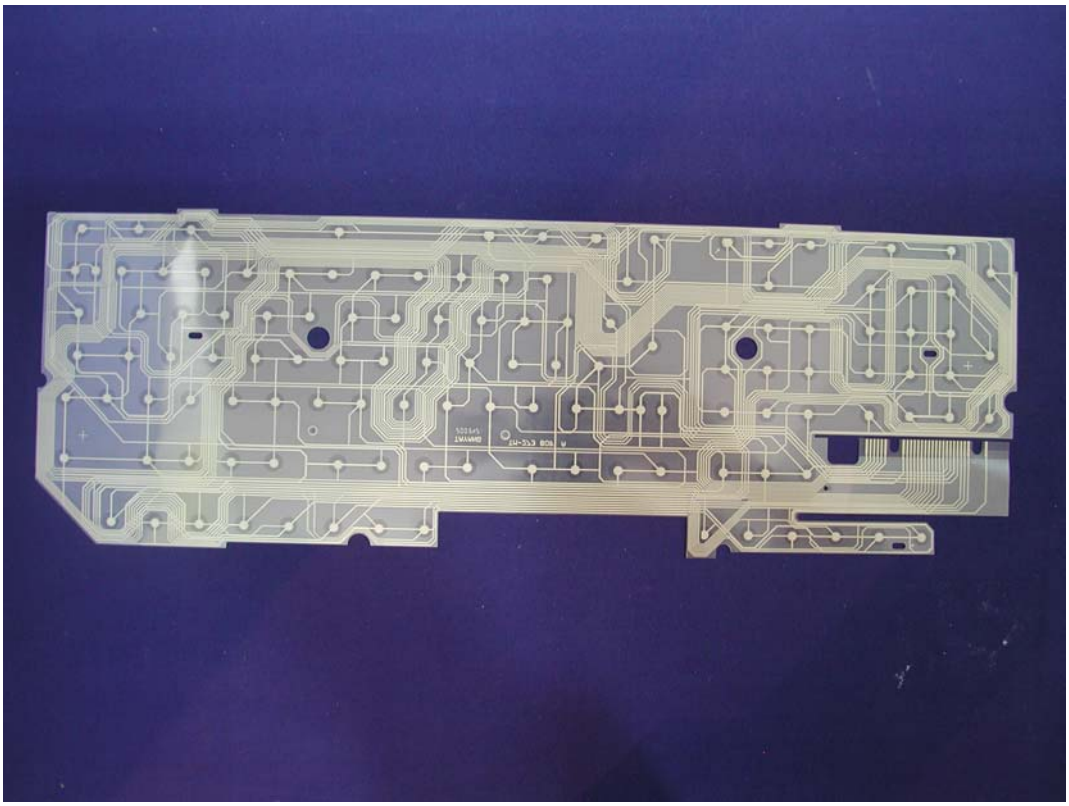

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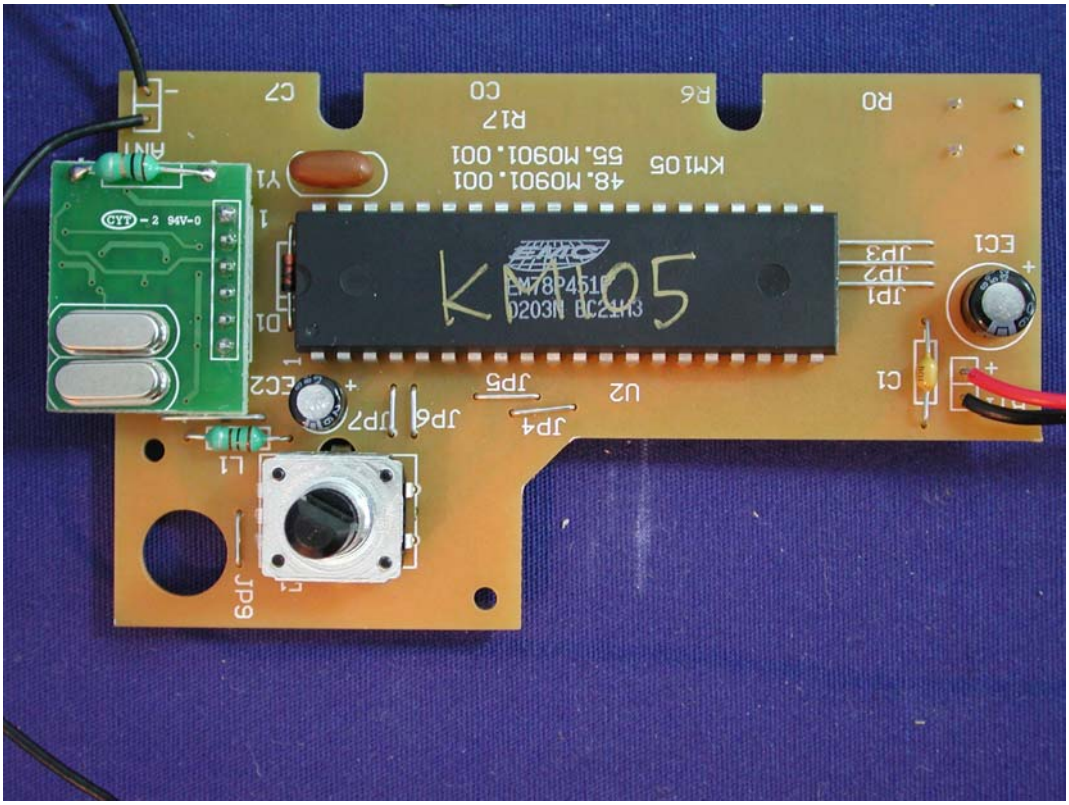
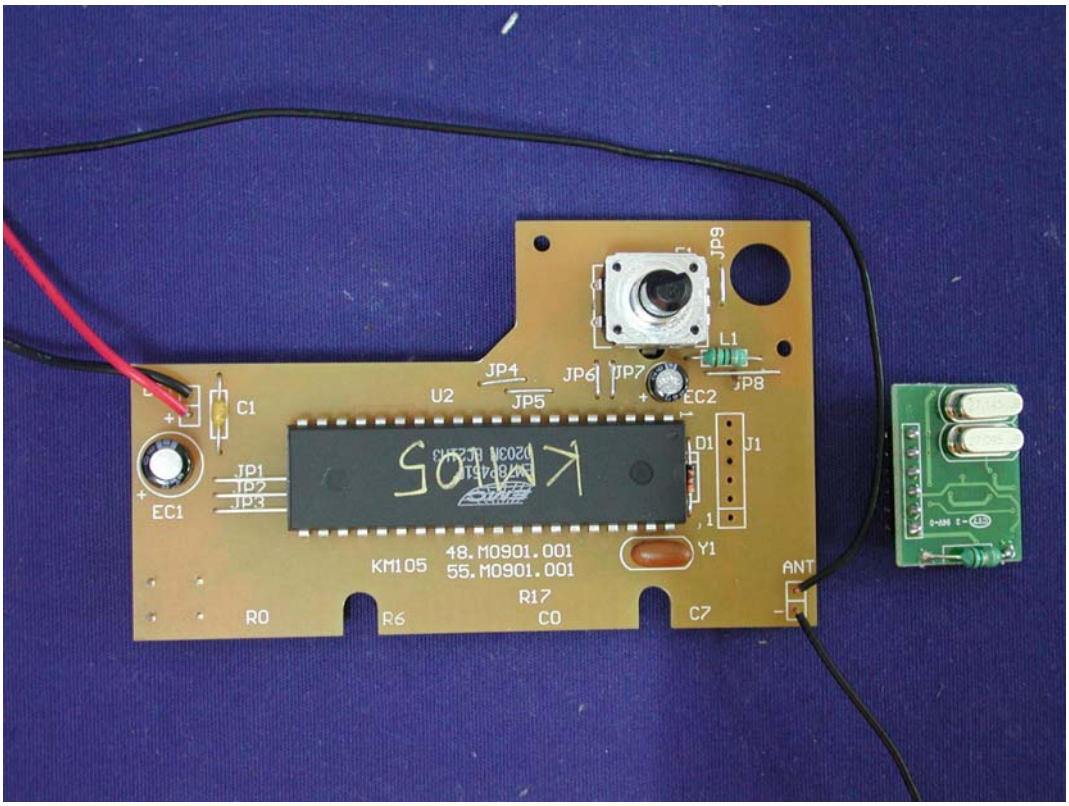
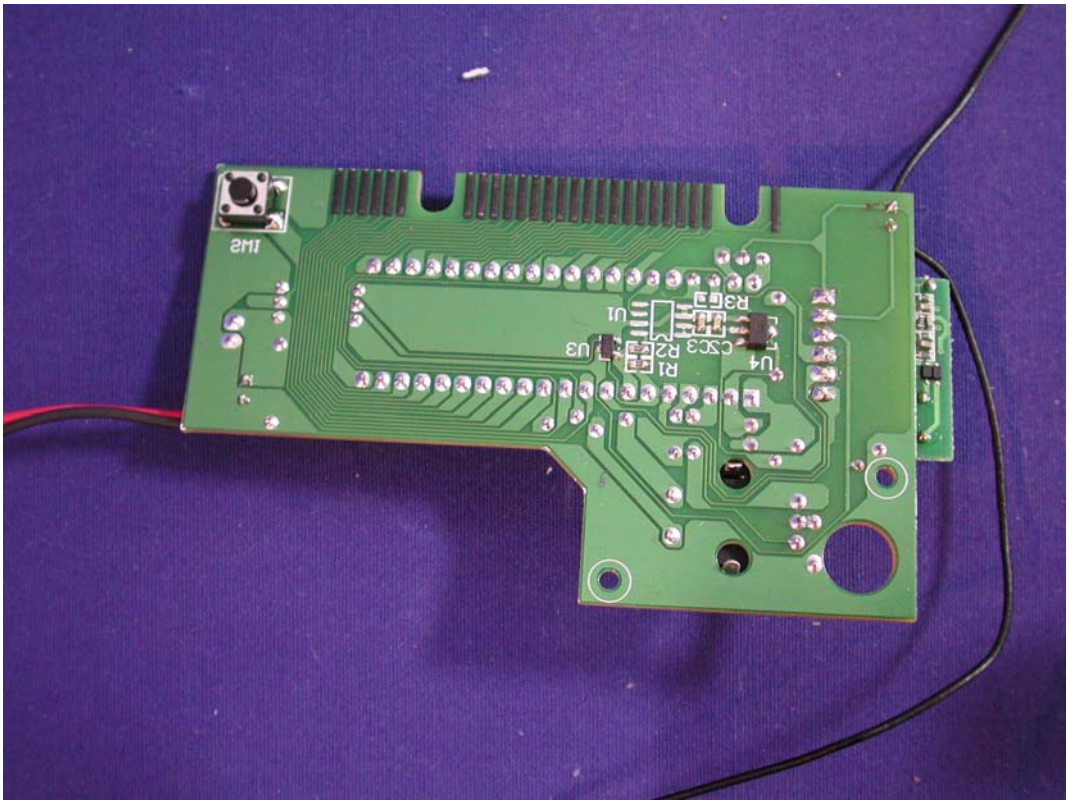


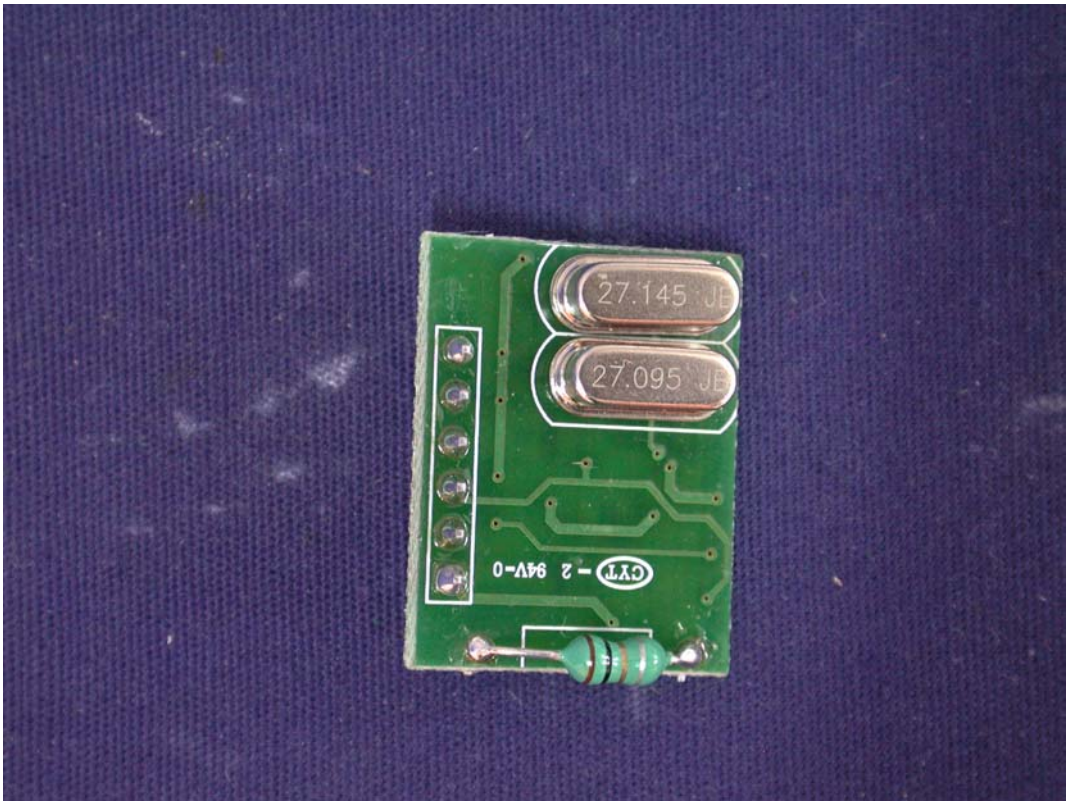
(7) EUT Photo



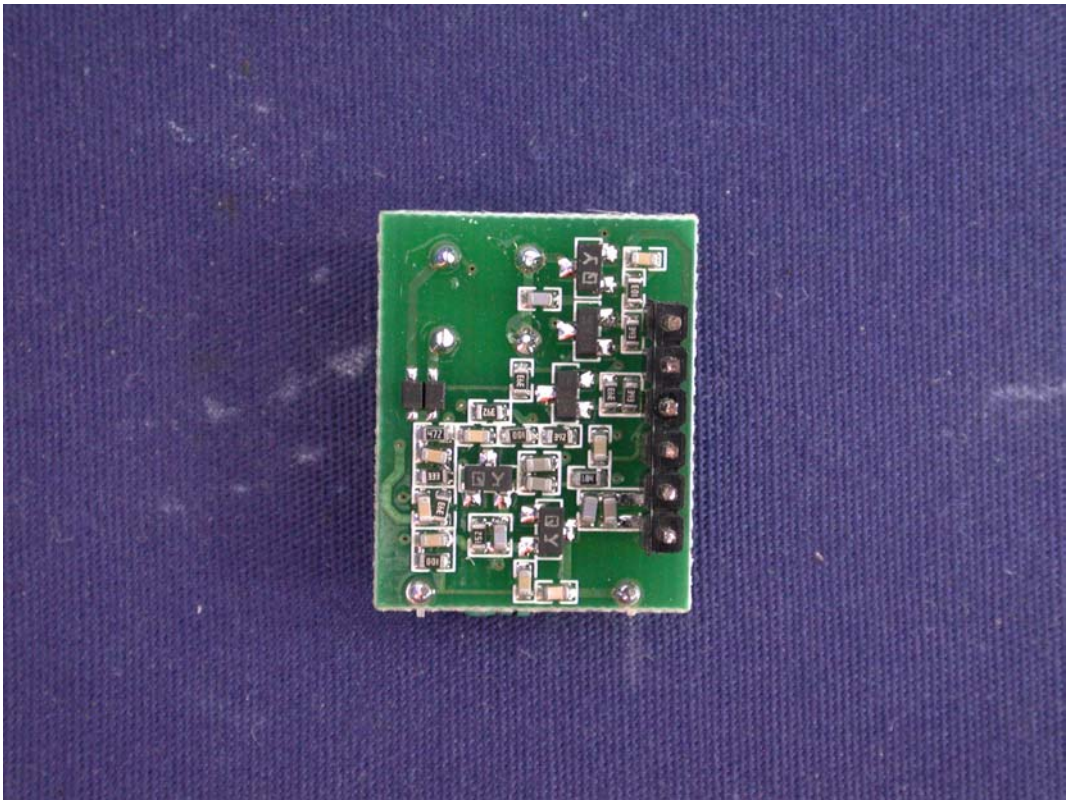
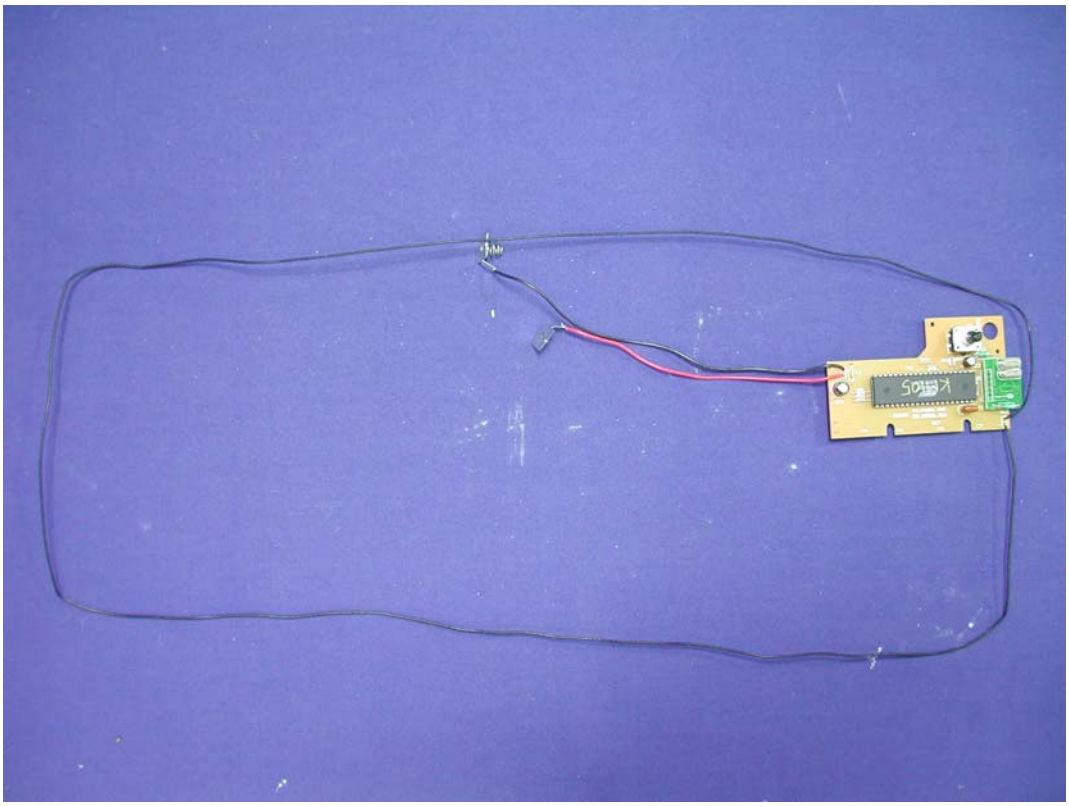
(8) EUT Photo



(9) EUT Photo



(10) EUT Photo



(11) EUT Photo