

FCC TEST REPORT

Under
FCC 15 Subpart C, Paragraph 15.227

Prepared For:

Nortek International (China) Ltd.

2601, 26/F., Harbour Centre, 25 Harbour Road, Wanchai, Hong Kong

FCC ID: S4S-ACTOWL

EUT: Wireless Mouse

Model: ACTO WL

March 12, 2005

Report Type: Original Report

Test Engineer: Peter Lin

Test Date: February 16, 2005


Review By: _____
Apollo Liu / Manager

TABLE OF CONTENTS

1. General Information.....	3
1. 1 Notes.....	3
1. 2 Testing Laboratory.....	3
1. 3 Details of Applicant.....	3
1. 4 Application Details.....	3
1. 5 Test Item.....	3
1. 6 Test Standards.....	3
2. Technical Test.....	4
2. 1 Summary of Test Results.....	4
3. EUT Modifications.....	4
4. Conducted Power Line Test.....	5
4. 1 Test Equipment.....	5
4. 2 Test Procedure.....	5
4. 3 Test Setup.....	5
4. 4 Configuration of The EUT.....	6
4. 5 EUT Operating Condition.....	7
4. 6 Conducted Power Line Emission Limits.....	7
4. 7 Conducted Power Line Test Result.....	7
5. Radiated Emission Test.....	8
5. 1 Test Equipment.....	8
5. 2 Test Procedure.....	8
5. 3 Radiated Test Setup.....	8
5. 4 Configuration of The EUT.....	9
5. 5 EUT Operating Condition.....	9
5. 6 Radiated Emission Limit.....	9
5. 7 Radiated Emission Test Result.....	10
6. Band Edge.....	11
6. 1 Test Equipment.....	11
6. 2 Test Procedure.....	11
6. 3 Radiated Test Setup.....	11
6. 4 Configuration of The EUT.....	12
6. 5 EUT Operating Condition.....	12
6. 6 Band Edge Limit.....	12
6. 7 Band Edge Test Result.....	12
7. Photos of Testing.....	13
7. 1 EUT Test Photographs.....	13
7. 2 EUT Detailed Photographs.....	14
8. FCC ID Label.....	18
9. Test Equipment.....	19

1. General Information

1.1 Notes

The test results of this report relate exclusively to the test item specified in 1.5. The KMO Lab does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the KMO Lab.

1.2 Testing Laboratory

Ke Mei Ou Laboratory Co., Ltd.

7A, Jiexiangge, JiahuiXincheng, No.3027, Shennan Rd., Futian, Shenzhen, Guangdong, P.R.China.

Tel: +86 755 83642690 Fax: +86 755 83297077

Email: kmo@kmlab.com

Internet: www.kmlab.com

Site on File with the Federal Communications Commission – United States

Registration Number: 125782

For 3 & 10 meter OATS

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC4986

For 3 & 10 meter OATS

1.3 Details of Applicant

Name : Nortek International (China) Ltd.
Address : 2601, 26/F Harbour Centre, 25 Harbour Road, Wanchai, Hong Kong
Contact : Jackie Chan / Purchasing Officer
Tel : + 852 25988918
Fax : + 852 25988618

1.4 Application Details

Date of Receipt of Application : January 31, 2005
Date of Receipt of Test Item : January 31, 2005
Date of Test : February 16~March 6, 2005

1.5 Test Item

Manufacturer : Same Applicant
Address : Same Applicant
Brand Name : NORTEK
Model No. : ACTO WL, ELECTA WL, ELECTA FLUO WL
Description : Wireless Mouse

Additional Information

Frequency : 27 MHz
Number of Channels : 1
Antenna Designation : A permanent fixed antenna, which is built-in, designed as an indispensable part of the EUT.
Power Supply : 3VDC
Operation Distance : N/A
Resolution : N/A

1.6 Test Standards

FCC 15 Subpart C, Paragraph 15.227

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

2. Technical Test

2.1 Summary of Test Results

The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.207	Conducted Test	N/A	Owing to the DC operation of EUT, this test item is not performed.
FCC Part 15 Subpart C Paragraph 15.227 Limit	Field Strength of Fundamental	PASS	Minimum passing margin is -25.90 dB at 27.0466 MHz Horizontal
FCC Part 15, Paragraph 15.209	Radiated Test	PASS	Meets Class B Limit Minimum passing margin is -12.08 dB at 54.093MHz Vertical
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)).	Band Edge Test	PASS	The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.

3. EUT Modifications

No modification by Ke Mei Ou Laboratory Co., Ltd.

4. Conducted Power Line Test

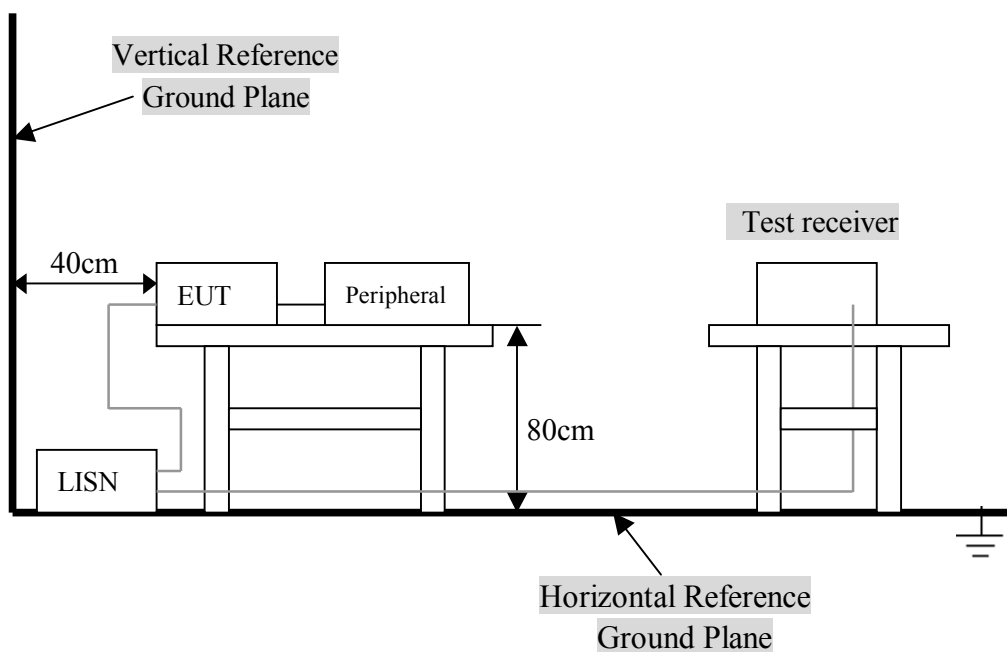
4.1 Test Equipment

Please refer to Section 9 this report.

4.2 Test Procedure

The EUT was tested according to ANSI C63.4 - 2001. The frequency spectrum from 0.45 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 uHenry as specified by section 5.1 OF ANSI C63.4 - 2001. cables and peripherals were moved to find the maximum emission levels for each frequency.

4.3 Test Setup



For the actual test configuration, Please refer to the related items – Photos of Testing.

4.4 Configuration of The EUT

The EUT was configured according to ANSI C63.4-2001. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

DEVICE	MANUFACTURER	MODEL #	FCC ID
Wireless Mouse	Nortek International (China) Ltd.	ACTO WL	S4S-ACTOWL

B. Internal Devices

DEVICE	MANUFACTURER	MODEL #	FCCID / DoC
N/A			

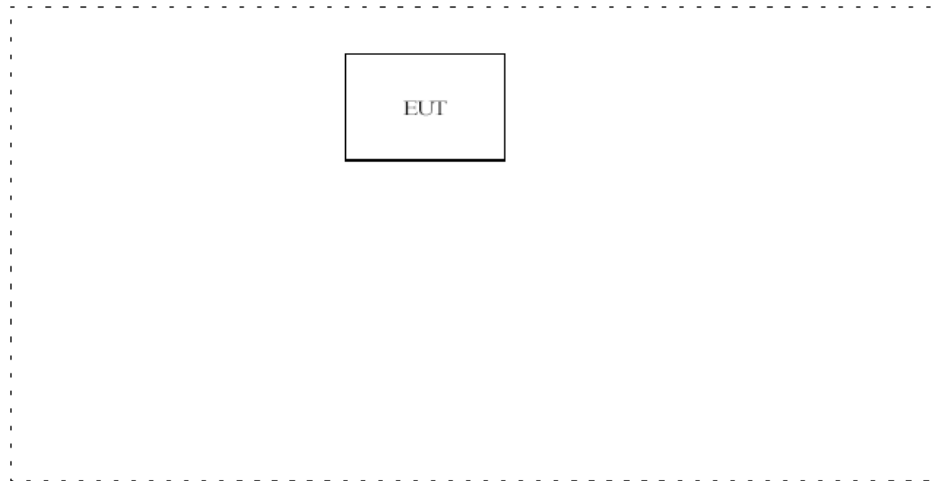
C. Peripherals

Device	Manufacturer	Model # Serial #	FCC ID/ DoC	Cable
Printer	HP	HP930C	DoC	1.5m unshielded power cord 1.2m unshielded data cable.
Modem	GVC	N/A	DoC	1.5m unshielded power cord 1.2m unshielded data cable.
Notebook	IBM	A31	DoC	1.5m unshielded power cord

4. 5 EUT Operating Condition

Operating condition is according to ANSI C63.4 - 2001.

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



4. 6 Conducted Power Line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
FREQUENCY RANGE (MHz)	CLASS A QP/AV	CLASS B QP/AV
0.15 – 0.5	79/66	66-56/56-46
0.5 – 5.0	73/60	56/46
5.0 - 30	73/60	60/50

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

4. 7 Conducted Power Line Test Result

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

5. Radiated Emission Test

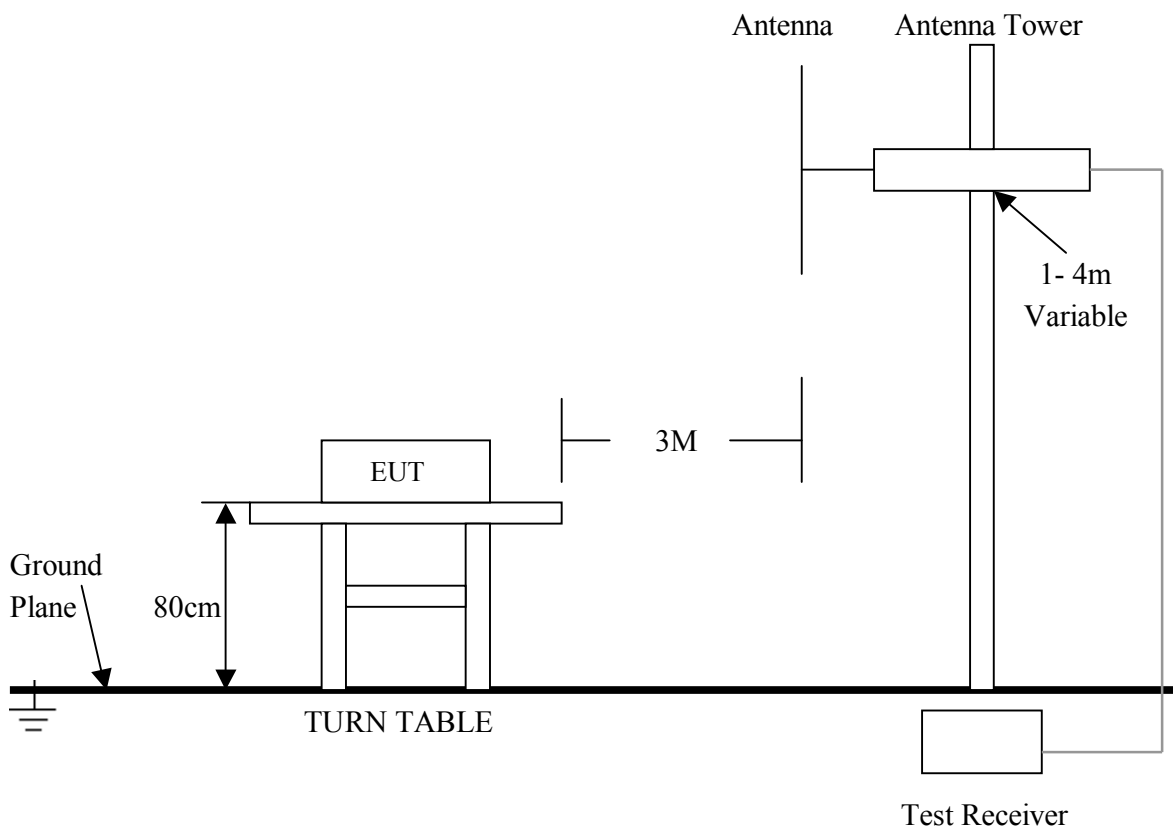
5.1 Test Equipment

Please refer to Section 9 this report.

5.2 Test Procedure

1. The EUT was tested according to ANSI C63.4 - 2001. The radiated test was performed at Ke Mei Ou Laboratory. This site is on file with the FCC laboratory division, Registration No. 125782.
2. The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.4-2001.
3. The frequency spectrum from 30 MHz to 1 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 KHz. All readings are above 1 GHz , peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
4. The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
5. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
6. The antenna polarization : Vertical polarization and Horizontal polarization.

5.3 Radiated Test Setup



For the actual test configuration , please refer to the related items – Photos of Testing.

5.4 Configuration of The EUT

Same as section 4.4 of this report

5.5 EUT Operating Condition

Same as section 4.5 of this report.

5.6 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below :

A. FCC Part 15 Subpart C Paragraph 15.227 Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental	
	uV/m	dBuV/m
26.96 – 27.28	10000	80.0

- Note:**
- (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.

B. Frequencies in restricted band are complied to limit on Paragraph 15.209.

Frequency (MHz)	Distance (m)	Field Strength (dBuV/m)
30 - 88	3	40.0
88 - 216	3	43.5
216 - 960	3	46.0
Above 960	3	54.0

- Note:**
- (1) RF Voltage (dBuV) = 20 log RF Voltage (uV)
 - (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

5. 7 Radiated Emission Test Result

A. Fundamental Radiated Emission Data

Product	: Wireless Mouse	Test Mode	: Normal
Test Item	: Fundamental Radiated Emission Data	Temperature	: 25 °C
Test Voltage	: DC 3V (Power by Battery)	Humidity	: 50%RH
Test Result	: PASS		

Freq. (MHz)	Emission (dBuV/m)	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
27.0466	54.10	HORIZ	80	-25.90
27.0466	51.36	VERT	80	-28.64

Note:

- (1) All Readings are Peak value.
- (2) Emission Level = Reading Level + Probe Factor + Cable Loss.
- (3) The average measurement was not performed when the peak measured data under the limit of average detection.

B. General Radiated Emission Data

Product	: Wireless Mouse	Test Mode	: Normal
Test Item	: General Radiated Emission Data	Temperature	: 25 °C
Test Voltage	: DC 3V (Power by Battery)	Humidity	: 50%RH
Test Result	: PASS		

Freq. (MHz)	Emission (dBuV/m)	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
54.093	23.94	HORIZ	40.0	-16.06
54.093	27.92	VERT	40.0	-12.08
81.139	24.96	HORZ	40.0	-15.04
81.139	27.68	VERT	40.0	-12.32
243.419	26.10	HORIZ	46.0	-19.90
243.419	30.22	VERT	46.0	-15.78
270.466	26.02	HORZ	46.0	-19.98
270.466	31.25	VERT	46.0	-14.75

Note:

- (1) All Reading Levels below 1GHz are Quasi-Peak, above are peak and average value.
- (2) Emission Level = Reading Level + Probe Factor + Cable Loss.

6. Band Edge

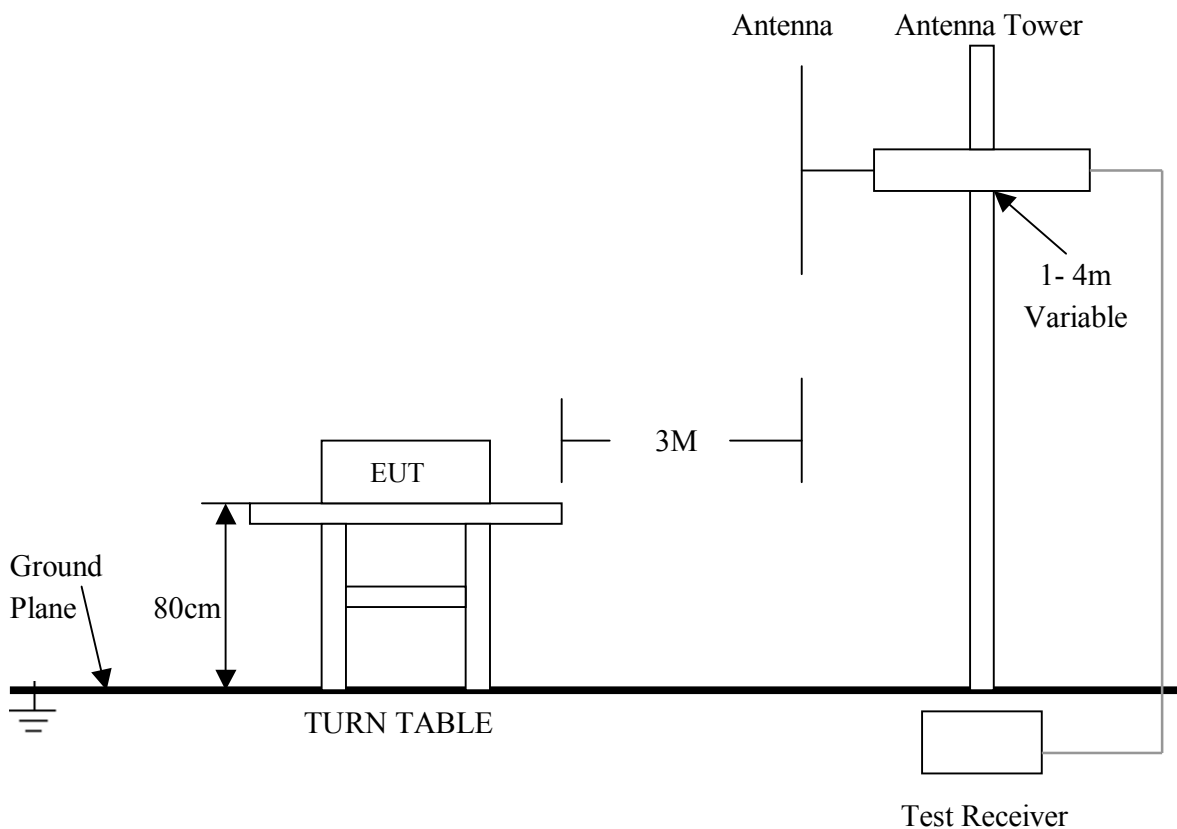
6.1 Test Equipment

Please refer to Section 9 this report.

6.2 Test Procedure

1. The EUT was tested according to ANSI C63.4 - 2001. The radiated test was performed at Ke Mei Ou Laboratory. This site is on file with the FCC laboratory division, Registration No. 125782.
2. The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.4-2001.
3. The frequency spectrum from 30 MHz to 1 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 KHz. All readings are above 1 GHz , peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
4. The antenna high were varied from 1 m to 4 m high to find the maximum emission for each frequency.
5. The additional latch filter below 1GHz was used to measure the level of harmonics radiated emission during field strength of harmonics measurement. The bandwidth below 30MHz setting on the field strength meter is 10 kHz, above 1GHz are 1 MHz.
6. Maximizing procedure was performed on the highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
7. The antenna polarization : Vertical polarization and horizontal polarization.

6.3 Radiated Test Setup



For the actual test configuration , please refer to the related items – Photos of Testing

6. 4 Configuration of The EUT

Same as section 4 . 4 of this report

6. 5 EUT Operating Condition

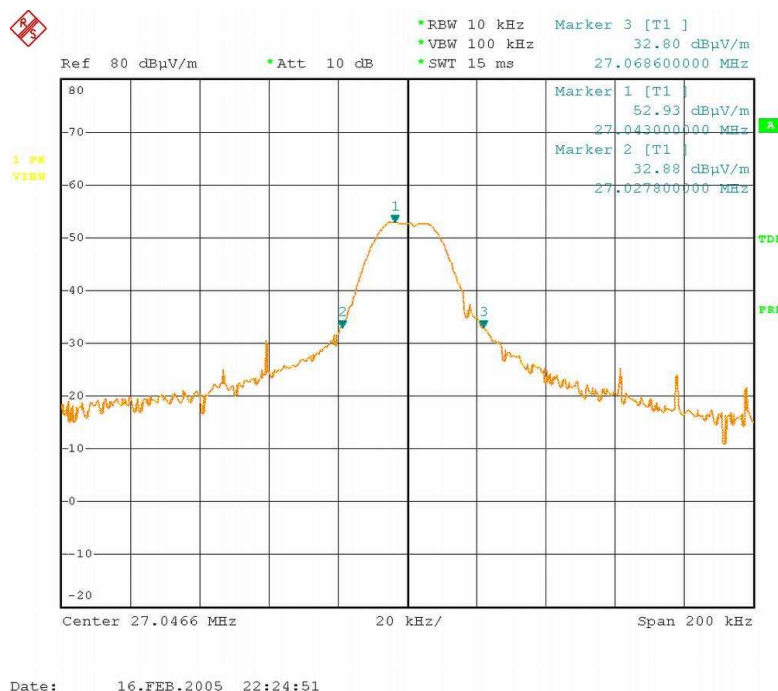
Same as section 4 . 5 of this report.

6. 6 Band Edge 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)).

6. 7 Band Edge Test Result

Product	: Wireless Mouse	Test Mode	: Normal
Test Item	: Band Edge Data	Temperature	: 25 °C
Test Voltage	: DC 3V (Power by Battery)	Humidity	: 50%RH
Test Result	: PASS		



- Note:**
- (1) The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.
 - (2) The average measurement was not performed when the peak measured data under the limit of average detection.

7. Photos of Testing

7.1 EUT Test Photographs

Radiated emission test view



7.2 EUT Detailed Photographs

EUT top view



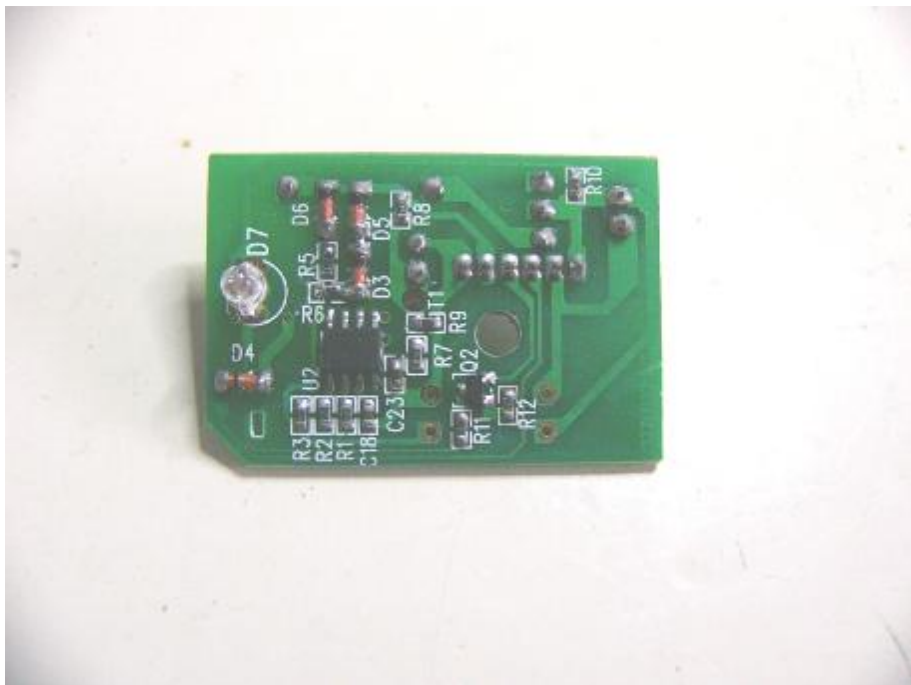
EUT bottom view

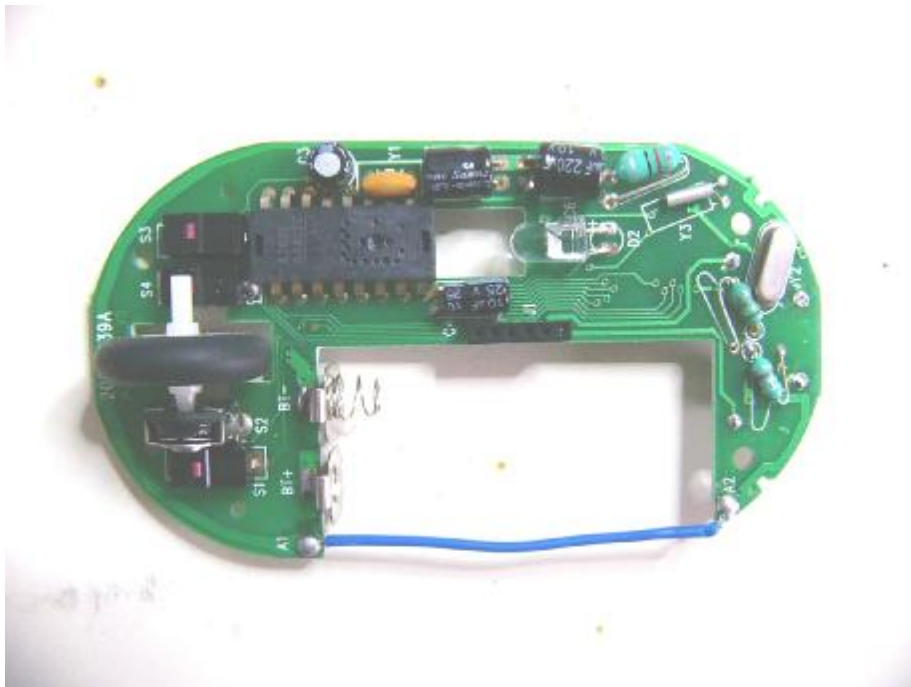


EUT inside whole view



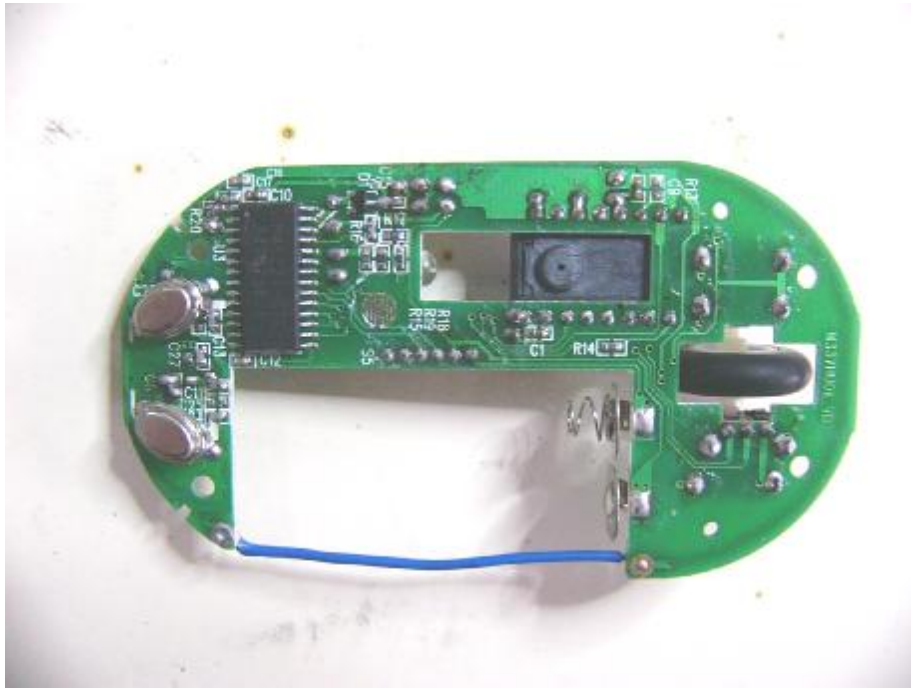
Main board component side





Main board solder side





8. FCC ID Label

FCC ID: S4S-ACTOWL

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The Label must not be a stick-on paper label. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT

EUT Bottom View/Proposed FCC ID Label Location



9. Test Equipment

The following test equipments were used during the radiated & conducted emission test:

Equipment/ Facilities	Manufacturer	Model #	Serial No.	Date of Cal.	Due Date
Turntable	KMO	KSZ001T	200306	NCR	NCR
Antenna Tower	KMO	KSZ002AT	200307	NCR	NCR
OATS	KMO	KSZSITE001	N/A	July 06, 2004	July 06, 2005
EMI Test Receiver	Rohde & Schwarz	ESPI3	100180	Oct.18, 2004	Oct.18, 2005
Signal Generator	Rohde & Schwarz	SMT03	100059	Feb.01, 2005	Feb.01, 2006
Signal Generator	FLUKE	PM5418+Y/C	LO747012	Feb 01, 2005	Feb 01, 2006
Signal Generator	FLUKE	PM5418TX	LO738007	Feb 01, 2005	Feb 01, 2006
Biconical Antenna	Rohde & Schwarz	HK116	EMC0502	Dec. 14,2004	Dec. 14,2005
Bilog Antenna	Chase	CBL6111C	2576	Feb.01, 2005	Feb.01, 2006
Ultra Broadband Antenna	Rohde & Schwarz	HL 562	100110	June.05, 2004	June.05, 2005
AMN	Rohde & Schwarz	ESH3-Z5	100196	Oct. 23,2004	Oct. 23, 2005
AMN	Rohde & Schwarz	ESH3-Z5	100197	Oct. 23,2004	Oct. 23, 2005
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	N/A	N/A	N/A
Absorbing Clamp	Rohde & Schwarz	MDS-21	N/A	Oct. 29,2004	Oct. 29,2005
KMO Shielded Room	KMO	KMO-001	N/A	N/A	N/A
EMI Test Receiver	Rohde & Schwarz	ESCS30	100003	Feb. 27, 2005	Feb.27, 2006
AMN	Rohde & Schwarz	ESH3-Z5	100002	Feb. 01, 2005	Feb.01, 2006
LISN	Kyoritsu	KNW-407	8-1441-8	Feb. 23, 2005	Feb.23, 2006
EMI Test Receiver	Rohde & Schwarz	ESI26	838786/013	Feb. 01, 2005	Feb.01, 2006
Bilog Antenna	Chase	CBL6112B	2591	Feb. 01, 2005	Feb.01, 2006
Horn Antenna	Rohde & Schwarz	HF906	100014	Feb. 01, 2005	Feb.01, 2006
Power Meter	Rohde & Schwarz	NRVD	100041	Feb. 01, 2005	Feb.01, 2006
Radio Communication Test Set	Rohde & Schwarz	CMS 54	846621/024	Feb 01, 2005	Feb 01, 2006
Modulation Analyzer	Hewlett-Packard	8901B	2303A00362	Feb 01, 2005	Feb 01, 2006
Temperature Chamber	TABAI	PSL-4GTW	N/A	Feb 06, 2005	Feb 06, 2006
3m Semi-Anechoic Chamber	Albatross Projects	9mX6mX6m	N/A	Feb. 01, 2005	Feb.01, 2006