

## ***FCC TEST REPORT***

Under  
FCC 15 Subpart C, Paragraph 15.227


Prepared For:

**Nortek International (China) Ltd.**

Unit 1604-05, 16/F., Island Place Tower, Island Place, 510 King's Road, North Point, Hong Kong.

<b>FCC ID: S4SM28WC</b>
<b>EUT: Wireless Keyboard &amp; Optical Mouse Combo Set (Mouse)</b>
<b>Model: M28WC</b>

October 26, 2005

<b>Report Type:</b> Original Report
<b>Test Engineer:</b> <u>Peter Lin</u>
<b>Test Date:</b> <u>September 28, 2005</u>

<b>Review By:</b> <u>Apollo Liu / Manager</u>

**TABLE OF CONTENTS**

<b>1. General Information.....</b>	<b>3</b>
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
<b>2. Technical Test.....</b>	<b>4</b>
2. 1 Summary of Test Results.....	4
2. 2 Antenna Requirement.....	4
<b>3. EUT Modifications.....</b>	<b>4</b>
<b>4. Conducted Power Line Test.....</b>	<b>5</b>
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
<b>5. Radiated Emission Test.....</b>	<b>9</b>
5. 1 Test Equipment.....	9
5. 2 Test Procedure.....	9
5. 3 Radiated Test Setup.....	9
5. 4 Configuration of The EUT.....	10
5. 5 EUT Operating Condition.....	10
5. 6 Radiated Emission Limit.....	10
5. 7 Radiated Emission Test Result.....	11
<b>6. Band Edge.....</b>	<b>12</b>
6. 1 Test Equipment.....	12
6. 2 Test Procedure.....	12
6. 3 Radiated Test Setup.....	12
6. 4 Configuration of The EUT.....	13
6. 5 EUT Operating Condition.....	13
6. 6 Band Edge Limit.....	13
6. 7 Band Edge Test Result.....	13
<b>7. Photos of Testing.....</b>	<b>14</b>
7. 1 EUT Test Photographs.....	14
7. 2 EUT Detailed Photographs.....	16
<b>8. FCC ID Label.....</b>	<b>21</b>
<b>9. Test Equipment.....</b>	<b>22</b>

## 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](mailto:kmo@kmlab.com)

Internet: [www.kmlab.com](http://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** : Unit 1604-05, 16/F., Island Place Tower, Island Place, 510 King's Road, North Point, Hong Kong.  
**Contact** : Jackie Chan / Product Manager  
**Tel** : + 852 25988918  
**Fax** : + 852 25988618

### 1.4 Application Details

Date of Receipt of Application : September 24, 2005  
Date of Receipt of Test Item : September 24, 2005  
Date of Test : September 28~October 26, 2005

### 1.5 Test Item

Manufacturer : See Applicant  
Brand Name : NORTEK / MLK  
Model No. : WK937 / MK0828WC (MK08+M28WC)  
Description : Wireless Keyboard & Optical Mouse Combo Set

### Additional Information

Frequency : 27.045MHz, 27.195MHz  
Number of Channels : 2  
Power Supply : DC3V  
Operation Distance : 1.8 Meter  
Resolution : 800dpi

### 1.6 Test Standards

FCC 15 Subpart C, Paragraph 15.227
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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 15.203	Antenna Requirement	PASS	Complies
FCC Part 15, Paragraph 15.207	Conducted Test	PASS	Complies.
FCC Part 15 Subpart C Paragraph 15.227 Limit	Field Strength of Fundamental	PASS	Complies.
FCC Part 15 , Paragraph 15.209	Radiated Test	PASS	Complies.
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.

### 2.2 Antenna Requirement

#### A. Regulation

FCC section 15.203, 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 shall be considered sufficient to comply with the provisions of Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

#### B. Result

The EUT no antenna connector for printed antenna. Therefore the EUT complies with Section 15.203 of the FCC rules.

## 3. EUT Modifications

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

## 4. Conducted Power Line Test

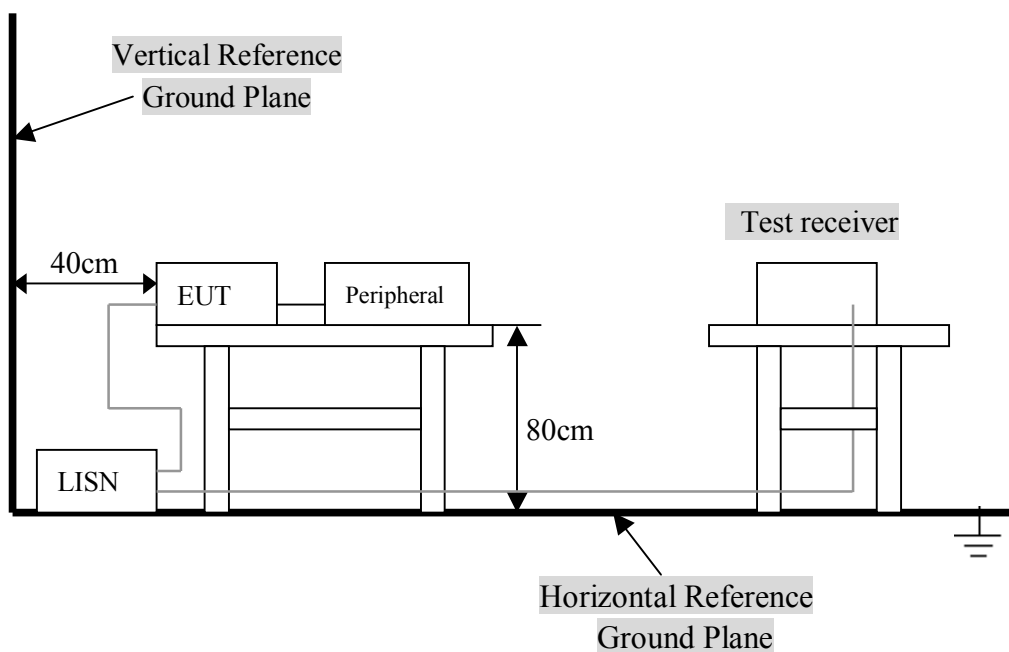
### 4.1 Test Equipment

Please refer to Section 9 this report.

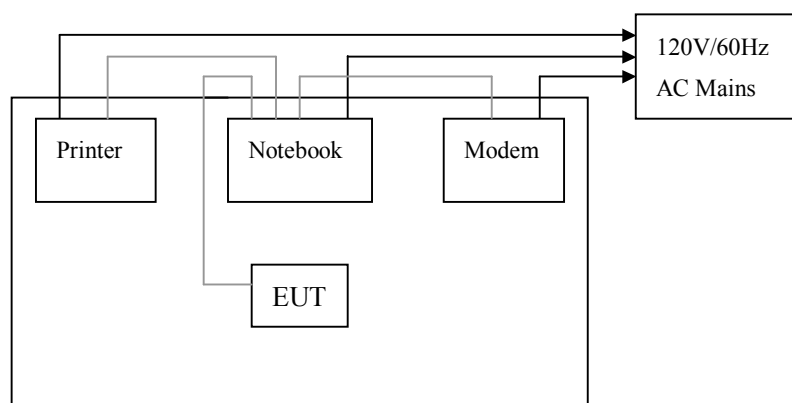
### 4.2 Test Procedure

The EUT was tested according to ANSI C63.4 - 2003. 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 - 2003. 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 C63.4-2003. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

##### A. EUT

DEVICE	MANUFACTURER	MODEL #	FCC ID
Wireless Optical Mouse	Nortek International (China) Ltd.	M28WC	S4SM28WC

##### B. Internal Devices

DEVICE	MANUFACTURER	MODEL #	FCCID / DoC
N/A			

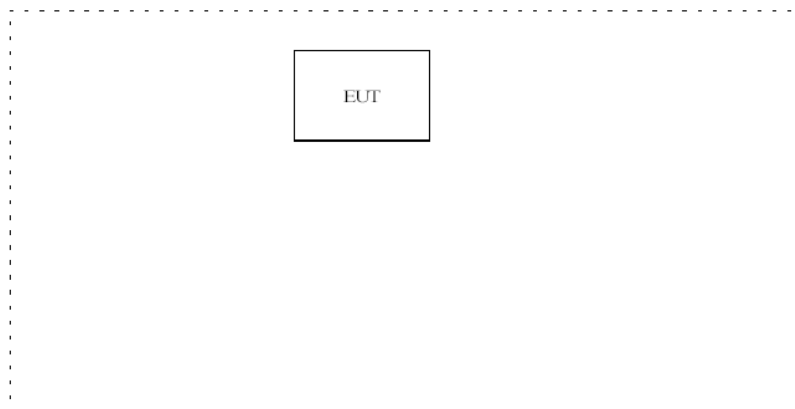
##### C. Peripherals

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	DELL	PP10L	DoC	1.5m unshielded power cord

## 4. 5 EUT Operating Condition

Operating condition is according to ANSI C63.4 - 2003.

- 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

The frequency spectrum from 0.15 MHz to 30 MHz was investigated. All readings are quasi -peak values with a resolution bandwidth of 9 KHz.

- Temperature : 26 °C
- Humidity : 53 % RH
- Result : **PASSED**

Receiver							
EN55022 Class B							
Frequency (MHz)	Emission (dBuV)		LINE/NEUTRAL	Limit (dBuV)		Margin (dB)	
	QP	AV		QP	AV	QP	AV
0.178	42.13	40.09	LINE	64.58	54.58	-22.45	-14.49
0.182	45.33	42.24	NEUTRAL	64.39	54.39	-19.06	-12.15
0.242	43.17	38.85	LINE	62.03	52.03	-18.86	-13.18
0.238	43.62	37.76	NEUTRAL	62.17	52.17	-18.55	-14.41
3.790	31.65	21.33	LINE	56.00	46.00	-24.35	-24.67
3.846	33.04	20.78	NEUTRAL	56.00	46.00	-22.96	-25.22

**Note:** NF = No Significant Peak was Found.

### Remarks :

- 1.Uncertainty in conducted emission measured is <+/- 2dB.
- 2.QP and AV are abbreviations of quasi-peak and average individually.
- 3.The emission levels of other frequencies were very low against the limit.
- 4.The Quasi-peak emission level also meets average limit and measurement with the average detector is unnecessary.
- 5.Margin Value= Emission Level – Limit Value.

**Conducted Emission****EN55022**

EUT: Receiver of Wireless Optical Mouse, M/N: M28WC

Manufacturer: Nortek International (China) Ltd.

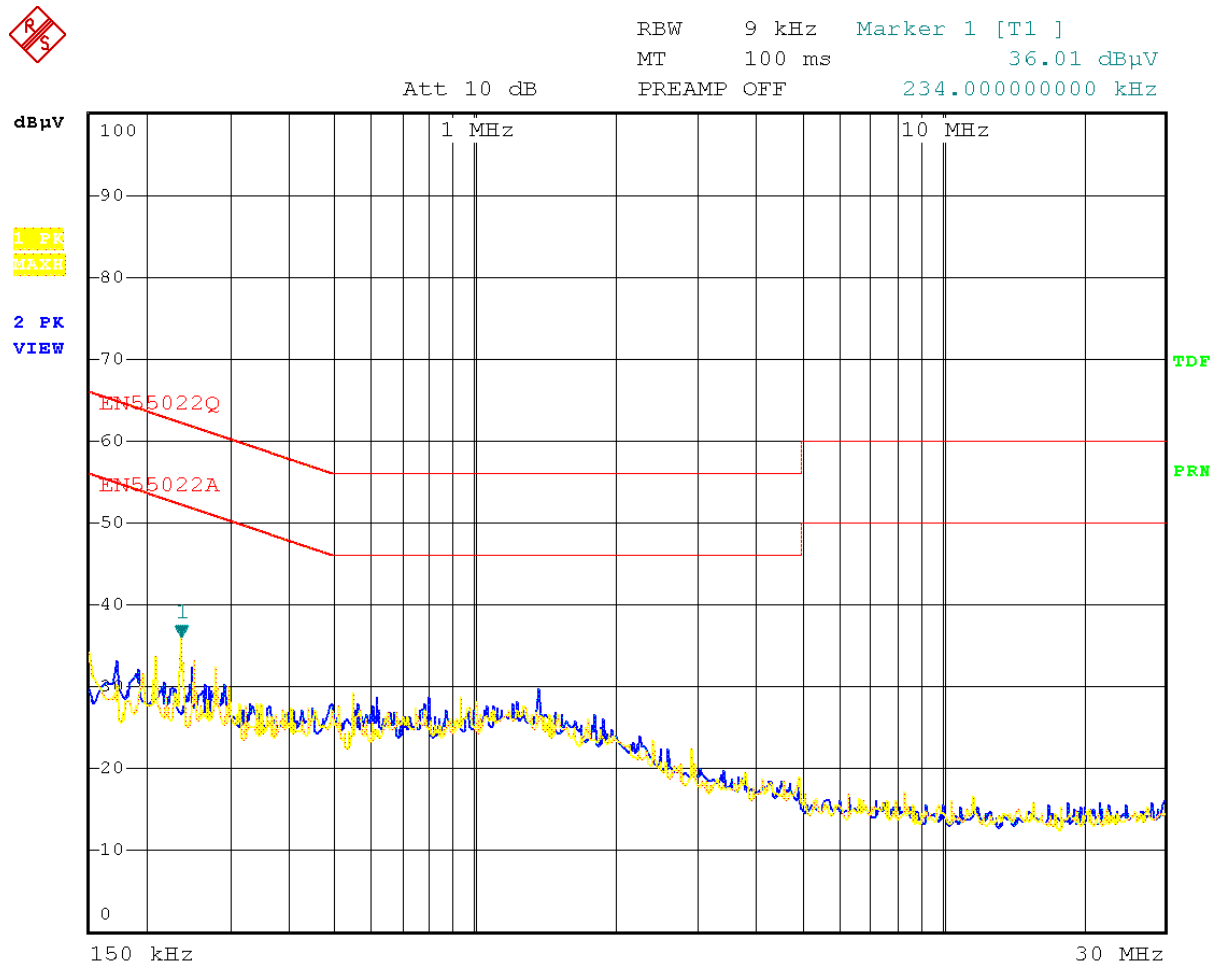
Operating Condition: Normal

Test Site: Ke Mei Ou Laboratory

Operator: Peter Lin

Test Specification: LINE&NEUTRAL

Comment:



Date: 30.SEP.2005 17:06:31



## 5. Radiated Emission Test

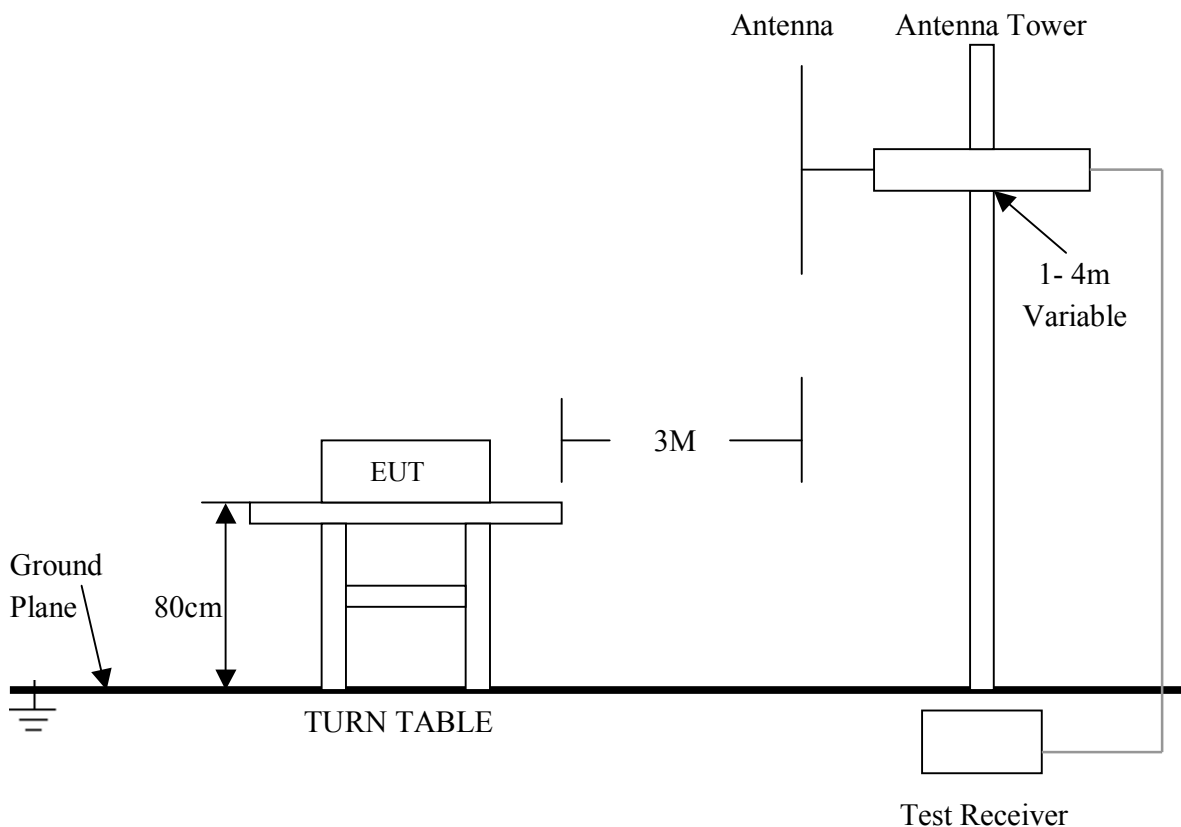
### 5.1 Test Equipment

Please refer to Section 9 this report.

### 5.2 Test Procedure

1. The EUT was tested according to ANSI C63.4 - 2003. 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 C63.4-2003.
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 Optical Mouse      Test Mode : CH1&CH2  
 Test Item : Fundamental Radiated Emission Data      Temperature : 25 °C  
 Test Voltage : DC 3V (Power by Battery)      Humidity : 50%RH  
 Test Result : **PASS**

#### CH1

Freq. (MHz)	Emission (dBuV/m)	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
27.045	51.29	HORIZ	80	-28.71
27.045	52.43	VERT	80	-27.57

#### CH2

Freq. (MHz)	Emission (dBuV/m)	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
27.195	50.35	HORIZ	80	-29.65
27.195	51.28	VERT	80	-28.72

- 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 Optical Mouse & Receiver      Test Mode : Tx & Rx  
 Test Item : General Radiated Emission Data      Temperature : 25 °C  
 Test Voltage : DC 3V (Power by Battery)      Humidity : 50%RH  
 Test Result : **PASS**

#### CH1

Freq. (MHz)	Emission (dBuV/m)	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
54.090	24.07	HORIZ	40.0	-15.93
54.090	21.93	VERT	40.0	-18.07
81.135	28.75	HORZ	40.0	-11.25
81.135	21.73	VERT	40.0	-18.27
108.180	30.15	HORZ	43.5	-13.35
108.180	23.56	VERT	43.5	-19.94

#### CH2

Freq. (MHz)	Emission (dBuV/m)	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
54.390	24.04	HORIZ	40.0	-15.96
54.390	18.39	VERT	40.0	-21.61
81.585	26.07	HORZ	40.0	-13.93
81.585	21.49	VERT	40.0	-18.51
108.780	22.57	HORZ	43.5	-20.93
108.780	22.94	VERT	43.5	-20.56

#### Rx

Freq. (MHz)	Emission (dBuV/m)	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
35.040	30.48	HORIZ	40.0	-9.52
42.960	32.78	VERT	40.0	-7.22
139.600	32.01	HORZ	43.5	-11.49
165.760	29.83	VERT	43.5	-13.67
272.040	28.45	HORZ	46.0	-17.55
329.360	30.36	VERT	46.0	-15.64

- 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

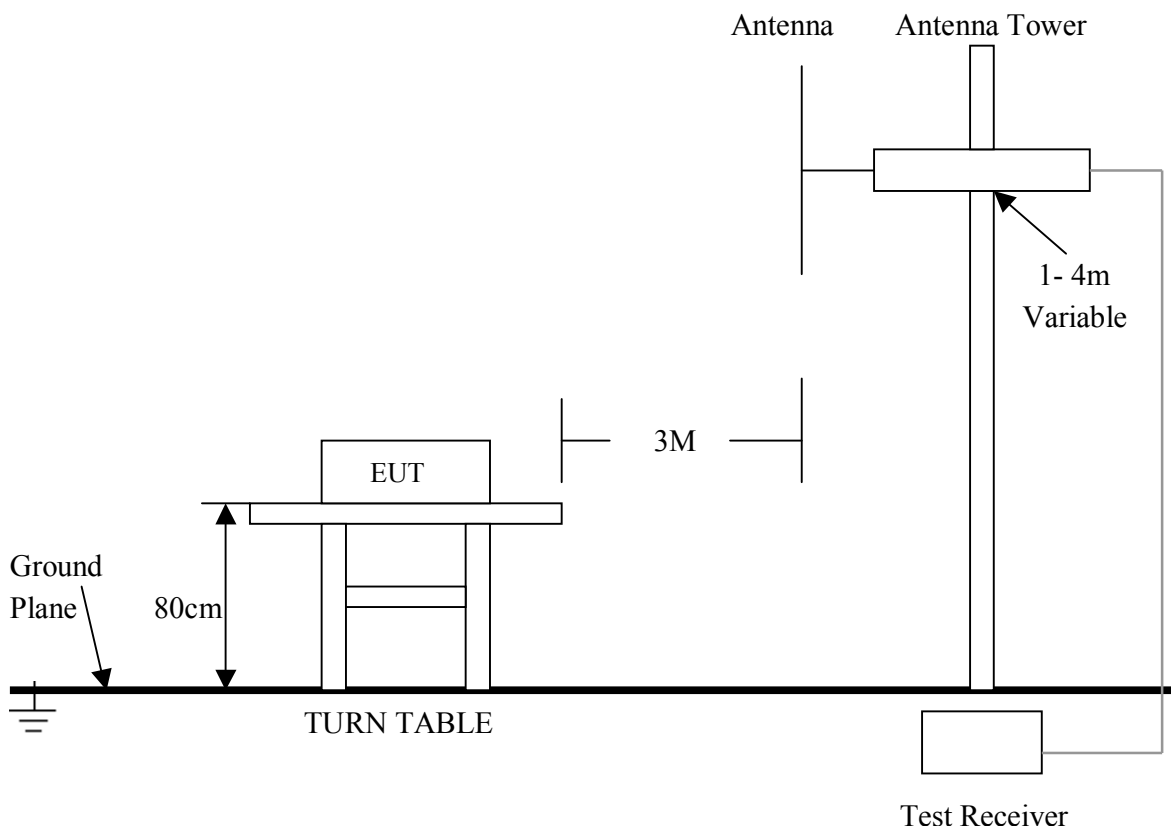
### 6.1 Test Equipment

Please refer to Section 9 this report.

### 6.2 Test Procedure

1. The EUT was tested according to ANSI C63.4 - 2003. 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 C63.4-2003.
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

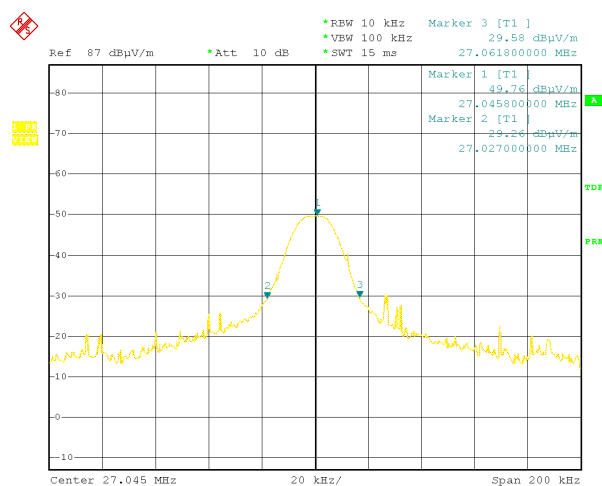
Same as section 4 . 5 of this report.

## 6. 6 Band Edge Limit

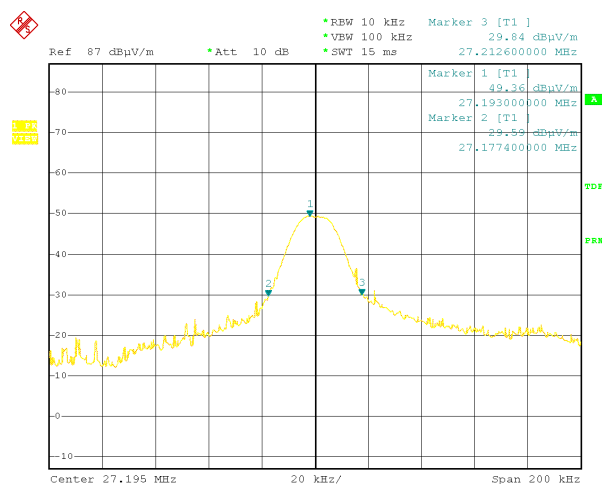
Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

## 6. 7 Band Edge Test Result

Product	: Wireless Optical Mouse	Test Mode	: CH1&CH2
Test Item	: Band Edge Data	Temperature	: 25 °C
Test Voltage	: DC 3V (Power by Battery)	Humidity	: 50%RH
Test Result	: <b>PASS</b>		



Date: 30.SEP.2005 15:41:03



Date: 30.SEP.2005 15:39:43

- 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

Conducted emission test view



Radiated emission test view





## 7.2 EUT Detailed Photographs

EUT top view

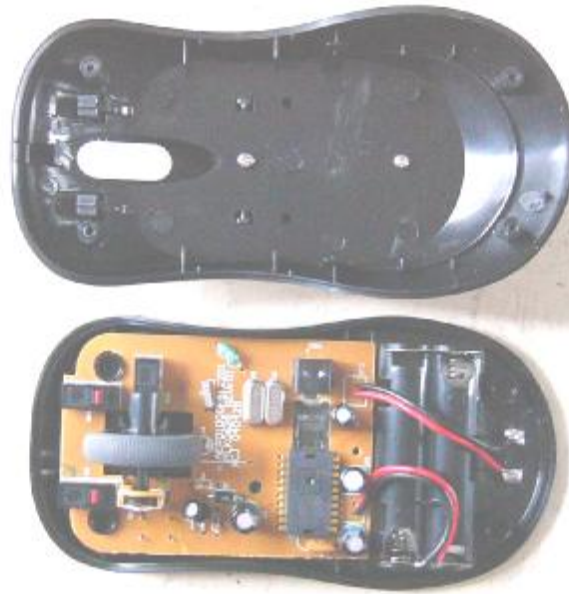


EUT bottom view

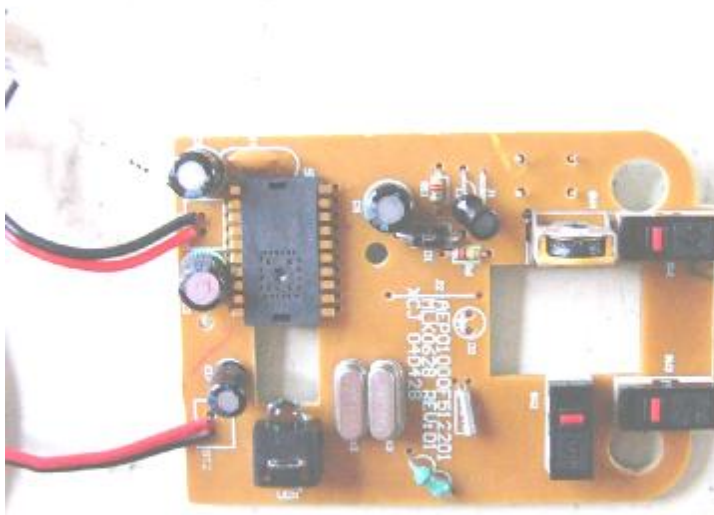




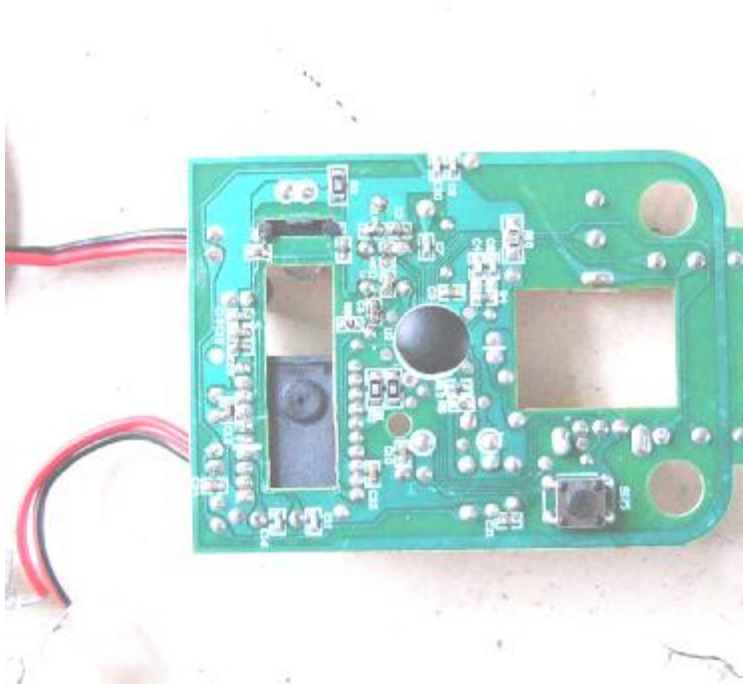
EUT inside whole view



Main board component side



Main board solder side



Rx top view



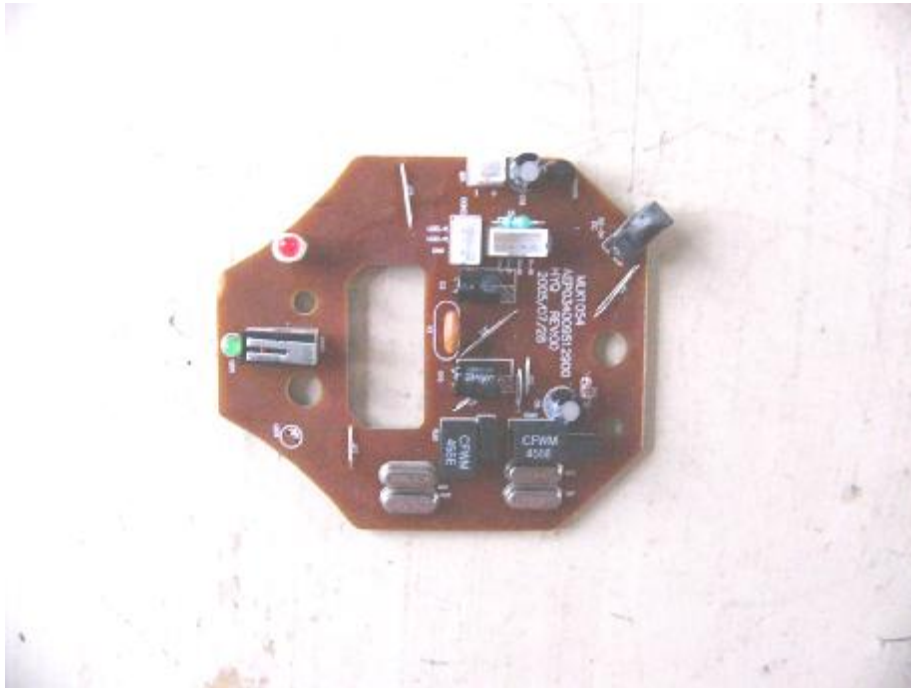
Rx bottom view



Rx inside whole view



Rx board component side



Rx board solder side



## 8. FCC ID Label

**FCC ID: S4SM28WC**

**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.

The remained portion of label statement required by FCC is attached in the user's manual.

### 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, 2005	July 06, 2006
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, 2005	June.05, 2006
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
SOHO Telephone Switching System	IKE	2000-108C	N/A	Feb 26, 2005	Feb 26, 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