

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : RF Mouse

Model No. : Mx-yy33/35/36; (x=F,G,O; y=0~9; A~Z)

FCC ID : HQKKMEMFY33

Filing Type : Certification

Applicant : Key Mouse Electronic Enterprise Co., Ltd.
Rm. No. 602, 6F-8, No. 3, Wu-Chuan 1st Rd., Hsin-Chuang City,
Taipei, Taiwan, R.O.C..

- The test result refers exclusively to the test presented test model / sample.
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- **Certificate or Test Report must not be used by the applicant to claim the product in this test report endorsement by NVLAP or any agency of U.S. government.**

SPORTON International Inc.

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

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History of this test report

Original Report Issue Date: Dec. 20, 2003

- No additional attachment.
- Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment : RF Mouse
Model No. : Mx-yy33/35/36; (x=F,G,O; y=0~9; A~Z)
FCC ID : HQKKMEMFYY33
Filing Type : Certification
Applicant : Key Mouse Electronic Enterprise Co., Ltd.
Rm. No. 602, 6F-8, No. 3, Wu-Chuan 1st Rd., Hsin-Chuang City,
Taipei, Taiwan, R.O.C..

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 2001** and the energy emitted by this equipment was **passed** all test items required in FCC Part 15 subpart C, relative to the equipment under test. Testing was carried out on Dec. 23, 2003 at **SPORTON International Inc. LAB.**



Alex Chen
Manager

SPORTON International Inc.

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

1. General Description of Equipment under Test

1.1. Applicant

,
Rm. No. 602, 6F-8, No. 3, Wu-Chuan 1st Rd., Hsin-Chuang City, Taipei, Taiwan, R.O.C..

1.2. Manufacturer

Same as 1.1

1.3. Basic Description of Equipment under Test

Equipment : RF Mouse
Model No. : Mx-yy33/35/36; (x=F, G, O; y=0~9; A~Z)
FCC ID : HQKKMEMFY33
Trade Name : N/A
Power Supply Type : From battery 3V
AC Power Input : N/A

1.4. Feature of Equipment under Test

Product Feature & Specification			
1. Type of Modulation	FSK		
2. Number of Channel	1		
3. Frequency Band	27MHz		
4. Carrier Frequency of each channel	27.045 MHz		
5. Bandwidth of each channel	15KHz		
6. Maximum Output Power to Antenna	10mW		
7. IF & L.O. frequency	455KHz/26.590 MHz		
8. Type of Antenna Connector (Ex: SMA,TNC, MCX, MMCX, UFC.....etc)	None		
9. Antenna Type / Class and Gain	PCB Printed Loop Antenna/-30dBi		
10. Function Type	Transmitter	V	Transceiver
11. Power Rating (DC/AC , Voltage)	3V		
12. Duty Cycle	None		
13. Basic function of product	Wireless Mouse for PC		
14. Temperature Range (Operating)	0-45°C		
15. Humidity	40-80RH		
16. Other Special	None		

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. The EUT pursuant to ANSI C63.4-2001 and configuration operated in a manner which tended to maximize its emission characteristics in a typical application.
- b. The complete test system included EUT for EMI test.
- c. Frequency range investigated: radiation 25 MHz to 1000MHz.

2.2. Description of Test System

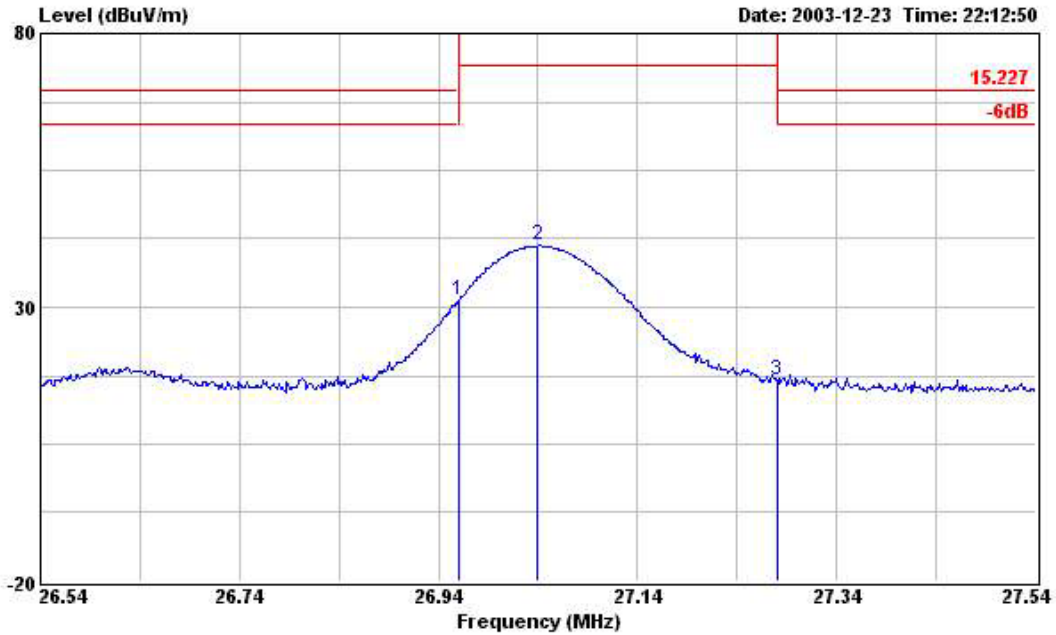
The EUT was tested alone. No support unit was needed during the test.

2.3. Connection Diagram of Test System



2.4. Band edge compliance plot per 15.227(b).

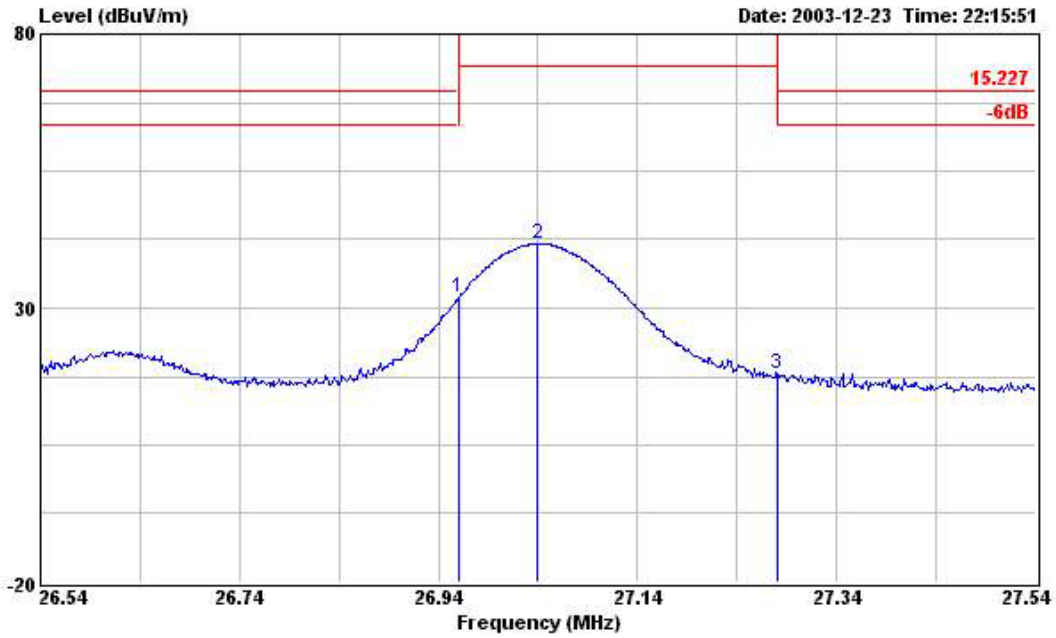
<HORIZONTAL>



Conformation of the fundamental frequency

Frequency (MHz)	Antenna Polarity	Cable Factor	Cable Loss	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Margin (dB)
26.960	H	14.84	0.87	43.57	69.54	2999.16	31.22	36.39	-38.3
27.040	H	14.83	0.87	53.59	80.00	10000.00	42.23	129.27	-37.8
27.280	H	14.80	0.87	29.09	69.54	2999.16	16.70	6.84	-52.8

<VERTICAL>



Conformation of the fundamental frequency

Frequency (MHz)	Antenna Polarity	Cable Factor	Cable Loss	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Margin (dB)
26.960	V	14.84	0.87	44.20	69.54	2999.16	31.85	39.13	-37.7
27.040	V	14.83	0.87	54.14	80.00	10000.00	41.78	122.74	-38.2
27.280	V	14.80	0.87	30.28	69.54	2999.16	17.89	7.84	-51.7

3. Test Software

The EUT kept transmitting signals at fixed frequency.

4. General Information of Test

4.1. Test Facility

Test Site Location : No. 52, Hwa Ya 1St Road, Hwa Ya Technology Park,
Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.
TEL : 886-3-3273456
FAX : 886-3-3180055
Test Site No. : 03CH03-HY

4.2. Test Voltage

DC 3V

4.3. Standard for Methods of Measurement

ANSI C63.4-2001

4.4. Frequency Range Investigated

FCC Part 15, Subpart C 15.227

4.5. Frequency Range Investigated

Radiation: from 25 MHz to 1000 MHz

4.6. Test Distance

The test distance of radiated emission from antenna to EUT is 3 M.

5. Test of Conducted Powerline

The power supply of the EUT is from Battery.

So Conducted Powerline test is not applicable to this equipment.

6. Test of Radiated Emission

Radiated emissions from 25 MHz to 1 GHz were measured with a bandwidth of 120 kHz according to the methods defines in ANSI C63.4-2001. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane, as shown in section 6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

6.1. Major Measuring Instruments

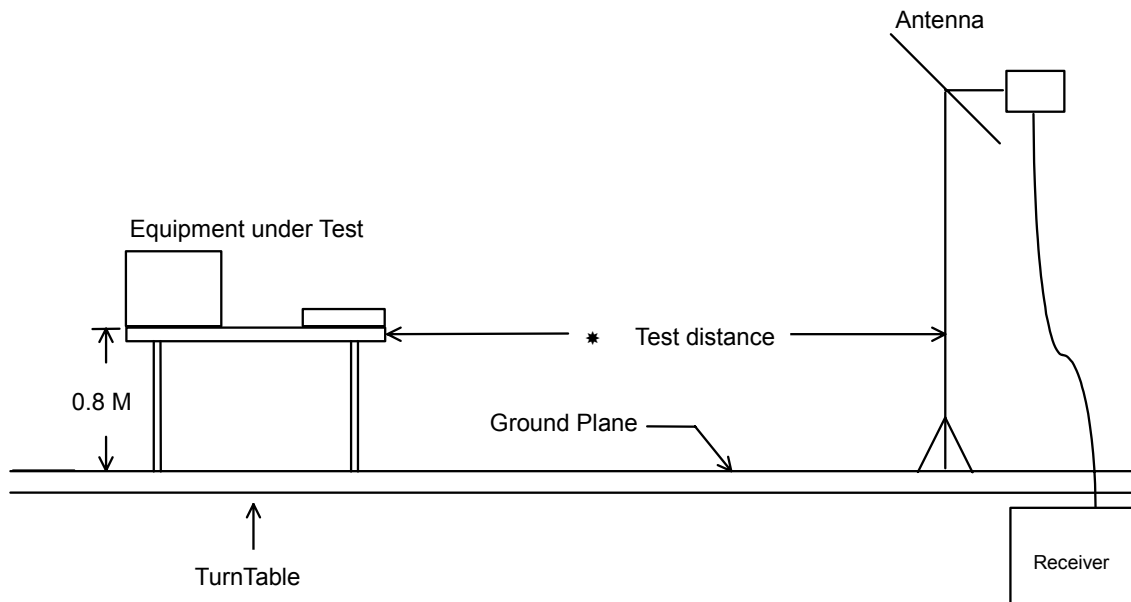
- Amplifier (HP 8447D)
 - RF Gain 30 dB
 - Signal Input 100 KHz to 1.3 GHz

- Test Receiver (SCHAFFNER SCR3501)
 - Resolution Bandwidth 120 KHz
 - Frequency Band 9 K – 1 GHz
 - Quasi-Peak Detector ON for Quasi-Peak Mode
OFF for Peak Mode

6.2. Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.

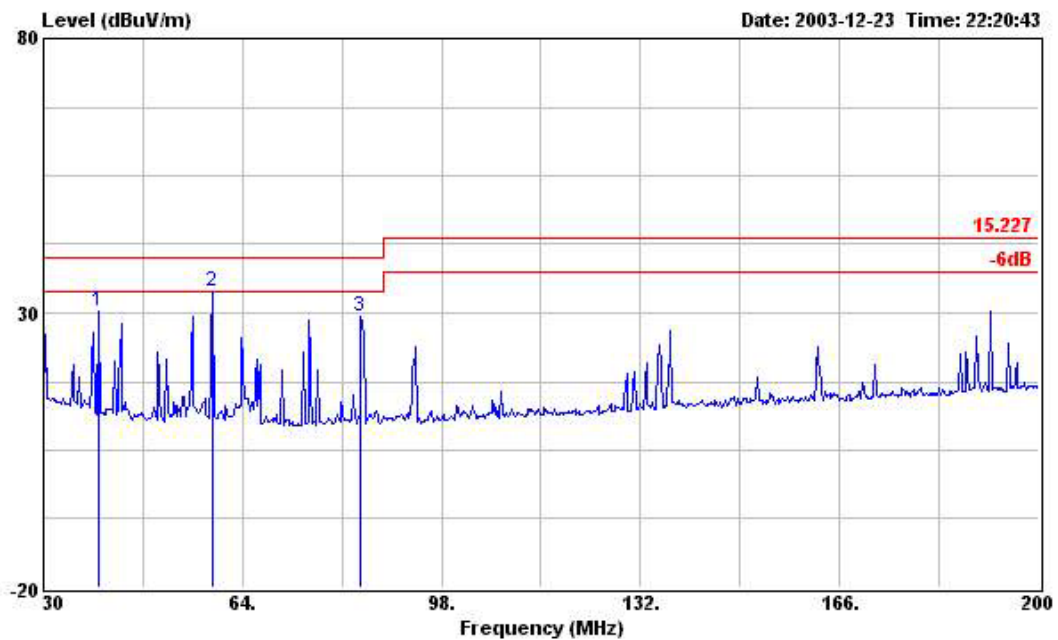
6.3. Typical Test Setup Layout of Radiated Emission



6.4. Test Result of Radiated Emission

- Test Distance: 3 M
- Temperature: 23°C
- Relative Humidity: 52 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

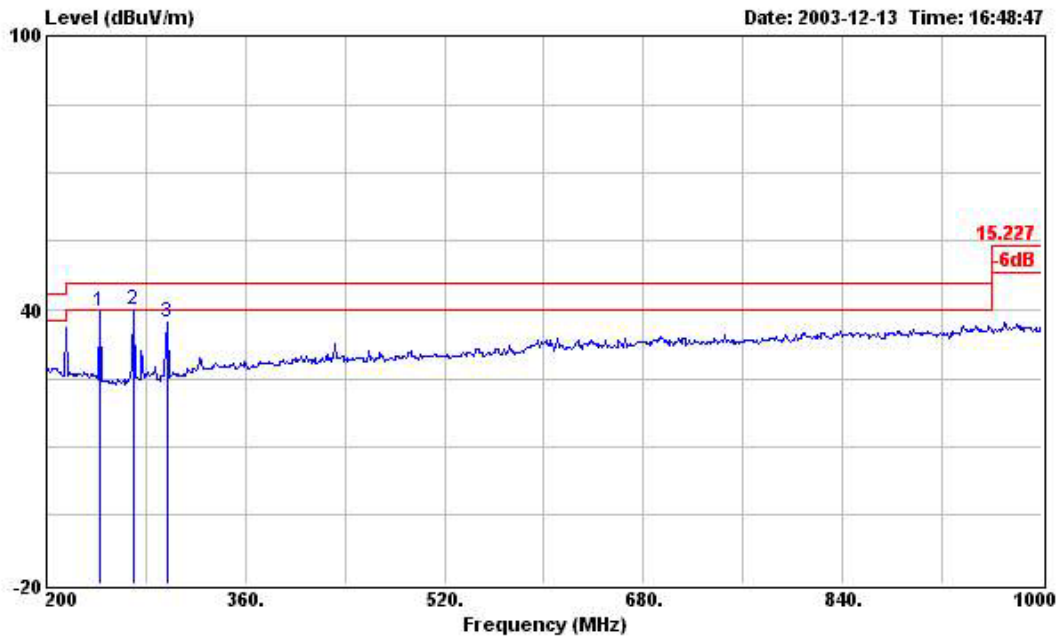
■ The test was passed at the minimum margin that marked by the frame in the following test record



Site : 03CH03-HY
 Condition : 3m BIC-9124--301 HORIZONTAL
 EUT : RF Mouse
 Power : Battery

MEMO : Tx

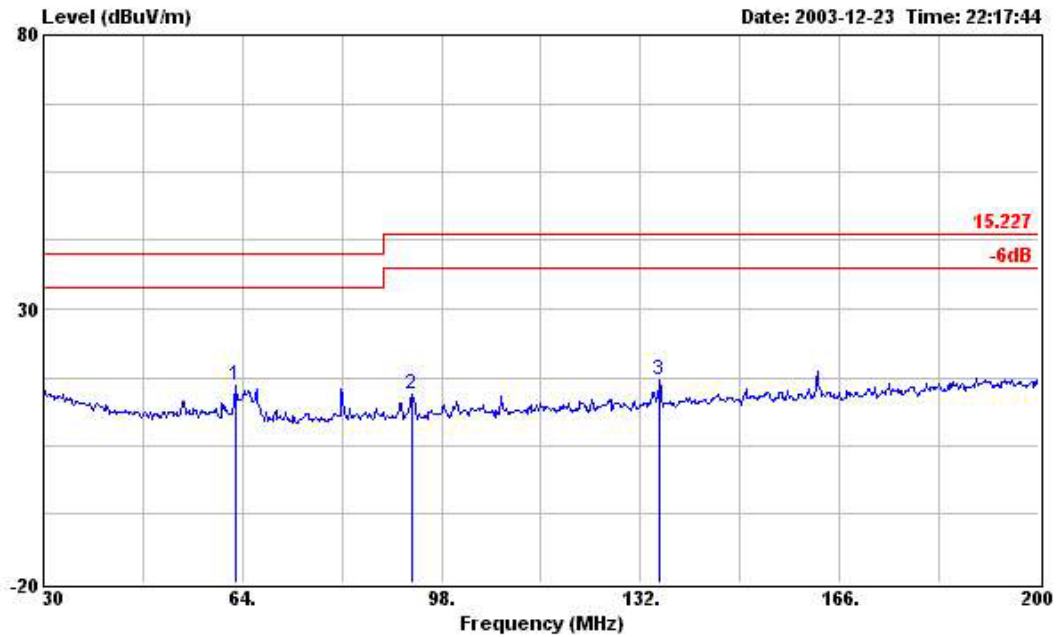
	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	39.350	30.27	-9.73	40.00	45.34	11.85	1.10	28.02	Peak	104	356
2	58.900	33.98	-6.02	40.00	50.32	10.29	1.35	27.98	Peak	105	357
3	84.230	29.49	-10.51	40.00	46.11	9.70	1.61	27.93	Peak	105	355



Site : 03CH03-HY
 Condition : 3m LOG-9111-221 HORIZONTAL
 EUT : RF Mouse
 Power : Battery

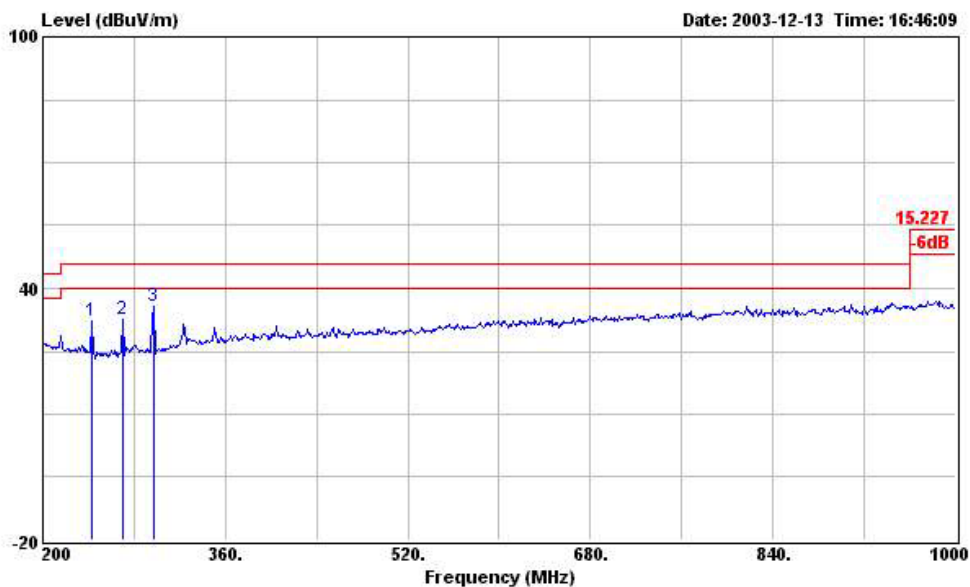
MEMO : TX

Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Remark	Ant	Table	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg	
1	243.200	39.59	-6.41	46.00	51.71	12.69	2.72	27.53	Peak	100	15
2	269.600	39.98	-6.02	46.00	51.96	12.53	2.91	27.42	Peak	100	13
3	297.600	37.40	-8.60	46.00	48.59	13.14	2.98	27.31	Peak	100	18



Site : 03CH03-HY
 Condition : 3m BIC-9124--301 VERTICAL
 EUT : RF Mouse
 Power : Battery
 MODEL : MU-353
 MEMO : Tx

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	62.980	15.91	-24.09	40.00	32.96	9.58	1.34	27.97	Peak	105	358
2	92.900	14.53	-28.97	43.50	31.46	9.30	1.68	27.91	Peak	105	354
3	135.230	17.04	-26.46	43.50	31.38	11.56	1.93	27.83	Peak	105	354



Site : 03CH03-HY
 Condition : 3m LOG-9111-221 VERTICAL
 EUT : RF Mouse
 Power : Battery
 MODEL : MU-353
 MEMO : TX

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	243.200	32.38	-13.62	46.00	44.50	12.69	2.72	27.53	Peak	100	15
2	269.600	32.75	-13.25	46.00	44.73	12.53	2.91	27.42	Peak	100	13
3	297.600	35.90	-10.10	46.00	47.09	13.14	2.98	27.31	Peak	100	18

Test Engineer:

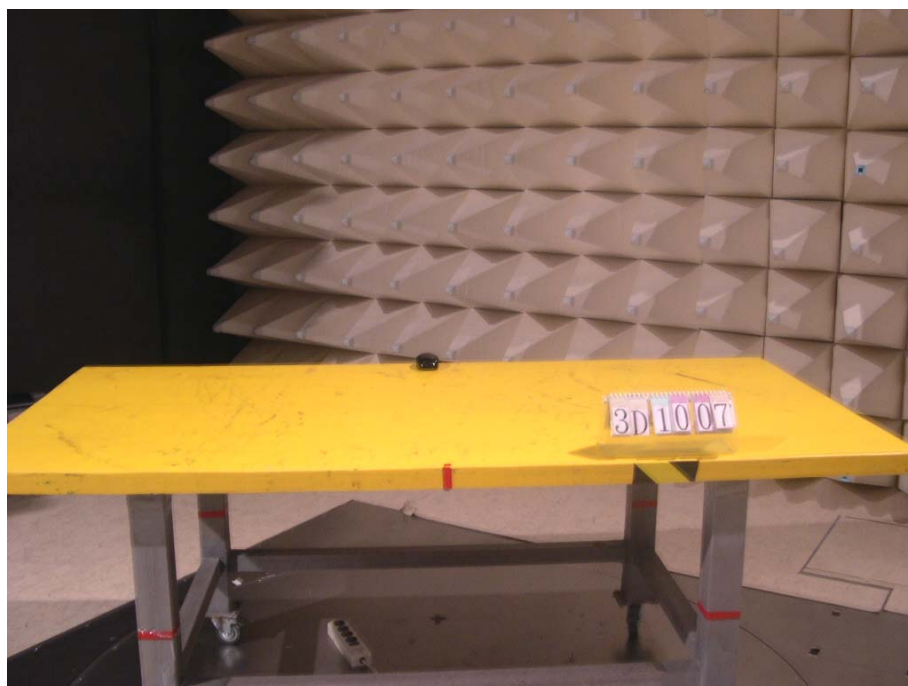
Jones Tsai

 Jones Tsai

6.4.1. Photographs of Radiated Emission Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW



REAR VIEW



7. EMI Suppression Component List

1. For 27Mhz harmonics ,series a Bead (LCB 1608K-301T10) and shunt a 33Pf at the signal trace as attached file A, Pages 7 (Marker 1,2)
- 2 For 27Mhz harmonics ,shunt a 47Pf (Size:0402) at the termination of RF signal output as attached file A, pages 8 (Marker 3)

8. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
25	15.02	0.81
30	14.47	0.92
35	13.08	1.05
40	11.70	1.08
45	10.64	1.15
50	10.14	1.29
55	10.21	1.63
60	10.21	1.30
65	9.35	1.36
70	8.91	1.43
75	9.12	1.48
80	9.50	1.53
85	9.71	1.61
90	9.30	1.69
95	9.36	1.67
100	9.80	1.76
110	10.44	1.80
120	10.58	1.90
130	11.37	1.61
140	11.74	2.14
150	12.38	2.16
160	12.68	2.16
170	13.26	1.99
180	13.56	2.39
190	14.57	2.38
200	14.80	2.46
200	15.39	2.46
220	14.08	2.59
240	12.85	2.68
260	12.46	2.91
280	12.91	2.92
300	13.21	2.99
320	14.37	3.03
340	15.31	3.22
360	15.23	3.28
380	15.39	3.80
400	15.79	3.80
450	16.52	3.69
500	17.35	3.93
550	17.77	3.56
600	19.00	4.15
650	18.78	4.58
700	19.80	4.73
750	20.01	4.71
800	20.38	4.99
850	20.86	5.24
900	21.08	5.38
950	21.83	5.57
1000	22.23	5.62

9. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	25MHz~1GHz	Jun. 21, 2003	Radiation (03CH03-HY)
Spectrum analyzer	R&S	FSP40	100004	9KHZ~40GHz	Aug. 23, 2003	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A09072	100KHz – 1.3GHz	Nov. 05, 2003	Radiation (03CH03-HY)
Biconical Antenna	SCHWARZBECK	VUSLP	9124-301	25MHz –200MHz	Jul. 24, 2003	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	25MHz~1GHz	Jan. 02, 2003	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)

※ Calibration Interval of instruments listed above is one year.

10. Uncertainty of Test Site

Uncertainty of Radiated Emission Measurement

Contribution	Probability Distribution	3m
Antenna factor calibration	normal(k=2)	±1
cable loss calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
Antenna Directivity	rectangular	±3
Antenna Factor V.S. Height	rectangular	±2
Antenna Factor Interpolation for Frequency	rectangular	±0.25
site imperfection	rectangular	±2
Mismatch Receiver VSWR $\Gamma_1=0.09$ Antenna VSWR $\Gamma_2=0.67$ Uncertainty= $20\log(1-\Gamma_1\Gamma_2)$	U-shaped	±0.54
combined standard uncertainty $U_e(y)$	normal	±2.7
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	normal (k=2)	±5.4

$$U = \sqrt{\{(1/2)^2 + (0.3/2)^2 + (2^2 + 0.5^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2\}} = 2.2 \text{ for 10m test distance}$$

$$U = \sqrt{\{(1/2)^2 + (0.3/2)^2 + (2^2 + 3^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2\}} = 2.7 \text{ for 3m test distance}$$

Uncertainty of Conducted Emission Measurement

Contribution	Probability Distribution	150KHz – 30MHz
Cable and I/P attenuator calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
LISN coupling specification	rectangular	±1.5
Transducer factor frequency interpolation	rectangular	±0.2
Mismatch Receiver VSWR $\Gamma_1=0.09$ LISN VSWR $\Gamma_2=0.33$ Uncertainty= $20\log(1-\Gamma_1\Gamma_2)$	U-shaped	0.2
combined standard uncertainty $U_e(y)$	normal	±1.66
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	normal (k=2)	±3.32

$$U = \sqrt{\{(0.3/2)^2 + (2^2 + 1.5^2 + 0.2^2)/3 + (0.2)^2/2\}} = 1.66$$