

FCC Part 15 Subpart C
EMI TEST REPORT
of

E.U.T. : Mouse

FCC ID. : TZALM5053

MODEL : LM5053

Working Frequency : 27.045MHz

for

APPLICANT : Linkworld Electronic Co,Ltd.

ADDRESS : 8F1, No.13, Lane35, Jihu Rd, Neihu, Chiu, Taipei
114, Taiwan.

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN

NO. 34, LIN 5, DING FU TSUN, LINKOU HSIANG,
TAIPEI HSIEN, TAIWAN, R.O.C.

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Report Number : 06-01-RBF-051-03

TEST REPORT CERTIFICATION

Applicant : Linkworld Electronic Co,Ltd.
8F1, No.13, Lane35, Jihu Rd, Neihu, Chiu, Taipei 114, Taiwan.

Manufacturer : Linkup Technology(Suzhou) Co; Ltd.
No,168 Jichang Road Luzhi Town, Suzhou Jiangsu China 215127


Description of EUT :

- a) Type of EUT : Mouse
- b) Trade Name : Linkworld
- c) Model No. : LM5053
- d) FCC ID : TZALM5053
- e) Working Frequencies : 27.045MHk
- f) Power Supply : DC 3.0 V Battery

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C (2005)

I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Issued Date : Mar. 15, 2006

Test Engineer : 
(Falcon Shi)


Approve & Authorized Signer : 
Will Yauo, Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1 GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	: Mouse
b) Trade Name	: Linkworld
c) Model No.	: LM5053
d) FCC ID	: TZALM5053
e) Working Frequencies	: 27.045MHz
f) Power Supply	: DC 3.0V Battery

1.2 Characteristics of Device:

The EUT is a wireless mouse that transmits RF signal to the receiver using the 27MHz band and perform like a normal mouse.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4.

The Mouse under test was operated in its normal operating mode for the purpose of the measurements.

The receiving antenna polarized horizontally was varied from 1 to 4 meters and the wooden turntable was rotated through 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. And also, each emission was to be maximized by changing the orientation of the Mouse under test.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No.34, Lin 5 Ding Fu Tsun, Linkou Hsiang, Taipei Hsien, Taiwan, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Oct. 20, 2005.

2 DEFINITION AND LIMITS

2.1 Definition

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.25
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3360-4400	Above 38.6
13.36-13.41			

Remark “**” : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.3 Limitation

(1) Conducted Emission Limits:

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency MHz	Quasi Peak dB μ V	Average dB μ V
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

- Decreases with the logarithm of the frequency

(2) Radiated Emission Limits :

According to 15.227 the field strength of emissions from intentional radiators operated under these frequency bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental	
	$\mu\text{V}/\text{meter}$	$\text{dB}\mu\text{V}/\text{meter}$
26.96-27.28	10000	80

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209,as following table:

Other Frequencies (MHz)	Field Strength of Fundamental	
	$\mu\text{V}/\text{meter}$	$\text{dB}\mu\text{V}/\text{meter}$
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

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.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3 SYSTEM TEST CONFIGURATION

3.1 Justification

For both radiated and conducted emissions the system was configured for testing in a typical fashion as a customer would normally use it.

3.2 Devices for Tested System

Device	Manufacture	Model / FCC ID.	Description
Mouse*	Linkup Technology(Suzhou) Co; Ltd.	LM5053 TZALM5053	----

Remark “*” means equipment under test.

4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

1. The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.
2. The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.

4.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

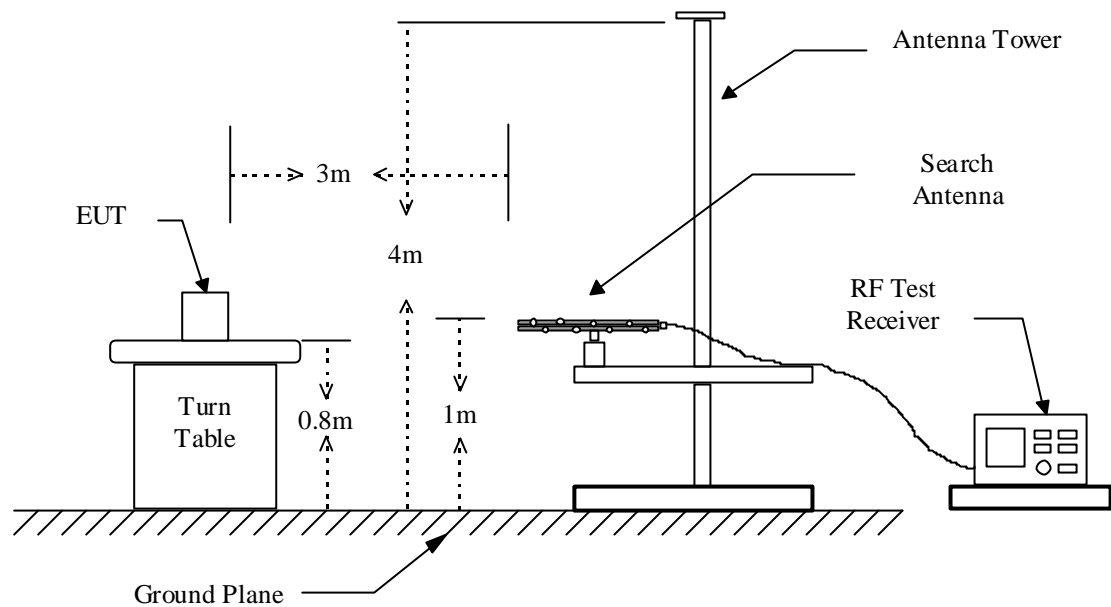
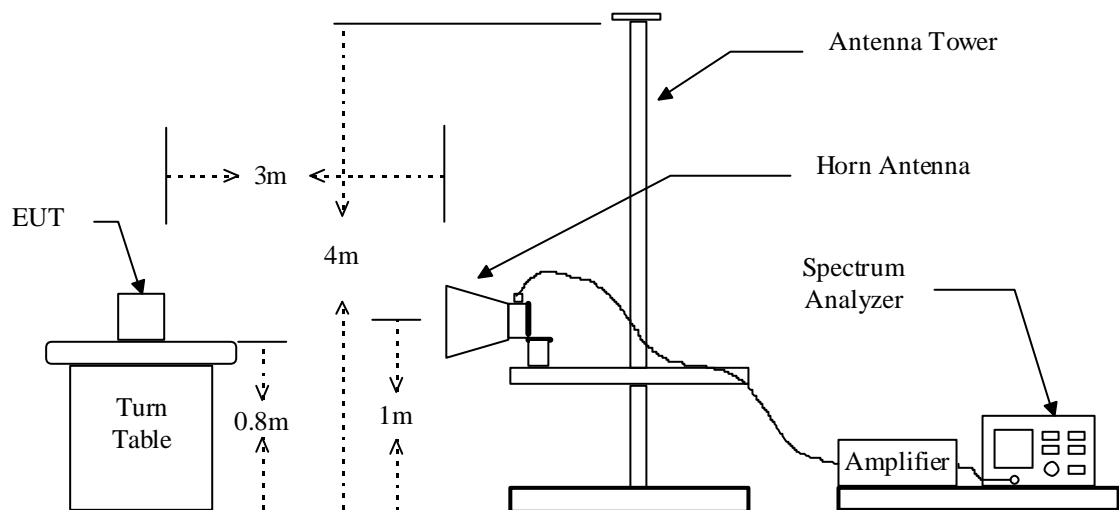


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Test Data

4.3.1 Fundamental

Operation Mode : Transmitting

Test Date : Mar.. 13, 2006Temperature : 19 °CHumidity : 56 %

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin (dB)
	Peak	Ave		Peak	Ave	Peak	Ave	
27.046	60.8	***	4.9	65.7	***	100.0	80.0	-14.3

Note :

1. It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark “***” means that Peak result is meet average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The expanded uncertainty of the radiated emission tests is 3.53 dB.

4.3.2 Harmonics

Operation Mode : Transmitting

Test Date : Mar.. 13, 2006Temperature : 19 °CHumidity : 56 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
54.097	V	39.0	-14.8	24.2	40.0	-15.8	179	1.1
81.138	H/V	---	-14.9	---	40.0	---	---	---
108.184	H/V	---	-12.1	---	43.5	---	---	---
135.245	H	44.5	-11.1	33.4	43.5	-10.1	89	1.8
162.276	H/V	---	-9.4	---	43.5	---	---	---
189.322	H/V	---	-8.4	---	43.5	---	---	---
216.344	H	38.2	-6.1	32.1	46.0	-13.9	102	1.6
243.414	H/V	---	-4.3	---	46.0	---	---	---
270.460	H/V	---	-3.6	---	46.0	---	---	---

Note :

1. Remark “---” means that the emissions level is too low to be measured.
2. The expanded uncertainty of the radiated emission tests is 3.53 dB.

4.3.2 Other Emission

a) Emission frequencies below 1 GHz

Operation Mode : Transmitting

Test Date : Mar.. 13, 2006Temperature : 19 °CHumidity : 56 %

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (m)
99.930	H	51.1	-13.9	37.2	43.5	-6.3	79	1.6
117.210	H	44.9	-11.1	33.8	43.5	-9.7	39	1.2
133.140	V	48.6	-11.3	37.3	43.5	-6.2	83	1.4
160.140	H	44.4	-9.5	34.9	43.5	-8.6	62	1.6
179.850	H	45.7	-9.1	36.6	43.5	-6.9	47	1.2
200.100	H	43.0	-7.1	35.9	43.5	-7.6	188	1.8

Note :

1. Remark “---” means that the emission level is too low to be measured.
2. The expanded uncertainty of the radiated emission tests is 3.53 dB.

b) Emission frequencies above 1 GHz

Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

4.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

4.5 Radiated Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
RF Test Receiver	Rohde & Schwarz	ESVS 30	12/22/2006
Spectrum	Advantest	R3361C	08/14/2006
Line Impedance Stabilization network	EMCO	3825/2	07/03/2006
Loop Antenna	EMCO	6512	08/25/2006
Log periodic Antenna	EMCO	3146	10/05/2006
Biconical Antenna	EMCO	3110B	10/05/2006
Horn Antenna	EMCO	3116	04/18/2006
Preamplifier	Hewlett-Packard	8449B	09/13/2006
Amplifier	Hewlett-Packard	83051A	04/18/2006
Preamplifier	Hewlett-Packard	8447D	10/17/2006
Spectrum Analyzer	Hewlett-Packard	8564E	08/08/2006

4.6 Measuring Instrument Setup

Explanation of measuring instrument setup in frequency band measured is as following:

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
0.9 to 30	RF Test Receiver	Peak	30 kHz	N/A
	RF Test Receiver	Avg.	30 kHz	N/A
30 to 1000	RF Test Receiver	Quasi Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz

4.7 Radiated Measurement Photos





5 CONFORMATION OF THE FUNDAMENTAL FREQUECNY

Operation within the band 26.96-27.28MHz.

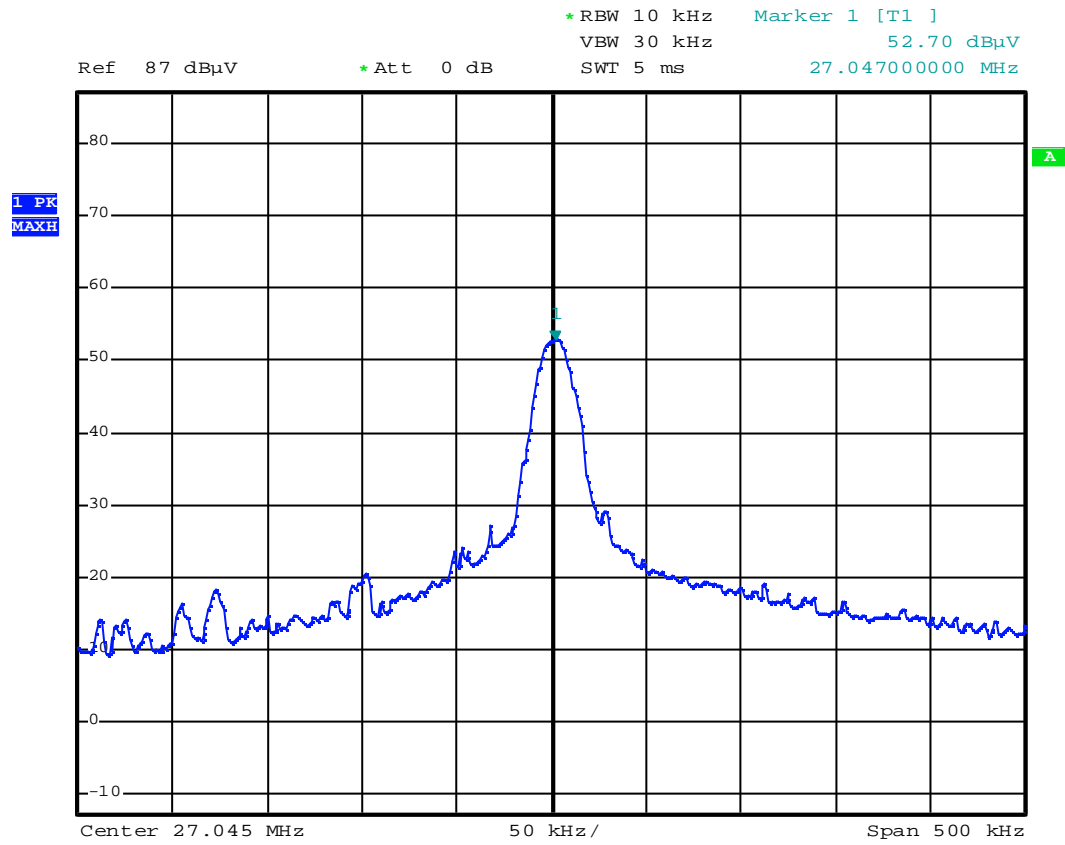
Note : Please see appendix 1 for Plotted Data

6 CONDUCTED EMISSION MEASUREMENT

6.1 Description

This EUT is excused from investigation of conducted emission, for it is powered by DC 3V battery only. According to § 5.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

APPENDIX 1 : PLOTTED DATA FOR CONFORMATION OF THE FUNDAMENTAL FREQUECNY



Date: 13.MAR.2006 16:33:31