

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT  
INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C REQUIREMENT  
OF**

**27MHz Wireless Mouse Transmitter**

**MODEL No.: MUF**

**BRAND NAME: ACROX**

**FCC ID: PRDMU0010340**

**REPORT NO: 03E1015-D**

**ISSUE DATE: June 17, 2003**

*Prepared for*

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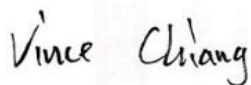
**VERIFICATION OF COMPLIANCE**

<b>Applicant:</b>	ACROX TECHNOLOGIES CO., LTD. 8F, NO. 437, RUI GUANG RD., NEI HU DIST., TAIPEI 114, TAIWAN, R. O. C.
<b>Product Description:</b>	27MHz Wireless Mouse Transmitter
<b>Brand Name:</b>	ACROX
<b>Model No.:</b>	MUF
<b>Serial Number:</b>	N/A
<b>File Number:</b>	03E1015-D
<b>Date of test:</b>	May 15, 2003 & May 19, 2003

**We hereby certify that:**

The above equipment was tested by C&C Laboratory Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (1992) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.227

The test results of this report relate only to the tested sample identified in this report.



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**Authorized Signatory**

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## 1. GENERAL INFORMATION

### 1.1 Product Description

ACROX TECHNOLOGIES CO., LTD. Model: MUF(referred to as the EUT in this report) The EUT is an short range, lower power, wireless optical mouse designed as an " Input Device. It is designed by way of utilizing the FSK modulation achieves the system operating.

Model difference: The mode MUF is same except the model designed.

A major technical descriptions of EUT is described as following:

- A). Operation Frequency: 27.045 MHz; 27.145MHz, two channels.
- B). Modulation: Frequency Shifting Key (FSK) Modulation
- C). Antenna Designation: Non-User Replaceable (Fixed)
- D). Power Supply: 3 Vdc by AAA \*2 battery.

### 1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: PRDMU0010340 filing to comply with Section 15.227 of the FCC Part 15, Subpart C Rules. The composite system (receiver) is compliance with Subpart B is authorized under a DoC procedure.

### 1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (1992). Radiated testing was performed at an antenna to EUT distance 3 meters.

### 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of C&C Laboratory Co., Ltd. No. 163-1, Chung Sheng Road, Hsin Tien City, Taipei, Taiwan, R. O. C. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 1992 and CISPR 22/EN 55022 requirements.

### 1.5 Special Accessories

Not available for this EUT intended for grant.

### 1.6 Equipment Modifications

Not available for this EUT intended for grant.

## 2. System Test Configuration

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-1992. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

#### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.

### 2.4 Limitation

#### (1) Conducted Emission (Not applicable in this report)

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

## (2) Radiated Emission

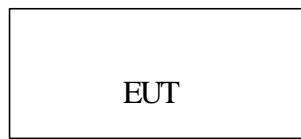
- a. The field strength of any emission within this band (section 15.227 frequency between 26.96MHz -27.28MHz) shall not exceed 10000 micro volts/meter at 3 meters. (80dB $\mu$ V at 3m) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.
- b. The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in section 15.209(Intentional Radiators general limit).as below.

Frequency (MHz)	Field strength $\mu$ V/m	Distance(m)	Field strength at 3m dB $\mu$ V/m
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

- Remark:
1. Emission level in dBuV/m=20 log (uV/m)
  2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
  3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of  $\xi$  15.205
  4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of  $\xi$ 15.205, then the general radiated emission limits in  $\xi$  15.209 apply.

**2.5 Configuration of Tested System**

**Fig. 2-1 Configuration of Tested System**



**Table 2-1 Equipment Used in Tested System**

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	27MHz Wireless Mouse Transmitter	ACROX TECHNOLOGIES CO., LTD.	MUF	PRDMU0010340	N/A	EUT

**Note**

⋮

- (1) Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment.

### 3. Summary Of Test Results

<b>FCC Rules</b>	<b>Description Of Test</b>	<b>Result</b>
§ 15.207	Conducted Emission	N/A
§ 15.227	Radiated Emission	Compliant
§ 15.227	26 dB Bandwidth	Compliant

### 4. Description of test modes

The EUT (27MHz Wireless Mouse Transmitter) has been tested under normal operating condition. The EUT stay in continuous transmitting mode. The Frequency 27.045MHz are chosen for testing.



**5. Conducted Emissions Test** (Not applicable in this report)**5.1 Measurement Procedure:**

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

**5.2 Test SET-UP (Block Diagram of Configuration)****5.3 Measurement Equipment Used:**

Conducted Emission Test Site #Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
TEST RECEIVER	R&S	ESHS20	840455/006	03/24/03	03/23/04
LISN	EMCO	3825/2	1842	01/29/03	01/28/04
LISN (EUT)	EMCO	3825/2	1435	01/20/03	01/19/04
BNC CABLE	TIMES MICROWAVE	LMR-195	BNC 03	05/02/03	05/01/04

**5.4 Measurement Result:**

N/A

**5.5 Conducted Measurement Photos:**

N/A

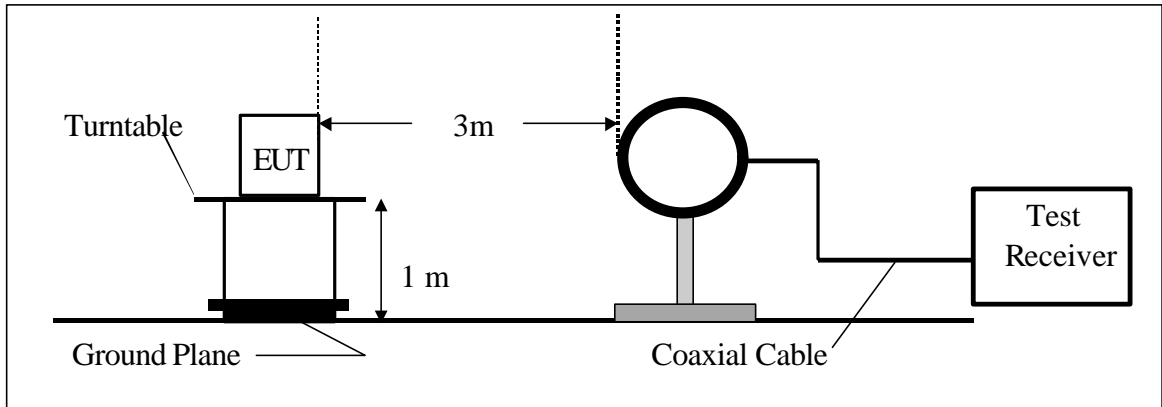
## **6. Radiated Emission Test**

### **6.1 Measurement Procedure**

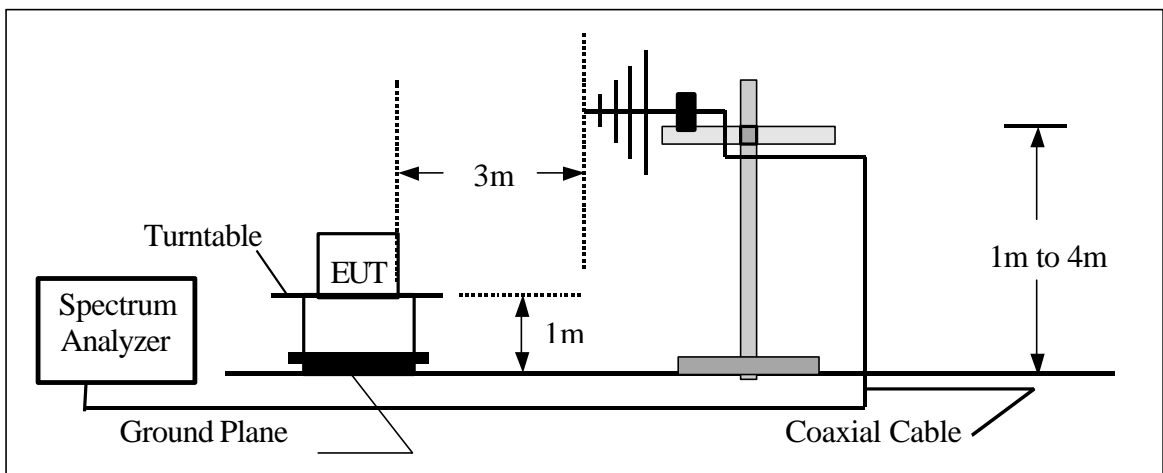
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

### 6.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



**6.3 Measurement Equipment Used:**

<b>Open Area Test Site # H</b>					
<b>EQUIPMENT TYPE</b>	<b>MFR</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>LAST CAL.</b>	<b>CAL DUE.</b>
MEASURE RECEIVER	SCHAFFNER	SCR3501	341	06/13/02	06/12/03
SPECTRUM ANALYZER	ADVANTEST	R3132	120900002	09/18/02	09/17/03
ANTENNA	SCHAFFNER	CBL 6112B	2801	10/03/02	10/02/03
CABLE	BELDEN	9913	N-TYPE #H1	10/14/02	10/13/03
PRE-AMPLIFIER	SCHAFFNER	CPA9231A	3613	10/31/02	10/30/03
LOOP ANTENNA	EMCO	6502	8905-2356	06/11/02	06/10/03

**6.4 Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

## 6.5 Measurement Result

Operation Mode:	Transmitting Mode	Test Date :	May 19, 2003
Fundamental Frequency:	27.045 MHz	Test By:	Jimmy Chen
Temperature :	27	Pol:	Vertical
Humidity :	72 %		

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
27.045	V	Peak	53.02	-12.70	40.32	80.00	-39.68	F
54.090	V	Peak	34.43	-10.57	23.86	40.00	-16.14	H
81.135	V	Peak	40.18	-10.10	30.08	40.00	-9.92	H
108.180	V	Peak	36.04	-5.28	30.76	43.50	-12.74	H
135.225	V	Peak	31.90	-5.64	26.26	43.50	-17.24	H
162.270	V	Peak	32.27	-5.17	27.10	43.50	-16.40	H
189.315	V	Peak	29.53	-6.23	23.30	43.50	-20.20	H
216.360	V	Peak	32.34	-5.92	26.42	46.00	-19.58	H
243.405	V	Peak	28.43	-5.38	23.05	46.00	-22.95	H
270.450	V	Peak	29.13	-3.48	25.65	46.00	-20.35	H

### Remark :

- (1) Measuring frequencies from 25 MHz to the 1GHz.
- (2) Radiated emissions measured in frequency range from 25 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB
- (4) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (5) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (6) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (7) The IF bandwidth of SPA between 25MHz to 30MHz was 10KHz; 30MHz to 1GHz was 100KHz.

## 6.6 Measurement Result

Operation Mode: Transmitting Mode  
 Fundamental Frequency: 27.045 MHz  
 Temperature : 27  
 Humidity : 72 %

Test Date : May 19, 2003  
 Test By: Jimmy Chen  
 Pol: Horizontal

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
27.045	H	Peak	57.33	-12.70	44.63	80.00	-35.37	F
54.093	H	Peak	31.26	-10.57	20.69	40.00	-19.31	H
81.154	H	Peak	33.76	-10.10	23.66	40.00	-16.34	H
108.199	H	Peak	37.23	-5.27	31.96	43.50	-11.54	H
135.244	H	Peak	33.53	-5.64	27.89	43.50	-15.61	H
162.289	H	Peak	36.30	-5.17	31.13	43.50	-12.37	H
189.315	H	Peak	31.55	-6.23	25.32	43.50	-18.18	H
216.360	H	Peak	37.83	-5.92	31.91	46.00	-14.09	H
243.405	H	Peak	33.87	-5.38	28.49	46.00	-17.51	H
270.450	H	Peak	35.56	-3.48	32.08	46.00	-13.92	H

### Remark :

- (1) Measuring frequencies from 25 MHz to the 1GHz.
- (2) Radiated emissions measured in frequency range from 25 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB
- (4) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (5) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (6) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (7) The IF bandwidth of SPA between 25MHz to 30MHz was 10KHz; 30MHz to 1GHz was 100KHz.

## **7. Occupied Bandwidth**

### **7.1 Measurement Procedure**

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency , RBW= 10KHz;VBW= 30KHz, Span =200KHz.
4. Set SPA Max hold. Mark peak, -26dB.

### **7.2 Test SET-UP (Block Diagram of Configuration)**

Same as 4.2 Radiated Emission Measurement.

### **7.3 Measurement Equipment Used:**

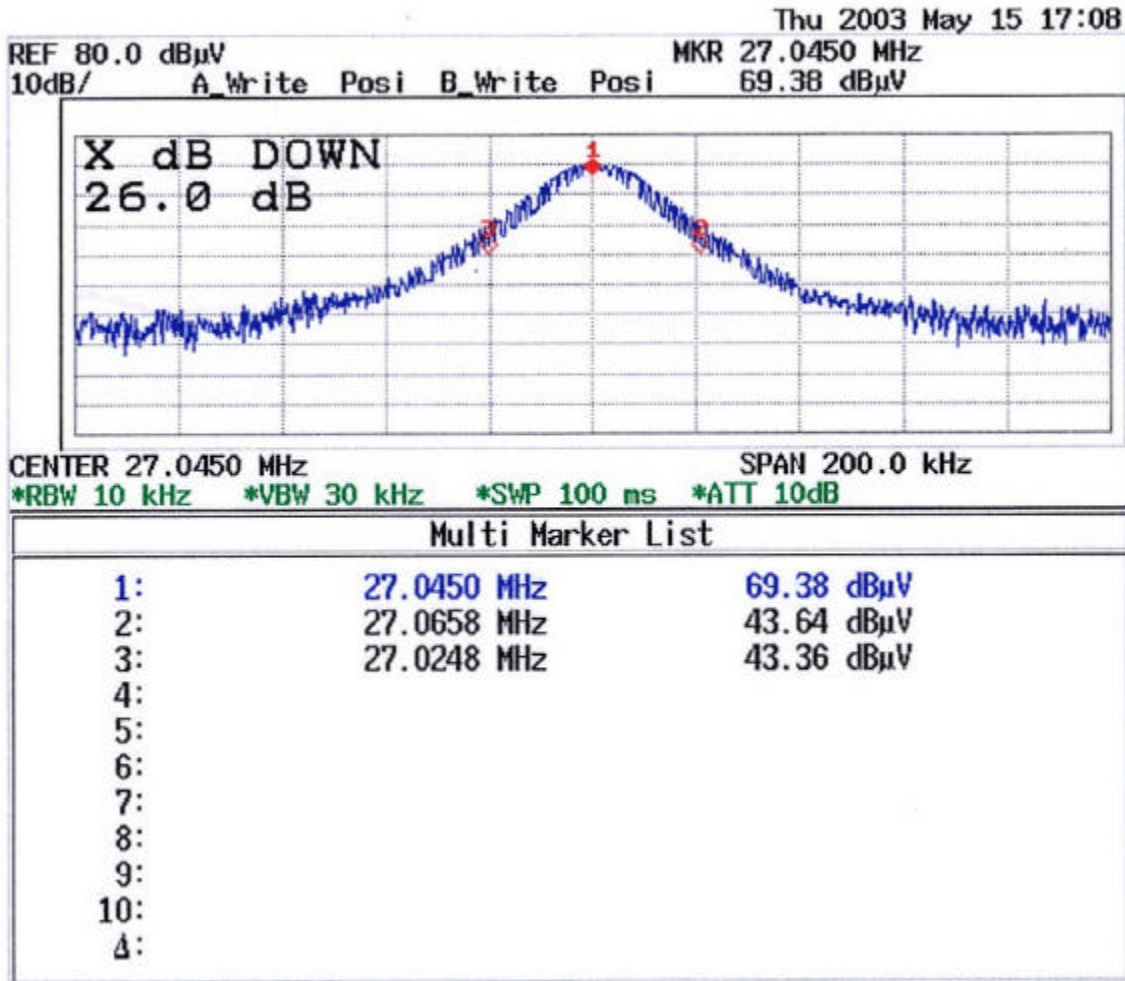
Same as 4.2 Radiated Emission Measurement.

### **7.4 Measurement Results:**

26dB bandwidth = 41.0 KHz

Refer to attached data chart.

### 26dB Band Width Test Data





## **APPENDIX 1**

### **PHOTOGRAPHS OF SET UP**

## **APPENDIX 2**

# **PHOTOGRAPHS OF EUT**