

**Date: 2002-11-01**

# **TEST REPORT**

**Page 1 of 20**

**No.: HM109144**

## **FCC PART 15 SUBPART C CERTIFICATION REPORT**

### **FOR LOW POWER TRANSMITTER**

**TEST REPORT No.: HM109144**

Equipment Under Test [EUT]:

Model Number:

Applicant:

FCC ID :

KG Racer 27MHz

4201

Lung Cheong Toys Limited.

P73KGRACER27TA

Date: 2002-11-01

# **TEST REPORT**

Page 2 of 20

No.: HM109144

## **CONTENT:**

Cover  
Content  
Conclusion

Page 1 of 20  
Page 2-3 of 20  
Page 4 of 20

### **1.0 General Details**

- 1.1 Test Laboratory
- 1.2 Applicant Details  
Applicant  
HKSTC Code Number for Applicant  
Manufacturer
- 1.3 Equipment Under Test [EUT]  
Description of EUT operation
- 1.4 Date of Order
- 1.5 Submitted Sample
- 1.6 Test Duration
- 1.7 Country of Origin
- 1.8 Additional Information of EUT

Page 5 of 20  
Page 5 of 20  
Page 6 of 20  
Page 6 of 20  
Page 6 of 20  
Page 6 of 20  
Page 6 of 20  
Page 7 of 20

### **2.0 Technical Details**

- 2.1 Investigations Requested
- 2.2 Test Standards and Results Summary

Page 8 of 20  
Page 8 of 20

### **3.0 Test Results**

- 3.1 Emission
- 3.2 Bandwidth Measurement

Page 9-13 of 20  
Page 14-15 of 20

**Date: 2002-11-01**

**No.: HM109144**

# **TEST REPORT**

**Page 3 of 20**

## **Appendix A**

List of Measurement Equipment

Page 16 of 20

## **Appendix B**

Duty Cycle Correction During 100 msec

Page 17-18 of 20

## **Appendix C**

Photographs

Page 19-20 of 20

Date: 2002-11-01

## **TEST REPORT**

Page 4 of 20

No.: HM109144

### **CONCLUSION**

The submitted product was deemed to have COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

---

Verify by

---

Patrick Wong  
for Chief Executive

Date: 2002-11-01

# **TEST REPORT**

Page 5 of 20

No.: HM109144

## **1.0 General Details**

### **1.1 Test Laboratory**

The Hong Kong Standards and Testing Centre Ltd.  
EMC Laboratory  
10 Dai Wang Street, Taipo Industrial Estate  
New Territories, Hong Kong

Telephone: 852 2666 1888  
Fax: 852 2664 4353

### **1.2 Applicant Details** **Applicant**

LUNG CHEONG TOYS LIMITED.  
Lung Cheong Building, 1 Lok Yip Road,  
On Lok Tsuen, Fanling, N.T., Hong Kong.

Telephone: 852 2676 8069  
Fax: 852 2682 2161

**HKSTC Code Number for Applicant**

**LUC001**

### **Manufacturer**

LUNG CHEONG TOYS LIMITED.  
Lung Cheong Building, 1 Lok Yip Road,  
On Lok Tsuen, Fanling, N.T., Hong Kong.

Fax: 852 2676 8069  
Fax: 852 2682 2161

**Date: 2002-11-01**

## **TEST REPORT**

**Page 6 of 20**

**No.: HM109144**

### **1.3 Equipment Under Test [EUT] Description of Sample**

Product: KG Racer 27MHz  
Manufacturer: Lung Cheong Toys Limited.  
Brand Name: KG Racer  
Model Number: 4201  
Input Voltage: 9Vd.c ("6F22" size battery x 1)  
Additional Model Number: 4202, 4203, 4204, 4301, 4302, 4303, 4401, 4402,  
4403

#### **1.3.1 Description of EUT Operation**

The Equipment Under Test(EUT) is an Lung Cheong Toys Limited., KG Racer 27MHz. The transmitter is a 2 button transmitter. The EUT continues to transmit while button is being pressed, Modulation by IC. and tape is pulse modulation.

### **1.4 Date of Order**

2002-10-28

### **1.5 Submitted Sample(s):**

1 Sample per model

### **1.6 Test Duration**

2002-10-30

### **1.7 Country of Origin**

China

Date: 2002-11-01

## TEST REPORT

Page 7 of 20

No.: HM109144

### 1.8 Additional Information of EUT

|                                    | Submitted                           | Not Available            |
|------------------------------------|-------------------------------------|--------------------------|
| User Manual                        | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Part List                          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Circuit Diagram                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Printed Circuit Board [PCB] Layout | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Block diagram                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| FCC ID Label                       | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Date: 2002-11-01

## **TEST REPORT**

Page 8 of 20

No.: HM109144

### **2.0 Technical Details**

#### **2.1 Investigations Requested**

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 and ANSI C63.4:2000 for FCC Certification.

#### **2.2 Test Standards and Results Summary Tables**

| <b>EMISSION<br/>Results Summary</b>                                |                  |                 |                     |                                     |                          |                                     |
|--------------------------------------------------------------------|------------------|-----------------|---------------------|-------------------------------------|--------------------------|-------------------------------------|
| Test Condition                                                     | Test Requirement | Test Method     | Class /<br>Severity | Test Result                         |                          |                                     |
|                                                                    |                  |                 |                     | Pass                                | Failed                   | N/A                                 |
| Field Strength of<br>Fundamental Emissions<br>& Spurious Emissions | FCC 47CFR 15.227 | ANSI C63.4:2000 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Radiated Emissions,<br>30MHz to 1GHz                               | FCC 47CFR 15.209 | ANSI C63.4:2000 | Class B             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Conducted Emissions on<br>AC, 0.45MHz to 30MHz                     | FCC 47CFR 15.207 | ANSI C63.4:2000 | Class B             | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Note: N/A - Not Applicable

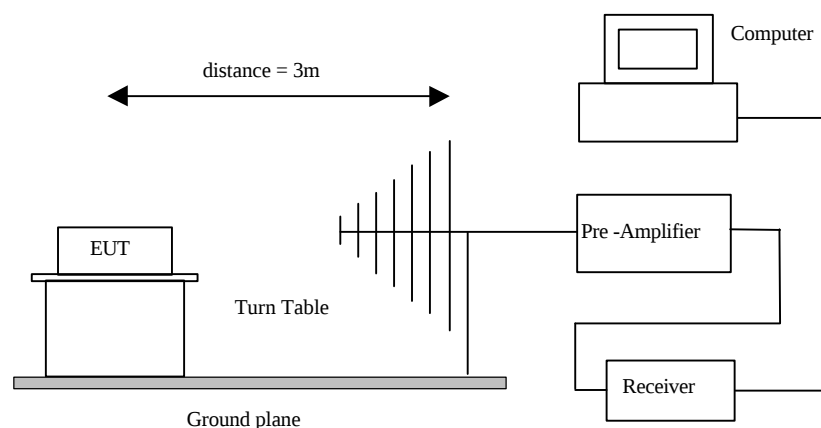
**3.0 Test Results****3.1 Emission****3.1.1 Radiated Emissions**

|                    |                  |
|--------------------|------------------|
| Test Requirement:  | FCC 47CFR 15.227 |
| Test Method:       | ANSI C63.4:2000  |
| Test Date:         | 2002-10-30       |
| Mode of Operation: | On mode          |

**Test Method:**

The sample was placed 0.8m above the ground plane on the OATS \*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigate all operating modes, rotated about all 3 axis (X, Y & Z) to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

\*: OATS [Open Area Test Site] located at HKSTC with a metal ground plane on filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 90657.

**Test Setup:**

Date: 2002-11-01

## **TEST REPORT**

Page 10 of 20

No.: HM109144

### **Limits for Field Strength of Fundamental Emissions [FCC 47CFR 15.227]:**

| Frequency Range of<br>Fundamental<br>[MHz] | Field Strength of<br>Fundamental Emission<br>[Peak]<br>[μV/m] | Field Strength of<br>Fundamental Emission<br>[Average]<br>[μV/m] |
|--------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------|
| 26.96-27.28                                | 100,000                                                       | 10,000                                                           |

### **Results:**

| <b>Field Strength of Fundamental Emissions</b> |                                 |                                |                             |                           |                   |                     |
|------------------------------------------------|---------------------------------|--------------------------------|-----------------------------|---------------------------|-------------------|---------------------|
| <b>Peak Value</b>                              |                                 |                                |                             |                           |                   |                     |
| Frequency<br>MHz                               | Measured<br>Level @3m<br>dBμV/m | Correction<br>Factor<br>dBμV/m | Field<br>Strength<br>dBμV/m | Field<br>Strength<br>μV/m | Limit @3m<br>μV/m | Antenna<br>Polarity |
| 27.15                                          | 58.5                            | 22.3                           | 80.8                        | 10,964.8                  | 100,000           | Vertical            |

| <b>Field Strength of Fundamental Emissions</b> |                                 |                                |                             |                           |                   |                     |
|------------------------------------------------|---------------------------------|--------------------------------|-----------------------------|---------------------------|-------------------|---------------------|
| <b>Average</b>                                 |                                 |                                |                             |                           |                   |                     |
| Frequency<br>MHz                               | Measured<br>Level @3m<br>dBμV/m | Correction<br>Factor<br>dBμV/m | Field<br>Strength<br>dBμV/m | Field<br>Strength<br>μV/m | Limit @3m<br>μV/m | Antenna<br>Polarity |
| 27.15                                          | 52.2                            | 22.3                           | 74.5                        | 5,308.8                   | 100,00            | Vertical            |

According to FCC 47CFR15.35, the limit on the radio frequency emissions as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

### **Remarks:**

\*: Adjusted by Duty Cycle = -6.3dB

\*: Linear interpolations

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty = 30MHz to 300MHz ±3.7dB  
300MHz to 1GHz +3.0dB / -2.7dB

Date: 2002-11-01

## TEST REPORT

Page 11 of 20

No.: HM109144

### Limited for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

| Frequency Range<br>[MHz] | Quasi-Peak Limits<br>[μV/m] |
|--------------------------|-----------------------------|
| 30-88                    | 100                         |
| 88-216                   | 150                         |
| 216-960                  | 200                         |
| Above960                 | 500                         |

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Results :

| Radiated Emissions<br>Quasi-Peak |                                 |                                |                             |                           |                   |                     |
|----------------------------------|---------------------------------|--------------------------------|-----------------------------|---------------------------|-------------------|---------------------|
| Frequency<br>MHz                 | Measured<br>Level @3m<br>dBμV/m | Correction<br>Factor<br>dBμV/m | Field<br>Strength<br>dBμV/m | Field<br>Strength<br>μV/m | Limit @3m<br>μV/m | Antenna<br>Polarity |
| 54.29                            | < 1.0                           | 12.5                           | < 13.5                      | < 4.7                     | 150               | Vertical            |
| 81.44                            | < 1.0                           | 9.8                            | < 10.8                      | < 3.5                     | 150               | Vertical            |
| 108.58                           | < 1.0                           | 11.5                           | < 12.5                      | < 4.2                     | 150               | Vertical            |
| 135.73                           | < 1.0                           | 15.9                           | < 16.9                      | < 7.0                     | 200               | Vertical            |
| 162.87                           | < 1.0                           | 17.4                           | < 18.4                      | < 8.3                     | 200               | Vertical            |
| 190.02                           | < 1.0                           | 17.2                           | < 18.2                      | < 8.1                     | 200               | Vertical            |
| 217.16                           | < 1.0                           | 18.8                           | < 19.8                      | < 9.8                     | 200               | Vertical            |
| 244.31                           | < 1.0                           | 19.7                           | < 20.7                      | < 10.8                    | 200               | Vertical            |
| 271.45                           | 22.4                            | 15.1                           | 37.5                        | 75.0                      | 200               | Vertical            |

Remarks:

\*: Linear interpolations

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty = 30MHz to 300MHz ±3.7dB  
300MHz to 1GHz +3.0dB / -2.7dB

Date: 2002-11-01

## TEST REPORT

Page 12 of 20

No.: HM109144

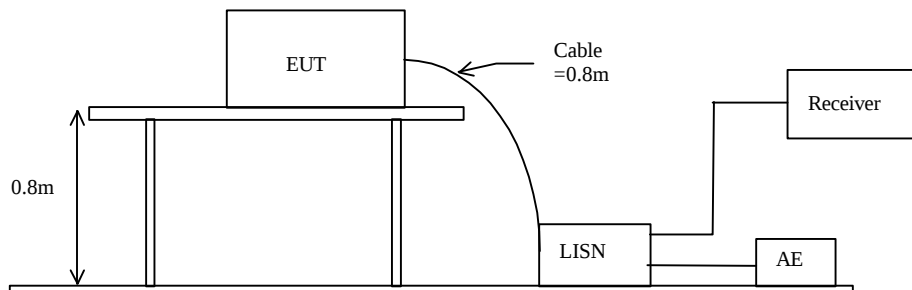
### 3.1.1 Conducted Emissions (0.15MHz to 30MHz)

|                    |                  |
|--------------------|------------------|
| Test Requirement:  | FCC 47CFR 15.207 |
| Test Method:       | ANSI C63.4:2000  |
| Test Date:         | 2002-10-30       |
| Mode of Operation: | On mode          |

#### Test Method:

The test was performed in accordance with ANSI C63.4:2000, with the following: an initial measurement was performed in peak and average detection mode on the live line. Any emissions recorded within 30dB of the relevant limit line were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

#### Test Setup:



Date: 2002-11-01

## **TEST REPORT**

Page 13 of 20

No.: HM109144

### **Limit for Conducted Emissions (FCC 47 CFR 15.207):**

| Frequency Range<br>[MHz] | Quasi-Peak Limits<br>[ $\mu$ V/m] |
|--------------------------|-----------------------------------|
| 0.15-30                  | 250                               |

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram labelled as (QP and AV).

Results: N/A

The EUT is operated by internal battery power only, therefore power line conducted emission was deemed unnecessary.

Remarks:

Calculated measurement uncertainty =  $\pm 2.3$ dB

Date: 2002-11-01

## **TEST REPORT**

Page 14 of 20

No.: HM109144

### **3.2 26dB Bandwidth of Fundamental Emission**

|                    |                                  |
|--------------------|----------------------------------|
| Test Requirement:  | FCC 47 CFR 15.227                |
| Test Method:       | ANSI C63.4:2000 (Section 13.1.7) |
| Test Date:         | 2002-10-30                       |
| Mode of Operation: | On mode                          |

#### **Test Method:**

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

#### **Test Setup:**

As Test Setup of clause 3.1.1 in this test report.

Date: 2002-11-01

## TEST REPORT

Page 15 of 20

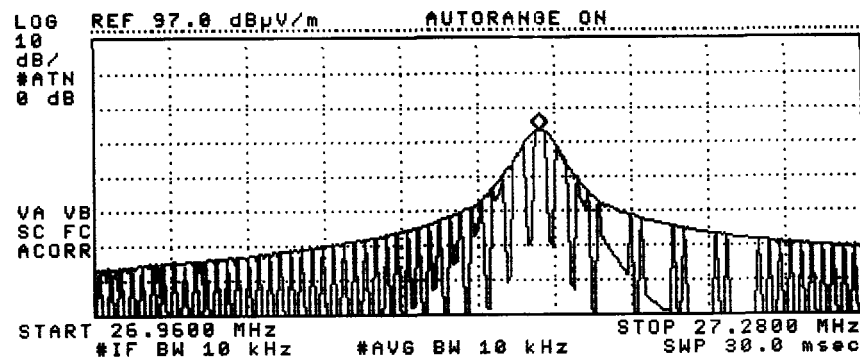
No.: HM109144

Limits for 26 dB Bandwidth of Fundamental Emission:

| Frequency Range<br>[MHz] | 26dB Bandwidth<br>[KHz] | FCC Limits *<br>[KHz] |
|--------------------------|-------------------------|-----------------------|
| 27.145                   | 29.7                    | within 26.96-27.28    |

### 26dB Bandwidth of Fundamental Emission

09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997  
MARKER 27.1456 MHz 70.09 dB $\mu$ V/m  
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 27.1456 MHz 70.09 dB $\mu$ V/m



Date: 2002-11-01

## TEST REPORT

Page 16 of 20

No.: HM109144

### Appendix A

#### Test Equipment Audit

##### Radiated Emission

| EQP NO. | DESCRIPTION                                                                  | MANUFACTURER                                          | MODEL NO.                      | SERIAL NO.                             | LAST CAL |
|---------|------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------|----------------------------------------|----------|
| EM007   | SPECTRUM ANALYZER                                                            | HEWLETT PACKARD                                       | HP85660B                       | 3144A21192                             | 07/09/01 |
| EM008   | SPECTRUM ANALYZER DISPLAY                                                    | HEWLETT PACKARD                                       | HP85662A                       | 3144A20514                             | 07/09/01 |
| EM009   | QUASI PEAK ADAPTOR                                                           | HEWLETT PACKARD                                       | HP85650A                       | 3303A01702                             | 07/09/01 |
| EM010   | RF PRESELECTOR                                                               | HEWLETT PACKARD                                       | HP85685A                       | 3221A01410                             | 07/09/01 |
| EM011   | ATTENUATOR/SWITCH                                                            | HEWLETT PACKARD                                       | HP11713A                       | 2508A10595                             | 07/09/01 |
| EM012   | PRE-AMPLIFIER                                                                | HEWLETT PACKARD                                       | HP8449B                        | 3008A00262                             | 07/09/01 |
| EM013   | CONTROLLER (COMPUTER),<br>COLOR MONITOR, KEYBOARD &<br>MOUSE<br>FLOPPY DRIVE | HEWLETT PACKARD<br>HEWLETT PACKARD<br>HEWLETT PACKARD | HP9000<br>HP A1097C<br>HP9133L | 6226A60314<br>3151J39517<br>2623A02468 | CM       |
| EM020   | HORN ANTENNA                                                                 | EMCO                                                  | 3115                           | 4032                                   | 19/07/00 |
| EM022   | LOOP ANTENNA                                                                 | EMCO                                                  | 6502                           | 1189-2424                              | 04/08/00 |
| EM072   | SIGNAL GENERATOR                                                             | HEWLETT PACKARD                                       | 8640B                          | 1948A11892                             | N/A      |
| EM083   | HKSTC OPEN AREA TEST SITE                                                    | HKSTC                                                 | N/A                            | N/A                                    | 14/02/02 |
| EM131   | PORTABLE SPECTRUM<br>ANALYSER                                                | HEWLETT PACKARD                                       | 8595EM                         | 3710A00155                             | 18/12/01 |
| EM145   | EMI TEST RECEIVER                                                            | R & S                                                 | ESCS 30                        | 830245/021                             | 22/07/02 |
| EM194   | BICONILOG ANTENNA                                                            | EMCO                                                  | 3142B                          | 1795                                   | 14/05/02 |
| EM195   | ANTENNA POSITIONING MAST                                                     | EMCO                                                  | 2075                           | 2368                                   | N/A      |
| EM196   | MULTI-DEVICE CONTROLLER                                                      | EMCO                                                  | 2090                           | 1662                                   | N/A      |

##### Conducted Emission

| EQP NO. | DESCRIPTION                         | MANUFACTURER                     | MODEL NO.  | SERIAL NO.          | LAST CAL |
|---------|-------------------------------------|----------------------------------|------------|---------------------|----------|
| EM078   | VARIAC                              | SHANGHAI VOLTAGE                 | TDGC-3/0.5 | N/A                 | CM       |
| EM081   | SMALL SCREENED ROOM                 | MIKO INST HK                     | N/A        | N/A                 | 04/10/01 |
| EM119   | LISN                                | R & S                            | ESH3-Z5    | 0831.5518.52        | 31/08/00 |
| EM127   | ISOLATION TRANSFORMER 220<br>TO 300 | WING SUN                         | N/A        | N/A                 | CM       |
| EM142   | PULSES LIMITER                      | R & S                            | ESH3Z2     | 357.8810.52         | 04/07/01 |
| EM181   | EMI TEST RECEIVER                   | R & S                            | ESIB7      | 100072              | 28/11/01 |
| EM154   | SHIELDING ROOM                      | SIEMENA MATSUSHITA<br>COMPONENTS | N/A        | 803-740-057-<br>99A | 02/01/02 |
| EM197   | LISN                                | EMCO                             | 4825/2     | 1193                | 28/03/02 |

Remarks:

CM        Corrective Maintenance  
N/A       Not Applicable or Not Available  
TBD       To Be Determined

Date: 2002-11-01

## TEST REPORT

Page 17 of 20

No.: HM109144

### Appendix B

#### Duty Cycle Correction During 100msec

Each function key sends a different series of characters, but each packet period (54.98msec) never exceeds a series of 4 long (1.2msec) and 58 short (375µsec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered  $4 \times 1.2\text{msec} + 58 \times 375\mu\text{sec}$  per 54.98msec = 48.3% duty cycle. Figure A through C show the characteristics of the pulse train for one of these functions.

Remarks:

Duty Cycle Correction =  $20\text{Log}(0.483) = -6.3\text{dB}$

The following figures [Figure A to Figure C] showed the characteristics of the pulse train for one of these functions.

Figure A [Pulse Train]

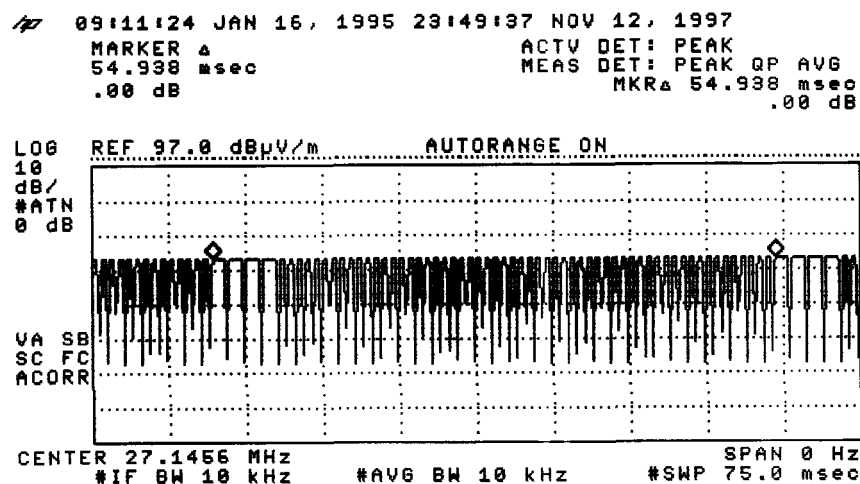


Figure B [Long Pulse]

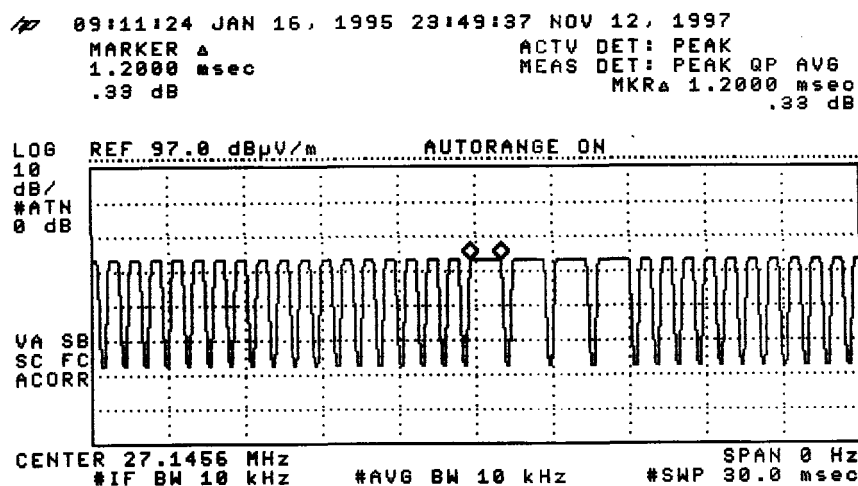
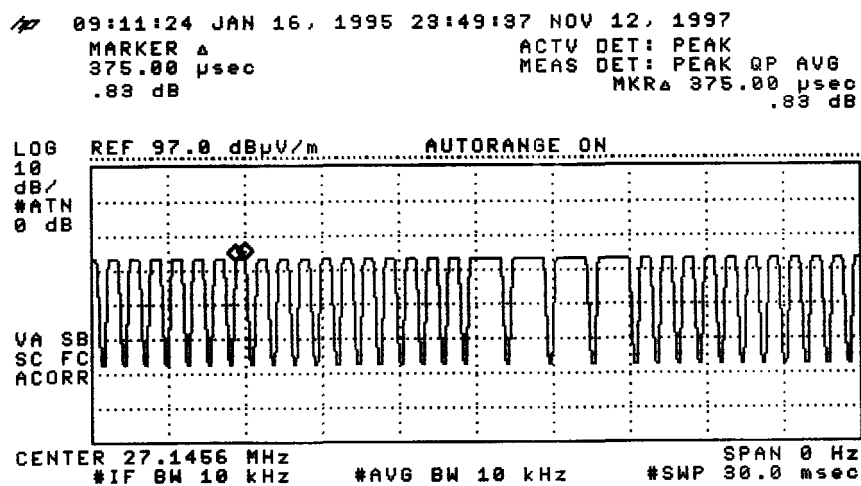


Figure C [Short Pulse]



Date: 2002-11-01

## TEST REPORT

Page 19 of 20

No.: HM109144

### Appendix C

#### Photographs of EUT

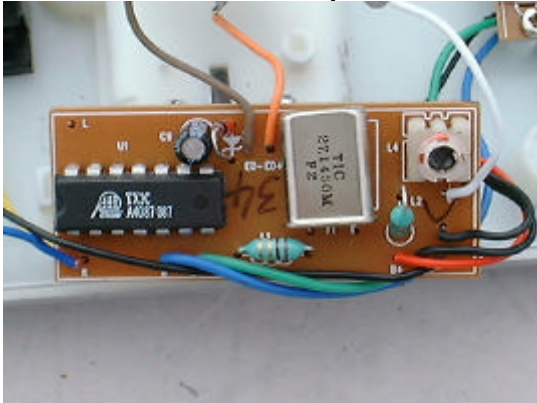
Front View of the product



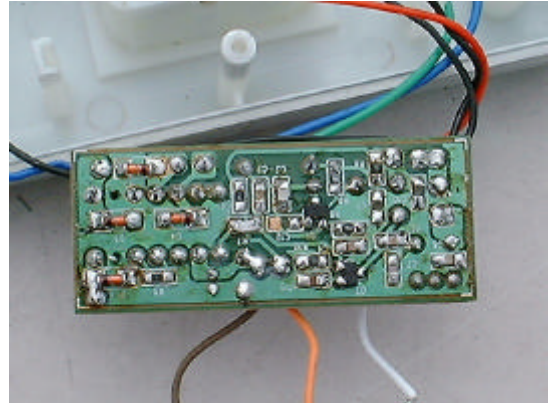
Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



Date: 2002-11-01

## **TEST REPORT**

Page 20 of 20

No.: HM109144

### Photographs of EUT

Measurement of Radiated Emission Test Set Up



End of Document