

Date: 2001-08-15

# **TEST REPORT**

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No.: HM105553

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

### **FOR LOW POWER TRANSMITTER**

**TEST REPORT No.: HM105553**

Equipment Under Test [EUT]:  
Model Number:  
Applicant:  
FCC ID :

Radio Control Toy Car  
608  
Hitari Ltd.  
NF260827

Date: 2001-08-15

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### **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.

Law Man Kit

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Verify by

Patrick Wong

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Patrick Wong  
for Managing Director

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## **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**

HITARI LTD.  
Braeside House, 43, Broomfield, Adel,  
LEEDS LS16 6AE, UK

Telephone: 852 2312 2800  
Fax: 852 2312 6750

**HKSTC Code Number for Applicant**

**HIL002**

### **Manufacturer**

WAVECON ELECTRONICS LTD.  
4/F., Blk. B Wo Fung Ind. Bldg.,  
20 Yip Wo St., On Lok Tsuen, Fanling, N.T., Hong Kong.

Telephone: 852 2312 2800  
Fax: 852 2312 6750

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### **1.3 Equipment Under Test [EUT]**

#### **Description of Sample**

|                |                                 |
|----------------|---------------------------------|
| Product:       | Radio Control Toy Car           |
| Manufacturer:  | Wavecon Electronics Ltd.        |
| Brand Name:    | N/A                             |
| Model Number:  | 608                             |
| Input Voltage: | 9Vd.c ("6F22" size battery x 1) |

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

The Equipment Under Test (EUT) is an Hitari Ltd., 27.144 MHz Transmitter. The transmitter is a 2 button transmitter. The EUT continues to transmit while button is being pressed. It is voice transmission & remote control toy, Modulation by IC and tape is frequency modulation.

### **1.4 Date of Order**

2001-08-06

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

1 Sample per model

### **1.6 Test Duration**

2001-08-13

### **1.7 Country of Origin**

China

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**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"/> |
| Rating Label                       | <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"/> |



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### **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 C63.4:1992 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 C63.4:1992 | N/A                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Radiated Emissions,<br>30MHz to 1GHz                               | FCC 47CFR 15.209 | ANSI C63.4:1992 | Class B             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Conducted Emissions<br>on AC, 0.45MHz to<br>30MHz                  | FCC 47CFR 15.207 | ANSI C63.4:1992 | 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**

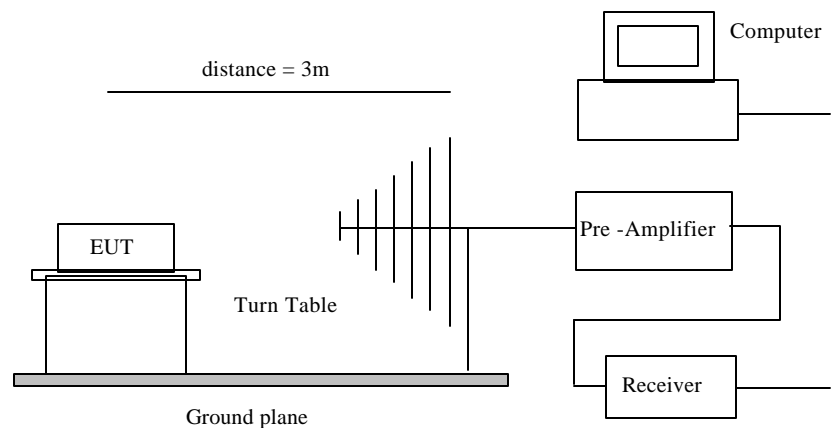
|                    |                  |
|--------------------|------------------|
| Test Requirement:  | FCC 47CFR 15.227 |
| Test Method:       | ANSI C63.4:1992  |
| Test Date:         | 2001-08-13       |
| Mode of Operation: | On mode          |

#### **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:**



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

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

### Results:

| Field Strength of Fundamental Emissions<br>Peak Value |                   |                           |                          |                        |                         |                  |
|---|-------------------|---------------------------|--------------------------|------------------------|-------------------------|------------------|
| Frequency<br>MHz                                      | Level @3m<br>dBμV | Correction Factor<br>dB/m | Field Strength<br>dBμV/m | Field Strength<br>μV/m | Limit **<br>@3m<br>μV/m | Antenna Polarity |
| 27.144  | 51.3              | 18.5                      | 69.8                     | 3,090.3                | 100,000                 | 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:

\*: 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

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**Results:**

| <b>Field Strength of Fundamental Emissions</b> |       |            |          |          |          |          |
|--|-------|------------|----------|----------|----------|----------|
| <b>Average Value *</b>                         |       |            |          |          |          |          |
| Frequency                                      | Level | Correction | Field    | Field    | Limit ** | Antenna  |
| MHz  | @3m   | Factor     | Strength | Strength | @3m      | Polarity |
|  | dBμV  | dB/m       | dBμV/m   | μV/m     | μV/m     |          |
| 27.144   | 44.0  | 18.5       | 62.5     | 1,333.5  | 100,00   | Vertical |

Remark:

\*: Adjusted by Duty Cycle = -7.3dB

Correction Factor included Antenna Factor and Cable Attenuation.

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

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

| Frequency Range<br>[MHz] | Quasi-Peak Limits<br>[ $\mu\text{V/m}$ ] |
|--------------------------|--|
| 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 :Transmitter

| Radiated Emissions<br>Quasi-Peak |                                  |                              |   |                                      |                                 |                     |
|----------------------------------|----------------------------------|------------------------------|---|--------------------------------------|---------------------------------|---------------------|
| Frequency<br>MHz                 | Level<br>@3m<br>dB $\mu\text{V}$ | Correction<br>Factor<br>dB/m | Field<br>Strength<br>dB $\mu\text{V/m}$ | Field<br>Strength<br>$\mu\text{V/m}$ | Limit<br>@3m<br>$\mu\text{V/m}$ | Antenna<br>Polarity |
| 54.3                             | <1.0                             | 12.9                         | <13.9                                   | <4.9                                 | 100                             | Vertical            |
| 81.4                             | <1.0                             | 8.9                          | <10.8                                   | <3.5                                 | 100                             | Vertical            |
| 108.6                            | <1.0                             | 12.2                         | <12.5                                   | <4.2                                 | 150                             | Vertical            |
| 135.7                            | <1.0                             | 10.8                         | <16.9                                   | <7.0                                 | 150                             | Vertical            |
| 162.9                            | <1.0                             | 9.5                          | <18.0                                   | <7.9                                 | 150                             | Vertical            |
| 190.0                            | <1.0                             | 11.1                         | <18.2                                   | <8.1                                 | 150                             | Vertical            |
| 217.2                            | <1.0                             | 12.2                         | <19.8                                   | <9.8                                 | 200                             | Vertical            |
| 244.3                            | <1.0                             | 13.5                         | <20.7                                   | <10.8                                | 200                             | Vertical            |
| 271.4                            | <1.0                             | 16.0                         | <21.6                                   | <12.0                                | 200                             | Vertical            |

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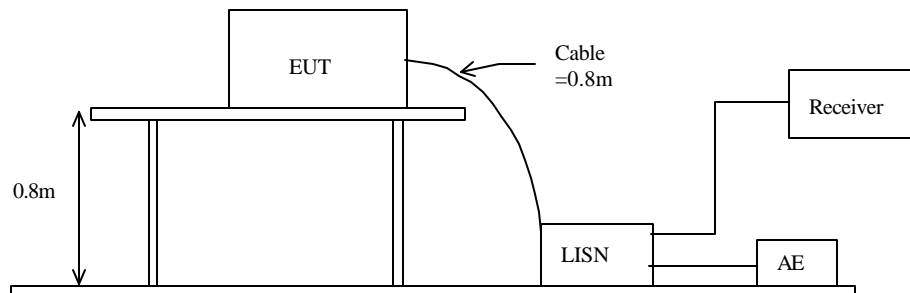
### 3.1.1 Conducted Emissions (0.45MHz to 30MHz)

|                    |                  |
|--------------------|------------------|
| Test Requirement:  | FCC 47CFR 15.207 |
| Test Method:       | ANSI C63.4:1992  |
| Test Date:         | 2001-08-13       |
| Mode of Operation: | On mode          |

#### Test Method:

The test was performed in accordance with ANSI C63.4:1992, 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:



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

| Frequency Range<br>[MHz] | Quasi-Peak Limits<br>[μV/m] |
|--------------------------|-----------------------------|
| 0.45-30                  | 250                         |

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

|  |            |
|--|------------|
| <b>Results:</b>  | <b>N/A</b> |
| <b>The EUT is operated by internal battery power only, therefore power line conducted emission was deemed unnecessary.</b> |            |

Remarks:

Calculated measurement uncertainty =  $\pm 2.3\text{dB}$

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

|                    |                                  |
|--------------------|----------------------------------|
| Test Requirement:  | FCC 47 CFR 15.227                |
| Test Method:       | ANSI C63.4:1992 (Section 13.1.7) |
| Test Date:         | 2001-08-13                       |
| 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.



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Limits for 26 dB Bandwidth of Fundamental Emission:

| Frequency Range<br>[MHz] | 26dB Bandwidth<br>[KHz] | FCC Limits *<br>[KHz] |
|--------------------------|-------------------------|-----------------------|
| 27.144                   | 9.2                     | within 26.96-27.28    |

### 26dB Bandwidth of Fundamental Emission

09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997

ACTV DET: PEAK

MEAS DET: PEAK QP AVG

MKR 27.1448 MHz

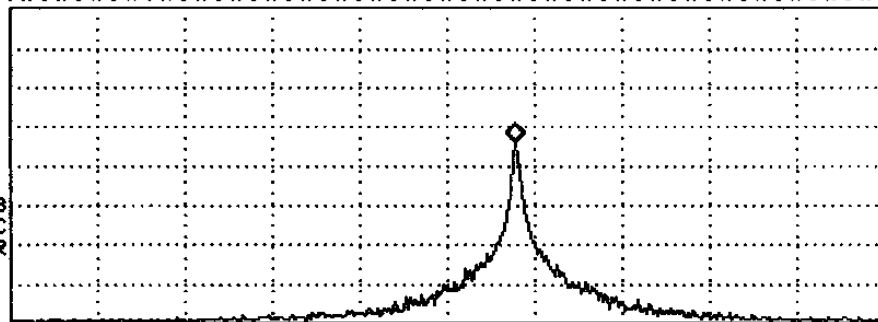
52.95 dB $\mu$ V/m

LOG REF 87.0 dB $\mu$ V/m AUTORANGE ON

10  
dB/  
#ATH  
0 dB

VA SB  
SC FC  
ACORR

START 26.9600 MHz STOP 27.2800 MHz  
#IF BW 1.0 kHz #AVG BW 10 kHz SWP 960 msec



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### Appendix A

#### Test Equipment Audit

##### Radiated Emission

| EQP NO. | DESCRIPTION  | MANUFACTURER  | MODEL NO.                      | SERIAL NO.                             | LAST CAL. |
|---------|--|---|--------------------------------|--|-----------|
| EM007   | SPECTRUM ANALYZER  | HEWLETT PACKARD                                       | HP85660B                       | 3144A21192                             | 18/07/00  |
| EM008   | SPECTRUM ANALYZER DISPLAY  | HEWLETT PACKARD                                       | HP85662A                       | 3144A20514                             | 18/07/00  |
| EM009   | QUASI PEAK ADAPTOR   | HEWLETT PACKARD                                       | HP85650A                       | 3303A01702                             | 18/07/00  |
| EM010   | RF PRESELECTOR   | HEWLETT PACKARD                                       | HP85685A                       | 3221A01410                             | 18/07/00  |
| EM011   | ATTENUATOR/SWITCH  | HEWLETT PACKARD                                       | HP11713A                       | 2508A10595                             | 18/07/00  |
| EM012   | PRE-AMPLIFIER  | HEWLETT PACKARD                                       | HP8449B                        | 3008A00262                             | 18/07/00  |
| 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        |
| EM131   | PORTABLE SPECTRUM<br>ANALYSER  | HEWLETT PACKARD                                       | 8595EM                         | 3710A00155                             | 10/07/00  |
| EM017   | ANTENNA  | ARA INC.  | LPB-2513/A                     | 1069                                   | 17/02/00  |
| EM020   | HORN ANTENNA   | EMCO  | 3115                           | 4032                                   | 09/08/00  |
| EM072   | SIGNAL GENERATOR   | HEWLETT PACKARD                                       | 8640B                          | 1948A11892                             | 30/03/98  |
| EM083   | HKSTC OPEN AREA TEST SITE  | HKSTC   | N/A                            | N/A                                    | 15/02/01  |
| EM145   | EMI TEST RECEIVER  | R & S   | ESCS 30                        | 830245/021                             | 31/05/00  |

##### 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          | 10/09/00 |
| EM002   | LISN                                | EMCO             | 3825-2     | 9005-1657    | 27/07/99 |
| EM119   | LISN                                | R & S            | ESH3-Z5    | 0831.5518.52 | 31/08/00 |
| EM145   | EMI TEST RECEIVER                   | R & S            | ESCS 30    | 830245/021   | 31/05/00 |
| EM120   | EMI TEST RECEIVER                   | R&S              | ESHS10     | 1004.0401.10 | 04/09/00 |
| EM127   | ISOLATION TRANSFORMER 220<br>TO 300 | WING SUN         | N/A        | N/A          | N/A      |
| EM142   | PLUSE LIMITER                       | R & S            | ESH3Z2     | 357.8810.52  | 29/01/00 |

Remarks:

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

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### Appendix B

#### Duty Cycle Correction During 100msec

Each function key sends a different series of characters, but each packet period (32.5msec) never exceeds a series of 6 long (1.5msec) and 10 short (500µsec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered  $6 \times 1.5\text{msec} + 10 \times 500\mu\text{sec}$  per 32.5msec = 43% duty cycle. Figure A through C show the characteristics of the pulse train for one of these functions.

Remarks:

Duty Cycle Correction =  $20\text{Log}(0.43) = -7.3\text{dB}$

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

Figure A [Pulse Train]

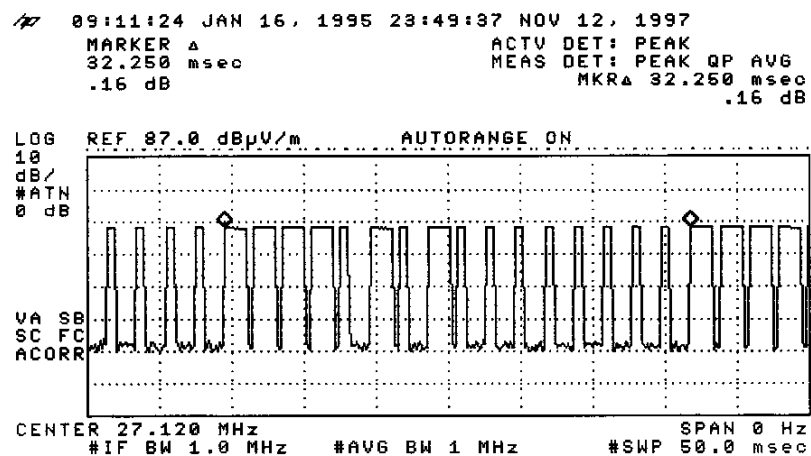


Figure B [Long Pulse]

09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997  
MARKER  $\Delta$  ACTV DET: PEAK  
1.5000 msec MEAS DET: PEAK QP AVG  
-.24 dB MKR  $\Delta$  1.5000 msec  
-.24 dB

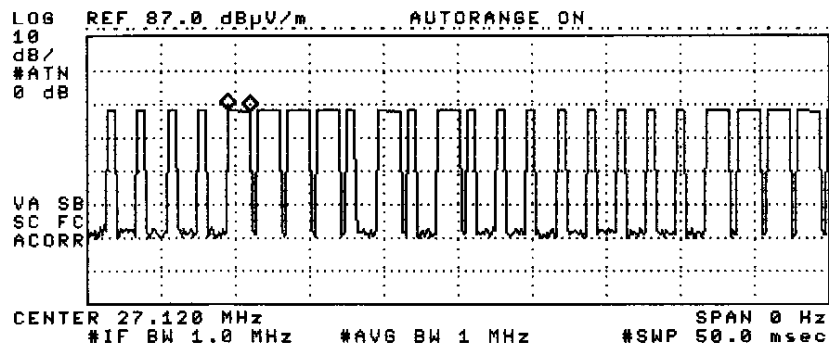
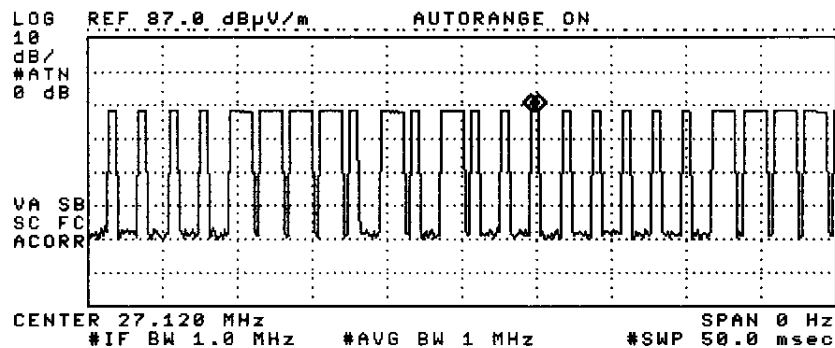


Figure C [Short Pulse]

09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997  
MARKER  $\Delta$  ACTV DET: PEAK  
500.00  $\mu$ sec MEAS DET: PEAK QP AVG  
-.02 dB MKR  $\Delta$  500.00  $\mu$ sec  
-.02 dB



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### Appendix C

#### Photographs of EUT

Front View of the product



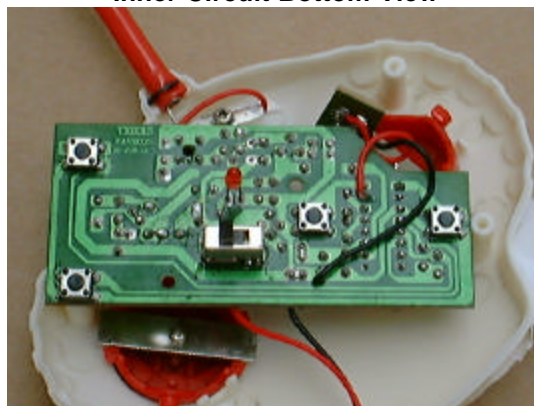
Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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