

Date: 2001-07-16

# **TEST REPORT**

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No.: HM105443

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

### **FOR LOW POWER TRANSMITTER**

**TEST REPORT No.: HM105443**

Equipment Under Test [EUT]:

Model Number:

Applicant:

FCC ID :

Handy Switch

HS-002T

Openzone

PSF-0701HS002

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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**

OPENZONE  
1956 Avenida Monte Vista, San Dimas, CA91773

Telephone: 0011 626 573 9710  
Fax: 0011 626 332 7369

**HKSTC Code Number for Applicant**

**OPE001**

### **Manufacturer**

EVERTOP OVERSEAS (ASIA) LIMITED.  
Rm. 13, 8/F., Yale Industrial Centre, 61-63 Au Pui Wan St.,  
Fo Tan, Shatin, Hong Kong.

Telephone: 852 2763 6488  
Fax: 852 2322 6819

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

#### **Description of Sample**

Product: Handy Switch  
Manufacturer: Evertop Overseas (Asia) Ltd.  
Brand Name: N/A  
Model Number: HS-002T  
Input Voltage: 12Vd.c.

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

The Equipment Under Test (EUT) is an Openzone, 433.6MHz RF wireless remote control. The EUT is to transmit RF signal while each button is be pressed Modulation by Data Code. Tape is pulses modulation.

### **1.4 Date of Order**

2000-08-26

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

7 Samples per model

### **1.6 Test Duration**

2001-07-13

### **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 Results Summary</b>						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	N/A
Field Strength of Fundamental Emissions & Spurious Emissions	FCC 47CFR 15.231a	ANSI C63.4:1992	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Emissions, 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 on AC, 0.45MHz to 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



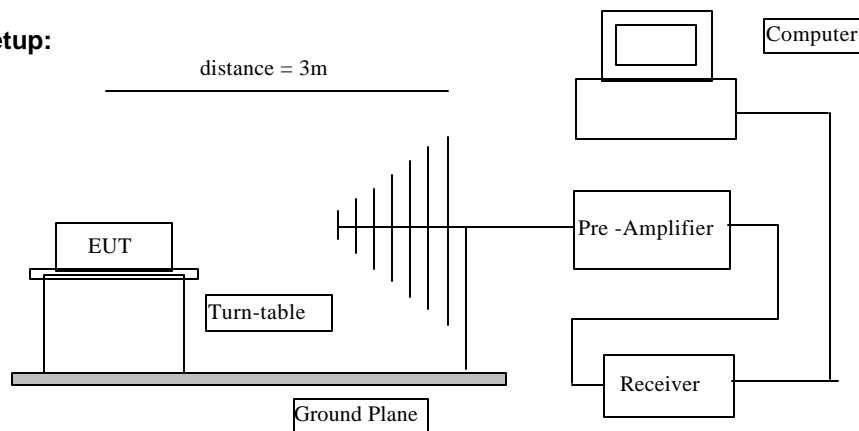
**3.0 Test Results****3.1 Emission****3.1.1 Radiated Emissions**

Test Requirement:	FCC 47CFR 15.231a
Test Method:	ANSI C63.4:1992
Test Date:	2001-07-13
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:**

**Limits for Field Strength of Fundamental Emissions [FCC 47CFR 15.231a]:**

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emissions [μV/m]	Field Strength of Spurious Emissions [μV/m]
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 *	50 to 150 *
174-260	1,500	150
260-470	1,500 to 5,000 *	150 to 500 *
Above 470	5,000	500

\*\* Linear interpolations

Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz,  $\mu\text{V/m}$  at meters=56.81818(F)-6136.3636; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =41.6667(F)-7083.3333. The maximum permissible unwanted emission level is 20dB below the maximum fundamental level.

**Results:**

Field Strength of Fundamental Emissions						
Peak Value						
Frequency	Level @3m	Correction Factor	Field Strength	Field Strength	Limit ** @3m	Antenna Polarity
MHz	dBμV	dB/m	dBμV/m	μV/m	μV/m	
433.6	61.9	21.7	83.6	15,135.6	109,833.4	Horizontal

Field Strength of Spurious Emissions						
Peak Value						
Frequency	Level @3m	Correction Factor	Field Strength	Field Strength	Limit @3m	Antenna Polarity
MHz	dBμV	dB/m	dBμV/m	μV/m	μV/m	
867.2	29.4	35.2	64.6	1698.2	10983.3	Horizontal
+1300.8	20.4	35.1	55.5	595.7	5000.0	Horizontal
1734.4	23.6	30.9	54.5	530.9	10983.3	Horizontal
2168.0	<1.0	26.2	27.2	22.9	10983.3	Vertical
2601.6	<1.0	28.0	29.0	28.2	10983.3	Vertical
3035.2	<1.0	28.5	29.5	29.9	10983.3	Vertical
3468.8	<1.0	30.6	31.6	38.0	10983.3	Vertical
+3902.4	<1.0	32.0	33.0	44.7	500.0	Vertical
+4336.0	<1.0	34.0	35.0	56.2	500.0	Vertical

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**Results:**

Field Strength of Fundamental Emissions Average Value *						
Frequency MHz	Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit ** @3m μV/m	Antenna Polarity
433.6	53.5	21.7	75.4	5754.4	10983.3	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	Antenna Polarity
867.2	21.0	35.2	64.6	1698.2	1098.3	Horizontal
+1300.8	12.0	35.1	47.1	226.5	500.0	Horizontal
1734.4	15.2	30.9	46.1	201.8	1098.3	Horizontal
2168.0	<1.0	26.2	27.2	22.9	1098.3	Vertical
2601.6	<1.0	28.0	29.0	28.2	1098.3	Vertical
3035.2	<1.0	28.5	29.5	29.9	1098.3	Vertical
3468.8	<1.0	30.6	31.6	38.0	1098.3	Vertical
+3902.4	<1.0	32.0	33.0	44.7	500.0	Vertical
+4336.0	<1.0	34.0	35.0	56.2	500.0	Vertical

**Remarks:**

\*: Adjusted by Duty Cycle = -8.4dB

\*\*: According to FCC C47CFR 15.231a,  
FCC Limit for Average Measurement =  $41.6667(433.6\text{MHz}) - 7083.3333 = 10983.34782\mu\text{V/m}$

+: Denotes restricted band of operation.  
Measurement were made using a peak detector. Any emission less than 1000 MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 were not adjusted for averaging and the limit of FCC Rules Part 15 Section 15.209 were applied

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	Quasi-Peak Limits
[MHz]	[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						
Quasi-Peak						
Frequency	Level @3m	Correction Factor	Field Strength	Field Strength	Limit @3m	Antenna Polarity
MHz	dBμV	dB/m	dBμV/m	μV/m	μV/m	
NO EMISSION DETECTED WITHIN 20dB OF THE FCC LIMITS						

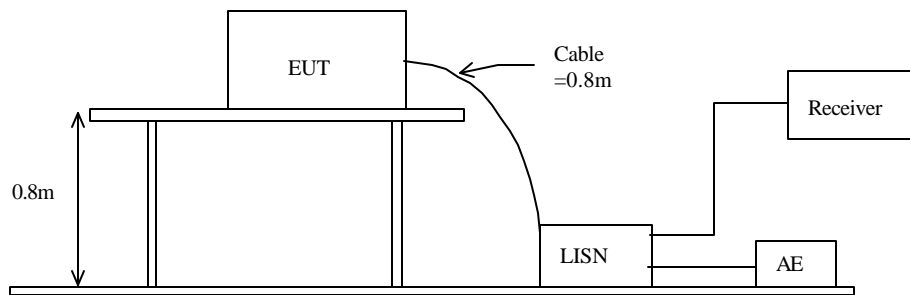
**3.1.1 Conducted Emissions (0.45MHz to 30MHz)**

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.4:1992
Test Date:	2001-07-13
Mode of Operation:	Not Applicable

**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 [MHz]	Quasi-Peak Limits [μV/m]
0.45-30	250

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

**Results:**

The EUT is operated by a single source of internal battery power [located in the battery compartment], therefore power line conducted emission was deemed unnecessary.

Remarks:

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

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### **3.2 20dB Bandwidth of Fundamental Emission**

Test Requirement:	FCC 47 CFR 15.231
Test Method:	ANSI C63.4:1992 (Section 13.1.7)
Test Date:	2001-07-13
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 20 dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [KHz]	FCC Limits * [KHz]
433.6	150.0	1084

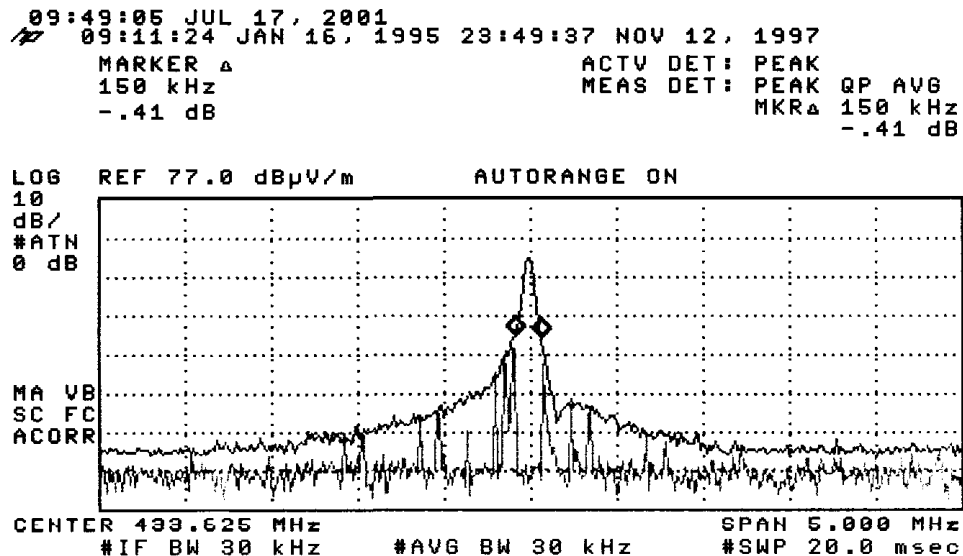
Remarks:

\*: FCC Limit for Bandwidth measurement =  $(0.25\%)(\text{Center Frequency})$   
=  $(0.0025)(433.6)$   
= 1084KHz

### Results:

The following figure is the measured bandwidth of Fundamental Emission.

### 20dB Bandwidth of Fundamental Emission





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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 PRESELECTION	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), COLOR MONITOR, KEYBOARD & MOUSE FLOPPY DRIVE	HEWLETT PACKARD HEWLETT PACKARD HEWLETT PACKARD	HP9000 HP A1097C HP9133L	6226A60314 3151J39517 2623A02468	CM
EM131	PORTABLE SPECTRUM 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 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

## Appendix B

### Duty Cycle Correction During 100msec

Each function key sends a different series of characters, but each packet period (28msec) never exceeds a series of 14 long (600µsec) and 11 short (200µsec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered  $14 \times 600\mu\text{sec} + 11 \times 200\mu\text{sec}$  per 28msec = 37.8% duty cycle. Figure A through C show the characteristics of the pulse train for one of these functions.

Remarks:

Duty Cycle Correction =  $20\text{Log}(0.378) = -84\text{dB}$

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

Figure A [Pulse Train]
------------------------

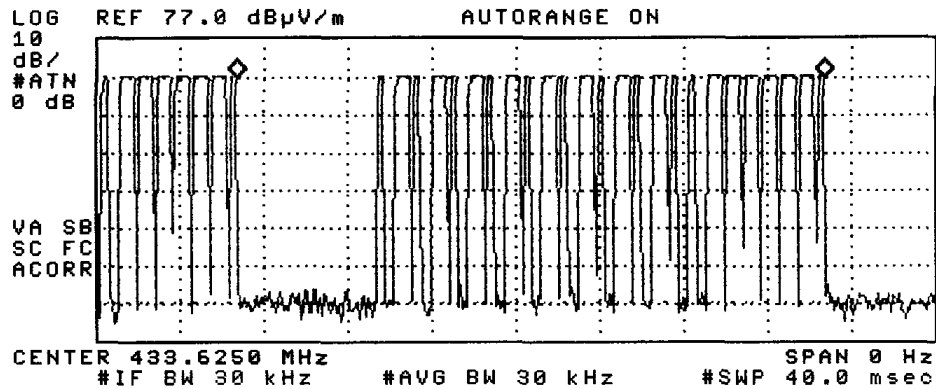
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09:35:37 JUL 17, 2001  
09:11:24 JAN 16, 1995 23:49:37 NOV 12, 1997  
MARKER  $\Delta$  ACTV DET: PEAK  
28.000 msec MEAS DET: PEAK QP AVG  
.00 dB MKRA 28.000 msec  
.00 dB



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Figure B [Long Pulse]

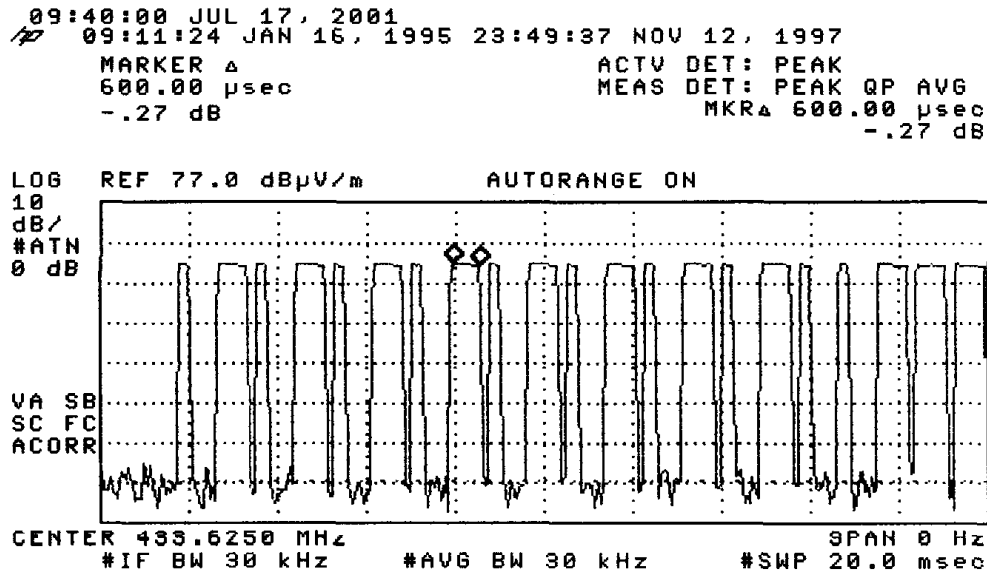
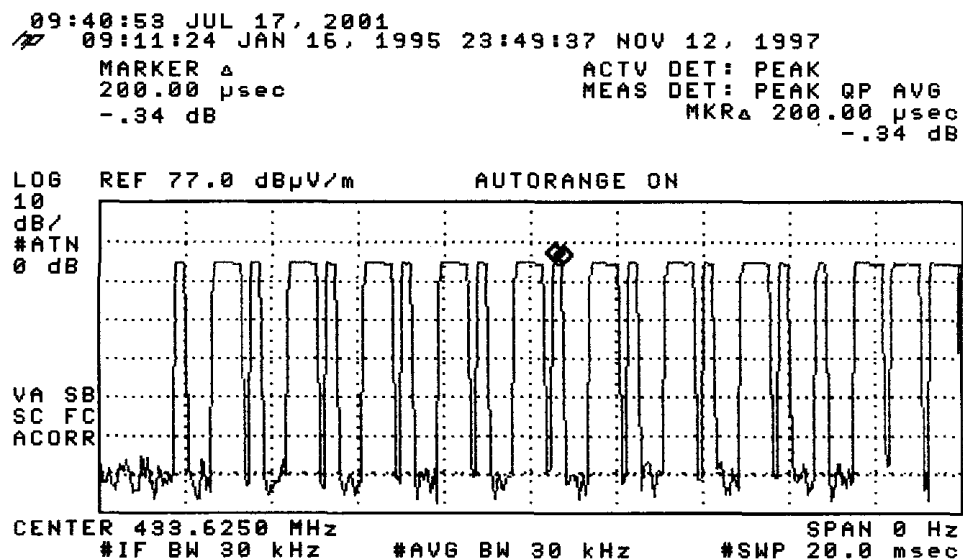


Figure C [Short Pulse]



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### **Appendix C**

#### **Periodic Operation [FCC 47CFR 15.231a]**

According to FCC 47CFR15.231a. A transmitter manually activated must automatically deactivate within not more than 5 seconds of being released. The transmitter is a 3 button transmitter. The EUT continues to transmit while each button is being pressed. The EUT ceases transmission almost immediately upon being released and appears to finish the current packet being transmitted. Therefore the longest period of time the transmitter should take to deactivate is a packet length.

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### **Appendix D**

#### **Photographs of EUT**

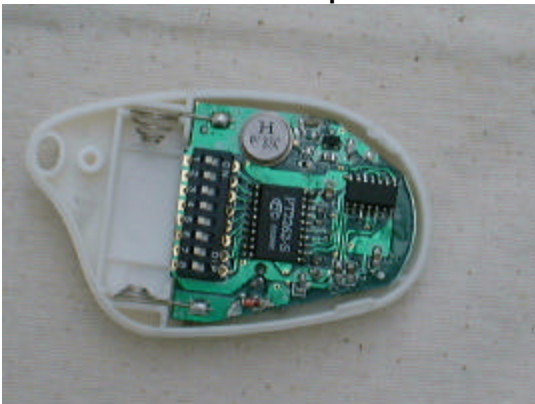
**Front View of the product**



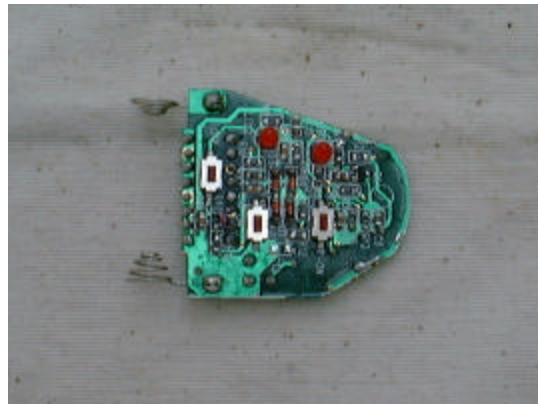
**Rear View of the product**



**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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