

Date: 2002-08-22

No.: HM108593

## **TEST REPORT**

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

#### **FOR LOW POWER TRANSMITTER**

#### **TEST REPORT No.: HM108593**

Equipment Under Test [EUT]:

Model Number:

Applicant:

FCC ID :

Finderz Keyperz

RT3310

Crystal Field Ltd.

NLHRT3310

Date: 2002-08-22

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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.

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Verify by

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Patrick Wong  
for Chief Executive

Date: 2002-08-22

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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**

CRYSTAL FIELD LTD.  
Unit 23, 16/F., Goldfield Ind. Ctr.,  
1 Sui Wo Road, Fotan, Shatin, N.T., Hong Kong.

Telephone: 852 2601 9282  
Fax: 852 2692 3197

**HKSTC Code Number for Applicant**

**CRF001**

##### **Manufacturer**

CRYSTAL FIELD LTD.  
Unit 23, 16/F., Goldfield Ind. Ctr.,  
1 Sui Wo Road, Fotan, Shatin, N.T., Hong Kong.

Telephone: 852 2601 9282  
Fax: 852 2692 3197

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

#### **Description of Sample**

Product: Finderz Keyperz  
Manufacturer: Crystal Field Ltd.  
Brand Name: Atamia  
Model Number: RT3310  
Input Voltage: 3Vd.c ("LIR2450" rechargeable battery x 1) with jack  
The AC/DC Adapter used for the tests was provided by the applicant with the following details: Model: U075015D12, Input: 120Va.c. 60Hz 6.5W, Output: 7.5Vd.c. 150mA

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

The Equipment Under Test (EUT) is a Crystal Field Ltd., Finderz Keyperz. The EUT is to transmit RF signal while each button is being, Modulation by Data Code tape is pulses modulation.

### **1.4 Date of Order**

2002-08-10

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

2 Samples per model

### **1.6 Test Duration**

2002-08-21 to 2002-08-22

### **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"/>
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 C63.4:2000 for FCC Certification.

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

EMISSION Results Summary						
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 C63.4:2000	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Emissions, 30MHz to 1GHz	FCC 47CFR 15.209	ANSI C63.4:2000	Class B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Emissions, 30MHz to 1GHz	FCC 47CFR 15.109	ANSI C63.4:2000	Class B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conducted Emissions on AC, 0.15MHz to 30MHz	FCC 47CFR 15.207	ANSI C63.4:2000	Class B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: N/A - Not Applicable

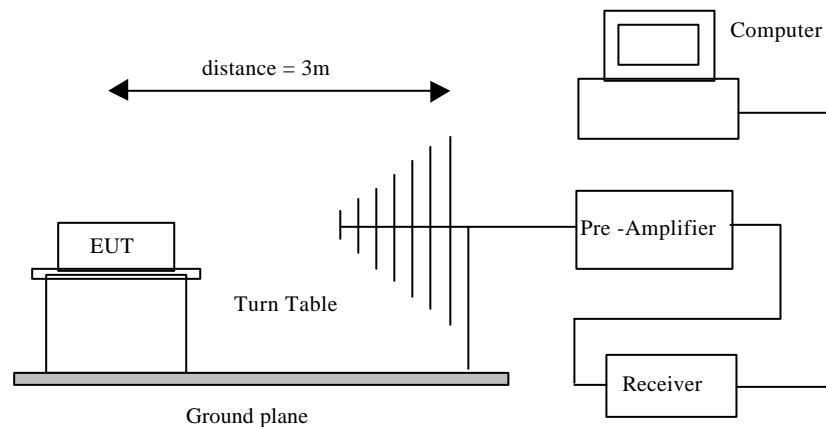
**3.0 Test Results****3.1 Emission****3.1.1 Radiated Emissions**

Test Requirement:	FCC 47CFR 15.231a
Test Method:	ANSI C63.4:2000
Test Date:	2002-08-21
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 polarization. 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 15.231a]:**

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Peak] [ $\mu$ V/m]	Field Strength of Fundamental Emission [Average] [ $\mu$ V/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,  $\mu$ V/m at meters=56.81818(F)-6136.3636; for the band 260-470 MHz,  $\mu$ 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 MHz	Measured Level @3m dB $\mu$ V/m	Correction Factor dB $\mu$ V/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit ** @3m $\mu$ V/m	Antenna Polarity
314.96	50.1	17.0	67.1	2264.6	60,400.1	Horizontal

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V/m	Correction Factor dB $\mu$ V/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit @3m $\mu$ V/m	Antenna Polarity
629.92	13.1	25.5	38.6	85.1	6,040.0	Horizontal
944.88	< 1.0	29.4	< 30.4	< 33.1	6,040.0	Vertical
1259.84	< 1.0	32.2	< 33.2	< 45.7	6,040.0	Vertical
+ 1574.80	< 1.0	15.9	< 16.9	< 7.0	5,000.0	Vertical
1889.76	< 1.0	17.4	< 18.4	< 8.3	6,040.0	Vertical
+ 2204.72	< 1.0	17.2	< 18.2	< 8.1	5,000.0	Vertical
2519.68	< 1.0	18.8	< 19.8	< 9.8	6,040.0	Vertical
+ 2834.64	< 1.0	19.7	< 20.7	< 10.8	5,000.0	Vertical
3149.60	< 1.0	20.6	< 21.6	< 12.0	6,040.0	Vertical

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### Results:

Field Strength of Fundamental Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V/m	Correction Factor dB $\mu$ V/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit ** @3m $\mu$ V/m	Antenna Polarity
314.96	39.9	17.0	56.9	699.8	6,040.0	Horizontal

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V/m	Correction Factor dB $\mu$ V/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit @3m $\mu$ V/m	Antenna Polarity
629.92	2.9	25.5	28.4	26.3	604.0	Horizontal
944.88	< 1.0	29.4	< 30.4	< 33.1	604.0	Vertical
1259.84	< 1.0	32.2	< 33.2	< 45.7	604.0	Vertical
+ 1574.80	< 1.0	15.9	< 16.9	< 7.0	500.0	Vertical
1889.76	< 1.0	17.4	< 18.4	< 8.3	604.0	Vertical
+ 2204.72	< 1.0	17.2	< 18.2	< 8.1	500.0	Vertical
2519.68	< 1.0	18.8	< 19.8	< 9.8	604.0	Vertical
+ 2834.64	< 1.0	19.7	< 20.7	< 10.8	500.0	Vertical
3149.60	< 1.0	20.6	< 21.6	< 12.0	604.0	Vertical

### Remarks:

\*: Adjusted by Duty Cycle = -10.2dB

\*\*: According to FCC C47CFR 15.231a,  
FCC Limit for Average Measurement =  $41.6667(314.96\text{MHz})-7083.3333=6,040.0\mu\text{V/m}$

+: Denotes restricted band of operation.  
Measurements 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  $\pm 3.7\text{dB}$   
300MHz to 1GHz  $+3.0\text{dB} / -2.7\text{dB}$

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

Frequency Range [MHz]	Quasi-Peak Limits [ $\mu$ V/m]
30-88	100
88-216	150
216-960	200
Above 960	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 MHz	Measured Level @3m dB $\mu$ V/m	Correction Factor dB $\mu$ V/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit @3m $\mu$ V/m	Antenna Polarity
NO EMISSION DETECTED WITHIN 20dB OF THE FCC LIMITS						

Remarks:

\*: Linear interpolations

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty = 30MHz to 300MHz  $\pm 3.7$ dB  
300MHz to 1GHz  $\pm 3.0$ dB /  $-2.7$ dB

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Limited for Radiated Emissions [FCC 47 CFR 15.109 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [ $\mu$ V/m]
30-88	100
88-216	150
216-960	200
Above 960	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: Receiver**

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	Antenna Polarity	Level . @3m dB $\mu$ V/m	Limit . @3m dB $\mu$ V/m	Level @3m . @3m $\mu$ V/m	Limit . @3m $\mu$ V/m
312.100	Vertical	34.3	46	51.9	200.0
312.400	Horizontal	37.0	46	70.8	200.0
624.800	Horizontal	33.7	46	48.4	200.0

\*\* For effective averaging, the bandwidth of the video filter must be smaller than the resolution bandwidth. The higher the ratio of resolution bandwidth to video bandwidth, the greater the averaging will be recorded. Below setting for HP8572A EMI Receiver.

Resolution Bandwidth = 3MHz  
Video Bandwidth = 1Hz

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

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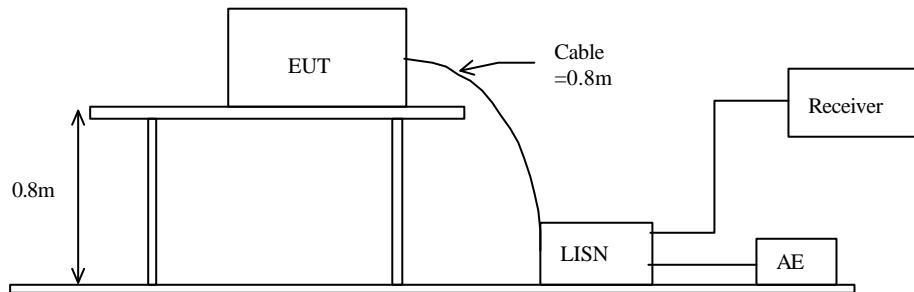
## **3.1.1 Conducted Emissions (0.45MHz to 30MHz)**

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.4:2000
Test Date:	2002-08-22
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:**



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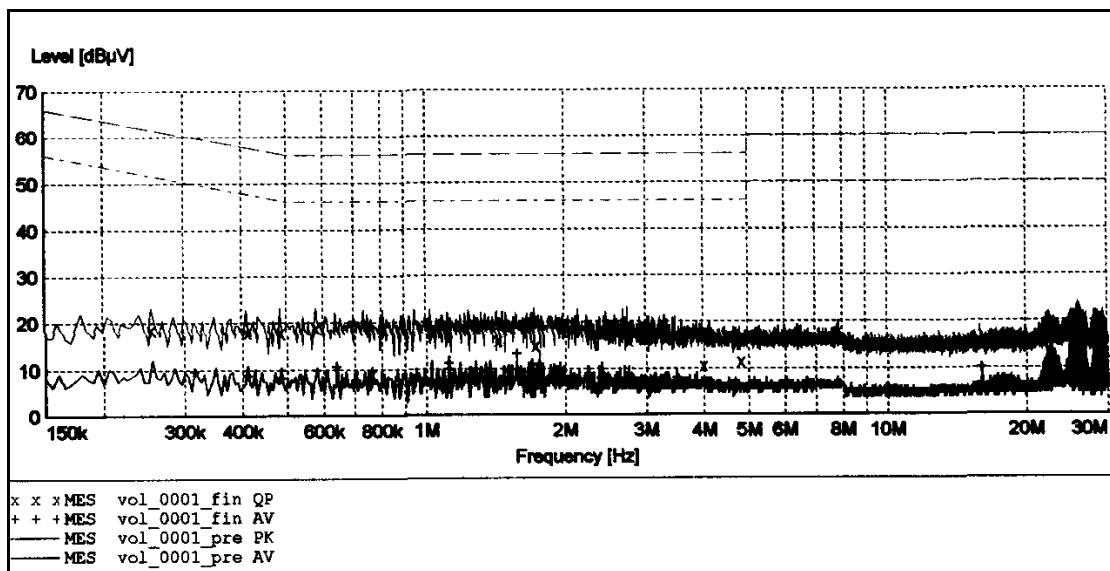
No.: HM108593

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

Frequency Range [MHz]	Quasi-Peak Limits [dB $\mu$ V/m]	Average Limits [dB $\mu$ V/m]
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

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

## Results:



Conductor	Frequency	Quasi-Peak		Average	
		Level dB $\mu$ V/m	Limit dB $\mu$ V/m	Level dB $\mu$ V/m	Limit dB $\mu$ V/m
Live or Neutral	MHz				
NO EMISSION DETECTED WITHIN 20dB OF THE FCC LIMITS.					

Remarks:

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

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

Test Requirement:	FCC 47 CFR 15.231a
Test Method:	ANSI C63.4:2000 (Section 13.1.7)
Test Date:	2002-08-22
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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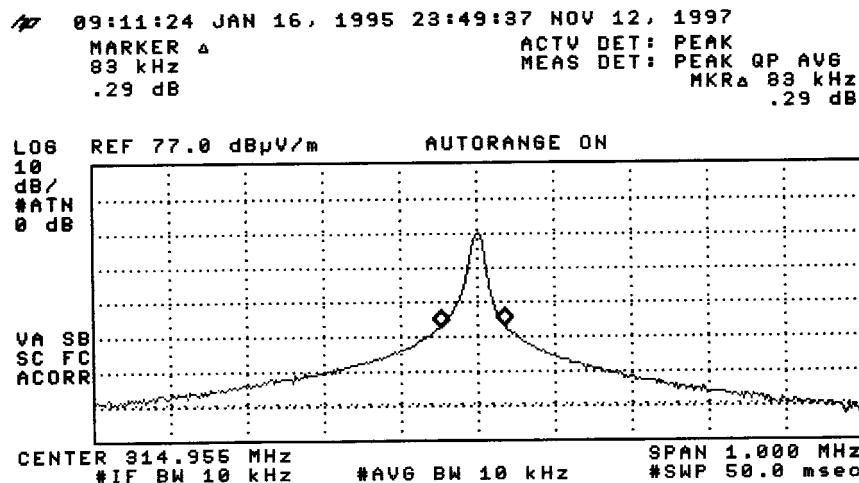
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### Limits for 20 dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	26dB Bandwidth [KHz]	FCC Limits * [KHz]
314.96	83	787.4

\*: FCC Limit for Bandwidth measurement  
=  $(0.25\%)(\text{Center Frequency})$   
=  $(0.0025)(314.96)$   
= 787.4KHz

### 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	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), COLOR MONITOR, KEYBOARD & MOUSE FLOPPY DRIVE	HEWLETT PACKARD HEWLETT PACKARD HEWLETT PACKARD	HP9000 HP A1097C HP9133L	6226A60314 3151J39517 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 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
EM196	MULTI-DEVICE CONTROLLER	EMCO	2090	1662	N/A
EM195	ANTENNA POSITIONING MAST	EMCO	2075	2368	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
EM002	LISN	EMCO	3825-2	9005-1657	22/08/01
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	31/08/00
EM127	ISOLATION TRANSFORMER 220 TO 300	WING SUN	N/A	N/A	CM
EM142	PULES 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 COMPONENTS	N/A	803-740-057- 99A	02/01/02

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

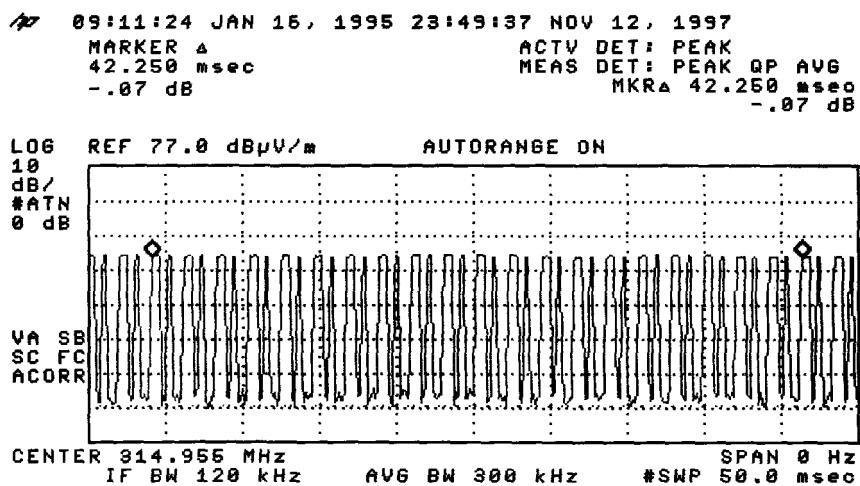
Each function key sends a different series of characters, but each packet period (42.25msec) never exceeds a series of 20 long (500 $\mu$ sec) and 20 short (150 $\mu$ sec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered  $20 \times 500\mu\text{sec} + 20 \times 150 \mu\text{sec} / 42.25\text{msec} = 30.7\%$  duty cycle. Figure A through C show the characteristics of the pulse train for one of these functions.

Remarks:

Duty Cycle Correction =  $20\log(0.307) = -10.2\text{dB}$

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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Figure B [Long Pulse]

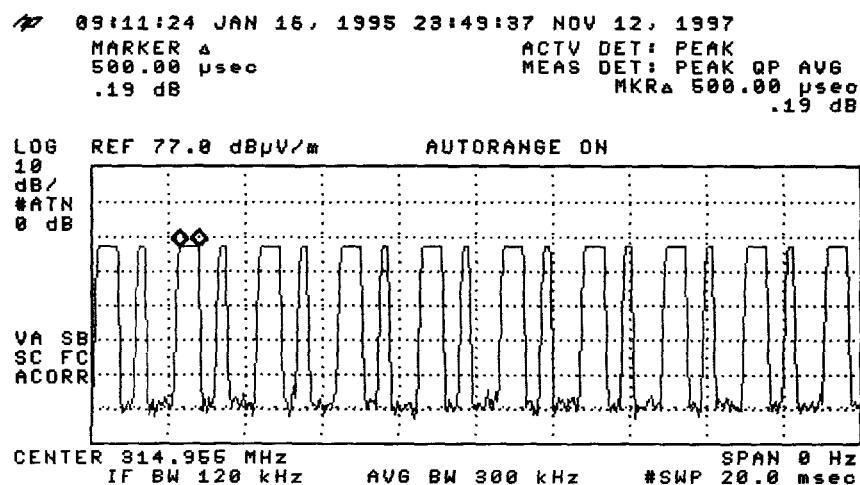
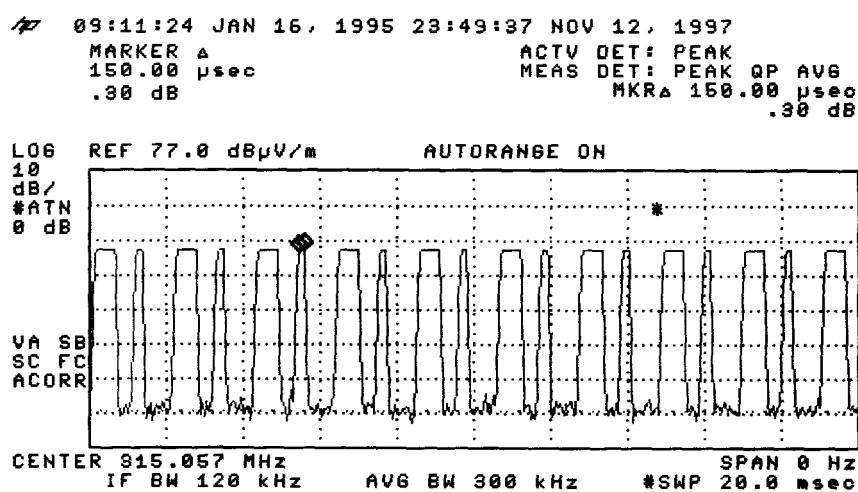


Figure C [Short Pulse]



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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 2 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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