

*FCC PART 15 SUBPART C  
CLASS II PERMISSIVE CHANGE  
TEST REPORT*

*for*

FOUR BUTTON RADIO TRANSMITTER

Model: DT418-4

Prepared for

ELITE ENTRY PHONE, INC.  
25741 COMMERCENTRE DRIVE  
LAKE FOREST, CALIFORNIA 92630

Prepared by: Kyle Fujimoto

KYLE FUJIMOTO

Approved by: Scott McCutchan

SCOTT McCUTCHAN

COMPATIBLE ELECTRONICS INC.  
114 OLINDA DRIVE  
BREA, CALIFORNIA 92823  
(714) 579-0500

DATE: JUNE 24, 2000

REPORT BODY	APPENDICES					TOTAL
	A	B	C	D	E	
PAGES	16	2	2	9	16	47

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1	Conducted Emissions Test Setup
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## GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Device Tested: Four Button Radio Transmitter  
Model: DT418-4  
S/N: 60020001

Modifications: The EUT was not modified during the testing.

Manufacturer: Elite Entry Phone, Inc.  
25741 Commercentre Drive  
Lake Forest, California 92630

Test Date: June 21, 2000

Test Specifications: EMI requirements  
CFR Title 47, Subpart C, sections 15.205, 15.209, and 15.231

Test Procedure: ANSI C63.4: 1992

Test Deviations: The test procedure was not deviated from during the testing.



## SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Radiated Emissions – 10 kHz to 4.2 GHz	Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.231
2	Conducted Emissions – 450 kHz to 30 MHz	This test was not performed because the EUT can only be powered by 12 volt battery and cannot be plugged in to the AC public mains.



## 1. PURPOSE

This document is a qualification test report for a class II change based on the Electromagnetic Interference (EMI) tests performed on the Four Button Radio Transmitter Model: DT418-4. Please see Appendix A for the changes made to the Four Button Radio Transmitter since the unit was previously granted by the FCC on June 8, 1999. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the Four Button Radio Transmitter Model: DT418-4, referred to as the EUT hereafter, are within the specification limits defined by sections 15.205, 15.209, and 15.231 of Subpart C.



## 2. ADMINISTRATIVE DATA

### 2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

### 2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

### 2.3 Cognizant Personnel

Elite Entry Phone, Inc.

Wayne Hom	Chief Engineer
Daniel Perez	Engineer

Compatible Electronics Inc.

Kyle Fujimoto	Test Engineer
Scott McCutchan	Lab Manager

### 2.4 Date Test Sample was Received

The test sample was received on June 21, 2000.

### 2.5 Disposition of the Test Sample

The test sample has not been returned to Elite Entry Phone, Inc. as of June 24, 2000.

### 2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network



**3.****APPLICABLE DOCUMENTS**

The following documents are referenced or used in the preparation of this EMI Test Report.

<b>SPEC</b>	<b>TITLE</b>
CFR Title 47, Part 15 Subpart C	FCC Rules - Radio frequency devices (including digital devices) – Intentional Radiators
ANSI C63.4 1992	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz



## 4. DESCRIPTION OF TEST CONFIGURATION

### 4.1 Description of Test Configuration – EMI

#### Specifics of the EUT and Peripherals Tested

The Four Button Radio Transmitter Model: WM7200 (EUT) was tested as a stand alone device and placed in the center of the wooden table. The EUT was tested in three orthogonal axis. The EUT was continuously transmitting. The EUT was setup as shown in Appendix D. The antenna is a PCB trace.

**Note:** During the initial investigation, the one button and two button versions of the radio transmitters were also tested in three orthogonal axis to determine if their emissions were higher than the four button radio transmitter. It was determined the four button radio transmitter produced the highest emissions and the final radiated data was taken for the four button radio transmitter. Please see Appendix E for the complete data.

**Note 2:** The PCB layout for all three versions of the radio transmitter are the same, the only difference is the positioning of the buttons on the PCB. Please see Appendix C for more details on the different versions.

#### 4.1.1 Cable Construction and Termination

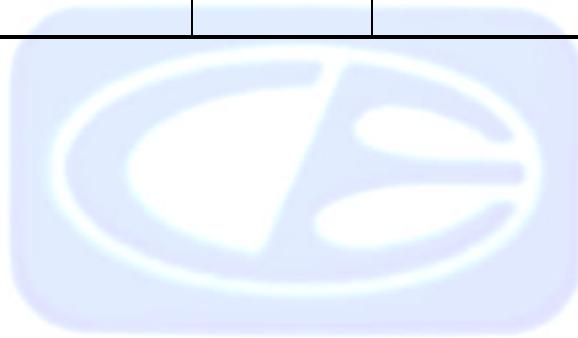
The EUT has no external cable connections.



## 5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

### 5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
FOUR BUTTON RADIO TRANSMITTER (EUT)	ELITE ENTRY PHONE, INC.	DT418-4	60020001	NIFDT1000



## 5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Spectrum Analyzer	Hewlett Packard	8566B	3638A08768	Dec. 14, 1999	Dec. 14, 2000
Preamplifier	Com Power	PA-102	1017	Jan. 11, 2000	Jan. 11, 2001
Quasi-Peak Adapter	Hewlett Packard	85650A	2811A01363	Dec. 14, 1999	Dec. 14, 2000
RF Attenuator	Sertek	412-10	N/A	Nov. 22, 1999	Nov. 22, 2000
LISN	Com Power	LI-215	12075	Nov. 13, 1999	Nov. 13, 2000
LISN	Com Power	LI-215	12078	Nov. 13, 1999	Nov. 13, 2000
Biconical Antenna	Com Power	AB-100	1548	Oct. 14, 1999	Oct. 14, 2000
Log Periodic Antenna	Com Power	AL-100	16039	Oct. 14, 1999	Oct. 14, 2000
Antenna Mast	Com Power	AM-100	N/A	N/A	N/A
Turntable	Com Power	TT-100	N/A	N/A	N/A
Computer	Hewlett Packard	D5251A 888	US74458128	N/A	N/A
Printer	Hewlett Packard	C5886A	SG7CM1P090	N/A	N/A
Monitor	Hewlett Packard	D5258A	DK74889705	N/A	N/A
Microwave Preamplifier	Com-Power	PA-122	25195	Jan. 13, 2000	Jan. 13, 2001
Horn Antenna	Antenna Research	DRG-118/A	1053	Dec. 8, 1995	N/A
Loop Antenna	Com-Power	AL-130	25309	May 25, 2000	May 25, 2001



## 6. TEST SITE DESCRIPTION

### 6.1 Test Facility Description

Please refer to section 2.1 and 7.1.2 of this report for EMI test location.

### 6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.



## 7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

### 7.1 RF Emissions

#### 7.1.1 Conducted Emissions Test

The spectrum analyzer was used as a measuring meter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 1992. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the HP software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave. The final qualification data is located in Appendix E.

#### Test Results:

This test was not performed because the EUT can only operate off a 12 volt battery and cannot be plugged in to the AC public mains.



## 7.1.2

**Radiated Emissions (Spurious and Harmonics) Test**

The spectrum analyzer was used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, and the Com Power Microwave Preamplifier Model: PA-122 was used for frequencies above 1 GHz. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps. The quasi-peak adapter was used only for those readings which are marked accordingly on the data sheets. The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
10 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 4200 GHz	1 MHz	Horn Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data.



## 7.2 Bandwidth of the Fundamental

The -20 dB bandwidth was checked to see that it was within 0.25% of the fundamental frequency for the transmitter. A plot of the -20 dB bandwidth is in Appendix E.



## 8. CONCLUSIONS

The Four Button Radio Transmitter Model: DT418-4 meets all of the specification limits defined by FCC Title 47 section 15.205, 15.209 and 15.231 of Subpart C.



**APPENDIX A**

***CHANGES MADE FOR CLASS II TO THE EUT***



## ***CHANGES MADE FOR CLASS II TO THE EUT***

The following changes were made to the EUT since its original approval.

- 1) The antenna loop is wider.
- 2) The encoder is working at 5 Vdc. The previous encoder for the old unit was working at 12 Vdc.
- 3) There is now a 5V regulator.
- 4) There are a few resistors added to capture the button being pressed.
- 5) Since the antenna is now wider, the values of the coupling capacitors for the antenna (C5, C6, and C7) have been changed.
- 6) Since the encoder is providing a 5V signal now, R2 is now lower in value than the old unit.



**APPENDIX B**

***MODIFICATIONS TO THE EUT***



## MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart C specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

Modifications:

No modifications were made to the EUT during the testing.



**APPENDIX C**

***ADDITIONAL MODELS COVERED  
UNDER THIS REPORT***



## ADDITIONAL MODELS COVERED UNDER THIS REPORT

### USED FOR THE PRIMARY TEST

Four Button Radio Transmitter  
Model: DT418-4  
S/N: 60020001

### ALSO APPROVED UNDER THIS REPORT:

Two Button Radio Transmitter  
Model: DT418-2  
S/N: 60020005

One Button Radio Transmitter  
Model: DT418  
S/N: 6020007

The two button and one button radio transmitters are similar to the four button radio transmitter except that the one and two button radio transmitters have less buttons and have the buttons placed in different positions on the PCB. The PCB for **all versions** of the radio transmitter is exactly identical.

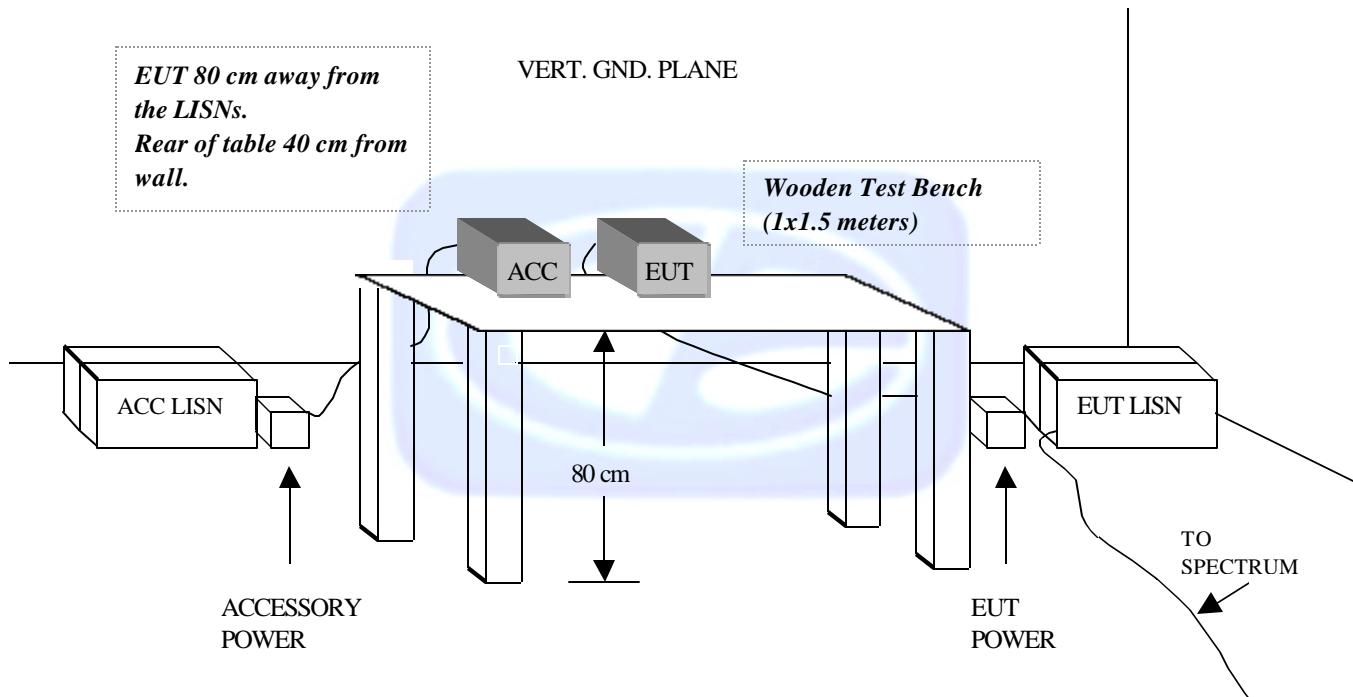
All three devices were tested. Please see section 4.1 of this test report for the description of the tests.

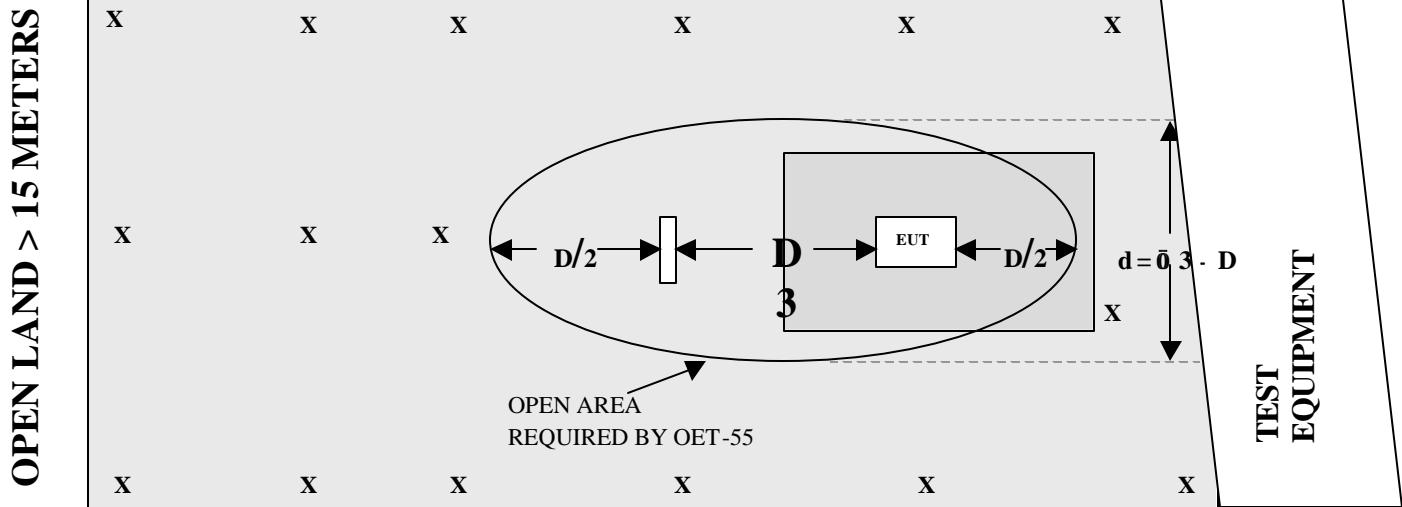


## **APPENDIX D**

### ***DIAGRAMS, CHARTS AND PHOTOS***



**FIGURE 1: CONDUCTED EMISSIONS TEST SETUP**

**FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE****OPEN LAND > 15 METERS****OPEN LAND > 15 METERS**

<b>X</b>	= GROUND RODS		= GROUND SCREEN
<b>D</b>	= TEST DISTANCE (meters)		= WOOD COVER



**FRONT VIEW**

ELITE ENTRY PHONE, INC.  
FOUR BUTTON RADIO TRANSMITTER

Model: DT418-4  
FCC SUBPART C - RADIATED EMISSIONS – 6-21-00

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**



**REAR VIEW**

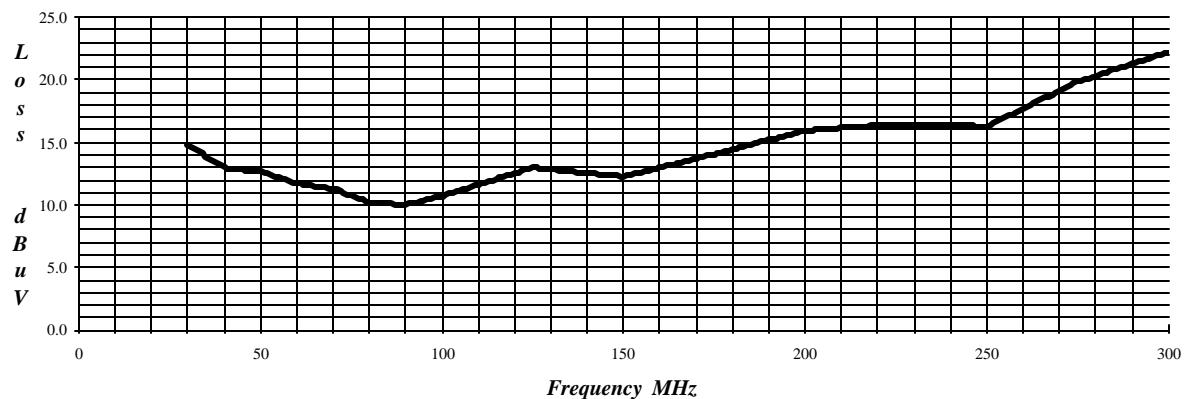
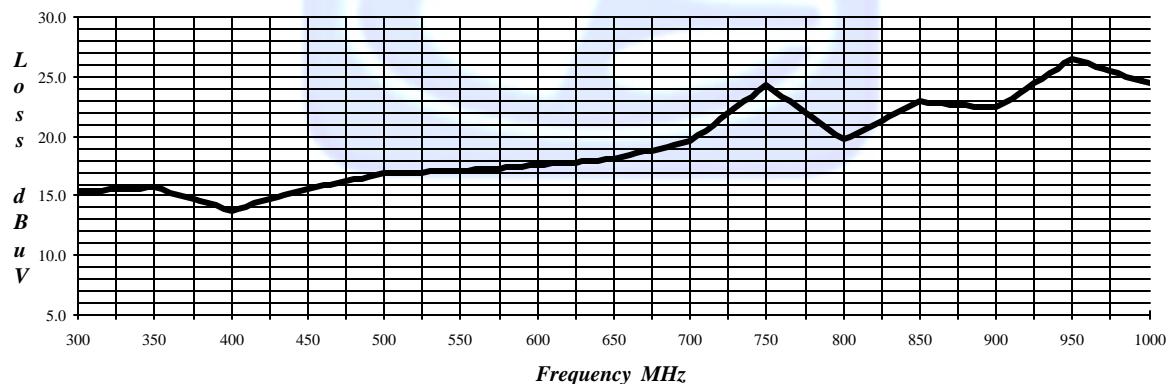
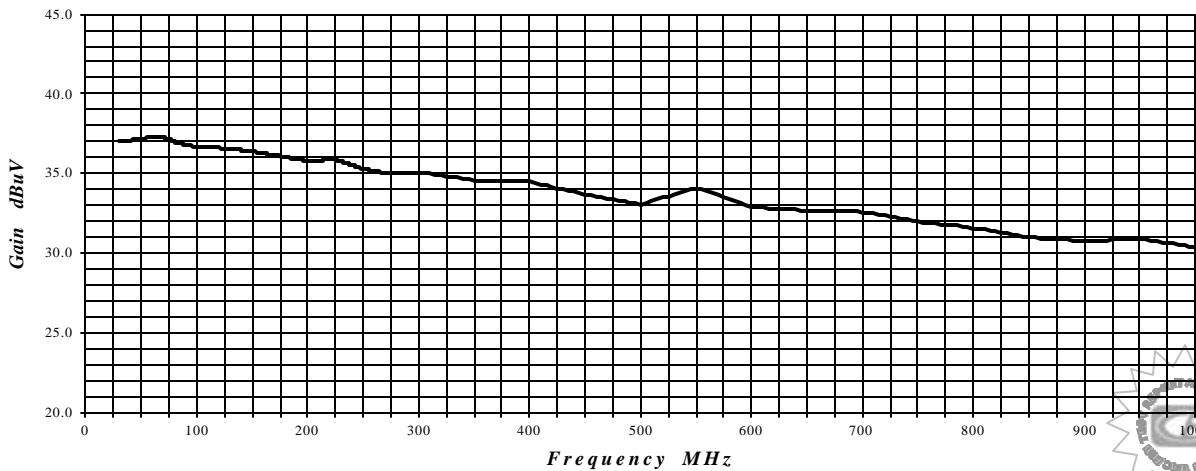
ELITE ENTRY PHONE, INC.  
FOUR BUTTON RADIO TRANSMITTER

Model: DT418-4

FCC SUBPART C - RADIATED EMISSIONS – 6-21-00

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**



**LAB "D" BICONICAL ANTENNA AB-100 S/N 01548 Cal: 10-14-99****LAB "D" LOG PERIODIC ANTENNA AL-100 S/N 16039 Cal: 10-14-99****PREAMPLIFIER EFFECTIVE GAIN AT 10 METERS PA-102 S/N: 1017 Effective 1-13-00**

COM-POWER PA-122  
MICROWAVE PREAMPLIFIER  
S/N: 25195

CALIBRATION DATE: JANUARY 13, 2000

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	34.4	9.0	30.7
1.1	34.1	9.5	31.5
1.2	34.2	10.0	31.0
1.3	34.1	10.5	31.4
1.4	33.9	11.0	30.7
1.5	33.8	11.5	29.5
1.6	33.0	12.0	27.8
1.7	33.3	12.5	31.4
1.8	33.3	13.0	31.0
1.9	31.9	13.5	31.0
2.0	32.7	14.0	31.5
2.5	31.8	14.5	30.2
3.0	31.7	15.0	29.2
3.5	31.9	15.5	30.1
4.0	31.0	16.0	29.0
4.5	31.4	16.5	27.8
5.0	31.1	17.0	30.8
5.5	31.0	17.5	31.5
6.0	32.0	18.0	30.8
6.5	31.6		
7.0	32.3		
7.5	32.9		
8.0	32.1		
8.5	31.6		



## E-FIELD ANTENNA FACTOR CALIBRATION

$$E(\text{dB V/m}) = V_o(\text{dB V}) + AFE(\text{dB/m})$$

Model number : DRG-118/A

Frequency GHz	AFE dB/m	Gain dBi
1	22.3	8.0
2	26.7	9.5
3	29.7	10.1
4	29.5	12.8
5	32.3	12.0
6	32.4	13.4
7	36.1	11.0
8	37.4	10.9
9	36.8	12.5
10	39.5	10.7
11	39.6	11.5
12	39.8	12.0
13	39.7	12.8
14	41.8	11.3
15	41.9	11.9
16	38.1	16.3
17	41.0	13.9
18	46.5	8.9

Serial number : 1053  
Job number : 96-092  
Remarks : 3 meter calibration  
Standards : LPD-118/A, TE-1000

Temperature : 72° F  
Humidity : 56 %  
Traceability : A01887  
Date : December 08, 1995

Calibrated By

# Com-Power Corporation

(949) 587-9800

## Antenna Calibration

Antenna Type:			Loop Antenna
Model:			AL-130
Serial Number:			25309
Calibration Date:			05/25/00
Frequency MHz	Magnetic (dB/m)	Electric dB/m	
0.009	-41.0	10.5	
0.01	-41.0	10.5	
0.02	-41.9	9.6	
0.05	-41.9	9.6	
0.075	-41.8	9.7	
0.1	-42.2	9.3	
0.15	-42.2	9.3	
0.25	-40.7	10.8	
0.5	-42.1	9.4	
0.75	-40.9	10.6	
1	-41.3	10.2	
2	-40.8	10.7	
3	-41.1	10.4	
4	-41.2	10.3	
5	-40.7	10.8	
10	-40.6	10.9	
15	-42.0	9.5	
20	-42.0	9.5	
25	-42.9	8.6	
30	-42.3	9.2	
Trans. Antenna Height	2 meter		
Receiving Antenna Height	2 meter		

**APPENDIX E**

***DATA SHEETS***



***RADIATED DATA SHEETS  
FOR THE TRANSMITTER***



## RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	ELITE ENTRY PHONE	DATE	6/21/00
EUT	4 BUTTON RADIO TRANSMITTER	DUTY CYCLE	40.00 %
MODEL	DT418-4	PEAK TO AVG	-7.96 dB
S/N	N/A	TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO	LAB	D

- CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

\*\* DELTA = SPEC LIMIT - CORRECTED READING

## RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)



# COMPATIBLE ELECTRONICS

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## RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)



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COMPANY	ELITE ENTRY PHONE	DATE	6/21/00
EUT	4 BUTTON RADIO TRANSMITTER	DUTY CYCLE	40.00 %
MODEL	DT418-4	PEAK TO AVG	-7.96 dB
S/N	N/A	TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO	LAB	D

\* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

\*\* DELTA = SPEC LIMIT - CORRECTED READING

Test location: Compatible Electronics  
 Customer : Elite Entry Phone Date : 6/21/2000  
 Manufacturer : Elite Entry Phone Time : 13.20  
 EUT name : 4 Button Radio Transmitter Model: DT418-4  
 Specification: Cispr\_B Test distance: 10.0 mtrs Lab: D  
 Distance correction factor( $20 \log(\text{test/spec})$ ) : 0.00  
 Test Mode : SPURIOUS EMISSIONS OF THE TRANSMITTER  
 VERTICAL AND HORIZONTAL POLARIZATION 30 TO 1000 MHz  
 TEMPERATURE 85 DEGREES F.  
 RELATIVE HUMIDITY 42%  
 TESTED BY: Kyle Fujimoto  
 KYLE FUJIMOTO

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	limit = L dBuV/m	Delta R-L dB
1H	32.03	40.70	0.72	14.47	38.36	17.53	40.00	-22.47
2H	36.03	42.00	0.76	13.71	38.48	17.99	40.00	-22.01
3H	40.03	45.90	0.80	12.96	38.60	21.06	40.00	-18.94
4V	70.59	40.50	1.00	11.27	38.89	13.88	40.00	-26.12
5H	70.59	41.00	1.00	11.27	38.89	14.38	40.00	-25.62
6V	279.62	36.30	2.22	20.27	38.52	20.27	46.00	-25.73
7H	279.65	37.00	2.22	20.27	38.52	20.97	46.00	-25.03
8H	418.00	33.20	2.74	14.42	38.42	11.94	46.00	-34.06
9H	488.65	36.70	3.03	16.59	37.95	18.38	46.00	-27.62
10V	488.65	34.40	3.03	16.59	37.95	16.08	46.00	-29.92



Page: 1 of 1

Test location: Compatible Electronics  
Customer : Elite Entry Phone Date : 6/21/2000  
Manufacturer : Elite Entry Phone Time : 13.20  
EUT name : 4 Button Radio Transmitter Model: DT418-4  
Specification: CISPR B Test distance: 10.0 mtrs Lab: D  
Distance correction factor( $20 \log(\text{test/spec})$ ) : 0.00  
Test Mode : SPURIOUS EMISSIONS OF THE TRANSMITTER  
10 kHz to 30 MHz  
TEMPERATURE 85 DEGREES F.  
RELATIVE HUMIDITY 42%  
TESTED BY: Kyle Fujimoto  
KYLE FUJIMOTO

NO EMISSIONS FOUND BETWEEN 10 kHz AND 30 MHz  
IN EITHER POLARIZATION FOR THE EUT

***-20 Db BANDWIDTH  
DATA SHEET***



-20 dB BANDWIDTH OF FUNDAMENTAL  
REF 100.0 dB $\mu$ V ATTEN 10 dB

MKR  $\Delta$  384 kHz  
0.00 dB

hp

10 dB/

DL  
99.2  
dB $\mu$ V

CORR'D

CENTER 418.00 MHz  
RES BW 1 MHz

VBW 1 MHz

SPAN 1.00 MHz  
SWP 20.0 msec

