

**Radio Systems Corporation  
FCC Part 15, Certification Application  
Model PG-1010**

**November 1, 2000**



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SECTION 1  
GENERAL INFORMATION

## **GENERAL INFORMATION**

### **Product Description**

The Equipment Under Test (EUT) is a Radio Systems Corporation Low Frequency, Low Power Petsafe Guardian Transmitter, Model PG-1010. The EUT consists of a 10.65 kHz dog fence transmitter. This report covers only the transmitter (dog fence) portion of the device.

### **Related Submittal(s) Grant(s)**

The EUT is subject to the following authorizations:

- a) Certification as a low power transmitter (10.65 kHz)

The information contained in this report is presented for the Certification authorization for the transmitter portion of the EUT.

SECTION 2  
TESTS AND MEASUREMENTS

## TESTS AND MEASUREMENTS

### Configuration of Tested System

The sample was tested per ANSI C63.4, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 30 MHz -1 GHz (1992). Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 100 Hz (9 kHz – 150 kHz), 9kHz (150 kHz - 30 MHz), and 120 kHz (30 MHz - 1 GHz) respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2.

The EUT was set up with a 320' length of wire connected to it, to simulate a typical installation. The wire was not buried, as it would be in a typical installation (approximately 2 -3 inches). Measurements were taken at all three antenna polarities on each side of the rectangle and intervals in between, at a distance of 3 meters. The side with the worst case results was re-measured at a distance of 10 meters. Results between 100 kHz and 30 MHz were corrected to 30 meters by the following  $40 \log (300/10) = 59.1$  dB. Those results below 100 kHz were corrected to 300 meters by the following  $60 \log (300/10) = 88.6$  dB (which has been applied to other submittals and is allowed per previous discussions with Greg Czumak at the FCC).

### Test Facility

Conducted and digital device testing was performed at US Tech's measurement facility as described to the FCC and acknowledged in their letter marked 31040/SIT/USTECH.

Additional radiated testing was performed at a vacant area that would allow measurements to be made 10 meters away from the EUT with the 320' length of wire connected to it.

### Test Equipment

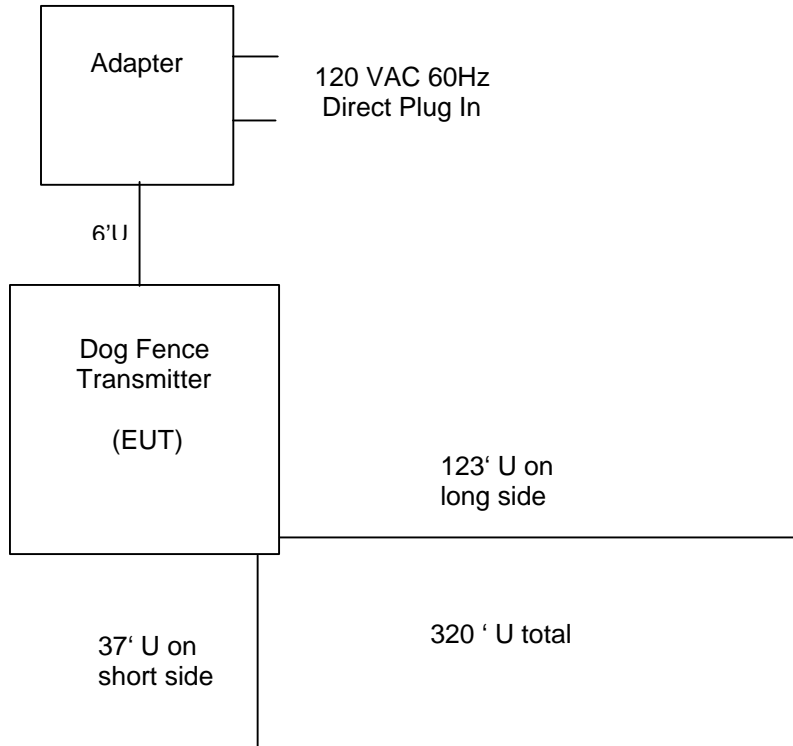
Table 2 describes test equipment used to evaluate this product.

### Modifications

No modifications were made to bring the EUT into compliance with FCC Part 15, Class B Requirements:



**FIGURE 1**  
**TEST CONFIGURATION**



**EUT and Peripherals**

<b>PERIPHERAL MANUFACTURER</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>FCC ID:</b>	<b>CABLES P/D</b>
Dog Fence Transmitter Radio Systems Corporation (EUT)	PG-1010	None	KE3PG1010 (pending)	320' U
Adapter Radio Systems Corporation	41A-12-830 P/N: 300-006	None	None	6' U

**TABLE 2**  
**TEST INSTRUMENTS**

<b>TYPE</b>	<b>MANUFACTURER</b>	<b>MODEL</b>	<b>SN.</b>
SPECTRUM ANALYZER	HEWLETT-PACKARD	8593E	3205A00124
SPECTRUM ANALYZER	HEWLETT-PACKARD	8558B	2332A09900
S A DISPLAY	HEWLETT-PACKARD	853A	2404A02387
COMB GENERATOR	HEWLETT-PACKARD	8406A	1632A01519
RF PREAMP	HEWLETT-PACKARD	8447D	1937A03355
RF PREAMP	HEWLETT-PACKARD	8449B	3008A00480
HORN ANTENNA	EMCO	3115	3723
BICONICAL ANTENNA	EMCO	3110	9307-1431
LOOP ANTENNA	AH SYSTEMS	SAS200/562	142
LOG PERIODIC ANTENNA	EMCO	3146	9110-3600
BILOG	CHASE	CBL6112A	2238
LISN	SOLAR ELE.	8028	N/A
THERMOMETER	FLUKE	52	5215250
MULTIMETER	FLUKE	85	53710469
FUNCTION GENERATOR	TEKTRONIX	CFG250	CFG250TW15059
PLOTTER	HEWLETT-PACKARD	7475A	2325A65394

### **Field Strength of Fundamental Emission (47 CFR 15.209)**

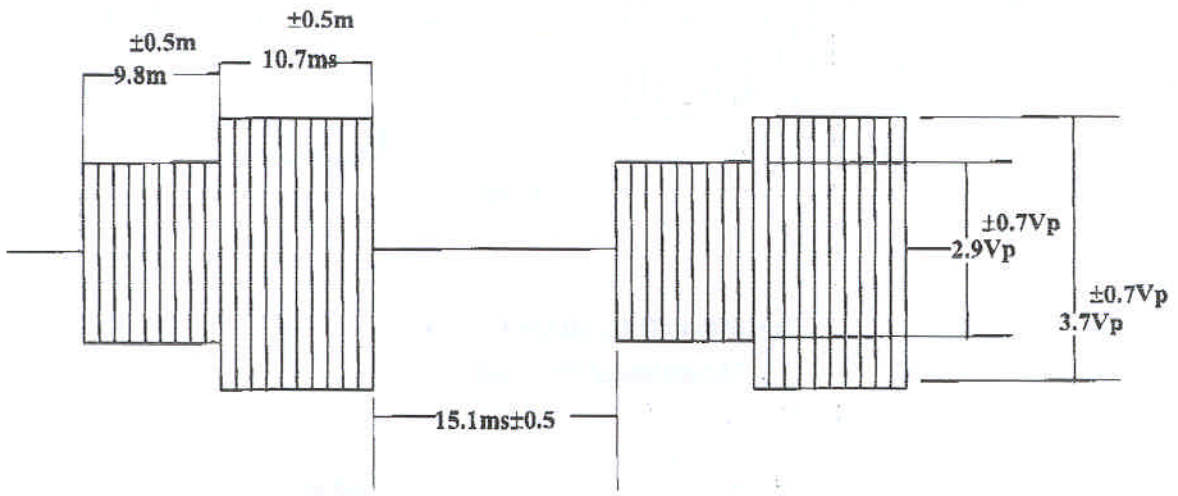
Measurements were made using a peak detector. Field strength of the peak fundamental emission is shown in Tables 3 and 4.

### **Duty Cycle Correction During 100 msec:**

The EUT has only one type of transmit cycle which consists of 20.5 ms of transmit time every 35.6 ms (57.6% Duty Cycle). Figure 3 shows the characteristics of the pulse train for this cycle.

$$\text{Duty Cycle Correction} = 20 \log (0.576) = - 4.8 \text{ dB}$$

FIGURE 3



PG1010 Out put Signal

**TABLE 3a**

**FIELD STRENGTH OF FUNDAMENTAL EMISSION**

**Test Date:** October 19, 2000  
**UST Project:** 00-0479  
**Customer:** Radio Systems Corporation  
**Model:** PG-1010

FREQ. (kHz)	TEST DATA (dBm) @ 10m	ANTENNA FACTOR + CABLE ATTENUATION	PEAK RESULTS (uV/m) @ 300m	PEAK FCC LIMITS (uV/m) @ 300m
10.65	-75.2	78.2	11.7	2253.5

**SAMPLE CALCULATIONS:**

**RESULTS uV/m @ 3m = Antilog ((-75.2 + 78.2 + 107 - 88.6)/20) = 11.7**  
**CONVERSION FROM dBm TO dBuV = 107 dB**  
**CORRECTION FROM 10m TO 300m = -88.6 dB**

**Test Results**  
**Reviewed By:** \_\_\_\_\_ **Name:** Tim R. Johnson

**TABLE 3b**

**FIELD STRENGTH OF FUNDAMENTAL EMISSION**

**Test Date:** October 19, 2000  
**UST Project:** 00-0479  
**Customer:** Radio Systems Corporation  
**Model:** PG-1010

FREQ. (kHz)	TEST DATA* (dBm) @ 10m	ANTENNA FACTOR + CABLE ATTENUATION	AVERAGE RESULTS (uV/m) @ 300m	AVERAGE FCC LIMITS (uV/m) @ 300m
10.65	-80.0	78.2	6.8	225.4

\* = Corrected for worse case duty cycle,  $20 \log (0.576) = -4.8 \text{ dB}$

**SAMPLE CALCULATIONS:**

**RESULTS uV/m @ 3m = Antilog  $((-80.0 + 78.2 + 107 - 88.6)/20) = 6.8$**   
**CONVERSION FROM dBm TO dBuV = 107 dB**  
**CORRECTION FROM 10m TO 300m = -88.6 dB**

**Test Results**  
**Reviewed By:** \_\_\_\_\_ **Name:** Tim R. Johnson

### **Field Strength Of Spurious Emissions (47 CFR 15.209)**

Measurements were made using a peak detector. Field strength of Spurious Emissions are shown in Table 4. For all emission measurements made the limits given in 15.209 were applied.



## TABLE 4a

## FIELD STRENGTH OF SPURIOUS EMISSIONS

**Test Date:** October 19, 2000  
**UST Project:** 00-0479  
**Customer:** Radio Systems Corporation  
**Model:** PG-1010

## Peak Readings (&lt; 30 MHz)

FREQ. (kHz.)	TEST DATA (dBm) @ 10m	ANTENNA FACTOR + CABLE ATTENUATION	PEAK RESULTS (uV/m) @ 300m	PEAK FCC LIMITS (uV/m) @ 300m
21.3	-80.7	71.2	8.9	1126.7
31.8	-88.3	68.9	0.9	754.7
42.6	-72.9	65.7	3.6	563.4

\*\* = Ground Floor

## SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog  $((-80.7 + 71.2 + 107 - 88.6)/20) = 8.9$

CONVERSION FROM dBm TO dBuV = 107 dB

CORRECTION FROM 10m TO 300m = -88.6 dB

Test Results

Reviewed By: \_\_\_\_\_

Name: Tim R. Johnson

## TABLE 4b

## FIELD STRENGTH OF SPURIOUS EMISSIONS

**Test Date:** October 19, 2000  
**UST Project:** 00-0479  
**Customer:** Radio Systems Corporation  
**Model:** PG-1010

## Average Readings (&lt; 30 MHz)

FREQ. (kHz.)	TEST DATA* (dBm) @ 10m	ANTENNA FACTOR + CABLE ATTENUATION	AVERAGE RESULTS (uV/m) @ 300m	AVERAGE FCC LIMITS (uV/m) @ 300m
21.3	-85.5	71.2	4.1	112.6
31.8	-93.1	68.9	0.5	75.5
42.6	-77.7	65.7	2.1	56.3

\* = Corrected for worse case duty cycle,  $20 \log(0.577) = -4.8 \text{ dB}$

## SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m =  $\text{Antilog}((-85.5 + 71.9 + 107 - 88.6)/20) = 0.22$

CONVERSION FROM dBm TO dBuV = 107 dB

CORRECTION FROM 10m TO 300m = -88.6 dB

Test Results

Reviewed By: \_\_\_\_\_

Name: Tim R. Johnson

**Radiated Emissions (47 CFR 15.109a)**

Radiated emissions were evaluated from 30 to 1000 MHz. Measurements were made with the analyzer's bandwidth set to 120 kHz. These results are shown Table 5.

**TABLE 5**

**FIELD STRENGTH OF SPURIOUS EMISSIONS (47 CFR 15.209)**

**CLASS B**

**Test Date:**            **October 24, 2000**  
**UST Project:**       **00-0479**  
**Customer:**           **Radio Systems Corporation**  
**Model:**               **Model PG-1010**

**Digital Device Emissions actually tested while in TX Mode**

Frequency (MHz)	Test Data (dBm) @3m	Ant. Factor + Cable Atten. - Amp Gain	Results (uV/m)	FCC Limits (uV/m) @3m	Margin Below FCC Limit (dB)
No emissions signals were seen from the EUT between the range of 30 MHz to 1 GHz					

**Test Results**  
**Reviewed By:** \_\_\_\_\_ **Name:** Tim R. Johnson

**Power Line Conducted Emissions (47 CFR 15.107a)**

Conducted Emissions were evaluated from 450 kHz to 30 MHz. Measurements were made with the analyzer's bandwidth set to 9 kHz, emissions are shown in Table 6. The EUT was checked with a 320' fence length.

**TABLE 6 CONDUCTED EMISSIONS DATA**

**CLASS B**

**Test Date:** October 24, 2000  
**UST Project:** 00-0479  
**Customer:** Radio Systems Corporation  
**Model:** PG-1010

FREQUENCY (MHz)	TEST DATA (dBm)		RESULTS (uV)		FCC LIMITS (uV)
	PHASE	NEUTRAL	PHASE	NEUTRAL	
0.47	-72.0	-73.0	56.1	50.1	250
0.97	-72.0	-73.0	56.1	50.1	250
1.26	-81.0	-89.0	20.0	7.9	250
9.55	-77.0	-78.0	31.6	28.2	250
9.99	-88.0	-87.0	8.9	10.0	250
11.76	-86.0	-88.0	11.2	8.9	250

**SAMPLE CALCULATIONS:**

**RESULTS uV = Antilog  $((-72.0 + 107)/20) = 50.1$**   
**CONVERSION FROM dBm TO dBuV = 107 dB**

**Test Results**  
**Reviewed By:** \_\_\_\_\_ **Name:** Tim R. Johnson