



TEST REPORT NO. RSI-2367E
ELECTROMAGNETIC INTERFERENCE (EMI)
OF THE
INTUITIVE CONTROL SYSTEMS
PAT MOTION ALERT SYSTEM
FCC PART 15, SUBPART C SECTION 15.249
3 SEPTEMBER 2002

PREPARED FOR:

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ADMINISTRATIVE DATA

TEST PERFORMED:

Measurements of Radiated Emissions.

PURPOSE OF TEST:

To evaluate the ElectroMagnetic Interference (EMI) characteristics of the Equipment Under Test with respect to Subpart C of Part 15 of the Federal Communications Commission (**FCC**) Rules for Intentional Radiators.

EQUIPMENT UNDER TEST (EUT):

Model: **PAT Motion Alert System**

CONTRACT:

Purchase Order Number: **PD8070201**

TEST PERIOD:

14-21 August 2002

TEST FACILITY:

Radiation Sciences Incorporated (RSI), EMI/EMC Test Laboratory, located at: 3131 Detwiler Road, Harleysville Pennsylvania 19438.

TEST PERSONNEL AND COORDINATORS:

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Intuitive Control Systems

Ted Graef



SUMMARY OF TEST RESULTS

The **PAT Motion Alert System** manufactured by **Intuitive Control Systems**, configured as described herein, **FULLY COMPLIES WITH THE REQUIREMENTS SET FORTH IN SUBPART C OF PART 15 OF THE FEDERAL COMMUNICATIONS COMMISSION (FCC) RULES FOR INTENTIONAL RADIATORS.**

The test results contained in this report represent emission and/or immunity characteristics of only the product (model and serial no.) tested. Radiation Sciences Inc. makes no claim that the test results contained herein will be obtained for a same model/equipment.



1.0 INTRODUCTION

This document is a report of tests to determine the ElectroMagnetic Interference (EMI) characteristics of the **PAT Motion Alert Systems** presented by **Intuitive Control System** of State College, Pennsylvania.

The purpose of the testing was to evaluate the EMI characteristics of the test sample with respect to Subpart C of Part 15 of the **FCC Rules** for Intentional Radiators.

Test setups and procedures are described in **RSI's Test Procedures 2059E/2** (see Appendix A) and test results are summarized herein on graphs.

All test procedures used meet the requirements of the American National Standards Institute Procedure C63.4: "**Methods of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz**" dated 17 July 1992.

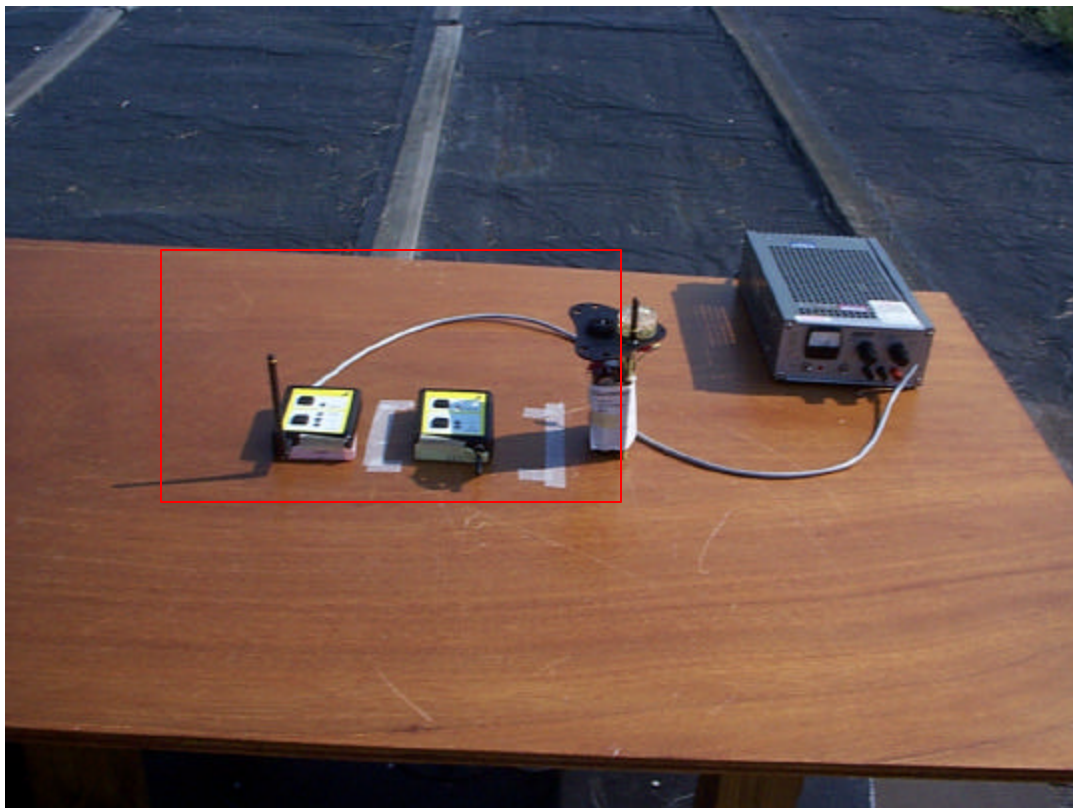


2.0 DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT)

The **PAT Motion Alert System**, manufactured by **Intuitive Control Systems** of State College, Pennsylvania, is a safety device system.

The transmitter sends a 916.4MHz carrier signal to the receiver/alarm, which would typically be mounted on a crane. An audible beep and/or a flashing light warning is activated alerting workers in the area that the crane is in motion or use to aid in avoiding injuries and alerting to stay clear of the work area.

Hereinafter, the **PAT Motion Alert System** will be referred to as the **EUT** (Equipment Under Test).





3.0 TEST INSTRUMENTATION

<u>RSI</u> <u>INV</u> <u>#</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial#</u>	<u>CAL</u> <u>Due</u> <u>Date</u>	<u>Cycle</u>
31	SPEC ANALYZER	ADVANTEST	R3271	J003583	3/8/2003	12
75	ANTENNA	TENSOR	4108	204	5/8/2003	12
80	ANTENNA	Amp. Res. Assoc.	AT1000	4094-025	5/1/2003	12
391	RECEIVER	Rhode &Schwartz	ESVP	861744/015	1/2/2003	12
503	CONTROLLER	EMCO	2090	0001-1489		
52	ANTENNA	EMCO	3115	2425	1/13/2003	12
705	30 FT CABLE	PASTERNAK	BNC TO BNC	N/A	5/22/2003	12
707	6 FT CABLE	BLUE CABLE	SMA TO SMA	N/A	4/8/2003	12

CAL DUE DATE = BLANK FIELD

Calibration is not required. This equipment is not used to obtain a final reading.

EXAMPLE: Transmitting Antenna



4.0 TEST RESULTS

4.1 Radiated Emissions (FCC Part 15 Section 15.249)

Radiated Emissions Testing was performed to the requirements of **FCC** Part 15 Subpart C Section 15.249 at the **Radiation Sciences Inc. (RSI)** Open Area Test Site (OATS) located at 3131 Detwiler Road in Harleysville, Pennsylvania.

Prior to testing, the **EUT** was pre-scanned with a near-field probe and spectrum analyzer. The probe was moved over the entire surface and all cables of the **EUT** and any emitting frequencies were recorded.

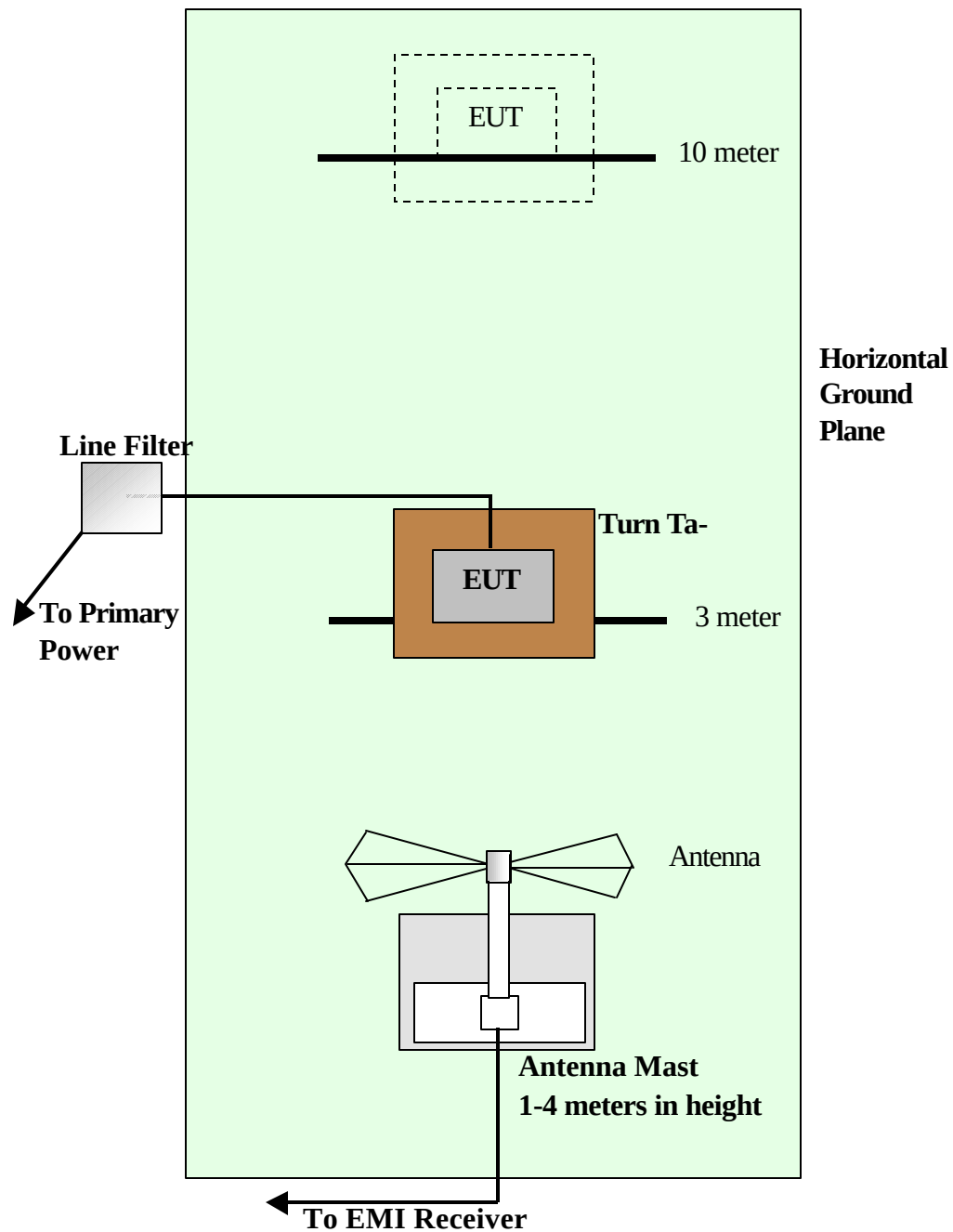
The **EUT** was then placed on a non-conductive turntable 80cm above the ground plane. The appropriate receiving antenna was placed on an antenna mast. Radiated Emissions testing was performed at a 10-meter distance from the **EUT**. The complete frequency range of 30MHz to 1000MHz was scanned with a Rohde & Schwarz CISPR Compliant Receiver. All signals were maximized by rotating the **EUT** 360° and moving the antenna from 1 to 4 meters in height. The maximum Radiated Emissions for the unintentional frequencies were then recorded and compared to the limits of **FCC** Part 15 Section 15.209.

For the intentional frequency the **EUT** was tested at a distance of 3 meters. The levels of the fundamental frequency and harmonics of the fundamental were maximized and compared to **FCC** Part 15 Section 15.249 limits. At frequencies above 1GHz a spectrum analyzer was used to record peak emissions.

The test setup diagram is shown in Figure 1. Test setup photographs are shown in Figures 2 & 3.

The results of Radiated Emissions testing are shown in Figures 4 through 9.

THE EUT COMPLIES WITH THE LIMITS OF FCC PART 15 SUBPART C RADIATED EMISSIONS.



**Radiated Emissions Test Setup
(Top View)
Figure 1**



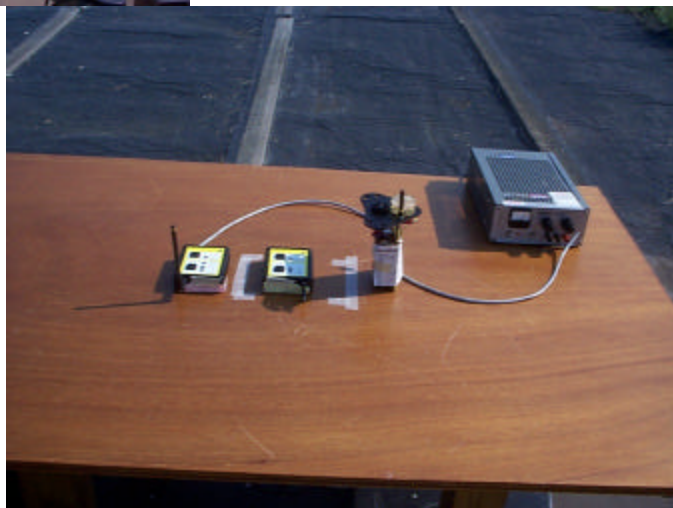
Biconical antenna
Frequency range 30-200MHz



Log-Periodic antenna
Frequency range 200-1000MHz



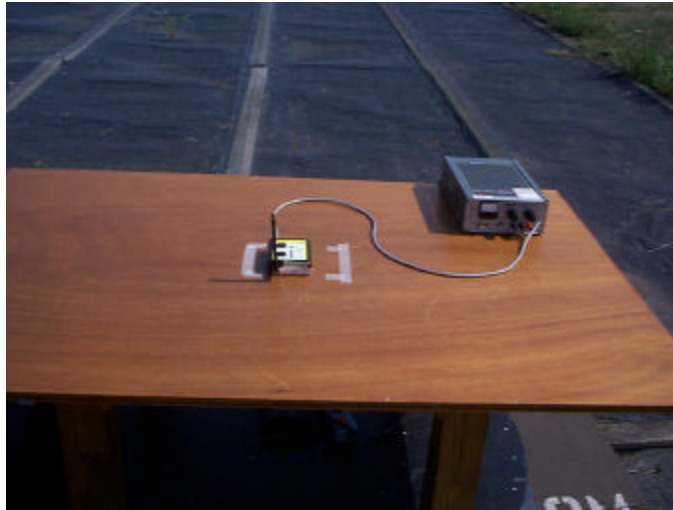
Equipment Under Test on table
Rx and both Tx units tested
as a system



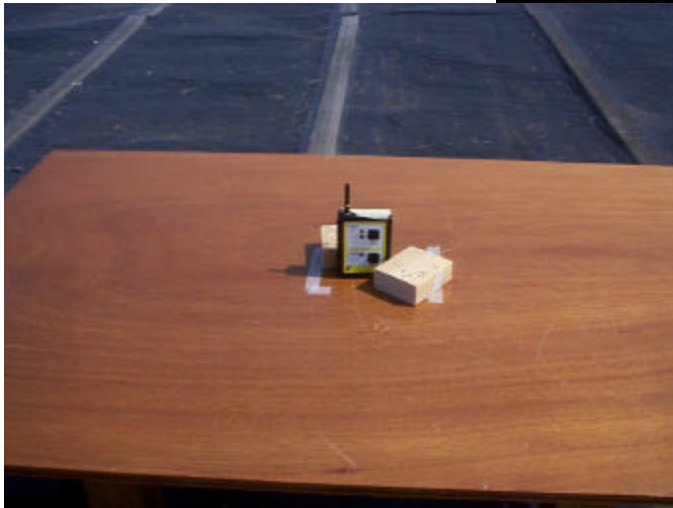
Unintentional Radiator Emissions Test Setup
Figure 2



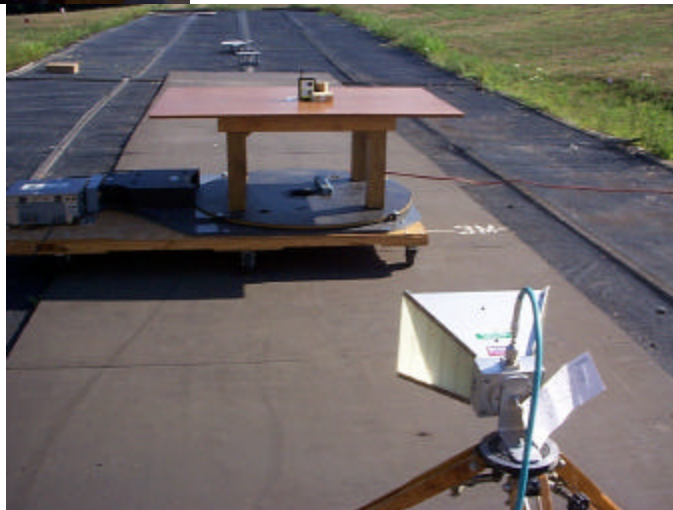
EUT (Power supply Unit)



EUT (Battery Unit)



3115 Horn Antenna
Frequency range 1-10GHz



Unintentional Radiator Emissions Test Setup
Figure 3



Electromagnetic Emission Test

E U T	Manufacturer: Intuitive Control Systems		Date: 8/19/02 and 8/21/02		Test Code RE			
	Model #: Pat Motion Alert System		Test Instruments: RSI # 391, 80, 52, 31, 75, 503		Technician			
	Serial #: N/A		Frequency Range: 30MHz – 1000MHz		Test Engineer			
Temperature: 80 °F Humidity: 50 %		Additional Info: 3 pieces tested as one system: 2-Transmitters (battery and power supply) units 1- Receiver Unit				Test Spec: FCC Part 15 Subpart C		
Radiated Distance: 10 meter Antenna: Bicon / Log		☒ HORIZ. ☐ BB ☐ NB ☒ VERT. ☐ I ☐		Conducted Line: Function:			☐ BB ☐ NB	
FREQ.	QP IND. Level	Correction Factors			QP Final Level	Antenna Height	EUT Azimuth	Remarks
MHz	dBμV	ANT.	Cable loss	10m to 3m	dBμV/m	Meters	Degree	
36	7	12	1	+10	30	3.50	312	Horizontal
48	3	10	1	+10	24	3.50	0	
150	7	13	1.5	+10	31.5	3.50	0	
200	-1.1	14	1	+10	23.9	3.50	0	
500	-.9	18	3	+10	30.1	3.50	0	
1000	.6	25	4	+10	39.6	3.50	0	▼
36	7	13	1	+10	31	2.57	180	Vertical
48	7	9	1	+10	27	2.04	266	
150	1	11	1.5	+10	23.5	1.00	360	
200	-1.6	14	1	+10	23.4	1.00	360	
500	.6	18	3	+10	31.6	1.00	0	
1000	.6	23	4	+10	37.6	1.00	0	▼

Figure 4

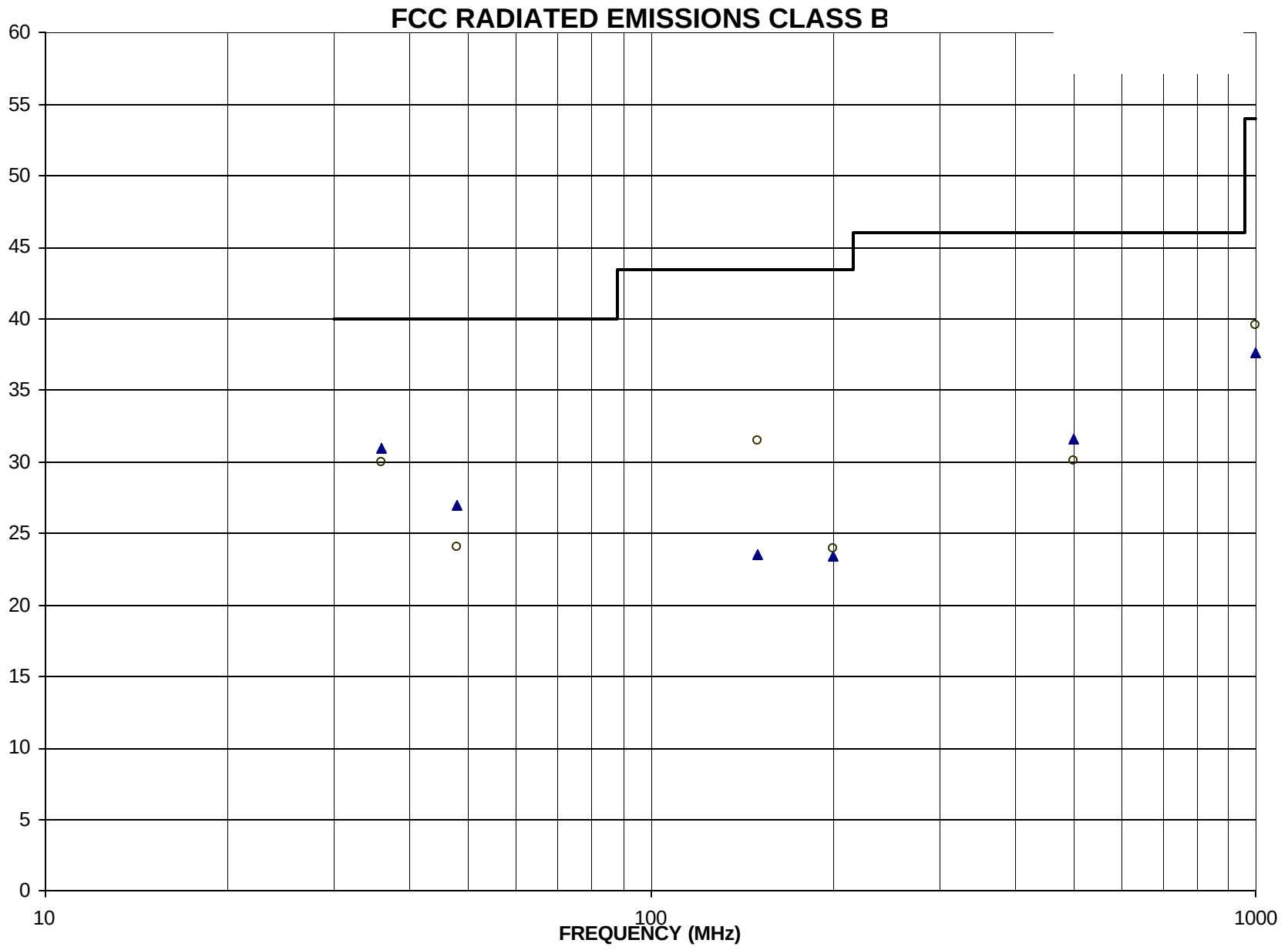


Figure 5



Electromagnetic Emission Test

E U T	Manufacturer: Intuitive Control Systems				Date: 8/19/02 – 9/21/02				Test Code RE		
	Model #: Pat Motion Alert System				Test Instruments: RSI # 391,80,52,31,75				Technician		
	Serial #: N/A				Frequency Range: 30MHz – 10000MHz				Test Engineer		
Temperature: 80 °F Humidity: 50%				Additional Info: <u>Battery Unit</u>				Test Spec: FCC Part 15 Section 15.249			
Radiated Distance: 3 meters Antenna: Bicon / Log			☒ HORIZ. ☐ BB ☐ NB ☒ VERT. ☐ H ☐ E		Conducted Line: Function:				☐ BB ☐ NB		
FREQ.	PEAK IND. Level	AVG IND. Level	Correction Factors		Pre-amp Corr. Factor	Final Level	Antenna Height	EUT Azimuth	Remarks		
MHz	dBµV	dBµV	ANT.	Cable loss	dB	dBµV/m	Meters	Degree			
916.4		51.5	24	4		77.8	1.00	60	Horizontal		
1832.8	30		28.1	1	-20	39.1		0			
2749.2	27		31	1	-20	39		0			
3665.6	28		33	1	-20	42		360			
4882	34		34.5	2	-20	50.5		0			
5498.4	25		36.7	2	-20	43.7		0			
6414.8	23		36.3	2	-20	41.3		0			
7331.2	25		37.5	2	-20	44.5		0			
8247.6	23		37.6	2	-20	42.6		0			
9164	31		39.4	2.5	-20	52.9		0	↓		
916.4		61.4	23.1	4		88.5		62	Vertical		
1832.8	35		27.9	1	-20	43.9		0			
2749.2	32		31	1	-20	44		360			
3665.6	30		33.4	1	-20	44.4		0			
4882	22		34.5	2	-20	38.5		0			
5498.4	22		36.7	2	-20	40.7		119			
6414.8	23		36.3	2	-20	41.3		180			
7331.2	23		37.6	2	-20	42.6		200			
8247.6	23		37.7	2	-20	42.7		300			
9164	22		39.4	2.5	-20	43.9	↓	360	↓		

Figure 6



FCC RADIATED EMISSIONS Part C Intentional Radiator(battery)

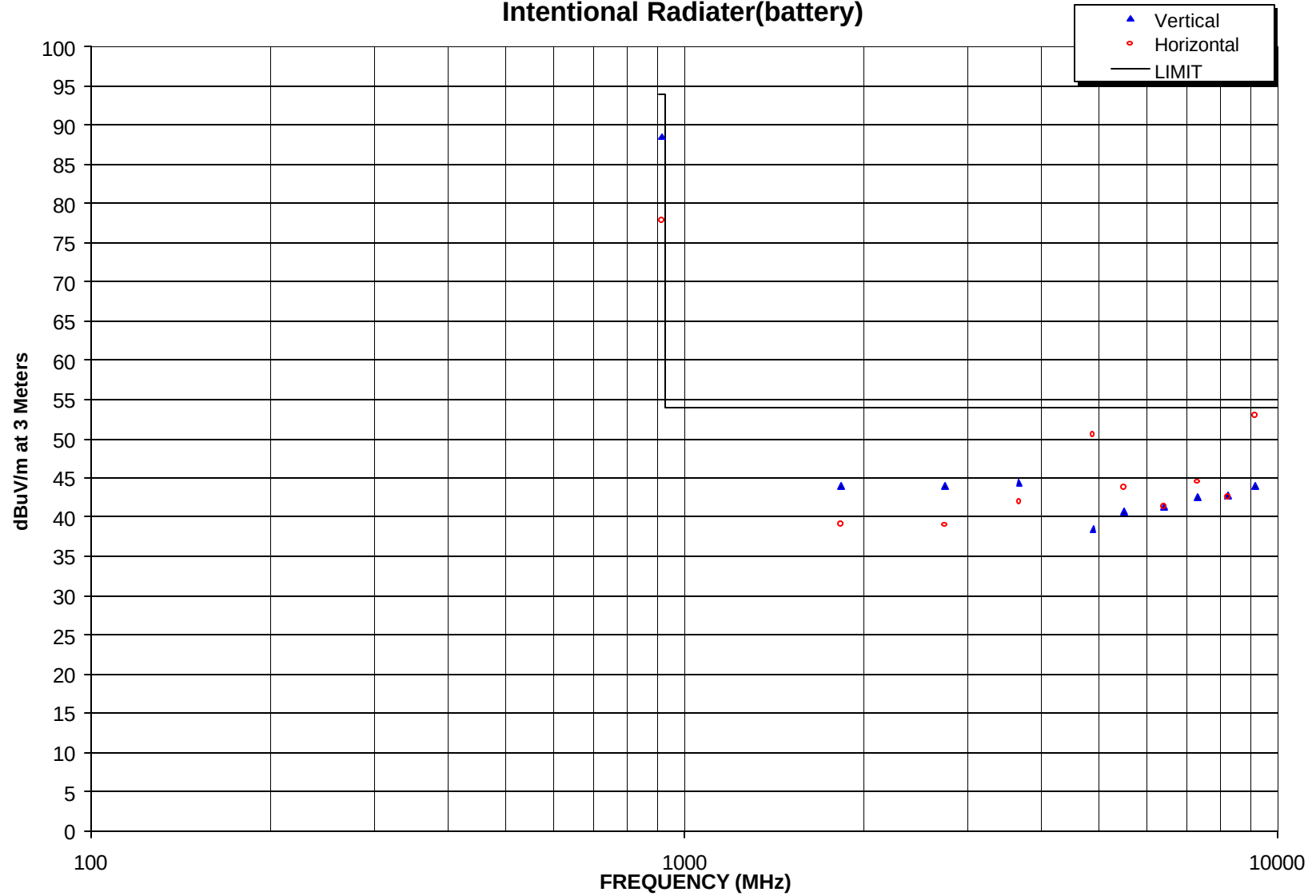


Figure 7



Electromagnetic Emission Test

E U T	Manufacturer: Intuitive Control System		Date: 8/19/02 – 8/21/02		Test Code RE				
	Model #: Pat Motion Alert System		Test Instruments: RSI # 391,80,52,31,75		Technician				
	Serial #: N/A		Frequency Range: 30MHz – 10000MHz		Test Engineer				
Temperature: 80 °F Humidity: 50%		Additional Info: Power Supply Unit			Test Spec: FCC Part 15 Section 15.249				
Radiated Distance: 3 meters Antenna: Bicon / Log		☒ HORIZ. ☐ BB ☐ NB ☒ VERT. ☐ H ☐ E		Conducted Line: Function:		☐ BB ☐ NB			
FREQ.	PEAK IND. Level	AVG IND. Level	Correction Factors		Pre-amp Corr. Factor	Final Level	Antenna Height	EUT Azimuth	Remarks
MHz	dBμV	dBμV	ANT.	Cable loss	dB	dBμV/m	Meters	Degree	
916.4		58.5	24	4		86.5	1.00		Horizontal
1832.8	38		28.1	1	-20	47.1		180	
2749.2	27		31	1	-20	39		200	
3665.6	25		33	1	-20	33.6		180	
4882	22		34.5	2	-20	38.5		80	
5498.4	21		36.7	2	-20	39.7		180	
6414.8	22		36.3	2	-20	40.3		300	
7331.2	23		37.5	2	-20	42.5		95	
8247.6	22		37.6	2	-20	41.6		45	
9164	22		39.4	2.5	-20	43.9		75	↓
916.4		66.8	23.1	4		93.9			Vertical
1832.8	41		27.9	1	-20	49.9		75	
2749.2	30		31	1	-20	42		300	
3665.6	34		33.4	1	-20	47.4		180	
4882	22		34.5	2	-20	38.5		300	
5498.4	22		36.7	2	-20	38.7		180	
6414.8	22		36.3	2	-20	38.3		75	
7331.2	22		37.6	2	-20	41.6		220	
8247.6	22		37.7	2	-20	41.7		100	
9164	23		39.4	2.5	-20	44.9	↓	200	↓

Figure 8



FCC RADIATED EMISSIONS Part C Intentional Radiator(power supply)

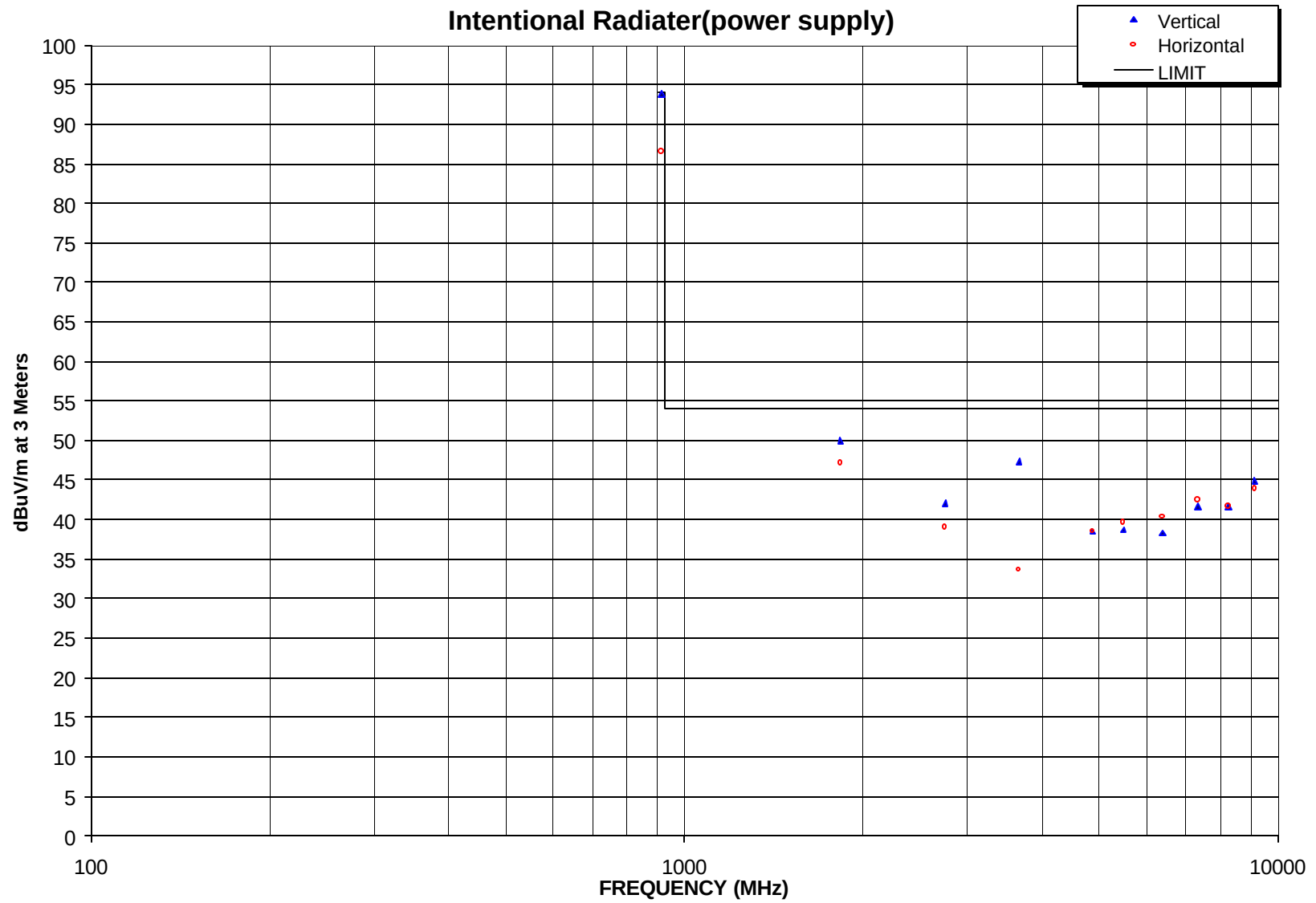


Figure 9



5.0 CONCLUSIONS

The evaluation of the **PAT Monitor Alert System**, configured as described herein, indicates that the unit complies with the requirements set forth in Subpart C of Part 15 of the **FCC** Rules for and Intentional Radiators.