



**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.

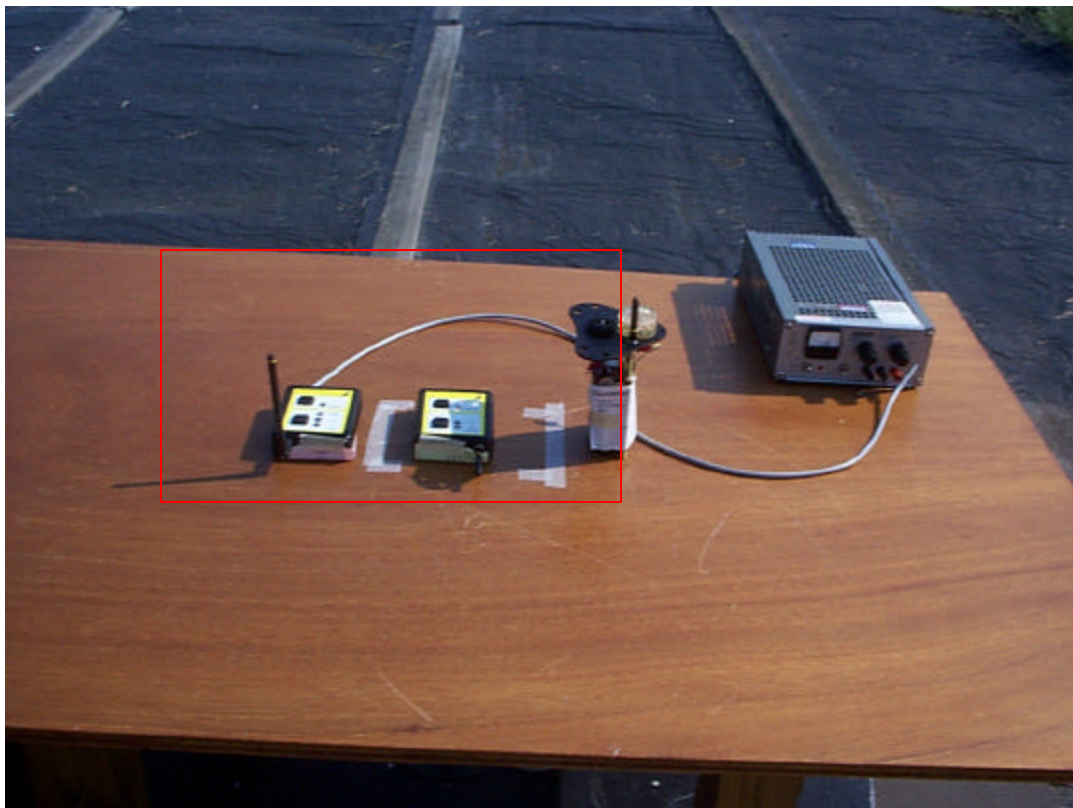


## **2.0 DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT)**

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 INV #</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial#</u>	<u>CAL Due 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**.

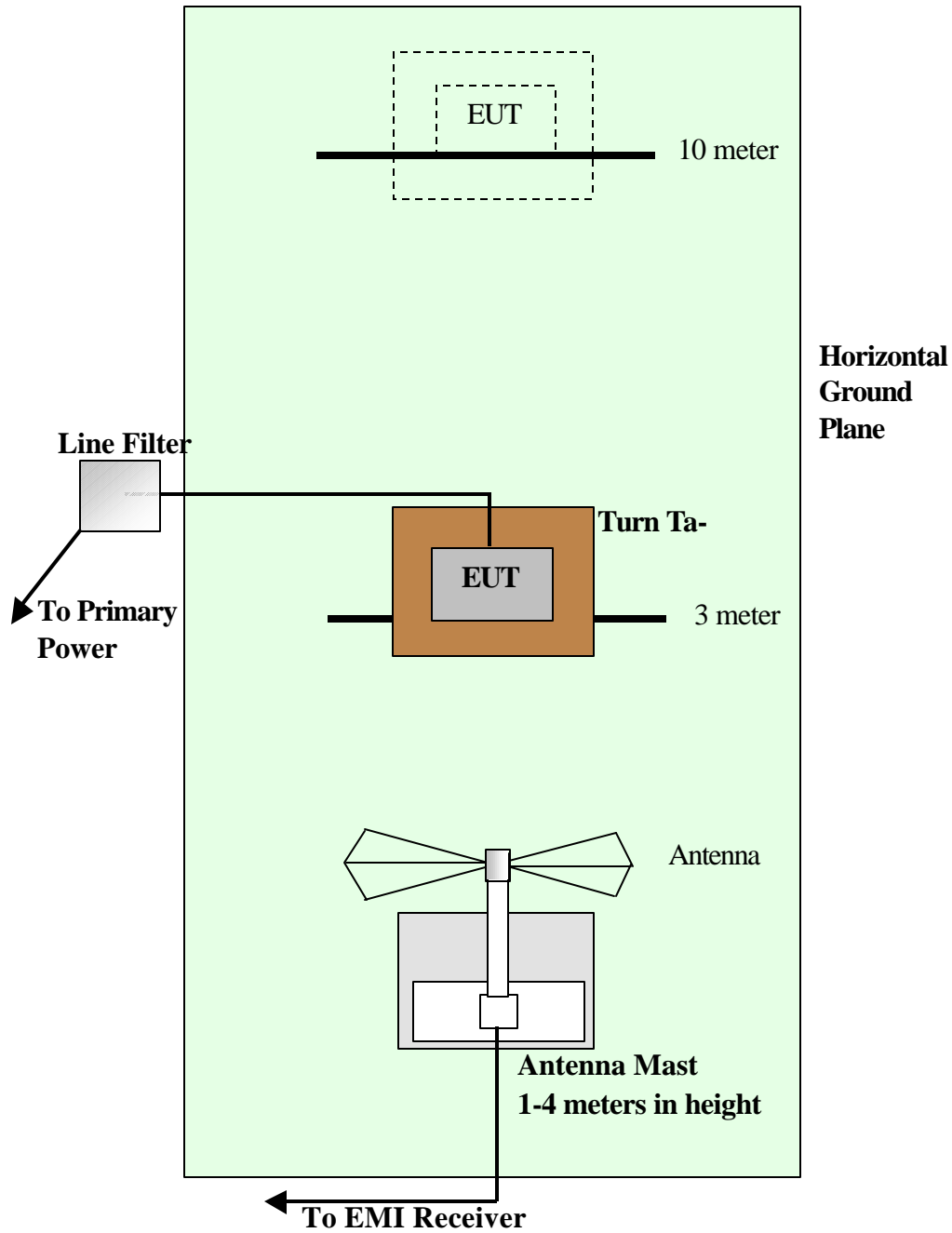
For the intentional frequency the **EUT** was tested at a distance of 3 meters. The levels of the fundamental frequency and harmonics of the fundamental were maximized and compared to **FCC Part 15 Section 15.249** limits. At frequencies above 1GHz a spectrum analyzer was used to record peak emissions.

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**



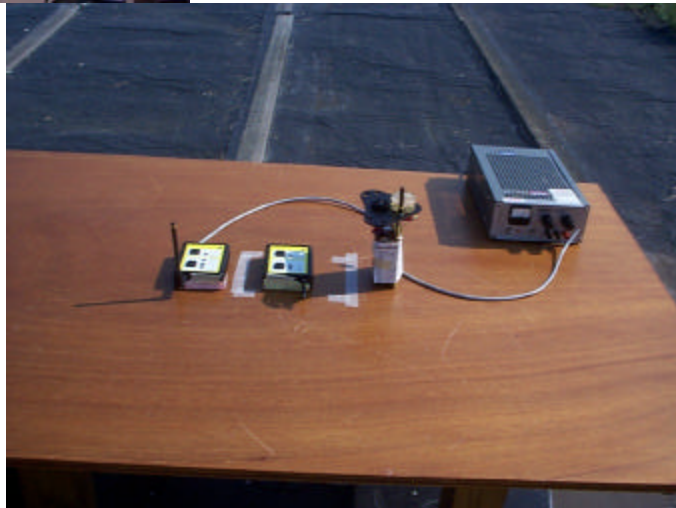
Biconical antenna  
Frequency range 30-200MHz



Log-Periodic antenna  
Frequency range 200-1000MHz



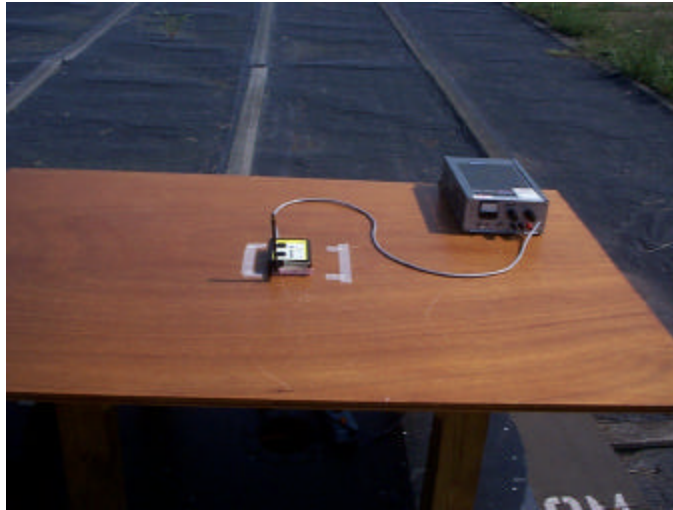
Equipment Under Test on table  
Rx and both Tx units tested  
as a system



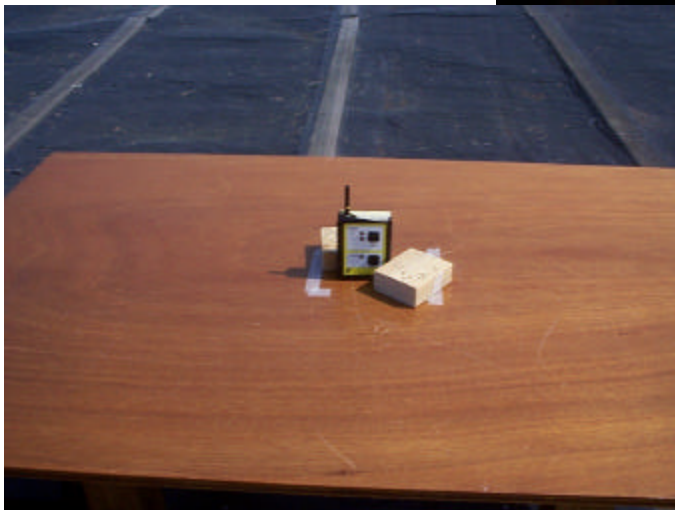
Unintentional Radiator Emissions Test Setup  
Figure 2



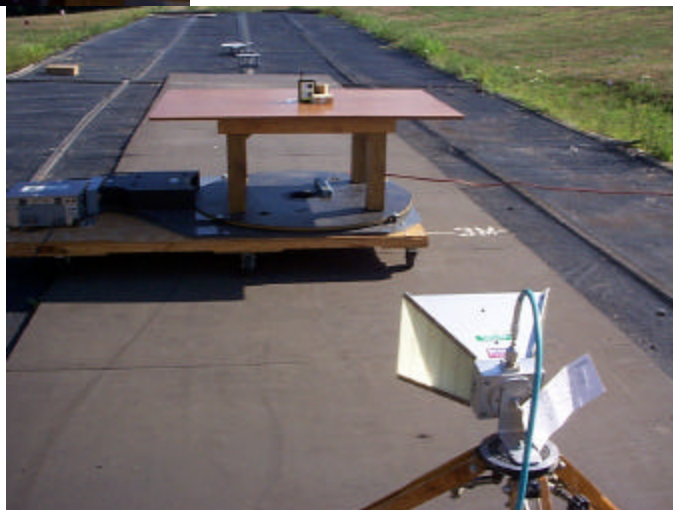
EUT (Power supply Unit)



EUT (Battery Unit)



3115 Horn Antenna  
Frequency range 1-10GHz



**Unintentional Radiator Emissions Test Setup  
Figure 3**



Electromagnetic Emission Test

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

Figure 4

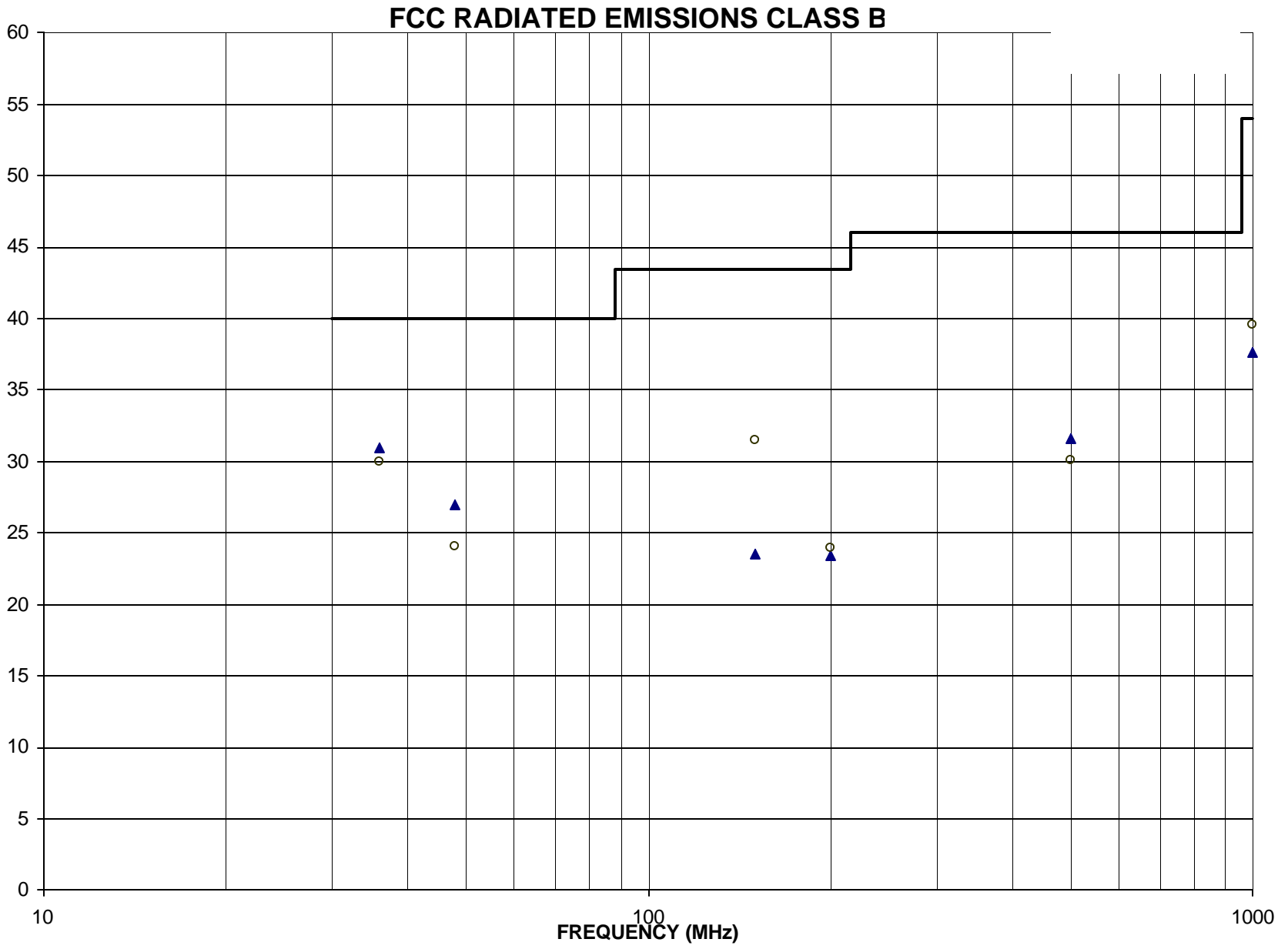


Figure 5



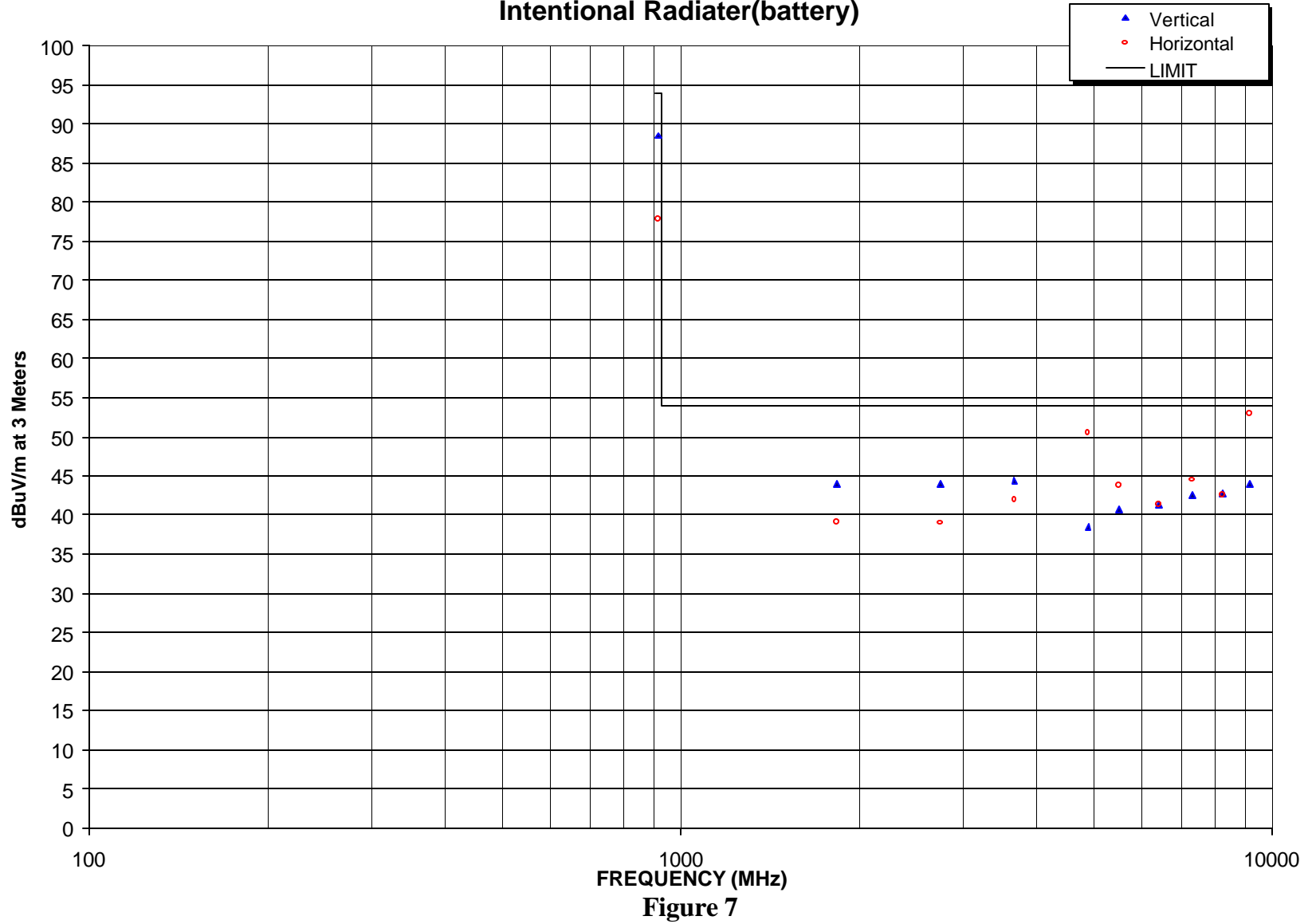
**Electromagnetic Emission Test**

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

**Figure 6**



### FCC RADIATED EMISSIONS Part C Intentional Radiator(battery)





**Electromagnetic Emission Test**

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

**Figure 8**





### FCC RADIATED EMISSIONS Part C Intentional Radiator(power supply)

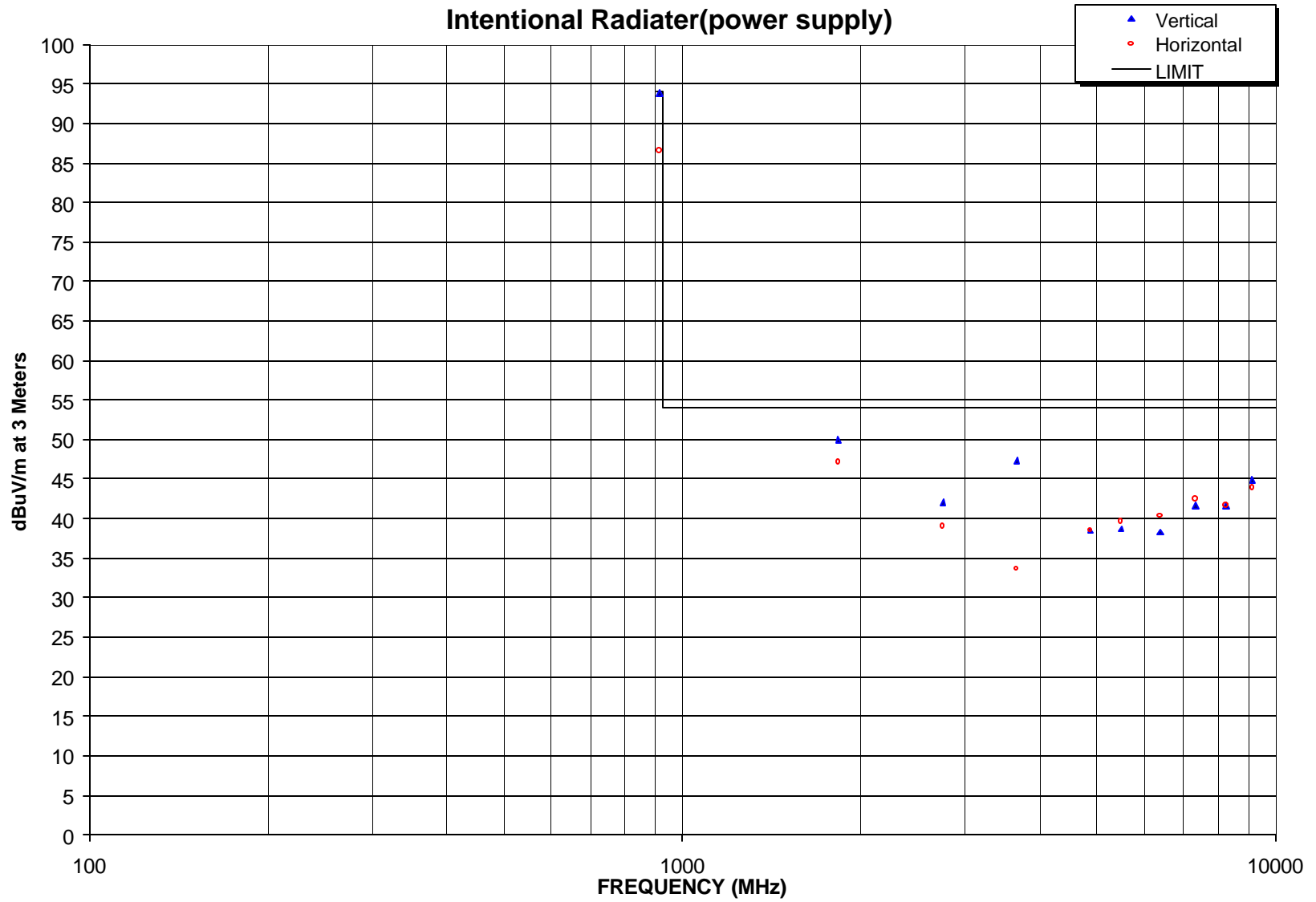


Figure 9



## 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.