



UL International EMC Services  
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<http://www.ul.com/emc/>

December 02, 2002

Accutec a Div.of  
Innovative Control Systems, Inc.  
Attn: Mr. Mark Kieckhefer  
N27 W23910-A Paul Rd.  
Pewaukee, WI 53072

UL Reference: File MC1670, Project 02NK45212

Subject: EMC Test and Measurement Report for  
Model TAD, Activator / Deactivator Module

Dear Mr. Kieckhefer:

We have provided with this letter your EMC Test Report for the above referenced model. The product was determined to comply with the requirements noted in the report.

Please review the attached report and direct any questions or comments to me. Samples will be returned to your attention.

We appreciate your interest in UL's EMC Services, and encourage you to contact us in the future should you need EMC test services. This closes Project 02NK45212.

Best regards,

Reviewed by:

A handwritten signature in black ink, appearing to read 'Mike Ehas'.

Mike Ehas (Ext 42351)  
EMC Lead Engineering Associate  
International EMC Services

A handwritten signature in black ink, appearing to read 'Jack Steiner'.

Jack Steiner  
Engineering Group Leader  
International EMC Services

# EMC – TEST REPORT

Issue Date: December 02, 2002

## √ EMISSIONS IMMUNITY

Test Report File No. : MC1670  
 Project No. : 02NK45212

Model / Type : TAD  
 Kind of Product : Activator / Deactivator Module

Applicant : Accutec a Div. of  
 Innovative Control Systems, Inc.

License Holder : Accutec a Div. of  
 Innovative Control Systems, Inc.

Address : N27 W23910-A Paul Rd  
 : Pewaukee, WI 53072

Manufacturer : Same as Applicant  
 :  
 :

**Test Result : COMPLIANT**

**This report without appendices consists of 10 pages. Appendix A contains test photos, Appendix B contains original test data and Appendix C contains sample calculations.**

**The data contained in this report reflects only the items tested in the configurations and mode of operations described. An attempt has been made to arrange the EUT, with the equipment provided, into a test configuration which maximizes the observed emissions of the EUT while simulating, as close as practical, a typical end-use installation. The photos and data provided in this report document that configuration.**

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**Underwriters Laboratories Inc. 333 Pfingsten Rd. Northbrook, IL 60062  
 Fax: (847) 272-8864**

# REPORT DIRECTORY

## SECTION   TITLE

### **GENERAL**

- 1.0            General Product Description
- 1.1            Model Differences
- 1.2            Environmental Conditions in Test Lab
- 1.3            Calibration Details of Equipment Used for Measurement
- 1.4            EUT (Equipment Under Test) Configuration
- 1.5            EUT Operating Mode
- 1.6            Device Modifications

### **EMISSIONS**

- 2.0            Emissions Test Regulations
  - Conducted Voltage
  - Radiated Electric Field Emissions

### **IMMUNITY**

- 3.0            Immunity Test Regulations

### **CONCLUSION**

- 4.0            General Remarks
- 4.1            Summary

### **APPENDICIES**

- A            Test Setups (Photos, Diagrams and Drawings)
- B            Test Data
- C            Sample Calculations
- D            Block Diagram of the Measurement System

## 1.0 GENERAL PRODUCT DESCRIPTION

The Equipment Under Test (EUT) is a activation / deactivation module. The module transmits at 132 kHz to activate or deactivate the Baby TAG Module. The module also receives at 418 MHz to verify the operation of the TAG if it were to be removed from the infant.

### 1.0.1 Equipment Mobility:

Floor Standing. See Appendix A for configuration photos.

### 1.0.2 Test Voltage and Frequency:

<u>Voltage (V)</u>	<u>Frequency (Hz)</u>
9	DC

## 1.1 MODEL DIFFERENCES

**Any other model(s) represented by the models tested in this investigation will be documented by the manufacturer.**

## 1.2 ENVIRONMENTAL CONDITIONS IN TEST LAB

<b>Temperature:</b>	<b>20-25 °C</b>
<b>Relative Humidity:</b>	<b>30-60% RH</b>
<b>Atmospheric Pressure:</b>	<b>860-1060 mbar</b>

## 1.3 CALIBRATION OF EQUIPMENT USED FOR MEASUREMENT

**All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.**

**All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST), therefore, all test data recorded in this report is traceable to NIST.**

**1.4 EUT CONFIGURATION(s)**

**See Appendix A for individual set-up configuration(s). In addition to the EUT, the following peripheral devices and/or cables were connected during the measurement:**

Device	Manufacturer	Model	Serial #	FCC ID
N/A				

Cable	Manufacturer	Length	Type	Shield Type	Shield Termination
N/A					

**1.5 EUT OPERATING MODE(s)**

**The equipment under test was operated during the measurements under the following conditions:**

Testing was conducted in the receive/standby mode and the transmit mode. Measurements were maximized with the device situated in the 3 orthogonal axes. Testing was conducted with a new battery.

**1.6 DEVICE MODIFICATIONS**

**The following modifications were necessary for compliance:**

None

## **2.0 EMISSIONS TEST REGULATIONS**

Emissions testing was performed according to the following regulations:

47 CFR Part 15 Subpart C: 2000 + ANSI C63.4 – 1992  
47 CFR Part 15.209(a)(b)(c)(d)

## **RADIATED ELECTRIC FIELD EMISSIONS, 10kHz to 30MHz**

### Test Location

10 Meter Semi-Anechoic Chamber

### UL Procedure

3014ANBK-LPG-002

### Test Instruments

Spectrum Analyzer / Quasi-peak Adapter / Preamplifier / Preselector

Hewlett Packard Model 8566B Spectrum Analyzer

Last Cal. 05/08/02    Next Cal. 05/08/03

Model 85650A Quasi-peak Adapter

Last Cal. 05/08/02    Next Cal. 05/08/03

Model 85685A RF Preselector        No. EMC4015

Last Cal. 05/08/02    Next Cal. 05/08/03

### Antennas

Solar Electronics., Loop Sensor, Model 7334-1

Last Cal. 03/07/02    Next Cal. 03/07/03

### Frequency Range of Measurement

10kHz-30MHz

### Measurement Distance

10 meters

### Antenna Height

150 cm

### Test Results

The requirements are:

MET

### Remarks

See App. B for complete test results.

Measurements were check in both the Horizontal and Vertical polarities. Only the antenna polarity with the highest reading was used for final measurements.

**RADIATED ELECTRIC FIELD EMISSIONS, 30MHz to 1000MHz**Test Location

10 Meter Semi-Anechoic Chamber

UL Procedure

3014ANBK-LPG-002

Test InstrumentsSpectrum Analyzer / Quasi-peak Adapter / Preamplifier / Preselector

Hewlett Packard Model 8566B Spectrum Analyzer

Last Cal. 05/08/02 Next Cal. 05/08/03

Model 85650A Quasi-peak Adapter

Last Cal. 05/08/02 Next Cal. 05/08/03

Miteq AM-3A-000110-N Preamp No. FCA4003, EMC4016, EMC4151

Last Cal. 05/08/02 Next Cal. 05/08/03

Model 85685A RF Preselector No. EMC4015

Last Cal. 05/08/02 Next Cal. 05/08/03

Antennas

Chase EMC Ltd., Biconical Antenna Model VBA6106A

S/N 1246

Last Cal. 05/25/02 Next Cal. 05/25/03

Chase EMC Ltd., Log Periodic Antenna Model UPA6108

S/N 1120

Last Cal. 05/25/02 Next Cal. 05/25/03

Frequency Range of Measurement

30MHz-1000MHz

Measurement Distance

3 meters

Test Results

The requirements are:

MET

Remarks

See App. B for complete test results.

Preliminary measurements (peak scans) were done by rotating the turntable 360° and at multiple antenna heights (1 meter and 3 meters).

If necessary, final measurements were conducted using a quasi-peak detector. These emissions were maximized by rotating the turntable 360° and positioning the receive antenna from 1 to 4 meters in height.



**RADIATED ELECTRIC FIELD EMISSIONS, 1000MHz to 5000MHz**

Test Location

10 Meter Semi-Anechoic Chamber

UL Procedure

3014ANBK-LPG-002

Test Instruments

Spectrum Analyzer / Preamplifier / Preselector

Hewlett Packard Model 8566B Spectrum Analyzer

Last Cal. 05/08/02 Next Cal. 05/08/03

Model 8499 Preamplifier No. EMC4201

Last Cal. 05/08/02 Next Cal. 05/08/03

Model 85685A RF Preselector No. EMC4015

Last Cal. 05/08/02 Next Cal. 05/08/03

Antennas

EMCO., Double Ridge Guide Antenna Model 3115 S/N 3032

Last Cal. 05/25/02 Next Cal. 05/25/03

Frequency Range of Measurement

1000MHz-5000MHz

Measurement Distance

3 meters

Test Results

The requirements are:

MET

Remarks

See App. B for complete test results.

Preliminary measurements (peak scans) were done by rotating the turntable 360° and at multiple antenna heights (1 meter and 3 meters).

If necessary, final measurements were conducted using a quasi-peak detector. These emissions were maximized by rotating the turntable 360° and positioning the receive antenna from 1 to 4 meters in height.

### 3.0 IMMUNITY TEST REGULATIONS

**Immunity testing was not required nor performed.**

### 4.0 GENERAL REMARKS

Sample Receipt Date : October 24, 2002

Test Dates

Start : October 30, 2002  
End : October 31, 2002

### 4.1 SUMMARY

The requirements according to the technical regulations are:

MET

Underwriters Laboratories Inc.  
333 Pfingsten Road  
Northbrook, IL 60062 USA

**FCC Site Number: 31040/SIT 1300F2**

Best regards,



Mike Ehas (Ext 42351)  
EMC Lead Engineering Associate  
International EMC Services

Reviewed by:



Jack Steiner  
Engineering Group Leader  
International EMC Services

**APPENDIX A**

**PHOTOS**



**Radiated Emissions**

**TAD Tx Mode**

**Fig. 1**



**Radiated Emissions**

**TAD Rx Mode  
TAG TX Mode**

**Fig. 2**

**APPENDIX B**

**TEST DATA**

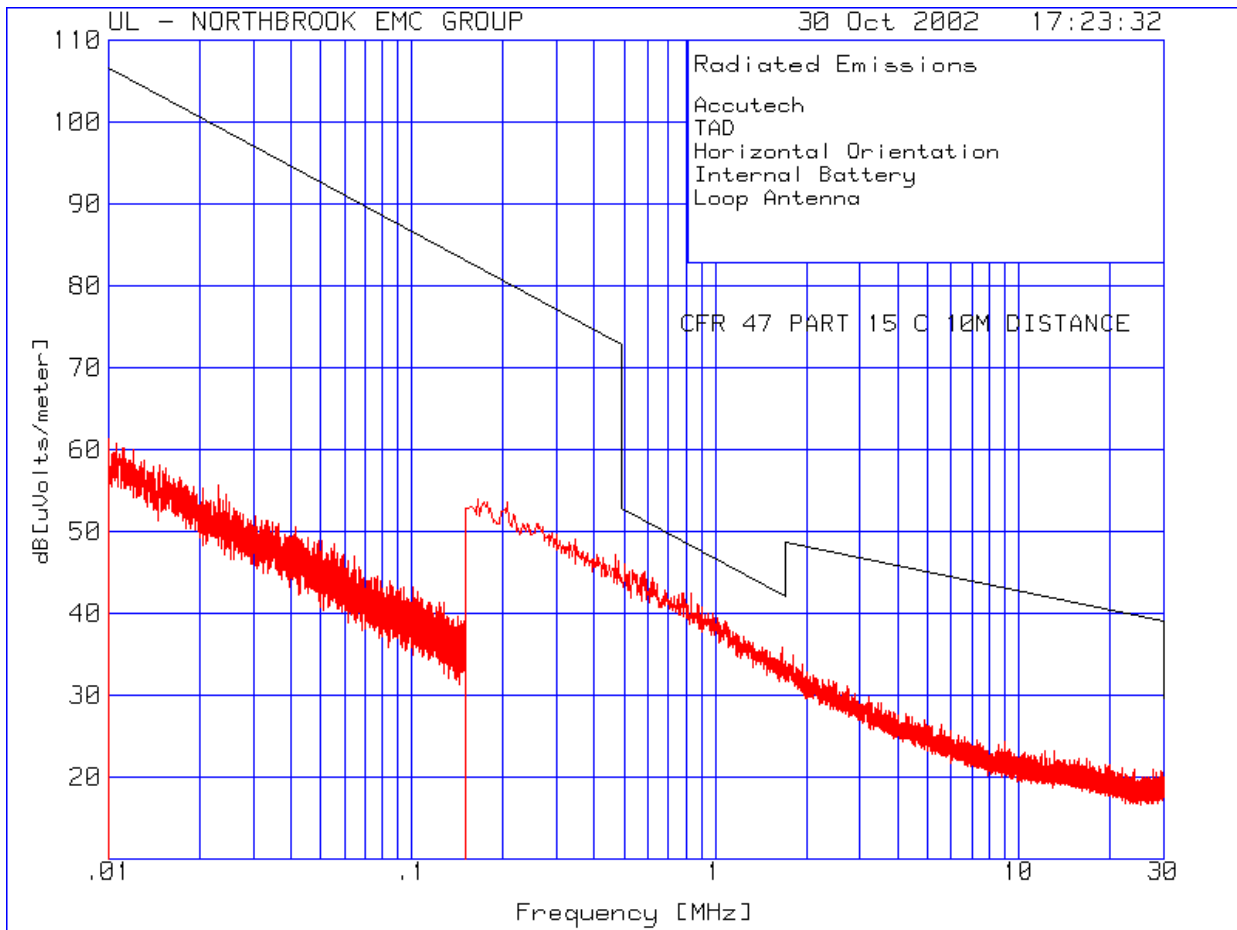
**EMISSIONS**

Radiated Electric Field Emissions

**UNDERWRITERS LABORATORIES INC.  
Radiated Emissions**

Date Tested: 30 October 2002

**Manufacturer** : Accutech  
**Equipment Under Test** : TAD (Full burst, Tx activation mode, Horizontal position)  
**Requirement** : CFR 47, Part 15  
**Detection Mode** : Average (Av)  
**Bandwidth** : 200 Hz (10 kHz-150 kHz), 9 kHz (150 kHz-30 MHz)  
**Measurement Distance** : 10 meter  
**Antenna Type** : 10 kHz – 30 MHz Loop Sensor

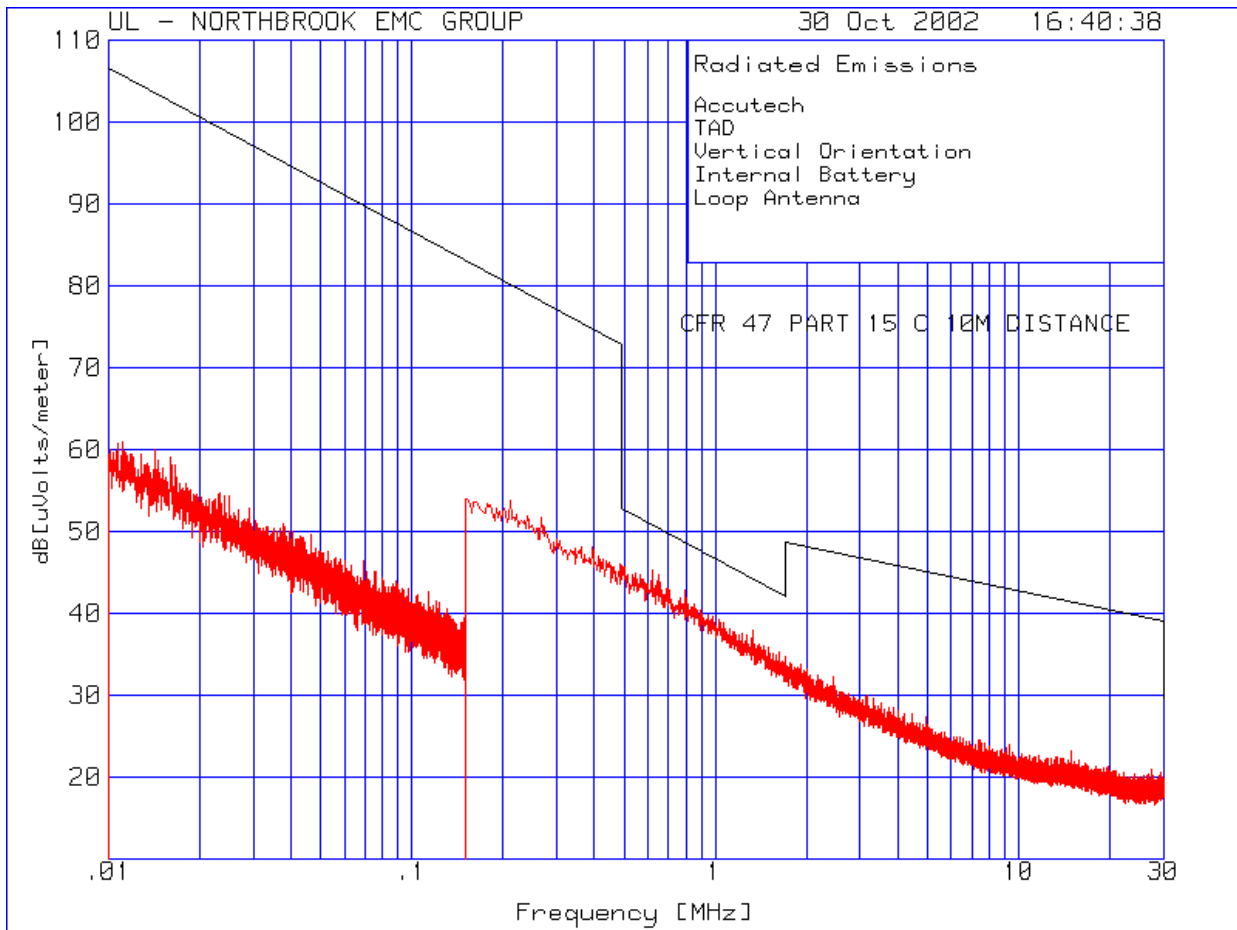


**Note - The Fundamental frequency emission amplitude was so low, the peak did not show up until the device was placed next to the antenna.**

**UNDERWRITERS LABORATORIES INC.  
Radiated Emissions**

Date Tested: 30 October 2002

**Manufacturer** : Accutech  
**Equipment Under Test** : TAD (Full burst, Tx activation mode, Vertical position)  
**Requirement** : CFR 47, Part 15  
**Detection Mode** : Average (Av)  
**Bandwidth** : 200 Hz (10 kHz-150 kHz), 9 kHz (150 kHz-30 MHz)  
**Measurement Distance** : 10 meter  
**Antenna Type** : 10 kHz – 30 MHz Loop Sensor

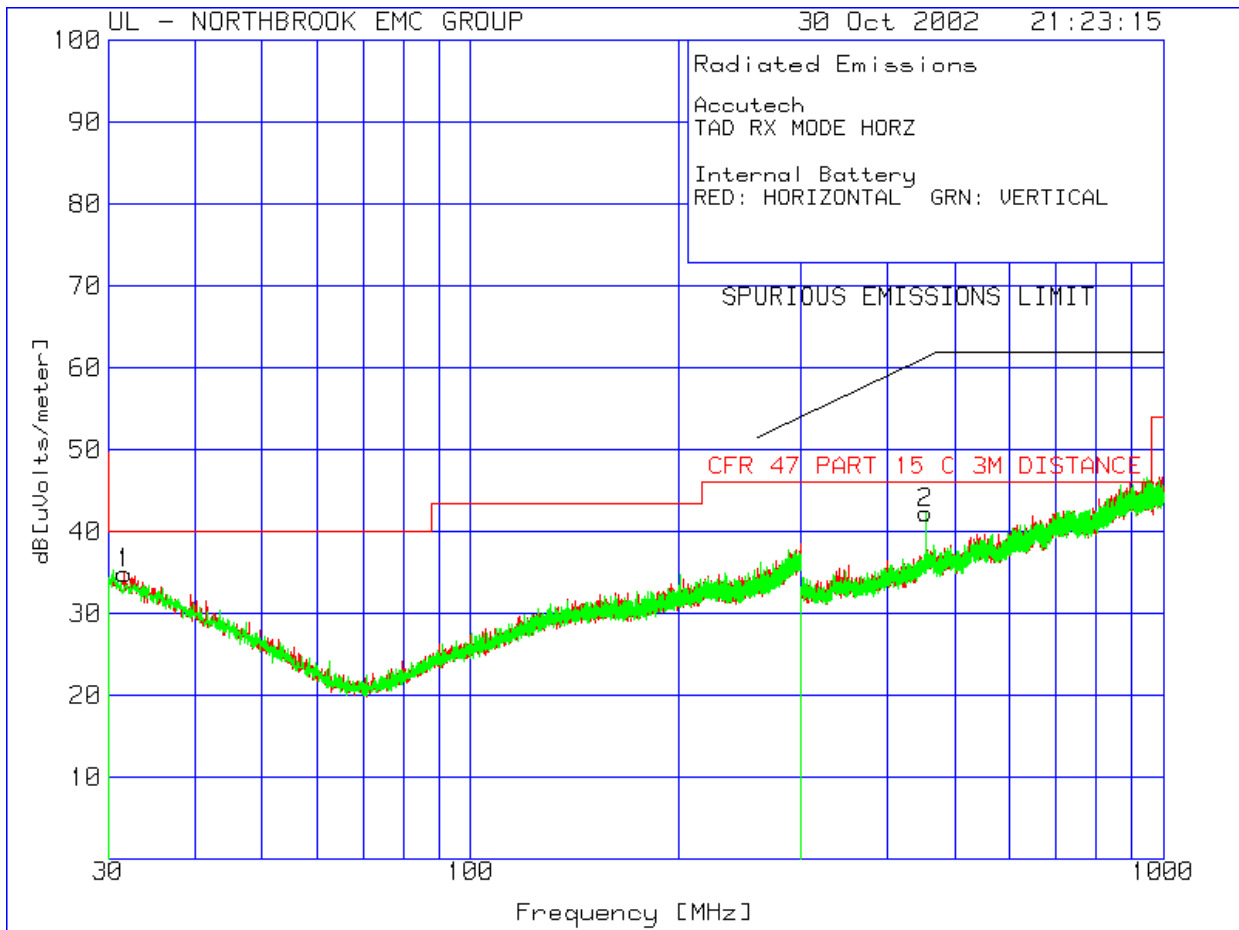


**Note - The Fundamental frequency emission amplitude was so low, the peak did not show up until the device was placed next to the antenna.**

**UNDERWRITERS LABORATORIES INC.  
Radiated Emissions**

Date Tested: 30 October 2002

**Manufacturer** : Accutech  
**Equipment Under Test** : TAD (Full burst, Tx activation mode, Horizontal position)  
**Requirement** : CFR 47, Part 15, Class B  
**Detection Mode** : Quasi-peak (qp) and Average (Av)  
**Bandwidth** : 120 kHz  
**Measurement Distance** : 3 meters  
**Antenna Type** : 30 - 300 MHz, Biconical  
 300 - 1000 MHz, Log-Periodic





Accutech  
 TAD RX MODE HORZ  
 Internal Battery  
 RED: HORIZONTAL GRN: VERTICAL

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
-----							
Range: 1 30 - 300MHz -----							
1	31.6188	16.45 pk	.4	18.05	34.9	40	
	Azimuth:120	Height:101	Horz	Margin [dB]		-5.1	
-----							
Range: 4 300 - 1000MHz -----							
AMBIENT							
2	454.4092	21.44 pk	2.24	18.62	42.3	46	61.33
	Azimuth:117	Height:101	Vert	Margin [dB]		-3.7	-19.03

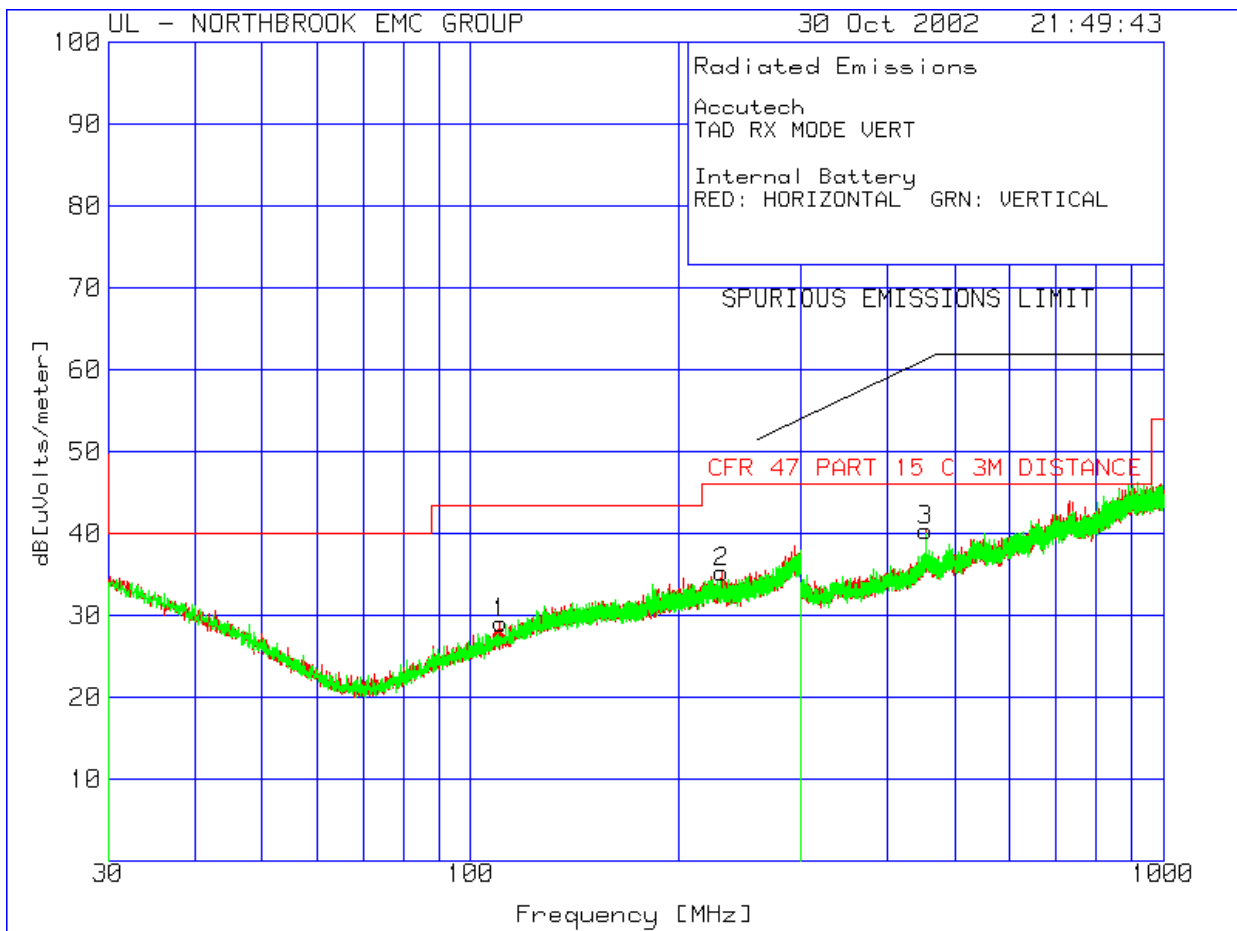
LIMIT 1: CFR 47 PART 15 C 3M DISTANCE  
 LIMIT 2: SPURIOUS EMISSIONS LIMIT

pk - Peak detector

**UNDERWRITERS LABORATORIES INC.**  
**Radiated Emissions**

Date Tested: 30 October 2002

**Manufacturer** : Accutech  
**Equipment Under Test** : TAD (Full burst, Tx activation mode, Vertical position)  
**Requirement** : CFR 47, Part 15, Class B  
**Detection Mode** : Quasi-peak (qp)  
**Bandwidth** : 120 kHz  
**Measurement Distance** : 3 meters  
**Antenna Type** : 30 - 300 MHz, Biconical  
 300 - 1000 MHz, Log-Periodic



Accutech  
 TAD RX MODE VERT  
 Internal Battery  
 RED: HORIZONTAL GRN: VERTICAL

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
=====							
Range: 1 30 - 300MHz -----							
1	110.3323	16.52 pk	1	11.58	29.1	43.46	
	Azimuth:122	Height:101	Horz	Margin [dB]		-14.36	
2	230.662	17.4 pk	1.5	16.4	35.3	46	
	Azimuth:233	Height:101	Horz	Margin [dB]		-10.7	
-----							
Range: 3 300 - 1000MHz -----							
3	453.8846	19.6 pk	2.21	18.59	40.4	46	61.31
	Azimuth:36	Height:101	Horz	Margin [dB]		-5.6	-20.91

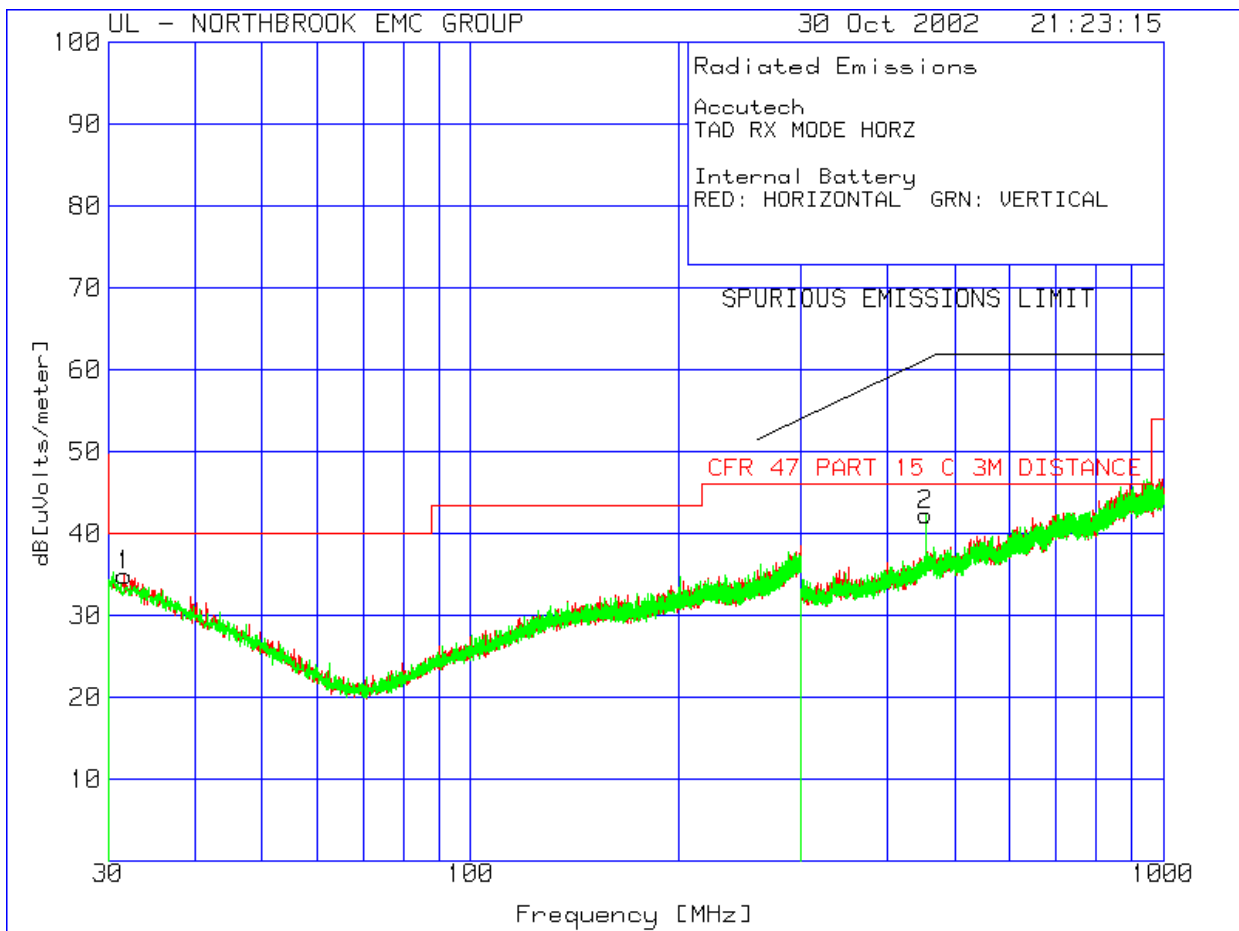
LIMIT 1: CFR 47 PART 15 C 3M DISTANCE  
 LIMIT 2: SPURIOUS EMISSIONS LIMIT

pk - Peak detector

**UNDERWRITERS LABORATORIES INC.**  
**Radiated Emissions**

Date Tested: 30 October 2002

**Manufacturer** : Accutech  
**Equipment Under Test** : TAD (RX Mode, Horizontal position)  
**Requirement** : CFR 47, Part 15, Class B  
**Detection Mode** : Quasi-peak (qp)  
**Bandwidth** : 120 kHz  
**Measurement Distance** : 3 meters  
**Antenna Type** : 30 - 300 MHz, Biconical  
 300 - 1000 MHz, Log-Periodic



Accutech  
TAD RX MODE HORZ  
Internal Battery  
RED: HORIZONTAL GRN: VERTICAL

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
-----							
Range: 1 30 - 300MHz -----							
1	31.6188	16.45 pk	.4	18.05	34.9	40	
	Azimuth:120	Height:101	Horz	Margin [dB]		-5.1	
-----							
Range: 4 300 - 1000MHz -----							
AMBIENT							
2	454.4092	21.44 pk	2.24	18.62	42.3	46	61.33
	Azimuth:117	Height:101	Vert	Margin [dB]		-3.7	-19.03

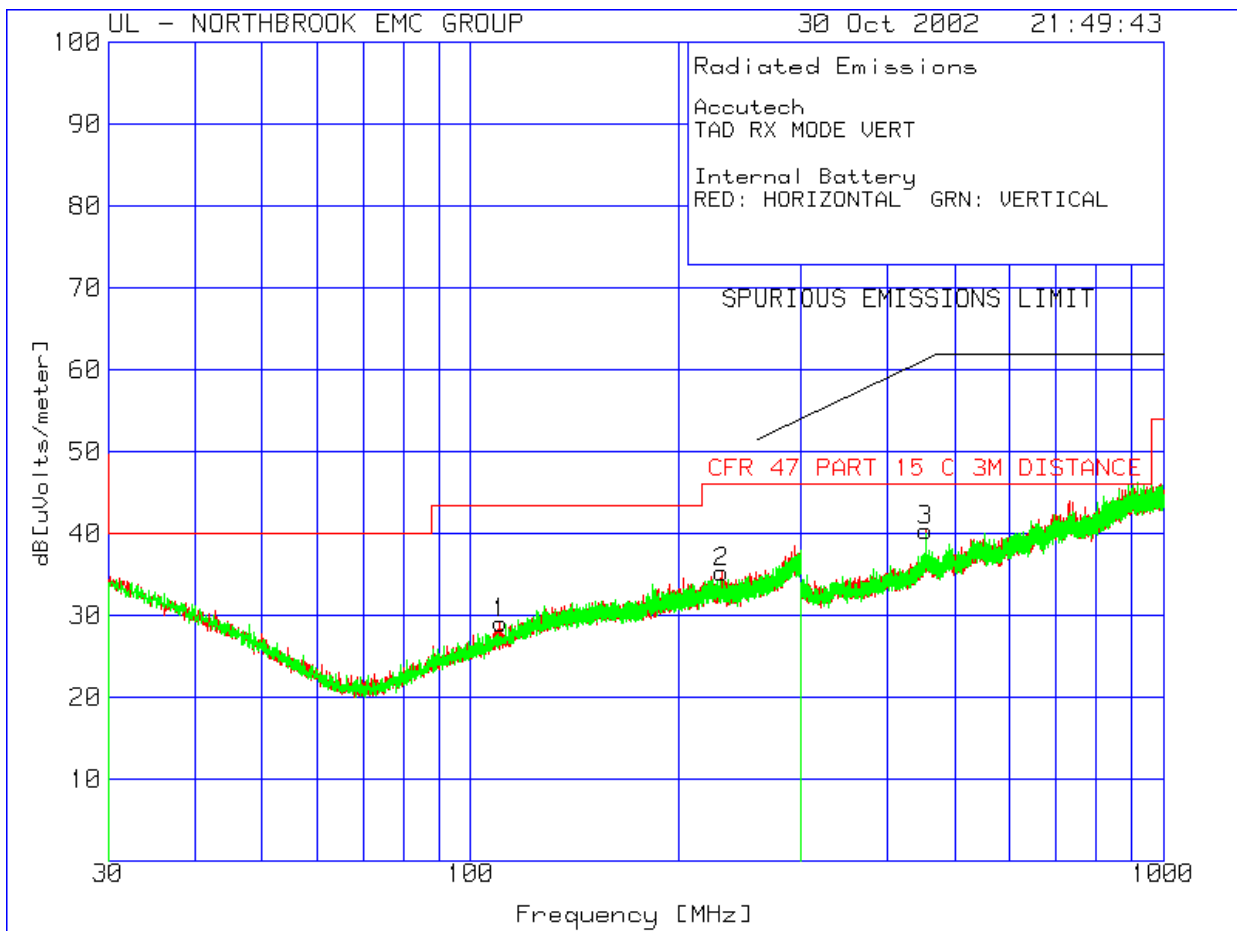
LIMIT 1: CFR 47 PART 15 C 3M DISTANCE  
LIMIT 2: SPURIOUS EMISSIONS LIMIT

pk - Peak detector

**UNDERWRITERS LABORATORIES INC.**  
**Radiated Emissions**

Date Tested: 30 October 2002

**Manufacturer** : Accutech  
**Equipment Under Test** : TAD (RX Mode, Vertical position)  
**Requirement** : CFR 47, Part 15, Class B  
**Detection Mode** : Quasi-peak (qp)  
**Bandwidth** : 120 kHz  
**Measurement Distance** : 3 meters  
**Antenna Type** : 30 - 300 MHz, Biconical  
 300 - 1000 MHz, Log-Periodic



Accutech  
 TAD RX MODE VERT  
 Internal Battery  
 RED: HORIZONTAL GRN: VERTICAL

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
Range: 1 30 - 300MHz -----							
1	110.3323	16.52 pk	1	11.58	29.1	43.46	
	Azimuth:122	Height:101	Horz	Margin [dB]		-14.36	
2	230.662	17.4 pk	1.5	16.4	35.3	46	
	Azimuth:233	Height:101	Horz	Margin [dB]		-10.7	
Range: 3 300 - 1000MHz -----							
3	453.8846	19.6 pk	2.21	18.59	40.4	46	61.31
	Azimuth:36	Height:101	Horz	Margin [dB]		-5.6	-20.91

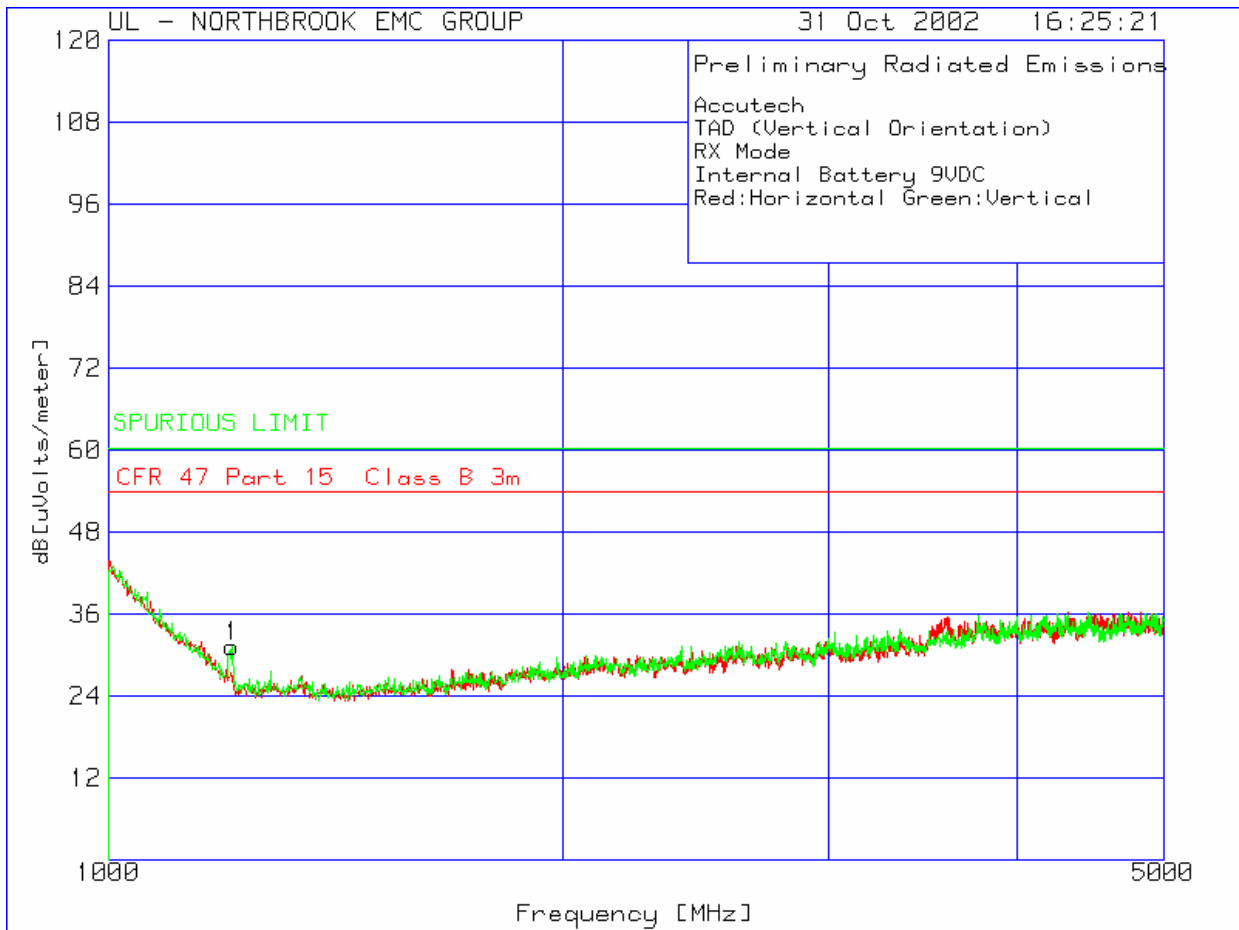
LIMIT 1: CFR 47 PART 15 C 3M DISTANCE  
 LIMIT 2: SPURIOUS EMISSIONS LIMIT

pk - Peak detector

**UNDERWRITERS LABORATORIES INC.  
Radiated Emissions**

Date Tested: 31 October 2002

**Manufacturer** : Accutech  
**Equipment Under Test** : TAD (Rx Mode, Vertical position)  
**Requirement** : CFR 47, Part 15, Class B  
**Detection Mode** : Average (Av)  
**Bandwidth** : 1 MHz  
**Measurement Distance** : 3 meters  
**Antenna Type** : 1000 - 5000 MHz, Horn



**Based on previous measurements, measurements were made with the product only in the vertical orientation.**



Accutech  
 TAD (Vertical Orientation)  
 RX Mode  
 Internal Battery 9VDC  
 Red:Horizontal Green:Vertical

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
=====							
Range: 3 1000 - 5000MHz -----							
1	1208.104	60.63 pk	-55.06	25.71	31.28	53.97	60.2
	Azimuth:209	Height:122	Vert	Margin [dB]		-22.69	-28.92

LIMIT 1: CFR 47 Part 15 Class B 3m  
 LIMIT 2: SPURIOUS LIMIT

pk - Peak detector

## APPENDIX C

### Sample Calculations of Field Strengths

#### Basic Equation:

The field strength is calculated by adding the Meter Reading, Cable Set Gain/Loss and Transducer (Antenna or LISN) Factor. The basic equation is as follows:

$$FS = MR + GL + TF$$

Where:

FS = Calculated Field Strength in dB(uV)/meter

MR = Meter Reading of receiver amplitude in dB(uV)

GL = Gain/Loss factor of cable set in dB

A negative Gain/Loss indicates signal amplification (gain)

A positive Gain/Loss indicates signal attenuation (loss)

TF = Transducer Factor of antenna or LISN in dB

#### Sample Calculation:

The measured receiver amplitude is 52.7 dB(uV).

The gain/loss factor is -30.2 dB (indicating a preamplifier is included in the cable set).

The transducer factor (antenna factor) is 6.6 dB.

These factors are added ( $52.7 + (-30.2) + 6.6$ ) resulting in a calculated field strength of 29.1 dB(uV)/meter.

## Sample Calculations of Limit

### Basic Equation:

The limit is calculated by using the information in table 15.209 for frequency (MHz), field strength (uV/m) and measurement distance (meters).

**The basic equation for converting uV/m to dBuV/m is as follows:**

$$20 \text{ Log (uV/m) = dBuV/m}$$

Where:

uV/m = micro volts per meter

dBuV/m = decibel micro volts per meter

### Sample Calculation:

The field strength per section 15.209 at 30 MHz (3 m measurement distance) is 100 uV/m.

$$20 \text{ Log (100 uV/m) = 40 dBuV/m}$$