UL International EMC Services
333 Pfingsten Road
Northbrook, Illinois 60062-2096
(800) 873-8536
Fax No. (847) 272-8864
http://www.ul.com/emc/

December 03, 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 TAG, Infant Security 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,

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

Reviewed by:

Jack Steiner
Engineering Group Leader
International EMC Services

EMC – TEST REPORT

Issue Date: December 03, 2002

√ **EMISSIONS**

IMMUNITY

Test Report File No.	:	MC1670
Project No.	:	02NK45212
Model / Type	:	TAG
Kind of Product	:	Infant Security 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.

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

REPORT DIRECTORY

SECTION TITLE

GENERAL

EMISSIONS

IMMUNITY

CONCLUSION

APPENDICIES

1.0 GENERAL PRODUCT DESCRIPTION

The Equipment Under Test (EUT) is an infant security module. The module is warn by the infant and if the module is removed or if the infant is passed through an area with doorway modules active (transmitting 132 kHz signal), the TAG then transmits a 418 MHz signal to a central receiving module which is in turn connected to the graphical display system or Multiplexer.

1.0.1 Equipment Mobility:

Floor Standing. See Appendix A for configuration photos.

1.0.2 Test Voltage and Frequency:

Voltage (V)	Frequency (Hz)
1.5	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

Temperature:	**20-25 °C**
Relative Humidity:	**30-60% RH**
Atmospheric Pressure:	**860-1060 mbar**

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 transmit mode. The device does not operate in the standby mode until it receives a 132 kHz signal from a doorway module or the strap has been removed from the infant. 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)
47 CFR Part 15.231(a)(b)(c)

This device transmits continuously when activated. Per 15.231(a)(4), A safety device may operate continuously during the pendency of the alarm.

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

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 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
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.

RADIATED EMISSIONS / BAND EDGE MEASUREMENT

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
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
418 MHz

Measurement Distance
3 meters

Test Results
The requirements are:
MET

Remarks
See App. B for complete test results.

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 24, 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 Rx Mode
TAG TX Mode

Fig. 2

APPENDIX B

TEST DATA

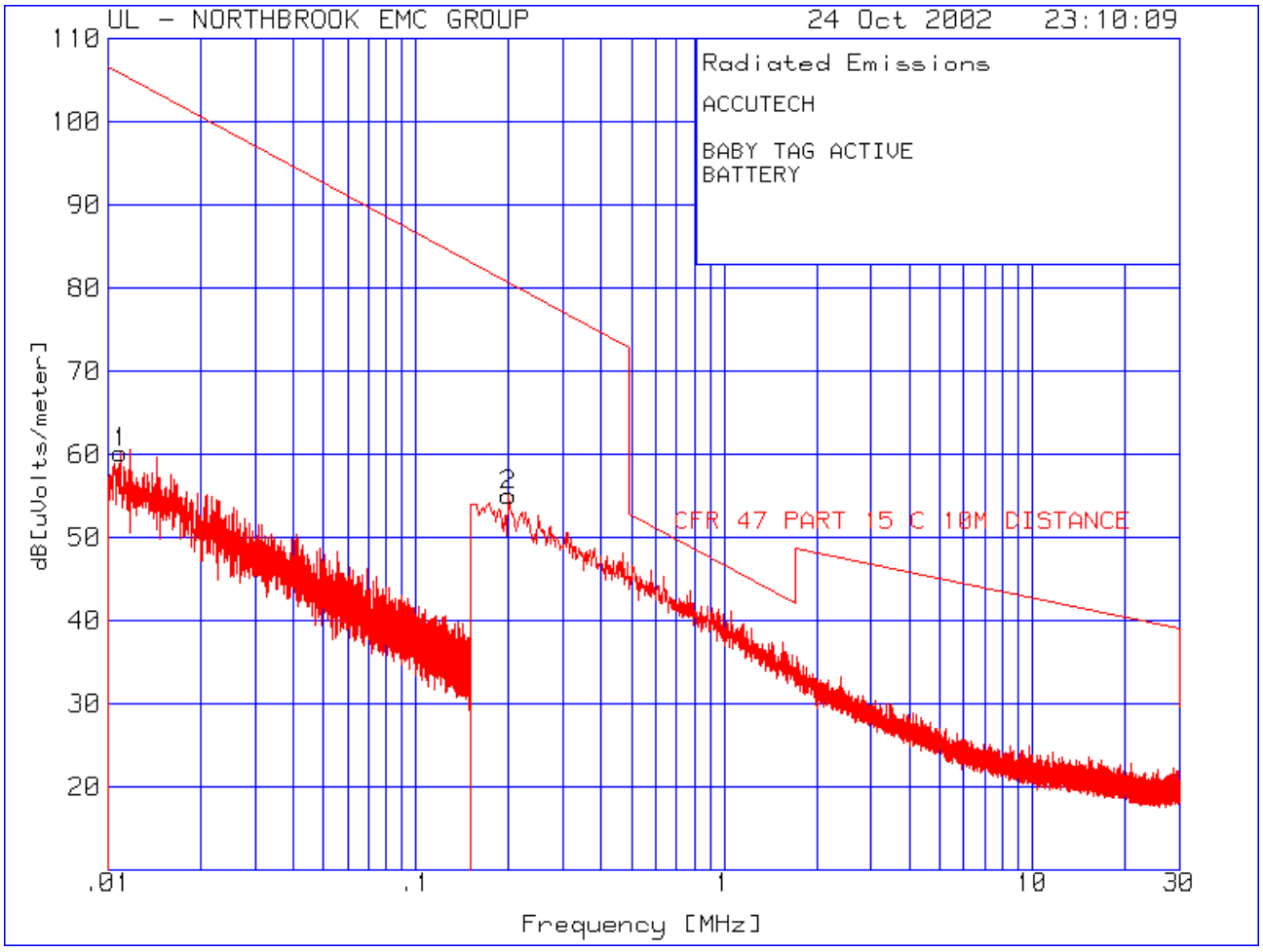
EMISSIONS

Radiated Electric Field Emissions

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 24 October 2002

Manufacturer	:	**Accutech**
Equipment Under Test	:	**TAG (Tx activation mode)**
Requirement	:	**CFR 47, Part 15**
Detection Mode	:	Quasi-peak (qp) and 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**



ACCUTECH
BABY TAG ACTIVE
BATTERY

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1
Range: 1 .01 - .15MHz						
1	.011	39.67 pk	0	20.53	60.2	105.86
	Azimuth:191	Height:100 Horz		Margin [dB]		-45.66
Range: 2 .15 - 30MHz						
2	.1997	42.99 pk	.01	12.1	55.1	80.69
	Azimuth:184	Height:100 Horz		Margin [dB]		-25.59

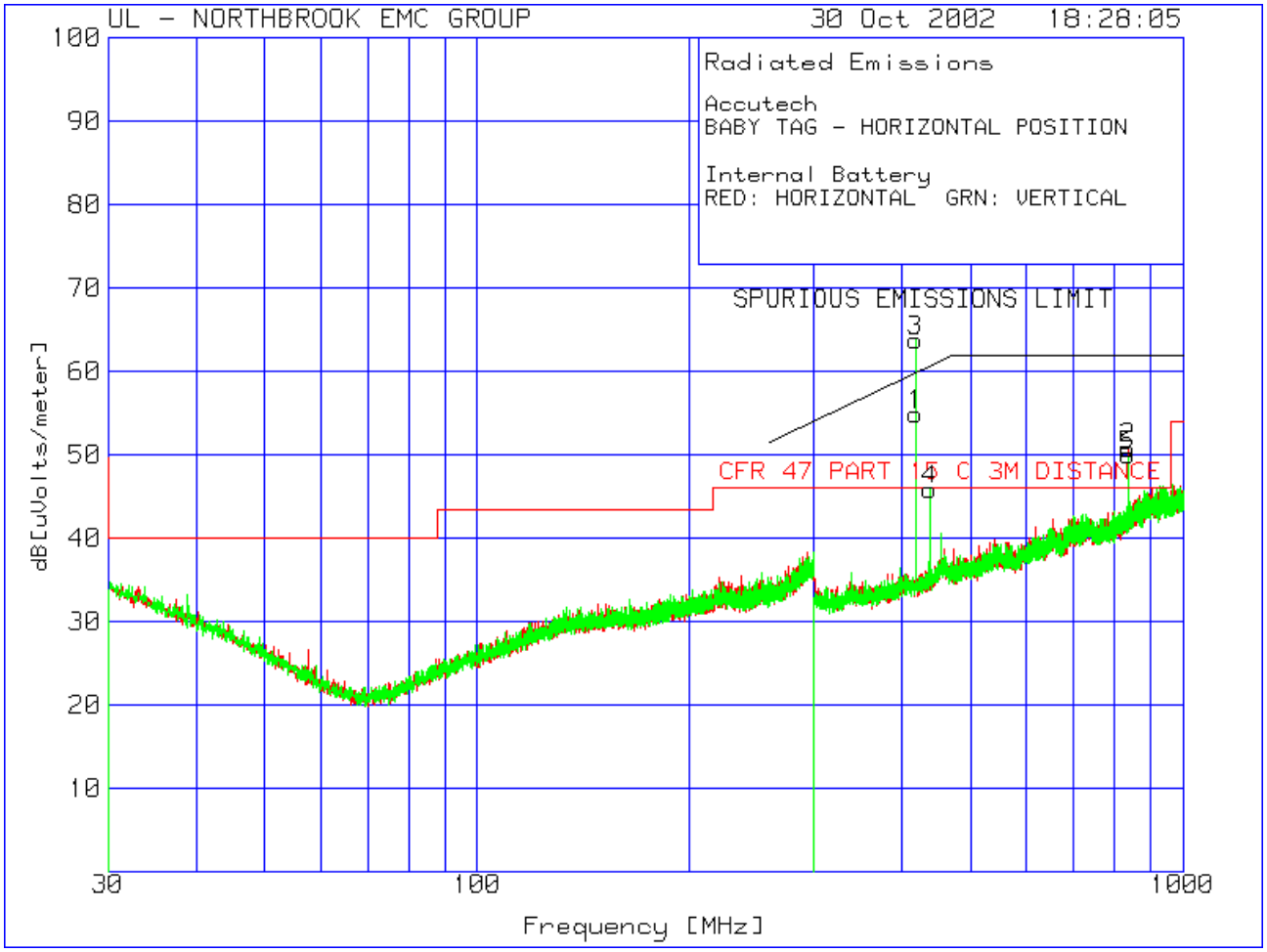
LIMIT 1: CFR 47 PART 15 C 10M DISTANCE

pk - Peak detector

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 30 October 2002

Manufacturer	:	**Accutech**
Equipment Under Test	:	**TAG (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



FUNDAMENTAL FREQUENCY = 417.9123
FUNDAMENTAL FREQUENCY LIMIT = 80.28dBuV/m

Accutech
BABY TAG - HORIZONTAL POSITION
Internal Battery
RED: HORIZONTAL GRN: VERTICAL

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
Range: 4 300 - 1000MHz						
417.9119	42.3 qp	2.1	16.9	61.3		80.28
Azimuth: 3	Height:200	Horz		Margin [dB]:		-28.98
417.9123	47.15 qp	2.1	16.9	66.15		80.28
Azimuth: 248	Height:138	Vert		Margin [dB]:		-25.13
438.0933	22.99 qp	2.2	17.4	42.59	46	60.7
Azimuth: 150	Height:182	Horz		Margin [dB]:	-3.41	-18.11
438.0668	26.34 qp	2.2	17.4	45.94	46	60.7
Azimuth: 254	Height:139	Vert		Margin [dB]:	-.06	-14.76
835.8479	22.45 qp	3.5	23.3	49.25	46	61.9
Azimuth: 61	Height:106	Horz		Margin [dB]:	3.25	-12.65
835.8497	24.71 qp	3.5	23.3	51.51	46	61.9
Azimuth: 212	Height:145	Vert		Margin [dB]:	5.51	-10.39

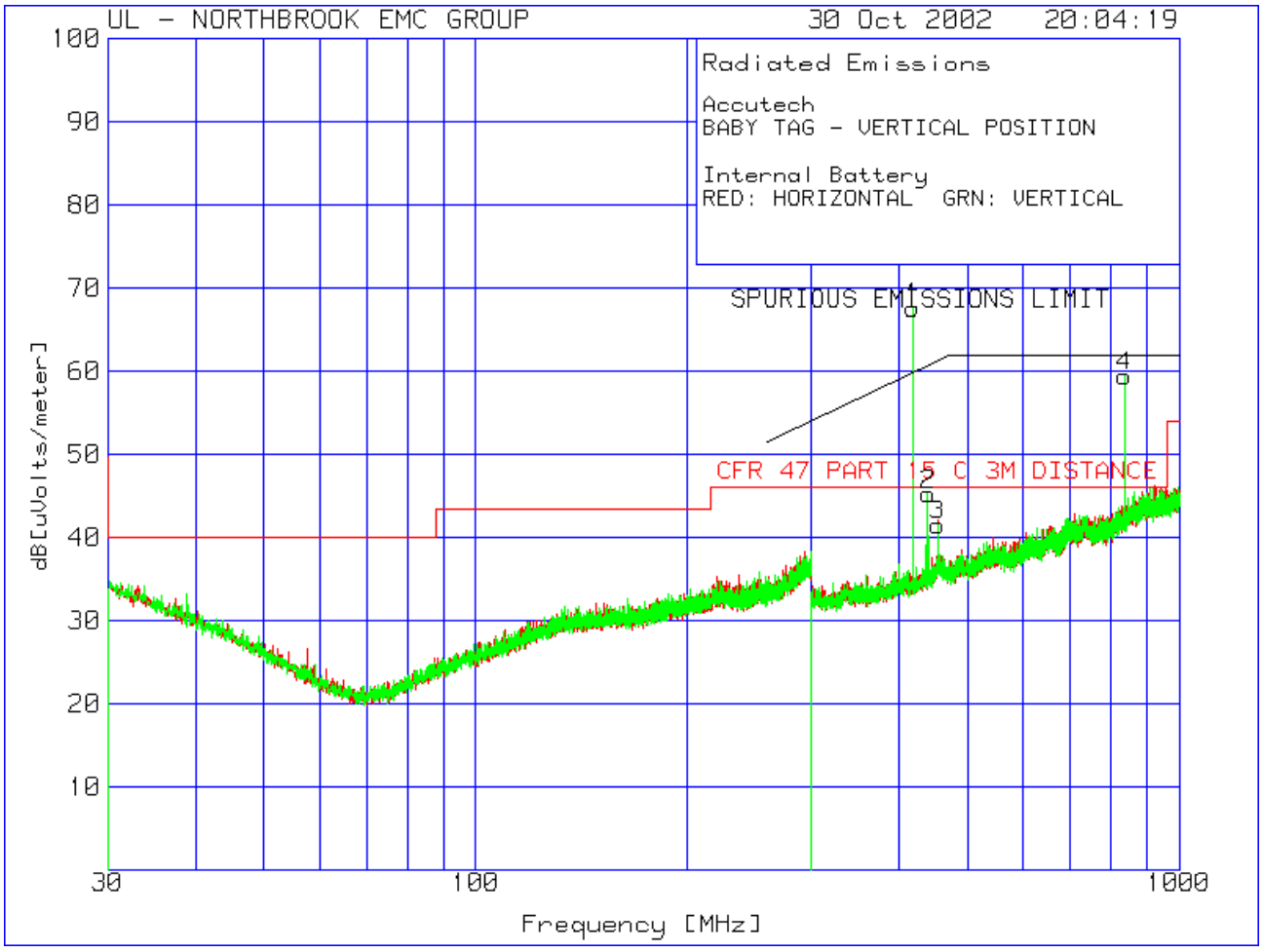
LIMIT 1: CFR 47 PART 15 C 3M DISTANCE
LIMIT 2: SPURIOUS EMISSIONS LIMIT

qp - Quasi-Peak detector

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 30 October 2002

Manufacturer	:	**Accutech**
Equipment Under Test	:	**TAG (Tx activation mode, Vertical 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
BABY TAG - VERTICAL POSITION
Internal Battery
RED: HORIZONTAL GRN: VERTICAL

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
Range: 3 300 - 1000MHz						
417.924	43.1 qp	2.1	16.9	62.1		80.28
Azimuth: 131	Height:100	Horz		Margin [dB]:		-28.18
417.9161	48.94 qp	2.1	16.9	67.94		80.28
Azimuth: 90	Height:142	Vert		Margin [dB]:		-22.34
439.5412	33.6 qp	2.2	17.5	53.3	46	60.8
Azimuth: 274	Height:116	Vert		Margin [dB]:	7.3	-7.5
439.5657	30.64 qp	2.2	17.5	50.34	46	60.8
Azimuth: 147	Height:103	Horz		Margin [dB]:	4.34	-10.46
835.861	32.44 qp	3.5	23.3	59.24	46	61.9
Azimuth: 59	Height:102	Horz		Margin [dB]:	13.24	-2.66
835.8683	26.63 qp	3.5	23.3	53.43	46	61.9
Azimuth: 209	Height:238	Vert		Margin [dB]:	7.43	-8.47

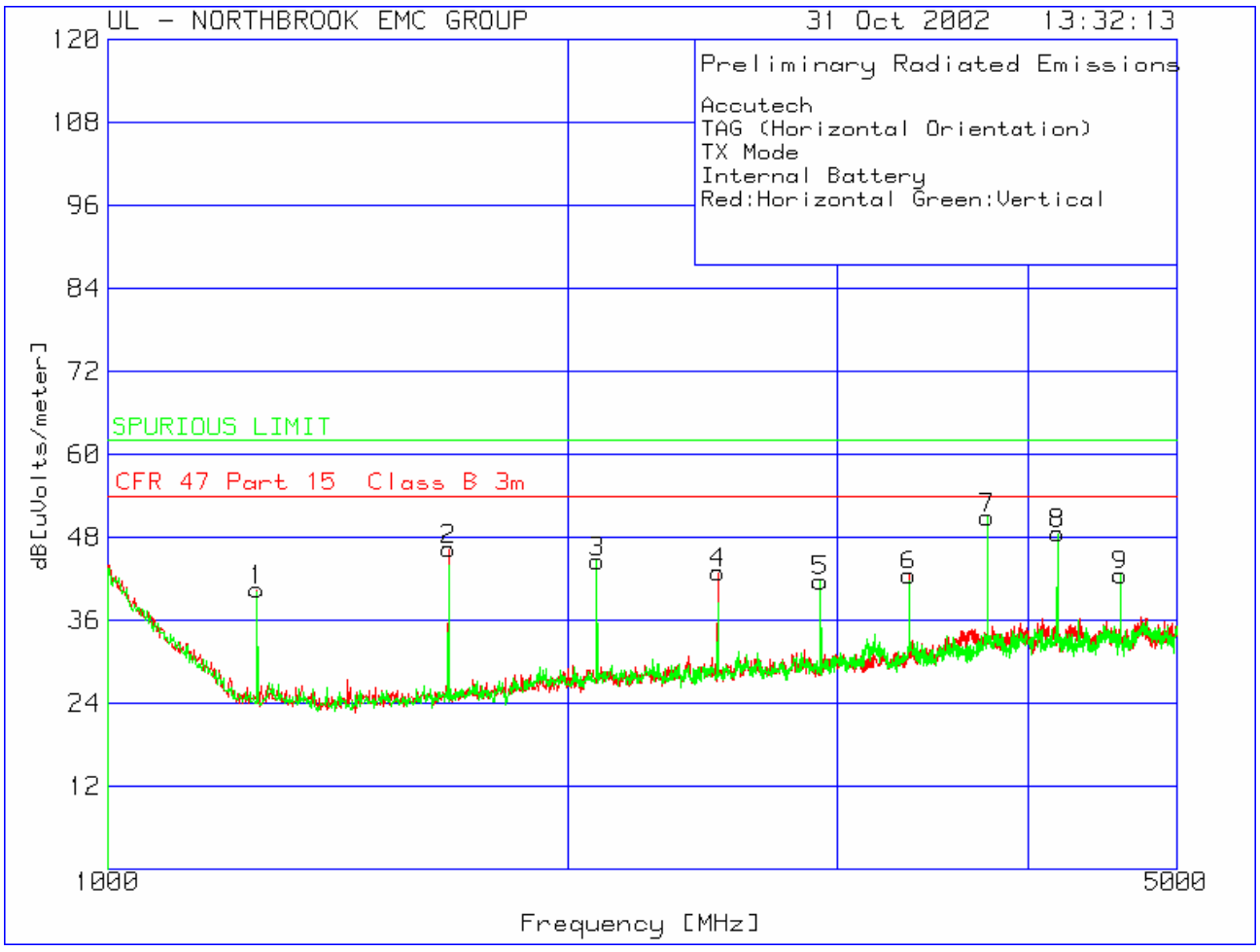
LIMIT 1: CFR 47 PART 15 C 3M DISTANCE
LIMIT 2: SPURIOUS EMISSIONS LIMIT

qp - Quasi-Peak detector

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 31 October 2002

Manufacturer	:	**Accutech**
Equipment Under Test	:	**TAG (Tx 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	:	**1000 - 5000 MHz, Horn**



Accutech
TAG (Horizontal Orientation)
TX Mode
Internal Battery
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	1252.126	69.91 pk	-55.37	25.86	40.4	53.97	61.93
	Azimuth:342	Height:100 Horz		Margin [dB]		-13.57	-21.53
2	1670.335	74.33 pk	-55.58	27.52	46.27	53.97	61.93
	Azimuth:183	Height:100 Horz		Margin [dB]		-7.7	-15.66
4	2506.753	64.65 pk	-52.37	30.61	42.89	53.97	61.93
	Azimuth:315	Height:100 Horz		Margin [dB]		-11.08	-19.04
6	3343.172	61.82 pk	-51.84	32.53	42.51	53.97	61.93
	Azimuth:302	Height:100 Horz		Margin [dB]		-11.46	-19.42
Range: 3 1000 - 5000MHz							
3	2088.544	68.61 pk	-53.48	29.37	44.5	53.97	61.93
	Azimuth:329	Height:100 Vert		Margin [dB]		-9.47	-17.43
5	2924.962	61.9 pk	-51.58	31.36	41.68	53.97	61.93
	Azimuth:209	Height:100 Vert		Margin [dB]		-12.29	-20.25
7	3761.381	68.97 pk	-51.98	33.89	50.88	53.97	61.93
	Azimuth:4	Height:100 Vert		Margin [dB]		-3.09	-11.05
8	4179.59	67.05 pk	-52.91	34.41	48.55	53.97	61.93
	Azimuth:196	Height:100 Vert		Margin [dB]		-5.42	-13.38
9	4597.799	60.82 pk	-52.42	34.13	42.53	53.97	61.93
	Azimuth:129	Height:100 Vert		Margin [dB]		-11.44	-19.4

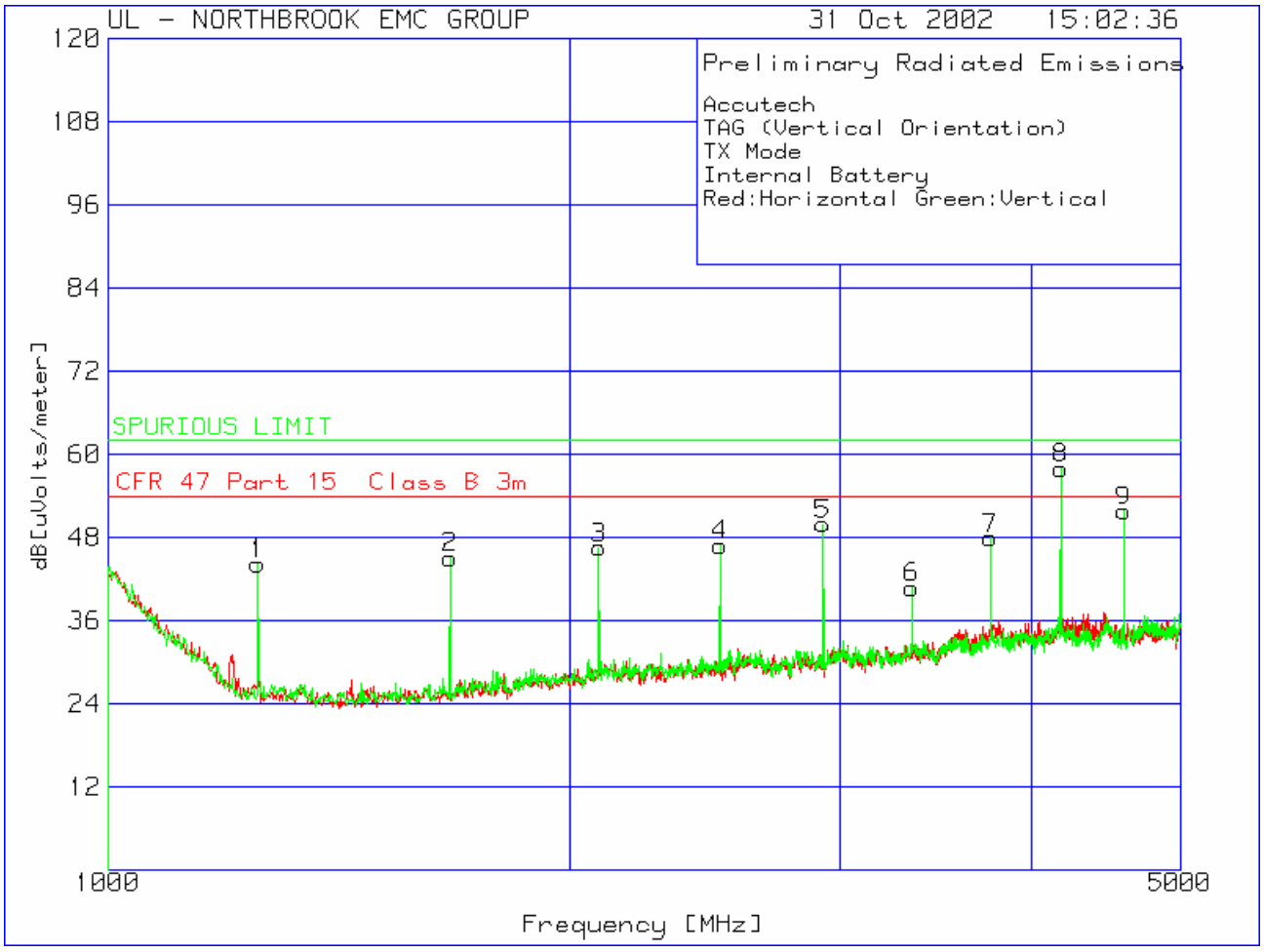
LIMIT 1: CFR 47 Part 15 Class B 3m
LIMIT 2: SPURIOUS LIMIT

pk - Peak detector

UNDERWRITERS LABORATORIES INC.
Radiated Emissions

Date Tested: 31 October 2002

Manufacturer	:	**Accutech**
Equipment Under Test	:	**TAG (Tx Mode, Vertical 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	:	**1000 - 5000 MHz, Horn**



Accutech
TAG (Vertical Orientation)
TX Mode
Internal Battery
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	1252.126	73.73 pk	-55.37	25.86	44.22	53.97	60.2
	Azimuth:298	Height:102 Vert		Margin [dB]		-9.75	-15.98
2	1670.335	73.18 pk	-55.58	27.52	45.12	53.97	60.2
	Azimuth:298	Height:102 Vert		Margin [dB]		-8.85	-15.08
3	2088.544	70.63 pk	-53.48	29.37	46.52	53.97	60.2
	Azimuth:331	Height:102 Vert		Margin [dB]		-7.45	-13.68
4	2506.753	68.62 pk	-52.37	30.61	46.86	53.97	60.2
	Azimuth:317	Height:102 Vert		Margin [dB]		-7.11	-13.34
5	2924.962	70.14 pk	-51.58	31.36	49.92	53.97	60.2
	Azimuth:48	Height:102 Vert		Margin [dB]		-4.05	-10.28
6	3343.172	60.11 pk	-51.84	32.53	40.8	53.97	60.2
	Azimuth:102	Height:102 Vert		Margin [dB]		-13.17	-19.4
7	3761.381	65.99 pk	-51.98	33.89	47.9	53.97	60.2
	Azimuth:315	Height:102 Vert		Margin [dB]		-6.07	-12.3
8	4179.59	76.48 pk	-52.91	34.41	57.98	53.97	60.2
	Azimuth:44	Height:102 Vert		Margin [dB]		4.01	-2.23
9	4597.799	70.12 pk	-52.42	34.13	51.83	53.97	60.2
	Azimuth:58	Height:102 Vert		Margin [dB]		-2.14	-8.37

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

pk - Peak detector

Accutech
TAG (Vertical Orientation)
TX Mode
Internal Battery
Red:Horizontal Green:Vertical

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						
4597.37	57.19 av	-52.4	34.1	38.89	54	60.2
Azimuth: 338	Height:122 Horz			Margin [dB]:	-15.11	-21.31
4597.37	68.85 av	-52.4	34.1	50.55	54	60.2
Azimuth: 27	Height:110 Vert			Margin [dB]:	-3.45	-9.65
4179.43	72.8 av	-52.9	34.4	54.3	54	60.2
Azimuth: 0	Height:142 Vert			Margin [dB]:	.3	-5.9
4179.4278	63.45 av	-52.9	34.4	44.95	54	60.2
Azimuth: 253	Height:140 Horz			Margin [dB]:	-9.05	-15.25
2925.5972	57.2 av	-51.6	31.4	37	54	60.2
Azimuth: 350	Height:122 Horz			Margin [dB]:	-17	-23.2
2925.5983	65.55 av	-51.6	31.4	45.35	54	60.2
Azimuth: 132	Height:122 Vert			Margin [dB]:	-8.65	-14.85

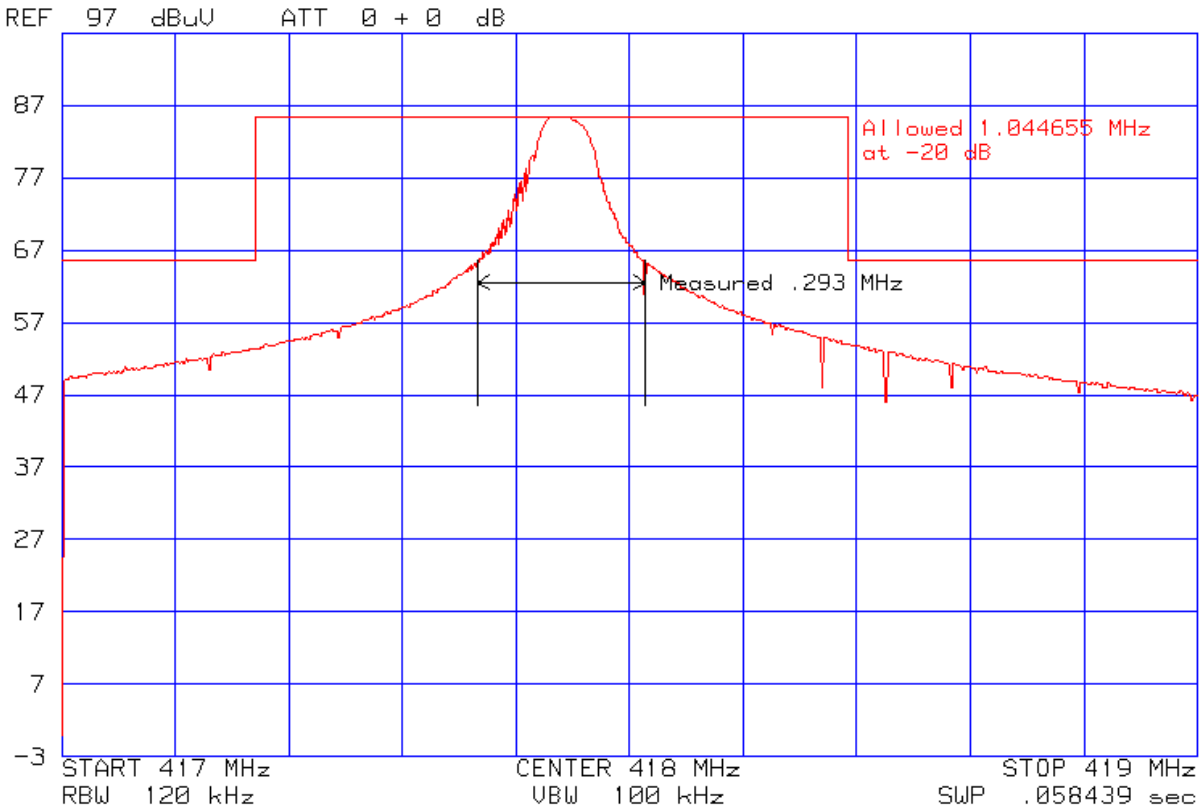
LIMIT 1: CFR 47 Part 15 Class B 3m
LIMIT 2: SPURIOUS LIMIT

av - Average detector

UNDERWRITERS LABORATORIES INC.
Band Edge Measurement

Date Tested: 31 October 2002

Manufacturer	:	**Accutec**
Equipment Under Test	:	**TAG (TX Mode)**
Requirement	:	**CFR 47, Part 15, Class B**
Detection Mode	:	Quasi-peak (qp) and Average (Av)
Bandwidth	:	120 kHz
Measurement Distance	:	3 meter
Antenna Type	:	**300 - 1000 MHz Log-Periodic**



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 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 Log (100 uV/m) = 40 dBuV/m