



166 South Carter, Genoa City, WI 53128

Company: Leggett & Platt
Model Tested: LPIC-S0001
Report Number: 16808
Project Number: 4239

Code of Federal Regulations 47 Part 15 – Radio Frequency Devices

Subpart C –Intentional Radiators

Section 15.209 / 15.207

Radiated Emissions / AC Conducted Emissions

THE FOLLOWING MEETS THE ABOVE TEST SPECIFICATION

Formal Name: Helios

Kind of Equipment: Wireless Charging Device

Frequency Range: 112 – 205 kHz

Test Configuration: Table-top

Model Number(s): LPIC-L0001, LPIC-P0001, LPIC-S0001

Model(s) Tested: LPIC-S0001

Serial Number(s): ENG-102

Date of Tests: August 23-24, 2010 and March 9, 2011

Test Conducted For: Leggett & Platt
1914 S. Baker
Carthage, MO 64836, USA

NOTICE: “This test report relates only to the items tested and must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government”. Please see the "Description of Test Sample" page listed inside of this report.

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166 South Carter, Genoa City, WI 53128

Company:
Model Tested:
Report Number:
Project Number:

Leggett & Platt
LPIC-S0001
16808
4239

SIGNATURE PAGE

Report By:

A handwritten signature in black ink, appearing to read "Adam D. Alger".

Adam Alger
EMC Engineer

Reviewed By:

A handwritten signature in black ink, appearing to read "William Stumpf".

William Stumpf
OATS Manager

Approved By:

A handwritten signature in black ink, appearing to read "Brian J. Mattson".

Brian Mattson
General Manager



166 South Carter, Genoa City, WI 53128

Company:	Leggett & Platt
Model Tested:	LPIC-S0001
Report Number:	16808
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United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100276-0

D.L.S. Electronic Systems, Inc.
Wheeling, IL

is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).



2010-10-01 through 2011-09-30

Effective dates

Jolly A. Buces
For the National Institute of Standards and Technology

NVLAP-01C (REV. 2009-01-28)



166 South Carter, Genoa City, WI 53128

Company: Leggett & Platt
Model Tested: LPIC-S0001
Report Number: 16808
Project Number: 4239

1.0 Summary of Test Report

It was determined that the Leggett & Platt Helios, Model LPIC-S0001, complies with CFR 47 Part 15 Subpart C Section 15.209(a) and 15.207(a).

Subpart C Applicable Technical Requirements Tested:

Section	Description	Procedure	Note	Compliant?
15.209(a)	Radiated Emissions Limits, General Requirements	ANSI C63.4 - 2003	1,3	Yes
15.207(a)	AC Conducted Emissions	ANSI C63.4 - 2003	3	Yes
15.215	Emission Bandwidth – 20dB	ANSI C63.4 - 2003	1,3	Yes

Note 1: Radiated emission measurement (Two modes of operation and two test distances)

Note 3: Supply voltage; 120VAC 60Hz

2.0 Introduction

In August, 2010 and March 2011 the Helios, Model LPIC-S0001, as provided from Leggett & Platt was tested to the requirements of CFR 47 Part 15 Subpart C Section 15.209(a) and 15.207(a). To meet these requirements, the procedures contained within this report were performed by personnel of D.L.S. Electronic Systems, Inc.

3.0 Test Facilities

D.L.S. Electronic Systems, Inc. is a full service EMC/Safety Testing Laboratory accredited to ISO 17025. NVLAP Certificate and Scope can be viewed at <http://www.dlsemc.com/certificate>. Our facilities are registered with the FCC, Industry Canada, and VCCI.

Wisconsin Test Facility:

D.L.S. Electronic Systems, Inc.
166 S. Carter Street
Genoa City, Wisconsin 53128

Wheeling Test Facility:

D.L.S. Electronic Systems, Inc.
1250 Peterson Drive
Wheeling, IL 60090



166 South Carter, Genoa City, WI 53128

Company:	Leggett & Platt
Model Tested:	LPIC-S0001
Report Number:	16808
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4.0 Description of Test Sample

Description:

The device is similar to an isolated switching power supply that uses coupled air coils for the switching transformer. When the primary (base/pad) coil and the secondary (phone case) coil are in close proximity (5 mm or less x, y, and z), power is transferred from the primary coil to the secondary coil. The primary coil operates in a frequency range from 112 kHz to 205 kHz. The secondary coil receives and rectifies the resulting inductively coupled energy, and supplies a regulated voltage to the device being powered or charged.

Type of Equipment / Frequency Range:

Wireless Charging Device / 112-205 kHz

Physical Dimensions of Equipment Under Test:

Length: 69.84 cm x Width: 33.4 cm x Height: 69.84 cm

Power Source:

Input to switching adapter: 120 VAC 60Hz Output: 19.0 VDC 520 mA

Internal Frequencies:

250 MHz, 31.25 MHz, 60 kHz (switching power supply)

Description of Circuit Board(s) / Part Number:

Primary, Low Power, 1.0 WPC,	S15-015-0010, REV 04
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5.0 Test Equipment

A list of the equipment used can be found in the table below. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.

D.L.S. Wisconsin – OATS 2 – Screen room

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 26	837491/010	20 Hz – 26 GHz	5/10	5/11
Filter- High Pass	Mini-Circuits	BHP-25	19708	25 MHz cut-off	1/10	1/11
Preamplifier	Rohde & Schwarz	TS-PR10	032001/004	9 kHz – 1 GHz	1/10	1/11
Antenna	EMCO	3104C	00054892	20 MHz – 200 MHz	7/09	7/11
Antenna	EMCO	3146	1205	200 MHz – 1 GHz	7/09	7/11
LISN	Solar	9252-50-R-24-BNC	961019	9 kHz – 30 MHz	7/10	7/11
Filter- High-Pass	SOLAR	7930-120	090702	120 kHz – 30 MHz	1/10	1/11
Limiter	Electro-Metrics	EM-7600	706	9 kHz – 30 MHz	1/10	1/11
Preamp	Miteq	AMF-6D-100200-50	313936	1GHz-10GHz	5/10	5/11
Horn Antenna	EMCO	3115	9903-5731	1-18GHz	6/09	6/11
Radiated Emissions 9kHz – 30MHz (March 9, 2011)						
Receiver	Rohde & Schwarz	ESI 40	837808/006	20 Hz – 40 GHz	4/10	4/11
Antenna	EMCO	6502	2038	9 kHz – 30 MHz	9/09	9/10



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6.0 Test Arrangements

Emissions Measurement Arrangement:

All radiated and conducted emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to ANSI C63.3 – 2003, unless otherwise noted. Description of procedures and measurements can be found in Appendix B – Measurement Data. See Appendix A for additional photos of the test set up.

Unless otherwise noted, the bandwidth of the measuring receiver / analyzer used during testing is shown below.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

7.0 Test Conditions

Test Conditions recorded during test:

Temperature and Humidity:

73°F at 69% RH (March 2011: 73°F at 24% RH)

Supply Voltage:

120 VAC 60 Hz

8.0 Modifications Made To EUT For Compliance

None noted at time of test.



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9.0 Additional Descriptions

Through investigation of all three Helios models, model LPIC-S001 was determined to represent the worst case emissions.

Two modes of the device were investigated for emissions:

Presence detection with impedance match on secondary – **Digital Ping**

Presence detection with no impedance (looking for secondary) – **Analog Ping**

Digital Ping was tested at a 14 meter test distance.

Analog Ping was tested at a 3 meter test distance.

Both modes of operation were investigated to greater than 10 times their fundamental operating frequency.

10.0 Results

Measurements were performed in accordance with ANSI C63.3 – 2009. Graphical and tabular data can be found in Appendix B at the end of this report.

11.0 Conclusion

The Helios, Model LPIC-S0001, as provided from Leggett & Platt tested in August, 2010 and March, 2011 **meets** the requirements of CFR 47 Part 15 Subpart C Section 15.209(a) and 15.207(a).



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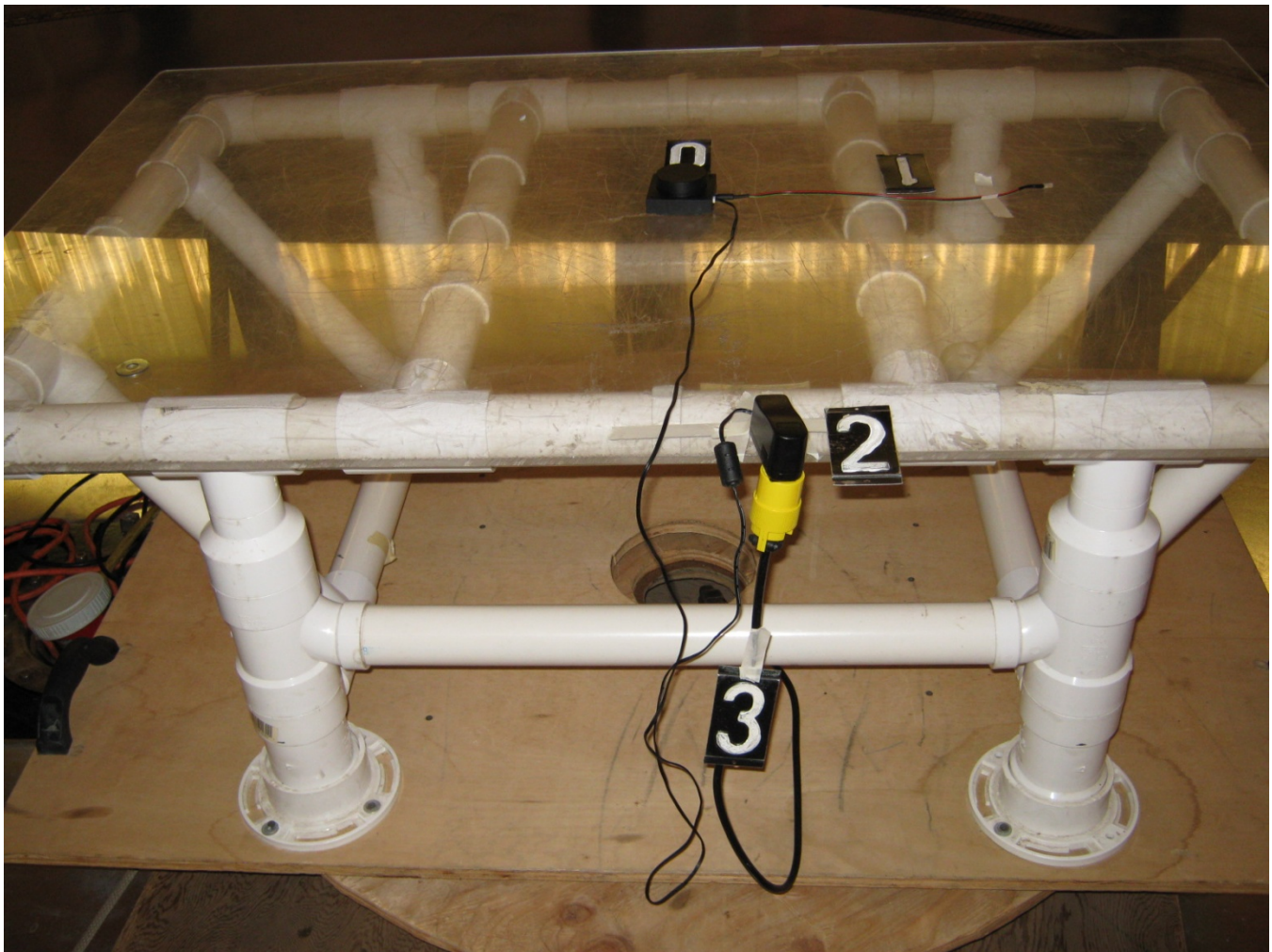
Company:	Leggett & Platt
Model Tested:	LPIC-S0001
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Appendix A – Test Photos

Photo Information and Test Setup:

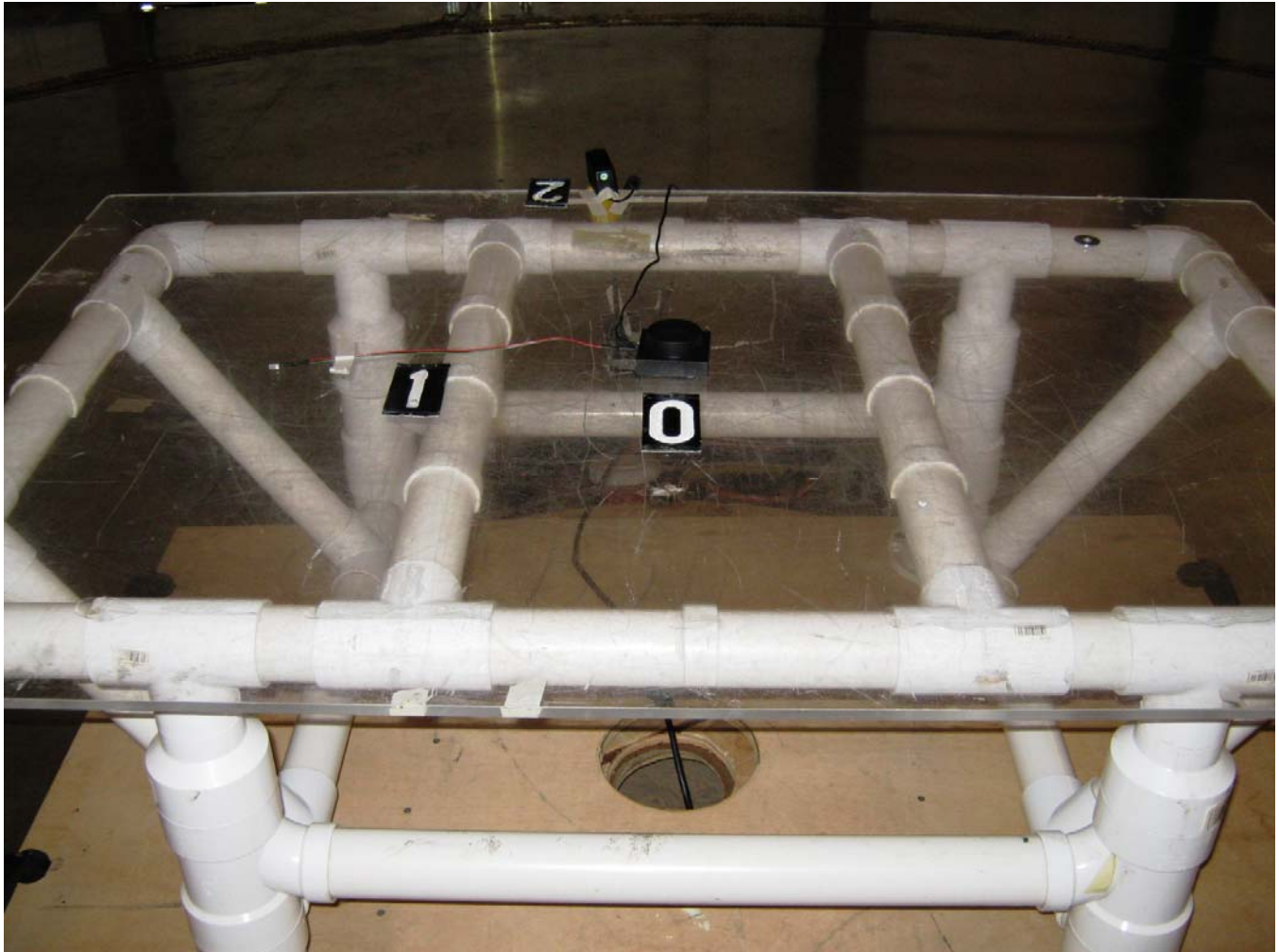
- Item 0: Helios, Model LPIC-S0001
- Item 1: Leggett & Platt LED Assembly. Model S15-015-0013
- Item 2: FLYPOWER AC power adapter Model PS12K1900520U5
- Item 3: Non-shielded AC power cord.1 meter

Radiated Emissions – Back



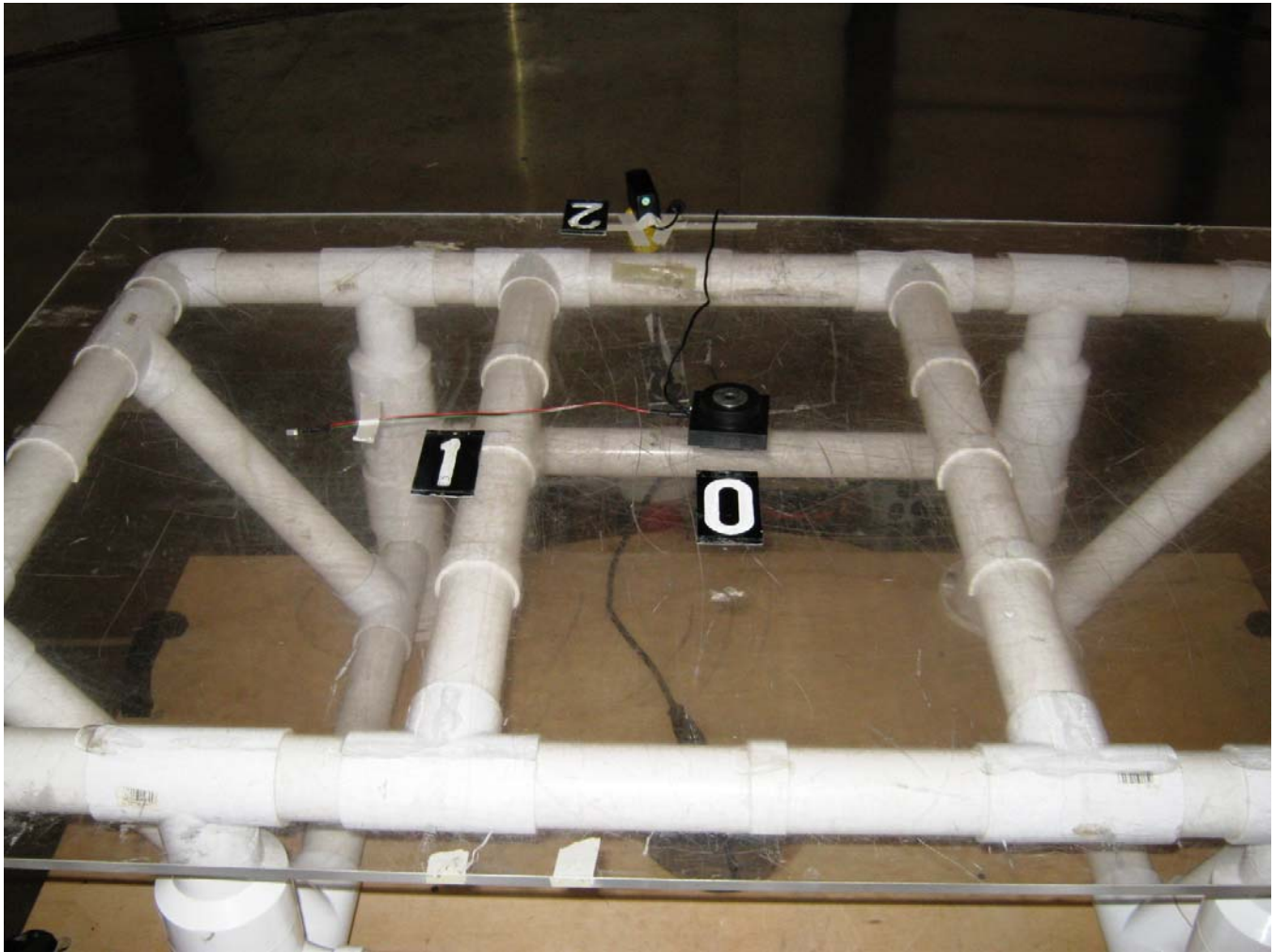
Appendix A

Radiated Emissions – Presence Detection



Appendix A

Radiated Emissions – Presence Detection



Appendix A

AC Line Conducted Emissions - Back





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Appendix B – Measurement Data

1.0 Presence Detection – Digital Ping

Rule Part:

15.209(a)

Test Procedure:

ANSI C 63.4 – 2003

Limit:

15.209(a)

Results:

Compliant

Sample Equation(s):

Total Level = Raw Level + Antenna Factor + System Loss
Margin = Limit – Total Level

Notes:

This was a radiated emissions measurement tested with an active loop antenna at a distance of 14 meters from the EUT. The antenna was rotated in the x, y, and z planes to determine the maximum emission.

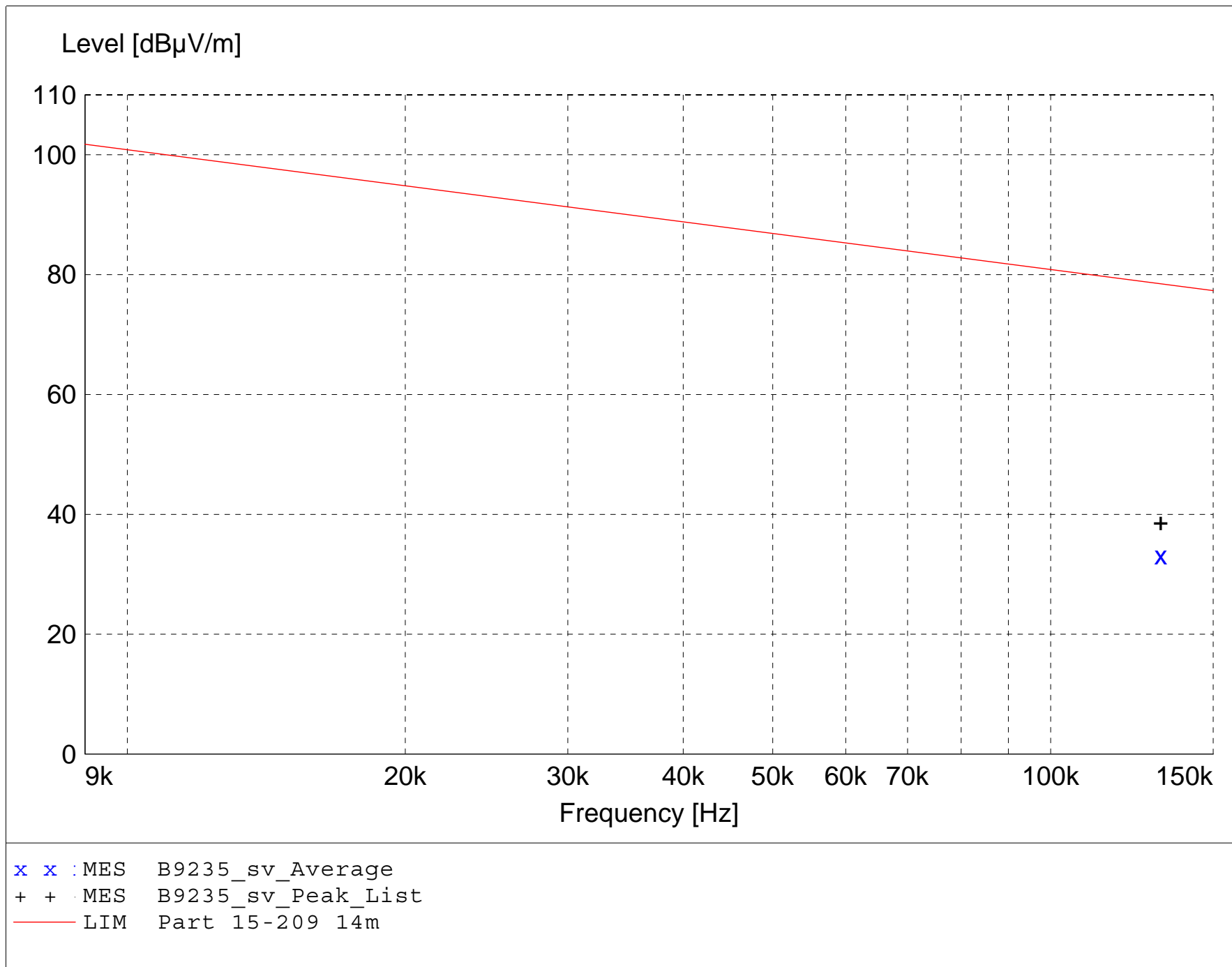
Electric Field Strength

EUT: LPIC-S0001
Manufacturer: Leggett & Platt
Operating Condition: 73 deg F; 69% R.H.
Test Site: D.L.S OATS Site 2
Operator: Craig B
Test Specification:
Comment: Digital Pinging mode
Date: 09-23-2010

TEXT: "E-Field 14 meters"

Short Description: Loop Antenna DLS# 571

TEST SET-UP: E-FIELD MEASURED AT 14 METERS



MEASUREMENT RESULT: "B9235_sv_Final"

9/24/2010 12:41PM

Frequency	Level	Antenna Factor	System Loss	Total Level	Limit	Margin	Height Ant.	EuT Angle	Final Detector	Comment
MHz	dBμV	dBμV/m	dB	dBμV/m	dBμV/m	dB	m	deg		
0.131600	22.32	10.47	0.3	33.1	78.5	45.3	1.00	0	AVERAGE	noise floor

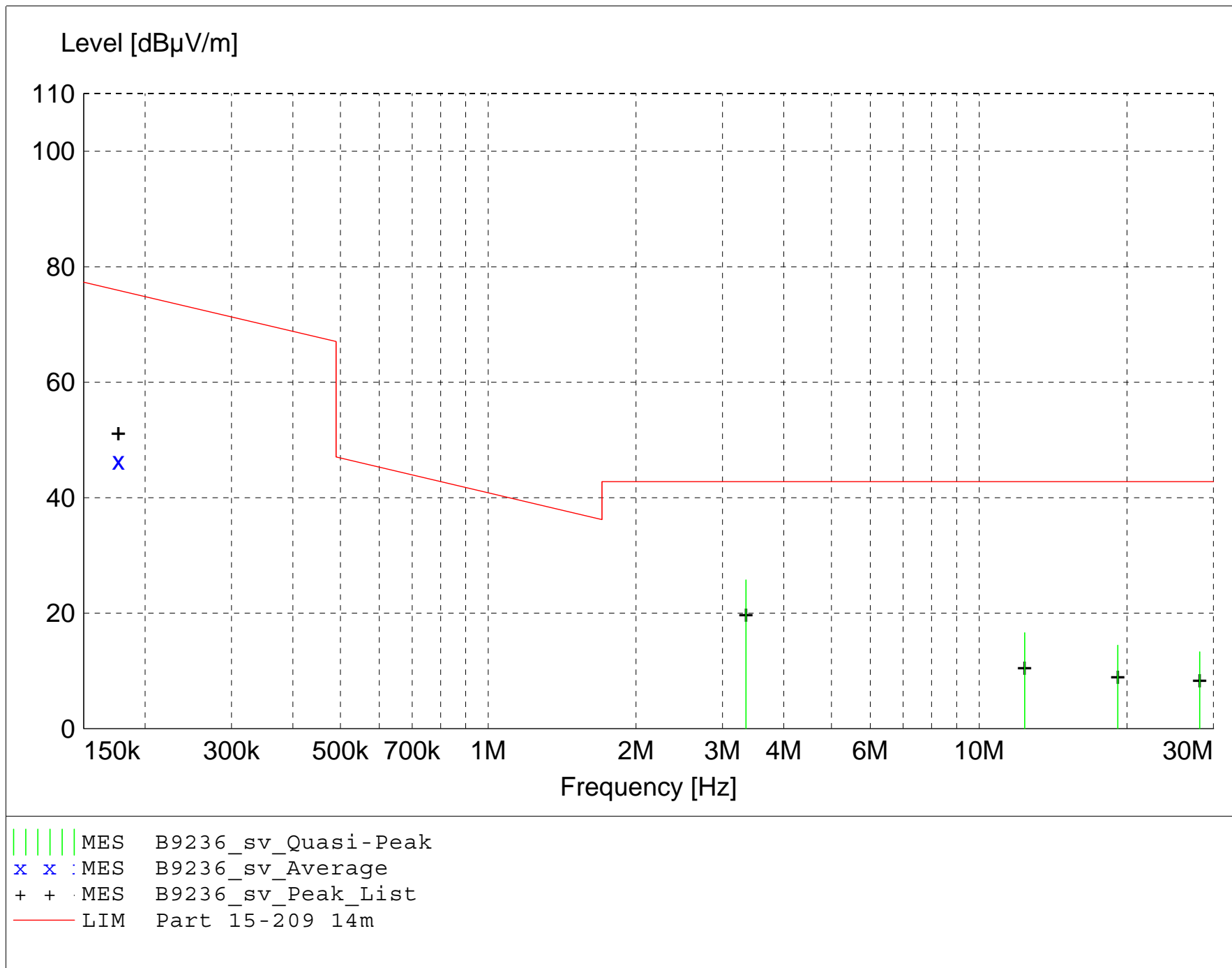
Electric Field Strength

EUT: LPIC-S0001
Manufacturer: Leggett & Platt
Operating Condition: 73 deg F; 69% R.H.
Test Site: D.L.S OATS Site 2
Operator: Craig B
Test Specification:
Comment: Digital Pinging mode
Date: 09-23-2010

TEXT: "E-Field 14 meters"

Short Description: Loop Antenna DLS# 571

TEST SET-UP: E-FIELD MEASURED AT 14 METERS



MEASUREMENT RESULT: "B9236_sv_Final"

9/24/2010 12:44PM

Frequency	Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
MHz	dBμV	Factor	Loss	Level			Ant.	Angle	Detector	
		dBμV/m	dB	dBμV/m	dBμV/m	dB	m	deg		
3.350000	14.39	10.54	0.8	25.8	42.8	17.0	1.00	0	QUASI-PEAK	noise floor
12.375000	4.75	10.60	1.3	16.6	42.8	26.2	1.00	0	QUASI-PEAK	noise floor
19.150000	2.50	10.43	1.5	14.4	42.8	28.3	1.00	0	QUASI-PEAK	noise floor
28.125000	3.13	8.46	1.7	13.3	42.8	29.5	1.00	0	QUASI-PEAK	noise floor
0.176530	35.63	10.42	0.3	46.4	75.9	29.5	1.00	100	AVERAGE	None



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Appendix B

2.0 Presence Detection – Analog Ping

Rule Part:

15.209(a)

Test Procedure:

ANSI C 63.4 – 2003

Limit:

15.209(a)

Results:

Compliant

Sample Equation(s):

None

Notes:

This was a radiated emissions measurement tested with an active loop antenna at a distance of 3 meters from the EUT. The antenna was rotated in the x, y, and z planes to determine the maximum emission.

FCC Part 15.209

Radiated Field Strength

EUT: LPIC-L0001
Manufacturer: Leggett & Platt
Operating Condition: 73 deg F; 24% R.H.
Test Site: DLS O.F. Site 3
Operator: Adam A
Test Specification: 120 VAC 60Hz
Comment: Presence Detection Mode
DATE: 3-09-2011

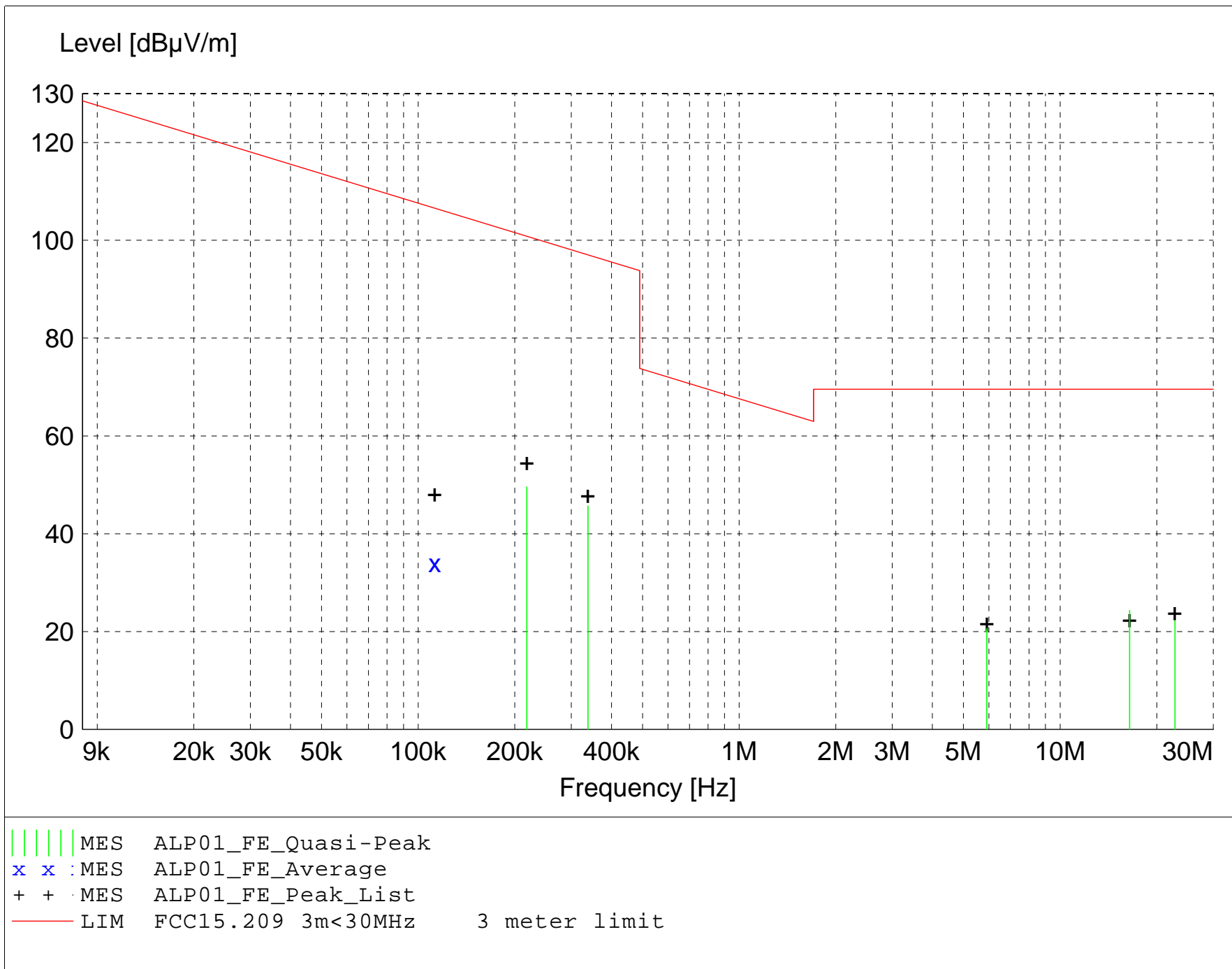
TEXT: "E-Field 3 meters"

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with Active Loop Antenna

Equations:
$$\text{Total Level(dB}\mu\text{V/m)} = \text{Level(dB}\mu\text{V)} + \text{System Loss(dB)} + \text{Antenna Factor(dB}\mu\text{V/m)}$$
$$\text{Margin(dB)} = \text{Limit(dB}\mu\text{V/m)} - \text{Total Level(dB}\mu\text{V/m)}$$

Graph Markers: + Frequency marker (Level of marker not related to final level)
| Final maximized level using Quasi-Peak detector
X Final maximized level using Average detector
Final maximized level using Peak detector



MEASUREMENT RESULT: "ALP01_FE_Final"

3/9/2011 10:36AM

Frequency	Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
MHz	dBμV	Factor	Loss	Level			Ant.	Angle	Detector	
		dBμV/m	dB	dBμV/m	dBμV/m	dB	m	deg		
16.460000	13.19	10.31	0.9	24.4	69.5	45.2	1.00	270	QUASI-PEAK	Noise Floor
22.784000	11.80	9.60	0.9	22.3	69.5	47.3	1.00	270	QUASI-PEAK	Noise Floor
5.912000	9.24	10.67	0.7	20.6	69.5	48.9	1.00	180	QUASI-PEAK	Noise Floor
0.218000	39.16	10.38	0.0	49.6	100.8	51.3	1.00	90	QUASI-PEAK	Noise Floor
0.338000	35.24	10.34	0.1	45.7	97.0	51.3	1.00	45	QUASI-PEAK	Noise Floor
0.112500	23.56	10.31	0.1	33.9	106.6	72.6	1.00	45	AVERAGE	None



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Company:
Model Tested:
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Appendix B

3.0 AC Line Conducted Emissions

Rule Part:

15.207(a)

Test Procedure:

ANSI C63.4 - 2003

Limit:

15.207(a)

Results:

Compliant

Sample Equation(s):

None

Notes:

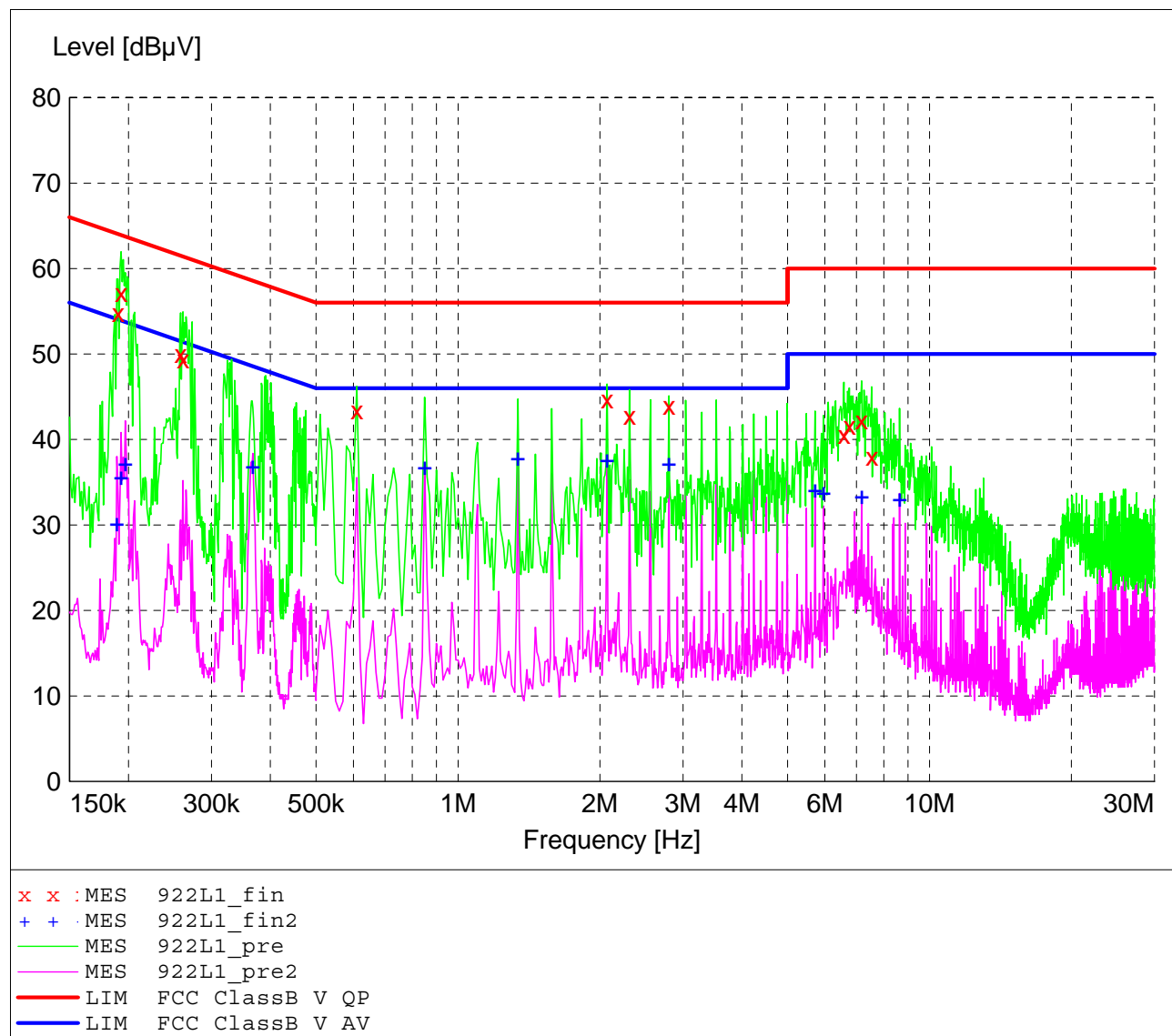
The 5 Watt load was determined to be the worst case mode for AC Line conducted emissions.

Voltage Mains Test

EUT: LPIC-S0001
 Manufacturer: Leggett & Platt
 Operating Condition: 76 deg. F, 50% R.H.
 Test Site: DLS O.F. Screenroom
 Operator: Craig B
 Test Specification: Line 1; 120 V 60 Hz
 Comment: 5 Watt load (found to be worst-case)
 Date: 09-24-2010

SCAN TABLE: "Line Cond Scrn RmFin"

Short Description:			Line Conducted Emissions			
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
9.0 kHz	150.0 kHz	4.0 kHz	QuasiPeak	2.0 s	200 Hz	LISN DLS#128
150.0 kHz	30.0 MHz	4.0 kHz	QuasiPeak	2.0 s	9 kHz	LISN DLS#128
CISPR AV						



MEASUREMENT RESULT: "922L1_fin"

9/24/2010 12:37PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector
0.190000	54.80	12.6	64	9.2	QP
0.193000	57.10	12.5	64	6.8	QP
0.258000	50.00	11.9	62	11.5	QP
0.261000	49.40	11.8	61	12.0	QP
0.610000	43.40	10.8	56	12.6	QP
2.070000	44.70	10.4	56	11.3	QP
2.310000	42.80	10.4	56	13.2	QP
2.800000	43.90	10.5	56	12.1	QP
6.580000	40.50	10.6	60	19.5	QP
6.760000	41.60	10.6	60	18.4	QP
7.180000	42.30	10.6	60	17.7	QP
7.540000	38.00	10.6	60	22.0	QP

MEASUREMENT RESULT: "922L1_fin2"

9/24/2010 12:37PM

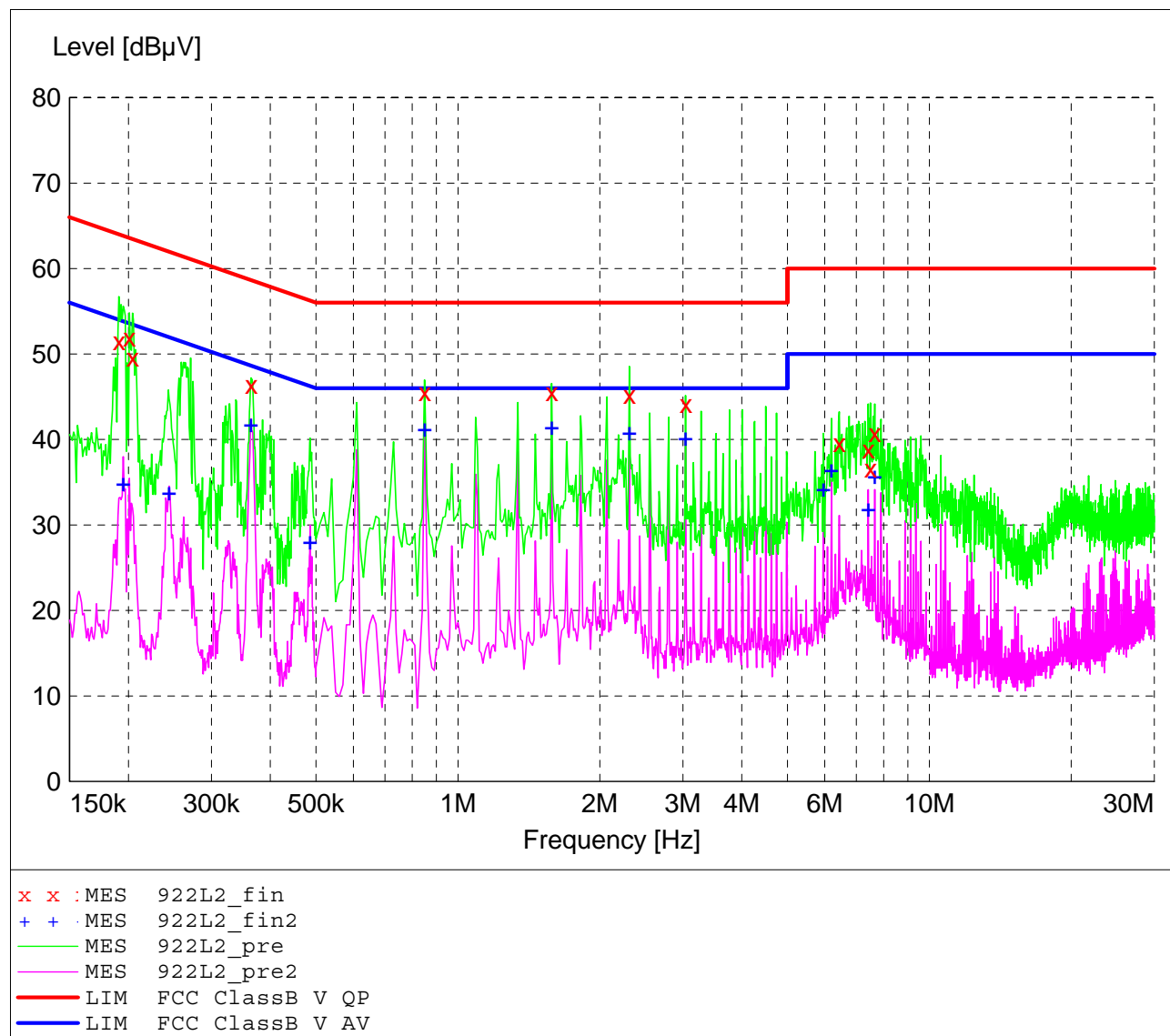
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector
0.189000	30.20	12.6	54	23.9	CAV
0.193000	35.60	12.5	54	18.3	CAV
0.197000	37.20	12.5	54	16.5	CAV
0.367000	36.90	11.3	49	11.7	CAV
0.850000	36.80	10.6	46	9.2	CAV
1.340000	37.90	10.4	46	8.1	CAV
2.070000	37.70	10.4	46	8.3	CAV
2.800000	37.30	10.5	46	8.7	CAV
5.720000	34.20	10.5	50	15.8	CAV
5.960000	33.80	10.6	50	16.2	CAV
7.180000	33.40	10.6	50	16.6	CAV
8.640000	33.10	10.6	50	16.9	CAV

Voltage Mains Test

EUT: LPIC-S0001
 Manufacturer: Leggett & Platt
 Operating Condition: 78 deg. F, 52% R.H.
 Test Site: DLS O.F. Screenroom
 Operator: Craig B
 Test Specification: Line 2; 120 V 60 Hz
 Comment: 5 Watt load (found to be worst-case)
 Date: 09-24-2010

SCAN TABLE: "Line Cond Scrn RmFin"

Short Description:			Line Conducted Emissions			
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
9.0 kHz	150.0 kHz	4.0 kHz	QuasiPeak	2.0 s	200 Hz	LISN DLS#128
150.0 kHz	30.0 MHz	4.0 kHz	QuasiPeak	2.0 s	9 kHz	LISN DLS#128
CISPR AV						



MEASUREMENT RESULT: "922L2_fin"

9/24/2010 12:43PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector
0.191000	51.50	12.6	64	12.5	QP
0.201000	51.90	12.4	64	11.7	QP
0.204000	49.60	12.4	63	13.8	QP
0.364000	46.40	11.4	59	12.2	QP
0.850000	45.60	10.6	56	10.4	QP
1.580000	45.50	10.3	56	10.5	QP
2.310000	45.20	10.4	56	10.8	QP
3.040000	44.20	10.5	56	11.8	QP
6.440000	39.60	10.6	60	20.4	QP
7.420000	38.80	10.6	60	21.2	QP
7.500000	36.60	10.6	60	23.4	QP
7.660000	40.80	10.6	60	19.2	QP

MEASUREMENT RESULT: "922L2_fin2"

9/24/2010 12:43PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector
0.195000	34.90	12.5	54	18.9	CAV
0.244000	33.80	12.0	52	18.2	CAV
0.364000	41.80	11.4	49	6.8	CAV
0.486000	28.10	11.0	46	18.1	CAV
0.850000	41.30	10.6	46	4.7	CAV
1.580000	41.50	10.3	46	4.5	CAV
2.310000	40.90	10.4	46	5.1	CAV
3.040000	40.20	10.5	46	5.8	CAV
5.960000	34.30	10.6	50	15.7	CAV
6.200000	36.50	10.6	50	13.5	CAV
7.420000	31.90	10.6	50	18.1	CAV
7.660000	35.80	10.6	50	14.2	CAV



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Appendix B

4.0 Emission Bandwidth – 20dB

Rule Part:

15.215

Test Procedure:

ANSI C63.4 - 2003

Limit:

Informative

Results:

Informative

Sample Equation(s):

None

Notes:

Informative

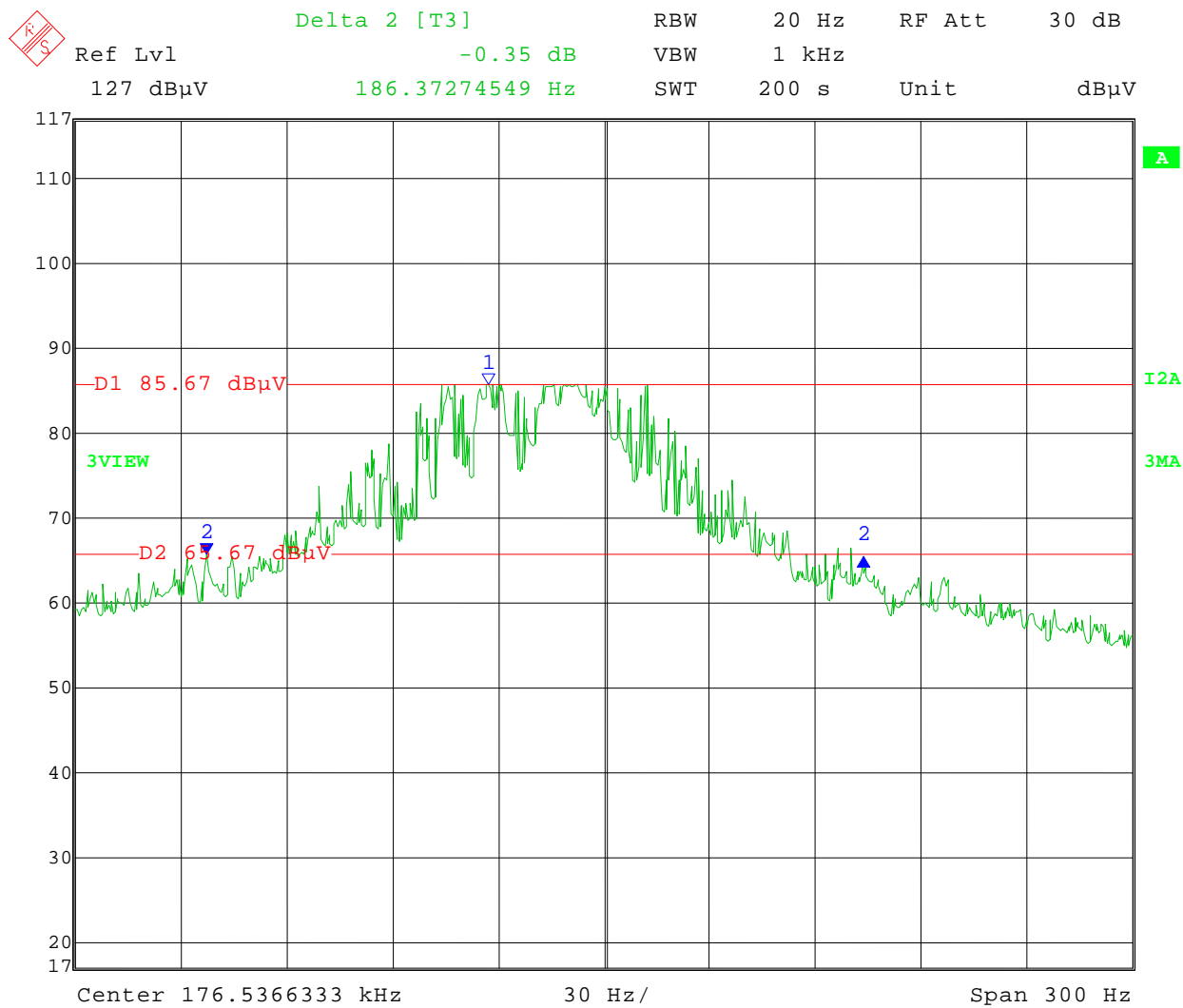


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Test Date: 09-24-2010
Company: Leggett & Platt
EUT: LPIC-S0001
Test: 20 dB Bandwidth - Radiated
Operator: Craig B
Comment: Digital Pinging

20 dB Bandwidth = 186.4 Hz



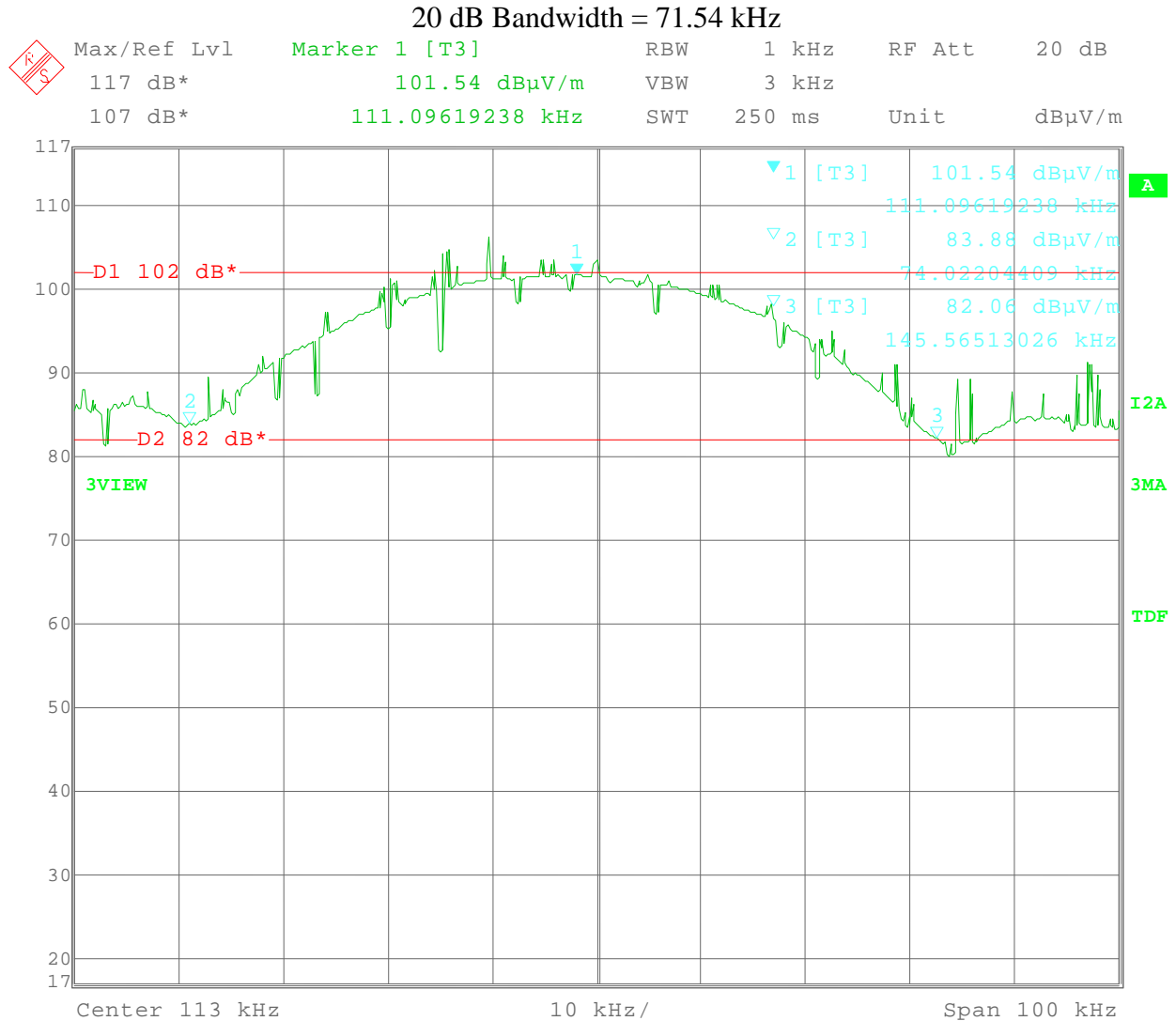
Date: 24.SEP.2010 12:01:54



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Company: Leggett & Platt
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Report Number: 16808
Project Number: 4239

Test Date: 3-09-2011
Company: Leggett & Platt
EUT: LPIC-L0001
Test: 20 dB Bandwidth - Radiated
Operator: Adam A
Comment: Presence Detection Mode – Analog Ping



Date: 9.MAR.2011 10:31:03



166 South Carter, Genoa City, WI 53128

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END OF REPORT

Revision #	Date	Comments	By
1.0	3-09-2011	Preliminary Release	AA