166 South Carter, Genoa City, WI 53128

Company:	California Eastern Laboratories
Model Tested:	ZICM357SP0-1
Report Number:	21983
DLS Project:	8205

Code of Federal Regulations 47 Part 15 – Radio Frequency Devices

Subpart C – Intentional Radiators
Section 15.247
Operation within the bands 902 - 928 MHz,
2400 - 2483.5 MHz, 5725 - 5875 MHz,
and 24.0 - 24.25 GHz.

Class II Permissive Change Report

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

FCC ID: W7Z-ZICM357SP0

Formal Name:	MeshConnect ZICM357SP0-1C Zigbee Module
Kind of Equipment:	802.15.4 Wireless Module
Frequency Range:	2405-2480 MHz
Test Configuration:	Tabletop
Model Number(s):	ZICM357SP0-1
Model(s) Tested:	ZICM357SP0-1
Serial Number(s):	00232C1, 00232CC
Date of Tests:	July 5th to 7th, 2016
Test Conducted For:	California Eastern Laboratories 4590 Patrick Henry Drive Santa Clara, CA 95054-1817, USA

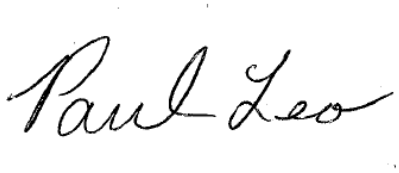
NOTICE: "This test report relates only to the items tested and must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government". Please see the "Description of Test Sample" page listed inside of this report.

DLS ELECTRONIC SYSTEMS, INC.
166 South Carter, Genoa City, WI 53128

Company:	California Eastern Laboratories
Model Tested:	ZICM357SP0-1
Report Number:	21983
DLS Project:	8205

SIGNATURE PAGE

Tested By:



Paul Leo
Test Engineer

Reviewed By:

William Stumpf
OATS Manager

Approved By:

Brian Mattson
General Manager

166 South Carter, Genoa City, WI 53128

Company: California Eastern Laboratories
Model Tested: ZICM357SP0-1
Report Number: 21983
DLS Project: 8205

Table of Contents

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

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 & 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 Communique dated January 2009).

2015-09-25 through 2016-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

ELECTROMAGNETIC COMPATIBILITY & TELECOMMUNICATIONS

NVLAP LAB CODE 100276-0

Emissions

Designation	***Description***
Off-site test location	D.L.S. Electronics performs radiated emissions testing at an additional location, 166 South Carter Street, Genoa City, WI 53128.

1.0 Summary of Test Report

It was determined that the California Eastern Laboratories MeshConnect ZICM357SP0-1C Zigbee Module, Model ZICM357SP0-1 with the new external antennas complies with the requirements of CFR 47 Part 15 Subpart C Section 15.247 to be added to FCC ID: W7Z-ZICM357SP0 as a Class II Permissive Change.

Subpart C Section 15.247 Applicable Technical Requirements Tested to show compliance for a Class II Permissive Change for adding an additional antenna:

Section	Description	Procedure	Note	Compliant?
15.247(d) 15.205(a) 15.209(a)	Unwanted Emissions into Restricted Frequency Bands – Radiated	558074 D01 DTS Meas Guidance v03r05 & ANSI C63.10-2013	1	Yes
15.247(d) 15.205(a) 15.209(a)	Band-Edge Measurements - Radiated	558074 D01 DTS Meas Guidance v03r05 & ANSI C63.10-2013	1	Yes

Note 1: Radiated emission measurement.

Testing was performed on the MeshConnect ZICM357SP0-1 Zigbee Module with the addition of optional external antennas (2). The original EUT had only a PCB trace antenna. Because the new antennas are external, the original PCB board and transmitter technical characteristics remain unchanged. Any RF Conducted measurement will be the same as in the original certification.

2.0 Introduction

In July, 2016 the MeshConnect ZICM357SP0-1C Zigbee Module, Model ZICM357SP0-1, as provided from California Eastern Laboratories was tested to the requirements of CFR 47 Part 15 Subpart C Section 15.247 for a Class II Permissive Change. 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

FCC Registration #90531

4.0 Description of Test Sample

Description:

The Test sample consists of an 802.15.4 specification compliant transceiver mounted on an FR4 substrate. The purpose of this test report is to show continued compliance to the FCC rules when adding either new dipole antenna to FCC ID:W7Z-ZICM357SP0 as a Class II Permissive Change.

Type of Equipment / Frequency Range:

Mobile / 2405-2480 MHz

Physical Dimensions of Equipment Under Test:

1 inch x 1 inch x 1 inch

Power Source:

3.34 VDC (Lab DC bench power supply used for testing)

Internal Frequencies:

24 MHz

Transmit / Receive Frequencies Used For Test Purpose:

Low channel (11): 2405 MHz, Middle channel (18): 2440 MHz, High channel (26): 2480 MHz
Additional channel tested - Channel 25: 2475 MHz

Type of Modulation(s) / Antenna Types for Class II Permissive Change:

Offset QPSK / Aveslink E-2820-CA Flying Lead External Dipole Antenna (2 dBi gain)
Or LSR Model 001-0010 External Dipole Antenna (2 dBi gain)

Description of Circuit Board(s) / Part Number:

DUT	0011-00-04-00-005, Rev X1b

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.

(SITE 2) EMISSIONS TEST EQUIPMENT LIST

30 – 1000 MHz

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Date	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/006	20 Hz – 40 GHz	6-23-16	6-23-17
Preamplifier	Rohde & Schwarz	TS-PR10	032001/004	9 kHz – 1 GHz	12-3-15	12-3-16
Antenna	EMCO	3104C	00054892	20 MHz – 200 MHz	3-11-16	3-11-18
Antenna	EMCO	3146	1205	200 MHz – 1 GHz	3-23-16	3-23-18
Test Software	Rohde & Schwarz	ESK-1	V1.7.1	N/A	N/A	N/A

Additional if 1-18 GHz

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Date	Cal Due Dates
Preamp	Miteq	AMF-7D-01001800-22-10P	17779900	1GHz-18GHz	1-22-16	1-22-17
Filter- High-Pass	Q-Microwave	100462	2	4.2GHz-18GHz	8-25-15	8-25-16
Horn Antenna	EMCO	3115	6204	1-18GHz	8-25-15	8-25-17
Test Software	Rohde & Schwarz	ESK-1	V1.7.1	N/A	N/A	N/A

Additional if 18-26 GHz

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Date	Cal Due Dates
Preamp	Miteq	AMF-8B-180265-40-10P-H/S	438727	18GHz-26GHz	6-6-16	6-6-17
Filter- High Pass	K&L	50140-11SH10-18000/T40000-K-K	438727	18-40GHz	1-27-16	1-27-17
Horn Antenna	EMCO	3116	2549	18 – 40GHz	9-2-14	9-2-16
Test Software	Rohde & Schwarz	ESK-1	V1.7.1	N/A	N/A	N/A

6.0 Test Arrangements

Radiated Emissions Measurement Arrangement:

All radiated emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to FCC KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10-2013, 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. See Appendix C for Measurement Uncertainty.

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

Normal Test Conditions:

Temperature and Humidity: 72°F at 49% RH

Supply Voltage: 3.34 VDC

8.0 Modifications Made To EUT For Compliance

Output power setting on channel 26 was reduced to -7 to meet the radiated upper band edge requirement at the 2.4835 GHz restricted band edge when testing the ZICM357SP0-1 module with the Aveslink Model E-2820-CA Flying Lead External Dipole Antenna.

Output power setting on channel 26 was reduced to -5 to meet the radiated upper band edge requirement at the 2.4835 GHz restricted band edge when testing the ZICM357SP0-1 module with the LSR Model 001-0010 External Dipole Antenna.

9.0 Additional Descriptions

The EUT was powered a serial interface cable that was connected to the bench supply set to 3.34 VDC.

The EUT was tested stand-alone as for Single Modular Approval.

The EUT was programmed to transmit at its maximum power, with a modulating signal representative of the worst-case signal encountered in a real system operation on the low, middle, and high channels of the operating band.

The EUT was rotated through 3 orthoganal axis to find worst-case.

10.0 Results

Measurements were performed in accordance with FCC KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10-2013. Graphical and tabular data can be found in Appendix B at the end of this report.

11.0 Conclusion

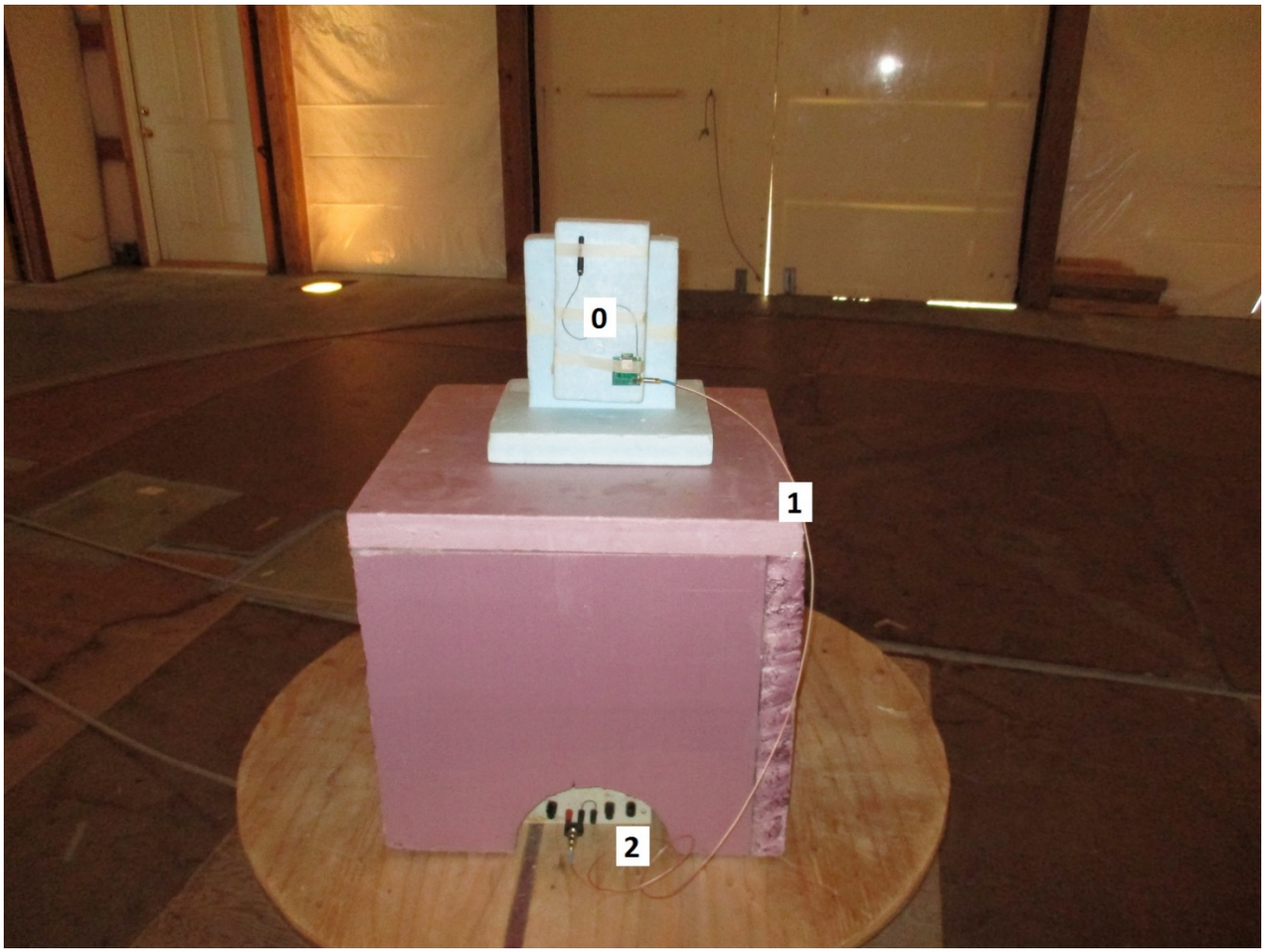
The MeshConnect ZICM357SP0-1C Zigbee Module, Model ZICM357SP0-1, as provided from California Eastern Laboratories, tested in July, 2016 **meets** the requirements of CFR 47 Part 15 Subpart C Section 15.247 for a Class II Permissive Change.

Appendix A – Test Photos with Aveslink Antenna

Photo Information and Test Setup:

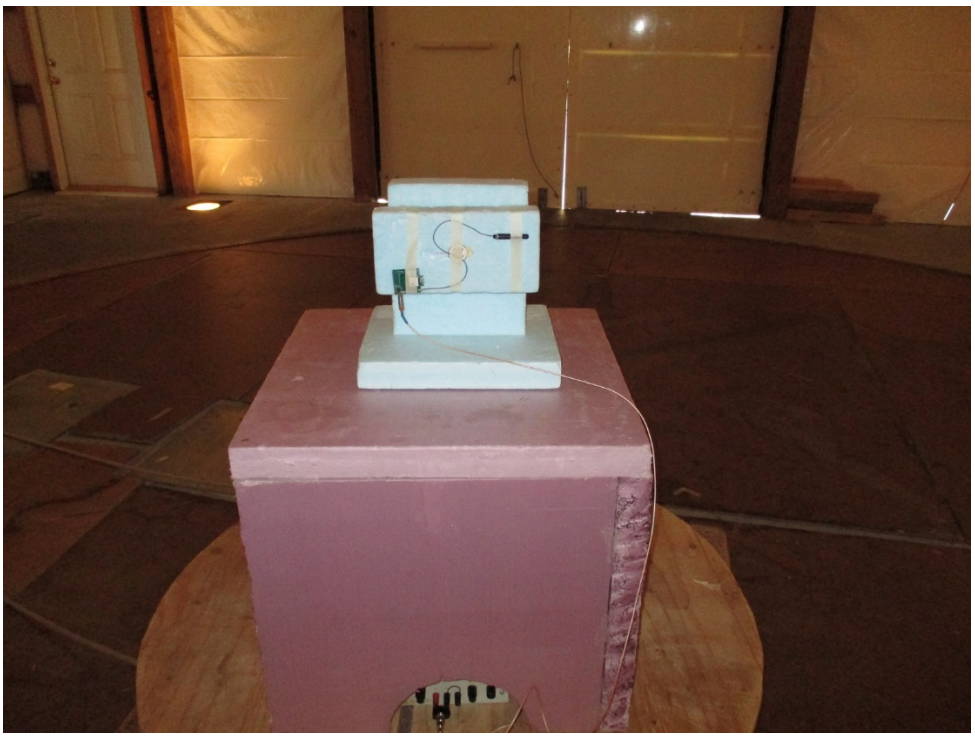
Item 0: MeshConnect ZICM357SP0-1C Zigbee Module, Model ZICM357SP0-1 with Aveslink Model E-2820-CA Flying Lead External Dipole Antenna
Item 1: Shielded DC Power Cable (coax) to power EUT, 1 meter long with metal SMA connector.
Item 2: Hewlett Packard DC power supply Model 6291A

Radiated Emissions below 1 GHz – Position 1

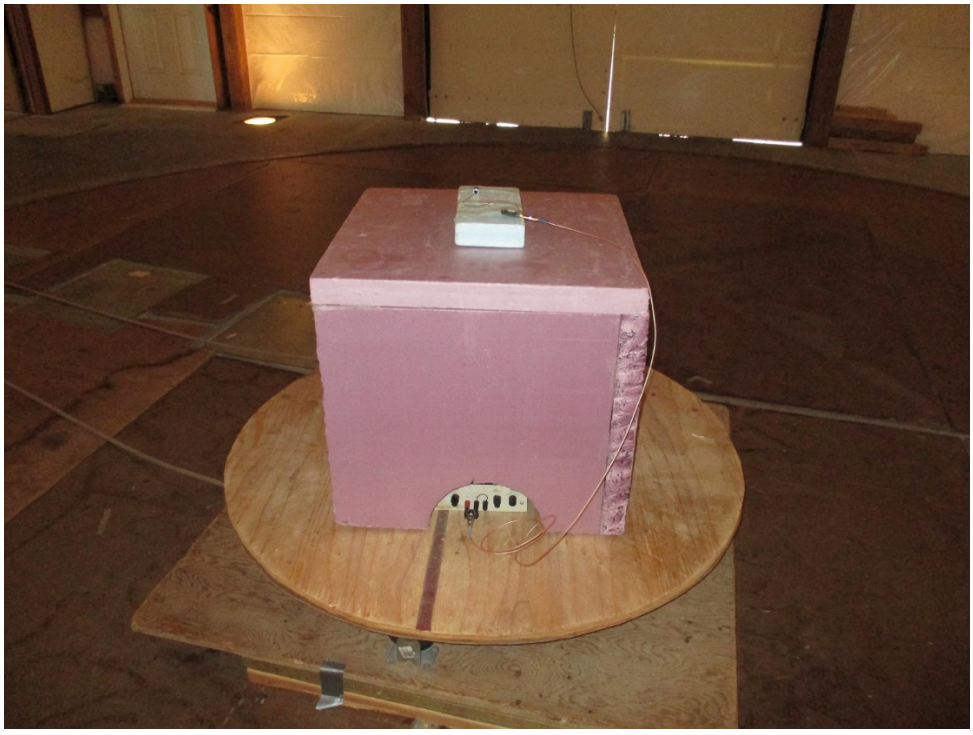


Appendix A

Radiated Emissions below 1 GHz – Position 2

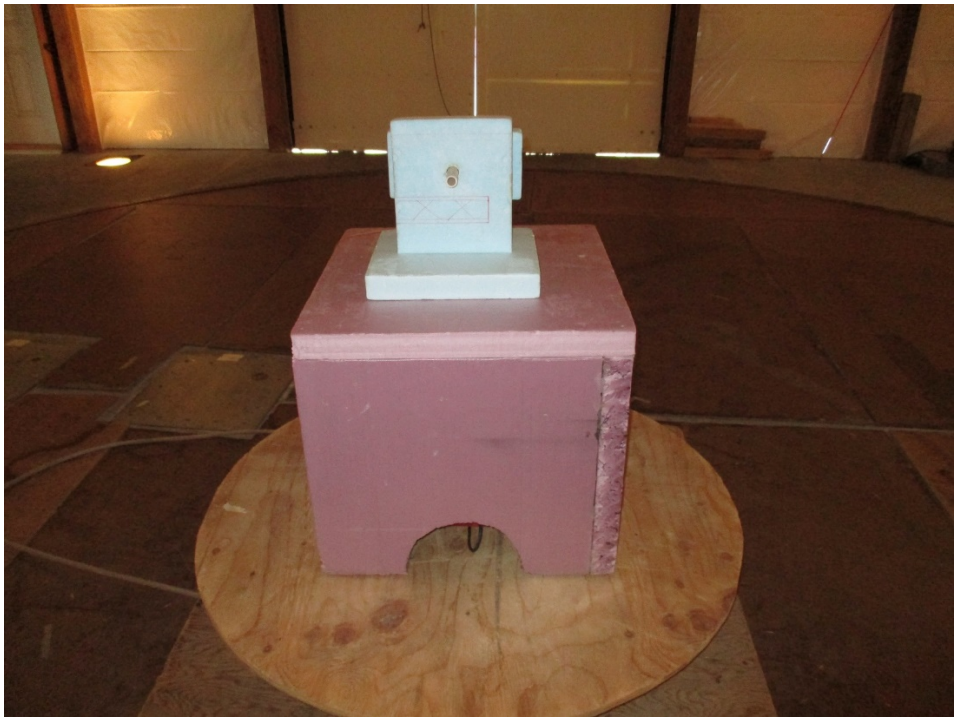


Radiated Emissions below 1 GHz – Position 3



Appendix A

Radiated Emissions below 1 GHz – Back

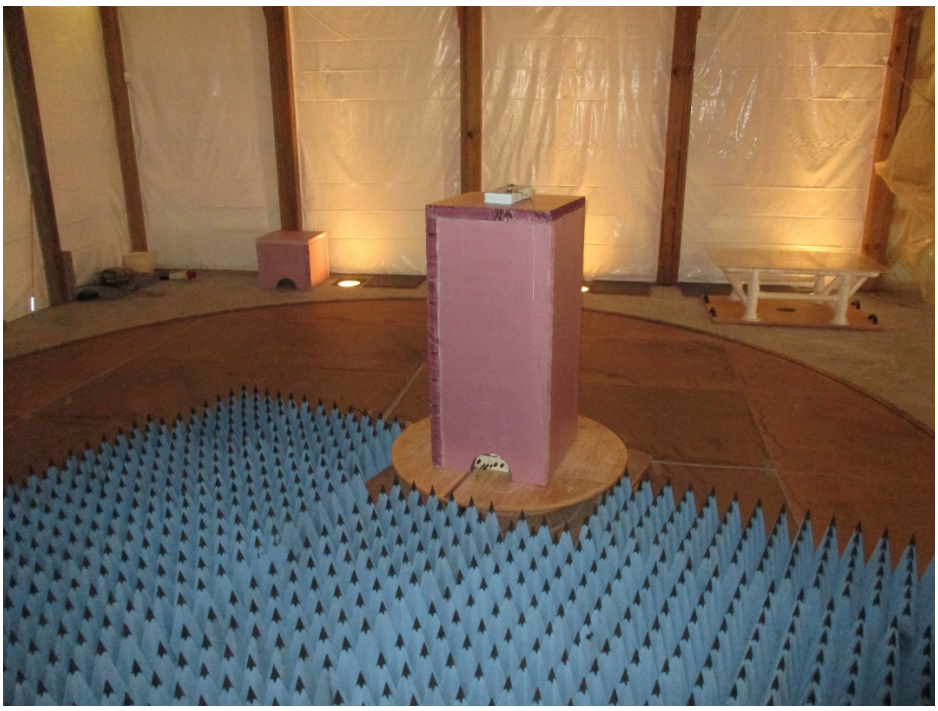


Radiated Emissions above 1 GHz – Position 1

Appendix A

Radiated Emissions above 1 GHz – Position 2

Radiated Emissions above 1 GHz – Position 3



Appendix A

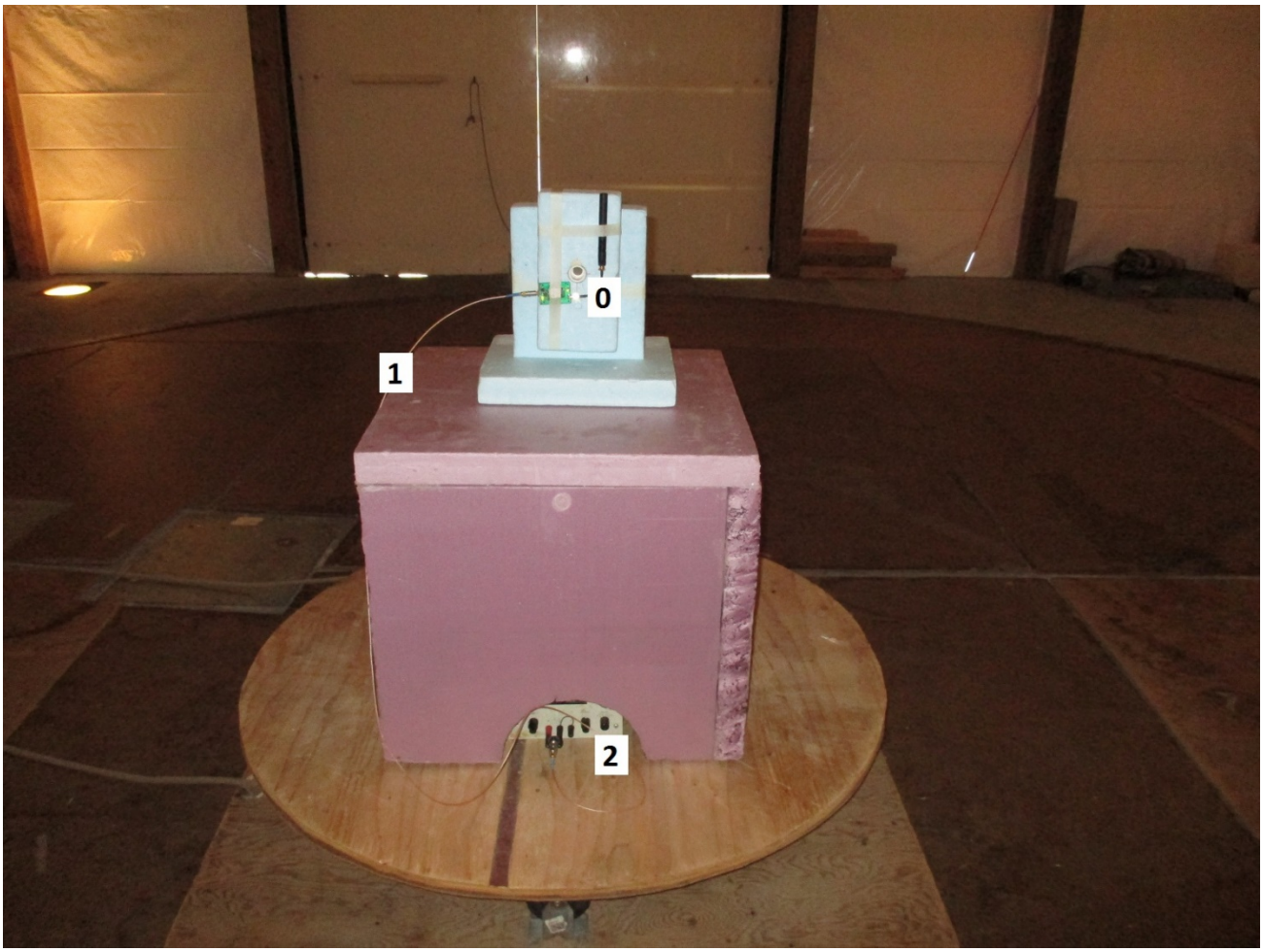
Radiated Emissions above 1 GHz – Back

Appendix A – Test Photos with LSR Antenna

Photo Information and Test Setup:

Item 0: MeshConnect ZICM357SP0-1C Zigbee Module, Model ZICM357SP0-1 with LSR Model 001-0010 External Dipole Antenna
Item 1: Shielded DC Power Cable (coax) to power EUT, 1 meter long with metal SMA connector.
Item 2: Hewlett Packard DC power supply Model 6291A

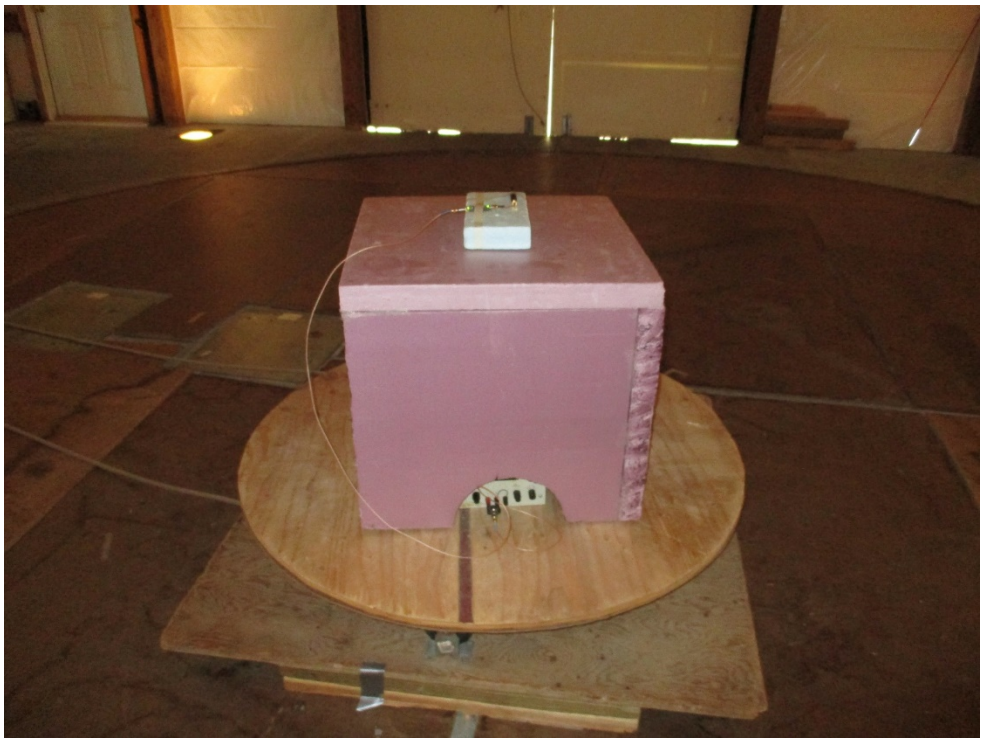
Radiated Emissions below 1 GHz – Position 1



Appendix A

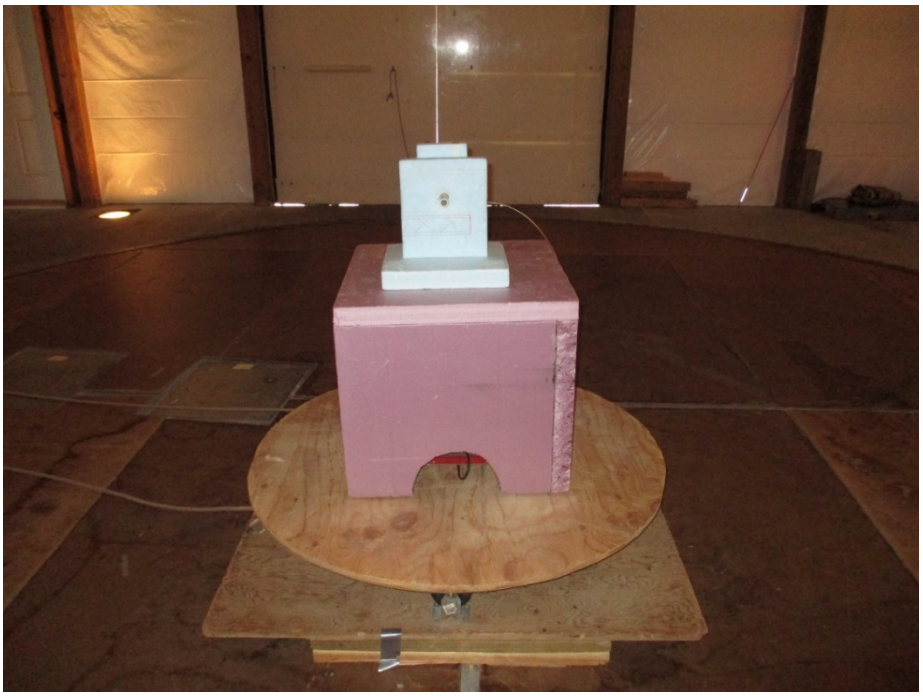
Radiated Emissions below 1 GHz – Position 2

Radiated Emissions below 1 GHz – Position 3



Appendix A

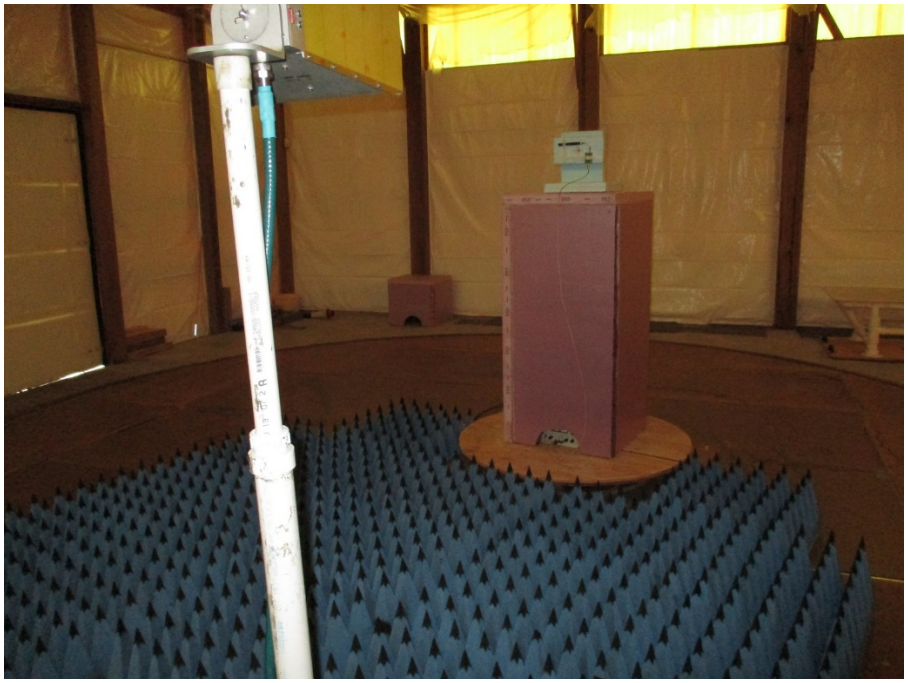
Radiated Emissions below 1 GHz – Back



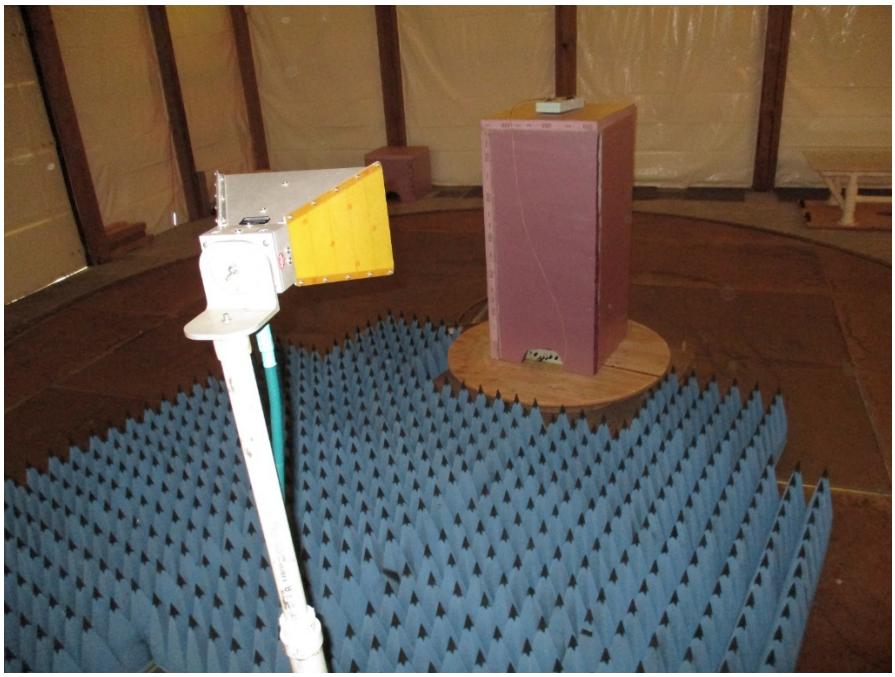
Radiated Emissions above 1 GHz – Position 1

Appendix A

Radiated Emissions above 1 GHz – Position 2



Radiated Emissions above 1 GHz – Position 3



Appendix A

Radiated Emissions above 1 GHz – Back

Appendix B

1.0 Unwanted Emissions into Restricted Frequency Bands – Radiated

Rule Part:

15.247(d), 15.205(a), 15.209(a)

Test Procedure:

558074 D01 DTS Meas Guidance v03r05, 4/8/2016
12.0 Emissions in restricted frequency bands
12.1 Radiated emission measurements
Measurement Procedure – ANSI C63.10-2013

Limits:

15.209(a)

Results:

Compliant

Notes:

This was a radiated measurement. The EUT was transmitting from an external dipole antenna. The EUT was powered through a serial interface cable that was connected to the bench supply set to 3.34 VDC. The EUT was set to transmit continuously at its maximum power, with a modulating signal representative of the worst-case signal encountered in a real system operation on the low, middle, and high channels of the operating band.

FCC 15.209

Electric Field Strength

EUT: ZICM357SP0-1 Module with Model E-2820-CA Antenna
Manufacturer: California Eastern Laboratories
Operating Condition: 72 deg. F; 49% R.H.
Test Site: DLS Site 2
Operator: Paul L 8205
Test Specification: Aveslink E-2820-CA 2dbi half wave Antenna
Comment: 3.34V DC
Date: 07-05-2016

TEXT: "Horz 3 meters"

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with HORIZONTAL Antenna Polarization

Equations: Total Level(dBµV/m) = Level(dBµV) + System Loss(dB) + Antenna Factor(dBµV/m)

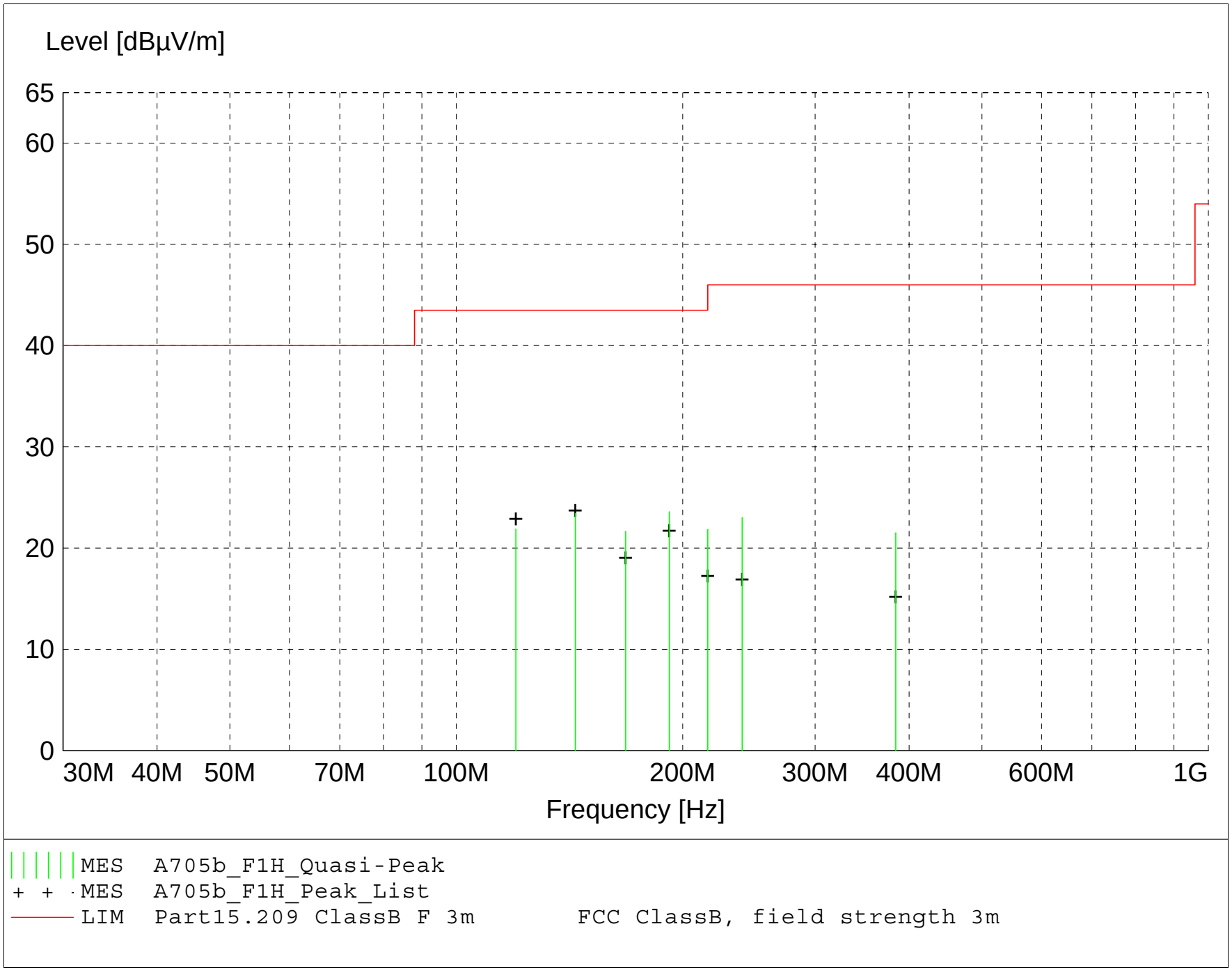
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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 dector

Final maximized level using Peak detector


Level [dBµV/m]
65
60
50
40
30
20
10
0
30M
40M
50M
70M
100M
200M
300M
400M
600M
1G
Frequency [Hz]
MES A705b_F1H_Quasi-Peak
MES A705b_F1H_Peak_List
LIM Part15.209 ClassB F 3m
FCC ClassB, field strength 3m

MEASUREMENT RESULT: "A705b_F1H_Final"

7/5/2016 3:02PM

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		
192.000000	28.60	17.70	-22.7	23.6	43.5	19.9	2.50	225	QUASI-PEAK	None
144.000000	34.43	12.10	-23.1	23.4	43.5	20.1	3.75	135	QUASI-PEAK	None
120.000000	32.44	12.70	-23.3	21.9	43.5	21.6	3.50	135	QUASI-PEAK	None
216.000000	33.02	11.46	-22.6	21.9	43.5	21.6	2.00	90	QUASI-PEAK	None
168.000000	30.45	14.10	-22.9	21.7	43.5	21.8	2.75	45	QUASI-PEAK	None
240.000000	33.67	11.80	-22.5	23.0	46.0	23.0	2.00	225	QUASI-PEAK	None
384.000000	27.79	15.36	-21.6	21.5	46.0	24.5	2.75	0	QUASI-PEAK	None

FCC 15.209

Electric Field Strength

EUT: ZICM357SP0-1 Module with Model E-2820-CA Antenna
Manufacturer: California Eastern Laboratories
Operating Condition: 72 deg. F; 49% R.H.
Test Site: DLS Site 2
Operator: Paul L 8205
Test Specification: Aveslink E-2820-CA 2dbi half wave Antenna
Comment: 3.34V DC
Date: 07-05-2016

TEXT: "Vert 3 meters"

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with VERTICAL Antenna Polarization

Equations: Total Level(dBµV/m) = Level(dBµV) + System Loss(dB) + Antenna Factor(dBµV/m)

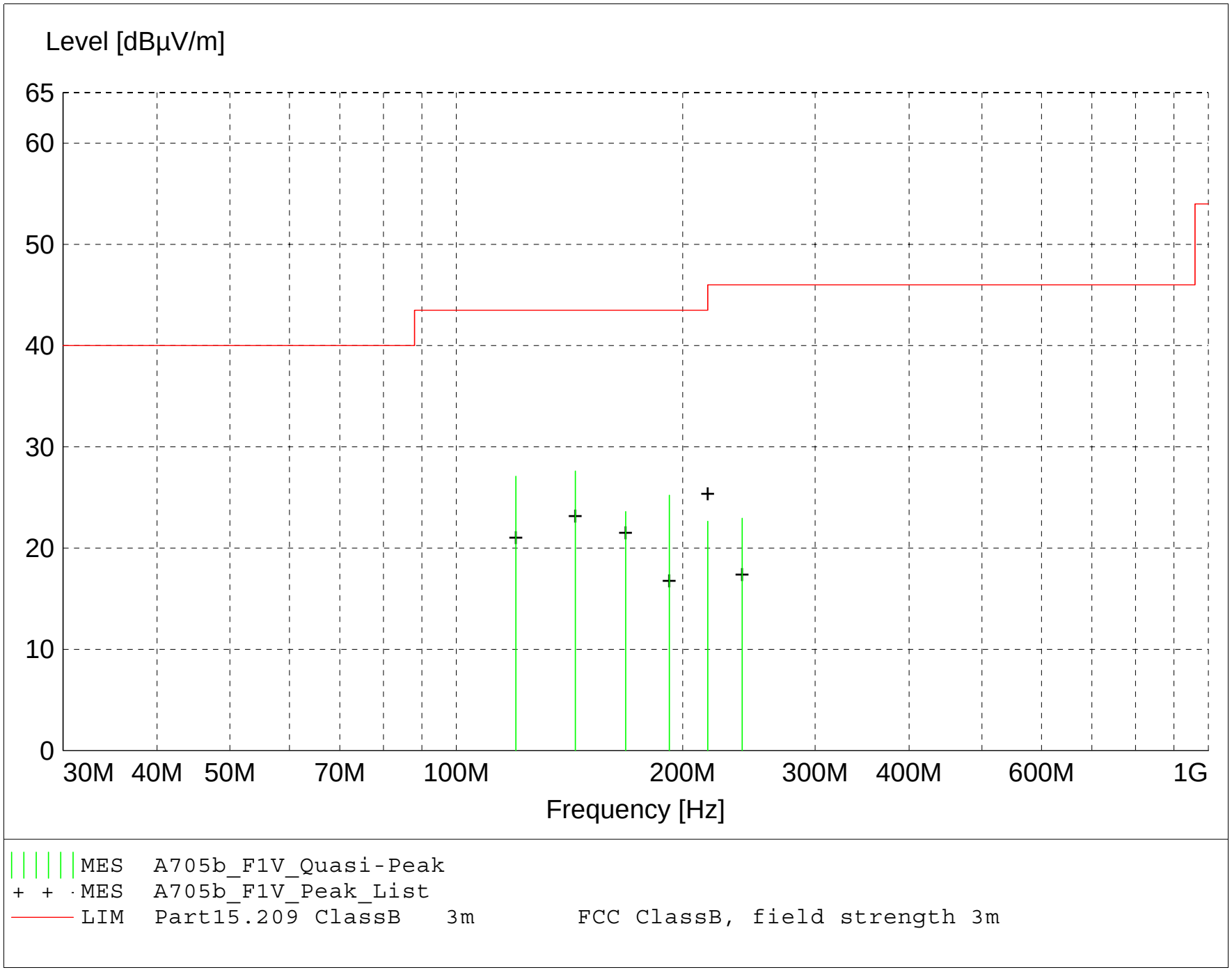
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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 dector

Final maximized level using Peak detector


Level [dBµV/m]
65
60
50
40
30
20
10
0
30M
40M
50M
70M
100M
200M
300M
400M
600M
1G
Frequency [Hz]
MES A705b_F1V_Quasi-Peak
MES A705b_F1V_Peak_List
LIM Part15.209 ClassB 3m
FCC ClassB, field strength 3m

MEASUREMENT RESULT: "A705b_F1V_Final"

7/5/2016 2:36PM

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		
144.000000	38.63	12.10	-23.1	27.6	43.5	15.9	1.00	225	QUASI-PEAK	None
120.000000	37.65	12.70	-23.3	27.1	43.5	16.4	1.00	45	QUASI-PEAK	None
192.000000	30.23	17.70	-22.7	25.2	43.5	18.3	1.00	200	QUASI-PEAK	None
168.000000	32.40	14.10	-22.9	23.6	43.5	19.9	1.00	200	QUASI-PEAK	None
216.000000	33.82	11.46	-22.6	22.7	43.5	20.8	1.00	22	QUASI-PEAK	None
240.000000	33.60	11.80	-22.5	23.0	46.0	23.0	1.00	90	QUASI-PEAK	None

166 South Carter, Genoa City, WI 53128

Company: California Eastern Laboratories
Model Tested: ZICM357SP0-1
Report Number: 21983
DLS Project: 8205

Radiated Emissions in Restricted Bands – 1 GHz to 25 GHz

1 GHz to 18 GHz Tested at a 3 Meter Distance

18 GHz to 25 GHz Tested at a 1 Meter Distance

EUT:	ZICM357SP0-1 with Aveslink E-2820-CA Flying Lead External Dipole Antenna
Manufacturer:	California Eastern Laboratories
Operating Condition:	72deg F; 54%R.H.
Test Site:	Site 2
Operator:	Paul L
Test Specification:	FCC Pt15.247(d) FCC Part15.205(a) FCC Part15.209(a)
Comment:	Continuous Transmit Mode, Output Power Setting 8
Date:	7-6-2016
Notes:	Peak measurements were taken with RBW=1MHz, VBW=3MHz, Detector=Peak
	Average measurements were taken with RBW=1MHZ, VBW=3MHz, Detector =Average
	All other restricted band emissions at least 20dB under the limit

Channel 11 (2.405GHz)

Frequency (GHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Duty Cycle Correction	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
4.8112	Max Peak	Vert	52.60	32.96	-53.6	0	53.1	74	20.9	Restricted Band 2nd
4.8112	Average	Vert	40.40	32.96	-53.6	0	45.2	54	8.8	Restricted Band 2nd
4.8112	Max Peak	Horz	73.04	32.96	-53.6	0	52.4	74	21.6	Restricted Band 2nd
4.8112	Average	Horz	47.82	32.96	-53.6	0	44.3	54	9.7	Restricted Band 2nd
7.2168	Max Peak	Vert	66.03	35.87	-51.1	0	50.8	74	23.2	3rd Harmonic
7.2168	Average	Vert	38.24	35.87	-51.1	0	38.6	54	15.4	3rd Harmonic

166 South Carter, Genoa City, WI 53128

Company: California Eastern Laboratories
Model Tested: ZICM357SP0-1
Report Number: 21983
DLS Project: 8205

Radiated Emissions in Restricted Bands – 1 GHz to 25 GHz

1 GHz to 18 GHz Tested at a 3 Meter Distance

18 GHz to 25 GHz Tested at a 1 Meter Distance

EUT:	ZICM357SP0-1 with Aveslink E-2820-CA Flying Lead External Dipole Antenna
Manufacturer:	California Eastern Laboratories
Operating Condition:	72deg F; 54%R.H.
Test Site:	Site 2
Operator:	Paul L
Test Specification:	FCC Pt15.247(d) FCC Part15.205(a) FCC Part15.209(a)
Comment:	Continuous Transmit Mode, Output Power Setting 8
Date:	7-6-2016
Notes:	Peak measurements were taken with RBW=1MHz, VBW=3MHz, Detector=Peak
	Average measurements were taken with RBW=1MHZ, VBW=3MHz, Detector =Average
	All other restricted band emissions at least 20dB under the limit

Channel 18 (2.440GHz)

Frequency (GHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Duty Cycle Correction	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
4.8800	Max Peak	Vert	52.60	33.01	-53.5	0	50.0	74	24.0	Restricted Band 2nd
4.8800	Average	Vert	40.40	33.01	-53.5	0	41.2	54	12.8	Restricted Band 2nd
4.8800	Max Peak	Horz	65.49	33.01	-53.5	0	45.0	74	29.0	Restricted Band 2nd
4.8800	Average	Horz	47.82	33.01	-53.5	0	52.7	54	1.3	Restricted Band 2nd

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Report Number: 21983
DLS Project: 8205

Radiated Emissions in Restricted Bands – 1 GHz to 25 GHz

1 GHz to 18 GHz Tested at a 3 Meter Distance

18 GHz to 25 GHz Tested at a 1 Meter Distance

EUT:	ZICM357SP0-1 with Aveslink E-2820-CA Flying Lead External Dipole Antenna
Manufacturer:	California Eastern Laboratories
Operating Condition:	72deg F; 54%R.H.
Test Site:	Site 2
Operator:	Paul L
Test Specification:	FCC Pt15.247(d) FCC Part15.205(a) FCC Part15.209(a)
Comment:	Continuous Transmit Mode, Output Power Setting -7
Date:	7-6-2016
Notes:	Peak measurements were taken with RBW=1MHz, VBW=3MHz, Detector=Peak
	Average measurements were taken with RBW=1MHZ, VBW=3MHz, Detector =Average
	All other restricted band emissions at least 20dB under the limit

Channel 26 (2.480GHz)

Frequency (GHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Duty Cycle Correction	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
4.9608	Max Peak	Vert	52.60	33.09	-53.4	0	50.2	74	23.8	Restricted Band 2nd Harmonic
4.9608	Average	Vert	40.40	33.09	-53.4	0	41.1	54	12.9	Restricted Band 2nd Harmonic
4.9608	Max Peak	Horz	68.91	33.09	-53.4	0	48.6	74	25.4	Restricted Band 2nd Harmonic
4.9608	Average	Horz	47.82	33.09	-53.4	0	38.3	54	15.7	Restricted Band 2nd Harmonic
7.4416	Max Peak	Vert	69.34	36.66	-50.2	0	55.8	74	18.2	Restricted Band 3rd Harmonic
7.4416	Average	Vert	38.24	36.66	-50.2	0	45.7	54	8.3	Restricted Band 3rd Harmonic
7.4416	Max Peak	Horz	67.94	36.66	-50.2	0	54.4	74	19.6	Restricted Band 3rd Harmonic
7.4416	Average	Horz	38.24	36.66	-50.2	0	44.1	54	9.9	Restricted Band 3rd Harmonic
12.4028	Max Peak	Vert	63.49	38.71	-49.9	0	52.3	74	21.7	Restricted Band 3rd Harmonic
12.4028	Average	Vert	38.24	38.71	-49.9	0	39.9	54	14.1	Restricted Band 3rd Harmonic
12.4028	Max Peak	Horz	66.44	36.66	-49.9	0	53.2	74	20.8	Restricted Band 3rd Harmonic
12.4028	Average	Horz	38.24	36.66	-49.9	0	41.0	54	13.0	Restricted Band 3rd Harmonic

FCC 15.209

Electric Field Strength

EUT: ZICM357SP0-1 Module with Model 001-0010 Dipole Antenna
Manufacturer: California Eastern Laboratories
Operating Condition: 72 deg. F; 53% R.H.
Test Site: DLS Site 2
Operator: Paul L 8205
Test Specification: LSR Model 001-0010 2dbi quarter wave Dipole Antenna
Comment: 3.34V DC
Date: 07-05-2016

TEXT: "Horz 3 meters"

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with HORIZONTAL Antenna Polarization

Equations: Total Level(dBµV/m) = Level(dBµV) + System Loss(dB) + Antenna Factor(dBµV/m)

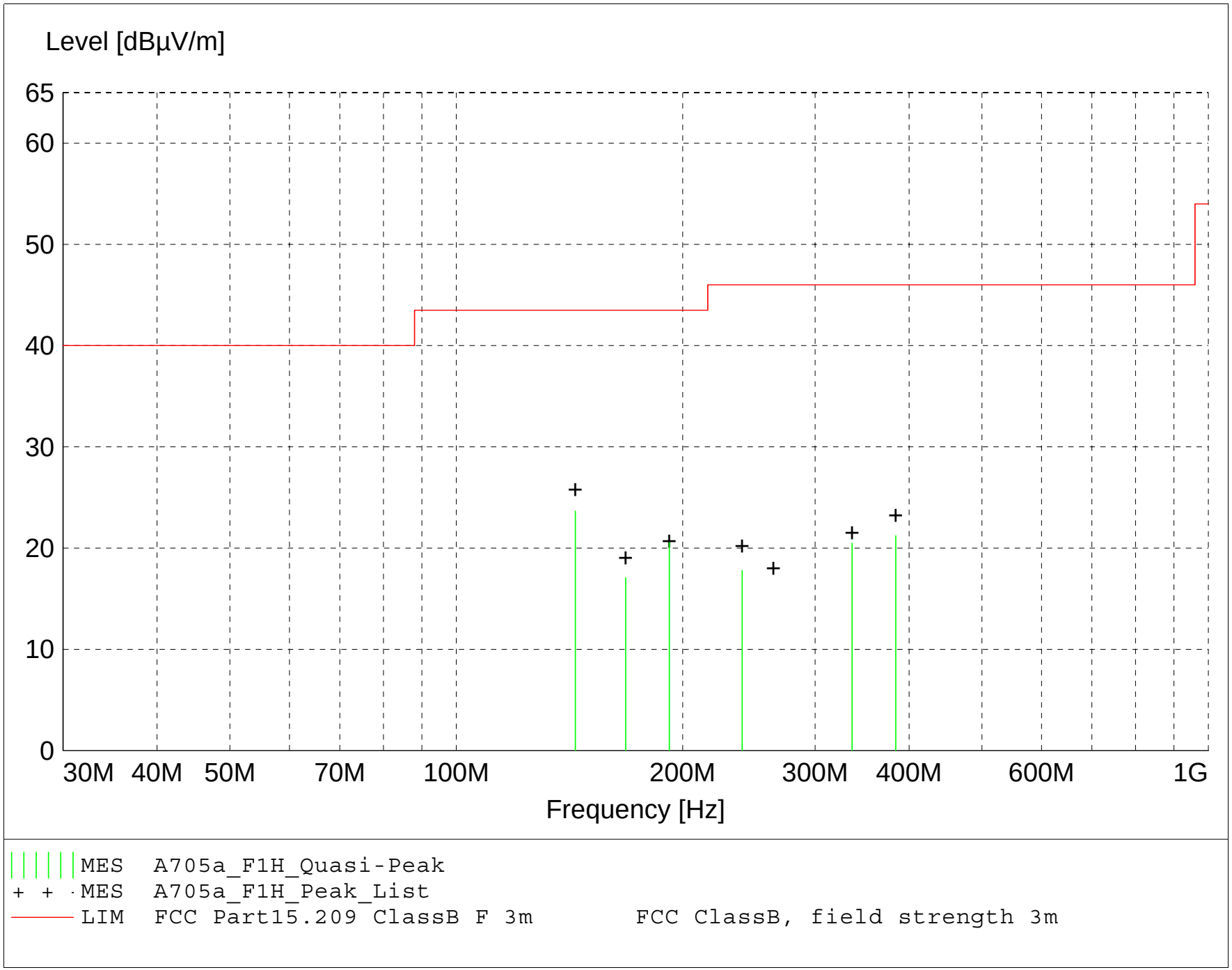
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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 dector

Final maximized level using Peak detector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60
50
40
30
20
10
0
30M
40M
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100M
200M
300M
400M
600M
1G
Frequency [Hz]
MES A705a_F1H_Quasi-Peak
MES A705a_F1H_Peak_List
LIM FCC Part15.209 ClassB F 3m
FCC ClassB, field strength 3m

MEASUREMENT RESULT: "A705a_F1H_Final"

7/5/2016 11:20AM

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		
144.000000	34.66	12.10	-23.1	23.6	43.5	19.9	3.50	340	QUASI-PEAK	None
192.000000	25.55	17.70	-22.7	20.5	43.5	23.0	2.25	0	QUASI-PEAK	None
384.000000	27.50	15.36	-21.6	21.2	46.0	24.8	2.50	225	QUASI-PEAK	None
336.000000	27.63	14.74	-21.9	20.5	46.0	25.5	1.75	340	QUASI-PEAK	None
168.000000	25.87	14.10	-22.9	17.1	43.5	26.4	1.75	0	QUASI-PEAK	None
239.950000	28.46	11.80	-22.5	17.8	46.0	28.2	1.75	340	QUASI-PEAK	None

FCC 15.209

Electric Field Strength

EUT: ZICM357SP0-1 Module with Model 001-0010 Dipole Antenna
Manufacturer: California Eastern Laboratories
Operating Condition: 72 deg. F; 53% R.H.
Test Site: DLS Site 2
Operator: Paul L 8205
Test Specification: LSR Model 001-0010 2dbi quarter wave Dipole Antenna
Comment: 3.34V DC
Date: 07-05-2016

TEXT: "Vert 3 meters"

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with VERTICAL Antenna Polarization

Equations: Total Level(dBµV/m) = Level(dBµV) + System Loss(dB) + Antenna Factor(dBµV/m)

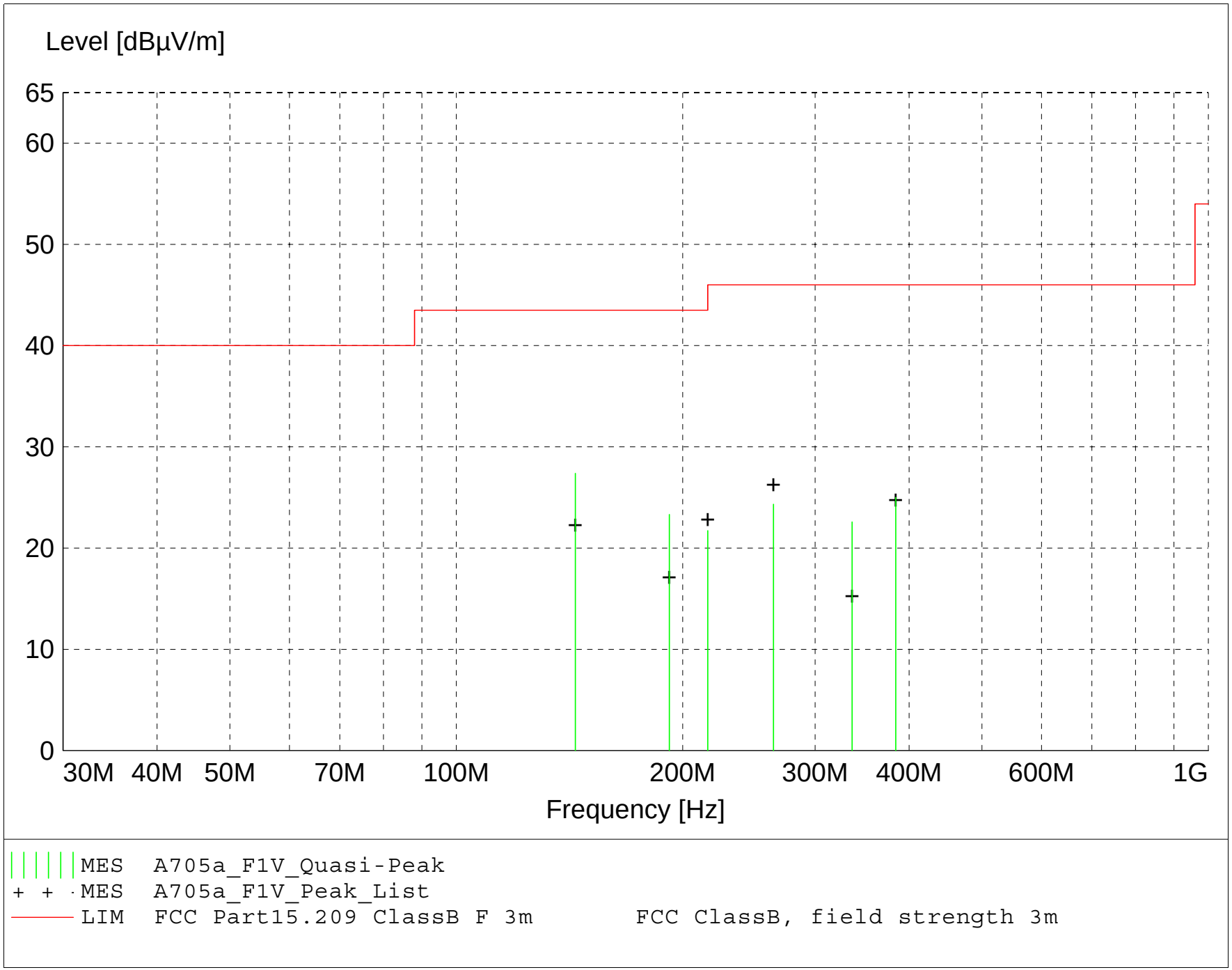
Margin(dB) = Limit(dBµV/m) - Total Level(dBµV/m)

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 dector

Final maximized level using Peak detector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65
60
50
40
30
20
10
0
30M
40M
50M
70M
100M
200M
300M
400M
600M
1G
Frequency [Hz]
MES A705a_F1V_Quasi-Peak
MES A705a_F1V_Peak_List
LIM FCC Part15.209 ClassB F 3m
FCC ClassB, field strength 3m

MEASUREMENT RESULT: "A705a_F1V_Final"

7/5/2016 12:38PM

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		
144.000000	38.39	12.10	-23.1	27.4	43.5	16.1	1.00	0	QUASI-PEAK	18
192.000000	28.34	17.70	-22.7	23.3	43.5	20.2	1.00	0	QUASI-PEAK	26
384.000000	31.27	15.36	-21.6	25.0	46.0	21.0	1.00	5225	QUASI-PEAK	None
264.100000	33.59	12.96	-22.2	24.3	46.0	21.7	1.00	90	QUASI-PEAK	None
216.000000	32.90	11.46	-22.6	21.7	43.5	21.8	1.00	0	QUASI-PEAK	None
336.000000	29.73	14.74	-21.9	22.6	46.0	23.4	1.00	335	QUASI-PEAK	None

166 South Carter, Genoa City, WI 53128

Company: California Eastern Laboratories
Model Tested: ZICM357SP0-1
Report Number: 21983
DLS Project: 8205

Radiated Emissions in Restricted Bands – 1 GHz to 25 GHz

1 GHz to 18 GHz Tested at a 3 Meter Distance

18 GHz to 25 GHz Tested at a 1 Meter Distance

EUT:	ZICM357SP0-1 with LSR 001-0100 Quarter Wave Dipole Antenna
Manufacturer:	California Eastern Laboratories
Operating Condition:	72deg F; 54%R.H.
Test Site:	Site 2
Operator:	Paul L
Test Specification:	FCC Pt15.247(d) FCC Part15.205(a) FCC Part15.209(a)
Comment:	Continuous Transmit Mode, Output Power Setting 8
Date:	7-6-2016
Notes:	Peak measurements were taken with RBW=1MHz, VBW=3MHz, Detector=Peak
	Average measurements were taken with RBW=1MHZ, VBW=3MHz, Detector =Average
	All other restricted band emissions at least 20dB under the limit

Channel 11 (2.405GHz)

Frequency (GHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Duty Cycle Correction	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
4.8112	Max Peak	Vert	52.60	32.96	-53.6	0	52.6	74	21.4	Restricted Band 2nd
4.8112	Average	Vert	40.40	32.96	-53.6	0	44.0	54	10.0	Restricted Band 2nd
4.8112	Max Peak	Horz	73.84	32.96	-53.6	0	53.2	74	20.8	Restricted Band 2nd
4.8112	Average	Horz	47.82	32.96	-53.6	0	45.1	54	8.9	Restricted Band 2nd
7.2160	Max Peak	Vert	66.24	35.86	-51.1	0	51.0	74	23.0	3rd Harmonic
7.2160	Average	Vert	38.24	35.86	-51.1	0	40.4	54	13.6	3rd Harmonic
7.2160	Max Peak	Horz	67.64	35.86	-51.1	0	52.4	74	21.6	3rd Harmonic
7.2160	Average	Horz	36.71	35.86	-51.1	0	41.7	54	12.3	3rd Harmonic

166 South Carter, Genoa City, WI 53128

Company: California Eastern Laboratories
Model Tested: ZICM357SP0-1
Report Number: 21983
DLS Project: 8205

Radiated Emissions in Restricted Bands – 1 GHz to 25 GHz

1 GHz to 18 GHz Tested at a 3 Meter Distance

18 GHz to 25 GHz Tested at a 1 Meter Distance

EUT:	ZICM357SP0-1 with LSR 001-0100 Quarter Wave Dipole Antenna
Manufacturer:	California Eastern Laboratories
Operating Condition:	72deg F; 54%R.H.
Test Site:	Site 2
Operator:	Paul L
Test Specification:	FCC Pt15.247(d) FCC Part15.205(a) FCC Part15.209(a)
Comment:	Continuous Transmit Mode, Output Power Setting 8
Date:	7-6-2016
Notes:	Peak measurements were taken with RBW=1MHz, VBW=3MHz, Detector=Peak
	Average measurements were taken with RBW=1MHZ, VBW=3MHz, Detector =Average
	All other restricted band emissions at least 20dB under the limit

Channel 18 (2.440GHz)

Frequency (GHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Duty Cycle Correction	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
4.8792	Max Peak	Vert	52.60	33.01	-53.5	0	52.1	74	21.9	Restricted Band 2nd
4.8792	Average	Vert	40.40	33.01	-53.5	0	43.8	54	10.2	Restricted Band 2nd
4.8792	Max Peak	Horz	73.09	33.01	-53.5	0	52.6	74	21.4	Restricted Band 2nd
4.8792	Average	Horz	47.82	33.01	-53.5	0	44.5	54	9.5	Restricted Band 2nd
7.3216	Max Peak	Vert	69.97	36.43	-50.7	0	55.7	74	18.3	Restricted Band 3rd
7.3216	Average	Vert	38.24	36.43	-50.7	0	46.5	54	7.5	Restricted Band 3rd
7.3216	Max Peak	Horz	71.97	36.43	-50.7	0	57.7	74	16.3	Restricted Band 3rd
7.3216	Average	Horz	36.71	36.43	-50.7	0	48.8	54	5.2	Restricted Band 3rd
9.7620	Max Peak	Horz	66.04	37.86	-52.7	0	51.2	74	22.8	4th Harmonic
9.7620	Average	Horz	38.24	37.86	-52.7	0	38.6	54	15.4	4th Harmonic

166 South Carter, Genoa City, WI 53128

Company: California Eastern Laboratories
Model Tested: ZICM357SP0-1
Report Number: 21983
DLS Project: 8205

Radiated Emissions in Restricted Bands – 1 GHz to 25 GHz

1 GHz to 18 GHz Tested at a 3 Meter Distance

18 GHz to 25 GHz Tested at a 1 Meter Distance

EUT:	ZICM357SP0-1 with LSR 001-0100 Quarter Wave Dipole Antenna
Manufacturer:	California Eastern Laboratories
Operating Condition:	72deg F; 54%R.H.
Test Site:	Site 2
Operator:	Paul L
Test Specification:	FCC Pt15.247(d) FCC Part15.205(a) FCC Part15.209(a)
Comment:	Continuous Transmit Mode, Output Power Setting -5
Date:	7-7-2016
Notes:	Peak measurements were taken with RBW=1MHz, VBW=3MHz, Detector=Peak
	Average measurements were taken with RBW=1MHZ, VBW=3MHz, Detector =Average
	All other restricted band emissions at least 20dB under the limit

Channel 26 (2.480GHz)

Frequency (GHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Duty Cycle Correction	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
4.9592	Max Peak	Vert	52.60	33.09	-53.4	0	49.4	74	24.6	Restricted Band 2nd
4.9592	Average	Vert	40.40	33.09	-53.4	0	39.7	54	14.3	Restricted Band 2nd
4.9592	Max Peak	Horz	68.71	33.09	-53.4	0	48.4	74	25.6	Restricted Band 2nd
4.9592	Average	Horz	47.82	33.09	-53.4	0	40.1	54	13.9	Restricted Band 2nd
7.4416	Max Peak	Horz	63.24	36.66	-50.2	0	49.7	74	24.3	Restricted Band 3rd
7.4416	Average	Horz	38.24	36.66	-50.2	0	36.7	54	17.3	Restricted Band 3rd

Appendix B

2.0 Band-Edge Measurements – Radiated

Rule Part:

15.247(d)

Test Procedure:

558074 D01 DTS Meas Guidance v03r05, 4/8/2016
12.0 Emissions in restricted frequency bands
12.1 Radiated emission measurements
Measurement Procedure – ANSI C63.10-2013

Limit:

15.209(a)

Results:

Compliant

Notes:

This was a radiated measurement. The EUT was transmitting from an external dipole antenna. The EUT was powered through a serial interface cable that was connected to the bench supply set to 3.34 VDC. The EUT was set to transmit continuously at its maximum power, with a modulating signal representative of the worst-case signal encountered in a real system operation on the low, middle, and high channels of the operating band.

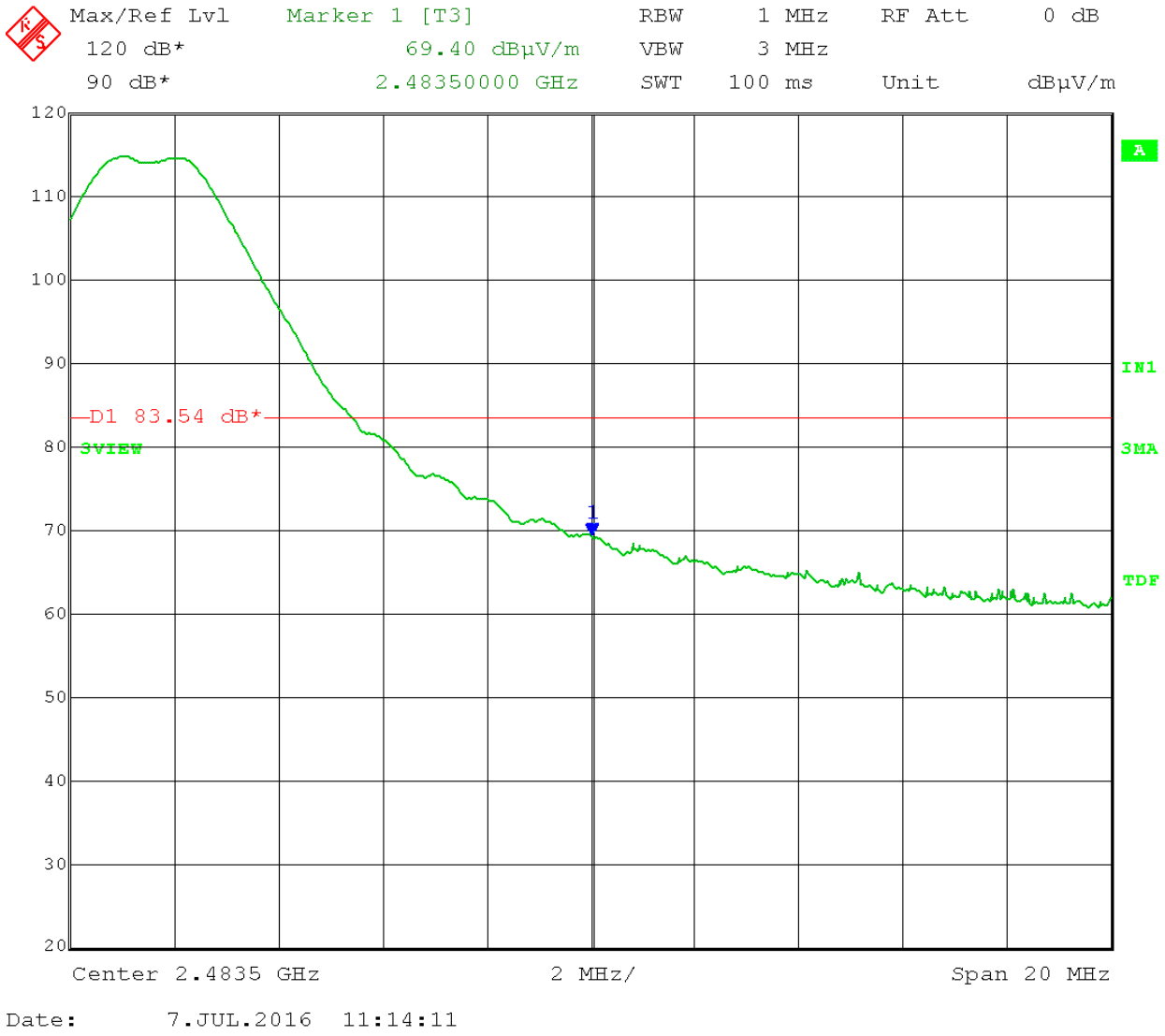
The highest channel (channel 26) power setting was reduced to -7 when the Aveslink Model E-2820-CA Flying Lead External Dipole Antenna is used in place of the trace antenna to meet the radiated upper band-edge requirement at the 2.4835 GHz restricted frequency band edge.

The highest channel (channel 26) power setting was reduced to -5 when the LSR Model 001-0010 External Dipole Antenna is used in place of the trace antenna to meet the radiated upper band-edge requirement at the 2.4835 GHz restricted frequency band edge.

Testing was also performed on channel 25 to show that the output power setting for this channel does not need to be lowered to meet the band-edge requirements.

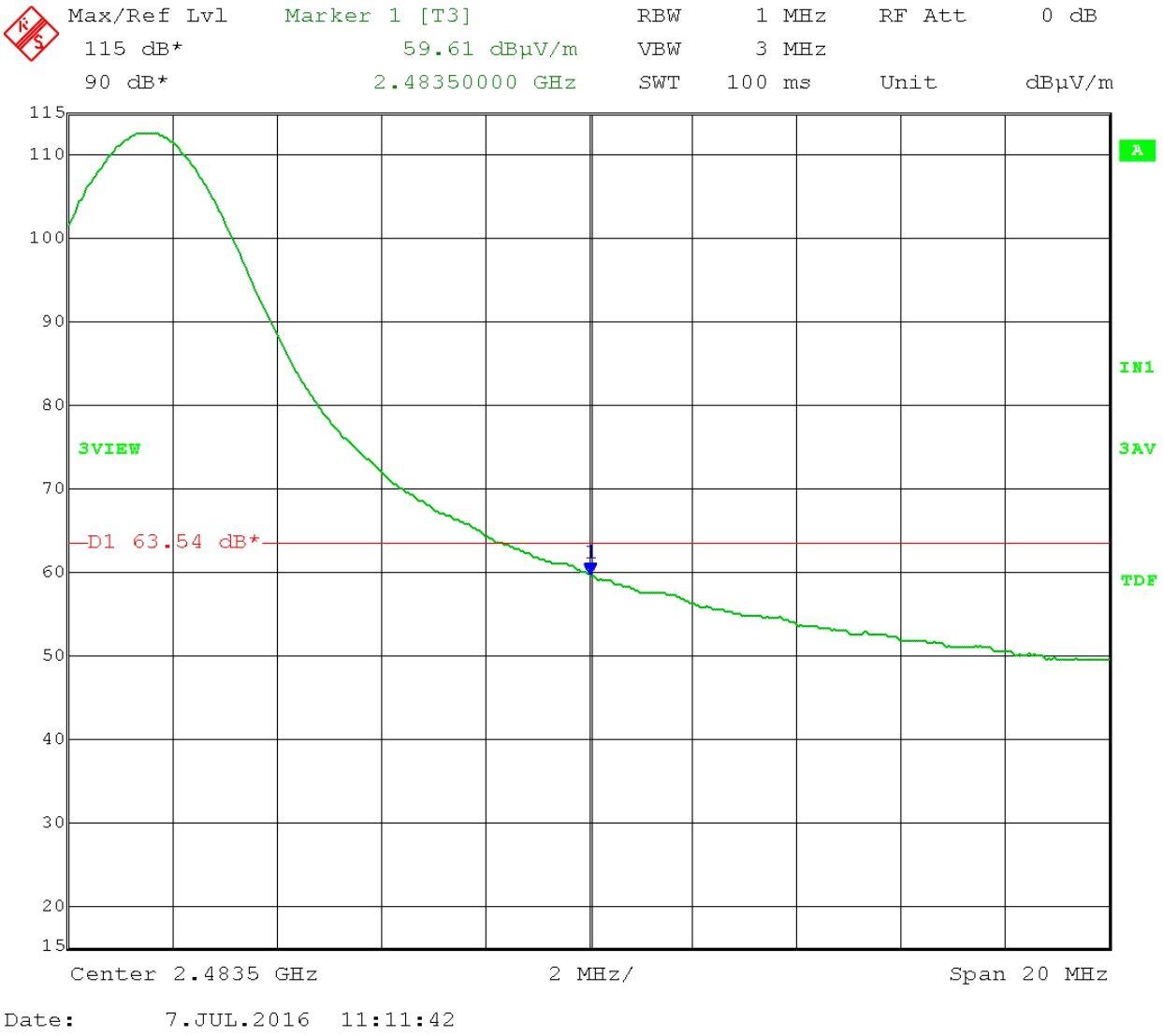
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with Aveslink E-2820-CA Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 25: Frequency- 2.475Ghz
Power Setting 8

Horizontal Polarization
Detector: Peak
Test Distance: 1meter
Limit: 63.54dbµV/m



Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with Aveslink E-2820-CA Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 25: Frequency- 2.475Ghz
Power Setting 8

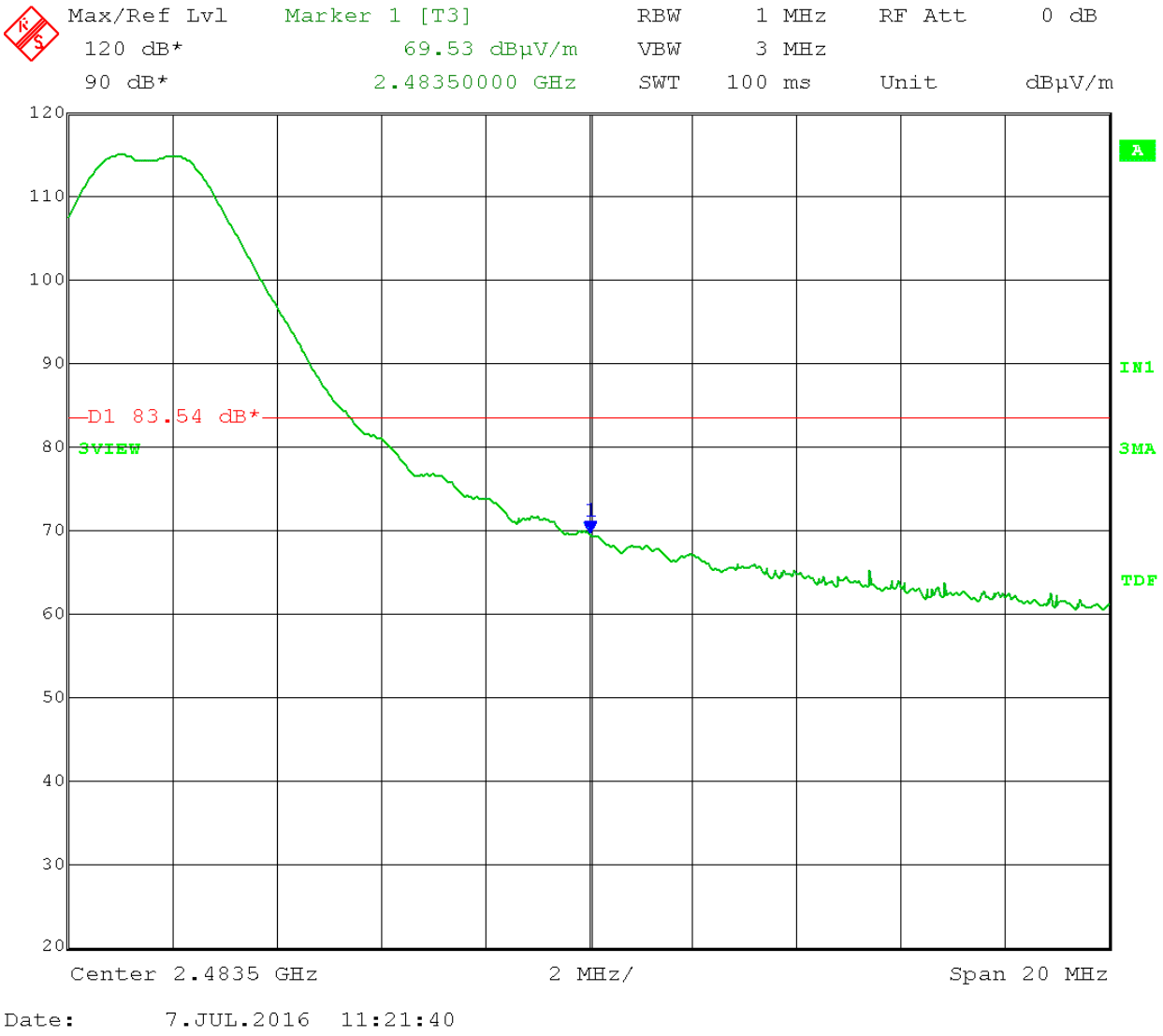
Horizontal Polarization
Detector: Average
Test Distance: 1meter
Limit: 63.54dbµV/m



Date: 7.JUL.2016 11:11:42

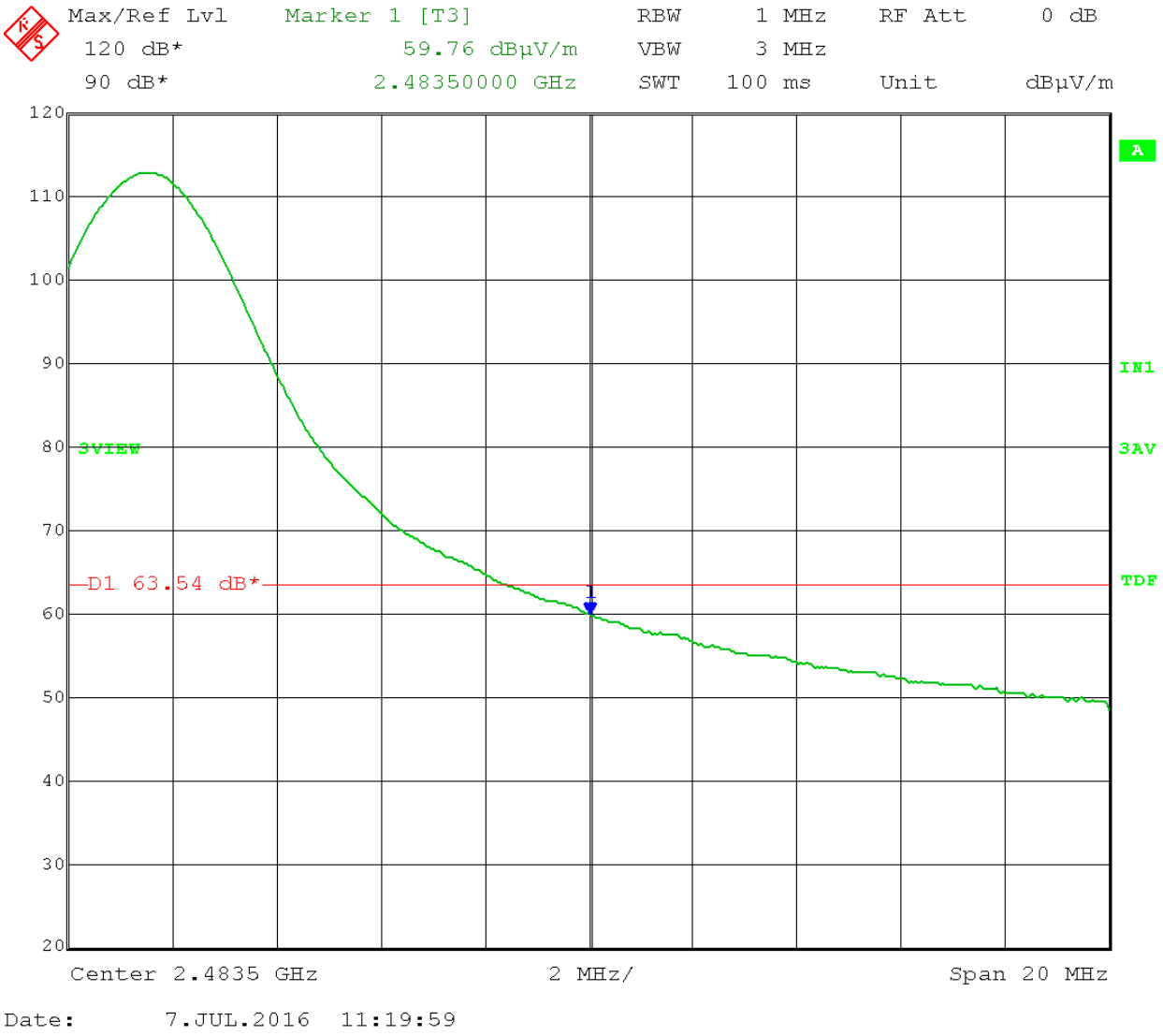
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with Aveslink E-2820-CA Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 25: Frequency- 2.475Ghz
Power Setting 8

Vertical Polarization
Detector: Peak
Test Distance: 1meter
Limit: 63.54dbµV/m



Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with Aveslink E-2820-CA Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 25: Frequency- 2.475Ghz
Power Setting 8

Vertical Polarization
Detector: Average
Test Distance: 1meter
Limit: 63.54dbµV/m



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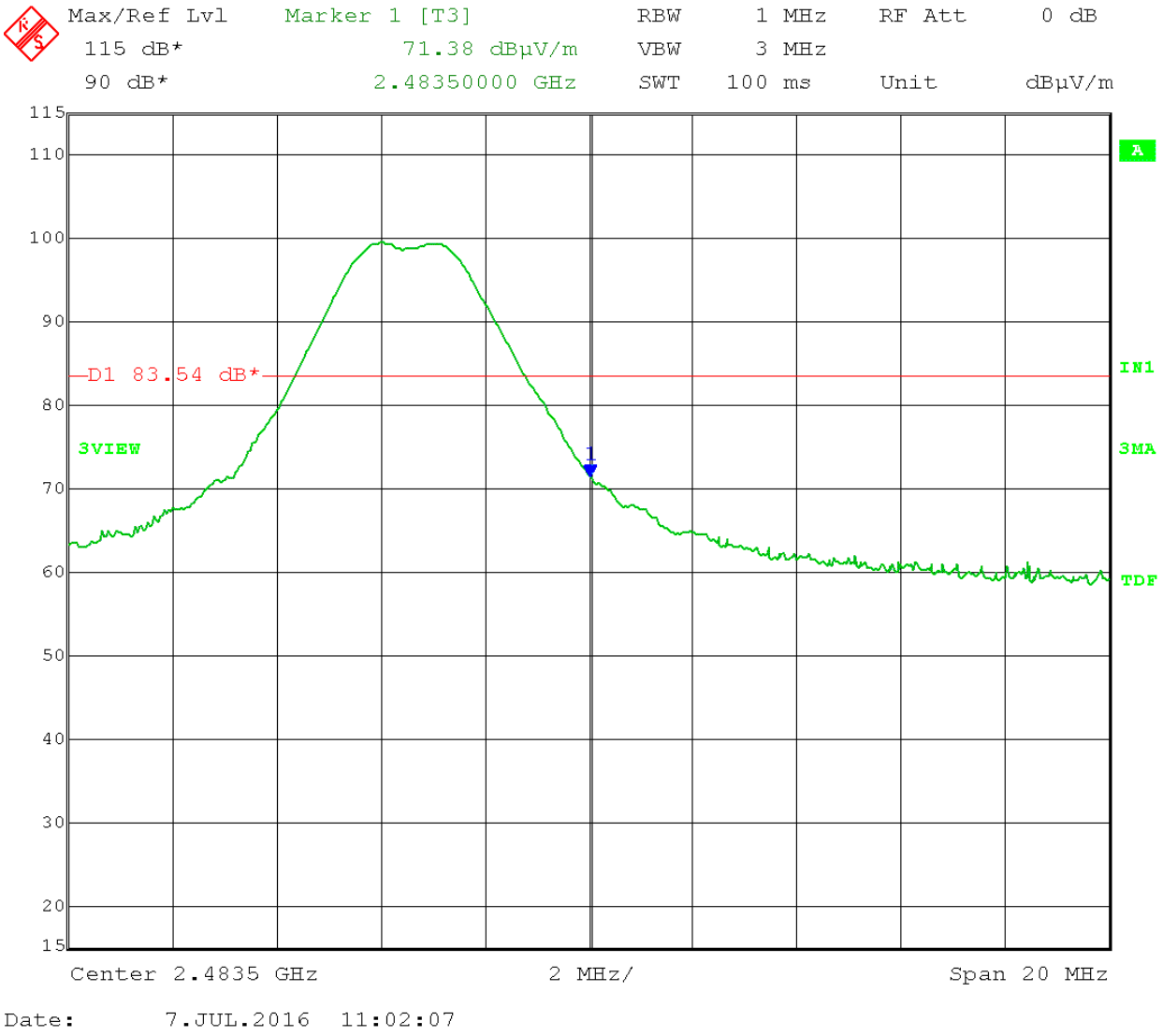
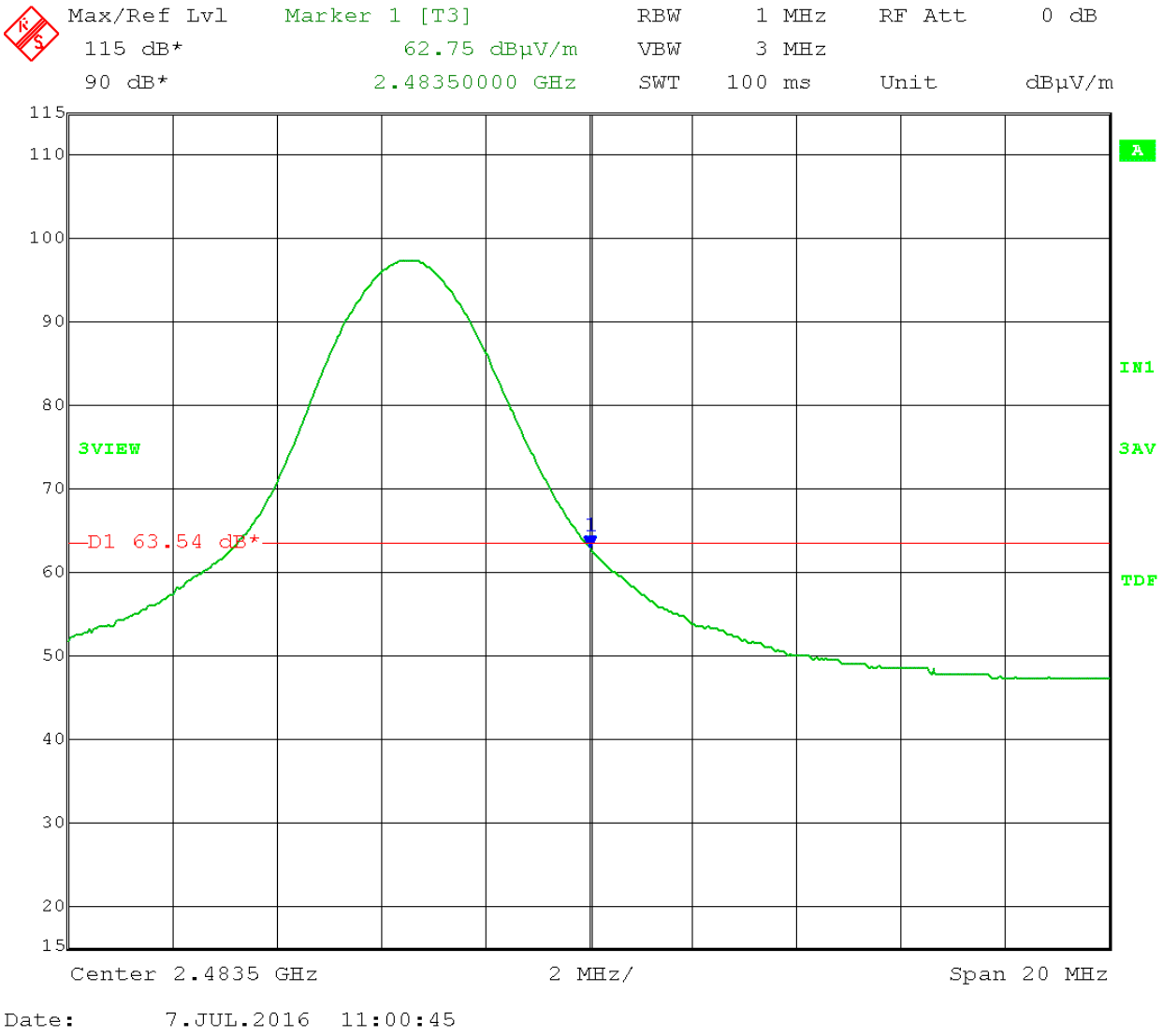
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with Aveslink E-2820-CA Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 26: Frequency- 2.480Ghz
Power Setting reduced from 8 to -7

Horizontal Polarization
Detector: Peak
Test Distance: 1meter
Limit: 63.54dbµV/m



Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with Aveslink E-2820-CA DipoleAntenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 26: Frequency- 2.480Ghz
Power Setting reduced from 8 to -7

Horizontal Polarization
Detector: Average
Test Distance: 1meter
Limit: 63.54dbµV/m



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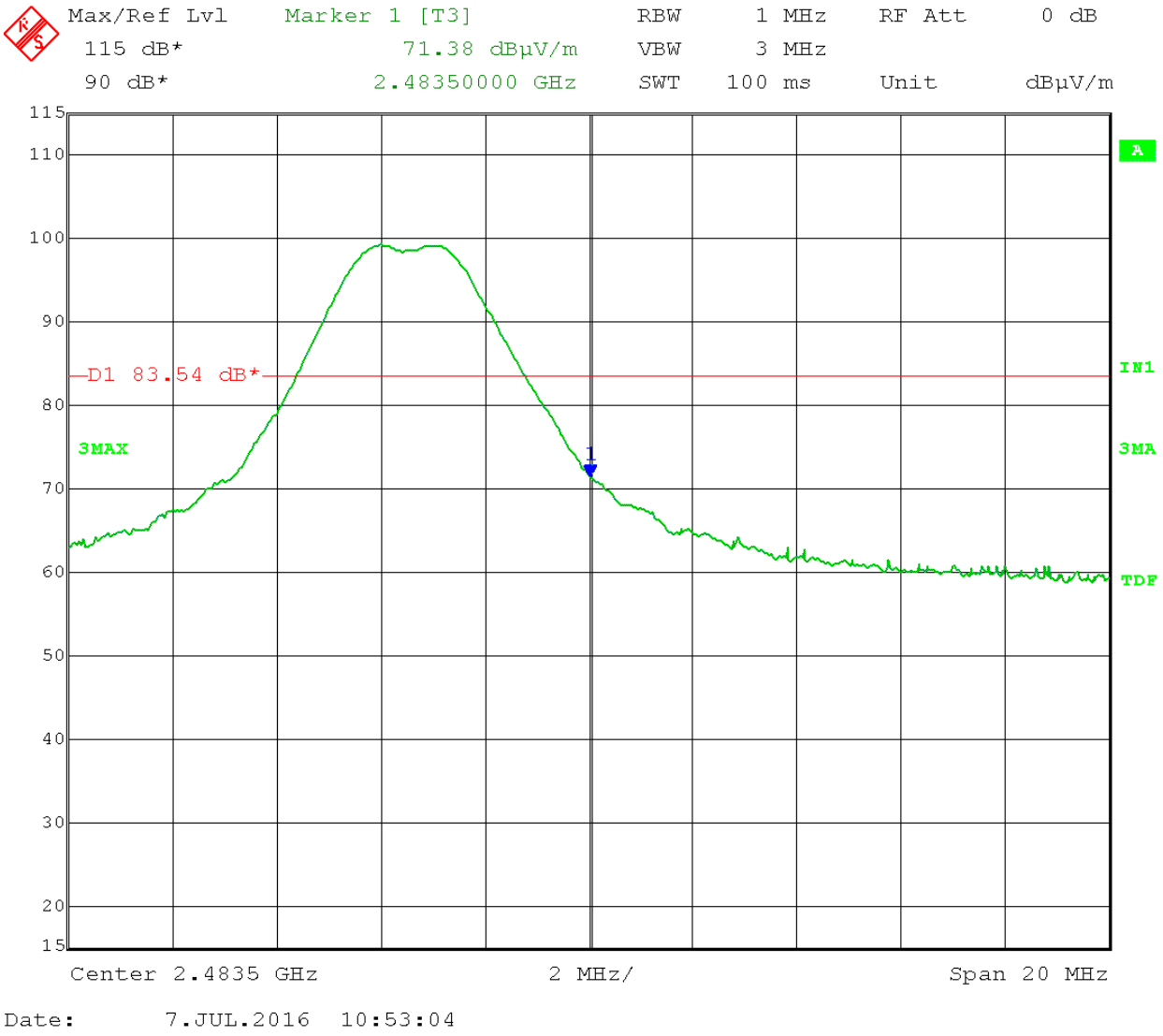
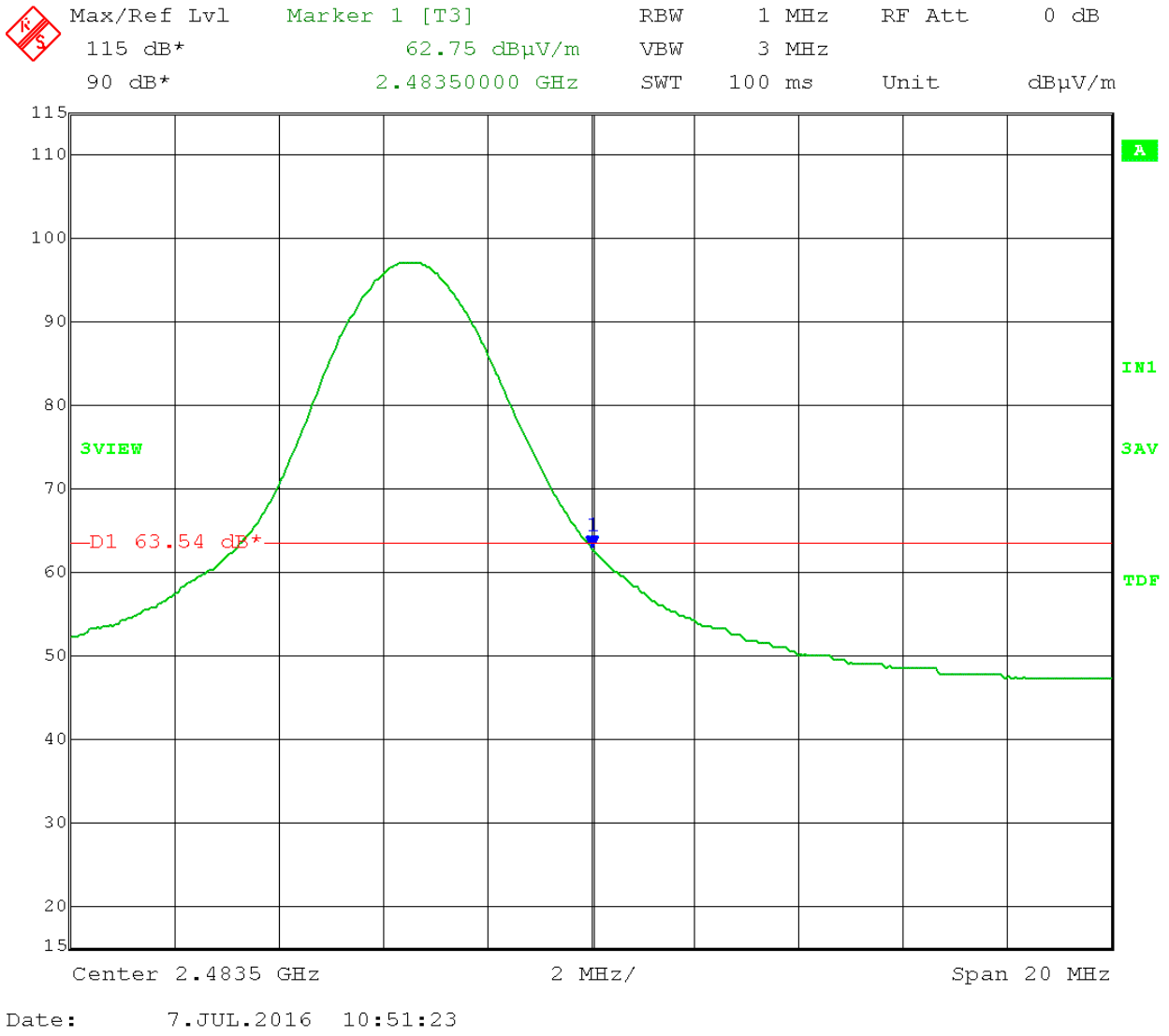
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with Aveslink E-2820-CA DipoleAntenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 26: Frequency- 2.480Ghz
Power Setting reduced from 8 to -7

Vertical Polarization
Detector: Peak
Test Distance: 1meter
Limit: 63.54dbµV/m



Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with Aveslink E-2820-CA Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 26: Frequency- 2.480Ghz
Power Setting reduced from 8 to -7

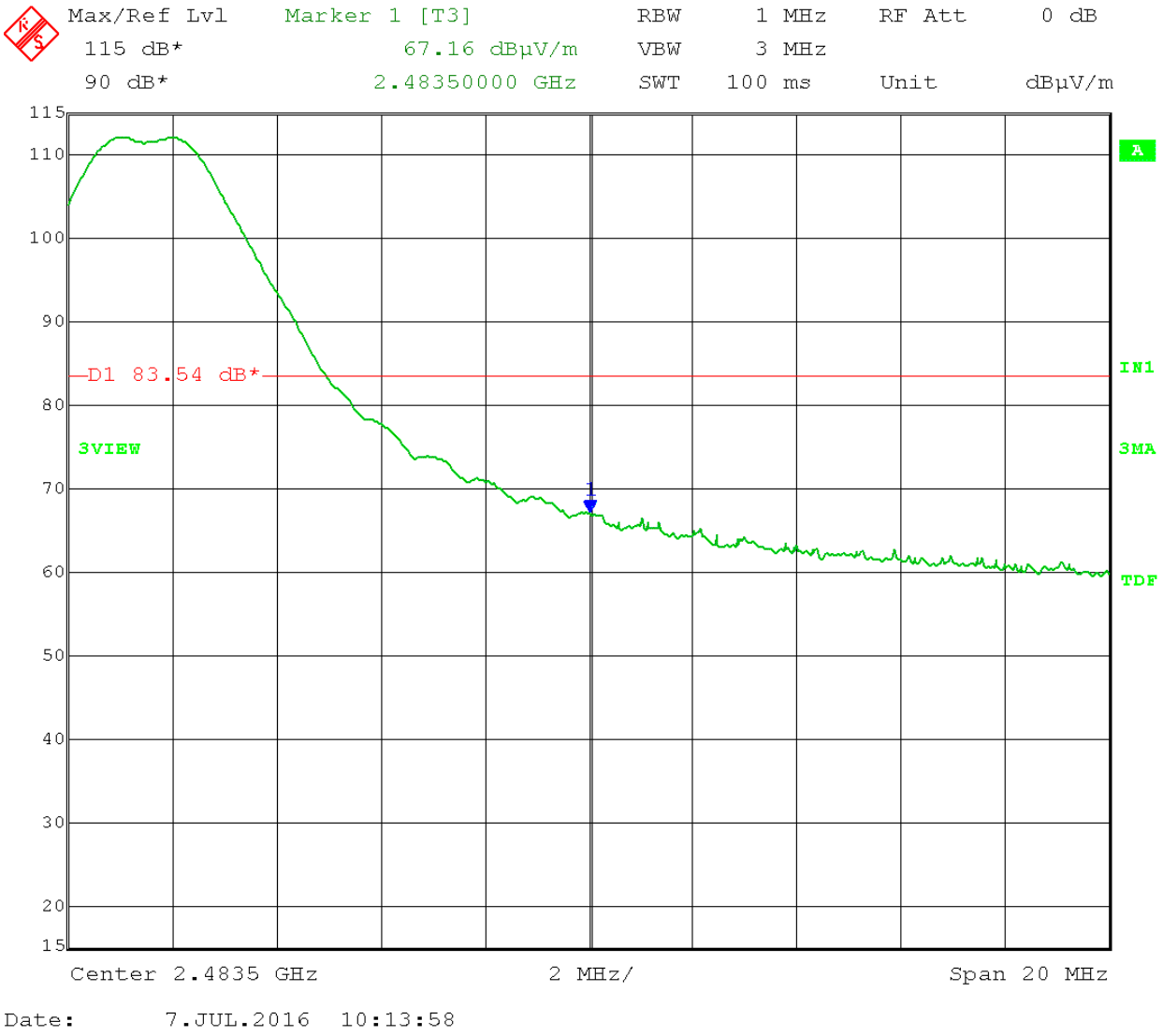
Vertical Polarization
Detector: Average
Test Distance: 1meter
Limit: 63.54dbµV/m



Date: 7.JUL.2016 10:51:23

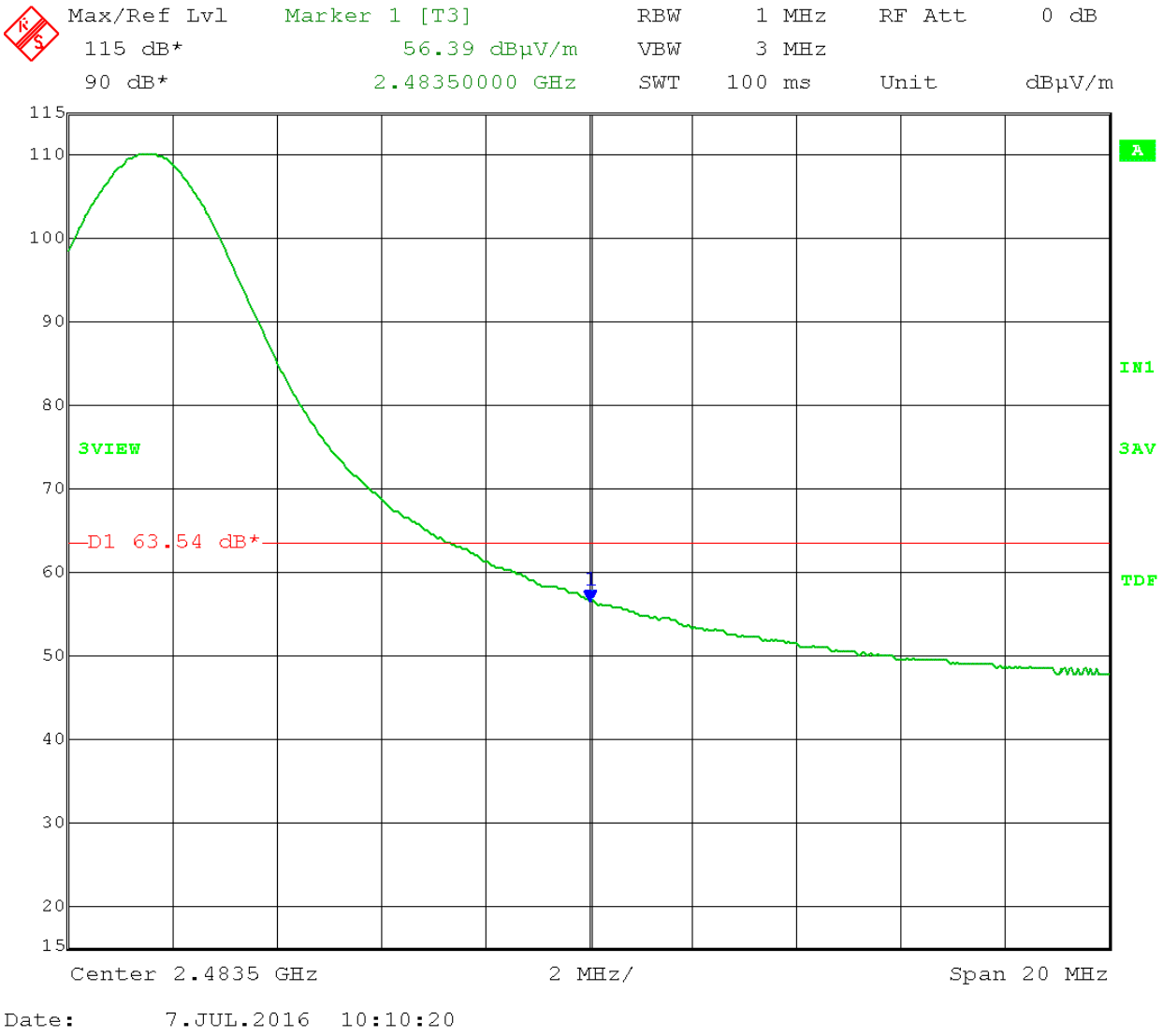
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with LSR001-0100 Quarter Wave Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 25: Frequency- 2.475Ghz
Power Setting 8

Horizontal Polarization
Detector: Peak
Test Distance: 1meter
Limit: 63.54dbµV/m



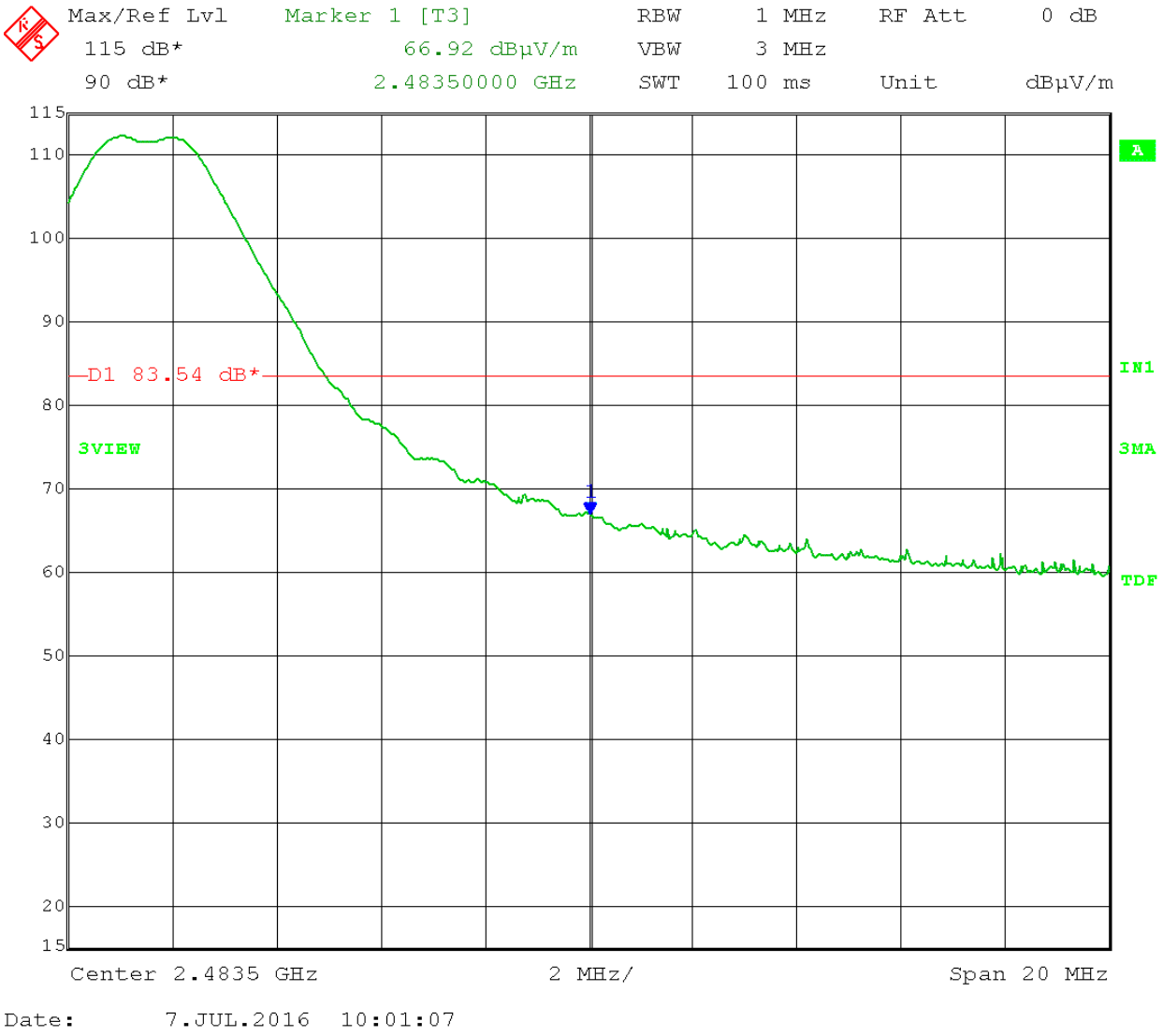
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with LSR001-0100 Quarter Wave Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 25: Frequency- 2.475Ghz
Power Setting 8

Horizontal Polarization
Detector: Average
Test Distance: 1meter
Limit: 63.54dbµV/m



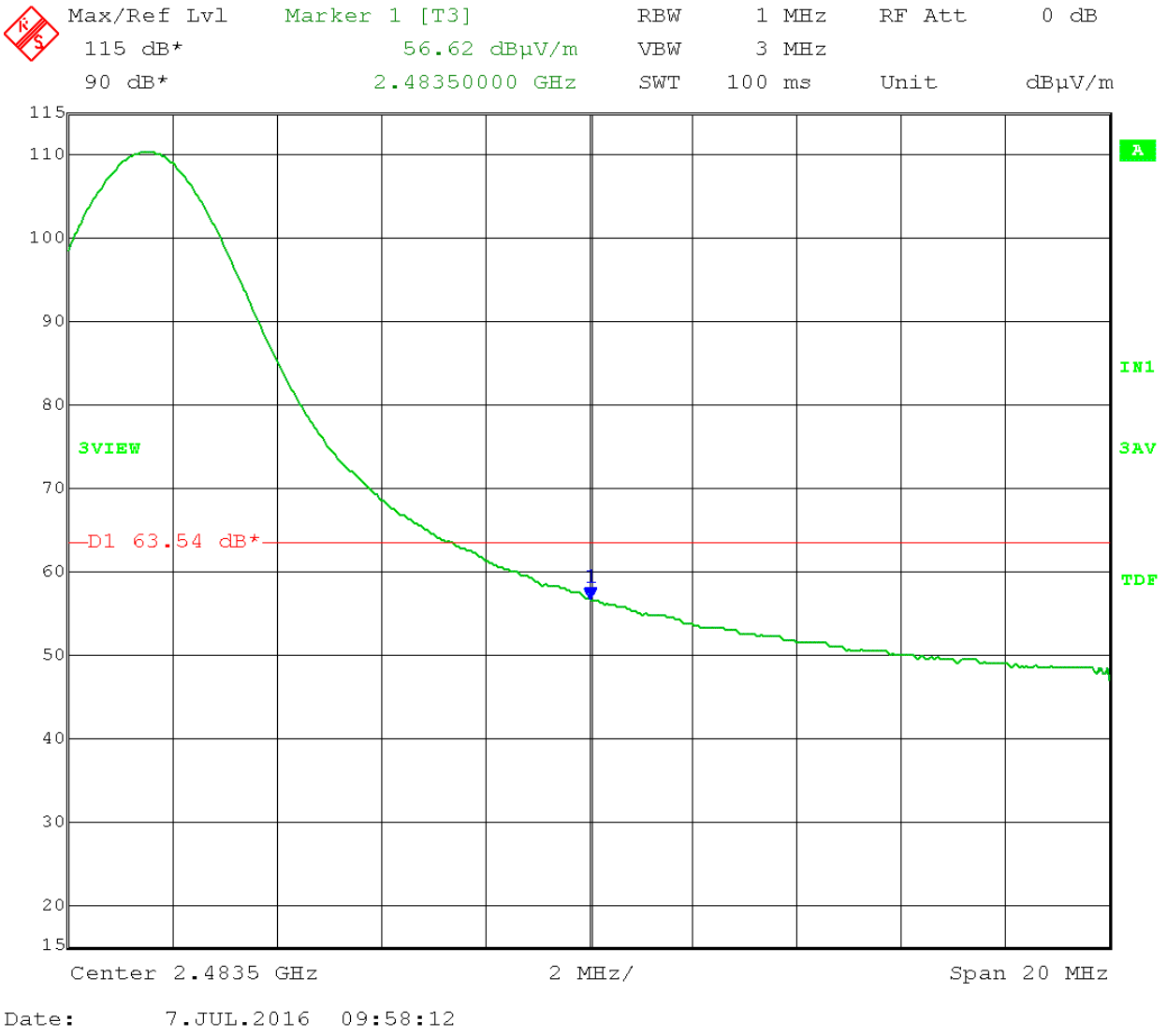
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with LSR001-0100 Quarter Wave Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 25: Frequency- 2.475Ghz
Power Setting 8

Vertical Polarization
Detector: Peak
Test Distance: 1meter
Limit: 83.54dbµV/m



Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with LSR001-0100 Quarter Wave Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 25: Frequency- 2.475Ghz
Power Setting 8

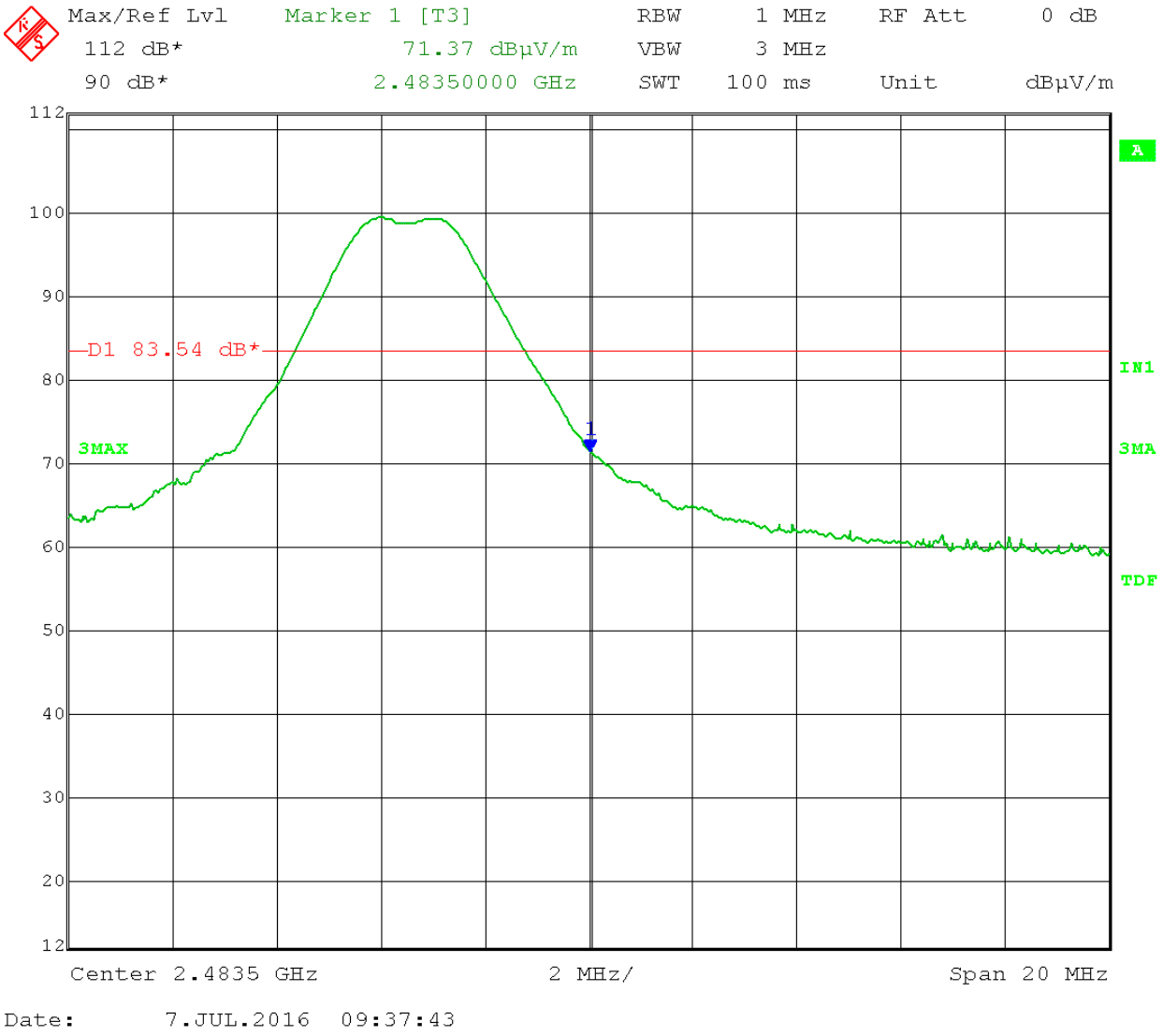
Vertical Polarization
Detector: Average
Test Distance: 1meter
Limit: 63.54dbµV/m



Date: 7.JUL.2016 09:58:12

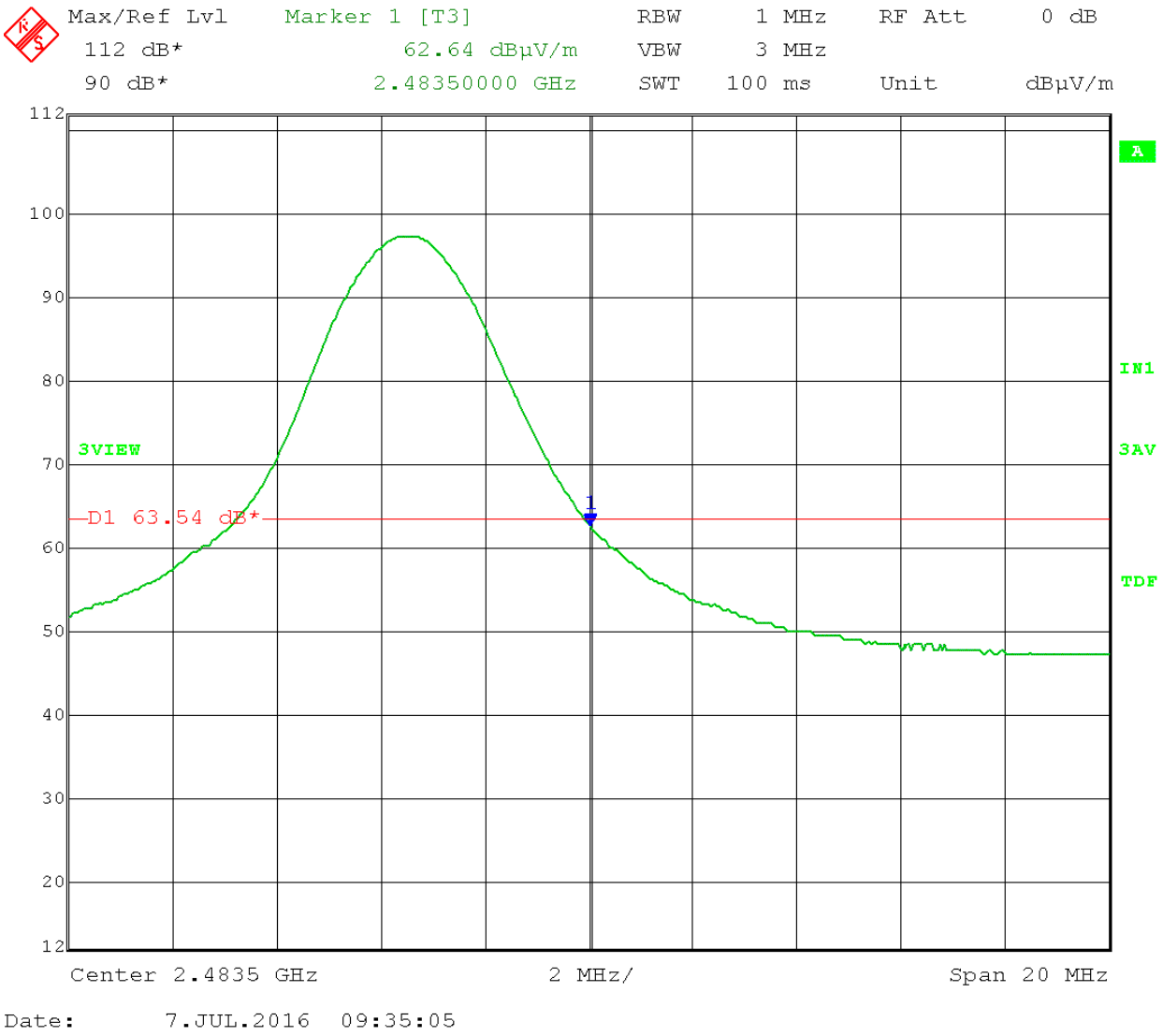
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with LSR001-0100 Quarter Wave Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 26: Frequency- 2.480Ghz
Power Setting reduced from 8 to -5

Horizontal Polarization
Detector: Peak
Test Distance: 1meter
Limit: 83.54dbµV/m



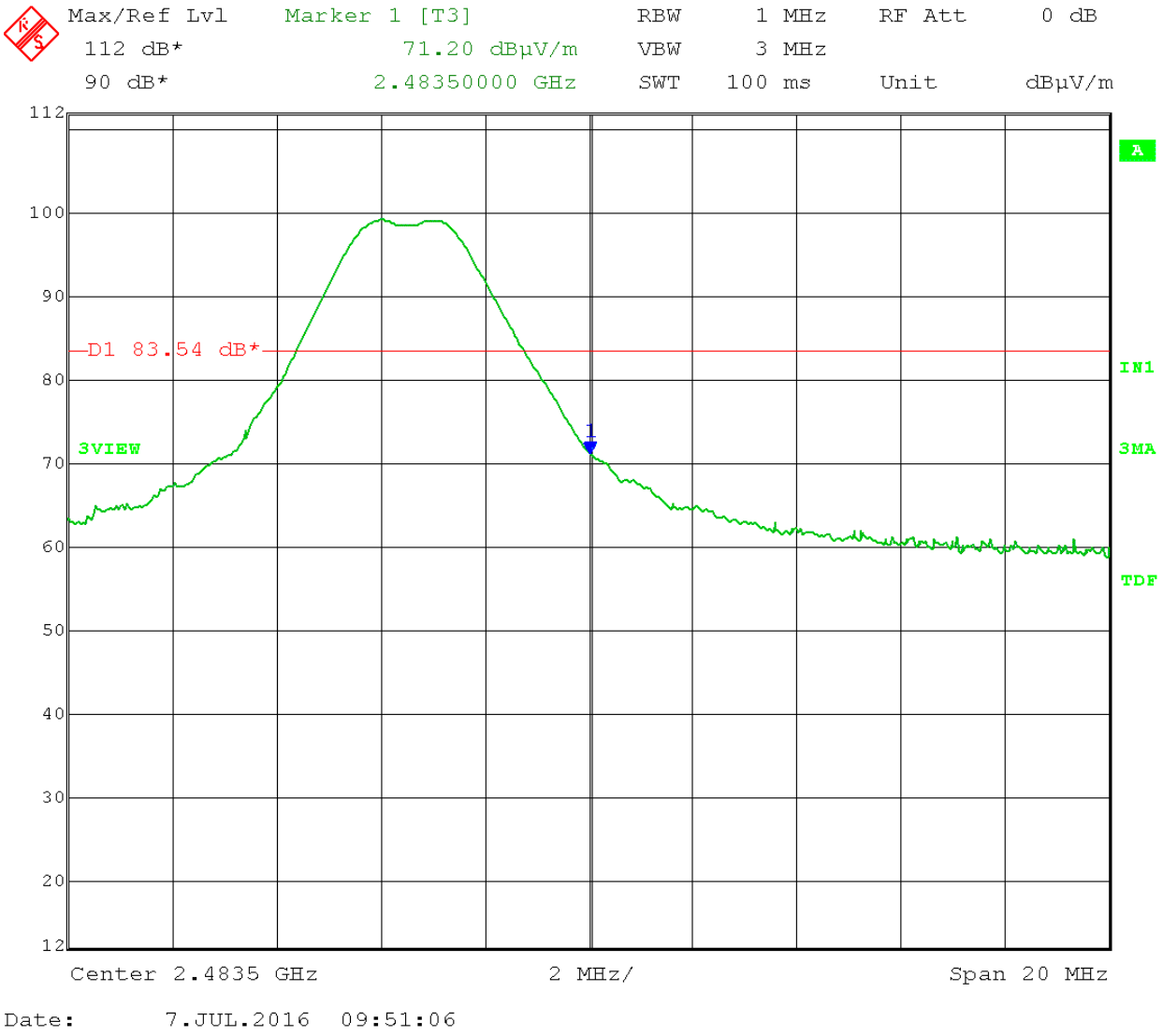
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with LSR001-0100 Quarter Wave Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 26: Frequency- 2.480Ghz
Power Setting reduced from 8 to -5

Horizontal Polarization
Detector: Average
Test Distance: 1meter
Limit: 63.54dbµV/m



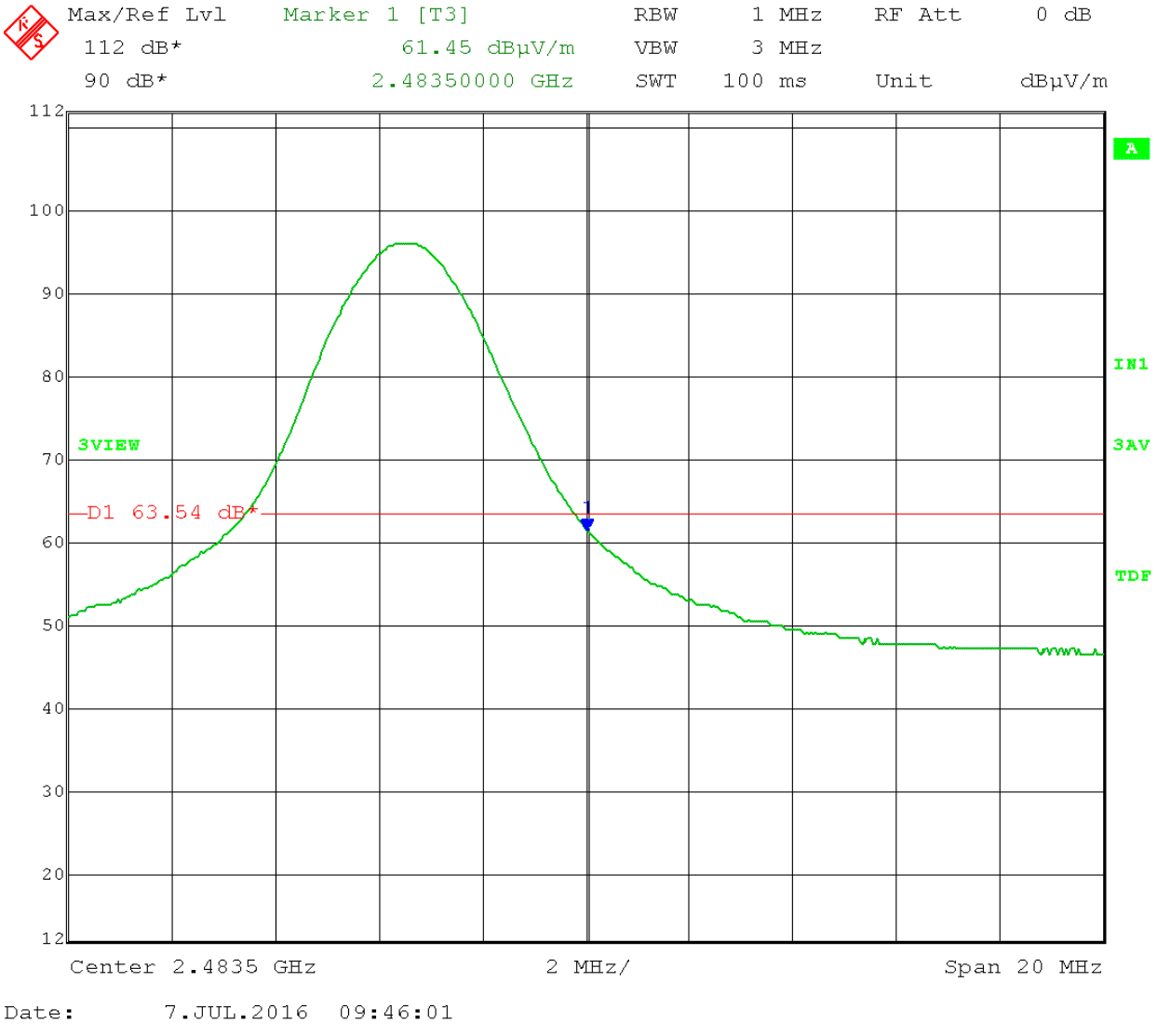
Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with LSR001-0100 Quarter Wave Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 26: Frequency- 2.480Ghz
Power Setting reduced from 8 to -5

Vertical Polarization
Detector: Peak
Test Distance: 1meter
Limit: 83.54dbµV/m



Test Date: 7-7-2016
Company: California Eastern Laboratories
EUT: ZICM357S:P0-1 with LSR001-0100 Quarter Wave Dipole Antenna
Test: Upper Band Edge-Radiated
Rule Part: FCC Part 15.247(d) and FCC Part 15.205
Operator: Paul L
Comment: Channel 26: Frequency- 2.480Ghz
Power Setting reduced from 8 to -5

Vertical Polarization
Detector: Average
Test Distance: 1meter
Limit: 63.54dbµV/m



Date: 7.JUL.2016 09:46:01

Appendix C - MEASUREMENT UNCERTAINTY

Compliance with the limits in this standard are based on the results of the compliance measurement. Our calculated measurement uncertainty including the measurement instrumentation, associated connections between the various instruments in the measurement chain, and other contributions, are provided in this section of the test report.

Radiated Emission Uncertainty above 30MHz										
		(± dB)	**(± dB)**	**(± dB)**	**(± dB)**	**(± dB)**	**(± dB)**	**(± dB)**	**(± dB)**	**(± dB)**
Contribution	Probability Distribution	3M	3M	3M	3M	3M	3M	10M	10M	10M
		30-100 MHz	100-700 MHz	700-1000 MHz	1- 4.5 GHz	4.5 – 7 GHz	7 – 18 GHz	30-100 MHz	100-700 MHz	700-1000 MHz
Combined Standard Uncertainty	Normal	1.70	1.62	1.66	2.13	2.48	2.85	1.64	1.58	1.66
Expanded Uncertainty	**Normal (k=2)**	**3.40**	**3.23**	**3.33**	**4.26**	**4.95**	**5.69**	**3.29**	**3.16**	**3.31**

166 South Carter, Genoa City, WI 53128

Company: California Eastern Laboratories
Model Tested: ZICM357SP0-1
Report Number: 21983
DLS Project: 8205

END OF REPORT

Revision #	Date	Comments	By
1.0	7-12-2016	Preliminary Release	JS
1.1	7-27-2016	PMN updated & removed “dbm” from power settings	JS