



**Keystone Compliance, LLC
131 Columbus Inner Belt
New Castle, PA 16101**

**Phone: 724-657-9940
Fax: 724-657-9920**

EMP Shield, LLC

1902-051E



EMI TEST REPORT 1902-051E REV. B

TEST STANDARDS: MIL-STD-188-125-1, MIL-STD-461G & MIL-STD-464C

For

EMP SHIELD, LLC
2010 6TH ST
BURLINGTON, KS 66839

On

SEE UNITS TESTED TABLE

MODEL NUMBER: N/A; PART NUMBER: N/A; SERIAL NUMBER: N/A

PERFORMED BY: **KEYSTONE COMPLIANCE, LLC.**
131 COLUMBUS INNER BELT
NEW CASTLE, PA 16101

Keystone Compliance, LLC. does hereby certify that all inspections and tests have been performed in accordance with the documents referenced herein with exceptions as noted in this report. The results in this report pertain to the specified equipment tested. This report shall not be reproduced, except in full, without the written authorization of Keystone Compliance, LLC.

Prepared By:

COY PRICE, Technical Writer

Date: 4/2/2019

Approved By:

TONY MASONE JR, EMC Lab Manager

Date: 4/2/2019

Approved By:

JOEY SULLIVAN, Quality Manager

Date: 4/2/2019

Testing Services

www.keystonecompliance.com



REPORT NO.: 1902-051E

REVISION: B

EMI TEST REPORT FOR EMP SHIELD, LLC

DOCUMENT HISTORY

Revision	Issue Date	Description Of Modifications	Revised By	Approved By
N/C	3/18/2019	Initial release	N/A	T.M.
A	3/28/2019	Added Specification	CP	TM
B	4/2/2019	Added data from Job # 1903-180E	CP	TM

EMI TEST REPORT FOR EMP SHIELD, LLC

CLIENT INFORMATION

Purchase Order	Check #3241
Quote Number	1902-051E
EUT Arrival Date	3/4/2019 -- Received in good condition
Company Name	EMP Shield, LLC
Address	2010 6th St
City, State Zip	Burlington, KS 66839
Contact Name	Tim Carty
Phone	620-412-9978
Email	TCarty@EMPShield.Net

TEST FACILITY INFORMATION

Test Laboratory	Keystone Compliance, LLC.
Address	131 Columbus Inner Belt
City, State, Zip Code	New Castle, PA 16101
Phone	(724) 657-9940
Fax	(724) 657-9920
Web Site	www.keystonecompliance.com
Contact Name	Tony Masone Jr
Title	EMC Lab Manager
E-Mail Address	tonyjr@keystonecompliance.com

TEST PROGRAM INFORMATION

Test Personnel	Mike Gennaro -- Lead Engineer
Test Title & Test Dates	Pulsed Current Injection – March 13, 2019 and March 29, 2019 RS105 – March 13, 2019

EMI TEST REPORT FOR EMP SHIELD, LLC

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EMI TEST REPORT FOR EMP SHIELD, LLC

INTRODUCTION

This report documents the results of the EMC tests performed on the See Units Tested Table, Model Number: N/A; Part Number: N/A; Serial Number: N/A, submitted by EMP Shield, LLC

The EMC test programs described herein were performed in accordance with the applicable requirements of MIL-STD-188-125-1, MIL-STD-461G & MIL-STD-464C.

All test data is included in Section 3 of this document.

All tests performed at Keystone Compliance New Castle, PA EMC test facility. All tests were performed using the test set-ups of the relevant standard for tests performed in laboratory conditions.

ACRONYMS AND ABBREVIATIONS

EMC – Electromagnetic Compatibility	EMI – Electromagnetic Interference
EUT – Equipment Under Test	M/N – Model Number
P/N – Part Number	S/N – Serial Number
Vac – Voltage Alternating Current	DC – Direct Current
AM – Amplitude Modulation	dB – Decibel
deg – Degree	H/V – Horizontal or Vertical Polarity
m – Meters	cm – Centimeter
V/m – Volts per meter	dBuV/m – Decibel microvolts per meter
kV – Kilovolt	Hz – Hertz
kHz – Kilohertz	MHz – Megahertz
GHz – Gigahertz	pF – Picofarad
Ω – Ohm	QP – Quasi-Peak
N/A – Not Applicable	

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CONFIGURATION

Testing performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations, and settings used to complete the evaluation. The actual test parameters specified in the test data; this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation, indicated in the test data.

EUT		
Description		Manufacturer
See Units Tested Table		EMP Shield, LLC
Model Number	Part Number	Serial Number
N/A	N/A	N/A

Units Tested			
Unit	Model	Unit	Model
Unit 1	SP Series	Unit 4	3P Series
Unit 2	DC Series	Coax 1	ANT Series
Unit 3	Meter Base	Coax 2	ANT Series

EU and RL Series Certified By Similarity.

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	EUT
	Unit 1

	EUT
	Unit 2

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EUT

Unit 3



EUT

Unit 4

EMI TEST REPORT FOR EMP SHIELD, LLC
EUT
Coax 1

EUT
Coax 2


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SUMMARY OF TESTS PERFORMED & RESULTS
TABLE 1 TESTS PERFORMED & RESULTS

Report Paragraph	Test Description	Specification	Notes	Results
MIL-STD-188-125-1, MIL-STD-461G & MIL-STD-464C				
3.1	Pulsed Current Injection	MIL-STD-125-1	Table B-II – Commercial Power Lines: 120/240VAC – 1Ph Filter Short Pulse (Powered): Common Mode 5000A/≥60Ω; ≤2×10 ⁻⁸ (Rise) x 5×10 ⁻⁷ -5.5×10 ⁻⁷ (Fall) Short Pulse (Un-powered): Wire to Ground 2500A/≥60Ω; ≤2×10 ⁻⁸ (Rise) x 5×10 ⁻⁷ -5.5×10 ⁻⁷ (Fall) Intermediate Pulse: Common Mode 250A/≥10Ω; ≤1.5×10 ⁻⁶ (Rise) x 3×10 ⁻³ -5×10 ⁻³ (Fall) Intermediate Pulse: Wire to Ground 250A/≥10Ω; ≤1.5×10 ⁻⁶ (Rise) x 3×10 ⁻³ -5×10 ⁻³ (Fall).	Complied
3.2	RS105	MIL-STD-461G / MIL-STD-464C	Test Level: 50kV/m Four (1-4) 250ft lengths of Romex cable unspooled and serpentine inside large RS105 antenna array. Cable layout to fit within 6ft x 8ft area.	Complied

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S**SECTION 1 – TEST CONDITIONS AND EQUIPMENT****1.1 INSTRUMENTATION AND EQUIPMENT**

Measuring and test equipment, utilized in the performance of these tests, was calibrated in accordance with ANSI/NCSL Z540-3-2006, by Keystone Compliance, LLC or a commercial facility, utilizing reference standards (or interim standards) whose calibrations have been certified as being traceable to the National Institute of Standards & Technology (NIST). All reference standards utilized in the above calibration system are supported by certificates, reports, or data sheets attesting to the date, accuracy, and conditions under which the results furnished were obtained. All subordinate standards, measuring and test equipment are supported by like data when such information is essential to achieve the accuracy control required by the procedure.

Keystone Compliance, LLC attests that the commercial sources providing calibration services on the above-referenced equipment, other than the NIST Standards are in fact capable of performing the required services to the satisfaction of Keystone Compliance, LLC Quality Assurance. Certifications of all calibrations performed are retained on file in the Keystone Compliance, LLC Quality Assurance Department, and are available for inspection upon request by customer representatives.

The test equipment utilized during this test program is listed on individual Test Equipment Logs located in Section 3 of this document.

1.2 TOLERANCES

All test conditions were maintained within all applicable specified tolerances.

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SECTION 2 – REFERENCES**2.1 APPLICABLE SPECIFICATIONS**

Reference Specification Title	MIL-STD-125-1 Standard Guides for Preparation of Item Descriptions
Reference Specification Title	MIL-STD-461G Requirements for The Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
Reference Specification Title	MIL-STD-464C Electromagnetic Environmental Effects Requirements For Systems
Calibration Information	ANSI/NCSL Z540-3-2006 Calibration Laboratories and Measuring Test Equipment - General Requirements

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SECTION 3 – TEST EQUIPMENT, TEST DATA, & TEST PHOTOGRAPHS**3.1 PULSED CURRENT INJECTION TEST**

- a) The Pulsed Current Injection test requirements for the See Units Tested Table are specified in MIL-STD-125-1.
- b) The Pulsed Current Injection test equipment used to test the See Units Tested Table is located in Paragraph 3.1.1 of this document.
- c) All recorded test data for the Pulsed Current Injection test on the See Units Tested Table is located in Paragraph 3.1.2 of this document.
- d) The Pulsed Current Injection test photographs for the See Units Tested Table are located in Paragraph 3.1.3 of this document.

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3.1.1 PULSED CURRENT INJECTION TEST EQUIPMENT LOG

Equipment Log	
Customer:	EMP Shield, LLC
Date:	3/13/19 – 3/29/19
Test Engineer:	M. Gennaro
Test:	Pulsed Current Injection

Test Equipment					
Asset No.	Description	Manufacturer	Model	Serial No.	Cal. Due
ED003	Digital Oscilloscope	Tektronix	TDS754A	B010876	5/30/2019
EJ045	Current Monitor	Pearson	4418	153932	1/30/2020
EJ051	Current Monitor	Pearson Electronics	110	93081	5/15/2020
EF095	Short Pulse Generator	Keystone	None	None	UWCE
EF096	Intermediate Pulse Generator	Keystone	None	None	UWCE
EU000	WaveStar (Version 2.9)	Tektronix	None	None	UWCE
EJ043	Oscilloscope Probe	Tektronix	P63015A	B036406	3/15/2019

UWCE: Used With Calibrated Equipment

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3.1.2 PULSED CURRENT INJECTION TEST DATA

Pulsed Current Injection Data Sheet			
Customer:	EMP Shield, LLC		
Date:	3/13/19	Test Engineer:	M. Gennaro
Power:	None	Job Site:	Keystone Compliance
Test Specifications			
Test Spec.:	MIL-STD-125-1	Para./Sec.:	Appendix B

Intermediate Pulse Test Data Summary

Unit	Result	Notes
Coax 1	No Damage Or Degradation	None
Coax 2	No Damage Or Degradation	None
Unit 1	No Damage Or Degradation	None
Unit 2	No Damage Or Degradation	None
Unit 3	No Damage Or Degradation	None

Short Pulse Test Data Summary

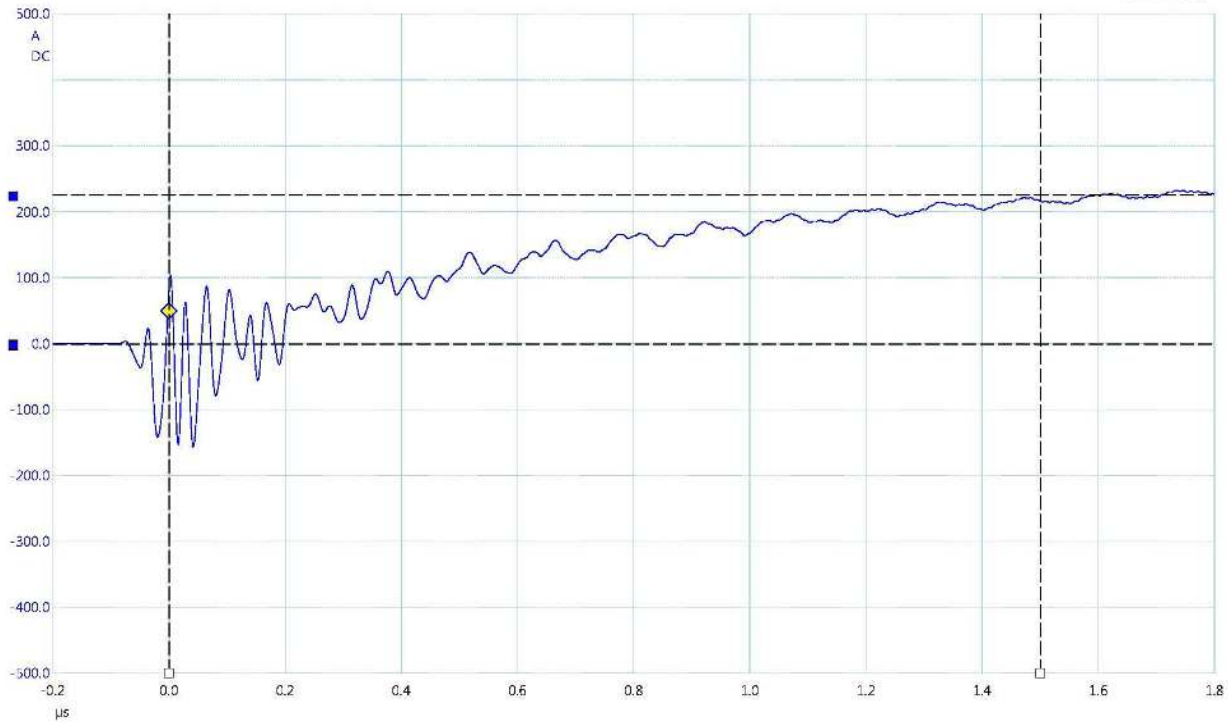
Unit	Reaction Time (ns)	Result	Notes
Coax 1	.32	No Damage Or Degradation	None
Coax 2	.24	No Damage Or Degradation	None
Unit 1	L1: 2.64; L2: 1.84	No Damage Or Degradation	None
Unit 2	L1 High: 2.08 L1 Return: .96 L2 High: 1.04 L2 Return: .48	No Damage Or Degradation	None
Unit 3	L1: 2.24; L2: 2.32	No Damage Or Degradation	None

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Intermediate Pulse Data

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Risetime Calibration Plot

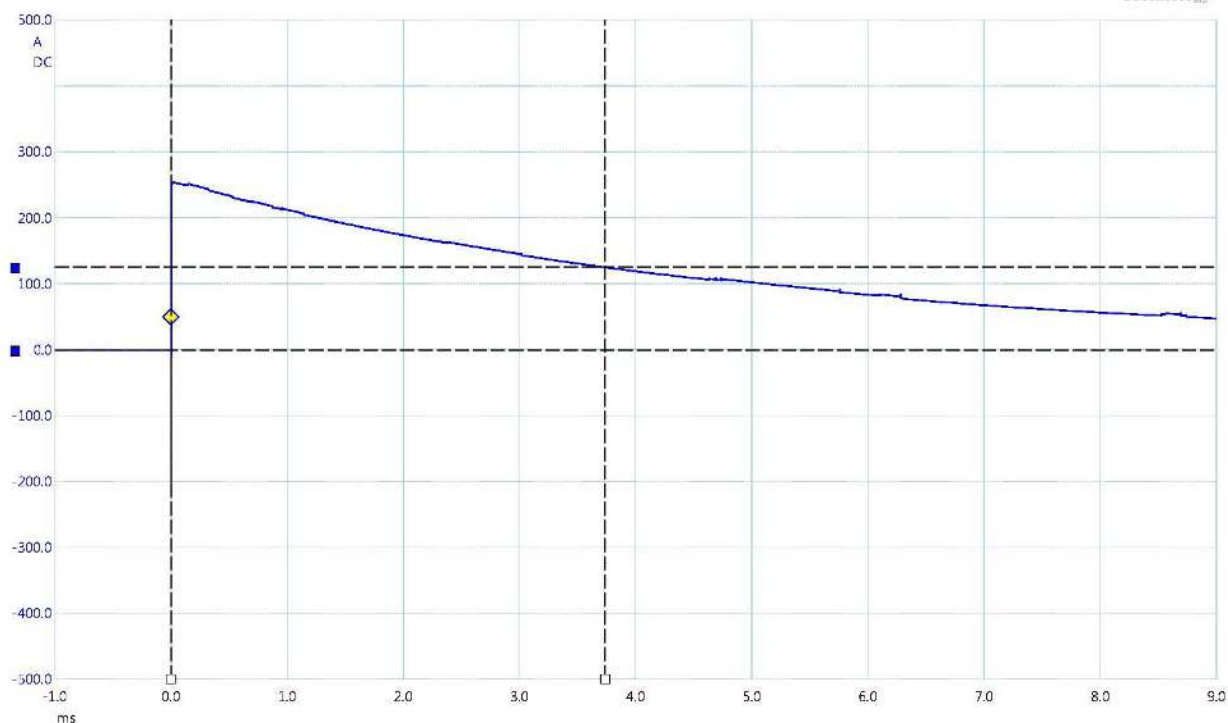


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	1	2	Δ	1/ Δ
Time Axis	0.0 s	1.5 μ s	1.5 μ s	666.7 kHz
Channel A	0.0 A	225.0 A	225.0 A	

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Falltime Calibration Plot



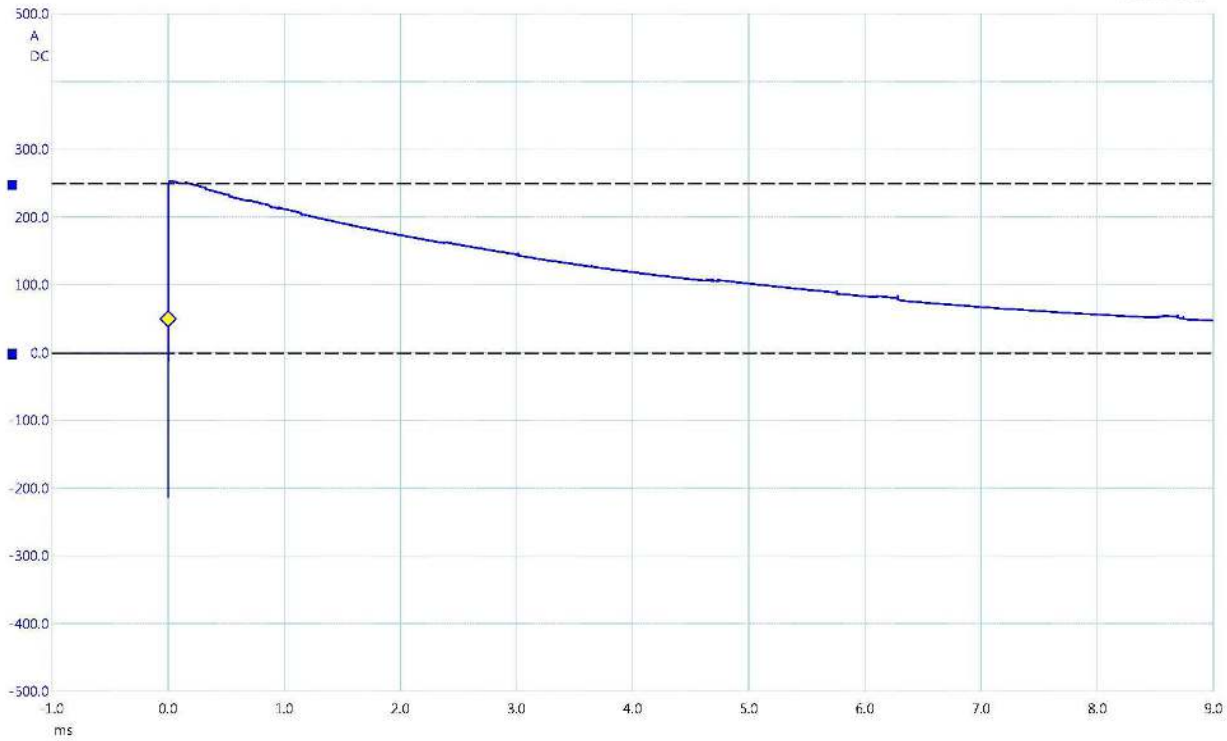
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	1	2	Δ	$1/\Delta$
Time Axis	0.0 s	3.735 ms	3.735 ms	267.8 Hz
Channel A	125.0 A	0.0 A	125.0 A	

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

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Amplitude Calibration Plot



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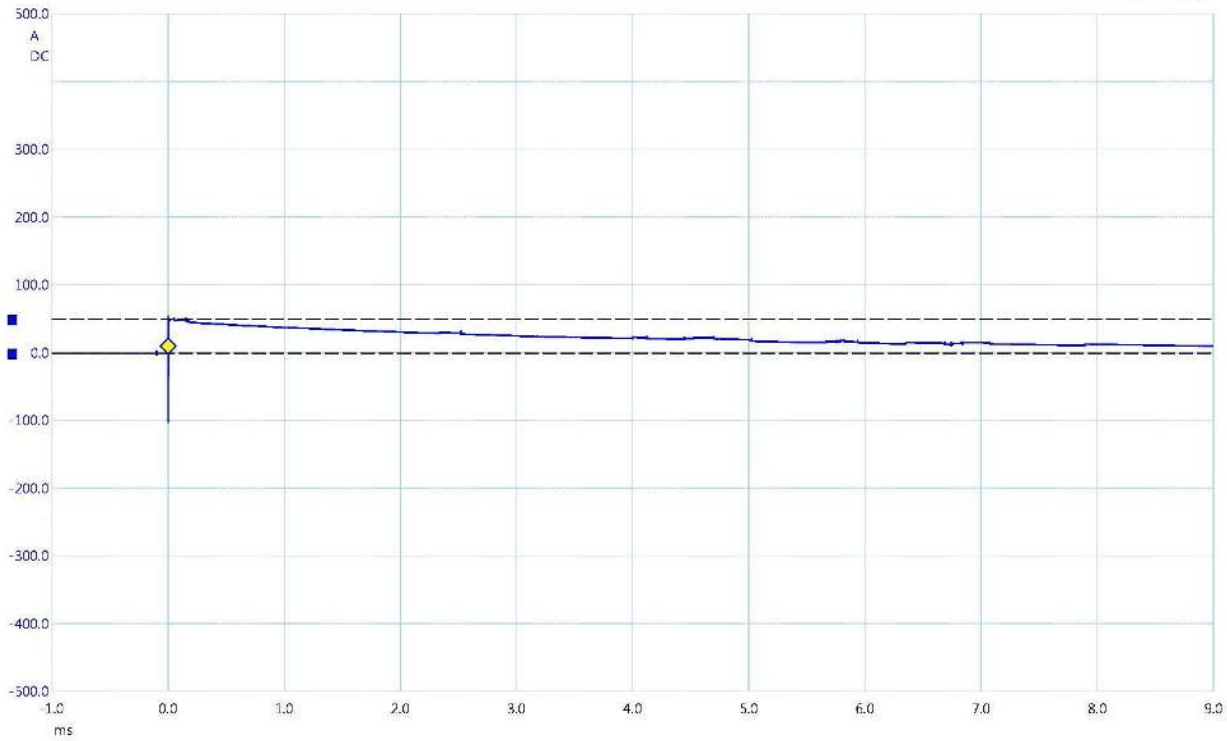
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Coax 1 Data Table

DC Breakdown Voltage				
Test Level (A)	Line Configuration	L-G Pre-Test (VDC)	Test Current (A)	L-G Post-Test (VDC)
50	L-G	243	49.91	244
100	L-G	244	106.4	244
150	L-G	244	162.9	243
200	L-G	243	215.6	243
250	L-G	243	264.6	243

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L-G 20% Plot



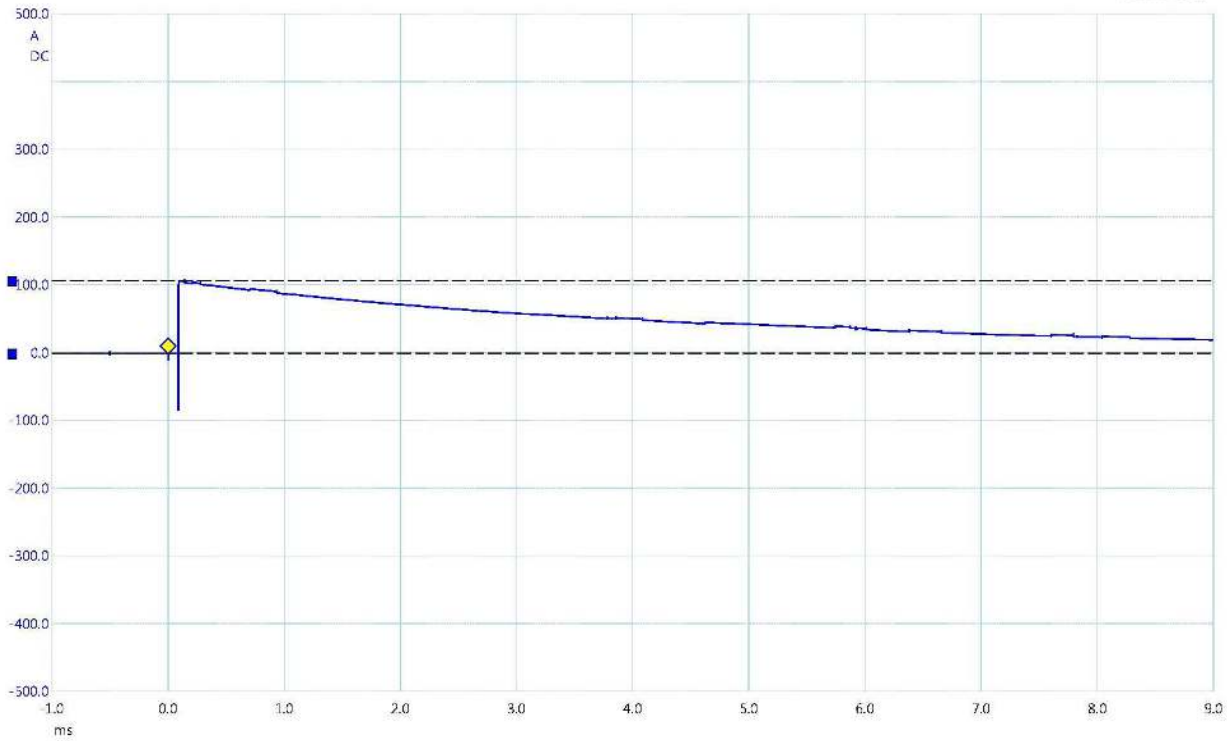
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Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

Channel A: 0.0 A / 59.91 A / 59.91 A

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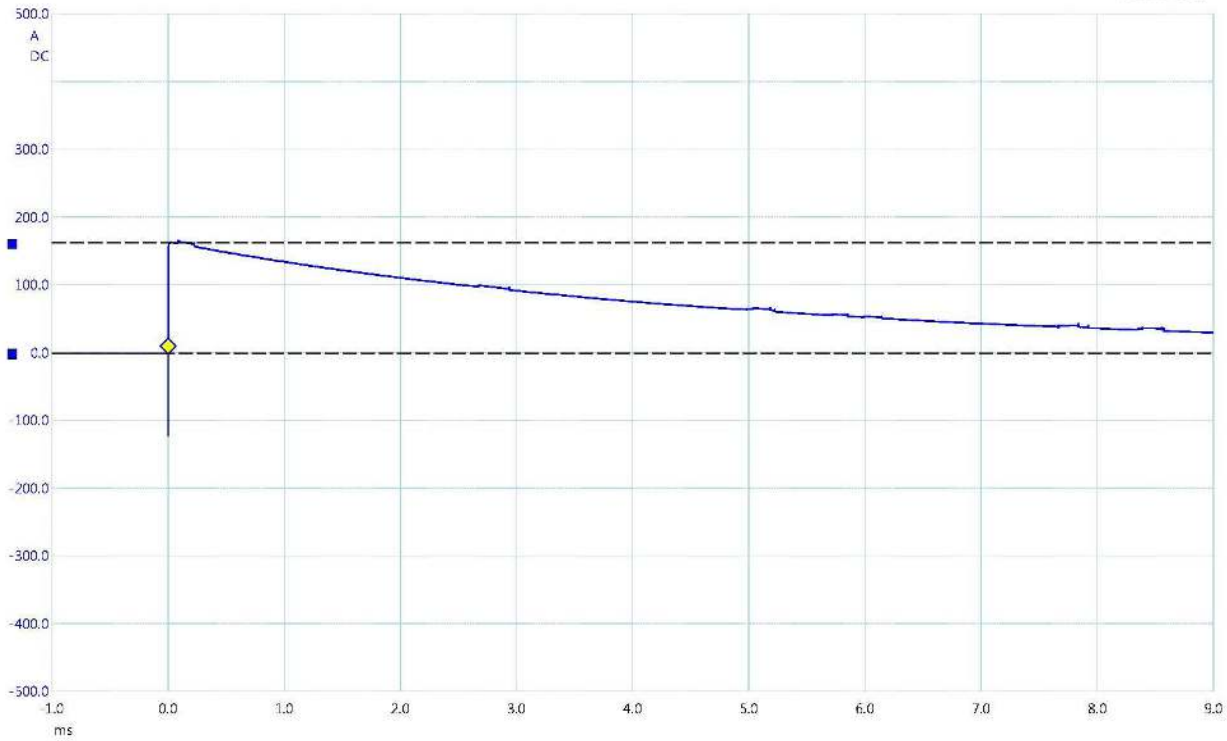
L-G 40% Plot



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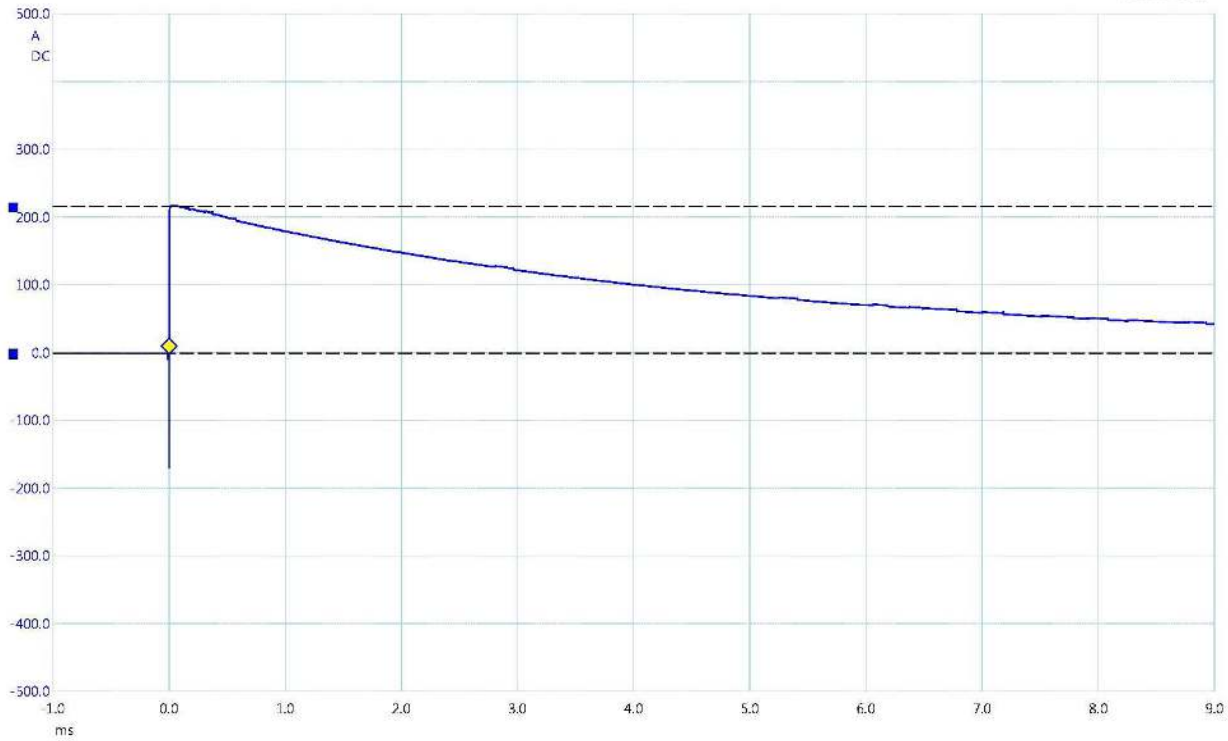
L-G 60% Plot



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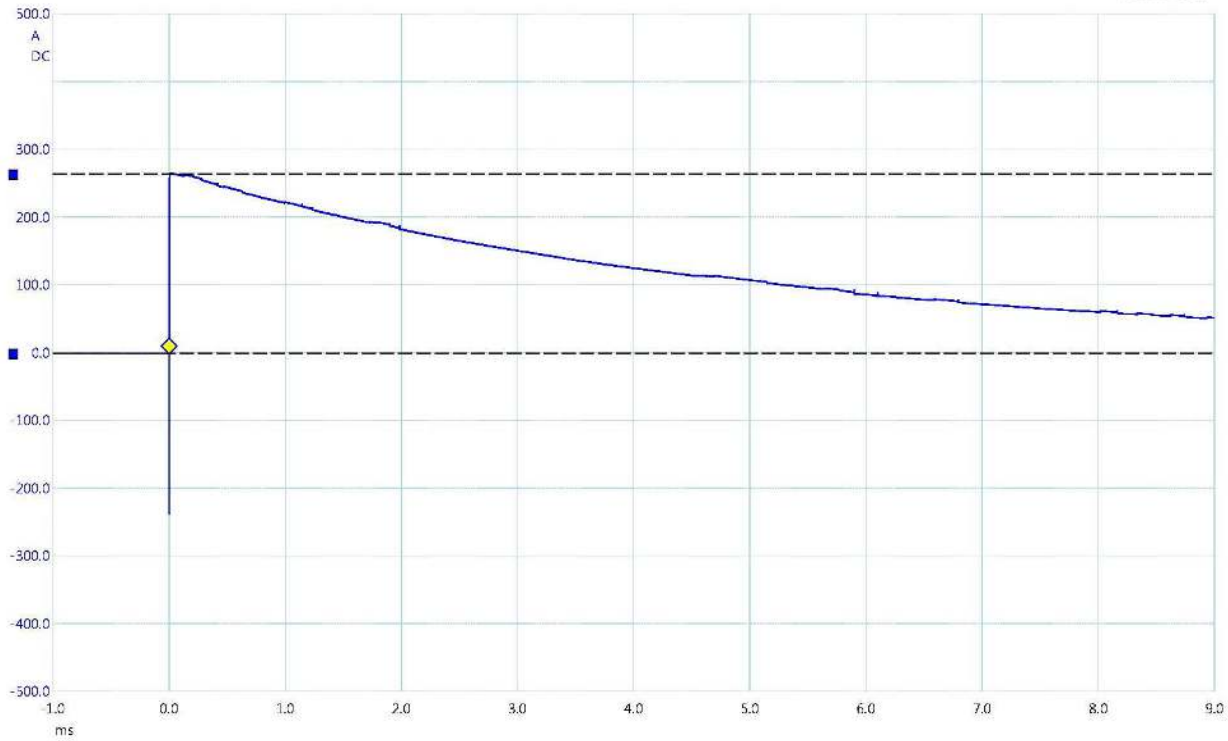
L-G 80% Plot



3/13/2019 3:09:03 PM

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L-G 100% Plot



3/13/2019 3:11:07 PM

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

	1	2	Δ
Channel A	0.0 A	264.6 A	264.6 A

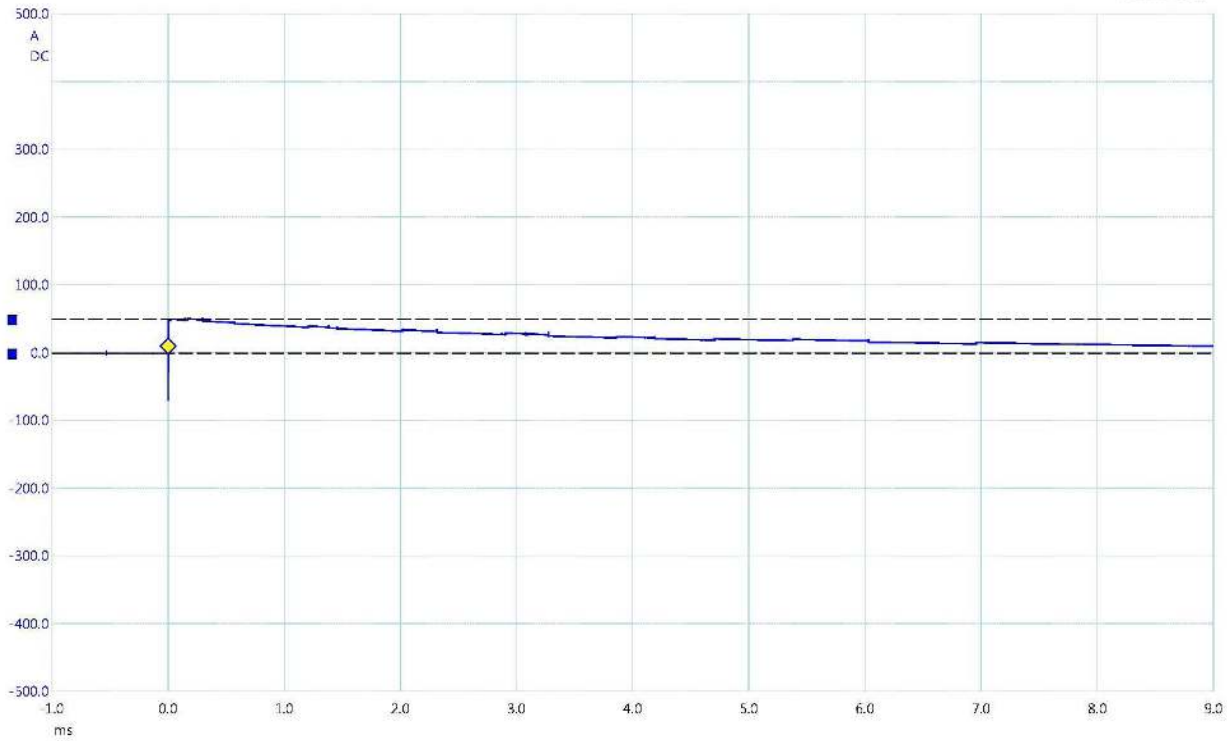
EMI TEST REPORT FOR EMP SHIELD, LLC

Coax 2 Data Table

DC Breakdown Voltage				
Test Level (A)	Line Configuration	L-G Pre-Test (VDC)	Test Current (A)	L-G Post-Test (VDC)
50	L-G	263	49.91	263
100	L-G	263	108.3	253
150	L-G	253	166.7	220
200	L-G	248	219.4	245
250	L-G	245	266.5	258

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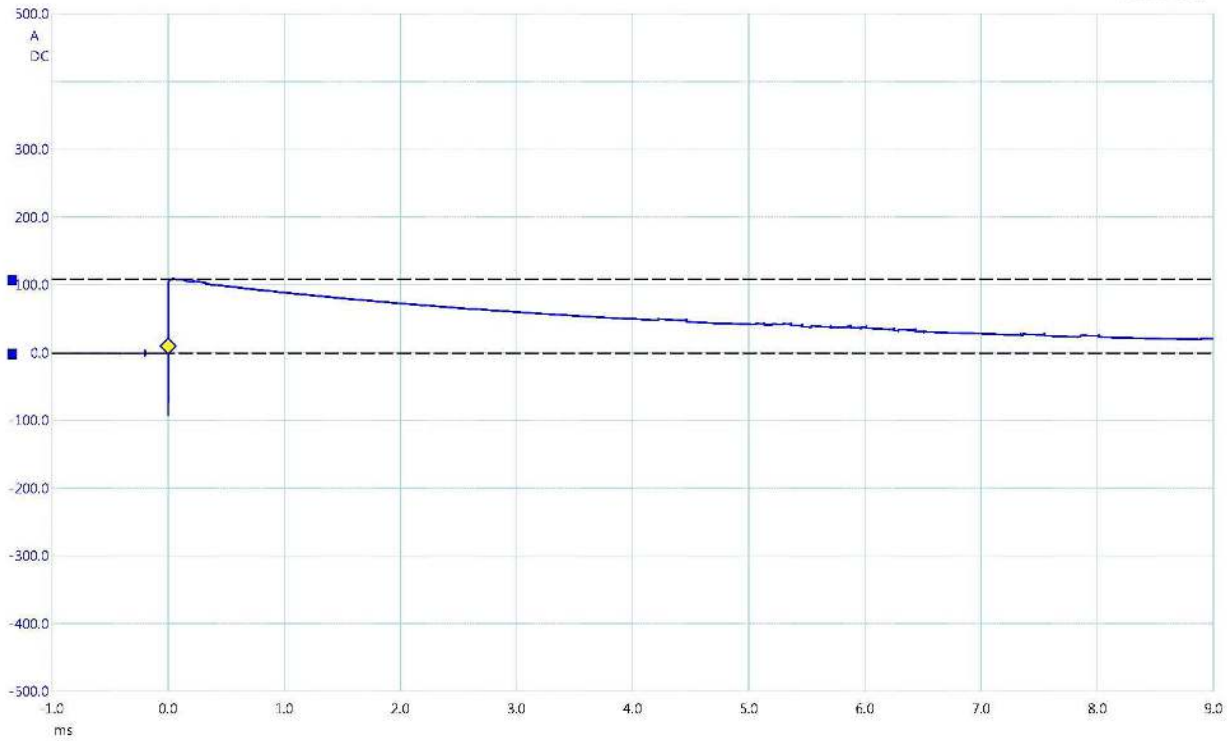
L-G 20% Plot



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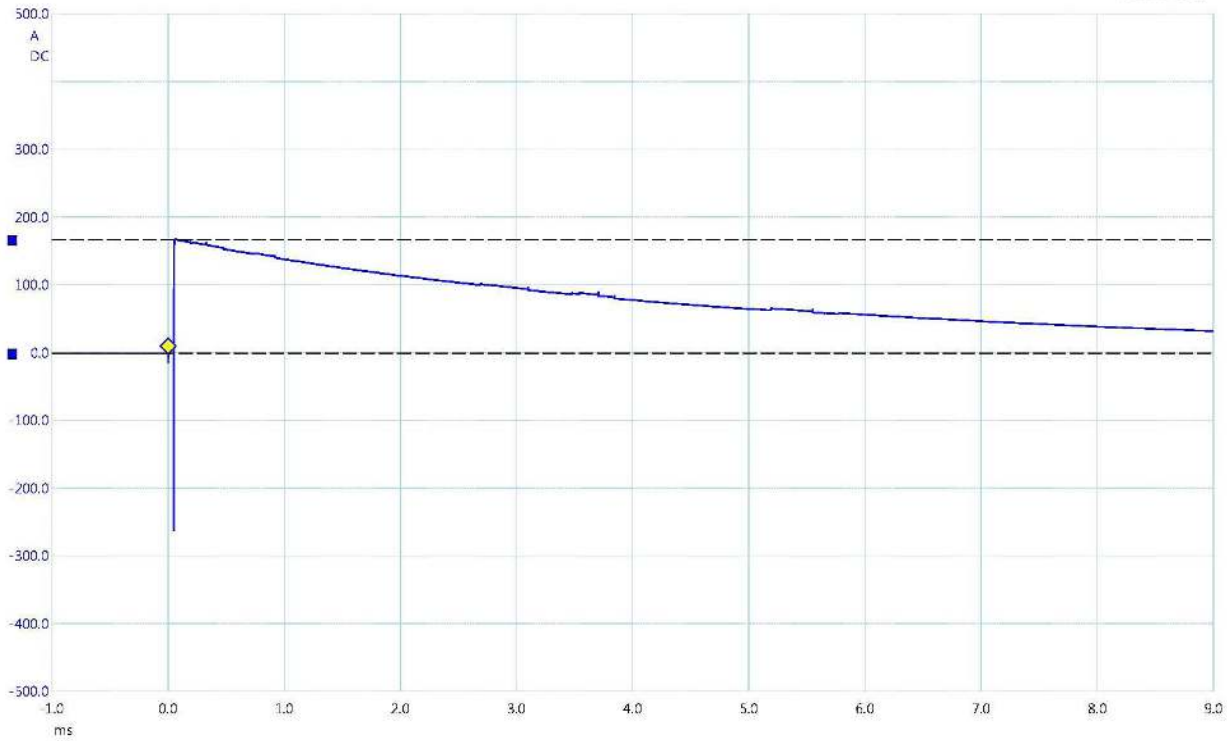
L-G 40% Plot



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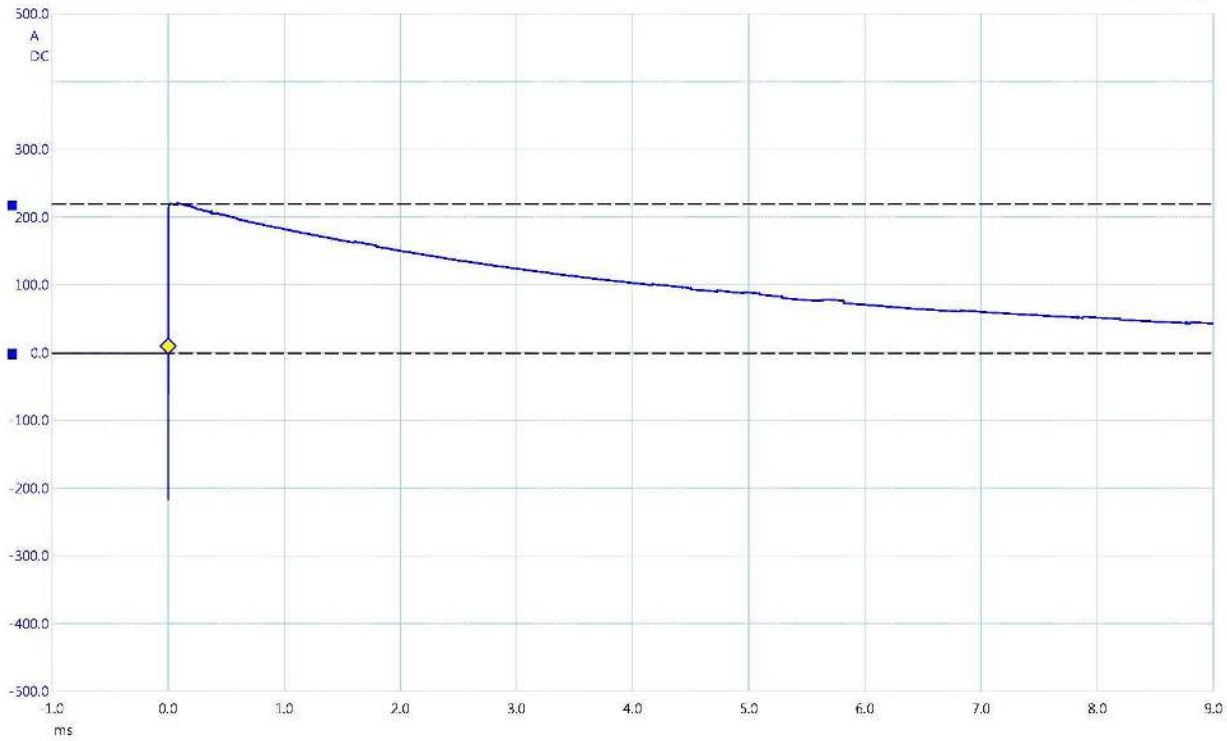
L-G 60% Plot



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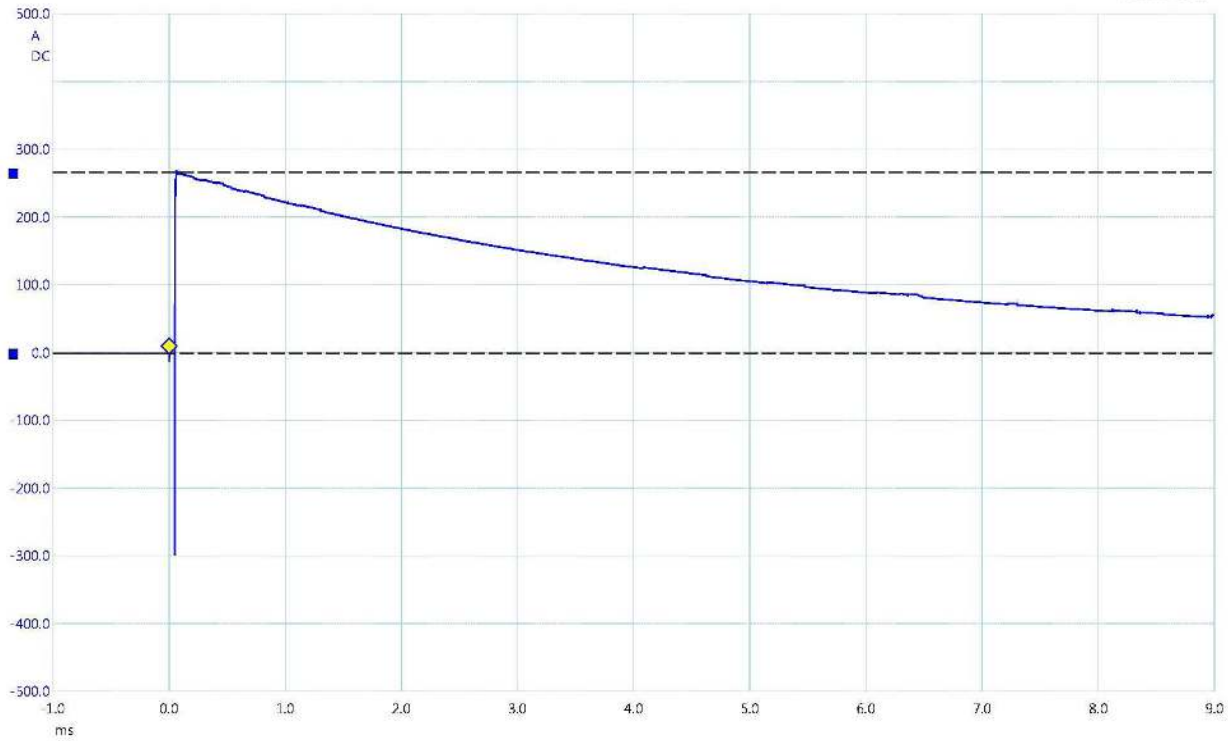
L-G 80% Plot



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EMI TEST REPORT FOR EMP SHIELD, LLC

L-G 100% Plot



3/13/2019 2:57:33 PM

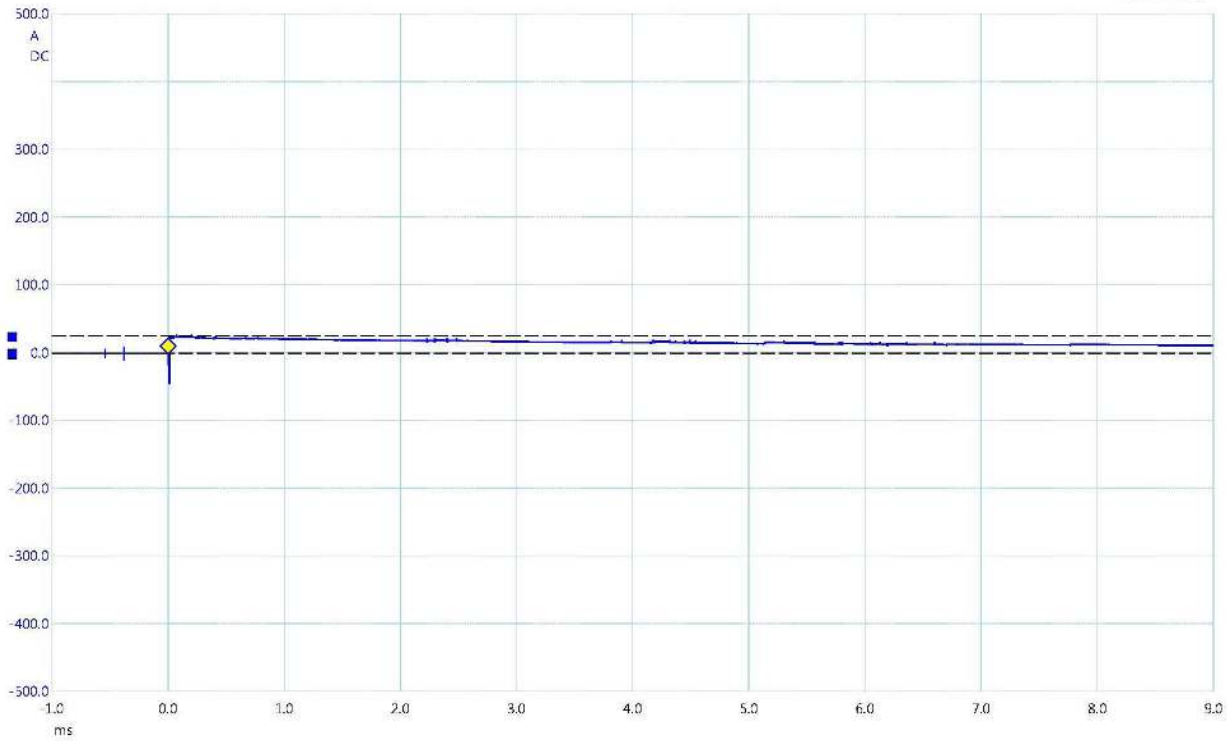
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Unit 1 Data Table

DC Breakdown Voltage								
Test Level (A)	Line Configuration	L1-L2 Pre- Test (VDC)	L1-G Pre- Test (VDC)	L2-G Pre- Test (VDC)	Test Current (A)	L1-L2 Post- Test (VDC)	L1-G Post- Test (VDC)	L2-G Post- Test (VDC)
50	L1-N/G	359	339	342	25.42	362	339	342
50	L2-N/G	359	339	342	23.54	362	339	342
100	L1-N/G	362	339	342	68.2	362	342	345
100	L2-N/G	362	339	342	70.08	362	342	345
150	L1-N/G	362	342	345	122.8	359	345	345
150	L2-N/G	362	342	345	124.7	359	345	345
200	L1-N/G	359	345	345	179.3	362	345	345
200	L2-N/G	359	345	345	169.3	362	345	345
250	L1-N/G	362	345	345	228.3	362	351	351
250	L2-N/G	362	345	345	228.3	362	351	351

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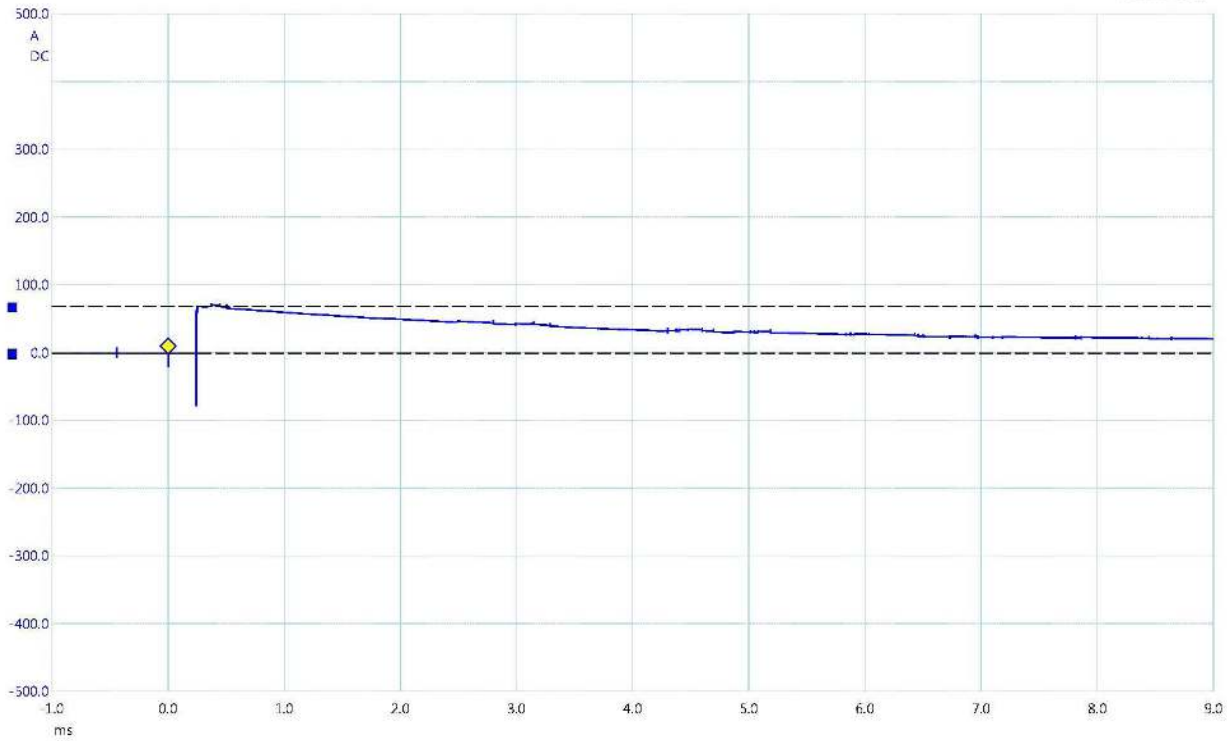
L1-G 20% Plot



3/4/2019 11:30:52 AM

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L1-G 40% Plot

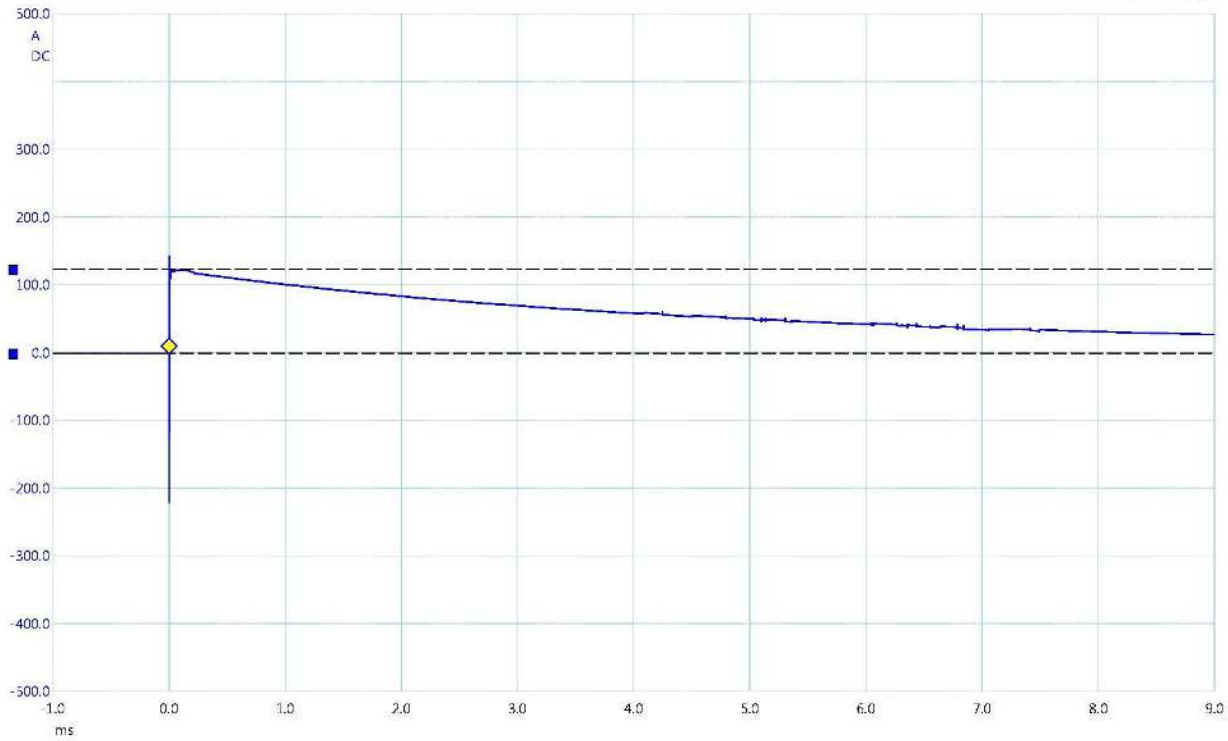


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1 2 Δ
Channel A 0.0 A 68.2 A 68.2 A

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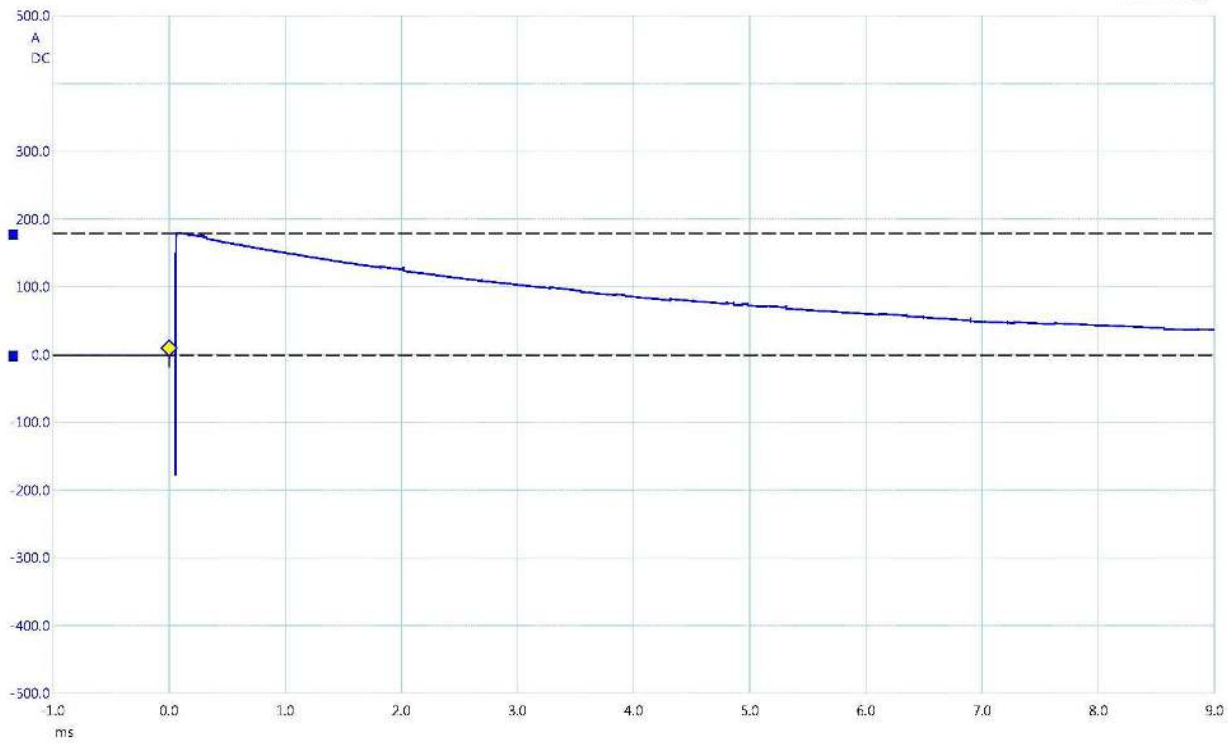
L1-G 60% Plot



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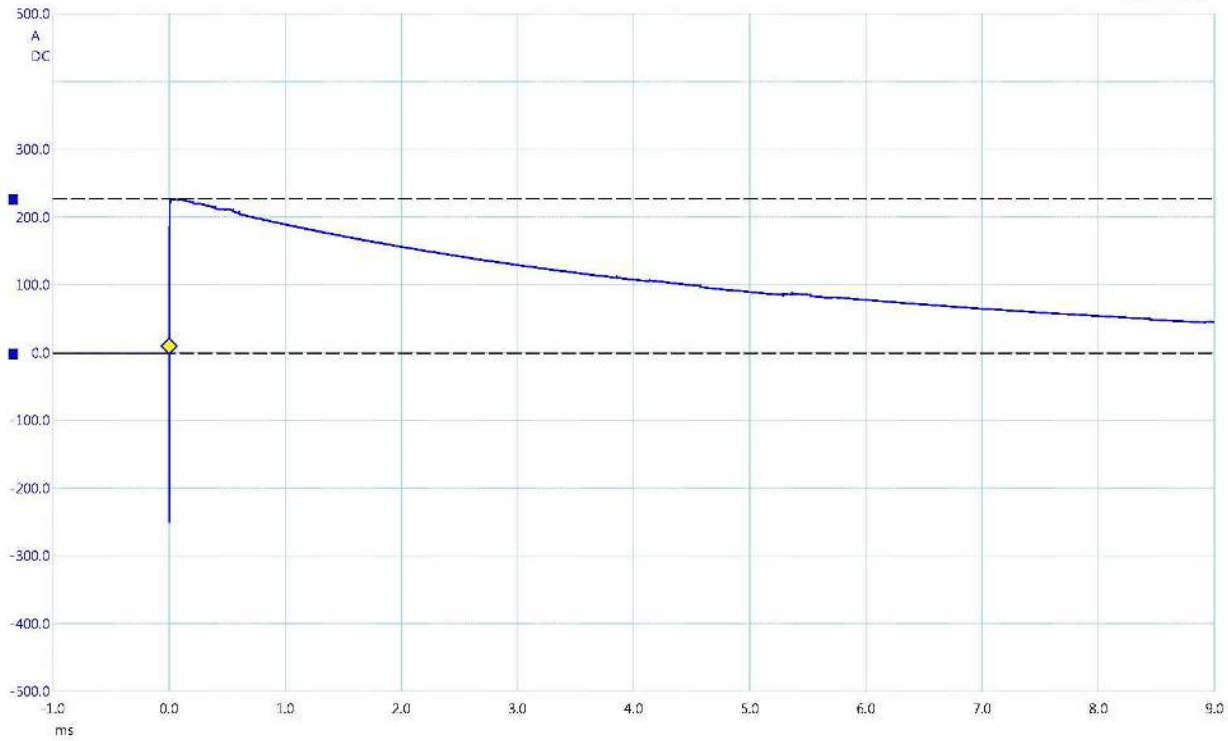
L1-G 80% Plot



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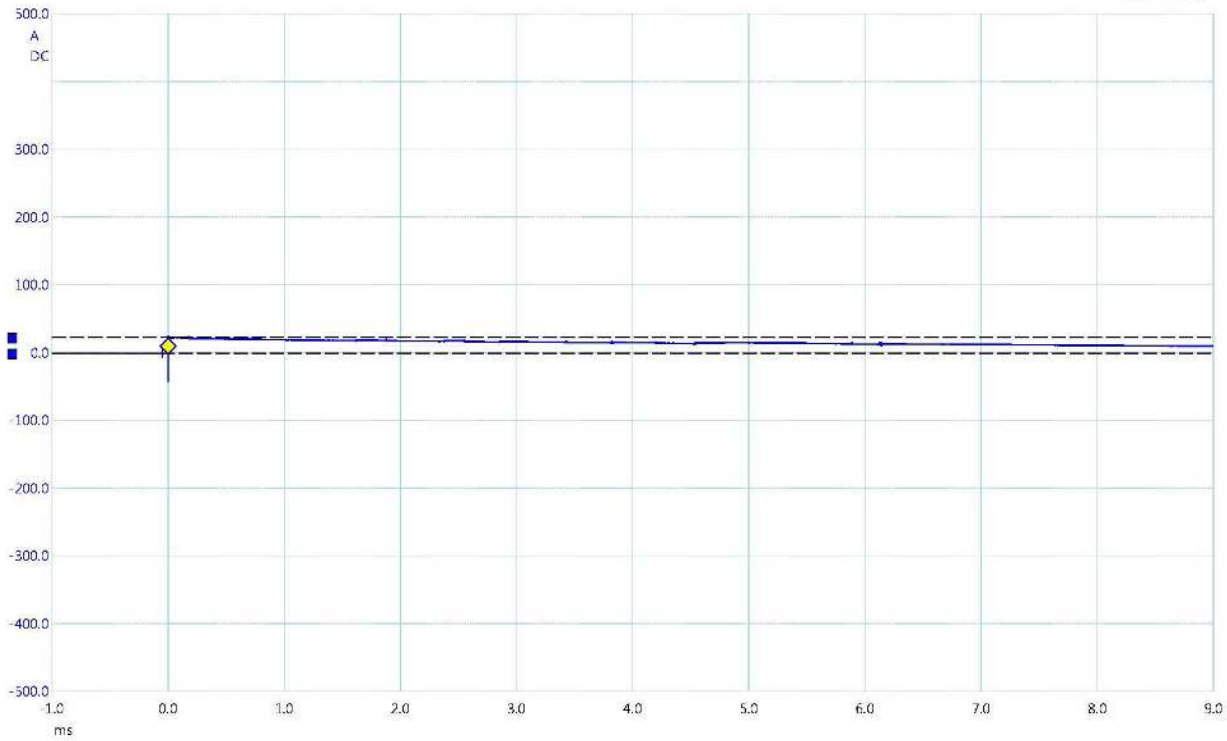
L1-G 100% Plot



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EMI TEST REPORT FOR EMP SHIELD, LLC

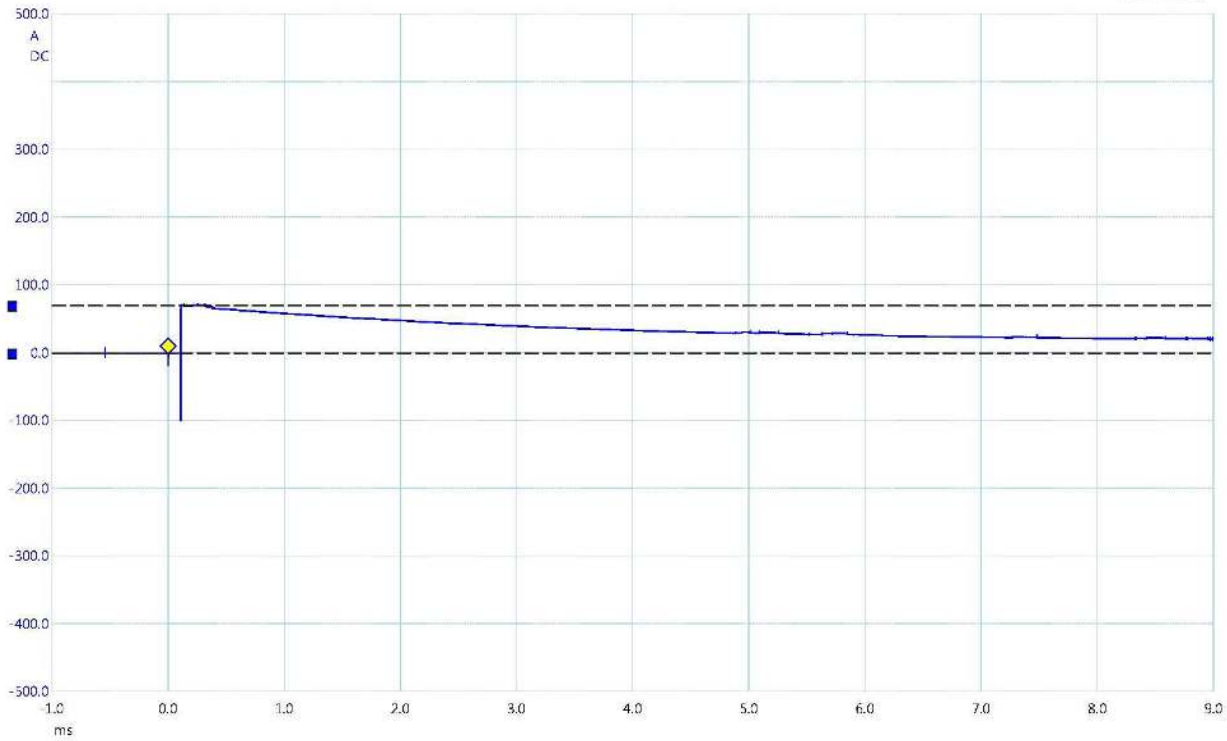
L2-G 20% Plot



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EMI TEST REPORT FOR EMP SHIELD, LLC

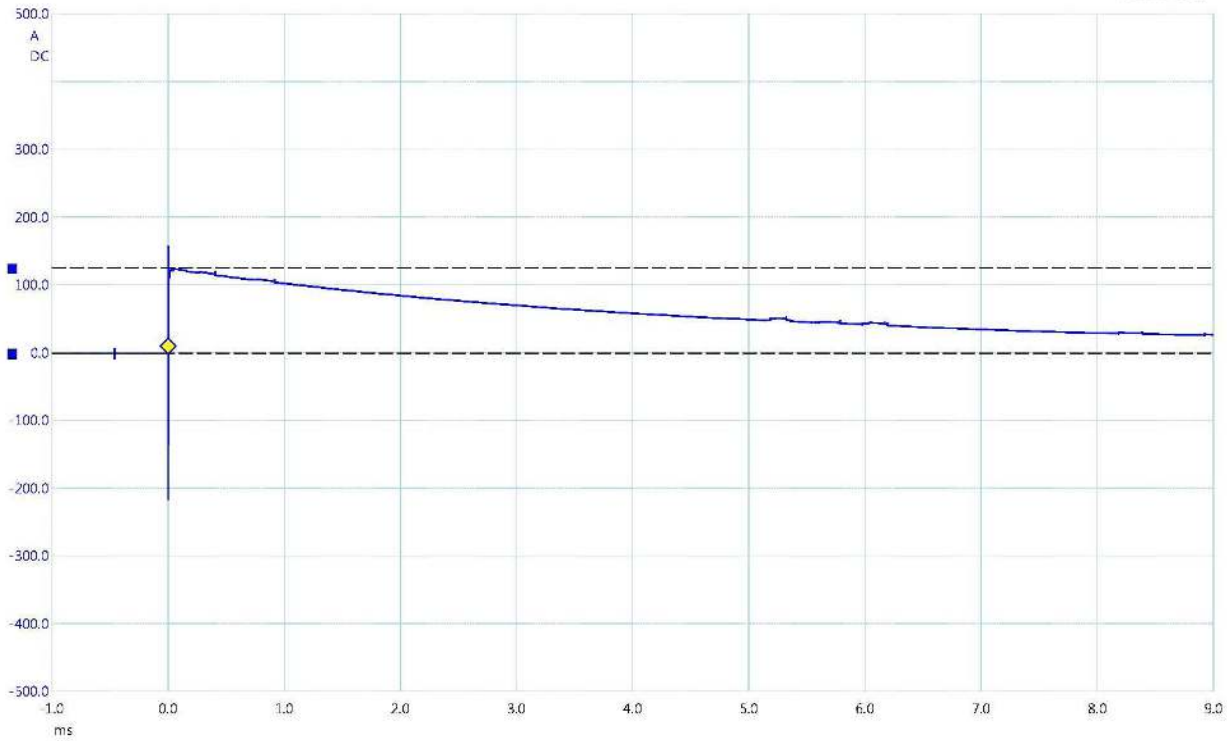
L2-G 40% Plot



3/4/2019 11:38:45 AM

EMI TEST REPORT FOR EMP SHIELD, LLC

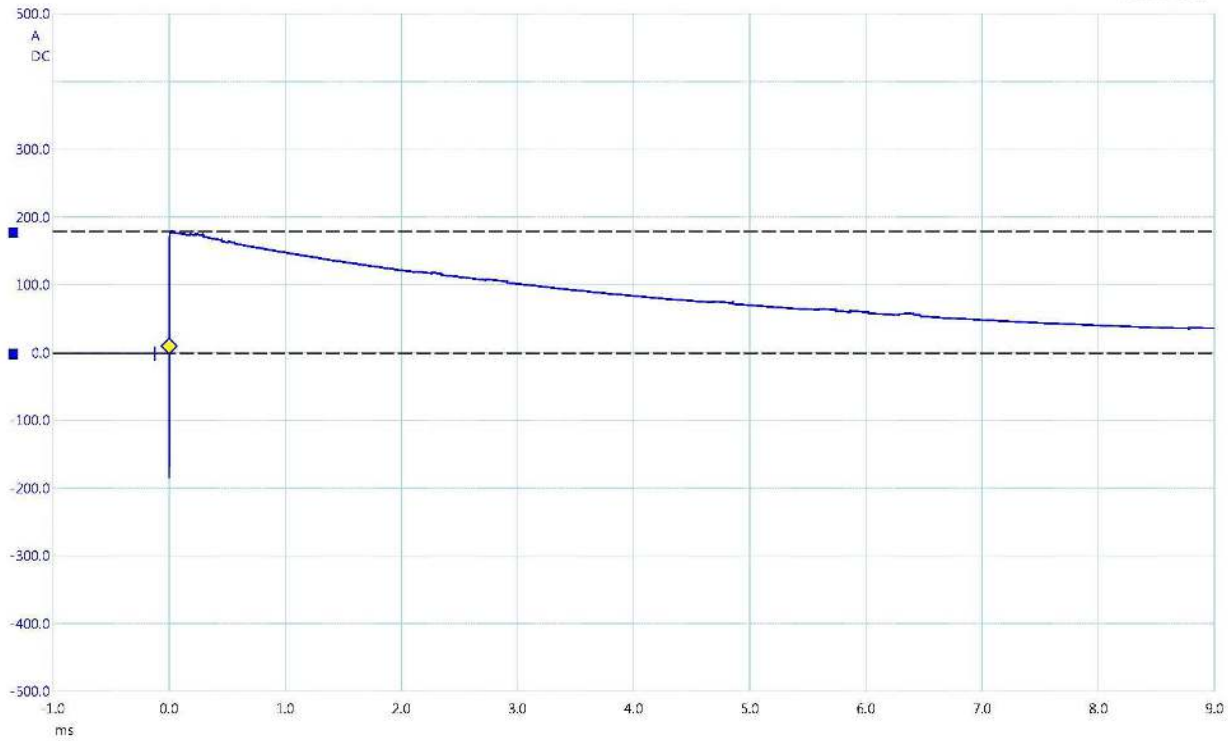
L2-G 60% Plot



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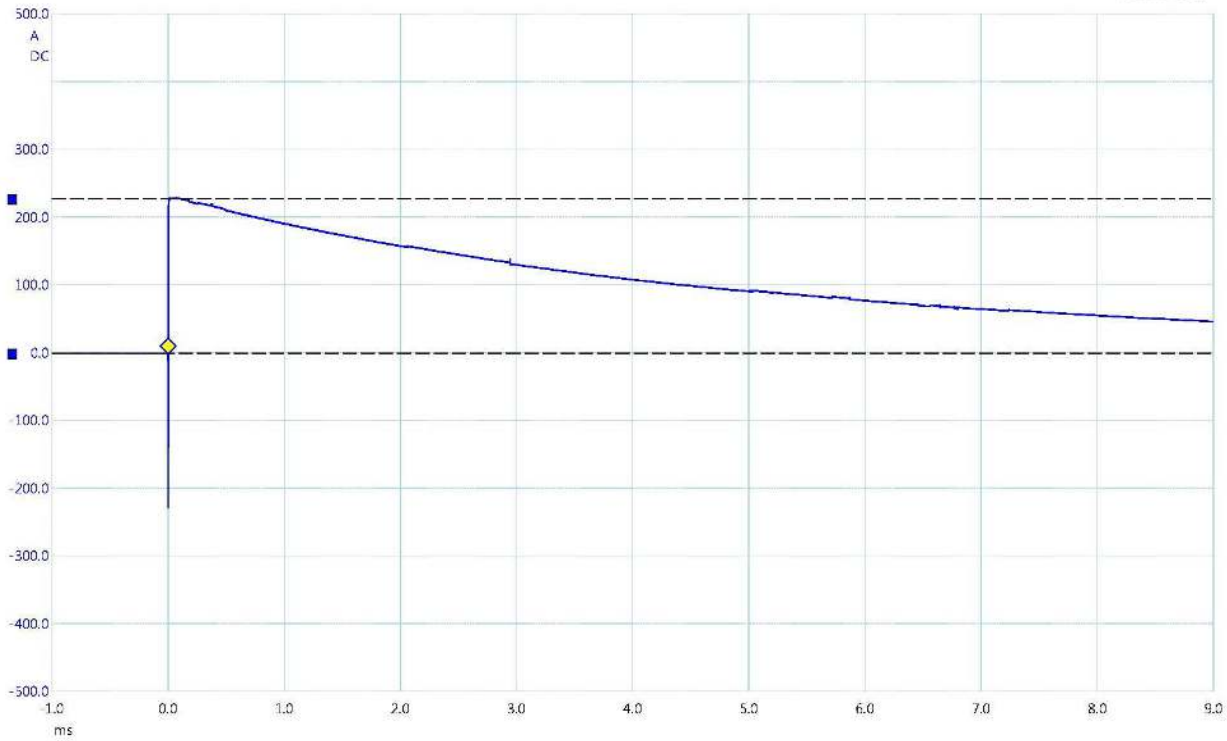
L2-G 80% Plot



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L2-G 100% Plot



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Unit 2 Data Table – DC Input 1

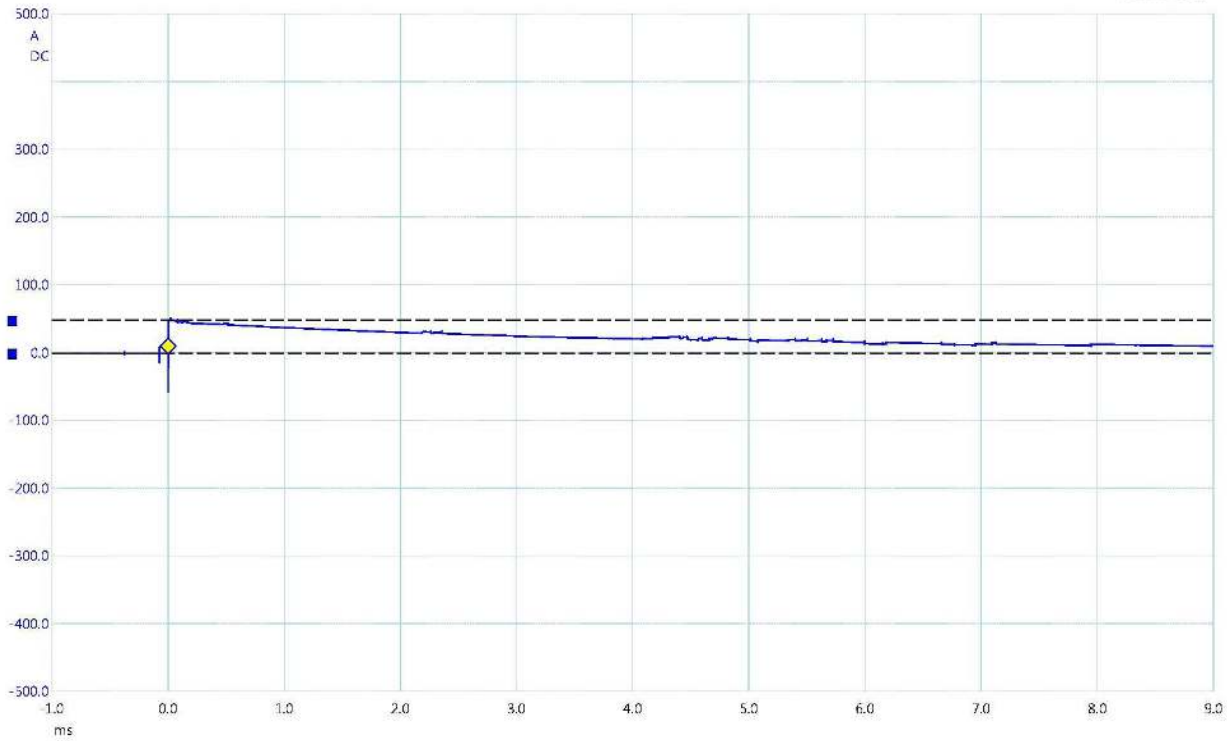
DC Breakdown Voltage								
Test Level (A)	Line Configuration	High-Return Pre-Test (VDC)	High-G Pre-Test (VDC)	Return-G Pre-Test (VDC)	Test Current (A)	High-Return Post-Test (VDC)	High-G Post-Test (VDC)	Return-G Post-Test (VDC)
50	High-G	59	39	40	48.02	59	39	42
50	Return-G	59	39	40	51.79	59	39	42
100	High-G	59	39	42	112.1	57	39	41
100	Return-G	59	39	42	108.3	57	39	41
150	High-G	57	39	41	164.8	57	41	41
150	Return-G	57	39	41	162.9	57	41	41
200	High-G	57	41	41	215.6	57	39	41
200	Return-G	57	41	41	215.6	57	39	41
250	High-G	57	39	41	262.7	57	39	40
250	Return-G	57	39	41	262.7	57	39	40

Unit 2 Data Table – DC Input 2

DC Breakdown Voltage								
Test Level (A)	Line Configuration	High-Return Pre-Test (VDC)	High-G Pre-Test (VDC)	Return-G Pre-Test (VDC)	Test Current (A)	High-Return Post-Test (VDC)	High-G Post-Test (VDC)	Return-G Post-Test (VDC)
50	High-G	57	40	39	51.79	58	40	41
50	Return-G	57	40	39	51.79	58	40	41
100	High-G	58	40	41	110.2	56	39	40
100	Return-G	58	40	41	104.5	56	39	40
150	High-G	56	39	40	162.9	56	39	41
150	Return-G	56	39	40	161	56	39	41
200	High-G	56	39	41	211.9	56	40	41
200	Return-G	56	39	41	217.5	56	40	41
250	High-G	56	40	41	264.8	56	41	40
250	Return-G	56	40	41	262.7	56	41	40

EMI TEST REPORT FOR EMP SHIELD, LLC

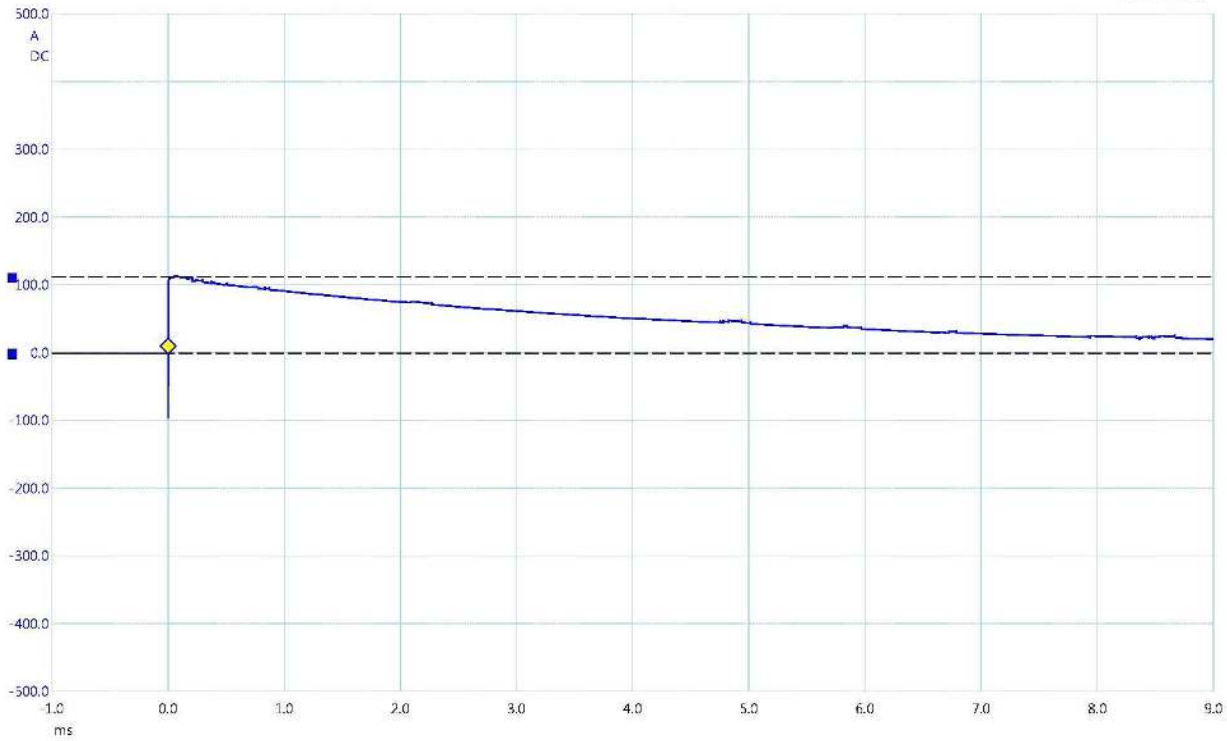
L1 High-G 20% Plot



3/13/2019 3:22:37 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

L1 High-G 40% Plot



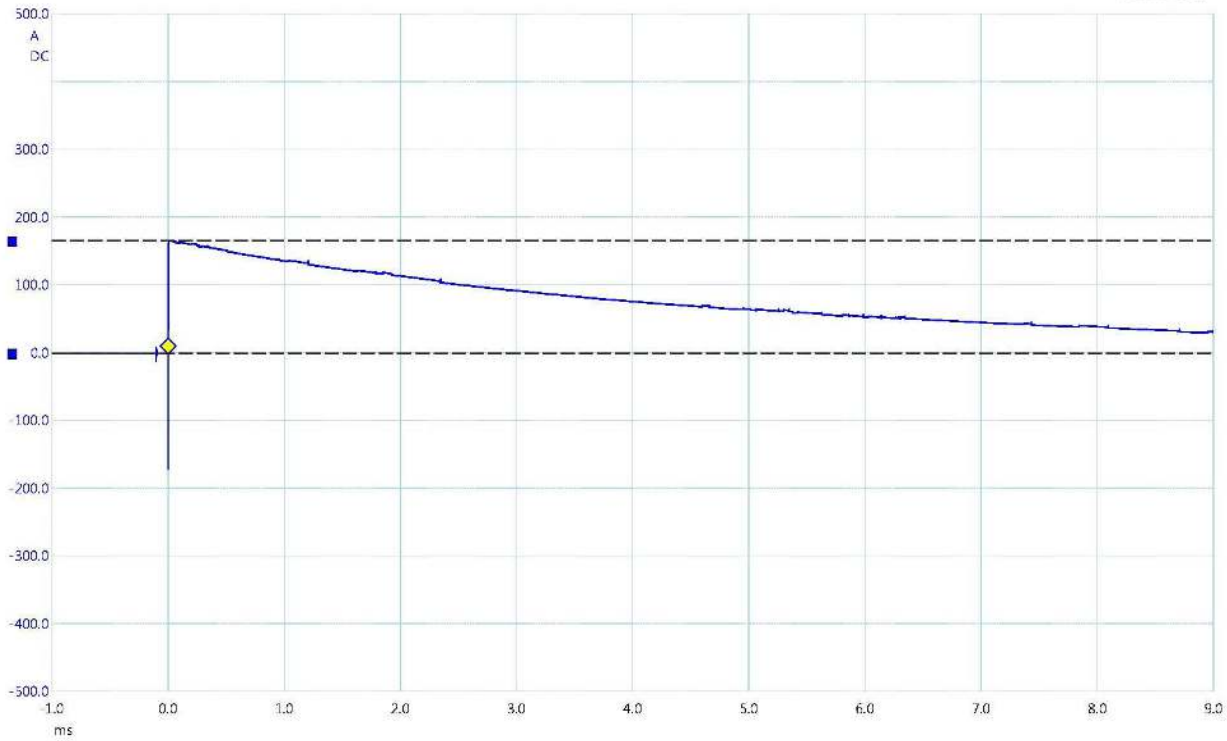
3/13/2019 3:28:01 PM

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

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Channel A	0.0 A	112.1 A	112.1 A

EMI TEST REPORT FOR EMP SHIELD, LLC

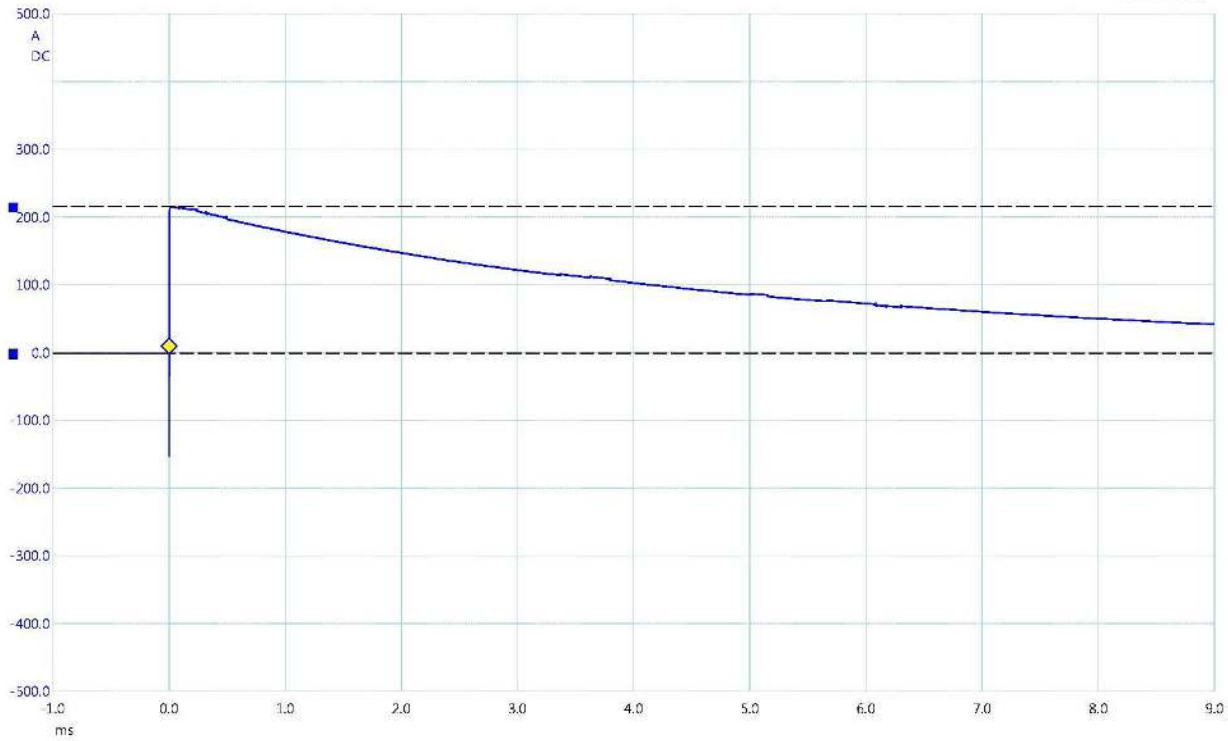
L1 High-G 60% Plot



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EMI TEST REPORT FOR EMP SHIELD, LLC

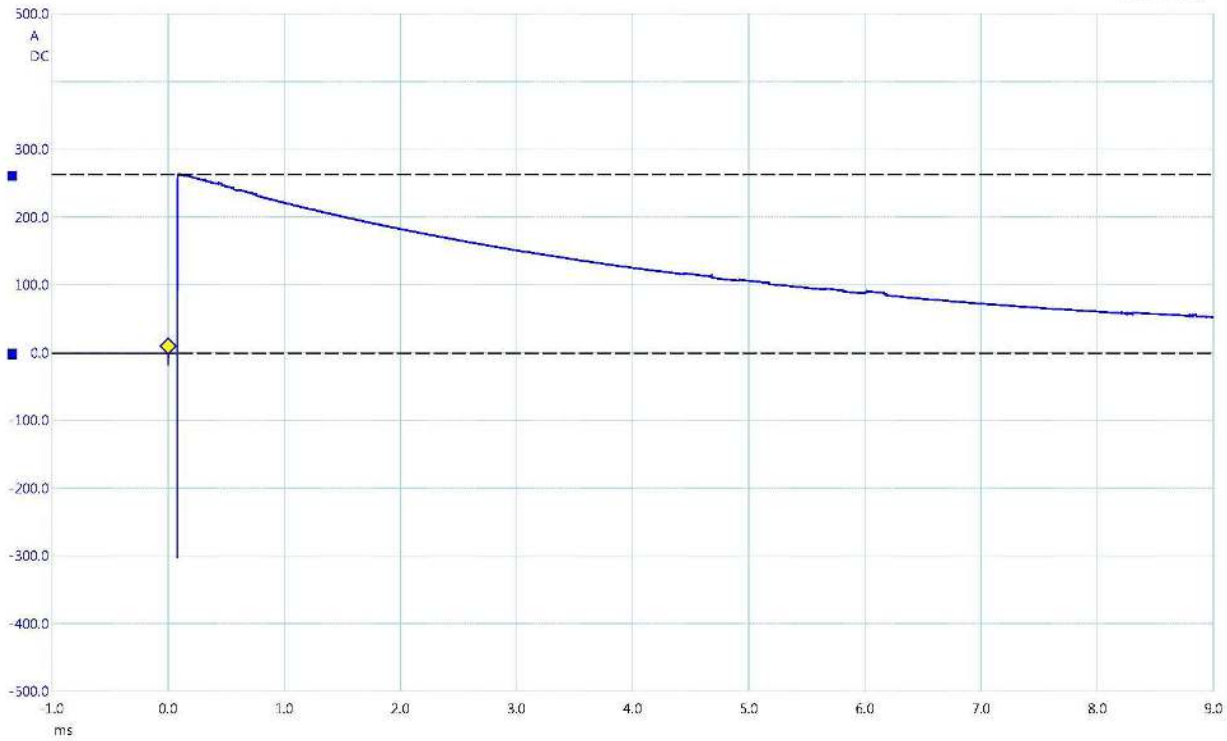
L1 High-G 80% Plot



3/13/2019 3:29:53 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

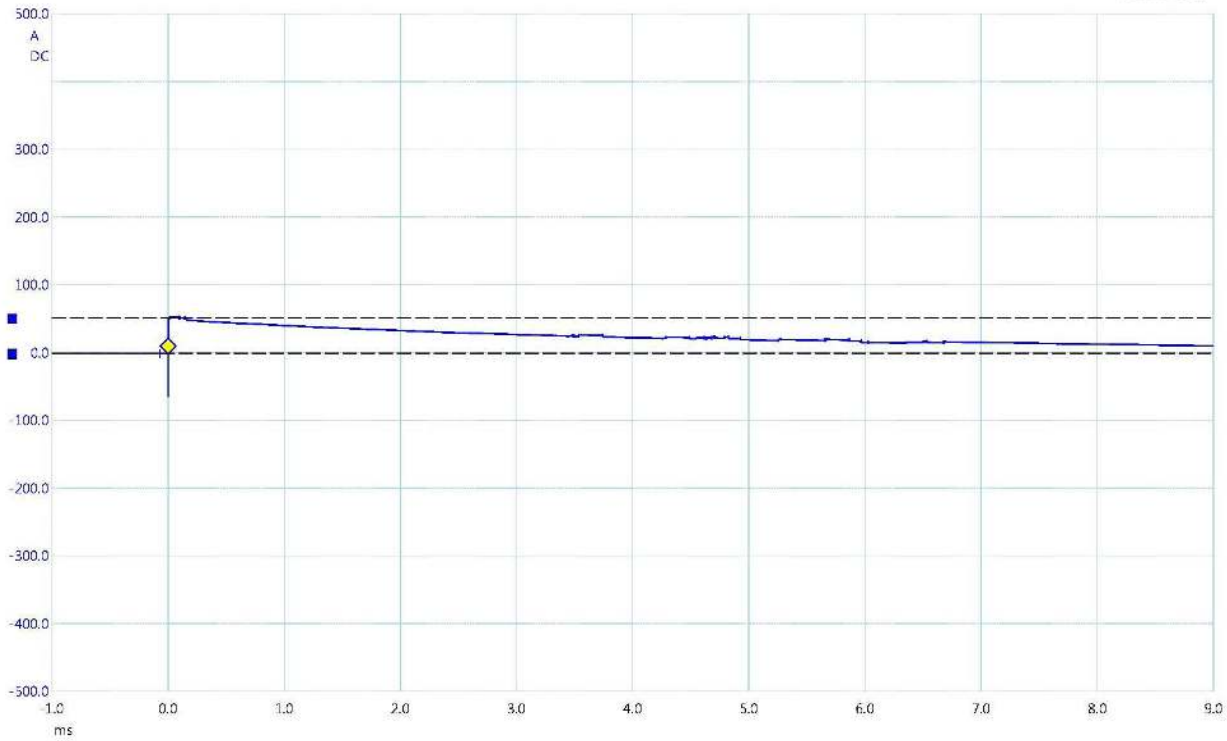
L1 High-G 100% Plot



3/13/2019 3:30:54 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

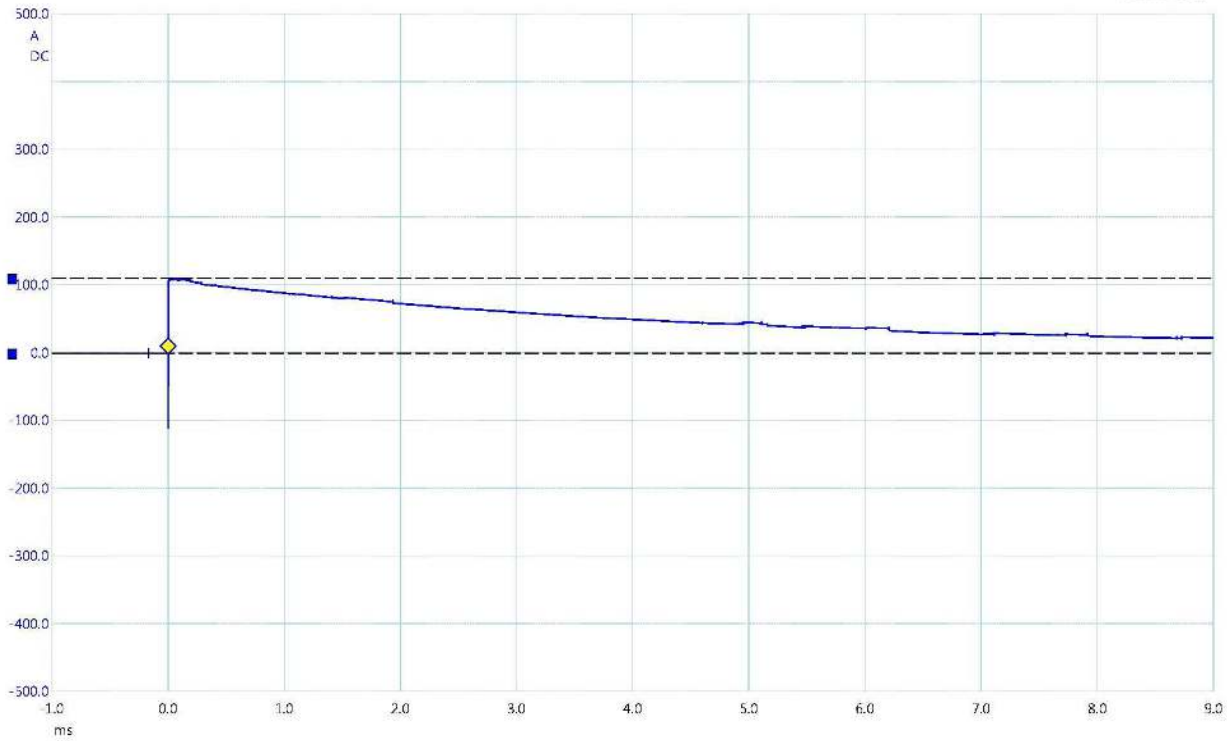
L2 High-G 20% Plot



3/13/2019 3:24:22 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

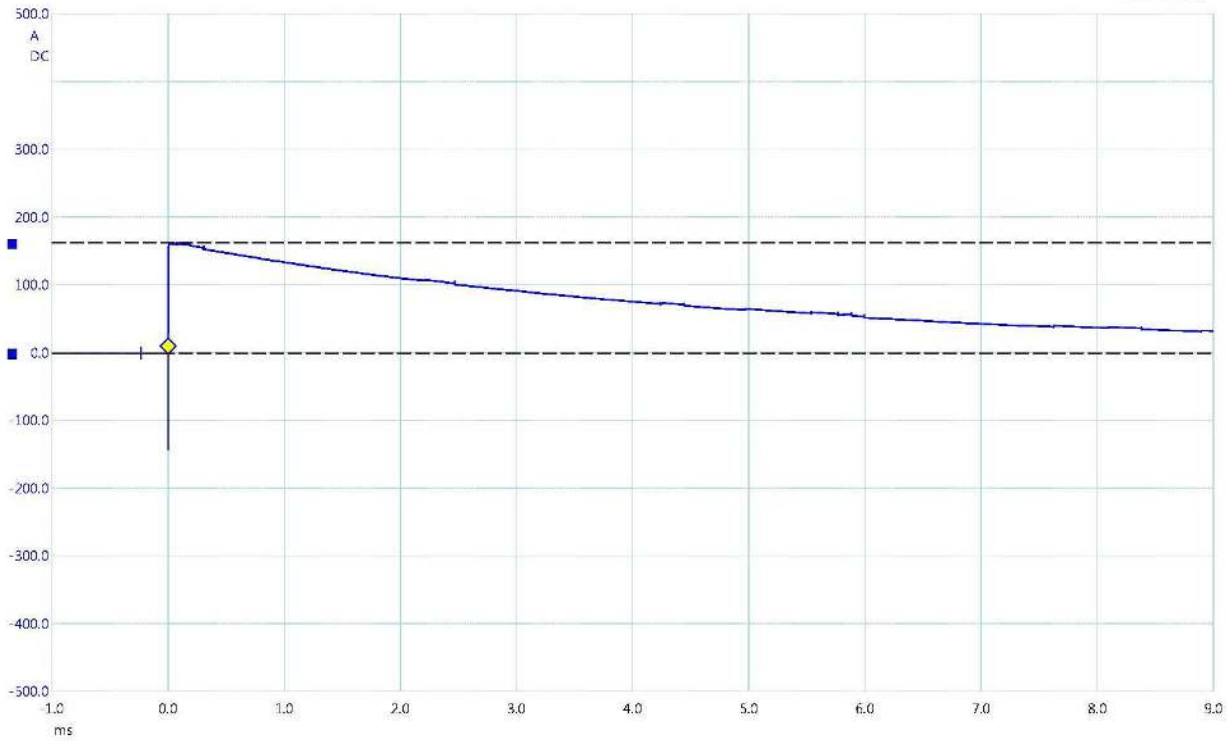
L2 High-G 40% Plot



3/13/2019 3:35:03 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

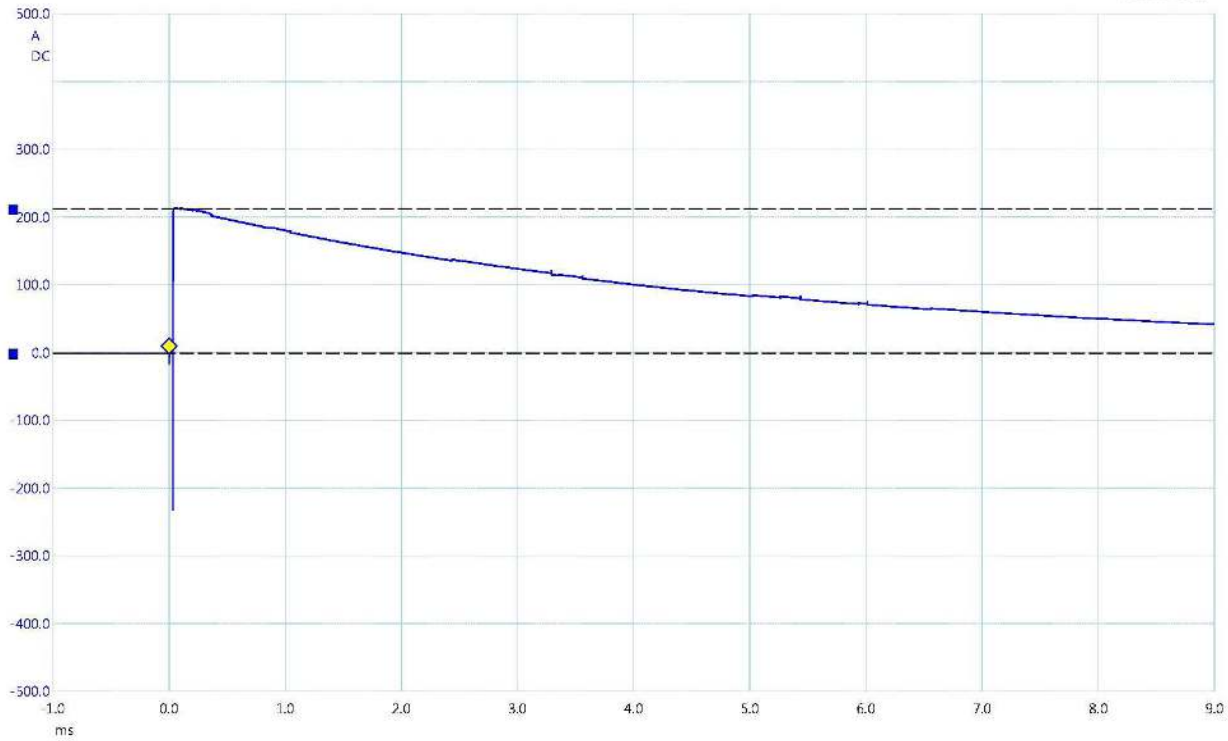
L2 High-G 60% Plot



3/13/2019 3:35:32 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

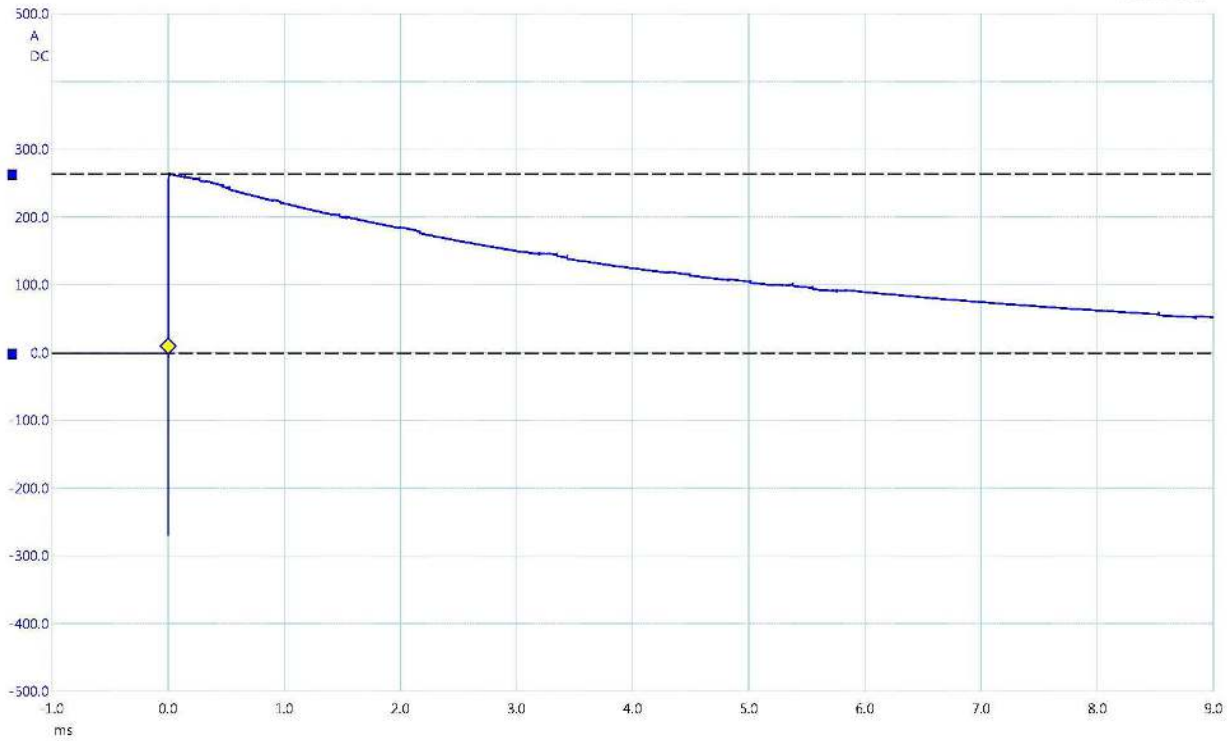
L2 High-G 80% Plot



3/13/2019 3:36:08 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

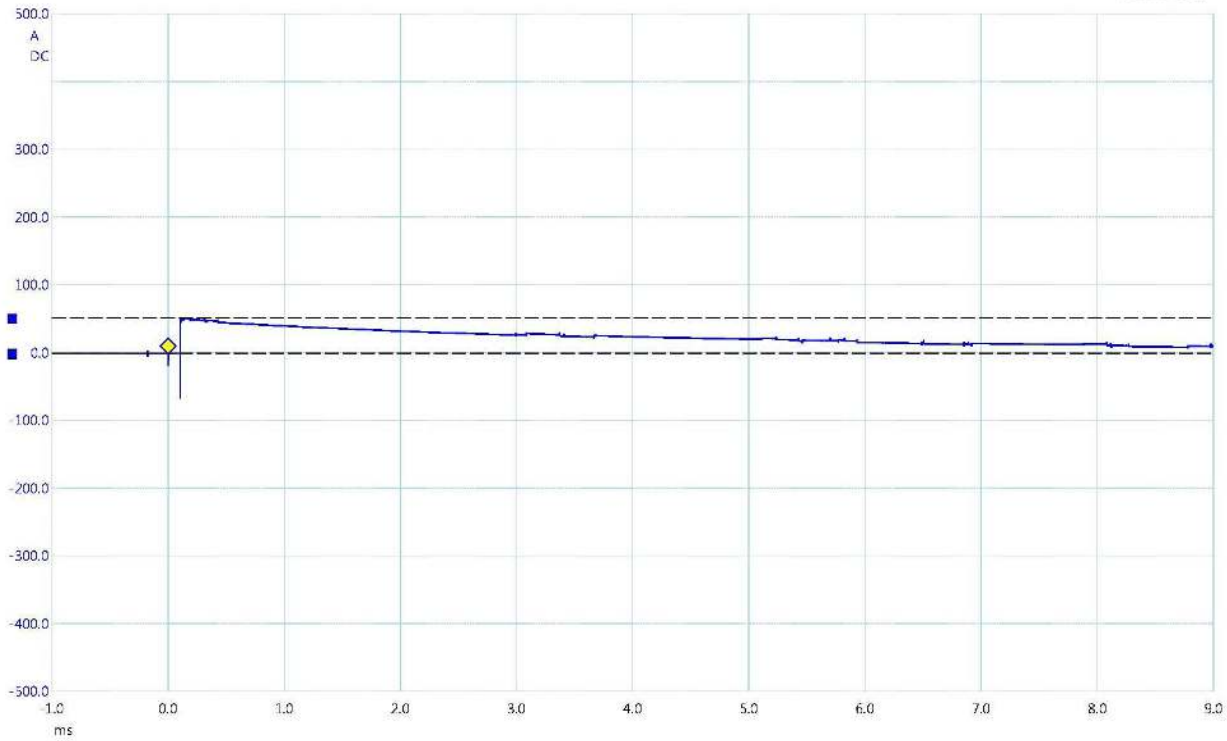
L2 High-G 100% Plot



3/13/2019 3:37:04 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

L1 Return-G 20% Plot



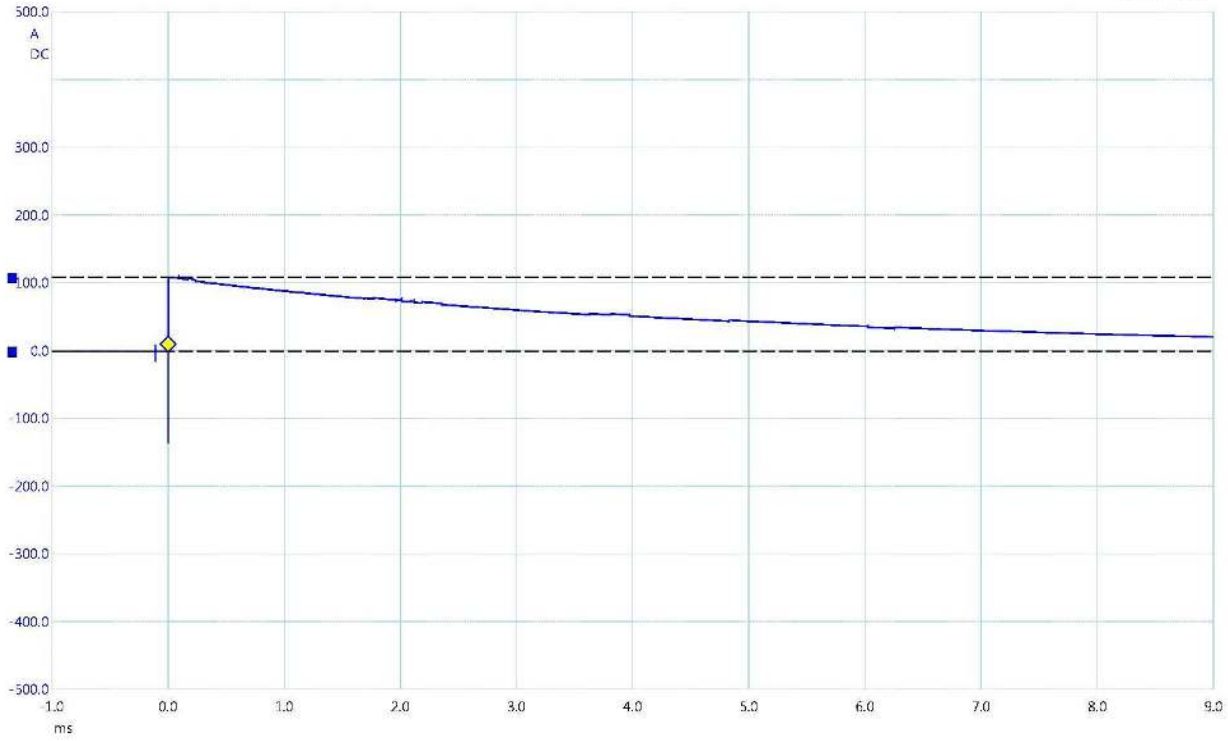
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1 2 Δ
Channel A: 0.0 A 51.79 A 51.79 A

EMI TEST REPORT FOR EMP SHIELD, LLC

L1 Return-G 40% Plot



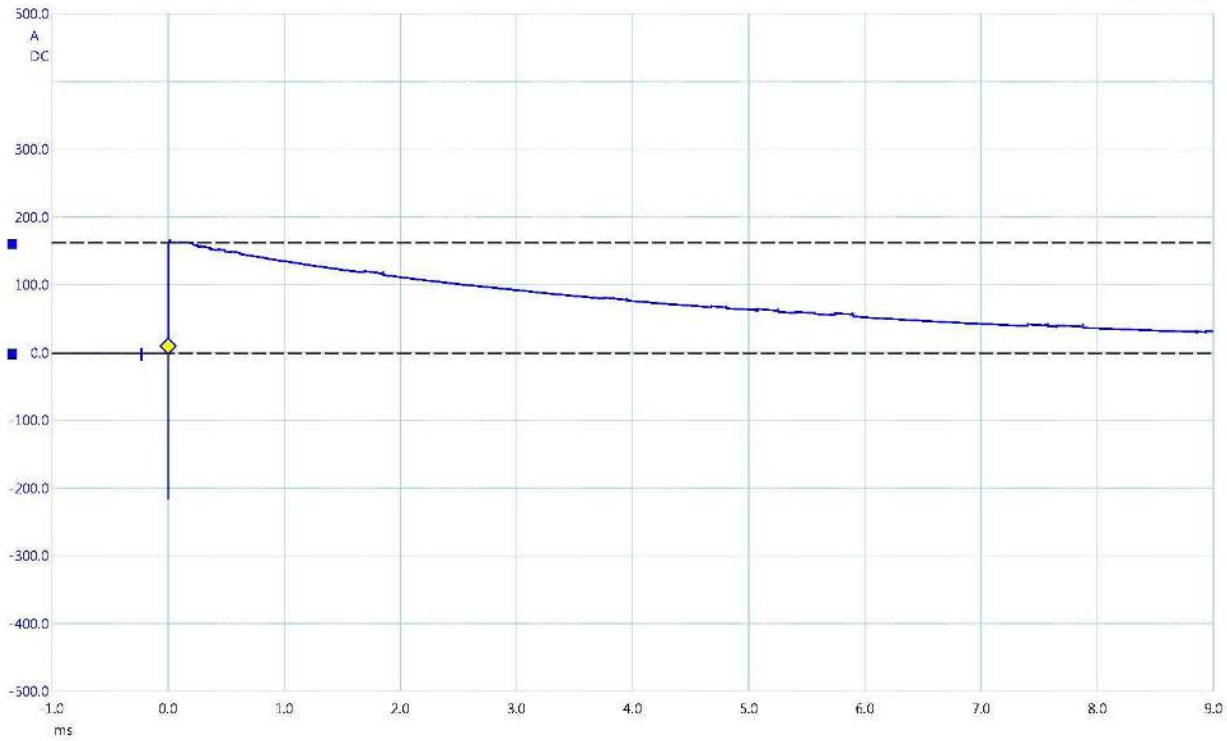
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Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

	1	2	Δ
Channel A	0.0 A	108.3 A	108.3 A

EMI TEST REPORT FOR EMP SHIELD, LLC

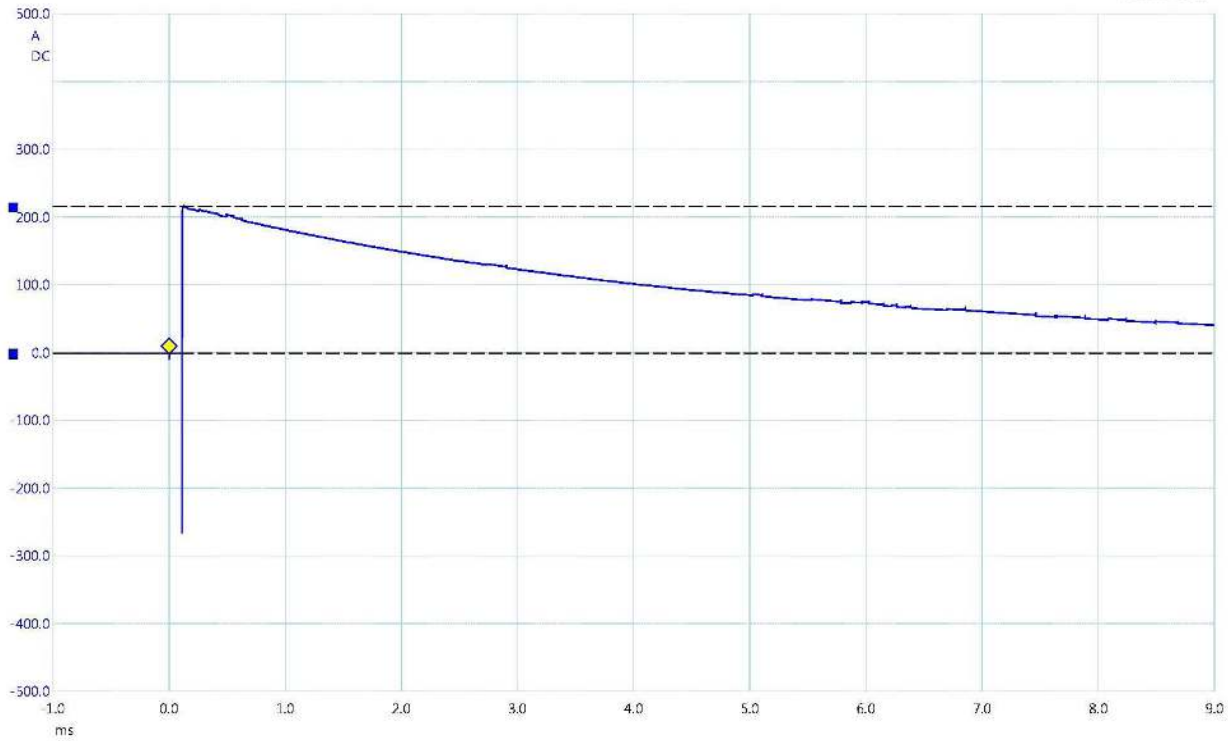
L1 Return-G 60% Plot



3/13/2019 3:31:56 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

L1 Return-G 80% Plot



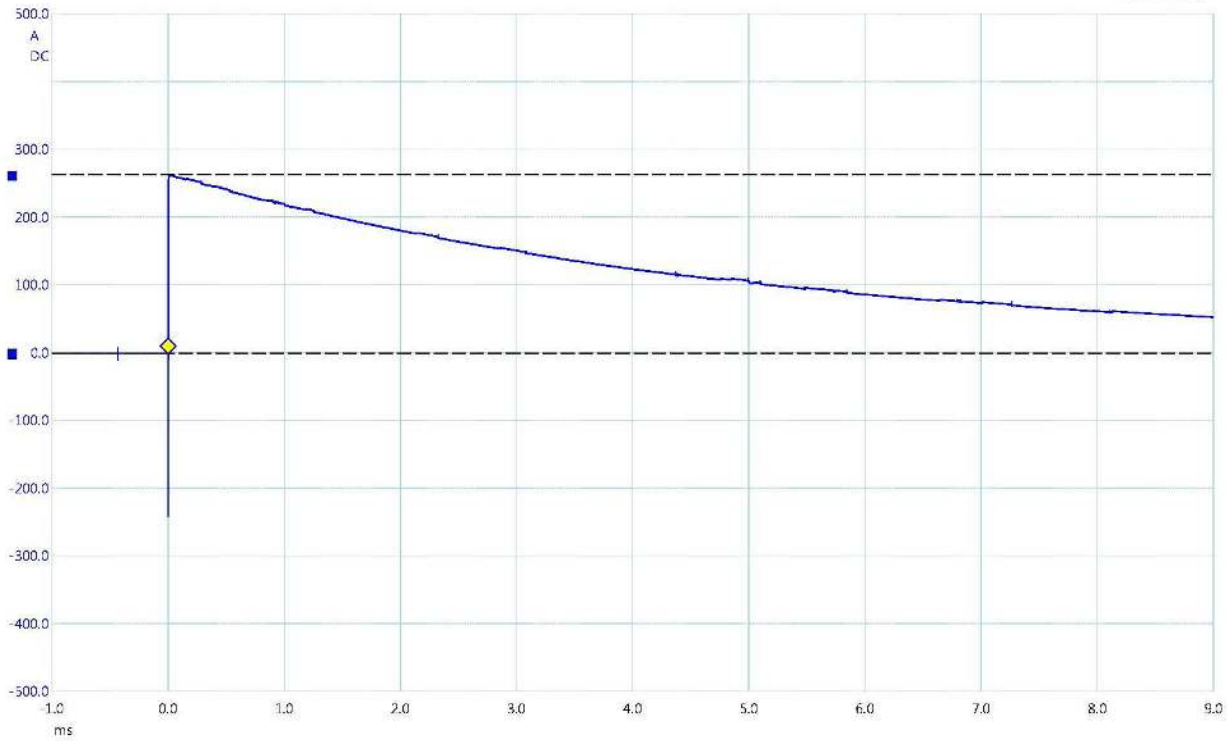
3/13/2019 3:32:32 PM

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

	1	2	Δ
Channel A	0.0 A	215.6 A	215.6 A

EMI TEST REPORT FOR EMP SHIELD, LLC

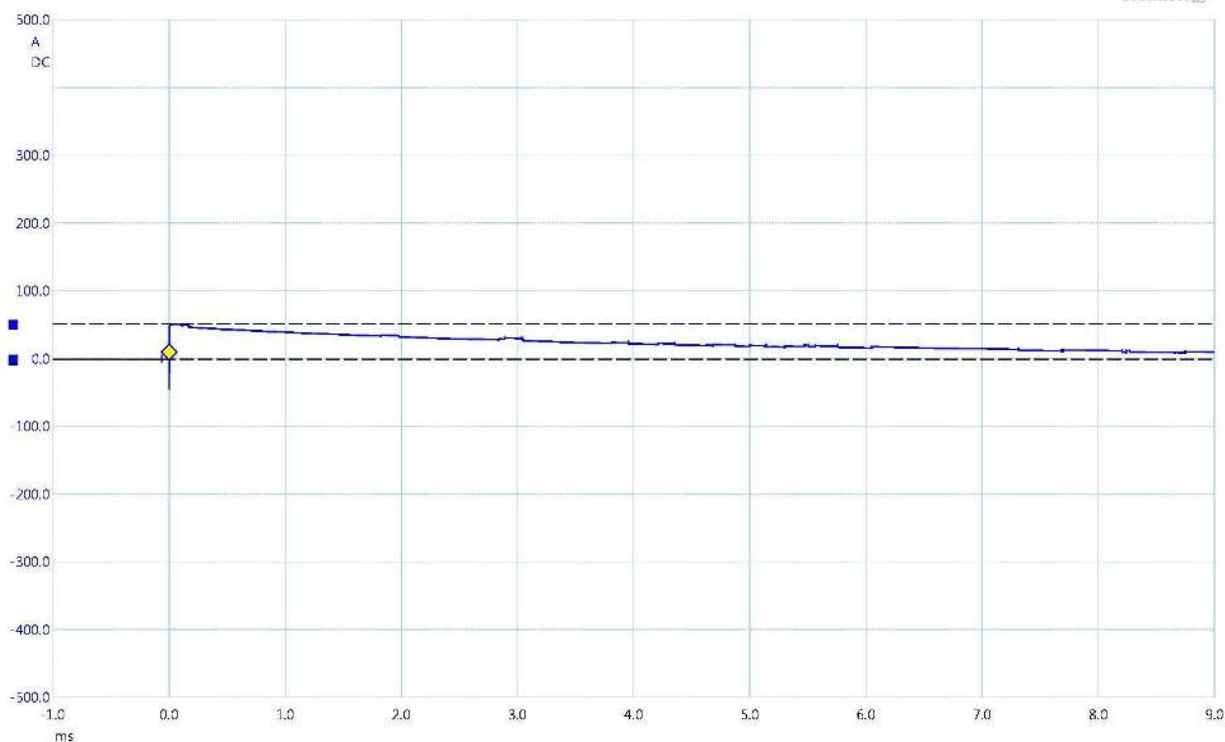
L1 Return-G 100% Plot



3/13/2019 3:34:25 PM

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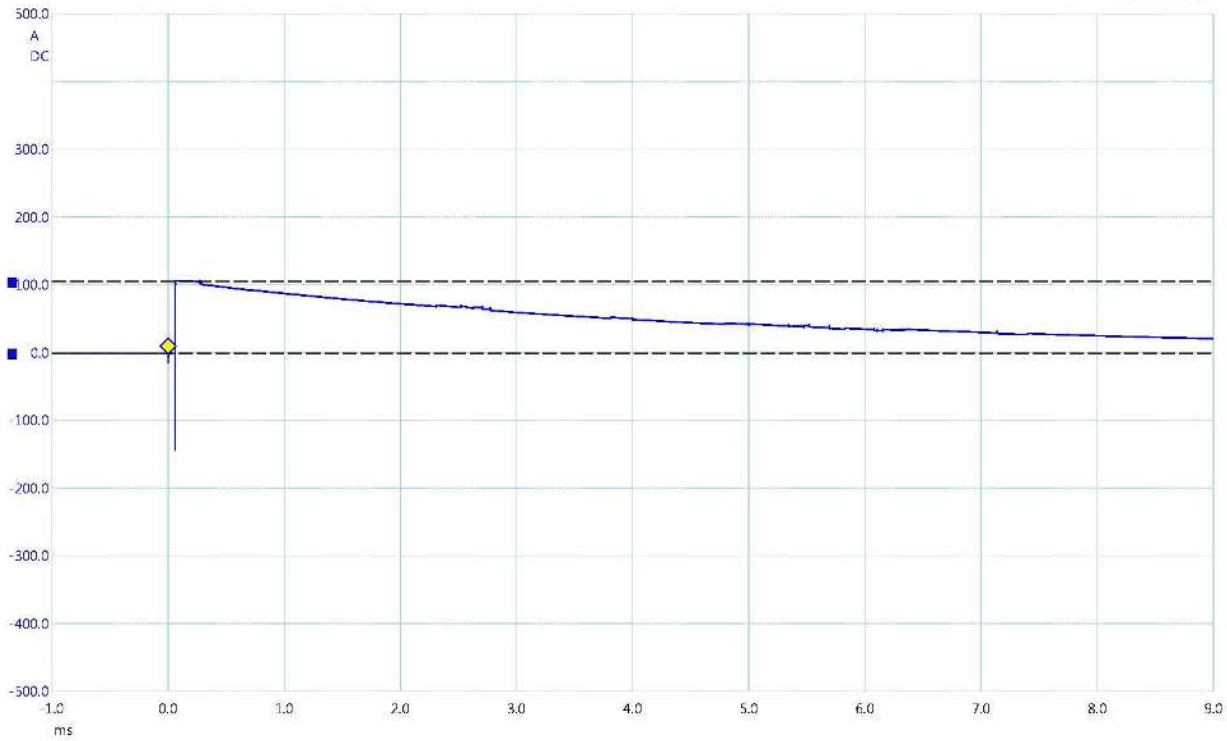
L2 Return-G 20% Plot



3/13/2019 3:24:56 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

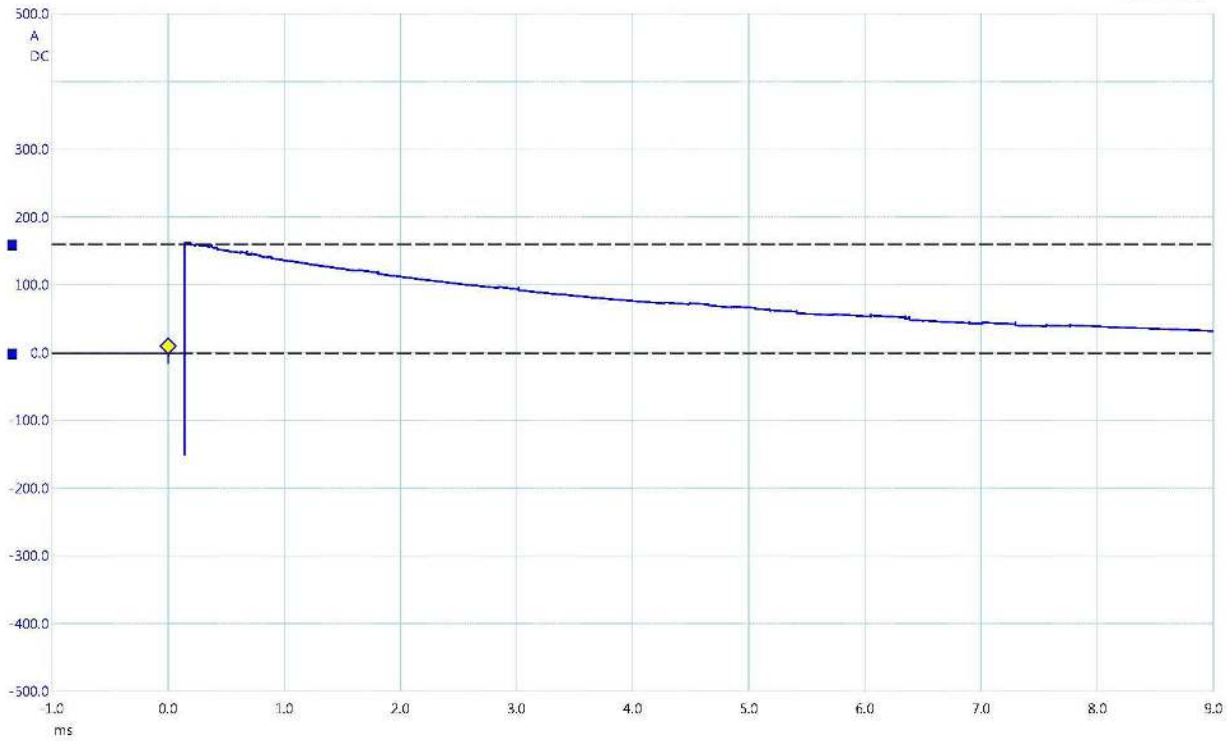
L2 Return-G 40% Plot



3/13/2019 3:37:38 PM

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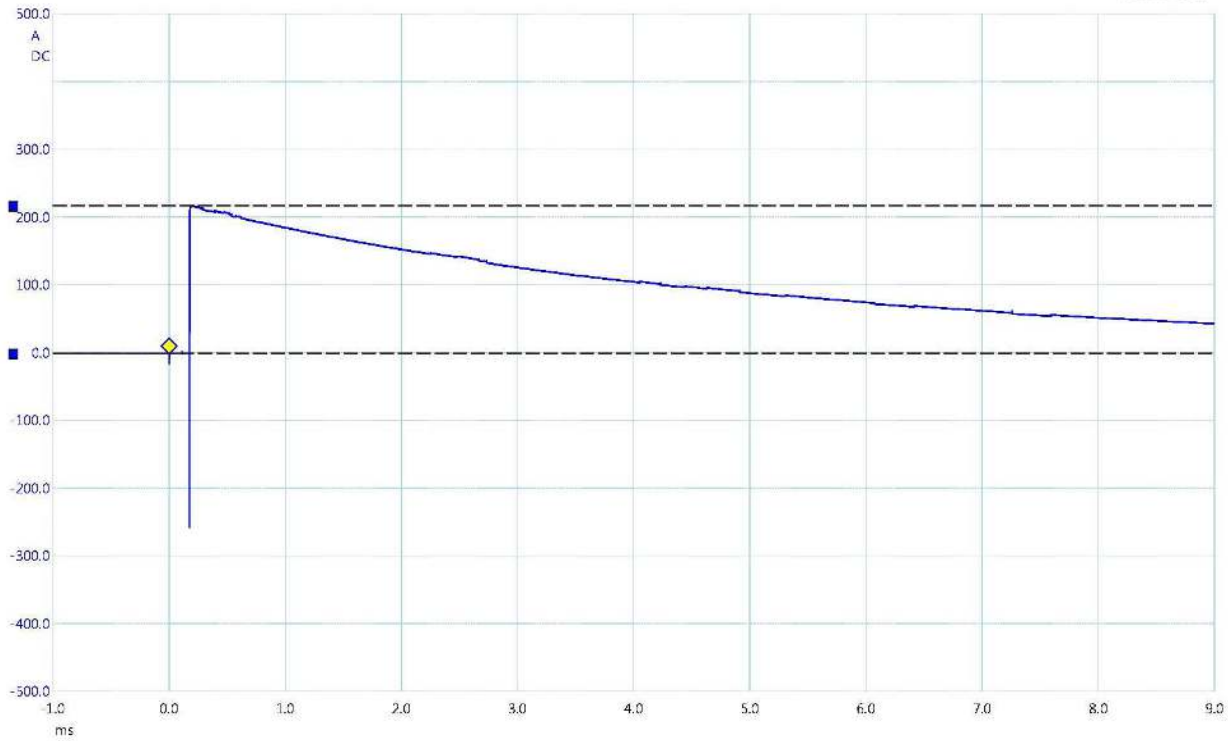
L2 Return-G 60% Plot



3/13/2019 3:37:59 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

L2 Return-G 80% Plot



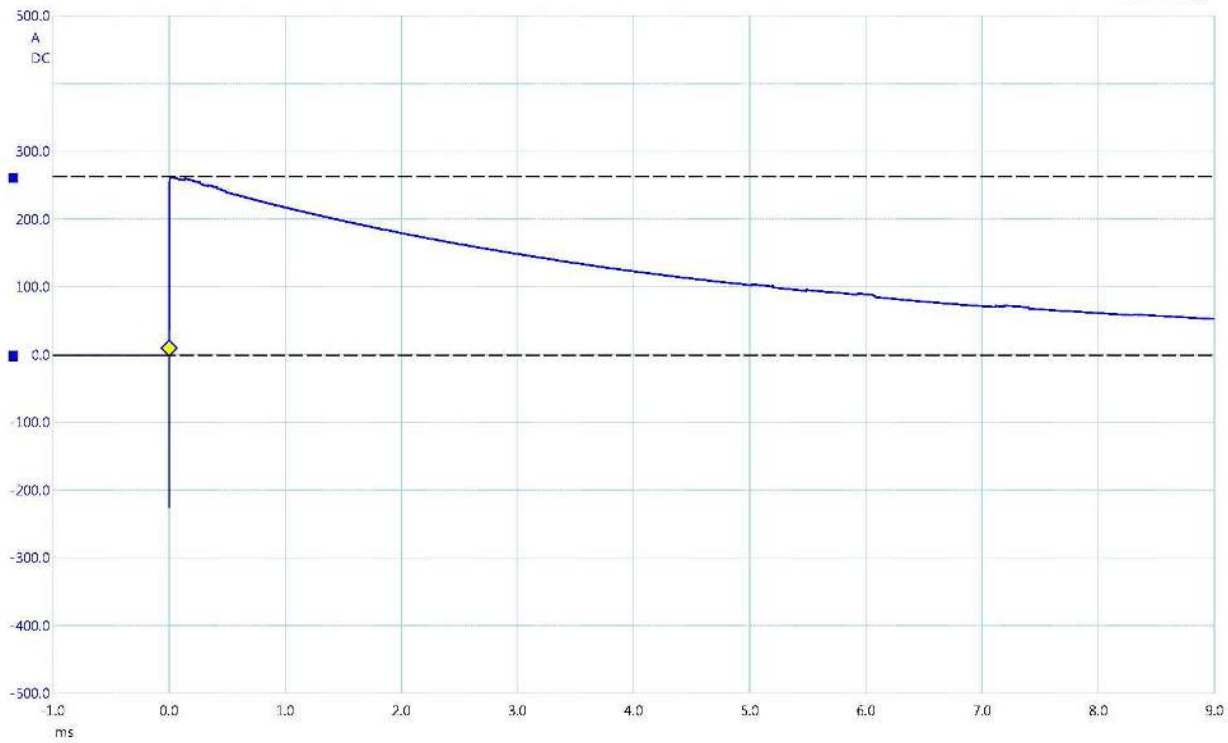
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Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

	1	2	Δ
Channel A	0.0 A	217.5 A	217.5 A

EMI TEST REPORT FOR EMP SHIELD, LLC

L2 Return-G 100% Plot



3/13/2019 3:39:25 PM

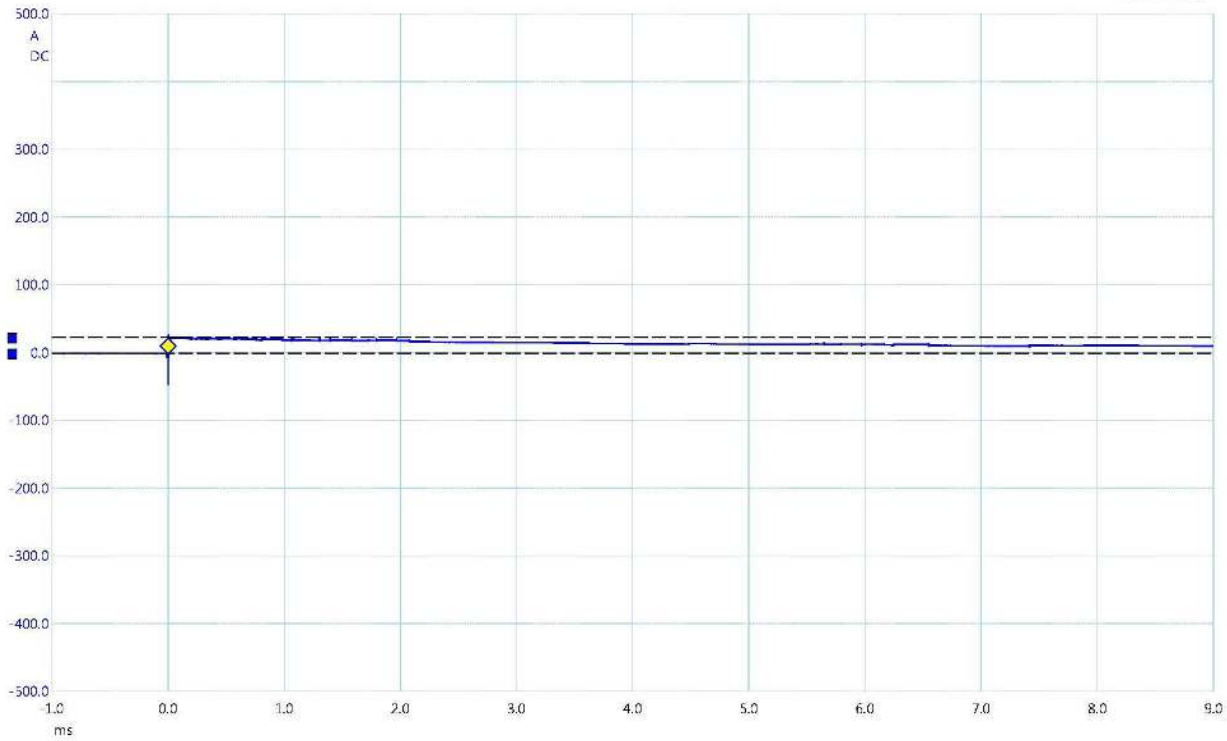
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 3 Data Table

DC Breakdown Voltage				
Test Level (A)	Line Configuration	L1-L2 Pre-Test (VDC)	Test Current (A)	L1-L2 Post-Test (VDC)
50	L1-G/N	345	23	351
50	L2-G/N	345	24.89	351
100	L1-G/N	351	71.97	351
100	L2-G/N	351	71.97	351
150	L1-G/N	351	124.7	313
150	L2-G/N	351	126.6	313
200	L1-G/N	313	181.2	315
200	L2-G/N	313	179.3	315
250	L1-G/N	315	226.4	315
250	L2-G/N	315	223.2	315

EMI TEST REPORT FOR EMP SHIELD, LLC

L1-G 20% Plot

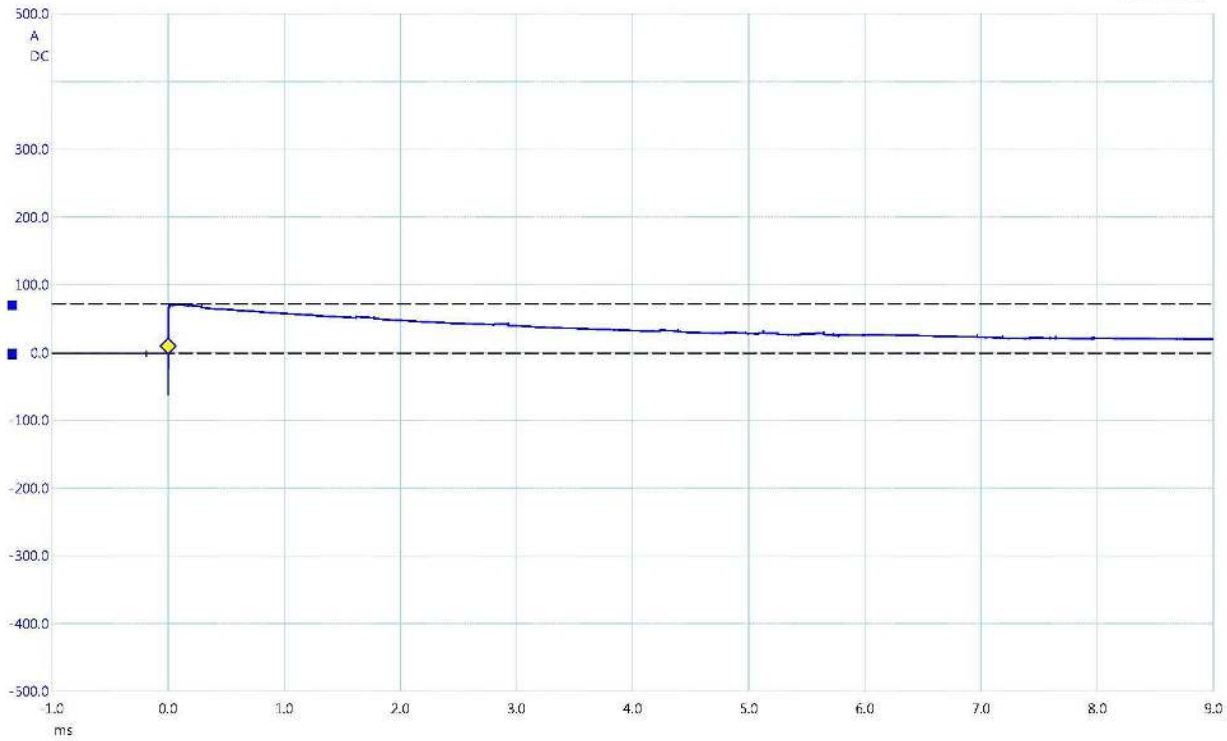


3/5/2019 1:18:47 PM

1 2 Δ
Channel A 0.0 A 23.0 A 23.0 A

EMI TEST REPORT FOR EMP SHIELD, LLC

L1-G 40% Plot



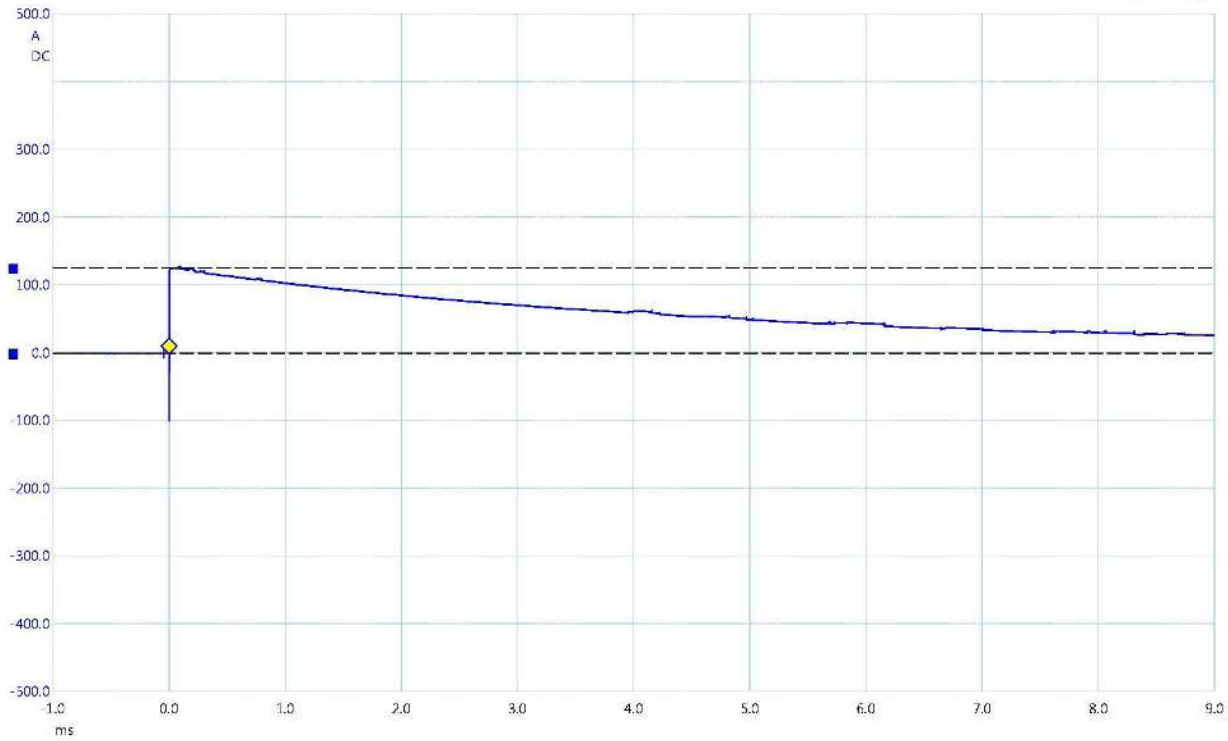
3/5/2019 1:21:31 PM

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

	1	2	Δ
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EMI TEST REPORT FOR EMP SHIELD, LLC

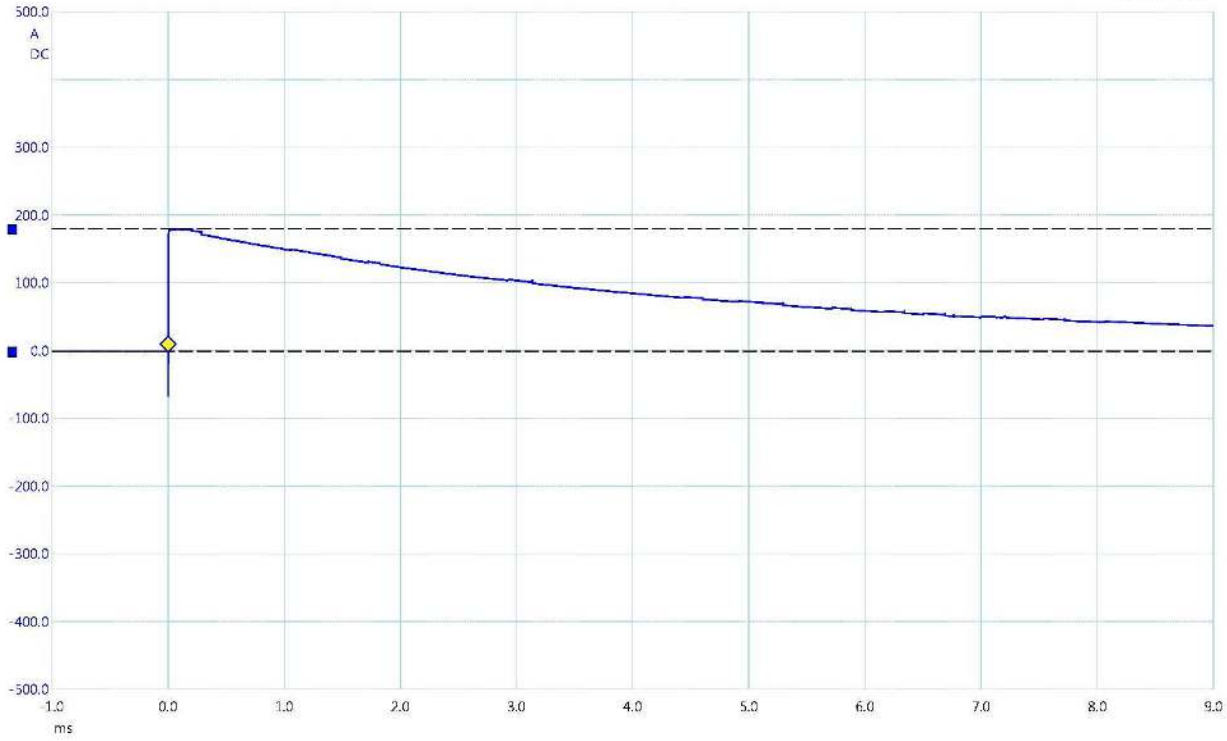
L1-G 60% Plot



3/5/2019 1:24:19 PM

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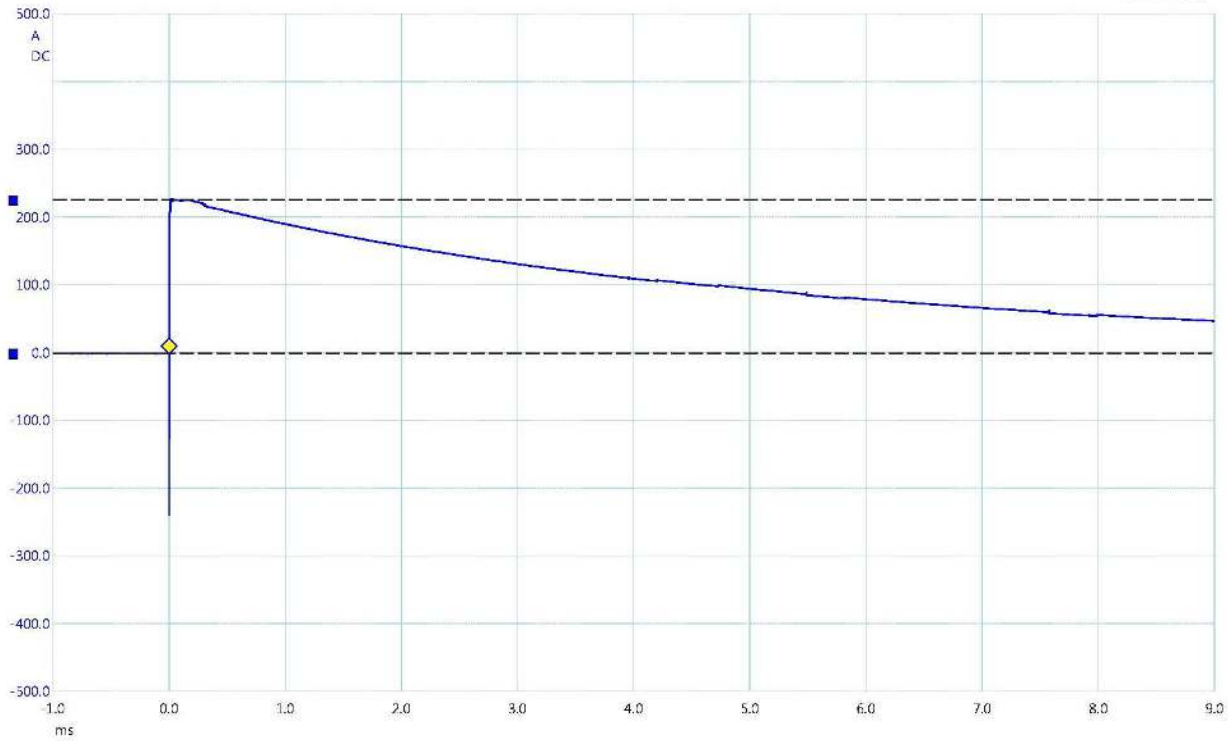
L1-G 80% Plot



3/5/2019 1:32:45 PM

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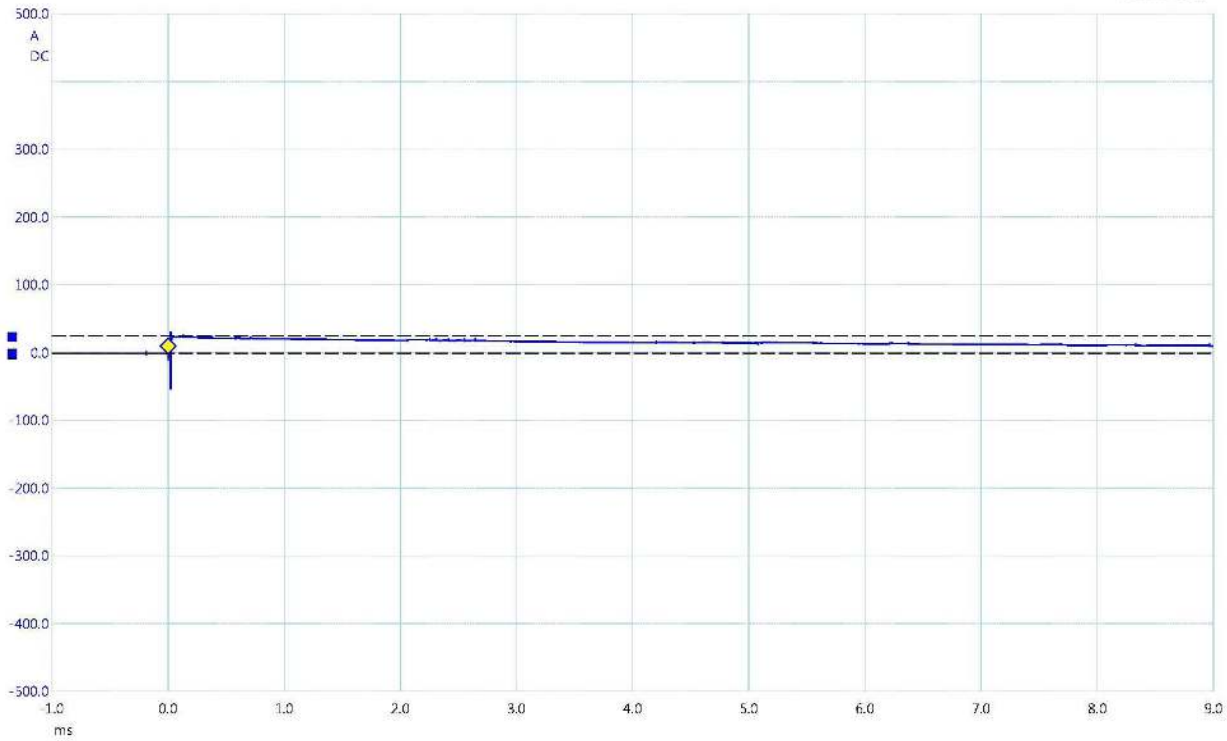
L1-G 100% Plot



3/5/2019 1:36:45 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

L2-G 20% Plot

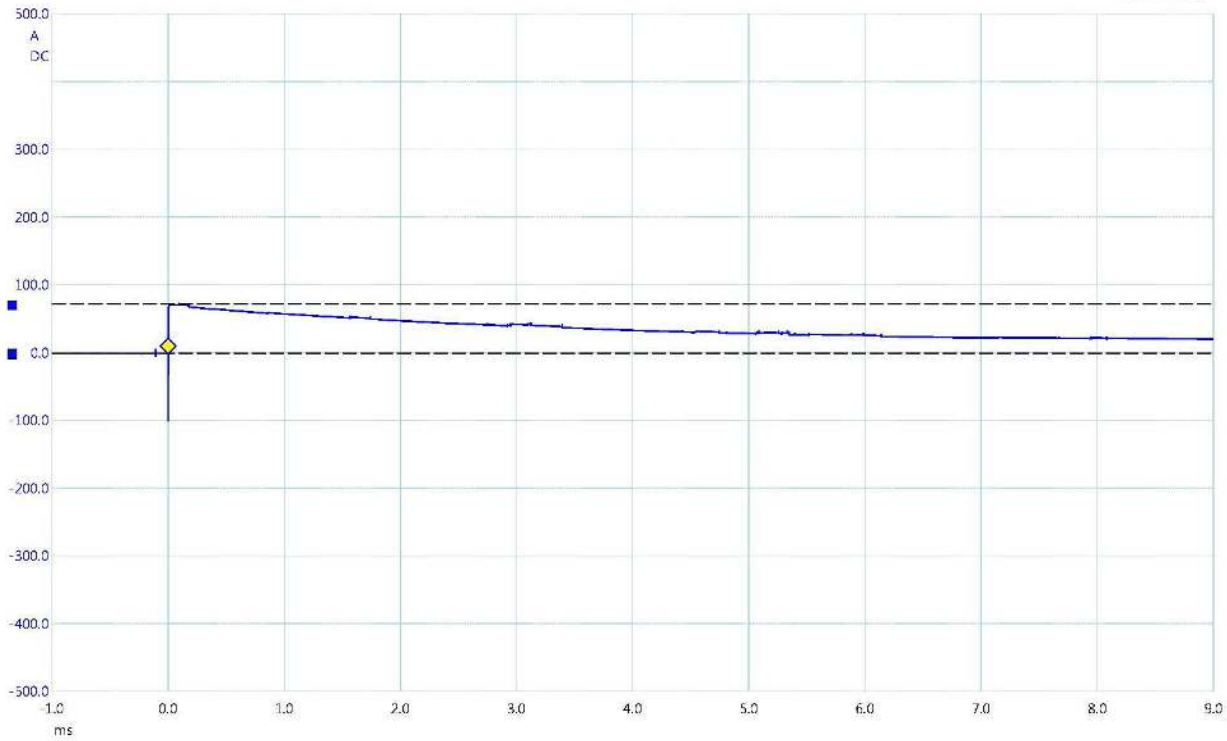


3/5/2019 1:19:52 PM

1 2 Δ
Channel A: 0.0 A 24.89 A 24.89 A

EMI TEST REPORT FOR EMP SHIELD, LLC

L2-G 40% Plot



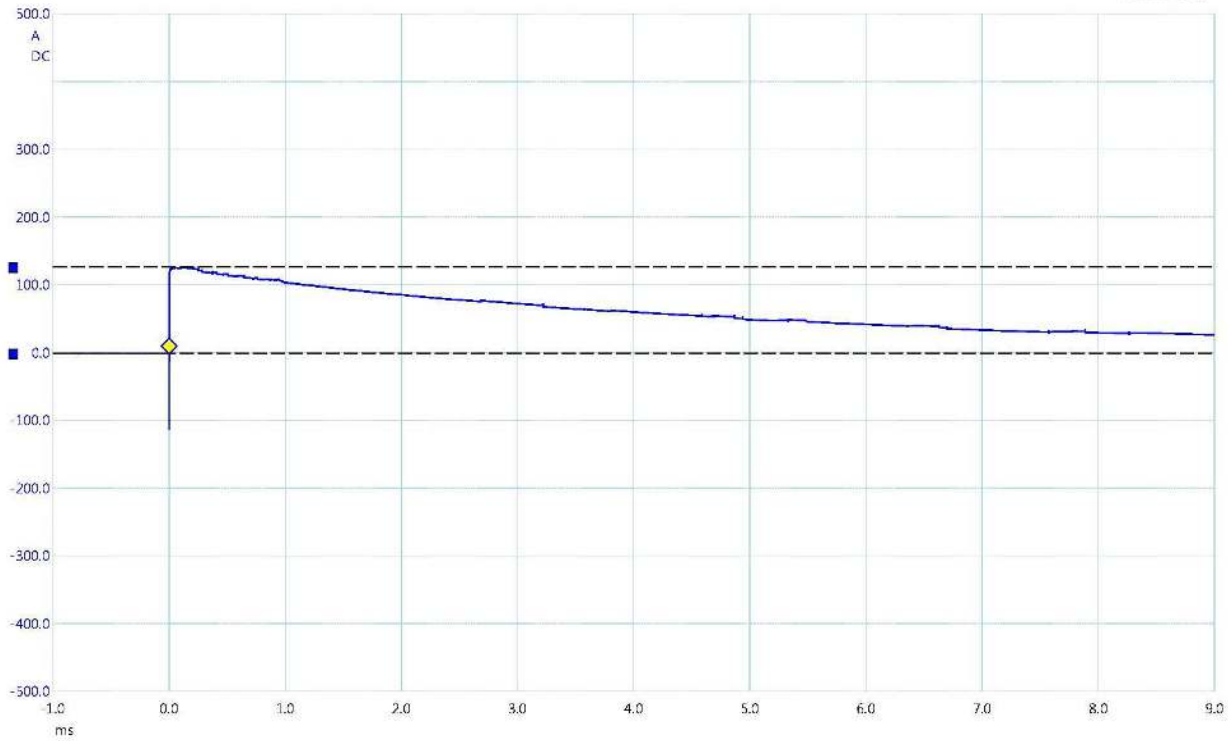
3/5/2019 1:22:34 PM

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

	1	2	Δ
Channel A	0.0 A	71.97 A	71.97 A

EMI TEST REPORT FOR EMP SHIELD, LLC

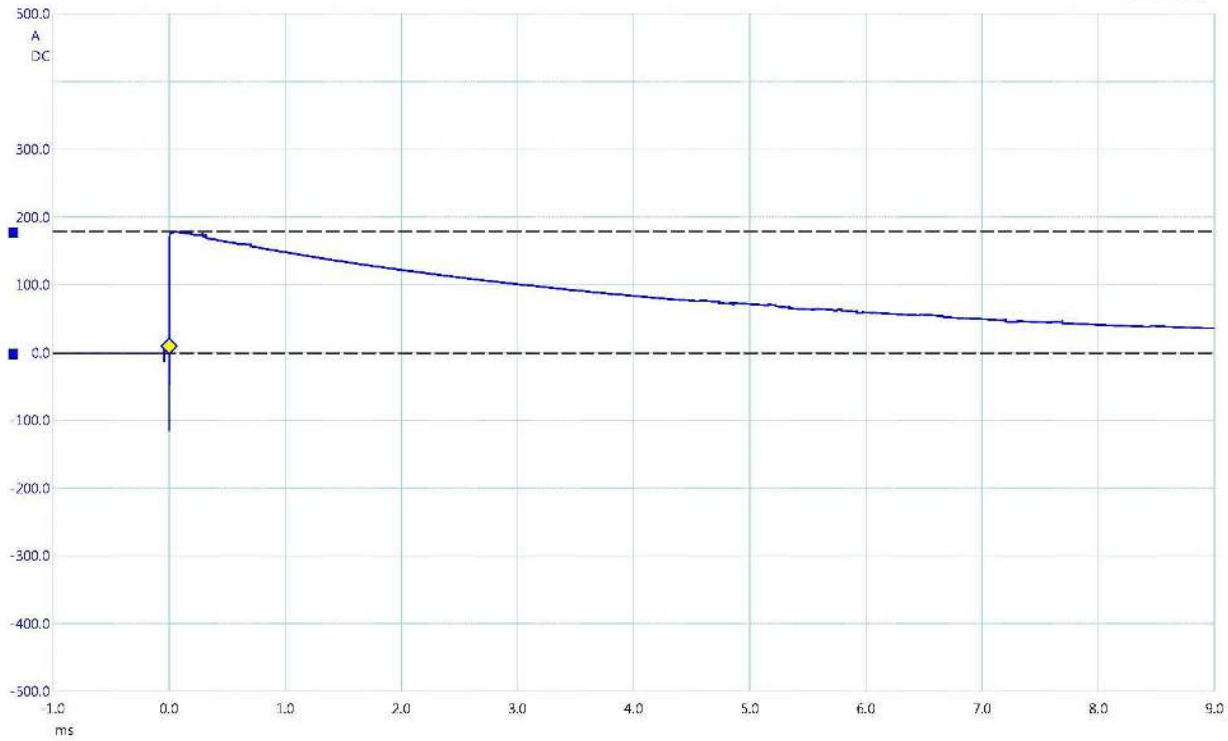
L2-G 60% Plot



3/5/2019 1:25:28 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

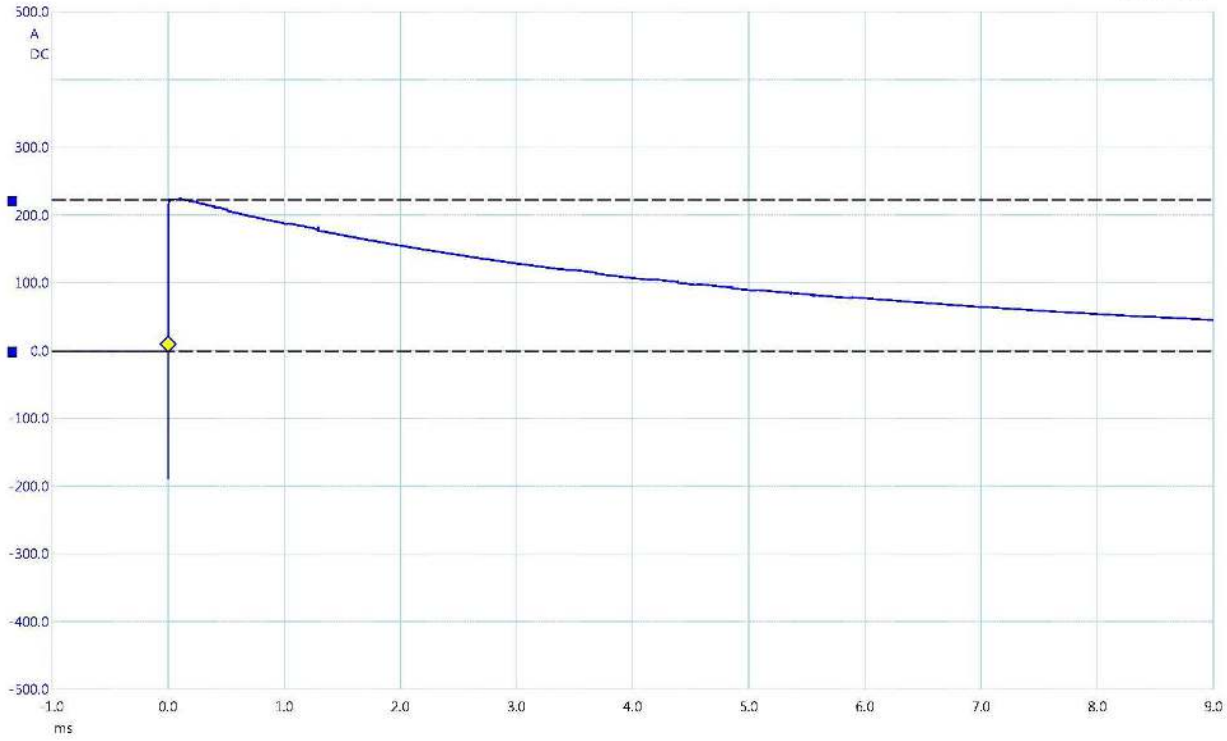
L2-G 80% Plot



3/5/2019 1:34:09 PM

EMI TEST REPORT FOR EMP SHIELD, LLC

L2-G 100% Plot



3/13/2019 2:44:05 PM

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	1	2	Δ
Channel A	0.0 A	223.2 A	223.2 A



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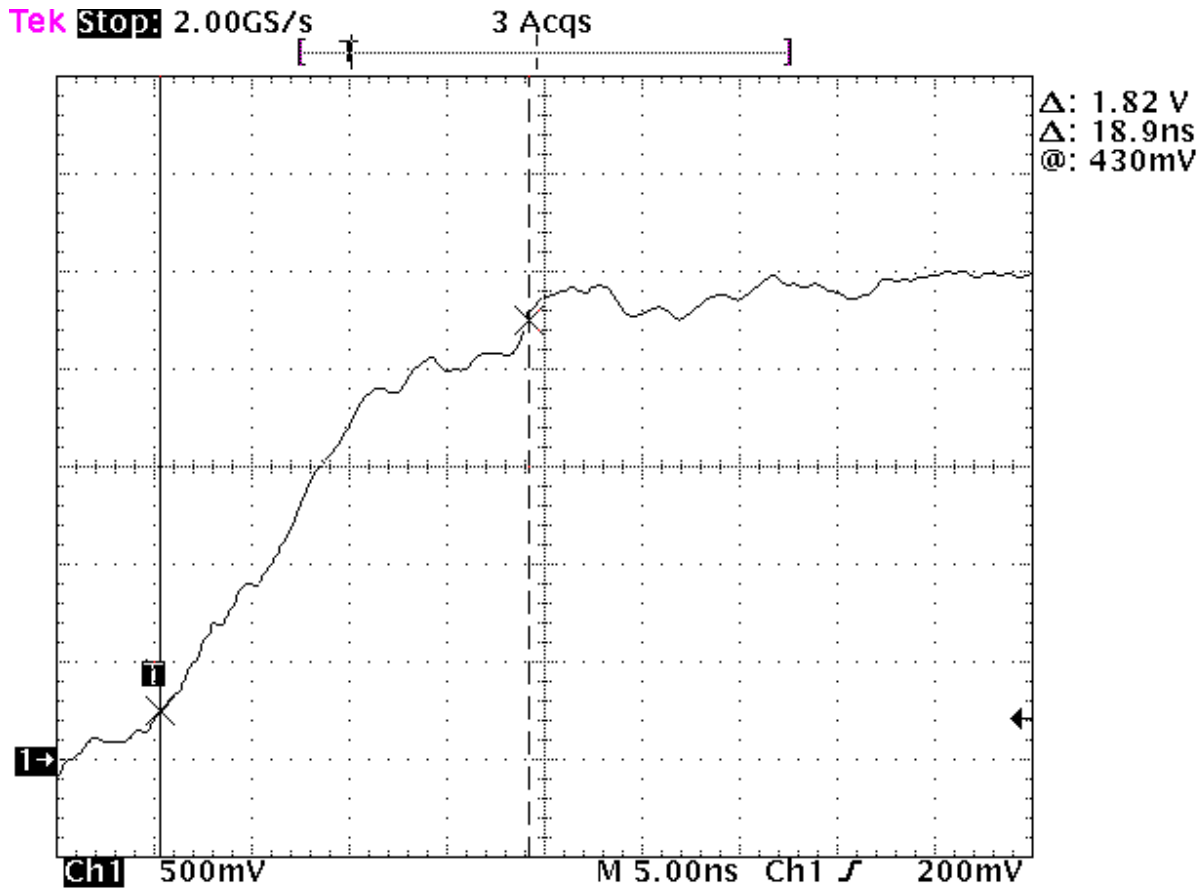
REPORT No.: 1902-051E
REVISION: B

EMI TEST REPORT FOR EMP SHIELD, LLC

Short Pulse Data

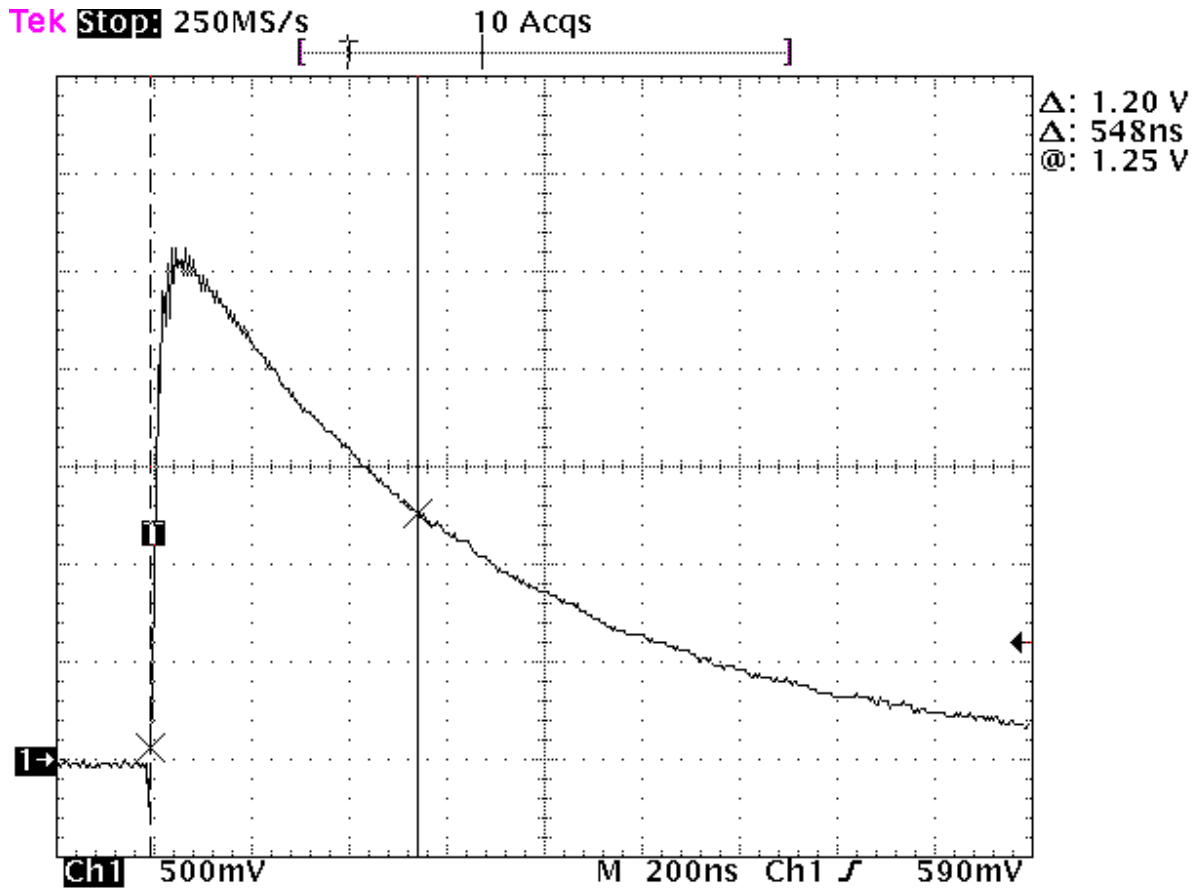
EMI TEST REPORT FOR EMP SHIELD, LLC

Risetime Calibration Plot



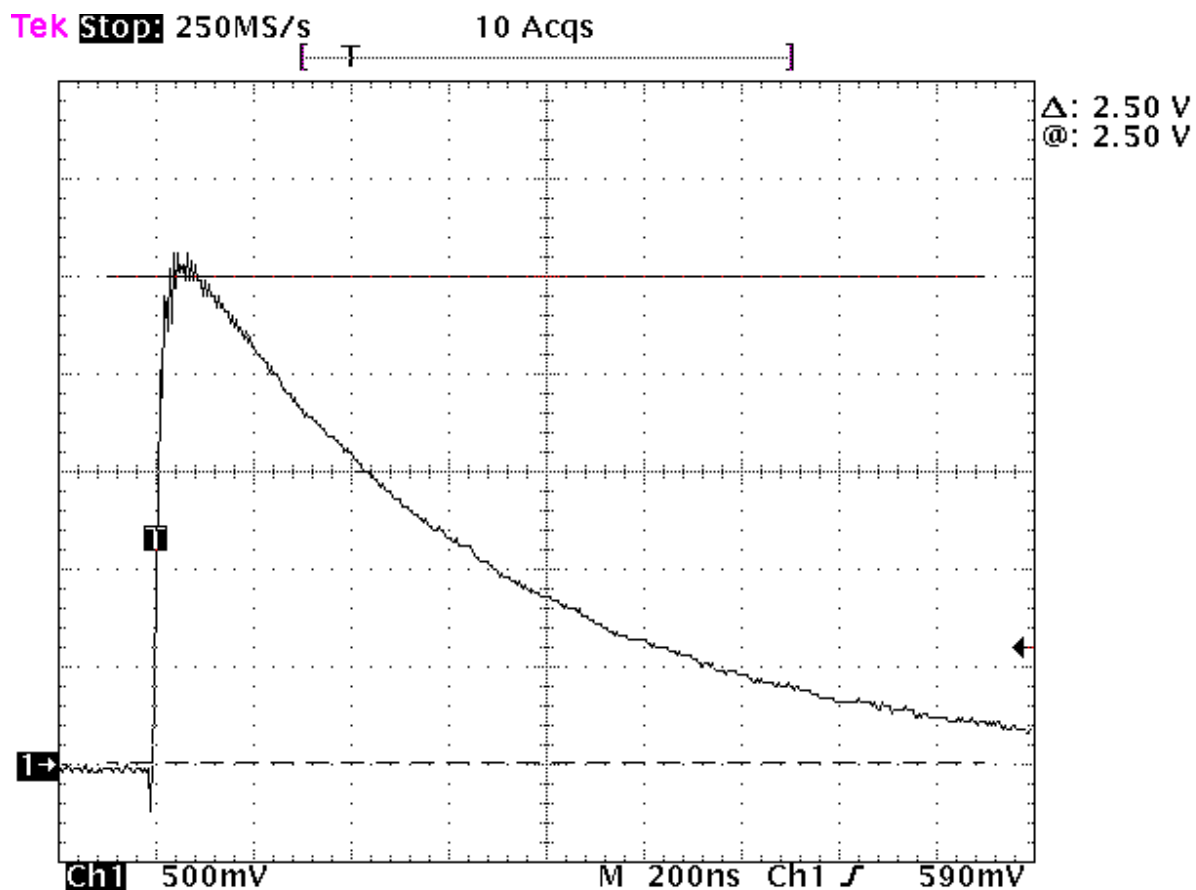
EMI TEST REPORT FOR EMP SHIELD, LLC

Falltime Calibration Plot



 EMI TEST REPORT FOR EMP SHIELD, LLC

Amplitude Calibration Plot



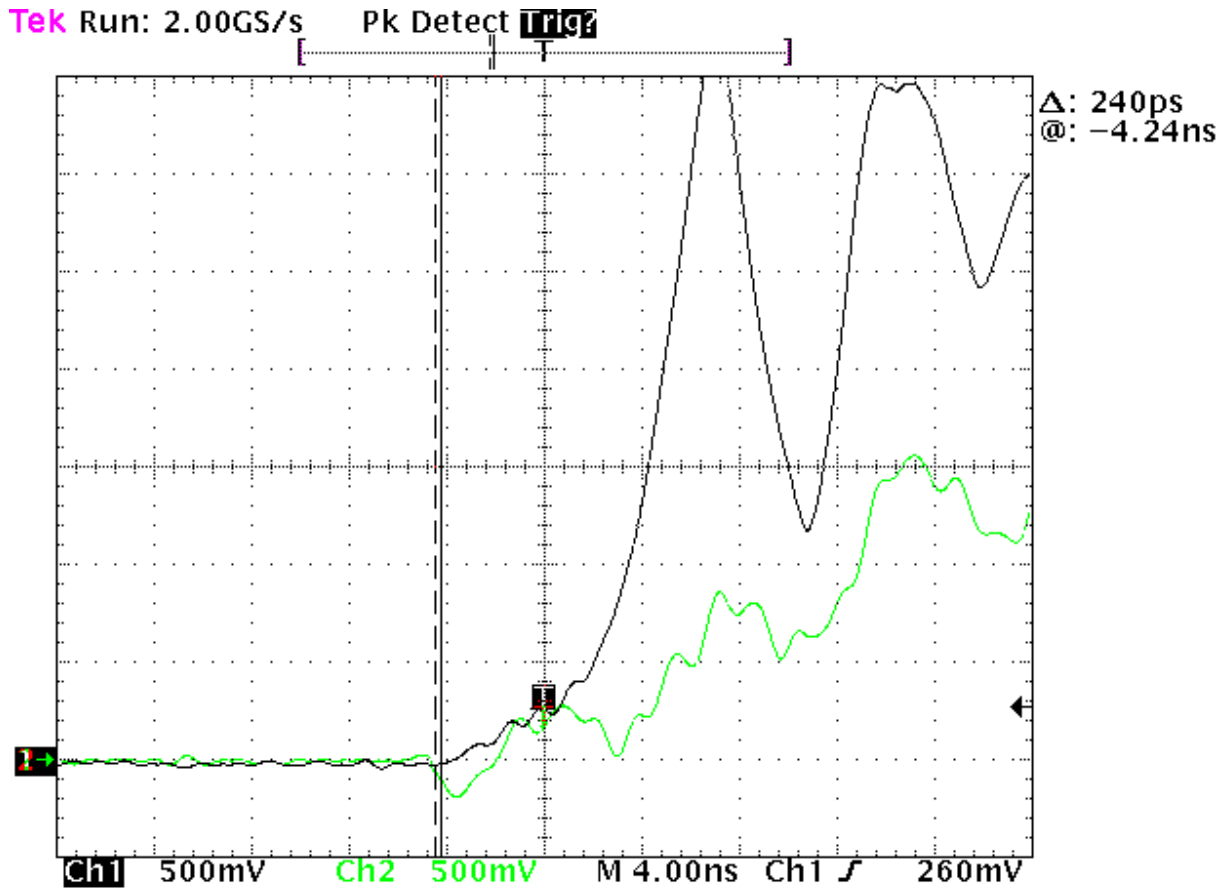
EMI TEST REPORT FOR EMP SHIELD, LLC

Tek Run: 2.00GS/s Pk Detect Trig?



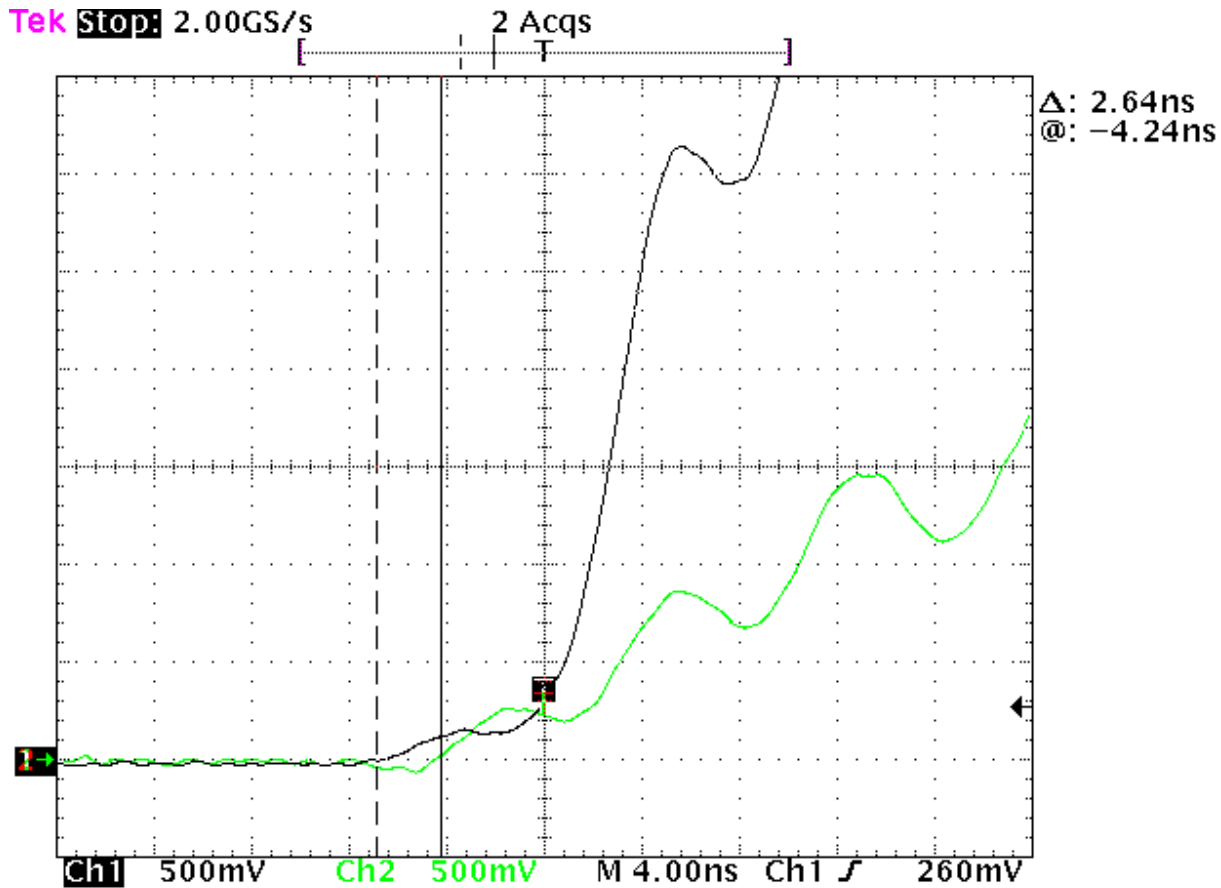
EMI TEST REPORT FOR EMP SHIELD, LLC

Coax 2 Test Plot



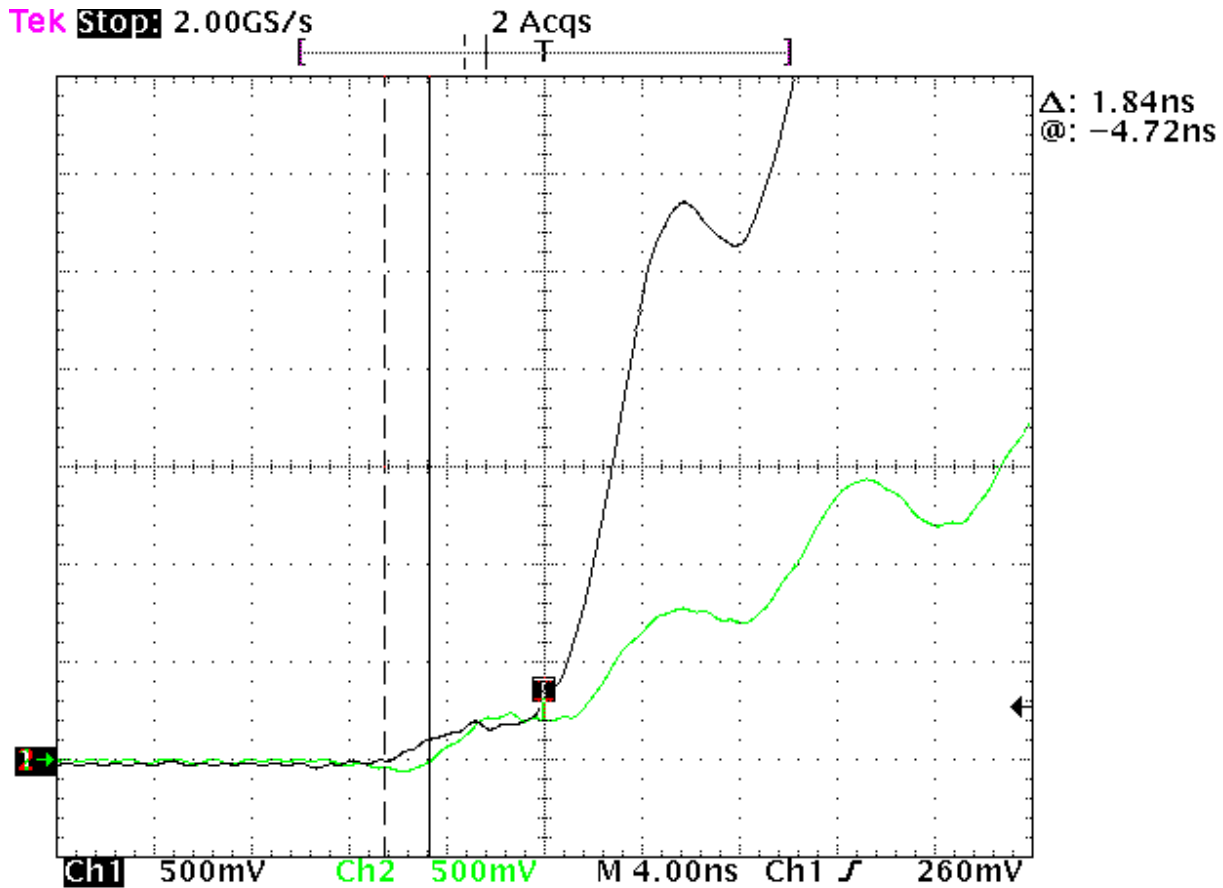
 EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 1 Line 1 Test Plot



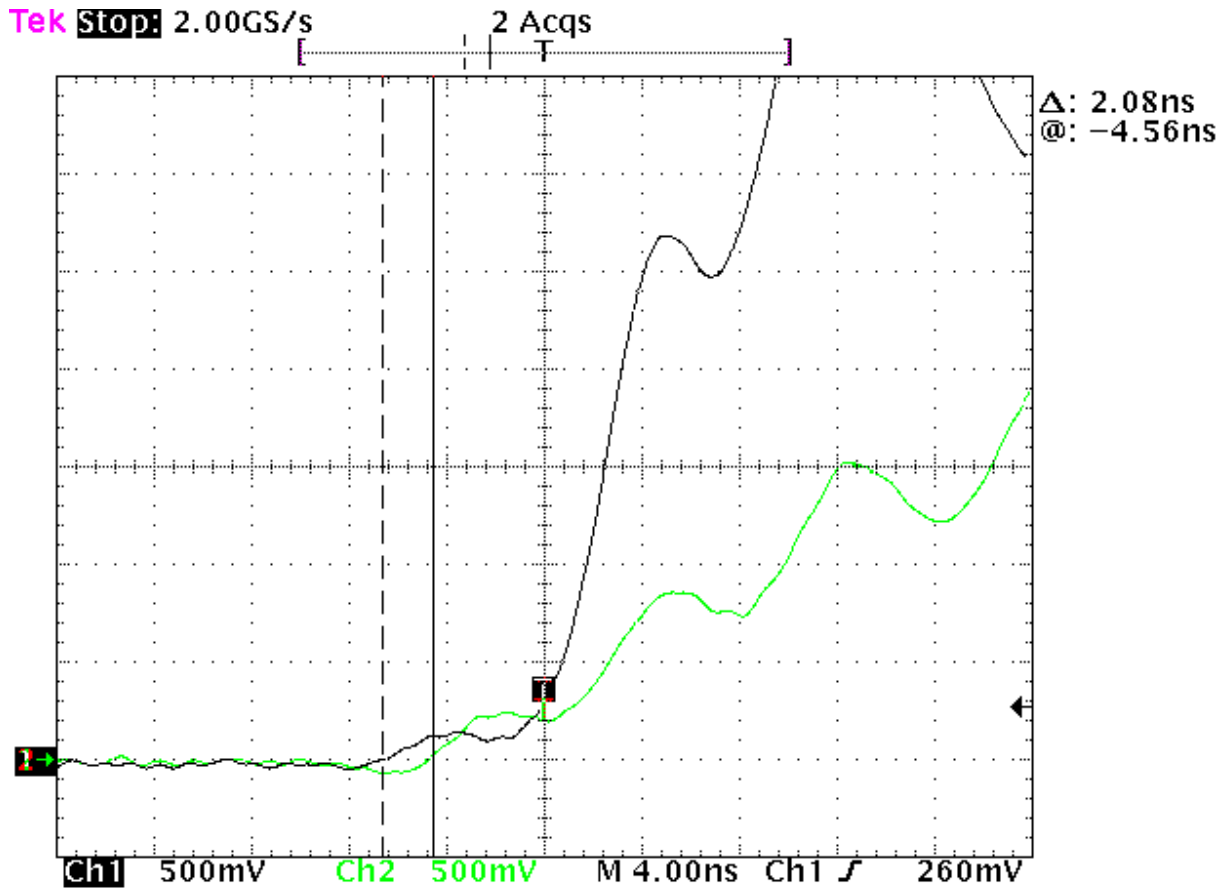
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 1 Line 2 Test Plot



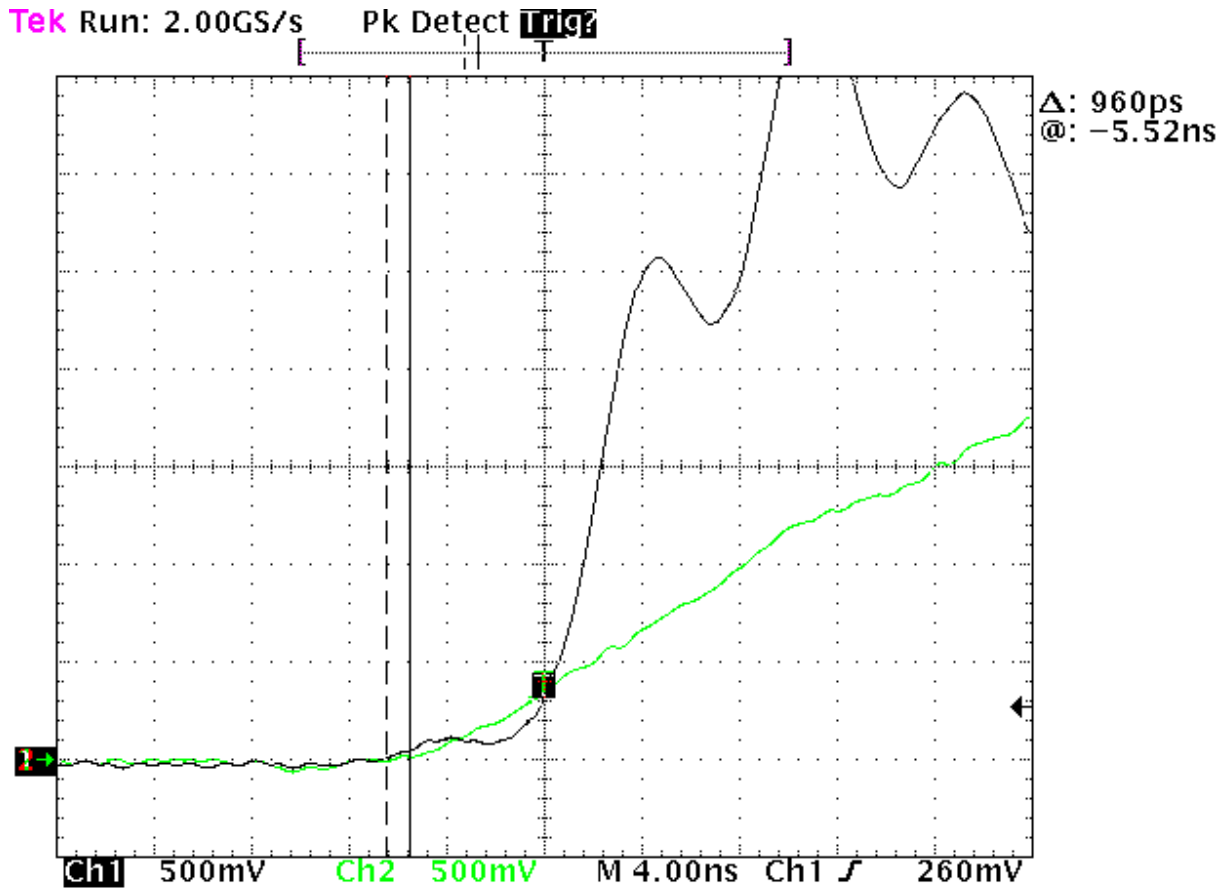
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 2 Line 1 High Test Plot



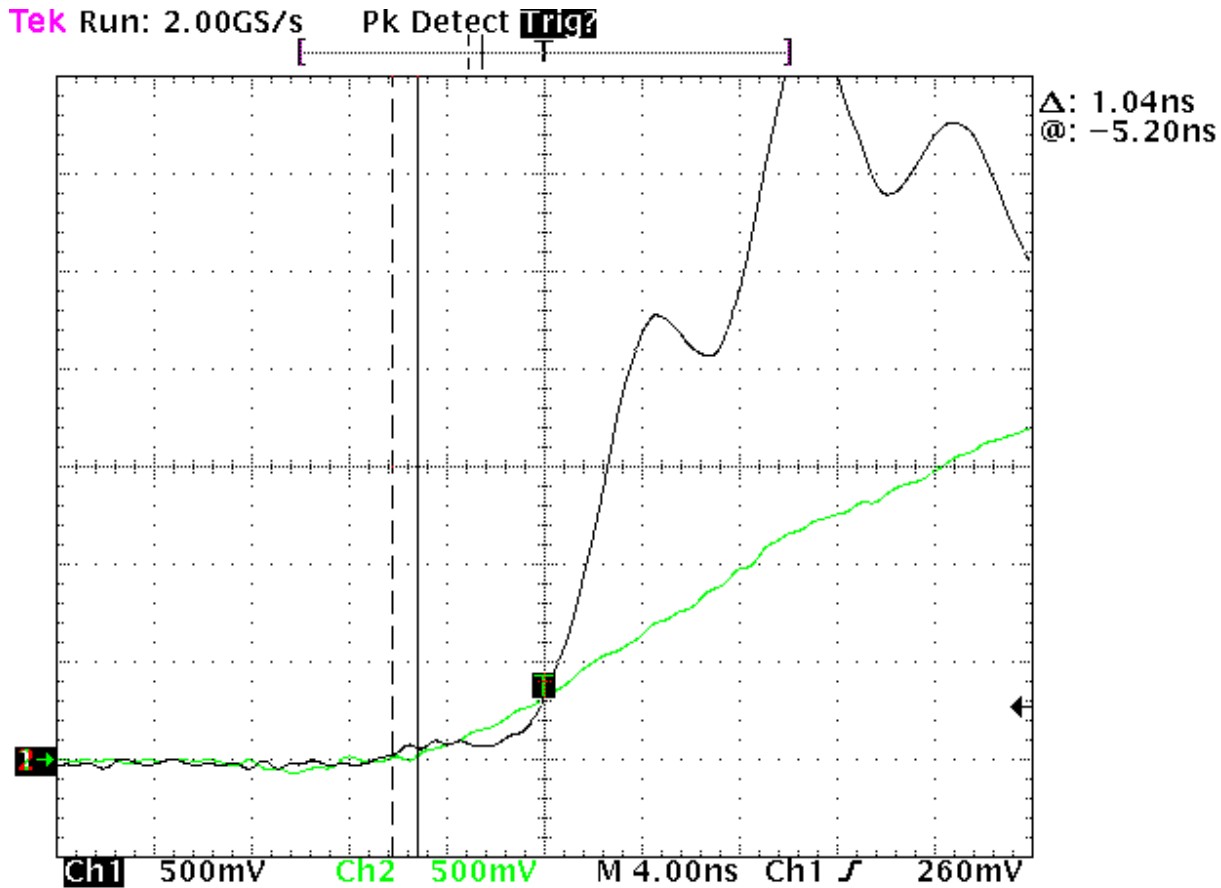
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 2 Line 1 Return Test Plot



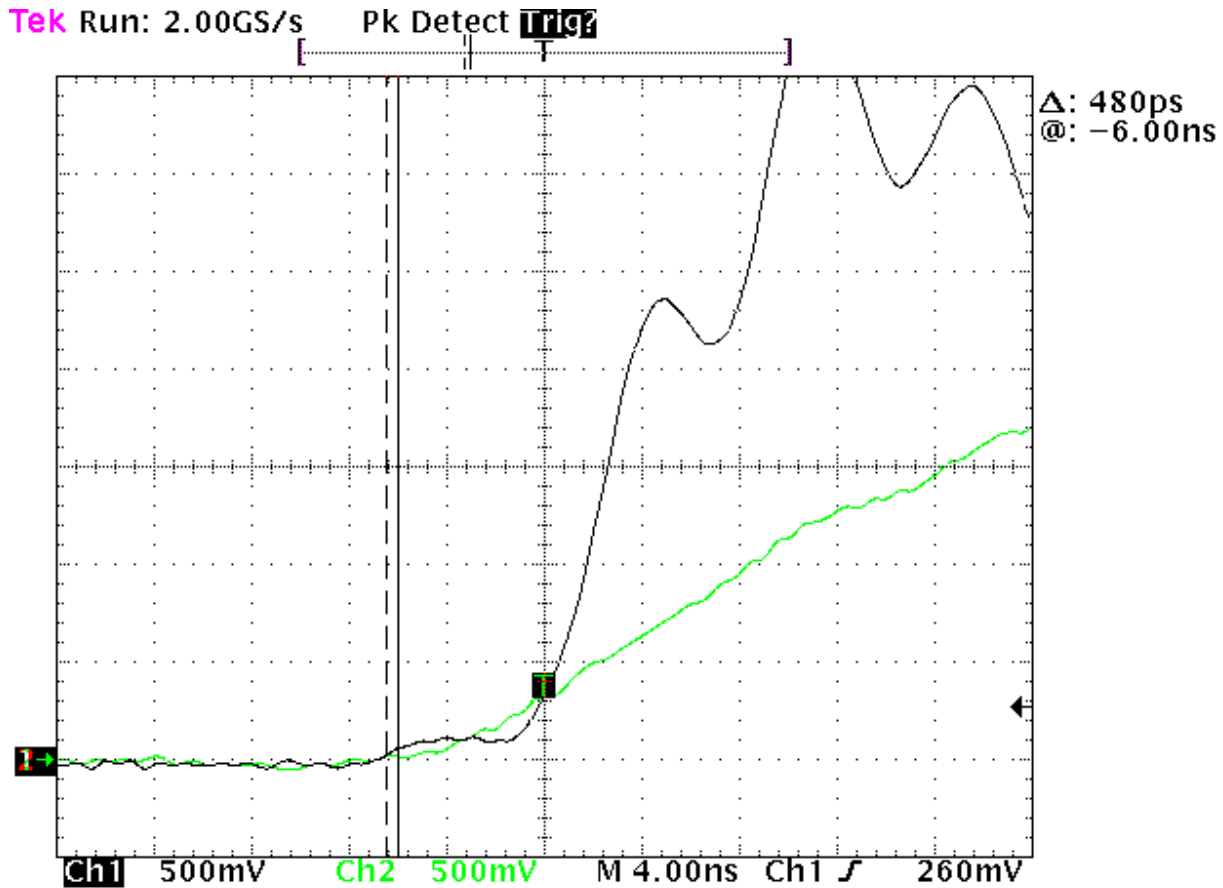
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 2 Line 2 High Test Plot



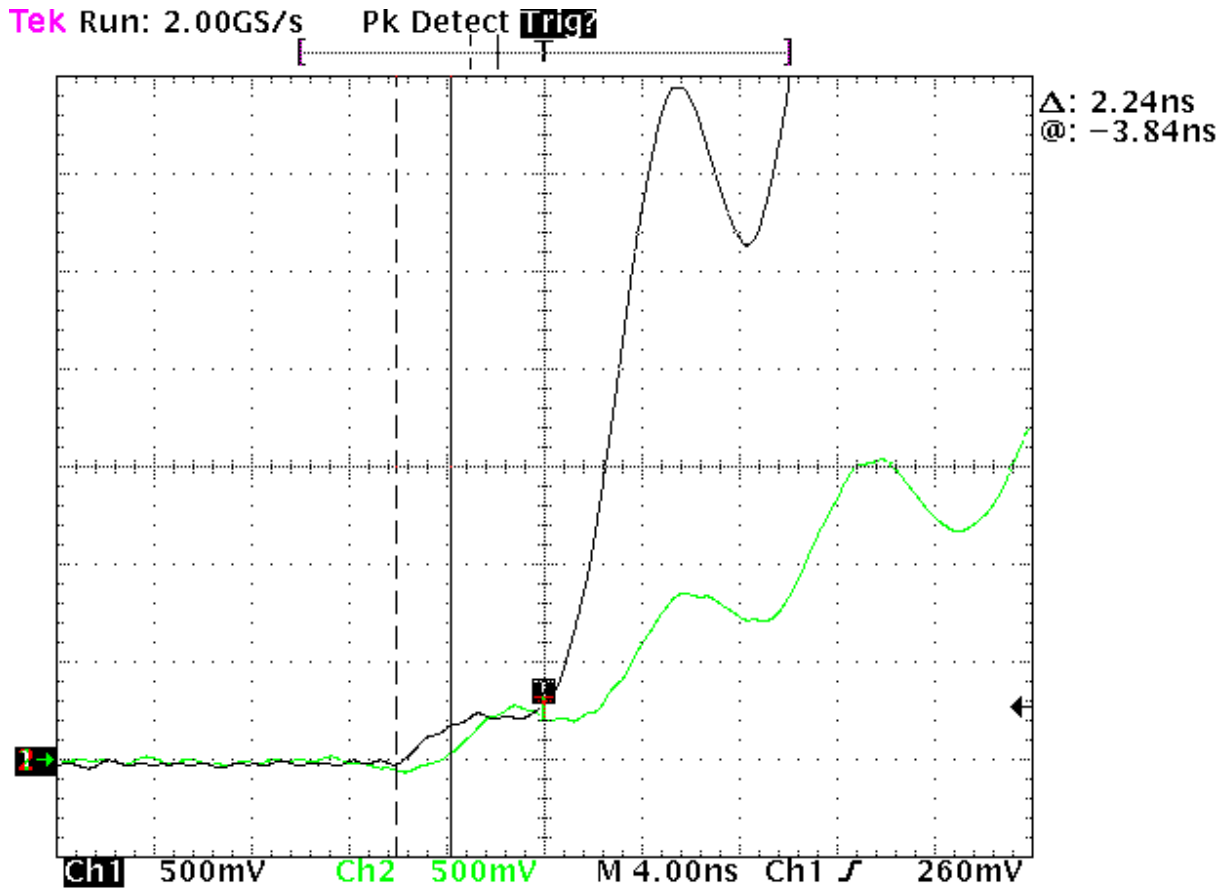
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 2 Line 2 Return Test Plot



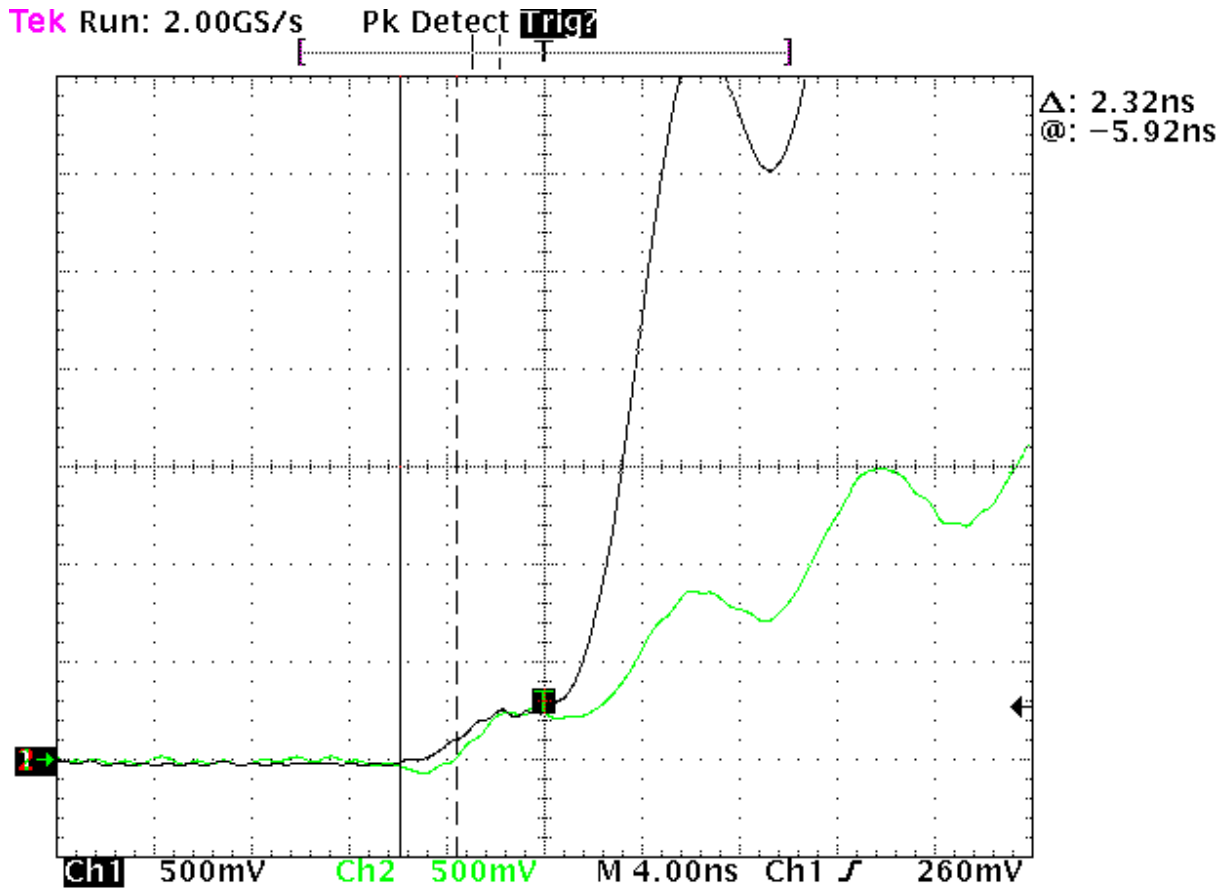
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 3 Line 1 Test Plot



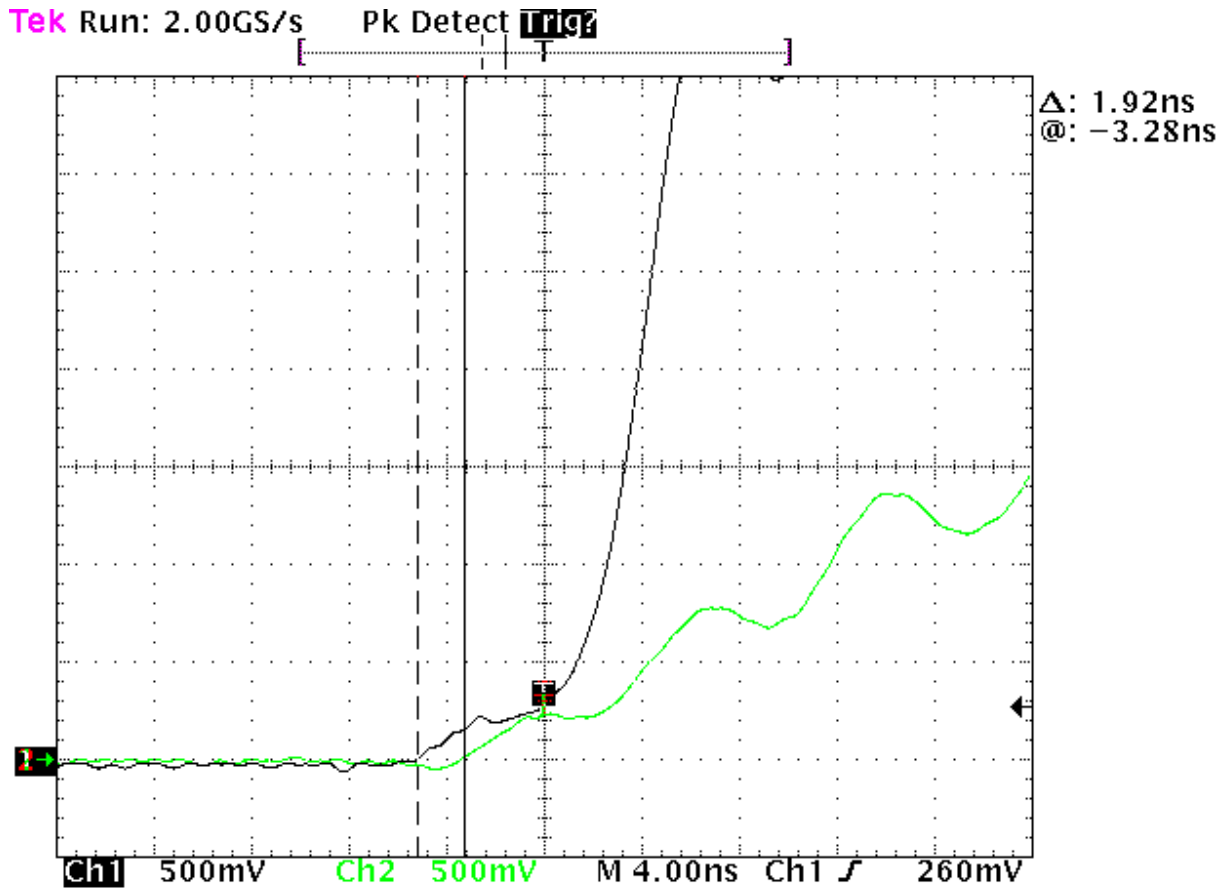
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 3 Line 2 Test Plot



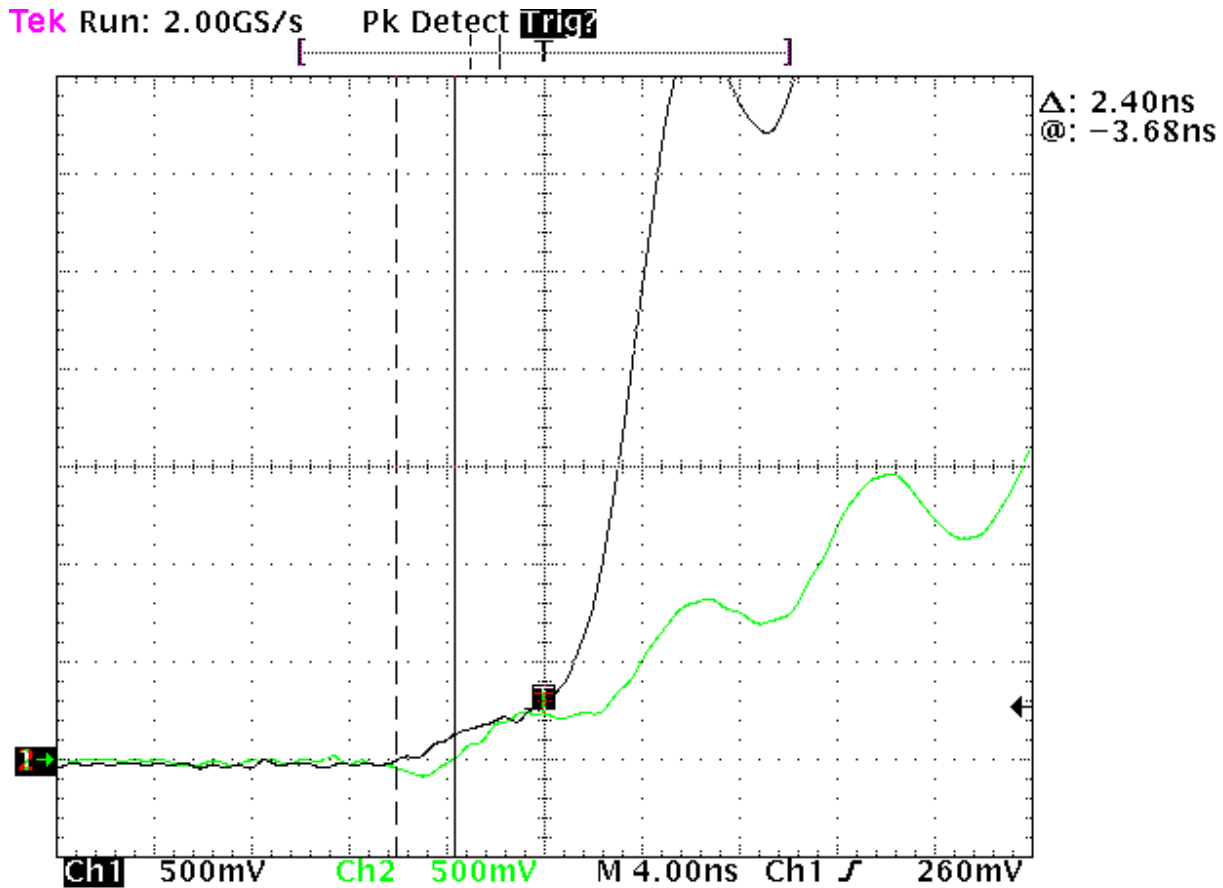
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 4 Line 1 Test Plot



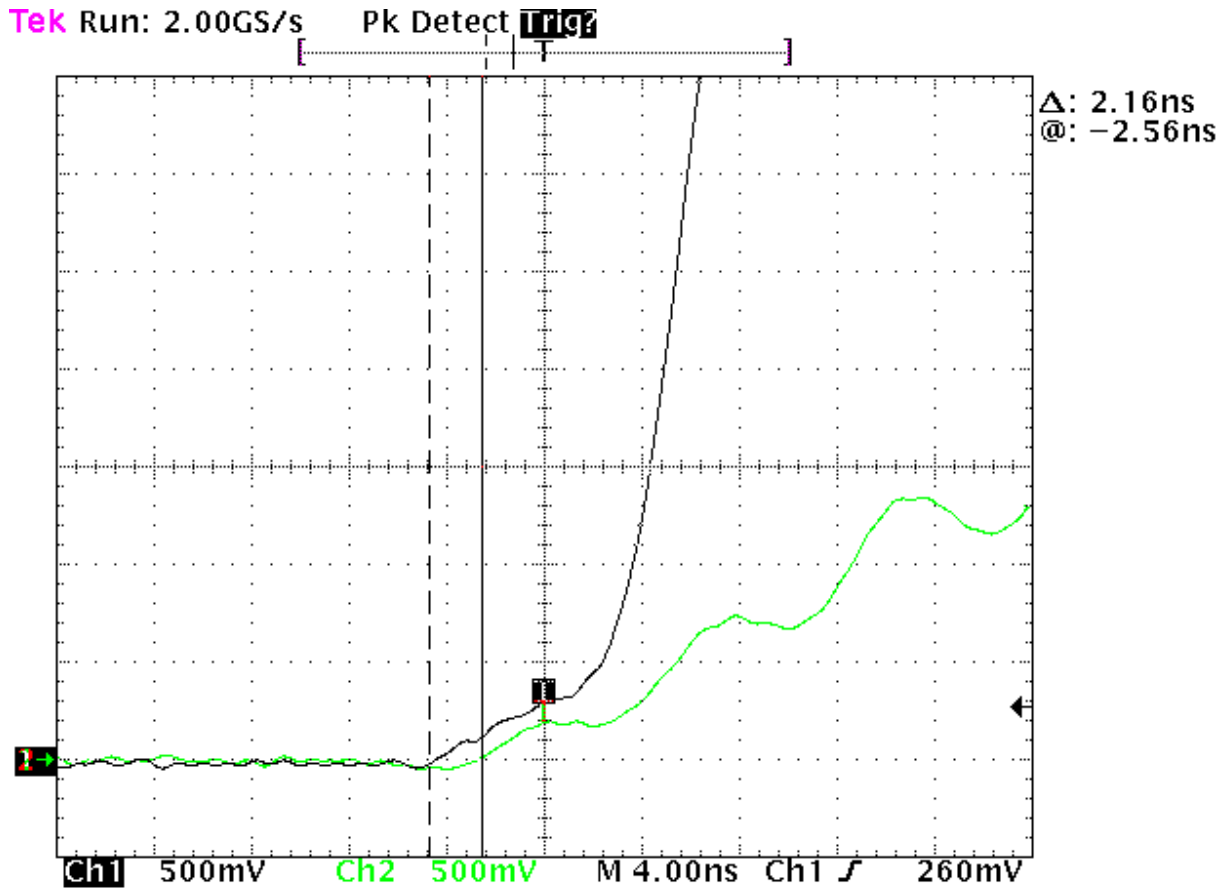
EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 4 Line 2 Test Plot



EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 4 Line 3 Test Plot





REPORT No.: 1902-051E
REVISION: B

EMI TEST REPORT FOR EMP SHIELD, LLC

Pulse Current Injection Testing			
Customer:	EMP Shield, LLC		
Date:	3/29/2019	Test Engineer:	M. Gennaro
Power:	NONE	Job Site:	Keystone Compliance
Test Specifications			
Test Spec.:	MIL-STD-188-125-1	Para./Sec.:	Appendix B

Intermediate Pulse Test Data Summary

Unit	Result	Notes
Unit 4	No Damage Or Degradation	None



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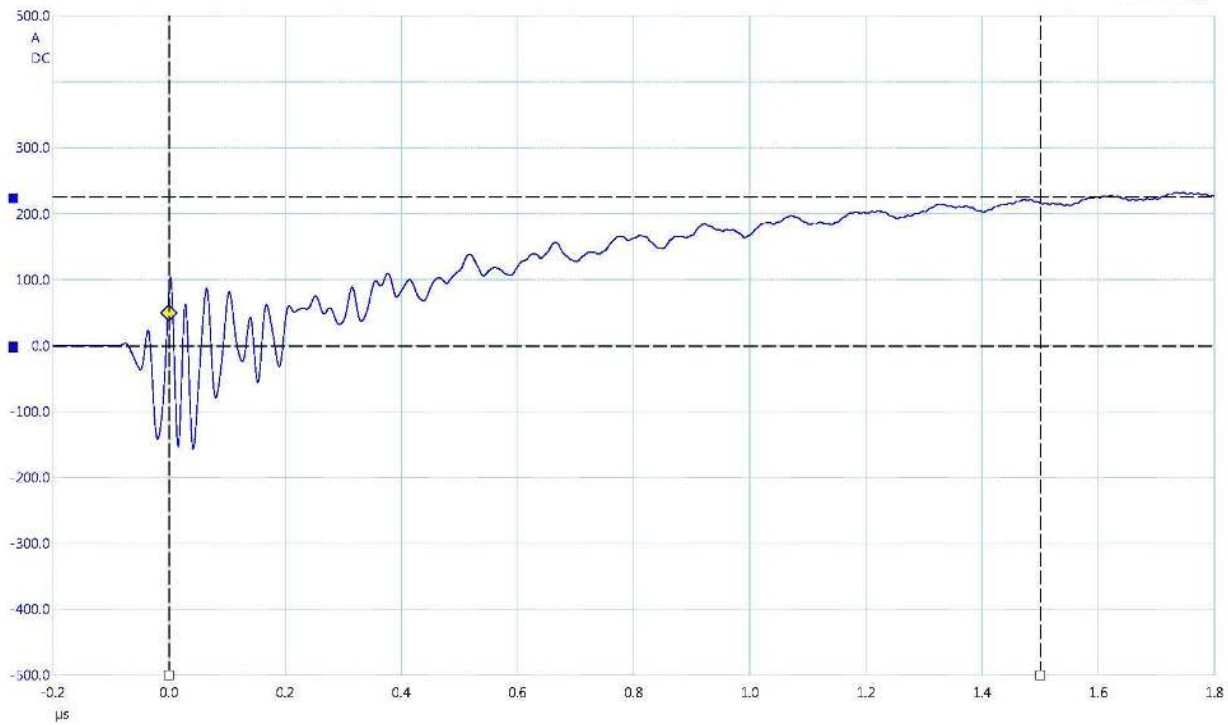
REPORT No.: 1902-051E
REVISION: B

EMI TEST REPORT FOR EMP SHIELD, LLC

Intermediate Pulse Data

EMI TEST REPORT FOR EMP SHIELD, LLC

Risetime Calibration Plot



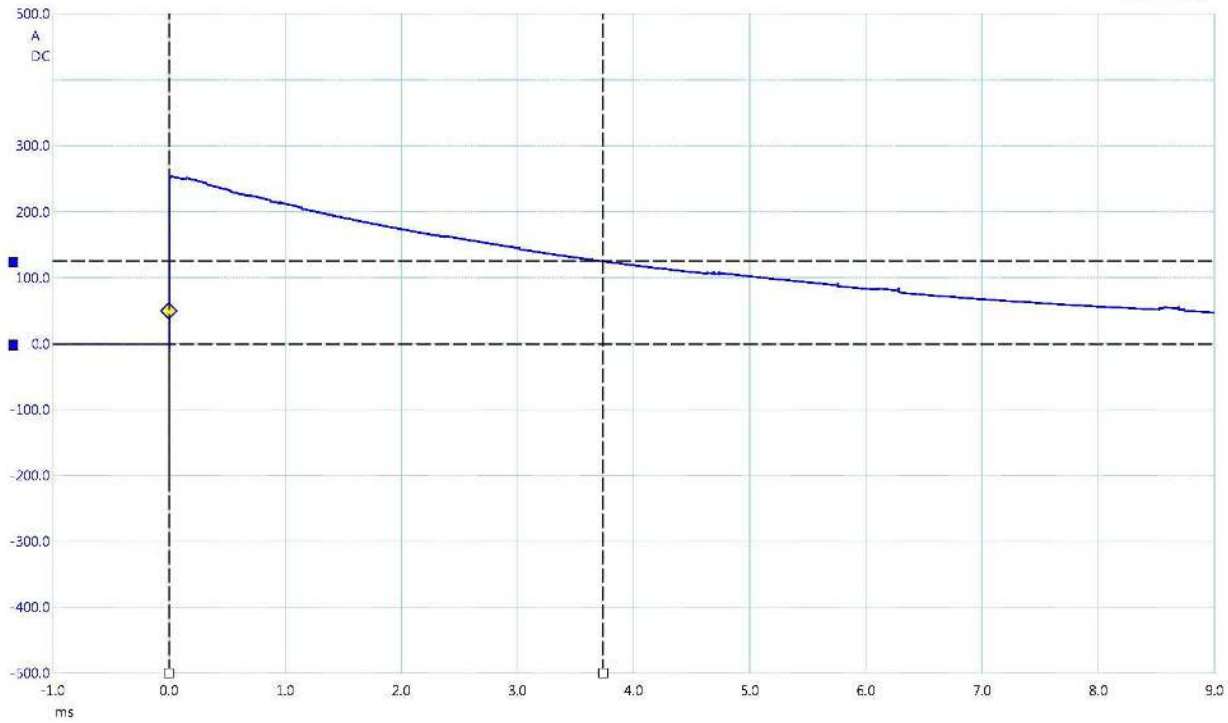
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Channel A	0.0 A	225.0 A	225.0 A	

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.4081 PicoScope 4824

EMI TEST REPORT FOR EMP SHIELD, LLC

Falltime Calibration Plot

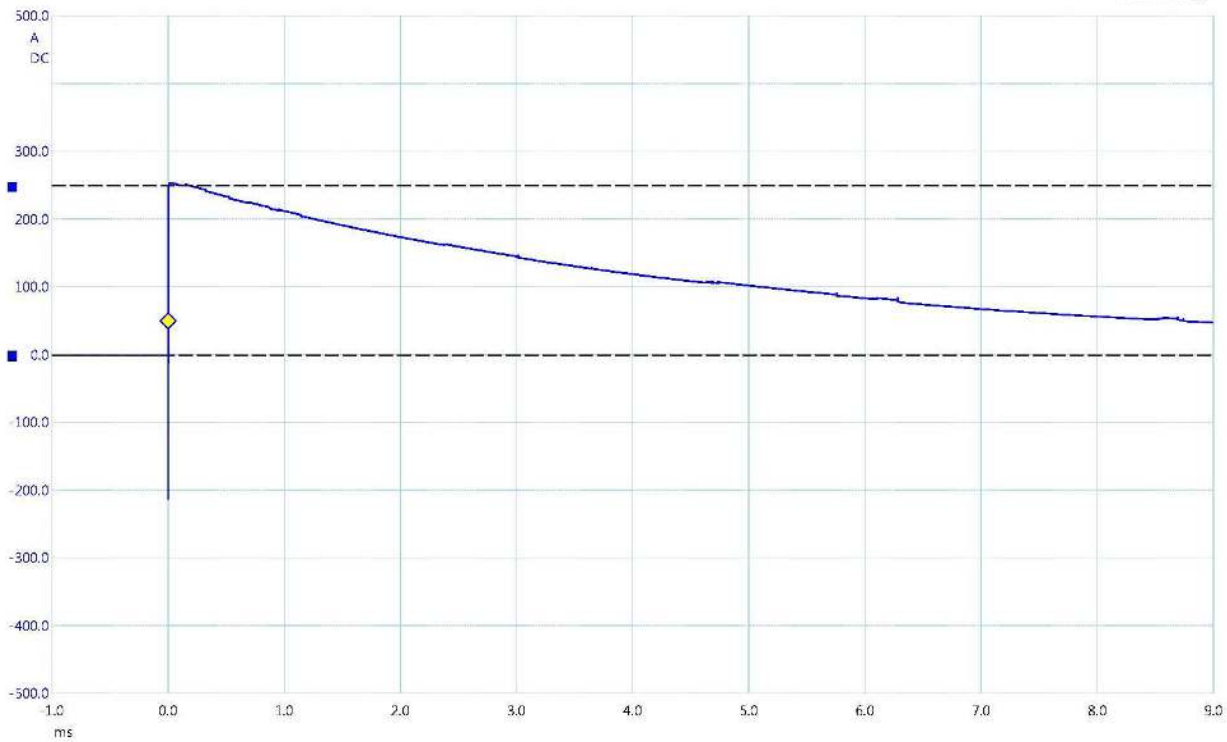


3/4/2019 10:56:12 AM

	1	2	Δ	1/ Δ
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Channel A	125.0 A	0.0 A	125.0 A	

EMI TEST REPORT FOR EMP SHIELD, LLC

Amplitude Calibration Plot



3/4/2019 10:56:12 AM

EMI TEST REPORT FOR EMP SHIELD, LLC

Unit 4 Data Table – Line 1

DC Breakdown Voltage								
Test Level(A)	Line Configuration	L1-G Pre-Test(VDC)	L1-L2 Pre-Test(VDC)	L1-L3 Pre-Test(VDC)	Test Current(A)	L1-G Post-Test(VDC)	L1-L2 Post-Test(VDC)	L1-L3 Post-Test(VDC)
50	L1-G/N	55	328	328	23.54	55	329	318
100	L1-G/N	55	329	329	72.5	55	330	318
150	L1-G/N	55	330	329	129	55	330	318
200	L1-G/N	55	330	330	181.7	55	330	318
250	L1-G/N	55	331	330	228.8	55	331	319

Unit 4 Data Table – Line 2

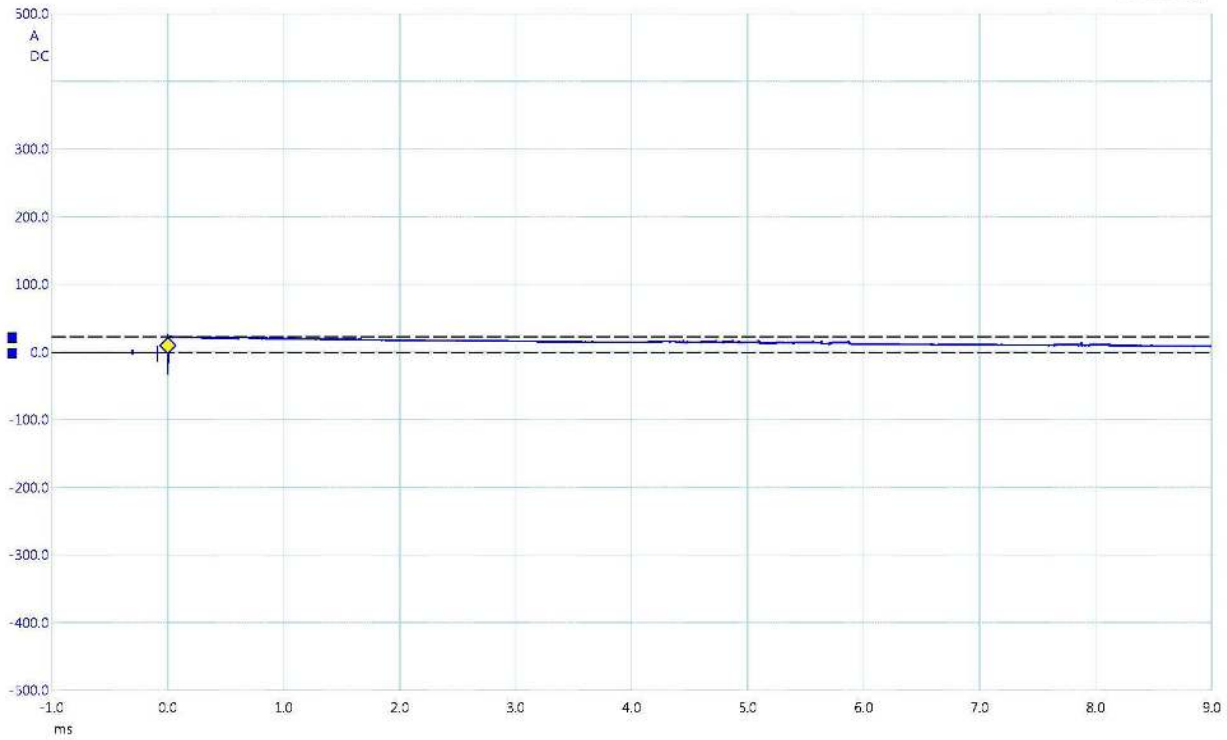
DC Breakdown Voltage								
Test Level(A)	Line Configuration	L2-G Pre-Test(VDC)	L2-L1 Pre-Test(VDC)	L2-L3 Pre-Test(VDC)	Test Current(A)	L2-G Post-Test(VDC)	L2-L1 Post-Test(VDC)	L2-L3 Post-Test(VDC)
50	L2-G/N	55	328	328	23.54	55	329	329
100	L2-G/N	55	329	329	72.5	55	330	329
150	L2-G/N	55	330	329	129	55	330	330
200	L2-G/N	55	330	330	181.7	55	330	330
250	L2-G/N	55	331	330	226.9	55	331	331

Unit 4 Data Table – Line 3

DC Breakdown Voltage								
Test Level(A)	Line Configuration	L3-G Pre-Test(VDC)	L3-L1 Pre-Test(VDC)	L3-L2 Pre-Test(VDC)	Test Current(A)	L3-G Post-Test(VDC)	L3-L1 Post-Test(VDC)	L3-L2 Post-Test(VDC)
50	L3-G/N	55	328	328	23.54	55	329	329
100	L3-G/N	55	329	329	72.5	55	329	329
150	L3-G/N	55	330	329	129	55	330	330
200	L3-G/N	55	330	330	181.7	55	330	330
250	L3-G/N	55	331	330	223.2	55	331	331

EMI TEST REPORT FOR EMP SHIELD, LLC

L1-G 20% Plot



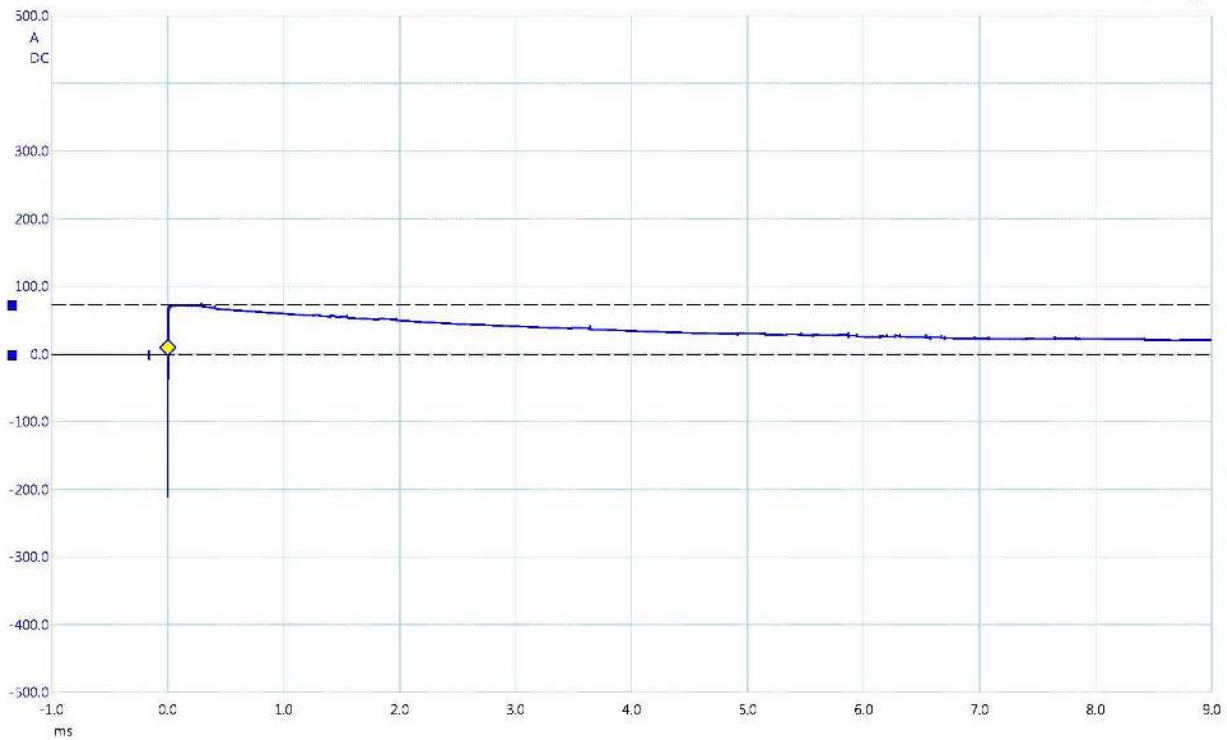
3/29/2019 9:43:58 AM

1 2 Δ
Channel A 0.0 A 23.54 A 23.54 A

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.1081 PicoScope 4821

EMI TEST REPORT FOR EMP SHIELD, LLC

L1-G 40% Plot



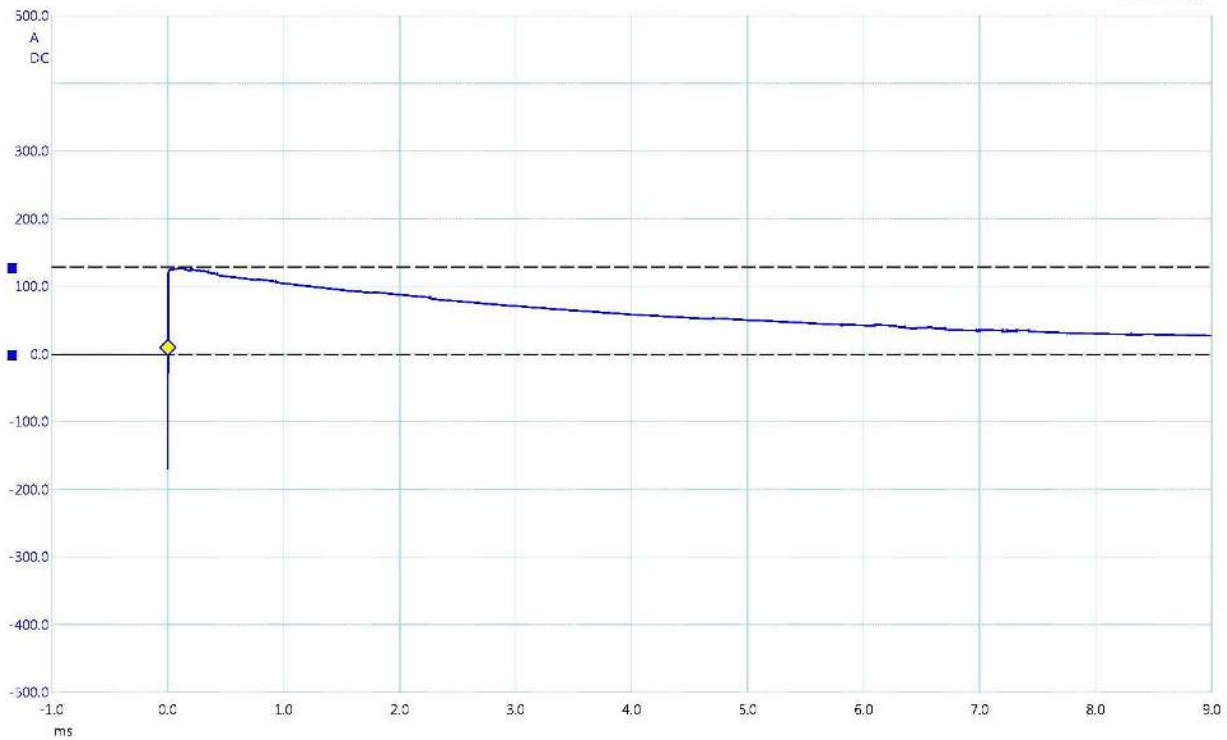
3/29/2019 9:51:12 AM

1 2 Δ
Channel A 0.0 A 72.5 A 72.5 A

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.1081 PicoScope 4824

EMI TEST REPORT FOR EMP SHIELD, LLC

L1-G 60% Plot



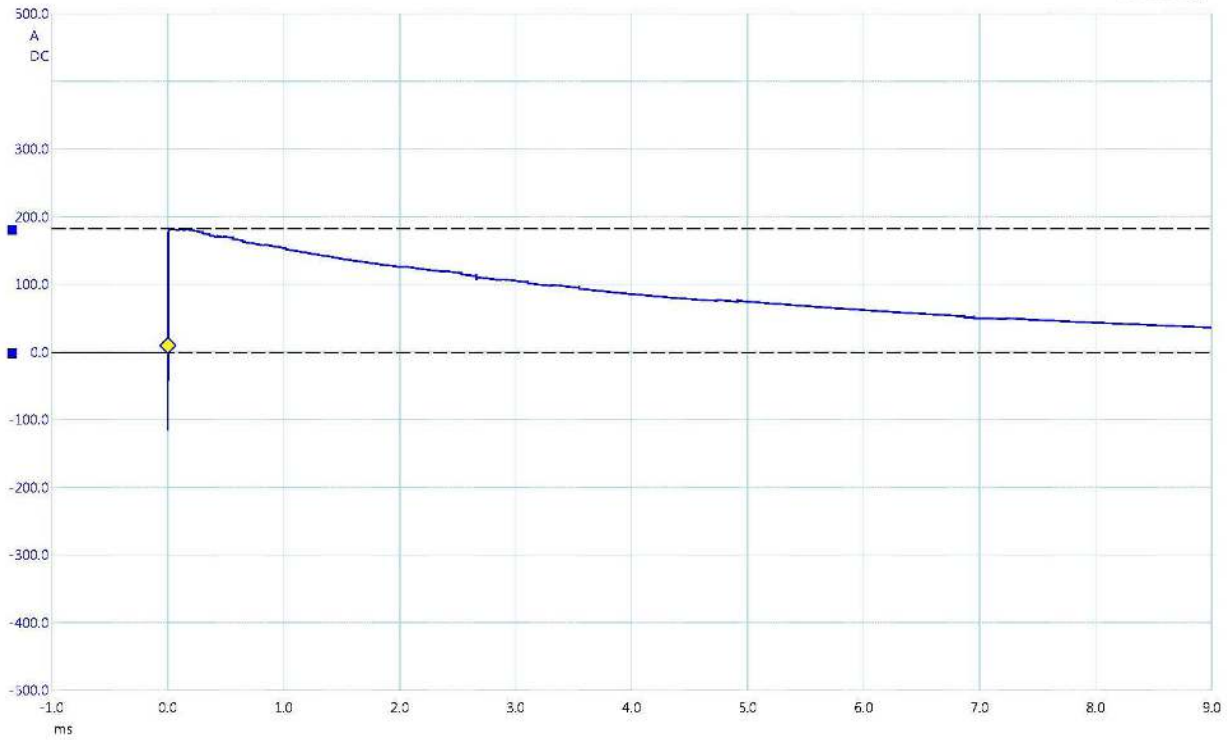
3/29/2019 9:56:54 AM

1 2 Δ
Channel A 0.0 A 129.0 A 129.0 A

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.1081 PicoScope 4821

EMI TEST REPORT FOR EMP SHIELD, LLC

L1-G 80% Plot



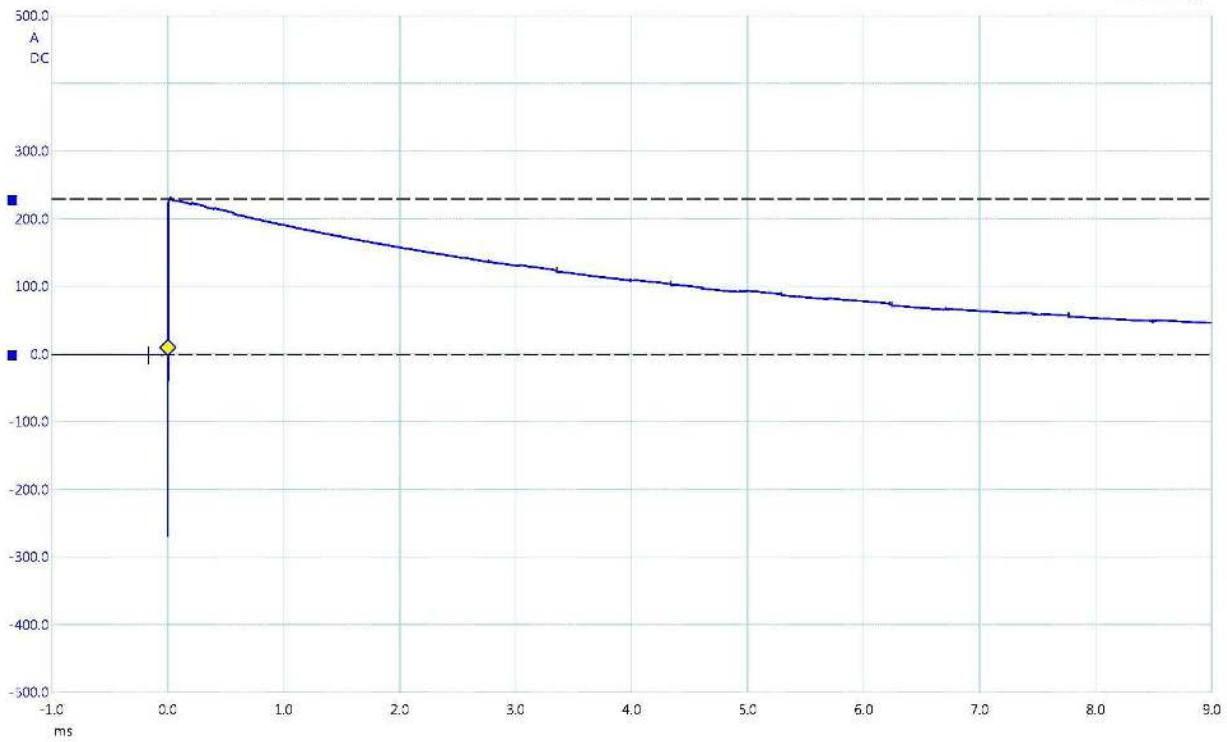
3/29/2019 10:03:37 AM

1 2 Δ
Channel A 0.0 A 181.7 A 181.7 A

Pico Technology www.picotech.com PicoScope 6 Version 6.13.15.1081 PicoScope 4824

EMI TEST REPORT FOR EMP SHIELD, LLC

L1-G 100% Plot



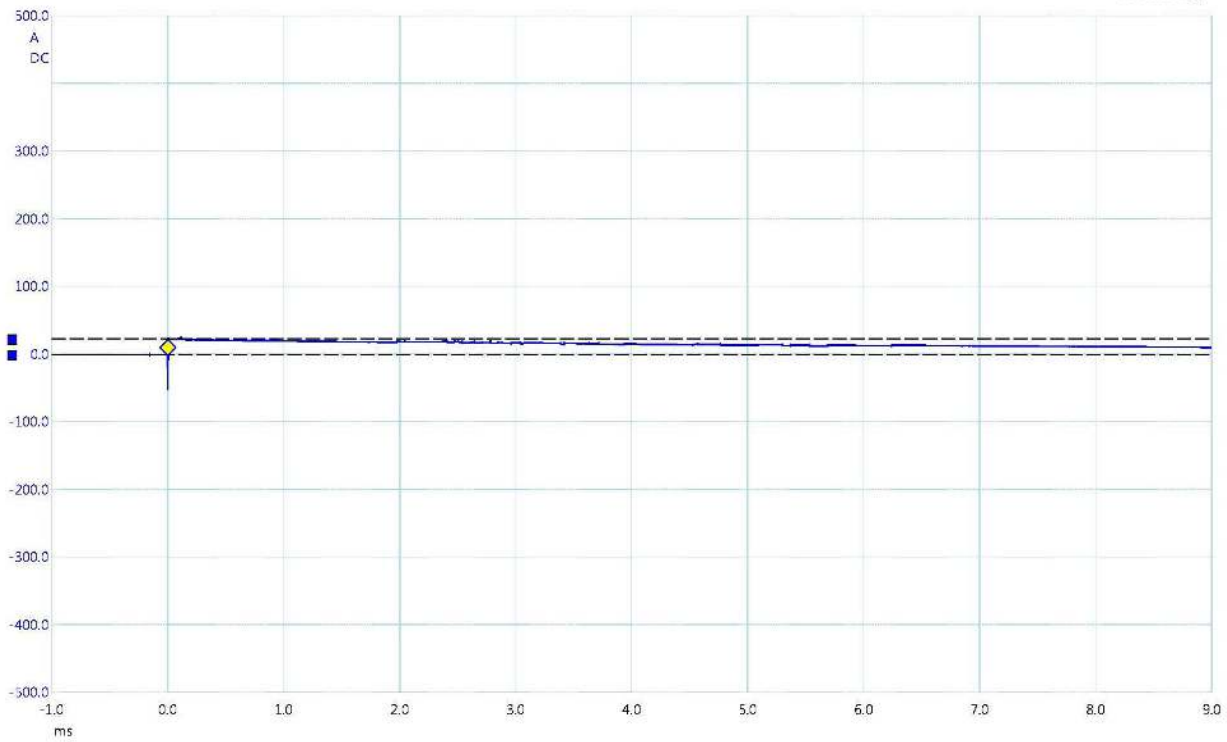
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EMI TEST REPORT FOR EMP SHIELD, LLC

L2-G 20% Plot



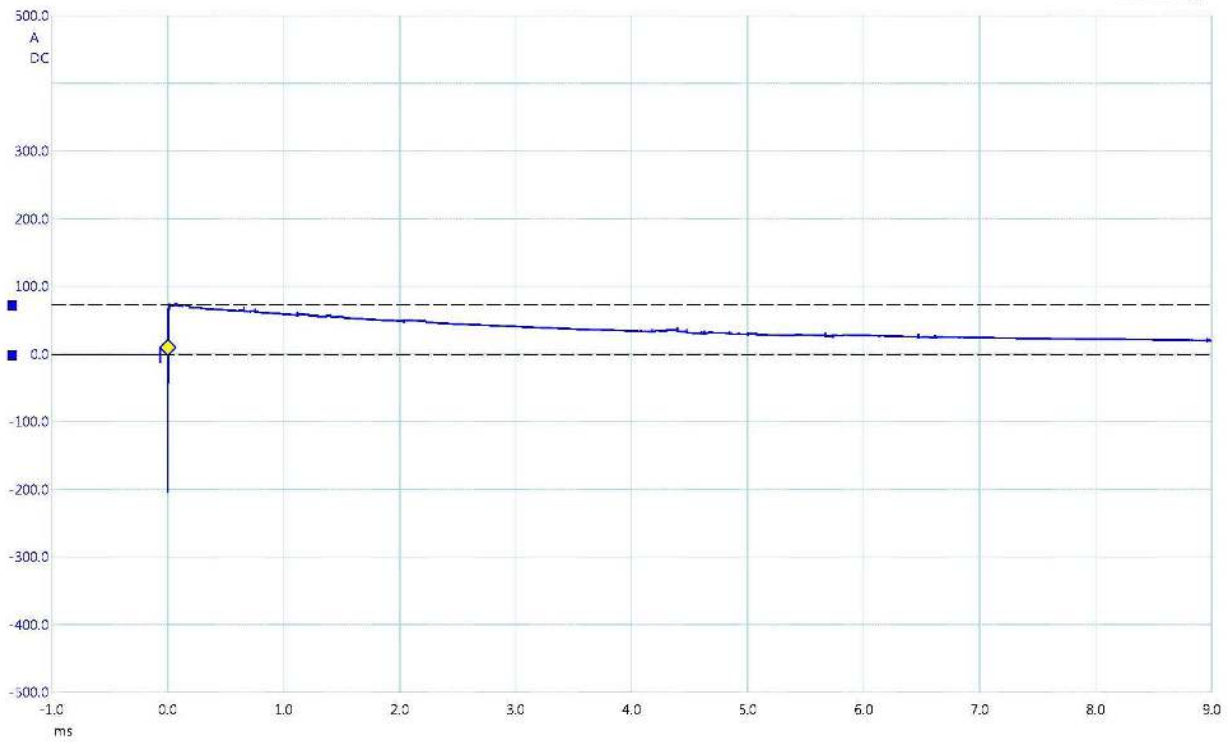
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EMI TEST REPORT FOR EMP SHIELD, LLC

L2-G 40% Plot



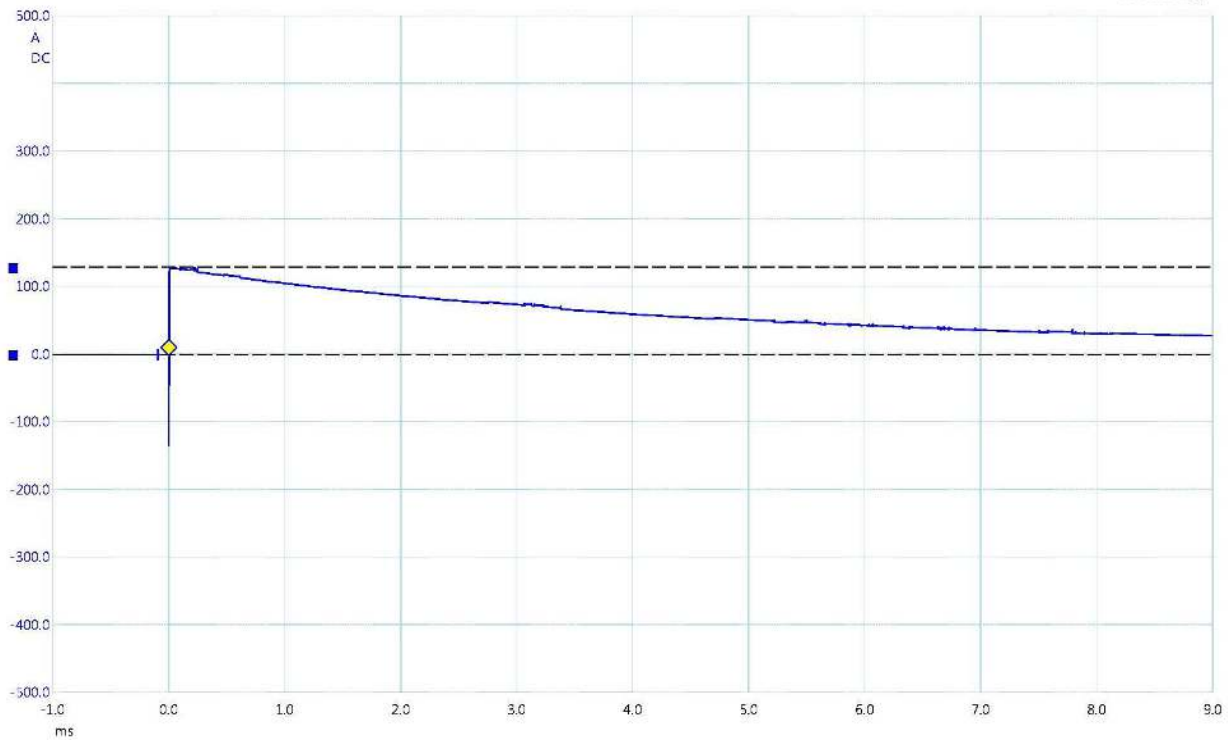
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EMI TEST REPORT FOR EMP SHIELD, LLC

L2-G 60% Plot



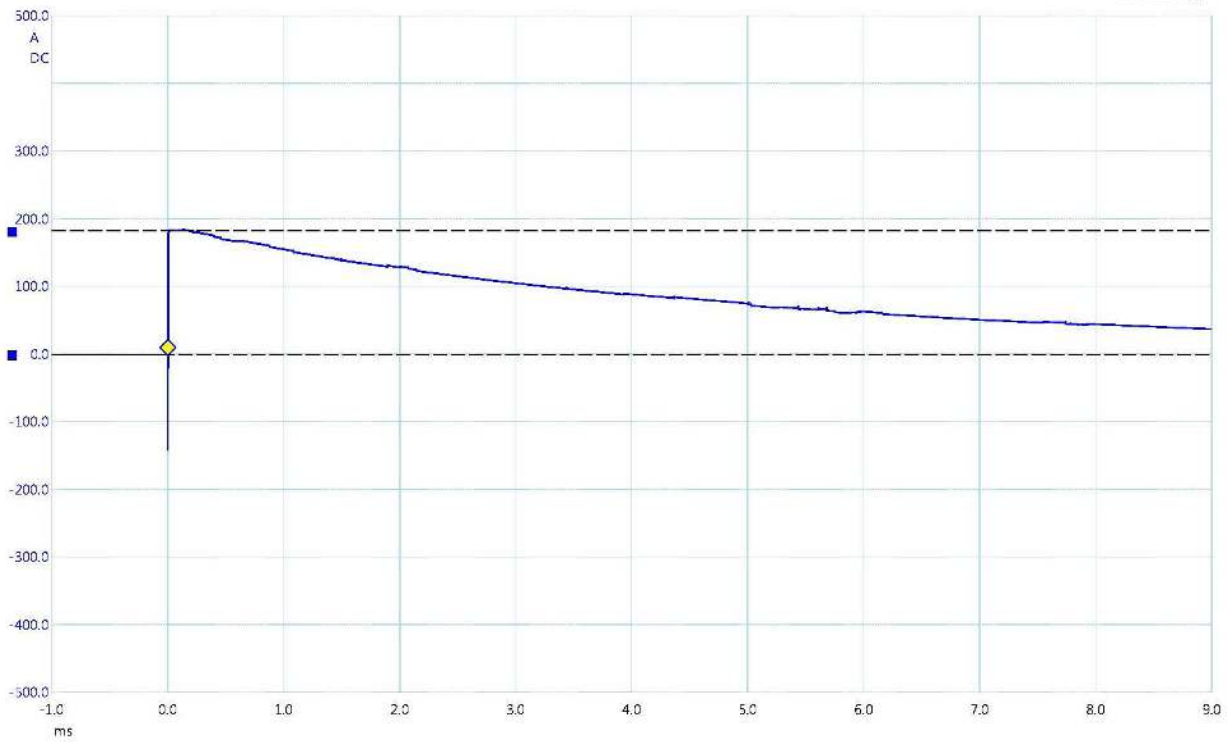
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EMI TEST REPORT FOR EMP SHIELD, LLC

L2-G 80% Plot



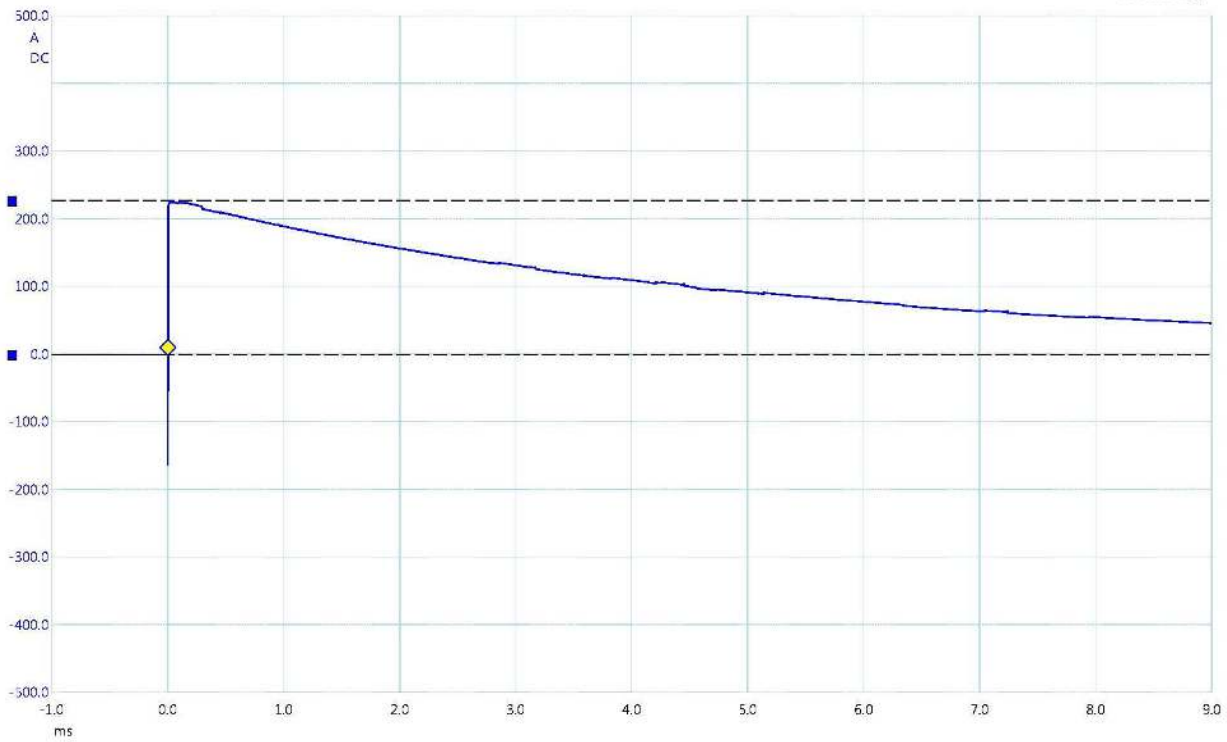
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1 2 Δ
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EMI TEST REPORT FOR EMP SHIELD, LLC

L2-G 100% Plot



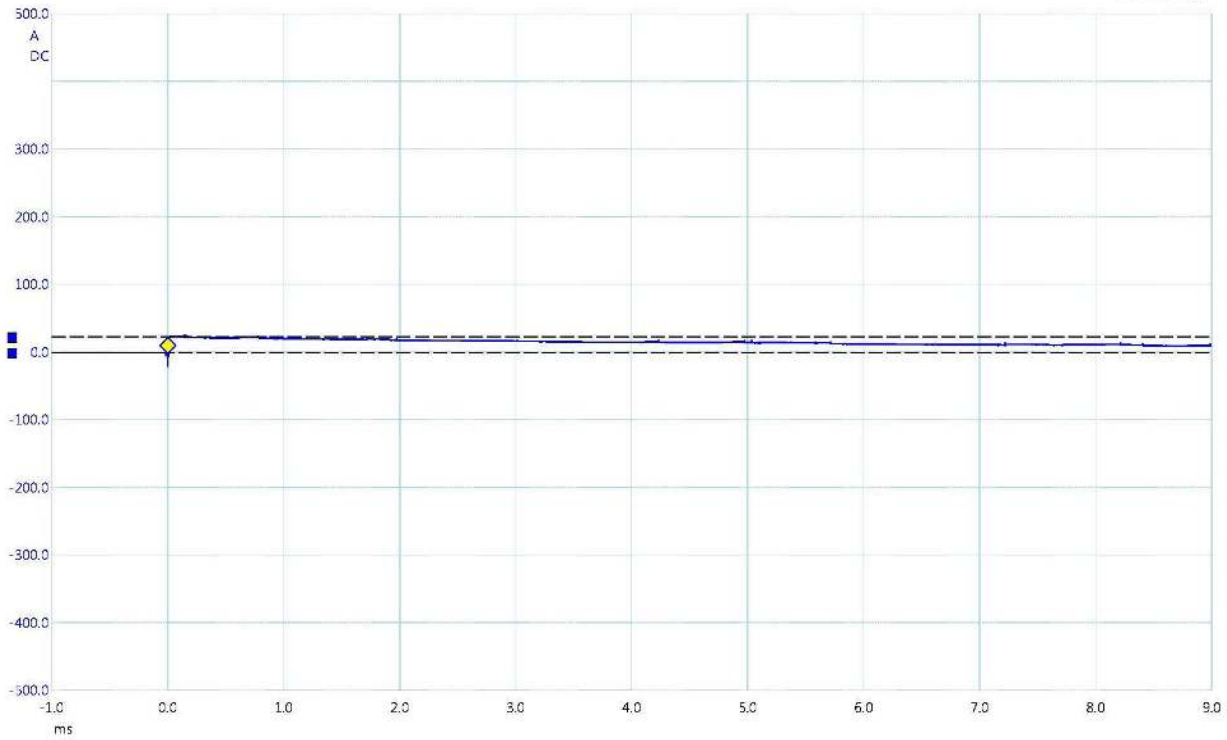
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EMI TEST REPORT FOR EMP SHIELD, LLC

L3-G 20% Plot

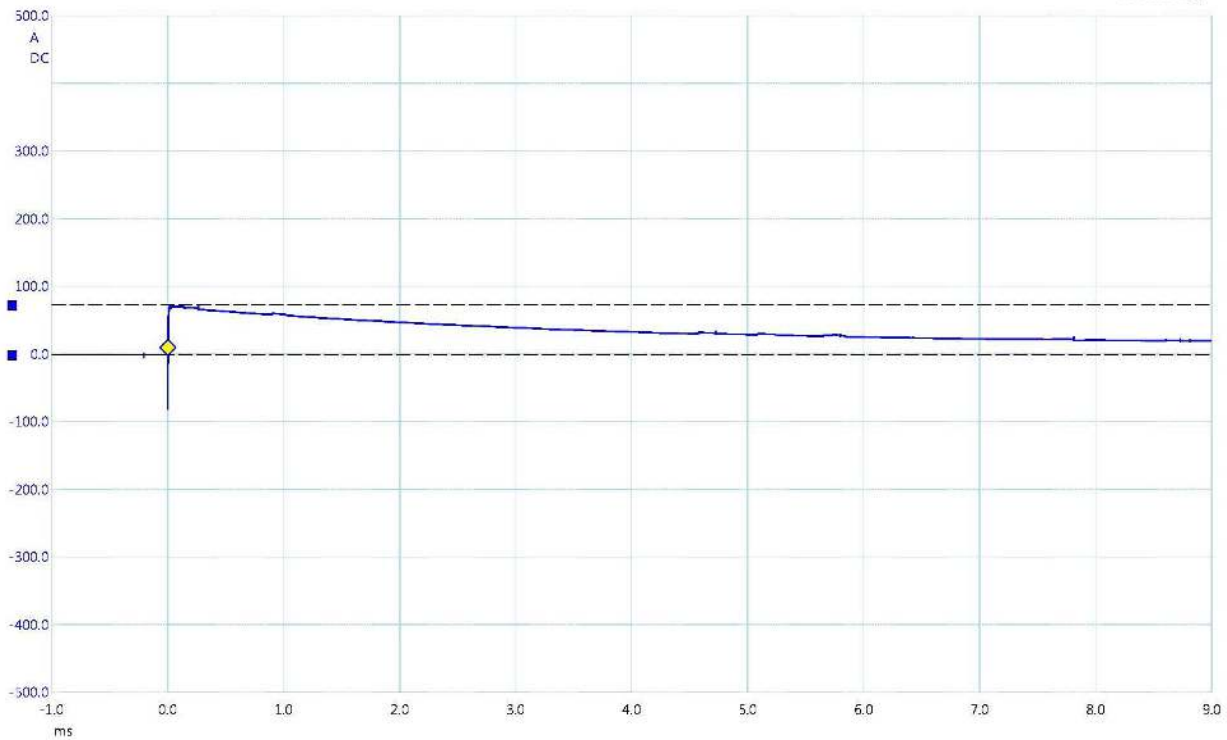


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EMI TEST REPORT FOR EMP SHIELD, LLC

L3-G 40% Plot

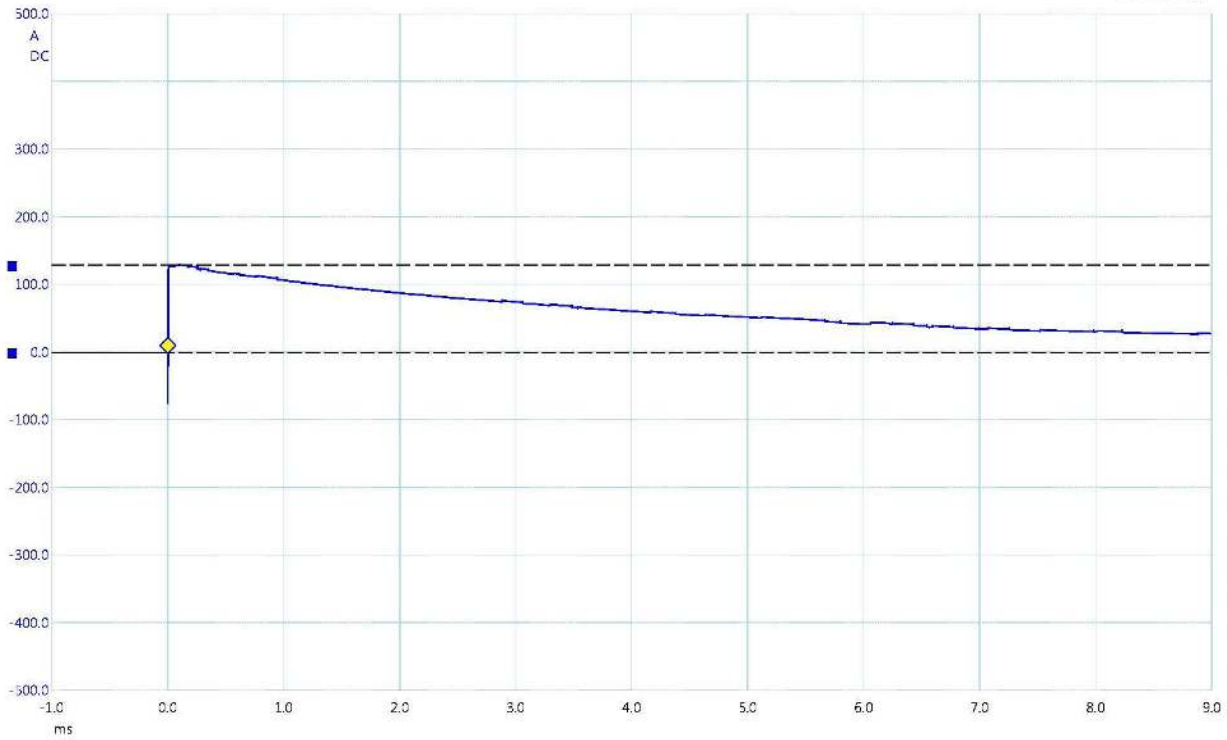


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EMI TEST REPORT FOR EMP SHIELD, LLC

L3-G 60% Plot



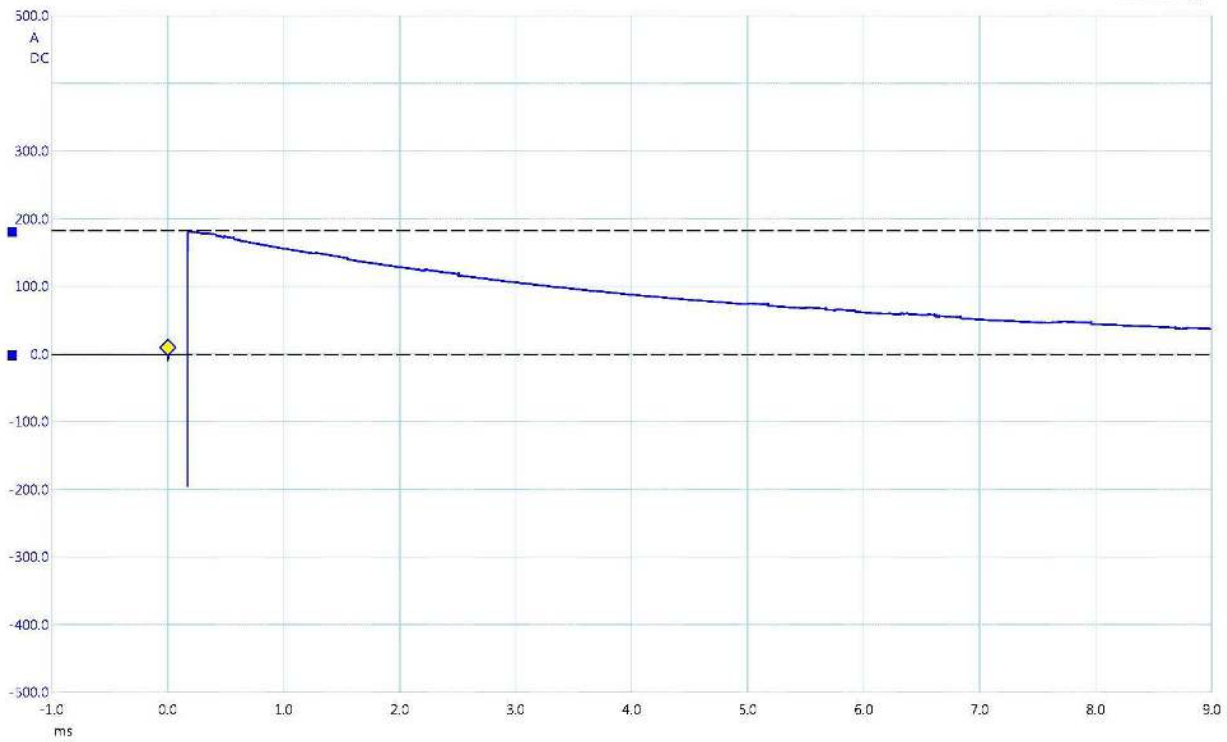
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EMI TEST REPORT FOR EMP SHIELD, LLC

L3-G 80% Plot



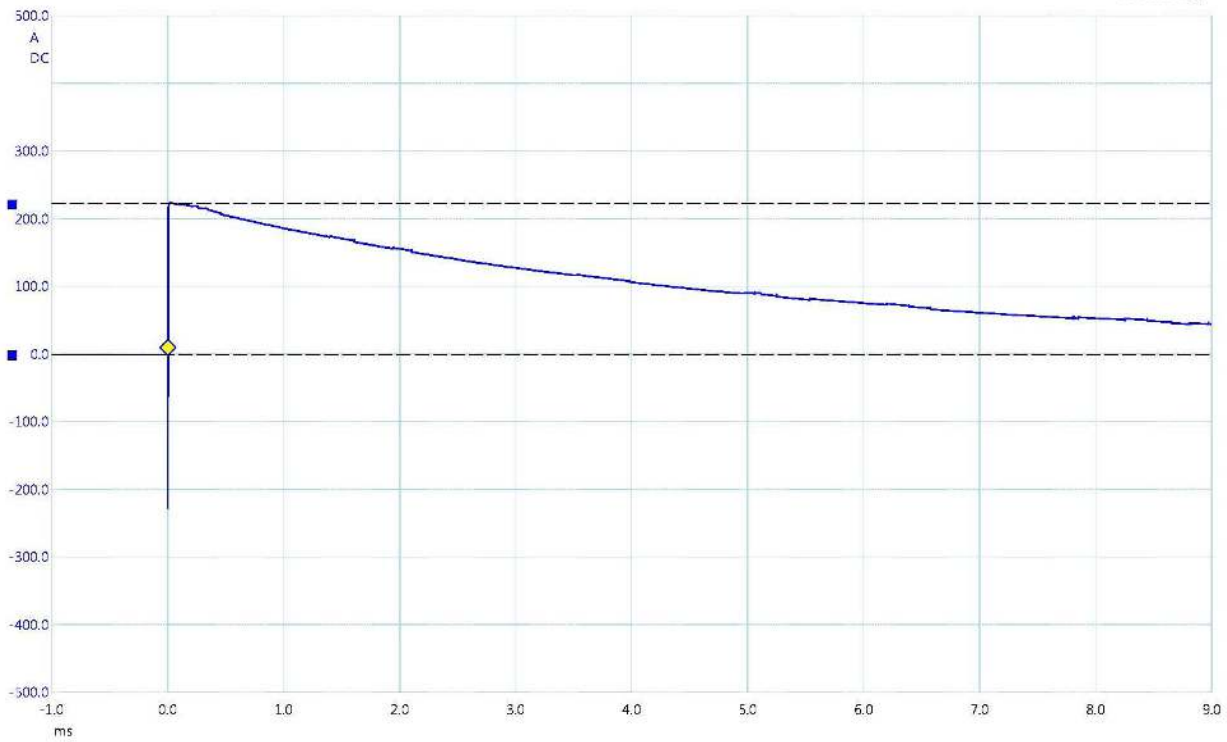
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EMI TEST REPORT FOR EMP SHIELD, LLC

L3-G 100% Plot

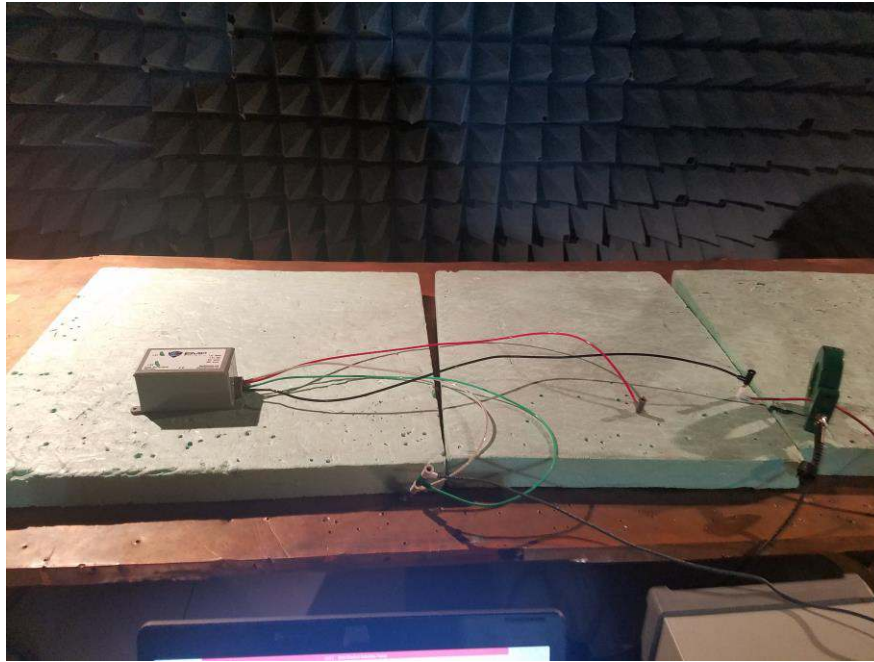


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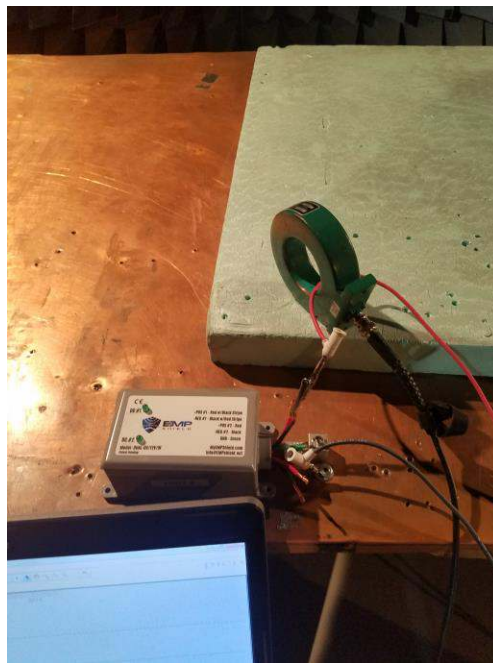
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Channel A 0.0 A 225.2 A 225.2 A

EMI TEST REPORT FOR EMP SHIELD, LLC

3.1.3 PULSED CURRENT INJECTION TEST PHOTOGRAPHS

Pulsed Current Injection

Test Setup
Intermediate Pulse
Unit 1


Pulsed Current Injection

Test Setup
Intermediate Pulse
Unit 2

EMI TEST REPORT FOR EMP SHIELD, LLC

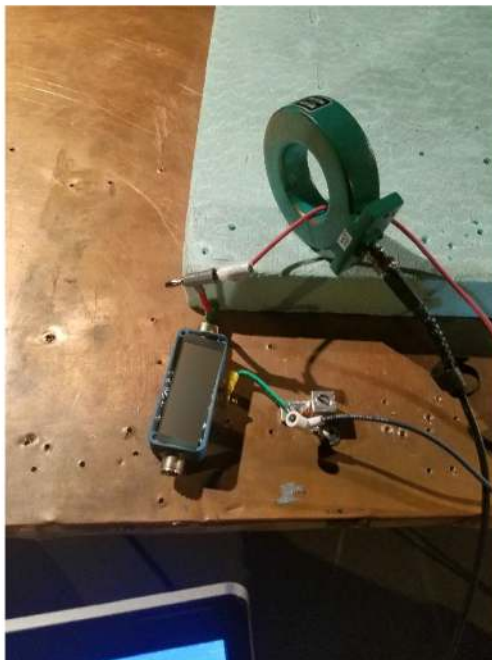


Pulsed Current Injection

Test Setup

Intermediate Pulse

Unit 3



Pulsed Current Injection

Test Setup

Intermediate Pulse

Coax 1



Intermediate Pulse

Coax 2



Short Pulse

Unit 1

EMI TEST REPORT FOR EMP SHIELD, LLC

Pulsed Current Injection
Test Setup
Short Pulse
Unit 2

Pulsed Current Injection
Test Setup
Short Pulse
Unit 3

EMI TEST REPORT FOR EMP SHIELD, LLC


Pulsed Current Injection
Test Setup
Short Pulse
Unit 4

Pulsed Current Injection
Test Setup
Short Pulse
Coax 1

EMI TEST REPORT FOR EMP SHIELD, LLC



Pulsed Current Injection

Test Setup

Short Pulse

Coax 2



Pulsed Current Injection

Test Setup

Intermediate Pulse

Unit 4

EMI TEST REPORT FOR EMP SHIELD, LLC

3.2 RS105 TEST

- a) The RS105 requirement for the See Units Tested Table is specified in MIL-STD-461G / MIL-STD-464C .
- b) The RS105 test equipment used to test the See Units Tested Table is located in Paragraph 3.2.1 of this document.
- c) All recorded test data for the RS105 test on the See Units Tested Table is located in Paragraph 3.2.2 of this document.
- d) The RS105 test photograph for the See Units Tested Table is located in Paragraph 3.2.3 of this document.

EMI TEST REPORT FOR EMP SHIELD, LLC

3.2.1 RS105 TEST EQUIPMENT LOG

Equipment Log	
Customer:	EMP Shield, LLC
Date:	3/13/19
Test Engineer:	M. Gennaro
Test:	RS105

Test Equipment					
Asset No.	Description	Manufacturer	Model	Serial No.	Cal. Due
ED003	Digital Oscilloscope	Tektronix	TDS754A	B010876	5/30/2019
EU000	WaveStar (Version 2.9)	Tektronix	None	None	UWCE
EF103	RS105 Generator	Keystone	None	None	CBU
EE055	D-Dot Sensor	Prodyn	AD-30(A)	75	11/15/2020
EE056	Passive Integrator	Prodyn	None	None	11/15/2020
ED007	Oscilloscope Probe	Pintek	CP3308	None	7/10/2019
EJ042	Oscilloscope Probe	Pintek	CP3308	None	7/10/2019
EE057	RS105 Antenna	Keystone	None	None	UWCE

UWCE: Used With Calibrated Equipment

CBU: Calibrate Before Use

EMI TEST REPORT FOR EMP SHIELD, LLC

3.2.2 RS105 TEST DATA

RS105 Data Sheet			
Customer:	EMP Shield, LLC		
Date:	3/13/19	Test Engineer:	M. Gennaro
Power:	None	Job Site:	Keystone Compliance
Test Specifications			
Test Spec.:	MIL-STD-461G / MIL-STD-464C	Para./Sec.:	5.21
Probe Cal Factor:	.004427 V per kV/m	Category/Limits:	50kV/m
Levels Tested kV/m:	50kV/m, ~90kV/m		

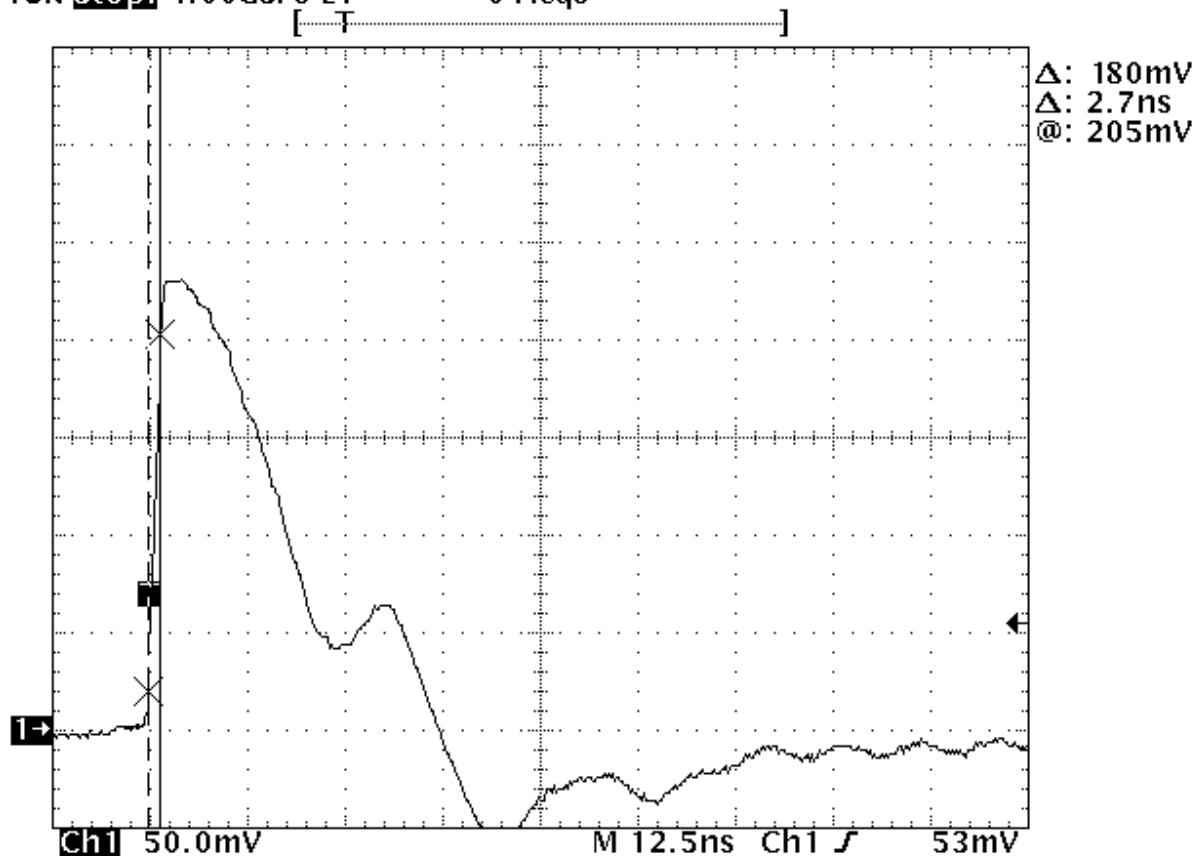
Test Data

EUT Operating Modes
Normal

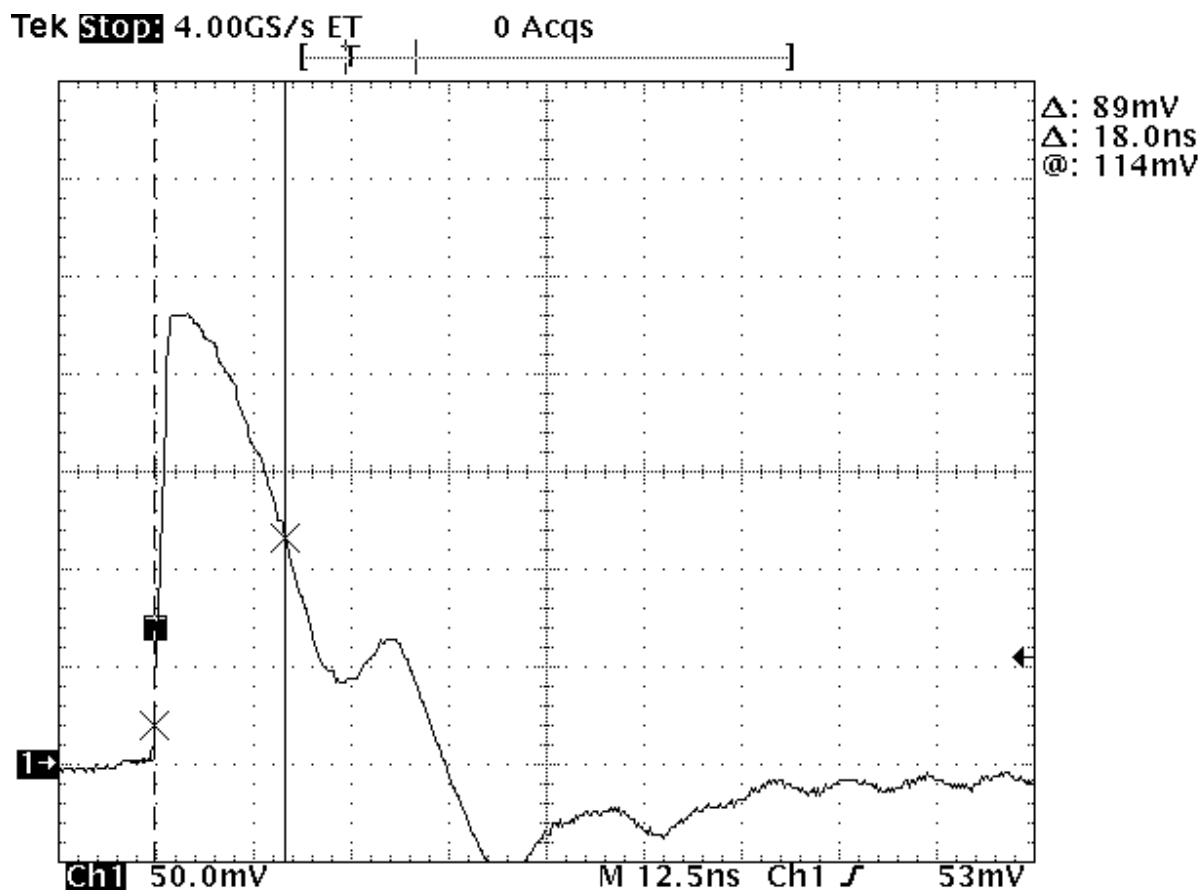
Comments
Unit 1 Only
Deviations From Test Standard
N/A
Results
Complied

EMI TEST REPORT FOR EMP SHIELD, LLC

Risetime Calibration Plot

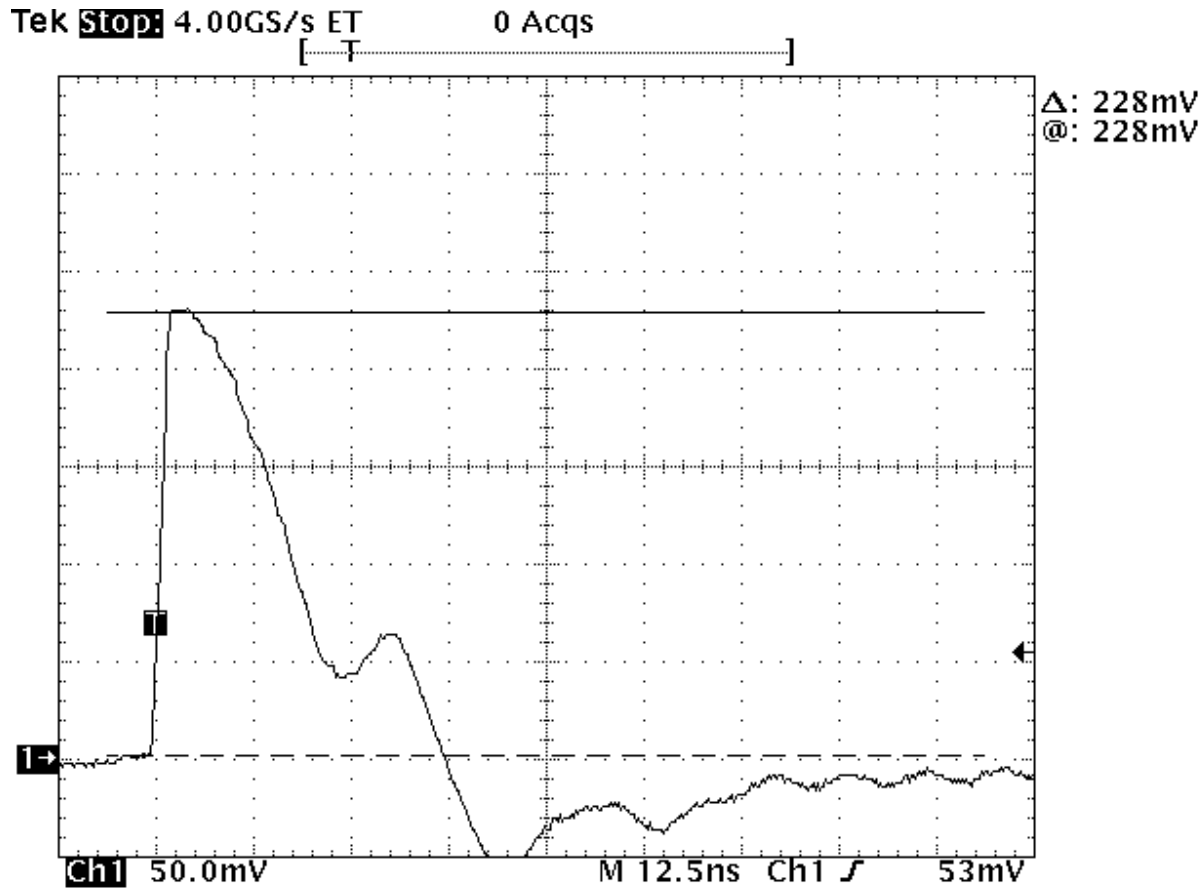
 Tek **Stop:** 4.00GS/s ET 0 Acqs


EMI TEST REPORT FOR EMP SHIELD, LLC

Falltime Calibration Plot


EMI TEST REPORT FOR EMP SHIELD, LLC

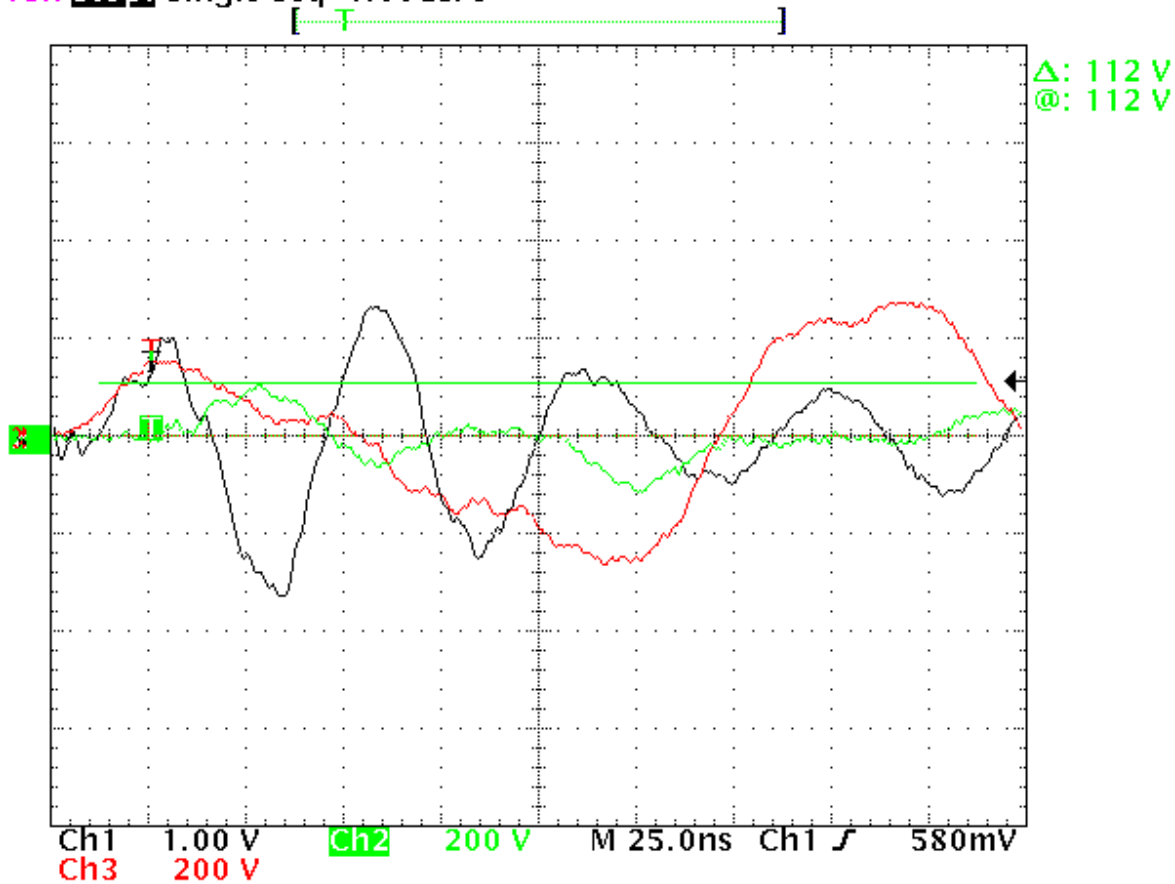
Amplitude Calibration Plot



EMI TEST REPORT FOR EMP SHIELD, LLC

Measurement at Breaker Plot

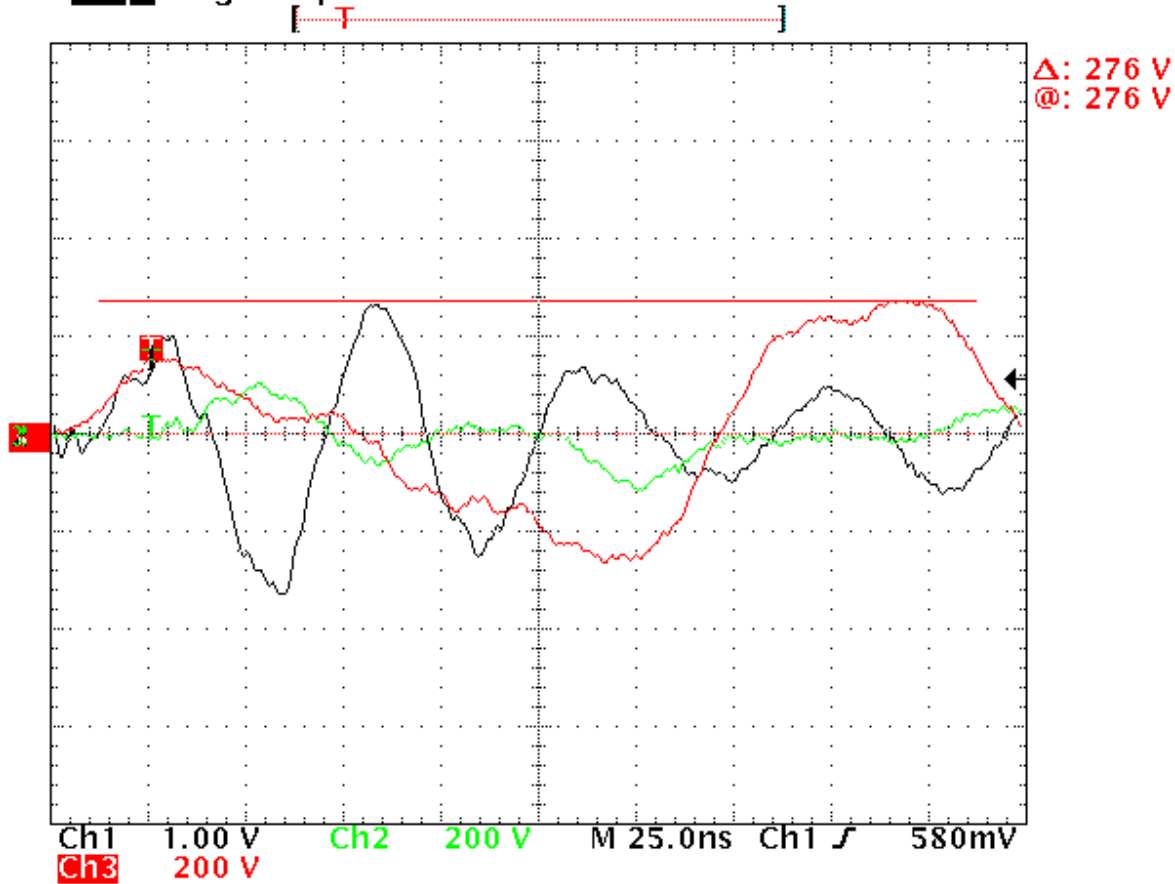
Tek Stop: Single Seq 1.00GS/s



EMI TEST REPORT FOR EMP SHIELD, LLC

Measurement at End Of 250 Feet Of Romex Plot

Tek Stop: Single Seq 1.00GS/s



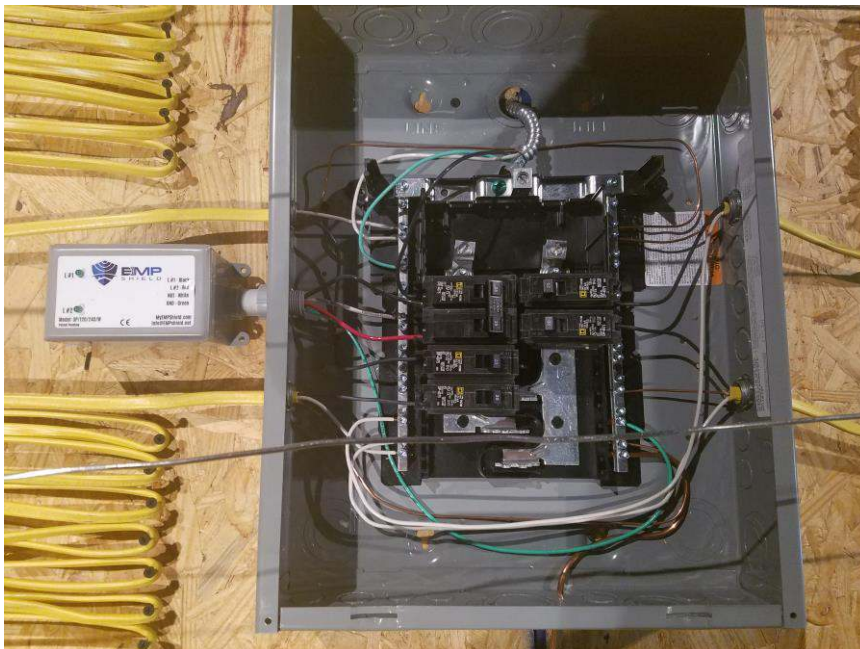
EMI TEST REPORT FOR EMP SHIELD, LLC

3.2.3 RS105 TEST PHOTOGRAPHS



RS105

Test Setup



RS105

Test Setup

EMI TEST REPORT FOR EMP SHIELD, LLC

SECTION 4 – CONCLUSION

- a) The See Units Tested Table, Model Number: N/A; Part Number: N/A; Serial Number: N/A, was subjected to the following EMC Tests in accordance with MIL-STD-188-125-1, MIL-STD-461G & MIL-STD-464C and the specifications as shown in Table 2:

TABLE 2 TESTS PERFORMED & RESULTS

Test Description	Specification	Results
MIL-STD-188-125-1, MIL-STD-461G & MIL-STD-464C		
Pulsed Current Injection	MIL-STD-125-1	Complied
RS105	MIL-STD-461G / MIL-STD-464C	Complied

- b) The See Units Tested Table were returned to EMP Shield, LLC after completion of the EMI Test.