



**Shielding Effectiveness & EMP Survivability Test
 Report
 EMI ECE Gaskets
 TO MIL-DTL-83528H**

<i>Report No.</i> 26033	<i>Issue Date</i> April 1, 2021
<i>Revision</i> 1.0	<i>Page</i> 1 of 27

Shielding Effectiveness & EMP Survivability TEST REPORT

Test Specification : MIL-DTL-83528H
Manufacturer : Specialty Silicone Products, Inc.
Test Samples : R+D 21-0133-AB (Type A)
R+D 21-0134-AB (Type K)

DOCUMENT HISTORY				
REVISION	ISSUE DATE	AFFECTED PAGE(S)	DESCRIPTION OF MODIFICATIONS	REVISED BY
1.0	April 1, 2021		Initial release	



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**TEST REPORT NO. 26033
from
D.L.S. Electronic Systems,
Test for Specialty Silicone Products, Inc.**

WRITTEN BY Jereme Irwin	REVIEWED BY Jack Prawica	REVIEWED BY Brian Mattson

TEST PERSONNEL	TITLE
Jereme Irwin	EMC Test Engineer

TEST DATE(S)	March 26-30, 2021
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TEST FACILITY ADDRESS CITY, STATE, ZIP CODE PHONE FAX	D.L.S. Electronic Systems, 1250 Peterson Drive Wheeling, IL. 60090 (847) 537-6400 (847) 537-6488
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ADMINISTRATIVE SUMMARY

REASON FOR TEST:

To test the Shielding Effectiveness and EMP Survivability of two material types as specified in MIL-DTL-83528H.

TEST SPECIFICATION:

MIL-DTL 83528H GASKET MATERIAL, CONDUCTIVE, SHIELDING GASKET,
ELECTRONIC, ELASTOMER, EMI/RFI
GENERAL SPECIFICATION

DATE(S) OF TEST:

March 26-30, 2021

TEST SAMPLES:

A total of two unique sample was presented for testing. Refer to Section 2 of this report for a description of each test sample along with the manufacturer's designation.

MANUFACTURER: Specialty Silicone Products, Inc.
3 McCrea Hill Road
Ballston Spa, NY 12020

MANUFACTURERS REPRESENTATIVE:

Dominic Testo

DISPOSITION OF TEST SAMPLE:

Samples will be returned to SSP, Inc.

TEST LOCATION:

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

TEST PERSONNEL:

Jereme Irwin EMC Test Engineer

SUMMARY OF TEST RESULTS:

Test results can be found under Section 6. The EMP Waveforms and Shielding Effectiveness of the test samples can be found in data sheets located in Appendix C of this report.



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MANUFACTURER: 3

MANUFACTURERS REPRESENTATIVE: 3

DISPOSITION OF TEST SAMPLE: 3

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TEST PERSONNEL: 3

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INTRODUCTION

This report documents the results of a series of EMI/EMC measurements performed on the test samples described in Section 2 of this report. The purpose of this series of tests was to demonstrate compliance of the test sample(s) with the requirements of the MIL-DTL-83528H Specification for comparison data of one test sample using a MIL-DTL-83528H test fixture.

SECTIONS

SECTION 1 - CLIENT INFORMATION

<i>COMPANY NAME</i> <i>ADDRESS</i> <i>CITY, STATE ZIP</i>	Specialty Silicone Products, Inc. 3 McCrea Hill Road Ballston Spa, NY 12020
<i>CONTACT NAME</i> <i>PHONE</i> <i>EMAIL</i>	Dominic Testo 518-363-5034 dtesto@sspinc.com
<i>MANUFACTURER</i> <i>ADDRESS</i> <i>CITY, STATE ZIP</i>	Specialty Silicone Products, Inc. 3 McCrea Hill Road Ballston Spa, NY 12020



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SECTION 2 - PURPOSE OF TEST

The purpose of this series of tests was to verify the EMP Survivability and Shielding Effectiveness of the ECE sample.

SECTION 3 - TEST SAMPLE DESCRIPTION

The following table provides a list of each type of **EMP** material tested.

<i>NO.</i>	<i>Material</i>	<i>Type</i>
1.	R+D 21-0133-AB	Type A
	R+D 21-0134-AB	Type K

The following table provides a list of each type of **Shielding Effectiveness** material tested.

<i>NO.</i>	<i>Material</i>	<i>Type</i>
1.	R+D 21-0133-AB	Type A
	R+D 21-0134-AB	Type K



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SECTION 4 - TEST SITE; FACILITIES, CONDITIONS AND TOLERANCES

The EMP tests were performed through a test fixture designed to the MIL-DTL-83528H test specification. The test sample was placed in between the two half of the fixture applying 10% compression. A calibrated caliper was used to determine the proper compression amount. A 1MHz 900Ap-p pulse was generated into the fixture and verified with an oscilloscope.

The Shielding Effectiveness measurements were performed through a test fixture designed to the MIL-DTL-83528H test specification. The receive chamber and the control (transmit) chamber meets the applicable requirements of NSA65-6. AC power is supplied to each enclosure from a dedicated isolation transformer through low-pass line filters, which provide a minimum of 120 dB of attenuation from 10 kHz to 10 GHz.

SECTION 5 - TEST EQUIPMENT

A complete test system equipment list is provided in APPENDIX A of this report. The equipment absolute performance calibration, of the equipment requiring calibration, is performed on an as needed basis in accordance with MIL-STD-45662. However, calibration periods do not exceed one (1) year. The test equipment is capable of making measurements within tolerances of at least +/- 2 dB amplitude and +/-2% frequency deviation. Equipment certifications showing traceability to NIST (National Institute of Standards and Technology) are maintained on file at D.L.S. Electronic Systems in Wheeling, IL. All equipment is checked and verified for proper operation before and after each series of tests.

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SECTION 6 - TEST RESULTS

The following table lists the results for each of the **EMP** test samples.

Part Number	Pre-Test Ohms- cm	Post-Test Ohms- cm
R+D 21-0133-AB (Type A)		
Sample #1	0.004	0.004
Sample #2	0.005	0.005
Sample #3	0.005	0.005

Part Number	Pre-Test Ohms- cm	Post-Test Ohms- cm
R+D 21-0134-AB (Type K)		
Sample #1	0.004	0.004
Sample #2	0.005	0.005
Sample #3	0.004	0.004

The following table lists the results for each of the **Shielding Effectiveness** test samples.

NO.	Material	<i>MINIMUM ATTENUATION LEVEL (dB)</i>	<i>BEST-CASE ATTENUATION LEVEL (dB)</i>
1.	R+D 21-0133-AB (Type A)	115 @ 20MHz	146 @ 200MHz
	R+D 21-0134-AB (Type K)	117 @ 20MHz	148 @ 80MHz



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APPENDIX A - TEST EQUIPMENT

A.1 Specific Equipment Used

TEST INSTRUMENTATION

TABLE 1

Description	Manufacturer	Model Number	Serial Number	Range	Cal On	Cal Due Dates
Meter, MilliOhm	Quad Tech	1880	1261146	1Microohm- 2Megaohm	01/12/2021	01/12/2022
Oscilloscope, Digital, 1.5GHz	Agilent Technologies	54845A	US40000305	DC- 2.25GHz, 8MS/s	06/22/2020	06/22/2021
Probe, Current, Injection	Fischer Custom Communications	F-120- 9A	342	10kHz- 230MHz	03/30/2021	03/30/2022
Probe, Current, Rogowski	PEM	CWT 6R	6997-8287	1200A	01/12/2021	01/12/2021
Test Fixture	DLS Electronic Systems	EMP	01	N/A	03/30/2021	03/30/2022
Digital Caliper	Mitutoyo	CD- 6inch- CS	RS000108	0-6 inches	10/27/2020	10/27/2021

All primary equipment is calibrated against known reference standards with a verified traceable path NIST.



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TABLE 2

Description	Manufacturer	Model Number	Serial Number	Range	Cal On	Cal Due Dates
Antenna, Biconical	Electro-Metrics	BIA-25	2727	20MHz-300MHz	01/27/2021	01/27/2023
Antenna, Horn	Electro-Metrics	3106	9501-2607	200MHz-2GHz	09/24/2020	09/24/2022
Antenna, Horn	EMCO	3106	2127	200MHz-2GHz	01/22/2021	01/22/2023
Antenna, Horn	ETS-Lindgren	3115	2479	1GHz-18GHz	03/26/2021	03/26/2021
Antenna, Horn	ETS-Lindgren	3117	00055158	1GHz-18GHz	11/03/2020	11/03/2022
Attenuator, RF, 10dB	JFW Industries	50FH-010-10	031	DC-1GHz	09/09/2020	09/09/2021
Generator, Signal,	Rohde & Schwarz	SML 03	101121	9kHz-3.3GHz	11/16/2020	11/16/2021
Generator, Signal	Rohde & Schwarz	SMR40	100092	1-40GHz	04/27/2020	04/27/2021
Spectrum Analyzer	Agilent Technologies	E4446A	MY46186619	3Hz-44GHz	01/12/2021	01/12/2022

TABLE 3

Description	Manufacturer	Model Number	Serial Number	Range
Amplifier, RF, Power	Amplifier Research	2500LM11	22714	10kHz-220MHz
Amplifier, RF, Power	Amplifier Research	500W1000	309687	80MHz-1000MHz
Antenna, Biconical	EMCO	3109	9803-3163	20MHz-300MHz



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APPENDIX B - DESCRIPTION OF TEST METHODS

B.1 - EMP Survivability Test Methods

The sample is placed in a test fixture and the gasket is compressed 10%. A 1MHz pulse is applied at 900A P-P. A before and after resistance measurement is taken, and then inspected for damage (if any) after the test. Any spare samples are then tested for repeatability.

B.2 – Shielding Effectiveness Test Methods

The shielding effectiveness measurements were made using a spectrum analyzer and a signal generator in conjunction with the appropriate power amplifiers and antennas. The transmitting antenna was located inside of a shielded control chamber located adjacent to the receiving chamber. The test fixture is a 24"x24" opening. References were made with the antennas positioned in horizontal polarity separated by 2 meters for 20-1000MHz and 1 meter for 2-10GHz.

The test levels were then recorded at each frequency and attenuation values were determined by calculating the difference between the reference level and the test level.

Dynamic range is determined by placing a solid plate between the two chambers, measuring the amplitude of each frequency, then subtracting that from the reference level.

Detailed data sheets, which provide the entire shielding effectiveness results across the entire frequency range for each of the five samples, are provided in APPENDIX C of this report. The following information provides a description of the test data sheet information.

All amplitude measurement levels are recorded in dBuV.
Attenuation Levels are recorded in dB.

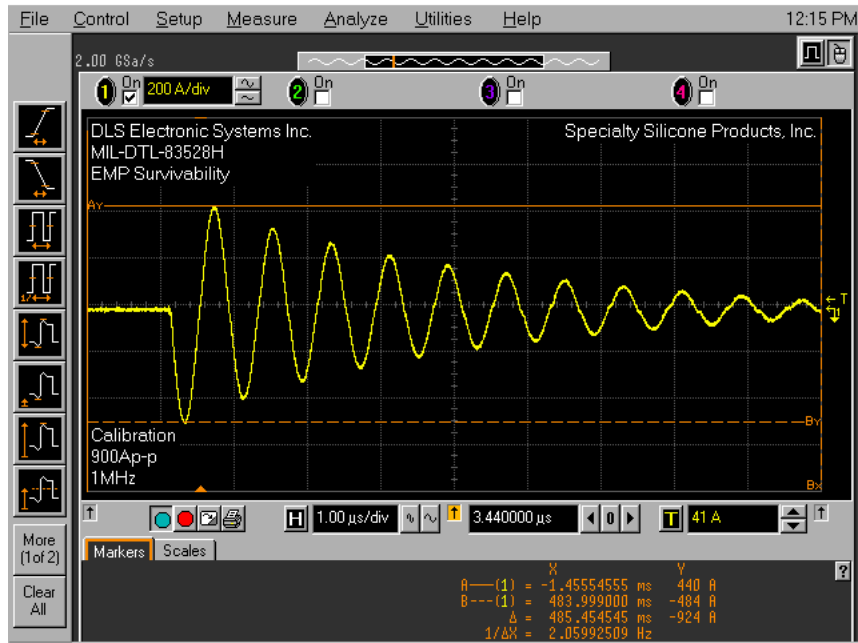
The data sheets contain the following categories:

- Frequency: Discrete frequency at which measurement was made. Recorded as MHz or GHz.
- Reference Level: Test level with shielding material not in place. This is an amplitude level recorded in dBuV.
- Attenuation: Added attenuation (10dB) to input of receiver when measuring the reference level so not to damage receiver; attenuation removed for testing of gasket. This value is added to the test level.
- Test Level: Measurement made with shielding material in the test fixture. This is an amplitude level recorded in dBuV.
- Shielding Effectiveness: Equal to [Reference Level minus the (Test Level minus the pre-amp)]. The result is in dB units.

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APPENDIX C - Supplemental Data:

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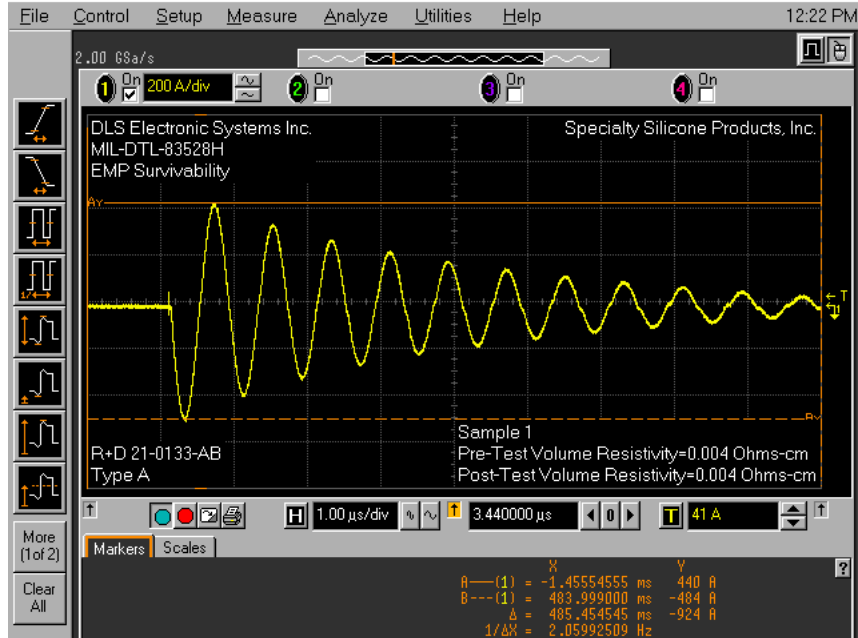


Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth manual Memory depth 32768pts Sampling rate automatic Sampling rate 2.00 GSa/s Averaging off 9-bit BW Filter off Interpolation off															
Channel 1	Scale 200 A/div Offset 17.1 A Coupling DC Impedance 1M Ohm Attenuation 200.0 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00															
Time base	Scale 1.00 μs/div Position 3.440000 μs Reference center															
Trigger	Mode edge Sweep triggered Hysteresis normal Holdoff time 60 ns Coupling DC Source channel 1 Trigger level 41 A Slope rising															
Marker	<table border="0"> <thead> <tr> <th></th> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>A—(1)</td> <td>-1.45554555 ms</td> <td>440 A</td> </tr> <tr> <td>B---(1)</td> <td>483.999000 ms</td> <td>-484 A</td> </tr> <tr> <td>Δ</td> <td>485.454545 ms</td> <td>-924 A</td> </tr> <tr> <td>1/ΔX</td> <td>2.05992509 Hz</td> <td></td> </tr> </tbody> </table>		X	Y	A—(1)	-1.45554555 ms	440 A	B---(1)	483.999000 ms	-484 A	Δ	485.454545 ms	-924 A	1/ΔX	2.05992509 Hz	
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Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth manual Memory depth 32768pts Sampling rate automatic Sampling rate 2.00 GSa/s Averaging off 9-bit BW Filter off Interpolation off															
Channel 1	Scale 200 A/div Offset 17.1 A Coupling DC Impedance 1M Ohm Attenuation 200.0 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00															
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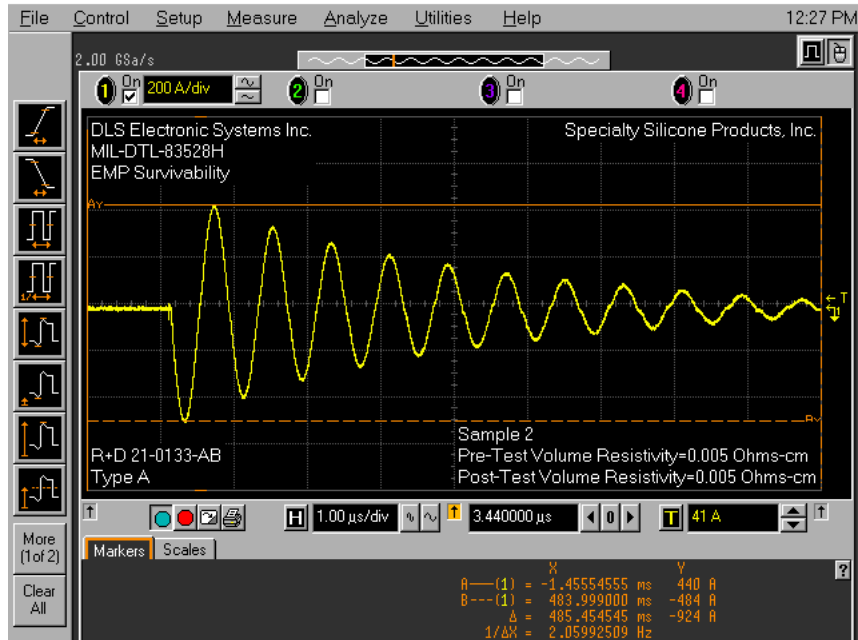
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Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth manual Memory depth 32768pts Sampling rate automatic Sampling rate 2.00 GSa/s Averaging off 9-bit BW Filter off Interpolation off															
Channel 1	Scale 200 A/div Offset 17.1 A Coupling DC Impedance 1M Ohm Attenuation 200.0 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00															
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Trigger	Mode edge Sweep triggered Hysteresis normal Holdoff time 60 ns Coupling DC Source channel 1 Trigger level 41 A Slope rising															
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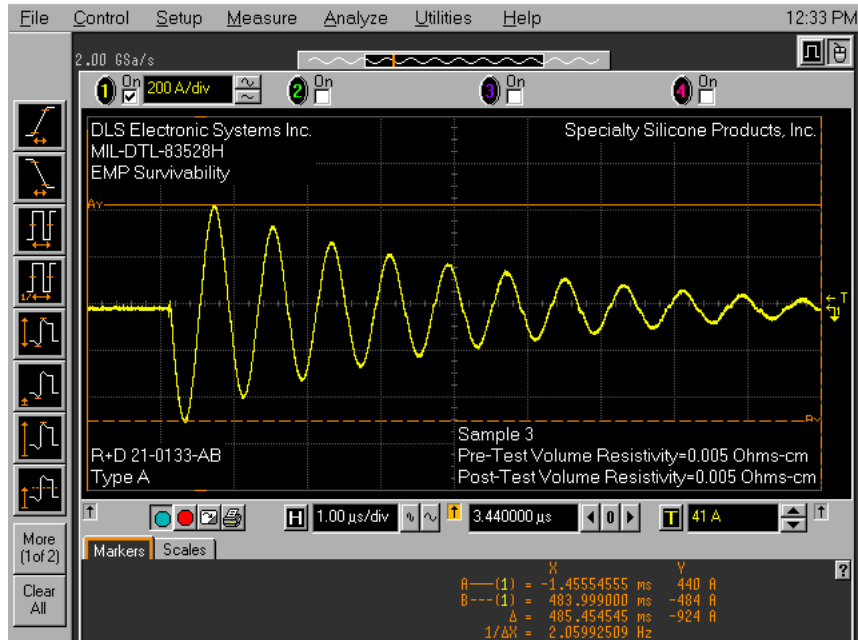
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Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth manual Memory depth 32768pts Sampling rate automatic Sampling rate 2.00 GSa/s Averaging off 9-bit BW Filter off Interpolation off															
Channel 1	Scale 200 A/div Offset 17.1 A Coupling DC Impedance 1M Ohm Attenuation 200.0 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00															
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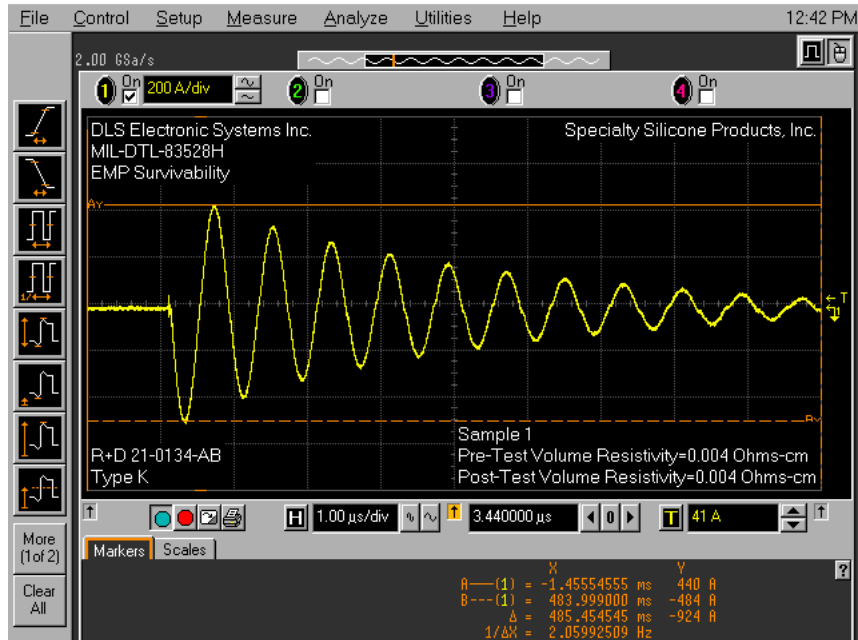
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Channel 1	Scale 200 A/div Offset 17.1 A Coupling DC Impedance 1M Ohm Attenuation 200.0 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00															
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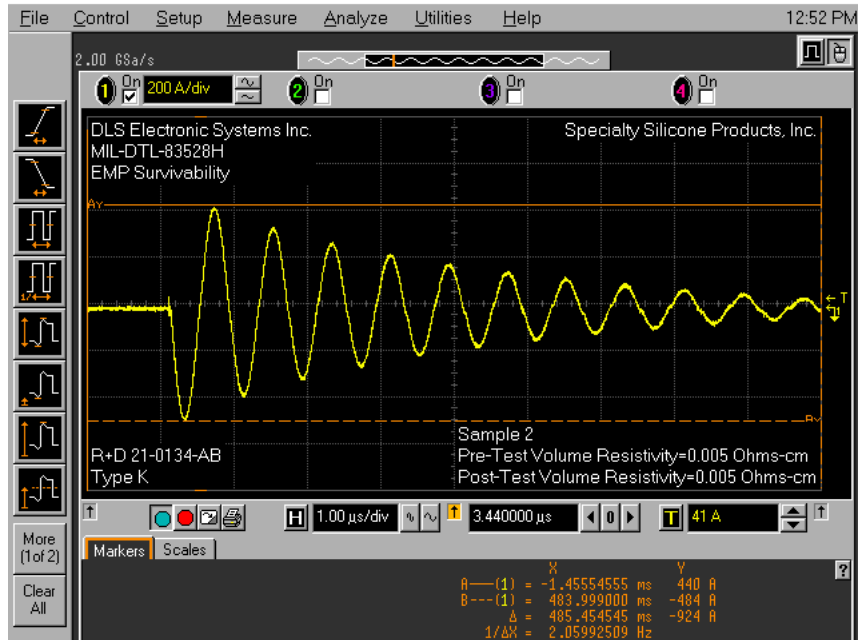
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Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth manual Memory depth 32768pts Sampling rate automatic Sampling rate 2.00 GSa/s Averaging off 9-bit BW Filter off Interpolation off															
Channel 1	Scale 200 A/div Offset 17.1 A Coupling DC Impedance 1M Ohm Attenuation 200.0 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00															
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Marker	<table border="0"> <thead> <tr> <th></th> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>A—(1)</td> <td>-1.45554555 ms</td> <td>440 A</td> </tr> <tr> <td>B---(1)</td> <td>483.999000 ms</td> <td>-484 A</td> </tr> <tr> <td>Δ</td> <td>485.454545 ms</td> <td>-924 A</td> </tr> <tr> <td>1/ΔX</td> <td>2.05992509 Hz</td> <td></td> </tr> </tbody> </table>		X	Y	A—(1)	-1.45554555 ms	440 A	B---(1)	483.999000 ms	-484 A	Δ	485.454545 ms	-924 A	1/ΔX	2.05992509 Hz	
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1/ΔX	2.05992509 Hz															

**Shielding Effectiveness & EMP Survivability Test
Report
EMI ECE Gaskets
TO MIL-DTL-83528H**

Report No.

26033

Issue Date

April 1, 2021

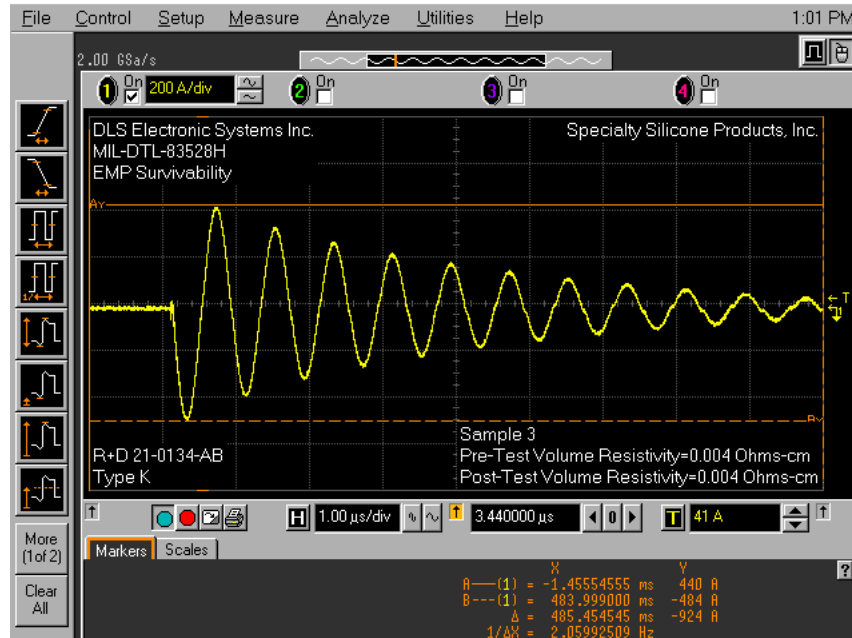
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Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth manual Memory depth 32768pts Sampling rate automatic Sampling rate 2.00 GSa/s Averaging off 9-bit BW Filter off Interpolation off															
Channel 1	Scale 200 A/div Offset 17.1 A Coupling DC Impedance 1M Ohm Attenuation 200.0 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00															
Time base	Scale 1.00 μs/div Position 3.440000 μs Reference center															
Trigger	Mode edge Sweep triggered Hysteresis normal Holdoff time 60 ns Coupling DC Source channel 1 Trigger level 41 A Slope rising															
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DLS Electronic Systems, Inc.

Company: Specialty Silicone Products, Inc.				Date: 3/29/21		
Type: R+D 21-0133-AB (Type A)						
Frequency MHz	OPEN Amplitude (dBuV)	SOLID PLATE Amplitude (dBuV)	Gasket Amplitude (dBuV)	Signal Generator Setting (dBm)	Shielding Effectiveness (dB)	Dynamic Range (dB)
20	90	-30	-25	-12	115	-120
30	100	-30	-22	-12	122	-130
40	110	-30	-27	-13	137	-140
60	110	-30	-23	-14	133	-140
80	120	-30	-25	-24	145	-150
100	120	-30	-21	-27	141	-150
200	120	-30	-26	-39	146	-150
400	120	-30	-22	-38	142	-150
600	120	-30	-15	-33	135	-150
800	120	-30	-17	-27	137	-150
1000	120	-15	-21	-30	141	-135
2000	120	-15	-11	-38	131	-135
4000	120	-15	-13	-38	133	-135
6000	120	-15	-6	-35	126	-135
8000	120	-15	-8	-35	128	-135
10000	120	-15	-10	-35	130	-135



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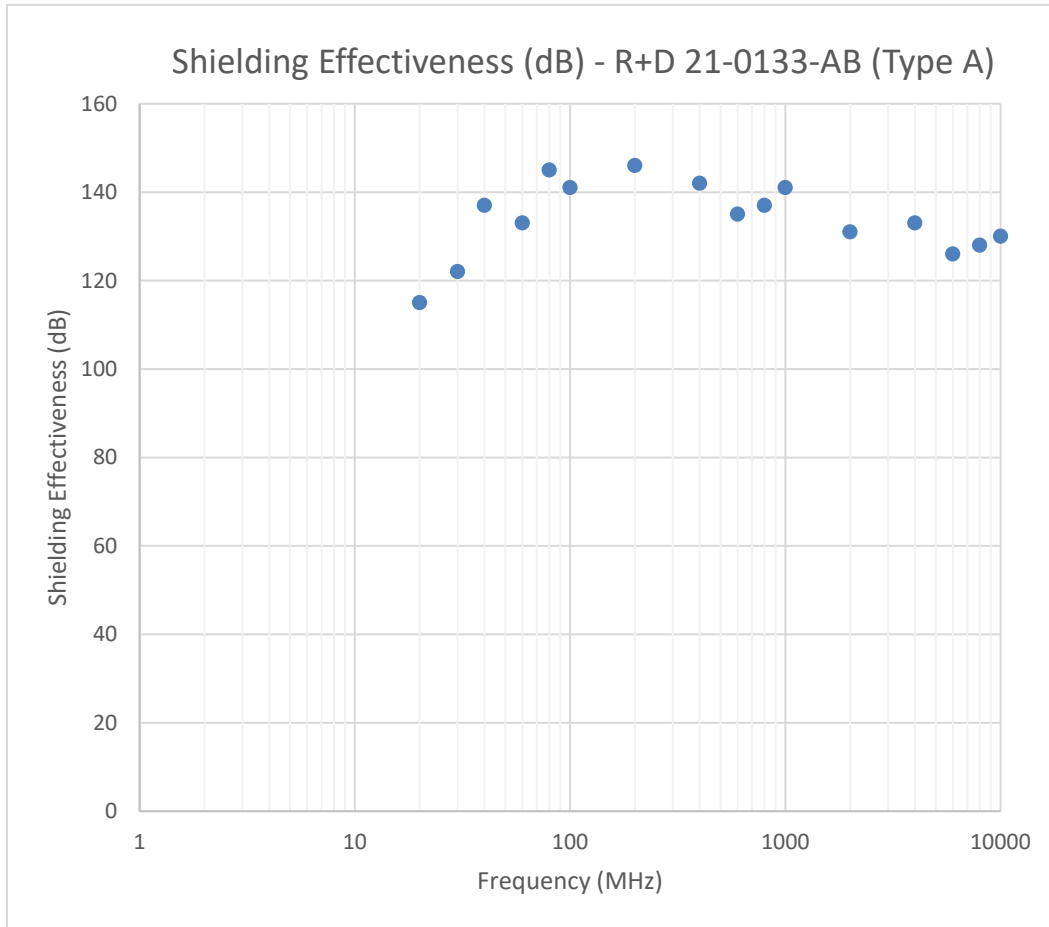
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DLS Electronic Systems, Inc.

Company: Specialty Silicone Products, Inc.				Date: 3/26/21		
Type: R+D 21-0134-AB (Type K)						
Frequency MHz	OPEN Amplitude (dBuV)	SOLID PLATE Amplitude (dBuV)	Gasket Amplitude (dBuV)	Signal Generator Setting (dBm)	Shielding Effectiveness (dB)	Dynamic Range (dB)
20	90	-30	-27	-12	117	-120
30	100	-30	-23	-12	123	-130
40	110	-30	-25	-13	135	-140
60	110	-30	-20	-14	130	-140
80	120	-30	-28	-24	148	-150
100	120	-30	-22	-27	142	-150
200	120	-30	-23	-39	143	-150
400	120	-30	-16	-38	136	-150
600	120	-30	-10	-33	130	-150
800	120	-30	-20	-27	140	-150
1000	120	-15	-13	-30	133	-135
2000	120	-15	-10	-38	130	-135
4000	120	-15	-7	-38	127	-135
6000	120	-15	-3	-35	123	-135
8000	120	-15	-9	-35	129	-135
10000	120	-15	-5	-35	125	-135



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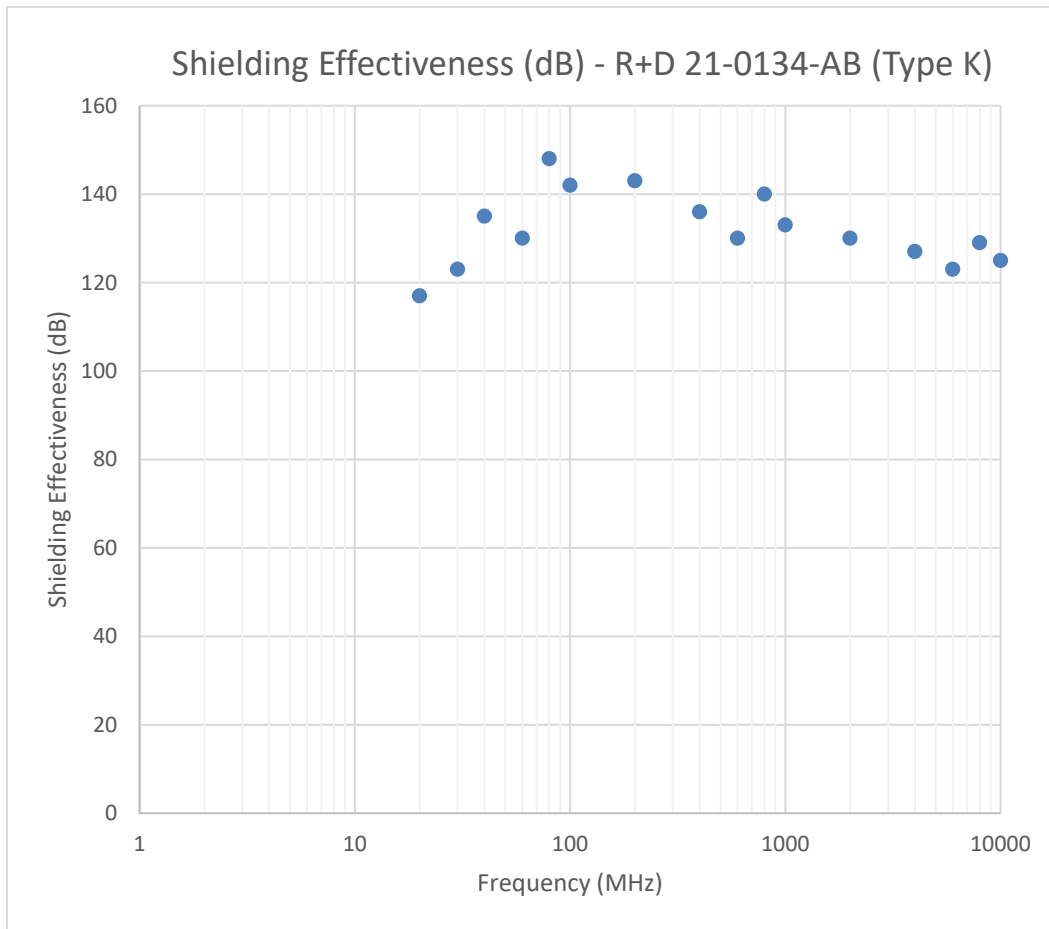
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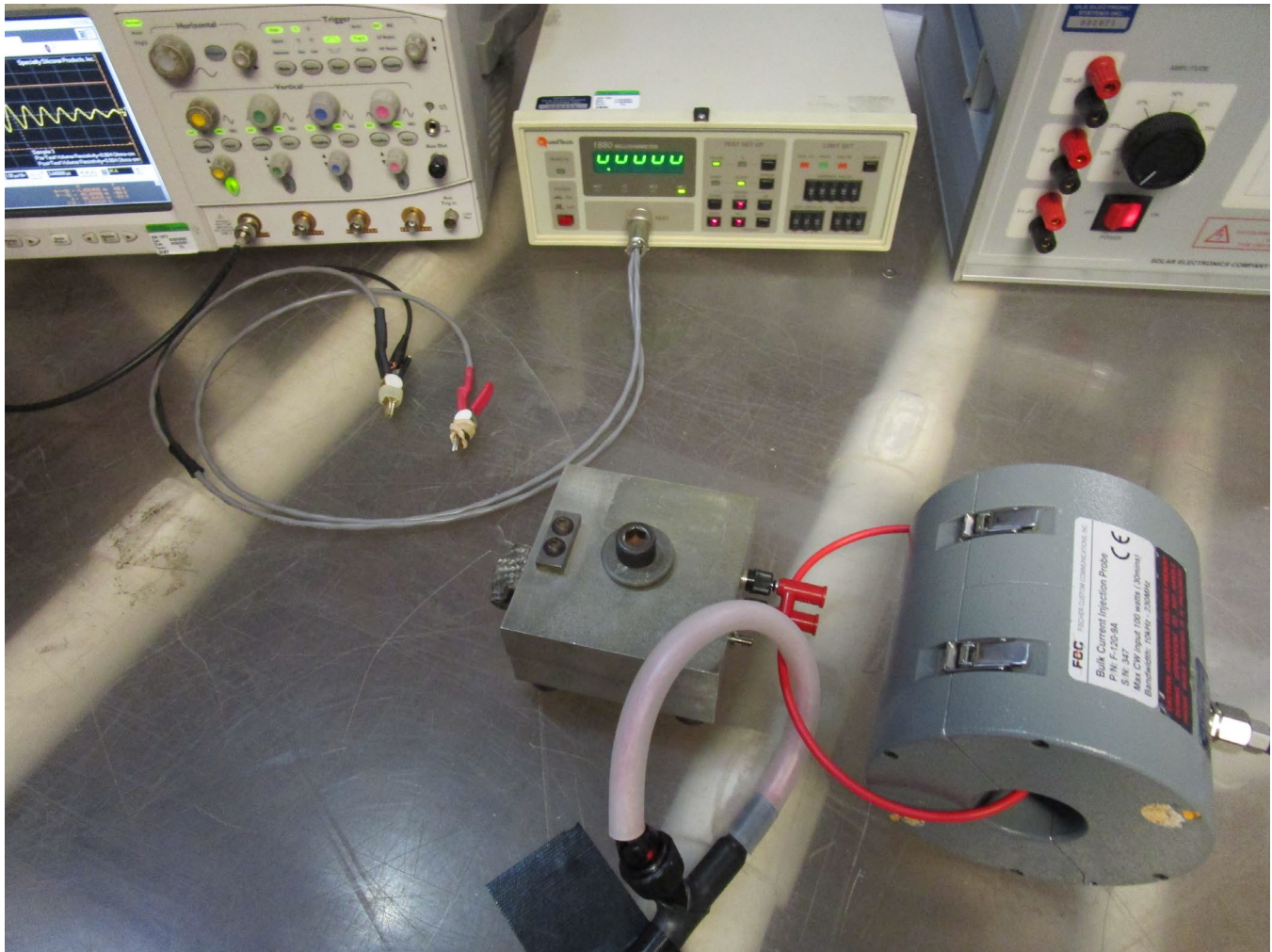
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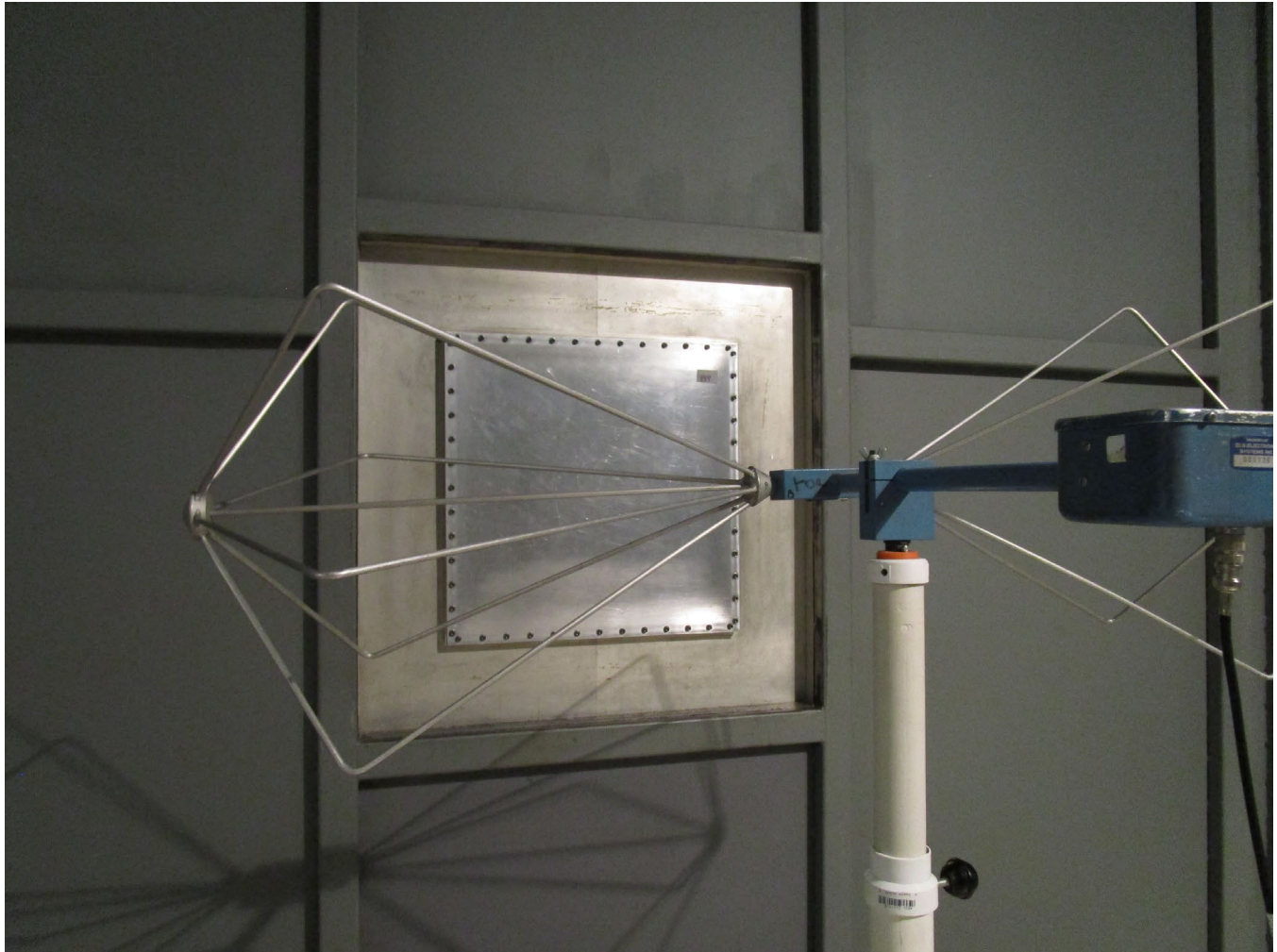
EMP Calibration

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EMP Test

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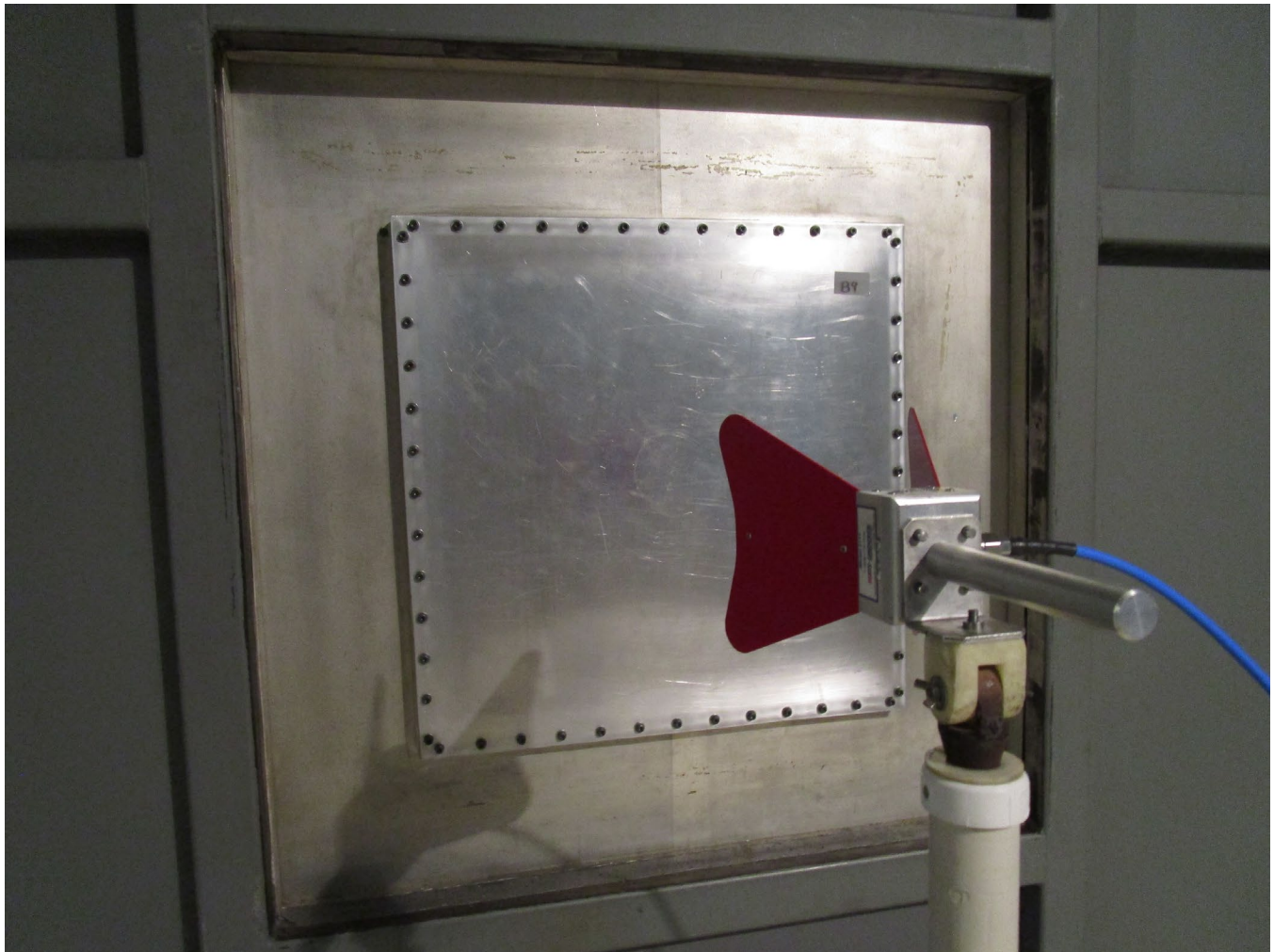
Shielding Effectiveness 20-100MHz

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Shielding Effectiveness 400-1000MHz

**Shielding Effectiveness & EMP Survivability Test
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Shielding Effectiveness 2-10GHz