Shielding Effectiveness, Volume Resistivity & EMP Survivability TEST REPORT

Test Specification : MIL-DTL-83528H
Manufacturer : Specialty Silicone Products, Inc.
Test Samples : SSP2569-65 (TypeA)
Batch: EE032

DOCUMENT HISTORY				
REVISION	**ISSUE DATE**	**AFFECTED PAGE(S)**	**DESCRIPTION OF MODIFICATIONS**	**REVISED BY**
1.0	July 23, 2024		Initial release	

TEST REPORT NO. 28664
from
D.L.S. Electronic Systems, Inc.

Test for Specialty Silicone Products, Inc.

WRITTEN BY	REVIEWED BY
Jereme Irwin	Brian Mattson
	

TEST PERSONNEL	TITLE
Jereme Irwin	EMC Test Engineer

TEST DATE(S)	July 8-9, 2024

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

ADMINISTRATIVE SUMMARY

REASON FOR TEST:

To test the Shielding Effectiveness, EMP Survivability of one material type as specified in MIL-DTL-83528

TEST SPECIFICATION:

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

DATE(S) OF TEST:

July 8-9, 2024

TEST SAMPLES:

A total of one 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:

Amelia Berry

DISPOSITION OF TEST SAMPLE:

Samples will be returned to SSP, Inc.

TEST LOCATION:

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

TABLE OF CONTENTS

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

COMPANY NAME *ADDRESS* *CITY, STATE ZIP*	**Specialty Silicone Products, Inc.** **3 McCrea Hill Road** **Ballston Spa, NY 12020**
CONTACT NAME *PHONE* *EMAIL*	**Amelia Berry** **518-363-5016** **aberry@sspinc.com**

MANUFACTURER *ADDRESS* *CITY, STATE ZIP*	**Specialty Silicone Products, Inc.** **3 McCrea Hill Road** **Ballston Spa, NY 12020**

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.

NO.	*Material*	*Type*
1.	**SSP2569-65**	**Type A**
	Batch: EE032	

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

NO.	*Material*	*Type*
1.	**SSP2569-65**	**Type A**
	Batch: EE032	

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.

SECTION 6 - TEST RESULTS

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

Part Number	Post-Test Ohms-cm
SSP2569-65 (Type A) Batch: EE032	
Sample #1	**0.002**
Sample #2	**0.001**
Sample #3	**0.001**
Sample #4	**0.002**

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

NO.	*Material*	*MINIMUM ATTENUATION LEVEL (dB)*	*BEST-CASE ATTENUATION LEVEL (dB)*
1.	**SSP2569-65 (Type A) Batch: EE032**	**121 @ 100MHz**	**132 @ 1GHz**

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	06/20/2023	06/20/2025
Oscilloscope, Digital	LeCroy	4104HD	4903C19106	DC-1GHz, 5MS/s	01/15/2024	01/15/2025
Probe, Current, Injection	Fischer Custom Communications	F-120-9A	342	10kHz-230MHz	07/09/2024	07/09/2024
Probe, Current, Rogowski	PEM	CWT 6R	57497-35398	1200A	01/15/2024	01/15/2025
Test Fixture	DLS Electronic Systems	EMP	01	N/A	07/09/2024	07/09/2024
Digital Caliper	Mitutoyo	CD-6inch-CS	RS000108	0-6 inches	10/27/2022	10/27/2025

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

TABLE 2

Description	Manufacturer	Model Number	Serial Number	Range	Cal On	Cal Due Dates
Antenna, Biconical	Electro-Metrics	BIA-25	2727	20MHz-300MHz	07/27/2022	07/27/2024
Antenna, Horn	EMCO	3106	2127	200MHz-2GHz	10/07/2022	10/07/2024
Antenna, Horn	ETS-Lindgren	3117	00055158	1GHz-18GHz	12/07/2022	12/07/2024
Preamplifier	Sonoma	310	185670	9kHz-1GHz	09/11/2023	09/11/2024
Preamplifier	Com-Power	PAM-118	18040165	1-20GHz	03/10/2024	03/10/2025
Generator, Signal,	Rohde & Schwarz	SML 01	100025	9kHz-1.1GHz	01/15/2024	01/15/2025
Generator, Signal	Rohde & Schwarz	SMB110	170106	1-40GHz	01/15/2024	01/15/2025
Spectrum Analyzer	Agilent Technologies	E4446A	MY46186619	3Hz-44GHz	03/14/2024	03/14/2025

TABLE 3

Description	Manufacturer	Model Number	Serial Number	Range
Antenna, Biconical	EMCO	3109	9803-3163	20MHz-300MHz
Antenna, Horn	Electro-Metrics	3106	9501-2607	200MHz-2GHz
Antenna, Horn	ETS Lindgren	3117	00055158	1-18GHz

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.

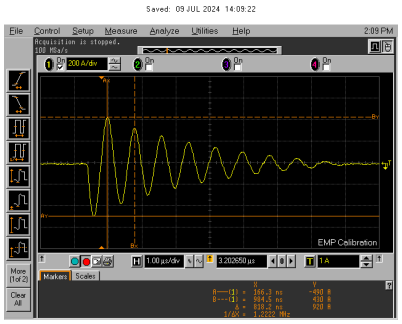
Detailed data sheets, which provide the entire shielding effectiveness results across the entire frequency range for each of the five samples, are provided in APPENDIX C of this report. The following information provides a description of the test data sheet information.

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.

APPENDIX C - Supplemental Data:



Acquisition: Sampling mode real time Configuration 4GSa/s
Memory depth automatic Memory depth 1004pts
Sampling rate automatic Sampling rate 100 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1: Scale 200 A/div Offset 7.1 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

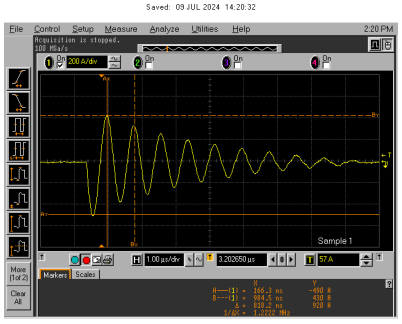
Time base: Scale 1.00 µs/div Position 3.202650 µs Reference center

Trigger: Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 1 A Slope rising

Marker

	X	Y
A——(1) =	166.3 ns	-490 A
B——(1) =	984.5 ns	430 A
Δ =	818.2 ns	920 A
1/ΔX =	1.2222 MHz	

EMP Calibration



Acquisition: Sampling mode real time Configuration 4GSa/s
Memory depth automatic Memory depth 1004pts
Sampling rate automatic Sampling rate 100 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1: Scale 200 A/div Offset 7.1 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

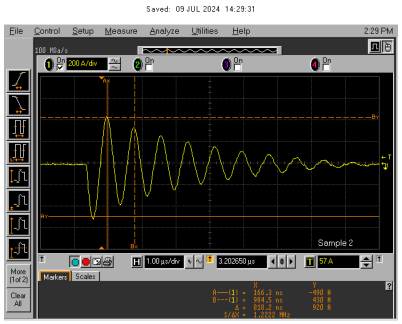
Time base: Scale 1.00 µs/div Position 3.202650 µs Reference center

Trigger: Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 57 A Slope rising

Marker

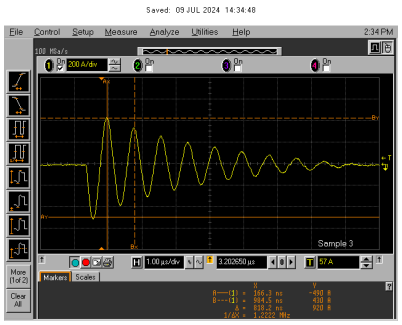
	X	Y
A——(1) =	166.3 ns	-490 A
B——(1) =	984.5 ns	430 A
Δ =	818.2 ns	920 A
1/ΔX =	1.2222 MHz	

EMP Sample 1



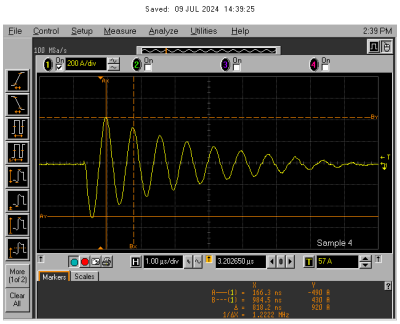
Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth automatic Memory depth 1004pts Sampling rate automatic Sampling rate 100 MSa/s Averaging off 9-bit BW Filter off Interpolation on
Channel 1	Scale 200 A/div Offset 7.1 A Coupling DC Impedance 1M Ohm Attenuation 200.0 : 1 Atten units 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 3.202650 µs Reference center
Trigger	Mode edge Sweep triggered Hysteresis normal Holdoff time 60 ns Coupling DC Source channel 1 Trigger level 57 A Slope rising
Marker	X Y B—(1) = 166.3 ns -490 A B---(1) = 984.5 ns 430 A Δ = 818.2 ns 920 A 1/ΔX = 1.2222 MHz

EMP Sample 2



Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth automatic Memory depth 1004pts Sampling rate automatic Sampling rate 100 MSa/s Averaging off 9-bit BW Filter off Interpolation on
Channel 1	Scale 200 A/div Offset 7.1 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 3.202650 µs Reference center
Trigger	Mode edge Sweep triggered Hysteresis normal Holdoff time 60 ns Coupling DC Source channel 1 Trigger level 57 A Slope rising
Marker	X Y B—(1) = 166.3 ns -490 A B---(1) = 984.5 ns 430 A Δ = 818.2 ns 920 A 1/ΔX = 1.2222 MHz

EMP Sample 3



Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth automatic Memory depth 1004pts
Sampling rate automatic Sampling rate 100 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 A/div Offset 7.1 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 3.202650 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 57 A Slope rising

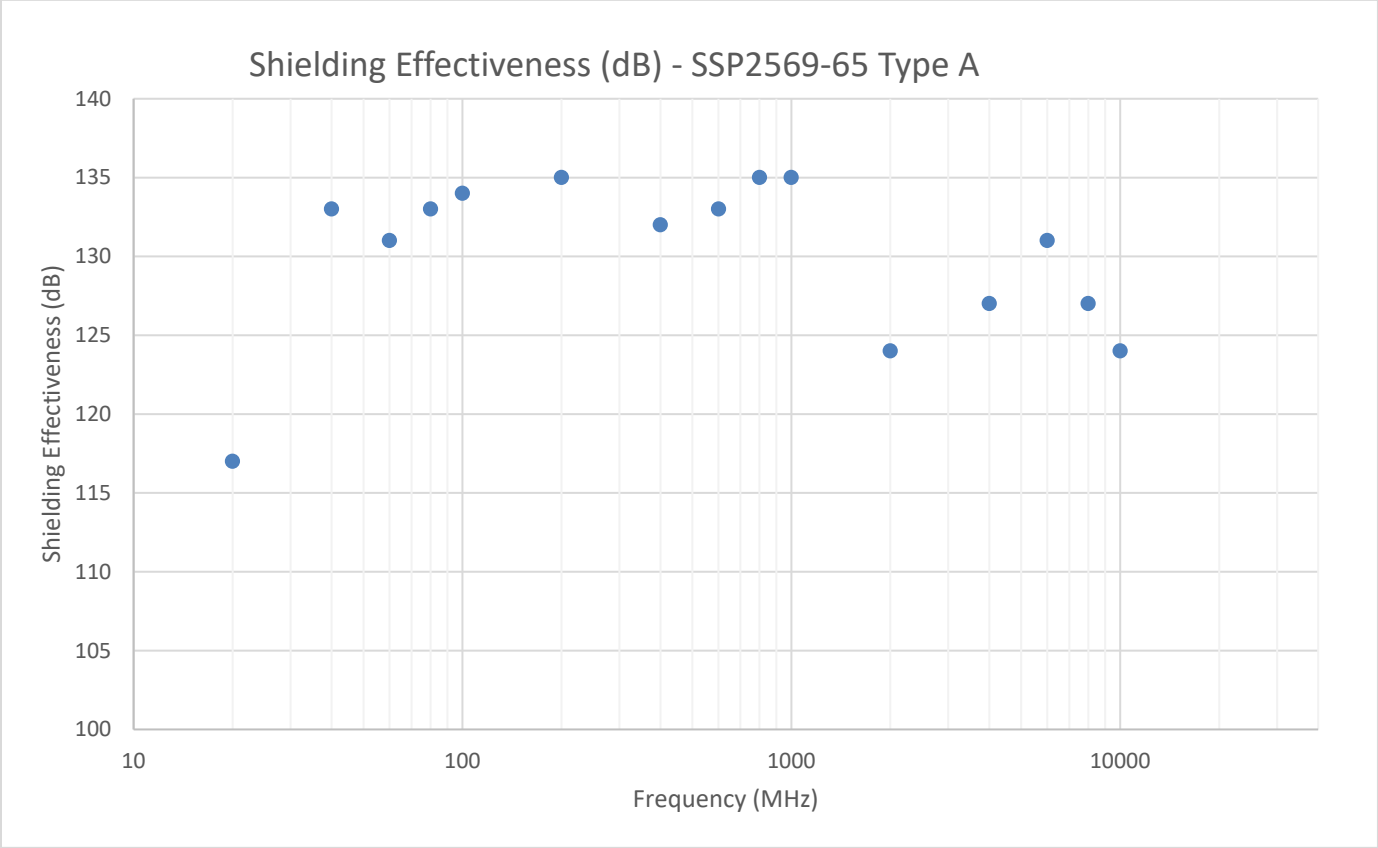
Marker

	X	Y
A——(1) =	166.3 ns	-490 A
B——(1) =	984.5 ns	430 A
Δ =	818.2 ns	920 A
1/ΔX =	1.2222 MHz	

EMP Sample 4

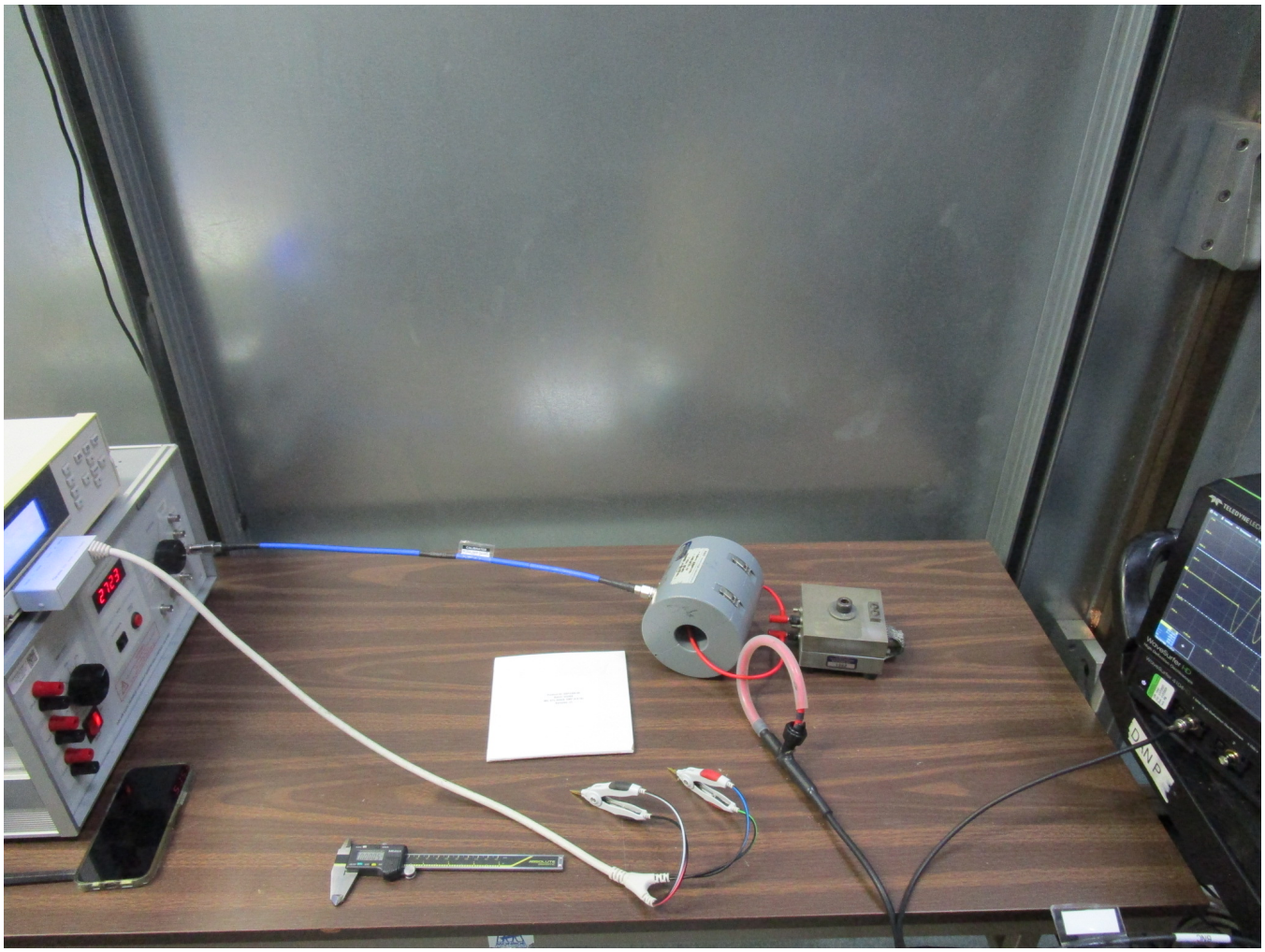
Company: Specialty Silicone Products				Date: 7/09/2024		
SSP2569-65 Type: A						
Frequency MHz	OPEN Amplitude (dBuV)	SOLID PLATE Ampitude (dBuV)	Gasket Amplitude (dBuV)	Signal Generator Setting (dBm)	Shielding Effectiveness (dB)	Dynamic Range (dB)
20	100	-25	-17	-15	117	125
40	110	-25	-23	-36	133	135
60	110	-25	-21	-35	131	135
80	110	-25	-23	-52	133	135
100	110	-25	-24	-61	134	135
200	115	-25	-20	-3	135	140
400	115	-25	-17	-9	132	140
601	115	-25	-18	-6	133	140
801	115	-25	-20	-4	135	140
1000	120	-20	-15	-43	135	140
2000	120	-20	-4	-27	124	140
4000	120	-20	-7	-27	127	140
6000	120	-20	-11	-27	131	140
8000	120	-20	-7	-27	127	140
10000	120	-20	-4	-24	124	140
400	115	-25	-10	-6	125	140
600	115	-25	-8	0	123	140
800	115	-25	-9	2	124	140
1000	115	-20	-17	-43	132	135
2000	110	-20	-15	-46	125	130
4000	110	-20	-13	-50	123	130
6000	110	-20	-15	-47	125	130
8000	110	-20	-16	-46	126	130
10000	110	-20	-15	-45	125	130

Shielding Effectiveness Data

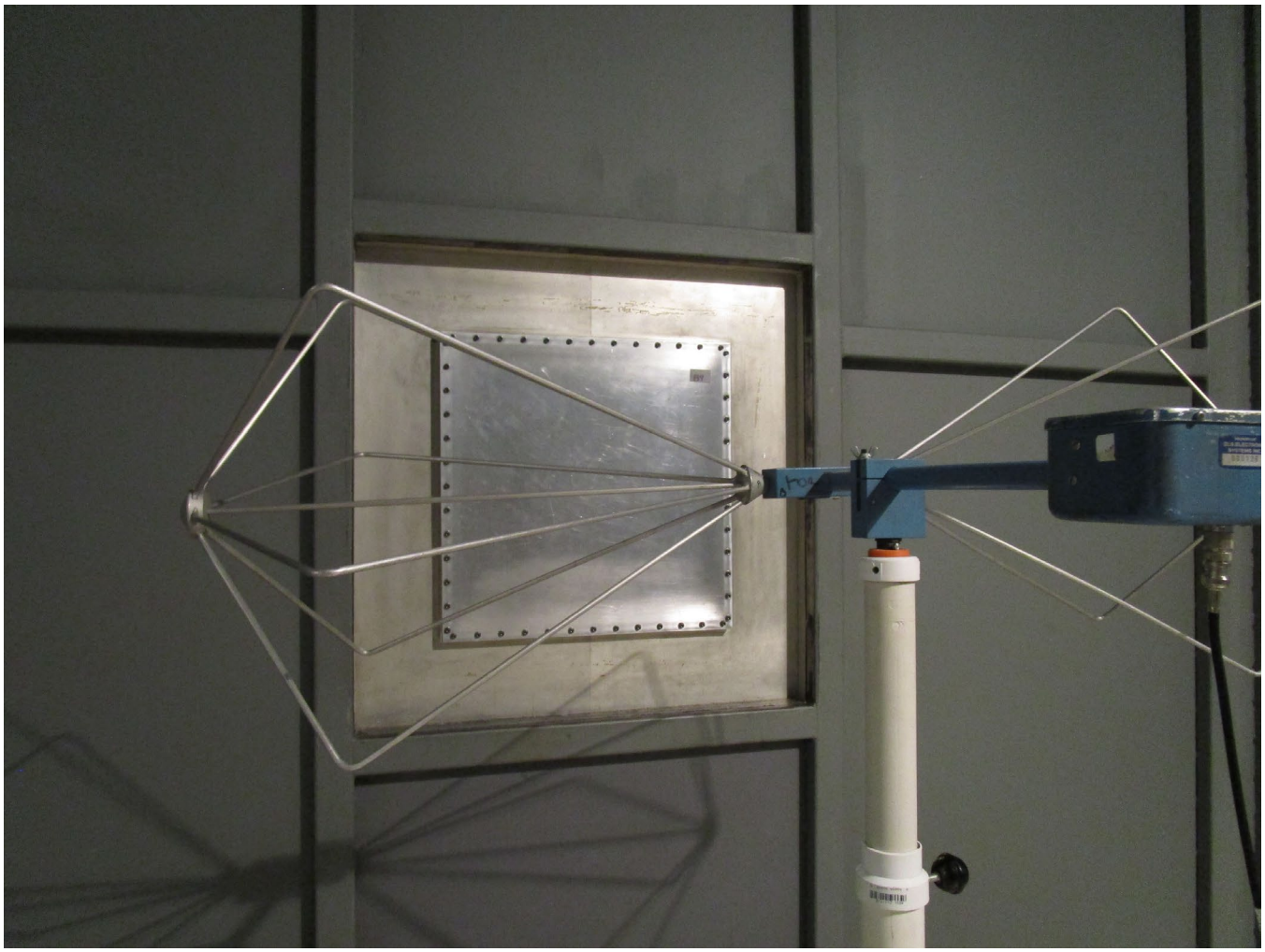


Shielding Effectiveness Data

Photos:

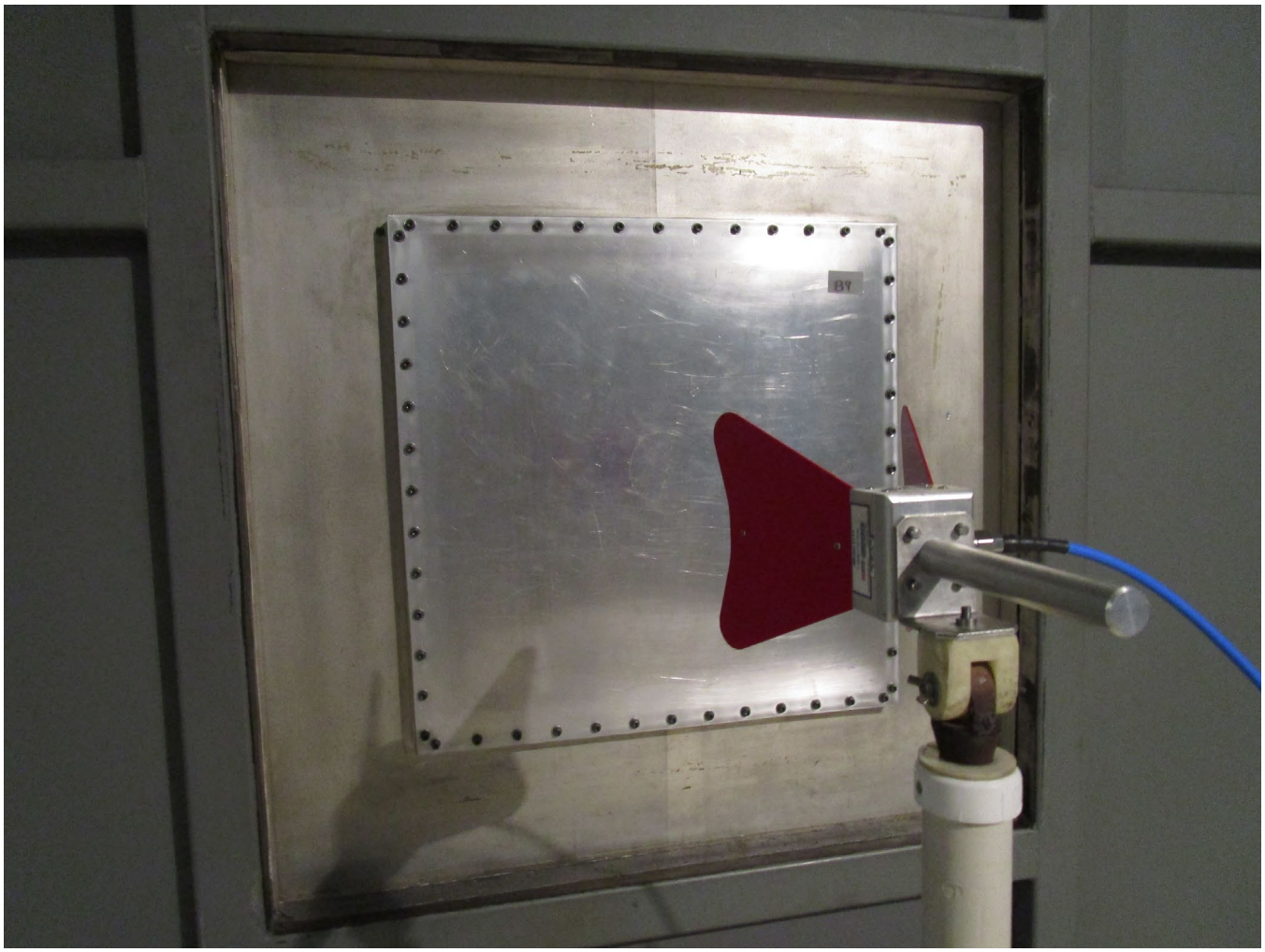


EMP Test



Shielding Effectiveness 20-100MHz

Shielding Effectiveness 200-800MHz



Shielding Effectiveness 1-10GHz