

**EVALUATION OF THE  
ZARGES INC  
K475 TRANSPORT & STORAGE CONTAINER**

**Date:** MAY 5, 2017  
**Test Report Number:** SR7012B.17

**IN ACCORDANCE WITH  
IEEE-STD-299:1997**

**Prepared For:** ZARGES INC  
1445 CENTER PARK ROAD  
CHARLOTTE, NORTH CAROLINA 28217  
ATTENTION: TRACY JOHNSON

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**Test Technician or Engineer:** William Couture  
William Couture

**CTS Approved Signatory:** David Inman  
David Inman

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**REVISION RECORD SHEET**

<b>Revision</b>	<b>Description</b>	<b>Date</b>	<b>Approval</b>
--	Created "B" report and revised "A" report.	2017-05-05	--

The latest revision of the report is valid, all prior revisions are superseded.

## LIST OF DEFINITIONS/ABBREVIATIONS

AC	Alternating Current
BB	Broadband
BW	Bandwidth
cm	Centimeter
CPU	Calibrate Prior to Use
dB	Decibel
DC	Direct Current
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ER	Electric Radiation
EUT	Equipment Under Test
GHz	Gigahertz
Hz	Hertz
I-face	Interface
kHz	Kilohertz
m	Meter
MHz	Megahertz
mm	Millimeter
mS	Millisecond
mV	Millivolt
MR	Magnetic Radiation
MUT	Material Under Test
N/A	Not Applicable or Not Available
NB	Narrowband
NCR	No Calibration Required
PLC	Power Line Conduction
PPS	Pulses Per Second
RF	Radio Frequency
rms	Root mean square
SUT	Sample Under Test
uF	MicroFarad
uH	MicroHenry
uS	Microsecond
UUT	Unit Under Test
uV	Microvolt
UWC	Use With Calibrated Equipment

## 1.0 GENERAL

### 1.1 Introduction

#### 1.1.1 Purpose

The purpose of this test is to evaluate a sequence of electromagnetic shielding tests at the request of Zarges Inc. The assessment will determine the shielding effectiveness of the material under test per IEEE-STD-299. The tests were performed by Chomerics Test Services of Woburn, Massachusetts.

Testing was performed on April 20 and April 21, 2017 under purchase order number 4500251446.

This document is written to report test results of Shielding Effectiveness performed in accordance with IEEE-STD-299.

#### 1.1.2 Requirements

The customer defined shielding requirements for the Transit Case are as follows:

The shielded enclosure shall meet the minimum shielding effectiveness requirements of 60dB in the frequency range of 150kHz to 18GHz (E-Field).

The tests were performed at Parker Chomerics, Woburn, Massachusetts. The tests have satisfied the requirements of IEEE-STD-299.

## 1.2 Summary

The Zarges enclosure was tested for shielding effectiveness over the frequency range of 1 - 18GHz and passed.

The terms "Passed" or "Failed" are intended to guide the reader as to whether the enclosure met the Zarges minimum requirements. The "Results" paragraph in each test section to follow and the test data sheets will outline specifically how the test samples performed during each test.

The following antennas were used:

Test Frequency Range	Transmit antenna	Receive antenna
150kHz to 20MHz	Chomerics Spiral Loop	Chomerics Spiral Loop
20MHz to 200MHz	Chomerics Spiral Loop	3109 Biconical
200MHz to 1GHz	Chomerics Spiral Loop	Log Spiral Antenna
2GHz to 18GHz	3115 Horn Antenna	3115 Horn Antenna

Due to the nature of this test cycle, the transmit antenna was placed inside the Transit Case. The cabinet dimensions only allowed for a custom spiral antenna and horn antenna to fit inside. This setup allowed the enclosure to be probed for RF leakage if there were any test failures.

### **1.2.1 Deviations, Additions, or Exclusions**

No deviations, additions, or exclusions to the test specification were made.

## **1.3 Administrative Data**

### **1.3.1 Test Facility**

Chomerics Test Services is located in Woburn, Massachusetts.

Parker Chomerics test facility operates under the current revision of Chomerics Test Services Quality Assurance (QA) Manual Document Number QA002.

The QA Manual has been constructed to reflect a quality program in accordance with the requirements of the National Institute of Standards and Technology (NIST), ISO 9002, ISO Guide 25, NIST Handbook 150, EN 45001, MIL-I-45208A, MIL-STD-461D, 462D and Chomerics Test Services Quality Assurance Program (QAP).

The QA Manual outlines and describes the procedures for establishing and maintaining the quality of analysis, research, inspection, and testing within Chomerics Test Service (CTS).

This test report does not represent an endorsement by the U.S. Government.

The results and/or conclusions within this test report refer and/or apply only to the unit(s) tested as defined by this report.

Measurements performed for this test are traceable to the National Institute of Standards and Technology (NIST) based on the fact that all test equipment used for the measurements were previously calibrated using standards traceable to NIST.

The system amplitude accuracy for the measurements made during the radiated emission tests was  $\pm 3\text{dB}$ . Chomerics Test Services measurement uncertainty calculations are available for review upon request.

### 1.3.2 Equipment Calibration

The calibration of Parker Chomerics test facility equipment is controlled under the current revision of Chomerics Laboratory Test Equipment Calibration Manual Document Number QA001.

The test equipment used throughout this test sequence conforms to laboratory calibration standards, ANSI/NCSL Z540-1 or ISO 10012, traceable to the National Institute of Standards and Technology (NIST). The date of the last calibration is listed in Appendix A for the applicable equipment.

We certify that the test equipment used to perform this test was in calibration at the time of the test and are calibrated per MIL-STD-45662 at least once per year.

### 1.3.3 Test Personnel

The test personnel performing or supervising the tests are accredited by the National Association of Radio and Telecommunications Engineers, Inc. (NARTE) as Certified Electromagnetic Compatibility Engineers (N.C.E.) and Technicians (N.C.T.).

## 1.4 Test Set-up

### 1.4.1 Test Site Descriptions

The following is a list of test sites and descriptions of each.

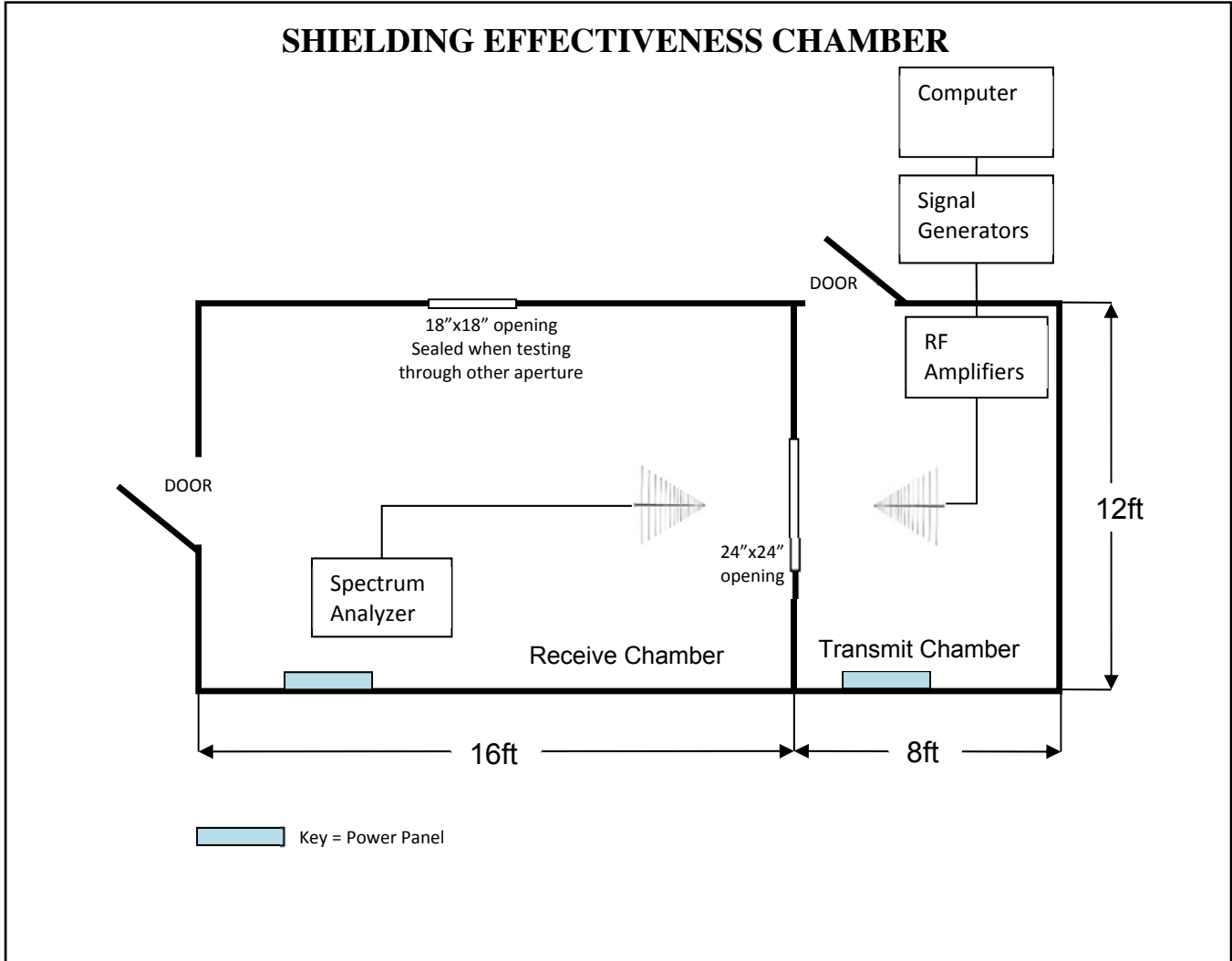
**“SE” Lab:** Chomerics' "Shielding Effectiveness" Test Chamber was used for this test program and is located in the Seeger Building at Parker Chomerics, 84 Dragon Court, Woburn, Massachusetts (see Figure 1). The shielded enclosure was manufactured by Sprague Shielding Corporation. Attenuation tests have demonstrated that the shielded enclosure meets the attenuation requirements of MIL-STD-285.

The receive chamber is a 1/4 inch plate steel structure measuring 12 x 16 x 8 feet in size. The structure is heated and/or air conditioned.

The transmit chamber is a 1/4 inch plate steel structure measuring 12 x 8 x 8 feet in size. The structure is heated and/or air conditioned.

The available AC power within the shielded enclosure is 110V AC, 220V AC, single and three phase, 60 cycle. The power line filters are rated for 100dB of attenuation from 10kHz to 10GHz.

Zarges Inc K475 Transport & Storage Container  
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**FIGURE 1**

### 1.4.2 Equipment Under Test

The Zarges K475 Transport & Storage Container is made of aluminum and measures 24" x 22" x 13". The box is welded aluminum enclosure with no access points except for the top cover. Three latches along each side pull the cover in and compress a conductive elastomeric gasket. There are also two black valve assemblies that protrude out of the exterior on one side.

The K475 Transport & Storage Container was tested for shielding effectiveness.

The available AC power within the shielded enclosure is 110V AC, 220V AC, single and three phase, 60 cycle. The power line filters are rated for 100dB of attenuation from 10kHz to 10GHz.



## 2.0 TESTS PERFORMED

### 2.1 Electric and Plane Wave Shielding Effectiveness (SE)

#### 2.1.1 Equipment Used

Test Equipment		Asset #	Serial #
X	HP 3326A Signal Generator	37	2519A00753
X	A.R. 30W1000M7 Amplifier	480	15657
X	Agilent 4440A Spectrum Analyzer	704	US41421236
X	EMCO 3109 Biconical Antenna	87	2123
X	ETS Lindgren T.I.L.E. Software Version 7.0.16.774	N/A	N/A
X	Dell Workstation Computer	N/A	N/A
X	HP 83620B Signal Generator	625	3844A00955
X	ENI 600L Amplifier	568	298
X	Solar 8552-1A Audio Amplifier	162	821095
X	EMCO 3101 Log Spiral Antenna	79	2495
X	EMCO 3106 Ridge Guide Horn Antenna	117	2213
X	Varian TWT amplifier 8-18GHz VZM6991K31194	Rental	5785
X	Ophir GRF5060 25 Watt Amplifier 0.8-4.2GHz	Rental	1004
X	Chomerics Spiral Loop Antenna	N/A	N/A

(See Appendix A for Equipment Calibration)

#### 2.1.2 Test Method

The Zarges K475 Transport & Storage Container was placed inside Chomerics' Shielding Effectiveness Test Chamber. The case was tested per Chomerics Test Procedure TP08 and IEEE STD 299-1997.

The test was performed at frequencies which meet the requirements of Section C.3.2 of IEEE STD 299-1997.

The test was performed in the shielded enclosure manufactured by Sprague Shielding Corporation. Attenuation tests have demonstrated that the shielded enclosure meets the attenuation requirements of MIL-STD-285.

Prior to the actual shielding effectiveness tests, a system reference test was performed to obtain a detection system dynamic range of at least 66dB (6dB beyond the test limit). During this test, transmit and receive antennas were placed in front of each other inside the test chamber. From 150kHz to 20MHz, the antenna to antenna distance was 0.6 meters. From 20MHz to 18GHz the antenna to antenna distance was 1 meter. The transmit antenna was placed at the position where the case was to be placed. An Open reference was taken for each frequency range. The receive equipment was located outside of the test chamber.

For the qualification tests, the transmit antenna was placed in the case and connected to the transmit equipment using Huber+Suhner Sucoflex-106 coaxial cable. The receive antenna was placed outside of the enclosure and connected to the receiving equipment using standard Pasternack microwave coaxial cable.

The transmitter and amplifiers were placed outside of the test chamber. The receiving equipment was located outside of the test chamber, in an adjacent support room.

The EUT was placed above a copper ground plane located in the test chamber. The EUT was bonded to the ground plane through two 4 inch wide strips of copper tape.

The test was performed in the shielded enclosure manufactured by Sprague Shielding Corporation. Attenuation tests have demonstrated that the shielded enclosure meets the attenuation requirements of MIL-STD-285.

The available AC power within the shielded enclosure is 110V AC, 220V AC, single and three phase, 60 cycle. The power line filters are rated for 100dB of attenuation from 10kHz to 10GHz.

### **2.1.3 Results**

Data sheets and graphs that follow display shielding performance for the material under test.

The Zarges enclosure PASSES the minimum 60dB shielding requirement.

## 2.1.4 Test Data

### SHIELDING EFFECTIVENESS TEST DATA

Customer: Zarges  
 Product Tested: K475 Rack Mountable Storage Container  
 Tested by: B Couture

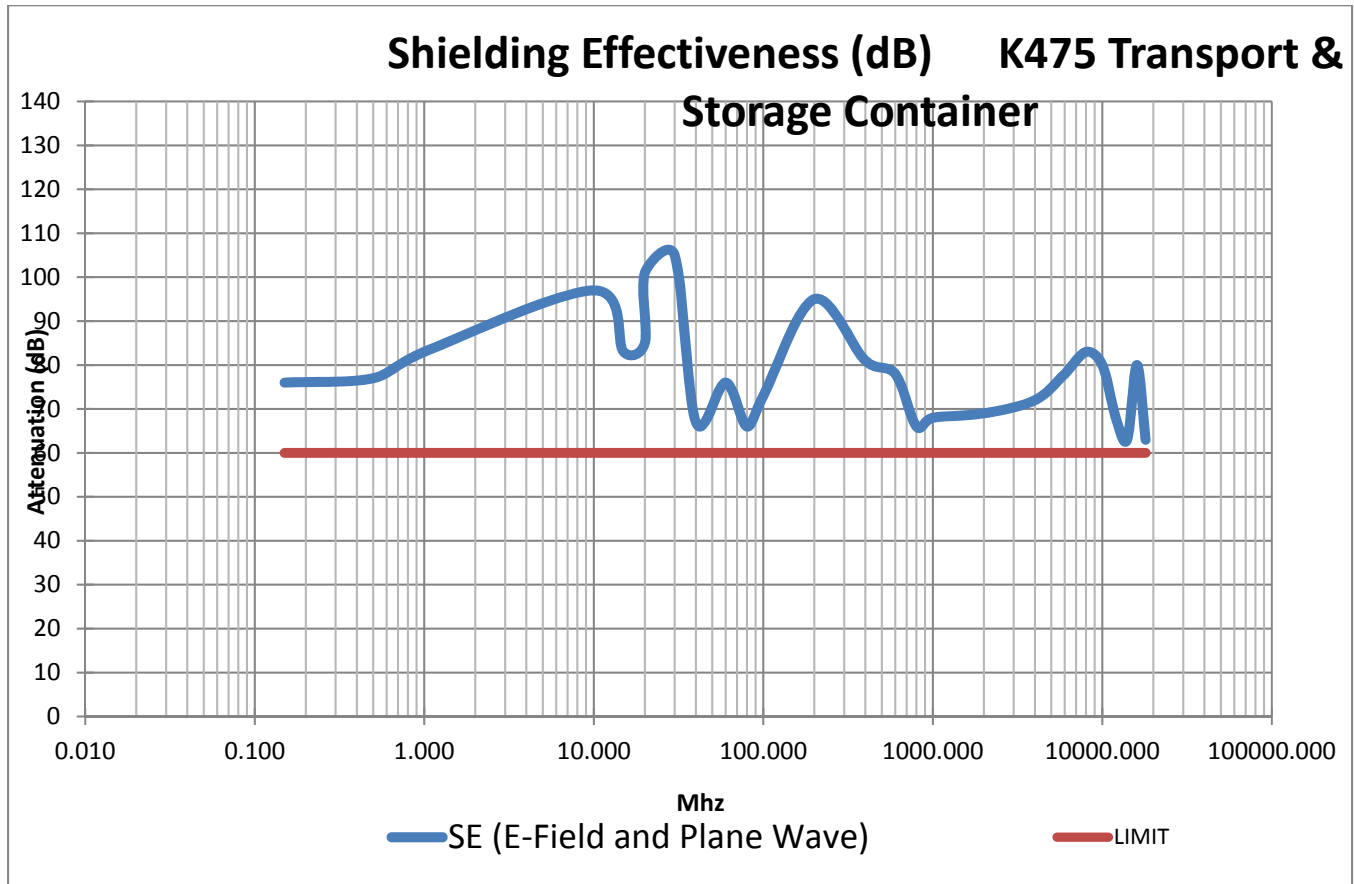
Date: 4/21/2017  
 Test No.: 1  
 Test Spec.: IEEE 299

Type of Field	Frequency (MHz)	Antenna Polarization	Open Reference	Closed	Shielding Effectiveness (dB)	LIMIT	Comments:	
E	0.150	H	-64	-140	76	60	pass	
E	0.500	H	-63	-140	77	60	pass	
E	1	H	-57	-140	83	60	pass	
E	10	H	-43	-140	97	60	pass	
E	15	H	-44	-127	83	60	pass	
E	20	H	-30	-115	85	60	pass	
E	20	H	-23	-124	101	60	pass	
E	30	H	-8	-113	105	60	pass	
E	40	H	-29	-96	67	60	pass	
E	60	H	0	-76	76	60	pass	
E	80	H	-2	-68	66	60	pass	
E	100	H	6	-67	73	60	pass	
E	200	H	16	-79	95	60	pass	
E	400	C	12	-69	81	60	pass	
E	600	C	16	-62	78	60	pass	
E	800	C	15	-51	66	60	pass	
E	1,000	C	10	-58	68	60	pass	
P	2,000	H	9	-60	69	60	pass	
P	4,000	H	1	-71	72	60	pass	
P	6,000	H	-4	-82	78	60	pass	
P	8,000	H	-2	-85	83	60	pass	
P	10,000	H	-11	-91	80	60	pass	
P	12,000	H	-18	-86	68	60	pass	
P	14,000	H	-26	-89	63	60	pass	
P	16,000	H	-20	-100	80	60	pass	
P	18,000	H	-44	-107	63	60	pass	

- Comments: 1) Free Space Open References  
 2) **Detection System noise floor is -140dBm**  
 3) Cabinet = 24in x 22in x 13in

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**Test Data**



**2.1.5 Photographic Documentation**

**Customer: Zarges Inc**  
**Equipment: K475 Transport & Storage Container**  
**Tested By: William Couture**  
**Operating Mode: N/A**

**Date: 2017-04-21**  
**Test Number: 1**

**Coupling Device: Antennas**  
**Test Spec: IEEE-STD 299**



Photograph Description: General Open Reference Test Setup (Open Field)

**FORM CTS-PHOTO**

Zarges Inc K475 Transport & Storage Container  
Document #: SR7012B.17  
Date: 2017-05-05

**Photographic Documentation**

**Customer: Zarges Inc**  
**Equipment: K475 Transport & Storage Container**  
**Tested By: William Couture**  
**Operating Mode: N/A**

**Date: 2017-04-21**  
**Test Number: 1**

**Coupling Device: Antennas**  
**Test Spec: IEEE-STD 299**



Photograph Description: General Open Reference Test Setup (Open Field)

**FORM CTS-PHOTO**

Zarges Inc K475 Transport & Storage Container  
Document #: SR7012B.17  
Date: 2017-05-05

**Photographic Documentation**

**Customer: Zarges Inc**  
**Equipment: K475 Transport & Storage Container**  
**Tested By: William Couture**  
**Operating Mode: N/A**

**Date: 2017-04-21**  
**Test Number: 1**

**Coupling Device: Antennas**  
**Test Spec: IEEE-STD 299**



Photograph Description: Transmit Antenna Placement in Case (150kHz to 1GHz)

**FORM CTS-PHOTO**

**Photographic Documentation**

**Customer: Zarges Inc**  
**Equipment: K475 Transport & Storage Container**  
**Tested By: William Couture**  
**Operating Mode: N/A**

**Date: 2017-04-21**  
**Test Number: 1**

**Coupling Device: Antennas**  
**Test Spec: IEEE-STD 299**



Photograph Description: General Test Setup (200MHz to 1GHz)

**FORM CTS-PHOTO**

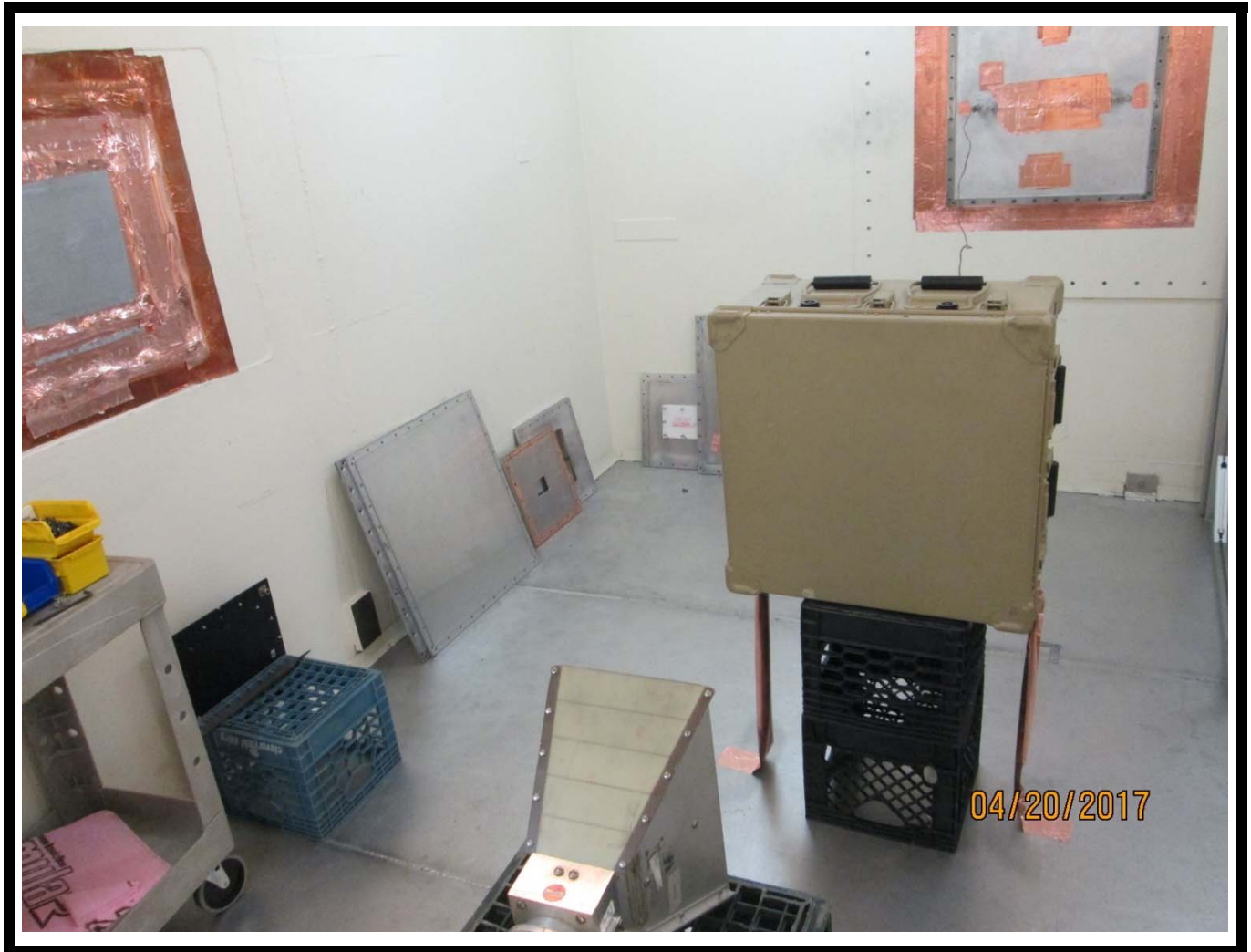


**Photographic Documentation**

**Customer: Zarges Inc**  
**Equipment: K475 Transport & Storage Container**  
**Tested By: William Couture**  
**Operating Mode: N/A**

**Date: 2017-04-21**  
**Test Number: 1**

**Coupling Device: Antennas**  
**Test Spec: IEEE-STD 299**



Photograph Description: General Test Setup (2GHz to 18GHz)

**FORM CTS-PHOTO**

**APPENDIX A: EQUIPMENT CALIBRATION**

Test Equipment	Asset #	Serial #	Last Cal Date
50uH Inductor	N/A	N/A	NCR
Agilent E4440A Spectrum Analyzer	704	US41421236	2017/02
Agilent 33210A Arbitrary Waveform Generator	909	MY48005722	NCR
Agilent E8257D PSG Analog Signal Generator	Rental	US44270147	2016/12
Agilent E4401B Spectrum Analyzer	725	MY44140273	2017/02
Agilent 33210A Arbitrary Waveform Generator	919	MY48005727	2016/09
Agilent 33522A Arbitrary Waveform Generator	952	MY50003045	2016/10
Agilent 6653A DC Power Supply	925	MY400030002	NCR
AH Systems SAS-550-2B Vertical Rod Antenna	897	283	2016/04
AH Systems ECF-10 Calibration Fixture	918	190	2016/04
Alpha 861W-387 75 to 110GHz Horn Antenna	1004	484	NCR
Alpha W861 75 to 110GHz Horn Antenna	1003	108	NCR
Amprobe LH41A	959	11110011	2017/03
Ametek CSW5550 Programmable Power Supply M/N CSW5-LAN-413-6579	Rental	1516A02568	UWC
AR Model DC2035A Dual Directional Coupler	854	306152	2016/11
AR 2500LMS 2.5kW Amplifier 10kHz - 220MHz	853	325925	NCR
AR 100W1000B 100 Watt Amplifier	768	311120	NCR
AR 30W1000M7 Amplifier	480	15657	NCR
AR 25A250 25 Watt Amplifier	924	14849	NCR
AR 100W1000M7 Amplifier	884	9568	NCR
AR 1000W1000M7 80-1000MHz Amplifier	818	323326	NCR
AR 250T1G3 1-2.5GHz Amplifier	784	313235	NCR
AR 300T2G8 2.5-7.5GHz Amplifier	785	313230	NCR
AR 250T8G18 7.5-18GHz Amplifier	786	313234	NCR
AR FM2000 Field Monitor	39	13009	UWC
AR FP2000 Isotropic Field Probe	40	12914	2016/06
AR FP2080 Isotropic Field Probe	767	309531	2016/06
AR 888 Leveling Preamplifier	491	15606	UWC
AR AT5000M1 Billboard Antenna	856	0325328	NCR
AR DC2035A Dual Directional Coupler	854	306152	2016/11
AR Model 150L Amplifier	888	9747	NCR
Bird 8130 50 watt Coaxial Load Resistor	220	3387	2017/04
Bird 8129 2000 watt Coaxial Load Resistor	419	2176	NCR
Bird 8125 300 watt Coaxial Load Resistor	292	3939	2017/04
Bird 9825 10 watt	584	N/A	UWC
Bird 9825 10 watt	585	N/A	UWC
Bird 9919 10watt	594	N/A	UWC

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Test Equipment	Asset #	Serial #	Last Cal Date
Bird 10-18T-MN	979	N/A	NCR
BK Precision 890C Capacitance Meter	965	128B12223	2016/08
Boonton 4232A RF Power Meter	777	148602	2016/09
Boonton 51011 EMC RF Power Sensor	778	33863	2016/09
Boonton 51011 EMC RF Power Sensor	983	34700	2016/09
Chomerics 1 GHz to 18 GHz L.N.A. System	800	1065365	NCR
Chomerics Closed Circuit CCD monitor	N/A	N/A	NCR
Chomerics Closed Circuit Color monitor	N/A	N/A	NCR
Chomerics 0.5Ω Resistor	1030	N/A	2016/10
Chomerics 100 Ohm Resistor	N/A	N/A	NCR
Chomerics Helmholtz Coil A	441	N/A	UWC
Chomerics Helmholtz Coil B	442	N/A	UWC
Chomerics Coil C	812	N/A	UWC
Chomerics Spiral Loop Antenna	N/A	N/A	NCR
Com-Power LI-325 LISN	963	201616	2016/10
Com-Power LI-325 LISN	964	201615	2016/10
Covidien ForceTriad	N/A	T2C28038EX	NCR
Covidien Cut/Coag Electrosurgical Pencil	N/A	N/A	NCR
Dell Computer System (Desktop and Flat Panel Monitor)	N/A	N/A	NCR
Eaton 94626-1 18-26.5GHz Antenna	334	145	2016/05
Eaton 94627-1 26.5-40GHz Antenna	333	136	NCR
Eaton Bulk Current Injection Probe 95242-1	215	290	NCR
Eaton Probe Calibration Fixture 95241-1	219	0179680-04	UWC
Eaton Current Probe 91550-1	218	2759	2017/03
Eaton Current Probe 954111-1	217	1393	2017/03
Eaton 91888-2 1-2.5GHz Antenna	401	529	NCR
Elgar Programmable Power Source SW5250A	N/A	0445A00489	UWC
Elgar Smartwave Control Suite v3.00.02	N/A	N/A	NCR
Elgar SW 5250M	870	0841A00418	UWC
Elgar SW 5250S	871	0841A00419	UWC
Elgar SW PDU	868	0839A0329	UWC
EMCO 3109 Biconical Antenna	82	2054	2017/02
EMCO 3301B Vertical Rod Antenna	371	2901	2017/03
EMCO 3109 Biconical Antenna	87	2123	2017/03
EMCO 3109 Biconical Antenna	116	2415	2017/03
EMCO 3109 Biconical Antenna	119	2414	2017/02
EMCO 3109 Biconical Antenna	281	2124	2017/02

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Test Equipment	Asset #	Serial #	Last Cal Date
EMCO 3115 Double Ridge Guide Antenna	282	2345	NCR
EMCO 3106 Ridge Guide Horn Antenna	117	2213	2017/04
EMCO 3106 Ridge Guide Horn Antenna	120	2212	2017/02
EMCO 3115 Ridge Guide Horn Antenna	376	2796	2017/03
EMCO 3115 Ridge Guide Horn Antenna	374	2174	2017/01
EMCO 3115 Double Ridge Guide Antenna	375	2174	2017/01
EMCO 3303 Passive Rod Antenna	280	9003-2662	2017/03
EMCO Log Spiral 3101 Antenna	79	2495	NCR
EMCO 3120 Tuned Dipole Antenna B1	453	42	2017/03
EMCO 3121 Tuned Dipole Antenna B2	475	177	2017/03
EMCO 3121 Tuned Dipole Antenna B3	476	698	2017/03
EMCO 7405 RF Probe Kit	3	9006-1648	NCR
EMCO 3810/2NM LISN	601	9612-1740	2017/01
EMCO 3825/2R LISN	890	1031	2016/07
EMCO Voltage Probe 3701	499	9604-1130	2017/04
EMCO 3143 Biconilog	505	1266	NCR
EMCO 3115 Double Ridged Guide	374	2174	2017/01
ENI Amplifier Model 510L	138	157	NCR
ENI Amplifier Model 600L	568	298	NCR
ETS 3142c Biconilog Antenna (Site B)	769	00046673	2016/05
ETS 3117 Ridge Guide Antenna	801	58877	2017/03
ETS Lindgren T.I.L.E. 4! Software Version 4.0.A.9 (only for classified/off-site tests)	N/A	N/A	NCR
ETS Lindgren T.I.L.E. Software Version 7.1.2.24 (CE with AMN and MIL-STD tests except for CS114)	N/A	N/A	NCR
ETS-Lindgren TILE EMC Software Version 7.0.16.774 (for Shielding, CS114, and commercial immunity tests)	N/A	N/A	NCR
ETS-Lindgren TILE EMC Software Version 7.0.21.880 (CE with LISN)	N/A	N/A	NCR
Fairgate Meter Stick	836	N/A	2017/02
FCC 150-50 Ohm Adapters	361	4	UWC
FCC 801-M3-25A Power Line Coupling/Decoupling Network	622	99125	2016/06
FCC 801-150-50 CDN	583	9975	UWC
FCC 801-150-50 CDN	582	9976	UWC
FCC 50-150 Ohm Adapter	486	276	UWC
FCC 50-150 Ohm Adapter	487	277	UWC
FCC 801-T4 Coupling Network	485	45	UWC

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Test Equipment	Asset #	Serial #	Last Cal Date
FCC 801-T2 Coupling Network	484	50	UWC
FCC 801-AF2 Coupling Network	483	35	UWC
FCC 801-150-50-BCI Adapter	702	343	UWC
FCC 801-150-50-BCI Adapter	775	449	UWC
FCC 801-150-50-BCI Adapter	776	450	UWC
FCC 801-M2-25 Coupler/Decoupler	363	1	UWC
FCC 150-50 Ohm Adapter	362	2	UWC
FCC 801-M3-16A CDN	912	100835	2016/07
Fischer Custom Comm. 5-10-1-01-CISPR 25 LISN	728	03073	2016/10
Fischer Custom Comm. 5-10-1-01-CISPR 25 LISN	729	03074	2016/10
Haefely P surge 4010 Generator	736	151542	2017/04
Haefely PHV 41.1 PEFT.1 Generator	489	082-106-18	2016/11
Haefely FP16/3-1 Coupling Filter	356	082-208-02	UWC
Haefely PC-288.1 Generator	357	081-813-10	UWC
Haefely IP4 Coupling Clamp	481	N/A	NCR
Haefely Metallic Surge Pistol	643	N/A	UWC
Haefely Fp20/3-3 Coupling Filter	358	082-170-06	UWC
Haefely IP 6.2 I/O Coupling Network	928	080-260-03	CPU
Hewlett Packard 8447D Pre Amp	887	2443A04253	NCR
Hewlett Packard 8447D Pre Amp	12	2944A06414	NCR
HP 8341B Synthesized Sweeper	105	2650A00418	UWC
HP Power Meter 437B	203	2949A02617	2017/04
HP Power Sensor 8481A	961	1550A14925	2017/04
HP 651B Signal Generator	57	1230A10422	2016/09
HP 3325A Signal Generator	617	2512A23039	NCR
HP 8753E Network Analyzer	738	US38432018	2016/05
HP 974A True RMS Voltmeter	642	JP40008954	2016/05
HP 974A True RMS Voltmeter	632	JP40009239	2016/07
HP 3326A Signal A Signal Generator	37	2519A00753	NCR
HP 83620B Signal Generator	624	3844A00963	NCR
HP 83620B Signal Generator	625	3844A00955	NCR
HP 11867A RF Limiter	N/A	05002	NCR
HP 11867A RF Limiter	N/A	MY4224-1318	NCR
HP 5340A Frequency Counter	139	2148A08245	UWC
HP 8474B GaAs Microwave Diode Detector	610	01656	UWC
HP N9355B RF Limiter	N/A	MY45450141	NCR

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HP N9355B RF Limiter	N/A	MY45450142	NCR
HP N9355B RF Limiter	N/A	MY45450146	NCR
Hughes 1277H09F000 Amplifier	N/A	082	NCR
Hughes 8101H11F000 18-26.5GHz Amplifier	230	039	NCR
Hughes 8010H12F000 26.5-40GHz Amplifier	231	051	NCR
IFI EFG-3B Billboard Antenna	122	453B	NCR
Integrity Design Geomagnometer IDR-321	743	1962	2017/04
Keysight InfiniVision MSO-X 3104A Oscilloscope	1017	MY53480275	2016/09
Keysight 10x Passive Probe N2890A	1019	N/A	2016/09
Keysight Model 974A Multimeter	319	JP34000528	2016/12
Keytek MZ-15 ESD Simulator	336	8801209	2016/12
Keytek VCP-1 Vertical Coupling Plane	368	9209332	NCR
Keytek CTC-3 Coax Monitor	440	N/A	NCR
Lietz Compass 8022-05	353	N/A	NCR
Logimetrics A300/C 4-8GHz	91	3093	NCR
Logimetrics A300/IJ Amplifier 7-18GHz	134	3094	NCR
Logimetrics A300/L (1-2 GHz)	135	3091	NCR
Logimetrics A300/S (2-4 GHz)	92	3092	NCR
MA/COM EWAL 1050-32 100-500MHz Amp	137	7364-1-001	NCR
MA/COM EWAL 5010-32 500-1000MHz Amp	136	7264-1-001	NCR
Narda 3024 Coupler	1016	08017	2016/08
Narda 3020A Directional Coupler	214	34514	2016/07
Narda 8616 Radiation Hazard Meter	417	27087	NCR
Narda 8621D Radiation Hazard Probe	428	27072	NCR
Narda 8661 Radiation Hazard Probe	416	04005	NCR
Narda 769-10 10dB 150 Watt Attenuator	221	03A26	2017/04
Narda 768-20 20dB 20Watt Attenuator	796	0110	2017/01
Narda 768-20 20dB 20Watt Attenuator	792	8902	2017/01
Narda 776C-20 Attenuator	N/A	2759	NCR
Narda 3020A Directional Coupler	214	34514	2016/07
Narda 3022 Directional Coupler	212	73360	2017/04
Narda 3022 Directional Coupler	814	81864	2016/09
Ohmite D225K250 variable resistor	N/A	N/A	NCR
Ohmite D1000K100 variable resistor	N/A	N/A	NCR
Ohmite RRS125 variable resistor	N/A	N/A	NCR
Ophir GRF5060 25 Watt Amplifier 0.8-4.2GHz	Rental	1004	NCR
Pearson Electronics PRD-240	1029	82197	2016/11
Polarad MDS21 Absorbing Clamp	435	301404/003	2016/12

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Polarad ESH2-25 Artificial Mains Network	23	890484/016	2017/01
Pomona 6492 Voltage Probe	841	NA	2016/09
Pomona 6492 Voltage Probe	978	NA	2016/09
Powerstat Variable Transformer 12560T	506	N/A	NCR
RF Power Labs 220-1K60L 1kW Amplifier	35	042594-1	NCR
RF Power Labs Pre Amp	562	N/A	NCR
RF Power Labs 20 Watt Power Amplifier	563	N/A	NCR
Rigel Electrosurgical Analyzer Model 377	929	O2C-0572	2016/12
Rohde and Schwarz ESH-2 Test Receiver	16	8799631020	2016/10
Rohde and Schwarz ESIB 40 EMI Test Receiver	803	100293	2016/05
Rohde and Schwarz Signal Generator	881	883 802/013	2016/07
Rohde and Schwarz ESCI7	902	100747	2017/03
RS Components Variac Transformer	885	N/A	NCR
Schaffner NSG 438 PN 400-348 ESD Simulator	755	385	2017/03
Schaffner INA 4380 150pF/330Ohm Network	756	403-550-0447	2017/03
Schaffner INA 4480 Magnetic Loop	763	403-615-0413	UWC
Schaffner INA 4551 150pF/500Ohm Network	757	403-591-0503	2017/03
Schaffner INA 4553 330pF/330Ohm Network	759	403-588-0447	2017/03
Schaffner INA 4554 150pF/150Ohm Network	760	403-588-0427	2017/03
Schaffner INA 4591 250pF/500Ohm Network	954	891	2017/03
Schaffner INA 4597 100pF/47Ohm Network	955	892	2017/03
Sharp Closed Circuit Video Monitor	N/A	N/A	NCR
Singer CLS-105 Log Spiral Antenna	89	00316-4780	NCR
Solar 50 Ohm/50uH L.I.S.N.	19	894304	2017/01
Solar 50 Ohm/50uH L.I.S.N.	20	894305	2017/01
Solar 50 Ohm/50uH L.I.S.N.	21	894307	2017/01
Solar 6220-1A Audio Isolation Transformer	170	N/A	NCR
Solar 6512-106R 10uF Capacitor	387	N/A	2017/01
Solar 6512-106R 10uF Capacitor	389	N/A	2017/01
Solar 6512-106R 10uF Capacitor	390	N/A	2017/01
Solar 6512-106R 10uF Capacitor	391	N/A	2017/01
Solar 6512-106R 10uF Capacitor	392	N/A	2017/01
Solar 6512-106R 10uF Capacitor	393	N/A	2017/01
Solar 6512-106R 10uF Capacitor	394	N/A	2017/01
Solar 7012-106R 10uF Capacitor	186	N/A	2017/01
Solar 7012-106R 10uF Capacitor	187	N/A	2017/01
Solar 7012-106R 10uF Capacitor	188	N/A	2017/01
Solar 7012-106R 10uF Capacitor	189	N/A	2017/01

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Solar 7012-106R 10uF Capacitor	190	N/A	2017/01
Solar 7012-106R 10uF Capacitor	191	N/A	2017/01
Solar 7012-106R 10uF Capacitor	723	N/A	2017/01
Solar 7012-106R 10uF Capacitor	724	N/A	2017/01
Solar 6512-106R 10uF Capacitor	807	N/A	2017/01
Solar 6512-106R 10uF Capacitor	808	N/A	2017/01
Solar 6512-106R 10uF Capacitor	809	N/A	2017/01
Solar 6512-106R 10uF Capacitor	810	N/A	2017/01
Solar 6512-106R 10uF Capacitor	811	N/A	2017/01
Solar LISN 8028-50-TS-24-BNC/461	381	852334	2017/01
Solar 50 Ohm/50uH L.I.S.N.	382	860622	2017/01
Solar LISN 8028-50TS-24-BNC	383	860623	2017/01
Solar LISN 8028-50-TS-24-BNC/461	384	8305125	2017/01
Solar LISN 8028-50TS-24-BNC	385	8379275	2017/01
Solar LISN 8028-50TS-24-BNC	805	062632	2017/01
Solar LISN 8028-50TS-24-BNC	806	062633	2017/01
Solar Coupling Probe Type 9335-2	753	0401507	UWC
Solar Coupling Probe Type 9144-1N	857	078003	UWC
Solar Coupling Probe Type 9142-1N	893	089816	UWC
Solar Calibration Fixture Type 9357-1	754	N/A	UWC
Solar Calibration Fixture Type 9125-1	894	N/A	NCR
Solar 9134-1 Current Probe	880	089523	2017/02
Solar 9355-1 Pulse Generator	740	041224	UWC
Solar 9354-1 Damped Sinusoid Generator	739	940559	UWC
Solar 9554-10k/100k Module	N/A	077604	UWC
Solar 9554-1M/6M Module	N/A	077804	UWC
Solar 9554-6M/50M Module	N/A	077904	UWC
Solar 9554-50M/100M Module	N/A	023815	UWC
Solar Loop Sensor Antenna 7334-1	164	945212	2016/07
Solar Current Probe 6741-1	468	901610	2017/03
Solar 6552-1A Audio Amplifier	162	829015	NCR
Solar 6220-4 Audio Isolation Transformer	816	N/A	NCR
Solar 6220-4 Audio Isolation Transformer	817	N/A	NCR
Solar High Pass Filter 7930-5.0	781	NA	NCR
Sorenson DCR40-60A DC Power Supply	185	1458	NCR
Staco 3PN 1520B Variac	635	N/A	NCR
Storm 90-010-722 Microwave coaxial cable	N/A	N/A	UWC
Suhner Sucoflex 100 Microwave cable	N/A	N/A	NCR

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Test Equipment	Asset #	Serial #	Last Cal Date
Suhner Sucoflex 102 Microwave cable	N/A	N/A	NCR
Tegram Bulk Current Injection Probe 95252-1	490	12180	UWC
Tegram B. C. I. Probe Calibrator 95251-1	507	12326	UWC
Tektronix 7A24 Dual Trace Amplifier	198	B130224	2016/12
Tektronix 7A19 600MHz Vertical Amplifier	199	B040898	2016/12
Tektronix 7A29 1GHz Vertical Amplifier	153	B040385	NCR
Tektronix 7A26 200MHz Vertical Amplifier	157	B226293	2016/12
Tektronix 7A26 200MHz Vertical Amplifier	152	B245956	2016/12
Tektronix 7B85 Delaying Time Base	194	B104724	2016/12
Tektronix 7B92A Dual Time Base	150	B094245	2016/12
Tektronix TDS 380 Oscilloscope	516	B012231	2016/09
Tektronix P6114B Voltage Probe	837	N/A	2016/06
Tektronix TB92A Time Base	196	B096042	NCR
Testec HVP-15HF High Voltage Probe	1027	20151109	2016/11
Testec HVP-15HF High Voltage Probe	1026	20152029	2016/11
Topaz 910002-32 Isolation Transformer	009	N/A	NCR
Topaz 910002-32 Isolation Transformer	118	N/A	NCR
Valhalla 4100ATC Digital Ohmmeter	158	2-2818	2017/02
Vaisala Pressure, Humidity, Temperature Transmitter PTU301-300	850	C3850004	2017/02
Varian TWT amplifier 8-18GHz VZM6991K31194	Rental	5785	NCR
Voltech PM3000A Power Analyzer	508	0882	2016/10
Voltech IEC 555 STD Impedance Network	509	685	2016/10
Voltech 3-Phase Power Analyzer PM3000A	882	508	UWC
Voltech Universal Power Analyzer PM6000	861	1000006700235	2017/03
Watrous/Durotherm Hygrometer	496	N/A	2017/04
Watrous/Durotherm Hygrometer	497	N/A	2017/04
Watrous/Durotherm Hygrometer	498	N/A	2017/04
Watrous/Durotherm Hygrometer	549	N/A	2016/10
Watrous/Durotherm Thermometer	605	N/A	2017/02
Watrous/Durotherm Thermometer	606	N/A	2017/02
Watrous/Durotherm Thermometer	607	N/A	2017/02
Watrous/Durotherm Thermometer	581	N/A	2017/04
Werlatone C6277-10 Directional Coupler	780	20250	2016/09
Werlatone C6177 Directional Coupler	731	14304	2016/11
Werlatone C6442-10 Dual Directional Coupler	982	106459	2016/11

**APPENDIX B: TEST LOG AND LABORATORY ENVIRONMENTS**

## TEST LOG

Customer: Zarges Inc  
Equipment: Films

Program: Shielding Effectiveness  
Tested By: William Couture

Pre-Test Checklist	Date	Comments					
	2017-04-20	Test Plan/Procedure: IEEE-STD-299 Test Specification: IEEE-STD-299 Chomerics Procedure: CHO TP08 EUT Power Requirement Verified: N/A EUT Functional Operational Check: [ X ] Pass [ ] Fail Environmental: Bonding/Grounding: N/A Safety Issues: N/A					
In-Process Test Checklist	Date	Test #	Test Type	Test Equipment Calibrated	Test Performed Properly – Data Accepted	EUT Set-up Check/ Operational Check	EUT Pass/ Fail
	2017-04-21	1	IEEE 299 SE	X	X	X	Pass
Post Test Checklist	Date:	EUT Functional Operation Check:		 Test Engineer/Tech      Approved Signatory			
	2017-04-21	[ X ] Pass [ ] Fail					

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## LABORATORY ENVIRONMENTS

Date	Test Site	Ambient Temperature (°C)	Relative Humidity (%)	Atmospheric Pressure (mBar)
2017-04-21	SE Lab	22	40	1017.9

Test Equipment		Asset #	Serial #
X	Watrous/Durotherm Hygrometer	498	N/A
X	Watrous/Durotherm Thermometer	581	N/A
X	Vaisala Pressure, Humidity, Temperature Transmitter PTU301-300	850	C3850004

(See Appendix A for Equipment Calibration)