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April 9, 2014

Dale Williams Tideland Signal Corporation 4310 Directors Row Houston, Texas 77092

Dear Dale:

Thank you for allowing Professional Testing (EMI), Inc. an opportunity to perform testing for Tideland Signal Corporation. Enclosed is the Electromagnetic Compatibility Test Report for the E-Navcon.

This report can be used to demonstrate EMC compliance for the European Union, the United States, and Canada. For this product, the standards used to demonstrate compliance to the EMC directive were EN 60945: 2002, CISPR 16-2: 1996, and ETSI EN 301 489 v1.9.2 (2011-09).

If you have any questions, please contact me.

Sincerely,

Jeffrey A. Lenk

President

Attachment

Project 13862-10

Tideland Signal Corporation E-Navcon

Electromagnetic Compatibility Test Report

Prepared for:

Tideland Signal Corporation 4310 Directors Row Houston, Texas 77092

By

Professional Testing (EMI), Inc. 1601 North A.W. Grimes, Suite B Round Rock, Texas 78665

April 9, 2014

Reviewed by

Robert McCollough Director of Testing Services Written by

Tara Duval Technical Writer

Revision History

Revision Number	Description	Date
00	Initial Release	April 8, 2014
Final	Final Release	April 9, 2014

Table of Contents

Title Page	1
Revision History	3
Certificate of Compliance	5
1.0 Introduction	6
1.1 Scope	6
1.2 EUT Description	6
1.3 EUT Operation	6
2.0 Applicable Documents	
2.1 Modifications to Equipment	7
3.0 Electromagnetic Emissions Testing	
3.1 Conducted Emissions Mains Terminal Measurements	8
3.1.1 Test Procedure	
3.1.2 Test Criteria	
3.1.3 Test Results	9
3.2 Radiated Emissions Measurements	
3.2.1 Test Procedure	15
3.2.2 Test Criteria	16
3.2.3 Test Results	
4.0 Electromagnetic Immunity Testing	
4.1 Performance Criteria	28
4.2 Electrostatic Discharge Testing	28
4.2.1 Test Procedures	28
4.2.2 Performance Criteria	29
4.2.3 Test Results	
4.3 Radiated Immunity Test	37
4.3.1 Test Procedures	37
4.3.2 Field Generation	39
4.3.3 Performance Criteria	39
4.3.4 Test Results	
4.4 Electrical Fast Transient/Burst Immunity Testing	
4.4.1 Test Procedures	52
4.4.2 Performance Criteria	53
4.4.3 Test Results	54
4.5 Conducted Immunity Test	58
4.5.1 Test Procedures	58
4.5.2 Performance Criteria	59
4.5.3 Test Results	
Appendix A: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty	
Appendix B: Accreditations	68

NOTICE: (1) This Report must not be used to claim product endorsement, by NVLAP, NIST, the FCC or any other Agency.

⁽²⁾ This report also does not warrant certification by NVLAP or NIST. This report shall not be reproduced except in full, without the written approval of Professional Testing (EMI), Inc.

⁽³⁾ The significance of this report is dependent on the representative character of the test sample submitted for evaluation and the results apply only in reference to the sample tested. The manufacturer must continuously implement the changes shown herein to attain and maintain the required degree of compliance.



Certificate of Compliance

Model:

E-Navcon

Applicant: Tideland Signal Corporation

4310 Directors Row Serial #: 7065 Houston, Texas 77092 Project #: 13862-10

The **E-Navcon** by **Tideland Signal Corporation** was tested utilizing the following documents and found to be in compliance with the required criteria on the indicated test date.

EN 60945: 2002, Section 9; CISPR 16-2: 1996						
Conducted Emissions	N/A	DC Power Line: 10 kHz to 30 MHz	11/18/2013			
Radiated Emissions	N/A	150 kHz to 40 GHz	11/15/2012 –			
Radiated Ellissions	N/A	150 kHZ tO 40 GHZ	11/16/2012			
EN 60945: 2002, Section	10; ETSI EN 301	l 489-1 v1.9.2				
IEC 61000-4-2: 1995	Criterion A	Air Discharge: 2, 4, & 8 kV	6/14/2013			
TEC 01000-4-2. 1993	CITTETION A	Contact Discharge: 2, 4 & 6 kV	0/14/2013			
IEC 61000-4-3: 1995	Criterion A	10 V/m (80 MHz to 2 GHz)	11/19/2012 –			
IEC 01000-4-3. 1993		3 V/m (2 to 2.7 GHz)	11/20/2012			
IEC 61000-4-4: 1995	Criterion A	DC Mains: 2 kV, 5/50 ns, 5 kHz	2/28/2014			
TEC 01000-4-4. 1993		I/O Line: 1 kV, 5/50 ns, 5 kHz	2/20/2014			
		DC Power Line:				
		3 Vrms at 150 kHz to 80 MHz				
		10 Vrms at 2, 3, 4, 6.2, 8.2, 12.6, 16.5,				
IEC 61000-4-6: 1996	Criterion A	18.8, 22, 25, 40, & 48 MHz	11/19/2012			
ILC 01000-4-0. 1990	CITTETIONA	Signal Cable Port:	11/13/2012			
		3 Vrms at 150 kHz to 80 MHz				
		10 Vrms at 2, 3, 4, 6.2, 8.2, 12.6, 16.5,				
		18.8, 22, 25, 40, & 48 MHz				

I, Robert McCollough, for Professional Testing (EMI), Inc., being familiar with the electromagnetic compatibility rules and test procedures, have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Robert McCollough

Robert McCollough

Director of Testing Services

NVLAP Lab Code 200062-0

This report has been reviewed and accepted by Tideland Signal Corporation. The undersigned is responsible for ensuring that the E-Navcon by Tideland Signal Corporation will continue to comply with the applicable rules.

Representative of Tideland Signal Corporation

1.0 Introduction

1.1 Scope

The purpose of the EMC testing was to determine compliance with specific emissions and immunity standards. This report describes the extent to which the equipment under test (EUT) conformed to the standards to which it was tested and the manner in which that testing was conducted.

1.2 EUT Description

The EUT is the E-Navcon by Tideland Signal Corporation, which is a navigational aid comprised of an AIS AtoN device and an X-Band Racon. Both devices are housed in the same enclosure and function independently of one another. The device is intended for use on land, stationary off-shore platforms, buoys, or other stationary locations where navigational aid is required. The system tested consisted of the following:

Table 1.2.1: Equipment Under Test

	Manufac	turer	Model	Se	rial #	Description						
EUT	Tideland Signal Corporation		E-Navcon	7065		7065		7065		7065		Navigational Aid
	Manufac	turer	Model	Se	rial #	Description						
Peripheral Equipment	Tideland Signal Corporation Junction Box None		None		None		None		None		Junction Box	
Per Equ	Del	I	Latitude C610	CN-0X076-48643-64C-5563		Notebook Computer to Monitor EUT functions						
Se	Quantity	Length	Shielded or	Unshielded?	D	Description						
Cables	1	20 feet	Shie	lded	Serial Port Cable to Computer							
3	1	15 feet	Shie	lded	Cable Bundle f	rom Junction Box to EUT						
lator encies	AIS AtoN Transmit/Receive, 156 to 162.5 MHz; transmits at 162 end.											
Oscillator Frequencies	RACON Transmit/Receive: 9300 to 9500 MHz.											

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations. It was operated using 12 VDC. The operation of the AIS AtoN portion of the system requires GPS signals; otherwise, it does not transmit. AIS transmit power is 25 Watts. It transmits very briefly and only in a GPS-based time slot, spaced by 1 to 2 minutes. The EUT was visually monitored for anomalies during testing and checked for functionality upon completion of each test.

2.0 Applicable Documents

The following documents were used as reference for the test procedures specified herein.

Document Identifier/Revision	Title/Description	Date of Publication
EN 60945	Maritime Navigation and Radio Communication Equipment and Systems – General Requirements Methods of Testing and Required Test Results	2002
ETSI EN 301 489-1 v1.9.2	Electromagnetic Compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements	2011-09
CISPR 11	Industrial, Scientific and Medical Equipment – Radio- Frequency Disturbance Characteristics – Limits and Methods of Measurement	2009
CISPR 16-1	Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods – Part 1: Radio Disturbance and Immunity Measuring Apparatus	1999
CISPR 16-2	Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods – Methods of Measurement of Disturbances and Immunity	1996
IEC 61000-4-3	Electromagnetic Compatibility for Electrical and Electronic Equipment, Part 3: Immunity to Radiated, Radio Frequency, Electromagnetic Fields	1995
IEC 61000-4-6	Electromagnetic Compatibility – Basic Immunity Standard – Conducted Disturbances Induced by Radio- Frequency Fields – Immunity Test	1996
IEC 61000-4-8	Electromagnetic Compatibility (EMC) – / Part 4: Testing and Measurement Techniques – Section 8: Power Frequency Magnetic Field immunity Test Basic EMC Publication	1993 A1: 2000

2.1 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

3.0 Electromagnetic Emissions Testing

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing. A copy of PTI's policy for EMC Measurement Uncertainty is provided in Appendix A.

3.1 Conducted Emissions Mains Terminal Measurements

Conducted emissions measurements were made to determine the line-to-ground radio noise from each DC power-input terminal of the EUT Conducted Emissions measurements were performed at Professional Testing, located in Austin, Texas.

3.1.1 Test Procedure

The tests were performed in a RayProof modular shielded room. The measurements were taken using a line impedance stabilization network (LISN). A spectrum analyzer and a quasi-peak adapter with a measurement bandwidth of 9 kHz were used to record the conducted emissions.

The power cord in excess of the distance folded back and forth forming a bundle 30 to 40 cm long in the approximate center of the cable. Power supply cords for the peripheral equipment were powered from an auxiliary LISN. Excess interface cable lengths were separately bundled in a non-inductive arrangement at the approximate center of the cable with the bundle 30 to 40 centimeters in length. The conducted emissions were maximized, by varying the operating states and configuration of the EUT. The configuration of the shielded room showing the location of the EUT and the measurement equipment is given as Figure 3.1.1.1. Although a laptop computer was used to monitor EUT functions during other tests, it was not used during conducted emissions testing.

13862-10 April 8, 2014 Page 8 of 67

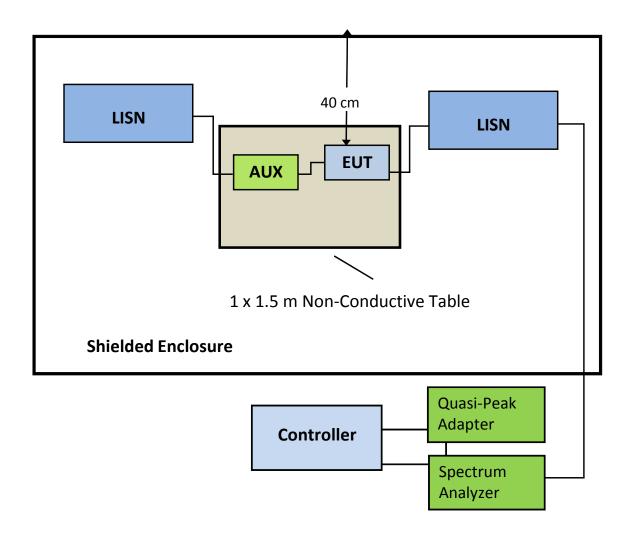


Figure 3.1.1.1: Conducted Emissions Test Setup

3.1.2 Test Criteria

The IEC 60945: 2002, CISPR 16-1 conducted emissions limits are given below.

Frequency	Protected	Exposed	Submerged			
10 kHz to 150 kHz	63 mV – 0.3 mV (96 dμBV – 50 dμBV)					
150 kHz to 350 kHz	1 mV – 0.3 mV (60 dμBV – 50 dμBV)					
350 kHz to 30 MHz	0.3 mV (50 dμBV)					

3.1.3 Test Results

During testing on November 18, 2013, the conducted emissions generated by the DC power lines of the EUT were measured to be below the EN 60945: 2002 maximum criteria.

<u> Table 3.1.</u>	3.1: Conducted	Emissions Tes	t Equipme	ent			
		Profess	sional Te	esting, EMI, Inc.			
Test Metho	d: CISPR 16-2: Specification for radio disturbance and immunity measuring apparatus and methods - Part 2: Methods of measurement of disturbance and immunity						
In accordar	ice with: equip	EC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results					
Section:	Secti	Section 9 Electromagnetic emission – Methods of testing and required test results					
Test Date(s): 11/18	3/2013		EUT Serial #:	7065		
Customer:	Tidel	and Signal Corpor	ation	EUT Part #:	None		
Project Nui		2-10		Test Technician:	Larry Fuller		
Purchase O		85 Rev 1		Supervisor:	Rob McCollough		
Equip. Under Test: E-Navcon Witness' Name: Paul Mueller							
		Conduct	ed Emission	s Test Equipment List			
Til	e! Software Versi	on: 4.1.A.	0, April 14,	2009, 11:01:00PM			
	Test Profile:	Profil	e#: CE_2010	til, dated December 16	, 2010		
Asset #	Manufacturer	Model	Equipn	nent Nomenclature	Serial Number	Calibration Due Date	
1842	HP	8568B	Sp	ectrum Analyzer	2732A03633	5/17/2014	
0045	HP	85662A	Spec Ar	nal Dsply for AN1842	2816A16413	N/A	
0990	HP	85685A	F	RF Preselector	3010A01119	8/29/2014	
1281	HP	85650A	Qua	asi Peak Adapter	2043A00063	6/5/2014	
C109	HP	none	Cable 19 inch BNC (grey) none		7/10/2014		
C107	Pomona	RG-223	Cable 9	ft BNC RG-223 (black)	none	7/10/2014	
C108	Pomona	RG-223	Cable 5.5	ft BNC RG-223 (black)	none	7/10/2014	
0939	EMCO	3825/2	LISN	I, 10kHz-100MHz	9603-2521	10/31/2014	
1185	EMCO	3825/2	LISN	I, 10kHz-100MHz	1235	10/31/2014	

Table 3.1.3.2: Conducted Emissions Spectrum Analyzer Bandwidth and Measurement Time

Professional Testing, EMI, Inc.					
Test Method:	CISPR 16-2: Specification for radio disturbance and immunity measuring apparatus and methods - Part 2: Methods of measurement of disturbance and immunity				
In accordance with:	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results				
Section:	Section 9 Electromagnetic emiss	sion – Methods of testir	ng and required test results		
Test Date(s):	11/18/2013	EUT Serial #:	7065		
Customer:	Tideland Signal Corporation	EUT Part #:	None		
Project Number:	13862-10	Test Technician:	Larry Fuller		
Purchase Order #:	116585 Rev 1	Supervisor:	Rob McCollough		
Equip. Under Test:	E-Navcon	Witness' Name:	Paul Mueller		

Conducted Emissions Spectrum Analyzer Bandwidth and Measurement Time						
Frequency Band	Frequency Band	6 dB Bandwidth	Number of	Measurement Time		
Start (MHz)	Stop (MHz)	(kHz)	Ranges Used	per Range		
0.01	0.15	0.3	7	Five 1 second sweeps		
0.15	30	9	20	Five 1 second sweeps		

*Notes:

^{1.} The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1,000 data points per range.

^{2.} The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 10-150 kHz.

^{3.} The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.

Table 3.1.3.3: Conducted Emissions Test Results, Neutral Lead

Table 3.1.3.3: Cond	lucted Emis	sions lest	Results, N	leutrai Lead				
		Profes	sional Te	esting, EMI, Inc	· ·•			
Test Method:		CISPR 16-2: Specification for radio disturbance and immunity measuring apparatus and methods - Part 2: Methods of measurement of disturbance and immunity						
In accordance with:	-	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test						
Section:	Section 9 E	Section 9 Electromagnetic emission – Methods of testing and required test results						
Test Date(s):	11/18/2013			EUT Serial #:	7065			
Customer:	Tideland Sig	gnal Corpo	ration	EUT Part #:	None			
Project Number:	13862-10			Test Technician:	Larry Fuller			
Purchase Order #:	116585 Rev 1		Supervisor:	Rob McCollough				
Equip. Under Test:	E-Navcon			Witness' Name:	Paul Muelle	r		
Conduc	ted Emissions	Test Result	ts Data Shee	t - Neutral Lead	Pag	ge:	1 of	2
EUT Line Voltage: 12 VDc			VDc	EUT Line Freq	juency:	N/A	Hz	

	Conducted Emissions Test Results Data Sheet - Neutral Lead							ge: 1	of 2
EU'	EUT Line Voltage:		ge: 12 VD		12 VDc EUT Line Frequ		ncy:	N/A	Hz
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi- peak Detector Reading	Quasi- peak Detector Limit	Quasi- peak Detector Margin	Quasi- peak Detector Test	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results
0.139574		25.437	51.224	-25.787	Pass				
0.139655		16.407	51.214	-34.807	Pass				
0.140485		15.845	51.113	-35.268	Pass				
0.142055		16.023	50.924	-34.902	Pass				
0.142268		25.882	50.899	-25.017	Pass				
0.26307		42.748	53.37	-10.622	Pass				
4.04651		29.431	50	-20.569	Pass				
4.39094		30.052	50	-19.948	Pass				
4.56398		33.978	50	-16.022	Pass				
4.66926		31.311	50	-18.689	Pass				
4.79348		32.745	50	-17.255	Pass				

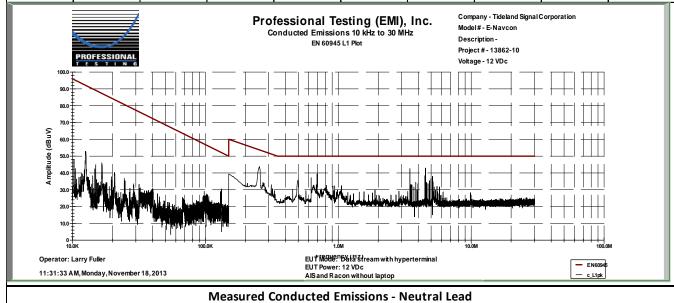


Table 3.1.3.4: Conducted Emissions Test Results, Phase Lead

	Professional	Testing, EMI, Inc	с.			
Test Method:	CISPR 16-2: Specification for radio disturbance and immunity measuring apparatus and methods - Part 2: Methods of measurement of disturbance and immunity					
In accordance with:	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results					
Section:	Section 9 Electromagnetic emiss	sion – Methods of testi	ng and required test results			
Test Date(s):	11/18/2013	EUT Serial #:	7065			
Customer:	Tideland Signal Corporation	EUT Part #:	None			
Project Number:	13862-10	Test Technician:	Larry Fuller			
Purchase Order #:	116585 Rev 1	Supervisor:	Rob McCollough			
		Witness' Name:	Paul Mueller			

	Conducted E	missions Te	st Results Da	ata Sheet - F	Phase Lead (Line 1)	Pa	ge: 2	of 2
EU	T Line Volta	ge:	12 VDc EUT Line Frequen			ncy: N/A Hz			
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi- peak Detector Reading	Quasi- peak Detector Limit	Quasi- peak Detector Margin	Quasi- peak Detector Test	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results
0.131264		18.349	52.266	-33.918	Pass				
0.131338		15.949	52.257	-36.308	Pass				
0.132536		24.487	52.103	-27.615	Pass				
0.132854		24.437	52.062	-27.625	Pass				
0.132998		15.597	52.043	-36.446	Pass				
0.26632		41.969	53.225	-11.256	Pass				
0.66167		24.589	50	-25.411	Pass				
3.44792		23.621	50	-26.379	Pass				
4.45369		30.256	50	-19.744	Pass				
4.5479		33.369	50	-16.631	Pass				
4.56418		32.75	50	-17.25	Pass				

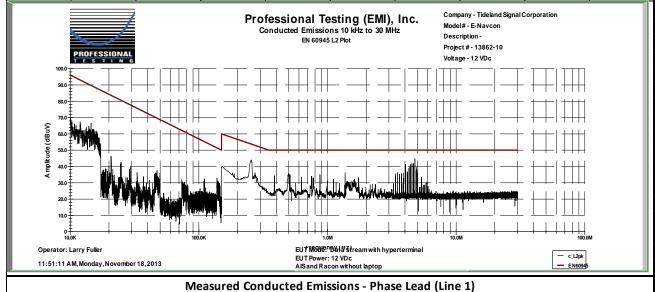
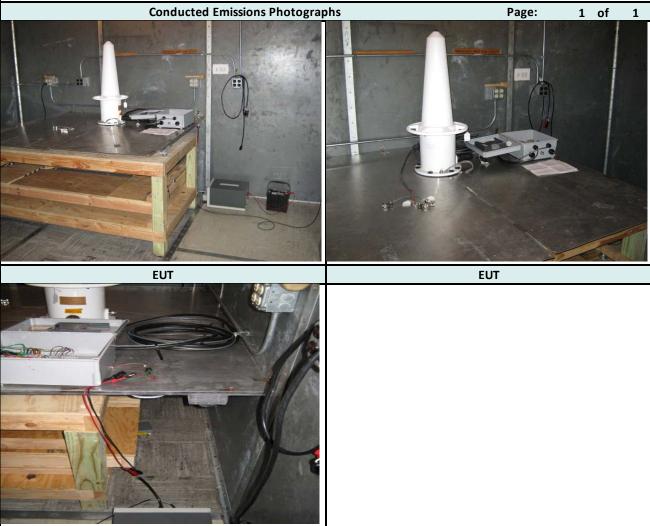


Table 3.1.3.5: Conducted Emissions Test Setup Photographs

	Professional	Testing, EMI, Inc	с.
Test Method:	CISPR 16-2: Specification for rac	dio disturbance and imn	nunity measuring apparatus and
- Cot Mictilous	methods - Part 2: Methods of n	neasurement of disturba	ance and immunity
	IEC 60945, Fourth Edition, 2002-	-08 Maritime navigation	and radio communication
In accordance with:	equipment and systems - Gener results	ral Requirements - Meth	nods of testing and required test
Section:	Section 9 Electromagnetic emis	sion – Methods of testi	ng and required test results
Test Date(s):	11/18/2013	EUT Serial #:	7065
Customer:	Tideland Signal Corporation	EUT Part #:	None
Project Number:	13862-10	Test Technician:	Larry Fuller
Purchase Order #:	116585 Rev 1	Supervisor:	Rob McCollough
Equip. Under Test:	E-Navcon	Witness' Name:	Paul Mueller



Cable View

3.2 Radiated Emissions Measurements

Radiated emissions measurements were made at the Professional Testing Site 45, located in Austin, Texas, to determine the radio frequency noise radiated from the EUT. The test methods used were CISPR 16-1 and CISPR 16-2 with the criteria of EN 60945: 2002.

3.2.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable which allows 360 degree rotation.

A measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT. Over the frequency range of 150 kHz to 30 MHz, the active rod antenna was located at a distance of 3 meters from the EUT. The height of this antenna was maintained at 1 meter. From 30 MHz to 200 MHz, a bi-conical antenna was used. From 200 MHz to 1 GHz, a log periodic antenna was used. For testing from 1 GHz to 2 GHz, a ridge guide horn antenna was used.

The radiated emissions were maximized by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 meters (above 30 MHz). A spectrum analyzer with peak detection was used to find the maximums of the radiated emissions during the variability testing. All final measurements in the frequency range of 150 kHz to 30 MHz and 156 MHz to 165 MHz were taken using a quasi-peak adapter with a measurement bandwidth of 9 kHz. Final measurements below 1 GHz were taken using a quasi-peak adapter with a measurement bandwidth of 120 kHz.

For frequencies greater than 1GHz, a measurement antenna was positioned at a constant height of 1 meter and at a distance of 3 meter from the closest point of the EUT. Average measurements were taken using a spectrum analyzer to find the maximums of the microwave radiated emissions. Final measurements above 1 GHz were taken using an average detector with a resolution bandwidth of 1 MHz. A diagram showing the test setup is given as Figure 3.2.1.1.

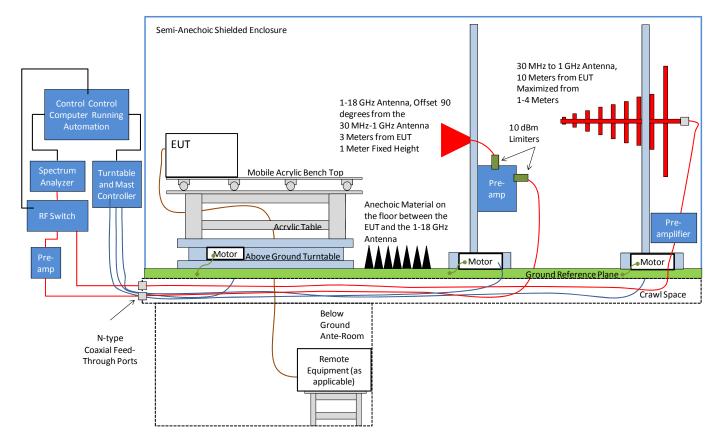


Figure 3.2.1.1: Radiated Emissions Test Setup

3.2.2 Test Criteria

The radiated emissions limits for IEC 60945: 2002, CISPR 16-1 are given below.

Frequency	Portable Protected Exposed						
150 kHz to 300 kHz	10 mV/m – 316 μV/m (80 dBμV/m – 52 dBμV/m)						
300 kHz to 30 MHz	316 μV/m – 50 μV/m (52 dBμV/m – 34 dBμV/m)						
30 MHz to 2 GHz	500 μV/m (54 dBμV/m) except for:						
156 MHz to 165 MHz	16 μV/m (24 dBμV/m) quasi-peak or						
156 MHz to 165 MHz	32	μV/m (30 dBμV/m) pe	eak				

3.2.3 Test Results

During testing on November 15 and 16, 2012, the emissions identified from the EUT were maximized at each frequency. The radiated emissions generated by EUT were below the IEC 60945: 2002 CISPR 16-1 maximum criteria.

Table 3.2.	3.1: Radiated E	missions Test Ed	quipment						
		Profess	sional Te	esting, EMI, Inc.					
Test Metho	a:	•		disturbance and immun		aratus and			
methods - Part 2: Methods of measurement of disturbance and immunity IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication									
				-					
In accordan	nce with: equip resulf		s - General F	Requirements - Method	s of testing and re	quired test			
Section:			etic emission	n – Methods of testing a	and required test r	esults			
Test Date(s)		5/2012 – 11/16/20		EUT Serial #:	7065	Courto			
Customer:		and Signal Corpora		EUT Part #:	None				
Project Nur	mber: 13862	2-10		Test Technician:	Bob Redoutey				
Purchase O			Supervisor: Witness' Name:	Rob McCollough					
Equip. Und	er Test: E-Nav	None							
	Radiated Emissions Test Equipment List								
Tile	e! Software Version	on: 4.2.A,	May 23, 20	10, 08:38:52 AM					
	Test Profile:	Radia	ted Emissio	ns_Profile Version Octo	ber 12, 2011				
Asset #	Manufacturer	Model	Equipm	nent Nomenclature	Serial Number	Calibration Due Date			
1509A	Braden	N/A	TDK 10M	Chamber, NSA < 1 GHz	DAC-012915-005	7/27/2013			
0586	HP	8447D	Preamp,	0.1-1300MHz, 26dB	1726A01364	12/21/2012			
1930	Agilent	E4440A-239	Spectrum A	nalyzer, 3 Hz - 26.5 GHz	MY45304903	6/19/2013			
1926	ETS-Lindgren	3142D	Antenna, Bi	conilog, 26 MHz - 6 GHz	00135454	7/24/2013			
C027	N/A	RG214	Cable	e Coax, N-N, 25m	none	9/7/2013			
1327	EMCO	1050	Contro	ller, Antenna Mast	none	N/A			
0942	EMCO	11968D		urntable, 4ft.	9510-1835	N/A			
1969	HP	11713A	Attenu	uator/Switch Driver	3748A04113	N/A			
6	EMCO	6502	Antenna, L	oop, Active, .01-30MHz	1030	4/26/2013			
1509B	Braden	N/A	TDK 10M C	hamber, VSWR > 1 GHz	DAC-012915-005	4/8/2013			
1594	Miteq	AFS44-00102650	Amplifi	er, 1-26.5GHz, 42dB	none	10/15/2013			
2004	Miteq	AFS44-00101800- 2S-10P-44	Amplif	ier, 40dB, .1-18GHz	0	12/12/2012			
C030	N/A	0	Cable	e Coax, N-N, 30m	none	9/7/2013			
1780	ETS-Lindgren	3117	Antenna,	Double Ridged Guide	00110313	1/19/2013			
1325	EMCO	1050	Contro	oller, Antenna Mast	9003-1461	N/A			

Table 3.2.3.2: Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time – Peak Scan

	Professional To	esting, EMI, Inc.							
Test Method:	CISPR 16-2: Specification for radio	disturbance and immur	nity measuring apparatus and						
rest iviethou.	methods - Part 2: Methods of measurement of disturbance and immunity								
In accordance with:	IEC 60945, Fourth Edition, 2002-08	Maritime navigation ar	nd radio communication						
in accordance with.	equipment and systems - General Requirements - Methods of testing and required test								
Section:	Section 9 Electromagnetic emission	n – Methods of testing	and required test results						
Test Date(s):	11/15/2012 - 11/16/2012	EUT Serial #:	7065						
Customer:	Tideland Signal Corporation	EUT Part #:	None						
Project Number:	13862-10	Test Technician:	Bob Redoutey						
Purchase Order #:	116585	Supervisor:	Rob McCollough						
Equip. Under Test:	E-Navcon	Witness' Name:	None						

Radiate	d Emissions Spectrum A	nalyzer Bandwidth and	Measurement Time -	Peak Scan
Frequency Band	Frequency Band	6 dB Bandwidth	Number of	Measurement Time
Start (MHz)	Stop (MHz)	(kHz)	Ranges Used	per Range
0.009	0.15	0.3	2	Multiple Sweeps
0.15	30	9	6	Multiple Sweeps
30	1000	120	2	Multiple 800 mS Sweeps
1000	6000	1000	2	Multiple Sweeps
6000	18000	300	2	Multiple Sweeps

*Notes:

- 1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range.
- 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz.
- 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.
- 4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz.
- 5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.

Table 3.2.3.3: Radiated Emissions Test Results, 30 MHz to 1 GHz, Vertical Polarization

14516 3.2.	.5.5: Kaui	ated Emis	sions les	t Results,	30 IVIHZ TO	I GHZ, V	erticai Po	iarization	
				sional Te					
Test Metho	od:		-	ion for radio			-		aratus and
In accorda	nce with:	-		tion, 2002-08 ms - General		_			
Section:		Section 9 E	lectromag	netic emissio	on – Metho	ds of testin	g and requ	ired test re	esults
Test Date(s	s):	11/15/201	2 – 11/16/2	2012	EUT Serial	#:	7065		
Customer:		Tideland S	ignal Corpo	ration	EUT Part #	:	None		
Project Nu	mber:	13862-10			Test Techn	ician:	Bob Redou	itey	
Purchase C	Order #:	116585			Supervisor	:	Rob McCol	lough	
Equip. Und	ler Test:	E-Navcon			Witness' N	ame:	None		
	R	adiated Em	issions Test	Results Dat	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage	: 1	2 VDC		EUT Pow	er Frequen	cy:	N/A	
Antenna	Orientation	on:	Vertic	al	Freque	ency Range	:	30MHz to	1GHz
	EUT N	lode of Ope	eration:			Stı	reaming Da	ta	
Frequency	Test	EUT	Antenna		Recorded	Corrected	Limit		_
Measured	Distance	Direction	Height	Detector	Amplitud	Level	Level	Margin	Test
(MHz)	(Meters)	(Degrees)	(Meters)	Function	е	(dBµV/m)		(dB)	Results
119.697	3	39	1.9	Quasi-peak	47.1	30.98	54.0	-23.0	Pass
121.971	3	34	2.87	Quasi-peak	45.6	29.469	54.0	-24.5	Pass
124.131	3	141	2.69	Quasi-peak	44.2	28.054	54.0	-25.9	Pass
129.412	3	219	2.06	Quasi-peak	31.8	15.571	54.0	-38.4	Pass
416.695	3	52	1.57	Quasi-peak	37.4	32.666	54.0	-21.3	Pass
426.371	3	274	2.28	Quasi-peak	40.4	36.055	54.0	-17.9	Pass
435.678	3	209	2.09	Quasi-peak	46.1	41.844	54.0	-12.2	Pass
445.406	3	282	2.57	Quasi-peak	36.2	32.104	54.0	-21.9	Pass
Radiated 30MHz -	sional Testing, Emissions, 10m Di 1GHz Vertical P		Emissions			∇ CorPea	asi-peak Limit Lev rected Quasi-peak k Limit Level rected Peak Value	Reading	SIONAL I N 6
13862_Ra	: Bob Redoutey d Emissions_3M_J PM, Thursday, No		100M EUT Mo	Frede: Streaming Data ver: 12VDC	uency	E	UT: E-Navcon roject Number: 13 lient: Tideland Sig	8862-10	1G
			Hz Vertical	Antenna Po	larity Meas			•	

Table 3.2.3.4: Radiated Emissions Test Results. 30 MHz to 1 GHz. Horizontal Polarization

Table 3.2.	3.4: Radi	ated Emis	sions Tes	t Results,	30 MHz to	1 GHz, H	orizontal	Polarizat	ion
			Profess	sional Te	sting, E	MI, Inc.			
Test Metho	od:		-	ion for radio			-		aratus and
In accorda	nce with:	-		tion, 2002-08 ms - General		_			
Section:		Section 9 E	lectromag	netic emissic	n – Metho	ds of testin	g and requ	ired test re	esults
Test Date(s	s):	11/15/201			EUT Serial	#:	7065		
Customer:		Tideland S	ignal Corpo	ration	EUT Part #		None		
Project Nu		13862-10			Test Techn		Bob Redou		
Purchase C		116585			Supervisor		Rob McCol	lough	
Equip. Und	er Test:	E-Navcon			Witness' N	ame:	None		
	Ra	adiated Em	issions Test	Results Dat	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage	: 1	2 VDC		EUT Pow	er Frequen	cy:	N/A	
Antenna	Orientatio	on:	Horizor	ntal	Freque	ency Range	:	30MHz to	1GHz
	EUT N	lode of Ope	eration:			Sti	reaming Da	ta	
Frequency	Test	EUT	Antenna		Recorded	Corrected	Limit		
Measured	Distance	Direction	Height	Detector	Amplitud	Level	Level	Margin	Test
(MHz)	(Meters)	(Degrees)	(Meters)	Function	е		(dBµV/m)	(dB)	Results
119.716	3	305	2.97	Quasi-peak	38.8	22.7	54.0	-31.3	Pass
122.077	3	24	2.5	Quasi-peak	34.4	18.3	54.0	-35.7	Pass
139.704	3	197	1.89	Quasi-peak	23.1	7.4	54.0	-46.6	Pass
416.646	3	124	2.58	Quasi-peak	39.7	35.0	54.0	-19.0	Pass
426.366	3	346	2.04	Quasi-peak	40.5	36.2	54.0	-17.8	Pass
435.891	3	350	1.6	Quasi-peak	39.3	35.1	54.0	-18.9	Pass
445.586	3	98	1.89	Quasi-peak	38.2	34.1	54.0	-19.9	Pass
Radiated	ional Testing, Emissions, 10m Di 1GHz Horizontal		d Emissions			▽ Cor — Pea	asi-peak Limit Lev rected Quasi-peak k Limit Level rected Peak Value	Reading	SIONAL
Field Strength (dB µV/m) 10 10	ar and but he had not been a		المرابع المراب		Mullimentary				
13862_Ra	: Bob Redoutey d Emissions_3M_E PM, Thursday, No		100M EUT Mo EUT Pov	Freq de: Streaming Data wer: 12VDC	uency	P	CUT: E-Navcon Project Number: 13 Dient: Tideland Sig		1G

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

Table 3.2.3.5: Radiated Emissions Test Results, 156 to 165 MHz, Vertical Polarization

10010 0121	J.J. Itaui	ateu Emis		t Results,			erticai Poi	arization	
			Profess	sional Te	sting, E	MI, Inc.			
Test Metho	od:		•	ion for radio			-		aratus an
In accorda	nce with:			tion, 2002-08 ms - General		_			
Section:		Section 9 I	lectromag	netic emissic	n – Metho	ds of testin	g and requ	ired test r	esults
Test Date(s	s):	11/15/201	2 – 11/16/2	2012	EUT Serial	#:	7065		
Customer:		Tideland S	ignal Corpo	oration	EUT Part #		None		
Project Nu		13862-10			Test Techn		Bob Redou		
Purchase C		116585			Supervisor		Rob McCol	lough	
Equip. Und	er Test:	E-Navcon			Witness' N	lame:	None		
	Ra	adiated Em	issions Test	Results Dat	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage	: 1	2 VDC		EUT Pow	er Frequen	cy:	N/A	
Antenna	Orientatio	on:	Vertic	al	Freque	ency Range	:	30MHz to	1GHz
	EUT N	lode of Ope	eration:			Stı	reaming Da	ta	
Frequency	Test	EUT	Antenna		Recorded	Corrected	Limit		
Measured	Distance	Direction	Height	Detector	Amplitud	Level	Level	Margin	Test
(MHz)	(Meters)	(Degrees)	(Meters)	Function	e	(dBµV/m)		(dB)	Results
158.963	3	99	2.47	Quasi-peak	36.6	22.03	24.0	-2.0	Pass
159.726	3	51	1.82	Peak	41.3	26.3	30.0	-3.7	Pass
161.158	3	26	2.03	Peak	14.6	28.1	30.0	-1.9	Pass
162.253	3	100	3.08	Quasi-peak	22.9	8.627	24.0	-15.4	Pass
163.343	3	252	1.75	Quasi-peak	31.4	17.273	24.0	-6.7	Pass
164.081	3	131	1.56	Quasi-peak	34.9	20.858	24.0	-3.1	Pass
Radiated 156-165M 60 50	ional Testing, Emissions, 3m Dis Hz Vertical Pola		issions			∇ CorPea	asi-peak Limit Lev rrected Quasi-peak ak Limit Level rrected Peak Value	Readin	SIONAL 1 N a
13862_Ra	: Bob Redoutey d Emissions_156_1 PM, Thursday, No	165MHz_Run03.til	EUT Me	Frequency of the streaming Data wer: 12VDC	quency	P	EUT: E-Navcon Project Number: 13		165M
	,		Hz Vertical	Antenna Po	larity Meas			,	

Table 3.2.3.6: Radiated Emissions Test Results, 156 to 165 MHz, Horizontal Polarization

				sional Te		•	orizontal I	0.0	<u> </u>
Test Metho	od:		: Specificat	ion for radio	disturban	ce and imm	-	•	aratus and
In accorda	nce with:			tion, 2002-08 ms - General		_			
Section:			lectromag	netic emissio	on – Metho	ds of testin	g and requ	ired test re	esults
Test Date(s	s):	11/15/201	2 – 11/16/2	2012	EUT Serial	#:	7065		
Customer:		Tideland S	ignal Corpo	oration	EUT Part #	:	None		
Project Nu		13862-10			Test Techn	ician:	Bob Redoι	itey	
Purchase C	rder #:	116585			Supervisor		Rob McCol	lough	
Equip. Und	er Test:	E-Navcon			Witness' N	lame:	None		
	R	adiated Em	issions Test	Results Dat	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage	: 1	2 VDC		EUT Pow	er Frequen	cy:	N/A	
	Orientation		Horizor	ntal	Freque	ency Range	:	30MHz to	1GHz
	EUT N	lode of Ope	eration:		-	Stı	reaming Da	ta	
Frequency	Test	EUT	Antenna		Recorded	Corrected	Limit		
Measured	Distance	Direction	Height	Detector	Amplitud	Level	Level	Margin	Test
(MHz)	(Meters)	(Degrees)	(Meters)	Function	е	(dBµV/m)		(dB)	Results
156.794	3	337	2.58	Quasi-peak	30.9	16.3	24.0	-7.7	Pass
157.105	3	346	1.7	Quasi-peak	22.2	7.6	24.0	-16.4	Pass
158.99	3	332	2.16	Quasi-peak	35.1	20.5	24.0	-3.5	Pass
159.726	3	350	3.24	Quasi-peak	34.3	19.8	24.0	-4.2	Pass
161.182	3	34	3.5	Quasi-peak	17.9	3.6	24.0	-20.4	Pass
163.958	3	188	2.04	Quasi-peak	20.4	6.3	24.0	-17.7	Pass
Radiated	ional Testing, Emissions, 3m Dis HZ Horizontal P		Emissions			▽ Cor — Pea	asi-peak Limit Lev rected Quasi-peal ak Limit Level rrected Peak Valu	Readin	SIONAL
Field Strength (dB μV/m) 30 30 10 10 10 10 10 10 10 10 10 10 10 10 10					Address of the second	philipped the sheet half	- Applum V	WHILL IN THE STATE OF THE STATE	
0	Pob Poderster					т.	TIT. E No		165M
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	: Bob Redoutey d Emissions_156_1 PM, Thursday, No	.65MHz_Run03.til ovember 15, 2012	EUT Mo EUT Po	Frequency of the streaming Data wer: 12VDC	quency	P	EUT: E-Navcon Project Number: 13 Dient: Tideland Sig		165M

Table 3.2.3.7: Radiated Emissions Test Results, 1 to 2 GHz, Vertical Polarization

			Profess	sional Te	sting, E	MI, Inc.			
Test Method:			=	ion for radio			-		aratus and
				tion, 2002-08					ation
n accordance	with:	equipme	nt and syste	ms - General	Requireme	ents - Meth	ods of test	ing and red	uired test
		results							
Section:		7		netic emission			_	ired test re	esults
Test Date(s):			<u> 12 – 11/16/2</u>		EUT Serial		7065		
Customer:		•	Signal Corpo	oration	EUT Part #		None		
Project Numb		13862-10			Test Techn		Bob Redou		
Purchase Ord Equip. Under		116585 E-Navcon			Supervisor Witness' N		Rob McCo None	llougn	
Equip. Onder						aille.			
F117 1 1				t Results Dat				ge: 1	of 1
EUT Line			12 VDC	I		er Frequen		- N/A	CI.
Antenna O			Vertic	aı	Freque	ency Range		Above 10	JHZ
		ode of O					reaming Da	ita	
- 1 /	Test	EUT	Antenna	Detector		Corrected	Limit	Margin	Test
	stance	Direction		Function	Amplitud	Level	Level	(dB)	Results
(MHz) (N	/leters)	(Degrees	(Meters)		е	(dBµV/m)	(dBµV/m)	(/	
1005.11	3	204	1	Quasi-peak	84	30.58	54.0	-23.4	Pass
1211.79	3	219	1	Quasi-peak	84	32.637	54.0	-21.4	Pass
1284.98	3	267	1	Quasi-peak		32.951	54.0	-21.0	Pass
1488.44	3	249	1	Quasi-peak	83.5	31.576	54.0	-22.4	Pass
Professionz Radiated Emis 1-2GHz Vertic 90 80 (m/\rm 70 60 40 40	sions, 3m Dist		ODIS			▽ Cor — Pea	rage Limit Level rected Average R k Limit Level rected Peak Read	eading	SIONAL
20 To IG Operator: Bot	-	Emissions_11021	2.til EUT Me	Frequency Data	understand value		UT: E-Navcon	3862-10	2G

Table 3.2.3.8: Radiated Emissions Test Results, 1 to 2 GHz, Horizontal Polarization

			Profess	sional Te	sting. F	MI. Inc.			
		CISPR 1	6-2: Specificat				unity mea	suring ann	aratus an
Test Metho	od:		s - Part 2: Me				-	•	aratus arr
			15, Fourth Edi	-					
n accorda	nce with:	equipm	ent and syste	ms - General	Requireme	ents - Meth	ods of test	ing and rec	uired tes
		results							
Section:	٠١.	1	9 Electromag					uired test re	esults
Test Date(s Customer:	5):	-	012 - 11/16/2		EUT Serial EUT Part #		7065		
roject Nu	mher	13862-1	d Signal Corpo	oration	Test Techn		None Bob Redo	utov	
Purchase C		116585	<u> </u>		Supervisor		Rob McCo		
Equip. Und		E-Navco	n		Witness' N		None	nougn	
			Emissions Test	t Results Dat	a Sheet			ige: 1	of 1
EUT Li	ne Voltage		12 VDC	results Dat	1	er Frequen		- N/A	01 1
	Orientation		Horizor	ntal		ency Range		Above 1	GHz
	EUT N	lode of (Operation:		- 1		reaming Da		
Frequency	Test	EUT	Antenna		Recorded	Corrected	Limit		
Measured	Distance	Direction		Detector	Amplitud	Level	Level	Margin	Test
(MHz)	(Meters)	(Degree		Function	e	(dBµV/m)		(dB)	Results
1108.79	3	136	1	Quasi-peak	83.1	30.7	54.0	-23.3	Pass
1253.61	3	72	1	Quasi-peak	84.2	33.2	54.0	-20.8	Pass
1284.58	3	301	1	Quasi-peak	84	32.8	54.0	-21.1	Pass
1671.22	3	76	1	Quasi-peak	84.1	33.2	54.0	-20.8	Pass
Radiated 1	sional Testing, Emissions, 3m Dis Horizontal Polari	stance	Emissions			▽ Cor — Pea	erage Limit Leve rrected Average l ak Limit Level rrected Peak Rea	Reading	SIONAL 1 N 6
80									
☐ 70 N									
E 60									
ength (dBµV/m									
- 40 ‡									
S 40	n jary seljerge kommenskyllen skyrenskyllel	~~~	والمهاوية والمراوية	t Andrewson and the second	المهام والمراد المراد والمالية والمالية والمراد والمراد والمراد والمراد والمراد والمراد والمراد والمراد والمراد	بدواللة للإصبيط والموالية والموادية إدرال ويتديد	particular	والمرافقة والمروبية والمرافقة والمرافقة والمرافقة والمرافقة والمرافقة والمرافقة والمرافقة والمرافقة والمرافقة	pitanish teninja
±		7	7 7				7		
20									
10 [±] 1G		1							2G
Operator	: Bob Redoutey			Free	quency	F	UT: E-Navcon		
12062 201	12 1 18CH~ D~J	Emissions 110	212 GI TITE M.	das Straaming Date		T	raigat Number 1	13862 10	
_	12 1_18GHz_Rad AM, Friday, Nove	_	FIT Po	ode: Streaming Data wer: 12VDC			roject Number: 1 lient: Tideland S	13862-10 ignal Corporation	

Table 3.2.3.9: Radiated Emissions Test Results, 150 kHz to 30 MHz, Perpendicular Polarization												
Professional Testing, EMI, Inc.												
Test Metho	CISPR 16-2: Specification for radio disturbance and immunity measuring apparatus and methods - Part 2: Methods of measurement of disturbance and immunity											
In accorda	nce with:	•	EC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test									
		results										
Section:	,		ection 9 Electromagnetic emission – Methods of testing and required test results									
Test Date(s	s):		2 – 11/16/2		EUT Serial		7065					
Customer: Project Nu	mher	13862-10	ignal Corpo	oration	EUT Part # Test Techn		None Bob Redou	ıtov				
Purchase C		116585			Supervisor		Rob McCol					
Equip. Und		E-Navcon			Witness' N		None	lougii				
			issions Test	Results Dat			Pa	ge: 1	of 1			
EUT Li	ne Voltage	e: 1	2 VDC		EUT Pow	er Frequen						
Antenna	Orientation	on:	Perpendi	cular	Freque	ency Range	:	Below 30	MHz			
	EUT N	lode of Ope	eration:			Stı	reaming Da	ta				
Frequency	Test	EUT	Antenna		Recorded	Corrected	Limit	limit				
Measured	Distance	Direction	Height	Detector	Amplitud	Level	Level	Margin	Test			
(MHz)	(Meters)	(Degrees)	(Meters)	Function	е	(dBµV/m)	(dBµV/m)	(dB)	Results			
0.365052	3	319	1	Quasi-peak	23.1	32.9	51.2	-18.4	Pass			
0.418898	3	217	1	Quasi-peak	22.4	32.2	50.7	-18.5	Pass			
0.671316	3	336	1	Quasi-peak	17.9	27.9	48.8	-21.0	Pass			
2.68709	3	212	1	Quasi-peak	8.8	18.7	43.4	-24.7	Pass			
24.1627	3	259	1	Quasi-peak	12.8	18.9	34.8	-16.0	Pass			
24.5783 24.9999	3	303 182	1	Quasi-peak	16.8 12.1	22.6 17.6	34.8 34.7	-12.2 -17.1	Pass			
24.9999		102		Quasi-peak	12.1	17.0	34.7	-1/.1	Pass			
Radiated	sional Testing, Emissions, 3m Dis o 30MHz Perpend	stance	n Measured Emissi	ons, Electric Field		CorPea	asi-peak Limit Lev rrected Quasi-peak ak Limit Level rrected Peak Read	Readin	SIONAL			
90 80	- + - +	_	 									
Field Strength (dBµV/m) 30 80 80 80 80 80 80 80 80 80 80 80 80 80	+	_										
# 50 ~~	my m	~~~. A										
5 40 €	_ +	The state of the s	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	William I								
S 30		_ Y _ Y	<u> </u>	trakanfarri atthorphyddyn and typagan	Maria Maria de la Companio de la Com	والمستعدد المستعدد ال						
E 20					7	Profession Company						
0.₺												
	: Bob Redoutey	Hz_30MHz_Run03		de: Streaming Data	quency		10M EUT: E-Navcon Project Number: 13	3862-10	30M			
03:38:28	PM, Thursday, No	ovember 15, 2012	EUT Po	wer: 12VDC		(lient: Tideland Sig	gnal Corporation				
		≤ 30MHz P	erpendicul	ar Antenna	Orientation	n Measured	Emissions					

Table 3.2.3.10: Radiated Emissions Test Results, 150 kHz to 30 MHz, Parallel Polarization

Table 3.2.3.10: Radiated Emissions Test Results, 150 kHz to 30 MHz, Parallel Polarization												
Professional Testing, EMI, Inc. CISPR 16-2: Specification for radio disturbance and immunity measuring apparatus and												
Test Metho	od:		-	ion for radion thods of me			-		aratus and			
In accorda	nce with:	-	EC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication quipment and systems - General Requirements - Methods of testing and required test esults									
Section:		Section 9 I	ection 9 Electromagnetic emission – Methods of testing and required test results									
Test Date(s	s):	11/15/201	2 – 11/16/2	2012	EUT Serial	#:	7065					
Customer:		Tideland S	ignal Corpo	oration	EUT Part #	:	None					
Project Nu		13862-10			Test Techn	ician:	Bob Redoι	ıtey				
Purchase C		116585			Supervisor		Rob McCol	lough				
Equip. Und	ler Test:	E-Navcon			Witness' N	lame:	None					
	R	adiated Em	issions Test	Results Dat	a Sheet		Pa	ge: 1	of 1			
EUT Li	ne Voltage	: 1	2 VDC		EUT Pow	er Frequen	cy:	N/A				
Antenna	Orientation	on:	Parall	el	Freque	ency Range	:	Below 30	MHz			
	EUT N	lode of Ope	eration:			Stı	reaming Da	ta				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitud e	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results			
0.317578	3	60	1	Quasi-peak	24.4	34.29	51.8	-17.5	Pass			
0.371176	3	316	1	Quasi-peak	23.2	32.979	51.2	-18.2	Pass			
0.528827	3	292	1	Quasi-peak	20.2	30.158	49.8	-19.6	Pass			
2.71872	3	111	1	Quasi-peak	20.8	30.712	43.4	-12.7	Pass			
20.5828	3	315	1	Quasi-peak	10.3	17.605	35.5	-17.9	Pass			
23.3125	3	217	1	Quasi-peak	17.8	24.224	35.0	-10.8	Pass			
24.5784	3	348	1	Quasi-peak	21.4	27.272	34.8	-7.5	Pass			
_	d Emissions_150kl PM, Thursday, No		EUT Po	ode: Streaming Data wer: 12VDC	quency	(Project Number: 13 Dient: Tideland Sig					
		≤ 30MH	Iz Parallel <i>I</i>	Antenna Orie	entation M	easured Em	nissions					

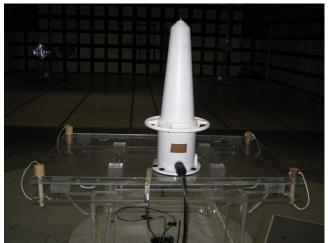
Table 3.2.3.11: Radiated Emissions Test Setup Photographs

Professional Testing, EMI, Inc.								
est Method: CISPR 16-2: Specification for radio disturbance and immunity measuring apparatus and methods - Part 2: Methods of measurement of disturbance and immunity								
In accordance with:	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication							
Section:	Section 9 Electromagnetic emiss	ion – Methods of testi	ng and required test results					
Test Date(s):	11/15/2012 - 11/16/2012	EUT Serial #:	7065					
Customer:	Tideland Signal Corporation	EUT Part #:	None					
Project Number:	13862-10	Test Technician:	Bob Redoutey					
Purchase Order #:	116585	Supervisor:	Rob McCollough					
Equip. Under Test:	E-Navcon	Witness' Name:	None					

Radiated Emissions Photographs

Page: 1 of 1





Front

Support Equipment

Rear

13862-10 April 8, 2014 Page 27 of 67

4.0 Electromagnetic Immunity Testing

4.1 Performance Criteria

EUT performance during testing was classified by the following criteria:

Performance Criterion A Normal performance within equipment specifications.

Performance Criterion B Degradation or loss of function or performance that is self-

recoverable when the interfering signal is removed.

Performance Criterion C Degradation or loss of function or performance that requires system

reset or operator intervention when the interfering signal is

removed.

4.2 Electrostatic Discharge Testing

4.2.1 Test Procedures

Electrostatic discharge immunity testing was performed using the procedures of IEC 61000-4-2. The EUT was placed in the approximate center of a ground reference plane (GRP) and was powered and operated in a normal configuration. The EUT was observed for any indications of erratic operation. Positive and negative air discharges of 2 kV, 4 kV, and 8 kV were applied to non-metallic test locations listed this report. Positive and negative contact discharges of 2 kV, 4 kV, and 6 kV were applied to any metallic test locations listed in the data sheets in this section of the report.

The positive and negative contact discharges were also applied to the horizontal coupling plane at a distance of 0.1 m around the periphery of the EUT and to the center of one edge of a 0.5 m by 0.5 m vertical coupling plane. Each discharge was applied a minimum of 10 times. A diagram showing the test setup is given as Figure 4.2.1.1.

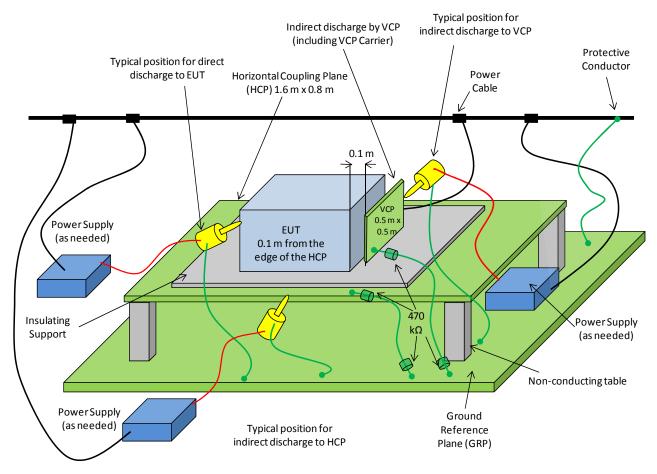


Figure 4.2.1.1: Electrostatic Discharge Immunity Test Setup

4.2.2 Performance Criteria

During the performance of electrostatic discharge immunity testing, only performance criterion A and performance criterion B were allowed. No performance criterion C failures were allowed.

4.2.3 Test Results

The EUT was subjected to electrostatic discharge immunity testing on June 14, 2013. No adverse indications were noted during the performance of the test. Therefore, the EUT met the performance criterion A.

Table 4.2.3.1: Electrostatic Discharge Immunity Test Equipment

Table 4.2.5.1. Lieutrostatic Discharge minimulity rest Equipment										
	Professional Testing, EMI, Inc.									
Tost Motho	IEC 61000-4-2: 1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement Test Method:									
rest ivietilo	techniques – Section 2: Electrostatic discharge immunity test – Basic EMC publication									
	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication									
In accordan	ice with: equ	pment and system	s - General I	Requirements - Meth	ods of testing and re	quired test				
	resu	lts								
Section:	ion: Table 6 - Electromagnetic Immunity, and Section 10.9									
Test Date(s)	: 6/14	6/14/2013 EUT Serial #: 7065								
Customer:	Tide	land Signal Corpor	ation	EUT Part #:	None					
Project Nur	nber: 1380	52-10		Test Technician:	Bob Redoutey / E	ric Lifsey				
Purchase O	rder #: 116!	85		Supervisor:	Rob McCollough					
Equip. Und	er Test: E-Na	vcon		Witness' Name:	None					
		Electrostatic D	ischarge Im	munity Test Equipme	nt List					
Asset #	Manufacturer	Model	Equipn	nent Nomenclature	Serial Number	Calibration Due Date				
0951	EMC-Partner	ESD3000		ESD Simulator	62	1/17/2015				

8kV

<u>Table 4.2.3</u>	able 4.2.3.2: Electrostatic Discharge Immunity Test Results, Air Discharge																
		P	rofessio	nal 1	Γesti	ing, EMI,	Inc.										
Test Metho	est Method: IEC 61000-4-2: 1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test – Basic EMC publication																
In accordan	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results																
Section:		Table 6 - Electron	nagnetic Imi	nunit	y, and	Section 10.	9										
Test Date(s)	:	6/14/2013			EUT S	erial #:	7065										
Customer:		Tideland Signal C	orporation		EUT P	art #:	None										
Project Nur	nber:	13862-10			Test 1	Technician:	Bob Red	doutey / Eric l	Lifsey								
Purchase O	rder #:	116585			Supe	rvisor:	Rob Mo	Collough									
Equip. Unde	er Test:	E-Navcon			Witne	ess' Name:	None										
Electrostatic Discharge Immunity Test Results Data Sheet Page: 1 of 1									1 of 1								
EUT Mode of Operation: Streaming text data																	
EUT Li	ne Voltage	: 12	VDC		Е	UT Power Fr	equency:	-	N/A								
			Part 1 - /	Air Dis	charg	e to the EUT	•	-	Part 1 - Air Discharge to the EUT								
Location Description																	
Test Point			Air Discharge Test Level	Pu Pola		Number of Discharges Applied	Performance Criterion Required	Performance Criterion Achieved	Test Result								
Test Point			Discharge	Pola		Discharges	Criterion	Criterion	Test Result Pass								
lest Point			Discharge Test Level	Pola	rity	Discharges Applied	Criterion Required	Criterion Achieved									
	Locatio	on Description	Discharge Test Level	Pola Pos Nega	itve	Discharges Applied	Criterion Required B	Criterion Achieved A	Pass								
Test Point	Locatio		Discharge Test Level 2kV 2kV	Pos Nega Pos	itve	Discharges Applied 10 10	Criterion Required B B	Criterion Achieved A A	Pass Pass								
	Locatio	on Description	Discharge Test Level 2kV 2kV 4kV	Pos Nega Pos Nega	itve ative itve	Discharges Applied 10 10 10	Criterion Required B B B	Criterion Achieved A A A	Pass Pass Pass								
	Locatio	on Description	Discharge Test Level 2kV 2kV 4kV	Pos Nega Pos Nega	itve ative itve ative itve	Discharges Applied 10 10 10 10	Criterion Required B B B B	Criterion Achieved A A A A A	Pass Pass Pass Pass								
	Locatio	on Description	Discharge Test Level 2kV 2kV 4kV 4kV	Posa Nega Pos Nega Pos Nega	itve ative itve ative itve	Discharges Applied 10 10 10 10 10 10	Criterion Required B B B B B	Criterion Achieved A A A A A A	Pass Pass Pass Pass Pass								
	Locatio	on Description	Discharge Test Level 2kV 2kV 4kV 4kV 8kV	Posa Nega Pos Nega Pos Nega	itve ative itve ative itve ative itve ative itve ative itve	Discharges Applied 10 10 10 10 10 10 10 10	Criterion Required B B B B B B B	Criterion Achieved A A A A A A A A A A A A A A A A A A	Pass Pass Pass Pass Pass Pass								
1	Locatio Circula	on Description	Discharge Test Level 2kV 2kV 4kV 4kV 8kV 8kV	Pola Pos Nega Pos Nega Pos Nega Pos Nega Nega	itve ative itve ative itve ative itve ative itve ative itve	10 10 10 10 10 10 10 10	Criterion Required B B B B B B B B	Criterion Achieved A A A A A A A A A A A A A A A A A A	Pass Pass Pass Pass Pass Pass Pass Pass								
	Locatio Circula	on Description	Discharge Test Level 2kV 2kV 4kV 4kV 8kV 2kV 2kV	Pola Pos Nega Pos Nega Pos Nega Pos Nega Nega	itve ative	10 10 10 10 10 10 10 10 10	Criterion Required B B B B B B B B B B B	Criterion Achieved A A A A A A A A A A A A A A A A A A	Pass Pass Pass Pass Pass Pass Pass Pass								

Negative

10

Pass

Table 4.2.	able 4.2.3.3: Electrostatic Discharge Immunity Test Results, Contact Discharge									
	Professional Testing, EMI, Inc.									
Test Metho	ų.			_				Testing and m		
IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results										
Section: Table 6 - Electromagnetic Immunity, and Section 10.9										
Test Date(s): 6/14/2013 EUT Serial #: 7065										
Customer: Tideland Signal Corporation EUT Part #: None										
Project Number: 13862-10 Test Technician: Bob Redoutey / Eric Lifsey										
Purchase O	rder #: 11658	85			Supe	rvisor:	Rob Mo	Collough		
Equip. Unde	er Test: E-Nav	vcon			Witne	ess' Name:	None			
	Electrostatic	Discharge I	mmunity Te	st Resu	lts Da	ata Sheet		Page:	1 of 1	
	e of Operation:	Streaming	text data							
EUT Li	ne Voltage:	12	VDC		Е	UT Power Fr	equency:	-	N/A	
			Part 2 - Co	ntact [ischa	rge to the E	UT			
Contact	Comboot Dia	-l	Contact			Number of	Performance	Performance		
Discharge	Contact Dis	_	Discharge	Pul		Discharges	Criterion	Criterion	Test Result	
Test Point	Location Des	cription	Test Level	Pola	rity	Applied	Required	Achieved		
			2kV	Posi	tve	10	В	А	Pass	
			2kV	Nega		10	В	А	Pass	
	Correct Stores C		4kV	Posi		10	В	Α	Pass	
1	Ground Strap C	onnection	4kV	Negative		10	В	А	Pass	
			6KV	Posi		10	В	Α	Pass	
			6KV	Nega	tive	10	В	Α	Pass	
				Posi	tve	10	В	Α	Pass	
			2kV	Nega	tive	10	В	Α	Pass	
2	Data / Power C	onnector	4kV	Posi	tve	10	В	Α	Pass	
2	Data / Tower C	Johneetoi	4kV	Nega	tive	10	В	Α	Pass	
			6KV	Posi	tve	10	В	Α	Pass	
			6KV	Nega	tive	10	В	Α	Pass	
			2kV	Posi		10	В	Α	Pass	
			2kV	Nega		10	В	Α	Pass	
3	Assembly S	icrews	4kV	Posi		10	В	Α	Pass	
	•		4kV	Nega		10	В	A	Pass	
			6KV	Posi		10	В	A	Pass	
			6KV	Nega		10	В	Α	Pass	
			2kV 2kV	Posi Nega		10 10	B B	Α Λ	Pass	
			4kV	Posi		10	В	A A	Pass	
4	Pressure Cor	nnector	4kV	Nega		10	В	A	Pass Pass	
		6KV	Posi		10	В	A	Pass		
			6KV	Nega		10	В	A	Pass	
			2kV	Posi		10	В	A	Pass	
			2kV	Nega		10	В	A	Pass	
_			4kV	Posi		10	В	Α	Pass	
5	Top Lightning S	trike Point	4kV	Nega		10	В	A	Pass	
			6KV	Posi		10	В	Α	Pass	
			6KV	Nega		10	В	Α	Pass	

Table 4.2.3.4: Electrostatic Discharge Immunity Test Results, Contact Discharge to the Horizontal Counling Plane

Horizonta	lorizontal Coupling Plane										
	P	rofessio	nal Te	stin	g, EMI,	, Inc.					
Test Metho	d: IEC 61000-4-2: 19		_	•		•	_				
		techniques – Section 2: Electrostatic discharge immunity test – Basic EMC publication IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment									
In accordan	ice with:	· · · · · · · · · · · · · · · · · · ·									
Section:		and systems - General Requirements - Methods of testing and required test results									
Test Date(s)		Table 6 - Electromagnetic Immunity, and Section 10.9 6/14/2013 EUT Serial #: 7065									
Customer:		6/14/2013 EUT Serial #: 7065 Tideland Signal Corporation EUT Part #: None									
Project Nur		or por action			hnician:		doutey / Eric I	ifsev			
Purchase O				pervi			Collough				
Equip. Unde				•	' Name:	None					
	Electrostatic Discharge I	mmunity To	rt Poculto	c Data	Shoot		Dago:	1 of 2			
EUT Mod	e of Operation: Streaming		st nesuits	S Data	Sileet		Page:	1 of 2			
	ine Voltage: 12	VDC		EUT	Power Fr	equency:	-	N/A			
	Part 3 - Contact	Discharge to	the Vert				Planes				
СР		СР		N	umber of	Performance	Performance				
Discharge	CP Discharge	Discharge	Pulse		ischarges		Criterion	Test Result			
Test Point	Location Description	Test Level	Polarit	:V	Applied	Required	Achieved				
		2kV	Positve		10	В	A	Pass			
		2kV			10	В	A	Pass			
	Horizontal Ground Plane, EUT		Positve		10	В	A	Pass			
1	Left Side	4kV	Negativ		10	В	A	Pass			
		6kV	Positve		10	В	А	Pass			
		6kV	Negative		10	В	А	Pass			
		2kV	Positve		10	В	Α	Pass			
		2kV	Negativ	/e	10	В	Α	Pass			
2	Horizontal Ground Plane, EUT	4kV	Positve	e	10	В	Α	Pass			
2	Right Side	4kV	Negativ	/e	10	В	Α	Pass			
		6kV	Positve	e	10	В	Α	Pass			
		6kV	Negativ	/e	10	В	Α	Pass			
		2kV	Positve	e	10	В	Α	Pass			
		2kV	Negativ		10	В	Α	Pass			
3	Horizontal Ground Plane, EUT		Positve		10	В	A	Pass			
	Rear	4kV	Negativ		10	В	A	Pass			
		6kV	Positve		10	В	A	Pass			
		6kV	Negativ		10	В	A	Pass			
		2kV 2kV	Positve		10	В	Α Λ	Pass			
	Horizontal Ground Plane, EUT		Negative Positve		10 10	В	A A	Pass			
4	Front	4kV	Negativ		10	B B	A	Pass Pass			
	TIOIL	6kV	Positve		10	В	A	Pass			
		6kV	Negativ		10	В	А	Pass			

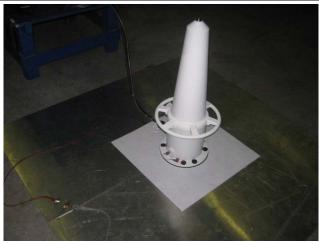
Table 4.2.3.5: Electrostatic Discharge Immunity Test Results, Contact Discharge to the Vertical Coupling Plane

verticai Co	rertical Coupling Plane											
		Р	rofessio	nal 1	Test i	ing, EMI,	Inc.					
Test Metho	d:	IEC 61000-4-2: 19										
In accordan	ce with:	techniques – Section 2: Electrostatic discharge immunity test – Basic EMC publication With: IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results										
Section:			able 6 - Electromagnetic Immunity, and Section 10.9									
Test Date(s)	:	6/14/2013				erial #:	7065					
Customer:		Tideland Signal C	orporation		EUT P	art #:	None					
Project Nun	nber:	13862-10			Test 7	Technician:	Bob Re	doutey / Eric I	ifsey			
Purchase O	rder #:	116585			Supe	rvisor:	Rob Mo	Collough				
Equip. Unde	er Test:	E-Navcon			Witn	ess' Name:	None					
	Electro	ostatic Discharge II	mmunity Tes	t Resu	ults Da	ata Sheet		Page:	2 of 2			
EUT Mode	of Operat	ion: Streaming	text data									
EUT Li	ne Voltage	: 12	VDC		Е	UT Power Fr	equency:	-	N/A			
		Part 3 - Contact l	Discharge to	the V	ertica	l and Horizo	ntal Coupling	Planes				
CP Discharge Test Point		Discharge on Description	CP Discharge Test Level	Pu Pola		Number of Discharges Applied	Performance Criterion Required	Performance Criterion Achieved	Test Result			
			2kV	Pos	itve	10	В	Α	Pass			
			2kV	Nega	ative	10	В	Α	Pass			
5		Coupling Plane,	4kV	Pos	itve	10	В	Α	Pass			
	EU	T Left Side	4kV	Nega	ative	10	В	Α	Pass			
			6kV		itve	10	В	Α	Pass			
			6kV	Nega		10	В	Α	Pass			
			2kV		itve	10	В	Α	Pass			
		C. II. Bl.	2kV	Nega		10	В	Α	Pass			
6		Coupling Plane,	4kV		itve	10	В	A	Pass			
	EUT	Γ Right Side	4kV	Nega		10	В	A	Pass			
			6kV		itve	10	В	A	Pass			
			6kV	Nega	ative	10	В	Α	Pass			

Table 4.2.3.6: Electrostatic Discharge Immunity Test Setup Photographs, Page 1

Professional Testing, EMI, Inc.								
Took Markhadi	IEC 61000-4-2: 1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement							
Test Method:	techniques – Section 2: Electros	static discharge immunit	ty test – Basic EMC publication					
	IEC 60945, Fourth Edition, 2002-	-08 Maritime navigation	and radio communication					
In accordance with:	n accordance with: equipment and systems - General Requirements - Methods of testing and required test							
	results							
Section:	ection: Table 6 - Electromagnetic Immunity, and Section 10.9							
Test Date(s):	6/14/2013	EUT Serial #:	7065					
Customer:	Tideland Signal Corporation	EUT Part #:	None					
Project Number:	13862-10	Test Technician:	Bob Redoutey / Eric Lifsey					
Purchase Order #:	116585	Supervisor:	Rob McCollough					
Equip. Under Test:	E-Navcon	Witness' Name:	None					
E	Electrostatic Discharge Immunity Photographs Page: 1 of 2							





Support Equipment

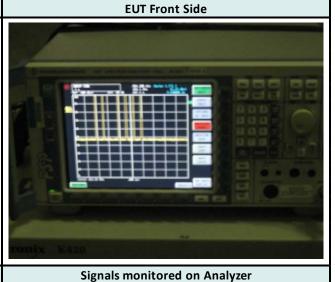
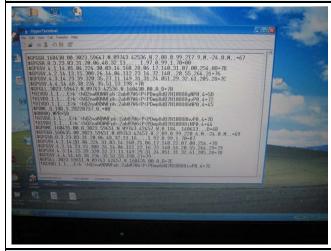


Table 4.2.3.7: Electrostatic Discharge Immunity Test Setup Photographs, Page 2

Professional Testing, EMI, Inc.								
Test Method:	IEC 61000-4-2: 1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test – Basic EMC publication							
In accordance with:	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results							
Section:	Table 6 - Electromagnetic Immu	nity, and Section 10.9						
Test Date(s):	6/14/2013	EUT Serial #:	7065					
Customer:	Tideland Signal Corporation	EUT Part #:	None					
Project Number:	13862-10	Test Technician:	Bob Redoutey / Eric Lifsey					
Purchase Order #:	116585	Supervisor:	Rob McCollough					
Equip. Under Test:	E-Navcon	Witness' Name:	None					

Electrostatic Discharge Immunity Photographs Page: 2 of





Data monitored on notebook computer

VCP



HGP

4.3 Radiated Immunity Test

4.3.1 Test Procedures

Radiated immunity testing was performed on the EUT using the procedures of IEC 61000-4-3. The testing was performed to determine the ability of the EUT to function properly while immersed in an electromagnetic field of 10 V/m at 80 MHz to 2 GHz and 3 V/m at 2 to 2.7 GHz, with 1 kHz at 80% amplitude modulation.

The testing was performed in a shielded enclosure with anechoic material placed throughout the enclosure to minimize reflections. The transmit antenna was located at a distance of 3 meters from the EUT. All other field generation equipment and monitoring equipment was placed outside the test enclosure.

Drive levels to the transmit antenna were monitored and maintained at the levels established by the initial field calibration described in this report. Testing was performed utilizing linearly polarized antennas, with the EUT exposed to both vertically and horizontally polarized fields. A diagram showing the test setup is given as Figure 4.3.1.1.

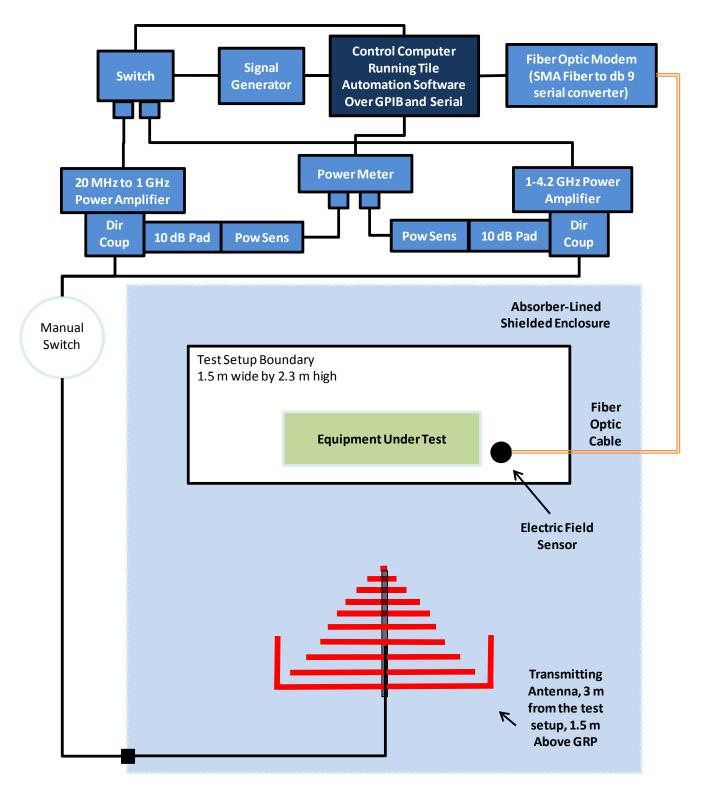


Figure 4.3.1.1: Radiated Immunity Test Setup

4.3.2 Field Generation

Calibration of the radiated field intensity was performed prior to testing of the EUT. For the input power levels required to generate the desired continuous wave (CW) field intensities at the plane of the EUT were established. The frequency band was covered in steps of one percent of the fundamental frequency. For frequencies of 80 to 240 MHz, the bi-conical transmit antenna was placed 3 meters from the plane of the EUT. For frequencies of 240 to 1,000 MHz the double-ridged horn transmit antenna was placed 3 meters from the plane of the EUT. Calibration of the field was performed in both horizontal and vertical antenna polarizations.

4.3.3 Performance Criteria

During performance of radiated immunity testing, only performance criterion A was allowed. Performance criterion B or performance criterion C failures were disallowed.

4.3.4 Test Results

The EUT was subjected to radiated immunity in both vertical and horizontal polarizations testing on November 19 and 20, 2012. No adverse indications were noted during the performance of the test. Therefore, the EUT met criterion A.

Table 4.3.	4.1: Radiated Ir	nmunity Test E	quipment		
		Profes	sional Testing, EMI, Inc.		
Took Markha	IEC 61	1000-4-3: 1995, Ele	ectromagnetic compatibility (EMC) -	- Part 4: Testing ar	nd measurement
Test Metho	techn	iques – Section 3	: Radiated, radio frequency, electro	magnetic field imr	nunity test
In accordar	nce witn:	•	on, 2002-08 Maritime navigation an s - General Requirements - Method		
Section:			tic Immunity, and Section 10.4.2	s or testing and re	quireu test
Test Date(s): 11/19/2012 – 11/20/2012 EUT Serial #: 7065					
Customer:		and Signal Corpor		None	
Project Nu			Test Technician:	Bob Redoutey	
Purchase O	order #: 11658	35	Supervisor:	Rob McCollough	
Equip. Und	er Test: E-Nav	/con	Witness' Name:	None	
		Radiate	d Immunity Test Equipment List		
Te	est Software Version	on: Tile V	ersion 3.4.K.15, October 13, 2006, 1	1:21:00 AM	
	Test Profile Used:	61000	0-4-3_09/06/2011.til		
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration
A33Ct #	Manaractarci	Wiouci	Equipment Nomenciature	Schai Wallisei	Due Date
		80	-1000 MHz Test Equipment		
1816	Agilent	N5181A	Generator, MXG Analog Signal	MY49060847	8/26/2016
1509C	Braden	N/A	TDK 10M Chamber, radiated immunity	DAC-012915-005	2/17/2015
1093	Boonton	4532	RF Power Meter	51501	8/6/2014
1503	Boonton	57318	Peak Power Sensor, .1-18GHz	3983	8/9/2014
1848	Ophir	5127FE	Amplifier, RF Power, 20-1000 MHz, 200W	1082	N/A
1025	Philco	642A-Z	Coupler, Directional .03-1GHz	171	7/10/2014
1846	ETS-Lindgren	4340-01XPC	CCTV System	126554	N/A
1681	ETS-Lindgren	HI-6053	Isotropic Electric Field Probe	82799	2/10/2015
1850	ETS-Lindgren	3140B	Antenna, Biconilog 26-3000 MHz	00126505	NCR
0931	JFW	50FHC-010-20	Attenuator, N, 10dB 20W	none	N/A
1940	Agilent	11713A	Switch Driver	MY44322006	N/A
1945	Agilent	87206B SP6T	Switch, Coaxial, 6-port, DC - 26.5 GHz	MY42140544	N/A
		1-2.7 GHz Test Equ	uipment (additional to equipment a	above)	
1554	AR	25S1G4A	Amplifier, 25W, 44dB, .800-4.2GHz	3131651	N/A
0832	Narda	3022	Coupler, Bi-Directional 1-4GHz	5015	N/A
1845	IFI	M406	Amplifier, RF Power, 10KHz- 220MHz, 1000W	0375-1037	N/A

Table 4.3.4.2: Radiated Immunity Test Results, Page 1

	able 4.3.4.2: Radiated immunity Test Results, Page 1								
				ssional T	<u> </u>				
Test Metho	d:			_	-		_	and measure mmunity test	ment
In accordan	ce with:	•		•	Naritime navigation and radio communication equipment and ethods of testing and required test results				
Section:				ic Immunity,			quireu test re	34163	
Test Date(s)	:		- 11/20/201		EUT Serial #		7065		
Customer:			gnal Corpora		EUT Part #:		None		
Project Nur	nber:	13862-10	•		Test Techni	cian:	Bob Redoute	У	
Purchase O	Purchase Order #: 116585				Supervisor:		Rob McCollou		
Equip. Unde	Equip. Under Test: E-Navcon Witness' Name: None								
	Radiated Immunity Test Results Data Sheet Page: 1 of 9								
EUT Mod	e of Operati	on: Strea	ming Data						
EUT Li	ne Voltage:	1	2 VDC		EUT Pow	er Frequenc	cy: -	N/A	
Frequency Range	Antenna Polarity	Test Level	EUT Face Illuminated	Modulation Parameters	Frequency Step Size	Dwell Time at Each Frequency	Performance Criterion Required	Performance Criterion Achieved	Test Results
0.08 - 1.0 GHz	Horizontal	10 V/m	Front	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	А	Pass
0.08 - 1.0 GHz	Vertical	10 V/m	Front	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	А	Pass
0.08 - 1.0 GHz	Horizontal	10 V/m	Left Side	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	Α	Pass
0.08 - 1.0 GHz	Vertical	10 V/m	Left Side	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	Α	Pass
0.08 - 1.0 GHz	Horizontal	10 V/m	Rear	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	Α	Pass
0.08 - 1.0 GHz	Vertical	10 V/m	Rear	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	Α	Pass
0.08 - 1.0 GHz	Horizontal	10 V/m	Right Side	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	Α	Pass
0.08 - 1.0 GHz	Vertical	10 V/m	Right Side	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	Α	Pass
			Radia	ated Immuni	ty Spot Fred	uencies			
	EUT - Spe	cific Spot Fi	requencies			Standard	Specific Spot	Frequencies	
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
None	((((2)	()	()	(2)	(2)	()

Table 4.3.	able 4.3.4.3: Radiated Immunity Test Results, Page 2								
			Profe	ssional T	esting, E	MI, Inc.			
Test Metho	d:		•	_	-		~	and measure	ment
								mmunity test	
In accordan	ce with:			-		_	radio commu equired test re	nication equip	oment and
Section:				ic Immunity,					
Test Date(s	st Date(s): 11/19/2012 – 11/20/2012				EUT Serial #	‡:	7065		
Customer:		Tideland Si	gnal Corpora	tion	EUT Part #:		None		
Project Nur	nber:	13862-10			Test Techni	cian:	Bob Redoute	У	
Purchase O	rder #:	116585			Supervisor:		Rob McCollo	ugh	
Equip. Und	er Test:	E-Navcon			Witness' Na	ame:	None		
		Radiated Im	munity Test	Results Data	Sheet		Pag	e: 2	of 9
EUT Mod	e of Operati	on: Strea	ming Data						
EUT Li	ne Voltage:	1	2 VDC		EUT Pov	ver Frequen	cy: -	N/A	
Frequency	Antenna	Test Level	EUT Face	Modulation	•	Dwell Time at Each	Performance Criterion	Performance Criterion	Test
Range	Polarity		Illuminated	Parameters	Step Size	Frequency	Required	Achieved	Results
1.0 - 1.4	Horizontal	10 V/m	Front	80% AM	0.01	Steps: 2 s,	А	А	Pass
GHz				(400 Hz)		Spots: 60 s			
1.0 - 1.4	Vertical	10 V/m	Front	80% AM	0.01	Steps: 2 s,	Α	Α	Pass
GHz 1.0 - 1.4				(400 Hz) 80% AM		Spots: 60 s			
1.0 - 1.4 GHz	Horizontal	10 V/m	Left Side	(400 Hz)	0.01	Steps: 2 s, Spots: 60 s	Α	Α	Pass
1.0 - 1.4				80% AM		Steps: 2 s,			
GHz	Vertical	10 V/m	Left Side	(400 Hz)	0.01	Spots: 60 s	Α	Α	Pass
1.0 - 1.4	Horizontal	10 V/m	Rear	80% AM	0.01	Steps: 2 s,	Α	А	Pass
GHz	поптина	10 7/111	Nedi	(400 Hz)	0.01	Spots: 60 s	A	A	Pd55
1.0 - 1.4	Vertical	10 V/m	Rear	80% AM	0.01	Steps: 2 s,	Α	А	Pass
GHz	vertical	10 7/111	Nedi	(400 Hz)	0.01	Spots: 60 s	A	A	Pd55
1.0 - 1.4 GHz	Horizontal	10 V/m	Right Side	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	А	Pass
1.0 - 1.4 GHz	Vertical	10 V/m	Right Side	80% AM (400 Hz)	0.01	Steps: 2 s, Spots: 60 s	А	А	Pass

Table 4.3.	able 4.3.4.4: Radiated Immunity Test Results, Page 3									
			Profe	ssional T	esting, E	MI, Inc.				
Test Metho	d:			_	<u>-</u>			_	and measure	ment
	<u> </u>								mmunity test	
In accordan	ice with:	-		n, 2002-08 M rements - Mo		_			nication equip	ment and
Section:				ic Immunity,						
Test Date(s)	:		- 11/20/201		EUT Serial #		7065			
Customer:			gnal Corpora		EUT Part #:		None			
Project Nur	nber:	13862-10			Test Techni	ician:	Bob Re	edoute	У	
Purchase O	rder #:	116585			Supervisor:		Rob M	cCollo	ugh	
Equip. Unde	er Test:	E-Navcon			Witness' Na	ame:	None			
		Radiated Im	munity Test	Results Data	Sheet			Pag	e: 3	of 9
EUT Mode	e of Operati	on: Strea	ming Data							
EUT Li	ine Voltage:	1	2 VDC		EUT Pov	ver Frequen	су:	-	N/A	
						Dwell Time	Perfor	mance	Performance	
Frequency	Antenna	Test Level	EUT Face	Modulation	_	at Each	Crite		Criterion	Test
Range	Polarity		Illuminated	Parameters	Step Size	Frequency	Requ		Achieved	Results
1.4. 2011-	11	10.1//	Fuent	80% AM	0.01	Steps: 2 s,	,		Δ.	Dana
1.4 - 2GHz	Horizontal	10 V/m	Front	(400 Hz)	0.01	Spots: 60 s	F	١.	А	Pass
1.4 - 2GHz	Vertical	10 V/m	Front	80% AM	0.01	Steps: 2 s,	<i> </i>	λ .	А	Pass
		20 1/		(400 Hz)	0.02	Spots: 60 s		•		
1.4 - 2GHz	Horizontal	10 V/m	Left	80% AM	0.01	Steps: 2 s,	μ	4	А	Pass
		,		(400 Hz)		Spots: 60 s				
1.4 - 2GHz	Horizontal	10 V/m	Left	80% AM	0.01	Steps: 2 s,	ļ ,	4	Α	Pass
		-		(400 Hz)		Spots: 60 s				
1.4 - 2GHz	Horizontal	10 V/m	Rear	80% AM (400 Hz)	0.01	Steps: 2 s,	Į.	4	А	Pass
				80% AM		Spots: 60 s Steps: 2 s,				
1.4 - 2GHz	Horizontal	10 V/m	Rear	(400 Hz)	0.01	Spots: 60 s	F	4	А	Pass
				80% AM		Steps: 2 s,				
1.4 - 2GHz	Horizontal	10 V/m	Right	(400 Hz)	0.01	Spots: 60 s	P	١	А	Pass
1.4. 2011-	Harizantal	10 1//	Diaht	80% AM	0.01	Steps: 2 s,	,		^	Dasa
1.4 - 2GHz	Horizontal	10 V/m	Right	(400 Hz)	0.01	Spots: 60 s	F	4	Α	Pass

1 abie 4.3.	able 4.3.4.5: Radiated Immunity Test Results, Page 4									
	Professional Testing, EMI, Inc.									
Test Metho	d:		•	•	_		•	4-3: Testing ar		
In accordan	ce with:	Electromag	netic compa	tibility and R	adio spectri	um Matters	(ERM); Electro	ommunication omagnetic Con cal requireme	npatibility	
Section:		Section 9.2 - Radio frequency electromagnetic field (80 MHz to 1000 MHz and 1400 MHz to 2700 MHz)							to 2700	
Test Date(s)):		<u> – 11/20/201</u>		EUT Serial #		7065			
Customer:			gnal Corpora	tion	EUT Part #:		None			
Project Nur		13862-10			Test Techni		Bob Redoute			
Purchase O Equip. Und		116585			Supervisor: Witness' Na		Rob McCollou None	ugn		
Equip. Onu		E-Navcon				aiiie.				
			•	Results Data	Sheet		Pag	e: 4	of 9	
	e of Operati		ming Data							
EUT Li	ne Voltage:	1	2 VDC		EUT Pow	ver Frequenc	c y : -	N/A		
Frequency Range	Antenna Polarity	Test Level	EUT Face Illuminated	Modulation Parameters	Frequency Step Size	Dwell Time at Each Frequency	Performance Criterion Required	Performance Criterion Achieved	Test Results	
2 - 2.7GHz										
	Horizontal	3 V/m	Front	80% (1000 Hz)	0.01	Steps: 2 s, Spots: 60 s	Α	Α	Pass	
2 - 2.7GHz	Horizontal Vertical	3 V/m 3 V/m	Front Front		0.01		A A	A A	Pass Pass	
2 - 2.7GHz 2 - 2.7GHz				(1000 Hz) 80%		Spots: 60 s Steps: 2 s,				
	Vertical	3 V/m	Front	(1000 Hz) 80% (1000 Hz) 80%	0.01	Spots: 60 s Steps: 2 s, Spots: 60 s Steps: 2 s,	А	А	Pass	
2 - 2.7GHz	Vertical Horizontal	3 V/m	Front Left	(1000 Hz) 80% (1000 Hz) 80% (1000 Hz) 80%	0.01	Spots: 60 s Steps: 2 s, Spots: 60 s Steps: 2 s, Spots: 60 s Steps: 2 s,	A A	A A	Pass Pass	
2 - 2.7GHz 2 - 2.7GHz	Vertical Horizontal Horizontal	3 V/m 3 V/m 3 V/m	Front Left Left	(1000 Hz) 80% (1000 Hz) 80% (1000 Hz) 80% (1000 Hz) 80%	0.01 0.01 0.01	Spots: 60 s Steps: 2 s, Spots: 60 s Steps: 2 s, Spots: 60 s Steps: 2 s, Spots: 60 s Steps: 2 s,	A A A	A A A	Pass Pass Pass	
2 - 2.7GHz 2 - 2.7GHz 2 - 2.7GHz	Vertical Horizontal Horizontal	3 V/m 3 V/m 3 V/m 3 V/m	Front Left Left Rear	(1000 Hz) 80%	0.01 0.01 0.01 0.01	Spots: 60 s Steps: 2 s,	A A A	A A A	Pass Pass Pass Pass	

Table 4.3.4.6: Radiated Immunity Test Results, Page 5

Test Method: In accordance with: Section:	Professiona IEC 61000-4-3: 1995, Electromagn techniques – Section 3: Radiated	al Testing, EMI, Inc	с.		
Test Method: In accordance with: Section:		/=====\			
In accordance with:	techniques - Section 3: Radiated	etic compatibility (EMC)	- Part 4: Testing and mea	surement	t
Section:	·	, radio frequency, electro	omagnetic field immunity	test	
Section:	IEC 60945, Fourth Edition, 2002-0	8 Maritime navigation a	nd radio communication	equipmer	nt an
	systems - General Requirements	- Methods of testing and	required test results		
	Table 6 - Electromagnetic Immur	nity, and Section 10.4.2			
Test Date(s):	11/19/2012 – 11/20/2012	EUT Serial #:	7065		
Customer:	Tideland Signal Corporation	EUT Part #:	None		
Project Number:	13862-10	Test Technician:	Bob Redoutey		
Purchase Order #:	116585	Supervisor:	Rob McCollough		
Equip. Under Test:	E-Navcon	Witness' Name:	None		
	Radiated Immunity Test Results D	Oata Sheet	Page:	5 of	9
EUT Mode of Operati	ion: Streaming Data				
PROFESSIONAL T L S T N G	610004-3, I	ssion al Testing (EMI), Inc. mmunity to Radiated RF Disturbances rizontal Polarity - Forward Power & Field Strength	— Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Power, Spots ♦ Testing Forward Power, Spots — Field Strength, Sepots (V/m) ■ Field Strength, Spots (V/m)		
50.0 (m) 40.0 (m) 20.0 (m) 30.0 (m) 20.0 (m) 20.					
10.0	man m				
80M	182M 285M 387M	489M 591M Frequency	694M 796M 898M	í 1	1G
Operator: B ob Redoutey	EUT Mode: Strea	aming Data	EUT: E-Navcon		
02:45:11 PM, Monday, November 19, 201	12		Customer: Tideland Signal Corporation		
	Graphical Data - 80MH:	z to 1000MHz, Horizontal	Polarity		
			•		
PROFESSIONAL 60.0	61000-4-3, In	ssion al Testing (EMI), Inc. mnumity to Raddaed RF Disturbances critical Polarity - Forward Power & Field Strength	— Calibration Forward Power, Sweep — Testing Forward Waver, Sweep — Calibration Forward Power, Spots ♦ Testing Forward Power, Spots Field Strength, Sweep (V/m) □ Held Strength, Spots (V/m)		
50.0	and the same of th			<i>~</i>	
9 30.0 (E) 30.0	A.M. I		_		
(m, 40.0 (mg) 30.0 (mg) 30.0 (mg) 20.0 (mg) 30.0 (mg) 30					
I mwy	182M 285M 387M	489M 591M Frequency	694M 796M 898M		iG
10.0	EUT Mode: Street	Frequency	694M 796M 898M EUT: E-Navcon Customer: Tideland Signal Corporation		lG

	ated Immunity Test Results, Pag	ge o			
	Professional 7	Testing, EMI, In	ıc.		
Test Method:	IEC 61000-4-3: 1995, Electromagneti		·		t
	techniques – Section 3: Radiated, ra				
n accordance with:	IEC 60945, Fourth Edition, 2002-08 N systems - General Requirements - N	_		equipme	nt and
Section:	Table 6 - Electromagnetic Immunity				
Test Date(s):	11/19/2012 - 11/20/2012	EUT Serial #:	7065		
Customer:	Tideland Signal Corporation	EUT Part #:	None		
Project Number:	13862-10	Test Technician:	Bob Redoutey		
Purchase Order #:	116585	Supervisor:	Rob McCollough		
Equip. Under Test:	E-Navcon	Witness' Name:	None		
	Radiated Immunity Test Results Data	a Sheet	Page:	6 of	9
EUT Mode of Opera	-		<u> </u>		
PROFESSIONAL SO.01	61000-4-3, I mmunity	l Testing (EMI), Inc. to Radiated RF Disturbances ularity - Forward Power & Field Strength	— Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Power, Spots ◇ Testing Forward Power, Spots — Field Strength, Sweep (V/m) □ Field Strength, Spots (V/m)		
40.0					
Amplitude (d B m), (V/m)					
10.0					
0 1.0G	1.1G	1.2G	1.3G		.4G
0 1.0G		Frequency	1.3G	, , , , , , , , , , , , , , , , , , , ,	.4G
0 1.0G	1.1G EUT Mode: Streaming D	Frequency	1.3G EUT: E.Navcon	. , , , ,	.4G
	EUT Mode: Streaming D	Frequency		. , , , ,	.4G
Operator: Bob Redoutey	EUT Mode: Streaming D	Frequency ata	EUT: E-Navcon Cus tomer: Tideland Signal Corporation		AG
Operator: Bob Redoutey	Graphical Data - 1GHz to	Frequency 1.4GHz, Horizontal I	EUT: E-Navcon Cus tomer: Tideland Signal Corporation Polarity		.4G
Operator: Bob Redoutey	Graphical Data - 1GHz to Professiona 61000-4.3, Immunity	Frequency ata	EUT: E-Navcon Cus tomer: Tideland Signal Corporation		AG
Operator: Bob Redoutey 04:33:37 PM, Monday, November 19,	Graphical Data - 1GHz to Professiona 61000-4.3, Immunity	Prequency D 1.4GHz, Horizontal I ITesting (EMI), Inc. to Radiated RF Disturbances	EUT: E-Navcon Cus tomer: Tideland Signal Corporation Polarity — Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Power, Spots ♦ Testing Forward Power, Spots — Field Strength, Sweep (Vm)		ĀG
Operator: Bob Redoutey 04:33:37 PM, Monday, November 19,	Graphical Data - 1GHz to Professiona 61000-4.3, Immunity	Prequency D 1.4GHz, Horizontal I ITesting (EMI), Inc. to Radiated RF Disturbances	EUT: E-Navcon Cus tomer: Tideland Signal Corporation Polarity — Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Power, Spots ♦ Testing Forward Power, Spots — Field Strength, Sweep (Vm)		ĀG
Operator: Bob Redoutey 04:33:37 PM, Monday, November 19,	Graphical Data - 1GHz to Professiona 61000-4.3, Immunity	Prequency D 1.4GHz, Horizontal I ITesting (EMI), Inc. to Radiated RF Disturbances	EUT: E-Navcon Cus tomer: Tideland Signal Corporation Polarity — Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Power, Spots ♦ Testing Forward Power, Spots — Field Strength, Sweep (Vm)		ĀG
Operator: Bob Redoutey 04:33:37 PM, Monday, November 19, PROFESSIONAL 50.0 (II) (III) (III) (IIII) (IIIIIIIIIIII	Graphical Data - 1GHz to Professiona 61000-4.3, Immunity	Prequency ata D 1.4GHz, Horizontal I ITesting (EMI), Inc. to Radiated RF Disturbances larity - Forward Power & Field Strength	EUT: E-Navcon Cus tomer: Tideland Signal Corporation Polarity — Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Power, Spots ♦ Testing Forward Power, Spots — Field Strength, Sweep (Vm)		AG
Operator: Bob Redoutey 04:33:37 FM, Monday, November 19, PROFESSIONAL 50.0 10.0 10.0	Graphical Data - 1GHz to Professiona 61000-43, Immunity Plot 6, 1 - 1.4GHz Vertical Po	Prequency D 1.4GHz, Horizontal I ITesting (EMI), Inc. to Radiated RF Disturbances larity - Forward Power & Field Strength	Cus tomer: Tideland Signal Corporation Polarity - Calibration Forward Power, Sweep - Testing Forward Power, Spots ◇ Testing Forward Power, Spots - Field Strength, Sweep (Vim) □ PR_Spots_B3V		
Operator: Bob Redoutey 04:33:37 FM, Monday, November 19, PROFESSIONAL 50.0 (III) 30.0 (III) 10.0	Graphical Data - 1GHz to Professio na 61000-4-3, Immunity Plot 6, 1 - 1.4GHz Vertical Po	Prequency D 1.4GHz, Horizontal I ITesting (EMI), Inc. to Radiated RF Disturbances larity - Forward Power & Field Strength	EUT: E.Navcon Cus tomer: Tideland Signal Corporation Polarity — Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Power, Spots ◇ Testing Forward Power, Spots — Field Strength, Sweep (Vim) □ PR_Spots_B3V		

Table 4.3.4.8: Radiated Immunity Test Results, Page 7

Гаble 4.3.4.8: Radi	ated Immunity Test Resu	ilts, Page 7			
	Professi	onal Testing, EMI, Ir	ıc.		
Tark Barkland.	IEC 61000-4-3: 1995, Electro	magnetic compatibility (EMC) – Part 4: Testing and mea	asurement	
Test Method:	techniques – Section 3: Rad	iated, radio frequency, elect	romagnetic field immunity	test	
n accordance with:		002-08 Maritime navigation		equipment	and
		ents - Methods of testing an	d required test results		
Section:		nmunity, and Section 10.4.2	7007		
Test Date(s):	11/19/2012 - 11/20/2012	EUT Serial #: EUT Part #:	7065		
Customer: Project Number:	Tideland Signal Corporation 13862-10	Test Technician:	None Bob Redoutey		
Purchase Order #:	116585	Supervisor:	Rob McCollough		
Equip. Under Test:	E-Navcon	Witness' Name:	None		
-1- p		·		f	_
EUT Mode of Opera	Radiated Immunity Test Restion: Streaming Data	uits Data Sneet	Page:	7 of	9
LOT WIGGE OF OPERA	tion. Streaming Data				
PROFESSIONAL		Pro fessio na l Testing (EMI), Inc. i1000-4-3, Inmunity to Radiated RF Disturbances 2GHz Horizontal Polarity - Forward Power & Field Strength	— Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Power, Spots ◇ Testing Forward Power, Spots — Field Strength, Sweep (Vim) □ Field Strength, Spots (Vim)		
50.0					
40.0					
(E) 30.0					
((E/, \) \((\text{M} \) B) abuilding ((\text{R} \) by a light ((\text{R} \) b) abuilding ((\text{R} \					
9 1 20.0					
d w v					
10.0					
0 1.4G					
1.4G	1.5G 1.60	Frequency	1.8G 1.9G	2.0G	
Operator: Bob Redoutey	EUT	Mode: Streaming Data	EUT: E-Navcon		
04:43:54 PM, Monday, November 19,	2012		Customer: Tideland Signal Corporation		
	Graphical Data -	1.4GHz to 2GHz, Horizontal	Polarity		
		Professional Testing (EMI), Inc.	— Calibration Forward Power, Sweep		
PROFESSIONAL TESTING		51000-4-3, Immunity to Radiated RF Disturbances -2GHz Vertical Polarity -Forward Power & Field Strength	Cambration for ward rower, sweep Testing Forward Bower, Sweep Calibration Forward Power, Spots Testing Forward Bower, Spots Field Strength, Sweep (V/m) Field Strength, Spots (V/m)		
50.0					
40.0					
. ₹ 1					
≥ 30.0					
Э) 30.0 (ш др)					
N) 30.0 (m g) 20.0					
Amplitude (dB m), (W/m)					
Amplitude (dB m), V					
10.0					
	1.5G 1.60	Frequency	1.9G	2.06	
10.0			1.8G 1.9G EUT: E-Navcon	2.0G	
10.0 0 1.4G	EUT	Frequency		2.06	

Table 4.3.4.9: Radia	ated Immunity Test Results, Page	8		
	Professional T	esting, EMI, Inc	C .	
est Method:	CENELEC EN 61000-4-3 (2006): Electro measurement techniques - Radiated			
	ETSI EN 301 489-1 V1.8.1 (2008-04) H			-
n accordance with:	Electromagnetic compatibility and R	·	•	•
i accordance with.	(EMC) standard for radio equipment		- · · · · · · - · · · · · · · · · · · ·	-
	Section 9.2 - Radio frequency electro			
ection:		omagnetic neid (60 ivi	nz to 1000 ivinz aliu 1400	WIHZ (0 2700
est Date(s):	MHz) 11/19/2012 – 11/20/2012	EUT Serial #:	7065	
ustomer:	Tideland Signal Corporation	EUT Part #:	None	
roject Number:	13862-10	Test Technician:	Bob Redoutey	
urchase Order #:	116585	Supervisor:	Rob McCollough	
quip. Under Test:	E-Navcon	Witness' Name:	None	
	Radiated Immunity Test Results Data	Sheet	Page:	8 of 9
EUT Mode of Opera		Sirect	1 050.	0 01 3
PROFESSIONAL	61000-4-3, I mmunity	Testing (EMI), Inc. to Radiated RF Disturbances olarity - Forward Power & Field Strength	Calibration Forward Power, Sweep Testing Forward Power, Sweep Calibration Forward Power, Spots Testing Forward Power, Spots Field Strength, Sweep (V/m)	
40.0			✓ Field-Strength, Spots (V/m)	
1				
30.0				
Amplitude (dB m, (V/m)				
€ 20.0 -				
aplitude				
10.0				
10.0				
0 2.0G	2.1G 2.2G	2.3G	2.4G	2.5G
Occasion B. b. B. Joseph	EUT Mode: Streaming Da	Frequency ata	FUT F November	
Operator: Bob Redoutey 07:19:38 AM, Tuesday, November 2	0, 2012		EUT: E-Navcon Customer: Tideland Signal Corporation	
	Graphical Data - 2GHz to	2 5GHz Horizontal Pe		
	•		Juney	
PROFESSIONAL	61000-4-3, Immunity	Testing (EMI), Inc. to Radiated RF Disturbances larity - Forward Power & Field Strength	— Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Power, Spots ◇ Testing Forward Power, Spots — Field Strength, Sweep (V/m) ▼ Field Strength, Spots (V/m)	
-				
30.0				
(EL/A) (EL EL E				
를 20.0 플				
A mplitude				
10.0				
‡				
2.0G				
Ž.ÔG	2.iG 2.2G	2.3G Frequency	2.ÅG	2.5G
Operator: Bob Redoutey	EUT Mode: Streaming Da	ıta	EUT: E-Navcon	
07:30:50 AM, Tuesday, November 2	0, 2012		Customer: Tideland Signal Corporation	
	Graphical Data - 2GHz t	o 2.5GHz. Vertical Pol	arity	

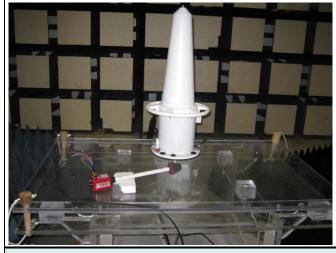
	Professiona	l Testing, EMI, In	ıc.		
	CENELEC EN 61000-4-3 (2006): Elec			ing and	
Test Method:	measurement techniques - Radiat	-	· ·	_	
	ETSI EN 301 489-1 V1.8.1 (2008-04				 es)
n accordance with:	Electromagnetic compatibility an	•	•		•
	(EMC) standard for radio equipme		· · · · · · · · · · · · · · · · · · ·	-	
	Section 9.2 - Radio frequency elec		<u> </u>		00
Section:	MHz)	,			
Test Date(s):	11/19/2012 - 11/20/2012	EUT Serial #:	7065		
Customer:	Tideland Signal Corporation	EUT Part #:	None		
Project Number:	13862-10	Test Technician:	Bob Redoutey		
Purchase Order #:	116585	Supervisor:	Rob McCollough		
quip. Under Test:	E-Navcon	Witness' Name:	None		
	Radiated Immunity Test Results Da	ata Sheet	Page:	9 of	9
EUT Mode of Opera	tion: Streaming Data				
Professional Testing (EMI), Inc. 61000-43, Immunity to Radiated RF Disturbances Plot 11, 2.5 - 2.7GHz Horizontal Polarity - Forward Power & Field Stren			— Calibration Forward Power, Sweep — Testing Forward Power, Sweep — Calibration Forward Tower, Spots ♦ Testing Forward Power, Spots — Feld Strength, Sweep (V/m)		
40.0			▼ Field Strength, Spots (V/m)		
30.0					
(qB m)					
15) pm 20.0					
epnjidu W					
10.0					
1					
0 + 2.50G	2.55G	2.60G Frequency	2.65G	2.70G	
Operator: Bob Redoutey	EUT Mode: Stream		EUT: E-Navcon		
07:25:10 AM, Tues day, November 2	0, 2012		Customer: Tideland Signal Corporation		
	Graphical Data - 2.5G	Hz to 2.7GHz, Vertical P	olarity		
	•		<u> </u>		_
PROFESSIONAL 40.0	61000-4-3, I m	ional Testing (EMI), Inc. munity to Radiated RF Disturbances tical Polarity - Forward Power & Field Strength	— Calibration Forward Dower, Sweep — Testing Forward Dower, Sweep — Calibration Forward Dower, Spots ♦ Testing Forward Dower, Spots — Field Strength, Sweep (V/m) Field Strength, Spots (V/m)		
30.0					
A/m)					
(H B) (M B) 20.0					
p) 20.0†					
Ampl					
10.0					
<u> </u>					
0	2,550	2.60C	2.65C	2 700	
0 2.50G	2.55G	2.60G Frequency	2.65G	2.70G	
0, 2.50G Operator: Bob Redoutey	2.SSG EUT Mode: Stream	Frequency	2.65G EUT : E-Navcon	2.70G	

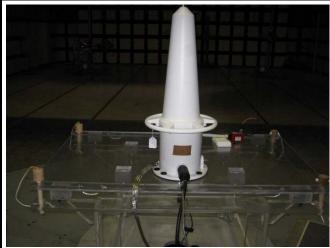
Table 4.3.4.11: Radiated Immunity Test Setup Photographs, Page 1

Table not need that are the state of the sta						
Professional Testing, EMI, Inc.						
Test Method:	IEC 61000-4-3: 1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement					
rest Method.	techniques – Section 3: Radiate	d, radio frequency, elec	ctromagnetic field immunity test			
In accordance with:	IEC 60945, Fourth Edition, 2002-	08 Maritime navigation	and radio communication			
in accordance with.	equipment and systems - General Requirements - Methods of testing and required test					
Section:	Table 6 - Electromagnetic Immu	nity, and Section 10.4.2	2			
Test Date(s):	11/19/2012 - 11/20/2012	EUT Serial #:	7065			
Customer:	Tideland Signal Corporation	EUT Part #:	None			
Project Number:	13862-10	Test Technician:	Bob Redoutey			
Purchase Order #:	116585	Supervisor:	Rob McCollough			
Equip. Under Test:	E-Navcon	Witness' Name:	None			

Radiated Immunity Photographs

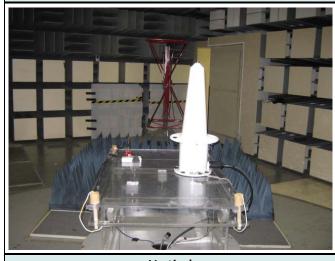
Page: 1 of 2

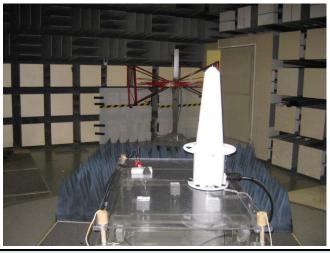




Front

Rear





Vertical

Horizontal

Table 4.3.4.12: Radiated Immunity Test Setup Photographs, Page 2

	Professional [*]	Testing, EMI, Inc	•				
Test Method:	IEC 61000-4-3: 1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 3: Radiated, radio frequency, electromagnetic field immunity test						
In accordance with:	EC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test						
Section:	Table 6 - Electromagnetic Immur	nity, and Section 10.4.2					
Test Date(s):	11/19/2012 - 11/20/2012	EUT Serial #:	7065				
Customer:	Tideland Signal Corporation	EUT Part #:	None				
Project Number:	13862-10	Test Technician:	Bob Redoutey				
Purchase Order #:	116585	Supervisor:	Rob McCollough				
Equip. Under Test:	E-Navcon	Witness' Name:	None				
	Radiated Immunity Photogra	iphs	Page: 2	of 2			



Support Equipment

4.4 Electrical Fast Transient/Burst Immunity Testing

4.4.1 Test Procedures

Electrical fast transient/burst immunity testing was performed on the EUT using the procedures of IEC 61000-4-4. The EUT was placed in the approximate center of the GRP and was powered and operated in a normal configuration. The EUT was observed for any indications of erratic operation. The coupling clamp was used to apply transients to I/O lines, while transients were applied to any power leads through the use of the burst generators back-filters. For each discharge sequence, the duration was one minute with a one-minute pause between sequences. The EUT was subjected to 0.50, 1 kV, and 2 kV transients to DC power input leads and 0.50 kV and 1.0 kV transients to any interconnecting cables greater than 3 meters in length. The transient/burst pulse was performed with a 5 kHz repetition rate. Both positive and negative polarity transients were applied. Diagrams showing the test setups are given as Figures 4.4.1.1, 4.4.1.2, and 4.4.1.3.

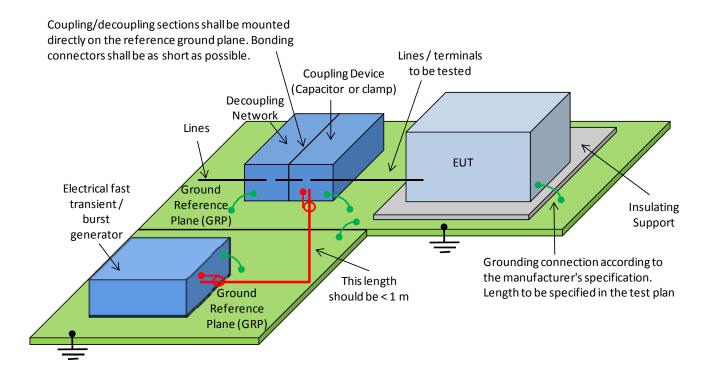


Figure 4.4.1.1: Electrical Fast Transient/Burst Immunity Test Setup

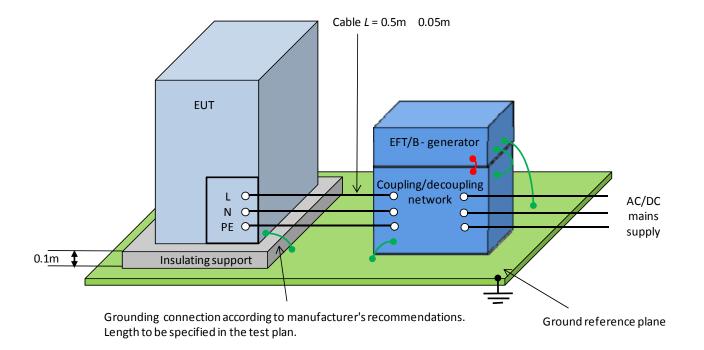
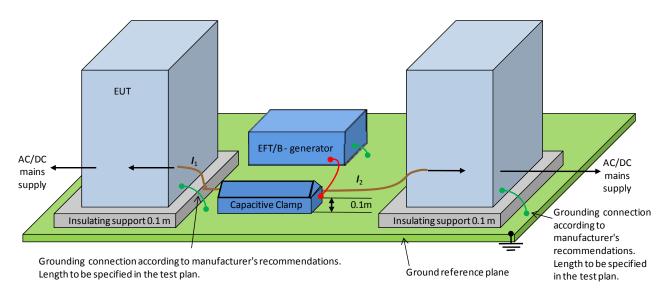


Figure 4.4.1.2: Electrical Fast Transient/Burst Immunity Test Setup

Direct Coupling of the Test Voltage to AC/DC Power Supply Ports/Terminal for Laboratory

Purposes (Figure 9)



When both EUTs are tested simultaneously: I1=I2=0.5 m ± 0.05 m between the clamp and the EUT being tested. When only one EUT is tested, a decoupling network must be inserted between the capacitive coupling and the non-tested EUT.

Figure 4.4.1.3: Electrical Fast Transient /Burst Immunity Test Setup

Application of the Test Voltage by the Capacitive Coupling Clamp for Laboratory Test

Purposes (Figure 10)

4.4.2 Performance Criteria

During the performance of electrical fast transient/burst immunity testing, only performance criterion A and performance criterion B were allowed. Performance criterion C failures were disallowed.

4.4.3 Test Results

The EUT was subjected to electrical fast transient/burst immunity testing on February 28, 2014. No adverse indications were noted during the performance of the test. Therefore, the EUT met performance criterion A.

Table 4.4.3.1: Electrical Fast Transient/Burst Immunity Test Equipment

	Professional Testing, EMI, Inc.								
Test Metho	IEC 61000-4-4: 1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measuremen								
	techr	niques – Section 4:	Electrical f	ast transient/burst imm	unity test – Basic	EMC publication			
In accordan	ice with:	0945, Fourth Editio	on, 2002-08	Maritime navigation an	d radio communio	ation			
	equip	ment and system	<u>s - General I</u>	Requirements - Method:	s of testing and re	quired test			
Section:	Table	6 - Electromagne	tic Immunit	y, and Section 10.5					
Test Date(s)): 2/28/	′ 2014		EUT Serial #:	7065				
Customer:	Tidel	and Signal Corpora	ation	EUT Part #:	None				
Project Nur	Project Number: 13862-10 Test Technician:				Bob Redoutey				
Purchase O	rder #: 11658	35		Supervisor:	Rob McCollough				
Equip. Unde	er Test: E-Nav	vcon .		Witness' Name:	None				
	E	lectrical Fast Trans	sient / Burs	t Immunity Test Equipm	ent List				
Te	st Software Versi	on: WinP	ats Version	3.28, Haefely Test AG					
Asset #	Manufacturer	Model	Model Equipment Nomenclature			Calibration Due Date			
1150	Haefely	PEFT 093 584.1	EFT Tester (used with Asset #1289)		083 383.11	7/16/2014			
1289	Haefely	FP-EFT 093 593.1	Filter, Cou	upling (used with Asset #1150)	083 318 01	7/16/2014			
1302	Haefely	093 596.1	Clamp, (Capacitive, EFT CISPR	083 369-19	7/2/2014			

Table 4.4.3.2: Electrical Fast Transient/Burst Immunity Test Results, DC Power Ports

	Professional Testing, EMI, Inc.								
Total Basels and	IEC 61000-4-4: 1995, Electromagi	netic compatibility (EMC	C) – Part 4: Testing and measurement						
Test Method:	techniques – Section 4: Electrica	I fast transient/burst im	nmunity test – Basic EMC publication						
In accordance with	IEC 60945, Fourth Edition, 2002-	08 Maritime navigation	and radio communication equipment						
In accordance with: and systems - General Requirements - Methods of testing and required test results									
Section:	Table 6 - Electromagnetic Immu	Table 6 - Electromagnetic Immunity, and Section 10.5							
Test Date(s):	2/28/2014	EUT Serial #:	7065						
Customer:	Tideland Signal Corporation	EUT Part #:	None						
Project Number:	13862-10	Test Technician:	Bob Redoutey						
Purchase Order #:	116585 Supervisor: Rob McCollough								
Equip. Under Test:	E-Navcon	Witness' Name:	None						
Electrical Fast Transient / Burst Immunity Test Results Data Sheet Page:									

Part 2 - d.c. power ports

(excluding equipment marketed with an a.c./d.c. power converter)

EUT Mode of Operation:	Streaming	Data
EUT Line Voltage:	12	VDC

LOIL	ille voltage.		Z VDC						
Line Tested	Test Level & Polarity	Pulse Repetition Frequency	Burst Duration	Burst Period	Test Duration	Coupling Method	Perfomance Criterion Required	Perfomance Criterion Achieved	Test Result
L1 (Hot Lead)	0.5kV Positive	5 kHz	15 mS	300 mS	5 minutes	CDN	В	А	Pass
L2 (Return	0.5kV Positive	5 kHz	15 mS	300 mS	5 minutes	CDN	В	Α	Pass
L1 (Hot Lead)	0.5kV Negative	5 kHz	15 mS	300 mS	5 minutes	CDN	В	А	Pass
L2 (Return	0.5kV Negative	5 kHz	15 mS	300 mS	5 minutes	CDN	В	А	Pass
L1 (Hot Lead)	1.0kV Positive	5 kHz	15 mS	300 mS	5 minutes	CDN	В	Α	Pass
L2 (Return	1.0kV Positive	5 kHz	15 mS	300 mS	5 minutes	CDN	В	Α	Pass
L1 (Hot Lead)	1.0kV Negative	5 kHz	15 mS	300 mS	5 minutes	CDN	В	Α	Pass
L2 (Return	1.0kV Negative	5 kHz	15 mS	300 mS	5 minutes	CDN	В	Α	Pass
L1 (Hot Lead)	2.0kV Positive	2.5 kHz	15 mS	300 mS	5 minutes	CDN	В	Α	Pass
L2 (Return	2.0kV Positive	2.5 kHz	15 mS	300 mS	5 minutes	CDN	В	Α	Pass
L1 (Hot Lead)	2.0kV Negative	2.5 kHz	15 mS	300 mS	5 minutes	CDN	В	Α	Pass
L2 (Return	2.0kV Negative	2.5 kHz	15 mS	300 mS	5 minutes	CDN	В	Α	Pass

Table 4.4.3.3: Electrical Fast Transient/Burst Immunity Test Results, I/O Ports

<u>Table 4.4.</u>	3.3: Elect	rical Fast	Transient/	Burst Imn	nunity Tes	t Results,	I/O Ports		
			Profes	sional Te	esting, El	MI, Inc.			
Test Metho	rest Method: IEC 61000-4-4: 1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test – Basic EMC publication								
In accordar	nce with:	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results							
Section:		Table 6 - El	ectromagne	tic Immunit	y, and Section	on 10.5			
Test Date(s):	2/28/2014			EUT Serial #	t:	7065		
Customer:		Tideland Si	gnal Corpor	ation	EUT Part #:		None		
Project Nui	mber:	13862-10			Test Techni	cian:	Bob Redou	tey	
Purchase O	rder #:	116585			Supervisor:		Rob McColl	ough	
Equip. Und	er Test:	E-Navcon			Witness' Na	ame:	None		
	Electrical Fa	st Transient	/ Burst Imn	nunity Test	Results Data	Sheet	Pa	ge: 1	of 1
	Pai	rt 3 - Immur	ity, I/O Cab	les, Signal C	ables, Teleco	mmunicati	ons Cables, e	etc.	
EUT Mod	e of Operati	ion: Strea	ming Data						
EUT L	ine Voltage:	1	.2 VDC		EUT Pow	ver Frequen	cy:	- N/A	
Line Tested	Test Level & Polarity	Pulse Repetition Frequency	Burst Duration	Burst Period	Test Duration	Coupling Method	Perfomance Criterion Required	Perfomance Criterion Achieved	Test Result
	0.5kV 5 kHz 15 mS 300 mS			300 mS	5 minutes	Capacitive Clamp	В	А	Pass
Signal Lin	0.5kV Negative	5 kHz	15 mS	300 mS	5 minutes	Capacitive Clamp	В	Α	Pass
Signal Lines	1.0kV Positive	5 kHz	15 mS	300 mS	5 minutes	Capacitive Clamp	В	Α	Pass
	1.0kV Negative	5 kHz	15 mS	300 mS	5 minutes	Capacitive Clamp	В	А	Pass

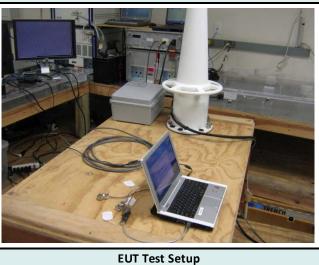
Table 4.4.3.4: Electrical Fast Transient/Burst Immunity Test Setup Photographs

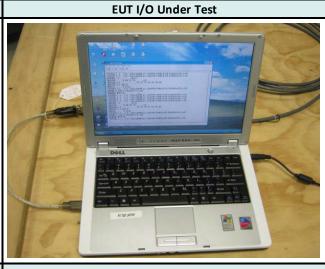
	Professional Testing, EMI, Inc.						
Test Method:	est Method: IEC 61000-4-4: 1995, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test – Basic EMC publication						
In accordance with:	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication cordance with: equipment and systems - General Requirements - Methods of testing and required test results						
Section:	Table 6 - Electromagnetic Immu	inity, and Section 10.5					
Test Date(s):	2/28/2014	EUT Serial #:	7065				
Customer:	Tideland Signal Corporation	EUT Part #:	None				
Project Number:	13862-10	Test Technician:	Bob Redoutey				
Purchase Order #:	116585 Supervisor: Rob McCollough						
Equip. Under Test:	E-Navcon	Witness' Name:	None				
Electi	rical Fast Transient / Burst Immun	ity Photographs	Page: 1 of 1				





EUT DC Mains Under Test





Support Equipment

4.5 Conducted Immunity Test

4.5.1 Test Procedures

Conducted immunity testing was performed using the procedures of IEC 61000-4-6. The EUT was placed in the approximate center and 10 cm above the reference ground plane and was powered and operated in a normal configuration. Injection to the AC power leads was performed with an M3 injection network. Testing of any signal input leads was performed via current clamp on the leads. Testing was performed on both the DC power line and the I/O power line at 3 Vrms, AM at 400 Hz, at 80% amplitude modulation injection over the frequency range 150 kHz to

80 MHz and also at 10 Vrms at 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, and 25 MHz. A diagram showing the test setup is given as Figure 4.3.1.1.

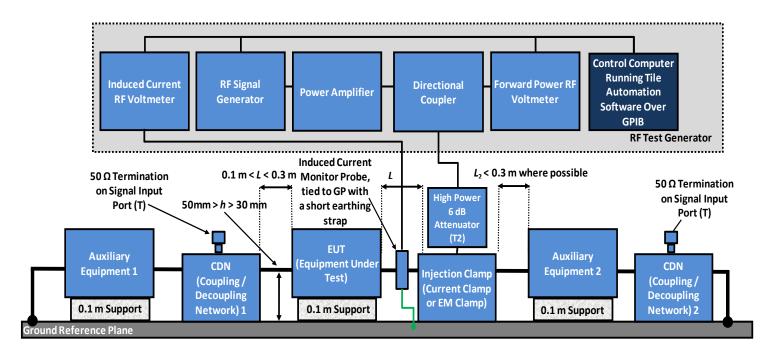


Figure 4.3.1.1: Conducted Immunity Test Setup Injection Clamp (Current Clamp) Tests

13862-10 April 8, 2014 Page 58 of 67

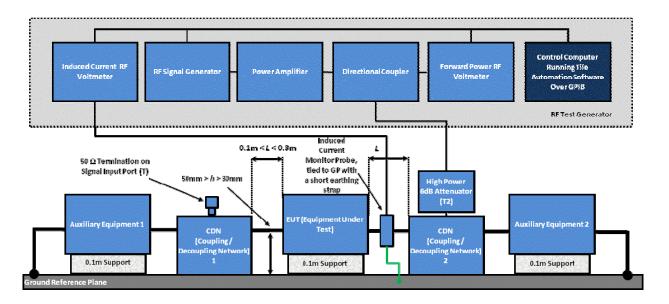


Figure 4.3.1.2: Conducted Immunity Test Setup CDN Tests (Coupling Decoupling Networks)

4.5.2 Performance Criteria

During performance of conducted RF immunity testing only performance criterion A was allowed. Performance criterion B or performance criterion C failures were disallowed.

4.5.3 Test Results

The EUT was subjected to the conducted RF immunity testing on November 19, 2012. No adverse indications were noted during the performance of the test. Therefore, the EUT met performance criterion A.

Table 4.5.	3.1: Conducted	Immunity Test	t Equipme	ent		
		Profess	sional Te	esting, EMI, Inc.		
Test Metho		•	_	tic compatibility (EMC)		
	fields	•	•		•	
		945, Fourth Editio	on, 2002-08	Maritime navigation ar	nd radio communio	cation
In accordar	nce with: equip	ment and system	s - General I	Requirements - Method	s of testing and re	quired test
	result					
Section:	Table			Ia		
Test Date(s	·	/2012		EUT Serial #:	7065	
Customer:		and Signal Corpor	ation	EUT Part #: Test Technician:	None	
Project Nui Purchase O				Supervisor:	Bob Redoutey	
Equip. Und				Witness' Name:	Rob McCollough None	
Equipi Onu	Ci icst. L-ivav				None	
				y Test Equipment List		
Te	st Software Version			.15, October 13, 2006, 1	1:21:00 AM	
	Test Profile Used:	CI_20	11_R0 Versi	on 03-28-2011.til		
Asset #	Manufacturer	Model	Equipn	nent Nomenclature	Serial Number	Calibration Due Date
1366	HP	437B		Power Meter	3125U13078	7/10/2014
1092	HP	8657B	Ge	enerator, Signal	3427U05972	9/20/2014
1226	AR	100L	Amplifie	r, 100W, 50dB, 10kHz- 220MHz	2232	N/A
1305	HD Com Corp	HDC5091-10	Cou	ıpler, Directional	31605-6	N/A
1043	JFW	50FH-006-300	Attenu	ator, N, 6dB 300W	None	1/22/2015
1132	AilTech	91550-1M	Probe, Ci	urrent, 10kHz-100MHz	1856	1/8/2015
1409	FCC	801-M2-16A	CDN, 1	50kHz-230MHz, 16A	1019	4/21/2013
1359	Schaffner	CIC-8101	Cla	mp, EM Injection	238	N/A

Table 4.5.3.2:	Condu	icted Imm	unity Test	Results, D	C Mains, P	age 1			
			Profe	ssional	Testing,	EMI, Inc.	•		
Test Method:		IEC 61000-4-6: 1996, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 6: Immunity to conducted disturbances, induced by radio-frequency fields							
In accordance v	vith:	IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results							
Section:		Table 6							
Test Date(s):		11/19/2012			EUT Serial	# :	7065		
Customer:		Tideland Si	gnal Corpora	ation	EUT Part #:		None		
Project Number	r:	13862-10			Test Techni	ician:	Bob Redoute	У	
Purchase Order	#:	116585			Supervisor		Rob McCollo	ugh	
Equip. Under Te	est:	E-Navcon			Witness' Na	ame:	None		
	Co	onducted Im	munity Test	t Results Da	ta Sheet		Pag	e: 1	of 2
EUT Mode of	Operati	ion: Strea	ming Data						
EUT Line	Tested:	DC M	ains						
Injection Met	thod Us	ed: M2 N	etwork						
EUT Line \	/oltage:	1	2 VDC		EUT Pov	ver Frequen	cy: -	N/A	
Frequency Range (MHz)		est Level olts rms)	Modulat Paramet	_ D	well Time	Frequency Step Size	Performance Criterion Required	Performance Criterion Achieved	Test Results
0.01 - 0.15	Not	Applicable							
0.15 - 6.765		freq's 3Vrms, reg's 10Vrms	AM, 400Hz ±	·	p Freq's: 2 S, t Freq's: 60 S	1% fo	А	Α	Pass
6.765 - 6.795	Swept	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ±	:10%, Ste	p Freq's: 2 S, t Freg's: 60 S	1% fo	А	А	Pass
6.795 - 13.553		freq's 3Vrms, reg's 10Vrms	AM, 400Hz ± depth 80% ±		p Freq's: 2 S, t Freg's: 60 S	1% fo	А	А	Pass
13.553 - 13.567		freq's 3Vrms, reg's 10Vrms	AM, 400Hz ± depth 80% ±		p Freq's: 2 S, t Freq's: 60 S	1% fo	Α	Α	Pass
13.567 - 26.957	, I .	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ± depth 80% ±	·	p Freq's: 2 S, t Freq's: 60 S	1% fo	А	Α	Pass
26.957 - 27.283	Spot f	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ± depth 80% ±	±10% Spc	p Freq's: 2 S, t Freq's: 60 S	1% fo	Α	Α	Pass
27.283 - 40.66	Spot f	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ± depth 80% ±	±10% Spc	p Freq's: 2 S, t Freq's: 60 S	1% fo	А	А	Pass
40.66 - 40.7	Spot f	freq's 3Vrms, req's 10Vrms	AM, 400Hz ±	±10% Spc	p Freq's: 2 S, t Freq's: 60 S	1% fo	А	А	Pass
40.7 - 47	Spot f	freq's 3Vrms, req's 10Vrms	AM, 400Hz ±	10% Spc	p Freq's: 2 S, t Freq's: 60 S	1% fo	А	А	Pass
47 - 68	Spot f	freq's 3Vrms, req's 10Vrms	AM, 400Hz ±	±10% Spc	p Freq's: 2 S, t Freq's: 60 S	1% fo	А	А	Pass
68 - 80	Spot f	freq's 3Vrms, req's 10Vrms	AM, 400Hz ± depth 80% ±		p Freq's: 2 S, t Freq's: 60 S	1% fo	А	А	Pass
80 - 230	Not	Applicable	0						
	UT C	:ti - c · -		ictea immi	inity Spot Fr	•	0	F	
	-	ific Spot Fre	-				Specific-Spot	1	
	quency MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
None	•			, ,	2.000	12.600	40.000		
22					3.000	16.500	48.000		
					4.000	18.800	2.230		
					6.200	22.000			
					8.200	25.000			

	t Results, DC Mains, Page 2		
Prof	essional Testing, EMI	, Inc.	
	• • • • • • • • • • • • • • • • • • • •	•	
•	•		• •
Table 6			
11/19/2012	EUT Serial #:	7065	
Tideland Signal Corpo		None	
13862-10		•	
E-Navcon	Witness' Name:	None	
Conducted Immunity Te	est Results Data Sheet	Page:	2 of 2
d: DC Mains			
	,	ction Network Sweep Forw	ard Power
	1.0M	10.0M	100.0M
edoutey onday, November 19, 2012	Frequency Line Tested: DC Mains	EUT: E-Navcon Customer: Tideland S	
	IEC 61000-4-6: 1996, E techniques – Section IEC 60945, Fourth Edit and systems - Genera Table 6 11/19/2012 Tideland Signal Corpo 13862-10 116585 E-Navcon Conducted Immunity Teles E: DC Mains F IEC 6100 150kHz to	IEC 61000-4-6: 1996, Electromagnetic compatibility (techniques – Section 6: Immunity to conducted dist IEC 60945, Fourth Edition, 2002-08 Maritime navigat and systems - General Requirements - Methods of te Table 6 11/19/2012 EUT Serial #: Tideland Signal Corporation EUT Part #: 13862-10 Test Technician: 116585 Supervisor: E-Navcon Witness' Name: Conducted Immunity Test Results Data Sheet 1: DC Mains Professional Testing (EMI), Inc. IEC 61000-4-6, Immunity to Conducted RI 150kHz to 80MHz - Forward Power to the Injection of	Tideland Signal Corporation EUT Part #: None 13862-10 Test Technician: Bob Redoutey 116585 Supervisor: Rob McCollough E-Navcon Witness' Name: None Conducted Immunity Test Results Data Sheet Page: DC Mains Professional Testing (EMI), Inc. IEC 61000-4-6, Immunity to Conducted RF Disturbances 150kHz to 80MHz - Forward Power to the Injection Network Sypots Forw Township Tequency Figure 10.0M Frequency FITT: E-Navcon

Table 4.5.3.4: Conducted Immunity Test Results, Signal Cable Port, Page 1

Table 4.5.3	3.4: C	ondu	cted Imm	unity Test	Results,	Signal Cabl	e Port, Pag	ge 1		
				Profe	ssional	Testing,	EMI, Inc.			
Test Method	d:				_	-			ng and measur by radio-frequ	
In accordan	ce wit	n:	•		•		•		nunication equ	uipment
Section:				s - General I	Requireme	nts - Method	s of testing	and required	test results	
Test Date(s)	:		Table 6 11/19/2012			EUT Serial	#:	7065		
Customer:				gnal Corpora	ation	EUT Part #:		None		
Project Nun			13862-10			Test Techn		Bob Redoute	У	
Purchase Or			116585			Supervisor		Rob McCollo	ugh	
Equip. Unde	er Test		E-Navcon			Witness' N	ame:	None		
				munity Test	Results D	ata Sheet		Pag	e: 1	of 2
EUT Mode	_			ming Data						
EUT Li				l Cable						
Injection						FUT D.			21./0	
EUT Lii		tage:	1	2 VDC		EUI POV	ver Frequen		,	
Frequenc Range (MHz)			est Level olts rms)	Modulat Paramet		Well Time	Frequency Step Size	Performance Criterion Required	Performance Criterion Achieved	Test Results
0.01 - 0.1	15	Not	Applicable							
0.15 - 6.7	65		freq's 3Vrms, reg's 10Vrms	AM, 400Hz ± depth 80% ±		ep Freq's: 2 S, ot Freg's: 60 S	1% fo	A	Α	Pass
6.765 - 6.7	795	Swept	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ±	10%, St	ep Freq's: 2 S, ot Freg's: 60 S	1% fo	Α	Α	Pass
6.795 - 13.	553	Swept	freq's 3Vrms, req's 10Vrms	AM, 400Hz ±	10%, St	ep Freq's: 2 S, ot Freq's: 60 S	1% fo	Α	Α	Pass
13.553 - 13	.567	Swept	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ±	10%, St	ep Freq's: 2 S, ot Freq's: 60 S	1% fo	Α	А	Pass
13.567 - 26	.957	Swept	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ±	10%, St	ep Freq's: 2 S, ot Freq's: 60 S	1% fo	А	А	Pass
26.957 - 27	.283	Swept	freq's 3Vrms, req's 10Vrms	AM, 400Hz ± depth 80% ±	10%, St	ep Freq's: 2 S, ot Freq's: 60 S	1% fo	А	А	Pass
27.283 - 40	0.66	Swept	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ± depth 80% ±		ep Freq's: 2 S, ot Freg's: 60 S	1% fo	А	А	Pass
40.66 - 40	0.7	Spot f	freq's 3Vrms, req's 10Vrms	AM, 400Hz ± depth 80% ±	10% Sp	ep Freq's: 2 S, ot Freg's: 60 S	1% fo	А	А	Pass
40.7 - 47	7	Spot f	freq's 3Vrms, req's 10Vrms	AM, 400Hz ± depth 80% ±	10% Sp	ep Freq's: 2 S, ot Freg's: 60 S	1% fo	А	Α	Pass
47 - 68		Spot f	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ±	10% Sp	ep Freq's: 2 S, ot Freq's: 60 S	1% fo	А	А	Pass
68 - 80		Spot f	freq's 3Vrms, reg's 10Vrms	AM, 400Hz ± depth 80% ±		ep Freq's: 2 S, ot Freg's: 60 S	1% fo	А	А	Pass
80 - 230)	Not	Applicable	0 1						
	ELIT	Snoo	ific Spot Fre		ictea imm	unity Spot Fr	-	Specific-Spot	Eroguancias	
Fraguese	Frequ		Frequency	-	Frequenc	y Frequency		Frequency	Frequency	Frequency
Frequency (MHz)	rrequ (MI	-	(MHz)	(MHz)	(MHz)	y Frequency (MHz)	(MHz)	(MHz)	(MHz)	(MHz)
None	•	,		. ,	. ,	2.000	12.600	40.000	, ,	, ,
						3.000	16.500	48.000		
						4.000	18.800			
						6.200 8.200	22.000 25.000			
						0.200	23.000		L	

Table 4.5.3.5: Conducted Immunity Test Results, Signal Cable Port, Page 2

	Professional Testing, EMI, Inc.						
Test Method:	IEC 61000-4-6: 1996, Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 6: Immunity to conducted disturbances, induced by radio-frequency fields						
In accordance with:		IEC 60945, Fourth Edition, 2002-08 Maritime navigation and radio communication equipment and systems - General Requirements - Methods of testing and required test results					
Section:	Table 6						
Test Date(s):	11/19/2012	EUT Serial #:	7065				
Customer:	Tideland Signal Corporation	EUT Part #:	None				
Project Number:	13862-10	Test Technician:	Bob Redoutey				
Purchase Order #:	116585	Supervisor:	Rob McCollough				
Equip. Under Test:	E-Navcon	Witness' Name:	None				

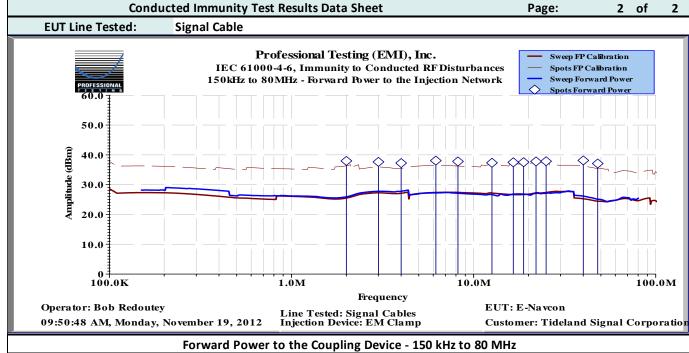


Table 4.5.3.6: Conducted Immunity Test Setup Photographs

	Professional Testing, EMI, Inc.						
Test Method:	_		IC) – Part 4: Testing and measurement pances, induced by radio-frequency				
In accordance with:	IEC 60945, Fourth Edition, 2002		n and radio communication nods of testing and required test				
Section:	Table 6						
Test Date(s):	11/19/2012	EUT Serial #:	7065				
Customer:	Tideland Signal Corporation	EUT Part #:	None				
Project Number:	13862-10	Test Technician:	Bob Redoutey				
Purchase Order #:	116585	Supervisor:	Rob McCollough				
Equip. Under Test:	E-Navcon	Witness' Name:	None				

Conducted Immunity Photographs

Page: 1 of 1

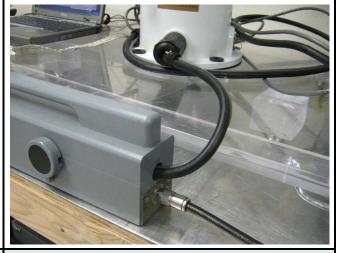




EUT with Support Equipment

EUT Setup





DC Mains Under Test

Signal Cable Under Test

Appendix A: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

Rationale and Summary of Expanded Uncertainty

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7

Appendix B: Accreditations

Laboratory Accreditation

NVLAP accreditation to ISO/IEC 17025: 2005 with the following scope of accreditation: NVLAP Lab code 200062-0

- EN 60945 (2002)
- EN 61326-1 (2006)
- IEC 61000-4-2, Ed. 1.2 (2001) + A1, A2; EN 61000-4-2
- IEC 61000-4-3, Ed. 2.0 (2002-03); EN 61000-4-3 (2002)
- IEC 61000-4-4(1995), A1(2000), A2(2001); EN 61000-4-4
- IEC 61000-4-6, Ed. 2.0 (2003-05); EN 61000-4-6
- CISPR 16-2-1 Ed. 2.0 (2008)
- CISPR 16-2-2 Ed. 1.2 (2005)
- CISPR 16-2-3 (2006) Ed. 2
- CISPR 16-2-4 (2003)

13862-10 April 8, 2014 Page 68 of 67