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February 24, 2012

Kevin Moses LDARTools 1320 Highway 3 South Unit D3 League City, Texas 77573

Dear Kevin:

Enclosed is the Wireless Test Report for the Shepherd Base by LDARTools. This report can be used to demonstrate compliance with FCC requirements for wireless devices in the United States and Canada. If you have any questions, please contact me.

Sincerely,

Jeffrey A. Lenk

President

Enclosure

Project 12345-10

LDARTools Shepherd Base

Wireless Certification Report

Prepared for: LDARTools 1320 Highway 3 South Unit D3 League City, Texas 77573

By

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

> October 24, 2011 Revised November 29, 2011 Revised December 13, 2011 Revised February 24, 2012

Reviewed by

Jeffrey A. Lenk President Written by

Layne Lueckemeyer Product Development Engineer

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

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⁽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.



Applicant: LDARTools

Applicant's Address: 1320 Highway 3 South, Unit D3, League City, TX 77573

FCC ID: ZJ2-BASE001 IC Identifier 9851A-BASE001

Project Number: 12345-10

Test Dates: July 20, August 4, 2011

The **LDARTools, Shepherd Base** was tested to and found to be in compliance with FCC 47 CFR, Part 15, RSS-GEN and RSS-210 The highest emissions generated by the above equipment are listed below:

Parameter	Leve	el	Limit	Margin (dB)					
Shepherd Base 432.99 MHz Transmitter: Radiated Spurious Emissions	1298.76 MHz: 58 3m	.3 dBuV/m @	60.8 dBuV/m	-2.5					
Shepherd Base 432.99 MHz Transmitter: Output Power at 3 meters	77.1 dBu	vV/m	80.8 dBuV/m	-3.7					
Shepherd Base 432.99 MHz Transmitter: Mains Conducted	0.5005 MHz: 4	40.4 dBuV	46 dBuV	-5.6					
Occupied Bandwidth									
20 dB			99%						
86 kHz			91 kHz						

I, Layne Lueckemeyer, for Professional Testing (EMI), Inc., being familiar with the FCC and Industry Canada rules and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Layne Lueckemeyer

Product Development Engineer

This report has been reviewed and accepted by LDARTools The undersigned is responsible for ensuring that this device will continue to comply with the FCC and Industry Canada rules.

Representative of LDARTools

1.0 Introduction

1.1 Scope

This report describes the extent of the equipment under test (EUT) conformance to the intentional radiator requirements of the United States and Canada.

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates, and expressions thereof for EMC testing. The procedures of ANSI C63.4: 2009 and KDB Publication No. 558074 were utilized for making all emissions measurements.

1.2 EUT Description

The Shepherd Base Station (BS) monitors Personal Monitors worn by field personnel who may be working in areas where hazardous gases might be found. The BS will be alerted if an individual carrying a personal monitor has been introduced to toxic fumes. The Base station will be connected to the internet and will report to the Home Office which individuals have had an alarm event. The Home Office personnel will contact the field personnel who have had an alarm event via their cell phone or landline.

The EUT was tested while in a continuous transmit mode. The EUT was tuned to a fixed channel to perform power, occupied bandwidth, spurious, and harmonic tests. The EUT continuously transmitted at maximum power. The system tested consisted of the following:

5	Manufacturer	Model	Serial Number	FCC ID Number	IC Identifier				
E	LDARTools	BASE001	None	ZJ2-BASE001	9851A-BASE001				
Transmit Frequency									
	432.99 MHz								

The following rules apply to the operation of the EUT:

Guidelines	FCC Rules, 47 CFR, Part 15	RSS-GEN Issue 3	RSS-210 Issue 8
Transmitter Characteristics for 433 MHz Transmitter	15.231	4.1-4.6, 7	2.2, 2.6-2.7, A2.9, A8, A9
Spurious Radiated Power	15.209	4.2, 4.7, 4.8, 6, 7	2.2, 2.6-2.7, A2.9, A8, A9
Power Line Conducted	15.207	4.2, 4.7, 7.2	
Antenna Requirement	15.203	7.1, 7.1.4	

1.3 Modifications

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

1.4 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644) in Austin, Texas. This site is registered with the FCC under Section 2.948, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas, 78758, while the main office is located at 1601 N. A.W. Grimes Blvd., Suite B, Round Rock, Texas, 78665.

1.5 Applicable Documents

Document	Title	Release
ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment	2009
ANSI 63.10	American National Standard for Testing Unlicensed Wireless Devices	2009
47 CFR	Part 15 – Radio Frequency Devices Subpart C – Intentional Radiators	
RSS-GEN	General Requirements and Information for the Certification of Radiocommunication Equipment Issue 3	2010
RSS-210	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment	2010

1.6 Applicable Tests

Test	Rule
Fundamental Field Strength	FCC 15.231(b), RSS-GEN 4.8
Occupied Bandwidth	FCC 15.231(c), RSS-GEN 4.6.1
Out of Band Spurious Emissions	FCC 15.205(a), 15.209(a), 15.231(b) , RSS-GEN 4.9
Powerline Conducted Emissions	FCC 15.207, RSS-GEN 7.2.2
Antenna Requirements	FCC 15.203, RSS-GEN 7.1.4

2.0 Power Line Conducted Emissions

2.1 Test Procedure

The EUT was configured and operated in a manner consistent with typical applications. The EUT power cord in excess of one meter was 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 tests were performed in an 8' x 8' RayProof modular shielded room. The EUT was placed on a non-metallic table 0.4 meters from a vertical metal reference plane and 0.8 meters from a horizontal metal reference plane. A drawing showing the test setup is given as Figure 2.1.1.

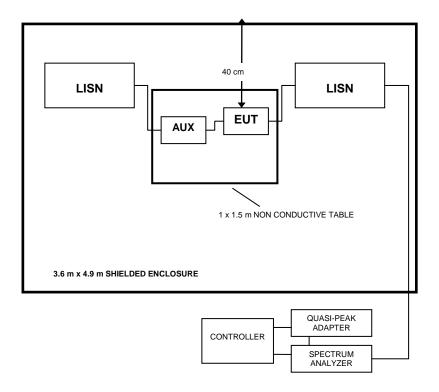


Figure 2.1.1: Conducted Emissions Test Setup

2.2 Test Criteria

The FCC Part 15 Class B conduction limits are given below.

Frequency	Conducted Limits (dBuV)				
(MHz)	Average	Quasi-Peak			
0.15 – .50	66-56*	56 – 46*			
.50 - 5	56	46			
5 – 30	60	50			

The tighter limit shall apply at the edge between two frequency bands.

2.3 Test Results

Conducted emission measurements for the EUT were taken on July 20, 2011, and the EUT was found to be in compliance with applicable requirements.

Table 2.3.1: Conducted Emissions Measurements – Test Equipment

able 2.5.1. Conducted Linissions ineasurements – rest Equipment											
Professional Testing, EMI, Inc.											
Test Method: ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference,											
FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators,											
In accordance with: Conducted Emissions Limits											
Section:	15.10	7									
Test Date(s)): 7/20/2	2011			EUT Serial #:	n/a					
Customer:	LDAI	R Tools			EUT Part #:	n/a					
Project Nun	nber: 12345	5-10			Test Technician:	Bob Redoutey					
Purchase O	rder #: 791				Supervisor:	Jason Haley					
Equip. Und	er Test: Shepl	nerd Monito	r Base		Witness' Name:	Bob Yarbrough					
Conducted Emissions Test Equipment List Page: 1 of 1											
Т	ile! Software Versio	n:	4.1.A.	0, April 14, 20	009, 11:01:00PM						
	Test Profile:		Profil	e#: CE_2010.t	til, dated December 16, 20	10					
Asset#	Manufacturer	Model		Equip	ment Nomenclature	Serial Number	Calibration Due Date				
1129	HP	8568B		Spectrum Analyzer 100Hz-1.5GHz		2140A01754	10/5/2011				
1629	HP	85662A		Spec An	al Display for AN1129	3001A18433	N/A				
1277	HP	85650A		Qι	asi Peak Adapter	2811A01117	11/11/2011				
0027	EMCO	3825/2	,	LIS	N, 10kHz-100MHz	9010-1708	11/16/2011				
1173	PTI	100k HF	100k HPF Filter, High Pass, 100kH		, High Pass, 100kHz	none	1/25/2012				
1087	PTI	PTI-ALI	74	Attenuator Limiter Filter		none	4/18/2012				
C109	HP	None			Cable, BNC, 19"	none	6/21/2012				
C107	Pomona	RG-58		C	able, BNC, 10.5'	none	6/21/2012				
C108	Pomona	RG-223 Cable, BNC, 5.5'			Cable, BNC, 5.5'	none	6/21/2012				
939	EMCO	3825/2	,	LIS	N, 10kHz-100MHz	9603-2521	11/8/2011				
1185	EMCO	3825/2		LIS	N, 10kHz-100MHz	1235	8/6/2011				

^{*}Decreases with the logarithm of the frequency.

7

20

Five 1 second sweeps

Five 1 second sweeps

Table 2.3.2: Conducted Emissions Measurements Bandwidth and Measurement Time Used for Testing

Professional Testing, EMI, Inc.										
ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference,										
FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Conducted Emissions Limits										
Section:	15.107		TOTAL CONTRACTOR	11	,					
Test Date(s): Customer:	7/20/2011 LDAR Tools		EUT Serial EUT Part #		n/a n/a					
Project Number:	12345-10		Test Technician: Bob Redoutev			ey				
Purchase Order #:	791	Supervisor: Jason Hale			Jason Haley	7				
Equip. Under Test:	Shepherd Monitor Base		Witness' Na	me:	Bob Yarbro	ugh				
	Conducted Emissions Bandwidth and Measurement Time Used for Testing									
Frequency Band Start	Frequency Band Stop		ndwidth	Number of	ranges used	Measurement Time per Range				

(kHz)

0.3

9

*Notes:

(MHz)

0.01

0.15

(MHz)

0.15

30

^{1.} The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1000 data points per range.

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

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

Table 2.3.	3: Condu	cted Emis	sions Mea	asuremen	ts – 120 V	AC – Neu	tral Lead	Test Resu	ılts		
	Professional Testing, EMI, Inc.										
Test Method	ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference, see §15.38).										
In accordan	In accordance with: FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Conducted Emissions Limits										
Section:	15.107										
Test Date(s)	:	7/20/2011			EUT Serial	#:	n/a				
Customer:		LDAR Tool	s		EUT Part #: n/a						
Project Nun	nber:	12345-10			Test Technician: Bob Redoutey						
Purchase O	rder #:	791			Supervisor: Jason Haley						
Equip. Und	er Test:	Shepherd M	Ionitor Base		Witness' Name: Bob Yarbrough						
	Condu	cted Emission	s Test Result	s Data Sheet -	Neutral Lead		Pa	ge: 1	of 2		
EU	T Line Volta	ge:	120	VAC	EUT Line Frequ		ency:	60	Hz		
Frequency	Peak	Quasi-peak	~ .	Quasi-peak	Quasi-peak	Average	Average	Average	Average		

EU	T Line Volta	ge:	120	VAC	EUT Line Frequency:			60 Hz				
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi-peak Detector Reading (dBµV)	Quasi-peak Detector Limit (dBµV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results			
0.41737	40.9	39.4	57.5	-18.1	PASS	38.9	47.5	-8.6	PASS			
0.41862	40.8	39.4	57.5	-18.1	PASS	39	47.5	-8.4	PASS			
0.498053	42.8	39.3	56	-16.7	PASS	33.8	46	-12.2	PASS			
0.5888	42.4	40.9	56	-15.1	PASS	39.1	46	-6.9	PASS			
2.0858	37.8	35.6	56	-20.4	PASS	32.4	46	-13.6	PASS			
2.4176	38.4	35.5	56	-20.5	PASS	32.4	46	-13.6	PASS			
7.5674	37	31.9	60	-28.1	PASS	24.7	50	-25.3	PASS			
7.5735	37.3	32.1	60	-27.9	PASS	25.1	50	-24.9	PASS			
7.6516	36.8	31.3	60	-28.7	PASS	23.6	50	-26.4	PASS			
10.0631	36.6	31.2	60	-28.8	PASS	22.9	50	-27.1	PASS			

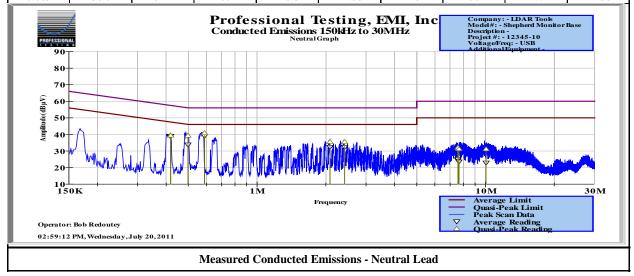


Table 2.3.	4: Condu	cted Emis	sions Mea	asuremen	ts – 120 V	AC – Pha	se Lead To	est Result	S
			Profess	ional Te	sting, EN	MI, Inc.			
Test Method	l:	ANSI C63.4–2 Equipment in		om Low-Voltag see §15.38).	ge Electrical ar	nd Electronic			
In accordan	ce with:	FCC Part 15.1 Limits	07 - Code of Fo	ederal Regulati	ions Part 47, Su	bpart B - Unir	ntentional Radi	ators, Conduct	ed Emissions
Section:		15.107							
Test Date(s)	:	7/20/2011			EUT Serial	#:	n/a		
Customer:		LDAR Tool	S		EUT Part #:		n/a		
Project Nun	nber:	12345-10			Test Technic	cian:	Bob Redout	ey	
Purchase O	rder #:	791			Supervisor:		Jason Haley	•	
Equip. Und	er Test:	Shepherd M	Ionitor Base		Witness' Na	me:	Bob Yarbro	ugh	
	Conducte	d Emissions T	est Results Da	ata Sheet - Ph	ase Lead (Lin	e 1)	Pa	ge: 2	of 2
EU	T Line Volta	ige:	120	VAC	EUT	Line Freque	ncy: 60 Hz		
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi-peak Detector Reading (dBµV)	Quasi-peak Detector Limit (dBµV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results
0.4166	41.9	39.9	57.5	-17.6	PASS	38.2	47.5	-9.3	PASS
0.42203	41.5	40.5	57.4	-16.9	PASS	39.5	47.4	-7.9	PASS
0.49553	44.4	40	56.1	-16	PASS	24.9	46.1	-21.2	PASS
0.500158	43.7	41.4	56	-14.6	PASS	38.8	46	-7.2	PASS
0.5005	43.2	41.4	56	-14.6	PASS	40.4	46	-5.6	PASS
1.997	38.9	36	56	-20	PASS	28.5	46	-17.5	PASS
5.00106	37	33	60	-27	PASS	26.1	50	-23.9	PASS
7.4941	36.9	32.5	60	-27.5	PASS	23.6	50	-26.4	PASS
7.6868	36.6	30.2	60	-29.8	PASS	21.3	50	-28.7	PASS
8.0361	36.3	29.4	60	-30.6	PASS	20.2	50	-29.8	PASS

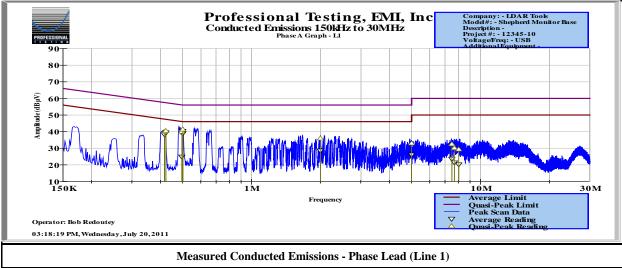


Table 2.3.5: Conducted Emissions Measurements – 12 VDC – Neutral Lead Test Results

	Professional Testing, EMI, Inc.						
Test Method:	ANSI C63.4–2009: Methods of Measu Equipment in the Range of 9 kHz to 4		ns from Low-Voltage Electrical and Electronic ace, see §15.38).				
In accordance with:	FCC Part 15.107 - Code of Federal Re Limits	gulations Part 47, Subpart B -	Unintentional Radiators, Conducted Emissions				
Section:	15.107						
Section: Test Date(s):	15.107 7/20/2011	EUT Serial #:	n/a				
		EUT Serial #: EUT Part #:	n/a n/a				
Test Date(s):	7/20/2011						
Test Date(s): Customer:	7/20/2011 LDAR Tools	EUT Part #:	n/a				

	Conducted Emissions Test Results Data Sheet - Neutral Lead								
EU	T Line Volta	ge:	12	VAC	EUT	Line Freque	n/a Hz		
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi-peak Detector Reading (dBµV)	Quasi-peak Detector Limit (dBµV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results
0.17594	45.1	42.3	64.7	-22.3	PASS	37	54.7	-17.7	PASS
0.34446	42.5	37.8	59.1	-21.3	PASS	32.2	49.1	-16.9	PASS
0.49255	46.7	42.5	56.1	-13.6	PASS	35.1	46.1	-11.1	PASS
0.50222	47.1	42.9	56	-13.1	PASS	37.6	46	-8.4	PASS
0.5089	45.5	40.9	56	-15.1	PASS	31.9	46	-14.1	PASS
2.3643	41	38.1	56	-17.9	PASS	34.9	46	-11.1	PASS
5.0487	38	33.8	60	-26.2	PASS	25.8	50	-24.2	PASS
7.531	41.1	38	60	-22	PASS	28.9	50	-21.1	PASS
7.5758	41.5	36.4	60	-23.6	PASS	26.4	50	-23.6	PASS
7.5799	41.3	36.5	60	-23.5	PASS	27	50	-23	PASS

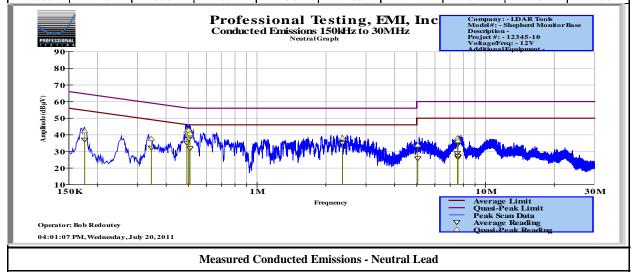
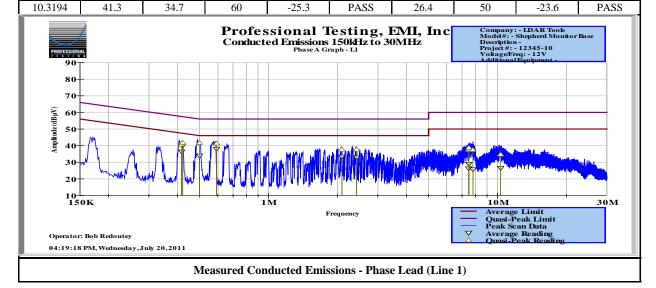


Table 2.3.6: Conducted Emissions Measurements - 12 VDC - Phase Lead Test Results

<u>l able 2.3.</u>	6: Condu	cted Emis	sions Mea	asuremen	ts – 12 VL	OC – Phase	e Lead Te	st Results	
			Profess	ional Te	sting, EN	MI, Inc.			
Test Method	d:				nt of Radio-Nois z (incorporated			ge Electrical an	d Electronic
In accordan	ce with:	FCC Part 15.1 Limits	07 - Code of Fo	ederal Regulati	ions Part 47, Su	bpart B - Unin	ntentional Radi	ators, Conduct	ed Emissions
Section:		15.107							
Test Date(s)):	7/20/2011			EUT Serial	#:	n/a		
Customer:		LDAR Tool	s		EUT Part #:		n/a		
Project Nun	nber:	12345-10			Test Techni	cian:	Bob Redout	ey	
Purchase O	rder #:	791			Supervisor:		Jason Haley	7	
Equip. Und	er Test:	Shepherd M	Ionitor Base		Witness' Na	me:	Bob Yarbro	ugh	
EU	Conducte JT Line Volta	d Emissions T	est Results Da	vac	`	e 1) Line Freque		ge: 2 n/a	of 2 Hz
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi-peak Detector Reading (dBµV)	Quasi-peak Detector Limit (dBµV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results
0.41689	43.7	40.7	57.5	-16.8	PASS	36.3	47.5	-11.2	PASS
0.4215	43.8	41.8	57.4	-15.7	PASS	40	47.4	-7.4	PASS
0.49908	45.5	41.8	56	-14.2	PASS	33.9	46	-12.1	PASS
0.5927	43.9	41.4	56	-14.6	PASS	38	46	-8	PASS
2.0891	40	37.7	56	-18.3	PASS	33.3	46	-12.7	PASS
2.4237	40.2	37.7	56	-18.3	PASS	32.8	46	-13.2	PASS
7.4858	42.4	37.6	60	-22.4	PASS	26.2	50	-23.8	PASS
7.5032	42.2	38.8	60	-21.2	PASS	28.9	50	-21.1	PASS
7.8053	43	37.5	60	-22.5	PASS	25.7	50	-24.3	PASS



able 2.3.7: Conducted Emissions Measurements Test Setup Photos				
	Professional Te	sting, EMI, Inc.		
Test Method:	ANSI C63.4–2009: Methods of Meas Electrical and Electronic Equipment	in the Range of 9 kHz t	to 40 GHz (incorporated by reference,	
	FCC Part 15.107 - Code of Federal I	Regulations Part 47, Sub	part B - Unintentional Radiators,	
In accordance with:	Conducted Emissions Limits			
Section:	15.107			
Test Date(s):	7/20/2011	EUT Serial #:	n/a	
Customer:	LDAR Tools	EUT Part #:	n/a	
Project Number:	12345-10	Test Technician:	Bob Redoutey	
Purchase Order #:	791	Supervisor:	Jason Haley	
Equip. Under Test:	Shepherd Monitor Base	Witness' Name:	Bob Yarbrough	
	Conducted Emissions Photograph		Page: 1 of 1	
	EUT	EUT w	rith support equipment	

3.0 Fundamental Field Strength Measurements

Fundamental field strength measurements were made on the selected fundamental transmit frequency of the EUT. Tests of the fundamental field strength of the EUT also determined the worse case polarization of the device. The emissions of the device were measured with the EUT in three orthogonal axes.

3.1 Test Procedure

Radiated emission measurements were made of the fundamental field strength level for the EUT. The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable that enables 360-degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 3 meters, as measured from the closest point of the EUT. The field strength emissions were maximized by rotating the EUT. A diagram showing the test setup is given as Figure 3.1.1.

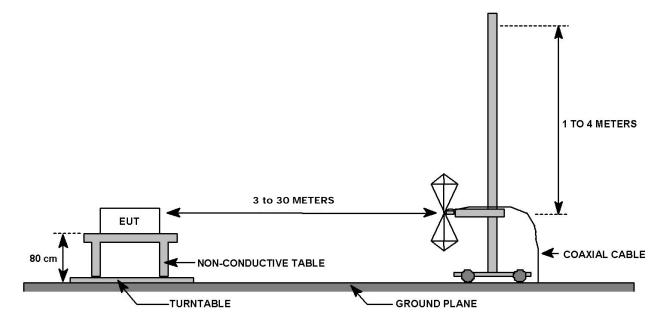


Figure 3.1.1: Radiated Emissions Test Setup

3.2 Test Criteria

According to 47 CFR, 15.231, and RSS-210 the field strength of emissions from intentional radiators operated under this section should not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (Microvolts/Meter)	Field Strength of Spurious Emissions (Microvolts/Meter)
40.66 – 40.70	2,250	255
70 – 130	1,250	125
130 – 174	1,250 to 3,750 ¹	125 to 375 ¹
174 – 260	3,750	375
260 – 470	3,750 to 12,500 ¹	375 to 1,250 ¹
Above 470	12,500	1,250

¹Linear interpolations

3.3 Test Results

Radiated emissions measurements of the fundamental field strength level for the EUT were taken on August 4, 2011, and the EUT was found to be in compliance with applicable requirements.

Table 3.3.1: Radiated Emissions Measurements of the Fundamental Field Strength Level – Test Equipment

rest Equi	pment							
		Profess	ional Testing, EMI, Inc.					
Test Metho			thods of Measurement of Radio-Noise c Equipment in the Range of 9 kHz to					
In accordar	In accordance with: FCC Part 15.231 - Code of Federal Regulations Part 47							
Test Date(s)	,		EUT Serial #:	N/A				
Customer: Project Nur		RTools	EUT Part #: Test Technician:	N/A Layne Lueckemey	ror.			
Purchase O			Supervisor:	Jason Halev	<u>C1</u>			
Equip. Und		nerd Base / Monito	r Witness' Name:	Jason Anderson				
	Rac	diated Emissions Tes	st Equipment List	Page:	1 of 1			
Т	Tile! Software Versio	n: 3.4.K.	11, June 7, 2006, 07:49:00 PM					
	Test Profile:	Radia	ted Emissions_updated_12-16-10.til					
Asset#	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date			
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	8/10/2011			
85	HP	85650A	Quasi-Peak Adapter CISPR	3033A01458	7/28/2011			
0949	HP	85662A	Spec Anal Dsply for AN	2542A12285	N/A			
1525	HP	8566B	Spectrum Analyzer 100Hz-22GHz	2532A02126	6/7/2012			
238	HP	85685A	RF Preselector	2887A00841	7/27/2011			
1497	EMCO	3108	Antenna, Bi Con, 30-300MHz	2121	8/4/2011			
1278	HP	85650A	Quasi Peak Adapter	2811A01147	7/28/2011			
1834	HP	85662A	Spec Anal Dsply	2349A06182	N/A			
1145	HP	8568B	Spectrum Analyzer 100Hz-1.5GHz	2517A01821	7/28/2011			
1035	HP	85685A	RF Preselector	2901A00891	4/13/2012			
1486	EMCO	3147	Antenna, Log Periodic, .2-5GHz	9112-1052	8/4/2011			
1497	EMCO	3108	Antenna, Bi Con, 30-300MHz	2121	8/4/2011			
C026	N/A	RG214	Cable Coax, N-N, 25m	none	8/10/2011			
C027	N/A	RG214	Cable Coax, N-N, 25m	none	8/10/2011			
1414	HP	8447D	Preamp	1937A03403	7/15/2011			
1509B	Braden	N/A	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	4/7/2012			
1594	Miteq	AFS4-01001800	Amplifier, 1-26.5GHz, 42dB	none	1/28/2012			
1529	Miteq	AFS4-01001800	Amplifier, 1-26.5GHz, 36dB	none	7/16/2011			
C030	N/A	0	Cable Coax, N-N, 30m	none	3/21/2012			

Table 3.3.2: Radiated Emissions Measurements of the Fundamental Field Strength Level Bandwidth and Measurement Time Used for Testing – Peak Scan

	Professional Testing, EMI, Inc.					
Test Method:	ANSI C63.4–2009: "Methods o Electrical and Electronic Equip		oise Emissions from Low-Voltage Iz to 40 GHz" (incorporated by			
In accordance with:	FCC Part 15.231 - Code of Fed	eral Regulations Part 47				
Test Date(s):	8/4/2011	EUT Serial #:	N/A			
Customer:	LDARTools	EUT Part #:	N/A			
Project Number:	12345-10	Test Technician:	Layne Lueckemeyer			
Purchase Order #:	791 / 792	Supervisor:	Jason Haley			
Equip. Under Test:	Shepherd Base / Monitor	Witness' Name:	Jason Anderson			
Radiated Emissions Bandwidth and Measurement Time Used for Testing - Peak Scan						

Ra	Radiated Emissions Bandwidth and Measurement Time Used for Testing - Peak Scan								
Frequency Band Start (MHz)	1 Number of ranges used								
0.009	0.15	0.3	2	Multiple Sweeps					
0.15	30	9	6	Multiple Sweeps					
30	200	120	1	Multiple 800mS Sweeps					
200	1000	120	1	Multiple 800mS Sweeps					
1000	18000	1000	17	Multiple Sweeps					

*Notes:

- 1. The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1000 data points per range.
- 2. The measurement receiver resolution bandwidth setting was 300Hz for Quasi-peak measurements from 9-150kHz.
- 3. The measurement receiver resolution bandwidth setting was 9kHz for Quasi-peak measurements from 0.15-30MHz.
- 4. The measurement receiver resolution bandwidth setting was 120kHz for Quasi-peak measurements from 30-1000MHz.
- 5. The measurement receiver resolution bandwidth setting was 1MHz for Average measurements from 1-18GHz.

Table 3.3.3: Radiated Emissions Measurements of the Fundamental Field Strength Level Test Results – Horizontal Antenna Polarity ≤ 1 GHz

	esuits – norizontal Antenna Polarity S 1 GHz								
	Professional Testing, EMI, Inc.								
Test Metho	d:						Noise Emiss ge of 9 kHz t		
In accorda	ance with:		15.231 - Coo						
Section:		0							
Test Date(s	:):	8/4/2011			EUT Serial	i #:	N/A		
Customer:		LDARToo	ls		EUT Part #	#:	N/A		
Project Nu	mber:	12345-10			Test Techn	ician:	Layne Lue	ckemeyer	
Purchase O	rder #:	791 / 792			Supervisor: Jason Haley				
Equip. Und	ler Test:	Shepherd	Base / Moni	tor	Witness' Name: Jason Anderson				
Radiate	ed Emissions	Test Result	s Data Sheet	- Horizontal	Antenna Po	larity ≤ 1GH	Iz Pa	ge: 1	of 1
EUT L	ine Voltage:	1	12	VDC	EUT Li	ne Frequenc	cy: N	/A	Hz
	EUT N	Mode of Ope	eration:						
Frequency Measured (MHz) Test EUT Antenna Height (Meters) Direction (Meters) Detector Function			Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results		
432.99	3	36	1	Peak	65.4	87.5	100.8	-13.3	Pass
	_		1 Peak 65.4 87.5 100.8 -13.3 1 Average 49 71.1 80.8 -9.7						

Table 3.3.4: Radiated Emissions Measurements of the Fundamental Field Strength Level Test Results – Vertical Antenna Polarity ≤ 1 GHz

	v Ci tidai 7		a Polarity S	1 0112						
	Professional Testing, EMI, Inc.									
Test Metho	d:		C63.4–2009: "Ne Electrical and						ow-	
In accorda	ance with:		art 15.231 - Co				ge of 9 KHZ	10 40 GHZ		
Section:		0								
Test Date(s) :	8/4/201	.1		EUT Serial	l #:	N/A			
Customer:		LDAR	Tools		EUT Part #	#:	N/A			
Project Nu	mber:	12345-1	10		Test Techn	ician:	Layne Lue	ckemeyer		
Purchase O	rder #:	791 / 79	92		Supervisor	:	Jason Hale	y		
Equip. Und	ler Test:	Shephe	erd Base / Mon	itor	Witness' Name: Jason Anderson					
Radia	ted Emission	ns Test R	Results Data She	et - Vertical A	Antenna Pola	arity ≤ 1GHz	z Pa	ge: 1	of	1
EUT L	ine Voltage		12	VDC	EUT Li	ne Frequenc	y: N	'A	Hz	
	EUT N	Mode of	Operation:			Trai	nsmit Max Po	ower		
Frequency Measured (MHz)	Test Distance (Meters)	EUT Directi (Degre	ion Height	Detector Function	Amplitude Level					
432.99	3	338	1	Peak	71.4	93.5	100.8	-7.3	Pas	S
432.99	3	338	1	Average	55	77.1	80.8	-3.7	Pas	-

EUT Rear

Table 3.3.5: Radiated Emissions Measurements of the Fundamental Field Strength Level Test Setup Photographs

Setup Photograph	ns		
	Professional To	esting, EMI, Inc	
Test Method:	ANSI C63.4–2009: "Methods of Me Electrical and Electronic Equipment		
In accordance with:	FCC Part 15.231 - Code of Federal	Regulations Part 47	
Test Date(s):	8/4/2011	EUT Serial #:	N/A
Customer:	LDARTools	EUT Part #:	N/A
Project Number:	12345-10	Test Technician:	Layne Lueckemeyer
Purchase Order #:	791 / 792	Supervisor:	Jason Haley
Equip. Under Test:	Shepherd Base / Monitor	Witness' Name:	Jason Anderson
	Radiated Emissions Photograph		Page: 1 of 1
		· A	

EUT Front

4.0 Occupied Bandwidth

Occupied bandwidth measurements were performed on the EUT to determine compliance with 47 CFR, Part 15.231 and RSS-GEN.

4.1 Test Procedure

The occupied bandwidth was measured with a spectrum analyzer connected to a double-ridged guide horn while the EUT was operating in continuous transmit mode at the appropriate center frequency. The analyzer center frequency was set to the EUT carrier frequency. Display line and marker delta functions were used to measure the occupied bandwidth of the EUT. However, the 20 dB bandwidth is referenced to a peak power measurement taken at the entire bandwidth or more for RBW, then using 1% RBW for the 20 dB bandwidth. A diagram showing the test setup is given as Figure 3.1.1.

4.2 Test Criteria

According to 47 CFR, Part 15.231 and RSS-GEN, the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

4.3 Test Results

Occupied bandwidth measurements were taken on July 20, 2011, and the EUT was found to be in compliance with applicable requirements.

Table 4.3.1: Radiated Emissions Measurements of Occupied Bandwidth – Test Equipment

		Profess	ional Testing, EMI, Inc.		
Test Metho	d.	C63.4–2009: "Met	hods of Measurement of Radio-Noise c Equipment in the Range of 9 kHz to		U
In accordan	FCC		of Federal Regulations Part 47	740 GHZ (meorpo	Tateu by
Test Date(s)			EUT Serial #:	N/A	
Customer:		RTools	EUT Part #:	N/A	
Project Nur Purchase O			Test Technician: Supervisor:	Layne Lueckemey Jason Haley	er
Equip. Und		nerd Base / Monito		Jason Anderson	
	Rac	liated Emissions Tes	t Equipment List	Page:	1 of 1
Т	Tile! Software Versio	n: 3.4.K.	11, June 7, 2006, 07:49:00 PM		
	Test Profile:	Radia	ted Emissions updated 12-16-10.til		
Asset#	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	8/10/2011
85	HP	85650A	Quasi-Peak Adapter CISPR	3033A01458	7/28/2011
0949	HP	85662A	Spec Anal Dsply for AN	2542A12285	N/A
1525	HP	8566B	Spectrum Analyzer 100Hz-22GHz	2532A02126	6/7/2012
238	HP	85685A	RF Preselector	2887A00841	7/27/2011
1497	EMCO	3108	Antenna, Bi Con, 30-300MHz	2121	8/4/2011
1278	HP	85650A	Quasi Peak Adapter	2811A01147	7/28/2011
1834	HP	85662A	Spec Anal Dsply	2349A06182	N/A
1145	HP	8568B	8568B Spectrum Analyzer 100Hz-1.5GHz		7/28/2011
1035	HP	85685A	RF Preselector	2901A00891	4/13/2012
1486	EMCO	3147	Antenna, Log Periodic, .2-5GHz	9112-1052	8/4/2011
1497	EMCO	3108	Antenna, Bi Con, 30-300MHz	2121	8/4/2011
C026	N/A	N/A RG214 Cable Coax, N-N, 25m		none	8/10/2011
C027	N/A	RG214	Cable Coax, N-N, 25m	none	8/10/2011
1414	HP	8447D	Preamp	1937A03403	7/15/2011
1509B	Braden	N/A	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	4/7/2012
1594	Miteq	AFS4-01001800	Amplifier, 1-26.5GHz, 42dB	none	1/28/2012
1529	Miteq	AFS4-01001800	Amplifier, 1-26.5GHz, 36dB	none	7/16/2011
C030	N/A	0	Cable Coax, N-N, 30m	none	3/21/2012

Table 4.3.2: Radiated Emissions Measurements of Occupied Bandwidth Test Results

	Professional	Testing, EMI, In	ıc.
Test Method:	ANSI C63.4–2009: "Methods	of Measurement of Radi	io-Noise Emissions from Low-
rest Method:	Voltage Electrical and Electro	onic Equipment in the Ra	ange of 9 kHz to 40 GHz"
In accordance with:	FCC Part 15.231 - Code of Fe	deral Regulations Part 4	7
T (D (()	8/4/2011	EUT Serial #:	N/A
Test Date(s):	0/4/2011	LUI Seliai π.	IV/A
	LDARTools	EUT Part #:	N/A
Customer:			*
Test Date(s): Customer: Project Number: Purchase Order #:	LDARTools	EUT Part #:	N/A

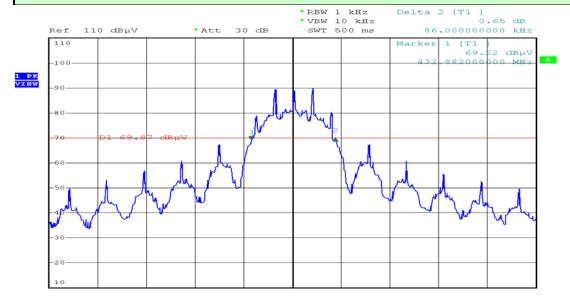


162.025 MHz Date: 20.JUL.2011 10:54:17

Table 4.3.3: Radiated Emissions Measurements of Occupied Bandwidth Test Results

	Professional	Testing, EMI, In	nc.
Test Method:	ANSI C63.4–2009: "Methods Voltage Electrical and Electro		io-Noise Emissions from Low- ange of 9 kHz to 40 GHz"
In accordance with:	FCC Part 15.231 - Code of Fe	deral Regulations Part 4	17
Test Date(s):	8/4/2011	EUT Serial #:	N/A
Customer:	LDARTools	EUT Part #:	N/A
Project Number:	12345-10	Test Technician:	Layne Lueckemeyer
Purchase Order #:	791 / 792	Supervisor:	Jason Haley
Equip. Under Test:	Shepherd Base / Monitor	Witness' Name:	Jason Anderson

Radiated Emissions Test Results Data Sheet - Occupied Bandwidth 20 dB Test Results



162.025 MHz

Date: 20.JUL.2011 10:55:31

EUT Rear

Table 4.3.4: Radiated Emissions Measurements of Occupied Bandwidth Test Setup Photographs

Photographs			
	Professional Te	esting, EMI, Inc.	
Test Method:	ANSI C63.4–2009: "Methods of Mea Electrical and Electronic Equipment		
In accordance with:	FCC Part 15.231 - Code of Federal I	0	
Test Date(s):	8/4/2011	EUT Serial #:	N/A
Customer:	LDARTools	EUT Part #:	N/A
Project Number:	12345-10	Test Technician:	Layne Lueckemeyer
Purchase Order #:	791 / 792	Supervisor:	Jason Haley
Equip. Under Test:	Shepherd Base / Monitor	Witness' Name:	Jason Anderson
	Radiated Emissions Photographs		Page: 1 of 1
		Sign	

EUT Front

5.0 Out of Band Spurious Emissions

Out of band spurious/harmonic emissions measurements were performed on the EUT to determine compliance to 47 CFR, Parts 15.231(c), and 15.209 and RSS-GEN.

5.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a rotating turntable at a distance of 10 meters from the measurement antenna.

For spurious emissions below 1 GHz, quasi-peak detection was used with a resolution bandwidth of 120 kHz. All measurements below 1 GHz were normalized to 3 meters using a 20 dB/decade distance extrapolation. The emissions were maximized by rotating the EUT and raising and lowering the measurement antenna from 1 to 4 meters.

Spurious/harmonic emissions above 1 GHz peak were measured with average and peak detection with a resolution bandwidth of 1 MHz and measured at a distance of 1 meter. Average detection was used to determine compliance of the EUT if the peak did not meet the average limit. Non-harmonic emissions must satisfy the average limit and the peak limit (20 dB above average). A diagram showing the test setup is given as Figure 3.1.1. Above 1 GHz, testing was completed at the transmit frequency to determine compliance.

5.2 Test Criteria

According to 47 CFR, Part 15.231 and RSS-GEN, field strength of emissions from intentional radiators operated under this section shall not exceed the limits in the table below. The limits specified are at 3 meters.

Fundamental Frequency (MHz)	Field Strength of Fundamental (Microvolts/Meter)	Field Strength of Spurious Emissions (Microvolts/Meter)
40.66 – 40.70	2,250	255
70 – 130	1,250	125
130 – 174	1,250 to 3,750 ¹	125 to 375 ¹
174 – 260	3,750	375
260 – 470	3,750 to 12,500 ¹	375 to 1,250 ¹
Above 470	12,500	1,250

¹Linear interpolations

The radiated limits of 47 CFR, Part 15.209 and RSS-GEN, are shown below. The limits specified are at 3 meters. The limits are quasi-peak for emissions below 1 GHz and average for emissions above 1 GHz. Also above 1 GHz, the peak limit is 20 dB above the average limit.

Frequency MHz	Specification Distance (Meters)	Field Strength (dBuV/m)	Test Distance (Meters)	Field Strength (dBuV/m)
30 to 88	3	40.0	10	29.5
88 to 216	3	43.5	10	33
216 to 960	3	46.0	10	35.5
Above 960	3	54.0	1	63.5

Note: Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Restricted bands of operation per 15.205(a) are shown below.

MHz	MHz	MHz	GHz
0.090-0.110	16.42–16.423	399.9–410	4.5-5.15
¹ 0.495–0.505	16.69475–16.69525	608–614	5.35-5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725-4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362-8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625-8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425-8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(²)
13.36–13.41			

5.3 Test Results

Out of band spurious emissions measurements were taken on July 20, 2011, and the EUT was found to be in compliance with applicable requirements.

Table 5.3	1: Out of Band	d Spurious Emi	ssions Measurements – Test	t Equipment		
		Profess	ional Testing, EMI, Inc.			
Test Metho	d.		chods of Measurement of Radio-Noise c Equipment in the Range of 9 kHz to		U	
In accordar	FCC 1		of Federal Regulations Part 47, Subj			
Section:	15.109					
Test Date(s)			EUT Serial #:	1		
Customer:		R Tools	EUT Part #:	N/A		
Project Nur Purchase O		5-10	Test Technician: Supervisor:	Layne Luckemey	er	
Equip. Und		nerd Base	Witness' Name:	Jason Haley Jason Anderson		
Equip. Ond		diated Emissions Tes		Page:	1 of 1	
				ı agc.	1 01 1	
Т	ile! Software Versio		11, June 7, 2006, 07:49:00 PM			
	Test Profile:	Radia	ted Emissions_updated_12-16-10.til	r		
Asset#	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date	
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	8/10/2011	
85	HP	85650A	Quasi-Peak Adapter CISPR	3033A01458	7/28/2011	
0949	HP	85662A	Spec Anal Dsply for AN	2542A12285	N/A	
1525	HP	8566B	Spectrum Analyzer 100Hz-22GHz	2532A02126	6/7/2012	
238	HP	85685A	RF Preselector	2887A00841	7/27/2011	
1497	EMCO	3108	Antenna, Bi Con, 30-300MHz	2121 8/4/2011		
1278	HP	85650A	Quasi Peak Adapter	2811A01147	7/28/2011	
1834	HP	85662A	Spec Anal Dsply	2349A06182	N/A	
1145	HP	8568B	Spectrum Analyzer 100Hz-1.5GHz	2517A01821	7/28/2011	
1035	HP	85685A	RF Preselector	2901A00891	4/13/2012	
1486	EMCO	3147	Antenna, Log Periodic, .2-5GHz	9112-1052	8/4/2011	
1497	EMCO	3108	Antenna, Bi Con, 30-300MHz	2121	8/4/2011	
C026	N/A	RG214	Cable Coax, N-N, 25m	none	8/10/2011	
C027	N/A	RG214	Cable Coax, N-N, 25m	none	8/10/2011	
1414	HP	8447D	Preamp	1937A03403	7/15/2011	
1509B	Braden	N/A	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	4/7/2012	
1594	Miteq	AFS4-01001800	Amplifier, 1-26.5GHz, 42dB	none	1/28/2012	
1529	Miteq	AFS4-01001800	Amplifier, 1-26.5GHz, 36dB	none	7/16/2011	
C030	N/A	0	Cable Coax, N-N, 30m	none	3/21/2012	
1780	ETS-Lindgren	3117	Antenna, DRG Horn, 1 - 18 GHz	1110313	1/14/2012	
948	EMCO	3301B	Antenna, Rod, Active, 30Hz-50MHz	29784	9/15/2011	

Table 5.3.2: Bandwidth and Measurement Time Used for Out of Band Spurious Emissions Testing – Peak Scan

	Profession	al Testing, EMI, In	с.
Test Method:	Electrical and Electronic Equ	uipment in the Range of 9 kH	oise Emissions from Low-Voltage Iz to 40 GHz" (incorporated by
	FCC Part 15.109 - Code of Fo	ederal Regulations Part 47, S	ubpart B - Unintentional Radiators,
In accordance with:	Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	7/20/2011	EUT Serial #:	1
Customer:	LDAR Tools	EUT Part #:	N/A
Project Number:	12345-10	Test Technician:	Layne Lueckemeyer
Purchase Order #:	791	Supervisor:	Jason Haley
Equip. Under Test:	Shepherd Base	Witness' Name:	Jason Anderson

Ra	diated Emissions Bandwid	th and Measurement Time	Used for Testing - Peak So	ean
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	Number of ranges used	Measurement Time per Range	
0.009	0.15	0.3	2	Multiple Sweeps
0.15	30	9	6	Multiple Sweeps
30	200	120	1	Multiple 800mS Sweeps
200	1000	120	1	Multiple 800mS Sweeps
1000	18000	1000	17	Multiple Sweeps

*Notes:

- 1. The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1000 data points per range.
- 2. The measurement receiver resolution bandwidth setting was 300Hz for Quasi-peak measurements from 9-150kHz.
- 3. The measurement receiver resolution bandwidth setting was 9kHz for Quasi-peak measurements from 0.15-30MHz.
- 4. The measurement receiver resolution bandwidth setting was 120kHz for Quasi-peak measurements from 30-1000MHz.
- 5. The measurement receiver resolution bandwidth setting was 1MHz for Average measurements from 1-18GHz.

Table 5.3.3: Out of Band Spurious Emissions Measurements Test Results – Horizontal Antenna Polarity ≤ 1GHz

]	Profess	iona	l T	esting, E	MI, Inc	•		
Test Metho	od:						Measuremen Equipment				ow-
In accorda	ance with:	FCC I	Part 1		de of l	Feder	al Regulation				nal
Section:		15.109		Kaulateu I	LIIIISSI	ons L	ammes				
Test Date(s	s):	7/20/2					EUT Serial	l #:	1		
Customer:	/	LDAR	R Too	ls			EUT Part #	#:	N/A		
roject Nu	mber:	12345	-10				Test Techn	ician:	Layne Luc	eckemeyer	
Purchase C)rder #:	791					Supervisor	:	Jason Hale	ey	
Equip. Und	ler Test:	Sheph	erd I	Base			Witness' N	ame:	Jason And	lerson	
Radiate	ed Emissions	Test R	esults	S Data Sheet	- Hor	izonta	al Antenna Po	larity < 1GF	Iz Pa	age: 1	of 1
	ine Voltage:		1		VDC			ne Frequenc		V/A	Hz
	EUT N	Mode of	oper of the contract of the co	ration:					Transmit		
Frequency Measured (MHz)	Test Distance (Meters)	EU Direc (Degr	tion	Antenna Height (Meters)		ector ection	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Leve	l Margin (dB)	Test Results
64.5	10	89)	4	Quas	i-peak	32.5	17.0	29.5	-12.5	Pass
133.19	10	48	3	4	_	i-peak		12.1	33.1	-21.0	Pass
193.88	10	183	3	4	Quas	i-peak	22.9	13.3	33.1	-19.8	Pass
299.268	10	99)	4	Quas	si-peak	27.3	13.9	35.6	-21.7	Pass
324.961	10	100	6	4	Quas	i-peak	28.2	15.5	35.6	-20.1	Pass
100.0	PROFESSIONAL TESTING				10 Mete	r Radia	Onal Testil ted Emissions s B Horizontal Plot	19 _M	Company - LDAR flodel # - Shepher Description - 432 P Project # - 12345- foltage - 12 VDC	d Base MHz Transceiver	
90.0											
80.0											
70.0 E											
de (dBuV/m)											
40.0 High											
30.0					A		dd	L. L. Lander	المسابلة المسابلة	Mark the state of	
20.0			~	mummhand	/ M	WWW.	A PROPERTY OF THE PROPERTY OF	White desired the state of			
10.0						11	7				
1						+	-l				
0 10.0	M						o.ʻoм ency (Hz)			1.0	3

Table 5.3.4: Out of Band Spurious Emissions Measurements Test Results – Vertical Antenna Polarity ≤ 1GHz

]	Pro	ofess	ion	al	Te	esting, E	MI, Inc	•																					
Test Metho	 od:								Teasuremen					ow-																		
									Equipment al Regulation					nal																		
	ance with:	Radia	ators,		iated I					115 T al t 47,	Subpart	- Cilli	пенио	ııaı .																		
ection:		15.109							I «	.,,																						
Test Date(s	5):	7/20/2		1					EUT Serial		1																					
Customer: Project Nu	mhon	LDAI 12345		IS					EUT Part # Test Techn		N/A Layne Lu	a o olz o m	OVION																			
roject Nu Purchase C		791)-1U						Supervisor		Jason Ha		eyer																			
Equip. Und		Shepl	nerd I	Base					Witness' N		Jason An																					
- фигру отго	-01 10500	оперт	10101						(11011000 11		J																					
Radia	ted Emissior	ıs Test	Resul	lts Da	ıta She	et - V	Vert	ical A	Antenna Pola	arity ≤ 1GHz	z I	Page:	1	of																		
EUT I	ine Voltage:		1	12		VD	C		EUT Li	ne Frequenc	ey:	N/A		Hz																		
	EUT N	Aode o	f Ope	ration	n:						Transmi	t																				
requency	Test	EU	JΤ	An	tenna				Recorded	Corrected																						
Measured	Distance	Direction			Height Detec			Amplitude		Limit Lev		rgin	Test																			
(MHz)	(Meters)	(Degi	rees)		(eters)	Fi	unct	ion	(dBµV)	(dBµV/m)	(dBµV/m	ı) (d	IB)	Resul																		
48.63	10	10)7		1	Qu	asi-j	peak	36.4	22.4	29.5	-7	7.1	Pass																		
64.5	10	11	9		1	Qu	asi-j	peak	40.7	25.2	29.5	-4	1.3	Pass																		
115.82	10			19 1	1								1				-		1					_		peak	30.2	17.1	33.1	_	-16.0	Pass
168.77	10	16		Ь—	1	_		peak	29.2	18.6	33.1	_	4.5	Pass																		
270.4	10	10)2		1	Qu	asi-j	peak	40.3	26.0	35.6	-9	9.6	Pass																		
	PROFESSIONAL					10 Me	eter R	Radiate	nal Testined Emissions s B Vertical Plot	ng ,	Company - LDA Model # - Shephe Description - 43: Project # - 12345 Voltage - 12 VDC	erd Base 2 MHz Tran 5-10	sceiver																			
100.0	TESTING									<u> </u>	Voltage - 12 VDC																					
90.0																																
80.0																																
70.0 - E V3. 60.0 -																																
ngp)											A		Шг																			
gp 50.0 -						- [/\			ATTENDANCE A		A/ N		a sure																			
Amplitu 40.0 -													and property.																			
ngp) 50.0			~	Markers at	war !	I	MAN		// """\//\	Mary Mary Mary	Mark The W	App and																				
njid 40.0 - W 30.0 -			M	muni		7	March	W. /	/ " "" \	many many fully	Albert T																					
7 40.0			M	mount		<i>[</i>	Name of the last	W. /	,	man hay word feeled	deline of the second																					
20.0 1	M :: Layne Luecken	eyer	M	mound		Trans		100.	om ncy (Hz)	market and the state of the sta	Mho T		1.00	G ical Data																		

Table 5.3.5: Out of Band Spurious Emissions Measurements Test Results – Horizontal Antenna Polarity ≥ 1GHz

]	Professi	onal Te	sting, E	MI, Inc	•		
Fest Metho	od:	ANSI C63.	4–2003: "M	ethods of M	Ieasuremen	t of Radio-l	Noise Emiss ge of 9 kHz t		ow-
In accorda	ance with:	FCC Part 1 Radiators,			_	ns Part 47,	Subpart B -	Unintentio	nal
Section:		15.109							
Test Date(s	<u>):</u>	7/20/2011			EUT Serial		1		
Customer:		LDAR Too	ls		EUT Part #		N/A	1	
Project Nu Purchase O		12345-10 791			Test Techn		Layne Luc		
Equip. Und		Shepherd I	Raca		Supervisor Witness' N		Jason Hale Jason Ando		
Equip. One	ici Test.	Shepheru I	Jase		Withest IV	anic.	Jason Anu	15011	
Radiate	ed Emissions	Test Results	Data Sheet	- Horizontal	Antenna Po	larity > 1GH	Iz Pa	ge: 1	of 1
EUT L	ine Voltage	: 1	2	VDC	EUT Li	ne Frequenc	y: N	'A	Hz
	EUT N	Mode of Oper	ration:				Transmit		
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
1298.76	3	180	1	Peak	92.3	55.9	60.8	-4.9	Pass
1731.68	3	180	1	Peak	78.1	43.2	60.8	-17.6	Pass
2164.6	3	180	1	Peak	89.5	56.8	60.8	-4.0	Pass
2597.52	3	180	1	Peak	84.7	52.9	60.8	-7.9	Pass
3030.44	3	180	1	Peak	88.4	57.7	60.8	-3.1	Pass
3463.36	3	180	1	Peak	85.2	55.1	60.8	-5.7	Pass
3896.28	3	180	1	Peak	83.7	54.8	74.0	-19.2	Pass
3896.28	3	180	1	Average	63.7	34.8	54.0	-19.2	Pass
4329.2 4329.2	3	180 180	1	Peak Average	76.5 56.5	48.1 28.1	74.0 54.0	-25.9 -25.9	Pass Pass
80.0	PROFESSIONAL T e s T I N G	100	Р		nal Testir	ng C M D Pi	ompany - LDARTo odel # - Shepherd escription - 432 M roject # - 12345-10 oltage - 12 VDC	ools Base Hz Transceiver	Tabb
70.0 (4D IV/W) Y mblunde (4D IV/W) 40.0 40.0 40.0 40.0 40.0 40.0 40.0 40.		ad and the second							
1.0	g 1.4G : Layne Lueckem	1.8G	2.2G	2.6G 3.0 Frequen		3.8G	4.2G	4.6G 5.00	zontal Data

Table 5.3.6: Out of Band Spurious Emissions Measurements Test Results – Vertical Antenna Polarity ≥ 1GHz

]	Professi	onal Te	sting, E	MI, Inc	•		
Γest Metho	od:	ANSI C63.	4–2003: "M	ethods of M	Ieasuremen Equipment	t of Radio-l	Noise Emiss		ow-
In accorda	ance with:		5.109 - Cod	le of Federa	l Regulation				nal
Section:		15.109							
Test Date(s	<u>):</u>	7/20/2011			EUT Serial		1		
Customer:	bow	LDAR Too	ls		EUT Part #		N/A	alrama arram	
Project Nur Purchase O		12345-10 791			Test Techn Supervisor		Layne Lue Jason Hale		
Equip. Und		Shepherd I	Base		Witness' N		Jason Ando		
-		ns Test Resul		t - Vortical /					of 1
	ine Voltage			VDC	r	ne Frequenc		-	Hz
		Mode of Oper	ration:			1	Transmit		
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
1298.76	3	180	1	Peak	94.7	58.3	60.8	-2.5	Pass
1731.68	3	180	1	Peak	77.8	42.9	60.8	-17.9	Pass
2164.6	3	180	1	Peak	90.6	57.9	60.8	-2.9	Pass
2597.52	3	180	1	Peak	84.7	52.9	60.8	-7.9	Pass
3030.44	3	180	1	Peak	87.2	56.5	60.8	-4.3	Pass
3463.36	3	180	1	Peak	87.2	57.1	60.8	-3.7	Pass
3896.28	3	180	1	Peak	87.3	58.4	74.0	-15.6	Pass
3896.28 4329.2	3	180 180	1	Average	67.3 79.3	38.4 50.9	54.0 74.0	-15.6 -23.1	Pass Pass
4329.2	3	180	1	Peak Average	59.3	30.9	54.0	-23.1	Pass
900	PROFESSIONAL TESTING					ng _M D P V	Company - LDART Nodel # - Shepherd Description - 432 M Project # - 12345-1 Voltage - 12 VDC	Base Hz Transceiver 0	
70.0 (MBu V/m) Amplitude (dBu V/m) 40.0 40.0 40.0 40.0 40.0 40.0 40.0 40.	G 1.4G	1.5G	226	26G 3.0	G 34G	3.8G	4.26	4.6G 5.0	G

Table 5.3.7: Out of Band Spurious Emissions Measurements Receive Test Results − Horizontal Antenna Polarity ≤ 1GHz

			Profe	ssior	nal '	Te	sting, E	MI, Inc	•					
Test Metho	d:		C63.4–2003: e Electrical a										ow-	
In accorda	ance with:	FCC Pa	art 15.109 - 0 ors, Radiate	Code o	of Fed	dera	l Regulation						nal	
ection:		15.109	,											
. ,							EUT Serial #: 1							
Customer: LDAR Tools							EUT Part #: N/A							
roject Nur urchase O		12345-1 701	10				Test Techn		Layne Jason I			yer		
Cquip. Und		791 Shepherd Base					Supervisor Witness' N		Jason A					
quip. Onc	ici Test.	оперис	Tu Dasc				Withes 1	umc.	343011 1	inuc	15011			
Radiate	ed Emissions	Test Re	sults Data Sh	eet - H	orizo	ntal	Antenna Po	larity ≤ 1GF	Iz	Pag	ge:	1	of	
EUT L	ine Voltage	:	12 VDC				EUT Line Frequency: N/A			A		Hz		
	EUT N	Mode of	Operation:						Stand	by				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Directi (Degre	ion Heigh	t E	Detector Function		Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit L (dBµV		Mai (d)	_	Test Result	
80.83	10	89	4	Qı	Quasi-peak		34.5	18.3	29.5		-11	1.2	Pass	
197.45	10	48	4	Qι	Quasi-peak		33	23.5	33.1		-9	.6	Pass	
299.2	10	183			Quasi-peak		40.1	26.7	35.6		-8		Pass	
430.4	10	99	4		Quasi-peak		35.6	26.3	35.6		-9		Pass	
497.6 661.6	10	106 18	4		ıasi-p ıasi-p	_	35.9 35.4	28.2 30.9	35.6 35.6	_	-7 -4		Pass Pass	
	PROFESSIONAL TESTING		•	Pro	fess eter Ra	SiOI	nal Testir ed Emissions B Horizontal Plot	19 _N	Company - Ll Model # - She Description - Project # - 12 \ Voltage - 12 \	pherd E 432 MH 345-10	Base Iz Trans	sceiver		
60.0 -														
€ 40.0												Цг		
a Wir												$+$ \parallel \parallel		
30.0 Tge					++	47					. ي.د د اورانيو	-		
Amplitude (d							المهافي عدديان	Lee May May have been been been been been been been be	والمعارض فاستطعه والمسائدة	Lipanii.	<u> </u>			
10.0			Mary Markey	white	www	والمعابد إديا	Parket Control of the							
0 10.0	м					100.0						1.00	à	
	: Layne Lueckem				Fre	equen	cy (Hz)						zontal Data	

Table 5.3.8: Out of Band Spurious Emissions Measurements Receive Test Results − Vertical Antenna Polarity ≤ 1GHz

			Profess	ional T	esting, E	MI, Inc	•					
Fest Metho	od:		63.4–2003: "N						ow-			
In accord	ance with:	FCC Par	Electrical and rt 15.109 - Cors, Radiated I	de of Fede	ral Regulatio				nal			
Section:		15.109	is, Kaulateu I	211113310113	Limits							
Test Date(s	s):	7/20/201	1		EUT Seria	ıl #:	1					
Customer:	/	LDAR T				EUT Part #: N/A						
Project Nu	mber:	12345-10	0		Test Techi	nician:	Layne Lue	ckemeyer				
Purchase (Order #:	791			Supervisor	r:	Jason Hale	ey				
Equip. Und	der Test:	Shepher	d Base		Witness' N	lame:	Jason And	erson				
Radia	nted Emission	ıs Test Re	sults Data She	et - Vertica	l Antenna Pol	arity ≤ 1GHz	z Pa	ge: 1	of 1			
EUT I	Line Voltage	:	12	VDC	EUT L	ine Frequenc	ey: N	/A	Hz			
	EUT N	Mode of O	peration:				Standby					
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees		Detector Function	I Amnlitude	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results			
48.63	10	107	1	Quasi-pea	ak 34.1	20.1	29.5	-9.4	Pass			
81.38	10	119	1	Quasi-pea		21.1	29.5	-8.4	Pass			
198.81	10	19	1	Quasi-pea	ak 34.8	25.4	33.1	-7.7	Pass			
299.2	10	162	1	Quasi-pea	ak 38.7	25.3	35.6	-10.3	Pass			
464.598	10	102	1	Quasi-pea	_	26.8	35.6	-8.8	Pass			
661.8	10	18	1	Quasi-pea	ık 34.3	29.8	35.6	-5.8	Pass			
60.0 -	PROFESSIONAL TESTING			10 Meter Rad	onal Testi ated Emissions ass B Vertical Plot	119 _M	Company - LDART Model # - Shepherd Description - 432 N Project # - 12345-1 Voltage - 12 VDC	Base MHz Transceiver				
50.0												
€ 40.0												
(m/ /mgp												
9) 30.0 - 20.0 -							March of the State					
			method and broken by some	Manch Mynd	Maria Company Control of the Control	M artt Athensis in						
10.0												
_	<u> </u>			-	100.0M			1.00				
0 - 10.	UIVI				100.0M			1.00	,			

Table 5.3.9: Out of Band Spurious Emissions Measurements Test Setup Photographs

able 5.3.9: Out o	r Band Spurious Emissions Me	easurements rest	Setup Photographs						
	Professional Te	esting, EMI, Inc.							
Test Method:	ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by								
	FCC Part 15.109 - Code of Federal I	Regulations Part 47, Sub	ppart B - Unintentional Radiators,						
In accordance with:	Radiated Emissions Limits								
Section:	15.109								
Test Date(s):	7/20/2011	EUT Serial #:	1						
Customer:	LDAR Tools	EUT Part #:	N/A						
Project Number:	12345-10	Test Technician:	Layne Lueckemeyer						
Purchase Order #:	791	Supervisor:	Jason Haley						
Equip. Under Test:	Shepherd Base	Witness' Name:	Jason Anderson						
	Radiated Emissions Photographs	S	Page: 1 of 1						
	EUT Front	THE WAY	EUT Rear						

6.0 Antenna Requirements

An antenna evaluation was performed on the EUT to determine compliance with 47 CFR, Part 15.203 and RSS-210.

6.1 Evaluation Procedure

The design of the EUT antenna was evaluated for conformance to engineering requirements for gain and to prevent substitution of unapproved antennae. Gain of the antenna was assessed by reviewing the antenna manufacturer's data sheet.

6.2 Evaluation Criteria

The antenna design must meet at least one of the following criteria:

- a) Antenna is permanently attached to the unit.
- b) Antenna must use a unique type of connector to attach to the EUT.
- c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

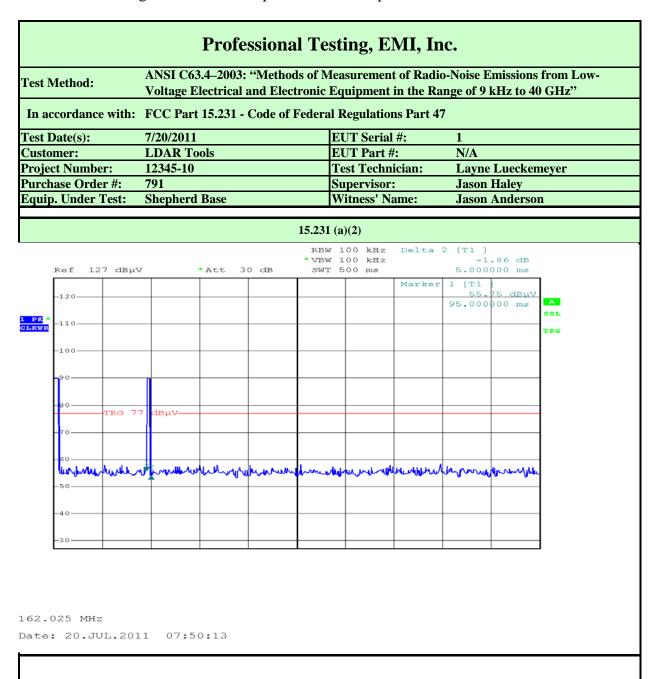
6.3 Evaluation Results

The Shepherd Base met the criteria of this rule by virtue of having an internal antenna inaccessible to the user. Therefore, the EUT is compliant.

7.0 Compliance with FCC 15.231(a)(2)

The Shepherd Base was tested to evaluate compliance to FCC 15.231(a)(2). The event was triggered by a software command to transmit under normal circumstances. The plot demonstrates compliance to FCC 15.231(a)(2) as the unit ceases transmission within 5 seconds after activation.

The EUT was observed beyond 5 seconds to ensure compliance to FCC 15.231(a)(2). Professional Testing attests to the compliance of the Shepherd Base.



8.0 Duty Cycle Calculation

Period = 100 msTotal on time over 100 ms = 6 ms + 3.3 ms = 9.3 msDuty Cycle Correction Factor = $20 \log (9.3 \text{ms} / 100 \text{ ms})$

Duty cycle Correction Factor = -20.0 dB Duty cycle = 9.3%

End of Report

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