

1601 North A.W. Grimes Blvd., Suite B Round Rock, TX 78665

e-mail: <u>info@ptitest.com</u>

(512) 244-3371 Fax: (512) 244-1846

December 13, 2011

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

# Dear Kevin:

Enclosed is the Wireless Test Report for the Shepherd Personal Monitor 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 12346-10

# **LDARTools Shepherd Personal Monitor**

# **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 December 13, 2011

Reviewed by

Jeffrey A. Lenk President Written by

Layne Lueckemeyer Product Development Engineer

# **Table of Contents**

Title P	age	1
Table (	of Contents	3
1.0	Introduction	5
1.1	Scope	
1.2	EUT Description	5
1.3	Modifications	6
1.4	Test Site	6
1.5	Applicable Documents	6
1.6	Applicable Tests	7
2.0	Fundamental Field Strength Measurements	8
2.1	Test Procedure	8
2.2	Test Criteria	9
2.3	Test Results	9
3.0	Occupied Bandwidth	
3.1	Test Procedure	15
3.2	Test Criteria	15
3.3	Test Results	15
4.0	Out of Band Spurious Emissions	20
4.1	Test Procedure	20
4.2	Test Criteria	20
4.3	Test Results	22
5.0	Antenna Requirements	31
5.1	Evaluation Procedure	31
5.2	Evaluation Criteria	
5.3	Evaluation Results	
6.0	Compliance with FCC 15.231(a)(2)	32
7.0	Duty Cycle Calculation	33

# $THIS\ REPORT\ SHALL\ NOT\ BE\ REPRODUCED\ EXCEPT\ IN\ FULL,\ WITHOUT\ THE\ WRITTEN\ APPROVAL\ OF\ PROFESSIONAL\ TESTING\ (EMI),\ INC.$

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.

<sup>(2)</sup> This report shall not be reproduced except in full, without the written approval of Professional Testing (EMI), Inc.

<sup>(3)</sup> 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-PM001 IC Identifier 9851A-PM001 Project Number: 12346-10

Test Dates: July 20, August 4, 2011

The **LDARTools, Shepherd Personal Monitor** 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	Level	Limit	Margin (dB)		
Shepherd Base 432.99 MHz Transmitter: Radiated Spurious Emissions	1298.76 MHz: 43.1 dBuV/m @ 3m	54 dBuV/m	-10.9		
Shepherd Base 432.99 MHz Transmitter: Output Power at 3 meters	77.1 dBuV/m	80.8 dBuV/m	-3.7		
	Occupied Bandwidth				
20 dB		99%			
84 kHz		90 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 were utilized for making all emissions measurements.

# 1.2 EUT Description

The Shepherd Personal Monitor (PM) is worn by personnel who may be working in areas where hazardous gases might be found. The PM employs a sniffing technology (sensing circuit) that will alert the microprocessor that potentially dangerous fumes are being detected.

Once the micro has been alerted, it will sound an alarm (buzzer) and also contact the Shepherd Base Station and identify which PM has detected the fumes. The Base station will be connected to the internet and will report to the Home Office which personnel have had an alarm event. This alarm condition can also occur if the panic button on the Personal Monitor is depressed. The alarm condition will then be broadcast to all other Personal Monitors connected to a particular base.

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	Serial Number FCC ID Number IC Ide					
E	LDARTools	PM001	None	ZJ2-PM001	9851A-PM001				
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
Antenna Requirements	FCC 15.203, RSS-GEN 7.1.4

# 2.0 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.

#### 2.1 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 2.1.1.

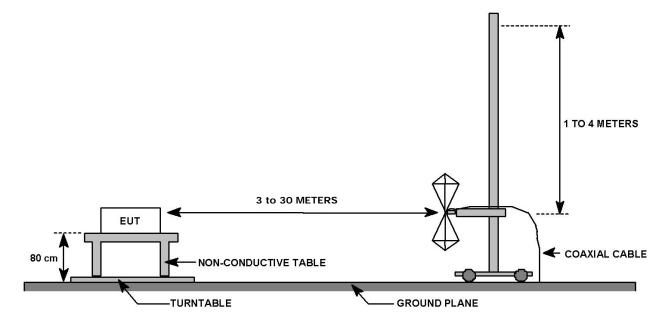


Figure 2.1.1: Radiated Emissions Test Setup

# 2.2 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 <sup>1</sup>	125 to 375 <sup>1</sup>
174 – 260	3,750	375
260 – 470	3,750 to 12,500 <sup>1</sup>	375 to 1,250 <sup>1</sup>
Above 470	12,500	1,250

<sup>&</sup>lt;sup>1</sup>Linear interpolations

# 2.3 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 2.3.1: Radiated Emissions Measurements of the Fundamental Field Strength Level – Test Equipment

Test Equi	pment				
		Profess	ional Testing, EMI, Inc.		
Test Metho	ų.		thods of Measurement of Radio-Noise c Equipment in the Range of 9 kHz to		U
In accord	ance 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	70.74
Purchase O			Supervisor:	Jason Haley	er
Equip. Und		herd Personal Mon		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 2.3.2: Radiated Emissions Measurements of the Fundamental Field Strength Level Bandwidth and Measurement Time Used for Testing – Peak Scan

	Professional	Testing, EMI, In	<b>c.</b>						
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									
In accordance with:	FCC Part 15.231 - Code of Feder	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:	12346-10	Test Technician:	Layne Lueckemeyer						
Purchase Order #:	791 / 792	Supervisor:	Jason Haley						
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson						

Ra	Radiated Emissions Bandwidth and Measurement Time Used for Testing - Peak Scan											
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	top 6dB Bandwidth (kHz) 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:

<sup>1.</sup> The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1000 data points per range.

<sup>2.</sup> The measurement receiver resolution bandwidth setting was 300Hz for Quasi-peak measurements from 9-150kHz.

<sup>3.</sup> The measurement receiver resolution bandwidth setting was 9kHz for Quasi-peak measurements from 0.15-30MHz.

<sup>4.</sup> The measurement receiver resolution bandwidth setting was 120kHz for Quasi-peak measurements from 30-1000MHz.

<sup>5.</sup> The measurement receiver resolution bandwidth setting was 1MHz for Average measurements from 1-18GHz.

Table 2.3.3: Radiated Emissions Measurements of the Fundamental Field Strength Level Test Results – Horizontal Antenna Polarity ≤ 1 GHz

	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"													
In accordance with: FCC Part 15.231 - Code of Federal Regulations Part 47													
Test Date(s	s):	8/4/2	011				<b>EUT Serial</b>	l #:	N/A				
Customer:		LDA	RTool	s			EUT Part #	<b>#:</b>	N/A				
Project Nu	mber:	1234	6-10				Test Techr	nician:	Layne Lue	ckem	ever		
Purchase O		791 /	792				Supervisor: Jason Haley						
Equip. Und	er Test:		herd P	erson	al Mo	nitor	Witness' Name: Jason Anderson						
Radiate	d Emissions	Test I	Results	Data	Sheet	- Horizontal	Antenna Po	larity ≤ 1GH	z Pa	ge:	1	of	1
EUT L	ine Voltage:	:	3.	.6		VDC	EUT Line Frequency: N/A Hz				Hz		
	EUT N	Mode o	of Ope	ration:	:		Transmit Max Power						
Frequency Measured (MHz)	Test Distance (Meters)	Dire	UT ction grees)	Ante Hei (Me	ght	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Level Margin		0	Te Res	
432.99	3	3	6	1		Peak	65.4	87.5	100.8	-13	3.3	Pa	SS
432.99	3	3	6	1	l	Average	49	71.1	80.8	-9	.7	Pa	SS

Table 2.3.4: Radiated Emissions Measurements of the Fundamental Field Strength Level Test Results – Vertical Antenna Polarity ≤ 1 GHz

	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"													
In accordance with: FCC Part 15.231 - Code of Federal Regulations Part 47													
Test Date(s	s):	8/4/2	011				<b>EUT Serial</b>	l #:	N/A				
Customer:		LDA	RTool	s			EUT Part #	<b>#:</b>	N/A				
Project Nu	mber:	12340	6-10				Test Techr	nician:	Layne Lue	ckem	ever		
Purchase O	rder #:	791 /	792				Supervisor: Jason Haley						
Equip. Und	er Test:			erson	al Mo	nitor	Witness' N	ame:	Jason And				
Radia	ted Emission	ıs Test	Resul	ts Data	Shee	t - Vertical A	Antenna Pola	arity ≤ 1GHz	Pa	ge:	1	of	1
EUT L	ine Voltage:	:	3.	.6		VDC	EUT Line Frequency: N/A Hz				Hz		
	EUT N	Aode o	f Ope	ration:			Transmit Max Power						
Frequency Measured (MHz)	Test Distance (Meters)	EU Direc (Deg	ction	Ante Heig (Met	ght	Detector Function	Recorded Amplitude (dBµV)	ide Level Level Mai		Margin (dB)		Te Res	~-
432.99	3	33	38	1		Peak	71.4	93.5	100.8	-7	1.3	Pa	.ss
432.99	3	33	38	1		Average	55	77.1	80.8	-3	3.7	Pa	.ss

Table 2.3.5: Radiated Emissions Measurements of the Fundamental Field Strength Level Test Setup Photographs

Setup Photographs	<b>S</b>						
	Professional Te	sting, 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 F	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:	12346-10	Test Technician:	Layne Lueckemeyer				
Purchase Order #:	791 / 792	Supervisor:	Jason Haley				
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson				
	Radiated Emissions Photographs		Page:	1 of 1			
			<b>Valuerat</b>				
	EUT Front		EUT Rear				

# 3.0 Occupied Bandwidth

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

#### 3.1 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 2.1.1.

#### 3.2 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.

#### 3.3 Test Results

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

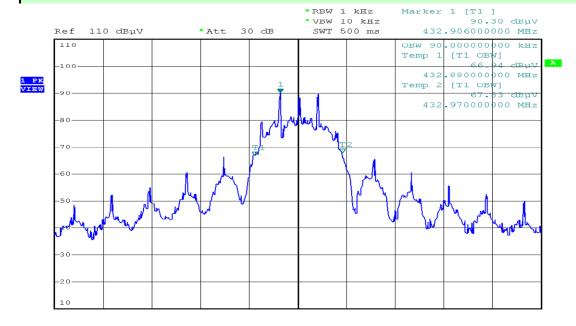
Table 3.3.1: Radiated Emissions Measurements of Occupied Bandwidth – Test Equipment

		D C			
		Profess	ional Testing, EMI, Inc.		
Test Method			thods of Measurement of Radio-Noise c Equipment in the Range of 9 kHz to		
In accorda	ance with: FCC	Part 15.231 - Code	of Federal Regulations Part 47		
Test Date(s)			EUT Serial #:	N/A	
Customer:		RTools	EUT Part #: Test Technician:	N/A	
Project Nun Purchase Or			Supervisor:	Layne Lueckemey Jason Halev	er
Equip. Unde			Jason Anderson		
	Rad	liated Emissions Tes	st Equipment List	Page:	1 of 1
T	ile! Software Version	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	Antenna, Bi Con, 30-300MHz 2121	
1278	HP	85650A	Quasi Peak Adapter	2811A01147	7/28/2011
1834	HP	85662A	Spec Anal Dsply	Spec Anal Dsply 2349A06182	
1145	HP	8568B	Spectrum Analyzer 100Hz-1.5GHz	2517A01821	7/28/2011
1035	HP	85685A	RF Preselector	RF Preselector 2901A00891	
1486	EMCO	3147	Antenna, Log Periodic, .2-5GHz	nna, Log Periodic, .2-5GHz 9112-1052	
1497	EMCO	3108	Antenna, Bi Con, 30-300MHz	Antenna, Bi Con, 30-300MHz 2121	
C026	N/A	RG214	Cable Coax, N-N, 25m none		8/10/2011
C027	N/A	RG214	Cable Coax, N-N, 25m	Cable Coax, N-N, 25m none	
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 Occupied Bandwidth Test Results

	Professional 7	Testing, EMI, II	10.		
Test Method:	ANSI C63.4–2009: "Methods o Voltage Electrical and Electron				
In accordance with:	ith: FCC Part 15.231 - Code of Federal Regulations Part 47				
Test Date(s):	7/20/2011	EUT Serial #:	N/A		
Customer:	LDARTools	EUT Part #:	N/A		
Project Number:	12346-10	Test Technician:	Layne Lueckemeyer		
Purchase Order #:	791 / 792	Supervisor:	Jason Haley		
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson		

#### Radiated Emissions Test Results Data Sheet -Occupied Bandwidth Test Results



162.025 MHz

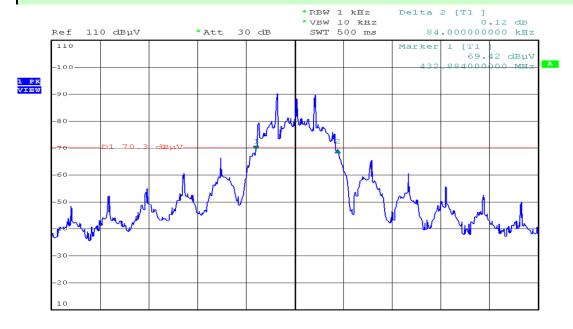
Date: 20.JUL.2011 10:44:59

Span = 5 MHz / RBW = 1kHz / VBW = 10kHz

Table 3.3.3: Radiated Emissions Measurements of Occupied Bandwidth Test Results

	<b>Professional</b> T	Testing, EMI, I	10.		
Test Method:	ANSI C63.4–2009: "Methods o Voltage Electrical and Electron				
In accordance with:	In accordance with: FCC Part 15.231 - Code of Federal Regulations Part 47				
Test Date(s):	7/20/2011	EUT Serial #:	N/A		
Customer:	LDARTools	EUT Part #:	N/A		
Project Number:	12346-10	Test Technician:	Layne Lueckemeyer		
Purchase Order #:	791 / 792	Supervisor:	Jason Haley		
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson		

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



162.025 MHz

Date: 20.JUL.2011 10:43:01

Span = 5 MHz / RBW = 1kHz / VBW = 10kHz

Table 3.3.4: 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 Equipmen		<del>_</del>
In accordance with:	FCC Part 15.231 - Code of Federal I	Regulations Part 47	
Test Date(s):	7/20/2011	EUT Serial #:	N/A
Customer:	LDARTools	EUT Part #:	N/A
Project Number:	12346-10	Test Technician:	Layne Lueckemeyer
Purchase Order #:	791 / 792	Supervisor:	Jason Haley
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson
	Radiated Emissions Photographs	S	Page: 1 of
			Anucat 13
	EUT Front		EUT Rear

# 4.0 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.

#### 4.1 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.

#### 4.2 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 <sup>1</sup>	125 to 375 <sup>1</sup>
174 – 260	3,750	375
260 – 470	3,750 to 12,500 <sup>1</sup>	375 to 1,250 <sup>1</sup>
Above 470	12,500	1,250

<sup>&</sup>lt;sup>1</sup>Linear 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
<sup>1</sup> 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	( <sup>2</sup> )
13.36–13.41			

12346-10 December 13, 2011 Page 21 of 35

# 4.3 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.

NOTE: Reference Section 7.0 for duty cycle calculation. A duty cycle correction factor of -16.5 dB was used.

Table 4.3.1: Out of Band Spurious Emissions Measurements – Test Equipment

i abie 4.3	.1: Out of Band	a Spurious Em	ssions Measurements – Tes	t Equipment	
		Profess	ional Testing, EMI, Inc.		
Test Metho	a: Electi	rical and Electronic	hods of Measurement of Radio-Noise Equipment in the Range of 9 kHz to	o 40 GHz" (incorpo	orated by
			of Federal Regulations Part 47, Subj	part B - Unintention	nal Radiators,
In accordant Section:	ice with: Radia	ited Emissions Lim	uts		
Test Date(s)			EUT Serial #:	1	
Customer:		R Tools	EUT Part #:	N/A	
Project Nur		<u>i-10</u>	Test Technician:	Layne Lueckemey	er
Purchase O Equip. Und		nerd Personal Mon	Supervisor: itor Witness' Name:	Jason Haley Jason Anderson	
Equip. Onu	ci i est. Shepi	ici u i ci sonai Mion	itoi withess ivanic.	Jason Anderson	
	Rac	liated Emissions Tes	t Equipment List	Page:	1 of 1
T	ile! 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	enna, Bi Con, 30-300MHz 2121	
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 4.3.2: Bandwidth and Measurement Time Used for Out of Band Spurious Emissions Testing – Peak Scan

	Professional	Testing, EMI, In	c.				
Test Method:			oise Emissions from Low-Voltage				
1 est Method.	Electrical and Electronic Equip	ment in the Range of 9 kH	Iz to 40 GHz" (incorporated by				
	FCC Part 15.109 - Code of Fede	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators,					
In accordance with:	<b>Radiated Emissions Limits</b>						
Section:	15.109						
Test Date(s):	7/20/2011	EUT Serial #:	1				
Customer:	LDAR Tools	EUT Part #:	N/A				
Project Number:	12346-10	Test Technician:	Layne Lueckemeyer				
Purchase Order #:	792	Supervisor:	Jason Haley				
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson				

Ra	Radiated Emissions Bandwidth and Measurement Time Used for Testing - Peak Scan						
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6dB Bandwidth (kHz)	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:

<sup>1.</sup> The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1000 data points per range.

<sup>2.</sup> The measurement receiver resolution bandwidth setting was 300Hz for Quasi-peak measurements from 9-150kHz.

<sup>3.</sup> The measurement receiver resolution bandwidth setting was 9kHz for Quasi-peak measurements from 0.15-30MHz.

<sup>4.</sup> The measurement receiver resolution bandwidth setting was 120kHz for Quasi-peak measurements from 30-1000MHz.

<sup>5.</sup> The measurement receiver resolution bandwidth setting was 1MHz for Average measurements from 1-18GHz.

Table 4.3.3: Out of Band Spurious Emissions Measurements Test Results – Horizontal Antenna Polarity ≤ 1GHz

			Profess	ional Te	sting, E	MI, Inc	•		
Test Metho	vq.		53.4–2003: "N						ow-
cst Mictilo			Electrical and						
In accorda	ance with:		t 15.109 - Co s, Radiated F		_	ns Part 47,	Subpart B -	Unintentio	nal
ection:		15.109							
est Date(s	<i>)</i> -	7/20/201			EUT Serial		1		
ustomer:		LDAR T			EUT Part #		N/A		
roject Nu		12346-10			Test Techn		Layne Lue		
urchase C		792	1D 134	•,	Supervisor		Jason Hale		
quip. Und	ier Test:	Shepher	d Personal M	onitor	Witness' N	ame:	Jason Ando	erson	
Radiate	ed Emissions	Test Resu	ılts Data Sheet	t - Horizontal	Antenna Po	larity≤1GH	Iz Pa	ge: 1	of 1
EUT I	ine Voltage:		3.6	VDC	EUT Li	ne Frequenc	y: N	/A	Hz
	EUT N	Iode of O	peration:				Transmit		
Frequency Measured (MHz)	Test Distance (Meters)	EUT Directio (Degrees		Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
38.52	10	109	1	Quasi-peak	19.6	6.6	29.5	-22.9	Pass
175.34	10	52	1	Quasi-peak	20.5	10.1	33.1	-23.0	Pass
181.365	10	263	1	Quasi-peak	23	12.8	33.1	-20.3	Pass
299.21	10	196	1	Quasi-peak	24.8	11.4	35.6	-24.2	Pass
378.914	10	118	1	Quasi-peak	24.5	13.6	35.6	-22.0	Pass
993.6	10	1	1	Quasi-peak	26.5	26.9	43.5	-16.6	Pass
100.0 ਤ	PROFESSIONAL 7 E S 7 I N 6			Professio 10 Meter Radiat 0-1000MHz Class	ed Emissions	iig ,	Company - LDART Model# - Shepherd Description - 432 N Project# - 12346-1 Voltage - 3.6 VDC	l Remote Monitor //Hz Transceiver	
90.0									
80.0									
70.0									
Amplitude (dBuV/m)									
9 50.0									
20.0 He									
₹ 30.0				++++			I Marian	Maria de La Caracteria	
20.0			Humandum		Mark Andrew	Harmman	The state of the s		
10.0			: 11 July 19 (19)	Mary Course Street					
o. 10.	DM	-		100	.om			1.0	ıG
Onorotos	: Layne Lueckem	eyer		Frequer	ncy (Hz)			— на	izontal Data
-	AM, Wednesday,			Transmit					B 30M-1GHz

Table 4.3.4: Out of Band Spurious Emissions Measurements Test Results – Vertical Antenna Polarity ≤ 1GHz

			I	Professi	onal	Te	sting, E	MI, Inc			
		ANICI					<u> </u>			· c 1	
est Metho	od:	Voltag	ge Ele	ctrical and	Electr	onic l	Equipment	in the Rang	ge of 9 kHz	sions from L to 40 GHz"	
In accord	ance with:			5.109 - Coo Radiated E			_	ns Part 47,	Subpart B	- Unintentio	nal
ection:		15.109									
est Date(s	s):	7/20/20					EUT Serial		1		
Customer: Project Nu	mhore	LDAR 12346-		lS			EUT Part # Test Techn		N/A Layne Lue	alzamazan	
Purchase C		792	-10				Supervisor		Jason Hale	•	
Equip. Und			erd P	ersonal Mo	onitor		Witness' N		Jason And	•	
D 11	. 15	TD 4.1	<b>.</b>	. D . GI				14CH	D		
						ical A		arity ≤ 1GHz		ige: 1	of 1
EUT I	Line Voltage	:	3.0	6	VDC		EUT Li	ne Frequenc	y: N	I/A	Hz
	EUT N	Mode of	Oper	ation:					Transmit		
Frequency Measured (MHz)	Test Distance (Meters)	EU' Direct (Degre	tion	Antenna Height (Meters)	Detec Funct		Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level	Margin (dB)	Test Results
38.52	10	118	8	1	Quasi-	peak	21.5	8.5	29.5	-21.0	Pass
175.34	10	29		1	Quasi-	_	26.4	16.0	33.1	-17.1	Pass
181.365	10	244		1	Quasi-		28.9	18.7	33.1	-14.4	Pass
299.21 378.914	10	187		1	Quasi- Quasi-		25.5 32	12.1 21.1	35.6 35.6	-23.5 -14.5	Pass Pass
993.6	10	1	+	1	Quasi-		26.5	26.9	43.5	-14.5	Pass
100.0	PROFESSIONAL 7 I S 7 I N G			•	10 Meter F	Radiate	nal Testi ed Emissions s B Vertical Plot	ing ,	-	d Remote Monitor MHz Transceiver	
90.0											
80.0											
£ 70.0											
Amplitude (dBuV/m)											
) 50.0-1 10 40.0-1											
20.0 A	_								1./\.	A STATE OF THE PARTY OF THE PAR	
20.0				M. Whene			ا اختله والإلهاب ال <sub>مال</sub>	part manufactured in	سسلها الملاسب	***************************************	
10.0					manana	مهراسارساسه	Lawrence .				
3											
0- 10.	ом	-	'		, ,	100.	ом cy(Hz)	, ,		1.0	iG .

Table 4.3.5: Out of Band Spurious Emissions Measurements Test Results – Horizontal Antenna Polarity ≥ 1GHz

Professional Testing, EMI, Inc.	olarity ≥	1GHz								
Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz*			]	Professi	onal Te	sting, E	MI, Inc	•		
Radiators, Radiated Emissions Limits	est Metho	od:	Voltage Ele	ectrical and	Electronic	Equipment	in the Rang	ge of 9 kHz t	o 40 GHz"	
EUT Bate(s): 7/20/2011		ance with:	Radiators,			U	ns Part 47,	Subpart B -	Unintentio	nal
Customer:   12346-10   Test Technician:   Layne Lucekemeyer   Izade-10   Test Technician:   Layne Lucekemeyer   Izade-10   Test Technician:   Layne Lucekemeyer   Izade-10   I						Ī				
Test   Technician:   Layne   Lueckemeyer   Jason   Haley		,						_		
Radiated Emissions   Test   Results   Data   Sheet - Horizontal   Antenna   Polarity > 1GHz   Page: 1   of 1				ls						
Radiated Emissions Test Results Data Sheet - Horizontal Antenna Polarity > 1GHz   Page: 1 of 1										
Radiated Emissions Test Results Data Sheet - Horizontal Antenna Polarity > 1GHz					•.				/	
EUT Line Voltage: 3.6	quip. Und	der Test:	Shepherd I	ersonal Mo	onitor	Witness' N	ame:	Jason Ande	erson	
Test   Corrected   Correcte	Radiate	ed Emissions	Test Results	S Data Sheet	- Horizontal	Antenna Po	larity > 1GH	Iz Paş	ge: 1	of 1
Test   Distance (Meters)   Detector   Height (Meters)   Detector	EUT I	Line Voltage	: 3.	.6	VDC	EUT Li	ne Frequenc	y: N/	A	Hz
Distance (MHz)		EUT I	Mode of Ope	ration:				Transmit		
1298.76   3   180   1   Average   79.5   43.1   54.0   -10.9   Pass     1731.68   3   180   1   Peak   93.8   58.9   74.0   -15.1   Pass     2164.6   3   180   1   Peak   89.5   56.8   74.0   -17.2   Pass     2597.52   3   180   1   Peak   86.7   54.9   74.0   -19.1   Pass     3030.44   3   180   1   Peak   88.4   57.7   74.0   -16.3   Pass     3463.36   3   180   1   Peak   83.4   53.3   74.0   -20.7   Pass     3896.28   3   180   1   Peak   81.2   52.3   74.0   -21.7   Pass     3896.28   3   180   1   Peak   82.9   54.5   74.0   -19.5   Pass     4329.2   3   180   1   Average   61.2   32.3   54.0   -21.7   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   180   1   Average   62.9   34.5   57.0   -19.5   Pass     4329.2   3   34.0   34.5   34.	Measured	Distance	Direction	Height		Amplitude	Level		0	Test Results
1731.68   3   180   1   Peak   93.8   58.9   74.0   -15.1   Pass	1298.76	3	180	1	Peak	95.9	59.5	74.0	-14.5	Pass
1	1298.76	3	180	1	Average	79.5	43.1	54.0	-10.9	Pass
2597.52 3 180 1 Peak 86.7 54.9 74.0 -19.1 Pass 3030.44 3 180 1 Peak 88.4 57.7 74.0 -16.3 Pass 3463.36 3 180 1 Peak 83.4 53.3 74.0 -20.7 Pass 3896.28 3 180 1 Peak 81.2 52.3 74.0 -21.7 Pass 3896.28 3 180 1 Average 61.2 32.3 54.0 -21.7 Pass 4329.2 3 180 1 Peak 82.9 54.5 74.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 66.0 Company LDARTools Model#- Shepherd Remote Monitor Description - 432 MHz Transceiver Project #- 12346-10 Voltage -3.6 VDC	1731.68	3	180	1	Peak	93.8	58.9	74.0	-15.1	Pass
3030.44 3 180 1 Peak 88.4 57.7 74.0 -16.3 Pass 3463.36 3 180 1 Peak 83.4 53.3 74.0 -20.7 Pass 3896.28 3 180 1 Peak 81.2 52.3 74.0 -21.7 Pass 3896.28 3 180 1 Average 61.2 32.3 54.0 -21.7 Pass 3896.28 3 180 1 Peak 82.9 54.5 74.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass 4429.2 3 180 1 Average 62.9 34.5 Fast 4429.2 3 180 1 Average	2164.6	3	180	1	Peak	89.5	56.8	74.0	-17.2	Pass
1	2597.52	3	180	1	Peak	86.7	54.9	74.0	-19.1	Pass
1896.28   3   180   1   Peak   81.2   52.3   74.0   -21.7   Pass	3030.44	3	180	1	Peak	88.4	57.7	74.0	-16.3	Pass
3896.28 3 180 1 Average 61.2 32.3 54.0 -21.7 Pass 4329.2 3 180 1 Peak 82.9 54.5 74.0 -19.5 Pass 4329.2 3 180 1 Average 62.9 34.5 54.0 -19.5 Pass  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Plot Voltage- 3.6 VDC  Operator: Layne Lueckemeyer  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Plot Transmit  Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Plot Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Plot Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Plot Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Plot Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Transmit  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Testing 1 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Testing 1 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Testing 1 Meter Radiated Emissions 1-5GHz Class B Horizontal Data Testing 1 Meter Radiated Emissions 1 Meter Radiat	3463.36	3	180	1	Peak	83.4	53.3	74.0	-20.7	Pass
## 180   1   Peak   82.9   54.5   74.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5   54.0   -19.5   Pass   ## 180   1   Average   62.9   34.5	3896.28		180	1	Peak	81.2	52.3	74.0	-21.7	Pass
Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Horizontal Plot Project # - 12346-10 Voltage - 3.6 VDC  Operator: Layne Lueckemeyer  Project # - 12346-10 Frequency (Hz)  Transmit	3896.28		180	1	Average	61.2	32.3		-21.7	Pass
PROFESSIONAL  PROFESSIONAL  PROFESSIONAL  PROFESSIONAL  PROFESSIONAL  PROFESSIONAL  PROFESSIONAL  SOLUTION  ACCOMPANY - LDARTools  Model # - Shepherd Remote Monkor Description - 432 MHz Transceiver Project # - 12346-10 Voltage - 3.6 VDC  Operator: Layne Lueckemeyer  Frequency (Hz)  Transmit  Transmit  Transmit  Company - LDARTools Model # - Shepherd Remote Monkor Description - 432 MHz Transceiver Project # - 12346-10 Voltage - 3.6 VDC					Peak	82.9				Pass
A Model #- Shepherd Remote Monitor Description - 432 MHz Transceiver Project #- 12346-10 Voltage - 3.6 VDC  PROFESSIONAL  **Professional Plot**  **Professional	4329.2	3	180	1	Average	62.9	34.5	54.0	-19.5	Pass
70.0  60.0  40.0  40.0  1.0G 1.4G 1.8G 2.2G 2.6G 3.0S 3.4G 3.8G 4.2G 4.6G 5.0G  Operator: Layne Lueckemeyer Frequency (Hz) — Horizontal Data  Transmit — SCC 8.44 6.04	80.0-	PROFESSIONAL T C S T I N G			3 Meter Radiate	ed Emissions	ng ,	Model# - Shepherd Description - 432 M Project # - 12346-1	Remote Monitor IHz Transceiver	
40.0  30.0  1.0G 1.4G 1.8G 2.2G 2.6G 3.0G 3.4G 3.8G 4.2G 4.6G 5.0G  Operator: Layne Lueckemeyer Frequency (Hz)  Transmit  Transmit	70.0-									
30.0 1.6 1.8 2.26 2.66 3.06 3.4G 3.8G 4.2G 4.6G 5.0G  Operator: Layne Lueckemeyer Frequency (Hz) — Horizontal Data  Transmit Frequency (Hz) — Frequency (Hz) — Frequency (Hz) — Horizontal Data	Amplitude (dBtA							4444.191.444.	Alight Unight Steam of Lat.	
Transmit FOR BLADON	30.0- 1.			2.2G			3.86	4.2G		
	-	-	-			ю у (П <i>2)</i>				

Table 4.3.6: Out of Band Spurious Emissions Measurements Test Results – Vertical Antenna Polarity ≥ 1GHz

Measured (MHz)         Distance (Meters)         Direction (Degrees)         Height (Meters)         Function         Amplitude (dBμV)         Level (dBμV/m)         (dBμV/m)         (dBμV/m)         Result           1298.76         3         180         1         Peak         93.9         57.5         74.0         -16.5         Pass           1298.76         3         180         1         Average         77.5         41.1         54.0         -12.9         Pass           1731.68         3         180         1         Peak         88.6         53.7         74.0         -20.3         Pass           2164.6         3         180         1         Peak         92.3         59.6         74.0         -14.4         Pass           2597.52         3         180         1         Peak         84.7         52.9         74.0         -21.1         Pass	olarity ≥	1GHz								
Voltage   Electrical and   Electronic   Equipment in the   Range of 9 kHz to 40 GHz			]	Professi	onal Te	sting, E	MI, Inc	•		
Common	est Metho	od:								ow-
St. 109   Step	In accorda	ance with:	FCC Part 1	15.109 - Coo	le of Federa	al Regulatio				nal
Customer:   LDAR Tools   EUT Part #: N/A										
Test		s):						-		
Supervisor:   Jason Haley   Witness' Name:   Jason Anderson		mhou		ols					alzomovou	
Radiated Emissions Test Results Data Sheet - Vertical Antenna Polarity > IGHz   Page: 1   of										
EUT Line Voltage: 3.6				Personal Mo	onitor					
Frequency   Test Distance (Meters)   Function   Height (Meters)   Function (Meters)	Radia	ted Emission	ıs Test Resul	ts Data Shee	t - Vertical A	Antenna Pola	arity > 1GHz	Pag	ge: 1	of 1
Test   Distance (Meters)   Direction (Degrees)   (Meters)   Detector   Height (Meters)   Direction (Meters)   D	EUT I	ine Voltage	: 3.	.6	VDC	EUT Li	ne Frequenc	y: N/	'A	Hz
Distance (MHz)   Direction (Meters)   Direction (Meters)   Height (Meters)   Detector Function (dBμV/m)   (dBμV/m) (d		EUT N	Mode of Ope	ration:				Transmit		
1298.76   3   180   1   Average   77.5   41.1   54.0   -12.9   Pass	Measured	Distance	Direction	Height		Amplitude	Level		U	Test Results
1731.68   3   180   1   Peak   88.6   53.7   74.0   -20.3   Pass	1298.76	3	180	1	Peak	93.9	57.5	74.0	-16.5	Pass
180	1298.76	3	180	1	Average	77.5	41.1	54.0	-12.9	Pass
2597.52 3 180 1 Peak 84.7 52.9 74.0 -21.1 Pass 3030.44 3 180 1 Peak 88.4 57.7 74.0 -16.3 Pass 3463.36 3 180 1 Peak 78.5 48.4 74.0 -25.6 Pass 3896.28 3 180 1 Peak 83.6 54.7 74.0 -19.3 Pass 3896.28 3 180 1 Average 67.2 38.3 54.0 -15.7 Pass 4329.2 3 180 1 Peak 84.5 56.1 74.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass 56.0 Pas	1731.68	3	180	1	Peak	88.6	53.7	74.0	-20.3	Pass
3030.44 3 180 1 Peak 88.4 57.7 74.0 -16.3 Pass 3463.36 3 180 1 Peak 78.5 48.4 74.0 -25.6 Pass 3896.28 3 180 1 Peak 83.6 54.7 74.0 -19.3 Pass 3896.28 3 180 1 Average 67.2 38.3 54.0 -15.7 Pass 4329.2 3 180 1 Peak 84.5 56.1 74.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass 4329.2 3 Meter Radiated Emissions 1-5GHz Class B Vertical Plot Voltage - 3.6 VDC			180	1	Peak	92.3	59.6	74.0	-14.4	Pass
3463.36 3 180 1 Peak 78.5 48.4 74.0 -25.6 Pass 3896.28 3 180 1 Peak 83.6 54.7 74.0 -19.3 Pass 3896.28 3 180 1 Average 67.2 38.3 54.0 -15.7 Pass 4329.2 3 180 1 Peak 84.5 56.1 74.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Vertical Plot Project #- 12346-10 Voltage - 3.5 VDC										Pass
3896.28 3 180 1 Peak 83.6 54.7 74.0 -19.3 Pass 3896.28 3 180 1 Average 67.2 38.3 54.0 -15.7 Pass 4329.2 3 180 1 Peak 84.5 56.1 74.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass Model# - Shepherd Remote Monitor Description - 432 MHz Transceiver Project # - 12346-10 Voltage - 3.6 VDC										Pass
3896.28 3 180 1 Average 67.2 38.3 54.0 -15.7 Pass 4329.2 3 180 1 Peak 84.5 56.1 74.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Vertical Plot Project #-12346-10 Voltage - 3.6 VDC  PROFESSIONAL  Average 64.5 36.1 74.0 -17.9 Pass Model #- Shepherd Remote Monitor Description - 432 MHz Transceiver Project #-12346-10 Voltage - 3.6 VDC										
4329.2 3 180 1 Peak 84.5 56.1 74.0 -17.9 Pass 4329.2 3 180 1 Average 64.5 36.1 54.0 -17.9 Pass  Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Vertical Plot Description - 432 MHz Transceiver Project # -12346-10 Voltage - 3.6 VDC  (Example 1										
Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Vertical Plot  PROFESSIONAL  Average 64.5 36.1 54.0 -17.9 Pass  Company - LDARTools  Model # - Shepherd Remote Monitor Description - 432 MHz Transceiver Project # - 12346-10  Voltage - 3.6 VDC		_								
Professional Testing 3 Meter Radiated Emissions 1-5GHz Class B Vertical Plot  PROFESSIONAL  80.0  70.0  60.0  60.0  1-5GHz Class B Vertical Plot  Company - LDARTools Model # - Shepherd Remote Monitor Description - 432 MHz Transceiver Project # - 12346-10 Voltage - 3.6 VDC										
70.0 (A)(A)(A)(A)(A)(A)(A)(A)(A)(A)(A)(A)(A)(					3 Meter Radiate	ed Emissions	ng F	Model# - Shepherd Description - 432 M Project # - 12346-1	Remote Monitor IHz Transceiver	
The state of the s	70.0	1								
000 1.4G 1.8G 2.2G 26G 3.0G 3.4G 3.8G 4.2G 4.6G 5.0G  Operator: Layne Lueckemeyer Frequency (Hz)  11:10:07 AM, Wednesday, July 20, 2011  Transmit — FCC B 1.48GHz	40.0 30.0 1.0 Operator	: Layne Luecken	neyer		Frequer		3.86	426	— Ver	tical Data

Table 4.3.7: Out of Band Spurious Emissions Measurements Receive Mode Test Results – Horizontal Antenna Polarity ≤ 1GHz

	l Antenna		•	1 T		MI I			
			Protess	ional Te	esting, E	MII, Inc	•		
Test Metho	vq.		3.4–2003: "N						ow-
CSt WICtild		Voltage E	lectrical and	Electronic	Equipment	in the Ran	ge of 9 kHz	to 40 GHz"	
In accorda	ance with:		15.109 - Co		_	ns Part 47,	Subpart B -	- Unintentio	nal
antion.			s, Radiated E	missions L	imits				
ection: est Date(s	١.	15.109 7/20/2011			EUT Seria	1 #•	1		
ustomer:	·)·	LDAR To	nols		EUT Part		N/A		
roject Nu	mber:	12346-10	7013		Test Techn		Layne Lue	ckemever	
urchase C		792			Supervisor		Jason Hale		
quip. Und	ler Test:	Shepherd	Personal M	onitor	Witness' N	ame:	Jason And	erson	
Radiate	ed Emissions	Test Resul	lts Data Sheet	- Horizonta	l Antenna Po	larity≤1GF	Iz Pa	ige: 1	of 1
EUT I	ine Voltage:		3.6	VDC	EUT Li	ne Frequenc	y: N	/ <b>A</b>	Hz
	EUT N	Mode of Op	eration:				Standby		
requency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	-	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
31.53	10	1	1	Quasi-peak	21.8	9.4	29.5	-20.1	Pass
156.31	10	1	1	Quasi-peak		10.7	33.1	-22.4	Pass
199.83	10	1	1	Quasi-peak	21.4	12.1	33.1	-21.0	Pass
566.4	10	1	1	Quasi-peak		20.3	35.6	-15.3	Pass
841.6	10	1	1	Quasi-peak		24.6	35.6	-11.0	Pass
993.6	10	1	1	Quasi-peak	26.5	26.9	43.5	-16.6	Pass
€0.09	PROFESSIONAL TESTING			10 Meter Radia	onal Testi ted Emissions s B Horizontal Plot	iig !	Company - LDAR Model# - Shepher Description - 432 Project # - 12346- Voltage - 3.6 VDC	d Remote Monitor MHz Transceiver	
50.0									
€ 40.0									
(GBu//m)									
Amplitude (0								AND THE PERSON NAMED IN COLUMN TWO	
F 20.0					المراجع المراج	Maria Maria Maria	Michigan		
			a market market and	white and many the	and the same of th	· WWW			
10.0									
0 10.1	nm			44	0.0М			1.0	ıG
	····							1.0	
	: Layne Luecken	neyer		Freque Standby Mode	ncy (nz)			— на	izontal Data

Table 4.3.8: Out of Band Spurious Emissions Measurements Receive Mode Test Results − Vertical Antenna Polarity ≤ 1GHz

			Profess	sional Te	sting, E	MI, Inc	•		
Test Metho	vq.		63.4–2003: "N						ow-
In accord	ance with:	FCC Par	Electrical and the state of the	de of Federa	l Regulatio				nal
Section:		15.109	rs, Radiated	Emissions Li	mus				
est Date(s		7/20/201	1		EUT Seria	l #:	1		
ustomer:	/	LDAR T			EUT Part		N/A		
roject Nu		12346-10			Test Techn		Layne Lue	ckemeyer	
urchase C	Order #:	792			Supervisor		Jason Hale		
quip. Uno	der Test:	Shepher	d Personal M	Ionitor	Witness' N	ame:	Jason And	erson	
Radia	ted Emission	ıs Test Re	sults Data She	eet - Vertical A	Antenna Pola	arity ≤ 1GHz	Pa	ge: 1	of 1
EUT I	Line Voltage:		3.6	VDC	EUT Li	ne Frequenc	y: N	/A	Hz
	EUT M	Mode of O	peration:				Standby		
Frequency Measured (MHz)	Test Distance (Meters)	EUT Directio (Degree		Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
31.53	10	1	1	Quasi-peak	21.8	9.4	29.5	-20.1	Pass
156.31	10	1	1	Quasi-peak	21.6	10.7	33.1	-22.4	Pass
199.83	10	1	1	Quasi-peak	21.4	12.1	33.1	-21.0	Pass
566.4	10	1	1	Quasi-peak	26.8	20.3	35.6	-15.3	Pass
841.6 993.6	10 10	1	1	Quasi-peak	26.1	24.6	35.6	-11.0	Pass
993.0	PROFESSIONAL	1		Quasi-peak Professio 10 Meter Radiate 30-1000MHz Class	ed Emissions	11 <b>9</b>	43.5 Company - LDART Model # - Shepherd Description - 432 N Project # - 12346-1 Voltage - 3.6 VDC	Remote Monitor IHz Transceiver	Pass
60.0									
50.0 F 40.0									
(LL)/A0.0									
B) 30.0						<u> </u>		Andread State of Stat	
							The state of the s	<b>"</b>	
<u>E</u>			memoraleman		. Later Later Control of the later	Market Market Market Market			
90.0- 20.0-	ţ		- " many M	MAN PARAMETER L. LAND	Alfana				
10.0-				The state of the s					
10.0-	ом			100	ом			1.0	G

Table 4.3.9: Out of Band Spurious Emissions Measurements Transmitter Test Setup Photographs

Photographs				
	<b>Professional To</b>	esting, EMI, Inc.		
Test Method:	ANSI C63.4-2003: "Methods of Me			
Test Method.	Electrical and Electronic Equipmen	t in the Range of 9 kHz t	to 40 GHz" (incorporate	ed by
T 1 1/1	FCC Part 15.109 - Code of Federal	Regulations Part 47, Sub	part B - Unintentional	Radiators,
In accordance with: Section:	Radiated Emissions Limits 15.109			
Test Date(s):	7/20/2011	EUT Serial #:	1	
Customer:	LDAR Tools	EUT Part #:	N/A	
Project Number:	12346-10	Test Technician:	Layne Lueckemeyer	
Purchase Order #:	792	Supervisor:	Jason Haley	
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson	
	Radiated Emissions Photograph	s	Page:	1 of 1
Marie Control	10 mm			
SUNALA STATE				
			SHEDHED	
			A Personal Books	
10 151				
	三 三 三 三 三 三 三 三 三 三 三 三 三 三 三 三 三 三 三			
	EUT Front		EUT Close	
		VI THE	protection ( ) and (	
		100		
A		THE STATE OF		
MILE				
Ch CIR			A STATE OF THE STA	
		17/1/4		
		Talk Land		
			17 17	
		EVI CO		-
	EUT Side		EUT Rear	

# 5.0 Antenna Requirements

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

#### 5.1 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.

#### **5.2** 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.

# **5.3** Evaluation Results

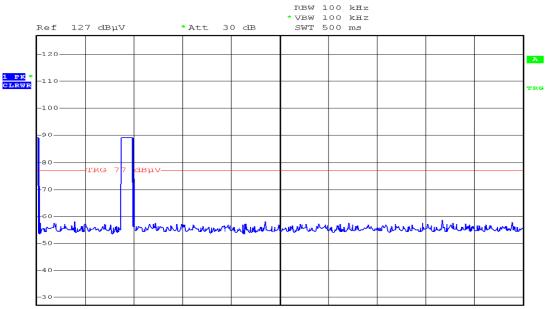
The Shepherd Personal Monitor met the criteria of this rule by virtue of having an internal antenna inaccessible to the user. Therefore, the EUT is compliant.

# 6.0 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 shows compliance to FCC 15.231(a)(2) as the unit ceases transmission within 5 seconds after activation. The EUT actually ceased transmission within 500 ms however it was observed beyond 5 seconds to ensure compliance to FCC 15.231(a)(2). Professional Testing (EMI), Inc. attests to the compliance of the Shepherd Base.

**Table 6.1 Timing Measurement** 

Table 0.1 Tilling is			
	Professional T	Testing, EMI, In	ıc.
Test Method:	ANSI C63.4–2009: "Methods of Voltage Electrical and Electron		
In accordance with:	FCC Part 15.231 - Code of Fedo	eral Regulations Part 4	7
Test Date(s):	7/20/2011	EUT Serial #:	N/A
Customer:	LDARTools	EUT Part #:	N/A
Project Number:	12346-10	Test Technician:	Layne Lueckemeyer
Purchase Order #:	791 / 792	Supervisor:	Jason Haley
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson
	15.3	231(a)(2)	



162.025 MHz

Date: 20.JUL.2011 08:00:59

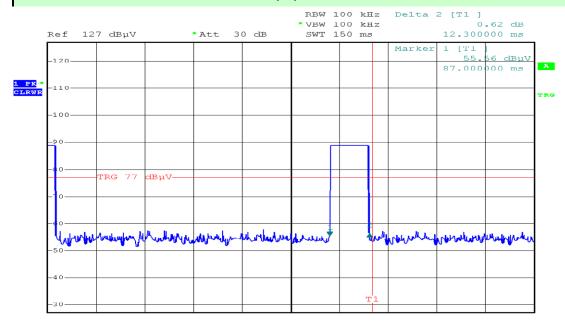
Span = 0 / RBW = 100kHz / VBW = 100kHz

# 7.0 **Duty Cycle Calculation**

# Table 7.1 Duty Cycle Measurements - Datasheet 1

	<b>Professional</b> T	Testing, EMI, I	10.
Test Method:	ANSI C63.4–2009: "Methods o Voltage Electrical and Electron		
In accordance with:	FCC Part 15.231 - Code of Fed	eral Regulations Part 4	7
Test Date(s):	7/20/2011	EUT Serial #:	N/A
Customer:	LDARTools	EUT Part #:	N/A
Project Number:	12346-10	Test Technician:	Layne Lueckemeyer
Purchase Order #:	791 / 792	Supervisor:	Jason Haley
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson

# **Duty Cycle Measurements**



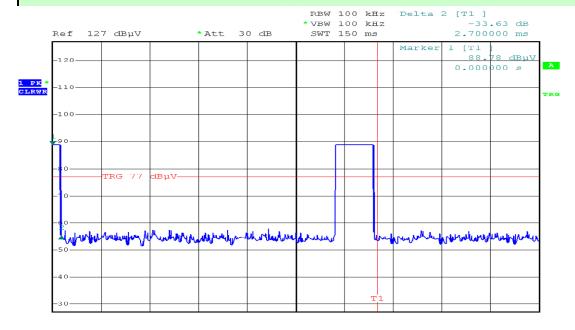
162.025 MHz

Date: 20.JUL.2011 08:02:22

Table 7.2 Duty Cycle Measurements - Datasheet 2

	Professional T	Testing, EMI, II	nc.
Test Method:	ANSI C63.4–2009: "Methods o Voltage Electrical and Electron		
In accordance with:	FCC Part 15.231 - Code of Fed	eral Regulations Part 4	17
Test Date(s):	7/20/2011	EUT Serial #:	N/A
Customer:	LDARTools	EUT Part #:	N/A
Project Number:	12346-10	Test Technician:	Layne Lueckemeyer
Purchase Order #:	791 / 792	Supervisor:	Jason Haley
Equip. Under Test:	Shepherd Personal Monitor	Witness' Name:	Jason Anderson

#### **Duty Cycle Measurements**



162.025 MHz Date: 20.JUL.2011 08:03:03

Period = 100 ms

Total on time over 100 ms = 12.3 ms + 2.7 ms = 15 msDuty Cycle Correction Factor =  $20 \log (15 \text{ms}) / 100 \text{ ms}$ 

Duty cycle Correction Factor = -16.5 dB Duty cycle = 15%

