



EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 102144226BOX-006a

Project Number: G102144226

Report Issue Date: 08/20/2015

Model(s) Tested: V9-VP

Model(s) Partially Tested: V9-SP
(Fundamental and harmonic frequencies
were tested on the V9-SP)

Standards: FCC Part 90:2015, " Private Land Mobile Radio Services"

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
LoJack Corporation
40 Pequot Way
Canton, MA 02021
USA

Report prepared by

Vathana Ven / Staff Engineer, EMC

Report reviewed by

Kouma Sinn / Staff Engineer, EMC

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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the products tested Comply with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	System Setup and Method	--
6	Transmitter Output Power (FCC 2.1046, 90.20(e)(6))	Pass
7	Transmitter Occupied Bandwidth (FCC 2.1049, 90.20(e)(6))	Pass
8	Transmitter Frequency Stability (FCC 2.1055, 90.213)	Pass
9	Transient Frequency Behavior (FCC 2.1055, 90.214)	Pass
10	Transmitter Emissions Mask (FCC 90.210(d))	Pass
11	Transmitter Out-of-Band Unwanted Emissions, Radiated (FCC 2.1053, 90.210(d))	Pass
12	Receiver Radiated Spurious Emissions (FCC 2.1053, 90.210(d))	Pass
13	Revision History	--

3 Client Information

This EUT was tested at the request of:

Client: LoJack Corporation
40 Pequot Way
Canton, MA 02021
USA

Contact: Vincent Ricci
Telephone: (781) 302-4332
Fax: Not provided
Email: vricci@lojack.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: LoJack Corporation
40 Pequot Way
Canton, MA 02021
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Vehicle Location Unit	LoJack Corporation	V9-VP	0F4B036
Vehicle Location Unit	LoJack Corporation	V9-SP	0F4B02B

Receive Date:	07/13/2015
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)

The equipment under test is a vehicle location unit

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
3.6 & 7.2 VDC	Not label on the device	N/A	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	The Vehicle Location Unit was powered from internal 3.6V & 7.2V Lithium battery pack and was programmed to transmit continuously during testing. During the frequency stability and the transient frequency behavior testing, unmodulated carrier was used.

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	None

Radio/Receiver Characteristics	
Frequency Band(s)	173.075 MHz
Modulation Type(s)	FSK and MSK
Maximum Output Power	24.63 dBm or 0.29 W
Test Channels	1
Occupied Bandwidth	13.38 kHz for MSK and 0.7 kHz for FSK
Frequency Hopper: Number of Hopping Channels	N/A
Frequency Hopper: Channel Dwell Time	N/A
Frequency Hopper: Max interval between two instances of use of the same channel	N/A
MIMO Information (# of Transmit and Receive antenna ports)	N/A
Equipment Type	Standalone
ETSI LBT/Adaptivity	N/A
ETSI Adaptivity Type	N/A
ETSI Temperature Category (I, II, III)	N/A
ETSI Receiver Category (1, 2, 3)	N/A
Antenna Type and Gain	Integrated antenna

5 System Setup and Method

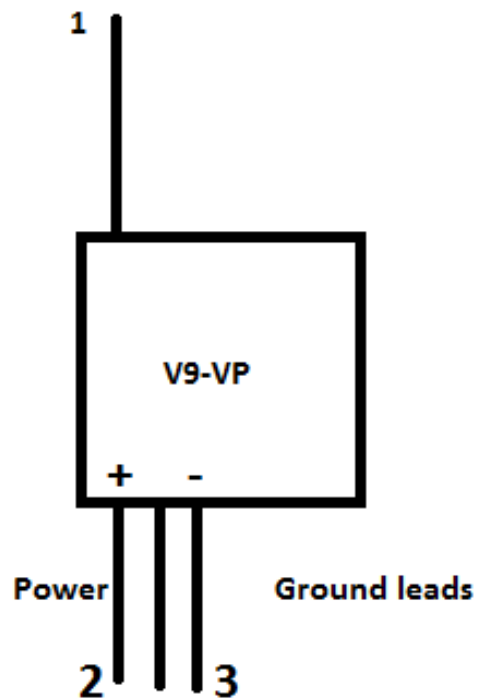
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	Antenna	1.067	None	None	Antenna
2	DC Ground	0.4	None	None	None
3	Control	0.4	None	None	None

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

5.1 Method:

Configuration as required by ANSI C63.10:2013.

5.2 EUT Block Diagram:



6 Transmitter Output power

6.1 Method

Tests are performed in accordance with FCC 2.1046, 90.20(e)(6).

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisprr
Radiated Emissions, 10m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.2 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.2 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$
$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
ANT1A'	BROADBAND ANTENNA	Compliance Design	B100	1649	11/04/2014	11/04/2015
HEW62'	Synthesized Sweep Generator	Hewlett Packard	83620A	3213A01244	05/13/2015	05/13/2017
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015

Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.8231.8221) SP3
EMI Boxborough.xls	Intertek	08/27/10

6.3 Results:

Transmitter output power shall be within ± 1.0 dB of the manufacturer's rated power.

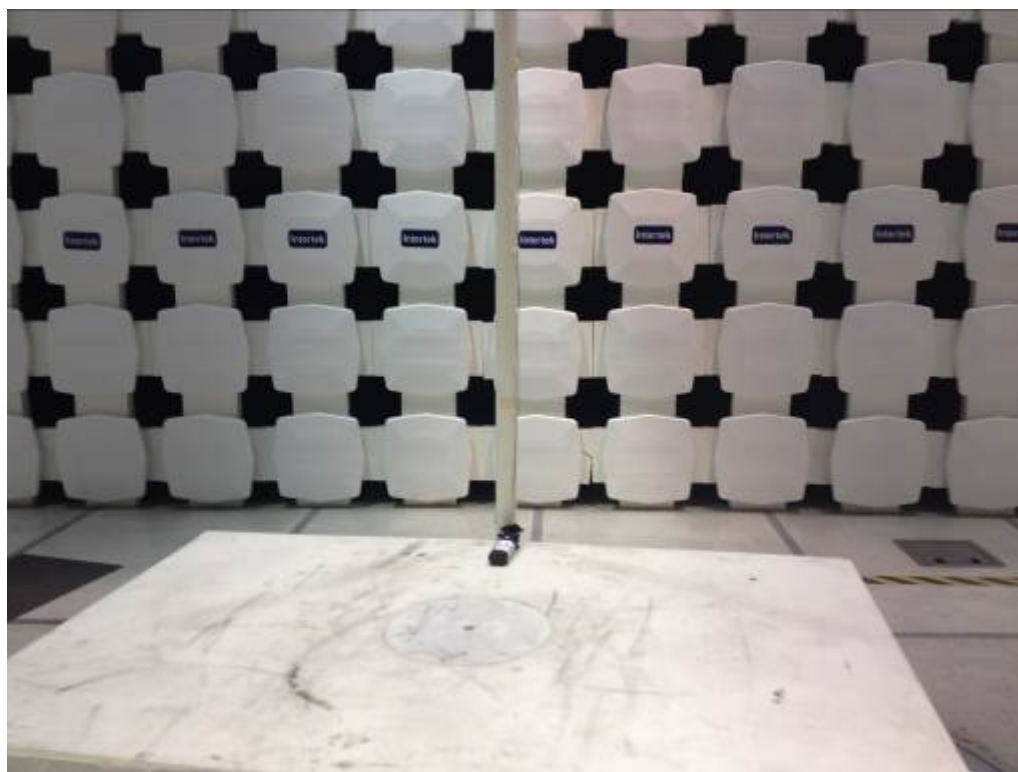
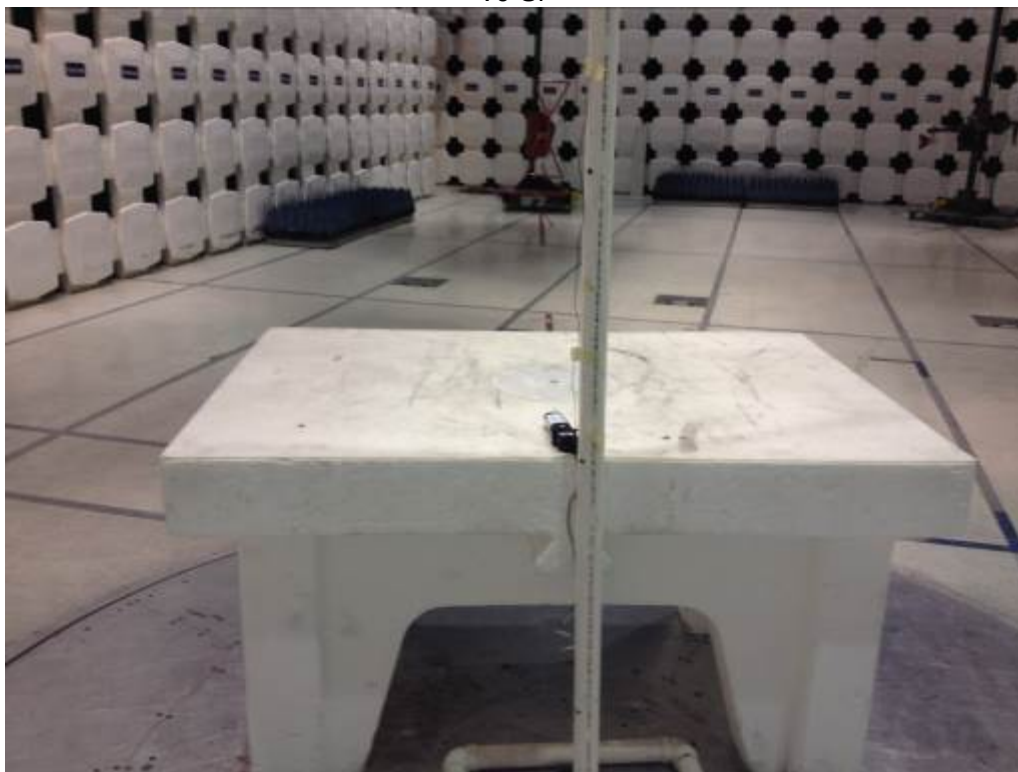
The samples tested were found to Comply.

6.4 Setup Photographs:

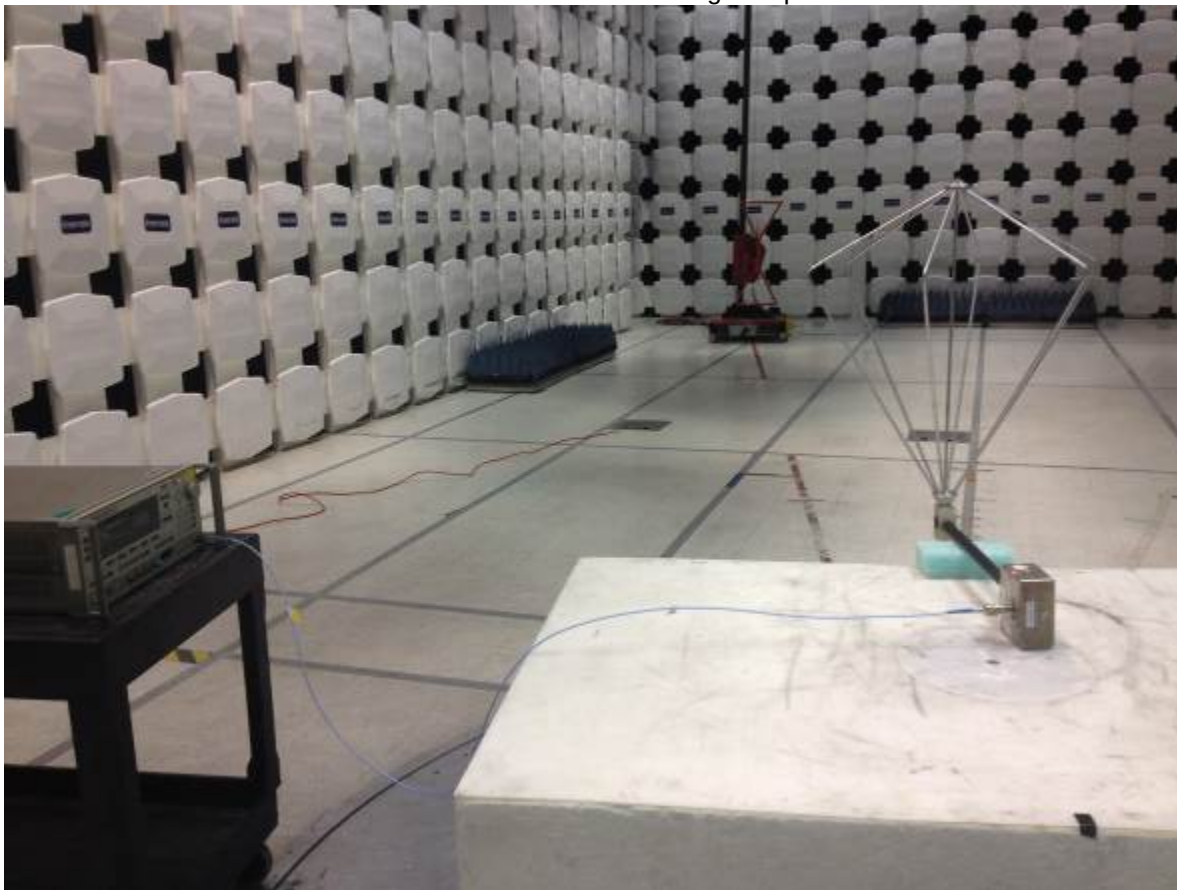
V9-VP



V9-SP



Substitution Method Testing Setup



6.5 Test Data:

Radiated Emissions, Substitution

Company: LoJack Corporation
 Model #: V9-VP
 Serial #: 0F4B036
 Engineer(s): Vathana Ven
 Project #: G102144226
 Standard: FCC Part 15 Subpart B Class B
 Barometer: DAV004 Temp/Humidity/Pressure: 22 deg. C 44% 1000 mB
 Test Distance (m): 10 Voltage/Frequency: Battery
 Net = Generator Level (0.00 dBm) + (EUT reading - Generator reading) - Cable Loss + Antenna Gain (dBi or dBd)
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor RB = Restricted Band; Bandwidth denoted as RBW/VBW

Rx Antenna: 145-106 ETS001
 Rx Cable(s): 10mTrack 145-410
 Rx Preamp: PRE145-014 Receiver: 145-128
 Tx Antenna: ETS002 ANT1 REA003
 Tx Cable(s): CBLHF2012-2M-1
 Tx Signal Generator: HEW62
 ERP or EIRP?: ERP
 Frequency Range: 30MHz-2GHz

Date(s): 07/13/15 7/15/2015
 Location: 10m Chamber

Detector Type	Ant. Pol. (V/H)	Frequency MHz	EUT Reading dB(uV)	Generator Reading dB(uV)	Transmit Cable Loss dB	Transmit Antenna dBi	Generator Level dBm	Net dBm	Limit dBm	Margin dB	Bandwidth
V9-VP_FSK_Transmit Mode @ 10m with no pre-amp											
MaxH PK	V	173.062	102.51	55.08	0.10	-2.00	-20.00	23.18	34.00	-10.82	120/300 kHz
V9-VP_MSK_Transmit Mode @ 10m with no pre-amp											
MaxH PK	V	173.062	103.96	55.08	0.10	-2.00	-20.00	24.63	34.00	-9.37	120/300 kHz

Radiated Emissions, Substitution

Company: LoJack Corporation
 Model #: V9-SP
 Serial #: 0F4B02B
 Engineer(s): Vathana Ven
 Project #: G102144226
 Standard: FCC Part 15 Subpart B Class B
 Barometer: DAV004 Temp/Humidity/Pressure: 22 deg. C 44% 1000 mB
 Test Distance (m): 10 Voltage/Frequency: Battery
 Net = Generator Level (0.00 dBm) + (EUT reading - Generator reading) - Cable Loss + Antenna Gain (dBi or dBd)
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor RB = Restricted Band; Bandwidth denoted as RBW/VBW

Rx Antenna: 145-106 ETS002
 Rx Cable(s): 10mTrack 145-410
 Rx Preamp: PRE145-014 Receiver: 145-128
 Tx Antenna: ETS002 ANT1 REA003
 Tx Cable(s): CBLHF2012-2M-1
 Tx Signal Generator: HEW62
 ERP or EIRP?: ERP
 Frequency Range: 30MHz-2GHz

Date(s): 07/13/15 7/15/2015
 Location: 10m Chamber

Detector Type	Ant. Pol. (V/H)	Frequency MHz	EUT Reading dB(uV)	Generator Reading dB(uV)	Transmit Cable Loss dB	Transmit Antenna dBi	Generator Level dBm	Net dBm	Limit dBm	Margin dB	Bandwidth
V9-SP_FSK_Transmit Mode @ 10m with no pre-amp											
MaxH PK	V	173.062	100.96	55.08	0.10	-2.00	-20.00	21.63	34.00	-12.37	120/300 kHz
V9-SP_MSK_Transmit Mode @ 10m with no pre-amp											
MaxH PK	V	173.062	103.09	55.08	0.10	-2.00	-20.00	23.76	34.00	-10.24	120/300 kHz

Test Personnel: Vathana Ven
 Supervising/Reviewing Engineer: N/A
 (Where Applicable)
 Product Standard: FCC Part 90
 Input Voltage: 12VDC (Car Battery) + 6VDC (Internal Battery)
 Pretest Verification w/ Ambient Signals or BB Source: Yes

Test Date: 07/13/2015, 07/15/2015

Limit Applied: Below specified limits

Ambient Temperature: 22 °C

Relative Humidity: 44 %

Atmospheric Pressure: 1000 mbars

Deviations, Additions, or Exclusions: None

7 Transmitter Occupied Bandwidth

7.1 Method

Tests are performed in accordance with FCC 2.1049, 90.20(e)(6).

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisprr
Radiated Emissions, 10m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.2 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.2 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61 A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwarz	FSEK-30	100225	06/04/2015	06/04/2016

Software Utilized:

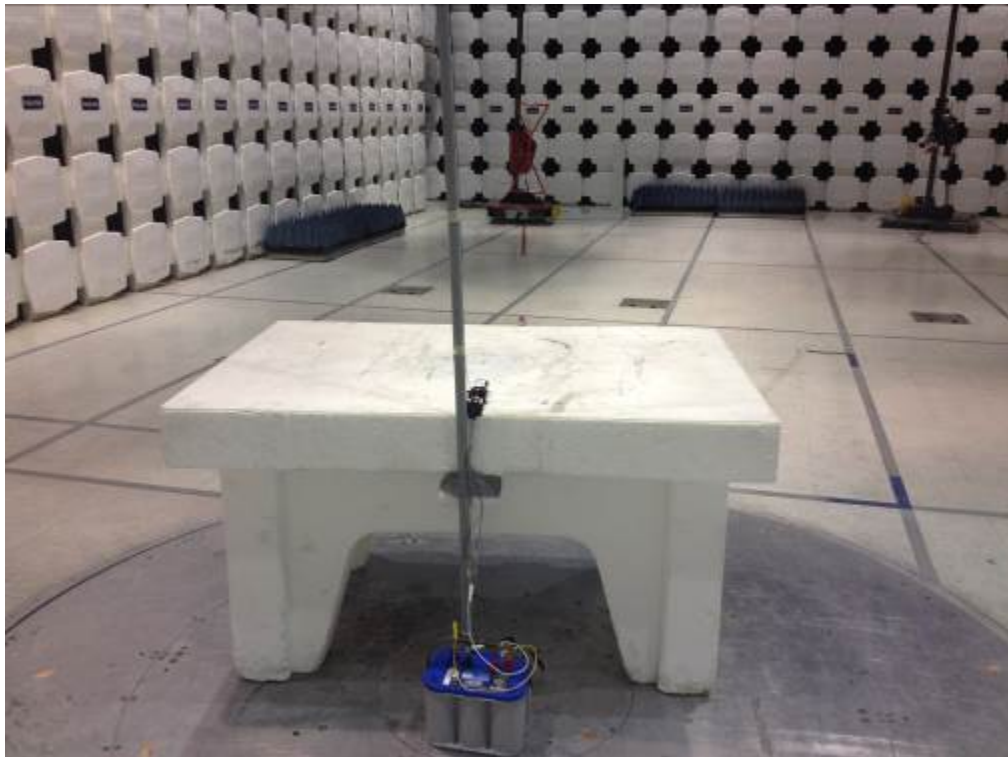
Name	Manufacturer	Version
None		

7.3 Results:

The sample tested was found to Comply.

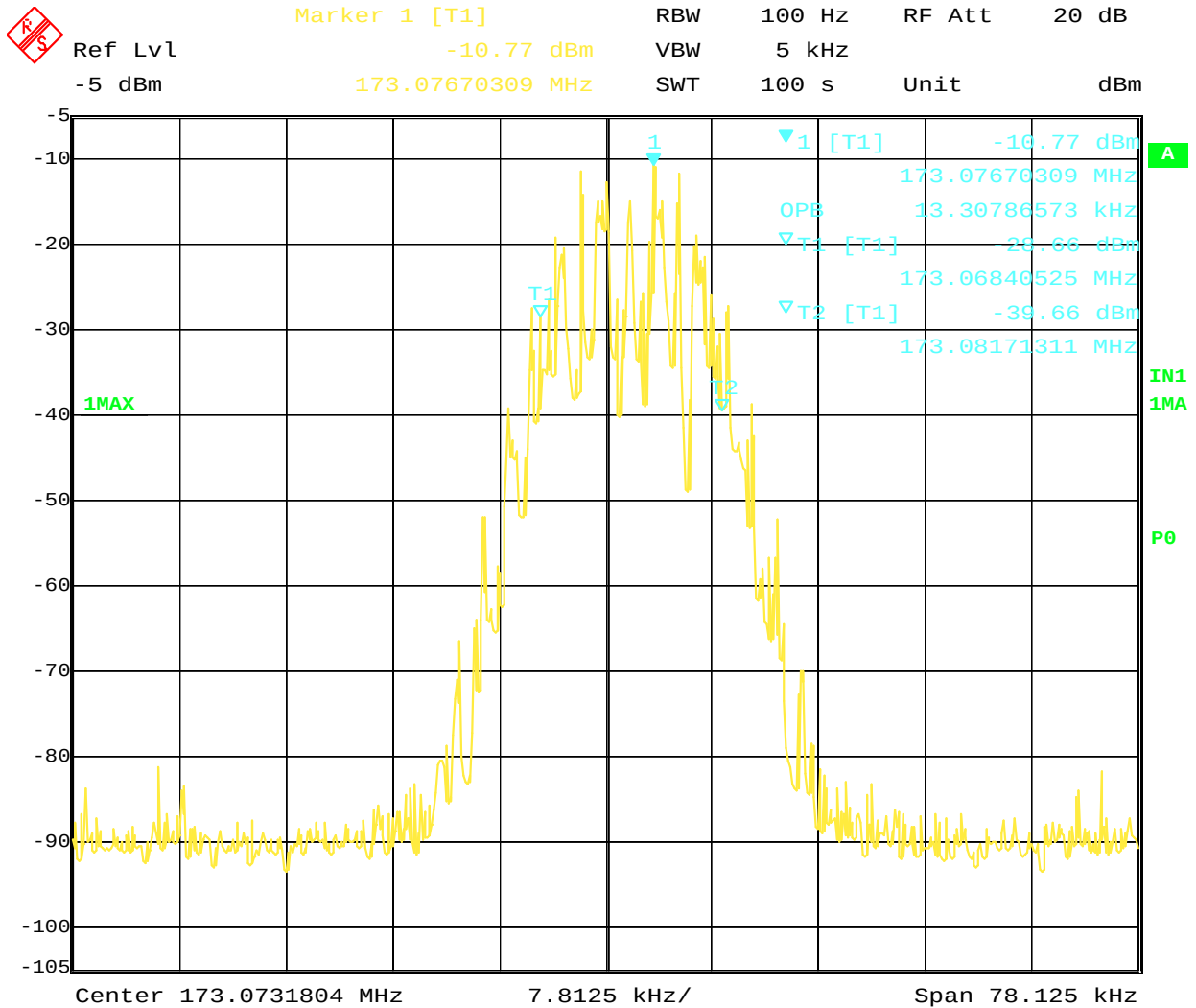
7.4 Setup Photographs:

V9-VP



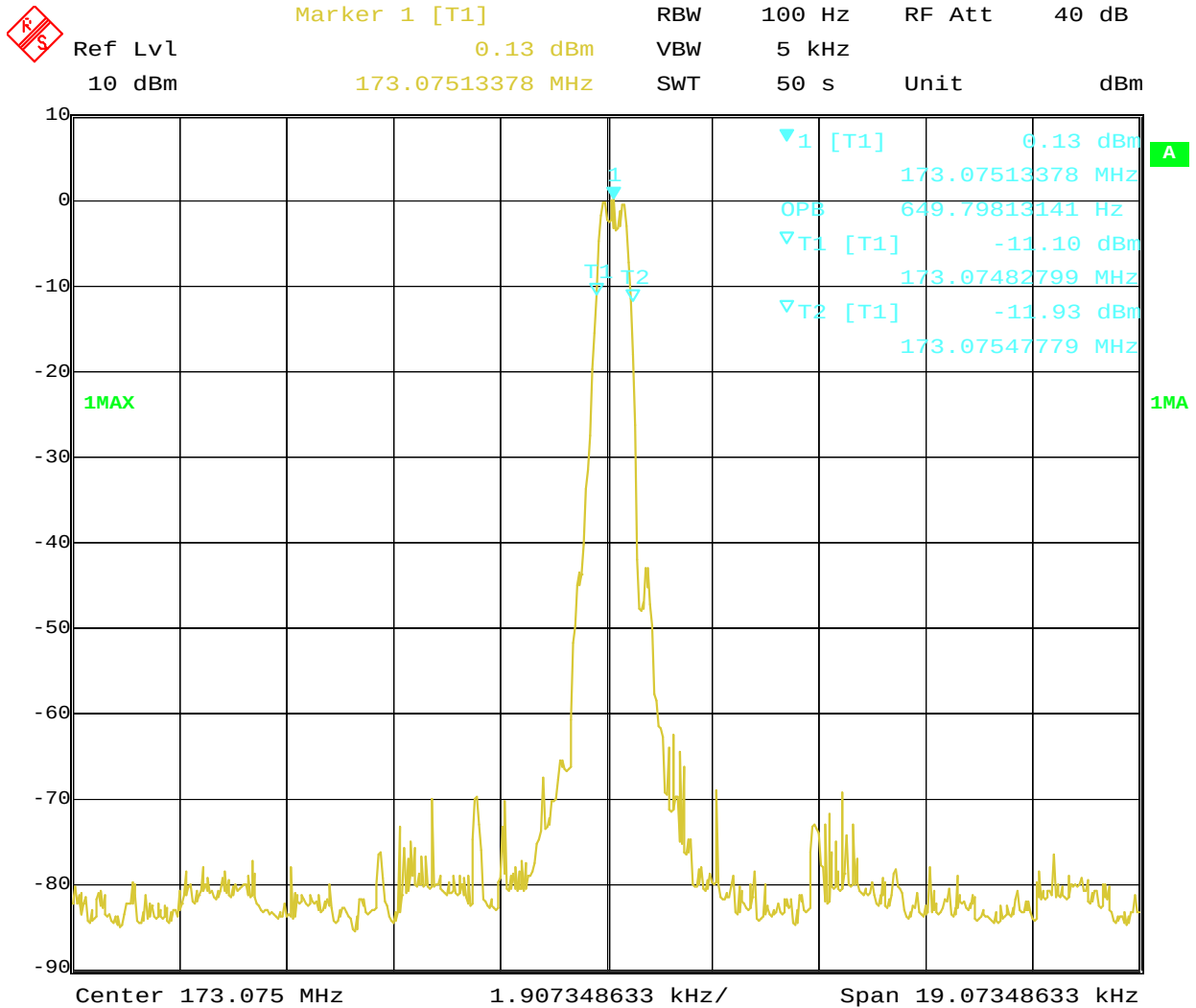
7.5 Plots/Data:

MSK, 13.308 kHz



Date: 14.JUL.2015 20:27:43

FSK, 0.650 kHz



Date: 1.JAN.1997 01:37:39

The plot above was with spectrum analyzer set to the manufacture default date. The actual test date was 07/13/2015.

Test Personnel: <u>Vathana Ven <i>VSV</i></u>	Test Date: <u>07/13/2015, 07/14/2015</u>
Supervising/Reviewing Engineer: <u>N/A</u>	
(Where Applicable) Product Standard: <u>FCC Part 90</u>	Limit Applied: <u>Below specified limits</u>
Input Voltage: <u>12VDC (Car Battery) + 6VDC (Internal Battery)</u>	
Pretest Verification w/ Ambient Signals or BB Source: <u>Yes</u>	Ambient Temperature: <u>22 °C</u>
	Relative Humidity: <u>44 %</u>
	Atmospheric Pressure: <u>1000 mbars</u>

Deviations, Additions, or Exclusions: None

8 Transmitter Frequency Stability

8.1 Method

Tests are performed in accordance with FCC 2.1055, 90.213.

TEST SITE: Safety Lab

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
CBLBNC10'	25 ft, 50 Ohm BNC Cable	Pomona	RG 58 C/U	CBLBNC10	10/04/2014	10/04/2015
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	06/04/2015	06/04/2016
148013'	Temp/Humidity Chamber	Envirotronics	SH27C	08015563S11264	09/19/2014	09/19/2015
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015

Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.8231.8221) SP3
EMI Boxborough.xls	Intertek	08/27/10

8.3 Results:

The sample tested was found to comply.

8.4 Setup Photographs:

Frequency Stability Test Setup Photo 1



Frequency Stability Test Setup Photo 2



8.5 Test Data:**Frequency Stability**

Company: LoJack Corporation

Model #: V9-VP

Serial #: 0F4B036

Engineer(s): Vathana Ven

Project #: G102144226

Standard: FCC Part 90

Limit: 50 PPM

Nominal f: 173.075 MHz

Location: Safety

Test Equipment Used:

DAV004 148013(ENV1)

ROS001 CBLBNC10

22 deg C

46% 1008 mB

Voltage: 3.6 & 7.2 VDC

Temp Celsius	Frequency MHz	Deviation kHz	Limit kHz
-30	173.064064	-0.00022	8.65
-20	173.064064	0	8.65
-10	173.064064	0	8.65
0	173.063355	-0.70948	8.65
10	173.064064	0	8.65
20	173.064064	0	8.65
30	173.064403	0.33869	8.65
40	173.064000	-0.06422	8.65
50	173.064064	-0.00022	8.65

Test Personnel: Vathana VenProduct Standard: FCC Part 90Input Voltage: 12VDC (Car Battery) +
6VDC (Internal Battery)Pretest Verification w/
BB Source: N/ATest Date: 07/16/2015Test Levels: Below specified limitsAmbient Temperature: 22 °CRelative Humidity: 46 %Atmospheric Pressure: 1008 mbars

Deviations, Additions, or Exclusions: None

9 Transient Frequency Behavior

9.1 Method

Tests are performed in accordance with FCC 2.1055, 90.214.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisprr
Radiated Emissions, 10m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.2 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.2 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015'
ROS002'	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	07/23/2015	07/23/2016'
ROS004'	Vector Signal Generator, 300kHz-3.3GHz	Rohde & Schwartz	SMIQ03B	100338	11/20/2013	11/20/2015'
CBLHF2012 -5M-1'	5m 9kHz-40GHz Coaxial Cable - SET 1	Huber & Suhner	SF102	252676001	02/05/2015	02/05/2016'
MIN005'	Splitter/Combiner 2-Way 10-2000 MHz	Mini Circuits	ZESC-2-11	none	12/02/2003	Verified
CBLBNC10'	25 ft, 50 Ohm BNC Cable	Pomona	RG 58 C/U	CBLBNC10	10/04/2014	10/04/2015'
AGL002'	1GHz 4CH O'Scope	Agilent Technologies	DSO6104A	MY44008115	08/05/2015	08/05/2016'
HEW65'	Measuring Receiver	Hewlett Packard	8902A	3749A04397	08/19/2013	08/19/2015'

Software Utilized:

Name	Manufacturer	Version
None		

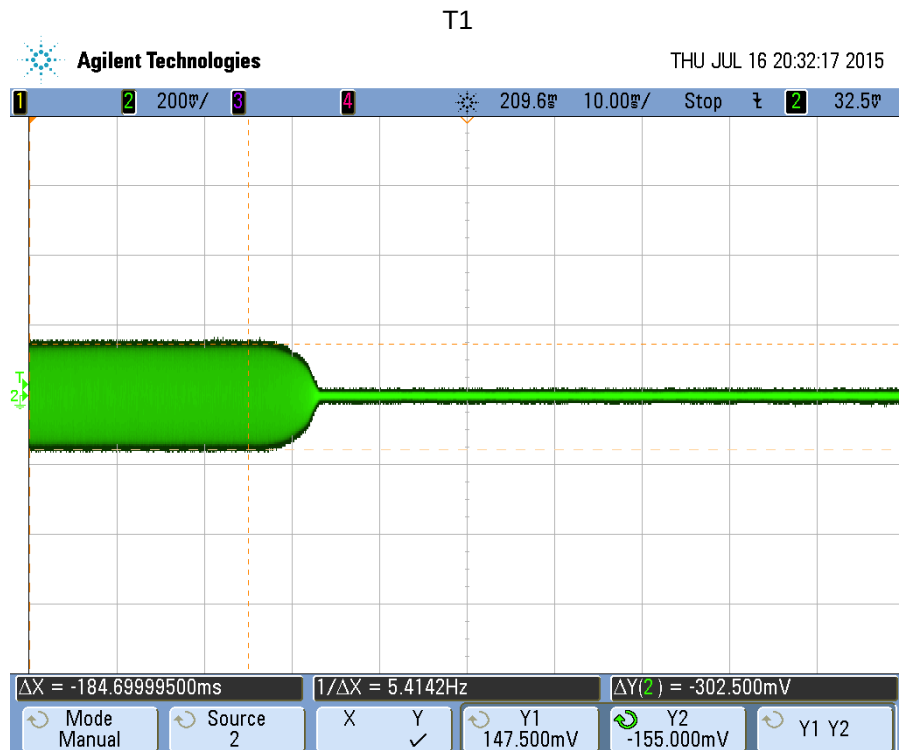
9.3 Results:

The sample tested was found to comply.

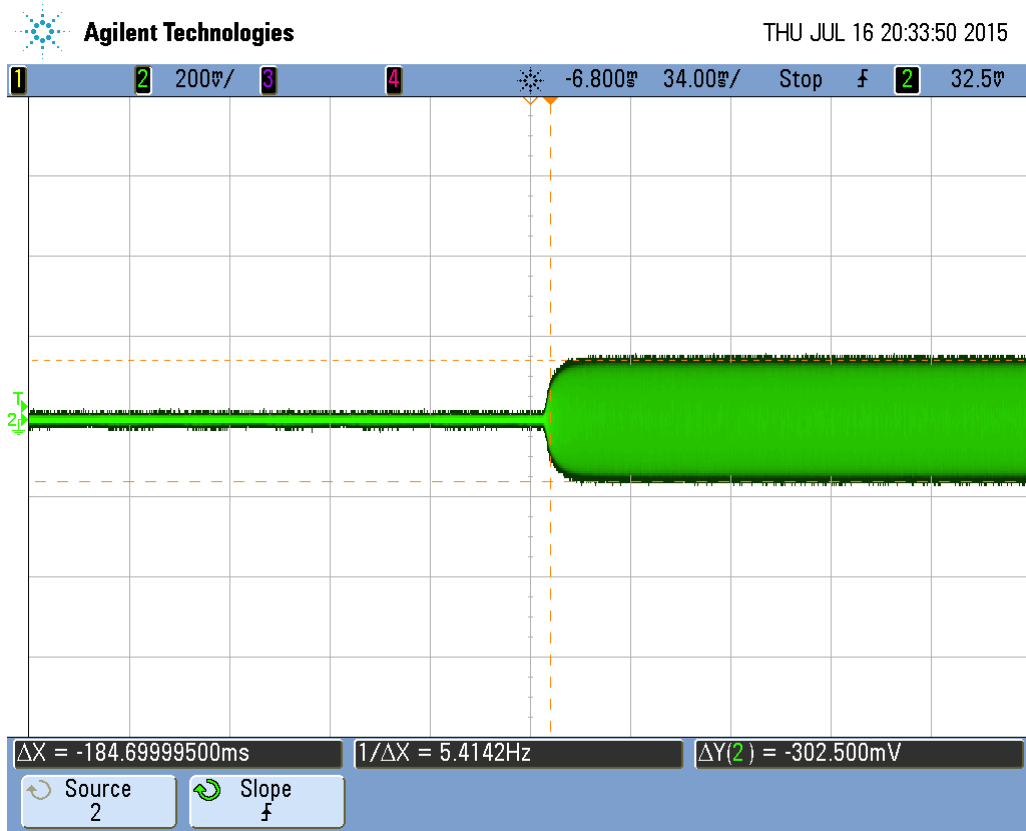
9.4 Setup Photographs:



9.5 Test Data:



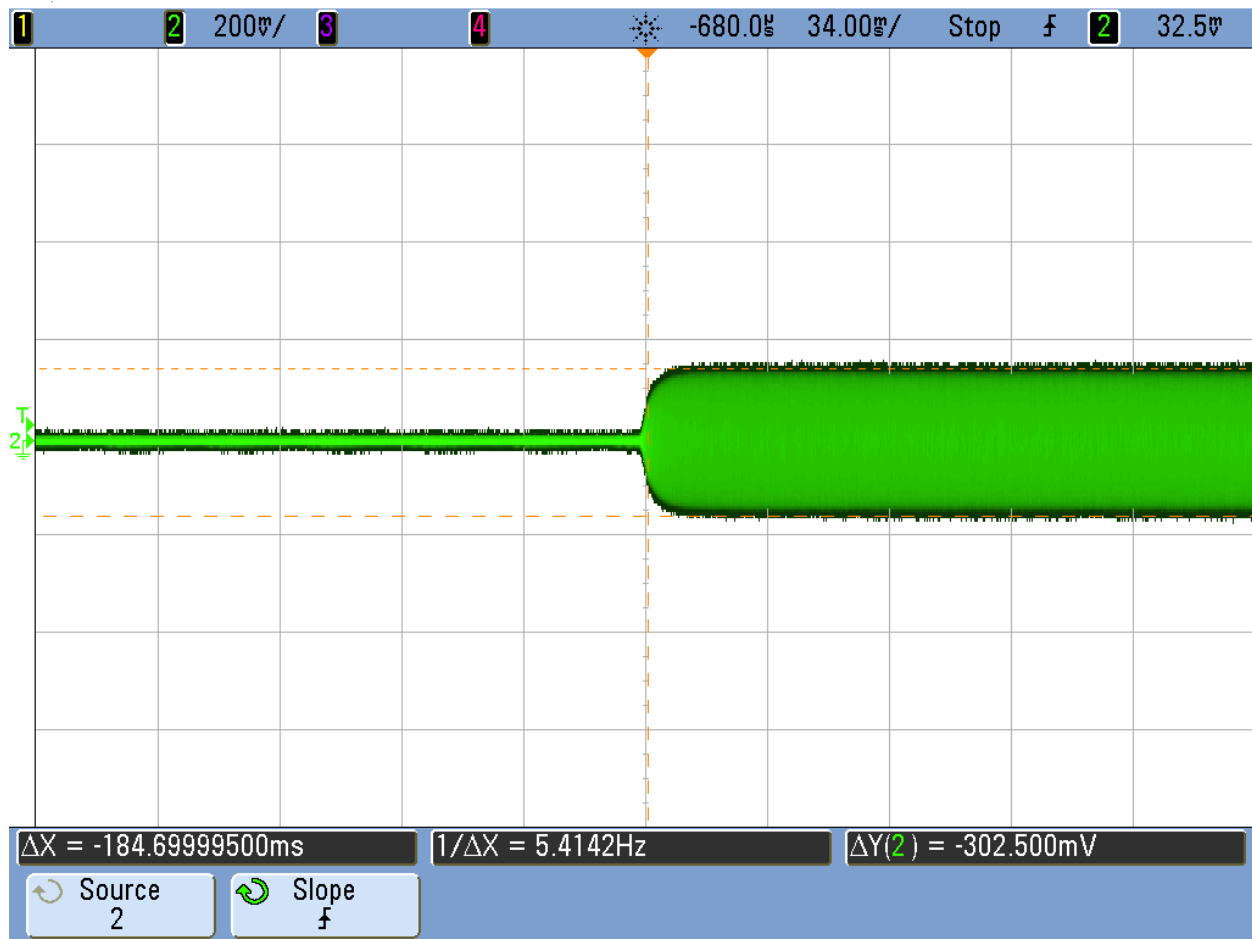
T2





Agilent Technologies

THU JUL 16 20:34:08 2015



Test Personnel: Vathana Ven
Product Standard: FCC Part 90
Input Voltage: 12VDC (Car Battery) + 6VDC (Internal Battery)

Pretest Verification w/
BB Source: N/A

Test Date: 07/16/2015
Test Levels: Below specified limits

Ambient Temperature: 22 °C

Relative Humidity: 46 %

Atmospheric Pressure: 1008 mbars

Deviations, Additions, or Exclusions: None

10 Transmitter Emissions Mask

10.1 Method

Tests are performed in accordance with FCC 90.210(c).

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisprr
Radiated Emissions, 10m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.2 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.2 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

10.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015

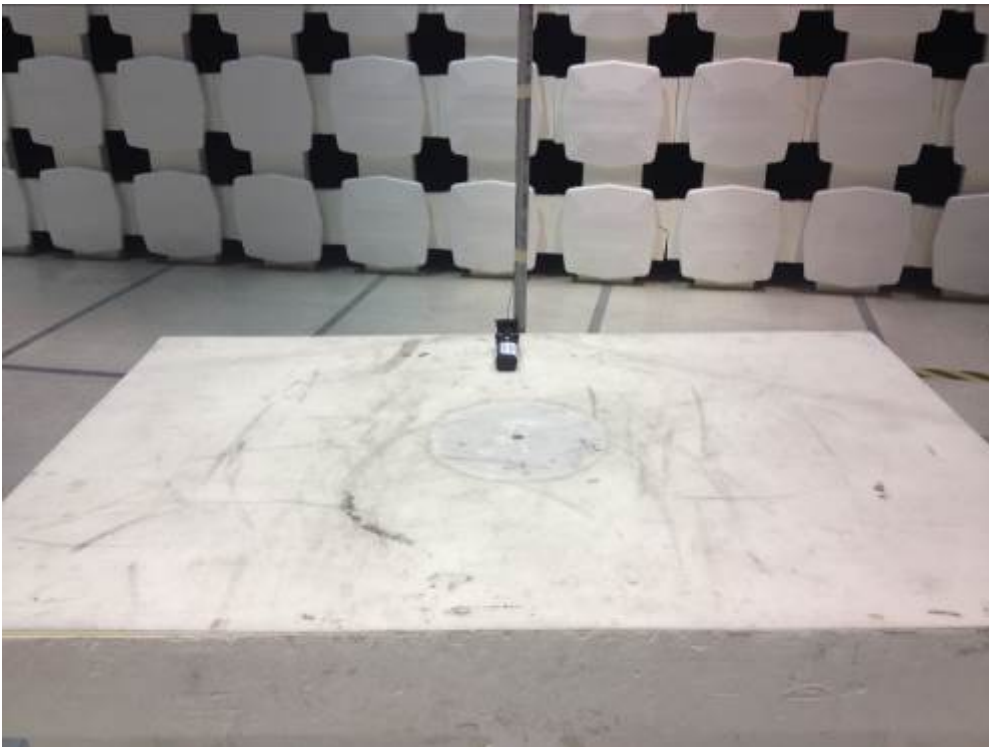
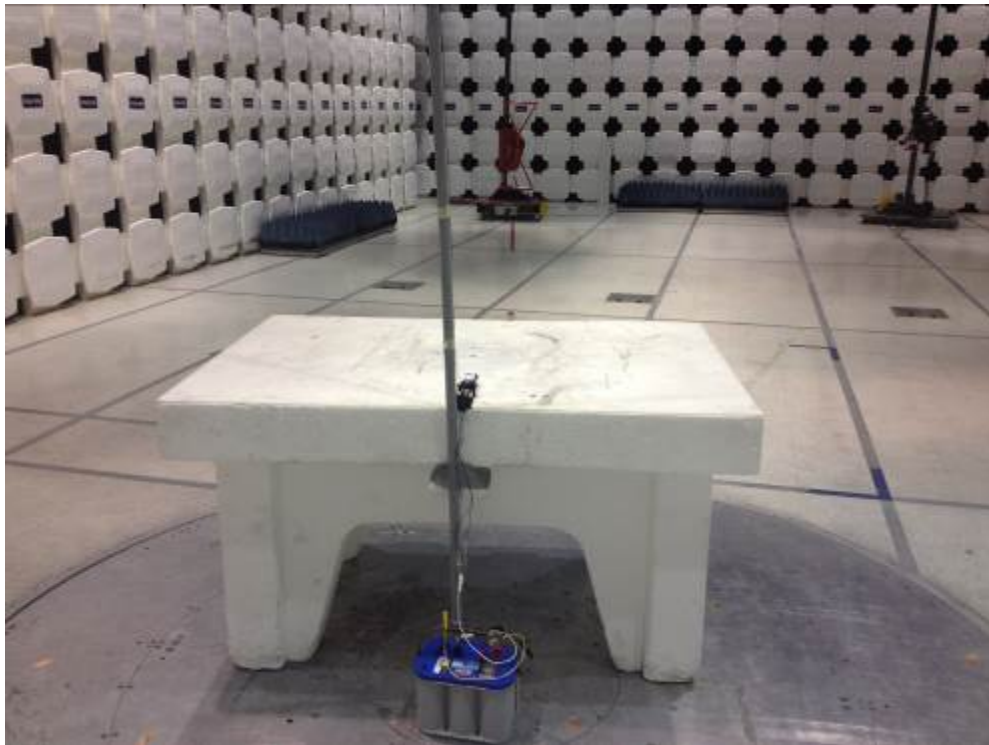
Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.8231.8221) SP3
EMI Boboxborough.xls	Intertek	08/27/10

10.3 Results:

The samples tested were found to comply.

10.4 Setup Photographs:



10.5 Test Data:

MSK



Ref Lvl
0 dBm

Marker 1 [T1]

-15.67 dBm

173.07332651 MHz

RBW

100 Hz

RF Att

30 dB

VBW

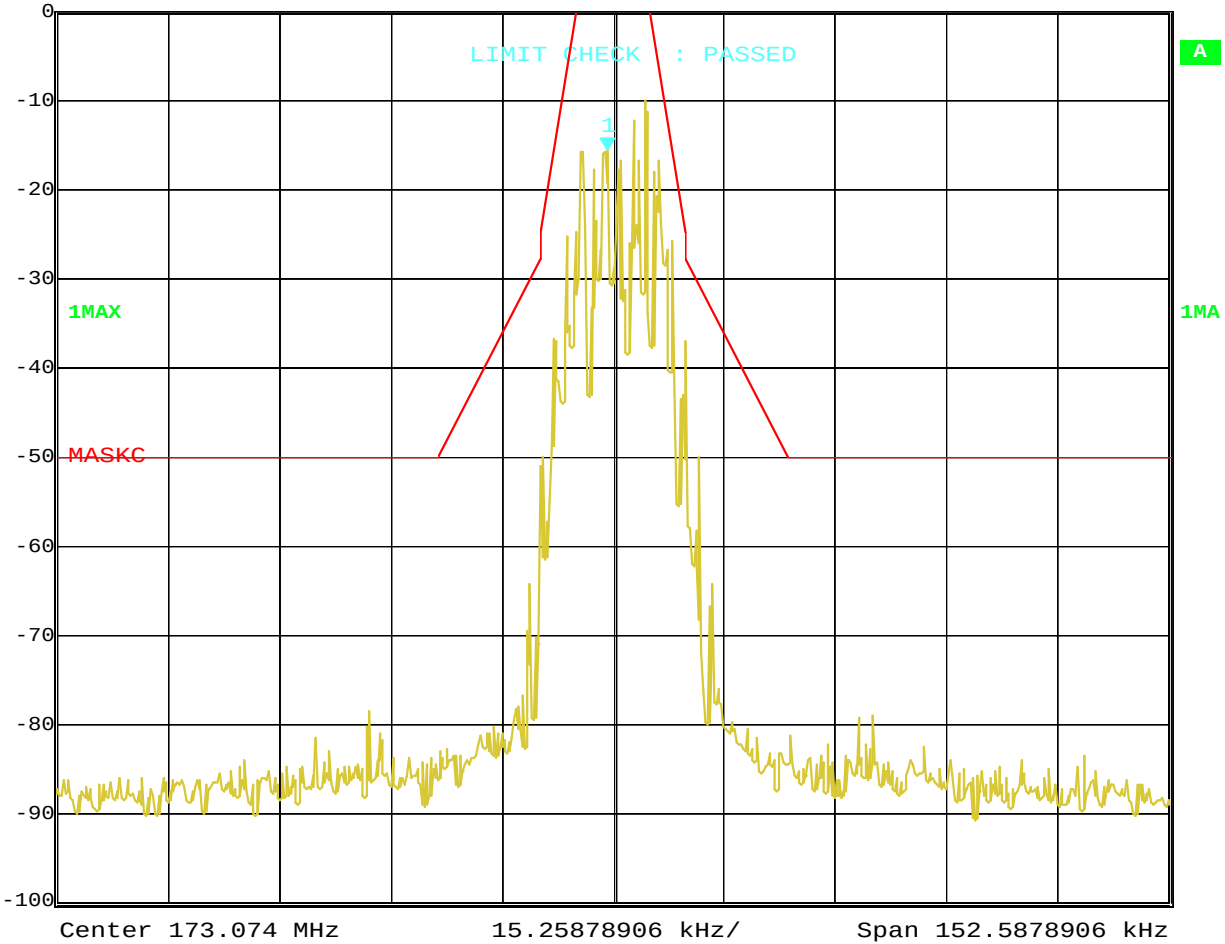
5 kHz

SWT

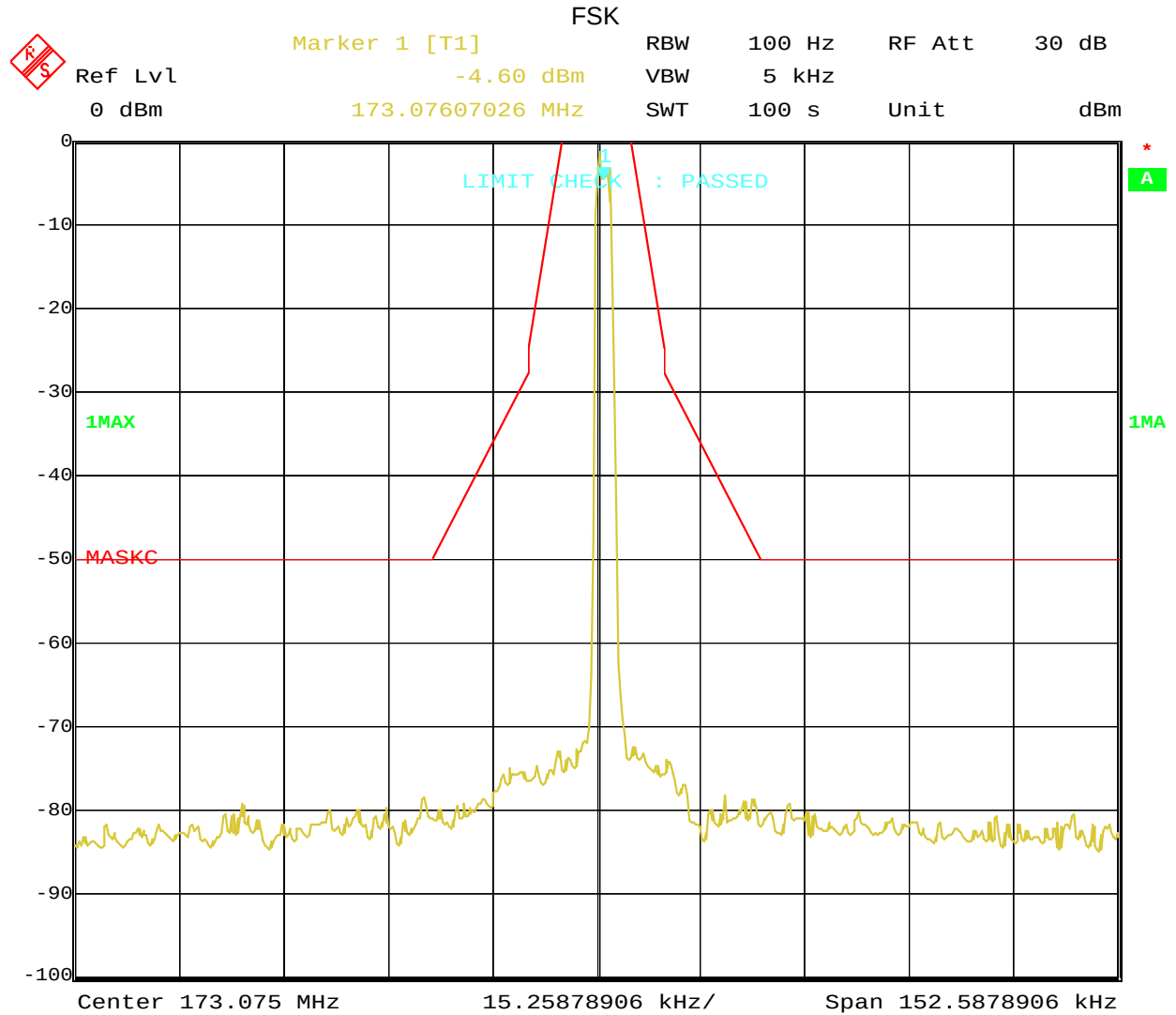
78 s

Unit

dBm



Date: 1.JAN.1997 00:59:43



Date: 1.JAN.1997 01:25:55

Test Personnel: Vathana Ven *VSV*
 Product Standard: FCC Part 90
 Input Voltage: 12VDC (Car Battery) + 6VDC (Internal Battery)
 Pretest Verification w/ BB Source: N/A

Test Date: 07/16/2015
 Test Levels: Below specified limits

Ambient Temperature: 22 °C
 Relative Humidity: 46 %
 Atmospheric Pressure: 1008 mbars

Deviations, Additions, or Exclusions: None

11 Transmitter Out-Of-Band Unwanted Emissions

11.1 Method

Tests are performed in accordance with FCC 2.1053, 90.210(d).

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.2 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.2 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 52.0 dB μ V
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dB μ V/m

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$
$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$

11.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
ETS002'	1-18GHz DRG Horn Antenna	ETS Lindgren	3117	00143260	04/10/2015	04/10/2016
ANT1A'	BROADBAND ANTENNA	Compliance Design	B100	1649	11/04/2014	11/04/2015
ANT1B'	BROADBAND ANTENNA	Compliance Design	B200	1650	11/04/2014	11/04/2015
ANT1C'	BROADBAND ANTENNA	Compliance Design	B300	00668	11/04/2014	11/04/2015
REA003'	1GHz High Pass Filter	Reactel, Inc	7HS-1G/10G-S11	06-1	12/30/2013	12/30/2015
HEW62'	Synthesized Sweep Generator	Hewlett Packard	83620A	3213A01244	05/13/2015	05/13/2017
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/13/2015	05/13/2016
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015
CBLHF2012 -2M-1'	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/05/2015	02/05/2016

Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.8231.8221) SP3
EMI Boxborough.xls	Intertek	08/27/10

11.3 Results:

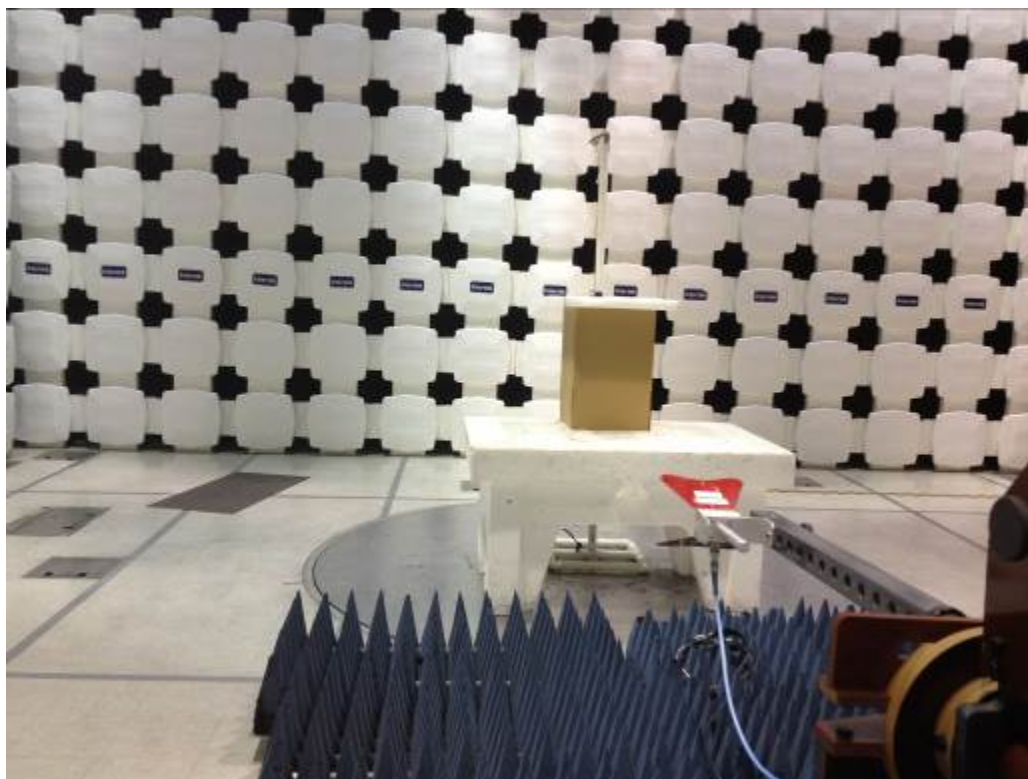
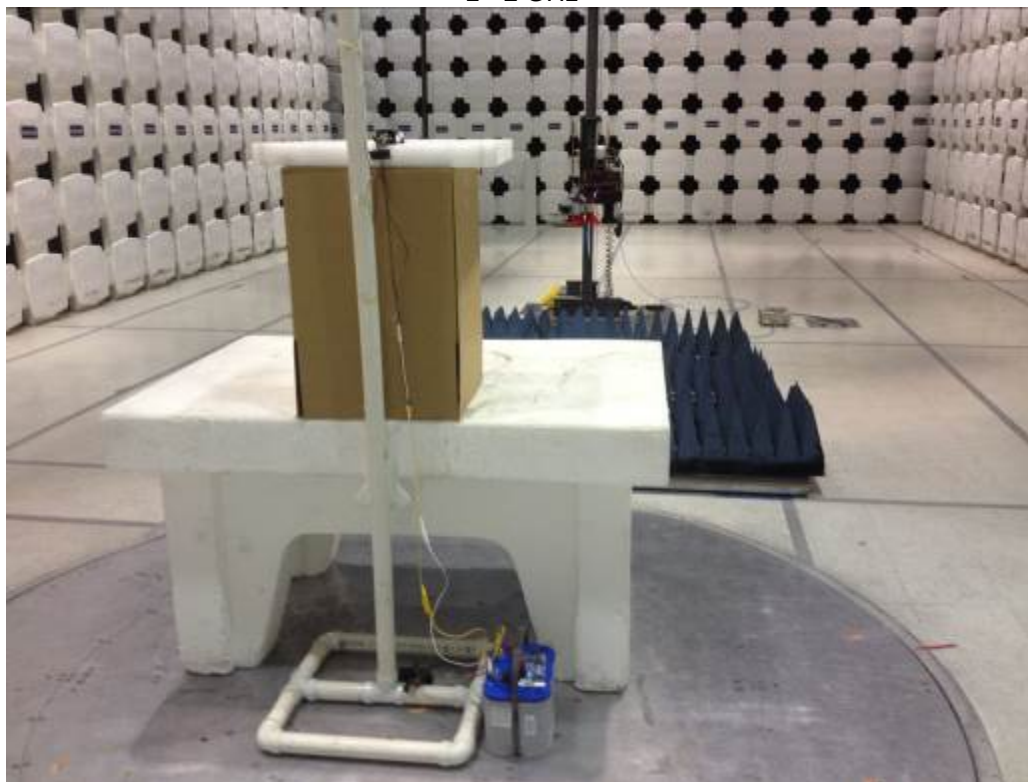
The sample tested was found to comply.

11.4 Setup Photographs:

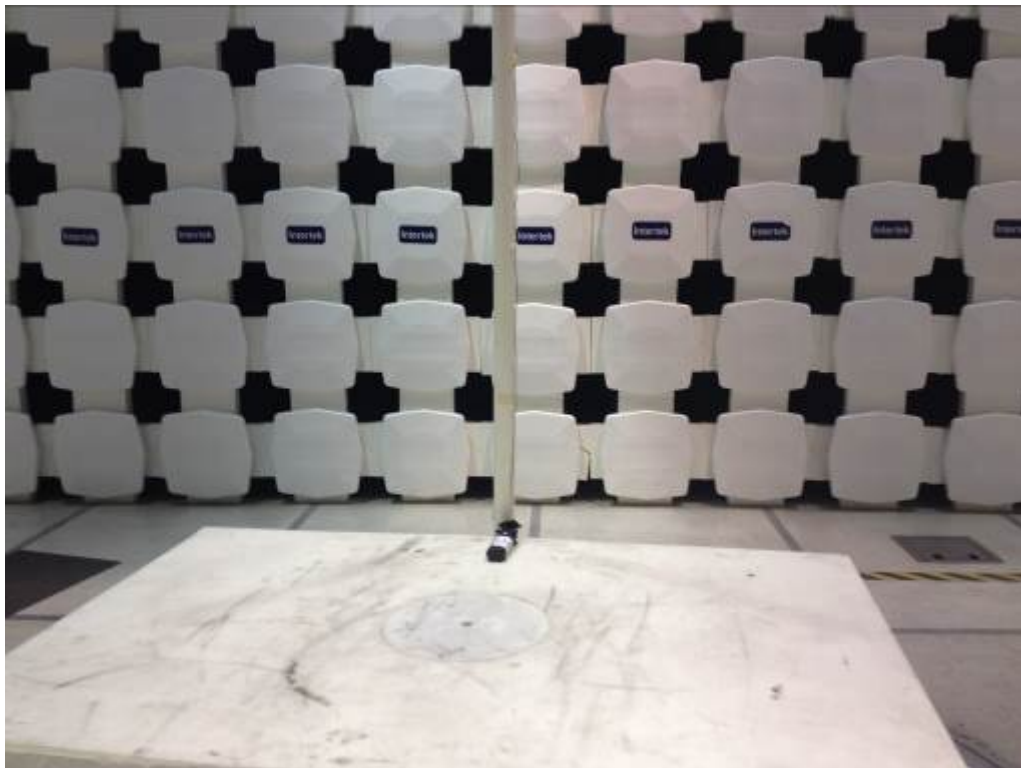
V9-VP, 30 – 1000 MHz



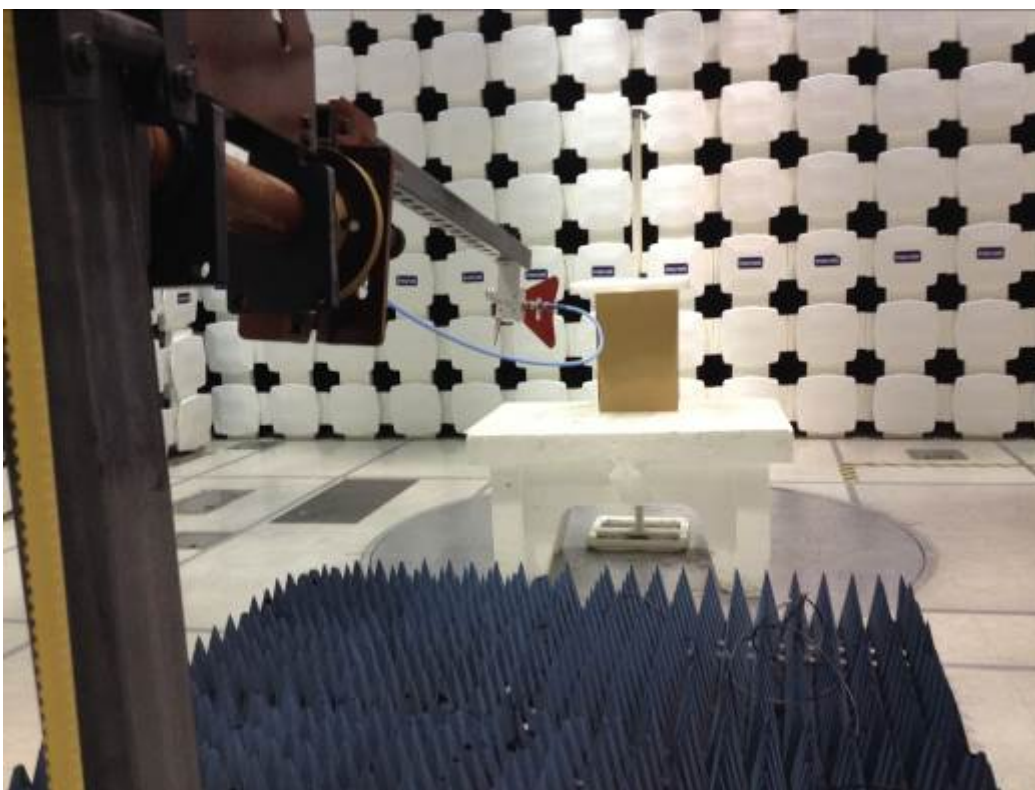
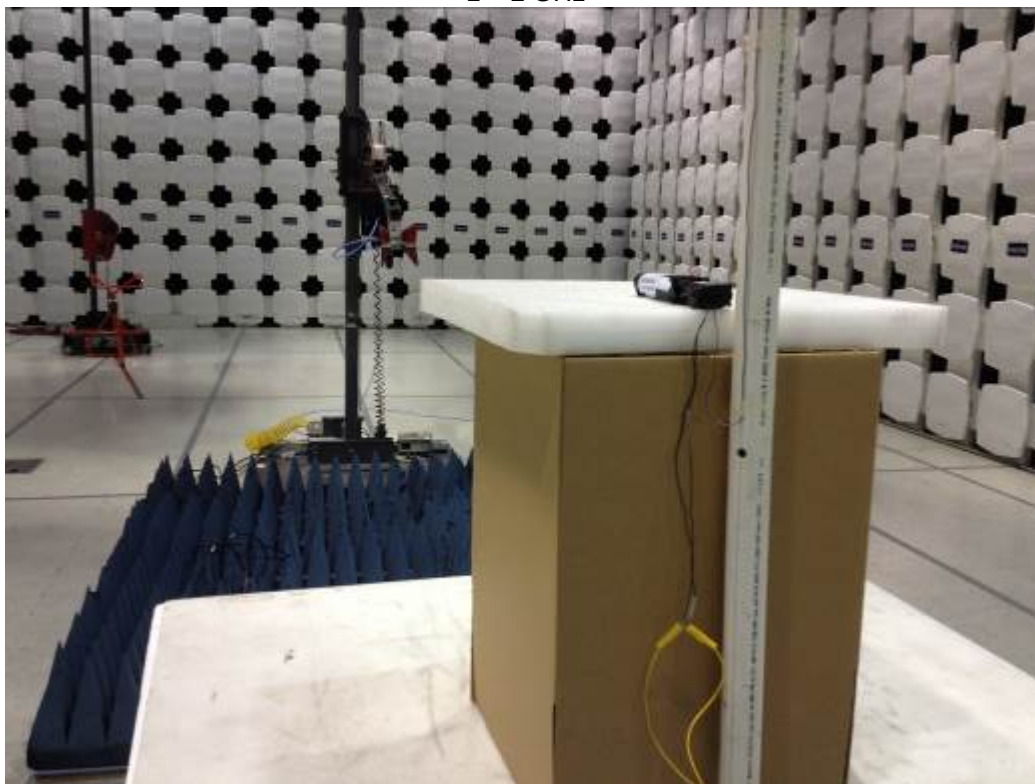
1 - 2 GHz



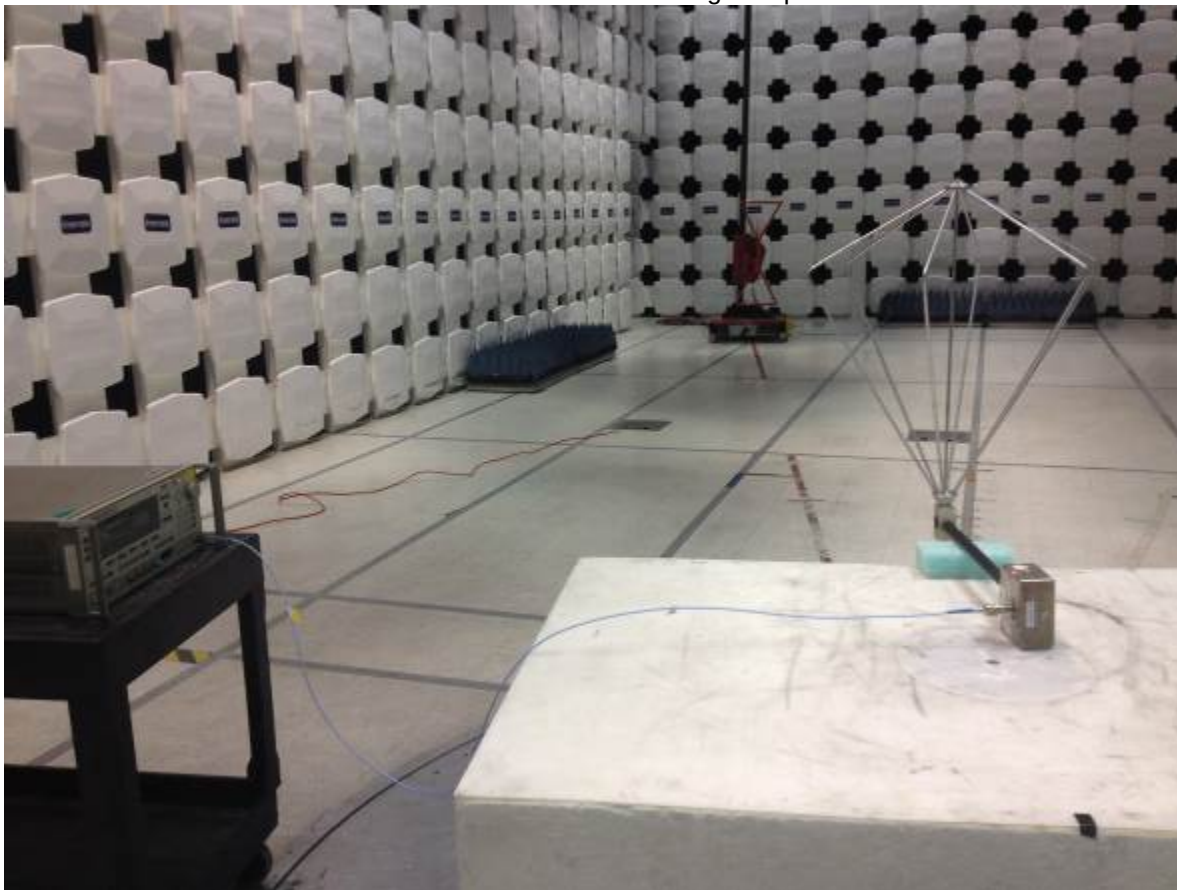
V9-SP, 30 – 1000 MHz



1 – 2 GHz



Substitution Method Testing Setup



11.5 Test Data:

Radiated Emissions, Substitution

Company: LoJack Corporation
 Model #: V9-VP
 Serial #: 0F4B036
 Engineer(s): Vathana Ven
 Project #: G102144226
 Standard: FCC Part 90
 Barometer: DAV004
 Temp/Humidity/Pressure: 22 deg. C 44% 1000 mB
 Test Distance (m): 10
 Voltage/Frequency: Battery
 Frequency Range: 30MHz-2GHz
 Net = Generator Level (0.00 dBm) + (EUT reading - Generator reading) - Cable Loss + Antenna Gain (dBi or dBd)
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor RB = Restricted Band; Bandwidth denoted as RBW/VBW

Rx Antenna: 145-106 ETS001
 Rx Cable(s): 10mTrack 145-410
 Rx Preamp: PRE145-014 Receiver: 145-128
 Tx Antenna: ETS002 ANT1 REA003
 Tx Cable(s): CBLHF2012-2M-1
 Tx Signal Generator: HEW62
 ERP or EIRP?: ERP

Location: 10m Chamber
 Date(s): 07/13/15 7/15/2015

Detector Type	Ant. Pol. (V/H)	Frequency MHz	EUT Reading dB(uV)	Generator Reading dB(uV)	Transmit Cable Loss dB	Transmit Antenna dBi	Generator Level dBm	Net dBm	Limit dBm	Margin dB	Bandwidth
V9-VP_FSK_Transmit Mode @ 10m with no pre-amp											
MaxH PK	V	346.124	24.60	49.05	0.10	-0.50	-20.00	-47.20	-20.00	-27.20	120/300 kHz
MaxH PK	V	519.186	25.33	48.03	0.10	2.20	-20.00	-42.75	-20.00	-22.75	120/300 kHz
MaxH PK	V	692.248	26.53	47.59	0.20	1.20	-20.00	-42.21	-20.00	-22.21	120/300 kHz
MaxH PK	V	865.310	26.47	45.07	0.20	-0.10	-20.00	-41.05	-20.00	-21.05	120/300 kHz
MaxH PK	V	1038.372	53.50	80.46	0.48	3.27	-20.00	-46.32	-20.00	-26.32	1/3 MHz
MaxH PK	V	1211.434	50.55	76.59	0.48	3.73	-20.00	-44.94	-20.00	-24.94	1/3 MHz
MaxH PK	V	1384.496	51.60	77.80	0.48	4.65	-20.00	-44.18	-20.00	-24.18	1/3 MHz
MaxH PK	V	1557.558	49.80	78.57	0.73	5.51	-20.00	-46.14	-20.00	-26.14	1/3 MHz
MaxH PK	V	1730.620	49.00	76.76	0.73	5.76	-20.00	-44.88	-20.00	-24.88	1/3 MHz
V9-VP_MSK_Transmit Mode @ 10m with no pre-amp											
MaxH PK	V	346.124	23.03	49.05	0.10	-0.50	-20.00	-48.77	-20.00	-28.77	120/300 kHz
MaxH PK	V	519.186	24.95	48.03	0.10	2.20	-20.00	-43.13	-20.00	-23.13	120/300 kHz
MaxH PK	V	692.248	25.33	47.59	0.20	1.20	-20.00	-43.41	-20.00	-23.41	120/300 kHz
MaxH PK	V	865.310	26.25	45.07	0.20	-0.10	-20.00	-41.27	-20.00	-21.27	120/300 kHz
MaxH PK	V	1038.372	53.80	80.46	0.48	3.27	-20.00	-46.02	-20.00	-26.02	1/3 MHz
MaxH PK	V	1211.434	49.50	76.59	0.48	3.73	-20.00	-45.99	-20.00	-25.99	1/3 MHz
MaxH PK	V	1384.496	50.00	77.80	0.48	4.65	-20.00	-45.78	-20.00	-25.78	1/3 MHz
MaxH PK	V	1557.558	49.00	78.57	0.73	5.51	-20.00	-46.94	-20.00	-26.94	1/3 MHz
MaxH PK	V	1730.620	50.76	76.76	0.73	5.76	-20.00	-43.12	-20.00	-23.12	1/3 MHz

Radiated Emissions, Substitution

Company: LoJack Corporation
Model #: V9-SP
Serial #: 0F4B02B

Rx Antenna: 145-106 ETS002
Rx Cable(s): 10mTrack 145-410
Rx Preamp: PRE145-014 Receiver: 145-128
Tx Antenna: ETS002 ANT1 REA003
Tx Cable(s): CBLHF2012-2M-1

Engineer(s): Vathana Ven Location: 10m Chamber

Project #: G102144226 Date(s): 07/13/15 7/15/2015

Standard: FCC Part 90

Tx Signal Generator: HEW62

Barometer: DAV004 Temp/Humidity/Pressure: 22 deg. C 44% 1000 mB

ERP or EIRP?: ERP

Test Distance (m): 10 Voltage/Frequency: Battery Frequency Range: 30MHz-2GHz

Net = Generator Level (0.00 dBm) + (EUT reading - Generator reading) - Cable Loss + Antenna Gain (dBi or dBd)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	EUT Reading dB(uV)	Generator Reading dB(uV)	Transmit Cable Loss dB	Transmit Antenna dBi	Generator Level dBm	Net dBm	Limit dBm	Margin dB	Bandwidth
V9-SP_FSK_Transmit Mode @ 10m with no pre-amp											
MaxH PK	V	346.124	25.32	49.05	0.10	-0.50	-20.00	-46.48	-20.00	-26.48	120/300 kHz
MaxH PK	V	519.186	25.16	48.03	0.10	2.20	-20.00	-42.92	-20.00	-22.92	120/300 kHz
MaxH PK	V	692.248	25.11	47.59	0.20	1.20	-20.00	-43.63	-20.00	-23.63	120/300 kHz
MaxH PK	V	865.310	24.94	45.07	0.20	-0.10	-20.00	-42.58	-20.00	-22.58	120/300 kHz
MaxH PK	V	1038.372	53.23	80.46	0.48	3.27	-20.00	-46.59	-20.00	-26.59	1/3 MHz
MaxH PK	V	1211.434	50.50	76.59	0.48	3.73	-20.00	-44.99	-20.00	-24.99	1/3 MHz
MaxH PK	V	1384.496	50.57	77.80	0.48	4.65	-20.00	-45.21	-20.00	-25.21	1/3 MHz
MaxH PK	V	1557.558	49.00	78.57	0.73	5.51	-20.00	-46.94	-20.00	-26.94	1/3 MHz
MaxH PK	V	1730.620	49.00	76.76	0.73	5.76	-20.00	-44.88	-20.00	-24.88	1/3 MHz
V9-SP_MSK_Transmit Mode @ 10m with no pre-amp											
MaxH PK	V	346.124	26.26	49.05	0.10	-0.50	-20.00	-45.54	-20.00	-25.54	120/300 kHz
MaxH PK	V	519.186	25.63	48.03	0.10	2.20	-20.00	-42.45	-20.00	-22.45	120/300 kHz
MaxH PK	V	692.248	25.32	47.59	0.20	1.20	-20.00	-43.42	-20.00	-23.42	120/300 kHz
MaxH PK	V	865.310	25.70	45.07	0.20	-0.10	-20.00	-41.82	-20.00	-21.82	120/300 kHz
MaxH PK	V	1038.372	51.05	80.46	0.48	3.27	-20.00	-48.77	-20.00	-28.77	1/3 MHz
MaxH PK	V	1211.434	53.50	76.59	0.48	3.73	-20.00	-41.99	-20.00	-21.99	1/3 MHz
MaxH PK	V	1384.496	50.00	77.80	0.48	4.65	-20.00	-45.78	-20.00	-25.78	1/3 MHz
MaxH PK	V	1557.558	48.00	78.57	0.73	5.51	-20.00	-47.94	-20.00	-27.94	1/3 MHz
MaxH PK	V	1730.620	49.28	76.76	0.73	5.76	-20.00	-44.60	-20.00	-24.60	1/3 MHz

Test Personnel: Vathana Ven
Product Standard: FCC Part 90

Input Voltage: 12VDC (Car Battery) + 6VDC (Internal Battery)

Pretest Verification w/ BB Source: N/A

Test Date: 07/13/2015, 07/15/2015
Test Levels: Below specified limits

Ambient Temperature: 22 °C
Relative Humidity: 44 %
Atmospheric Pressure: 1000 mbars

Deviations, Additions, or Exclusions: None

12 Receiver Radiated Spurious Emissions

12.1 Method

Tests are performed in accordance with FCC 2.1053, 90.210(d).

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	3.5 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.2 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.2 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.2 dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$

12.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
ETS002'	1-18GHz DRG Horn Antenna	ETS Lindgren	3117	00143260	04/10/2015	04/10/2016
ANT1A'	BROADBAND ANTENNA	Compliance Design	B100	1649	11/04/2014	11/04/2015
ANT1B'	BROADBAND ANTENNA	Compliance Design	B200	1650	11/04/2014	11/04/2015
ANT1C'	BROADBAND ANTENNA	Compliance Design	B300	00668	11/04/2014	11/04/2015
REA003'	1GHz High Pass Filter	Reactel, Inc	7HS-1G/10G-S11	06-1	12/30/2013	12/30/2015
HEW62'	Synthesized Sweep Generator	Hewlett Packard	83620A	3213A01244	05/13/2015	05/13/2017
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/13/2015	05/13/2016
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015
CBLHF2012 -2M-1'	2m 9kHz-40GHz Coaxial Cable - SET1	Huber + Suhner	SF102	252675001	02/05/2015	02/05/2016

Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.8231.8221) SP3
EMI Boxborough.xls	Intertek	08/27/10

12.3 Results:

The sample tested was found to comply.

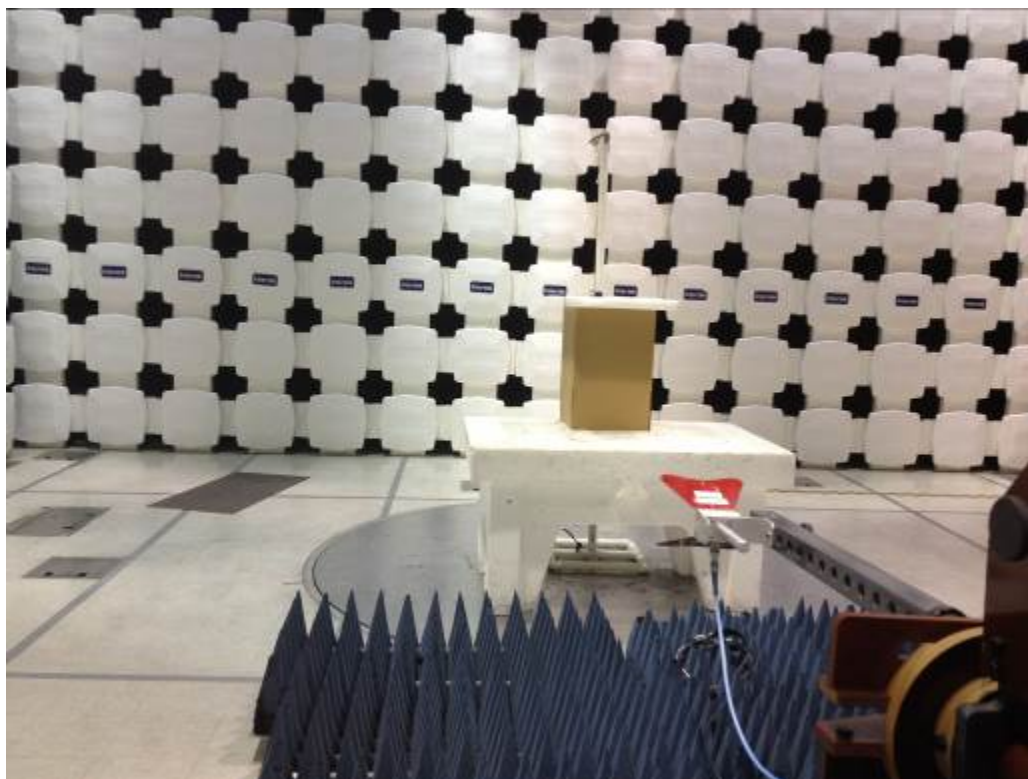
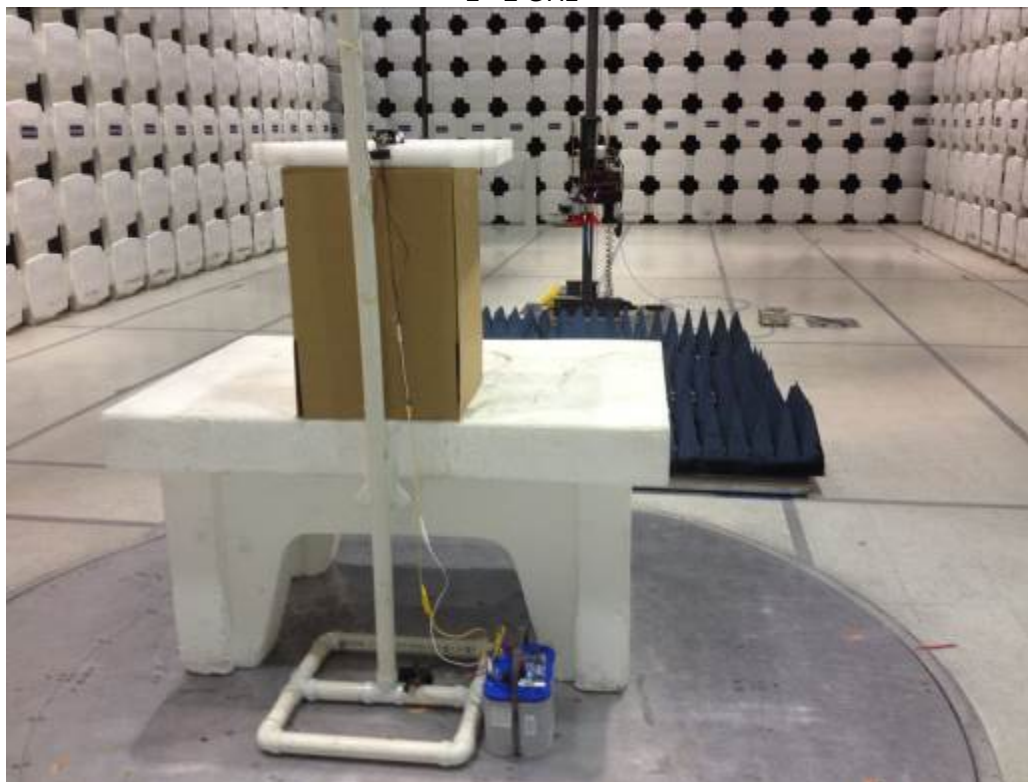
.

12.4 Setup Photographs:

V9-VP



1 - 2 GHz

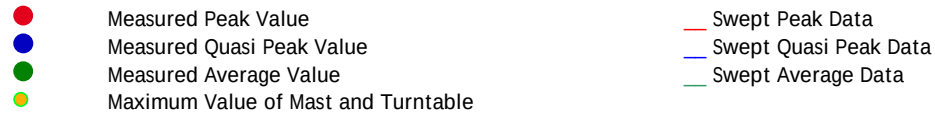
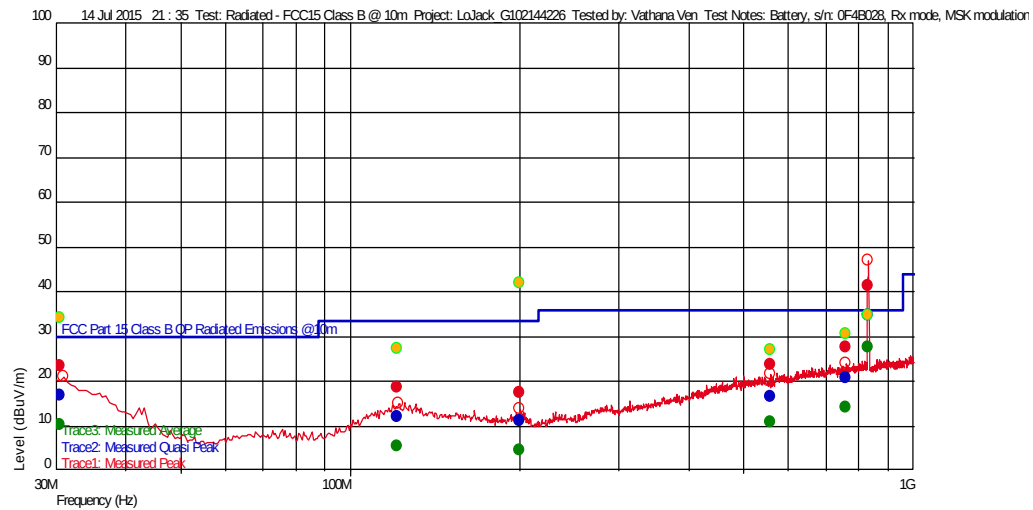


12.5 Test Data:

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	LoJack_G102144226	
Test Notes:	Battery, s/n: 0F4B028, Rx mode, MSK modulation	
Temperature:	23 deg C	
Humidity:	44%, 992 mB	
Tested by:	Vathana Ven	
Test Started:	14 Jul 2015 21 : 35	

Prescan Emission Graph



Emissions Test Data

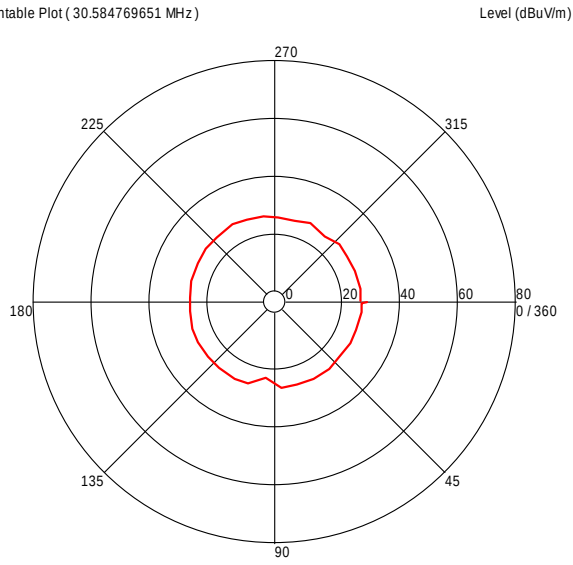
Trace2: Measured Quasi Peak

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (—), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
199.999598838 M	11.08	11.900	-24.040	33.520	-22.44		50	1.77	120 k	
121.382163934 M	12.07	13.938	-24.685	33.520	-21.45	--	330	1.15	120 k	
557.173947834 M	16.50	17.543	-22.254	36.020	-19.52		105	1.44	120 k	
759.986974285 M	20.60	20.400	-21.622	36.020	-15.42		360	2.39	120 k	
30.584769651 M	16.90	20.649	-26.029	30.000	-13.10		1	1.05	120 k	
833.171141982 M	34.92	21.237	-21.458	36.020	-1.10	--	360	3.48	120 k	

Notes: During testing, the EUT was in receive mode in between transmit bursts.

Azimuth Plots

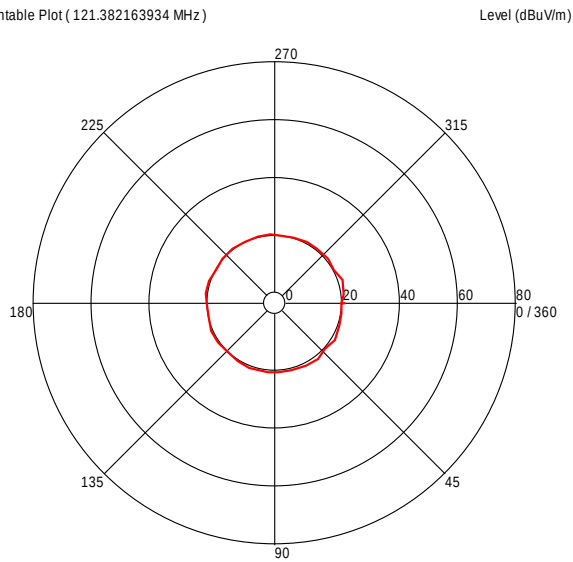
Turntable Plot (30.584769651 MHz)



All Polarities

Azimuth (Degrees)

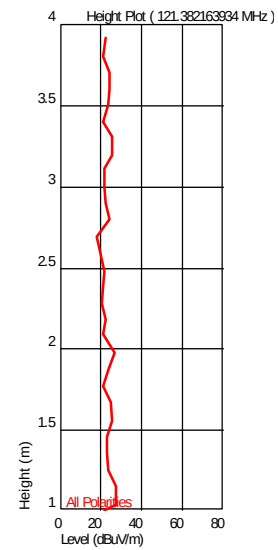
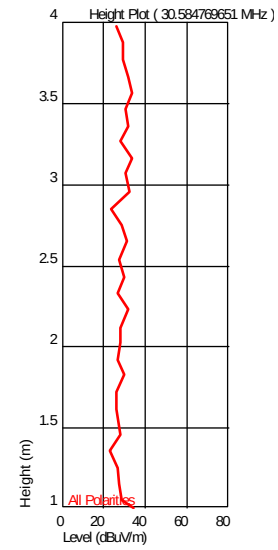
Turntable Plot (121.382163934 MHz)



All Polarities

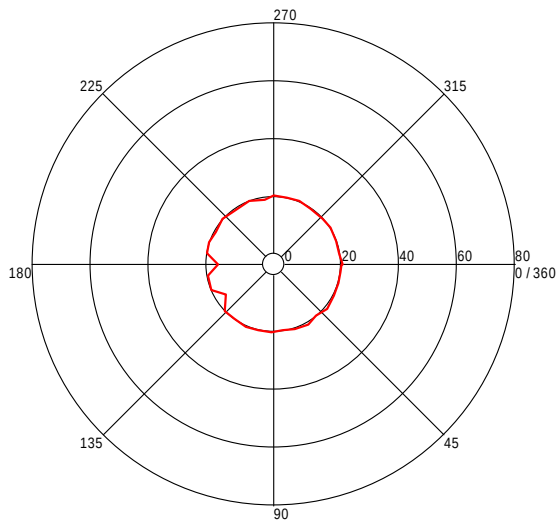
Azimuth (Degrees)

Turntable Plots



Turntable Plot (199.999598838 MHz)

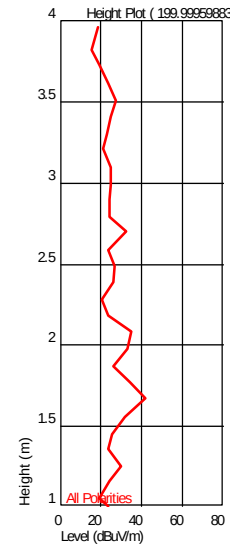
Level (dBuV/m)



All Polarities

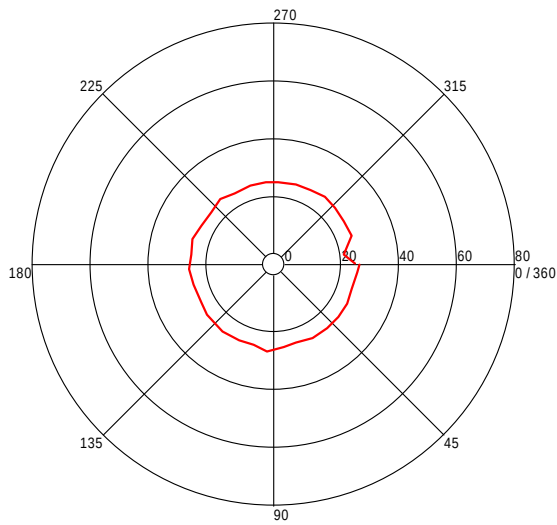
Azimuth (Degrees)

Height Plot (199.999598838 MHz)



Turntable Plot (557.173947834 MHz)

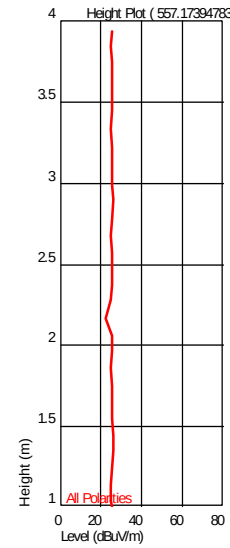
Level (dBuV/m)



All Polarities

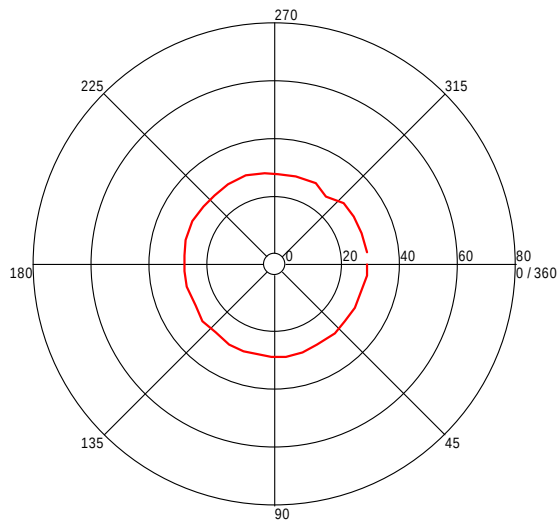
Azimuth (Degrees)

Height Plot (557.173947834 MHz)



Turntable Plot (759.986974285 MHz)

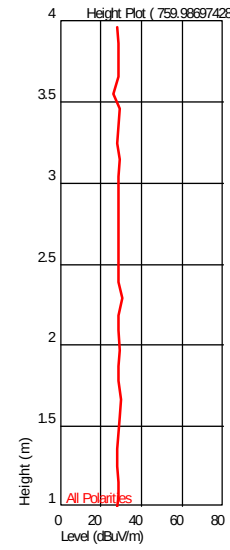
Level (dBuV/m)



All Polarities

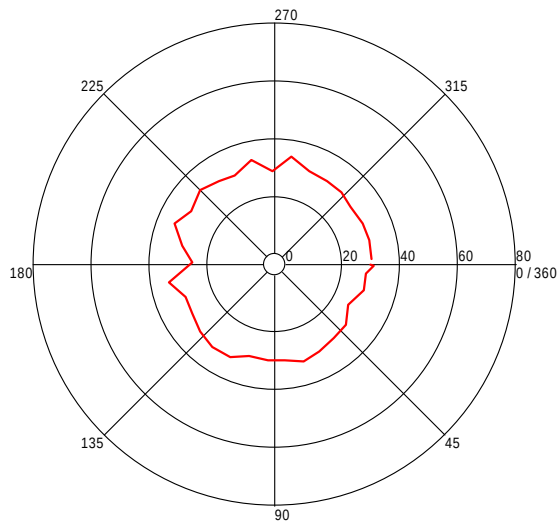
Azimuth (Degrees)

Height Plot (759.986974285 MHz)



Turntable Plot (833.171141982 MHz)

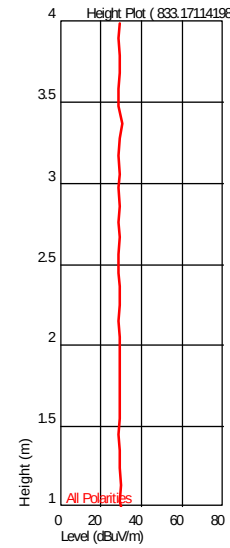
Level (dBuV/m)



All Polarities

Azimuth (Degrees)

Height Plot (833.171141982 MHz)



Test Information

Test Details

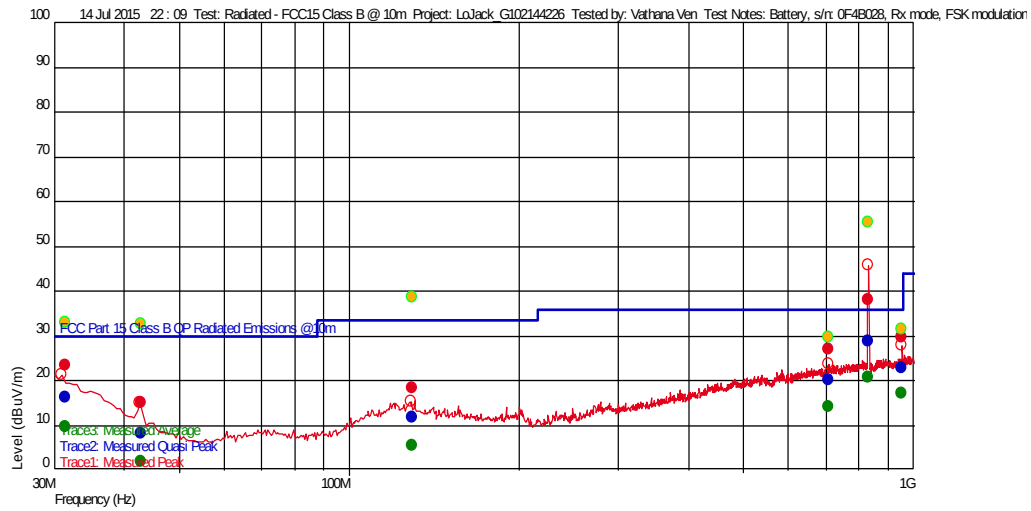
Test: Radiated - FCC15 Class B @ 10m
 Project: LoJack_G102144226
 Test Notes: Battery, s/n: 0F4B028, Rx mode, FSK modulation
 Temperature: 23 deg C
 Humidity: 44%, 992 mB
 Tested by: Vathana Ven
 Test Started: 14 Jul 2015 22 : 09

User Entry

Radiated - FCC15 Class B @ 10m
 LoJack_G102144226
 Battery, s/n: 0F4B028, Rx mode, FSK modulation
 23 deg C
 44%, 992 mB
 Vathana Ven
 14 Jul 2015 22 : 09

Additional Information

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

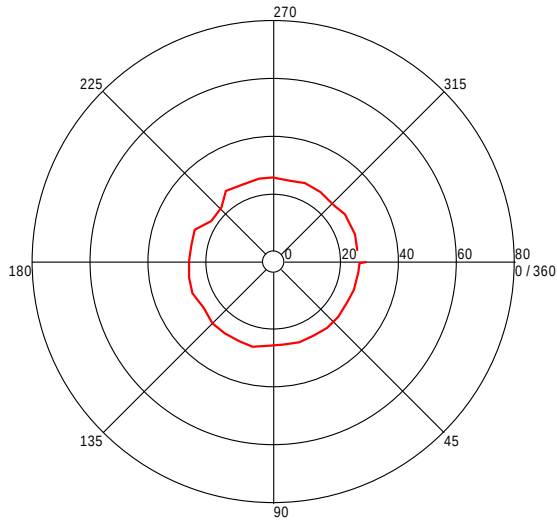
Trace2: Measured Quasi Peak

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
129.564729906 M	11.79	13.600	-24.629	33.520	-21.73	--	29	1.15	120 k	
42.934268996 M	8.30	11.639	-26.052	30.000	-21.70		212	3.97	120 k	
706.143487082 M	20.30	19.991	-21.746	36.020	-15.72		105	1.15	120 k	
31.400000112 M	16.29	20.040	-26.030	30.000	-13.71		1	3.58	120 k	
953.218436487 M	22.82	22.000	-21.226	36.020	-13.20	--	17	1.87	120 k	
832.851101846 M	28.72	21.243	-21.459	36.020	-7.30	--	313	3.21	120 k	

Azimuth Plots

Turntable Plot (31.400000112 MHz)

Level (dBuV/m)

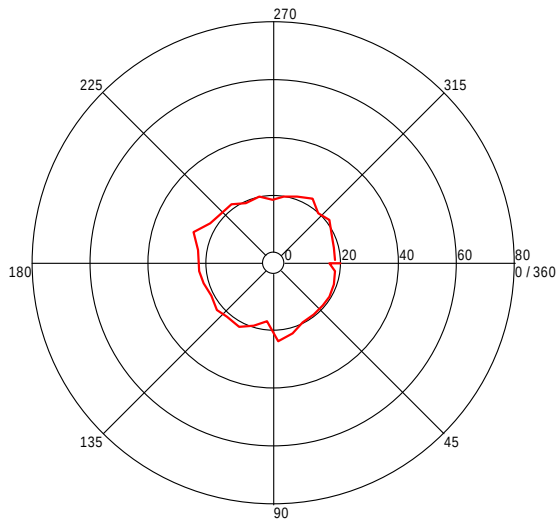


All Polarities

Azimuth (Degrees)

Turntable Plot (42.934268996 MHz)

Level (dBuV/m)

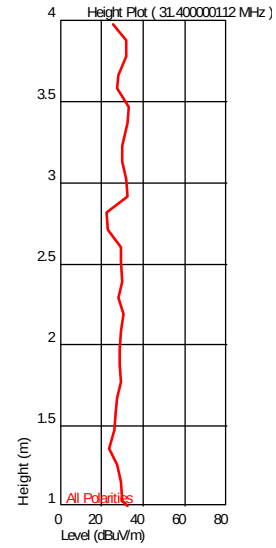


All Polarities

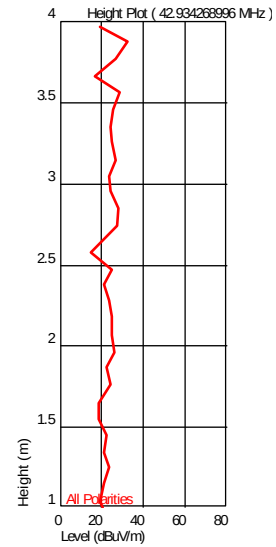
Azimuth (Degrees)

Turntable Plots

Height Plot (31.400000112 MHz)

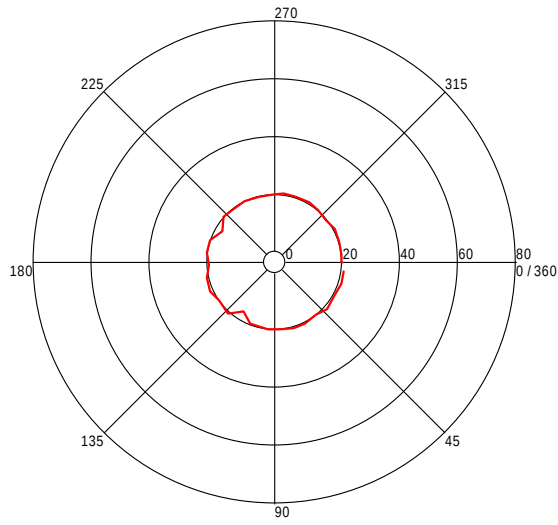


Height Plot (42.934268996 MHz)



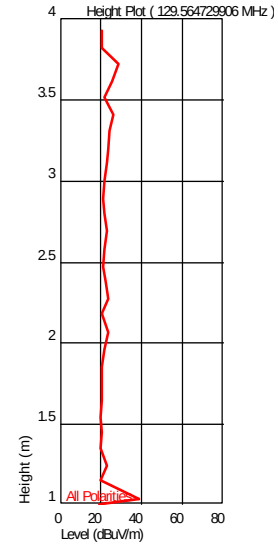
Turntable Plot (129.564729906 MHz)

Level (dBuV/m)



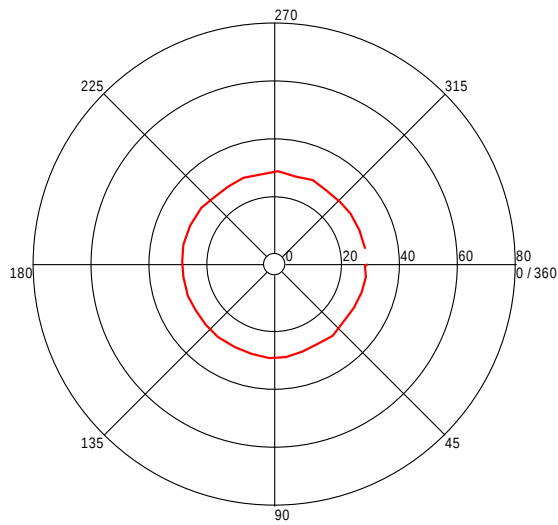
All Polarities

Azimuth (Degrees)



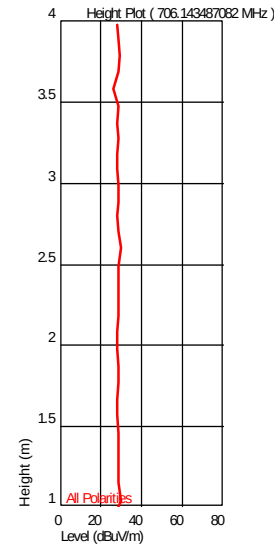
Turntable Plot (706.143487082 MHz)

Level (dBuV/m)



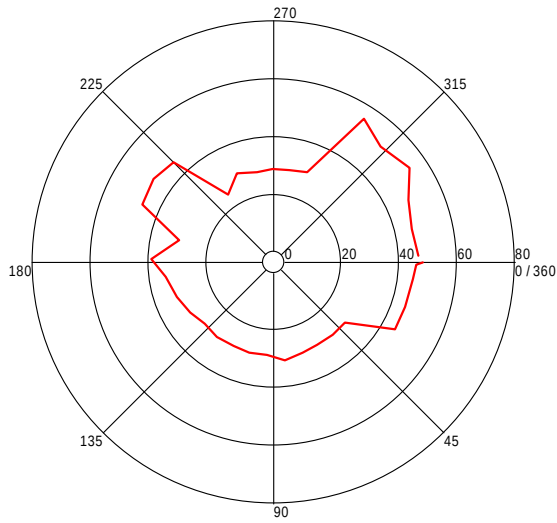
All Polarities

Azimuth (Degrees)



Turntable Plot (832.851101846 MHz)

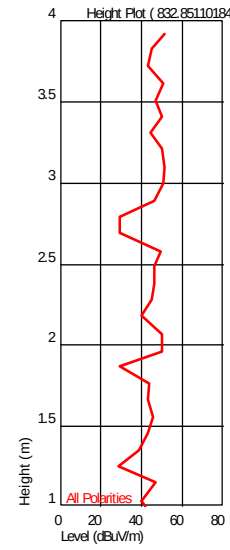
Level (dBuV/m)



All Polarities

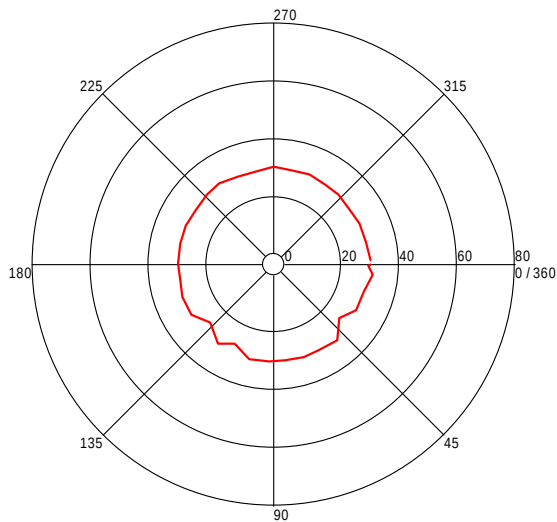
Azimuth (Degrees)

Height Plot (832.851101846 MHz)



Turntable Plot (953.218436487 MHz)

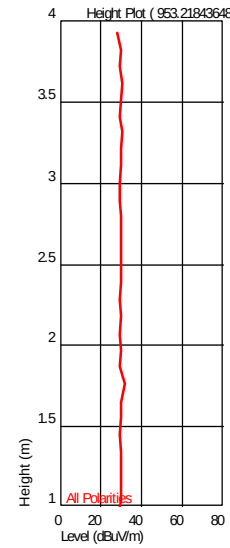
Level (dBuV/m)



All Polarities

Azimuth (Degrees)

Height Plot (953.218436487 MHz)



Test Information

Test Details

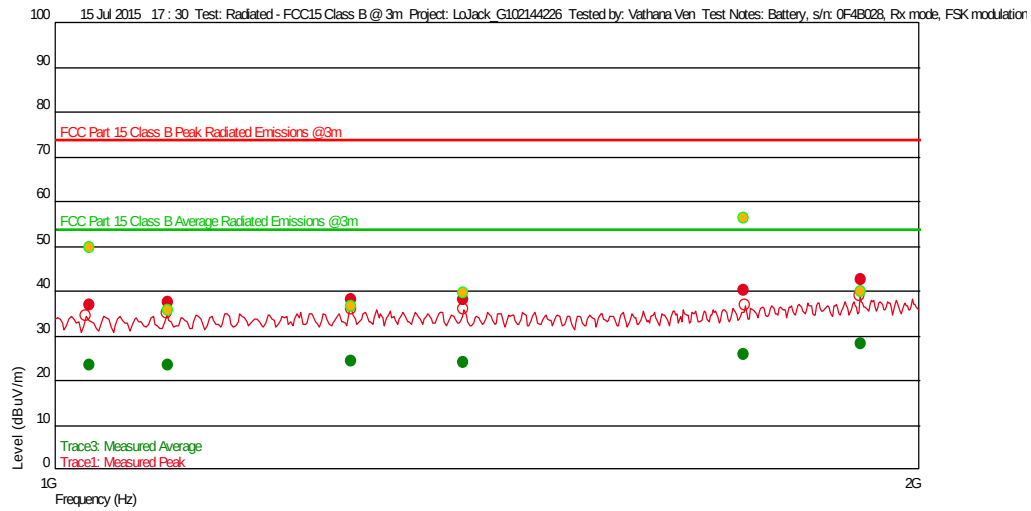
Test: Radiated - FCC15 Class B @ 3m
 Project: LoJack_G102144226
 Test Notes: Battery, s/n: 0F4B028, Rx mode, FSK modulation
 Temperature: 25 deg C
 Humidity: 43%, 996 mB
 Tested by: Vathana Ven
 Test Started: 15 Jul 2015 17 : 30

User Entry

Radiated - FCC15 Class B @ 3m
 LoJack_G102144226
 Battery, s/n: 0F4B028, Rx mode, FSK modulation
 25 deg C
 43%, 996 mB
 Vathana Ven
 15 Jul 2015 17 : 30

Additional Information

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace1: Measured Peak

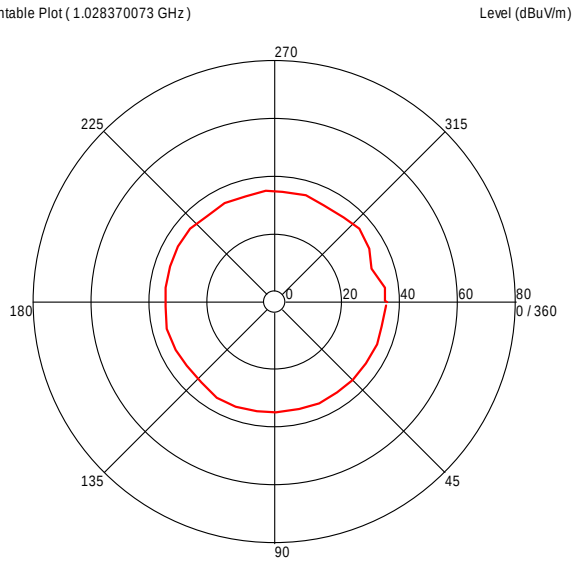
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
1.028370073 G	36.94	27.109	-33.910	74.000	-37.06	--	309	1.34	1 M	
1.095671343 G	37.47	27.303	-33.841	74.000	-36.53		335	1.68	1 M	
1.388256513 G	37.97	28.732	-33.464	74.000	-36.03		211	2.16	1 M	
1.268463594 G	38.08	28.635	-33.651	74.000	-35.92		90	4.01	1 M	
1.737869071 G	40.01	29.334	-32.947	74.000	-33.99	--	162	2.05	1 M	
1.91 G	42.65	30.826	-32.604	74.000	-31.35		0	2.22	1 M	

Trace3: Measured Average

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
1.028370073 G	23.34	27.109	-33.910	54.000	-30.66	--	309	1.34	1 M	
1.095671343 G	23.46	27.303	-33.841	54.000	-30.54		335	1.68	1 M	
1.388256513 G	24.02	28.732	-33.464	54.000	-29.98		211	2.16	1 M	
1.268463594 G	24.23	28.635	-33.651	54.000	-29.77		90	4.01	1 M	
1.737869071 G	25.94	29.334	-32.947	54.000	-28.06	--	162	2.05	1 M	
1.91 G	28.22	30.826	-32.604	54.000	-25.78		0	2.22	1 M	

Azimuth Plots

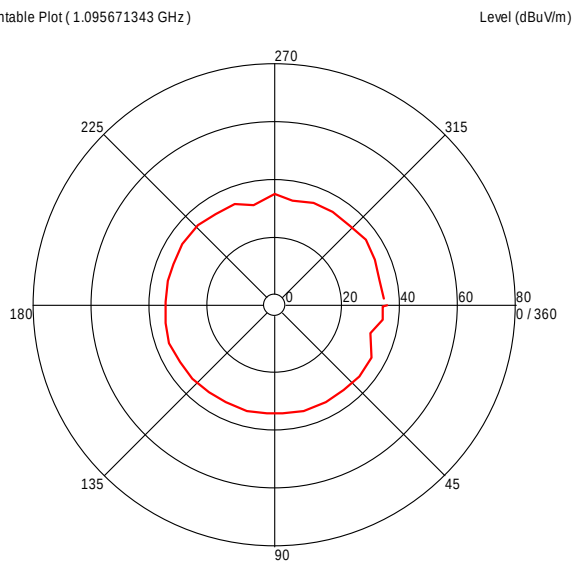
Turntable Plot (1.028370073 GHz)



All Polarities

Azimuth (Degrees)

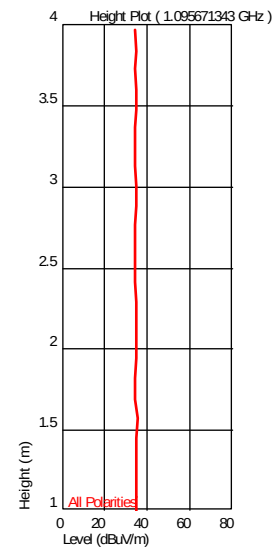
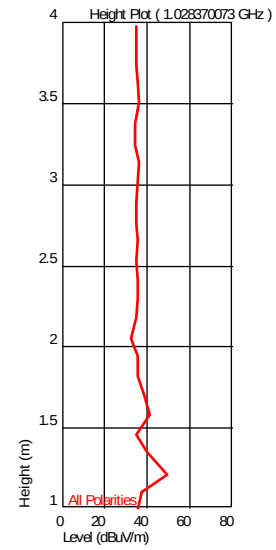
Turntable Plot (1.095671343 GHz)



All Polarities

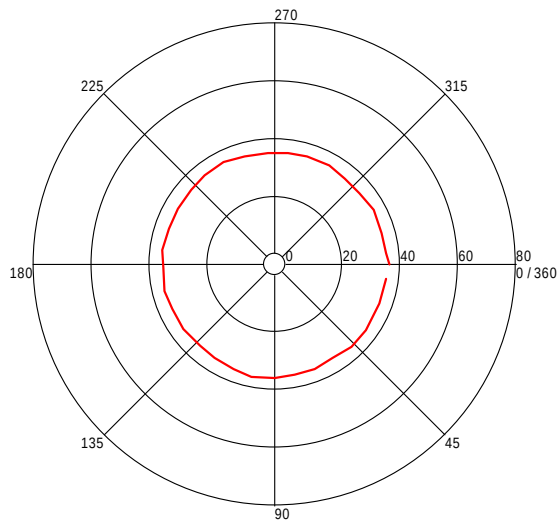
Azimuth (Degrees)

Turntable Plots



Turntable Plot (1.268463594 GHz)

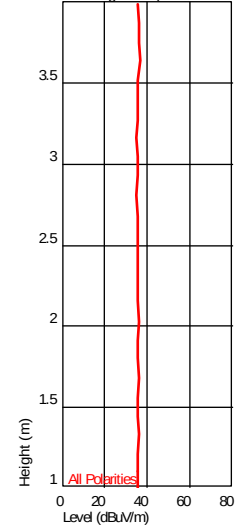
Level (dBuV/m)



All Polarities

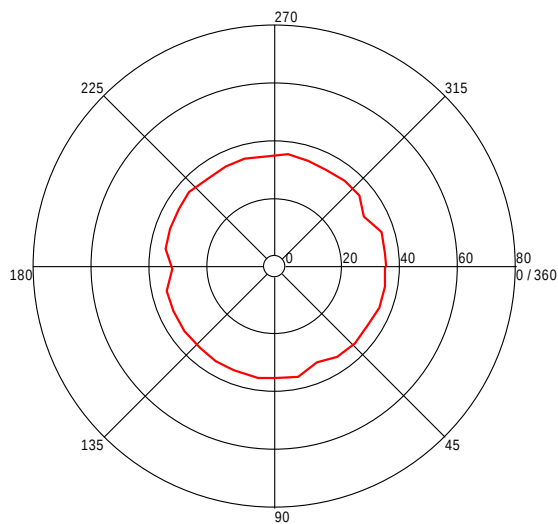
Azimuth (Degrees)

Height Plot (1.268463594 GHz)



Turntable Plot (1.388256513 GHz)

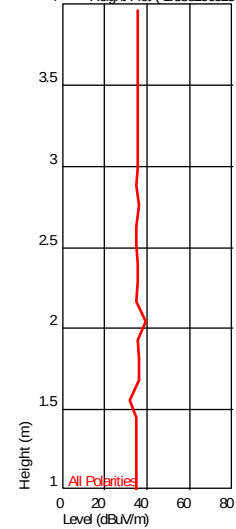
Level (dBuV/m)



All Polarities

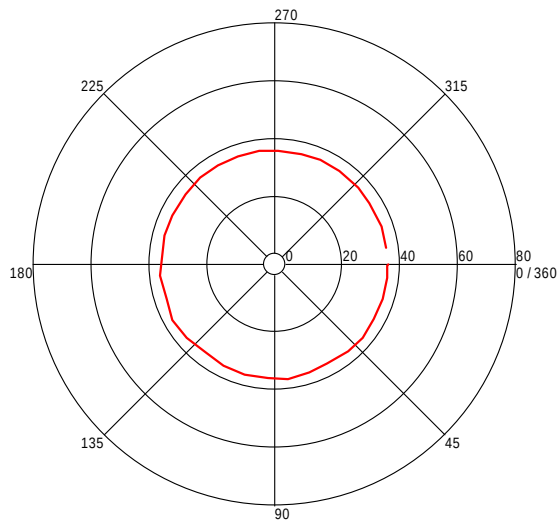
Azimuth (Degrees)

Height Plot (1.388256513 GHz)



Turntable Plot (1.737869071 GHz)

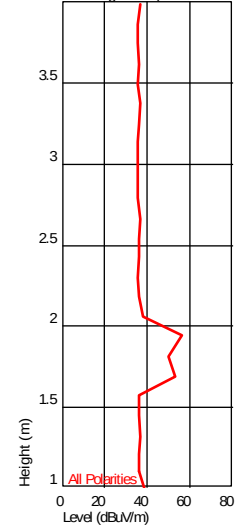
Level (dBuV/m)



All Polarities

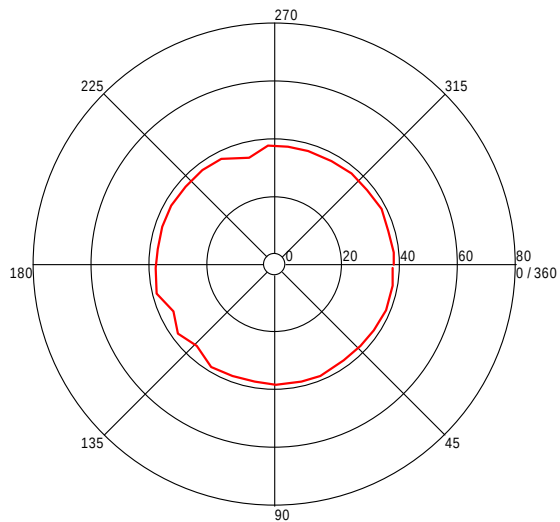
Azimuth (Degrees)

Height Plot (1.737869071 GHz)



Turntable Plot (1.91 GHz)

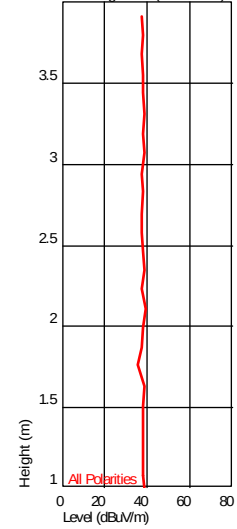
Level (dBuV/m)



All Polarities

Azimuth (Degrees)

Height Plot (1.91 GHz)



Test Information

Test Details

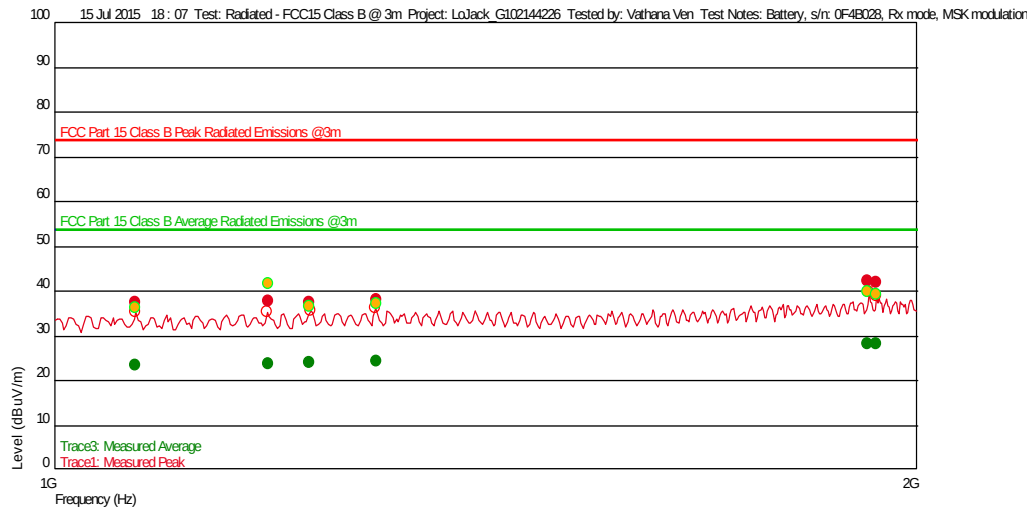
Test: Radiated - FCC15 Class B @ 3m
Project: LoJack_G102144226
Test Notes: Battery, s/n: 0F4B028, Rx mode, MSK modulation
Temperature: 25 deg C
Humidity: 43%, 996 mB
Tested by: Vathana Ven
Test Started: 15 Jul 2015 18 : 07

User Entry

Radiated - FCC15 Class B @ 3m
LoJack_G102144226
Battery, s/n: 0F4B028, Rx mode, MSK modulation
25 deg C
43%, 996 mB
Vathana Ven
15 Jul 2015 18 : 07

Additional Information

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace1: Measured Peak

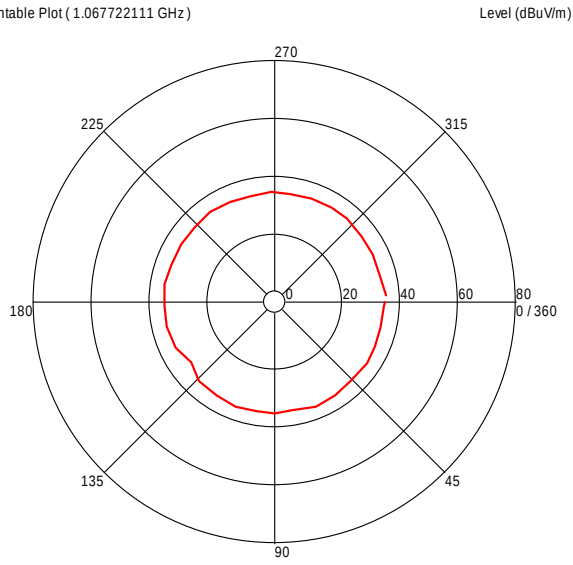
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
1.067722111 G	37.50	27.223	-33.870	74.000	-36.50	--	80	3.84	1 M	
1.227768871 G	37.58	28.323	-33.703	74.000	-36.42		41	1.45	1 M	
1.187915831 G	37.65	28.014	-33.745	74.000	-36.35		0	1.82	1 M	
1.296158984 G	38.07	28.848	-33.608	74.000	-35.93	--	332	1.69	1 M	
1.936032064 G	41.89	30.939	-32.550	74.000	-32.11	--	72	1.57	1 M	
1.922885771 G	42.19	30.882	-32.577	74.000	-31.81	--	8	2.33	1 M	

Trace3: Measured Average

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
1.067722111 G	23.35	27.223	-33.870	54.000	-30.65	--	80	3.84	1 M	
1.187915831 G	23.82	28.014	-33.745	54.000	-30.18		0	1.82	1 M	
1.227768871 G	24.02	28.323	-33.703	54.000	-29.98		41	1.45	1 M	
1.296158984 G	24.32	28.848	-33.608	54.000	-29.68	--	332	1.69	1 M	
1.936032064 G	28.09	30.939	-32.550	54.000	-25.91	--	72	1.57	1 M	
1.922885771 G	28.16	30.882	-32.577	54.000	-25.84	--	8	2.33	1 M	

Azimuth Plots

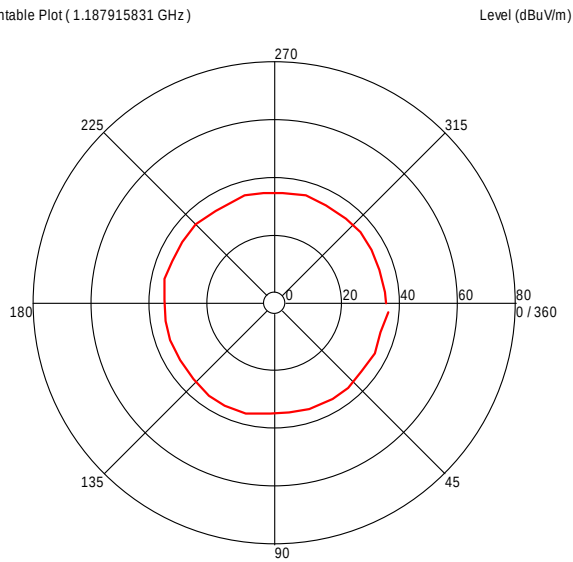
Turntable Plot (1.067722111 GHz)



All Polarities

Azimuth (Degrees)

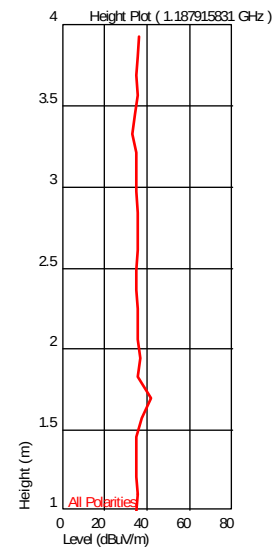
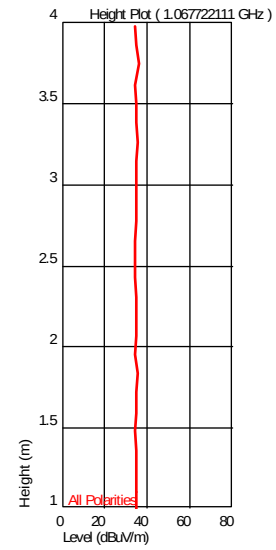
Turntable Plot (1.187915831 GHz)



All Polarities

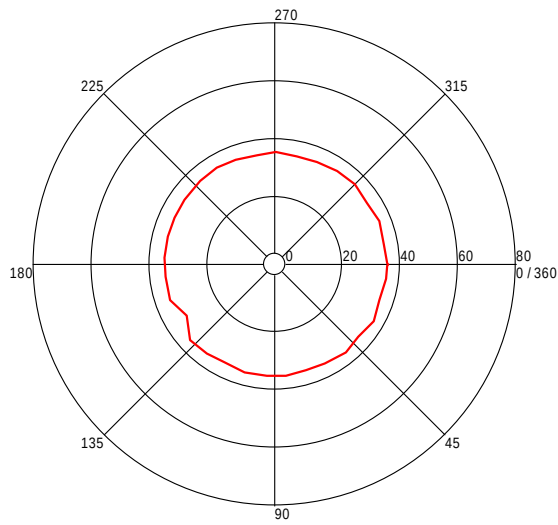
Azimuth (Degrees)

Turntable Plots



Turntable Plot (1.227768871 GHz)

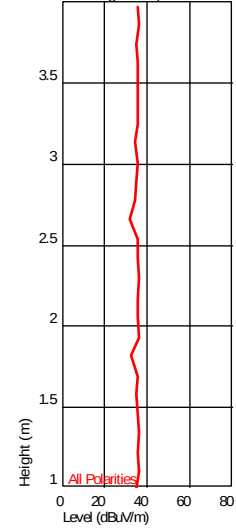
Level (dBuV/m)



All Polarities

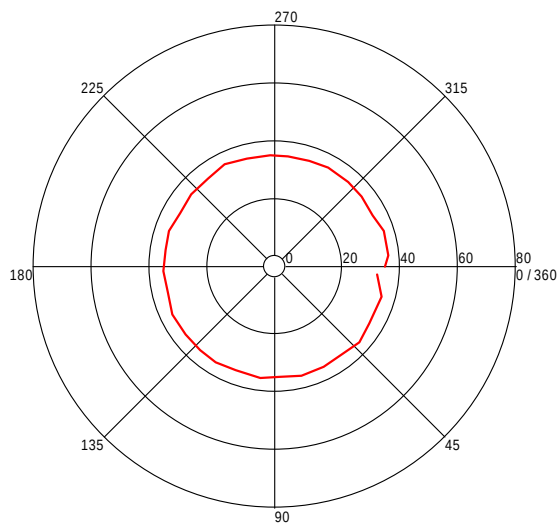
Azimuth (Degrees)

Height Plot (1.227768871 GHz)



Turntable Plot (1.296158984 GHz)

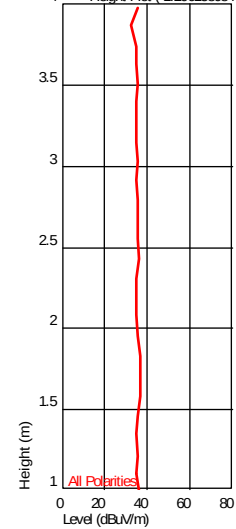
Level (dBuV/m)



All Polarities

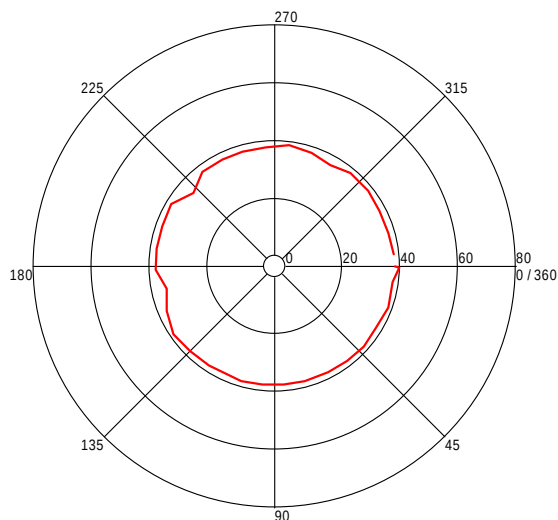
Azimuth (Degrees)

Height Plot (1.296158984 GHz)



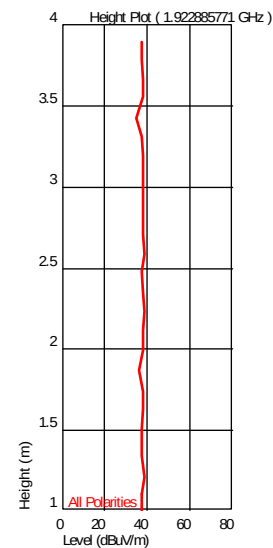
Turntable Plot (1.922885771 GHz)

Level (dBuV/m)



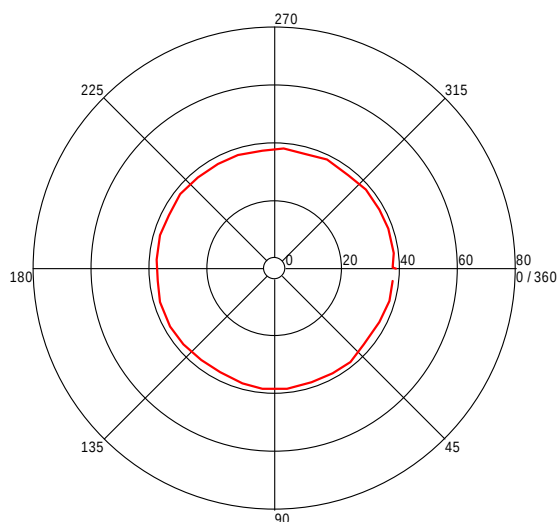
All Polarities

Azimuth (Degrees)



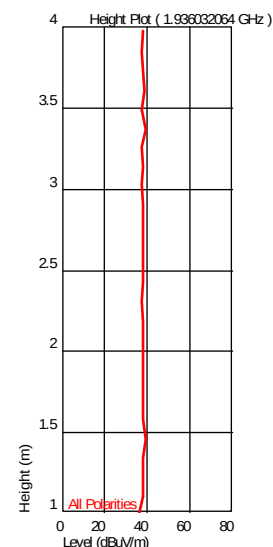
Turntable Plot (1.936032064 GHz)

Level (dBuV/m)



All Polarities

Azimuth (Degrees)



Test Personnel: Vathana Ven
Product Standard: FCC Part 90
Input Voltage: 12VDC (Car Battery) + 6VDC (Internal Battery)
Pretest Verification w/ BB Source: N/A

Test Date: 07/13/2015
Test Levels: Below specified limits

Ambient Temperature: 22 °C
Relative Humidity: 44 %
Atmospheric Pressure: 1000 mbars

Deviations, Additions, or Exclusions: None

13 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	08/17/2015	102144226BOX-006	VFV <i>VFV</i>	KPS <i>KPS</i>	Original Issue
1	08/20/2015	102144226BOX-006a	VFV <i>VFV</i>	KPS <i>KPS</i>	Address correction, fixed EUT block diagram