Amber Helm Development L.C.
92723 Michigan Hwy-152
Sister Lakes, MI 49047

EMC Test Report

#MN-1401860FX
Issued 9/18/2014

Regarding the FCC Part 15, SubPart C testing

Home Aware Main Unit

Model Number: HA360M, HA360R
FCCID: OQYHA360M
Category: 15.249 Transmitting Device

Judgments: FCC Part 15.249 – Compliant

NVLAP LAB CODE 200129-0

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Statements concerning this report

NVLAP Accreditation: NVLAP Lab Code 200129-0
The scope of AHD accreditation are the test methods of:

IEC/CISPR 22:	Limits and methods measurement of radio disturbance characteristics of information technology equipment.
FCC Method – 47 CFT Part 15:	Digital Devices.
AS/NZS 3548:	Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment.
IEC61000-4-2 and Amend.1:	Electrostatic Discharge Immunity
IEC61000-4-5:	Surge Immunity

Test Data:
This test report contains data included in the scope of NVLAP accreditation.

Subcontracted Testing:
This report does not contain data produced under subcontract.

Test Traceability:
The calibration of all measuring and test equipment and the measured data using this equipment are traceable to the National Institute for Standards and Technology (NIST).

Limitations on results:
The test results contained in this report relate only to the Item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require an evaluation to verify continued compliance.

Limitations on copying:
This report shall not be reproduced, except in full, without the written approval of AHD.

Limitations of the report:
This report shall not be used to claim product endorsement by NVLAP, FCC, or any agency of the US Government.

Statement of Test Results Uncertainty:
Following the guidelines of NAMAS publication NIS81 and NIST Technical Note 1297, the Measurement Uncertainty at a 95% confidence level is determined to be: +/- 2.3 dB

Retention of Records:
For equipment verified to comply with FCC regulations, the manufacturer is obliged to retain this report with the product records for ten years following the manufacture of the equipment that was tested.

For equipment verified to comply with RSS-210, the manufacturer is obliged to retain this report with the product records for as long as the model is being marketed in Canada.

FCC Required user statements:

FCC Part 18 ISM Devices:

1. For all industrial, scientific, medical (ISM) devices, the instruction manual or, if no instruction manual is provided, the product packaging, must provide information that addresses the following: (1) interference potential of the device, (2) maintenance of the system and (3) simple measures that can be taken to correct interference. RF lighting devices must add a statement similar to the following: "This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment, ships at sea or other critical navigation or communications equipment operating between 0.45-30 MHz." (Section 18.213)

   In addition, Part 18 devices that are authorized under the DoC procedure shall also include in the instruction manual, on a separate sheet, or on the packaging the following: (1) identification of the product (e.g. name and model number), (2) a statement similar to "This device complies with Part 18 of the FCC Rules" (Section 18.212), and (3) the name and address of the responsible party (Section 2.909).

2. For products certified using the Declaration of Conformity approach, this FCC conformity LOGO is to be placed on the ISM Device.

FCC Part 15 Class A or B Digital Devices or Peripherals:

For products satisfying the FCC Part 15 Class A or Class B requirements the following are to be satisfied:

1. The following statement is required to be labeled on the product or, if the device is too small, in the user's manual:

   This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2. A statement is required to be placed in the User's Manual shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For an FCC Part 15 Class A digital device or peripheral, the user instructions shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against

harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Modifications not expressly approved by the manufacturer could void the user's authority to operated the equipment under FCC rules.

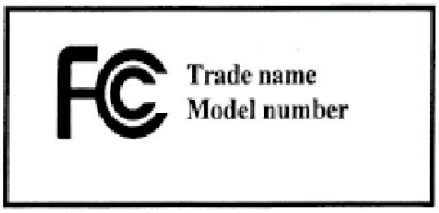
Additionally, for products satisfying the FCC Part 15 Class B requirements the following are to be satisfied:

1. The User's Manual shall include this or similar statement:

   NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

   i. *Reorient or relocate the receiving antenna.*
   ii. *Increase the separation between the equipment and receiver.*
   iii. *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
   iv. *Consult the dealer or an experienced radio/TV technician for help.*

2. For products certified using the Declaration of Conformity approach,
   a. The FCC conformity LOGO is to be placed on the Class B Digital Device.



   b. The FCC requires a Compliance Information statement (Declaration of Conformity) to accompany each product to the end user.

Industry Canada Required user statements:

Applies to: [Category II Equipment]

1. For products satisfying the ICES-003, RSS-Gen and RSS-210 Issue 6 requirements the following are to be satisfied:

   User manuals for license-exempt LPDs shall contain the following or equivalent statements in a conspicuous position:

"Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."

If the antenna is detachable (i.e. selectable by the user), see the user manual requirement in Section 7.1.4. The following instructions in the user manual are also required:

"To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropic radiated power (e.i.r.p.) is not more than that permitted for successful communication."

The above statements may be placed on the device instead of the manual.

2. User Manual:

   User manual shall also contain text declaring compliance to the limits found in this Standard in both English and French.

3. Equipment Labels:

   Equipment subject to certification under the applicable RSS's, shall be permanently labeled on each item, or as an inseparable combination. The label must contain the following information for full compliance:

   (a) the certification number, prefixed by the term "IC:";
   (b) the manufacturer's name, trade name or brand name; and
   (c) a model name or number.

   Equipment for which a certificate has been issued is not considered certified if it is not properly labeled.

   The information on the Canadian label can be combined with the manufacturer's other labeling requirements.

   If the device size is too small to put a label, the label can be included in the user's manual, upon agreement with Industry Canada.

Summary of Results

1. The device model number HA360M was tested for compliance with FCC Regulations, Part 15, SubPart C, Section 249. These tests were performed at AHD EMC Laboratory following the procedures outlined in ANSI C63.4.
2. The test results apply to model HA360M and HA360R.
3. HA360R is a reduced functionality product that is electrically equivalent. See product description for list of differences
4. The device tested is compliant to the requirements of FCC Subpart C 15.249. The Device FCCID will be OQYHA360M.
5. The equipment under test was received on 2/20/14 and this test series commenced on 2/20/2014.
6. In 120VAC 60Hz operation, the conducted emission level nearest the limit occurred at 480 kHz. The signal was measured to be 13 dB below the Class B Quasi-Peak limit and 18 dB below the Class B Average limit when measuring phase to ground.
7. The spurious radiated emission level nearest the limit occurred at 399 MHz vertically polarized. This signal was measured to be 1.1 dB below the Class B Quasi-peak limit. Note that the emission measurement was within the AHD 95% confidence level of +/- 2.3 dB.
8. The Receiver local oscillator frequency measurements of 305 MHz and 1220 MHz and associated harmonics indicated very low signals, well within FCC limits.
9. The operational Duty Cycle of the transmitter was measured to be 60%, allowing a 4.4dB correction factor for harmonic measurements measured above 1 GHz using a peak detector.
10. The worst case fundamental signal measurement was measured at 915 Mhz, with the device in the side orientation vertically polarized. The signal was measured to be 12.42 mV/m below the 15.249 FCC Limit.
11. The worst case harmonic signal near the fundamental was measured at the 4th harmonic of 3660 MHz. The signal was measured in a maximized orientation. The signal was measured to be 66.99 uV/m below the 15.249 FCC limit. Note that this is also the worst case restricted band signal, which utilizes the same limits.
12. The worst case high harmonic signal was measured at the 6th harmonic at 5490 MHz. The signal was measured to be 161.66 uV/m below the FCC limit.
13. The worst case harmonic peak signal was measured at 3660 MHz. The signal was measured to be 16.87 dB below the FCC limit.
14. For informational purposes, the fundamental signal 20 dB BW was measured to be 593 kHz. At 915 MHz, this places the signal well within the 902-928 MHz band.
15. The worst case frequency drift due to 85%-115% voltage variation was measured to be 0 Hz.
16. The worst case frequency drift due to temperature variation from –20 to 50 deg C was measured to be 65 Hz within the .001% limit.

Changes Made to Achieve Compliance:

1. Z1, Z3 - 3.9 pF caps, Z2 1 nH choke utilized in transmit output. The changes were documented as in the product schematic.

EUT Descriptions

Model: Home Aware Main Unit

Model number: HA360M, HA360R (reduced feature unit)

Serial/ID No: AHD-001

Description: The device operates as a 915 MHz 15.209 PCM transceiver that communicates with peripheral devices when sound or noise is detected. The device operates at a 60% duty cycle. The device transceiver utilizes receive local oscillator frequencies of 305 MHz and 1220 MHz.

The device features include
- External Battery Input
- External DC Lamp Relay Switch Output
- Internal Flashing light
- USB connector and charging circuit
- TEL, TEL LINE connectors, caller ID circuit
- cell phone detector connector (future product)
- vibrator connector and drive circuit
- speaker and audio circuit

The reduced feature model (HA360R) excludes the following features:
- USB connector and charging circuit
- TEL, TEL LINE connectors, caller ID circuit
- cell phone detector connector (future product)
- vibrator connector and drive circuit
- speaker and audio circuit

Antenna: PCB / Integrated with less than 3dBi gain

PCB's:

Main: HA360M Rev A
Flash Board: HA360-200C
Display Board: SB2000-400C
Keyboard: SB2000-300C

Associated Device: HA360DB Door Bell and HA360SS Sound Signaler

Specifications:

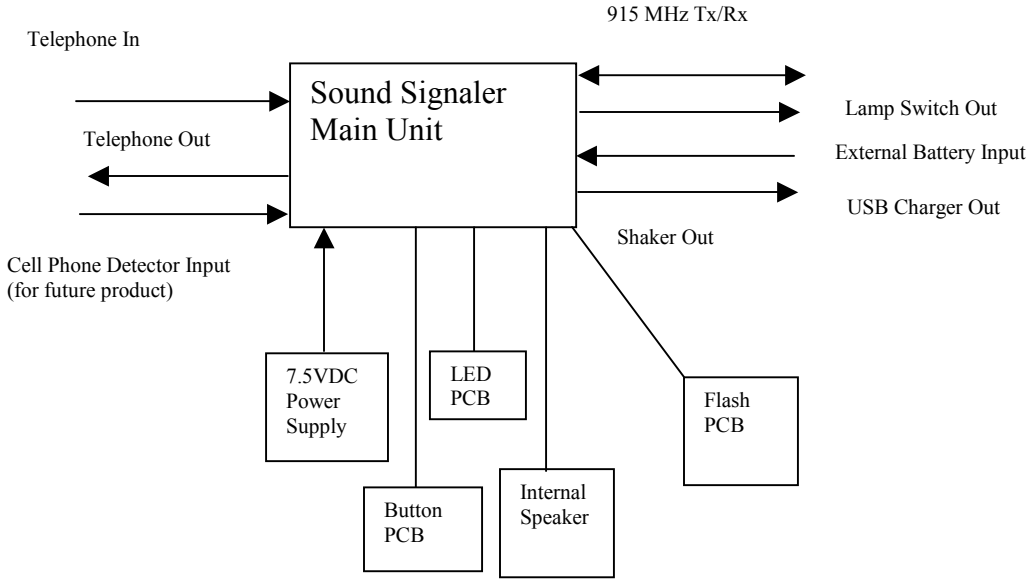
Input Power: TENPAO 7.5VDC 2000 MA Wall Adaptor S018KU0750200

Input Signals: Cell Phone Detector (future wired product), external battery input

Outputs Signals: Vibrator power, Lamp Switch, USB Charge,

Input / Output Signals: 15.249 RF Transceiver, Telephone in, telephone out

EUT Block Diagram:



EUT Pictures

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- Main PCB Top View Page 11
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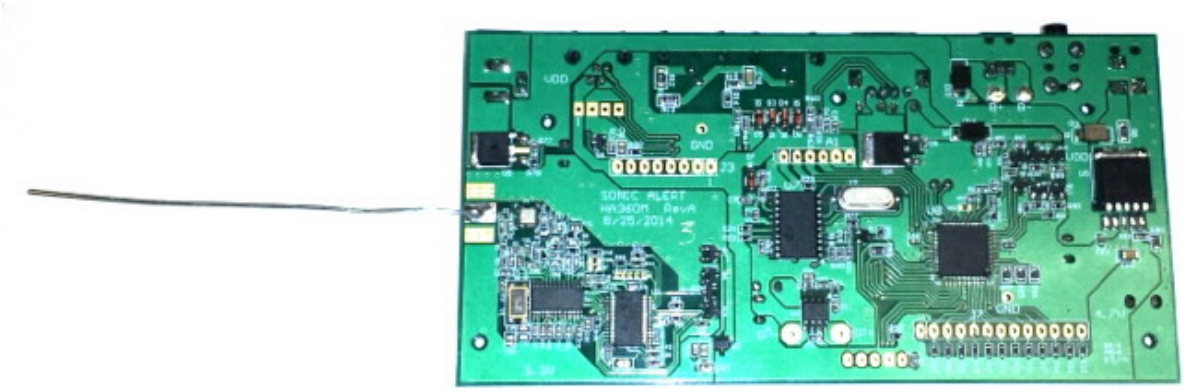
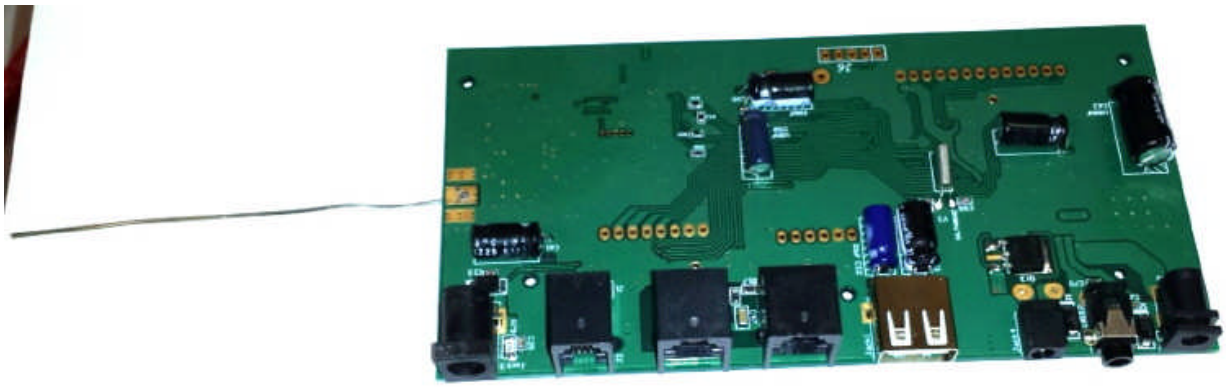
- Power Supply View Page 14
- Rear Panel View Page 14

Exterior View

Main PCB Top View



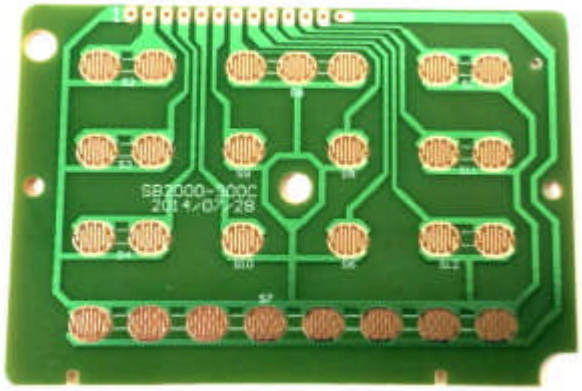
Main PCB Bottom View



Flash PCB Top View

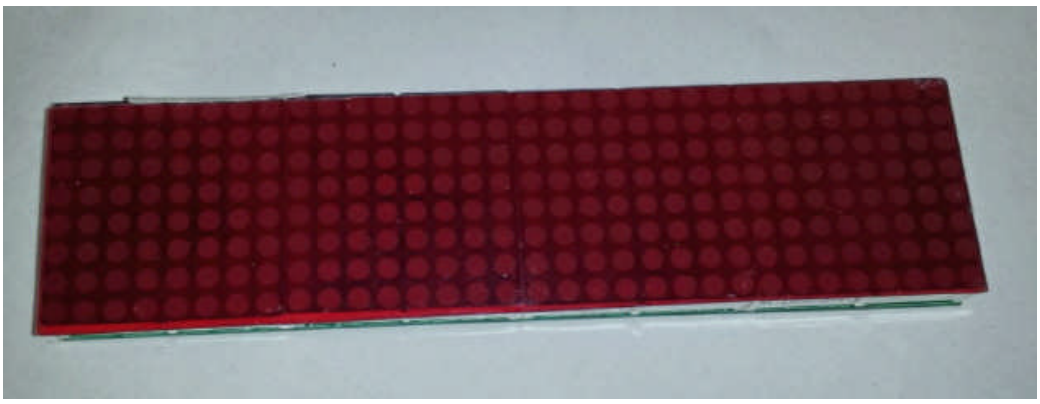
Flash PCB Bottom View

Button PCB Top View

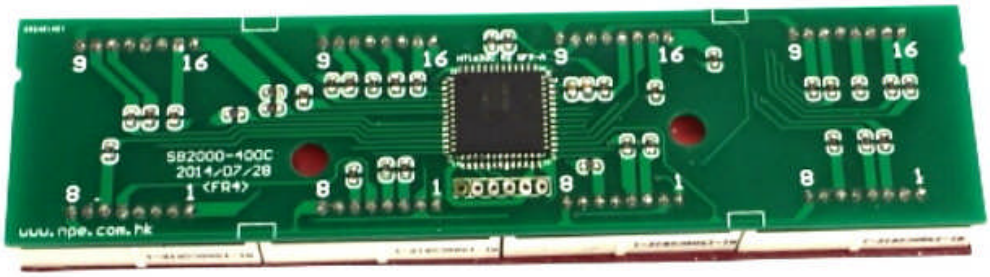


Button PCB Bottom View

LED PCB Top View

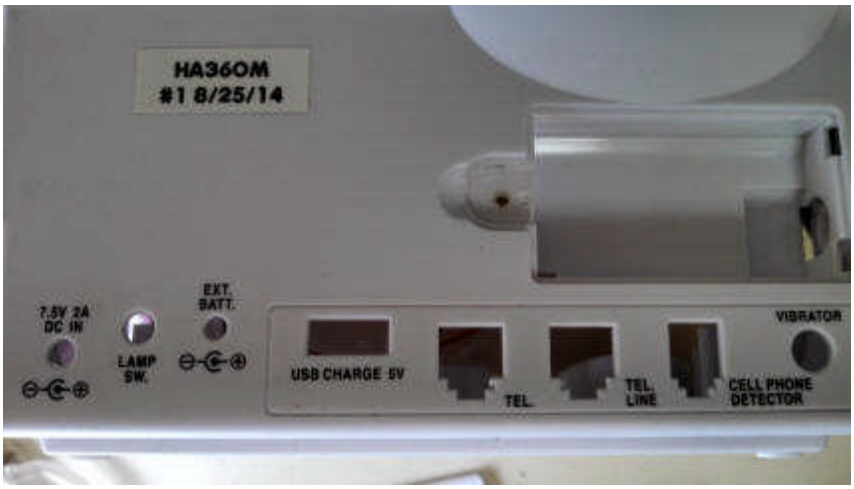


LED PCB Bottom View



Power Supply View

Rear Panel View

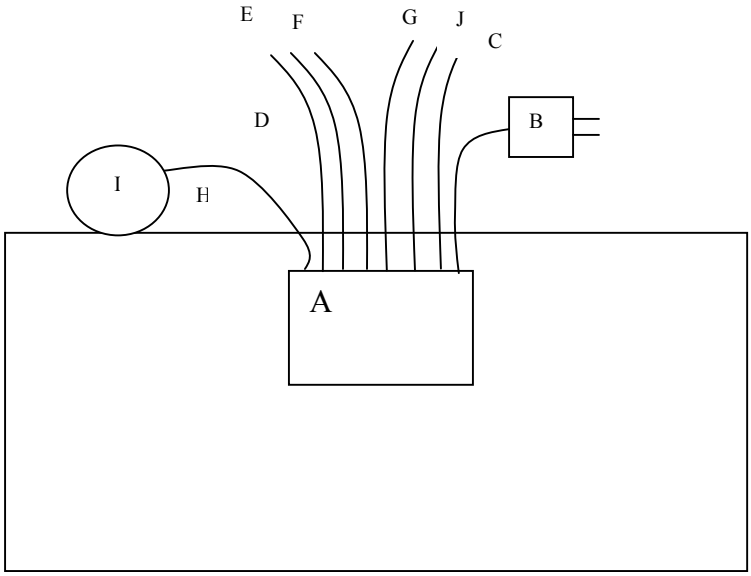


Equipment Test Setup:

Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	Home Aware Main Unit	HA360M	AHD-001	915 MHz txcvr, 60% duty cycle
B	7.5VDC 2000 MA Wall Adaptor Power Supply	TENPAO	S018KU07 50200	SWITCHING SUPPLY
C	External Lamp Switch Cable			3 M UNSHIELDED
D	Cell Phone Detector Cord			3 M UNSHIELDED
E	Telephone Wire			3M UNSHIELDED UNTERMINATED
F	Telephone Wire			3 M UNSHIELDED UNTERMINATED
G	USB Charger Cable			3 M SHIELDED UNTERMINATED
H	Shaker Power Cable			3 M UNSHIELDED
I	Shaker Unit			DC MOTOR UNIT
J	External Battery Input Cable			3 M UNSHIELDED

Block Diagram



Setup Pictures

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- Conducted Setup Front View Page 16
- Conducted Setup Rear View Page 17
- Spurious Setup Front View Page 17
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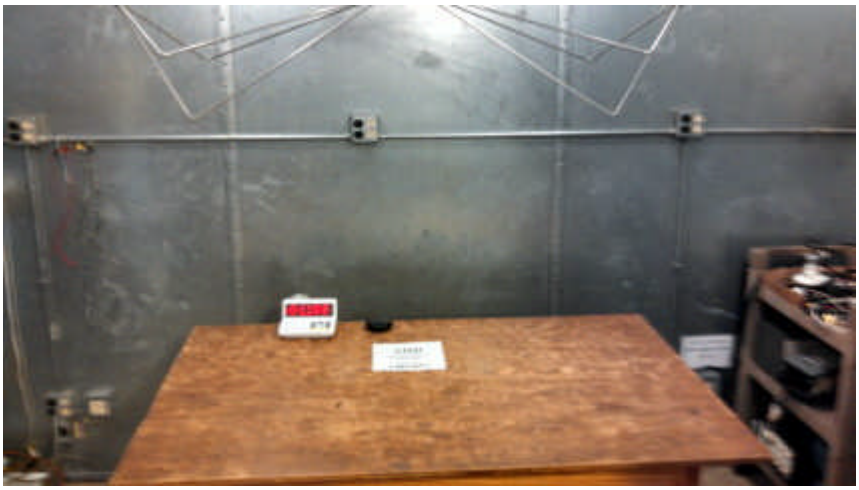
- Tx Setup End Orientation Page 19
- Environmental Test View Page 19

Radiated Prescreen Setup



Conducted Setup Front View

Conducted Setup Rear View

Spurious Setup Front View

Spurious Setup Rear View

Tx Setup Flat Orientation

Tx Setup Side Orientation

Tx Setup End Orientation

Environmental Test Setup View

Measurement Report

Standards Applied to Test

ANSI C63.4 – Radio Noise Emissions 2003.12
CFR47 FCC Part 15, SubPart B
CFR47 FCC Part 15, SubPart C 15.249
AHD/SEI test procedures TP0101LC, TP0102RA
EN55022 ITE Disturbance 2005.11
EN61000-6-3 Generic 2007.2

Equipment Configuration

For the testing, the placement of the EUT and the support equipment was selected to –

- Be a representation of a configuration typical of user installation, and
- Comply with the minimum system configuration of ANSI C63.4.

Test Methodology

Line Conducted:

Line Conducted test procedures are described in Appendix A.

Radiated:

Spurious radiated testing was performed at a 3 meter open field test site, and completed according to the procedures in FCC 15, SubPart B with supporting instructions from ANSI C63.4. Please reference Appendix A for further details on Test Methodology.

Note that distances less than 3 meters (i.e. 1 and 0.1 meter) may be used if signals are not detectable at specified distances, and distances compensated for within the tabulated measurements.

A scan of the EUT was made in a shielded room to study the emission profile of this EUT. This scan indicated low level spurious emissions from the unit.

The suspect signals recorded in the shielded room prescan for each module were then measured at the 3-meter open area test site.

For fundamental transmit testing, emissions were tested in three orientations: Front, Side, and End, using both horizontal and vertical antenna polarities. Experimentation revealed that the worst case orientation was Flat – Vertical. This was the orientation used for all fundamental and harmonic transmit measurements.

Fundamental signal testing was performed using Quasi-peak detection, and transmit harmonics over 1000 MHz were tested using peak detection and mathematically compensated using the measured duty cycle adjustment.

For receive local oscillator testing, the device was placed in a “receive only” mode. The receiver local oscillator frequencies of 305 MHz and 1220 MHz and their harmonics were inspected up to 5 harmonics, or 6100 MHz.

The EUT was scanned for radiated energy up to 10 GHz to meet FCC 15.249 requirements.

The EUT under test was placed per ANSI C63.4

The EUT was exercised as follows:

1. Device was powered via external power adaptor
2. The device was activated at power up.
3. Test modes simulated Transmit and Receive operation, LED activity, shaker vibration, flasher operation, and sound from device
4. Test mode displayed on LED panel

The cables were manipulated to produce the highest signal level relative to the limit.

The pictures, in the preceding pages, show the position of the equipment and cabling that produced the maximum signal level.

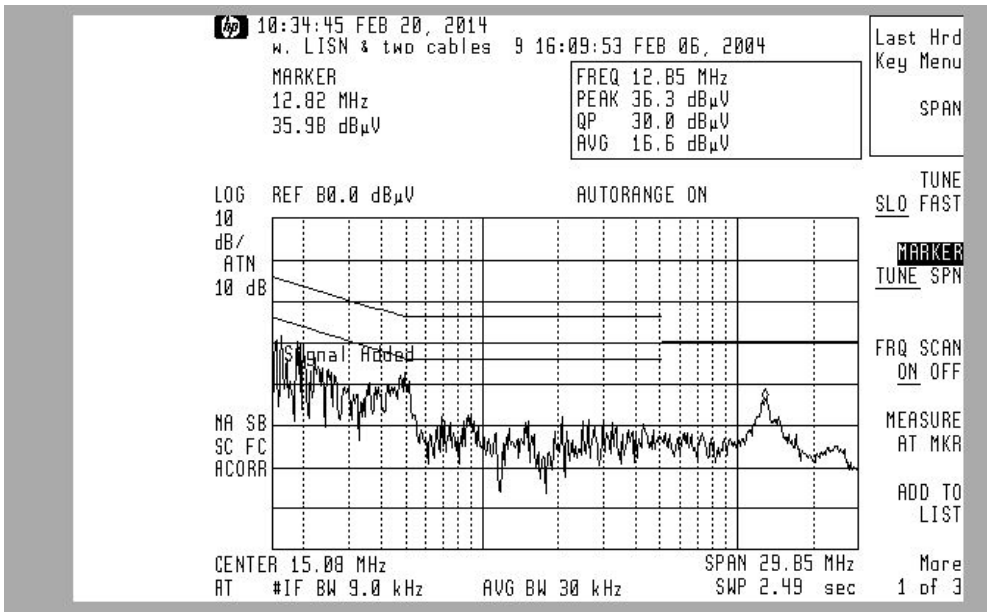
Variance from Test Procedure:

None

Test Data

Line Conducted:

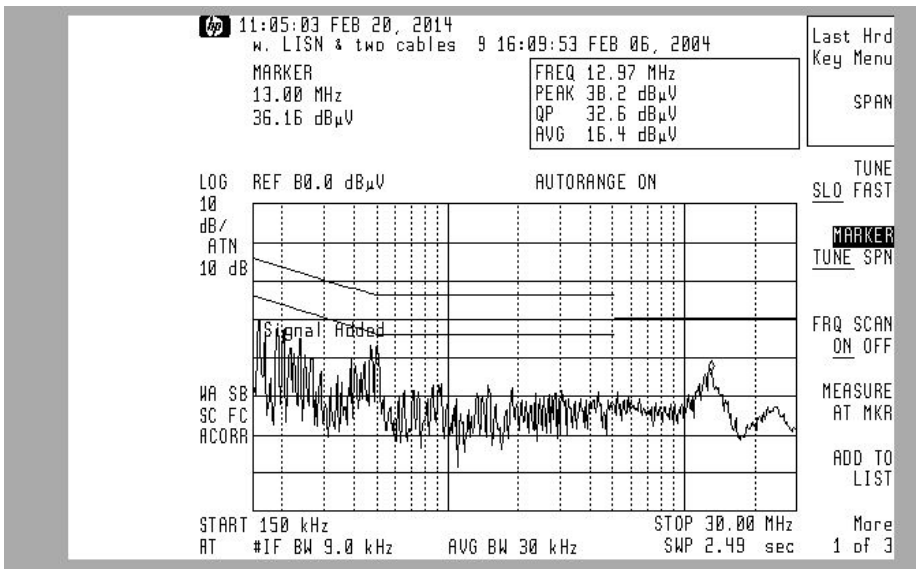
NEUTRAL to Ground Measurement.
Class B Plot of Peak Values



NEUTRAL to Ground Conducted
Class B Tabulated Measurements

Frequency	dBuV Reading		FCC / EN55022 dBuV Class B Limit		dB Margin	
MHz	QP	Avg	QP	Avg	QP	Avg
0.16	**50.00**	**31.00**	65.46	55.46	15.46	24.46
0.19	**46.00**	**26.00**	64.04	54.04	18.04	28.04
0.50	**39.00**	**25.00**	56.00	46.00	17.00	21.00
0.88	**27.00**	**14.00**	56.00	46.00	29.00	32.00
1.30	**26.00**	**12.00**	56.00	46.00	30.00	34.00
12.80	**30.00**	**16.60**	60.00	50.00	30.00	33.40

PHASE to Ground Measurement.
Class B Plot of Peak Values

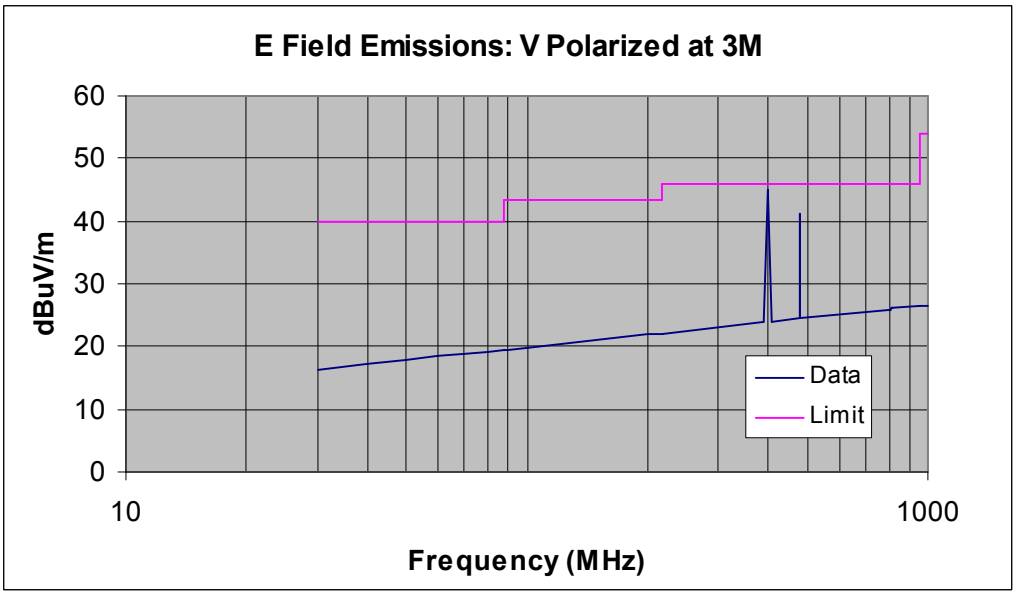


PHASE to Ground Conducted
Class B Tabulated Measurements

Frequency	dBuV Reading		FCC / EN55022 dBuV Class B Limit		dB Margin	
MHz	QP	Avg	QP	Avg	QP	Avg
0.16	**49.00**	**37.00**	65.46	55.46	16.46	18.46
0.19	**47.00**	**32.00**	64.04	54.04	17.04	22.04
0.48	**43.00**	**28.00**	56.00	46.00	13.00	18.00
0.86	**31.00**	**17.00**	56.00	46.00	25.00	29.00
1.30	**30.00**	**17.00**	56.00	46.00	26.00	29.00
12.90	**32.60**	**16.40**	60.00	50.00	27.40	33.60

Radiated Spurious Emissions

Class B Plot of Spurious Quasi-Peak Measurements
Vertically Polarized at 3 Meters

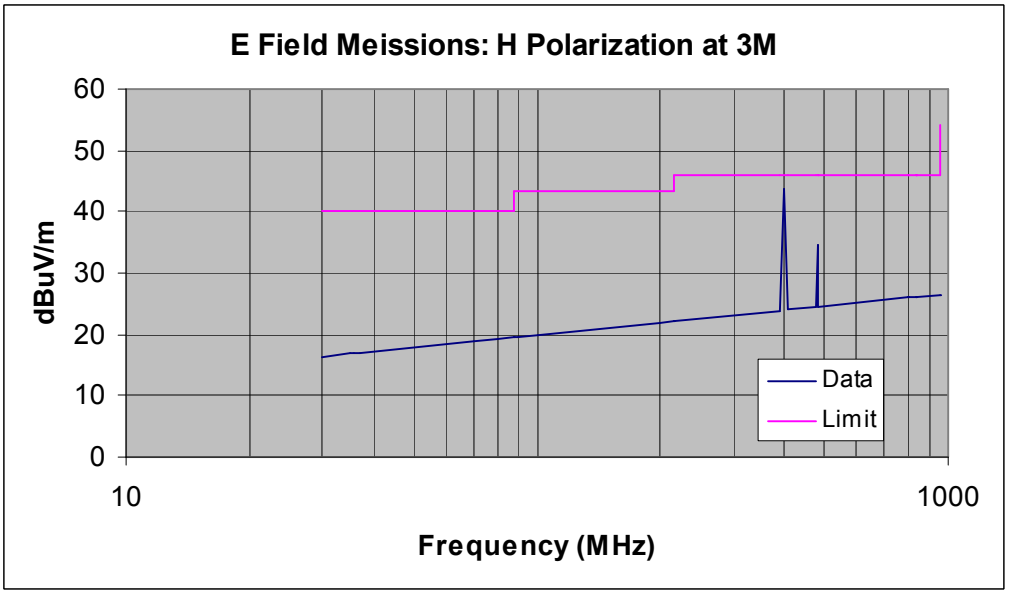


Class B Tabulated Spurious Quasi-Peak Measurements
Vertically Polarized at 3 Meters

Frequency	Corrected Quasipeak Measurement	Turntable Azimuth	Antenna Height	FCC Class B Limit	Margin Class B
MHz	dBuV/m	deg	Mtr	dBuV/m	dB
***399.00**	**44.90**	150.00	1.00	**46.00**	**1.10**
478.00	**41.30**	180.00	1.00	**46.00**	**4.70**

* Note that the emission measurement was within the AHD 95% confidence level of +/- 2.3 dB.

Class B Plot of Spurious Quasi-Peak Measurements
Horizontally Polarized at 3 Meters

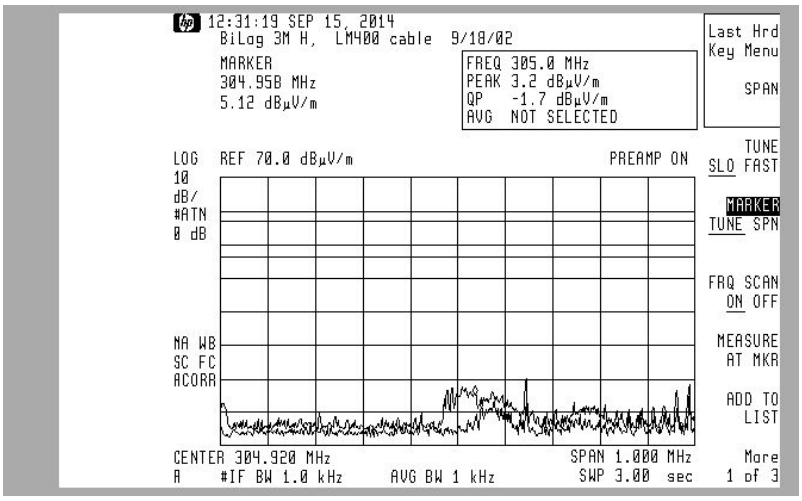


Class B Tabulated Spurious Quasi-Peak Measurements
Horizontally Polarized at 3 Meters

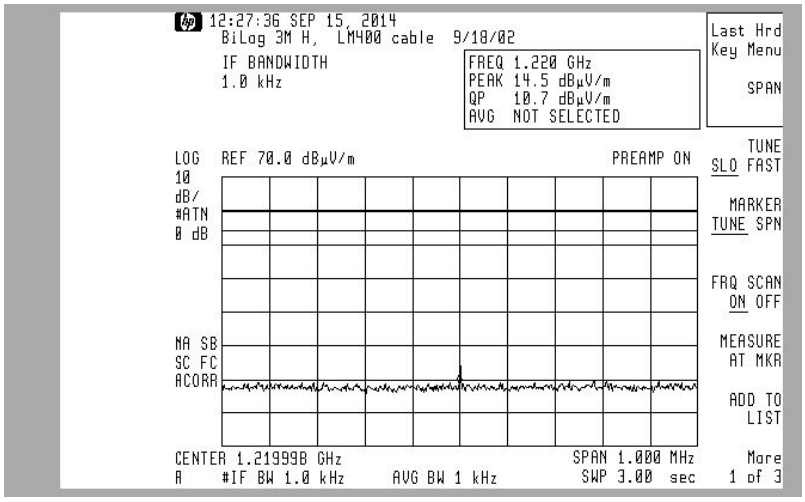
Frequency	Corrected Quasipeak Measurement	Turntable Azimuth	Antenna Height	FCC Class B Limit	Margin
MHz	dBuV/m	deg	Mtr	dBuV/m	dB
401.00	**43.70**	120.00	2.10	**46.00**	**2.30**
481.00	**34.50**	90.00	1.90	**46.00**	**11.50**

Radiated Receive Measurements:

RX LO 305 MHz Plot



RX LO 1220 MHz Plot



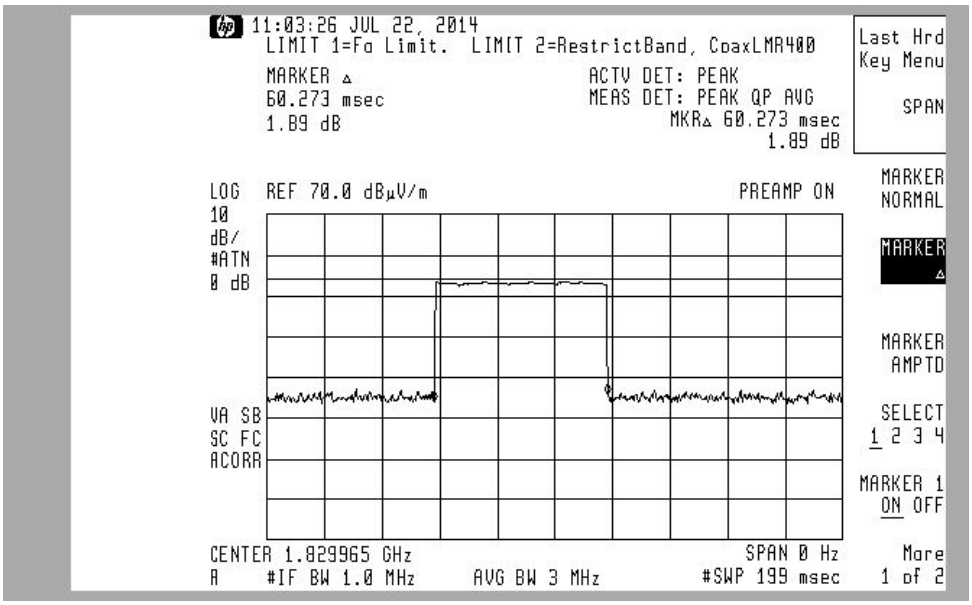
Tabulated Local Oscillator Measurement

Frequency	E Field Measurement at 0.1 meter	Antenna Correction	E Field Distance Adjust	E Field Duty Cycle Adjust	E Field Measurement	E Field Measurement	FCC Limit	Margin
MHz	dBuV/m	dB	dB	dB	dBuV/m	uV/m	uV/m	uV/m
305.00	***-1.70**	**0.00**	**-29.54**	**0.00**	**-31.24**	**0.03**	**200.00**	**199.97**
1220.00	****14.50**	**25.15**	**-29.54**	**-4.40**	**5.71**	**1.93**	**500.00**	**498.07**

* Using QP Detector, ** Using Peak Detector
Note that Harmonics measured up to 6100 MHz were below instrument noise floor when measured at 3M.

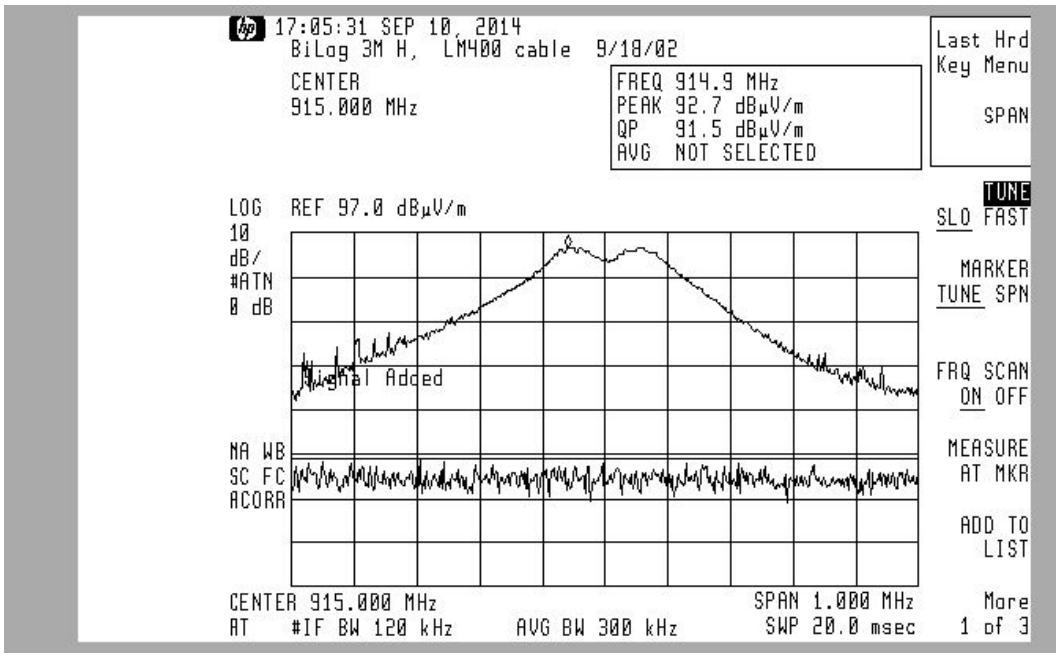
Radiated Transmit Measurements

Duty Cycle Plot



Note: Transmit was measured to be "on" 60 mS out of any 100 mSec period. 60% duty cycle = -4.4 dB correction for averaging peaked harmonic measurements over 1 GHz.

Transmit Fundamental Plot



Transmit Fundamental Measurement

Frequency	Rx Antenna Polarization	EUT Orientation	E Field Measurement at 3M (Quasipeak)	E Field Measurement	E Field Measurement	FCC 15.209 Limit	Margin
MHz	deg		dBuV/m	dBmV/m	mV/m	mV/m	mV/m
915.00	**V**	**Flat**	**91.50**	**31.50**	**37.58**	**50.00**	**12.42**

Transmit Lower Harmonics Measurements

Frequency	E Field Peak Measurement at 3 meter	Preamp Correction	E Field Duty Cycle Adjust	E Field Measurement	E Field Measurement	FCC Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m	uV/m	uV/m	uV/m
1830.00	**78.70**	**-22.50**	**-4.40**	**51.80**	**389.05**	**500.00**	**110.95**
***2745.00**	**76.10**	**-21.00**	**-4.40**	**50.70**	**342.77**	**500.00**	**157.23**

*Restricted Frequency. Note that restricted limits are same as spurious limits.

Transmit Upper Harmonics Measurements

Frequency	E Field Peak Measurement at 3 meter	Antenna + preamp Correction	E Field Duty Cycle Adjust	E Field Measurement	E Field Measurement	FCC Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m	uV/m	uV/m	uV/m
***3660.00**	**44.70**	**12.43**	**-4.40**	**52.73**	**433.01**	**500.00**	**66.99**
***4575.00**	**54.00**	**-7.00**	**-4.40**	**42.60**	**134.90**	**500.00**	**365.10**
5490.00	**60.00**	**-5.00**	**-4.40**	**50.60**	**338.84**	**500.00**	**161.16**
6405.00	**53.00**	**-4.79**	**-4.40**	**43.81**	**155.06**	**500.00**	**344.94**
***7320.00**	**49.00**	**-2.40**	**-4.40**	**42.20**	**128.82**	**500.00**	**371.18**
***8232.00**	**N 34.00**	**-2.20**	**-4.40**	**27.40**	**23.44**	**500.00**	**476.56**
***9150.00**	**49.00**	**-1.77**	**-4.40**	**42.83**	**138.52**	**500.00**	**361.48**

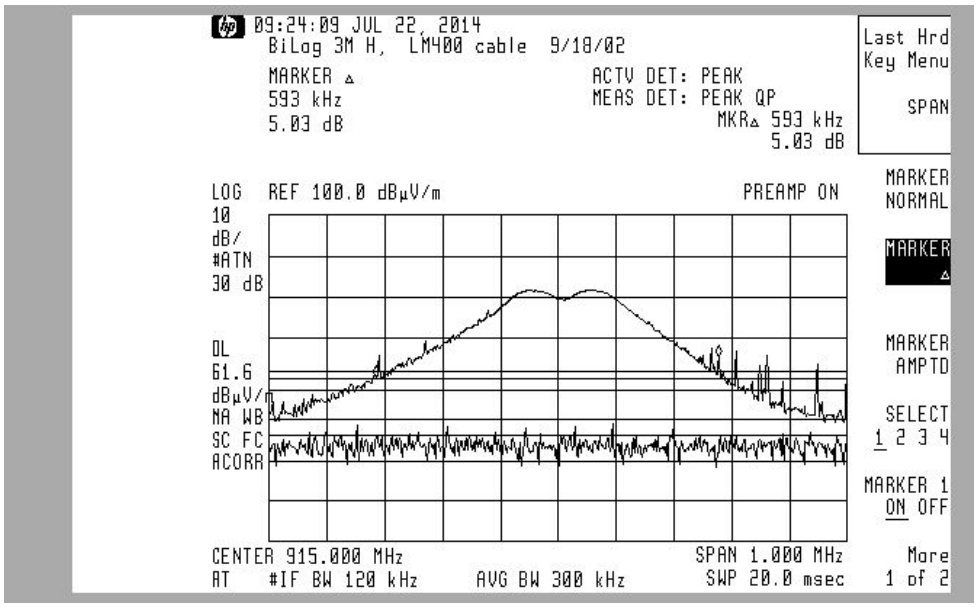
*Restricted Frequencies. Note that restricted limits are same as spurious limits.
N – Signal not detected, noise floor measurement recorded

Upper Harmonics Peak Measurements

Frequency	E Field Peak Measurement at 1 meter	Antenna Plus Preamp Correction	E Field Measurement	FCC Limit	Margin
MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB
1830.00	**78.70**	**-22.50**	**56.20**	**74.00**	**17.80**
***2745.00**	**76.10**	**-21.00**	**55.10**	**74.00**	**18.90**
***3660.00**	**44.70**	**12.43**	**57.13**	**74.00**	**16.87**
***4575.00**	**54.00**	**-7.00**	**47.00**	**74.00**	**27.00**
5490.00	**60.00**	**-5.00**	**55.00**	**74.00**	**19.00**
6405.00	**53.00**	**-4.79**	**48.21**	**74.00**	**25.79**
***7320.00**	**49.00**	**-2.40**	**46.60**	**74.00**	**27.40**
***8232.00**	**N 34.00**	**-2.20**	**31.80**	**74.00**	**42.20**
***9150.00**	**49.00**	**-1.77**	**47.23**	**74.00**	**26.77**

*Restricted Frequencies. Note that restricted limits are same as spurious limits.
N – Signal not detected, noise floor measurement recorded

Transmit 20dB BW Plot



Tabulated Frequency Drift due to Voltage Variation

Frequency	AC Voltage	Frequency	AC Voltage	Frequency Change	Spec	Margin
MHz	V	MHz	V	MHz	MHz	MHz
915.04140	**132.25**	**915.04140**	**97.75**	**0.00000**	**0.009150**	**0.00915**

Tabulated Frequency Drift due to Temperature Variation

Frequency	Temp	Frequency	Temp	Frequency Change	Spec	Margin
MHz	deg C	MHz	deg C	MHz	MHz	MHz
915.03770	**-20.00**	**915.04620**	**50.00**	**0.00850**	**0.009150**	**0.00065**

Environment

The test was performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 75 deg F, the relative humidity 45%.

APPENDIX A

Measurement Procedures

Line Conducted

The system was placed upon a 1 x 1.5 meter non-metallic table 80cm from the ground floor and 40cm from the vertical conducting plane in the prescribed setup per ANSI C63.4. This table is housed in a shielded enclosure to prevent the detection of unwanted ambients.

The EUT, or host unit if applicable, was connected to the LISN being monitored by the EMI Receiver. The remaining support devices requiring mains power were connected to a second LISN.

The EUT was continuously exercised by methods supplied by the manufacturer.

While monitoring the display of the EMI Receiver, via remote video monitor, the cables were manipulated to determine a position that maximized the emissions being observed. Once the highest amplitude relative to the limit was determined for the Phase current carrying line the procedure was repeated for the Neutral current carrying line.

The configuration that created an emission closest to the limit was used during the course of taking final measurements. Pictures of this final configuration are recorded in this report.

The principal settings of the EMI Receiver for line conducted testing include:
Bandwidth = 9kHz
Detector Function: scanning and signal search = Peak Detection Mode
measurements = Quasi Peak Detection and Average Detection

The cable losses of the coax used in line conducted testing are charted in this appendix.

Radiated

The system was placed upon a 1 x 1.5 meter non-metallic table 80cm from the open field site ground plane in the prescribed setup per ANSI C63.4, Figure 9(c).

The table sits upon a remote controlled turntable. The receiving antenna, located at the appropriate standards distance of 3 or 10 meters from the table center, is also remote controlled.

Note that distances less than 3 meters (i.e. 1 and 0.1 meter) may be used if signals are not detectable at specified distances, and distances compensated for within the tabulated measurements.

The EUT was continuously exercised by software supplied by the manufacturer.

Preliminary tests were done at the 3 meter open field test site. The final tests are done at the appropriate standards distance of 3 or 10 meters. The "Biconical/Log Periodic" broadband antenna connected to an EMI Receiver, meeting CISPR 16, is used throughout the testing.

During the preliminary scans and while monitoring the display of the EMI Receiver, the turntable was rotated 360 degrees and the receiving antenna height varied from 1 to 4 meters to search out the highest emissions. At the significant emissions, the cables were manipulated to determine a position that maximized the emissions being observed. Once the cable position was determined that presented the highest amplitude relative to the limit for Vertical polarized emissions the procedure was repeated for the Horizontal polarization.

The configuration that created an emission closest to the limit was used during the course of taking final measurements. Pictures of this final configuration are recorded in this report.

The principal settings of the EMI Receiver for radiated signal testing between 30 MHz and 1 GHz include:

Resolution Bandwidth: 120kHz
Video Bandwidth: 300 KHz
Detector Function: scanning and signal search = Peak Mode
measurements = Quasi Peak Mode.
Search Range: 30MHz to 1000MHz or to 2GHz as appropriate

The principal settings of the EMI Receiver for radiated testing above 1 GHz include:

Resolution Bandwidth: 1 MHz
Video Bandwidth: 3 MHz
Detector Function: scanning and signal search = Peak Mode
Duty Cycle Compensated Measurements = Peak Mode
Direct Signal Measurements = Average Mode.
Search Range: Above 1000MHz as required

The cable loss of the coax used in radiated scanning is charted in this appendix.
The antenna factors, for the test distance used, are charted in this appendix.

The resultant Field Strength (FS) is a summation in decibels (dB) of the Indicated Receiver Level (RF), the Antenna Correction Factor (AF), and the Cable Loss Factor (CF). If a PreAmplifier (PA) is used, its gain (dB) is subtracted from the above sum.

Formula 1: FS(dBuV/m) = RF(dBuV) + AF(dB/m) +CF(dB) - PA(dB)

To convert the Field Strength dBuV/m term to uV/m, the dBuV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in uV/m terms.

Formula 2: FS(uV/m) = AntiLog[(FS(dBuV/m))/20]

Measurement Facilities & Equipment

Test Site

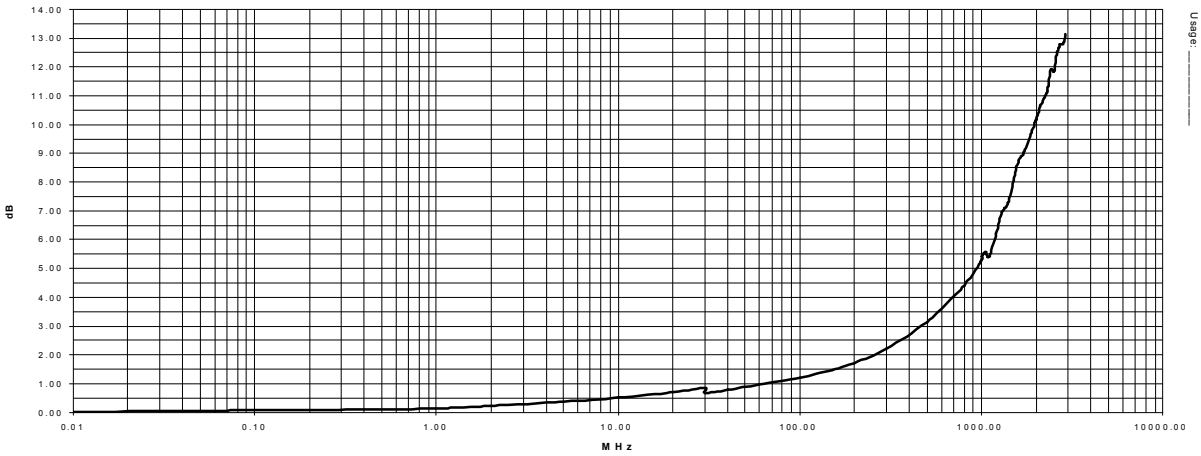
The AHD test facility is centered on 9 acres of rural property near Sister Lakes, Michigan. The mailing address is 92723 Michigan Hwy152, Sister Lakes, 49047. This test facility is NVLAP accredited (LabCode 200129-0). It has been fully described in a report filed with the FCC (No.90413) and Industry Canada (file:IC3161).

Measurement Equipment Used

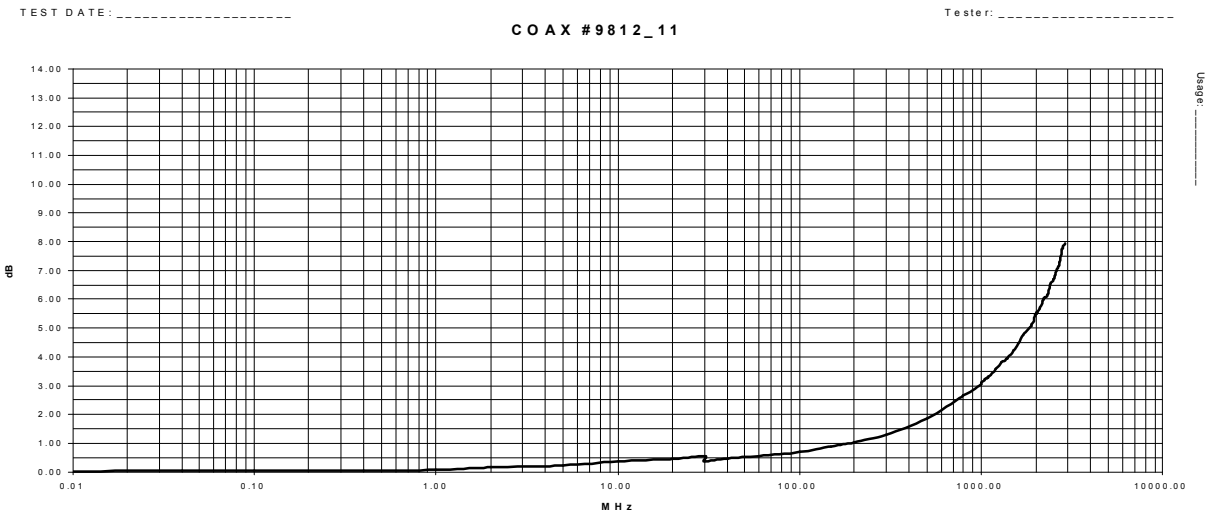
Equipment	Model	S/N	Last Cal Date	Calibration Interval
HP EMI Receiver system	HP 8546A			
RF Filter Section	HP-85460A	3448A00283	3 Apr-14	12 months
RF Receiver Section	HP-85462A	3625A00342	3 Apr-14	12 months
EMCO BiconiLog Antenna	3142	1069	18- Nov-13	12 months
EMCO Double Ridged Horn	3115	7770	20-Sept-13	12 months
Solar LISN	8012-50-R-24-BNC	962137	1 Nov-13	12 months
Solar LISN	8012-50-R-24-BNC	962138	22-Oct-13	12 months
(3-m) LMR-400 Ultra Flex	LMR400	C090804	01-July-14	6 months
(3-m) CS-3227 RG8	CS-3227	C060914	01-July-14	6 months
(10-m) Amelco 50ohm Coax	RG213U	9903-10ab	01-July-14	6 months
(LCI) Double shielded 50ohm Coax	RG58/U	920809	01-July-14	12 months
Keytek Surge	711B	8511854	05-May-14	12 months
Schaffner ESD	NSG432	01027	06-May-14	12 months
Schaffner EFT	NSG600/641	0113	05-May-14	12 months
EMCO Loop	6205	2164	22-Sept-12	36 months

Cable Loss

Line Conducted 150KHz through 30MHz, Coax #920809
Last Calibration date: 01-July-14

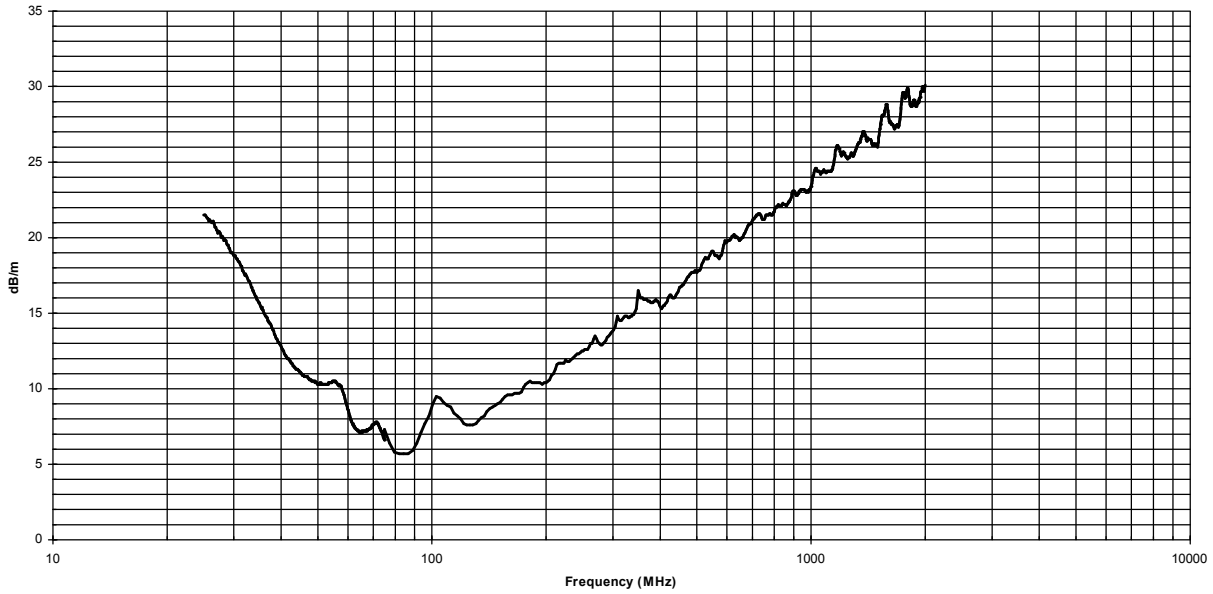


Radiated at 3 meters; 30MHz through 3000MHz, Coax #C090804
Last Calibration date: 01-July-14

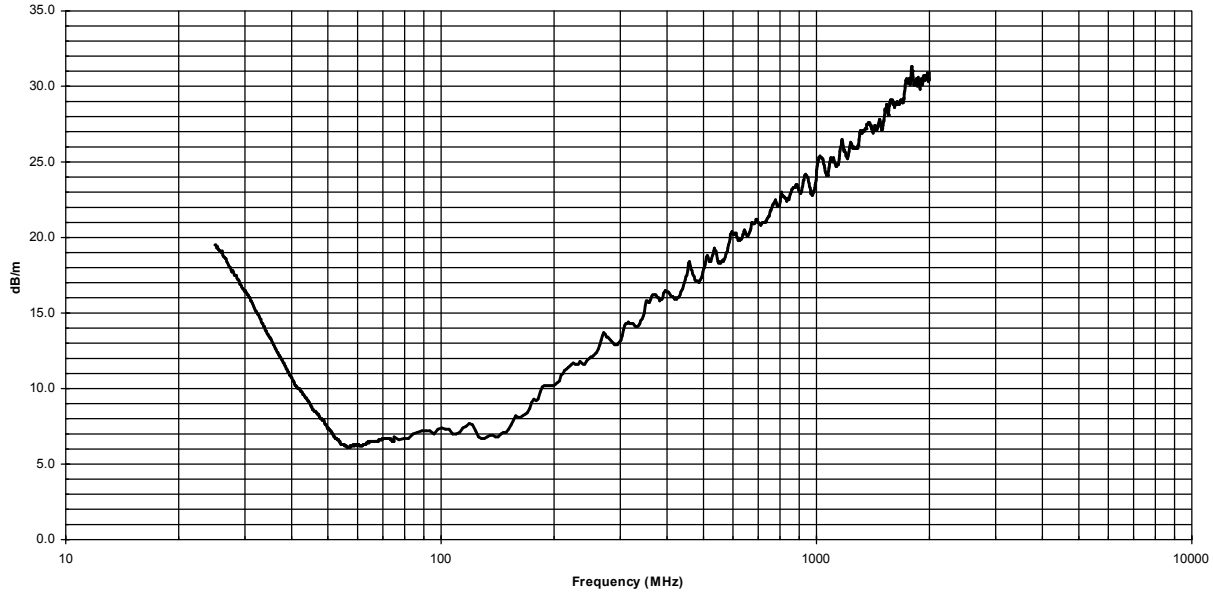


Antenna Factors

EMCO Model 3142 Antenna #1069
Last Calibration Date; 18- Nov-13
3 Meter Distance Factors



10 Meter Distance Factors



AHD Accreditation

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200129-0

AHD (Amber Helm Development; L.C.)
Sister Lakes, MI

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2014-07-01 through 2015-06-30
Effective dates

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2009-01-28)

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

December 04, 2013

Registration Number: 90413

AHD EMC Laboratory
92723 M-152,
Dowagiac, MI 49047

Attention: Gordon Helm, President

Re: Measurement facility located at Sister Lakes
3 & 10 meter site
Date of Renewal: December 04, 2013

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish
Industry Analyst

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