

Amber Helm Development L.C.

92723 Michigan Hwy-152
Sister Lakes, MI 49047

EMC Test Report

#1001328FX

Issued 04/09/2010

Regarding the FCC Part 15, SubPart C testing



4 Button Transmitter

Model Number: P1000-TR

Category: Periodic Intentional Radiator

Judgments: FCC Part 15 Part 15.231 – Compliant
Industry Canada RSS-210 Issue 7, ICES-003 and RSS-Gen - Compliant



NVLAP LAB CODE 200129-0

Prepared for:

Ron Mathia
TouchTronics
57315 Nagy Dr.
Elkhart, IN 46517

Test Date(s):

2/10/10-3/23/10

Report prepared by:



David J. Miller, NCE

Report reviewed by



Gordon L. Helm, NCE

Data recorded by:



Gordon L. Helm, NCE
Test Engineer, AHD

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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: ± 1.4 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:**Applies to:** [Class A or B Digital Devices or Peripheral].

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.

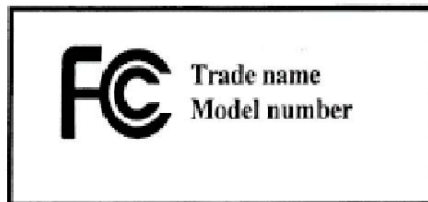
2. A statement is required to be placed in the User's Manual shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 7 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

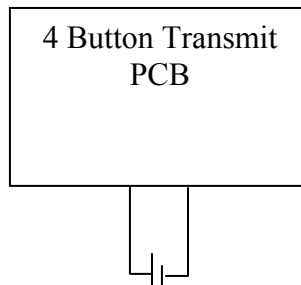
1. The device model number P1000-TR was tested for compliance with FCC Regulations, Part 15, SubPart 231, and Industry Canada ICES-003, RSS-Gen, RSS-210 Issue 7 (Annex 1 for momentarily operated devices.) These tests were performed at AHD EMC Laboratory following the procedures outlined in ANSI C63.4.
2. The test results apply to model P1000-TR.
3. The device tested is compliant to the requirements of FCC Part 15 SubPart C for periodic transmission intentional radiators and Industry Canada RSS-210 Issue 7 Annex 1, ICES-003, RSS-Gen.
4. The equipment under test was received on 2/10/2010 and this test series commenced on 3/23/2010.
5. Because the EUT is battery operated, no conducted emissions testing was required.
6. Prescreen of the EUT revealed no detectable spurious radiated emissions.
7. The device meets the requirements of 15.231 section a.1 and IC RSS-210 A1.1.1.a for automatic transmit deactivation within 5 seconds after manual button release. The device releases the transmitter by design within 70 milliseconds after button release.
8. Measurements were taken using peak detector mode. Because normal operation utilizes Manchester encoding, the peak measurements were adjusted to reflect a 50% pulse modulation profile by -6dB. Measurements performed in average detector mode confirmed the 6dB adjustment factor.
9. The 15.231 fundamental signal limit is calculated to be 80.83 dBuV/m using average detection at a distance of 3 meters per 15.231.b.1. The adjusted radiated fundamental transmit emission level nearest the limit occurred at 433.92 MHz, in a vertically polarized end orientation. The signal was measured to be 3.38dB below the FCC calculated average limit.
10. The 15.231 spurious signal limit is calculated to be 60.83 dBuV/m using average detection at a distance of 3 meters per 15.231.b.1. The adjusted radiated second harmonic transmit emission level nearest the limit occurred at 867.72 MHz, in a vertically polarized end orientation. The signal was measured to be 12.07 dB below the FCC calculated average limit.
11. The 20 dB bandwidth limit is calculated to be 1.085 MHz per 15.231.c. The fundamental signal bandwidth was measured to be 0.795 MHz below the calculated limit.
12. The 99% bandwidth limit is calculated to be 1.085 MHz per RSS-210 A1.1.3. The fundamental signal bandwidth was measured to be 0.425 MHz below the calculated limit.
13. The fundamental signal was found to be 199.93 mW below the IC SAR limit of 200 mW. SAR measurement is not required for IC certification.
14. The fundamental signal was found to be 138 mW below the FCC KDB 447948-D01 recommended limit for evaluating SAR performance. SAR measurement is not required for FCC certification.

Changes Made to Achieve Compliance:

1. R1 = 2870 ohms
2. D1 populated

EUT Descriptions**Model:** 4 Button Transmitter**Model number:** P1000-TR**Serial/ID No:** AHD 27**Description:** 4 Button Periodic Transmitter**Antenna:** PCB Integrated**PCB Bare Board:** PCB11900-1**PCB Assembly:** SUB11902-1**Description:**

The device is a periodic operation transmitter operating at 434 MHz. The device operates using Manchester encoding modulation. The device operates as an FCC 15.231 / RSS-210.A1 compatible intentional transmitting device. The device automatically deactivates the transmitter within 70 mSec of button release.

Specifications:**Input Power:** 2 AA batteries at 3V**Outputs Signals:** 434 MHz Pulse Modulation**Input Signals:** NA**EUT Block Diagram:**

EUT Pictures

- Exterior Overall View Page 8
- Interior PCB Top View Page 8
- Interior PCB Bottom View Page 9

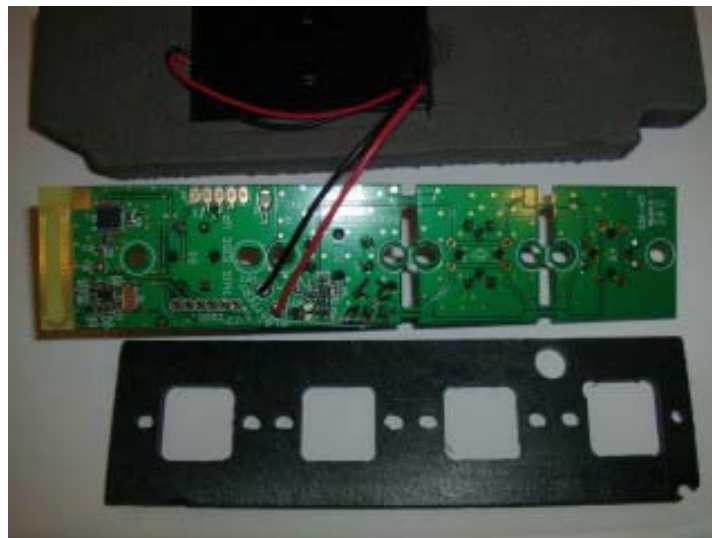
Exterior View



Interior PCB Top View



Interior PCB Bottom View

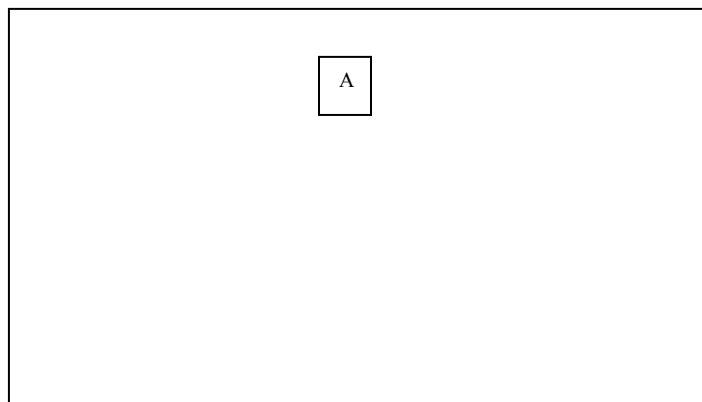


Equipment Test Setup:

Support Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	4 Button Transmitter	P1000-TR	AHD27	434 MHz Intermittent Transmitter

Block Diagram



Setup Pictures

- Radiated Prescreen Setup Page 11
- Radiated Setup Front View Page 11
- Radiated Setup Rear View Page 12
- Transmit Setup Flat Orientation Page 12
- Transmit Setup Side Orientation Page 13
- Transmit Setup End Orientation Page 13

Radiated Prescreen Setup



Radiated Setup Front View



Radiated Setup Rear View



Transmit Setup Flat Orientation



Transmit Setup Side Orientation



Transmit Setup End Orientation



Measurement Report

Standards Applied to Test

ANSI C63.4 – 2003

CFR47 FCC Part 15, sub-part 231

AHD/SEI test procedures TP0101LC, TP0102RA

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

Radiated:

Spurious radiated testing was performed at a 3 meter open field test site, and completed according to the procedures in FCC 15 and IC RSS 210 with supporting instructions from ANSI C63.4. Please reference Appendix A for further details on Test Methodology.

A scan of the EUT was made in a shielded room to study the emission profile of this EUT. This scan indicated no detectable 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.

The EUT was scanned for radiated energy up to 4.339 GHz to meet FCC 15.33 requirements.

Measurements were taken using peak detector mode. Because normal operation utilizes Manchester encoding, the peak measurements were adjusted to reflect a 50% pulse modulation profile by –6dB. Average measurements were performed to confirm the 6dB adjustment.

The EUT under test was placed per ANSI C63.4

The EUT was exercised as follows:

1. Device was powered via inserting batteries.
2. The device was activated via non-conducting clamp pushing a button
3. Evidence of operation was demonstrated through the presence of a transmit signal

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

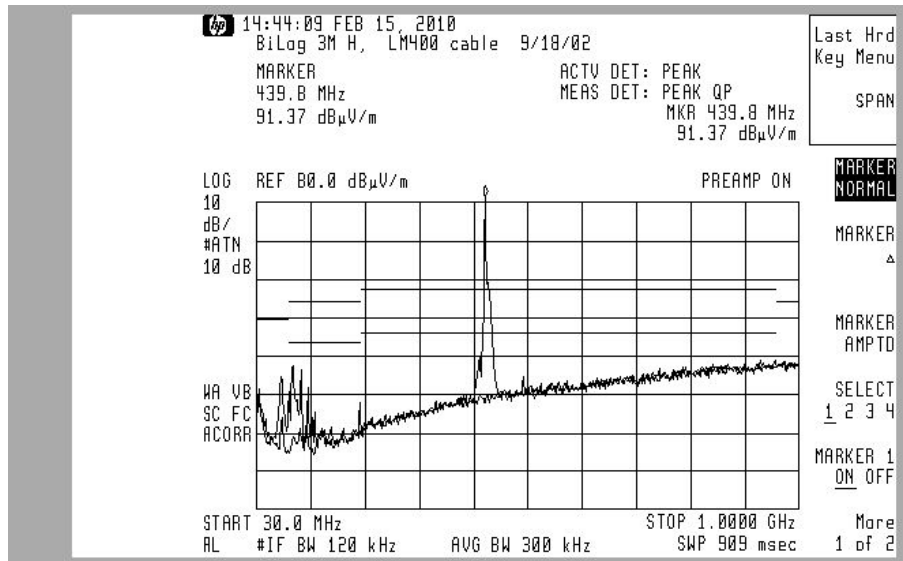
Variance from Test Procedure:

None

Test Data

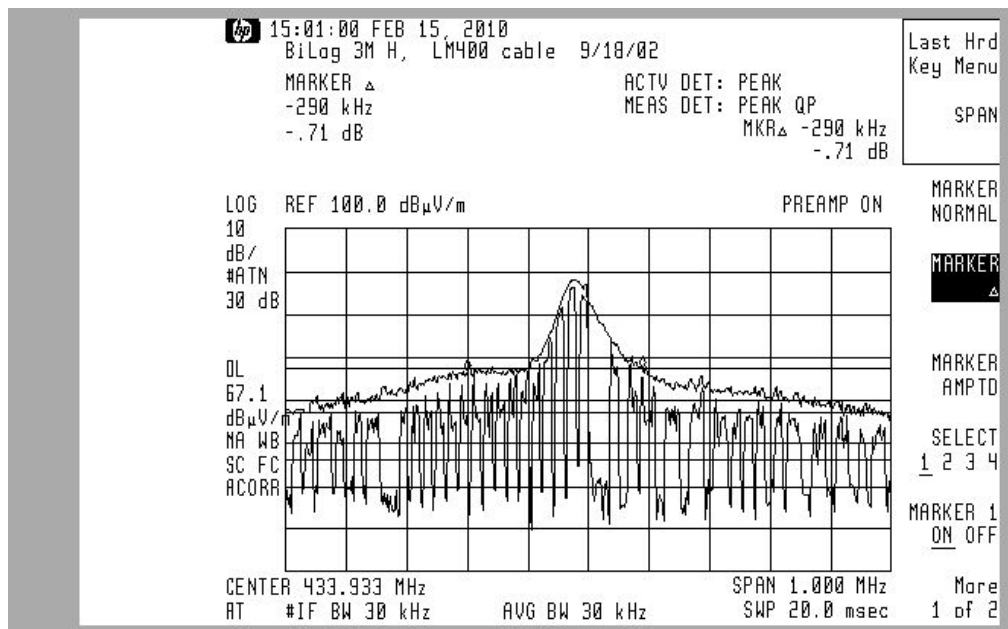
Radiated Spurious Emissions:

Screen Room Spurious Emissions Profile

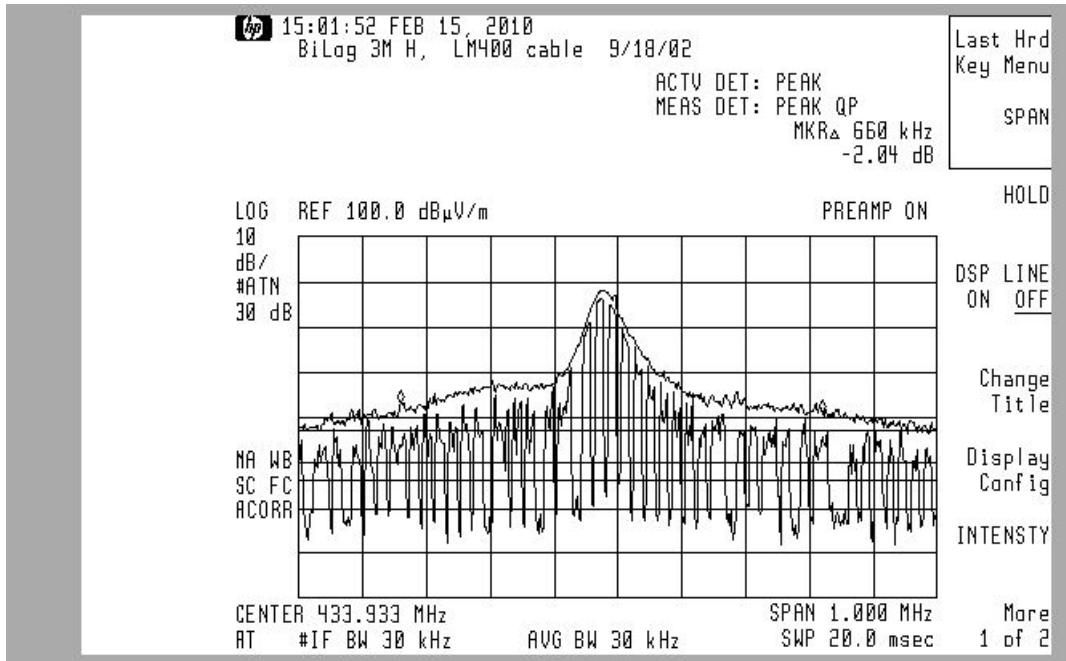


Radiated Transmit Emissions

FCC 20 dB Bandwidth Plot



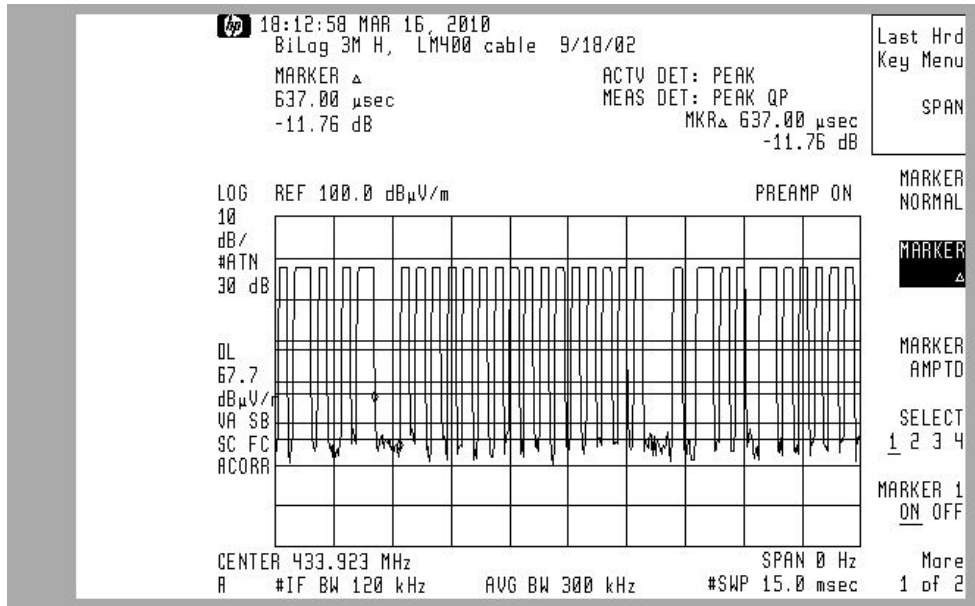
IC 99% Bandwidth Plot



Radiated Transmit 15.231 Calculations

15.231 / RSS-210 Reference	15.231 / RSS 210 Spec	15.231 Limit Calculation	Units	Spec	Measurement	Pass / Margin
a.1 / A1.1.1a	automatic tx deactivation after manual button release		seconds	5 seconds	70 msec by design	pass
b / 2.2	Restricted bands		MHz	Nearest 399.9-410 MHz	434 MHz	pass
b.1 / 2.7 Table 4	fund limit	Linear Interpolation between 260 and 470 MHz from 3750 to 12500 uV/m @ 3M	uV/m	11000.78		
b.1 / 2.7 Table 4	fund limit	20log(spec uV/m)	dBuV/m	80.83	See data	
b.1 / 2.7 Table 4	spur limit	fund limit - 20 dB	uV/m	60.83	See data	
15.231.cc	20 dB bw, 0.25% of frequency	0.25% of center frequency (434 MHz)	MHz	1.085	0.29	0.795
RSS-210 A1.1.3	99% bw, 0.25% of frequency	0.25% of center frequency (434 MHz)	MHz	1.085	0.66	0.425

Manchester Encoding Plot



Example of Peak to Average Measurement Comparison to Demonstrate Manchester Encoding Duty Cycle Effect

Frequency	Corrected Peak Measurement	Corrected Average Measurement	EUT orientation	Turntable Azimuth	Antenna Height	Peak to Average Delta
MHz	dBuV/m	dBuV/m				dBuV/m
433.92	81.50	75.08	End-v	180	1.1	6.4

Vertically Polarized Fundamental and Second Harmonic Tabulated Measurements

Frequency	Corrected Peak Measurement	Compensated Average Measurement	EUT orientation	Turntable Azimuth	Antenna Height	Average FCC 15.231 limit	Margin Class B
MHz	dBuV/m	dBuV/m		deg	Mtr		dBuV/m
433.93	80.98	74.98	flat	190	2.1	80.8	5.85
433.92	73.85	67.85	side	180	1.7	80.8	12.98
433.92	83.45	77.45	end	230	1.1	80.8	3.38
867.72	48.79	42.79	flat	330	2.0	60.8	18.01
867.77	49.65	43.65	side	0	2.5	60.8	17.15
867.72	54.73	48.73	end	220	1.1	60.8	12.07

Horizontally Polarized Fundamental and Second Harmonic Tabulated Measurements

Frequency	Corrected Peak Measurement	Compensated Average Measurement	EUT orientation	Turntable Azimuth	Antenna Height	Average FCC 15.231 limit	Margin Class B
MHz	dBuV/m	dBuV/m		deg	Mtr		dBuV/m
433.92	80.56	74.56	flat	280	1.6	80.8	6.27
433.92	80.32	74.32	side	240	1.3	80.8	6.51
433.92	73.29	67.29	end	220	1.0	80.8	13.54
867.75	49.33	43.33	flat	130	1.0	60.8	17.47
867.73	49.96	43.96	side	240	1.0	60.8	16.84
867.76	42.40	36.40	end	0	1.3	60.8	24.40

Upper Harmonic Tabulated Measurements

Frequency	Average Measurement	EUT Orientation	Polarization	Average FCC 15.231 limit	Margin Class B
MHz	dBuV/m			dBuV/m	dBuV/m
1301.90	46.39	Flat	H	54.0	7.61
1735.73	42.74	Flat	H	60.8	18.06
2169.61	35.05	Side	V	60.8	25.75
2603.64	41.52	Flat	H	60.8	19.28
3037.33	39.43	Flat	H	60.8	21.37
3470.99	36.78	Flat	H	60.8	24.02
3905.71	39.13	Flat	H	54.0	14.87
4339.30	44.45	Side	V	54.0	9.55

IC SAR Calculations

Frequency	Corrected Peak Measurement	EUT orientation	V/m	EIRP*	Turntable Azimuth	Antenna Height	IC SAR Limit	Margin
MHz	dBuV/m		V/m	mW	deg	Mtr	mW	mW
433.92	83.45	v-end	0.01	0.07	240	2.2	200.0	199.93

note: max EIRP mW calculated using $P=1000(E*D)^2/30G$, with $G \leq 1$

FCC SAR Calculations

FCC Spec Reference	Spec Data	Units	Spec	Data	Margin
KDB 447948 D01	min SAR Evaluation Limit = 60/Freq (GHz)	mW	138.249	0.070	138.179
15.203	Fixed Antenna	NA	Antenna unchangeable by end user	Integrated PCB Antenna	
1.1310	Max Occupational Exposure (assuming distance of 2.5cm) using formula $EIRP/(4*(\pi)*(d^2))$	mW/cm ²	5.000	0.000	5.000
1.1310	General Population Exposure (assuming distance of 2.5cm) using formula $EIRP/(4*(\pi)*(d^2))$	mW/cm ²	1.000	0.000	1.000

Environment

The test was performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 60 deg F, the relative humidity 38%.

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.

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 testing include:

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

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: $FS(\text{dBuV/m}) = RF(\text{dBuV}) + AF(\text{dB/m}) + CF(\text{dB}) - PA(\text{dB})$

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: $FS(\text{uV/m}) = \text{AntiLog}[(FS(\text{dBuV/m}))/20]$

Measurement Facilities & Equipment

Test Site

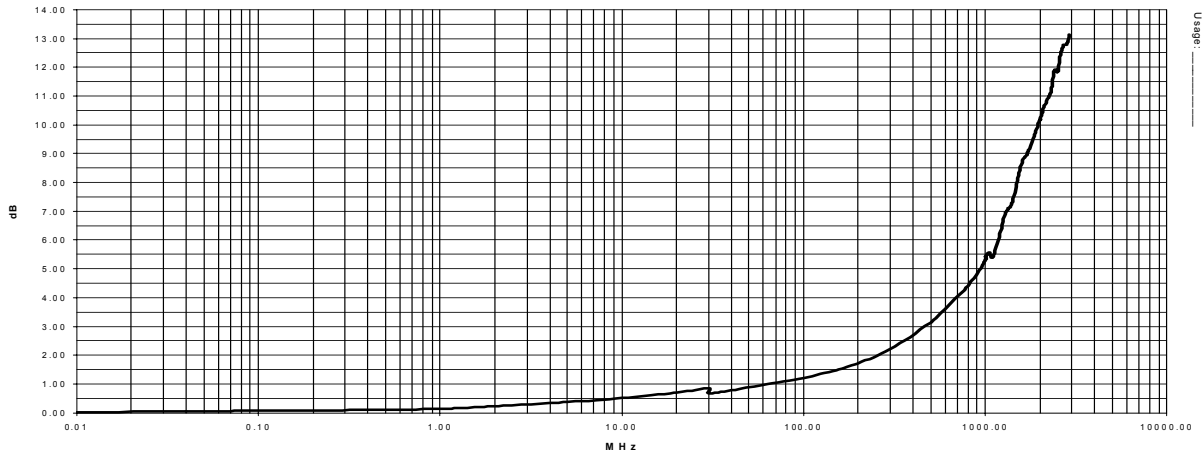
The AHD test facility is centered on 9 acres of rural property near Sister Lakes, Michigan. The mailing address is 92723 Michigan Hwy152, Sister Lakes, 49047. This test facility is NVLAP accredited (LabCode 200129-0). It has been fully described in a report filed with the FCC (No.90413) and Industry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

Measurement Equipment Used

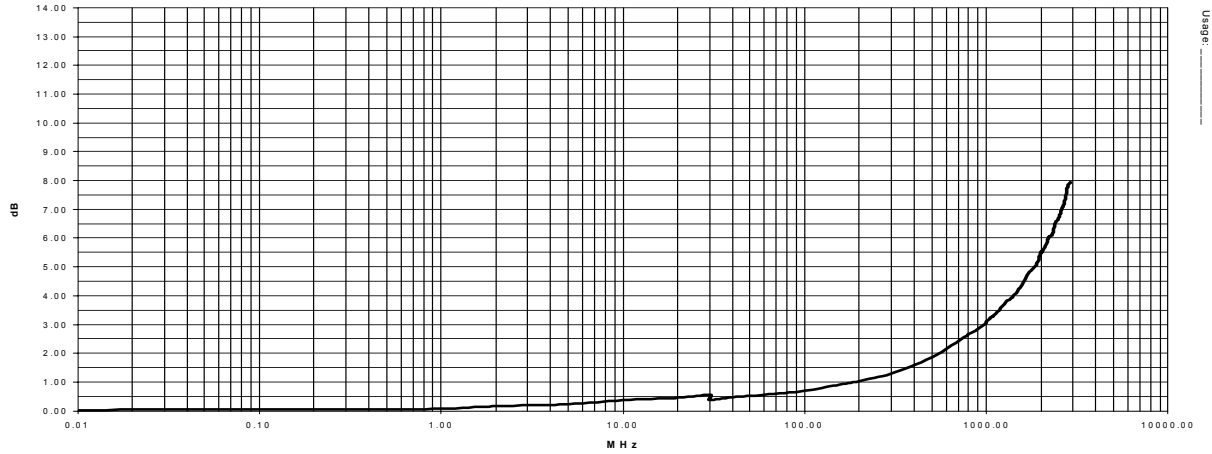
Equipment	Model	S/N	Last Cal Date	Calibration Interval
HP EMI Receiver system	HP 8546A			
RF Filter Section	HP-85460A	3448A00283	25 July-09	12 months
RF Receiver Section	HP-85462A	3625A00342	25 July-09	12 months
EMCO BiconiLog Antenna	3142	1069	27-July-09	12 months
Solar LISN	8012-50-R-24-BNC	962137	3-Aug-09	12 months
Solar LISN	8012-50-R-24-BNC	962138	23-July-09	12 months
(LCI) Double shielded 50ohm Coax	RG58/U	920809	10-Mar-10	12 months
(3-m) LMR-400 Ultra Flex	LMR400	C090804	4-Dec-09	6 months
(3-m) CS-3227 RG8	CS-3227	C060914	4-Dec-09	6 months
(10-m) Amelco 50ohm Coax	RG213U	9903-10ab	4-Dec-09	6 months
Double Ridged Horn	ONO91202-2	A00329	27-July-09	12 months
Schaffner ESD	NSG432	01027	04-Feb-10	12 months

Cable Loss

Line Conducted 150KHz through 30MHz, Coax #920809
 Last Calibration date: Mar 10, 2010

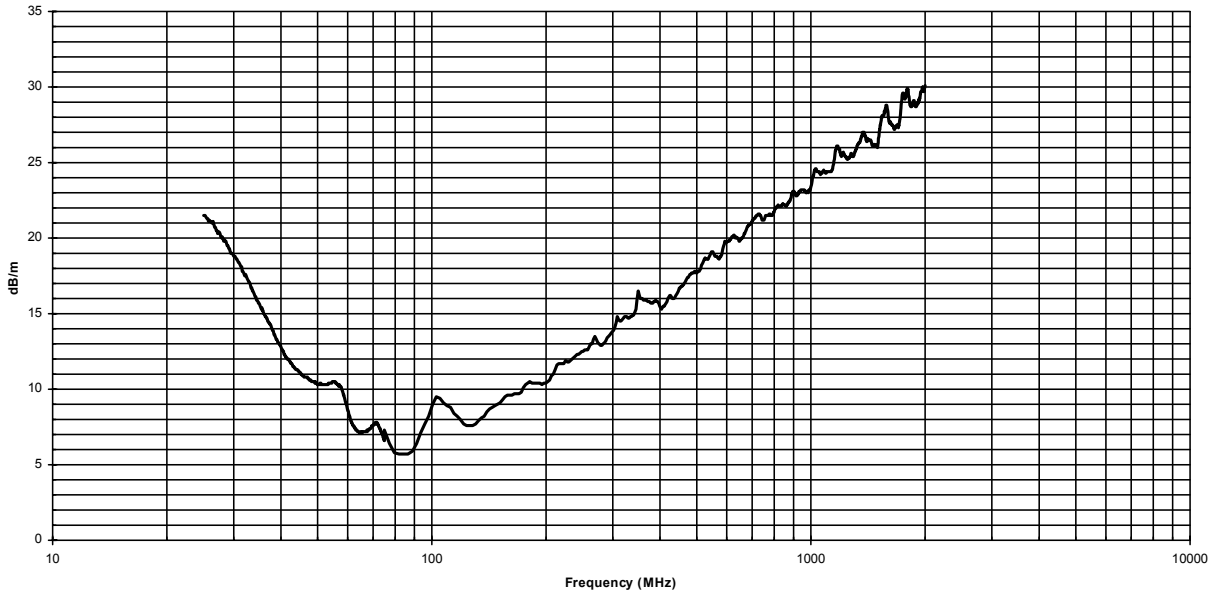


Radiated at 3 meters; 30MHz through 3000MHz, Coax #C090804
Last Calibration date: Dec 04, 2009

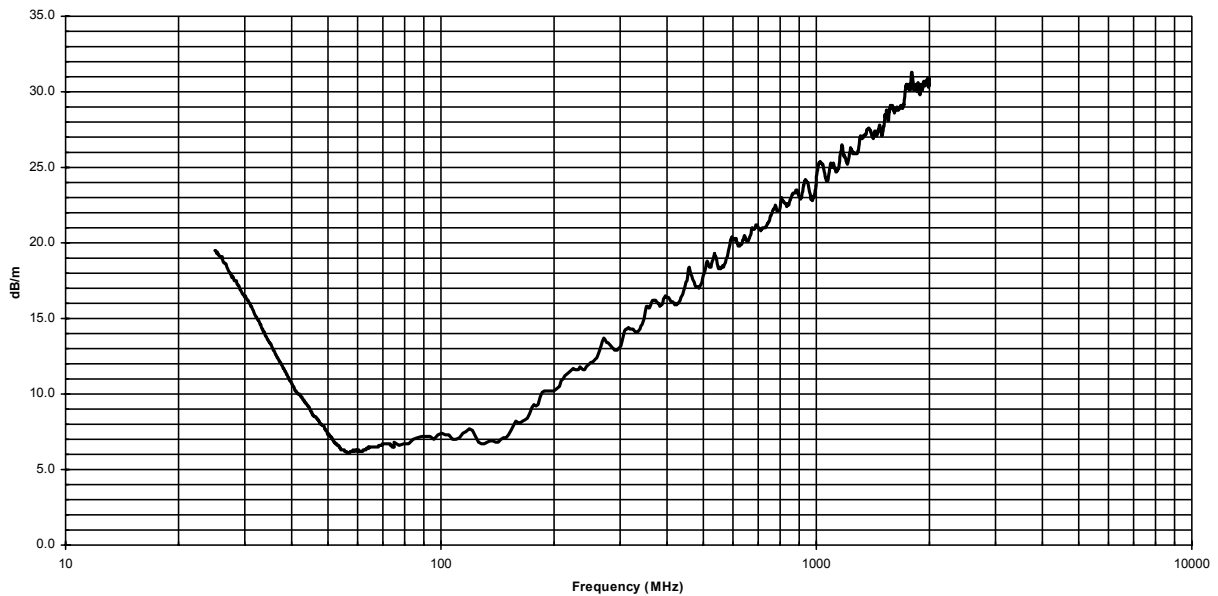


Antenna Factors

EMCO Model 3142 Antenna #1069
Last Calibration Date; 27-July-09
3 Meter Distance Factors

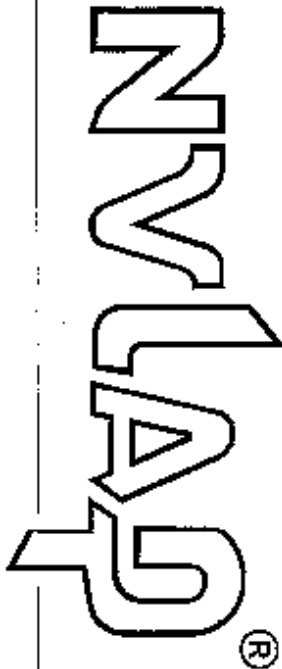


10 Meter Distance Factors



AHD Accreditation

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200129-0

AHD (Amber Helm Development, L.C.)
Dowagiac, 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 Communiqué dated January 2009).*

2009-07-01 through 2010-06-30

Effective dates



Cheryl A. Bowers
For the National Institute of Standards and Technology

NVLAP-0-C (REV. 2008-01-28)

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

March 02, 2010

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: March 02, 2010

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

NARTE Seal

