H.B. Compliance Solutions

Un-Intentional Radiator Test Report

For the

Integrated Solutions, Inc.

IONaer 7000 Generator & Display Unit

Tested under

The FCC Rules contained in Title 47 of the CFR, Part 15 Subpart B

For Class B Digital Device

November 9, 2016

Prepared for:

Integrated Solutions, Inc.

16602 North 23rd Avenue, Suite 109

Phoenix, AZ 85023-3200

Prepared By:

H.B. Compliance Solutions

5005 S. Ash Avenue, Suite # A-10

Tempe, Arizona 85282

Reviewed By:

Hoosamuddin Bandukwala

Cert # ATL-0062-E

Engineering Statement: The measurements shown in this report were made in accordance with the procedure indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. All results contained herein relate only to the sample tested.

Report Status Sheet

Revision #	Report Date	Reason for Revision
Ø	November 9, 2016	Initial Issue

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EXECUTIVE SUMMARY

1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15. All tests were conducted using measurement procedure from ANSI ANSI C.63.4 2014 as appropriate.

Test Name	Test Method/Standard	Result	Comments
Conducted Emissions	15.107	Pass	Device power up with 120VAC
Radiated Emissions	15.109	Pass	Emissions within applicable limits

EQUIPMENT CONFIGURATION

1. Overview

H.B Compliance Solutions was contracted by Integrated Solutions, Inc. to perform testing on the IONaer 7000 under the purchase order number 7493.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Integrated Solutions, Inc., IONaer 7000.

The tests were based on FCC Part 15 Subpart B Rules. The tests described in this document were formal tests as described with the objective of the testing was to evaluate compliance of the Equipment Under Test (EUT) to the requirements of the aforementioned specifications. Integrated Solutions, Inc. should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been permanently discontinued. The results obtained relate only to the item(s) tested.

Product Name:	IONaer 7000
Model(s) Tested:	N/A
Supply Voltage Input:	Primary Power : 120VAC
Test Item:	Pre-Production
Environmental Test Conditions:	Temperature: 15-35°C Humidity: 30-60% Barometric Pressure: 860-1060 mbar
Modification to the EUT:	None
Evaluated By:	Staff at H.B. Compliance Solutions
Test Date(s):	11/07/2016 till 11/08/2016

2. Test Facility

All testing was performed at H.B. Compliance Solutions. This facility is located at 5005 S. Ash Avenue, Suite # A-10, Tempe AZ-85282. All equipment used in making physical determination is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a GTEM chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at H.B. Compliance Solutions.

Test facility H.B. Compliance Solutions is an L-A-B accredited test site. The L-A-B certificate number is L2458. The scope of accreditation can be found on L-A-B website www.l-a-b.com

3. Description of Test Sample

The Integrated Solutions, Inc. IONaer 7000, is an electronic air purification unit that generates negative ions – and was specifically designed for use in residential, commercial and industrial applications. Unit is intended to be installed in duct systems, air handling units or furnace plenums.

4. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number
# 1	IONaer 7000 Generator	None	None
# 2	IONaer 7000 – Display Unit	None	None

Table 1. Equipment Configuration

5. Support Equipment

All support equipment supplied is listed in the following Support Equipment List.

Ref ID	Name / Description	Manufacturer	Model #	Serial #
# 2	IONaer 7000	Integrated Solutions Inc.	None	None

Table 2. Support Equipment

6. Ports and Cabling Information

Ref ID	Port name on the EUT	Cable Description	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
# 4	Power	3 wire	1	1	N	AC Mains

Table 3. Ports and Cabling Information

7. Method of Monitoring EUT Operation

Customer provided with instruction to monitor the device. For Generator connect the AC Power. Unit will operate and a Blue solid light will indicated full power. For the Display unit plug the A/C adaptor. Check the "Pairing" screen which shows the MAD IDs of the generator. A sensor unit was also provided to monitor the ION levels. LED were observed to show all other digital circuit were operating.

8. Mode of Operation

The EUT will be configured in its normal operating mode.

9. Modifications

9.1 Modifications to EUT

No modifications were made to the EUT

9.2 Modifications to Test Standard

No Modifications were made to the test standard.

10. Disposition of EUT

The test sample including all support equipment submitted to H.B Compliance Solutions for testing will be returned to Integrated Solutions, Inc. upon completion of testing & certification

Criteria for Un-Intentional Radiators

1. Conducted Emissions

Test Requirement(s):	§15.107	**Test Engineer(s):**	Keith T.
Test Results:	Pass	**Test Date(s):**	Nov/07/2016

Test Procedures: The EUT was placed on a non-metallic table, 80cm above the ground plane inside a shielded enclosure. The EUT was powered through a 50Ω/50µH LISN. The conducted emissions tests were performed using the mode of operation and configuration noted within this report. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are the same as those cords normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network). All 50 Ohm measuring ports of the LISN are terminated by 50 Ohms, either by the 50 Ohm EMI receiver or a 50 Ohm resistive load.

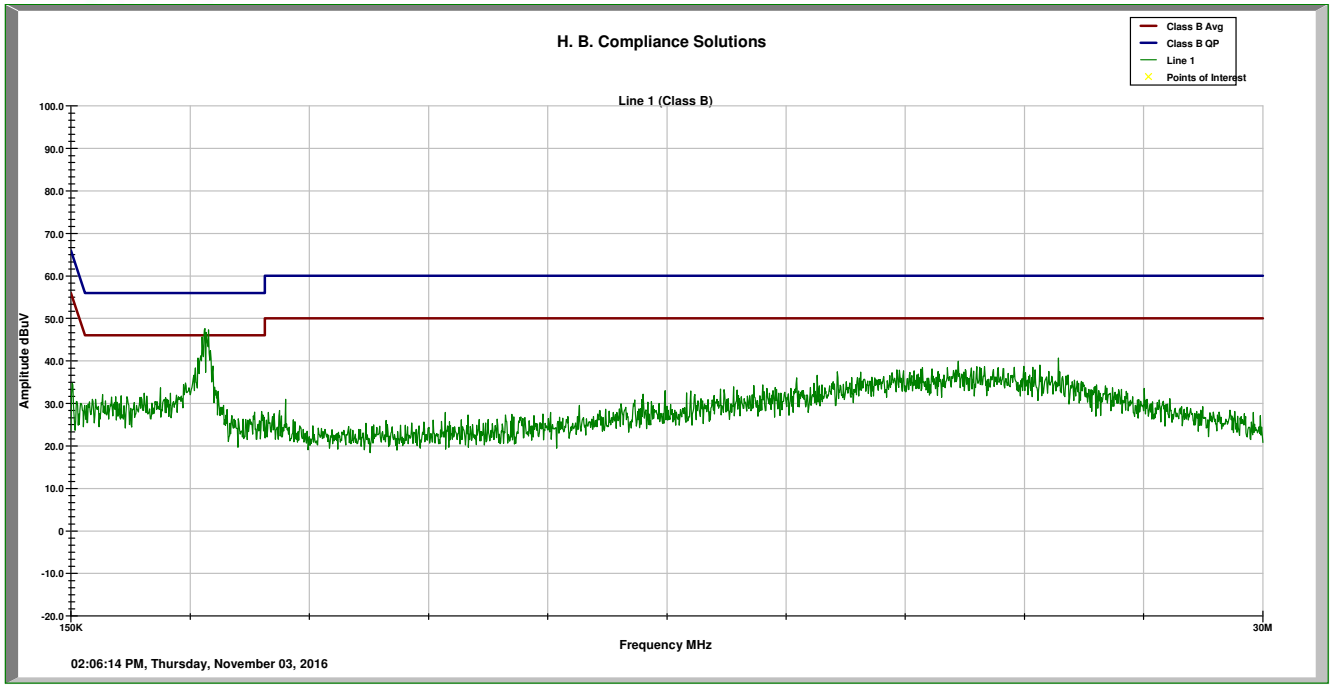
Refer to the Emissions Tests Calculations section in the Radiated Emissions section for sample calculations. For the purposes of the conducted emissions test, the Antenna Factor (AF) is replaced by the LISN correction factor.

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.150 - 30	9.0	9.0	9.0
Measurements were made using the bandwidths and detectors specified. No video filter was used.			

Table 1.Conducted Emissions – Measurement Bandwidth

Frequency Range (MHz)	15.107(b), Class A Limits (dBuV)		15.107(a), Class B Limits (dBuV)	
	Quasi-Peak	Average	Quasi Peak	Average
0.15 – 0.5	79	66	66 - 56	56 - 46
0.5 – 5.0	73	60	56	46
5.0 – 30	73	60	60	50
Note 1 – The lower limit shall apply at the transition frequencies.				

Table 2. Conducted Emissions Limits – FCC Limits from Section 15.107(a)(b)



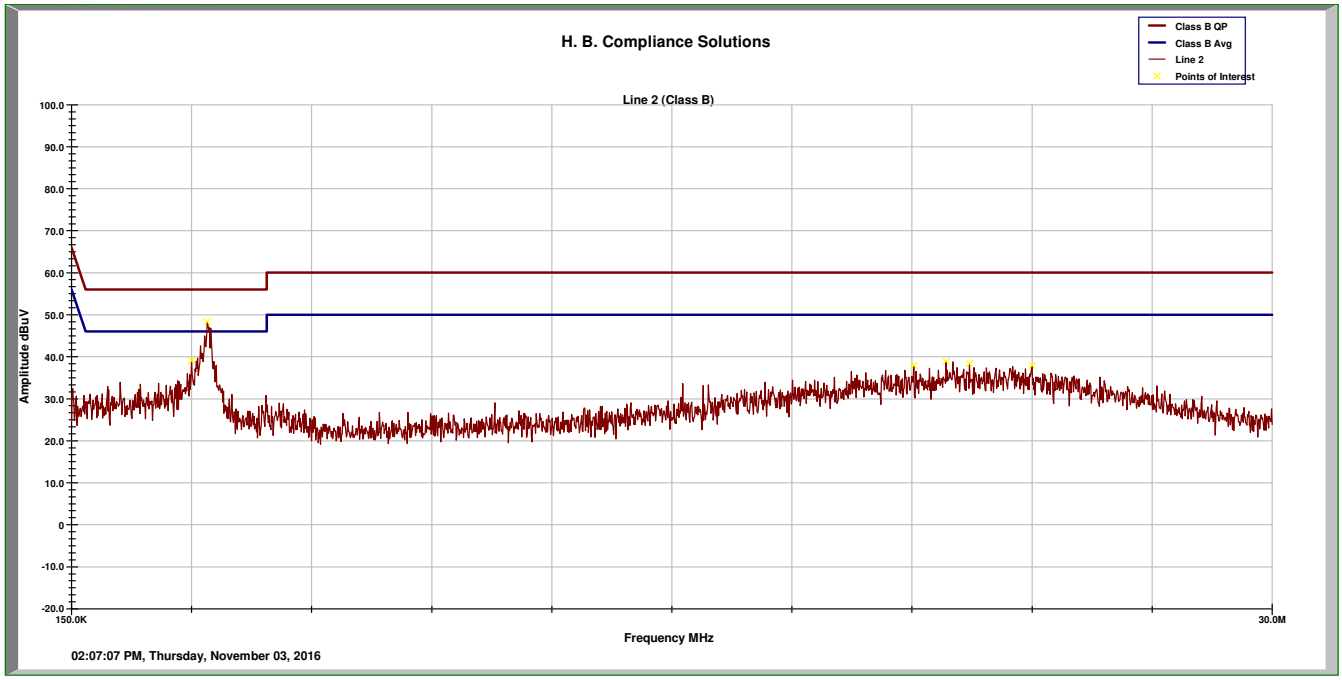
Plot 1 – Conducted Emission Plot – Line Side (Class B) – Generator Unit

Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)
3.14	38.47	56	-17.53
3.55	50.63	56	-5.37
3.72	38.88	56	-17.12
18.97	33.99	60	-26.01
21.20	35.62	60	-24.38
21.34	35.25	60	-24.75

Table 3. Measurement Results for QP

Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)
3.14	24.51	46	-21.48
3.55	34.76	46	-11.23
3.72	24.13	46	-21.86
18.97	20.43	50	-29.56
21.20	21.95	50	-28.04
21.34	22.02	50	-27.98

Table 4. Measurement Results for Average



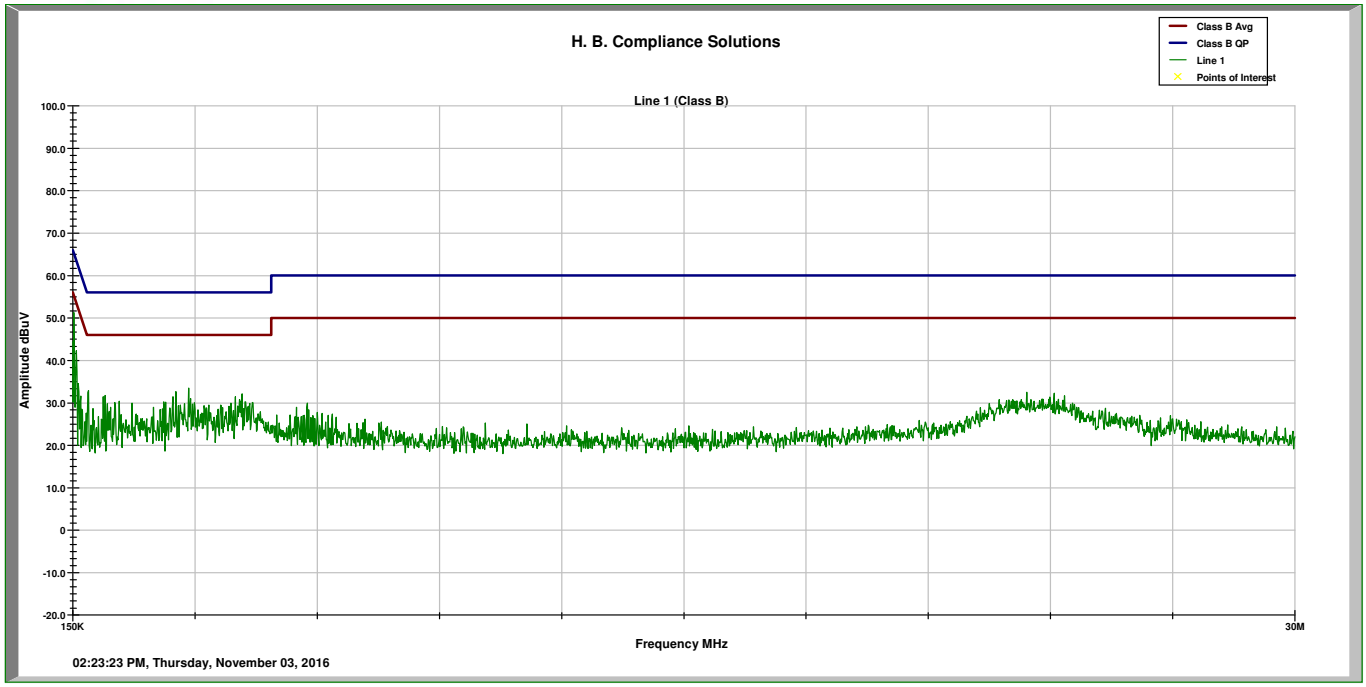
Plot 2 – Conducted Emissions – Neutral Side (Class B) – Generator Unit

Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)
3.139	31.77	56	-24.23
3.525	44.34	56	-11.66
21.08	30.77	60	-29.23
21.89	31.42	60	-28.58
22.47	31.54	60	-28.46
24.04	31.13	60	-28.87

Table 5. Measurement Results for Quasi Peak

Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)
3.139	18.355	46	-27.64
3.525	29.65	46	-16.35
21.08	18.508	50	-31.49
21.89	18.682	50	-31.31
22.47	19.085	50	-30.91
24.04	18.587	50	-31.41

Table 6. Measurement Results for Average



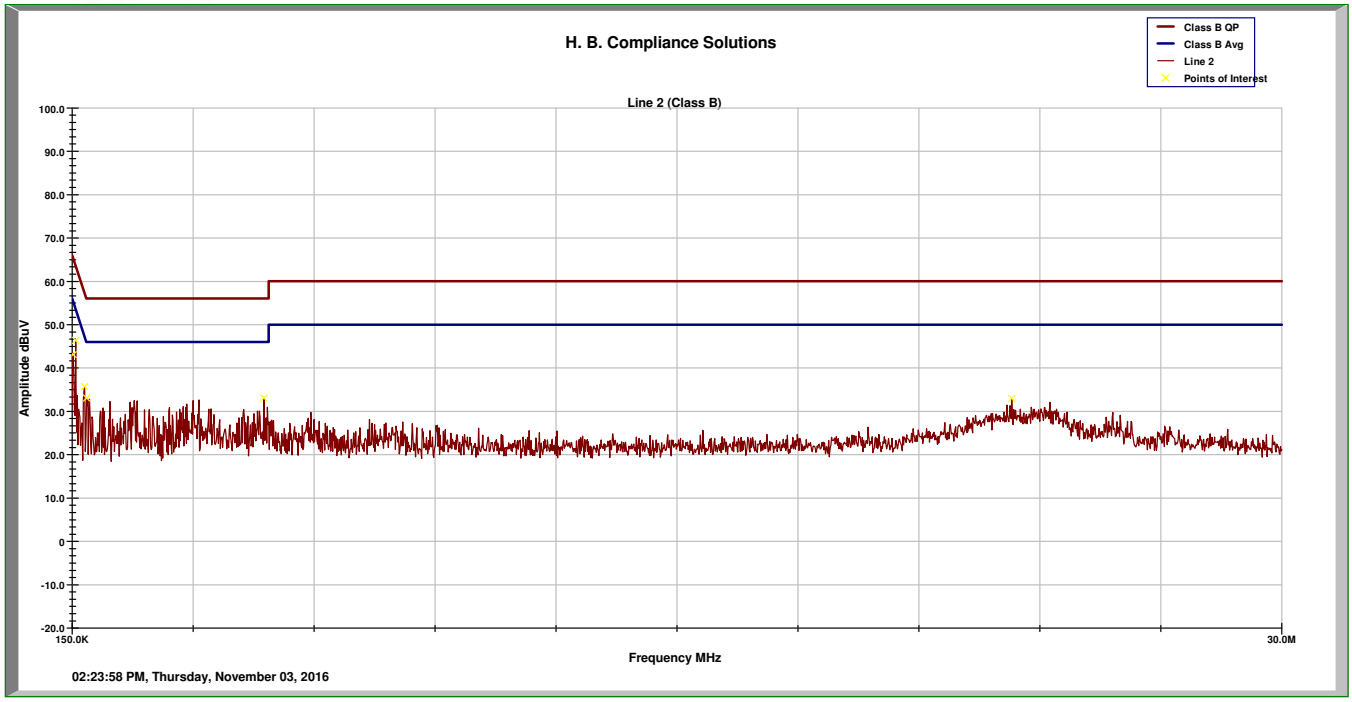
Plot 3 – Conducted Emission Plot – Line Side (Class B) – Display Unit

Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)
0.201	50.77	64.51	-13.74
0.269	44.53	62.59	-18.06
0.468	36.57	56.91	-20.341
0.550	37.31	56	-18.69
1.683	30.48	56	-25.52
1.751	30.06	56	-25.94

Table 7. Measurement Results for QP

Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)
0.201	37.93	54.51	-16.584
0.269	36.05	52.59	-16.545
0.468	26.51	46.91	-20.399
0.550	25.20	46	-20.793
1.683	14.24	46	-31.752
1.751	13.42	46	-32.58

Table 8. Measurement Results for Average



Plot 4 – Conducted Emissions – Neutral Side (Class B) – Display Unit

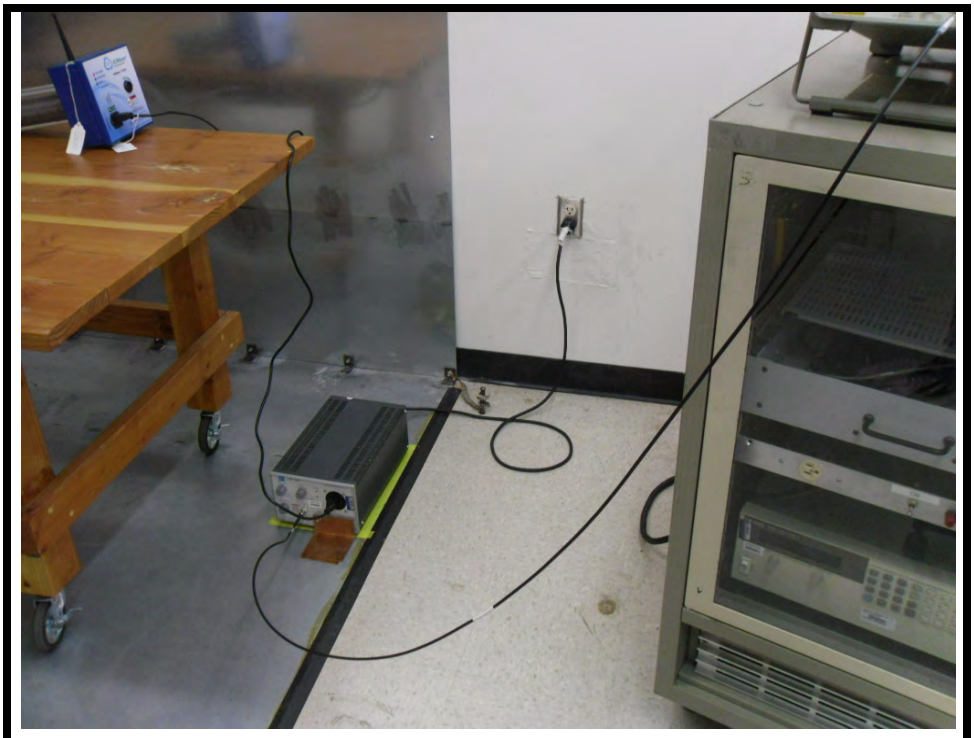
Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)
0.163	40.72	65.61	-24.891
0.233	25.09	63.60	-38.513
0.477	35.99	56.65	-20.666
0.490	35.58	56.28	-20.703
4.87	25.03	56	-30.97
23.35	26.29	60	-33.71

Table 9. Measurement Results for Quasi Peak

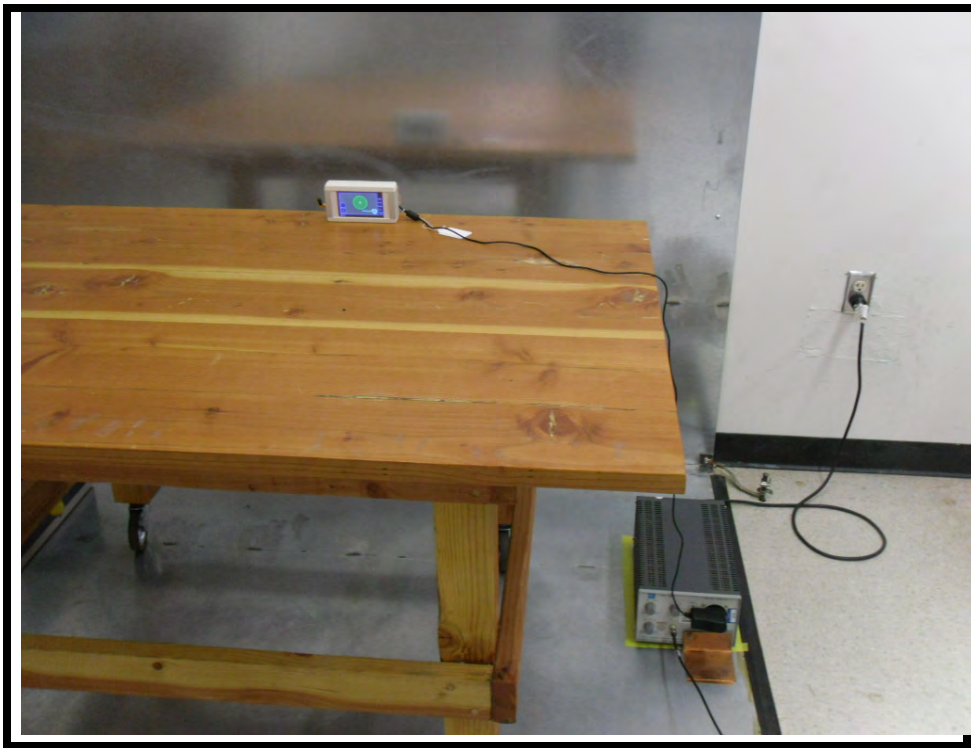
Frequency (MHz)	Measured Level (dBuV)	Limit (dBuV)	Margin (dB)
0.163	14.76	55.61	-40.84
0.233	25.69	53.60	-27.91
0.477	26.40	46.65	-20.24
0.490	20.8	46.28	-25.48
4.87	14.37	46	-31.62
23.35	20.53	50	-29.47

Table 10. Measurement Results for Average

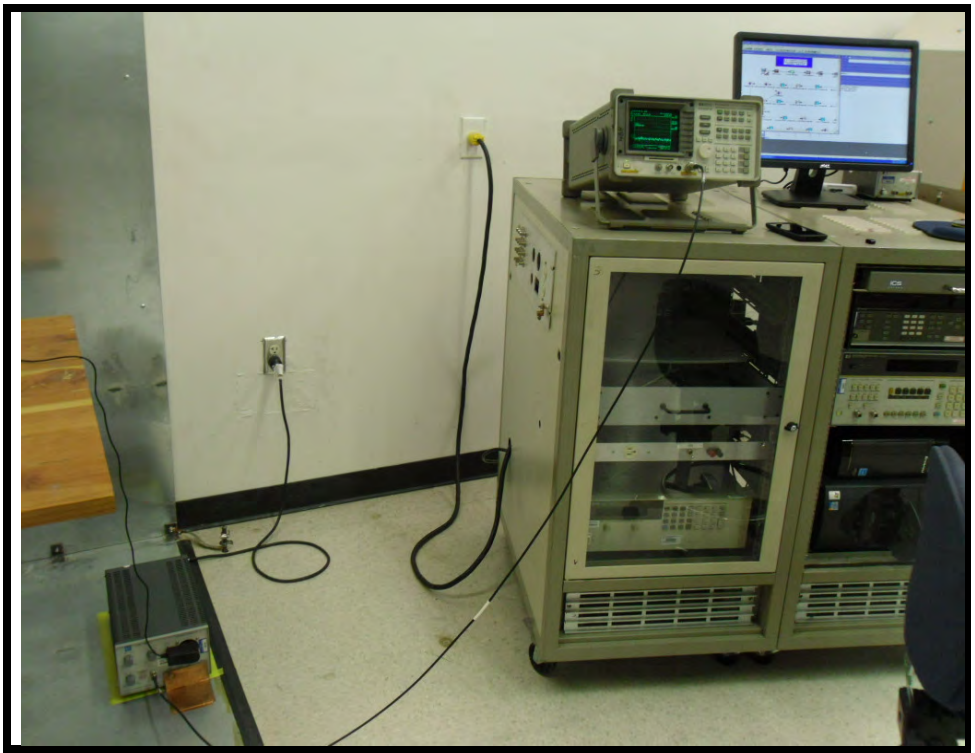
Test Setup Photo 1 – Conducted Emissions – Generator



Test Setup Photo 2 – Conducted Emissions - Generator



Test Setup Photo 3 – Conducted Emissions – Display Unit



Test Setup Photo 4 – Conducted Emissions – Display Unit

2. Radiated Emissions

Test Requirement(s):	§15.109	**Test Engineer(s):**	Keith T.
Test Results:	Pass	**Test Date(s):**	Nov/07/2016

Test Procedures:

The final radiated emissions test was performed using the parameters described above as worst case. That final test was conducted at a facility that meets the ANSI C63.4 TEM waveguides requirements. The frequency range noted in the data sheets was scanned/tested at that facility. Emissions were maximized as specified, by varying table azimuth and manipulating cables.

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth such that the maximum radiated emissions level will be detected. This requires the use of a manipulator.

Tests were made with the EUT rotated on X,Y,Z planes to obtain the maximum signal strength. Though specified in the report, the measurement distance shall be 3 meters.

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
30 MHz to 1 GHz	120 kHz	120 kHz	N/A
1 GHz to 11 GHz	1MHz	N/A	1MHz
Measurements were made using the bandwidths and detectors specified. The video filter was at least as wide as the IF bandwidth of the measuring receiver.			

Table 11. Radiated Emissions – Measurement Bandwidth

Emissions Tests Calculations

In the case of indoor measurements, radiated emissions measurements are made by the manipulation of correction factors using TILE software. This is done automatically by the software during the final measurement process.

In both cases, the level of the Field Strength of the interfering signal is calculated by adding the Antenna Factor, Cable Factor and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + (CF –AG)

Where: FS = Field Strength

RA = Receiver (indicated) Amplitude

AF = Antenna Factor (GTEM Correlation)

CF = Cable Attenuation Factor

AG = Amplifier Gain

This laboratory uses an approach of combining the CF and AG using an end-to-end measurement of the entire cabling system, including the test cable, any in-line amplifiers, attenuators, or transient protection networks, all measured in-situ.

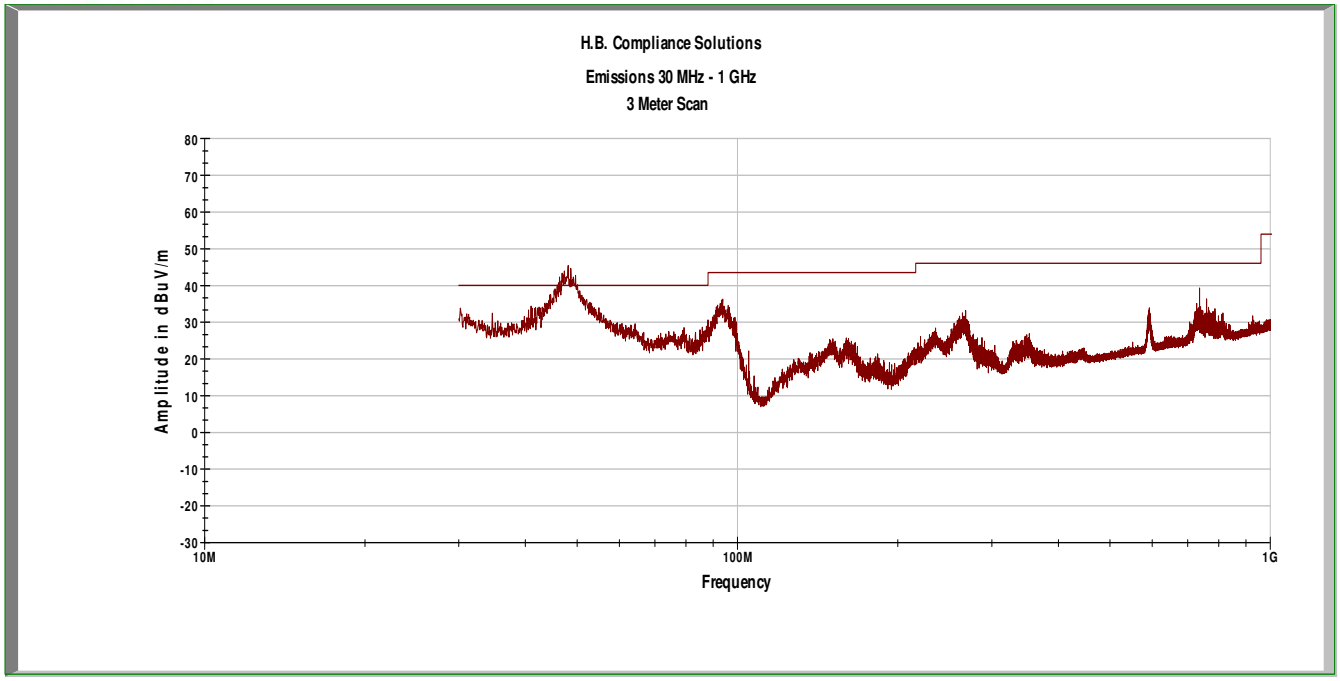
For a sample calculation, assume a receiver reading of 52.5 dBuV is obtained. With an antenna factor of 7.4 and a combined cable factor (CF + AG) of -27.9:

FS = 52.5 + 7.4 + (-27.9) = 32 dBuV/m

FS = 32 dBuV/m

If desired, this can be converted into its corresponding level in uV/m:

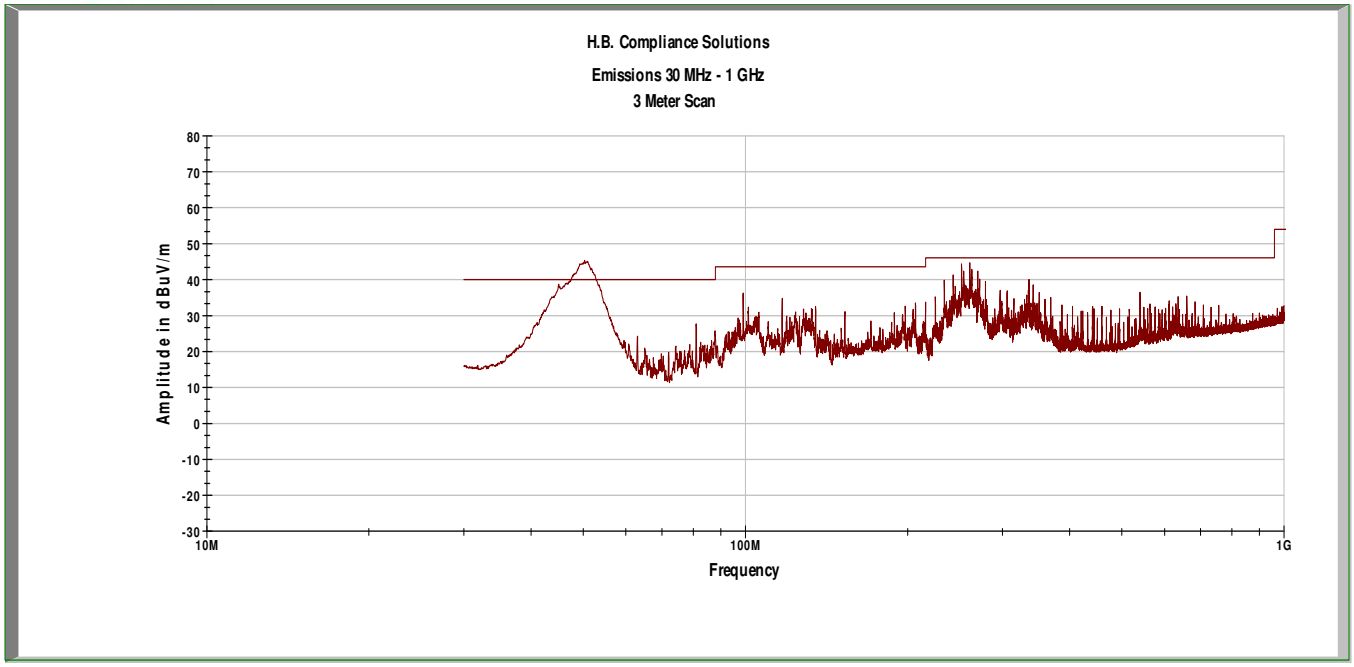
FS = 10^((32 dBuV/m)/20) = 39.8 uV/m



Plot 5 – Radiated Emissions – 30MHz to 1GHz (Class B) – Generator

Frequency (MHz)	Detector Used	Measured Level (dBuV/m)	Limit (dBuV)	Margin (dB)
48.10	QP	36.43	40.0	-3.57
93.30	Peak	36.04	40.0	-3.96
268.03	Peak	33.13	46.0	-12.87
592.72	Peak	33.78	46.0	-12.22
736.93	Peak	39.25	46.0	-6.75

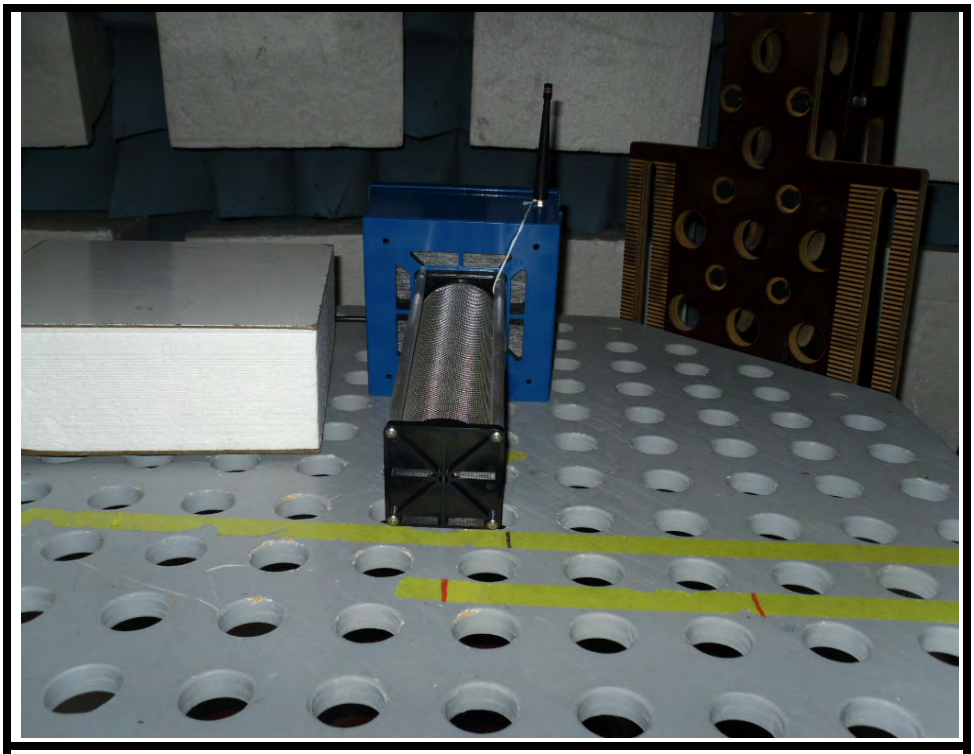
Table 12. Final Measurement Results for Radiated Emissions



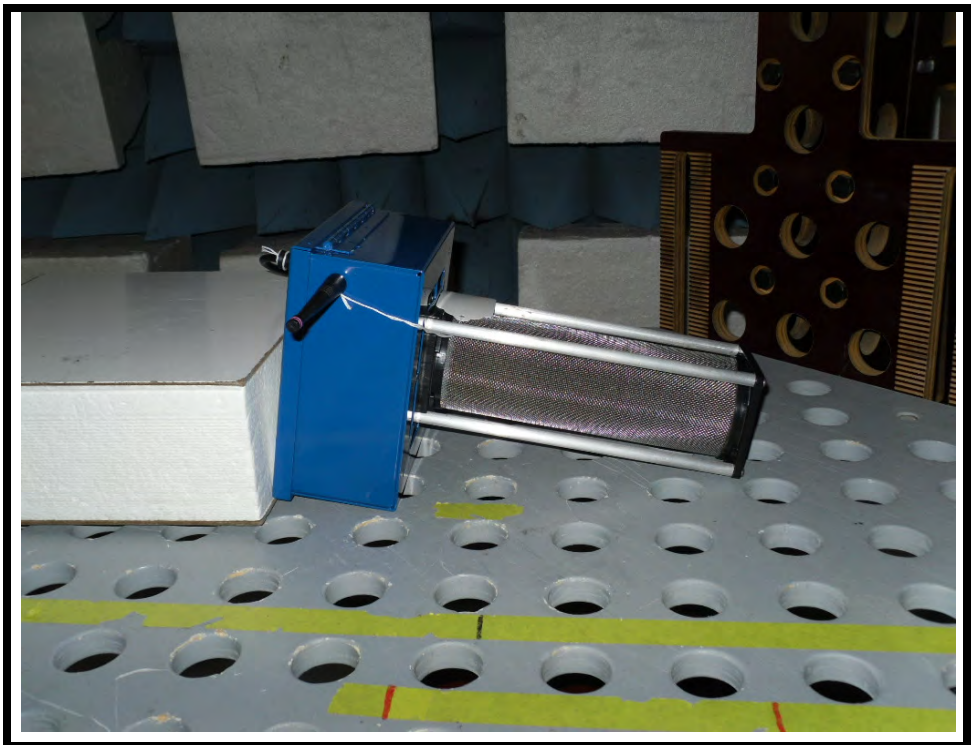
Plot 6 – Radiated Emissions – 30MHz to 1GHz (Class B) – Display Unit

Frequency (MHz)	Detector Used	Measured Level (dBuV/m)	Limit (dBuV)	Margin (dB)
50.24	QP	36.52	40.0	-3.48
99.06	Peak	36.23	40.0	-3.77
252.0	Peak	44.37	46.0	-1.63
260.98	Peak	44.61	46.0	-1.39
342.06	Peak	38.42	46.0	-7.58
540.02	Peak	36.47	46.0	-9.53

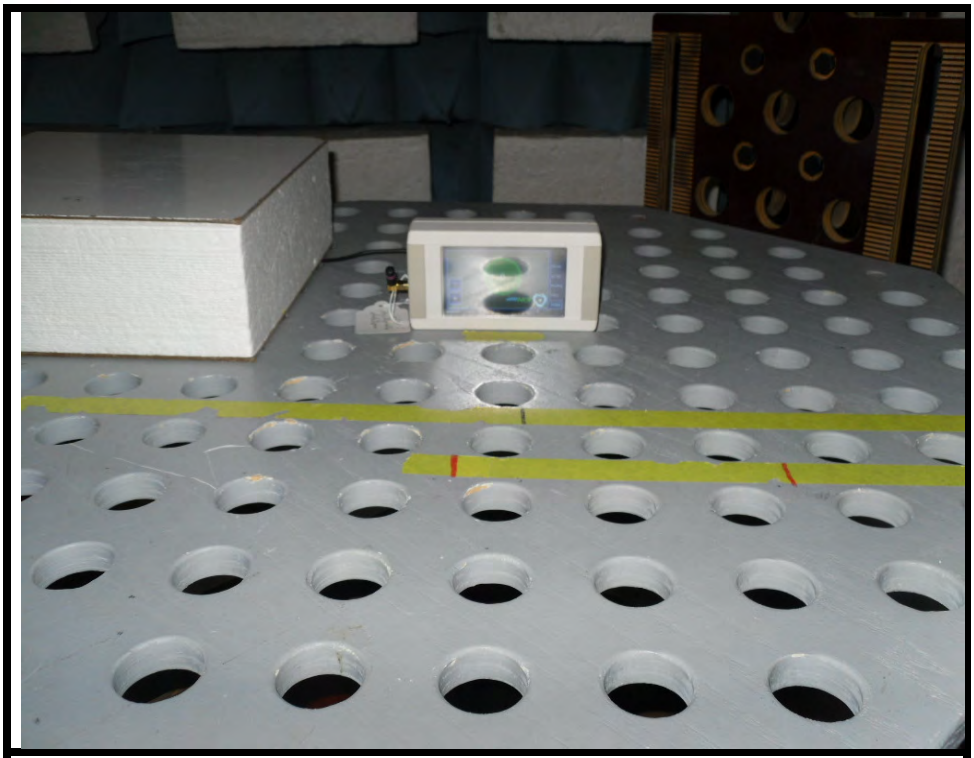
Table 13. Final Measurement Results for Radiated Emissions



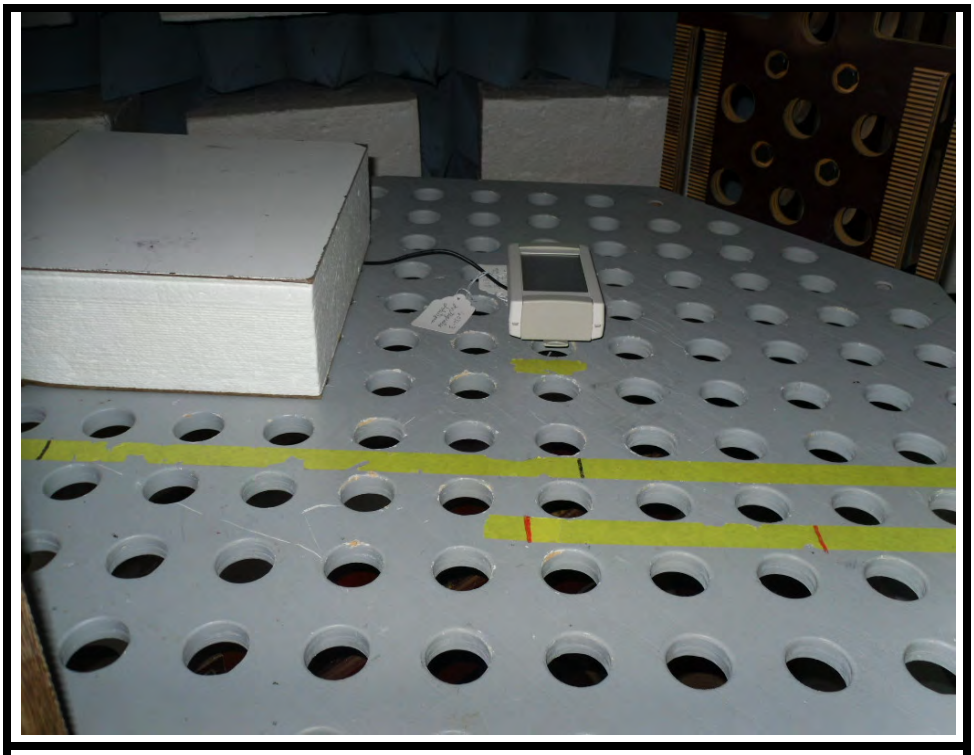
Test Setup Photo 5 – Radiated Emissions - Generator



Test Setup Photo 6 – Radiated Emissions - Generator



Test Setup Photo 7 – Radiated Emissions – Display Unit



Test Setup Photo 8 – Radiated Emissions – Display Unit

3. Test Equipment

Equipment	Manufacturer	Model	Serial #	Last Cal Date	Cal Due Date
EMI Receiver	Hewlett Packard	8568B	2314A02642	27-Apr-16	27-Apr-17
Spectrum Analyzer	Hewlett Packard	8595EM	3801A00177	21-Dec-15	21-Dec-16
Antenna	EMCO	GTEM 5417	1063	Verified	N/A
LISN	Laplace Instruments	LISN 1600	152946	19-Dec-15	19-Dec-16

Table 14 – Test Equipment List

***Statement of Traceability:** Test equipment is maintained and calibrated on a regular basis. All calibrations have been performed by a 17025 accredited test facility, traceable to National Institute of Standards and Technology (NIST)

15.105(b) Information to the User

(For Class B equipment only)

For a Class B digital device or peripheral, the instructions furnished the user 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 of 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 instructions, 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:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

The applicant has been cautioned as to the following:

15.27(a) Special Accessories.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

47 CFR 15.19 Labeling requirements.

(b) Products subject to authorization under a Declaration of Conformity shall be labeled as follows:

(1) The label shall be located in a conspicuous location on the device and shall contain the unique identification described in §2.1074 of this chapter and the following logo:

(i) If the product is authorized based on testing of the product or system; or

Trade Name Model Number

Tested To Comply

With FCC Standards

FOR HOME OR OFFICE USE

(ii) If a personal computer is authorized based on assembly using separately authorized components, in accordance with §15.101(c)(2) or (c)(3) and the resulting product is not separately tested:

Trade Name Model Number

Assembled From

Tested Components

(Complete system not tested)

FOR HOME OR OFFICE USE

(2) Label text and information should be in a size of type large enough to be readily legible, consistent with the dimensions of the equipment and the label. However, the type size for the text is not required to be larger than eight point.

(3) When the device is so small to for such use that it is not practicable to place the statement specified under paragraph (b)(1) of this section on it, such as for CPU board or plug-in circuit board peripheral device, the text associated with the logo may be placed in a prominent location in the instruction manual or pamphlet supplied to the user. However, the unique identification (trade name and model number) and the logo must be displayed on the device.

(4) The Label shall not be a stick-on, paper label. The label shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase, as described in §2.2925(d) of this chapter. "Permanently affixed" means that the label is etched, engraved, stamped, silk-screened, indelibly printed, or otherwise permanently marked on a permanently attached part of the equipment or on a nameplate of metal, plastic, or other material fastened to the equipment by welding, riveting, or permanent adhesive. The label must be designed to last the expected lifetime of the equipment in the environment in which the equipment may be operated and must not be readily detachable.

END OF TEST REPORT