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CERTIFICATION REPORT

PART 15.247, SUBPART C

DECLARATION OF CONFORMANCE PROCEDURES
TEST REPORT

For The **Point of Sale Availability Indicator**

Model: Lane Controller 9701037
FCC ID#: GFB01037

PREPARED FOR:

Micro Industries
8399 Greenmeadows Dr. North
Westerville, OH 43081

PREPARED ON JUNE 22, 2006

REPORT NUMBER: 2006 060348-FCC2

PROJECT NUMBER: 26-348-MIC-R1

Total Pages: 39

DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	6-22-06	Prepared By: A. Laudani
-	6-22-06	Initial Release: M. Krumweide

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to the Subclause 5.10 Requirements of ISO/IEC 17025 "General Criteria For the Competence Of Testing and Calibration Laboratories":

- The unit described in this report was received at Nemko USA, Inc.'s facilities on May 22, 2006. Testing was performed on the unit described in this report on June 2, 2006.
- The Test Results reported herein apply only to the Unit actually tested, and to substantially identical Units.
- This report does not imply the endorsement of the Federal Communications Commission (FCC), NVLAP or any other government agency.

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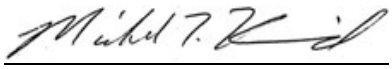
CERTIFICATION

Nemko USA, Inc., an independent Electromagnetic Compatibility (EMC) Test Laboratory, produced this Test Report and performed the Radio Frequency Interference (RFI) testing and data evaluation contained herein.

Nemko USA, Inc.'s measurement facility is currently registered with the United States Federal Communications Commission (FCC) in accordance with the provisions of 47 United States Code (CFR) Part 2, Subpart I, Section 2.948(a). A current description of Nemko USA, Inc.'s measurement facility is on file with the FCC. Nemko USA Inc. has additionally satisfied the FCC that it complies with the requirements set forth in 47 CFR Part 2, Subpart I, Section 2.948(d) regarding the accreditation of EMC laboratories. As a result, the FCC has placed Nemko USA Inc. on its list of EMC laboratories approved to perform Declaration of Conformity (DOC) procedure testing.

The RFI testing, test data collection and test data evaluation were accomplished in accordance with the ANSI C63.4-2004 Standard, and in accordance with the applicable sections of the FCC rules (47 CFR Parts 2 and 15) for Class "**B**" digital devices. The testing was also accomplished in accordance with Industry Canada's ICES-003 standard for unintentional radiating device per EMCAB-3, Issue 3 (May 1998). The administrative summary of this test report provides a description of the test sample.

I hereby certify that the test data, test data evaluation, and equipment configurations used to compile this test report are a true and accurate representation of the test sample's radio frequency interference characteristics as of the test date(s), and, for the design of the test sample.



Michael T. Krumweide
EMC Supervisor

1. ADMINISTRATIVE DATA AND TEST SUMMARY

1.1. Administrative Data

CLIENT:	Micro Industries 8399 Greenmeadows Dr. North Westerville, OH 43081
CONTACT:	Joe Colecchi
DATE (S) OF TEST:	June 9, 2006 to June 22, 2006
EQUIPMENT UNDER TEST (EUT):	Point of Sale Availability Indicator
MODEL	Lane Display Controller 9701037
CONDITION UPON RECEIPT	Suitable for Test
TEST SPECIFICATION:	FCC, Part 15.247, Subpart C

1.1.1. Test Summary

Specification	*Frequency Range*	*Compliance Status*
FCC, CFR 47, Section 15.207	0.15 MHz - 30.00 MHz	PASS
FCC, CFR 47, Section 15.209	30 MHz – 10th Harmonic	PASS
FCC CFR 47, §15.247 Plus Band edge	2474.9 MHz	PASS

Test Supervisor: Michael T. Krumweide

M. Krumweide, Nemko USA, Inc.

Refer to the test results section for further details.

2. SYSTEM CONFIGURATION

The Lane Director/Control is a Point of Sale Availability Indicator. Its function is to provide information via visual method or wirelessly to a remote PC on a Point of Sale environment. The EUT was exercised by running on Standby Mode as well as Flashing Mode as the test requires.

2.1. System Components and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - Point of Sale Availability Indicator	Micro Industries Lane Director/Control (consisting of three modules) SN: NA	Via external power supply
EUT – External Power Supply	Phihong PSA15R-120P P60700199A1	Direct wall plug-in
Support – Host PC	Micro Industries 17" LCD Touch Panel Computer 051100002	Via external power supply
Support - External Power Supply for Host PC	Elpac Power Systems MWP9012 000178	1.8 meters, unshielded, 18AWG x3, IEC Type

2.2. Device Interconnection and I/O Cables

CONNECTION	I/O CABLE
EUT (Remote Module to Host PC)	3 meters, shielded, standard USB cable
EUT (Interface Module and Power Module)	1.5 meters, unshielded, 18AWG x 2
EUT (Interface Module and Switch Module)	0.15 meter, unshielded, 18AWG x2

3. DESCRIPTION OF TEST SITE AND EQUIPMENT

3.1. Description of Test Site

The test site is located at 11696 Sorrento Valley Road, Suite F, San Diego, CA 92121. The site is physically located 18 miles Northwest of downtown San Diego. The general area is a valley 1.5 miles east of the Pacific Ocean. This particular part of the valley tends to minimize ambient levels, i.e. radio and TV broadcast stations and land mobile communications. The three and ten-meter Open Area Test Site (OATS) is located behind the office/lab building. It conforms to the normalized site attenuation limits and construction specifications as set in the EN 55022: 1998/A1: 2000/A2: 2003 , CISPR 16 (2003) and ANSI C63.4 (2004) documents. The OATS normalized site attenuation characteristics are verified for compliance every year, and registered with the Federal Communications Commission under Registration Number 90579.

4. DESCRIPTION OF TESTING METHODS

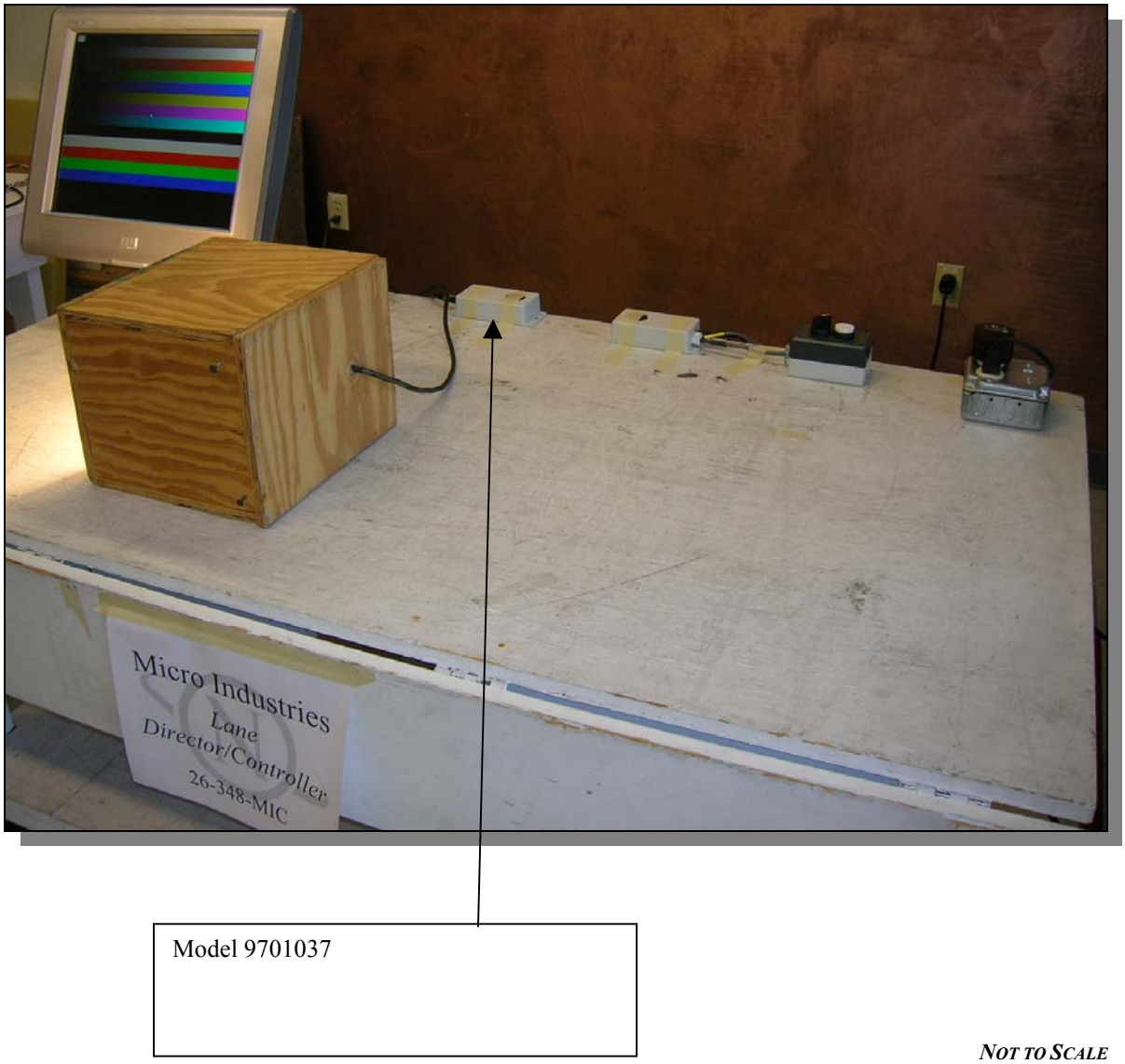
4.1. Introduction

As required in 47 CFR, Parts 2 and 15, the methods employed to test the radiated and conducted emissions (as applicable) of the EUT are those contained within the American National Standards Institute (ANSI) document ANSI C63.4 (2004) , titled "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." All applicable FCC Rule Sections that provide further guidance for performance of such testing are also observed.

For General Test Configuration please refer to Figure 1 on the following page.

Digital devices sold in Canada are required to comply with the Interference Causing Equipment Standard for Digital Apparatus, ICES-003. These test methods and limits are specified in the Canadian Standards Association's (CSA) Standard C108.8-M1983 (1-1-94 version) and are "essentially equivalent" with FCC, Part 15 and CISPR 22 (EN55022) rules for unintentional radiators per EMCAB-3, Issue 3 (May 1998). No further testing is required for compliance to ICES-003.

Figure 1. General EUT Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

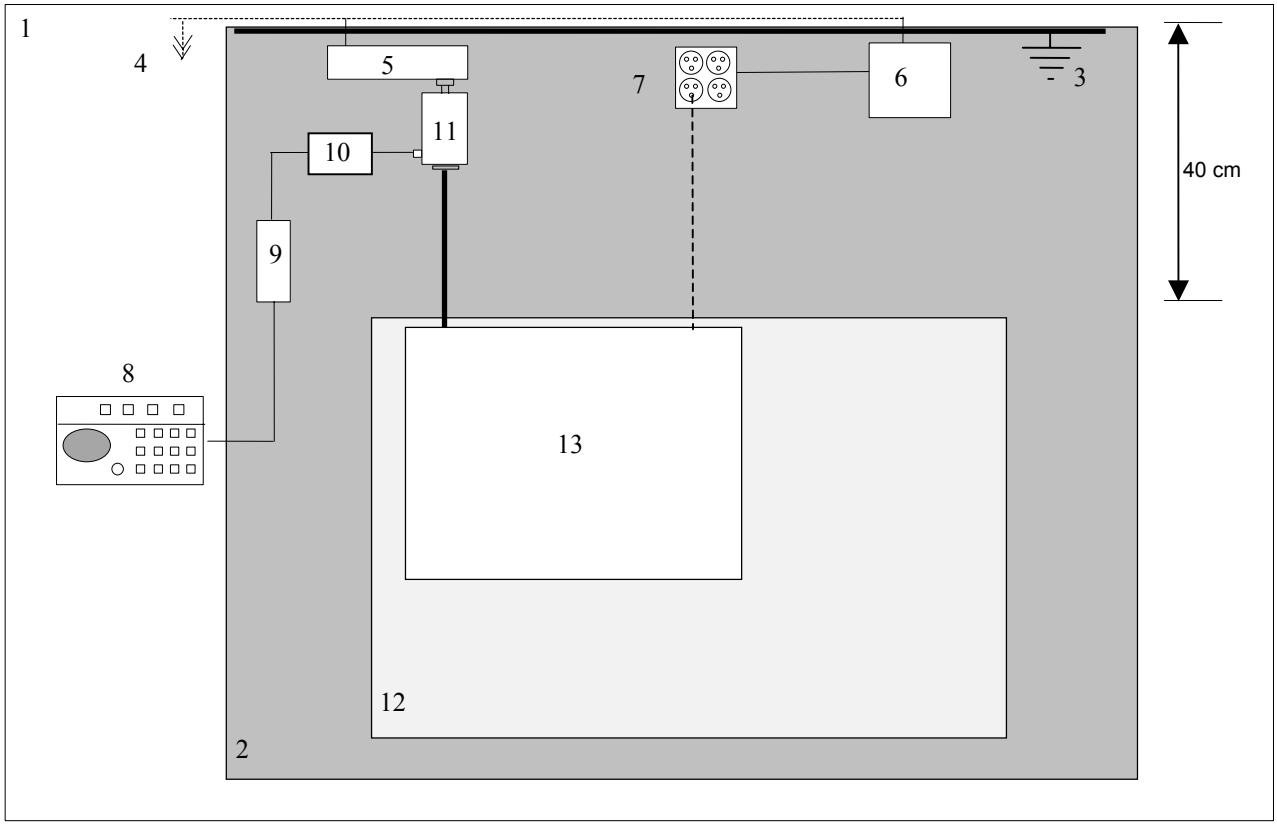
1. Test Laboratory
2. AC Power for Peripheral Devices

4.2. Configuration and Methods of Measurements for Conducted Emissions

Section 7 of ANSI C63.4 determines the general configuration of the EUT and associated equipment, as well as the test platform for conducted emissions testing. Tabletop devices are placed on a non-conducting surface 80 centimeters above the ground plane floor and 40 centimeters from the ground plane wall. The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. The EUT is powered via a Line Impedance Stabilization Network (LISN). The emissions are recorded using the required bandwidth of 9 kHz in the quasi-peak mode. The average amplitude is also observed employing a 10 kHz bandwidth to determine the presence of broadband RFI. When such interference is caused by broadband sources (as defined by the FCC and ANSI Rules), the deviation guidelines contained in Section 11.3.1 of ANSI C63.4 are employed, which allows a correction factor of 13 dB to be subtracted from the quasi-peak reading. The emission levels are then compared to the applicable FCC limits to determine compliance.

For Conducted Emissions Test Configuration please refer to Figure 2 on the following page.

Figure 2. Conducted Emissions Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

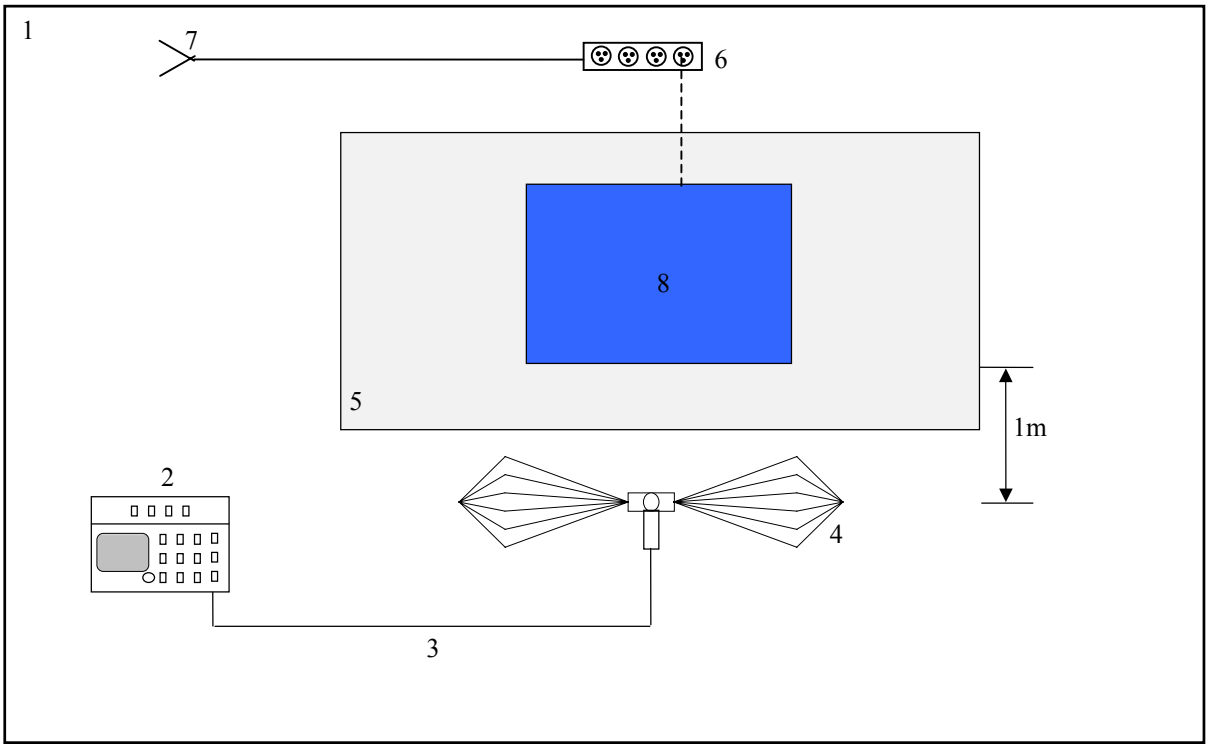
1. Test Laboratory (6 X 6 meters)
2. Ground Plane (15 square meters)
3. Vertical Conducting Wall (Grounded through Ground Plane via 10' ground rod)
4. AC Power for Devices
5. Power Line Filter, Lindgren, 120 dB, 30 amp
6. Line Impedance Stabilization Network (LISN) for peripheral devices
7. Power Distribution Box for peripheral devices
8. Spectrum Analyzer with Quasi-Peak Adapter
9. High Pass Filter
10. Transient Limiter
11. LISN for EUT
12. Non-Conducting table 80 cm above ground plane

4.3. Configuration and Methods of Measurements for Frequency Identification

When performing all testing of equipment, the actual emissions of the EUT are segregated from ambient signals present within the laboratory or the open-field test range. Preliminary testing is performed to ensure that ambient signals are sufficiently low to allow for proper observation of the emissions from the EUT. Incoming power lines are filtered using a 120 dB, 30-ampere; 115/208-volt filter to assist in reducing ambient signals for tests of levels of conducted emissions. Ambients within the laboratory are compared to those noted at the nearby open-field site to discriminate between signals produced from the EUT and ambient signals. In the event that a significant emission is produced by the EUT at a frequency which is also demonstrating significant ambient signals, the spectrum analyzer is placed in the peak mode, the bandwidth is narrowed, the EUT's signal is centered on the analyzer, the scan width is expanded to 50 kHz while monitoring the audio to ensure that only the EUT signal is present, the analyzer is switched to quasi-peak mode, and the level of the EUT signal is recorded.

For Frequency ID Test Configuration please refer to Figure 3 on the following page.

Figure 3. Frequency ID of Radiated Emissions Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Antenna to Spectrum Analyzer
4. Receive Antenna (basic relative position)
5. Non-Conducting table 80 cm above ground plane
6. Power strip for EUT and peripherals
7. AC power for devices
8. EUT Wireless Base Station and Associated System

4.4. Configuration and Methods of Measurements for Radiated Emissions

Section 8 of ANSI C63.4 determines the general configuration and procedures for measuring the radiated emissions of equipment under test. Initially, the primary emission frequencies are identified inside the test lab by positioning a broadband receive antenna one meter from the EUT to locate frequencies of significant radiation. Next, the EUT and associated system are placed on a turntable on a ten meter open area test site (registered with the FCC in accord with its Rules and ANSI C63.4) and the receive antenna is located at a distance of ten meters from the EUT.

The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. All significant radiated emissions are recorded when maximum radiation on each frequency is observed, in accordance with part 8 of ANSI C63.4 and Section 15.33 of the FCC Rules. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to horizontal and vertical polarities, and the turntable is also rotated to determine the worst emitting configuration. The numerical results of the test are included herein to demonstrate compliance.

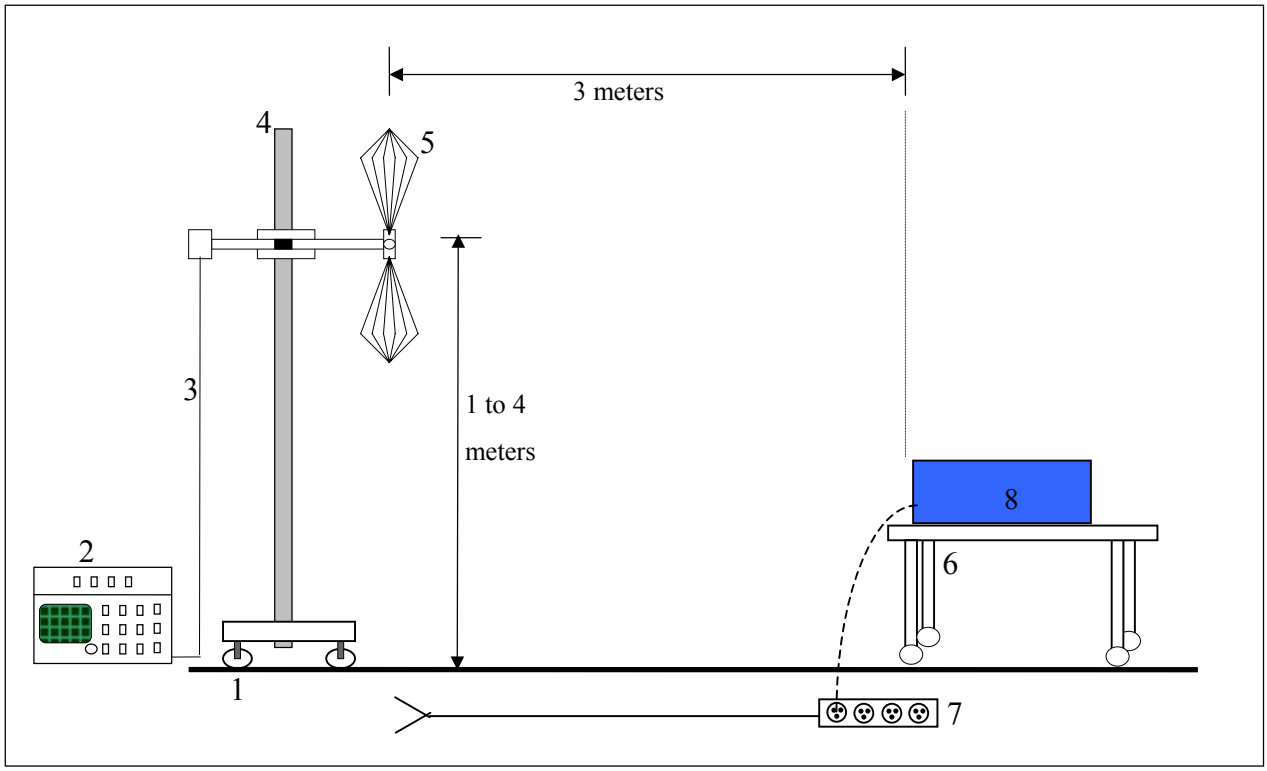
The numerical results that are applied to the emissions limits are arrived at by the following method:
Example: A=RR+CL+AF
A = Amplitude dBuV/m
RR = Receiver Reading dBuV
CL = cable loss dB
AF = antenna factor dBm

Example Frequency = 110MHz
18.5 dBuV (spectrum analyzer reading)
+3.0 dB (cable loss @ frequency)
21.5 dBuV
+15.4 dBm (antenna factor @ frequency)
36.9 dBuV/m Final adjusted value

The final adjusted value is then compared to the appropriate emission limit to determine compliance.

For Radiated Emissions Test Configuration please refer to Figure 4 on the following page.

Figure 4. Radiated Emissions Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Ground plane (11 X 17 meters)
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Receive Antenna to Spectrum Analyzer
4. Antenna Mast with motorized mounting assembly
5. Receive Antenna (basic relative position)
6. Non-Conducting table 80 cm above ground plane
7. AC power for devices
8. EUT: Wireless Base Stationand Associated System

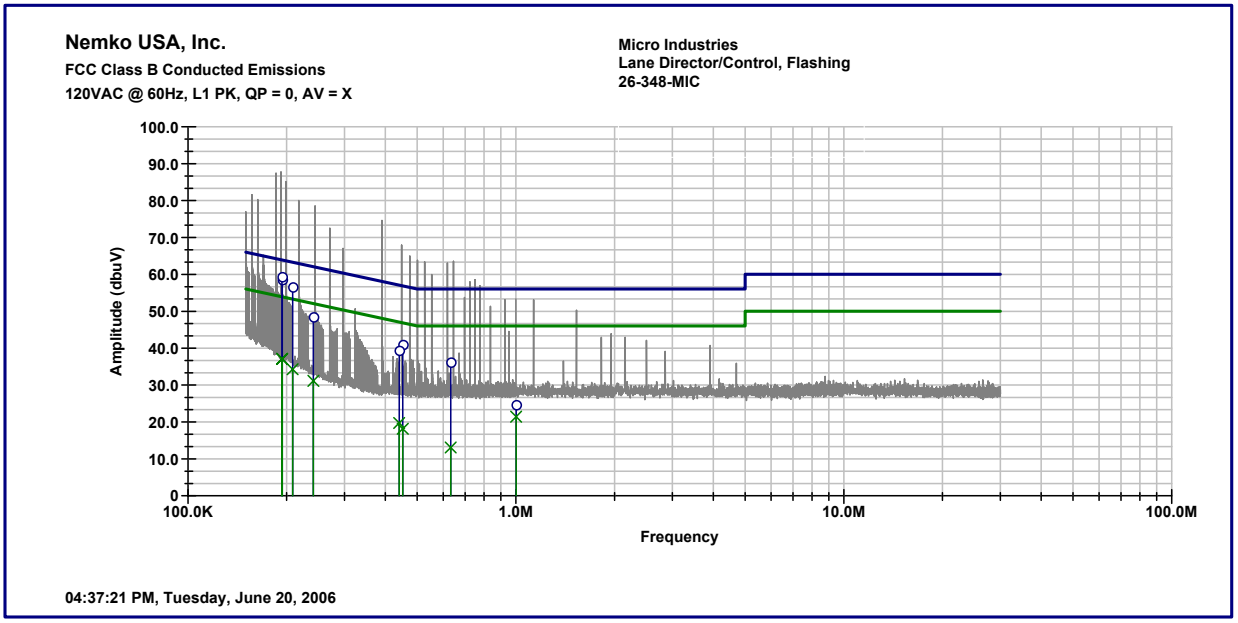
4.5. Operation in the 15.247 bands

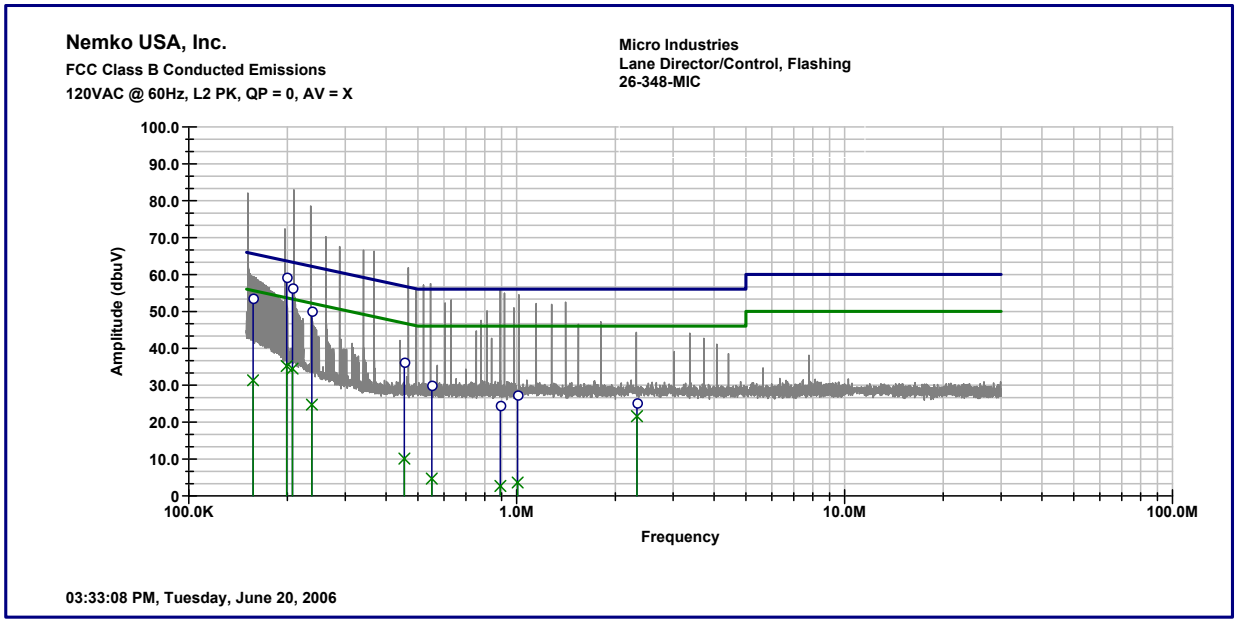
In Addition to the general radiated emissions requirements described in FCC, Part 15B, Section 15.247 determines the configuration and procedures for measuring additional emissions of Intentional Radiating Devices.

5. TEST RESULTS

5.1. Conducted Emissions Test Data

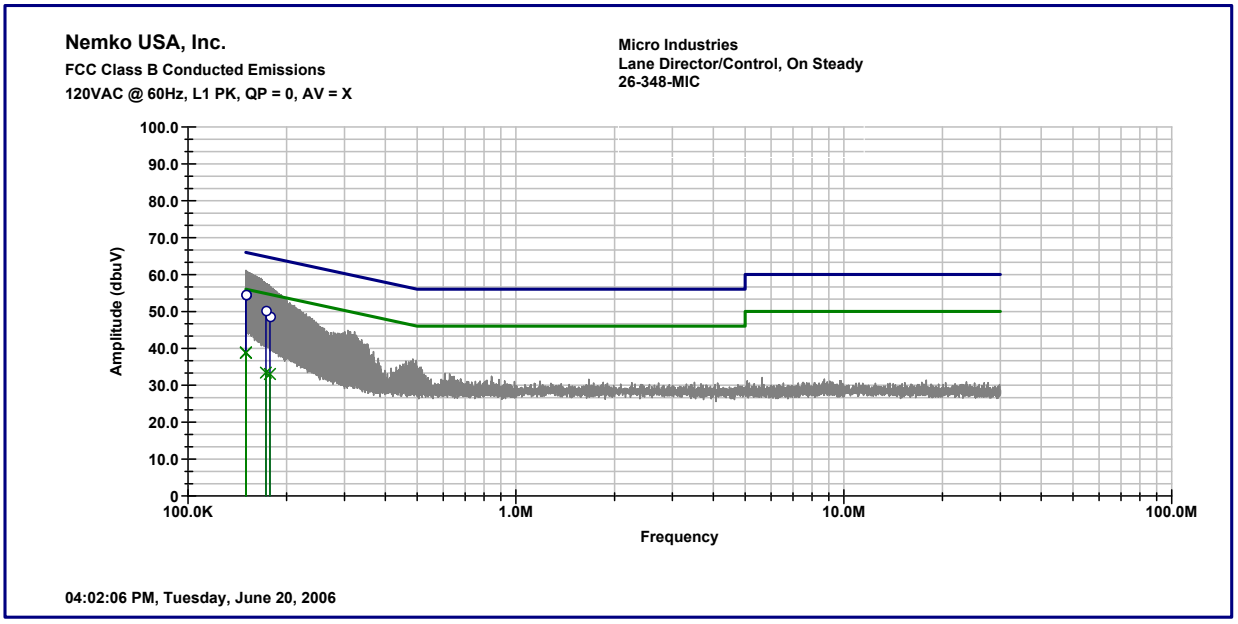
Client	**Micro Industries**	Temperature	71	deg F
PAN #	26-348-MIC-R1	Relative Humidity	45	%
EUT Name	**Point of Sale Availability Indicator**	Barometric Pressure	30.1	Hg
EUT Model	**Lane Director/Control**	Test Location	Shielded Room 1	
Governing Doc	CFR 47, Part 15B	Test Engineer	M. Krumweide	
Basic Standard	Sec. 15.107	Date	6-20-06	

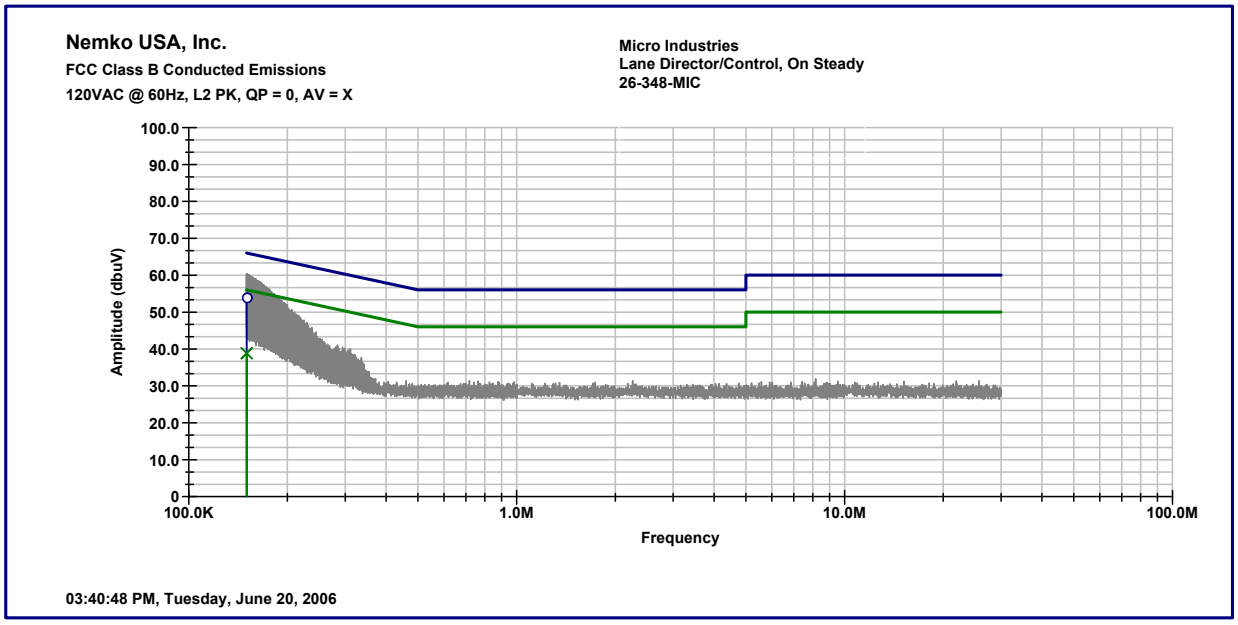




5.2. Standby mode

Client	**Micro Industries**	Temperature	71	deg F
PAN #	26-348-MIC-R1	Relative Humidity	45	%
EUT Name	**Point of Sale Availability Indicator**	Barometric Pressure	30.1	Hg
EUT Model	**Lane Director/Control**	Test Location	Shielded Room 1	
Governing Doc	CFR 47, Part 15B	Test Engineer	M. Krumweide	
Basic Standard	Sec. 15.107	Date	6-20-06	





Conducted Emissions Test Equipment

Client	**Micro IndustriesMicro Industries**	EUT Name	**Point of Sale Availability Indicator**
PAN #	26-348-MIC-R1	EUT Model	**Lane Director/Control**

Nemko ID	Device	Manufac.	Model	Serial #	Cal Date	Cal Due Date
107	Spectrum Analyzer	HP	85680B	2415A00373	8/11/05	8/11/06
534	Spectrum Analyzer Display	HP	85662A	2534A10452	8/11/05	8/11/06
538	Quasi-Peak Adapter	HP	85650A	2521A00588	8/11/05	8/11/06
682	Transient Limiter	HP	11974A	3107A02633	11/16/205	11/16/06
564	High Pass Filter	Solar	7801-5.0	853130	5/4/06	5/4/07
805	LISN	Solar	9348-50-R-24-BNC	992823	11/16/05	11/16/06
384	LISN	Solar	9348-50-R-24-BNC	941716	5/9/06	5/9/07

5.3 Radiated Emissions Test Data

Radiated Emissions Data

Complete: X
Preliminary:
Job # : 26-348-MIC
Test # :
Page 1 of 1

Client Name : Micro Industries
EUT Name : Lane Director/Control
EUT Model # : 9701037
EUT Part # :
EUT Serial # :
EUT Config. : Standby/Flashing

Specification : CFR47 Part 15, Subpart B, Class B
Reference :

Rod. Ant. #:	NA	Temp. (deg. C) :	22	Date :	6/20/2006
Bicon Ant.#:	128	Humidity (%) :	63	Time :	10AM
Log Ant.#:	110	EUT Voltage :	120	Staff :	Mike Krumweide
DRG Ant. #	NA	EUT Frequency :	60Hz	Quasi-Peak RBW:	120 kHz
Dipole Ant.#:	NA	Phase:	1	Video Bandwidth	120 kHz
Cable#:	NOATS	Location:	NOATS	Average RBW:	1 MHz
Preamp#:	901	Distance:	3m	Video Bandwidth	10 Hz
Spec An.#:	674			Peak RBW:	1 MHz
QP #:	676			Video Bandwidth	1 MHz
PreSelect#:	NA				

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
64	V	0	45.1	11.4	1.4	31.9	26.0	40.0	-14.0	Pass	flashing
64.83	V	0	43.2	11.4	1.4	31.9	24.1	40.0	-15.9	Pass	flashing
65.4	V	0	44.5	11.4	1.4	31.9	25.4	40.0	-14.6	Pass	flashing
68.03	V	0	43.5	11.4	1.4	31.9	24.4	40.0	-15.6	Pass	flashing
280.03	H	0	46.4	13.4	3.0	31.9	30.9	46.0	-15.1	Pass	
296.02	H	0	45.4	13.6	3.0	31.9	30.1	46.0	-15.9	Pass	
456	H	0	45.6	16.4	3.8	31.8	34.0	46.0	-12.0	Pass	
824	H	0	37.4	21.8	5.5	32.3	32.4	46.0	-13.7	Pass	

Radiated Emissions Test Equipment

Client	**Micro Industries**	EUT Name	**Point of Sale Availability Indicator**
PAN #	26-348-MIC-R1	EUT Model	**Lane Director/Control**

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
128	Antenna, Bicon	EMCO	NA	NA	10/6/05	10/6/06
110	Antenna, LPA	Electrometrics	LPA-25	NA	11/29/05	11/29/06
901	pre amp	Sonoma	310 N	NA	12/19/05	12/19/06
674	Spectrum Analyzer	HP	8568B	2007A00910	2/15/06	8/15/06
676	Quasi-Peak Adapter	HP	85650 A	2430A00576	1/5/06	7/5/06
675	Spectrum Analyzer Display	HP	85662 A	2005A01282	2/15/06	8/15/06

5.3. CFR 47 Part 15c §15.247 Test Results

EUT is single channel device.

EUT has an integral antenna within the circuit board with a design gain of 0.4 dBi.

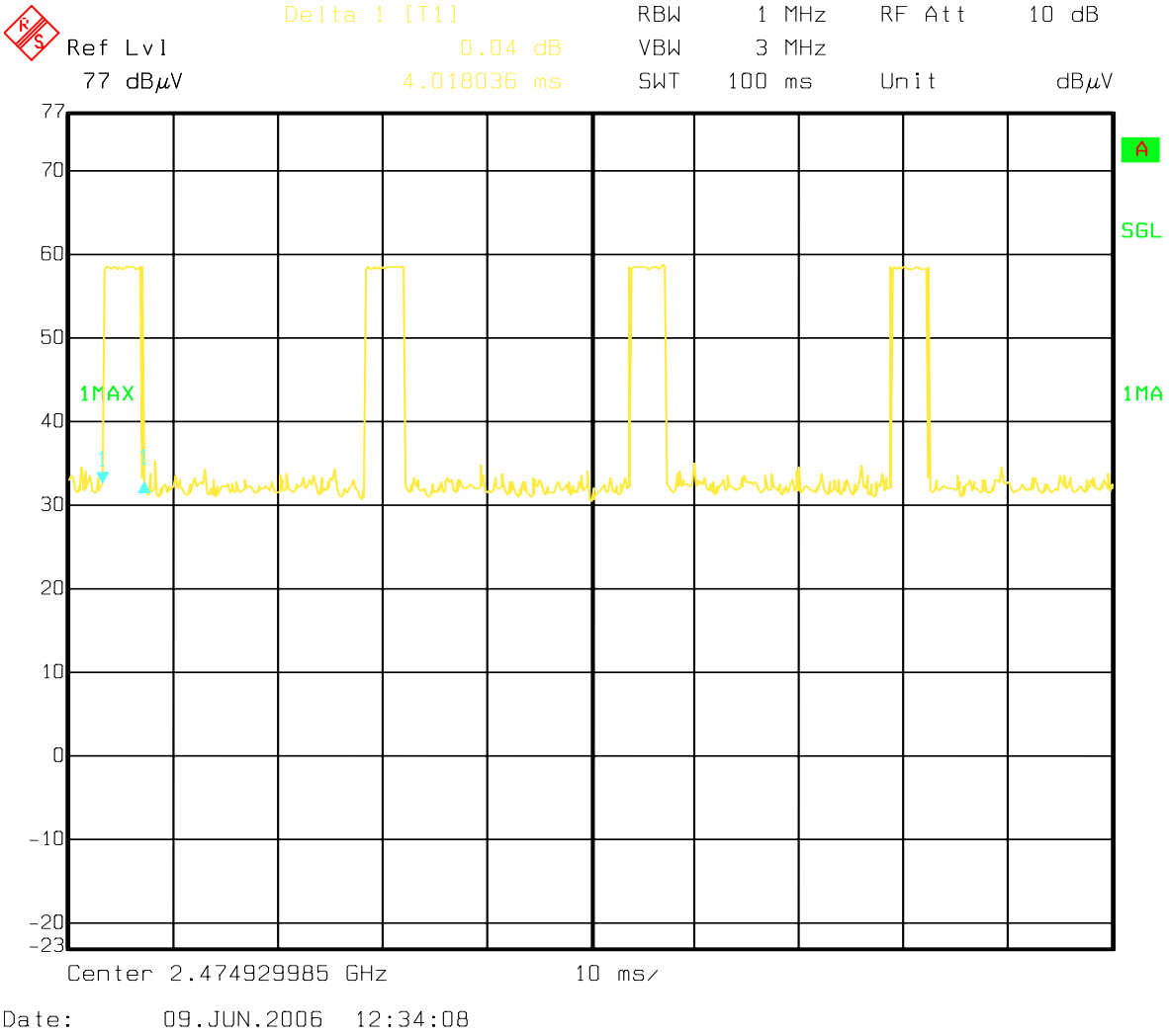
The power level was measured at 3m to be 95.8 dBuV/m or 0.57 dBm, which when subtracting 0.4 dBi results in an antenna port output power of 0.17 dB or 0.00104 W.

5.4. Duty Cycle

4.0 ms x 4 = 16.0 ms in 100 ms

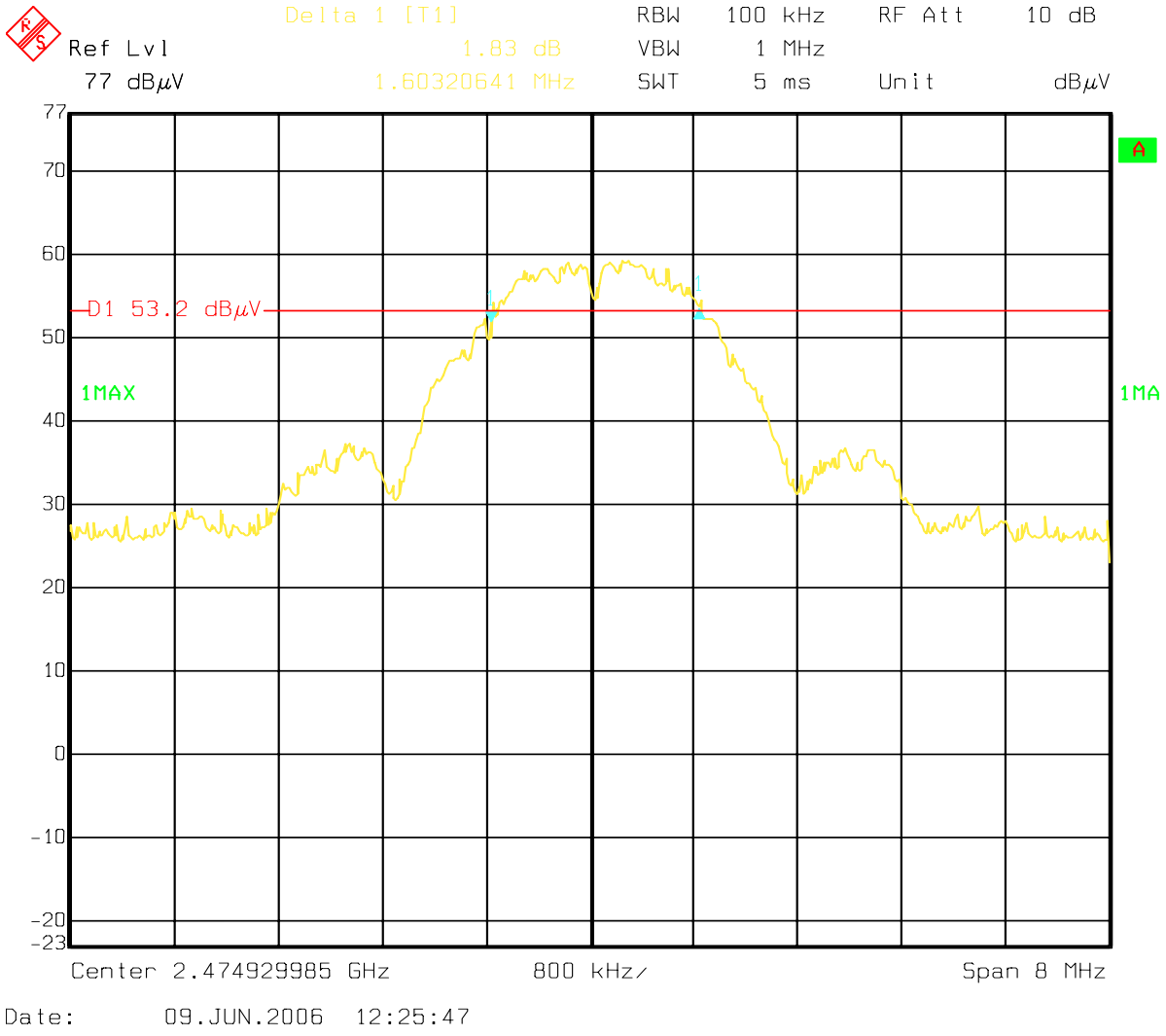
Duty Cycle Factor

20 x log (0.16) = -15.9 dB



5.5. 6 dB Bandwidth

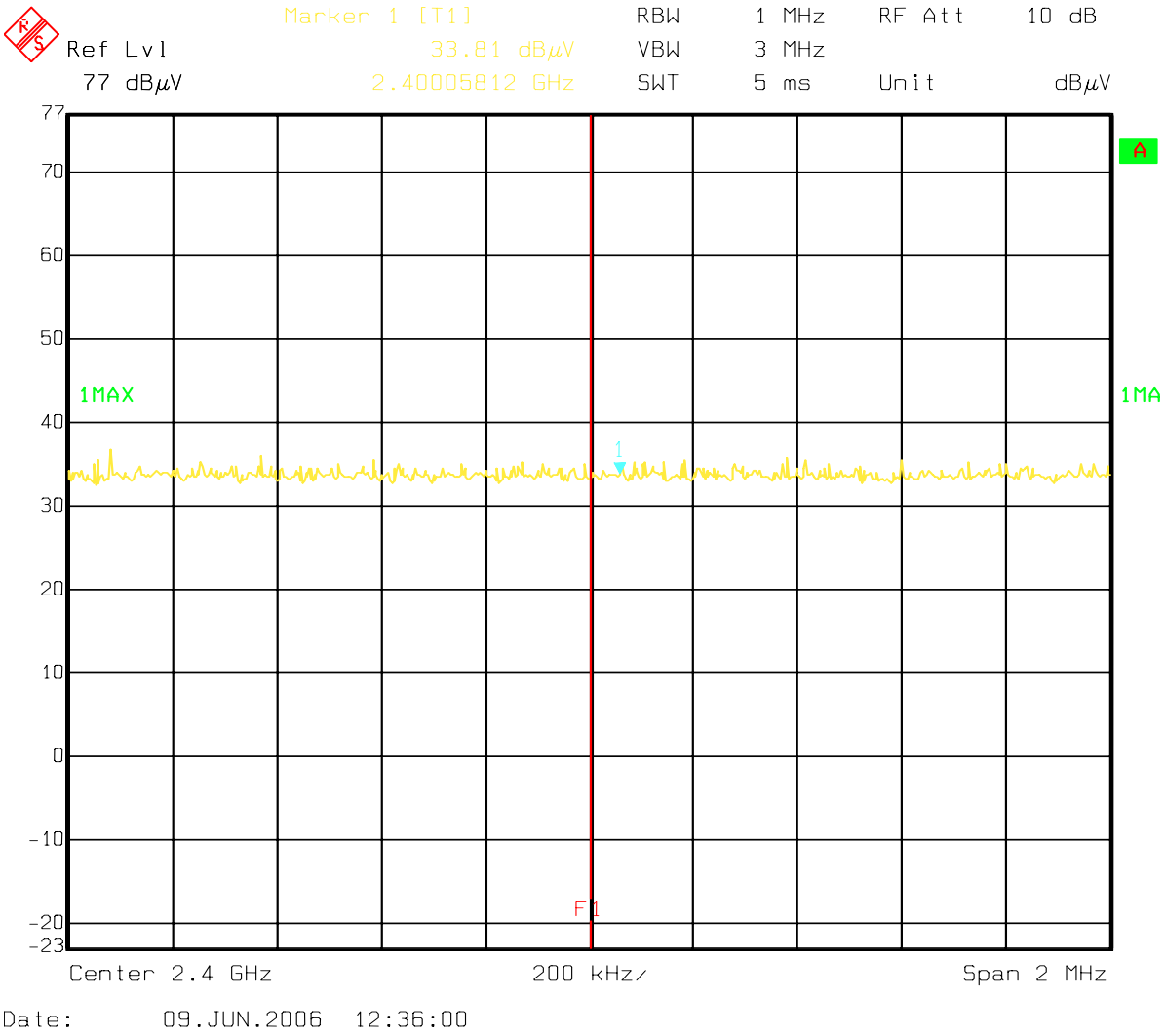
1.60 MHz is greater than 500 kHz and therefore complies.



5.6. Band Edge Low

Peak: 33.8 dBuV + 32.1 correction factor = 65.9 dBuV/m complies with FCC 15.209 of 74 dBuV/m

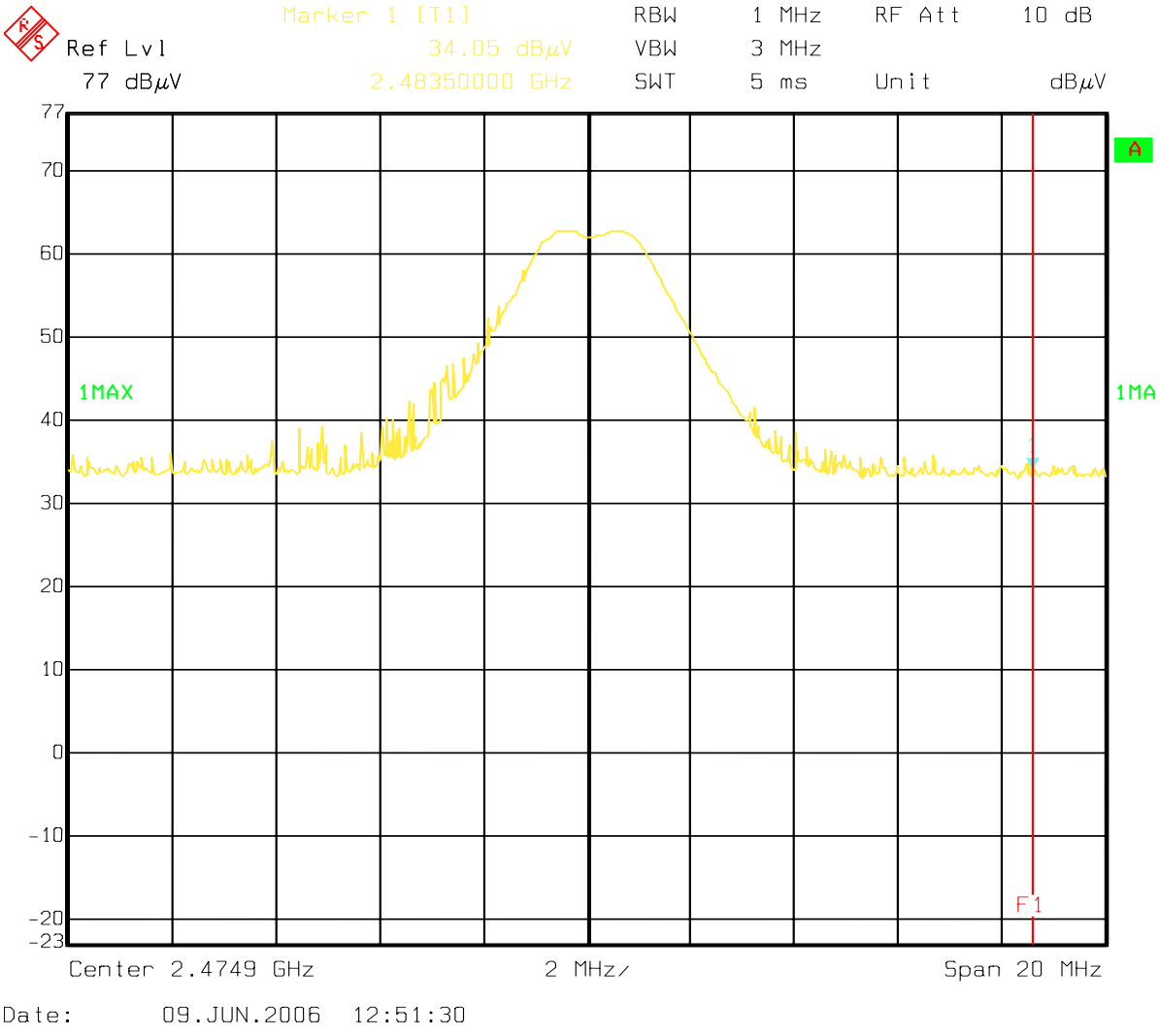
Average: 33.8 dBuV + 32.1 correction factor –15.9 dB duty cycle factor = 50.0 dBuV/m complies with FCC 15.209 of 54 dBuV/m



5.7. Band Edge High

Peak: 34.1 dBuV + 32.1 correction factor = 66.2 dBuV/m complies with FCC 15.209 of 74 dBuV/m

Average: 34.6 dBuV + 32.1 correction factor –15.9 dB duty cycle factor = 50.3 dBuV/m complies with FCC 15.209 of 54 dBuV/m



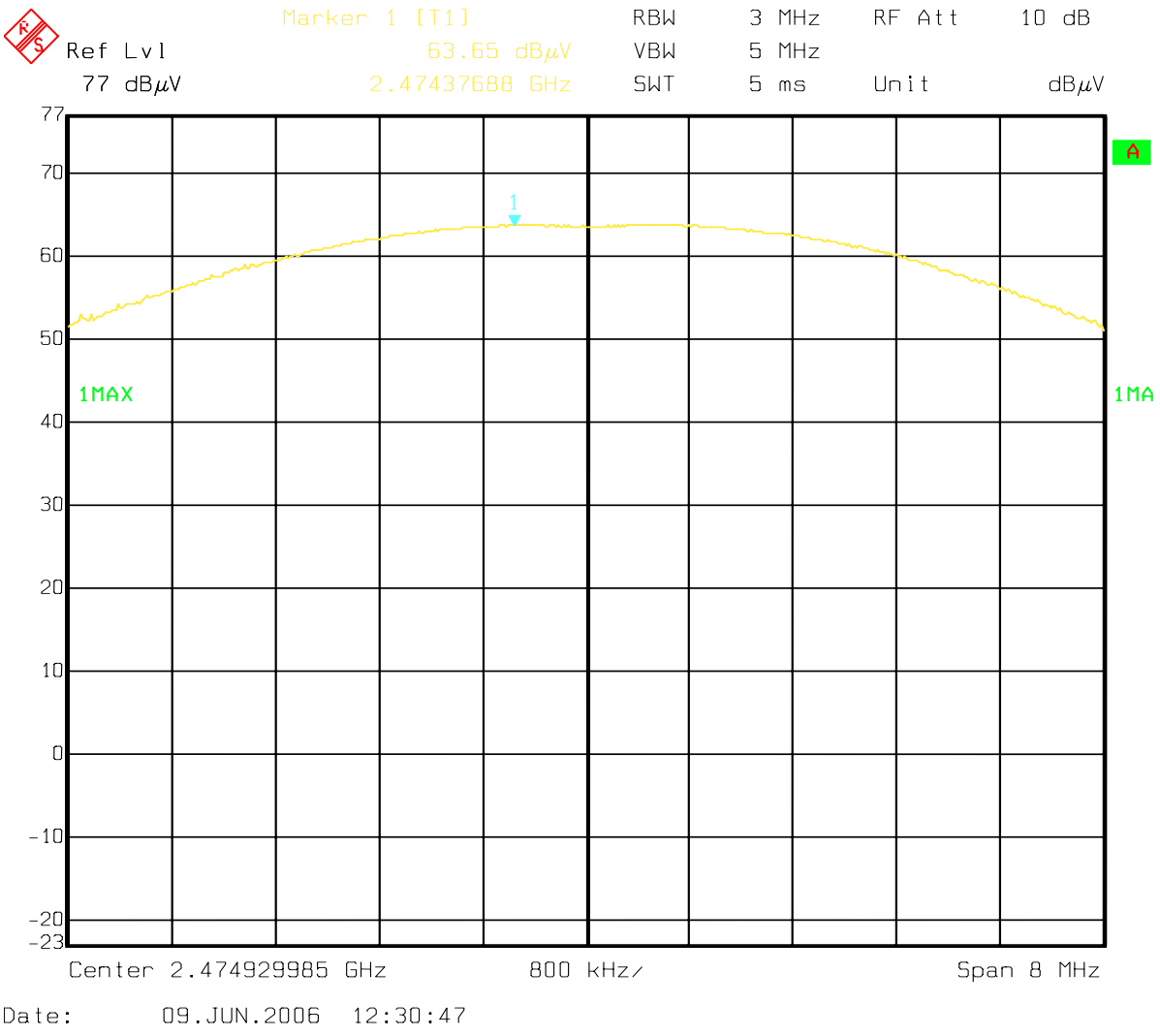
5.8. Peak Power

63.7 + 32.1 correction factor = 95.8 dBuV/m

95.8 dBuV/m at 3m converts to 0.00114 W; which complies with the limit of 0.125 W

[Field Strength in V/m x distance /5.5]^2 = (Power in Watts

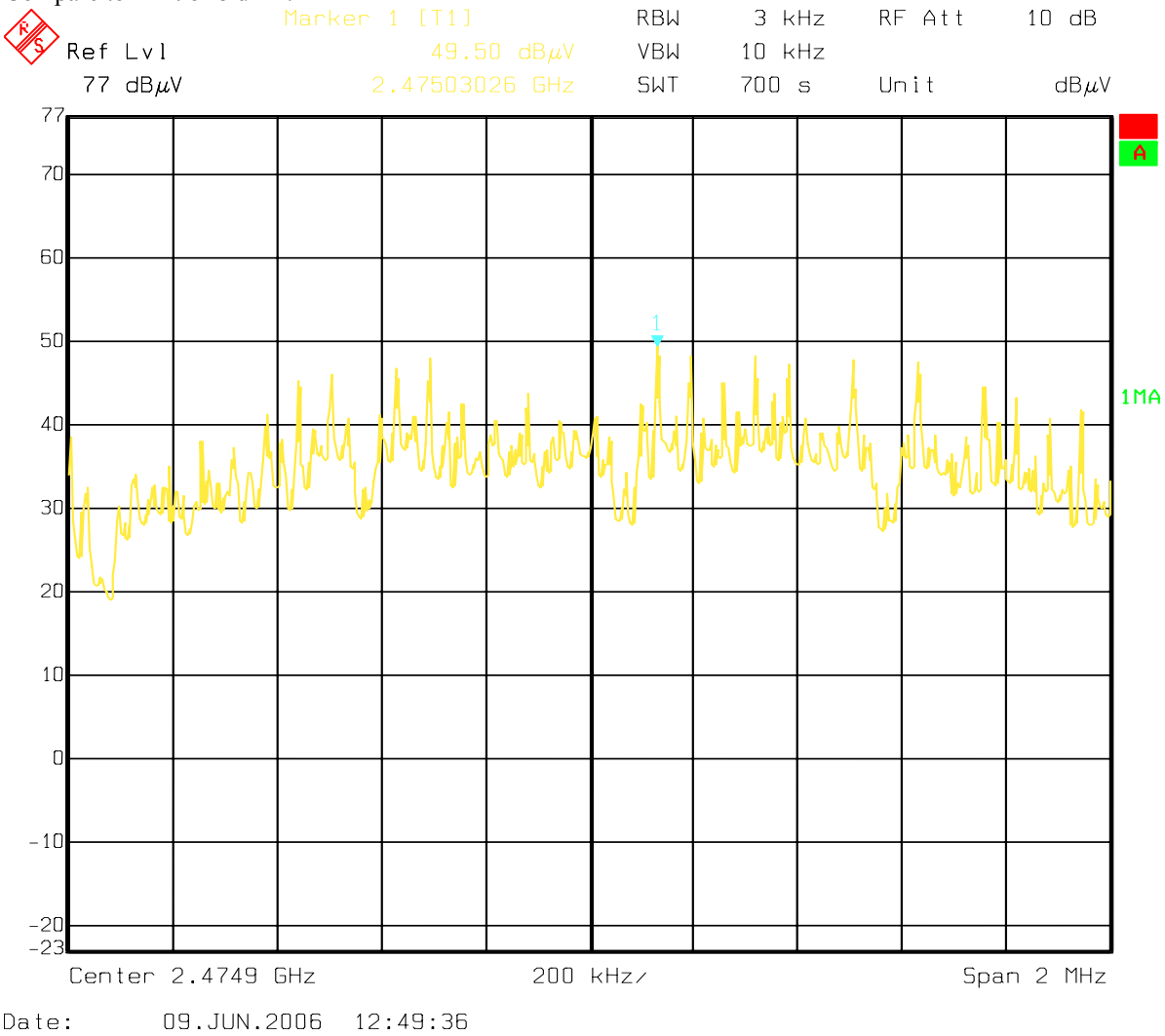
Input power was varied by ±15%, RF power did not vary with voltage change.



5.9. Peak Power Density

Frequency reported **2475.0 MHz**
49.5 dBuV + 32.1 correction factor = 81.6 dBuV/m
79.6 dBuV/m – 95.23 dBuV/m to dBm conversion factor = -13.6 dBm which complies with the limit of 8 dBm.

Maximized emission with rotation and antenna height.
RBW 1 MHz, VBW 1MHz
Vertical and horizontal peak
Reset VBW to 3 kHz, sweep set to Span / 3k = 700 seconds.
Located max peak with peak search, centered in span, set to zero span.
Report frequency found.
Maximized Field strength measurement in dBuV/m + CF - 95.3 dBm/dBuV/m=
Result in dBm.(antenna gain is included as it is a Radiated Measurement)
Compare to limit of 8 dBm.



5.10. Radiated Spurious

Emissions were investigated from 30 MHz to 25000 MHz
No emissions found from 30 to 2400 MHz, no other emissions found other than noted below.

Radiated Emissions Data

Complete	YES			Job # :	26-348-MIC-R1	Test # :	1
Preliminary				Page	1	of	1
Client Name :	Micro Industries						
EUT Name :	Lane Display Controller						
EUT Model # :	9701037						
EUT ANTENNA Part # :							
EUT Serial # :							
EUT Config. :	Transmit						
	FCC Part 15.247						
Specification :	FCC Part 15.209 (a)	FCC Part 15.205 (a)					
Rod. Ant. #:	NA	Temp. (deg. C) :	19	Date :	6/9/2006		
Bicon Ant.#:	na	Humidity (%) :	73	Time :			
Log Ant.#:	na	EUT Voltage :	5 Vdc	Staff :	AAL		
DRG Ant. #	529	EUT Frequency :		Photo ID:			
DRG Ant. 18-40 #	625	Phase:		Peak Res Bandwidth Rest. Band:	1 MHz		
Cable#:	40ft	Location:	SOATS	Peak Video Bandwidth Rest. Band	1 MHz		
Preamp#:	842	Distance:	3 m	Peak Res Bandwidth	100 kHz		
Spec An.#:	835	Duty Cycle Factor	-15.9	Peak Video Bandwidth	100 kHz		
QP #:	NA						

Meas. Freq. (MHz)	Vertical (dBuV) pk	Vertical (dBuV) av	Horizontal (dBuV) pk	Horizontal (dBuV) av	CF (db)	Max Level (dBuV/m) pk	Max Level (dBuV/m) av	Spec. Limit (dBuV/m) pk	Spec. Limit (dBuV/m) av	Margin dB pk	Margin dB av	EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
2474.90	63.7	47.7	59.0	43.1	32.1	95.8		116.2		-20.5		0.0	1.2	Pass	RBW 5 MHz, VBW 10 MHz
4949.80	59.5	43.6	59.7	43.8	-5.4	54.3	38.4	74.0	54.0	-19.7	-15.6		1.0	Pass	
7424.70	53.1	37.2	61.8	45.9	3.3	65.1	49.2	74.0	54.0	-8.9	-4.8		1.0	Pass	
															Power density
2475.00	49.5				32.1	81.6		103.3		-21.7					103.3 dBuV/m = 8 dBm
2400.00	33.8	17.9	33.6	17.7	32.1	65.9	50.0	75.8	55.8	-9.8	-5.8	0.0	1.2	Pass	bandedge
2483.50	34.0	18.1	34.0	18.1	32.1	66.1	50.2	74.0	54.0	-7.9	-3.8	0.0	1.2	Pass	bandedge

Emissions Test Equipment

Asset Number	Description	Model Number	Serial Number	Last Cal	Cal Due
835	Spectrum Analyzer, Rhode & Schwartz	RHDFSEK	829058/005	1/18/06	1/18/07
842	Preamp	Nemko	na	5/19/06	5/19/07
529	Antenna, DRWG, EMCO	3115	2505	4/13/06	4/13/07
625	Antenna, Dbl Ridge Horn, EMCO	3116	2325	2/3/06	2/3/07

APPENDIX A

A. Radiated Emissions Measurement Uncertainties

1. Introduction

ISO/IEC 17025:1999 and ANSI/NCSL Z540-1-1994 require that all measurements contained in a test report be "traceable". "Traceability" is defined in the *International Vocabulary of Basic and General Terms in Metrology* (ISO: 1993) as: "the property of the result of a measurement... whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, *all having stated uncertainties*".

The purposes of this Appendix are to "state the *Measurement Uncertainties*" of the conducted emissions and radiated emissions measurements contained in Section 5 of this Test Report, and to provide a practical explanation of the meaning of these measurement uncertainties.

2. Statement of the Worst-Case Measurement Uncertainties for the Conducted and Radiated Emissions Measurements Contained in This Test Report

Table 1: Worst-Case Expanded Uncertainty "U" of Measurement for a k=2 Coverage Factor

Radiated Emissions Measurement Detection Systems	Applicable Frequency Range	"U" for a k=2 Coverage Factor
HP8568B Spectrum Analyzer with QPA & Sonoma 310 Preamplifier	30 MHz - 200 MHz	+4.0 dB, -4.1 dB
HP8568B Spectrum Analyzer with QPA Sonoma 310 Preamplifier	200 MHz-1000 MHz	+/- 3.5 dB
Rohde & Schwartz Spectrum Analyzer with Nemko Preamplifier	1 GHz - 18 GHz	+2.5 dB, -2.6 dB
Rohde & Schwartz Spectrum Analyzer with High Frequency Preamplifier	18 GHz - 40 GHz	+/- 3.4 dB
NOTES: 1. Applies to 3 and 10 meter measurement distances 2. Applies to all valid combinations of Transducers (i.e. LISNs, Line Voltage Probes, and Antennas, as appropriate) 3. Excludes the Repeatability of the EUT		

3. Practical Explanation of the Meaning of Radiated Emissions Measurement Uncertainties

In general, a "Statement of Measurement Uncertainty" means that with a certain (specified) confidence level, the "true" value of a measurand will be between a (stated) upper bound and a (stated) lower bound.

In the specific case of EMC Measurements in this test report, the measurement uncertainties of the conducted emissions measurements and the radiated emissions measurements have been calculated in accordance with the method detailed in the following documents:

- *ANSI Z540.2 (2002) Guide to the Expression of Uncertainty in Measurement*
- NIS 81:1994, *The Treatment of Uncertainty in EMC Measurements* (NAMAS, 1994)
- NIST Technical Note 1297(1994), *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results* (NIST, 1994)

The calculation method used in these documents requires that the stated uncertainty of the measurements be expressed as *an "expanded uncertainty", U, with a k=2 coverage factor*. The practical interpretation of this method of expressing measurement uncertainty is shown in the following example:

EXAMPLE: Assume that at 39.51 MHz, the (measured) radiated emissions level was equal to +26.5 dBuV/m, and that the +/- 2 standard deviations (i.e. 95% confidence level) measurement uncertainty was +/- 3.4 dB.

In the example above, the phrase "k = 2 Coverage Factor" simply means that the measurement uncertainty is stated to cover +/-2 standard deviations (i.e. a 95% confidence interval) about the measurand. The measurand is the radiated emissions measurement of +26.5 dBuV/m at 39.51 MHz, and the 95% bounds for the uncertainty are –3.4 dB to + 3.4 dB. One can thus be 95% confident that the "true" value of the radiated emissions measurement is between +23.1 dBuV/m and +29.5 dBuV/m. *In effect, this means that in the above example there is only a 2.5% chance that the "true" radiated emissions value exceeds +29.5 dBuV/m.*

APPENDIX B

B. Nemko USA, Inc. Test Equipment & Facilities Calibration Program

Nemko USA, Inc. operates a comprehensive Periodic Calibration Program in order to ensure the validity of all test data. Nemko USA's Periodic Calibration Program is fully compliant to the requirements of NVLAP Policy Guide PG-1-1988, ANSI/NCSL Z540-1-1994, ISO 10012:2003, ISO/IEC 17025:1999, and ISO-9000:2000. Nemko USA, Inc.'s calibrations program therefore meets or exceeds the US national commercial and military requirements [N.B. ANSI/NCSL Z540-1-1994 replaces MIL-STD-45662A].

Specifically, all of Nemko USA's *primary reference standard devices* (e.g. vector voltmeters, multimeters, attenuators and terminations, RF power meters and their detector heads, oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, field-strength meters and their detector heads, etc.) and certain *secondary standard devices* (e.g. RF Preamplifiers used in CISPR 11/22 and FCC Part 15/18 tests) are periodically recalibrated by:

- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratories by NIST; or,
- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratory by another accreditation body (such as A2LA) that is mutually recognized by NIST; or,
- A manufacturer of Measurement and Test Equipment (M&TE), if the manufacturer uses NIST-traceable standards and is ISO Guide 25-accredited as calibration laboratory either by NIST or by another accreditation body (such as A2LA) that is mutually recognized by NIST; or
- A manufacturer of M&TE (or by a Nemko USA-approved independent third party metrology laboratory) that is not ISO Guide 25-accredited. (In these cases, Nemko USA conducts an annual audit of the manufacturer or metrology laboratory for the purposes of proving traceabilty to NIST, ensuring that adequate and repeatable calibration procedures are being applied, and verifying conformity with the other requirements of ISO Guide 25).

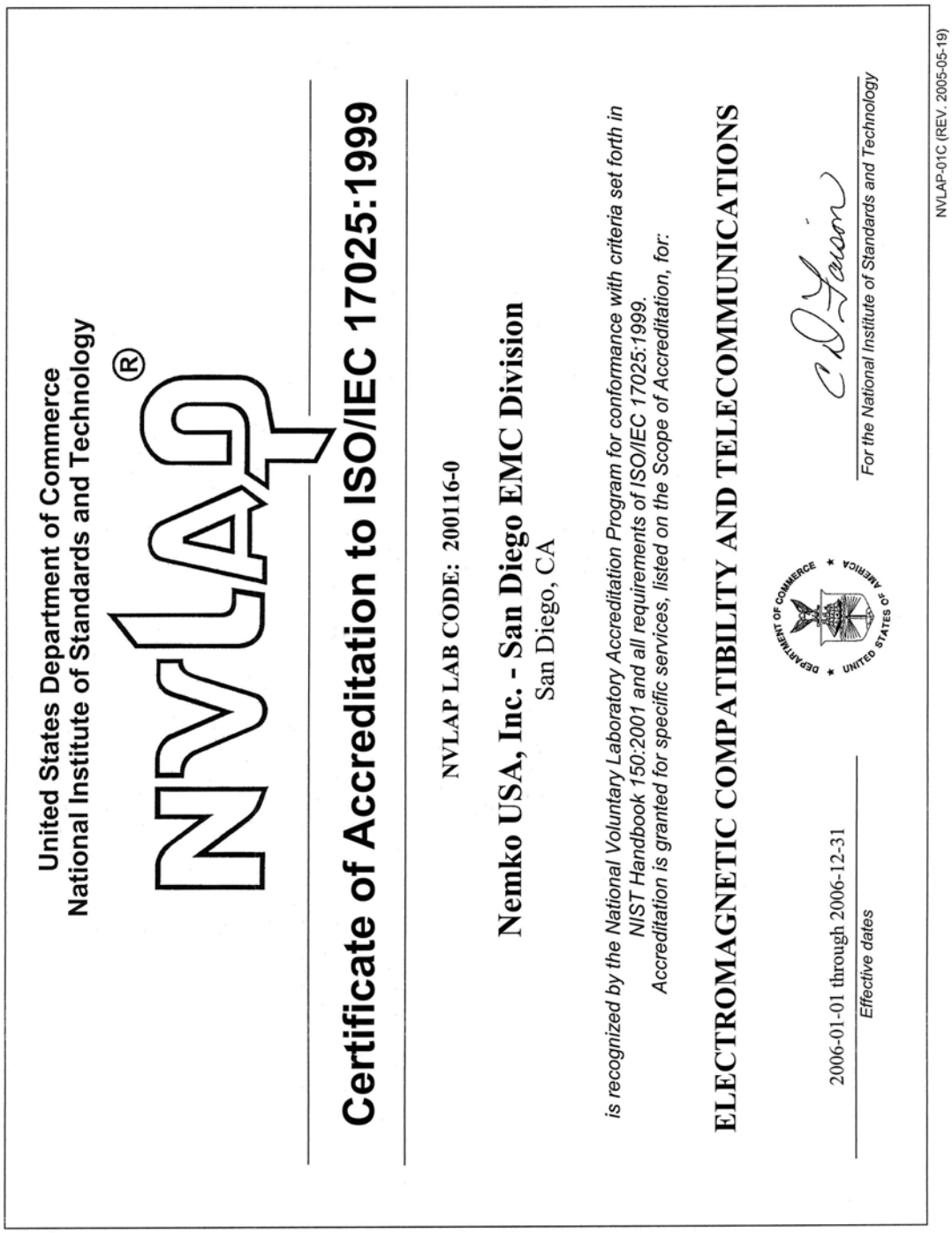
In all cases, the entity performing the Calibration is required to furnish Nemko USA with a calibration test report and/or certificate of calibration, and a "calibration sticker" on each item of M&TE that is successfully calibrated.

Calibration intervals are normally one year, except when the manufacture advises a shorter interval (e.g. the HP 8568B Spectrum Analyzer is recalibrated every six months) or if US Government directives or client requirements demand a shorter interval. Items of instrumentation/related equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either in-house [if minor] or by a Nemko USA-approved independent [third party] metrology laboratory, or by the manufacturer of the item of M&TE).

Each antenna used for CISPR 11 and CISPR 22 and FCC Part 15 and Part 18 radiated emissions testing (and for testing to the equivalent European Norms) is calibrated annually by either a NIST (or A2LA) ISO Standard 17025-Accredited third-party Antenna Calibration Laboratory or by the antenna's OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory. The antenna calibrations are performed using the methods specified in Annex G.5 of CISPR 16-1(2003) or ANSI C63.5-2004, including the "Three-Antenna Method". Certain other kinds of antennas (e.g. magnetic-shielded loop antennas) are calibrated annually by either a NIST (or A2LA) ISO Standard 17025-accredited third-party antenna calibration laboratory, or by the antenna's OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory using the procedures specified in the latest version of SAE ARP-958.

In accordance with FCC and other regulations, Nemko USA recalibrates its suite of antennas used for radiated emissions tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of Nemko USA's Open Area Test Site. Nemko USA, Inc. uses the procedures given in both Sub clause 16.6 and Annex G.2 of CISPR 16-1 (2003), and, ANSI C63.4-2004 when performing the normalized site attenuation measurements.

APPENDIX C
C. NVLAP Accreditation



United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:1999

NVLAP LAB CODE: 200116-0

Nemko USA, Inc. - San Diego EMC Division
San Diego, CA

is recognized by the National Voluntary Laboratory Accreditation Program for conformance with criteria set forth in NIST Handbook 150:2001 and all requirements of ISO/IEC 17025:1999.
Accreditation is granted for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

2006-01-01 through 2006-12-31
Effective dates

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2005-05-19)

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999

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ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS **NVLAP LAB CODE 200116-0**

NVLAP Code	*Designation / Description*
Emissions Test Methods:	
12/CIS14	CISPR 14-1 (March 30, 2000): Limits and Methods of Measurement of Radio interference Characteristics of Household Electrical Appliances, Portable Tools and Similiar Electrical Apparatus - Part 1: Emissions
12/CIS14a	EN 55014-1 (1993), A1 (1997), A2 (1999):
12/CIS14b	AS/NZS 1044 (1995):
12/CIS14c	CNS 13783-1: Electromagnetic Compatibility Requirements for household appliances, electric tools and similar apparatus - Part 1: Emissions
12/CIS15b	CNS 13439 (2000) + A1 (2001): Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS22	IEC/CISPR 22 (1997) & EN 55022 (1998) + A1(2000): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22a	IEC/CISPR 22 (1993) and EN 55022 (1994): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996)
12/CIS22b	CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment

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NVLAP Code	*Designation / Description*
12/EM02a	IEC 61000-3-2, Edition 2.1 (2001-10), EN 61000-3-2 (2000), and AS/NZS 2279.1 (2000): Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A)
12/EM03b	IEC 61000-3-3, Edition 1.1(2002-03) & EN 61000-3-3, A1(2001): EMC - Part 3-3: Limits - Limitations of voltage changes, voltage flucuations and flicker, in public low-voltage supply-systems, for equipment with rated current <=16 A per phase and not subject to conditional connections
12/F18	FCC OST/MP-5 (1986): FCC Methods of Measurement of Radio Noise Emissions for ISM Equipment (cited in FCC Method 47 CFR Part 18 - Industrial, Scientific, and Medical Equipment)
12/T51a	AS/NZS CISPR 22 (2004): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement

Immunity Test Methods:

12/I01	IEC 61000-4-2, Ed. 1.2 (2001) + A1, A2; EN 61000-4-2: Electrostatic Discharge Immunity Test
12/I02	IEC 61000-4-3, Ed. 2.0 (2002-03); EN 61000-4-3 (2002): Radiated Radio-Frequency Electromagnetic Field Immunity Test
12/I03	IEC 61000-4-4(1995), A1(2000), A2(2001); EN 61000-4-4: Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical Fast Transient/Burst Immunity Test
12/I04	IEC 61000-4-5, Ed. 1.1 (2001-04); EN 61000-4-5: Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
12/I05	IEC 61000-4-6, Ed. 2.0 (2003-05); EN 61000-4-6: Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/I06	IEC 61000-4-8, Ed. 1.1 (2001); EN 61000-4-8: Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test

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NVLAP Code	*Designation / Description*
12/I07	IEC 61000-4-11, Ed. 1.1 (2001-03); EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

MIL-STD-462 : Conducted Emissions:

12/A13	MIL-STD-462 Version D Method CE101
12/A14	MIL-STD-462 Version D Method CE102
12/A15	MIL-STD-462 Version D Method CE106
12/A16	MIL-STD-461 Version E Method CE101
12/A17	MIL-STD-461 Version E Method CE102
12/A18	MIL-STD-461 Version E Method CE106

MIL-STD-462 : Conducted Susceptibility:

12/B12	MIL-STD-462 Version D Method CS101
12/B13	MIL-STD-462 Version D Method CS103
12/B14	MIL-STD-462 Version D Method CS104
12/B15	MIL-STD-462 Version D Method CS105
12/B16	MIL-STD-462 Version D Method CS109
12/B17	MIL-STD-462 Version D Method CS114
12/B18	MIL-STD-462 Version D Method CS115
12/B19	MIL-STD-462 Version D Method CS116
12/B20	MIL-STD-461 Version E Method CS101
12/B21	MIL-STD-461 Version E Method CS103
12/B22	MIL-STD-461 Version E Method CS104

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12/B23	MIL-STD-461 Version E Method CS105
12/B24	MIL-STD-461 Version E Method CS109
12/B25	MIL-STD-461 Version E Method CS114
12/B26	MIL-STD-461 Version E Method CS115
12/B27	MIL-STD-461 Version E Method CS116
MIL-STD-462 : Radiated Emissions:	
12/D04	MIL-STD-462 Version D Method RE101
12/D05	MIL-STD-462 Version D Method RE102
12/D06	MIL-STD-462 Version D Method RE103
12/D07	MIL-STD-461 Version E Method RE101
12/D08	MIL-STD-461 Version E Method RE102
12/D09	MIL-STD-461 Version E Method RE103
MIL-STD-462 : Radiated Susceptibility:	
12/E08	MIL-STD-462 Version D Method RS101
12/E09	MIL-STD-462 Version D Method RS103
12/E10	MIL-STD-462 Version D Method RS105
12/E11	MIL-STD-461 Version E Method RS101
12/E12	MIL-STD-461 Version E Method RS103
12/E13	MIL-STD-461 Version E Method RS105

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