Nemko USA, Inc.
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PART 15.249, SUBPART C

For The

Ambulatory ECG Monitor with a Wireless (RF) Interface

Model:

FCC ID: TW7100

PREPARED FOR:

Signalife, Inc.
531 S. Main St. Suite 301
Greenville, South Carolina 29601

PREPARED ON MARCH 3, 2006

REPORT NUMBER 2006 0301040 FCC

PROJECT NUMBER: 25-1040-SIG-R1

DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	March 3rd, 2006	Prepared By: A. Laudani
-	March 3rd, 2006	Initial Release: Chip Fleury

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (2003) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The unit described in this report was received at Nemko USA, Inc.'s facilities on Jan 30, 2006. Testing was performed on the unit described in this report on February 3, to February 15, 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.

The RFI testing, test data collection and test data evaluation were accomplished in accordance with the ANSI C63.4-2003 Standard, and in accordance with the applicable sections of the FCC rules (47 CFR Parts 2 and 15). 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.

FR Fleury
Manager of EMC Operations

1. ADMINISTRATIVE DATA AND TEST SUMMARY

Administrative Data

CLIENT: Signalife, Inc.
531 S. Main St. Suite 301
Greenville, South Carolina 29601

CONTACT: Bill Mathews, bmatthews@recom-systems.com

DATE (S) OF TEST: March 3rd, 2006

EQUIPMENT UNDER TEST (EUT): Ambulatory ECG Monitor with a Wireless (RF) Interface
Model: Fidelity 100

Condition Upon Receipt: Suitable for Test

TEST SPECIFICATION: FCC, Part 15.249, Subpart C, Output power and spurious emission.

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, §15.249 Plus Bandedge	2400 – 2483.5 MHz	PASS

Battery operated device.

Test Supervisor : *FR Fleury*
Nemko, USA

Refer to the test results section for further details.

2. SYSTEM CONFIGURATION

Description of EUT

The **Fidelity 100** is a **Ambulatory ECG Monitor with a Wireless (RF) Interface**. Its function is to transmit ECG data to a computer receiver via Bluetooth.

System Components and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - Ambulatory ECG Monitor with a Wireless (RF) Interface	Signalife, Inc. Fidelity 100 Serial #: NA	7.2 Vdc internal rechargeable battery
EUT Test Board and Laptop	Signalife, Inc. Model # NA Removed for test	N/A
Battery Charging Unit	Signalife, Inc. Fidelity 100 Serial #: NA	1 m 2 prong wall plug 120 Vac 60 Hz

Device Interconnection and I/O Cables

CONNECTION	I/O CABLE
No connections	Battery charging mode

Test Configuration

In operation, the Fidelity 100 takes measurements of the body via skin sensors and then transmits these measurements via Bluetooth enabled computer. For battery charging mode the skin sensors are removed to facilitate the charger connection. This facilitates 15.107 and 15.109 testing. The EUT cannot transmit when connected to the battery charger. For 15.209 and 15.249 testing, connection to the skin sensors did not result in any differences and the set up without the skin sensors was presented.

The following design modifications were made to the EUT during testing.

No design modifications were made to the EUT during testing.

3. DESCRIPTION OF TEST SITE AND EQUIPMENT

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 (1987), CISPR 16 and 22 (1985) and ANSI C63.4-2003 documents. The OATS normalized site attenuation characteristics are verified for compliance every year.

4. DESCRIPTION OF TESTING METHODS

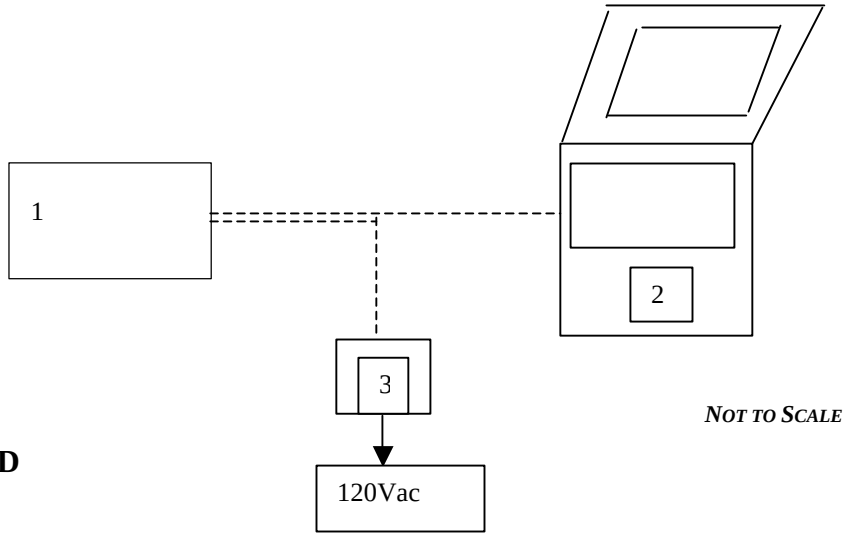
Introduction

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 C63.4-2003, 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

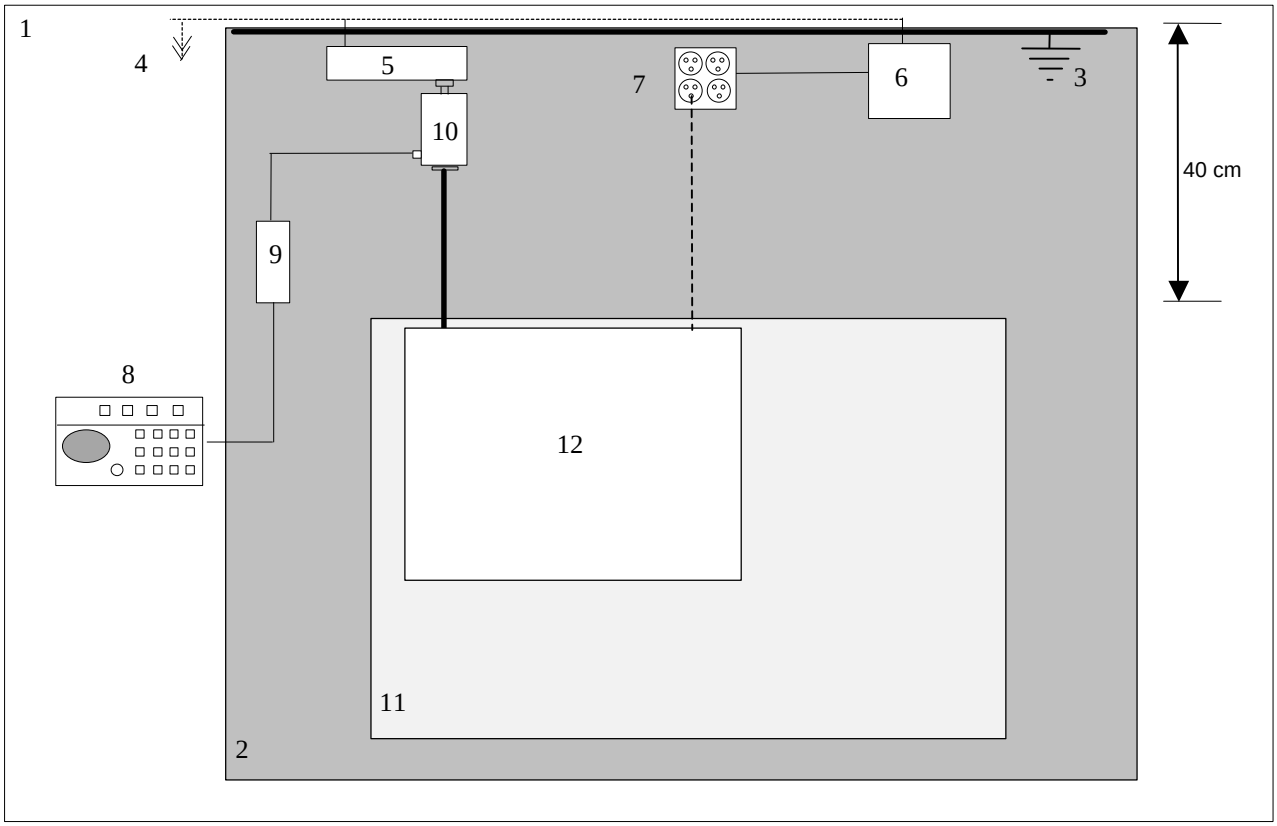
1. EUT
2. Computer and test board – Removed after programming EUT
3. Battery Charger – Removed after Battery is charged, used for 15.107 and 15.109.

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

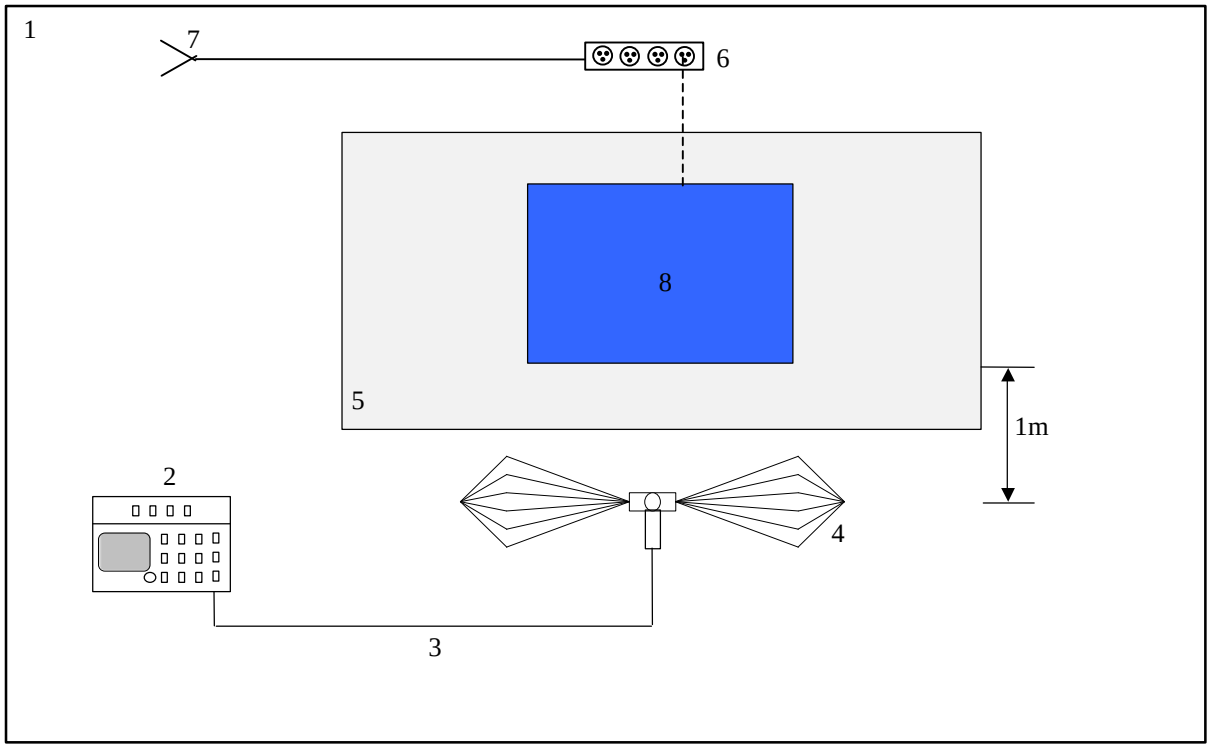
1. Test Laboratory (6 X 6 meters)
2. Ground Plane (15 square meters)
3. Vertical Conducting Wall (Grounded through Ground Plane via 10' ground rod)
4. AC Power for Devices
5. Power Line Filter, Lindgren, 120 dB, 30 amp
6. Line Impedance Stabilization Network (LISN) for peripheral devices Not Applicable
7. Power Distribution Box for peripheral devices Not Applicable
8. Spectrum Analyzer with Quasi-Peak Adapter
9. Transient Limiter
10. LISN for EUT
11. Non-Conducting table 80 cm above ground plane
12. EUT:

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

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 C63.4-2003 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.

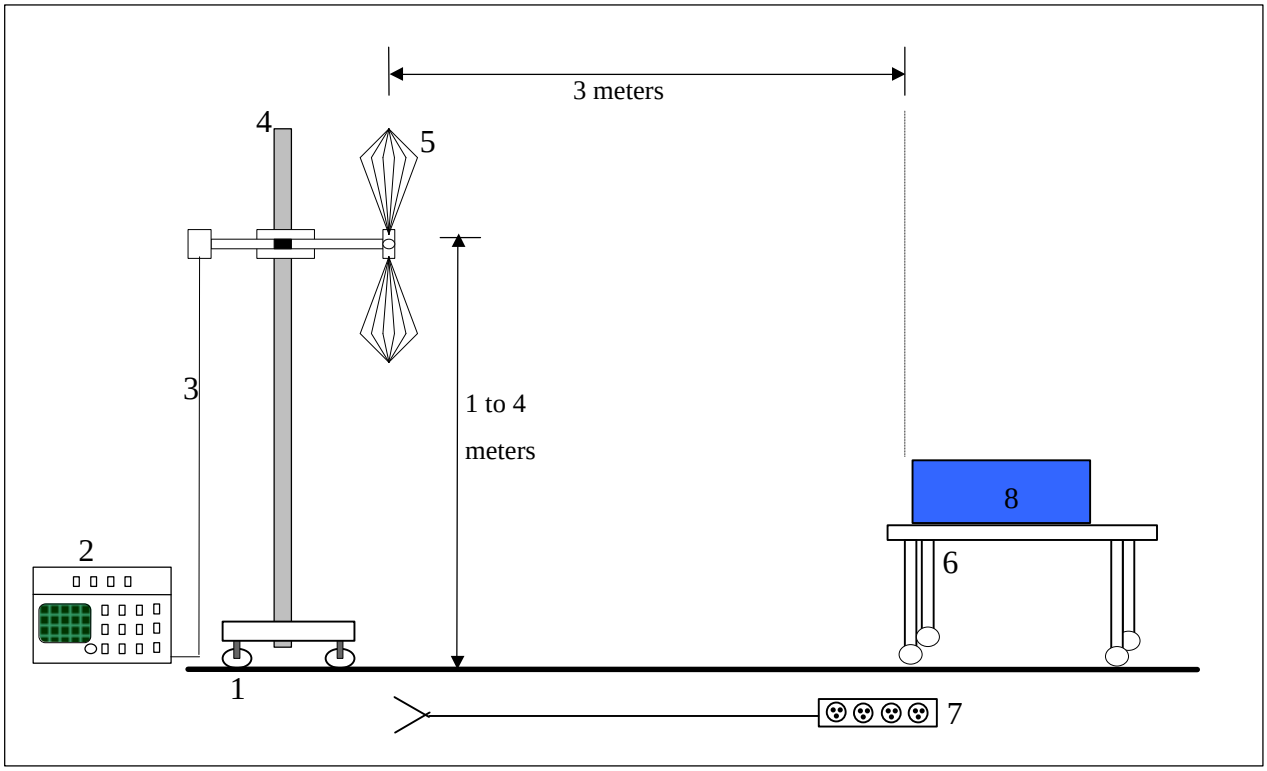
The numerical results that are applied to the emissions limits are arrived at by the following method:
Example: A=RR+CL+AF
A = Amplitude dBuV/m
RR = Receiver Reading dBuV
CL = cable loss dB
AF = antenna factor dB

Example Frequency = 110MHz
18.5 dBuV (spectrum analyzer reading)
+3.0 dB (cable loss @ frequency)
21.5 dBuV
+15.4 dB (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 – Not Used
8. EUT: Fidelity 100

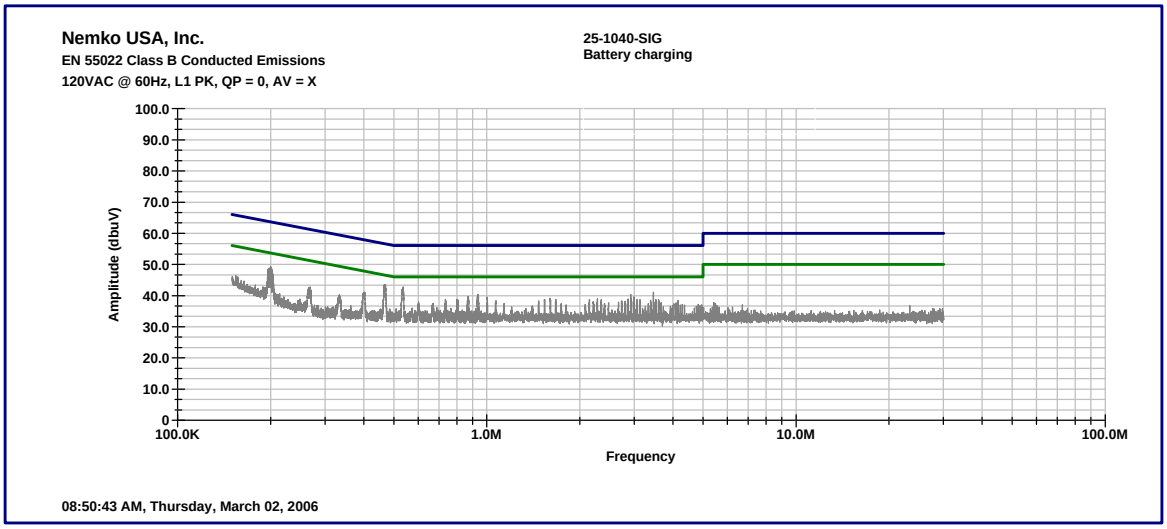
Operation in the 15.249 bands

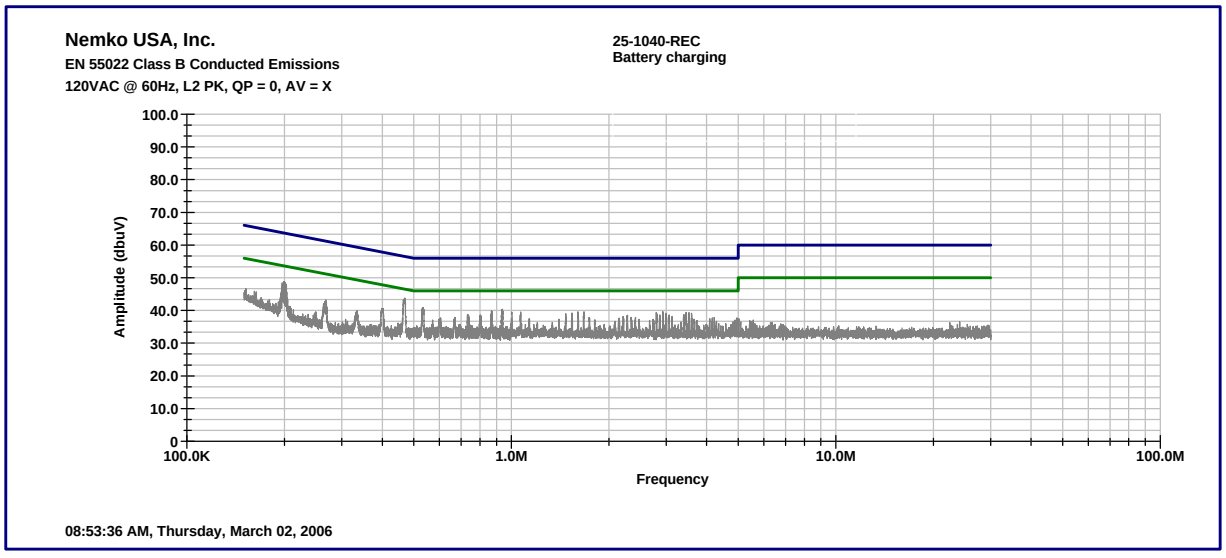
In Addition to the general radiated emissions requirements described in FCC, Part 15B, Section 15.249 determines the configuration and procedures for measuring additional emissions of Intentional Radiating Devices.

5. TEST RESULTS

Conducted Emissions Test Data

Limits 15.107(a)





Conducted Emissions Test Equipment

Asset Number	Description	Model Number	Serial Number	Last Cal	Cal Due
533	Quasi-Peak Adapter, HP	85650A	2043A00211	4/12/05	4/12/06
674	Spectrum Analyzer, HP	8568B	2007A00910	10/12/05	10/12/06
675	Spectrum Analyzer Display, HP	85662A	2005A01282	10/12/05	10/12/06
560	Transient Limiter, HP	11947A	2820A00502	1/18/06	1/18/07
395	LISN, Solar	9348-50-R-24-BNC	941718	1/18/06	1/18/07

5.3 Radiated Emissions Test Data –

15.249 Transmit

Radiated Emissions Data

Complete: YES — Job # : 25-1040-SIG — Test # : 1
Preliminary: — Page 1 of 1

Client Name : Signalife
EUT Name :
EUT Model # : Fidelity 100
EUT ANTENNA Part # :
EUT Serial # :
EUT Config. : Transmit
FCC Part 15.249
Specification : FCC Part 15.209 (a) limit 50 mV/m@ 3m Aveage = 94 dBuV/m

Rod. Ant. #:	NA	Temp. (deg. C) :	14	Date :	3/2/2006
Bicon Ant.#:	na	Humidity (%) :	64	Time :	
Log Ant.#:	na	EUT Voltage : 7.2 Vdc Freshed Charged Batt		Staff :	al
DRG Ant. #	529	EUT Frequency :		Photo ID:	
Dipole Ant.#:	NA	Phase:		Peak Res Bandwidth:	1 MHz
Cable#:	40ft	Location:	SOATS	Peak Video Bandwidth	1 MHz
Preamp#:	842	Distance:	3 m		
Spec An.#:	835	Duty Cycle Factor	-8.1		
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
2400.00	24.6	16.5	22.1	14.0	32.1	56.7	48.6	74.0	54.0	-17.3	-5.4	0.0	1.3	Pass	Bandedge
2402.00	43.1	35.0	36.8	28.7	32.1	75.2	67.1		94.0		-26.9	0.0	1.3	Pass	
4804.00					-5.4			74.0	54.0				1.0		nf
7206.00					3.3			74.0	54.0				1.0		nf
9608.00					9.5			74.0	54.0				1.0		nf
12010.00					16.2			74.0	54.0				1.0		nf
14412.00					21.8			74.0	54.0				1.0		nf
16814.00					22.4			74.0	54.0				1.0		nf
19216.00					40.9			74.0	54.0				1.0		nf
2441.00	41.5	33.4	37.2	29.1	32.1	73.6	65.5		94.0		-28.5	0.0	1.3	Pass	
4882.00					-5.4			74.0	54.0				1.0		nf
7323.00					3.3			74.0	54.0				1.0		nf
9764.00					9.5			74.0	54.0				1.0		nf
12205.00					16.2			74.0	54.0				1.0		nf
14646.00					21.2			74.0	54.0				1.0		nf
17087.00					29.9			74.0	54.0				1.0		nf
19528.00					40.9			74.0	54.0				1.0		nf
21969.00					40.9			74.0	54.0				1.0		nf
24410.00					40.9			74.0	54.0				1.0		nf
2483.50	24.7	16.6	23.7	15.6	32.1	56.8	48.7	74.0	54.0	-17.2	-5.3	0.0	1.3	Pass	Bandedge
2480.00	40.8	32.7	35.9	27.8	32.1	72.9	64.8		94.0		-29.2	0.0	1.3	Pass	
4960.00					-5.4			74.0	54.0				1.0		nf
7440.00					3.3			74.0	54.0				1.0		nf
9920.00					9.5			74.0	54.0				1.0		nf
12400.00					16.2			74.0	54.0				1.0		nf
14880.00					21.2			74.0	54.0				1.0		nf
17360.00					29.9			74.0	54.0				1.0		nf
19840.00					40.9			74.0	54.0				1.0		nf
22320.00					40.9			74.0	54.0				1.0		nf
24800.00					40.9			74.0	54.0				1.0		nf

CFR 47 Part 15c §15.249 Test Results

1. Testing was completed to the 10th harmonic, i.e. 1000 MHz to 25 GHz. No harmonics were noted other than those in the spreadsheet above
2. All measurements were made with a peak detector at 1MHz RBW and VBW. Average was calculated by adding the duty cycle correction factor.
3. The EUT was tested with the antenna in three orthogonal orientations and the worst-case emissions are presented above. The battery was freshly charged before test.
4. The bandedge measurement was performed as follows. Peak emissions was measured at bandedge. Average was calculated by adding the duty cycle correction factor.

Sec. 15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following: 2400-2483.5 MHz: 50mV/m

(b) … Not applicable. EUT not in band 24.05-24.25 GHz

(c) Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Sec. 15.209, whichever is the lesser attenuation.

(e) As shown in Sec. 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits

Duty Cycle Factor

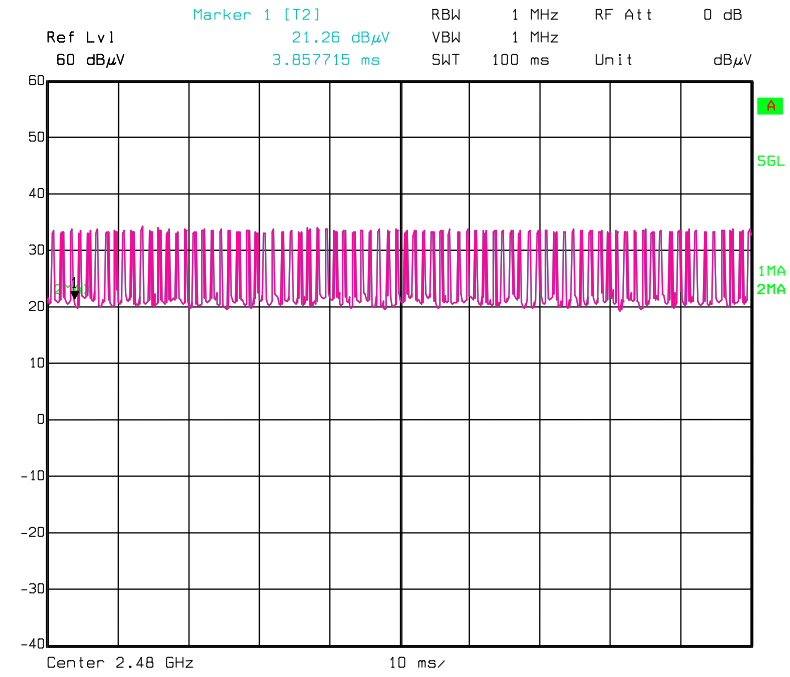
Duty Cycle Factor = 20 x log (duty cycle)

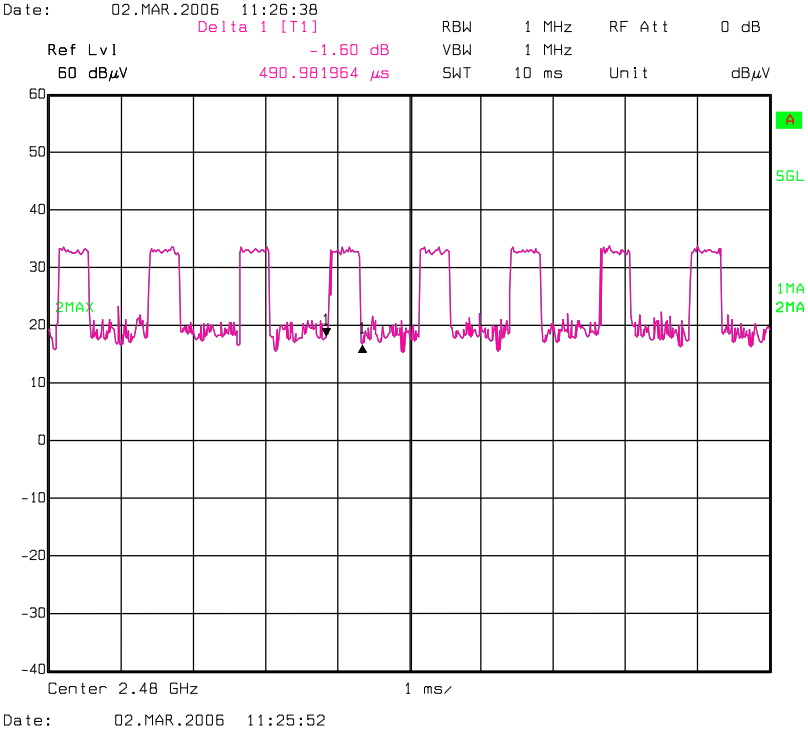
80 emissions x 0.00049 s = 39.2 ms

Duty cycle = 39.2 ms / 100 ms = .392

Duty Cycle Factor = 20 x log (.392) = -8.1 dB

Count 80





Upper Bandedge

EUT complies.

Peak from Plot below = 24.6 dBuV/m

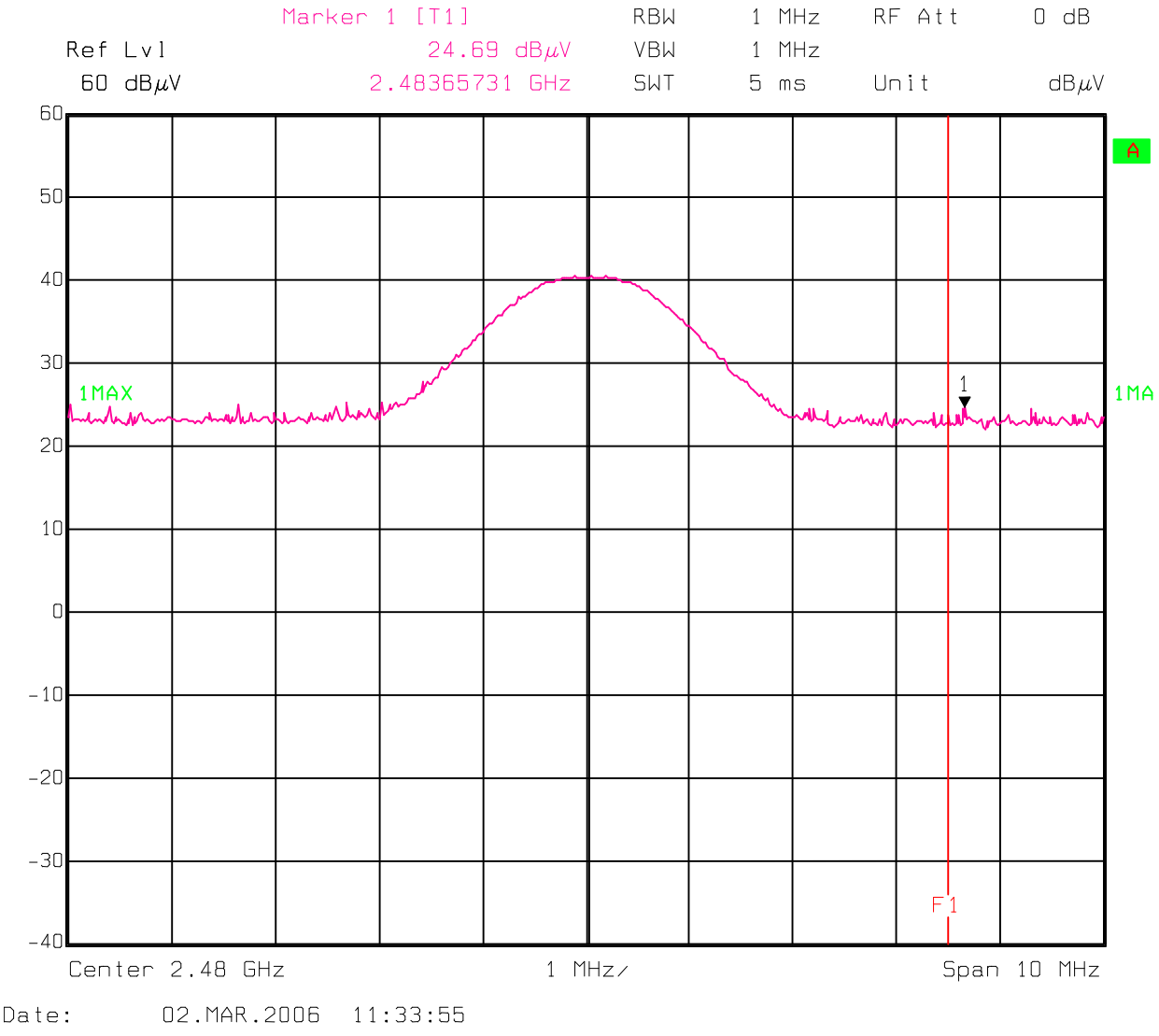
Limit = 74 dBuV/m

Level = 24.7 + 32.1 = 56.8 dBuV/m EUT Complies.

Average = Peak + Duty Cycle Factor

Limit = 54 dBuV/m

Level = 24.7 + 32.1 – 8.1= 48.7 dBuV/m EUT Complies.



Lower Bandedge

EUT complies.

Peak from Plot below = 24.6 dBuV/m

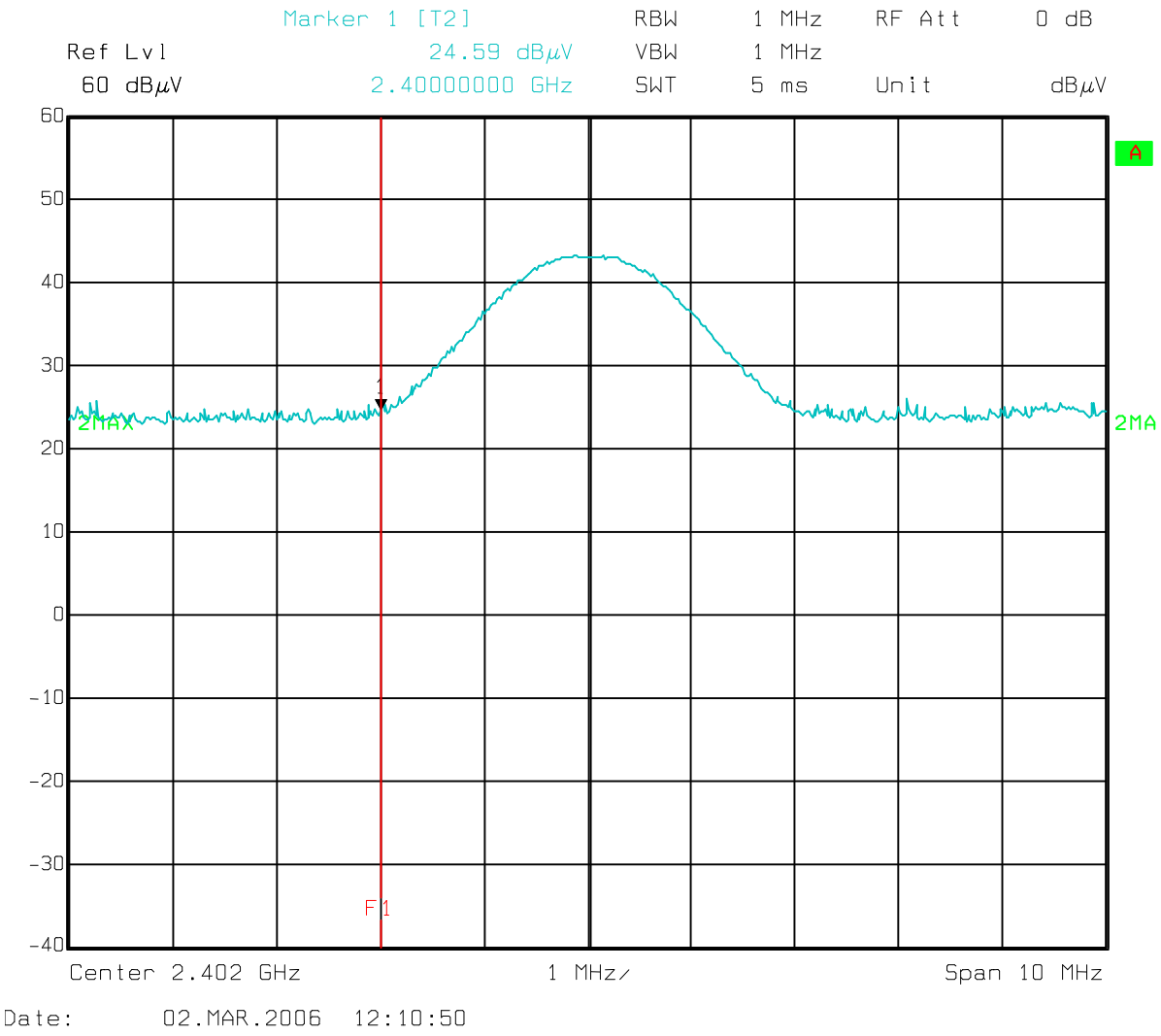
Limit = 74 dBuV/m

Level = 24.6 + 32.1 = 56.8 dBuV/m EUT Complies.

Average = Peak + Duty Cycle Factor

Limit = 54 dBuV/m

Level = 24.6 + 32.1 – 8.1 = 48.6 dBuV/m EUT Complies.



15.109 Unintentional Emissions due to the Battery Charger

Radiated Emissions Data

Complete x — Job # : 25-1040-SIG — Test # : 1
Preliminary — Page 1 of 1

Client Name : Signalife
EUT Name :
EUT Model # : Fidelity 100
EUT Part # :
EUT Serial # :
EUT Config. :

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

Rod. Ant. #:	NA	Temp. (deg. C) :	16	Date :	3/2/2006
Bicon Ant.#:	128	Humidity (%) :	77	Time :	
Log Ant.#:	110	EUT Voltage :	120Vac	Staff :	al
DRG Ant. #	NA	EUT Frequency :	60Hz	Photo ID:	
Dipole Ant.#:	NA	Phase:	1	Peak Bandwidth:	100 kHz
Cable#:	soats2	Location:	SOATS	Video Bandwidth	100 kHz
Preamp#:	901	Distance:	3m		
Spec An.#:	674				
QP #:	533				
PreSelect#:	NA				

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
32.9	v	0	35.6	13	1.1	31.8	17.9	40.0	-22.1	Pass	Ant 1 m Rotation 10 deg
35.4	v	0	37.2	11.7	1.1	31.8	18.2	40.0	-21.8	Pass	Ant 1 m Rotation 10 deg
39.4	v	0	49.2	11.7	1.1	31.9	30.1	40.0	-9.9	Pass	Ant 1 m Rotation 10 deg
135	v	0	38.0	11.5	1.8	31.9	19.4	43.5	-24.1	Pass	Ant 1 m Rotation 10 deg
150	v	0	40.3	12.5	1.8	32.0	22.7	43.5	-20.9	Pass	Ant 1 m Rotation 10 deg
185.4	v	0	37.9	15.4	1.8	32.0	23.2	43.5	-20.4	Pass	Ant 1 m Rotation 10 deg

Radiated Emissions Test Equipment

Asset Number	Description	Model Number	Serial Number	Last Cal	Cal Due
110	Antenna, LPA, Electrometrics	LPA-25	1217	11/29/05	11/29/06
529	Antenna, DRWG, EMCO	3115	2505	4/13/05	4/13/06
128	Antenna, Bicon, EMCO	3104	2882	10/6/05	10/6/06
533	Quasi-Peak Adapter, HP	85650A	2043A00211	4/12/05	4/12/06
674	Spectrum Analyzer, HP	8568B	2007A00910	10/12/05	10/12/06
675	Spectrum Analyzer Display, HP	85662A	2005A01282	10/12/05	10/12/06
835	Spectrum Analyzer, Rhode & Schwarz	RHDFSEK	829058/005	1/18/06	1/18/07
902	pre amp, Sonoma Instrument 310	310 N	185803	12/19/05	12/19/06
842	Preamp	Nemko	na	5/19/05	5/19/06

APPENDIX A
A. Conducted & Radiated Emissions Measurement Uncertainties

1. Introduction

ISO Standard 17025 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

Conducted Emissions Measurement Detection Systems	Applicable Frequency Range	"U" for a k=2 Coverage Factor
HP8568B Spectrum Analyzer with QPA and HP8447F Preamplifier	150 kHz - 30 MHz	+/- 3.0 dB
HP8566B Spectrum Analyzer with QPA and Preselector	9 kHz - 30 MHz	+/- 2.9 dB
Radiated Emissions Measurement Detection Systems	**Applicable Frequency Range**	**"U" for a k=2 Coverage Factor**
HP8568B Spectrum Analyzer with QPA & HP8447F Preamplifier	30 MHz - 200 MHz	+4.0 dB, -4.1 dB
HP8568B Spectrum Analyzer with QPA & HP8447F Preamplifier	200 MHz-1000 MHz	+/- 3.5 dB
HP8566B Spectrum Analyzer with QPA & Preselector	30 MHz - 200 MHz	+3.9 dB, -4.0 dB
HP8566B Spectrum Analyzer with QPA & Preselector	200 MHz-1000 MHz	+/- 3.4 dB
HP8566B Spectrum Analyzer with QPA & HP 8449A Preamplifier	1 GHz - 18 GHz	+2.5 dB, -2.6 dB
HP8566B Spectrum Analyzer with QPA & HP8449A 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 the Conducted and 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:

- *ISO Guide to the Expression of Uncertainty in Measurement* (ISO, 1993)
- 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.'s 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 10012-1 (1993-05-01), ISO Standard 17025, ISO-9000 and EN 45001. Nemko USA, Inc.'s calibrations program therefore meets or exceed 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(1993) or ANSI C63.5-1991, 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 Subclause 16.6 and Annex G.2 of CISPR 16-1 (1993), and, ANSI C63.4-2003 when performing the normalized site attenuation measurements.