Nemko USA, Inc.
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CERTIFICATION TEST REPORT

PART 15.247, SUBPART C

RSS-210 - LOW POWER LICENSE EXEMPT RADIO-COMMUNICATION DEVICES (ALL FREQUENCY BANDS)

DECLARATION OF CONFORMANCE PROCEDURES
TEST REPORT

For The **Transceiver**

Model: XCVR2G4

FCC ID#: BYMXCVR2G4

PREPARED FOR:

HME
14110 Stowe Drive
Poway, CA 92064

PREPARED ON 9-12-05

REPORT NUMBER: **2005 080640-FCC**

PROJECT NUMBER: **25-640-HME**

Total Pages: 1

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DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	9-12-05	Prepared By: A. LAUDANI
-	9-12-05	Initial Release: F. Fleury
	10-28-05	Revised By: A. LAUDANI

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 March 11, 2004. Testing was performed on the unit described in this report on March 11, 2004 to March 16, 2004.
- 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 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.

Test Supervisor: *Chip Fleury*

Chip Fleury, Frontline Manager Nemko USA, Inc.

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ADMINISTRATIVE DATA AND TEST SUMMARY

1.1. Administrative Data

CLIENT:	**HME** **14110 Stowe Drive** **Poway, CA 92064**
CONTACT:	Nirosh Wijayaratne
DATE (S) OF TEST:	August 5, 2005 to August 5, 2005
EQUIPMENT UNDER TEST (EUT):	Transceiver, 2.4 GHz Spread Sprectrum
FCC ID#	BYMXCVR2G4
Model	XCVR2G4
Condition Upon Receipt	Suitable for Test
TEST SPECIFICATION:	FCC, Part 15.247, Subpart C,

1.2. Test Summary

Specification	***Frequency Range***	***Compliance Status***
FCC CFR 47, §15.247 Plus Bandedge	2401.9---2481.3 MHz	PASS
RSS-210 - Low Power License Exempt Radio-communication Devices (All Frequency Bands)	2401.9---2481.3 MHz	PASS

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2. SYSTEM CONFIGURATION

The BS100/2.4 GHz is a Transceiver. Its function is to allow users with the HME Belt Pack radio to communicate by relaying transmissions. The EUT was exercised by two Belt Pack radios. It fails by not relaying transmissions.

2.1. System Components and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - Transceiver	HME BS100/2.4 GHz XCVR2G4 Serial #:	N/A
EUT Power Supply	OEM Model # SYS1097-4812 Serial # 0311007508	Three Prong power cord 100--240 Vac 50/60 Hz

2.2. Device Interconnection and I/O Cables

CONNECTION	I/O CABLE
No connections	

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

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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 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.

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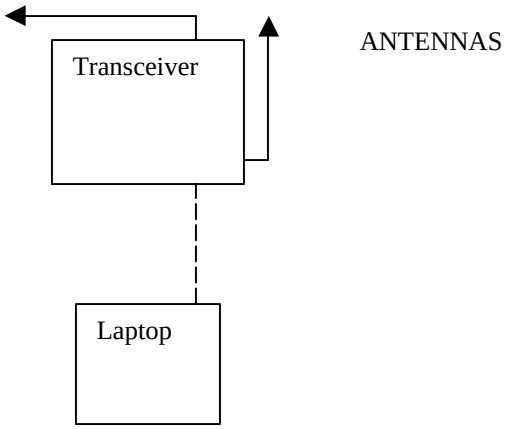
Figure 1. General EUT Test Setup Diagram



NOT TO SCALE

Laptop used to set individual channels and modes for testing, and then removed from test setup.

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4.2. 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 dBm-1

Example Frequency = 110MHz
18.5 dBuV (spectrum analyzer reading)
+3.0 dB (cable loss @ frequency)
21.5 dBuV
+15.4 dBm-1 (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.

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5. CFR 47 Part 15c §15.247

15.247

Testing for this device is based on the same circuitry used by FCC ID: BYMBS200 and BYMBASE6000 as provided by Test Report Number G0M20306-7970-P-15 included in this submittal.

15.247 Testing was initiated by the ELECTRONIC TECHNOLOGY SYSTEMS test report G0M20306-7970-P-15 published in three parts for the BYMBASE6000 for use with the antennas, Model 181. Nemko Tests show the radiated spurious restricted bands and the band edge emissions still comply using the 2dBi gain antennas. The difference between the BS100 and the BYMBASE6000 and BYMBS200 were in regard to the analog audio circuit boards, with no changes to the RF boards. This summary lists the test results done by ELECTRONIC TECHNOLOGY SYSTEMS. The Nemko test report 2005030172-FCC shows the result of the RF circuitry complying with the needs of 15.207 and 15.209.

Antenna 1: 2 dBi gain -- Nearson Model 181

Base6000Testrpt1.pdf

Page 6 Use of an unique antenna connector
Page 7 Test Environment
Pages 8-14 Test Equipment
Page 17 Conductive and Radiated ERP/Peak Output Power
Pages 19--22 Out of Band Spurious Radiated Emissions, Radiated Emissions in Restricted bands
Page 23 Carrier Frequency Separation
Page 24 Number of Hopping Frequencies
Page 25 Time of Occupancy
Page 26 20 dB Bandwidth
Page 27 Band-edge Compliance

Base6000Testrpt2-1.pdf

Plots for Peak Output Power and Carrier Power for Antennas 1 & 2

Base6000Testrpt2-2.pdf

Setup photos

Base6000Testrpt2-3.pdf

Plots for field strength of spurious emissions
Plots for Carrier frequency separation
Plots for Number of hopping frequencies
Plots for Time of Occupancy
Plots for 20 dB Bandwidth

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CFR 47 Part 15c §15.247 Test Results

5.1. Conducted RF power

SA # 835, RBW 10 MHz

Frequency	Conducted Power Level	ANT. GAIN	ERP	ERP
GHz	**dBm**	**DBi**	**dBm**	**W**
2.4018	18.8	2	20.2	0.1105
2.4415	17.1	2	19.1	0.0813
2.4813	16.9	2	18.9	0.0776

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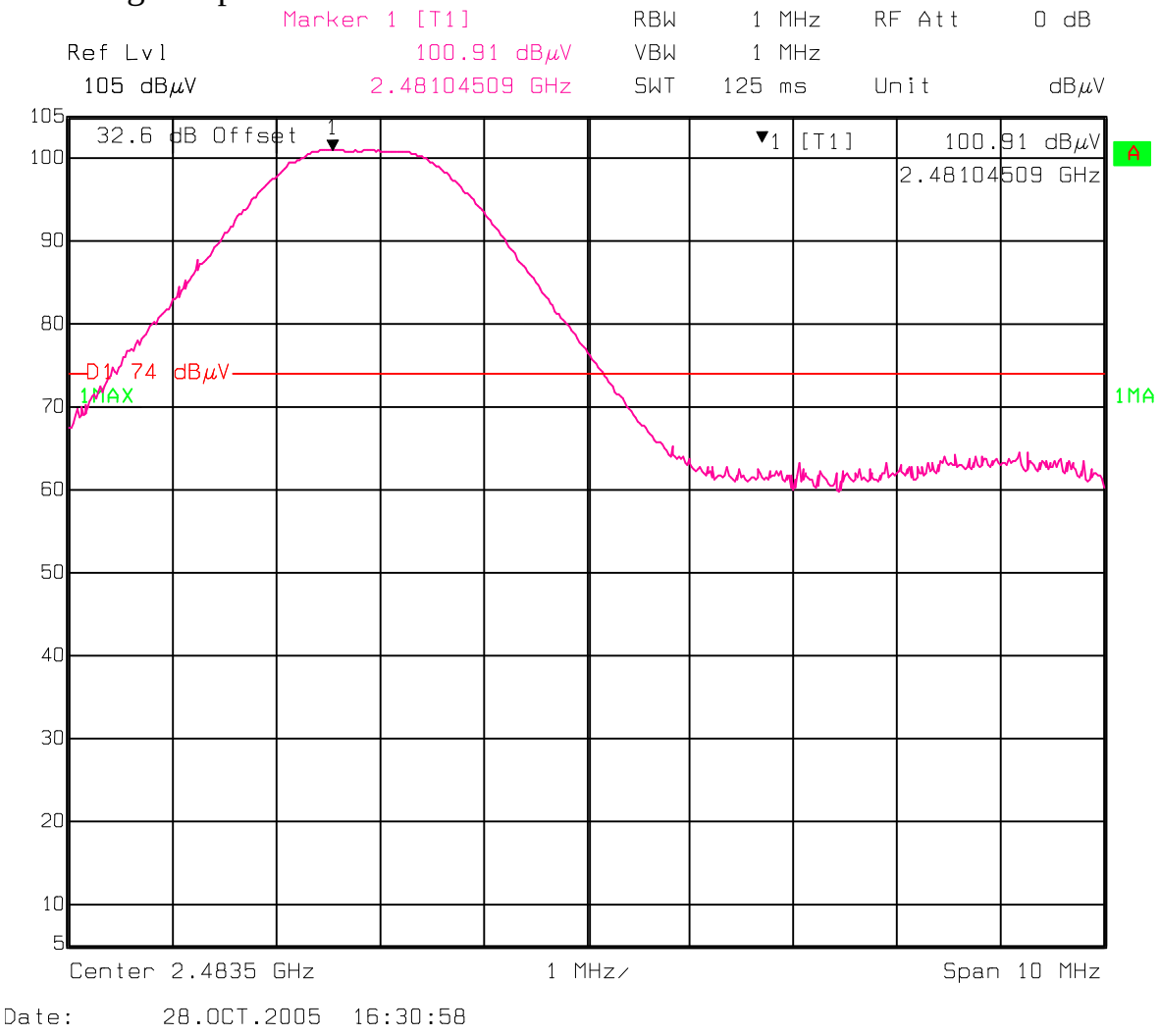
5.2. Plots for Band-edge Compliance

Due to energy of channel close to band edge, two step Band edge measurement applies.
Bandedge: High Channel Peak
100.91 –27.66 = 73.25, which is less than 74, therefore complies

Bandedge: High Channel Average
Using a duty cycle factor of –20
100.91-20 –27.66 = 53.25, which is less than 54, therefore complies

Band edge Step 1



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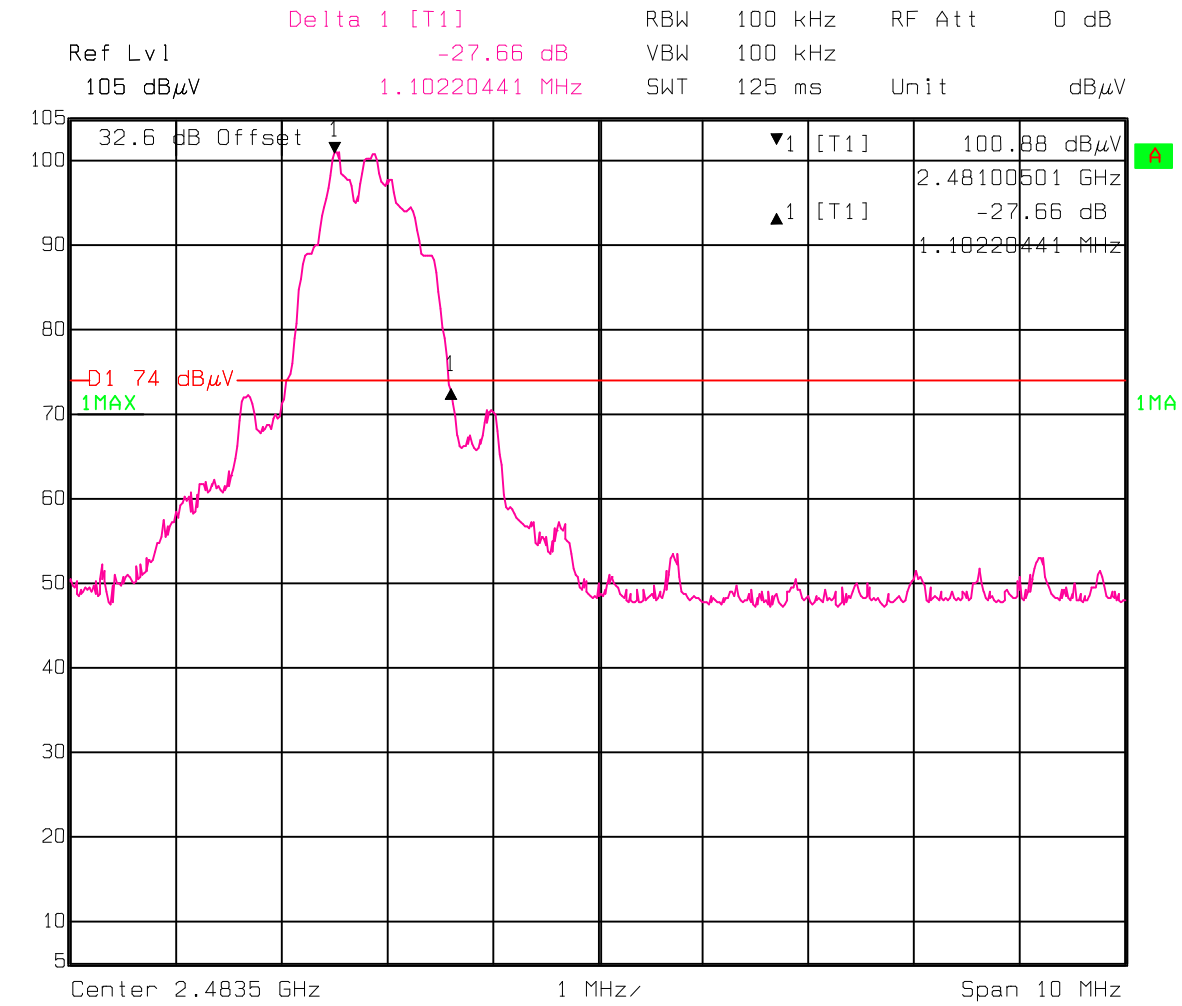
Band edge Step 2



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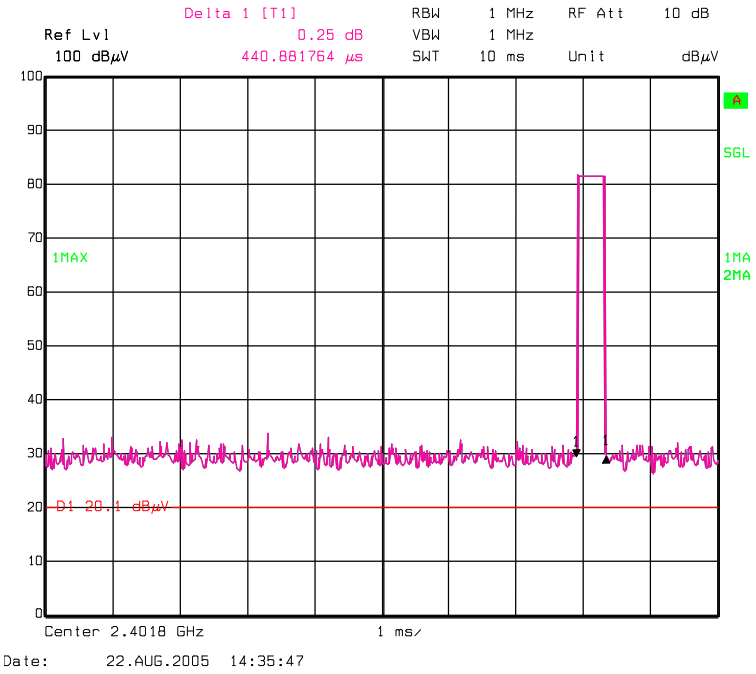
5.3. Radiated Emissions

Frequency range searched: 30 MHz to 24850 MHz.

Restricted band 2310—2390 MHz was also noted as having no emissions to be measured.

5.4. Duty Cycle

Duty cycle; x = 440 us on in 10 ms = 0.044
Duty cycle factor = 20 log (0.044) = -27.1, or -20



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Frequency range searched: 30 MHz to 24850 MHz.

Radiated Emissions Data

Complete: YES Job # : 25-640-HME Test # : 1
Preliminary: Page 1 of 1

Client Name : HM Electronics
EUT Name : Base Station Module
EUT Model # : BS100_XCVR2G4
EUT ANTENNA Part # : S181TC-2450R
EUT Serial # :
EUT Config. : Continuous Transmit
Transmit spurious within the Restricted Bands of 15.205, emissions investigated from 1000 MHz to 24,835 MHz.
Pulse Modulation
Specification : FCC Part 15.247C, 15.209, 15.205(a) Reference :

Rod. Ant. #:	NA	Temp. (deg. C) :	22	Date :	8/4/2005
Bicon Ant.#:	NA	Humidity (%) :	69	Time :	
Log Ant.#:	NA	EUT Voltage :	120 Vac	Staff :	A. Laudani
DRG Ant. #	752	EUT Frequency :	60 Hz	Photo ID:	
Dipole Ant.#:	NA	Phase:	1	Peak Res Bandwidth:	1 MHx
Cable#:	40ft	Location:	SOATS	Peak Video Bandwidth	1 MHx
Preamp#:	842	Distance:	3M		
Spec An.#:	835	Duty Cycle Factor	-20		
QP #:	NA				
PreSelect#:	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
			Continuous Burst Modulation mode with duty factor												
2401.9	73.6		80.4		32.6	113.0		116.2		-3.2		120.0	1.1	Pass	O.P limit 125 mW
4803.9	61.4	41.4	41.2	21.2	-5.4	56.0	36.0	74.0	54.0	-18.0	-18.0	120	1.0	Pass	restricted band
7205.9	62.0	42.0	49.1	29.1	3.7	65.7	45.7	93.0	73.0	-27.3	-27.3	120	1.0	Pass	
2441.9	76.5		80.4		32.6	113.0		116.2		-3.2			1.1	Pass	O.P limit 125 mW
4883.8	61.3	41.3	41.2	21.2	-5.4	55.9	35.9	74.0	54.0	-18.1	-18.1	120	1.0	Pass	restricted band
7325.7	57.8	37.8	49.1	29.1	3.7	61.5	41.5	74.0	54.0	-12.5	-12.5	120	1.0	Pass	restricted band
2481.3	68.7		77.2		32.6	109.8		116.2		-6.4		120.0	1.1	Pass	O.P limit 125 mW
4962.6	57.3	37.3	55.8	35.8	-5.4	51.9	31.9	74.0	54.0	-22.1	-22.1	120	1.0	Pass	restricted band
7443.9	51.4	31.4	44.1	24.1	3.7	55.11	35.1	74.0	54.0	-18.9	-18.9	120	1.0	Pass	restricted band

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Emissions Test Equipment

Client	**HME**	EUT Name	**Transceiver**
PAN #	25-640-HME	EUT Model	**BS100/2.4 GHz**

Asset Number	Description	Model Number	Serial Number	Last Cal	Cal Due
835	Spectrum Analyzer, Rhode & Schwartz	RHDFSEK	829058/005	12/30/04	12/30/05
752	Antenna, DRWG, EMCO	3115	4943	12/29/04	12/29/05
842	Preamp	Nemko	na	5/19/05	verified
111	Antenna, LPA, EMCO	3146	1382	2/3/05	2/3/06
116	Antenna, Bicon, EMCO	3110	1267	8/30/04	8/30/05

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TEST SETUP PHOTO

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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

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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.*

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APPENDIX 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).

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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.