



**Nemko USA, Inc**  
11696 Sorrento Valley Rd., Suite F  
San Diego, CA 92121-1024

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**EMC TEST REPORT**  
**Kyocera Wireless Corp.**  
**Tri-Mode Cellular Phone with Bluetooth**

Model: **KX5-5X0**

**RADIATED AND CONDUCTED EMISSIONS**

**FCC, PART 15.247**

**RSS 210**

**FCC ID: OVFKWC-KX5-5X0**

**TEST REPORT # 2005 080713 KX5-5X0 EMC**

**25-713-KYO**

**NEMKO USA, INC.**  
**11696 SORRENTO VALLEY ROAD SUITE F**  
**SAN DIEGO, CA 92121**  
**PHONE: 858-755-5525**

<b>Nemko USA, Inc.</b>		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
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EMC Test Report  
For  
**Kyocera Wireless Corp.**

Test Number : 25-713-KYO

Product Name : **Tri-Mode Cellular Phone with Bluetooth**

Regulation : FCC, Part 15.247

: RSS 210

:

Date : August 24, 2005

Report Reviewed

Accepted by: \_\_\_\_\_

**Kyocera Wireless Corp.**  
**10300 Campus Point Drive**  
**San Diego, CA 92121**  
Phone: **858 882-2879**  
Fax: **858 882-2010**

Report Issued By: \_\_\_\_\_

  
Ricky Hill, Senior EMC Engineer

Tested By: \_\_\_\_\_

  
Mike Krumweide EMC Test Engineer

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## Administrative Data

Regulation : FCC, Part 15B  
: Canada, ICES-003  
:

Level : Class B

Test Method : ANSI C63.4 – 2003  
: CSA C108. - M1983  
:

Test Type : Qualification

Manufacturer : **Kyocera Wireless Corp.**

EUT /:Model # : **Tri-Mode Cellular Phone with Bluetooth / KX5-5X0**

Date(s) of Test : August 18, 2005

Customer Personnel : John Turner, Engineer

Nemko Personnel : R. Hill, Senior EMC Engineer  
: Mike Krumweide, EMC Test Engineer

Test Location : OPEN Area Test Site  
Nemko USA, Inc.  
11696 Sorrento Valley Road, Suite F  
San Diego, CA 92121

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## EUT Description

The **KX5-5X0** is a **Tri-Mode Cellular Phone with Bluetooth with Bluetooth capabilities**. Its function is to provide communication for mobile phone users. The EUT was exercised in Bluetooth Transmit mode for Conducted Emissions and Bluetooth Receive mode for Radiated Emissions.

<b>DEVICE</b>	<b>MANUFACTURER</b>		<b>POWER CABLE</b>
	<b>MODEL #</b>	<b>SERIAL #</b>	
EUT - <b>Tri-Mode Cellular Phone with Bluetooth</b>	<b>Kyocera Wireless Corp.</b> Model: <b>KX5-5X0</b> SN: A9DX----1CTZ08		N/A
EUT – Battery Charger	Travel Charger TXTVL10071 N/A		N/A

<b>CONNECTION</b>	<b>I/O CABLE</b>
Battery Charger to Cell Phone	2m, unshielded, 22AWG, 2wire, DC jack – Wall mount.

### REASON FOR TEST:

The EUT was tested to establish compliance.

### CHANGES MADE DURING TEST

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

No design modifications were made to the EUT during testing.

### DEVIATIONS FROM STANDARD TEST METHOD

None

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CERTIFICATION AND TEST SUMMARY

<i>Test Type</i>	<i>In Accordance with Document</i>	<i>Frequency Range Investigated</i>	<i>EUT Complies</i>
Conducted Emissions	FCC 15 B Sec.207 Class "B"	150 kHz to 30 MHz	Pass
Radiated Emissions	FCC 15 B Sec.209 Class "B"	30 MHz to 1000 MHz	Pass
Radiated Emissions	FCC 15 C Sec. 247	2.4GHz to 24.0 GHz	Pass

The **Tri-Mode Cellular Phone with Bluetooth** complied with FCC, PART 15B and CANADA, ICES-003, when tested in the system configuration defined herein.

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## **1. DESCRIPTION OF TEST SITE AND EQUIPMENT**

### **1.1. 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), CISPR 16 (2000) and 22 (1997) and ANSI C63.4-2003 documents. The OATS normalized site attenuation characteristics are verified for compliance every.

## **2. DESCRIPTION OF TESTING METHODS**

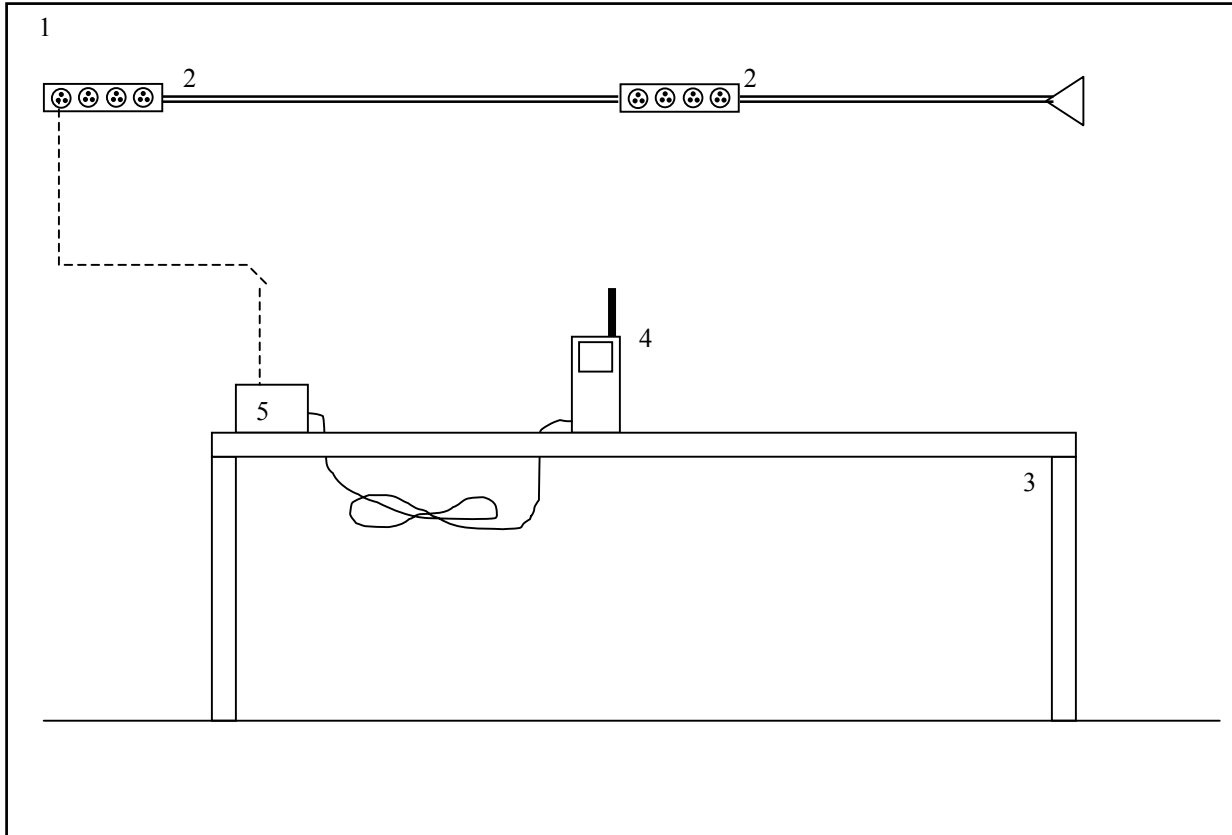
### **2.1. Introduction**

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. In addition, TIA/EIA 603, "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards," provides the method employed to check the radiated measurements known as Signal Substitution.

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

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**Figure 1. General EUT Test Setup Diagram**



*NOT TO SCALE*

**CONFIGURATION LEGEND**

1. Test Laboratory
2. AC Power for Peripheral Devices (120V, 60 cycles, single phase)
3. Non-Conducting tables 80 cm above ground plane
4. EUT: **Tri-Mode Cellular Phone with Bluetooth**
5. 120VAC Domestic Charger.



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**Photograph 1. Front View of EUT**



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**Photograph 2. EUT Charger**



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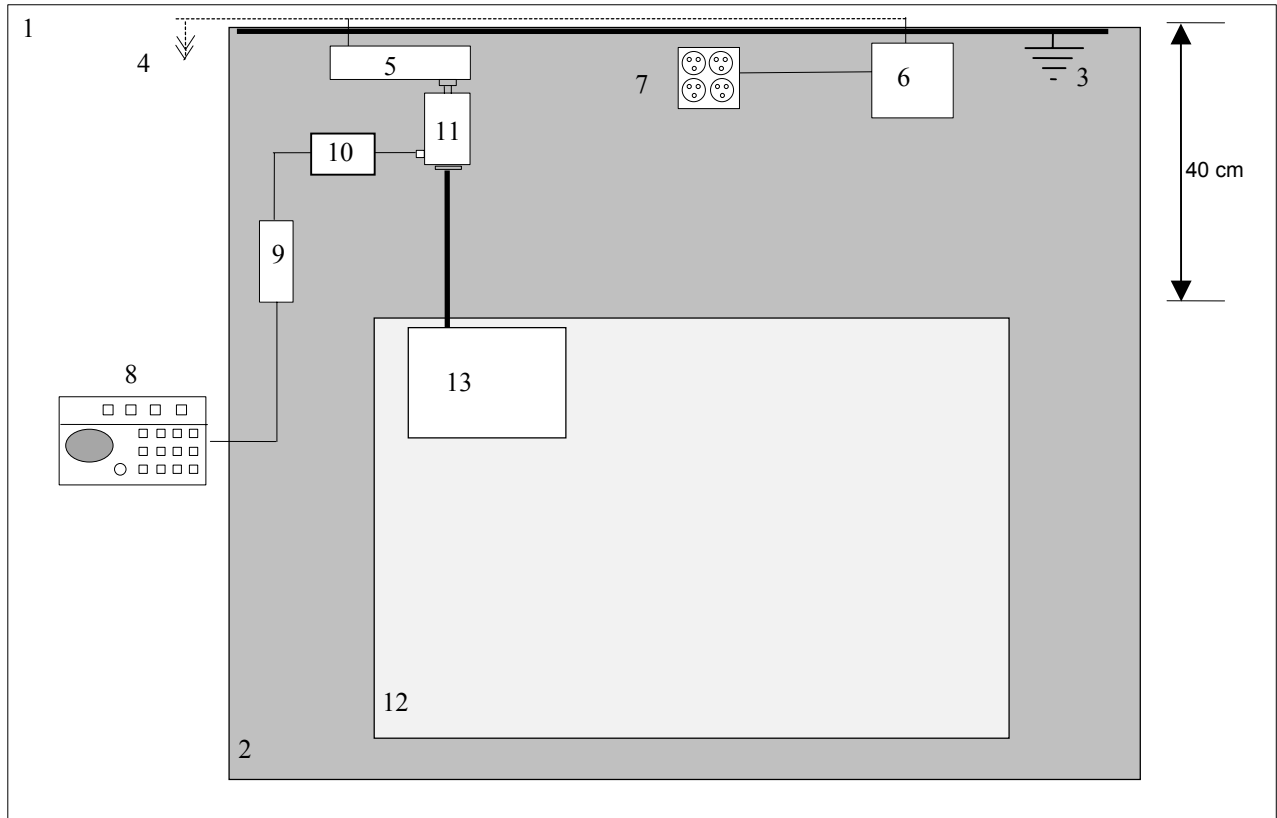
## **2.2. Configuration and Methods of Measurements for Conducted Emissions**

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.

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**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
13. EUT: **Tri-Mode Cellular Phone with Bluetooth** and Associated System

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### 2.3. 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-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)

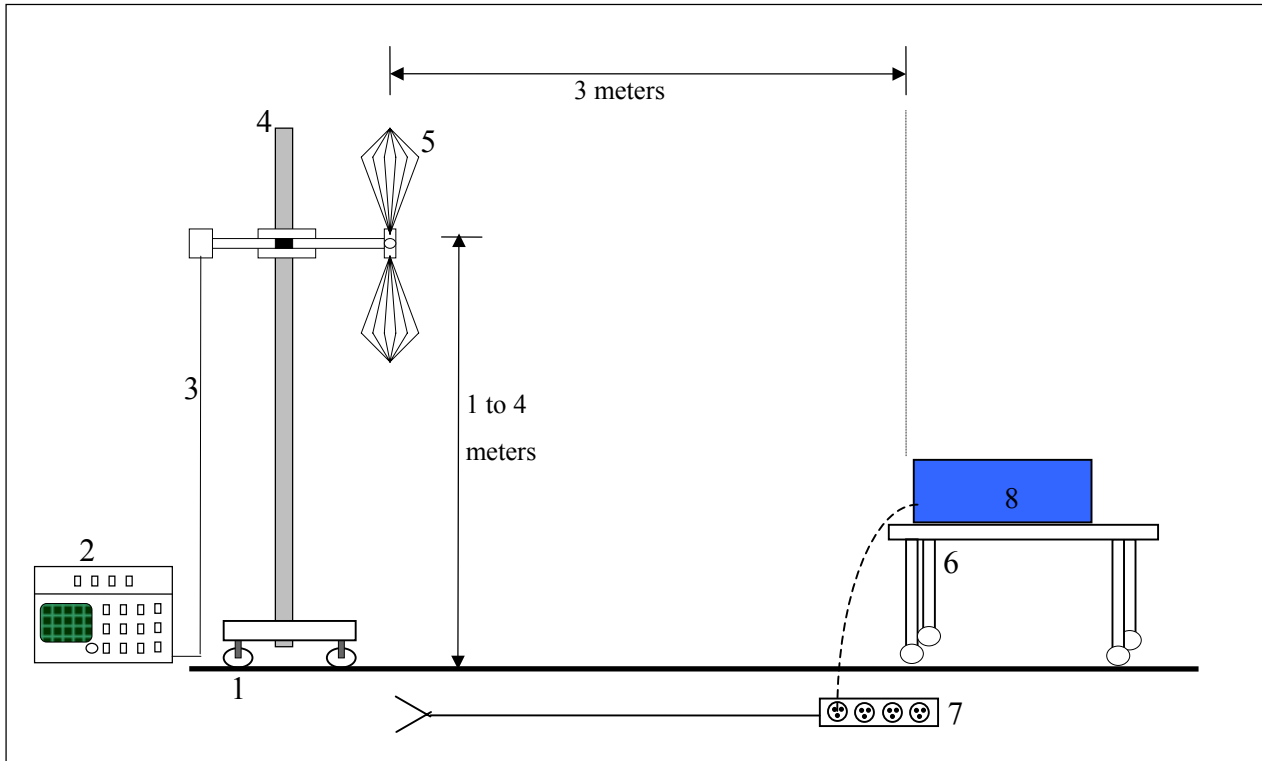
36.9 dBuV/M Final adjusted value

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

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

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**Figure 3. 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: **Tri-Mode Cellular Phone with Bluetooth** and Associated System

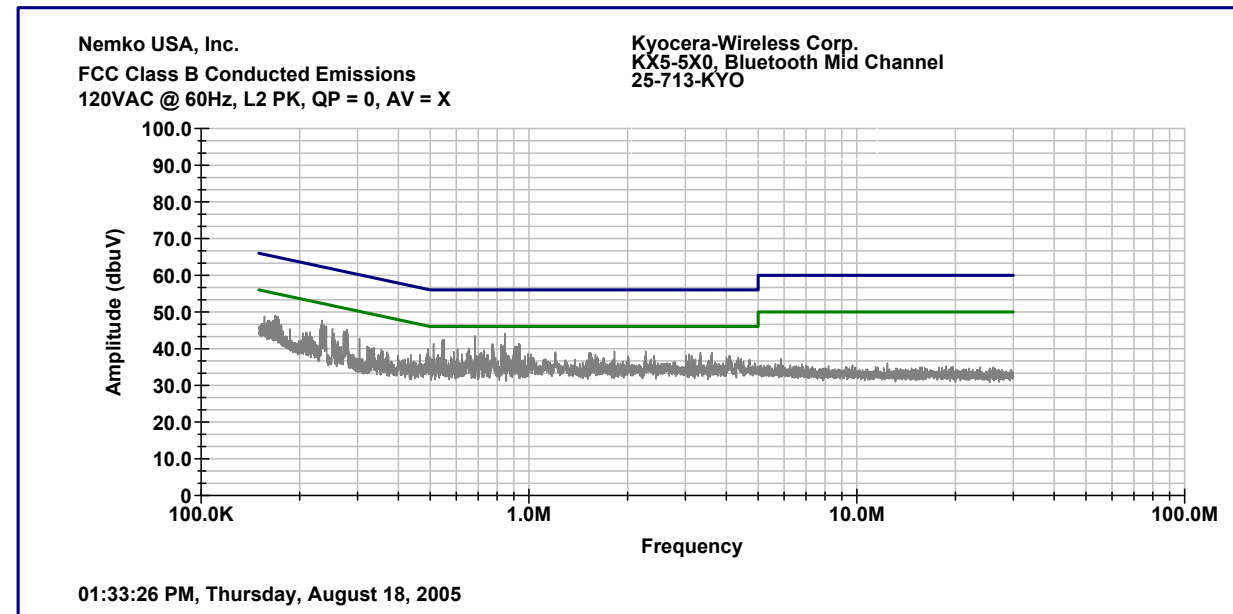
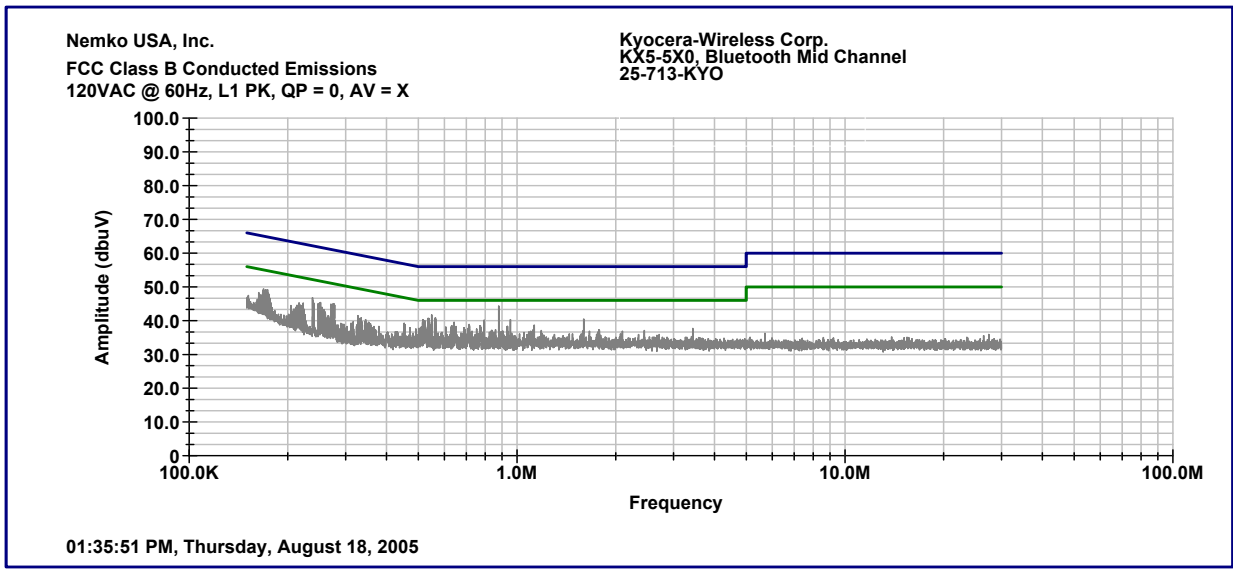
Bluetooth fundamental frequencies and radiated emissions were tested on 3 orthogonal axes. The maximum emissions were measured and recorded. Test setup pictures of these axes are found further in this report.

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Test Results

**2.4. Conducted Emissions Test Data**

Client	<b>Kyocera Wireless Corp.</b>	Temperature	76	deg F
PAN #	25-713-KYO	Relative Humidity	56	%
EUT Name	<b>Tri-Mode Cellular Phone with Bluetooth</b>	Barometric Pressure	30.2	Hg
EUT Model	<b>KX5-5X0</b>	Test Location	Enclosure 1	
Governing Doc	CFR 47 Part 15C	Test Engineer	Mike Krumweide	
Basic Standard	Sec. 15.207	Date	8/18/05	







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## 2.5. Radiated Emissions Test Data

Radiated Emissions Data											
Complete	<u>  X  </u>		Job # :	<u>  25-713-KYO  </u>		Test # :	<u>  1  </u>				
Preliminary	<u>          </u>			Page <u>  1  </u>		of	<u>  1  </u>				
Client Name :	<u>  Kyocera-Wireless  </u>										
EUT Name :	<u>  Cellular Phone  </u>										
EUT Model # :	<u>  KX5-5X0  </u>										
EUT Part # :	<u>                  </u>										
EUT Serial # :	<u>  A9DX----1CTZ08  </u>										
EUT Config. :	<u>  Bluetooth Mid Channel, X - Orientation (Up-right)  </u>										
Specification :	<u>  CFR47 Part 15, Subpart B, Class B  </u>					Reference :	<u>                  </u>				
Rod. Ant. #:	<u>  NA  </u>	Temp. (deg. C) :	<u>  25  </u>		Date :	<u>  8/18/2005  </u>					
Bicon Ant.#:	<u>  114  </u>	Humidity (%) :	<u>  57  </u>		Time :	<u>                  </u>					
Log Ant.#:	<u>  110  </u>	EUT Voltage :	<u>  120  </u>		Staff :	<u>  MK  </u>					
DRG Ant. #	<u>  NA  </u>	EUT Frequency :	<u>  60  </u>		Photo ID:	<u>                  </u>					
Dipole Ant.#:	<u>  NA  </u>	Phase:	<u>  1  </u>		Peak Bandwidth:	<u>  100 kHz  </u>					
Cable#:	<u>  NOATS  </u>	Location:	<u>  RN#: 329550-01  </u>		Video Bandwidth	<u>  100 kHz  </u>					
Preamp#:	<u>  827  </u>	Distance:	<u>  3m  </u>								
Spec An.#:	<u>  535  </u>	422									
QP #:	<u>  421  </u>										
PreSelect#:	<u>  NA  </u>										
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	v		45.8	12.9	0.9	32.4	27.2	40.0	-12.8	Pass	
36.6	v		54	11.6	0.9	32.6	33.9	40.0	-6.1	Pass	
45.1	v		47.3	11.3	1.0	32.6	27.0	40.0	-13.0	Pass	
65	v		49.3	9.7	1.3	32.4	27.9	40.0	-12.1	Pass	
118.4	v		36.7	15	1.7	32.6	20.8	43.5	-22.7	Pass	

Radiated prescans determined that the Open Phone condition has higher emissions.





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**Radiated Emissions Data**

Job # : 25-713-KYO      Test # : 1  
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Client Name : Kyocera Wireless Corp.  
EUT Name : Cellular Phone  
EUT Model # : KX5-5X0  
EUT Part # : \_\_\_\_\_  
EUT Serial # : A9DX----1CTZ08  
EUT Config. : Bluetooth X - Orientation (Vertical)  
Open  
Specification : FCC Part 15.247                      Reference : \_\_\_\_\_  
Rod. Ant. # : NA                      Temp. (°C) : 26                      Date : 08/18/05  
Bicon Ant.# : NA                      Humidity (%) : 53                      Time : \_\_\_\_\_  
Log Ant.# : 112                      EUT Voltage : NA                      Staff : M. Krumweide  
DRG Ant. # : 752                      EUT Frequency : NA                      \_\_\_\_\_  
Dipole Ant.# : NA                      Phase: NA                      Peak Bandwidth: 1 MHz /100 kHz  
Cable# : 40ft                      Location: RN # 329550-01                      Video Bandwidth 1 MHz  
Preamp# : 842                      Distance: 3m  
Spec An.# : 104                      ERP conversion factor 7  
QP # : NA  
PreSelect# : NA

Meas. Freq. (MHz)	Vertical (dBuV) pk	Horizontal (dBuV) pk	CF (db)	Max Level (dBm) pk	Spec. Limit (ERP) (dBm) pk	Margin dB pk	EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
2402.00	66.8	59.6	32.6	2.1	30.0	-27.9			Pass	Fundamental
2441.00	67.3	57.9	32.6	2.6	30.0	-27.4			Pass	Fundamental
2480.00	66.4	57.5	32.6	1.7	30.0	-28.3			Pass	Fundamental













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**Radiated Emissions Data**

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Client Name : Kyocera Wireless Corp.  
 EUT Name : Cellular Phone  
 EUT Model # : KX5-5X0  
 EUT Part # : \_\_\_\_\_  
 EUT Serial # : \_\_\_\_\_  
 EUT Config. : Bluetooth  
Open  
 Specification : FCC Part 15.247 (c), 15.209(a) Reference : \_\_\_\_\_  
 Rod. Ant. # : NA Temp. (°C) : 18 Date : 8/17/05  
 Bicon Ant.#: NA Humidity (%) : 83 Time : \_\_\_\_\_  
 Log Ant.#: 112 EUT Voltage : NA Staff : M. Krumweide  
 DRG Ant. # : 752 EUT Frequency : NA Photo ID: \_\_\_\_\_  
 Dipole Ant.#: NA Phase: NA Peak Measurement Bandwidth: 1 MHz/ 1 MHz  
 Cable#: 40ft Location: RN # 329550-01 Average Measurement Bandwidth: 1 MHz/ 10 Hz  
 Preamp#: 842 Distance: 3m  
 Spec An.#: 104  
 QP #: NA  
 PreSelect#: NA

Meas. Freq. (MHz)	Vertical (dBuV)		Horizontal (dBuV)		CF (db)	Max Level (dBuV/m)		Spec. Limit (dBuV/m)		Margin dB		EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
	pk	av	pk	av		pk	av	pk	av	pk	av				
2402.00	66.8	66.6	59.6	59.0	32.6	99.4	99.2	125.3	N/A	-25.9	N/A			Pass	Fundamental
4804.00					-5.4			74.0	54.0					Pass	noise floor *
7206.00					3.7			74.0	54.0					Pass	noise floor
9608.00					10.2			74.0	54.0						noise floor
12010.00					17.1			74.0	54.0						noise floor
14412.00					22.2			74.0	54.0						noise floor
16814.00					23.9			74.0	54.0						
19216.00					40.5			74.0	54.0						
21618.00					40.5			74.0	54.0						
24020.00					40.5			74.0	54.0						
2441.00	67.3	67.3	57.9	56.8	32.6	99.9	99.9	125.3	N/A	-25.4	N/A			Pass	Fundamental
4882.00					-5.4			74.0	54.0					Pass	noise floor *
7323.00					3.7			74.0	54.0						noise floor
9764.00					10.2			74.0	54.0						noise floor
12205.00					17.1			74.0	54.0						noise floor
14646.00					21.5			74.0	54.0						noise floor
17087.00					31.0			74.0	54.0						noise floor
19528.00					40.5			74.0	54.0						noise floor
21969.00					40.5			74.0	54.0						
24410.00					40.5			74.0	54.0						
2480.00	66.4	66.4	57.5	56.3	32.6	99.0	99.0	125.3	N/A	-26.3	N/A			Pass	Fundamental
4960.00					-5.4			74.0	54.0					Pass	noise floor *
7440.00					3.7			74.0	54.0					Pass	noise floor
9920.00					10.2			74.0	54.0						noise floor
12400.00					17.1			74.0	54.0						noise floor
14880.00					21.5			74.0	54.0						noise floor
17360.00					31.0			74.0	54.0						noise floor
19840.00					40.5			74.0	54.0						noise floor
22320.00					40.5			74.0	54.0						noise floor
24800.00					40.5			74.0	54.0						noise floor

\* The radiated emissions comply with -20dBc requirements of 15.247(c)  
 Frequencies which fall in the restricted bands of 15.205(a) comply with 15.209(a) limits.

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**Radiated Emissions Data**

Job # : 25-713-KYO Test # : 7  
Page 1 of 1

Client Name : Kyocera Wireless Corp.  
 EUT Name : Cellular Phone  
 EUT Model # : KX5-5X0  
 EUT Part # : \_\_\_\_\_  
 EUT Serial # : \_\_\_\_\_  
 EUT Config. : Bluetooth  
                   Closed  
 Specification : FCC Part 15.247 (c), 15.209(a) Reference : \_\_\_\_\_  
 Rod. Ant. # : NA Temp. (°C) : 18 Date : 8/17/05  
 Bicon Ant.# : NA Humidity (%) : 83 Time : \_\_\_\_\_  
 Log Ant.# : 112 EUT Voltage : NA Staff : M. Krumweide  
 DRG Ant. # : 752 EUT Frequency : NA Photo ID : \_\_\_\_\_  
 Dipole Ant.# : NA Phase : NA Peak Measurement Bandwidth: 1 MHz/ 1 MHz  
 Cable# : 40ft Location : RN # 329550-01 Average Measurement Bandwidth: 1 MHz/ 10 Hz  
 Preamp# : 842 Distance : 3m  
 Spec An.# : 104  
 QP # : NA  
 PreSelect# : NA

Meas. Freq. (MHz)	Vertical (dBuV)		Horizontal (dBuV)		CF (db)	Max Level (dBuV/m)		Spec. Limit (dBuV/m)		Margin dB		EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
	pk	av	pk	av		pk	av	pk	av	pk	av				
2402.00	67.8	66.4	57.0	55.7	32.6	100.4	99.0	125.3	N/A	-24.9	N/A			Pass	Fundamental
4804.00					-5.4			74.0	54.0						noise floor *
7206.00					3.7			74.0	54.0						noise floor
9608.00					10.2			74.0	54.0						noise floor
12010.00					17.1			74.0	54.0						noise floor
14412.00					22.2			74.0	54.0						noise floor
16814.00					23.9			74.0	54.0						noise floor
19216.00					40.5			74.0	54.0						noise floor
21618.00					40.5			74.0	54.0						
24020.00					40.5			74.0	54.0						
2441.00	65.9	65.7	60.0	59.2	32.6	98.5	98.3	125.3	N/A	-26.8	N/A			Pass	Fundamental
4882.00					-5.4			74.0	54.0						noise floor *
7323.00					3.7			74.0	54.0						noise floor
9764.00					10.2			74.0	54.0						noise floor
12205.00					17.1			74.0	54.0						noise floor
14646.00					21.5			74.0	54.0						noise floor
17087.00					31.0			74.0	54.0						noise floor
19528.00					40.5			74.0	54.0						noise floor
21969.00					40.5			74.0	54.0						
24410.00					40.5			74.0	54.0						
2480.00	65.2	64.9	59.4	58.3	32.6	97.8	97.5	125.3	N/A	-27.5	N/A			Pass	Fundamental
4960.00					-5.4			74.0	54.0						noise floor *
7440.00					3.7			74.0	54.0						noise floor
9920.00					10.2			74.0	54.0						noise floor
12400.00					17.1			74.0	54.0						noise floor
14880.00					21.5			74.0	54.0						noise floor
17360.00					31.0			74.0	54.0						noise floor
19840.00					40.5			74.0	54.0						noise floor
22320.00					40.5			74.0	54.0						noise floor
24800.00					40.5			74.0	54.0						noise floor

\* The radiated emissions comply with -20dBc requirements of 15.247(c)  
Frequencies which fall in the restricted bands of 15.205(a) comply with 15.209(a) limits.

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### Radiated Emissions Test Equipment

Client	<b>Kyocera Wireless Corp.</b>	EUT Name	<b>Tri-Mode Cellular Phone with Bluetooth</b>
PAN #	25-713-KYO	EUT Model	<b>KX5-5X0</b>

Asset Number	Description	Model Number	Serial Number	Last Cal	Cal Due
114	Antenna, Bicon, EMCO	3104	2997	9/30/04	9/30/05
110	Antenna, LPA, Electrometrics	LPA-25	1217	10/4/04	10/4/05
827	Preamplifier, Com-Power	PA-103	161032	10/22/04	10/22/05
421	Quasi-Peak Adapter, HP	85650A	3145A01672	8/9/05	2/9/06
422	Spectrum Analyzer Display, HP	85662A	2403A07080	8/9/05	2/9/06
535	Spectrum Analyzer, HP	85680A	2517A01757	8/9/05	2/9/06
842	Preamp	Nemko	na	5/19/05	verified
752	Antenna, DRWG, EMCO	3115	4943	12/29/04	12/29/05
104	Spectrum Analyzer, HP	8566B	2747A04729	6/24/05	12/24/05
404	Spectrum Analyzer Display, HP	85662A	2648A15448	6/24/05	12/24/05

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### Photograph 3. Conducted Emissions Test Configuration



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### Photograph 4. Radiated Emissions Test Configuration



X - Orientation

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Y - Orientation

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Z - Orientation



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**Photograph 5. Fundamental Radiated Emissions Test Configuration  
(Open)**



X - Orientation

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**Photograph 6. Fundamental Radiated Emissions Test Configuration  
(Closed)**



X - Orientation

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## 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**

<b>Radiated Emissions Measurement Detection Systems</b>	<b>Applicable Frequency Range</b>	<b>"U" for a k=2 Coverage Factor</b>
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 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.*



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## **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 10012:2003 , ISO/IEC 17025:1999, and ISO-9000:2000. 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 traceability 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(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 Subclause 16.6 and Annex G.2 of CISPR 16-1 (2003), and, ANSI C63.4-2003 when performing the normalized site attenuation measurements.

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**APPENDIX C**  
**C. FCC and NVLAP Accreditation**

United States Department of Commerce  
National Institute of Standards and Technology



**Certificate of Accreditation**

ISO/IEC 17025:1999  
ISO 9002:1994



**NEMKO USA, INC. - SAN DIEGO EMC DIVISION**  
SAN DIEGO, CA

*is recognized by the National Voluntary Laboratory Accreditation Program  
for satisfactory compliance with criteria set forth in NIST Handbook 150:2001,  
all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994.  
Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:*

**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

December 31, 2005

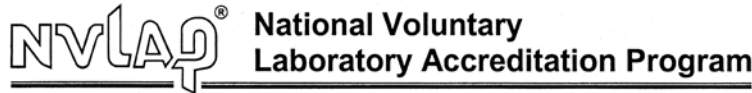
*For the National Institute of Standards and Technology  
NVLAP Lab Code: 200116-0*

Effective through

*W. P. Welch*

NVLAP-01C (06-01)

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**SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999**

**Nemko USA, Inc. - San Diego EMC Division**  
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Revised Scope 06/22/2005

**ELECTROMAGNETIC COMPATIBILITY  
 AND TELECOMMUNICATIONS**

**NVLAP LAB CODE 200116-0**

*NVLAP Code Designation / Description*

**Emissions Test Methods:**

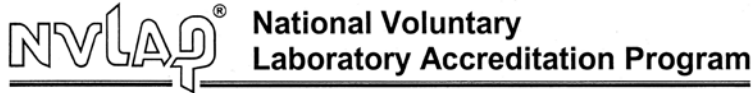
- 12/CIS14 CISPR 14-1 (March 30, 2000): Limits and Methods of Measurement of Radio interference Characteristics of Household Electrical Appliances, Portable Tools and Similiar Electrical Apparatus - Part 1: Emissions
- 12/CIS14a EN 55014-1 (1993), A1 (1997), A2 (1999):
- 12/CIS14b AS/NZS 1044 (1995):
- 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

2005-01-01 through 2005-12-31

*Effective dates*

*For the National Institute of Standards and Technology*

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Revised Scope 06/22/2005

**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

**NVLAP LAB CODE 200116-0**

**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 fluctuations 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/T51 AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

**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

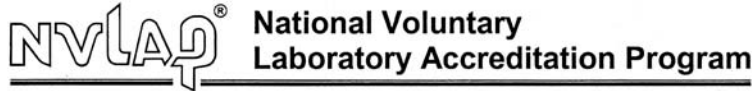
2005-01-01 through 2005-12-31

Effective dates

For the National Institute of Standards and Technology

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

<b>Nemko USA, Inc.</b>		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
<b>DATE</b>	<b>DOCUMENT NAME</b>	<b>DOCUMENT #</b>	<b>PAGE</b>
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**ELECTROMAGNETIC COMPATIBILITY  
AND TELECOMMUNICATIONS**

**NVLAP LAB CODE 200116-0**

**NVLAP Code Designation / Description**

12/107 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

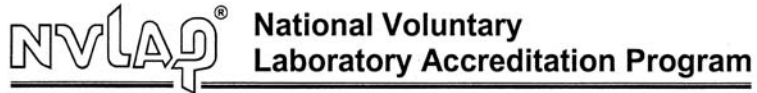
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**ELECTROMAGNETIC COMPATIBILITY  
AND TELECOMMUNICATIONS**

**NVLAP LAB CODE 200116-0**

<i>NVLAP Code</i>	<i>Designation / Description</i>
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

2005-01-01 through 2005-12-31

*Effective dates*

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