

Nemko Test Report: 4L0148RUS1

Applicant: Micro Systems Inc.
35 Hill Avenue
Fort Walton Beach, FL 32548
USA

Equipment Under Test: Rapid Scoring System
(E.U.T.)

In Accordance With: **FCC** Part 15, Subpart C, 15.249
For 2.4 GHz Transmitters

Tested By: Nemko Dallas Inc.
802 N. Kealy
Dallas, Texas 75057

Authorized By:

A handwritten signature in black ink, appearing to read "David Light", is positioned above the printed name.

David Light, Lab Production Manager

Date: 7/13/04

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EQUIPMENT: Rapid Scoring System

Section 1. Summary Of Test Results

Manufacturer: Micro Systems Inc.

Model No.: Rapid Scoring System

Serial No.: SN001

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15.249. All tests were conducted using measurement procedure ANSI C63.4-2001. Radiated Emissions were made on an open area test site.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. NONE

See " Summary of Test Data".



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EQUIPMENT: Rapid Scoring System

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Conducted Emissions	15.207	Complies
Radiated Emissions	15.249	Complies

Section 2. General Equipment Specification

Base:

Frequency Range:	2405 - 2480 MHz
Operating Frequency(ies) of Sample:	2405 - 2480 MHz
Tunable Bands:	N/A
Number of Channels:	Sixteen
Channel Spacing:	5 MHz
Crystal Frequencies:	500 kHz, 4.00 MHz, 12.00 MHz, 14.7456 MHz, 16.00 MHz, 19.2 kB/sec, 250 kB/sec, 2.405 - 2.480 GHz
User Frequency Adjustment:	Manual adjustment in 5 MHz increments
Antenna	The remote unit has integral antenna Base unit has duck antenna with reverse SMA connector

Description of EUT

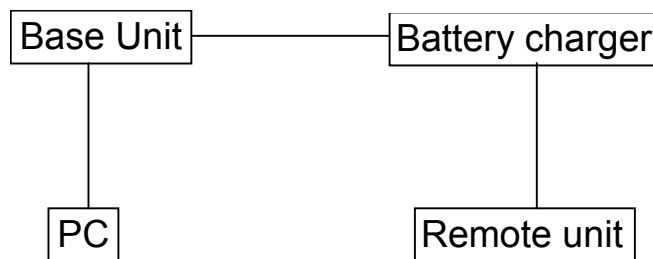
A wireless testing and assessment tool for use in classrooms which displays questions and records answers. Comprised of the following three devices:

NiMH Battery Charger, designed to simultaneously charge 8 battery packs within a 3 hour period.

Base Unit, transmits tests to Remote Units and collects test data, communicates data to PC.

Remote Unit, displays questions, records answers, relays data to base unit.

System Diagram



EQUIPMENT: Rapid Scoring System

Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207
TESTED BY: Dana Tassler	DATE: 7/2/04

Minimum Standard:

Frequency range MHz	Limits dB (μV)	
	Quasi-peak	Average
0.15 to 0.50	66 Decreasing linearly with logarithm of frequency to 56	56 Decreasing linearly with logarithm of frequency to 46
0.50 to 5	56	46
5 to 30	60	50
NOTE – Care should be taken to comply with leakage current requirements.		

Test Results: Complies. See attached graph(s).**Measurement Data:** See attached data.**Method of Measurement:** (Procedure ANSI C63.4-2001)

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak Detector. Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak Detector.

*EQUIPMENT: Rapid Scoring System***Test Data – Powerline Conducted Emissions**

Conducted Emissions											
Powerline Voltage Measurement											
Complete	<u>X</u>		Job # : <u>4L0148E</u>				Test # : <u>CEPV-01</u>				
Preliminary			Page <u>1</u>				of <u>2</u>				
Client Name : <u>Micro Systems Inc</u>											
EUT Name : <u>IRespond Battery Charger</u>											
EUT Model # : <u>None</u>											
EUT Part # : <u>AY03150</u>											
EUT Serial # : <u>None</u>											
EUT Config. : <u>Charging</u>											
Specification : <u>CFR 47, Part 15, Subpart B, Class B</u>											
Reference :											
Transducer # :	<u>1258</u>		Temp. (deg. C) :	<u>21</u>		Date :	<u>07/02/04</u>				
HP Filter # :	<u>968</u>		Humidity (%) :	<u>37</u>		Time :	<u>8:30</u>				
Cable 1 # :	<u>1551</u>		EUT Voltage :	<u>120 VAC</u>		Staff :	<u>Dana Tassler</u>				
Cable 2 # :	<u>970</u>		EUT Frequency :	<u>60 Hz</u>		Location :	<u>Shielded Enclosure</u>				
Detector 1 # :	<u>1464</u>		Peak Bandwidth :	<u>10kHz</u>		Photo ID :	<u>0148CEPV01F1SR</u>				
Detector 2 # :	<u>NA</u>		QP Bandwidth :	<u>10kHz</u>							
Limiter # :	<u>NA</u>		Avg. Bandwidth :	<u>10kHz</u>							

Meas. Freq. (MHz)	EUT Test Point	Detector Type (P, QP, A)	Limit Type (QP, A)	Meter Reading (dBuV)	Path Loss (dB)	Transducer Factor (dB)	Corrected Reading (dBuV)	Spec. limit (dBuV)		CR/SL Diff. (dB)	Pass Fail Unc.	Comment
								Q.P.	Avg.			
0.1582	Line	P	A	39.0	0	0	39.0	65.6	55.6	-16.6	Pass	

Date: 07/02/2004 Time: 08:47:37 WO#:
 FCC Class B Average Limit Test Lead: Black Sequence#: 2
 Micro Systems Inc. TR 101 Charger, charging TR101 and TB 101

dBuV/m

80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0

150kHz 1MHz 10MHz 30MHz

FCC Class B Quasi-Peak Limit

FCC Class B Average Limit

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*EQUIPMENT: Rapid Scoring System***Test Data – Powerline Conducted Emissions**

Conducted Emissions Powerline Voltage Measurement												
Complete	<u>X</u>		Job # : <u>4L0148E</u>		Test # : <u>CEPV-01</u>							
Preliminary	<u> </u>		Page <u>2</u>		of <u>2</u>							
Client Name : <u>Micro Systems Inc</u>												
EUT Name : <u>IRespond Battery Charger</u>												
EUT Model # : <u>None</u>												
EUT Part # : <u>AY03150</u>												
EUT Serial # : <u>None</u>												
EUT Config. : <u>Charging</u>												
Specification : <u>CFR 47, Part 15, Subpart B, Class B</u> Reference : <u> </u>												
Meas. Freq. (MHz)	EUT Test Point	Detector Type (P, QP, A)	Limit Type (QP, A)	Meter Reading (dBuV)	Path Loss (dB)	Transducer Factor (dB)	Corrected Reading (dBuV)	Spec. limit (dBuV)		CR/SL Diff. (dB)	Pass Fail Unc.	Comment
								Q.P.	Avg.			
0.1562	Neutral	P	A	39.0	0.0	0.0	39.0	65.6	56.6	-17.6	Pass	
Meas. Freq. (MHz)	EUT Test Point	Detector Type (P, QP, A)	Limit Type (QP, A)	Meter Reading (dBuV)	Path Loss (dB)	Transducer Factor (dB)	Corrected Reading (dBuV)	Spec. limit (dBuV)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment	
0.1562	Neutral	P	A	39.0	0.0	0.0	39.0	65.6	56.6	-17.6	Pass	

EQUIPMENT: Rapid Scoring System

Conducted Photographs (Worst Case Configuration)



Section 4. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.249
TESTED BY: Dana Tassler	DATE: 7/2/04

Minimum Standard: Para no. 15.249

(a) The field strengths shall not exceed the following:

Fundamental (MHz)	Field Strength (mV/m)	Field Strength (dB μ V)	Harmonic (mV/m)	Harmonic (dB μ V)
2400 - 2483.5	50	94	0.5	54

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

(c) 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 limits of 15.209 whichever is the less attenuation.

(d) The emission limits shown above are based on measurement instrumentation employing a CISPR quasi-peak detector below 1000 MHz and an averaging detector above 1000 MHz. However, the peak field strength of any emission shall not exceed the average limit by more than 20 dB.

Test Results: Complies. The worst-case emission level is 90.0 dB μ V/m @ 3m at 2429.5 MHz. This is 4.0 dB below the specification limit.

Note – The supply voltage was varied from 2.55 to 3.45 Vdc with no effect on output power of the carrier.

Measurement Data: See data below.

Maximizing Emission Levels:

The EUT was tested on three channels. During operation, the transmitting frequency and its harmonics were recorded after finding the maximum amplitude using vertical and horizontal antenna polarities and 360° table rotation.

EQUIPMENT: Rapid Scoring System

Test Data - Radiated Emissions



NEMKO Dallas, Inc.

Dallas Headquarters:

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Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Radiated Emissions Data

Complete	<u> X </u>	Job # :	<u>4L0148E</u>	Test # :	<u>REHE-01</u>
Preliminary	<u> </u>		Page <u> 1 </u>	of	<u> 1 </u>
Client Name : <u>Micro Systems Inc</u>					
EUT Name : <u>IRapid Scoring System</u>					
EUT Model # : <u>TR101, TB101</u>					
EUT Part # : <u>AY03150, AY04745, AY04735</u>					
EUT Serial # : <u>SN001</u>					
EUT Config. : <u>Charging</u>					
Specification : <u>CFR47 Part 15.209</u>					
Rod. Ant. #:	<u>NA</u>	Temp. (deg. C) :	<u>23</u>	Date :	<u>07/02/04</u>
Bicon Ant. #:	<u>1479</u>	Humidity (%) :	<u>39</u>	Time :	<u>14:00</u>
Log Ant. #:	<u>NA</u>	EUT Voltage :	<u>3 VDC</u>	Staff :	<u>Dana Tassler</u>
Bilog Ant. #:	<u>NA</u>	EUT Frequency :	<u>NA</u>	Photo ID:	<u>0148REHE01F1SR</u>
Dipole Ant. #:	<u>NA</u>	Phase:	<u>NA</u>	Peak Bandwidth:	<u>100 kHz</u>
Cable#:	<u>1983</u>	Location:	<u>A OATS</u>	Video Bandwidth	<u>100kHz</u>
Preamp#:	<u>1025</u>	Distance:	<u>3m</u>		
Limiter#:	<u>NA</u>				
Atten #:	<u>NA</u>				
Detector#:	<u>765</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.	peak readings Comment
53.541	V	0	50	9.8	1.6	28.1	33.3	40.0	-6.7	Pass	
49.889	V	0	47	10.3	1.3	28.2	30.4	40.0	-9.6	Pass	
48.658	V	0	45	10.3	1.3	28.2	28.4	40.0	-11.6	Pass	
48.023	V	0	45.2	10.3	1.3	28.2	28.6	40.0	-11.4	Pass	
49.214	V	0	41	10.3	1.3	28.2	24.4	40.0	-15.6	Pass	
57.38	V	0	48.4	9.9	1.6	28.1	31.8	40.0	-8.2	Pass	
47.348	V	0	38	10.3	1.3	28.2	21.4	40.0	-18.6	Pass	
53.541	H	0	30.5	9.8	1.6	28.1	13.8	40.0	-26.2	Pass	
49.889	H	0	27	10.3	1.3	28.2	10.4	40.0	-29.6	Pass	
48.658	H	0	27.5	10.3	1.3	28.2	10.9	40.0	-29.1	Pass	
48.023	H	0	31.4	10.3	1.3	28.2	14.8	40.0	-25.2	Pass	
49.214	H	0	28.8	10.3	1.3	28.2	12.2	40.0	-27.8	Pass	
57.38	H	0	35	9.9	1.6	28.1	18.4	40.0	-21.6	Pass	
47.348	H	0	28	10.3	1.3	28.2	11.4	40.0	-28.6	Pass	

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*EQUIPMENT: Rapid Scoring System***Test Data - Radiated Emissions**

NEMKO Dallas, Inc.

Dallas Headquarters:

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Tel: (972) 436-9600
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Microwave Radiated Emissions Data

Complete	<u>X</u>	Job # : <u>4L0148E</u>	Test # : <u>REWE-01</u>
Preliminary	<u> </u>	Page <u>1</u>	of <u>1</u>
Client Name : <u>Micro Systems Inc</u>			
EUT Name : <u>Rapid Scoring System</u>			
EUT Model # : <u>TR101, TB101</u>			
EUT Part # : <u>AY03150, AY04745, AY04735</u>			
EUT Serial # : <u>SN001</u>			
EUT Config. : <u>Charging batteries, remote and base units communicating.</u>			
Specification : <u>CFR47 Part 15.249</u>			
Antenna # :	<u>1033</u>	Temp. (deg. C) :	<u>21</u>
Detector # :	<u>1464</u>	Humidity (%) :	<u>38</u>
Cable 1 # :	<u>1041</u>	EUT Voltage :	<u>3 VDC</u>
Cable 2 # :	<u>1972</u>	EUT Frequency :	<u>NA</u>
Cable 3 # :	<u>1067</u>	Phase :	<u>NA</u>
Preamp 1 # :	<u>1016</u>	Location :	<u>AC 2</u>
Preamp 2 # :	<u>NA</u>	Distance :	<u>3m</u>
Preamp 3 # :	<u>NA</u>		
Reference :		Date :	<u>07/07/04</u>
		Time :	<u>10:30</u>
		Staff :	<u>Dana Tassler</u>
		Photo ID :	<u> </u>
		Peak Bandwidth :	<u>1 MHz</u>
		Avg. Bandwidth :	<u>10 Hz</u>
		Video Bandwidth :	<u>1 MHz</u>

Meas. Freq. (GHz)	Meter Reading (dBm)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Conversion Factor (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Pol.	Comment
2.4295	-17	28.3	4.7	32.98	107.0	90.0	94.0	-4.0	Pass	V	Carrier (channel 5)
2.4295	-26.33	28.3	4.7	32.98	107.0	80.7	94.0	-13.3	Pass	H	Carrier (channel 5)
2.4550	-17	28.3	4.7	32.98	107.0	90.0	94.0	-4.0	Pass	V	Carrier (channel 10)
2.4550	-25.67	28.3	4.7	32.98	107.0	81.4	94.0	-12.7	Pass	H	Carrier (channel 10)
2.4801	-17.3	28.3	4.7	32.98	107.0	89.7	94.0	-4.3	Pass	V	Carrier (channel 15)
2.4801	-26.33	28.3	4.7	32.98	107.0	80.7	94.0	-13.3	Pass	H	Carrier (channel 15)

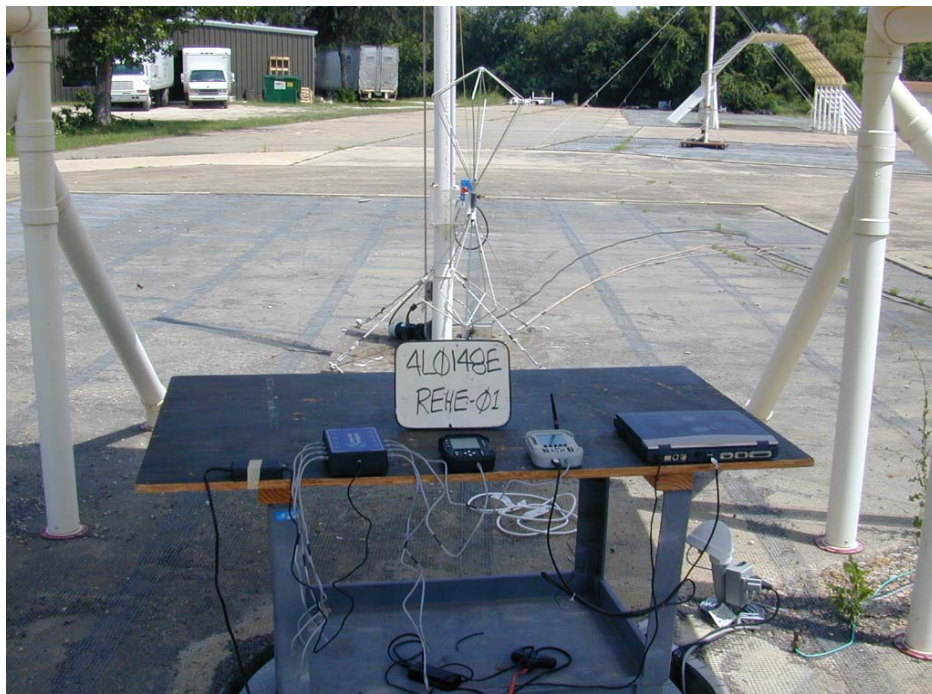
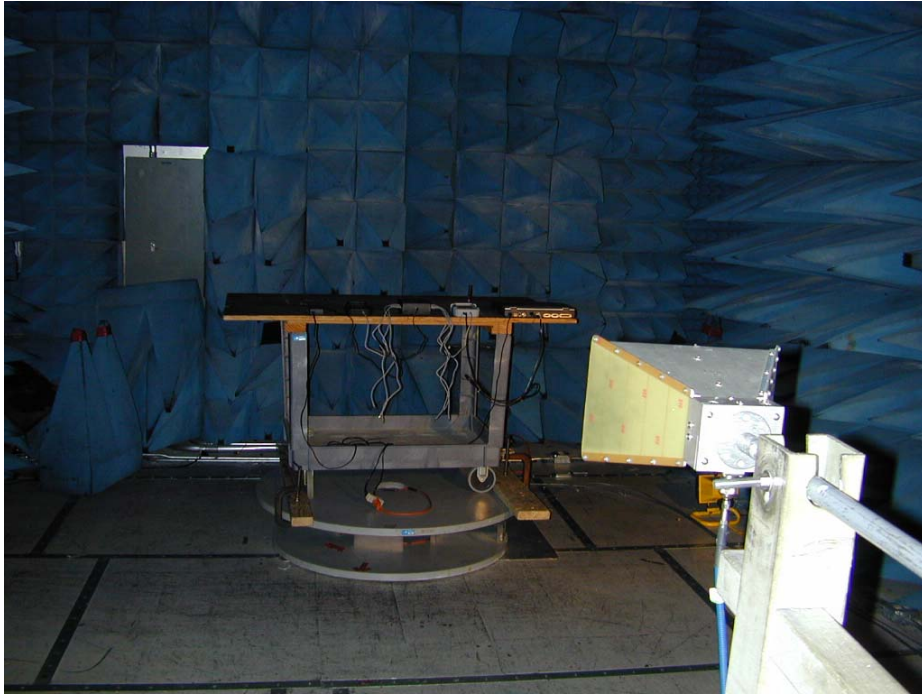
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Note: The spectrum was searched to the 10th harmonic of the carrier. No harmonic emissions were detected above the noise floor.

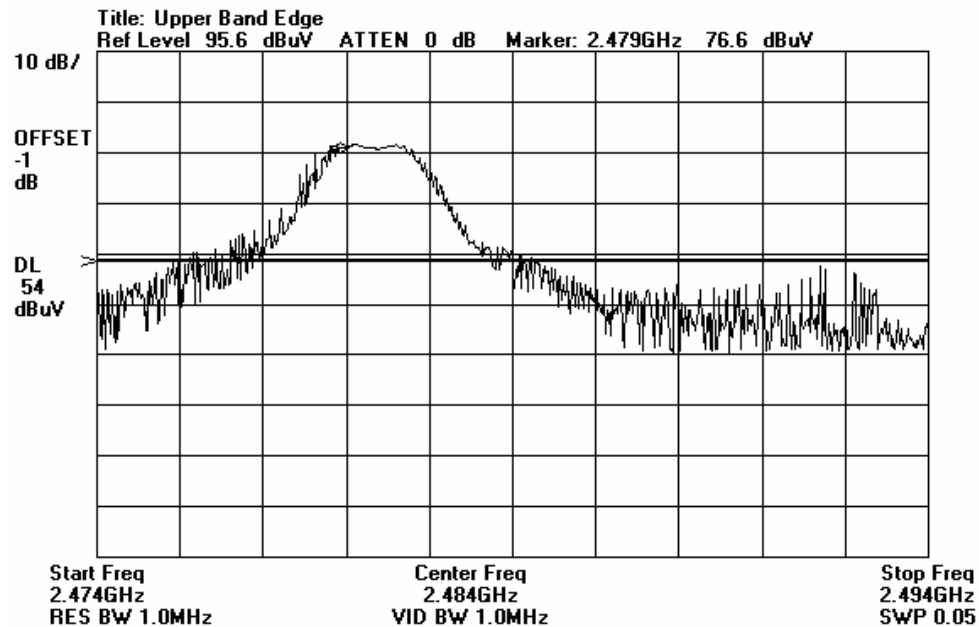
EQUIPMENT: Rapid Scoring System

Radiated Photographs

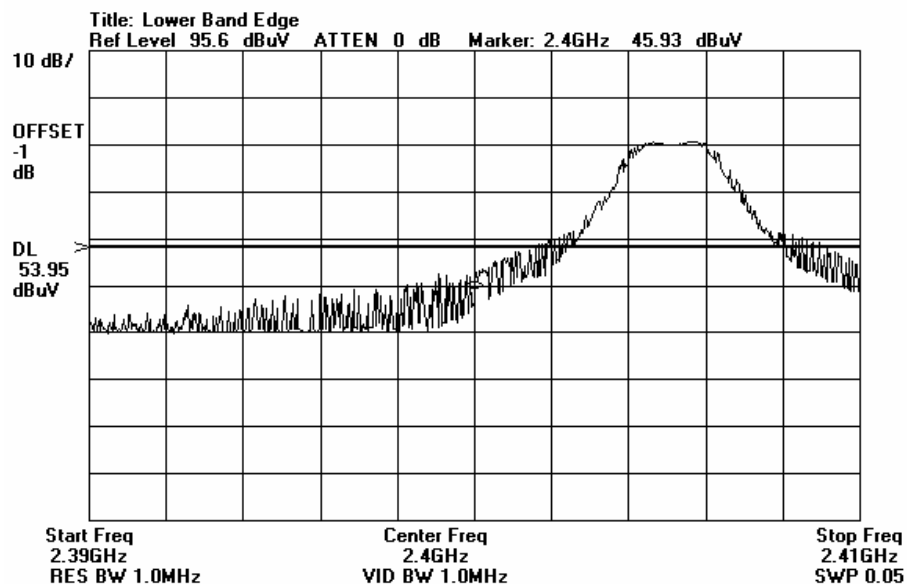


*EQUIPMENT: Rapid Scoring System***Test Data - Radiated Emissions**

Upper Band Edge (Plot is PEAK measurement)



Lower Band Edge (Plot is PEAK measurement)

**Marker Delta method used to show compliance at Band Edge.**

EQUIPMENT: Rapid Scoring System

Marker Delta Method:

Step 1: (1MHz RBW=VBW) Fundamental

PK: 87.27dBuV

AV: 70.8dBuV

Step 2: (100kHz = RBW=VBW; Span = 10MHz)

Delta from Fund to bandedge= 37.0dB @ 2479.5MHz

Step 3: Band edge reading

Band Edge measurement = $70.8 - 37.0 = 33.8$ dBuV @ 3 meters

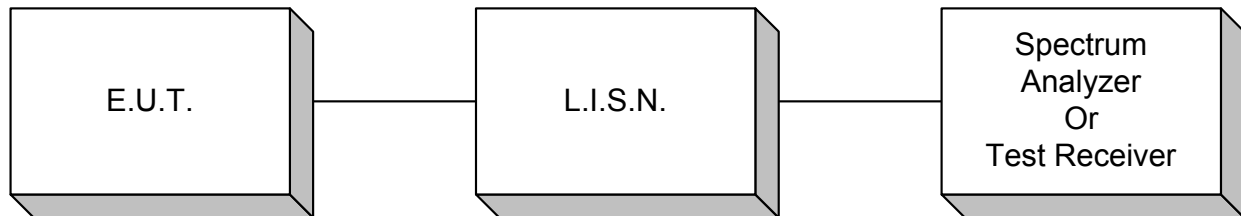
*EQUIPMENT: Rapid Scoring System***Section 5. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05
1041	CABLE, 3m	KTL Semi-Flex	N/A	07/29/03	07/28/04
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
1083	Cable 2m	Astrolab 32027-2-29094-72TC	N/A	09/02/03	09/01/04
1033	Horn antenna	EMCO 3115	8812-3035	09/22/03	09/22/05
1067	Blue cable 4m	Storm PR90-010-144	0	07/29/03	07/28/04
1479	Bi Conical Antenna 20-330 Mhz	A. H. Systems SAS-200/540	496	07/02/03	07/01/04
1983	CABLE	KTL Site A OATS	N/A	03/11/04	03/11/05
1025	PREAMP, 25dB	ICC LNA25	399	06/09/04	06/09/05
765	RECEIVER (20-1000 MHz)	ROHDE & SCHWARZ ESVS 30	843710/0001	09/12/03	09/11/04
A OATS	Open Area Test Site	KTL None	A	03/11/04	03/11/05

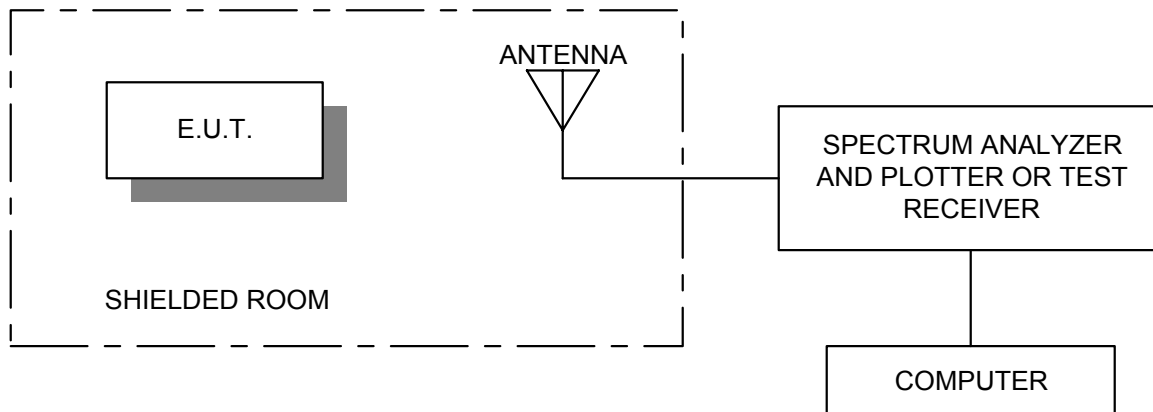
ANNEX A
TEST DIAGRAMS

EQUIPMENT: Rapid Scoring System

Conducted Emissions



Radiated Prescan



EQUIPMENT: Rapid Scoring System

Test Site For Radiated Emissions

