



**Nemko USA, Inc.**  
11696 Sorrento Valley Rd., Suite F  
San Diego, CA 92121-1024  
Phone (858) 755-5525 Fax (858) 452-1810

---

**Certification Test Report:** 2007 087161-1-FCC

**Project number:** 7161-1-EMC

**Equipment Under Test (EUT):** RFID Contactless Card Reader

**Model:** AR4

**FCC ID:** EHA-AR4  
**IC:** 1223A-AR4

**In Accordance With:** FCC Part 15 Subpart C, 15.225  
RSS-210, Issue 7 June 2007

**For:** Semtek Innovation Solutions  
9340 Hazard Way Suite D  
San Diego, CA 92123  
USA

**Tested By:** Nemko USA Inc.  
11696 Sorrento Valley Road, Suite F  
San Diego, CA 92121  
USA

**Authorized By:** *FR Fleury*  
FR Fleury, Manager

**Date:** **AUGUST 21, 2007**

**Total Number of Pages:** 21

## **2.1. Section 1. Summary of Test Results**

### **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 Part 15; Subpart C and RSS-210, Issue 7 June 2007 2005. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and IC.

The assessment summary is as follows:

<b>Apparatus Assessed:</b>	RFID Contactless Card Reader Model AR4
<b>Specifications:</b>	FCC Part 15 Subpart C, 15.225 RSS-210, Issue 7 June 2007 A2.6
<b>Date Received in Laboratory:</b>	August 14, 2007
<b>Compliance Status:</b>	Complies
<b>Exclusions:</b>	None
<b>Non-compliances:</b>	None

**Report Release History:**

REVISION	DATE	COMMENTS
-	August 21, 2007	Prepared By: Alan Laudani
-	August 21, 2007	Initial Release: F. Fleury

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

Nemko USA Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko USA Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

TESTED BY:



Alan Laudani, EMC Test Engineer  
Date: August 21, 2007

## TABLE OF CONTENTS

<b>2.1. Section 1. Summary of Test Results .....</b>	<b>2</b>
<b>Section 2: Equipment Under Test.....</b>	<b>5</b>
2.1 Product Identification .....	5
2.2 Technical Specifications of the EUT.....	5
<b>Section 3: Test Conditions .....</b>	<b>6</b>
3.1 Specifications .....	6
3.2 Deviations From Laboratory Test Procedures .....	6
3.3 Test Environment .....	6
3.4 Test Equipment .....	7
<b>Section 4: Observations.....</b>	<b>8</b>
4.1 Modifications Performed During Assessment .....	8
4.2 Record Of Technical Judgements .....	8
4.3 EUT Parameters Affecting Compliance .....	8
4.4 Test Deleted.....	8
4.5 Additional Observations .....	8
<b>Section 5: Results Summary.....</b>	<b>9</b>
5.1 Test Results .....	9
<b>Appendix A: Test Results .....</b>	<b>10</b>
Field Strength of any Emissions within the Band 13.553-13.567 MHz .....	10
Emission Mask .....	11
Radiated Emissions and Restricted Bands .....	15
20 dB Bandwidth .....	16
Frequency Stability .....	17
<b>2.1. Appendix B: Setup Photographs.....</b>	<b>18</b>
Radiated Emissions Setup:.....	18
Frequency Stability Setup:.....	20
<b>2.2 Appendix C: Block Diagram of Test Setups.....</b>	<b>21</b>

## Section 2: Equipment Under Test

### 2.1 Product Identification

The EUT Model AR4 is part of a Mobile Identity Verification reader snap-on attachment for the Intermec 751G Handheld Terminals. It operates on one frequency 15.560 MHz. It draws its power from the 751G Handheld terminal and allows recharging of the terminal through the snap-on attachment, but is prevented from transmitting when so configured. The RFID is read during transmitting, so it has no non-transmit receiver function.

### 2.2 Technical Specifications of the EUT

<b>Manufacturer:</b>	Semtek Innovation Solutions
<b>Operating Frequency:</b>	13.560 MHz in the 13.110 to 14.010 MHz Band
<b>Output Power:</b>	35.5 dBuV/m @ 30 m
<b>Modulation:</b>	ASK
<b>Antenna Data: ( FCC 15.203)</b>	Integral antenna trace on circuit board
<b>Antenna Connector:</b>	None
<b>Power Source:</b>	3 Vdc from a 7.2 VDC Lithium battery

## **Section 3: Test Conditions**

### **3.1 Specifications**

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.225  
Operation within the band 13.110-14.010 MHz.

RSS-210, Issue 7 June 2007  
Annex 2 – Devices Operating in Frequency Bands for Any Application  
A2.6 13.110 –14.010 MHz

### **3.2 Deviations From Laboratory Test Procedures**

No deviations from Laboratory Test Procedure

### **3.3 Test Environment**

All tests were performed under the following environmental conditions:

Temperature range	:	15.6 – 30.3 °C
Humidity range	:	26 - 65 %
Pressure range	:	86 - 106 kPa
Power supply range	:	Measurements started with freshly charged battery

**Nemko USA, Inc.**IC: 1223A-AR4  
FCC ID: EHA-AR411696 Sorrento Valley Road, Suite F, San Diego, CA 92121  
Phone (858) 755-5525/Fax (858) 452-1810Report Number: 2007 087161-1-FCC  
Specifications: FCC Part 15 Subpart C, 15.225; IC RSS-210 A2.6**3.4 Test Equipment**

<b>Nemko ID</b>	<b>Device</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
110	Antenna, LPA	Electrometrics	LPA-25	1217	12/18/2006	12/18/2007
128	Antenna	Electro-Metrics	3104	2882	11/10/2006	11/10/2007
N149	Environmental Chamber	Cincinnati Sub-Zero	ZPHS-32-2-2-H/AC	ZP0552665	5/30/2007	5/30/2008
552	Antenna, Loop	EMCO	ALR-30M	820	6/7/2007	6/7/2008
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	6/20/2007	06/20/08
898	EMI Receiver	HP	8546A	3625A00348	1/18/2007	01/18/08
899	RF Filter Section	HP	85460A	3448A00288	1/18/2007	01/18/08

OATS: IC Site #: 2040B-1; RN#: 90579

## **Section 4: Observations**

### **4.1 Modifications Performed During Assessment**

No modifications were performed during assessment.

### **4.2 Record Of Technical Judgements**

No technical judgements were made during the assessment.

### **4.3 EUT Parameters Affecting Compliance**

The user of the apparatus could not alter parameters that would affect compliance.

### **4.4 Test Deleted**

No Tests were deleted from this assessment.

### **4.5 Additional Observations**

There were no additional observations made during this assessment.



## Section 5: Results Summary

The column headed "Required" indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

- N No: not applicable / not relevant
- Y Yes: Mandatory i.e. the apparatus shall conform to these test.
- N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

### 5.1 Test Results

Part 15	FCC Test Description	RSS-210 IC Test Description	Required	Result
	Operation within the band 13.110-14.010 MHz.	A2.6 13.110-14.010 MHz		
15.225(b)(c)	Field Strength of Emissions within the Band	Emission Mask	Y	Pass
15.225(a)	Field Strength	A2.6 (a)(b)(c) (a) 15.848 millivolts/m (84 dBV/m) at 30 m, within the band 13.553-13.567 MHz.	Y	Pass
	20dB Bandwidth	IC 99% bandwidth spectral plot required for determination of emission designator.	Y	Pass
15.225(f)	RF Power Tag		NA <sup>1</sup>	Pass
15.225(d)	Radiated Emissions outside the band 13.110-14.010 MHz.	(d) Radiated Emissions outside the band 13.110-14.010 MHz.	Y	Pass
15.225(e)	Bandedge Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).	Bandedge Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).	Y	Pass
15.109	Receiver Spurious Emissions	RSS-GEN	NA <sup>2</sup>	Pass

<sup>1</sup>The RFID Power Tag is non-powered and not subject to testing.

<sup>2</sup>The EUT does not receive RF when not transmitting.

## Appendix A: Test Results

### Field Strength of any Emissions within the Band 13.553-13.567 MHz

15.225(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

A2.6 (a) The field strength of any emissions shall not exceed 15,848 microvolts/meter at 30 meters within the band 13.553-13.567 MHz

### Test Conditions:

<b>Sample Number:</b>	AR4	<b>Temperature:</b>	84°F
<b>Date:</b>	8-15-07	<b>Humidity:</b>	35%
<b>Modification State:</b>	Lo/Mid/High Channels	<b>Tester:</b>	Alan Laudani
		<b>Laboratory:</b>	Nemko NOATS

### Test Results:

The EUT was placed 3m from the receiving loop antenna. The Spectrum Analyzer RES BW was set to 10 kHz, the VBW was set to 10 kHz. The EUT's internal battery was freshly recharged. The nominal battery voltage is 7.2 VDC. Measurements were made along three orthogonal axes with the worst-case result presented in the table below. The loop antenna was turned 180 degrees to the plane defined between the antenna mast and the EUT vertically and horizontally. Peak Hold detector used.

Frequency of Emission (MHz)	Emission Level (dBuV) at 3m	Antenna Factor and Cable Losses	Extrapolation Factor (30 to 3m)	Field Strength (dBuV/m @ 3m)*	Limit (dBuV/m@30m)	Margin (dB)
13.560	39.4	36.1	-40	35.5	84	48.5

\*Extrapolated field strength = emission level + antenna factor and cable losses + extrapolation factor.

Sample calculation  $39.4 + 35.6 + 0.5 - 40 = 35.5$  dBuV/m @ 30 m

30 to 3 m extrapolation factor =  $-40 \text{ Log}(3/30) = -40$  dB

Equipment Used: 552, 835

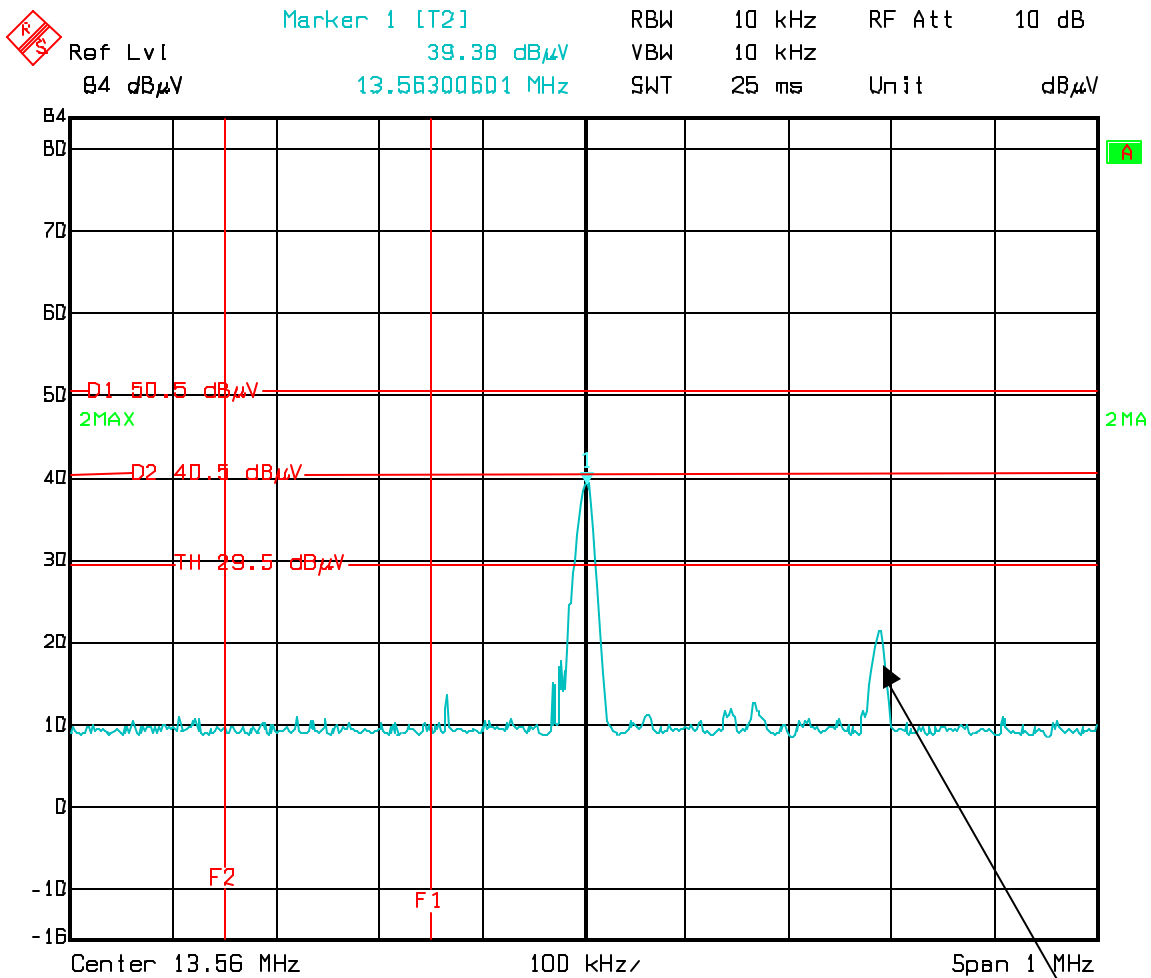
**Emission Mask**

A2.6 (a) The field strength of any emissions shall not exceed 15.848 millivolts/meter at 30 meters within the band 13.553-13.567 MHz

antenna factor and cable losses + extrapolation factor = absolute values.  
 $35.6 + 0.5 - 40 = -3.9$  Therefore subtract 3.9 for absolute values.

Ref Lvl = 84  
 D1 = 50.5 = 84 - 33.5  
 D2 = 40.5 = 84 - 43.5  
 TH = 29.5 = 84 - 54.5  
 F1 = 13.410 MHz  
 F2 = 13.110 MHz

**Set Up for field strength**



Date: 16.JUL.2007 20:46:53

AMBIENT EMISSION

Set Up for field strength with Extrapolation and Correction Factor

Appling Offset:  $84 - 3.9 = 80.1$  dBuV

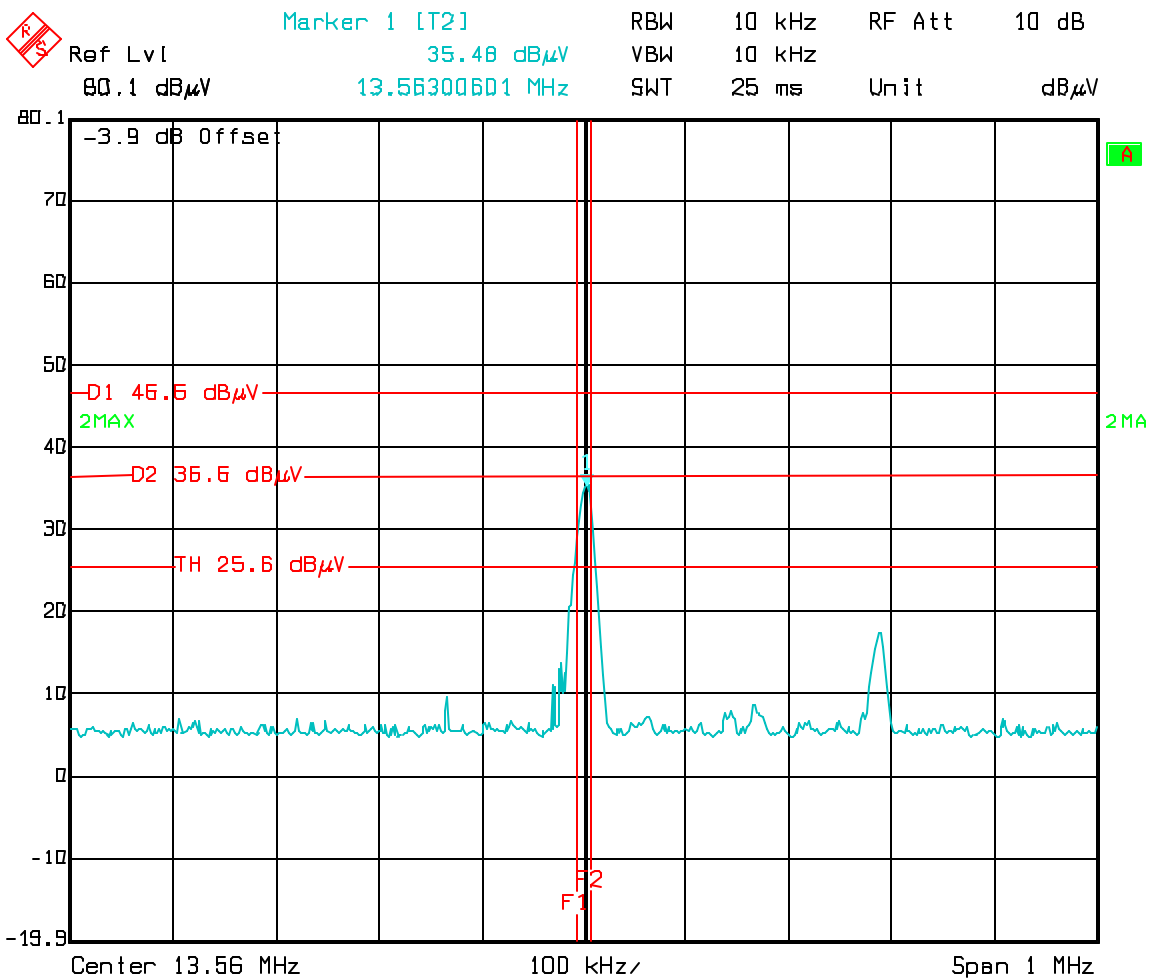
F1 = 13.553 MHz

F2 = 13.567 MHz

D1 =  $50.5 - 3.9 = 46.6$

No emissions evident above D1 outside of F1 and F2 so EUT complies.

A2.6 (b) The field strength of any emissions shall not exceed 334 microvolts/meter (50.5 dBuV/m) at 30 meters within the band 13.410-13.553 MHz and 13.567-13.710 MHz.



Date: 16 JUL 2007 20:50:51

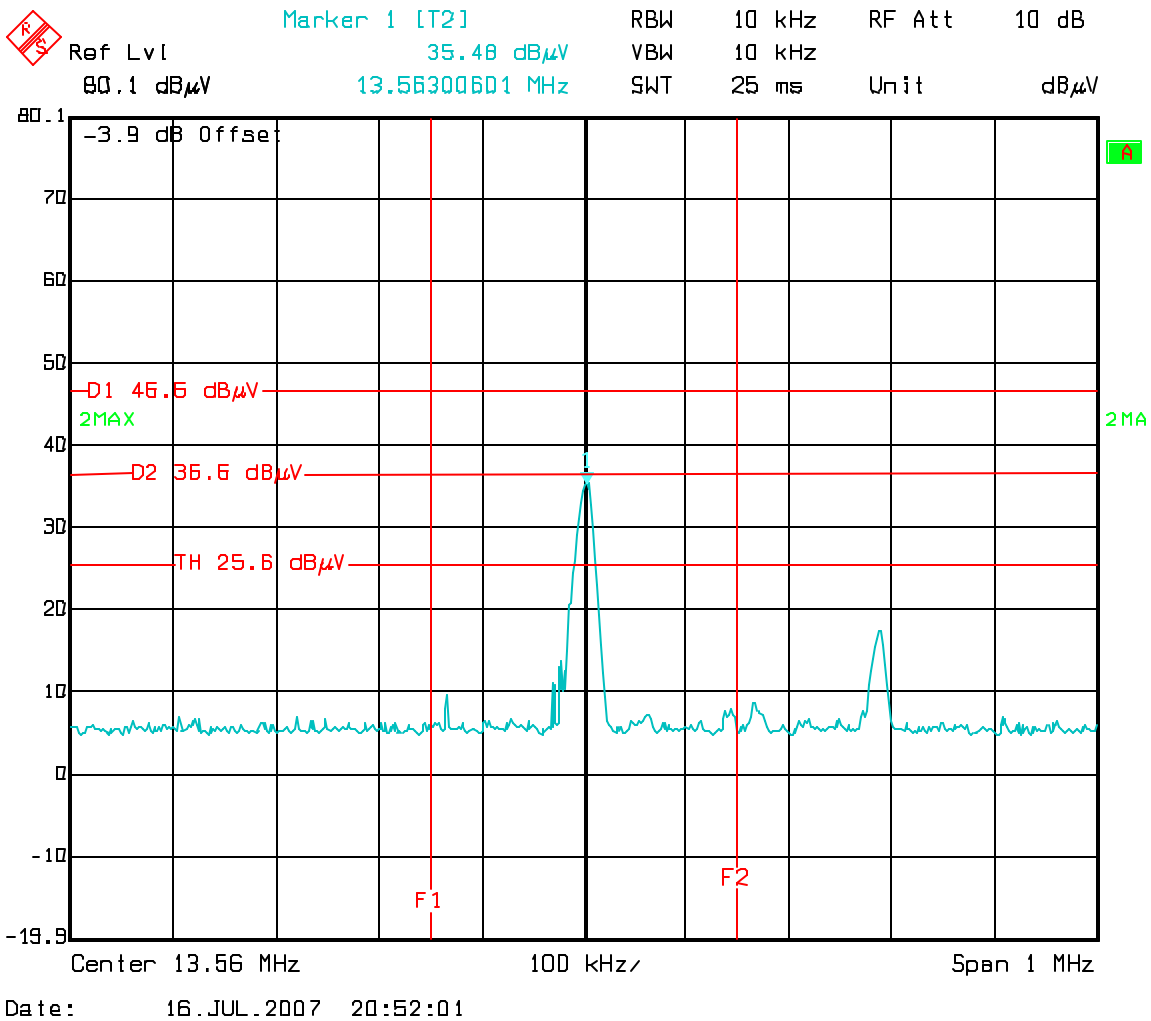
IC: 1223A-AR4  
 FCC ID: EHA-AR4

Report Number: 2007 087161-1-FCC  
 Specifications: FCC Part 15 Subpart C, 15.225; IC RSS-210 A2.6

Applying Offset:  $84 - 3.9 = 80.1$  dBuV  
 F1 = 13.410 MHz  
 F2 = 13.553 MHz  
 D2 =  $40.5 - 3.9 = 36.6$

**No emissions evident above D2 outside of F1 and F2 so EUT complies.**

A2.6 (c) The field strength of any emissions shall not exceed 106 microvolts/meter (40.5 dBuV/m) at 30 meters within the band 13.110-13.410 MHz and 13.710-14.010 MHz



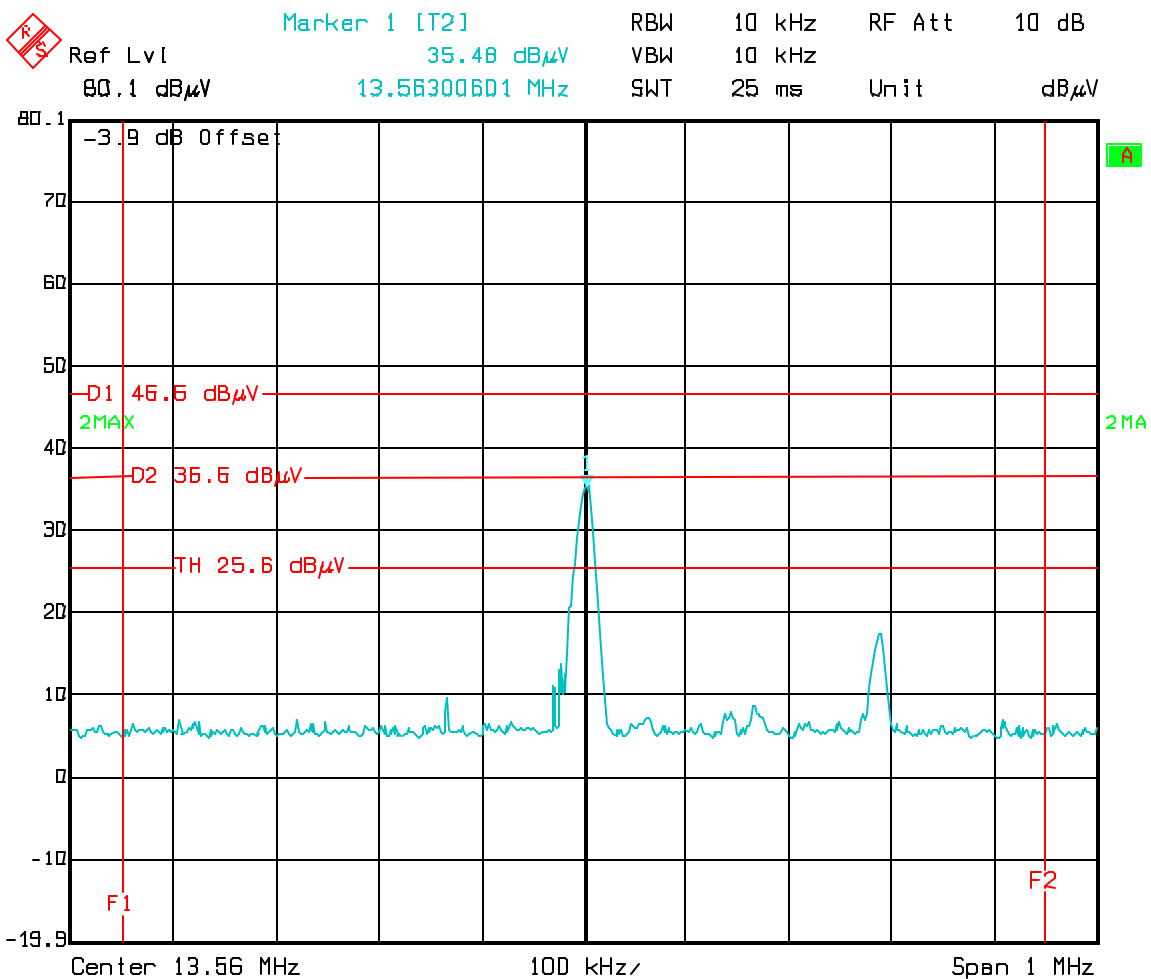
Appling Offset:  $84 - 3.9 = 80.1$  dBuV

F1 = 13.110 MHz  
 F2 = 14.010 MHz  
 TH =  $29.5 - 3.9 = 25.6$

**No emissions evident above D1 outside of F1 and F2 so EUT complies.**

Emissions were searched from 9 kHz to 10 times the transmit frequency of 13.560 MHz or 136 MHz.  
 No emissions were detected other than the transmit frequency.

A2.6 (d) The field strength of any emissions shall not exceed 30 microvolts/meter (29.5 dBuV/m) at 30 meters outside the 13.110-14.010 MHz band.



Date: 16.JUL.2007 20:53:03

**Radiated Emissions and Restricted Bands**

Clause 15.209(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:		
Frequency (MHz)	Field Strength (uV/meter)	Measurement Distance (meter)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
(d) 30 microvolts/m (29.5 dB $\mu$ V/m) at 30 m, outside the band 13.110-14.010 MHz. 30 uV = 29.5 dB $\mu$ V At 3m, 29.5 + 40*log(30/3) = 69.5		

**Test Conditions:**

<b>Sample Number:</b>	AR4	<b>Temperature:</b>	84.0°F
<b>Date:</b>	8-15-07	<b>Humidity:</b>	35 %
<b>Modification State:</b>		<b>Tester:</b>	A. Laudani
		<b>Laboratory:</b>	NOATS

**Test Results:**

No emissions found within 20 dB of the limits of Part 15, Subpart C 15.209 and 15.205.

Emissions searched between 9 kHz and 30 MHz and none were evident within 20 dB of 29.5 dB $\mu$ V/m of RSS-210(d)(extrapolated for 3m). During the search, RBW was reduced to 100 Hz from 9 kHz to 150 kHz.

Equipment used 552, 111, 128, 674, 675, 676 in a 1m prescan in an enclosed shielded room.

OATS: IC Site #: 2040B-1; RN#: 90579

**Additional Observations:**

The Spectrum was searched from 9 kHz to 1000 MHz  
 Three orthogonal axes were tried to maximize emissions. Worst case was used in measurements presented. The internal battery was fully charged initially.

Measurements below 1GHz were performed at 3m with a Quasi-Peak detector while Peak and Average detectors were used above 1GHz.

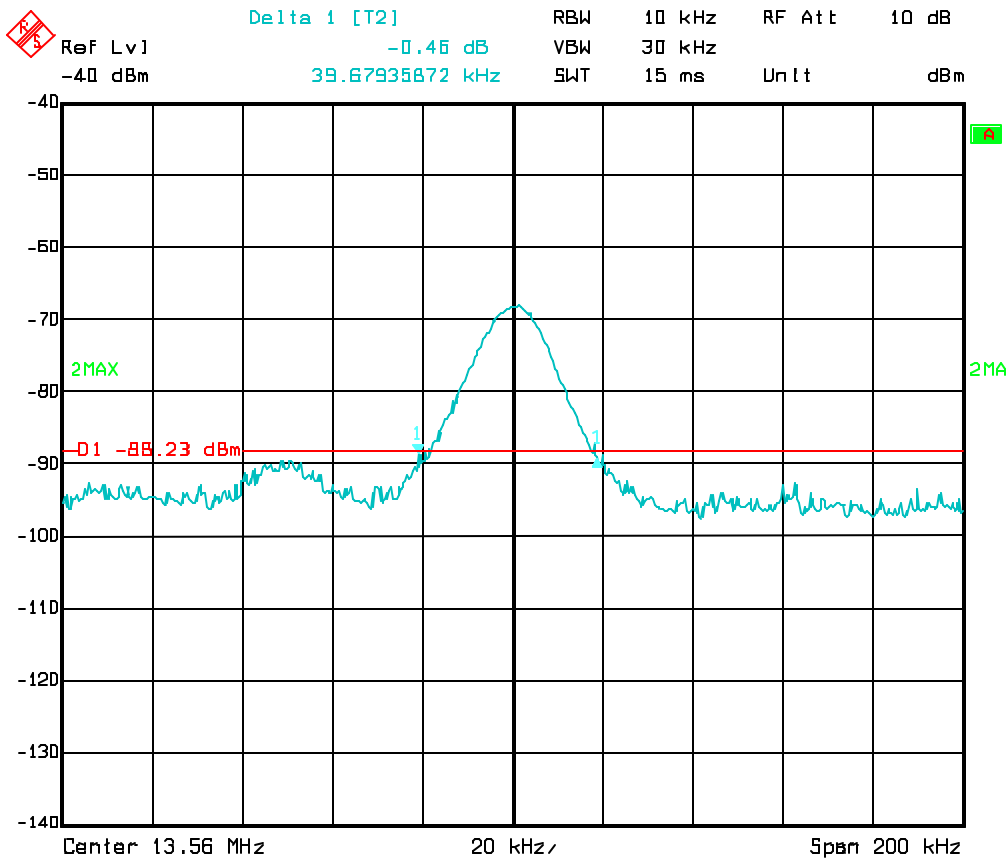
**20 dB Bandwidth**

99% bandwidth spectral plot required for determination of emission designator.

**Test Conditions:**

<b>Sample Number:</b>	AR4	<b>Temperature:</b>	76°F
<b>Date:</b>	August 21, 2007	<b>Humidity:</b>	55%
<b>Modification State:</b>		<b>Tester:</b>	Alan Laudani
		<b>Laboratory:</b>	Nemko

**Test Results: 39.7 kHz**



Date: 22.JUL.2007 13:17:32



**Frequency Stability**

Carrier Frequency Stability shall be maintained to  $\pm 0.01\%$  (100 ppm)

**Test Conditions:**

<b>Sample Number:</b>	AR4	<b>Temperature:</b>	76°F
<b>Date:</b>	August 17, 2007	<b>Humidity:</b>	55%
<b>Modification State:</b>		<b>Tester:</b>	Alan Laudani
		<b>Laboratory:</b>	Nemko Environmental Chamber

**Test Results:**

EUT is battery powered, therefore no power input stability results.  
 The Frequency drift is 0.06 ppm < 100 ppm, therefore the EUT complies.

Temperature Degrees C	Frequency MHz	Frequency Drift		
		Hz	ppm	%
-30	13.5606006	-0.4	0.03	.000003
-20	13.5606010	0	0	0
-10	13.5606010	0	0	0
0	13.5606010	0	0	0
10	13.5606010	0	0	0
20	13.5606010	0	0	0
30	13.5606002	-0.8	0.06	.000006
40	13.5606010	0	0	0
50	13.5606006	-0.4	0.03	.000003

## 2.1. Appendix B: Setup Photographs

### Radiated Emissions Setup:



**Nemko USA, Inc.**

IC: 1223A-AR4

FCC ID: EHA-AR4

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121  
Phone (858) 755-5525/Fax (858) 452-1810

Report Number: 2007 087161-1-FCC

Specifications: FCC Part 15 Subpart C, 15.225; IC RSS-210 A2.6





**Nemko USA, Inc.**

IC: 1223A-AR4

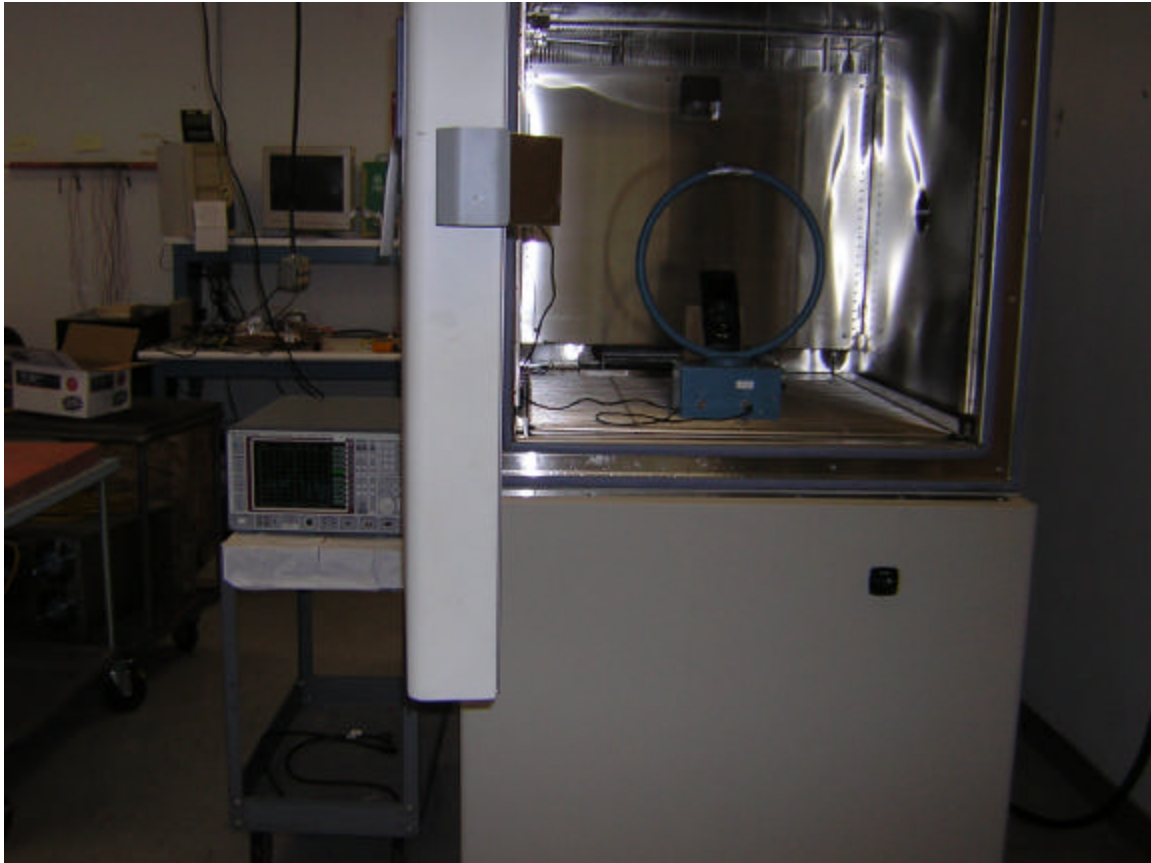
FCC ID: EHA-AR4

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121  
Phone (858) 755-5525/Fax (858) 452-1810

Report Number: 2007 087161-1-FCC

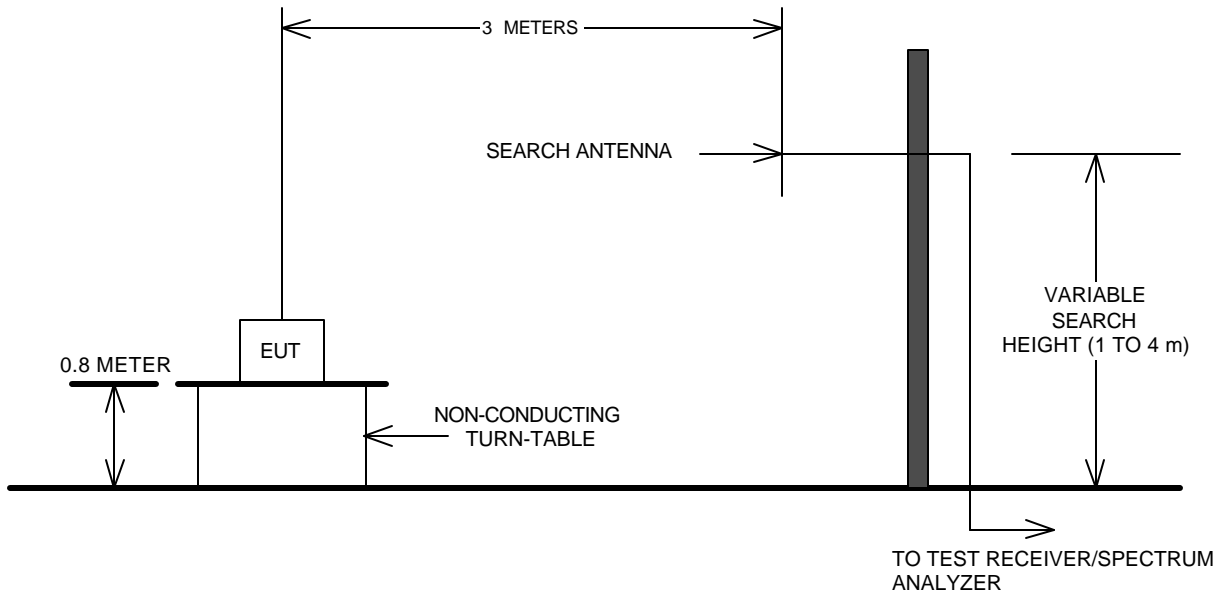
Specifications: FCC Part 15 Subpart C, 15.225; IC RSS-210 A2.6

**Frequency Stability Setup:**



## 2.2 Appendix C: Block Diagram of Test Setups

### Test Site For Radiated Emissions



### Conducted Emissions

Not tested as no connection can be made to the device.