

Nemko Test Report: 6L0033RUS1

Applicant: Metro Automation, Inc.
3011 S. Skyway Circle
Irving, TX 75038

Equipment Under Test: RFID
(E.U.T.)

In Accordance With: FCC Part 15, Subpart C, Paragraph 15.225
Operation within the band 13.110-14.010 MHz

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

Authorized By:



Kevin Rose
Wireless Engineer

Date: May 3, 2006

Table of Contents

SECTION 1. SUMMARY OF TEST RESULTS	3
SECTION 2. GENERAL EQUIPMENT SPECIFICATION	5
SECTION 3. POWERLINE CONDUCTED EMISSIONS	7
SECTION 4. RADIATED EMISSIONS	13
SECTION 5. FREQUENCY ERROR	18
SECTION 6. TEST EQUIPMENT LIST	19
ANNEX A TEST DIAGRAMS	20

Section 1. Summary Of Test Results

Manufacturer: Metro Automation, Inc.

Model No.: RFID

Serial No.: None

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, Subpart C for low power devices. All tests were conducted using measurement procedure ANSI C63.4-2003. 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.

See "Summary of Test Data".

**NVLAP LAB CODE: 100426-0**

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This report applies only to the items tested.

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207	Complies
Radiated Emissions	15.225(a)	Complies
Frequency Stability	15.225(e)	Complies

Footnotes For N/A's:

Section 2. General Equipment Specification

Frequency Range: 13.56 MHz Fixed

Operating Frequency(ies) of Sample: 13.56 MHz Fixed

Crystal Frequencies: 13.56 MHz

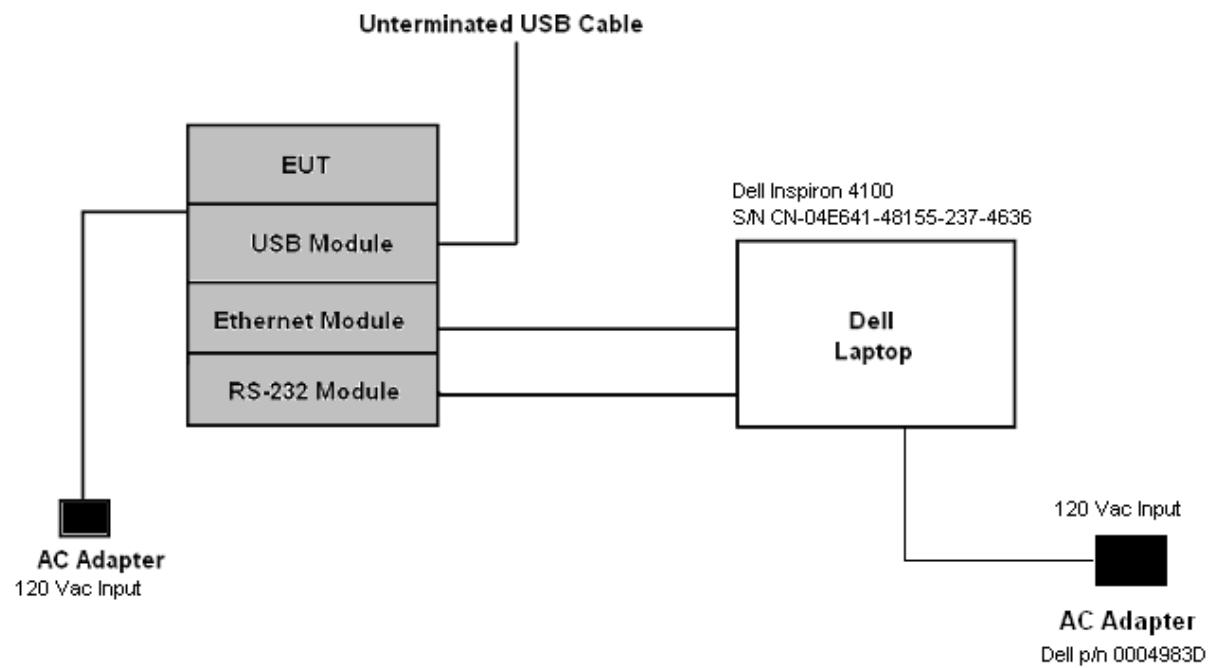
Integral Antenna	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
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Modifications Made During Testing

Added Fair-Rite torroid p/n 2643540002 with three turns installed on antenna lead wire. This ferrite or equivalent to be added to BOM and assembly process to quiten spurious emissions at 13.56 MHz.



System Diagram



Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207
TESTED BY: David Light	DATE:01 February 2006

Minimum Standard:

Limits for conducted disturbance at the mains ports

Frequency Range (MHz)	Quasi-peak Limits (dB μ V)	Average Limits (dB μ V)
0.15 to 0.50	66-56	56-46
0.50 to 5.00	56	46
5.00-30.0	60	50

The limit decreases with the logarithm of the frequency in the range 0.15MHz to 0.5 MHz

Test Results: Complies.

Measurement Data: See attached graph(s).

The worse emission was 57.35 dB μ V at 13.56 MHz on the neutral side. This is 2.65 dB below the specification limit of 60 dB μ V.

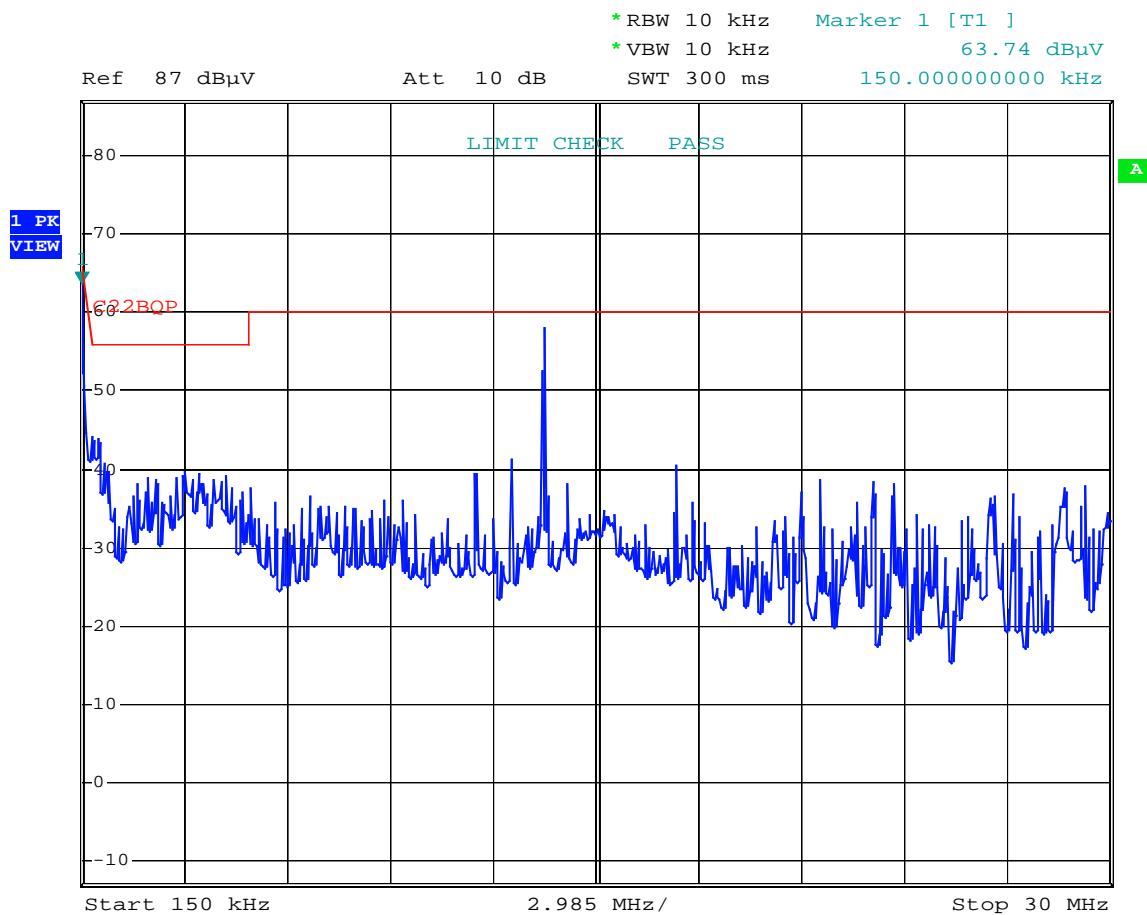
Method of Measurement: (Procedure ANSI C63.4-2003)

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.

Test Equipment Used: 1258-1547-1555-1534-1036

EUT: RFID**Test Data – Powerline Conducted Emissions**

Hot Lead - Peak

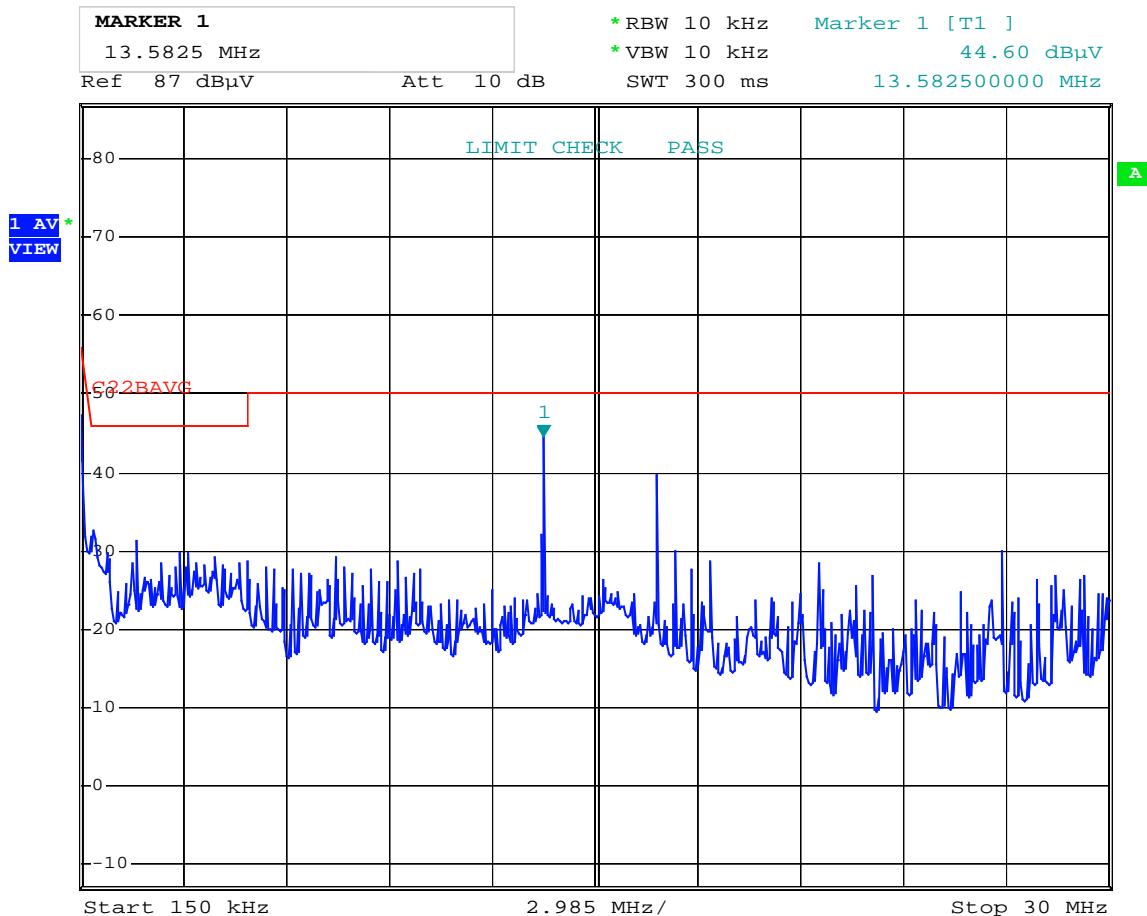


Comment: Quasi Peak
Date: 1.FEB.2006 15:07:02

EUT: RFID

Test Data – Powerline Conducted Emissions

Hot Lead - Average

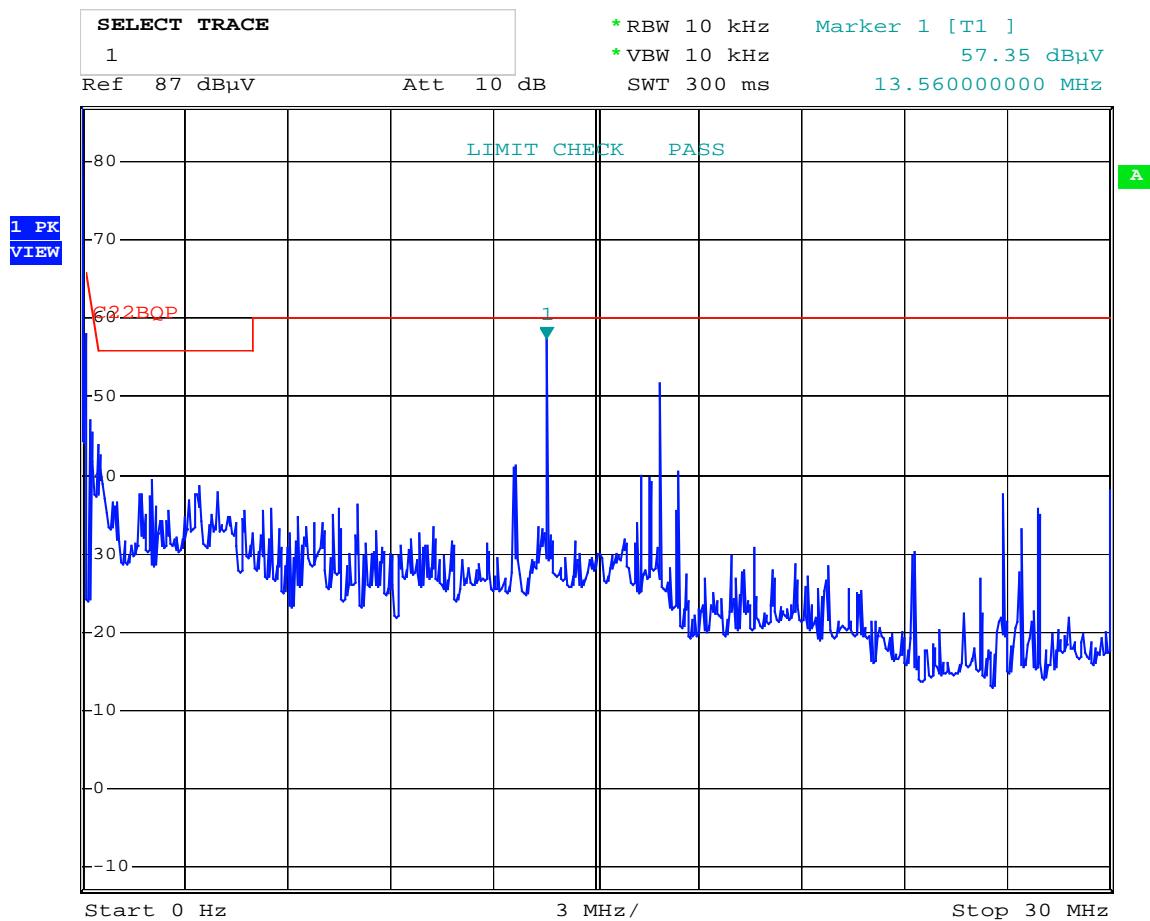


Comment: Quasi Peak
Date: 1.FEB.2006 15:08:16

EUT: RFID

Test Data – Powerline Conducted Emissions

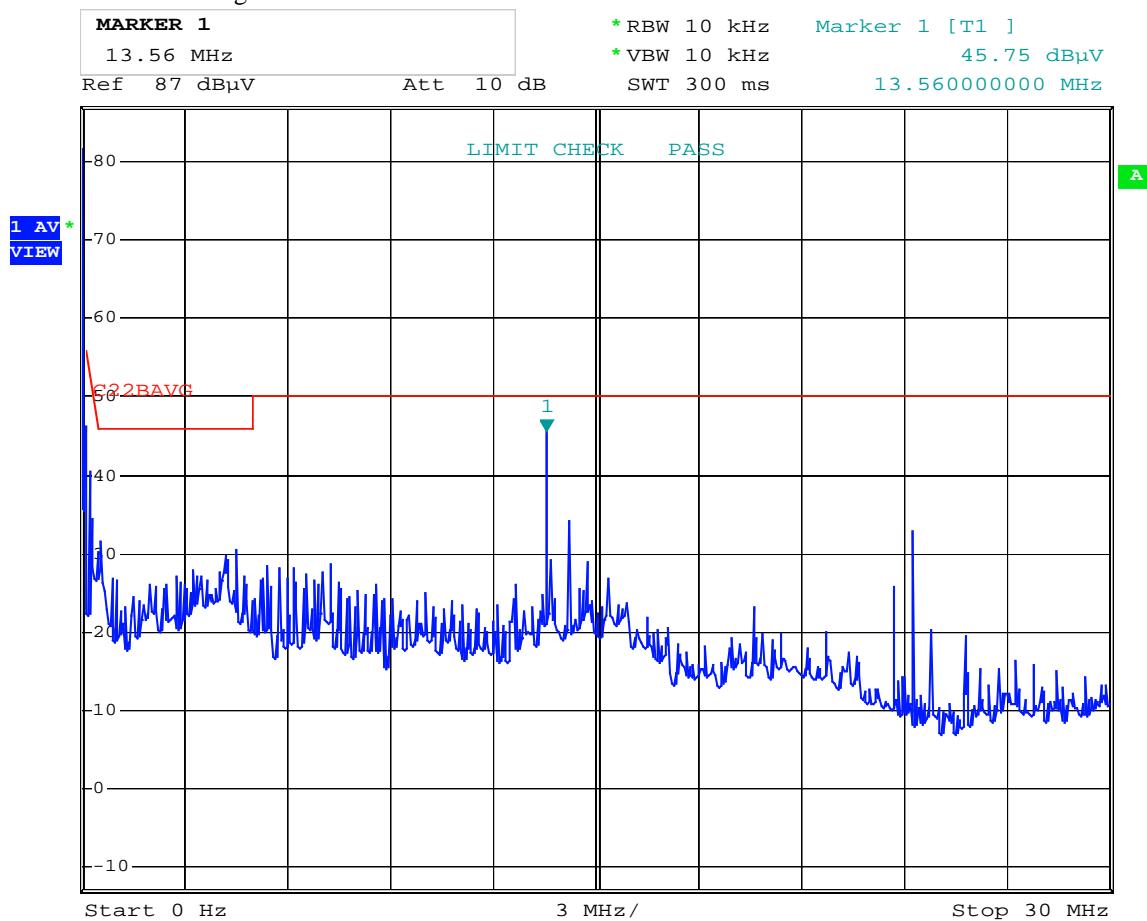
Neutral Lead - Peak



Comment: Quasi Peak
Date: 1.FEB.2006 15:11:24

EUT: RFID**Test Data – Powerline Conducted Emissions**

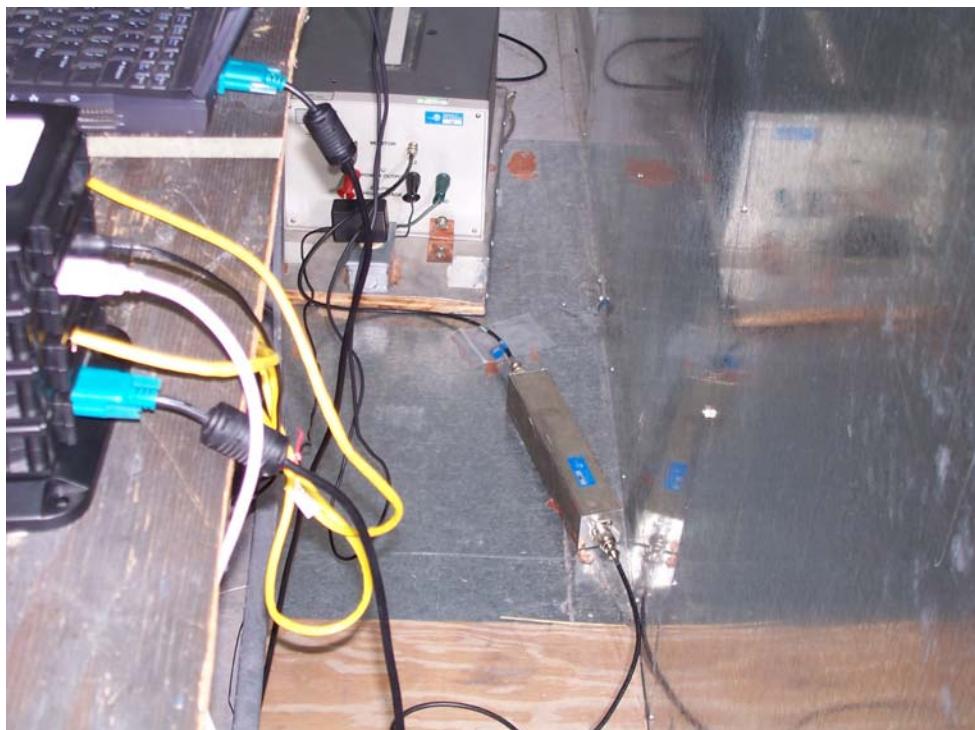
Neutral Lead - Average



Comment: Quasi Peak
Date: 1.FEB.2006 15:10:18

EUT: RFID

Powerline Conducted Photographs



Section 4. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.225(a)
TESTED BY: David Light	DATE: 31 January 2006

Minimum Standard:

(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.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209

Test Results: Complies.

Measurement Data: See attached. The carrier measured 42.7 dB μ V/m at 3 meters. This is 81.3 dB below the specification limit of 124 dB μ V/m.

Procedure ANSI C63.4-2003**Maximizing Emission Levels:**

For hand held equipment or equipment that may be mounted in a variety of positions, the E.U.T. was tested on three orthogonal axis to determine orientation of worst-case emission levels. Below 30 MHz an active loop antenna is used at a fixed height of 1 meter. The loop is rotated about it's vertical axis to obtain worst-case results.

Spectrum Searched:

The spectrum was searched from the lowest frequency generated in the E.U.T. up to 1000 MHz, or the 10th harmonic of the fundamental emission.

Near-Field Measurement:

Emissions below 30 MHz are measured in the near-field and an extrapolation factor of 40 dB per decade is used to determine the 3m limit.

Example: Measurement Distance = 3m
 Specification Distance = 30m

3m Limit: Specified limit (at 30m) - (40 Log $\frac{3}{30}$)

Thus for measurement at 3m the specified limit is increased by 40 dB.

EUT: RFID**Test Data - Radiated Emissions**

<u>Radiated Emissions</u>								
Page <u>1</u> of <u>2</u>								
Job No.:	6L0033	Date: 4/24/2006						
Specification:	15.225	Temperature(°C): <u>20</u>						
Tested By:	David Light	Relative Humidity(%) <u>40</u>						
E.U.T.:	RFID Reader							
Configuration:	Tx							
Sample Number:	<u>1</u>							
Location:	AC 3	RBW: <u>10</u> kHz						
Detector Type:	Peak	VBW: <u>10</u> kHz						
<u>Test Equipment Used</u>								
Antenna:	<u>1140</u>	Directional Coupler: <u>#N/A</u>						
Pre-Amp:	<u>#N/A</u>	Cable #1: <u>1484</u>						
Filter:	<u>#N/A</u>	Cable #2: <u>1485</u>						
Receiver:	<u>1464</u>	Cable #3: <u>#N/A</u>						
Attenuator #1	<u>#N/A</u>	Cable #4: <u>#N/A</u>						
Attenuator #2:	<u>#N/A</u>	Mixer: <u>#N/A</u>						
Measurement Uncertainty: <u>+- 3.6</u> dB								
Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector / Polarity
13.560	17.3	4.7	1.0	0.0	23.0	124		
13.560	30.6	4.7	1.0	0.0	36.3	124		
13.560	37.0	4.7	1.0	0.0	42.7	124		
13.560	28.7	4.7	1.0	0.0	34.4	124		
								Searched 9 kHz-30 MHz

Supply voltage was varied from 102 Vac to 138 Vac with no effect on output power.

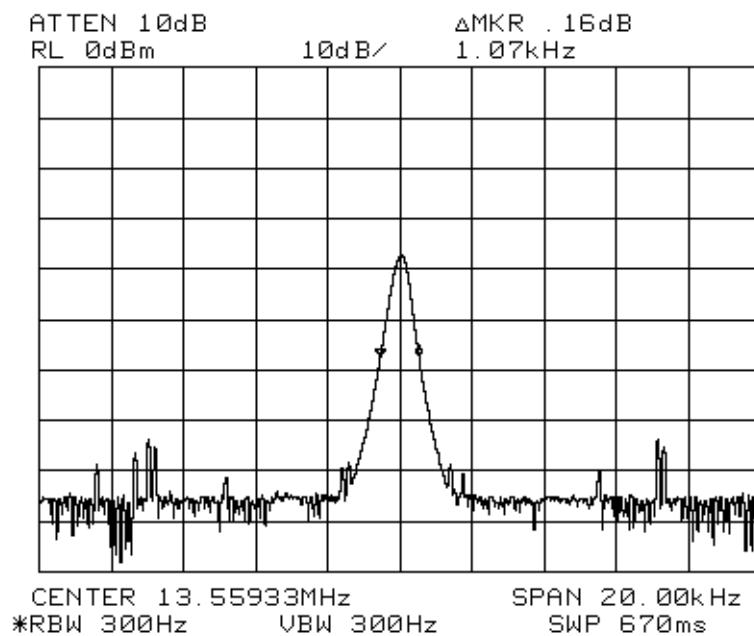
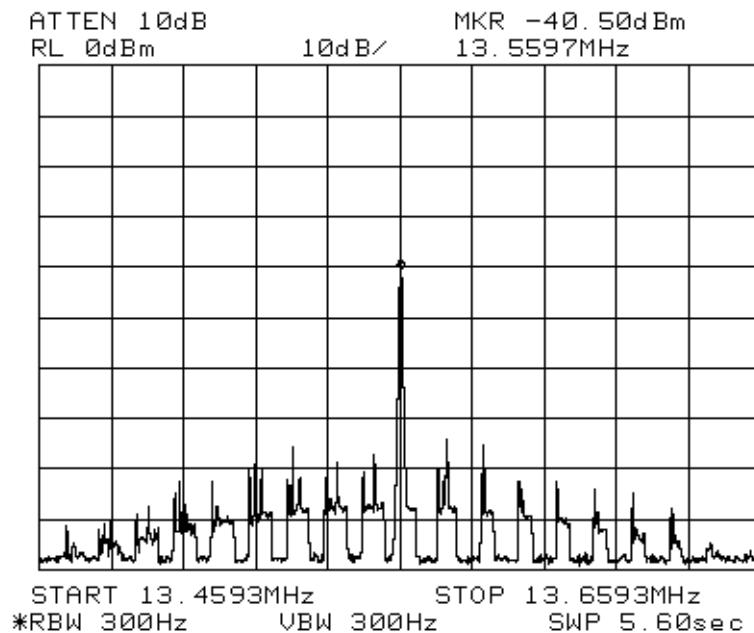
EUT: RFID**Radiated Emissions Data**Complete X
Preliminary _____Job # : 6L0033
Page 1Test # : REHE-02
of 1

Client Name : Metro Automation, Inc.
 EUT Name : RFID
 EUT Model # : RFID
 EUT Part # : None
 EUT Serial # : None
 EUT Config. : Reading tag and passing data via Ethernet and RS-232 ports

Specification : CFR47 Part 15, Subpart C Reference : _____

Loop Ant. #:	Temp. (deg. C) :	<u>22</u>	Date :	<u>01/31/06</u>
Bicon Ant.#:	Humidity (%) :	<u>45</u>	Time :	<u>1:00</u>
Log Ant.#:	EUT Voltage :	<u>120</u>	Staff :	<u>D. Light</u>
Bilog Ant.#:	EUT Frequency :	<u>60</u>	Photo ID:	<u></u>
Dipole Ant.#:	Phase:	<u>1-Jan</u>	Peak Bandwidth:	<u>100 KHz</u>
Cable#:	Location:	<u>A OATS</u>	Video Bandwidth	<u>100 KHz</u>
Preamp#:	Distance:	<u>3</u>		
Limiter#:				
Detector 1#:				
Detector 2#:				

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.	QP readings Comment
34	V	0	46	12.5	1.3	24.9	34.9	40.0	-5.1	Pass	
108.48	V	0	47	12.4	2.4	24.7	37.1	43.5	-6.4	Pass	
161.86	V	0	41	13.5	2.7	24.6	32.6	43.5	-10.9	Pass	
135.6	V	0	47	11.7	2.7	24.6	36.8	43.5	-6.7	Pass	
398.8	V	0	42.6	15.7	4.4	24.4	38.3	46.0	-7.7	Pass	
108.48	H	0	48	12.4	2.4	24.7	38.1	43.5	-5.4	Pass	
398.8	H	0	42.7	15.7	4.4	24.4	38.4	46.0	-7.6	Pass	
											Searched spectrum from
											30 MHz to 1000 MHz

EUT: RFID**Bandwidth Plots**

EUT: RFID

Radiated Photographs



Section 5. Frequency Error

NAME OF TEST: Frequency Error	PARA. NO.: 15.225(e)
TESTED BY: David Light	DATE: 02 February 2006

Minimum Standard: +/- 0.01% (1356 Hz)

Test Results: Complies. The maximum frequency error was 700 Hz (0.005%)

Test Equipment Used: 1036-283-619

Method of Measurement:Frequency Stability With Voltage Variation

The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied from -20 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured.

EUT: RFID**Section 6. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1983	CABLE	KTL Site A OATS	N/A	12/12/05	12/12/06
1479	Bi Conical Antenna 20-330 Mhz	A. H. Systems SAS-200/540	496	04/29/05	04/29/06
1311	ANTENNA, LOG PERIODIC	EMCO 3146	1753	08/02/05	08/02/06
791	PREAMP, 25dB	ICC LNA25	398	11/12/05	11/12/06
716	Receiver	Polarad ESH2	879342/005	02/01/05	02/01/06
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	CNR	NA
619	THERMOMETER	FLUKE 51	4520028	09/26/05	09/26/06
1258	LISN .15mhz-30mhz	EMCO 0	1305	09/17/05	09/17/06
1547	CABLE .6m	KTL RG223	N/A	06/09/05	06/09/06
1555	Filter high pass 5KHz	Solar Electronics 7930-5.0	933125	04/20/05	04/20/06
1534	CABLE, 9M	KTL RG223	NA	08/10/05	08/10/06
1140	ACTIVE LOOP ANTENNA	A.H. SYSTEMS SAS-200/562B	213	03/09/06	03/09/08

Nemko USA, Inc.

FCC PART 15, SUBPART C

PARAGRAPH 15.225

Test Report No.: 6L0033RUS1

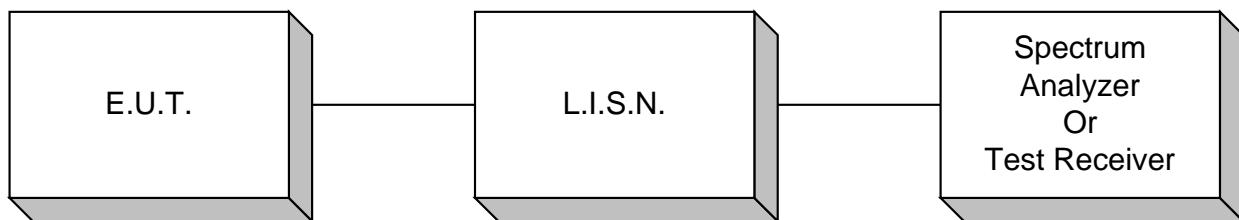
EUT: RFID

ANNEX A

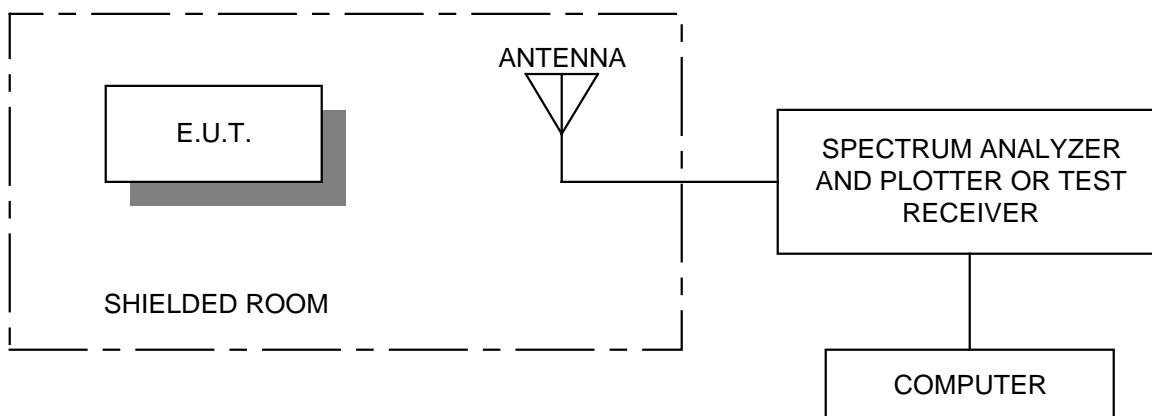
TEST DIAGRAMS

EUT: RFID

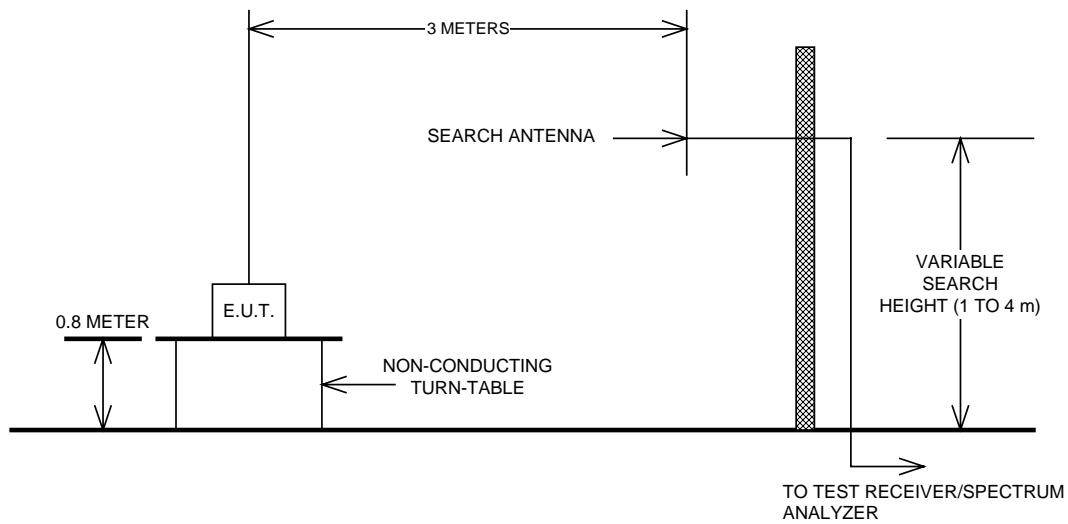
Conducted Emissions



Radiated Prescan



Test Site For Radiated Emissions



Frequency Error

