

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

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EUT: RFID

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.

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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:

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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



No



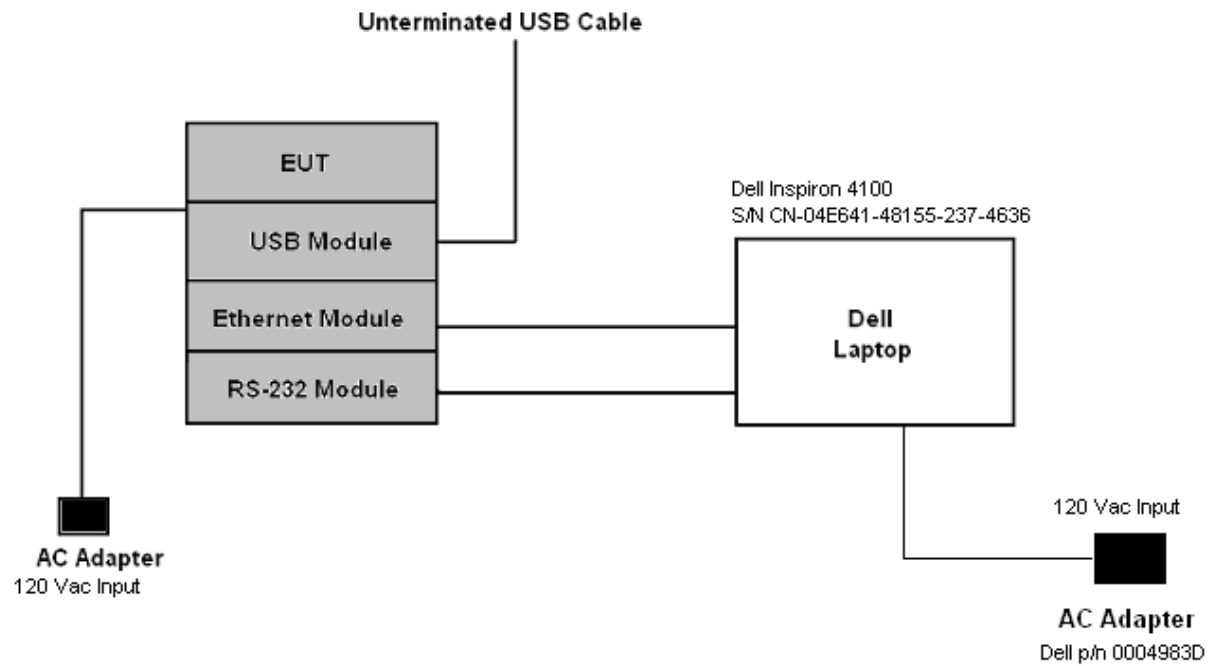
Modifications Made During Testing

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.



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System Diagram



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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 (dBuV)	Average Limits (dBuV)
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)

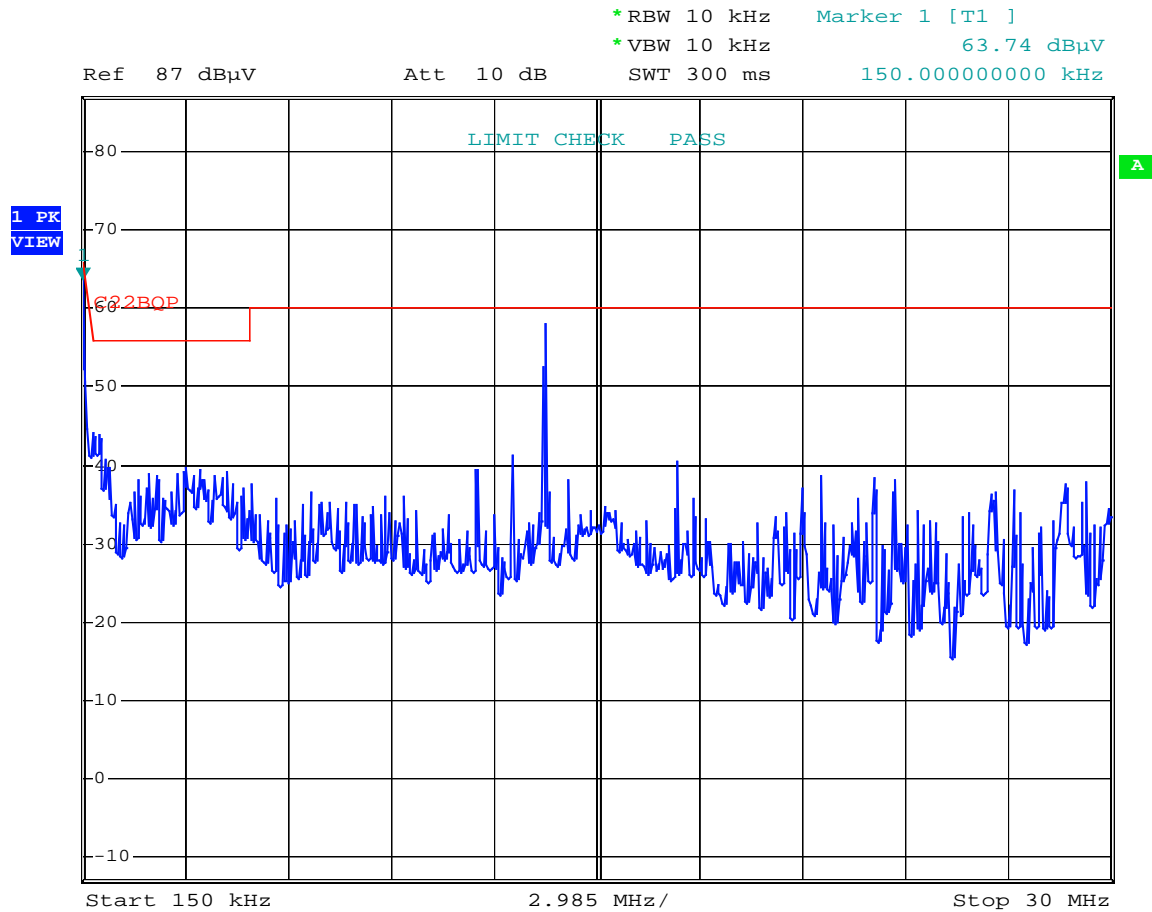
Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak Detector. Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak Detector.

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

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Test Data – Powerline Conducted Emissions

Hot Lead - Peak

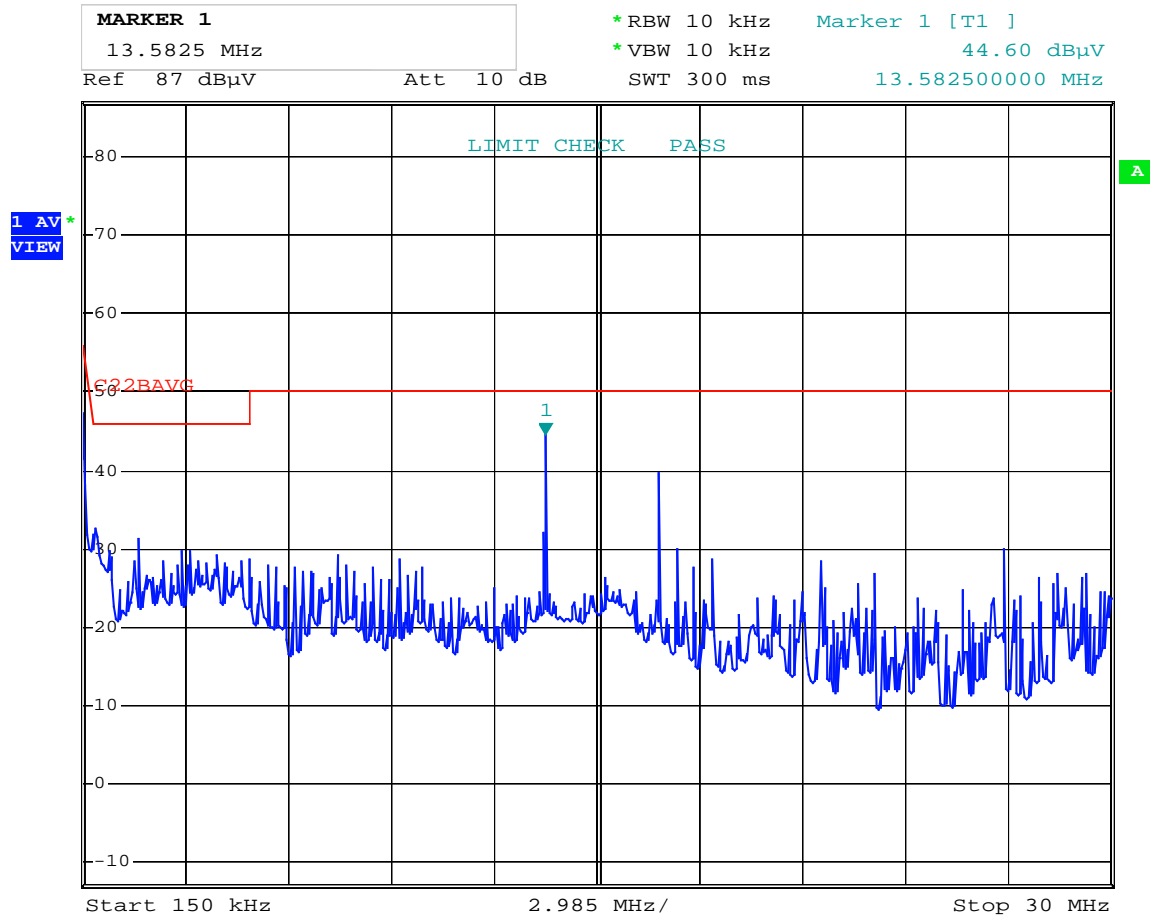


Comment: Quasi Peak

Date: 1.FEB.2006 15:07:02

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

Hot Lead - Average

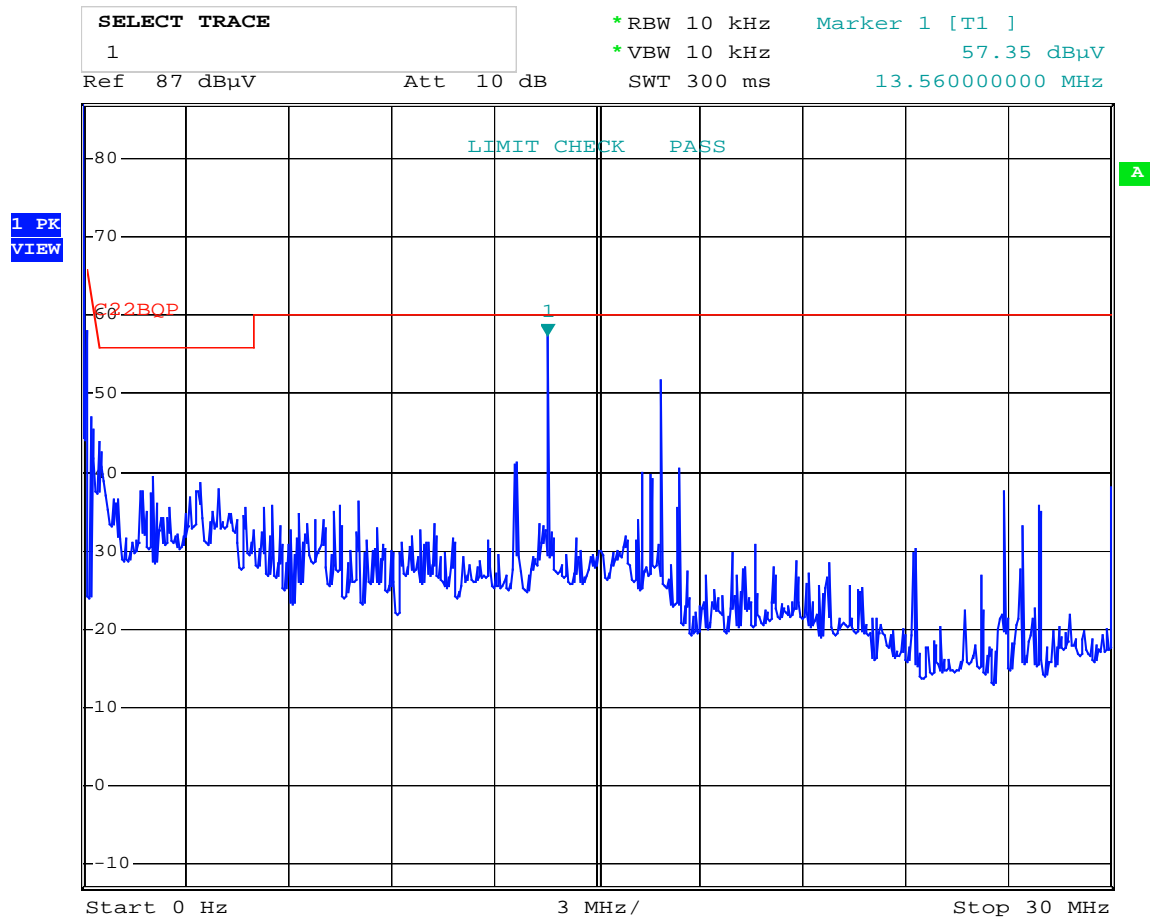


Comment: Quasi Peak

Date: 1.FEB.2006 15:08:16

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

Neutral Lead - Peak



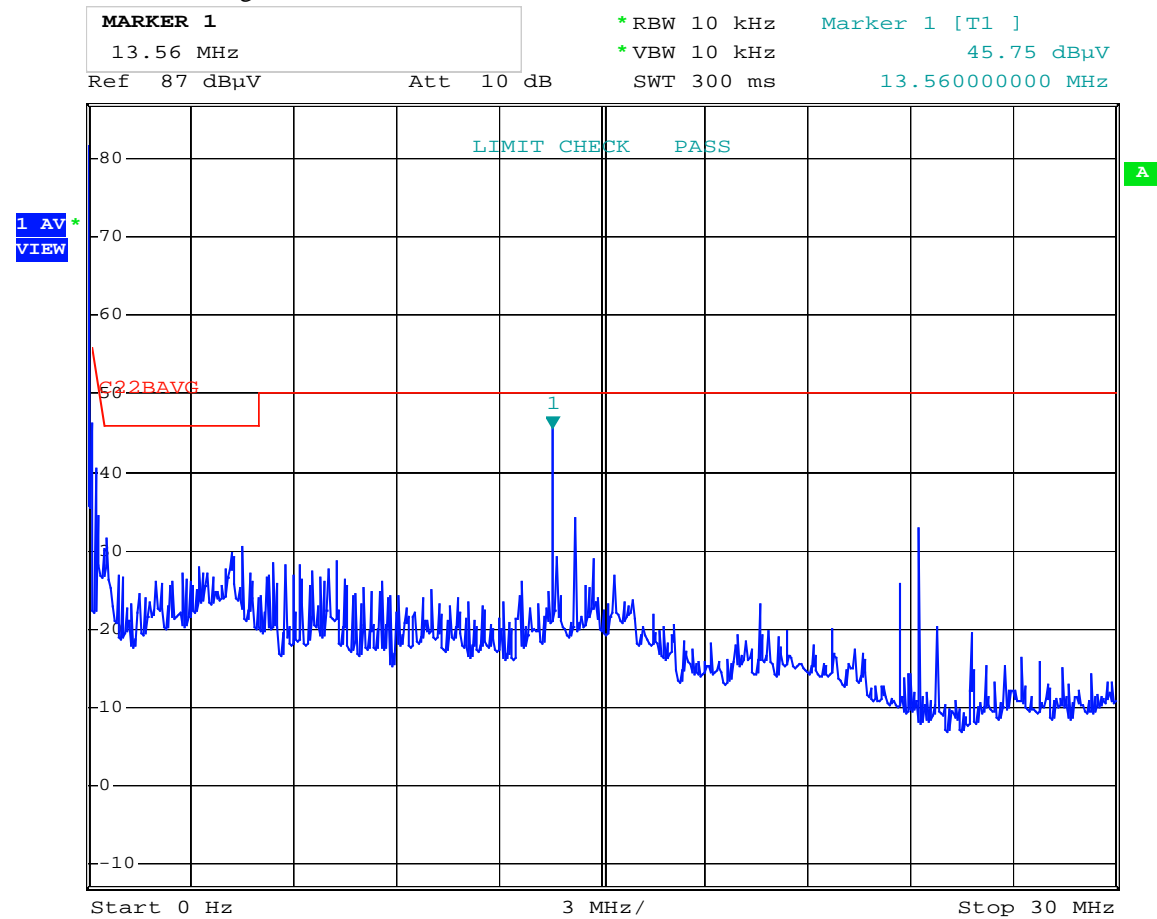
Comment: Quasi Peak

Date: 1.FEB.2006 15:11:24

EUT: RFID

Test Data – Powerline Conducted Emissions

Neutral Lead - Average

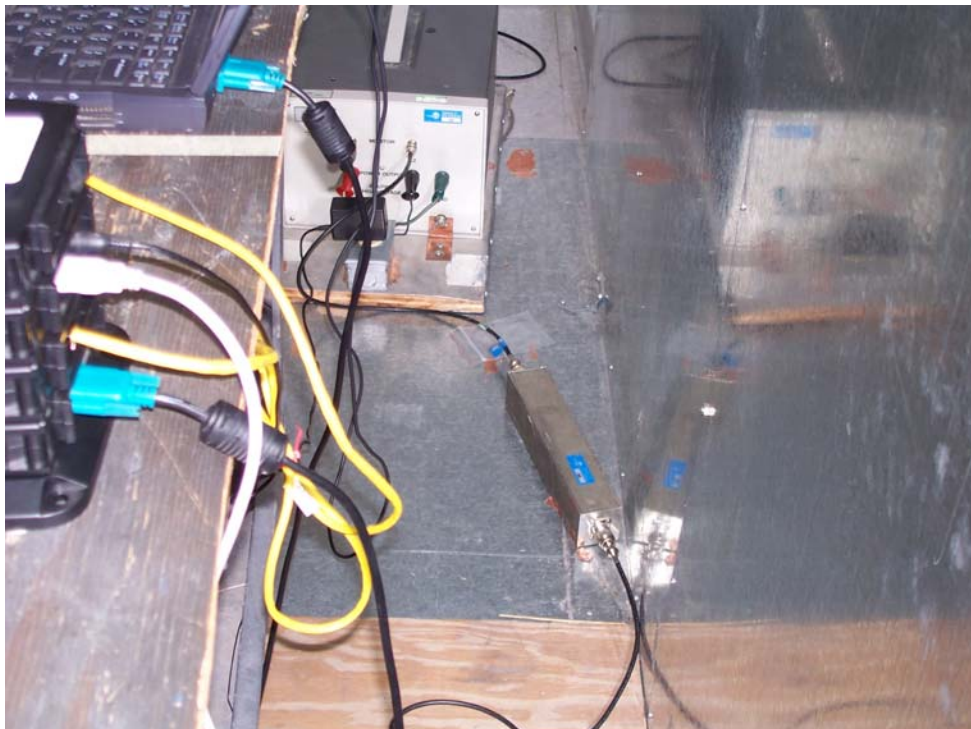


Comment: Quasi Peak

Date: 1.FEB.2006 15:10:18

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Powerline Conducted Photographs



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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 dBμV/m at 3 meters. This is 81.3 dB below the specification limit of 124 dBμV/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) - $(40 \text{ Log } \frac{3}{30})$

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

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

Page <u>1</u> of <u>2</u>		<u>Radiated Emissions</u>	
Job No.:	610033	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 kHz</u>
Detector Type:	Peak	VBW:	<u>10 kHz</u>
<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 dB</u>			

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.

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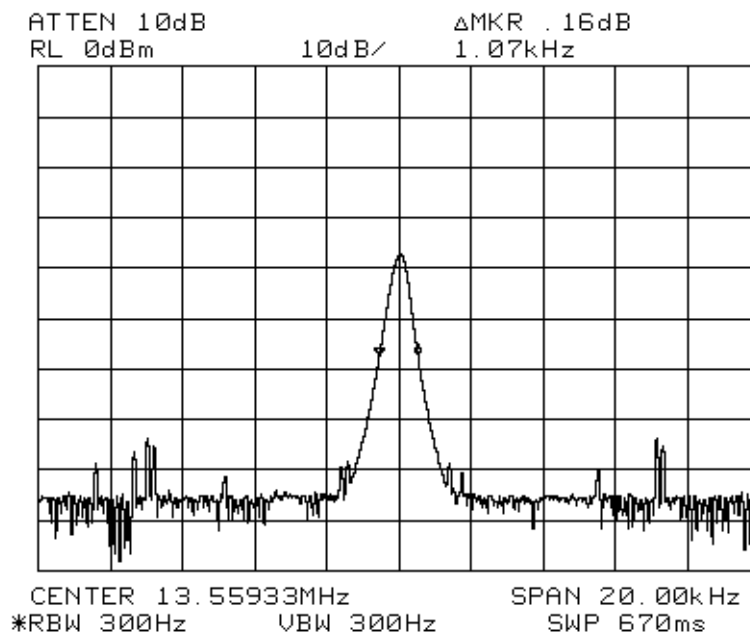
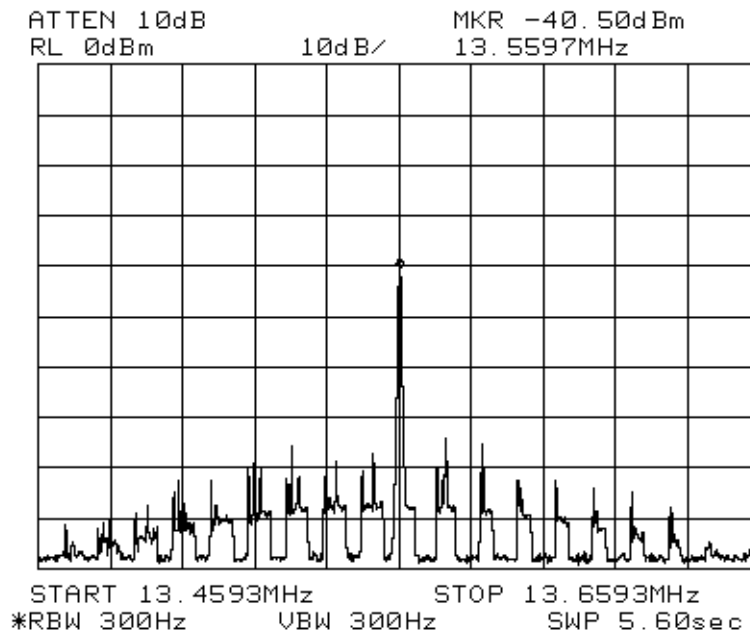
Radiated Emissions Data											
Complete	<u> X </u>			Job # : <u>6L0033</u>	Test # : <u>REHE-02</u>						
Preliminary				Page <u> 1 </u>	of <u> 1 </u>						
Client Name : <u>Metro Automation, Inc.</u>											
EUT Name : <u>RFID</u>											
EUT Model # : <u>RFID</u>											
EUT Part # : <u>None</u>											
EUT Serial # : <u>None</u>											
EUT Config. : <u>Reading tag and passing data via Ethernet and RS-232 ports</u>											
Specification : <u>CFR47 Part 15, Subpart C</u>											
Reference :											
Loop Ant. #:		Temp. (deg. C) :	<u>22</u>	Date :	<u>01/31/06</u>						
Bicon Ant. #:	<u>1479</u>	Humidity (%) :	<u>45</u>	Time :	<u>1:00</u>						
Log Ant. #:	<u>1311</u>	EUT Voltage :	<u>120</u>	Staff :	<u>D. Light</u>						
Bilog Ant. #:		EUT Frequency :	<u>60</u>	Photo ID:							
Dipole Ant. #:		Phase:	<u>1-Jan</u>	Peak Bandwidth:	<u>100 KHz</u>						
Cable#:	<u>1983</u>	Location:	<u>A OATS</u>	Video Bandwidth	<u>100 KHz</u>						
Preamp#:	<u>791</u>	Distance:	<u>3</u>								
Limiter#:	<u>na</u>										
Detector 1#:	<u>716</u>										
Detector 2#:	<u>1036</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.	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

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EUT: RFID

Bandwidth Plots



EUT: RFID

Radiated Photographs



EUT: RFID

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.

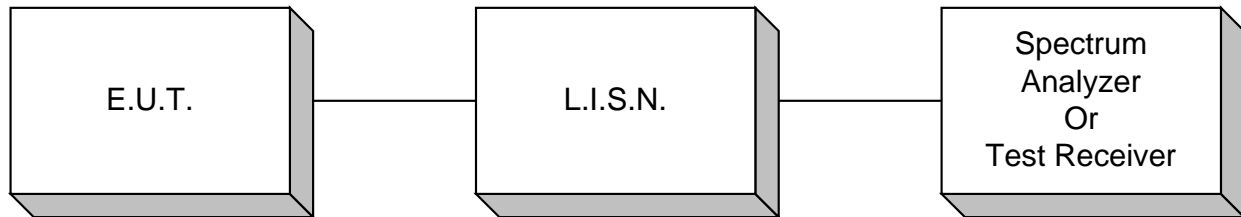
*EUT: RFID***Section 6. Test Equipment List**

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	Polorad 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

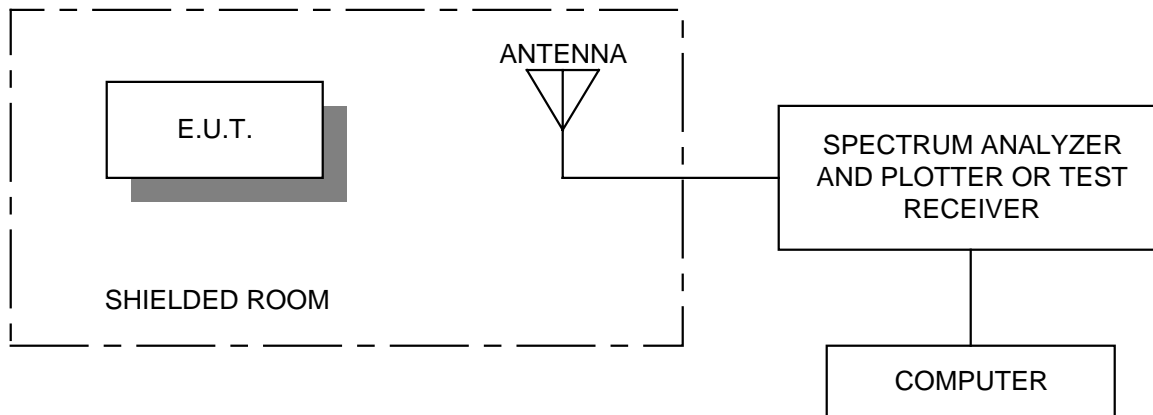
ANNEX A
TEST DIAGRAMS

EUT: RFID

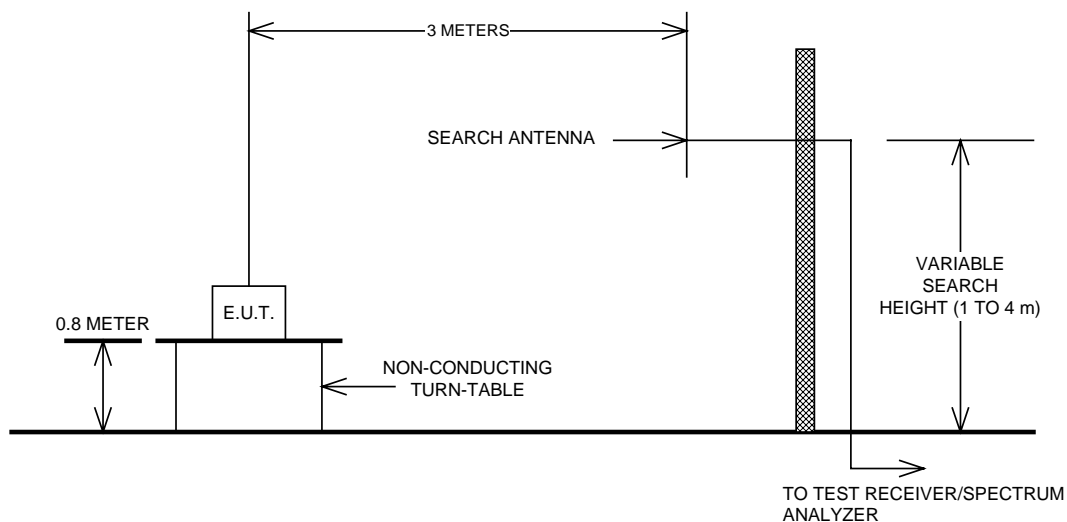
Conducted Emissions



Radiated Prescan



Test Site For Radiated Emissions



EUT: RFID

Frequency Error

