



Nemko Test Report: 6L0297RUS1rev1

Applicant: Sirit, Inc.
1321 Valwood Parkway
Carrollton, TX 75006

Equipment Under Test: IDentity MaX Reader-013
(E.U.T.)

In Accordance With: **FCC Part 15, Subpart C, 15.247**
Frequency Hopping Transmitters

Tested By: Nemko USA Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

TESTED BY: 

David Light, Senior Wireless Engineer

DATE: 02 November 2006

APPROVED BY: 

Kevin Rose Wireless Engineer

DATE: 02 November 2006

Total Number of Pages: 41

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Section 1. Summary of Test Results

Manufacturer: Sirit, Inc.

Model No.: Identity Max Reader-013

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 Part 15, Subpart C, Paragraph 15.247 for Frequency Hopping Spread Spectrum devices. 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.

- | | | | |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission | <input type="checkbox"/> | Production Unit |
| <input type="checkbox"/> | Class II Permissive Change | <input checked="" type="checkbox"/> | 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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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207(a)	Complies
Channel Separation	15.247(a)(1)	Complies
Time of Occupancy	15.247(a)(1)	Complies
20 dB Occupied Bandwidth	15.247(a)(1)	Complies
Peak Power Output	15.247(b)	Complies
Spurious Emissions (Antenna Conducted)	15.247(d)	Complies
Spurious Emissions (Radiated)	15.247(d)	Complies

Footnotes:

Section 2. Equipment Under Test (E.U.T.)**General Equipment Information**

Frequency Band: 902 – 928 MHz
 2400 – 2483.5 MHz
 5725 – 5850 MHz

Operating Frequency Range: 902.793 to 927.293

Number of Channels: 50

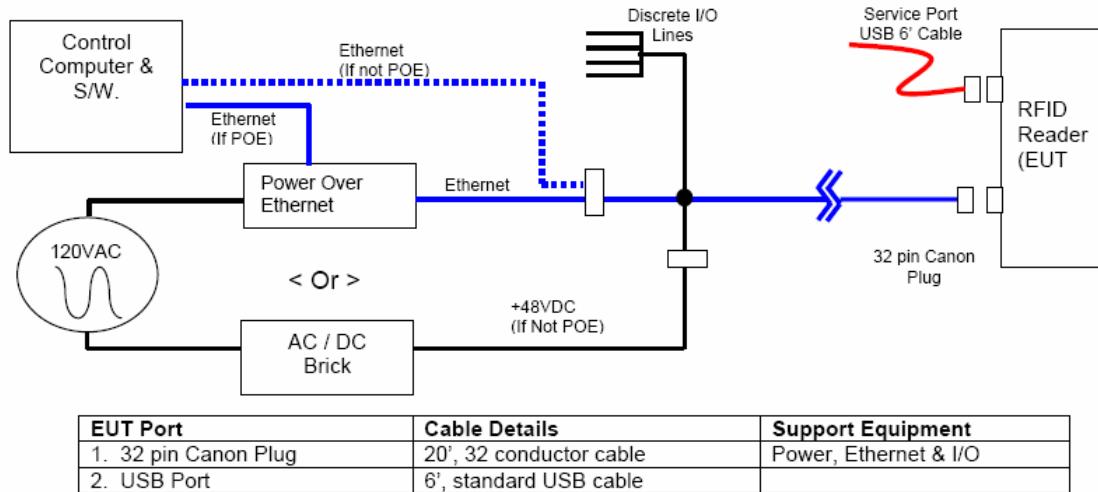
Channel Spacing: 500 kHz

User Frequency Adjustment: Software controlled

Description of EUT

The IDentity MaX reader is an RFID device capable of reading EPC Class 0, Class 1 and Class 1 Gen 2 RFID tags, and processing the data for a gated access type application. Generally, the reader is configured, upon installation, to work with specific inputs and outputs to interface with customer systems including access panels, gates and visual indicators. All system configurations are accomplished using either a PC based application or a web based user interface.

System Diagram



Power Supplies:

- 1) POE: Phihong Model PSA16U-480(POE)
- 2) AC/DC: I.T.E. Model PW118

Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: David Light	DATE: 31 Oct 2006

Test Results: Complies. The worst case emission was 55.9 dB μ V at 0.150 MHz. This is 0.1 dB below the average specification limit of 56 dB μ V. This was a peak measurement.

Test Data: Refer to attached plots

Equipment Used: 1114-1325-704-1258-1663-674

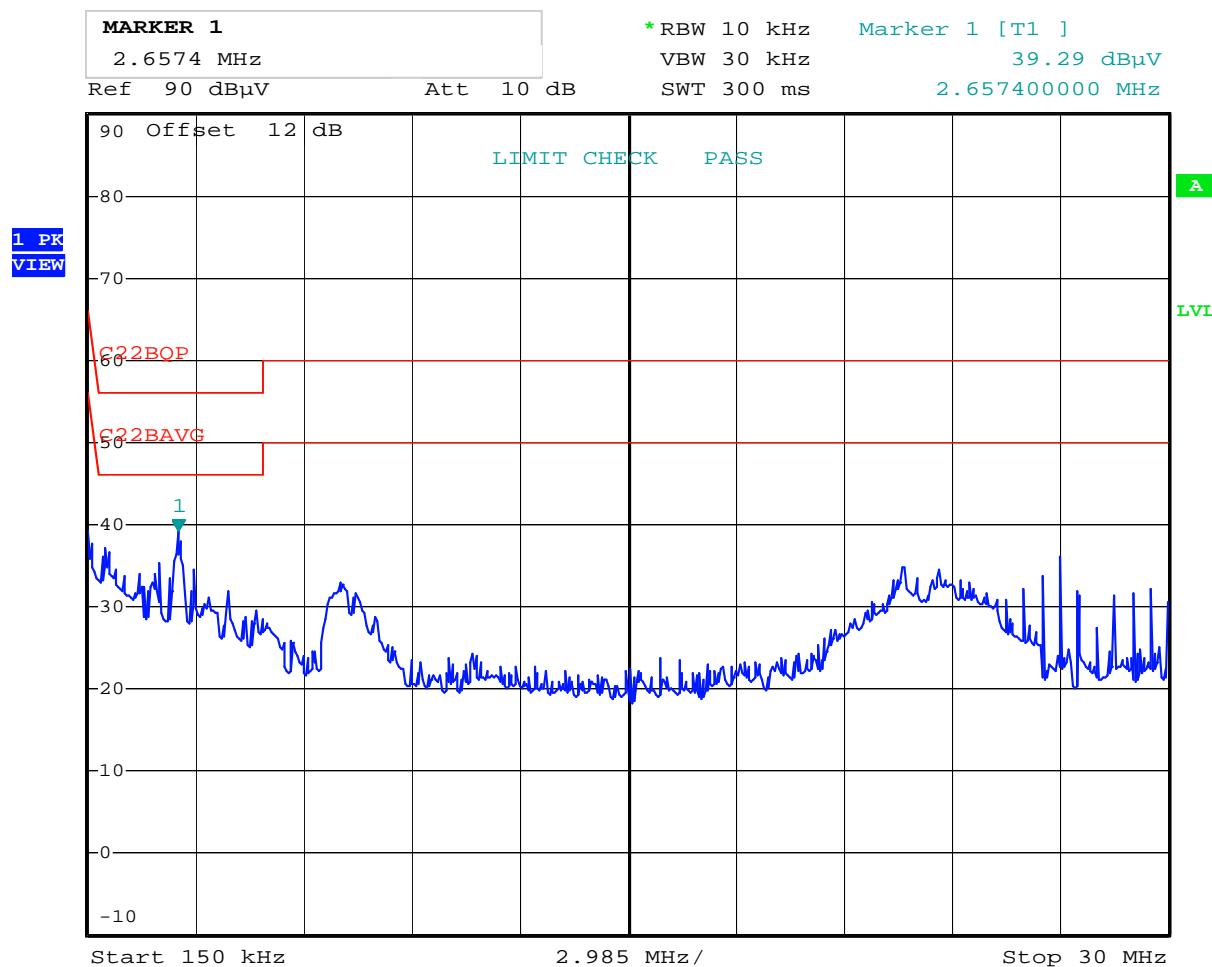
Measurement Uncertainty: +/- 1.7 dB

Temperature: 21 °C

Relative Humidity: 35 %

Test Data – Powerline Conducted Emissions

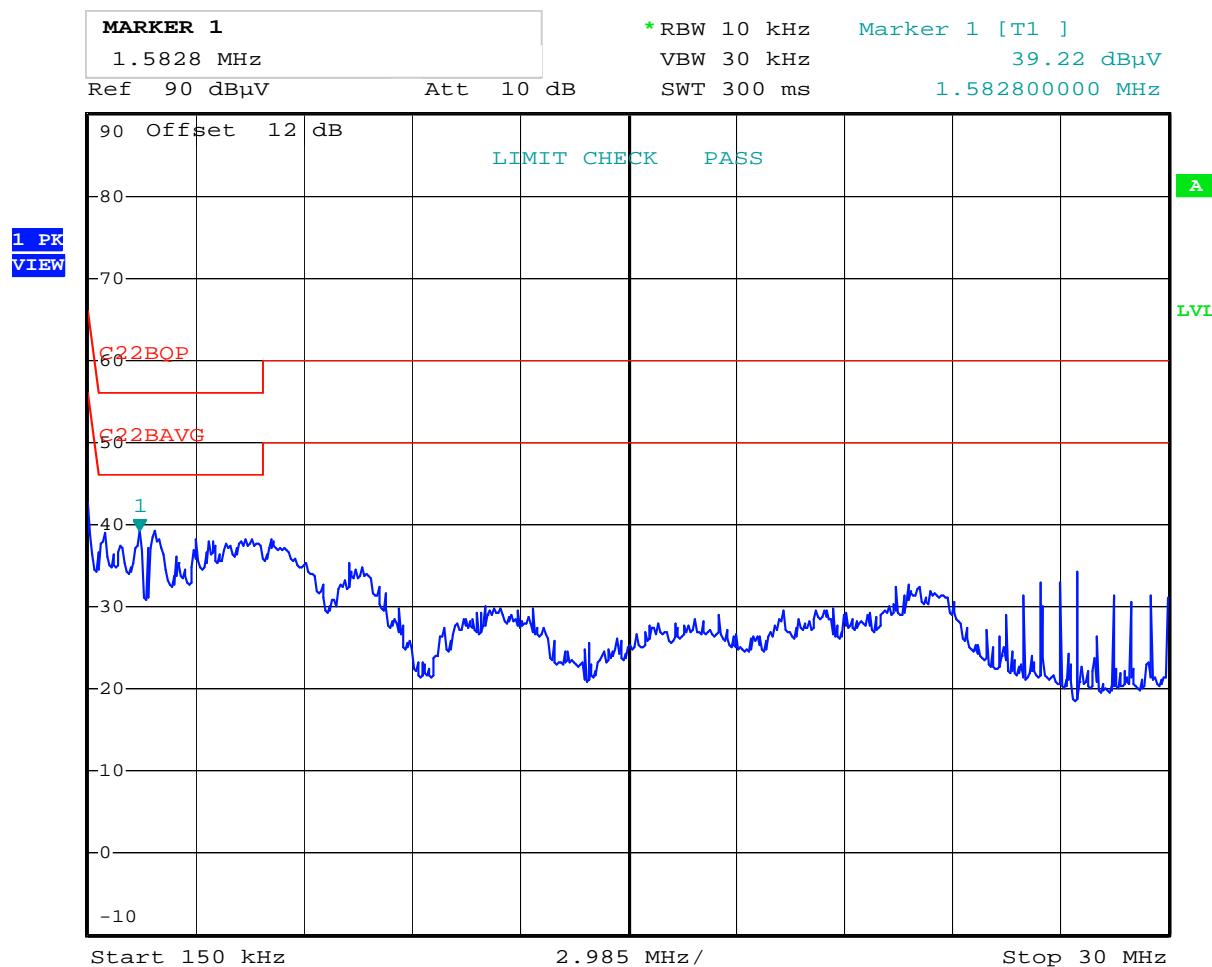
L1 – Wall Wart



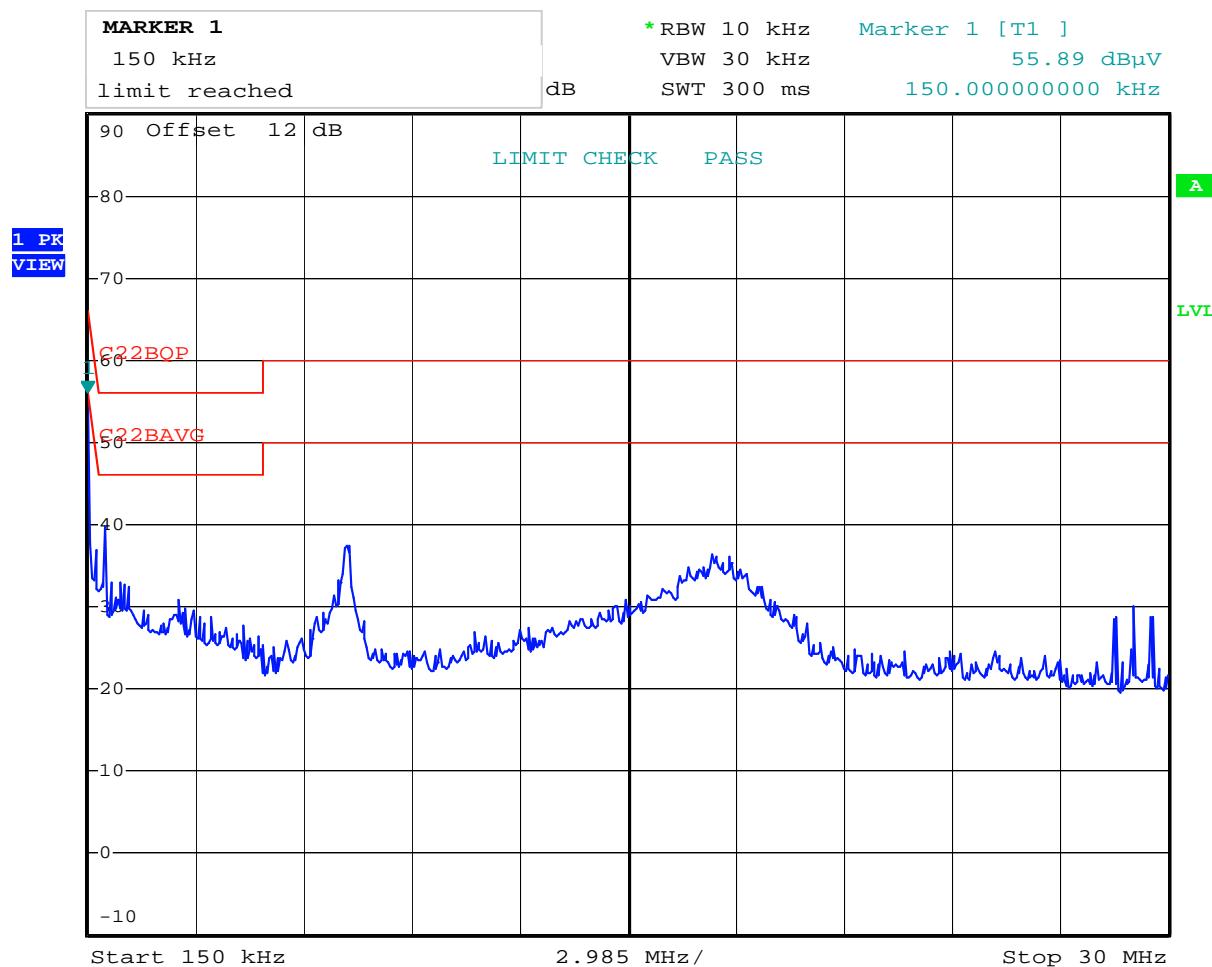
Date: 31.OCT.2006 11:35:07

Test Data – Powerline Conducted Emissions

L2 – Wall Wart



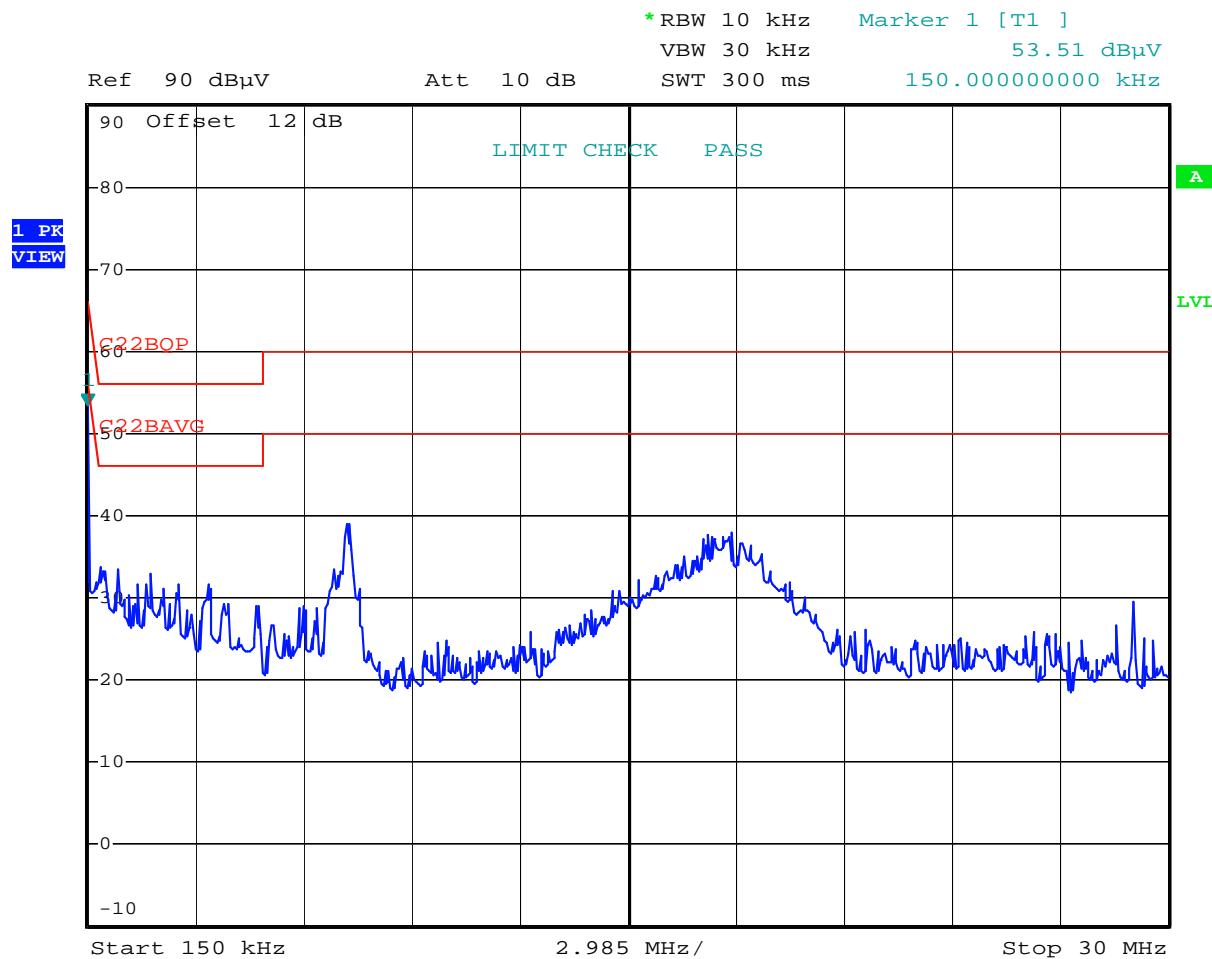
Date: 31.OCT.2006 11:32:58

Test Data – Powerline Conducted Emissions**L1 – Ethernet Adapter**

Date: 31.OCT.2006 11:47:33

Test Data – Powerline Conducted Emissions

L2 – Ethernet Adapter



Date: 31.OCT.2006 11:50:12

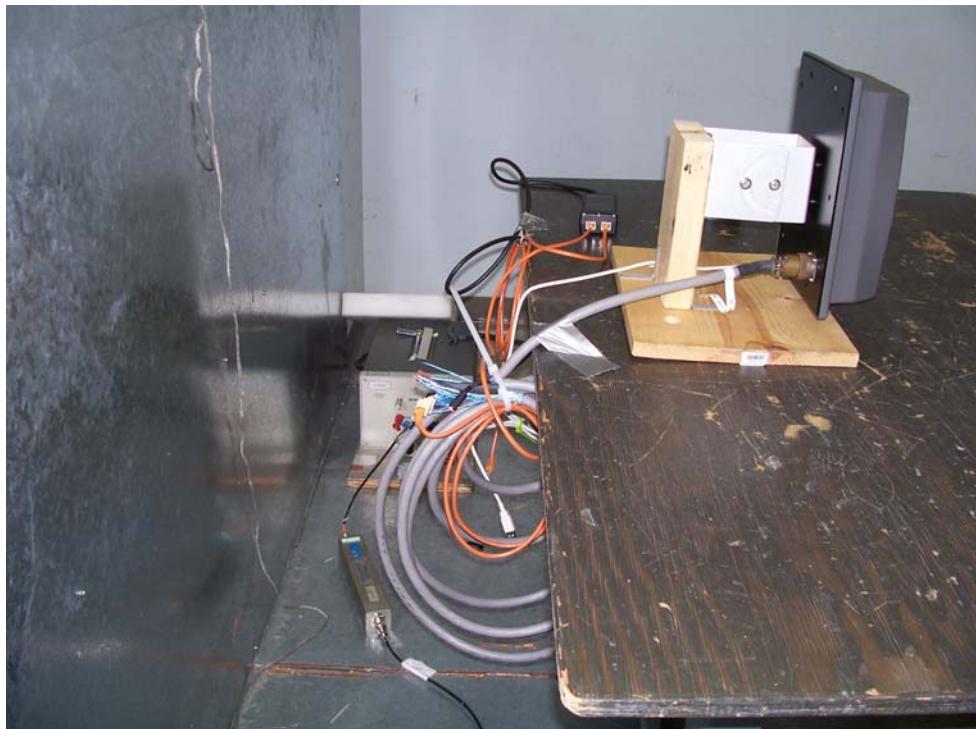
Test Setup Photos – Powerline Conducted Emissions

Wall Wart



Test Setup Photos – Powerline Conducted Emissions

Ethernet Adapter



Section 4. Channel Separation

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE: 31 Oct 2006

Test Results: Complies.**Measurement Data:** See 20 dB BW plot
Measured 20 dB bandwidth: 212 kHz Max
Channel Separation: 500 kHz**Equipment Used:** 1464-1484-1485-993**Measurement Uncertainty:** 1X10⁻⁷ppm**Temperature:** 21 °C**Relative Humidity:** 35 %

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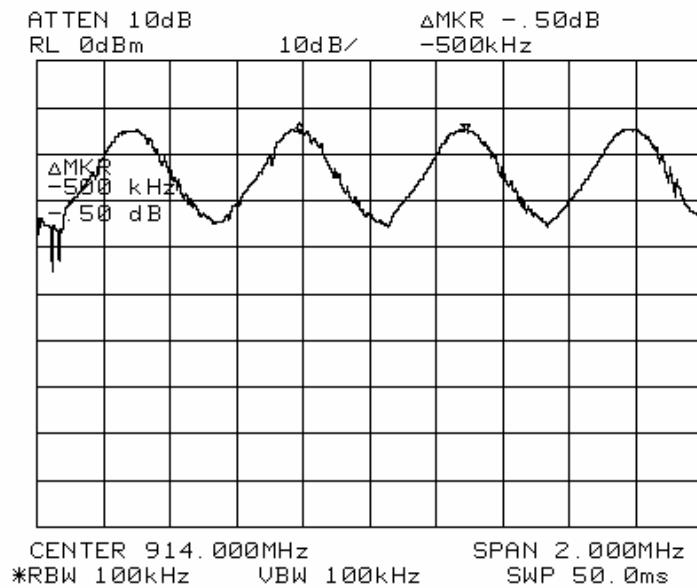
FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: Identity Max Reader-013

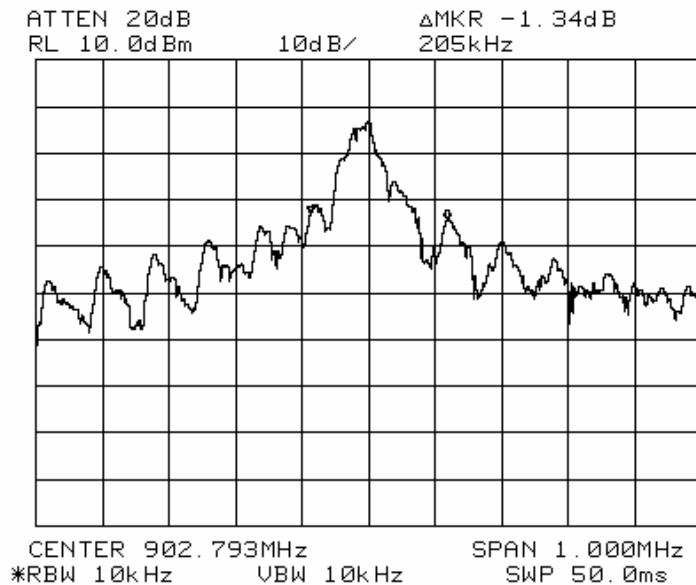
PROJECT NO.:6L0297RUS1rev1

Test Data – Channel Separation

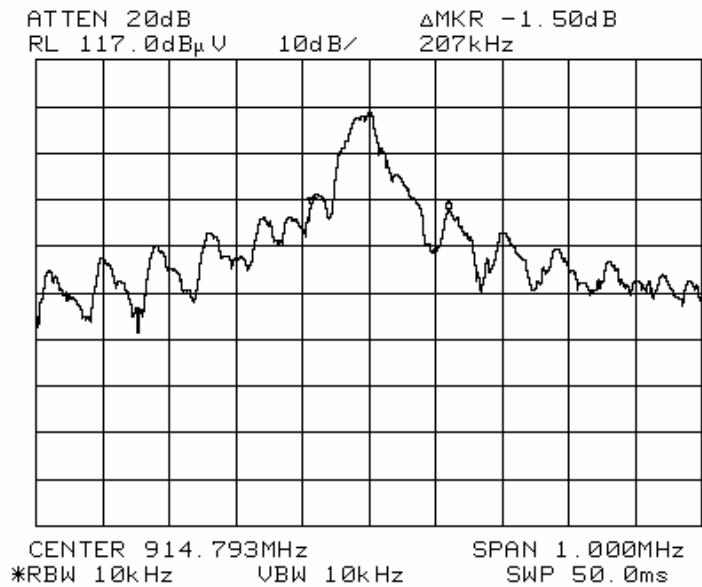


Test Data – 20 dB Bandwidth

Low Channel

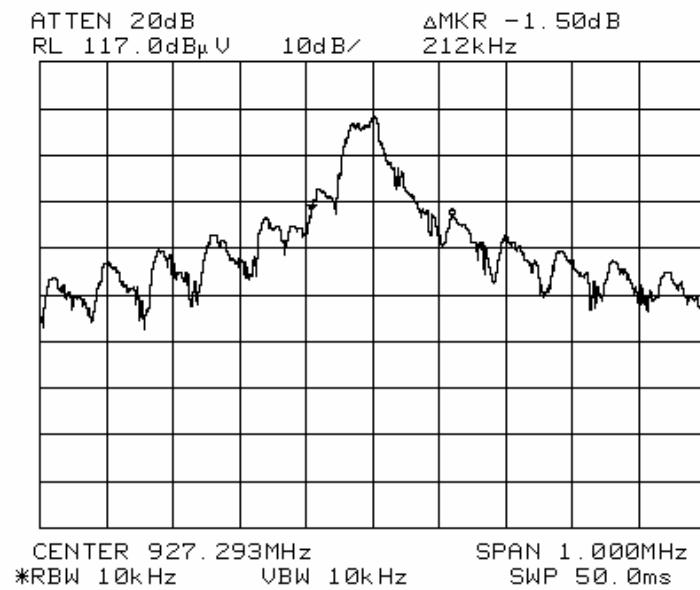


Mid Channel



Test Data – 20 dB Bandwidth

High Channel



Section 5. Time of Occupancy

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
TESTED BY: David Light	DATE: 31 Oct 2006

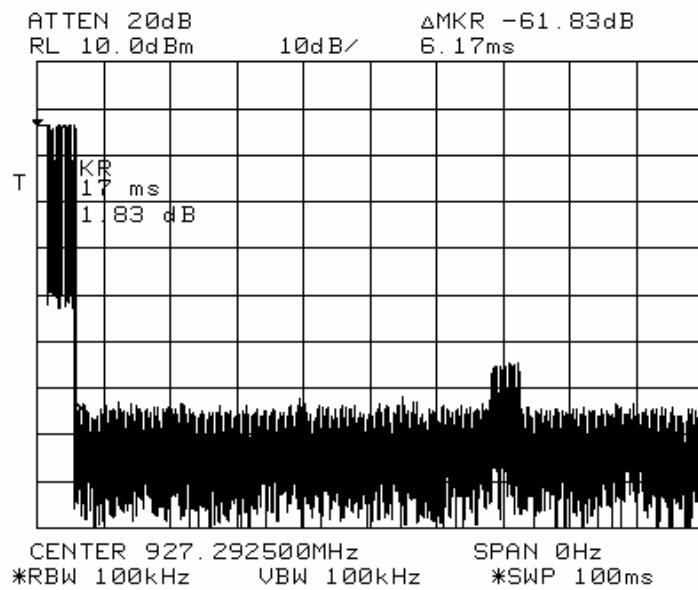
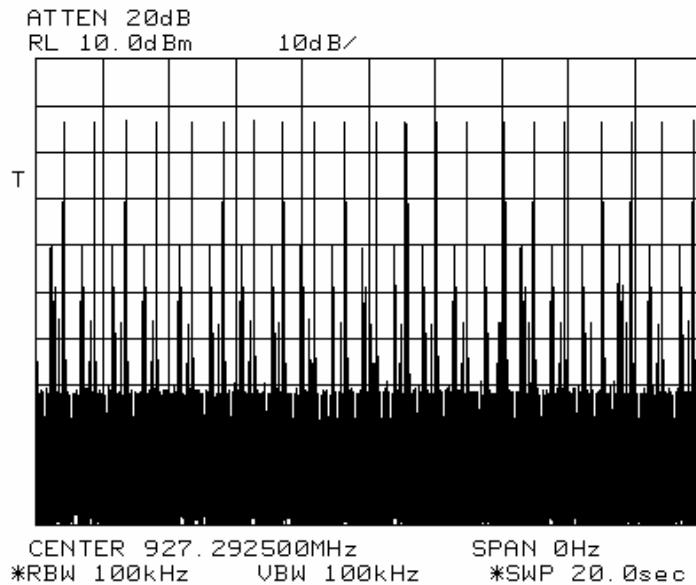
Test Results: Complies.**Measurement Data:**

Maximum Dwell Time On Any Channel: 130 mS in 20 seconds
Number of Hopping Channels: 50

Equipment Used: 1464-1484-1485-993**Measurement Uncertainty:** 1X10⁻⁷ppm**Temperature:** 21 °C**Relative Humidity:** 35 %

Test Data – Time of Occupancy

Pulse Width = 6.17 mS

Duty cycle correction = $20 \log (6.17/100) = -24.2 \text{ dB}$ Time of Occupancy in 20 seconds = $21 \times 6.17 = 129.6 \text{ mS}$ 

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FCC PART 15, SUBPART C

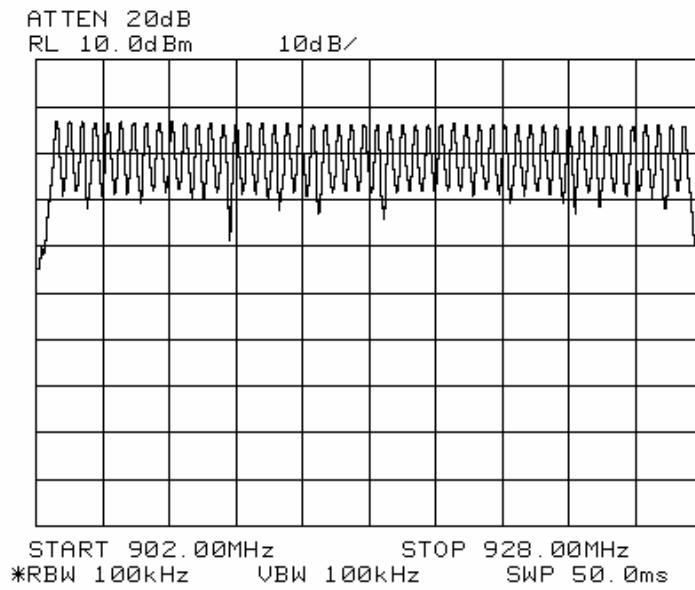
FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: Identity Max Reader-013

PROJECT NO.:6L0297RUS1rev1

Test Data – Time of Occupancy

Number of hopping channels = 50



Section 6. Peak Power Output

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
TESTED BY: David Light	DATE: 31 Oct 2006

Test Results: Complies.**Measurement Data:** Detachable antenna? Yes No
If yes, state the type of non-standard connector used:

Frequency (MHz)	Peak Power (dBm)	Peak Power (W)	Antenna Type	Gain (dBi)	E.I.R.P. (dBm)	E.I.R.P. (W)
902.3	29.57	0.906	Circular polarized	5.27	34.84	3.05
914.7	29.73	0.940	Circular polarized	5.27	35.00	3.16
927.7	29.90	0.977	Circular polarized	5.27	35.17	3.29
Maximum EIRP (W): 3.16						

RBW=VBW=1 MHz

- This device was tested at +/- 15% input power per 15.31(e), with no variation in output power.
- For battery powered equipment, the device was tested with a fresh battery per 15.31(e).
- The device was tested on three channels per 15.31(l).
- This test was performed radiated.

Equipment Used: 1464-1083-1472-1469**Measurement Uncertainty:** 1.7 dB**Temperature:** 21 °C**Relative Humidity:** 35 %

Section 7. Spurious Emissions (Antenna Conducted)

NAME OF TEST: Spurious Emissions (Antenna Conducted)	PARA. NO.: 15.247(d)
TESTED BY: David Light	DATE: 31 Oct 2006

Test Results: Complies.

Measurement Data: There were no emissions detected within 20 dB of the specification limit of -20 dBc. Bandedge data presented. See attached plots.

Equipment Used: 1464-1484-1485-993

Measurement Uncertainty: 1X10⁻⁷ppm

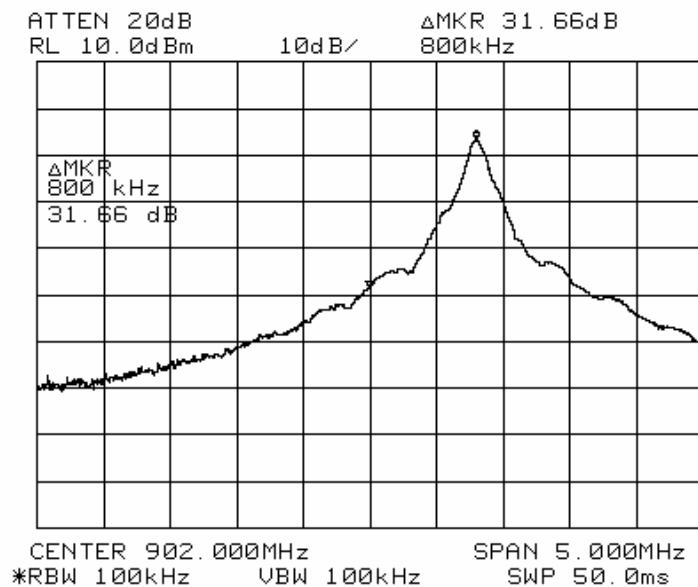
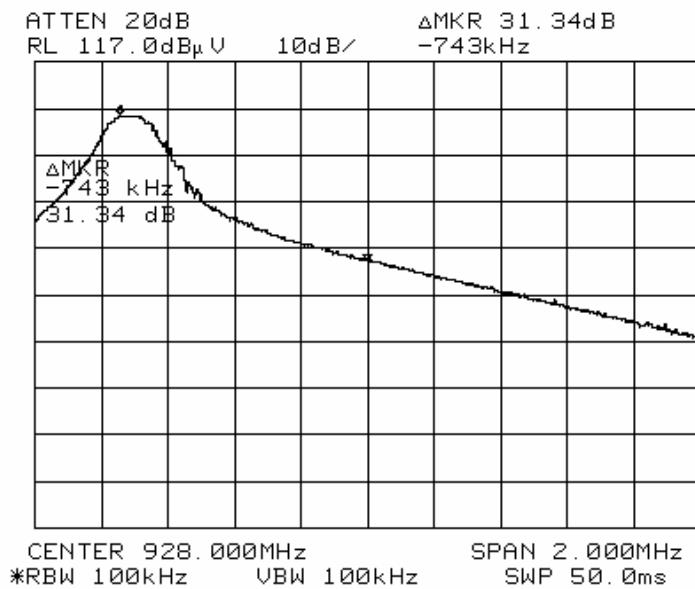
Temperature: 21 °C

Relative Humidity: 35 %

Spectrum Analyzer Settings: RBW=VBW=100 kHz

The device was tested on three channels per 15.31(l).

The spectrum was searched from 30 MHz to the 10th harmonic of the highest carrier frequency.

Test Data – Spurious Emissions at Antenna Terminals**Lower Band Edge****Upper Band Edge**

Section 8. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(d)
TESTED BY: David Light	DATE: 31 Oct 2006

Test Results: Complies. The worst case emission was 63.6 dB μ V/m at 2744.4 MHz. This is 10.4 dB below the peak specification limit of 74 dB μ V/m.

Measurement Data: See attached table.

Duty Cycle Calculation:

Duty Cycle correction factor (dB) = $20 \log (rf_{ON} \text{ in ms}/100\text{ms})$

Duty cycle correction = $20 \log (6.17/100) = -24.1 \text{ dB}$

Notes:

- For handheld devices, the EUT was tested on three orthogonal axis'
- The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33
- The device was tested on three channels per 15.31(l).
- All emissions within 20 dB of the specification limit are reported per 15.31(o).

Equipment Used: 1195-759-1514-678-1663-1464-1484-1485-1016-993

Measurement Uncertainty: +/-3.6 dB

Temperature: 21 °C

Relative Humidity: 35 %

Test Data - Radiated Emissions

Low Channel

Measurement Data:			Reading listed by order taken.			Test Distance:			3 Meters		
#	Freq MHz	Rdng dB μ V	Cable Duty dB	Cable dB	Pre-A dB	Horn dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
5	4513.953 Peak	50.8 +0.0	+1.0 +0.0	+3.1	-31.6	+32.1	+0.0	55.4	74.0	-18.6	Vert
6	4513.953 Average	50.8 -24.1	+1.0 -24.1	+3.1	-31.6	+32.1	+0.0	31.3	54.0	-22.7	Vert
7	5416.744 Peak	49.8 +0.0	+1.2 +0.0	+3.5	-31.9	+33.6	+0.0	56.2	74.0	-17.8	Vert
8	5416.744 Average	49.8 -24.1	+1.2 -24.1	+3.5	-31.9	+33.6	+0.0	32.1	54.0	-21.9	Vert
11	7222.323 Peak	46.5 +0.0	+1.2 +0.0	+3.9	-32.1	+35.8	+0.0	55.3	74.0	-18.7	Vert
12	7222.323 Average	46.5 -24.1	+1.2 -24.1	+3.9	-32.1	+35.8	+0.0	31.2	54.0	-22.8	Vert
13	8125.113 Peak	45.2 +0.0	+1.4 +0.0	+4.3	-33.6	+37.5	+0.0	54.8	74.0	-19.2	Vert
14	8125.113 Average	45.2 -24.1	+1.4 -24.1	+4.3	-33.6	+37.5	+0.0	30.7	54.0	-23.3	Vert
17	2708.373 Peak	61.7 +0.0	+0.8 +0.0	+2.8	-32.7	+29.3	+0.0	61.9	74.0	-12.1	Horiz
18	2708.373 Average	61.7 -24.1	+0.8 -24.1	+2.8	-32.7	+29.3	+0.0	37.8	54.0	-16.2	Horiz
21	4513.953 Peak	54.8 +0.0	+1.0 +0.0	+3.1	-31.6	+32.1	+0.0	59.4	74.0	-14.6	Horiz
22	4513.953 Average	54.8 -24.1	+1.0 -24.1	+3.1	-31.6	+32.1	+0.0	35.3	54.0	-18.7	Horiz
23	5416.744 Peak	51.7 +0.0	+1.2 +0.0	+3.5	-31.9	+33.6	+0.0	58.1	74.0	-15.9	Horiz
24	5416.744 Average	51.7 -24.1	+1.2 -24.1	+3.5	-31.9	+33.6	+0.0	34.0	54.0	-20.0	Horiz
25	6319.534 Peak	44.8 +0.0	+1.3 +0.0	+3.9	-30.7	+34.9	+0.0	54.2	74.0	-19.8	Horiz
26	6319.534 Average	44.8 -24.1	+1.3 -24.1	+3.9	-30.7	+34.9	+0.0	30.1	54.0	-23.9	Horiz
27	7222.323 Peak	46.5 +0.0	+1.2 +0.0	+3.9	-32.1	+35.8	+0.0	55.3	74.0	-18.7	Horiz
28	7222.323 Average	46.5 -24.1	+1.2 -24.1	+3.9	-32.1	+35.8	+0.0	31.2	54.0	-22.8	Horiz
29	8125.113 Peak	44.7 +0.0	+1.4 +0.0	+4.3	-33.6	+37.5	+0.0	54.3	74.0	-19.7	Horiz
30	8125.113 Average	44.7 -24.1	+1.4 -24.1	+4.3	-33.6	+37.5	+0.0	30.2	54.0	-23.8	Horiz

Analyzer Settings:

Below 1000 MHz: RBW=VBW=100 kHz

Above 1000 MHz: RBW=VBW=1 MHz

Test Data - Radiated Emissions

Mid Channel

Measurement Data:			Reading listed by order taken.		Test Distance:			3 Meters			
#	Freq MHz	Rdng dB μ V	Cable Duty dB	Cable dB	Pre-A dB	Horn dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	2744.378 Peak	63.2	+0.8 +0.0	+2.9	-32.7	+29.4	+0.0	63.6	74.0	-10.4	Horiz
2	2744.378 Average	63.2	+0.8 -24.1	+2.9	-32.7	+29.4	+0.0	39.5	54.0	-14.5	Horiz
5	4573.963 Peak	55.2	+1.0 +0.0	+3.1	-31.8	+32.3	+0.0	59.8	74.0	-14.2	Horiz
6	4573.963 Average	55.2	+1.0 -24.1	+3.1	-31.8	+32.3	+0.0	35.7	54.0	-18.3	Horiz
7	5488.755 Peak	50.3	+1.2 +0.0	+3.5	-31.9	+33.6	+0.0	56.7	74.0	-17.3	Horiz
8	5488.755 Average	50.3	+1.2 -24.1	+3.5	-31.9	+33.6	+0.0	32.6	54.0	-21.4	Horiz
11	7318.340 Peak	46.8	+1.2 +0.0	+4.0	-32.3	+35.8	+0.0	55.5	74.0	-18.5	Horiz
12	7318.340 Average	46.8	+1.2 -24.1	+4.0	-32.3	+35.8	+0.0	31.4	54.0	-22.6	Horiz
17	2744.378 Peak	55.5	+0.8 +0.0	+2.9	-32.7	+29.4	+0.0	55.9	74.0	-18.1	Vert
18	2744.378 Average	55.5	+0.8 -24.1	+2.9	-32.7	+29.4	+0.0	31.8	54.0	-22.2	Vert
21	4573.963 Peak	49.5	+1.0 +0.0	+3.1	-31.8	+32.3	+0.0	54.1	74.0	-19.9	Vert
22	4573.963 Average	49.5	+1.0 -24.1	+3.1	-31.8	+32.3	+0.0	30.0	54.0	-24.0	Vert
27	7318.340 Peak	47.0	+1.2 +0.0	+4.0	-32.3	+35.8	+0.0	55.7	74.0	-18.3	Vert

Analyzer Settings:

Below 1000 MHz: RBW=VBW=100 kHz

Above 1000 MHz: RBW=VBW=1 MHz

Test Data - Radiated Emissions

High Channel

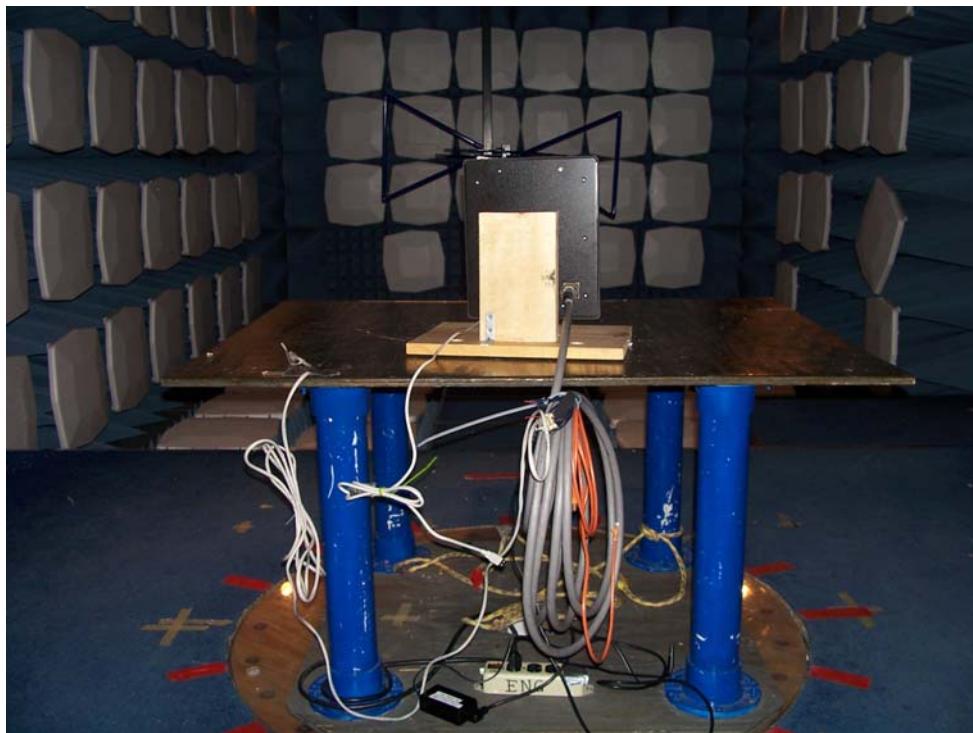
Measurement Data:			Reading listed by order taken.					Test Distance:			3 Meters	
#	Freq MHz	Rdng dB μ V	Cable Duty dB	Cable dB	Pre-A dB	Horn dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant	
1	2781.877 Peak	54.3 +0.0	+0.8 +0.0	+2.9	-32.7	+29.4	+0.0	54.7	74.0	-19.3	Vert	
2	2781.877 Average	54.3 -24.1	+0.8 -24.1	+2.9	-32.7	+29.4	+0.0	30.6	54.0	-23.4	Vert	
5	4636.462 Peak	50.2 +0.0	+1.0 +0.0	+3.2	-32.1	+32.5	+0.0	54.8	74.0	-19.2	Vert	
6	4636.462 Average	50.2 -24.1	+1.0 -24.1	+3.2	-32.1	+32.5	+0.0	30.7	54.0	-23.3	Vert	
11	7418.340 Peak	46.8 +0.0	+1.2 +0.0	+4.1	-32.5	+35.9	+0.0	55.5	74.0	-18.5	Vert	
12	7418.340 Average	46.8 -24.1	+1.2 -24.1	+4.1	-32.5	+35.9	+0.0	31.4	54.0	-22.6	Vert	
13	8345.632 Peak	45.2 +0.0	+1.2 +0.0	+4.4	-33.5	+37.1	+0.0	54.4	74.0	-19.6	Vert	
14	8345.632 Average	45.2 -24.1	+1.2 -24.1	+4.4	-33.5	+37.1	+0.0	30.3	54.0	-23.7	Vert	
17	2781.877 Peak	63.2 +0.0	+0.8 +0.0	+2.9	-32.7	+29.4	+0.0	63.6	74.0	-10.4	Horiz	
18	2781.877 Average	63.2 -24.1	+0.8 -24.1	+2.9	-32.7	+29.4	+0.0	39.5	54.0	-14.5	Horiz	
21	4636.462 Peak	53.7 +0.0	+1.0 +0.0	+3.2	-32.1	+32.5	+0.0	58.3	74.0	-15.7	Horiz	
22	4636.462 Average	53.7 -24.1	+1.0 -24.1	+3.2	-32.1	+32.5	+0.0	34.2	54.0	-19.8	Horiz	
23	5563.755 Peak	48.3 +0.0	+1.2 +0.0	+3.5	-31.8	+33.7	+0.0	54.9	74.0	-19.1	Horiz	
24	5563.755 Average	48.3 -24.1	+1.2 -24.1	+3.5	-31.8	+33.7	+0.0	30.8	54.0	-23.2	Horiz	
27	7418.340 Peak	49.0 +0.0	+1.2 +0.0	+4.1	-32.5	+35.9	+0.0	57.7	74.0	-16.3	Horiz	
28	7418.340 Average	49.0 -24.1	+1.2 -24.1	+4.1	-32.5	+35.9	+0.0	33.6	54.0	-20.4	Horiz	

Analyzer Settings:

Below 1000 MHz: RBW=VBW=100 kHz

Above 1000 MHz: RBW=VBW=1 MHz

Radiated Photographs



Section 9. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1114	CABLE, 7m	Nemko USA, Inc. RG223	N/A	08/22/06	08/22/07
1325	CABLE, .5m	Nemko USA, Inc. RG223	N/A	04/20/06	04/20/07
704	FILTER, HIGH PASS, 5 KHz	SOLAR 7930-5.0	933126	04/20/06	04/20/07
1258	LISN .15mhz-30mhz	EMCO 0	1305	04/19/06	04/19/07
1663	Spectrum Analyzer	Rhode & Schwarz FSP	973351	05/18/06	05/18/07
674	LIMITER	HP 11947A	3107A02200	04/19/06	04/19/07
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
1484	Cable	Storm PR90-010-072	N/A	10/02/06	10/02/07
1485	Cable	Storm PR90-010-216	N/A	10/02/06	10/02/07
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/01/05	08/02/07
1083	Cable 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1195	ANTENNA,BICONICAL	A.H. SYSTEMS SAS-200/542	235	02/10/06	02/10/07
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	02/13/06	02/13/07
1514	CABLE ASSY, LAB 2- B OATS	Nemko USA, Inc. SITE B OATS	N/A	06/08/06	06/08/07
678	PREAMP	Nemko USA, Inc. 30MHZ-1.4GHZ	408	10/03/06	10/03/07
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	04/20/06	04/20/07

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FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: Identity Max Reader-013

PROJECT NO.:6L0297RUS1rev1

ANNEX A - TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
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Minimum Standard: §15.207 Conducted limits.

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Conducted Emission (MHz)	Limit (dBmV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as provided in §15.205 and §§15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
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Minimum Standard:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
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Minimum Standard:

Frequency Band (MHz)	20 dB Bandwidth	No. of Hopping Channels	Average Time of Occupancy
902 - 928	>250 kHz	50	=<0.4 sec. in 20 sec.
902 - 928	=<250 kHz	25	=<0.4 sec. in 10 sec.
2400 - 2483.5	-----	75	=<0.4 sec. in 0.4 seconds multiplied by the number of hopping channels employed.
5725 - 5850	-----	75	=<0.4 sec. in 30 sec.

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: 1 MHz

VBW: = RBW

Span: 0 Hz

LOG dB/div.: 10 dB

Sweep: Sufficient to see one hop time sequence.

Trigger: Video

The occupancy time of one hop is measured as above. The average time of occupancy is calculated over the appropriate period of time from above table

Avg. time of occupancy = (period from table/duration of one hop)/no. of channels multiplied by the duration of one hop.

For instance:

If a 2.4 GHz system has a measured hop duration time of 1 msec. and uses 75 channels, then the average time of occupancy would be:

(30 sec./.001 sec.)/75 chan. = 400 x 1 msec. = 400 msec. or 0.4 sec. in 30 sec.

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 15.247(a)(1)

Minimum Standard:

Frequency Band (MHz)	Maximum 20 dB Bandwidth
902 - 928	500 kHz
2400 – 2483.5	Not defined
5725 – 5850	1 MHz

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: At least 1% of span/div.

VBW: >RBW

Span: Sufficient to display 20 dB bandwidth

LOG dB/div.: 10 dB

Sweep: Auto

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247(b)
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Minimum Standard:

Frequency Band (MHz)	No. of Hopping Channels	Maximum Peak Power Output at Antenna Port
902 - 928	at least 50	1 watt
902 – 928	25 - 49	0.25 watts
2400 – 2483.5	75	1 watt
5725 – 5850	75	1 watt

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Calculation Of EIRP For Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

The RBW of the spectrum analyzer shall be set to a value greater than the measured 20 dB occupied bandwidth of the E.U.T.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 15.247(d)
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Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (μ V/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

Method Of Measurement:

30 MHz - 10th harmonic plot

RBW: 100 kHz

VBW: 300 kHz

Sweep: Auto

Display line: -20 dBc

Lower Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz

Marker: Peak of fundamental emission

Marker Δ: Peak of highest spurious level below center frequency.

Upper Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz

Marker: Peak of fundamental emission

Marker Δ: Peak of highest spurious level above center frequency.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Radiated Spurious Emissions

PARA. NO.: 15.247(d)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (μ V/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

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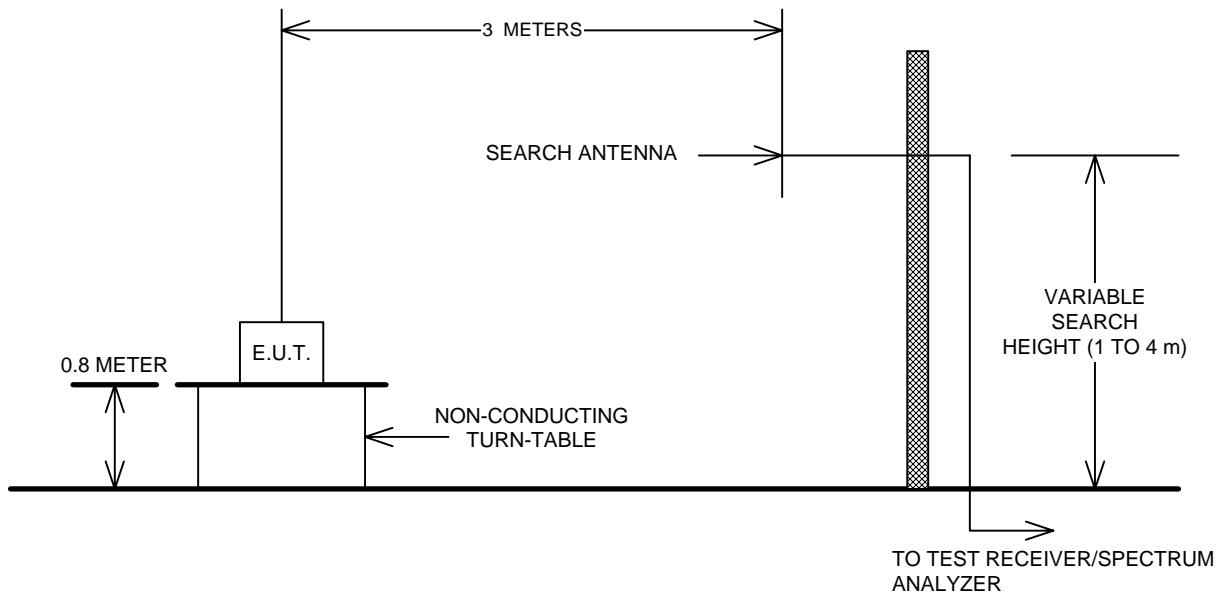
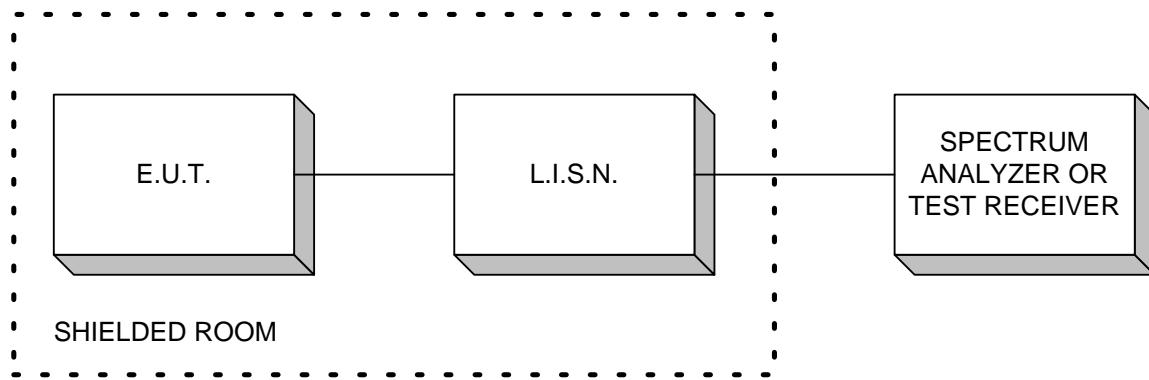
FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSMITTER

EQUIPMENT: Identity Max Reader-013

PROJECT NO.:6L0297RUS1rev1

ANNEX B - TEST DIAGRAMS

Test Site For Radiated Emissions**Conducted Emissions**

Peak Power at Antenna Terminals

