LS Research, LLC
ACCREDITED
Testing Cert. # 1255.01
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ENGINEERING TEST REPORT # 309380
LSR Job #: C-772

Compliance Testing of:
Schlage AD-300
Wired Door Lock with Multi-tech plus keypad

Test Date(s):
December 2nd and 3rd 2009

Prepared For:

Ingersoll-Rand Company
11819 N. Pennsylvania St.
Carmel, IN 46074.

In accordance with:
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.209
Industry Canada (IC)
RSS 210 Annex 2 and section 2.7
General Operating Requirements for Low-Power License-Exempt Transceivers

Test Report Reviewed by: Teresa A. White, Quality Manager Signature: Teresa A. White Date: December 23, 2009	**Approved/Tested by:** Khairul Aidi Zainal, Senior EMC Engineer Signature: Date: December 23, 2009

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EXHIBIT 1. INTRODUCTION

1.1 SCOPE

References:	FCC Part 15, Subpart C, Section 15.209
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Certification Authorization for Low-Power License-Exempt Transmitters.

References:	RSS 210 Annex 2
Title:	Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I equipment.
Purpose of Test:	To gain IC Certification Authorization for Low-Power License-Exempt Transmitters.

References:	RSS GEN
Title:	General requirements and Information for the Certification of Radiocommunication Equipment.
Purpose of Test:	To gain IC Certification Authorization for Low-Power License-Exempt Transmitters.

Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	• Commercial, Industrial or Business • Residential

1.2 NORMATIVE REFERENCES

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2008	Code of Federal Regulations - Telecommunications
RSS 210 Annex 2	2007	Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I equipment.
RSS GEN	2007	General requirements and information for the certification of Radiocommunication Equipment.
ANSI C63.4	2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-1-1	2006-03 A1: 2006-09 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003 A1: 2004-04 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.

1.3 LS Research, LLC TEST FACILITY

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 "General Requirements for the Competence of Calibration and Testing Laboratories".

LS Research, LLC's scope of accreditation includes all test methods listed herein, unless otherwise noted. A copy of the accreditation may be accessed on our web site: www.lsr.com. Accreditation status can be verified at A2LA's web site: www.a2la2.net.

1.4 LOCATION OF TESTING

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Chamber
- Semi-Anechoic Chamber
- Open Area Test Site (OATS)

1.5 TEST EQUIPMENT UTILIZED

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated in accordance with A2LA standards.

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 CLIENT INFORMATION

Manufacturer Name:	**Ingersoll-Rand Company**
Address:	**11819 N. Pennsylvania St.** **Carmel, IN 46074**
Contact Person:	**Sheldon White**
Contact Phone:	317.810.3166
Contact Email:	Sheldon_white@irco.com

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	Schlage AD-300
Model Number:	23507296 (Multi-tech with no keypad) 23507262 (Multi-tech plus keypad)
Serial Number:	N/A

2.3 ASSOCIATED ANTENNA DESCRIPTION

There are two antennas associated with the EUT:

1. The antenna for the 127 kHz transmitter is a loop antenna made from 33 gauge wire. The coil is in series with a 1500pH tuning inductance.
2. The antenna for the 13.56 MHz transmitter is a 2 baluns, 2turn loop antenna terminated to ground and 180° out of phase. The antenna is a PCB trace around the PCB.

2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

Frequency Range (in MHz)	127 kHz/0.127 MHz and 13.56MHz
RF Power in Watts (Near-field measurement at 3 meters)	127 kHz transmitter: operates at very low power and is subject to verification only per 15.201(a). Refer to Ingersoll Rand/LS Research report 309380-PROX. 13.56 MHz transmitter: 0.000845 Watts
Conducted Output Power (in dBm)	Could not be measured for 13.56MHz transmitters.
Field Strength at 3 meters	13.56 MHz transmitter: 64.5 dBuV/m.
Occupied Bandwidth (99% BW)	13.56MHz: 134.7kHz
Type of Modulation	Un-modulated when scanning. AM when reading .
Emission Designator	135KA1D
Transmitter Spurious (worst case) at 3 meters	13.56MHz transmitter: 31.8dBuV/m at 180.3MHz
Microprocessor Model # (if applicable)	PIC24F128GB106.
EUT will be operated under FCC Rule Part(s)	CFR 47 part 15.209
Antenna Information:	
a) Antenna Type	125kHz: Loop antenna made from 33 gauge wire. 13.56MHz: 2 2-turn loop antenna 180° out of phase.
b) Detachable/Non-Detachable	Non-detachable.
c) Antenna Gain (in dBi)	Not available.
Modular Filing	☐ Yes ☒ No
Portable or Mobile?	Mobile

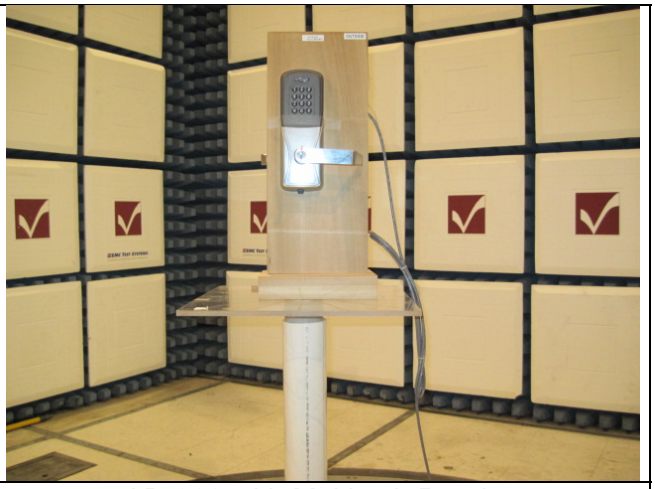
Note:
Since the 127 kHz transmitter (PROX) portion of the device is subject to verification and not certification per CFR 47 Part 15 (Subpart C) section 15.201(a) and CFR 47 Part 2 (Subpart J) section 2.902, this test report contains data pertaining to the 13.56MHz transmitter ONLY. Test results/data for the 127 kHz transmitter (PROX) are contained in a separate report (report number: 309380-PROX) available from the manufacturer or LS Research.

2.5 PRODUCT DESCRIPTION

The Schlage AD-300 is an open architecture product designed to interface with Schlage brand access control panels as well as all other third party panels which use the Schlage RSI RS-485 protocol. When using a third party panel that does not use the Schlage RSI RS-485 protocol, the addition of a PIB300 is required. Normal operation is on-line mode. Information contained in the user credential is passed to an ACP (Access Control Point), which controls lock functions and maintains audit trails of the credential used. The locking function ensures that the inside lever allows egress and outside lever be locked.

The AD-300 can have any one of the following ACPs:

1. Magnetic Stripe reader with keypad.
2. Magnetic stripe reader.
3. Multitech reader (127 kHz and 13.56 MHz) with keypad.
4. Multitech reader (127 kHz and 13.56 MHz).
5. Keypad reader.
6. 127 kHz reader with keypad.
7. 127 kHz reader.

	
ACP:Multitech reader with keypad	AD-300 with Multitech Reader

The Multitech reader has the capability to read ID badges at 127 kHz (PROX) and 13.56 MHz. When ***both*** transmit capability is active the transmitter never transmits at the same time. The Multitech will scan ID cards by transmitting a 127 kHz signal first, and if there is no response it will turn off the 127 kHz and then transmit the 13.56 MHz signal. This process will then repeat.

The Multitech reader comes in two options:

1. With a keypad (as in figure).
2. Without keypad.

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 CLIMATE TEST CONDITIONS

Temperature:	70° Fahrenheit
Humidity:	36%
Pressure:	741 mmHg

3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Paragraph	Test Requirements	Compliance (yes/no)
FCC : 15.107 IC : RSS GEN 7.2.2	Power Line Conducted Emissions Measurements	Yes
IC: RSS GEN 4.6	Occupied Bandwidth	Yes
FCC : 15.109 IC : RSS 210 2.6	Un-Intentional Radiated Emissions	Yes
FCC : 15.209 (a) IC : RSS 210 A2	Maximum RF Output Power	Yes
FCC : 15.209 (c) IC : RSS 210 A2	Maximum RF Spurious Emissions	Yes
FCC : 15.109 & 15.205 IC : RSS 210 A2 and 2.6	Transmitter General Radiated Emissions	Yes
FCC: 15.209 (b)	Band edge requirements	Yes

3.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

☒ **None** ☐ **Yes (explain below)**

3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

☒ **None** ☐ **Yes (explain below)**

EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to **MEET** the requirements as described within the specification of FCC Title 47, CFR Part 15.209, and Industry Canada RSS-210, Issue 7 (2007), Section 2.6 for a Low-Power License-Exempt Transmitters, as well as the specification of FCC Title 47, CFR Part 15.109, and Industry Canada RSS-210, Issue 7 (2007), Section 7 for non-intentional radiators.

If some emissions are seen to be within 3 dB of their respective limits:
As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

EXHIBIT 5. RADIATED EMISSIONS TEST

5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15, RSS GEN and ANSI C63.4. The AD-300 with the Multitech plus keypad badge reader, henceforth referred to as the EUT, was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber.

Testing of the Multitech reader was performed on a reader that includes a keypad since this configuration was deemed to have worse emission characteristics compared to the Multitech reader without keypad. The radio portion of Multitech with keypad reader is exactly the same as that of the Multitech reader with no keypad. The difference lies in the components involving the keypad itself.

For the test, the EUT was set in a configuration where it continuously transmits at 127 kHz and 13.56 MHz separately. This was done by a scanning a setup card (1 time for 127 KHz and 3 times for 13.56 MHz). Its operation was then validated using a card set to work at the selected mode. Initial measurements were performed at 3m separation to identify the emissions below 30MHz and all identified emissions were then re-measured at a 10m separation distance.

5.2 Test Procedure

Radiated RF measurements were performed on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber. The frequency range from 10 kHz to 1000 MHz was scanned and investigated. In cases where emissions below 30MHz were found, measurements of those emissions were repeated on the OATS at a 10m measurement distance. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the EUT. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. For emissions below 30 MHz, an active loop antenna was used. This loop antenna was set at a height of 1m above the conducting ground plane and it was rotated about its vertical and horizontal axes (while utilizing the turntable to rotate the EUT) in order to measure the maximum radiated RF emissions. The maximum radiated RF emissions above 30MHz were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities and rotating the EUT using the turntable.

In addition, the fundamental power and frequency was monitored while the EUT supply voltage was varied ±15% of the nominal (102 VAC and 138 VAC).

The receiver was operated with the resolution bandwidth set at 200 Hz for measurements between 9kHz and 150kHz, 9kHz for measurements between 150kHz and 30MHz and 120kHz for measurements between 30MHz and 1000 MHz.

5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and an Agilent E4445A/N9039A EMI System. The resulting correction factors and the cable loss factors from these calibrations were entered into the EMI Receiver database. As a result, the data taken from the EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The EMI Receiver was operated with resolution bandwidths as prescribed in ANSI C63.4.

5.4 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.209 for a Low-Power License-Exempt transmitter [Canada RSS-210, Issue 7 (2007), section 2.6]. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

The voltage variation test revealed that the EUT showed no variation in power and frequency. The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characteristics were within compliant parameters, and the system returned to the same state of operation as before the power cycle.

5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

Transmitter Limits

The maximum peak output power of an intentional radiator in the 9kH-24 GHz band, as specified in Title 47 CFR 15.209 and RSS 210 section 2.7, is calculated in a formula as described below. The harmonic and spurious RF emissions, with appropriate receiver bandwidths, as specified in 15.209 (c) and section 2.7 of RSS 210, shall be below the measured power of the desired signal, and must also meet the requirements described in 15.205(c) for FCC and table 1 of RSS 210 where applicable.

The following table depicts the general radiated emission limits. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements and are comparable to that of table 3 in RSS 210 section 2.7. These limits were applied to the fundamental emission of the intentional radiator as well as all other significant spurious signals.

Frequency (MHz)	Limit μV/m	Limit (dBμV/m)	Measurement Distance (m)
0.009-0.490	2400/F (kHz)	Note 1	300
0.490-1.705	24000/F (kHz)		30
1.705-30.0	30		30
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
960-24,000	500	54.0	3

Note 1: Sample calculation for the Fundamental Emission of a transmitter:

For Example:

If a transmitter operates at a fundamental frequency of 25 kHz, the emission limit may be calculated:

2400/F = 2400/25 = 96.0 μV/m if measured at 300 meters separation.

Expressed in decibels: $20 \log_{10} (96.0)$ = 39.64 dBμV/m at 300 m separation.

At 3 meters separation, the limit may be extrapolated by the addition of 40 dB/decade per 47CFR 15.31(f)(2)

Limit for the fundamental emission = 39.64 dBμV/m + 80 dB = 119.6 dB/μV/m at 3 meters

Sample conversion from field strength μV/m to dBμV/m:

dBμV/m = $20 \log_{10} (100)$

= 40 dBμV/m (from 30-88 MHz)

For measurements made at 1.0 meter, a 9.5 dB correction may be invoked.

960 MHz to 10,000 MHz

500μV/m or 54.0 dB/μV/m at 3 meters

54.0 + 9.5 = 63.5 dB/μV/m at 1 meter

For measurements made at 0.3 meter, a 20 dB correction may be invoked.

960 MHz to 10,000 MHz

500μV/m or 54.0 dB/μV/m at 3 meters

54.0 + 20 = 74 dB/μV/m at 0.3 meters

5.6 RADIATED EMISSIONS DATA CHART

3 Meter Measurements of Electromagnetic Radiated Emissions
Test Standard: 47CFR, Part 15.209. RSS 210 section 2.7
Frequency Range Inspected: 9 kHz to 1000 MHz

Manufacturer:	Ingersoll-Rand Company						
Date(s) of Test:	December 2nd and 3rd 2009						
Test Engineer(s):	Khairul Aidi Zainal						
Voltage:	120 VAC						
Operation Mode:	Normal operation. Simultaneous transmit and receive						
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %						
EUT Power:	√	Single Phase 120VAC		3 Phase ___VAC			
		Battery		Other:			
EUT Placement:	√	80cm non-conductive table		10cm Spacers			
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber		10m OATS			
Measurements:		Pre-Compliance		Preliminary	√	Final	
Detectors Used:		Peak	√	Quasi-Peak	√	Average	

The following table depicts the level of significant fundamental and spurious radiated RF emissions found for the 13.56MHz transmitter:

i. 3 meter measurement

Frequency (MHz)	Polarization	Height (meters)	Azimuth (°)	Peak (dBuV/m)	Quasi Peak (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)
13.56	Vertical	1.00	0	69.0	64.5	69.5	5.0
27.11	Vertical	1.00	169	34.4	30.6	69.5	38.9
40.67	Vertical	1.00	271	40.6	29.6	40.0	10.4
97.30	Vertical	1.00	37	30.3	28.5	43.0	14.5
106.1	Horizontal	2.05	0	27.9	26.8	43.0	16.2
180.3	Vertical	1.00	209	35.7	32.8	43.0	10.2
183.6	Vertical	1.00	0	35.2	31.2	43.0	11.8
338.9	Horizontal	1.00	271	32.3	30.1	46.0	15.9

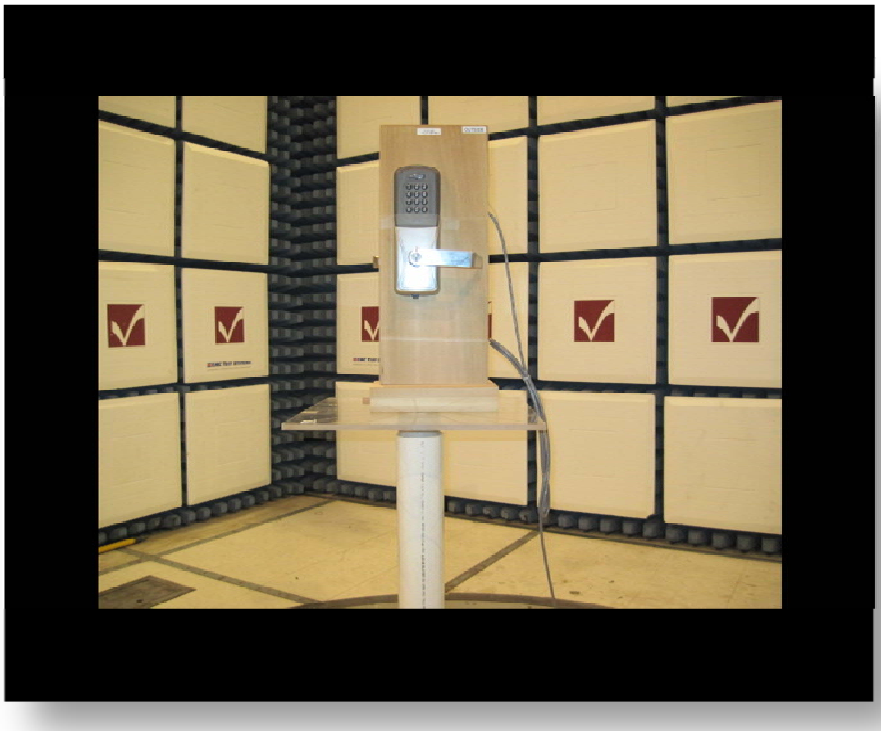
ii. 10 meter measurement

Frequency (MHz)	Polarization	Height (meters)	Azimuth (°)	Peak (dBuV/m)	Quasi Peak (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)
13.56	Vertical	1.00	162	16.6	10.2	48.6	38.4
27.11				Note 4			

Notes:

1) An Average and quasi peak Detector function was used in measurements below 30 MHz, a Quasi-Peak Detector was used in measurements between 30 MHz and 1 GHz.
2) Measurement buried within receiver system noise floor. Data reported is that of the noise floor at the particular frequencies.
3) Measurements below 30MHz were performed at 3m and 10m separation distance. The limits were corrected to reflect the change in measurement distance.
4) Spurious emissions buried under system noise floor.

5.7 Test Setup Photo(s) – Radiated Emissions Test



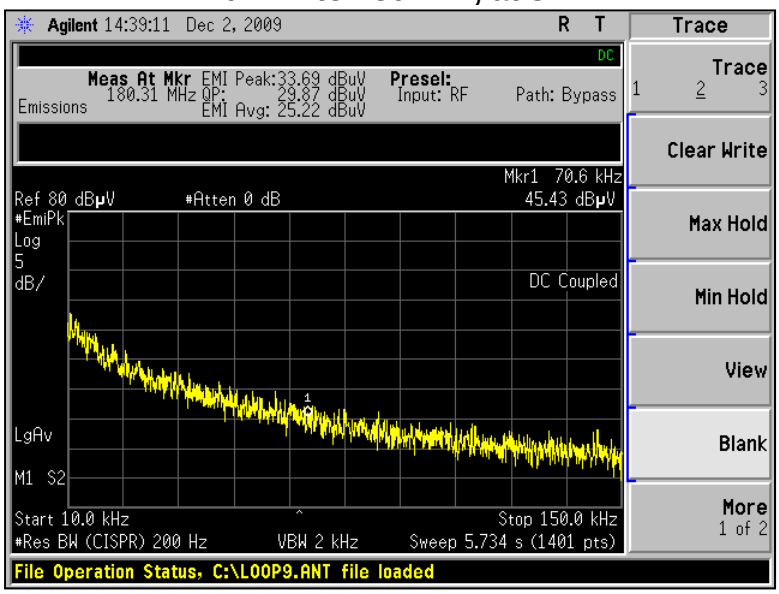
From left to right: Setup ID card for setting different transmit modes, 13.56MHz ID card and 125kHz ID card. These cards were used to set EUT in test mode and test for functionality of the PROX reader.

5.8 Screen Captures - Radiated Emissions Testing

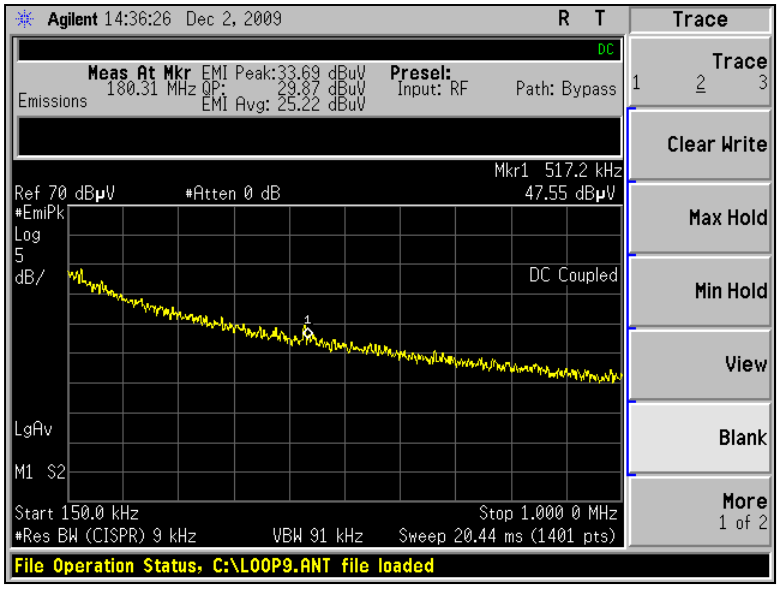
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak or Average detector function is utilized when measuring frequencies below 1 GHz.

The signature scans shown here are from worst-case emissions with the sense antenna in either vertical or horizontal polarity for worst case presentations.

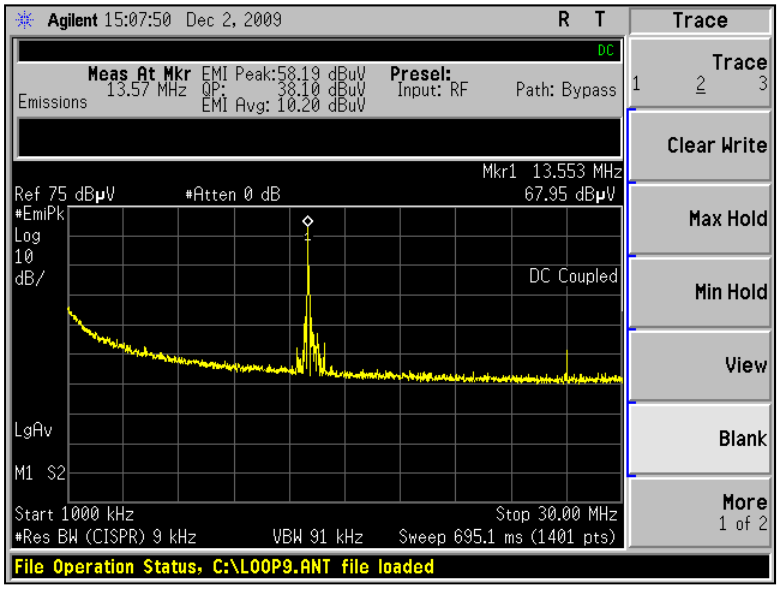
10 kHz to 150 kHz, at 3m



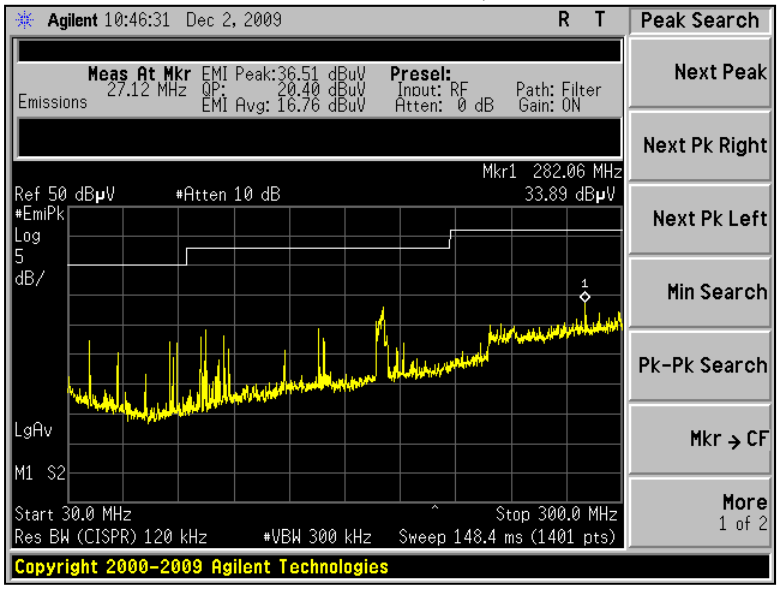
150 kHz-1MHz, at 3m



1 MHZ to 30 MHz, at 3m



30 MHz to 300 MHz, at 3m



300 MHz to 1000 MHz, at 3m

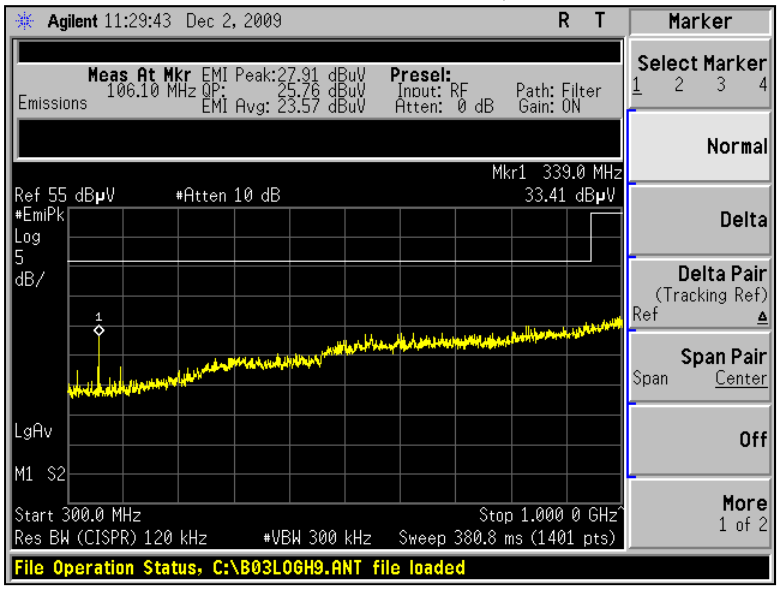


EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE

6.1 Test Setup

The test area and setup are in accordance with ANSI C63.4and with Title 47 CFR, FCC Part 15 (Industry Canada RSS-210, Issue 7, 2007). The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50Ω (ohm), 50/250 μH Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the Agilent E4445A/N9039A EMI System. The EMCO LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

6.2 Test Procedure

The EUT was investigated while it was transmitting for this portion of the testing. The EUT was powered by a generic 12VDC AC to DC adaptor which was connected to the Mains network via a calibrated LISN. The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1 Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

6.3 Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the Agilent E4445A/N9039A EMI System, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

6.4 Test Results

The EUT was found to **MEET** the Conducted Emission requirements of FCC Part 15.207 and RSS GEN 7.2.2 Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

6.5 FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBµV)		Measuring Bandwidth
	Quasi-Peak	Average	
0.150 -0.50 *	66-56	56-46	RBW = 9 kHz VBW ≥ 9 kHz for QP VBW = 1 Hz for Average
0.5 – 5.0	56	46	
5.0 – 30	60	50	
* The limit decreases linearly with the logarithm of the frequency in this range.			

6.6 CONDUCTED EMISSIONS – TEST DATA CHART

Frequency Range inspected: 150 KHz to 30 MHz

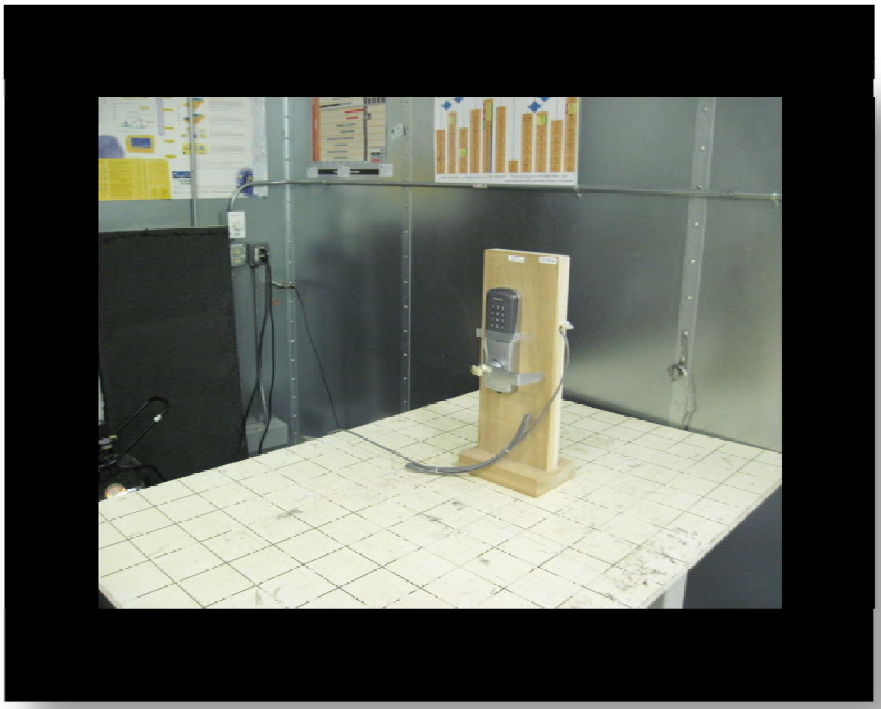
Test Standard: FCC 15.207 Class B

IC RSS 210 7.2.2

Manufacturer:	Ingersoll-Rand Company					
Date(s) of Test:	December 3rd 2009					
Test Engineer:	Khairul Aidi Zainal					
Voltage:	120 VAC					
Operation Mode:	Normal operation					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
Test Location:	√	AC mains test bench				Chamber
EUT Placed On:	√	40cm from Vertical Ground Plane			√	10cm Spacers
	√	80cm above Ground Plane				Other:
Measurements:		Pre-Compliance		Preliminary	√	Final
Detectors Used:		Peak	√	Quasi-Peak	√	Average

		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµ V)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµ V)	Average Margin (dB)
0.150	2	47.9	66.0	18.1	20.7	56.0	35.3
13.560	2	44.0	60.0	16.0	31.7	50.0	18.3
27.110	2	29.2	60.0	30.8	18.3	50.0	31.7
13.560	1	44.5	60.0	15.5	32.0	50.0	18.0
27.110	1	32.4	60.0	27.6	20.7	50.0	29.3

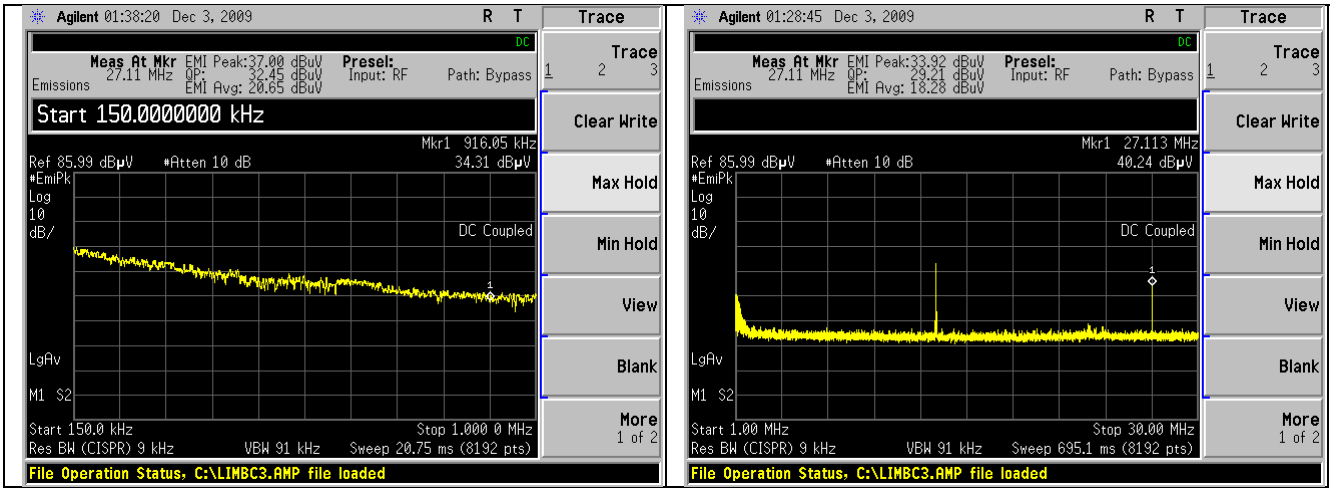
6.7 Test Setup Photo(s) – Conducted Emissions Test



6.8 Screen Captures – Conducted Emissions Test

These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.207 and RSS GEN 7.2.2.

Line 1



Line 2

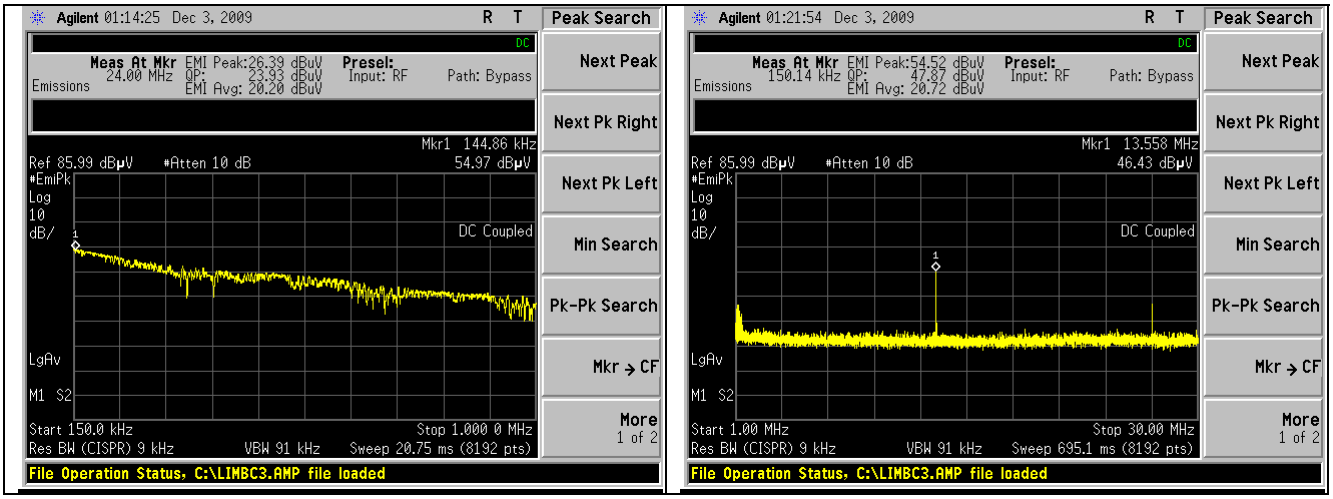


EXHIBIT 7. OCCUPIED BANDWIDTH

7.1 Limits

There are no stated limits for the occupied bandwidth for devices operating under 47CFR Part 15.209. However it is required by Industry Canada per RSS GEN 4.6

7.2 Method of Measurements

ANSI C63.4, FCC and IC standard procedures were adhered to in these measurements.

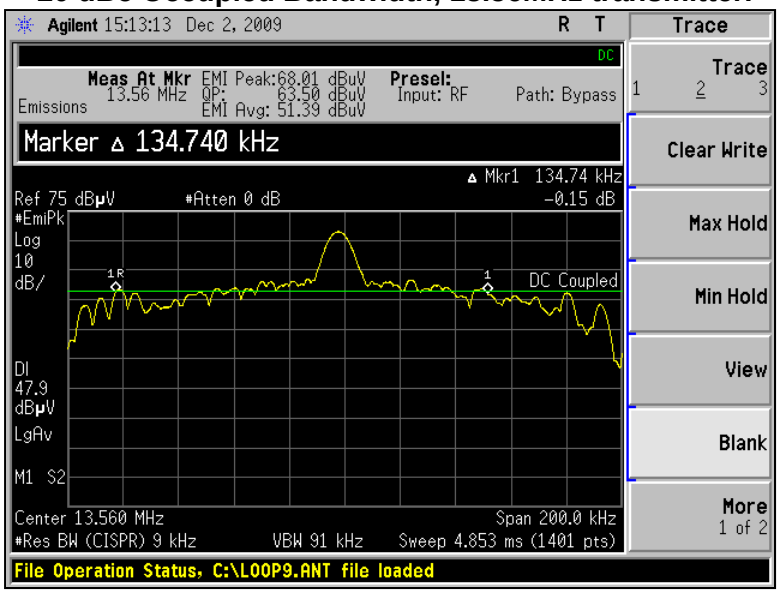
The transmitter output was placed in normal operation mode. The bandwidth of the fundamental frequency was measured via radiated measurement with the Spectrum Analyzer using RBW=9kHz and VBW=91 kHz for the 13.56MHz transmitter.

7.3 Test Data

Mode	Center Frequency (MHz)	Measured -6 dBc Occ. BW (kHz)	Measured -20 dBc Occ.Bw (kHz)
AD-300 with 13.56 MHz reader	13.560	11.7	134.7

7.4 Screen Captures - OCCUPIED BANDWIDTH

-20 dBc Occupied Bandwidth, 13.56MHz transmitter.



-6 dBc Occupied Bandwidth, 13.56 MHz transmitter

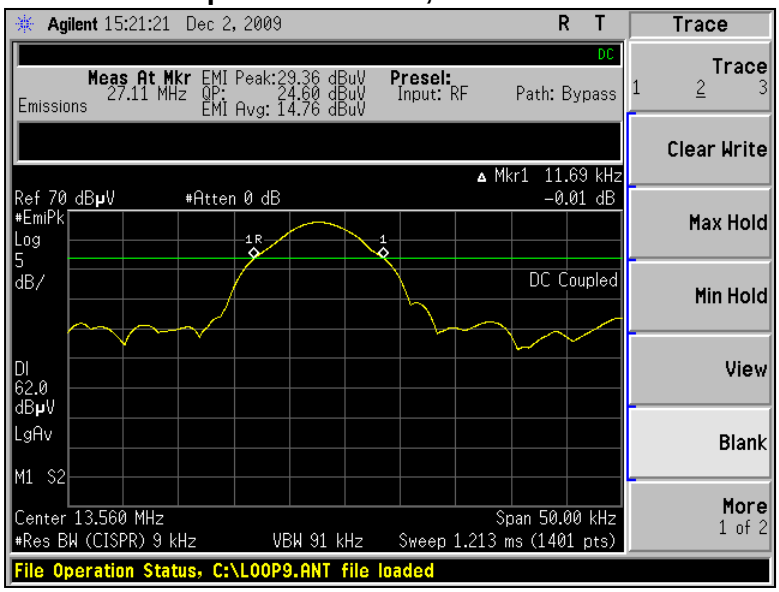
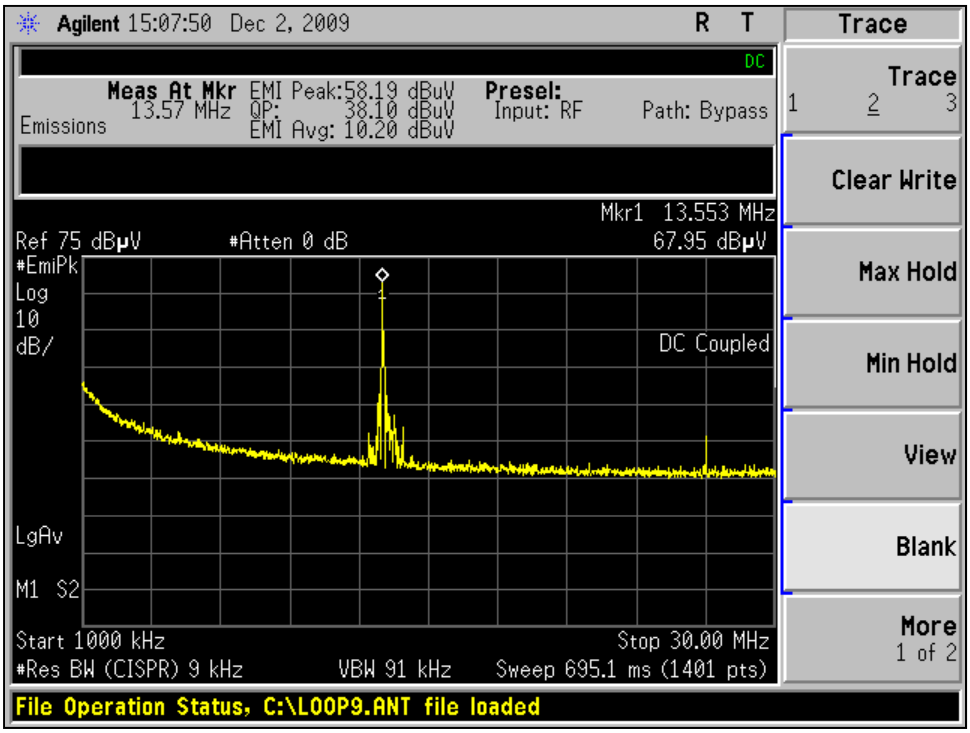


EXHIBIT 8. BAND EDGE MEASUREMENT.

8.1 Test Criterion

FCC 15.209(b) requires a measurement of spurious emission levels to be no higher than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. The operation of this device shall also be limited to the frequency band 1.705MHz to 30MHz for the 13.56MHz transmitter. No components of the fundamental emission shall be allowed outside of this band.

8.2 Screen captures.



Screen capture shows that fundamental emissions were contained within the allowed band of operation.

APPENDIX A

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 8-Dec-2009 Type Test : Conducted Emissions Job # : C-772

Prepared By: Aidi Customer : Ingersoll Rand Quote #: 309380

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	aa 960008	LISN	EMCO	3816/2NM	9701-1057	12/29/2008	12/29/2009	Active Calibration
2	aa 960031	Transient Limiter	HP	11947A	3107A01708	9/15/2009	9/15/2010	Active Calibration
3	ee 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	3/17/2009	3/17/2010	Active Calibration
4	ee 960158	RF Preselecter	Agilent	N9039A	MY46520110	7/2/2009	7/2/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Teresa

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 8-Dec-2009 Type Test : Radiated Emissions (209) Job # : C-772

Prepared By: Aidi Customer : Ingersoll Rand Quote #: 309380

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	ee 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	3/17/2009	3/17/2010	Active Calibration
2	ee 960158	RF Preselecter	Agilent	N9039A	MY46520110	7/2/2009	7/2/2010	Active Calibration
3	aa 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/16/2009	10/16/2010	Active Calibration
4	aa 960006	Active Loop Antenna	EMCO	6502	9205-2753	9/14/2009	9/14/2011	Active Calibration
5	aa 960150	Bicon Antenna	ETS	3110B	0003-3346	11/3/2009	11/3/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Teresa

APPENDIX B
TEST STANDARDS – CURRENT PUBLICATION DATES RADIO

STANDARD #	DATE	Am. 1	Am. 2
ANSI C63.4	2009		
ANSI C63.10	2009		
CISPR 11	2009-05		
CISPR 12	2007-05		
CISPR 14-1	2005-11	2008-11	
CISPR 14-2	2001-11	2001-11	2008-05
CISPR 16-1-1 Note 1	2006-03	2006-09	2007-07
CISPR 16-1-2 Note 1	2003	2004-04	2006-07
CISPR 22	2008-09		
CISPR 24	1997-09	2001-07	2002-10
EN 55011	2007-05		
EN 55014-1	2006		
EN 55014-2	1997		
EN 55022	2006	2007	
EN 60601-1-2	2007-03		
EN 61000-3-2	2006-05		
EN 61000-3-3	2008-12		
EN 61000-4-2	2009-05		
EN 61000-4-3	2006-07	2008-05	
EN 61000-4-4	2004		
EN 61000-4-5	2006-12		
EN 61000-4-6	2009-05		
EN 61000-4-8	1994	2001	
EN 61000-4-11	2004-10		
EN 61000-6-1	2007-02		
EN 61000-6-2	2005-12		
EN 61000-6-3	2007-02		
EN 61000-6-4	2007-02		
FCC 47 CFR, Parts 0-15, 18, 90, 95	2008		
FCC Public Notice DA 00-1407	2000		
FCC ET Docket # 99-231	2002		
FCC Procedures	2007		
ICES 001	2006-06		
ICES 002	2009-08		
ICES 003	2004-02		
IEC 60601-1-2 Note 1	2007-03		
IEC 61000-3-2	2005-11	2008-03	2009-02
IEC 61000-3-3	2008-06		
IEC 61000-4-2	2008-12		
IEC 61000-4-3	2008-04	incl in 2006	

STANDARD #	DATE	Am. 1	Am. 2
IEC 61000-4-4	2004-07		
IEC 61000-4-5	2005-11		
IEC 61000-4-6	2008-10		
IEC 61000-4-8	2009-09		
IEC 61000-4-11	2004-03		
IEC 61000-6-1	2005-03		
IEC 61326-1	2006-06		
ISO 14982	1998-07		
MIL Std. 461E	1999-08		
RSS GEN	2007-06		
RSS 119	2007-06		
RSS 123	1999-11		
RSS 125	2000-03		
RSS 131	2003-07		
RSS 136	2002-10		
RSS 137	2009-02		
RSS 210	2007-06		
RSS 213	2005-12		
RSS 243	2005-11		
RSS 310	2007-06		

Note 1: Test not on LSR Scope of Accreditation.

Updated on 10-21-09

APPENDIX C
Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V