



LS Research, LLC



Testing Cert. # 1255.01

W66 N220 Commerce Court • Cedarburg, WI 53012 • USA

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www.lsr.com

ENGINEERING TEST REPORT # 310092-05

LSR Job #: C-896

Compliance Testing of:

Electrified Locking Device with RF Proximity Detector

Model Number: 23518350

Test Date(s):

May 4th and August 22nd -24th, 2010

Prepared For:



Ingersoll-Rand Company
11819 N. Pennsylvania St.
Carmel, IN 46032.

In accordance with:

Federal Communications Commission (FCC)

Part 15, Subpart C, Section 15.209, and 15.109

Industry Canada (IC)

RSS 210 Annex 2 and section 2.7

General Operating Requirements for Low-Power License-Exempt Transceivers

This Test Report is issued under the Authority of:

Signature:  Date: 08.25.10

Test Report Reviewed by:

Thomas T. Smith, Manager EMC Test Services

Signature:  Date: 08.25.10

Tested by:

Khairul Aidi Zainal, Senior EMC Engineer

Signature:  Date: 08.25.10

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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:	FCC Part 15, Subpart B, Section 15.109
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Certification Authorization for a Digital Device or a Non-Intentional Radiator.

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:	<ul style="list-style-type: none"> • Commercial, Industrial or Business • Residential

Prepared For: Ingersoll Rand	Model #: 23518350	LS Research, LLC
EUT: Schlage Core 200 Locks	IC: 8053B-COPROX	Template: 15.209 - v1 10-22-09
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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.

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 CLIENT INFORMATION

Manufacturer Name:	Ingersoll-Rand Company
Address:	11819 N. Pennsylvania St. Carmel, IN 46074
Contact Person:	Frank Nardelli
Contact Phone:	317.810.3193
Contact Email:	fnardelli@irco.com

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	Schlage Core 200 Locks
Model Number:	23518350
Serial Number:	Engineering Sample

2.3 ASSOCIATED ANTENNA DESCRIPTION

Wire loop antenna using 33 gauge wire.

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2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

EUT Frequency Range (in MHz)	0.12496
RF Power in Watts	0.0001918
Conducted Output Power (in dBm)	N/A
Field Strength at 10 meters	47.60dBuV/m
Occupied Bandwidth (99% BW)	437Hz
Type of Modulation	Un-modulated when scanning. AM when reading.
Emission Designator	437HA1D
Transmitter Spurious (worst case) at 3 meters	43.61dBuV/m at 250kHz
Microprocessor Model # (if applicable)	PIC24FJ256GB106T
EUT will be operated under FCC Rule Part(s)	CFR 47 Part 15.209
EUT will be operated under IC Rule Part(s)	RSS-210
Antenna Information:	
a) Antenna Type	Wire Loop from 33 gauge wire
b) Detachable/Non-Detachable	Non-detachable
c) Antenna Gain (in dBi)	Not Available
Modular Filing	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Portable or Mobile?	Mobile

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2.5 PRODUCT DESCRIPTION

The CO-200-CY-50-PRK is an electrified locking device, controllable via a proximity RF detector, and a product of the CORE family of offline locks.

PHOTO (Optional)



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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)
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

The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B, RSS 210 and RSS GEN – Radio Receivers. The Receiver Test Report is available upon request.

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)

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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.

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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 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. The EUT was operated in a continuous transmit mode, and final testing was performed using power as provided by 4AA batteries. The unit has the capability to operate at 125kHz.

The applicable limits apply at a 3 meter distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment.

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 9kHz to 1GHz was scanned and investigated. 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.

The battery voltage was checked frequently, and the batteries were replaced as necessary.

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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.

Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	Agilent	E4445/N9039A	
EMI Receiver Pre-Select.	Agilent	N9039A	
Spectrum Analyzer	Agilent	E4446A	US45300564
Log Periodic Antenna	EMCO	93146	9701-4855
Horn Antenna	EMCO	3115	6907
Bicon Antenna	EMCO	93110B	9702-2918
Pre-Amp	Adv. Microwave	WLA612	1145A04094
Horn Antenna – Std. Gain	EMCO	3160-09	9809-1120

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.

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5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

Transmitter Limits

The maximum peak output power of an intentional radiator in the 9-490 kHz 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 is 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 $\mu\text{V/m}$	Limit (dB $\mu\text{V/m}$)	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 the transmitter:

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

$$2400/F = 2400/25 = 96.0 \mu\text{V/m} \text{ if measured at 300 meters separation.}$$

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

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

$$\text{Limit for the fundamental emission} = 39.64 \text{ dB}\mu\text{V/m} + 80 \text{ dB} = 119.6 \text{ dB}/\mu\text{V/m at 3 meters}$$

Sample conversion from field strength $\mu\text{V/m}$ to dB $\mu\text{V/m}$:

$$\begin{aligned} \text{dB}\mu\text{V/m} &= 20 \log_{10} (100) \\ &= 40 \text{ dB}\mu\text{V/m (from 30-88 MHz)} \end{aligned}$$

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

$$\begin{aligned} &960 \text{ MHz to } 10,000 \text{ MHz} \\ &500\mu\text{V/m or } 54.0 \text{ dB}/\mu\text{V/m at 3 meters} \\ &54.0 + 9.5 = 63.5 \text{ dB}/\mu\text{V/m at 1 meter} \end{aligned}$$

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

$$\begin{aligned} &960 \text{ MHz to } 10,000 \text{ MHz} \\ &500\mu\text{V/m or } 54.0 \text{ dB}/\mu\text{V/m at 3 meters} \\ &54.0 + 20 = 74 \text{ dB}/\mu\text{V/m at 0.3 meters} \end{aligned}$$

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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					
Date(s) of Test:	May 4 th , 2010 and August 22 nd -24 th , 2010					
Test Engineer(s):	Khairul Aidi Zainal and Thomas T. Smith					
Voltage:	4 AA batteries					
Operation Mode:	Normal, continuous transmit,					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
EUT Power:		Single Phase ___ VAC			3 Phase ___ VAC	
	X	Battery			Other:	
EUT Placement:	X	80cm non-conductive table			10cm Spacers	
EUT Test Location:	X	3 Meter Semi-Anechoic FCC Listed Chamber		X	3/10m OATS	
Measurements:		Pre-Compliance			Preliminary	X Final
Detectors Used:		Peak		X	Quasi-Peak	X Average

The following table depicts the level of significant spurious radiated RF emissions found:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBµV/m)	Emission Limit (dBµV/m)	Margin (dB)
0.125	LOOP	1.0	0	47.60	84.8	37.2*
0.250	LOOP	1.0	0	43.60	99.7	56.0
299.19	Horiz	1.00	0°	25.83	46.0	20.17
297.03	Vert	1.00	0°	24.87	46.0	21.13
998.50	Horiz	1.00	0°	29.98	54.0	24.02
998.50	Vert	1.00	0°	29.02	54.0	24.98

* Denotes measurement made at 10m on the OATS

5.7 Test Setup Photo(s) – Radiated Emissions Test

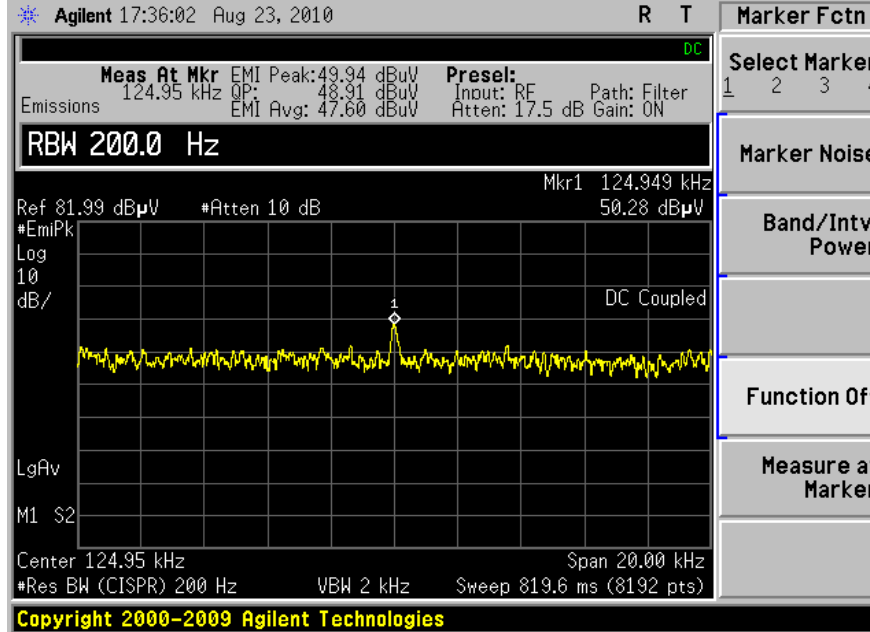


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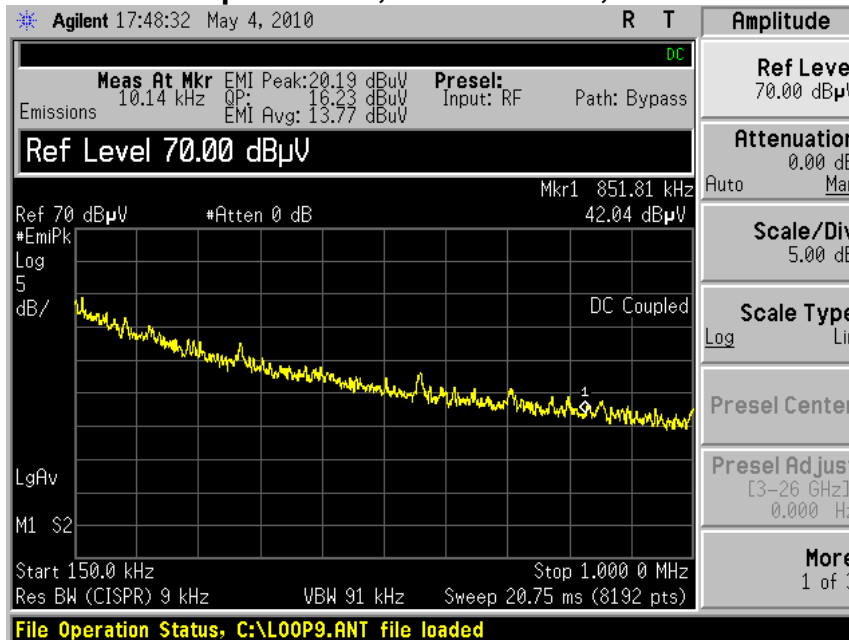
5.8 Screen Captures - Radiated Emissions Testing

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, and an Average detector function is utilized when measuring frequencies above 1 GHz.

Loop Antenna, 10kHz-150kHz, at 10m



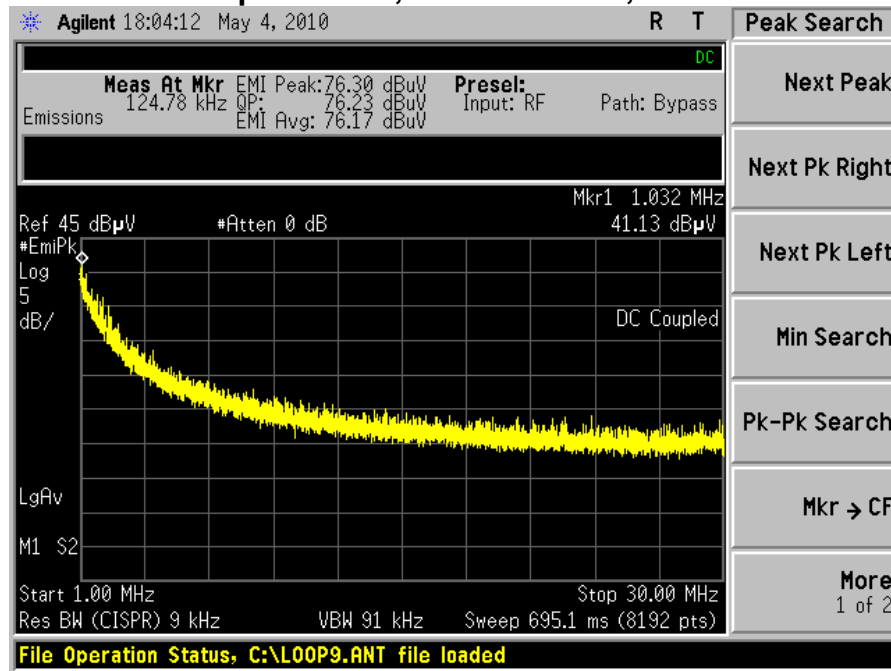
Loop Antenna, 150kHz-1MHz, at 3m



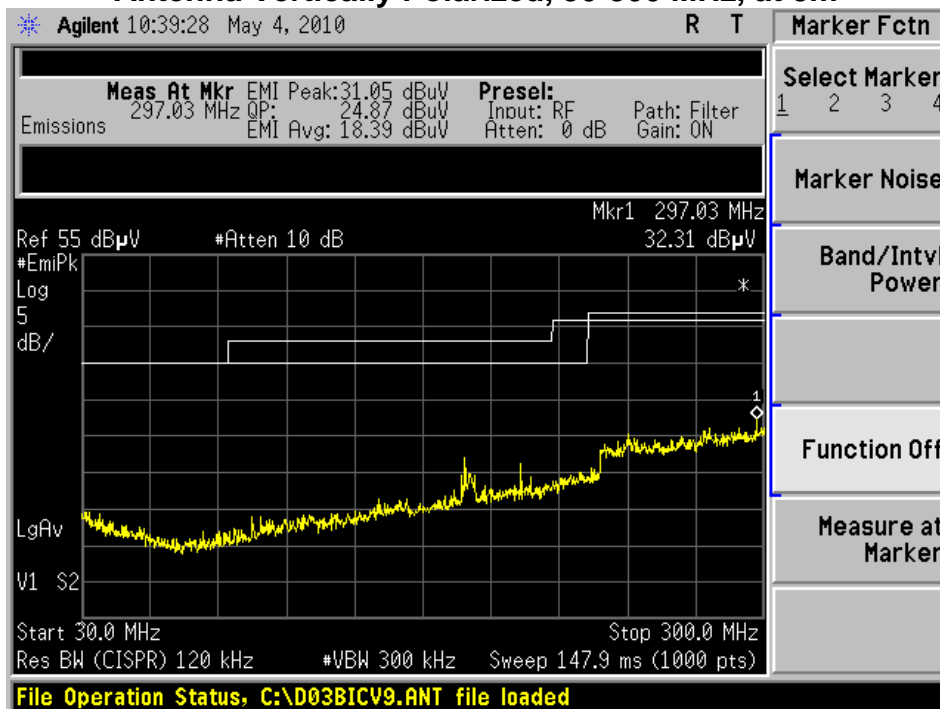
Prepared For: Ingersoll Rand	Model #: 23518350	LS Research, LLC
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Screen Captures - Radiated Emissions Testing (continued)

Loop Antenna, 1MHz - 30MHz, at 3m



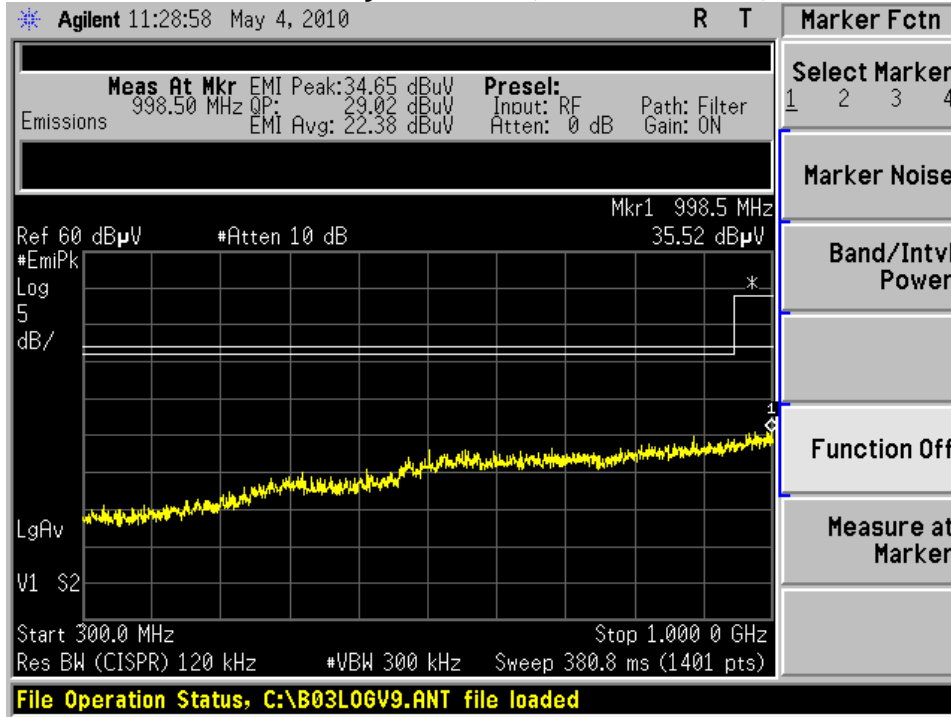
Antenna Vertically Polarized, 30-300 MHz, at 3m



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Screen Captures - Radiated Emissions Testing (continued)

Antenna Vertically Polarized, 300-1000 MHz, at 3m



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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 continuous transmit mode, with modulation from typical data as generated by the device. The bandwidth of the fundamental frequency was measured with the Spectrum Analyzer using RBW=100 Hz and VBW=300 Hz.

7.3 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256
Spectrum Analyzer	Agilent	E4446A	US45300564

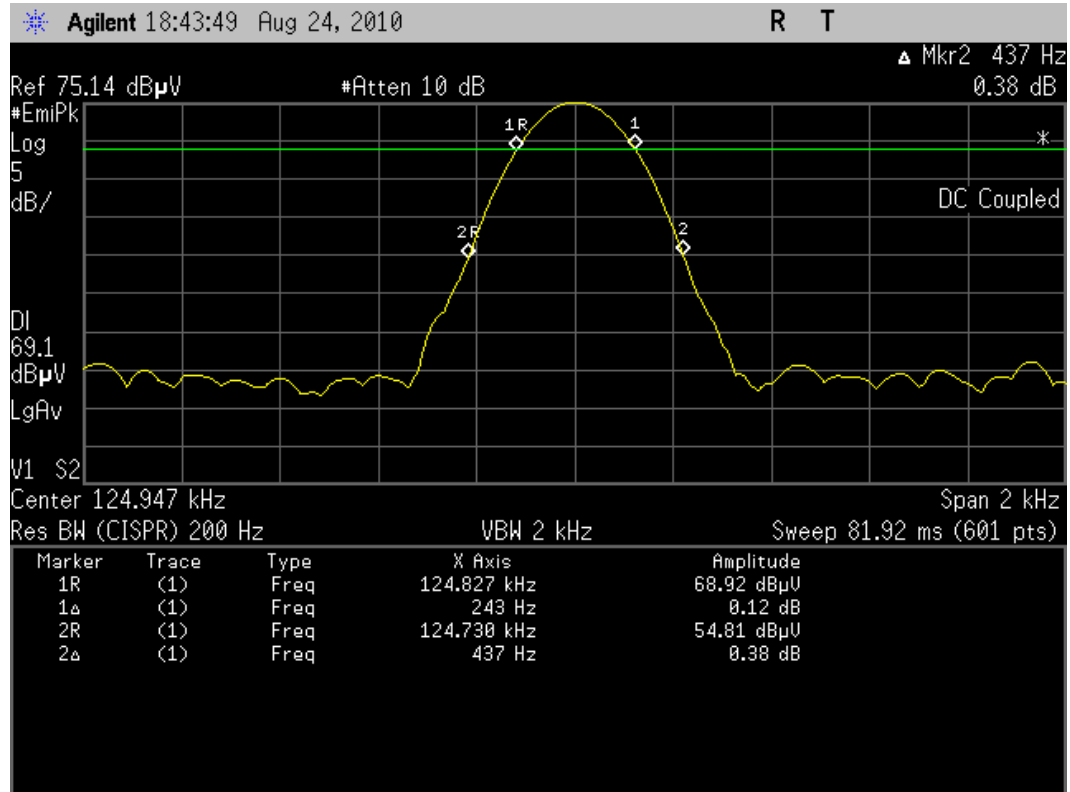
7.4 Test Data

Center Frequency (MHz)	Measured -6 dBc Occ. BW (kHz)	Minimum -6 dBc Limit (kHz)	Measured -20 dBc Occ.Bw (kHz)
0.12495	0.243	500	0.437

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7.5 Screen Captures - OCCUPIED BANDWIDTH

-20 dBc Occupied Bandwidth
And
-6 dBc Occupied Bandwidth



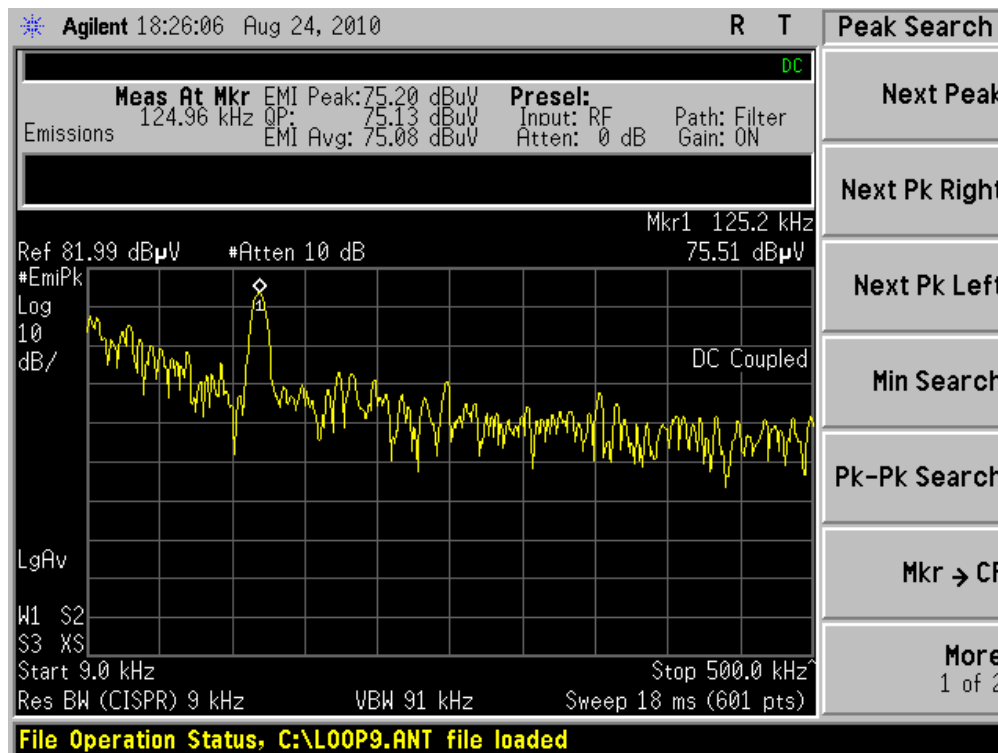
Prepared For: Ingersoll Rand	Model #: 23518350	LS Research, LLC
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EXHIBIT 8. BAND EDGE MEASUREMENT.

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 between 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.

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APPENDIX A



LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 5/4/2010 and 8/24/2010

Type Test : Radiated Emissions

Job # : C-896

Prepared By: R. Urness

Customer : Ingersoll Rand

Quote # : 310092

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960156	100kHz-1GHz Analog Signal Generator	Agilent	N5181A	MY49060062	6/7/2010	6/7/2011	Active Calibration
2	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	6/7/2010	6/7/2011	Active Calibration
3	EE 960158	RF Preselector	Agilent	N9039A	MY46520110	6/7/2010	6/7/2011	Active Calibration
4	AA 960077	Bicon Antenna	EMCO	93110B	9702-2918	11/20/2009	11/20/2010	Active Calibration
5	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/16/2009	10/16/2010	Active Calibration
6	AA 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	11/10/2009	11/10/2010	Active Calibration

Project Engineer:

Thomas T. Smith

Quality Assurance:

[Signature]

Prepared For: <u>Ingersoll Rand</u>	Model #: <u>23518350</u>	LS Research, LLC
EUT: <u>Schlage Core 200 Locks</u>	IC: <u>8053B-COPROX</u>	Template: <u>15.209 - v1 10-22-09</u>
Report #: <u>310092-05</u>	FCC ID #: <u>XPB-COPROX</u>	Page 23 of 25

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