LS RESEARCH, LLC
WIRELESS PRODUCT DEVELOPMENT
ACCREDITED
Testing Cert. 1255.01
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# TEST REPORT # 310380
# LSR Job #: C-1179

Compliance Testing of:
Yale Real Living Deadbolt

Test Date(s):
Feb 24, 28, April 18, 19, 2011

Prepared For:
Assa Abloy
Attn: Mark Caterino
100 Sargent Drive
New Haven, CT 06511

**In accordance with:**
**Federal Communications Commission (FCC)**
**Part 15, Subpart C, Section 15.249**
**Industry Canada (IC) RSS 210 Annex 2**
**Transmitters Operating in the**
**Frequency Band 902 MHz – 928 MHz**

**This Test Report is issued under the Authority of: Thomas T. Smith**

Thomas T. Smith

Signature: Date:5.11.11

| **Test Report Reviewed by:** | **Tested by:** |
|---|---|
| Thomas T. Smith<br><br>Thomas T. Smith<br><br>Signature:<br>Date: 5.11.11 | Peter Feilen, EMC Engineer<br><br>Signature: Peter Feilen Date: 05.11.11 |

# TABLE OF CONTENTS


| | |
|---|---|
| EXHIBIT 1: INTRODUCTION | |
| 1.1 Scope | 3 |
| 1.2 Normative References | 3 |
| 1.3 LS Research, LLC Test Facility | 4 |
| 1.4 Location of Testing | 4 |
| 1.5 Test Equipment Utilized | 4 |
| | |
| EXHIBIT 2: PERFORMANCE ASSESSMENT | |
| 2.1 Client Information | 5 |
| 2.2 Equipment Under Test (EUT) Information | 5 |
| 2.3 Associated Antenna Description | 5 |
| 2.4 EUT's Technical Specifications | 6 |
| 2.5 Product Description | 7 |
| | |
| EXHIBIT 3: EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS | |
| 3.1 Climate Test Conditions | 7 |
| 3.2 Applicability & Summary of EMC Emission Test Results | 7 |
| 3.3 Modifications Incorporated in the EUT for Compliance Purposes | 7 |
| 3.4 Deviations & Exclusions from Test Specifications | 7 |
| | |
| EXHIBIT 4: DECLARATION OF CONFORMITY | 8 |
| | |
| EXHIBIT 5: RADIATED EMISSIONS TESTING | |
| 5.1 Test Setup | 9 |
| 5.2 Test Procedure | 9 |
| 5.3 Test Equipment Utilized | 10 |
| 5.4 Test Results | 10 |
| 5.5 Calculation of Radiated Emissions Limits | 11 |
| 5.6 Radiated Emissions Test Data Chart | 13 |
| 5.7 Screen Captures – Radiated Emissions Test | 15 |
| | |
| EXHIBIT 6: OCCUPIED BANDWIDTH | |
| 6.1 Limits | 19 |
| 6.2 Method of Measurements | 19 |
| 6.3 Test Data | 19 |
| 6.4 Screen Capture – Occupied Bandwidth | 19 |
| | |
| EXHIBIT 7: BAND-EDGE MEASUREMENTS | |
| 7.1 Method of Measurements | 20 |
| 7.2 Screen Captures | 20 |
| | |
| APPENDICES | |
| APPENDIX A: TEST EQUIPMENT LIST | 22 |
| APPENDIX B: TEST STANDARDS – RADIO | 23 |
| APPENDIX C: UNCERTAINTY STATEMENT | 24 |

# EXHIBIT 1. INTRODUCTION

## 1.1 SCOPE

| | |
|---|---|
| **References:** | FCC Part 15, Subpart C, Section 15.249 and 15.209<br>FCC Part 2, Section 2.1043 paragraph (b)1.<br>RSS GEN and RSS 210 Annex 2 |
| **Title:** | FCC : Telecommunication – Code of Federal Regulations, CFR 47, Part 15.<br>IC : Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment |
| **Purpose of Test:** | To gain FCC and 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<br>• Residential |

## 1.2 NORMATIVE REFERENCES

| Publication | Title |
|---|---|
| 47 CFR, Parts 0-15 (FCC) | Code of Federal Regulations - Telecommunications |
| RSS 210 | Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment |
| 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. |
| CISPR 16-1-1 | Specification for radio disturbance and immunity measuring apparatus and methods.<br>Part 1-1: Measuring Apparatus. |
| CISPR 16-2-1 | Specification for radio disturbance and immunity measuring apparatus and methods.<br>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:** | **Assa Abloy** |
| **Address:** | **110 Sargent Drive, New Haven, CT 06511** |
| **Contact Name:** | **Mark Caterino** |

## 2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

*The following information has been supplied by the applicant.*

| | |
|---|---|
| **Product Name:** | Yale Real Living Deadbolt |
| **Model Number:** | YRDZW |
| **Serial Number:** | N/A |

## 2.3 ASSOCIATED ANTENNA DESCRIPTION

Meandering trace PCB antenna.

## 2.4 EUT'S TECHNICAL SPECIFICATIONS

**Additional Information:**

| | |
|---|---|
| EUT Frequency Range (in MHz) | 908.4 MHz |
| RF Power in Watts | 0.00008 Watts |
| Field Strength at 3 meters | 84.3 dBµV/m |
| Occupied Bandwidth | 111.8 kHz |
| Type of Modulation | FSK |
| Emission Designator | 112KF1D |
| EIRP (in mW) | 0.081 mW |
| Transmitter Spurious (worst case) at 3 meters | 37.5 dBµV/m at 1816.8 MHz |
| Stepped (Y/N) | N |
| Step Value: | N/A |
| Microprocessor Model # (if applicable) | L152K6 |
| Antenna Information | |
| Detachable/non-detachable | Non-detachable |
| Type | Trace |
| Gain (in dBi) | -5.7 dBi |
| EUT will be operated under FCC Rule Part(s) | 15.249 |
| EUT will be operated under RSS Rule Part(s) | RSS 210 |
| Modular Filing | ☐ Yes ☒ No |
| Portable or Mobile? | N/A |

**RF Technical Information:**

| | | |
|---|---|---|
| Type of Evaluation (check one) | | SAR Evaluation: Device Used in the Vicinity of the Human Head |
| | | SAR Evaluation: Body-worn Device |
| | | RF Evaluation |

If RF Evaluation checked above, test engineer to complete the following:

- Evaluated against exposure limits: ☒ General Public Use ☐ Controlled Use
- Duty Cycle used in evaluation: %
- Standard used for evaluation: OET 65
- Measurement Distance: 20 cm
- RF Value: 0.00038 ☐ V/m ☐ A/m ☒ W/m$^2$
  ☐ Measured ☐ Computed ☒ Calculated

**This product has a maximum output power of 0.081 mW and thus it is exempt from RF and SAR evaluation.**

## 2.5 PRODUCT DESCRIPTION

The Yale Real Living Deadbolt is a deadbolt lock that also contains a 900MHz transceiver which can control peripherals though out the residence it is associated with. The unit requires 4-AA batteries and transmits data with a trace antenna.

## EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

### 3.1 CLIMATE TEST CONDITIONS

| | |
|---|---|
| **Temperature:** | 20-25 ° C |
| **Humidity:** | 35-65 % R.H. |

### 3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

| FCC and IC Paragraph | Test Requirements | Compliance (yes/no) |
|---|---|---|
| FCC : 15.207<br>IC : RSS GEN sect. 7.2.2 | Power Line Conducted Emissions Measurements | N/A |
| IC : RSS GEN section 4.6.1 | 20 dB Bandwidth | Yes |
| FCC : 15.249(A) & 1.1310<br>IC : RSS 210 A2.9 (a) | Maximum Output Power | Yes |
| FCC : 1.1307, 1.1310, 2.1091 & 2.1093<br>IC : RSS 102 | RF Exposure Limit | Yes |
| FCC : 15.249(a)<br>IC : RSS 210 A2.9(a) | Transmitter harmonics | Yes |
| FCC : 15.249(d), 15.209 & 15.205<br>IC : RSS 210 A2.9(b), | Transmitter 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 (RSS GEN and RSS 210 of IC) and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers (RSS GEN and RSS 210 of IC). 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)**

# EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.249, and Industry Canada RSS-210, Annex 2.9.

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 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 continuously transmitting modulated mode using power as provided by a battery.

The applicable limits apply at a 3 meter distance. Measurements above 4 GHz were performed at a 1.0 meter separation 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. The test sample was operated on one channel: **908.4 MHz.**

### 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 30 MHz to 10000 MHz 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. A Double-Ridged Waveguide Horn Antenna was used from 1 GHz to 10 GHz.

In the frequency range of 30 MHz to 4 GHz, the maximum radiated RF emissions were found by raising and lowering the antenna between 1 and 4 meters in height while for the range of 4 GHz to 10 GHz the antenna was raised and lowered between 1 and 1.8 meters in height. In addition, the polarity of the antenna was switched between horizontal and vertical polarity.

Battery Voltage was periodically checked to ensure sufficient supply.

## 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 IEC/ISO 17025 accredited calibration laboratory, traceable to the SI standard. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and an EMI Receiver. 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 15.249 and Canada RSS-210, Annex 2.9. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

## 5.5 CALCULATION OF RADIATED EMISSIONS LIMITS AND REPORTED DATA.

**Reported data:**

For both fundamental and spurious emissions measurement, the data reported includes all necessary correction factors. These correction factors are loaded onto the EMI receiver when measurements are performed.

**Reported Measurement data = Raw receiver measurement (dBµV/m) + Antenna correction Factor + Cable factor (dB) + Miscellaneous factors when applicable (dB) – amplification factor when applicable (dB).**

**Generic example of reported data at 200 MHz:**

**Reported Measurement data = 18.2 (raw receiver measurement ) + 15.8 (antenna factor) + 1.45 (cable factor) = 35.45 (dBµV/m).**

**Field Strength of Fundamental Frequencies:**
The fundamental emissions for an intentional radiator in the 902-928 MHz band, operating under FCC part 15.249 and RSS 210 A2.9 limits, must have electric field strength of no greater than 50 mV/m, for the fundamental frequency, when measured at 3 meters, and harmonic field strength of no greater than 500 µV/m, when measured at 3 meters. Spurious emissions outside the 902-928 MHz band shall be attenuated by at least 50 dB below the level of the fundamental, or meet the limits expressed in FCC part 15.209 under general emission limits.
**Field Strength of Fundamental Frequencies is Limited to 50,000 µV/m, or 94 dBµV/m.**
**Field Strength of Harmonic and Spurious Frequencies is Limited by FCC 15.249 a and d**
The harmonic limit of –50 dBc with respect to the fundamental limit would be:

94 dBµV/m – 50 dB = 44 dBµV/m,

*****with the exception of where FCC 15.209***** allows for a higher limit to be used.

| Frequency (MHz) | 3 m Limit (µV/m) | 3 m Limit (dBµV/m) |
|---|---|---|
| 902-928 | 50,000 | 94.0 |
| 30-88 ; 88-216 | 159 | 44.0 |
| 216-902 ; 928-960 | 500 | 46.0***** |
| 960-40,000 | 500 | 54.0***** |

The following table depicts the general radiated emission limits obtained from Title 47 CFR, part 15.209a, for radiated emissions measurements, including restricted band limits as expressed in 47 CFR, part 15.205.

| Frequency (MHz) | 3 m Limit (µV/m) | 3 m Limit (dBµV/m) |
|---|---|---|
| 30-88 | 100 | 40.0 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46.0 |
| 960-40,000 | 500 | 54.0 |

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

$dB\mu V/m = 20 \log_{10}$ (3m limit)

from 30 - 88 MHz for example: $dB\mu V/m = 20 \log_{10}$ (100)

$40.0\ dB\mu V/m = 20 \log_{10}$ (100)

**For measurements made at 1 meter, a 9.5 dB correction may be been invoked.**

960 MHz to 40,000 MHz

500 µV/m or 54.0 dBµV/m at 3 meters

54.0 + 9.5 = 63.5 dBµV/m at 1 meter

*Note: Limits are conservatively rounded to the nearest tenth of a whole number.*

## 5.6 RADIATED EMISSIONS TEST DATA CHART

Measurements of Electromagnetic Radiated Emissions
Frequency Range Inspected: 30 MHz to 25000 MHz

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Manufacturer: | Assa Abloy | | | | | | |
| Date(s) of Test: | February 24,April 18, 2011 | | | | | | |
| Project Engineer: | Peter Feilen | | | | | | |
| Test Engineer(s): | Peter Feilen | | | | | | |
| Voltage: | 6.0 VDC | | | | | | |
| Operation Mode: | Continuous transmit | | | | | | |
| EUT Power: | | Single Phase 120 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 | | 3/10m OATS | | | |
| Measurements: | | Pre-Compliance | | Preliminary | X | Final | |
| Detectors Used: | X | Peak | X | Quasi-Peak | X | Average | |

**The following table depicts the level of radiated fundamental:**

| FREQ (MHz) | ANT | EUT | HEIGHT (m) | AZIMUTH (°) | PEAK (dBµv/m) | Q.PEAK (dBµv/m) | Q.PEAK (mv/m) | LIMIT (mv/m) | LIMIT (dBµv/m) | MARGIN (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 908.40 | H | TT | 1.27 | 31 | 81.7 | 81.2 | 11.5 | 50.0 | 94.0 | 12.8 |
| 908.40 | V | TT | 1.00 | 0 | 84.9 | 84.3 | 16.4 | 50.0 | 94.0 | 9.7 |

**The following table depicts the level of radiated spurious emissions:**

| Frequency (MHz) | Height (m) | Azimuth (degree) | Quasi Peak Reading (dBµV/m) | Quasi Peak Limit (dBµV/m) | Margin (dB) | Antenna Polarity | EUT orientation |
|---|---|---|---|---|---|---|---|
| 296.4 | 1.00 | 0 | 23.5 | 46.0 | 22.5 | V | TT |
| 40.5 | 1.00 | 0 | 12.15 | 40.0 | 27.9 | H | TT |
| 891.4 | 1.00 | 0 | 28.16 | 46.0 | 17.8 | H | TT |
| 890.2 | 1.00 | 0 | 27.66 | 46.0 | 18.3 | V | TT |

# RADIATED EMISSIONS DATA CHART *(continued)*

**The following table depicts the level of harmonic emissions seen:**

| Antenna Polarity | Frequency (MHz) | Peak (dBµV/m) | Average (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Antenna Height (cm) | Azimuth (°) |
|---|---|---|---|---|---|---|---|
| Horizontal | 1816.84 | 43.5 | 37.5 | 54.0 | 16.5 | 114.0 | 0 |
| Horizontal | 2725.26 | Note 3 | | 54.0 | 54.0 | | |
| Horizontal | 3633.68 | Note 3 | | 54.0 | 54.0 | | |
| Horizontal | 4542.38 | 42.7 | 31.0 | 63.5 | 32.5 | 102.7 | 5 |
| Horizontal | 5450.40 | 44.4 | 32.4 | 63.5 | 31.1 | 101.7 | 4 |
| Horizontal | 6356.72 | 45.2 | 33.2 | 63.5 | 30.3 | 102.3 | 14 |
| Horizontal | 7266.46 | 45.5 | 34.1 | 63.5 | 29.4 | 101.4 | 9 |
| Horizontal | 8177.58 | 46.2 | 34.4 | 63.5 | 29.1 | 79.9 | 10 |
| Horizontal | 9086.42 | 48.1 | 36.2 | 63.5 | 27.3 | 103.2 | 20 |
| Vertical | 1816.84 | 39.6 | 30.5 | 54.0 | 23.5 | 194.0 | 0 |
| Vertical | 2725.26 | 41.2 | 37.0 | 54.0 | 17.1 | 158.0 | 0 |
| Vertical | 3633.68 | Note 3 | | 54.0 | 54.0 | | |
| Vertical | 4540.6 | 43.0 | 31.5 | 63.5 | 32.0 | 102.0 | 311 |
| Vertical | 5450.98 | 44.5 | 32.4 | 63.5 | 31.1 | 122.9 | 4 |
| Vertical | 6359.58 | 45.1 | 33.2 | 63.5 | 30.3 | 104.3 | 4 |
| Vertical | 7267.19 | 45.4 | 34.1 | 63.5 | 29.4 | 102.2 | 89 |
| Vertical | 8177.44 | 46.2 | 34.5 | 63.5 | 29.0 | 98.1 | 4 |
| Vertical | 9083.84 | 48.0 | 36.2 | 63.5 | 27.3 | 103.2 | 3 |

Notes:

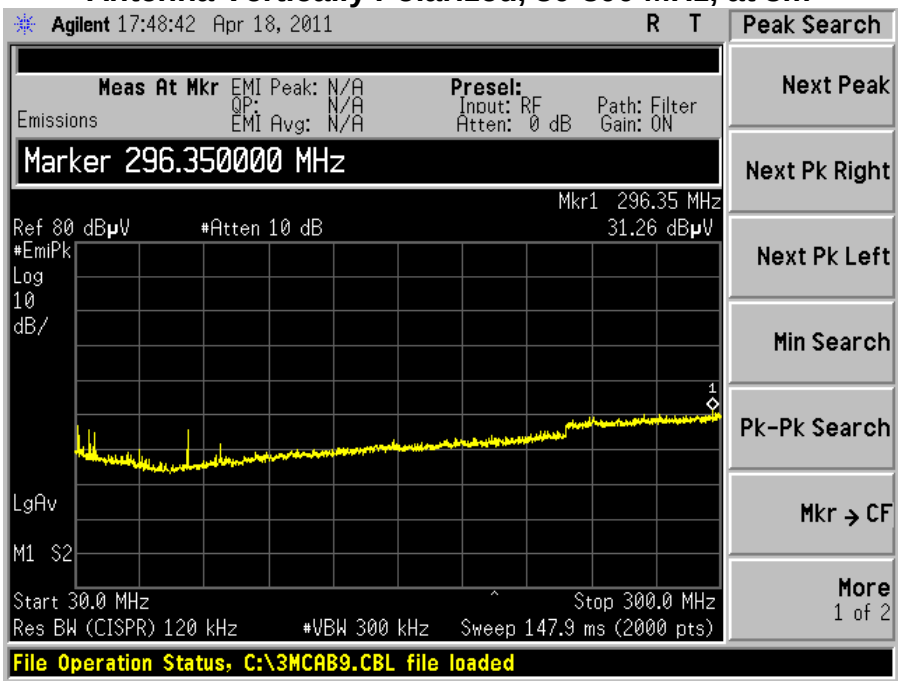
1) A Peak Detector was used in measurements above 1 GHz, for average measurement, the peak detector was used with lower VBW. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
2) Measurements above 4 GHz were made at 1 meter of separation from the EUT. Limits are corrected to reflect this distance.
3) Measurement buried within receiver system noise floor.

## 5.7 Screen Captures - Radiated Emissions Test

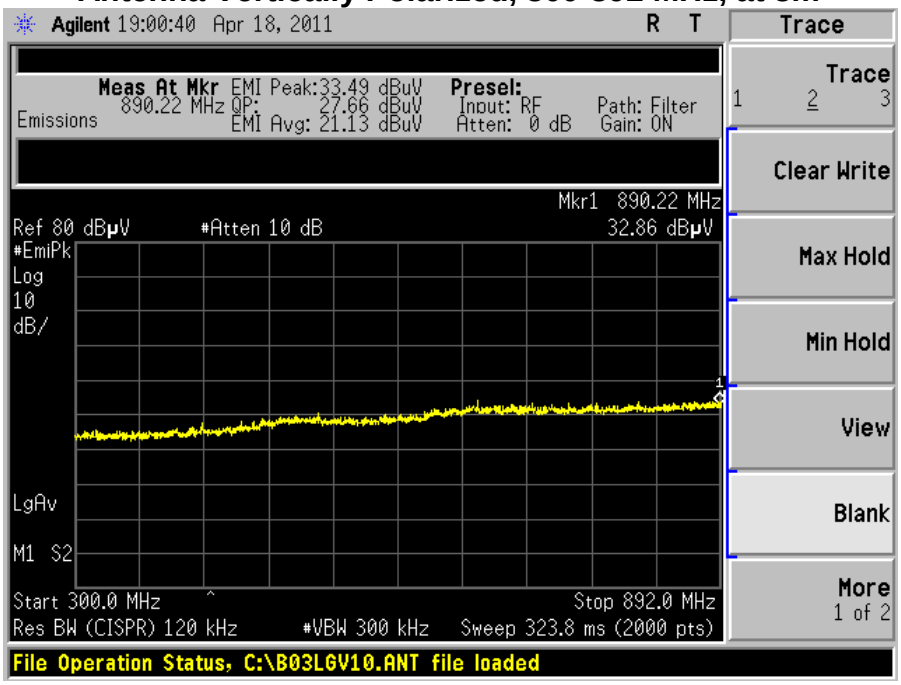
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and a peak detector with video averaging is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels low, middle and hign, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

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

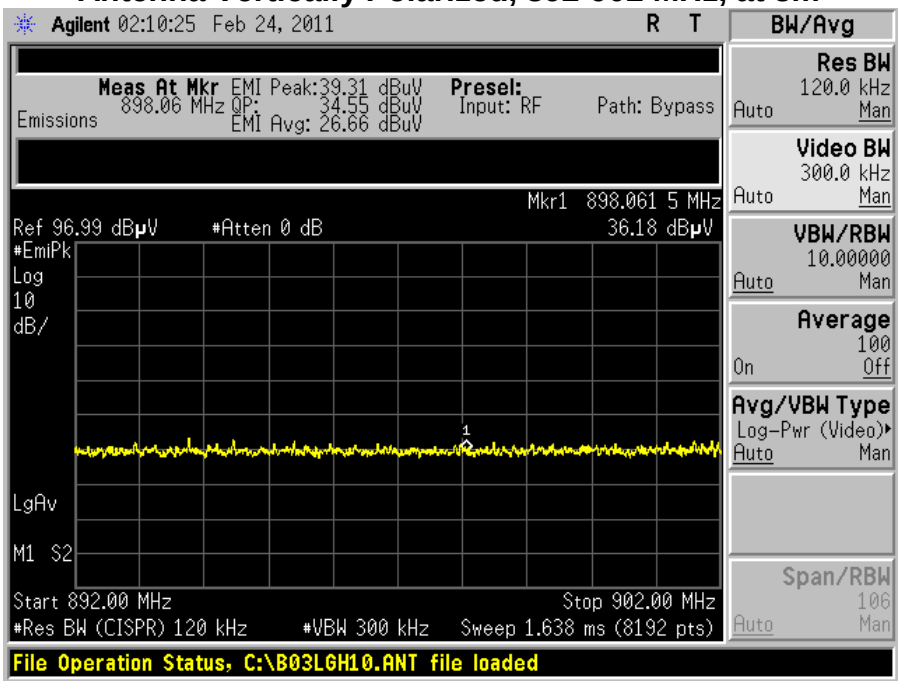



### Antenna Vertically Polarized, 300-892 MHz, at 3m

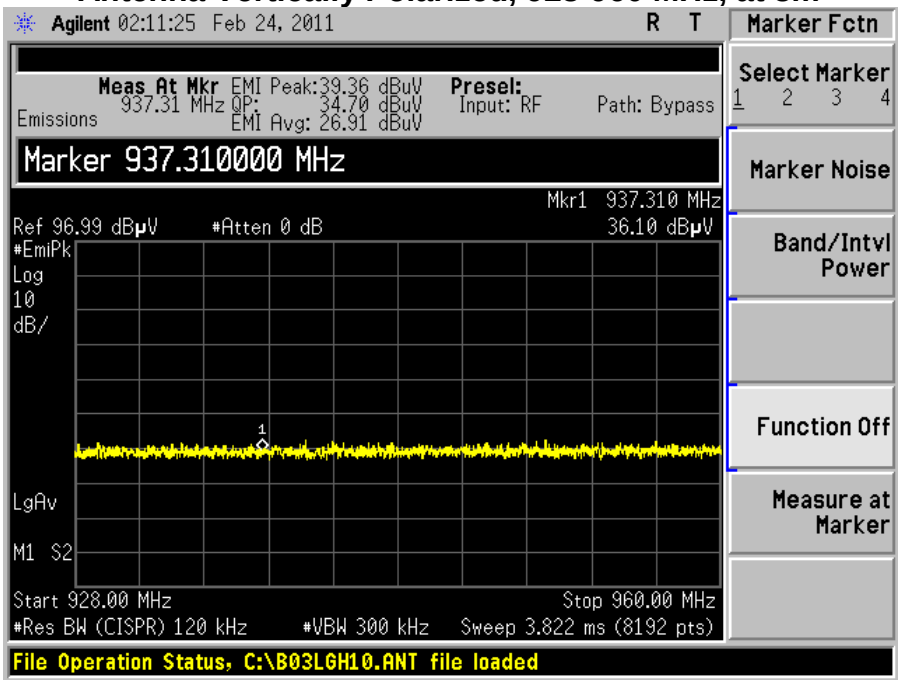


## ***Screen Screen Captures - Radiated Emissions Testing*** **(continued)**

### Antenna Vertically Polarized, 892-902 MHz, at 3m

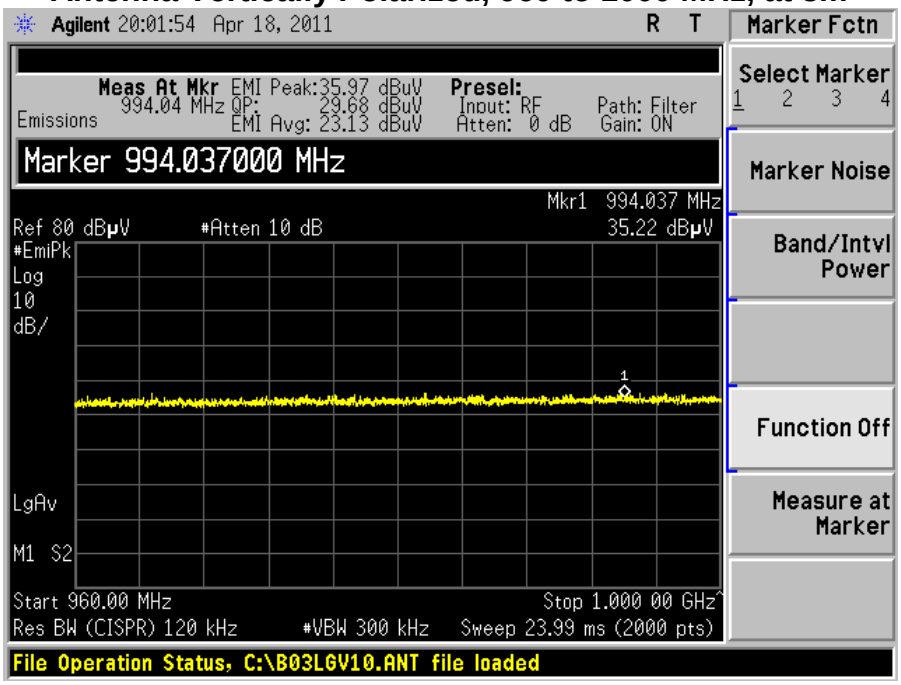



### Antenna Vertically Polarized, 928-960 MHz, at 3m

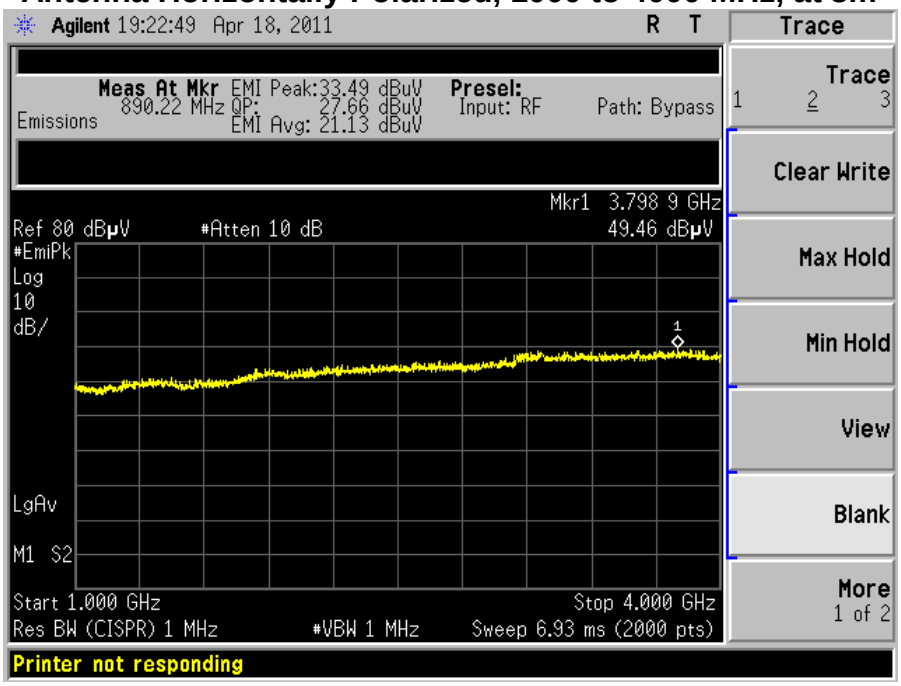


## Screen Screen Captures - Radiated Emissions Testing *(continued)*

### Antenna Vertically Polarized, 960 to 1000 MHz, at 3m

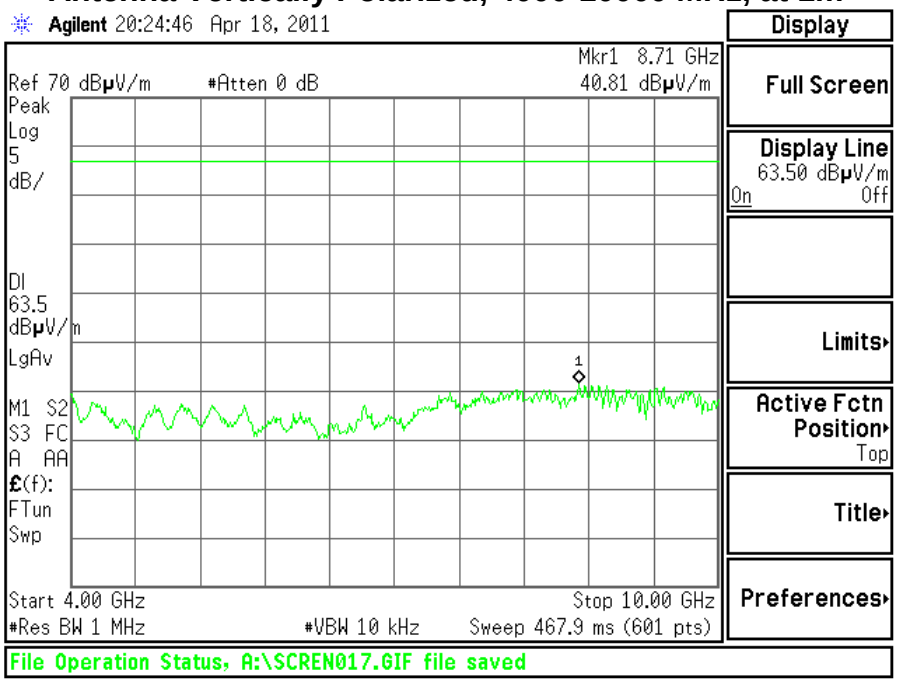



### Antenna Horizontally Polarized, 1000 to 4000 MHz, at 3m



## Screen Captures - Radiated Emissions Testing *(continued)*

### Antenna Vertically Polarized, 4000-10000 MHz, at 1m



# EXHIBIT 6. OCCUPIED BANDWIDTH:

## 6.1 Limits

There are no limits specified. The occupied bandwidth need only be reported.

## 6.2 Method of Measurements

This test was performed radiated in a 3-meter semi-anechoic chamber. The resolution bandwidth was set such that it was greater than the occupied bandwidth. This maximum value for the fundamental was then used as reference for 20dBc.

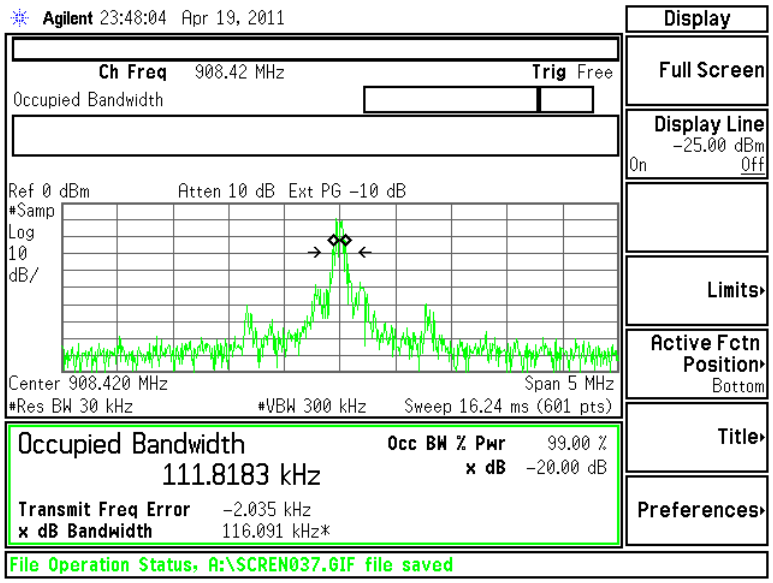
The resolution bandwidth was then set to a value that was greater than or equal to 1% of the bandwidth. Using the 20dBc, marker, the bandwidth was measured.

## 6.3 Test Data

| Center Frequency (MHz) | Measured -20 dBc Occ.Bw (kHz) |
|---|---|
| 908.42 | 111.8 |

## 6.4 Screen Captures - OCCUPIED BANDWIDTH

**Occupied Bandwidth**



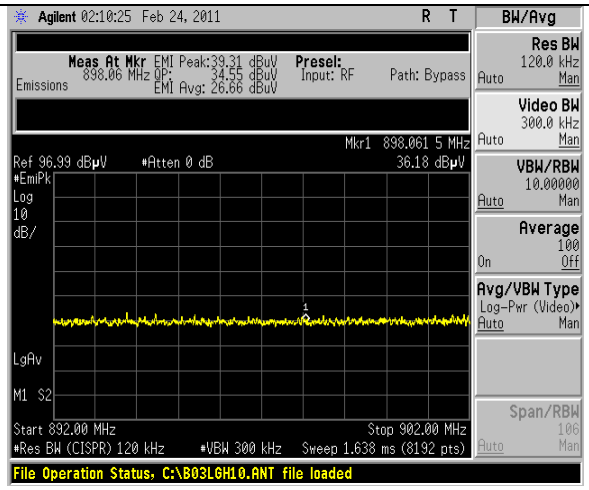
# EXHIBIT 7. BAND-EDGE MEASUREMENTS

## 7.1 Method of Measurements

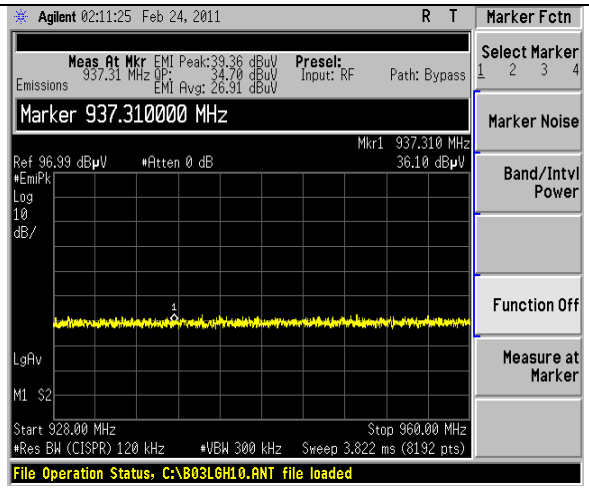
FCC 15.209(b) and 15.249(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. Also, RSS 210 Section 2.2 requires that unwanted emissions meet limits listed in tables 2 and 3 of the same standard and also to the limits in the applicable annex. The following screen captures demonstrate compliance of the intentional radiator at the 902-928 MHz Band-Edges. The EUT was operated in continuous transmit mode with continuous modulation, with internally generated data as the modulating source.

## 7.2 Screen Captures

Screen Capture Demonstrating Compliance at the **Band-Edges**




**Lower band edge**




**Upper band edge**

# APPENDIX A

**LS RESEARCH LLC**
Wireless Product Development
**Equipment Calibration**

Date : 11-May-2011 Type Test : Radiated Emissions (109) Job # : C-1179

Prepared By: Customer : ASSA ABLOY Quote #: 310380

| 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 Preselecter | Agilent | N9039A | MY46520110 | 6/7/2010 | 6/7/2011 | Active Calibration |
| 4 | AA 960078 | Log Periodic Antenna | EMCO | 93146 | 9701-4855 | 10/16/2009 | 10/16/2010 | Active Calibration |
| 5 | AA 960150 | Bicon Antenna | ETS | 3110B | 0003-3346 | 11/3/2009 | 11/3/2010 | Active Calibration |
| 6 | AA 960081 | Double Ridge Horn Antenna | EMCO | 3115 | 6907 | 12/22/2009 | 12/22/2010 | Active Calibration |
| 7 | EE 960159 | 0.8 - 21GHz LNA | Mini-Circuits | ZVA-213X-S+ | 740411007 | 8/19/2010 | 8/19/2011 | Active Calibration |
| 8 | AA 960158 | Double Ridge Horn Antenna | EMCO | 3117 | 109300 | 8/19/2010 | 8/19/2011 | Active Calibration |

Project Engineer: Peter Fielen Quality Assurance: Thomas T Smith

**LS RESEARCH LLC**
Wireless Product Development
**Equipment Calibration**

Date : 11-May-2011 Type Test : Conducted Power Output Job # : C-1179

Prepared By: Customer : ASSA ABLOY Quote #: 310380

| No. | Asset # | Description | Manufacturer | Model # | Serial # | Cal Date | Cal Due Date | Equipment Status |
|---|---|---|---|---|---|---|---|---|
| 1 | AA 960144 | Phaseflex | Gore | EKD01D010720 | 5800373 | 6/4/2010 | 6/4/2011 | Active Calibration |
| 2 | EE 960073 | Spectrum Analyzer | Agilent | E4446A | US45300564 | 9/22/2010 | 9/22/2011 | Active Calibration |

Project Engineer: Peter Fielen Quality Assurance: Thomas T Smith

**LS RESEARCH LLC**
Wireless Product Development
**Equipment Calibration**

Date : 11-May-2011 Type Test : Occupied Bandwidth (6dB & 20dB) Job # : C-1179

Prepared By: Peter Customer : ASSA ABLOY Quote #: 310380

| No. | Asset # | Description | Manufacturer | Model # | Serial # | Cal Date | Cal Due Date | Equipment Status |
|---|---|---|---|---|---|---|---|---|
| 1 | AA 960144 | Phaseflex | Gore | EKD01D010720 | 5800373 | 6/4/2010 | 6/4/2011 | Active Calibration |
| 2 | EE 960073 | Spectrum Analyzer | Agilent | E4446A | US45300564 | 9/22/2010 | 9/22/2011 | Active Calibration |

Project Engineer: Peter Fielen Quality Assurance: Thomas T Smith

**LS RESEARCH LLC**
Wireless Product Development
**Equipment Calibration**

Date : 11-May-2011 Type Test : Spurious Emissions Job # : C-1179

Prepared By: Peter Customer : ASSA ABLOY Quote #: 310380

| No. | Asset # | Description | Manufacturer | Model # | Serial # | Cal Date | Cal Due Date | Equipment Status |
|---|---|---|---|---|---|---|---|---|
| 1 | AA 960144 | Phaseflex | Gore | EKD01D010720 | 5800373 | 6/4/2010 | 6/4/2011 | Active Calibration |
| 2 | EE 960073 | Spectrum Analyzer | Agilent | E4446A | US45300564 | 9/22/2010 | 9/22/2011 | Active Calibration |

Project Engineer: Peter Fielen Quality Assurance: Thomas T Smith

**LS RESEARCH LLC**
Wireless Product Development
**Equipment Calibration**

Date : 11-May-2011 Type Test : Band-Edge Job # : C-1179

Prepared By: Peter Customer : ASSA ABLOY Quote #: 310380

| No. | Asset # | Description | Manufacturer | Model # | Serial # | Cal Date | Cal Due Date | Equipment Status |
|---|---|---|---|---|---|---|---|---|
| 1 | AA 960078 | Log Periodic Antenna | EMCO | 93146 | 9701-4855 | 10/16/2009 | 10/16/2010 | Active Calibration |
| 2 | EE 960156 | 100kHz-1GHz Analog Signal Generator | Agilent | N5181A | MY49060062 | 6/7/2010 | 6/7/2011 | Active Calibration |
| 3 | EE 960157 | 3Hz-13.2GHz Spectrum Analyzer | Agilent | E4445A | MY48250225 | 6/7/2010 | 6/7/2011 | Active Calibration |
| 4 | EE 960158 | RF Preselecter | Agilent | N9039A | MY46520110 | 6/7/2010 | 6/7/2011 | Active Calibration |

Project Engineer: Peter Fiduccia Quality Assurance: Thomas T. Scott

**LS RESEARCH LLC**
Wireless Product Development
**Equipment Calibration**

Date : 11-May-2011 Type Test : Radiated Emissions Job # : C-1179

Prepared By: Peter Customer : ASSA ABLOY Quote #: 310380

| 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 Preselecter | Agilent | N9039A | MY46520110 | 6/7/2010 | 6/7/2011 | Active Calibration |
| 4 | AA 960078 | Log Periodic Antenna | EMCO | 93146 | 9701-4855 | 10/16/2009 | 10/16/2010 | Active Calibration |
| 5 | AA 960150 | Bicon Antenna | ETS | 3110B | 0003-3346 | 11/3/2009 | 11/3/2010 | Active Calibration |
| 6 | AA 960081 | Double Ridge Horn Antenna | EMCO | 3115 | 6907 | 12/22/2009 | 12/22/2010 | Active Calibration |
| 7 | EE 960159 | 0.8 - 21GHz LNA | Mini-Circuits | ZVA-213X-S+ | 740411007 | 8/19/2010 | 8/19/2011 | Active Calibration |
| 8 | AA 960158 | Double Ridge Horn Antenna | EMCO | 3117 | 109300 | 8/19/2010 | 8/19/2011 | Active Calibration |

Project Engineer: Peter Fiduccia Quality Assurance: Thomas T. Scott

# 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 | 2009-12 P | |
| 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 | 2010-01 | | |
| 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 | 2009 | | |
| 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 | 2009 | | |
| 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 2008-04 | 2009-12 FD |

| STANDARD # | DATE | Am. 1 | Am. 2 |
|---|---|---|---|
| IEC 61000-4-4 | 2004-07 | 2010-10 | |
| 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 | 2010-12 | | |
| RSS 213 | 2005-12 | | |
| RSS 243 | 2010-02 | | |
| RSS 310 | 2007-06 | | |

*Note 1: Test not on LSR Scope of Accreditation.*

**Updated on 04-27-10**

P=Project FD= Final Draft

## 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 |