Excellence in Compliance Testing

Certification Test Report

FCC ID: U4A-YRIZW1US
IC: 6982A-YRIZW1US

FCC Rule Part: 15.249
IC Radio Standards Specification: RSS-210

ACS Report Number: 14-0099.W06.1A

Manufacturer: Assa Abloy Inc.
Model(s): YRD110-ZW-US, YRD120-ZW-US

Test Begin Date: March 18, 2014
Test End Date: March 18, 2014

Report Issue Date: March 31, 2014

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Reviewed by:
Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 14 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210 for Certification.

1.2 Product description

Models YRD110-ZW-US and YRD120-ZW-US are electromechanical deadbolt locks, where the user can interact with the lock by using the touchscreen/pushbuttons on the outside escutcheon, a few buttons and a thumbturn on the inside escutcheon, and/or by sending Z-Wave RF commands to it using the proper Z-Wave controller.

The lock features include but are not limited to user pin codes, user schedules, automatic (using a small motor) and manual operation of the deadbolt locally and/or remotely, logging lock events locally, reporting events and/or status to a controller over RF, etc.

The product consists of the outside escutcheon (where the keypad/touchscreen is), the main/inside escutcheon, and the deadbolt assembly. All components and circuits related to RF communications are on the PCB of the main escutcheon. The only difference between the two models is that one has a pushbutton interface, and the other has a touchscreen interface on the front escutcheon. All other functionality is the same.

Model Variants:
Pushbutton Deadbolt: YRD110-ZW-US
Touchscreen Deadbolt: YRD120-ZW-US

Technical Information:

Detail	Description
Frequency Range	908.42 MHz
Number of Channels	1
Modulation Format	GFSK
Operating Voltage	6 VDC (4 AA alkaline batteries)
Antenna Type / Gain	Bare wire 10 turn, normal mode helical antenna / -1 dBi

Manufacturer Information:
Assa Abloy Inc.
110 Sargent Dr.
New Haven, CT 06511

EUT Serial Numbers: #3 (YRD110-ZW-US), #1 (YRD120-ZW-US)

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

The EUT was tested in an orientation of typical use. EUT test modes consisted of a continuous modulated carrier. Both model variants were tested in full to the radiated emission limits. The EUT is a battery powered lock therefore no AC power conducted emissions measurements were performed.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 511277
Industry Canada Lab Code: 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

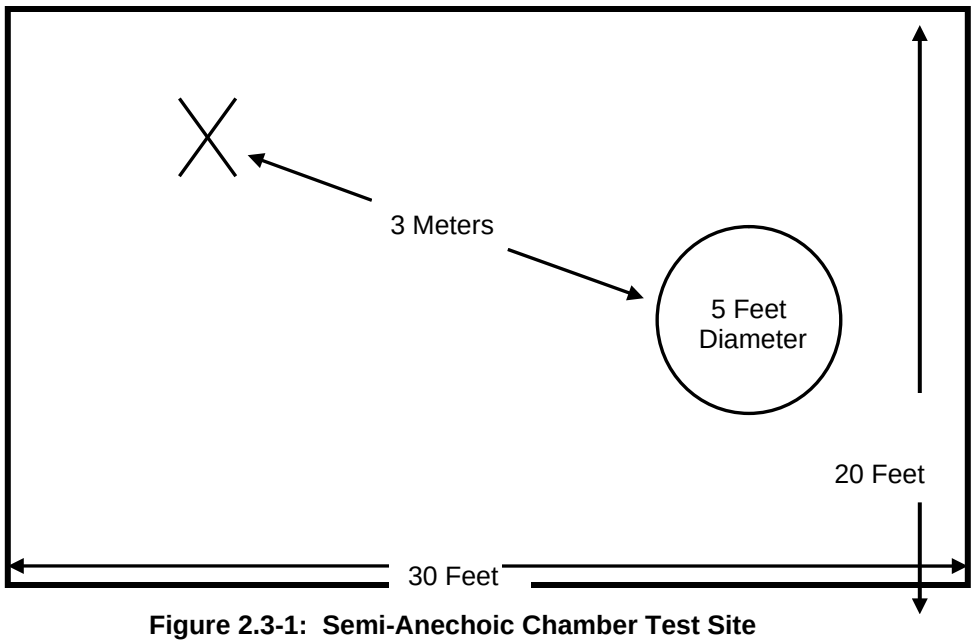

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

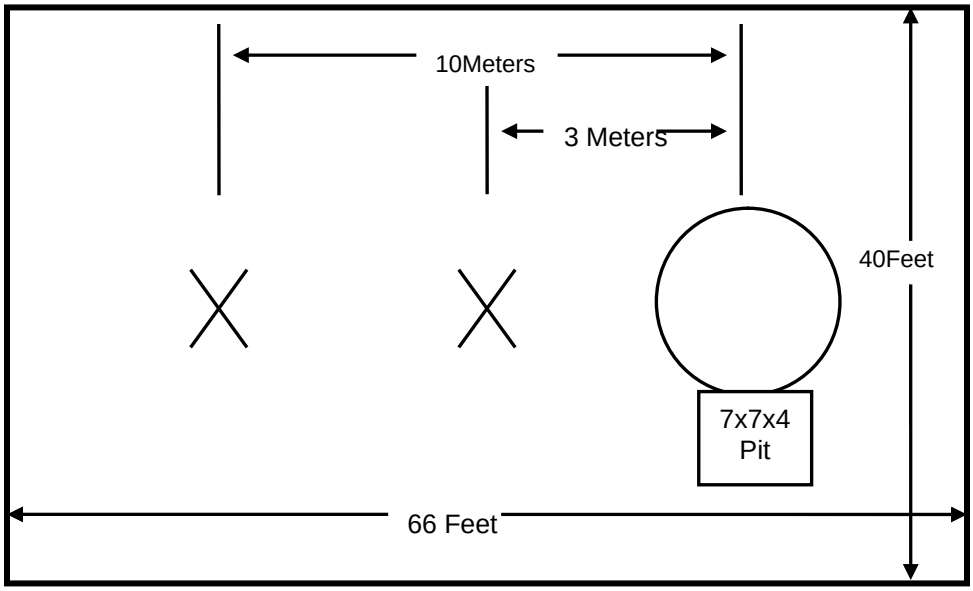

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal ground reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

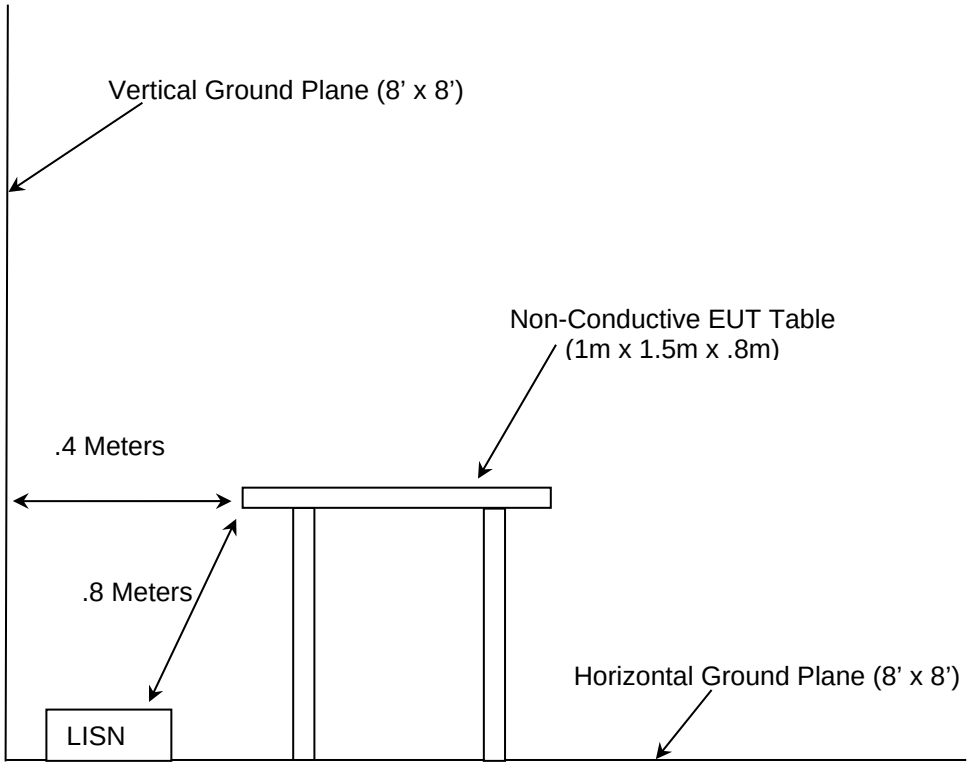

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2014
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2014
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8, December 2010
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, December 2010.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	8/2/2012	8/2/2014
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	8/2/2012	8/2/2014
30	Spectrum Technologies	DRH-0118	Antennas	970102	4/23/2013	4/23/2015
40	EMCO	3104	Antennas	3211	2/14/2013	2/14/2015
73	Agilent	8447D	Amplifiers	2727A05624	7/16/2013	7/16/2014
167	ACS	Chamber EMI Cable Set	Cable Set	167	11/7/2013	11/7/2014
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	3/26/2013	3/26/2014
331	Microwave Circuits	H1G513G1	Filters	31417	6/19/2013	6/19/2014
338	Hewlett Packard	8449B	Amplifiers	3008A01111	7/30/2013	7/30/2015
412	Electro Metrics	LPA-25	Antennas	1241	7/27/2012	7/27/2014
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	11/7/2013	11/7/2014
616	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	N/A	9/26/2013	9/26/2014
622	Rohde & Schwarz	FSV40	Analyzers	101338	11/19/2013	11/19/2014

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type (Host)	Manufacturer	Model Number	Serial Number
The EUT is a stand-alone device therefore no support equipment was utilized.				

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

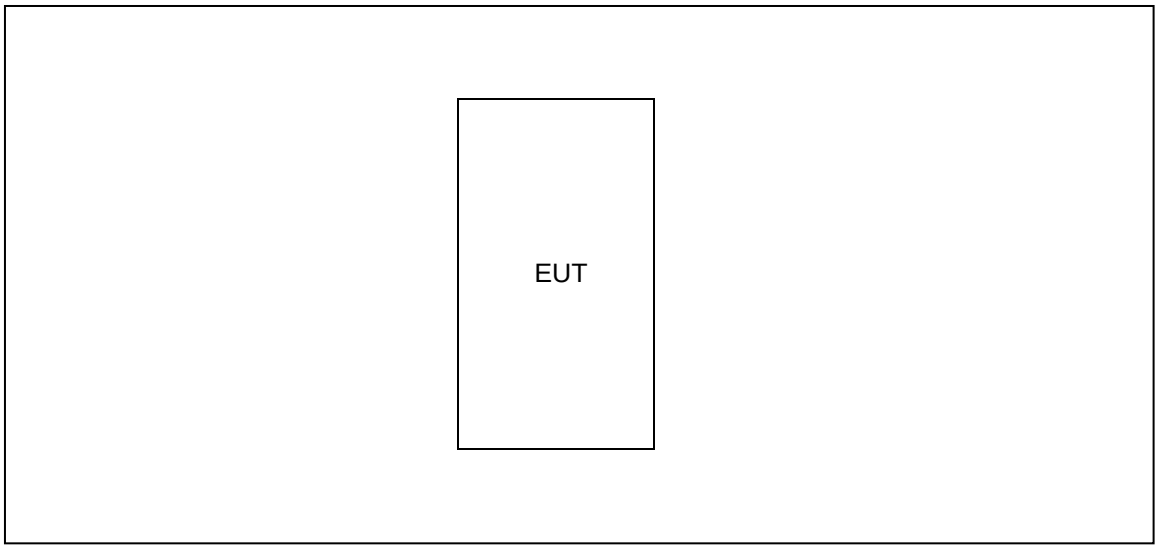

Figure 6-1: Test Setup Block Diagram

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC 15.203

The EUT utilizes a fixed bare wire 10 turn, normal mode helical antenna which cannot be removed without permanently damaging the device thus satisfying Part 15.203.

7.2 Power Line Conducted Emissions – FCC 15.207; IC RSS-Gen 7.2.4

The EUT is a battery powered lock therefore no AC power conducted emissions measurements were performed.

7.3 20dB / 99% Bandwidth – FCC 15.215; IC RSS-Gen 4.6

7.3.1 Measurement Procedure

The span of the spectrum analyzer display was set between two times and five times the occupied bandwidth (OBW) of the emission. The RBW of the spectrum analyzer was set to approximately 1 % to 5 % of the OBW. The trace was set to max hold with a peak detector active. The Delta function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. A sampling detector was used.

7.3.2 Measurement Results

Results are shown below in Table 7.3.2-1 and Figures 7.3.2-1 to 7.3.2-2.

Table 7.3.2-1: 20dB / 99% Bandwidth

Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
908.42	87.94	93.82

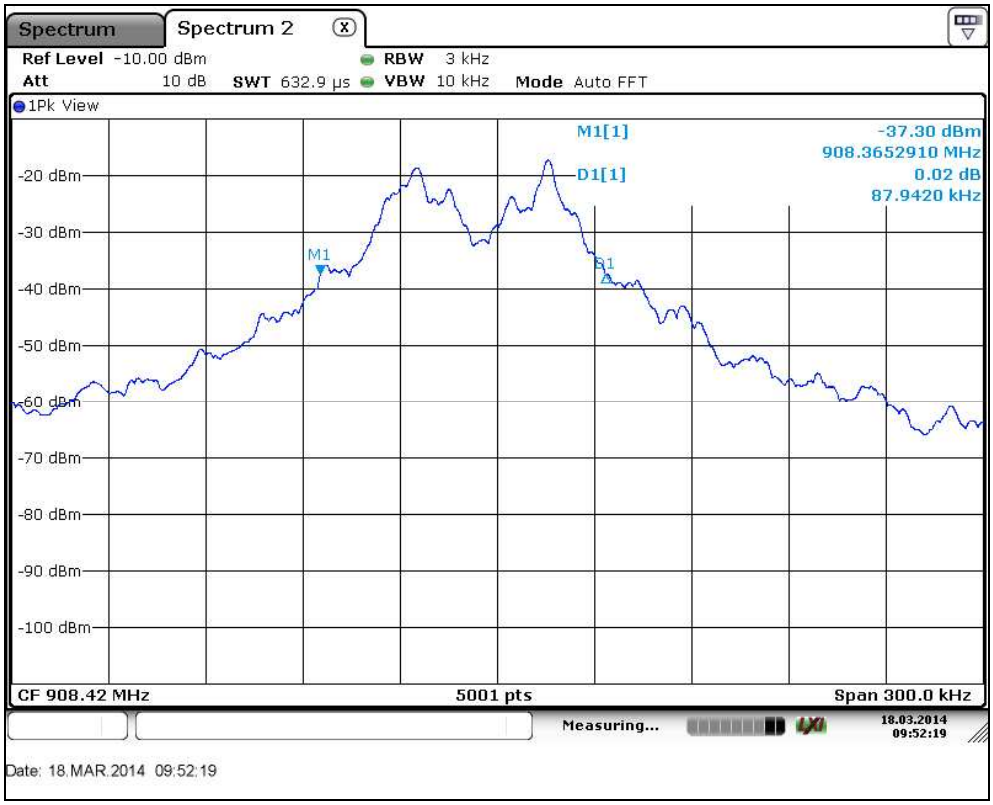

Figure 7.3.2-1: 20dB BW

Figure 7.3.2-2: 99% OBW

7.4 Fundamental Field Strength – FCC 15.249(a); IC RSS-210 A2.9(a)

7.4.1 Measurement Procedure

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz.

7.4.2 Measurement Results

Results are shown below in Tables 7.4.2-1 to 7.4.2-2.

Table 7.4.2-1: Fundamental Field Strength - Pushbutton Deadbolt YRD110-ZW-US

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
908.42	------	86.84	H	-0.26	------	86.58	------	94.0	------	7.4
908.42	------	92.97	V	-0.26	------	92.71	------	94.0	------	1.3

Table 7.4.2-2: Fundamental Field Strength - Touchscreen Deadbolt YRD120-ZW-US

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
908.42	------	85.79	H	-0.26	------	85.53	------	94.0	------	8.5
908.42	------	93.72	V	-0.26	------	93.46	------	94.0	------	0.5

7.5 Radiated Spurious Emissions – FCC 15.249(a)(d)(e); IC RSS-210 A2.9(a)(b)

7.5.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 10 GHz, > 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3MHz respectively.

All out of band emissions were evaluated, including any emissions at or near the band-edge.

7.5.2 Measurement Results

Radiated spurious emissions are reported in the table 7.5.2-1 to 7.5.2-2 below.

Table 7.5.2-1: Radiated Spurious Emissions - Pushbutton Deadbolt YRD110-ZW-US

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
902	------	20.92	H	-0.52	------	20.40	------	46.0	------	25.6
902	------	21.41	V	-0.52	------	20.89	------	46.0	------	25.1
928	------	20.54	H	1.10	------	21.64	------	46.0	------	24.4
928	------	20.92	V	1.10	------	22.02	------	46.0	------	24.00
1816.84	53.55	48.16	H	-8.84	44.71	39.32	74.0	54.0	29.30	14.70
1816.84	51.93	45.24	V	-8.84	43.09	36.40	74.0	54.0	30.90	17.60
2725.26	48.21	38.33	H	-4.60	43.61	33.73	74.0	54.0	30.40	20.30
2725.26	48.58	39.17	V	-4.60	43.98	34.57	74.0	54.0	30.00	19.40

Table 7.5.2-2: Radiated Spurious Emissions - Touchscreen Deadbolt YRD120-ZW-US

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
143.99	------	32.12	V	-12.52	------	19.60	------	43.5	------	23.9
902	------	20.72	H	-0.52	------	20.20	------	46.0	------	25.8
902	------	21.51	V	-0.52	------	20.99	------	46.0	------	25.0
928	------	20.85	H	1.10	------	21.95	------	46.0	------	24.10
928	------	21.71	V	1.10	------	22.81	------	46.0	------	23.20
1816.84	53.14	47.96	H	-8.84	44.30	39.12	74.0	54.0	29.70	14.90
1816.84	51.42	44.17	V	-8.84	42.58	35.33	74.0	54.0	31.40	18.70
2725.26	47.59	36.94	H	-4.60	42.99	32.34	74.0	54.0	31.00	21.70
2725.26	48.19	38.97	V	-4.60	43.59	34.37	74.0	54.0	30.40	19.60

7.5.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak
Corrected Level: 53.55 - 8.84 = 44.71dBuV
Margin: 74dBuV – 44.71dBuV = 29.3dB

Example Calculation: Average
Corrected Level: 48.16 - 8.84 - 0 = 39.32dBuV
Margin: 54dBuV – 39.32dBuV = 14.7dB

8 CONCLUSION

In the opinion of ACS, Inc. the YRD110-ZW-US and YRD120-ZW-US, manufactured by Assa Abloy Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT