Excellence in Compliance Testing

Certification Test Report

FCC ID: U4A-SCYICLS1
IC: 6982A-SCYICLS1

FCC Rule Part: 15.225
IC Radio Standards Specification: RSS-210

ACS Report Number: 10-0345.W06.22.A

Manufacturer: Assa Abloy
Model: N2-IA/IK

Test Begin Date: November 23, 2010
Test End Date: February 28, 2010

Report Issue Date: March 21, 2011

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.

Prepared by:

Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 15 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.

1.2 Product description

The N2-IA/IK lock is designed for applications requiring wireless access control. It is a self-contained microprocessor-controlled access control product with non-volatile memory able to utilize the wireless LAN 802.15.4 UHF interface to communicate with the access control system. This product is operated by six "AA" alkaline batteries and may be used for both indoor and outdoor applications.

Frequency Range: 13.56 MHz
Operating channels: 1
Modulation: AM
Operating Voltage: 9 VDC

Manufacturer Information:
Assa Abloy
110 Sargent Drive
New Haven, CT 06511

Test Sample Serial Number(s):
ACS#1

Test Sample Condition:
The test sample was provided in working order with no visible defects.

1.3 Test Methodology and Considerations

The N2-IA/IK is a battery powered device therefore no support equipment was utilized. Radiated emissions were performed to include all antenna types. As the EUT is battery powered, no AC power line conducted emissions measurements were required.

The N2-IA/IK is a composite device which utilizes both 2.4GHz IEEE 802.15.4 under Part 15.247 and 13.56MHz RFID under Part 15.225. This report addresses the 13.56MHz RFID operation under Part 15.225 only. The 2.4GHz operation under Part 15.247 is addressed in a separate report.

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: 894540
Industry Canada Lab Code: IC 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:

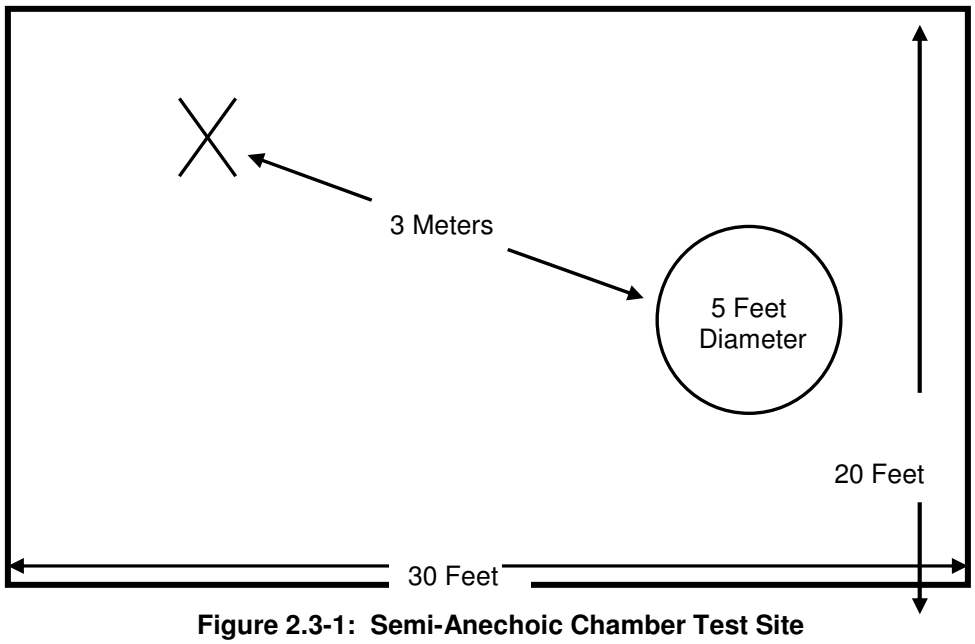

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

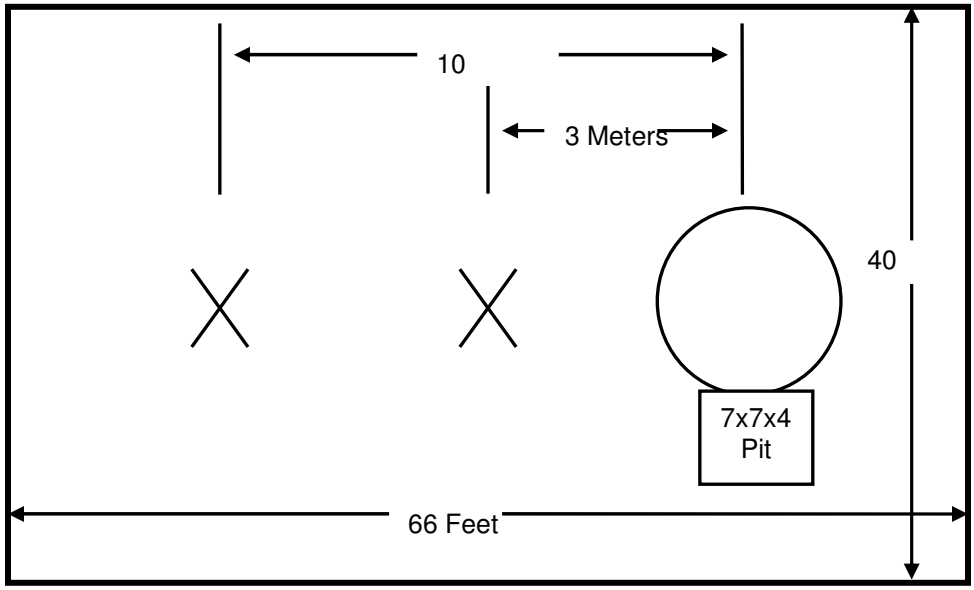

Figure 2.3-2: Open Area Test Site

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 group 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:

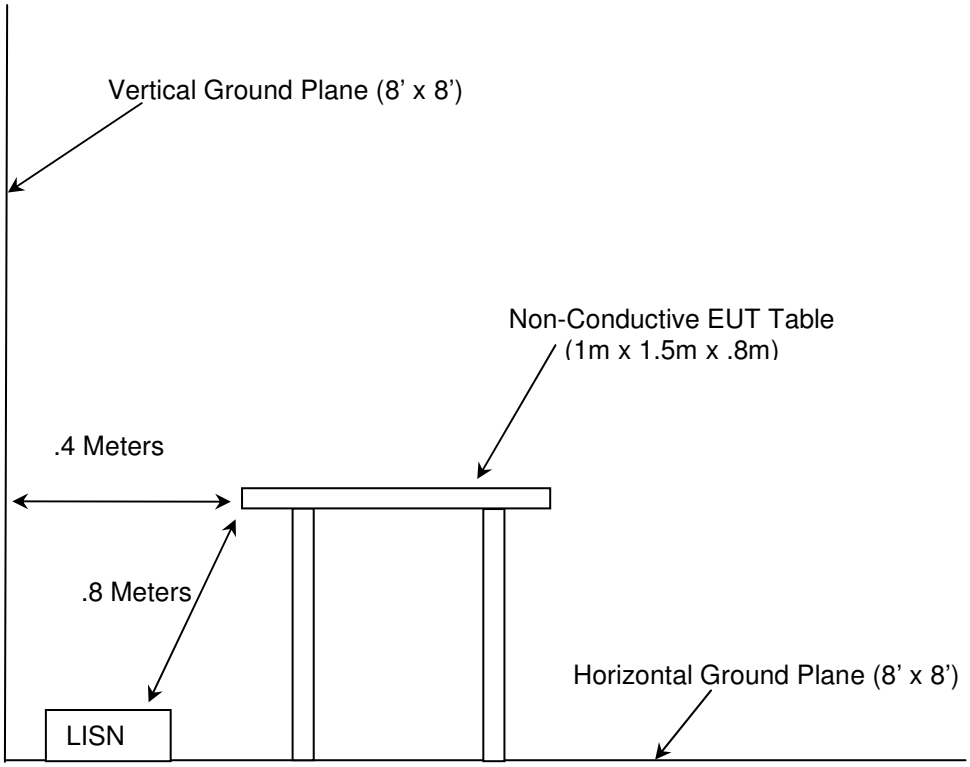

Figure 2.4-1: AC Mains Conducted EMI Site

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
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2010
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2010
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8, Dec 2010
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, Dec 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	9/23/2010	9/23/2012
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	9/23/2010	9/23/2012
25	Chase	CBL6111	Antennas	1043	9/13/2010	9/13/2012
30	Spectrum Technologies	DRH-0118	Antennas	970102	5/8/2009	5/8/2011
73	Agilent	8447D	Amplifiers	2727A05624	5/26/2010	5/26/2011
78	EMCO	6502	Antennas	9104-2608	1/31/2011	1/31/2013
167	ACS	Chamber EMI Cable Set	Cable Set	167	1/26/2011	1/26/2012
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/31/2010	8/31/2011
291	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	None	12/7/2010	12/7/2011
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	12/7/2010	12/7/2011
338	Hewlett Packard	8449B	Amplifiers	3008A01111	10/29/2010	10/29/2011
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	12/29/2010	12/29/2011
426	Thermotron	S-8 Mini Max	Environmental Chamber	25-2888-10	8/30/2010	8/30/2011

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
The EUT is battery operated and was tested standalone with no support equipment utilized.				

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

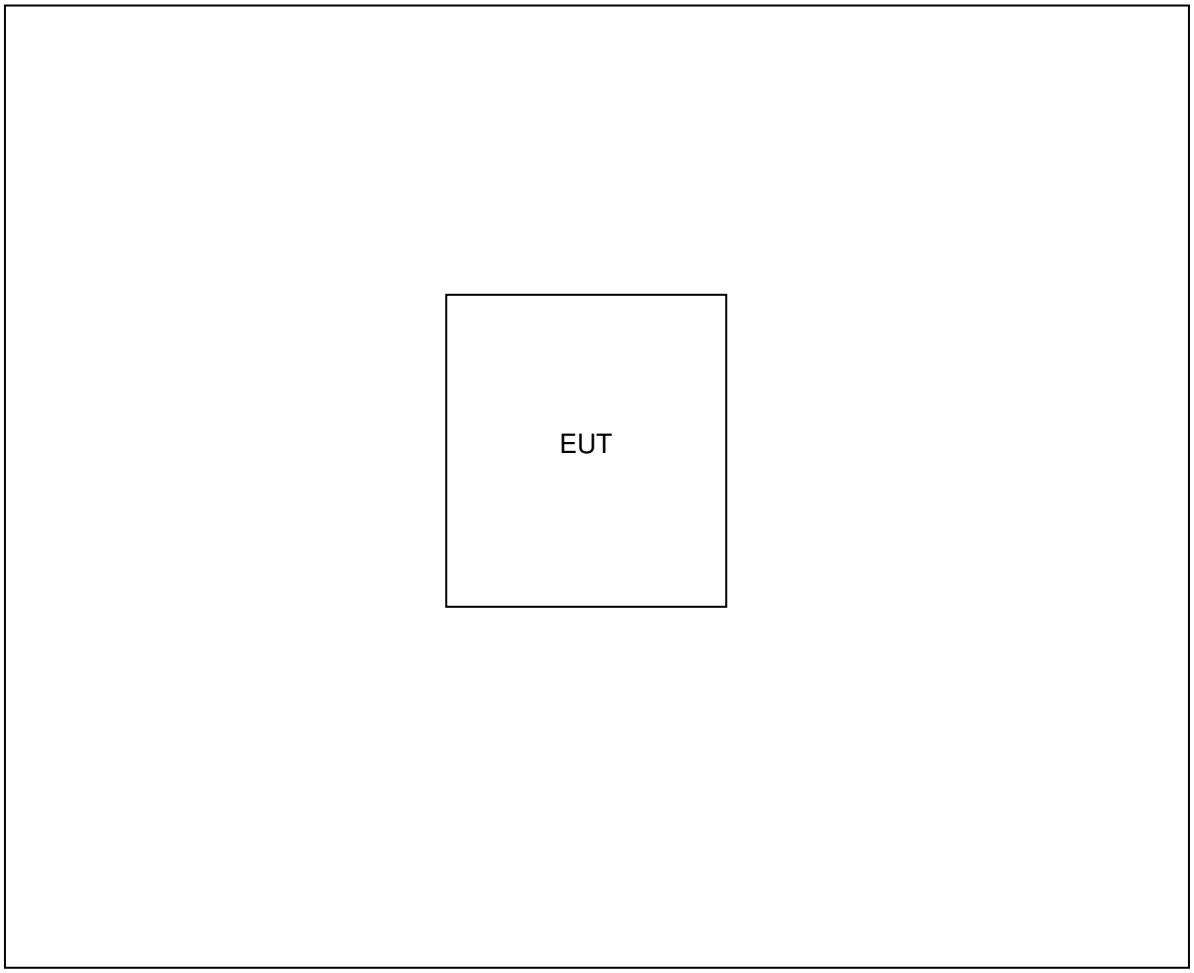

Figure 6-1: EUT Test Setup

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: CFR 47 Part 15.203

The antenna is a non-detachable 13.56 MHz near field antenna connected over wires, thus satisfying Part 15.203.

7.2 Power Line Conducted Emissions – FCC: CFR 47 Part 15.207/ IC RSS-GEN 7.2.2

7.2.1 Measurement Procedure

The EUT is battery powered therefore AC power line conducted emissions is not applicable.

7.3 Radiated Emissions – Intentional Radiation

7.3.1 In-Band Emissions Limitations – FCC Part 15.225(a),(b),(c) / IC RSS-210 A2.6

7.3.1.1 Test Methodology

Measurements below 30MHz were performed in a semi-anechoic chamber with a 3 meter separation distance between the EUT and measurement antenna. The EUT was rotated 360º and the loop antenna rotated about the vertical axis to maximize each emission. The magnetic loop receiving antenna was positioned with its center 1 meter above the ground.

The spectrum analyzer's resolution and video bandwidths were set to 9 kHz and 30 kHz respectively. A peak detector was used which shows worst case. The measurements were corrected by a distance correction factor, antenna correction factors, and cable loss for comparison to the limits. Sample correction factors and calculations can be found section 7.3.2.2 and 7.3.2.4.

7.3.1.2 Test Results

Compliance with the emissions levels are shown in figure 7.3.1.2-1 below.

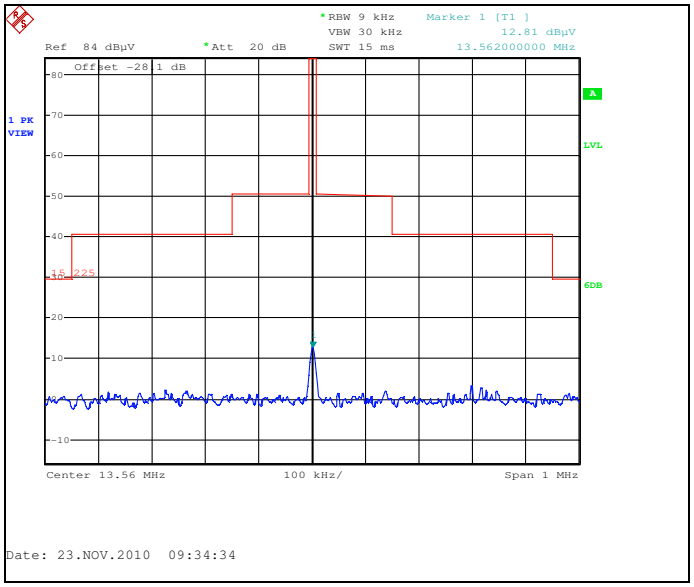

Figure 7.3.1.2-1: Emission Mask Plot

7.3.2 Out-of-Band Emissions – FCC Part 15.225(d), 15.209, 15.109 / IC RSS-210 2.6

7.3.2.1 Test Methodology

Section 15.33(a)(4) specifies, if the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to frequency specified in 15.33(b)(1) for unintentional radiators. The upper frequency range for the digital device is 1000MHz which greater than the 10^{th} harmonic of the fundamental frequency. The upper frequency range measured was 1000MHz.

Measurements below 30MHz were performed in a semi-anechoic chamber with a 3 meter separation distance between the EUT and measurement antenna. The EUT was rotated 360º and the loop antenna rotated about the vertical axis to maximize each emission. The magnetic loop receiving antenna was positioned with its center 1 meter above the ground.

For measurements in the frequency bands 9-90 kHz and 110-490 kHz, an average detector was used. When average measurements are specified, the peak emissions were also compared to a limit corresponding to 20 dB above the maximum permitted average limit according to Part 15.35. All other emissions were measured using a Quasi-peak detector. The final measurements were then corrected by a distance correction factor, antenna correction factors, and cable loss for comparison to the limits.

Measurements above 30MHz were performed in a semi-anechoic chamber with a 3 meter separation distance between the EUT and measurement antenna. 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.

The spectrum analyzer's resolution bandwidth was set to equal to or greater than 100 Hz from 9 kHz to 150 kHz, 9 kHz from 150 kHz to 30 MHz, 120 kHz from 30 MHz to 1000 MHz, and 1 MHz from 1 GHz to 40 GHz.

7.3.2.2 Distance Correction for Measurements Below 30 MHz – Part 15.31

Radiated measurements were performed at a distance closer than 30m as required according to Part 15.209. Therefore a correction factor was applied to account for propagation loss at the specified distance. The propagation loss was determined by using the square of an inverse linear distance extrapolation factor (40dB/decade) according to 15.31. A sample calculation of the distance correction factor is shown below for limits expressed at a 30m measurement distance.

Distance correction factor (30m Specified Test Distance) = 40*Log (Test Distance/30)
= 40*Log (3/30)
= - 40 dB

7.3.2.3 Test Results

Radiated spurious emissions found are reported in Tables 7.3.2.3-1.

Table 7.3.2.3-1: Radiated Spurious Emissions

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
27.12	--------	6.25		10.18	---------	16.43	--------	69.5	---------	53.1
54.24	--------	25.72	H	-18.44	---------	7.28	--------	40.0	---------	32.7
54.24	--------	23.53	V	-18.44	---------	5.09	--------	40.0	---------	34.9
67.8	--------	26.48	H	-19.38	---------	7.10	--------	40.0	---------	32.9
67.8	--------	23.99	V	-19.38	---------	4.61	--------	40.0	---------	35.4
81.36	--------	26.65	H	-17.66	---------	8.99	--------	40.0	---------	31.0
94.92	--------	22.59	H	-15.51	---------	7.08	--------	43.5	---------	36.4
94.92	--------	26.96	V	-15.51	---------	11.45	--------	43.5	---------	32.1
122.04	--------	24.67	H	-13.36	---------	11.31	--------	43.5	---------	32.2
122.04	--------	24.98	V	-13.36	---------	11.62	--------	43.5	---------	31.9
135.6	--------	24.37	H	-13.54	---------	10.83	--------	43.5	---------	32.7
135.6	--------	25.23	V	-13.54	---------	11.69	--------	43.5	---------	31.8
353.33	---------	44.44	h	-9.03	---------	35.41	--------	46.0	---------	10.6
380.28	---------	45.57	h	-8.20	---------	37.37	--------	46.0	---------	8.6
393.21	---------	41.81	h	-7.88	---------	33.93	--------	46.0	---------	12.1
461.11	---------	32.54	h	-6.54	---------	26.00	--------	46.0	---------	20.0
569.97	---------	33.68	h	-3.10	---------	30.58	--------	46.0	---------	15.4
596.91	---------	38.76	h	-3.21	---------	35.55	--------	46.0	---------	10.4
610.92	---------	38.23	h	-2.60	---------	35.63	--------	46.0	---------	10.4
624.93	---------	39.17	h	-1.75	---------	37.42	--------	46.0	---------	8.6
678.82	---------	40.21	h	-1.20	---------	39.01	--------	46.0	---------	7.0
909.47	---------	28.45	h	1.51	---------	29.96	--------	46.0	---------	16.0

Note: Spurious emissions associated with the transmitter that are not reported in the table above are below the noise floor of the measurement system.

7.3.2.4 Sample Calculation:

Example Calculation – Average/Quasi-Peak

Limit < 30MHz

Limit (dBuV/m) = 20*log(30) - Distance Correction Factor (Section 7.3.2.2)
Limit (dBuV/m) = 29.5 + 40
Limit (dBuV/m) = 69.5

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain

Corrected Level: 6.25 + 10.18 = 16.43dBuV
Margin: 69.5dBuV – 16.43dBuV = 53.1dB

7.4 Occupied Bandwidth – FCC Part 15.215(c) / IC RSS-Gen 4.6.1

7.4.1 Test Methodology

The spectrum analyzer span was set to 2 to 3 times the estimated bandwidth of the emission. The RBW was to ≥ 1% of the estimated bandwidth. The trace was set to max hold with a peak detector active. The measurement function of the analyzer was utilized to determine the 99% occupied bandwidth.

7.4.2 Test Results

The results are shown in Figure 7.4.2-1 and 7.4.2-2.

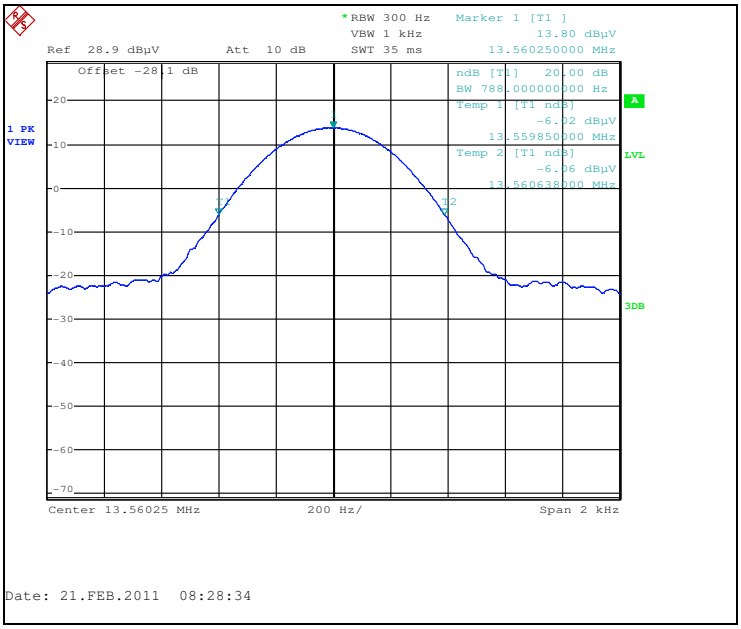

Figure 7.4.2-1: Occupied Bandwidth – 20dB

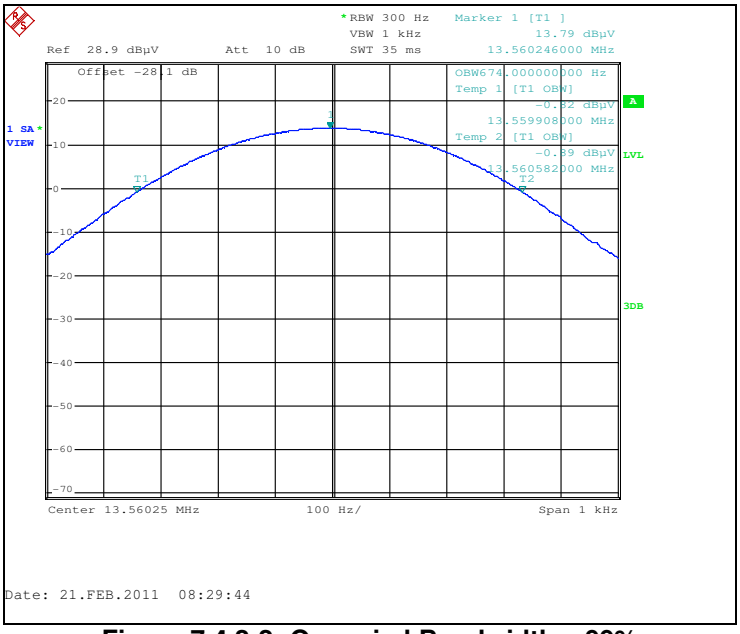

Figure 7.4.2-2: Occupied Bandwidth – 99%

7.5 Frequency Stability – FCC CFR 47 Part 15.225(e) / IC RSS-210 A2.6

7.5.1 Test Methodology

The equipment under test is placed inside an environmental chamber. The RF output is coupled to the input of the measurement equipment via a near field probe.

Frequency measurements were made at the extremes of the of temperature range -20º C to +50º C and at intervals of 10º C at normal supply voltage. A period of time sufficient to stabilize all components of the equipment was allowed at each frequency measurement. The maximum variation of frequency was recorded. The limit from rule part 15.225 is 0.01% or 100ppm.

7.5.2 Test Results

Results of the test are shown below in Figure 7.5.2-1.

Frequency Stability

Frequency (MHz): 13.56
Deviation Limit (PPM): 100ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-20 C	**13.560180**	**13.274**	100%	9.00
-10 C	**13.560182**	**13.422**	100%	9.00
0 C	**13.560230**	**16.962**	100%	9.00
10 C	**13.560262**	**19.322**	100%	9.00
20 C	**13.560267**	**19.690**	100%	9.00
30 C	**13.560260**	**19.174**	100%	9.00
40 C	**13.560255**	**18.805**	100%	9.00
50 C	**13.560250**	**18.437**	100%	9.00

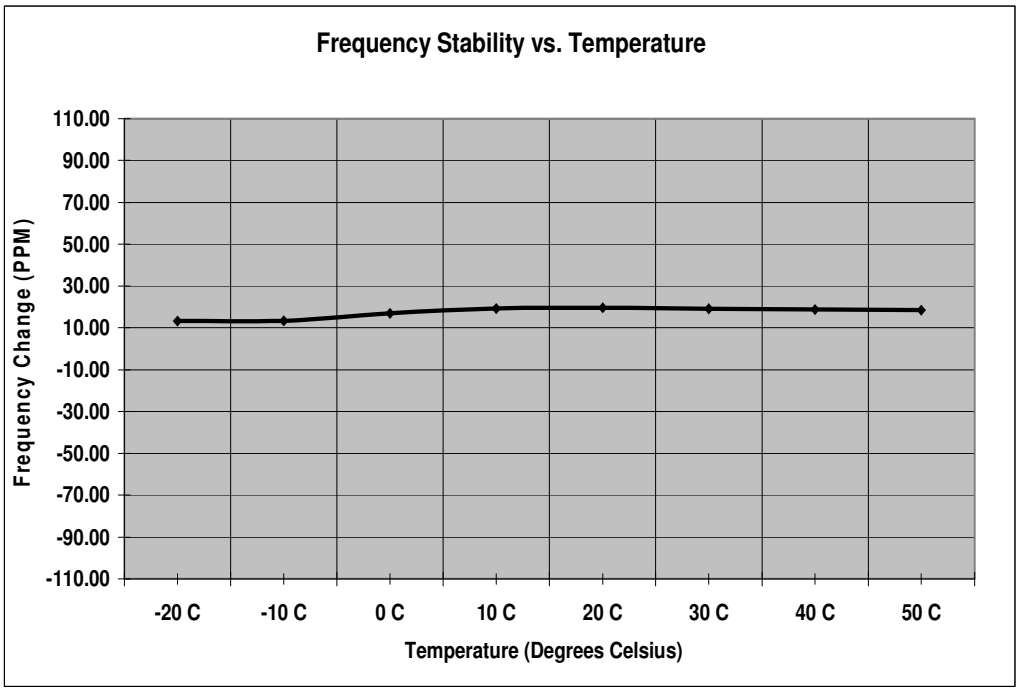

Figure 7.5.2-1: Frequency Stability

8 CONCLUSION

In the opinion of ACS, Inc. the N2-IA/IK manufactured by Assa Abloy met the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT