

Test Report

Product	Reader and Communication Controller
Name and address of the applicant	ASSA ABLOY Global Solutions Norway AS Postboks 340, Anolitveien 1-3, 1402 Ski, Norway
Name and address of the manufacturer	ASSA ABLOY Global Solutions Norway AS Postboks 340, Anolitveien 1-3, 1402 Ski, Norway
Model	RCC1601
Rating	4.5 VDC, (3x1.5 VDC secondary Batteries)
Trademark	ASSA ABLOY
Serial number	See page 3
Additional information	RFID Card Reader operates in 13.56MHz
Tested according to	FCC Part 15.225 Low Power Transmitter 13.110 - 14.010 MHz Band Industry Canada RSS-210, Issue 10 Low Power Licence-Exempt Radiocommunications Devices
Order number	480298
Tested in period	2022-11-15 – 2022-11-25
Issue date	2023-06-19
Name and address of the testing laboratory	<div> Nemko Scandinavia AS Instituttveien 6, 2007 Kjeller, Norway </div> <div> CAB Number: FCC: NO0001 ISED: NO0470 </div> <div>   </div>
An accredited technical test executed under the Norwegian accreditation scheme	
<div> <div>  </div> <div>  </div> </div> <div> Prepared by [G.Suhanthakumar] Approved by [Frode Sveinsen] </div>	
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Revision history

Revision #	Date	Order #	Comment	Sign
A	2023-06-19	480298	First Issue	gns



THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

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1 INFORMATION

1.1 Test Item

Name	ASSA ABLOY
FCC ID	Y7V-RCC1601C1
Industry Canada ID	9514A-RCC1601C1
Model/version	RCC1601
Serial number	2241 FLX 00762 (Marked as "480298001")
Hardware identity and/or version	RCC1601C1
Software identity and/or version	Ver.1.0
Operating frequency	13.56MHz
Assigned Frequency Band	13.110-14.010 MHz
Tunable Bands	None
Number of Channels	1
Operating Modes	TX/RX
Type of Modulation	ASK
Data rate	106 kbit/s
User Frequency Adjustment	None
Type of Power Supply	4.5V DC
Antenna Connector	Integral loop antenna
Antenna Diversity Supported	None
Desktop Charger	None

Description of Test Item

The Reader and Communication Controller is an electronic module located inside the external door handle of the electro-mechanic lock. The device is designed to implement several functions: user interface by the RGB LED, Touch sensor and proximity detector; setup and emergency power function by the USB-C service connector; communication function by BLE (for mobile phone access and interaction) and ZigBee technologies (for a local system monitoring) realized in a single chip solution and finally the function of reading the RFID card through the RFID reader. The device is powered by the Lock Case Controller (the device that control the mechanical part) by two of the six wires, the remaining wires are used for signaling. The 3 mentioned radio technologies: RFID, BLE and ZigBee cannot operate simultaneously, and this test report covers only the RFID operation.

1.2 Normal test condition

Temperature: 20 - 24 °C
Relative humidity: 20 - 50 %
Normal test voltage: 4.5V DC

The values are the limit registered during the test period.

1.3 Test Engineer(s)

G. Suhanthakumar

1.4 Test Equipment

See list of test equipment in clause 5.

1.5 Antenna Requirement

Is the antenna detachable?

☐ Yes ☒ No

If detachable, is the antenna connector non-standard?

☐ Yes ☐ No

Type of antenna connector: N/A

Ref. FCC §15.203

1.6 Worst-Case Configuration and Mode

Radiated Emissions were performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

1.7 Comments

And the output level is set to maximum in the software.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.225, RSS-GEN Issue 5 and Industry Canada RSS-210 Issue 10.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3m and 10m.

A description of the test facility is on file with FCC and ISED.

<input checked="" type="checkbox"/> New Submission	<input type="checkbox"/> Production Unit
<input type="checkbox"/> Class II Permissive Change	<input checked="" type="checkbox"/> Pre-production Unit
DXX Equipment Code	<input type="checkbox"/> Family Listing

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-210 Issue 10 RSS-GEN Issue 5	Result
Supply Voltage Variations	15.31(e)	N/A	N/A ¹
Antenna Requirement	15.203	6.8 (RSS-Gen)	NA ²
Power-Line Conducted Emission	15.207(a)(c)	7.2/.8.8 (RSS-Gen)	N/A ¹
99% Occupied Bandwidth	N/A	6.7 (RSS-GEN)	-
Fundamental Field strength	15.225(a)	B.6(a) (RSS-210)	Complies
Band Emissions	15.225(b)(c)	B.6(b)(c) (RSS-210)	Complies
Spurious Emissions (Radiated)	15.225 (d) 15.209	B.6(d) (RSS-210) 7.3/8.9/8.10 (RSS-GEN)	Complies
Frequency stability	15.225(e)	B.6 (RSS-210) B.6.11 (a) (RSS-Gen)	Complies

¹ EUT is battery operated

² Integral loop-antenna

RSS Gen issue 5 covers section 6,7, 8

RSS 210 issue 9 covers section B.6

3 TEST RESULTS

3.1 99% Occupied Bandwidth

ISED Canada RSS-GEN Issue 5, Clause 6.7

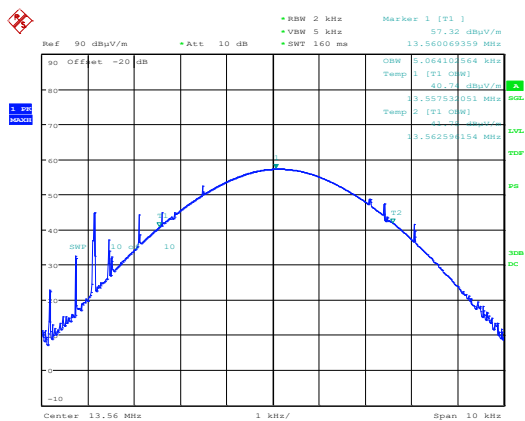
Test Results: Complies

Measurement Data:

99% BW (kHz)
13.56MHz
5.06

Requirements:

For information only



Date: 15.NOV.2022 14:53:33

OBW- 13.56 MHz

3.2 Fundamental Field Strength

FCC 15.225 (a) / B.6 (a)

ISED Canada RSS-210 Issue 10, B.6(a)

Test Results: Complies

Measurement data:

Maximum field strength

RF channel	Measured PK value (dB μ V/m) @ 10m	Distance Correction factor for Limit dB	Converted Limit @10m (dB μ V/m)
13.56MHz	36.05	19.1	103.1

The limit line given in the graph is corrected to 10m distance.

Pulse train period during reading card reading mode (duty cycle: 10.48 %)

Radiated measurements are performed at 10 m distance.

Detachable antenna?

☐ Yes

☒ No

If detachable, is the antenna connector non-standard?

☐ Yes

☐ No

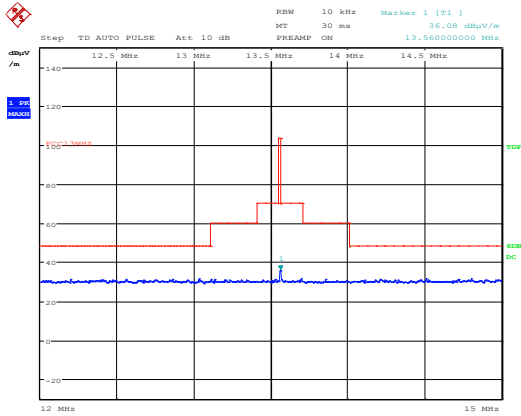
Integral loop antenna

Requirements:

The maximum field strength within band 13.553 – 13.567MHz at 30 meters shall be ≤ 84.0 dB μ V/m (at 10 meters ≤ 103.1 dB μ V/m)

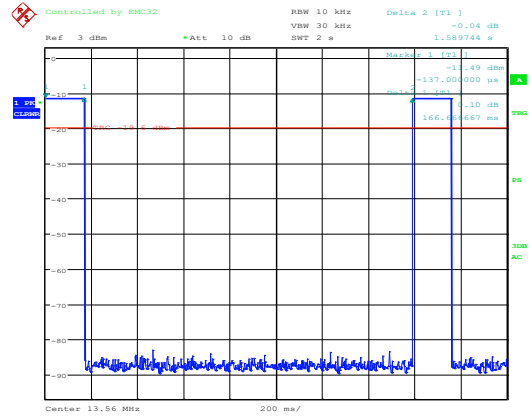
(b) 334 microvolts/m (50.5 dB μ V/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz. (at 10 meters ≤ 89.5 dB μ V/m)

(c) 106 microvolts/m (40.5 dB μ V/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz. (at 10 meters ≤ 50 dB μ V/m)



Date: 15.NOV.2022 09:24:35

Field strength, 13.56 MHz, PK



Date: 15.NOV.2022 14:32:15

Duty cycle

3.3 Spurious emissions (radiated)

FCC 15.209 / 15.225 (b,c,d)

ISED Canad RSS-210 Issue 10, B.6(d) and RSS-Gen 7.3/8.9/8.10

Test Results: Complies

Measurement Data:

Radiated Emissions with loop antenna, 9kHz – 30MHz

measured at a distance of 10m.

Measured with Peak Detector:

Frequency	Dist. corr. factor	Measured Field strength, Peak @ 10m	Duty cycle corr. factor	Calculated Field strength, Average @ 30m	Limit @ 300m	Margin
kHz	dB	dB μ V/m	dB	dB μ V/m	dB μ V/m	dB
/	/	/	/	/	/	> 30

The limit line given in the graph is corrected to 10m distance.

The maximum is observed in Transverse polarization

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

Duty Cycle Correction Factor Calculation:

RF duty cycle: Calculation according to RF burst Para 15.35 (c)

minimum DC Correction factor = $-20 \times \log(0.01048) = -19.59$ dB

Maximum Duty Cycle Correction Factor according to Para 15.35 (b): 20 dB

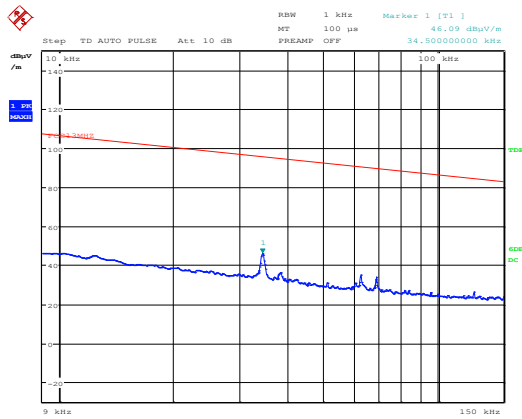
Requirement:

(d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

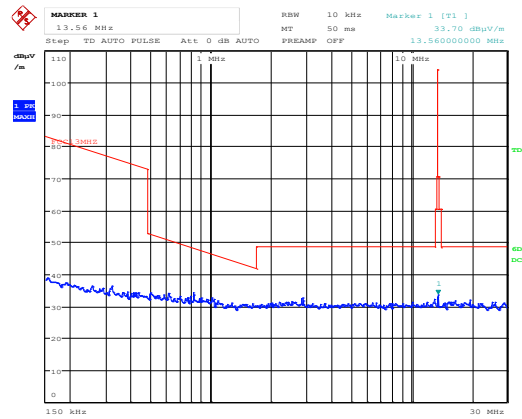
Radiated emissions 9kHz – 30 MHz.

Detector: Peak

Measuring distance 10 m. The limit is corrected to 10m distance.



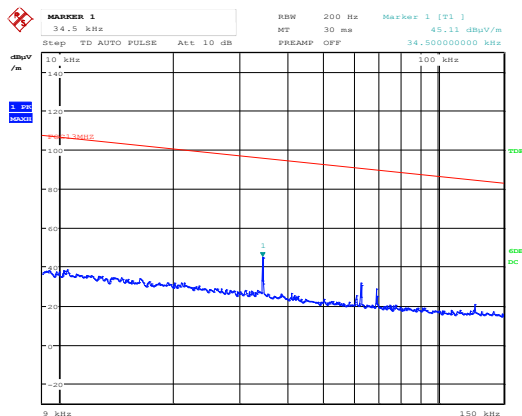
Date: 15.NOV.2022 09:03:05



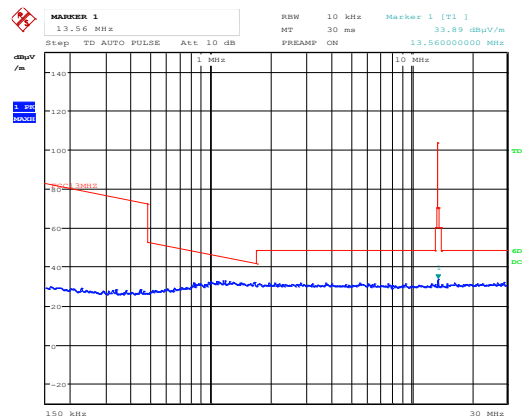
Date: 15.NOV.2022 10:18:46

Longitudinal mode

Radiated spurious emissions, 9kHz – 150kHz, PK scan
 (The emission at 34.50kHz is not from the EUT, it is a part of the test setup)



Date: 15.NOV.2022 09:10:39



Date: 15.NOV.2022 09:09:16

Transverse mode

Radiated spurious emissions, 9kHz – 150kHz, PK scan
 (The emission at 34.50kHz is not from the EUT, it is a part of the test setup)

Transverse mode

Radiated spurious emissions, 150kHz - 30MHz, PK scan

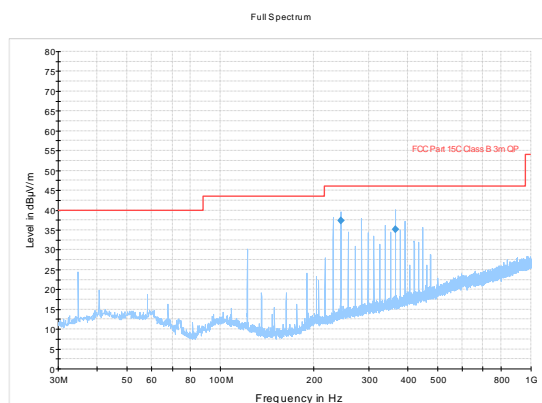
Radiated emissions 30 – 1000 MHz.

Detector: QP

Measuring distance 3 m.

The graph shows peak scan and highest values.

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
244.081754	37.32	46.00	8.68	15000.0	120.000	203.0	V	357.0	-12.1
366.121938	35.10	46.00	10.90	15000.0	120.000	125.0	H	295.0	-8.9



Radiated emissions@ 3m , 30 - 1000 MHz

3.4 Transmitter Frequency Stability

FCC 15.225(e)

ISED Canada RSS-210 Issue 10, B.6 and RSS-Gen B.6.11 (a)

Test Results: Complies

Measurement Data:

Temperature	Given Frequency (MHz)	Measured value (MHz)	Deviation (%)
+50 ° C	13.56	13.56000	-0.0044983
+20 ° C	13.56	13.56061	Reference
-20 ° C	13.56	13.56012	-0.0036134

Supply voltage:4.5Vdc

Requirement:

(e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ ($\pm 100\%$) of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage.

4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

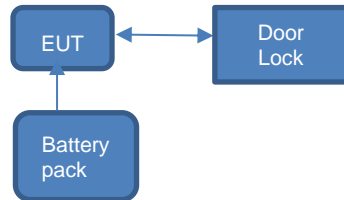
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2022.01	2023.01
2.	ESR	Spectrum analyser	Rohde & Schwarz	LR1675	2021.07	2023.07
3.	HFH2-Z2	Active Loop antenna	Rohde & Schwarz	LR1660	2022.01	2024.01
4.	VULB9163	Bi-log Hybrid Antenna	Schwarzbeck	LR 1616	2021.05	2023.05
5.	4768-10	Attenuator	Narda	LR 1670	Cal b4 use	
6.	310N	Pre-amplifier	Sonoma	LR 1686	2022.08	2023.08
7.	46	Multimeter	Fluke	LT 5218	2022.03	2023.03
8.	CPX400D	Power supply	TTi	LR 1744	Cal b4 use	
9.	TY 80	Climatic chamber	ACS	LR 1083	2022.03	2024.03

The software listed below has been used for one or more tests.

No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	GPBShot	2.7	Screenshots from R&S Spectrum Analyzers
2	Rohde & Schwarz	RSCOMMANDER	1.9.2	Software Tool for R&S Instruments
3	Rohde & Schwarz	EMC 32	10.50.40	Radiated Emission test software

6 System set up

6.1 System set up for radiated measurements

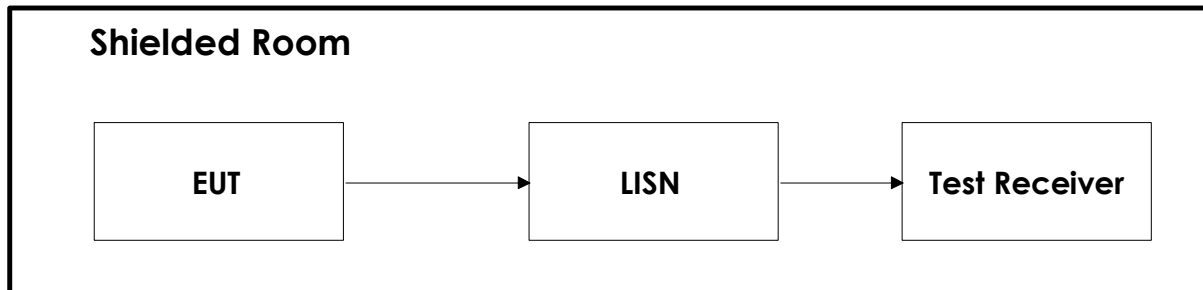


Radiated measurement set-up

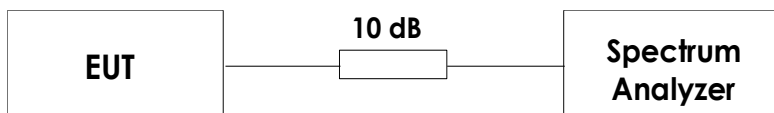
Test equipment: 1-9

7 BLOCK DIAGRAM

7.1 Power Line Conducted Emission

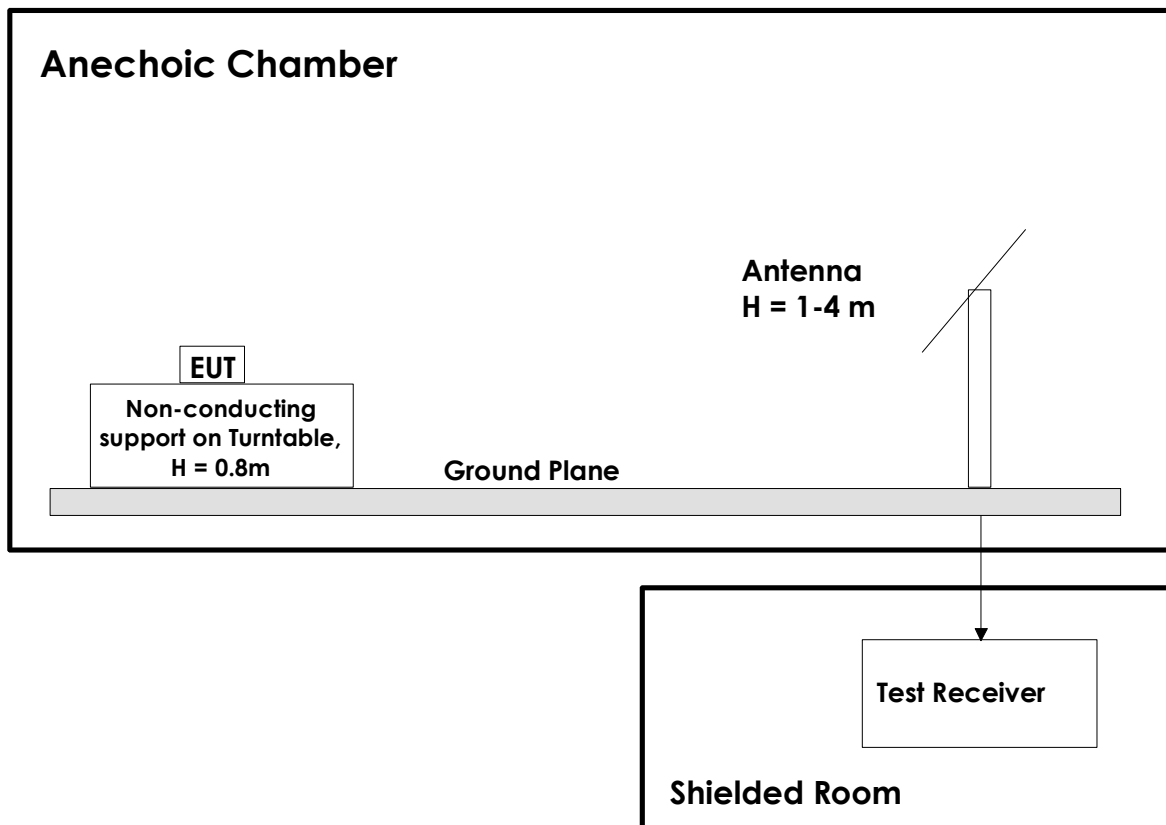


7.2 Conducted Tests



This test set-up is used for all Conducted tests.
For Frequency Stability test the EUT was placed in a climatic chamber.

7.3 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10m, for all other frequencies it is 3m or 1m. Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss. All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers. A pre-amplifier is used for all measurements above 30 MHz, and High-Pass or Band-Pass filter is used for all harmonics.