REP025651

Test Report

Product	Reader and Communication Controller
Name and address of the applicant	ASSA ABLOY Global Solutions Norway AS P.O. Box 340, Anolitveien 1-3 N-1402 SKI - Norway
Name and address of the manufacturer	ASSA ABLOY Global Solutions Norway AS P.O. Box 340, Anolitveien 1-3 N-1402 SKI - Norway
Model	RCC 6470
Rating	Near Field Communications 13.56 MHz, Internal battery (3x1.5V DC)
Trademark	vingcard ASSA ABLOY
Additional information	-
Tested according to	**FCC Part 15.209** **FCC Part 15.225** Digital Transmission Systems **Industry Canada RSS-210, Issue 11** Low Power Licence-Exempt Radio Apparatus, Category I Equipment
Order number	PRJ0051915
Tested in period	2024-09-01 – 2024-10-11
Issue date	2025-05-05
Name and address of the testing laboratory	Instituttveien 6 Kjeller, Norway www.nemko.com CAB Number: FCC: NO0001 ISED: NO0470 **An accredited technical test executed under the Norwegian accreditation scheme**

Prepared by [Jan G Eriksen]	Approved by [Frode Sveinsen]

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Revision history

Revision	Date	Comment	Sign
A	2024-10-29	First edition	JGER
B	2025-04-23	Editorials	JGER
C	2025-05-05	Frequency stability measurements included	JGER
D	2025-05-05	Added FCC part 15.225 reference	RU

GENERAL REMARKS

This report applies only to the sample(s) tested. It is the manufacturer's responsibility to ensure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is solely responsible for any modifications to the product that could result in non-compliance with the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither are opinions expressed regarding model variants covered by the testing of this report.

CALIBRATION

All instruments used in the tests given in this test report are calibrated and traceable to national or international standards. Between calibrations all test set-ups are controlled and verified on a regular basis by periodic checks to ensure, with 95% confidence, that the instruments remain within the calibrated levels.

MEASUREMENT UNCERTAINTY

Measurement uncertainties are calculated or considered for all instruments and instrument set-ups used during these tests. Uncertainty figures are found in a separate clause in this report.

1 INFORMATION

1.1 Test Item

Name	Reader and Communication Controller
FCC ID	Y7V-RCC6470C1
IC ID	9514A-RCC6470C1
Model/version	RCC 6470
Serial number	2423 HAN 00070
Hardware identity and/or version	RCC6470C1
Software identity and/or version	Ver.1.4
NFC chip/ic type/version	Nexperia Semiconductors CLRC 66303
Frequency Range	13.110-14.010 MHz
Operating frequency	13.56 MHz
Type of Modulation	ASK
Output Power	65 dBuV/m @ 3 meters distance
User Frequency Adjustment	None
Duty cycle during normal use	18.3 % (the duty cycle was 100% during testing)
Type of Power Supply	External battery 4.5 V DC
Antenna type	Loop Integral
Antenna Connector	None
Antenna Diversity Supported	No
Power supply	External battery 4.5V DC (3x1.5 V) during radiated tests.
Desktop Charger	None

1.2 Description of Tested Device

The tested device is a reader and communications controller module for near field communication at 13.56 MHz.

1.3 Test Environment

Temperature	**20.0 – 23.3 °C**
Relative humidity	**20.0 – 44.0 %**
Normal test voltage	**4.5 V DC**

The values are the limit registered during the test period.

All conducted tests have been performed with a regulated power supply.

Radiated tests have been performed with the EUT powered from fresh batteries.

1.4 Test Engineers

Jan G Eriksen

1.5 Antenna Requirement

Does the EUT have detachable antenna(s)?	☐ **YES**	☒ **NO**
If detachable, is the antenna connector(s) non-standard?	☐ **YES**	☐ **NO**
The EUT have internal antennas.		

Requirement: FCC 15.203, 15.204

1.6 Worst-Case Configuration and Mode

Radiated Emissions were performed with the EUT set to transmit at the frequency (13.56 MHz) programmed by the manufacturer.

1.7 Comments

The measurements were done with the EUT powered by 4.5 V DC. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

All measurements were done with the EUT powered by a fully charged battery.

All ports were populated during spurious emission measurements.

2 TEST REPORT SUMMARY

2.1 General

The tests were conducted on a sample of the equipment for demonstrating compliance with one or more of the following standards:

Standard	Description
FCC CFR 47 Part 15C	Unlicensed transmitters
ISED RSS-210, Issue 11	Licence-Exempt Radio Apparatus: Category I Equipment
ISED RSS-GEN Issue 5	General Requirements for Compliance of Radio Apparatus

The following standards and documents were used for one or more measurements:

Standard	Description
ANSI C63.4-2014	Unintentional Radiators
ANSI C63.10-2013	Intentional Radiators
FCC KDB 412172 D01	Determining ERP and EIRP

All measurements are traceable to national standards.

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

☒ **New Submission**	☒ **Production Unit**
☐ **Class II Permissive Change**	☐ **Pre-production Unit**
NFC Equipment Class	☐ **Family Listing**

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-210 Issue 11, RSS-GEN Issue 5 reference	ANSI C63.10-2013 reference	Verdict
Supply Voltage Variations	**15.31(e)**	**6.11 (RSS-GEN)**	**5.13**	**Pass**
Number of Frequencies	**15.31(m)**	**6.9 (RSS-GEN)**	**N/A**	**Pass**
Antenna Requirement	**15.203**	**6.8 (RSS-GEN)**		**Pass**
Power Line Conducted Emission	**15.207(a)**	**7.2 / 8.8 (RSS-GEN)**	**N/A**	**N/A**
Occupied Bandwidth (99% BW)	**N/A**	**6.7 (RSS-GEN)**	**6.9.3**	**Pass**
Spurious Emissions (Radiated)	**15.209(a)**	**7.3 (RSS-GEN)** **8.9 (RSS-GEN)**	**6.3, 6.5, 6.6, 6.10**	**Pass**
Frequency Tolerance	**15.225 (e)**	**RSS-Gen 6.11** **RSS-210 Issue 11, B.6(b)**		**Pass**

3 TEST RESULTS

3.1 Operation within the band 13.110-14.010 MHz

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.3 / 7.8.3

Measurement Data:

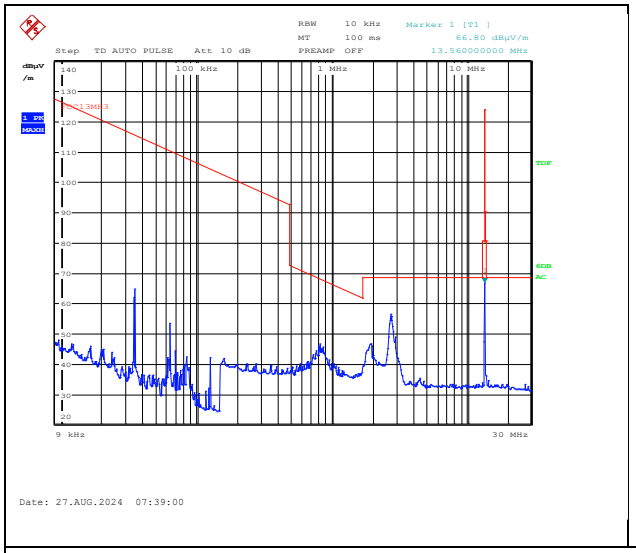
Regulation	Frequency	Distance (m)	Field Strength	Detector	Limit	Margin
FCC 15.209	13.56 MHz	3	66.8 dBµV/m	RMS/MaxH	69.5 dBµV/m	2.7 dB
RSS-GEN	13.56 MHz	3	17.3 dBµA/m	RMS/MaxH	18.1 dBµA/m	0.8 dB

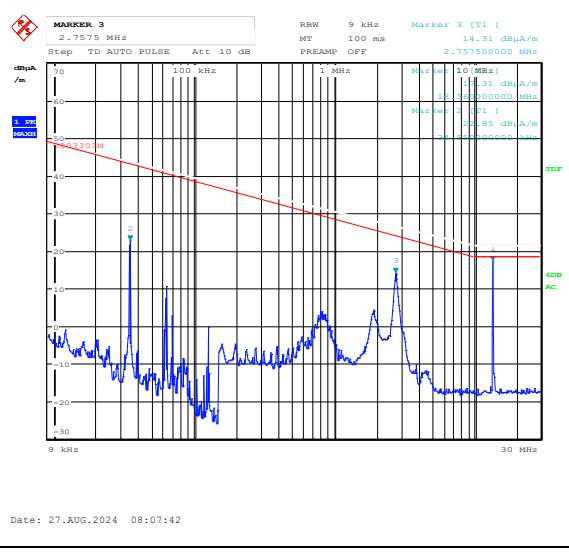
The limits at 30 meters distance of 30uV/m (29.5 dBuV/m) and 0.08 uA/m (-21.9 dBuA/m) have been converted to 3 meters distance using the conversion factor 40 * log (30 / 3) – corresponding to 3 meter limits of 69.5 dBuV/m and 18.1 dBuA/m respectively.

See plots below

Requirements/Limit

FCC	Part 15.209		
ISED	RSS-GEN, Issue 5, Clause 8.9		
Frequency	Radiated emission limit		Distance
13.56 MHz (FCC 15.209)	30 µV/m	29.5 dBµV/m	30m
13.56 MHz (RSS-GEN)	0.08 µA/m	-21.9 dBµA/m	30m
	Limits above are with Average Detector		





Measured field strength @ 3 meters distance, Loop Transversal

3.2 99% Occupied Bandwidth

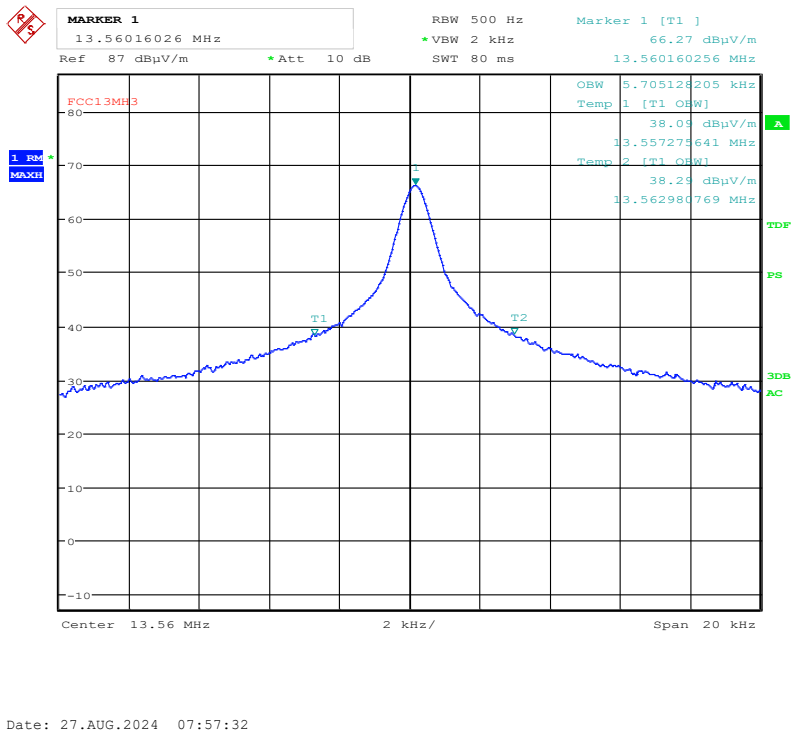
ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.3 / 7.8.3

Measurement Data:

Occupied Bandwidth (99%)	
Operating Frequency	**13.56 MHz**
Measured OBW (99%)	5.705 kHz

Requirements: No requirement for 99% BW, reported for information only.



99% OBW

3.3 Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED RSS-GEN, Issue 5 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 5, clause 8.9.

FCC (MHz)	ISED (MHz)	FCC (GHz)	ISED (GHz)
0.090-0.110		**0.96-1.24** **1.3-1.427**	**0.96-1.427**
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	3.020-3.026	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	5.677-5.683	2.4835-2.5	
6.215-6.218		**2.69-2.9**	**2.655-2.9**
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		**3.6-4.4**	**3.5-4.4**
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
108-121.94 **123-138**	**108-138**	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISED, all other frequencies are common.

3.4 Spurious Emissions (Radiated)

FCC Part 15.31, 15.33, 15.35, 15.209 (a) (d)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Radiated emissions 9kHz - 30 MHz

Detector: Peak

Measuring distance 3m

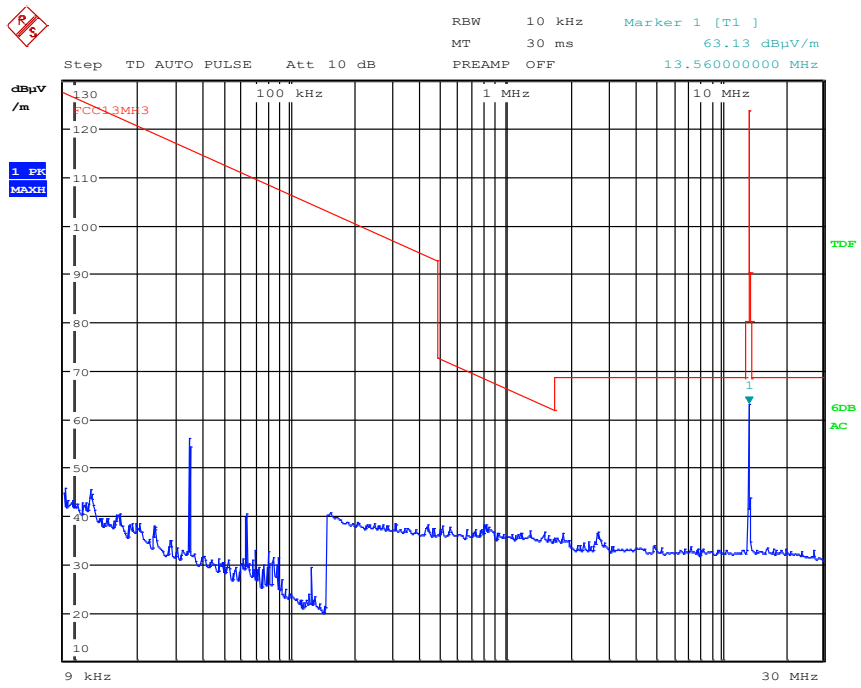
As can be seen in the plots below there are no significant spurious emissions close to the limits in the whole frequency range 9 kHz to 30 MHz. the table thus give approximate observed spurious levels and corresponding margins to the limit.

Frequency kHz	Channel kHz	Measured Field Strength @3m (dBµV/m)	Detector	Limit @3m (dBµV/m)	Margin dB
9-490	13.56	< 70-50	PK	128.5-93.8	> 40
490-1705	13.56	< 40	PK	73.8-63.0	> 20
1705-30000	13.56	< 40	PK	30	> 10

The limit line in the graphs is corrected for 3m distance.

Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer “Transducer factor”.

See attached graphs.



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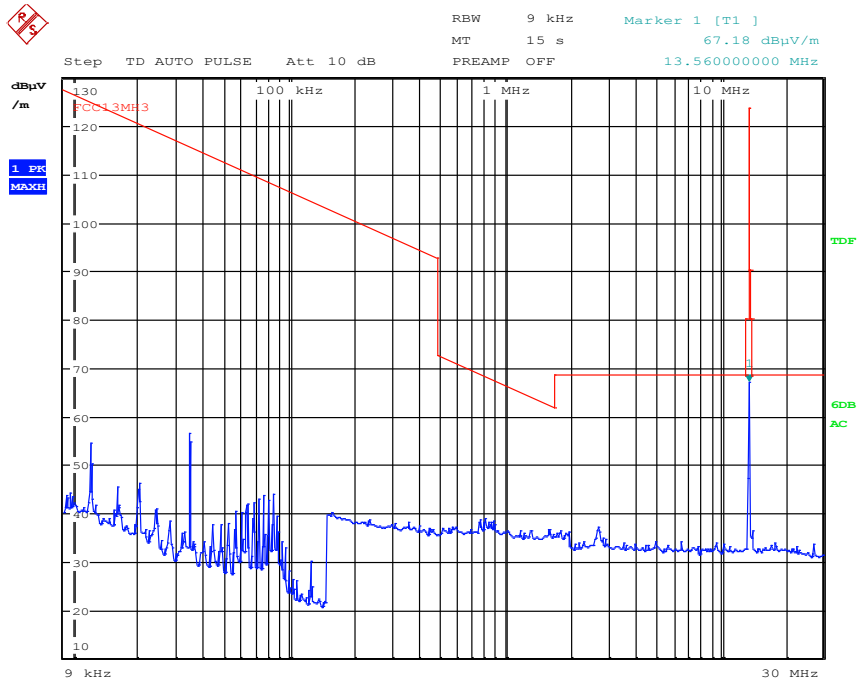
Radiated Emissions, 0.09 - 30MHz @3m – Loop longitidual



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Radiated Emissions, 0.09 - 30MHz @3m – Loop transversal

3.5 Radiated Emission, 30 – 1000 MHz

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Detector: Peak (found frequencies were measured with Quasi-Peak Detector)

Measuring distance 3 m

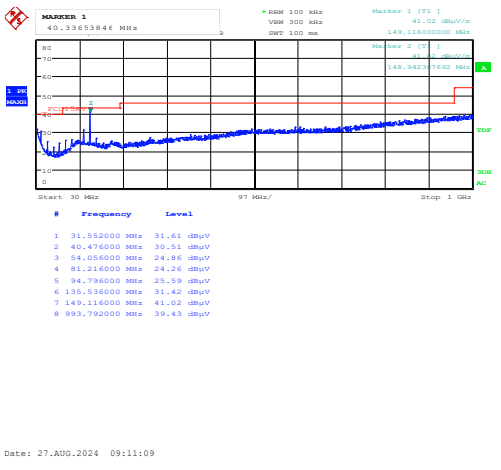
Tested in speech mode with active connection

Frequency MHz	Field strength @3m Peak Det., dBµV/m	Limit @3m QP Det., dBµV/m	Margin dB
40.7	34.5	40.0	5.5
149.2	43.2	43.5	0.3

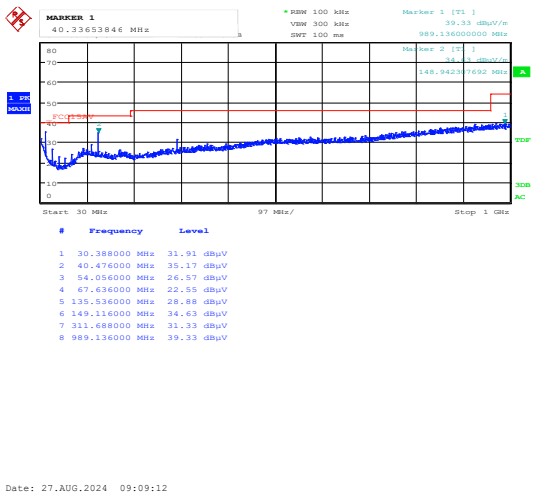
See attached plots

Requirements/Limit

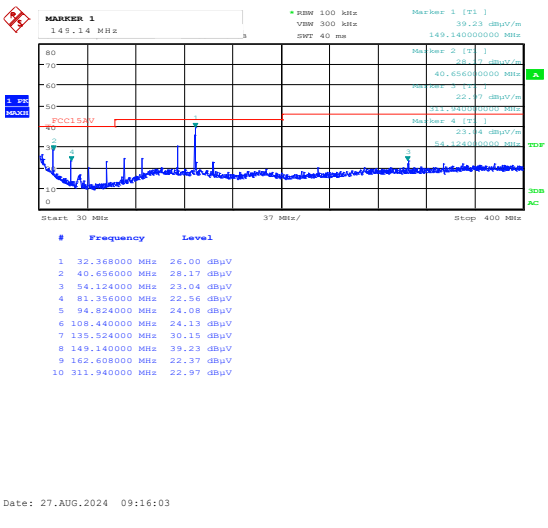
FCC	**Part 15.209 @ frequencies defined in §15.205**	
ISED	**RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10**	
Frequency	**Radiated emission limit @3 meters**	
30 – 88 MHz	**100 µV/m**	**40.0 dBµV/m**
88 – 216 MHz	**150 µV/m**	**43.5 dBµV/m**
216 – 960 MHz	**200 µV/m**	**46.0 dBµV/m**
960 – 1000 MHz	**500 µV/m**	**54.0 dBµV/m**
	Limits above are with Quasi Peak Detector	



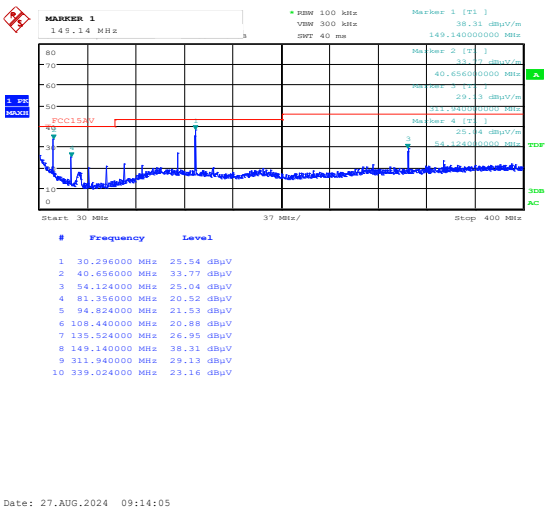
NFC 13.56 MHz, 30-1000 MHz, HP



, VP



NFC 13.56 MHz, 30-400 MHz, HP



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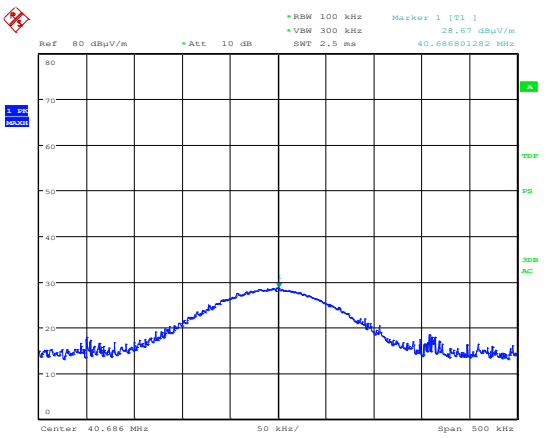
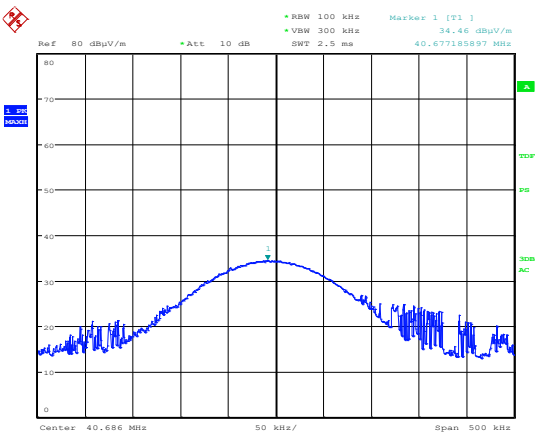


NFC 13.56 MHz, 40.7 MHz, HP



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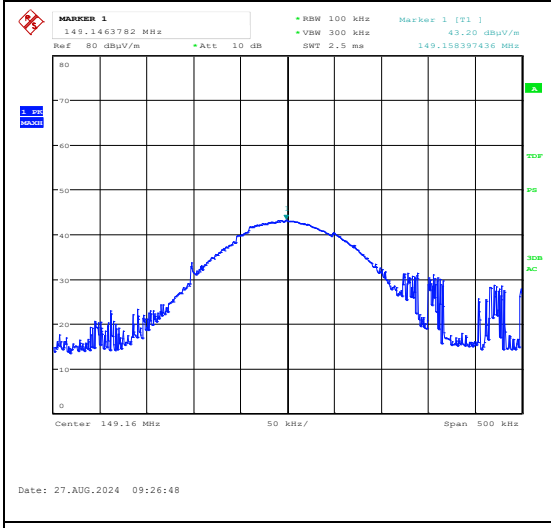
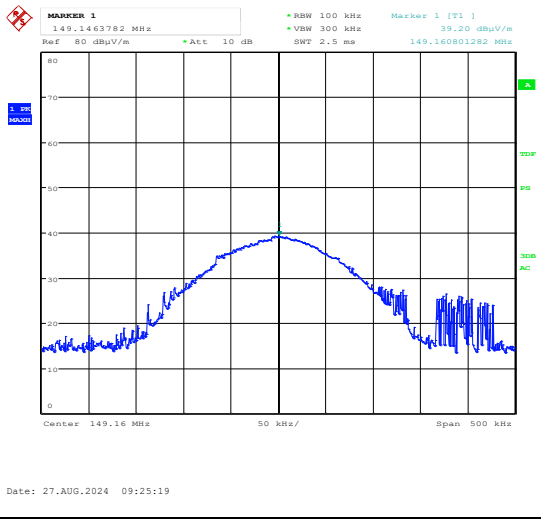
	
NFC 13.56 MHz, 149.2 MHz, HP	, VP

3.6 Transmitter Frequency Stability

FCC 15.225(e)

ISED Canada RSS-210 Issue 11, B.6 (b) and RSS-Gen 6.11 (a)

Test Results: Complies

Measurement Data:

Temperature Dec C	Voltage DC	Nominal frequency MHz	Measured frequency MHz	Deviation PPM *)
+50	+15%	13.56	13.560113	8.36
+50	Nominal	13.56	13.560108	7.93
+50	-15%	13.56	13.560102	7.54
+20	+15%	13.56	13.560118	8.67
+20	Nominal	13.56	13.560124	9.16
+20	-15%	13.56	13.560127	9.38
-20	+15%	13.56	13.560150	11.08
-20	Nominal	13.56	13.560143	10.54
-20	-15%	13.56	13.560140	10.30

Note: *) 0.01% is equial to 100 PPM

Nominal supply voltage:4.5Vdc

Requirement:

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% (±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
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
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.

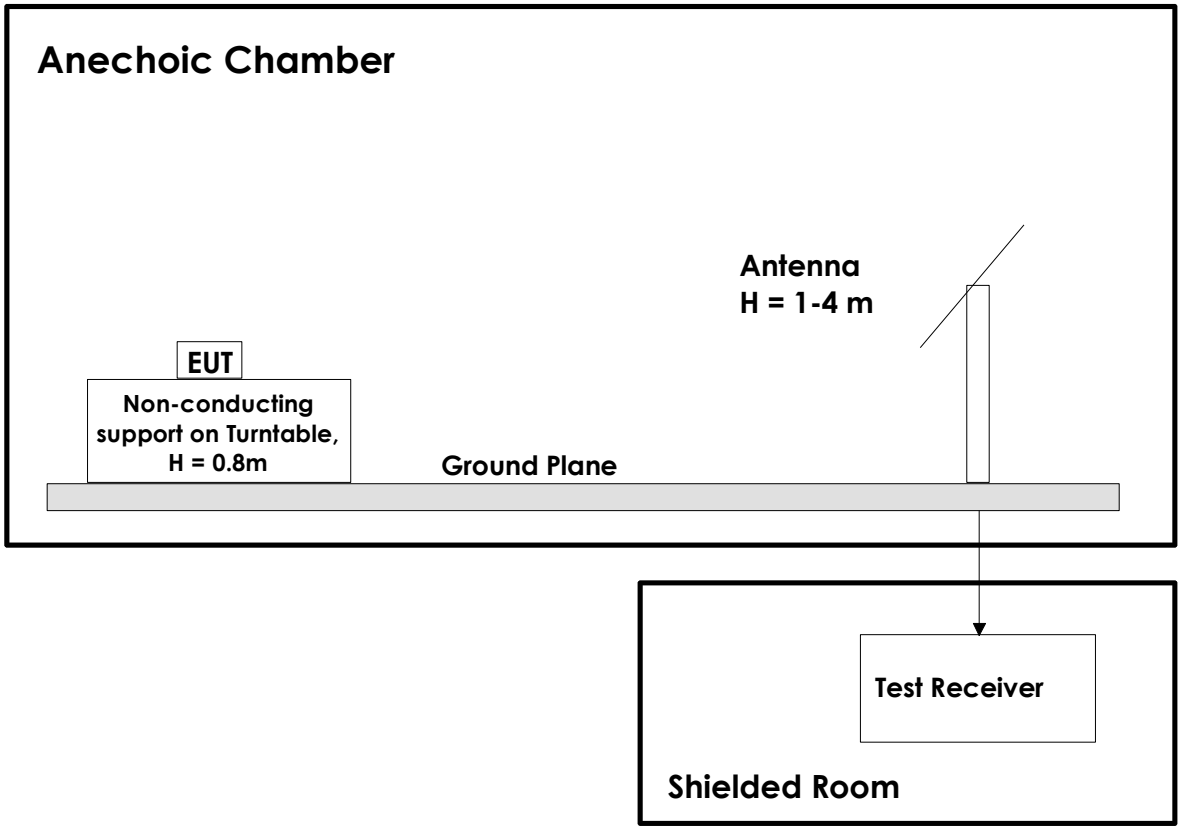
No.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2024.03	2025.03
2	HFH2-Z2	Loop antenna	Rohde & Schwarz	LR1660	2022.01	2025.01
3	3117-PA	Antenna horn	ETS-Lindgren	LR 1717	2023.11	2025.11
4	JB3	Antenna Bilog	Sunol Sciences Inc.	N-4525	2023.04	2025.04
5	310N	Pre-amplifier	Sonoma	LR 1686	2023.09	2024.09
6	Model 87 V	Multimeter	Fluke	LR 1597	2023.04	2025.04
7	6812B	AC Power source	Agilent	LR 1515	2022.12	2024.12

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

No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.40	EMC test software
2	Rohde & Schwarz	GPIBShot	2.7	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 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.