Wireless FCC Report on the Testing of the

Entrust
RFID PWA 534455-002

FCC ID: GDI-534455002
IC: 889B-534455002

In accordance with:
FCC Part 15 Subpart C §15.225
ISED RSS-210 Issue 11, June 2024

America

Add value.
Inspire trust.

Prepared for: Entrust
1187 Park Place
Shakopee MN 55379

COMMERCIAL-IN-CONFIDENCE

Document Number: NC721002443.2 | Issue: 1

SIGNATURE			
			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Sean Sellergren	**Sr. EMC Engineer**	**Authorized Signatory**	**23 September 2024**

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD America, Inc. document control rules.

FCC Accreditation Designation Number US1148 New Brighton, MN Test Laboratory	Innovation, Science, and Economic Development Canada Accreditation Site Number 4512A New Brighton, MN Test Laboratory

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with the standards listed above and the tests shown in Table 1.3.1 of this report.

A2LA Cert. No. 2955.11

ACCREDITATION
Our A2LA Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our A2LA Accreditation.

TÜV SÜD America Inc
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Contents

1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Table 1.1-1 – Modification Record

Issue	Description of Change	Date of Issue
1	First Issue	23rd September 2024

1.2 Introduction

Applicant	Entrust
Manufacturer	Entrust
Applicant's Email Address	Mark.Forster@entrustdatacard.com
Model Number(s)	RFID PWA 534455-002
System Component(s)	ST25R100 RFID IC, AP7343 LDO
Serial Number(s)	N/A
Number of Samples Tested	1
Test Specification/Issue/Date	FCC Part 15 Subpart C §15.225 ISED RSS-210 Issue 11, June 2024
Order Number	721002443
Start of Test	3rd September 2024
Finish of Test	5th September 2024
Related Document(s)	ANSI C63.10 & RSS-GEN

1.3 Scope of Testing

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

1.4 Summary of Results

A summary of the tests carried out in accordance with the specifications shown below.

Table 1.4-1 – Summary of Results

Section	Specification Clause		Test Description	Accreditation	Base Standard
2.1	15.203	RSS-GEN (6.8)	Antenna Requirements	A2LA	FCC Sub Part C 15.203
2.2	N/A	RSS-GEN (6.7)	Occupied Bandwidth	A2LA	RSS-GEN
2.3	15.225(a-c)	RSS-210 (B.6(a))	Fields Strength within the bands 13.110 MHz – 14.010 MHz	A2LA	ANSI C63.10:2013
2.4	15.225(d)	RSS-210 (B.6(a))	Fields Strength outside the bands 13.110 MHz – 14.010 MHz	A2LA	ANSI C63.10:2013
2.5	15.225(e)	RSS-210(B.6(b))	Frequency Tolerance	A2LA	ANSI C63.10:2013
2.6	15.207	RSS-GEN (8.8)	Conducted Emission	A2LA	ANSI C63.10:2013

Table 1.4-2 – Test Accreditation

Test Name	Name of Tester(s)	Results / Comments
Antenna Requirements	Sean Sellergren	Pass
Occupied Bandwidth	Duranta K. Barua	Pass
Fields Strength within the bands 13.110 MHz – 14.010 MHz	Duranta K. Barua	Pass
Fields Strength outside the bands 13.110 MHz – 14.010 MHz	Duranta K. Barua	Pass
Frequency Tolerance	Sean Sellergren	Pass
Conducted Emission	Duranta K. Barua	Pass

1.5 Product Information

1.5.1 Technical Description

The Equipment Under Test (EUT): PWA, RFID Module.

Table 1.5-1 – Wireless Module Technical Information [RFID]

Detail	Description
FCC ID	GDI-534455002
IC	889B-534455002
Transceiver Model #	534455
Operating Frequency	13.56 MHz
Modulation Format	RFID
Oscillator	27.12MHz
Input Power	5VDC
Antenna Type / Gain:	Coil / 1 dBi

A full description and detailed product specification details are available from the manufacturer.

Table 1.5-2 – Cable Descriptions

Cable/Port	Description
N/A	N/A

Table 1.5-3 – Support Equipment Descriptions

Make/Model	Description
N/A	N/A

1.5.2 Modes of Operation

The tested mode of operation was: EUT loaded with test firmware to put RFID into 100% transmit mode.
The EUT was placed in transmit mode 100% duty cycle.

Frequency	13.56 MHz

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test program. The modifications incorporated during each test are recorded on the appropriate test pages.

Table 1.7-1 – Modification Record

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	Initial State	-	-

1.8 Test Location

TÜV SÜD conducted the following tests at our New Brighton, MN Test Laboratory.

Office address:

TÜV SÜD America
141 14th Street NW
New Brighton, MN 55112 USA

2 Test Details

2.1 Antenna Requirements

2.1.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, 15.203
RSS-GEN Issue 5

2.1.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state “0”, as noted in §1.6.

2.1.3 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Note: Above statement is taken from FCC Part 15 Subpart C §15.203

Table 2.1-1 – Antenna Used In EUT

Antenna Type	Connection Type
Coil	On board / Fixed

2.2 Occupied Bandwidth

2.2.1 Specification Reference

RSS-GEN Section 6.7

2.2.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state “0”, as noted in §1.6.

2.2.3 Date of Test

5th September 2024

2.2.4 Test Method

The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth value. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The RBW to 1-5% of the occupied bandwidth and the VBW set to ≥ 3 times the RBW.

2.2.5 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.

2.2.6 Test Results

Table 2.2-1 – 99% Bandwidth Results

Frequency (MHz)	99% Bandwidth (Hz)
13.56	635.4491

Test Summary: The EUT operated as intended before, during, and after testing.

Test Result: Pass

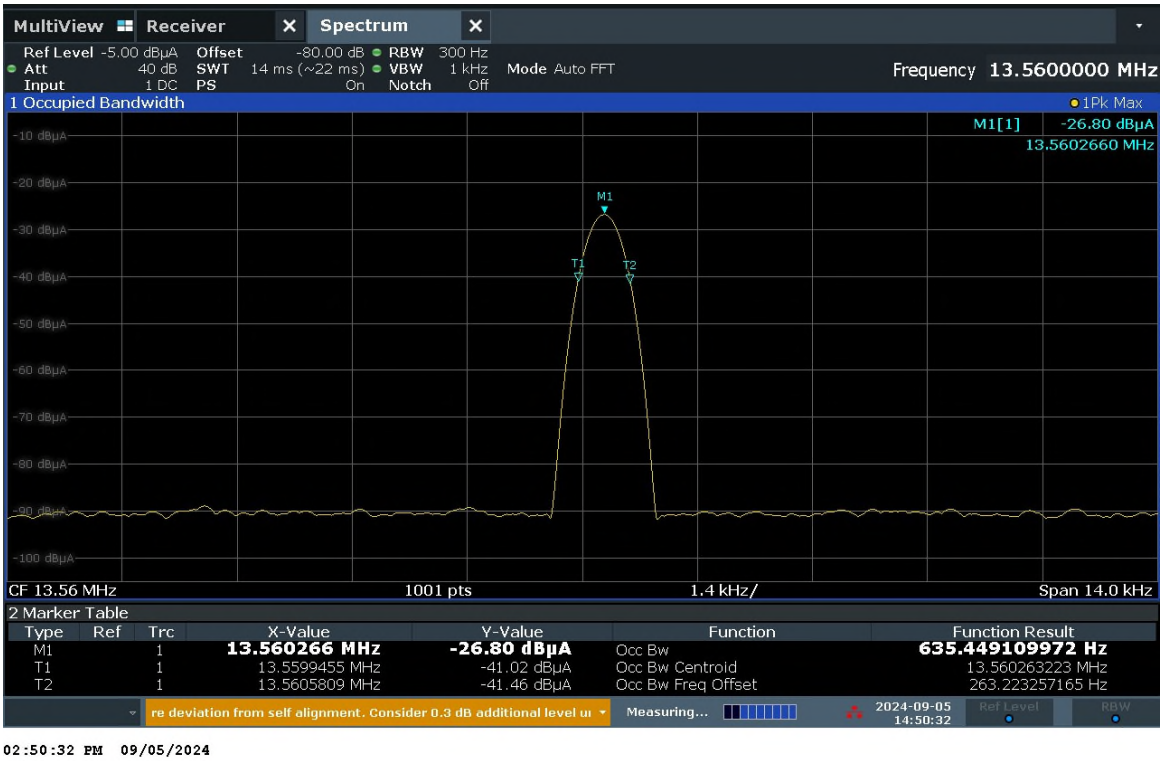


Figure 2-1 – 99% Bandwidth – Transmit Freq.

2.2.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: GRP2

Table 2.2-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11142	Hewlett-Packard	Preamplifier, 0.1 to 1300 MHz	8447D	2727A05370	B	10/19/2023	10/19/2024
NBLE11645	Schwarzbeck	Antenna, Trilog Broadband, 30-7000 MHz	VULB 9162	0254	G	04/25/2023	04/25/2025
NBLE11754	Rohde & Schwarz	Receiver, 1 Hz-44 GHz	ESW44	103037	G	10/02/2023	10/02/2024

Cal Code G = Calibration performed by an accredited outside source.
Cal Code B = Calibration verification performed internally.
Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

2.3 Fields Strength within the bands 13.110 MHz – 14.010 MHz

2.3.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, §15.225(a)(b)(c)
ISED RSS-210 B.6(a)(b)(c)

2.3.2 Equipment Under Test and Modification State

As shown in §1.2 with modifications if any as shown in §1.6.

2.3.3 Date of Test

3rd September 2024

2.3.4 Test Method

Measurements were performed in a semi anechoic chamber. The fundamental emission was measured at 3m with the limit adjusted using the formulas provided in ANSI C63.10. The EUT was rotated 360° and the magnetic loop antenna was used to maximize emissions. Final emissions were performed using a quasi-peak detector.

2.3.5 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.

2.3.6 Additional Observations

Measurements were performed using BAT-EMC (v2022.0.27.0) automated software. The reported level is the actual level with all the correction factors factored in. The Correction Factor column is for informational purposes only.

2.3.7 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dBµV) @ 150 kHz			30.0
Correction Factor (dB/m)	TEMC00002 - LISN	0.03	10.53
	Cable 1	10.50	
Reported Quasi-peak Final Measurement (dBµV) @ 150 kHz			40.53

2.3.8 Test Results

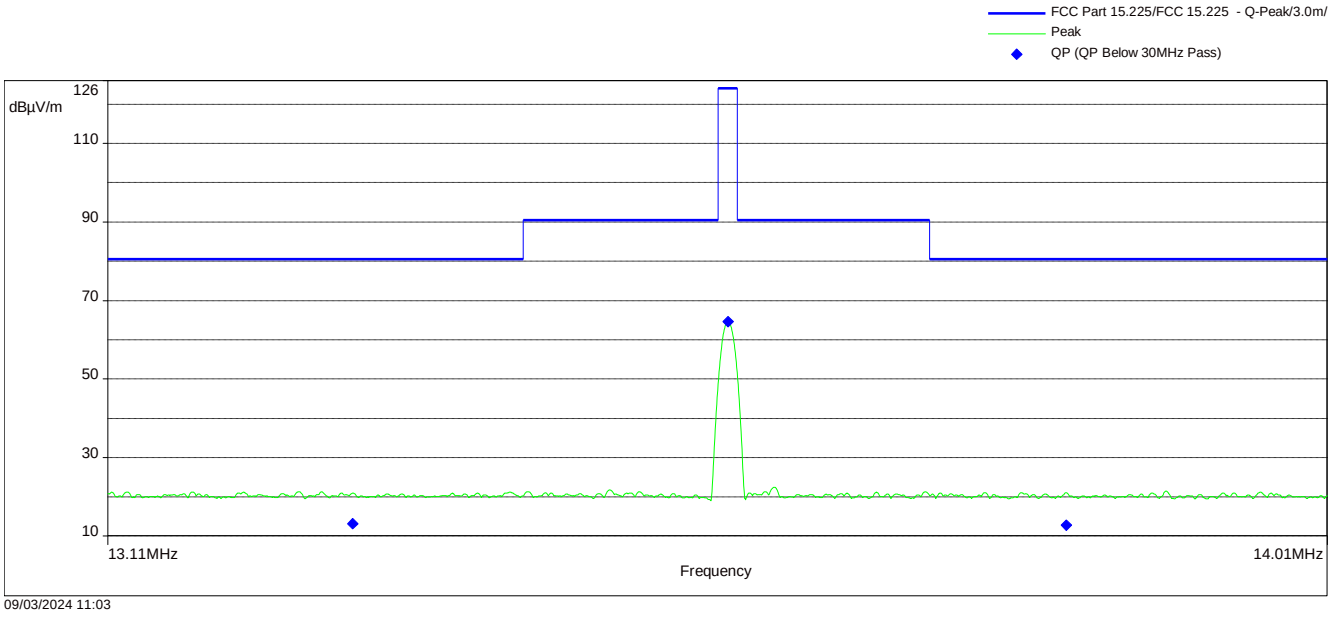
Test Summary: EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

Radiated Magnetic Emission 13.110MHz - 14.01MHz

Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
13.11 MHz - 14.01 MHz	3m	*H/V*	9 kHz	*18001 Pts*	*1 ms/MHz*



Limit: FCC Part 15.225/FCC 15.225

Test Date: 9/3/2024

Test Results: Pass

Figure 2.3-1 – Graphical Results – 13.110MHz – 14.01MHz In Band Measurement – Transmitter Operational

Table 2.3-1 – 13.110MHz – 14.01MHz In Band Measurement – Transmitter Operational

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (º)	Result
13.286	13.20	80.50	-67.3	168.00	Pass
13.5602	64.60	124.01	-59.81	272.00	Pass
13.8122	12.78	80.50	-67.72	335.00	Pass

2.3.9 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: 3mSAC

Table 2.3-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
WRLE02418	EMCO/EMC Test	Antenna, Loop	6502	2215	G	01/23/2023	01/23/2025
NBLE11754	Rohde & Schwarz	Receiver, 1 Hz-44 GHz	ESW44	103037	G	10/02/2023	10/02/2024

Cal Code G = Calibration performed by an accredited outside source.
Cal Code B = Calibration verification performed internally.
Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

2.4 Fields Strength outside the bands 13.110 MHz – 14.010 MHz

2.4.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, §15.225(d)
ISED RSS-210 B.6(d)

2.4.2 Equipment Under Test and Modification State

As shown in §1.2 with modifications if any as shown in §1.6.

2.4.3 Date of Test

3rd September 2024

2.4.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive table 0.8 m above a reference ground plane.

For 9kHz – 30MHz a pre-scan of the EUT emissions profile was made with the EUT rotated 360° and the magnetic loop antenna used to maximize emissions at a 3m distance. Final measurements were then taken using a quasi-peak detector.

For 30-1000 MHz a pre-scan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarization using a peak detector; measurements were taken at a 3m distance.

Final readings were maximized by adjusting the antenna height, polarization and turntable azimuth, in accordance with the specification. For below 1 GHz final measurements were taken with a quasi-peak detector.

The EUT was assessed against the limits specified in FCC 47 CFR Part 15C §15.209.

2.4.5 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.

2.4.6 Additional Observations

The highest frequency to which the DUT was measured was determined in accordance with §15.33(a)(1).

Automated measurements used BAT-EMC (v2022.0.27.0) software. All measurements were done at a 3m distance. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only.

2.4.7 Sample Computation (Radiated Emissions)

Measuring equipment raw measurement (dBµV) @ 30 MHz			20.0
Correction Factor (dB/m)	Cable 2	0.24	18.94
	TEMC00011 (antenna)	18.70	
Reported Quasi-peak Final Measurement (dBµV/m) @ 30 MHz			38.94

2.4.8 Test Results

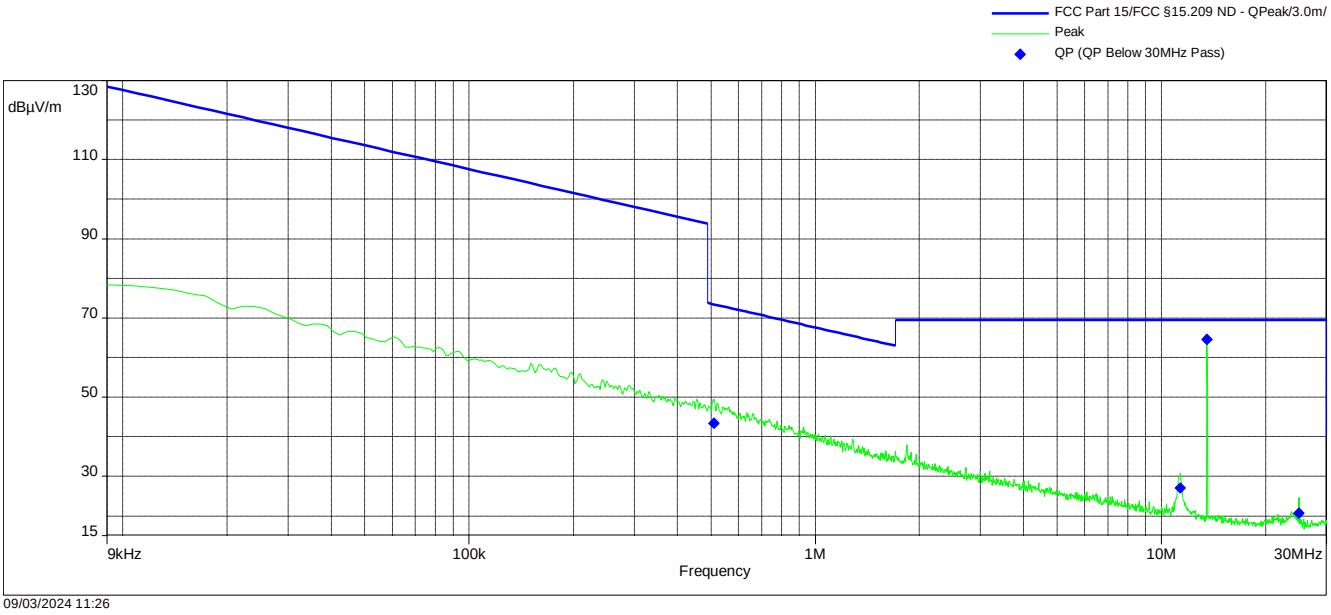
Test Summary: The EUT was set to transmit constant transmit mode using special test software loaded in the EUT.

Test Result: Pass

See data below for detailed results.

Spurious Magnetic Radiated Emissions 9kHz - 30MHz

Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
9 kHz - 30 MHz	3m	*H/V*	9 kHz	*18001 Pts*	*1 ms/MHz*



Limit:	Test Date:	Test Results:
FCC Part 15/FCC §15.209	9/3/2024	Pass

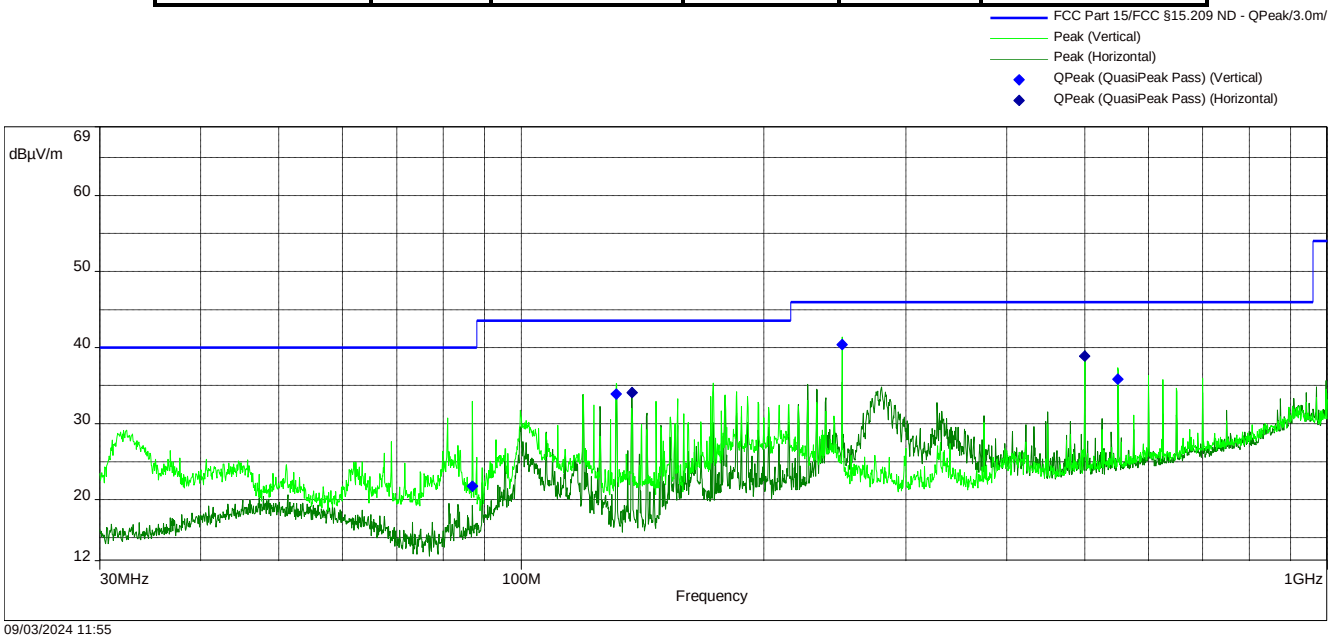
Figure 2.4-1 – RE Spurious Emissions 9 kHz- 30 MHz – Transmitter Operational

Table 2.4-1 – RE Spurious Emissions 9 kHz- 30 MHz – Transmitter Operational

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (º)	Result
0.51051	43.42	73.44	-30.02	320.00	Pass
11.33389	27.08	69.54	-42.46	360.00	Pass
13.55993	64.54	69.54	-5.00	266.00	Pass
24.99816	20.62	69.54	-48.92	69.00	Pass

Spurious Radiated Emissions 30M-1GHz

Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
30 MHz - 1 GHz	3m	*Vertical*	100 kHz	*18001 Pts*	*1 ms/MHz*
30 MHz - 1 GHz	3m	*Horizontal*	100 kHz	*18001 Pts*	*1 ms/MHz*



Limit:	Test Date:	Test Results:
FCC Part 15/FCC §15.209	9/3/2023	Pass

Figure 2.4-2 – RE Spurious Emissions 30-1000 MHz – Transmitter Operational

Table 2.4-2 – RE Spurious Emissions 30-1000 MHz – Transmitter Operational

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (º)	Height (m)	Polarity	Result
86.991	21.80	40.00	-18.20	248.00	1.12	Vertical	Pass
131.220	33.87	43.50	-9.63	181.00	1.00	Vertical	Pass
137.172	34.09	43.50	-9.41	167.00	2.85	Horizontal	Pass
249.997	40.36	46.00	-5.64	179.00	1.00	Vertical	Pass
499.994	38.86	46.00	-7.14	235.00	1.99	Horizontal	Pass
549.993	35.84	46.00	-10.16	250.00	1.00	Vertical	Pass

2.4.9 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: 3mSAC

Table 2.4-3 – Radiated Emissions Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11142	Hewlett-Packard	Preamplifier, 0.1 to 1300 MHz	8447D	2727A05370	B	10/19/2023	10/19/2024
WRLE02418	EMCO/EMC Test	Antenna, Loop	6502	2215	G	01/23/2023	01/23/2025
NBLE11645	Schwarzbeck	Antenna, Trilog Broadband, 30-7000 MHz	VULB 9162	0254	G	04/25/2023	04/25/2025
NBLE11754	Rohde & Schwarz	Receiver, 1 Hz-44 GHz	ESW44	103037	G	10/02/2023	10/02/2024

Cal Code G = Calibration performed by an accredited outside source.
Cal Code B = Calibration verification performed internally.
Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

2.5 Frequency Tolerance

2.5.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, §15.225(e)
ISED RSS-210 B.6

2.5.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state “0”, as noted in §1.6.

2.5.3 Date of Test

4th September 2024

2.5.4 Test Method

A baseline measurement was taken with the EUT powered at nominal voltage / nominal temperature and was used for a reference to determine frequency stability at the various temperature and voltage conditions. The EUT was placed inside a temperature chamber with a near field probe placed near the EUT’s antenna location for frequency measurement. The voltages and temperature was adjusted per the requirements of FCC 15.225(e) and the peak frequency was measured and recorded to ensure that the frequency remained within ±0.01% (±100ppm).

2.5.5 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the test standard requirements inside a temperature chamber.

2.5.6 Test Results

Test Summary: The EUT was tested at 20ºC with the power supply to the EUT set to 85% and 115% of nominal voltage. The EUT was then powered by nominal voltage starting at a temperature of +50ºC and stepped down to -20ºC in 10ºC steps. At each temperature step the EUT was stabilized to the temperature and the maximum transmit frequency was recorded before moving to the next temperature value.

Test Result: Pass

See data below for detailed results.

RFID PWA 534455-002

Degrees C	Frequency (MHz)	ppm	Percentage (%)	ppm upper limit	ppm lower limit	Percentage Limit (%)	Reference Frequency (MHz)
50	13.560237	-2.581	0.000258	100	-100	0.01	13.560272
40	13.560239	-2.434	0.000243	100	-100	0.01	13.560272
30	13.560253	-1.409	0.000141	100	-100	0.01	13.560272
20	13.560278	0.442	-0.000044	100	-100	0.01	13.560272
10	13.560300	2.094	-0.000209	100	-100	0.01	13.560272
0	13.560313	3.038	-0.000304	100	-100	0.01	13.560272
-10	13.560310	2.788	-0.000279	100	-100	0.01	13.560272
-20	13.560285	0.951	-0.000095	100	-100	0.01	13.560272

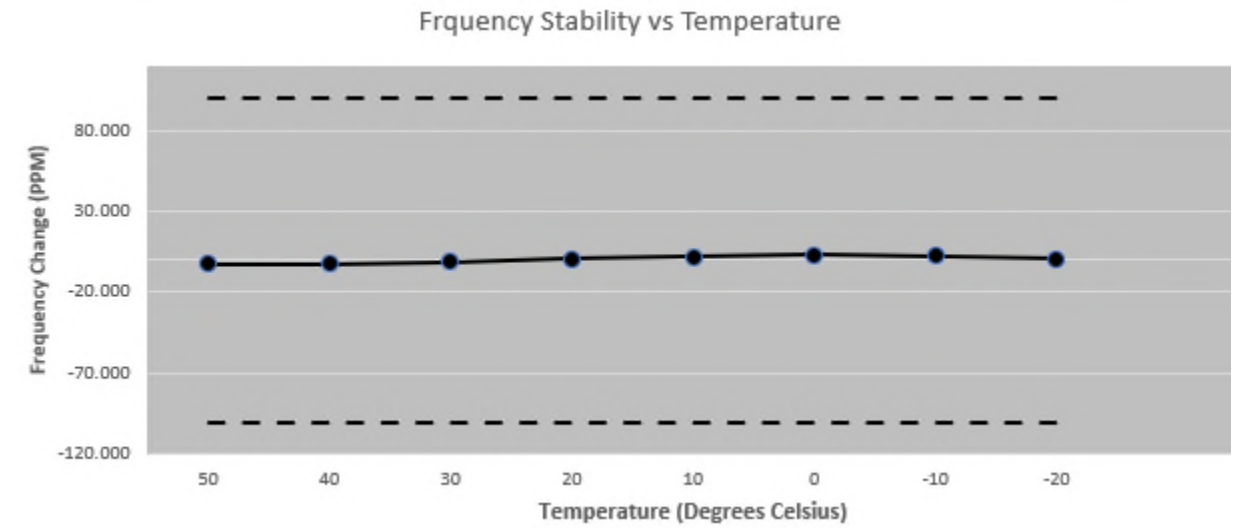


Figure 2.5-1 – Frequency Tolerance – Nominal Voltage – Variable Temperature [2 Min Interval]

RFID PWA 534455-002

Degrees C	Frequency (MHz)	ppm	Percentage (%)	ppm upper limit	ppm lower limit	Percentage Limit (%)	Reference Frequency (MHz)
50	13.560237	-2.581	0.000258	100	-100	0.01	13.560272
40	13.560239	-2.434	0.000243	100	-100	0.01	13.560272
30	13.560253	-1.372	0.000137	100	-100	0.01	13.560272
20	13.560278	0.442	-0.000044	100	-100	0.01	13.560272
10	13.560300	2.080	-0.000208	100	-100	0.01	13.560272
0	13.560313	3.016	-0.000302	100	-100	0.01	13.560272
-10	13.560308	2.625	-0.000263	100	-100	0.01	13.560272
-20	13.560282	0.737	-0.000074	100	-100	0.01	13.560272

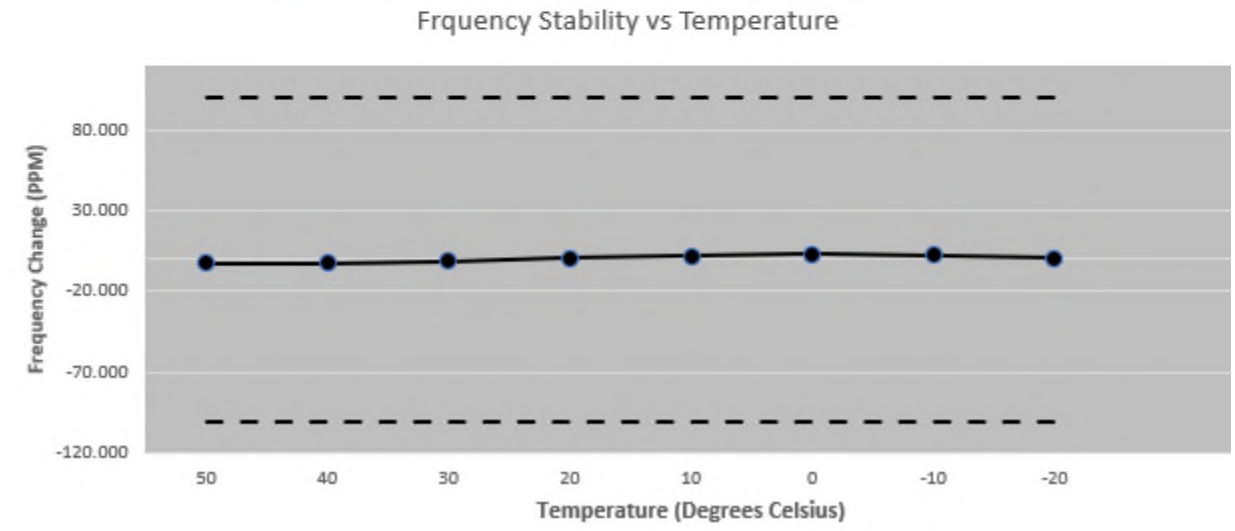


Figure 2.5-2 – Frequency Tolerance – Nominal Voltage – Variable Temperature [5 Min Interval]

RFID PWA 534455-002

Degrees C	Frequency (MHz)	ppm	Percentage (%)	ppm upper limit	ppm lower limit	Percentage Limit (%)	Reference Frequency (MHz)
50	13.560237	-2.581	0.000258	100	-100	0.01	13.560272
40	13.560239	-2.434	0.000243	100	-100	0.01	13.560272
30	13.560254	-1.327	0.000133	100	-100	0.01	13.560272
20	13.560278	0.442	-0.000044	100	-100	0.01	13.560272
10	13.560300	2.080	-0.000208	100	-100	0.01	13.560272
0	13.560313	3.038	-0.000304	100	-100	0.01	13.560272
-10	13.560307	2.611	-0.000261	100	-100	0.01	13.560272
-20	13.560278	0.435	-0.000044	100	-100	0.01	13.560272

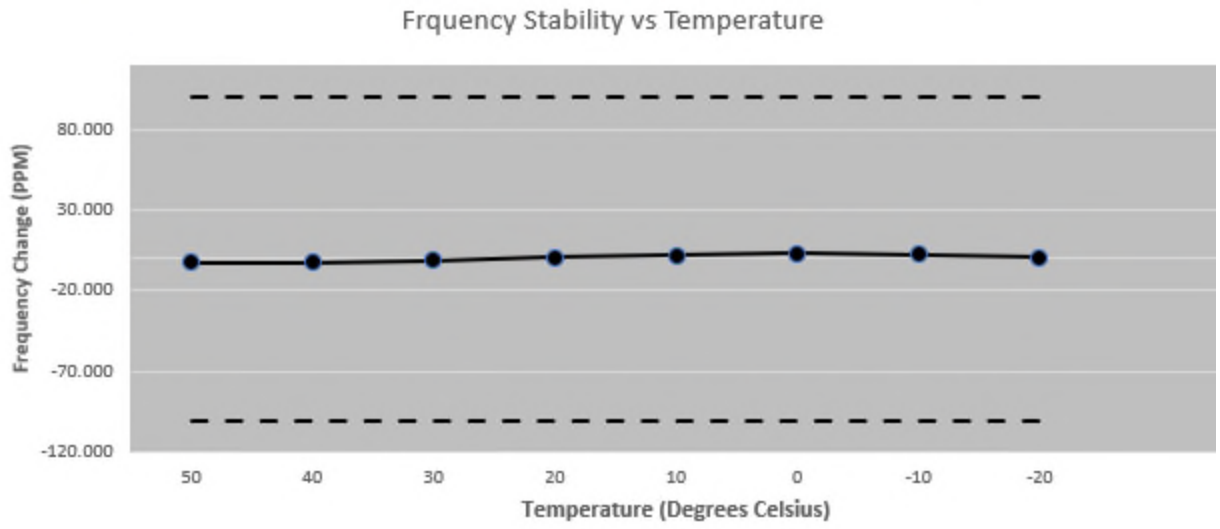


Figure 2.5-3 – Frequency Tolerance – Nominal Voltage – Variable Temperature [10 Min Interval]

Table 2.5-1 – Frequency Stability

Temperature ºC	EUT Power Supply Setting (VDC)	Measured Frequency	PPM	Measured Tolerance Percentage (%)	PPM Limit	Tolerance Percentage Limit (%)
20	24 VDC (Nominal)	13.560272	N/A	N/A	N/A	N/A
20	22 VDC (91.66%)	13.560274	0.147	-0.000015	±100	±0.01
20	27.6 VDC (115%)	13.560285	0.935	-0.000094	±100	±0.01

Note: Measurement taken at 20ºC nominal voltage is used as the reference frequency and not compared to any limits. 22.0VDC Lowest Possible Voltage via product.

2.5.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: TRN1

Table 2.5-2 – Restricted Band Edge Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11105	Sorensen	Power Supply, DC 33V-33A	XHR33-33-MGA (SAP 21003730)	1215A01757	Y	N/A	N/A
NBLE11522	Espec	Environmental Chamber	SU-241 (TUV)	92010168	G	08/01/2023	08/01/2024
WRLE10998	Rohde & Schwarz	Receiver, 20 Hz-26.5 GHz	ESU 26 (SAP 21003498)	100379	G	08/22/2023	08/22/2024

Cal Code G = Calibration performed by an accredited outside source.
Cal Code B = Calibration verification performed internally.
Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

2.6 AC power lines conducted emissions

2.6.1 Specification Reference

FCC 47 CFR Part 15 Subpart C, §15.207
ISED RSS-Gen clause 7.2

2.6.2 Equipment Under Test and Modification State

As shown in §1.2 with modifications if any as shown in §1.6.

2.6.3 Date of Test

18 September 2019

2.6.4 Test Method

The EUT is powered by its main control board which is powered by an AC to DC power supply (PS). The EUT, control board, and PS were placed on a non-conductive table 0.8 m above a reference ground plane and 0.4 m away from a vertical coupling plane. AC power was connected to the PS through an Artificial Mains Network (AMN). Conducted disturbance voltage measurements on mains lines were made at the output of the AMN. The AMN was placed 0.8 m from the boundary of the EUT and bonded to the reference ground plane. The system was assessed against the FCC §15.207 limits.

2.6.5 Environmental Conditions

The EUT was evaluated within the temperature and humidity range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient temperature range of 20°C to 40°C and humidity range of 30% to 80%.

2.6.6 Additional Observations

Measurements were performed using BAT-EMC v2022.0.27.0 automated software. The reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.2.7 for a sample computation.

2.6.7 Sample Computation (Mains Terminal Disturbance Voltage)

Measuring equipment raw measurement (dBµV) @ 150kHz			30.0
Correction Factor (dB)	TEMC00002 - LISN	0.03	10.53
	Cable 1	10.50	
Reported Quasi-peak Final Measurement (dBµV) @ 150kHz			40.53

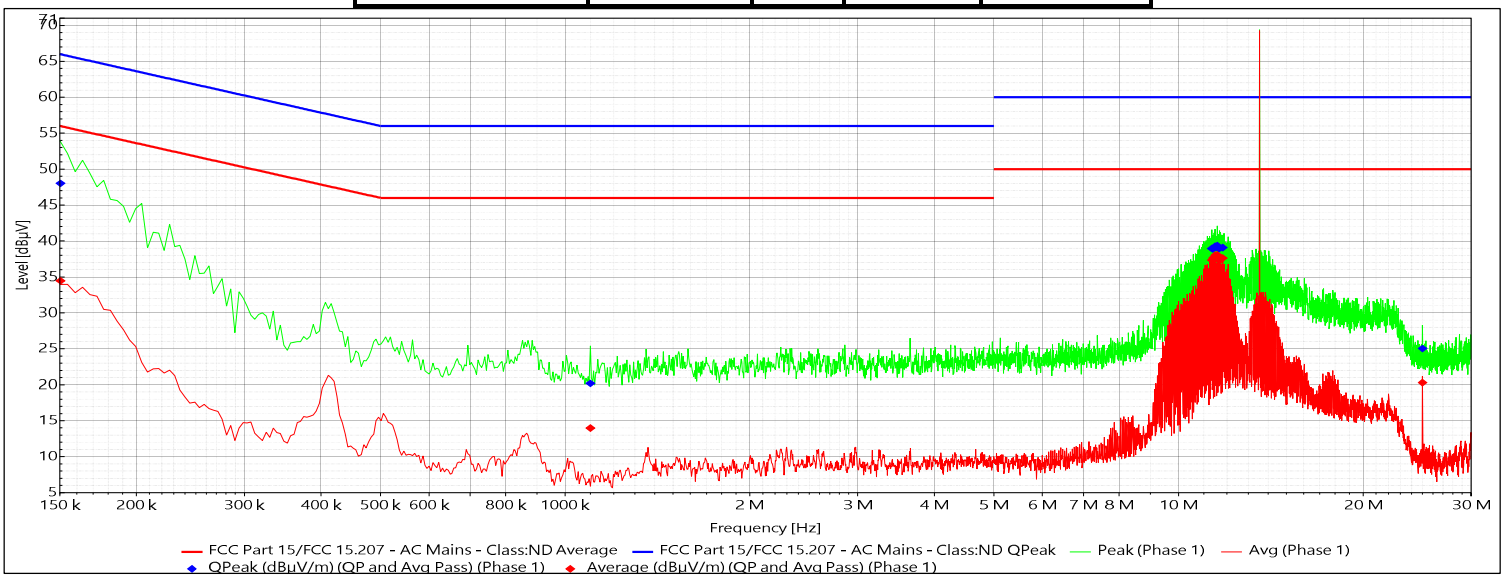
2.6.8 Test Results

Results for Configuration and Mode: Transmit signal continuously on

Performance assessment of the EUT made during this test: **Pass**
Detailed results are shown below.

Transmitter Enabled - L1

Frequency Range	Line Tested	RBW	Step Size	Sweep Time
150 kHz - 30 MHz	L1	9 kHz	4.5 kHz	5 s/MHz



Limit:	Test Date:	Test Results:
FCC Part 15/FCC 15.207 - AC Mains	9/3/2024	Pass

Test Notes: 13.56M - Fundamental TX Freq. Exempt

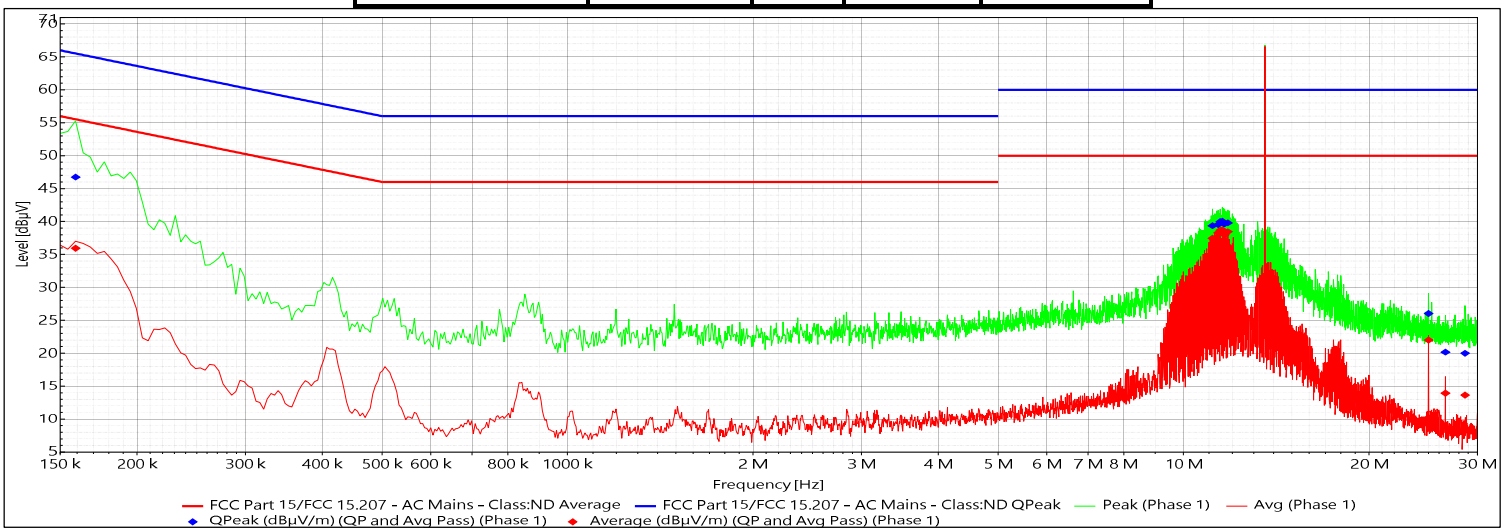
Figure 2.6-1 - Graphical Results - AC Mains L1 Plot

Table 2.6-1 – Results on the AC Power Port L1

Frequency (MHz)	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
0.150	34.46	56.00	-21.54	48.01	66.00	-17.99	Pass
1.100	13.98	46.00	-32.02	20.19	56.00	-35.81	Pass
11.333	37.34	50.00	-12.66	38.96	60.00	-21.04	Pass
11.382	37.62	50.00	-12.38	38.87	60.00	-21.13	Pass
11.477	38.03	50.00	-11.97	39.28	60.00	-20.72	Pass
11.571	38.07	50.00	-11.93	39.35	60.00	-20.65	Pass
11.621	37.84	50.00	-12.16	38.95	60.00	-21.05	Pass
11.666	37.24	50.00	-12.76	38.98	60.00	-21.02	Pass
11.810	37.63	50.00	-12.37	39.08	60.00	-20.92	Pass
13.560	69.40	50.00	19.40	69.38	60.00	9.38	Fail
24.999	20.29	50.00	-29.71	25.04	60.00	-34.96	Pass

Transmitter Enabled – L2

Frequency Range	Line Tested	RBW	Step Size	Sweep Time
150 kHz - 30 MHz	L2	9 kHz	4.5 kHz	5 s/MHz



Limit:	Test Date:	Test Results:
FCC Part 15/FCC 15.207 - AC Mains	9/3/2024	Pass

Test Notes: 13.56M - Fundamental TX Freq. Exempt

Figure 2.6-2 - Graphical Results - AC Mains L2 Plot

Table 2.6-2 – Results on the AC Power Port L2

Frequency (MHz)	Average (dBuV)	Average Limit (dBuV)	Average Margin (dB)	QPeak (dBuV)	QPeak Limit (dBuV)	QPeak Margin (dB)	Result
0.159	35.94	55.52	-19.58	46.75	65.52	-18.76	Pass
11.144	37.46	50.00	-12.54	39.36	60.00	-20.64	Pass
11.382	38.27	50.00	-11.73	39.53	60.00	-20.47	Pass
11.477	38.67	50.00	-11.33	39.98	60.00	-20.02	Pass
11.571	38.73	50.00	-11.27	40.03	60.00	-19.97	Pass
11.621	38.53	50.00	-11.47	39.67	60.00	-20.33	Pass
11.666	37.96	50.00	-12.04	39.67	60.00	-20.33	Pass
11.810	38.45	50.00	-11.55	39.80	60.00	-20.20	Pass
13.560	66.67	50.00	16.67	66.64	60.00	6.64	Fail
24.999	21.98	50.00	-28.02	26.03	60.00	-33.97	Pass
26.628	13.94	50.00	-36.06	20.17	60.00	-39.83	Pass
28.658	13.63	50.00	-36.37	19.98	60.00	-40.02	Pass

2.6.9 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN using equipment listed below in Table 2.2.10-1.
Test Area: GRP2

Table 2.6-3 Conducted emissions. Test equipment list

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE10459	Weinschel	Attenuator, 20 dB	34-20-34	BP1557	B	12/18/2023	12/18/2024
WRLE10944	Fischer Custom Comm.	LISN	FCC-LISN-50-25-2-10	120308	G	05/26/2023	05/26/2025
WRLE10945	Fischer Custom Comm.	LISN	FCC-LISN-50-25-2-10	120309	G	05/29/2024	05/29/2026
NBLE11555	Rohde & Schwarz	Receiver, 2 Hz-44 GHz	ESW44 (SAP 21006053)	101537	G	01/26/2024	01/26/2025

Cal Code G = Calibration performed by an accredited outside source.
Cal Code B = Calibration verification performed internally.
Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.

3 Diagram of Test Setups

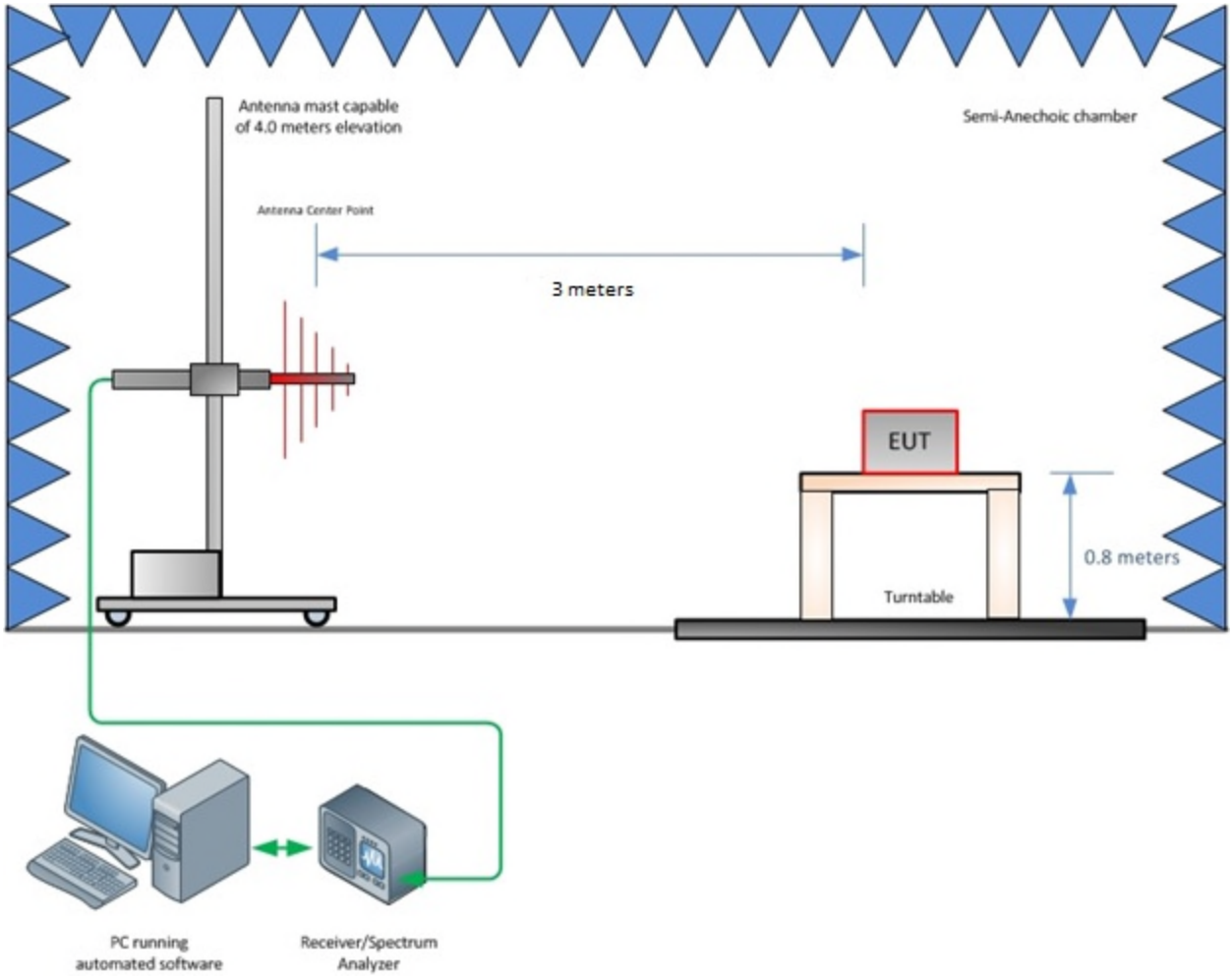


Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz

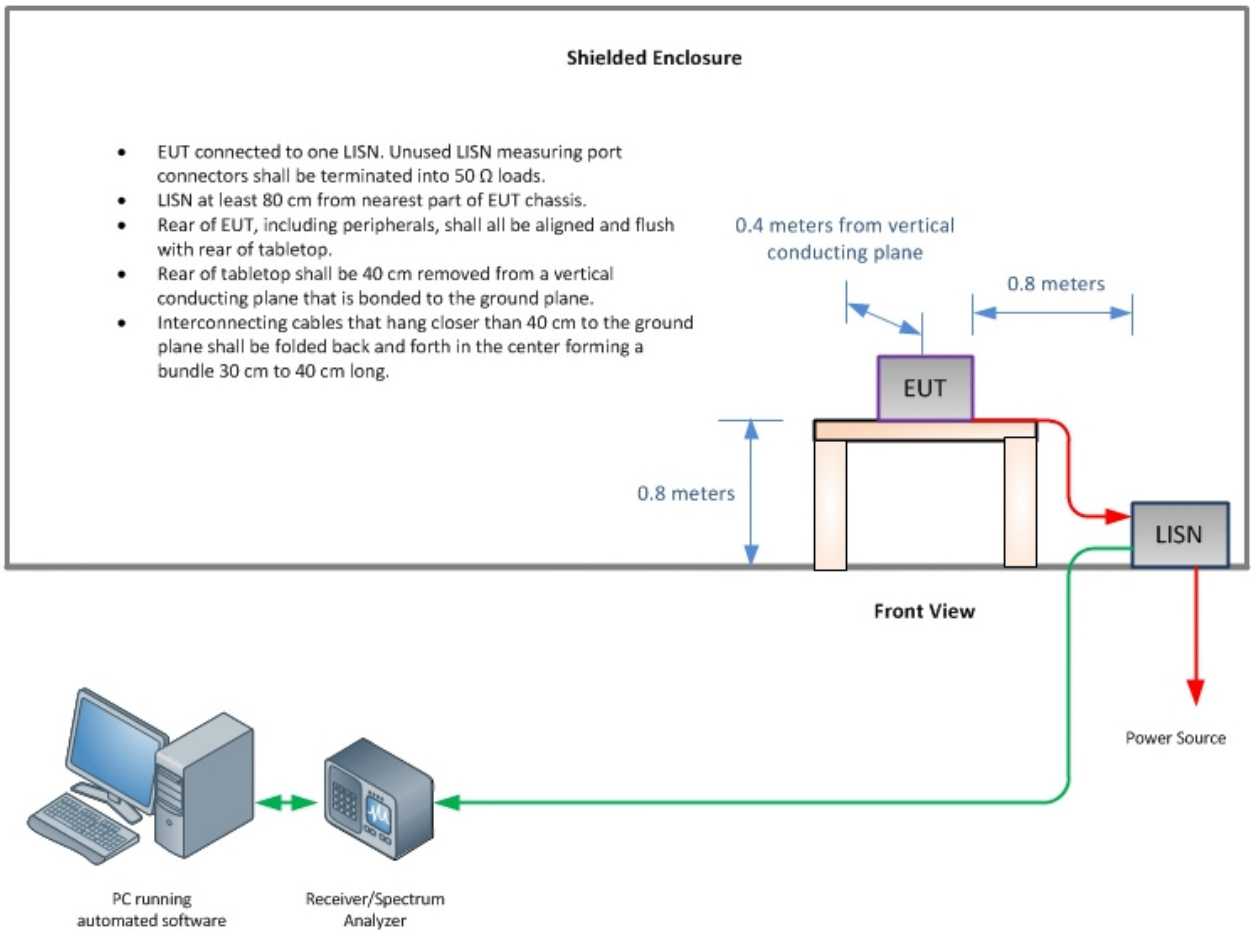


Figure 3-2 – Conducted Emissions Test Setup – Tabletop

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STATEMENT OF MEASUREMENT UNCERTAINTY – Emissions

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. This test system has a measurement uncertainty of ±3.30 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. This test system for 30 MHz-1000 MHz has a measurement uncertainty of ±5.88 dB and above 1 GHz a measurement uncertainty of ±4.47 dB. The measurement uncertainty values for conducted and radiated emissions meet the requirements as expressed in CISPR 16-4-2. The equipment comprising the test systems is calibrated on an annual basis.

TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated to meet test method standard requirements and/or manufacturer's specifications