Report on the Testing of the

Cinch Systems, Inc.
RF-PIR-433

FCC ID: 2ABBZ-RF-PIR-433D
IC: 11817A-RFPIR433D

In accordance with:
FCC 47 CFR Part 15.231
ISED RSS-210 Issue 10, December 2019

America

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Prepared for: Cinch Systems, Inc
12075 43rd St NE Ste 300
St Michael MN 55376

COMMERCIAL-IN-CONFIDENCE

Document Number: NC72194975.1 | Issue: 1

SIGNATURE			
Joel T. Schneider			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Joel Schneider	**Senior EMC Engineer**	**Authorized Signatory**	09 January 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

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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	09 January 2024

1.2 Introduction

Applicant	Cinch Systems
Manufacturer	Cinch Systems
Applicant's Email Address	Mark.cawley@cincysystems.com
Model Number(s)	RF-PIR-433
Serial Number(s)	N/A
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15.231 ISED RSS-210 Issue 10, December 2019
Order Number	72194975
Date of Receipt of EUT	14 December 2023
Start of Test	14 December 2023
Finish of Test	15 December 2023
Related Document(s)	ANSI C63.10 2013 ISED RSS-GEN Issue 5 Amendment 2, February 2021

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1.3 Scope of Testing

To perform certification testing to confirm that the wireless device(s) meet the requirements of the applicable standards and guidance documents.

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

Report Section	Specification Clause		Test Description	Accredit -ation	Base Standard
2.1	15.203	RSS-GEN	Antenna Requirements	A2LA	FCC Part 15.203
2.2	15.231(a)(1), (2)	RSS-210 A.1.1 a, b	Deactivation Period	A2LA	ANSI C63.10:2013
2.3	15.231(a)(3)	RSS-210 A.1.1 c	Polling or Supervision Transmissions & Duty Cycle of Transmitter	A2LA	ANSI C63.10:2013
2.4	15.231(b)(1), (e)	RSS-210 A.1.2; A.1.4	Field Strength of Fundamental	A2LA	ANSI C63.10:2013
2.5	15.231(b)(1), (e)	RSS-210 A.1.2; A.1.4	Field Strength of Emissions	A2LA	ANSI C63.10:2013
2.6	15.231(c)	RSS-210 A.1.3	Occupied Bandwidth	A2LA	ANSI C63.10:2013

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Table 1.4-2 – Test Accreditation

Test Name	Name of Tester(s)	Results / Comments
Antenna Requirements	Sean Sellergren	Pass
Deactivation Period	Sean Sellergren	Pass
Polling or Supervision Transmissions & Duty Cycle of Transmitter	Sean Sellergren	Pass
Field Strength of Fundamental	Sean Sellergren	Pass
Field Strength of Emissions	Sean Sellergren	Pass
Occupied Bandwidth	Sean Sellergren	Pass

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1.5 Product Information

1.5.1 Technical Description

The Equipment Under Test (EUT): Transmitters for periodic operations. transmission of a control signal such as those used with alarm security systems.

Table 1.5-1 – Wireless Module Technical Information

Detail	Description
FCC ID	2ABBZ-RF-PIR-433D
IC	11817A-RFPIR433D
Transceiver Model #	RF-PIR-433
Operating Frequency	433.92 MHz
Modulation Format	OOK
Antenna Type / Gain:	Integral / 0.0 dBi

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

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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

Table 1.5-4 – Test Frequencies & Modes of Operation

Channel	Frequency (MHz)
Single Channel Operation	433.95 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 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	Antenna Gain
Integral	n/a	0.0

Note: The antenna and antenna connector are fully contained within the EUT and are inaccessible to the end user.

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2.2 Deactivation Period

2.2.1 Specification Reference

FCC 47 CFR Part 15.231(a)(1), (2)
ISED RSS-210 A.1.1 a, b

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

14 December 2023

2.2.4 Test Method

The spectrum analyzer was video triggered to sweep on the TX of the device. Sweep time was set equal to or greater than the specified time for periodic operation. The device was manually activated and to confirm that it ceases transmission within the specified time of deactivation.

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

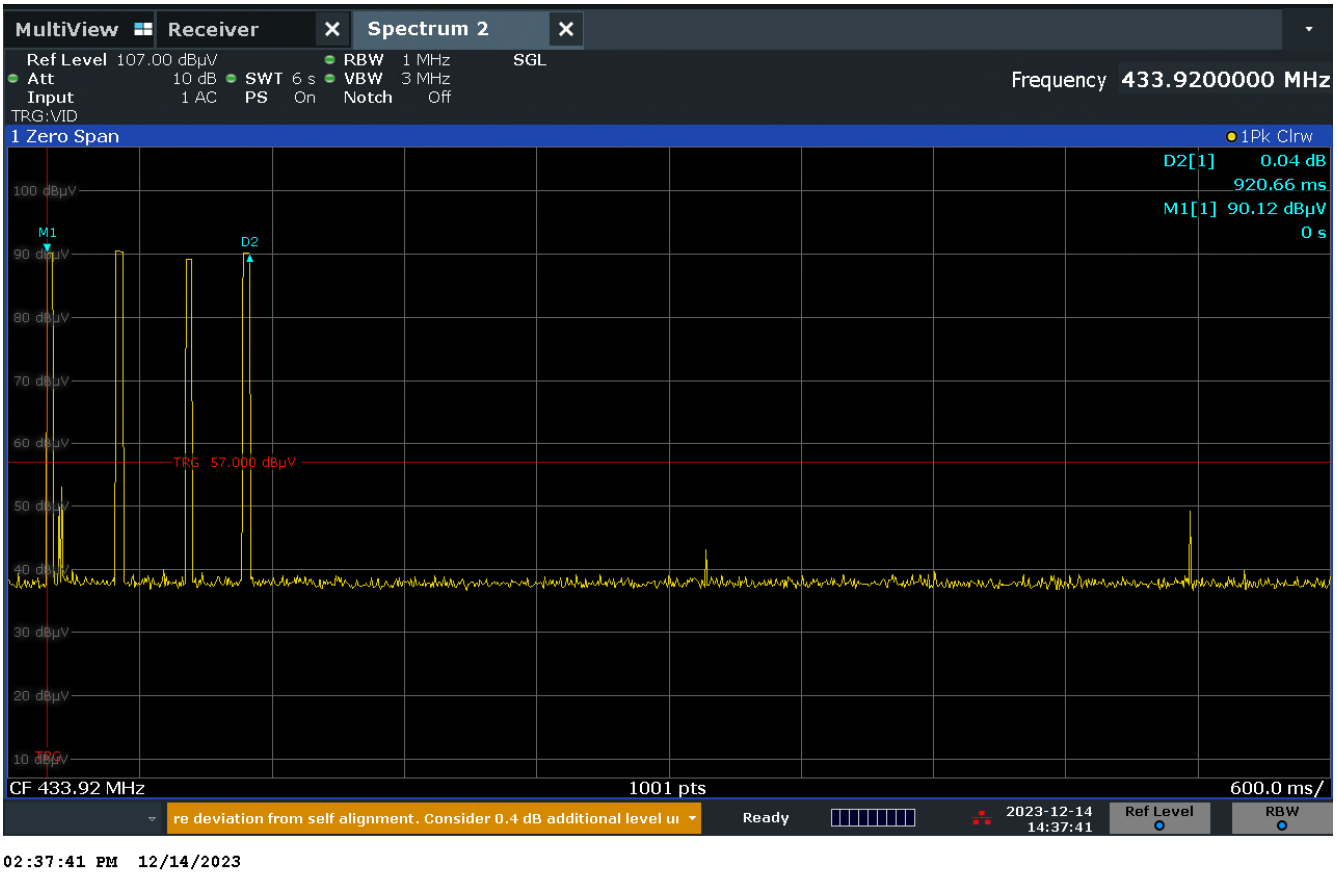

Figure 2-1 – Deactivation Period

Test Summary: The EUT operated as intended before, during, and after testing. The deactivation period is 920ms and within the 5 second requirement.

Test Result: Pass

2.2.7 Test Location and Test Equipment Used

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

Table 2.2-1 – Deactivation Period Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11085	Inmet	Attenuator, 10 dB	18N20W-10dB	11085	B	09/02/2023	09/02/2024
NBLE11142	Hewlett-Packard	Preamplifier, 0.1 to 1300 MHz	8447D	2727A05370	B	10/19/2023	10/19/2024
WRLE11519	Com-Power Corp.	Preamplifier, 500 MHz-18 GHz	PAM-118A	18040002	B	01/23/2023	01/23/2024
NBLE11630	ETS-Lindgren	Antenna, 1-18 GHz	3117	00218816	G	09/27/2022	09/27/2024
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.

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2.3 Pulse Polling or Supervision Transmissions & Duty Cycle of Transmitter

2.3.1 Specification Reference

FCC 47 CFR Part 15.231(a)(3)
ISED RSS-210 A.1.1 c

2.3.2 Equipment Under Test and Modification State

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

2.3.3 Date of Test

14 December 2023

2.3.4 Test Method

Duty cycle:

The EUT switches, controls, or input data streams were adjusted to ensure that the EUT is transmitting or encoded to obtain the "worst-case" pulse ON time. A radiated, direct connection (i.e., conducted) or a "near-field" coupling method was used to assess the EUT. The RBW was adjusted to be equal or larger than the occupied bandwidth of the signal; the center frequency of the spectrum analyzer was set to the center of the RF signal, and the spectrum analyzer was put into Time Domain analysis (Zero Hz Span). The Sweep Time was adjusted to obtain at least a 100 ms period of time on the horizontal display axis of the spectrum analyzer.

The EUT pulse train is **periodic** (i.e., consists of a series of pulses that repeat in a characteristic pattern over a constant time period), and the period (T) is less than or equal to 100 ms. The Trigger was set to capture at least one period of the pulse train, including any blanking intervals. Total maximum pulse "On time" (tON) over one period of the pulse train was determined by summing the duration of all of the pulses within the pulse train [i.e., tON = Σ(t1 + t2 + …tn), and the duty cycle was then determined by dividing the total maximum "On time" by the period of the pulse train (tON/T).

The duty cycle correction factor was then determined by applying the following equation to the duty cycle determined in the preceding steps:

*20 * Log(numeric duty cycle) = Duty Correction (dB)*

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 Test Results

Table 2.3-1 – Duty Cycle Results

Burst Name / Number	Pulse Width (µs)	Occurrences in Period	Total On-time (µs)
1	2505	1	2505
2	225	28	6300
		TOTAL	8805

Total On-Time: **8805 µs**

Aperiodic Duty Cycle: 8.81 ms / 100 ms = 0.081 = **8.1%**

Duty Correction Factor: 20 * Log(0.083) = **-21.10 dB**

Test Summary: Periodic transmissions at regular predetermined intervals were verified to not exist, except where regulatory requirements allow polling or supervision transmissions, including data, to determine system integrity. In addition to this test data, compliance is addressed by an attestation supported by the equipment theory of operation.

Duty cycle will be used to convert peak measurements to average.

Test Result: Pass

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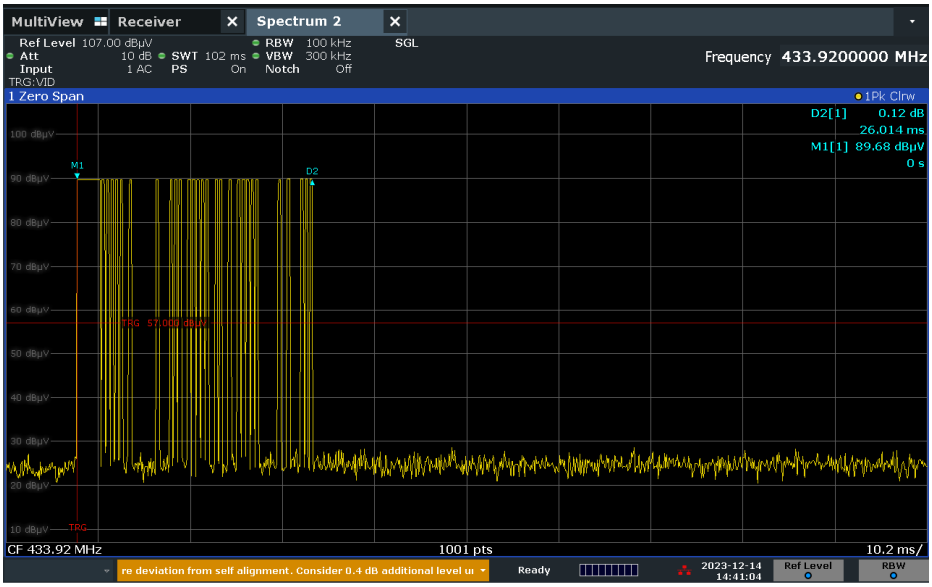

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Figure 2-2 – Pulse within 100ms

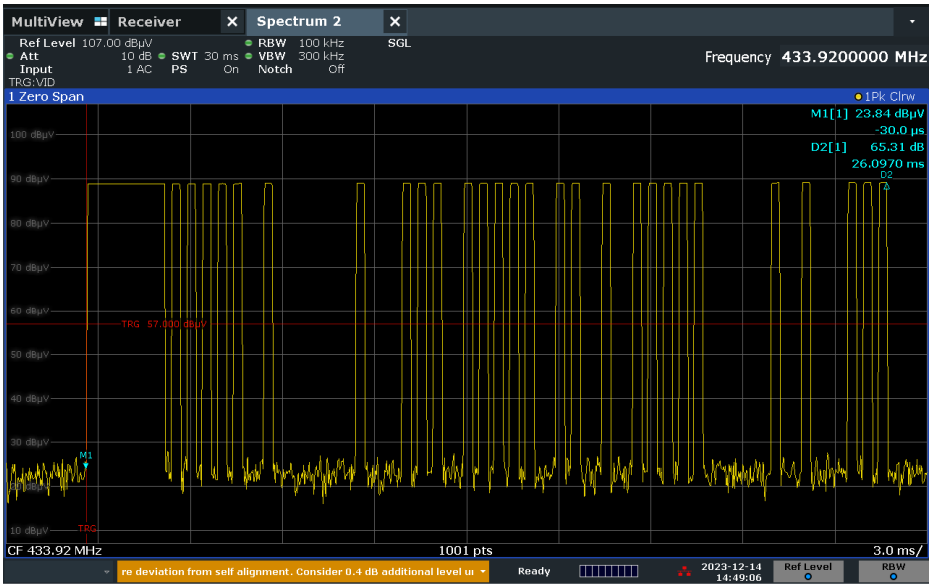

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Figure 2-3 – Total Number of Pulses Within 100ms

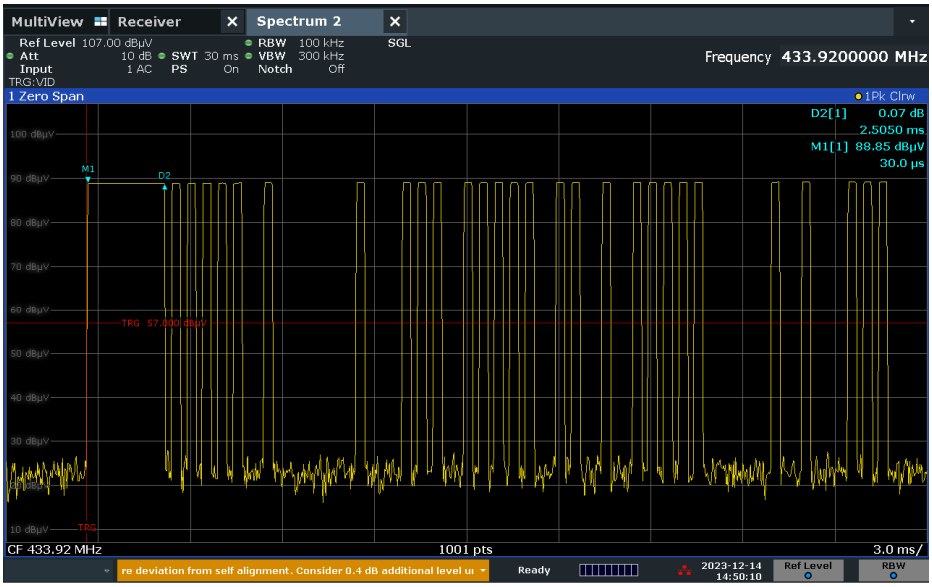

Figure 2-4 – Pulse Width 1

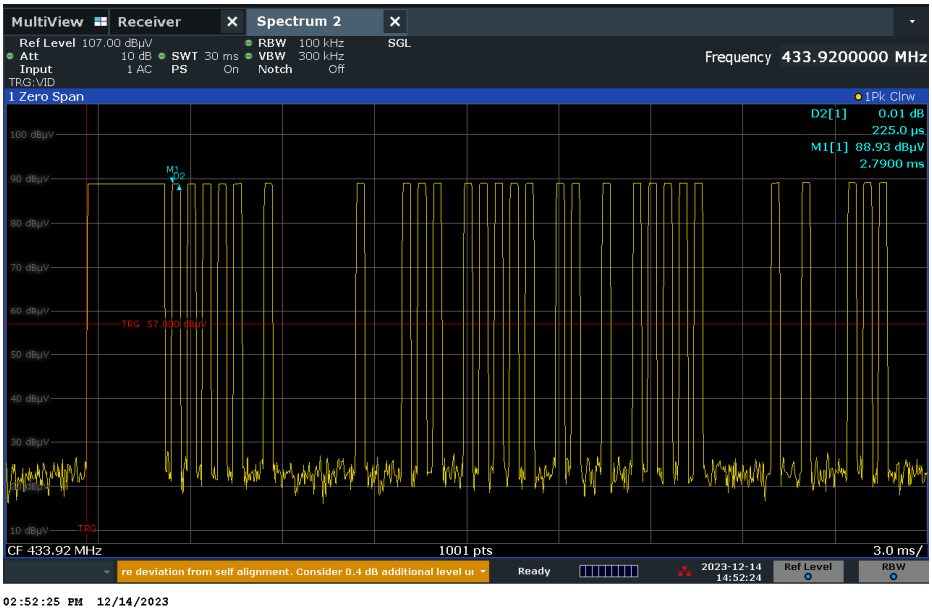

Figure 2-5 – Pulse Width 2

2.3.7 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
NBLE11085	Inmet	Attenuator, 10 dB	18N20W-10dB	11085	B	09/02/2023	09/02/2024
NBLE11142	Hewlett-Packard	Preamplifier, 0.1 to 1300 MHz	8447D	2727A05370	B	10/19/2023	10/19/2024
WRLE11519	Com-Power Corp.	Preamplifier, 500 MHz-18 GHz	PAM-118A	18040002	B	01/23/2023	01/23/2024
NBLE11630	ETS-Lindgren	Antenna, 1-18 GHz	3117	00218816	G	09/27/2022	09/27/2024
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.

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2.4 Radiated Fundamental Field Strength

2.4.1 Specification Reference

FCC 47 CFR Part 15.231(b)(1)
ISED RSS-210 A.1.2; A.1.4

2.4.2 Equipment Under Test and Modification State

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

2.4.1 Date of Test

14 December 2023

2.4.2 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 30-1000 MHz and 1.5m above the ground plane for above 1 GHz.

For all frequency ranges the final readings were maximized by adjusting the antenna height, polarization and turntable azimuth, in accordance with the specification. For final measurements a manual measurement using the spectrum analyzer was used. All corrections factors, including the duty cycle value, were added as an offset to provide a corrected output power value.

2.4.3 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.

2.4.4 Additional Observations

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

Automated measurements used BAT-EMC (v3.18) software. 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.

2.4.5 Sample Computation (Radiated Emissions)

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

2.4.6 Test Results

Test Summary: Measurements were done with the EUT in 3 orthogonal axes to determine worst case.

Test Result: Pass

See data below for detailed results.

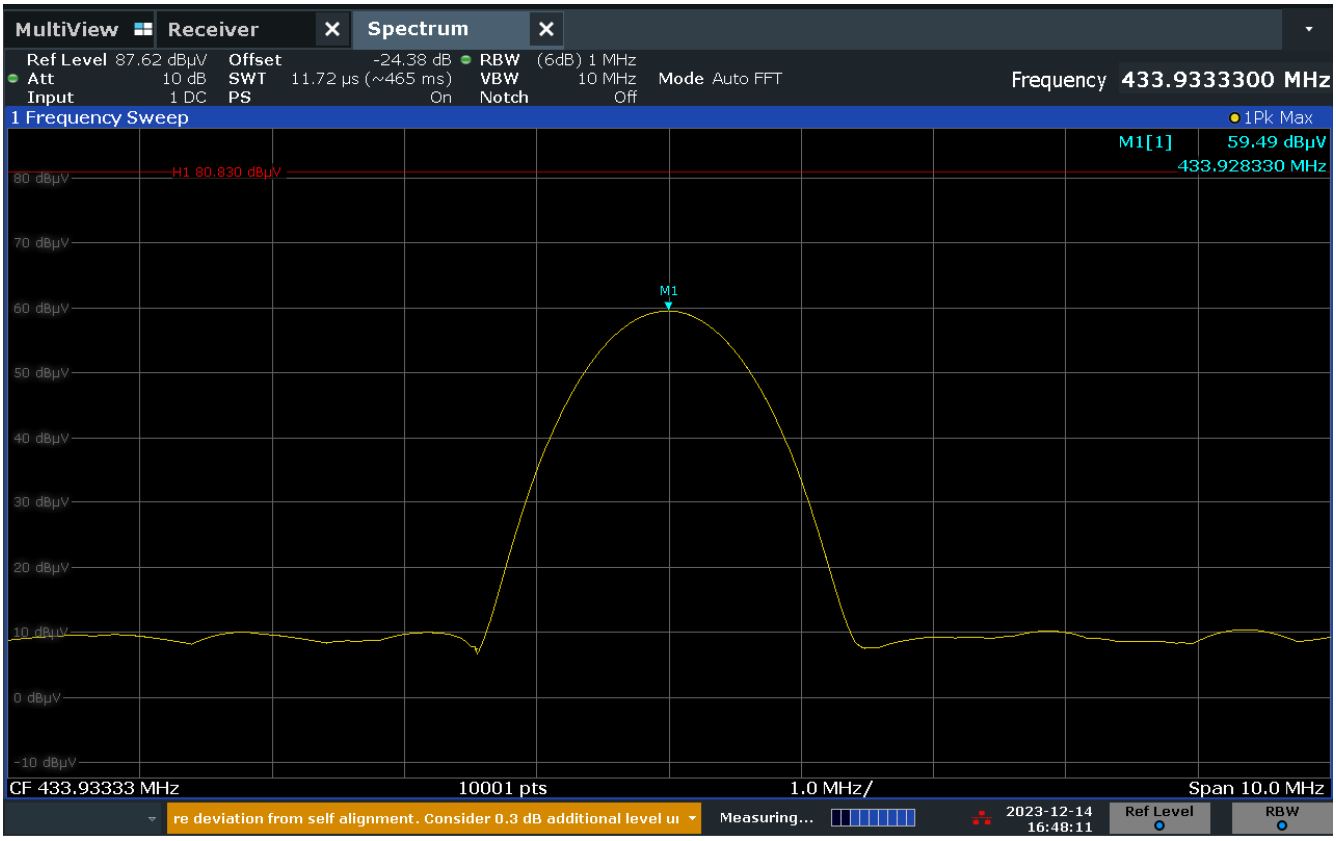

Figure 2-6 – Fundamental Field Strength – X-Axis

Frequency (MHz)	Detector Type	Correction Factor (dB)	Test Distance (m)	Average Fundamental Radiated Field Strength (dBuV/m)	Average Fundamental Radiated limit (dBuV/m)	Margin (dB)
433.92	Peak	-24.38	3	59.49	80.83	-21.34

Note: Correction factor includes duty cycle correction factor as described in Section 2.3 of this test report.

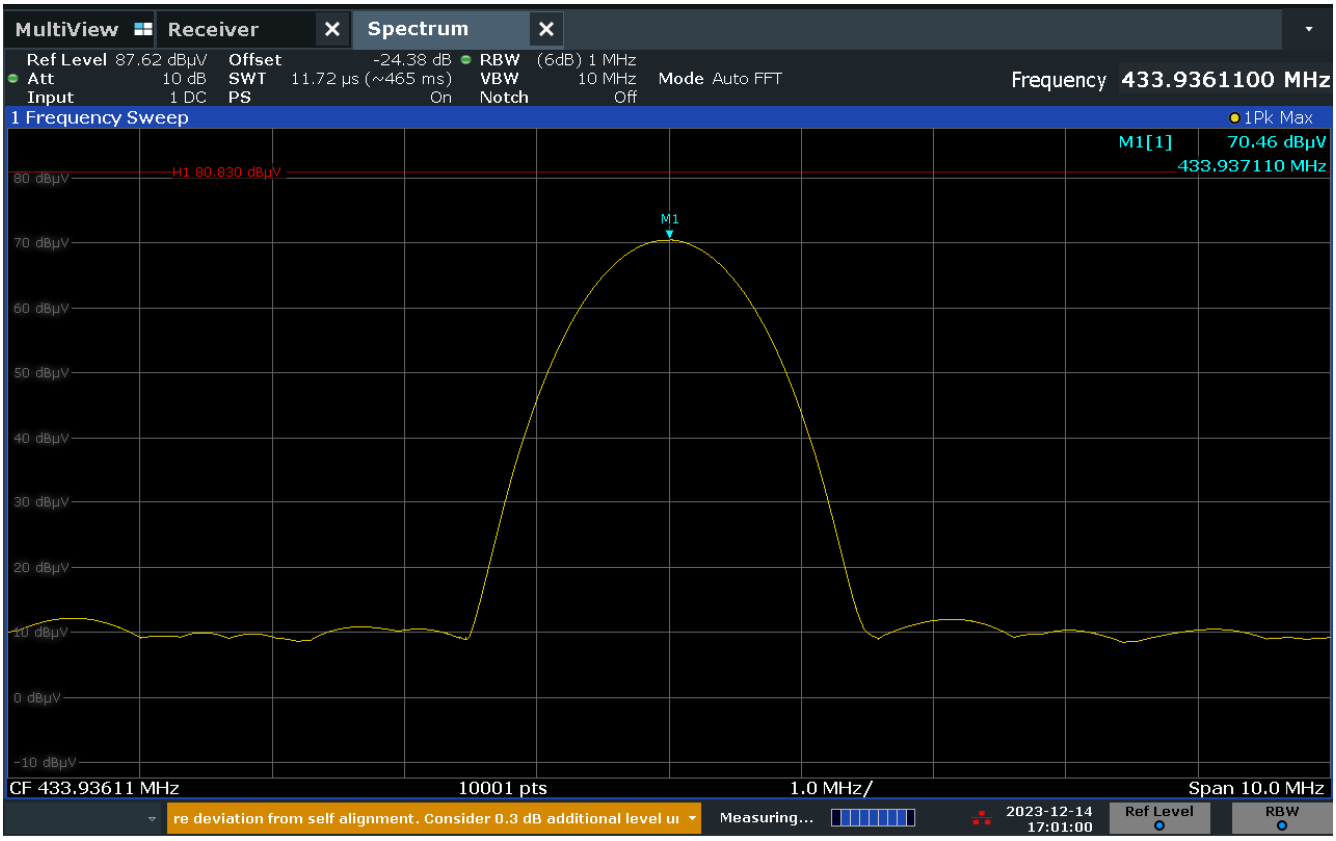

Figure 2-7 – Fundamental Field Strength – Y-Axis

Frequency (MHz)	Detector Type	Correction Factor (dB)	Test Distance (m)	Average Fundamental Radiated Field Strength (dBuV/m)	Average Fundamental Radiated limit (dBuV/m)	Margin (dB)
433.93	Peak	-24.38	3	70.46	80.83	-10.37

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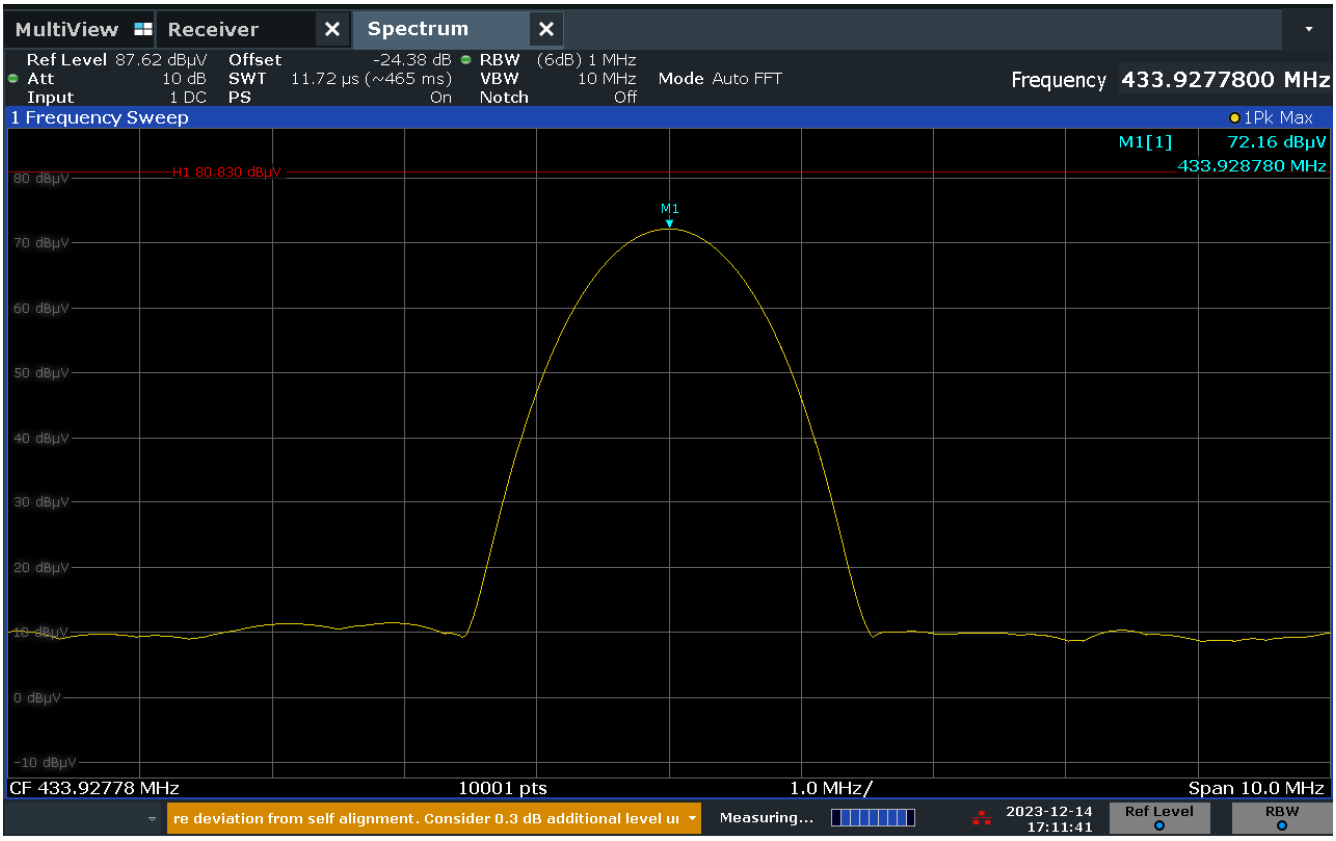

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Figure 2-8 – Fundamental Field Strength – Z-Axis

Frequency (MHz)	Detector Type	Correction Factor (dB)	Test Distance (m)	Average Fundamental Radiated Field Strength (dBuV/m)	Average Fundamental Radiated limit (dBuV/m)	Margin (dB)
433.92	Peak	-24.38	3	72.16	80.83	-8.67

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2.4.7 Test Location and Test Equipment Used

The tests were carried out in New Brighton, MN.
Test Area: SAC3

Table 2.4-1 – Radiated Emissions Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11085	Inmet	Attenuator, 10 dB	18N20W-10dB	11085	B	09/02/2023	09/02/2024
NBLE11142	Hewlett-Packard	Preamplifier, 0.1 to 1300 MHz	8447D	2727A05370	B	10/19/2023	10/19/2024
WRLE11519	Com-Power Corp.	Preamplifier, 500 MHz-18 GHz	PAM-118A	18040002	B	01/23/2023	01/23/2024
NBLE11630	ETS-Lindgren	Antenna, 1-18 GHz	3117	00218816	G	09/27/2022	09/27/2024
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.

2.5 Radiated Spurious Emissions

2.5.1 Specification Reference

FCC 47 CFR Part 15.231(b)(1), (e)
ISED RSS-210 A.1.2; A.1.4

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

15 December 2023

2.5.4 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 30-1000 MHz and 1.5m above the ground plane for above 1 GHz.

For all frequency ranges 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.

For all frequency ranges the final readings were maximized by adjusting the antenna height, polarization and turntable azimuth, in accordance with the specification. The pre-calculated duty cycle factor was included in the correction factor to provide a corrected peak measurement.

The EUT was assessed against the limits specified in FCC 47 CFR Part 15C §15.231(b).

2.5.5 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.

2.5.6 Additional Observations

Automated measurements used BAT-EMC (v2022.0.27.0) software. 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.

2.5.7 Sample Computation (Radiated Emissions)

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

2.5.8 Test Results

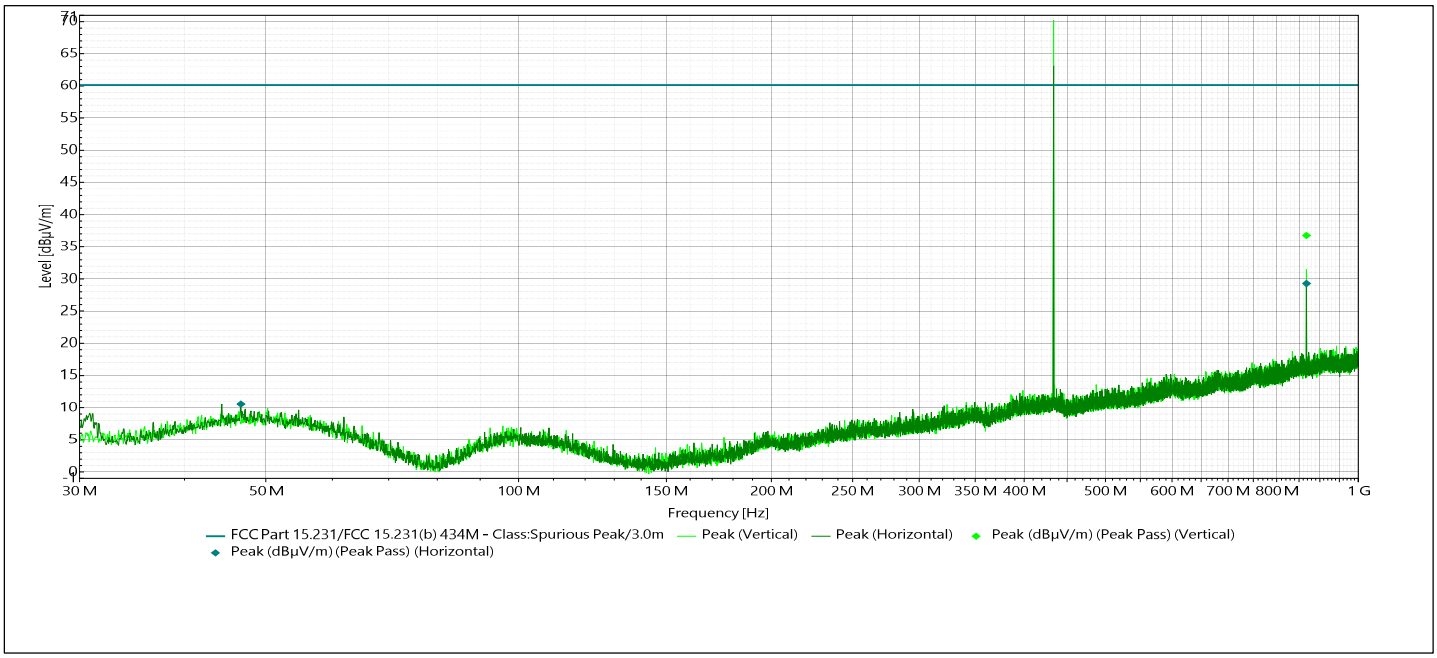
Test Summary: The duty cycle correction factor as shown in this report was used as part of the overall measurement correction factor. The EUT was tested only in the worst-case axis orientation based on the radiated output power measurements, Z axis was determined as worst-case orientation. EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.

Spurious Emissions 30M-1GHz

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



Limit:	Test Date:	Test Results:
FCC Part 15.231/FCC 15.231(b) 434M	12/15/2023	Pass

Test Notes: Duty cycle correction factor of -21.10dB was included in the overall measurement correction.

Figure 2-9 – RE Spurious Emissions 30-1000 MHz

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Table 2.5-1 – RE Spurious Emissions 30-1000 MHz

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
867.864	36.76	60.15	-23.39	264.00	1.34	Vertical	Pass
46.706	10.55	60.15	-49.60	96.00	4.00	Horizontal	Pass
867.864	29.29	60.15	-30.86	193.00	1.00	Horizontal	Pass

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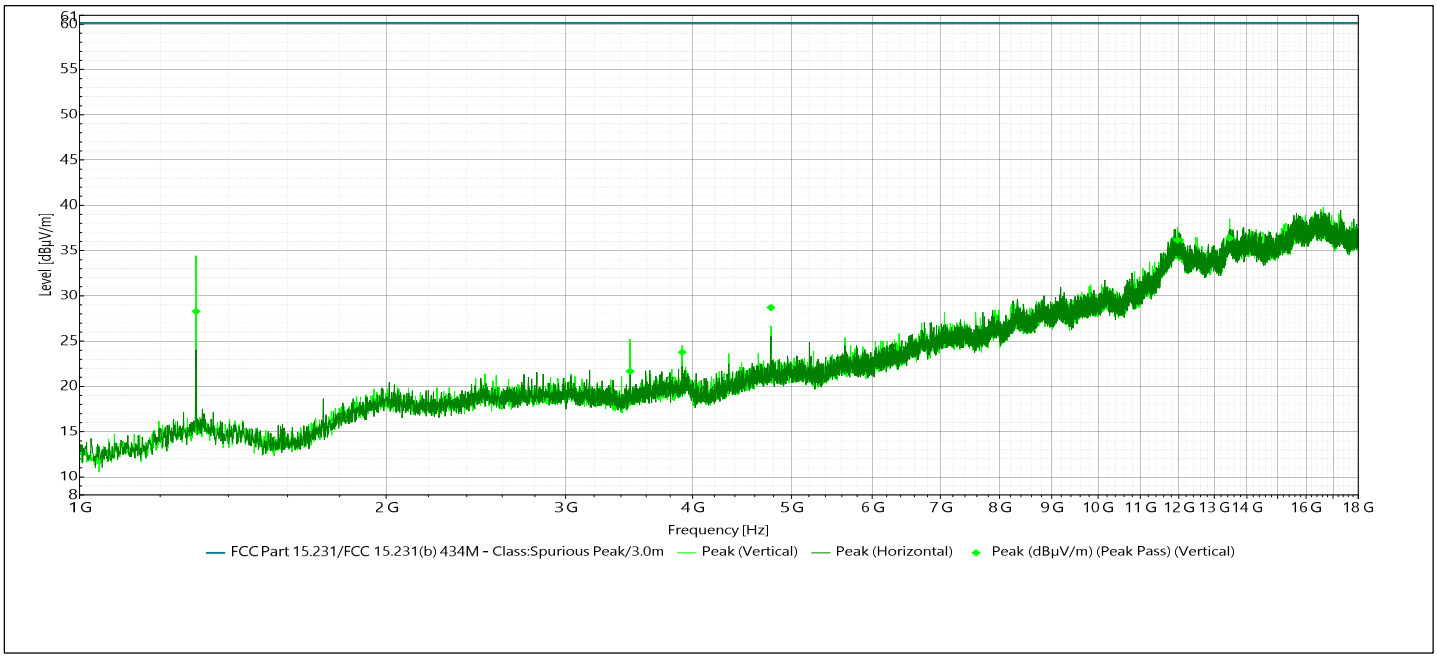
Spurious Emissions 1 - 18GHz

Frequency Range	Antenna Distance	Antenna Polarization	RBW	Step Size	Sweep Time
1 GHz - 18 GHz	3m	*Vertical*	1 MHz	*18001 Pts*	*Auto*
1 GHz - 18 GHz	3m	*Horizontal*	1 MHz	*18001 Pts*	*Auto*



Limit:	Test Date:	Test Results:
FCC Part 15.231/FCC 15.231(b) 434M	12/15/2023	Pass

Test Notes: Duty cycle correction factor of -21.10dB was included in the overall measurement correction.

Figure 2-10 – RE Spurious Emissions 1-18 GHz

Table 2.5-2 – RE Spurious Emissions 1-18 GHz

Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (°)	Height (m)	Polarity	Result
1301.278	28.29	60.15	-31.86	267.00	1.00	Vertical	Pass
3470.667	21.68	60.15	-38.47	93.00	1.00	Vertical	Pass
3905.111	23.77	60.15	-36.38	132.00	4.00	Vertical	Pass
4773.056	28.71	60.15	-31.44	360.00	1.00	Vertical	Pass
11962.167	36.17	60.15	-23.98	0.00	1.00	Vertical	Pass
13463.833	36.37	60.15	-23.78	0.00	1.00	Vertical	Pass

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2.5.9 Test Location and Test Equipment Used

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

Table 2.5-3 – Radiated Emissions Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11085	Inmet	Attenuator, 10 dB	18N20W-10dB	11085	B	09/02/2023	09/02/2024
NBLE11142	Hewlett-Packard	Preamplifier, 0.1 to 1300 MHz	8447D	2727A05370	B	10/19/2023	10/19/2024
WRLE11519	Com-Power Corp.	Preamplifier, 500 MHz-18 GHz	PAM-118A	18040002	B	01/23/2023	01/23/2024
NBLE11630	ETS-Lindgren	Antenna, 1-18 GHz	3117	00218816	G	09/27/2022	09/27/2024
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.

2.6 Occupied Bandwidth

2.6.1 Specification Reference

FCC 47 CFR Part 15.231(c)
ISED RSS-210 A.1.3

2.6.2 Equipment Under Test and Modification State

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

2.6.3 Date of Test

14 December 2023

2.6.4 Test Method

The center frequency of the Spectrum Analyzer was set to the nominal EUT channel center frequency. The span range for the spectrum analyzer was set between 2 × to 5 × the EBW (or OBW). The RBW was set to 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW. The reference level of the spectrum analyzer was set to accommodate the maximum input amplitude level, with the detection mode set to peak, and trace mode set to max hold. The OBW automatic measurement function in the spectrum analyzer was utilized to produce either the Power Bandwidth or XdB down Bandwidth.

2.6.5 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.

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2.6.6 Test Results

Table 2.6-1 – Occupied Bandwidth

Frequency (MHz)	Occupied Bandwidth Type	Occupied Bandwidth (kHz)	Limit (kHz)
433.91	20 dB down	2.60	0.25% of center Freq = 108.47

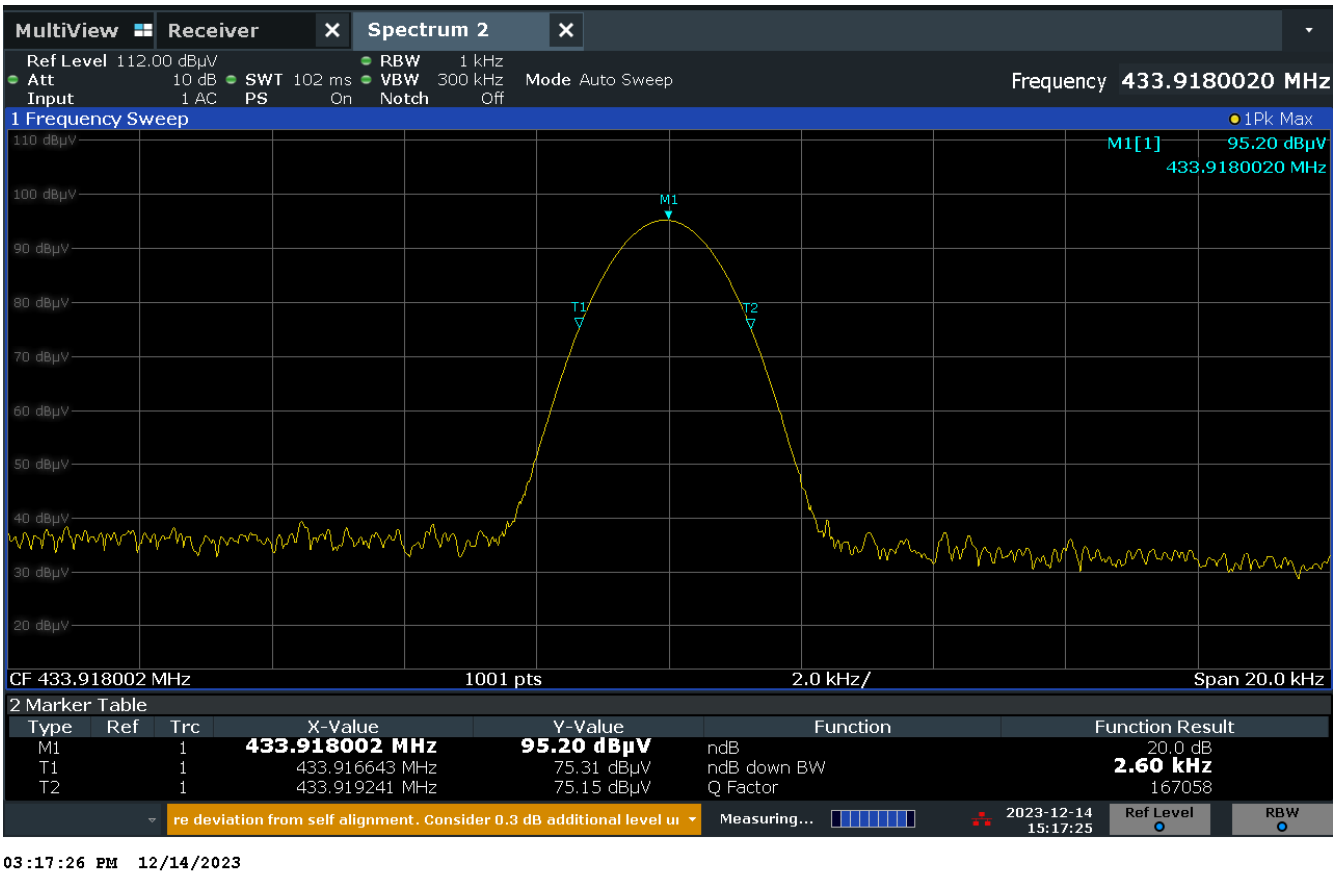

Figure 2-11 – Occupied Bandwidth

2.6.7 Test Location and Test Equipment Used

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

Table 2.6-2 – Conducted Emissions Test Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11085	Inmet	Attenuator, 10 dB	18N20W-10dB	11085	B	09/02/2023	09/02/2024
NBLE11142	Hewlett-Packard	Preamplifier, 0.1 to 1300 MHz	8447D	2727A05370	B	10/19/2023	10/19/2024
WRLE11519	Com-Power Corp.	Preamplifier, 500 MHz-18 GHz	PAM-118A	18040002	B	01/23/2023	01/23/2024
NBLE11630	ETS-Lindgren	Antenna, 1-18 GHz	3117	00218816	G	09/27/2022	09/27/2024
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.
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3 Diagram of Test Setups

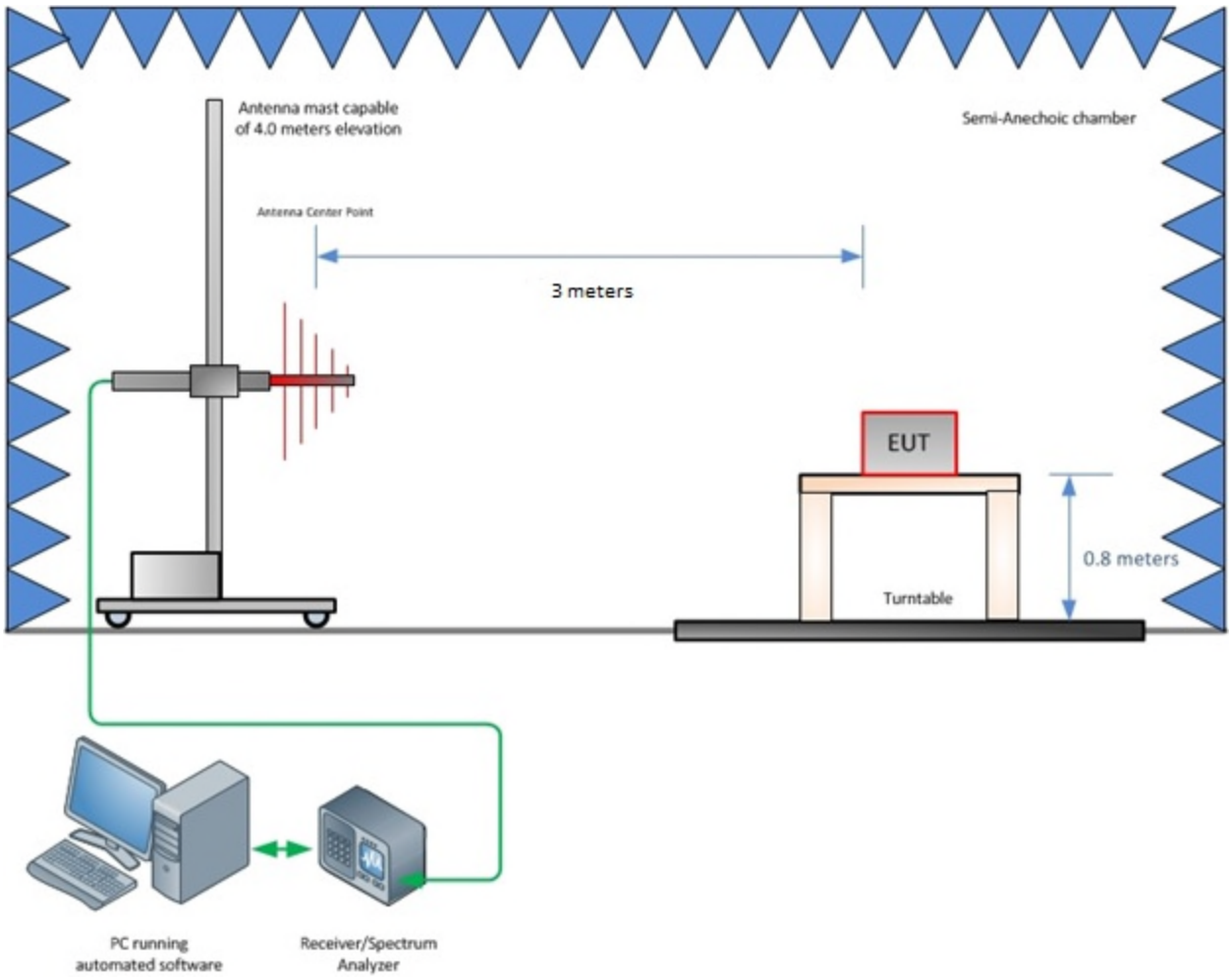

Figure 3-1 – Radiated Emissions Test Setup up to 1 GHz

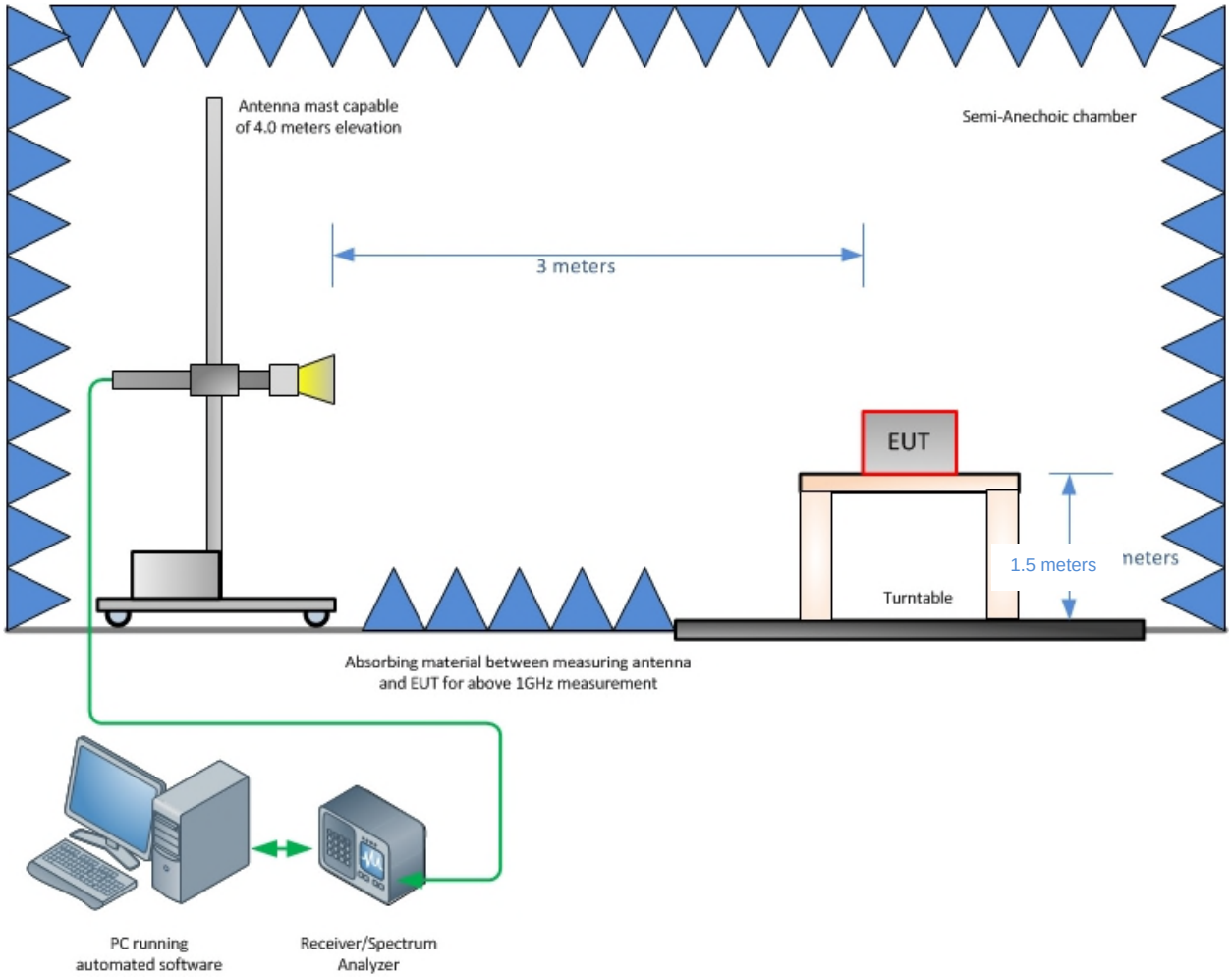

Figure 3-2 – Radiated Emissions Test Setup above 1 GHz

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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

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