

# 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

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



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Document Number: NC72194975.1 | Issue: 1

### SIGNATURE

*Joel T. Schneider*

| NAME           | JOB TITLE           | RESPONSIBLE FOR      | ISSUE DATE      |
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| Joel Schneider | Senior EMC Engineer | Authorized Signatory | 09 January 2024 |

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| FCC Accreditation<br>Designation Number US1148 New Brighton, MN Test<br>Laboratory | Innovation, Science, and Economic Development Canada<br>Accreditation<br>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<br>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<br>ISED RSS-GEN Issue 5 Amendment 2, February 2021 |



### 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                                                 | Accreditation | 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 |



**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 &<br>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               |



## 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-RFP433D     |
| 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.

**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.



## **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

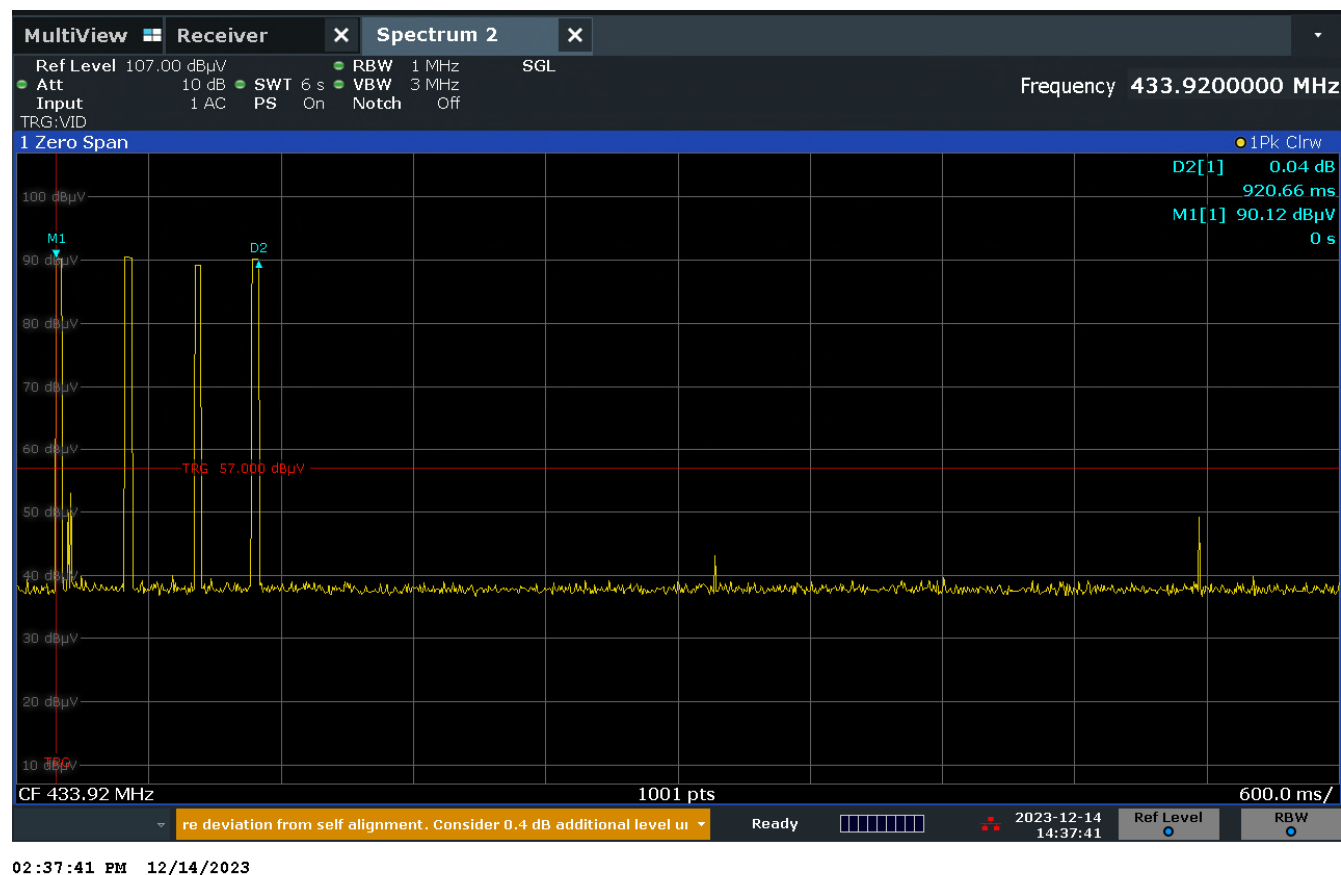


Figure 2-1 – Deactivation Period

**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.



## 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.,  $t_{ON} = \sum(t_1 + t_2 + \dots t_n)$ ], and the duty cycle was then determined by dividing the total maximum “On time” by the period of the pulse train ( $t_{ON}/T$ ).

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

$$20 * \text{Log}(\text{numeric duty cycle}) = \text{Duty Correction (dB)}$$

### 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               |
| <b>TOTAL</b>        |                  |                       | 8805               |

Total On-Time: **8805 µs**

Aperiodic Duty Cycle:  $8.81 \text{ ms} / 100 \text{ ms} = 0.081 = \mathbf{8.1\%}$

Duty Correction Factor:  $20 * \text{Log}(0.083) = \mathbf{-21.10 \text{ dB}}$

**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**

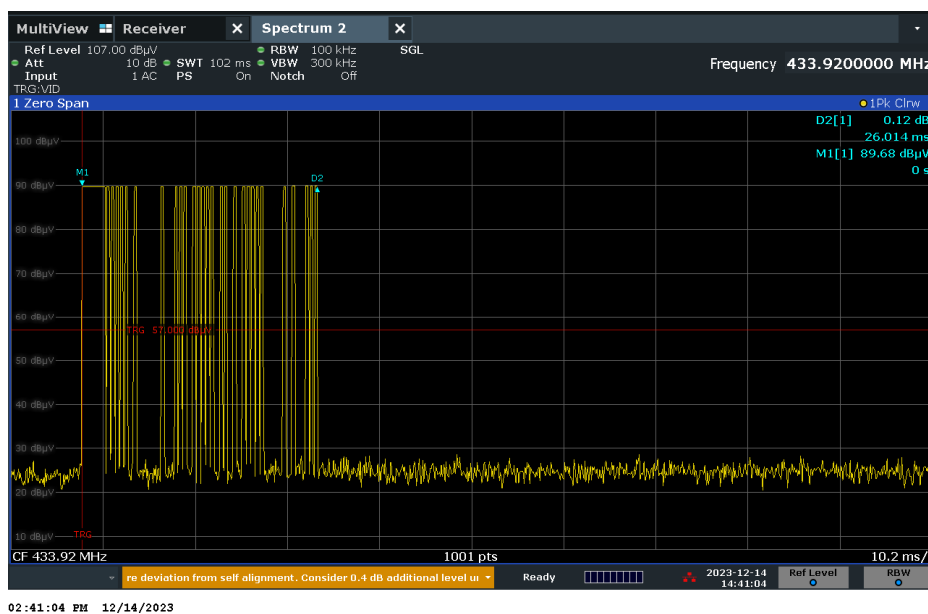


Figure 2-2 – Pulse within 100ms

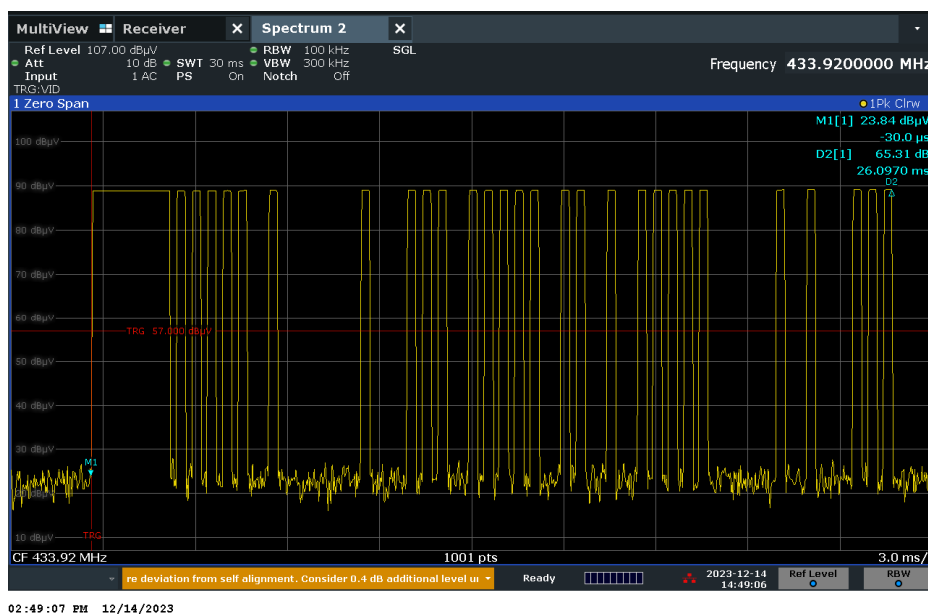


Figure 2-3 – Total Number of Pulses Within 100ms

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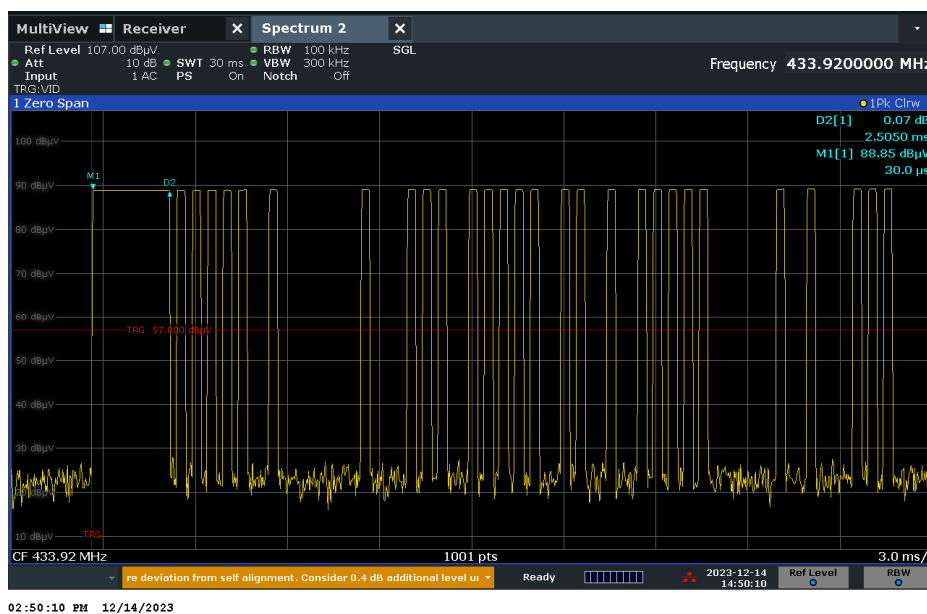


Figure 2-4 – Pulse Width 1

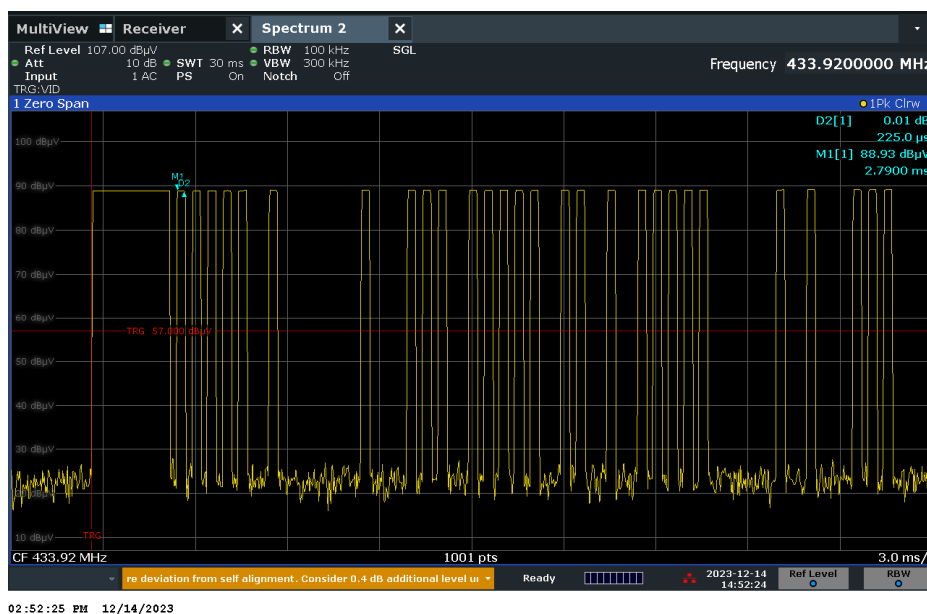


Figure 2-5 – Pulse Width 2

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### 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.



## **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)

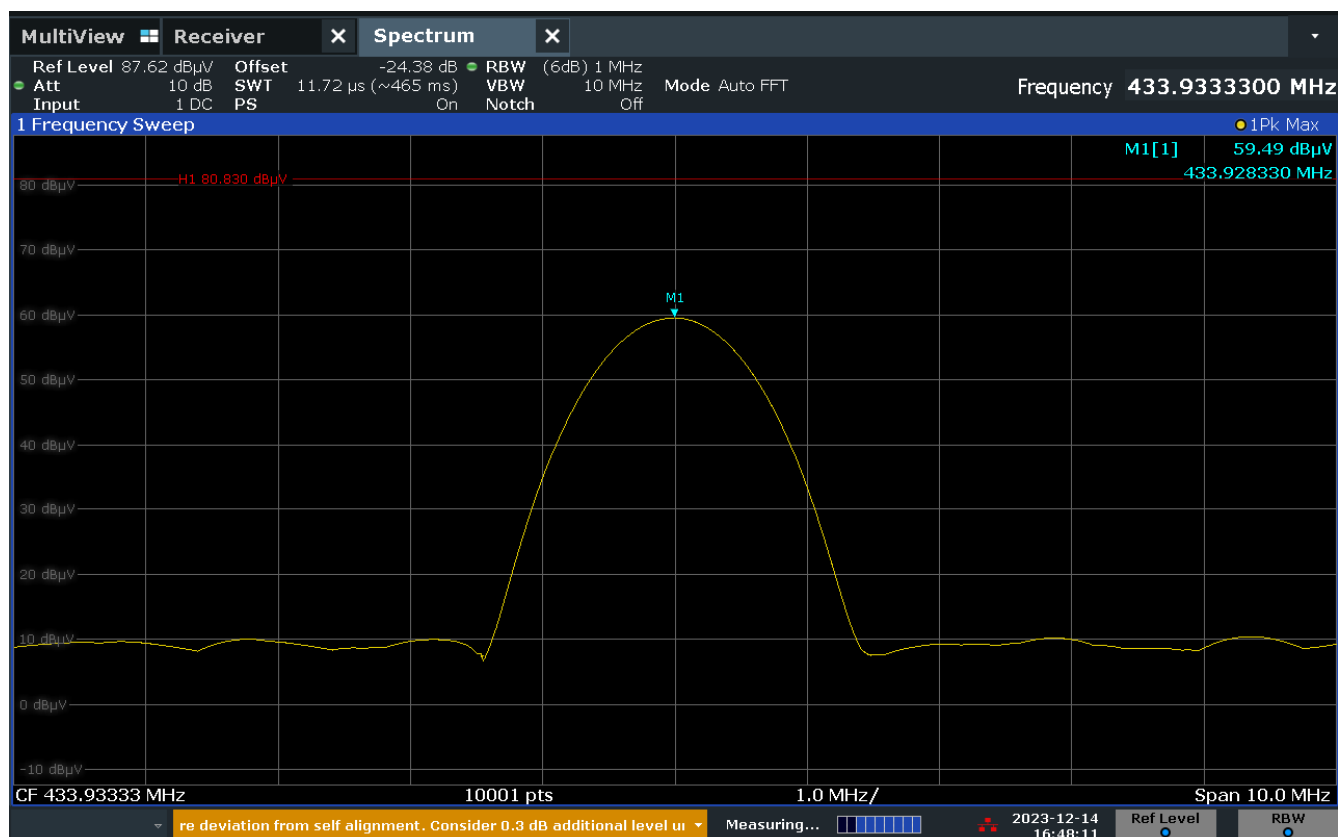
|                                                         |                     |       |       |
|---------------------------------------------------------|---------------------|-------|-------|
| Measuring equipment raw measurement (dBμV) @ 30 MHz     |                     |       | 20.0  |
| Correction 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.



04:48:12 PM 12/14/2023

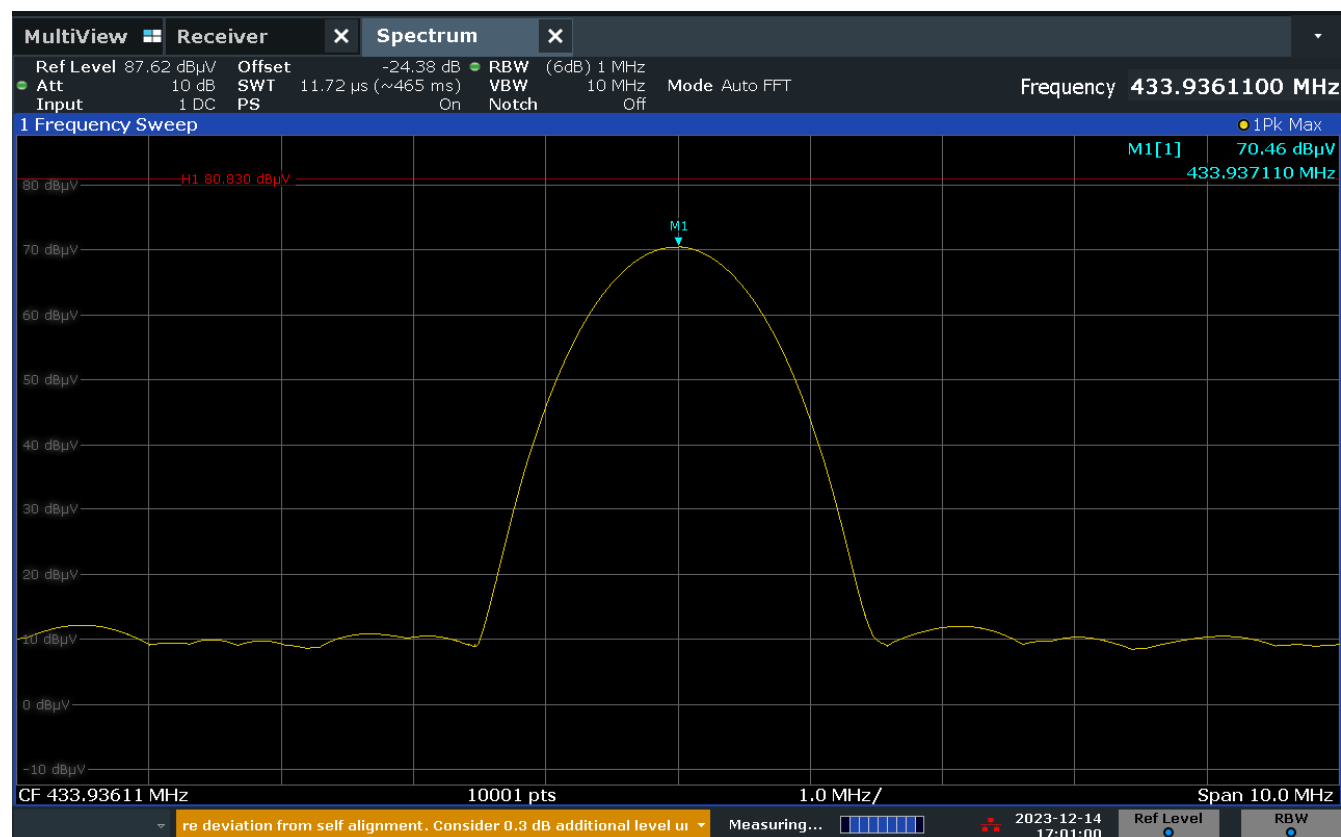
Figure 2-6 – Fundamental Field Strength – X-Axis

| 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.

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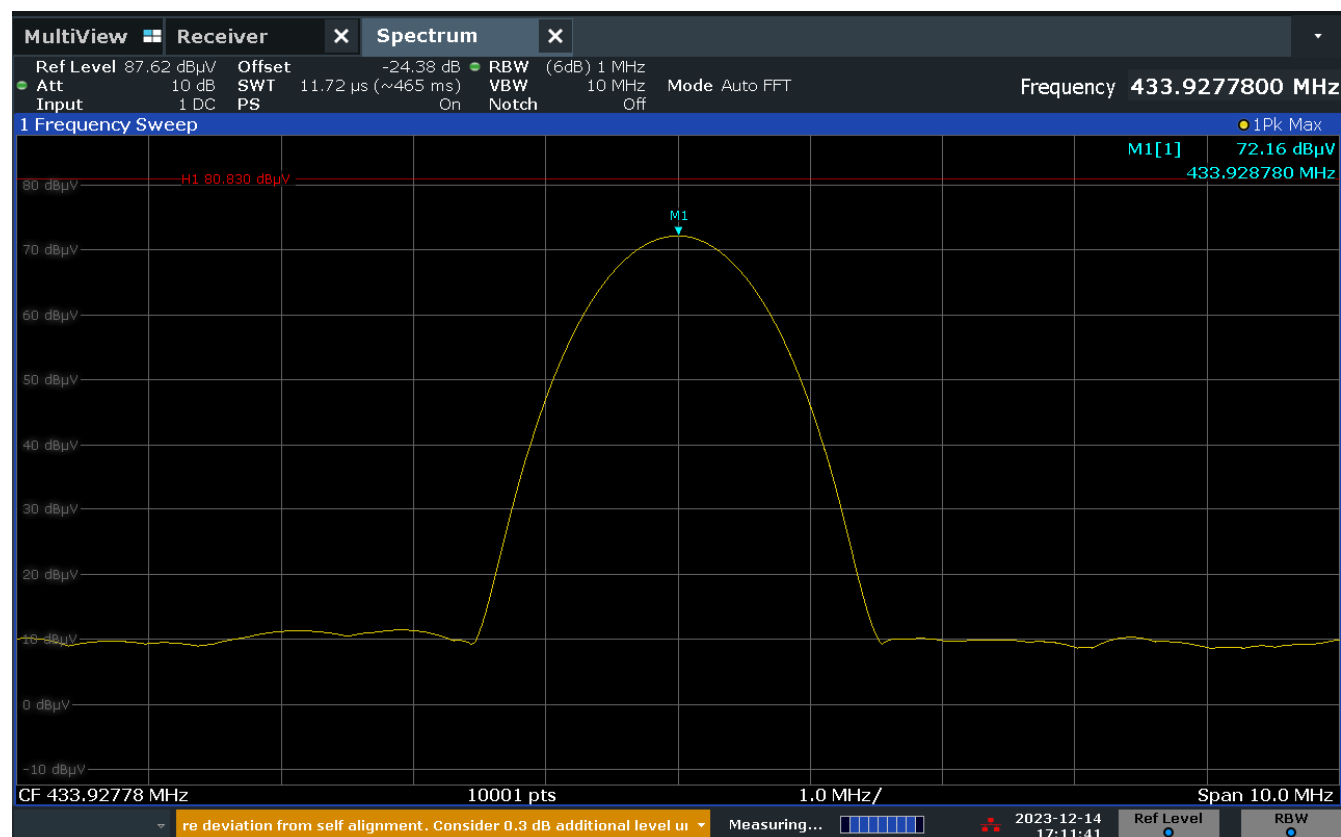
05:01:00 PM 12/14/2023

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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05:11:41 PM 12/14/2023

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 Field 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 |
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| 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 |

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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 (dB $\mu$ V/m) @ 30 MHz   |                     |       | 20.0  |
| Correction Factor (dB)                                        | Cable 2             | 0.24  | 18.94 |
|                                                               | TEMC00011 (antenna) | 18.70 |       |
|                                                               |                     |       |       |
|                                                               |                     |       |       |
| Reported Quasi-peak Final Measurement (dB $\mu$ V/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.

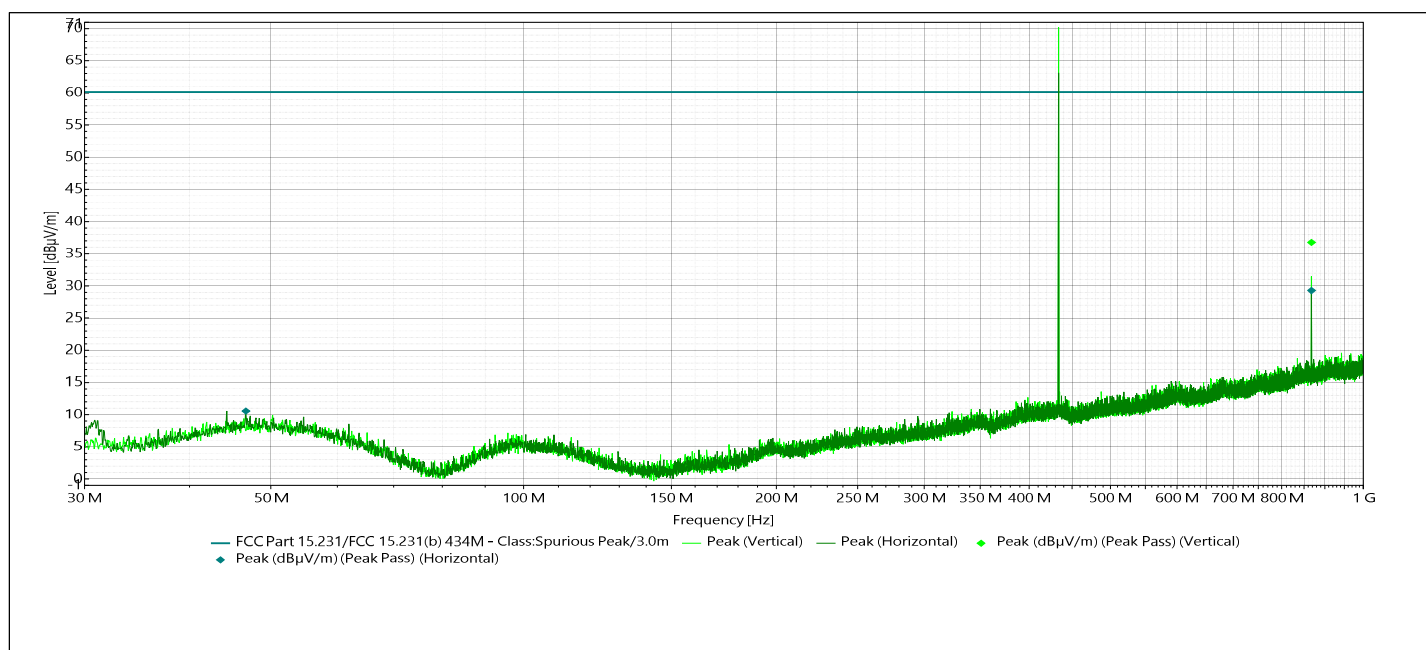
**Test Result: Pass**

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

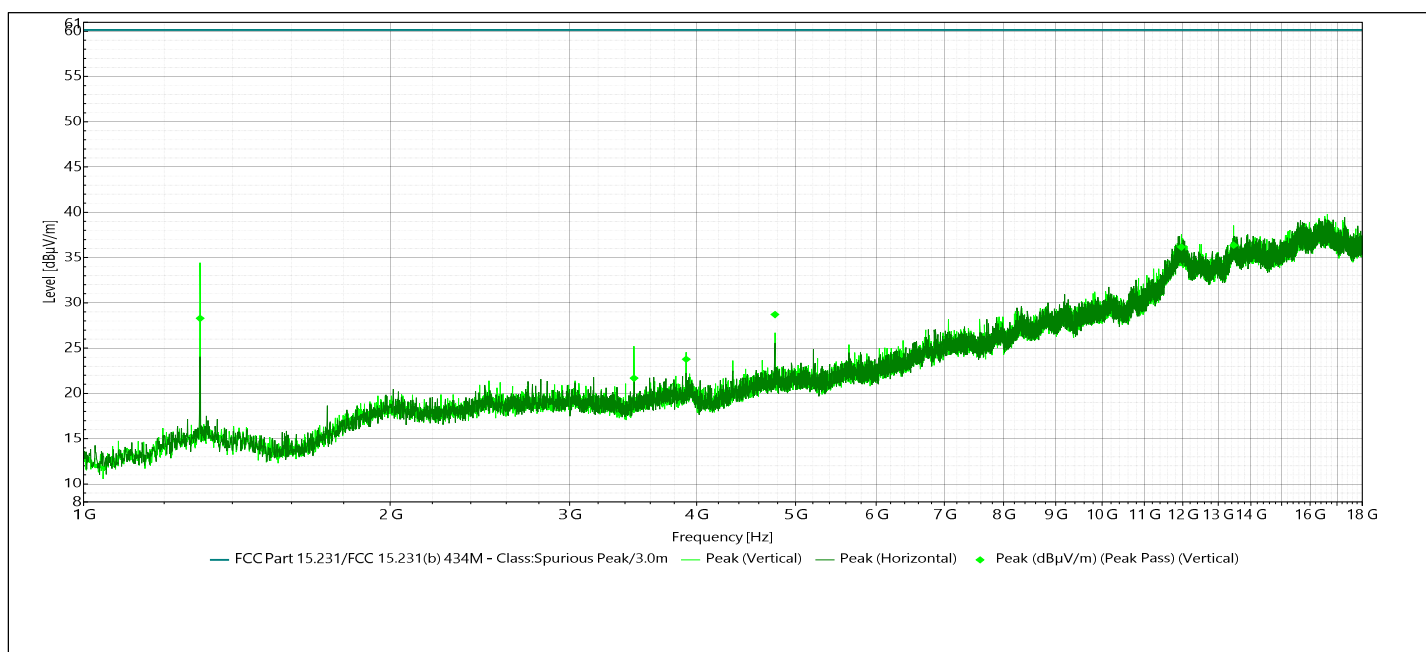
**Table 2.5-1 – RE Spurious Emissions 30-1000 MHz**

| 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   |



## 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:** FCC Part 15.231/FCC 15.231(b) 434M **Test Date:** 12/15/2023 **Test Results:** 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   |



### 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  $2 \times$  to  $5 \times$  the EBW (or OBW). The RBW was set to 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times$  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**

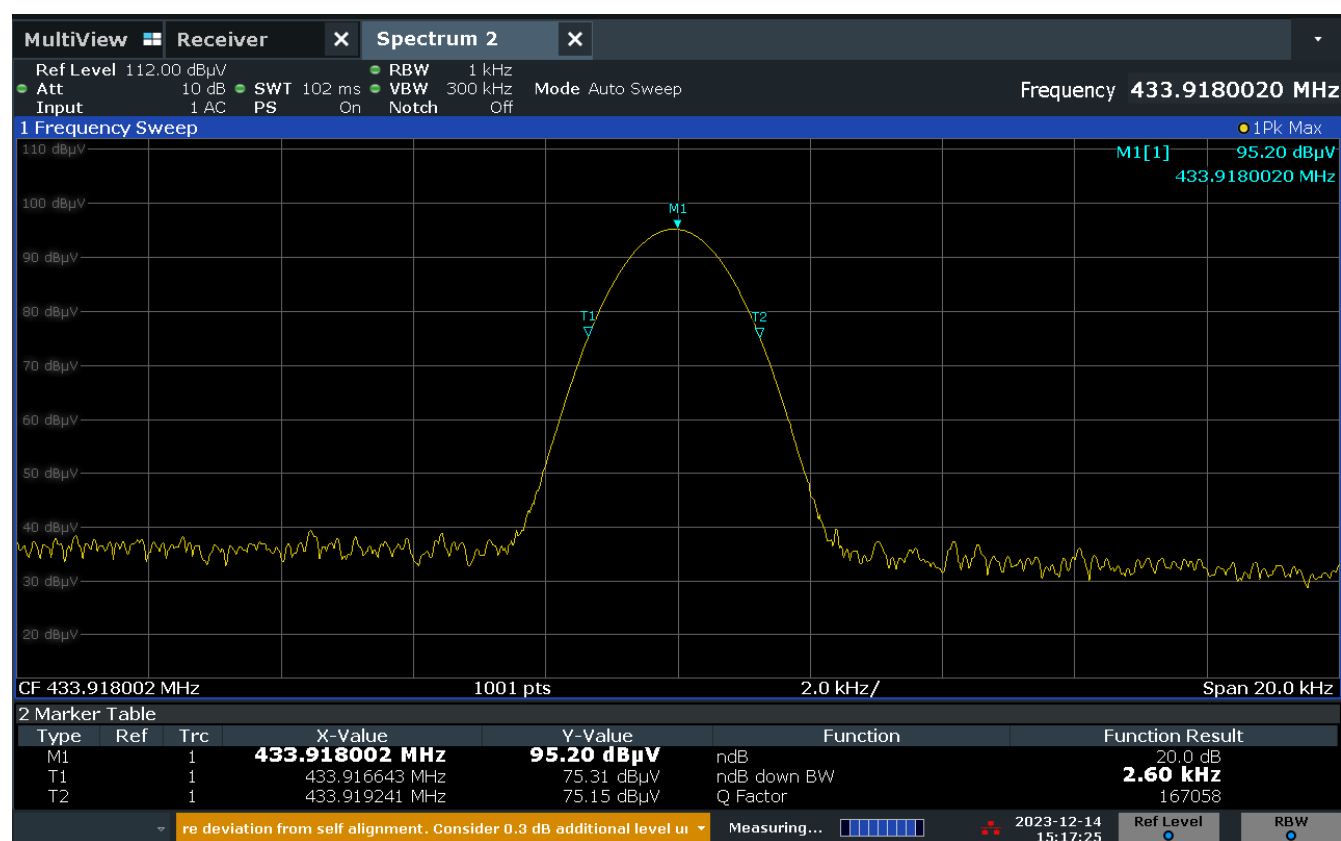
The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.



## 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 |



03:17:26 PM 12/14/2023

Figure 2-11 – Occupied Bandwidth

TÜV SÜD America Inc  
141 14<sup>th</sup> Street NW  
New Brighton, MN 55112

Phone: 651-631-2487  
[www.tuv-sud-america.com](http://www.tuv-sud-america.com)



## 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**

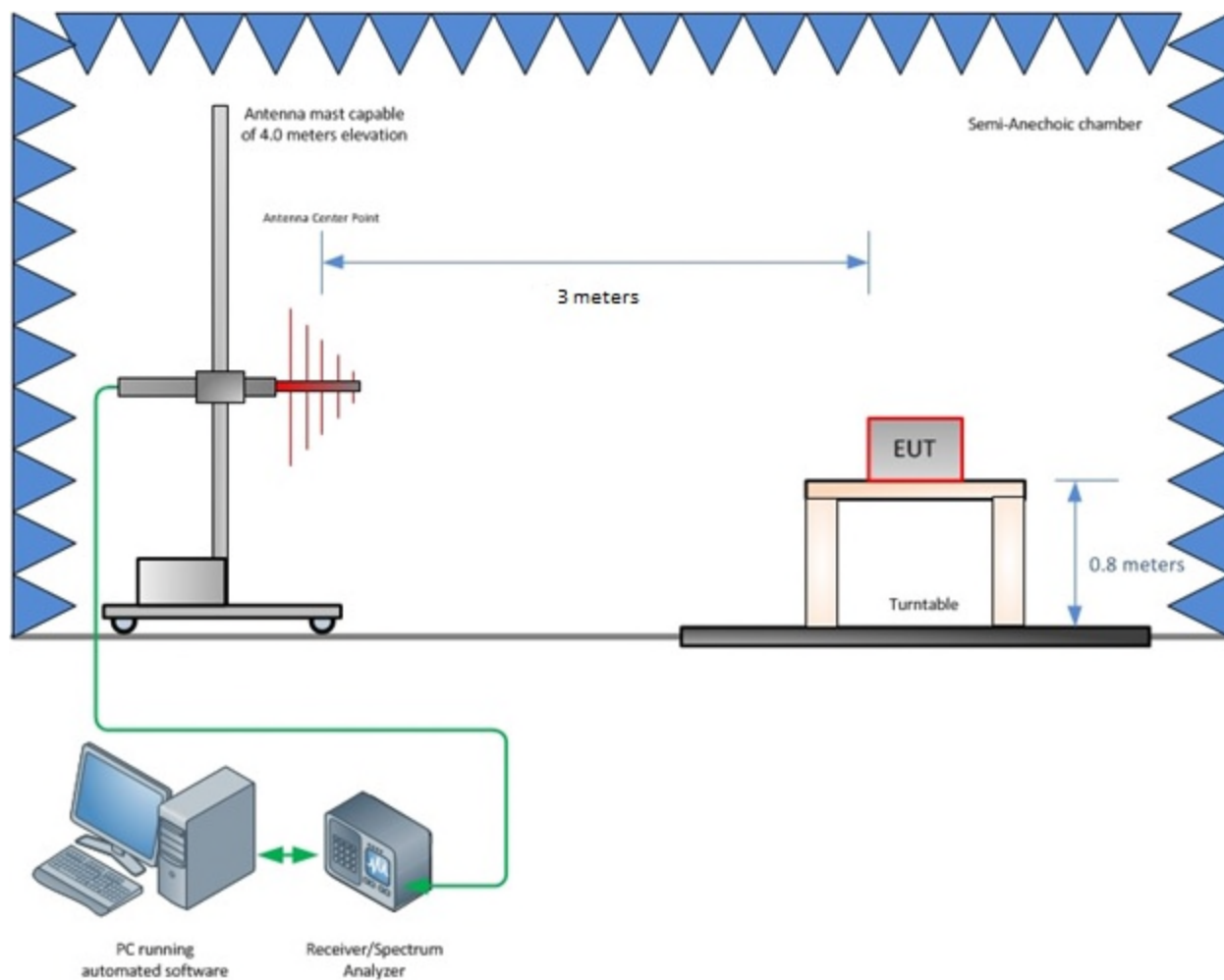
| Device #  | Manufacturer    | Description                            | Model       | Serial #   | Cal Code | Cal Date   | Cal Due    |
|-----------|-----------------|----------------------------------------|-------------|------------|----------|------------|------------|
| NBLE11085 | Inmet           | 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.

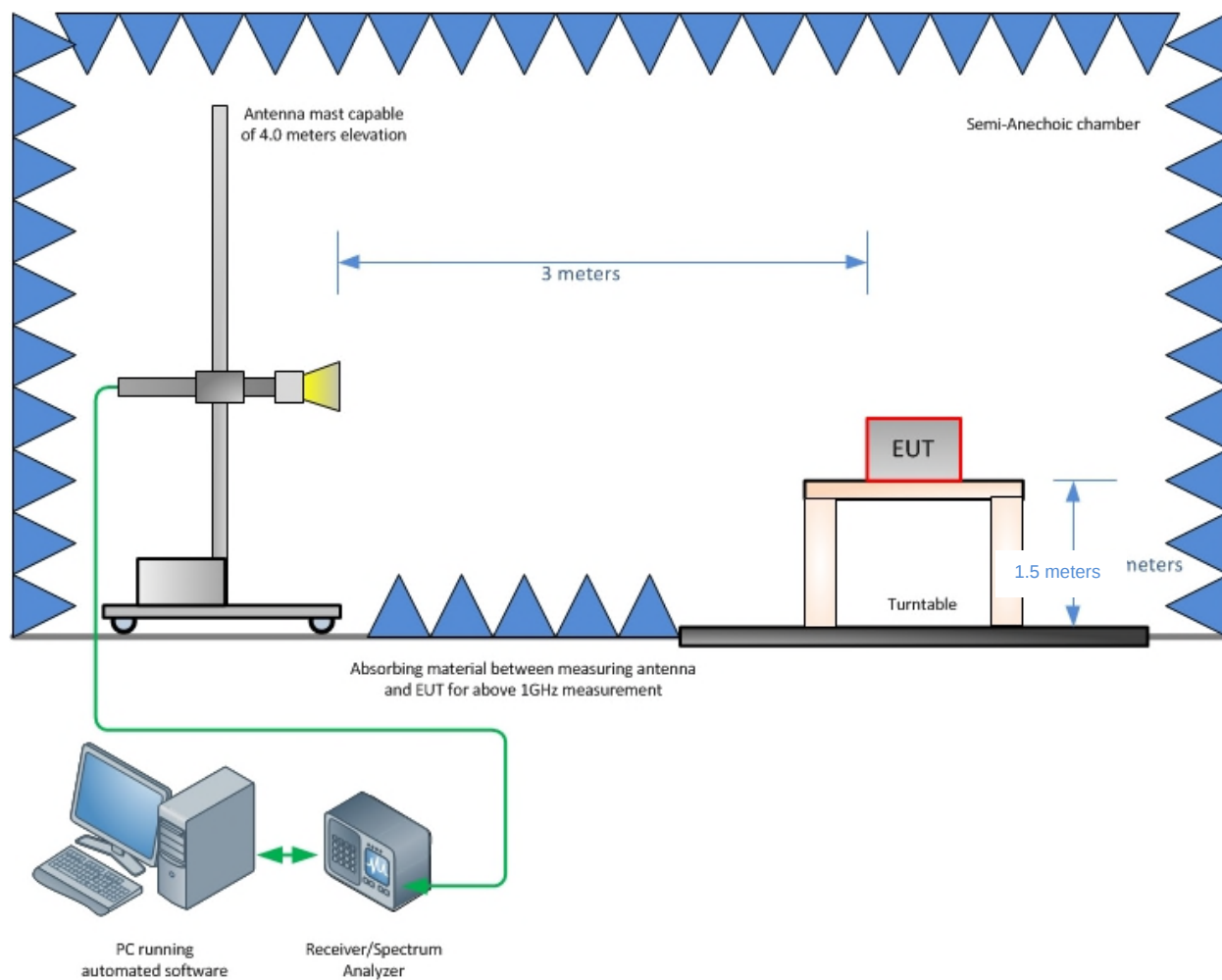
Cal Code B = Calibration verification performed internally.

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 – Radiated Emissions Test Setup above 1 GHz**



## 4 Accreditation, Disclaimers and Copyright

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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  $\pm 3.30$  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  $\pm 5.88$  dB and above 1 GHz a measurement uncertainty of  $\pm 4.47$  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