

# **ROGERS LABS, INC.**

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## 47CFR, PART 15C - Intentional Radiators 47CFR Paragraph 15.249 and Industry Canada RSS-GEN Issue 5 and RSS-210 Issue 10 Application For Grant of Certification

**Model: GMN-01410-01**

24.0-24.25 GHz

Low Power Transmitter (DXX)

**FCC ID: IPH-04099**

**IC: 1792A-04099**

# **Garmin International, Inc.**

1200 East 151st Street  
Olathe, KS 66062

FCC Designation: US5305  
ISED Registration: 3041A

Test Report Number: 221214

Test Date: January 4, 2023

Authorized Signatory: *Scot D. Rogers*  
Scot D. Rogers

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Phone/Fax: (913) 837-3214  
Revision r1

Garmin International, Inc.  
Model: GMN-01410-01  
Test: 221214  
Test to: CFR47 15.249, RSS-210, RSS-Gen Date: February 13, 2023  
File: GMN-01410-01 DXX TstRpt 221214 r1

SN: 6M1000202  
FCC ID: IPH-04099  
IC: 1792A-04099

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## Revisions

Revision r1 Issued February 13, 2023 – updated antenna Gain (10.95 dBi)

Revision 1 Issued January 25, 2023

## Foreword

The following information is submitted for consideration in obtaining Grant of Certification for low power intentional radiator per 47CFR Paragraph 15.249, Industry Canada RSS-210 Issue 10 and RSS-GEN Issue 5, low power digital device transmitter operations in the 24.0-24.25 GHz frequency band.

Name of Applicant: Garmin International, Inc.  
1200 East 151st Street  
Olathe, KS 66062

HVIN: GMN-01410-01

FCC ID: IPH-04099 IC: 1792A-04099

Operating Frequency Range: 24.0-24.25 GHz

| Frequency Band (GHz) | Peak Power (dB $\mu$ V/m@3m) | Average power (dB $\mu$ V/m@3m) | 99% OBW (MHz) |
|----------------------|------------------------------|---------------------------------|---------------|
| 24.00 - 24.25        | 107.3                        | 81.3                            | 198.7         |

## Opinion / Interpretation of Results

| Tests Performed                                       | Margin (dB) | Results  |
|---|-------------|----------|
| Restricted Bands 47CFR 15.205, RSS-210 Issue 10       | -16.5       | Complies |
| AC Line Conducted 47CFR 15.207, RSS-GEN 8.8           | N/A         | Complies |
| Radiated Emissions 47CFR 15.209, RSS-GEN 8.9          | -12.6       | Complies |
| Harmonic Emissions per 47CFR 15.249, RSS-210 Issue 10 | -30.5       | Complies |

## Equipment Tested

Model: GMN-01410-01

| <u>Equipment</u> | <u>Model / PN</u> | <u>Serial Number</u> |
|------------------|-------------------|----------------------|
| EUT              | GMN-01410-01      | 6M1000202            |
| Interface Cables | Manufacturer      | N/A                  |

Test results in this report relate only to the items tested.

Software Version 1.10b, Integral PCB Patch Antenna providing 10.95 dBi gain.

The design continuously sweeps across the 197 MHz band in 1mS, utilizing Frequency-Modulated Continuous-Wave (FMCW modulation)

Test results in this report relate only to the items tested.

### ***Equipment Function and Configuration***

The EUT is a mobile mounted low power field disturbance sensor for aviation. The test sample was provided with interface cabling for testing. The cabling provides for power input and provides for interfacing with other avionic equipment when installed in an aircraft. The test system only required direct current power to enable the transmitter function during testing. The test sample operated the transmitter at near 100% duty cycle while powered for testing purposes. The testing mode of operation exceeds typical duty cycle operation of production equipment. The EUT was arranged as described by the manufacturer emulating typical use configuration for testing purposes. For testing purposes, the EUT received powered from an external DC power supply and was configured to operate in the manufacturer provided mode and duty cycle. As requested by the manufacturer and required by regulations, the equipment was tested for compliance using the available configurations with the worst-case data presented. This report documents the performed testing and results for applicable configuration and product operation. Test results in this report relate only to the products described in this report.

### ***Equipment Configuration***



## Application for Certification

- (1) Manufacturer: Garmin International, Inc.  
1200 East 151st Street  
Olathe, KS 66062
- (2) Identification: HVIN: GMN-01410-01  
FCC ID: IPH-04099 IC: 1792A-04099
- (3) Instruction Book:  
Refer to Exhibit for Instruction Manual.
- (4) Description of Circuit Functions:  
Refer to Exhibit of Operational Description.
- (5) Block Diagram with Frequencies:  
Refer to Exhibit of Operational Description.
- (6) Report of Measurements:  
Report of measurements follows in this Report.
- (7) Photographs: Construction, Component Placement, etc.:  
Refer to Exhibit for photographs of equipment.
- (8) List of Peripheral Equipment Necessary for operation. The equipment operates from direct current power provided from aircraft installation. The design provides interface options with unique connection the wiring harness for aviation installation as presented in this filing. The EUT offers no other connection ports than those presented in this filing.
- (9) Transition Provisions of 47CFR 15.37 are not requested.
- (10) Not Applicable. The unit is not a scanning receiver.
- (11) Not Applicable. The EUT does not operate in the 59 – 64 GHz frequency band.
- (12) The equipment is not software defined and this section is not applicable.
- (13) Applications for certification of U-NII devices in the 5.15-5.35 GHz and the 5.47-5.85 GHz bands must include a high-level operational description of the security procedures that control the radio frequency operating parameters and ensure that unauthorized modifications cannot be made. This requirement is not applicable to this device.
- (14) Contain at least one drawing or photograph showing the test set-up for each of the required types of tests applicable to the device for which certification is requested. These drawings or photographs must show enough detail to confirm other information contained in the test report. Any photographs used must be focused originals without glare or dark spots and must clearly show the test configuration used. This information is provided in this report and Test Setup Exhibits provided with the application filing.

## Applicable Standards & Test Procedures

In accordance with the Title 47 of the Code of Federal Regulations (47CFR), dated January 4, 2023: Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, and applicable parts of paragraph 15, Part 15C Paragraph 15.249, Industry Canada RSS-210 Issue 10, Annex B10, and RSS-GEN Issue 5 operation in the 24.0-24.25 GHz Frequency band. Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in ANSI C63.10-2013.

## Testing Procedures

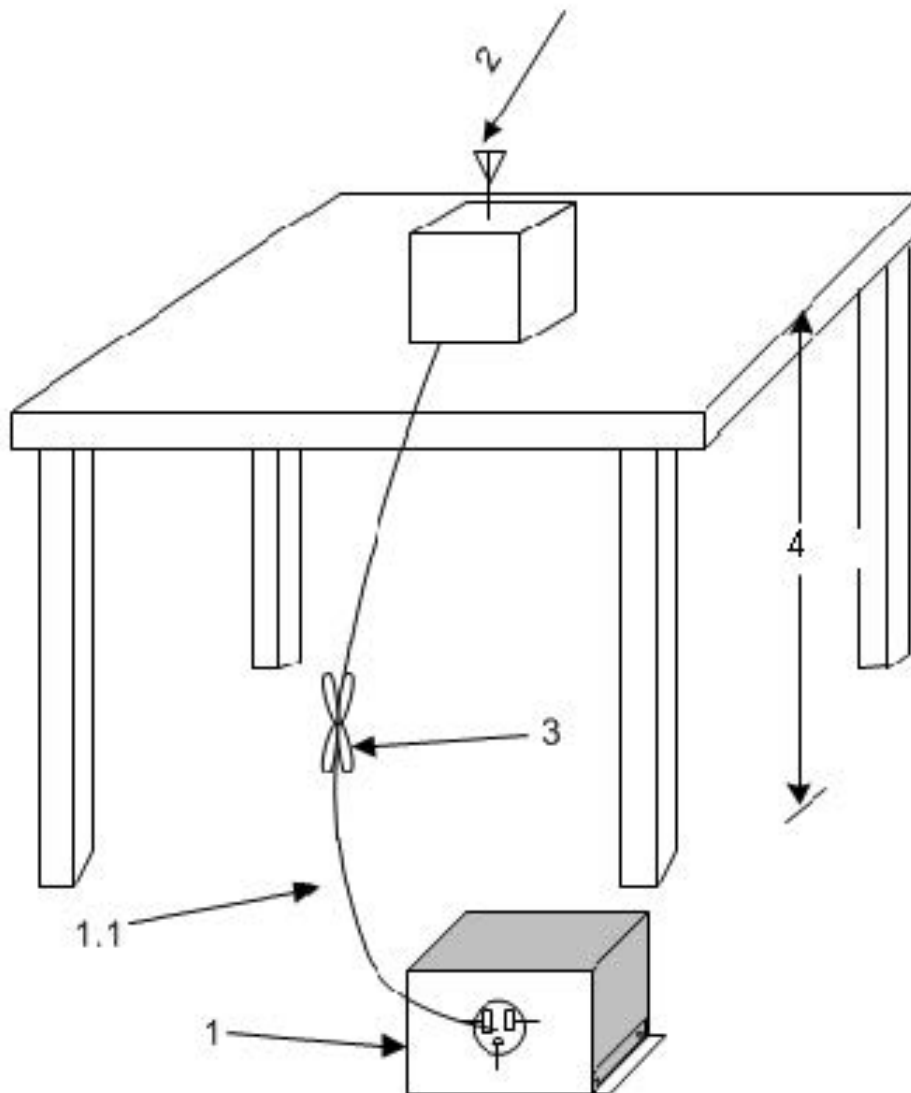
### ***AC Line Conducted Emission Test Procedure***

The design operates from Direct Current power only and offers no provision to interface with Utility AC Power systems. Therefore, No AC Line conducted emissions testing was required or preformed.

### ***Radiated Emission Test Procedure***

Radiated emissions testing was performed as required in 47CFR 15C, RSS-210 Issue 10 and specified in ANSI C63.10-2013. The EUT was placed on a rotating 0.9 x 1.2-meter platform, elevated as required above the ground plane at a distance of 3 meters from the FSM antenna. EMI energy was maximized by equipment placement permitting orientation in three orthogonal axes, raising, and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before data was taken and recorded. The frequency spectrum from 9 kHz to 40,000 MHz was searched for emissions during preliminary investigation. Refer to diagrams one and two showing typical test setup. Refer to photographs in the test setup.

**Diagram 1 Test arrangement for radiated emissions of tabletop equipment.**



1—A LISN is optional for radiated measurements between 30 MHz and 1000 MHz but not allowed for measurements below 30 MHz and above 1000 MHz (see 6.3.1). If used, then connect EUT to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$  loads. The LISN may be placed on top of, or immediately beneath, the reference ground plane (see 6.2.2 and 6.2.3.2).

1.1—LISN spaced at least 80 cm from the nearest part of the EUT chassis.

2—Antenna can be integral or detachable, depending on the EUT (see 6.3.1).

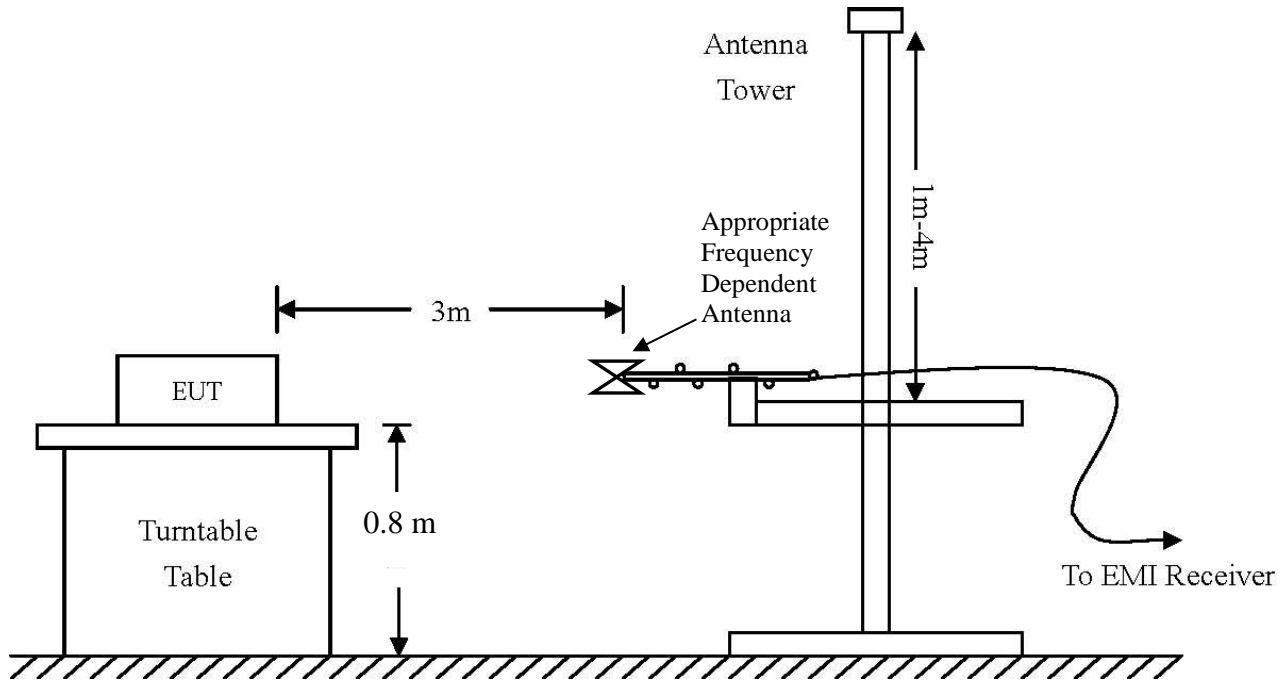
3—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long (see 6.3.1).

4—For emission measurements at or below 1 GHz, the table height shall be 80 cm. For emission measurements above 1 GHz, the table height shall be 1.5 m for measurements, except as otherwise specified (see 6.3.1 and 6.6.3.1).

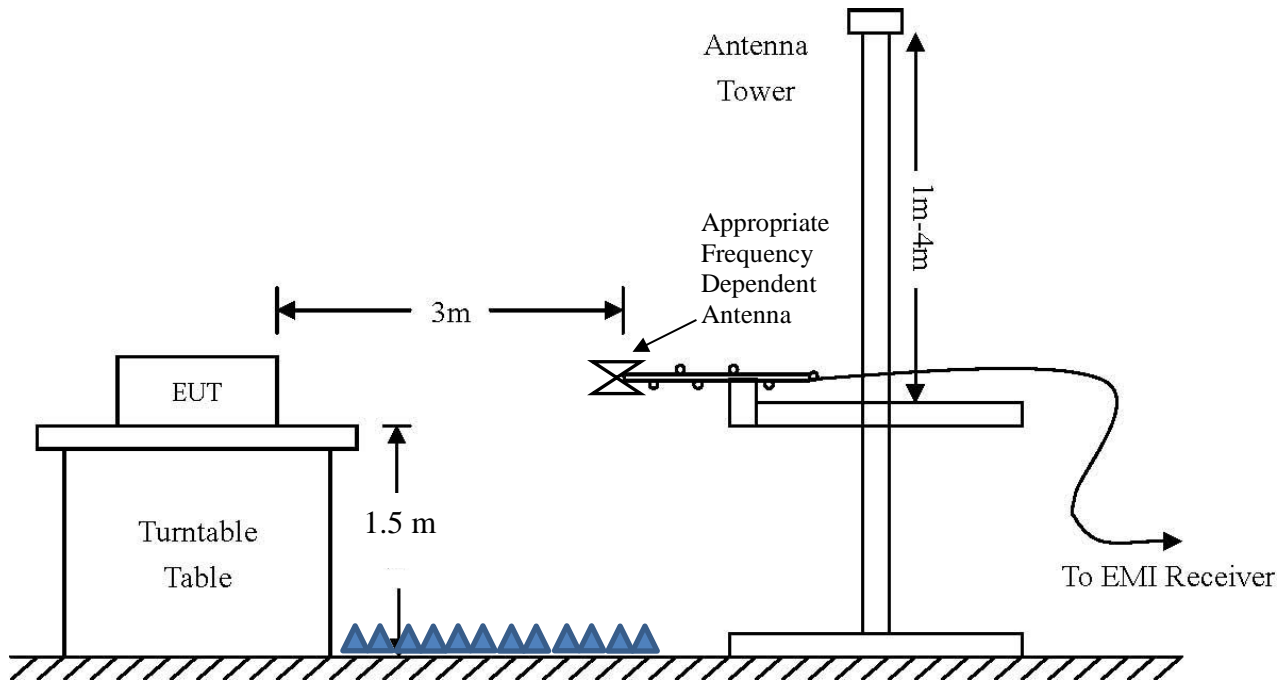


**Diagram 2 Test arrangement for radiated emissions tested on Open Area Test Site**

**Test arrangement for radiated emissions Below 1 GHz**



**Test arrangement for radiated emissions Above 1 GHz**



## Test Site Locations

Conducted EMI AC line conducted emissions testing performed in a shielded screen room located at Rogers Labs, Inc., 4405 West 259<sup>th</sup> Terrace, Louisburg, KS

Antenna port Antenna port conducted emissions testing was performed in a shielded screen room located at Rogers Labs, Inc., 4405 West 259<sup>th</sup> Terrace, Louisburg, KS

Radiated EMI The radiated emissions tests were performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 West 259<sup>th</sup> Terrace, Louisburg, KS

Registered Site information: FCC Site: US5305, ISED: 3041A, CAB Identifier: US0096

NVLAP Accreditation Lab code 200087-0

## Units of Measurements

Conducted EMI Data presented in dB $\mu$ V; dB referenced to one microvolt.

Antenna port Conducted Data is in dBm; dB referenced to one milliwatt.

Radiated EMI Data presented in dB $\mu$ V/m; dB referenced to one microvolt per meter.

Note: Radiated limit may be expressed for measurement in dB $\mu$ V/m when the measurement is taken at a distance of 3 or 10 meters. Data taken for this report was taken at distance of 3 meters. Sample calculation demonstrates corrected field strength reading for Open Area Test Site using the measurement reading and correcting for receive antenna factor, cable losses, and amplifier gains.

Sample Calculation:

RFS = Radiated Field Strength, FSM = Field Strength Measured

A.F. = Receive antenna factor, Losses = attenuators/cable losses, Gain = amplification gains

$RFS (dB\mu V/m @ 3m) = FSM (dB\mu V) + A.F. (dB/m) + Losses (dB) - Gain (dB)$

## Environmental Conditions

|                      |           |
|----------------------|-----------|
| Ambient Temperature  | 20.3° C   |
| Relative Humidity    | 33%       |
| Atmospheric Pressure | 1025.9 mb |

## Statement of Modifications and Deviations

No modifications to the EUT were required for the equipment to demonstrate compliance with the 47CFR Part 15C, 15.249, Industry Canada RSS-210 Issue 10, and RSS-GEN Issue 5 emission requirements. There were no deviations to the specifications.

## Intentional Radiators

The following information is submitted supporting compliance with the requirements of 47CFR, Subpart C, paragraph 15.249, Industry Canada RSS-210 Issue 10, and RSS-GEN Issue 5.

### *Antenna Requirements*

The EUT incorporates integral antenna system. Production equipment offers no provision for connection to alternate antenna system. The antenna connection point complies with the unique antenna connection requirements. There are no deviations or exceptions to the specification.

### *Restricted Bands of Operation*

Spurious emissions falling in the restricted frequency bands of operation were measured at the OATS. The EUT utilizes frequency, determining circuitry, which generates harmonics falling in the restricted bands. Emissions were investigated at the OATS, using appropriate antennas or pyramidal horns, amplification stages, and a spectrum analyzer. Peak and average amplitudes of frequencies above 1000 MHz were compared to the required limits with worst-case data presented below. Test procedures of ANSI C63.10-2013 were used during testing. No other significant emission was observed which fell into the restricted bands of operation. Computed emission values take into account the received radiated field strength, receive antenna correction factor, amplifier gain stage, and test system cable losses.

**Table 1 Radiated Emissions in Restricted Frequency Bands Data**

| Frequency in MHz | Horizontal Peak (dB $\mu$ V/m) | Horizontal Average (dB $\mu$ V/m) | Vertical Peak (dB $\mu$ V/m) | Vertical Average (dB $\mu$ V/m) | Limit @ 3m (dB $\mu$ V/m) | Horizontal Margin (dB) | Vertical Margin (dB) |
|------------------|--------------------------------|-----------------------------------|------------------------------|---------------------------------|---------------------------|------------------------|----------------------|
| 48,102.0         | 39.3                           | 27.2                              | 36.6                         | 25.8                            | 54.0                      | -26.8                  | -28.2                |
| 48,300.0         | 37.7                           | 26.3                              | 36.6                         | 29.5                            | 54.0                      | -27.7                  | -24.5                |
| 48,495.8         | 39.7                           | 27.3                              | 36.5                         | 26.1                            | 54.0                      | -26.7                  | -27.9                |
| 72,153.0         | 42.3                           | 31.0                              | 40.5                         | 31.5                            | 54.0                      | -23.0                  | -22.5                |
| 72,450.0         | 40.9                           | 30.9                              | 41.3                         | 31.0                            | 54.0                      | -23.1                  | -23.0                |
| 72,743.7         | 41.1                           | 31.1                              | 41.1                         | 30.8                            | 54.0                      | -22.9                  | -23.2                |
| 96,204.0         | 47.9                           | 37.5                              | 47.8                         | 37.2                            | 54.0                      | -16.5                  | -16.8                |
| 96,600.0         | 47.4                           | 36.6                              | 46.5                         | 36.4                            | 54.0                      | -17.4                  | -17.6                |
| 96,991.6         | 47.1                           | 37.2                              | 45.6                         | 36.8                            | 54.0                      | -16.9                  | -17.2                |

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded for frequency range below 1000 MHz. Peak and Average amplitude emissions are recorded for frequency range above 1000 MHz.

**Summary of Results for Radiated Emissions in Restricted Bands**

The EUT demonstrated compliance with the radiated emissions requirements of 47CFR Part 15C and RSS-210 Issue 10 Intentional Radiator requirements. The EUT demonstrated a worst-case minimum margin of -16.5 dB below the emissions requirements in restricted frequency bands. Peak, Quasi-peak, and average amplitudes were checked for compliance with the regulations. Worst-case emissions are reported with other emissions found in the restricted frequency bands at least 20 dB below the requirements.

### **General Radiated Emissions Procedure**

The EUT was arranged in typical equipment configurations and operated through available modes during testing. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Radiated emissions measurements were performed to identify the frequencies, which produced the highest emissions. Each radiated emission was then maximized at the OATS location before final radiated measurements were performed. Final data was taken with the EUT located at the OATS at a distance of 3 meters between the EUT and the receiving antenna. The frequency spectrum from 9 kHz to 100,000 MHz was searched for general radiated emissions. Measured emission levels were maximized by EUT placement on the table, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna position between horizontal and vertical polarization. Antennas used were Loop from 9 kHz to 30 MHz, Broadband Biconical from 30 to 200 MHz, Biconilog from 30 to 1000 MHz, Log Periodic from 200 MHz to 1 GHz and or double Ridge or pyramidal horns and mixers above 1 GHz, notch filters and appropriate amplifiers and external mixers were utilized.

**Table 2 General Radiated Emissions Data**

| Frequency (MHz) | Horizontal Peak (dB $\mu$ V/m) | Horizontal Quasi-Peak (dB $\mu$ V/m) | Vertical Peak (dB $\mu$ V/m) | Vertical Quasi-Peak (dB $\mu$ V/m) | FCC/ISED Limit @ 3m (dB $\mu$ V/m) | Horizontal Margin (dB) | Vertical Margin (dB) |
|-----------------|--------------------------------|--------------------------------------|------------------------------|------------------------------------|------------------------------------|------------------------|----------------------|
| 41.9            | 27.4                           | 21.2                                 | 34.6                         | 27.3                               | 40.0                               | -18.8                  | -12.7                |
| 60.4            | 24.6                           | 17.4                                 | 32.4                         | 21.7                               | 40.0                               | -22.6                  | -18.3                |
| 69.7            | 31.9                           | 18.6                                 | 35.7                         | 27.4                               | 40.0                               | -21.4                  | -12.6                |
| 80.0            | 32.4                           | 20.1                                 | 29.7                         | 21.0                               | 40.0                               | -19.9                  | -19.0                |
| 120.0           | 30.8                           | 15.6                                 | 33.1                         | 21.3                               | 43.5                               | -27.9                  | -22.2                |
| 147.0           | 35.6                           | 27.4                                 | 27.9                         | 16.3                               | 43.5                               | -16.1                  | -27.2                |
| 160.0           | 34.0                           | 21.5                                 | 25.7                         | 13.5                               | 43.5                               | -22.0                  | -30.0                |

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded for frequency range below 1000 MHz. Peak and Average amplitude emissions are recorded for frequency range above 1000 MHz.

**Summary of Results for General Radiated Emissions**

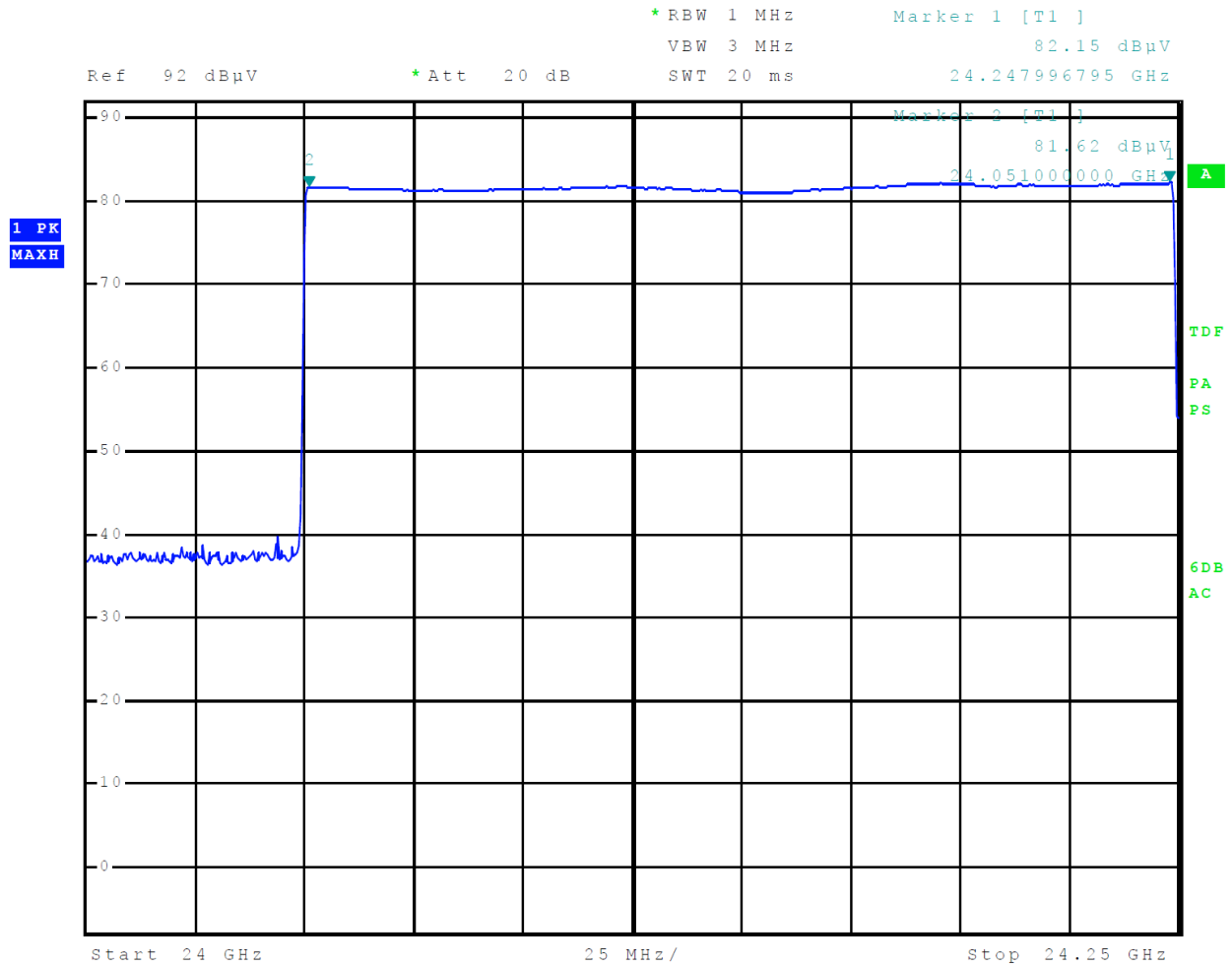
The EUT demonstrated compliance with the radiated emissions requirements of 47CFR Part 15C paragraph 15.209, RSS-210 Issue 10, and RSS-GEN Intentional Radiators. The EUT demonstrated a minimum margin of -12.6 dB below the requirements. Other emissions were present with amplitudes at least 20 dB below the Limits.

### **Operation in the Band 24.0–24.25 GHz**

The transmitter output power and emissions were measured on an open area test site @ 3 meters. The EUT was placed on a turntable elevated as required above the ground plane and at a distance of 3 meters from the FSM antenna. The peak and quasi-peak amplitude of frequencies below 1000 MHz were measured using a spectrum analyzer. The peak and average amplitude of frequencies above 1000 MHz were measured using a spectrum analyzer. The amplitude of each emission was then recorded from the analyzer display. Emissions radiated outside of the specified bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits, whichever is the lesser attenuation. The amplitude of each radiated emission was measured on the OATS at a distance of 3 meters from the FSM antenna testing was performed on sample representative of production with worst-case data provided. The amplitude of each radiated emission was maximized by equipment orientation and placement on the turn table, raising and lowering the FSM (Field Strength Measuring) antenna, changing the FSM antenna polarization, and by rotating the turntable. A Loop antenna was used for measuring emissions from 0.009 to 30 MHz, Biconilog Antenna for 30 to 1000 MHz, Double-Ridge, and/or Pyramidal Horn Antennas from 1 GHz to 40 GHz. Emissions were measured in dB $\mu$ V/m @ 3 meters. External mixers were used to measure the harmonic emissions.

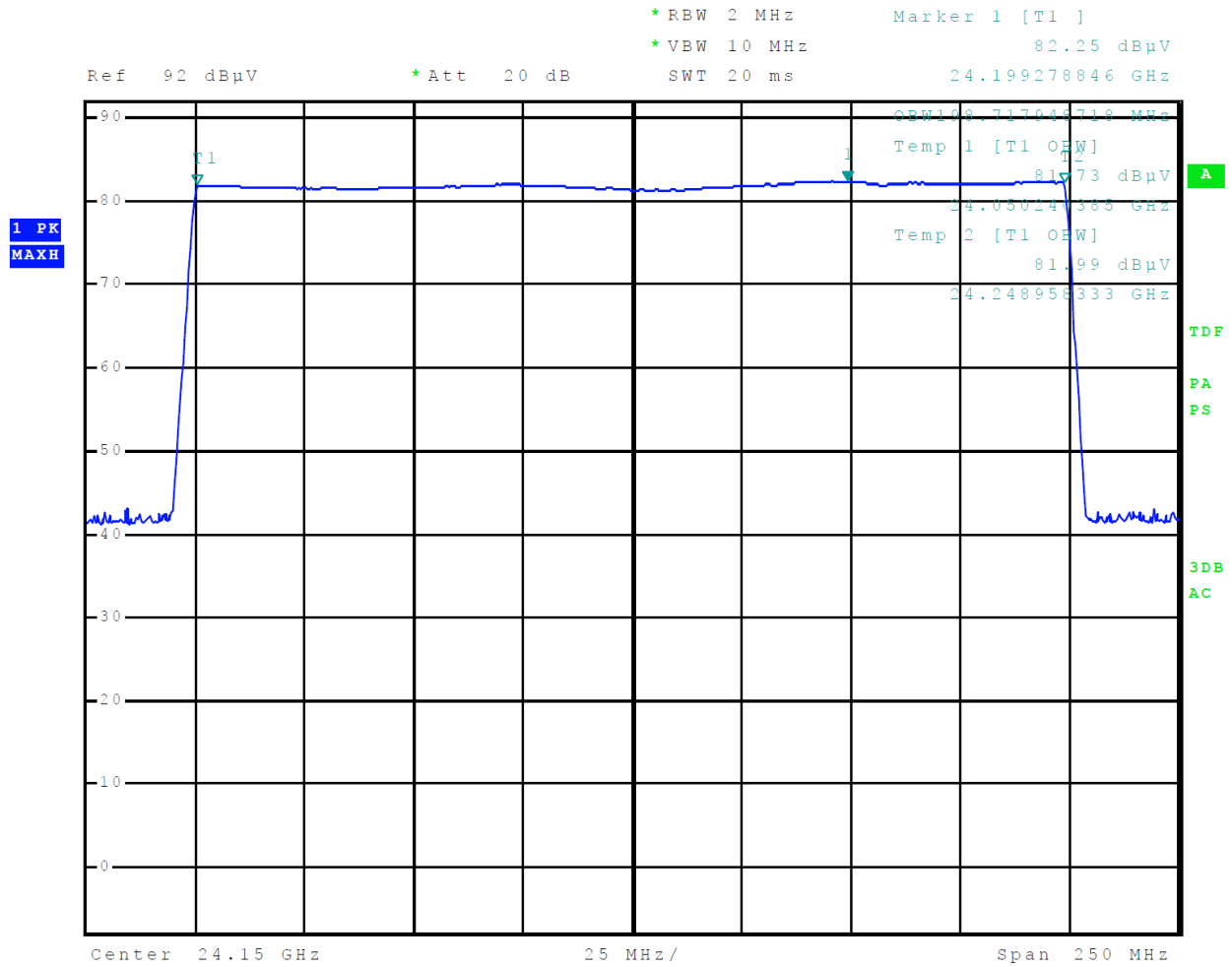
Refer to figures one through four showing plots taken of the 24.0-24.25 GHz transmitter operation.

**Figure 1 Plot of Transmitter Emissions Operation in 24.0-24.25 GHz**





**Figure 2 Plot of Transmitter Emissions 99% Occupied Bandwidth**



**Figure 3 Plot of Transmitter Emissions Low Band Edge**

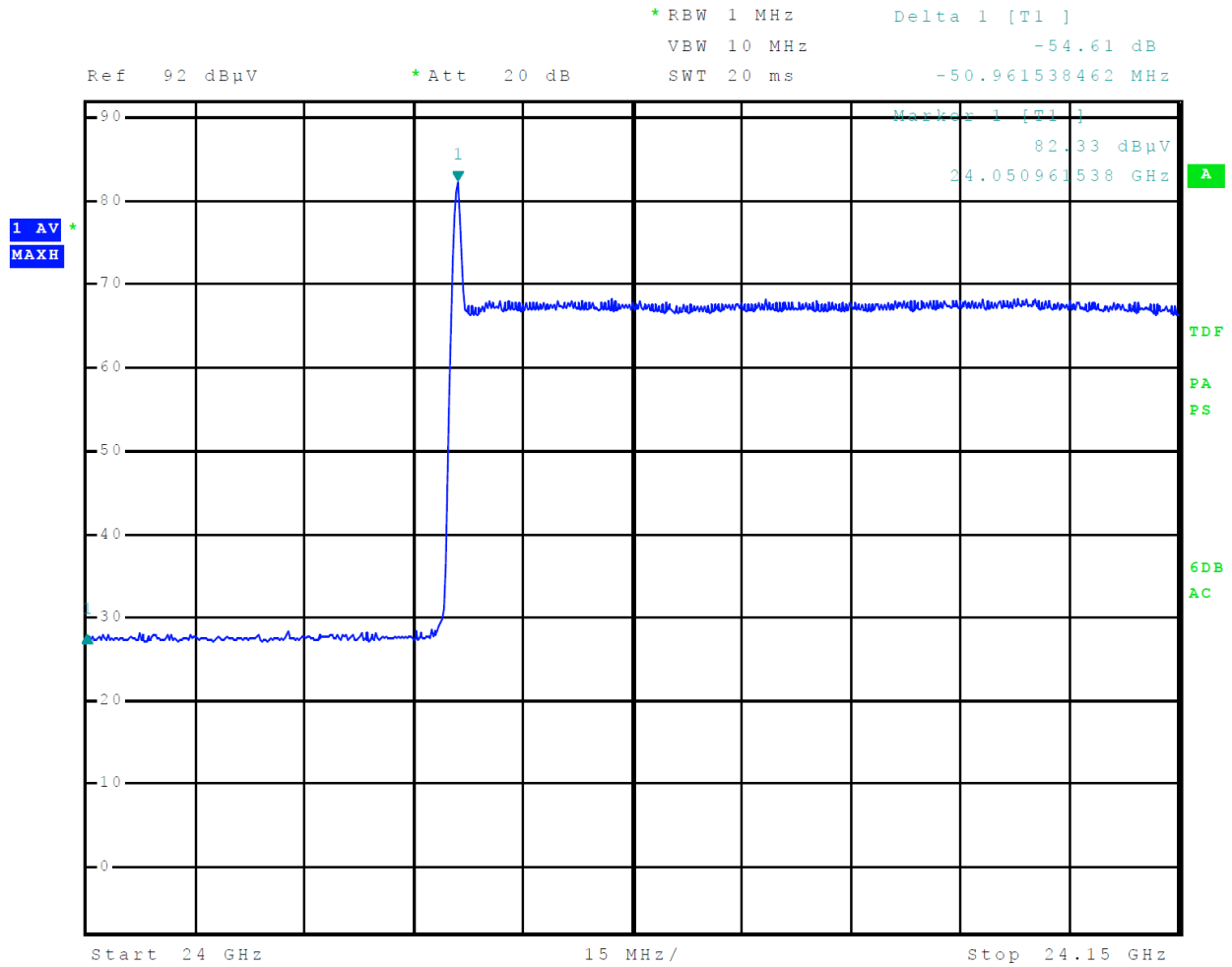
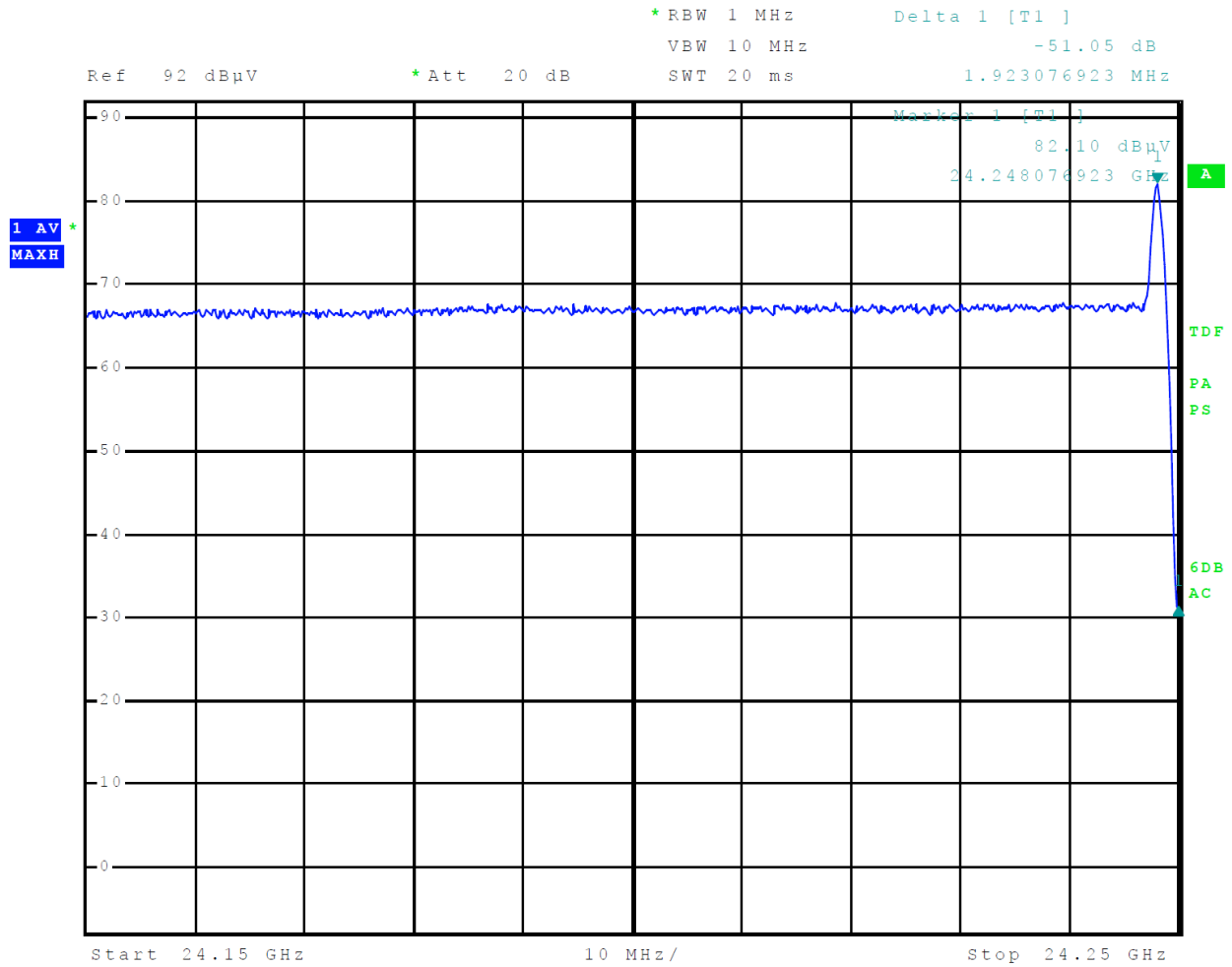


Figure 4 Plot of Transmitter Emissions High Band Edge



## Transmitter Emissions Data

**Table 3 Transmitter Radiated Emissions**

| Frequency in MHz | Horizontal Peak (dB $\mu$ V/m) | Horizontal Average (dB $\mu$ V/m) | Vertical Peak (dB $\mu$ V/m) | Vertical Average (dB $\mu$ V/m) | Limit @ 3m (dB $\mu$ V/m) | Horizontal Margin (dB) | Vertical Margin (dB) |
|------------------|--------------------------------|-----------------------------------|------------------------------|---------------------------------|---------------------------|------------------------|----------------------|
| 24,051.0         | 107.3                          | 81.1                              | 86.6                         | 64.0                            | 108.0                     | -26.9                  | -44.0                |
| 48,102.0         | 39.3                           | 27.2                              | 36.6                         | 25.8                            | 68.0                      | -40.8                  | -42.2                |
| 72,153.0         | 42.3                           | 31.0                              | 40.5                         | 31.5                            | 68.0                      | -37.0                  | -36.5                |
| 96,204.0         | 47.9                           | 37.5                              | 47.8                         | 37.2                            | 68.0                      | -30.5                  | -30.8                |
| 24,150.0         | 107.3                          | 65.6                              | 85.8                         | 58.6                            | 108.0                     | -42.4                  | -49.4                |
| 48,300.0         | 37.7                           | 26.3                              | 36.6                         | 29.5                            | 68.0                      | -41.7                  | -38.5                |
| 72,450.0         | 40.9                           | 30.9                              | 41.3                         | 31.0                            | 68.0                      | -37.1                  | -37.0                |
| 96,600.0         | 47.4                           | 36.6                              | 46.5                         | 36.4                            | 68.0                      | -31.4                  | -31.6                |
| 24,247.9         | 107.2                          | 81.3                              | 85.9                         | 63.7                            | 108.0                     | -26.7                  | -44.3                |
| 48,495.8         | 39.7                           | 27.3                              | 36.5                         | 26.1                            | 68.0                      | -40.7                  | -41.9                |
| 72,743.7         | 41.1                           | 31.1                              | 41.1                         | 30.8                            | 68.0                      | -36.9                  | -37.2                |
| 96,991.6         | 47.1                           | 37.2                              | 45.6                         | 36.8                            | 68.0                      | -30.9                  | -31.2                |

Other emissions present had amplitudes at least 20 dB below the limit. Peak and Quasi-Peak amplitude emissions are recorded for frequency range below 1000 MHz. Peak and Average amplitude emissions are recorded for frequency range above 1000 MHz.

### Summary of Results for Transmitter Radiated Emissions of Intentional Radiator

The EUT demonstrated compliance with the radiated emissions requirements of FCC 47CFR Part 15.249, Industry Canada RSS-210 Issue 10, and RSS-GEN Issue 5 Intentional Radiator regulations. The EUT worst-case test sample configuration demonstrated minimum average margin of -26.7 dB below the average emission limit for the fundamental. The EUT worst-case configuration demonstrated minimum radiated harmonic emission margin of -30.5 dB below the limit. No other radiated emissions were found in the restricted bands less than 20 dB below limits than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the limits.

## Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Test Equipment
- Annex C Rogers Qualifications
- Annex D Rogers Labs Certificate of Accreditation

### **Annex A Measurement Uncertainty Calculations**

The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16-4. Result of measurement uncertainty calculations are recorded below. Component and process variability of production devices similar to those tested may result in additional deviations. The manufacturer has the sole responsibility of continued compliance.

| Measurement                                     | Expanded Measurement Uncertainty $U_{(lab)}$ |
|---|--|
| 3 Meter Horizontal 0.009-1000 MHz Measurements  | 4.16   |
| 3 Meter Vertical 0.009-1000 MHz Measurements    | 4.33   |
| 3 Meter Measurements 1-18 GHz                   | 5.14   |
| 3 Meter Measurements 18-40 GHz                  | 5.16   |
| 10 Meter Horizontal Measurements 0.009-1000 MHz | 4.15   |
| 10 Meter Vertical Measurements 0.009-1000 MHz   | 4.32   |
| AC Line Conducted                               | 1.75   |
| Antenna Port Conducted power                    | 1.17   |
| Frequency Stability                             | 1.00E-11                                     |
| Temperature                                     | 1.6°C  |
| Humidity  | 3%   |

## Annex B Test Equipment List

| <u>Equipment</u>  | <u>Manufacturer</u> | <u>Model (SN)</u>               | <u>Band</u>  | <u>Cal Date(m/d/y)</u> | <u>Due</u> |
|---|---------------------|---------------------------------|--------------|------------------------|------------|
| <input type="checkbox"/> LISN                                       | FCC                 | FCC-LISN-50-25-10(1PA) (160611) | .15-30MHz    | 3/29/2022              | 3/29/2023  |
| <input type="checkbox"/> LISN: Fischer Custom Communications Model: |                     | FCC-LISN-50-16-2-08             |              | 3/29/2022              | 3/29/2023  |
| <input checked="" type="checkbox"/> Cable                           | Huber & Suhner Inc. | Sucoflex102ea(L10M)(303073)     | 9kHz-40 GHz  | 10/11/2022             | 10/11/2023 |
| <input type="checkbox"/> Cable                                      | Huber & Suhner Inc. | Sucoflex102ea(1.5M)(303069)     | 9kHz-40 GHz  | 10/11/2022             | 10/11/2023 |
| <input checked="" type="checkbox"/> Cable                           | Huber & Suhner Inc. | Sucoflex102ea(1.5M)(303070)     | 9kHz-40 GHz  | 10/11/2022             | 10/11/2023 |
| <input type="checkbox"/> Cable                                      | Belden              | RG-58 (L1-CAT3-11509)           | 9kHz-30 MHz  | 10/11/2022             | 10/11/2023 |
| <input type="checkbox"/> Cable                                      | Belden              | RG-58 (L2-CAT3-11509)           | 9kHz-30 MHz  | 10/11/2022             | 10/11/2023 |
| <input checked="" type="checkbox"/> Antenna                         | Com Power           | AL-130 (121055)                 | .001-30 MHz  | 10/11/2022             | 10/11/2023 |
| <input type="checkbox"/> Antenna:                                   | EMCO                | 6509                            | .001-30 MHz  | 10/14/2020             | 10/11/2023 |
| <input type="checkbox"/> Antenna                                    | ARA                 | BCD-235-B (169)                 | 20-350MHz    | 10/11/2022             | 10/11/2023 |
| <input checked="" type="checkbox"/> Antenna                         | Sunol               | JB-6 (A100709)                  | 30-1000 MHz  | 10/11/2022             | 10/11/2023 |
| <input type="checkbox"/> Antenna                                    | ETS-Lindgren        | 3147 (40582)                    | 200-1000MHz  | 10/11/2022             | 10/11/2024 |
| <input checked="" type="checkbox"/> Antenna                         | ETS-Lindgren        | 3117 (200389)                   | 1-18 GHz     | 3/29/2022              | 3/29/2024  |
| <input type="checkbox"/> Antenna                                    | Com Power           | AH-118 (10110)                  | 1-18 GHz     | 10/11/2022             | 10/11/2024 |
| <input checked="" type="checkbox"/> Antenna                         | Com Power           | AH-840 (101046)                 | 18-40 GHz    | 4/6/2021               | 4/6/2023   |
| <input checked="" type="checkbox"/> Analyzer                        | Rohde & Schwarz     | ESU40 (100108)                  | 20Hz-40GHz   | 3/9/2022               | 3/9/2023   |
| <input checked="" type="checkbox"/> Analyzer                        | Rohde & Schwarz     | ESW44 (101534)                  | 20Hz-44GHz   | 1/18/2022              | 1/18/2023  |
| <input checked="" type="checkbox"/> Analyzer                        | Rohde & Schwarz     | FS-Z60, 90, 140, and 220        | 40GHz-220GHz | 12/22/2017             | 12/22/2027 |
| <input checked="" type="checkbox"/> Amplifier                       | Com-Power           | PA-010 (171003)                 | 100Hz-30MHz  | 10/11/2022             | 10/11/2023 |
| <input checked="" type="checkbox"/> Amplifier                       | Com-Power           | CPPA-102 (01254)                | 1-1000 MHz   | 10/11/2022             | 10/11/2023 |
| <input checked="" type="checkbox"/> Amplifier                       | Com-Power           | PAM-118A (551014)               | 0.5-18 GHz   | 10/11/2022             | 10/11/2023 |
| <input checked="" type="checkbox"/> Amplifier                       | Com-Power           | PAM-840A (461328)               | 18-40 GHz    | 10/11/2022             | 10/11/2023 |
| <input type="checkbox"/> Pwr Sensor                                 | Rohde & Schwarz     | NRP33T                          | 0.05-33 GHz  | 8/31/2022              | 8/31/2023  |
| <input type="checkbox"/> Power Meter                                | Agilent             | N1911A with N1921A              | 0.05-40 GHz  | 3/29/2022              | 3/29/2023  |
| <input type="checkbox"/> Generator                                  | Rohde & Schwarz     | SMB100A6 (100150)               | 20Hz-6 GHz   | 3/29/2022              | 3/29/2023  |
| <input type="checkbox"/> Generator                                  | Rohde & Schwarz     | SMBV100A6 (260771)              | 20Hz-6 GHz   | 3/29/2022              | 3/29/2023  |
| <input type="checkbox"/> RF Filter                                  | Micro-Tronics       | HPM50114 (017)1.5G HPF          | 30-18000 MHz | 4/6/2021               | 4/6/2023   |
| <input type="checkbox"/> RF Filter                                  | Micro-Tronics       | HPM50117 (063) 3G HPF           | 30-18000 MHz | 4/6/2021               | 4/6/2023   |
| <input type="checkbox"/> RF Filter                                  | Micro-Tronics       | HPM50105 (059) 6G HPF           | 30-18000 MHz | 4/6/2021               | 4/6/2023   |
| <input type="checkbox"/> RF Filter                                  | Micro-Tronics       | BRM50702 (172) 2G notch         | 30-18000 MHz | 4/6/2021               | 4/6/2023   |
| <input type="checkbox"/> RF Filter                                  | Micro-Tronics       | BRC50703 (G102) 5G notch        | 30-18000 MHz | 4/6/2021               | 4/6/2023   |
| <input type="checkbox"/> RF Filter                                  | Micro-Tronics       | BRC50705 (024) 5G notch         | 30-18000 MHz | 4/6/2021               | 4/6/2023   |
| <input type="checkbox"/> Attenuator                                 | Fairview            | SA6NFN100W-40 (1625)            | 30-18000 MHz | 3/29/2022              | 3/29/2023  |
| <input type="checkbox"/> Attenuator                                 | Mini-Circuits       | VAT-3W2+ (1436)                 | 30-6000 MHz  | 3/29/2022              | 3/29/2023  |
| <input type="checkbox"/> Attenuator                                 | Mini-Circuits       | VAT-3W2+ (1445)                 | 30-6000 MHz  | 3/29/2022              | 3/29/2023  |
| <input type="checkbox"/> Attenuator                                 | Mini-Circuits       | VAT-3W2+ (1735)                 | 30-6000 MHz  | 3/29/2022              | 3/29/2023  |
| <input type="checkbox"/> Attenuator                                 | Mini-Circuits       | VAT-6W2+ (1438)                 | 30-6000 MHz  | 3/29/2022              | 3/29/2023  |
| <input type="checkbox"/> Attenuator                                 | Mini-Circuits       | VAT-6W2+ (1736)                 | 30-6000 MHz  | 3/29/2022              | 3/29/2023  |
| <input checked="" type="checkbox"/> Weather station                 | Davis               | 6312 (A81120N075)               |              | 10/11/2022             | 10/11/2023 |

Rogers Labs, Inc.  
4405 West 259<sup>th</sup> Terrace  
Louisburg, KS 66053  
Phone/Fax: (913) 837-3214  
Revision r1

Garmin International, Inc.  
Model: GMN-01410-01  
Test: 221214  
Test to: CFR47 15.249, RSS-210, RSS-Gen  
File: GMN-01410-01 DXX TstRpt 221214 r1

SN: 6M1000202  
FCC ID: IPH-04099  
IC: 1792A-04099  
Date: February 13, 2023  
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List of Test Equipment

Calibration Date (m/d/y) Due

|                                     |   |              |            |
|-------------------------------------|---|--------------|------------|
| <input type="checkbox"/>            | Frequency Counter: Leader LDC-825 (8060153)                       | 3/29/2022    | 3/29/2023  |
| <input type="checkbox"/>            | ISN: Com-Power Model ISN T-8                                      | 3/29/2022    | 3/29/2023  |
| <input type="checkbox"/>            | LISN Compliance Design FCC-LISN-2.Mod.cd,(126) .15-30MHz          | 10/11/2022   | 10/11/2024 |
| <input type="checkbox"/>            | LISN: Com-Power Model LI-220A                                     | 3/29/2022    | 3/29/2024  |
| <input type="checkbox"/>            | LISN: Com-Power Model LI-550C                                     | 10/11/2022   | 10/11/2024 |
| <input type="checkbox"/>            | Cable Huber & Suhner Inc. Sucoflex102ea(1.5M)(303072) 9kHz-40 GHz | 10/11/2022   | 10/11/2023 |
| <input type="checkbox"/>            | Cable Huber & Suhner Inc. Sucoflex102ea(L1M)(281183) 9kHz-40 GHz  | 10/11/2022   | 10/11/2023 |
| <input type="checkbox"/>            | Cable Huber & Suhner Inc. Sucoflex102ea(L4M)(281184) 9kHz-40 GHz  | 10/11/2022   | 10/11/2023 |
| <input type="checkbox"/>            | Cable Huber & Suhner Inc. Sucoflex102ea(L10M)(317546)9kHz-40 GHz  | 10/11/2022   | 10/11/2023 |
| <input type="checkbox"/>            | Cable Time Microwave 4M-750HF290-750 (4M) 9kHz-24 GHz             | 10/11/2022   | 10/11/2023 |
| <input type="checkbox"/>            | RF Filter Micro-Tronics BRC17663 (001) 9.3-9.5 notch 30-1800 MHz  | 4/6/2021     | 4/6/2023   |
| <input type="checkbox"/>            | RF Filter Micro-Tronics BRC19565 (001) 9.2-9.6 notch 30-1800 MHz  | 10/14/2021   | 10/14/2023 |
| <input type="checkbox"/>            | Analyzer HP 8562A (3051A05950) 9kHz-125GHz                        | 3/29/2022    | 3/29/2023  |
| <input type="checkbox"/>            | Wave Form Generator Keysight 33512B (MY57400128)                  | 3/29/2022    | 3/29/2023  |
| <input type="checkbox"/>            | Antenna: Solar 9229-1 & 9230-1                                    | 2/22/2022    | 2/22/2023  |
| <input type="checkbox"/>            | CDN: Com-Power Model CDN325E                                      | 10/11/2022   | 10/11/2024 |
| <input type="checkbox"/>            | Oscilloscope Scope: Tektronix MDO 4104                            | 2/22/2022    | 2/22/2023  |
| <input type="checkbox"/>            | EMC Transient Generator HVT TR 3000                               | 2/22/2022    | 2/22/2023  |
| <input type="checkbox"/>            | AC Power Source (Ametech, California Instruments)                 | 2/22/2022    | 2/22/2023  |
| <input type="checkbox"/>            | Field Intensity Meter: EFM-018                                    | 2/22/2022    | 2/22/2023  |
| <input type="checkbox"/>            | ESD Simulator: MZ-15  | 2/22/2022    | 2/22/2023  |
| <input type="checkbox"/>            | Injection Clamp Luthi Model EM101                                 | not required |            |
| <input type="checkbox"/>            | R.F. Power Amp ACS 230-50W  | not required |            |
| <input type="checkbox"/>            | R.F. Power Amp EIN Model: A301                                    | not required |            |
| <input type="checkbox"/>            | R.F. Power Amp A.R. Model: 10W 1010M7                             | not required |            |
| <input type="checkbox"/>            | R.F. Power Amp A.R. Model: 50U1000                                | not required |            |
| <input type="checkbox"/>            | Temperature Chamber   | not required |            |
| <input checked="" type="checkbox"/> | Shielded Room   | not required |            |

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Model: GMN-01410-01  
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SN: 6M1000202  
FCC ID: IPH-04099  
IC: 1792A-04099  
Date: February 13, 2023  
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## **Annex C Rogers Qualifications**

**Scot D. Rogers, Engineer**

### **Rogers Labs, Inc.**

Mr. Rogers has over 36 years' experience in the field of electronics. Engineering experience includes six years in the automated controls industry and remaining years working with the design, development and testing of radio communications and electronic equipment.

#### Positions Held:

Systems Engineer: A/C Controls Mfg. Co., Inc.

Electrical Engineer: Rogers Consulting Labs, Inc.

Electrical Engineer: Rogers Labs, Inc. Current

#### Educational Background:

Bachelor of Science Degree in Electrical Engineering from Kansas State University

Bachelor of Science Degree in Business Administration Kansas State University

Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming

## Annex D Laboratory Certificate of Accreditation

United States Department of Commerce  
National Institute of Standards and Technology



### Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200087-0

**Rogers Labs, Inc.**  
Louisburg, KS

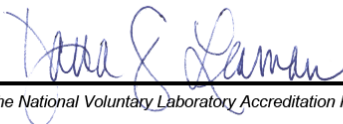
*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:*

#### **Electromagnetic Compatibility & Telecommunications**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2022-03-22 through 2023-03-31  
*Effective Dates*



  
*For the National Voluntary Laboratory Accreditation Program*