



## **REGULATORY COMPLIANCE TEST REPORT**

**FCC Part 15 Subpart C 15.247 (DTS)  
ISED RSS-247 Issue 3**

**Report No.: ROLN01-U4 Rev A**

**Company:** Drum Workshop

**Model Name:** WT-10

## REGULATORY COMPLIANCE TEST REPORT

**Company Name:** Drum Workshop

**Model Name:** WT-10

**To:** FCC Part 15 Subpart C 15.247 (DTS) & ISED RSS-247 Issue 3

**Test Report Serial No.:** ROLN01-U4 Rev A

This report supersedes: NONE

**Applicant:** Drum Workshop  
3450 Lunar Ct  
Oxnard, California 93030  
USA

**Issue Date:** 28th October 2024

**This Test Report is Issued Under the Authority of:**

**MiCOM Labs, Inc.**  
575 Boulder Court  
Pleasanton California 94566  
USA  
Phone: +1 (925) 462-0304  
Fax: +1 (925) 462-0306  
[www.micomlabs.com](http://www.micomlabs.com)



**MiCOM Labs is an ISO 17025 Accredited Testing Laboratory**

## Table of Contents

|                                                                 |           |
|-----------------------------------------------------------------|-----------|
| <b>1. ACCREDITATION, LISTINGS &amp; RECOGNITION .....</b>       | <b>4</b>  |
| 1.1. Testing Accreditation .....                                | 4         |
| 1.2. Recognition .....                                          | 5         |
| 1.3. Product Certification .....                                | 6         |
| <b>2. DOCUMENT HISTORY .....</b>                                | <b>7</b>  |
| <b>3. TEST RESULT CERTIFICATE .....</b>                         | <b>8</b>  |
| <b>4. REFERENCES AND MEASUREMENT UNCERTAINTY .....</b>          | <b>9</b>  |
| 4.1. Normative References .....                                 | 9         |
| 4.2. Test and Uncertainty Procedure .....                       | 10        |
| <b>5. PRODUCT DETAILS AND TEST CONFIGURATIONS .....</b>         | <b>11</b> |
| 5.1. Technical Details .....                                    | 11        |
| 5.2. Scope Of Test Program .....                                | 12        |
| 5.3. Equipment Model(s) and Serial Number(s) .....              | 13        |
| 5.4. Antenna Details .....                                      | 13        |
| 5.5. Cabling and I/O Ports .....                                | 13        |
| 5.6. Test Configurations .....                                  | 13        |
| 5.7. Equipment Modifications .....                              | 14        |
| 5.8. Deviations from the Test Standard .....                    | 14        |
| <b>6. TEST SUMMARY .....</b>                                    | <b>15</b> |
| <b>7. TEST EQUIPMENT CONFIGURATION(S) .....</b>                 | <b>16</b> |
| 7.1. Radiated Emissions .....                                   | 16        |
| <b>8. MEASUREMENT AND PRESENTATION OF TEST DATA .....</b>       | <b>19</b> |
| <b>9. TEST RESULTS .....</b>                                    | <b>20</b> |
| 9.1. Radiated Emissions .....                                   | 20        |
| 9.1.1. <i>TX Spurious &amp; Restricted Band Emissions</i> ..... | 22        |
| 9.1.1.1. Integral Wire Antenna .....                            | 22        |
| 9.1.1.2. Integral Chip Antenna .....                            | 28        |
| 9.1.2. <i>Receiver Spurious Emissions</i> .....                 | 34        |
| 9.1.3. <i>Restricted Edge &amp; Band-Edge Emissions</i> .....   | 38        |
| 9.1.3.1. Integral Wire Antenna .....                            | 38        |
| 9.1.3.2. Integral Chip Antenna .....                            | 40        |

## **1. ACCREDITATION, LISTINGS & RECOGNITION**

### **1.1. Testing Accreditation**

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2017. The company is accredited by the American Association for Laboratory Accreditation (A2LA) [www.a2la.org](http://www.a2la.org) test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-01.pdf>



### **Accredited Laboratory**

A2LA has accredited

**MICOM LABS**

Pleasanton, CA

for technical competence in the field of

**Electrical Testing**

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



Presented this 28<sup>th</sup> day of February 2024.



Mr. Trace McInturf, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 2381.01  
Valid to November 30, 2025

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

## 1.2. Recognition

MiCOM Labs, Inc is widely recognized for its wireless testing and certification capabilities. In addition to being recognized for Testing and Certification under Phase 2 Mutual Recognition Agreements (MRA) with Canada, Europe, United Kingdom and Japan, our international recognition includes Conformity Assessment Body (CAB) designation status under agreements with Asia Pacific (APEC) MRA Phase 1 countries giving acceptance of MiCOM Labs test reports. MiCOM Labs test reports are accepted globally.

| Country        | Recognition Body                                                                                 | Status | MRA Phase    | Identification No.                       |
|----------------|--------------------------------------------------------------------------------------------------|--------|--------------|------------------------------------------|
| USA            | Federal Communications Commission (FCC)                                                          | TCB    | -            | US0159<br>Test Firm Designation#: US1084 |
| Canada         | Industry Canada (ISED)                                                                           | FCB    | APEC MRA 2   | US0159<br>ISED#: 4143A                   |
| Japan          | MIC (Ministry of Internal Affairs and Communication)                                             | CAB    | Japan MRA 2  | RCB 210                                  |
|                | Japan Approvals Institute for Telecommunication Equipment (JATE)                                 |        |              |                                          |
|                | VCCI                                                                                             | --     | --           | A-0012                                   |
| Europe         | European Commission                                                                              | NB     | EU MRA 2     | NB 2280                                  |
| United Kingdom | Department for Business, Energy & Industrial Strategy (BEIS)                                     | AB     | UK MRA 2     | AB 2280                                  |
| Mexico         | Instituto Federal de Telecomunicaciones (IFT)                                                    | CAB    | Mexico MRA 1 | US0159                                   |
| Australia      | Australian Communications and Media Authority (ACMA)                                             | CAB    | APEC MRA 1   | US0159                                   |
| Hong Kong      | Office of the Telecommunication Authority (OFTA)                                                 |        |              |                                          |
| Korea          | Ministry of Information and Communication Radio Research Laboratory (RRL)                        |        |              |                                          |
| Singapore      | Infocomm Development Authority (IDA)                                                             |        |              |                                          |
| Taiwan         | National Communications Commission (NCC)<br>Bureau of Standards, Metrology and Inspection (BSMI) |        |              |                                          |
| Vietnam        | Ministry of Communication (MIC)                                                                  |        |              |                                          |

TCB – Telecommunications Certification Bodies (TCB)

FCB – Foreign Certification Body

CAB – Conformity Assessment Body

NB – Notified Body

AB – Approved Body

MRA – Mutual Recognition Agreement

MRA Phase I - recognition for product testing

MRA Phase II – recognition for both product testing and certification

### 1.3. Product Certification

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) [www.a2la.org](http://www.a2la.org) test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-02.pdf>



## Accredited Product Certification Body

A2LA has accredited

**MiCOM LABS**

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 Requirements for bodies certifying products, processes and services. This product certification body also meets the A2LA R322 – Specific Requirements – Notified Body Accreditation Requirements and A2LA R308 - Specific Requirements - ISO-IEC 17065 - Telecommunication Certification Body Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.



Presented this 28<sup>th</sup> day of February 2024.



Mr. Trace McInturff, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 2381.02  
Valid to November 30, 2025

*For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.*

United States of America – Telecommunication Certification Body (TCB)  
Industry Canada – Certification Body, CAB Identifier – US0159  
Europe – Notified Body (NB), NB Identifier - 2280  
UK – Approved Body (AB), AB Identifier - 2280  
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

## 2. DOCUMENT HISTORY

| Document History |                               |                                                                                                                                                                                                                                                                                                                                 |
|------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Revision         | Date                          | Comments                                                                                                                                                                                                                                                                                                                        |
| Draft            | 16 <sup>th</sup> October 2024 | Draft report for Client Review<br>Radio Module utilized in the WT-10 is pre-certified will full test information provided in the following report.<br><br>RFXP01-U2 Rev A DWE DLM1 FCC 15 247 RSS 247 Dated Nov. 21 <sup>st</sup> , 2022<br><br>Only the necessary additional emission testing is reported within this document |
| Rev A            | 28 <sup>th</sup> October 2024 | Initial Release                                                                                                                                                                                                                                                                                                                 |
|                  |                               |                                                                                                                                                                                                                                                                                                                                 |
|                  |                               |                                                                                                                                                                                                                                                                                                                                 |
|                  |                               |                                                                                                                                                                                                                                                                                                                                 |
|                  |                               |                                                                                                                                                                                                                                                                                                                                 |
|                  |                               |                                                                                                                                                                                                                                                                                                                                 |

In the above table the latest report revision will replace all earlier versions.

### 3. TEST RESULT CERTIFICATE

|                                                                                                                                                                      |                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| <b>Manufacturer:</b> Roland Corporation<br>(The parent company of Drum Workshop)<br>2036-1 Nakagawa, Hosoe-cho<br>Hamana-ku, Hamamatsu<br>Shizuoka 431-1304<br>Japan | <b>Tested By:</b> MiCOM Labs, Inc.<br>575 Boulder Court<br>Pleasanton California 94566<br>USA |
| <b>Model:</b> WT-10                                                                                                                                                  | <b>Telephone:</b> +1 925 462 0304                                                             |
| <b>Type Of Equipment:</b> DTS Transceiver                                                                                                                            | <b>Fax:</b> +1 925 462 0306                                                                   |
| <b>S/N's:</b> Proto1                                                                                                                                                 |                                                                                               |
| <b>Test Date(s):</b> 8 <sup>th</sup> – 9 <sup>th</sup> October 2024                                                                                                  | <b>Website:</b> www.micomlabs.com                                                             |

| STANDARD(S)                                                       | TEST RESULTS       |
|-------------------------------------------------------------------|--------------------|
| FCC CFR 47 Part 15 Subpart C 15.247 (DTS)<br>ISED RSS-247 Issue 3 | EQUIPMENT COMPLIES |

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

#### Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

**Approved & Released for MiCOM Labs, Inc. by:**



Graeme Grieve  
Quality Manager MiCOM Labs, Inc.

Gordon Hurst  
President & CEO MiCOM Labs, Inc.

## 4. REFERENCES AND MEASUREMENT UNCERTAINTY

### 4.1. Normative References

| REF. | PUBLICATION            | YEAR                     | TITLE                                                                                                                                                                                     |
|------|------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I    | KDB 558074 D01 v05r02  | Apr 2019                 | Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices operating under section 15.247 of the FCC Rules. |
| II   | A2LA                   | 22nd June 2022           | R105 - Requirement's When Making Reference to A2LA Accreditation Status                                                                                                                   |
| III  | ANSI C63.10            | 2020                     | American National Standard for Testing Unlicensed Wireless Devices                                                                                                                        |
| IV   | ANSI C63.4             | 2014                     | American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz                      |
| V    | ETSI TR 100 028        | 2001-12                  | Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics                                  |
| VI   | FCC 47 CFR Part 15.247 | Apr 2020                 | Radio Frequency Devices; Subpart C – Intentional Radiators                                                                                                                                |
| VII  | ICES-003               | Issue 7; Oct 2020        | Information Technology Equipment (Including Digital Apparatus)                                                                                                                            |
| VIII | M 3003                 | EDITION 5 Sept 2022      | Expression of Uncertainty and Confidence in Measurements                                                                                                                                  |
| IX   | RSS-247 Issue 3        | Aug 2023                 | Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices                                                               |
| X    | RSS-Gen Issue 5        | Amendment 1,2 (Feb 2021) | General Requirements for Compliance of Radio Apparatus. With Amendments 1: March 2019 and 2: Feb 2021.                                                                                    |
| XI   | FCC 47 CFR Part 2.1033 | May 2023                 | FCC requirements and rules regarding photographs and test setup diagrams.                                                                                                                 |
| XII  | KDB 789033 D02 V02r01  | Dec 2017                 | Guidelines For Compliance Testing Of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E                                                                    |

#### **4.2. Test and Uncertainty Procedure**

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

## 5. PRODUCT DETAILS AND TEST CONFIGURATIONS

### 5.1. Technical Details

| Details                          | Description                                                                                             |
|----------------------------------|---------------------------------------------------------------------------------------------------------|
| Purpose:                         | Test of the Drum Workshop, WT-10 to FCC CFR 47 Part 15 Subpart C 15.247 (DTS) and ISED RSS-247 Issue 3. |
| Applicant:                       | Drum Workshop<br>3450 Lunar Ct<br>Oxnard, California 93030<br>USA                                       |
| Manufacturer:                    | Roland Corporation                                                                                      |
| Laboratory performing the tests: | MiCOM Labs, Inc.<br>575 Boulder Court<br>Pleasanton California 94566 USA                                |
| Test report reference number:    | ROLN01-U4                                                                                               |
| Date EUT received:               | 3 <sup>rd</sup> October 2024                                                                            |
| Standard(s) applied:             | FCC CFR 47 Part 15 Subpart C 15.247 (DTS)<br>ISED RSS-247 Issue 3                                       |
| Dates of test (from - to):       | 8 <sup>th</sup> – 9 <sup>th</sup> October 2024                                                          |
| No of Units Tested:              | 1                                                                                                       |
| Product Family Name:             | Roland Corporation                                                                                      |
| Model(s):                        | WT-10                                                                                                   |
| Location for use:                | Both                                                                                                    |
| Declared Frequency Range(s):     | 2402 - 2480 MHz                                                                                         |
| Type of Modulation:              | GFSK                                                                                                    |
| Declared Nominal Output Power:   | +10.0 dBm                                                                                               |
| Transmit/Receive Operation:      | Transceiver                                                                                             |
| Rated Input Voltage and Current: | Nominal: 2.5 Vdc, 2 - 3 Vdc, 80mA                                                                       |
| Operating Temperature Range:     | +10°C – +50°C                                                                                           |
| ITU Emission Designator:         | 1M10F1D                                                                                                 |
| Equipment Dimensions:            | W=2.75" (69.85mm) x H=3.85" (97.79 mm) x D=1.22" (30.99mm)                                              |
| Weight:                          | 0.37 lbs (0.17 kg)                                                                                      |
| Hardware Rev:                    | Rev X2                                                                                                  |
| Software Rev:                    | N/A                                                                                                     |

## 5.2. Scope Of Test Program

### Drum Workshop, WT-10

The scope of the test program was to test the Drum Workshop, WT-10 for radiated emissions in its 802.11 configurations in the frequency ranges 2400 - 2483.5 MHz for compliance against the following specifications:

#### **FCC CFR 47 Part 15 Subpart C 15.247 (DTS)**

Radio Frequency Devices; Subpart C – Intentional Radiators

#### **ISED RSS-247 Issue 3**

Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and License-Exempt Local Area Network (LE-LEN) Devices

#### **Antenna Additions as per section 5.4 and as such testing was limited to:**

Transmitter Spurious & Band Edge Emissions.

The following two antenna configurations have the highest gain for their type and were tested as representing the worst case for all antennas (highest emissions).

| Type     | Manufacturer        | Model         | Type | Gain (dBi) | Frequency Band (MHz) |
|----------|---------------------|---------------|------|------------|----------------------|
| integral | DW                  | Wire          | Wire | 1          | 2400 - 2483.5        |
| integral | Johanson Technology | 2450AT18A100E | Chip | 1          | 2400 - 2483.5        |

Radio Module utilized in the WT-10 is pre-certified will full test information provided in the following report.

RFXP01-U2 Rev A DWE DLM1 FCC 15 247 RSS 247 Dated Nov. 21<sup>st</sup>, 2022

Only the necessary additional emission testing is reported within this document

### 5.3. Equipment Model(s) and Serial Number(s)

| Type (EUT/<br>Support) | Equipment Description | Manufacturer       | Model No. | Serial No.   |
|------------------------|-----------------------|--------------------|-----------|--------------|
| EUT                    | WT-10                 | Roland Corporation | WT-10     | AS6973000002 |

### 5.4. Antenna Details

| Type     | Manufacturer | Model         | Family | Gain (dBi) | BF Gain | Dir BW | X-Pol | Frequency Band (MHz) |
|----------|--------------|---------------|--------|------------|---------|--------|-------|----------------------|
| integral | DW           | Wire          | PCB    | 1          | -       | 1      | -     | 2400 - 2483.5        |
| integral | Johanson     | 2450AT18A100E | Chip   | 1          | -       | 1      | -     | 2400 - 2483.5        |

BF Gain - Beamforming Gain  
Dir BW - Directional BeamWidth  
X-Pol - Cross Polarization

### 5.5. Cabling and I/O Ports

| Port Type   | Max Cable Length | # of Ports | Screened | Conn Type   | Data Type | Bit Rate | Environment |
|-------------|------------------|------------|----------|-------------|-----------|----------|-------------|
| Stereo Jack | N/A              | 2          | No       | Stereo Jack | N/A       | N/A      | Indoors     |

### 5.6. Test Configurations

Results for the following configurations are provided in this report:

| Results for the following configurations are provided in this report: |                                     |                         |          |          |
|-----------------------------------------------------------------------|-------------------------------------|-------------------------|----------|----------|
| Operational Mode(s)                                                   | Data Rate with Highest Power MBit/s | Channel Frequency (MHz) |          |          |
|                                                                       |                                     | Low                     | Mid      | High     |
| 2400 - 2483.5 MHz                                                     |                                     |                         |          |          |
| GFSK                                                                  | 1                                   | 2,402.00                | 2,442.00 | 2,480.00 |

### **5.7. Equipment Modifications**

The following modifications were required to bring the equipment into compliance:

1. NONE

### **5.8. Deviations from the Test Standard**

The following deviations from the test standard were required in order to complete the test program:

1. NONE

## 6. TEST SUMMARY

List of Measurements

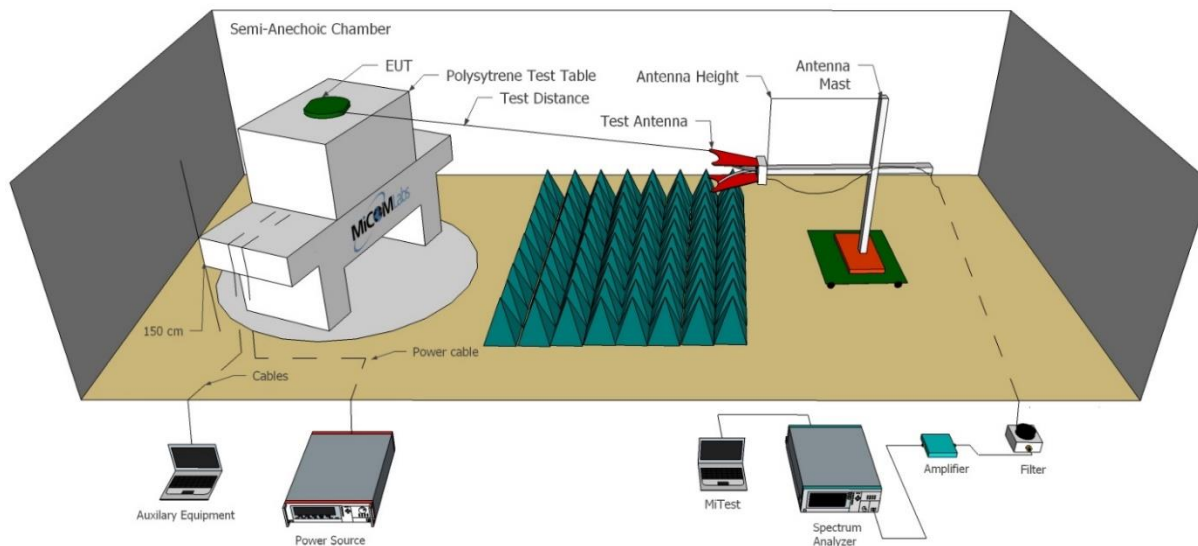
| Test Header                                 | Result   | Data Link                 |
|---------------------------------------------|----------|---------------------------|
| Emissions                                   | Complies | -                         |
| (1) Radiated Emissions                      | Complies | -                         |
| (i) TX Spurious & Restricted Band Emissions | Complies | <a href="#">View Data</a> |
| (ii) Receiver Spurious Emissions            | Complies | <a href="#">View Data</a> |
| (iii) Restricted Edge & Band-Edge Emissions | Complies | <a href="#">View Data</a> |

## 7. TEST EQUIPMENT CONFIGURATION(S)

### 7.1. Radiated Emissions

The following tests were performed using the radiated test set-up shown in the diagram below.  
 Radiated emissions above and below 1GHz.

Radiated Emissions Above 1GHz Test Setup



### Test Equipment Utilized

| Asset# | Description                                       | Manufacturer         | Model#                                  | Serial#    | Calibration Due Date |
|--------|---------------------------------------------------|----------------------|-----------------------------------------|------------|----------------------|
| 170    | Video System Controller for Semi Anechoic Chamber | Panasonic            | WV-CU101                                | 04R08507   | Not Required         |
| 266    | 10 Hz to 50GHz MXA Signal Analyzer                | Keysight             | N9020B                                  | MY60110791 | 25 Jul 2025          |
| 285    | DC Power Supply                                   | Keysight             | E36155A                                 | MY63000156 | 4 Dec 2024           |
| 298    | 3M Radiated Emissions Chamber Maintenance Check   | MiCOM                | 3M Chamber                              | 298        | 11 Dec 2024          |
| 330    | Variac 0-280 Vac                                  | Staco Energy Co      | 3PN1020B                                | 0546       | Cal when used        |
| 336    | Active loop Ant 10kHz to 30 MHz                   | EMCO                 | EMCO 6502                               | 00060498   | 7 Dec 2024           |
| 338    | Sunol 30 to 3000 MHz Antenna                      | Sunol                | JB3                                     | A052907    | 5 Dec 2024           |
| 342    | 2.4 GHz Notch Filter                              | EWT                  | EWT-14-0203                             | H1         | 13 Jan 2025          |
| 373    | 26III RMS Multimeter                              | Fluke                | Fluke 26 series III                     | 76080720   | 29 Sep 2025          |
| 377    | Band Rejection Filter 5150 to 5880MHz             | Microtronics         | BRM50716                                | 034        | 13 Jan 2025          |
| 396    | 2.4 GHz Notch Filter                              | Microtronics         | BRM50701                                | 001        | 13 Jan 2025          |
| 397    | Amp 10 - 2500MHz                                  | MiCOM Labs           | Amp 10 - 2500 MHz                       | NA         | 27 Dec 2024          |
| 399    | ETS 1-18 GHz Horn Antenna                         | ETS                  | 3117                                    | 00154575   | 7 Dec 2024           |
| 406    | Amplifier for Radiated Emissions                  | MiCOM Labs           | 40dB 1 to 18GHz Amp                     | 0406       | 2 Nov 2024           |
| 410    | Desktop Computer                                  | Dell                 | Inspiron 620                            | WS38       | Not Required         |
| 411    | Mast/Turntable Controller                         | Sunol Sciences       | SC98V                                   | 060199-1D  | Not Required         |
| 412    | USB to GPIB Interface                             | National Instruments | GPIB-USB HS                             | 11B8DC2    | Not Required         |
| 413    | Mast Controller                                   | Sunol Science        | TWR95-4                                 | 030801-3   | Not Required         |
| 414    | DC Power Supply 0-60V                             | HP                   | 6274                                    | 1029A01285 | Cal when used        |
| 415    | Turntable Controller                              | Sunol Sciences       | Turntable Controller                    | None       | Not Required         |
| 416    | Gigabit ethernet filter                           | ETS-Lingren          | Gigafoil 260366                         | None       | Not Required         |
| 447    | MiTest Rad Emissions Test Software                | MiCOM                | Rad Emissions Test Software Version 1.0 | 447        | Not Required         |
| 462    | Schwarzbeck cable from Antenna to Amplifier.      | Schwarzbeck          | AK 9513                                 | 462        | 18 Jan 2025          |
| 463    | Schwarzbeck cable from                            | Schwarzbeck          | AK 9513                                 | 463        | 18 Jan 2025          |

|      |                                                        |                    |                   |             |               |
|------|--------------------------------------------------------|--------------------|-------------------|-------------|---------------|
|      | Amplifier to Bulkhead.                                 |                    |                   |             |               |
| 464  | Schwarzbeck cable from Bulkhead to Receiver            | Schwarzbeck        | AK 9513           | 464         | 16 Jan 2025   |
| 465  | Low Pass Filter DC-1000 MHz                            | Mini-Circuits      | NLP-1200+         | VUU01901402 | 14 Jan 2025   |
| 480  | Cable - Bulkhead to Amp                                | SRC Haverhill      | 157-3050360       | 480         | 18 Jan 2025   |
| 481  | Cable - Bulkhead to Receiver                           | SRC Haverhill      | 151-3050787       | 481         | 18 Jan 2025   |
| 510  | Barometer/Thermometer                                  | Digi Sense         | 68000-49          | 170871375   | 4 Jan 2026    |
| 554  | Precision SMA Cable                                    | Fairview Microwave | SCE18060101-400CM | 554         | 18 Jan 2025   |
| 555  | Rhode & Schwarz Receiver (Firmware Version : 3.10 SP1) | Rhode & Schwarz    | ESW 44            | 101893      | 28 Jun 2025   |
| 87   | Uninterruptible Power Supply                           | Falcon Electric    | ED2000-1/2LC      | F3471 02/01 | Cal when used |
| CC05 | Confidence Check                                       | MiCOM              | CC05              | None        | 11 Nov 2024   |

## 8. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by [MiTest](#). [MiTest](#) is an automated test system developed by MiCOM Labs. [MiTest](#) is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.



The MiCOM Labs "[MiTest](#)" Automated Test System" (Patent Pending)

## 9. TEST RESULTS

### 9.1. Radiated Emissions

| Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions (Restricted Bands) |                                                           |                     |             |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------------------|-------------|
| Standard:                                                                                 | FCC CFR 47 Part 15 Subpart C 15.247 (DTS)<br>ISED RSS-247 | Ambient Temp. (°C): | 20.0 - 24.5 |
| Test Heading:                                                                             | Radiated Spurious and Band-Edge Emissions                 | Rel. Humidity (%):  | 32 - 45     |
| Standard Section(s):                                                                      | 15.205, 15.209<br>RSS-247:5.5                             | Pressure (mBars):   | 999 - 1001  |
| Reference Document(s):                                                                    | See Normative References                                  |                     |             |

**Test Procedure for Radiated Spurious and Band-Edge Emissions** (Restricted Bands)

Radiated emissions for restricted bands above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned. Measurements on any restricted band frequency or frequencies above 1 GHz are based on the use of measurement instrumentation employing peak and average detectors. All measurements were performed using a resolution bandwidth of 1 MHz.

Test configuration and setup for Radiated Spurious and Band-Edge Measurement were per the Radiated Test Set-up specified in this document.

Orientation testing of the EUT was performed and the EUT standing upright was determined to be the worst case for Spurious and Band Edge emissions with the integral antennas attached.

Limits for Restricted Bands  
Peak emission: 74 dBuV/m  
Average emission: 54 dBuV/m  
Average Measurements were performed following ANSI C63.10 section11.12.2.5.2 Trace averaging across on and off times of the EUT transmissions followed by a duty cycle correction.  
RMS detector used, DCCF of 10log (1/D) where D is the Duty Cycle.

Field Strength Calculation  
The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.  
FS = R + AF + CORR - FO

where:  
FS = Field Strength  
R = Measured Spectrum analyzer Input Amplitude  
AF = Antenna Factor  
CORR = Correction Factor = CL – AG + NFL  
CL = Cable Loss  
AG = Amplifier Gain  
FO = Distance Falloff Factor  
NFL = Notch Filter Loss or Waveguide Loss

Example:  
Given receiver input reading of 51.5 dBmV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength (FS) of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBmV/m

Conversion between dBmV/m (or dBmV) and mV/m (or mV) are as follows:  
Level (dBmV/m) = 20 \* Log (level (mV/m))  
40 dBmV/m = 100 mV/m  
48 dBmV/m = 250 mV/m

#### Restricted Bands of Operation (15.205)

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| Frequency Band    |                     |               |             |
|-------------------|---------------------|---------------|-------------|
| MHz               | MHz                 | MHz           | GHz         |
| 0.090-0.110       | 16.42-16.423        | 399.9-410     | 4.5-5.15    |
| 0.495-0.505       | 16.69475-16.69525   | 608-614       | 5.35-5.46   |
| 2.1735-2.1905     | 16.80425-16.80475   | 960-1240      | 7.25-7.75   |
| 4.125-4.128       | 25.5-25.67          | 1300-1427     | 8.025-8.5   |
| 4.17725-4.17775   | 37.5-38.25          | 1435-1626.5   | 9.0-9.2     |
| 4.20725-4.20775   | 73-74.6             | 1645.5-1646.5 | 9.3-9.5     |
| 6.215-6.218       | 74.8-75.2           | 1660-1710     | 10.6-12.7   |
| 6.26775-6.26825   | 108-121.94          | 1718.8-1722.2 | 13.25-13.4  |
| 6.31175-6.31225   | 123-138             | 2200-2300     | 14.47-14.5  |
| 8.291-8.294       | 149.9-150.05        | 2310-2390     | 15.35-16.2  |
| 8.362-8.366       | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4   |
| 8.37625-8.38675   | 156.7-156.9         | 2690-2900     | 22.01-23.12 |
| 8.41425-8.41475   | 162.0125-167.17     | 3260-3267     | 23.6-24.0   |
| 12.29-12.293      | 167.72-173.2        | 3332-3339     | 31.2-31.8   |
| 12.51975-12.52025 | 240-285             | 3345.8-3358   | 36.43-36.5  |
| 12.57675-12.57725 | 322-335.4           | 3600-4400     | Above 38.6  |
| 13.36-13.41       |                     |               |             |

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this section:

- (1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle.
- (2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.
- (3) Cable locating equipment operated pursuant to §15.213.
- (4) Any equipment operated under the provisions of §15.253, 15.255, and 15.256 in the frequency band 75-85 GHz, or §15.257 of this part.
- (5) Biomedical telemetry devices operating under the provisions of §15.242 of this part are not subject to the restricted band 608-614 MHz but are subject to compliance within the other restricted bands.
- (6) Transmitters operating under the provisions of subparts D or F of this part.
- (7) Devices operated pursuant to §15.225 are exempt from complying with this section for the 13.36-13.41 MHz band only.
- (8) Devices operated in the 24.075-24.175 GHz band under §15.245 are exempt from complying with the requirements of this section for the 48.15-48.35 GHz and 72.225-72.525 GHz bands only, and shall not exceed the limits specified in §15.245(b).
- (9) Devices operated in the 24.0-24.25 GHz band under §15.249 are exempt from complying with the requirements of this section for the 48.0-48.5 GHz and 72.0-72.75 GHz bands only, and shall not exceed the limits specified in §15.249(a).

(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).

## 9.1.1. TX Spurious & Restricted Band Emissions

### 9.1.1.1. Integral Wire Antenna

#### Equipment Configuration for FCC SPURIOUS 1 GHz -18 GHz

|                                 |          |                        |          |
|---------------------------------|----------|------------------------|----------|
| <b>Antenna:</b>                 | Integral | <b>Variant:</b>        | Wire     |
| <b>Antenna Gain (dBi):</b>      | 1.0      | <b>Modulation:</b>     | GFSK     |
| <b>Beam Forming Gain (Y):</b>   | N/A      | <b>Duty Cycle (%):</b> | Max      |
| <b>Channel Frequency (MHz):</b> | 2402     | <b>Data Rate:</b>      | 1 Mbit/s |
| <b>Power Setting:</b>           | 10       | <b>Tested By:</b>      | EC       |

#### Test Measurement Results



FCC Spurious 1 GHz -18 GHz

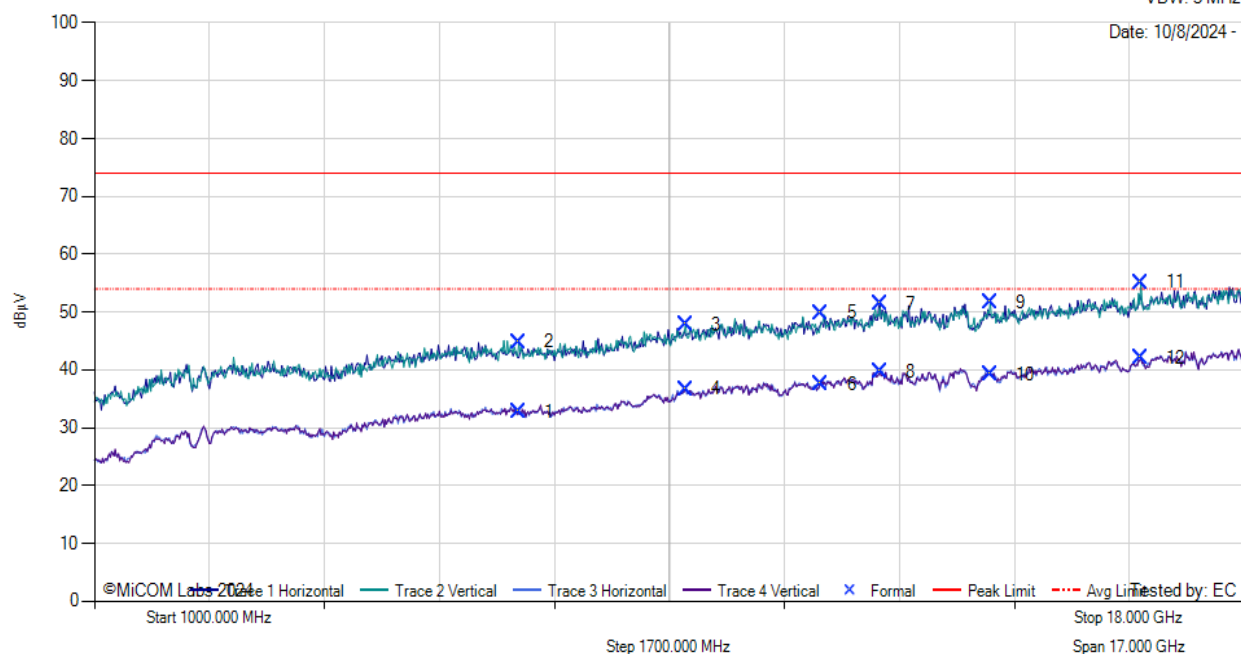
Antenna: PCB

Measurement Distance: 3m

Sweep Time: 100 ms

RBW: 1 MHz  
VBW: 3 MHz

Date: 10/8/2024 -



| 1000.00 - 18000.00 MHz                                   |               |          |               |         |              |                  |            |        |         |              |           |            |
|----------------------------------------------------------|---------------|----------|---------------|---------|--------------|------------------|------------|--------|---------|--------------|-----------|------------|
| Num                                                      | Frequency MHz | Raw dBµV | Cable Loss dB | AF dB/m | Level dBµV/m | Measurement Type | Pol        | Hgt cm | Azt Deg | Limit dBµV/m | Margin dB | Pass /Fail |
| 1                                                        | 7273.00       | 37.13    | 3.63          | 35.90   | 32.72        | AVG              | Vertical   | 199    | 330     | 54.0         | -21.3     | Pass       |
| 2                                                        | 7273.00       | 49.27    | 3.63          | 35.90   | 44.86        | MaxP             | Vertical   | 199    | 59      | 74.0         | -29.1     | Pass       |
| 3                                                        | 9738.00       | 49.13    | 4.51          | 36.90   | 47.90        | MaxP             | Vertical   | 150    | 149     | 74.0         | -26.1     | Pass       |
| 4                                                        | 9738.00       | 37.88    | 4.51          | 36.90   | 36.64        | AVG              | Vertical   | 150    | 59      | 54.0         | -17.4     | Pass       |
| 5                                                        | 11744.00      | 51.35    | 5.05          | 38.59   | 49.84        | MaxP             | Vertical   | 150    | 0       | 74.0         | -26.1     | Pass       |
| 6                                                        | 11744.00      | 39.04    | 5.05          | 38.59   | 37.53        | AVG              | Vertical   | 199    | 149     | 54.0         | -16.5     | Pass       |
| 7                                                        | 12611.00      | 52.74    | 5.26          | 39.00   | 51.44        | MaxP             | Horizontal | 150    | 90      | 74.0         | -22.6     | Pass       |
| 8                                                        | 12611.00      | 40.91    | 5.26          | 39.00   | 39.61        | AVG              | Horizontal | 150    | 120     | 54.0         | -14.4     | Pass       |
| 9                                                        | 14243.00      | 53.66    | 5.21          | 39.37   | 51.59        | MaxP             | Vertical   | 150    | 119     | 74.0         | -22.4     | Pass       |
| 10                                                       | 14243.00      | 41.31    | 5.21          | 39.37   | 39.25        | AVG              | Vertical   | 199    | 330     | 54.0         | -14.8     | Pass       |
| 11                                                       | 16470.00      | 49.45    | 6.35          | 41.02   | 55.17        | MaxP             | Vertical   | 150    | 89      | 74.0         | -18.8     | Pass       |
| 12                                                       | 16470.00      | 36.40    | 6.35          | 41.02   | 42.12        | AVG              | Vertical   | 150    | 29      | 54.0         | -11.9     | Pass       |
| Test Notes: 2402 MHz, Mod, battery powered, Wire Antenna |               |          |               |         |              |                  |            |        |         |              |           |            |

|                                 |          |                        |          |
|---------------------------------|----------|------------------------|----------|
| <b>Antenna:</b>                 | Integral | <b>Variant:</b>        | Wire     |
| <b>Antenna Gain (dBi):</b>      | 1.0      | <b>Modulation:</b>     | GFSK     |
| <b>Beam Forming Gain (Y):</b>   | N/A      | <b>Duty Cycle (%):</b> | Max      |
| <b>Channel Frequency (MHz):</b> | 2442     | <b>Data Rate:</b>      | 1 Mbit/s |
| <b>Power Setting:</b>           | 10       | <b>Tested By:</b>      | EC       |

### Test Measurement Results



### FCC Spurious 1 GHz -18 GHz

Antenna: PCB

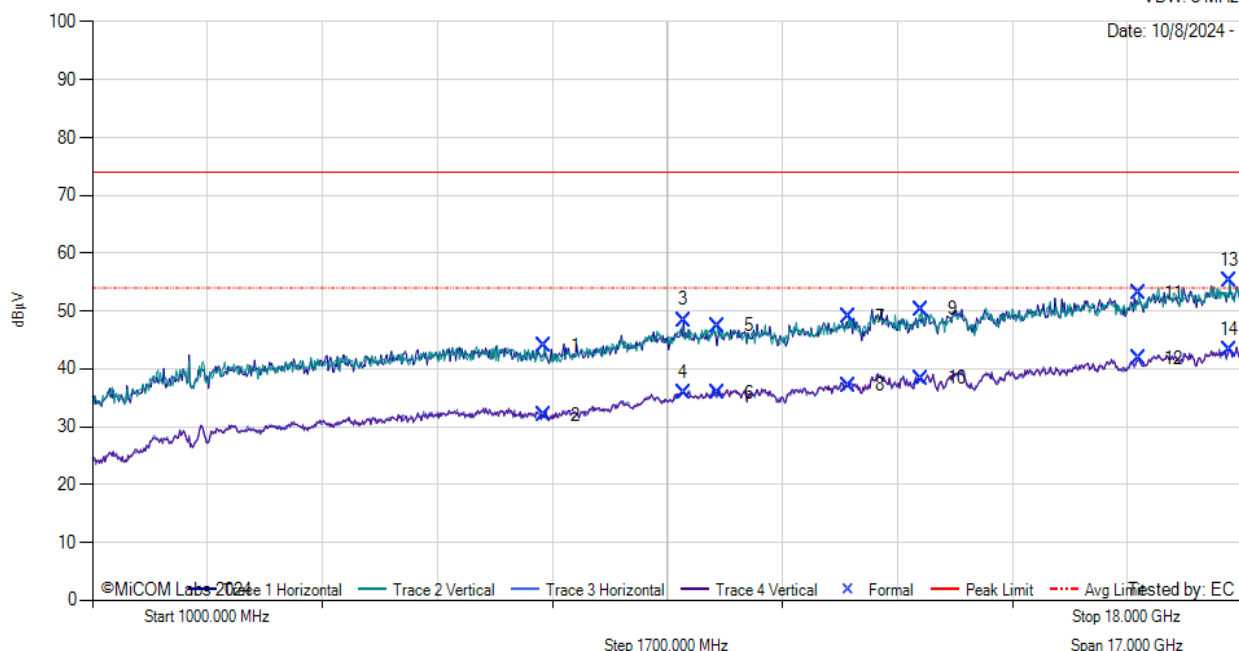
Measurement Distance: 3m

Sweep Time: 100 ms

RBW: 1 MHz

VBW: 3 MHz

Date: 10/8/2024 -



| 1000.00 - 18000.00 MHz |               |          |               |         |              |                  |            |        |         |              |           |            |
|------------------------|---------------|----------|---------------|---------|--------------|------------------|------------|--------|---------|--------------|-----------|------------|
| Num                    | Frequency MHz | Raw dBµV | Cable Loss dB | AF dB/m | Level dBµV/m | Measurement Type | Pol        | Hgt cm | Azt Deg | Limit dBµV/m | Margin dB | Pass /Fail |
| 1                      | 7681.00       | 48.07    | 3.81          | 35.85   | 44.07        | MaxP             | Vertical   | 150    | 119     | 74.0         | -29.9     | Pass       |
| 2                      | 7681.00       | 35.96    | 3.81          | 35.85   | 31.96        | AVG              | Vertical   | 199    | 239     | 54.0         | -22.0     | Pass       |
| 3                      | 9738.00       | 49.65    | 4.51          | 36.90   | 48.42        | MaxP             | Horizontal | 150    | 150     | 74.0         | -25.6     | Pass       |
| 4                      | 9738.00       | 37.10    | 4.51          | 36.90   | 35.86        | AVG              | Horizontal | 150    | 270     | 54.0         | -18.1     | Pass       |
| 5                      | 10248.00      | 48.17    | 4.74          | 37.46   | 47.50        | MaxP             | Vertical   | 150    | 149     | 74.0         | -26.5     | Pass       |
| 6                      | 10248.00      | 36.59    | 4.74          | 37.46   | 35.92        | AVG              | Vertical   | 150    | 209     | 54.0         | -18.1     | Pass       |
| 7                      | 12186.00      | 50.60    | 4.56          | 38.93   | 49.06        | MaxP             | Vertical   | 199    | 269     | 74.0         | -24.9     | Pass       |
| 8                      | 12186.00      | 38.74    | 4.56          | 38.93   | 37.20        | AVG              | Vertical   | 199    | 89      | 54.0         | -16.8     | Pass       |
| 9                      | 13257.00      | 51.90    | 4.93          | 39.05   | 50.34        | MaxP             | Vertical   | 199    | 209     | 74.0         | -23.7     | Pass       |
| 10                     | 13257.00      | 39.88    | 4.93          | 39.05   | 38.32        | AVG              | Vertical   | 199    | 149     | 54.0         | -15.7     | Pass       |
| 11                     | 16470.00      | 47.32    | 6.35          | 41.02   | 53.03        | MaxP             | Vertical   | 199    | 269     | 74.0         | -21.0     | Pass       |
| 12                     | 16470.00      | 36.06    | 6.35          | 41.02   | 41.78        | AVG              | Vertical   | 150    | 0       | 54.0         | -12.2     | Pass       |
| 13                     | 17813.00      | 48.05    | 6.27          | 41.66   | 55.19        | MaxP             | Vertical   | 199    | 209     | 74.0         | -18.8     | Pass       |
| 14                     | 17813.00      | 36.10    | 6.27          | 41.66   | 43.24        | AVG              | Vertical   | 150    | 119     | 54.0         | -10.8     | Pass       |

**Test Notes:** 2442 MHz, Mod, battery powered, Wire antenna

### Equipment Configuration for FCC SPURIOUS 1 GHz -18 GHz

|                                 |          |                        |          |
|---------------------------------|----------|------------------------|----------|
| <b>Antenna:</b>                 | Integral | <b>Variant:</b>        | Wire     |
| <b>Antenna Gain (dBi):</b>      | 1.0      | <b>Modulation:</b>     | GFSK     |
| <b>Beam Forming Gain (Y):</b>   | N/A      | <b>Duty Cycle (%):</b> | Max      |
| <b>Channel Frequency (MHz):</b> | 2480     | <b>Data Rate:</b>      | 1 Mbit/s |
| <b>Power Setting:</b>           | 10       | <b>Tested By:</b>      | EC       |

### Test Measurement Results



### FCC Spurious 1 GHz -18 GHz

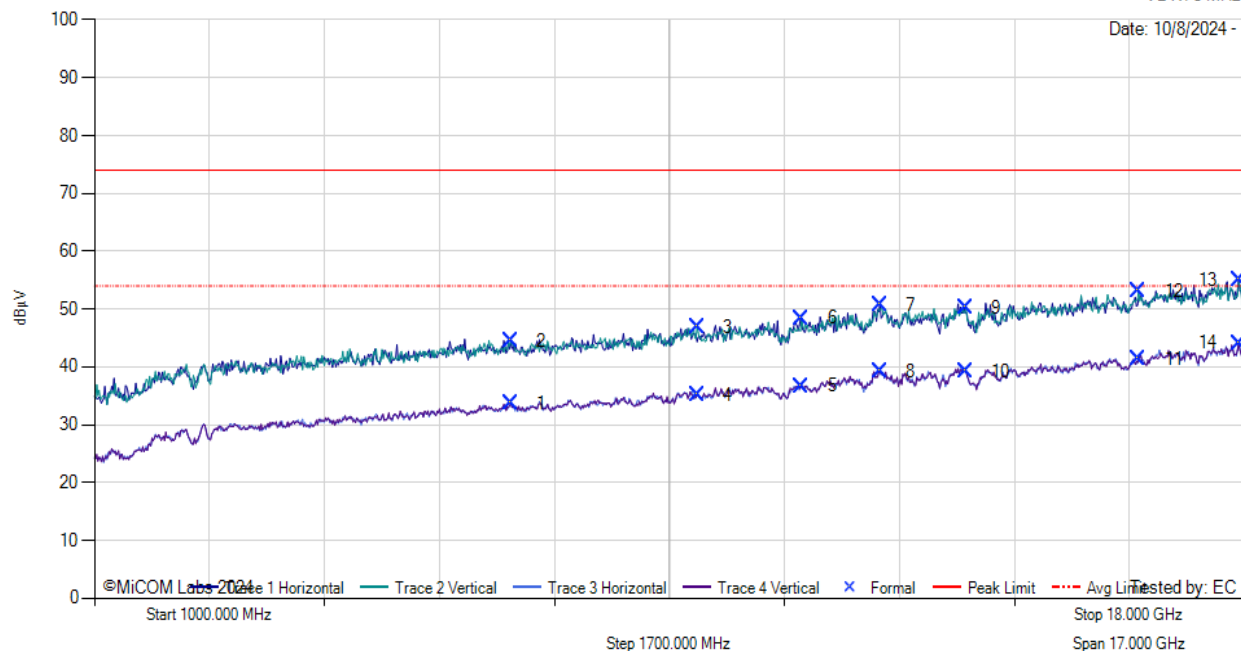
Antenna: PCB

Measurement Distance: 3m

Sweep Time: 100 ms

RBW: 1 MHz  
VBW: 3 MHz

Date: 10/8/2024 -



| 1000.00 - 18000.00 MHz |               |          |               |         |              |                  |            |        |         |              |           |            |
|------------------------|---------------|----------|---------------|---------|--------------|------------------|------------|--------|---------|--------------|-----------|------------|
| Num                    | Frequency MHz | Raw dBµV | Cable Loss dB | AF dB/m | Level dBµV/m | Measurement Type | Pol        | Hgt cm | Azt Deg | Limit dBµV/m | Margin dB | Pass /Fail |
| 1                      | 7154.00       | 37.96    | 3.65          | 35.94   | 33.74        | AVG              | Vertical   | 199    | 0       | 54.0         | -20.3     | Pass       |
| 2                      | 7154.00       | 48.66    | 3.65          | 35.94   | 44.44        | MaxP             | Vertical   | 149    | 59      | 74.0         | -29.6     | Pass       |
| 3                      | 9908.00       | 47.84    | 4.19          | 37.24   | 46.82        | MaxP             | Vertical   | 149    | 119     | 74.0         | -27.2     | Pass       |
| 4                      | 9908.00       | 36.17    | 4.19          | 37.24   | 35.15        | AVG              | Vertical   | 149    | 239     | 54.0         | -18.9     | Pass       |
| 5                      | 11455.00      | 37.34    | 4.89          | 38.16   | 36.72        | AVG              | Vertical   | 199    | 59      | 54.0         | -17.3     | Pass       |
| 6                      | 11455.00      | 49.03    | 4.89          | 38.16   | 48.41        | MaxP             | Vertical   | 149    | 299     | 74.0         | -25.6     | Pass       |
| 7                      | 12611.00      | 52.06    | 5.26          | 39.00   | 50.76        | MaxP             | Horizontal | 149    | 240     | 74.0         | -23.2     | Pass       |
| 8                      | 12611.00      | 40.51    | 5.26          | 39.00   | 39.21        | AVG              | Horizontal | 199    | 60      | 54.0         | -14.8     | Pass       |
| 9                      | 13886.00      | 52.26    | 5.25          | 39.13   | 50.23        | MaxP             | Vertical   | 199    | 29      | 74.0         | -23.8     | Pass       |
| 10                     | 13886.00      | 41.23    | 5.25          | 39.13   | 39.20        | AVG              | Vertical   | 199    | 299     | 54.0         | -14.8     | Pass       |
| 11                     | 16436.00      | 36.19    | 6.15          | 40.93   | 41.43        | AVG              | Vertical   | 149    | 119     | 54.0         | -12.6     | Pass       |
| 12                     | 16436.00      | 47.92    | 6.15          | 40.93   | 53.16        | MaxP             | Vertical   | 150    | 0       | 74.0         | -20.8     | Pass       |
| 13                     | 17915.00      | 47.02    | 6.67          | 41.55   | 54.97        | MaxP             | Horizontal | 149    | 60      | 74.0         | -19.0     | Pass       |
| 14                     | 17915.00      | 36.19    | 6.67          | 41.55   | 44.15        | AVG              | Horizontal | 149    | 150     | 54.0         | -9.9      | Pass       |

**Test Notes:** 2480 MHz, Mod, battery powered, Wire Antenna

### 9.1.1.2. Integral Chip Antenna

#### Equipment Configuration for FCC SPURIOUS 1 GHz -18 GHz

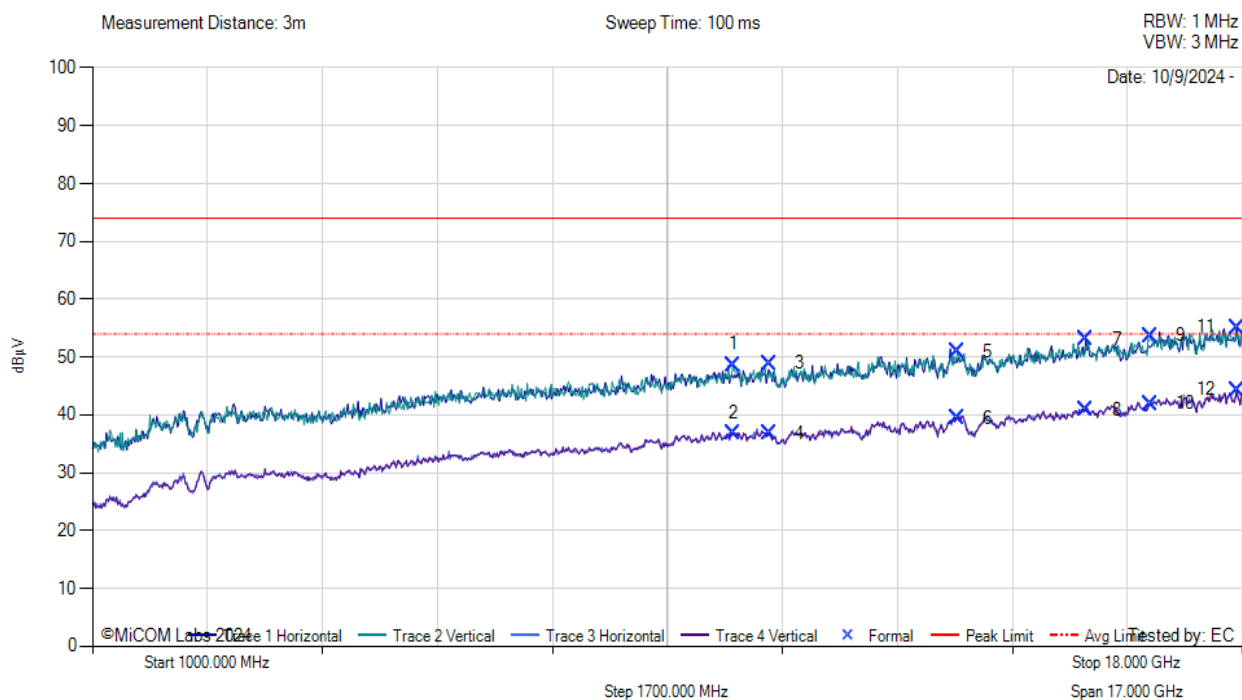
|                                 |          |                        |          |
|---------------------------------|----------|------------------------|----------|
| <b>Antenna:</b>                 | Integral | <b>Variant:</b>        | Chip     |
| <b>Antenna Gain (dBi):</b>      | 1.0      | <b>Modulation:</b>     | GFSK     |
| <b>Beam Forming Gain (Y):</b>   | N/A      | <b>Duty Cycle (%):</b> | Max      |
| <b>Channel Frequency (MHz):</b> | 2402     | <b>Data Rate:</b>      | 1 Mbit/s |
| <b>Power Setting:</b>           | 10       | <b>Tested By:</b>      | EC       |

#### Test Measurement Results



FCC Spurious 1 GHz -18 GHz

Antenna: Chip



| 1000.00 - 18000.00 MHz                                   |               |          |               |         |              |                  |            |        |         |              |           |            |
|----------------------------------------------------------|---------------|----------|---------------|---------|--------------|------------------|------------|--------|---------|--------------|-----------|------------|
| Num                                                      | Frequency MHz | Raw dBµV | Cable Loss dB | AF dB/m | Level dBµV/m | Measurement Type | Pol        | Hgt cm | Azt Deg | Limit dBµV/m | Margin dB | Pass /Fail |
| 1                                                        | 10469.00      | 48.57    | 4.50          | 37.61   | 48.64        | MaxP             | Vertical   | 150    | 239     | 74.0         | -25.4     | Pass       |
| 2                                                        | 10469.00      | 36.70    | 4.50          | 37.61   | 36.77        | AVG              | Vertical   | 199    | 89      | 54.0         | -17.2     | Pass       |
| 3                                                        | 11013.00      | 49.01    | 4.66          | 37.81   | 48.93        | MaxP             | Vertical   | 150    | 0       | 74.0         | -26.5     | Pass       |
| 4                                                        | 11013.00      | 36.94    | 4.66          | 37.81   | 36.86        | AVG              | Vertical   | 150    | 239     | 54.0         | -17.1     | Pass       |
| 5                                                        | 13784.00      | 52.63    | 5.11          | 39.09   | 50.87        | MaxP             | Vertical   | 150    | 29      | 74.0         | -23.1     | Pass       |
| 6                                                        | 13784.00      | 41.18    | 5.11          | 39.09   | 39.42        | AVG              | Vertical   | 199    | 270     | 54.0         | -14.6     | Pass       |
| 7                                                        | 15688.00      | 49.18    | 5.75          | 40.41   | 53.06        | MaxP             | Horizontal | 150    | 120     | 74.0         | -20.9     | Pass       |
| 8                                                        | 15688.00      | 36.95    | 5.75          | 40.41   | 40.83        | AVG              | Horizontal | 150    | 120     | 54.0         | -13.2     | Pass       |
| 9                                                        | 16640.00      | 48.27    | 6.08          | 41.49   | 53.70        | MaxP             | Vertical   | 199    | 300     | 74.0         | -20.3     | Pass       |
| 10                                                       | 16640.00      | 36.51    | 6.08          | 41.49   | 41.94        | AVG              | Vertical   | 199    | 29      | 54.0         | -12.1     | Pass       |
| 11                                                       | 17915.00      | 47.22    | 6.67          | 41.55   | 55.18        | MaxP             | Horizontal | 199    | 240     | 74.0         | -18.8     | Pass       |
| 12                                                       | 17915.00      | 36.37    | 6.67          | 41.55   | 44.33        | AVG              | Horizontal | 199    | 330     | 54.0         | -9.7      | Pass       |
| Test Notes: 2402 MHz, Mod, battery powered, Chip Antenna |               |          |               |         |              |                  |            |        |         |              |           |            |

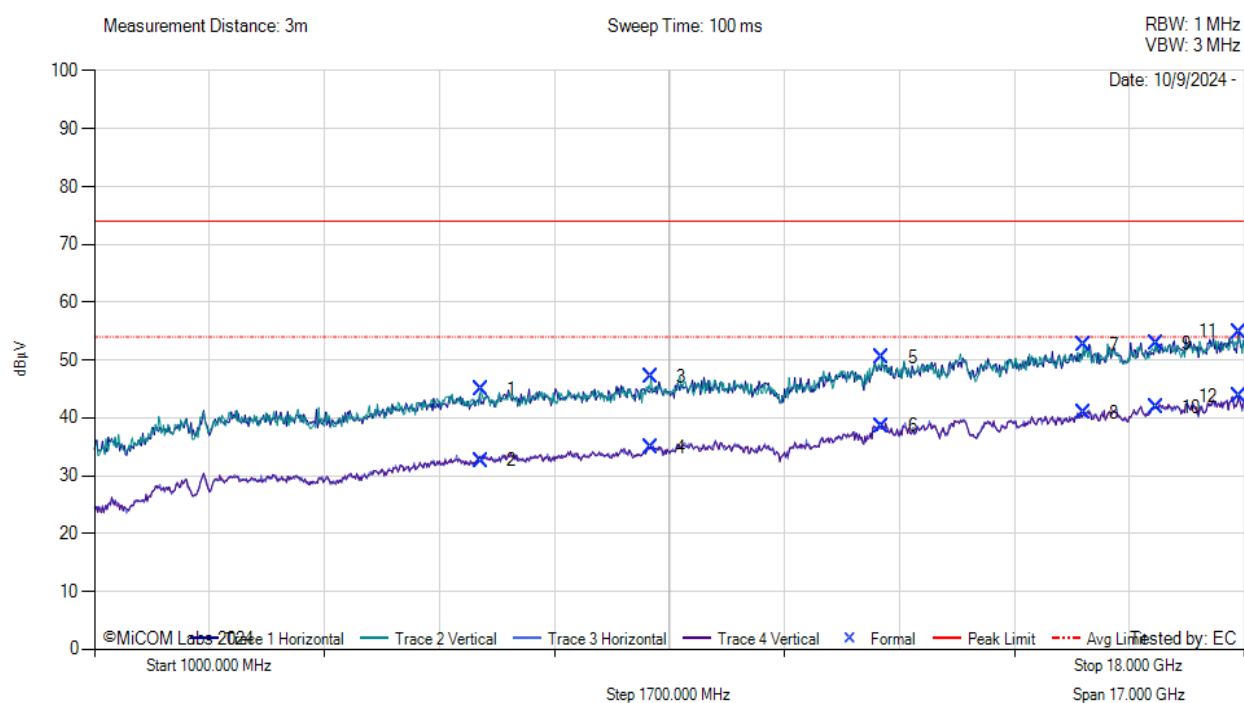
|                                 |          |                        |          |
|---------------------------------|----------|------------------------|----------|
| <b>Antenna:</b>                 | Integral | <b>Variant:</b>        | Chip     |
| <b>Antenna Gain (dBi):</b>      | 1.0      | <b>Modulation:</b>     | GFSK     |
| <b>Beam Forming Gain (Y):</b>   | N/A      | <b>Duty Cycle (%):</b> | Max      |
| <b>Channel Frequency (MHz):</b> | 2442     | <b>Data Rate:</b>      | 1 Mbit/s |
| <b>Power Setting:</b>           | 10       | <b>Tested By:</b>      | EC       |

### Test Measurement Results



FCC Spurious 1 GHz -18 GHz

Antenna: Chip



| 1000.00 - 18000.00 MHz                                   |               |          |               |         |              |                  |            |        |         |              |           |            |
|----------------------------------------------------------|---------------|----------|---------------|---------|--------------|------------------|------------|--------|---------|--------------|-----------|------------|
| Num                                                      | Frequency MHz | Raw dBμV | Cable Loss dB | AF dB/m | Level dBμV/m | Measurement Type | Pol        | Hgt cm | Azt Deg | Limit dBμV/m | Margin dB | Pass /Fail |
| 1                                                        | 6712.00       | 50.00    | 3.45          | 35.75   | 44.89        | MaxP             | Vertical   | 150    | 270     | 74.0         | -29.1     | Pass       |
| 2                                                        | 6712.00       | 37.76    | 3.45          | 35.75   | 32.65        | AVG              | Vertical   | 150    | 239     | 54.0         | -21.4     | Pass       |
| 3                                                        | 9228.00       | 50.02    | 4.27          | 36.30   | 47.05        | MaxP             | Vertical   | 150    | 239     | 74.0         | -26.9     | Pass       |
| 4                                                        | 9228.00       | 37.82    | 4.27          | 36.30   | 34.85        | AVG              | Vertical   | 150    | 0       | 54.0         | -19.2     | Pass       |
| 5                                                        | 12645.00      | 52.15    | 5.42          | 39.03   | 50.40        | MaxP             | Vertical   | 150    | 210     | 74.0         | -23.6     | Pass       |
| 6                                                        | 12645.00      | 40.33    | 5.42          | 39.03   | 38.58        | AVG              | Vertical   | 199    | 270     | 54.0         | -15.4     | Pass       |
| 7                                                        | 15620.00      | 49.44    | 5.58          | 40.33   | 52.56        | MaxP             | Vertical   | 150    | 179     | 74.0         | -21.4     | Pass       |
| 8                                                        | 15620.00      | 37.77    | 5.58          | 40.33   | 40.89        | AVG              | Vertical   | 150    | 330     | 54.0         | -13.1     | Pass       |
| 9                                                        | 16691.00      | 47.19    | 6.22          | 41.59   | 52.84        | MaxP             | Vertical   | 150    | 29      | 74.0         | -21.2     | Pass       |
| 10                                                       | 16691.00      | 36.18    | 6.22          | 41.59   | 41.83        | AVG              | Vertical   | 199    | 179     | 54.0         | -12.2     | Pass       |
| 11                                                       | 17915.00      | 46.91    | 6.67          | 41.55   | 54.86        | MaxP             | Horizontal | 150    | 240     | 74.0         | -19.1     | Pass       |
| 12                                                       | 17915.00      | 35.87    | 6.67          | 41.55   | 43.82        | AVG              | Horizontal | 199    | 300     | 54.0         | -10.2     | Pass       |
| Test Notes: 2442 MHz, Mod, battery powered, Chip Antenna |               |          |               |         |              |                  |            |        |         |              |           |            |

|                                 |          |                        |          |
|---------------------------------|----------|------------------------|----------|
| <b>Antenna:</b>                 | Integral | <b>Variant:</b>        | Chip     |
| <b>Antenna Gain (dBi):</b>      | 1.0      | <b>Modulation:</b>     | GFSK     |
| <b>Beam Forming Gain (Y):</b>   | N/A      | <b>Duty Cycle (%):</b> | Max      |
| <b>Channel Frequency (MHz):</b> | 2480     | <b>Data Rate:</b>      | 1 Mbit/s |
| <b>Power Setting:</b>           | 10       | <b>Tested By:</b>      | EC       |

### Test Measurement Results



FCC Spurious 1 GHz -18 GHz

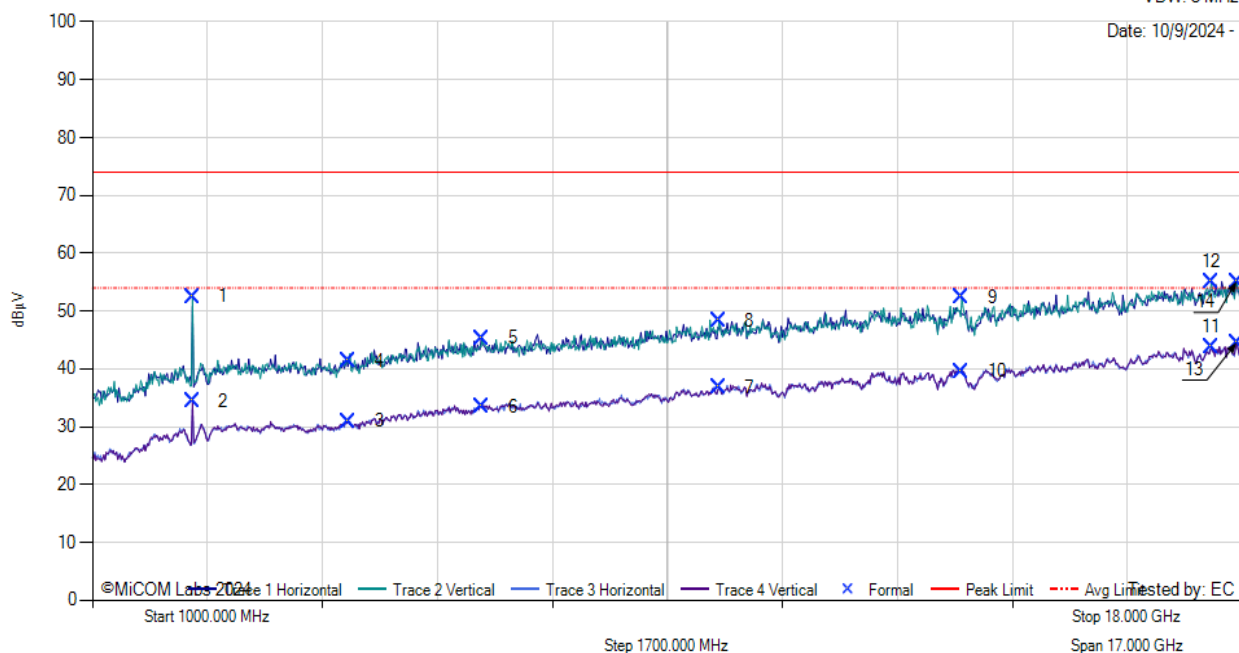
Antenna: Chip

Measurement Distance: 3m

Sweep Time: 100 ms

RBW: 1 MHz  
VBW: 3 MHz

Date: 10/9/2024 -



| 1000.00 - 18000.00 MHz                                   |               |          |               |         |              |                  |          |        |         |              |           |            |
|----------------------------------------------------------|---------------|----------|---------------|---------|--------------|------------------|----------|--------|---------|--------------|-----------|------------|
| Num                                                      | Frequency MHz | Raw dBµV | Cable Loss dB | AF dB/m | Level dBµV/m | Measurement Type | Pol      | Hgt cm | Azt Deg | Limit dBµV/m | Margin dB | Pass /Fail |
| 1                                                        | 2479.00       | 62.41    | 1.98          | 32.40   | 52.53        | MaxP             | Vertical | 149    | 149     | 74.0         | -21.5     | Pass       |
| 2                                                        | 2479.00       | 44.28    | 1.98          | 32.40   | 34.41        | AVG              | Vertical | 149    | 149     | 54.0         | -19.6     | Pass       |
| 3                                                        | 4791.00       | 40.28    | 2.93          | 34.00   | 30.96        | AVG              | Vertical | 150    | 0       | 54.0         | -23.0     | Pass       |
| 4                                                        | 4791.00       | 50.70    | 2.93          | 34.00   | 41.38        | MaxP             | Vertical | 149    | 59      | 74.0         | -32.6     | Pass       |
| 5                                                        | 6763.00       | 50.14    | 3.45          | 35.78   | 45.30        | MaxP             | Vertical | 199    | 149     | 74.0         | -28.7     | Pass       |
| 6                                                        | 6763.00       | 38.25    | 3.45          | 35.78   | 33.41        | AVG              | Vertical | 150    | 0       | 54.0         | -20.6     | Pass       |
| 7                                                        | 10265.00      | 37.08    | 4.76          | 37.46   | 36.86        | AVG              | Vertical | 149    | 0       | 54.0         | -17.1     | Pass       |
| 8                                                        | 10265.00      | 48.56    | 4.76          | 37.46   | 48.33        | MaxP             | Vertical | 149    | 209     | 74.0         | -25.7     | Pass       |
| 9                                                        | 13852.00      | 54.18    | 5.29          | 39.11   | 52.34        | MaxP             | Vertical | 199    | 0       | 74.0         | -21.7     | Pass       |
| 10                                                       | 13852.00      | 41.42    | 5.29          | 39.11   | 39.58        | AVG              | Vertical | 199    | 209     | 54.0         | -14.4     | Pass       |
| 11                                                       | 17541.00      | 37.97    | 6.50          | 41.55   | 43.76        | AVG              | Vertical | 149    | 299     | 54.0         | -10.2     | Pass       |
| 12                                                       | 17541.00      | 49.30    | 6.50          | 41.55   | 55.09        | MaxP             | Vertical | 149    | 0       | 74.0         | -18.9     | Pass       |
| 13                                                       | 17915.00      | 36.62    | 6.67          | 41.55   | 44.57        | AVG              | Vertical | 150    | 0       | 54.0         | -9.4      | Pass       |
| 14                                                       | 17915.00      | 47.22    | 6.67          | 41.55   | 55.17        | MaxP             | Vertical | 149    | 29      | 74.0         | -18.8     | Pass       |
| Test Notes: 2480 MHz, Mod, battery powered, Chip antenna |               |          |               |         |              |                  |          |        |         |              |           |            |

### 9.1.2. Receiver Spurious Emissions

#### Equipment Configuration for Receiver Spurious Emissions

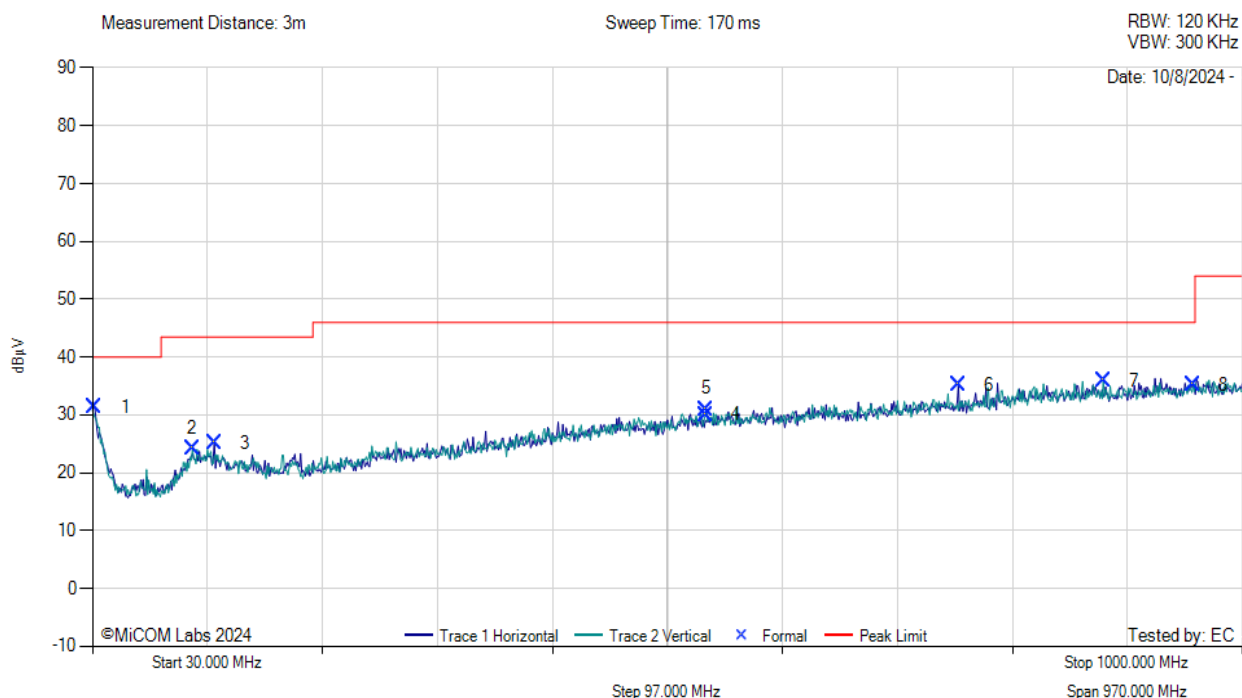
|                                 |               |                        |          |
|---------------------------------|---------------|------------------------|----------|
| <b>Antenna:</b>                 | Integral Wire | <b>Variant:</b>        | N/A      |
| <b>Antenna Gain (dBi):</b>      | 1.0           | <b>Modulation:</b>     | GFSK     |
| <b>Beam Forming Gain (Y):</b>   | N/A           | <b>Duty Cycle (%):</b> | Max      |
| <b>Channel Frequency (MHz):</b> | RX Mode       | <b>Data Rate:</b>      | 1 Mbit/s |
| <b>Power Setting:</b>           | 10            | <b>Tested By:</b>      | EC       |

#### Test Measurement Results



30 MHz to 1 GHz

Antenna: PCB



| 30.00 - 1000.00 MHz |               |          |               |         |              |                  |            |        |         |              |           |            |
|---------------------|---------------|----------|---------------|---------|--------------|------------------|------------|--------|---------|--------------|-----------|------------|
| Num                 | Frequency MHz | Raw dBµV | Cable Loss dB | AF dB/m | Level dBµV/m | Measurement Type | Pol        | Hgt cm | Azt Deg | Limit dBµV/m | Margin dB | Pass /Fail |
| 1                   | 31.94         | 32.63    | 3.53          | -4.85   | 31.31        | MaxP             | Horizontal | 199    | 270     | 40.0         | -8.7      | Pass       |
| 2                   | 114.39        | 31.52    | 4.17          | -11.51  | 24.18        | MaxP             | Vertical   | 199    | 29      | 43.5         | -19.3     | Pass       |
| 3                   | 132.82        | 32.48    | 4.27          | -11.55  | 25.20        | MaxP             | Horizontal | 99     | 60      | 43.5         | -18.3     | Pass       |
| 4                   | 547.01        | 30.44    | 5.85          | -6.25   | 30.04        | MaxP             | Vertical   | 199    | 149     | 46.0         | -16.0     | Pass       |
| 5                   | 547.98        | 31.37    | 5.85          | -6.25   | 30.97        | MaxP             | Vertical   | 199    | 209     | 46.0         | -15.0     | Pass       |
| 6                   | 760.41        | 32.42    | 6.49          | -3.72   | 35.19        | MaxP             | Horizontal | 199    | 120     | 46.0         | -10.8     | Pass       |
| 7                   | 882.63        | 31.28    | 6.88          | -2.23   | 35.92        | MaxP             | Vertical   | 99     | 29      | 46.0         | -10.1     | Pass       |
| 8                   | 958.29        | 29.16    | 7.10          | -1.14   | 35.12        | MaxP             | Vertical   | 199    | 119     | 46.0         | -10.9     | Pass       |

**Test Notes:** RX, battery powered

### Equipment Configuration for Receiver Spurious Emissions

|                                 |               |                        |          |
|---------------------------------|---------------|------------------------|----------|
| <b>Antenna:</b>                 | Integral Wire | <b>Variant:</b>        | N/A      |
| <b>Antenna Gain (dBi):</b>      | 1.0           | <b>Modulation:</b>     | GFSK     |
| <b>Beam Forming Gain (Y):</b>   | N/A           | <b>Duty Cycle (%):</b> | Max      |
| <b>Channel Frequency (MHz):</b> | RX Mode       | <b>Data Rate:</b>      | 1 Mbit/s |
| <b>Power Setting:</b>           | 10            | <b>Tested By:</b>      | EC       |

### Test Measurement Results



FCC Spurious 1 GHz -18 GHz

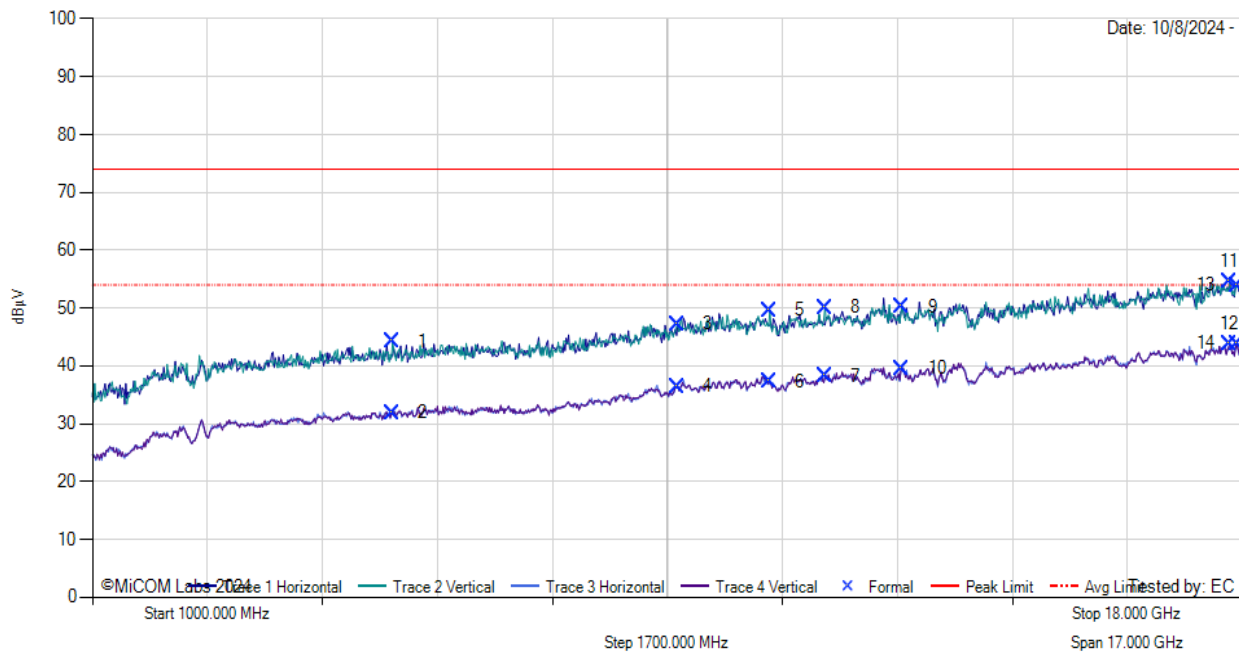
Antenna: PCB

Measurement Distance: 3m

Sweep Time: 100 ms

RBW: 1 MHz  
VBW: 3 MHz

Date: 10/8/2024 -



| 1000.00 - 18000.00 MHz          |               |          |               |         |              |                  |          |        |         |              |           |            |
|---------------------------------|---------------|----------|---------------|---------|--------------|------------------|----------|--------|---------|--------------|-----------|------------|
| Num                             | Frequency MHz | Raw dBμV | Cable Loss dB | AF dB/m | Level dBμV/m | Measurement Type | Pol      | Hgt cm | Azt Deg | Limit dBμV/m | Margin dB | Pass /Fail |
| 1                               | 5437.00       | 52.41    | 3.04          | 34.51   | 44.17        | MaxP             | Vertical | 149    | 89      | 74.0         | -29.8     | Pass       |
| 2                               | 5437.00       | 40.14    | 3.04          | 34.51   | 31.90        | AVG              | Vertical | 149    | 0       | 54.0         | -22.1     | Pass       |
| 3                               | 9653.00       | 49.22    | 4.37          | 36.74   | 47.21        | MaxP             | Vertical | 149    | 330     | 74.0         | -26.8     | Pass       |
| 4                               | 9653.00       | 38.50    | 4.37          | 36.74   | 36.48        | AVG              | Vertical | 199    | 300     | 54.0         | -17.5     | Pass       |
| 5                               | 11013.00      | 49.74    | 4.66          | 37.81   | 49.66        | MaxP             | Vertical | 199    | 59      | 74.0         | -24.3     | Pass       |
| 6                               | 11013.00      | 37.30    | 4.66          | 37.81   | 37.22        | AVG              | Vertical | 199    | 300     | 54.0         | -16.8     | Pass       |
| 7                               | 11829.00      | 39.61    | 5.14          | 38.71   | 38.31        | AVG              | Vertical | 199    | 119     | 54.0         | -15.7     | Pass       |
| 8                               | 11829.00      | 51.40    | 5.14          | 38.71   | 50.09        | MaxP             | Vertical | 149    | 239     | 74.0         | -23.9     | Pass       |
| 9                               | 12968.00      | 52.76    | 5.15          | 39.09   | 50.28        | MaxP             | Vertical | 199    | 0       | 74.0         | -23.7     | Pass       |
| 10                              | 12968.00      | 42.08    | 5.15          | 39.09   | 39.60        | AVG              | Vertical | 199    | 59      | 54.0         | -14.4     | Pass       |
| 11                              | 17813.00      | 47.40    | 6.27          | 41.66   | 54.54        | MaxP             | Vertical | 199    | 29      | 74.0         | -19.5     | Pass       |
| 12                              | 17813.00      | 36.54    | 6.27          | 41.66   | 43.68        | AVG              | Vertical | 149    | 59      | 54.0         | -10.3     | Pass       |
| 13                              | 17915.00      | 46.02    | 6.67          | 41.55   | 53.98        | MaxP             | Vertical | 199    | 239     | 74.0         | -20.0     | Pass       |
| 14                              | 17915.00      | 35.88    | 6.67          | 41.55   | 43.84        | AVG              | Vertical | 199    | 89      | 54.0         | -10.2     | Pass       |
| Test Notes: RX, battery powered |               |          |               |         |              |                  |          |        |         |              |           |            |

### 9.1.3. Restricted Edge & Band-Edge Emissions

#### 9.1.3.1. Integral Wire Antenna

#### Equipment Configuration for BE 2400 MHz

|                          |          |             |          |
|--------------------------|----------|-------------|----------|
| Antenna:                 | Integral | Variant:    | Wire     |
| Antenna Gain (dBi):      | 1.0      | Modulation: | GFSK     |
| Channel Frequency (MHz): | 2402     | Data Rate:  | 1 Mbit/s |
| Power Setting:           | 10       | Tested By:  | EC       |

#### Test Measurement Results



BE 2400 MHz

Antenna: PCB



| 2300.00 - 2430.00 MHz |               |          |               |         |              |                  |            |        |         |              |           |            |
|-----------------------|---------------|----------|---------------|---------|--------------|------------------|------------|--------|---------|--------------|-----------|------------|
| Num                   | Frequency MHz | Raw dBμV | Cable Loss dB | AF dB/m | Level dBμV/m | Measurement Type | Pol        | Hgt cm | Azt Deg | Limit dBμV/m | Margin dB | Pass /Fail |
| 1                     | 2326.26       | 37.54    | 1.93          | 31.89   | 61.36        | MaxP             | Horizontal | 99     | 150     | 74.0         | -12.6     | Pass       |
| 2                     | 2326.26       | 23.37    | 1.93          | 31.89   | 47.19        | AVG              | Horizontal | 99     | 150     | 54.0         | -6.8      | Pass       |
| 3                     | 2389.31       | 35.43    | 1.96          | 32.14   | 59.53        | MaxP             | Vertical   | 149    | 270     | 74.0         | -14.5     | Pass       |
| 4                     | 2389.31       | 23.25    | 1.96          | 32.14   | 47.35        | AVG              | Vertical   | 99     | 239     | 54.0         | -6.6      | Pass       |

Test Notes: 2402 MHz, Mod, battery powered, Wire Antenna

### Equipment Configuration for BE 2483.5 MHz

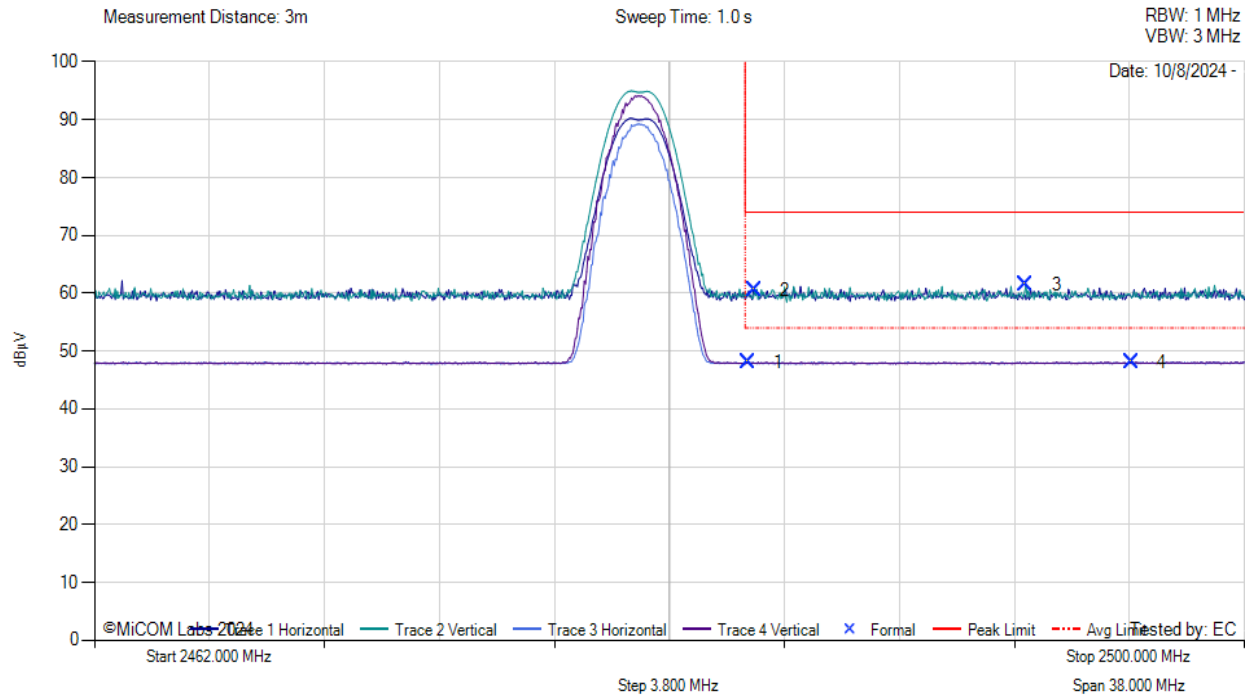
|                                 |          |                    |          |
|---------------------------------|----------|--------------------|----------|
| <b>Antenna:</b>                 | Integral | <b>Variant:</b>    | Wire     |
| <b>Antenna Gain (dBi):</b>      | 1.0      | <b>Modulation:</b> | GFSK     |
| <b>Channel Frequency (MHz):</b> | 2480     | <b>Data Rate:</b>  | 1 Mbit/s |
| <b>Power Setting:</b>           | 10       | <b>Tested By:</b>  | EC       |

### Test Measurement Results



BE 2483.5 MHz

Antenna: PCB



### 2462.00 - 2500.00 MHz

| Num | Frequency MHz | Raw dBμV | Cable Loss dB | AF dB/m | Level dBμV/m | Measurement Type | Pol        | Hgt cm | Azt Deg | Limit dBμV/m | Margin dB | Pass /Fail |
|-----|---------------|----------|---------------|---------|--------------|------------------|------------|--------|---------|--------------|-----------|------------|
| 1   | 2483.58       | 23.62    | 1.98          | 32.41   | 48.02        | AVG              | Vertical   | 149    | 0       | 54.0         | -6.0      | Pass       |
| 2   | 2483.81       | 36.17    | 1.98          | 32.41   | 60.57        | MaxP             | Vertical   | 99     | 179     | 74.0         | -13.4     | Pass       |
| 3   | 2492.78       | 37.04    | 1.99          | 32.43   | 61.47        | MaxP             | Vertical   | 99     | 29      | 74.0         | -12.5     | Pass       |
| 4   | 2496.28       | 23.66    | 2.00          | 32.44   | 48.11        | AVG              | Horizontal | 99     | 120     | 54.0         | -5.9      | Pass       |

**Test Notes:** 2480 MHz, Mod, battery powered, Wire Antenna

### 9.1.3.2. Integral Chip Antenna

#### Equipment Configuration for BE 2400 MHz

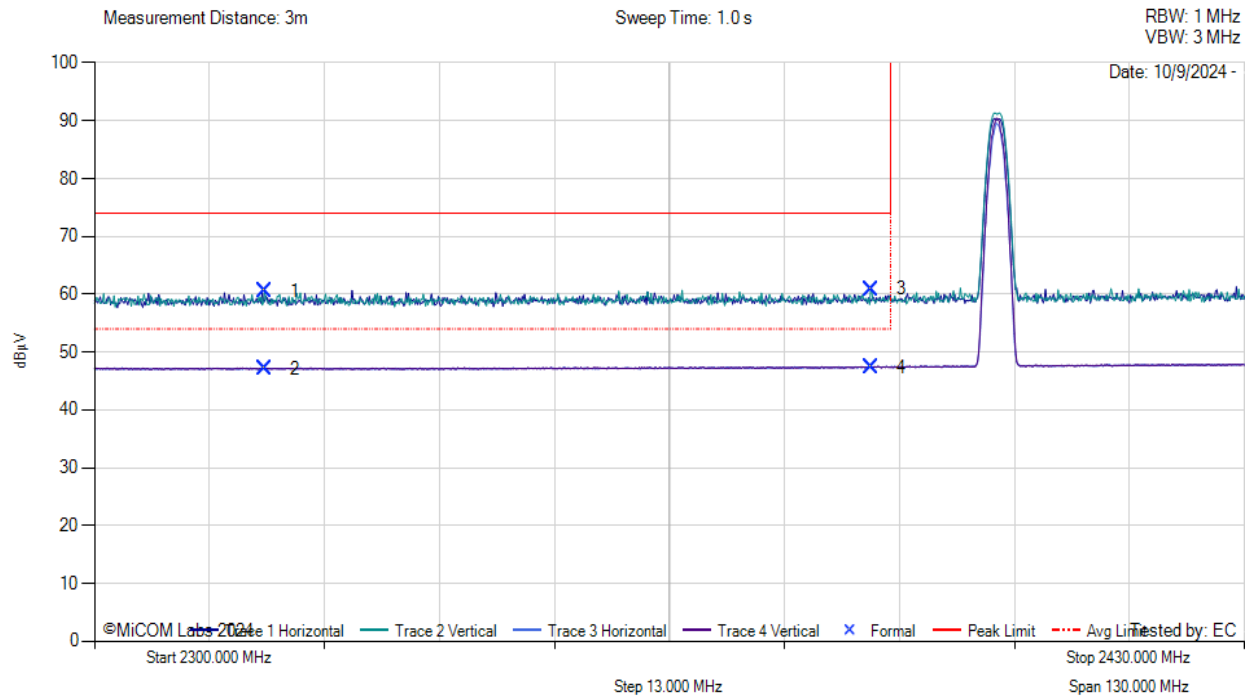
|                                 |          |                    |          |
|---------------------------------|----------|--------------------|----------|
| <b>Antenna:</b>                 | Integral | <b>Variant:</b>    | Chip     |
| <b>Antenna Gain (dBi):</b>      | 1.0      | <b>Modulation:</b> | GFSK     |
| <b>Channel Frequency (MHz):</b> | 2402     | <b>Data Rate:</b>  | 1 Mbit/s |
| <b>Power Setting:</b>           | 10       | <b>Tested By:</b>  | EC       |

#### Test Measurement Results



BE 2400 MHz

Antenna: Chip



#### 2300.00 - 2430.00 MHz

| Num | Frequency MHz | Raw dBμV | Cable Loss dB | AF dB/m | Level dBμV/m | Measurement Type | Pol      | Hgt cm | Azt Deg | Limit dBμV/m | Margin dB | Pass /Fail |
|-----|---------------|----------|---------------|---------|--------------|------------------|----------|--------|---------|--------------|-----------|------------|
| 1   | 2319.24       | 36.69    | 1.93          | 31.87   | 60.49        | MaxP             | Vertical | 149    | 330     | 74.0         | -13.5     | Pass       |
| 2   | 2319.24       | 23.30    | 1.93          | 31.87   | 47.10        | AVG              | Vertical | 100    | 330     | 54.0         | -6.9      | Pass       |
| 3   | 2387.75       | 36.80    | 1.96          | 32.13   | 60.90        | MaxP             | Vertical | 149    | 119     | 74.0         | -13.1     | Pass       |
| 4   | 2387.75       | 23.29    | 1.96          | 32.13   | 47.39        | AVG              | Vertical | 149    | 119     | 54.0         | -6.6      | Pass       |

**Test Notes:** 2402 MHz, Mod, battery powered, Chip antenna

### Equipment Configuration for BE 2483.5 MHz

|                                 |          |                    |          |
|---------------------------------|----------|--------------------|----------|
| <b>Antenna:</b>                 | Integral | <b>Variant:</b>    | Chip     |
| <b>Antenna Gain (dBi):</b>      | 1.0      | <b>Modulation:</b> | GFSK     |
| <b>Channel Frequency (MHz):</b> | 2480     | <b>Data Rate:</b>  | 1 Mbit/s |
| <b>Power Setting:</b>           | 10       | <b>Tested By:</b>  | EC       |

### Test Measurement Results



BE 2483.5 MHz

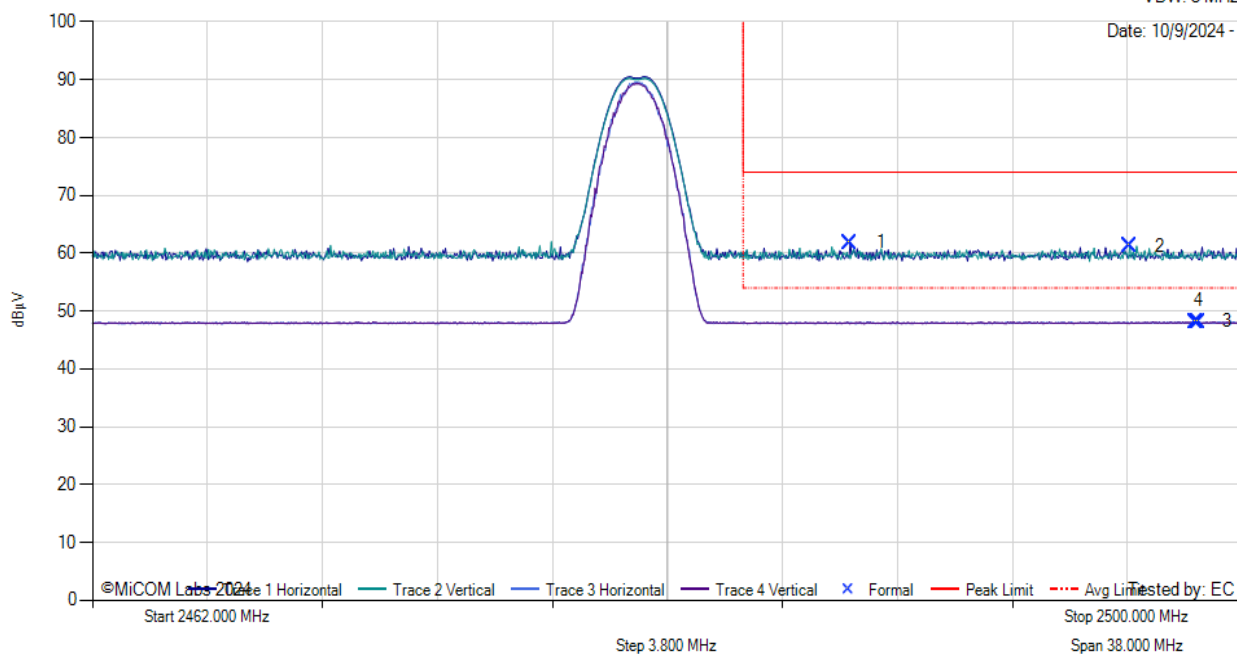
Antenna: Chip

Measurement Distance: 3m

Sweep Time: 1.0 s

RBW: 1 MHz  
VBW: 3 MHz

Date: 10/9/2024 -



### 2462.00 - 2500.00 MHz

| Num | Frequency MHz | Raw dBμV | Cable Loss dB | AF dB/m | Level dBμV/m | Measurement Type | Pol        | Hgt cm | Azt Deg | Limit dBμV/m | Margin dB | Pass /Fail |
|-----|---------------|----------|---------------|---------|--------------|------------------|------------|--------|---------|--------------|-----------|------------|
| 1   | 2487.04       | 37.41    | 1.98          | 32.42   | 61.81        | MaxP             | Horizontal | 149    | 300     | 74.0         | -12.2     | Pass       |
| 2   | 2496.28       | 36.87    | 2.00          | 32.44   | 61.32        | MaxP             | Vertical   | 99     | 119     | 74.0         | -12.7     | Pass       |
| 3   | 2498.48       | 23.69    | 2.01          | 32.45   | 48.15        | AVG              | Vertical   | 99     | 0       | 54.0         | -5.9      | Pass       |
| 4   | 2498.56       | 23.76    | 2.01          | 32.45   | 48.21        | AVG              | Horizontal | 149    | 270     | 54.0         | -5.8      | Pass       |

**Test Notes:** 2480 MHz, Mod, battery powered, Chip antenna



575 Boulder Court  
Pleasanton, California 94566, USA  
Tel: +1 (925) 462 0304  
Fax: +1 (925) 462 0306  
[www.micomlabs.com](http://www.micomlabs.com)