

# TEST REPORT

**Report Number:** R15972923-E1

**Applicant :** Garmin International Inc.  
1200 East 151st Street  
Olathe, KS 66062-3426, USA

**Model :** A04537

**FCC ID :** IPH-04537

**IC :** 1792A-04537

**EUT Description :** Portable Sensor

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART C: 2025  
ISED RSS-247 ISSUE 3: 2023  
ISED RSS-GEN ISSUE 5 + A1 + A2: 2021

**Date Of Issue:**  
2025-08-29

**Prepared by:**  
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## REPORT REVISION HISTORY

| Rev. | Issue Date | Revisions     | Revised By    |
|------|------------|---------------|---------------|
| V1   | 2025-08-29 | Initial Issue | Charles Moody |

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Garmin International Inc.  
1200 East 151<sup>st</sup> Street  
Olathe, KS 66062-3426, USA

**EUT DESCRIPTION:** Portable Sensor

**MODEL:** A04537

**SERIAL NUMBER:** 0651913 / 0684537

**SAMPLE RECEIPT DATE:** 2024-11-13, 2025-07-30

**DATE TESTED:** 2024-11-20 TO 2024-11-26, 2025-08-08 TO 2025-08-12

| APPLICABLE STANDARDS                 |                    |
|--------------------------------------|--------------------|
| STANDARD                             | TEST RESULTS       |
| CFR 47 Part 15 Subpart C: 2025       |                    |
| ISED RSS-247 Issue 3: 2023           | Refer to Section 2 |
| ISED RSS-GEN Issue 5 + A1 + A2: 2021 |                    |

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document.

Approved & Released  
For UL LLC By:

Prepared By:



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Consumer, Medical and IT Segment  
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## 2. TEST RESULTS SUMMARY

This report contains info provided by the customer which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.

Below is a list of the data/info provided by the customer:

- 1) Antenna gain and type (see section 6.3)
- 2) Worst-case data rates (see section 6.5)

| FCC Clause     | ISED Clause       | Requirement                  | Result                  | Comment                              |
|----------------|-------------------|------------------------------|-------------------------|--------------------------------------|
| See Comment    |                   | Duty Cycle                   | Reporting purposes only | ANSI C63.10 Section 11.6.            |
| -              | RSS-GEN 6.7       | 99% OBW                      | Reporting purposes only | ANSI C63.10 Section 6.9.3.           |
| 15.247 (a) (2) | RSS-247 5.2 (a)   | 6dB BW                       | Compliant               | None                                 |
| 15.247 (b) (3) | RSS-247 5.4 (d)   | Output Power                 |                         |                                      |
| See Comment    |                   | Average power                | Reporting purposes only | Per ANSI C63.10, Section 11.9.2.3.2. |
| 15.247 (e)     | RSS-247 5.2 (b)   | PSD                          | Compliant               | None                                 |
| 15.247 (d)     | RSS-247 5.5       | Conducted Spurious Emissions |                         |                                      |
| 15.209, 15.205 | RSS-GEN 8.9, 8.10 | Radiated Emissions           |                         |                                      |
| 15.207         | RSS-Gen 8.8       | AC Mains Conducted Emissions |                         |                                      |

## 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 15, ANSI C63.10-2020 + Cor.1-2023 + C63.10a-2024, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A1 + A2, and RSS-247 Issue 3.

## 4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification # 0751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

|                                     | Address  | ISED CABID | ISED Company Number | FCC Registration |
|-------------------------------------|--|------------|---------------------|------------------|
| <input type="checkbox"/>            | Building:<br>12 Laboratory Dr<br>Durham, NC 27713, U.S.A                     | US0067     | 2180C               | 825374           |
| <input checked="" type="checkbox"/> | Building:<br>2800 Perimeter Park Dr. Suite B<br>Morrisville, NC 27560, U.S.A |            | 27265               |                  |

## 5. DECISION RULES AND MEASUREMENT UNCERTAINTY

### 5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

### 5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

### 5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                                | UNCERTAINTY                 |
|--|-----------------------------|
| Radio Frequency (Spectrum Analyzer)      | 141.2 Hz                    |
| Occupied Channel Bandwidth               | 1.22%                       |
| RF output power, conducted               | 1.3 dB (PK)<br>0.45 dB (AV) |
| Power Spectral Density, conducted        | 2.47 dB                     |
| Unwanted Emissions, conducted            | 1.94 dB                     |
| All emissions, radiated                  | 6.01 dB                     |
| Conducted Emissions (0.150-30MHz) - LISN | 3.40 dB                     |
| Temperature                              | 0.57°C                      |
| Humidity                                 | 3.39%                       |
| DC Supply voltages                       | 1.70%                       |
| Time                                     | 3.39%                       |

Uncertainty figures are valid to a confidence level of 95%.

### 5.4. SAMPLE CALCULATION

#### **RADIATED EMISSIONS**

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

#### **MAINS CONDUCTED EMISSIONS**

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

## 6. EQUIPMENT UNDER TEST

### 6.1. EUT DESCRIPTION

The EUT is a portable sensor with BLE and ANT/ANT+. This report covers testing of the BLE radio.

There are three variations of the portable sensor that only differ by the enclosure. All variations were investigated and the worst-case sensor was tested.

### 6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

| Frequency Range (MHz) | Mode      | Output Power (dBm) | Output Power (mW) |
|-----------------------|-----------|--------------------|-------------------|
| 2402 - 2480           | BLE 1Mbps | 8.00               | 6.31              |
| 2402 - 2480           | BLE 2Mbps | 8.02               | 6.34              |

### 6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:  
The radio utilizes an antenna with the following type and maximum gain:

| Type      | Frequency Range (MHz) | Maximum Gain (dBi) |
|-----------|-----------------------|--------------------|
| PCB Patch | 2402-2480             | 0.35dBi            |

### 6.4. SOFTWARE AND FIRMWARE

The software version installed during testing was 4.8.2.

## 6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel and mode with highest PSD as worst-case scenario. BLE supports 1Mbps and 2Mbps.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at low, and high channels, as well as middle channel for radiated spurious emissions.

The fundamental of the EUT was investigated in three orthogonal axes, X, Y, and Z. The worst-case orientation was determined to be the X-axis. Therefore, all testing was performed with the EUT in the X-axis.

The client has elected to declare an operational duty cycle of 70% for BLE 1Mbps and 2Mbps resulting in a duty cycle correction factor of -3.1dB. FAQ#3c from the KDB 558074 was used to determine the average emissions for BLE 1Mbps and 2Mbps.

## 6.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List |              |             |                         |        |
|------------------------|--------------|-------------|-------------------------|--------|
| Description            | Manufacturer | Model       | Serial Number           | FCC ID |
| Laptop                 | Lenovo       | T14 Gen 3   | PF4FKW0T                | NA     |
| Laptop Charger         | Lenovo       | ADLX65YLC2D | 8SSA10R16970D1SG35A138Y | NA     |

### I/O CABLES

| I/O Cable List |             |                      |                   |              |                  |                        |
|----------------|-------------|----------------------|-------------------|--------------|------------------|------------------------|
| Cable No.      | Port        | # of Identical Ports | Connector Type    | Cable Type   | Cable Length (m) | Remarks                |
| 1              | Proprietary | 1                    | 4 pin Proprietary | Non-Shielded | <3m              | Used for charging only |

### TEST SETUP

EUT was configured to transmit at default power at the desired frequencies and modes. For final emissions testing, the EUT was connected to AC mains.

### SETUP DIAGRAMS

Please refer to R15972923-EP1 for setup diagrams

## 7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

| Equip. ID | Description                                       | Manufacturer/Brand   | Model Number              | Last Cal.  | Next Cal.  |
|-----------|---|----------------------|---------------------------|------------|------------|
|           | <b>0.009-30MHz</b>                                |                      |                           |            |            |
| 135144    | Active Loop Antenna                               | ETS-Lindgren         | 6502                      | 2024-10-02 | 2025-10-02 |
|           | <b>30-1000 MHz</b>                                |                      |                           |            |            |
| 90628     | Hybrid Broadband Antenna                          | Sunol Sciences Corp. | JB3                       | 2024-01-02 | 2026-01-02 |
|           | <b>1-18 GHz</b>                                   |                      |                           |            |            |
| 206211    | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren         | 3117                      | 2024-04-09 | 2026-04-09 |
|           | <b>18-40 GHz</b>                                  |                      |                           |            |            |
| 91186     | Horn Antenna, 18-26.5GHz                          | ARA                  | MWH-1826/B                | 2024-05-16 | 2026-05-16 |
|           | <b>Gain-Loss Chains</b>                           |                      |                           |            |            |
| 207638    | Gain-loss string: 0.009-30MHz                     | Various              | Various                   | 2025-06-13 | 2026-06-13 |
| 207639    | Gain-loss string: 25-1000MHz                      | Various              | Various                   | 2025-06-13 | 2026-06-13 |
| 207640    | Gain-loss string: 1-18GHz                         | Various              | Various                   | 2025-06-13 | 2026-06-13 |
| 225795    | Gain-loss string: 18-40GHz                        | Various              | Various                   | 2025-06-13 | 2026-06-13 |
|           | <b>Receiver &amp; Software</b>                    |                      |                           |            |            |
| 197954    | Spectrum Analyzer                                 | Rohde & Schwarz      | ESW44                     | 2025-04-21 | 2026-04-21 |
| 90411     | Spectrum Analyzer                                 | Keysight             | N9030A                    | 2025-07-30 | 2026-07-30 |
| SOFTEMI   | EMI Software                                      | UL                   | Version 9.5 (18 Oct 2021) |            |            |
|           | <b>Additional Equipment used</b>                  |                      |                           |            |            |
| 241204    | Environmental Meter                               | Fisher Scientific    | 15-077-963                | 2023-09-05 | 2025-09-05 |

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

| Equip. ID | Description                                       | Manufacturer/Brand | Model Number              | Last Cal.  | Next Cal.  |
|-----------|---|--------------------|---------------------------|------------|------------|
|           | <b>1-18 GHz</b>                                   |                    |                           |            |            |
| 88761     | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren       | 3117                      | 2023-10-05 | 2025-10-05 |
|           | <b>Gain-Loss Chains</b>                           |                    |                           |            |            |
| 91977     | Gain-loss string: 1-18GHz                         | Various            | Various                   | 2025-05-31 | 2026-05-31 |
|           | <b>Receiver &amp; Software</b>                    |                    |                           |            |            |
| 206496    | Spectrum Analyzer                                 | Rohde & Schwarz    | ESW44                     | 2025-07-29 | 2026-07-29 |
| SOFTEMI   | EMI Software                                      | UL                 | Version 9.5 (18 Oct 2021) |            |            |
|           | <b>Additional Equipment used</b>                  |                    |                           |            |            |
| 239540    | Environmental Meter                               | Fisher Scientific  | 15-077-963                | 2025-08-05 | 2027-08-05 |

Test Equipment Used - Wireless Conducted Measurement Equipment

| Equipment ID                                 | Description                                    | Manufacturer                       | Model Number           | Last Cal.  | Next Cal.  |
|--|--|------------------------------------|------------------------|------------|------------|
| <b>Common Equipment<br/>Conducted Room 2</b> |  |                                    |                        |            |            |
| 90416  | Spectrum Analyzer                              | Keysight Technologies              | N9030A                 | 2024-09-23 | 2025-09-23 |
| 248881                                       | Environmental Meter                            | Control Company                    | 06-662-4               | 2024-04-10 | 2026-04-10 |
| 211055                                       | Real-Time Peak Power Sensor<br>50MHz to 8GHz   | Boonton                            | RTP5000                | 2024-08-01 | 2025-08-01 |
| SOFTEMI                                      | Antenna Port Software                          | UL                                 | Version 2024.2.23      | NA         | NA         |
| Power Software                               | Boonton Power Analyzer                         | Boonton                            | Version 3.0.13.0       | NA         | NA         |
| <b>Attenuators</b>                           |  |                                    |                        |            |            |
| CBL105                                       | Micro-Coax UTiFLEX Cable<br>Assembly, Low Loss | Carlisle Interconnect Technologies | UFB-197C-0-0160-300300 | 2024-03-01 | 2025-03-01 |

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

| Equipment ID | Description                                   | Manufacturer        | Model Number              | Last Cal.  | Next Cal.  |
|--------------|---|---------------------|---------------------------|------------|------------|
| 70374        | EMI Test Receiver                             | ROHDE & SCHWARZ     | ESC17                     | 2024-07-30 | 2025-07-30 |
| CBL087       | Coax cable, RG223, N-male to BNC-male, 20-ft. | Pasternack          | PE3W06143-240             | 2024-04-04 | 2025-04-04 |
| 179892       | Environmental Meter                           | Fisher Scientific   | 15-077-963                | 2024-08-12 | 2025-08-12 |
| 80391        | LISN, 50-ohm/50-uH, 250uH<br>2-conductor, 25A | Fischer Custom Com. | FCC-LISN-50/250-25-2-01   | 2024-08-01 | 2025-08-01 |
| PS216        | AC Power Source                               | Elgar               | CW2501M                   | NA         | NA         |
| SOFTEMI      | EMI Software                                  | UL                  | Version 9.5 (18 Oct 2021) |            |            |

\*NOTE: All conducted testing was done between 2024-11-20 and 2024-11-25. Therefore, at the time of testing, all equipment was in calibration.

## 8. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10-2020 Section 11.6

6 dB BW: ANSI C63.10-2020 Subclause -11.8.2

Occupied BW (99%): ANSI C63.10-2020 Section 6.9.3

Output Power: ANSI C63.10-2020 Subclause -11.9.1.2 Method PKPM1 Peak-reading power meter  
ANSI C63.10-2020 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

PSD: ANSI C63.10-2020 Subclause -11.10.2 Method PKPSD (peak PSD)

Conducted emissions non-restricted frequency bands: ANSI C63.10-2020 Subclause -11.11 and 6.10.4

Radiated emissions restricted frequency bands: ANSI C63.10-2020 Subclause -11.12.1 and 6.10.5

General radiated emissions: ANSI C63.10 Subclause - 6.3-6.6

AC Power-line conducted emissions: ANSI C63.10-2020, Section 6.2.

## 9. ANTENNA PORT TEST RESULTS

Note: To reduce file size of report, only representative plots are included for some conducted test data in section 9.

### 9.1. ON TIME AND DUTY CYCLE

#### LIMITS

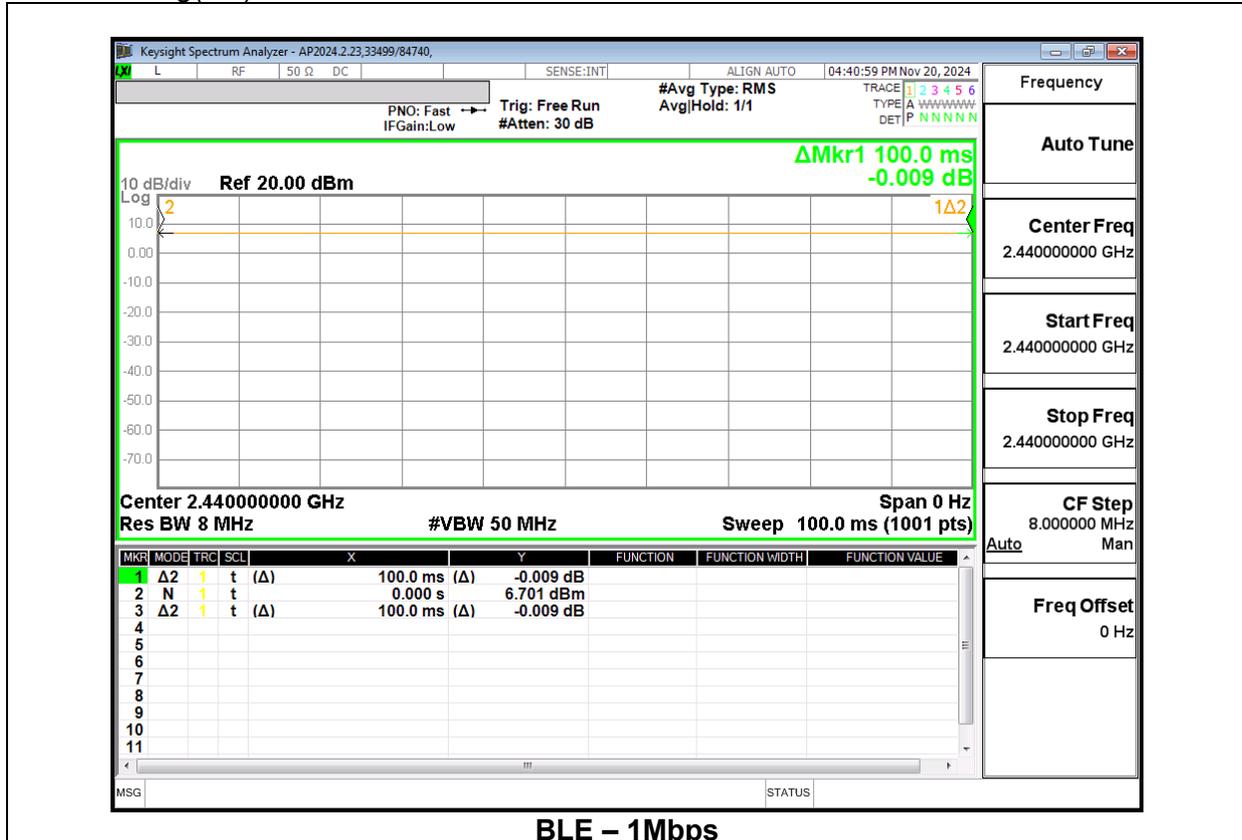
None; for reporting purposes only.

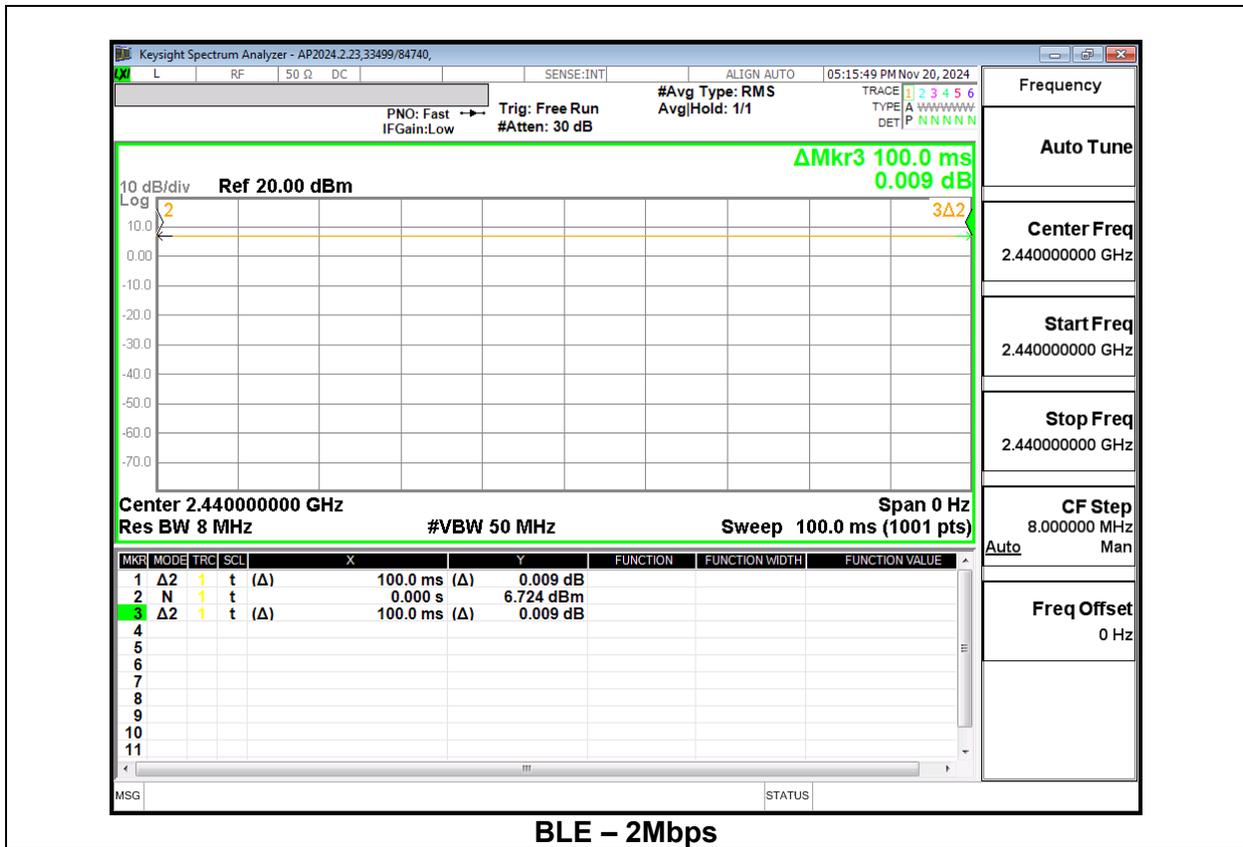
#### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

| Mode               | ON Time B (msec) | Period (msec) | Duty Cycle x (linear) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | 1/B Minimum VBW (kHz) |
|--------------------|------------------|---------------|-----------------------|----------------|-----------------------------------|-----------------------|
| <b>2.4GHz Band</b> |                  |               |                       |                |                                   |                       |
| BLE - 1Mbps        | 100.000          | 100.000       | 1.000                 | 100.00         | 0.00                              | 0.010                 |
| BLE - 2Mbps        | 100.000          | 100.000       | 1.000                 | 100.00         | 0.00                              | 0.010                 |

The client has declared an operational duty cycle of 70% resulting in a DCCF of -3.1dB.  
 $DCCF = 20\log(0.7) = -3.1\text{dB}$





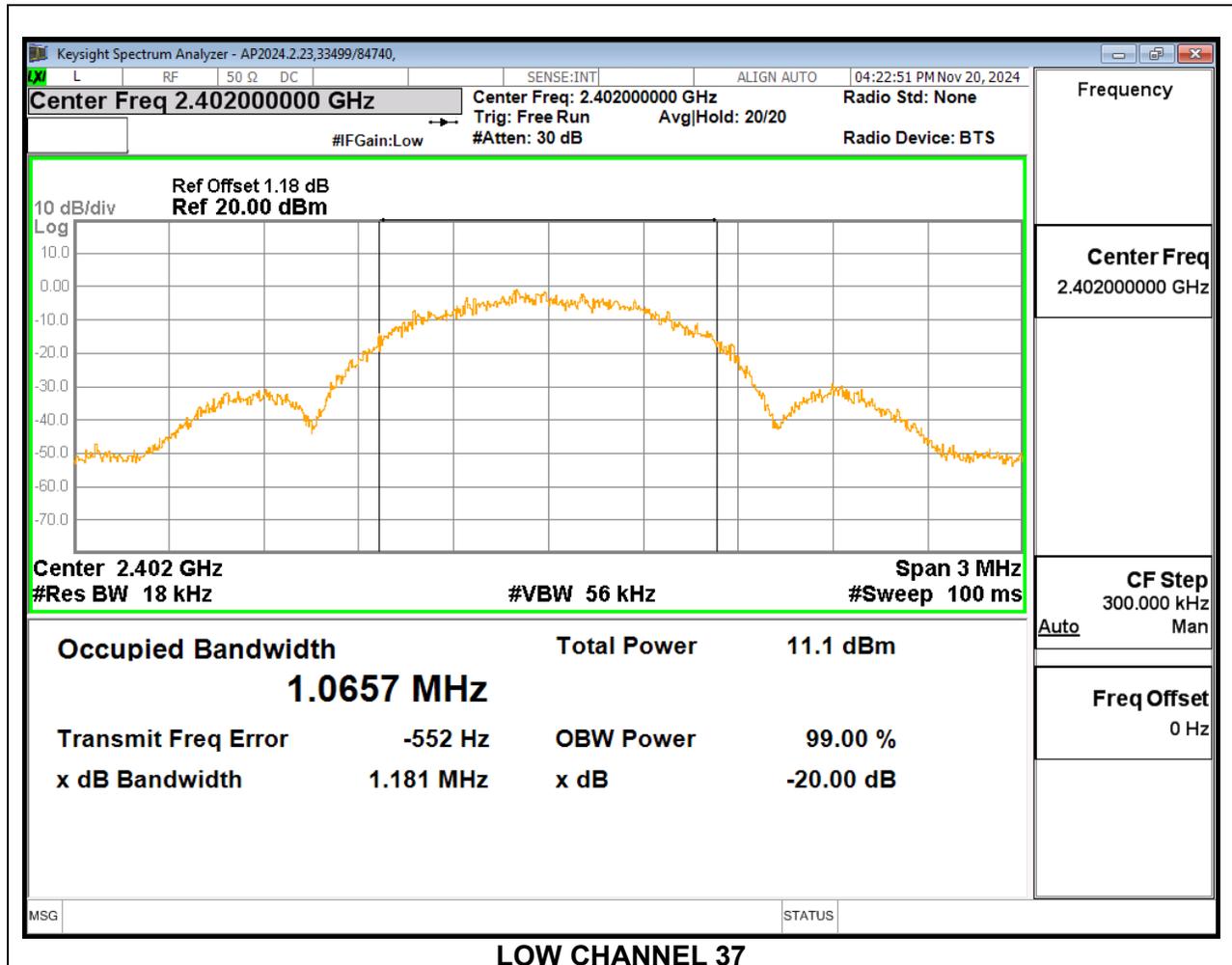
## 9.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

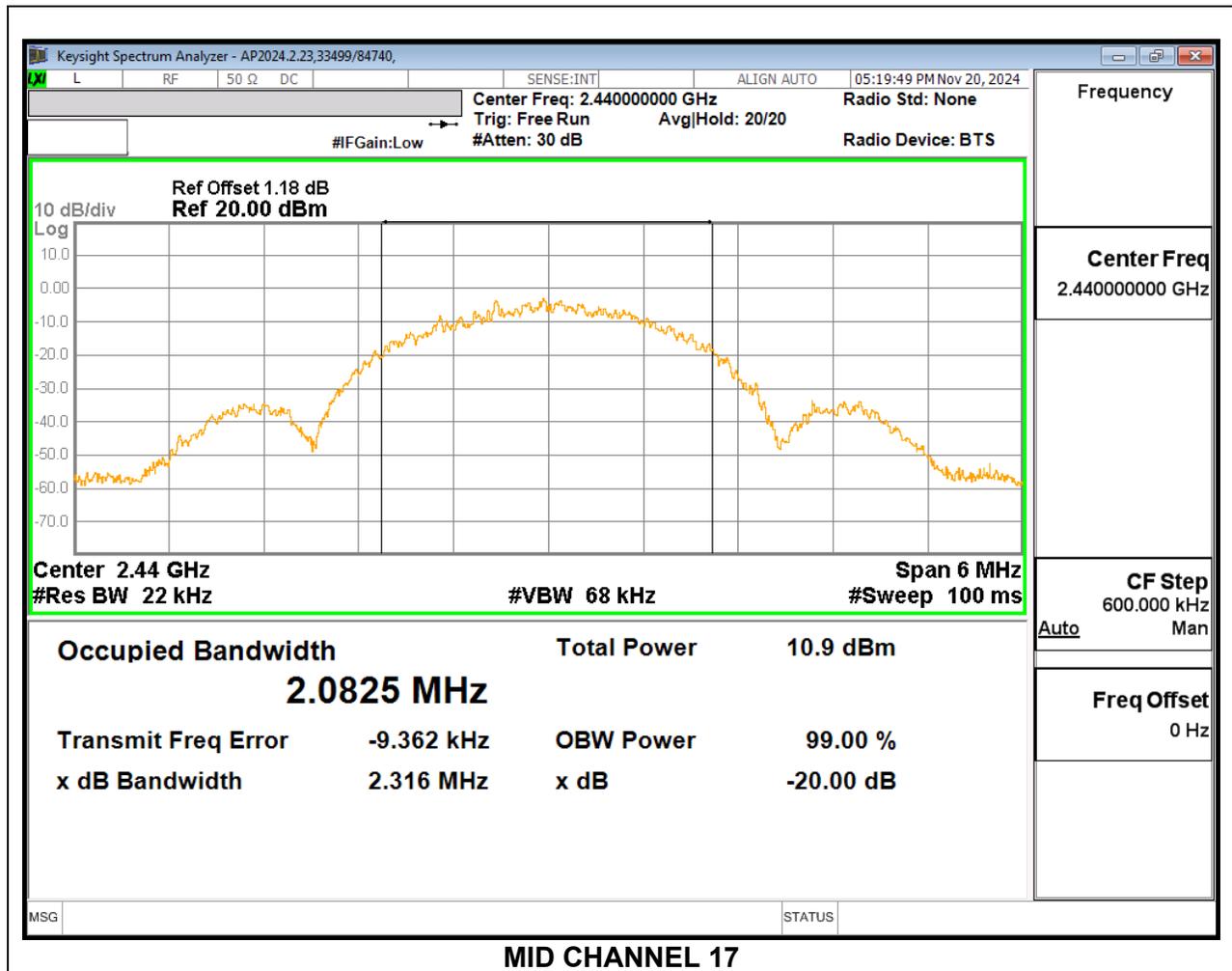
### 9.2.1. BLE 1Mbps MODE

| Channel | Frequency<br>(MHz) | 99%<br>Bandwidth<br>Chain 0<br>(MHz) |
|---------|--------------------|--------------------------------------|
| Low 37  | 2402               | 1.0657                               |
| Mid 17  | 2440               | 1.0639                               |
| High 39 | 2480               | 1.0608                               |



### 9.2.2. BLE 2Mbps MODE

| Channel | Frequency<br>(MHz) | 99%<br>Bandwidth<br>Chain 0<br>(MHz) |
|---------|--------------------|--------------------------------------|
| Low 37  | 2402               | 2.0746                               |
| Mid 17  | 2440               | 2.0825                               |
| High 39 | 2480               | 2.08                                 |



### 9.3. 6 dB BANDWIDTH

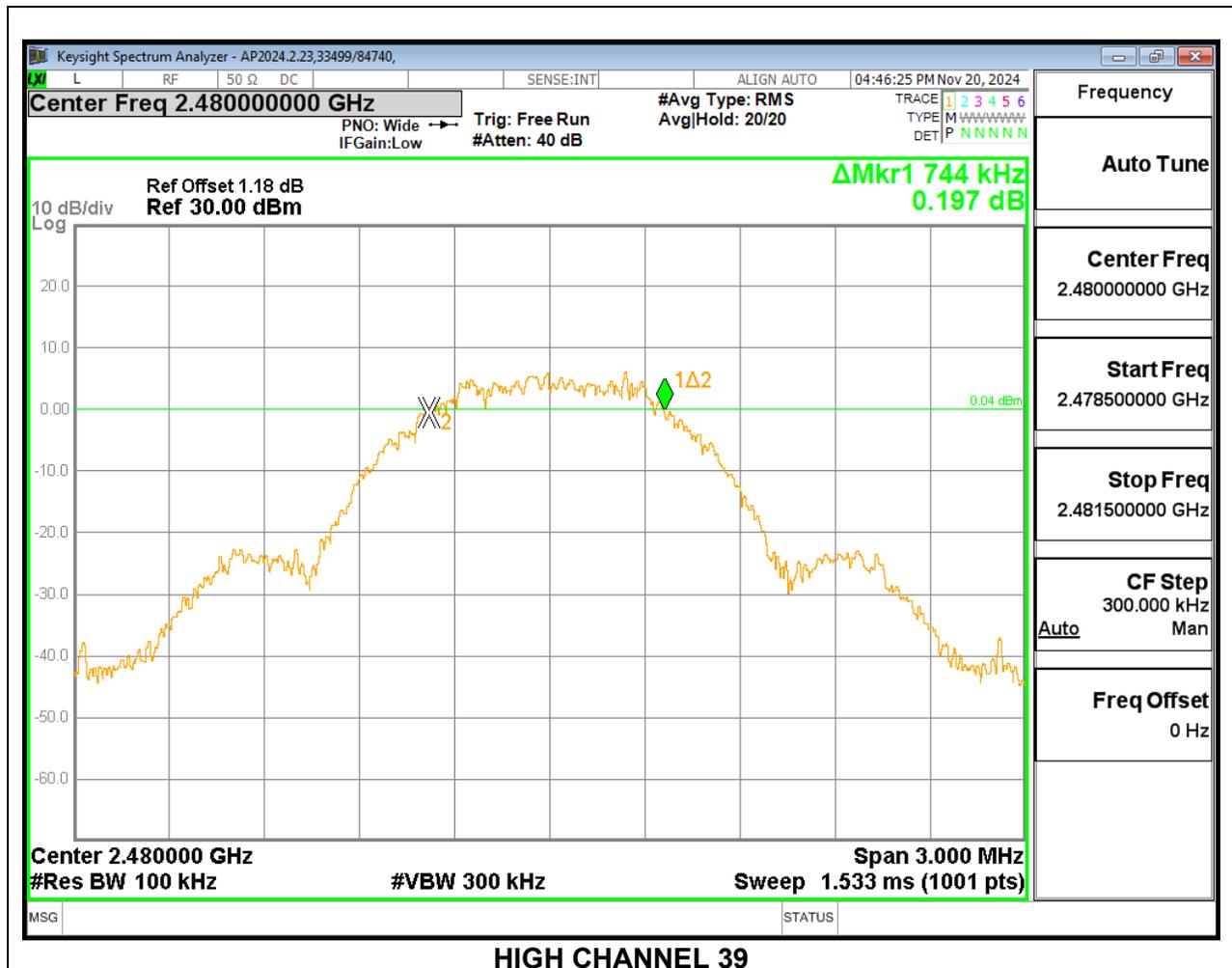
**LIMITS**

FCC §15.247 (a) (2)  
 RSS-247 5.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

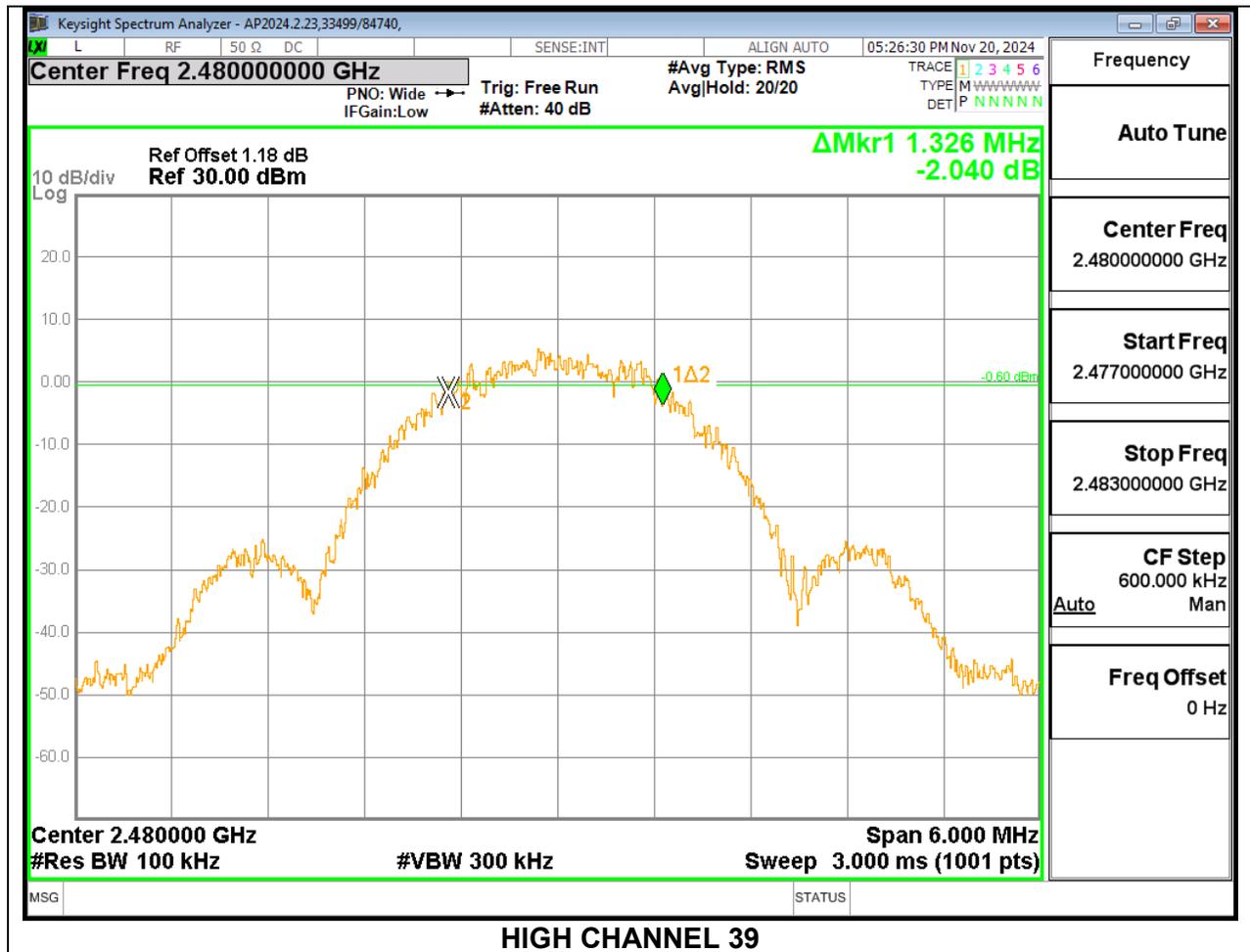
#### 9.3.1. BLE 1Mbps MODE

| Channel | Frequency (MHz) | 6 dB Bandwidth Chain 0 (MHz) | Minimum Limit (MHz) |
|---------|-----------------|------------------------------|---------------------|
| Low 37  | 2402            | 0.681                        | 0.5                 |
| Mid 17  | 2440            | 0.723                        | 0.5                 |
| High 39 | 2480            | 0.744                        | 0.5                 |



### 9.3.2. BLE 2Mbps MODE

| Channel | Frequency (MHz) | 6 dB Bandwidth Chain 0 (MHz) | Minimum Limit (MHz) |
|---------|-----------------|------------------------------|---------------------|
| Low 37  | 2402            | 1.224                        | 0.5                 |
| Mid 17  | 2440            | 1.23                         | 0.5                 |
| High 39 | 2480            | 1.326                        | 0.5                 |



## **9.4. OUTPUT POWER**

### **LIMITS**

FCC §15.247 (b) (3)  
RSS-247 5.4 (d)

### **TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 0.87 dB (including 0.87 dB cable) was entered as an offset in the power meter.

The power output was measured on the EUT antenna port using SMA cable connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.

### **DIRECTIONAL ANTENNA GAIN**

For 1Tx, directional gain equals antenna gain.

**RESULTS**

**9.4.1. BLE 1Mbps MODE**

|                       |              |
|-----------------------|--------------|
| <b>Test Engineer:</b> | 105900/84740 |
| <b>Test Date:</b>     | 2024-11-25   |

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-------------------------|----------------|
| Low 37  | 2402               | 8.00                              | 30.00                   | 22.00          |
| Mid 17  | 2440               | 7.67                              | 30.00                   | 22.33          |
| High 39 | 2480               | 7.25                              | 30.00                   | 22.75          |

**9.4.2. BLE 2Mbps MODE**

|                       |              |
|-----------------------|--------------|
| <b>Test Engineer:</b> | 105900/84740 |
| <b>Test Date:</b>     | 2024-11-25   |

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) | Power<br>Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|-----------------------------------|-------------------------|----------------|
| Low 37  | 2402               | 8.02                              | 30.00                   | 21.98          |
| Mid 17  | 2440               | 7.67                              | 30.00                   | 22.33          |
| High 39 | 2480               | 7.24                              | 30.00                   | 22.76          |

## 9.5. AVERAGE POWER

### LIMITS

None; for reporting purposes only

### TEST PROCEDURE

The transmitter output is connected to a gated average power meter.

The cable assembly insertion loss of 0.87 dB (including 0.87 dB cable) was entered as an offset in the power meter.

The power output was measured on the EUT antenna port using SMA cable connected to a power meter via wideband power sensor. Gated average output power was read directly from power meter.

### 9.5.1. BLE 1Mbps Mode

|                       |              |
|-----------------------|--------------|
| <b>Test Engineer:</b> | 105900/84740 |
| <b>Test Date:</b>     | 2024-11-25   |

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) |
|---------|--------------------|-----------------------------------|
| Low 37  | 2402               | 7.789                             |
| Mid 17  | 2440               | 7.442                             |
| High 39 | 2480               | 7.014                             |

### 9.5.2. BLE 2Mbps Mode

|                       |              |
|-----------------------|--------------|
| <b>Test Engineer:</b> | 105900/84740 |
| <b>Test Date:</b>     | 2024-11-25   |

| Channel | Frequency<br>(MHz) | Chain 0<br>Meas<br>Power<br>(dBm) |
|---------|--------------------|-----------------------------------|
| Low 37  | 2402               | 7.786                             |
| Mid 17  | 2440               | 7.442                             |
| High 39 | 2480               | 7.016                             |

## 9.6. POWER SPECTRAL DENSITY

### LIMITS

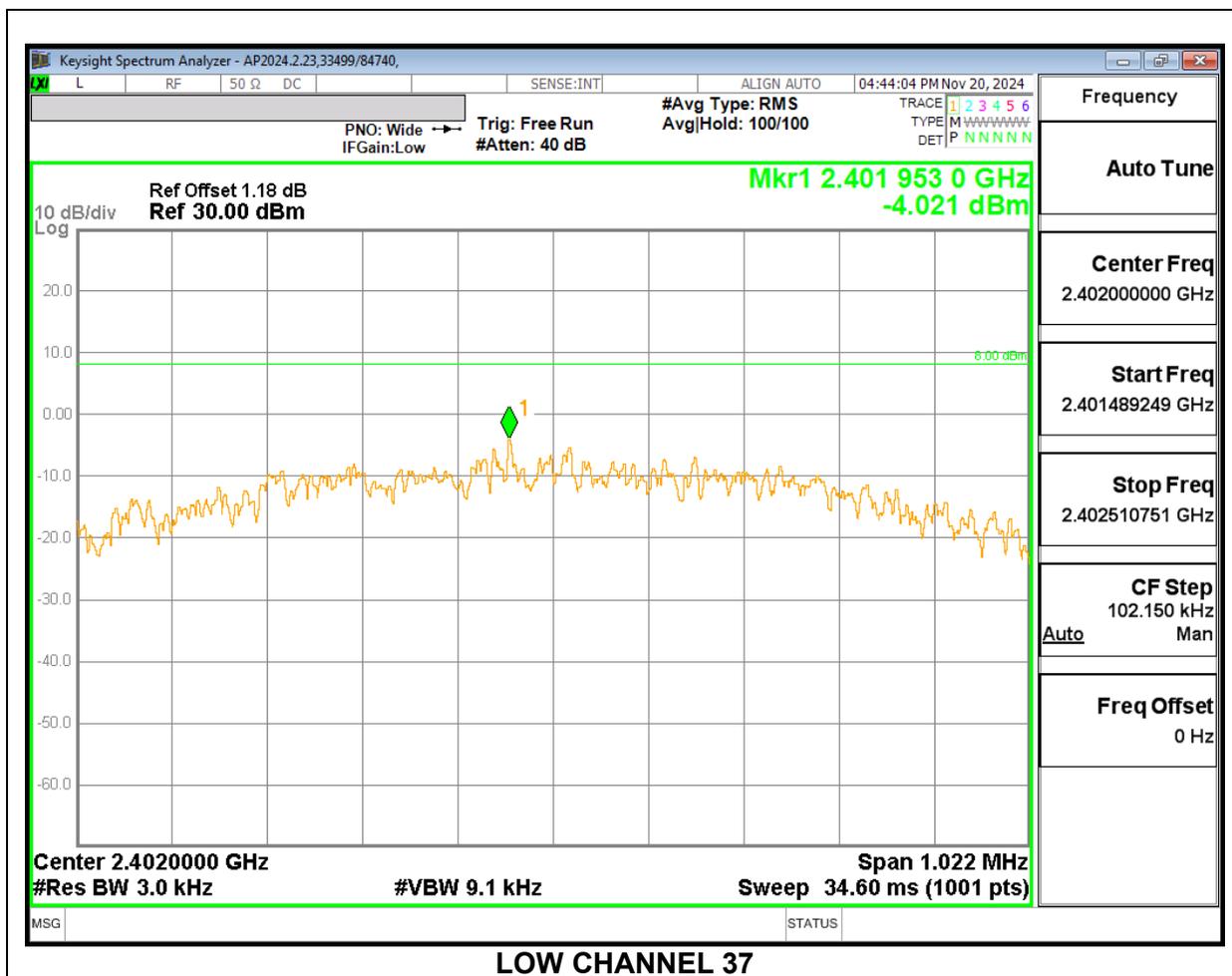
FCC §15.247 (e)  
 RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 9.6.1. BLE 1Mbps MODE

#### PSD Results

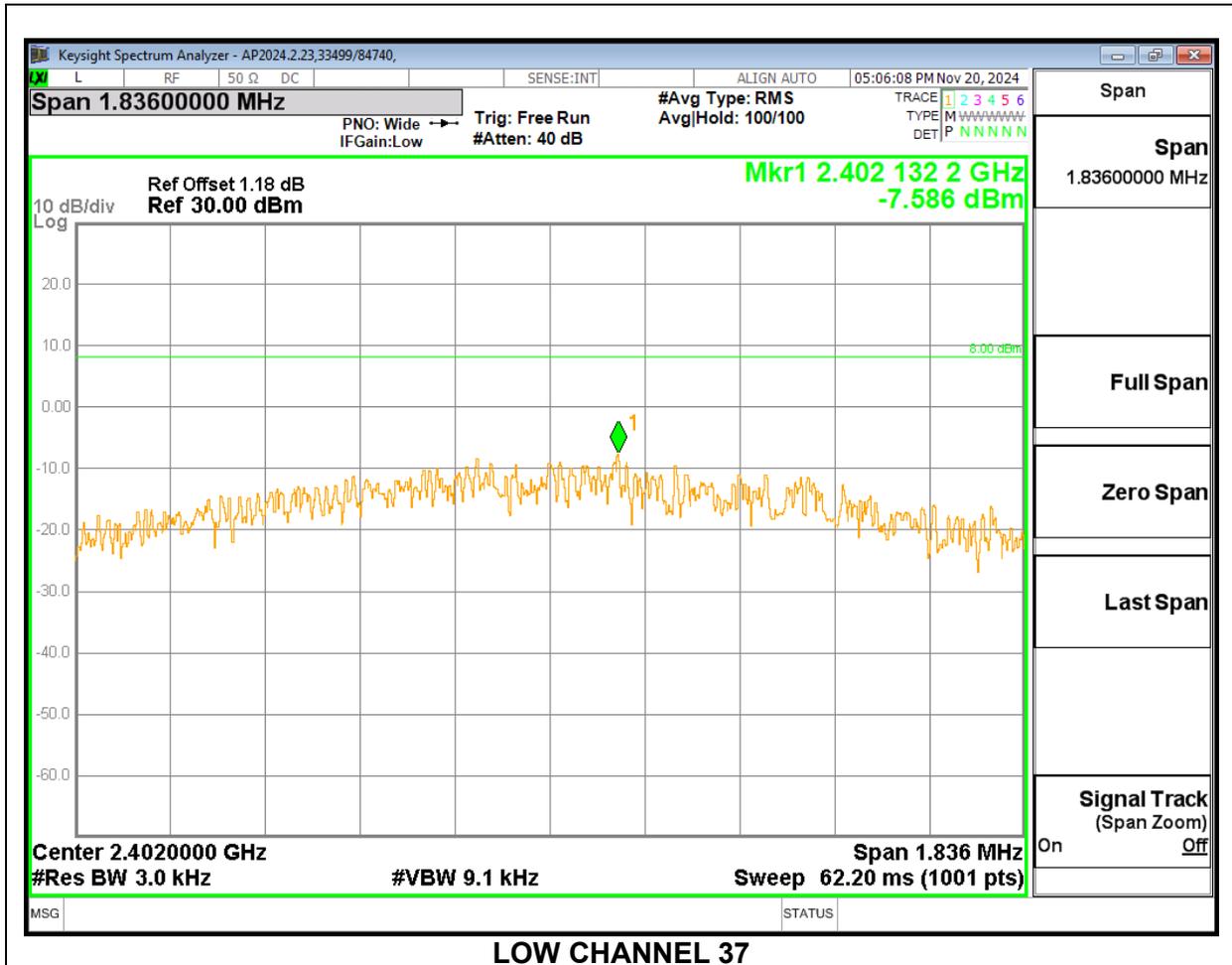
| Channel | Frequency (MHz) | Chain 0 Meas (dBm/ 3kHz) | Limit (dBm/ 3kHz) | Margin (dB) |
|---------|-----------------|--------------------------|-------------------|-------------|
| Low 37  | 2402            | -4.02                    | 8.0               | -12.0       |
| Mid 17  | 2440            | -5.59                    | 8.0               | -13.6       |
| High 39 | 2480            | -4.69                    | 8.0               | -12.7       |



### 9.6.2. BLE 2Mbps MODE

#### PSD Results

| Channel | Frequency (MHz) | Chain 0 Meas (dBm/ 3kHz) | Limit (dBm/ 3kHz) | Margin (dB) |
|---------|-----------------|--------------------------|-------------------|-------------|
| Low 37  | 2402            | -7.59                    | 8.0               | -15.6       |
| Mid 17  | 2440            | -7.90                    | 8.0               | -15.9       |
| High 39 | 2480            | -8.67                    | 8.0               | -16.7       |



## **9.7. CONDUCTED SPURIOUS EMISSIONS**

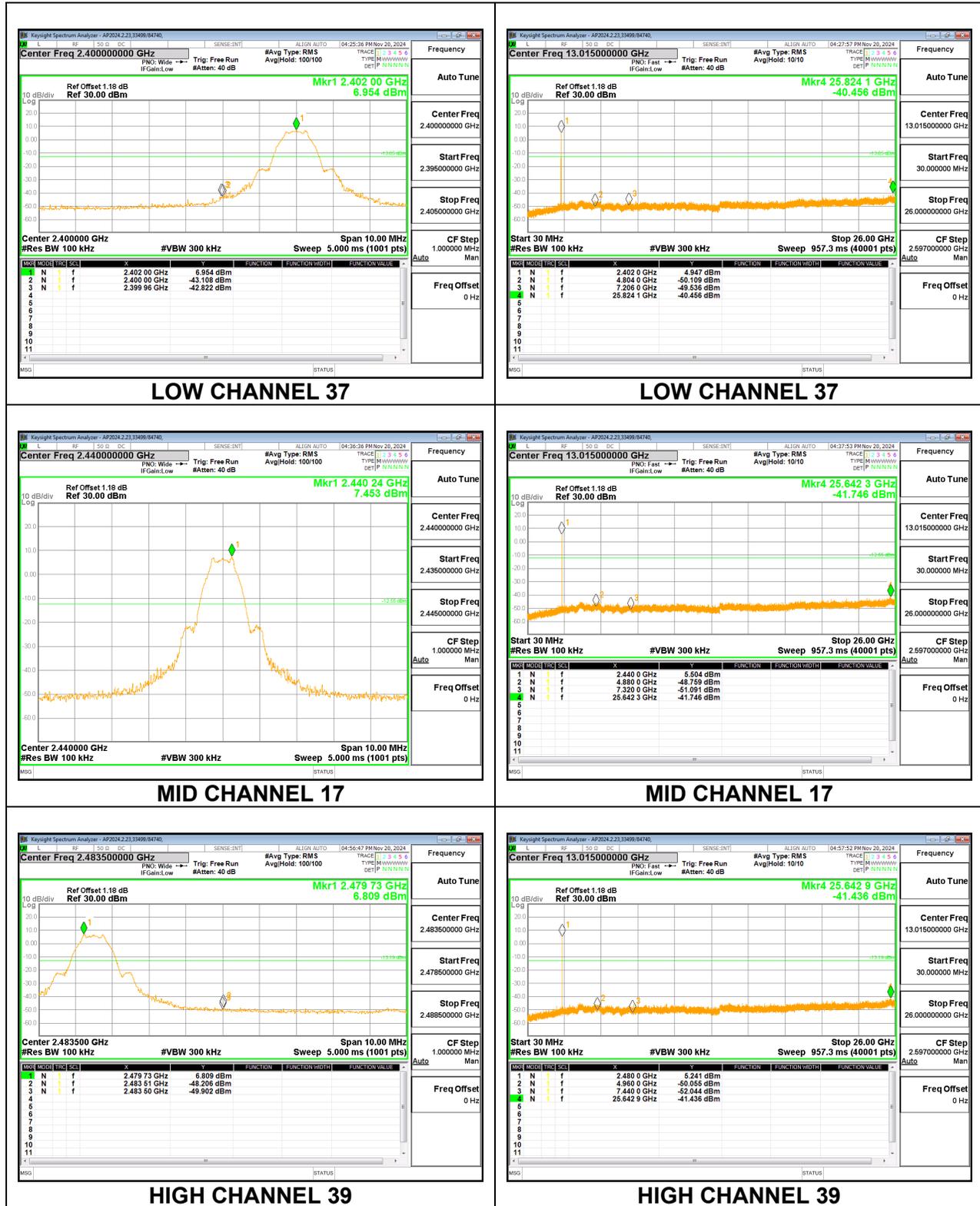
### **LIMITS**

FCC §15.247 (d)  
RSS-247 5.5

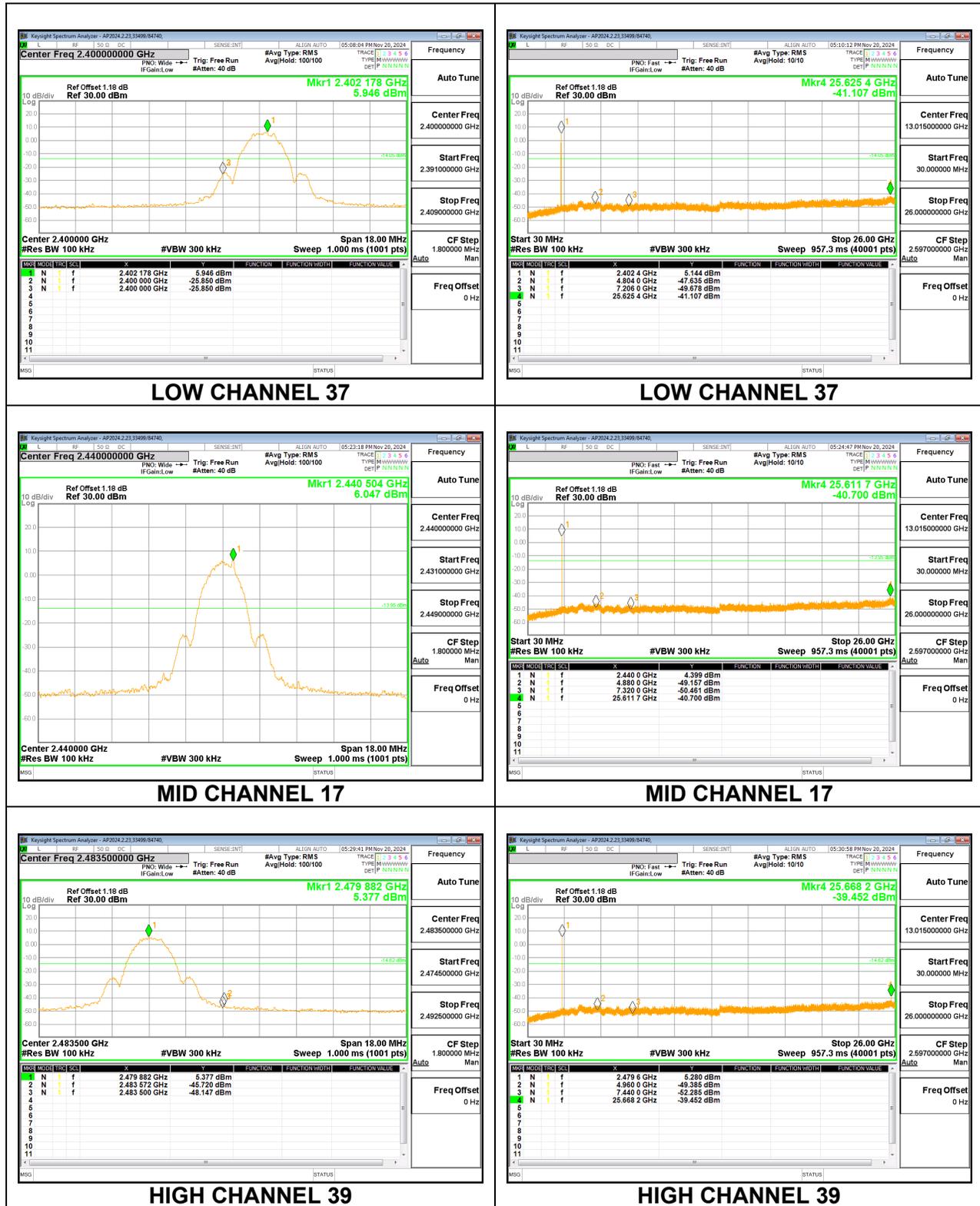
Output power was measured based on the use of peak measurement, therefore the required attenuation is -20 dBc.

### **RESULTS**

### 9.7.1. BLE 1Mbps MODE



### 9.7.2. BLE 2Mbps MODE



## 10. RADIATED TEST RESULTS

### LIMITS

FCC §15.205 and §15.209

| Frequency Range (MHz) | Field Strength Limit (uV/m) at 3 m | Field Strength Limit (dBuV/m) at 3 m |
|-----------------------|------------------------------------|--------------------------------------|
| 0.009-0.490           | 2400/F(kHz) @ 300 m                | -                                    |
| 0.490-1.705           | 24000/F(kHz) @ 30 m                | -                                    |
| 1.705 - 30            | 30 @ 30m                           | -                                    |
| 30 - 88               | 100                                | 40                                   |
| 88 - 216              | 150                                | 43.5                                 |
| 216 - 960             | 200                                | 46                                   |
| Above 960             | 500                                | 54                                   |

IC RSS-GEN Clause 8.9 and 8.10

| Frequency Range (kHz) | Field Strength Limit (uA/m) at 3 m | Field Strength Limit (dBuV/m) at 3 m |
|-----------------------|------------------------------------|--------------------------------------|
| 0.009-0.490           | 6.37/F(kHz) @ 300 m                | -                                    |
| 0.490-1.705           | 63.7/F(kHz) @ 30 m                 | -                                    |
| 1.705 - 30            | 0.08 @ 30m                         | -                                    |
| Frequency Range (MHz) | Field Strength Limit (uV/m) at 3 m | Field Strength Limit (dBuV/m) at 3 m |
| 30 - 88               | 100                                | 40                                   |
| 88 - 216              | 150                                | 43.5                                 |
| 216 - 960             | 200                                | 46                                   |
| Above 960             | 500                                | 54                                   |

### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3MHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for linear voltage average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to low, middle, and high channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest PSD was tested.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

### **KDB 414788 Open Field Site (OFS) and Chamber Correlation Justification**

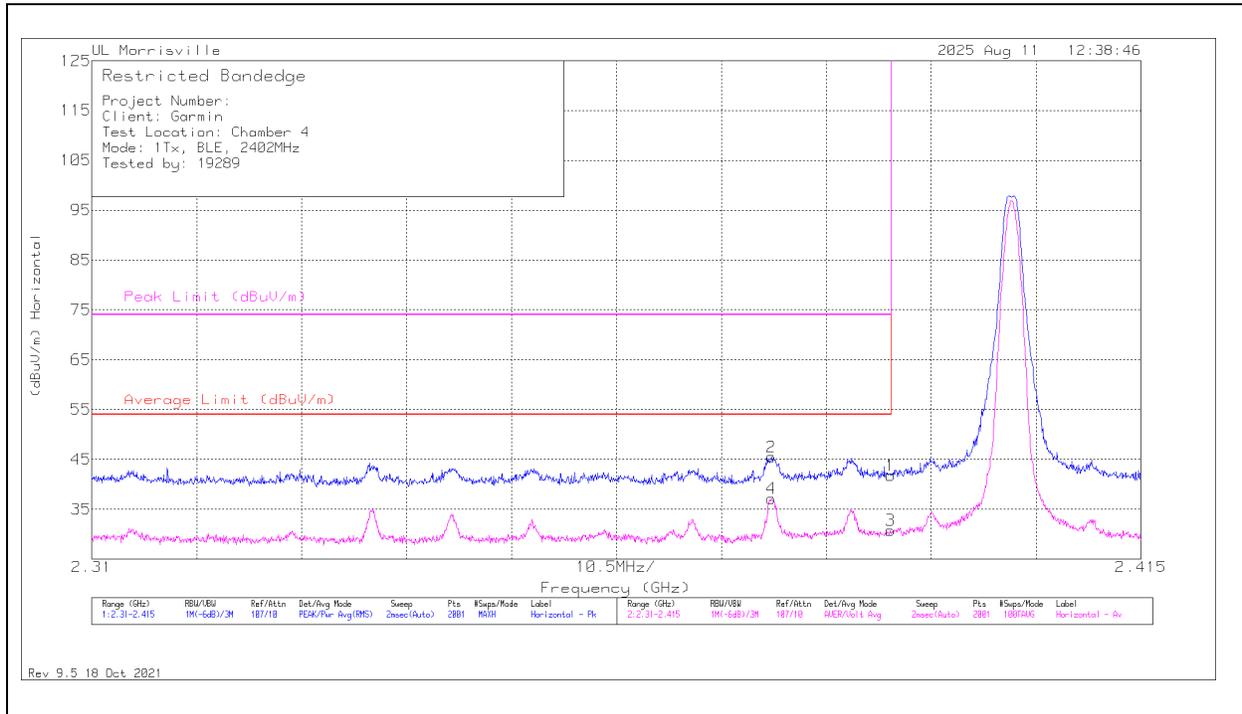
OFS and chamber correlation testing had been performed and chamber measured test result is the worst-case test result.

## 10.1. TRANSMITTER ABOVE 1 GHz

### 10.1.1. TX ABOVE 1 GHz BLE 1Mbps MODE IN THE 2.4 GHz BAND

#### BANDEDGE (LOW CHANNEL, 2402MHz)

#### HORIZONTAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | *** 2.38996     | 32.75                | Pk  | 32            | -23            | -            | 41.75                      | -                      | -           | 74                  | -32.25         | 60             | 139         | H        |
| 2      | *** 2.37799     | 37.06                | Pk  | 32            | -23.6          | -            | 45.46                      | -                      | -           | 74                  | -28.54         | 60             | 139         | H        |
| 3      | *** 2.38996     | 21.76                | ADV | 32            | -23            | -3.1         | 27.66                      | 54                     | -26.34      | -                   | -              | 60             | 139         | H        |
| 4      | *** 2.37799     | 28.75                | ADV | 32            | -23.6          | -3.1         | 34.05                      | 54                     | -19.95      | -                   | -              | 60             | 139         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

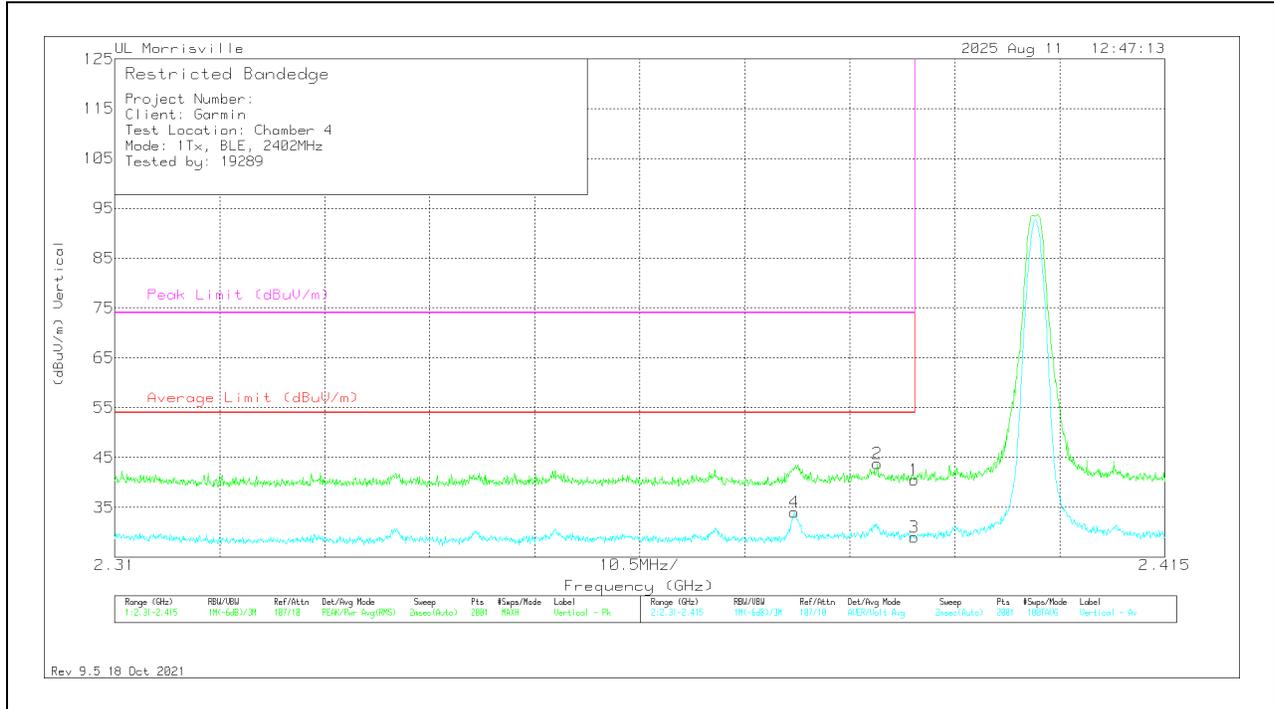
\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

Note: Order number is 15972923

### VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | *** 2.38996     | 31.5                 | Pk  | 32            | -23            | 0            | 40.5                       | -                      | -           | 74                  | -33.5          | 292            | 140         | V        |
| 2      | *** 2.38623     | 34.66                | Pk  | 32            | -22.9          | 0            | 43.76                      | -                      | -           | 74                  | -30.24         | 292            | 140         | V        |
| 3      | *** 2.38996     | 19.99                | ADV | 32            | -23            | -3.1         | 25.89                      | 54                     | -28.11      | -                   | -              | 292            | 140         | V        |
| 4      | *** 2.37794     | 25.58                | ADV | 32            | -23.6          | -3.1         | 30.88                      | 54                     | -23.12      | -                   | -              | 292            | 140         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

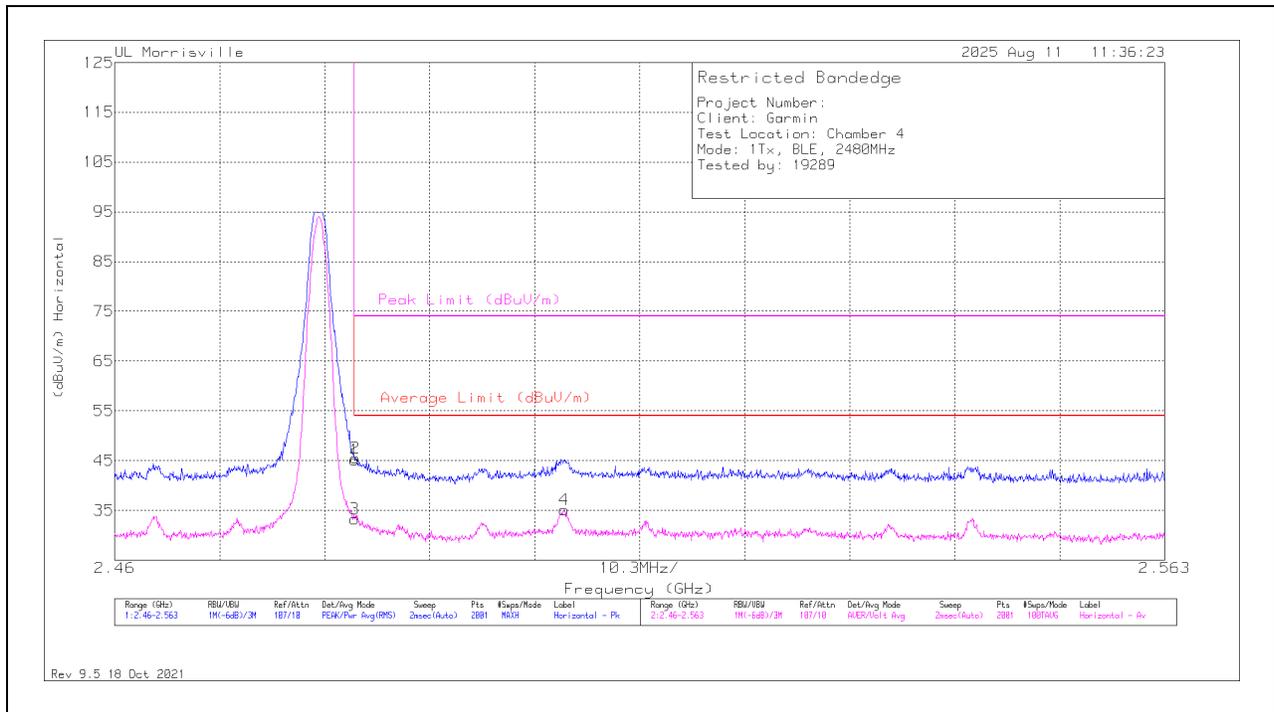
Pk - Peak detector

ADV - Linear Voltage Average

Note: Order number is 15972923

**BANDEDGE (HIGH CHANNEL, 2480MHz)**

**HORIZONTAL RESULT**

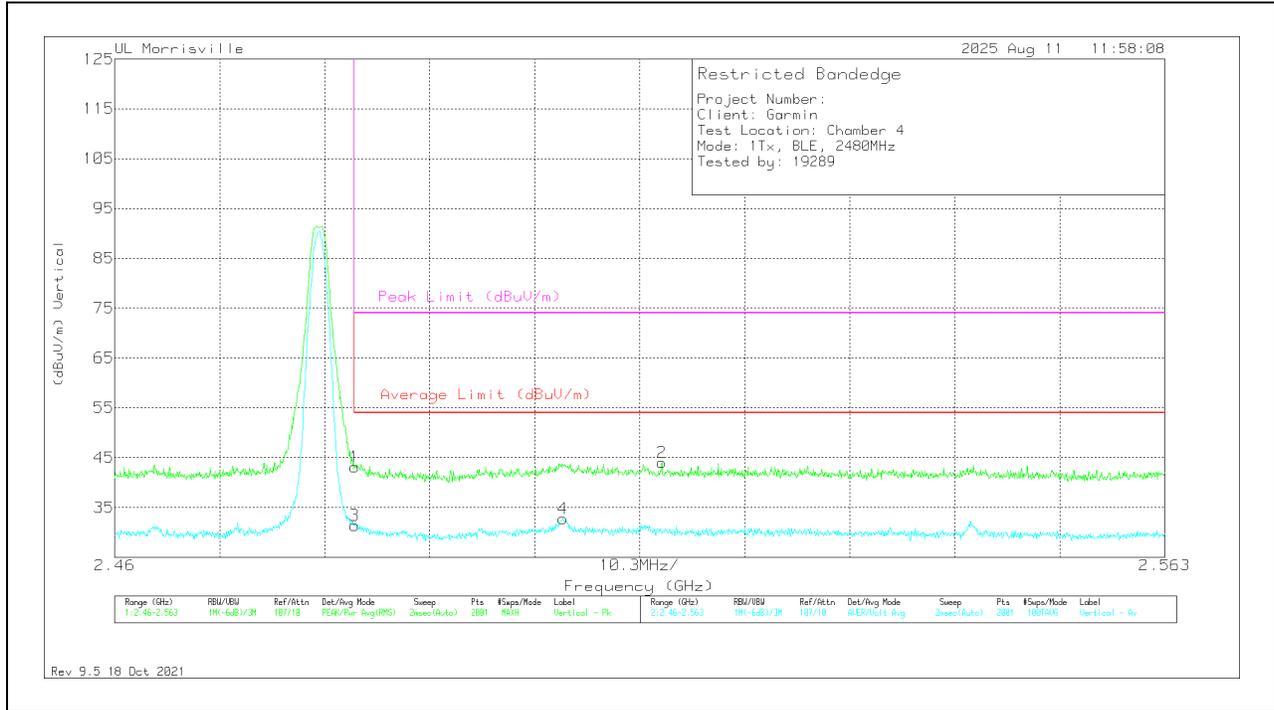


| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * ** 2.48354    | 36.04                | Pk  | 32.3          | -23.2          | 0            | 45.14                      | -                      | -           | 74                  | -28.86         | 87             | 122         | H        |
| 2      | * ** 2.48359    | 36.47                | Pk  | 32.3          | -23.2          | 0            | 45.57                      | -                      | -           | 74                  | -28.43         | 87             | 122         | H        |
| 3      | * ** 2.48354    | 24.11                | ADV | 32.3          | -23.2          | -3.1         | 30.11                      | 54                     | -23.89      | -                   | -              | 87             | 122         | H        |
| 4      | ** 2.50408      | 24.93                | ADV | 32.4          | -22.2          | -3.1         | 32.03                      | 54                     | -21.97      | -                   | -              | 87             | 122         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 \*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band  
 Pk - Peak detector  
 ADV - Linear Voltage Average

Note: Order number is 15972923

### VERTICAL RESULT



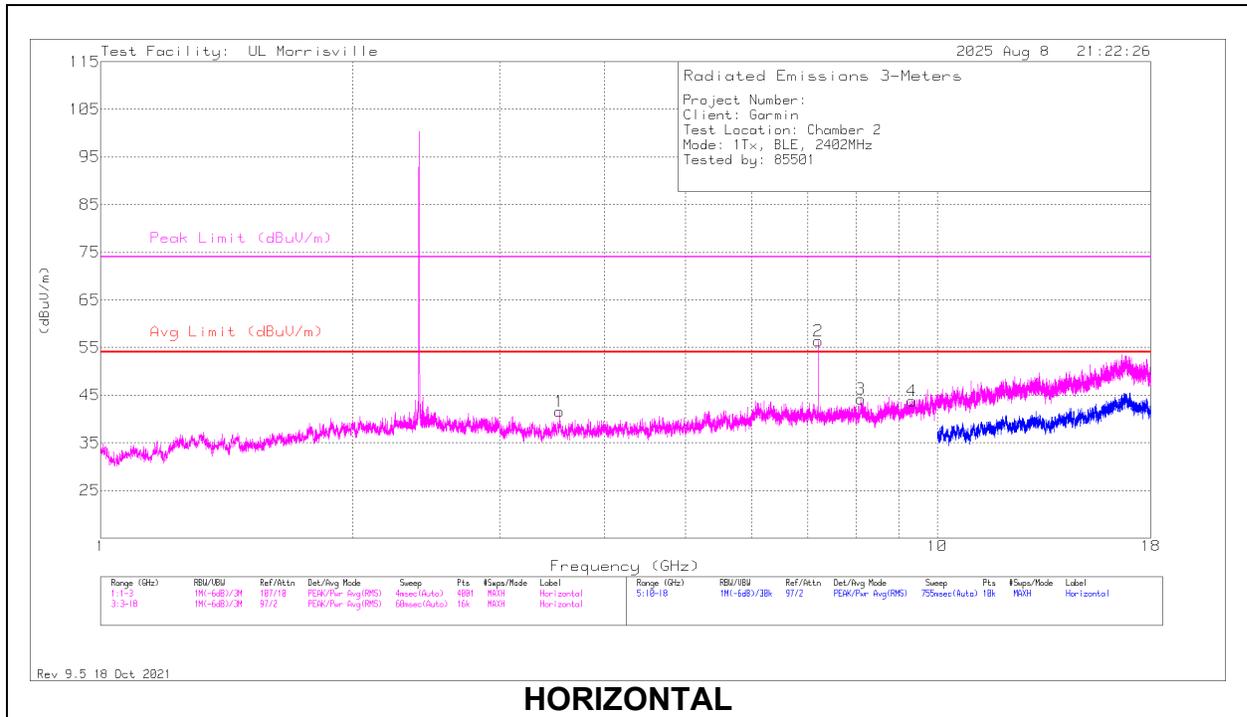
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * ** 2.48354    | 34.02                | Pk  | 32.3          | -23.2          | 0            | 43.12                      | -                      | -           | 74                  | -30.88         | 340            | 112         | V        |
| 2      | ** 2.51366      | 34.39                | Pk  | 32.4          | -22.8          | 0            | 43.99                      | -                      | -           | 74                  | -30.01         | 340            | 112         | V        |
| 3      | * ** 2.48354    | 22.29                | ADV | 32.3          | -23.2          | -3.1         | 28.29                      | 54                     | -25.71      | -                   | -              | 340            | 112         | V        |
| 4      | ** 2.50398      | 22.59                | ADV | 32.4          | -22.2          | -3.1         | 29.69                      | 54                     | -24.31      | -                   | -              | 340            | 112         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 \*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band  
 Pk - Peak detector  
 ADV - Linear Voltage Average

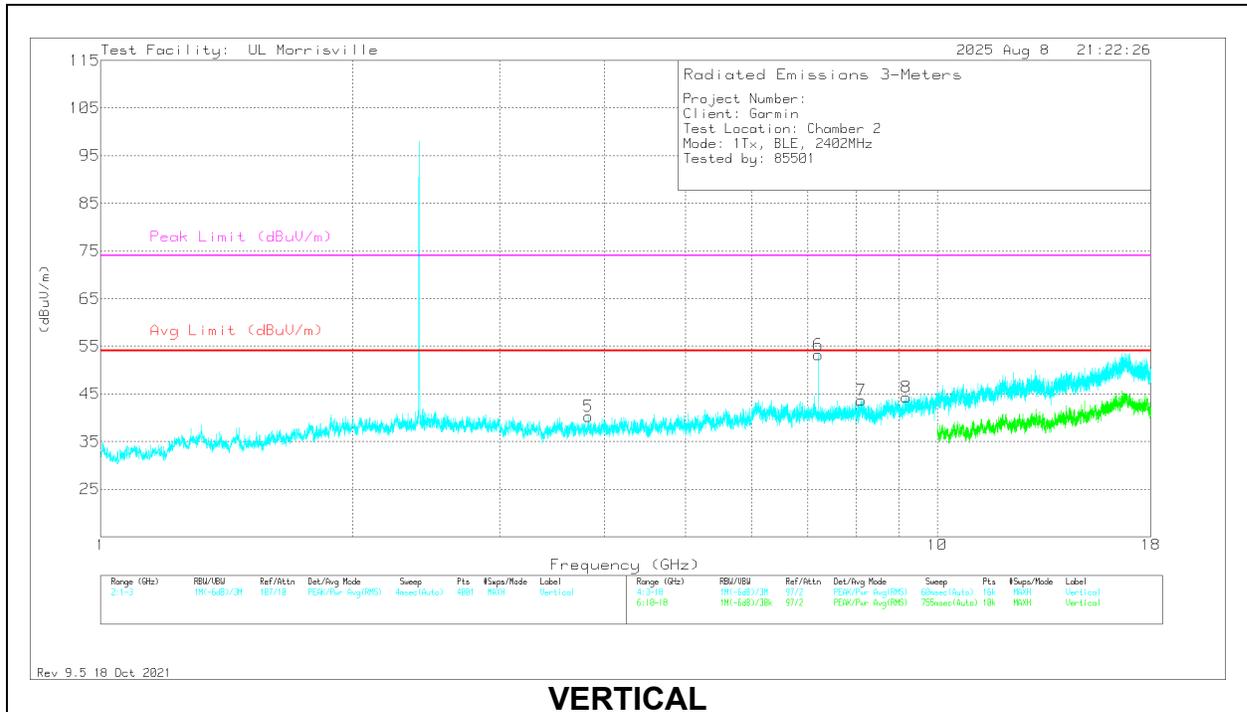
Note: Order number is 15972923

# HARMONICS AND SPURIOUS EMISSIONS

## LOW CHANNEL



**HORIZONTAL**



**VERTICAL**

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 88761 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|----------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * ** 3.53719    | 53.32                | Pk  | 33.1         | -44.9          | 41.52                      | 54                 | -12.48      | 74                  | -32.48         | 0-360          | 199         | H        |
| 3      | * ** 8.10844    | 49.74                | Pk  | 35.7         | -41.2          | 44.24                      | 54                 | -9.76       | 74                  | -29.76         | 0-360          | 101         | H        |
| 4      | * ** 9.32719    | 48.86                | Pk  | 36.5         | -41.6          | 43.76                      | 54                 | -10.24      | 74                  | -30.24         | 0-360          | 199         | H        |
| 5      | * ** 3.82969    | 52.36                | Pk  | 33.4         | -45.5          | 40.26                      | 54                 | -13.74      | 74                  | -33.74         | 0-360          | 199         | V        |
| 7      | * ** 8.11688    | 49.07                | Pk  | 35.8         | -41.2          | 43.67                      | 54                 | -10.33      | 74                  | -30.33         | 0-360          | 101         | V        |
| 8      | * ** 9.19031    | 48.64                | Pk  | 36.4         | -40.7          | 44.34                      | 54                 | -9.66       | 74                  | -29.66         | 0-360          | 199         | V        |
| 6      | 7.20469         | 60.28                | Pk  | 35.5         | -42.6          | 53.18                      | -                  | -           | -                   | -              | 0-360          | 101         | V        |
| 2      | 7.20656         | 63.51                | Pk  | 35.5         | -42.6          | 56.41                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |

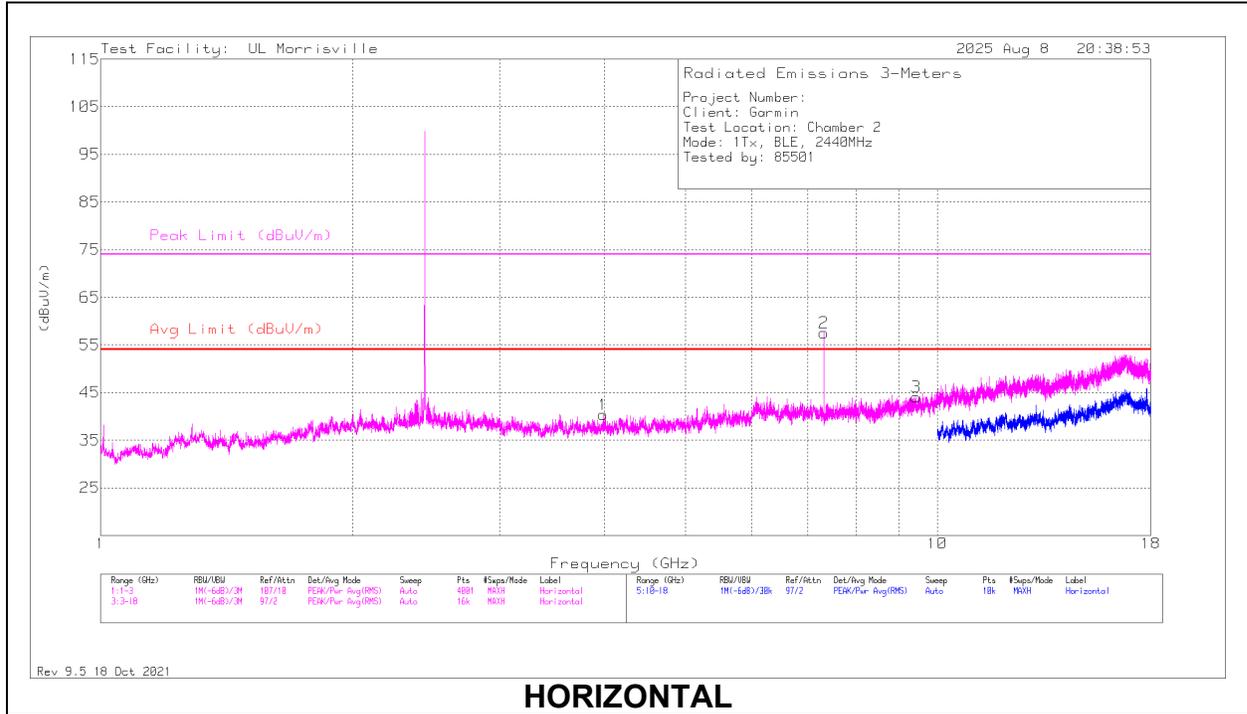
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

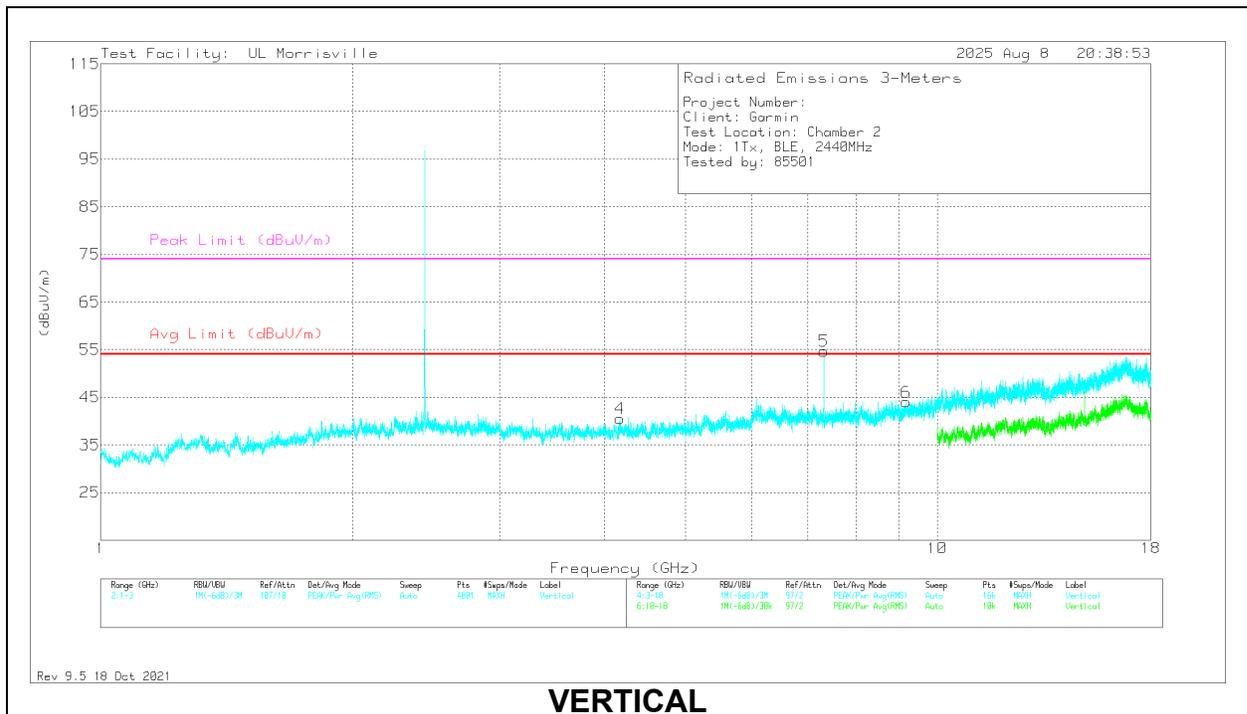
Pk - Peak detector

Note: Order number is 15972923

### MID CHANNEL



### HORIZONTAL



### VERTICAL

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 88761 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|----------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * ** 3.98625    | 53.03                | Pk  | 33.4         | -46.1          | 0            | 40.33                      | 54                 | -13.67      | 74                  | -33.67         | 0-360          | 200         | H        |
| 2      | * ** 7.31928    | 67.29                | PK2 | 35.6         | -43.2          | 0            | 59.69                      | -                  | -           | 74                  | -14.31         | 290            | 316         | H        |
|        | * ** 7.3206     | 61.9                 | ADV | 35.6         | -43.3          | -3.1         | 51.1                       | 54                 | -2.9        | -                   | -              | 290            | 316         | H        |
| 3      | * ** 9.43594    | 49.14                | Pk  | 36.6         | -41.7          | 0            | 44.04                      | 54                 | -9.96       | 74                  | -29.96         | 0-360          | 200         | H        |
| 4      | * ** 4.17844    | 53.49                | Pk  | 33.3         | -46.3          | 0            | 40.49                      | 54                 | -13.51      | 74                  | -33.51         | 0-360          | 101         | V        |
| 5      | * ** 7.31922    | 61.74                | PK2 | 35.6         | -43.2          | 0            | 54.14                      | -                  | -           | 74                  | -19.86         | 359            | 294         | V        |
|        | * ** 7.32068    | 55.16                | ADV | 35.6         | -43.3          | -3.1         | 44.36                      | 54                 | -9.64       | -                   | -              | 359            | 294         | V        |
| 6      | * ** 9.17719    | 48.39                | Pk  | 36.3         | -40.7          | 0            | 43.99                      | 54                 | -10.01      | 74                  | -30.01         | 0-360          | 199         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

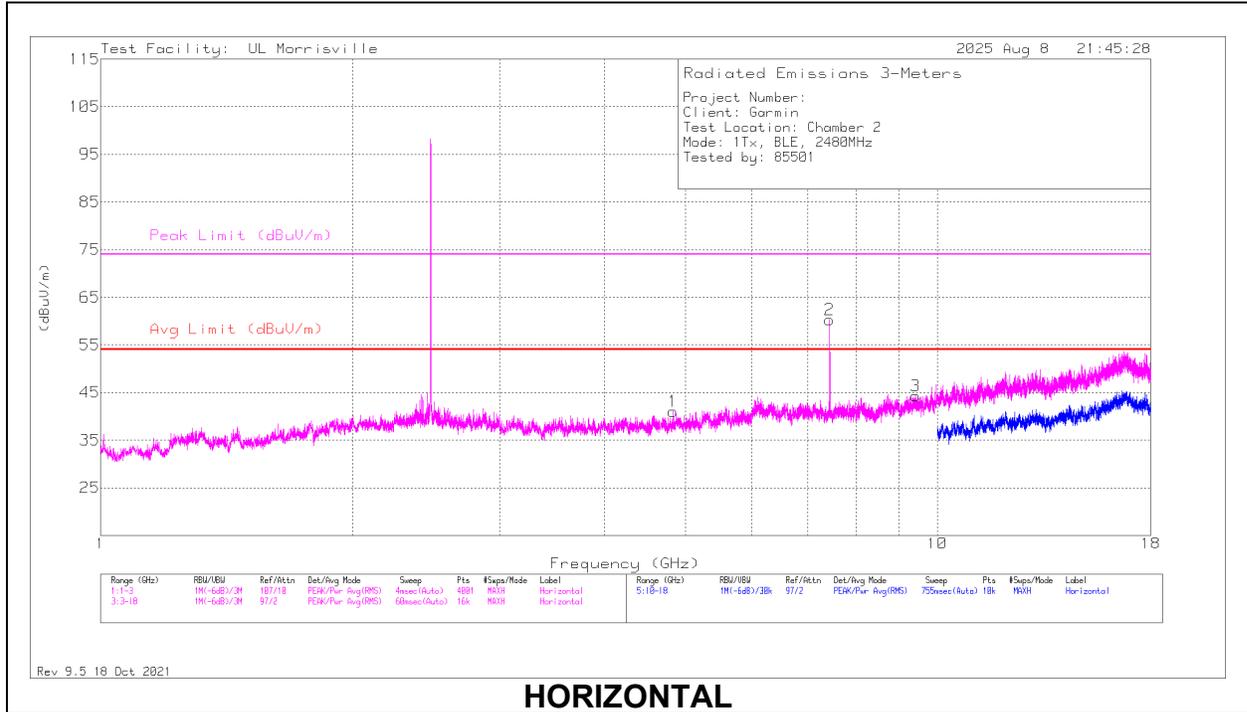
Pk - Peak detector

PK2 - Maximum Peak

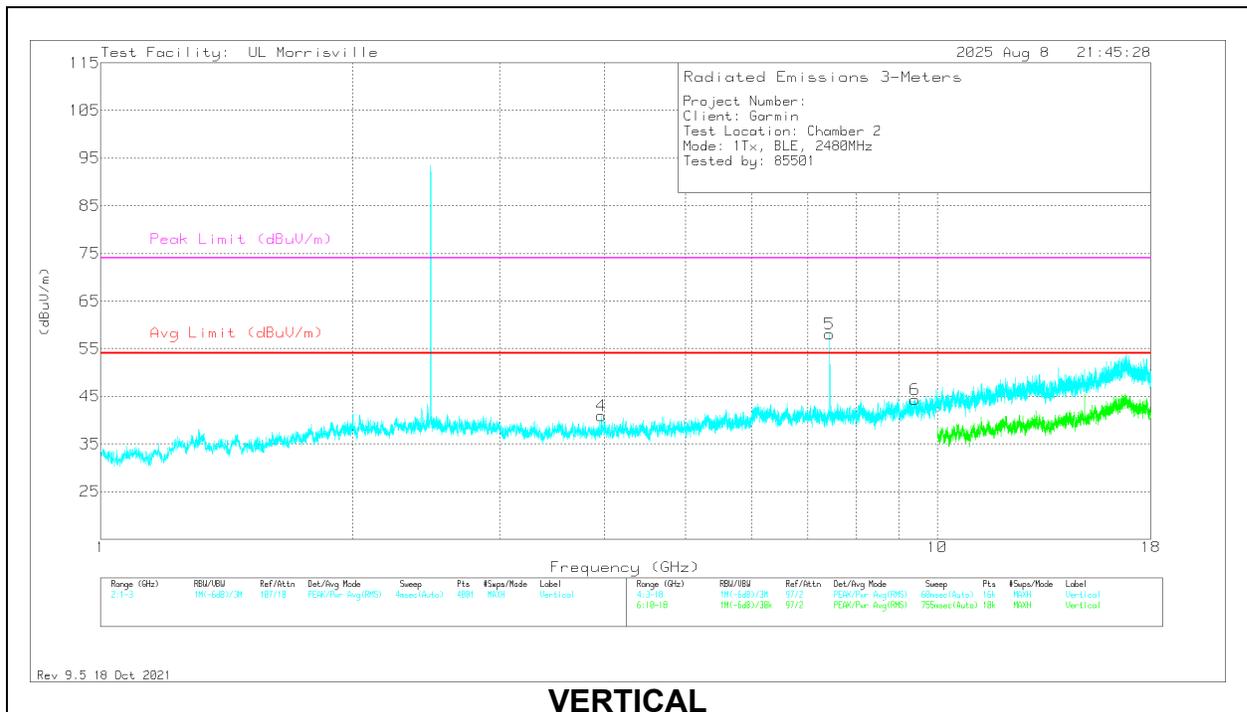
ADV - Linear Voltage Average

Note: Order number is 15972923

### HIGH CHANNEL



### HORIZONTAL



### VERTICAL

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 88761 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|----------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * ** 4.83281    | 51.94                | Pk  | 34.1         | -45            | 0            | 41.04                      | 54                 | -12.96      | 74                  | -32.96         | 0-360          | 200         | H        |
| 2      | * ** 7.43931    | 68.34                | PK2 | 35.6         | -42.5          | 0            | 61.44                      | -                  | -           | 74                  | -12.56         | 291            | 315         | H        |
|        | * ** 7.44063    | 62.54                | ADV | 35.6         | -42.6          | -3.1         | 52.44                      | 54                 | -1.56       | -                   | -              | 291            | 315         | H        |
| 3      | * ** 9.4275     | 49.17                | Pk  | 36.6         | -41.4          | 0            | 44.37                      | 54                 | -9.63       | 74                  | -29.63         | 0-360          | 101         | H        |
| 4      | * ** 3.96938    | 53.72                | Pk  | 33.3         | -46.1          | 0            | 40.92                      | 54                 | -13.08      | 74                  | -33.08         | 0-360          | 101         | V        |
| 5      | * ** 7.43921    | 62.48                | PK2 | 35.6         | -42.5          | 0            | 55.58                      | -                  | -           | 74                  | -18.42         | 360            | 283         | V        |
|        | * ** 7.44062    | 56.29                | ADV | 35.6         | -42.6          | -3.1         | 46.19                      | 54                 | -7.81       | -                   | -              | 360            | 283         | V        |
| 6      | * ** 9.40313    | 48.45                | Pk  | 36.6         | -40.7          | 0            | 44.35                      | 54                 | -9.65       | 74                  | -29.65         | 0-360          | 199         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

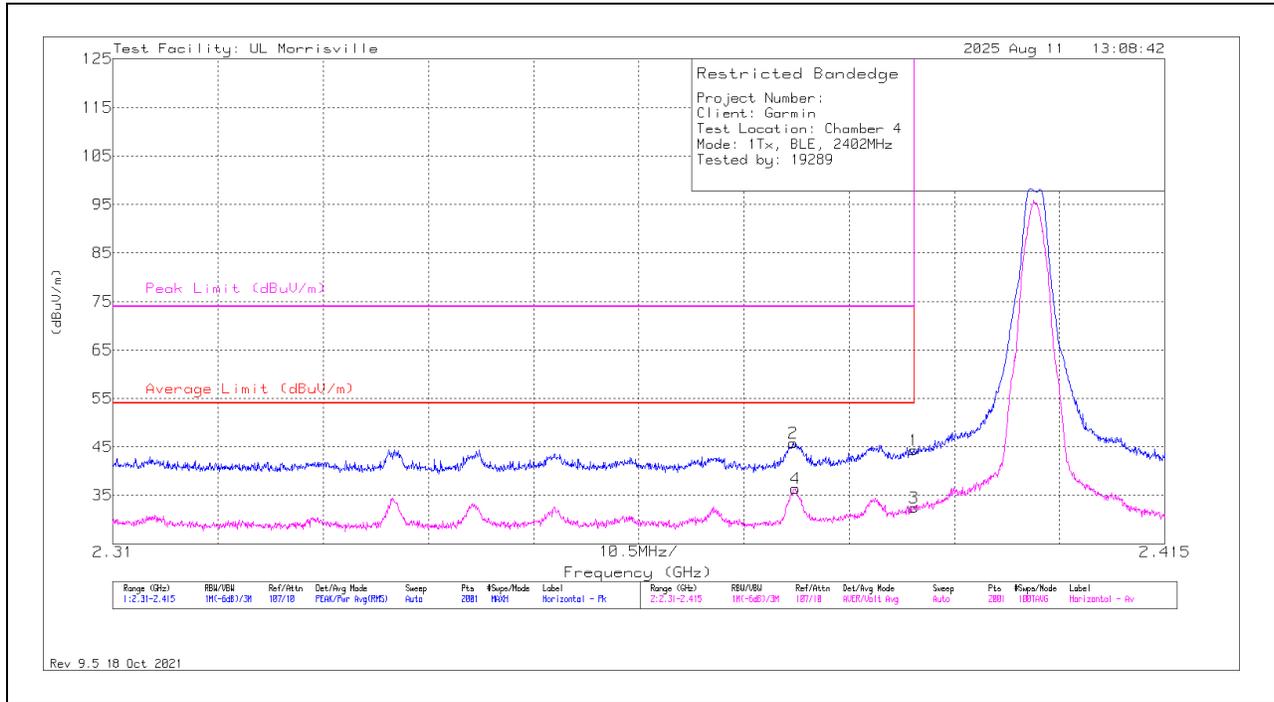
ADV - Linear Voltage Average

Note: Order number is 15972923

### 10.1.2. TX ABOVE 1 GHz BLE 2Mbps MODE IN THE 2.4 GHz BAND

#### BANDEDGE (LOW CHANNEL, 2402MHz)

#### HORIZONTAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | *** 2.38996     | 35.37                | Pk  | 32            | -23            | 0            | 44.37                      | -                      | -           | 74                  | -29.63         | 66             | 139         | H        |
| 2      | *** 2.37788     | 37.41                | Pk  | 32            | -23.6          | 0            | 45.81                      | -                      | -           | 74                  | -28.19         | 66             | 139         | H        |
| 3      | *** 2.38996     | 23.48                | ADV | 32            | -23            | -3.1         | 29.38                      | 54                     | -24.62      | -                   | -              | 66             | 139         | H        |
| 4      | *** 2.37815     | 28.02                | ADV | 32            | -23.6          | -3.1         | 33.32                      | 54                     | -20.68      | -                   | -              | 66             | 139         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

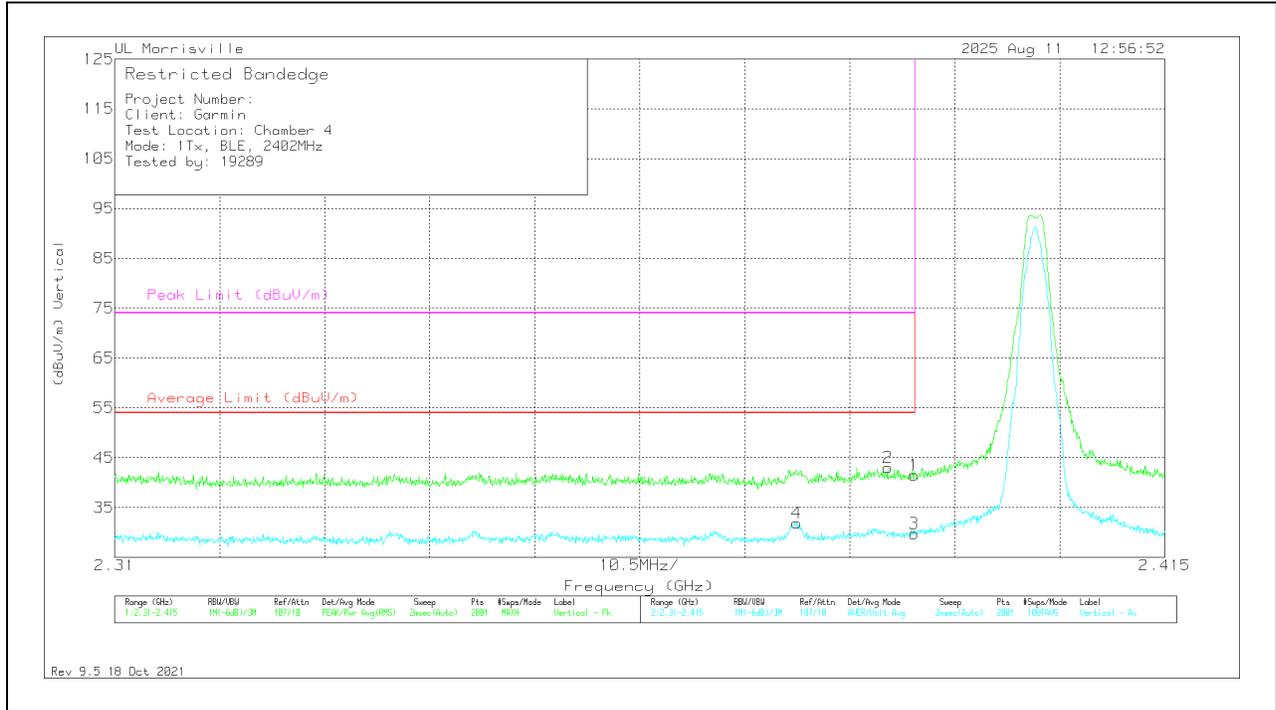
\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK - Peak detector

ADV - Linear Voltage Average

Note: Order number is 15972923

### VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * ** 2.38996    | 32.49                | Pk  | 32            | -23            | 0            | 41.49                      | -                      | -           | 74                  | -32.51         | 294            | 152         | V        |
| 2      | * ** 2.38728    | 33.96                | Pk  | 32            | -22.9          | 0            | 43.06                      | -                      | -           | 74                  | -30.94         | 294            | 152         | V        |
| 3      | * ** 2.38996    | 20.72                | ADV | 32            | -23            | -3.1         | 26.62                      | 54                     | -27.38      | -                   | -              | 294            | 152         | V        |
| 4      | * ** 2.3782     | 23.49                | ADV | 32            | -23.6          | -3.1         | 28.79                      | 54                     | -25.21      | -                   | -              | 294            | 152         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

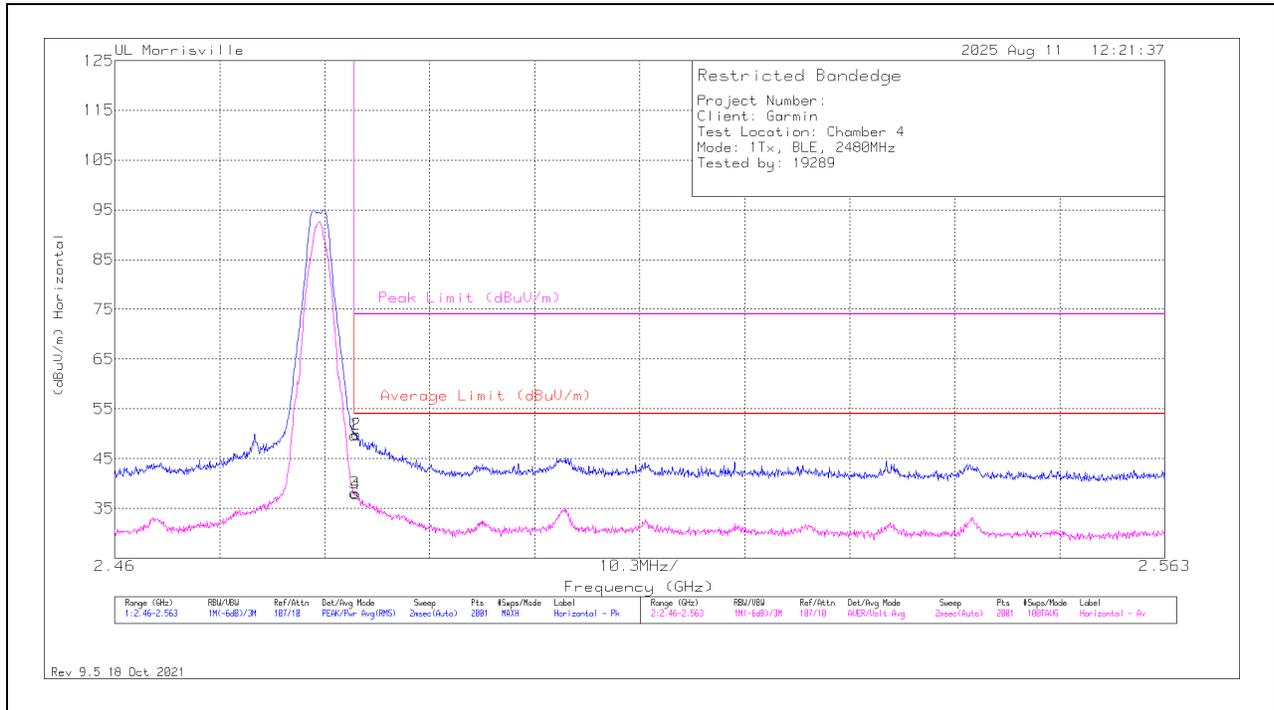
Pk - Peak detector

ADV - Linear Voltage Average

Note: Order number is 15972923

**BANDEDGE (HIGH CHANNEL, 2480MHz)**

**HORIZONTAL RESULT**



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | *** 2.48354     | 40.52                | Pk  | 32.3          | -23.2          | 0            | 49.62                      | -                      | -           | 74                  | -24.38         | 89             | 121         | H        |
| 2      | *** 2.48369     | 40.79                | Pk  | 32.3          | -23.2          | 0            | 49.89                      | -                      | -           | 74                  | -24.11         | 89             | 121         | H        |
| 3      | *** 2.48354     | 29.04                | ADV | 32.3          | -23.2          | -3.1         | 35.04                      | 54                     | -18.96      | -                   | -              | 89             | 121         | H        |
| 4      | *** 2.48364     | 28.74                | ADV | 32.3          | -23.2          | -3.1         | 34.74                      | 54                     | -19.26      | -                   | -              | 89             | 121         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

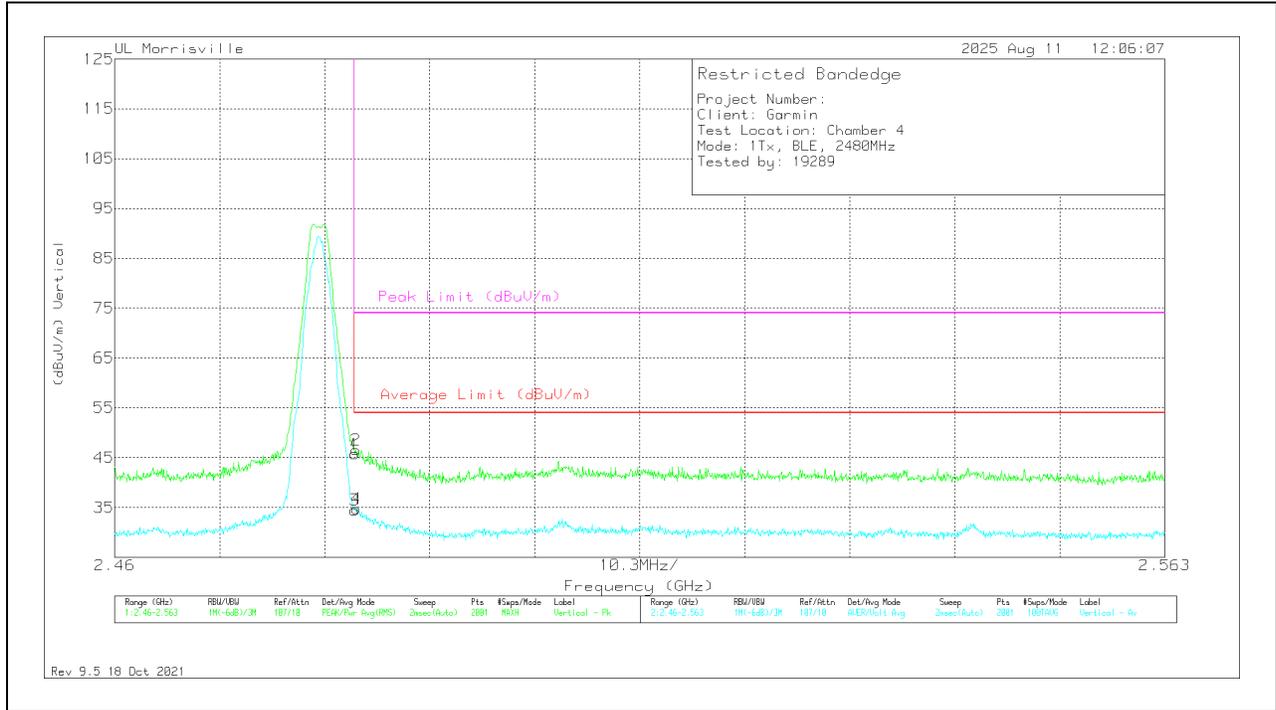
\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

Note: Order number is 15972923

### VERTICAL RESULT



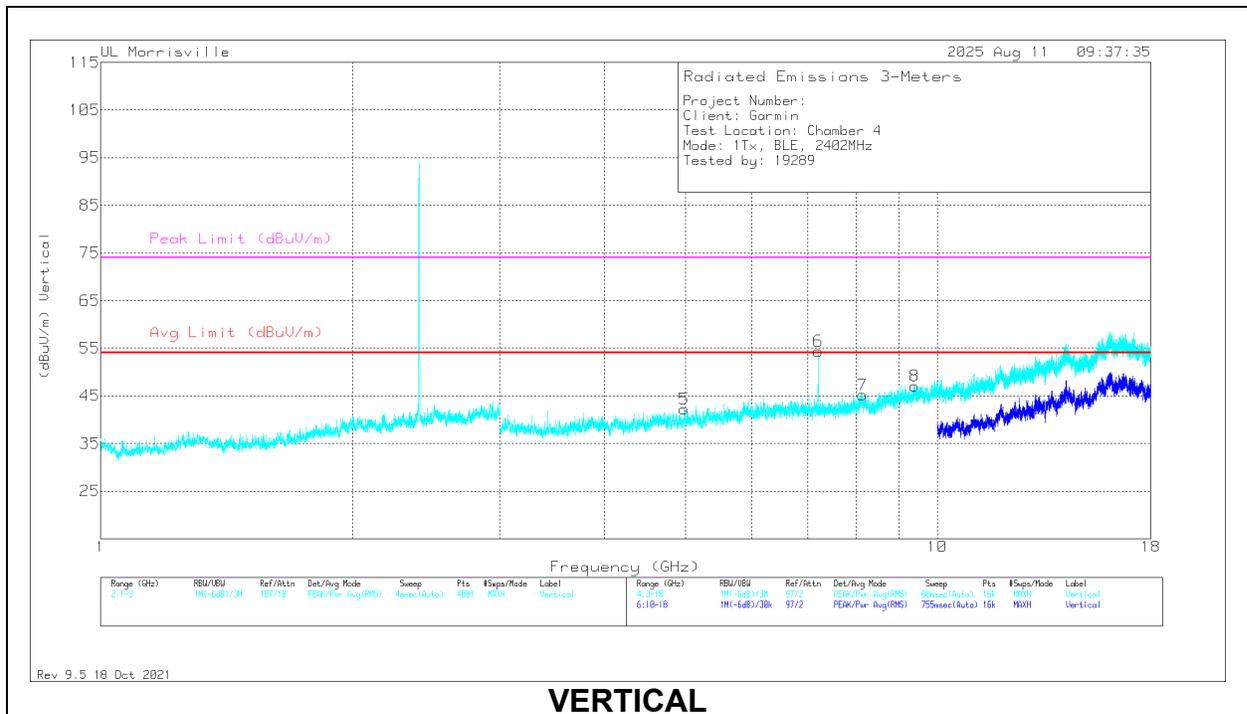
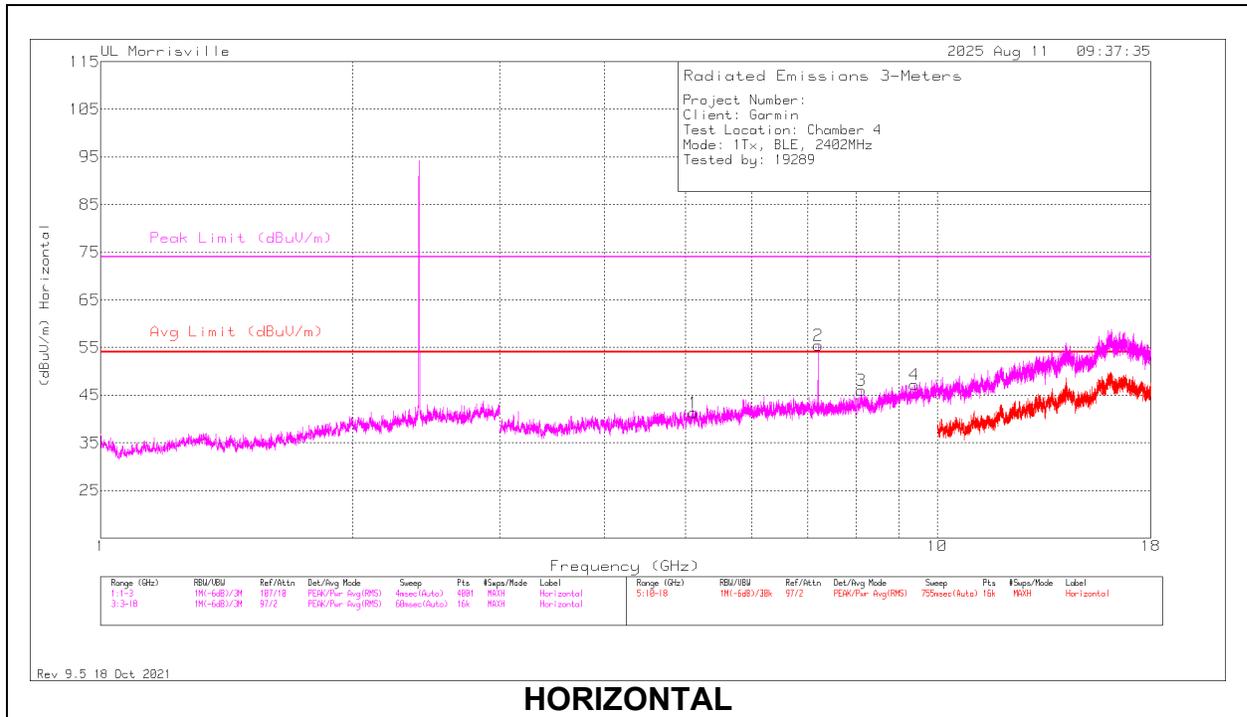
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * ** 2.48354    | 36.62                | Pk  | 32.3          | -23.2          | 0            | 45.72                      | -                      | -           | 74                  | -28.28         | 345            | 111         | V        |
| 2      | * ** 2.48364    | 37.48                | Pk  | 32.3          | -23.2          | 0            | 46.58                      | -                      | -           | 74                  | -27.42         | 345            | 111         | V        |
| 3      | * ** 2.48354    | 25.39                | ADV | 32.3          | -23.2          | -3.1         | 31.39                      | 54                     | -22.61      | -                   | -              | 345            | 111         | V        |
| 4      | * ** 2.48369    | 25.63                | ADV | 32.3          | -23.2          | -3.1         | 31.63                      | 54                     | -22.37      | -                   | -              | 345            | 111         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 \*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band  
 Pk - Peak detector  
 ADV - Linear Voltage Average

Note: Order number is 15972923

# HARMONICS AND SPURIOUS EMISSIONS

## LOW CHANNEL



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * ** 5.11406    | 38.91                | Pk  | 34.2          | -31.8          | 41.31                      | 54                 | -12.69      | 74                  | -32.69         | 0-360          | 100         | H        |
| 3      | * ** 8.115      | 37.17                | Pk  | 35.6          | -26.7          | 46.07                      | 54                 | -7.93       | 74                  | -27.93         | 0-360          | 100         | H        |
| 4      | * ** 9.38438    | 35.75                | Pk  | 36.5          | -25.1          | 47.15                      | 54                 | -6.85       | 74                  | -26.85         | 0-360          | 100         | H        |
| 5      | * ** 4.98563    | 39.47                | Pk  | 33.9          | -31.1          | 42.27                      | 54                 | -11.73      | 74                  | -31.73         | 0-360          | 200         | V        |
| 7      | * ** 8.14688    | 36.38                | Pk  | 35.6          | -26.8          | 45.18                      | 54                 | -8.82       | 74                  | -28.82         | 0-360          | 200         | V        |
| 8      | * ** 9.39844    | 34.61                | Pk  | 36.5          | -24            | 47.11                      | 54                 | -6.89       | 74                  | -26.89         | 0-360          | 200         | V        |
| 2      | 7.2075          | 48.31                | Pk  | 35.5          | -28.4          | 55.41                      | -                  | -           | -                   | -              | 0-360          | 100         | H        |
| 6      | 7.2075          | 47.25                | Pk  | 35.5          | -28.4          | 54.35                      | -                  | -           | -                   | -              | 0-360          | 200         | V        |

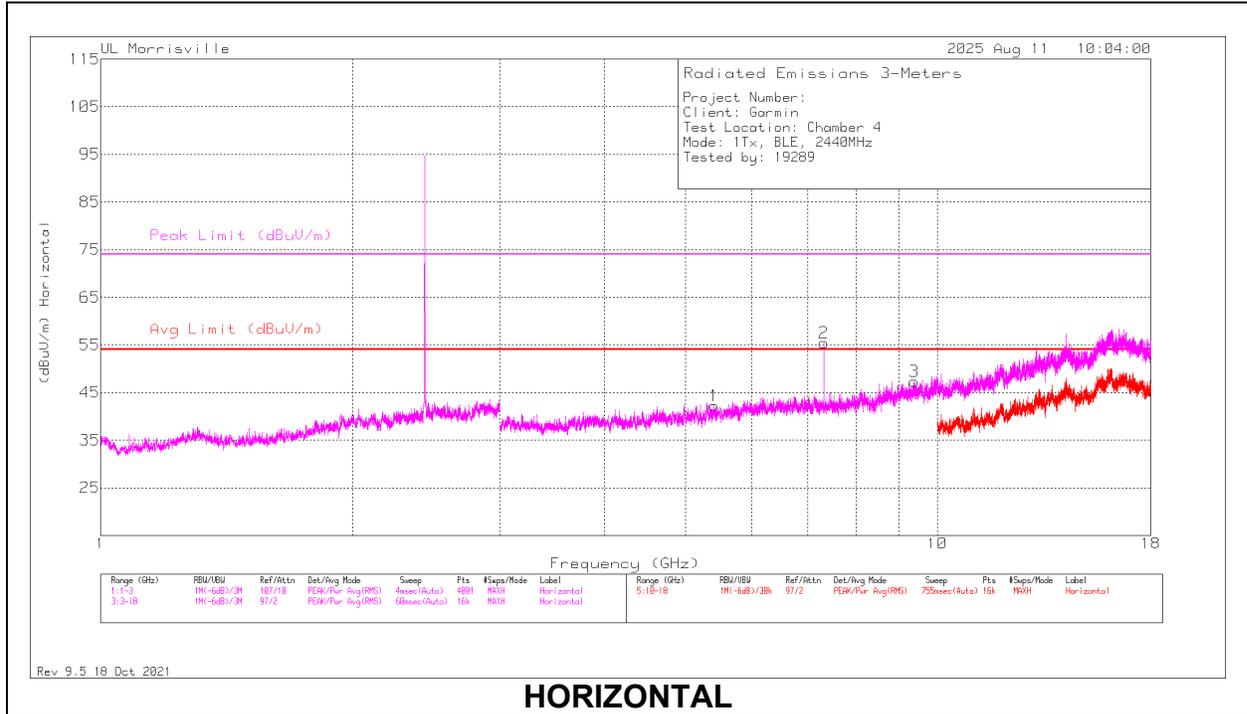
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

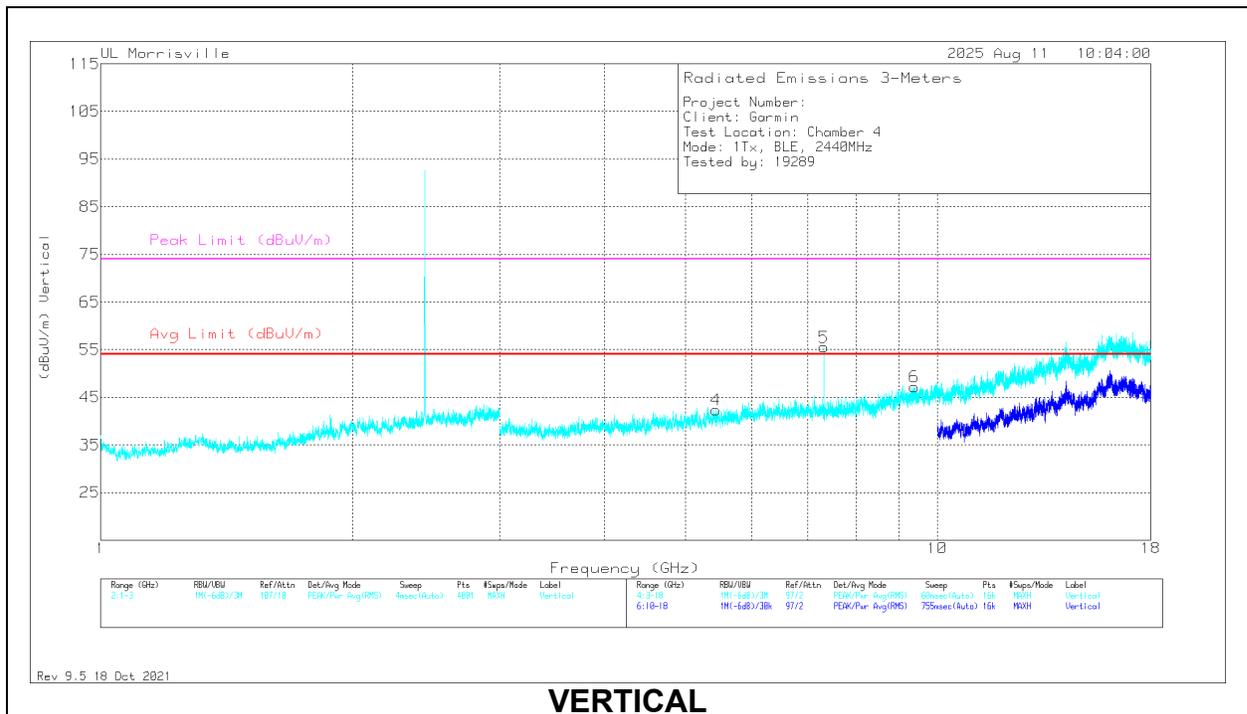
Pk - Peak detector

Note: Order number is 15972923

### MID CHANNEL



### HORIZONTAL



### VERTICAL

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * ** 5.41125    | 38.18                | Pk  | 34.4          | -30.3          | 0            | 42.28                      | 54                 | -11.72      | 74                  | -31.72         | 0-360          | 100         | H        |
| 2      | * ** 7.32148    | 50.76                | PK2 | 35.5          | -28.5          | 0            | 57.76                      | -                  | -           | 74                  | -16.24         | 202            | 155         | H        |
|        | * ** 7.31871    | 43.71                | ADV | 35.5          | -28.4          | -3.1         | 47.71                      | 54                 | -6.29       | -                   | -              | 202            | 155         | H        |
| 3      | * ** 9.39375    | 35.18                | Pk  | 36.5          | -24.4          | 0            | 47.28                      | 54                 | -6.72       | 74                  | -26.72         | 0-360          | 100         | H        |
| 4      | * ** 5.43938    | 38.68                | Pk  | 34.4          | -30.7          | 0            | 42.38                      | 54                 | -11.62      | 74                  | -31.62         | 0-360          | 200         | V        |
| 5      | * ** 7.31855    | 50.09                | PK2 | 35.5          | -28.4          | 0            | 57.19                      | -                  | -           | 74                  | -16.81         | 193            | 111         | V        |
|        | * ** 7.31874    | 42.96                | ADV | 35.5          | -28.4          | -3.1         | 46.96                      | 54                 | -7.04       | -                   | -              | 193            | 111         | V        |
| 6      | * ** 9.39375    | 35.11                | Pk  | 36.5          | -24.4          | 0            | 47.21                      | 54                 | -6.79       | 74                  | -26.79         | 0-360          | 200         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

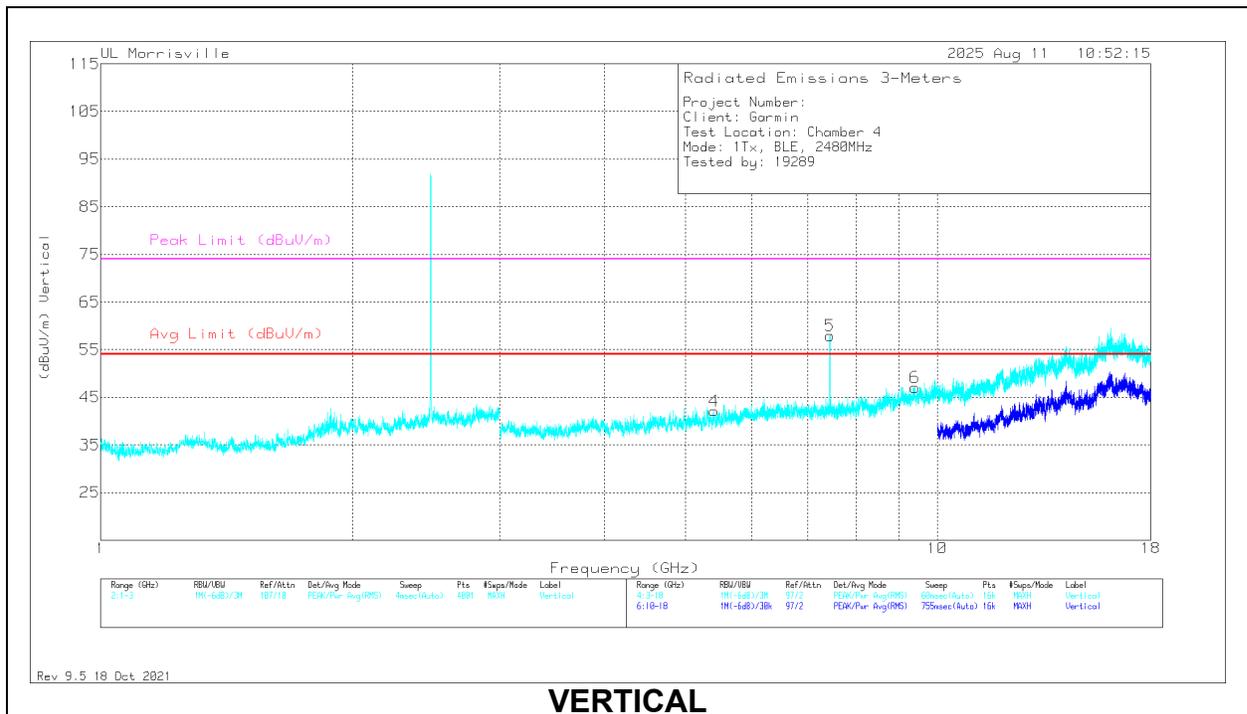
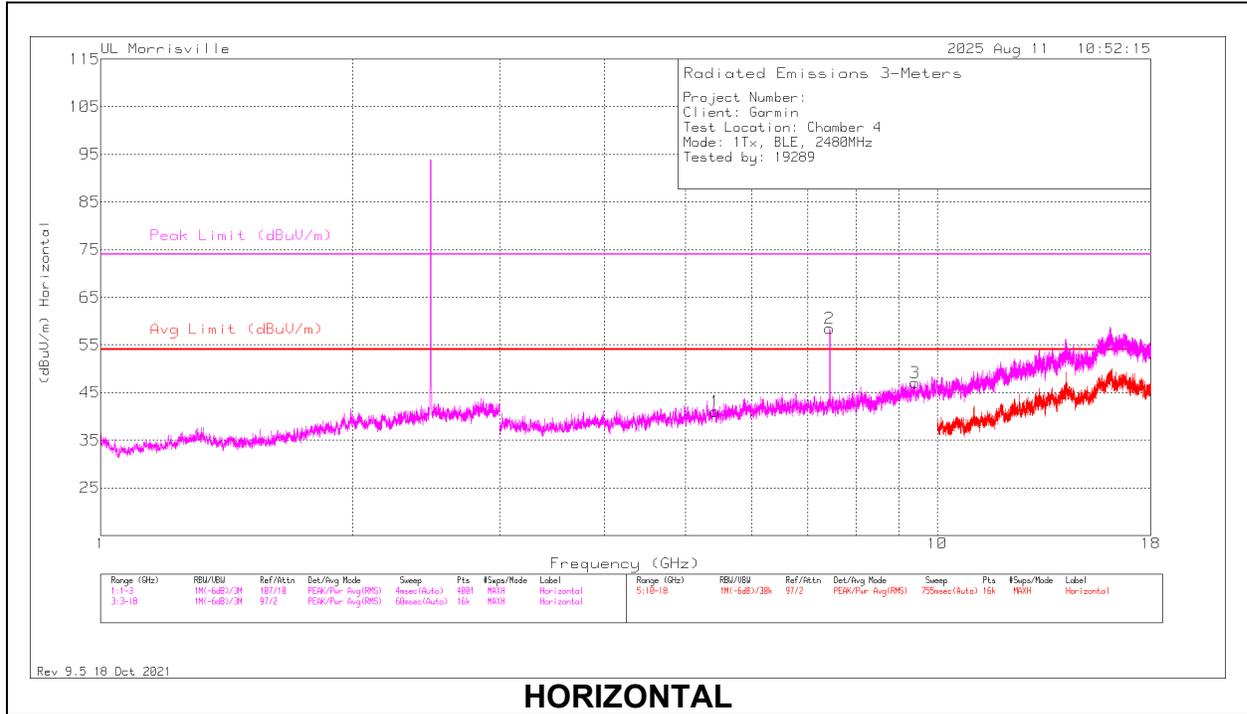
Pk - Peak detector

PK2 - Maximum Peak

ADV - Linear Voltage Average

Note: Order number is 15972923

### HIGH CHANNEL



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|----------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | *** 5.43375     | 37.72                | Pk  | 34.4          | -31.1          | 0            | 41.02                      | 54                 | -12.98      | 74                  | -32.98         | 0-360          | 100         | H        |
| 2      | *** 7.44157     | 52.34                | PK2 | 35.6          | -28.1          | 0            | 59.84                      | -                  | -           | 74                  | -14.16         | 202            | 142         | H        |
|        | *** 7.44124     | 45.66                | ADV | 35.6          | -28.1          | -3.1         | 50.06                      | 54                 | -3.94       | -                   | -              | 202            | 142         | H        |
| 3      | *** 9.4125      | 35.39                | Pk  | 36.5          | -24.8          | 0            | 47.09                      | 54                 | -6.91       | 74                  | -26.91         | 0-360          | 100         | H        |
| 4      | *** 5.41313     | 38.05                | Pk  | 34.4          | -30.3          | 0            | 42.15                      | 54                 | -11.85      | 74                  | -31.85         | 0-360          | 200         | V        |
| 5      | *** 7.44147     | 52.55                | PK2 | 35.6          | -28.1          | 0            | 60.05                      | -                  | -           | 74                  | -13.95         | 204            | 113         | V        |
|        | *** 7.44135     | 46.11                | ADV | 35.6          | -28.1          | -3.1         | 50.51                      | 54                 | -3.49       | -                   | -              | 204            | 113         | V        |
| 6      | *** 9.40594     | 34.66                | Pk  | 36.5          | -24.1          | 0            | 47.06                      | 54                 | -6.94       | 74                  | -26.94         | 0-360          | 200         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

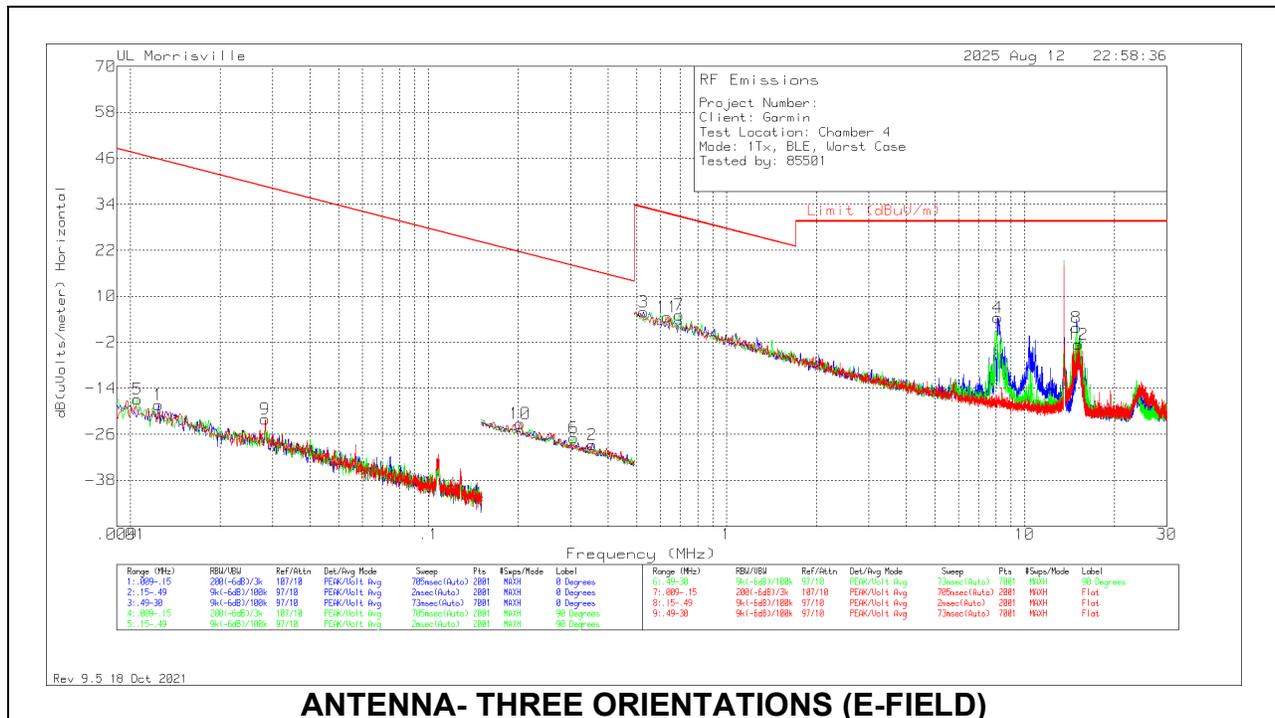
ADV - Linear Voltage Average

Note: Order number is 15972923

## 10.2. WORST CASE SPURIOUS BELOW 30MHZ

Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40\*Log (test distance / specification distance).

### 10.2.1. BLE

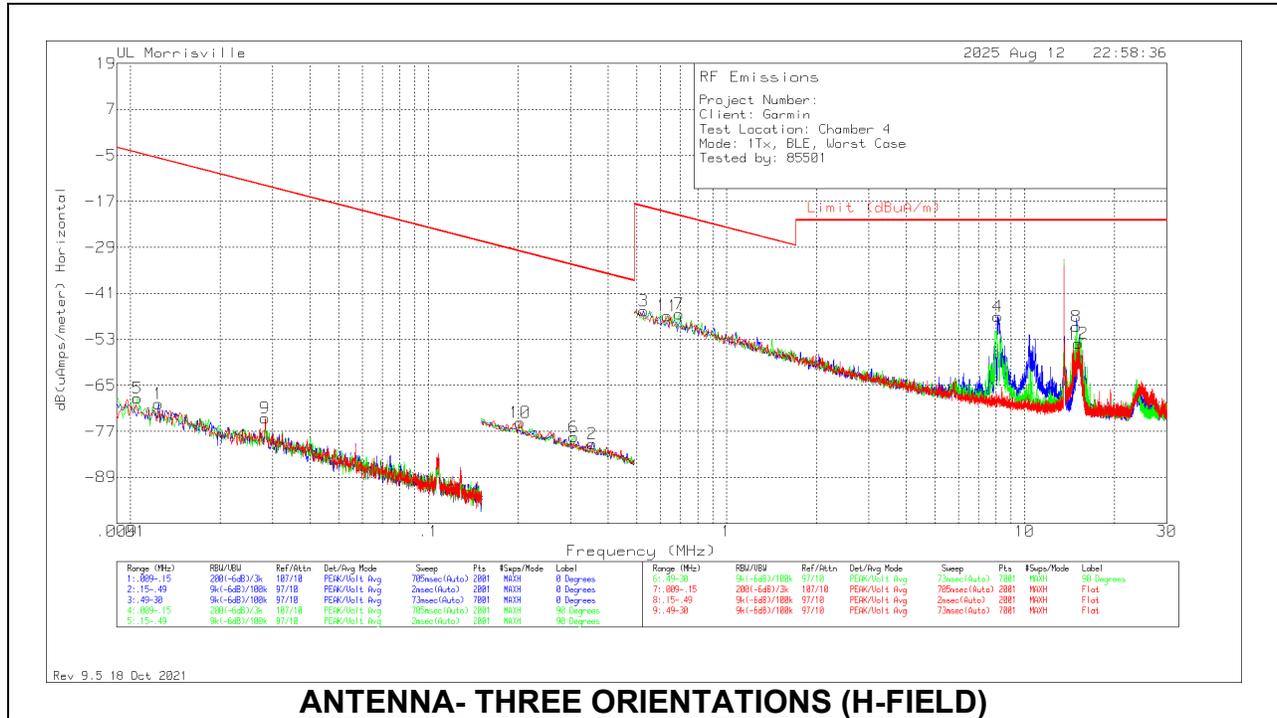


### ANTENNA- THREE ORIENTATIONS (E-FIELD)

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | ANT (dB/m) | Gain/Loss (dB) | Dist. Corr. Factor (dB) | Corrected Reading dB(uVolts/meter) | QP/AV Limit (dBuV/m) | PK Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Loop Angle |
|--------|-----------------|----------------------|-----|------------|----------------|-------------------------|------------------------------------|----------------------|-------------------|-------------|----------------|------------|
| 5      | .01056          | 44.47                | Pk  | 18.7       | 0              | -80                     | -16.83                             | 47.13                | 67.13             | -63.96      | 0-360          | 90 degs    |
| 1      | .01241          | 43.95                | Pk  | 17.7       | 0              | -80                     | -18.35                             | 45.73                | 65.73             | -64.08      | 0-360          | 0 degs     |
| 9      | .02831          | 44.67                | Pk  | 13.3       | 0              | -80                     | -22.03                             | 38.57                | 58.57             | -60.6       | 0-360          | Flat       |
| 10     | .20287          | 45.78                | Pk  | 10.9       | .1             | -80                     | -23.22                             | 21.46                | 41.46             | -44.68      | 0-360          | Flat       |
| 6      | .30683          | 41.99                | Pk  | 10.9       | .1             | -80                     | -27.01                             | 17.87                | 37.87             | -44.88      | 0-360          | 90 degs    |
| 2      | .354            | 40.32                | Pk  | 10.9       | .1             | -80                     | -28.68                             | 16.62                | 36.62             | -45.3       | 0-360          | 0 degs     |
| 3      | .52794          | 34.83                | Pk  | 11         | .1             | -40                     | 5.93                               | 33.15                | -                 | -27.22      | 0-360          | 0 degs     |
| 11     | .63334          | 33.49                | Pk  | 11         | .1             | -40                     | 4.59                               | 31.57                | -                 | -26.98      | 0-360          | Flat       |
| 7      | .69237          | 33.96                | Pk  | 11         | .1             | -40                     | 5.06                               | 30.8                 | -                 | -25.74      | 0-360          | 90 degs    |
| 4      | 8.11253         | 33.49                | Pk  | 10.7       | .3             | -40                     | 4.49                               | 29.54                | -                 | -25.05      | 0-360          | 0 degs     |
| 8      | 14.9298         | 30.9                 | Pk  | 10.6       | .4             | -40                     | 1.9                                | 29.54                | -                 | -27.64      | 0-360          | 90 degs    |
| 12     | 15.09844        | 26.6                 | Pk  | 10.5       | .4             | -40                     | -2.5                               | 29.54                | -                 | -32.04      | 0-360          | Flat       |

Pk - Peak detector

Note: Order number is 15972923



**ANTENNA- THREE ORIENTATIONS (H-FIELD)**

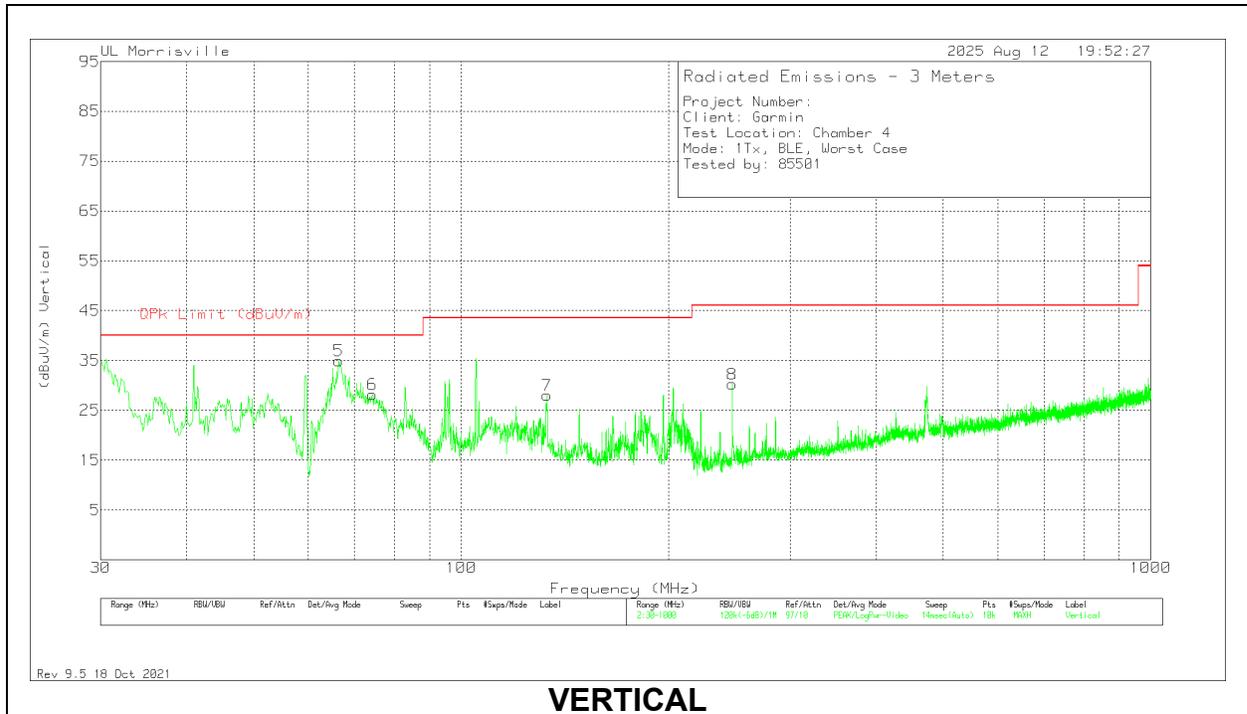
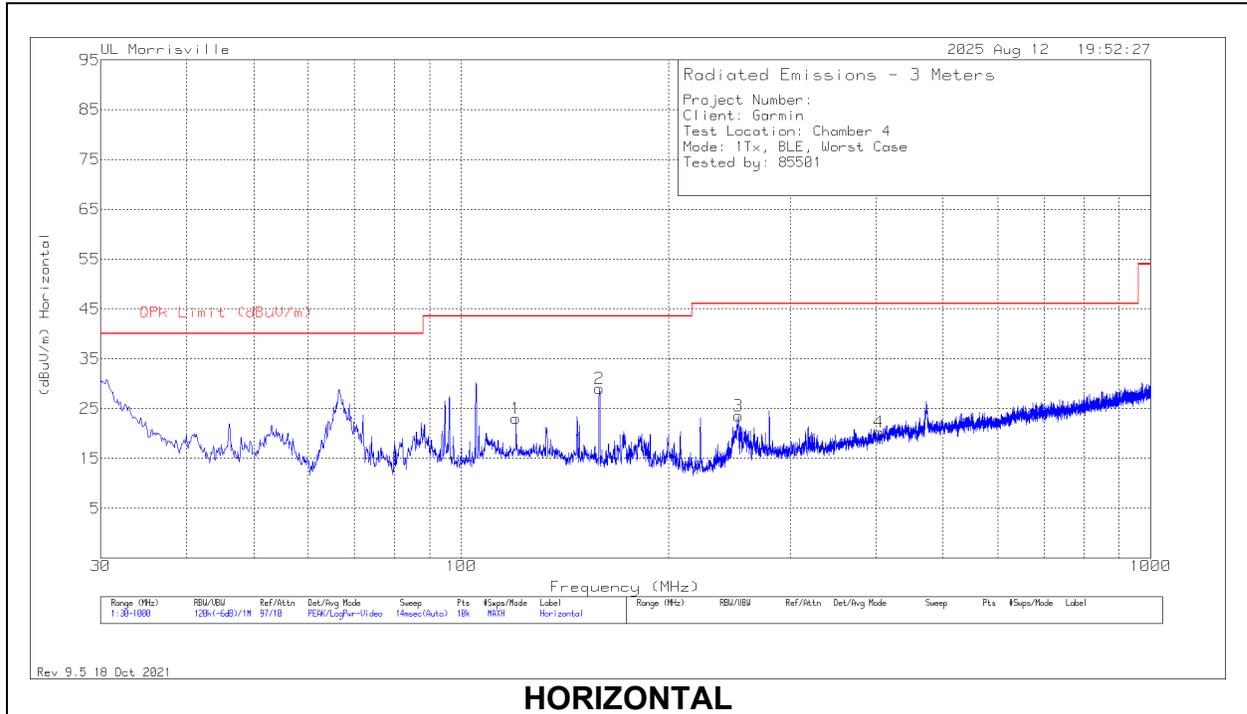
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | ANT (dB/m) | Gain/Loss (dB) | Dist. Corr. Factor (dB) | Corrected Reading dB(uAmps/meter) | QP/AV Limit (dBuA/m) | PK Limit (dBuA/m) | Margin (dB) | Azimuth (Degs) | Loop Angle |
|--------|-----------------|----------------------|-----|------------|----------------|-------------------------|-----------------------------------|----------------------|-------------------|-------------|----------------|------------|
| 5      | .01056          | 44.47                | Pk  | -32.8      | 0              | -80                     | -68.33                            | -4.37                | 15.63             | -63.96      | 0-360          | 90 degs    |
| 1      | .01241          | 43.95                | Pk  | -33.8      | 0              | -80                     | -69.85                            | -5.77                | 14.23             | -64.08      | 0-360          | 0 degs     |
| 9      | .02831          | 44.67                | Pk  | -38.2      | 0              | -80                     | -73.53                            | -12.93               | 7.07              | -60.6       | 0-360          | Flat       |
| 10     | .20287          | 45.78                | Pk  | -40.6      | .1             | -80                     | -74.72                            | -30.04               | -10.04            | -44.68      | 0-360          | Flat       |
| 6      | .30683          | 41.99                | Pk  | -40.6      | .1             | -80                     | -78.51                            | -33.63               | -13.63            | -44.88      | 0-360          | 90 degs    |
| 2      | .354            | 40.32                | Pk  | -40.6      | .1             | -80                     | -80.18                            | -34.88               | -14.88            | -45.3       | 0-360          | 0 degs     |
| 3      | .52794          | 34.83                | Pk  | -40.5      | .1             | -40                     | -45.57                            | -18.35               | -                 | -27.22      | 0-360          | 0 degs     |
| 11     | .63334          | 33.49                | Pk  | -40.5      | .1             | -40                     | -46.91                            | -19.93               | -                 | -26.98      | 0-360          | Flat       |
| 7      | .69237          | 33.96                | Pk  | -40.5      | .1             | -40                     | -46.44                            | -20.7                | -                 | -25.74      | 0-360          | 90 degs    |
| 4      | 8.11253         | 33.49                | Pk  | -40.8      | .3             | -40                     | -47.01                            | -21.96               | -                 | -25.05      | 0-360          | 0 degs     |
| 8      | 14.9298         | 30.9                 | Pk  | -40.9      | .4             | -40                     | -49.6                             | -21.96               | -                 | -27.64      | 0-360          | 90 degs    |
| 12     | 15.09844        | 26.6                 | Pk  | -41        | .4             | -40                     | -54                               | -21.96               | -                 | -32.04      | 0-360          | Flat       |

Pk - Peak detector

Note: Order number is 15972923

### 10.3. WORST CASE SPURIOUS BELOW 1 GHZ

#### 10.3.1. BLE



| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | 90628 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|----------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 1      | * ** 120.113    | 33.34                | Pk  | 20           | -30.3          | 23.04                      | 43.52              | -20.48      | 0-360          | 100         | H        |
| 3      | * ** 252.421    | 35.2                 | Pk  | 17.5         | -29.2          | 23.5                       | 46.02              | -22.52      | 0-360          | 100         | H        |
| 4      | * ** 403.547    | 27.39                | Pk  | 21.8         | -28.9          | 20.29                      | 46.02              | -25.73      | 0-360          | 200         | H        |
| 6      | * ** 74.329     | 44.84                | Pk  | 14.2         | -30.9          | 28.14                      | 40                 | -11.86      | 0-360          | 100         | V        |
| 7      | * ** 133.208    | 38.88                | Pk  | 19.8         | -30.7          | 27.98                      | 43.52              | -15.54      | 0-360          | 100         | V        |
| 8      | * ** 247.28     | 43.03                | Pk  | 17.5         | -30.3          | 30.23                      | 46.02              | -15.79      | 0-360          | 100         | V        |
| 5      | 66.472          | 51.84                | Pk  | 14.3         | -31.2          | 34.94                      | -                  | -           | 0-360          | 100         | V        |
| 2      | 158.622         | 40.72                | Pk  | 18.4         | -30.1          | 29.02                      | -                  | -           | 0-360          | 100         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

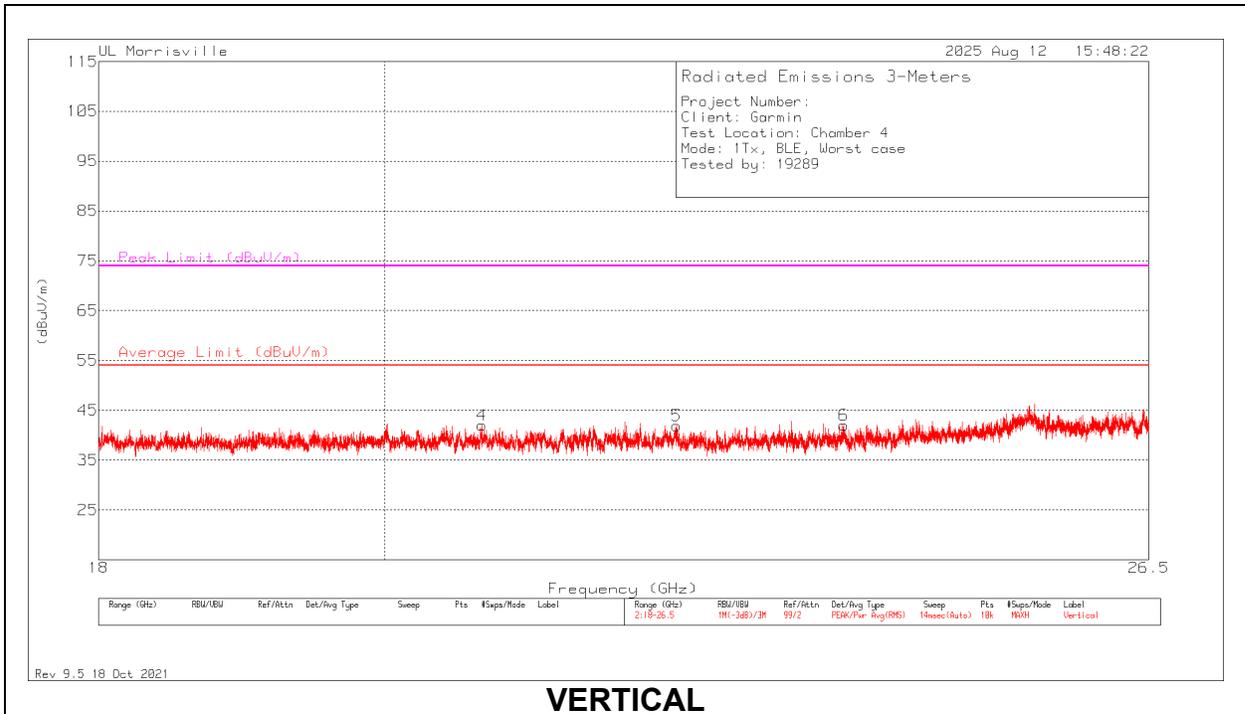
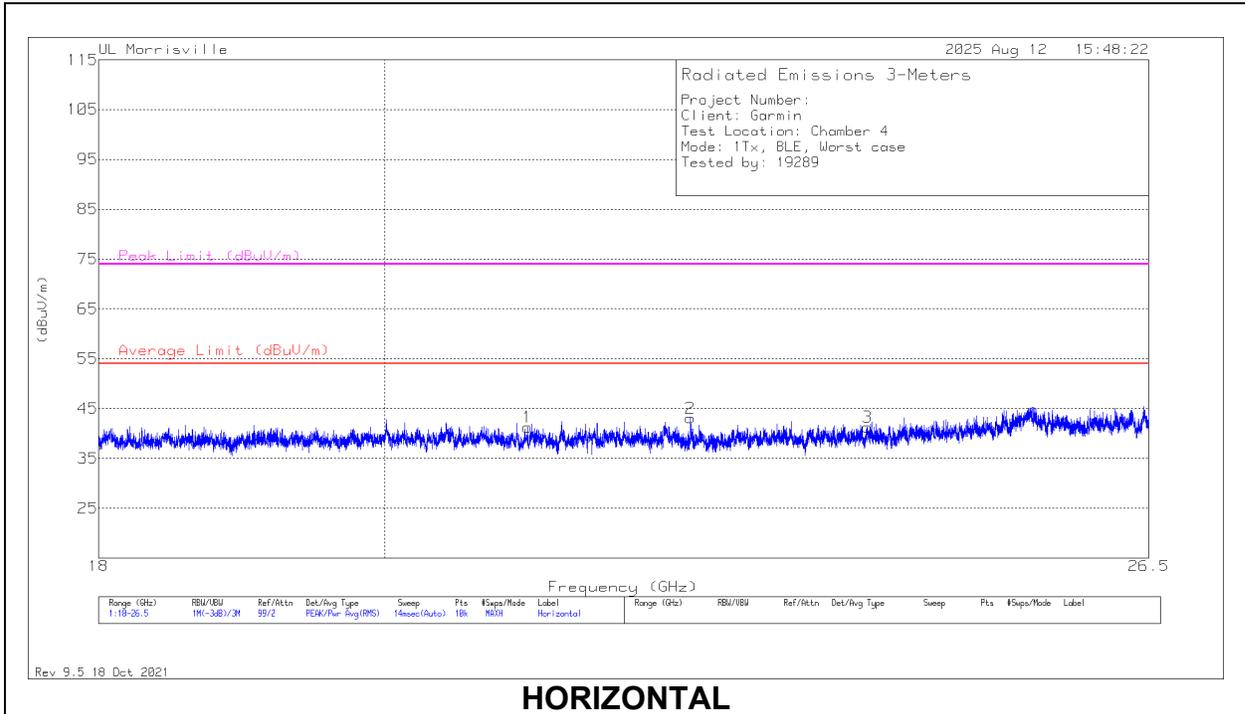
\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

Note: Order number is 15972923

## 10.4. WORST CASE SPURIOUS 18-26 GHZ

### 10.4.1. BLE



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 91186 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|----------------|----------------------------|------------------------|-------------|---------------------|-------------|----------------|-------------|----------|
| 1      | * ** 21.07986   | 47.85                | Pk  | 32.8         | -39.4          | 41.25                      | 54                     | -12.75      | 74                  | -32.75      | 0-360          | 150         | H        |
| 2      | * ** 22.38474   | 48.79                | Pk  | 33.3         | -39            | 43.09                      | 54                     | -10.91      | 74                  | -30.91      | 0-360          | 150         | H        |
| 3      | * ** 23.89279   | 44.89                | Pk  | 33.7         | -37.3          | 41.29                      | 54                     | -12.71      | 74                  | -32.71      | 0-360          | 100         | H        |
| 4      | * ** 20.72877   | 48.18                | Pk  | 32.7         | -38.9          | 41.98                      | 54                     | -12.02      | 74                  | -32.02      | 0-360          | 300         | V        |
| 5      | * ** 22.27083   | 47.53                | Pk  | 33.4         | -39            | 41.93                      | 54                     | -12.07      | 74                  | -32.07      | 0-360          | 300         | V        |
| 6      | * ** 23.68622   | 45.7                 | Pk  | 33.9         | -37.6          | 42                         | 54                     | -12         | 74                  | -32         | 0-360          | 300         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 \*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band  
 Pk - Peak detector

## 11. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)  
RSS-Gen 8.8

| Frequency of Emission (MHz) | Conducted Limit (dBuV) |            |
|-----------------------------|------------------------|------------|
|                             | Quasi-peak             | Average    |
| 0.15-0.5                    | 66 to 56 *             | 56 to 46 * |
| 0.5-5                       | 56                     | 46         |
| 5-30                        | 60                     | 50         |

\* Decreases with the logarithm of the frequency.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

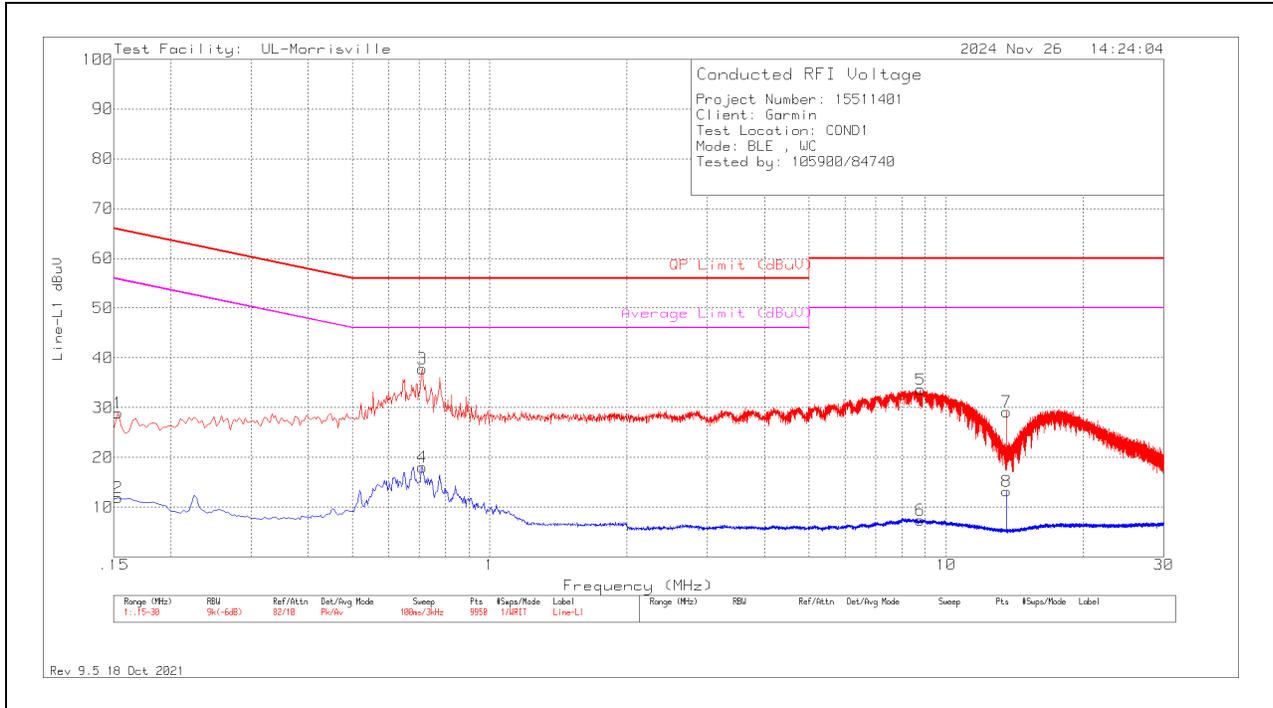
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both lines.

## 11.1. AC POWER LINE

### 11.1.1. BLE

#### LINE 1 RESULTS

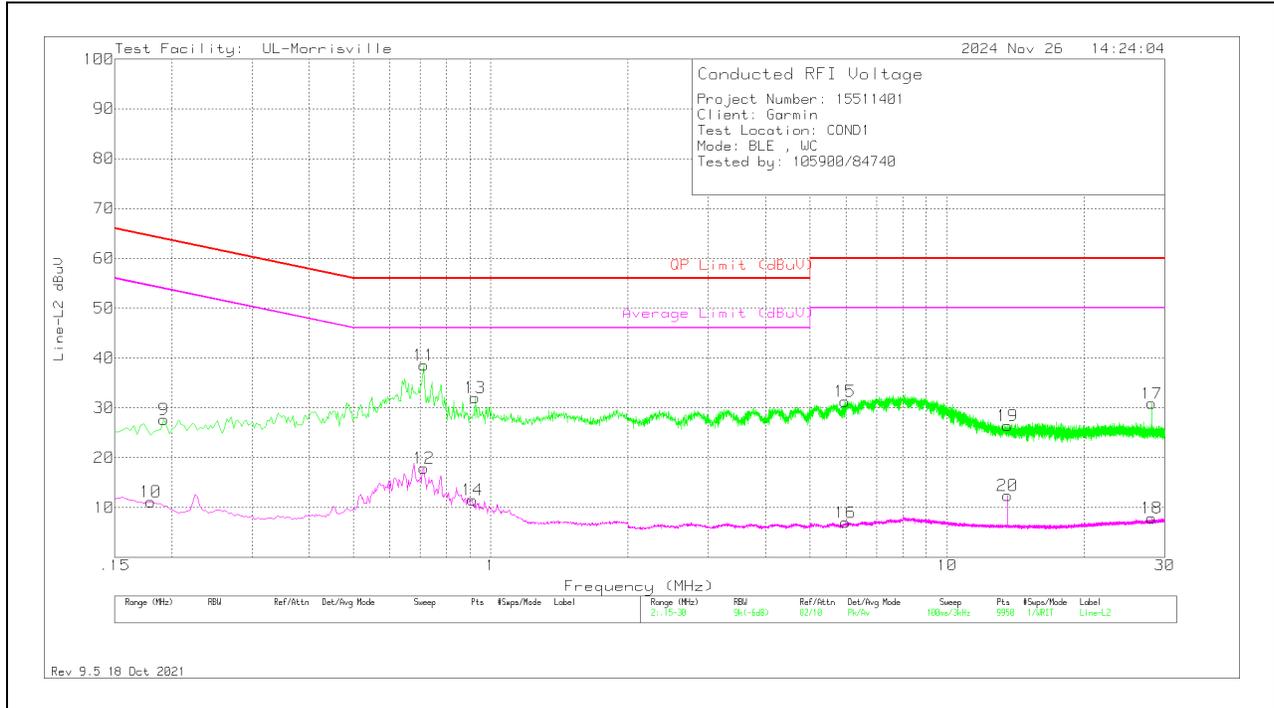


| Range 1: Line-L1 .15 - 30MHz |                 |                      |     |               |                  |                        |                 |             |                      |             |
|------------------------------|-----------------|----------------------|-----|---------------|------------------|------------------------|-----------------|-------------|----------------------|-------------|
| Marker                       | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VDF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
| 1                            | .153            | 18.86                | Pk  | .2            | 9.8              | 28.86                  | 65.84           | -36.98      | -                    | -           |
| 2                            | .153            | 1.91                 | Av  | .2            | 9.8              | 11.91                  | -               | -           | 55.84                | -43.93      |
| 3                            | .711            | 27.95                | Pk  | 0             | 9.8              | 37.75                  | 56              | -18.25      | -                    | -           |
| 4                            | .711            | 8.2                  | Av  | 0             | 9.8              | 18                     | -               | -           | 46                   | -28         |
| 5                            | 8.781           | 23.51                | Pk  | .1            | 10               | 33.61                  | 60              | -26.39      | -                    | -           |
| 6                            | 8.778           | -2.74                | Av  | .1            | 10               | 7.36                   | -               | -           | 50                   | -42.64      |
| 7                            | 13.56           | 19.01                | Pk  | .1            | 10               | 29.11                  | 60              | -30.89      | -                    | -           |
| 8                            | 13.563          | 3.09                 | Av  | .1            | 10               | 13.19                  | -               | -           | 50                   | -36.81      |

Pk - Peak detector  
 Av - Average detection

NOTE: Markers 7 and 8 are from RFID signals in the lab.  
 Note: Project number is 15781262

### LINE 2 RESULTS



| Range 2: Line-L2 .15 - 30MHz |                 |                      |     |               |                  |                        |                 |             |                      |             |
|------------------------------|-----------------|----------------------|-----|---------------|------------------|------------------------|-----------------|-------------|----------------------|-------------|
| Marker                       | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VDF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
| 10                           | .18             | 1.1                  | Av  | .2            | 9.8              | 11.1                   | -               | -           | 54.49                | -43.39      |
| 9                            | .192            | 17.63                | Pk  | .2            | 9.8              | 27.63                  | 63.95           | -36.32      | -                    | -           |
| 11                           | .714            | 28.7                 | Pk  | 0             | 9.8              | 38.5                   | 56              | -17.5       | -                    | -           |
| 12                           | .714            | 8.07                 | Av  | 0             | 9.8              | 17.87                  | -               | -           | 46                   | -28.13      |
| 14                           | .912            | 1.66                 | Av  | 0             | 9.8              | 11.46                  | -               | -           | 46                   | -34.54      |
| 13                           | .924            | 22.2                 | Pk  | 0             | 9.8              | 32                     | 56              | -24         | -                    | -           |
| 15                           | 5.973           | 21.29                | Pk  | .1            | 9.9              | 31.29                  | 60              | -28.71      | -                    | -           |
| 16                           | 5.997           | -3.05                | Av  | .1            | 9.9              | 6.95                   | -               | -           | 50                   | -43.05      |
| 19                           | 13.56           | 16.35                | Pk  | .1            | 10               | 26.45                  | 60              | -33.55      | -                    | -           |
| 20                           | 13.56           | 2.29                 | Av  | .1            | 10               | 12.39                  | -               | -           | 50                   | -37.61      |
| 17                           | 28.107          | 20.26                | Pk  | .4            | 10.2             | 30.86                  | 60              | -29.14      | -                    | -           |
| 18                           | 28.107          | -2.69                | Av  | .4            | 10.2             | 7.91                   | -               | -           | 50                   | -42.09      |

Pk - Peak detector  
 Av - Average detection

NOTE: Markers 19 and 20 are from RFID signals in the lab.  
 Note: Project number is 15781262

## 12. SETUP PHOTOS

Please refer to R15972923-EP1 for setup photos

**END OF TEST REPORT**