# TEST REPORT

**Report Number. :** R14275554-E2

| | | |
|---|---|---|
| **Applicant** | : | InfoBionic, Inc<br>400 Totten Pond Rd STE 315<br>Waltham, MA, 02451, U.S.A |
| **Model** | : | MoMe ARC K3 Sensor |
| **FCC ID** | : | 2AHLC01857 |
| **EUT Description** | : | Sensor |
| **Test Standard(s)** | : | FCC 47 CFR PART 15 SUBPART C: 2022<br>ISED RSS-247 ISSUE 2: 2017<br>ISED RSS-GEN ISSUE 5 + A2: 2021 |

**Date Of Issue:**
2022-10-10

**Prepared by:**
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400

ACCREDITED
CERT #0751.06

# REPORT REVISION HISTORY

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| V1 | 2022-10-10 | Initial Issue | Charles Moody |



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

# TABLE OF CONTENTS





UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** InfoBionic, Inc
400 Totten Pond Rd STE 315
Waltham, MA 02451, U.S.A

**EUT DESCRIPTION:** Sensor

**MODEL:** MoMe ARC K3 Sensor

**SERIAL NUMBER:** SIA2008, MIB1033

**SAMPLE RECEIPT DATE:** 2022-08-15

**DATE TESTED:** 2022-08-15 TO 2022-08-25

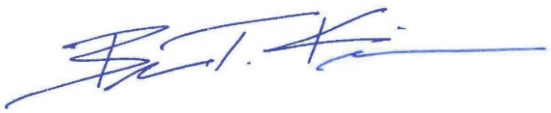
| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| CFR 47 Part 15 Subpart C: 2022 | Complies |
| ISED RSS-247 Issue 2: 2017 | Complies |
| ISED RSS-GEN Issue 5 + A2: 2021 | Complies |

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.

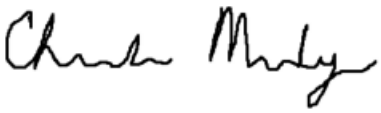
This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document.

Approved & Released For
UL LLC By:



Brian Kiewra
Project Engineer
Consumer, Medical, and IT Segment
UL LLC

Prepared By:



Charles Moody
Electrical Engineer
Consumer, Medical, and IT Segment
UL LLC

# 2. TEST RESULTS SUMMARY

This report contains data provided by the applicant 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.

| 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 | Compliant | None. |
| 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 | Compliant | None. |
| 15.209, 15.205 | RSS-GEN 8.9, 8.10 | Radiated Emissions | Compliant | None. |
| 15.207 | RSS-Gen 8.8 | AC Mains Conducted Emissions | Not performed. | Device is battery powered. |

# 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A2, and RSS-247 Issue 2.

# 4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, Certificate Number 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 |
|---|---|---|---|---|
| ☐ | Building<br>12 Laboratory Dr<br>RTP, NC 27709, U.S.A | US0067 | 2180C | 825374 |
| ☒ | Building<br>2800 Suite Perimeter Park Dr. Suite B<br>Morrisville, NC 27560, U.S.A | US0067 | 27265 | 825374 |

# 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 | $U_{LAB}$ |
|---|---|
| Radio Frequency | 141.2Hz |
| Occupied Bandwidth, conducted | 1.22% |
| RF output power, conducted | 1.3 dB (PK)<br>0.45 dB (AV) |
| Unwanted emissions, conducted | ±1.94 dB |
| Power Spectral Density, conducted | ±2.466 dB |
| All emissions, radiated | 6.01 dB |
| Conducted Emissions (0.150-30MHz) - LISN | ±3.40 dB |
| Humidity | ±3.39 % RH |
| Temperature | ±0.57°C |
| 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 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 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 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

# 6. EQUIPMENT UNDER TEST

## 6.1. EUT DESCRIPTION

The EUT is the sensor portion of a three component ambulatory electrocardiogram that contains a BLE radio. This report covers full emissions testing for the BLE radio.

## 6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| 2402 - 2480 | BLE | 3.29 | 2.13 |

## 6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

The radio utilizes an 26 mm long, 26 AWG wire antenna, with a maximum gain of -4.5 dBi.

## 6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was Sensor Bootloader + App: V00.1355.

The test utility software used during testing was Sensor Bootloader + App: V00.1355.

## 6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz were performed with the EUT set to transmit at the channel and data rate with the worst-case power spectral density.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low and high channels. Additionally, the EUT was set to transmit at its highest power on mid channel for spurious emissions as well.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in X orientation.

The EUT was also capable of transmitting in two data rates (1Mbps and 2Mbps).



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## 6.6. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID** |
| Terminated Lead Set | N/A | N/A | N/A | N/A |

**I/O CABLES**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No.** | **Port** | **# of Identical Ports** | **Connector Type** | **Cable Type** | **Cable Length (m)** | **Remarks** |
| 1 | N/A | 3 | Leads | Shielded | <3m | Lead Cables |

**TEST SETUP**

Prior to testing, the transmitting channel and data rate were set by using built-in buttons on the EUT to control the BLE radio. The terminated lead set was also connected to the built-in leads that are part of the EUT.

**SETUP DIAGRAMS**

Please refer to 14275554-EP2 for setup diagrams



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

# 7. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Subclause -11.8.1

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Output Power: ANSI C63.10 Subclause -11.9.1.3 Method PKPM1 Peak-reading power meter
Output Power: ANSI C63.10 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

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

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

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

General Radiated Spurious Emissions: ANSI C63.10-2013, Section 6.3 to 6.6.



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

# 8. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Wireless Conducted Measurement Equipment

| Equipment ID | Description | Manufacturer | Model Number | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| **Conducted 1** | | | | | |
| SA0025 | Spectrum Analyzer | Keysight Technologies | N9030A | 2022-05-02 | 2023-05-02 |
| PWM003 | Power Meter | Keysight Technologies | N1911A | 2021-08-30 | 2022-08-30 |
| HI0091 | Environmental Meter | Fisher Scientific | 15-077-963 | 2022-07-20 | 2023-07-20 |
| PWS006 | Power Sensor | Keysight Technologies | N1921A | 2021-12-17 | 2022-12-17 |
| 208720 | Callbox | Rohde & Schwarz | CMW 500 | 2022-05-02 | 2023-05-02 |
| SOFTEMI | Antenna Port Software | UL | Version 2022.5.4 | | |
| **Conducted 2** | | | | | |
| SA0027 | Spectrum Analyzer | Keysight Technologies | N9030A | 2022-05-24 | 2023-05-24 |
| HI0090 | Environmental Meter | Fisher Scientific | 15-077-963 | 2022-07-20 | 2023-07-20 |
| PWM004 | RF Power Meter | Keysight Technologies | N1911A | 2021-08-17 | 2022-08-31 |
| PWS007 | Peak and Avg Power Sensor, 50MHz – 18GHz | Keysight Technologies | N1921A | 2022-03-22 | 2023-03-22 |
| SOFTEMI | Antenna Port Software | UL | Version 2022.5.4 | | |



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

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

| Equip. ID | Description | Manufacturer/Brand | Model Number | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| | **0.009-30MHz** | | | | |
| AT0079 | Active Loop Antenna | ETS-Lindgren | 6502 | 2021-08-19 | 2022-08-31 |
| | **30-1000 MHz** | | | | |
| AT0073 | Hybrid Broadband Antenna | Sunol Sciences Corp. | JB3 | 2021-08-30 | 2022-08-30 |
| | **1-18 GHz** | | | | |
| 206211 | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren | 3117 | 2022-03-21 | 2023-03-21 |
| | **18-26 GHz** | | | | |
| AT0063 | Horn Antenna, 18-26.5GHz | ARA | MWH-1826/B | 2021-11-04 | 2022-11-04 |
| | **Gain-Loss Chains** | | | | |
| C2-SAC01 | Gain-loss string: 0.009-30MHz | Various | Various | 2022-05-10 | 2023-05-10 |
| C2-SAC02 | Gain-loss string: 25-1000MHz | Various | Various | 2022-05-10 | 2023-05-10 |
| C2-SAC03 | Gain-loss string: 1-18GHz | Various | Various | 2022-05-10 | 2023-05-10 |
| C2-SAC04 | Gain-loss string: 18-40GHz | Various | Various | 2022-05-10 | 2023-05-10 |
| | **Receiver & Software** | | | | |
| 197955 | Spectrum Analyzer | Rohde & Schwarz | ESW44 | 2022-03-08 | 2023-03-08 |
| SA0020 | Spectrum Analyzer | Agilent | E4446A | 2022-06-08 | 2023-06-08 |
| SOFTEMI | EMI Software | UL | Version 9.5 (18 Oct 2021) | | |
| | **Additional Equipment used** | | | | |
| 200540 | Environmental Meter | Fisher Scientific | 15-077-963 (s/n 181474409) | 2021-09-27 | 2022-09-27 |

# 9. ANTENNA PORT TEST RESULTS

## 9.1. ON TIME AND DUTY CYCLE

**LIMITS**

None; for reporting purposes only.

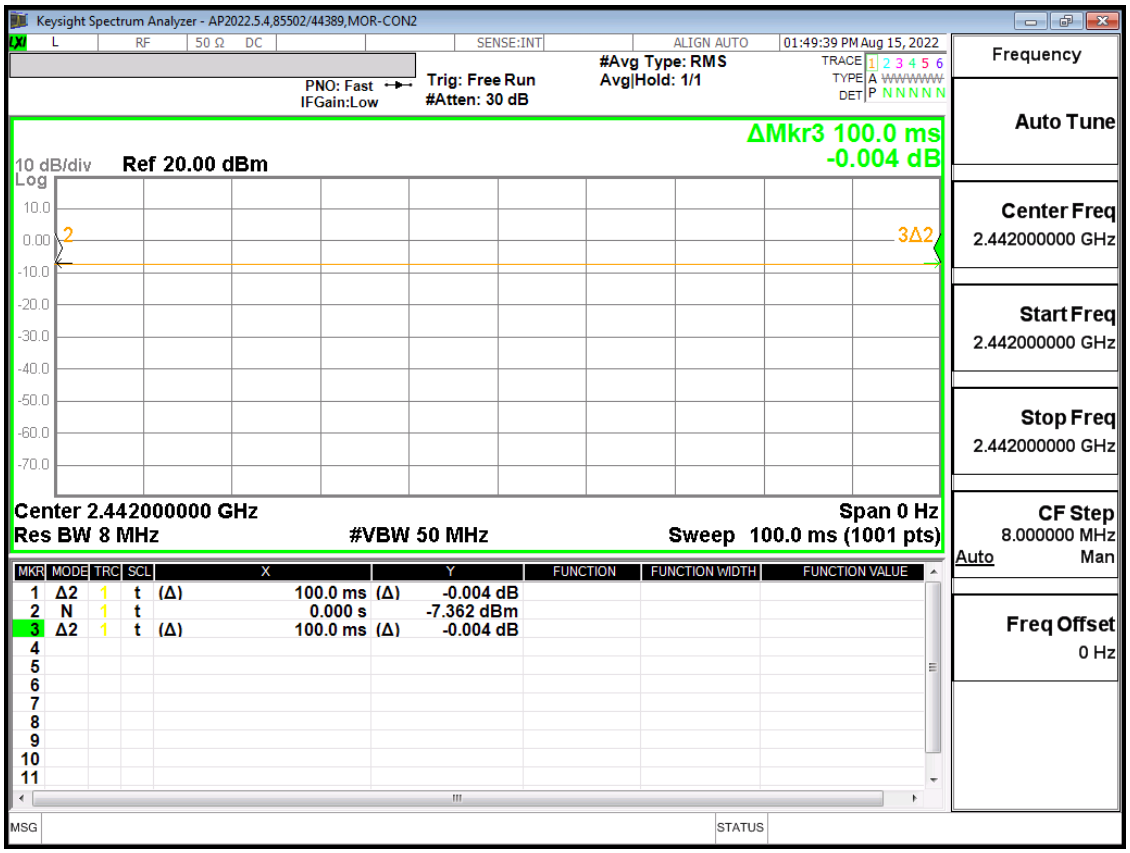
**PROCEDURE**

KDB 558074 Zero-Span Spectrum Analyzer Method.
ANSI C63.10 – Subclause 11.6

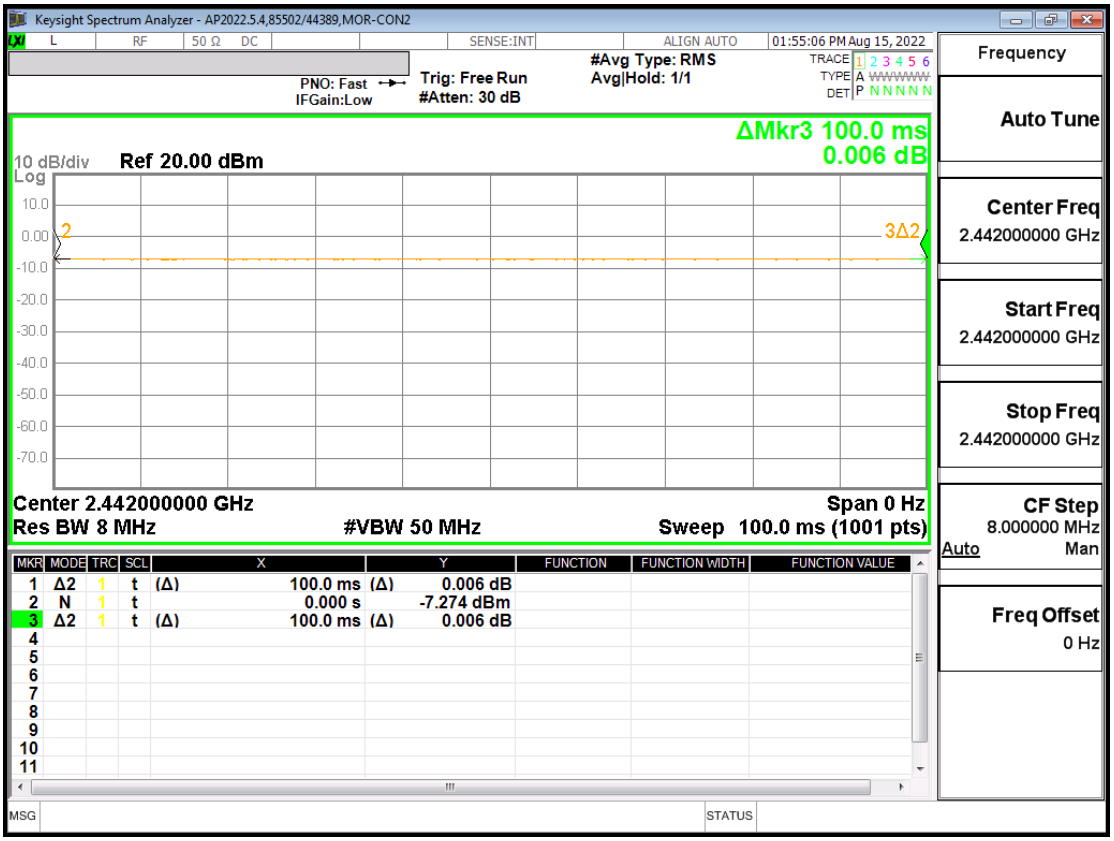
**ON TIME AND DUTY CYCLE RESULTS**

| Mode | ON Time B (msec) | Period (msec) | Duty Cycle x (linear) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | 1/B Minimum VBW (kHz) |
|---|---|---|---|---|---|---|
| **2.4GHz Band** | | | | | | |
| 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 |
| | | | | | | |

DUTY CYCLE PLOTS




**DUTY CYCLE BLE (1Mbps)**




**DUTY CYCLE BLE (2Mbps)**

## 9.2. 99% BANDWIDTH

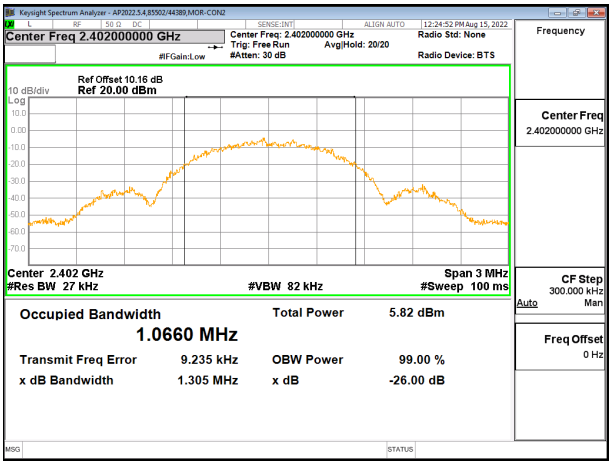
**LIMITS**

None; for reporting purposes only.

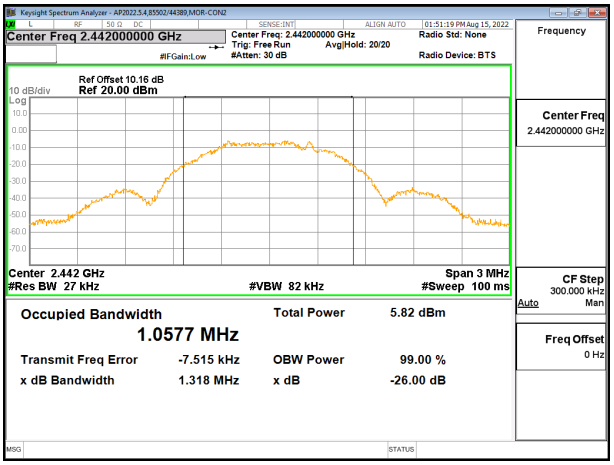
**RESULTS**

### 9.2.1. BLE (1Mbps)

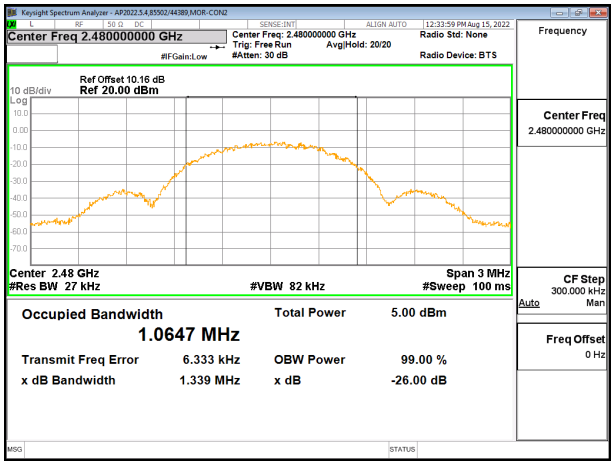
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2402 | 1.0660 |
| Middle | 2442 | 1.0577 |
| High | 2480 | 1.0647 |




LOW CHANNEL




MID CHANNEL



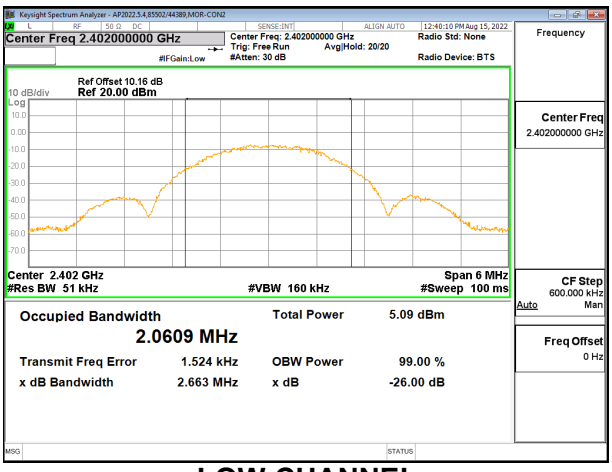

HIGH CHANNEL



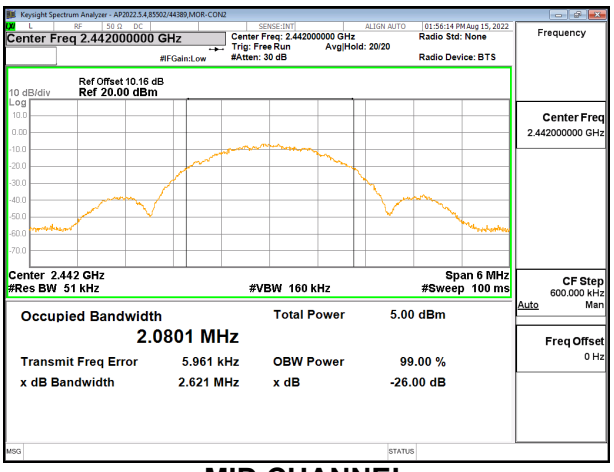
UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

### 9.2.1. BLE (2Mbps)

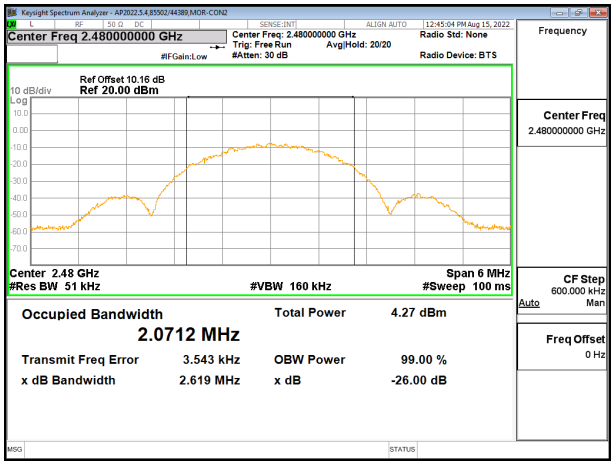
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2402 | 2.0609 |
| Middle | 2442 | 2.0801 |
| High | 2480 | 2.0712 |




LOW CHANNEL




MID CHANNEL




HIGH CHANNEL



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## 9.3. 6 dB BANDWIDTH

**LIMITS**

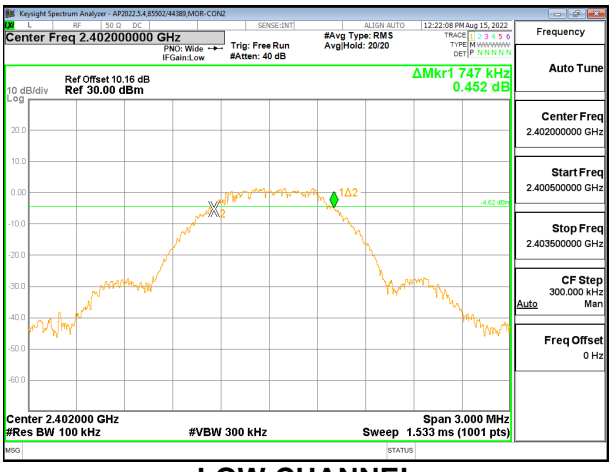
FCC §15.247 (a) (2)
RSS-247 5.2 (a)

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

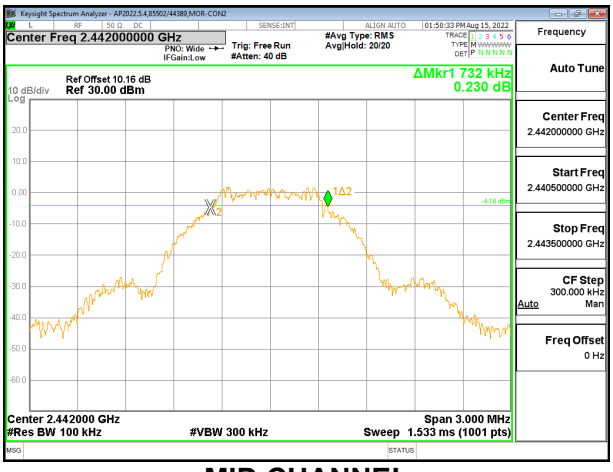
**RESULTS**

### 9.3.1. BLE (1Mbps)

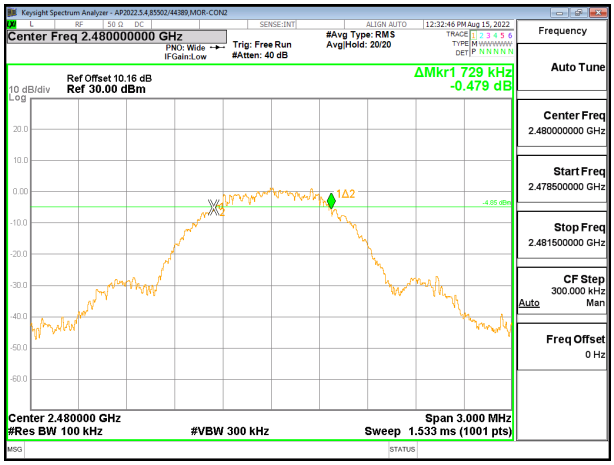
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2402 | 0.747 | 0.5 |
| Middle | 2442 | 0.732 | 0.5 |
| High | 2480 | 0.729 | 0.5 |




**LOW CHANNEL**



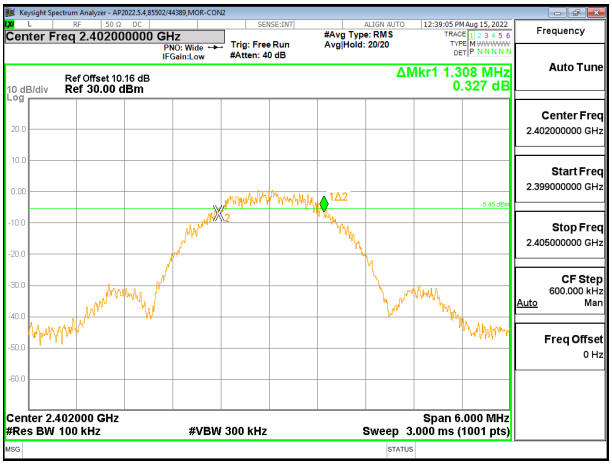

**MID CHANNEL**



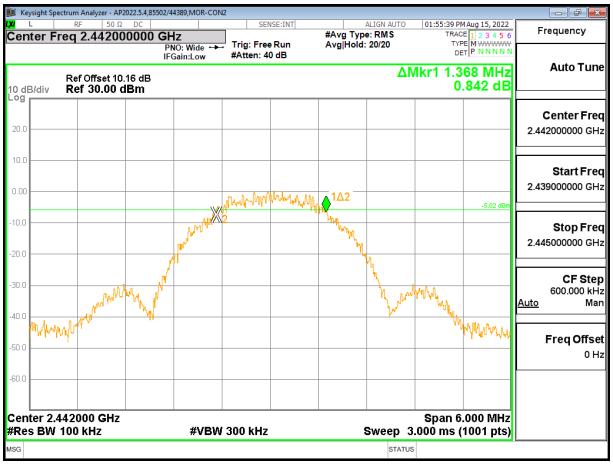

**HIGH CHANNEL**

### 9.3.1. BLE (2Mbps)

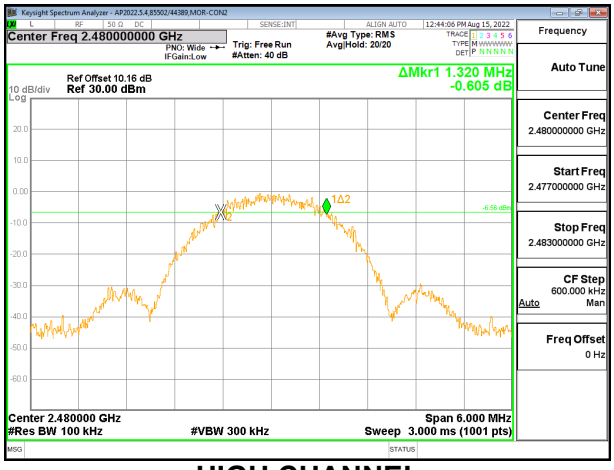
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2402 | 1.308 | 0.5 |
| Middle | 2442 | 1.368 | 0.5 |
| High | 2480 | 1.320 | 0.5 |




LOW CHANNEL




MID CHANNEL




HIGH CHANNEL



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## 9.4. OUTPUT POWER

**LIMITS**

FCC §15.247 (b) (3)
RSS-247 5.4 (d)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

**TEST PROCEDURE**
The transmitter output is connected to a power meter.

The cable assembly insertion loss of 0.51 dB was entered as an offset in the power meter.

### 9.4.1. BLE (1Mbps)

| | |
|---|---|
| **Tested By:** | 27465/44389 |
| **Date:** | 8/15/2022 |

| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 3.29 | 30 | -26.71 |
| Middle | 2442 | 2.87 | 30 | -27.13 |
| High | 2480 | 2.43 | 30 | -27.57 |

### 9.4.1. BLE (2Mbps)

| | |
|---|---|
| **Tested By:** | 27465/44389 |
| **Date:** | 8/15/2022 |

| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 3.27 | 30 | -26.73 |
| Middle | 2442 | 2.86 | 30 | -27.14 |
| High | 2480 | 2.32 | 30 | -27.68 |



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## 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 0.51 dB was entered as an offset in the power meter.

**RESULTS**

### 9.5.1. BLE (1Mbps)

| | |
|---|---|
| **Tested By:** | 27465/44389 |
| **Date:** | 8/15/2022 |

| Channel | Frequency (MHz) | AV power (dBm) |
|---|---|---|
| Low | 2402 | 3.10 |
| Middle | 2442 | 2.60 |
| High | 2480 | 2.20 |

### 9.5.2. BLE (2Mbps)

| | |
|---|---|
| **Tested By:** | 27465/44389 |
| **Date:** | 8/15/2022 |

| Channel | Frequency (MHz) | AV power (dBm) |
|---|---|---|
| Low | 2402 | 3.00 |
| Middle | 2442 | 2.60 |
| High | 2480 | 2.10 |



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## 9.6. POWER SPECTRAL DENSITY

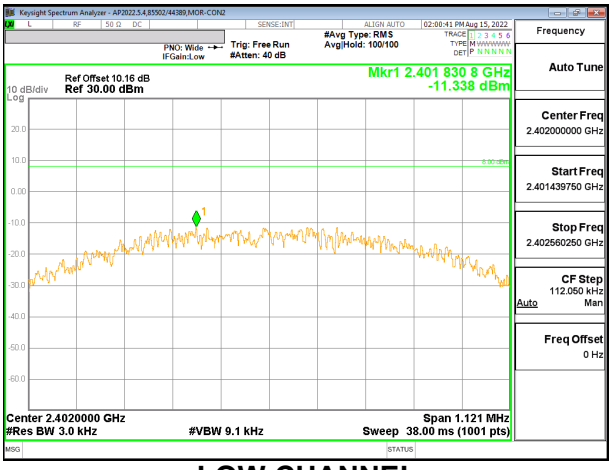
**LIMITS**

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.

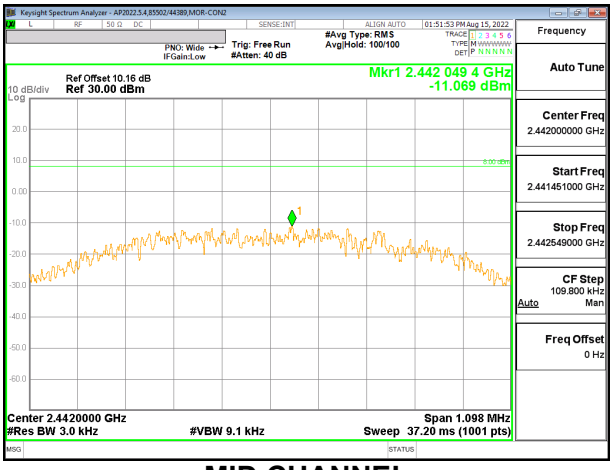
**RESULTS**

### 9.6.1. BLE (1Mbps)

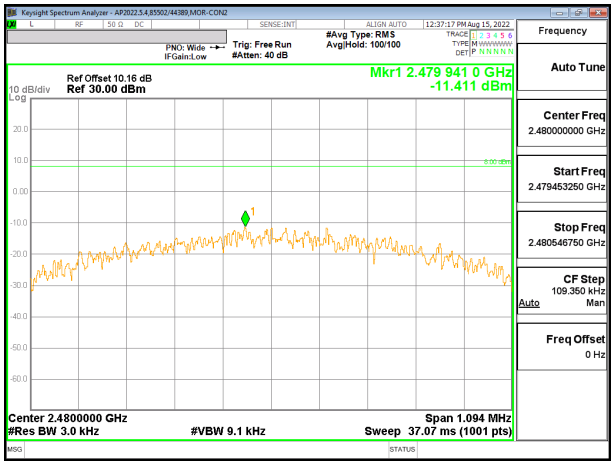
| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | -11.338 | 8 | -19.338 |
| Middle | 2442 | -11.069 | 8 | -19.069 |
| High | 2480 | -11.411 | 8 | -19.411 |




LOW CHANNEL




MID CHANNEL



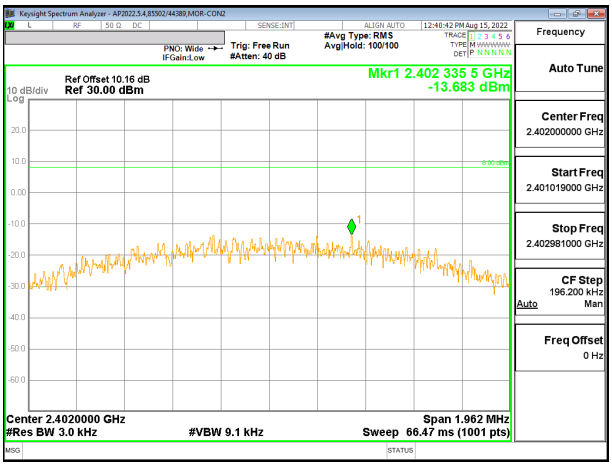

HIGH CHANNEL



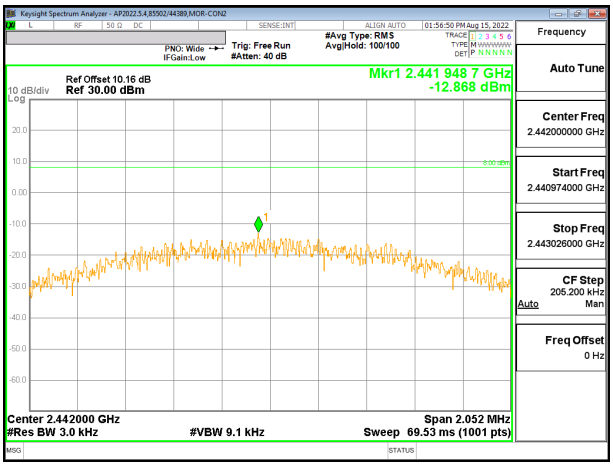
UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

### 9.6.1. BLE (2Mbps)

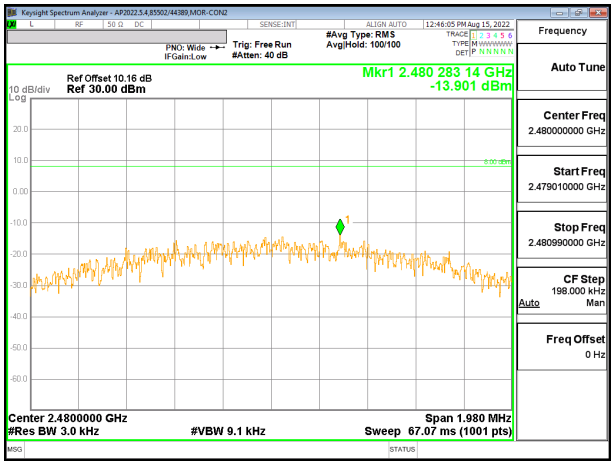
| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | -13.683 | 8 | -21.683 |
| Middle | 2442 | -12.868 | 8 | -20.868 |
| High | 2480 | -13.901 | 8 | -21.901 |




**LOW CHANNEL**




**MID CHANNEL**




**HIGH CHANNEL**

## 9.7. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)
RSS-247 5.5

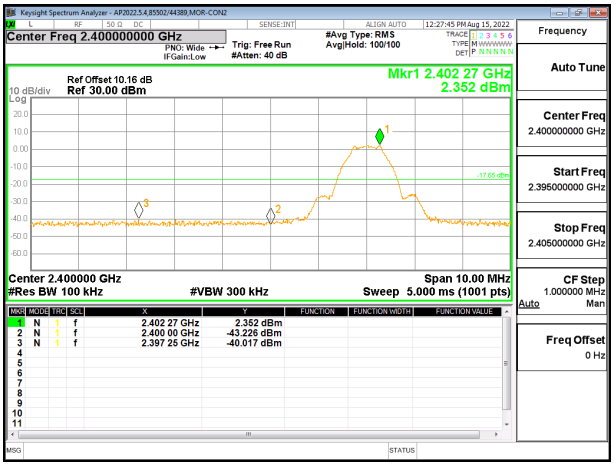
Output power was measured based on the use of a peak measurement; therefore, the required attenuation is -20 dBc.

**RESULTS**

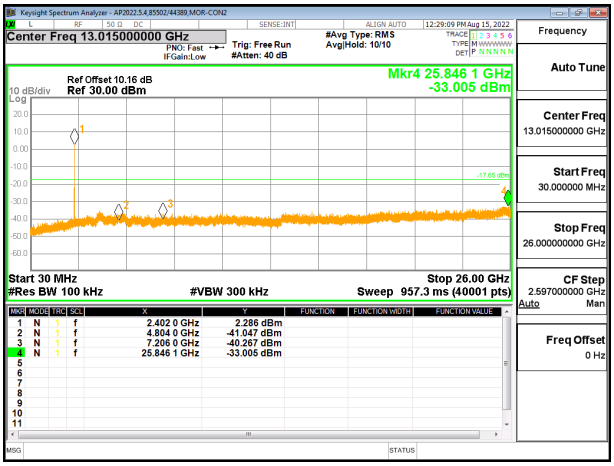


UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

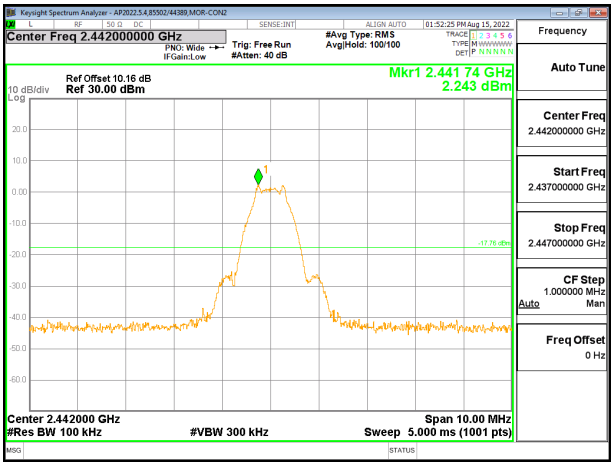
## 9.7.1. BLE (1Mbps)



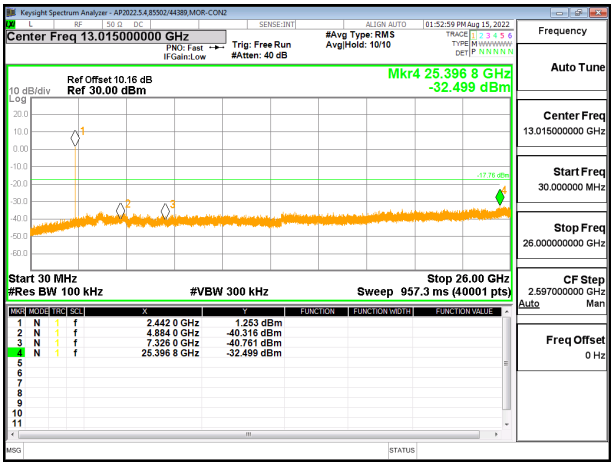

LOW CHANNEL BANDEDGE



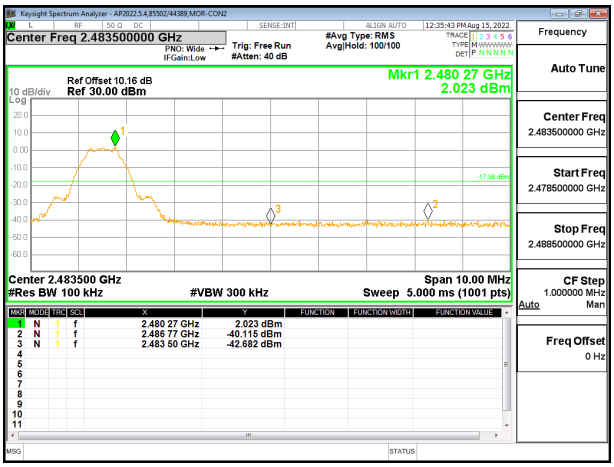

OUT-OF-BAND LOW CHANNEL



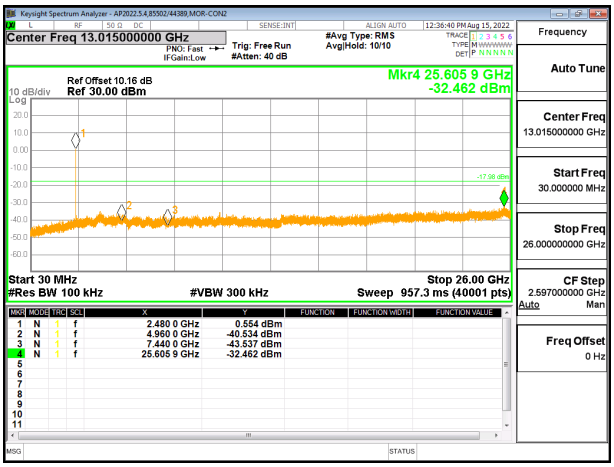

IN-BAND REFERENCE LEVEL




OUT-OF-BAND MID CHANNEL




HIGH CHANNEL BANDEDGE

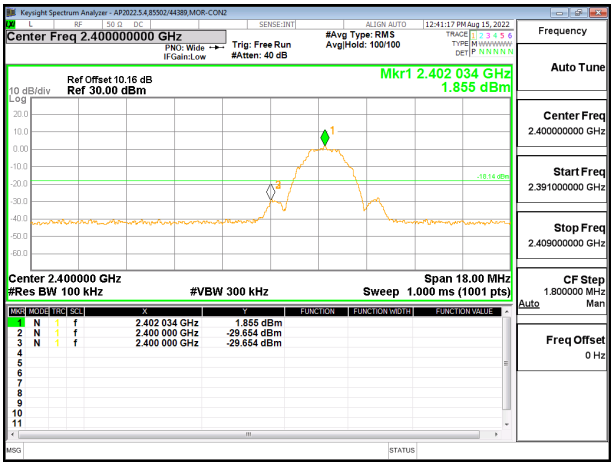



OUT-OF-BAND HIGH CHANNEL

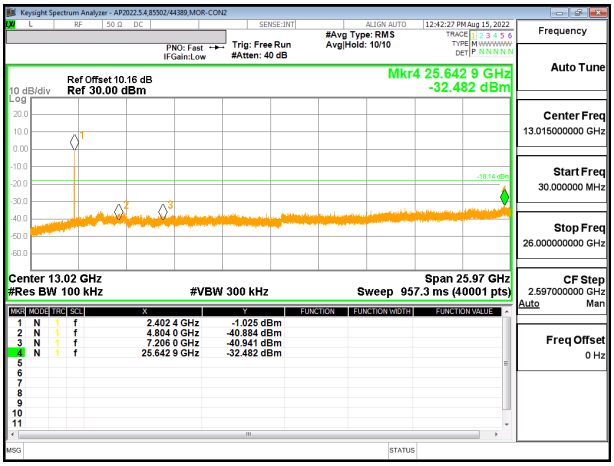


UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

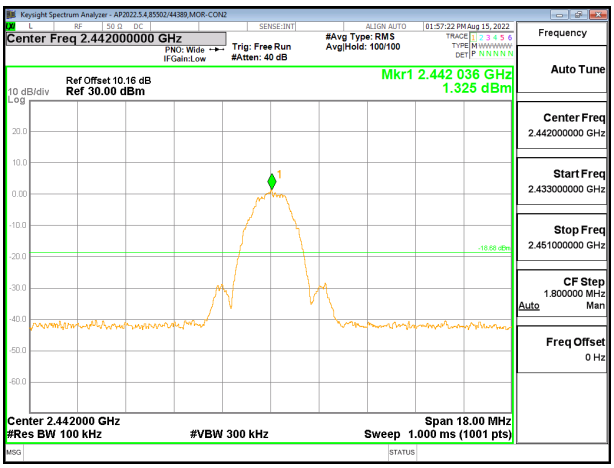
## 9.7.1. BLE (2Mbps)



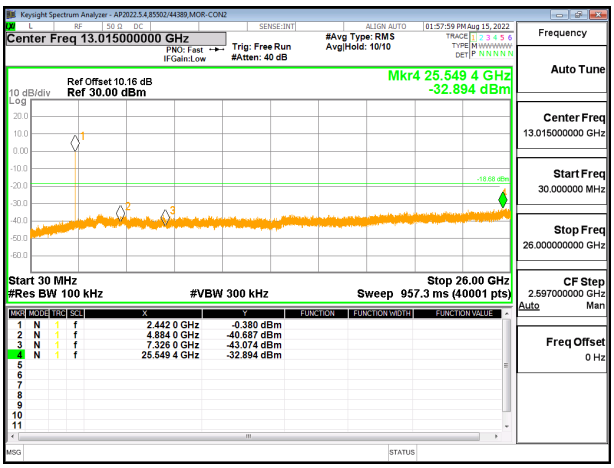

LOW CHANNEL BANDEDGE



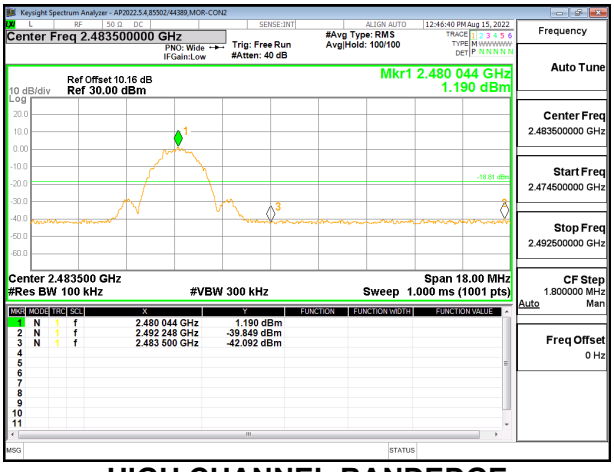

OUT-OF-BAND LOW CHANNEL



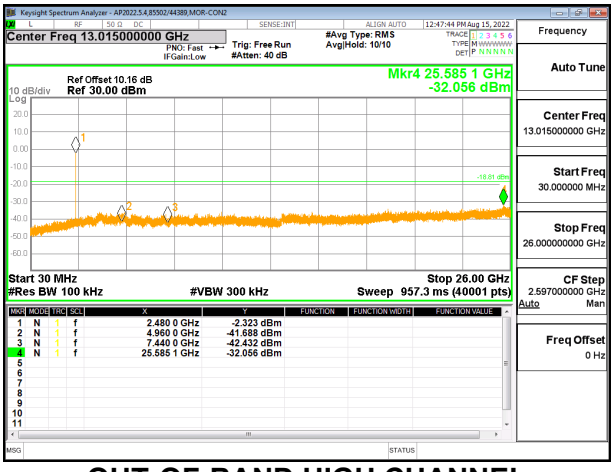

IN-BAND REFERENCE LEVEL




OUT-OF-BAND MID CHANNEL




HIGH CHANNEL BANDEDGE




OUT-OF-BAND HIGH CHANNEL



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

# 10. RADIATED TEST RESULTS

## 10.1. LIMITS AND PROCEDURE

**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 |

RSS-GEN, Section 8.9 and 8.10.

| Frequency Range (MHz) | Field Strength Limit (uA/m) at 3 m | Field Strength Limit (dBuA/m) at 3 m |
|---|---|---|
| 0.009-0.490 | 6.37/F(kHz) @ 300 m | - |
| 0.490-1.705 | 6.37/F(kHz) @ 30 m | - |
| 1.705 - 30 | .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 3 MHz for peak measurements.



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

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 average measurements. Linear Voltage Averaging was used.

For below 1GHz and above 18GHz emissions, the channel and data rate with the highest power spectral density, 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).

Based 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.



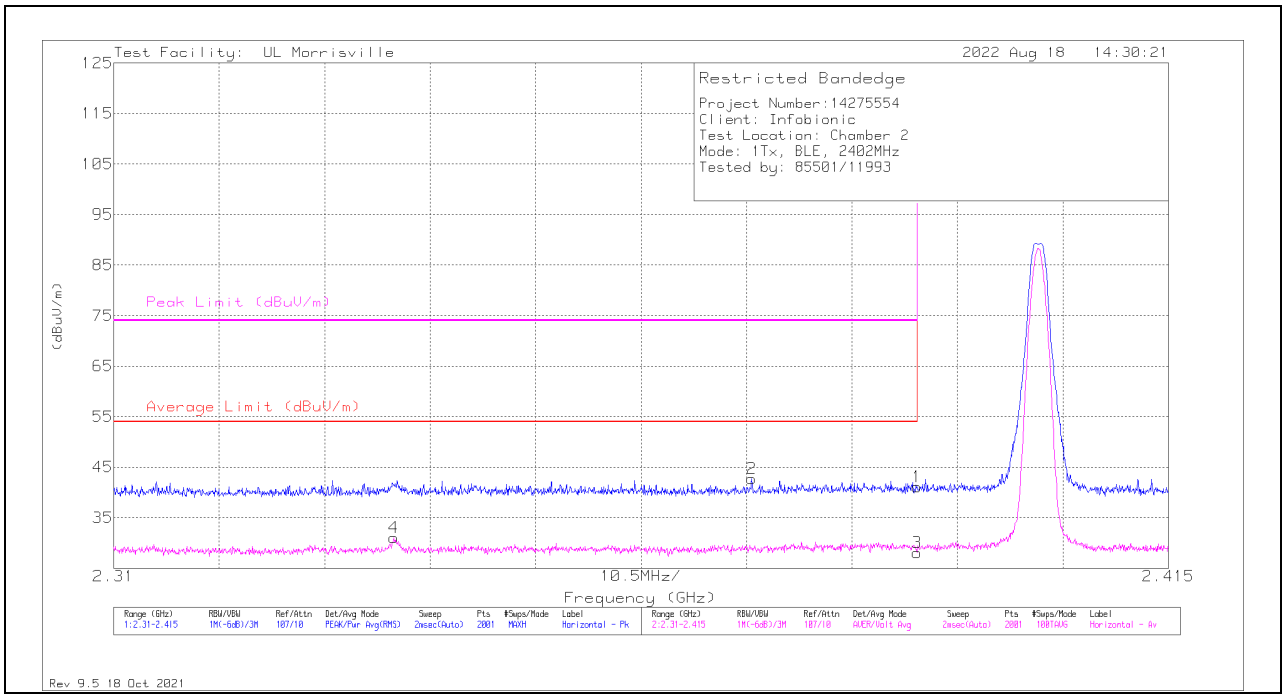
UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## 10.2. TRANSMITTER ABOVE 1 GHz

### 10.2.1. BLE (1Mbps)

**BANDEDGE (LOW CHANNEL)**

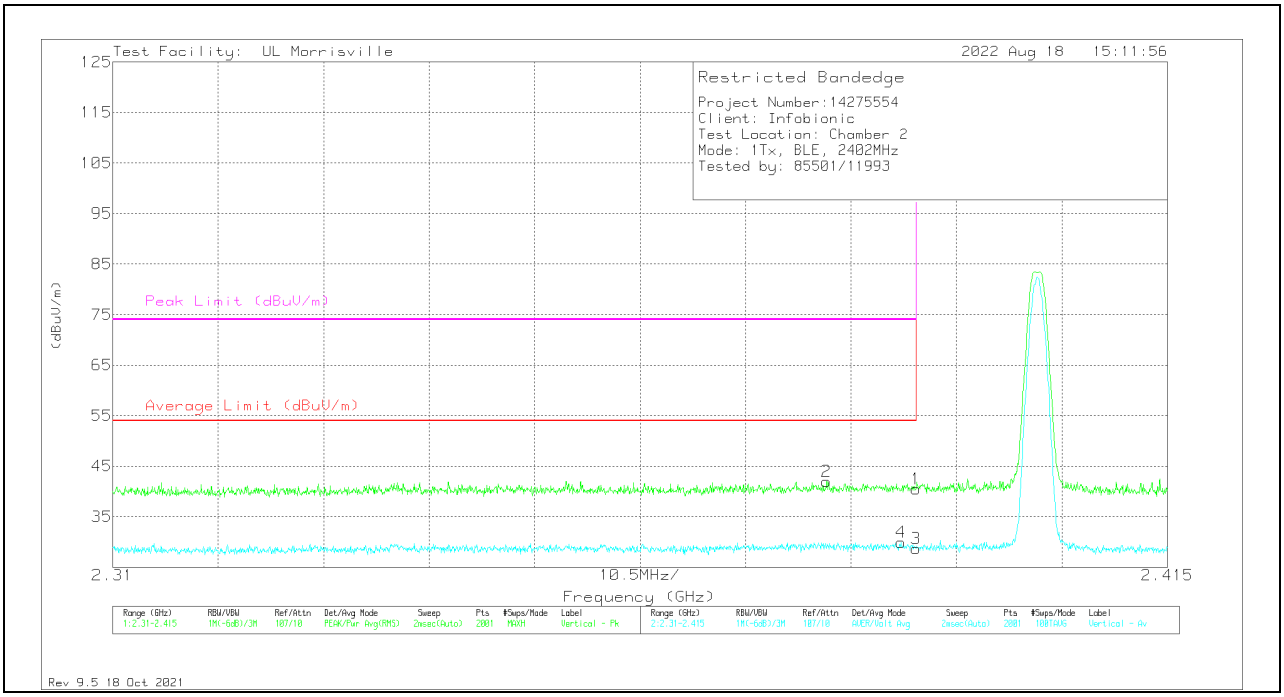
**HORIZONTAL RESULT**




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (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 | 32.86 | Pk | 32 | -23.8 | 41.06 | - | - | 74 | -32.94 | 87 | 396 | H |
| 2 | * ** 2.37353 | 34.73 | Pk | 32 | -24 | 42.73 | - | - | 74 | -31.27 | 87 | 396 | H |
| 3 | * ** 2.38996 | 19.86 | ADV | 32 | -23.8 | 28.06 | 54 | -25.94 | - | - | 87 | 396 | H |
| 4 | * ** 2.33788 | 23.13 | ADV | 31.9 | -24 | 31.03 | 54 | -22.97 | - | - | 87 | 396 | 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

## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (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 | 32.24 | Pk | 32 | -23.8 | 40.44 | - | - | 74 | -33.56 | 102 | 257 | V |
| 2 | * ** 2.38109 | 33.82 | Pk | 32.1 | -23.9 | 42.02 | - | - | 74 | -31.98 | 102 | 257 | V |
| 3 | * ** 2.38996 | 20.51 | ADV | 32 | -23.8 | 28.71 | 54 | -25.29 | - | - | 102 | 257 | V |
| 4 | * ** 2.38849 | 21.74 | ADV | 32 | -23.8 | 29.94 | 54 | -24.06 | - | - | 102 | 257 | V |

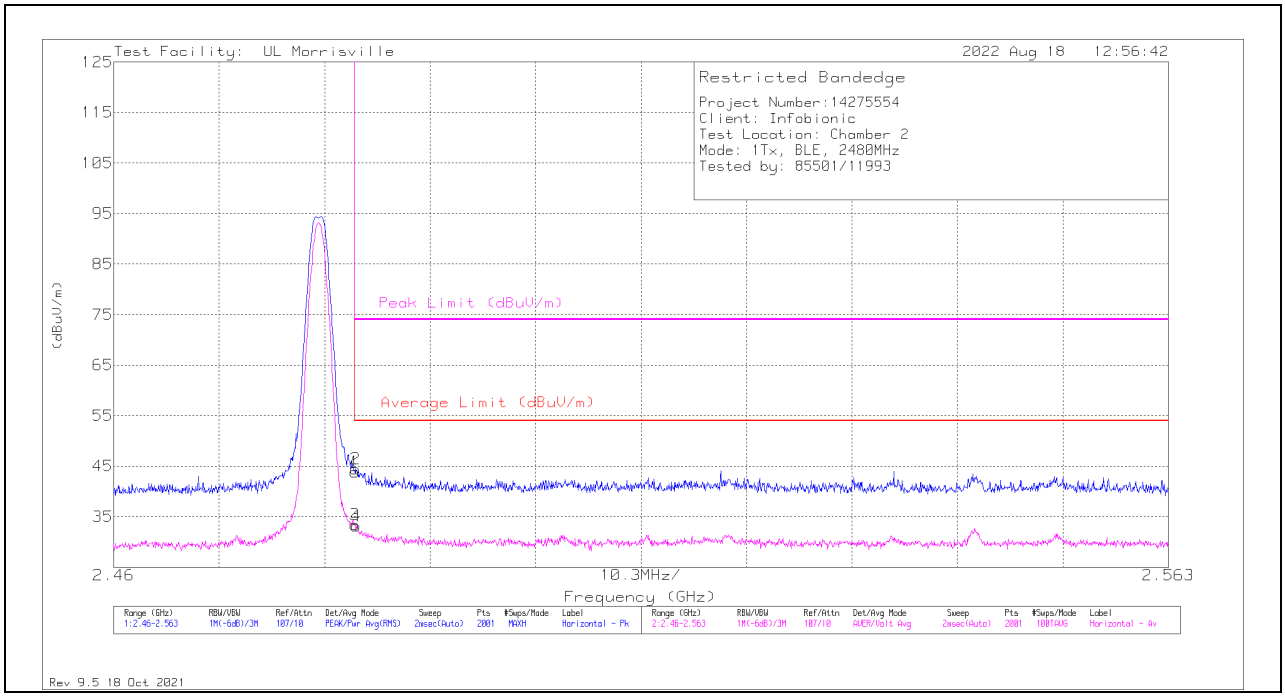
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT



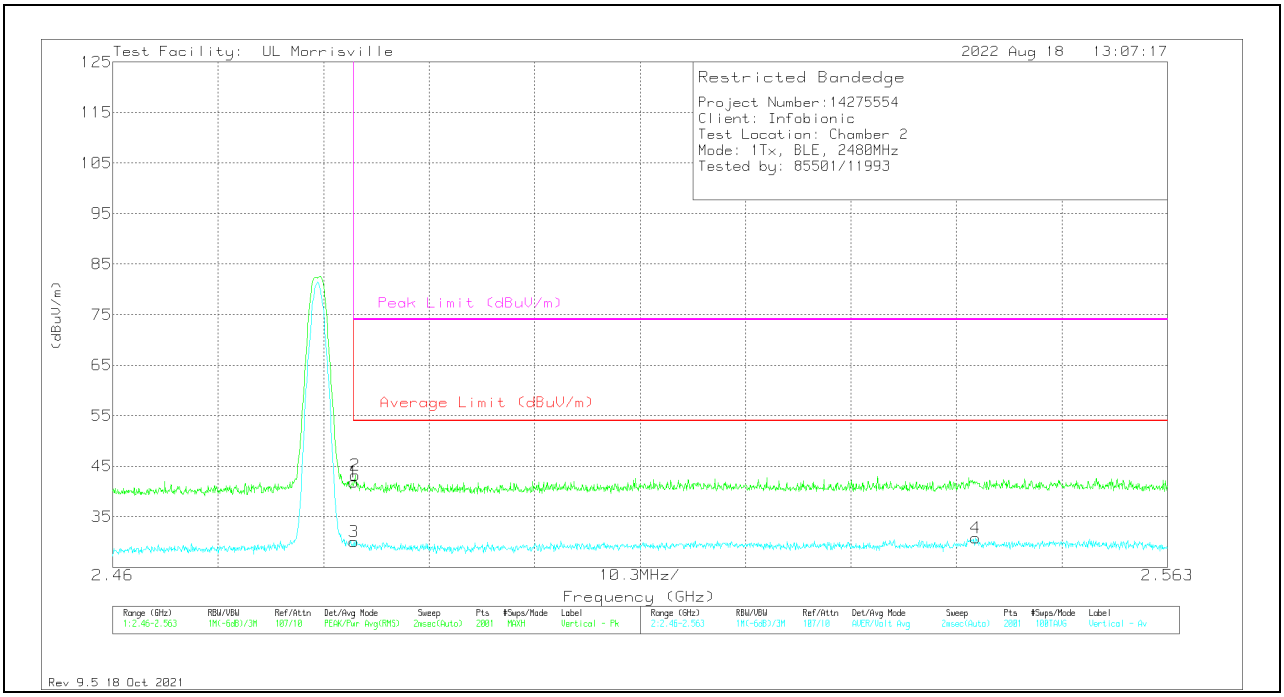

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.48354 | 35.82 | Pk | 32.3 | -24.3 | 43.82 | - | - | 74 | -30.18 | 99 | 333 | H |
| 2 | * ** 2.48364 | 36.48 | Pk | 32.3 | -24.3 | 44.48 | - | - | 74 | -29.52 | 99 | 333 | H |
| 3 | * ** 2.48354 | 25.36 | ADV | 32.3 | -24.3 | 33.36 | 54 | -20.64 | - | - | 99 | 333 | H |
| 4 | * ** 2.48369 | 25.13 | ADV | 32.3 | -24.3 | 33.13 | 54 | -20.87 | - | - | 99 | 333 | 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



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (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 | 33.9 | Pk | 32.3 | -24.3 | 41.9 | - | - | 74 | -32.1 | 213 | 278 | V |
| 2 | * ** 2.48369 | 35.2 | Pk | 32.3 | -24.3 | 43.2 | - | - | 74 | -30.8 | 213 | 278 | V |
| 3 | * ** 2.48354 | 22.07 | ADV | 32.3 | -24.3 | 30.07 | 54 | -23.93 | - | - | 213 | 278 | V |
| 4 | ** 2.54425 | 23.01 | ADV | 32.5 | -24.7 | 30.81 | 54 | -23.19 | - | - | 213 | 278 | V |

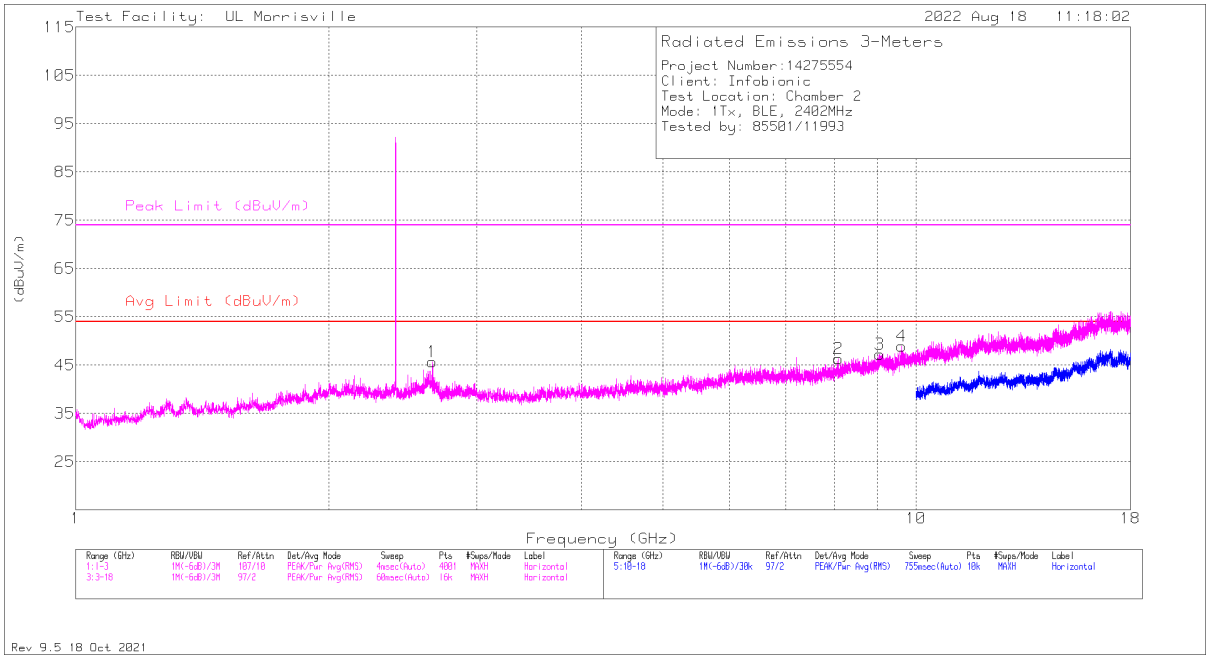
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average



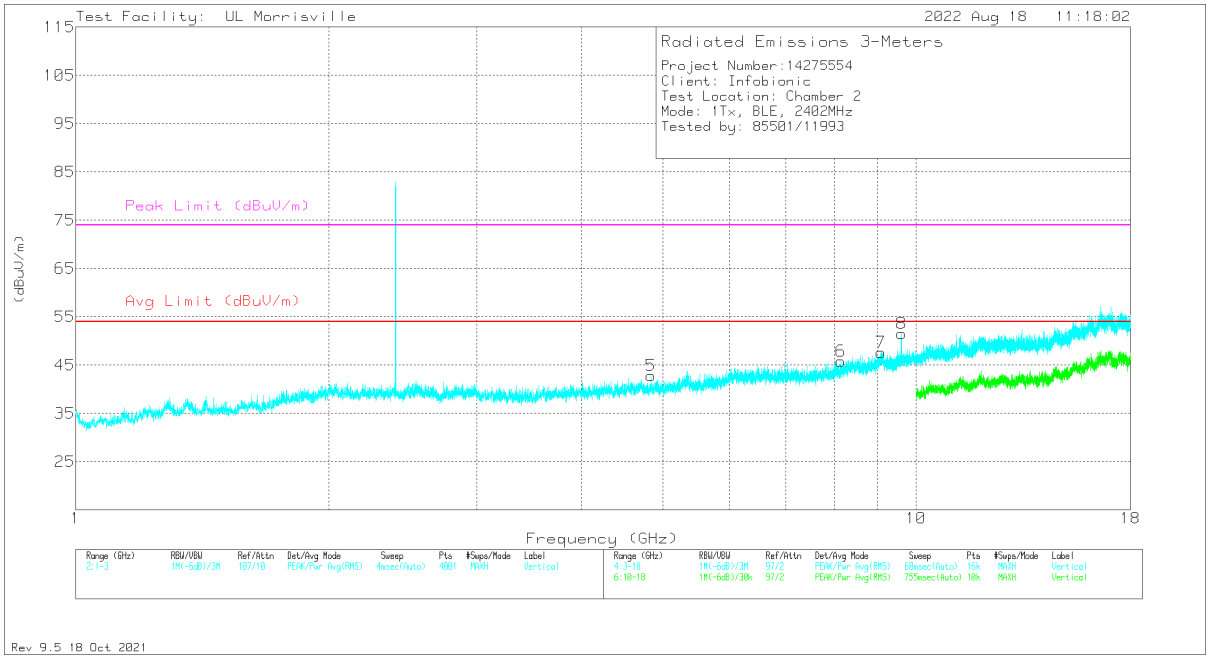
UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**

## RADIATED EMISSIONS

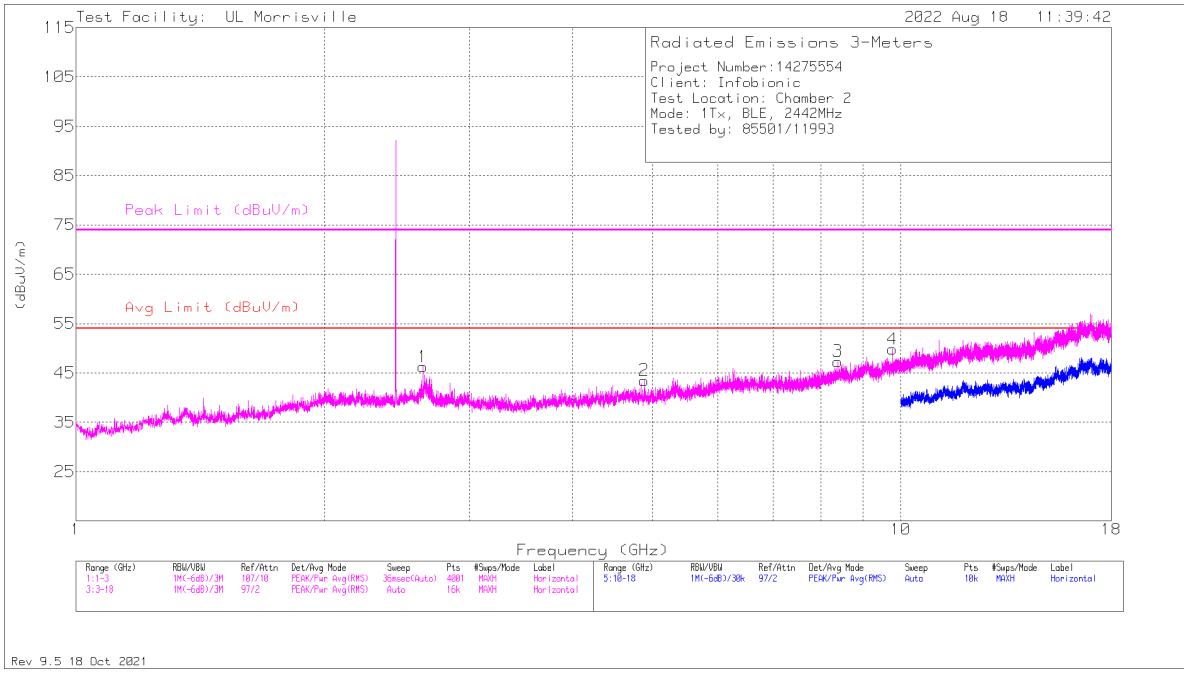
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.6585 | 39.06 | Pk | 32.1 | -25.5 | 45.66 | 54 | -8.34 | 74 | -28.34 | 0-360 | 101 | H |
| 2 | * ** 8.07938 | 37.4 | Pk | 35.8 | -26.8 | 46.4 | 54 | -7.6 | 74 | -27.6 | 0-360 | 101 | H |
| 3 | * ** 9.05719 | 36.62 | Pk | 36.1 | -25.5 | 47.22 | 54 | -6.78 | 74 | -26.78 | 0-360 | 200 | H |
| 5 | * ** 4.8375 | 39.44 | Pk | 34 | -30.6 | 42.84 | 54 | -11.16 | 74 | -31.16 | 0-360 | 101 | V |
| 6 | * ** 8.14406 | 36.75 | Pk | 35.7 | -26.6 | 45.85 | 54 | -8.15 | 74 | -28.15 | 0-360 | 200 | V |
| 7 | * ** 9.09094 | 36.87 | Pk | 36.1 | -25.3 | 47.67 | 54 | -6.33 | 74 | -26.33 | 0-360 | 200 | V |
| 4 | 9.60938 | 37.37 | Pk | 36.7 | -25.1 | 48.97 | - | - | - | - | 0-360 | 101 | H |
| 8 | 9.60938 | 39.92 | Pk | 36.7 | -25.1 | 51.52 | - | - | - | - | 0-360 | 101 | V |

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

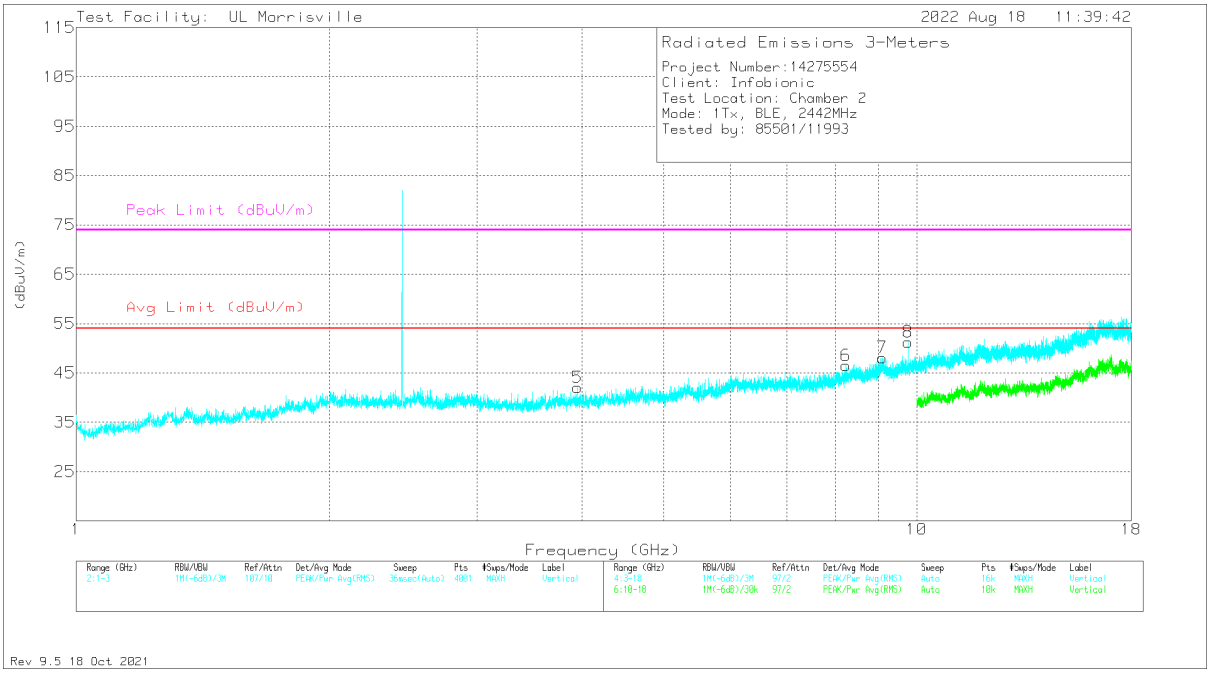


UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## MID CHANNEL RESULTS




## HORIZONTAL




## VERTICAL



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## RADIATED EMISSIONS

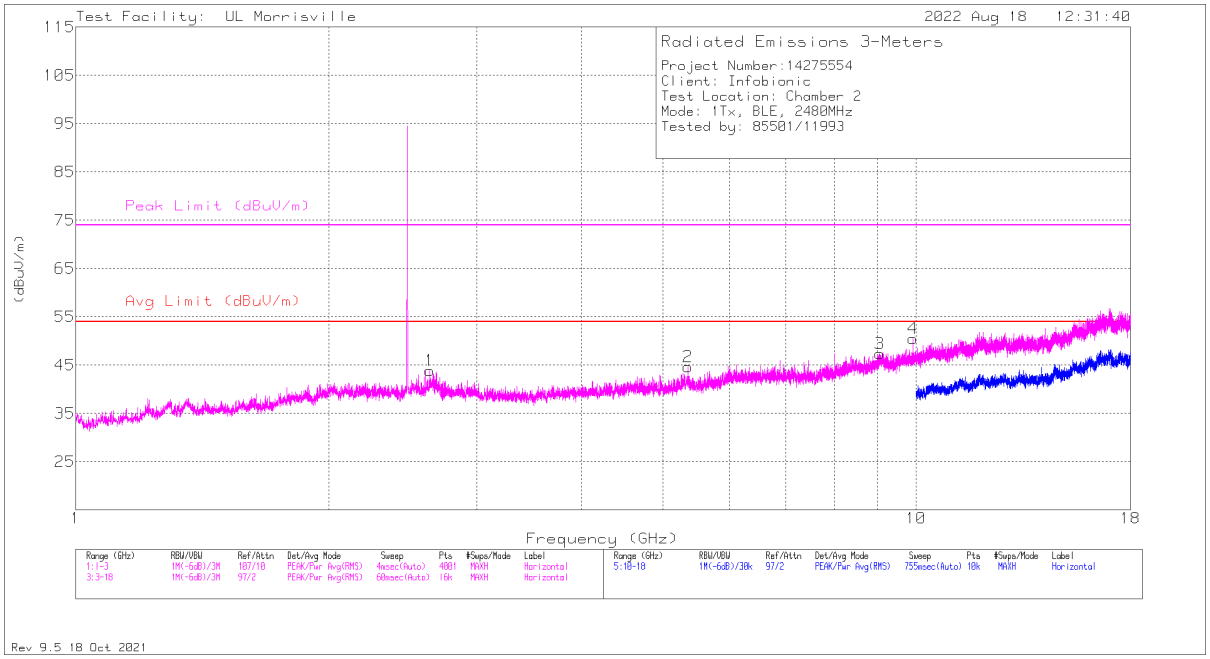
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ** 2.634 | 39.66 | Pk | 32.1 | -25.5 | 46.26 | 54 | -7.74 | 74 | -27.74 | 0-360 | 101 | H |
| 2 | * ** 4.88344 | 40.27 | Pk | 33.9 | -30.7 | 43.47 | 54 | -10.53 | 74 | -30.53 | 0-360 | 101 | H |
| 3 | * ** 8.39063 | 38.23 | Pk | 35.8 | -26.7 | 47.33 | 54 | -6.67 | 74 | -26.67 | 0-360 | 200 | H |
| 5 | * ** 3.95063 | 39.93 | Pk | 33.4 | -31.3 | 42.03 | 54 | -11.97 | 74 | -31.97 | 0-360 | 101 | V |
| 6 | * ** 8.23688 | 37.81 | Pk | 35.8 | -27.1 | 46.51 | 54 | -7.49 | 74 | -27.49 | 0-360 | 200 | V |
| 7 | * ** 9.10117 | 39.35 | PK2 | 36.2 | -25.4 | 50.15 | - | - | 74 | -23.85 | 203 | 241 | V |
|  | * ** 9.09894 | 25.7 | ADV | 36.2 | -25.4 | 36.5 | 54 | -17.5 | - | - | 203 | 241 | V |
| 4 | 9.76688 | 38.03 | Pk | 36.8 | -25 | 49.83 | - | - | - | - | 0-360 | 101 | H |
| 8 | 9.76688 | 39.44 | Pk | 36.8 | -25 | 51.24 | - | - | - | - | 0-360 | 101 | 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

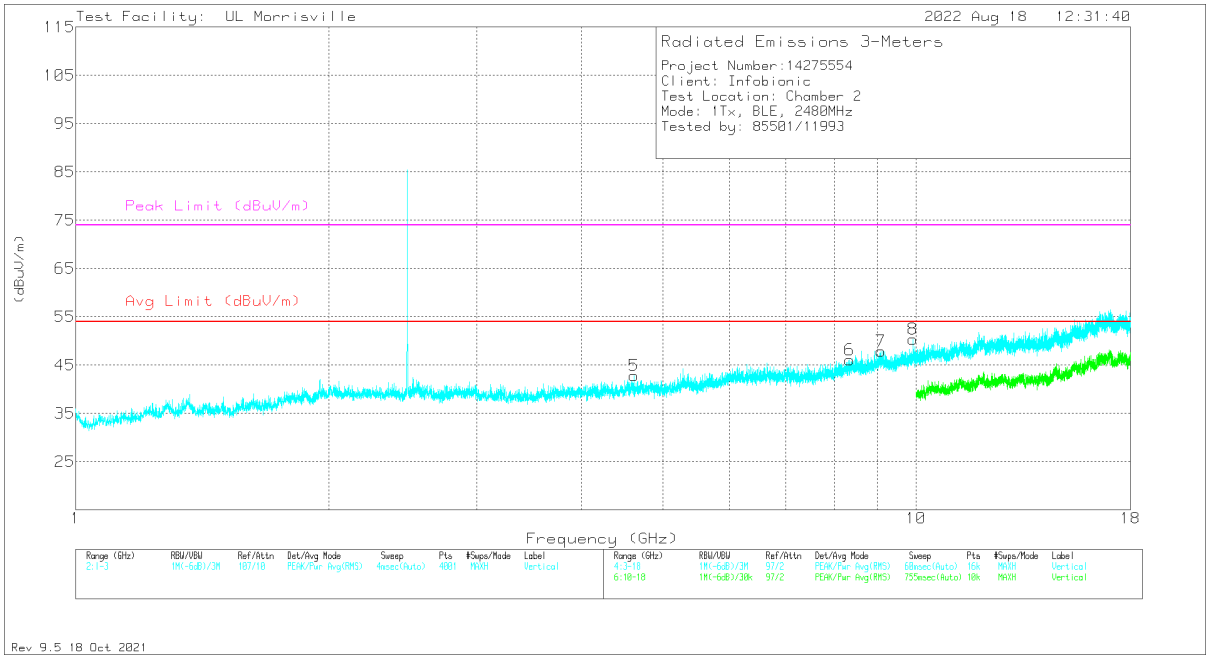


UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## HIGH CHANNEL RESULTS




## HORIZONTAL




## VERTICAL



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## RADIATED EMISSIONS

| 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 | ** 2.64 | 37.07 | Pk | 32.1 | -25.3 | 43.87 | 54 | -10.13 | 74 | -30.13 | 0-360 | 101 | H |
| 2 | * ** 5.35125 | 38.62 | Pk | 34.6 | -28.6 | 44.62 | 54 | -9.38 | 74 | -29.38 | 0-360 | 200 | H |
| 3 | * ** 9.04969 | 36.85 | Pk | 36.1 | -25.6 | 47.35 | 54 | -6.65 | 74 | -26.65 | 0-360 | 200 | H |
| 5 | * ** 4.62 | 39.99 | Pk | 34.2 | -31.3 | 42.89 | 54 | -11.11 | 74 | -31.11 | 0-360 | 101 | V |
| 6 | * ** 8.34469 | 36.84 | Pk | 35.8 | -26.5 | 46.14 | 54 | -7.86 | 74 | -27.86 | 0-360 | 101 | V |
| 7 | * ** 9.07969 | 37.53 | Pk | 36.1 | -25.7 | 47.93 | 54 | -6.07 | 74 | -26.07 | 0-360 | 200 | V |
| 4 | 9.92156 | 38.45 | Pk | 37 | -25 | 50.45 | - | - | - | - | 0-360 | 101 | H |
| 8 | 9.92156 | 38.42 | Pk | 37 | -25 | 50.42 | - | - | - | - | 0-360 | 101 | V |

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

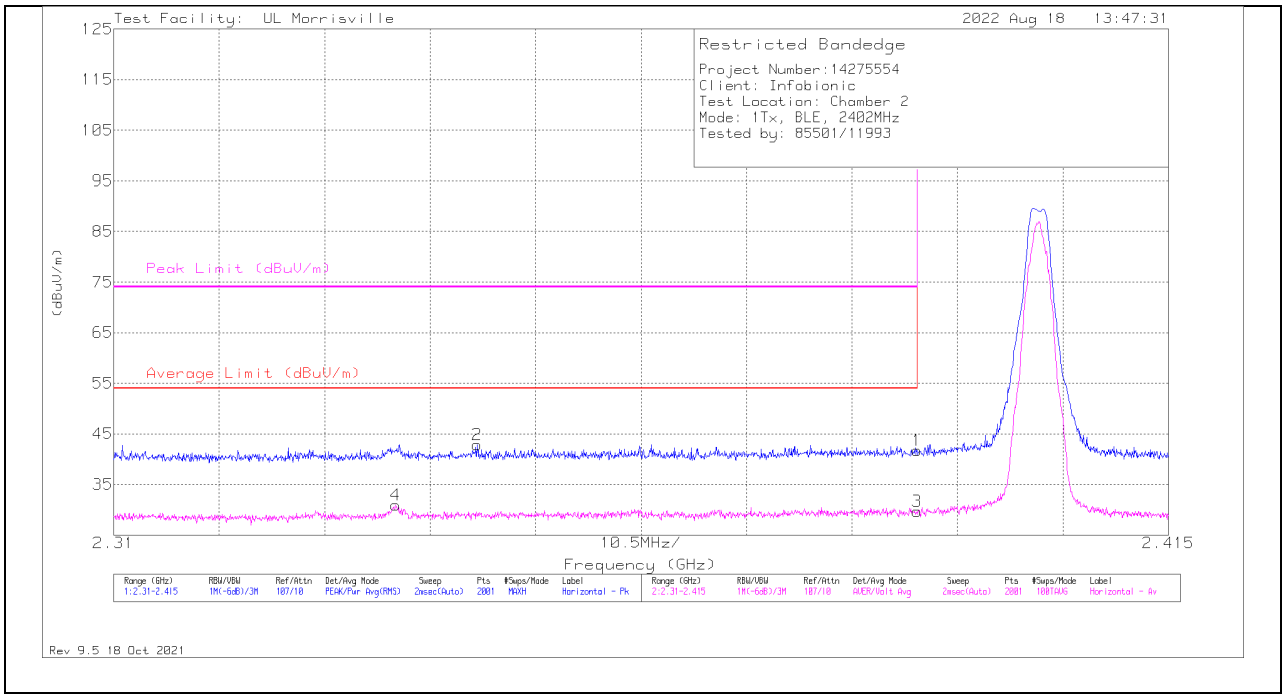


UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

### 10.2.1. BLE (2Mbps)

## BANDEDGE (LOW CHANNEL)

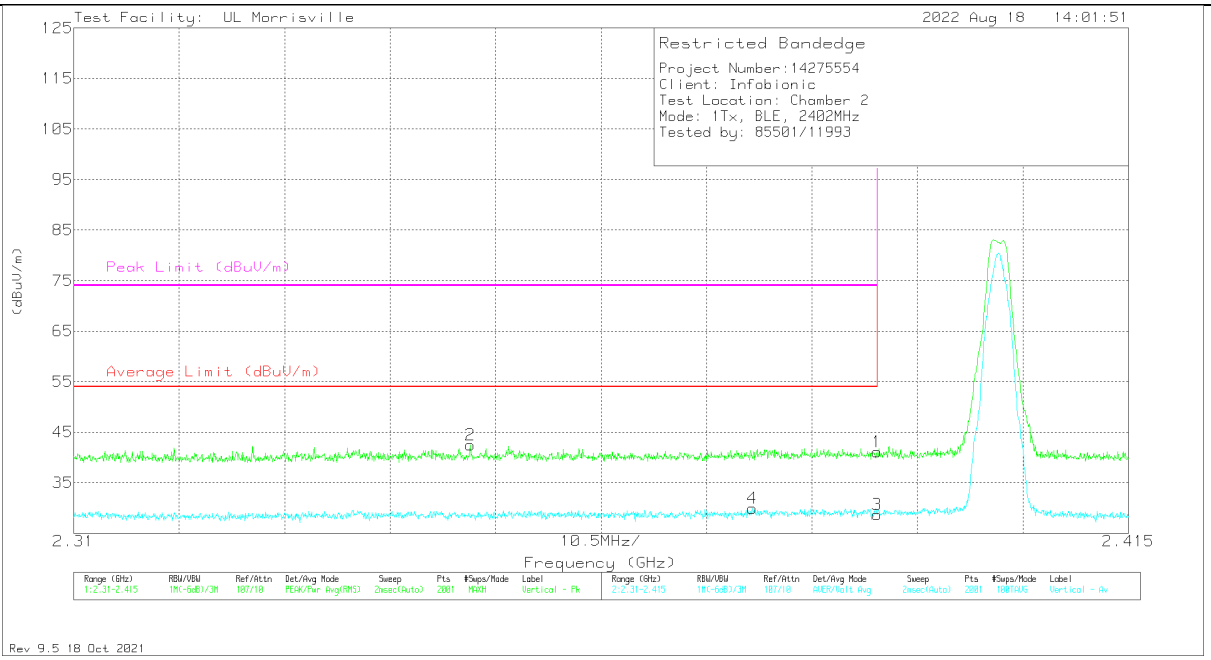
## HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (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 | 33.58 | Pk | 32 | -23.8 | 41.78 | - | - | 74 | -32.22 | 74 | 191 | H |
| 2 | * ** 2.34617 | 34.86 | Pk | 31.9 | -23.9 | 42.86 | - | - | 74 | -31.14 | 74 | 191 | H |
| 3 | * ** 2.38996 | 21.53 | ADV | 32 | -23.8 | 29.73 | 54 | -24.27 | - | - | 74 | 191 | H |
| 4 | * ** 2.33809 | 23.03 | ADV | 31.9 | -24 | 30.93 | 54 | -23.07 | - | - | 74 | 191 | 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

## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (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 | 32.93 | Pk | 32 | -23.8 | 41.13 | - | - | 74 | -32.87 | 87 | 309 | V |
| 2 | * ** 2.34948 | 34.42 | Pk | 31.9 | -23.9 | 42.42 | - | - | 74 | -31.58 | 87 | 309 | V |
| 3 | * ** 2.38996 | 20.53 | ADV | 32 | -23.8 | 28.73 | 54 | -25.27 | - | - | 87 | 309 | V |
| 4 | * ** 2.37757 | 21.78 | ADV | 32.1 | -23.9 | 29.98 | 54 | -24.02 | - | - | 87 | 309 | V |

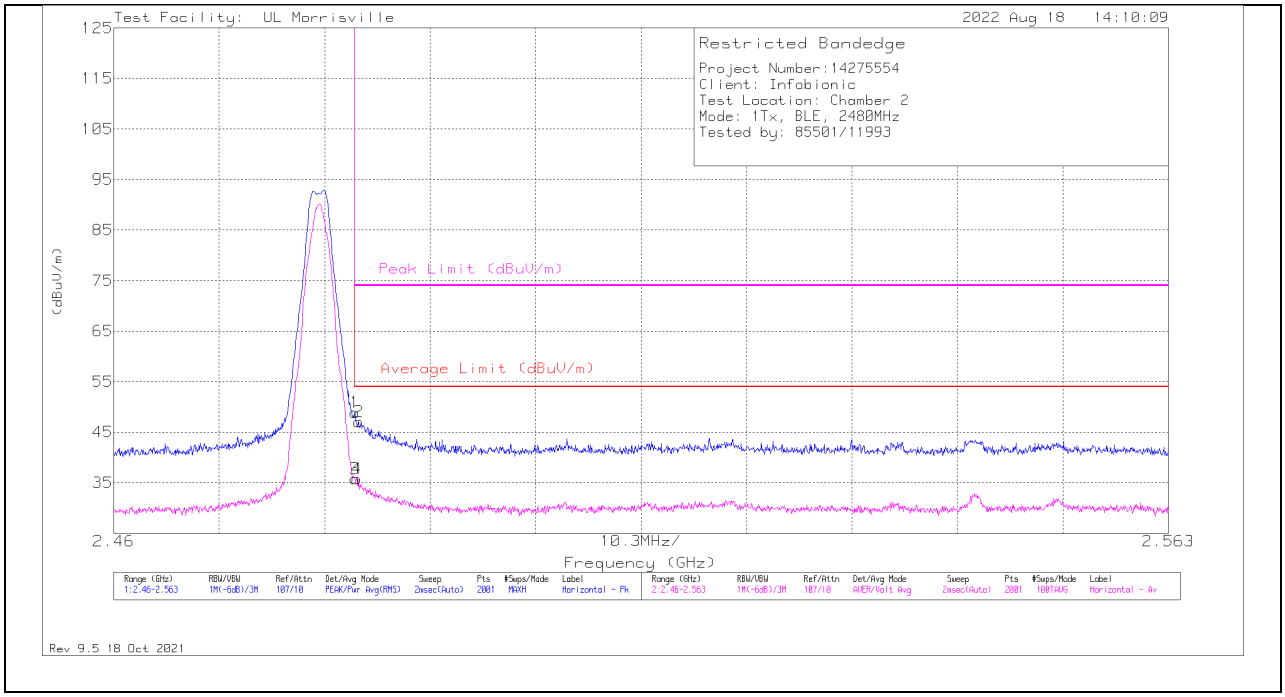
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT



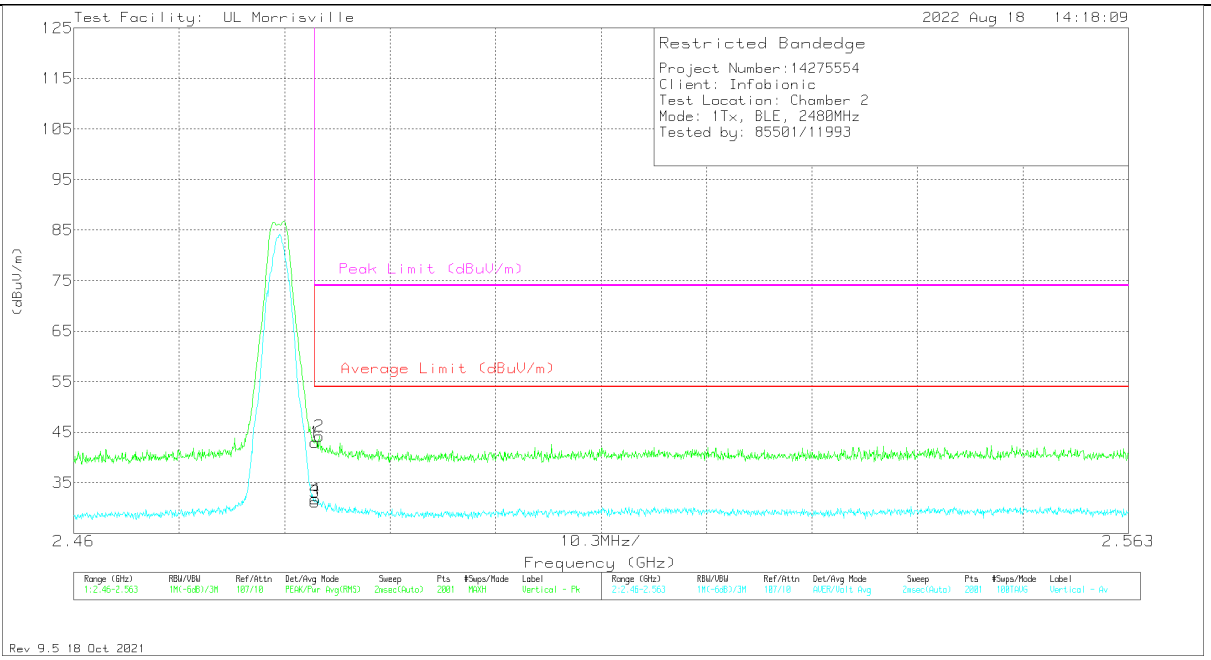

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.48354 | 40.92 | Pk | 32.3 | -24.3 | 48.92 | - | - | 74 | -25.08 | 85 | 116 | H |
| 2 | * ** 2.4839 | 39.17 | Pk | 32.3 | -24.4 | 47.07 | - | - | 74 | -26.93 | 85 | 116 | H |
| 3 | * ** 2.48354 | 27.74 | ADV | 32.3 | -24.3 | 35.74 | 54 | -18.26 | - | - | 85 | 116 | H |
| 4 | * ** 2.48374 | 27.73 | ADV | 32.3 | -24.3 | 35.73 | 54 | -18.27 | - | - | 85 | 116 | 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



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (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 | 35.01 | Pk | 32.3 | -24.3 | 43.01 | - | - | 74 | -30.99 | 77 | 331 | V |
| 2 | * ** 2.484 | 36.32 | Pk | 32.3 | -24.4 | 44.22 | - | - | 74 | -29.78 | 77 | 331 | V |
| 3 | * ** 2.48354 | 23.23 | ADV | 32.3 | -24.3 | 31.23 | 54 | -22.77 | - | - | 77 | 330 | V |
| 4 | * ** 2.48359 | 23.82 | ADV | 32.3 | -24.3 | 31.82 | 54 | -22.18 | - | - | 77 | 330 | V |

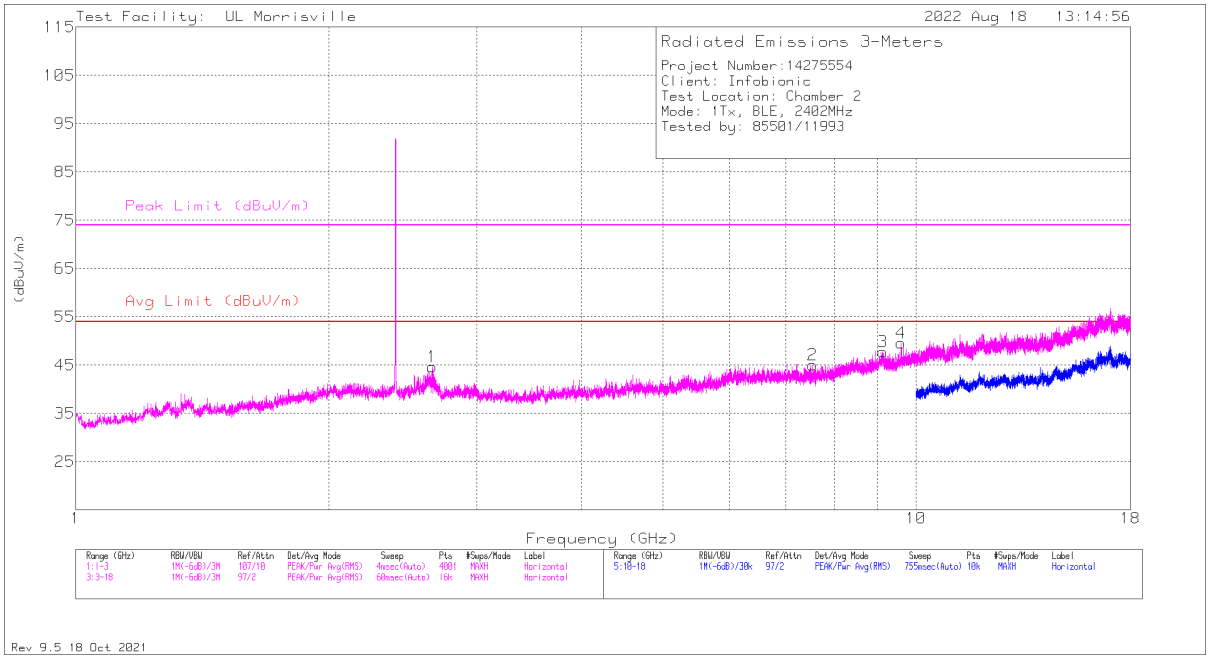
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average



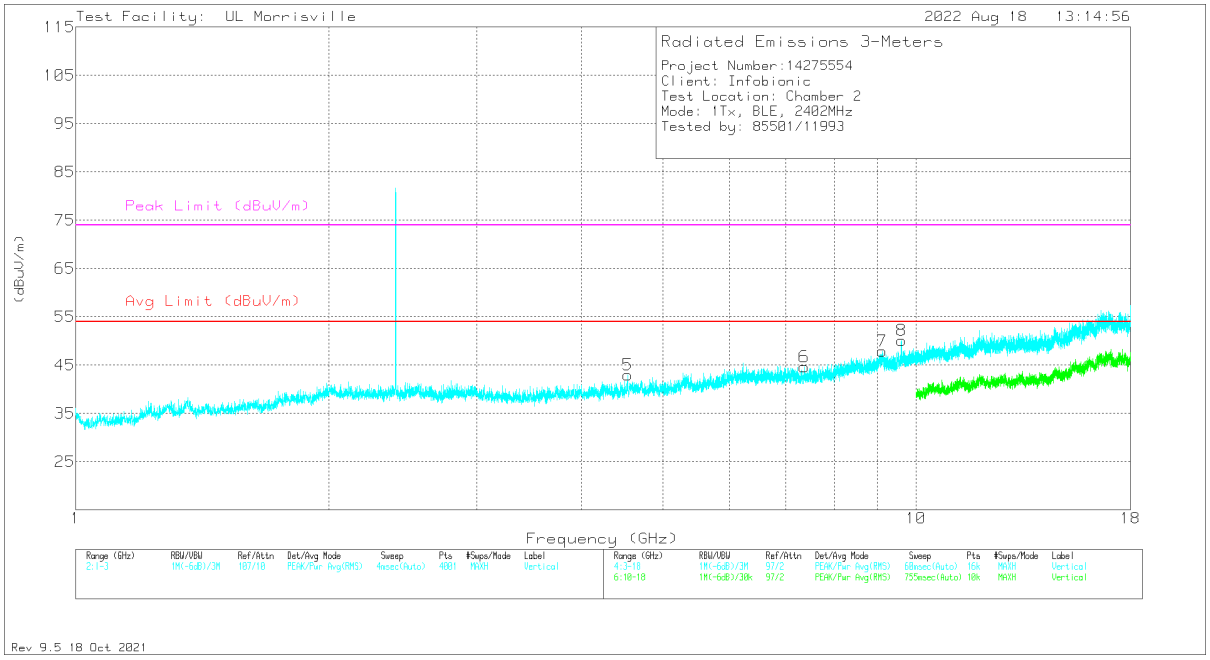
UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**

## RADIATED EMISSIONS

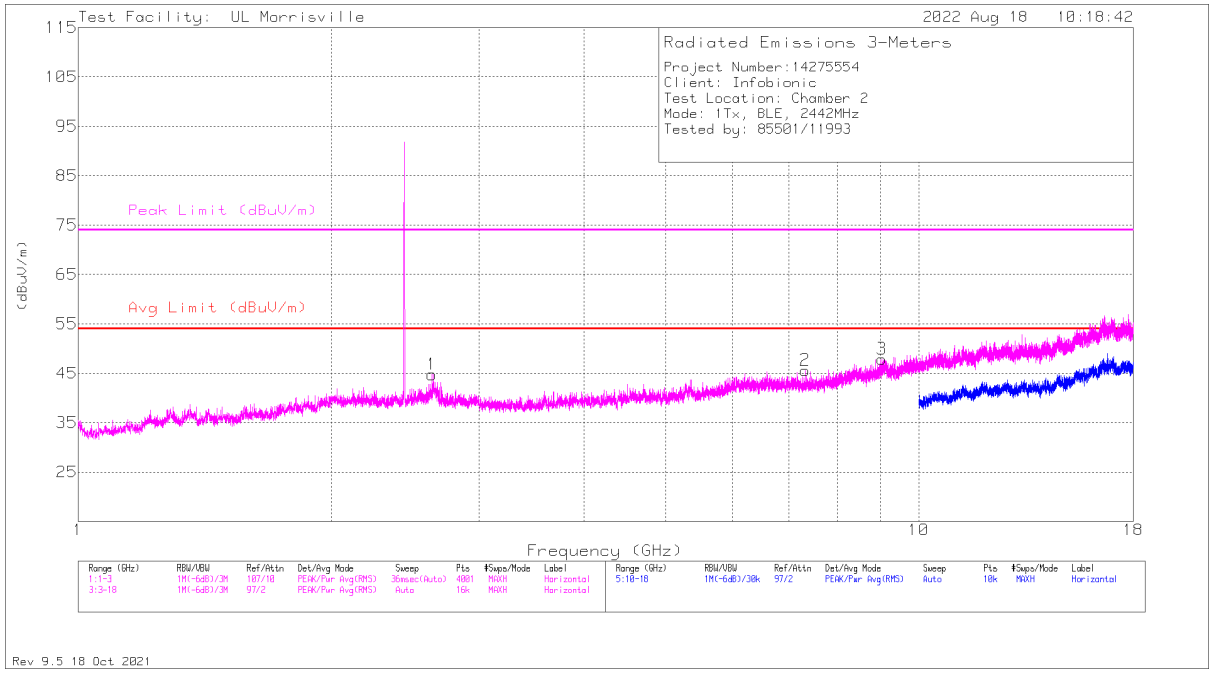
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.6585 | 38.08 | Pk | 32.1 | -25.5 | 44.68 | 54 | -9.32 | 74 | -29.32 | 0-360 | 200 | H |
| 2 | * ** 7.53844 | 37.2 | Pk | 35.7 | -27.8 | 45.1 | 54 | -8.9 | 74 | -28.9 | 0-360 | 101 | H |
| 3 | * ** 9.13969 | 36.57 | Pk | 36.2 | -25 | 47.77 | 54 | -6.23 | 74 | -26.23 | 0-360 | 199 | H |
| 5 | * ** 4.53844 | 39.31 | Pk | 34.1 | -30.4 | 43.01 | 54 | -10.99 | 74 | -30.99 | 0-360 | 199 | V |
| 6 | * ** 7.36219 | 36.03 | Pk | 35.6 | -27 | 44.63 | 54 | -9.37 | 74 | -29.37 | 0-360 | 199 | V |
| 7 | * ** 9.12281 | 36.89 | Pk | 36.2 | -25.2 | 47.89 | 54 | -6.11 | 74 | -26.11 | 0-360 | 101 | V |
| 4 | 9.60563 | 38.07 | Pk | 36.7 | -25.2 | 49.57 | - | - | - | - | 0-360 | 101 | H |
| 8 | 9.60938 | 38.5 | Pk | 36.7 | -25.1 | 50.1 | - | - | - | - | 0-360 | 101 | V |

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

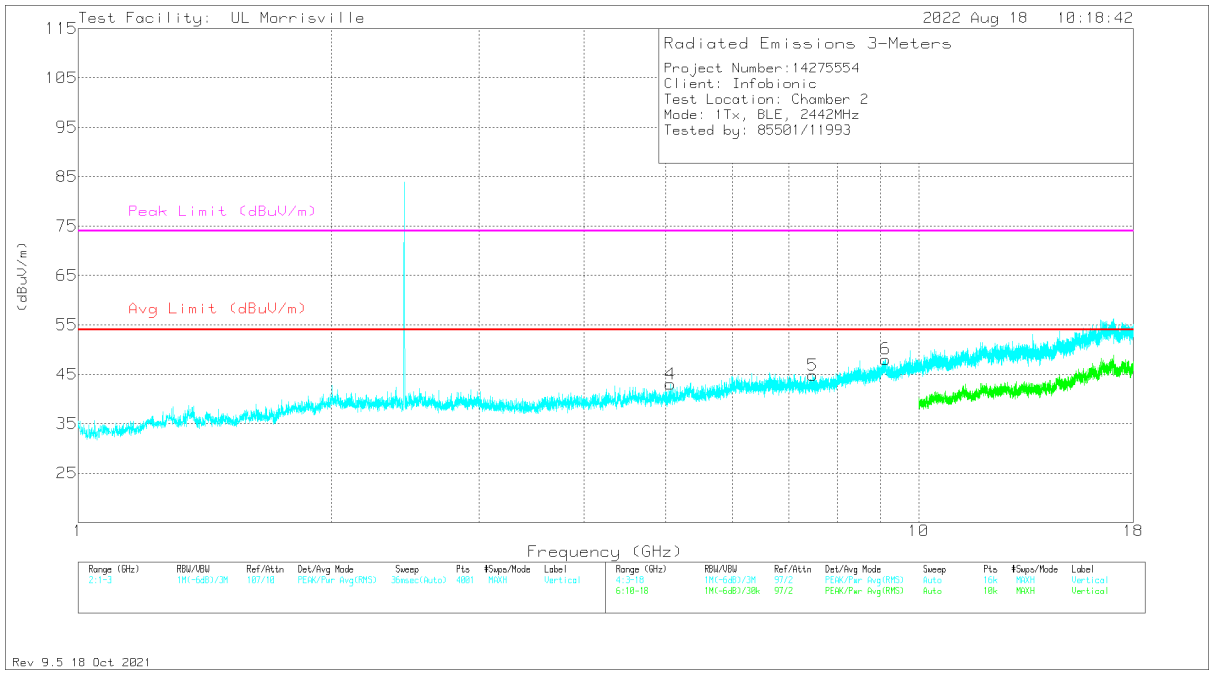


UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## MID CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**

## RADIATED EMISSIONS

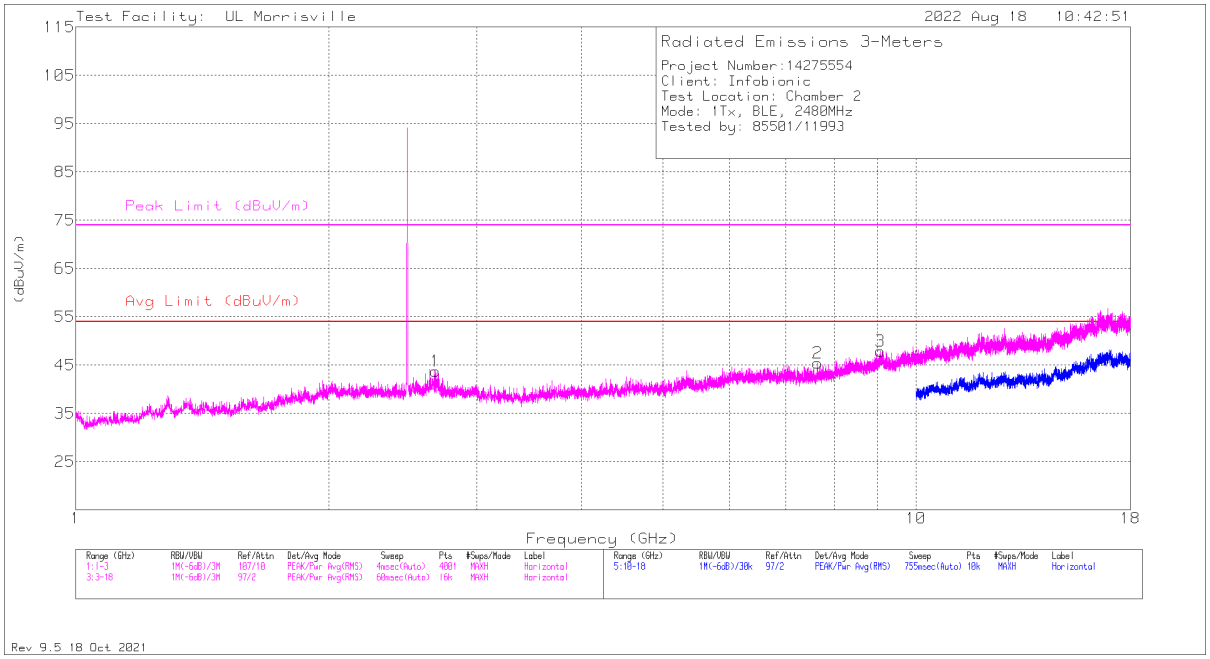
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 206211 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ** 2.6345 | 38.15 | Pk | 32.1 | -25.5 | 44.75 | 54 | -9.25 | 74 | -29.25 | 0-360 | 101 | H |
| 2 | * ** 7.3275 | 37.11 | Pk | 35.6 | -27.1 | 45.61 | 54 | -8.39 | 74 | -28.39 | 0-360 | 101 | H |
| 3 | * ** 9.04219 | 37.6 | Pk | 36 | -25.7 | 47.9 | 54 | -6.1 | 74 | -26.1 | 0-360 | 101 | H |
| 4 | * ** 5.06531 | 39.72 | Pk | 34.1 | -30.8 | 43.02 | 54 | -10.98 | 74 | -30.98 | 0-360 | 101 | V |
| 5 | * ** 7.47938 | 36.57 | Pk | 35.7 | -27.5 | 44.77 | 54 | -9.23 | 74 | -29.23 | 0-360 | 101 | V |
| 6 | * ** 9.13123 | 38.03 | PK2 | 36.2 | -25.1 | 49.13 | - | - | 74 | -24.87 | 90 | 194 | V |
|  | * ** 9.13221 | 25.61 | ADV | 36.2 | -25 | 36.81 | 54 | -17.19 | - | - | 90 | 194 | 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

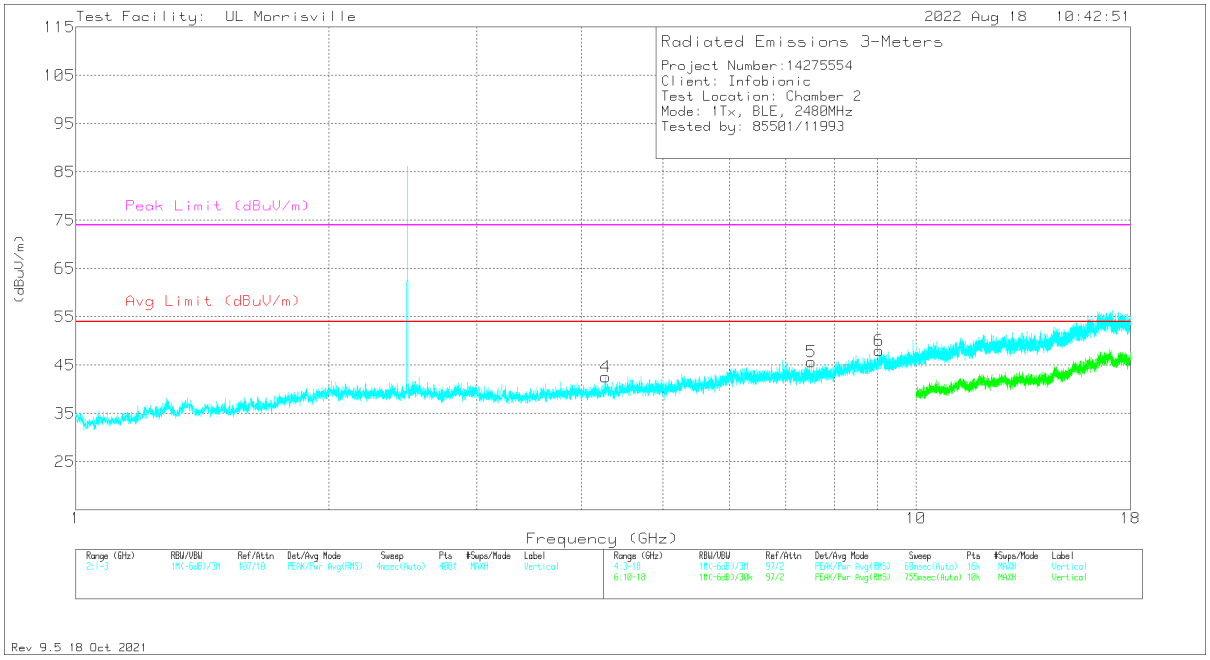


UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## HIGH CHANNEL RESULTS




## HORIZONTAL




## VERTICAL



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## RADIATED EMISSIONS

| 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 | * ** 2.6795 | 37.37 | Pk | 31.9 | -25.5 | 43.77 | 54 | -10.23 | 74 | -30.23 | 0-360 | 101 | H |
| 2 | * ** 7.64063 | 37 | Pk | 35.7 | -27.2 | 45.5 | 54 | -8.5 | 74 | -28.5 | 0-360 | 101 | H |
| 3 | * ** 9.06656 | 37.12 | Pk | 36.1 | -25.3 | 47.92 | 54 | -6.08 | 74 | -26.08 | 0-360 | 101 | H |
| 4 | * ** 4.27125 | 40.17 | Pk | 33.3 | -30.9 | 42.57 | 54 | -11.43 | 74 | -31.43 | 0-360 | 200 | V |
| 5 | * ** 7.50656 | 37.55 | Pk | 35.7 | -27.5 | 45.75 | 54 | -8.25 | 74 | -28.25 | 0-360 | 200 | V |
| 6 | * ** 9.04397 | 38.09 | PK2 | 36 | -25.6 | 48.49 | - | - | 74 | -25.51 | 136 | 171 | V |
|  | * ** 9.04616 | 25.71 | ADV | 36 | -25.6 | 36.11 | 54 | -17.89 | - | - | 136 | 171 | 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

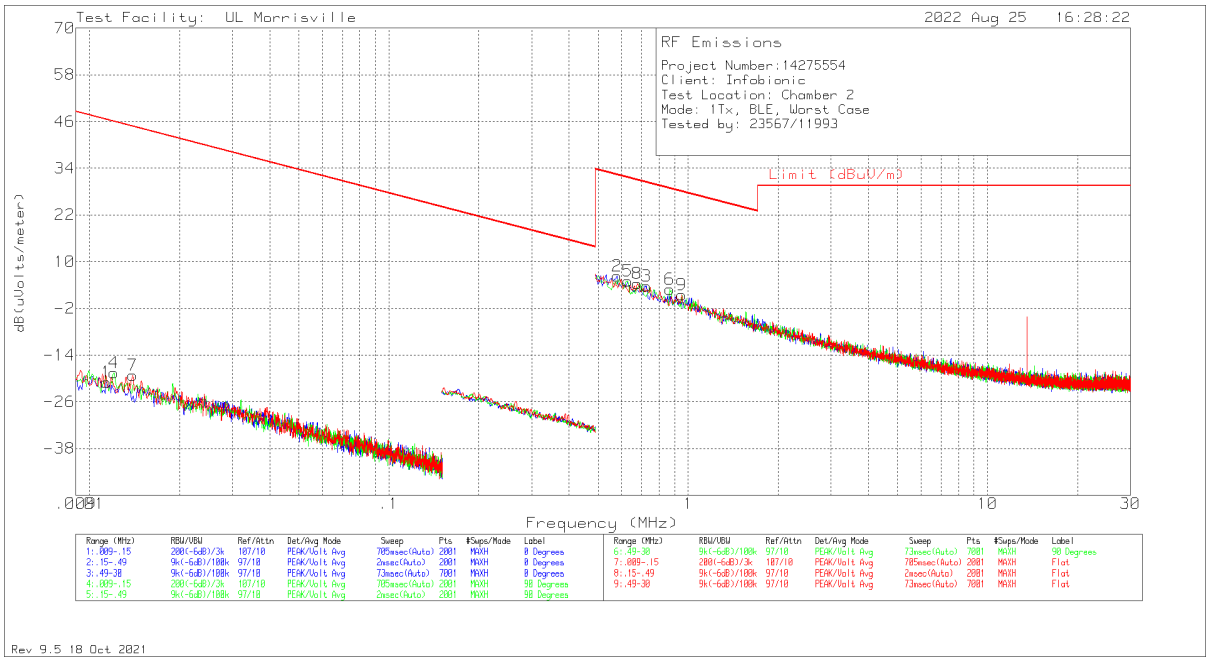


UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## 10.3. WORST CASE BELOW 30MHZ

**SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)**

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).




**ANTENNA- THREE ORIENTATIONS E FIELD**

## Below 30MHz Data E FIELD

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0079 (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) | Height (cm) | Loop Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .01141 | 41.16 | Pk | 17.8 | .1 | -80 | -20.94 | 46.46 | 66.46 | -67.4 | 0-360 | 401 | 0 degs |
| 4 | .01205 | 43.81 | Pk | 17.5 | .1 | -80 | -18.59 | 45.98 | 65.98 | -64.57 | 0-360 | 401 | 90 degs |
| 7 | .01397 | 44 | Pk | 16.7 | .1 | -80 | -19.2 | 44.7 | 64.7 | -63.9 | 0-360 | 401 | Flat |
| 2 | .57854 | 34.96 | Pk | 11.2 | .2 | -40 | 6.36 | 32.36 | - | -26 | 0-360 | 401 | 0 degs |
| 5 | .62913 | 33.51 | Pk | 11.3 | .2 | -40 | 5.01 | 31.63 | - | -26.62 | 0-360 | 401 | 90 degs |
| 8 | .6755 | 32.91 | Pk | 11.3 | .2 | -40 | 4.41 | 31.01 | - | -26.6 | 0-360 | 401 | Flat |
| 3 | .7261 | 32.27 | Pk | 11.3 | .2 | -40 | 3.77 | 30.38 | - | -26.61 | 0-360 | 401 | 0 degs |
| 6 | .86944 | 31.36 | Pk | 11.3 | .2 | -40 | 2.86 | 28.82 | - | -25.96 | 0-360 | 401 | 90 degs |
| 9 | .94954 | 29.95 | Pk | 11.3 | .2 | -40 | 1.45 | 28.05 | - | -26.6 | 0-360 | 401 | Flat |

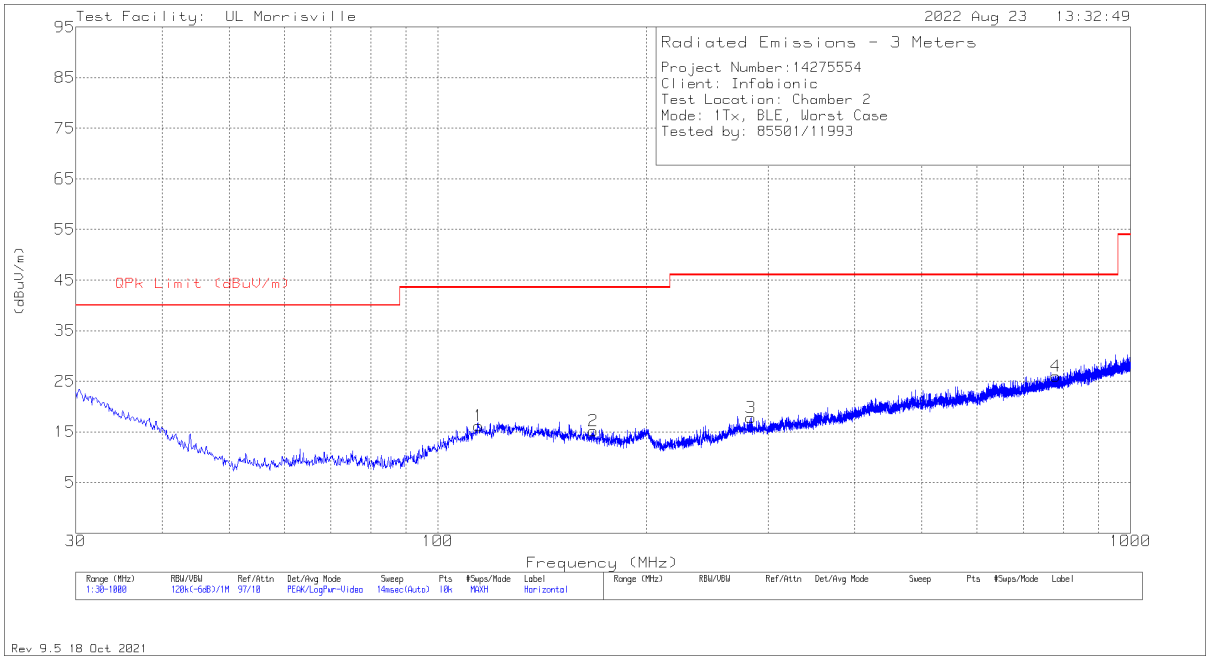
Pk - Peak detector



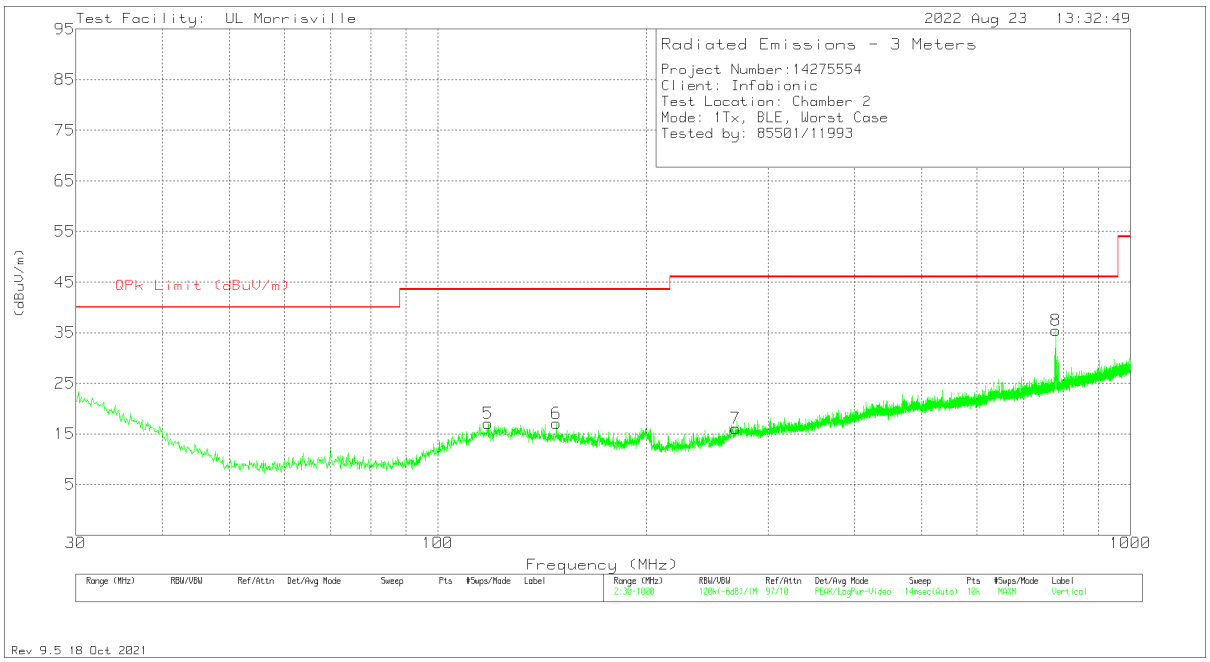
UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

# 10.4. WORST CASE BELOW 1 GHZ

**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)**




**HORIZONTAL**




**VERTICAL**



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## Below 1GHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0073 (dB/m) | Gain/Loss (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 114.584 | 26.98 | Pk | 19.5 | -30.3 | 16.18 | 43.52 | -27.34 | 0-360 | 399 | H |
| 2 | * ** 167.837 | 27 | Pk | 18 | -29.8 | 15.2 | 43.52 | -28.32 | 0-360 | 299 | H |
| 3 | * ** 283.17 | 27.28 | Pk | 19.3 | -28.8 | 17.78 | 46.02 | -28.24 | 0-360 | 299 | H |
| 4 | ** 780.004 | 25.42 | Pk | 27.3 | -26.7 | 26.02 | 46.02 | -20 | 0-360 | 299 | H |
| 5 | * ** 118.27 | 27.88 | Pk | 19.8 | -30.6 | 17.08 | 43.52 | -26.44 | 0-360 | 299 | V |
| 7 | * ** 268.814 | 25.91 | Pk | 19.3 | -29.1 | 16.11 | 46.02 | -29.91 | 0-360 | 299 | V |
| 8 | ** 780.877 | 34.87 | Pk | 27.2 | -26.6 | 35.47 | 46.02 | -10.55 | 0-360 | 299 | V |
| 6 | 148.243 | 28.42 | Pk | 18.7 | -30 | 17.12 | 43.52 | -26.4 | 0-360 | 101 | V |

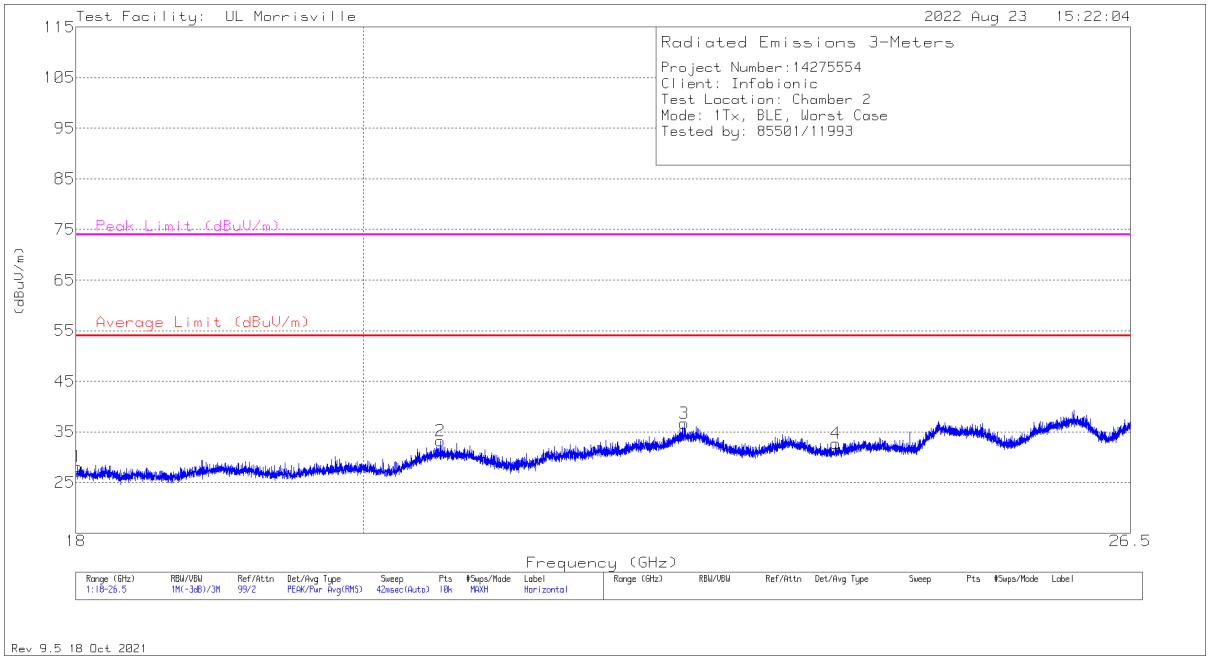
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector



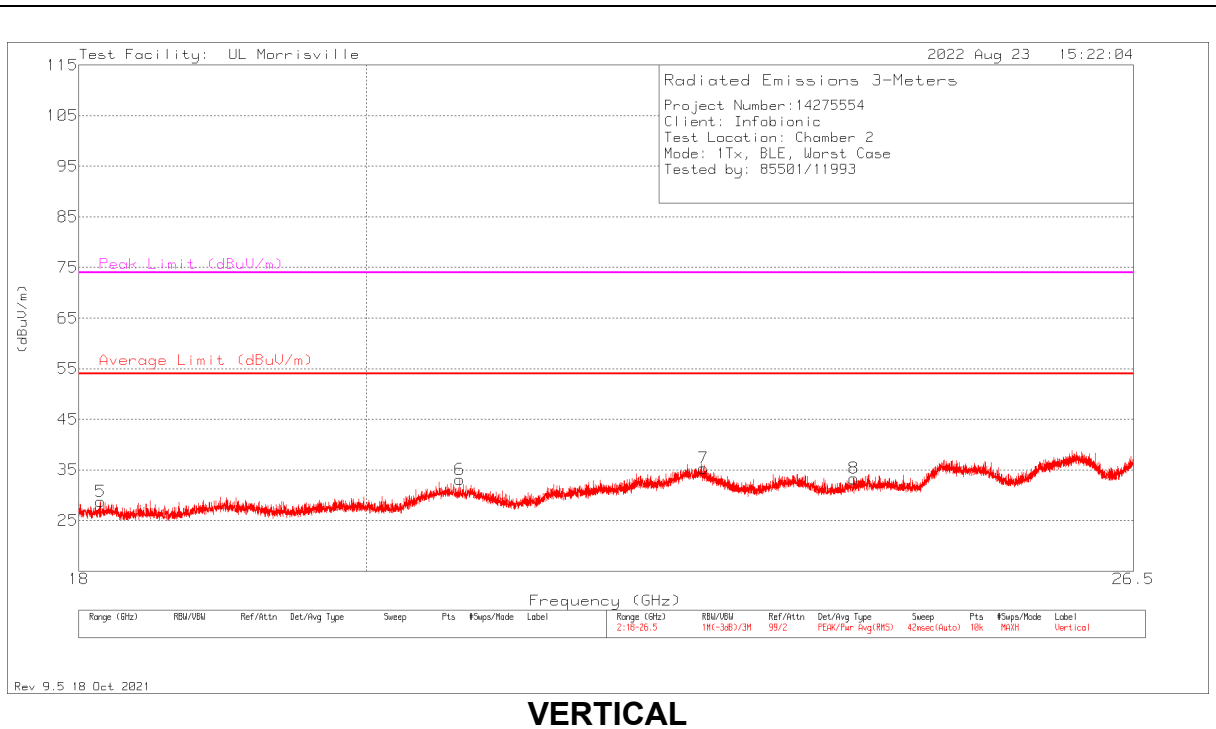
UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## 10.5. WORST CASE 18-26 GHZ

**SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION)**




**HORIZONTAL**




**VERTICAL**



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

## 18 – 26GHz Data

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0063 (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 | * ** 18.01105 | 33.68 | Pk | 33.2 | -38.7 | 28.18 | 54 | -25.82 | 74 | -45.82 | 0-360 | 101 | H |
| 2 | * ** 20.57354 | 37.73 | Pk | 33.9 | -38.4 | 33.23 | 54 | -20.77 | 74 | -40.77 | 0-360 | 150 | H |
| 3 | * ** 22.502 | 38.34 | Pk | 36.4 | -38.1 | 36.64 | 54 | -17.36 | 74 | -37.36 | 0-360 | 250 | H |
| 4 | * ** 23.78452 | 35.4 | Pk | 34.9 | -37.6 | 32.7 | 54 | -21.3 | 74 | -41.3 | 0-360 | 101 | H |
| 5 | * ** 18.14534 | 34.46 | Pk | 33.1 | -38.8 | 28.76 | 54 | -25.24 | 74 | -45.24 | 0-360 | 299 | V |
| 6 | * ** 20.69933 | 37.67 | Pk | 33.9 | -38.5 | 33.07 | 54 | -20.93 | 74 | -40.93 | 0-360 | 101 | V |
| 7 | * ** 22.63629 | 37.07 | Pk | 36.2 | -38 | 35.27 | 54 | -18.73 | 74 | -38.73 | 0-360 | 101 | V |
| 8 | * ** 23.91711 | 35.88 | Pk | 34.9 | -37.5 | 33.28 | 54 | -20.72 | 74 | -40.72 | 0-360 | 150 | V |

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



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400

# 11. SETUP PHOTOS

Please refer to 14275554-EP2 for setup photos

# END OF TEST REPORT



UL LLC
12 Laboratory Dr., RTP, NC 27709; USA TEL:(919) 549-1400