



# **CERTIFICATION TEST REPORT**

**Report Number:** R13333199-E1

**Applicant :** Resideo  
2 Corporate Center Drive  
Melville, NY 11749-3265, USA

**Model :** ProA7

**FCC ID :** CFS8DL-GRIPAI07B

**IC :** 573F-GRIPAI07B

**EUT Description :** Alarm Control Panel

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART C  
ISED RSS-247 ISSUE 2  
ISED RSS-GEN ISSUE 5

**Date Of Issue:**  
2020-07-17

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

| Ver. | Issue Date | Revisions                                                                                                                 | Revised By      |
|------|------------|---------------------------------------------------------------------------------------------------------------------------|-----------------|
| 1    | 2020-06-30 | Initial Issue                                                                                                             | Brian T. Kiewra |
| 2    | 2020-07-01 | Corrected conducted setup photo                                                                                           | Brian T. Kiewra |
| 3    | 2020-07-17 | Revised report to show that peak power for 802.15.4 is for reference only and average power for BLE is for reference only | Brian T. Kiewra |

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Resideo  
2 Corporate Center Drive  
Melville, NY 11749-3265, USA

**EUT DESCRIPTION:** Alarm Control Panel

**MODEL:** ProA7

**SERIAL NUMBER:** MEL-943

**DATE TESTED:** 2020-04-30 to 2020-06-09

| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart C | Complies     |
| ISED RSS-247 Issue 2     | Complies     |
| ISED RSS-GEN Issue 5     | 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. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. government.

Approved & Released  
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Project Engineer  
Consumer Technology Division  
UL LLC

## 2. TEST RESULTS SUMMARY

| FCC Clause                           | ISED Clause       | Requirement                  | Result      | Comment    |
|--------------------------------------|-------------------|------------------------------|-------------|------------|
| ANSI C63.10 Section 11.6.            |                   | Duty Cycle                   | See Comment | See Note 1 |
| ANSI C63.10 Section 6.9.3.           | RSS-GEN 6.7       | 99% OBW                      |             |            |
| 15.247 (a) (2)                       | RSS-247 5.2 (a)   | 6dB BW                       |             |            |
| 15.247 (b) (3)                       | RSS-247 5.4 (d)   | Output Power                 | Compliant   | None       |
| Per ANSI C63.10, Section 11.9.2.3.2. |                   | Average power                |             |            |
| 15.247 (e)                           | RSS-247 5.2 (b)   | PSD                          | See Comment | See Note 1 |
| 15.247 (d)                           | RSS-247 5.5       | Conducted Spurious Emissions |             |            |
| 15.209, 15.205                       | RSS-GEN 8.9, 8.10 | Radiated Emissions           | Compliant   | None       |
| 15.207                               | RSS-Gen 8.8       | AC Mains Conducted Emissions |             |            |

Note 1: Manufacturer requested power, radiated emissions, and AC mains line conducted emissions testing only. Remaining test results to be leveraged from separate test reports and/or documentation. This documentation will be provided by the manufacturer upon request.

### 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, RSS-GEN Issue 5, and RSS-247 Issue 2.

### 4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, NC 27709, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, NC 27560, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 12 Laboratory Dr.                      | 2800 Perimeter Park Dr.                           |
|----------------------------------------|---------------------------------------------------|
| Site Code: 2180C                       |                                                   |
| <input type="checkbox"/> Chamber A RTP | <input checked="" type="checkbox"/> North Chamber |
| <input type="checkbox"/> Chamber C RTP | <input checked="" type="checkbox"/> South Chamber |

The above test sites and facilities are covered under FCC Test Firm Registration # 703469. Chambers above are covered under Industry Canada company address and respective code.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0

## 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 <sub>Lab</sub> |
|--------------------------------------------------|------------------|
| Worst Case Conducted Disturbance, 0.15 to 30 MHz | ± 3.07 dB        |
| Worst Case Radiated Disturbance, 9kHz to 26GHz   | ± 4.88 dB        |

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 control panel with a proprietary 802.15.4 and BLE transceivers.

### 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             | 1.11               | 1.29              |
| 2405 - 2475           | 802.15.4 - ANT1 | 21.50              | 141.25            |
| 2405 - 2475           | 802.15.4 - ANT2 | 20.98              | 125.31            |

### 6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The BLE radio utilizes an BLE antenna, with a maximum gain of 6 dBi.

The 802.15.4 transmitters utilizes two antennas for diversity with maximum gains of:

Antenna 1: 6.6 dBi

Antenna 2: 4.7 dBi

### 6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was v 20200226164413 v01.23-1632.

The test utility software used during testing was TestMenuScript.sh

### 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 with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

The EUT is intended to operate in only one orientation (wall mounted). Therefore, all final radiated testing was performed with the EUT in its intended orientation.

## 6.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

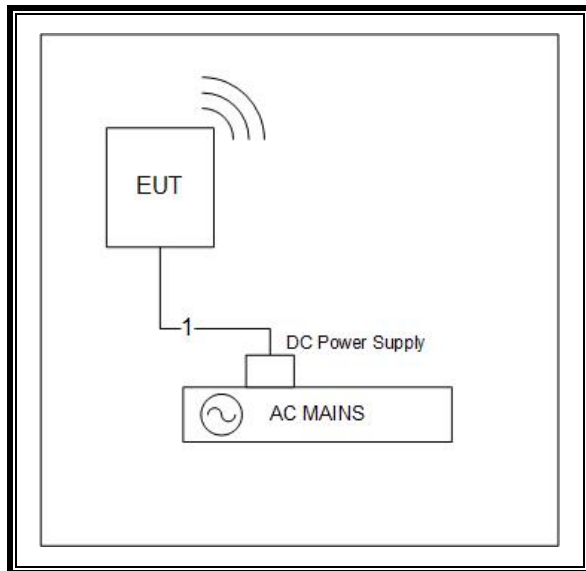
| Support Equipment List |              |                       |                     |        |
|------------------------|--------------|-----------------------|---------------------|--------|
| Description            | Manufacturer | Model                 | Serial Number       | FCC ID |
| Power Supply           | Honeywell    | ADS-25STA-1209023EPCU | 300-10260C1K5066084 | N/A    |

### I/O CABLES

| I/O Cable List |          |                      |                |            |                  |                            |
|----------------|----------|----------------------|----------------|------------|------------------|----------------------------|
| Cable No.      | Port     | # of Identical Ports | Connector Type | Cable Type | Cable Length (m) | Remarks                    |
| 1              | DC Mains | 1                    | Barrel         | Main       | <3m              | DC Mains from power supply |

### SETUP DIAGRAMS

Please refer to R13333199-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 - North Chamber)

| Equipment ID                                    | Description                                       | Manufacturer         | Model Number | Last Cal.              | Next Cal.              |
|-------------------------------------------------|---------------------------------------------------|----------------------|--------------|------------------------|------------------------|
| <b>0.009-30MHz (Loop Ant.)</b>                  |                                                   |                      |              |                        |                        |
| AT0079                                          | Active Loop Antenna                               | ETS-Lindgren         | 6502         | 2019-08-08             | 2020-08-08             |
| <b>30-1000 MHz</b>                              |                                                   |                      |              |                        |                        |
| AT0073                                          | Hybrid Broadband Antenna                          | Sunol Sciences Corp. | JB3          | 2019-08-08             | 2020-08-08             |
| <b>1-18 GHz</b>                                 |                                                   |                      |              |                        |                        |
| AT0069<br>(Out of service @ noon on 05/09/2020) | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren         | 3117         | 2019-05-15             | 2020-05-15             |
| AT0072<br>(In service @ noon on 05/09/2020)     | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren         | 3117         | 2020-04-27             | 2021-04-27             |
| <b>Gain-Loss Chains</b>                         |                                                   |                      |              |                        |                        |
| N-SAC01                                         | Gain-loss string: 0.009-30MHz                     | Various              | Various      | 2020-04-24             | 2021-04-24             |
| N-SAC02                                         | Gain-loss string: 25-1000MHz                      | Various              | Various      | 2019-05-02, 2020-04-24 | 2020-05-02, 2021-04-24 |
| N-SAC03                                         | Gain-loss string: 1-18GHz                         | Various              | Various      | 2020-03-15             | 2021-03-15             |
| <b>Receiver &amp; Software</b>                  |                                                   |                      |              |                        |                        |
| SA0025                                          | Spectrum Analyzer                                 | Agilent              | N9030A       | 2020-03-17             | 2021-03-17             |
| SOFTEMI                                         | EMI Software                                      | UL                   | Version 9.5  | NA                     | NA                     |
| <b>Additional Equipment used</b>                |                                                   |                      |              |                        |                        |
| s/n 181474341                                   | Environmental Meter                               | Fisher Scientific    | 15-077-963   | 2018-07-27             | 2020-07-27             |

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

| Equipment ID                     | Description                                       | Manufacturer         | Model Number | Last Cal.  | Next Cal.  |
|----------------------------------|---------------------------------------------------|----------------------|--------------|------------|------------|
| <b>0.009-30MHz (Loop Ant.)</b>   |                                                   |                      |              |            |            |
| AT0079                           | Active Loop Antenna                               | ETS-Lindgren         | 6502         | 2019-08-08 | 2020-08-08 |
| <b>30-1000 MHz</b>               |                                                   |                      |              |            |            |
| AT0074                           | Hybrid Broadband Antenna                          | Sunol Sciences Corp. | JB3          | 2019-07-16 | 2020-07-16 |
| <b>1-18 GHz</b>                  |                                                   |                      |              |            |            |
| AT0078                           | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren         | 3117         | 2019-10-28 | 2020-10-28 |
| <b>18-26 GHz</b>                 |                                                   |                      |              |            |            |
| AT0076                           | Horn Antenna, 18-26.5GHz                          | ARA                  | MWH-1826/B   | 2019-11-07 | 2020-11-07 |
| <b>Gain-Loss Chains</b>          |                                                   |                      |              |            |            |
| S-SAC01                          | Gain-loss string: 0.009-30MHz                     | Various              | Various      | 2020-04-23 | 2021-04-23 |
| S-SAC02                          | Gain-loss string: 25-1000MHz                      | Various              | Various      | 2020-04-23 | 2021-04-23 |
| S-SAC03                          | Gain-loss string: 1-18GHz                         | Various              | Various      | 2020-04-12 | 2021-04-12 |
| S-SAC04                          | Gain-loss string: 18-40GHz                        | Various              | Various      | 2020-03-23 | 2021-03-23 |
| <b>Receiver &amp; Software</b>   |                                                   |                      |              |            |            |
| SA0027                           | Spectrum Analyzer                                 | Agilent              | N9030A       | 2019-05-15 | 2020-05-31 |
| SOFTEMI                          | EMI Software                                      | UL                   | Version 9.5  | NA         | NA         |
| <b>Additional Equipment used</b> |                                                   |                      |              |            |            |
| s/n 181474409                    | Environmental Meter                               | Fisher Scientific    | 15-077-963   | 2018-07-27 | 2020-07-27 |

Test Equipment Used - Wireless Conducted Measurement Equipment

| Equipment ID        | Description                              | Manufacturer           | Model Number | Last Cal.  | Next Cal.  |
|---------------------|------------------------------------------|------------------------|--------------|------------|------------|
| 72822               | Spectrum Analyzer                        | Keysight Technologies  | E4446A       | 2020-01-02 | 2021-01-02 |
| PWM004 (PRE0137346) | RF Power Meter                           | Keysight Technologies  | N1911A       | 2019-08-23 | 2020-08-23 |
| PWS004 (PRE0126443) | Peak and Avg Power Sensor, 50MHz to 6GHz | Keysight Technologies  | E9323A       | 2019-08-23 | 2020-08-23 |
| SN 181474341        | Environmental Meter                      | Fisher Scientific      | 15-077-963   | 2018-07-27 | 2020-07-27 |
| 76021               | DC Regulated Power Supply                | CircuitSpecialists.Com | CSI3005X5    | N/A        | N/A        |
| PS215               | CW-AC Power Source                       | Ametek                 | CW2501       | NA         | NA         |

Test Equipment Used - Conducted Disturbance Emissions Test Equipment (Morrisville – COND1)

| Equipment ID          | Description                                   | Manufacturer        | Model Number                 | Last Cal.  | Next Cal.  |
|-----------------------|-----------------------------------------------|---------------------|------------------------------|------------|------------|
| CBL087                | Coax cable, RG223, N-male to BNC-male, 20-ft. | Pasternack          | PE3W06143-240                | 2019-05-29 | 2020-05-29 |
| s/n 161024885         | Environmental Meter                           | Fisher Scientific   | 15-0770-963                  | 2018-09-04 | 2020-09-04 |
| LISN003               | LISN, 50-ohm/50-uH, 2-conductor, 25A          | Fischer Custom Com. | FCC-LISN-50-25-2-01-550V     | 2019-08-19 | 2020-08-19 |
| 75141<br>(PRE0101521) | EMI Test Receiver 9kHz-7GHz                   | Rohde & Schwarz     | ESCI 7                       | 2019-08-20 | 2020-08-20 |
| TL001                 | Transient Limiter, 0.009-30MHz                | Com-Power           | LIT-930A                     | 2019-05-29 | 2020-05-29 |
| PS214                 | AC Power Source                               | Elgar               | CW2501M<br>(s/n 1523A02396)  | NA         | NA         |
| SOFTEMI               | EMI Software                                  | UL                  | Version 9.5<br>June 15, 2019 | NA         | NA         |

## 8. MEASUREMENT METHOD

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)

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

Radiated Spurious Emissions: ANSI C63.10-2013 Section 6.3 – 6.6

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

## 9. ANTENNA PORT TEST RESULTS

### 9.1. ON TIME AND DUTY CYCLE

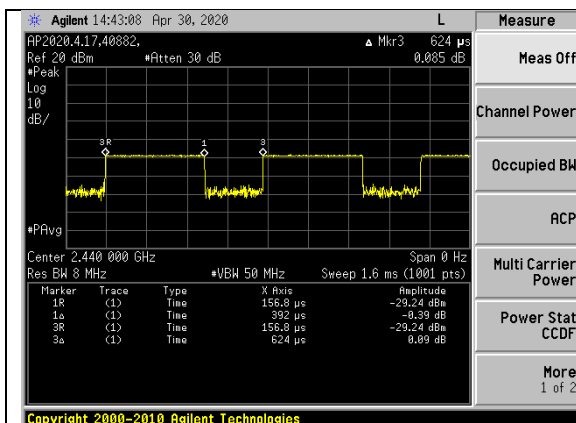
#### LIMITS

None; for reporting purposes only.

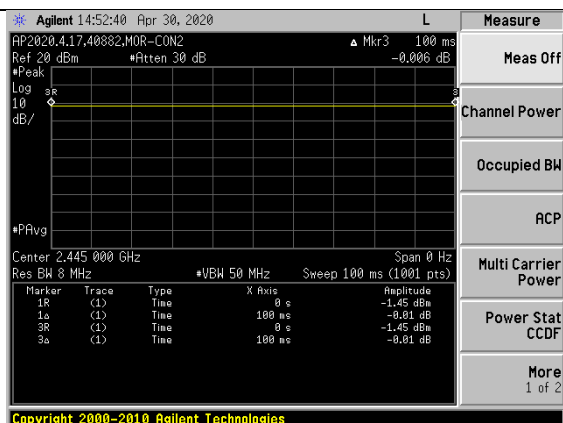
#### PROCEDURE

ANSI C63.10 Zero-Span Spectrum Analyzer Method.

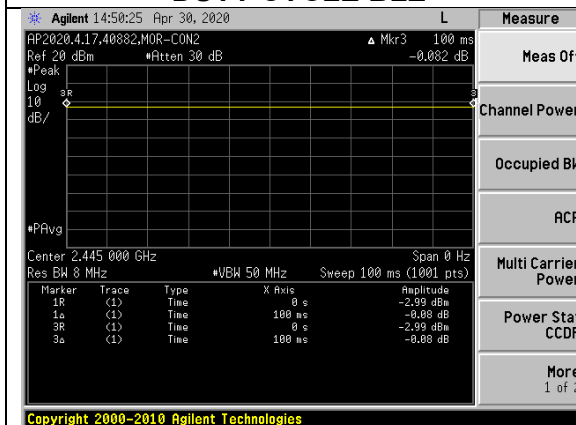
| Mode        | ON Time<br>B<br>(msec) | Period<br>(msec) | Duty Cycle<br>x<br>(linear) | Duty Cycle<br>(%) | Duty Cycle<br>Correction Factor<br>(dB) |
|-------------|------------------------|------------------|-----------------------------|-------------------|-----------------------------------------|
| BLE         | 0.392                  | 0.624            | 0.628                       | 62.82%            | 4.04                                    |
| 802.11a 1TX | 100.000                | 100.000          | 1.000                       | 100.00%           | 0.00                                    |
| 802.11a CDD | 100.000                | 100.000          | 1.000                       | 100.00%           | 0.00                                    |



DUTY CYCLE BLE



802.15.4 ANT1



802.15.4 ANT2

INTENTIONALLY LEFT BLANK

Note: Even though the 802.15.4 radio is operating at 100% duty cycle for test purposes, the manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  dB correction.

## 9.2. OUTPUT POWER

### LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

The BLE radio utilizes an antenna with a maximum gain of 6 dBi.

So the limit for BLE is 30dBm.

802.15.4 PK power is for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 0.5 dB (including 0.5 dB cable) was entered as an offset in the power meter to allow for a peak reading of power.

### RESULTS

#### 9.2.1. BLE

|            |            |
|------------|------------|
| Tested By: | 40882      |
| Date:      | 2020-06-09 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2402               | 1.11                           | 30             | -28.89         |
| Middle  | 2440               | 0.74                           | 30             | -29.26         |
| High    | 2480               | 0.27                           | 30             | -29.73         |

## 9.2.2. 802.15.4

### ANT 1

|            |            |
|------------|------------|
| Tested By: | 40882      |
| Date:      | 2020-06-09 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) |
|---------|--------------------|--------------------------------|
| Low     | 2405               | 21.46                          |
| Middle  | 2445               | 21.50                          |
| High    | 2475               | 19.25                          |

### ANT 2

|            |            |
|------------|------------|
| Tested By: | 40882      |
| Date:      | 2020-06-09 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) |
|---------|--------------------|--------------------------------|
| Low     | 2405               | 19.90                          |
| Middle  | 2445               | 20.98                          |
| High    | 2475               | 19.89                          |

## 9.1. AVERAGE POWER

### LIMITS

FCC §15.247 (b) (3)  
RSS-247 5.4 (d)

The 802.15.4 transmitters utilizes two antennas for diversity with maximum gains of:  
Antenna 1: 6.6 dBi  
Antenna 2: 4.7 dBi

So the limit for 802.15.4 ANT2 is 30dBm, 802.15.4 ANT1 is 29.4dBm.

BLE average power is for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 0.5 dB (0.5 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

### RESULTS

#### 9.1.1. BLE

|                   |            |
|-------------------|------------|
| <b>Tested By:</b> | 40882      |
| <b>Date:</b>      | 2020-06-09 |

| <b>Channel</b> | <b>Frequency<br/>(MHz)</b> | <b>Average Power<br/>Reading<br/>(dBm)</b> |
|----------------|----------------------------|--------------------------------------------|
| Low            | 2402                       | 0.761                                      |
| Middle         | 2440                       | 0.437                                      |
| High           | 2480                       | -0.040                                     |

### 9.1.2. 802.15.4

#### ANT 1

|            |            |
|------------|------------|
| Tested By: | 40882      |
| Date:      | 2020-06-09 |

| Channel | Frequency<br>(MHz) | Average Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|-----------------------------------|----------------|----------------|
| Low     | 2405               | 21.42                             | 29.4           | -7.98          |
| Middle  | 2445               | 21.46                             | 29.4           | -7.94          |
| High    | 2475               | 19.18                             | 29.4           | -10.22         |

#### ANT 2

|            |            |
|------------|------------|
| Tested By: | 40882      |
| Date:      | 2020-06-09 |

| Channel | Frequency<br>(MHz) | Average Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|-----------------------------------|----------------|----------------|
| Low     | 2405               | 19.84                             | 30             | -10.16         |
| Middle  | 2445               | 20.93                             | 30             | -9.07          |
| High    | 2475               | 19.83                             | 30             | -10.17         |

## 10. RADIATED TEST RESULTS

### 10.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209  
RSS-GEN, Section 8.9 and 8.10.

| 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                                   |

#### 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 120 kHz for peak and/or 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.

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz 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 average measurements. Voltage averaging was used for BLE and voltage with duty cycle correction per KDB 558074 D01 15.247 V05r02, FAQ Answer 3c) for 802.15.4.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power 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.

**KDB 558074 D01 15.247 Meas Guidance V05r02**

11. Frequently Asked Questions; Answer 3: c)

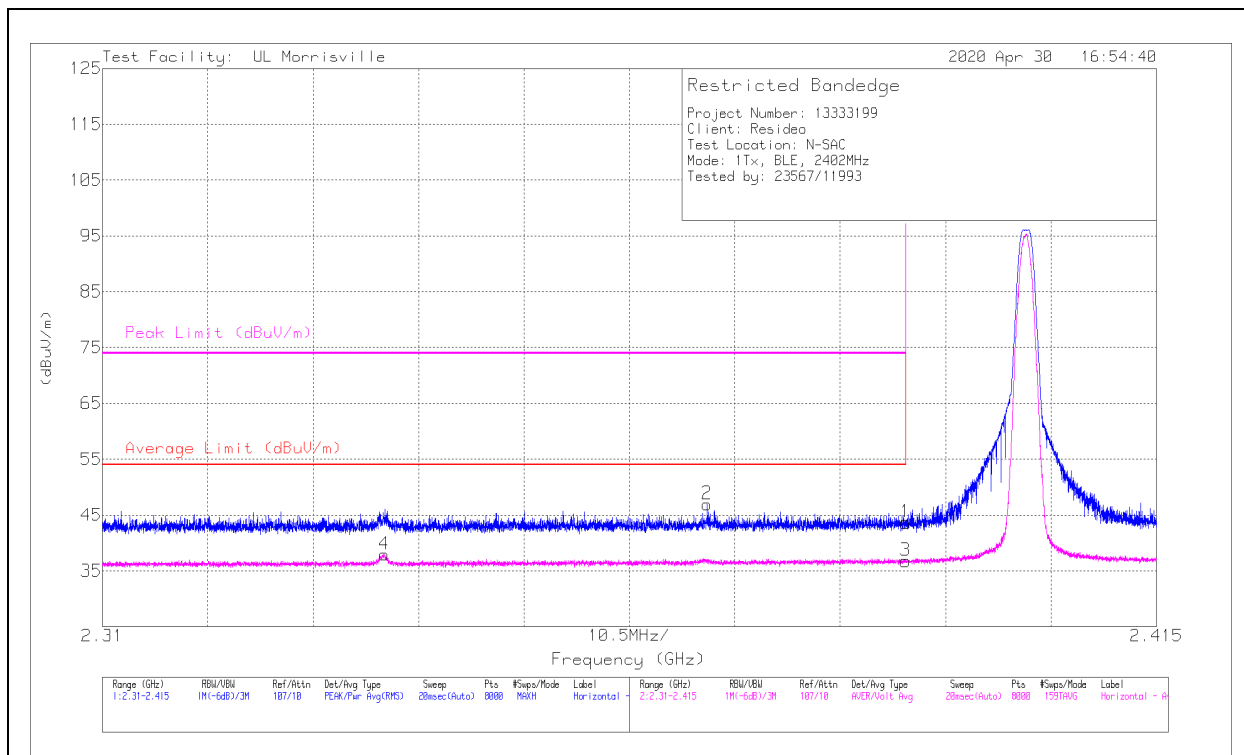
A voltage averaging measurement was taken in accordance to ANSI C63.10. The average measurement was corrected down based on the protocol-limited worst-case duty cycle of 6.75% provided by the manufacturer. The calculation of  $20 \cdot \log(0.0675)$  leads to a -23.41dB correction factor that is subtracted from the average measurement.

## 10.2. TRANSMITTER ABOVE 1 GHz

### 10.2.1. BLE

#### BANDEDGE (LOW CHANNEL)

#### HORIZONTAL RESULT



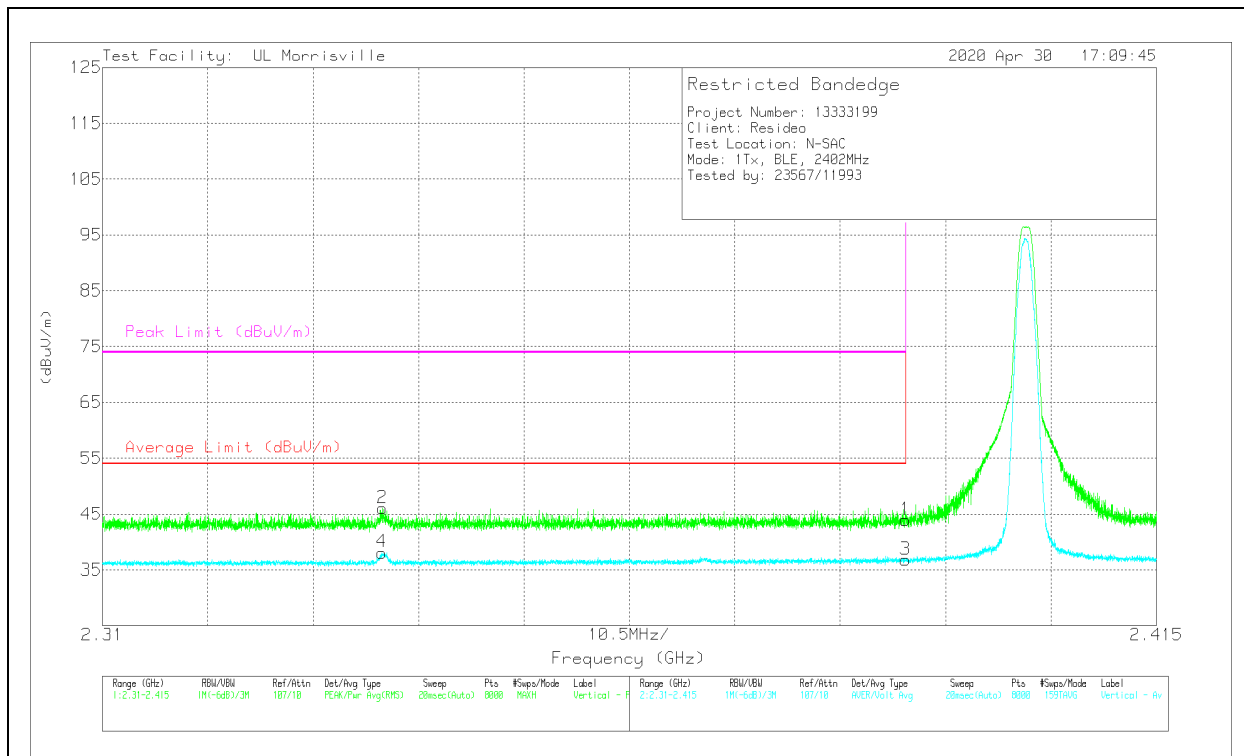
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB/(m)] | Amp/Cbl/Filtr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------------|------------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 35.36                | Pk  | 31.9            | -23.6                  | 0            | 43.66                      | -                      | -           | 74                  | -30.34         | 174            | 236         | H        |
| 2      | * 2.37023       | 38.75                | Pk  | 31.8            | -23.6                  | 0            | 46.95                      | -                      | -           | 74                  | -27.05         | 174            | 236         | H        |
| 3      | * 2.39          | 24.43                | ADV | 31.9            | -23.6                  | 4.04         | 36.77                      | 54                     | -17.23      | -                   | -              | 174            | 236         | H        |
| 4      | * 2.33811       | 25.65                | ADV | 31.7            | -23.5                  | 4.04         | 37.89                      | 54                     | -16.11      | -                   | -              | 174            | 236         | H        |

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

Pk - Peak detector

ADV - Linear Voltage Average

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB/(m)] | Amp/Cbl/Filtr/Pad (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      | * 2.39          | 35.61                | Pk  | 31.9            | -23.6                  | 0            | 43.91                      | -                      | -           | 74                  | -30.09         | 244            | 256         | V        |
| 2      | * 2.33788       | 37.83                | Pk  | 31.7            | -23.5                  | 0            | 46.03                      | -                      | -           | 74                  | -27.97         | 244            | 256         | V        |
| 3      | * 2.39          | 24.46                | ADV | 31.9            | -23.6                  | 4.04         | 36.8                       | 54                     | -17.2       | -                   | -              | 244            | 256         | V        |
| 4      | * 2.33786       | 25.87                | ADV | 31.7            | -23.5                  | 4.04         | 38.11                      | 54                     | -15.89      | -                   | -              | 244            | 256         | V        |

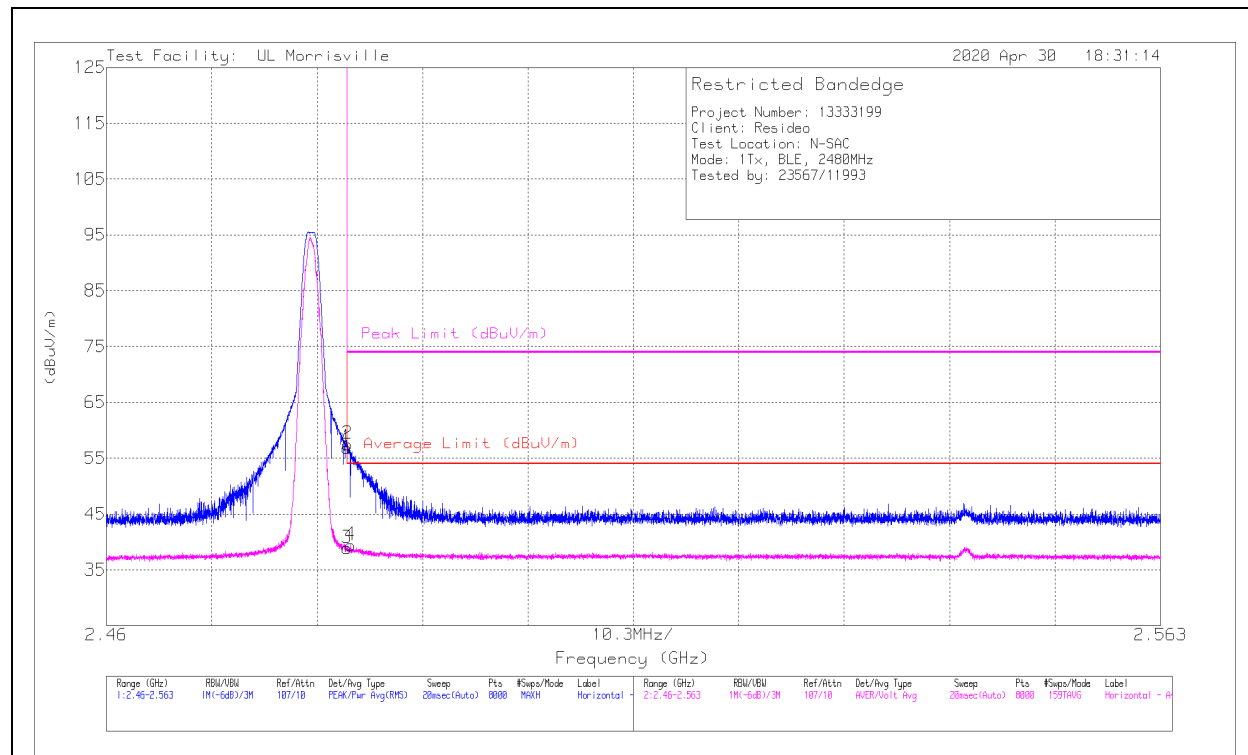
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT



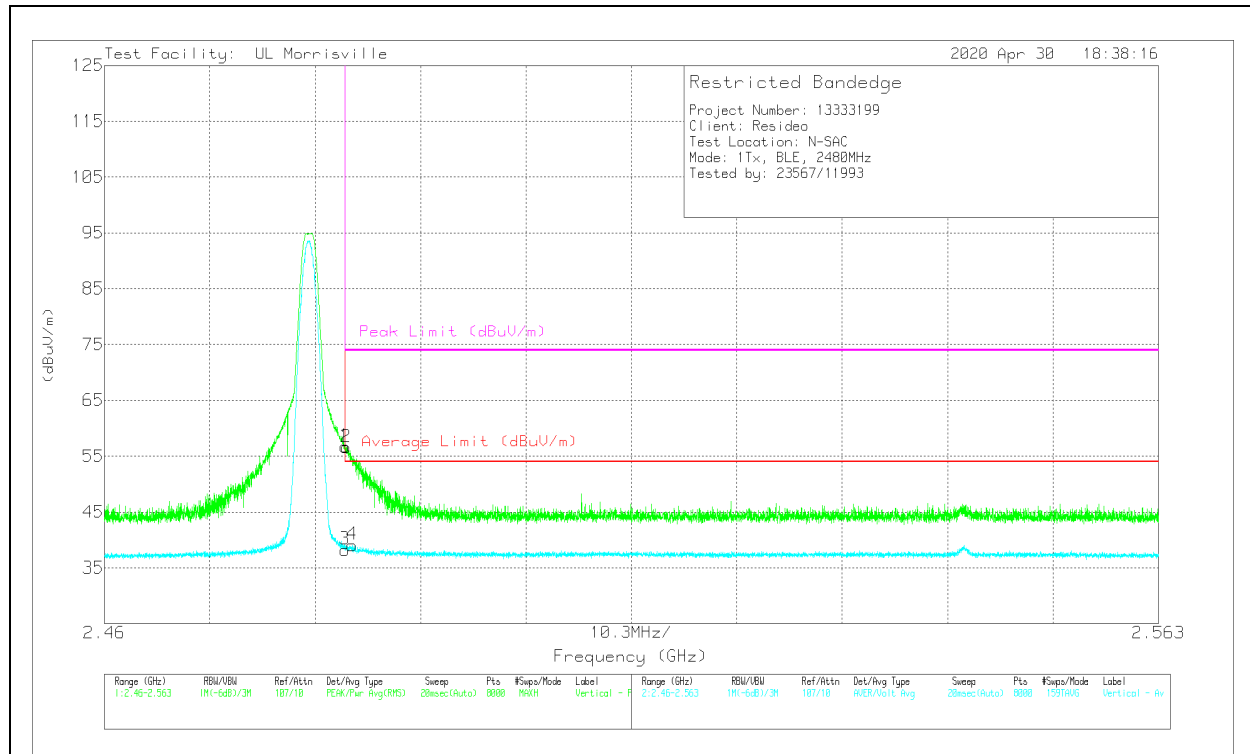
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB/(m)] | Amp/Cbl/Filtr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------------|------------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.4835        | 48.02                | Pk  | 32.3            | -23.4                  | 0            | 56.92                      | -                      | -           | 74                  | -17.08         | 129            | 266         | H        |
| 2      | * 2.48357       | 48.63                | Pk  | 32.3            | -23.4                  | 0            | 57.53                      | -                      | -           | 74                  | -16.47         | 129            | 266         | H        |
| 3      | * 2.4835        | 25.98                | ADV | 32.3            | -23.4                  | 4.04         | 38.92                      | 54                     | -15.08      | -                   | -              | 129            | 266         | H        |
| 4      | * 2.48386       | 26.41                | ADV | 32.4            | -23.4                  | 4.04         | 39.45                      | 54                     | -14.55      | -                   | -              | 129            | 266         | H        |

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

Pk - Peak detector

ADV - Linear Voltage Average

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB(/m)] | Amp/Cbl/Filtr/Pad (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      | * 2.4835        | 47.83                | Pk  | 32.3            | -23.4                  | 0            | 56.73                      | -                      | -           | 74                  | -17.27         | 242            | 209         | V        |
| 2      | * 2.4836        | 47.71                | Pk  | 32.3            | -23.4                  | 0            | 56.61                      | -                      | -           | 74                  | -17.39         | 242            | 209         | V        |
| 3      | * 2.4835        | 25.3                 | ADV | 32.3            | -23.4                  | 4.04         | 38.24                      | 54                     | -15.76      | -                   | -              | 242            | 209         | V        |
| 4      | * 2.48421       | 26.06                | ADV | 32.4            | -23.4                  | 4.04         | 39.1                       | 54                     | -14.9       | -                   | -              | 242            | 209         | V        |

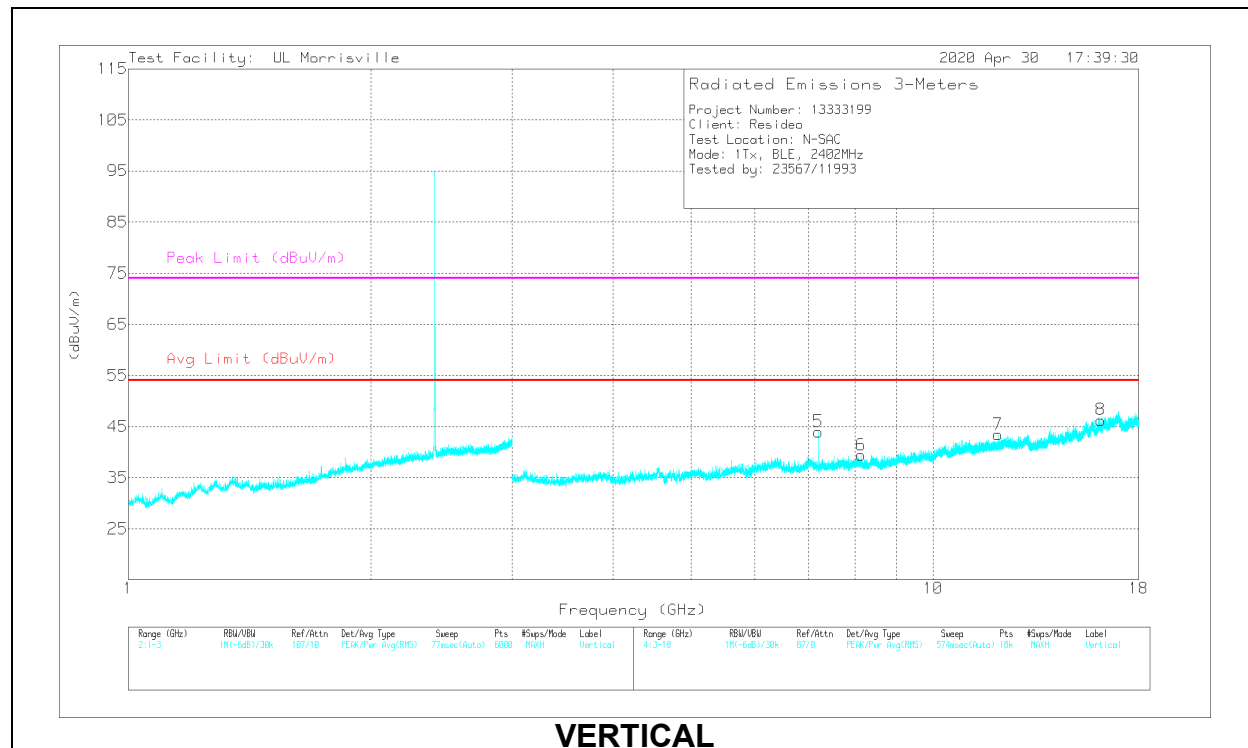
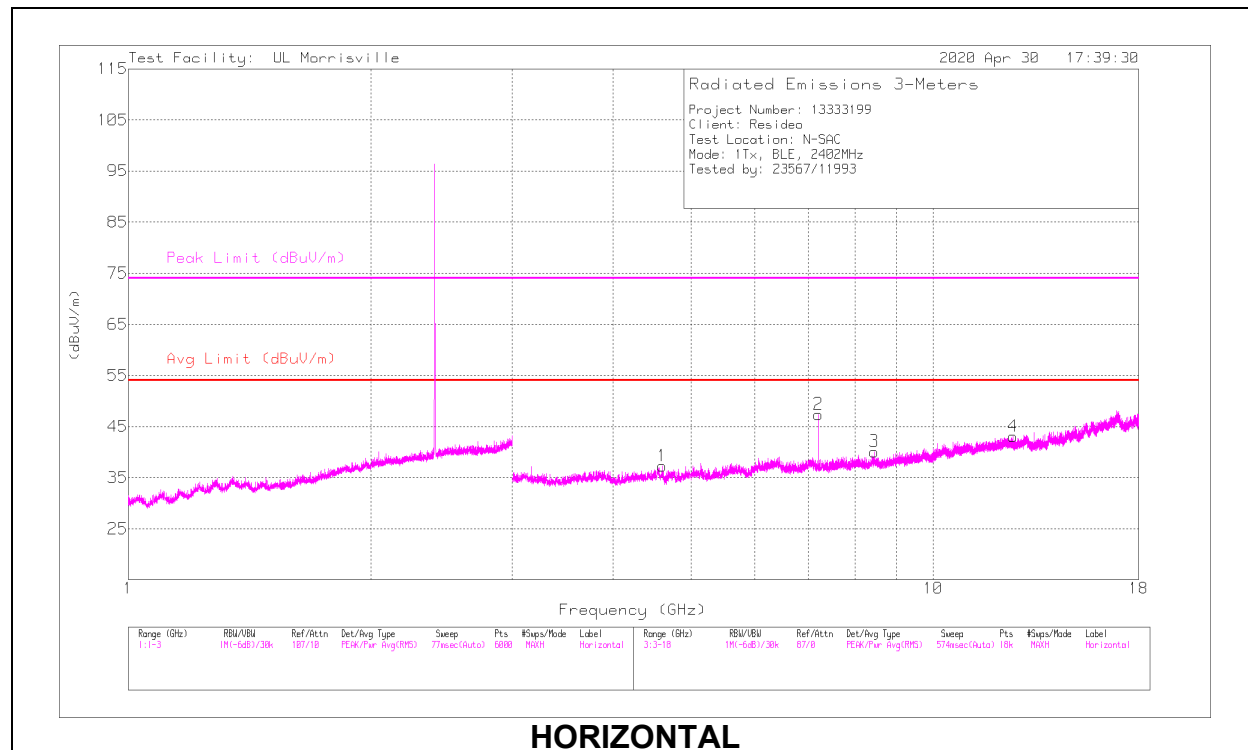
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB/(m)] | Amp/Cbl/Filtr/Pad (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      | * 4.60872       | 40.8                 | PK2 | 34.1            | -31.8                  | 0            | 43.1                       | -                  | -           | 74                  | -30.9          | 71             | 373         | H        |
|        | * 4.608         | 27.78                | ADV | 34.1            | -31.8                  | 4.04         | 34.12                      | 54                 | -19.88      | -                   | -              | 71             | 373         | H        |
| 3      | * 8.45656       | 38.11                | PK2 | 35.8            | -27.8                  | 0            | 46.11                      | -                  | -           | 74                  | -27.89         | 164            | 195         | H        |
|        | * 8.45463       | 24.37                | ADV | 35.8            | -27.8                  | 4.04         | 36.41                      | 54                 | -17.59      | -                   | -              | 164            | 195         | H        |
| 4      | * 12.56184      | 36.66                | PK2 | 39              | -25.8                  | 0            | 49.86                      | -                  | -           | 74                  | -24.14         | 328            | 230         | H        |
|        | * 12.56257      | 22.91                | ADV | 39              | -25.8                  | 4.04         | 40.15                      | 54                 | -13.85      | -                   | -              | 328            | 230         | H        |
| 6      | * 8.13458       | 38.44                | PK2 | 35.8            | -28.1                  | 0            | 46.14                      | -                  | -           | 74                  | -27.86         | 359            | 211         | V        |
|        | * 8.13526       | 24.52                | ADV | 35.8            | -28.1                  | 4.04         | 36.26                      | 54                 | -17.74      | -                   | -              | 359            | 211         | V        |
| 7      | * 12.04779      | 35.08                | PK2 | 38.8            | -24.8                  | 0            | 49.08                      | -                  | -           | 74                  | -24.92         | 301            | 231         | V        |
|        | * 12.0474       | 21.93                | ADV | 38.8            | -24.8                  | 4.04         | 39.97                      | 54                 | -14.03      | -                   | -              | 301            | 231         | V        |
| 8      | * 16.16187      | 36.85                | PK2 | 40.9            | -25                    | 0            | 52.75                      | -                  | -           | 74                  | -21.25         | 6              | 147         | V        |
|        | * 16.16343      | 23.66                | ADV | 40.9            | -25                    | 4.04         | 43.6                       | 54                 | -10.4       | -                   | -              | 6              | 147         | V        |
| 2      | 7.20524         | 40.98                | Pk  | 35.6            | -29.2                  | 0            | 47.38                      | -                  | -           | -                   | -              | 0-360          | 102         | H        |
| 5      | 7.20607         | 37.59                | Pk  | 35.6            | -29.2                  | 0            | 43.99                      | -                  | -           | -                   | -              | 0-360          | 198         | V        |

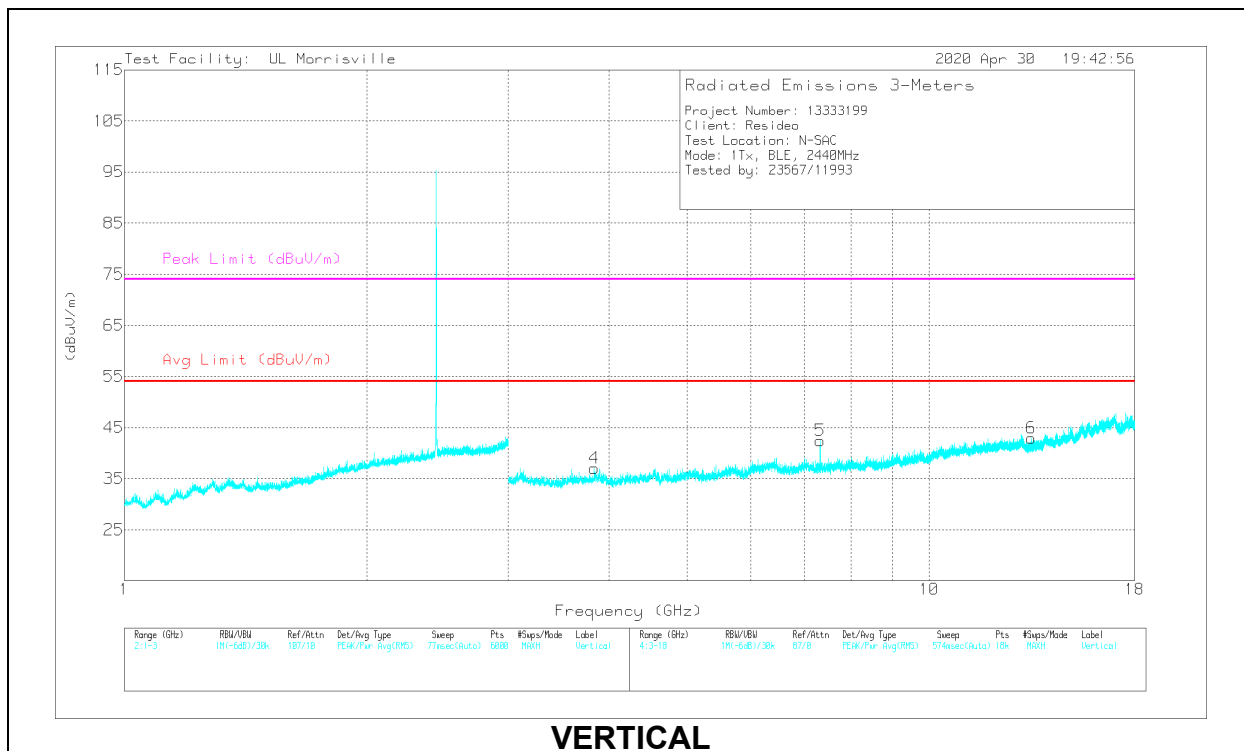
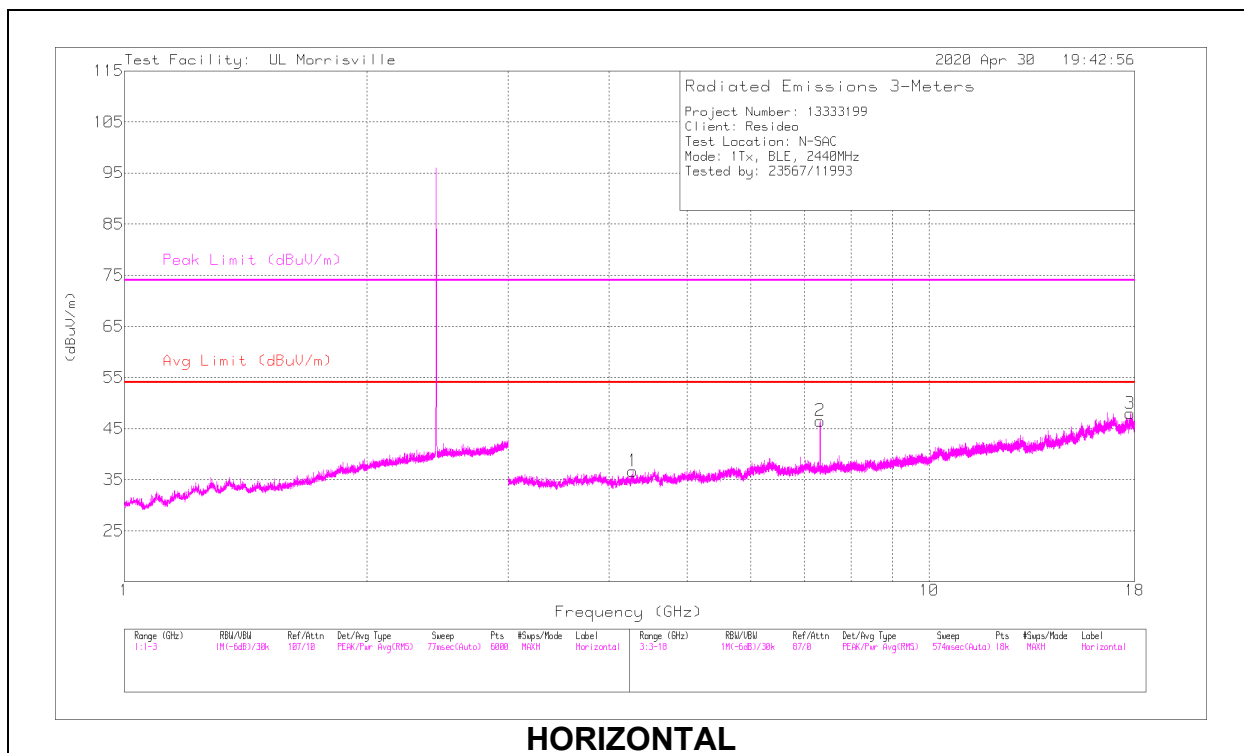
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - Maximum Peak

ADV - Linear Voltage Average

Pk - Peak detector

## MID CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB/(m)] | Amp/Cbl/Filtr/Pad (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      | * 4.28073       | 40.69                | PK2 | 33.4            | -31.2                  | 0            | 42.89                      | -                  | -           | 74                  | -31.11         | 133            | 200         | H        |
|        | * 4.2821        | 27.48                | ADV | 33.4            | -31.2                  | 4.04         | 33.72                      | 54                 | -20.28      | -                   | -              | 133            | 200         | H        |
| 2      | * 7.32082       | 44.22                | PK2 | 35.5            | -28.4                  | 0            | 51.32                      | -                  | -           | 74                  | -22.68         | 186            | 123         | H        |
|        | * 7.31931       | 33.08                | ADV | 35.5            | -28.4                  | 4.04         | 44.22                      | 54                 | -9.78       | -                   | -              | 186            | 123         | H        |
| 3      | * 17.76987      | 34.83                | PK2 | 41.2            | -22                    | 0            | 54.03                      | -                  | -           | 74                  | -19.97         | 59             | 279         | H        |
|        | * 17.77114      | 21.87                | ADV | 41.2            | -22                    | 4.04         | 45.11                      | 54                 | -8.89       | -                   | -              | 59             | 279         | H        |
| 4      | * 3.83547       | 41.21                | PK2 | 33.5            | -31.9                  | 0            | 42.81                      | -                  | -           | 74                  | -31.19         | 250            | 389         | V        |
|        | * 3.83497       | 27.99                | ADV | 33.5            | -31.9                  | 4.04         | 33.63                      | 54                 | -20.37      | -                   | -              | 250            | 389         | V        |
| 5      | * 7.32005       | 43.26                | PK2 | 35.5            | -28.4                  | 0            | 50.36                      | -                  | -           | 74                  | -23.64         | 214            | 332         | V        |
|        | * 7.31934       | 32                   | ADV | 35.5            | -28.4                  | 4.04         | 43.14                      | 54                 | -10.86      | -                   | -              | 214            | 332         | V        |
| 6      | * 13.39814      | 37.17                | PK2 | 38.9            | -27                    | 0            | 49.07                      | -                  | -           | 74                  | -24.93         | 293            | 271         | V        |
|        | * 13.39831      | 23.98                | ADV | 38.9            | -27                    | 4.04         | 39.92                      | 54                 | -14.08      | -                   | -              | 293            | 271         | V        |

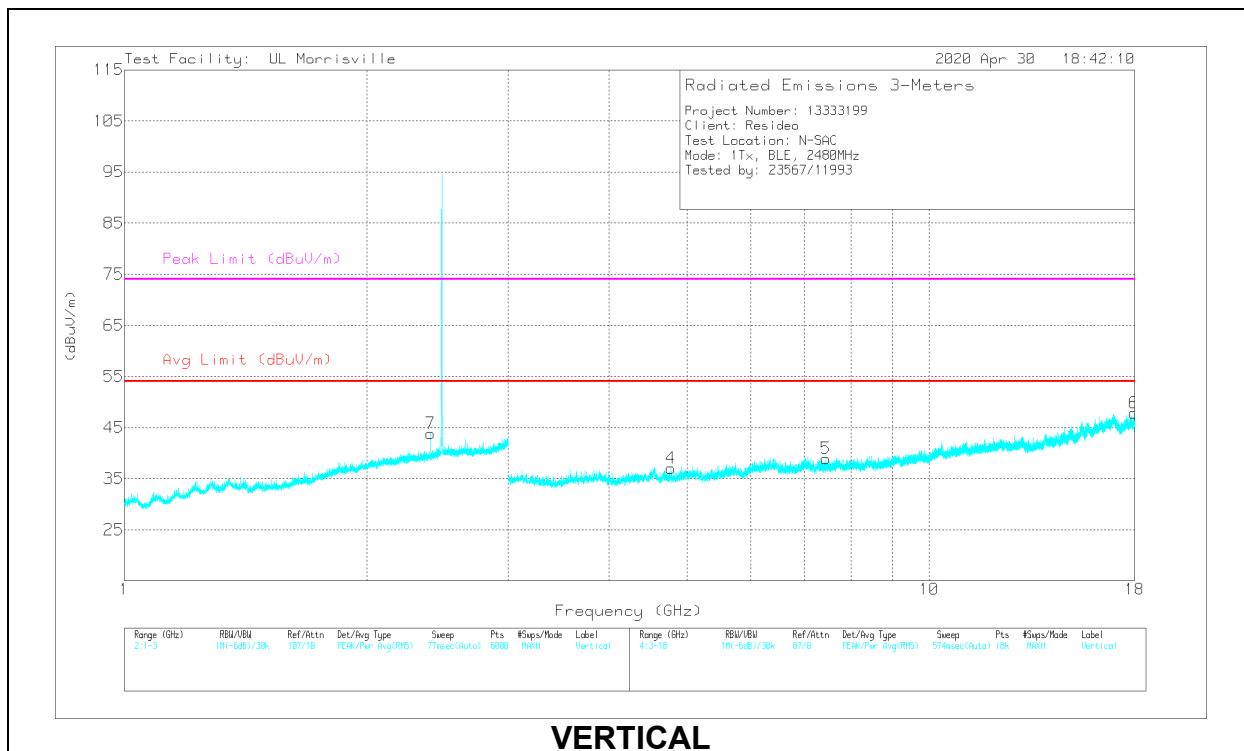
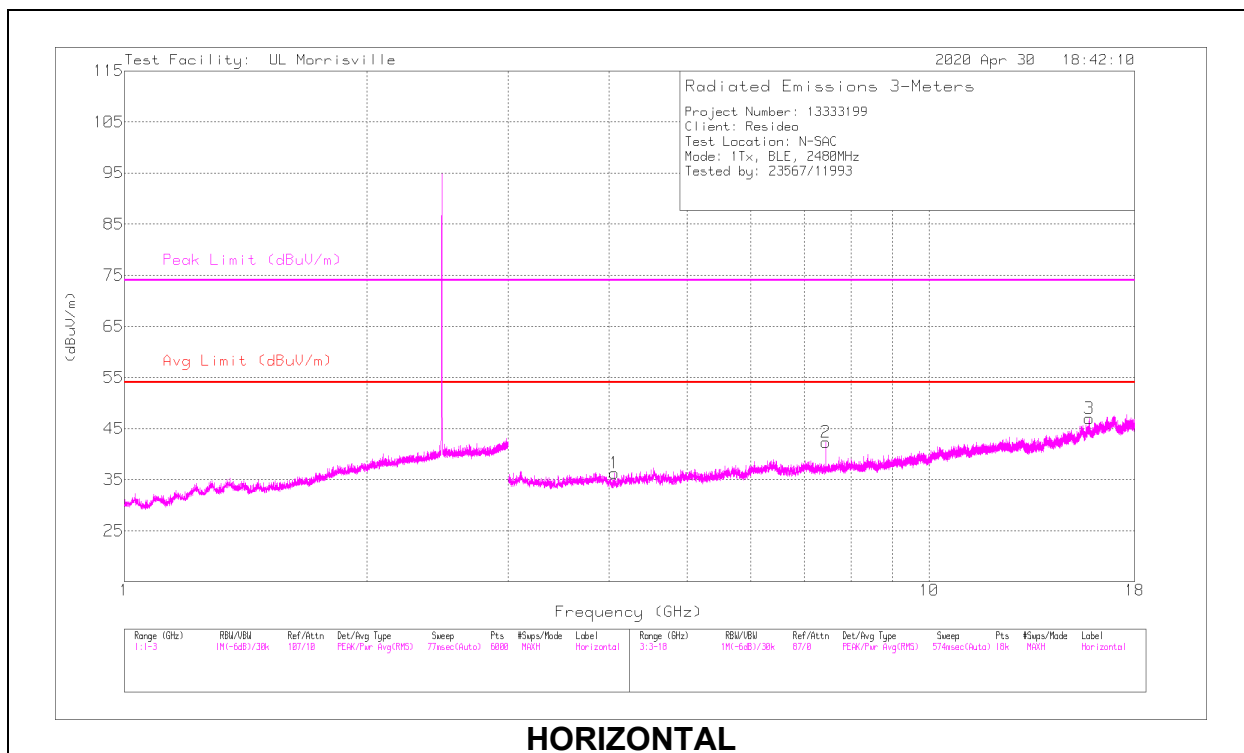
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - Maximum Peak

ADV - Linear Voltage Average

Pk - Peak detector

## HIGH CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB/(m)] | Amp/Cbl/Filtr/Pad (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      | * 4.06471       | 41.14                | PK2 | 33.4            | -32.3                  | 0            | 42.24                      | -                  | -           | 74                  | -31.76         | 329            | 232         | H        |
|        | * 4.06438       | 27.84                | ADV | 33.4            | -32.3                  | 4.04         | 32.98                      | 54                 | -21.02      | -                   | -              | 329            | 232         | H        |
| 2      | * 7.43896       | 41.52                | PK2 | 35.6            | -28.4                  | 0            | 48.72                      | -                  | -           | 74                  | -25.28         | 19             | 225         | H        |
|        | * 7.43936       | 29.44                | ADV | 35.6            | -28.4                  | 4.04         | 40.68                      | 54                 | -13.32      | -                   | -              | 19             | 225         | H        |
| 3      | * 15.8125       | 36.02                | PK2 | 40.6            | -24                    | 0            | 52.62                      | -                  | -           | 74                  | -21.38         | 44             | 129         | H        |
|        | * 15.81238      | 22.84                | ADV | 40.6            | -24                    | 4.04         | 43.48                      | 54                 | -10.52      | -                   | -              | 44             | 129         | H        |
| 4      | * 4.77137       | 40.51                | PK2 | 34              | -31.2                  | 0            | 43.31                      | -                  | -           | 74                  | -30.69         | 291            | 195         | V        |
|        | * 4.7712        | 27.4                 | ADV | 34              | -31.2                  | 4.04         | 34.24                      | 54                 | -19.76      | -                   | -              | 291            | 195         | V        |
| 5      | * 7.43941       | 40.01                | PK2 | 35.6            | -28.4                  | 0            | 47.21                      | -                  | -           | 74                  | -26.79         | 223            | 384         | V        |
|        | * 7.43927       | 27.36                | ADV | 35.6            | -28.4                  | 4.04         | 38.6                       | 54                 | -15.4       | -                   | -              | 223            | 384         | V        |
| 6      | * 17.97935      | 35.75                | PK2 | 41.2            | -23                    | 0            | 53.95                      | -                  | -           | 74                  | -20.05         | 318            | 340         | V        |
|        | * 17.98062      | 22.18                | ADV | 41.2            | -23                    | 4.04         | 44.42                      | 54                 | -9.58       | -                   | -              | 318            | 340         | V        |
| 7      | 2.4019          | 35.29                | Pk  | 32              | -23.5                  | 0            | 43.79                      | -                  | -           | -                   | -              | 0-360          | 102         | V        |

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

PK2 - Maximum Peak

ADV - Linear Voltage Average

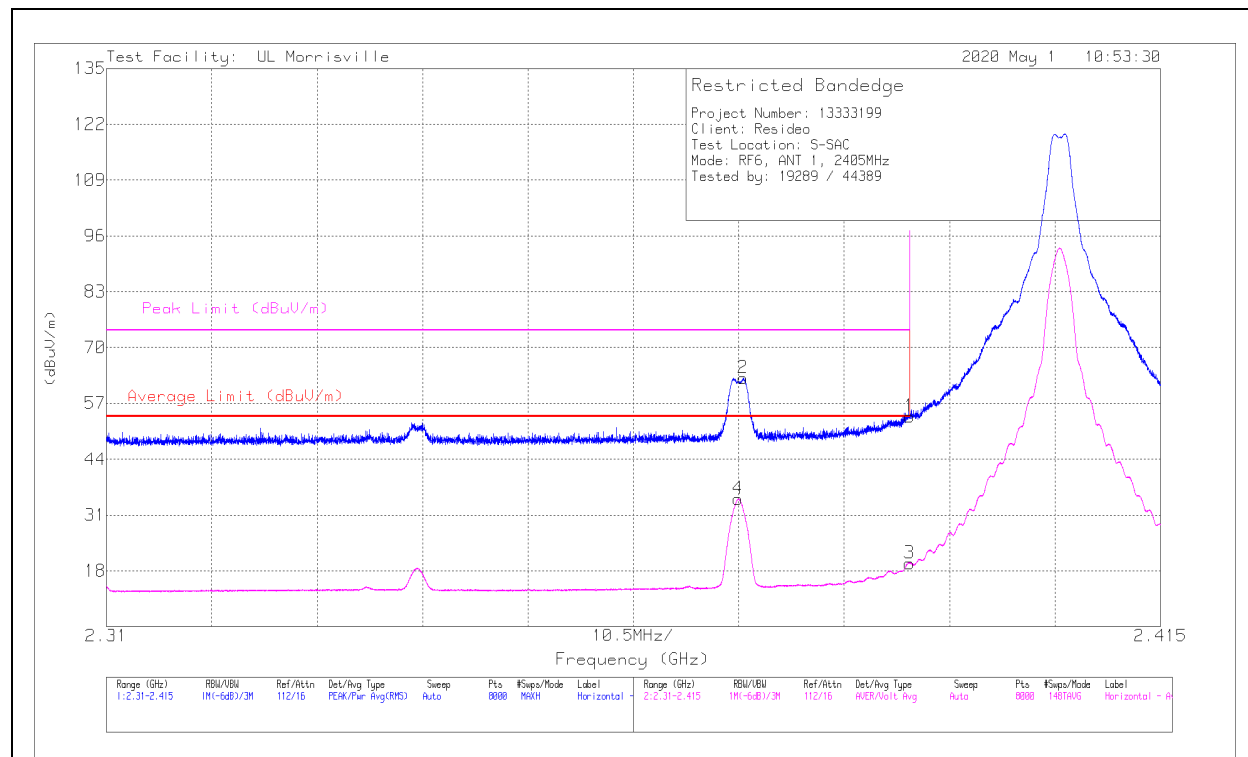
Pk - Peak detector

10.2.2. 802.15.4

ANT 1

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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      | * 2.39          | 45.95                | Pk  | 32            | -24                    | 0            | 53.95                      | -                      | -           | 74                  | -20.05         | 203            | 198         | H        |
| 2      | * 2.37344       | 54.77                | Pk  | 32            | -23.9                  | 0            | 62.87                      | -                      | -           | 74                  | -11.13         | 203            | 198         | H        |
| 3      | * 2.39          | 35.18                | ADV | 32            | -24                    | -23.41       | 19.77                      | 54                     | -34.23      | -                   | -              | 203            | 198         | V        |
| 4      | * 2.37294       | 50.05                | ADV | 32            | -23.9                  | -23.41       | 34.74                      | 54                     | -19.26      | -                   | -              | 203            | 198         | V        |

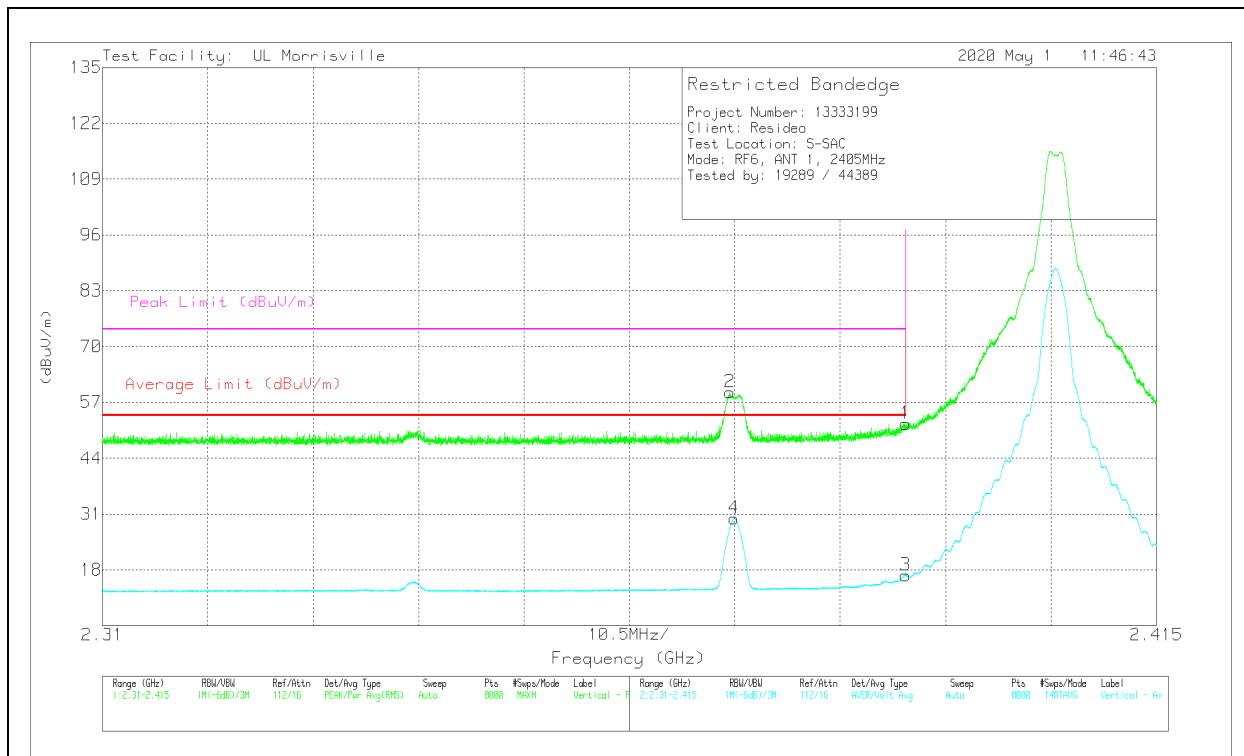
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBUV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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      | * 2.39          | 44.02                | Pk  | 32            | -24                    | 0            | 52.02                      | -                      | -           | 74                  | -21.98         | 275            | 199         | V        |
| 2      | * 2.37251       | 51.21                | Pk  | 32            | -23.9                  | 0            | 59.31                      | -                      | -           | 74                  | -14.69         | 275            | 199         | V        |
| 3      | * 2.39          | 32.07                | ADV | 32            | -24                    | -23.41       | 16.66                      | 54                     | -37.34      | -                   | -              | 275            | 199         | V        |
| 4      | * 2.37294       | 45.24                | ADV | 32            | -23.9                  | -23.41       | 29.93                      | 54                     | -24.07      | -                   | -              | 275            | 199         | V        |

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

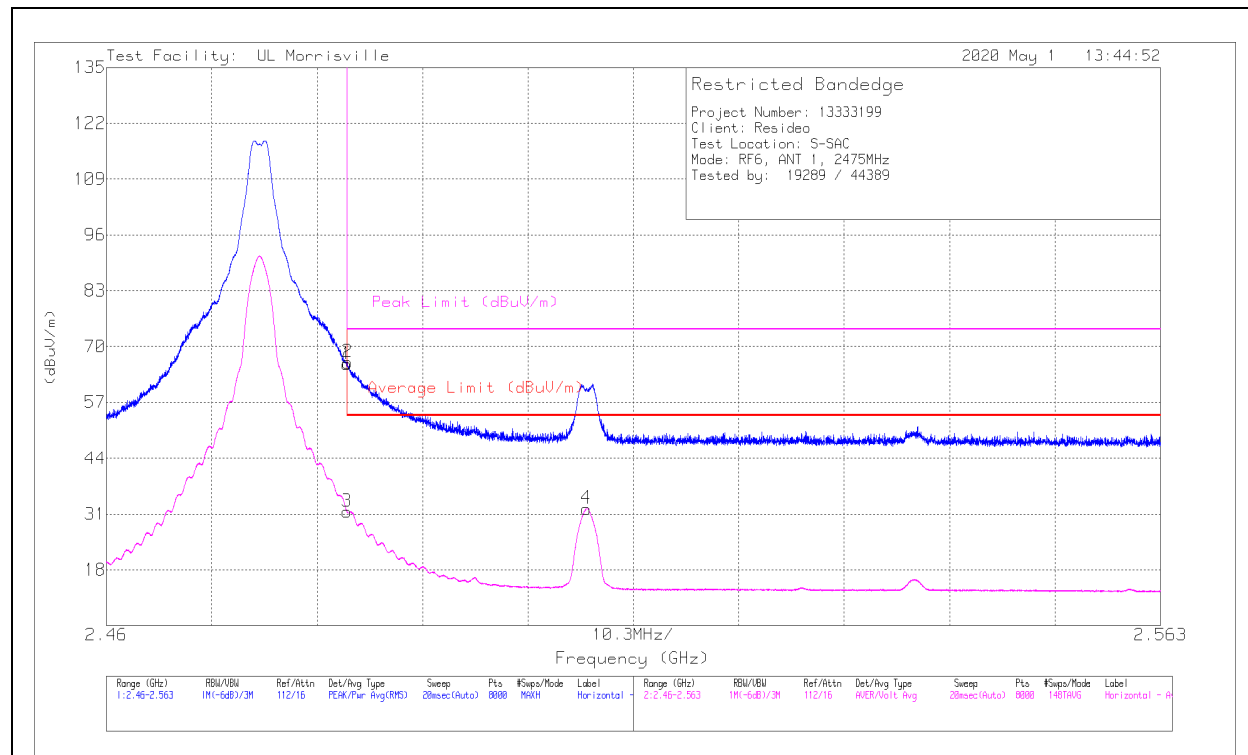
Pk - Peak detector

ADV - Linear Voltage Average

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## BANDEGE (HIGH CHANNEL)

### HORIZONTAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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      | * 2.4835        | 58.19                | Pk  | 32.1          | -24.4                  | 0            | 65.89                      | -                      | -           | 74                  | -8.11          | 191            | 179         | H        |
| 2      | * 2.48355       | 58.62                | Pk  | 32.1          | -24.4                  | 0            | 66.32                      | -                      | -           | 74                  | -7.68          | 191            | 179         | H        |
| 3      | * 2.4835        | 47.28                | ADV | 32.1          | -24.4                  | -23.41       | 31.57                      | 54                     | -22.43      | -                   | -              | 191            | 179         | V        |
| 4      | 2.50692         | 48.18                | ADV | 32.2          | -24.7                  | -23.41       | 32.27                      | 54                     | -21.73      | -                   | -              | 191            | 179         | V        |

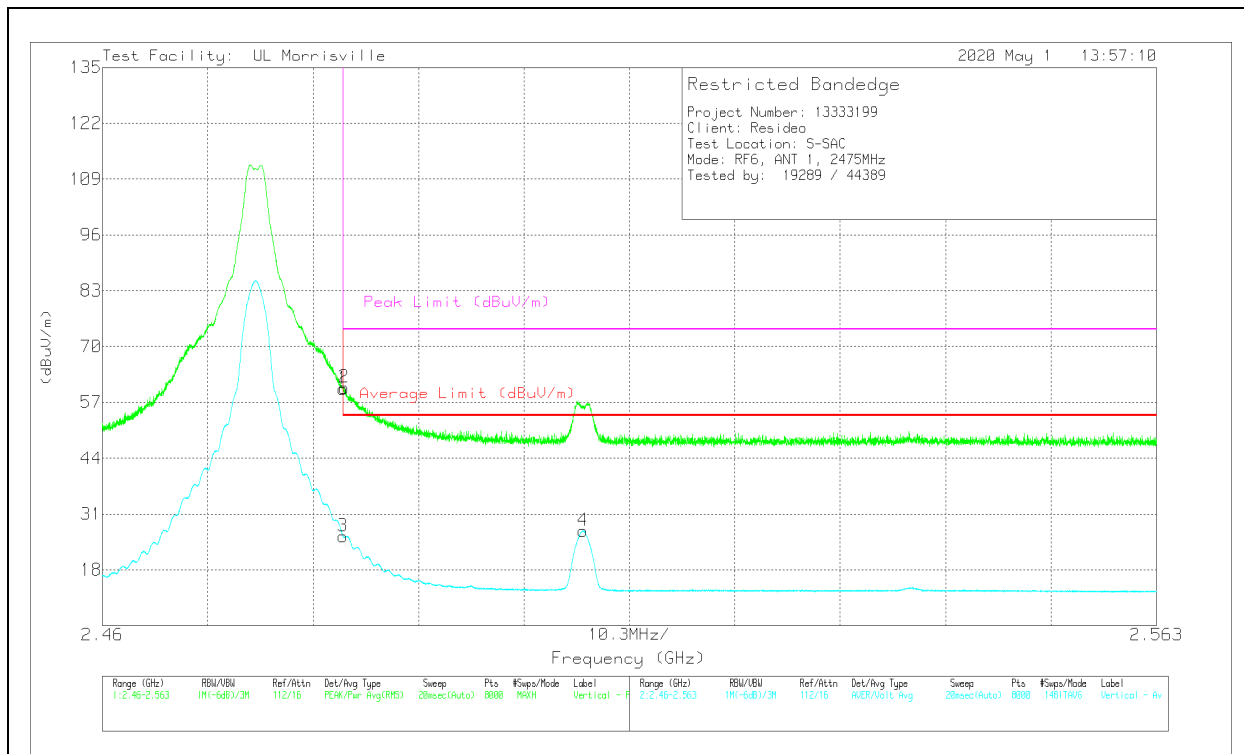
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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      | * 2.4835        | 52.49                | Pk  | 32.1          | -24.4                  | 0            | 60.19                      | -                      | -           | 74                  | -13.81         | 279            | 165         | V        |
| 2      | * 2.4836        | 52.71                | Pk  | 32.1          | -24.4                  | 0            | 60.41                      | -                      | -           | 74                  | -13.59         | 279            | 165         | V        |
| 3      | * 2.4835        | 41.55                | ADV | 32.1          | -24.4                  | -23.41       | 25.84                      | 54                     | -28.16      | -                   | -              | 279            | 165         | V        |
| 4      | 2.50698         | 43                   | ADV | 32.2          | -24.7                  | -23.41       | 27.09                      | 54                     | -26.91      | -                   | -              | 279            | 165         | V        |

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

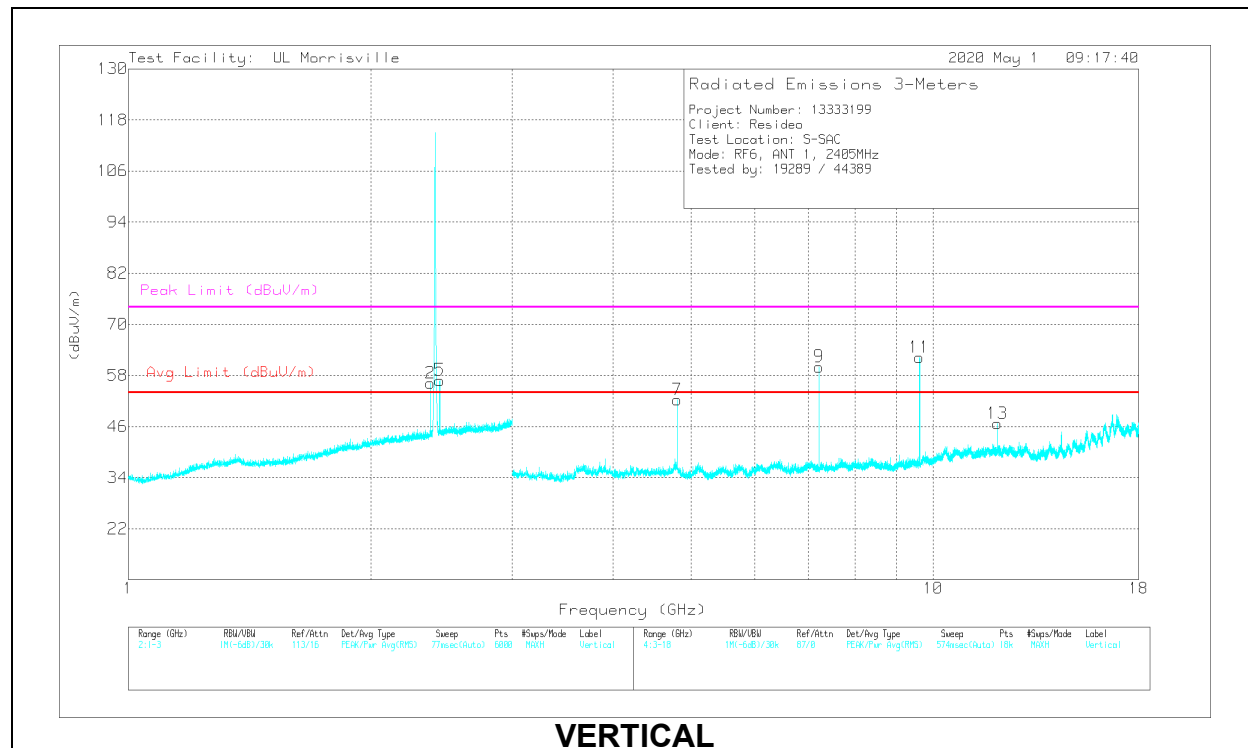
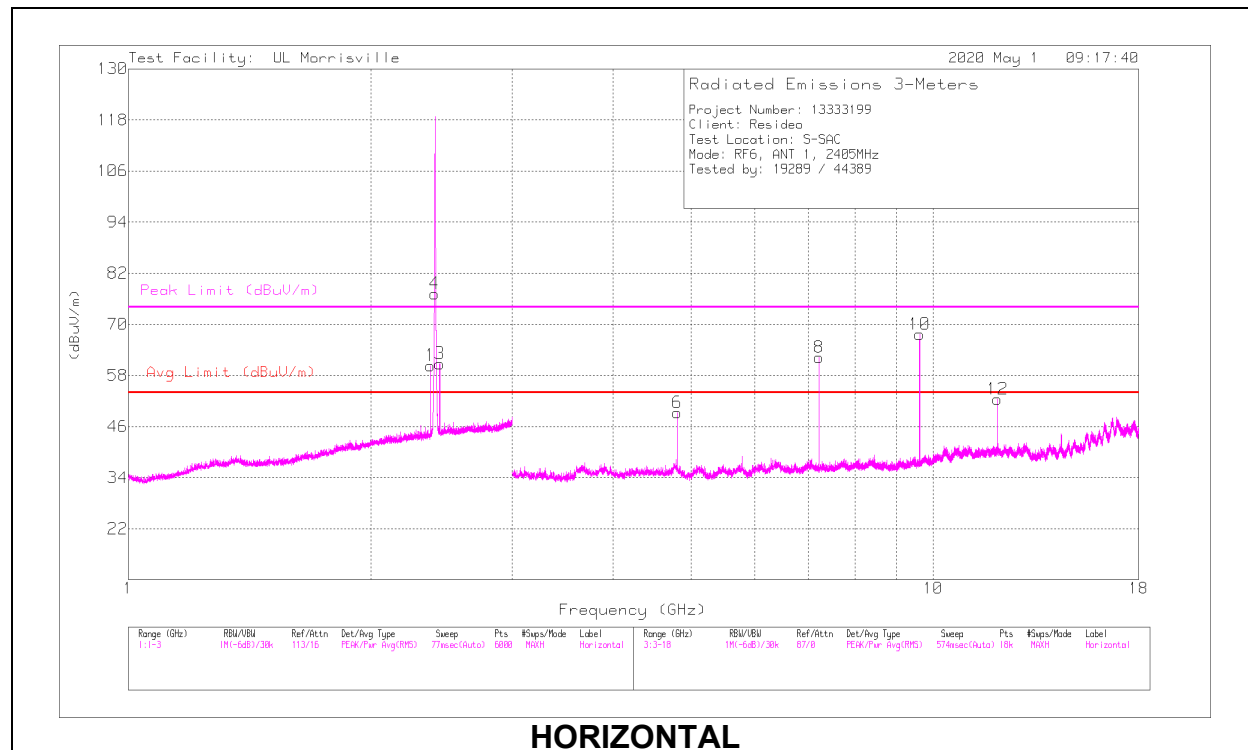
Pk - Peak detector

ADV - Linear Voltage Average

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB/(m)] | Amp/Cbl/Fitr/Pad (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      | * 2.37248       | 55.24                | PK2 | 31.9            | -23.6                 | 0            | 63.54                      | -                  | -           | 74                  | -10.46         | 200            | 200         | H        |
|        | * 2.37296       | 50.31                | ADV | 31.9            | -23.6                 | -23.41       | 35.2                       | 54                 | -18.8       | -                   | -              | 200            | 200         | H        |
| 2      | * 2.37256       | 50.89                | PK2 | 31.9            | -23.6                 | 0            | 59.19                      | -                  | -           | 74                  | -14.81         | 318            | 201         | V        |
|        | * 2.37296       | 45.32                | ADV | 31.9            | -23.6                 | -23.41       | 30.21                      | 54                 | -23.79      | -                   | -              | 318            | 201         | V        |
| 6      | * 4.80899       | 49.37                | PK2 | 34              | -31.1                 | 0            | 52.27                      | -                  | -           | 74                  | -21.73         | 345            | 101         | H        |
|        | * 4.80897       | 41.03                | ADV | 34              | -31.1                 | -23.41       | 20.52                      | 54                 | -33.48      | -                   | -              | 345            | 101         | H        |
| 12     | * 12.02737      | 44.21                | PK2 | 38.7            | -24.9                 | 0            | 58.01                      | -                  | -           | 74                  | -15.99         | 271            | 227         | H        |
|        | * 12.02723      | 35.03                | ADV | 38.7            | -24.9                 | -23.41       | 25.42                      | 54                 | -28.58      | -                   | -              | 271            | 227         | H        |
| 7      | * 4.809         | 53.88                | PK2 | 34              | -31.1                 | 0            | 56.78                      | -                  | -           | 74                  | -17.22         | 12             | 263         | V        |
|        | * 4.80899       | 46.3                 | ADV | 34              | -31.1                 | -23.41       | 25.79                      | 54                 | -28.21      | -                   | -              | 12             | 263         | V        |
| 13     | * 12.02247      | 40.23                | PK2 | 38.7            | -25                   | 0            | 53.93                      | -                  | -           | 74                  | -20.07         | 144            | 156         | V        |
|        | * 12.02254      | 29.98                | ADV | 38.7            | -25                   | -23.41       | 20.27                      | 54                 | -33.73      | -                   | -              | 144            | 156         | V        |
| 4      | 2.40057         | 68.7                 | Pk  | 32              | -23.5                 | 0            | 77.2                       | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 3      | 2.43724         | 52.07                | Pk  | 32.2            | -23.5                 | 0            | 60.77                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 5      | 2.43724         | 48.17                | Pk  | 32.2            | -23.5                 | 0            | 56.87                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 8      | 7.21607         | 55.81                | Pk  | 35.5            | -29.1                 | 0            | 62.21                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 9      | 7.21607         | 53.63                | Pk  | 35.5            | -29.1                 | 0            | 60.03                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 11     | 9.61704         | 52.94                | Pk  | 36.7            | -27.4                 | 0            | 62.24                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 10     | 9.6212          | 58.45                | Pk  | 36.7            | -27.5                 | 0            | 67.65                      | -                  | -           | -                   | -              | 0-360          | 101         | H        |

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

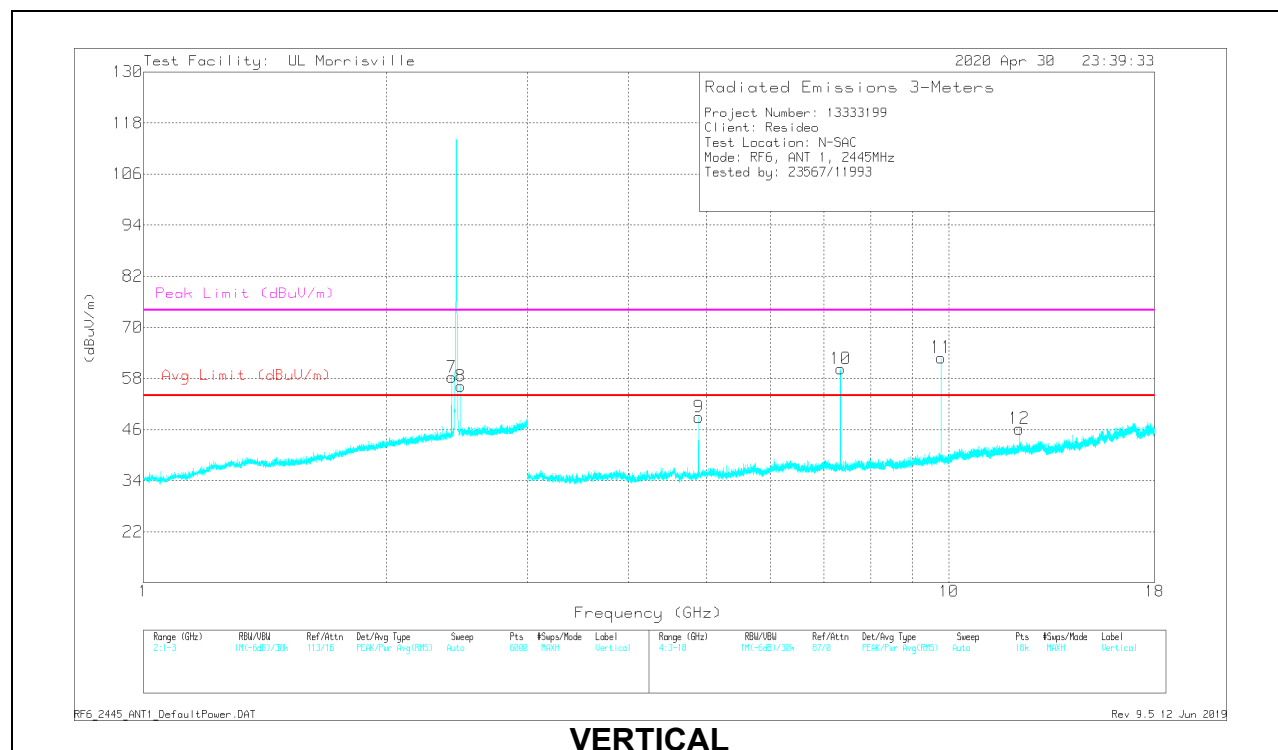
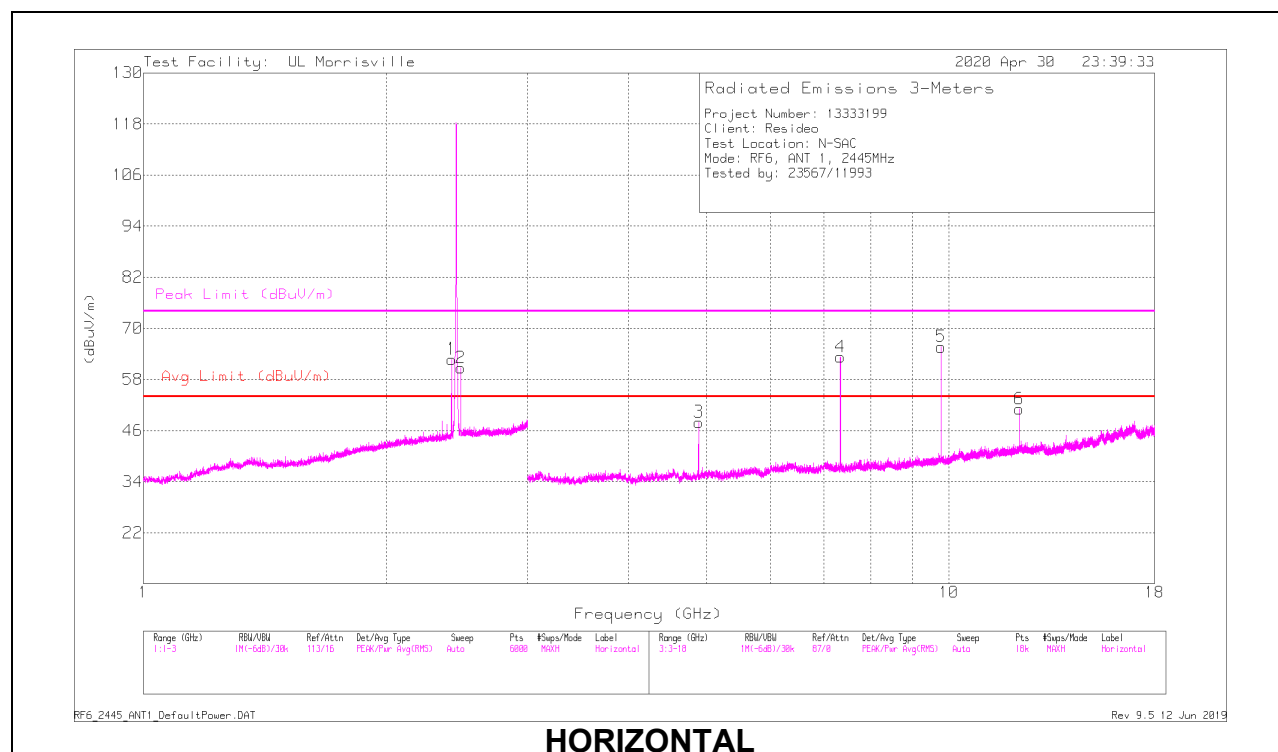
PK2 - KDB558074 Method: Maximum Peak

ADV - AD primary method, Linear Voltage Average

Pk - Peak detector

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## MID CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB/(m)] | Amp/Cbl/Fitr/Pad (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 |
|--------|-----------------|----------------------|-----|-----------------|-----------------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 4      | * 7.33335       | 59.71                | PK2 | 35.6            | -28.3                 | 0            | 67.01                      | -                  | -           | 74                  | -6.99          | 191            | 111         | H        |
|        | * 7.33354       | 52.98                | ADV | 35.6            | -28.3                 | -23.41       | 36.87                      | 54                 | -17.13      | -                   | -              | 191            | 111         | H        |
| 3      | * 4.891         | 49.78                | PK2 | 34              | -30.9                 | 0            | 52.88                      | -                  | -           | 74                  | -21.12         | 279            | 103         | H        |
|        | * 4.89083       | 41.79                | ADV | 34              | -30.9                 | -23.41       | 21.48                      | 54                 | -32.52      | -                   | -              | 279            | 103         | H        |
| 6      | * 12.22726      | 42.04                | PK2 | 38.9            | -25.6                 | 0            | 55.34                      | -                  | -           | 74                  | -18.66         | 189            | 211         | H        |
|        | * 12.22722      | 32.24                | ADV | 38.9            | -25.6                 | -23.41       | 22.13                      | 54                 | -31.87      | -                   | -              | 189            | 211         | H        |
| 9      | * 4.88897       | 49.95                | PK2 | 34              | -30.8                 | 0            | 53.15                      | -                  | -           | 74                  | -20.85         | 289            | 194         | V        |
|        | * 4.88897       | 42.21                | ADV | 34              | -30.8                 | -23.41       | 22                         | 54                 | -32         | -                   | -              | 289            | 194         | V        |
| 10     | * 7.33643       | 56.56                | PK2 | 35.6            | -28.4                 | 0            | 63.76                      | -                  | -           | 74                  | -10.24         | 338            | 395         | V        |
|        | * 7.33626       | 49.41                | ADV | 35.6            | -28.4                 | -23.41       | 33.2                       | 54                 | -20.8       | -                   | -              | 338            | 395         | V        |
| 12     | * 12.22247      | 41.02                | PK2 | 38.9            | -25.6                 | 0            | 54.32                      | -                  | -           | 74                  | -19.68         | 209            | 331         | V        |
|        | * 12.22247      | 30.84                | ADV | 38.9            | -25.6                 | -23.41       | 20.73                      | 54                 | -33.27      | -                   | -              | 209            | 331         | V        |
| 7      | 2.4129          | 49.77                | Pk  | 32              | -23.5                 | 0            | 58.27                      | -                  | -           | -                   | -              | 0-360          | 198         | V        |
| 1      | 2.41357         | 54.14                | Pk  | 32.1            | -23.5                 | 0            | 62.74                      | -                  | -           | -                   | -              | 0-360          | 198         | H        |
| 2      | 2.47691         | 51.68                | Pk  | 32.4            | -23.4                 | 0            | 60.68                      | -                  | -           | -                   | -              | 0-360          | 198         | H        |
| 8      | 2.47758         | 47.22                | Pk  | 32.4            | -23.4                 | 0            | 56.22                      | -                  | -           | -                   | -              | 0-360          | 102         | V        |
| 5      | 9.77788         | 55.34                | Pk  | 36.9            | -26.6                 | 0            | 65.64                      | -                  | -           | -                   | -              | 0-360          | 102         | H        |
| 11     | 9.77788         | 52.59                | Pk  | 36.9            | -26.6                 | 0            | 62.89                      | -                  | -           | -                   | -              | 0-360          | 198         | V        |

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

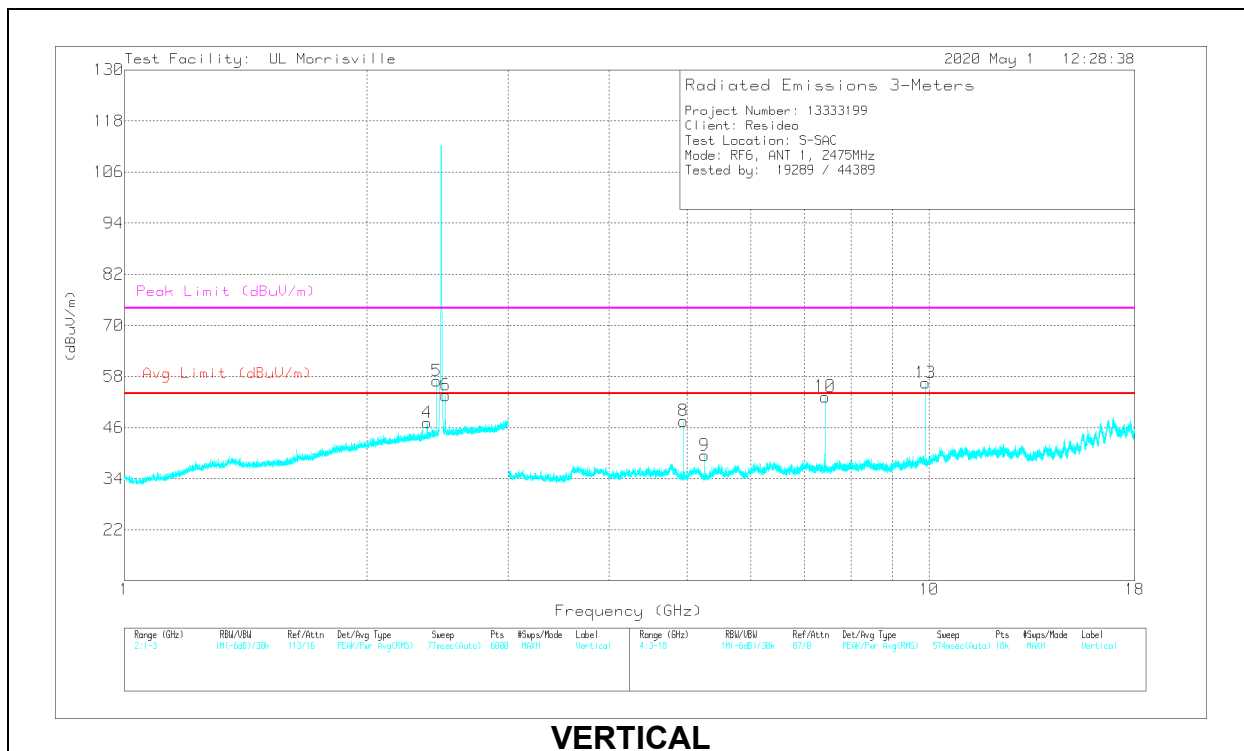
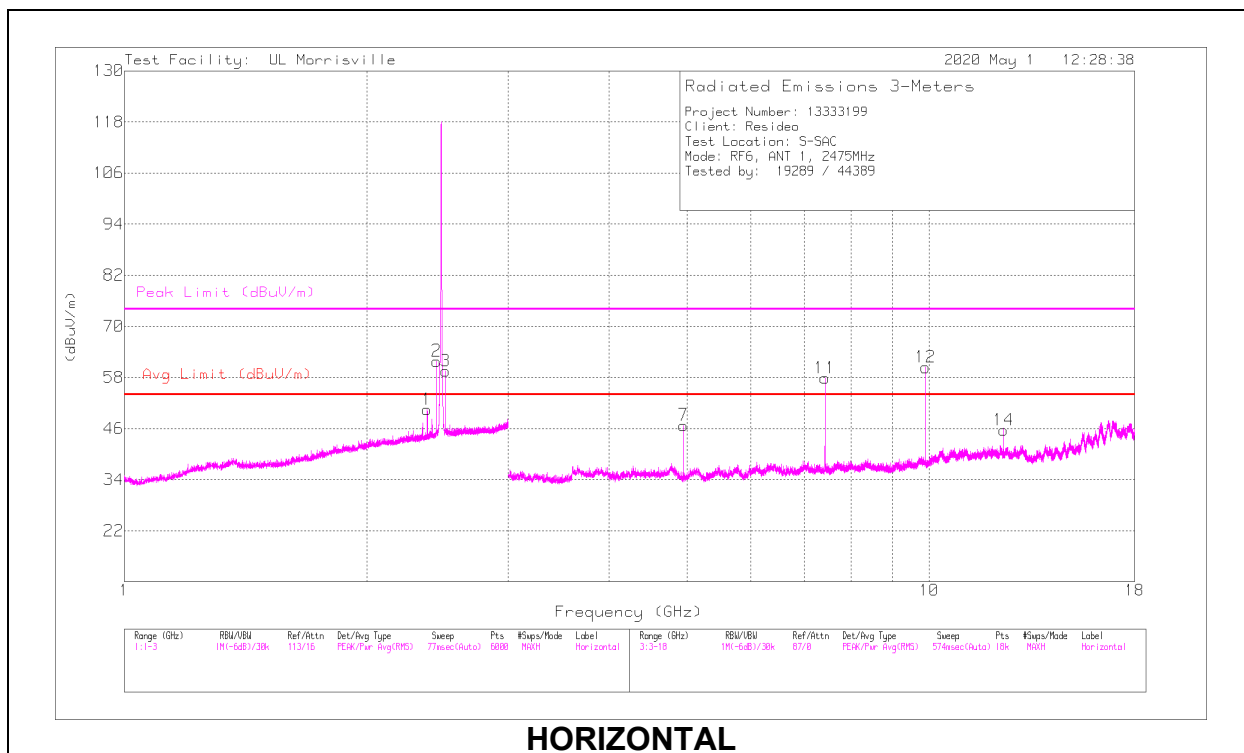
PK2 - Maximum Peak

ADV - Linear Voltage Average

Pk - Peak detector

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## HIGH CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 [dB(/m)] | Amp/Cbl/Filtr/Pad (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      | * 2.3784        | 47.65                | PK2 | 31.9            | -23.6                  | 0            | 55.95                      | -                  | -           | 74                  | -18.05         | 199            | 228         | H        |
|        | * 2.37899       | 37.93                | ADV | 31.9            | -23.6                  | -23.41       | 22.82                      | 54                 | -31.18      | -                   | -              | 199            | 228         | H        |
| 4      | * 2.37945       | 45.72                | PK2 | 31.9            | -23.6                  | 0            | 54.02                      | -                  | -           | 74                  | -19.98         | 286            | 160         | V        |
|        | * 2.37902       | 35.19                | ADV | 31.9            | -23.6                  | -23.41       | 20.08                      | 54                 | -33.92      | -                   | -              | 286            | 160         | V        |
| 7      | * 4.95101       | 48.87                | PK2 | 34              | -31.6                  | 0            | 51.27                      | -                  | -           | 74                  | -22.73         | 358            | 101         | H        |
|        | * 4.94896       | 41.16                | ADV | 34              | -31.6                  | -23.41       | 20.15                      | 54                 | -33.85      | -                   | -              | 358            | 101         | H        |
| 11     | * 7.42335       | 52.49                | PK2 | 35.6            | -28.4                  | 0            | 59.69                      | -                  | -           | 74                  | -14.31         | 158            | 214         | H        |
|        | * 7.42353       | 45.22                | ADV | 35.6            | -28.4                  | -23.41       | 29.01                      | 54                 | -24.99      | -                   | -              | 158            | 214         | H        |
| 14     | * 12.37286      | 37.09                | PK2 | 38.8            | -25.8                  | 0            | 50.09                      | -                  | -           | 74                  | -23.91         | 171            | 134         | H        |
|        | * 12.37239      | 26.27                | ADV | 38.8            | -25.8                  | -23.41       | 15.86                      | 54                 | -38.14      | -                   | -              | 171            | 134         | H        |
| 8      | * 4.94885       | 48.77                | PK2 | 34              | -31.6                  | 0            | 51.17                      | -                  | -           | 74                  | -22.83         | 22             | 297         | V        |
|        | * 4.95092       | 41.07                | ADV | 34              | -31.6                  | -23.41       | 20.06                      | 54                 | -33.94      | -                   | -              | 22             | 297         | V        |
| 10     | * 7.42339       | 51.27                | PK2 | 35.6            | -28.4                  | 0            | 58.47                      | -                  | -           | 74                  | -15.53         | 39             | 371         | V        |
|        | * 7.42357       | 44.24                | ADV | 35.6            | -28.4                  | -23.41       | 28.03                      | 54                 | -25.97      | -                   | -              | 39             | 371         | V        |
| 2      | 2.44257         | 53.13                | Pk  | 32.2            | -23.5                  | 0            | 61.83                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 5      | 2.44324         | 48.27                | Pk  | 32.2            | -23.5                  | 0            | 56.97                      | -                  | -           | -                   | -              | 0-360          | 101         | V        |
| 6      | 2.50659         | 44.58                | Pk  | 32.4            | -23.4                  | 0            | 53.58                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 3      | 2.50725         | 50.51                | Pk  | 32.4            | -23.4                  | 0            | 59.51                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 9      | 5.26096         | 36.8                 | Pk  | 34.3            | -31.6                  | 0            | 39.5                       | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 13     | 9.89705         | 46.36                | Pk  | 37.1            | -27                    | 0            | 56.46                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 12     | 9.90122         | 50.27                | Pk  | 37.1            | -27                    | 0            | 60.37                      | -                  | -           | -                   | -              | 0-360          | 101         | H        |

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

PK2 - Maximum Peak

ADV - Linear Voltage Average

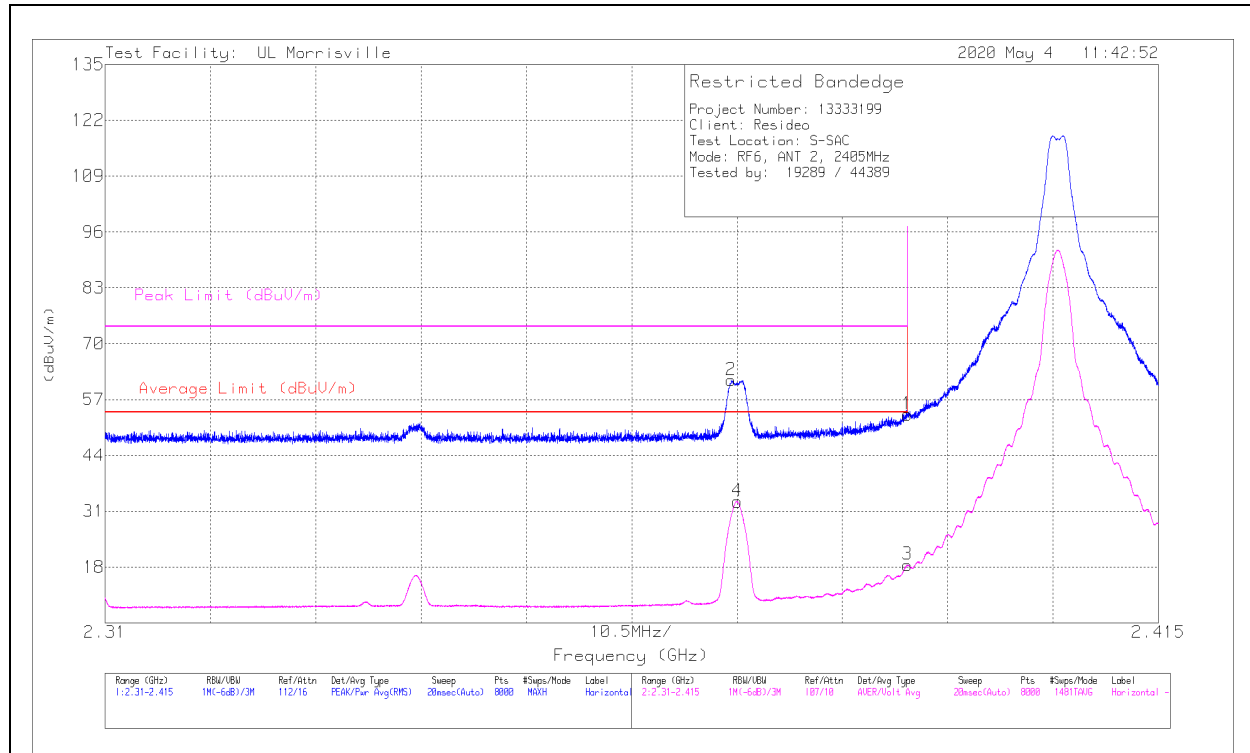
Pk - Peak detector

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## ANT 2

## BANDEDGE (LOW CHANNEL)

### HORIZONTAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Fitr/Pad (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      | * 2.39          | 45.53                | Pk  | 32            | -24                   | 0            | 53.53                      | -                      | -           | 74                  | -20.47         | 251            | 292         | H        |
| 2      | * 2.37241       | 53.39                | Pk  | 32            | -23.9                 | 0            | 61.49                      | -                      | -           | 74                  | -12.51         | 251            | 292         | H        |
| 3      | * 2.39          | 33.92                | ADV | 32            | -24                   | -23.41       | 18.51                      | 54                     | -35.49      | -                   | -              | 251            | 292         | H        |
| 4      | * 2.37301       | 48.59                | ADV | 32            | -23.9                 | -23.41       | 33.28                      | 54                     | -20.72      | -                   | -              | 251            | 292         | H        |

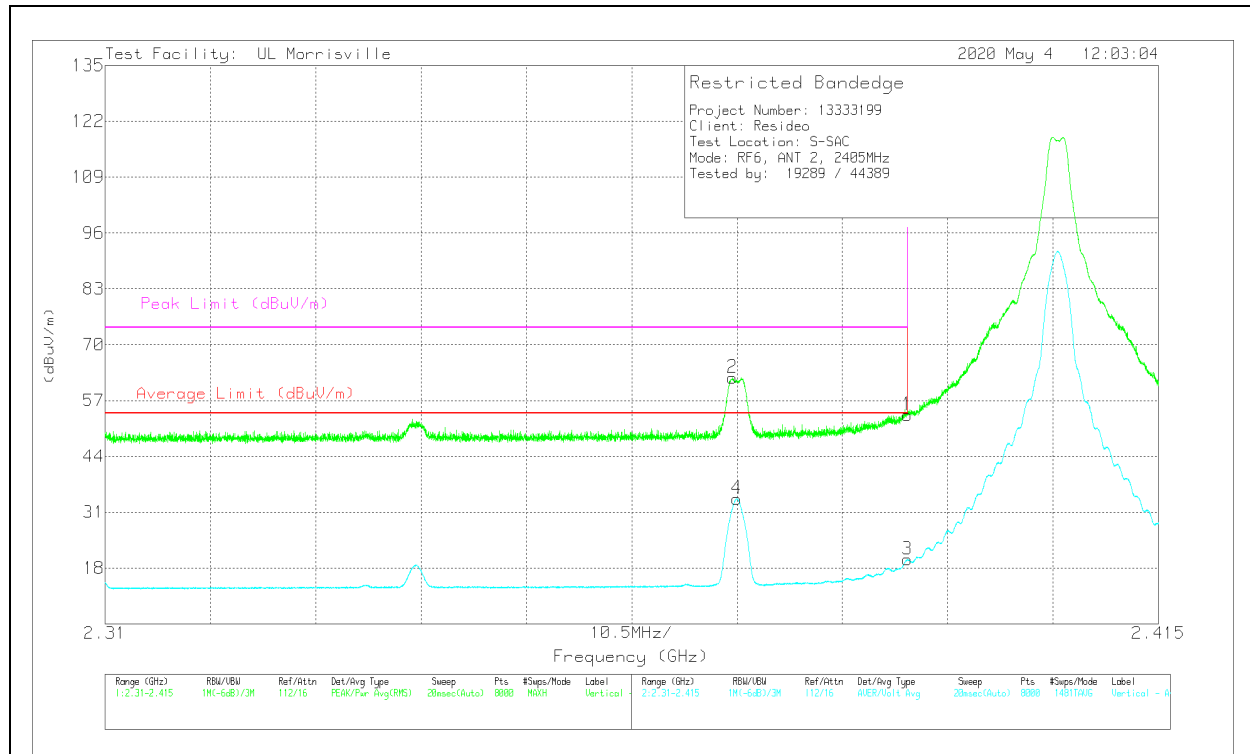
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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      | * 2.39          | 45.61                | Pk  | 32            | -24                    | 0            | 53.61                      | -                      | -           | 74                  | -20.39         | 124            | 192         | V        |
| 2      | * 2.37254       | 54.21                | Pk  | 32            | -23.9                  | 0            | 62.31                      | -                      | -           | 74                  | -11.69         | 124            | 192         | V        |
| 3      | * 2.39          | 35.4                 | ADV | 32            | -24                    | -23.41       | 19.99                      | 54                     | -34.01      | -                   | -              | 124            | 192         | V        |
| 4      | * 2.37297       | 49.44                | ADV | 32            | -23.9                  | -23.41       | 34.13                      | 54                     | -19.87      | -                   | -              | 124            | 192         | V        |

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

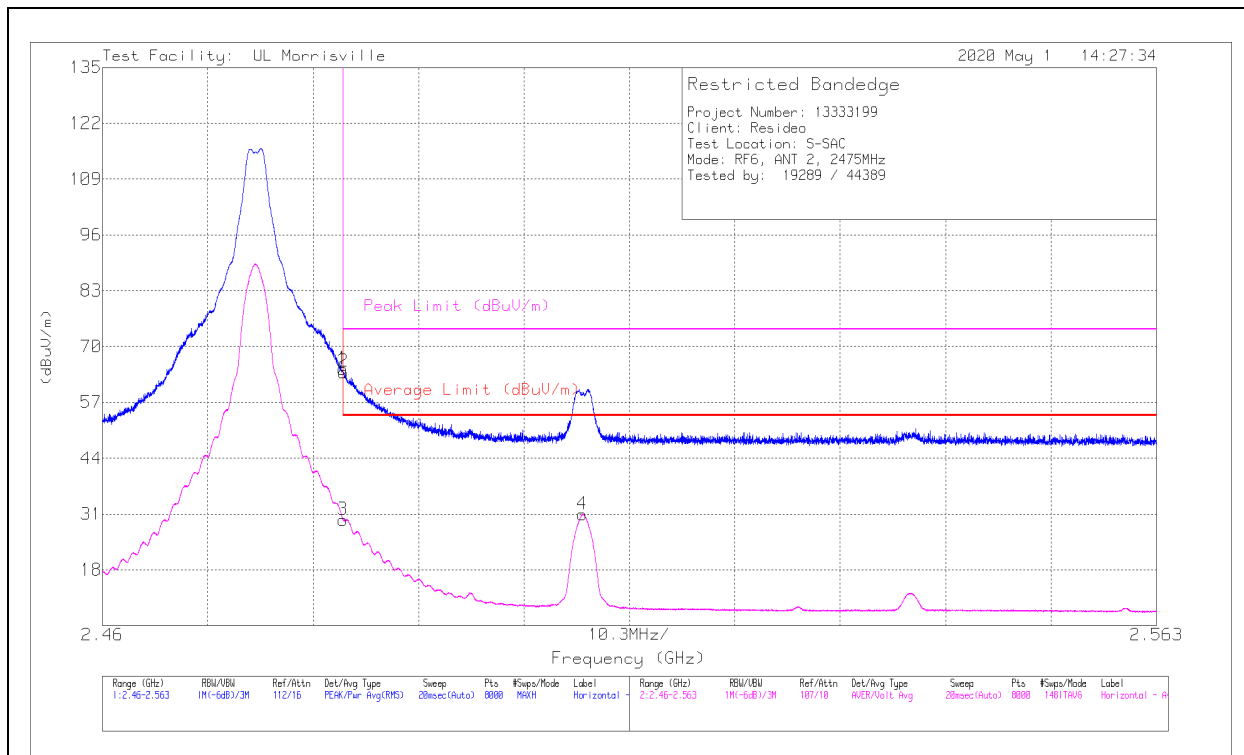
Pk - Peak detector

ADV - Linear Voltage Average

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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      | * 2.4835        | 57.09                | Pk  | 32.1          | -24.4                  | 0            | 64.79                      | -                      | -           | 74                  | -9.21          | 253            | 209         | H        |
| 2      | * 2.48359       | 56.38                | Pk  | 32.1          | -24.4                  | 0            | 64.08                      | -                      | -           | 74                  | -9.92          | 253            | 209         | H        |
| 3      | * 2.4835        | 45.39                | ADV | 32.1          | -24.4                  | -23.41       | 29.68                      | 54                     | -24.32      | -                   | -              | 253            | 209         | H        |
| 4      | 2.50691         | 46.86                | ADV | 32.2          | -24.7                  | -23.41       | 30.95                      | 54                     | -23.05      | -                   | -              | 253            | 209         | H        |

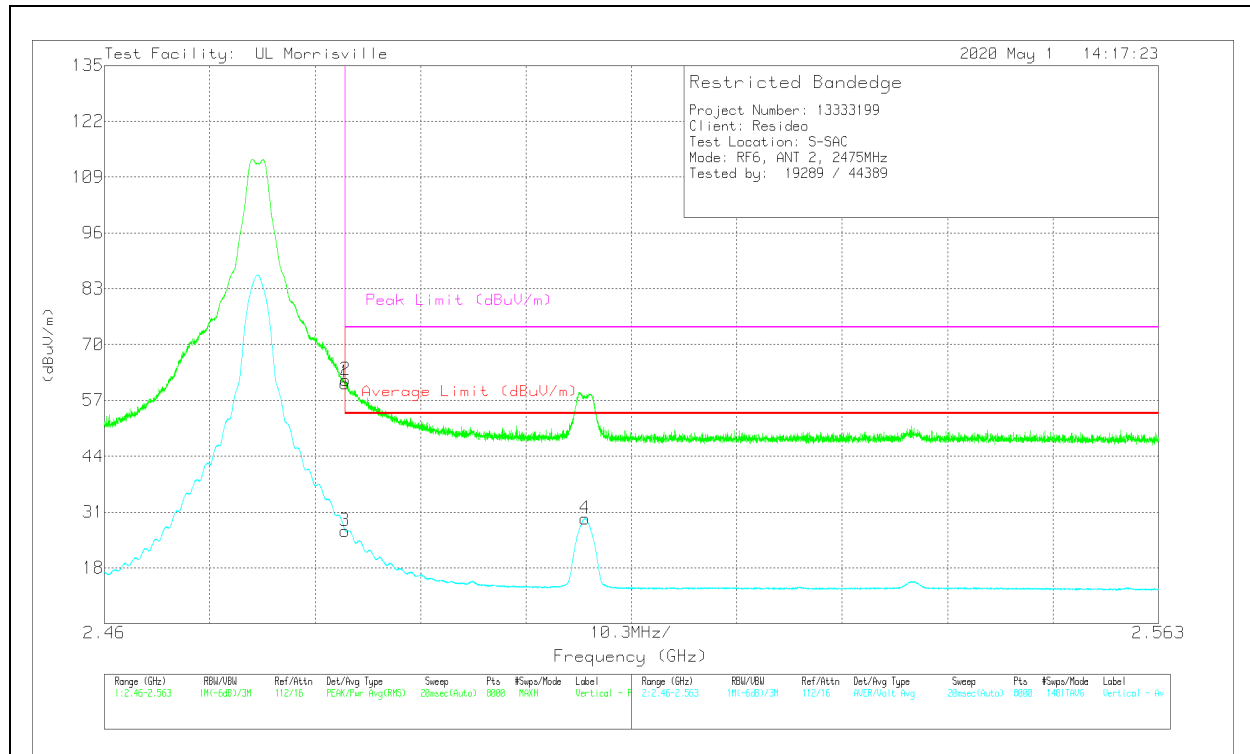
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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      | * 2.4835        | 53.34                | Pk  | 32.1          | -24.4                  | 0            | 61.04                      | -                      | -           | 74                  | -12.96         | 292            | 144         | V        |
| 2      | * 2.48359       | 54.09                | Pk  | 32.1          | -24.4                  | 0            | 61.79                      | -                      | -           | 74                  | -12.21         | 292            | 144         | V        |
| 3      | * 2.4835        | 42.34                | ADV | 32.1          | -24.4                  | -23.41       | 26.63                      | 54                     | -27.37      | -                   | -              | 292            | 144         | V        |
| 4      | 2.50696         | 45.39                | ADV | 32.2          | -24.7                  | -23.41       | 29.48                      | 54                     | -24.52      | -                   | -              | 292            | 144         | V        |

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

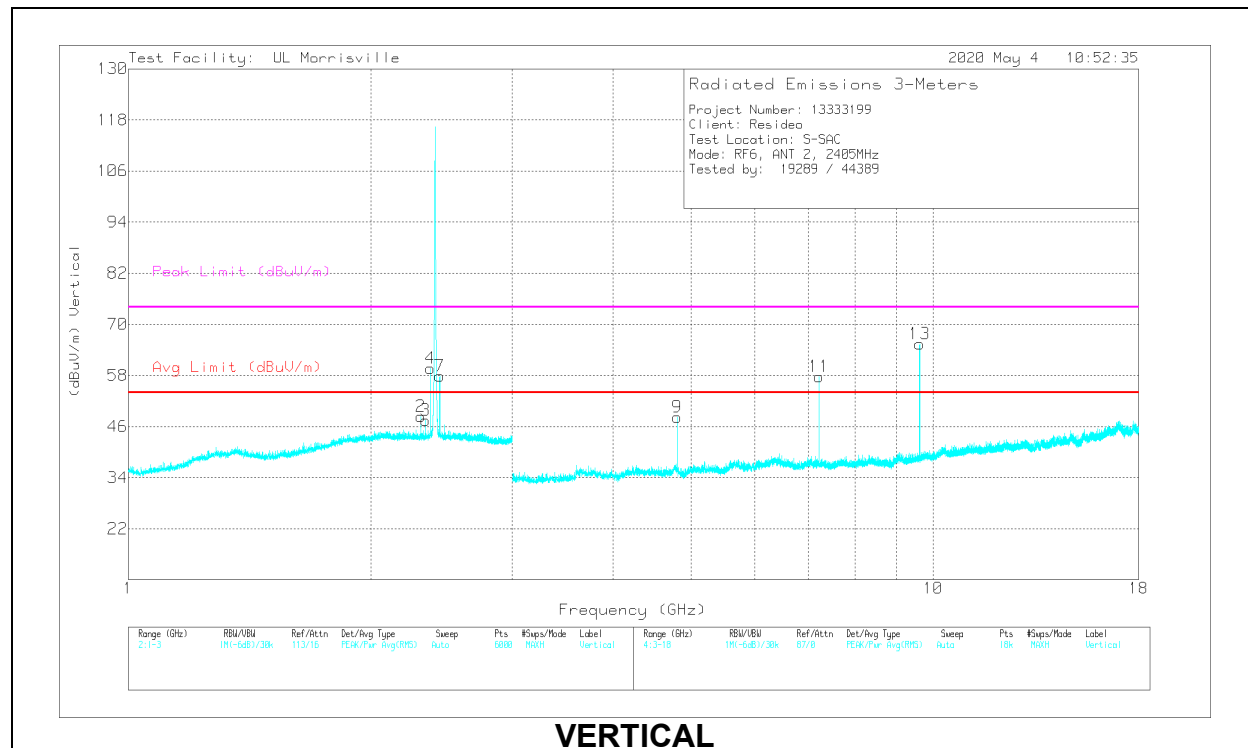
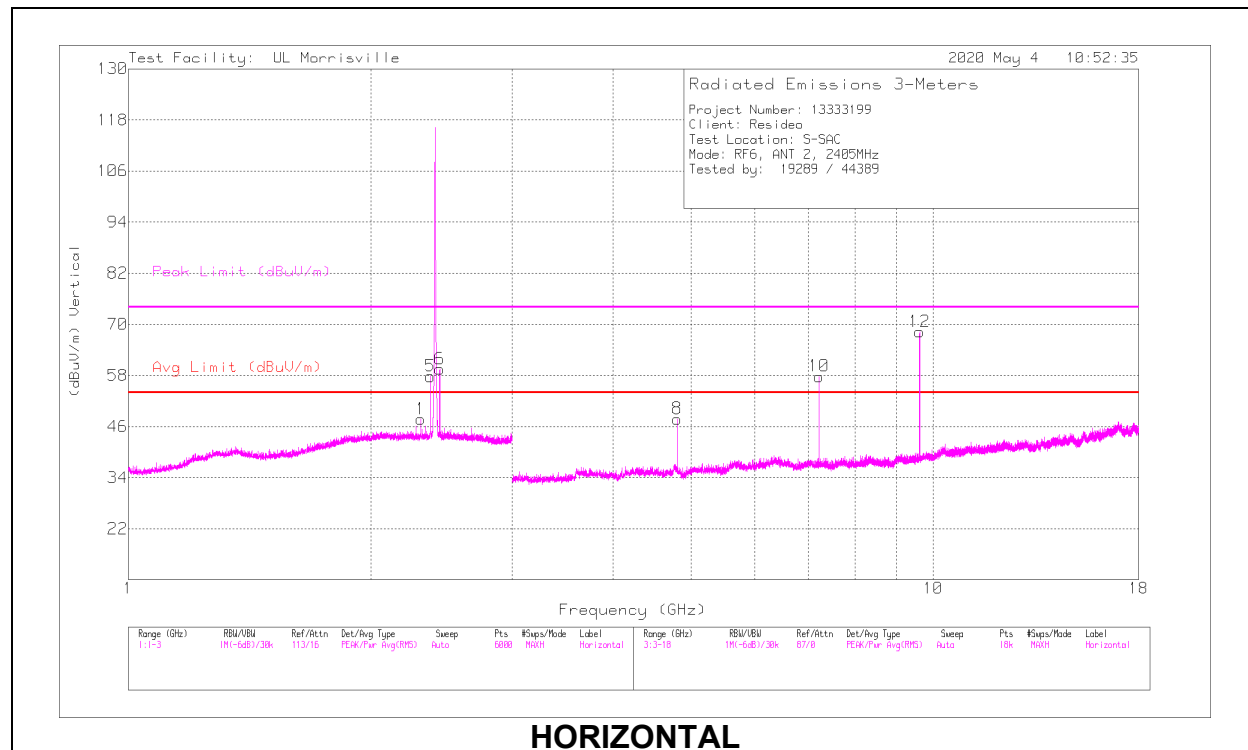
Pk - Peak detector

ADV - Linear Voltage Average

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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 |
|--------|-----------------|----------------------|-----|---------------|------------------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 5      | * 2.37255       | 53.25                | PK2 | 32            | -23.9                  | 0            | 61.35                      | -                  | -           | 74                  | -12.65         | 174            | 108         | H        |
|        | * 2.37301       | 48.21                | ADV | 32            | -23.9                  | -23.41       | 32.9                       | 54                 | -21.1       | -                   | -              | 174            | 108         | H        |
| 3      | * 2.34073       | 45.56                | PK2 | 31.8          | -23.8                  | 0            | 53.56                      | -                  | -           | 74                  | -20.44         | 115            | 209         | V        |
|        | * 2.34097       | 35.26                | ADV | 31.8          | -23.8                  | -23.41       | 19.85                      | 54                 | -34.15      | -                   | -              | 115            | 209         | V        |
| 4      | * 2.37241       | 54.17                | PK2 | 32            | -23.9                  | 0            | 62.27                      | -                  | -           | 74                  | -11.73         | 131            | 208         | V        |
|        | * 2.37296       | 49.36                | ADV | 32            | -23.9                  | -23.41       | 34.05                      | 54                 | -19.95      | -                   | -              | 131            | 208         | V        |
| 8      | * 4.81093       | 49.15                | PK2 | 33.9          | -30.9                  | 0            | 52.15                      | -                  | -           | 74                  | -21.85         | 146            | 142         | H        |
|        | * 4.81077       | 40.92                | ADV | 33.9          | -30.9                  | -23.41       | 20.51                      | 54                 | -33.49      | -                   | -              | 146            | 142         | H        |
| 9      | * 4.80889       | 51.32                | PK2 | 33.9          | -30.9                  | 0            | 54.32                      | -                  | -           | 74                  | -19.68         | 12             | 298         | V        |
|        | * 4.80898       | 43.53                | ADV | 33.9          | -30.9                  | -23.41       | 23.12                      | 54                 | -30.88      | -                   | -              | 12             | 298         | V        |
| 1      | 2.30922         | 39.62                | Pk  | 31.7          | -23.6                  | 0            | 47.72                      | -                  | -           | -                   | -              | 0-360          | 101         | H        |
| 2      | 2.30955         | 40.23                | Pk  | 31.7          | -23.6                  | 0            | 48.33                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 6      | 2.43691         | 51.6                 | Pk  | 32.1          | -24.2                  | 0            | 59.5                       | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 7      | 2.43724         | 49.98                | Pk  | 32.1          | -24.2                  | 0            | 57.88                      | -                  | -           | -                   | -              | 0-360          | 101         | V        |
| 11     | 7.21357         | 50.17                | Pk  | 35.6          | -28.1                  | 0            | 57.67                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 10     | 7.21607         | 50.18                | Pk  | 35.6          | -28                    | 0            | 57.78                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 12     | 9.6212          | 57.9                 | Pk  | 36.6          | -26.2                  | 0            | 68.3                       | -                  | -           | -                   | -              | 0-360          | 101         | H        |
| 13     | 9.62204         | 54.95                | Pk  | 36.6          | -26.2                  | 0            | 65.35                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |

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

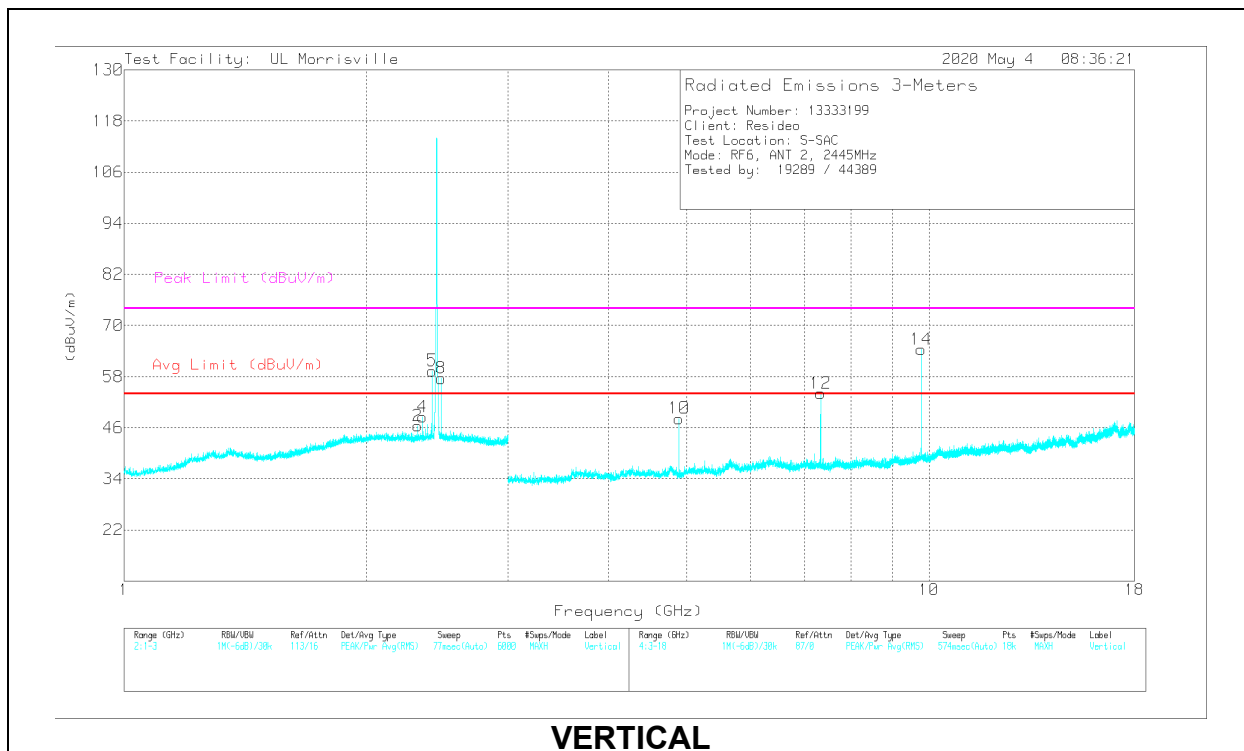
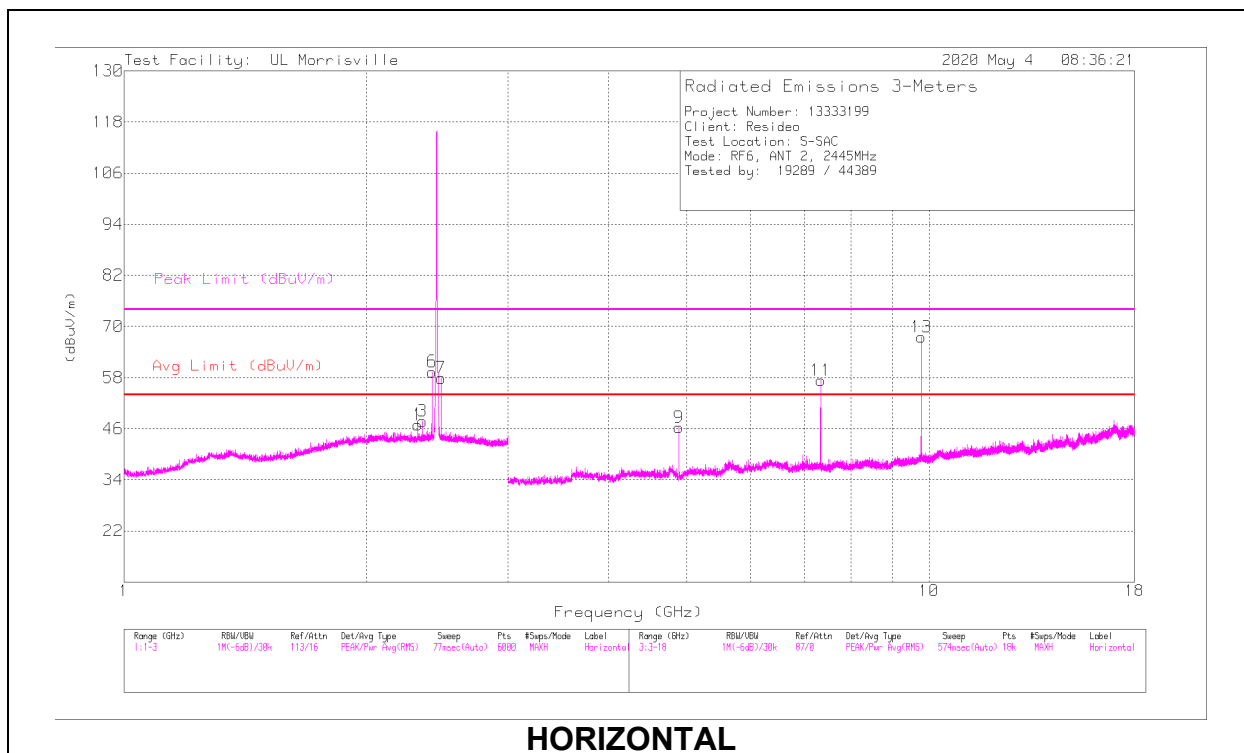
PK2 - Maximum Peak

ADV - Linear Voltage Average

Pk - Peak detector

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## MID CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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      | * 2.31655       | 44.92                | PK2 | 31.7          | -23.6                  | 0            | 53.02                      | -                  | -           | 74                  | -20.98         | 180            | 138         | H        |
|        | * 2.317         | 33.28                | ADV | 31.7          | -23.6                  | -23.41       | 17.97                      | 54                 | -36.03      | -                   | -              | 180            | 138         | H        |
| 3      | * 2.34944       | 46.45                | PK2 | 31.8          | -24                    | 0            | 54.25                      | -                  | -           | 74                  | -19.75         | 173            | 112         | H        |
|        | * 2.34898       | 36.66                | ADV | 31.8          | -23.9                  | -23.41       | 21.15                      | 54                 | -32.85      | -                   | -              | 173            | 112         | H        |
| 2      | * 2.31628       | 44.49                | PK2 | 31.7          | -23.6                  | 0            | 52.59                      | -                  | -           | 74                  | -21.41         | 116            | 302         | V        |
|        | * 2.31695       | 33.47                | ADV | 31.7          | -23.6                  | -23.41       | 18.16                      | 54                 | -35.84      | -                   | -              | 116            | 302         | V        |
| 4      | * 2.34951       | 46.62                | PK2 | 31.8          | -24                    | 0            | 54.42                      | -                  | -           | 74                  | -19.58         | 103            | 198         | V        |
|        | * 2.34896       | 37.49                | ADV | 31.8          | -23.9                  | -23.41       | 21.98                      | 54                 | -32.02      | -                   | -              | 103            | 198         | V        |
| 9      | * 4.89096       | 47.63                | PK2 | 33.8          | -30.9                  | 0            | 50.53                      | -                  | -           | 74                  | -23.47         | 1              | 264         | H        |
|        | * 4.89087       | 39.46                | ADV | 33.8          | -30.9                  | -23.41       | 18.95                      | 54                 | -35.05      | -                   | -              | 1              | 264         | H        |
| 11     | * 7.33345       | 49.19                | PK2 | 35.6          | -27.6                  | 0            | 57.19                      | -                  | -           | 74                  | -16.81         | 94             | 265         | H        |
|        | * 7.33348       | 41.55                | ADV | 35.6          | -27.6                  | -23.41       | 26.14                      | 54                 | -27.86      | -                   | -              | 94             | 265         | H        |
| 10     | * 4.88895       | 48.83                | PK2 | 33.8          | -30.9                  | 0            | 51.73                      | -                  | -           | 74                  | -22.27         | 18             | 266         | V        |
|        | * 4.889         | 40.75                | ADV | 33.8          | -30.9                  | -23.41       | 20.24                      | 54                 | -33.76      | -                   | -              | 18             | 266         | V        |
| 12     | * 7.33336       | 51.72                | PK2 | 35.6          | -27.6                  | 0            | 59.72                      | -                  | -           | 74                  | -14.28         | 66             | 269         | V        |
|        | * 7.33355       | 44.62                | ADV | 35.6          | -27.6                  | -23.41       | 29.21                      | 54                 | -24.79      | -                   | -              | 66             | 269         | V        |
| 6      | 2.41324         | 51.34                | Pk  | 32.1          | -24.1                  | 0            | 59.34                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 5      | 2.41357         | 51.36                | Pk  | 32.1          | -24.1                  | 0            | 59.36                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 7      | 2.47708         | 50.29                | Pk  | 32.1          | -24.5                  | 0            | 57.89                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 8      | 2.47725         | 50                   | Pk  | 32.1          | -24.5                  | 0            | 57.6                       | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 14     | 9.77788         | 53.55                | Pk  | 36.8          | -26                    | 0            | 64.35                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |
| 13     | 9.78121         | 56.61                | Pk  | 36.8          | -25.9                  | 0            | 67.51                      | -                  | -           | -                   | -              | 0-360          | 101         | H        |

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

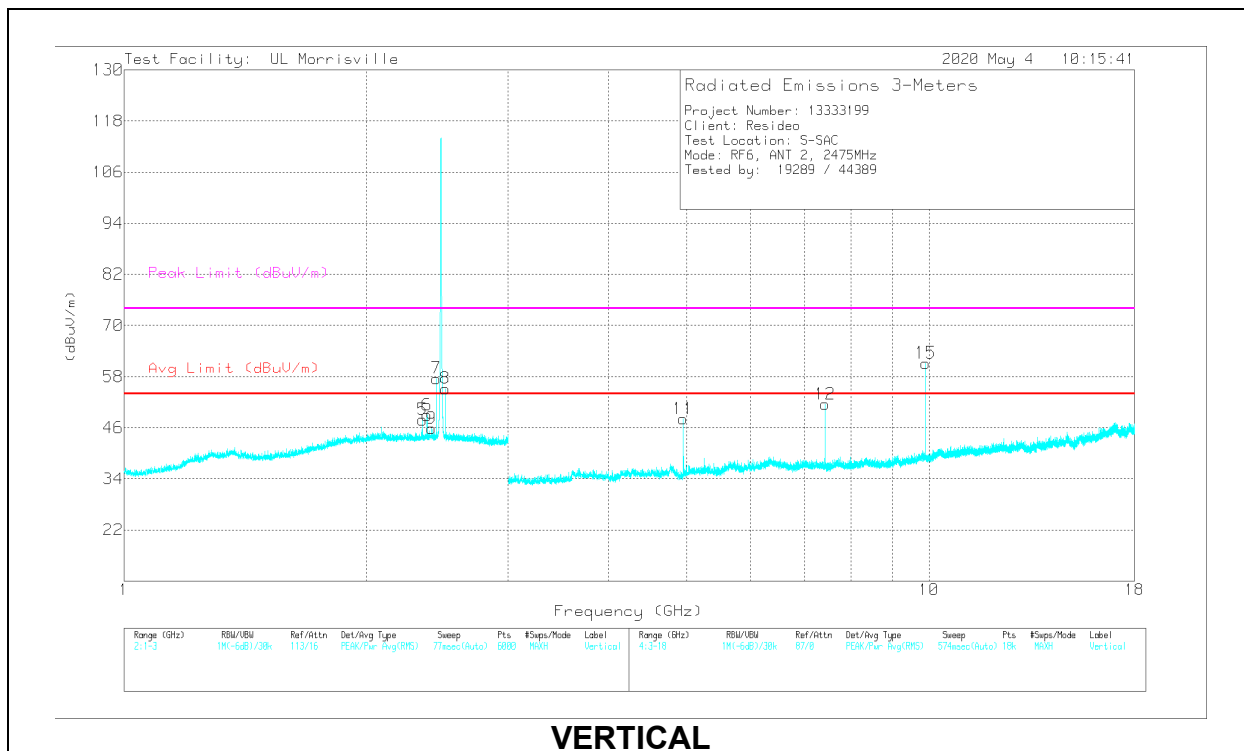
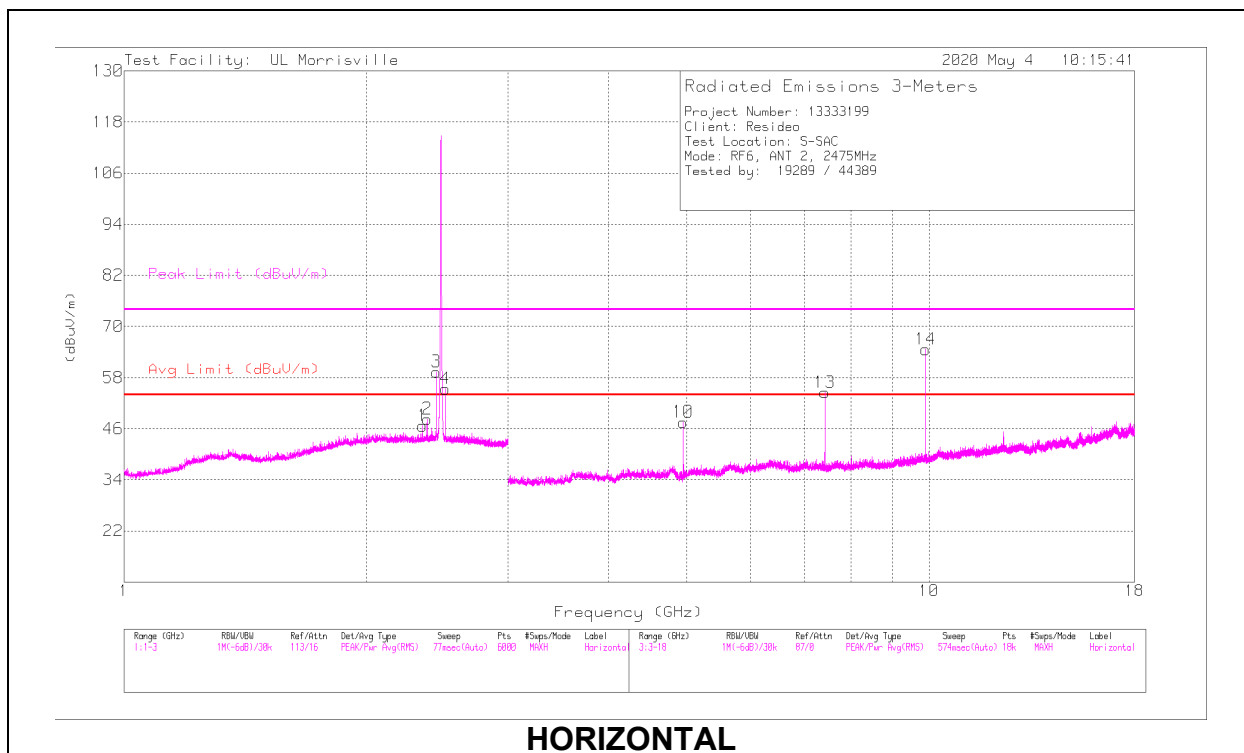
PK2 - Maximum Peak

ADV - Linear Voltage Average

Pk - Peak detector

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

## HIGH CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0078 (dB/m) | Amp/Cbl/Filtr/Pad (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      | * 2.34726       | 44.91                | PK2 | 31.8          | -23.9                  | 0            | 52.81                      | -                  | -           | 74                  | -21.19         | 177            | 115         | H        |
|        | * 2.347         | 34.59                | ADV | 31.8          | -23.9                  | -23.41       | 19.08                      | 54                 | -34.92      | -                   | -              | 177            | 115         | H        |
| 2      | * 2.37967       | 45.78                | PK2 | 32            | -24                    | 0            | 53.78                      | -                  | -           | 74                  | -20.22         | 178            | 151         | H        |
|        | * 2.37901       | 35.42                | ADV | 32            | -24                    | -23.41       | 20.01                      | 54                 | -33.99      | -                   | -              | 178            | 151         | H        |
| 5      | * 2.34672       | 46.58                | PK2 | 31.8          | -23.9                  | 0            | 54.48                      | -                  | -           | 74                  | -19.52         | 121            | 198         | V        |
|        | * 2.34696       | 36.18                | ADV | 31.8          | -23.9                  | -23.41       | 20.67                      | 54                 | -33.33      | -                   | -              | 121            | 198         | V        |
| 6      | * 2.34727       | 46.04                | PK2 | 31.8          | -23.9                  | 0            | 53.94                      | -                  | -           | 74                  | -20.06         | 121            | 198         | V        |
|        | * 2.34694       | 36.21                | ADV | 31.8          | -23.9                  | -23.41       | 20.7                       | 54                 | -33.3       | -                   | -              | 121            | 198         | V        |
| 10     | * 4.94894       | 48.19                | PK2 | 34            | -30.9                  | 0            | 51.29                      | -                  | -           | 74                  | -22.71         | 1              | 205         | H        |
|        | * 4.94898       | 40.76                | ADV | 34            | -30.9                  | -23.41       | 20.45                      | 54                 | -33.55      | -                   | -              | 1              | 205         | H        |
| 13     | * 7.4264        | 51.07                | PK2 | 35.6          | -27.9                  | 0            | 58.77                      | -                  | -           | 74                  | -15.23         | 165            | 179         | H        |
|        | * 7.42627       | 43.34                | ADV | 35.6          | -27.9                  | -23.41       | 27.63                      | 54                 | -26.37      | -                   | -              | 165            | 179         | H        |
| 11     | * 4.9489        | 49.3                 | PK2 | 34            | -30.9                  | 0            | 52.4                       | -                  | -           | 74                  | -21.6          | 12             | 281         | V        |
|        | * 4.94895       | 41.87                | ADV | 34            | -30.9                  | -23.41       | 21.56                      | 54                 | -32.44      | -                   | -              | 12             | 281         | V        |
| 12     | * 7.42639       | 49.28                | PK2 | 35.6          | -27.9                  | 0            | 56.98                      | -                  | -           | 74                  | -17.02         | 61             | 270         | V        |
|        | * 7.42623       | 41.66                | ADV | 35.6          | -27.9                  | -23.41       | 25.95                      | 54                 | -28.05      | -                   | -              | 61             | 270         | V        |
| 9      | 2.41024         | 37.94                | Pk  | 32            | -24.1                  | 0            | 45.84                      | -                  | -           | -                   | -              | 0-360          | 201         | V        |
| 3      | 2.44291         | 51.46                | Pk  | 32.1          | -24.2                  | 0            | 59.36                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 7      | 2.44291         | 49.68                | Pk  | 32.1          | -24.2                  | 0            | 57.58                      | -                  | -           | -                   | -              | 0-360          | 201         | V        |
| 8      | 2.50659         | 47.68                | Pk  | 32.2          | -24.7                  | 0            | 55.18                      | -                  | -           | -                   | -              | 0-360          | 201         | V        |
| 4      | 2.50725         | 47.87                | Pk  | 32.2          | -24.7                  | 0            | 55.37                      | -                  | -           | -                   | -              | 0-360          | 199         | H        |
| 14     | 9.90122         | 53.42                | Pk  | 37            | -25.8                  | 0            | 64.62                      | -                  | -           | -                   | -              | 0-360          | 101         | H        |
| 15     | 9.90122         | 49.94                | Pk  | 37            | -25.8                  | 0            | 61.14                      | -                  | -           | -                   | -              | 0-360          | 199         | V        |

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

PK2 - Maximum Peak

ADV - Linear Voltage Average

Pk - Peak detector

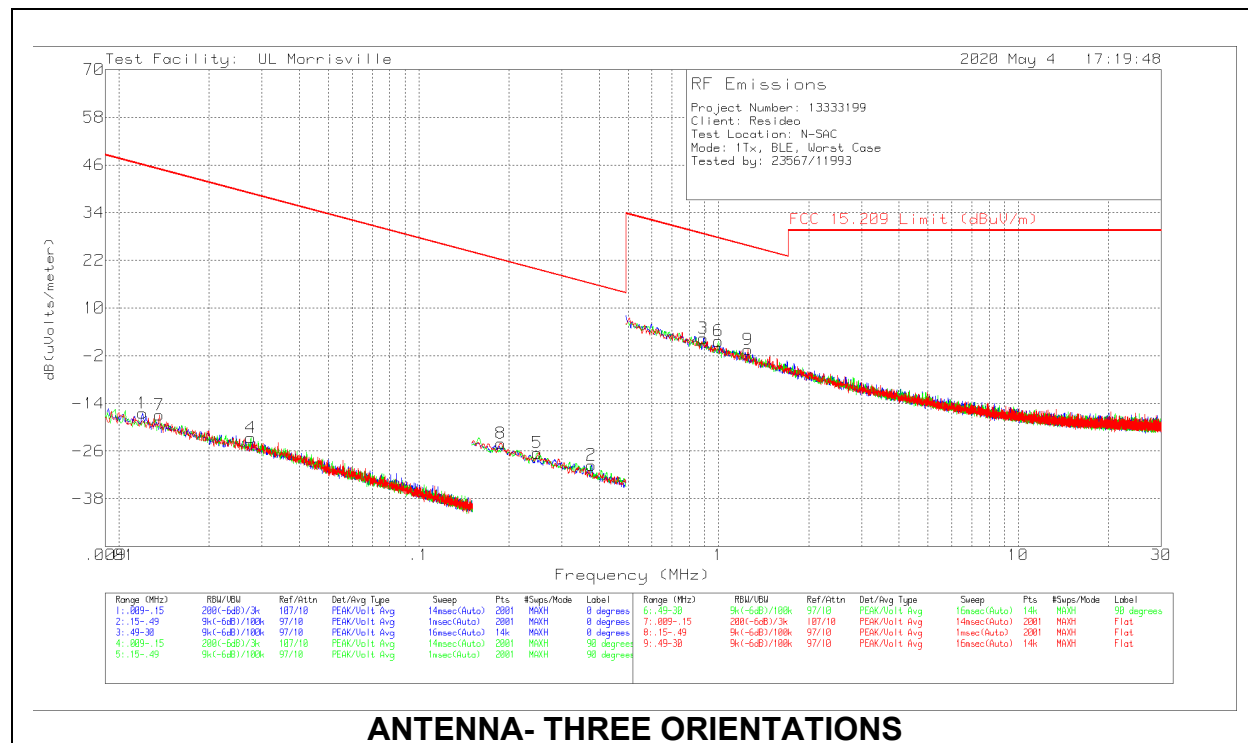
Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

### 10.3. WORST CASE BELOW 30MHZ

Note for below 30 MHz scans: 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  $40 \cdot \log(\text{test distance} / \text{specification distance})$ .

The below 30 MHz limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of  $377\Omega$ . For example, the measurement frequency 11.98 KHz resulted in a level of -16.46 dBuV/m, which is equivalent to  $-16.46 - 51.5 = -67.96$  dBuA/m, which has the same margin, -62.49 dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

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

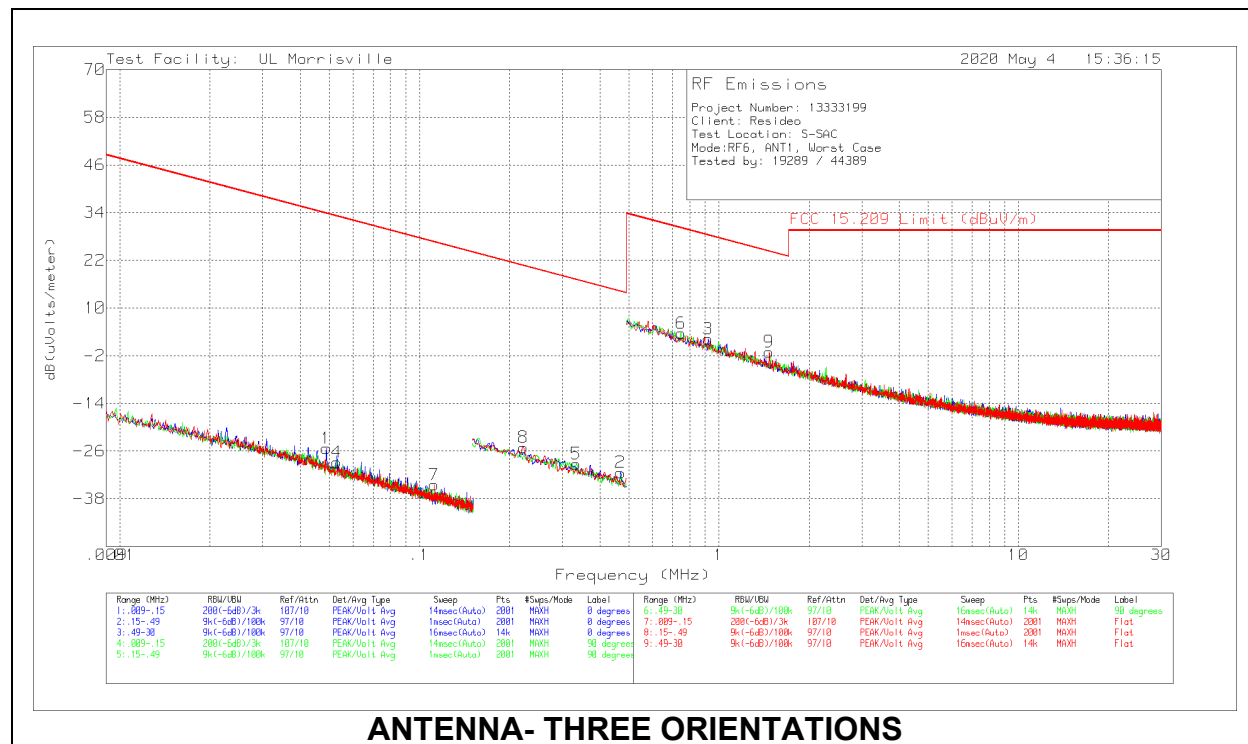


## **BELOW 30MHz DATA**

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0079 AF (dB/m) | Cbl (dB) | Dist. Corr. Factor (dB) | Corrected Reading dB(uV/meter) | FCC 15.209 QP/AV Limit (dBuV/m) | FCC 15.209 PK Limit (dBuV/m) | Worst-Case Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|------------------|----------|-------------------------|--------------------------------|---------------------------------|------------------------------|------------------------|----------------|
| 1      | .01198          | 46.04                | Pk  | 17.4             | .1       | -80                     | -16.46                         | 46.03                           | 66.03                        | -62.49                 | 0-360          |
| 7      | .01362          | 46.26                | Pk  | 16.7             | .1       | -80                     | -16.94                         | 44.92                           | 64.92                        | -61.86                 | 0-360          |
| 4      | .02753          | 43.88                | Pk  | 13.4             | .1       | -80                     | -22.62                         | 38.81                           | 58.81                        | -61.43                 | 0-360          |
| 8      | .18783          | 44.84                | Pk  | 11               | .1       | -80                     | -24.06                         | 22.13                           | 42.13                        | -46.19                 | 0-360          |
| 5      | .24835          | 42.44                | Pk  | 11               | .1       | -80                     | -26.46                         | 19.7                            | 39.7                         | -46.16                 | 0-360          |
| 2      | .37721          | 39.37                | Pk  | 11               | .1       | -80                     | -29.53                         | 16.07                           | 36.07                        | -45.6                  | 0-360          |
| 3      | .89052          | 31.25                | Pk  | 11               | .1       | -40                     | 2.35                           | 28.61                           | -                            | -26.26                 | 0-360          |
| 6      | 1.00014         | 30.49                | Pk  | 11               | .2       | -40                     | 1.69                           | 27.6                            | -                            | -25.91                 | 0-360          |
| 9      | 1.2531          | 28.22                | Pk  | 11.1             | .2       | -40                     | -.48                           | 25.64                           | -                            | -26.12                 | 0-360          |

Pk - Peak detector

# **SPURIOUS EMISSIONS BELOW 30 MHz (802.15.4 ANT1 WORST-CASE CONFIGURATION)**

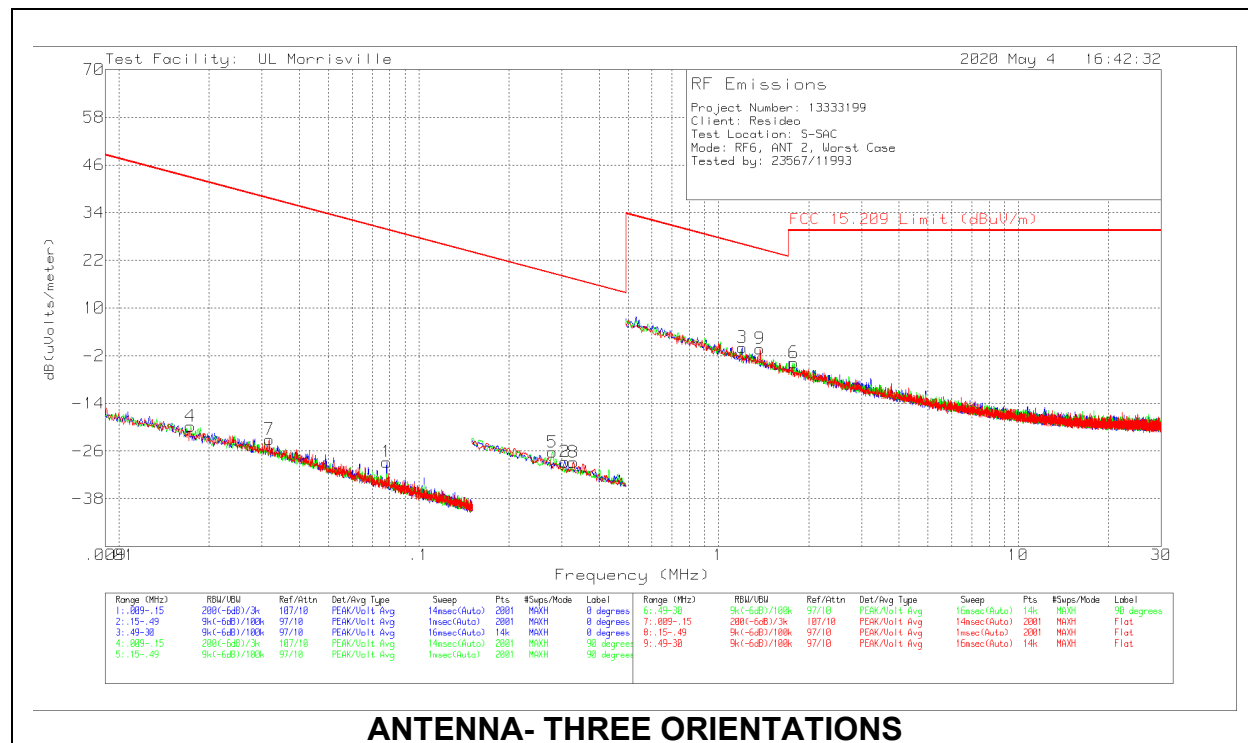


## **BELOW 30MHz DATA**

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0079 AF (dB/m) | Cbl (dB) | Dist. Corr. Factor (dB) | Corrected Reading dB(uVolts/meter) | FCC 15.209 QP/AV Limit (dBuV/m) | FCC 15.209 PK Limit (dBuV/m) | Worst-Case Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|------------------|----------|-------------------------|------------------------------------|---------------------------------|------------------------------|------------------------|----------------|
| 1      | .0489           | 42.96                | Pk  | 11.6             | .1       | -80                     | -25.34                             | 33.82                           | 53.82                        | -59.16                 | 0-360          |
| 4      | .05288          | 39.57                | Pk  | 11.5             | .1       | -80                     | -28.83                             | 33.14                           | 53.14                        | -61.97                 | 0-360          |
| 7      | .11181          | 34.29                | Pk  | 11.1             | .1       | -80                     | -34.51                             | 26.63                           | 46.63                        | -61.14                 | 0-360          |
| 8      | .22259          | 43.79                | Pk  | 11               | .1       | -80                     | -25.11                             | 20.65                           | 40.65                        | -45.76                 | 0-360          |
| 5      | .3336           | 39.66                | Pk  | 11               | .1       | -80                     | -29.24                             | 17.14                           | 37.14                        | -46.38                 | 0-360          |
| 2      | .46892          | 37.5                 | Pk  | 11               | .1       | -80                     | -31.4                              | 14.18                           | 34.18                        | -45.58                 | 0-360          |
| 6      | .74718          | 32.55                | Pk  | 11               | .1       | -40                     | 3.65                               | 30.14                           | -                            | -26.49                 | 0-360          |
| 3      | .92214          | 31.1                 | Pk  | 11               | .1       | -40                     | 2.2                                | 28.31                           | -                            | -26.11                 | 0-360          |
| 9      | 1.47233         | 27.62                | Pk  | 11.1             | .2       | -40                     | -1.08                              | 24.24                           | -                            | -25.32                 | 0-360          |

Pk - Peak detector

# **SPURIOUS EMISSIONS BELOW 30 MHz (802.15.4 ANT2 WORST-CASE CONFIGURATION)**



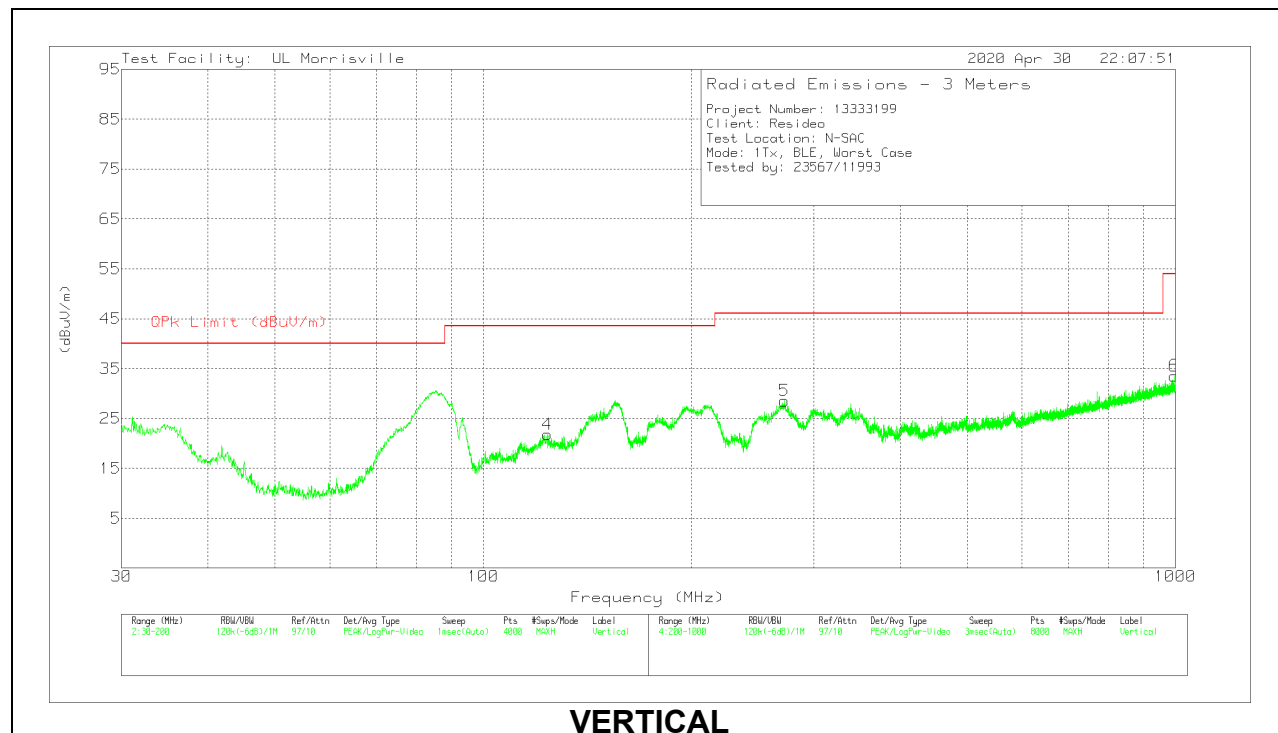
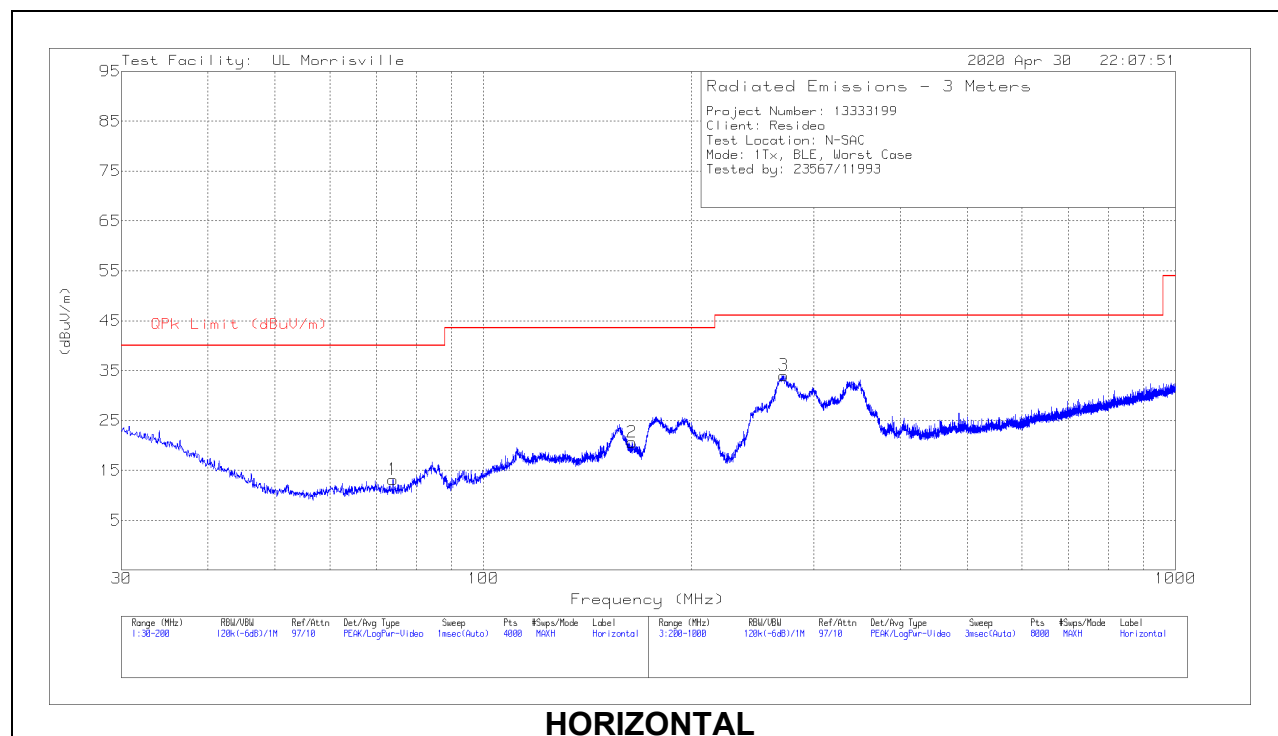
## **BELOW 30MHz DATA**

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0079 AF (dB/m) | Cbl (dB) | Dist. Corr. Factor (dB) | Corrected Reading dB(uVolts/meter) | FCC 15.209 QP/AV Limit (dBuV/m) | FCC 15.209 PK Limit (dBuV/m) | Worst-Case Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|------------------|----------|-------------------------|------------------------------------|---------------------------------|------------------------------|------------------------|----------------|
| 4      | .01731          | 45.05                | Pk  | 15.1             | .1       | -80                     | -19.75                             | 42.84                           | 62.84                        | -62.59                 | 0-360          |
| 7      | .03172          | 43.83                | Pk  | 13               | .1       | -80                     | -23.07                             | 37.58                           | 57.58                        | -60.65                 | 0-360          |
| 1      | .07815          | 39.98                | Pk  | 11.2             | .1       | -80                     | -28.72                             | 29.75                           | 49.75                        | -58.47                 | 0-360          |
| 5      | .27946          | 42.63                | Pk  | 11               | .1       | -80                     | -26.27                             | 18.68                           | 38.68                        | -44.95                 | 0-360          |
| 2      | .30742          | 40.23                | Pk  | 11               | .1       | -80                     | -28.67                             | 17.85                           | 37.85                        | -46.52                 | 0-360          |
| 8      | .32808          | 40.12                | Pk  | 11               | .1       | -80                     | -28.78                             | 17.28                           | 37.28                        | -46.06                 | 0-360          |
| 3      | 1.2004          | 28.76                | Pk  | 11.1             | .2       | -40                     | .06                                | 26.02                           | -                            | -25.96                 | 0-360          |
| 9      | 1.37536         | 28.48                | Pk  | 11.1             | .2       | -40                     | -.22                               | 24.84                           | -                            | -25.06                 | 0-360          |
| 6      | 1.78642         | 24.84                | Pk  | 11.2             | .2       | -40                     | -3.76                              | 29.54                           | -                            | -33.3                  | 0-360          |

Pk - Peak detector

## 10.4. WORST CASE 30 – 1000MHZ

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



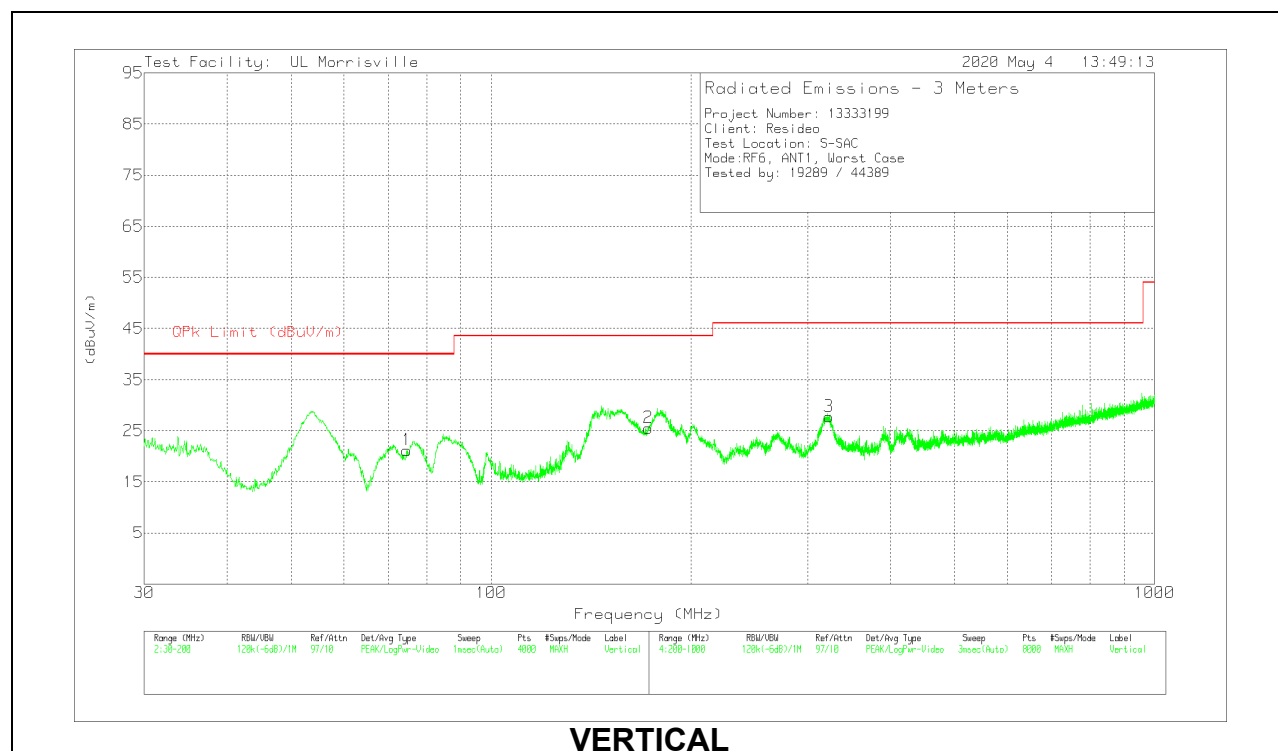
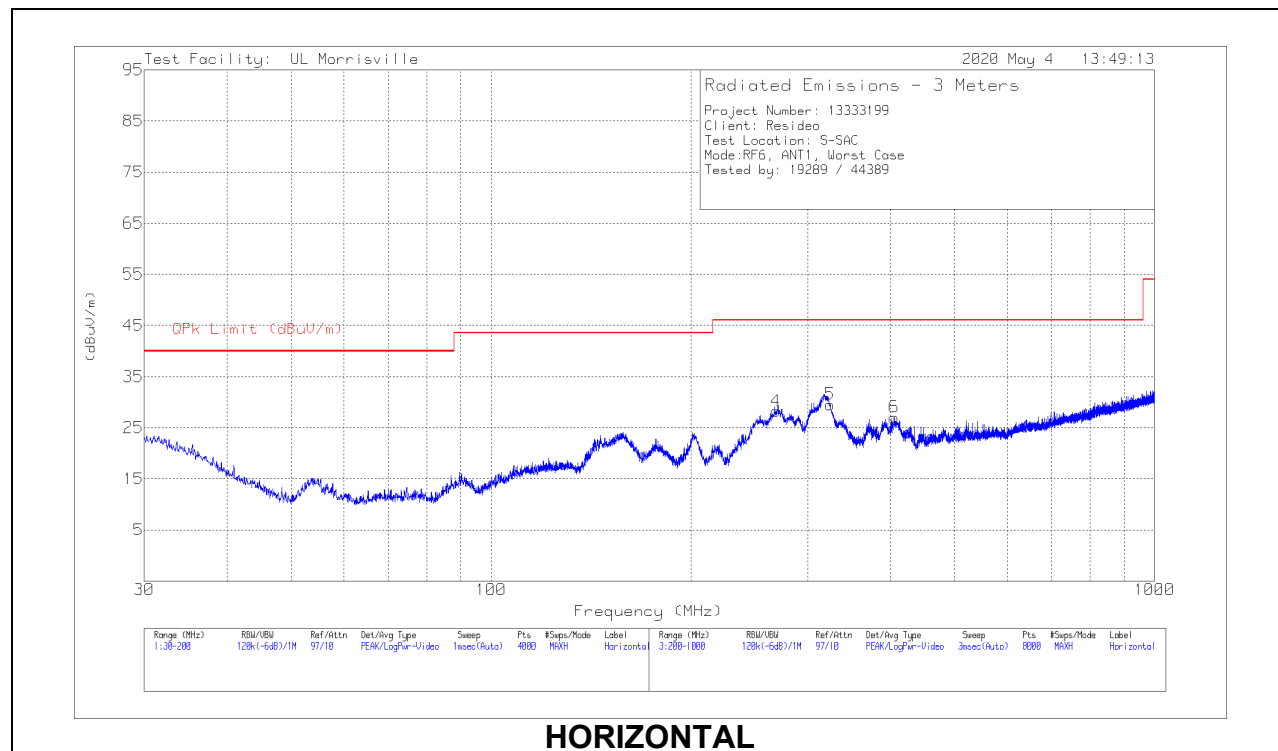
## BELOW 1GHz DATA

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0073 AF (dB/m) | Cbl/Amp (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|------------------|--------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 1      | * 74.0414       | 30.3                 | Pk  | 14               | -31.1        | 13.2                       | 40                 | -26.8       | 0-360          | 299         | H        |
| 2      | * 163.9522      | 32.73                | Pk  | 18.3             | -30.4        | 20.63                      | 43.52              | -22.89      | 0-360          | 299         | H        |
| 3      | * 271.6093      | 44.16                | Pk  | 19.4             | -29.5        | 34.06                      | 46.02              | -11.96      | 0-360          | 102         | H        |
| 4      | * 123.6942      | 32.6                 | Pk  | 19.9             | -30.7        | 21.8                       | 43.52              | -21.72      | 0-360          | 102         | V        |
| 5      | * 272.1094      | 38.65                | Pk  | 19.4             | -29.5        | 28.55                      | 46.02              | -17.47      | 0-360          | 199         | V        |
| 6      | * 996.1035      | 29.25                | Pk  | 29.4             | -25.1        | 33.55                      | 53.97              | -20.42      | 0-360          | 102         | V        |

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

Pk - Peak detector

**SPURIOUS EMISSIONS 30 TO 1000 MHz (802.15.4 ANT1 WORST-CASE CONFIGURATION)**

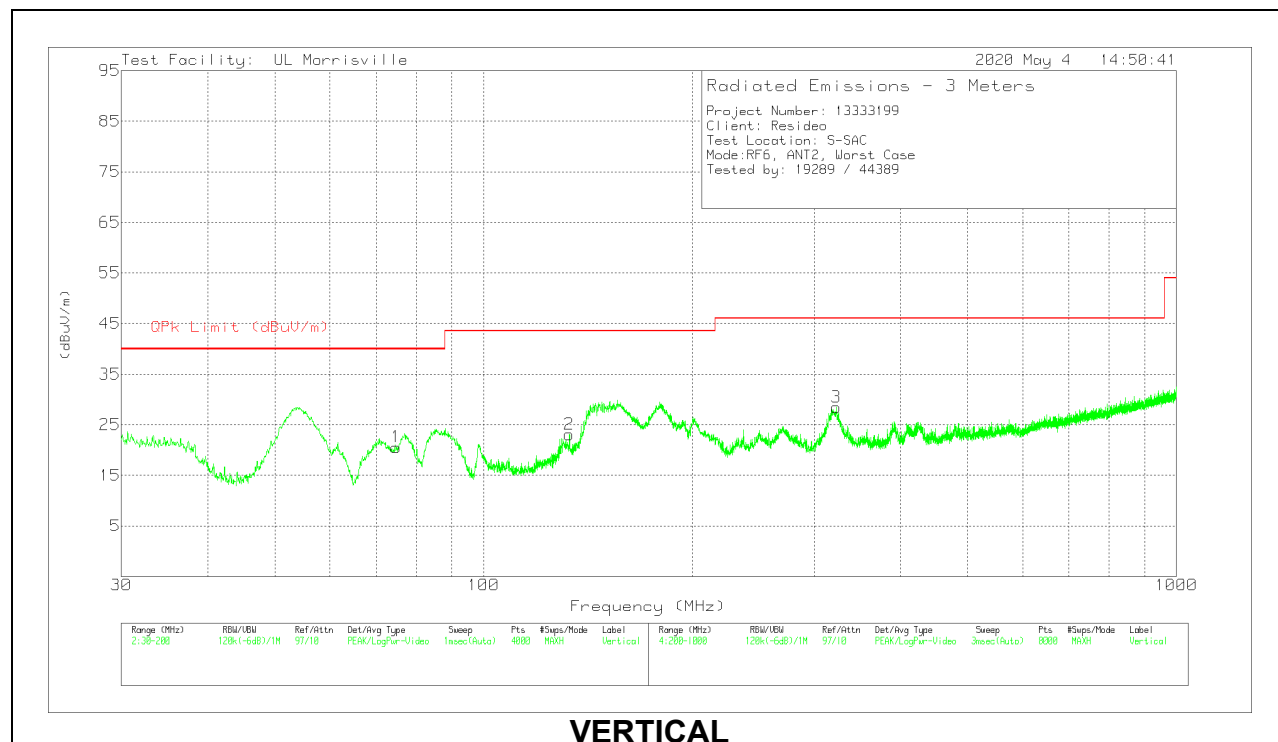
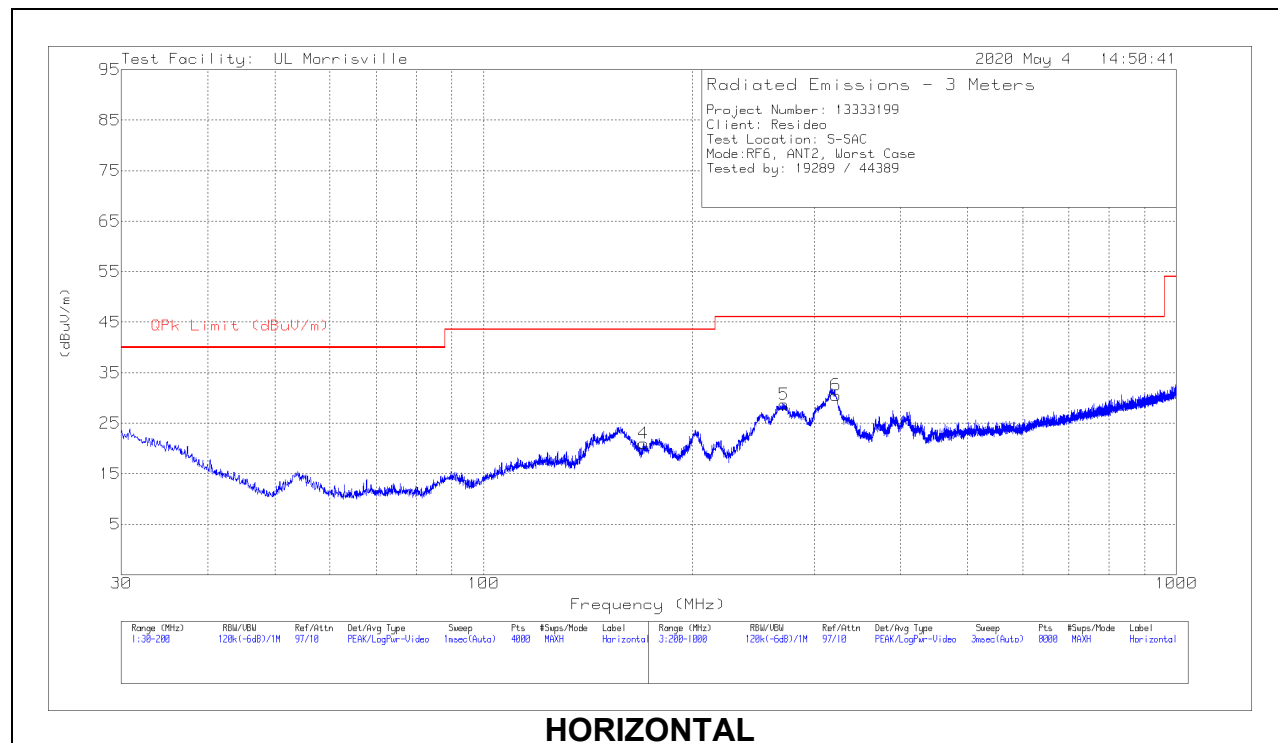


## BELOW 1GHz DATA

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0074 AF (dB/m) | Cbl/Amp (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|------------------|--------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 4      | * 268.8089      | 38.74                | Pk  | 19.2             | -29.7        | 28.24                      | 46.02              | -17.78      | 0-360          | 199         | H        |
| 5      | * 324.2161      | 38.94                | Pk  | 20               | -29.4        | 29.54                      | 46.02              | -16.48      | 0-360          | 101         | H        |
| 6      | * 405.1267      | 34.25                | Pk  | 21.9             | -29.1        | 27.05                      | 46.02              | -18.97      | 0-360          | 101         | H        |
| 1      | 74.6366         | 38.4                 | Pk  | 14               | -31.2        | 21.2                       | 40                 | -18.8       | 0-360          | 101         | V        |
| 2      | * 172.5819      | 38.25                | Pk  | 17.8             | -30.5        | 25.55                      | 43.52              | -17.97      | 0-360          | 101         | V        |
| 3      | * 322.916       | 37.16                | Pk  | 20               | -29.4        | 27.76                      | 46.02              | -18.26      | 0-360          | 198         | V        |

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

**SPURIOUS EMISSIONS 30 TO 1000 MHz (802.15.4 ANT2 WORST-CASE CONFIGURATION)**



## BELOW 1GHz DATA

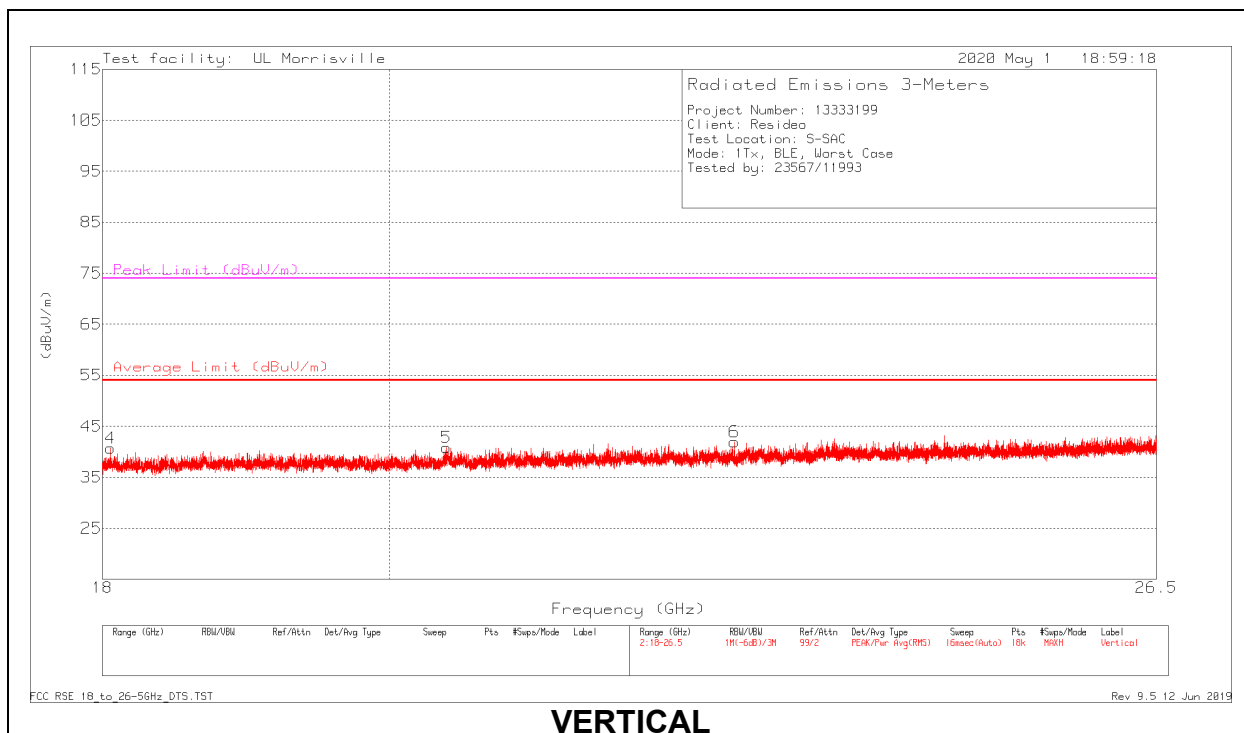
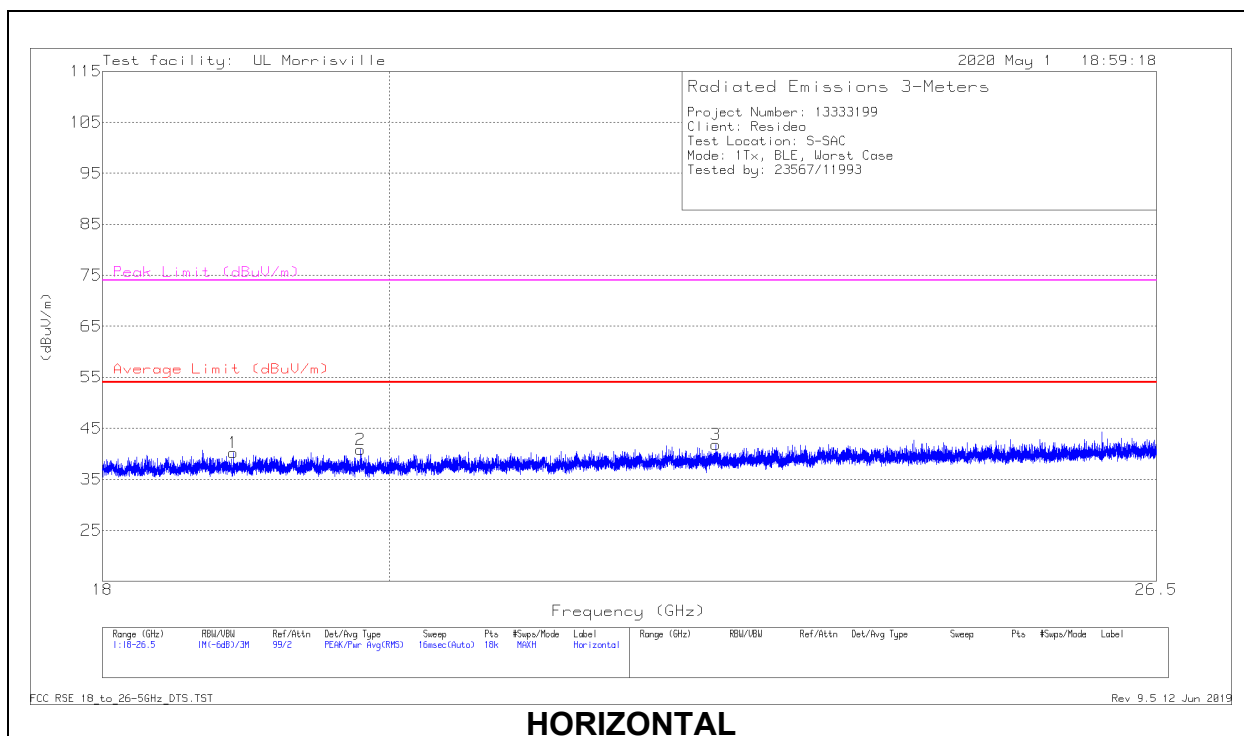
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0074 AF (dB/m) | Cbl/Amp (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|------------------|--------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 4      | * 170.2438      | 33.4                 | Pk  | 18               | -30.4        | 21                         | 43.52              | -22.52      | 0-360          | 199         | H        |
| 5      | * 271.5093      | 39.12                | Pk  | 19.3             | -29.7        | 28.72                      | 46.02              | -17.3       | 0-360          | 199         | H        |
| 6      | * 322.6159      | 39.94                | Pk  | 20               | -29.4        | 30.54                      | 46.02              | -15.48      | 0-360          | 101         | H        |
| 1      | 74.7853         | 37.78                | Pk  | 14               | -31.2        | 20.58                      | 40                 | -19.42      | 0-360          | 101         | V        |
| 2      | * 133.0467      | 34.18                | Pk  | 19.6             | -30.7        | 23.08                      | 43.52              | -20.44      | 0-360          | 101         | V        |
| 3      | * 322.816       | 37.85                | Pk  | 20               | -29.4        | 28.45                      | 46.02              | -17.57      | 0-360          | 199         | V        |

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

Pk - Peak detector

## 10.5. WORST CASE 18-26 GHZ

### SPURIOUS EMISSIONS 18-26 GHZ (BLE WORST-CASE CONFIGURATION)

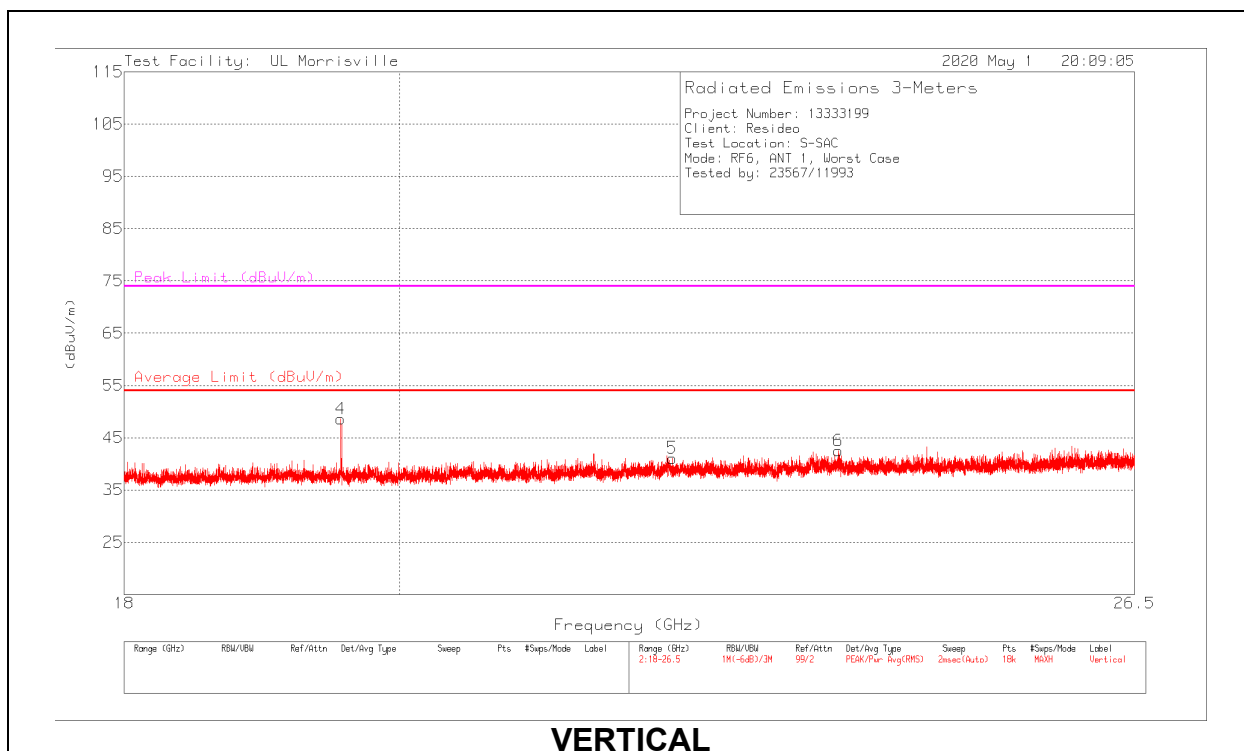
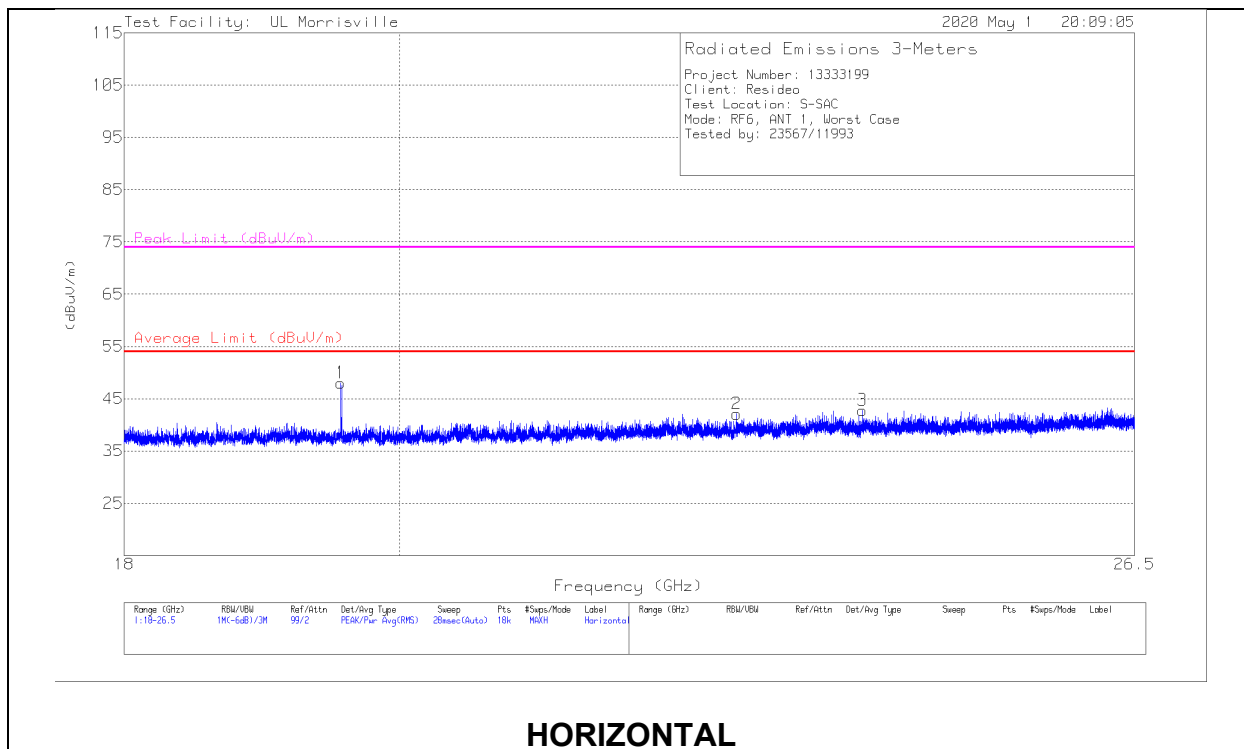


## 18 – 26GHz DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0076 AF (dB/m) | Amp/Cbl (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|------------------|--------------|----------------------------|------------------------|-------------|---------------------|-------------|----------------|-------------|----------|
| 1      | * 18.88688      | 45.6                 | Pk  | 32.7             | -38.1        | 40.2                       | 54                     | -13.8       | 74                  | -33.8       | 0-360          | 298         | H        |
| 2      | * 19.78935      | 45.42                | Pk  | 32.9             | -37.5        | 40.82                      | 54                     | -13.18      | 74                  | -33.18      | 0-360          | 198         | H        |
| 3      | * 22.54586      | 45.23                | Pk  | 33.5             | -36.9        | 41.83                      | 54                     | -12.17      | 74                  | -32.17      | 0-360          | 102         | H        |
| 4      | * 18.05384      | 46.72                | Pk  | 32.5             | -38.5        | 40.72                      | 54                     | -13.28      | 74                  | -33.28      | 0-360          | 252         | V        |
| 5      | * 20.42263      | 45.11                | Pk  | 33.1             | -37.4        | 40.81                      | 54                     | -13.19      | 74                  | -33.19      | 0-360          | 298         | V        |
| 6      | * 22.69745      | 45.55                | Pk  | 33.5             | -37.1        | 41.95                      | 54                     | -12.05      | 74                  | -32.05      | 0-360          | 298         | V        |

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

**SPURIOUS EMISSIONS 18-26 GHz (802.15.4 ANT1 WORST-CASE CONFIGURATION)**



## 18 – 26GHz DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0076 AF (dB/m) | Amp/Cbl (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|------------------|--------------|--------------|----------------------------|------------------------|-------------|---------------------|-------------|----------------|-------------|----------|
| 1      | * 19.55577      | 54.63                | Pk  | 32.7             | -37.8        | 0            | 49.53                      | -                      | -           | 74                  | -24.47      | 169            | 161         | H        |
|        | * 19.55577      | 51.08                | Av  | 32.7             | -37.8        | -23.41       | 22.57                      | 54                     | -31.43      | -                   | -           | 169            | 161         | H        |
| 2      | * 22.75743      | 45.5                 | Pk  | 33.5             | -36.9        | 0            | 42.1                       | 54                     | -11.9       | 74                  | -31.9       | 0-360          | 102         | H        |
| 3      | * 23.87854      | 45.18                | Pk  | 34               | -36.4        | 0            | 42.78                      | 54                     | -11.22      | 74                  | -31.22      | 0-360          | 298         | H        |
| 4      | * 19.55568      | 54.94                | Pk  | 32.7             | -37.8        | 0            | 49.84                      | -                      | -           | 74                  | -24.16      | 171            | 102         | V        |
|        | * 19.55568      | 50.98                | Av  | 32.7             | -37.8        | -23.41       | 22.47                      | 54                     | -31.53      | -                   | -           | 171            | 102         | V        |
| 5      | * 22.20301      | 44.86                | Pk  | 33.6             | -37.4        | 0            | 41.06                      | 54                     | -12.94      | 74                  | -32.94      | 0-360          | 252         | V        |
| 6      | * 23.658        | 45.1                 | Pk  | 33.9             | -36.5        | 0            | 42.5                       | 54                     | -11.5       | 74                  | -31.5       | 0-360          | 298         | V        |

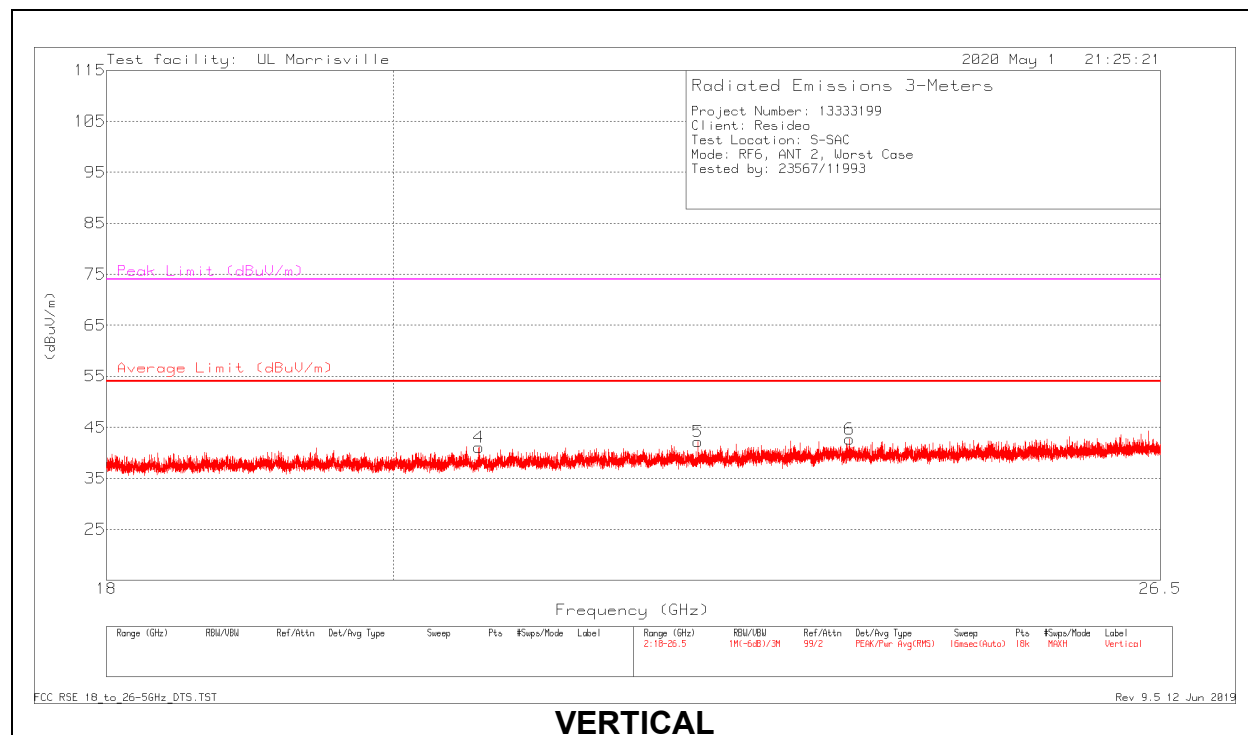
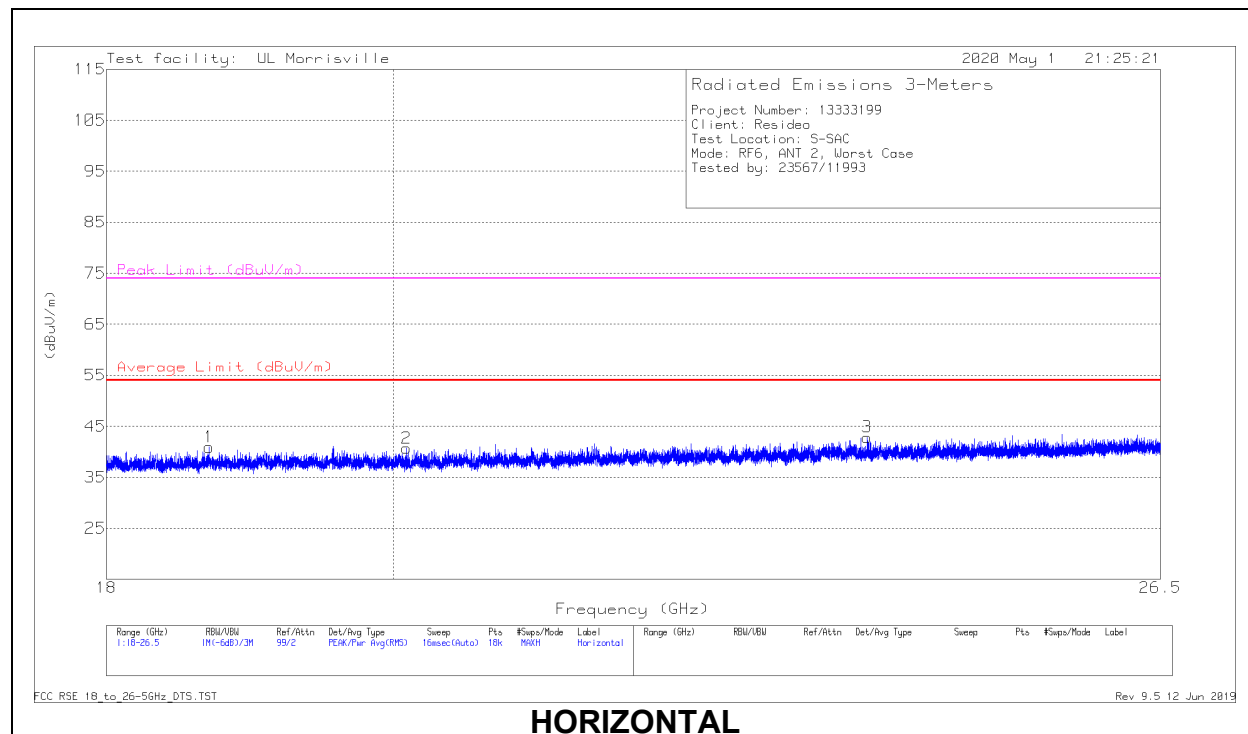
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Av – Average detector

Note: The manufacturer has declared a real world duty cycle of 6.75%. This results in a  $20\log(0.0675) = -23.41$  correction.

**SPURIOUS EMISSIONS 18-26 GHz (802.15.4 ANT2 WORST-CASE CONFIGURATION)**



## 18 – 26GHz DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0076 AF (dB/m) | Amp/Cbl (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|------------------|--------------|----------------------------|------------------------|-------------|---------------------|-------------|----------------|-------------|----------|
| 1      | * 18.68995      | 46.61                | Pk  | 32.5             | -38.2        | 40.91                      | 54                     | -13.09      | 74                  | -33.09      | 0-360          | 148         | H        |
| 2      | * 20.09395      | 45.62                | Pk  | 32.7             | -37.6        | 40.72                      | 54                     | -13.28      | 74                  | -33.28      | 0-360          | 148         | H        |
| 3      | * 23.79543      | 45.26                | Pk  | 34               | -36.4        | 42.86                      | 54                     | -11.14      | 74                  | -31.14      | 0-360          | 298         | H        |
| 4      | * 20.63609      | 45.71                | Pk  | 33               | -37.6        | 41.11                      | 54                     | -12.89      | 74                  | -32.89      | 0-360          | 102         | V        |
| 5      | * 22.36263      | 45.58                | Pk  | 33.5             | -36.9        | 42.18                      | 54                     | -11.82      | 74                  | -31.82      | 0-360          | 152         | V        |
| 6      | * 23.64289      | 45.24                | Pk  | 33.9             | -36.5        | 42.64                      | 54                     | -11.36      | 74                  | -31.36      | 0-360          | 298         | V        |

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

## 11. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)  
RSS-Gen 8.8

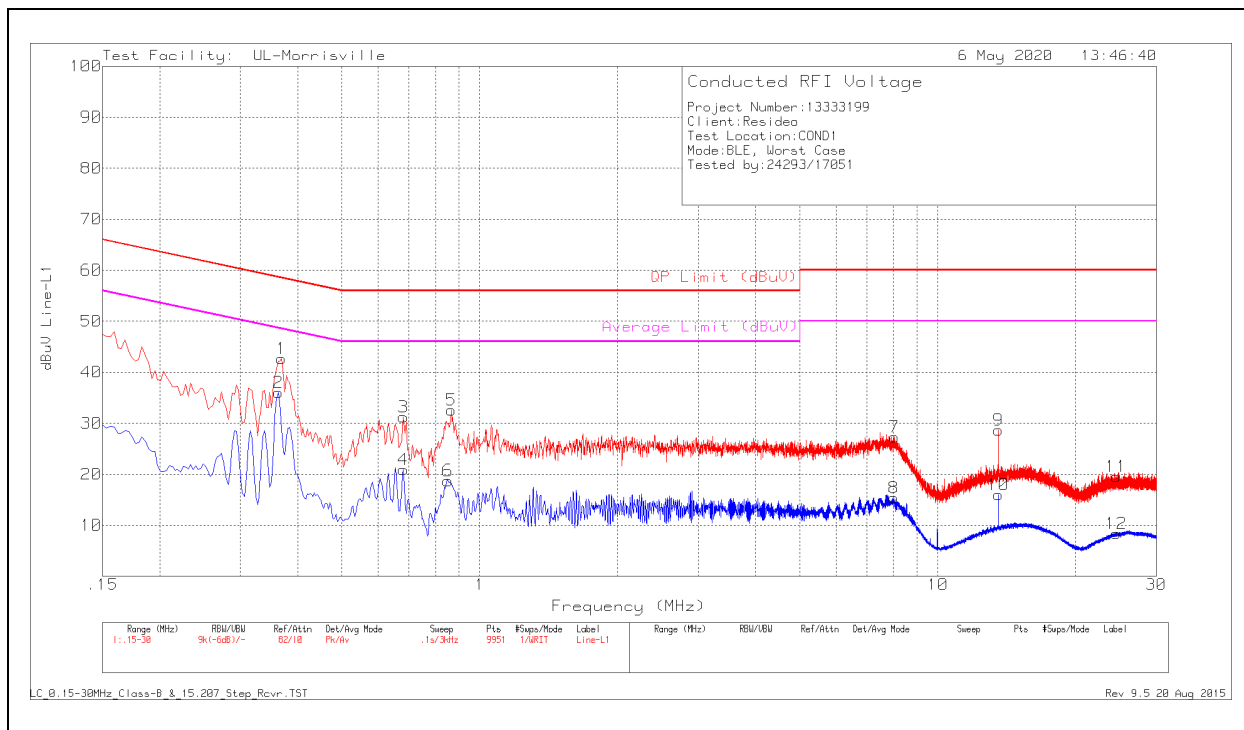
| Frequency of Emission (MHz) | Conducted Limit (dBuV) |            |
|-----------------------------|------------------------|------------|
|                             | Quasi-peak             | Average    |
| 0.15-0.5                    | 66 to 56 *             | 56 to 46 * |
| 0.5-5             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

\* Decreases with the logarithm of the frequency.

### RESULTS

# 11.1.1. BLE

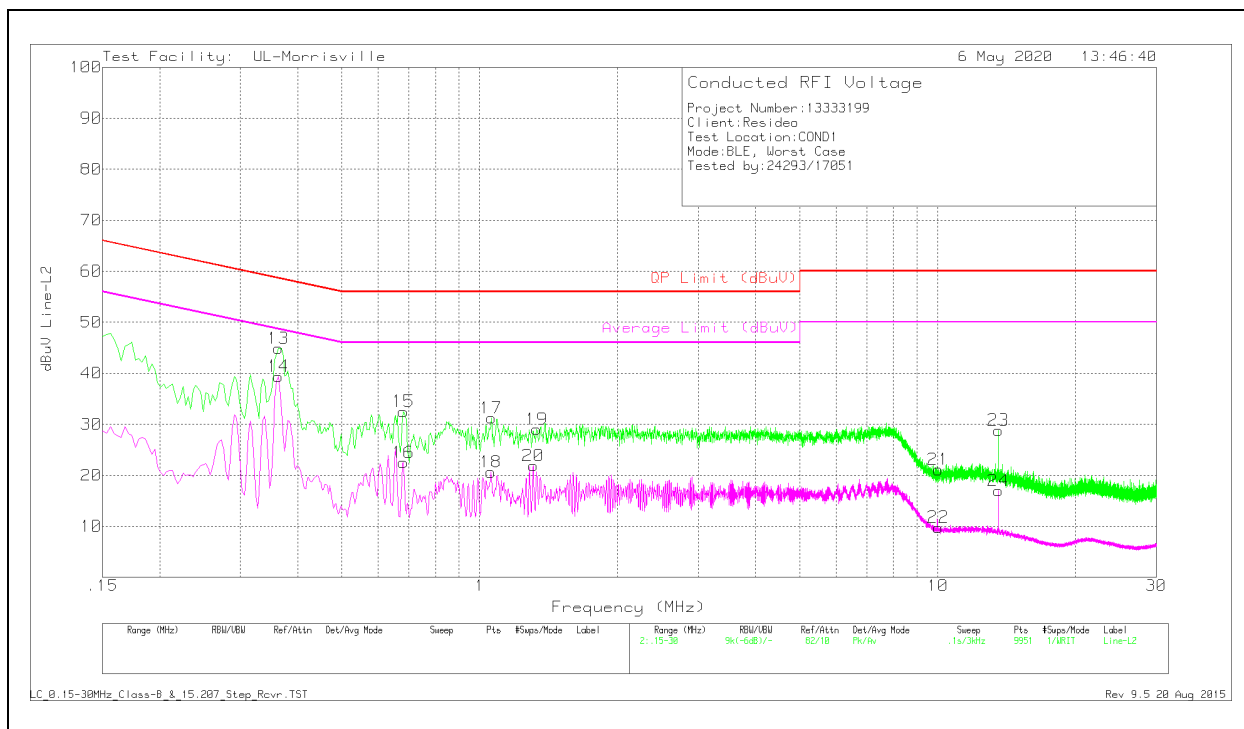
## LINE 1 RESULTS



| Range 1: Line-L1 .15 - 30MHz |                 |                      |     |               |                  |                        |                 |             |                      |             |
|------------------------------|-----------------|----------------------|-----|---------------|------------------|------------------------|-----------------|-------------|----------------------|-------------|
| Marker                       | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
| 1                            | .369            | 32.84                | Pk  | .1            | 9.7              | 42.64                  | 58.52           | -15.88      | -                    | -           |
| 2                            | .363            | 26.21                | Av  | .1            | 9.7              | 36.01                  | -               | -           | 48.66                | -12.65      |
| 3                            | .681            | 21.31                | Pk  | .1            | 9.8              | 31.21                  | 56              | -24.79      | -                    | -           |
| 4                            | .681            | 11.03                | Av  | .1            | 9.8              | 20.93                  | -               | -           | 46                   | -25.07      |
| 5                            | .867            | 22.81                | Pk  | 0             | 9.8              | 32.61                  | 56              | -23.39      | -                    | -           |
| 6                            | .852            | 8.94                 | Av  | 0             | 9.8              | 18.74                  | -               | -           | 46                   | -27.26      |
| 7                            | 8.043           | 17.17                | Pk  | .1            | 10               | 27.27                  | 60              | -32.73      | -                    | -           |
| 8                            | 8.013           | 5.28                 | Av  | .1            | 10               | 15.38                  | -               | -           | 50                   | -34.62      |
| 9                            | 13.563          | 18.59                | Pk  | .1            | 10               | 28.69                  | 60              | -31.31      | -                    | -           |
| 10                           | 13.56           | 5.89                 | Av  | .1            | 10               | 15.99                  | -               | -           | 50                   | -34.01      |
| 11                           | 24.519          | 9.18                 | Pk  | .2            | 10.2             | 19.58                  | 60              | -40.42      | -                    | -           |
| 12                           | 24.531          | -2.03                | Av  | .2            | 10.2             | 8.37                   | -               | -           | 50                   | -41.63      |

Pk - Peak detector  
Av - Average detection

## LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz

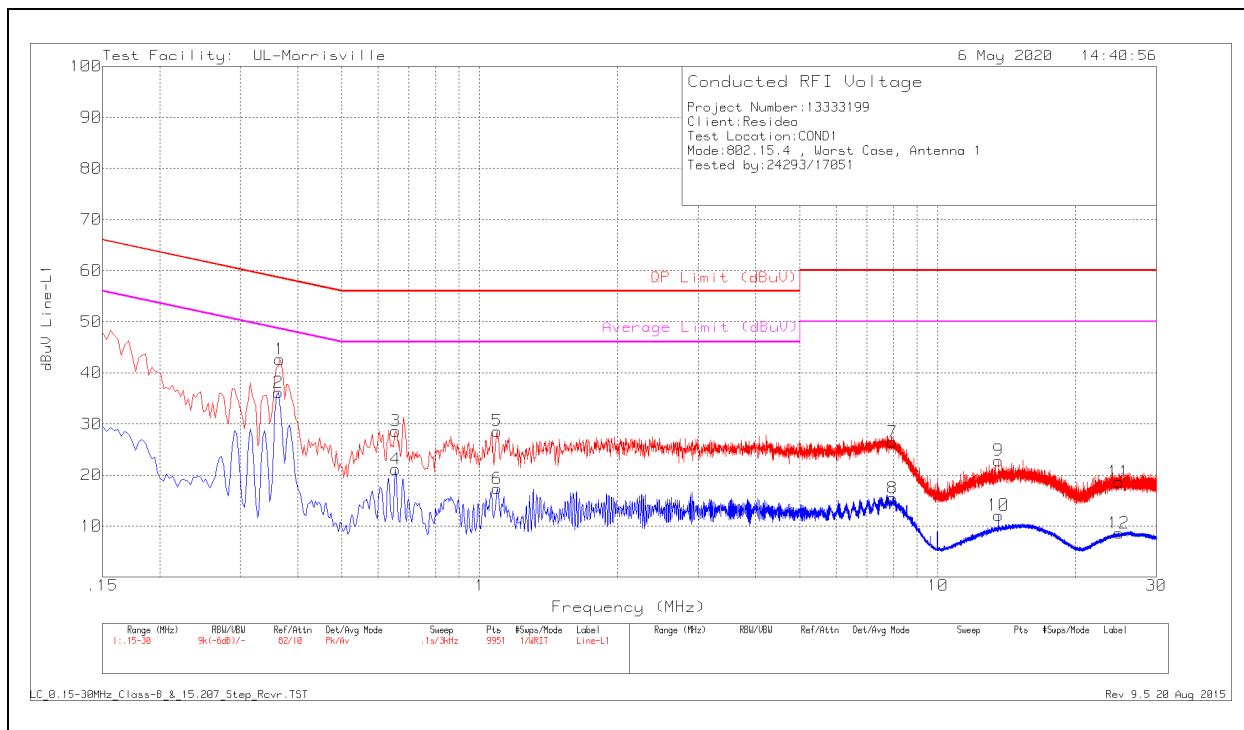
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
|--------|-----------------|----------------------|-----|---------------|------------------|------------------------|-----------------|-------------|----------------------|-------------|
| 13     | .363            | 35.09                | Pk  | .1            | 9.7              | 44.89                  | 58.66           | -13.77      | -                    | -           |
| 14     | .363            | 29.59                | Av  | .1            | 9.7              | 39.39                  | -               | -           | 48.66                | -9.27       |
| 15     | .681            | 22.71                | Pk  | 0             | 9.8              | 32.51                  | 56              | -23.49      | -                    | -           |
| 16     | .681            | 12.71                | Av  | 0             | 9.8              | 22.51                  | -               | -           | 46                   | -23.49      |
| 17     | 1.059           | 21.43                | Pk  | 0             | 9.8              | 31.23                  | 56              | -24.77      | -                    | -           |
| 18     | 1.056           | 10.82                | Av  | 0             | 9.8              | 20.62                  | -               | -           | 46                   | -25.38      |
| 19     | 1.332           | 19.2                 | Pk  | 0             | 9.8              | 29                     | 56              | -27         | -                    | -           |
| 20     | 1.308           | 12.06                | Av  | 0             | 9.8              | 21.86                  | -               | -           | 46                   | -24.14      |
| 21     | 10.017          | 11.02                | Pk  | .1            | 10               | 21.12                  | 60              | -38.88      | -                    | -           |
| 22     | 10.032          | -.31                 | Av  | .1            | 10               | 9.79                   | -               | -           | 50                   | -40.21      |
| 23     | 13.563          | 18.72                | Pk  | .1            | 10               | 28.82                  | 60              | -31.18      | -                    | -           |
| 24     | 13.56           | 6.88                 | Av  | .1            | 10               | 16.98                  | -               | -           | 50                   | -33.02      |

Pk - Peak detector

Av - Average detection

# 11.1.2. 802.15.4 ANT1

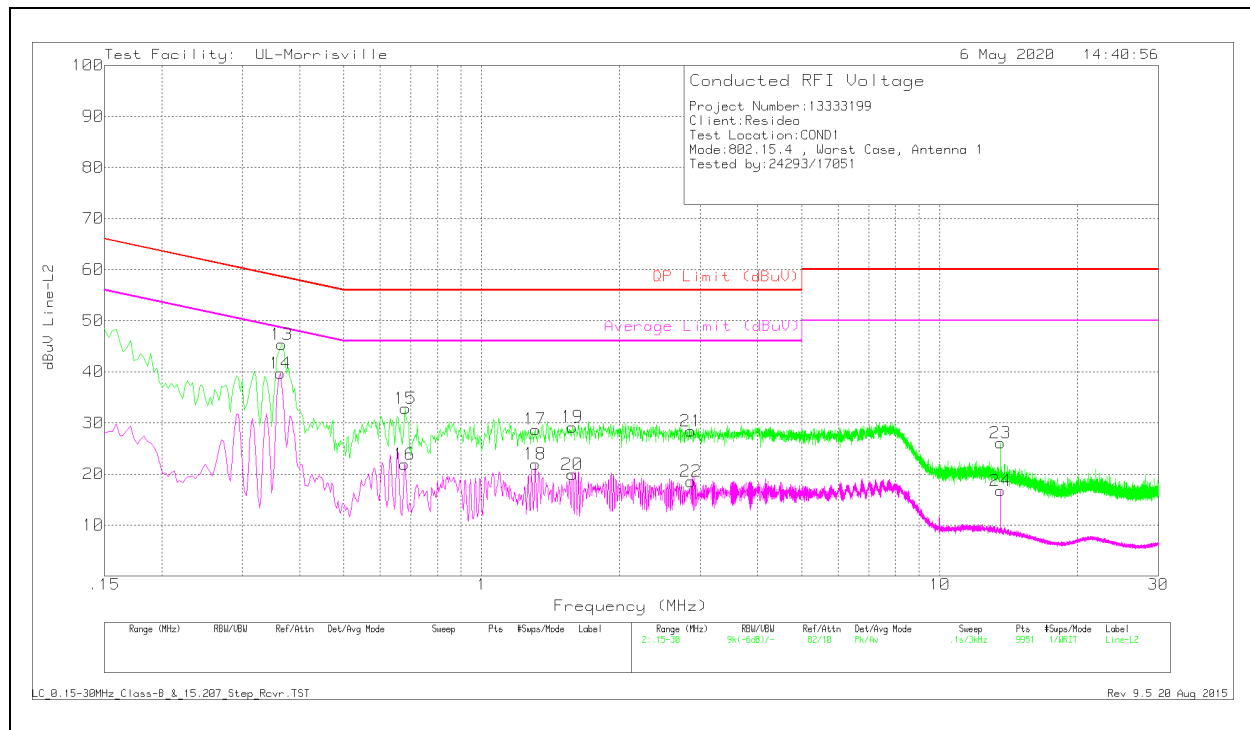
## LINE 1 RESULTS



| Range 1: Line-L1 .15 - 30MHz |                 |                      |     |               |                  |                        |                 |             |                      |             |
|------------------------------|-----------------|----------------------|-----|---------------|------------------|------------------------|-----------------|-------------|----------------------|-------------|
| Marker                       | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
| 1                            | .366            | 32.82                | Pk  | .1            | 9.7              | 42.62                  | 58.59           | -15.97      | -                    | -           |
| 2                            | .363            | 26.36                | Av  | .1            | 9.7              | 36.16                  | -               | -           | 48.66                | -12.5       |
| 3                            | .654            | 18.71                | Pk  | .1            | 9.8              | 28.61                  | 56              | -27.39      | -                    | -           |
| 4                            | .654            | 11.21                | Av  | .1            | 9.8              | 21.11                  | -               | -           | 46                   | -24.89      |
| 5                            | 1.092           | 18.8                 | Pk  | 0             | 9.8              | 28.6                   | 56              | -27.4       | -                    | -           |
| 6                            | 1.092           | 7.55                 | Av  | 0             | 9.8              | 17.35                  | -               | -           | 46                   | -28.65      |
| 7                            | 7.974           | 16.37                | Pk  | .1            | 10               | 26.47                  | 60              | -33.53      | -                    | -           |
| 8                            | 7.968           | 5.38                 | Av  | .1            | 10               | 15.48                  | -               | -           | 50                   | -34.52      |
| 9                            | 13.56           | 12.72                | Pk  | .1            | 10               | 22.82                  | 60              | -37.18      | -                    | -           |
| 10                           | 13.56           | 2.02                 | Av  | .1            | 10               | 12.12                  | -               | -           | 50                   | -37.88      |
| 11                           | 24.819          | 8.26                 | Pk  | .2            | 10.2             | 18.66                  | 60              | -41.34      | -                    | -           |
| 12                           | 24.846          | -1.77                | Av  | .2            | 10.2             | 8.63                   | -               | -           | 50                   | -41.37      |

Pk - Peak detector  
Av - Average detection

## LINE 2 RESULTS



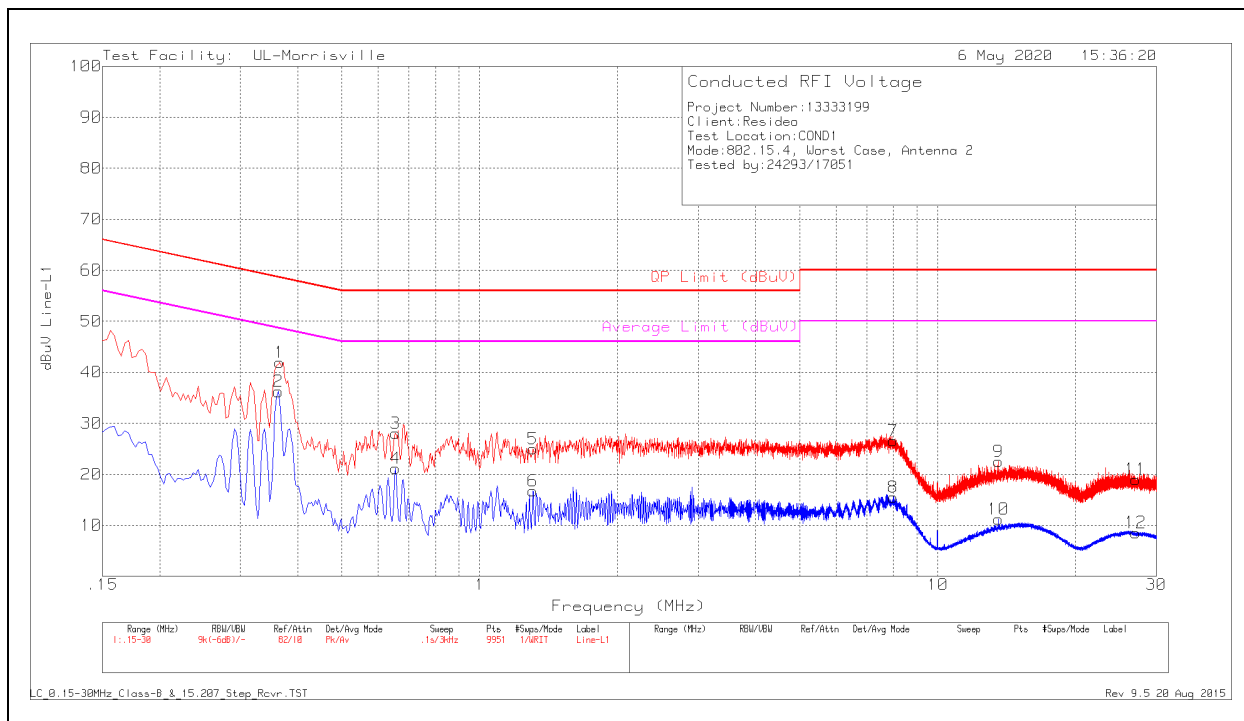
Range 2: Line-L2 .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
|--------|-----------------|----------------------|-----|---------------|------------------|------------------------|-----------------|-------------|----------------------|-------------|
| 13     | .366            | 35.54                | Pk  | .1            | 9.7              | 45.34                  | 58.59           | -13.25      | -                    | -           |
| 14     | .363            | 29.93                | Av  | .1            | 9.7              | 39.73                  | -               | -           | 48.66                | -8.93       |
| 15     | .681            | 23.03                | Pk  | 0             | 9.8              | 32.83                  | 56              | -23.17      | -                    | -           |
| 16     | .678            | 12.11                | Av  | 0             | 9.8              | 21.91                  | -               | -           | 46                   | -24.09      |
| 17     | 1.308           | 18.92                | Pk  | 0             | 9.8              | 28.72                  | 56              | -27.28      | -                    | -           |
| 18     | 1.308           | 12.14                | Av  | 0             | 9.8              | 21.94                  | -               | -           | 46                   | -24.06      |
| 19     | 1.578           | 19.4                 | Pk  | 0             | 9.8              | 29.2                   | 56              | -26.8       | -                    | -           |
| 20     | 1.575           | 10.15                | Av  | 0             | 9.8              | 19.95                  | -               | -           | 46                   | -26.05      |
| 21     | 2.862           | 18.6                 | Pk  | 0             | 9.8              | 28.4                   | 56              | -27.6       | -                    | -           |
| 22     | 2.862           | 8.73                 | Av  | 0             | 9.8              | 18.53                  | -               | -           | 46                   | -27.47      |
| 23     | 13.563          | 15.96                | Pk  | .1            | 10               | 26.06                  | 60              | -33.94      | -                    | -           |
| 24     | 13.56           | 6.65                 | Av  | .1            | 10               | 16.75                  | -               | -           | 50                   | -33.25      |

Pk - Peak detector  
Av - Average detection

# 11.1.3. 802.15.4 ANT2

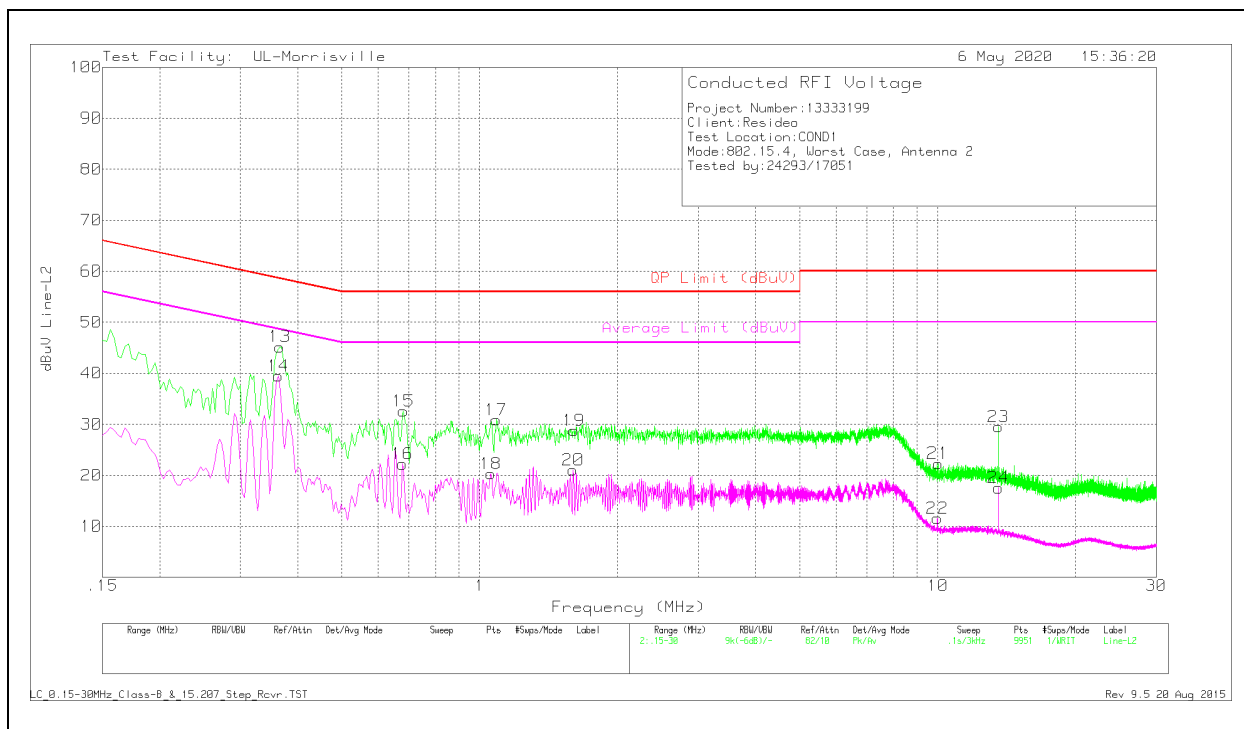
## LINE 1 RESULTS



| Range 1: Line-L1 .15 - 30MHz |                 |                      |     |               |                  |                        |                 |             |                      |             |
|------------------------------|-----------------|----------------------|-----|---------------|------------------|------------------------|-----------------|-------------|----------------------|-------------|
| Marker                       | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
| 1                            | .366            | 32.16                | Pk  | .1            | 9.7              | 41.96                  | 58.59           | -16.63      | -                    | -           |
| 2                            | .363            | 26.43                | Av  | .1            | 9.7              | 36.23                  | -               | -           | 48.66                | -12.43      |
| 3                            | .654            | 18.16                | Pk  | .1            | 9.8              | 28.06                  | 56              | -27.94      | -                    | -           |
| 4                            | .654            | 11.25                | Av  | .1            | 9.8              | 21.15                  | -               | -           | 46                   | -24.85      |
| 5                            | 1.305           | 15.17                | Pk  | 0             | 9.8              | 24.97                  | 56              | -31.03      | -                    | -           |
| 6                            | 1.305           | 6.91                 | Av  | 0             | 9.8              | 16.71                  | -               | -           | 46                   | -29.29      |
| 7                            | 7.986           | 16.45                | Pk  | .1            | 10               | 26.55                  | 60              | -33.45      | -                    | -           |
| 8                            | 7.989           | 5.42                 | Av  | .1            | 10               | 15.52                  | -               | -           | 50                   | -34.48      |
| 9                            | 13.557          | 12.4                 | Pk  | .1            | 10               | 22.5                   | 60              | -37.5       | -                    | -           |
| 10                           | 13.56           | 1.13                 | Av  | .1            | 10               | 11.23                  | -               | -           | 50                   | -38.77      |
| 11                           | 27.036          | 8.49                 | Pk  | .3            | 10.2             | 18.99                  | 60              | -41.01      | -                    | -           |
| 12                           | 27.042          | -1.94                | Av  | .3            | 10.2             | 8.56                   | -               | -           | 50                   | -41.44      |

Pk - Peak detector  
Av - Average detection

## LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
|--------|-----------------|----------------------|-----|---------------|------------------|------------------------|-----------------|-------------|----------------------|-------------|
| 13     | .366            | 35.39                | Pk  | .1            | 9.7              | 45.19                  | 58.59           | -13.4       | -                    | -           |
| 14     | .363            | 29.7                 | Av  | .1            | 9.7              | 39.5                   | -               | -           | 48.66                | -9.16       |
| 15     | .681            | 22.78                | Pk  | 0             | 9.8              | 32.58                  | 56              | -23.42      | -                    | -           |
| 16     | .678            | 12.42                | Av  | 0             | 9.8              | 22.22                  | -               | -           | 46                   | -23.78      |
| 17     | 1.086           | 21.08                | Pk  | 0             | 9.8              | 30.88                  | 56              | -25.12      | -                    | -           |
| 18     | 1.056           | 10.49                | Av  | 0             | 9.8              | 20.29                  | -               | -           | 46                   | -25.71      |
| 19     | 1.605           | 18.99                | Pk  | 0             | 9.8              | 28.79                  | 56              | -27.21      | -                    | -           |
| 20     | 1.599           | 11.27                | Av  | 0             | 9.8              | 21.07                  | -               | -           | 46                   | -24.93      |
| 21     | 10.011          | 12.22                | Pk  | .1            | 10               | 22.32                  | 60              | -37.68      | -                    | -           |
| 22     | 9.975           | 1.49                 | Av  | .1            | 10               | 11.59                  | -               | -           | 50                   | -38.41      |
| 23     | 13.56           | 19.43                | Pk  | .1            | 10               | 29.53                  | 60              | -30.47      | -                    | -           |
| 24     | 13.56           | 7.45                 | Av  | .1            | 10               | 17.55                  | -               | -           | 50                   | -32.45      |

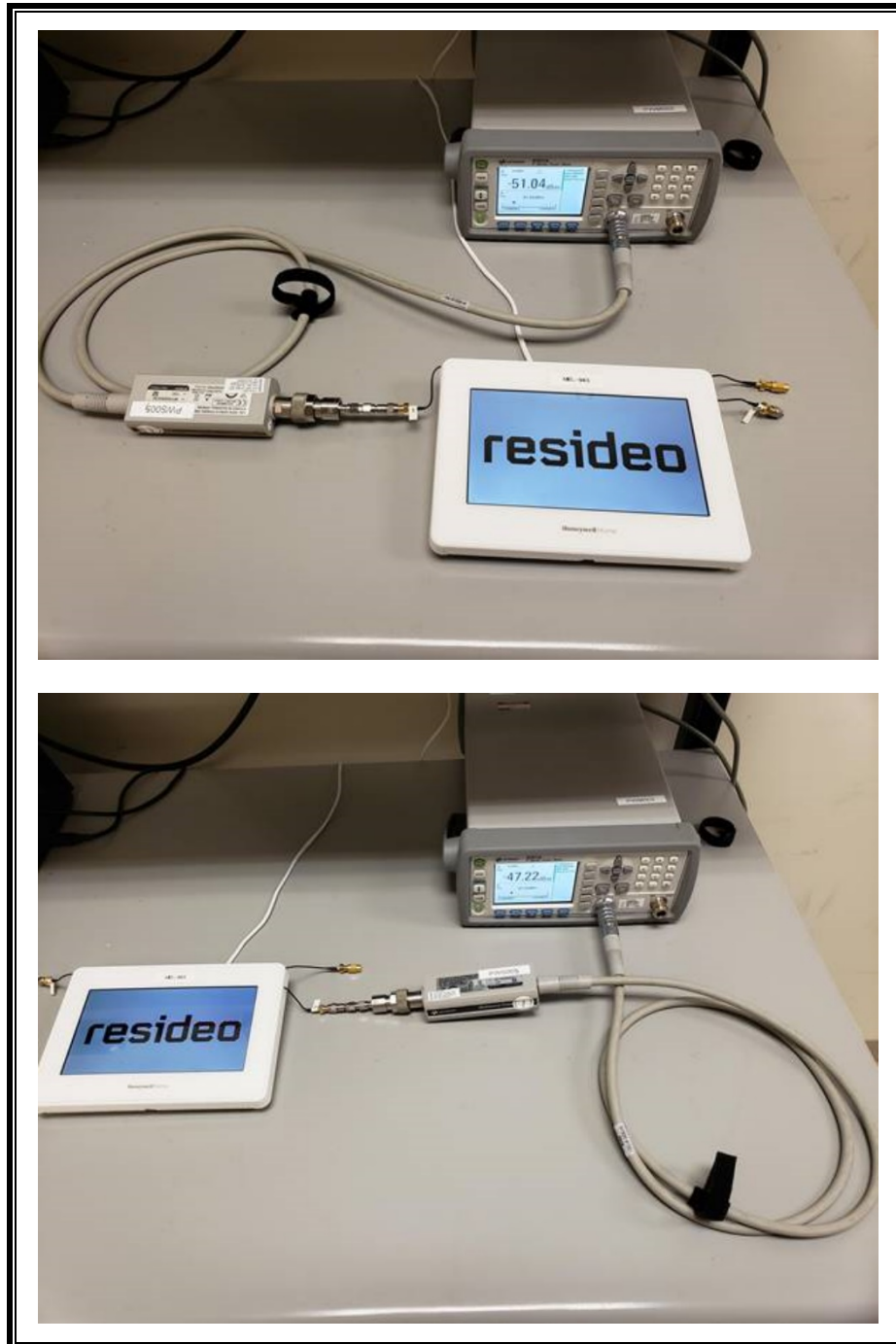
Pk - Peak detector

Av - Average detection

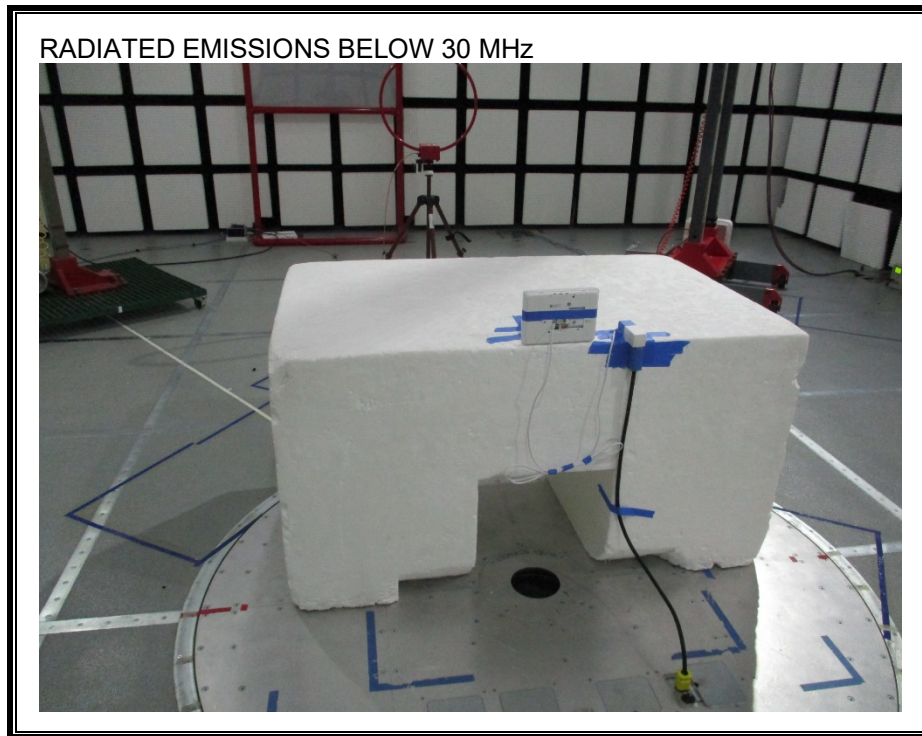
## 12. SETUP PHOTOS

Please refer to R13333199-EP1 for setup photos

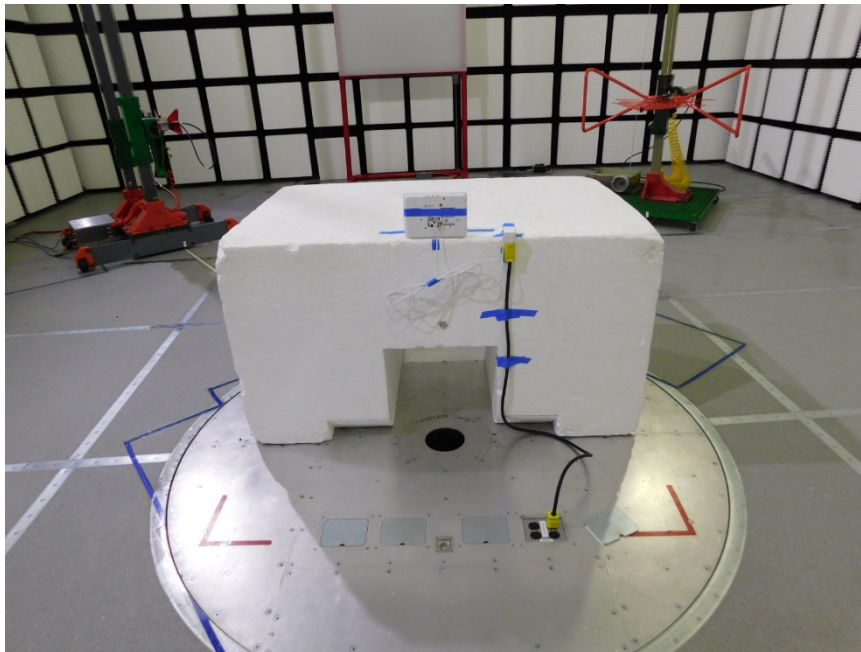
### CONDUCTED SETUP

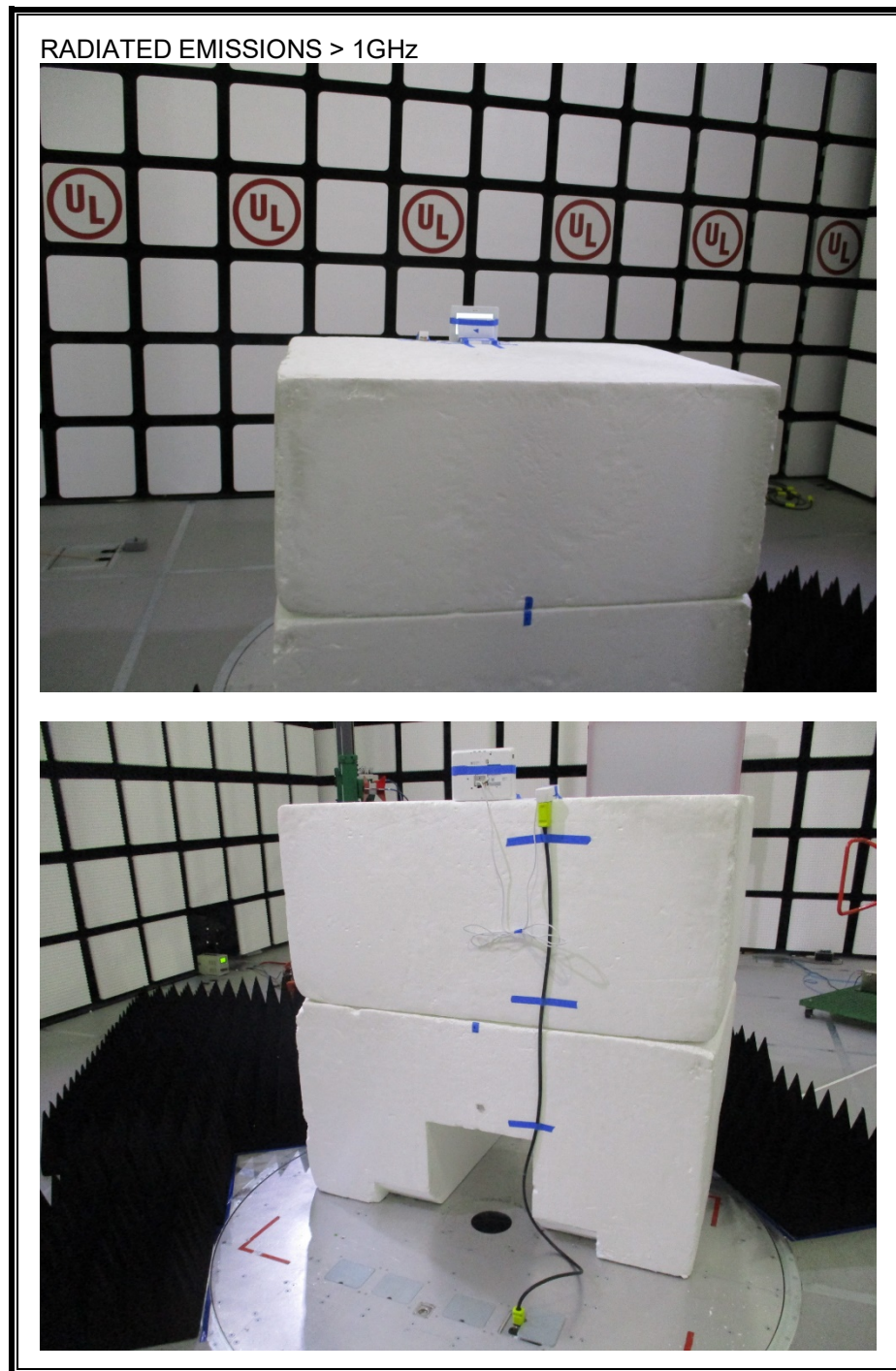


**RADIATED EMISSIONS**

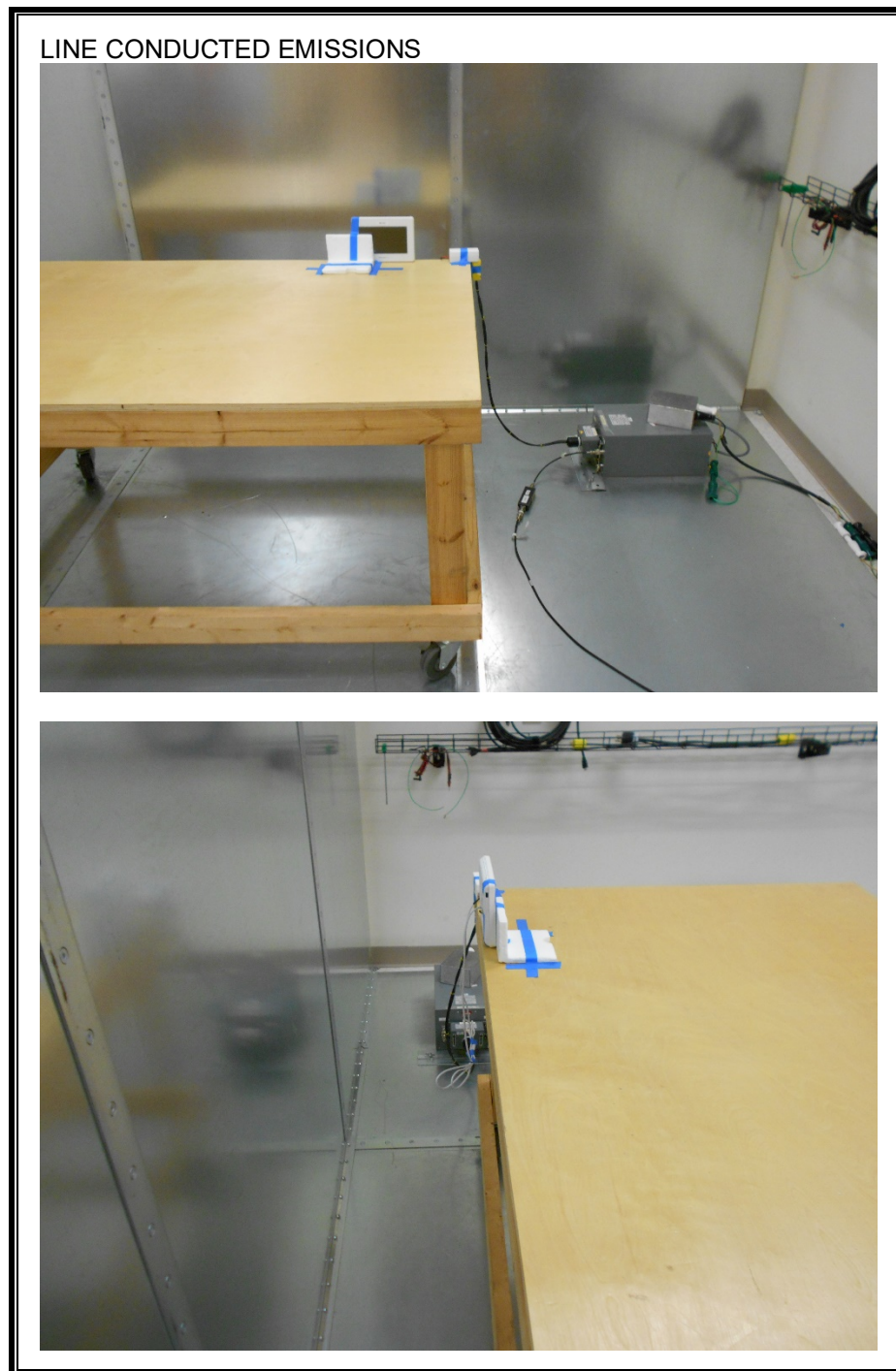


RADIATED EMISSIONS <1GHz





**AC MAINS LINE CONDUCTED EMISSION**



**END OF TEST REPORT**