# CERTIFICATION TEST REPORT

**Report Number. :** 12672932-E1V3

| | | |
|---|---|---|
| **Applicant** | : | ALIVECOR<br>444 CASTRO STREET<br>MOUNTAIN VIEW, CA 94043, U.S.A. |
| **Model** | : | AC-019 |
| **FCC ID** | : | 2ASFFAC019 |
| **EUT Description** | : | ECG SYSTEM |
| **Test Standard(s)** | : | FCC 47 CFR PART 15 SUBPART C<br>ISED RSS-247 ISSUE 2<br>ISED RSS-GEN ISSUE 5 |

**Date Of Issue:**
February 27, 2019

**Prepared by:**
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NVLAP Lab code: 200065-0

# REPORT REVISION HISTORY

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| V1 | 2/11/2019 | Initial Issue | -- |
| V2 | 2/14/2019 | Updated Section 5.3, 7 | Tina Chu |
| V3 | 2/27/2019 | Updated Section 9.1 | Tina Chu |


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# TABLE OF CONTENTS

**1. ATTESTATION OF TEST RESULTS ..... 4**

**2. TEST METHODOLOGY ..... 6**

**3. FACILITIES AND ACCREDITATION ..... 6**

**4. CALIBRATION AND UNCERTAINTY ..... 7**

*4.1. MEASURING INSTRUMENT CALIBRATION ..... 7*

*4.2. SAMPLE CALCULATION ..... 7*

*4.3. MEASUREMENT UNCERTAINTY ..... 7*

**5. EQUIPMENT UNDER TEST ..... 8**

*5.1. EUT DESCRIPTION ..... 8*

*5.2. MAXIMUM OUTPUT POWER ..... 8*

*5.3. DESCRIPTION OF AVAILABLE ANTENNAS ..... 8*

*5.4. SOFTWARE AND FIRMWARE ..... 8*

*5.5. WORST-CASE CONFIGURATION AND MODE ..... 8*

*5.6. DESCRIPTION OF TEST SETUP ..... 9*

**6. MEASUREMENT METHOD ..... 12**

**7. TEST AND MEASUREMENT EQUIPMENT ..... 13**

**8. ANTENNA PORT TEST RESULTS ..... 14**

*8.1. ON TIME AND DUTY CYCLE ..... 14*

*8.2. 99% BANDWIDTH ..... 15*

*8.3. 6 dB BANDWIDTH ..... 16*

*8.4. OUTPUT POWER ..... 17*

*8.5. AVERAGE POWER ..... 18*

*8.6. POWER SPECTRAL DENSITY ..... 19*

*8.7. CONDUCTED SPURIOUS EMISSIONS ..... 20*

**9. RADIATED TEST RESULTS ..... 22**

*9.1. LIMITS AND PROCEDURE ..... 22*

*9.2. TRANSMITTER ABOVE 1 GHz ..... 24*

*9.3. WORST CASE BELOW 30MHz ..... 34*

*9.4. WORST CASE BELOW 1 GHz ..... 35*

*9.5. WORST CASE 18-26 GHz ..... 37*

**10. SETUP PHOTOS ..... 39**



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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** ALIVECOR
444 CASTRO STREET
MOUNTAIN VIEW, CA 94043, U.S.A.

**EUT DESCRIPTION:** ECG SYSTEM

**MODEL:** AC-019

**SERIAL NUMBER:** 19DVT527B (CONDUCTED)
19DVT519C (RADIATED)

**DATE TESTED:** JANUARY 29, 2019 TO FEBRUARY 05, 2019

| 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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, any agency of the Federal Government, or any agency of the U.S. government.


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# 2. 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 v05, RSS-GEN Issue 5, and RSS-247 Issue 2.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. 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.

| 47173 Benicia Street | 47266 Benicia Street | 47658 Kato Rd. |
|---|---|---|
| ☐ Chamber A (ISED:2324B-1) | ☐ Chamber D (ISED:22541-1) | ☐ Chamber I (ISED: 2324A-5) |
| ☐ Chamber B (ISED:2324B-2) | ☐ Chamber E (ISED:22541-2) | ☒ Chamber J (ISED: 2324A-6) |
| ☐ Chamber C (ISED:2324B-3) | ☐ Chamber F (ISED:22541-3) | ☒ Chamber K (ISED: 2324A-1) |
| | ☐ Chamber G (ISED:22541-4) | ☐ Chamber L (ISED: 2324A-3) |
| | ☐ Chamber H (ISED:22541-5) | |

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0


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# 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

## 4.2. SAMPLE CALCULATION

**RADIATED EMISSIONS**

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

**MAINS CONDUCTED EMISSIONS**

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

## 4.3. MEASUREMENT UNCERTAINTY

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

| PARAMETER | UNCERTAINTY |
|---|---|
| Worst Case Conducted Disturbance, 9KHz to 0.15 MHz | 3.84 dB |
| Worst Case Conducted Disturbance, 0.15 to 30 MHz | 3.65 dB |
| Worst Case Radiated Disturbance, 9KHz to 30 MHz | 2.52 dB |
| Worst Case Radiated Disturbance, 30 to 1000 MHz | 4.88 dB |
| Worst Case Radiated Disturbance, 1000 to 18000 MHz | 4.24 dB |
| Worst Case Radiated Disturbance, 18000 to 26000 MHz | 4.37 dB |
| Worst Case Radiated Disturbance, 26000 to 40000 MHz | 5.17 dB |

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


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# 5. EQUIPMENT UNDER TEST

## 5.1. EUT DESCRIPTION

The EUT is a handheld ECG system with BLE function, it is powered by a lithium coin cell battery.

## 5.2. 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 | 1.44 | 1.39 |

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a SMT Chip antenna with a maximum gain of -2 dBi.

## 5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Kardia Mobile 5.5.0
The firmware installed in the EUT during testing was Version 1.2.6

## 5.5. WORST-CASE CONFIGURATION AND MODE

Band edge and radiated emissions were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

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

Worst-case data rate as provided by the client was BLE: 1 Mbps.


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## 5.6. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Description | Manufacturer | Model | Serial Number | FCC ID/DoC |
|---|---|---|---|---|
| Laptop | Lenovo | Type 20LT-S12D00 | PF-1H0N1K | DoC |
| Laptop AC/DC adapter | Lenovo | ADLX65YCC2A | 8SSA10M13947C1SG8BNGD0Y | DoC |
| DC power supply | Ametek | XT20-3 | 1318A00529 | DoC |
| DC power box | AliveCor | - | - | DoC |

Note: 30-1GHz testing, DC power box was used. Power box contains batteries. Above 1GHz testing the DC power supply was used.

**I/O CABLES (CONDUCTED TEST)**

| I/O CABLE LIST | | | | | | |
|---|---|---|---|---|---|---|
| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length m | Remarks |
| 1 | AC | 1 | AC | Unshielded | 1 | AC Mains to AC/DC adapter |
| 2 | DC | 1 | DC | Unshielded | 1.8 | AC/DC adapter to laptop |
| 3 | USB | 1 | Serial ports | Shielded | 1.9 | Laptop to EUT |
| 4 | Antenna | 1 | SMA | Unshielded | 0.22 | To spectrum analyzer |
| 5 | AC | 1 | 3-prong | Unshielded | 1.5 | |
| 6 | 2-core DC power | 1 | Hook clips | Unshielded | 0.8 | DC power supply to EUT |

**I/O CABLES (RADIATED TEST)**

| I/O CABLE LIST | | | | | | |
|---|---|---|---|---|---|---|
| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length m | Remarks |
| 1 | AC | 1 | 3-prong | Unshielded | 1.5 | |
| 2 | 2-core DC power | 1 | Banana ports | Unshielded | 0.8 | DC power supply to EUT |
| 3 | USB | 1 | Serial ports | Shielded | 1.9 | Laptop to EUT |


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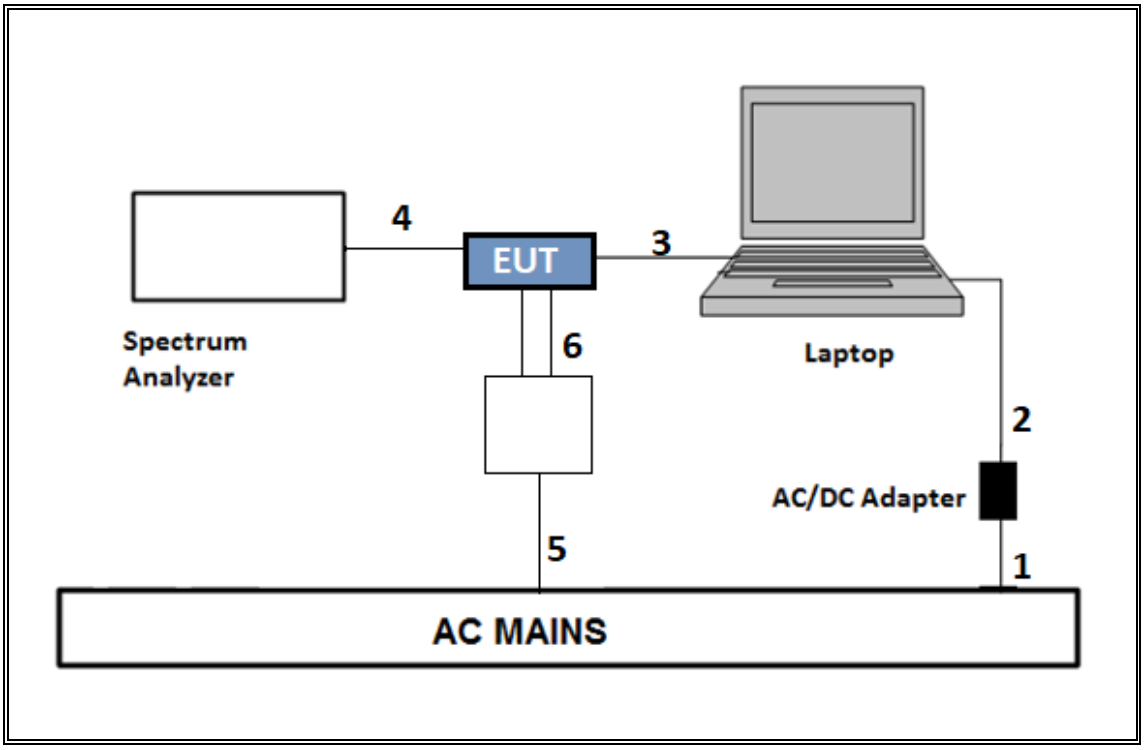
**TEST SETUP-CONDUCTED TEST**

The EUT powered by DC power supply. Test software exercised the EUT.

**SETUP DIAGRAM**





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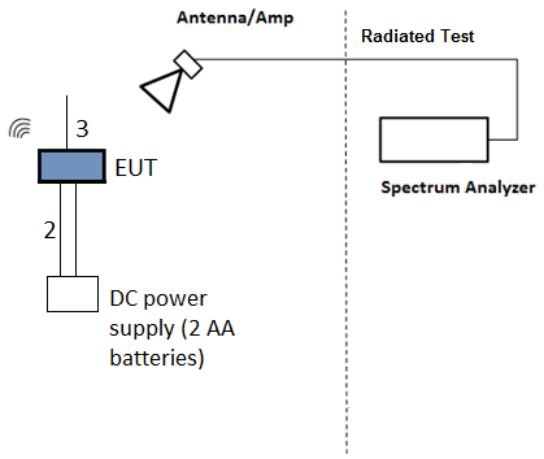
**TEST SETUP- RADIATED TEST**

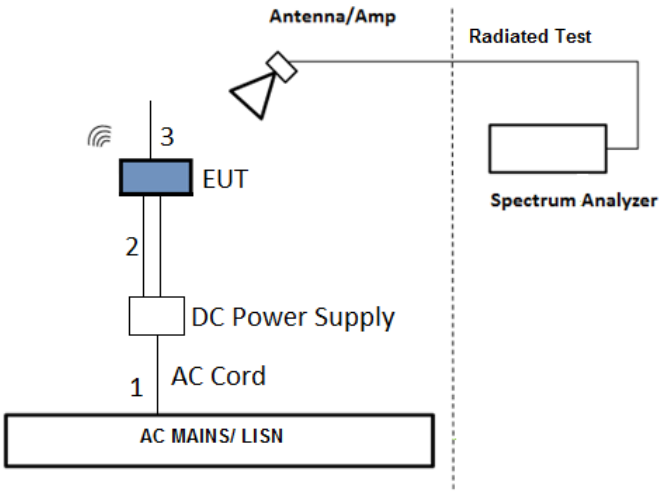
The EUT powered by DC power supply. Test software exercised the EUT. Laptop was removed after test script was started.

**SETUP DIAGRAM**

**Below 30MHz to 1GHz**




**30MHz to 26GHz**





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# 6. MEASUREMENT METHOD

6 dB BW: ANSI C63.10 Subclause -11.8.1

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

Output Power: ANSI C63.10 Subclause-11.9.1.3 PKPM1 Peak power meter method

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

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

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

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

Conducted emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.2

Band-edge: ANSI C63.10 Subclause -11.13.3.4 Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction


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# 7. TEST AND MEASUREMENT EQUIPMENT

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

| TEST EQUIPMENT LIST | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Asset** | **Cal Due** |
| Antenna, Passive Loop 30Hz to 1MHz | ELETRO METRICS | EM-6871 | PRE0179465 | 05/22/2019 |
| Antenna, Passive Loop 100kHz to 30MHz | ELETRO METRICS | EM-6872 | PRE0179467 | 05/22/2019 |
| Amplifier, 9KHz to 1GHz, 32dB | SONOMA INSTRUMENT | 310 | 175953 | 12/13/2019 |
| EMI TEST RECEIVER | Rohde&Schwarz | ESW44 | PRE0179375 | 05/08/2019 |
| Antenna, Horn 1-18GHz | ETS Lindgren | 3117 | AT0067 | 03/06/2019 |
| Amplifier, 1 to 18GHz | Amplical | AMP1G18-35 | T1571 | 07/30/2019 |
| Antenna, Broadband Hybrid, 30MHz to 2000MHz | Sunol Sciences | JB1 | PRE0181575 | 08/01/2019 |
| Amplifier, 10KHz to 1GHz, 32dB | SONOMA INSTRUMENT | 310 | PRE0180174 | 05/31/2019 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz | Keysight | E4446A | T146 | 08/13/2019 |
| Antenna Horn, 18 to 26.5GHz | ARA | MWH-1826/B | T448 | 03/13/2019 |
| Pre-Amp 1-26.5 GHz | Agilent | 8449B | T404 | 03/09/2019 |
| EMI Test Receiver | Rohde&Schwarz | ESW44 | PRE0179372 | 05/04/2019 |
| EMI Test Receiver | Rohde&Schwarz | ESW44 | PRE0179367 | 04/28/2019 |
| Power Meter, P-series single channel | Agilent (Keysight) Technologies | N1911A | T1271 | 07/17/2019 |
| Power Sensor, P-series, 50MHz to 18GHz, Wideband | Agilent (Keysight) Technologies | N1921A | T1225 | 04/10/2019 |
| **UL AUTOMATION SOFTWARE** | | | | |
| Radiated Software | UL | UL EMC | Ver 9.5, Jan 11, 2019 | |
| Radiated Software | UL | UL EMC | Ver 9.5, Jun 22, 2018 | |
| Antenna Port Software | UL | UL RF | Ver 9.3.1, Dec 17, 2018 | |

**NOTES**:
1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.


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# 8. ANTENNA PORT TEST RESULTS

## 8.1. ON TIME AND DUTY CYCLE

**LIMITS**

None; for reporting purposes only.

**PROCEDURE**

KDB 558074 Zero-Span Spectrum Analyzer Method.

**RESULTS**

| | |
|---|---|
| Date: | 1/29/2019 |
| Test Engineer: | 10629 RL |

ON TIME AND DUTY CYCLE RESULTS

| Mode | ON Time B (msec) | Period (msec) | Duty Cycle x (linear) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | 1/B Minimum VBW (kHz) |
|---|---|---|---|---|---|---|
| BLE | 0.392 | 0.626 | 0.626 | 62.62% | 2.03 | 2.551 |

DUTY CYCLE PLOTS

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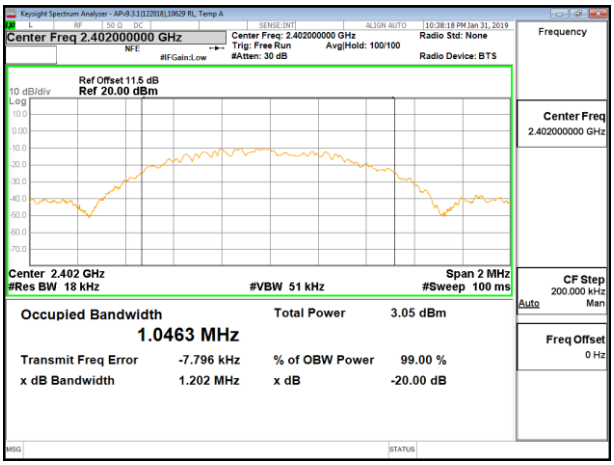
## 8.2. 99% BANDWIDTH

**LIMITS**

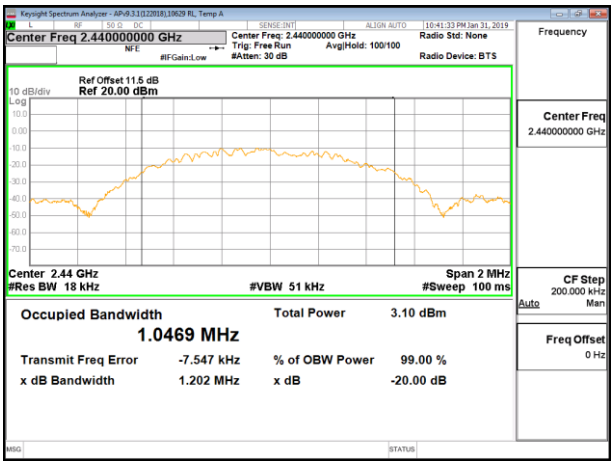
None; for reporting purposes only.

**RESULTS**

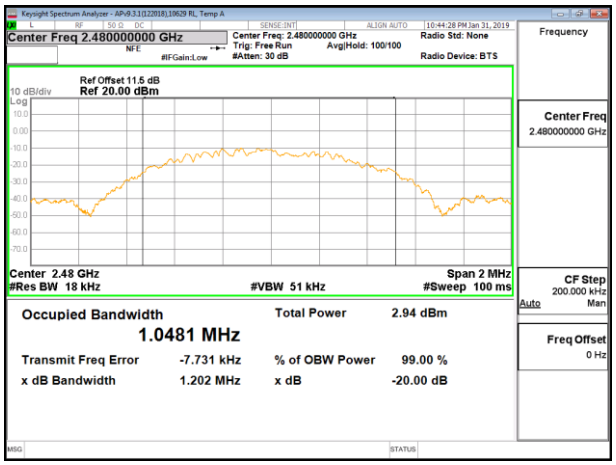
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2402 | 1.0463 |
| Middle | 2440 | 1.0469 |
| High | 2480 | 1.0481 |




**LOW CHANNEL**




**MID CHANNEL**




**HIGH CHANNEL**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## 8.3. 6 dB BANDWIDTH

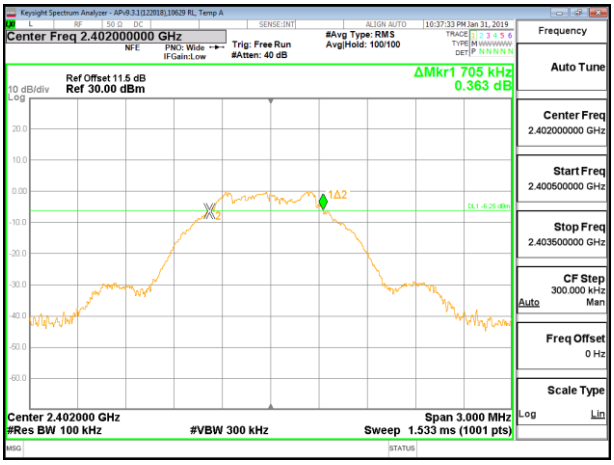
**LIMITS**

FCC §15.407 (e)
RSS-247 5.2 (a)

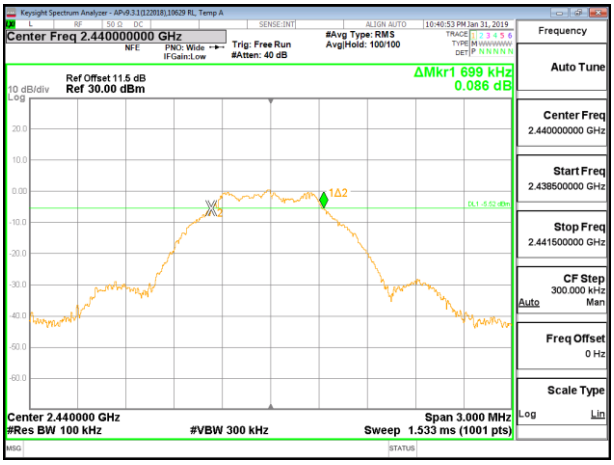
The minimum 6 dB bandwidth shall be at least 500 kHz.

**RESULTS**

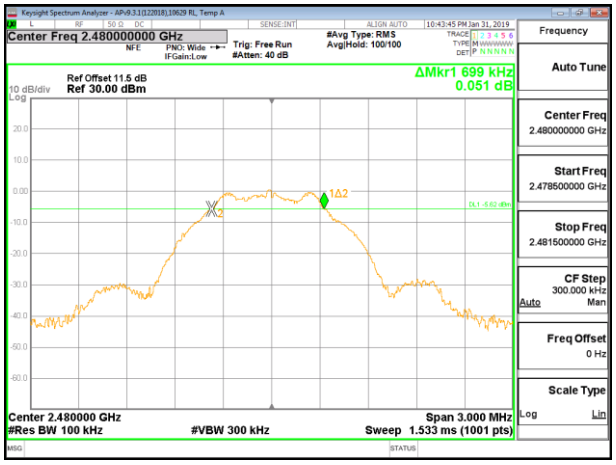
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2402 | 0.705 | 0.5 |
| Middle | 2440 | 0.699 | 0.5 |
| High | 2480 | 0.699 | 0.5 |




**LOW CHANNEL**




**MID CHANNEL**

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## 8.4. OUTPUT POWER

**LIMITS**

FCC §15.247 (b) (3)
RSS-247 5.4 (d)

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

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for a gated peak reading of power.

**RESULTS**

| | |
|---|---|
| **Tested By:** | 10629 RL |
| **Date:** | 1/29/2019 |

| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 1.350 | 30 | -28.650 |
| Middle | 2440 | 1.440 | 30 | -28.560 |
| High | 2480 | 1.320 | 30 | -28.680 |


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## 8.5. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

**RESULTS**

| | |
|---|---|
| **Tested By:** | 10629 RL |
| **Date:** | 1/29/2019 |

| Channel | Frequency (MHz) | AV power (dBm) |
|---|---|---|
| Low | 2402 | 1.28 |
| Middle | 2440 | 1.37 |
| High | 2480 | 1.25 |


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## 8.6. POWER SPECTRAL DENSITY

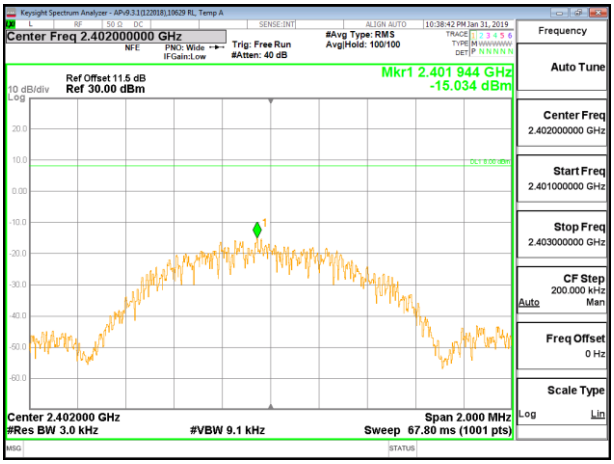
**LIMITS**

FCC §15.247 (e)
RSS-247 (5.2) (b)

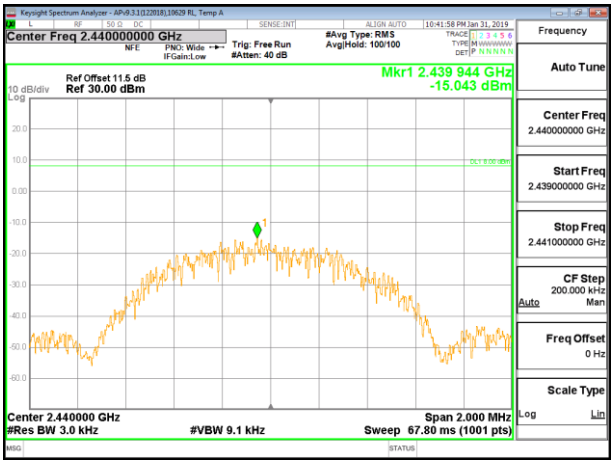
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

**RESULTS**

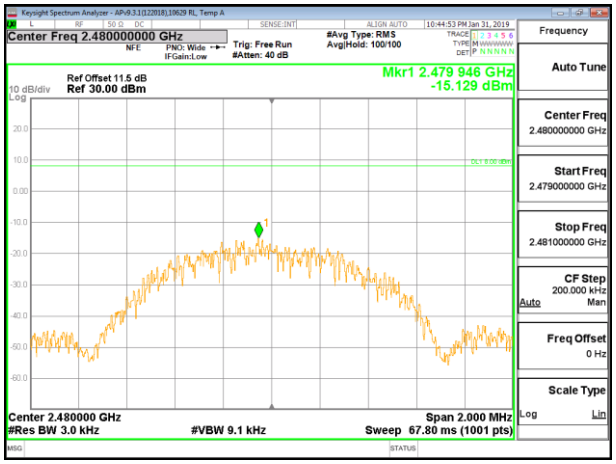
| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | -15.03 | 8 | -23.03 |
| Middle | 2440 | -15.04 | 8 | -23.04 |
| High | 2480 | -15.13 | 8 | -23.13 |




**LOW CHANNEL**




**MID CHANNEL**




**HIGH CHANNEL**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## 8.7. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)

RSS-247 5.5

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

**RESULTS**


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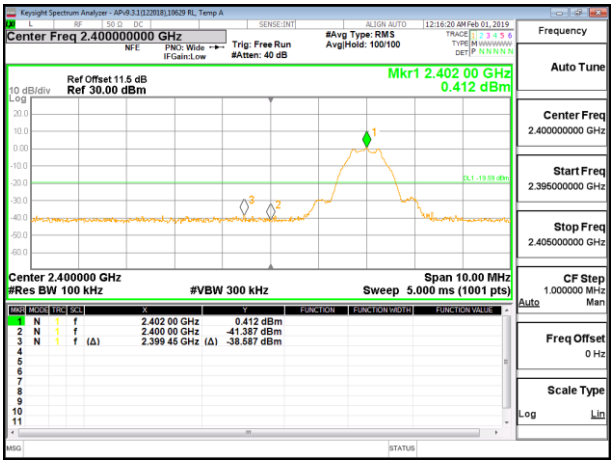
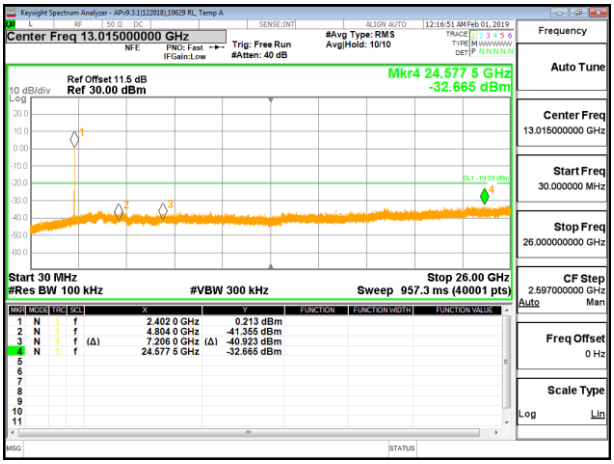
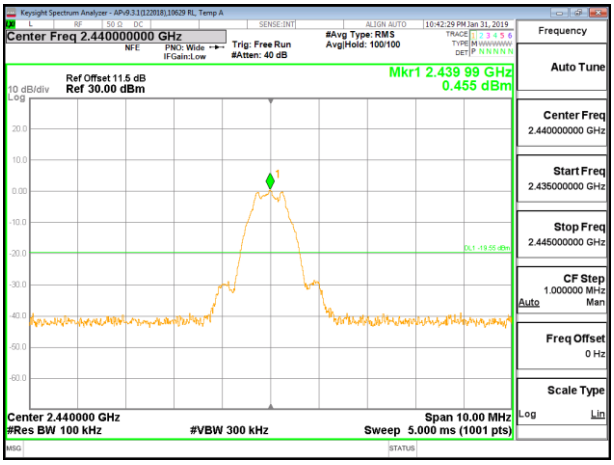


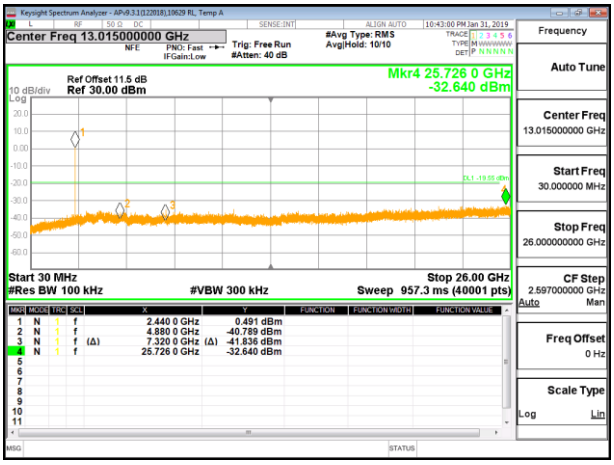

**LOW CHANNEL BANDEDGE**



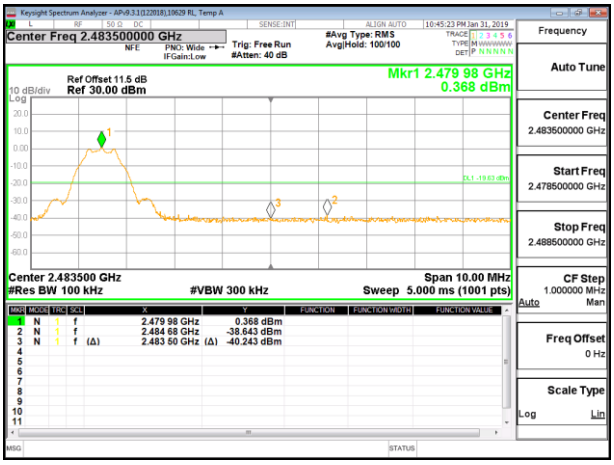

**OUT-OF-BAND LOW CHANNEL**



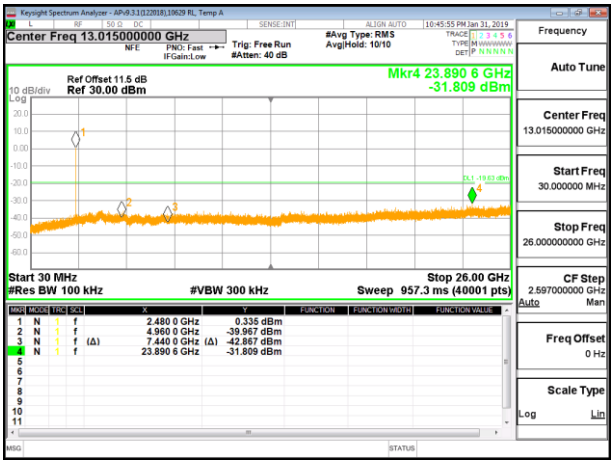

**IN-BAND REFERENCE LEVEL**




**OUT-OF-BAND MID CHANNEL**




**HIGH CHANNEL BANDEDGE**




**OUT-OF-BAND HIGH CHANNEL**



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# 9. RADIATED TEST RESULTS

## 9.1. 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 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. 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.

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.

2D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.


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**KDB 414788 Open Field Test Site and Chamber Correlation Justification**

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.

Open field test site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.


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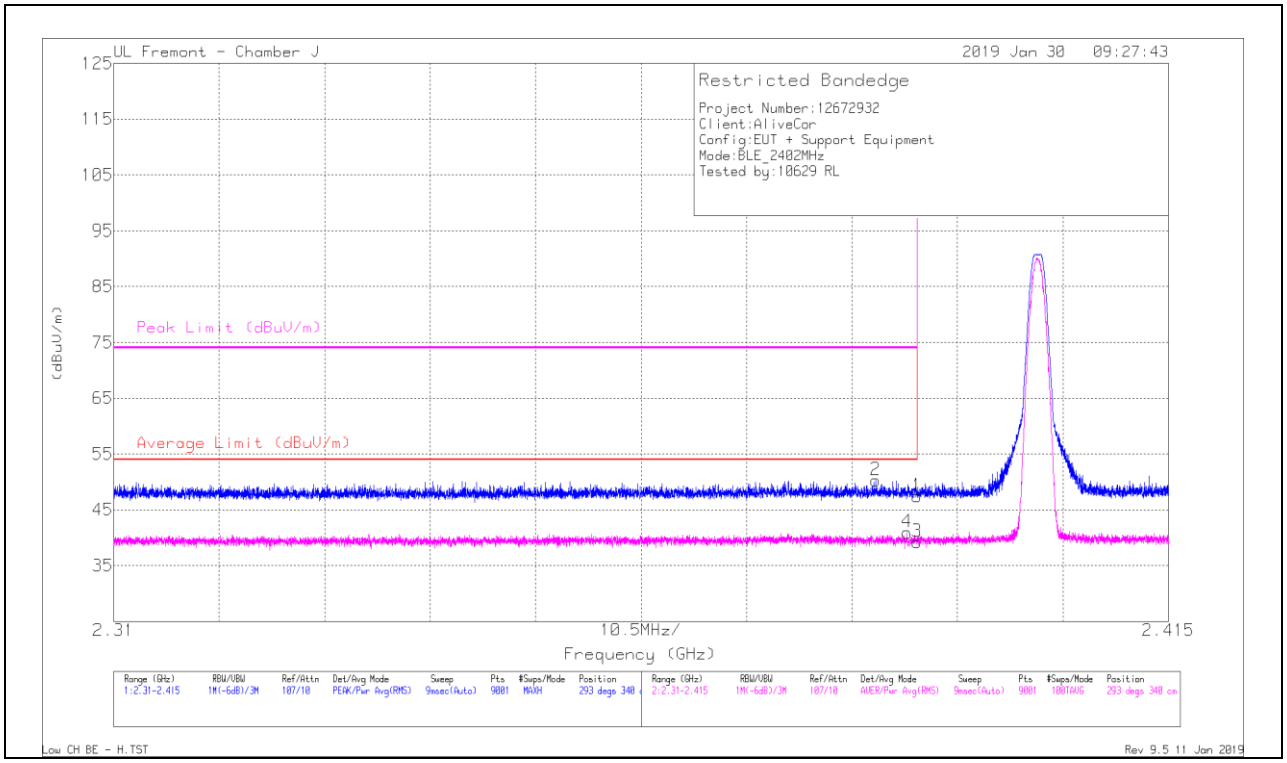
## 9.2. TRANSMITTER ABOVE 1 GHz

### BANDEDGE (LOW CHANNEL)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF AT0067 (dB/m) | Amp/Cbl/Fltr/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 | 41.25 | Pk | 32 | -25.8 | 0 | 47.45 | - | - | 74 | -26.55 | 293 | 340 | H |
| 2 | * 2.386 | 44.06 | Pk | 32 | -25.8 | 0 | 50.26 | - | - | 74 | -23.74 | 293 | 340 | H |
| 3 | * 2.39 | 31.03 | RMS | 32 | -25.8 | 2.03 | 39.26 | 54 | -14.74 | - | - | 293 | 340 | H |
| 4 | * 2.389 | 32.69 | RMS | 32 | -25.8 | 2.03 | 40.92 | 54 | -13.08 | - | - | 293 | 340 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection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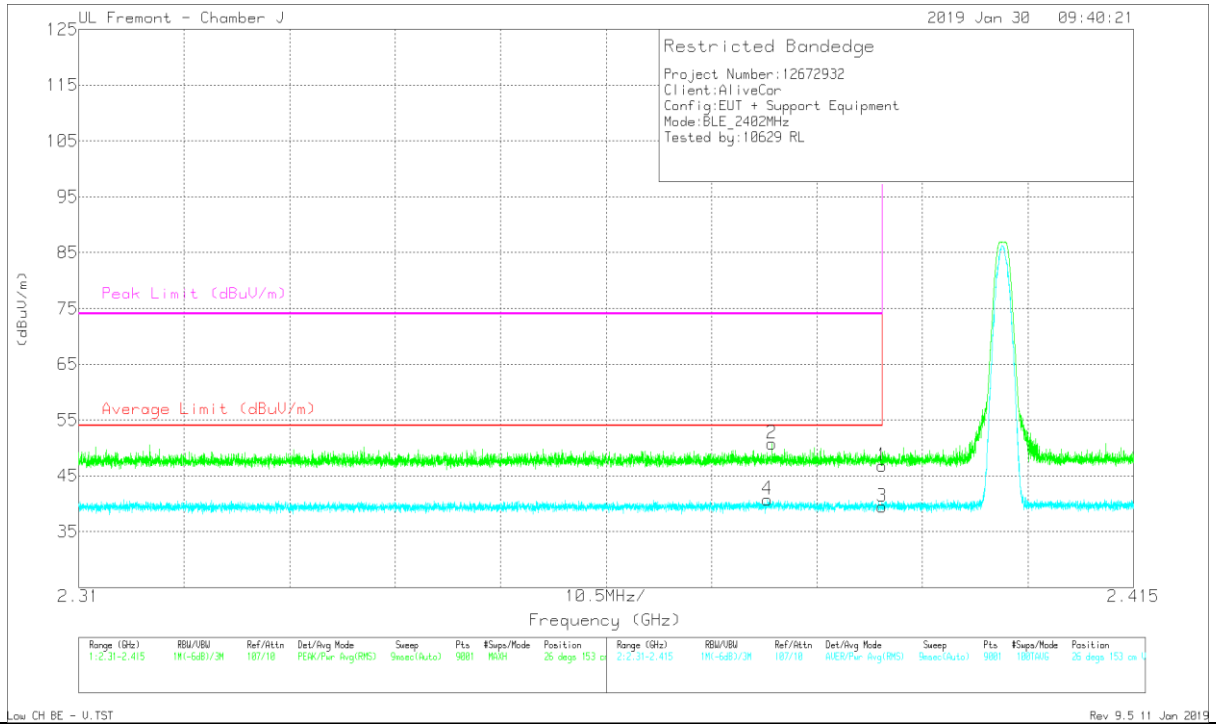
# VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF AT0067 (dB/m) | Amp/Cbl/Fltr/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 | 40.66 | Pk | 32 | -25.8 | 0 | 46.86 | - | - | 74 | -27.14 | 26 | 153 | V |
| 2 | * 2.379 | 44.57 | Pk | 32 | -25.8 | 0 | 50.77 | - | - | 74 | -23.23 | 26 | 153 | V |
| 3 | * 2.39 | 31.28 | RMS | 32 | -25.8 | 2.03 | 39.51 | 54 | -14.49 | - | - | 26 | 153 | V |
| 4 | * 2.379 | 32.56 | RMS | 32 | -25.8 | 2.03 | 40.79 | 54 | -13.21 | - | - | 26 | 153 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection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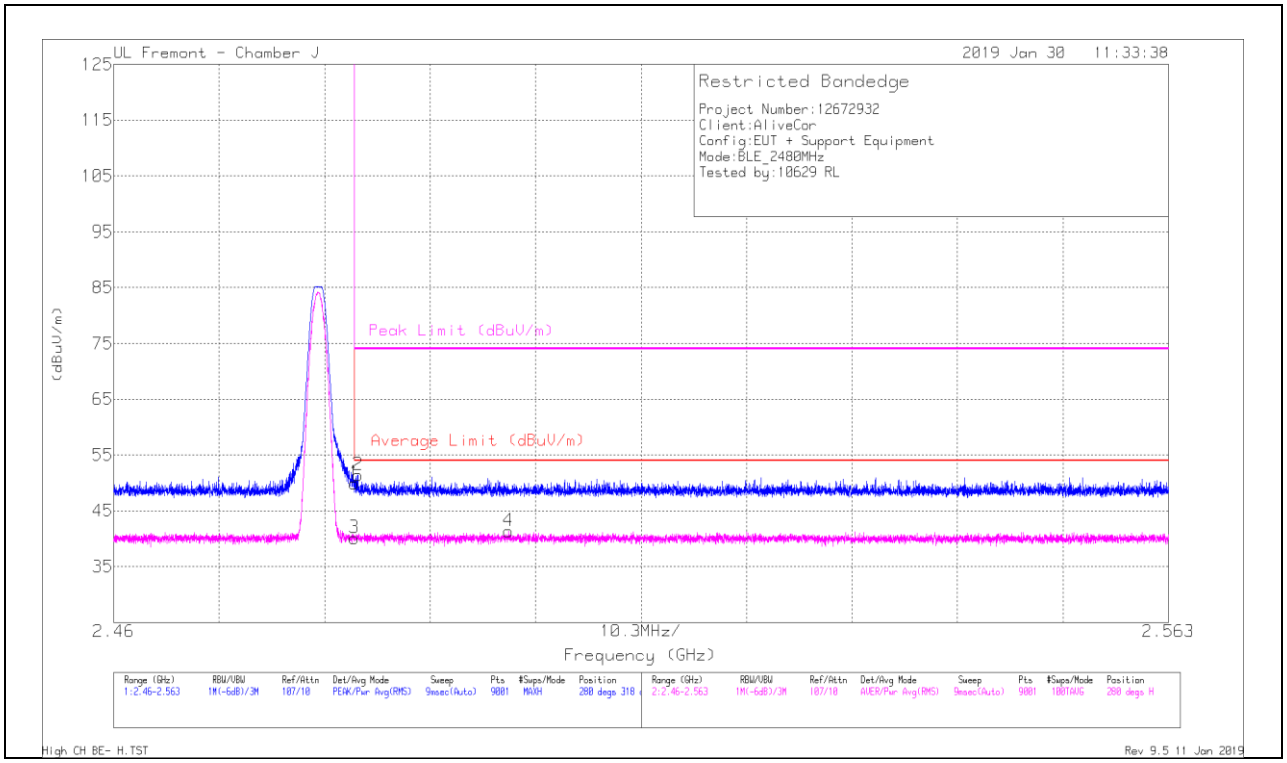
## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF AT0067 (dB/m) | Amp/Cbl/Fltr/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 | * 2.484 | 43.24 | Pk | 32.5 | -25.8 | 0 | 49.94 | - | - | 74 | -24.06 | 280 | 318 | H |
| 2 | * 2.484 | 44.71 | Pk | 32.5 | -25.8 | 0 | 51.41 | - | - | 74 | -22.59 | 280 | 318 | H |
| 3 | * 2.484 | 31.36 | RMS | 32.5 | -25.8 | 2.03 | 40.09 | 54 | -13.91 | - | - | 280 | 318 | H |
| 4 | * 2.499 | 32.5 | RMS | 32.5 | -25.7 | 2.03 | 41.33 | 54 | -12.67 | - | - | 280 | 318 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection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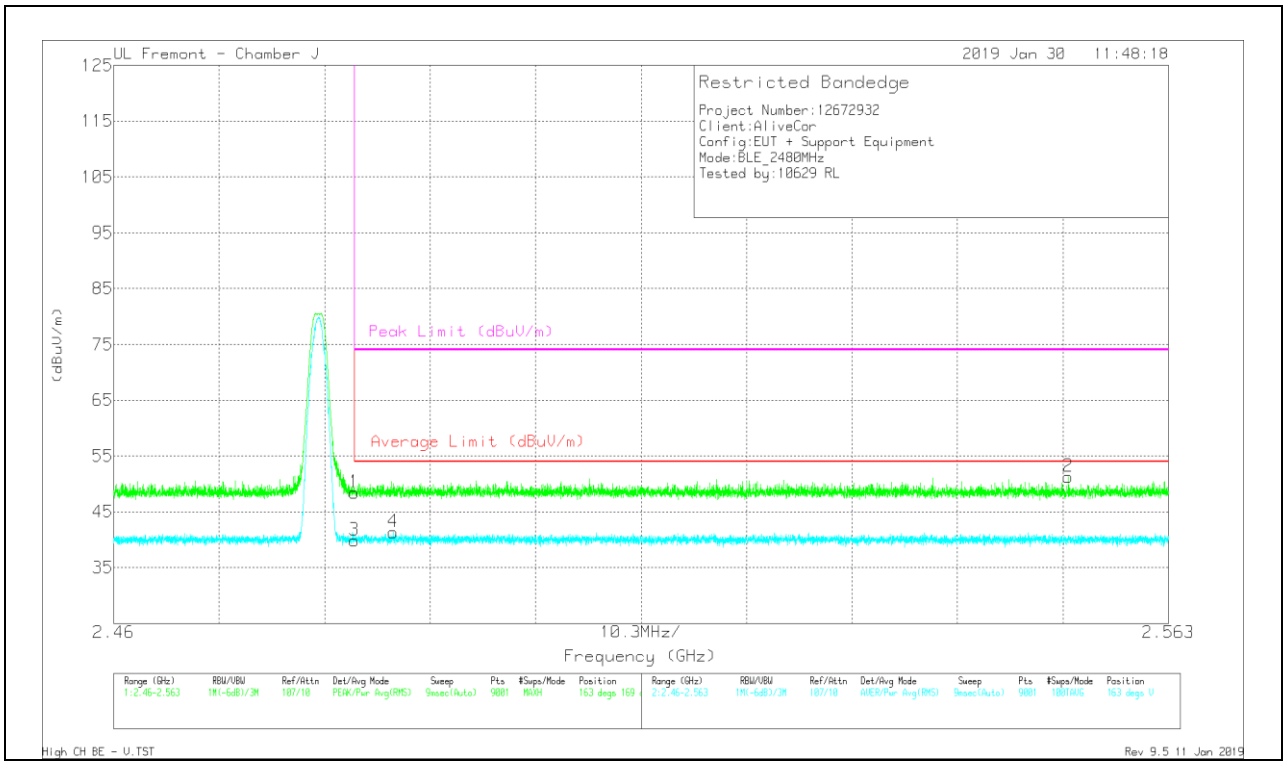
# VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF AT0067 (dB/m) | Amp/Cbl/Fltr/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 | * 2.484 | 41.68 | Pk | 32.5 | -25.8 | 0 | 48.38 | - | - | 74 | -25.62 | 163 | 169 | V |
| 2 | 2.553 | 44.54 | Pk | 32.5 | -25.7 | 0 | 51.34 | - | - | 74 | -22.66 | 163 | 169 | V |
| 3 | * 2.484 | 31.09 | RMS | 32.5 | -25.8 | 2.03 | 39.82 | 54 | -14.18 | - | - | 163 | 169 | V |
| 4 | * 2.487 | 32.53 | RMS | 32.5 | -25.7 | 2.03 | 41.36 | 54 | -12.64 | - | - | 163 | 169 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection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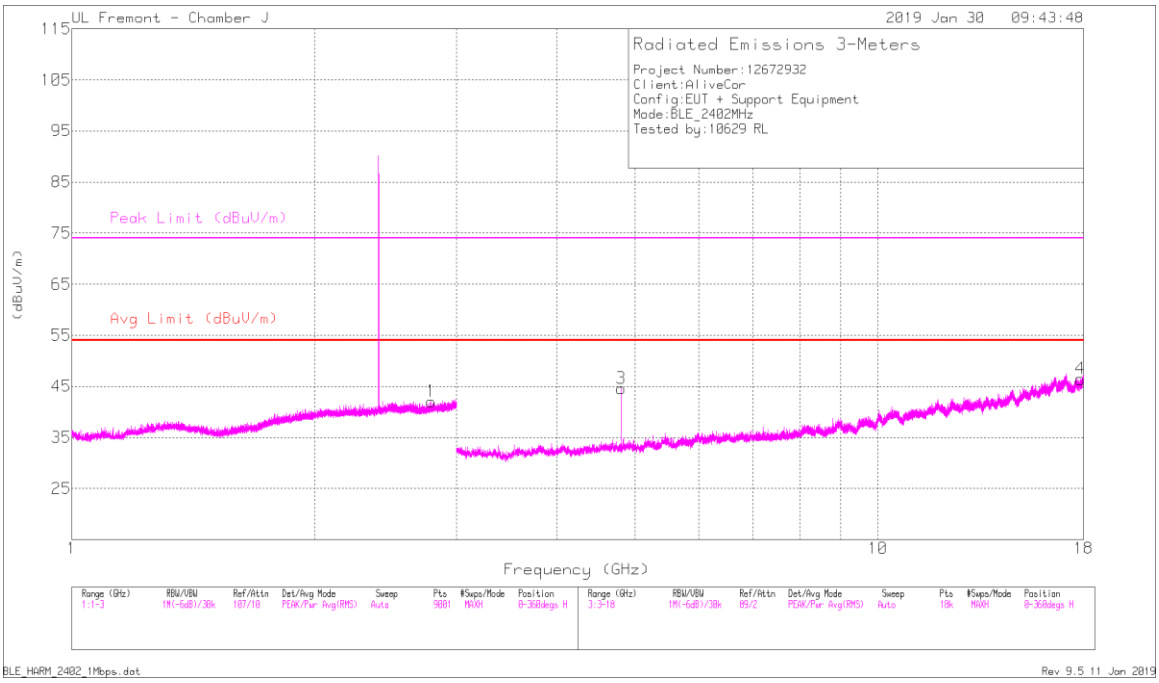
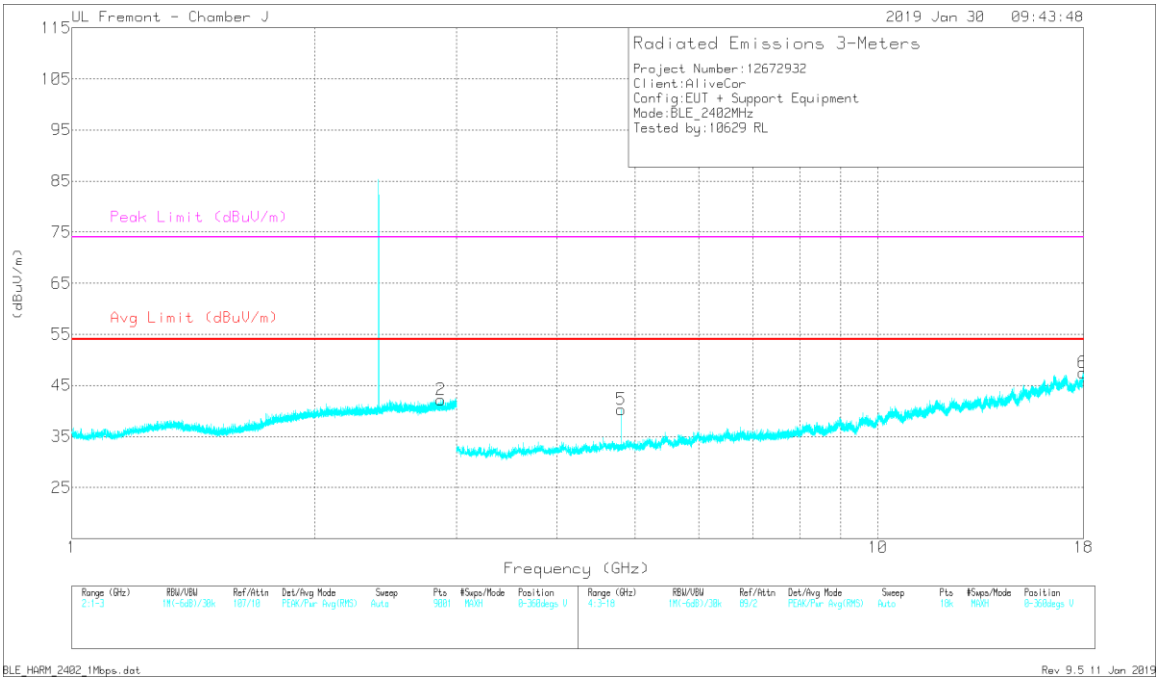
## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**



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## RADIATED EMISSIONS

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF AT0067 (dB/m) | Amp/Cbl/Fltr/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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * 2.793 | 42.3 | PK2 | 32.5 | -25.5 | 0 | 49.3 | - | - | 74 | -24.7 | 316 | 169 | H |
| * 2.791 | 32.18 | MAv1 | 32.4 | -25.5 | 2.03 | 41.11 | 54 | -12.89 | - | - | 316 | 169 | H |
| * 2.866 | 41.17 | PK2 | 32.5 | -25.4 | 0 | 48.27 | - | - | 74 | -25.73 | 211 | 361 | V |
| * 2.868 | 31.86 | MAv1 | 32.5 | -25.4 | 2.03 | 40.99 | 54 | -13.01 | - | - | 211 | 361 | V |
| * 4.804 | 46.12 | PK2 | 34.1 | -31.3 | 0 | 48.92 | - | - | 74 | -25.08 | 218 | 134 | H |
| * 4.804 | 38.47 | MAv1 | 34.1 | -31.3 | 2.03 | 43.3 | 54 | -10.7 | - | - | 218 | 134 | H |
| * 17.849 | 29.89 | PK2 | 40.7 | -18.2 | 0 | 52.39 | - | - | 74 | -21.61 | 258 | 133 | H |
| * 17.848 | 20.87 | MAv1 | 40.7 | -18.2 | 2.03 | 45.4 | 54 | -8.6 | - | - | 258 | 133 | H |
| * 4.804 | 43.14 | PK2 | 34.1 | -31.3 | 0 | 45.94 | - | - | 74 | -28.06 | 243 | 230 | V |
| * 4.804 | 34.81 | MAv1 | 34.1 | -31.3 | 2.03 | 39.64 | 54 | -14.36 | - | - | 243 | 230 | V |
| * 17.963 | 30.41 | PK2 | 40.7 | -18.2 | 0 | 52.91 | - | - | 74 | -21.09 | 38 | 147 | V |
| * 17.963 | 21.36 | MAv1 | 40.7 | -18.2 | 2.03 | 45.89 | 54 | -8.11 | - | - | 38 | 147 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average


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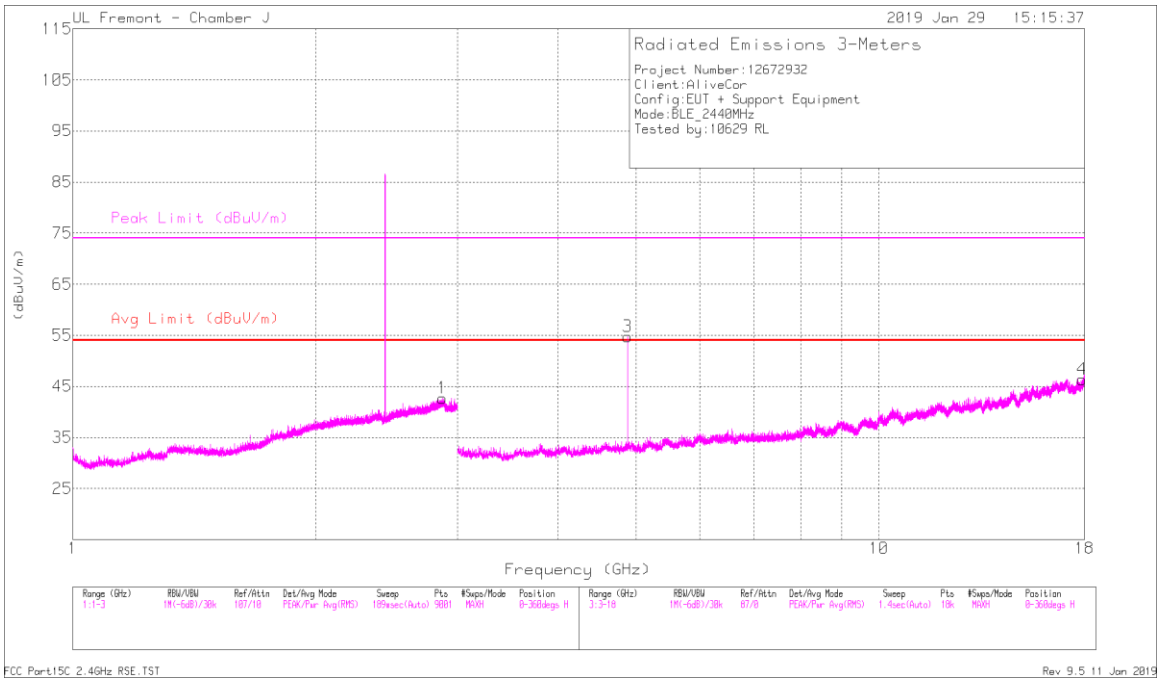
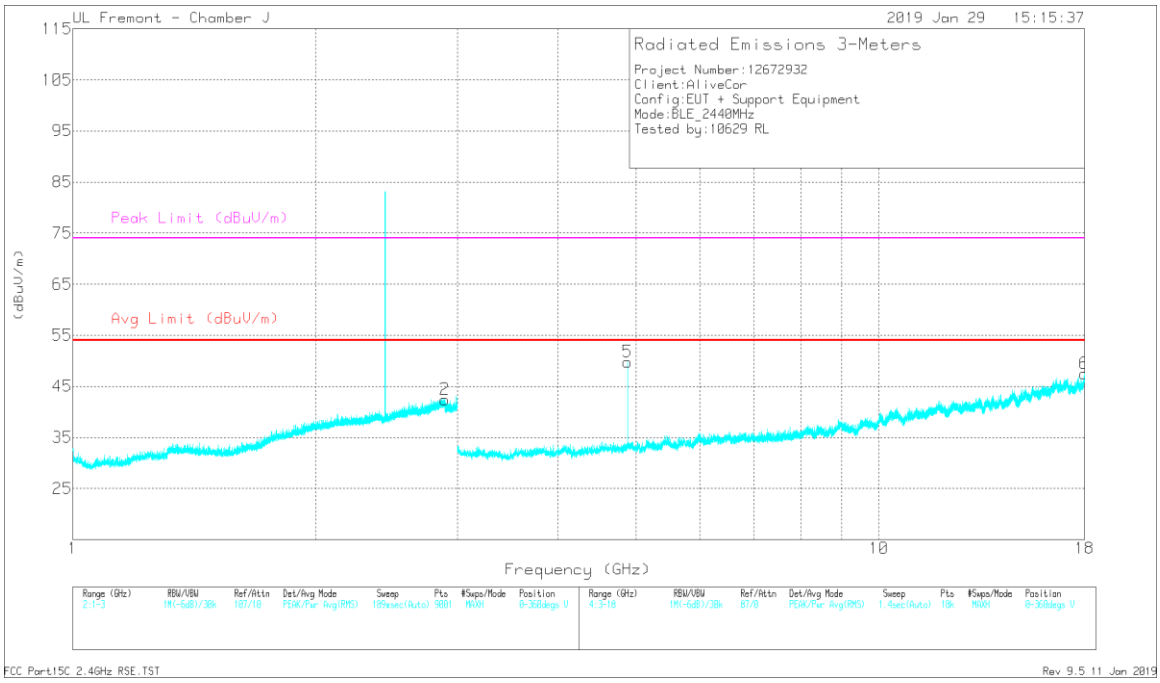
## MID CHANNEL RESULTS




**HORIZONTAL**

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## RADIATED EMISSIONS

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF AT0067 (dB/m) | Amp/Cbl/Fltr/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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * 2.873 | 28.59 | PK2 | 32.5 | -13.7 | 0 | 47.39 | - | - | 74 | -26.61 | 270 | 109 | H |
| * 2.875 | 19.37 | MAv1 | 32.5 | -13.7 | 2.03 | 40.2 | 54 | -13.8 | - | - | 270 | 109 | H |
| * 2.895 | 32.34 | PK2 | 32.6 | -13.6 | 0 | 51.34 | - | - | 74 | -22.66 | 14 | 104 | V |
| * 2.894 | 21.18 | MAv1 | 32.6 | -13.7 | 2.03 | 42.11 | 54 | -11.89 | - | - | 14 | 104 | V |
| * 4.879 | 54.02 | PK2 | 34 | -31.4 | 0 | 56.62 | - | - | 74 | -17.38 | 173 | 133 | H |
| * 4.88 | 44.39 | MAv1 | 34 | -31.4 | 2.03 | 49.02 | 54 | -4.98 | - | - | 173 | 133 | H |
| * 17.867 | 30.46 | PK2 | 40.7 | -18.3 | 0 | 52.86 | - | - | 74 | -21.14 | 14 | 389 | H |
| * 17.865 | 20.98 | MAv1 | 40.7 | -18.2 | 2.03 | 45.51 | 54 | -8.49 | - | - | 14 | 389 | H |
| * 4.88 | 50.56 | PK2 | 34 | -31.4 | 0 | 53.16 | - | - | 74 | -20.84 | 92 | 242 | V |
| * 4.88 | 42.61 | MAv1 | 34 | -31.4 | 2.03 | 47.24 | 54 | -6.76 | - | - | 92 | 242 | V |
| * 17.985 | 30.63 | PK2 | 40.7 | -17.9 | 0 | 53.43 | - | - | 74 | -20.57 | 287 | 201 | V |
| * 17.984 | 21.06 | MAv1 | 40.7 | -17.9 | 2.03 | 45.89 | 54 | -8.11 | - | - | 287 | 201 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average


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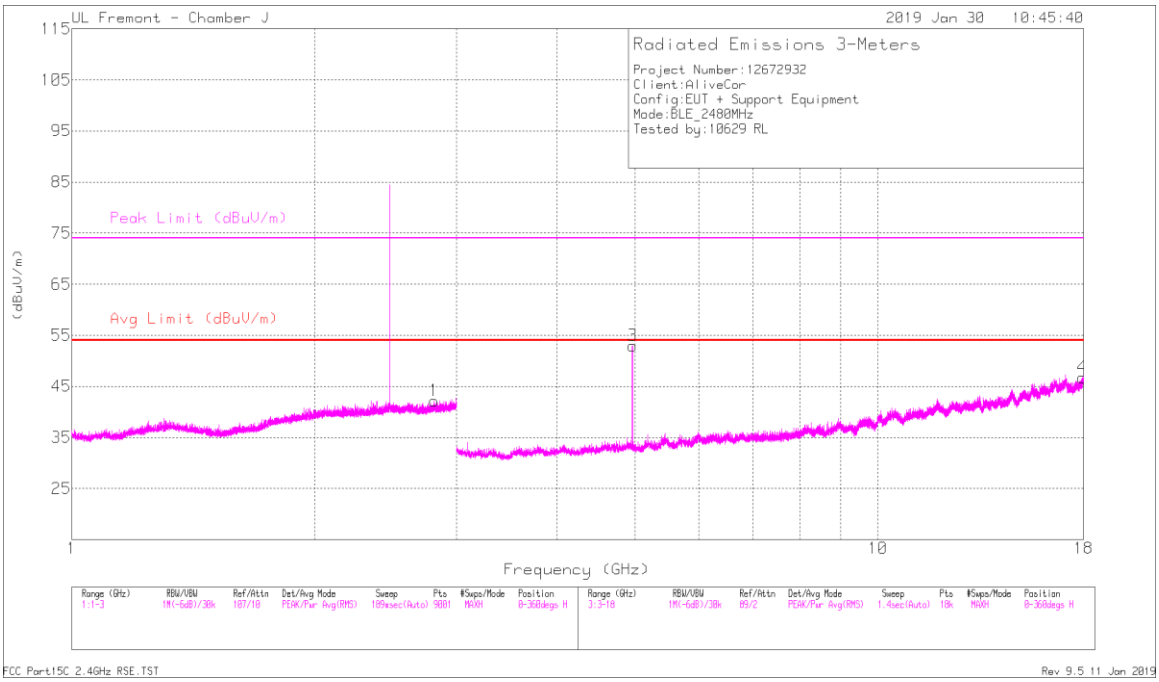
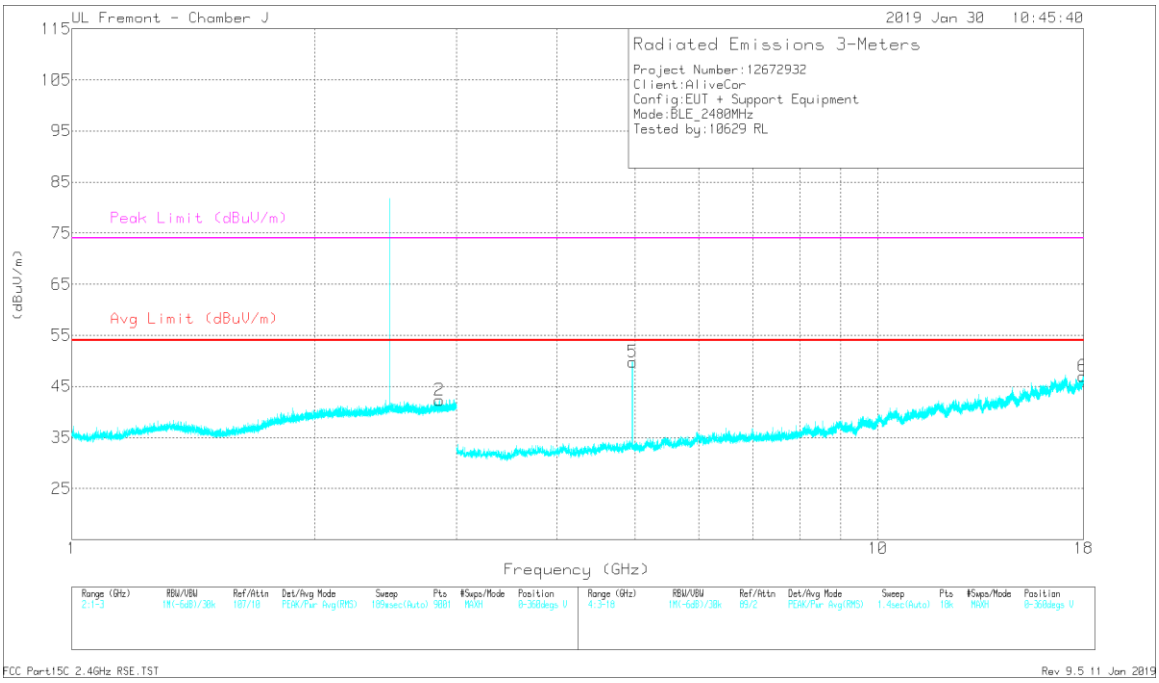
## HIGH CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**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## RADIATED EMISSIONS

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF AT0067 (dB/m) | Amp/Cbl/Fltr/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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * 2.815 | 41.8 | PK2 | 32.5 | -25.5 | 0 | 48.8 | - | - | 74 | -25.2 | 135 | 181 | H |
| * 2.816 | 31.54 | MAv1 | 32.5 | -25.5 | 2.03 | 40.57 | 54 | -13.43 | - | - | 135 | 181 | H |
| * 2.859 | 42.02 | PK2 | 32.5 | -25.4 | 0 | 49.12 | - | - | 74 | -24.88 | 340 | 217 | V |
| * 2.858 | 32.66 | MAv1 | 32.5 | -25.4 | 2.03 | 41.79 | 54 | -12.21 | - | - | 340 | 217 | V |
| * 4.959 | 52.59 | PK2 | 34 | -30.4 | 0 | 56.19 | - | - | 74 | -17.81 | 218 | 105 | H |
| * 4.96 | 44.51 | MAv1 | 34 | -30.4 | 2.03 | 50.14 | 54 | -3.86 | - | - | 218 | 105 | H |
| * 17.949 | 30.33 | PK2 | 40.7 | -18.4 | 0 | 52.63 | - | - | 74 | -21.37 | 125 | 246 | H |
| * 17.952 | 21.25 | MAv1 | 40.7 | -18.4 | 2.03 | 45.58 | 54 | -8.42 | - | - | 125 | 246 | H |
| * 4.96 | 49.53 | PK2 | 34 | -30.4 | 0 | 53.13 | - | - | 74 | -20.87 | 271 | 207 | V |
| * 4.96 | 40.7 | MAv1 | 34 | -30.4 | 2.03 | 46.33 | 54 | -7.67 | - | - | 271 | 207 | V |
| * 17.982 | 30.81 | PK2 | 40.7 | -18 | 0 | 53.51 | - | - | 74 | -20.49 | 281 | 266 | V |
| * 17.979 | 20.88 | MAv1 | 40.7 | -18 | 2.03 | 45.61 | 54 | -8.39 | - | - | 281 | 266 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average


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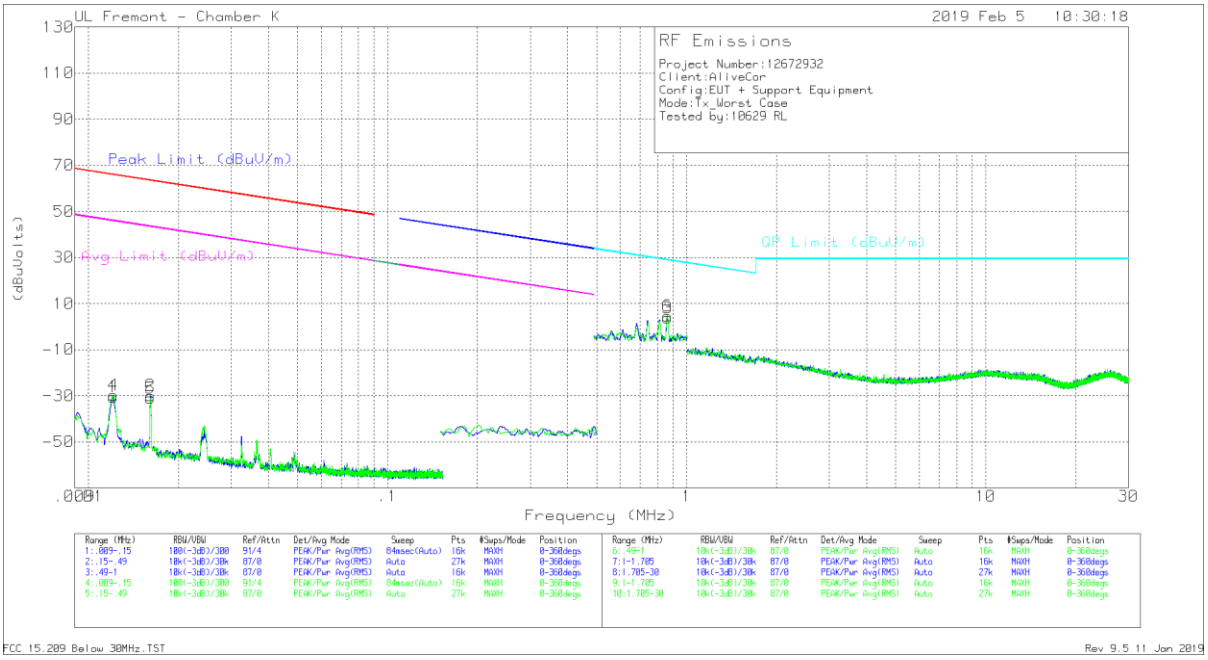
## 9.3. WORST CASE BELOW 30MHz

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




**ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF**

## Below 30MHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (ACF) | Cables w/ PRE0186650 | Dist Corr 300m | Corrected Reading (dBuVolts) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .01213 | 21.38 | Pk | 60 | -31.8 | -80 | -30.42 | 65.91 | -96.33 | 45.91 | -76.33 | 0-360 |
| 2 | .01614 | 22.56 | Pk | 59.5 | -31.9 | -80 | -29.84 | 63.43 | -93.27 | 43.43 | -73.27 | 0-360 |
| 4 | .01214 | 22.05 | Pk | 60 | -31.8 | -80 | -29.75 | 65.9 | -95.65 | 45.9 | -75.65 | 0-360 |
| 5 | .01615 | 21.46 | Pk | 59.5 | -31.9 | -80 | -30.94 | 63.42 | -94.36 | 43.42 | -74.36 | 0-360 |

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (ACF) | Cables w/ PRE0186650 | Dist Corr 30m (dB) 40Log | Corrected Reading (dBuVolts) | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | .86472 | 19.68 | Pk | 56.3 | -32.1 | -40 | 3.88 | 28.88 | -25 | 0-360 |
| 6 | .86176 | 20.46 | Pk | 56.3 | -32.1 | -40 | 4.66 | 28.91 | -24.25 | 0-360 |

Pk - Peak detector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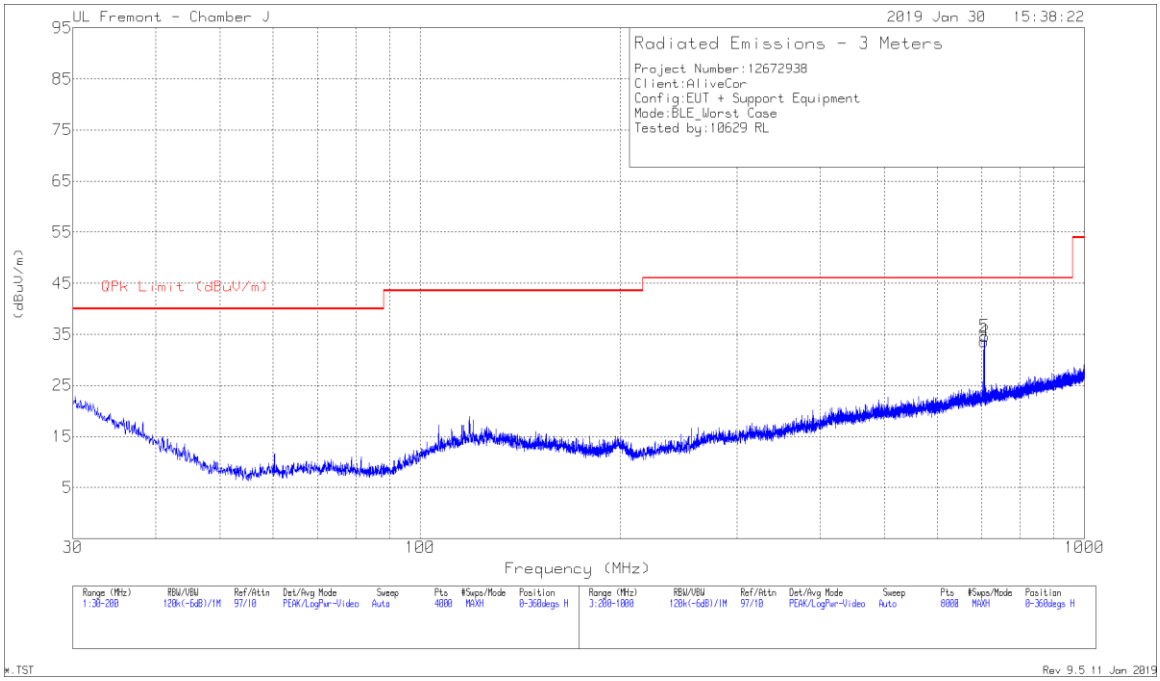
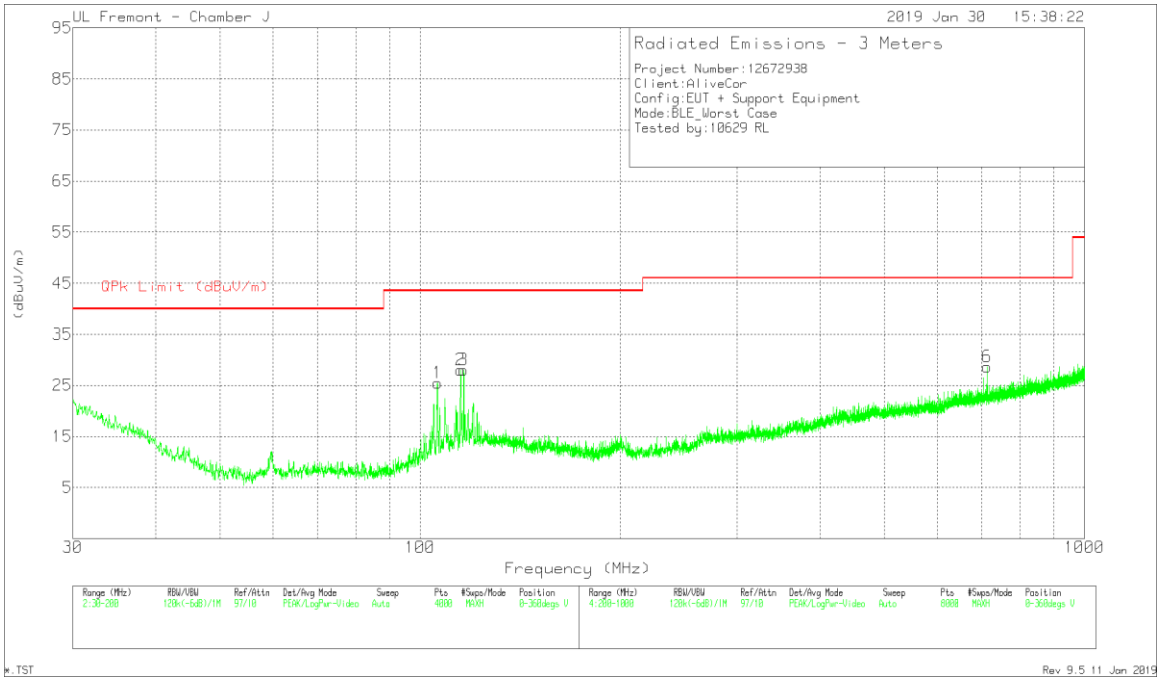
## 9.4. WORST CASE BELOW 1 GHz

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




**HORIZONTAL**




**VERTICAL**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## Below 1GHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AF PRE0181575 (dB/m) | Amp Cbl (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 106.1372 | 38.43 | Pk | 17.9 | -30.9 | 25.43 | 43.52 | -18.09 | 0-360 | 101 | V |
| 2 | * 115.0645 | 39.62 | Pk | 19.3 | -30.9 | 28.02 | 43.52 | -15.5 | 0-360 | 101 | V |
| 3 | * 116.2548 | 39.55 | Pk | 19.4 | -30.9 | 28.05 | 43.52 | -15.47 | 0-360 | 101 | V |
| 4 | 705.3657 | 36.24 | Pk | 26.2 | -28.8 | 33.64 | 46.02 | -12.38 | 0-360 | 198 | H |
| 5 | 707.466 | 37.21 | Pk | 26.2 | -28.8 | 34.61 | 46.02 | -11.41 | 0-360 | 198 | H |
| | 713.045 | 21.37 | Qp | 26.3 | -28.9 | 18.77 | 46.02 | -27.25 | 125 | 229 | V |
| 6 | 713.1667 | 31.27 | Pk | 26.3 | -28.9 | 28.67 | 46.02 | -17.35 | 0-360 | 101 | V |

Pk - Peak detector
Qp - Quasi-Peak detector


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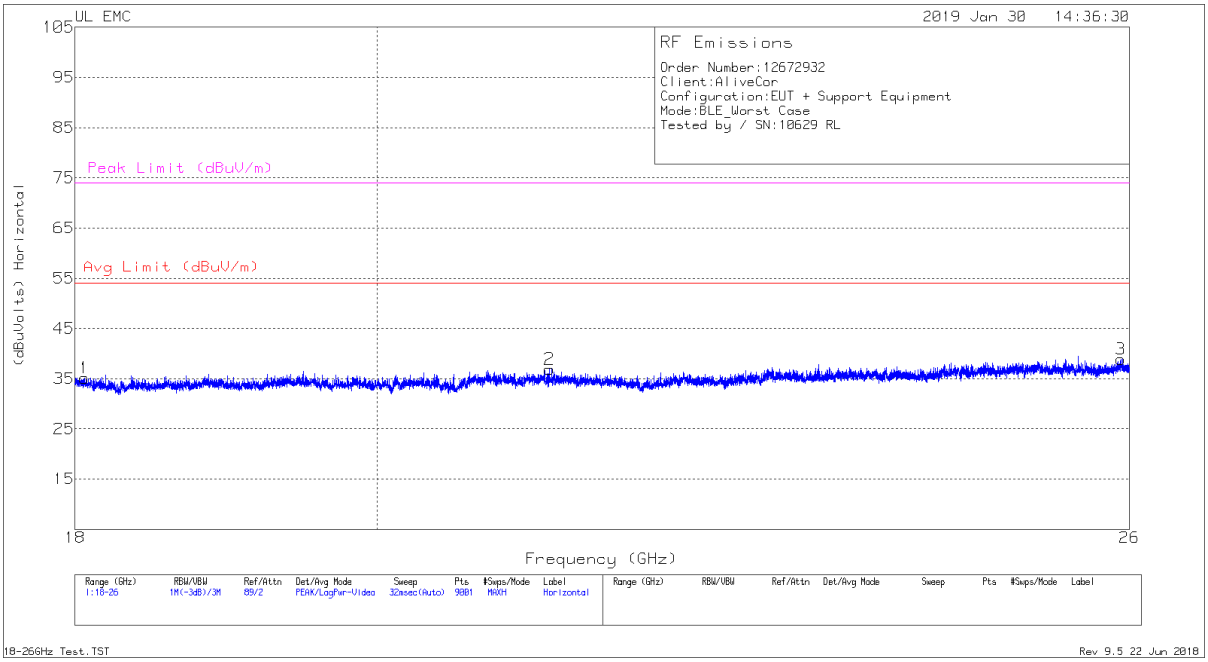
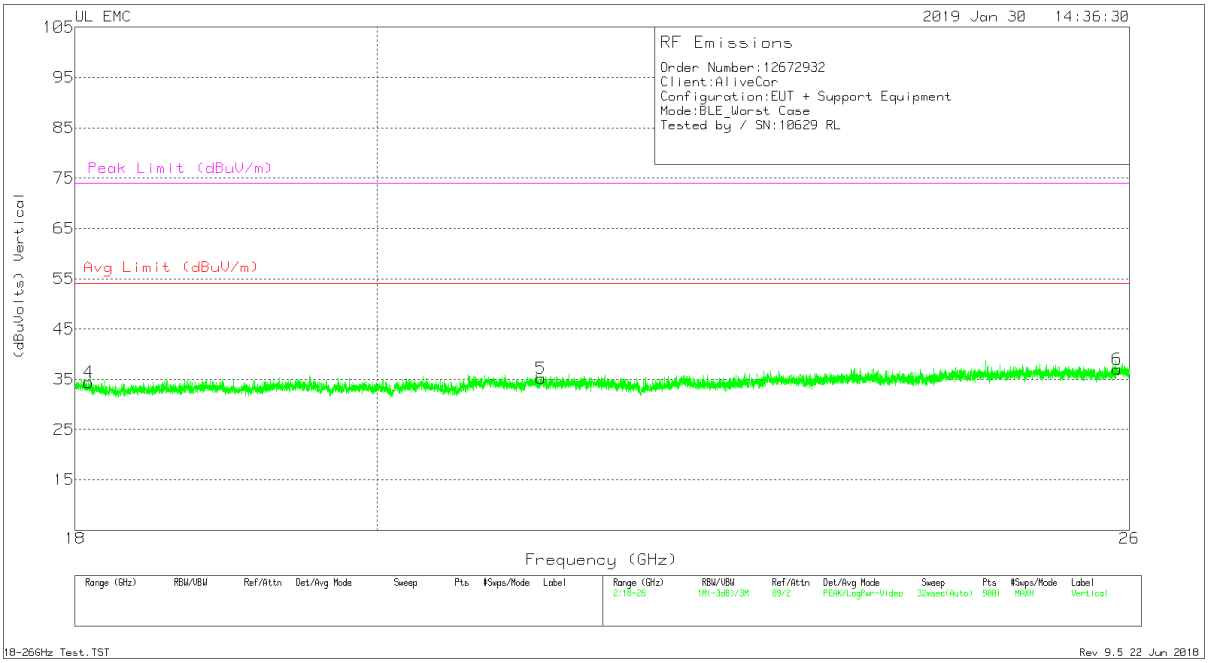
## 9.5. WORST CASE 18-26 GHz

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




**HORIZONTAL**




**VERTICAL**



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## 18 – 26GHz DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | T448 AF (dB/m) | Amp/Cbl (dB) | Dist Corr (dB) | Corrected Reading (dBuVolts) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18.06 | 72.13 | Pk | 32.4 | -59.9 | -9.5 | 35.13 | 54 | -18.87 | 74 | -38.87 |
| 2 | 21.239 | 70.09 | Pk | 33.1 | -56.8 | -9.5 | 36.89 | 54 | -17.11 | 74 | -37.11 |
| 3 | 25.921 | 68.79 | Pk | 34.7 | -55.1 | -9.5 | 38.89 | 54 | -15.11 | 74 | -35.11 |
| 4 | 18.085 | 71.57 | Pk | 32.3 | -60 | -9.5 | 34.37 | 54 | -19.63 | 74 | -39.63 |
| 5 | 21.176 | 68 | Pk | 33.2 | -56.5 | -9.5 | 35.2 | 54 | -18.8 | 74 | -38.8 |
| 6 | 25.889 | 67.12 | Pk | 34.7 | -55.3 | -9.5 | 37.02 | 54 | -16.98 | 74 | -36.98 |

Pk - Peak detector


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