# CERTIFICATION TEST REPORT

**Report Number. :** 12886359-E1V2

| | | |
|---|---|---|
| **Applicant** | : | PLANTRONICS INC.<br>345 ENCINAL ST<br>SANTA CRUZ, CA 95060 U.S.A. |
| **Model** | : | CB4222 D, CB4222 CD, CB4222-M CD, CB5232 D, CB5232 CD, CB5232-M CD |
| **FCC ID** | : | AL8-CBX2X2 |
| **IC** | : | 457A-CBX2X2 |
| **EUT Description** | : | BLUETOOTH BASE |
| **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:**
July 19, 2019

**Prepared by:**
UL Verification Services Inc.
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NVLAP Lab code: 200065-0

# REPORT REVISION HISTORY

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| V1 | 7/2/2019 | Initial Issue | -- |
| V2 | 7/19/2019 | Updated worst case | Tri Pham |



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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** PLANTRONICS INC.
345 ENCINAL ST
SANTA CRUZ, CA 95060 U.S.A.

**EUT DESCRIPTION:** BLUETOOTH BASE

**MODEL:** CB4222 D, CB4222 CD, CB4222-M CD, CB5232 D, CB5232 CD, CB5232-M CD

**SERIAL NUMBER:** 143P29 (CB4222-CD conducted)
143PD5 (CB4222-CD Radiated)

**DATE TESTED:** Jun 5, 2019 – June 13, 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 | ☐ Chamber D | ☒ Chamber I |
| ☐ Chamber B | ☐ Chamber E | ☐ Chamber J |
| ☐ Chamber C | ☐ Chamber F | ☐ Chamber K |
| | ☐ Chamber G | ☐ Chamber L |
| | ☐ Chamber H | ☐ Chamber M |

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.

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 Bluetooth Base.

## 5.2. DESCRIPTION OF MODELS DIFFERENCES

Client specified all models in the product family are electrically identical. Power measurements were performed on both CB5200-CD and CB4222-CD and it was determined that the CB4222-CD was worst case. Therefore, testing was performed on the CB4222-CD to represent the family.

## 5.3. 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 | 6.95 | 4.95 |

## 5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an omni directional monopole antenna, with a maximum gain of 2.85 dBi.

## 5.5. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was V204

The test utility software used during testing was HIDTWidler Version 1.0.0.1 and BlueSuite 2.6.8.

## 5.6. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 30MHz, 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.

Pretesting was performed for standalone and with accessories attached. It was found that standalone was worst case, therefore all tests were performed as standalone.

The fundamental of the EUT is a desktop device and was tested in normal operating conditions.

## 5.7. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID** |
| AC/DC Adapter | Plantronics | SSC-090100 | N/A | N/A |
| BT Headset | Plantronics | 203-JN0508 | 163CTW | N/A |
| Laptop | Lenovo | TP000p6A | PF1H0N1K | N/A |

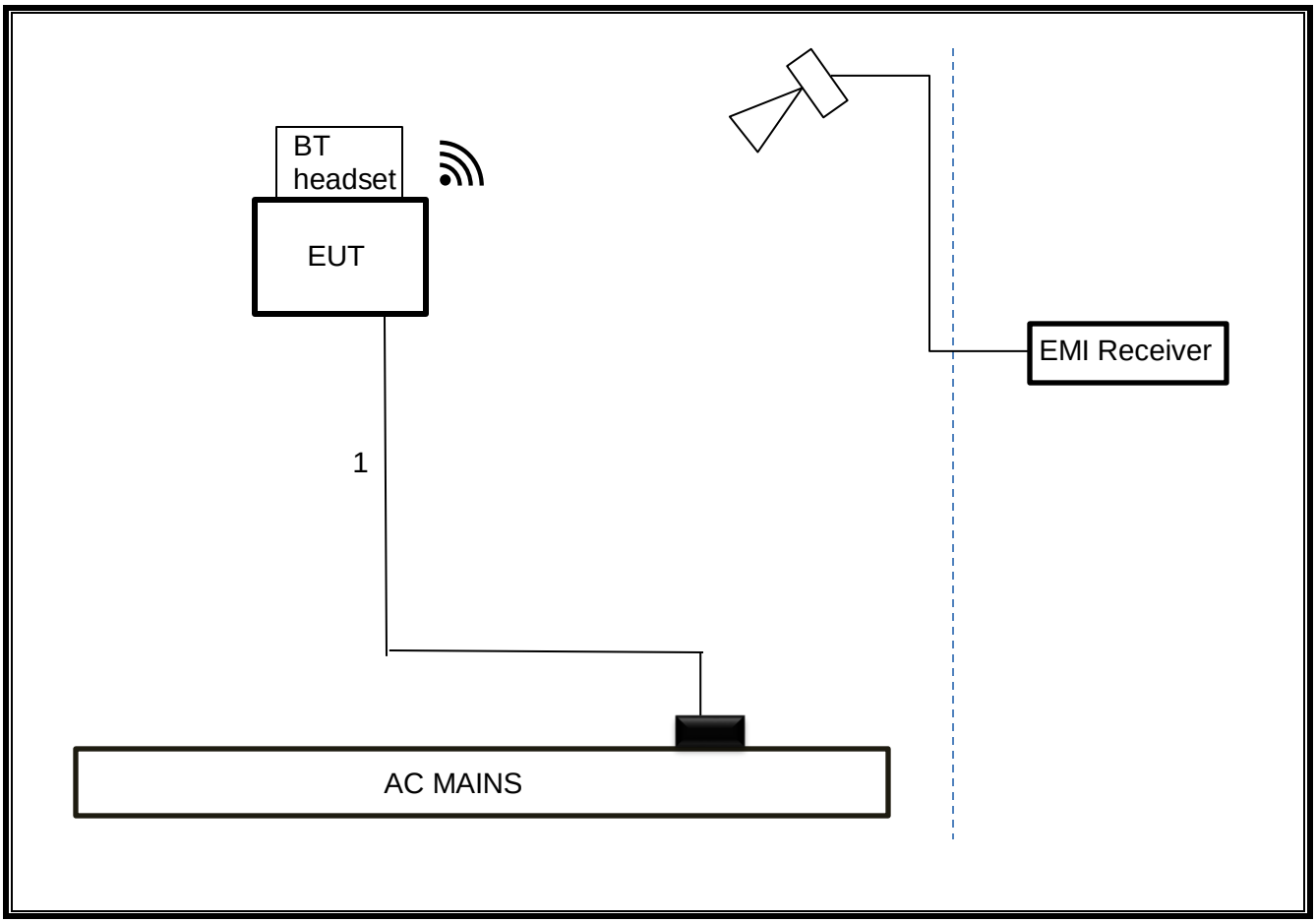
**I/O CABLES**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No** | **Port** | **# of identical ports** | **Connector Type** | **Cable Type** | **Cable Length (m)** | **Remarks** |
| 1 | DC | 1 | DC | Unshielded | 1 | AC/DC Adapter to Base Plug |
| 2 | Antenna | 1 | SMA | Unshielded | .08 | To Spectrum Analyzer |

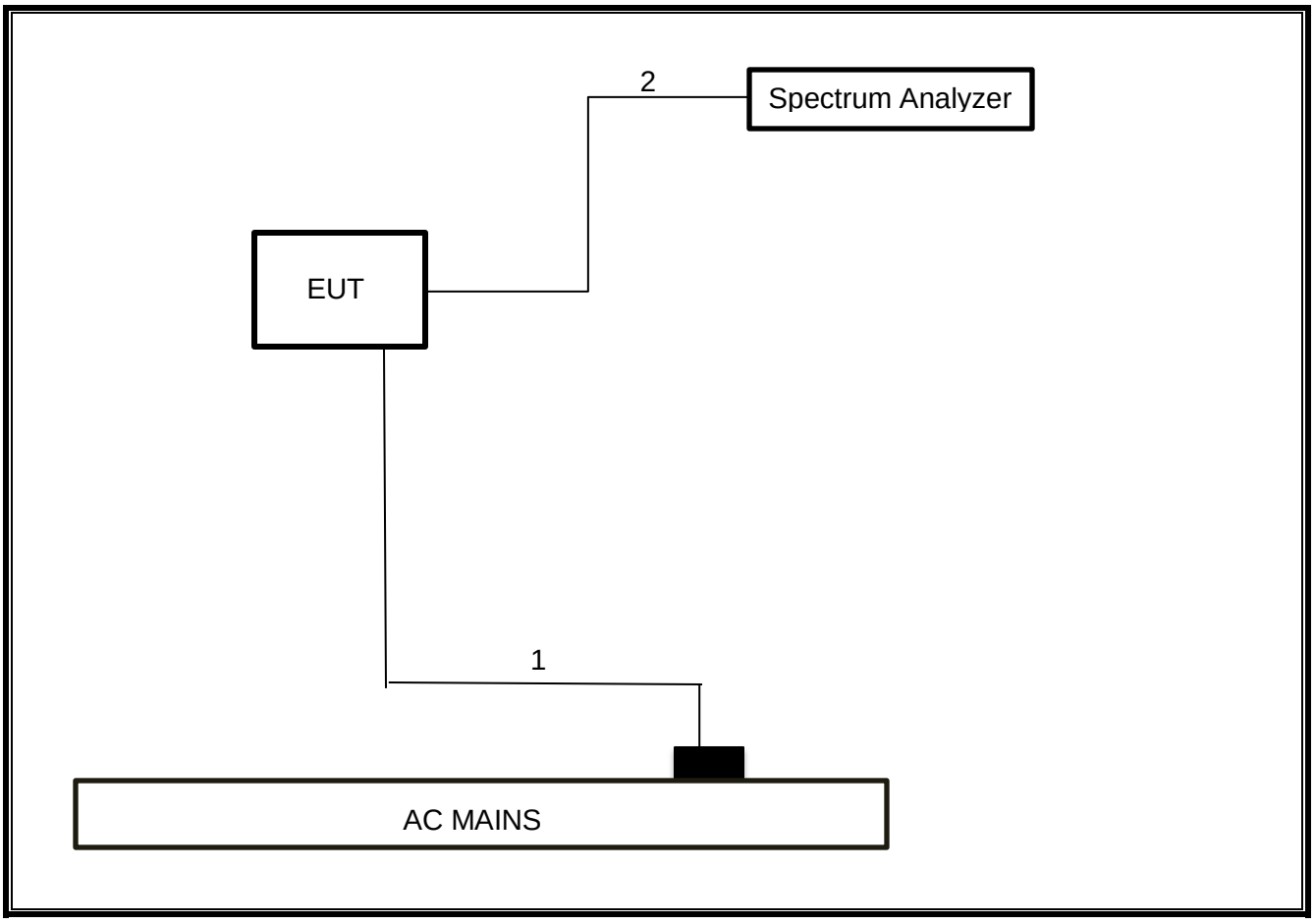
**TEST SETUP**

The EUT was tested as standalone. Test software exercised the radio card.

**SETUP DIAGRAM: RADIATED TESTS**



**SETUP DIAGRAM: CONDUCTED TESTS**



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# 6. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10 Section11.6

6 dB BW: ANSI C63.10 Section 11.8.1

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

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

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

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

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

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

Radiated emissions restricted frequency bands: ANSI C63.10 Section 11.12.1

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

Conducted emissions in restricted frequency bands: ANSI C63.10 Section 11.12.

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



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# 7. TEST AND MEASUREMENT EQUIPMENT

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

| TEST EQUIPMENT LIST | | | | | |
|---|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **ID Num** | **Cal Due** | **Last Cal** |
| Antenna, Passive Loop 30Hz to 1MHz | ELETRO METRICS | EM-6871 | PRE0179465 | 05/31/2020 | 05/31/2019 |
| Antenna, Passive Loop 100kHz to 30MHz | ELETRO METRICS | EM-6872 | PRE0179467 | 05/31/2020 | 05/31/2019 |
| Antenna, Double Ridge Guide Horn Antenna 700MHz to 18GHz | A.H. SYSTEMS, INC. | SAS-571 | PRE0190810 | 07/10/2019 | 07/10/2017 |
| RF Amplifier, 1-18GHz | MITEQ | AFS42-00101800-25-S-42 | PRE0181078 | 08/01/2019 | 08/01/2018 |
| Hybrid Antenna, 30MHz to 3GHz | SunAR rf motion | JB3 | PRE0184971 | 11/13/2019 | 11/13/2018 |
| Amplifier, 9KHz to 1GHz, 32dB | SONOMA INSTRUMENT | 310 | PRE0180175 | 07/09/2019 | 07/09/2018 |
| Antenna, Horn 18 to 26.5GHz | ARA | MWH-1826/B | PRE0182188 | 08/29/2019 | 08/29/2018 |
| Rf Amplifier, 18-26.5GHz, 60dB gain | Amplical | AMP18G26.5-60 | PRE0181238 | 05/01/2020 | 05/01/2019 |
| EMI TEST RECEIVER | Rohde & Schwarz | ESW44 | PRE0179376 | 02/14/2020 | 02/14/2019 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz | Agilent (Keysight) Technologies | N9030A | T908 | 01/23/2020 | 01/23/2019 |
| **AC Line Conducted** | | | | | |
| EMI Receiver | Rohde & Schwarz | ESR | T1436 | 02/14/2020 | 02/14/2019 |
| LISN for Conducted Emissions CISPR-16 | FCC INC. | FCC LISN 50/250 | T1310 | 01/24/2020 | 01/24/2019 |
| **Test Software List** | | | | | |
| Radiated Software | UL | UL EMC | | Ver 9.5, June 22, 2018 | |
| Antenna Port Software | UL | UL RF | | Ver 9.6, April 18, 2019 | |
| AC Line Conducted Software | UL | UL EMC | | Ver 9.5, May 26, 2015 | |



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# 8. ANTENNA PORT TEST RESULTS (BLE)

## 8.1. ON TIME AND DUTY CYCLE

**LIMITS**

None; for reporting purposes only.

**PROCEDURE**

KDB 558074 Zero-Span Spectrum Analyzer Method.

**ON TIME AND DUTY CYCLE RESULTS**

| Mode | ON Time B (msec) | Period (msec) | Duty Cycle x (linear) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | 1/B Minimum VBW (kHz) |
|---|---|---|---|---|---|---|
| **2.4GHz Band** | | | | | | |
| BLE | 0.405 | 0.624 | 0.650 | 64.95% | 1.87 | 2.467 |



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DUTY CYCLE PLOTS


**DUTY CYCLE BLE**



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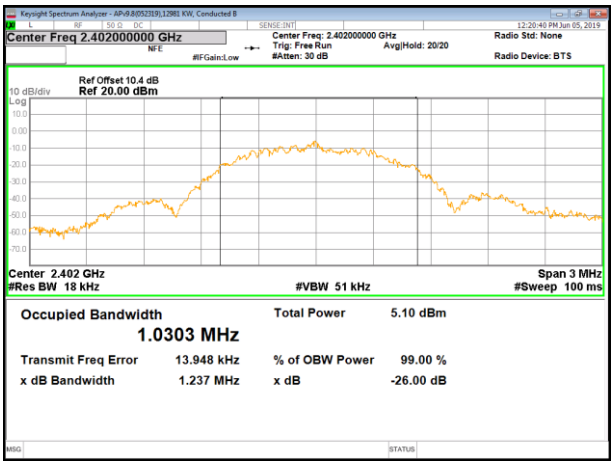
## 8.2. 99% BANDWIDTH

**LIMITS**

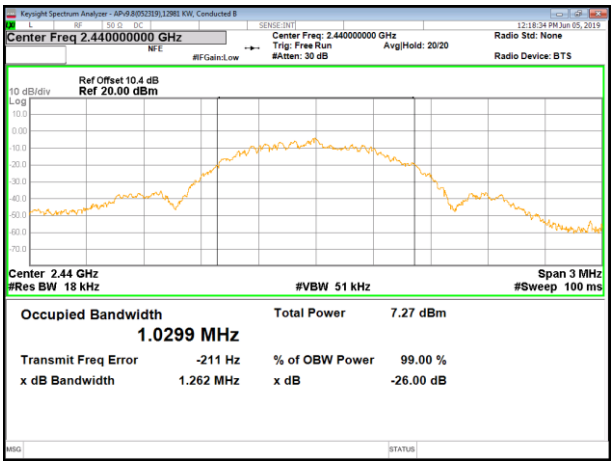
None; for reporting purposes only.

**RESULTS**

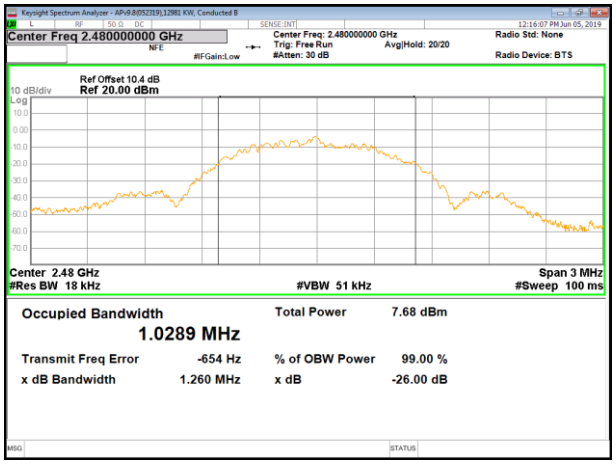
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2402 | 1.0303 |
| Middle | 2440 | 1.0299 |
| High | 2480 | 1.0289 |




**LOW CHANNEL**




**MID CHANNEL**




**HIGH CHANNEL**

## 8.3. 6 dB BANDWIDTH

**LIMITS**

FCC §15.247 (a) (2)

RSS-247 5.2 (a)

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



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**RESULTS**

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2402 | 0.6870 | 0.5 |
| Middle | 2440 | 0.6660 | 0.5 |
| High | 2480 | 0.6870 | 0.5 |


**LOW CHANNEL**


**MID CHANNEL**


**HIGH CHANNEL**

## 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.

**RESULTS**

| | |
|---|---|
| **Tested By:** | KW 12981 |
| **Date:** | 6/5/2019 |

| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 4.41 | 30 | -25.59 |
| Middle | 2440 | 6.95 | 30 | -23.05 |
| High | 2480 | 6.12 | 30 | -23.88 |



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## 8.5. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**RESULTS**

| | |
|---|---|
| **Tested By:** | KW 12981 |
| **Date:** | 6/5/2019 |

| Channel | Frequency (MHz) | AV power (dBm) |
|---|---|---|
| Low | 2402 | 3.87 |
| Middle | 2440 | 5.53 |
| High | 2480 | 5.68 |



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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.



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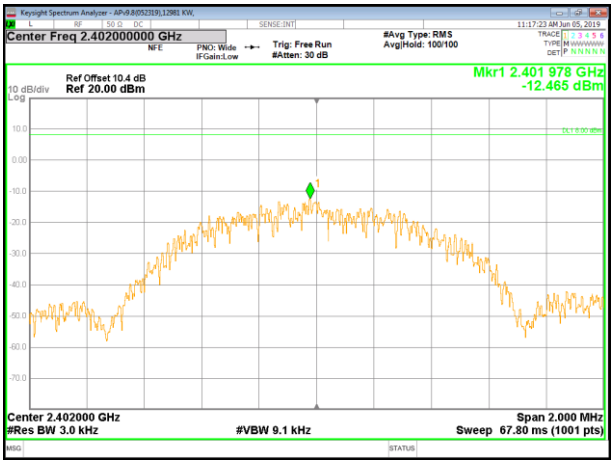
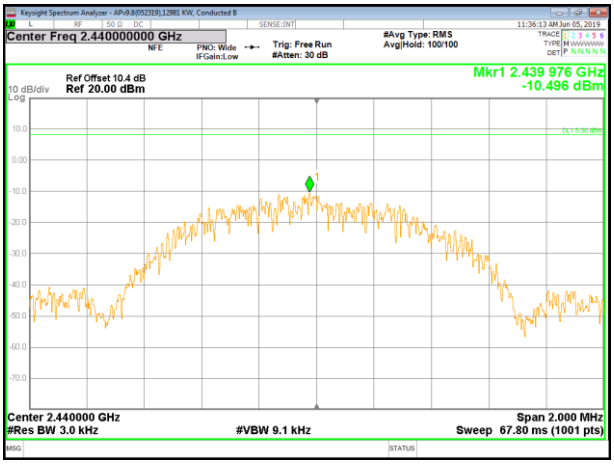
**RESULTS**

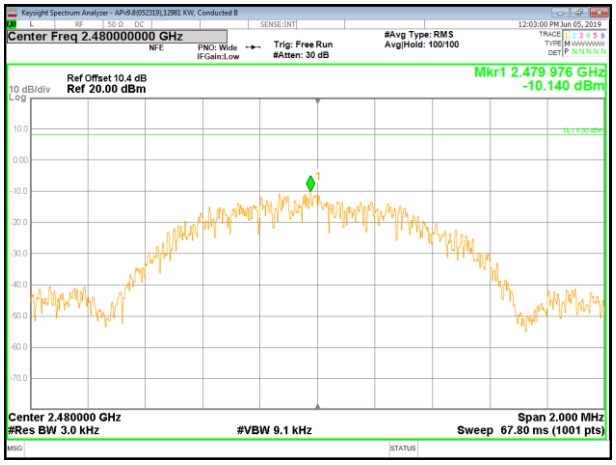
| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | -12.46 | 8 | -20.46 |
| Middle | 2440 | -10.50 | 8 | -18.50 |
| High | 2480 | -10.14 | 8 | -18.14 |




**LOW CHANNEL**




**MID CHANNEL**




**HIGH CHANNEL**

## 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.



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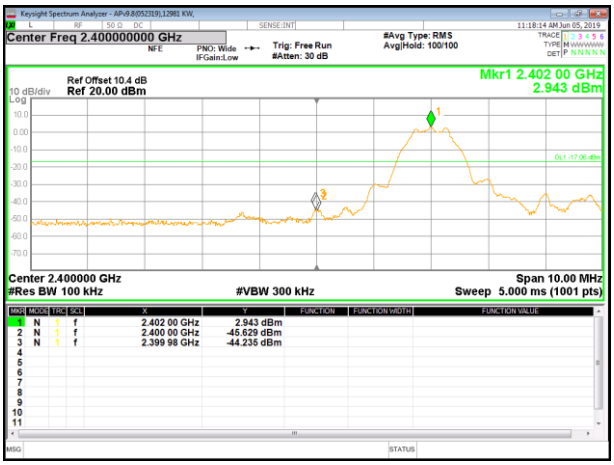
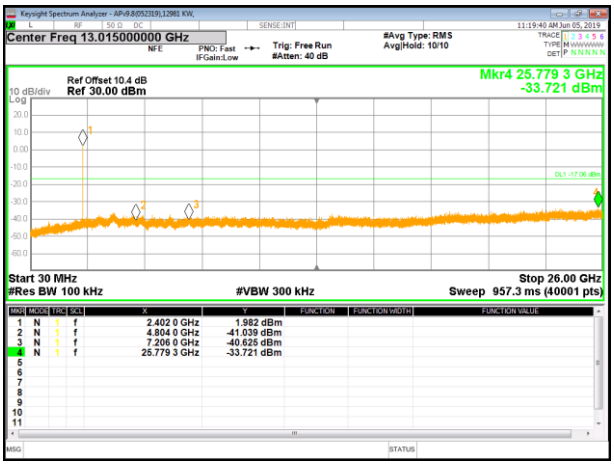
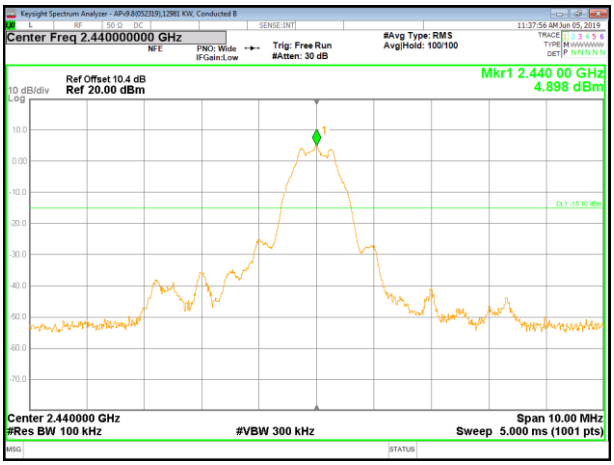
**RESULTS**



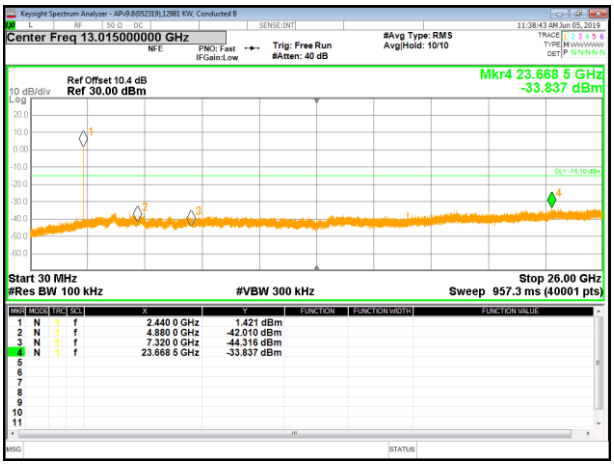

**LOW CHANNEL BANDEDGE**



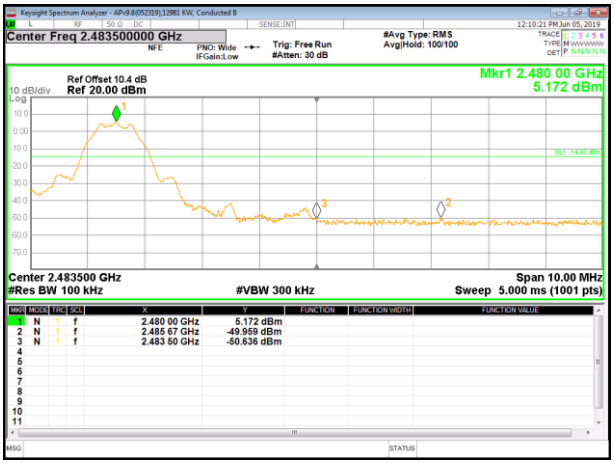

**OUT-OF-BAND LOW CHANNEL**



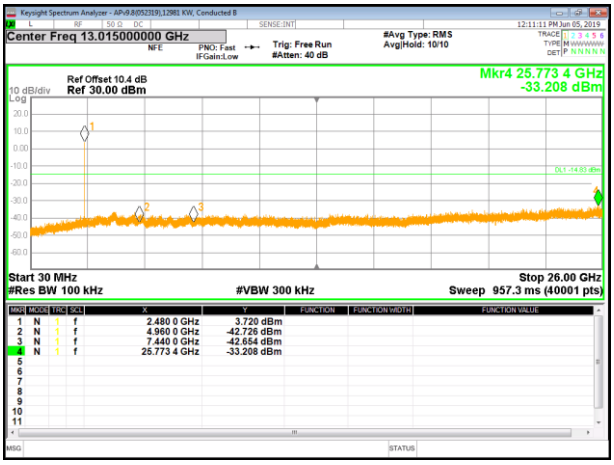

**IN-BAND REFERENCE LEVEL**




**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 |



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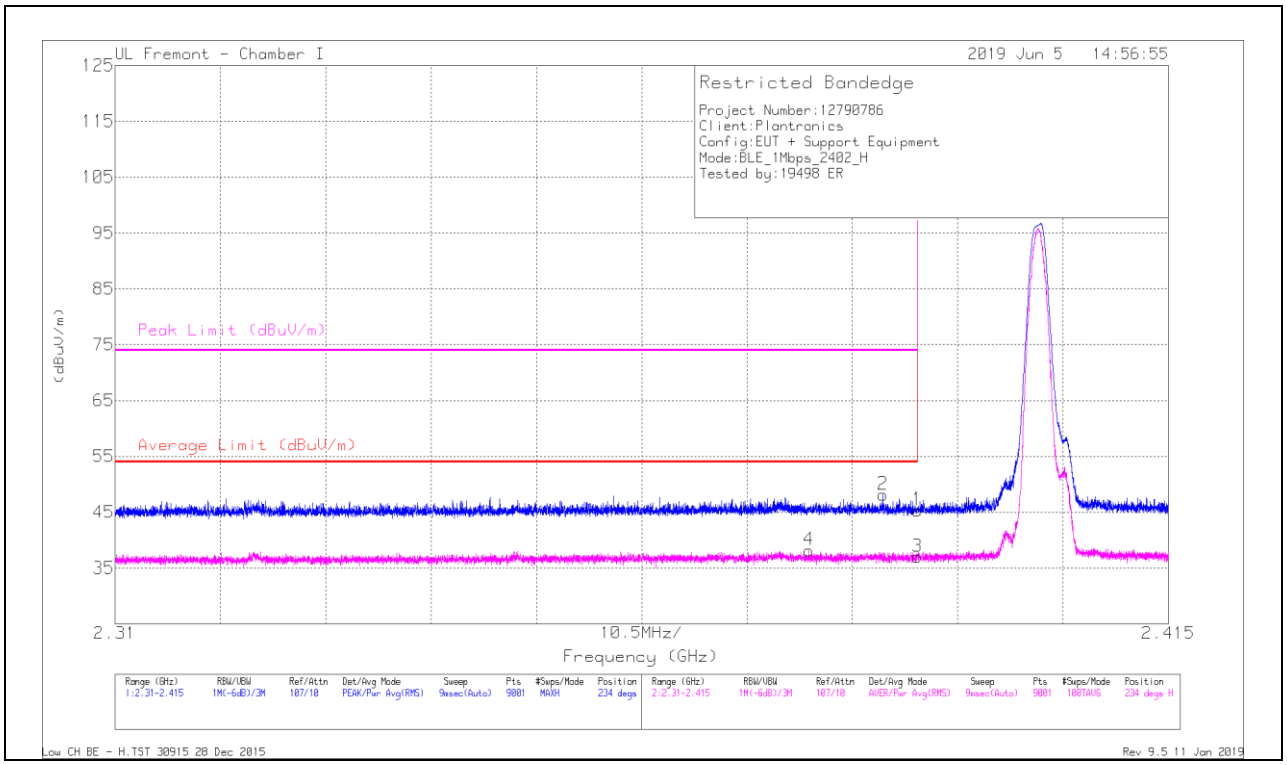
## 9.2. TRANSMITTER ABOVE 1 GHz

**Antenna 1**

## BANDEDGE (LOW CHANNEL)

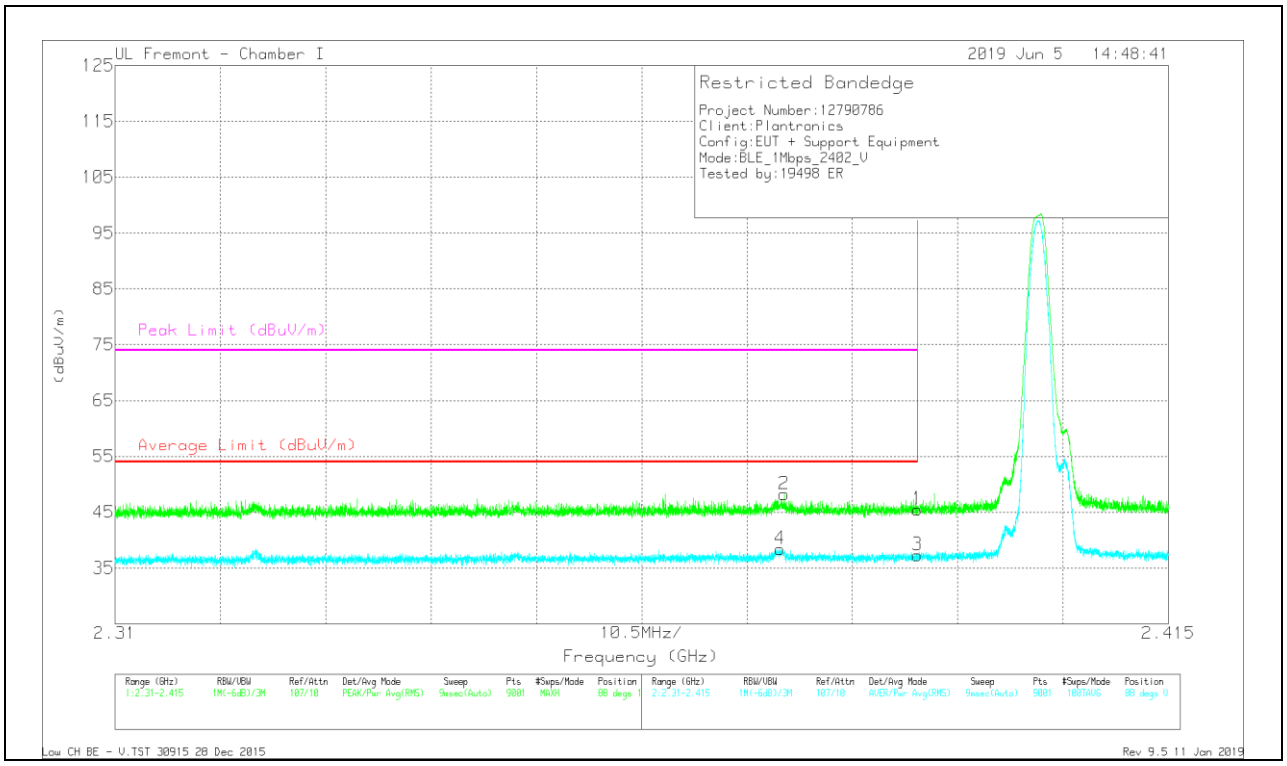
### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF PRE0190810 (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 | 38.04 | Pk | 28.9 | -21.6 | 0 | 45.34 | - | - | 74 | -28.66 | 234 | 115 | H |
| 2 | 2.387 | 40.84 | Pk | 28.9 | -21.6 | 0 | 48.14 | - | - | 74 | -25.86 | 234 | 115 | H |
| 3 | 2.39 | 27.69 | RMS | 28.9 | -21.6 | 1.87 | 36.86 | 54 | -17.14 | - | - | 234 | 115 | H |
| 4 | 2.379 | 28.77 | RMS | 28.9 | -21.5 | 1.87 | 38.04 | 54 | -15.96 | - | - | 234 | 115 | H |

Pk - Peak detector
RMS - RMS detection

## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF PRE0190810 (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 | 38.17 | Pk | 28.9 | -21.6 | 0 | 45.47 | - | - | 74 | -28.53 | 88 | 112 | V |
| 2 | 2.377 | 40.95 | Pk | 28.8 | -21.5 | 0 | 48.25 | - | - | 74 | -25.75 | 88 | 112 | V |
| 3 | 2.39 | 27.99 | RMS | 28.9 | -21.6 | 1.87 | 37.16 | 54 | -16.84 | - | - | 88 | 112 | V |
| 4 | 2.376 | 29.07 | RMS | 28.8 | -21.5 | 1.87 | 38.24 | 54 | -15.76 | - | - | 88 | 112 | V |

Pk - Peak detector
RMS - RMS detection



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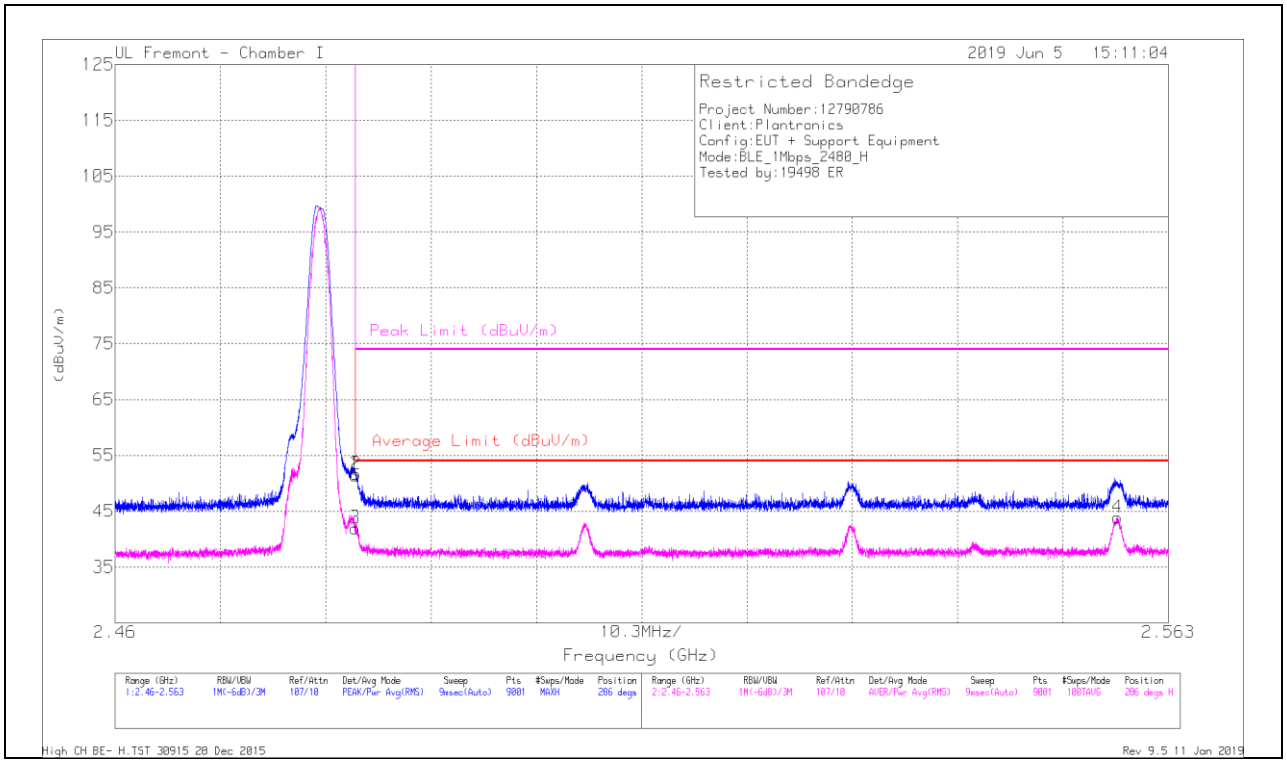
## BANDEDGE (HIGH CHANNEL)

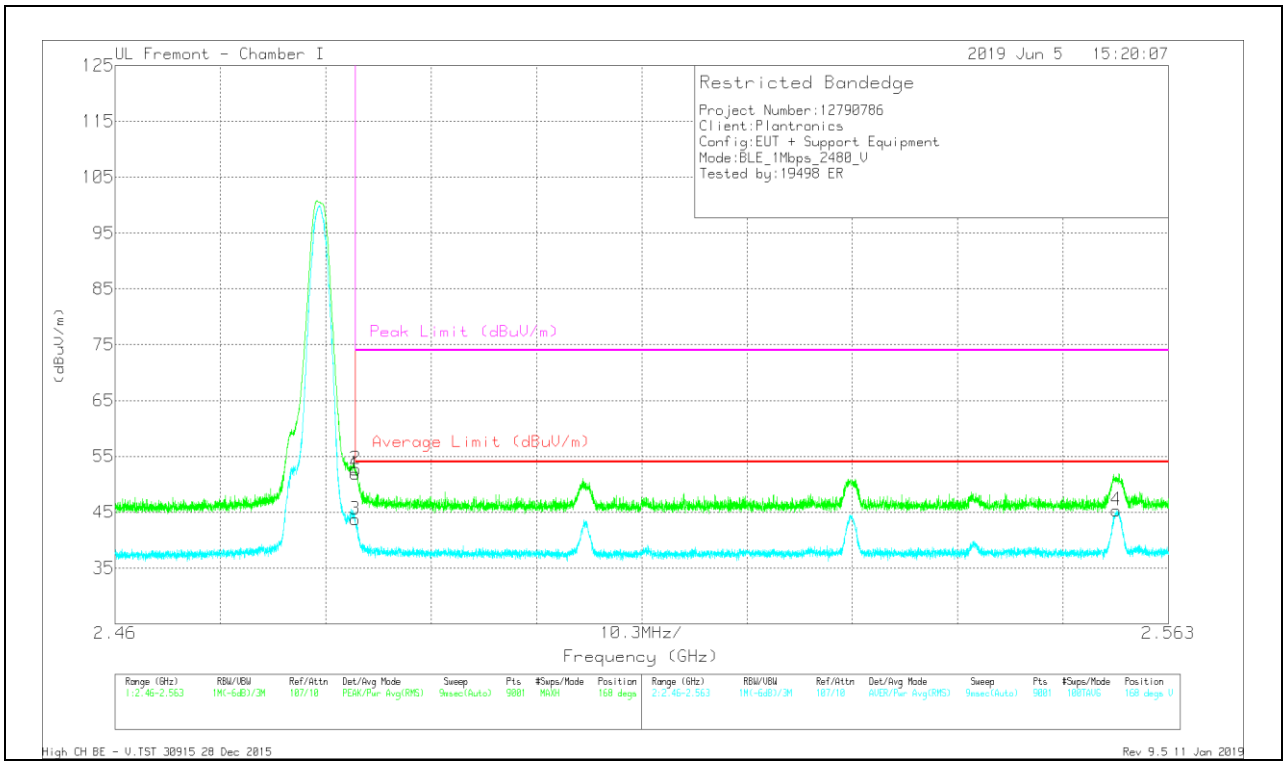
### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF PRE0190810 (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 | 43.73 | Pk | 29.4 | -21.7 | 0 | 51.43 | - | - | 74 | -22.57 | 286 | 105 | H |
| 2 | 2.484 | 43.93 | Pk | 29.4 | -21.7 | 0 | 51.63 | - | - | 74 | -22.37 | 286 | 105 | H |
| 3 | 2.484 | 32.2 | RMS | 29.4 | -21.7 | 1.87 | 41.77 | 54 | -12.23 | - | - | 286 | 105 | H |
| 4 | 2.558 | 33.81 | RMS | 29.6 | -21.6 | 1.87 | 43.68 | 54 | -10.32 | - | - | 286 | 105 | H |

Pk - Peak detector
RMS - RMS detection

## VERTICAL RESULT

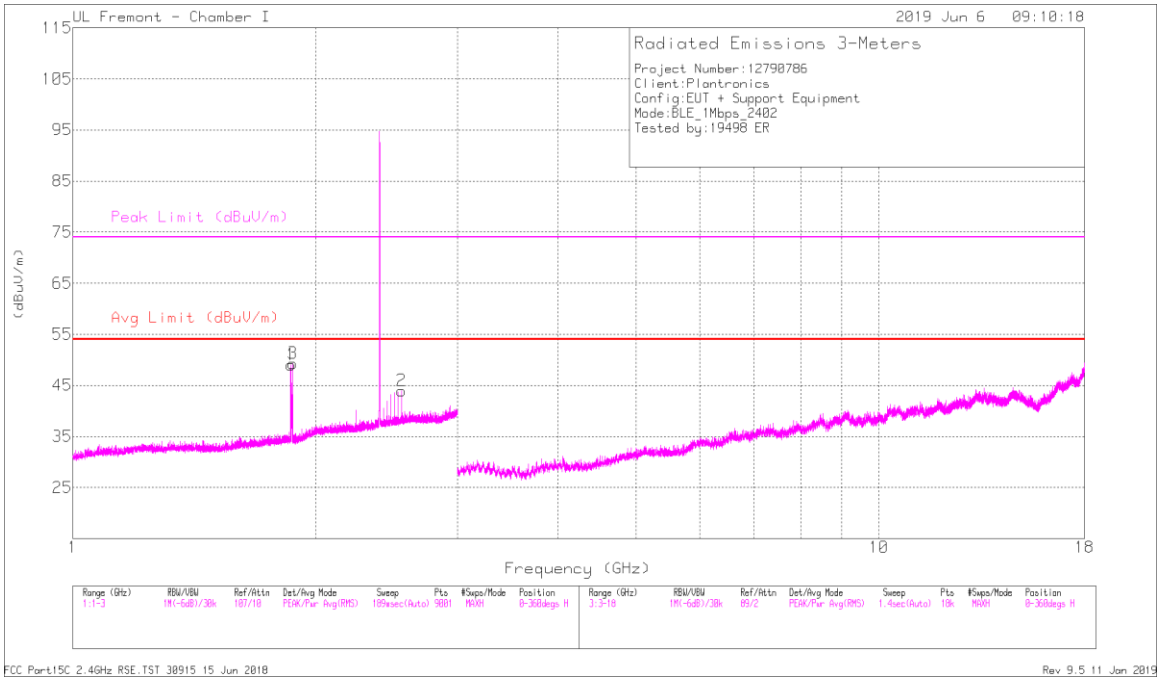



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF PRE0190810 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2.484 | 44.2 | Pk | 29.4 | -21.7 | 0 | 51.9 | - | - | 74 | -22.1 | 168 | 194 | V |
| 2 | 2.484 | 45.01 | Pk | 29.4 | -21.7 | 0 | 52.71 | - | - | 74 | -21.29 | 168 | 194 | V |
| 3 | 2.484 | 33.99 | RMS | 29.4 | -21.7 | 1.87 | 43.56 | 54 | -10.44 | - | - | 168 | 194 | V |
| 4 | 2.558 | 35.32 | RMS | 29.6 | -21.6 | 1.87 | 45.19 | 54 | -8.81 | - | - | 168 | 194 | V |

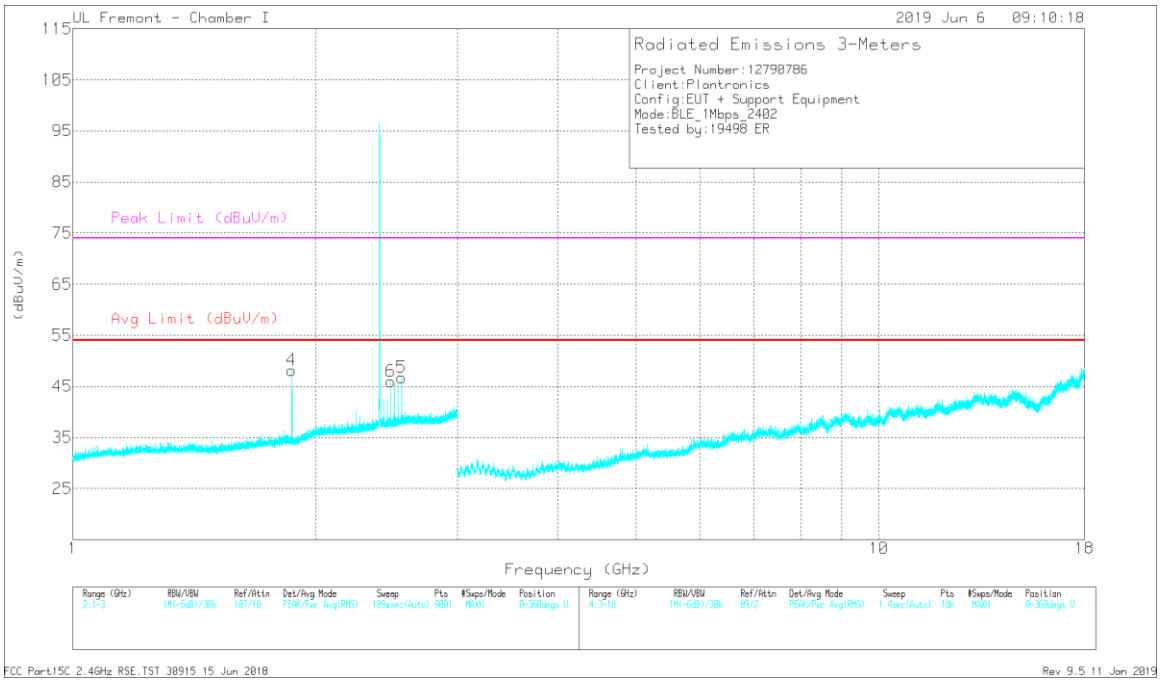
Pk - Peak detector
RMS - RMS detection

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**

## RADIATED EMISSIONS

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF PRE0190810 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.855 | 38.4 | PK2 | 26.3 | -22.3 | 0 | 42.4 | - | - | - | - | 190 | 164 | H |
| 2.558 | 41.1 | PK2 | 29.6 | -21.6 | 0 | 49.1 | - | - | - | - | 294 | 109 | H |
| 1.871 | 37.2 | PK2 | 26.4 | -22.3 | 0 | 41.3 | - | - | - | - | 123 | 233 | H |
| 1.867 | 38.45 | PK2 | 26.4 | -22.3 | 0 | 42.55 | - | - | - | - | 28 | 126 | V |
| 2.558 | 41.7 | PK2 | 29.6 | -21.6 | 0 | 49.7 | - | - | - | - | 51 | 101 | V |
| 2.48 | 42.47 | PK2 | 29.4 | -21.7 | 0 | 50.17 | - | - | - | - | 178 | 201 | V |

PK2 - KDB558074 Method: Maximum Peak

All points selected fell under non-restricted bands and are covered in RF conducted spurious testing.



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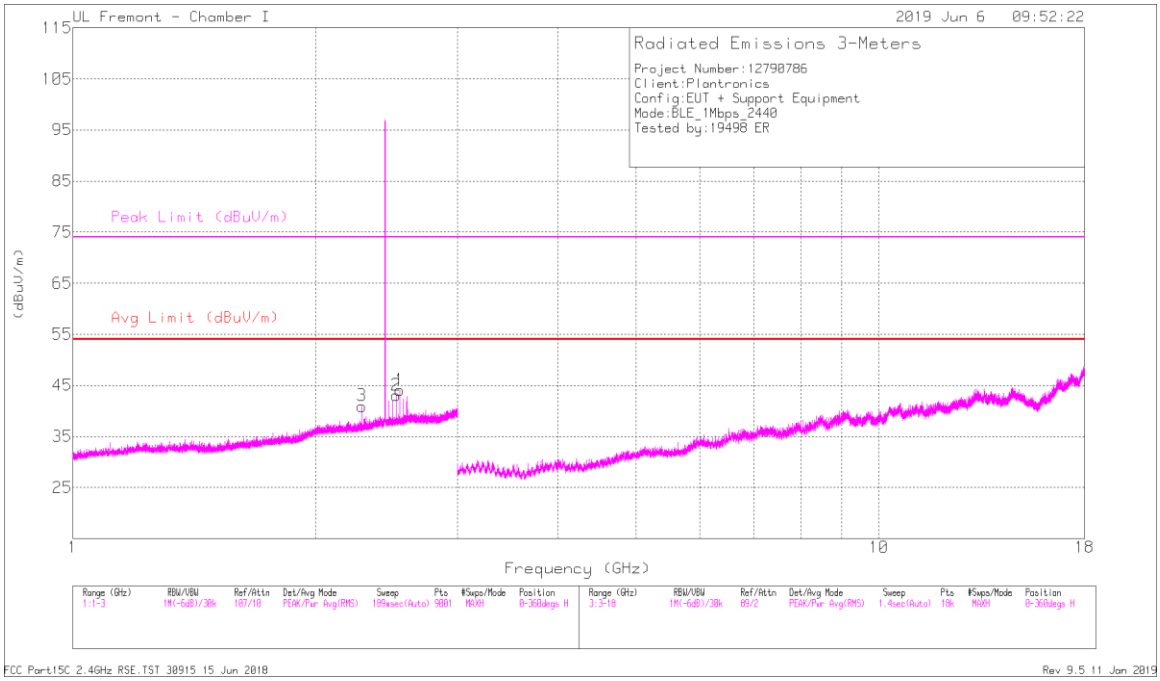
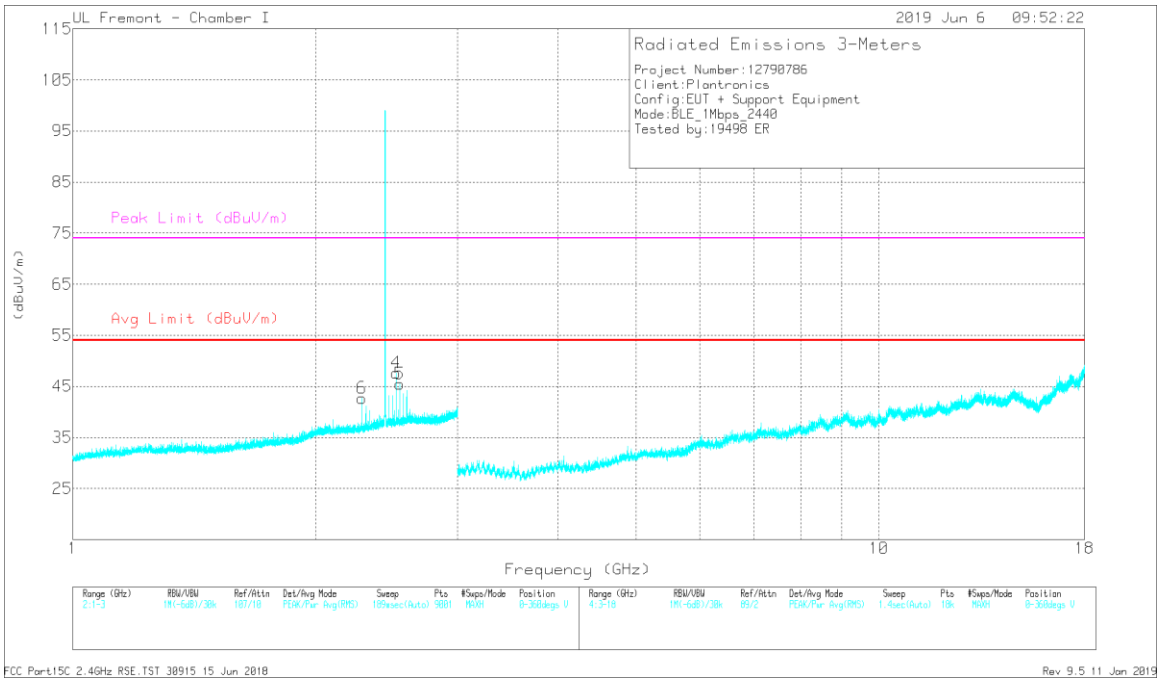
## MID CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**

## RADIATED EMISSIONS

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF PRE01908 10 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * 2.284 | 39.79 | PK2 | 28.2 | -21.5 | 0 | 46.49 | - | - | 74 | -27.51 | 307 | 387 | H |
| * 2.284 | 31.9 | MAv1 | 28.2 | -21.5 | 1.87 | 40.47 | 54 | -13.53 | - | - | 307 | 387 | H |
| 2.544 | 40.18 | PK2 | 29.6 | -21.8 | 0 | 47.98 | - | - | - | - | 252 | 247 | H |
| 2.518 | 41.61 | PK2 | 29.5 | -21.7 | 0 | 49.41 | - | - | - | - | 158 | 327 | H |
| * 2.284 | 41.09 | PK2 | 28.2 | -21.5 | 0 | 47.79 | - | - | 74 | -26.21 | 173 | 200 | V |
| * 2.284 | 34.14 | MAv1 | 28.2 | -21.5 | 1.87 | 42.71 | 54 | -11.29 | - | - | 173 | 200 | V |
| 2.518 | 42.32 | PK2 | 29.5 | -21.7 | 0 | 50.12 | - | - | - | - | 179 | 108 | V |
| 2.544 | 41.45 | PK2 | 29.6 | -21.8 | 0 | 49.25 | - | - | - | - | 178 | 174 | 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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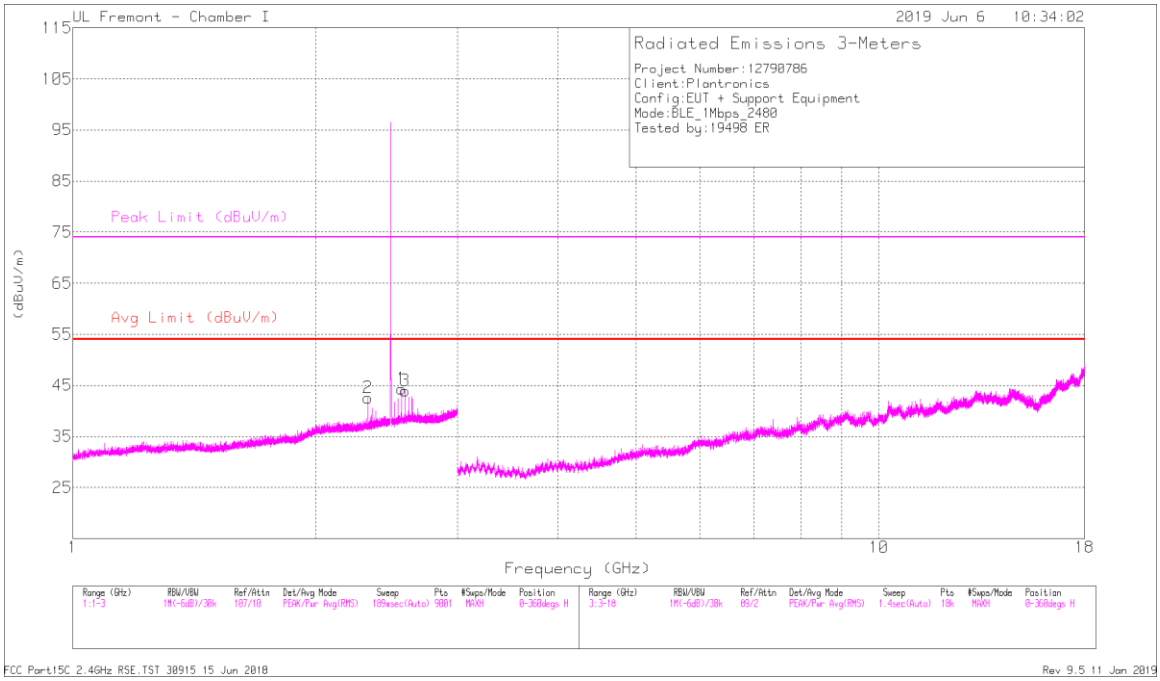
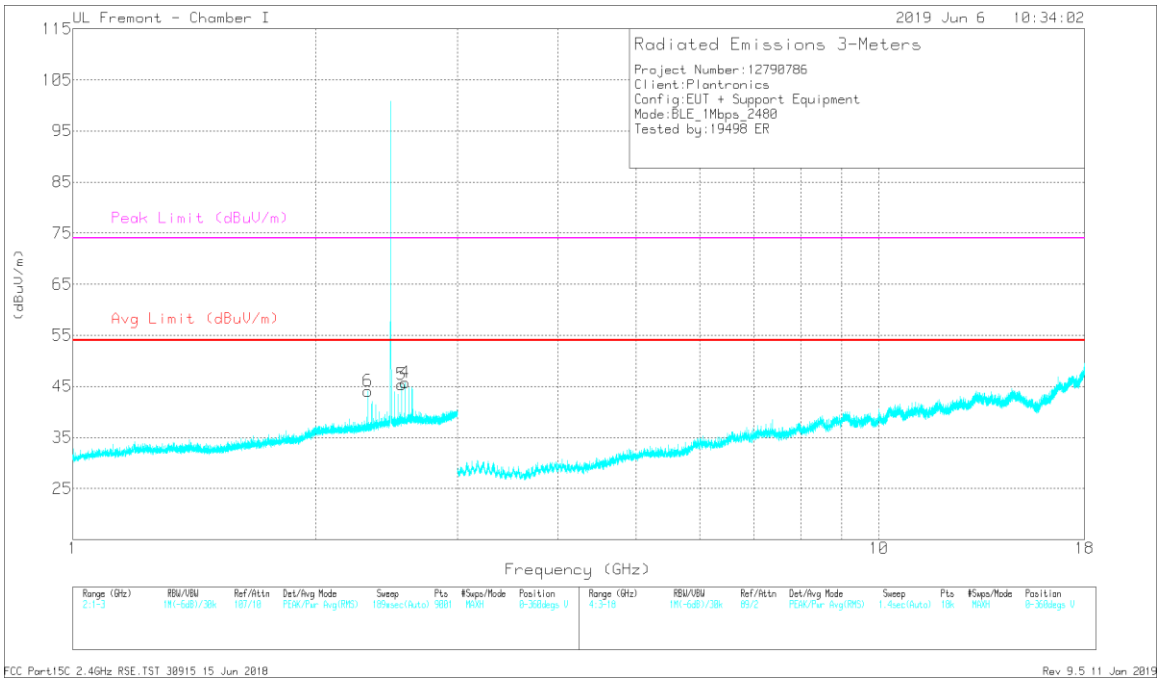
## HIGH CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**

## RADIATED EMISSIONS

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF PRE01908 10 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * 2.324 | 39.68 | PK2 | 28.4 | -21.5 | 0 | 46.58 | - | - | 74 | -27.42 | 247 | 207 | H |
| * 2.324 | 32.54 | MAv1 | 28.4 | -21.5 | 1.87 | 41.31 | 54 | -12.69 | - | - | 247 | 207 | H |
| 2.558 | 40.62 | PK2 | 29.6 | -21.6 | 0 | 48.62 | - | - | - | - | 243 | 199 | H |
| 2.584 | 40.05 | PK2 | 29.8 | -21.6 | 0 | 48.25 | - | - | - | - | 241 | 187 | H |
| * 2.324 | 40.72 | PK2 | 28.4 | -21.5 | 0 | 47.62 | - | - | 74 | -26.38 | 170 | 246 | V |
| * 2.324 | 33.53 | MAv1 | 28.4 | -21.5 | 1.87 | 42.3 | 54 | -11.7 | - | - | 170 | 246 | V |
| 2.584 | 41.72 | PK2 | 29.8 | -21.6 | 0 | 49.92 | - | - | - | - | 207 | 215 | V |
| 2.558 | 41.47 | PK2 | 29.6 | -21.6 | 0 | 49.47 | - | - | - | - | 192 | 131 | 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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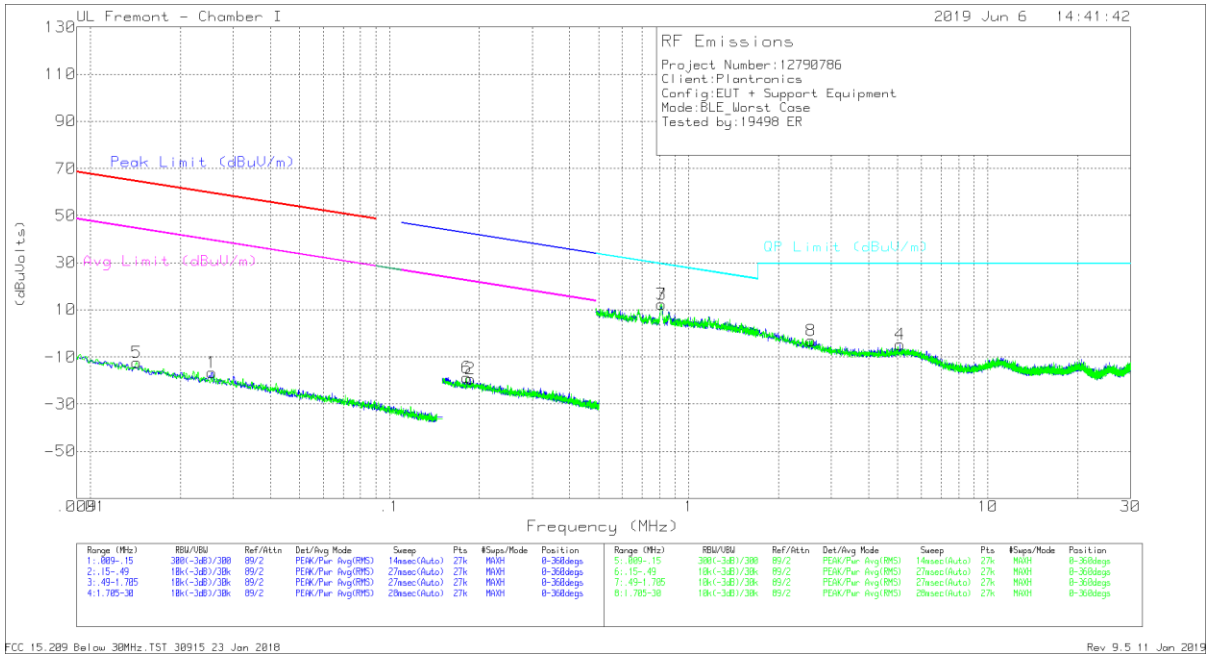
## 9.3. WORST CASE BELOW 30MHZ

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




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

## Below 30MHz Data

Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dB/m) | Cables (dB) | Dist Corr 300m | Corrected Reading (dBuVolts) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .02547 | 48.54 | Pk | 14.9 | 0 | -80 | -16.56 | 59.46 | -76.02 | 39.46 | -56.02 | 0-360 |
| 2 | .18643 | 46.8 | Pk | 13.8 | .1 | -80 | -19.3 | 42.21 | -61.51 | 22.21 | -41.51 | 0-360 |
| 5 | .01427 | 52.66 | Pk | 14.9 | 0 | -80 | -12.44 | 64.5 | -76.94 | 44.5 | -56.94 | 0-360 |
| 6 | .18105 | 47.28 | Pk | 13.8 | .1 | -80 | -18.82 | 42.46 | -61.28 | 22.46 | -41.28 | 0-360 |

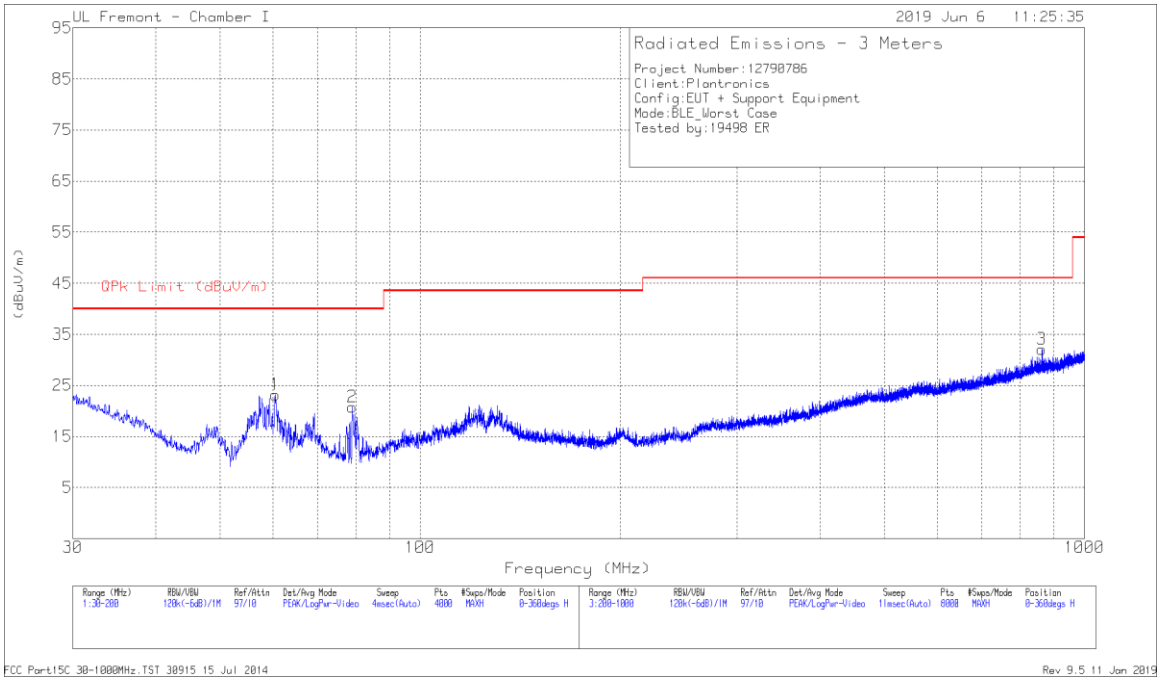
Pk - Peak detector

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dB/m) | Cables (dB) | Dist Corr 30m (dB) 40Log | Corrected Reading (dBuVolts) | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | .80959 | 38.32 | Pk | 13.9 | .1 | -40 | 12.32 | 29.45 | -17.13 | 0-360 |
| 4 | 5.08428 | 20.87 | Pk | 14.3 | .2 | -40 | -4.63 | 29.5 | -34.13 | 0-360 |
| 7 | .81002 | 38.38 | Pk | 13.9 | .1 | -40 | 12.38 | 29.45 | -17.07 | 0-360 |
| 8 | 2.56331 | 22.49 | Pk | 14.3 | .2 | -40 | -3.01 | 29.5 | -32.51 | 0-360 |

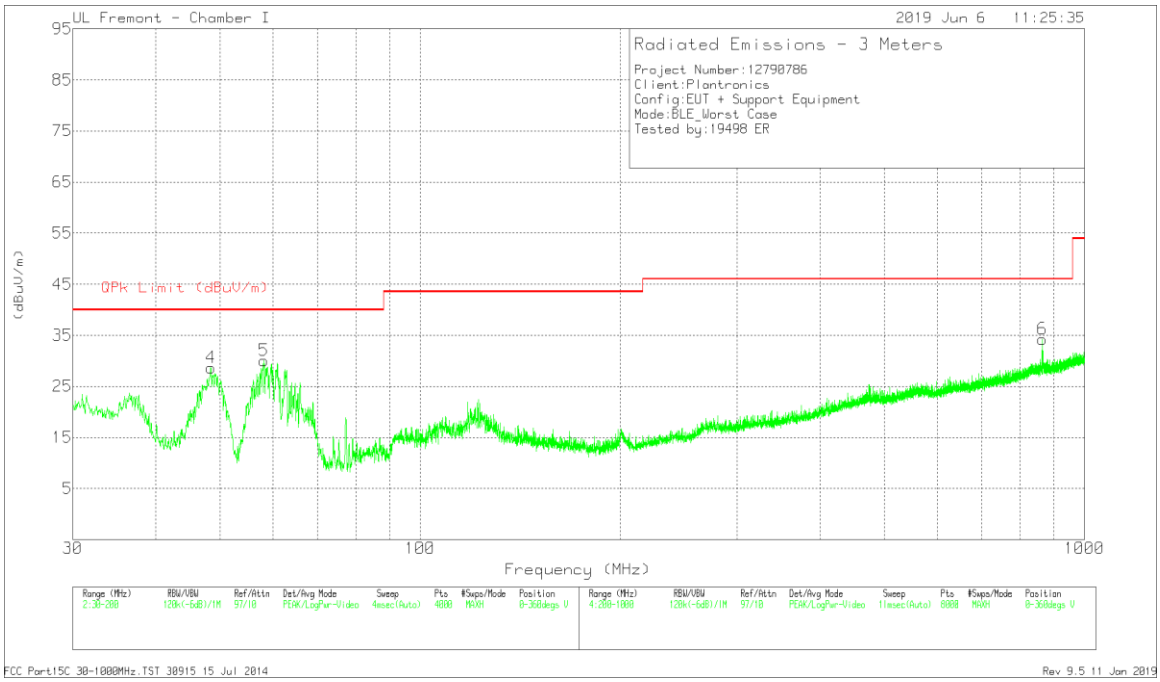
Pk - Peak detector

## 9.4. WORST CASE BELOW 1 GHZ

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




**HORIZONTAL**




**VERTICAL**

## Below 1GHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AF PRE0184971 (dB/m) | Amp Cbl (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 60.4804 | 40.94 | Pk | 13.2 | -31 | 23.14 | 40 | -16.86 | 0-360 | 300 | H |
| 2 | 79.0152 | 38.13 | Pk | 13.5 | -30.9 | 20.73 | 40 | -19.27 | 0-360 | 300 | H |
| 4 | 48.386 | 45.71 | Pk | 14.1 | -31.2 | 28.61 | 40 | -11.39 | 0-360 | 101 | V |
| 5 | 58.2273 | 47.96 | Pk | 13.1 | -31 | 30.06 | 40 | -9.94 | 0-360 | 101 | V |
| 3 | 862.6861 | 32.07 | Pk | 27.7 | -27.7 | 32.07 | 46.02 | -13.95 | 0-360 | 300 | H |
| 6 | 863.4862 | 34.18 | Pk | 27.7 | -27.7 | 34.18 | 46.02 | -11.84 | 0-360 | 102 | V |



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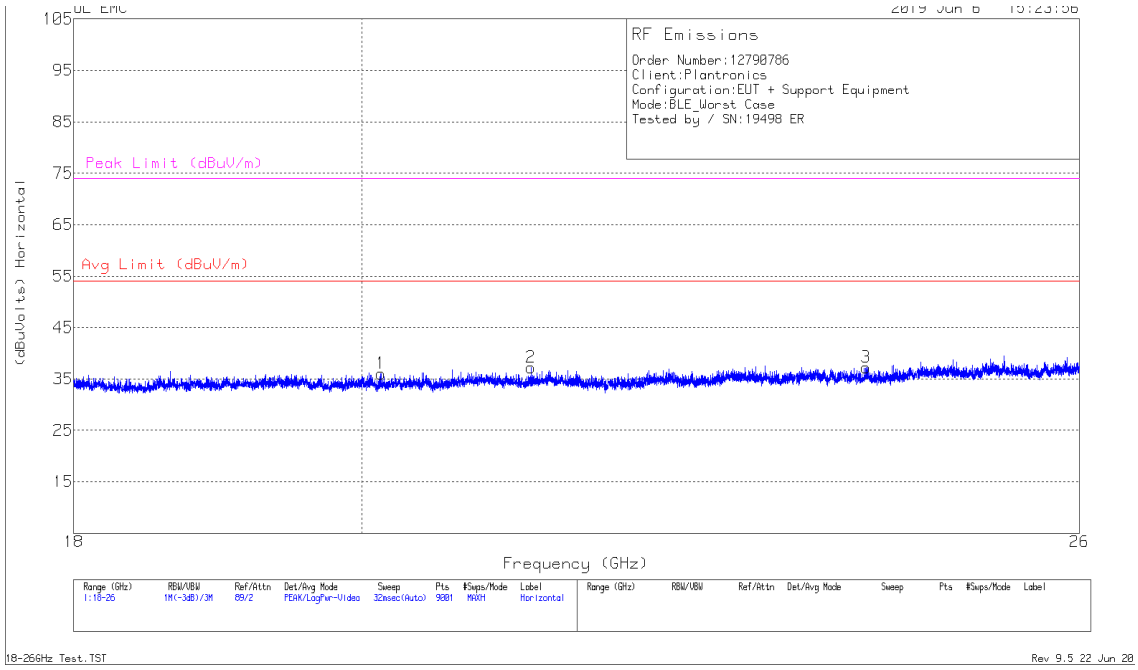
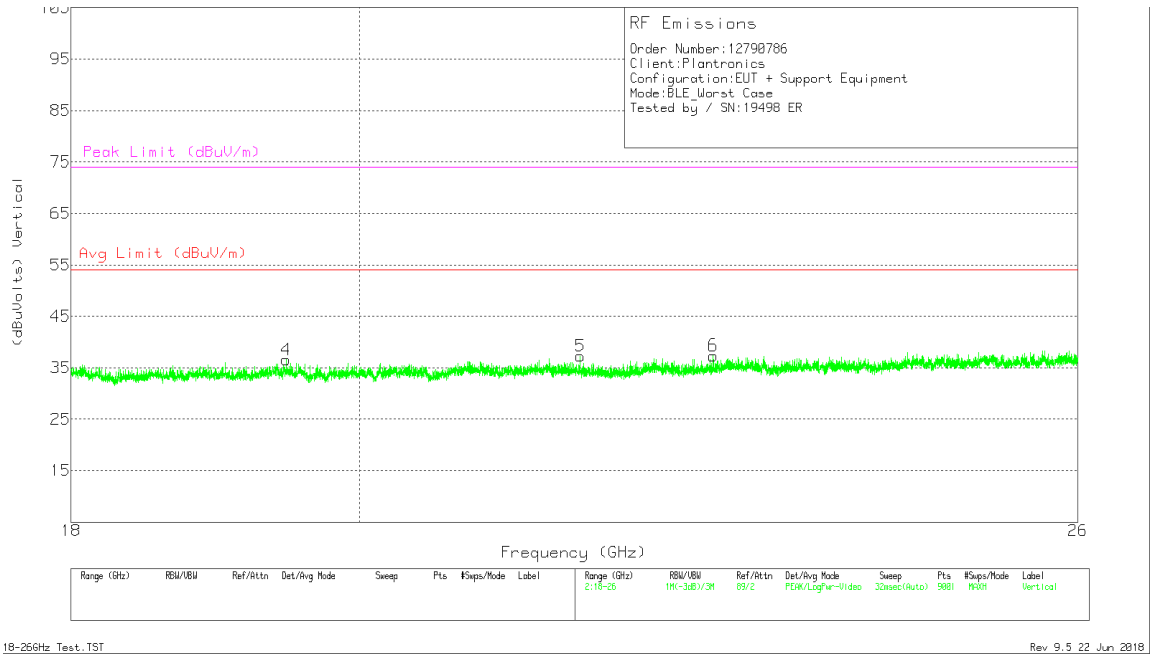
## 9.5. WORST CASE 18-26 GHZ

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




**HORIZONTAL**




**VERTICAL**

## 18 – 26GHz DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF PRE0182188 (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 | 20.14 | 68.85 | Pk | 33.5 | -56.8 | -9.5 | 36.05 | 54 | -17.95 | 74 | -37.95 |
| 2 | 21.275 | 70.52 | Pk | 33.5 | -57.3 | -9.5 | 37.22 | 54 | -16.78 | 74 | -36.78 |
| 3 | 24.048 | 68.65 | Pk | 34.6 | -56.5 | -9.5 | 37.25 | 54 | -16.75 | 74 | -36.75 |
| 4 | 19.472 | 69.86 | Pk | 33.4 | -57.2 | -9.5 | 36.56 | 54 | -17.44 | 74 | -37.44 |
| 5 | 21.678 | 70.46 | Pk | 33.9 | -57.6 | -9.5 | 37.26 | 54 | -16.74 | 74 | -36.74 |
| 6 | 22.757 | 70.34 | Pk | 34.2 | -57.7 | -9.5 | 37.34 | 54 | -16.66 | 74 | -36.66 |

Pk - Peak detector



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# 10. 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**



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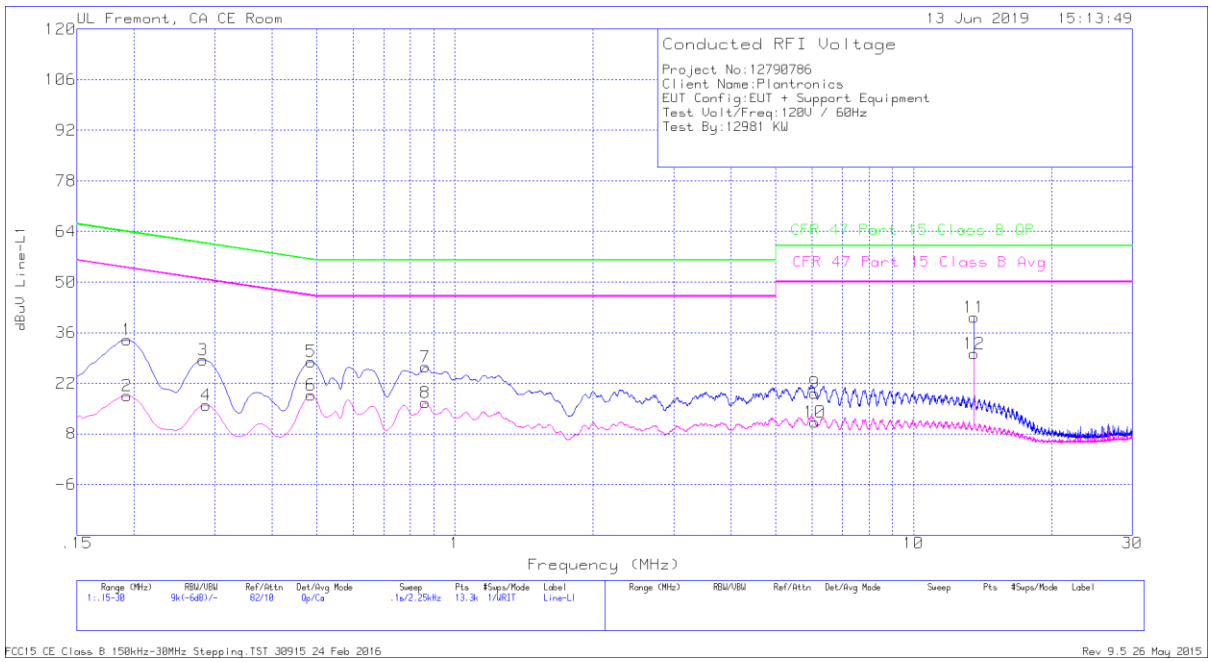
# LINE 1 RESULTS




| Range 1: Line-L1 .15 - 30MHz | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN L1 | LC Cables C1&C3 | Limiter (dB) | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | QP Margin (dB) | CFR 47 Part 15 Class B Avg | Av(CISPR )Margin (dB) |
| 1 | .19275 | 23.83 | Qp | 0 | 0 | 10.1 | 33.93 | 63.92 | -29.99 | - | - |
| 2 | .19275 | 8.42 | Ca | 0 | 0 | 10.1 | 18.52 | - | - | 53.92 | -35.4 |
| 3 | .28275 | 18.39 | Qp | 0 | 0 | 10.1 | 28.49 | 60.73 | -32.24 | - | - |
| 4 | .28725 | 5.9 | Ca | 0 | 0 | 10.1 | 16 | - | - | 50.6 | -34.6 |
| 5 | .48525 | 17.91 | Qp | 0 | 0 | 10.1 | 28.01 | 56.25 | -28.24 | - | - |
| 6 | .48525 | 8.65 | Ca | 0 | 0 | 10.1 | 18.75 | - | - | 46.25 | -27.5 |
| 7 | .86325 | 16.51 | Qp | 0 | 0 | 10.1 | 26.61 | 56 | -29.39 | - | - |
| 8 | .86325 | 6.46 | Ca | 0 | 0 | 10.1 | 16.56 | - | - | 46 | -29.44 |
| 9 | 6.0945 | 8.9 | Qp | 0 | .2 | 10.2 | 19.3 | 60 | -40.7 | - | - |
| 10 | 6.0945 | .85 | Ca | 0 | .2 | 10.2 | 11.25 | - | - | 50 | -38.75 |
| 11 | 13.56225 | 29.74 | Qp | .1 | .2 | 10.2 | 40.24 | 60 | -19.76 | - | - |
| 12 | 13.56 | 19.74 | Ca | .1 | .2 | 10.2 | 30.24 | - | - | 50 | -19.76 |

Qp - Quasi-Peak detector
Ca - CISPR average detection



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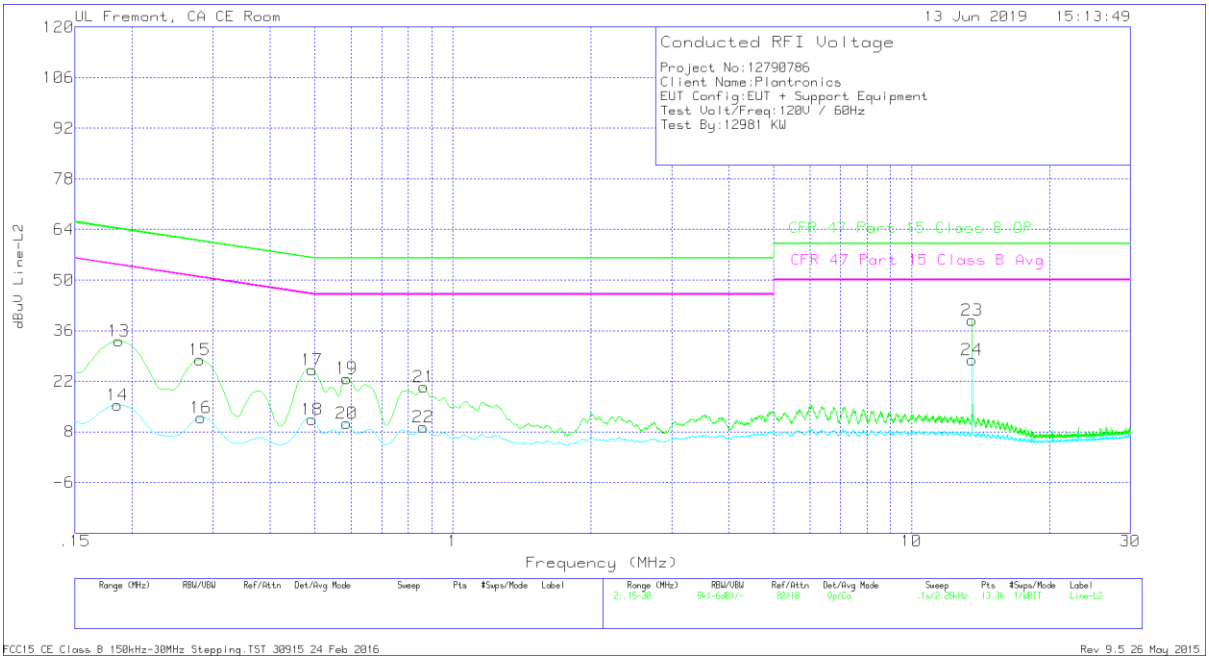
# LINE 2 RESULTS




| Range 2: Line-L2 .15 - 30MHz | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN L2 | LC Cables C2&C3 | Limiter (dB) | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | QP Margin (dB) | CFR 47 Part 15 Class B Avg | Av(CISPR )Margin (dB) |
| 13 | .18713 | 23.06 | Qp | 0 | 0 | 10.1 | 33.16 | 64.16 | -31 | - | - |
| 14 | .186 | 5.38 | Ca | 0 | 0 | 10.1 | 15.48 | - | - | 54.21 | -38.73 |
| 15 | .2805 | 17.78 | Qp | 0 | 0 | 10.1 | 27.88 | 60.8 | -32.92 | - | - |
| 16 | .28275 | 1.86 | Ca | 0 | 0 | 10.1 | 11.96 | - | - | 50.73 | -38.77 |
| 17 | .49425 | 15.11 | Qp | 0 | 0 | 10.1 | 25.21 | 56.1 | -30.89 | - | - |
| 18 | .49425 | 1.34 | Ca | 0 | 0 | 10.1 | 11.44 | - | - | 46.1 | -34.66 |
| 19 | .5865 | 12.69 | Qp | 0 | 0 | 10.1 | 22.79 | 56 | -33.21 | - | - |
| 20 | .5865 | .3 | Ca | 0 | 0 | 10.1 | 10.4 | - | - | 46 | -35.6 |
| 21 | .8655 | 10.29 | Qp | 0 | 0 | 10.1 | 20.39 | 56 | -35.61 | - | - |
| 22 | .861 | -.8 | Ca | 0 | 0 | 10.1 | 9.3 | - | - | 46 | -36.7 |
| 23 | 13.56225 | 28.39 | Qp | .1 | .2 | 10.2 | 38.89 | 60 | -21.11 | - | - |
| 24 | 13.56 | 17.35 | Ca | .1 | .2 | 10.2 | 27.85 | - | - | 50 | -22.15 |

Qp - Quasi-Peak detector
Ca - CISPR average detection



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