# CERTIFICATION TEST REPORT

**Report Number. :** 16U23816-E1V1

| | | |
|---|---|---|
| **Applicant** | : | APPLE, INC<br>1 INFINITE LOOP<br>CUPERTINO, CA 95014, U.S.A. |
| **Model** | : | A1671, A1821 |
| **FCC ID** | : | BCGA1671 |
| **IC** | : | 579C-A1671 |
| **EUT Description** | : | TABLET DEVICE |
| **Test Standard(s)** | : | FCC 47 CFR PART 15 SUBPART C<br>INDUSTRY CANADA RSS - 247 ISSUE 1 |

**Date Of Issue:**
February 21, 2017

**Prepared by:**
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NVLAP TESTING
NVLAP LAB CODE 200065-0

## Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| V1 | 02/21/2017 | Initial Issue | Chin Pang |


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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

**EUT DESCRIPTION:** TABLET DEVICE

**MODEL:** A1671, A1821

**SERIAL NUMBER:** DLXST016HPJQ (Conducted), DLXST00NHPJQ (Radiated)

**DATE TESTED:** NOVEMBER 28, 2016 – FEBRUARY 03, 2017

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| CFR 47 Part 15 Subpart C | Pass |
| INDUSTRY CANADA RSS-247 Issue 1 | Pass |
| INDUSTRY CANADA RSS-GEN Issue 4 | Pass |

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. 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 any government.

Approved & Released For
UL Verification Services Inc. By:

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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, KDB 558074 D01 v03r05, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 1.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, 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 |
|---|---|
| ☐ Chamber A (IC:2324B-1) | ☒ Chamber D (IC:2324B-4) |
| ☐ Chamber B (IC:2324B-2) | ☐ Chamber E (IC:2324B-5) |
| ☐ Chamber C (IC:2324B-3) | ☒ Chamber F (IC:2324B-6) |
| | ☐ Chamber G (IC:2324B-7) |
| | ☐ Chamber H (IC:2324B-8) |

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. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.


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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

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

## 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 | 3.15 dB |
| Worst Case Radiated Disturbance, 30 to 1000 MHz | 5.36 dB |
| Worst Case Radiated Disturbance, 1000 to 18000 MHz | 4.32 dB |
| Worst Case Radiated Disturbance, 18000 to 26000 MHz | 4.45 dB |
| Worst Case Radiated Disturbance, 26000 to 40000 MHz | 5.24 dB |

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


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# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT, model number, A1670, A1821 is a tablet with multimedia functions (music, application support, and video), Cellular GSM/GPRS/EGPRS/CDMA2000 1xRTT/1x Advanced/EVDO Rev.A /WCDMA /HSPA+/DC- HSDPA/LTE FDD & Carrier Aggregation/TDD/TD-SCDMA radio, IEEE 802.11a/b/g/n/ac radio, and Bluetooth radio. The rechargeable battery is not user accessible.

## 5.2. DESCRIPTION OF MODELS DIFFERENCES

Both Model A1671 and A1821 have identical PCB layout, design and functionality, except that A1671 supports second electronic-UICC based SIM or “soft SIM” (called eSIM) beside the regular UICC based SIM and A1821 will come with eSIM removed. RF and electromagnetic characteristic are independent of the eSIM element. Both Models have exactly same technology and band support. Model A1671 is used for EMC/RSE Testing and that data will be used for both Models

## 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 | 17.40 | 54.95 |

## 5.4. DESCRIPTION OF AVAILABLE ANTENNAS

| Frequency Band (GHz) | Antenna Gain (dBi) |
|---|---|
| 2.4 | -0.48 |

## 5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 14E232.


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## 5.6. WORST-CASE CONFIGURATION AND MODE

For below 1G, 18-26GHz radiated emission, and power line conducted 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 orientation.

Worst-case data rates as provided by the client were:
Based on the baseline scan, the worst-case data rates were:

BLE: 1 Mbps.

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.


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## 5.7. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Laptop | Apple | A1286 | 7313700NAGW | N/A |
| Laptop AC/DC adapter | Apple | A1343 | C062172045DDJ94A6 | N/A |
| Earphone | Apple | NA | NA | N/A |
| EUT AC/DC adapter | Apple | A1357 | W010A051 | N/A |

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

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| Cable No | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1 | Antenna | 1 | SMA | Un-Shielded | 0.2 | To spectrum Analyzer |
| 2 | USB | 1 | USB | Shielded | 1 | N/A |
| 3 | AC | 1 | AC | Un-shielded | 2 | N/A |

**I/O CABLES (RADIATED ABOVE 1 GHZ)**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| Cable No | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| None Used | | | | | | |

**I/O CABLES (RADIATED BELOW 1 GHZ AND AC LINE CONDUCTED: AC/DC ADAPTER CONFIGURATION)**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| Cable No | Port | # of identical | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1 | Earphone Jack | 1 | 3.5mm Audio | Shielded | 0.9 | N/A |
| 2 | USB | 1 | USB | shielded | 1 | N/A |

**I/O CABLES (AC LINE CONDUCTED: LAPTOP CONFIGUARTION)**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| Cable No | Port | # of identical | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1 | Earphone Jack | 1 | 3.5mm Audio | Shielded | 0.9 | N/A |
| 2 | USB | 1 | USB | Shielded | 1 | N/A |
| 3 | AC | 1 | AC | Un-shielded | 2 | N/A |


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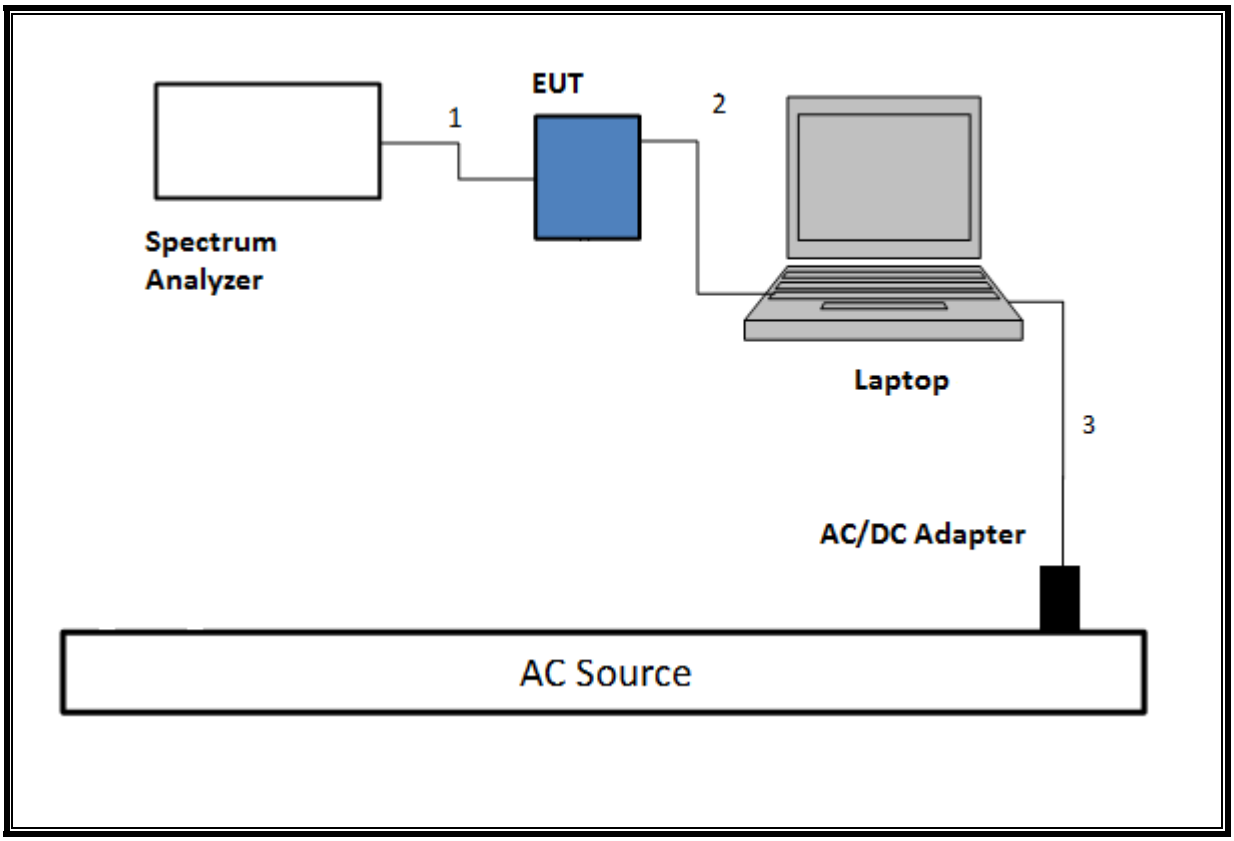
**TEST SETUP - CONDUCTED TESTS**

The EUT was connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

**SETUP DIAGRAM**





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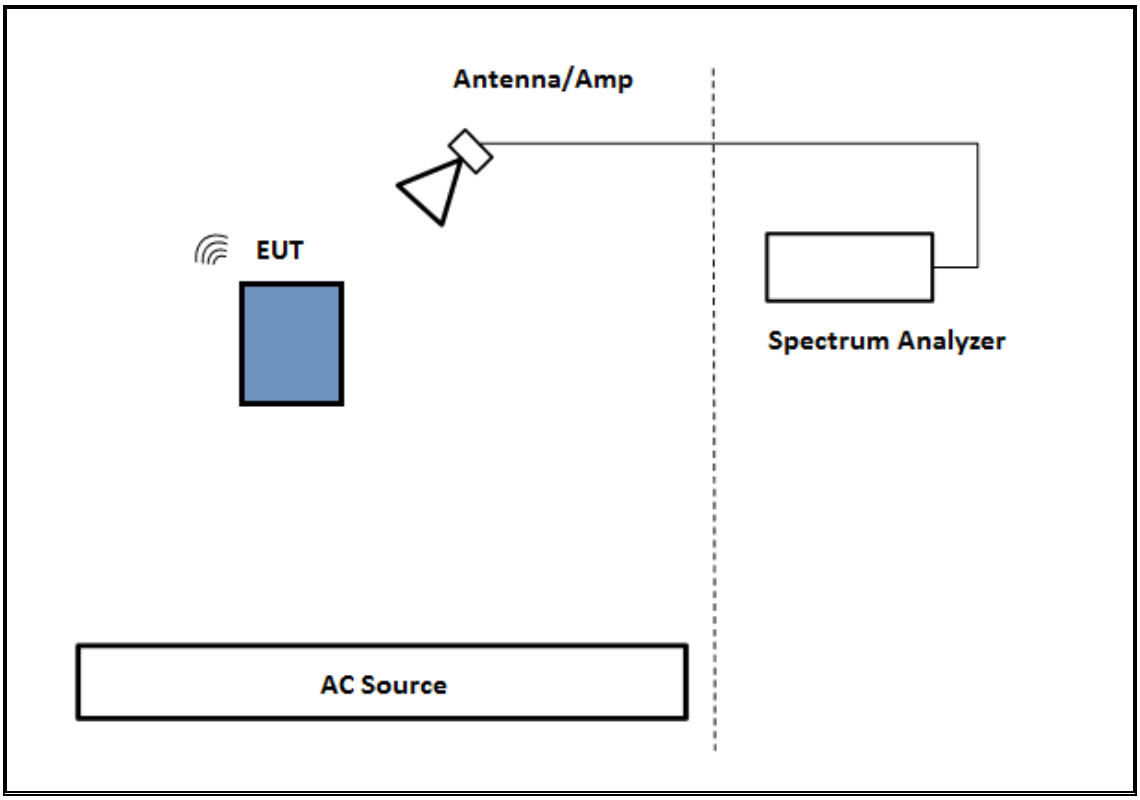
**TEST SETUP- RADIATED-ABOVE 1 GHZ**

The EUT was powered by battery. Test software exercised the EUT.

**SETUP DIAGRAM**





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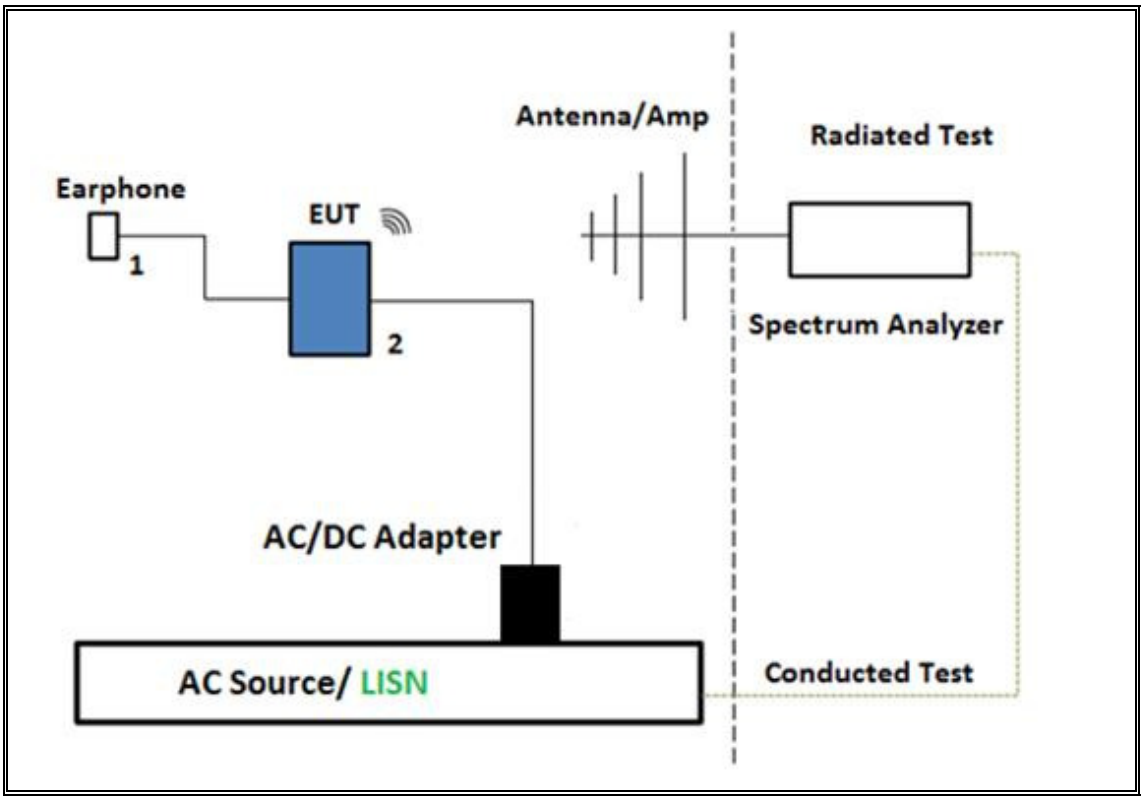
**TEST SETUP- BELOW 1GHz**

The EUT was powered by AC/DC adapter and connected with earphone. Test software exercised the EUT.

**SETUP DIAGRAM**





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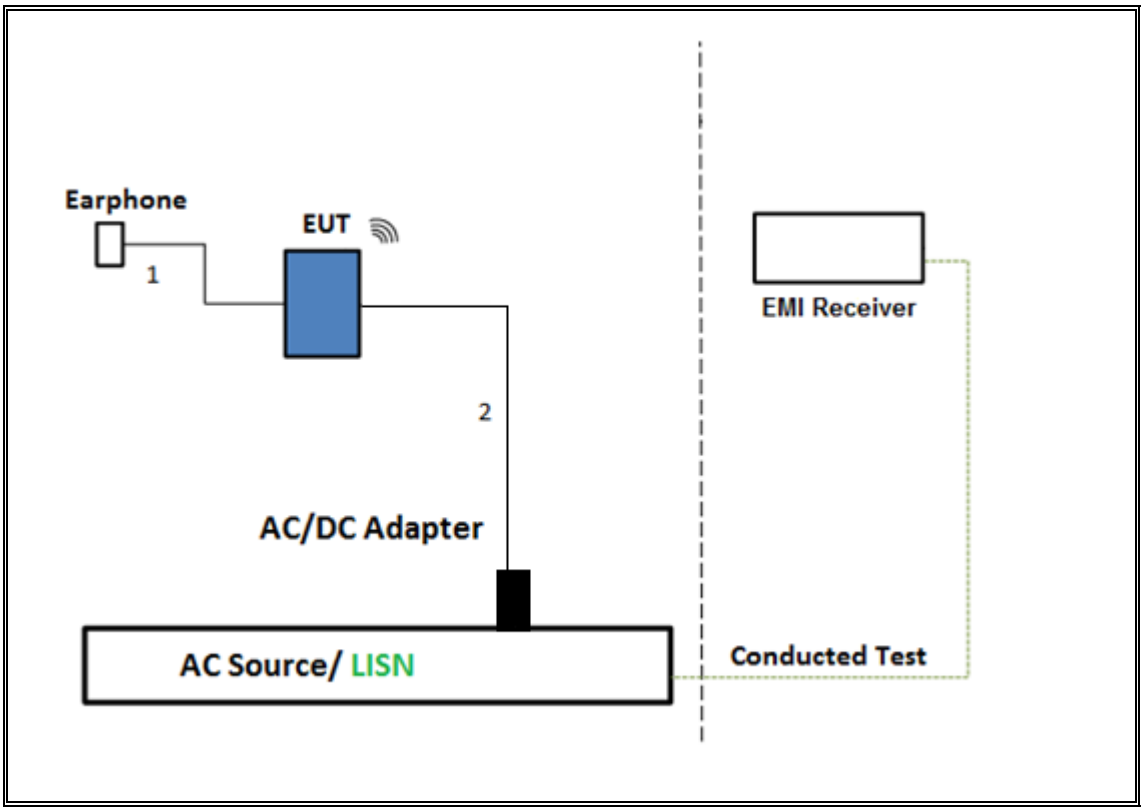
**TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER CONFIGURATION**

The EUT was tested with earphone connected and powered by AC/DC adapter via USB cable. Test software exercised the EUT.

**SETUP DIAGRAM**





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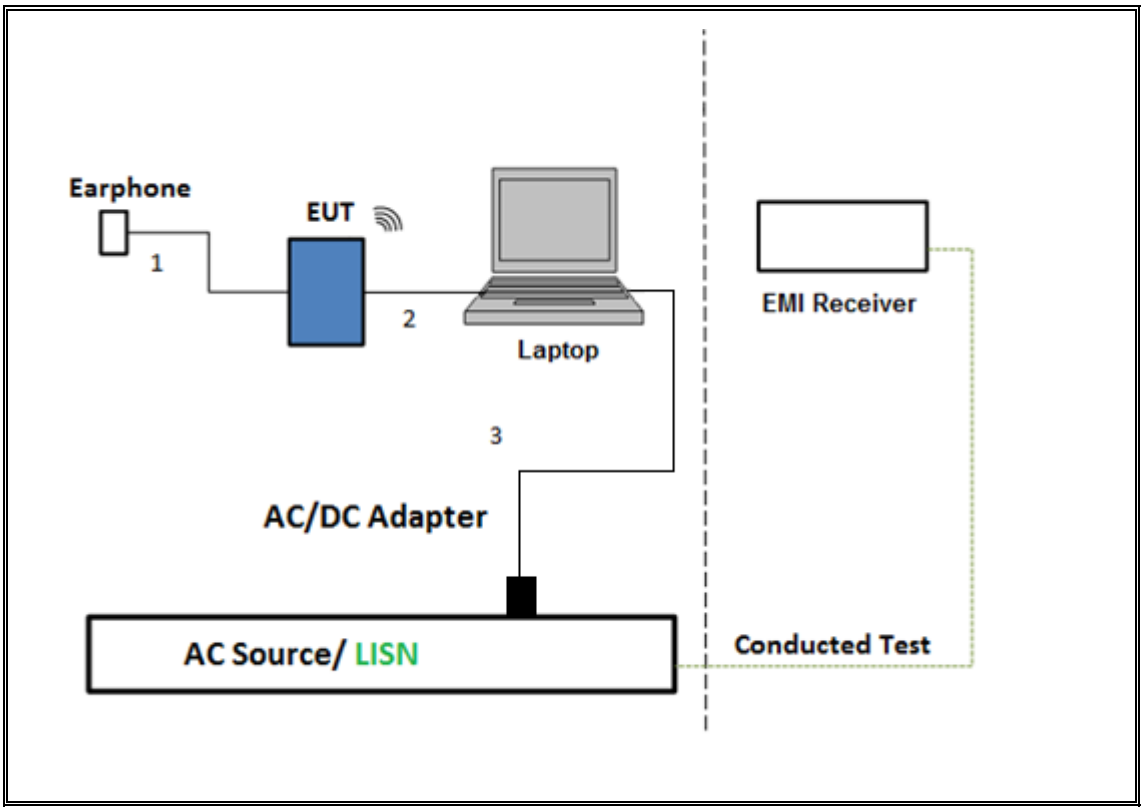
**TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION**

The EUT was tested with earphone connected and powered by host PC via USB cable. Test software exercised the EUT.

**SETUP DIAGRAM**





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# 6. 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, Horn 1-18GHz | ETS Lindgren | 3117 | T344 | 2/22/2017 |
| Antenna, Broadband Hybrid, 30MHz to 2000MHz | Sunol Sciences | JB3 | T407 | 4/4/2017 |
| Amplifier, 10KHz to 1GHz, 32dB | Sonoma | 310N | T286 | 5/4/2017 |
| Amplifier, 1 to 18GHz | Miteq | AFS42-00101800-25-S-42 | T740 | 11/29/2017 |
| Spectrum Analyzer, PXA 3Hz to 44GHz | Keysight | N9030A | T340 | 12/14/2017 |
| Antenna, Horn 1-18GHz | ETS Lindgren | 3117 | T120 | 04/5/2017 |
| Amplifier, 1 to 18GHz | Miteq | AFS42-00101800-25-S-42 | T742 | 11/29/2017 |
| Spectrum Analyzer, PXA 3Hz to 44GHz | Keysight | N9030A | T341 | 10/25/2017 |
| Antenna, Broadband Hybrid, 30MHz to 2000MHz | Sunol Sciences | JB3 | T899 | 05/26/2017 |
| Amplifier, 10KHz to 1GHz, 32dB | Sonoma | 310N | T834 | 06/17/2017 |
| Spectrum Analyzer, PXA 3Hz to 44GHz | Keysight | N9030A-544 | T1210 | 06/30/2017 |
| Power Meter, P-series single channel | Keysight | N1912A | T1244 | 05/03/2017 |
| Power Sensor | ETS LINDGREN | 7002-006 | T1126 | 02/10/2017 |
| Power Sensor, Peak and average, 50 MHz to 18 GHz, 5 MHz BW | HEWLET PACKARD | 8481A | T246 | 06/24/2017 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz | Keysight | N9030A | T339 | 09/22/2017 |
| Spectrum Analyzer | Keysight | 8564E | T106 | 09/07/2017 |
| Antenna, Horn 18 to 26.5GHz | ARA | MWH-1826/B | T447 | 06/16/2017 |
| Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum | Keysight | 8449B | T402 | 07/5/2017 |
| **AC Line Conducted** | | | | |
| *EMI Test Receiver 9Khz-7GHz | Rohde & Schwarz | ESCI7 | T1436 | 12/19/2016 |
| LISN for Conducted Emissions CISPR-16 | Fischer | 50/250-25-2-01 | T1310 | 06/08/2017 |
| Power Cable, Line Conducted Emissions | UL | PG1 | T861 | 9/1/2017 |
| **UL AUTOMATION SOFTWARE** | | | | |
| Radiated Software | UL | UL EMC | Ver 9.5, April 26, 2016 | |
| Conducted Software | UL | UL EMC | Ver 5.4, October 13, 2016 | |
| AC Line Conducted Software | UL | UL EMC | Ver 9.5, May 26, 2015 | |

NOTE: *testing is completed before equipment calibration expiration date.


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# 7. ANTENNA PORT TEST RESULTS

## 7.1. MEASUREMENT METHODS

6 dB BW: KDB 558074 D01 v03r05, Section 8.1.

Output Power: KDB 558074 D01 v03r05, Section 9.1.2.

Power Spectral Density: KDB 558074 D01 v03r05, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v03r05, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v03r05, Section 12.1.

Band-edge: KDB 558074 D01 v03r05, Section 12.1.


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## 7.2. ON TIME, 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) |
|---|---|---|---|---|---|---|
| BLE High Power | 1.000 | 1.000 | 1.000 | 100% | 0.00 | 0.010 |
| BLE Low Power | 1.000 | 1.000 | 1.000 | 100% | 0.00 | 0.010 |


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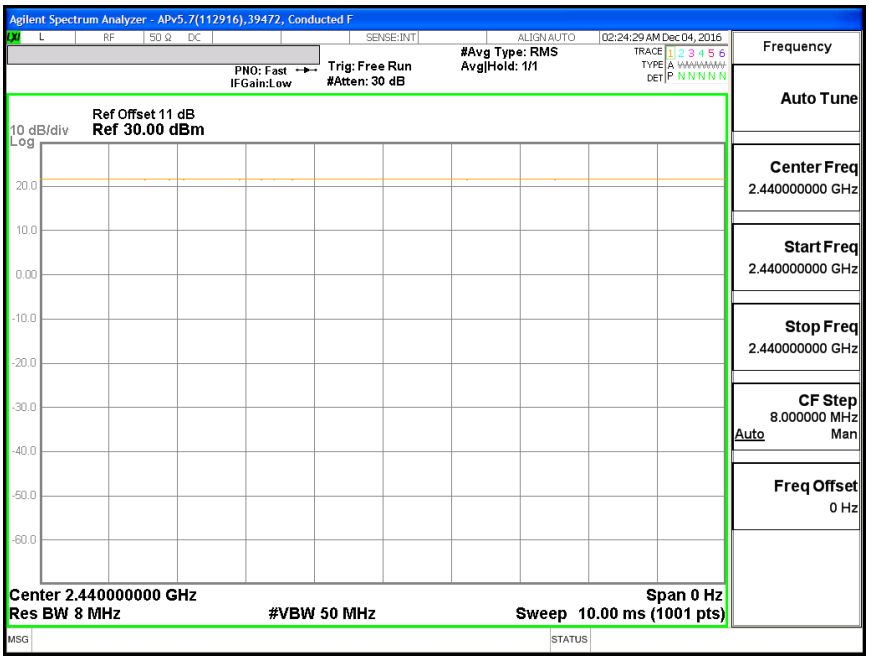
**DUTY CYCLE PLOTS**

DUTY CYCLE BLE HIGH POWER MODE




DUTY CYCLE BLE LOW POWER MODE

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## 7.3. HIGH POWER MODE

### 7.3.1. 6 dB BANDWIDTH

**LIMITS**

FCC §15.247 (a) (2)

IC RSS-247 (5.2) (1)

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

**RESULTS**

| Channel | Frequency | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2402 | 0.686 | 0.5 |
| Middle | 2440 | 0.688 | 0.5 |
| High | 2480 | 0.716 | 0.5 |


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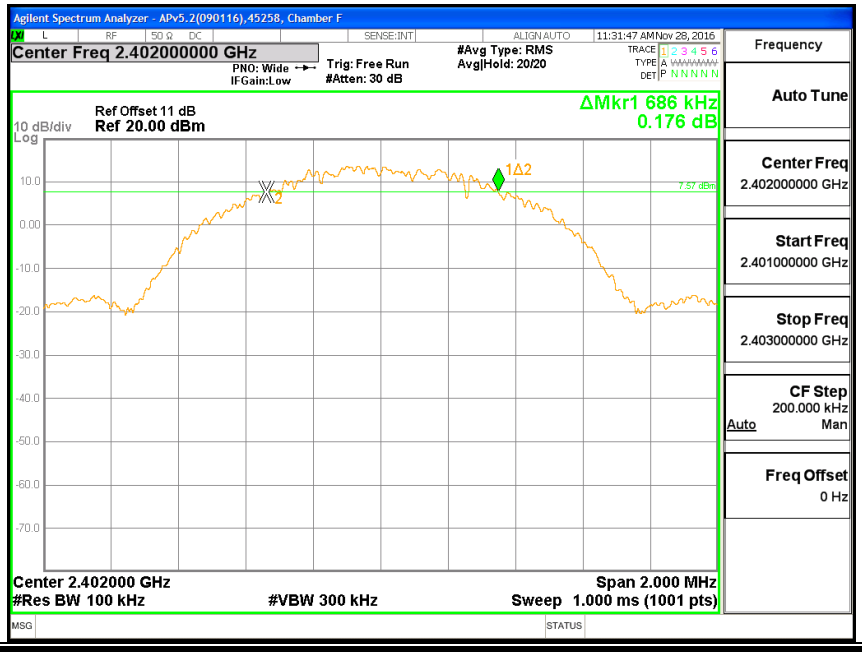
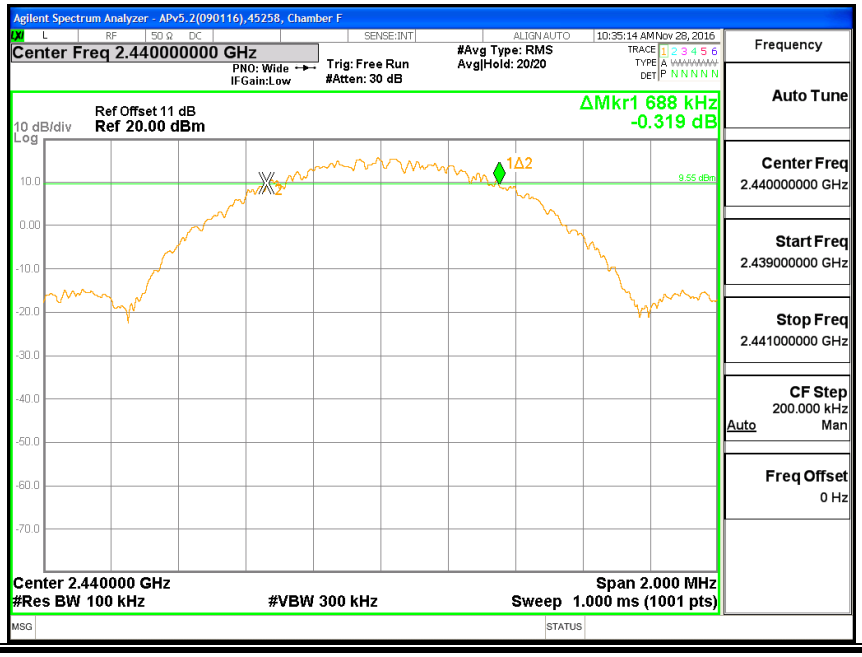
6dB LOW CH




6dB MID CH





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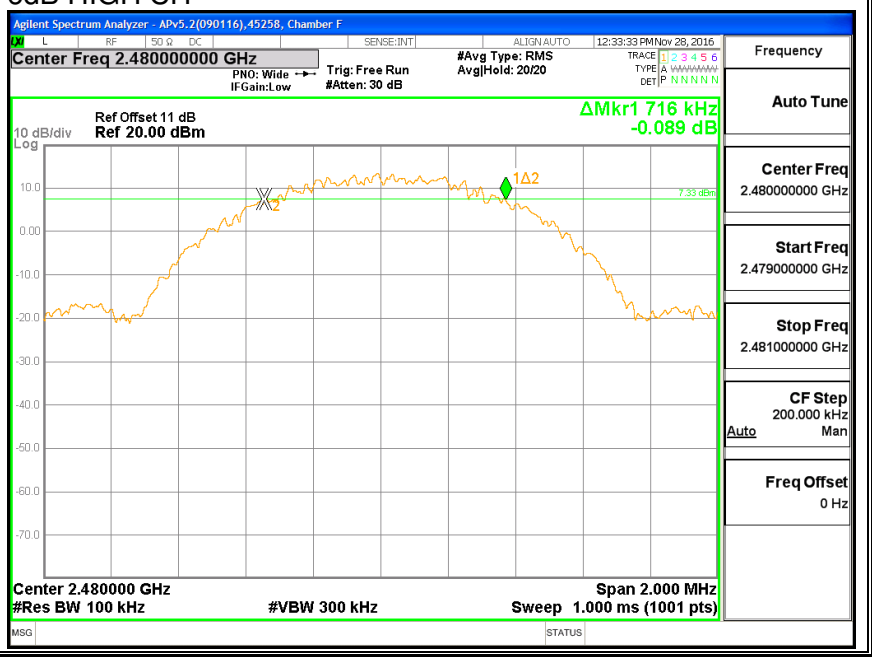
6dB HIGH CH





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### 7.3.2. 99% BANDWIDTH

**LIMITS**

None; for reporting purposes only.

**Test Procedure**

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

**RESULTS**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2402 | 1.0596 |
| Middle | 2440 | 1.0574 |
| High | 2480 | 1.0579 |


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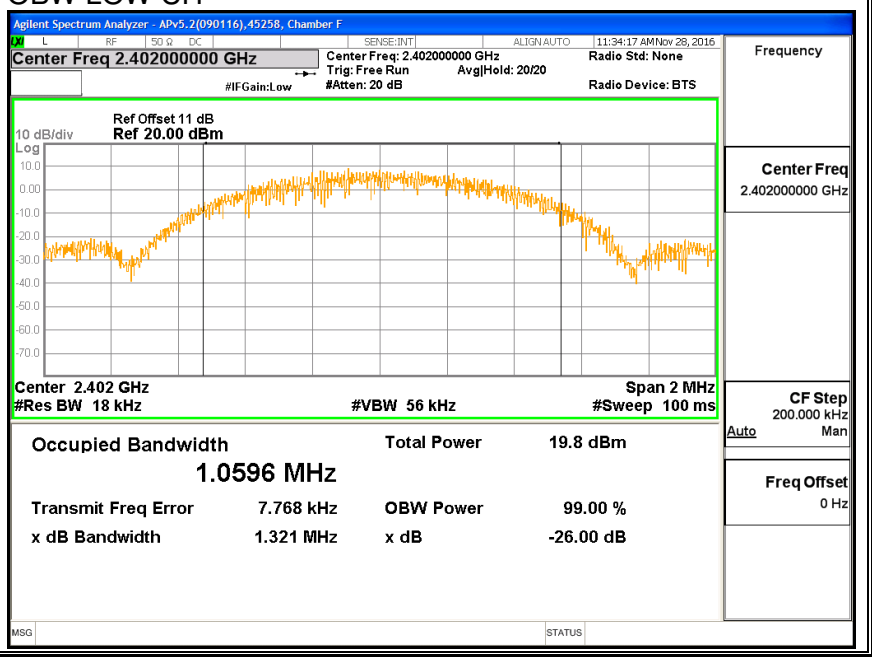
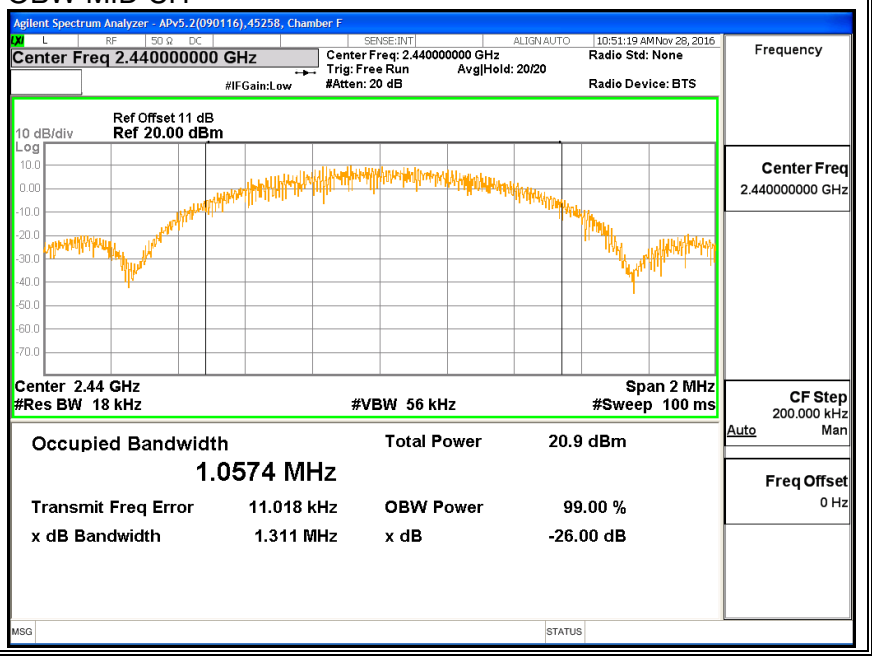
OBW LOW CH




OBW MID CH





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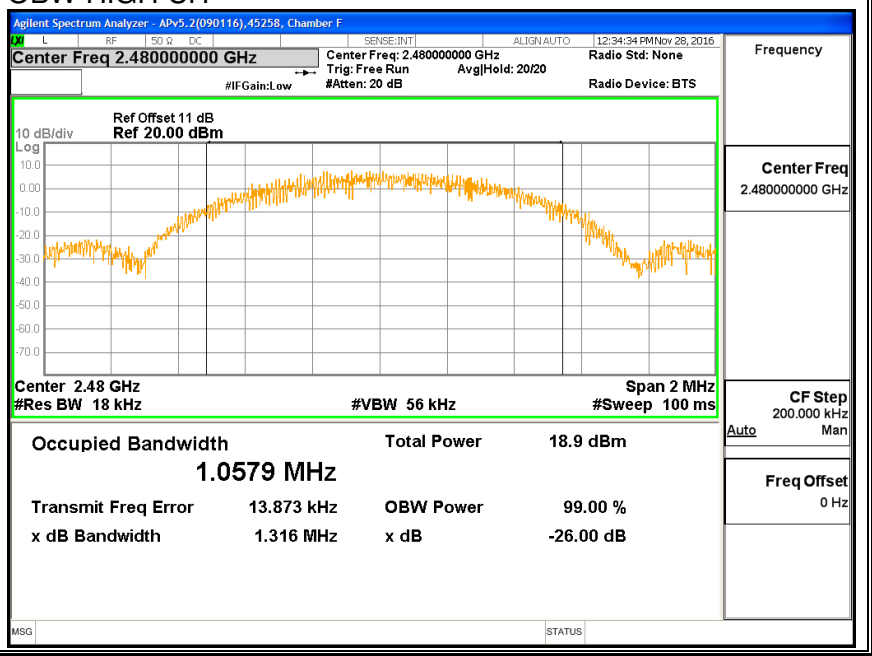
OBW HIGH CH





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### 7.3.3. AVERAGE POWER

| ID: | 39316 | Date: | 2/03/2017 |
|---|---|---|---|

**LIMITS**

None; for reporting purposes only.

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**RESULTS**

| Channel | Frequency (MHz) | AV Power (dBm) |
|---|---|---|
| Low | 2402 | 16.80 |
| Middle | 2440 | 16.81 |
| High | 2480 | 16.54 |


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### 7.3.4. OUTPUT POWER

| ID: | 39316 | Date: | 2/03/2017 |
|---|---|---|---|

**LIMITS**

FCC §15.247 (b)

IC RSS-247 (5.4) (4)

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

**RESULTS**

| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 17.30 | 30 | -10.15 |
| Middle | 2440 | 17.40 | 30 | -9.90 |
| High | 2480 | 17.00 | 30 | -12.99 |


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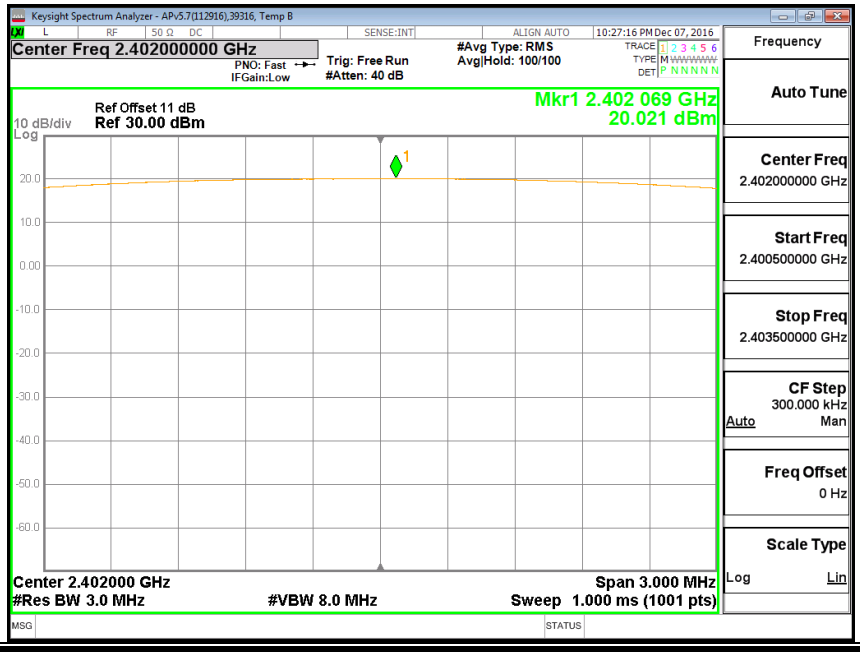
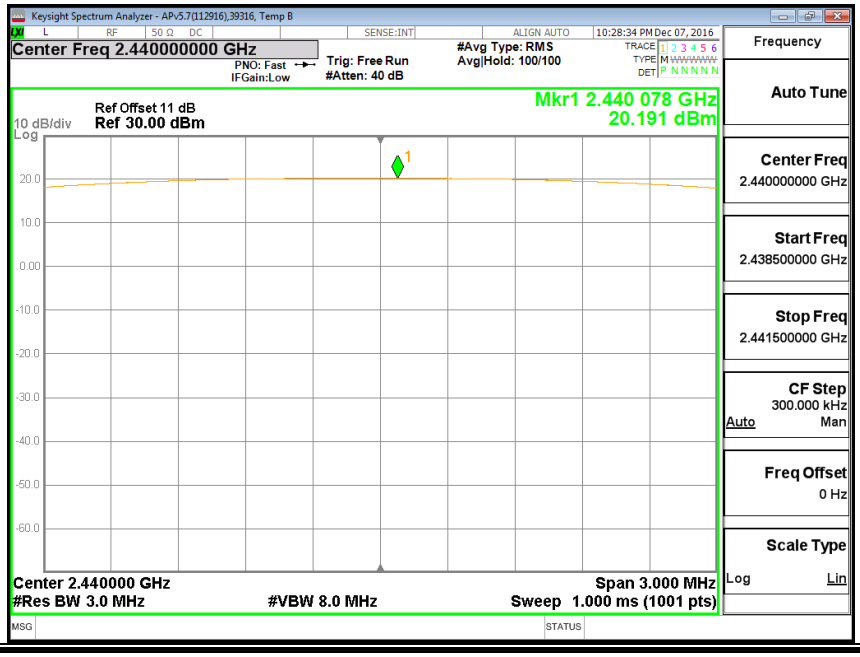
CHPOW LOW CH




CHPOW MID CH





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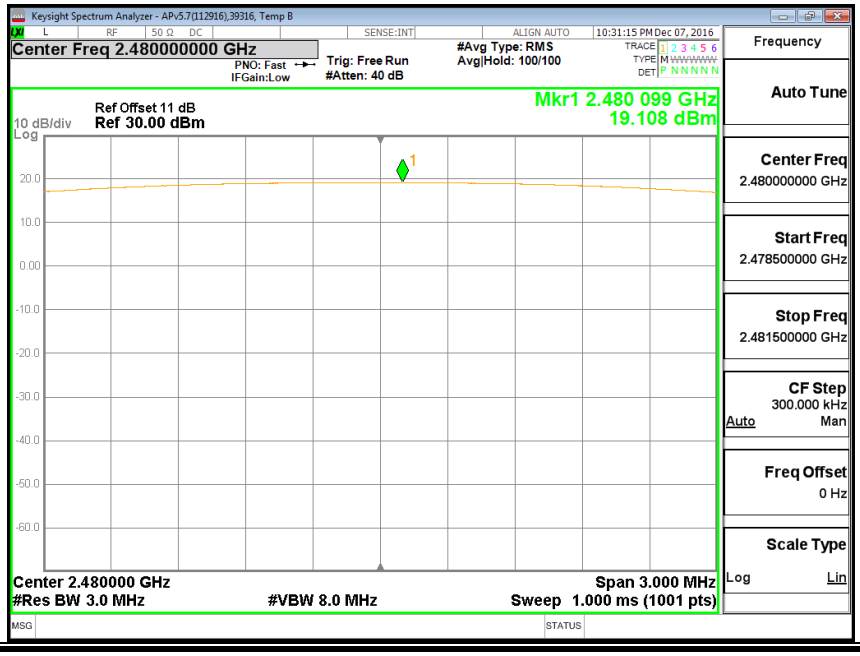
CHPOW HIGH CH





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### 7.3.5. POWER SPECTRAL DENSITY

**LIMITS**

FCC §15.247 (e)

IC RSS-247 (5.2) (2)

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) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 3.289 | 8 | -4.711 |
| Middle | 2440 | 4.491 | 8 | -3.509 |
| High | 2480 | 2.548 | 8 | -5.452 |


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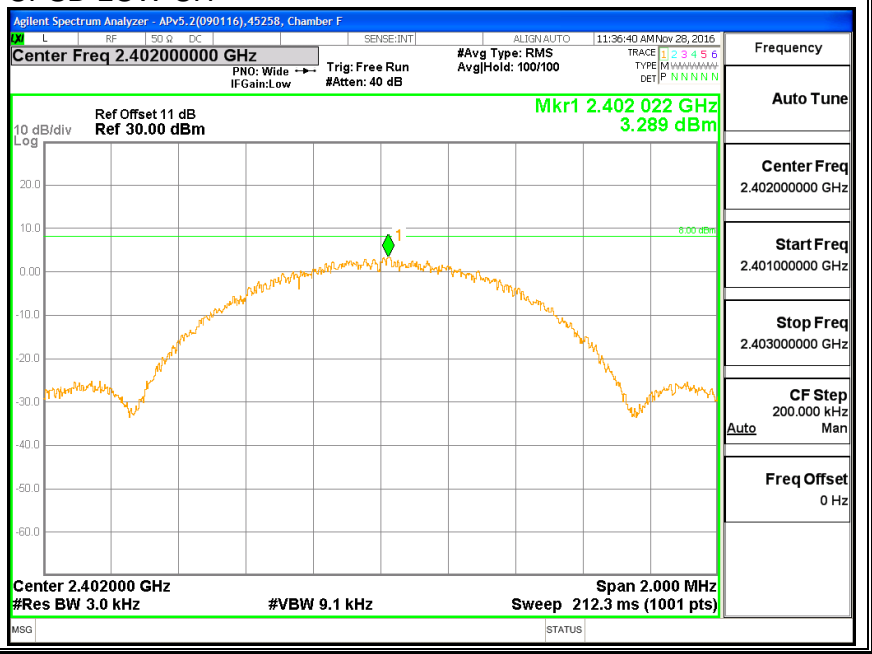
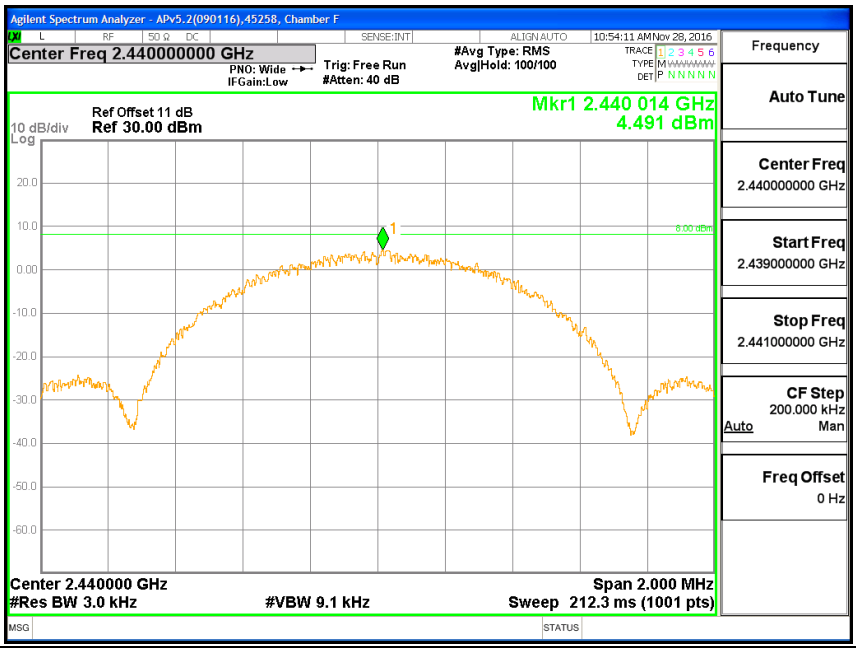
CPSD LOW CH




CPSD MID CH





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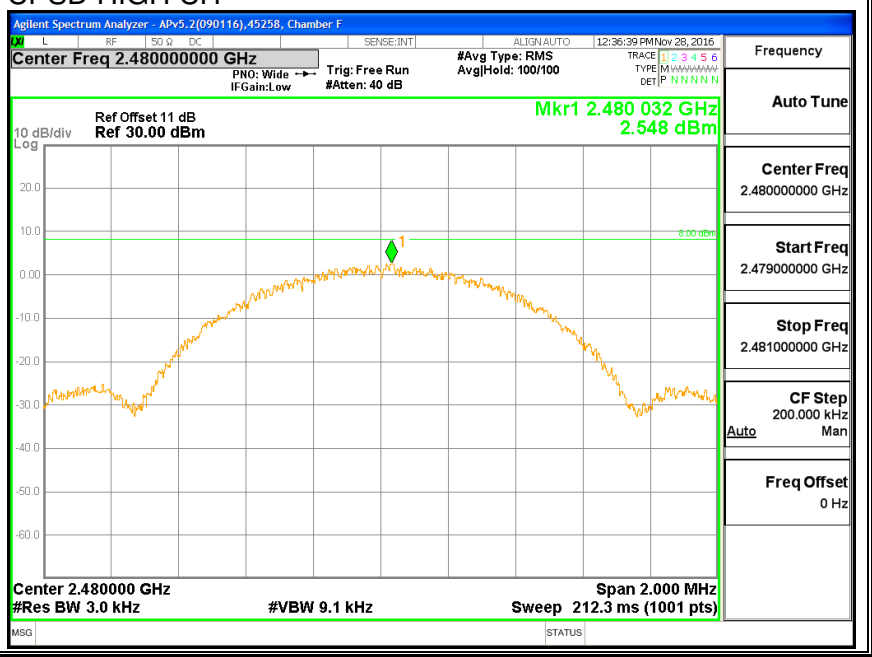
CPSD HIGH CH





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## 7.3.6. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)

IC 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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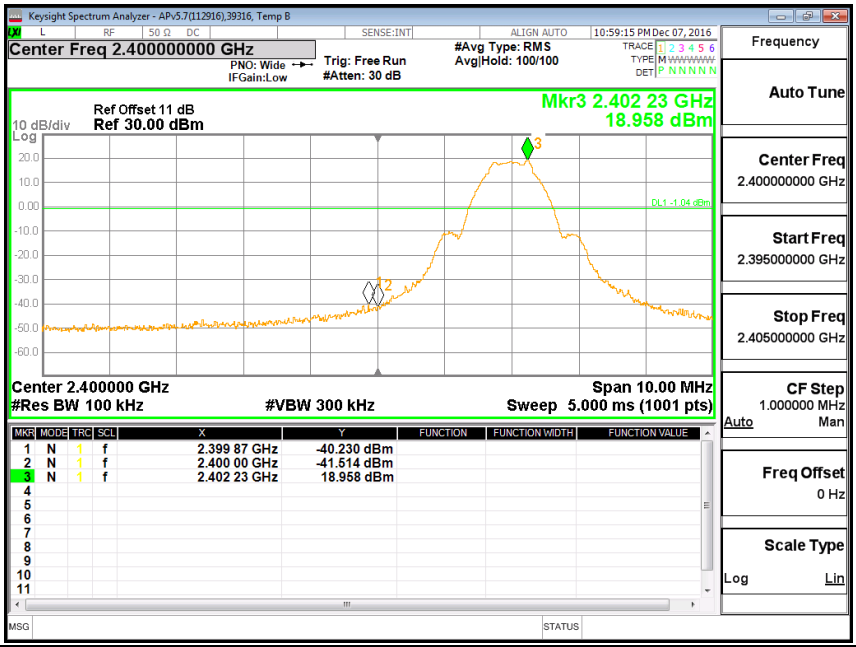
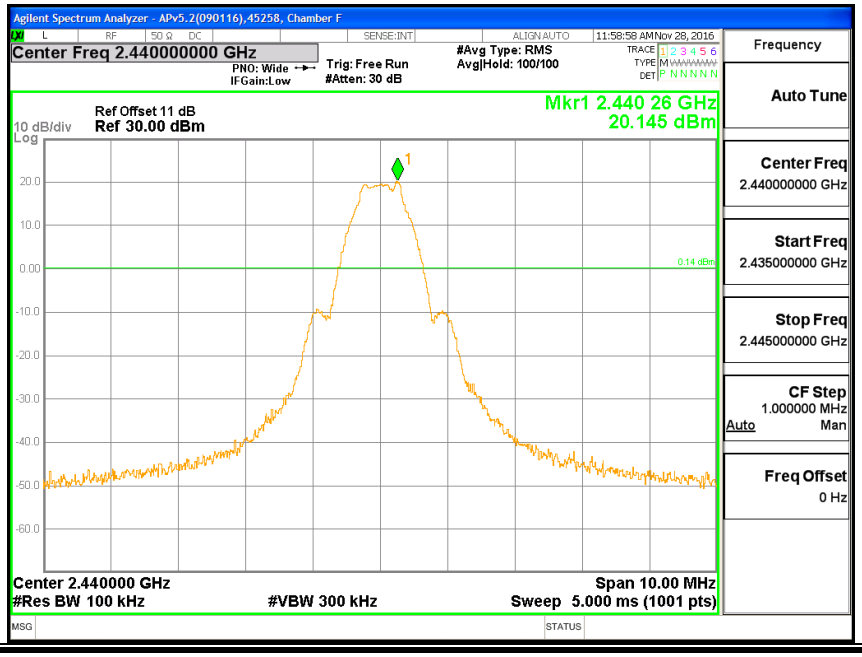
CBE LOW CH




CBE MID CH





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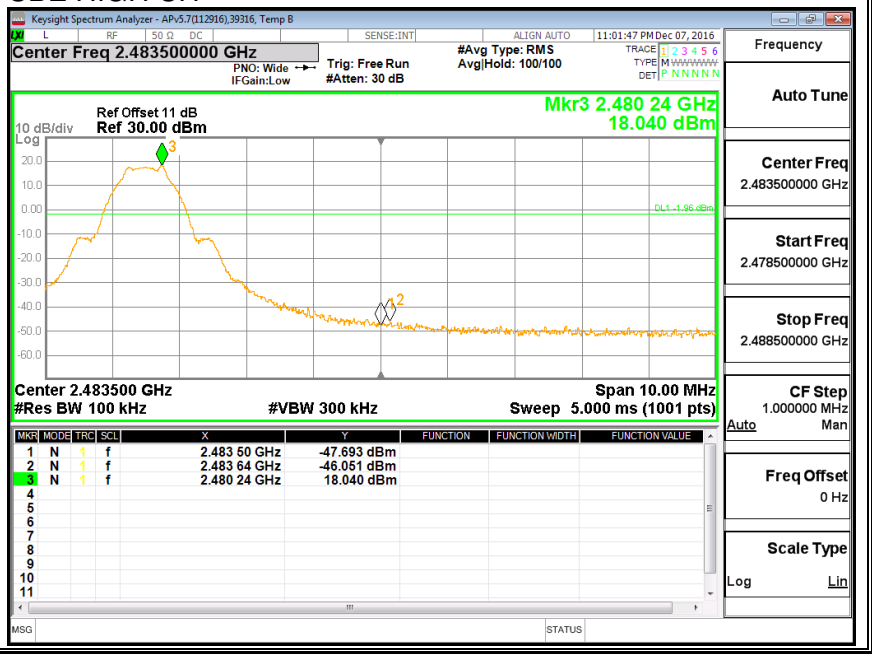
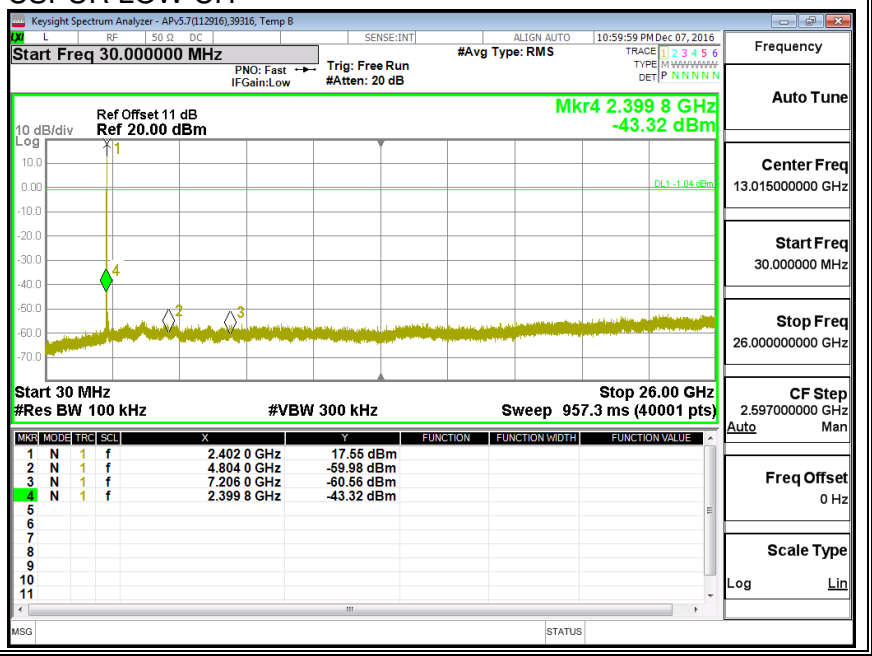
CBE HIGH CH




CSPUR LOW CH





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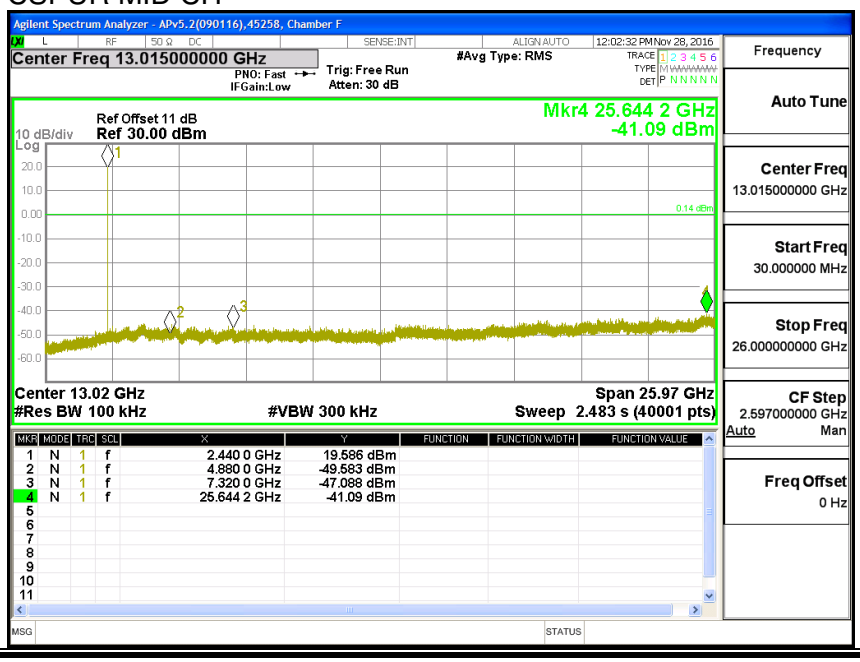
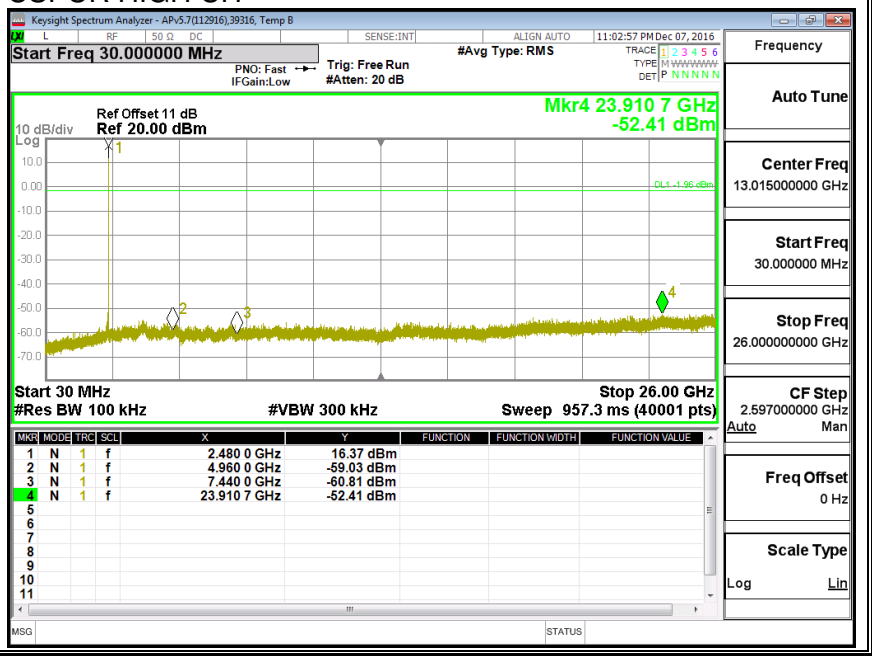
CSPUR MID CH




CSPUR HIGH CH





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## 7.4. LOW POWER MODE

### 7.4.1. 6 dB BANDWIDTH

**LIMITS**

FCC §15.247 (a) (2)

IC RSS-247 (5.2) (1)

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

**RESULTS**

| Channel | Frequency | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2402 | 0.726 | 0.5 |
| Middle | 2440 | 0.688 | 0.5 |
| High | 2480 | 0.728 | 0.5 |


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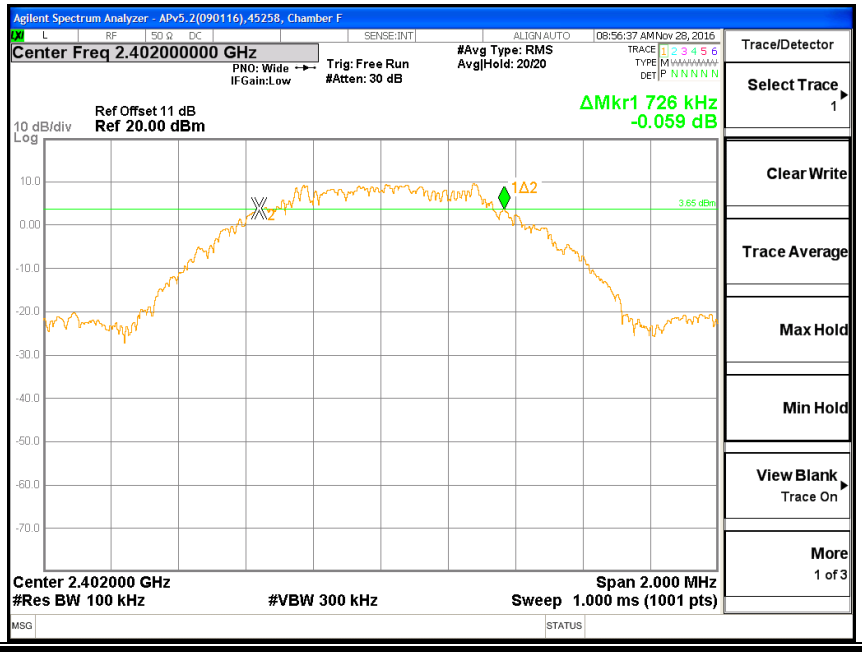
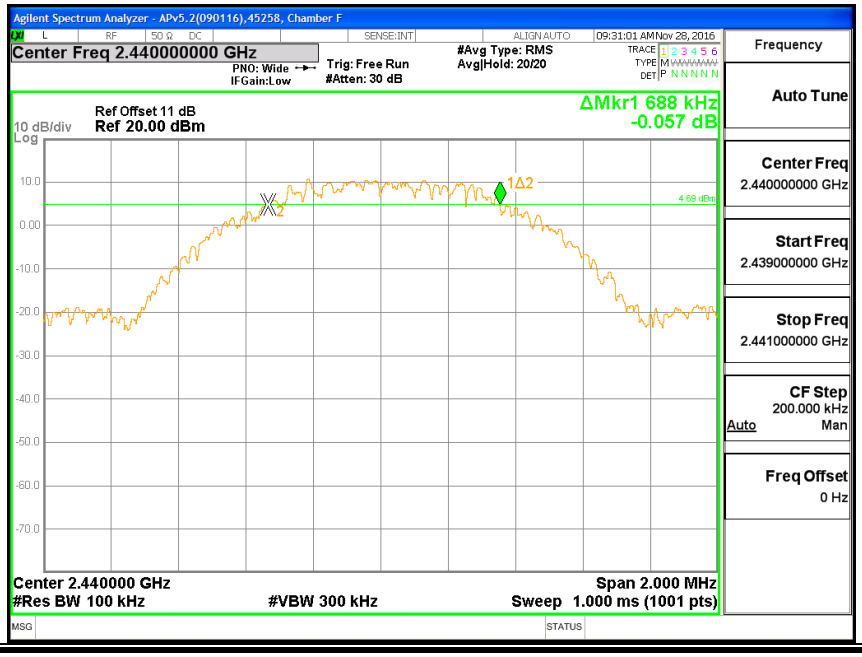
6dB LOW CH




6dB MID CH





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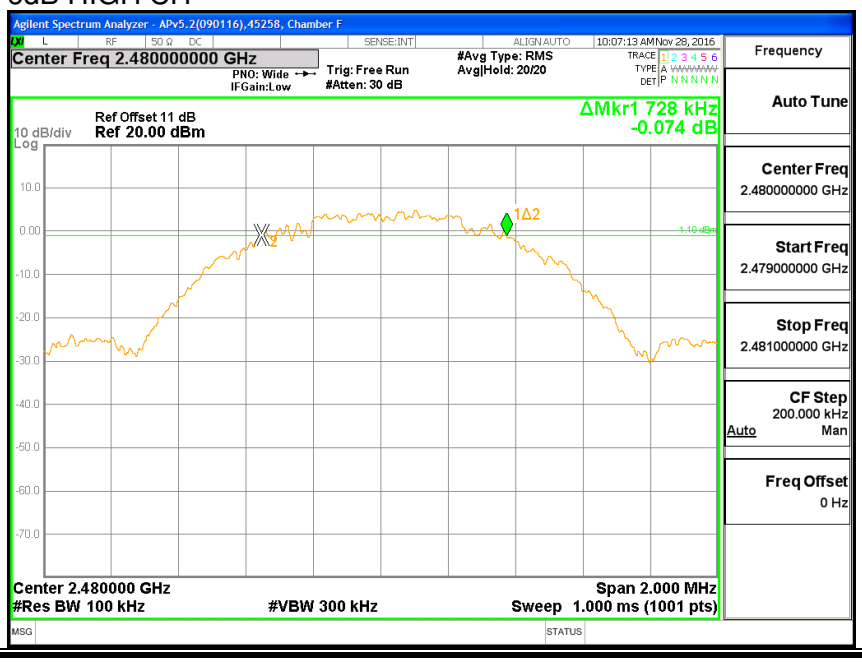
6dB HIGH CH





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### 7.4.2. 99% BANDWIDTH

**LIMITS**

None; for reporting purposes only.

**Test Procedure**

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

**RESULTS**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2402 | 1.0586 |
| Middle | 2440 | 1.0627 |
| High | 2480 | 1.0630 |


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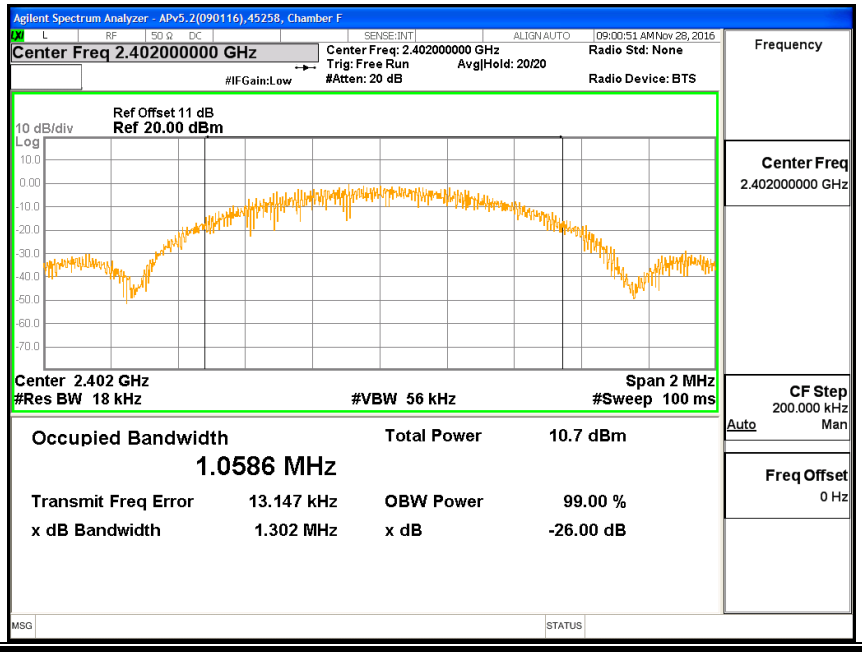
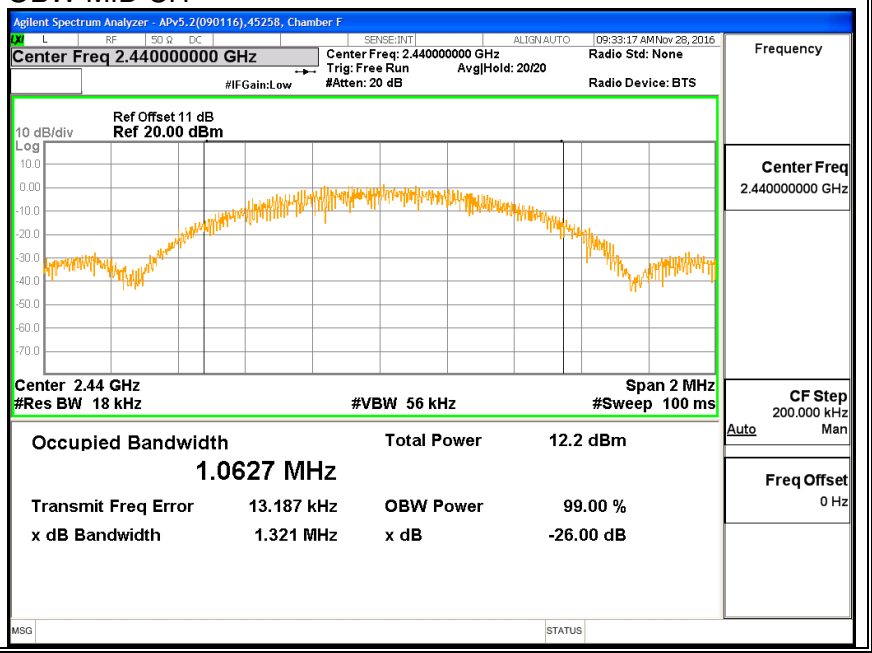
OBW LOW CH




OBW MID CH





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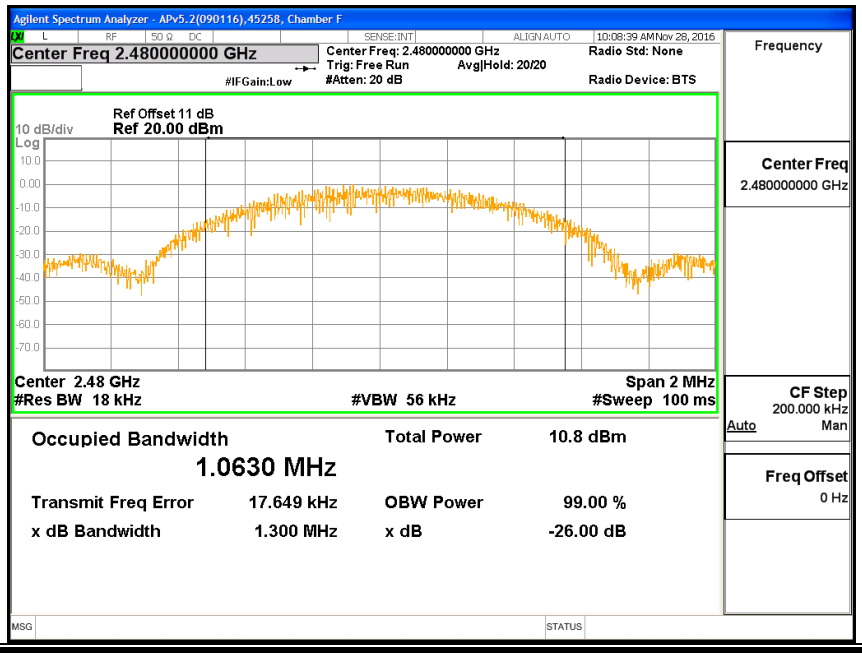
OBW HIGH CH





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### 7.4.3. AVERAGE POWER

| ID: | 39316 | Date: | 2/03/2017 |
|---|---|---|---|

**LIMITS**

None; for reporting purposes only.

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

**TEST PROCEDURE**

The transmitter output is connected to a wideband peak and average power meter.

**RESULTS**

| Channel | Frequency (MHz) | AV Power (dBm) |
|---|---|---|
| Low | 2402 | 9.39 |
| Middle | 2440 | 9.50 |
| High | 2480 | 9.31 |


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## 7.4.4. OUTPUT POWER

| ID: | 39316 | Date: | 2/03/2017 |
|---|---|---|---|

**LIMITS**

FCC §15.247 (b)

IC RSS-247 (5.4) (4)

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 wideband peak and average power meter.

**RESULTS**

| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | 9.53 | 30 | -20.47 |
| Middle | 2440 | 9.90 | 30 | -19.88 |
| High | 2480 | 9.46 | 30 | -20.54 |


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## 7.4.5. POWER SPECTRAL DENSITY

**LIMITS**

FCC §15.247 (e)

IC RSS-247 (5.2) (2)

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) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | -5.548 | 8 | -13.548 |
| Middle | 2440 | -3.941 | 8 | -11.941 |
| High | 2480 | -5.269 | 8 | -13.269 |


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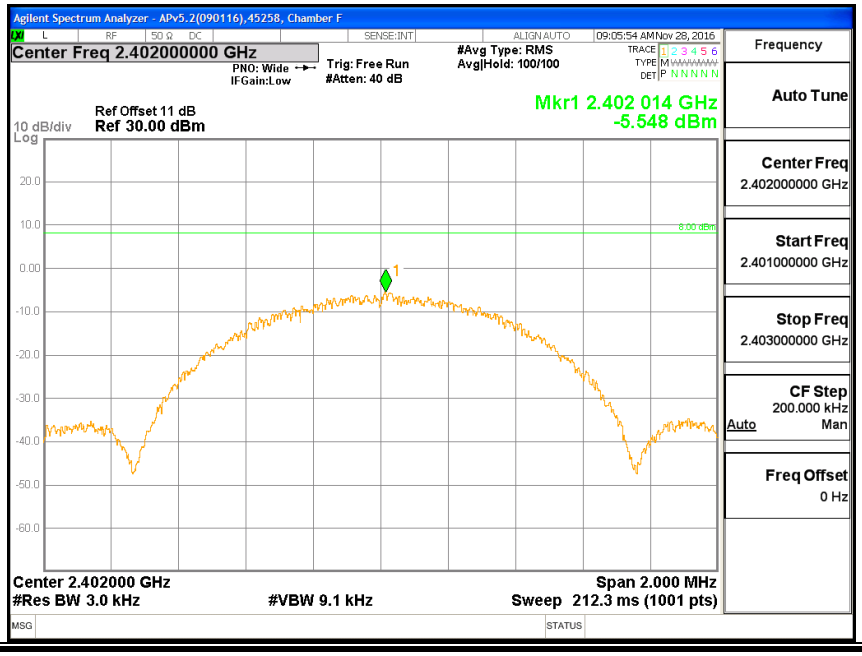
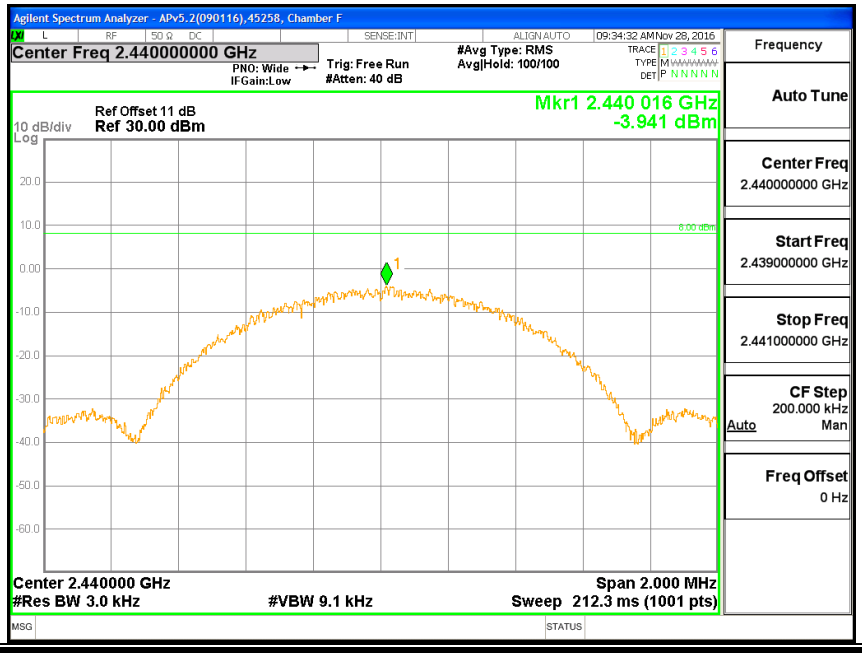
CPSD LOW CH




CPSD MID CH





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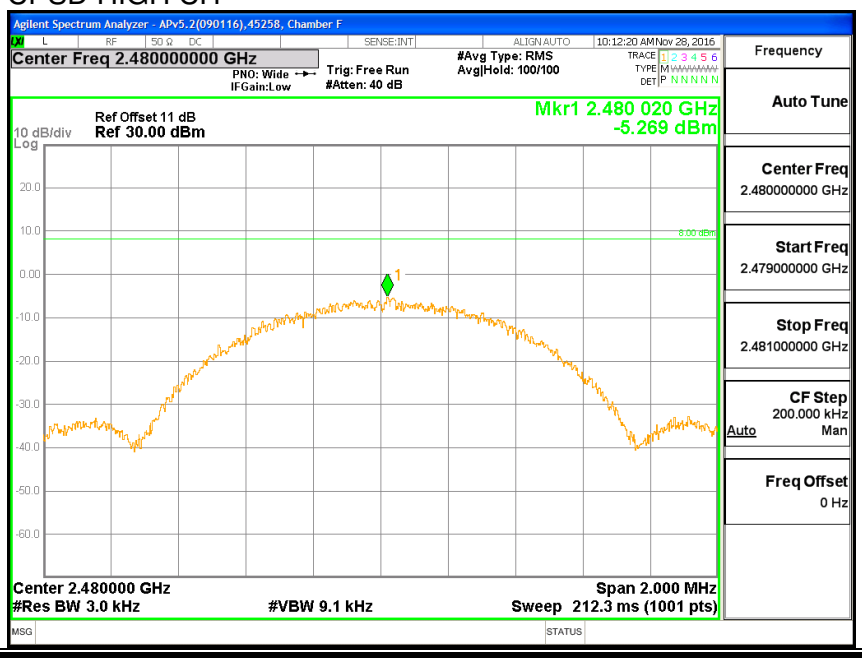
CPSD HIGH CH





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## 7.4.6. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)

IC 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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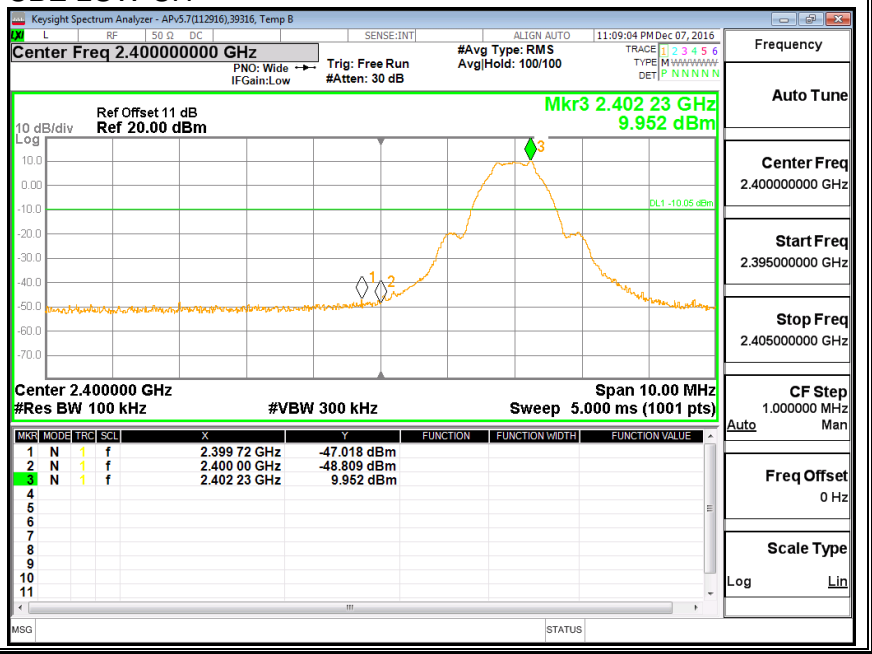
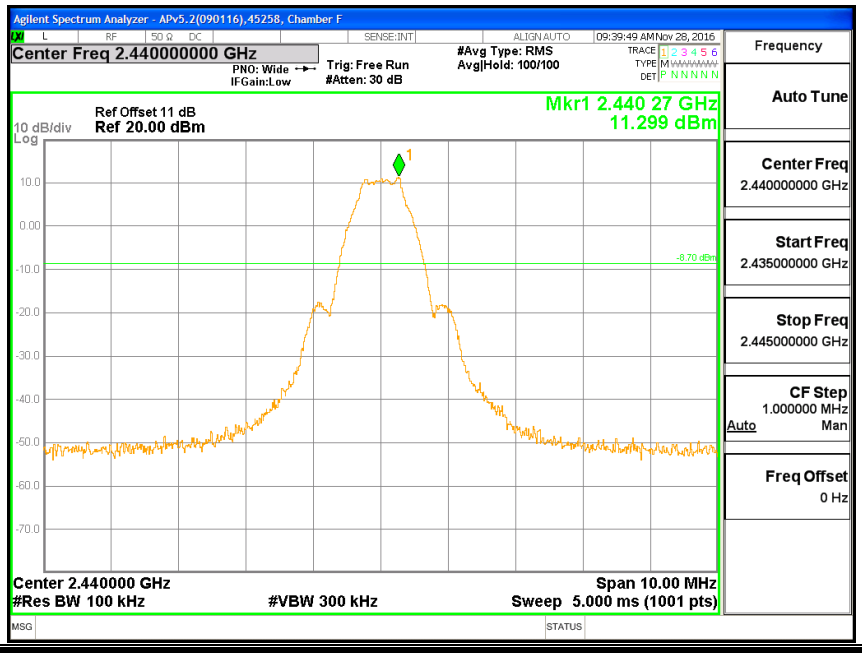
CBE LOW CH




CBE MID CH





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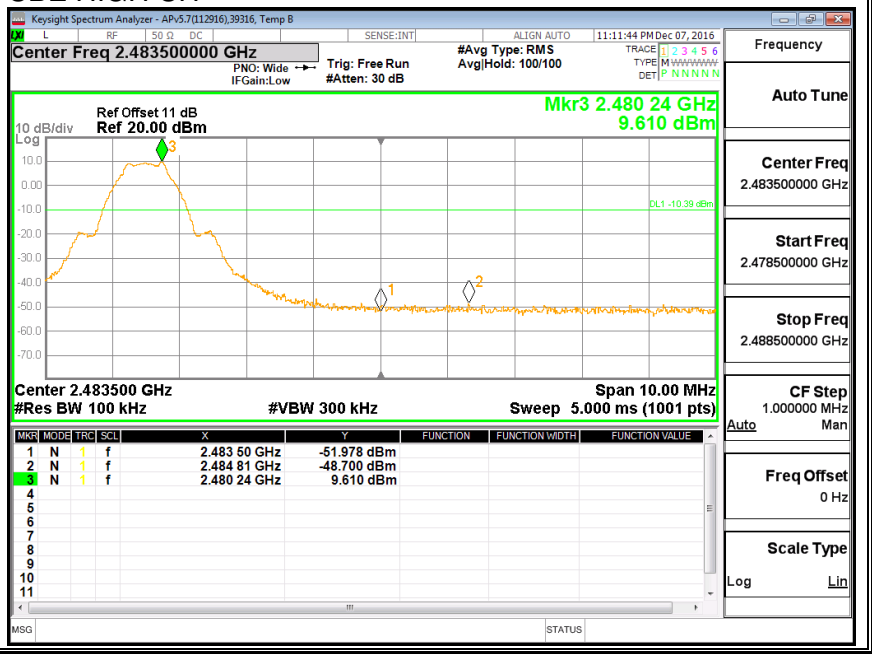
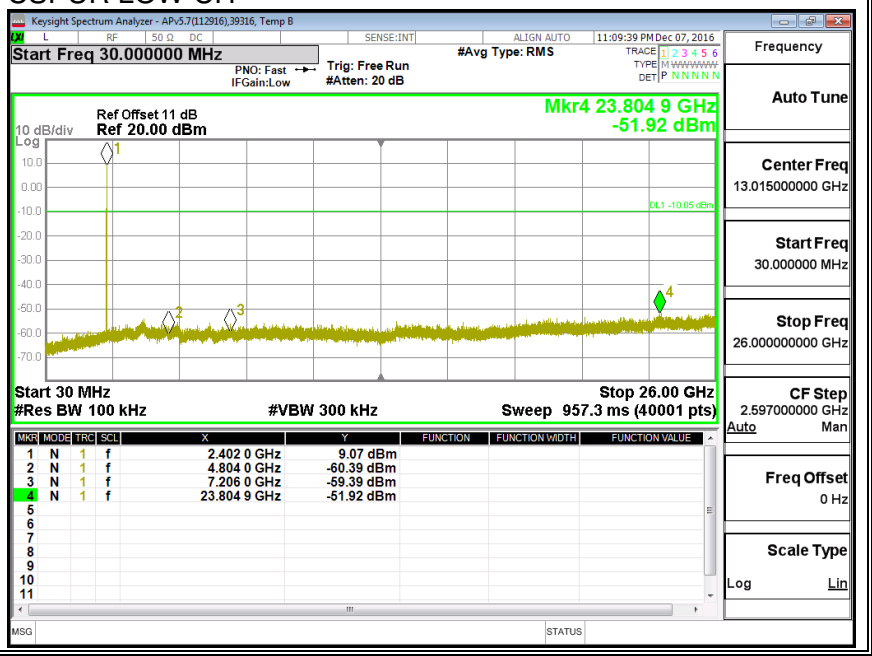
CBE HIGH CH




CSPUR LOW CH





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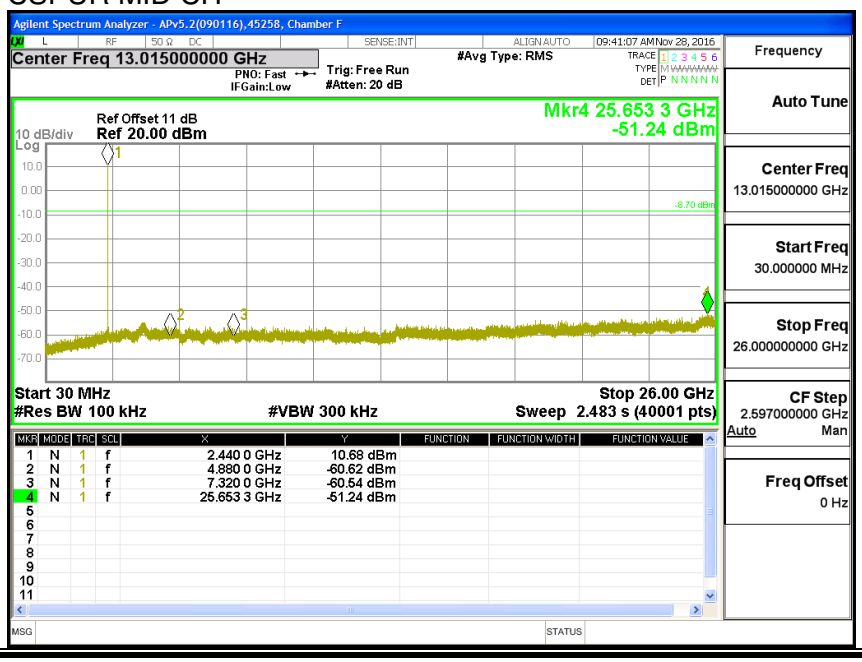
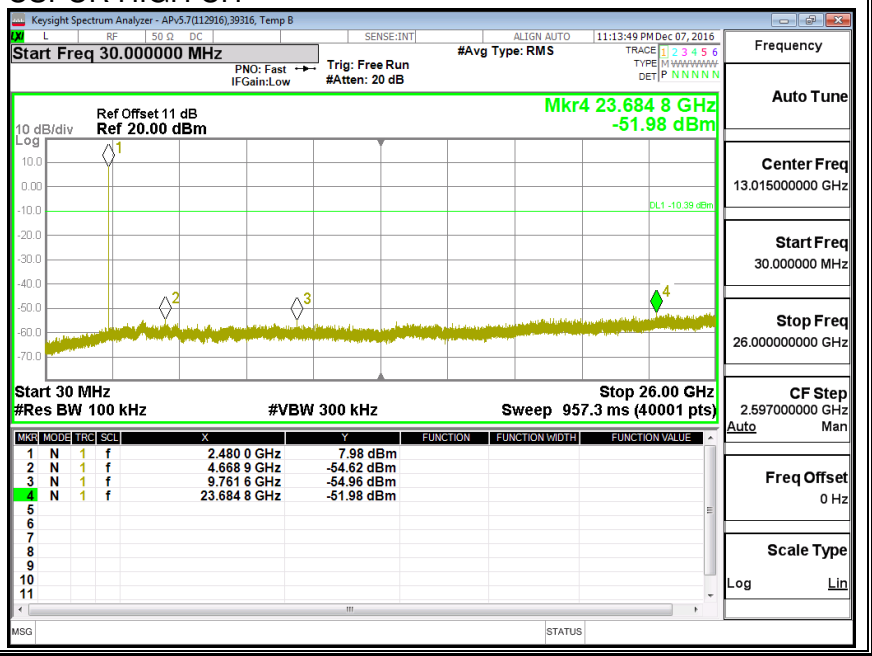
CSPUR MID CH




CSPUR HIGH CH





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# 8. RADIATED TEST RESULTS

## 8.1. LIMITS AND PROCEDURE

**LIMITS**

FCC §15.205 and §15.209

IC 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 |
|---|---|---|
| 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 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.


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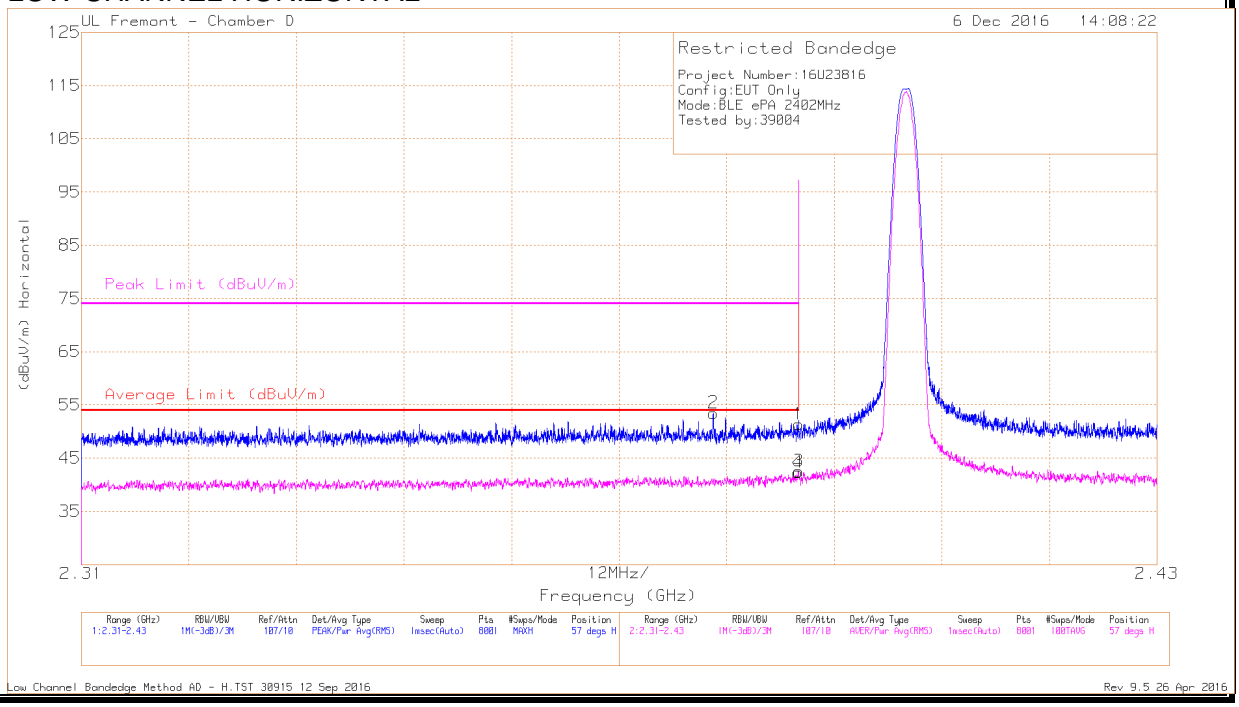
## 8.2. HIGH POWER MODE

### 8.2.1. RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl /Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | * 2.381 | 42.28 | Pk | 32 | -20.8 | 53.48 | - | - | 74 | -20.52 | 57 | 356 | H |
| 1 | * 2.39 | 39.94 | Pk | 32.1 | -20.7 | 51.34 | - | - | 74 | -22.66 | 57 | 356 | H |
| 3 | * 2.39 | 31.12 | RMS | 32.1 | -20.7 | 42.52 | 54 | -11.48 | - | - | 57 | 356 | H |
| 4 | * 2.39 | 30.92 | RMS | 32.1 | -20.7 | 42.32 | 54 | -11.68 | - | - | 57 | 356 | H |

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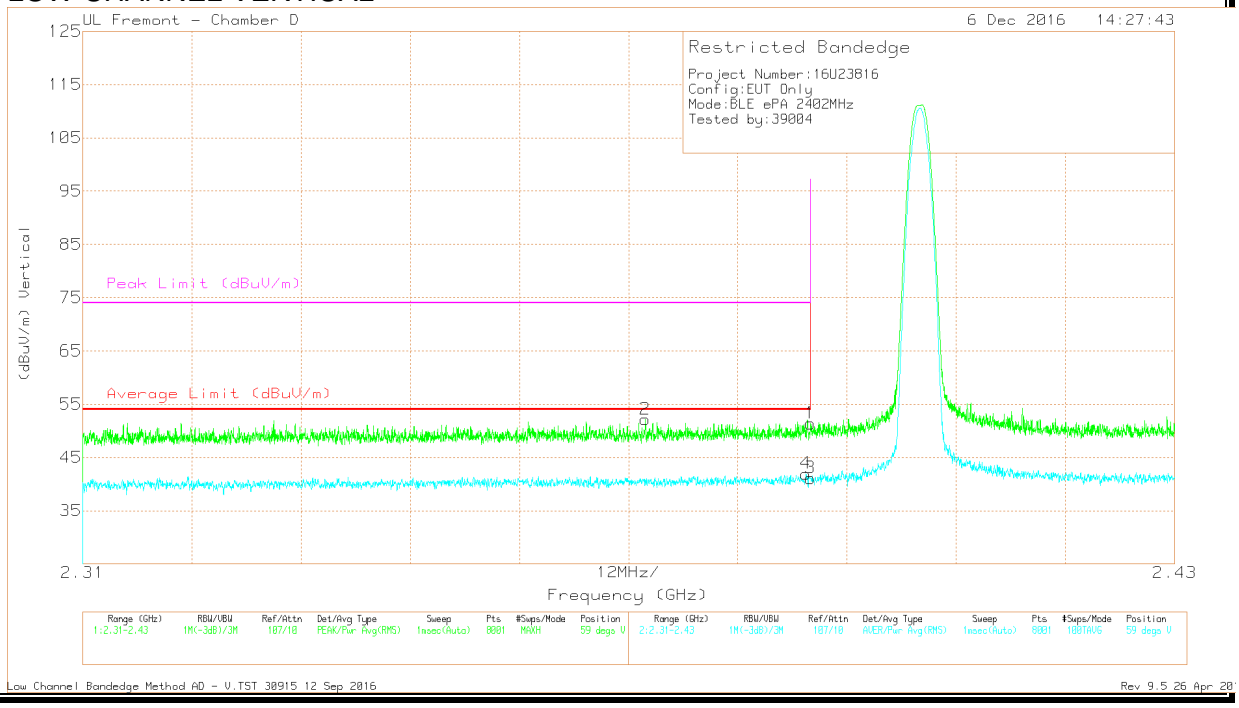
LOW CHANNEL VERTICAL




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl/ Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | * 2.372 | 40.96 | Pk | 32 | -20.8 | 52.16 | - | - | 74 | -21.84 | 59 | 142 | V |
| 4 | * 2.389 | 30.65 | RMS | 32.1 | -20.8 | 41.95 | 54 | -12.05 | - | - | 59 | 142 | V |
| 1 | * 2.39 | 39.98 | Pk | 32.1 | -20.7 | 51.38 | - | - | 74 | -22.62 | 59 | 142 | V |
| 3 | * 2.39 | 29.71 | RMS | 32.1 | -20.7 | 41.11 | 54 | -12.89 | - | - | 59 | 142 | V |

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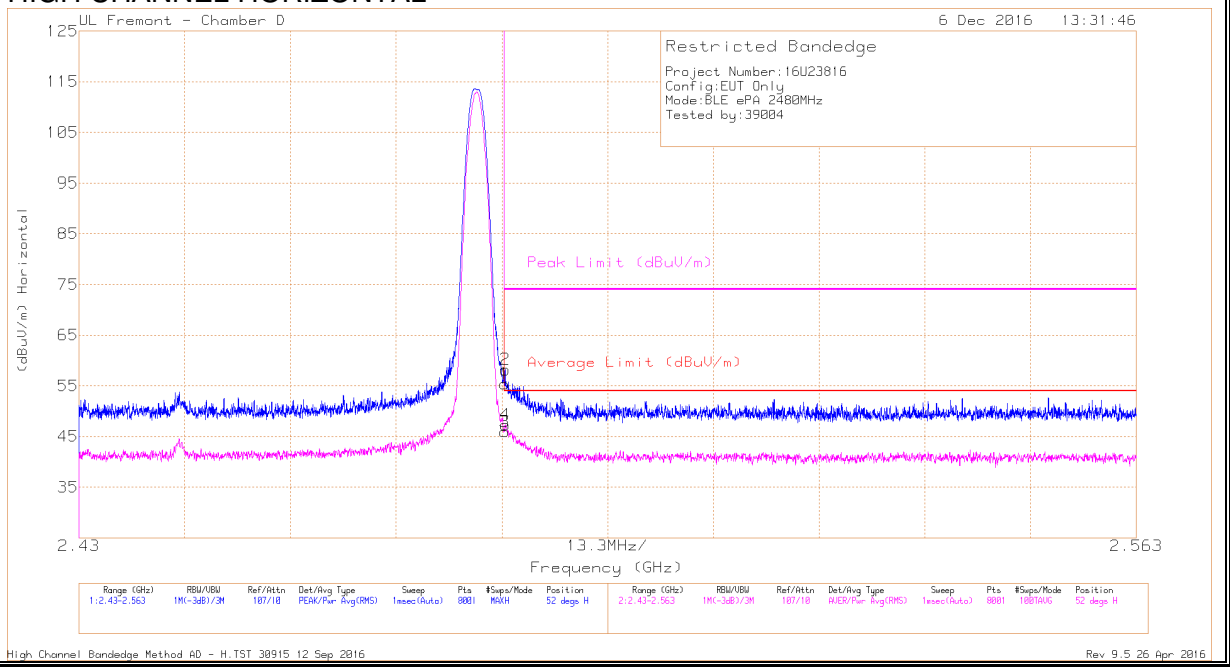
## 8.2.2. AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL HORIZONTAL




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl/Fltr /Pad (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 | 43.87 | Pk | 32.3 | -20.8 | 55.37 | - | - | 74 | -18.63 | 52 | 102 | H |
| 2 | * 2.484 | 46.68 | Pk | 32.3 | -20.8 | 58.18 | - | - | 74 | -15.82 | 52 | 102 | H |
| 3 | * 2.484 | 34.42 | RMS | 32.3 | -20.8 | 45.92 | 54 | -8.08 | - | - | 52 | 102 | H |
| 4 | * 2.484 | 35.79 | RMS | 32.3 | -20.8 | 47.29 | 54 | -6.71 | - | - | 52 | 102 | H |

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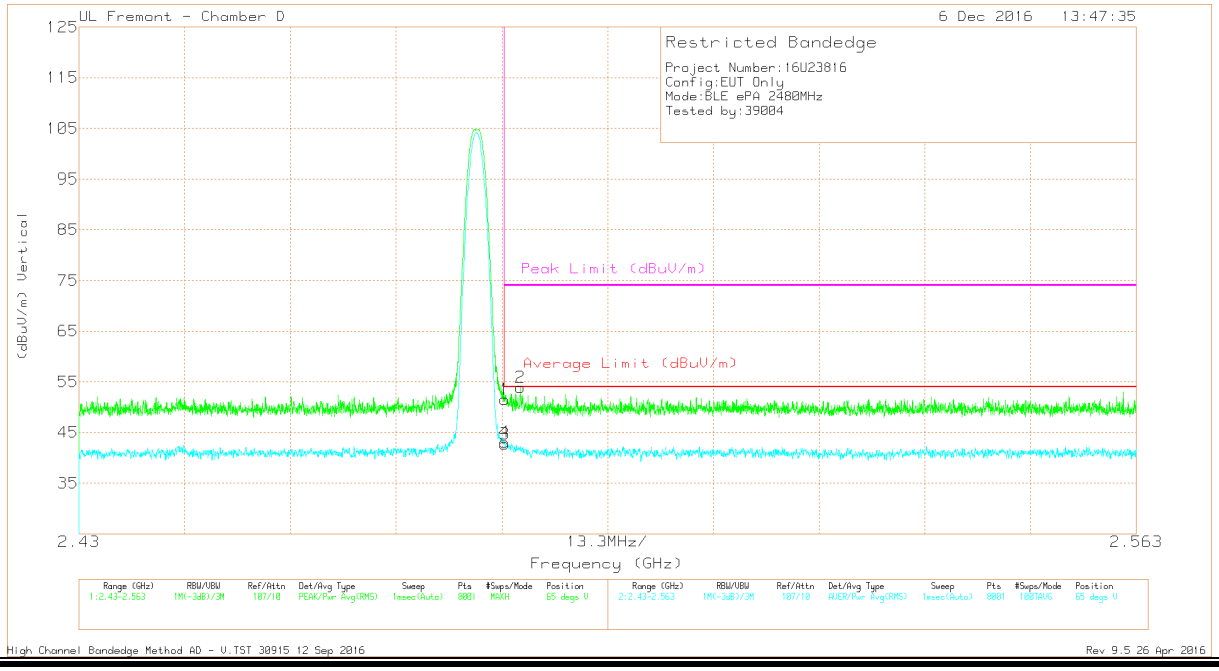
HIGH CHANNEL VERTICAL




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl/Fltr/Pad (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 | 39.98 | Pk | 32.3 | -20.8 | 51.48 | - | - | 74 | -22.52 | 65 | 336 | V |
| 2 | * 2.486 | 42.43 | Pk | 32.3 | -20.8 | 53.93 | - | - | 74 | -20.07 | 65 | 336 | V |
| 3 | * 2.484 | 31.26 | RMS | 32.3 | -20.8 | 42.76 | 54 | -11.24 | - | - | 65 | 336 | V |
| 4 | * 2.484 | 31.56 | RMS | 32.3 | -20.8 | 43.06 | 54 | -10.94 | - | - | 65 | 336 | V |

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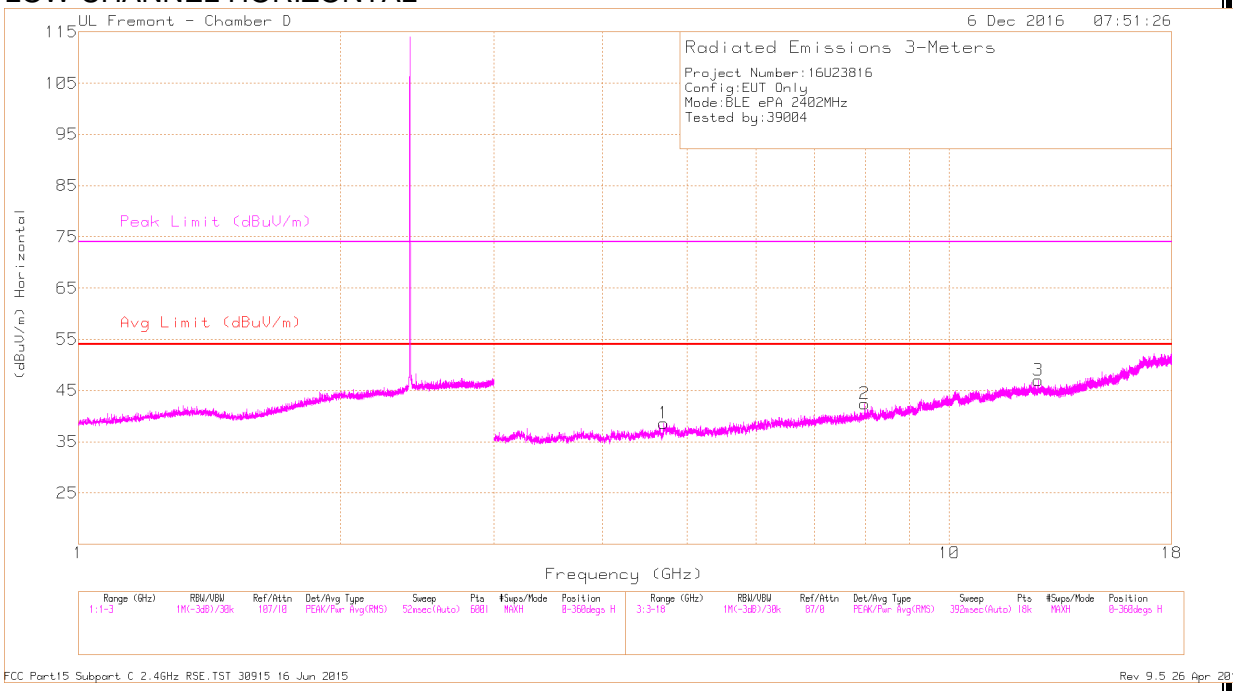
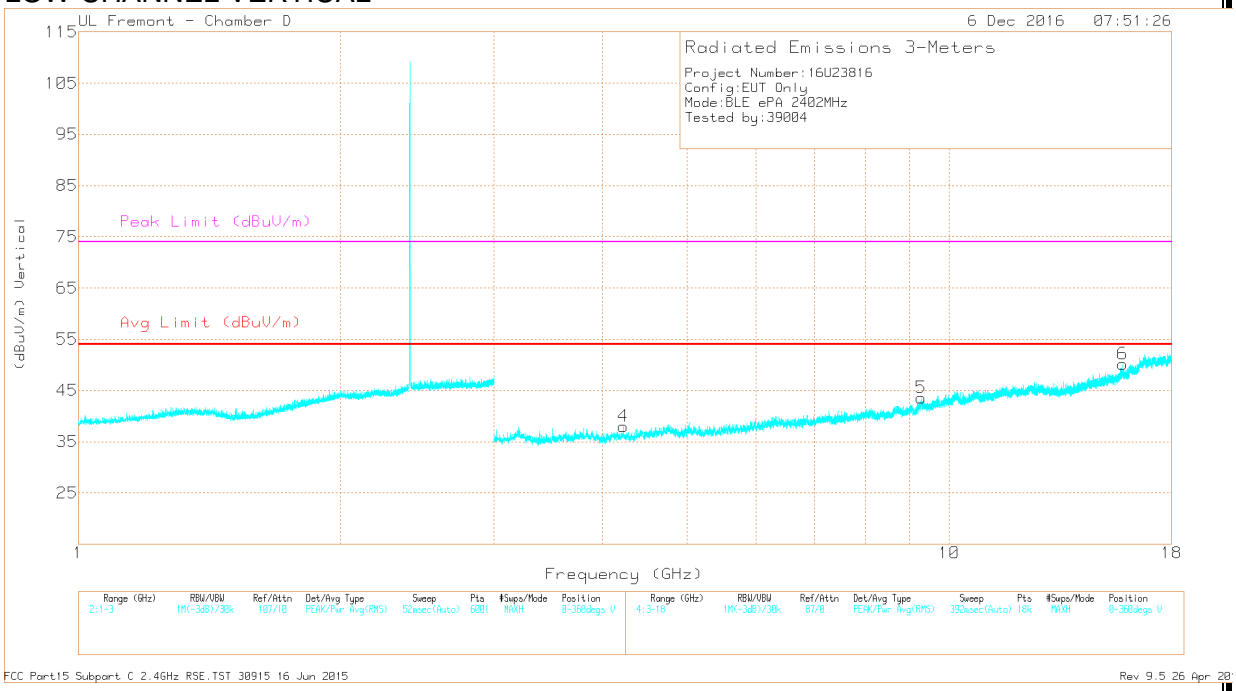
## 8.2.3. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL




LOW CHANNEL VERTICAL





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| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (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 | * 4.703 | 38.35 | PK2 | 34 | -27.3 | 0 | 45.05 | - | - | 74 | -28.95 | 7 | 138 | H |
| | * 4.703 | 27.75 | MAv1 | 34 | -27.2 | 0 | 34.55 | 54 | -19.45 | - | - | 7 | 138 | H |
| 3 | * 12.639 | 34.2 | PK2 | 39.1 | -21 | 0 | 52.3 | - | - | 74 | -21.7 | 202 | 118 | H |
| | * 12.641 | 23.87 | MAv1 | 39.1 | -21.1 | 0 | 41.87 | 54 | -12.13 | - | - | 202 | 118 | H |
| 4 | * 4.225 | 36.8 | PK2 | 33.5 | -27.3 | 0 | 43 | - | - | 74 | -31 | 356 | 365 | V |
| | * 4.224 | 26.88 | MAv1 | 33.5 | -27.3 | 0 | 33.08 | 54 | -20.92 | - | - | 356 | 365 | V |
| 6 | * 15.81 | 34.04 | PK2 | 40.3 | -19 | 0 | 55.34 | - | - | 74 | -18.66 | 357 | 307 | V |
| | * 15.811 | 23.87 | MAv1 | 40.3 | -19 | 0 | 45.17 | 54 | -8.83 | - | - | 357 | 307 | V |
| 2 | 7.999 | 35.85 | PK2 | 35.9 | -23.9 | 0 | 47.85 | - | - | - | - | 269 | 369 | H |
| 5 | 9.283 | 33.77 | PK2 | 36.3 | -20.4 | 0 | 49.67 | - | - | - | - | 305 | 102 | 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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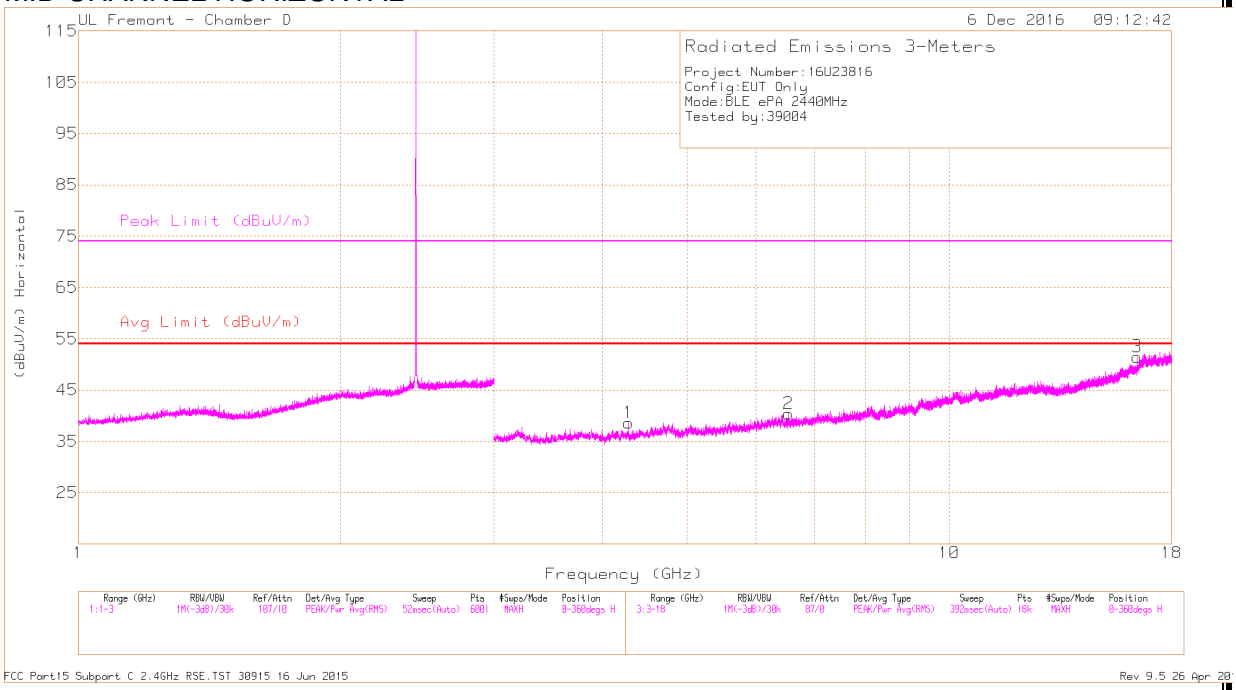
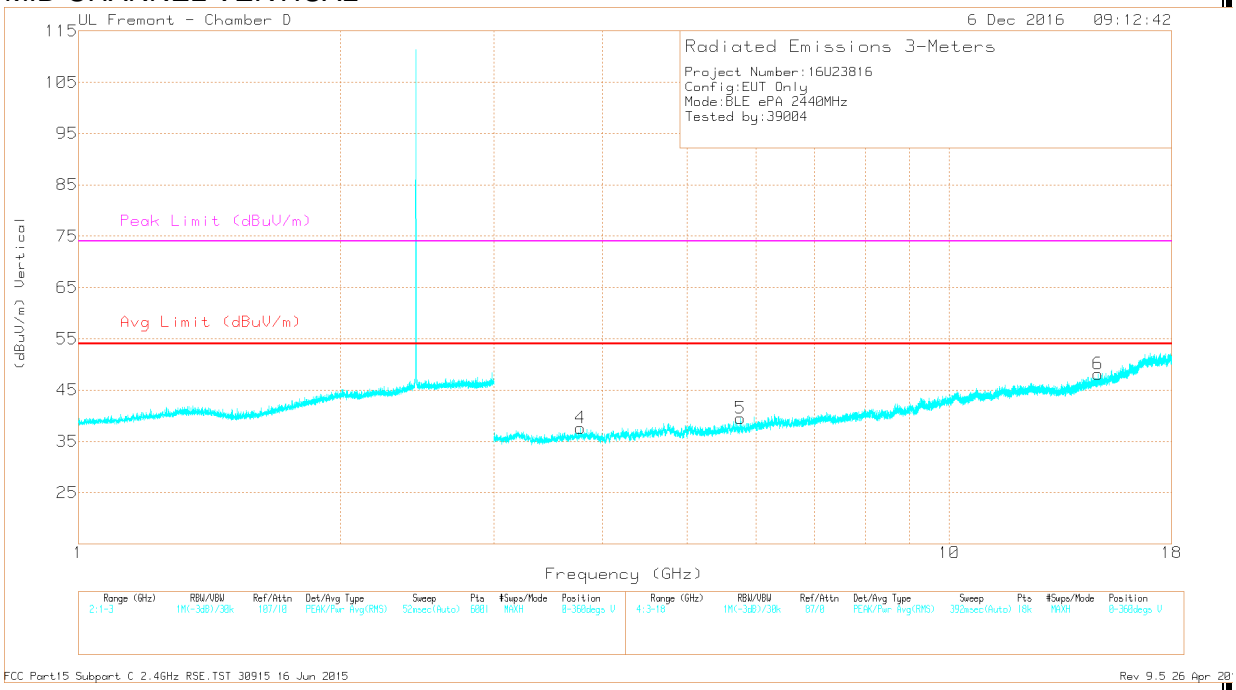
## MID CHANNEL HORIZONTAL




## MID CHANNEL VERTICAL





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| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (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 | * 4.278 | 37.79 | PK2 | 33.5 | -28 | 0 | 43.29 | - | - | 74 | -30.71 | 200 | 344 | H |
| | * 4.279 | 27.46 | MAv1 | 33.5 | -28 | 0 | 32.96 | 54 | -21.04 | - | - | 200 | 344 | H |
| 4 | * 3.774 | 38.45 | PK2 | 33.5 | -28.1 | 0 | 43.85 | - | - | 74 | -30.15 | 18 | 172 | V |
| | * 3.772 | 27.32 | MAv1 | 33.5 | -28.1 | 0 | 32.72 | 54 | -21.28 | - | - | 18 | 172 | V |
| 5 | 5.758 | 37.39 | PK2 | 34.8 | -27 | 0 | 45.19 | - | - | - | - | 178 | 236 | V |
| 2 | 6.539 | 36.43 | PK2 | 35.6 | -25.8 | 0 | 46.23 | - | - | - | - | 47 | 229 | H |
| 6 | 14.813 | 36.83 | PK2 | 39.7 | -21.6 | 0 | 54.93 | - | - | - | - | 261 | 347 | V |
| 3 | 16.433 | 34.31 | PK2 | 41 | -18.5 | 0 | 56.81 | - | - | - | - | 5 | 391 | H |

* - 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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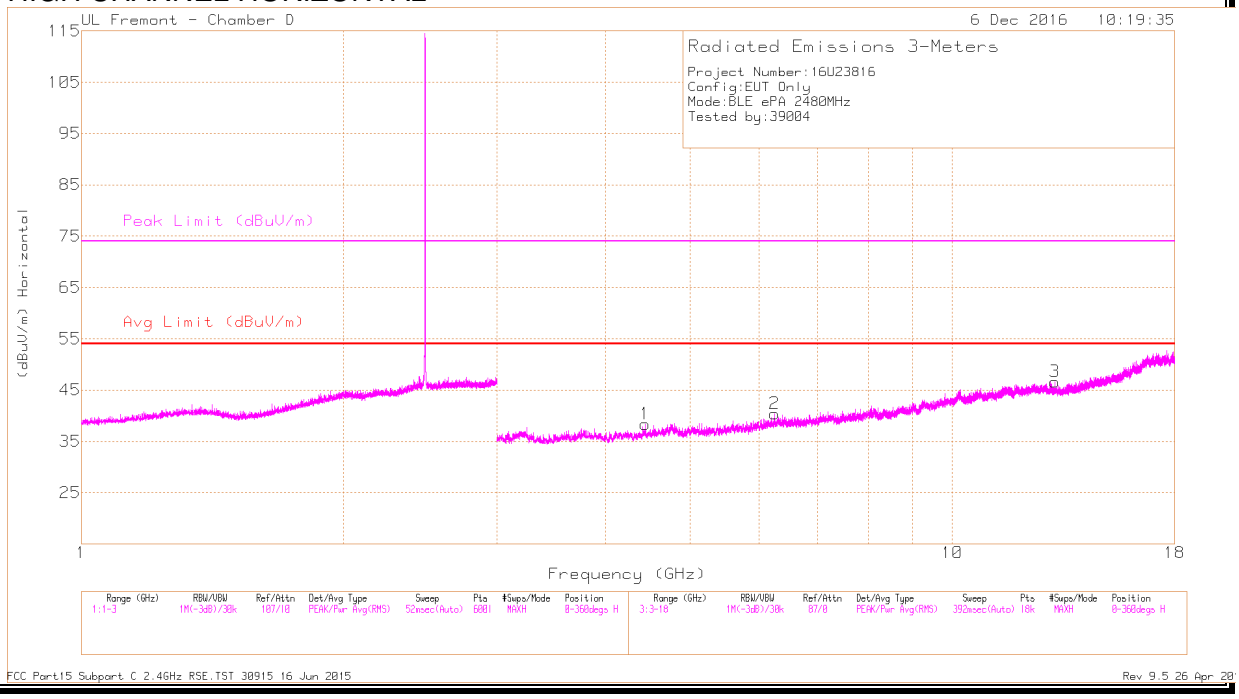
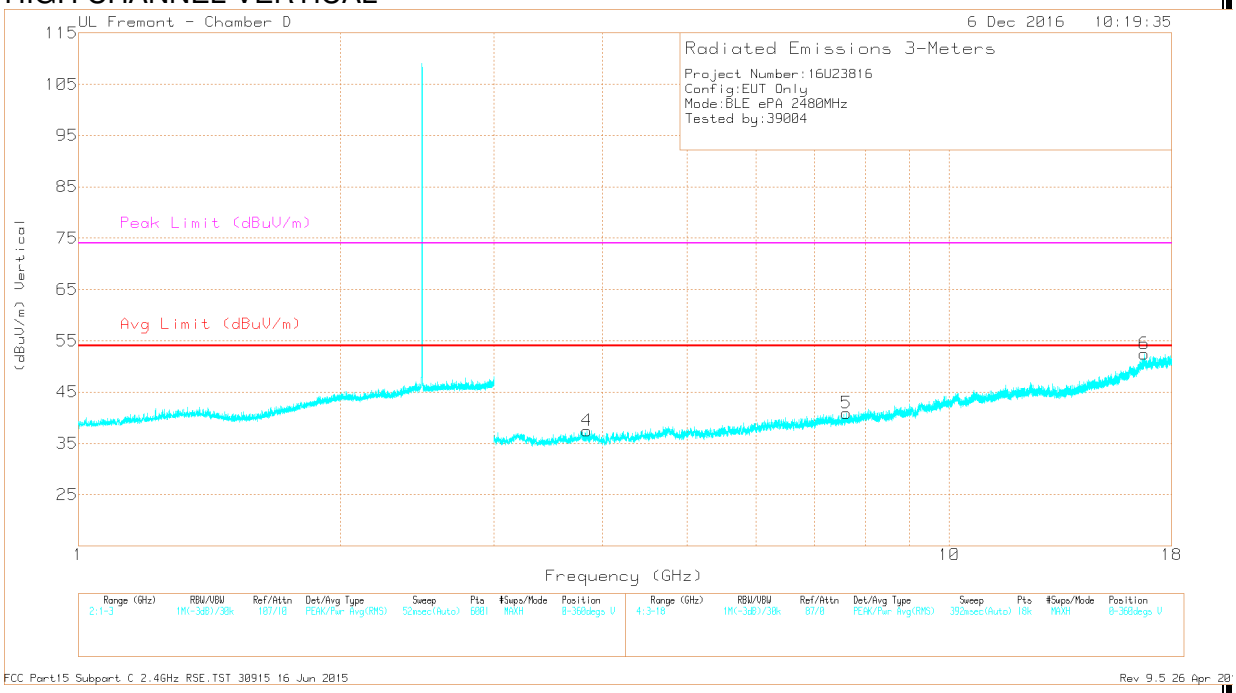
## HIGH CHANNEL HORIZONTAL




## HIGH CHANNEL VERTICAL





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| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | * 3.836 | 38.94 | PK2 | 33.5 | -28.6 | 0 | 43.84 | - | - | 74 | -30.16 | 212 | 339 | V |
| | * 3.835 | 28.12 | MAv1 | 33.5 | -28.6 | 0 | 33.02 | 54 | -20.98 | - | - | 212 | 339 | V |
| 5 | * 7.618 | 35.77 | PK2 | 35.8 | -24.7 | 0 | 46.87 | - | - | 74 | -27.13 | 267 | 157 | V |
| | * 7.618 | 25.16 | MAv1 | 35.8 | -24.7 | 0 | 36.26 | 54 | -17.74 | - | - | 267 | 157 | V |
| 1 | 4.439 | 37.68 | PK2 | 33.9 | -27.4 | 0 | 44.18 | - | - | - | - | 252 | 368 | H |
| 2 | 6.247 | 37.05 | PK2 | 35.6 | -26.2 | 0 | 46.45 | - | - | - | - | 180 | 108 | H |
| 3 | 13.113 | 34.51 | PK2 | 39 | -21.5 | 0 | 52.01 | - | - | - | - | 229 | 232 | H |
| 6 | 16.749 | 34.01 | PK2 | 41.8 | -17.4 | 0 | 58.41 | - | - | - | - | 118 | 334 | 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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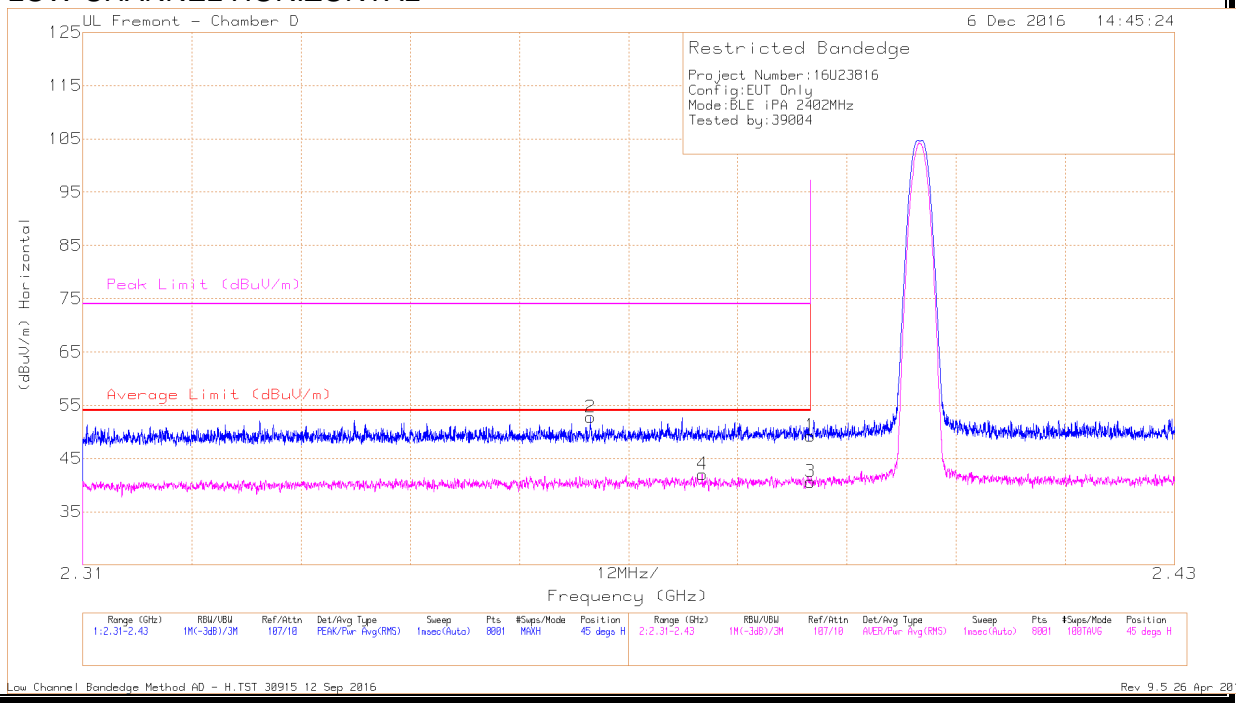
## 8.3. LOW POWER MODE

### 8.3.1. RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl/Flt r/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | * 2.366 | 41.64 | Pk | 31.9 | -20.8 | 52.74 | - | - | 74 | -21.26 | 45 | 132 | H |
| 4 | * 2.378 | 30.85 | RMS | 32 | -20.8 | 42.05 | 54 | -11.95 | - | - | 45 | 132 | H |
| 1 | * 2.39 | 37.86 | Pk | 32.1 | -20.7 | 49.26 | - | - | 74 | -24.74 | 45 | 132 | H |
| 3 | * 2.39 | 29.24 | RMS | 32.1 | -20.7 | 40.64 | 54 | -13.36 | - | - | 45 | 132 | H |

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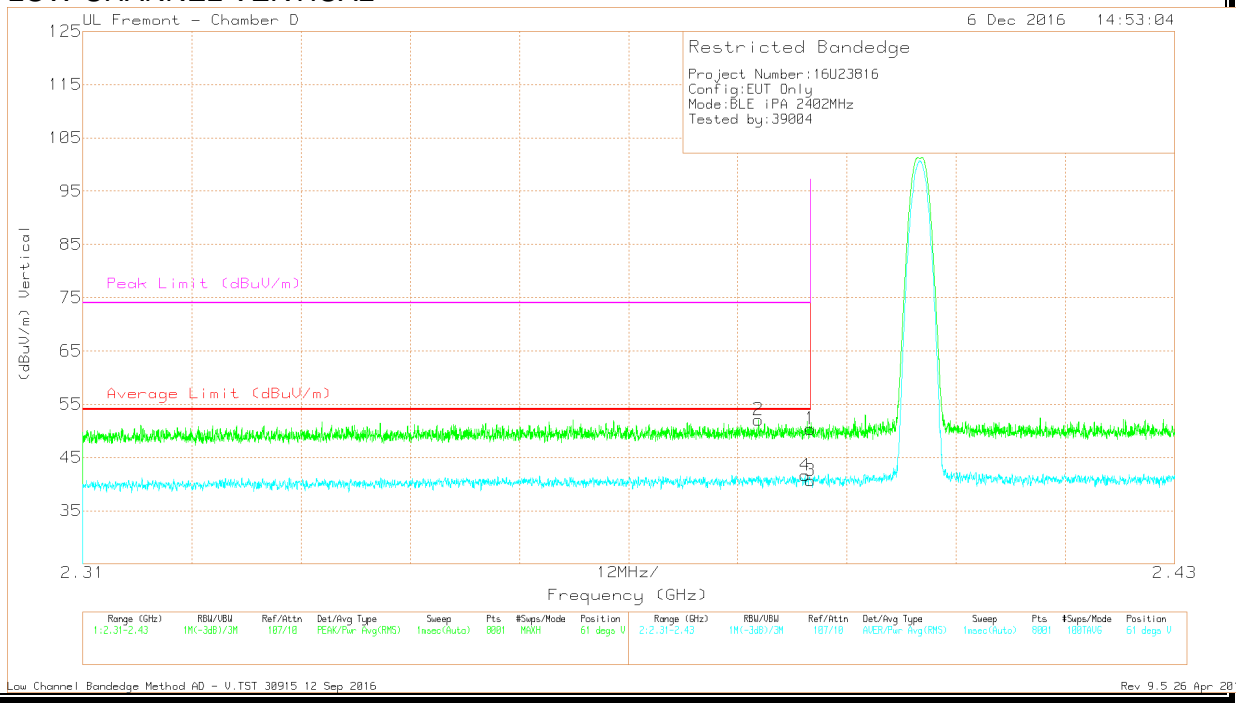
LOW CHANNEL VERTICAL




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl/Flt r/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | * 2.384 | 40.77 | Pk | 32.1 | -20.8 | 52.07 | - | - | 74 | -21.93 | 61 | 148 | V |
| 4 | * 2.389 | 30.36 | RMS | 32.1 | -20.8 | 41.66 | 54 | -12.34 | - | - | 61 | 148 | V |
| 1 | * 2.39 | 38.95 | Pk | 32.1 | -20.7 | 50.35 | - | - | 74 | -23.65 | 61 | 148 | V |
| 3 | * 2.39 | 29.25 | RMS | 32.1 | -20.7 | 40.65 | 54 | -13.35 | - | - | 61 | 148 | V |

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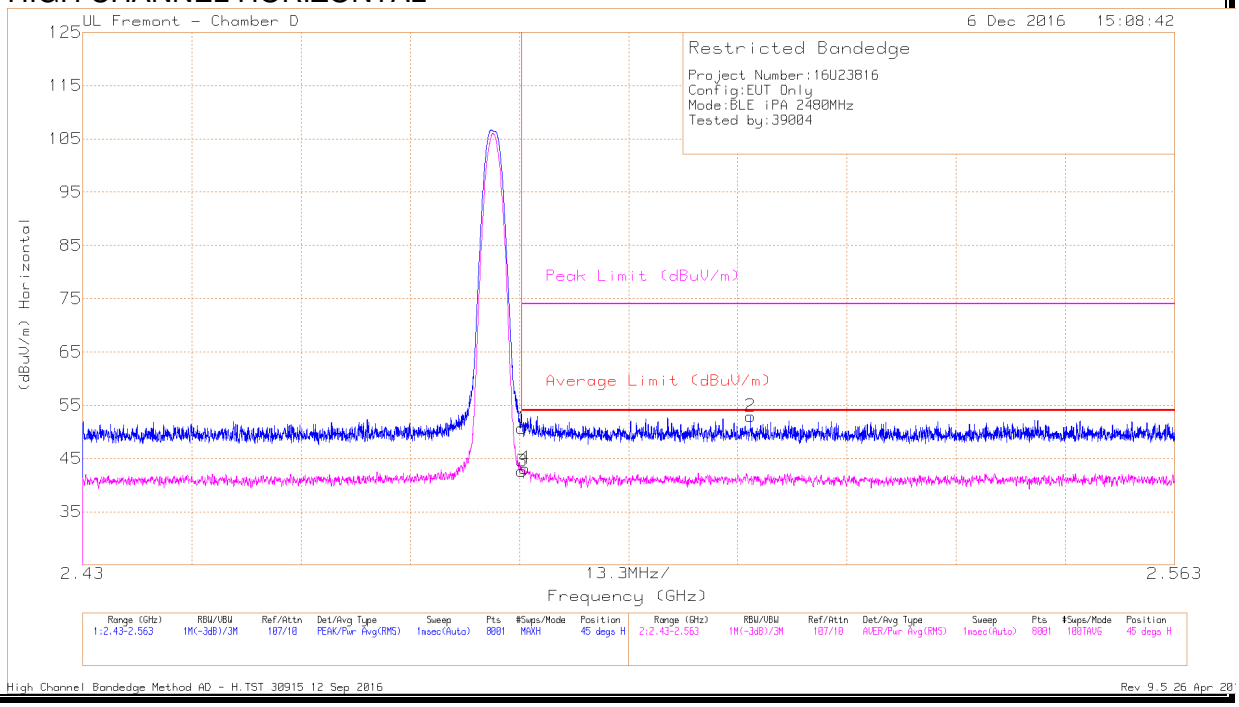
## 8.3.2. AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL HORIZONTAL




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl/Fltr/Pad (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 | 39.16 | Pk | 32.3 | -20.8 | 50.66 | - | - | 74 | -23.34 | 45 | 104 | H |
| 3 | * 2.484 | 31.11 | RMS | 32.3 | -20.8 | 42.61 | 54 | -11.39 | - | - | 45 | 104 | H |
| 4 | * 2.484 | 31.67 | RMS | 32.3 | -20.8 | 43.17 | 54 | -10.83 | - | - | 45 | 104 | H |
| 2 | 2.511 | 41.23 | Pk | 32.3 | -20.6 | 52.93 | - | - | 74 | -21.07 | 45 | 104 | H |

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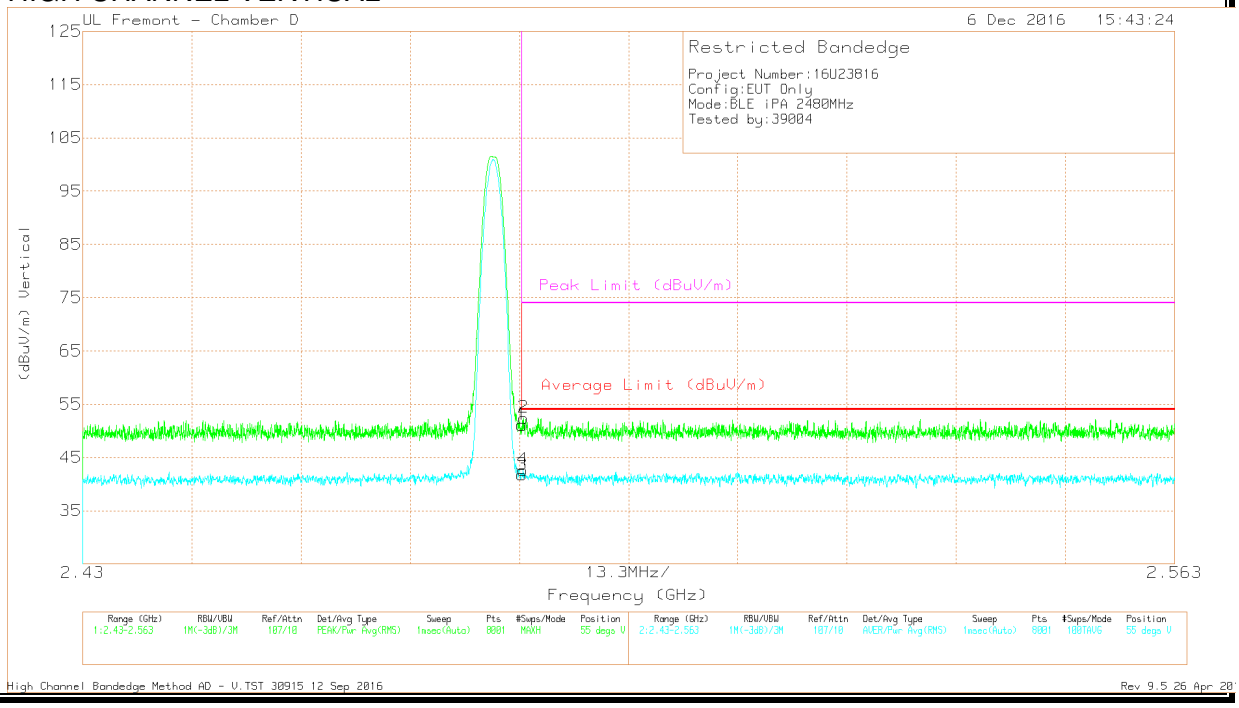
HIGH CHANNEL VERTICAL




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl/Flt r/Pad (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 | 39.63 | Pk | 32.3 | -20.8 | 51.13 | - | - | 74 | -22.87 | 55 | 114 | V |
| 2 | * 2.484 | 40.96 | Pk | 32.3 | -20.8 | 52.46 | - | - | 74 | -21.54 | 55 | 114 | V |
| 3 | * 2.484 | 30.24 | RMS | 32.3 | -20.8 | 41.74 | 54 | -12.26 | - | - | 55 | 114 | V |
| 4 | * 2.484 | 31.17 | RMS | 32.3 | -20.8 | 42.67 | 54 | -11.33 | - | - | 55 | 114 | V |

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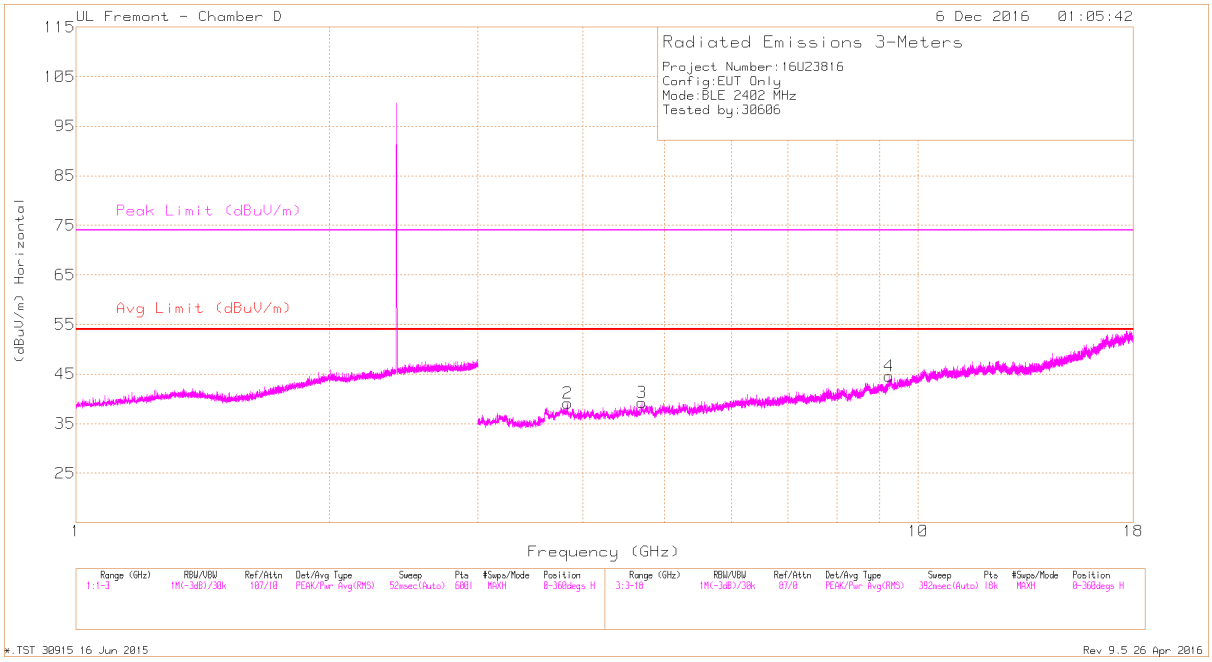
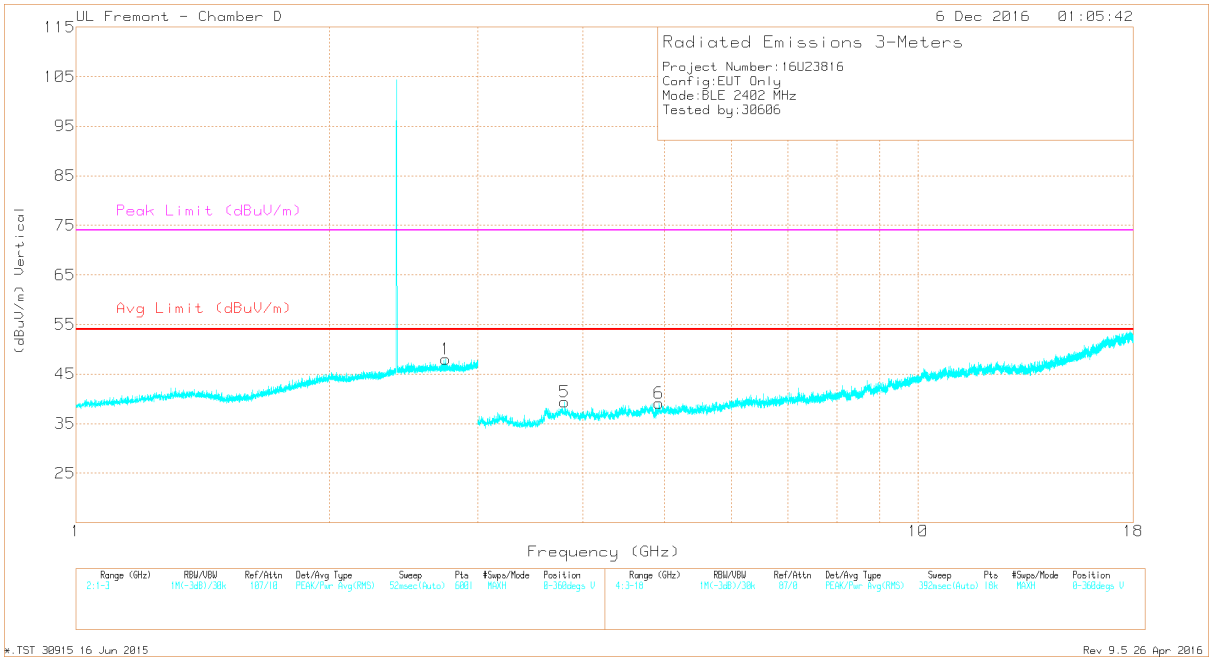
## 8.3.3. HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL




LOW CHANNEL VERTICAL





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| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl /Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 2.748 | 41.28 | PK2 | 32.4 | -20.4 | 53.28 | - | - | 74 | -20.72 | 36 | 121 | V |
| | * 2.748 | 30.33 | MAv1 | 32.4 | -20.4 | 42.33 | 54 | -11.67 | - | - | 36 | 121 | V |
| 2 | * 3.832 | 39.57 | PK2 | 33.5 | -28.6 | 44.47 | - | - | 74 | -29.53 | 224 | 130 | H |
| | * 3.833 | 29.2 | MAv1 | 33.5 | -28.6 | 34.1 | 54 | -19.9 | - | - | 224 | 130 | H |
| 3 | * 4.696 | 38.17 | PK2 | 34 | -27.3 | 44.87 | - | - | 74 | -29.13 | 316 | 131 | H |
| | * 4.697 | 27.72 | MAv1 | 34 | -27.3 | 34.42 | 54 | -19.58 | - | - | 316 | 131 | H |
| 5 | * 3.804 | 39.96 | PK2 | 33.6 | -28.3 | 45.26 | - | - | 74 | -28.74 | 327 | 153 | V |
| | * 3.804 | 28.74 | MAv1 | 33.6 | -28.3 | 34.04 | 54 | -19.96 | - | - | 327 | 153 | V |
| 6 | * 4.924 | 38.52 | PK2 | 34.1 | -27.9 | 44.72 | - | - | 74 | -29.28 | 46 | 391 | V |
| | * 4.925 | 28.25 | MAv1 | 34.1 | -27.8 | 34.55 | 54 | -19.45 | - | - | 46 | 391 | V |
| 4 | 9.242 | 35.09 | PK2 | 36.3 | -20.5 | 50.89 | - | - | - | - | 127 | 370 | H |

* - 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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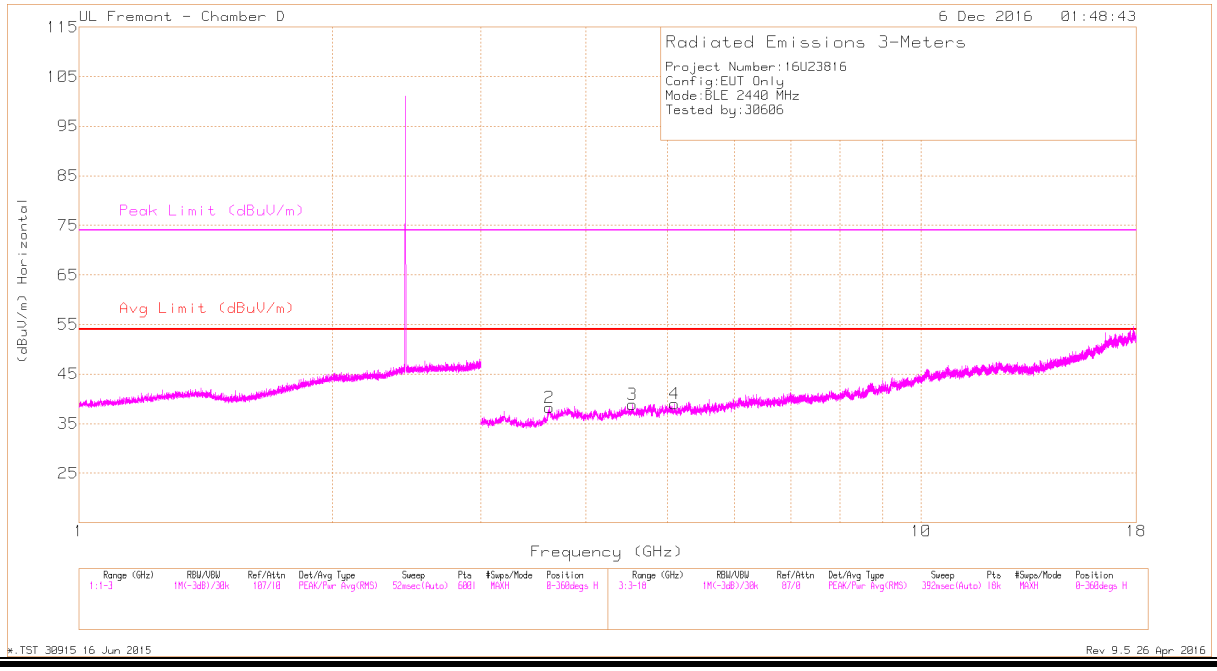
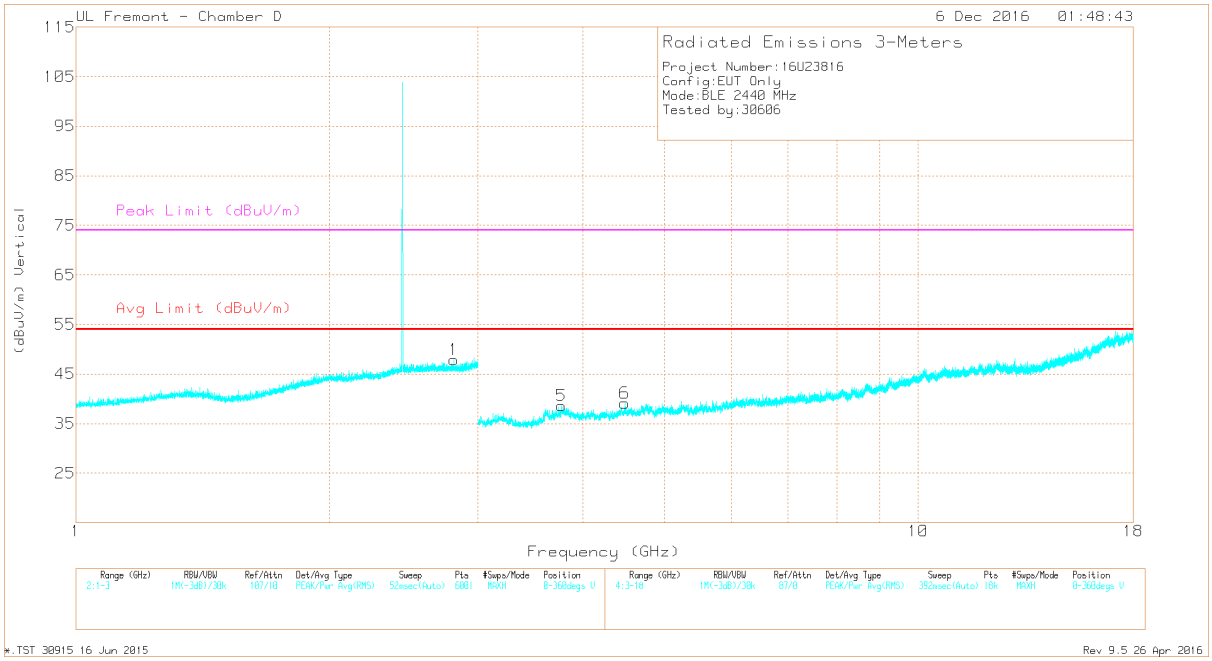
## MID CHANNEL HORIZONTAL




## MID CHANNEL VERTICAL





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| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (dB/m) | Amp/Cbl/ Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 2.81 | 41.43 | PK2 | 32.3 | -20.3 | 53.43 | - | - | 74 | -20.57 | 312 | 271 | V |
| | * 2.81 | 30.2 | MAv1 | 32.3 | -20.3 | 42.2 | 54 | -11.8 | - | - | 312 | 271 | V |
| 2 | * 3.615 | 39.83 | PK2 | 33.3 | -28.4 | 44.73 | - | - | 74 | -29.27 | 309 | 102 | H |
| | * 3.617 | 29.01 | MAv1 | 33.3 | -28.4 | 33.91 | 54 | -20.09 | - | - | 309 | 102 | H |
| 3 | * 4.544 | 39.09 | PK2 | 34 | -27.8 | 45.29 | - | - | 74 | -28.71 | 139 | 201 | H |
| | * 4.544 | 28.35 | MAv1 | 34 | -27.8 | 34.55 | 54 | -19.45 | - | - | 139 | 201 | H |
| 4 | * 5.092 | 37.73 | PK2 | 34 | -26.7 | 45.03 | - | - | 74 | -28.97 | 181 | 201 | H |
| | * 5.094 | 27.15 | MAv1 | 34 | -26.8 | 34.35 | 54 | -19.65 | - | - | 181 | 201 | H |
| 5 | * 3.771 | 39.58 | PK2 | 33.5 | -28.1 | 44.98 | - | - | 74 | -29.02 | 271 | 246 | V |
| | * 3.773 | 28.61 | MAv1 | 33.5 | -28.1 | 34.01 | 54 | -19.99 | - | - | 271 | 246 | V |
| 6 | 4.481 | 38.22 | PK2 | 33.9 | -27.6 | 44.52 | - | - | - | - | 147 | 399 | 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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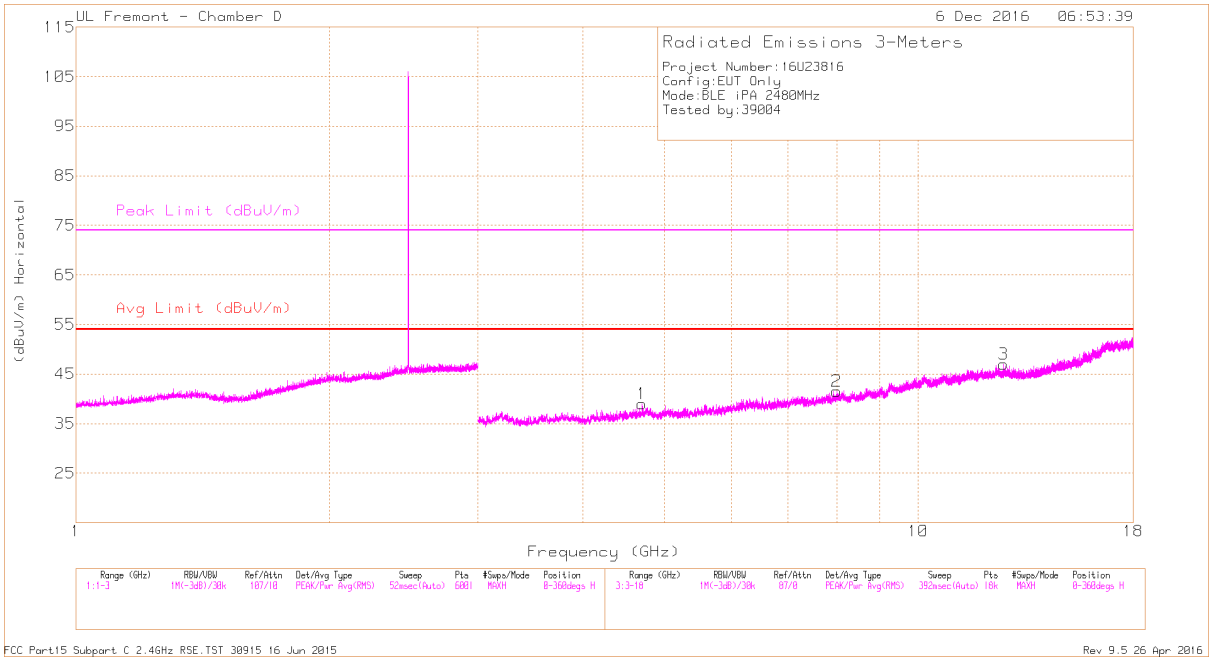
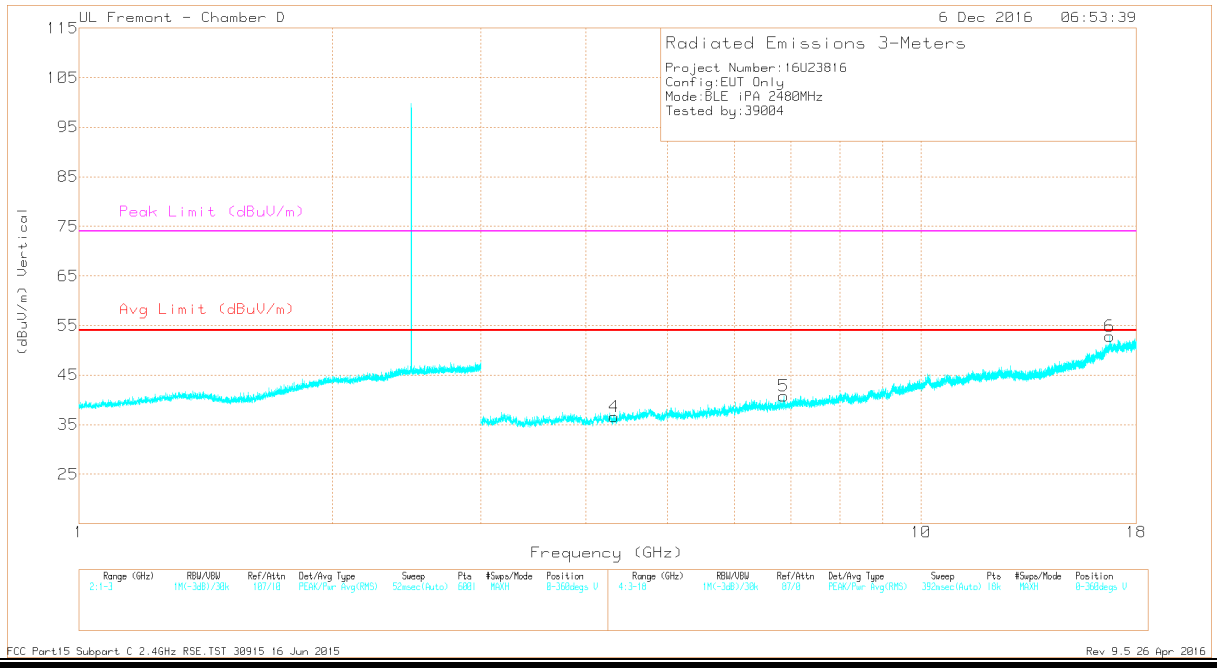
## HIGH CHANNEL HORIZONTAL




## HIGH CHANNEL VERTICAL





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| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T712 (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 | * 4.696 | 38.04 | PK2 | 34 | -27.3 | 0 | 44.74 | - | - | 74 | -29.26 | 243 | 316 | H |
| | * 4.695 | 27.59 | MAv1 | 34 | -27.3 | 0 | 34.29 | 54 | -19.71 | - | - | 243 | 316 | H |
| 3 | * 12.632 | 35.22 | PK2 | 39.1 | -21.2 | 0 | 53.12 | - | - | 74 | -20.88 | 229 | 249 | H |
| | * 12.629 | 23.97 | MAv1 | 39.1 | -21.4 | 0 | 41.67 | 54 | -12.33 | - | - | 229 | 249 | H |
| 4 | * 4.324 | 38.56 | PK2 | 33.6 | -28.5 | 0 | 43.66 | - | - | 74 | -30.34 | 227 | 191 | V |
| | * 4.321 | 27.65 | MAv1 | 33.6 | -28.4 | 0 | 32.85 | 54 | -21.15 | - | - | 227 | 191 | V |
| 5 | 6.865 | 37.05 | PK2 | 35.7 | -25.8 | 0 | 46.95 | - | - | - | - | 335 | 266 | V |
| 2 | 8.002 | 35.53 | PK2 | 35.8 | -23.9 | 0 | 47.43 | - | - | - | - | 310 | 101 | H |
| 6 | 16.749 | 34.17 | PK2 | 41.8 | -17.4 | 0 | 58.57 | - | - | - | - | 51 | 264 | 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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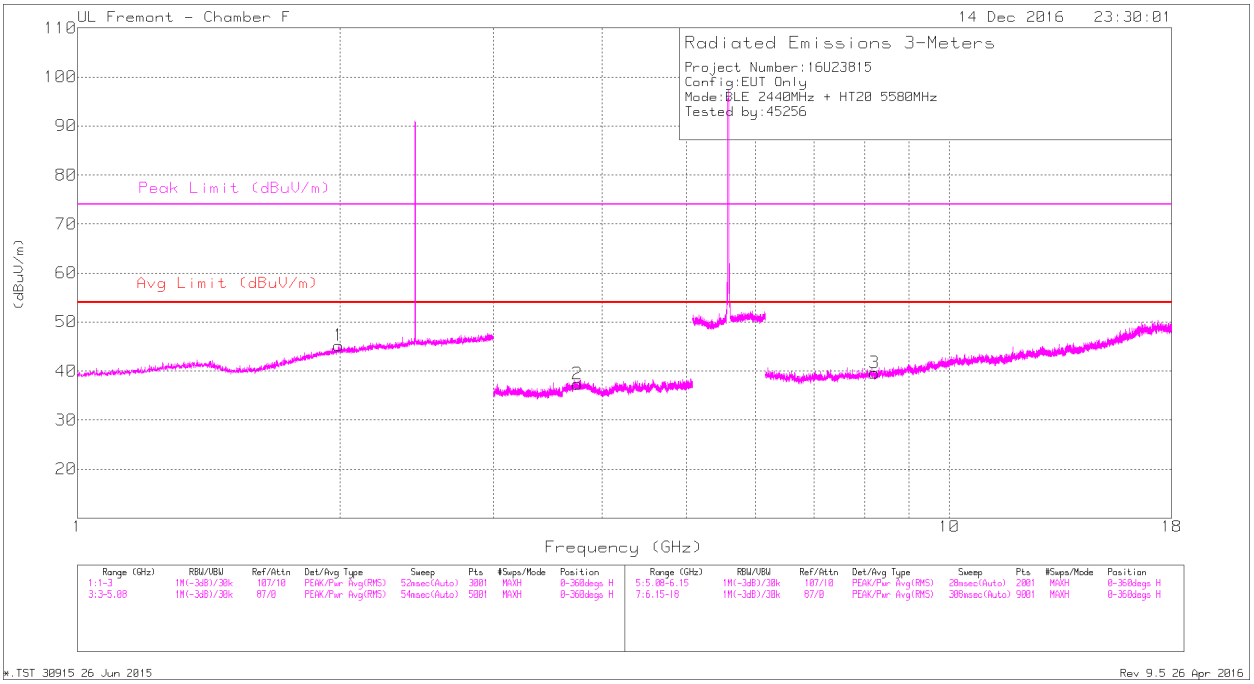
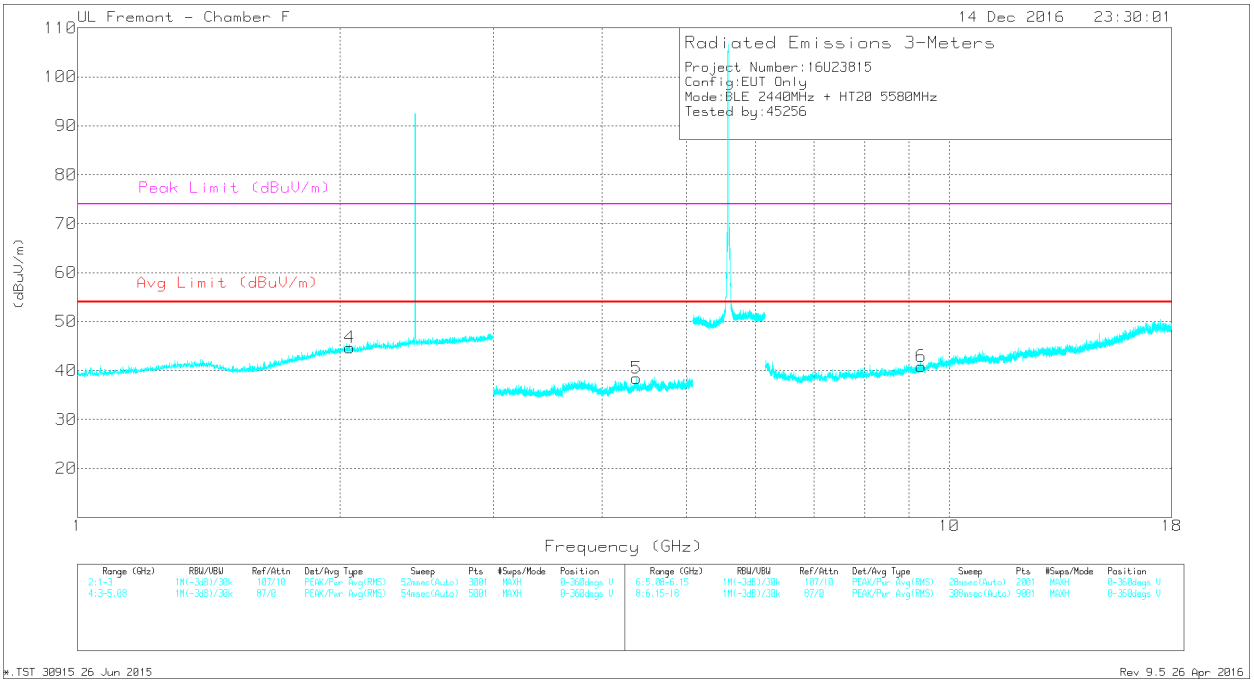
## 8.4. WORST-CASE CO-LOCATION

**BLUETOOTH LOW ENERGY AND 802.11 HT20 2Tx CDD MODE IN THE 5.6GHz BAND**

HORIZONTAL PLOT




VERTICAL PLOT





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## DATA

| | Meter Reading (dBuV) | Det | AF T344 (dB/m) | Amp/Cbl /Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.993 | 41.56 | PK-U | 31.5 | -21.4 | 0 | 51.66 | | | 74 | -22.34 | 148 | 200 | H |
| 1.992 | 30.44 | ADR | 31.5 | -21.4 | 0 | 40.54 | 53.97 | -13.43 | - | - | 148 | 200 | H |
| 2.053 | 42.44 | PK-U | 31.5 | -21.4 | 0 | 52.54 | | | 74 | -21.46 | 27 | 172 | V |
| 2.054 | 30.56 | ADR | 31.5 | -21.4 | 0 | 40.66 | 53.97 | -13.31 | - | - | 27 | 172 | V |
| * 3.747 | 37.93 | PK-U | 33.4 | -29.1 | 0 | 42.23 | | | 74 | -31.77 | 167 | 301 | H |
| * 3.746 | 27.75 | ADR | 33.4 | -29.1 | 0 | 32.05 | 53.97 | -21.92 | - | - | 167 | 301 | H |
| * 4.38 | 38.94 | PK-U | 34 | -28.9 | 0 | 44.04 | | | 74 | -29.96 | 343 | 293 | V |
| * 4.38 | 28.04 | ADR | 34 | -28.9 | 0 | 33.14 | 53.97 | -20.83 | - | - | 343 | 293 | V |
| * 8.207 | 34.89 | PK-U | 35.8 | -24.7 | 0 | 45.99 | | | 74 | -28.01 | 39 | 254 | H |
| * 8.205 | 24.69 | ADR | 35.8 | -24.6 | 0 | 35.89 | 53.97 | -18.08 | - | - | 39 | 254 | H |
| 9.29 | 34.28 | PK-U | 36.3 | -22.6 | 0 | 47.98 | | | 74 | -26.02 | 228 | 168 | V |
| 9.29 | 23.18 | ADR | 36.3 | -22.6 | 0 | 36.88 | 53.97 | -17.09 | - | - | 228 | 168 | V |


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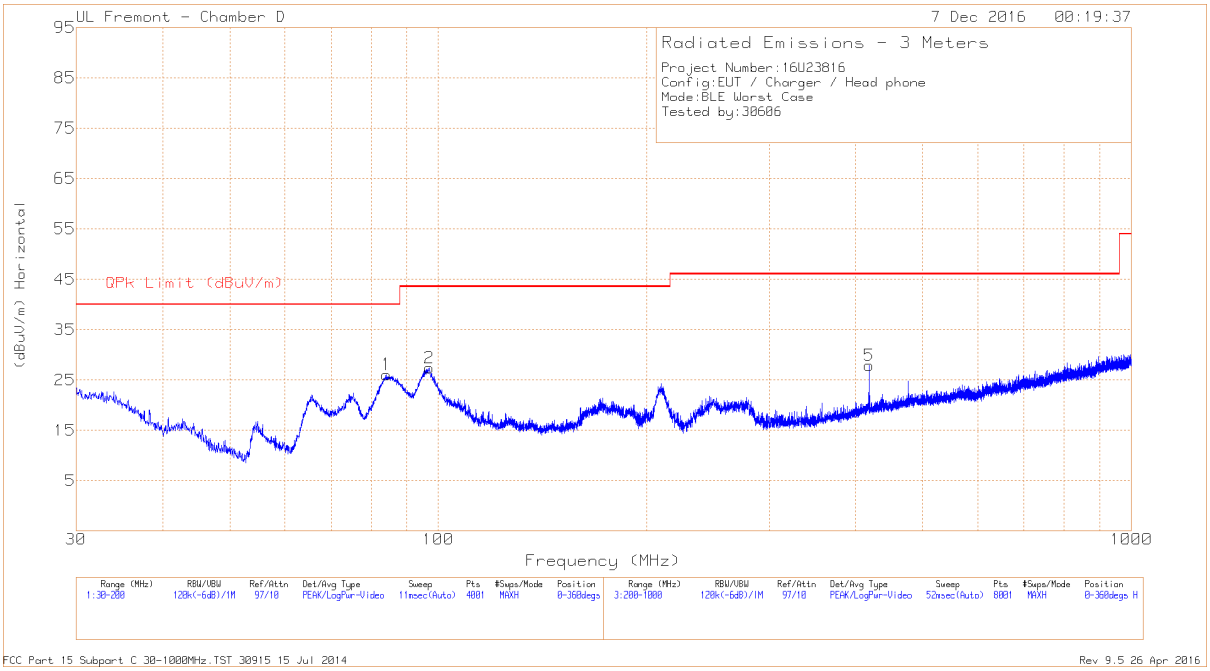
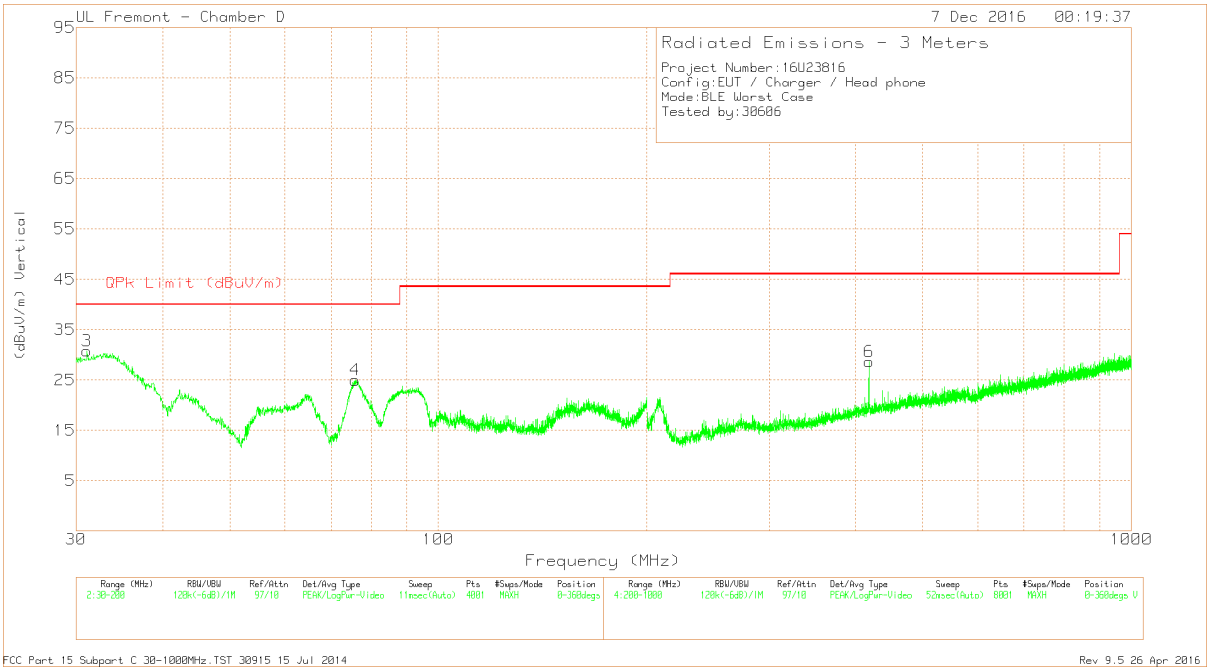
## 8.5. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT




VERTICAL PLOT





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**DATA**

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AF T243 (dB/m) | Amp/Cbl (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 31.105 | 38.17 | Pk | 24.5 | -31.9 | 30.77 | 40 | -9.23 | 0-360 | 100 | V |
| 4 | 75.9 | 44.59 | Pk | 11.9 | -31.5 | 24.99 | 40 | -15.01 | 0-360 | 100 | V |
| 1 | 84.23 | 46.17 | Pk | 11.3 | -31.4 | 26.07 | 40 | -13.93 | 0-360 | 299 | H |
| 2 | 96.98 | 45.5 | Pk | 13.3 | -31.4 | 27.4 | 43.52 | -16.12 | 0-360 | 299 | H |
| 5 | 418.25 | 37.38 | Pk | 20.4 | -29.9 | 27.88 | 46.02 | -18.14 | 0-360 | 299 | H |
| 6 | 418.4 | 38.13 | Pk | 20.4 | -29.9 | 28.63 | 46.02 | -17.39 | 0-360 | 201 | V |

Pk - Peak detector


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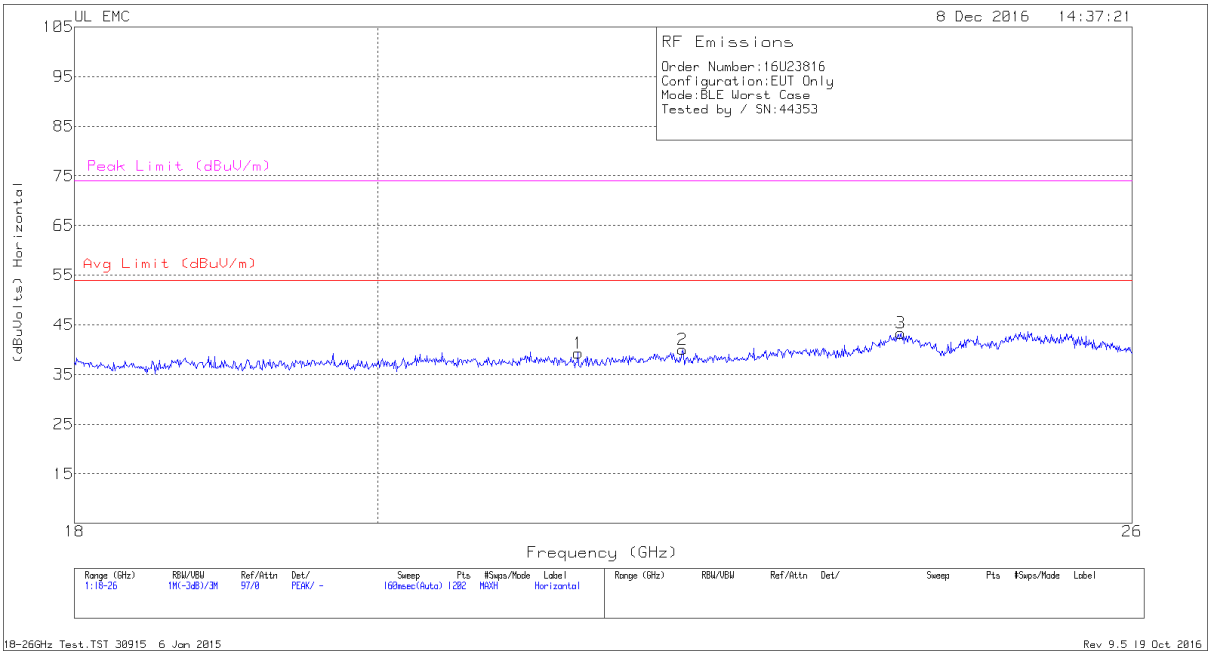
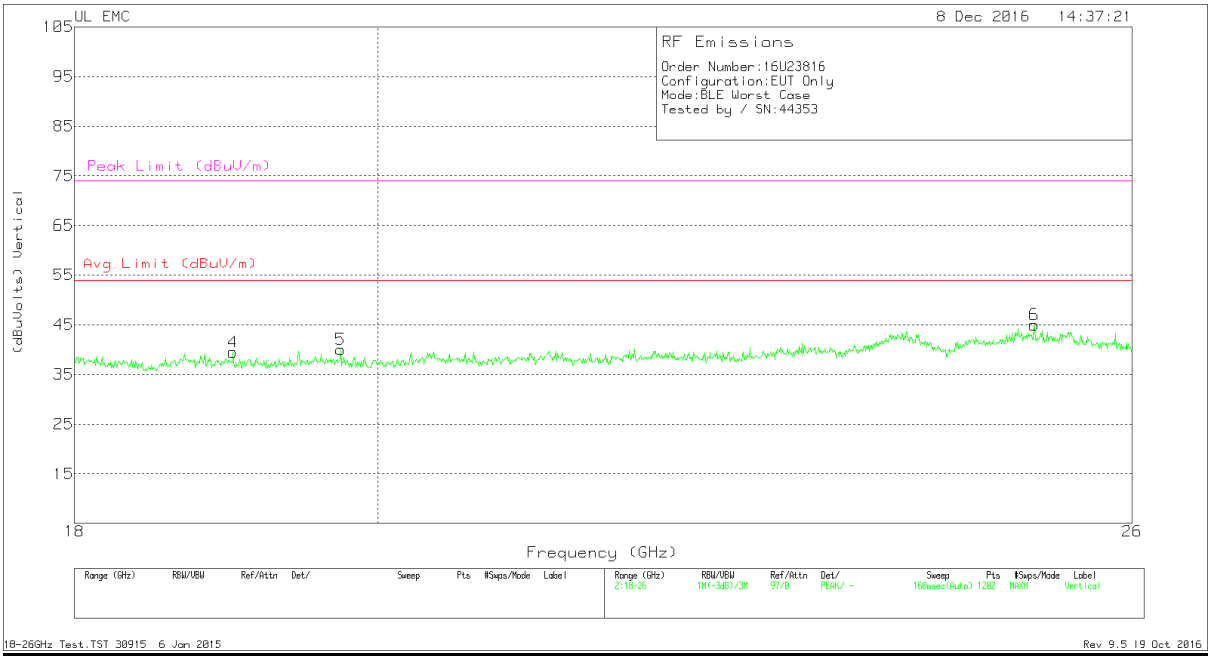
## 8.6. WORST-CASE ABOVE 18 GHz

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

HORIZONTAL PLOT




VERTICAL PLOT





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**Data**

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T449 (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 | 21.444 | 41.13 | Pk | 33.2 | -25.5 | -9.5 | 39.33 | 54 | -14.67 | 74 | -34.67 |
| 2 | 22.236 | 40.7 | Pk | 33.5 | -24.7 | -9.5 | 40 | 54 | -14 | 74 | -34 |
| 3 | 23.988 | 43.13 | Pk | 34 | -24.3 | -9.5 | 43.33 | 54 | -10.67 | 74 | -30.67 |
| 4 | 19.019 | 41.1 | Pk | 32.6 | -24.7 | -9.5 | 39.5 | 54 | -14.5 | 74 | -34.5 |
| 5 | 19.745 | 41.7 | Pk | 32.7 | -24.9 | -9.5 | 40 | 54 | -14 | 74 | -34 |
| 6 | 25.127 | 44.8 | Pk | 34.3 | -24.6 | -9.5 | 45 | 54 | -9 | 74 | -29 |

Pk - Peak detector


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# 9. AC POWER LINE CONDUCTED EMISSIONS

**LIMITS**

FCC §15.207 (a)

RSS-Gen 8.8

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

*Decreases with the logarithm of the frequency.

**TEST PROCEDURE**

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

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

Line conducted data is recorded for both NEUTRAL and HOT lines.

**RESULTS**


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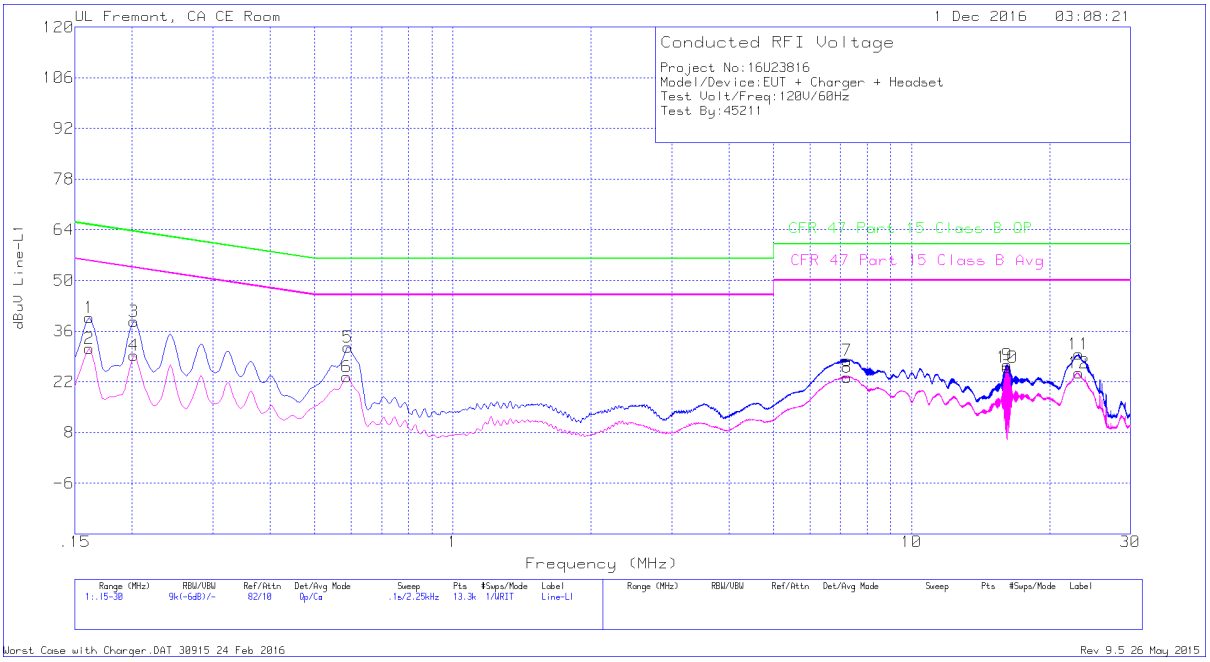
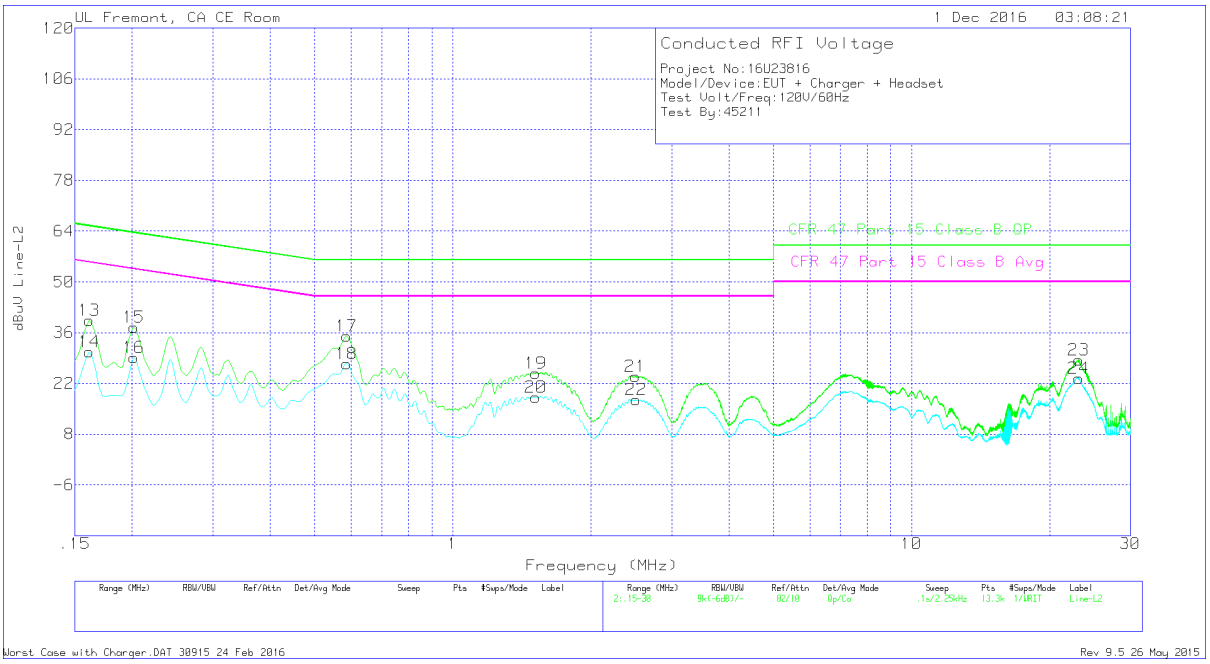
## 9.1. EUT POWERED BY AC/DC ADAPTER VIA USB CABLE

**LINE RESULTS**





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**WORST EMISSIONS**

| Range 1: Line-L1 .15 - 30MHz | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN L1 | LC Cables 1&3 | 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 | .16125 | 29.67 | Qp | 0 | 0 | 10.1 | 39.77 | 65.4 | -25.63 | - | - |
| 2 | .16125 | 21.06 | Ca | 0 | 0 | 10.1 | 31.16 | - | - | 55.4 | -24.24 |
| 3 | .20175 | 28.66 | Qp | 0 | 0 | 10.1 | 38.76 | 63.54 | -24.78 | - | - |
| 4 | .20175 | 19.16 | Ca | 0 | 0 | 10.1 | 29.26 | - | - | 53.54 | -24.28 |
| 5 | .591 | 21.49 | Qp | 0 | 0 | 10.1 | 31.59 | 56 | -24.41 | - | - |
| 6 | .5865 | 13.27 | Ca | 0 | 0 | 10.1 | 23.37 | - | - | 46 | -22.63 |
| 7 | 7.24425 | 17.65 | Qp | 0 | .1 | 10.2 | 27.95 | 60 | -32.05 | - | - |
| 8 | 7.23525 | 12.88 | Ca | 0 | .1 | 10.2 | 23.18 | - | - | 50 | -26.82 |
| 9 | 16.1588 | 16.26 | Qp | 0 | .2 | 10.3 | 26.76 | 60 | -33.24 | - | - |
| 10 | 16.1588 | 15.55 | Ca | 0 | .2 | 10.3 | 26.05 | - | - | 50 | -23.95 |
| 11 | 23.1315 | 18.96 | Qp | .1 | .2 | 10.4 | 29.66 | 60 | -30.34 | - | - |
| 12 | 23.1293 | 13.79 | Ca | .1 | .2 | 10.4 | 24.49 | - | - | 50 | -25.51 |
| Range 2: Line-L2 .15 - 30MHz | | | | | | | | | | | |
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN L2 | LC Cables 2&3 | 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 | .16125 | 29.22 | Qp | 0 | 0 | 10.1 | 39.32 | 65.4 | -26.08 | - | - |
| 14 | .16125 | 20.54 | Ca | 0 | 0 | 10.1 | 30.64 | - | - | 55.4 | -24.76 |
| 15 | .20175 | 27.39 | Qp | 0 | 0 | 10.1 | 37.49 | 63.54 | -26.05 | - | - |
| 16 | .20175 | 18.97 | Ca | 0 | 0 | 10.1 | 29.07 | - | - | 53.54 | -24.47 |
| 17 | .5865 | 24.93 | Qp | 0 | 0 | 10.1 | 35.03 | 56 | -20.97 | - | - |
| 18 | .5865 | 17.35 | Ca | 0 | 0 | 10.1 | 27.45 | - | - | 46 | -18.55 |
| 19 | 1.518 | 14.57 | Qp | 0 | .1 | 10.1 | 24.77 | 56 | -31.23 | - | - |
| 20 | 1.518 | 8.03 | Ca | 0 | .1 | 10.1 | 18.23 | - | - | 46 | -27.77 |
| 21 | 2.499 | 13.76 | Qp | 0 | .1 | 10.1 | 23.96 | 56 | -32.04 | - | - |
| 22 | 2.5125 | 7.24 | Ca | 0 | .1 | 10.1 | 17.44 | - | - | 46 | -28.56 |
| 23 | 23.1675 | 17.76 | Qp | .1 | .2 | 10.4 | 28.46 | 60 | -31.54 | - | - |
| 24 | 23.1495 | 12.71 | Ca | .1 | .2 | 10.4 | 23.41 | - | - | 50 | -26.59 |

Qp - Quasi-Peak detector

Ca - CISPR average detection


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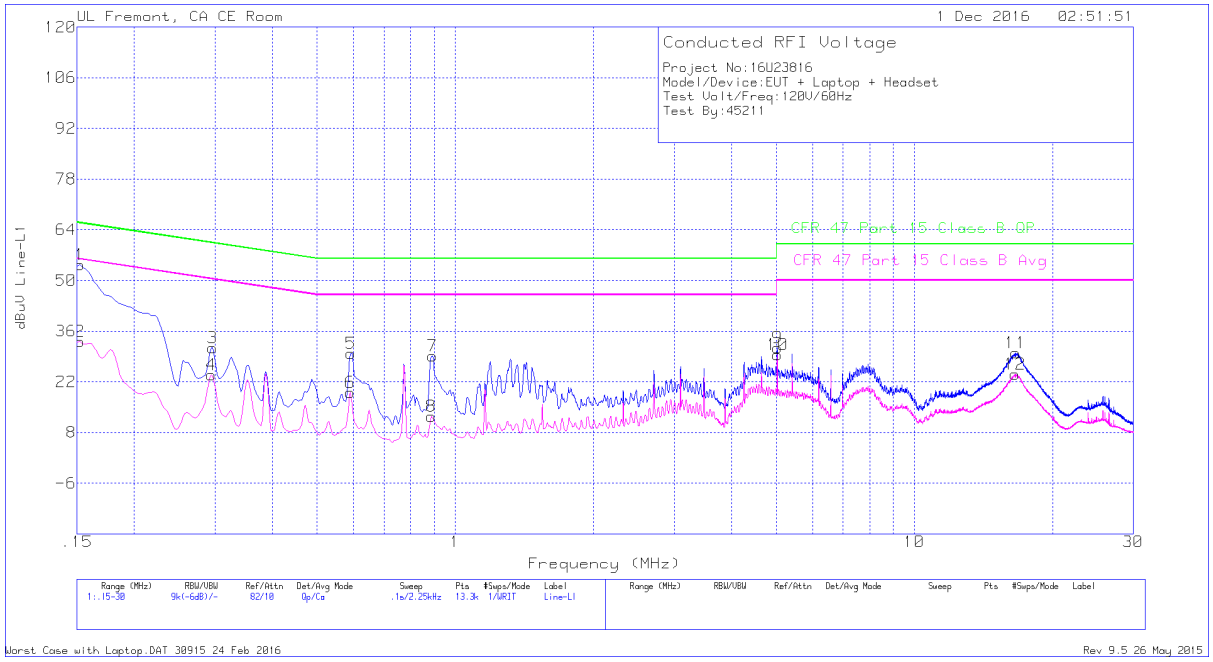
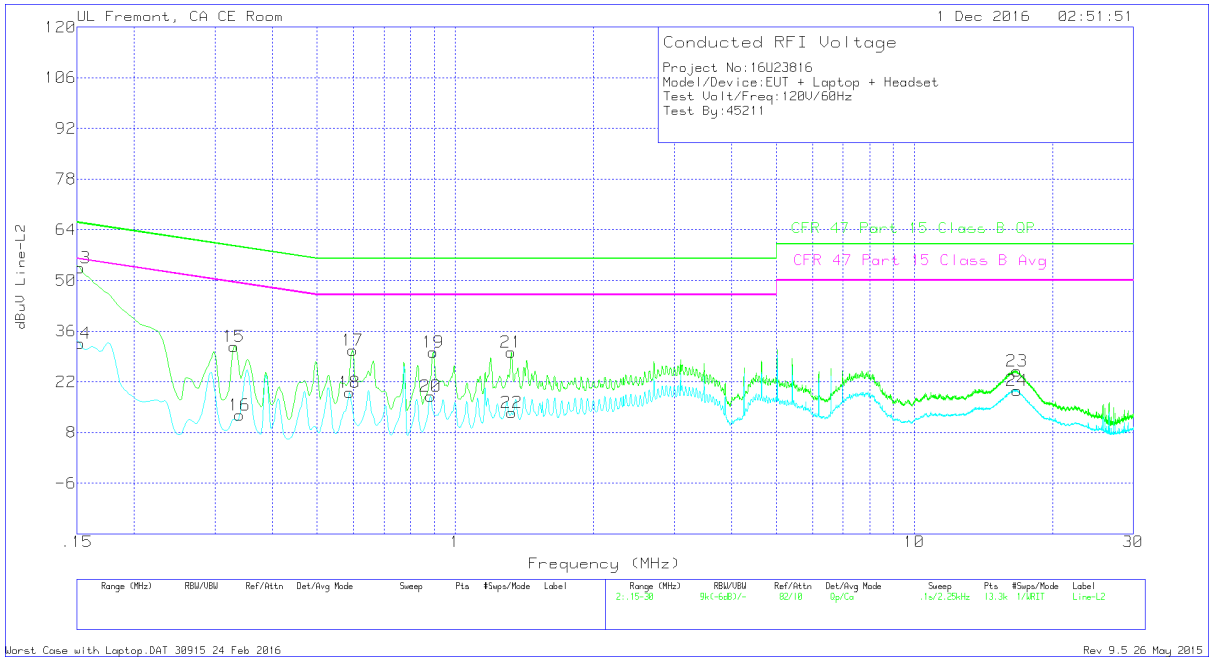
## 9.2. EUT POWERED BY HOST PC VIA USB CABLE

**LINE RESULTS**





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**WORST EMISSIONS**

| Range 1: Line-L1 .15 - 30MHz | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN L1 | LC Cables 1&3 | 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 | .15225 | 44.18 | Qp | .1 | 0 | 10.1 | 54.38 | 65.88 | -11.5 | - | - |
| 2 | .15225 | 22.94 | Ca | .1 | 0 | 10.1 | 33.14 | - | - | 55.88 | -22.74 |
| 3 | .29625 | 21.36 | Qp | 0 | 0 | 10.1 | 31.46 | 60.35 | -28.89 | - | - |
| 4 | .294 | 13.8 | Ca | 0 | 0 | 10.1 | 23.9 | - | - | 50.41 | -26.51 |
| 5 | .59325 | 19.76 | Qp | 0 | 0 | 10.1 | 29.86 | 56 | -26.14 | - | - |
| 6 | .591 | 8.91 | Ca | 0 | 0 | 10.1 | 19.01 | - | - | 46 | -26.99 |
| 7 | .8925 | 19.11 | Qp | 0 | 0 | 10.1 | 29.21 | 56 | -26.79 | - | - |
| 8 | .888 | 2.33 | Ca | 0 | 0 | 10.1 | 12.43 | - | - | 46 | -33.57 |
| 9 | 5.03025 | 21.19 | Qp | 0 | .1 | 10.1 | 31.39 | 60 | -28.61 | - | - |
| 10 | 5.03025 | 19.32 | Ca | 0 | .1 | 10.1 | 29.52 | - | - | 50 | -20.48 |
| 11 | 16.63125 | 19.49 | Qp | 0 | .2 | 10.3 | 29.99 | 60 | -30.01 | - | - |
| 12 | 16.5705 | 13.6 | Ca | 0 | .2 | 10.3 | 24.1 | - | - | 50 | -25.9 |
| Range 2: Line-L2 .15 - 30MHz | | | | | | | | | | | |
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN L2 | LC Cables 2&3 | 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 | .15225 | 43.42 | Qp | 0 | 0 | 10.1 | 53.52 | 65.88 | -12.36 | - | - |
| 14 | .15225 | 22.5 | Ca | 0 | 0 | 10.1 | 32.6 | - | - | 55.88 | -23.28 |
| 15 | .33 | 21.71 | Qp | 0 | 0 | 10.1 | 31.81 | 59.45 | -27.64 | - | - |
| 16 | .339 | 2.67 | Ca | 0 | 0 | 10.1 | 12.77 | - | - | 49.23 | -36.46 |
| 17 | .59775 | 20.53 | Qp | 0 | 0 | 10.1 | 30.63 | 56 | -25.37 | - | - |
| 18 | .58875 | 9.02 | Ca | 0 | 0 | 10.1 | 19.12 | - | - | 46 | -26.88 |
| 19 | .89475 | 20.06 | Qp | 0 | 0 | 10.1 | 30.16 | 56 | -25.84 | - | - |
| 20 | .8835 | 7.96 | Ca | 0 | 0 | 10.1 | 18.06 | - | - | 46 | -27.94 |
| 21 | 1.3245 | 20.06 | Qp | 0 | .1 | 10.1 | 30.26 | 56 | -25.74 | - | - |
| 22 | 1.32675 | 3.27 | Ca | 0 | .1 | 10.1 | 13.47 | - | - | 46 | -32.53 |
| 23 | 16.73475 | 14.54 | Qp | 0 | .2 | 10.3 | 25.04 | 60 | -34.96 | - | - |
| 24 | 16.73588 | 9.12 | Ca | 0 | .2 | 10.3 | 19.62 | - | - | 50 | -30.38 |

Qp - Quasi-Peak detector

Ca - CISPR average detection


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