# FCC CFR47 PART 15 SUBPART C
# INDUSTRY CANADA RSS-247 ISSUE 1

## BLUETOOTH LOW ENERGY
## CERTIFICATION TEST REPORT

**FOR**

**BLE SMART MEASURE PRO**

**MODEL NUMBER: STHT77366**

**FCC ID: 2ACBG3000**
**IC ID: 11952A-3000**

**REPORT NUMBER: 15R21104-E1 REVISION A**

**ISSUE DATE: SEP 16, 2015**

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NVLAP LAB CODE 200065-0

Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| -- | 8/12/15 | Initial Issue | P. ZHANG |
| A | 9/16/15 | Update 99% BW | P. ZHANG |

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** ikeGPS
**EUT DESCRIPTION:** BLE SMART MEASURE PRO
**MODEL:** STHT77366
**SERIAL NUMBER:** 2175294 (Conducted) ; 2175293 (Radiated)
**DATE TESTED:** JULY 30 –AUGUST 10, 2015

| 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.

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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 v03r03, ANSI C63.10-2009 for FCC and ANSI C63.10-2013 for IC, RSS-GEN Issue 4, and RSS-247 Issue 1.

ANSI C63.10-2009 Deviation

Radiated spurious emission above 1GHz EUT height is 1.5m not 0.8m.

# 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) |

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.

# 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 |
|---|---|
| Conducted Disturbance, 0.15 to 30 MHz | 3.52 dB |
| Radiated Disturbance, 30 to 18000 MHz | 4.94 dB |

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

# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is a BLE Smart Measure Pro.

## 5.2. MAXIMUM OUTPUT POWER

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

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| 2402-2480 | BLE | -10.91 | 0.08 |

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -5.9dBi.

## 5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission 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 orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

## 5.5. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID** |
| LAPTOP | Lenovo | T430 | N/A | N/A |
| LAPTOP CHARGER | Lenovo | N/A | N/A | N/A |

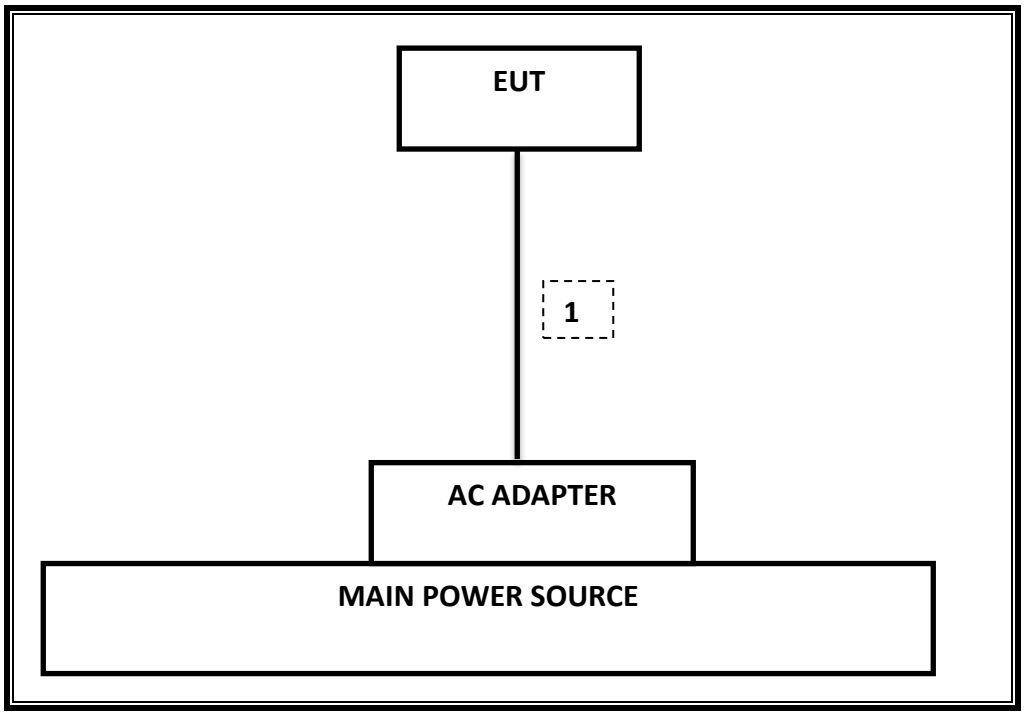
**I/O CABLES**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No** | **Port** | **# of identical ports** | **Connector Type** | **Cable Type** | **Cable Length (m)** | **Remarks** |
| 1 | USB | 1 | USB Cable | Shielded | 1m | N/A |
| 2 | Ethernet | 1 | RJ-45 | Unshielded | 1m | N/A |
| | | | | | | |

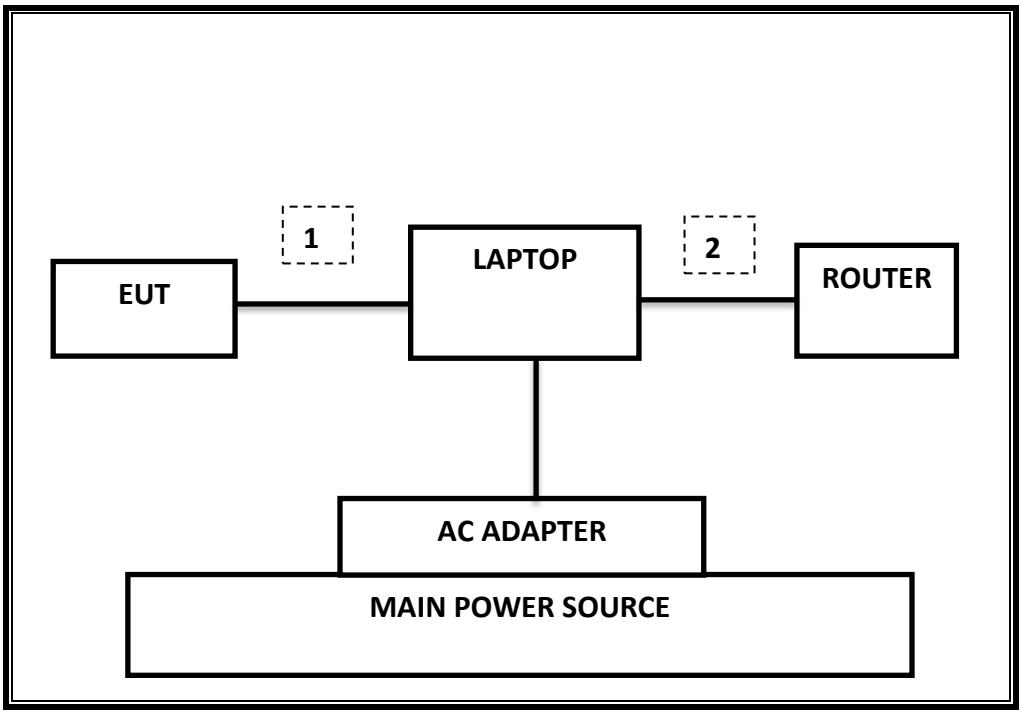
**TEST SETUP**

EUT was set in the BLE mode to enable BLE communications.

**SETUP DIAGRAM FOR TESTS**



**SETUP DIAGRAM FOR AC LINE TESTS**



# 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** |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01069 | 12/20/15 |
| Spectrum Analyzer,9KHz-40GHz | HP | 8564E | C00986 | 04/01/16 |
| EMI Test Receiver, 9 kHz-7 GHz | R & S | ESCI 7 | 1000741 | 08/13/15 |
| EMI Test Receiver, 30 MHz | R & S | ESHS 20 | N02396 | 08/18/15 |
| Peak Power Meter | Agilent / HP | E4416A | C00963 | 12/13/15 |
| Peak / Average Power Sensor | Agilent / HP | E9327A | C00964 | 12/13/15 |
| Antenna, Horn, 1-18 GHz | ETS | 3117 | C01022 | 02/21/16 |
| Antenna, Horn,18- 26 GHz | ARA | MWH-1826/B | C00946 | 11/12/15 |
| Antenna, Horn, 26-40 GHz | ARA | MWH-2640 | C00891 | 06/28/16 |
| Antenna, Bilog, 30MHz-1 GHz | Sunol Sciences | JB1 | T243 | 03/06/16 |
| RF Preamplifier, 1GHz - 18GHz | Miteq | NSP4000-SP2 | 924343 | 03/23/16 |
| RF Preamplifier, 1GHz - 26.5GHz | HP | 8449B | T404 | 06/29/16 |
| AC Power Supply, 2,500VA 45-500Hz | Elgar-Ametek | CW2501M | F00013 | CNR |
| RF Preamplifier, 1GHz - 40GHz | Miteq | NSP4000-SP2 | C00990 | 08/20/15 |
| Attenuator / Switch driver | HP | 11713A | F00204 | CNR |
| Low Pass Filter 5GHz | Micro-Tronics | LPS17541 | F00219 | 05/23/16 |
| High Pass Filter 6GHz | Micro-Tronics | HPS17542 | F00222 | 05/22/16 |
| High Pass Filter 3GHz | Micro-Tronics | HPM17543 | F00224 | 05/22/16 |

| Test Software List | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Version** |
| Radiated Software | UL | UL EMC | Version 9.5, 07/22/14 |
| Conducted Software | UL | UL EMC | Version 9.5, 05/17/14 |
| CLT Software | UL | UL RF | Version 1.0, 02/02/15 |
| Antenna Port Software | UL | UL RF | Version 2.1.1.1, 1/20/15 |

# 7. SUMMARY

| FCC Part Section | RSS Section(s) | Test Description | Test Limit | Test Condition | Test Result | Worst Case |
|---|---|---|---|---|---|---|
| 15.247 (a)(2) | RSS-247 5.2 (1) | Occupied Band width (6dB) | >500KHz | Conducted | Pass | 0.680 MHz |
| 2.1051, 15.247 (d) | RSS-247 5.5 | Band Edge / Conducted Spurious Emission | -20dBc | | Pass | -31.102 dBm |
| 15.247 | RSS-247 5.4 (4) | TX conducted output power | <30dBm | | Pass | -10.91dBm |
| 15.247 | RSS-247 5.2 (2) | PSD | <8dBm | | Pass | -23.46dBm |
| 15.207 (a) | RSS-GEN 8.8 | AC Power Line conducted emissions | Section 10 | Radiated | Pass | 49.7dBuV(QP) |
| 15.205, 15.209 | RSS-GEN 8.9 | Radiated Spurious Emission | < 54dBuV/m | | Pass | 51.08dBuV/m |

# ANTENNA PORT TEST RESULTS

## 8.1. 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.

**TEST PROCEDURE**

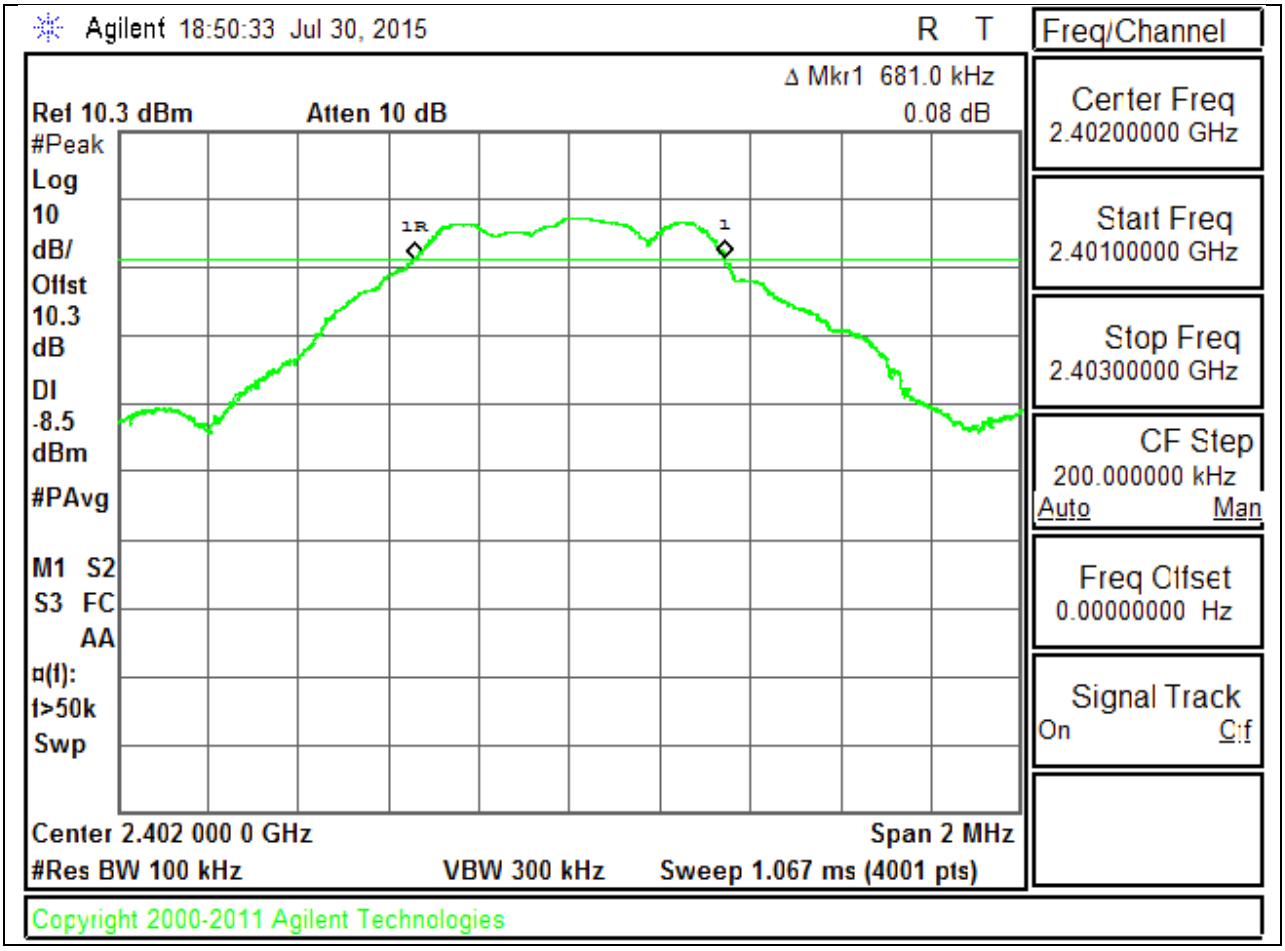
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

**RESULTS**

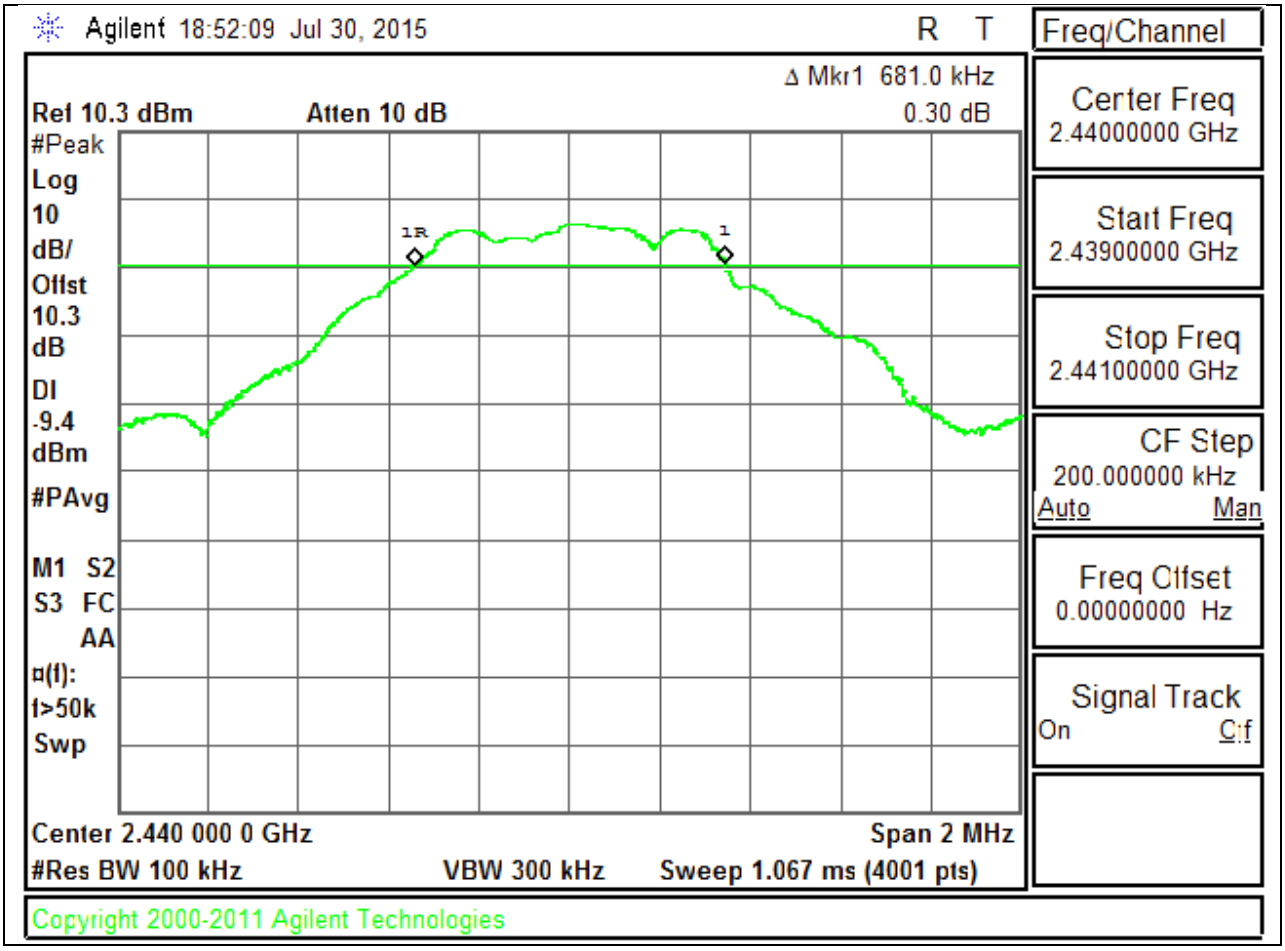
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2402 | 0.681 | 0.5 |
| Middle | 2440 | 0.681 | 0.5 |
| High | 2480 | 0.680 | 0.5 |

**6 dB BANDWIDTH PLOTS**

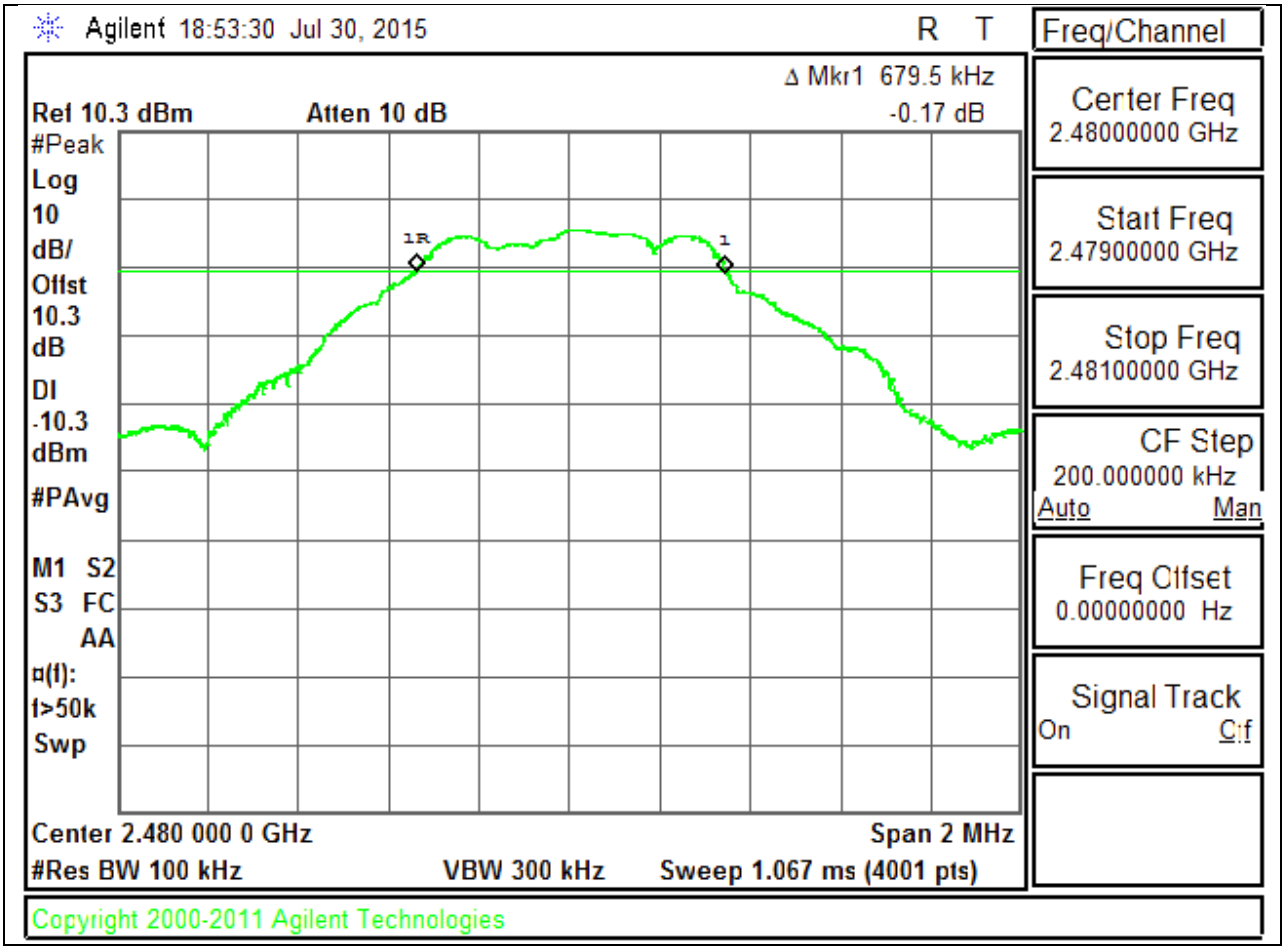
## LOW CHANNEL



## MID CHANNEL



## HIGH CHANNEL



## 8.2. 99% BANDWIDTH

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

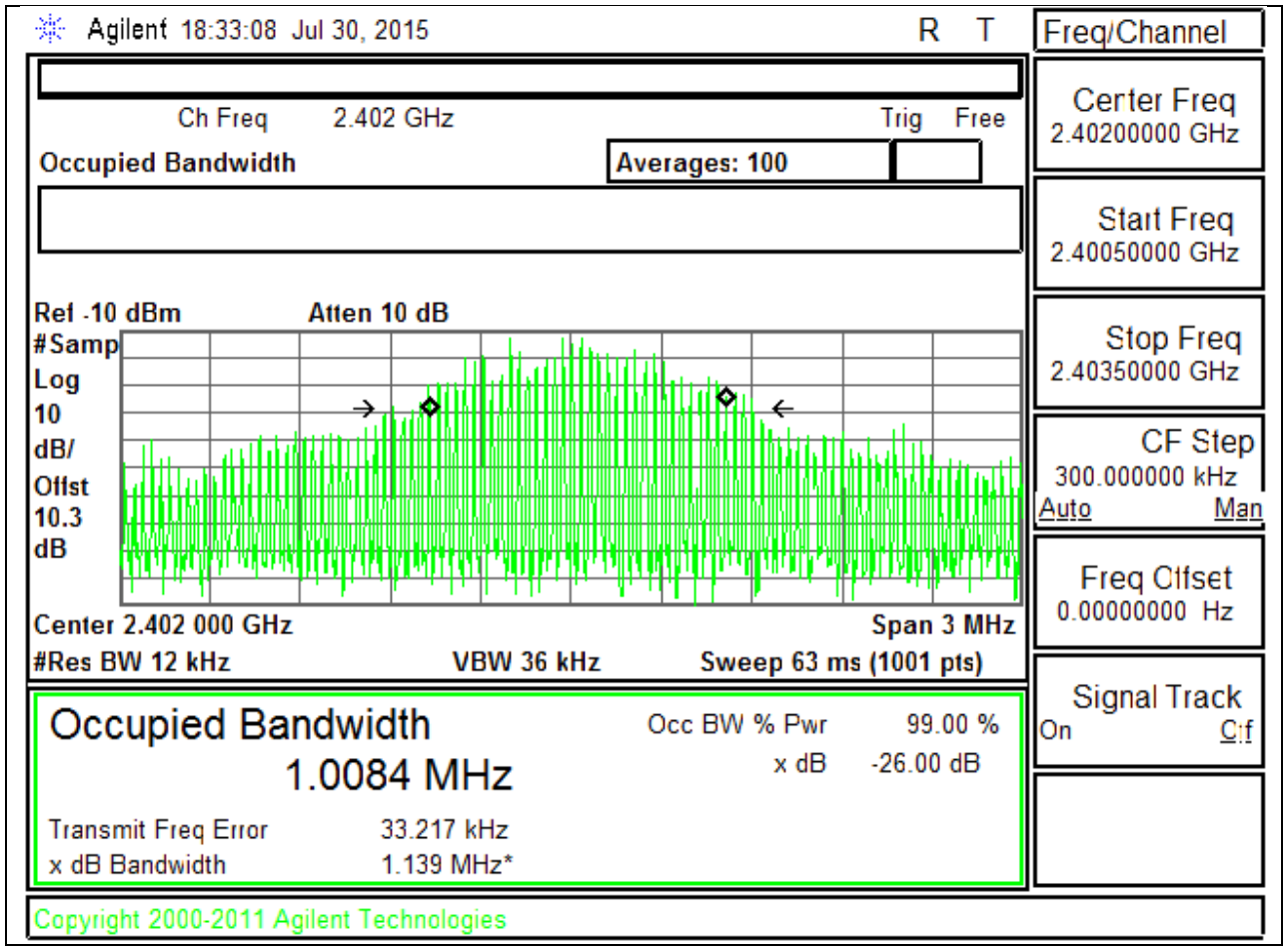
Reference to KDB558074 D01 DTS Meas Guidance v03r03: The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

**RESULTS**

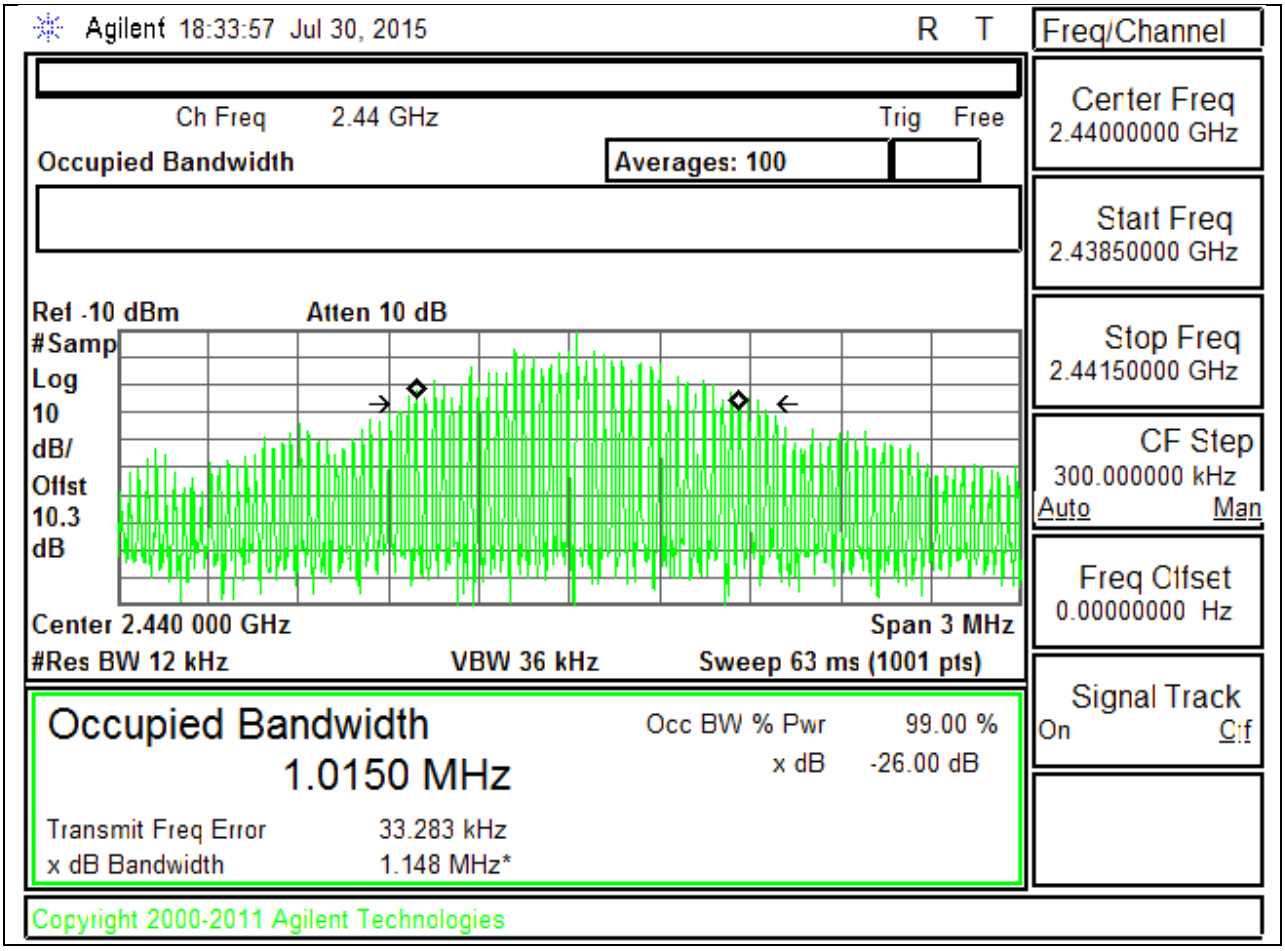
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2402 | 1.0088 |
| Middle | 2440 | 1.0150 |
| High | 2480 | 1.0076 |

**99% BANDWIDTH PLOTS**

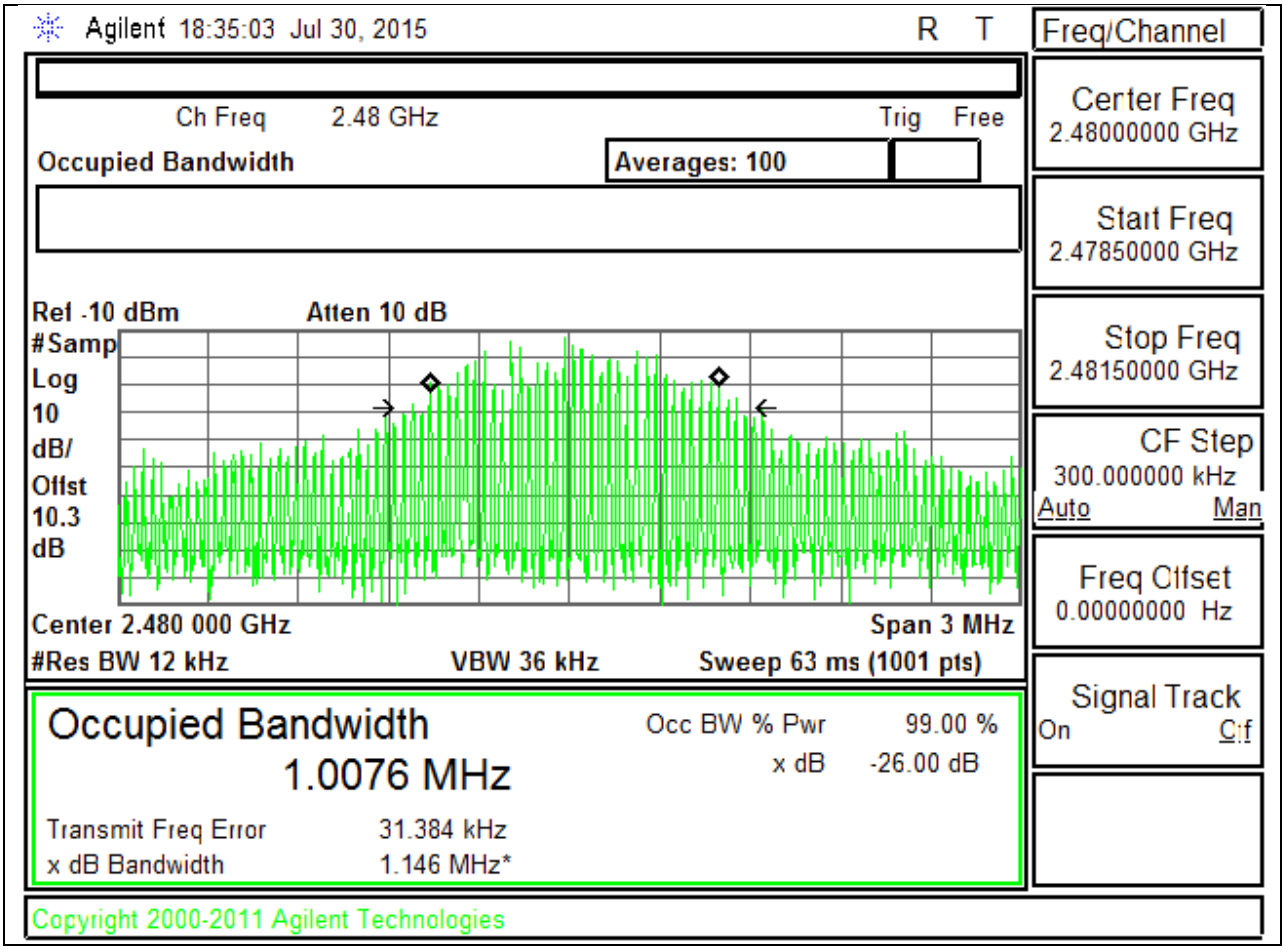
## LOW CHANNEL



## MID CHANNEL



## HIGH CHANNEL



## 8.3. OUTPUT POWER

**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**

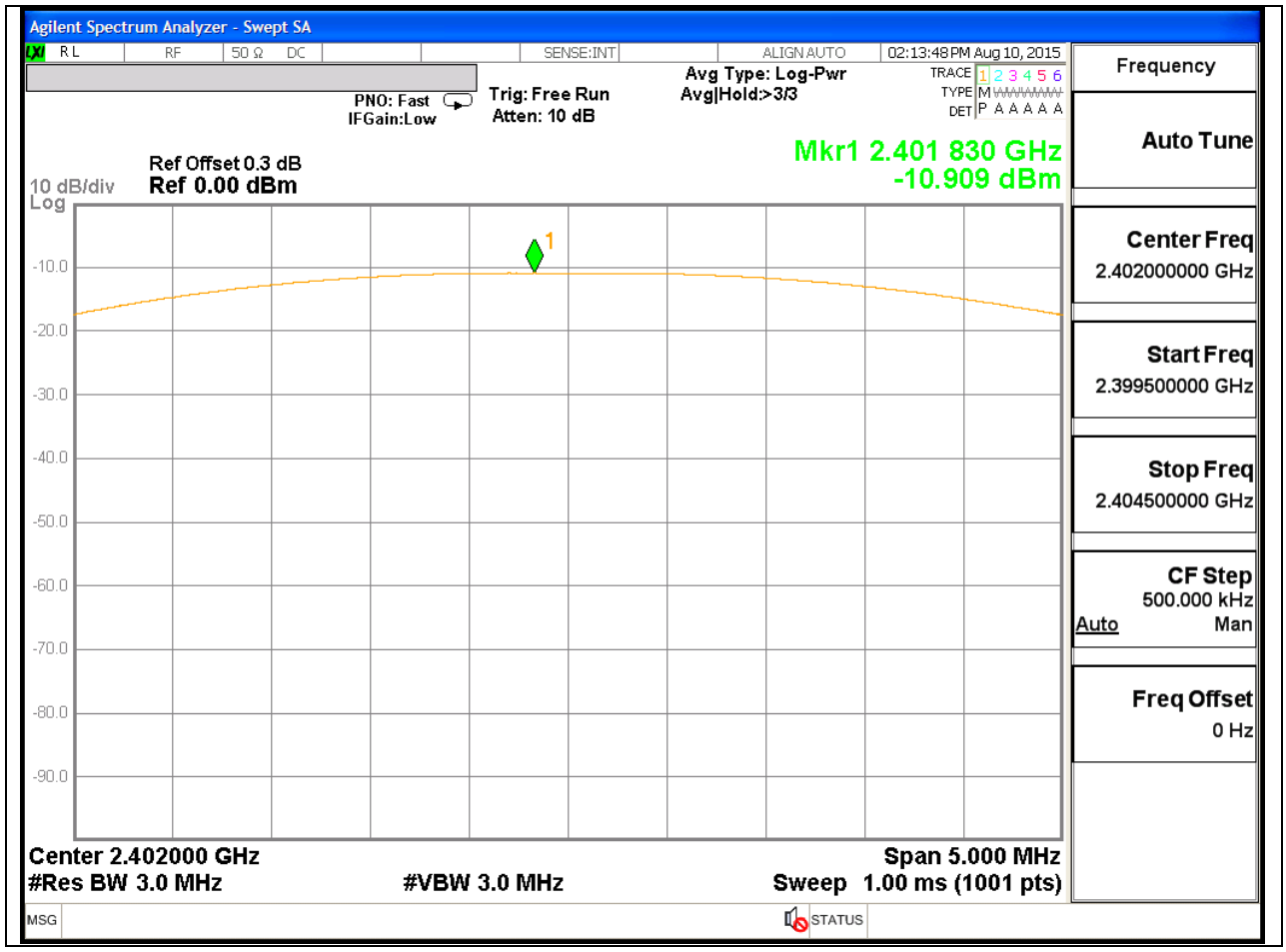
Peak power is measured using KDB558074 D01 DTS Meas Guidance v03r03 utilizing spectrum analyzer.

**RESULTS**

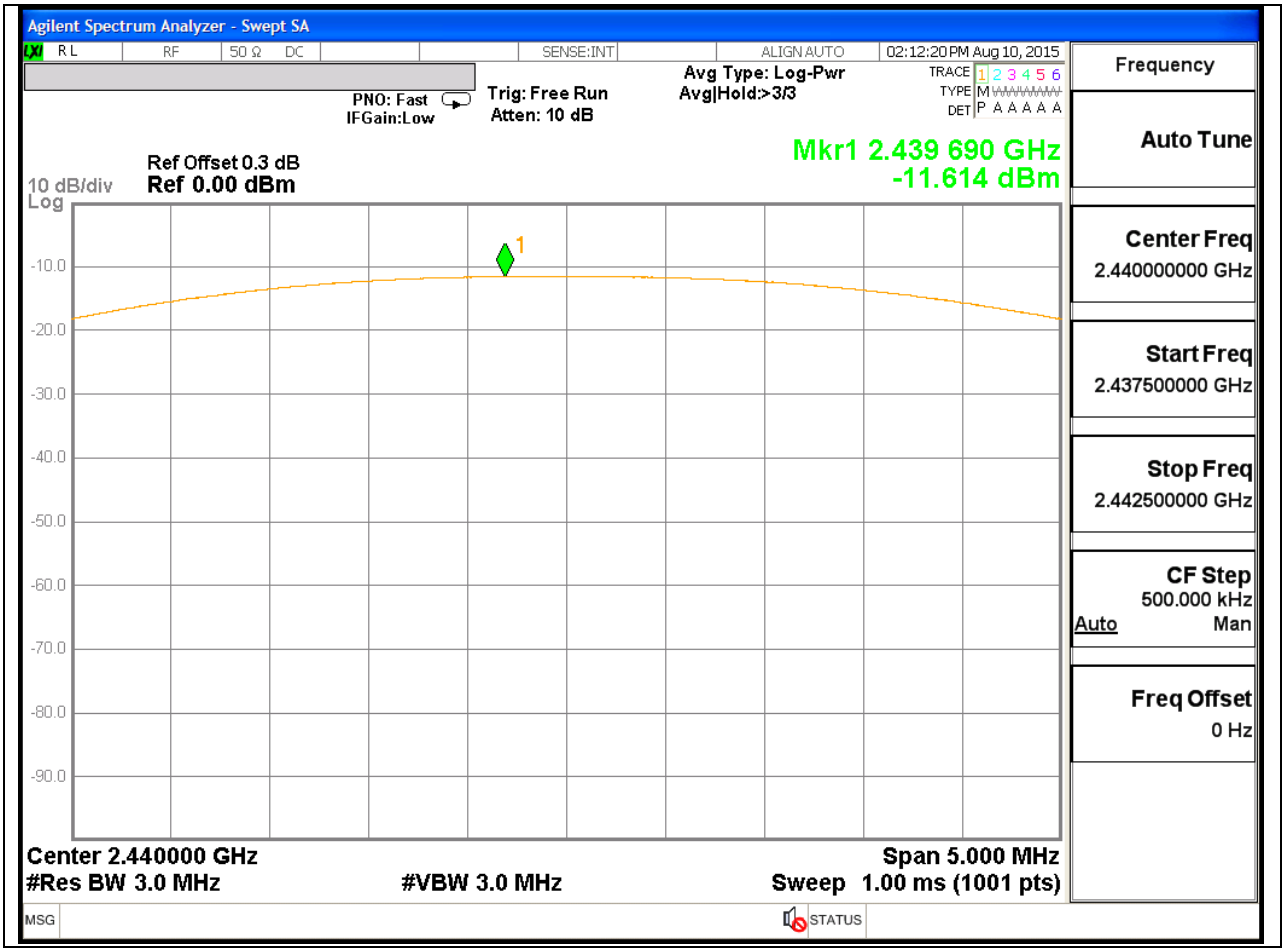
| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | -10.91 | 30 | -40.909 |
| Middle | 2440 | -11.61 | 30 | -41.614 |
| High | 2480 | -12.50 | 30 | -42.496 |

**OUTPUT POWER PLOTS**

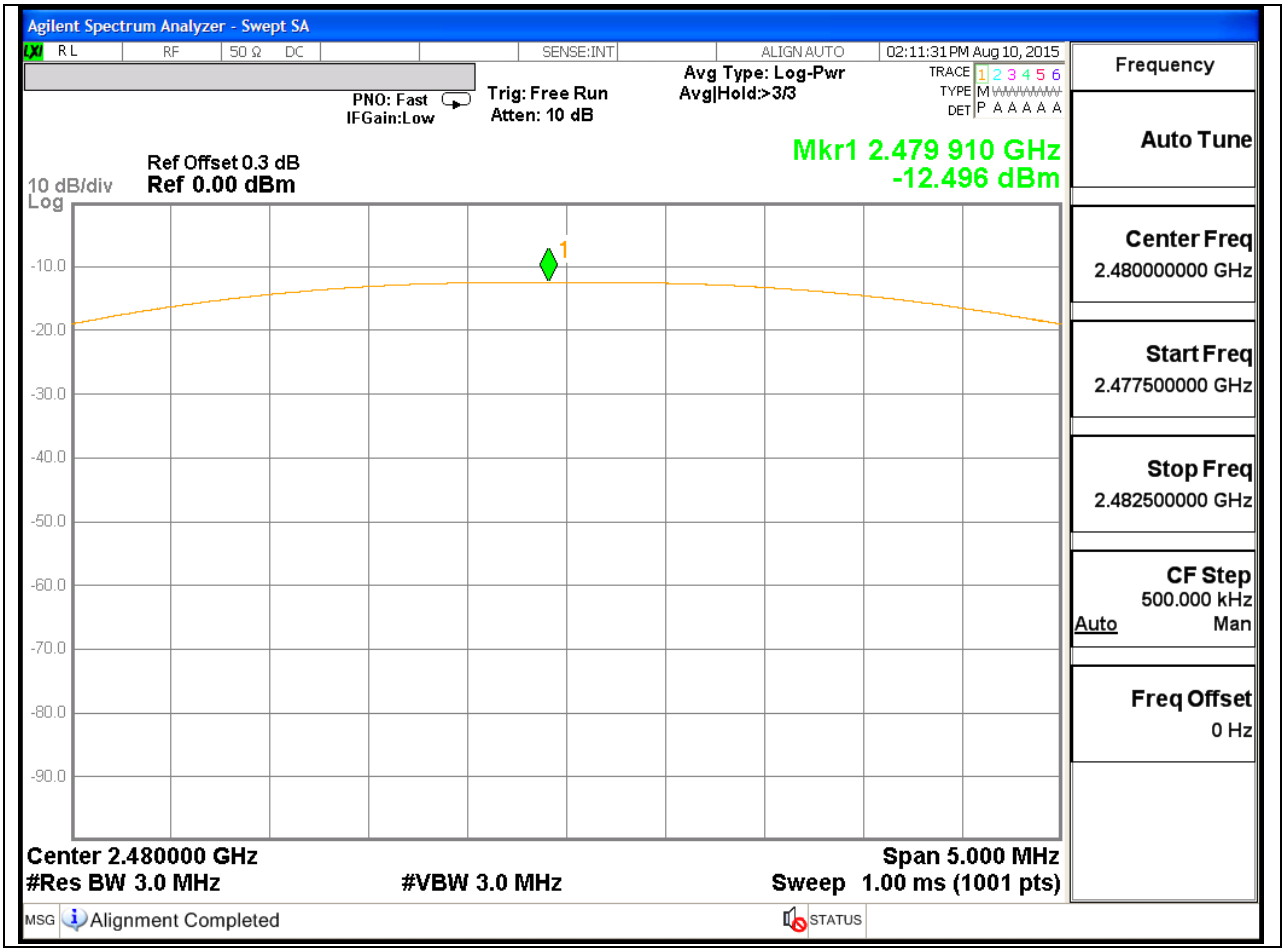
## LOW CHANNEL



## MID CHANNEL



## HIGH CHANNEL



## 8.4. AVERAGE POWER

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

**RESULTS**

The cable assembly insertion loss of 0.3 dB (including 0.3dB cable) was entered as an offset in the power meter to allow for direct reading of power.

| Channel | Frequency (MHz) | AV power (dBm) |
|---|---|---|
| Low | 2402 | -10.95 |
| Middle | 2440 | -11.81 |
| High | 2480 | -12.72 |

## 8.5. 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.

**TEST PROCEDURE**

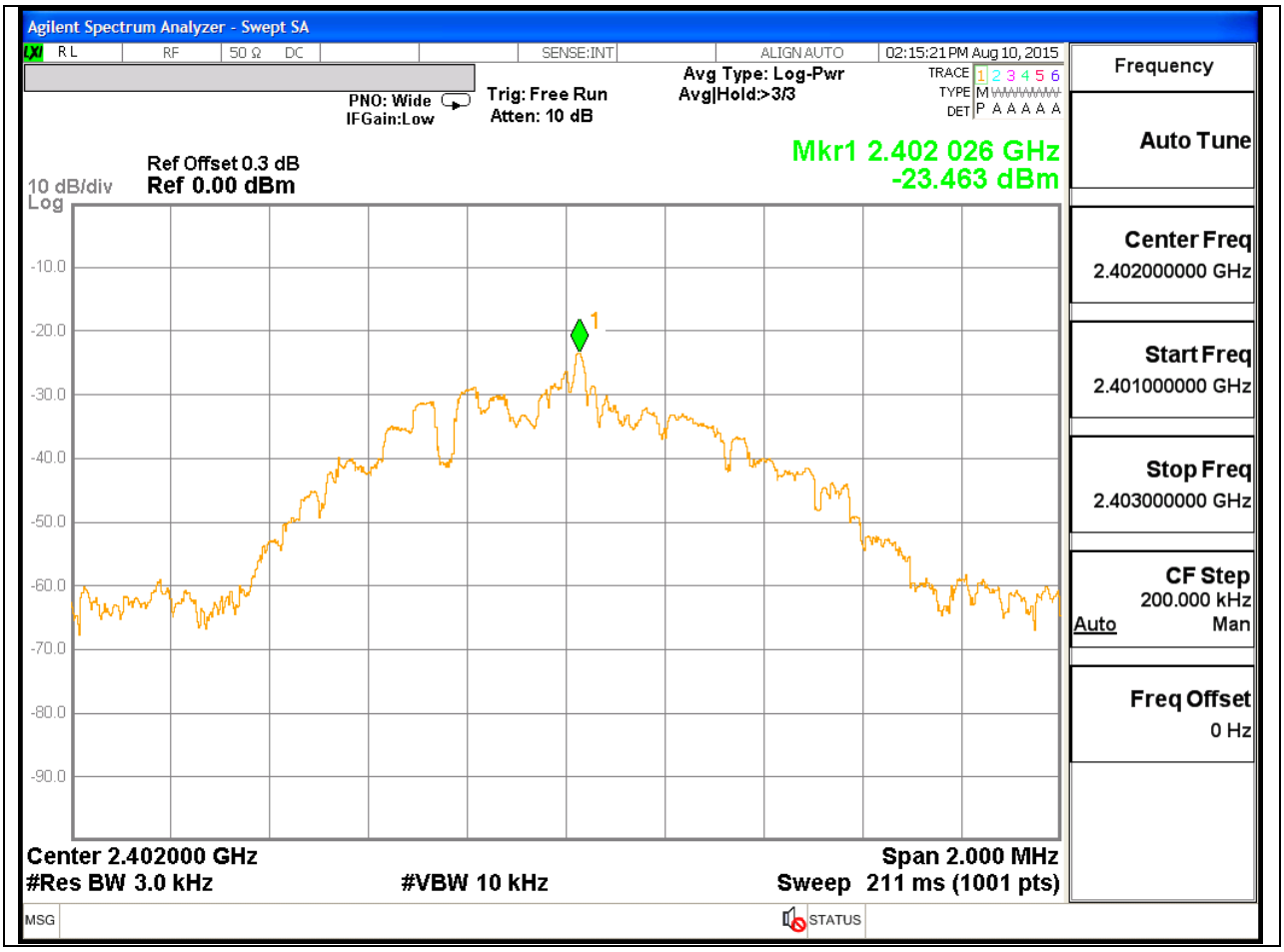
Power Spectral Density was performed utilizing the "Method PKPSD (Peak PSD)" under KDB558074 D01 DTS Meas Guidance v03r03.

**RESULTS**

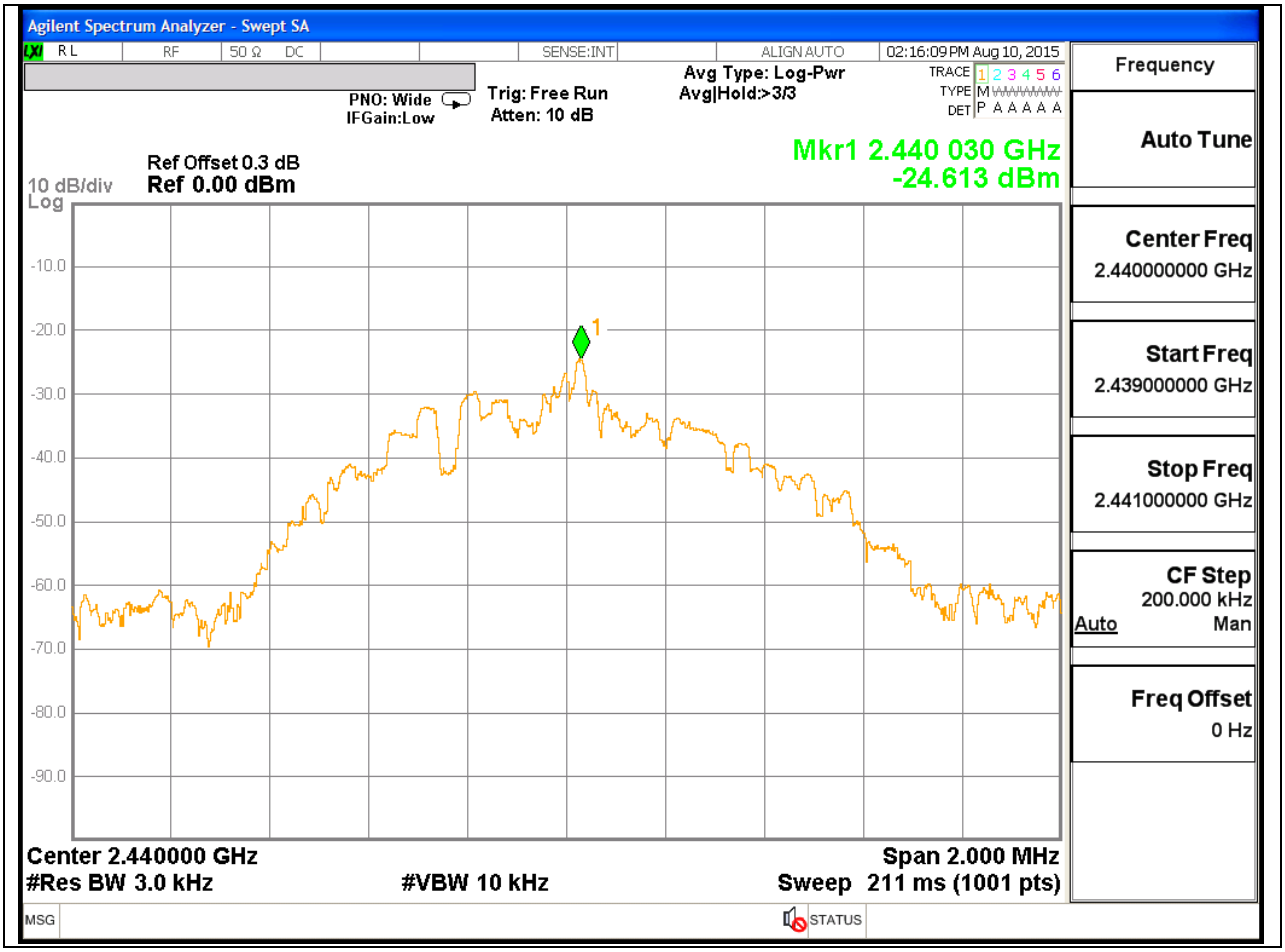
| Channel | Frequency (MHz) | PSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2402 | -23.46 | 8 | -31.46 |
| Middle | 2440 | -24.61 | 8 | -32.61 |
| High | 2480 | -24.65 | 8 | -32.65 |

**POWER SPECTRAL DENSITY PLOTS**

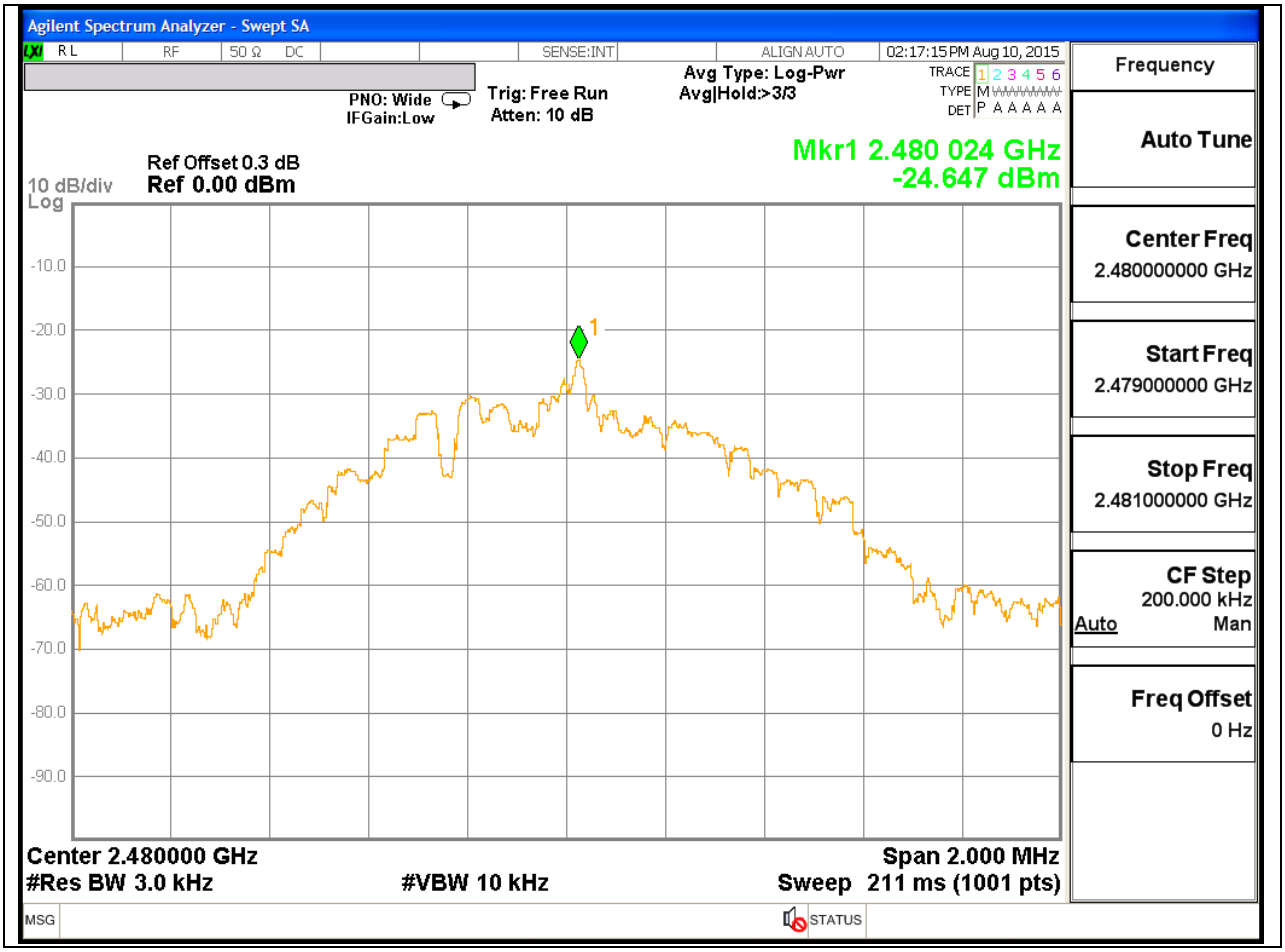
## LOW CHANNEL



## MID CHANNEL



## HIGH CHANNEL



## 8.6. CONDUCTED 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.

**TEST PROCEDURE**

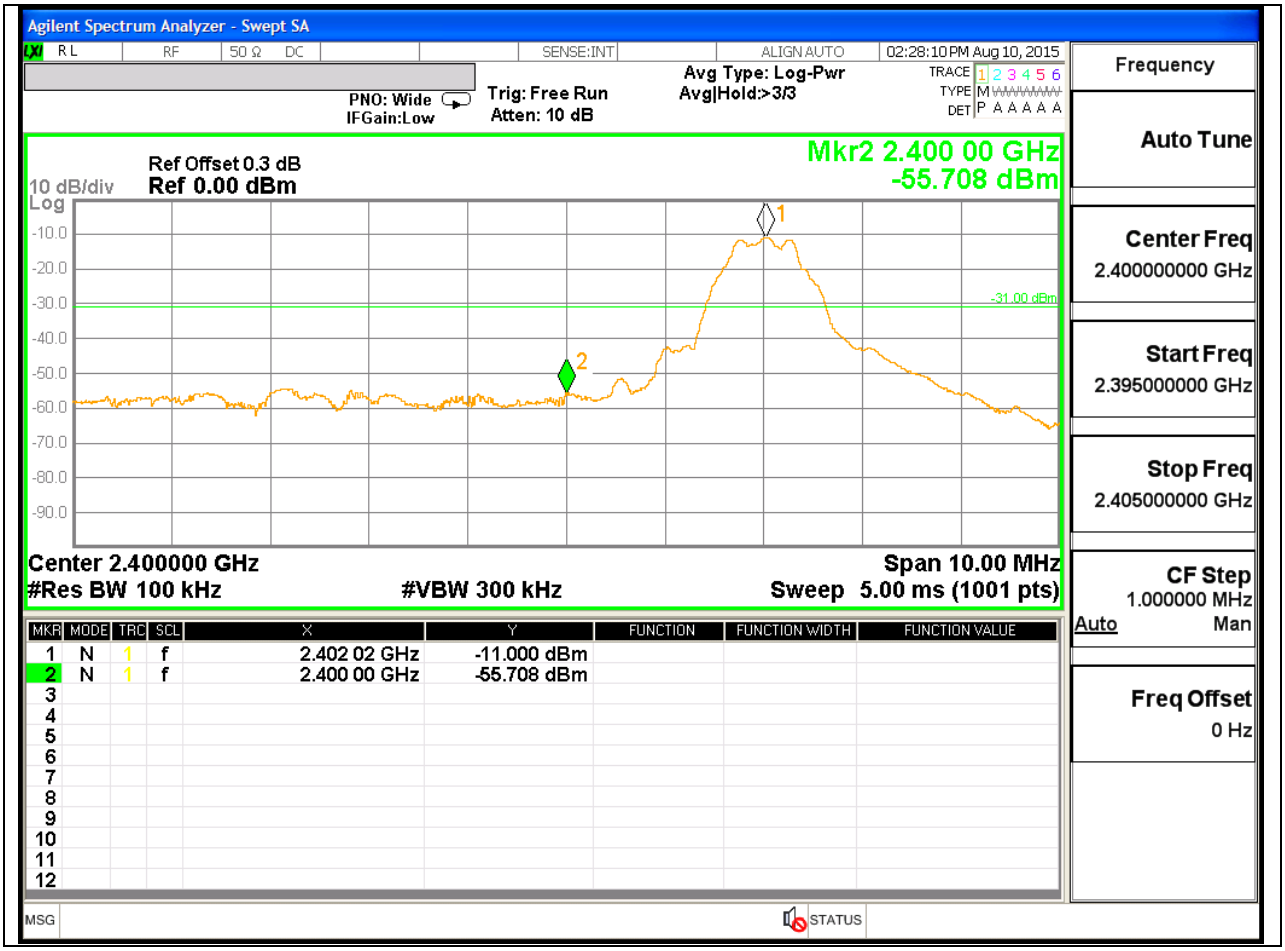
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

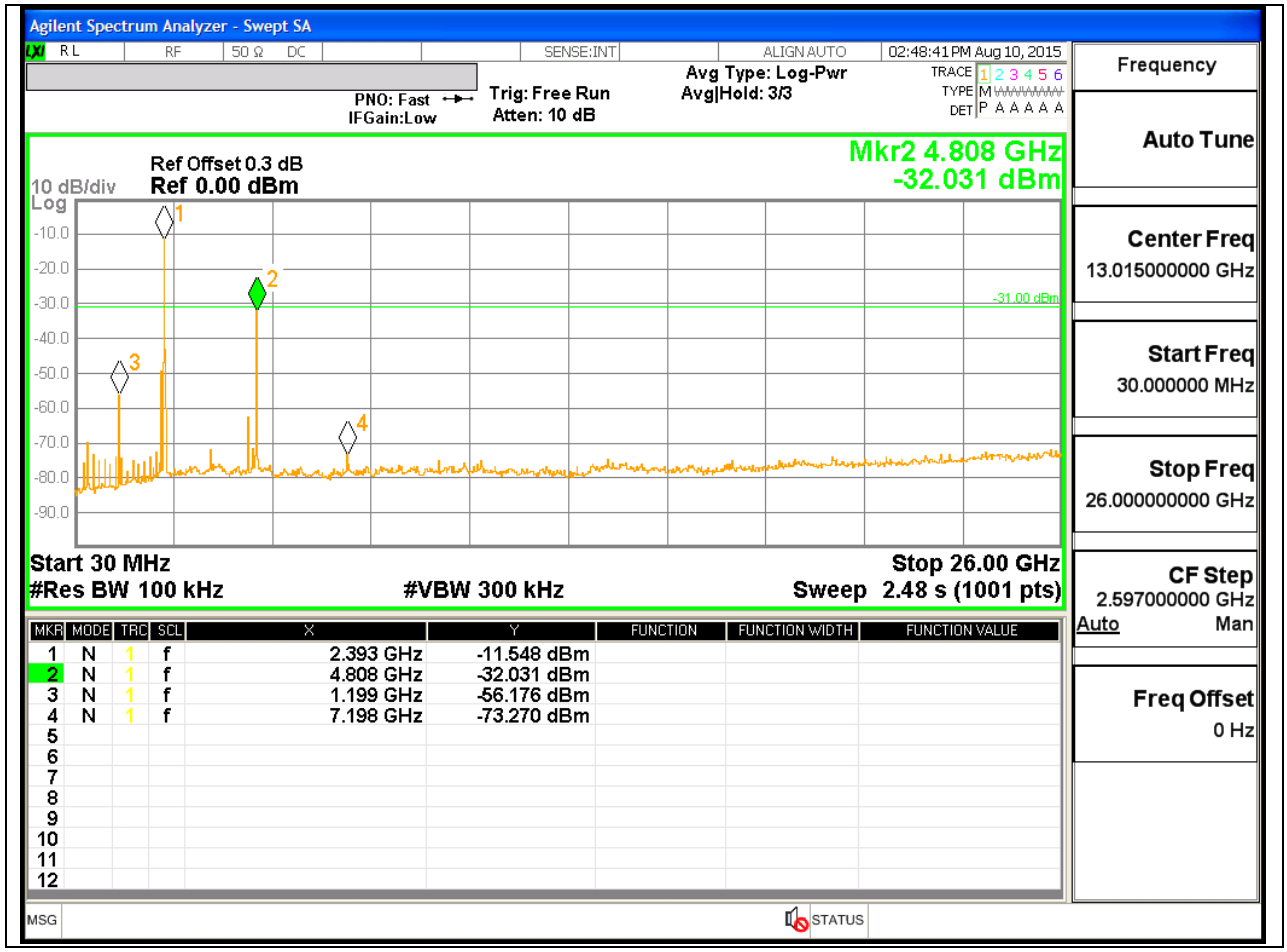
## RESULTS

## SPURIOUS EMISSIONS, LOW CHANNEL

### LOW CHANNEL BANDEDGE

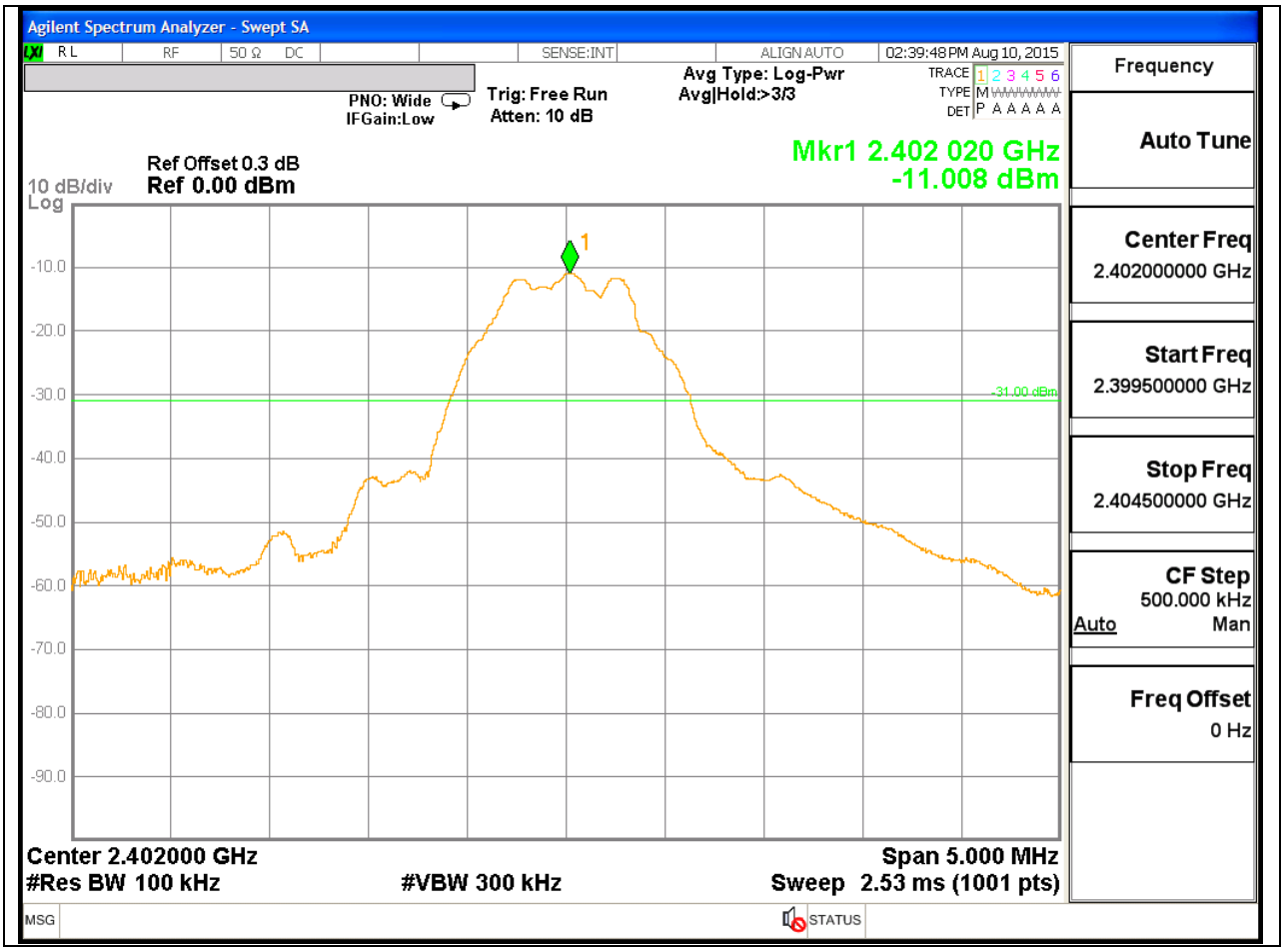


## LOW CHANNEL SPURIOUS

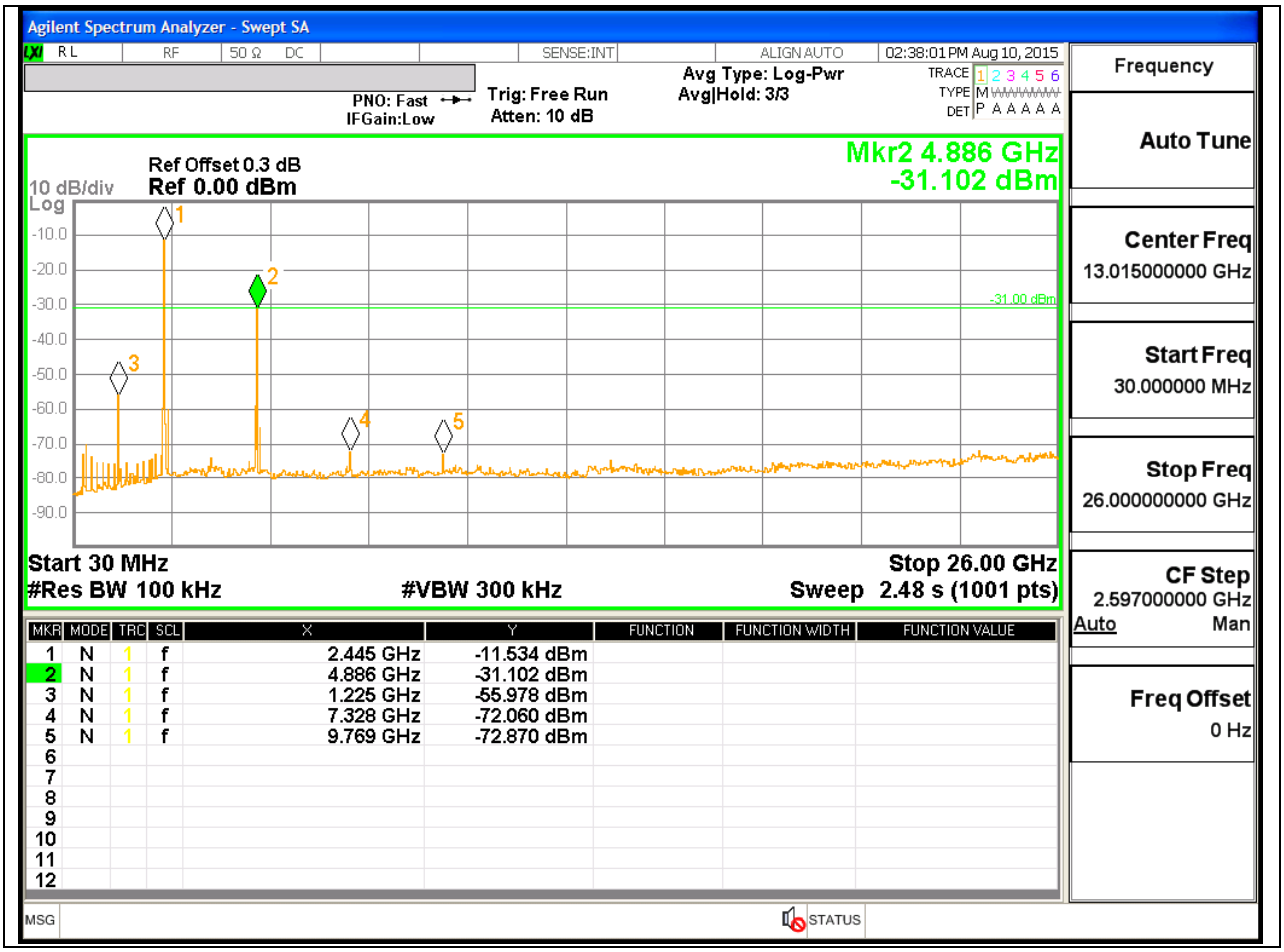


**SPURIOUS EMISSIONS, MID CHANNEL**

## LOW CHANNEL REFERENCE

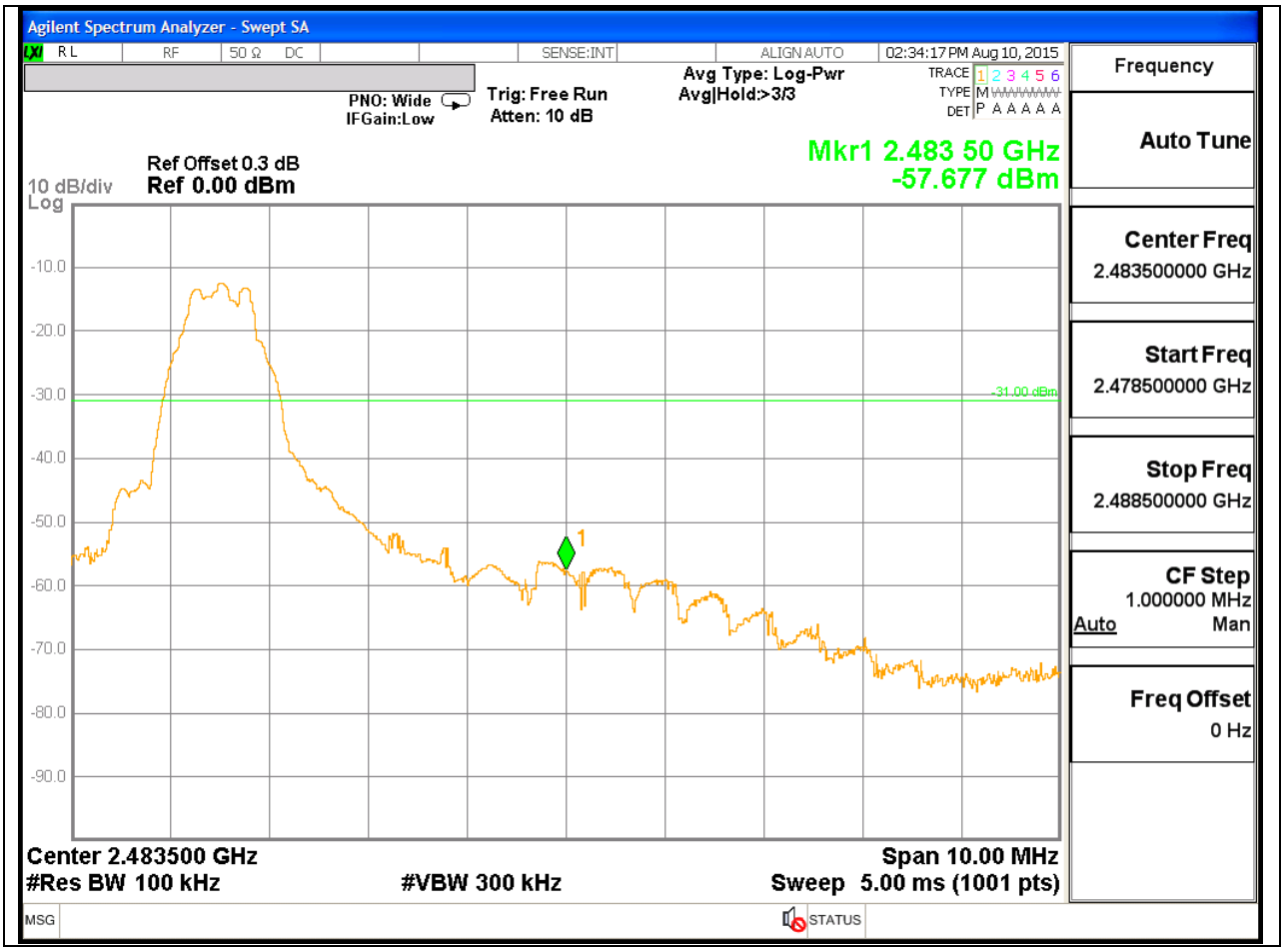


## MID CHANNEL SPURIOUS

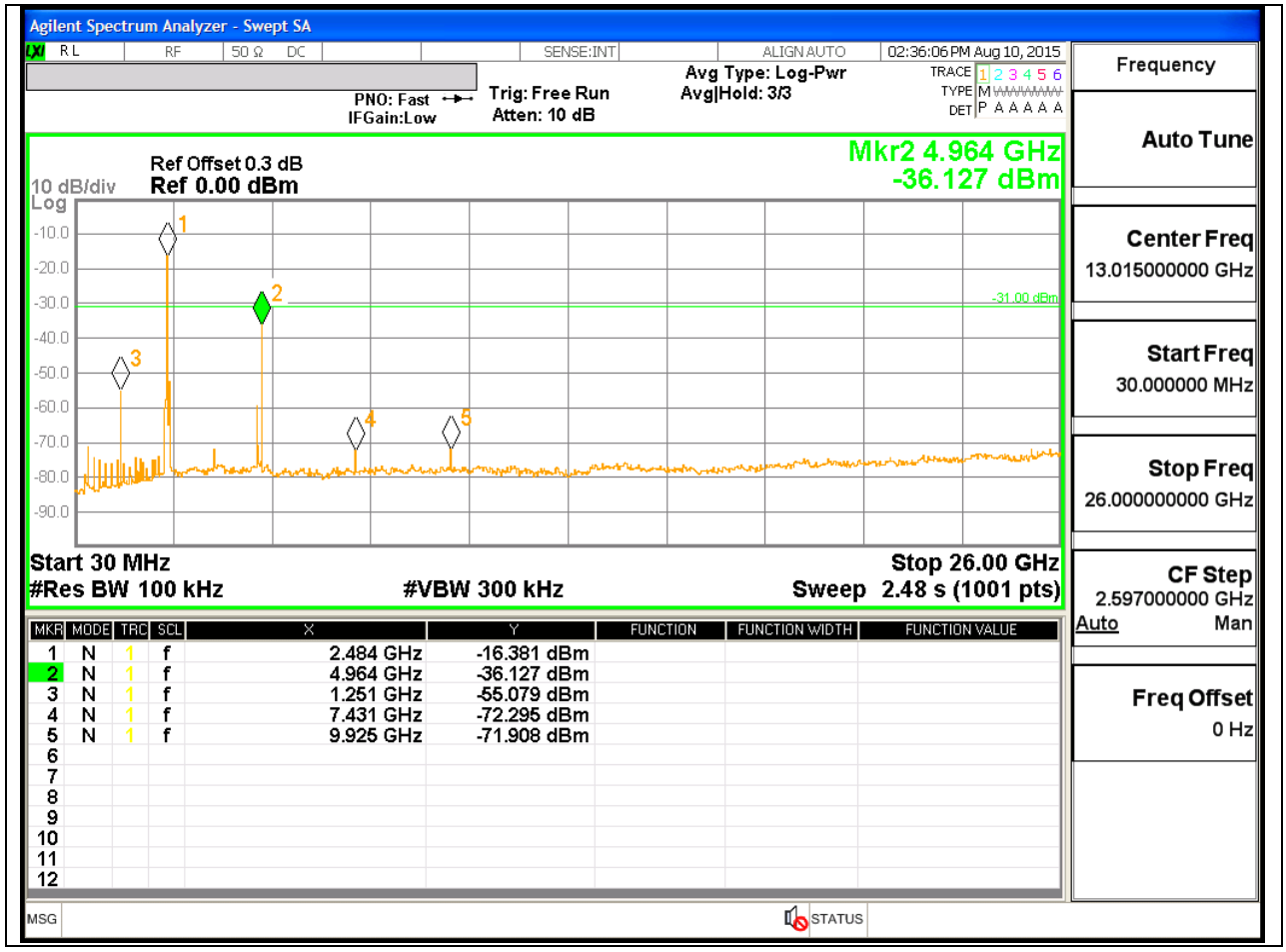


**SPURIOUS EMISSIONS, HIGH CHANNEL**

## HIGH CHANNEL BANDEDGE



# HIGH CHANNEL SPURIOUS



# 9. RADIATED TEST RESULTS

## 9.1. LIMITS AND PROCEDURE

**LIMITS**

FCC §15.205 and §15.209
IC RSS-GEN Clause 8.9 (Transmitter)
IC RSS-GEN Clause 7 (Receiver)

| 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 below 1GHz and 150cm for 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 measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and add duty cycle factor for average measurements. Duty cycle factor = 10 log (1/x). For this sample: DCCF = 10log (1/0.222)=6.54 dB

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

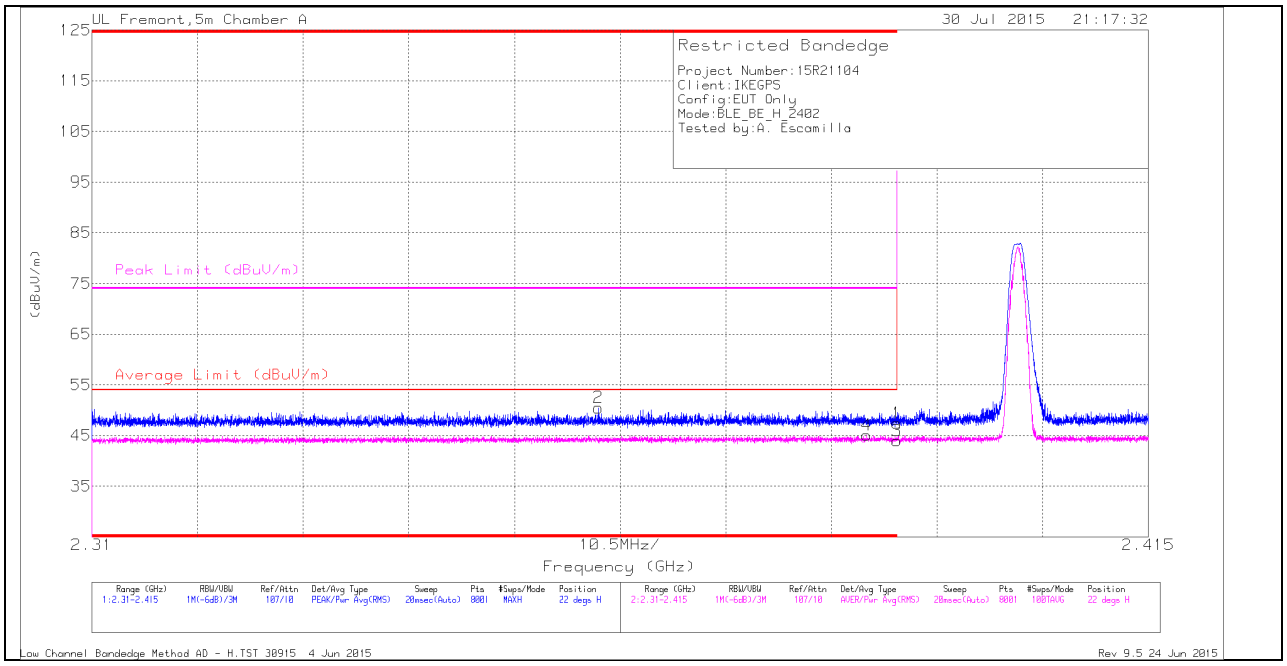
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

# 9.2. TRANSMITTER ABOVE 1 GHz

## RESTRICTED BANDEDGE (LOW CHANNEL)

### HORIZONTAL PEAK AND AVERAGE PLOT




### HORIZONTAL DATA

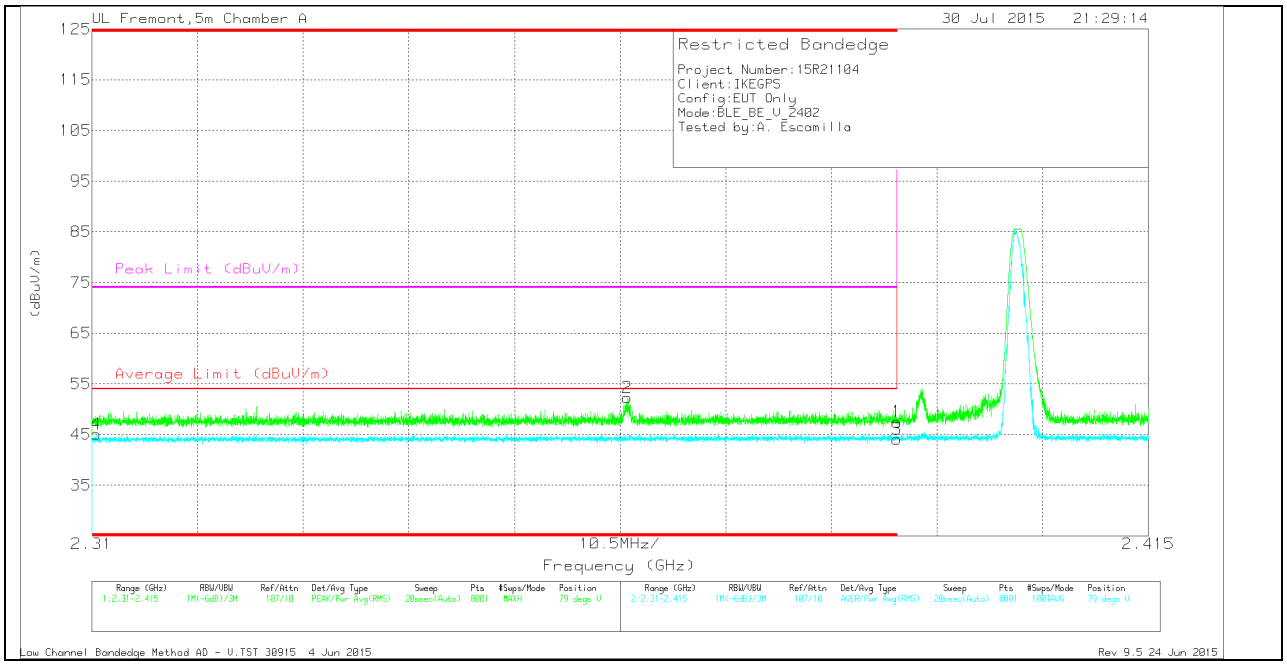
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T136 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | * 2.36 | 43.28 | Pk | 31.9 | -24.7 | 0 | 50.48 | - | - | 74 | -23.52 | 22 | 360 | H |
| 4 | * 2.387 | 31.08 | RMS | 32 | -24.6 | 6.54 | 45.02 | 54 | -8.98 | - | - | 22 | 360 | H |
| 1 | * 2.39 | 40.05 | Pk | 32 | -24.6 | 0 | 47.45 | - | - | 74 | -26.55 | 22 | 360 | H |
| 3 | * 2.39 | 30 | RMS | 32 | -24.6 | 6.54 | 43.94 | 54 | -10.06 | - | - | 22 | 360 | H |

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

## VERTICAL PEAK AND AVERAGE PLOT




## VERTICAL DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T136 (dB/m) | Amp/Cbl/Flt r/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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | * 2.31 | 31.31 | RMS | 31.9 | -24.7 | 6.54 | 45.05 | 54 | -8.95 | - | - | 79 | 200 | V |
| 2 | * 2.363 | 45.06 | Pk | 31.9 | -24.7 | 0 | 52.26 | - | - | 74 | -21.74 | 79 | 200 | V |
| 1 | * 2.39 | 40.1 | Pk | 32 | -24.6 | 0 | 47.5 | - | - | 74 | -26.5 | 79 | 200 | V |
| 3 | * 2.39 | 30.2 | RMS | 32 | -24.6 | 6.54 | 44.14 | 54 | -9.86 | - | - | 79 | 200 | V |

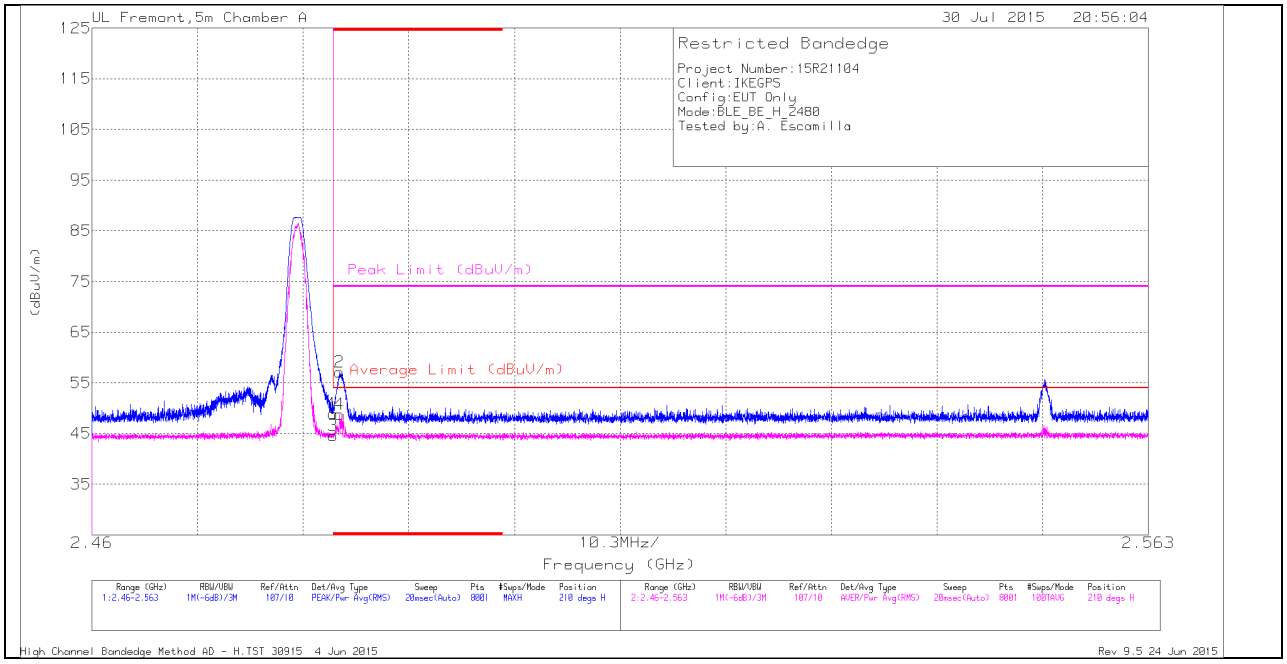
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

# AUTHORIZED BANDEDGE (HIGH CHANNEL)

## HORIZONTAL PEAK AND AVERAGE PLOT




## HORIZONTAL DATA

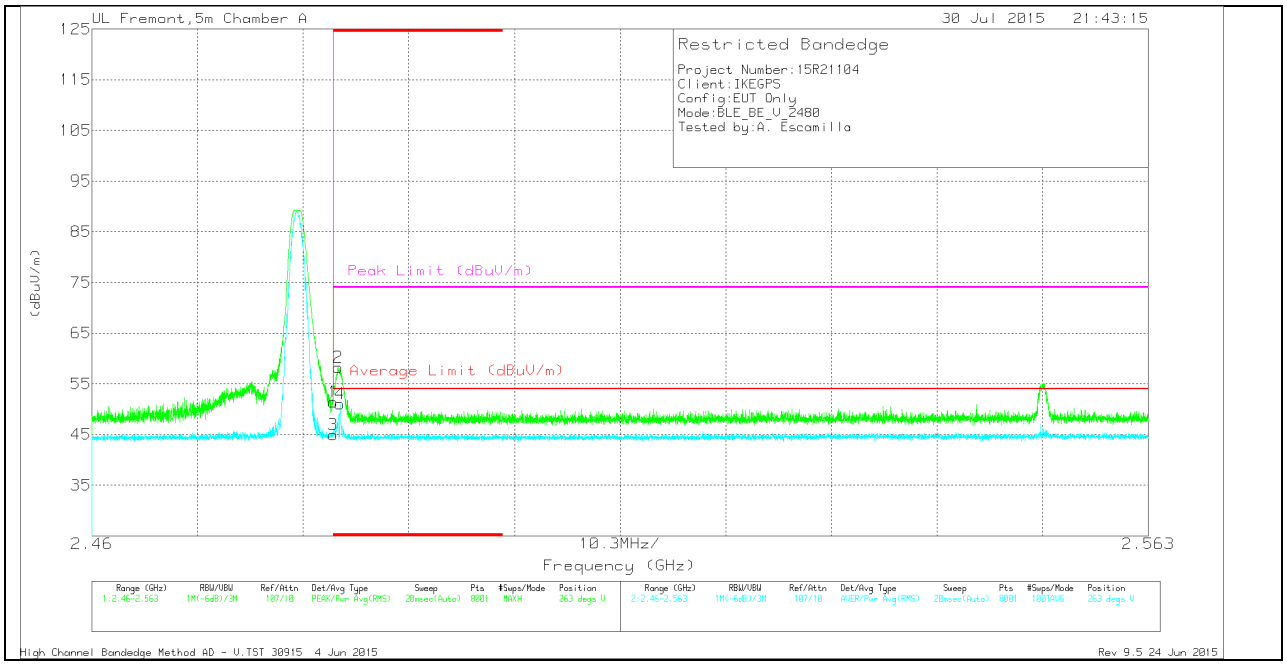
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T136 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 2.484 | 41.37 | Pk | 32.1 | -24.5 | 0 | 48.97 | - | - | 74 | -25.03 | 210 | 245 | H |
| 2 | * 2.484 | 49.52 | Pk | 32.1 | -24.5 | 0 | 57.12 | - | - | 74 | -16.88 | 210 | 245 | H |
| 3 | * 2.484 | 30.39 | RMS | 32.1 | -24.5 | 6.54 | 44.53 | 54 | -9.47 | - | - | 210 | 245 | H |
| 4 | * 2.484 | 34.61 | RMS | 32.1 | -24.5 | 6.54 | 48.75 | 54 | -5.25 | - | - | 210 | 245 | H |

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

## VERTICAL PEAK AND AVERAGE PLOT




## VERTICAL DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T136 (dB/m) | Amp/Cbl/Flt r/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 | 43.77 | Pk | 32.1 | -24.5 | 0 | 51.37 | - | - | 74 | -22.63 | 263 | 313 | V |
| 2 | * 2.484 | 50.59 | Pk | 32.1 | -24.5 | 0 | 58.19 | - | - | 74 | -15.81 | 263 | 313 | V |
| 3 | * 2.484 | 30.84 | RMS | 32.1 | -24.5 | 6.54 | 44.98 | 54 | -9.02 | - | - | 263 | 313 | V |
| 4 | * 2.484 | 36.94 | RMS | 32.1 | -24.5 | 6.54 | 51.08 | 54 | -2.92 | - | - | 263 | 313 | V |

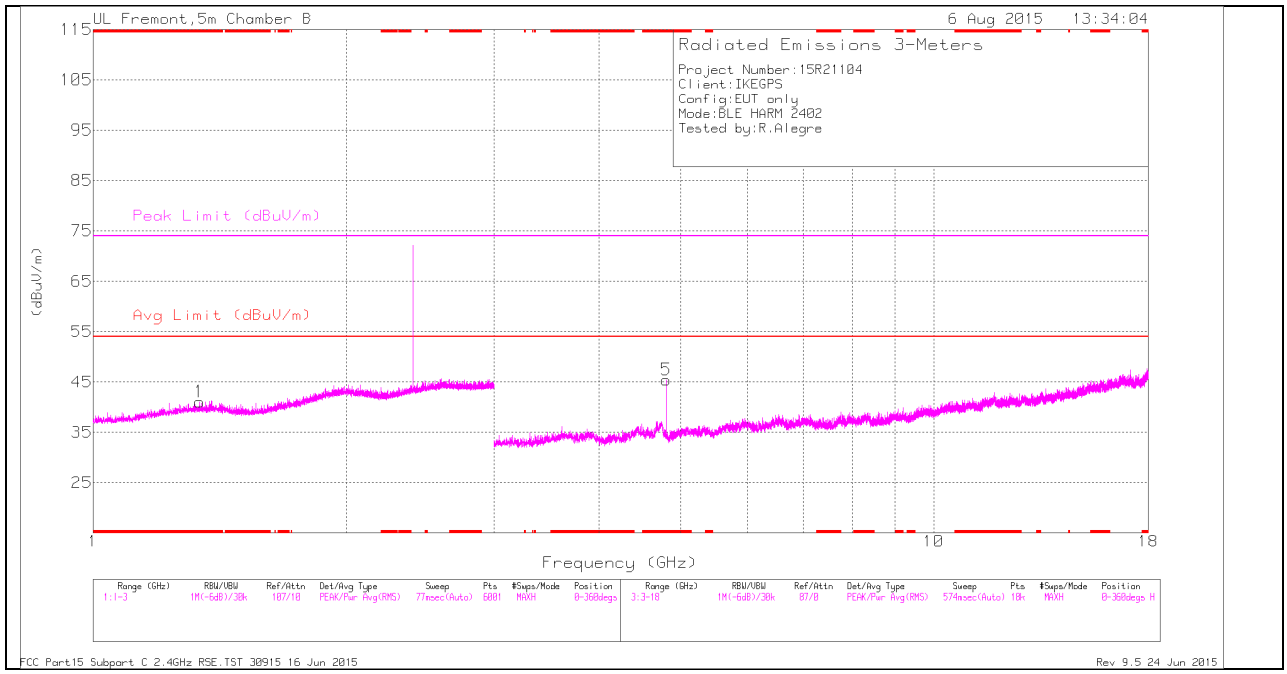
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

RMS - RMS detection

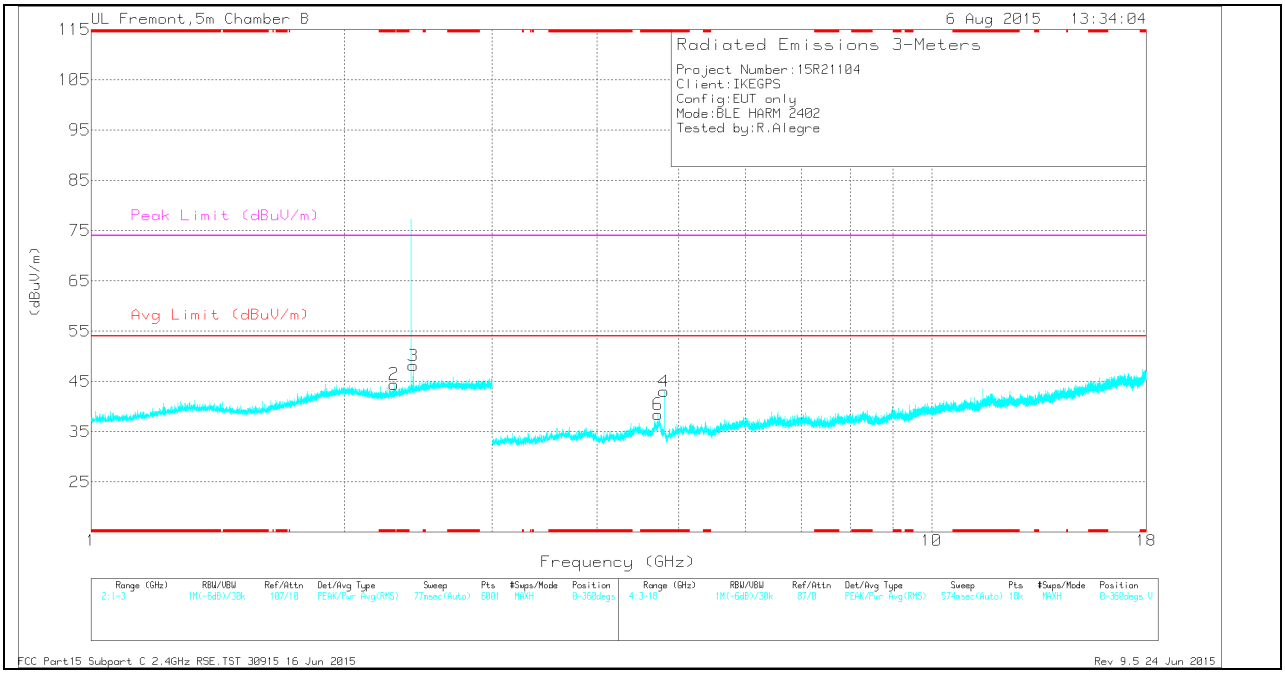
**HARMONICS AND SPURIOUS EMISSIONS**

## LOW CHANNEL HORIZONTAL




Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## LOW CHANNEL VERTICAL




Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

# LOW CHANNEL DATA

*TRACE MARKERS*

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (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 | * 1.339 | 37.08 | Pk | 29.4 | -25.4 | 0 | 41.08 | - | - | 74 | -32.92 | 0-360 | 101 | H |
| 2 | * 2.292 | 37.15 | Pk | 31.5 | -24.2 | 0 | 44.45 | - | - | 74 | -29.55 | 0-360 | 101 | V |
| 5 | * 4.804 | 42.14 | Pk | 34.3 | -31 | 0 | 45.44 | - | - | 74 | -28.56 | 0-360 | 199 | H |
| 4 | * 4.803 | 39.73 | Pk | 34.3 | -31 | 0 | 43.03 | - | - | 74 | -30.97 | 0-360 | 101 | V |
| 6 | * 4.726 | 34.93 | Pk | 34.3 | -30.8 | 0 | 38.43 | - | - | 74 | -35.57 | 0-360 | 199 | V |
| 3 | 2.417 | 40.13 | Pk | 32.1 | -24.1 | 0 | 48.13 | - | - | - | - | 0-360 | 199 | V |

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

Radiated Emissions

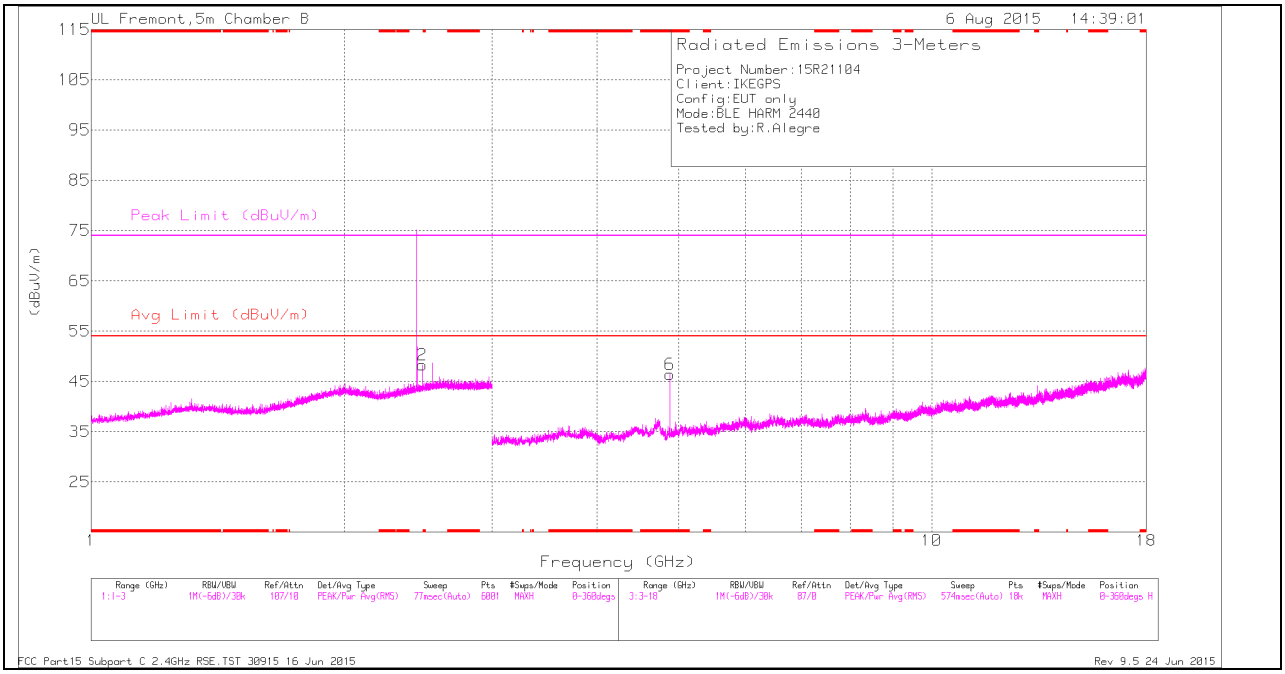
| Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (dB/m) | Amp/Cbl/ Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * 1.338 | 36.66 | PK2 | 29.4 | -25.4 | 0 | 40.66 | - | - | 74 | -33.34 | 360 | 200 | H |
| * 1.338 | 32.84 | MAv1 | 29.4 | -25.4 | 6.54 | 43.38 | 54 | -10.62 | - | - | 360 | 200 | H |
| * 2.292 | 36.2 | PK2 | 31.5 | -24.2 | 0 | 43.5 | - | - | 74 | -30.5 | 360 | 200 | V |
| * 2.291 | 32.25 | MAv1 | 31.5 | -24.3 | 6.54 | 45.99 | 54 | -8.01 | - | - | 360 | 200 | V |
| * 4.804 | 39.42 | PK2 | 34.3 | -31 | 0 | 42.72 | - | - | 74 | -31.28 | 319 | 113 | H |
| * 4.804 | 39.53 | MAv1 | 34.3 | -31 | 6.54 | 49.37 | 54 | -4.63 | - | - | 319 | 113 | H |
| * 4.803 | 37.61 | PK2 | 34.3 | -31 | 0 | 40.91 | - | - | 74 | -33.09 | 208 | 117 | V |
| * 4.804 | 36.82 | MAv1 | 34.3 | -31 | 6.54 | 46.66 | 54 | -7.34 | - | - | 208 | 117 | V |
| * 4.727 | 34.36 | PK2 | 34.3 | -30.8 | 0 | 37.86 | - | - | 74 | -36.14 | 208 | 192 | V |
| * 4.725 | 30.81 | MAv1 | 34.3 | -30.8 | 6.54 | 40.85 | 54 | -13.15 | - | - | 208 | 192 | V |
| 2.417 | 38.63 | PK2 | 32.1 | -24.1 | 0 | 46.63 | - | - | 74 | -27.37 | 30 | 207 | V |
| 2.417 | 32.48 | MAv1 | 32.1 | -24.1 | 6.54 | 47.02 | 54 | -6.98 | - | - | 30 | 207 | V |

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

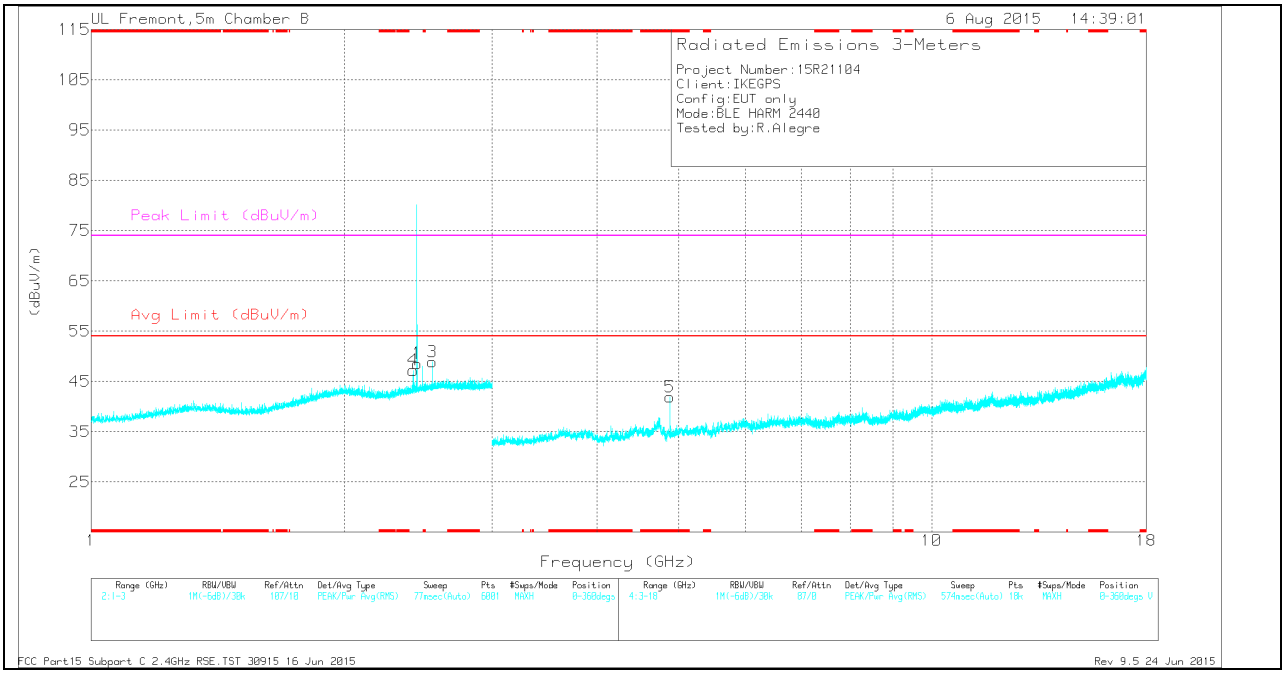
MAv1 - KDB558074 Option 1 Maximum RMS Average

## MID CHANNEL HORIZONTAL




Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## MID CHANNEL VERTICAL




Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

# MID CHANNEL DATA

*TRACE MARKERS*

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | * 4.88 | 44.7 | Pk | 34.2 | -32.5 | 0 | 46.4 | - | - | 74 | -27.6 | 0-360 | 101 | H |
| 5 | * 4.88 | 40.18 | Pk | 34.2 | -32.5 | 0 | 41.88 | - | - | 74 | -32.12 | 0-360 | 101 | V |
| 4 | 2.417 | 39.22 | Pk | 32.1 | -24.1 | 0 | 47.22 | - | - | - | - | 0-360 | 200 | V |
| 1 | 2.445 | 40.25 | Pk | 32.3 | -24 | 0 | 48.55 | - | - | - | - | 0-360 | 200 | V |
| 2 | 2.478 | 39.84 | Pk | 32.4 | -24 | 0 | 48.24 | - | - | - | - | 0-360 | 200 | H |
| 3 | 2.546 | 40.17 | Pk | 32.6 | -23.9 | 0 | 48.87 | - | - | - | - | 0-360 | 200 | V |

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

Radiated Emissions

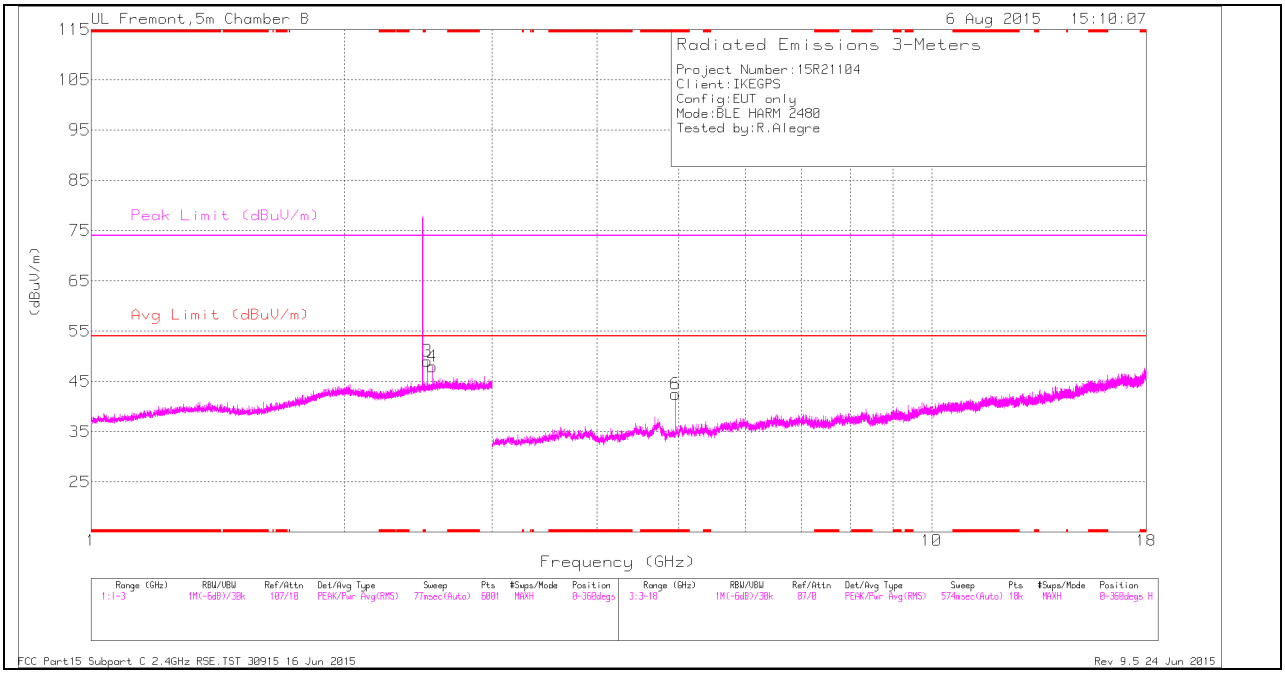
| Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (dB/m) | Amp/Cbl/ Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * 4.88 | 39.27 | PK2 | 34.2 | -32.5 | 0 | 40.97 | - | - | 74 | -33.03 | 321 | 101 | H |
| * 4.88 | 38.16 | MAv1 | 34.2 | -32.5 | 6.54 | 46.40 | 54 | -7.6 | - | - | 321 | 101 | H |
| * 4.88 | 37.54 | PK2 | 34.2 | -32.5 | 0 | 39.24 | - | - | 74 | -34.76 | 200 | 113 | V |
| * 4.88 | 33 | MAv1 | 34.2 | -32.5 | 6.54 | 41.24 | 54 | -12.76 | - | - | 200 | 113 | V |
| 2.417 | 38.56 | PK2 | 32.1 | -24.1 | 0 | 46.56 | - | - | 74 | -27.44 | 80 | 350 | V |
| 2.417 | 32.79 | MAv1 | 32.1 | -24.1 | 6.54 | 47.33 | - | - | - | - | 80 | 350 | V |
| 2.445 | 36.43 | PK2 | 32.3 | -24 | 0 | 44.73 | - | - | 74 | -29.27 | 8 | 270 | V |
| 2.445 | 32.95 | MAv1 | 32.3 | -24 | 6.54 | 47.79 | - | - | - | - | 8 | 270 | V |
| 2.477 | 38.94 | PK2 | 32.4 | -24 | 0 | 47.34 | - | - | 74 | -26.66 | 8 | 290 | H |
| 2.478 | 32.13 | MAv1 | 32.4 | -24 | 6.54 | 47.07 | - | - | - | - | 8 | 290 | H |
| 2.546 | 36.1 | PK2 | 32.6 | -23.9 | 0 | 44.8 | - | - | 74 | -29.2 | 10 | 201 | V |
| 2.546 | 32.41 | MAv1 | 32.6 | -23.9 | 6.54 | 47.65 | - | - | - | - | 10 | 201 | V |

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

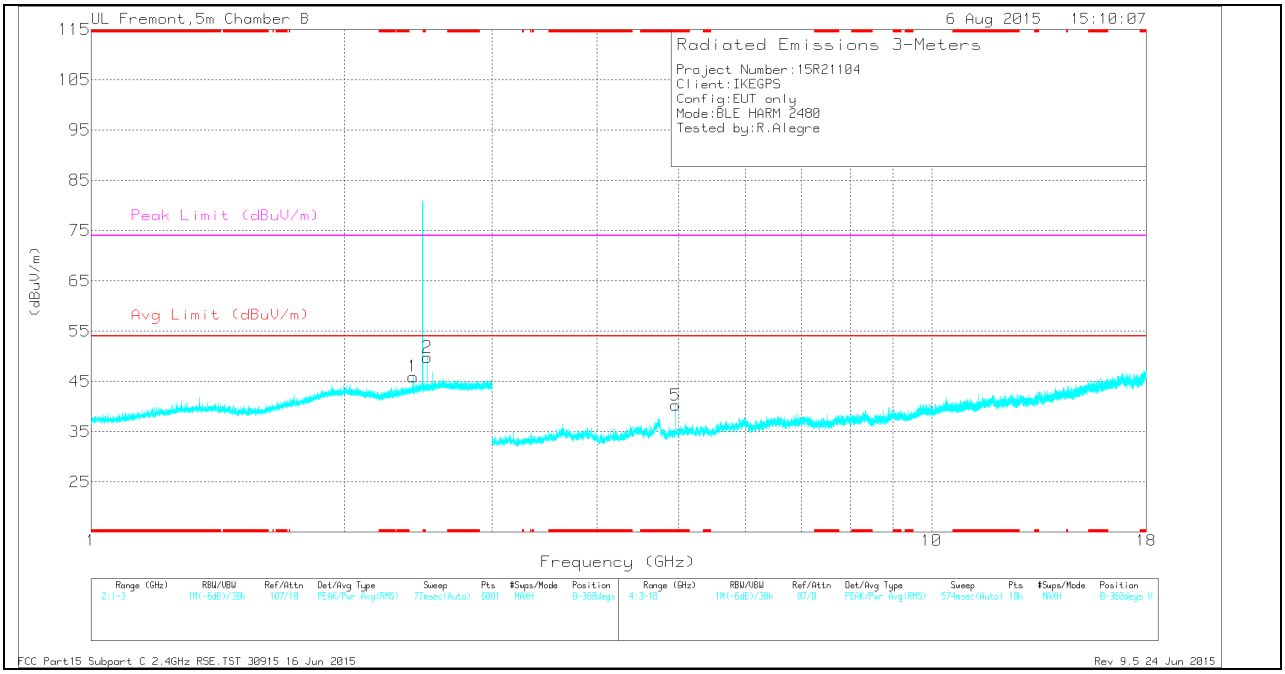
MAv1 - KDB558074 Option 1 Maximum RMS Average

## HIGH CHANNEL HORIZONTAL




Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

## HIGH CHANNEL VERTICAL




Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

# HIGH CHANNEL DATA

*TRACE MARKERS*

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | * 4.96 | 40.28 | Pk | 34.1 | -31.9 | 0 | 42.48 | - | - | 74 | -31.52 | 0-360 | 200 | H |
| 5 | * 4.96 | 38.06 | Pk | 34.1 | -31.9 | 0 | 40.26 | - | - | 74 | -33.74 | 0-360 | 101 | V |
| 1 | 2.417 | 37.96 | Pk | 32.1 | -24.1 | 0 | 45.96 | - | - | - | - | 0-360 | 101 | V |
| 3 | 2.511 | 40.45 | Pk | 32.6 | -24 | 0 | 49.05 | - | - | - | - | 0-360 | 199 | H |
| 2 | 2.511 | 41.19 | Pk | 32.6 | -24 | 0 | 49.79 | - | - | - | - | 0-360 | 101 | V |
| 4 | 2.546 | 39.28 | Pk | 32.6 | -23.9 | 0 | 47.98 | - | - | - | - | 0-360 | 199 | H |

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

Radiated Emissions

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF T345 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * 4.96 | 38.88 | PK2 | 34.1 | -31.9 | 0 | 41.08 | - | - | 74 | -32.92 | 324 | 128 | H |
| * 4.96 | 35.56 | MAv1 | 34.1 | -31.9 | 6.54 | 44.3 | 54 | -9.7 | - | - | 324 | 128 | H |
| * 4.96 | 37.91 | PK2 | 34.1 | -31.9 | 0 | 40.11 | - | - | 74 | -33.89 | 215 | 105 | V |
| * 4.96 | 32.52 | MAv1 | 34.1 | -31.9 | 6.54 | 41.26 | 54 | -12.74 | - | - | 215 | 105 | V |
| 2.417 | 36.22 | PK2 | 32.1 | -24.1 | 0 | 44.22 | - | - | 74 | -29.78 | 33 | 206 | V |
| 2.417 | 32.74 | MAv1 | 32.1 | -24.1 | 6.54 | 47.28 | - | - | - | - | 33 | 206 | V |
| 2.511 | 38.83 | PK2 | 32.6 | -24 | 0 | 47.43 | - | - | 74 | -26.57 | 6 | 255 | H |
| 2.511 | 32.56 | MAv1 | 32.6 | -24 | 6.54 | 47.7 | - | - | - | - | 6 | 255 | H |
| 2.511 | 36.32 | PK2 | 32.6 | -24 | 0 | 44.92 | - | - | 74 | -29.08 | 33 | 200 | V |
| 2.511 | 33.24 | MAv1 | 32.6 | -24 | 6.54 | 48.38 | - | - | - | - | 33 | 200 | V |
| 2.545 | 36.21 | PK2 | 32.6 | -23.9 | 0 | 44.91 | - | - | 74 | -29.09 | 9 | 200 | H |
| 2.546 | 32.86 | MAv1 | 32.6 | -23.9 | 6.54 | 48.10 | - | - | - | - | 9 | 200 | H |
| 2.546 | 32.44 | MAv1 | 32.6 | -23.9 | 6.54 | 47.68 | - | - | - | - | 9 | 200 | H |
| 2.546 | 31.91 | MAv1 | 32.6 | -23.9 | 6.54 | 47.15 | - | - | - | - | 11 | 139 | H |
| 2.547 | 36.22 | PK2 | 32.6 | -23.9 | 0 | 44.92 | - | - | 74 | -29.08 | 9 | 200 | H |
| 2.547 | 38.41 | PK2 | 32.6 | -23.9 | 0 | 47.11 | - | - | 74 | -26.89 | 11 | 139 | H |

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

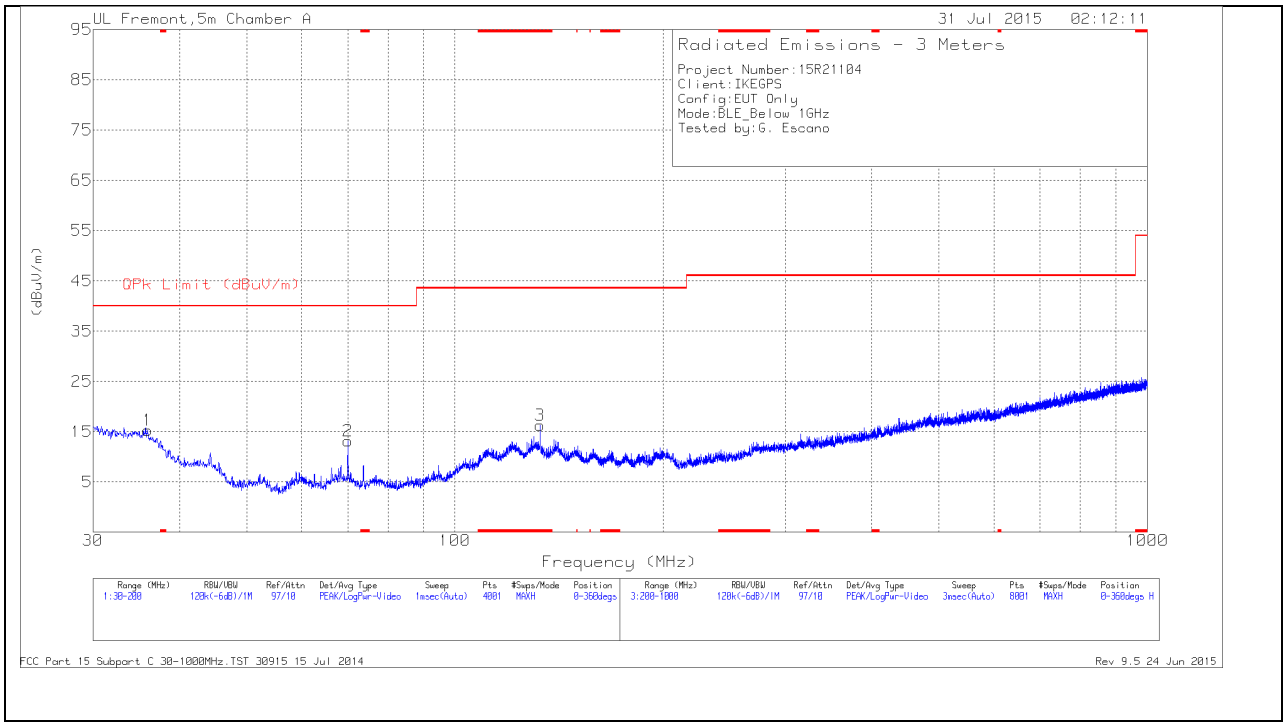
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

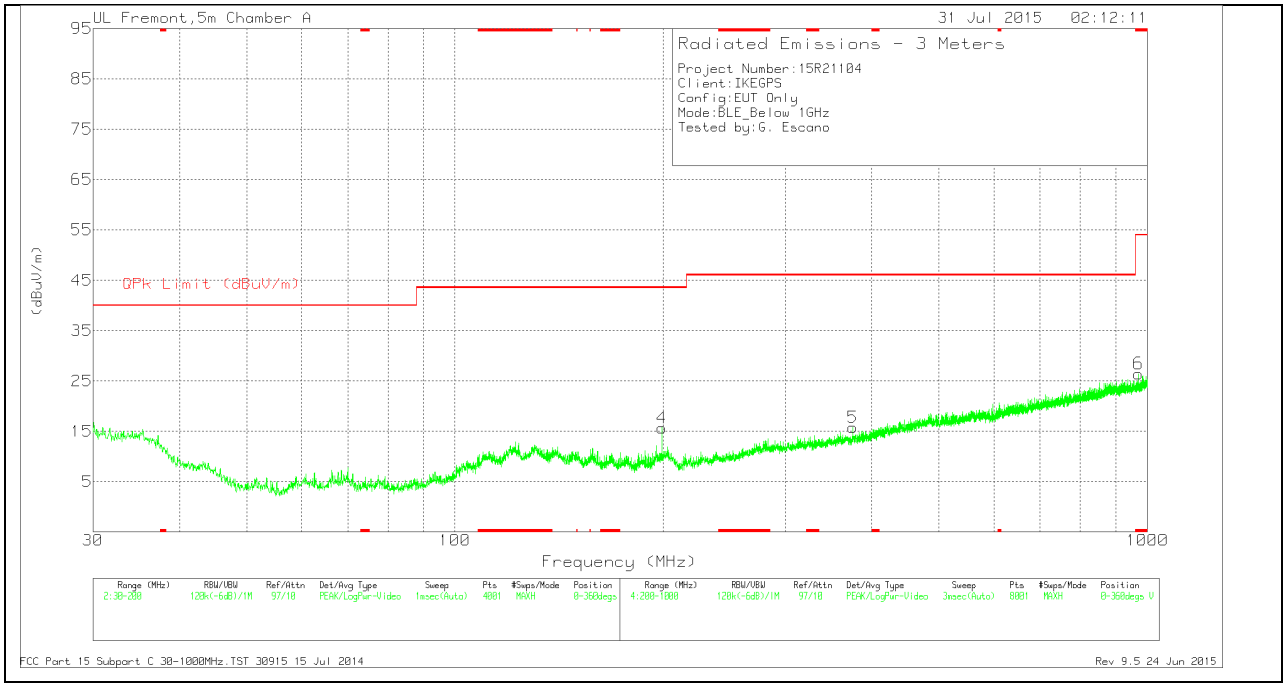
## 9.3. WORST-CASE BELOW 1 GHz

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

### HORIZONTAL PLOT



# VERTICAL PLOT



# BELOW 1 GHz TABLE

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AF T130 (dB/m) | Amp/Cbl (dB/m) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | * 132.7225 | 32.46 | Pk | 14.1 | -30.3 | 16.26 | 43.52 | -27.26 | 0-360 | 101 | H |
| 6 | * 970.2 | 30.44 | Pk | 22.7 | -26.7 | 26.44 | 53.97 | -27.53 | 0-360 | 101 | V |
| 1 | 35.9925 | 29.45 | Pk | 17 | -31.2 | 15.25 | 40 | -24.75 | 0-360 | 101 | H |
| 2 | 70.035 | 35.83 | Pk | 8.1 | -30.8 | 13.13 | 40 | -26.87 | 0-360 | 199 | H |
| 4 | 199.0225 | 33.04 | Pk | 12.5 | -29.9 | 15.64 | 43.52 | -27.88 | 0-360 | 101 | V |
| 5 | 375.6 | 30.05 | Pk | 14.8 | -29.1 | 15.75 | 46.02 | -30.27 | 0-360 | 199 | V |

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

Pk - Peak detector

# 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.

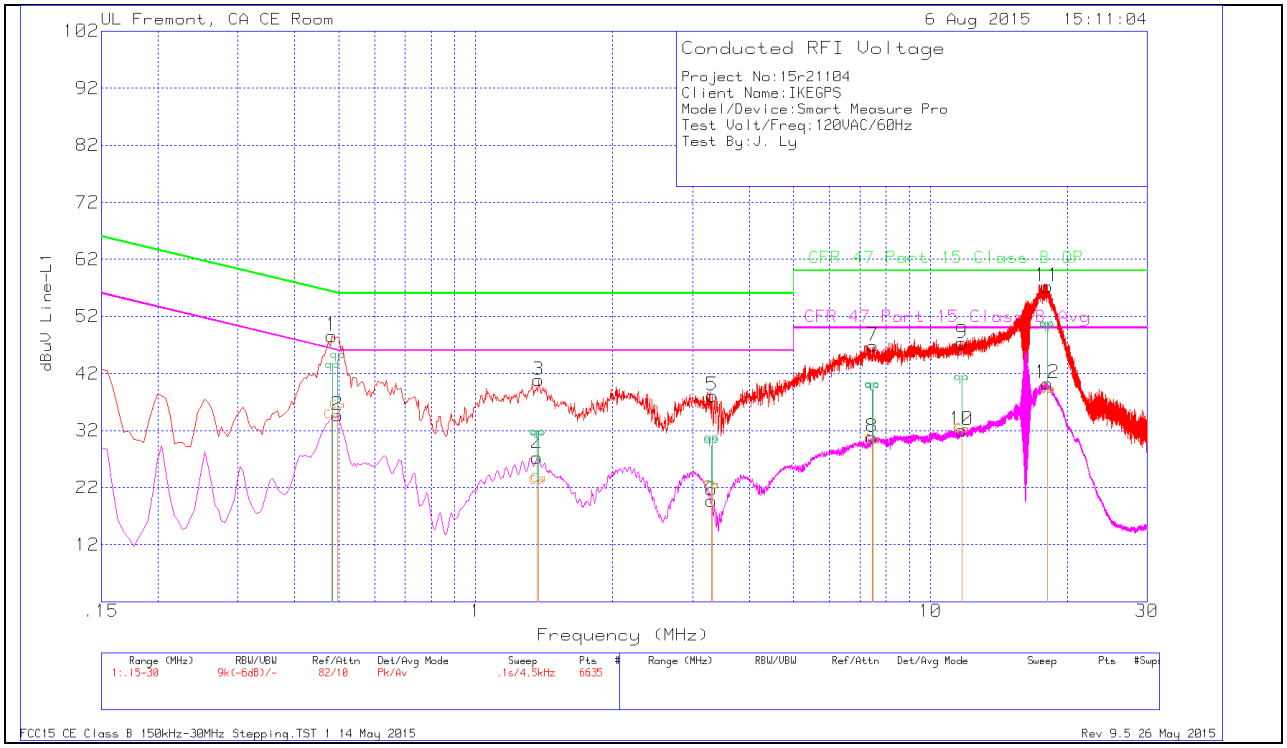
**TEST PROCEDURE**

ANSI C63.10

**RESULTS**

**6 WORST EMISSIONS**

# LINE 1 PLOT



# LINE 1 RESULTS

Range 1: Line-L1 .15 - 30MHz

| Frequency (MHz) | Meter Reading (dBuV) | Det | T24 IL L1 | LC Cables 1&3 | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | Margin (dB) | CFR 47 Part 15 Class B Avg | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| .48413 | 33.24 | Ca | .4 | 0 | 33.64 | - | - | 46.27 | -12.63 |
| .49763 | 35.14 | Ca | .3 | 0 | 35.44 | - | - | 46.04 | -10.6 |
| 1.37378 | 22.24 | Ca | .2 | .1 | 22.54 | - | - | 46 | -23.46 |
| 1.36568 | 21.89 | Ca | .2 | .1 | 22.19 | - | - | 46 | -23.81 |
| 3.30788 | 21.05 | Ca | .2 | .1 | 21.35 | - | - | 46 | -24.65 |
| 3.30518 | 20.93 | Ca | .2 | .1 | 21.23 | - | - | 46 | -24.77 |
| 7.47128 | 28.91 | Ca | .2 | .1 | 29.21 | - | - | 50 | -20.79 |
| 7.45463 | 29.09 | Ca | .2 | .1 | 29.39 | - | - | 50 | -20.61 |
| 11.7292 | 30.83 | Ca | .2 | .2 | 31.23 | - | - | 50 | -18.77 |
| 11.7202 | 30.69 | Ca | .2 | .2 | 31.09 | - | - | 50 | -18.91 |
| 18.0949 | 37.78 | Ca | .3 | .2 | 38.28 | - | - | 50 | -11.72 |
| 18.0742 | 37.58 | Ca | .3 | .2 | 38.08 | - | - | 50 | -11.92 |

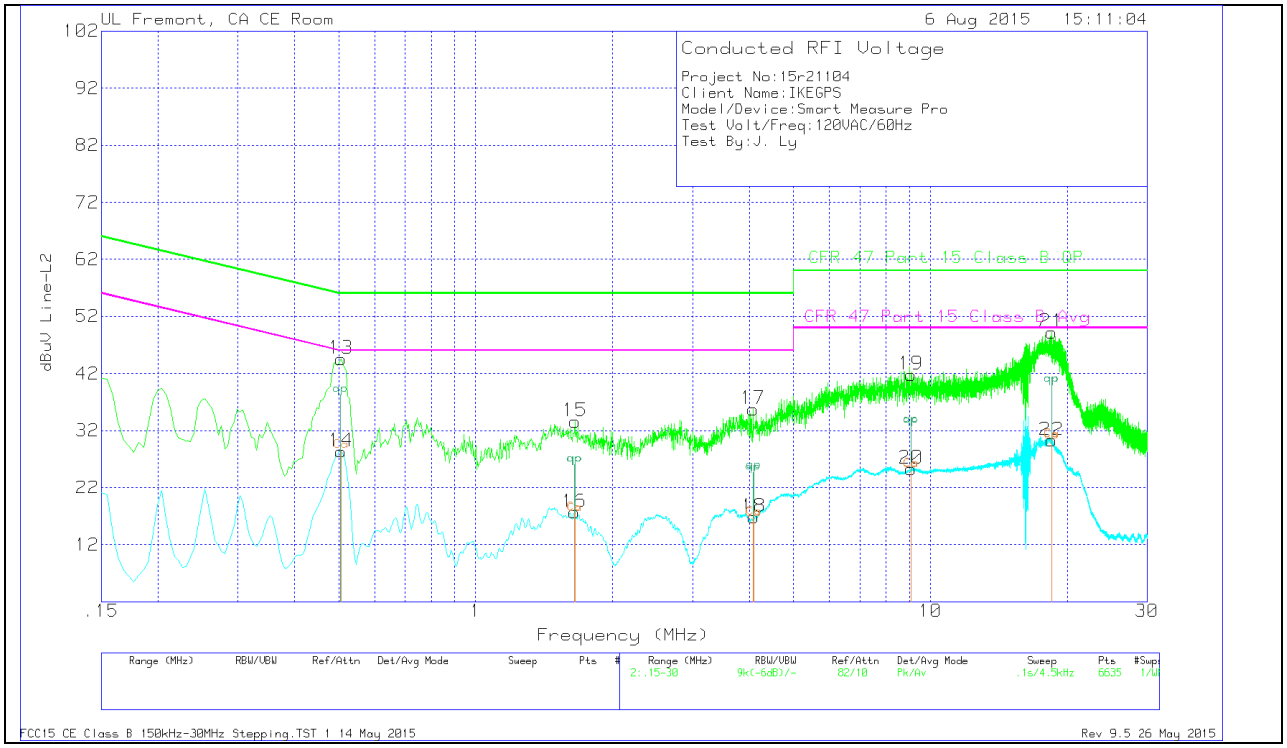
Ca - CISPR average detection

Range 1: Line-L1 .15 - 30MHz

| Frequency (MHz) | Meter Reading (dBuV) | Det | T24 IL L1 | LC Cables 1&3 | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | Margin (dB) | CFR 47 Part 15 Class B Avg | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| .48413 | 42 | Qp | .4 | 0 | 42.4 | 56.27 | -13.87 | - | - |
| .49763 | 43.9 | Qp | .3 | 0 | 44.2 | 56.04 | -11.84 | - | - |
| 1.37378 | 30.34 | Qp | .2 | .1 | 30.64 | 56 | -25.36 | - | - |
| 1.36568 | 30.39 | Qp | .2 | .1 | 30.69 | 56 | -25.31 | - | - |
| 3.30788 | 29.37 | Qp | .2 | .1 | 29.67 | 56 | -26.33 | - | - |
| 3.30518 | 29.04 | Qp | .2 | .1 | 29.34 | 56 | -26.66 | - | - |
| 7.47128 | 38.64 | Qp | .2 | .1 | 38.94 | 60 | -21.06 | - | - |
| 7.45463 | 38.78 | Qp | .2 | .1 | 39.08 | 60 | -20.92 | - | - |
| 11.7292 | 39.87 | Qp | .2 | .2 | 40.27 | 60 | -19.73 | - | - |
| 11.7202 | 39.87 | Qp | .2 | .2 | 40.27 | 60 | -19.73 | - | - |
| 18.0949 | 48.97 | Qp | .3 | .2 | 49.47 | 60 | -10.53 | - | - |
| 18.0742 | 49.2 | Qp | .3 | .2 | 49.7 | 60 | -10.3 | - | - |

Qp - Quasi-Peak detector

## LINE 2 PLOT



# LINE 2 RESULTS

Range 2: Line-L2 .15 - 30MHz

| Frequency (MHz) | Meter Reading (dBuV) | Det | T24 IL L2 | LC Cables 2&3 | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | Margin (dB) | CFR 47 Part 15 Class B Avg | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| .50438 | 28.05 | Ca | .4 | 0 | 28.45 | - | - | 46 | -17.55 |
| 1.65368 | 17.03 | Ca | .2 | .1 | 17.33 | - | - | 46 | -28.67 |
| 1.64963 | 17.24 | Ca | .2 | .1 | 17.54 | - | - | 46 | -28.46 |
| 4.07963 | 16.24 | Ca | .2 | .1 | 16.54 | - | - | 46 | -29.46 |
| 4.09538 | 16.5 | Ca | .2 | .1 | 16.8 | - | - | 46 | -29.2 |
| 9.06113 | 24.75 | Ca | .2 | .1 | 25.05 | - | - | 50 | -24.95 |
| 9.08228 | 24.87 | Ca | .2 | .1 | 25.17 | - | - | 50 | -24.83 |
| 18.4751 | 29.62 | Ca | .3 | .2 | 30.12 | - | - | 50 | -19.88 |
| 18.4976 | 29.89 | Ca | .3 | .2 | 30.39 | - | - | 50 | -19.61 |

Ca - CISPR average detection

Range 2: Line-L2 .15 - 30MHz

| Frequency (MHz) | Meter Reading (dBuV) | Det | T24 IL L2 | LC Cables 2&3 | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | Margin (dB) | CFR 47 Part 15 Class B Avg | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| .50438 | 37.84 | Qp | .4 | 0 | 38.24 | 56 | -17.76 | - | - |
| 1.65368 | 25.77 | Qp | .2 | .1 | 26.07 | 56 | -29.93 | - | - |
| 1.64963 | 25.73 | Qp | .2 | .1 | 26.03 | 56 | -29.97 | - | - |
| 4.07963 | 24.31 | Qp | .2 | .1 | 24.61 | 56 | -31.39 | - | - |
| 4.09538 | 24.66 | Qp | .2 | .1 | 24.96 | 56 | -31.04 | - | - |
| 9.06113 | 32.64 | Qp | .2 | .1 | 32.94 | 60 | -27.06 | - | - |
| 9.08228 | 32.52 | Qp | .2 | .1 | 32.82 | 60 | -27.18 | - | - |
| 18.4751 | 39.53 | Qp | .3 | .2 | 40.03 | 60 | -19.97 | - | - |
| 18.4976 | 39.52 | Qp | .3 | .2 | 40.02 | 60 | -19.98 | - | - |

Qp - Quasi-Peak detector