**FCC CFR47 PART 15 SUBPART C**

**Bluetooth Low Energy**

**CERTIFICATION TEST REPORT**

**FOR**

**GSM/WCDMA Phone + BT/BLE, DTS b/g/n and NFC**

**MODEL NUMBER : SM-J320YZ**

**FCC ID: A3LSMJ320YZ**

**REPORT NUMBER: 15K22477-E2**

**ISSUE DATE: DEC 30, 2015**

*Prepared for*
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ACCREDITED
TL-637

## Revision History

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| -- | 12/23/15 | Initial issue | Junwhan Lee |
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# TABLE OF CONTENTS

**1. ATTESTATION OF TEST RESULTS ..... 5**

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

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

**4. CALIBRATION AND UNCERTAINTY ..... 6**

*4.1. MEASURING INSTRUMENT CALIBRATION ..... 6*

*4.2. SAMPLE CALCULATION ..... 6*

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

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

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

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

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

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

*5.5. DESCRIPTION OF TEST SETUP ..... 9*

**6. TEST AND MEASUREMENT EQUIPMENT ..... 11**

**7. MEASUREMENT METHODS ..... 12**

**8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS ..... 12**

*8.1. ON TIME AND DUTY CYCLE RESULTS ..... 12*

**9. SUMMARY TABLE ..... 13**

**10. ANTENNA PORT TEST RESULTS ..... 14**

*10.1. 6 dB BANDWIDTH ..... 14*

*10.2. 99% BANDWIDTH ..... 16*

*10.3. OUTPUT POWER ..... 18*

*10.4. AVERAGE POWER ..... 20*

*10.5. PSD ..... 21*

*10.6. CONDUCTED SPURIOUS EMISSIONS ..... 23*

**11. RADIATED TEST RESULTS ..... 27**

*11.1. LIMITS AND PROCEDURE ..... 27*

*11.2. TRANSMITTER ABOVE 1 GHz ..... 28*

*11.3. WORST-CASE BELOW 1 GHz ..... 38*



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**12. AC POWER LINE CONDUCTED EMISSIONS ..... 40**

**13. SETUP PHOTOS ..... 44**


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# 1. ATTESTATION OF TEST RESULTS

| | |
|---|---|
| **COMPANY NAME:** | SAMSUNG ELECTRONICS CO., LTD. |
| **EUT DESCRIPTION:** | GSM/WCDMA Phone + BT/BLE, DTS b/g/n and NFC |
| **MODEL NUMBER:** | SM-J320YZ |
| **SERIAL NUMBER:** | d6d2d642 (RADIATED); d6cdd626 (CONDUCTED) |
| **DATE TESTED:** | DEC 13, 2015 - DEC 30, 2015 |

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| CFR 47 Part 15 Subpart C | Pass |

UL Korea, Ltd. 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 Korea, Ltd. 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 Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. 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 IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

CY Choi
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Junwhan Lee
Suwon Lab Engineer
UL Korea, Ltd.


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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 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.

| 218 Maeyeong-ro |
|---|
| ☒ Chamber 1 |
| ☐ Chamber 2 |

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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


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## 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 | 2.32 dB |
| Radiated Disturbance, Below 1GHz | 4.14 dB |
| Radiated Disturbance, Above 1 GHz | 5.97 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 is GSM/WCDMA Phone + BT/BLE, DTS b/g/n and NFC.
This test report addresses the DTS (BLE) operational mode.

## 5.2. MAXIMUM OUTPUT POWER

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

| Frequency Range [MHz] | Mode | Power Mode | Output Power [dBm] | Output Power [mW] |
|---|---|---|---|---|
| 2402 - 2480 | BLE | Peak | 1.28 | 1.34 |
| | | Average | 0.78 | 1.20 |

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -5.37dBi

## 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 and Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.


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## 5.5. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Charger | SAMSUNG | ETA0U61JWE | DK1GA12HS/A-E | N/A |
| Data Cable | SAMSUNG | ECB-DU68WE | N/A | N/A |
| Earphone | SAMSUNG | EHS61ASFWE | 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 | DC Power | 1 | Mini-USB | Shielded | 0.8m | N/A |
| 1 | Audio | 1 | Mini-Jack | Unshielded | 1.0m | N/A |

**TEST SETUP**

The EUT is a stand-alone unit during the tests. Test software exercised the radio card.


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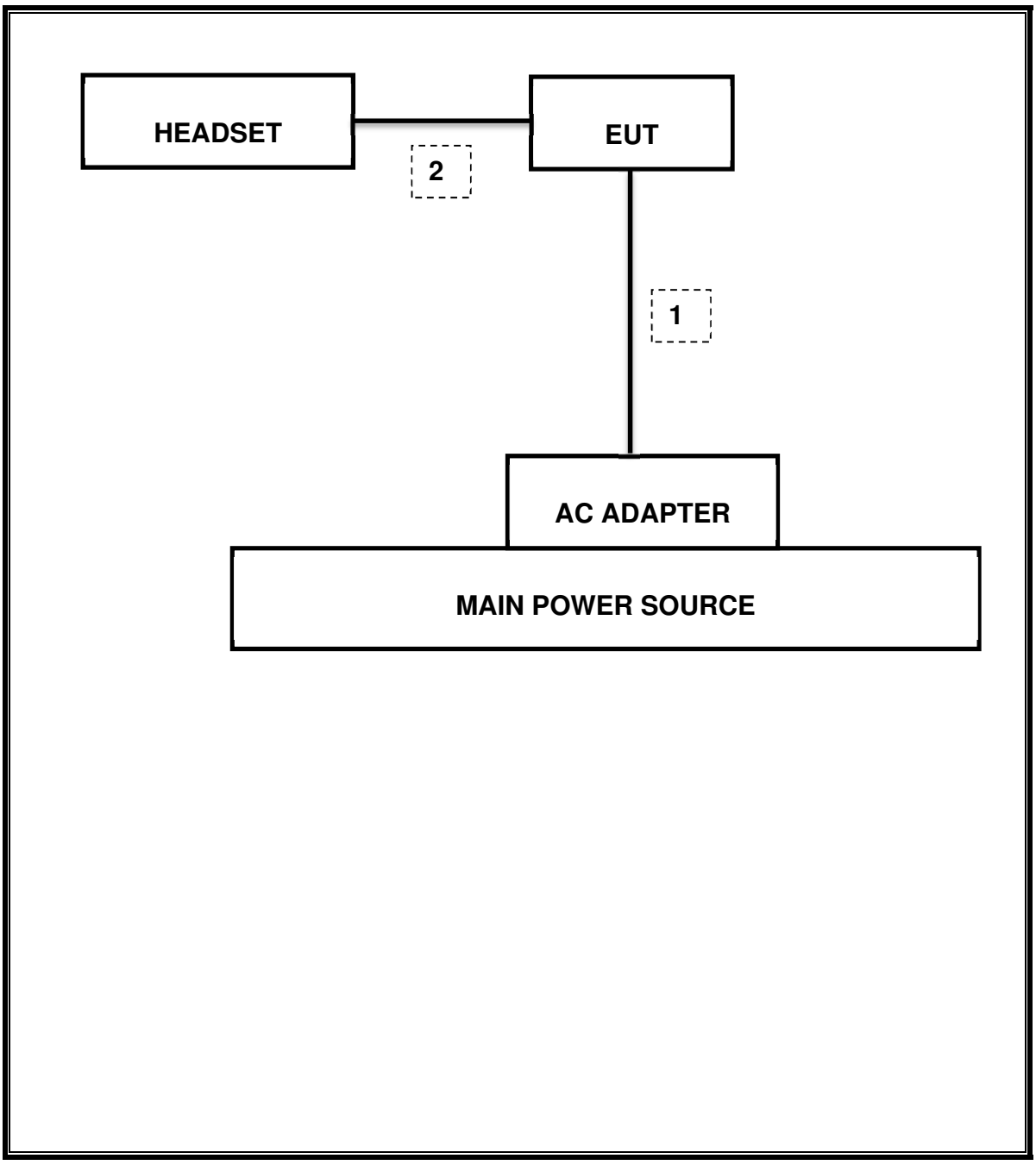
**SETUP DIAGRAM FOR TESTS**





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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** | **S/N** | **Cal Due** |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 750 | 11-17-16 |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 749 | 04-25-17 |
| Antenna, Loop, 9kHz-30MHz | R&S | HFH2-Z2 | 100418 | 11-25-17 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00167211 | 09-26-16 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00161451 | 05-17-17 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168724 | 06-17-17 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168717 | 06-17-17 |
| Antenna, Horn, 40 GHz | ETS | 3116C | 00166155 | 09-23-16 |
| Antenna, Horn, 40 GHz | ETS | 3116C-PA | 00168841 | 08-24-17 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 341282 | 08-18-16 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 351741 | 08-18-16 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1876511 | 08-18-16 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1896138 | 08-18-16 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54170614 | 08-19-16 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54490312 | 08-19-16 |
| Bluetooth Tester | TESCOM | TC-3000C | 3000C000546 | 08-18-16 |
| Average Power Sensor | R&S | NRZ-Z91 | 102681 | 08-18-16 |
| Average Power Sensor | Agilent / HP | U2000 | MY54270007 | 08-18-16 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100439 | 08-19-16 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100457 | 08-19-16 |
| EMI Test Receive, 3 GHz | R&S | ESR3 | 101832 | 08-19-16 |
| Attenuator / Switch driver | HP | 11713A | 3748A04272 | N/A |
| Low Pass Filter 3GHz | Micro-Tronics | LPS17541 | 009 | 08-18-16 |
| Low Pass Filter 3GHz | Micro-Tronics | LPS17541 | 015 | 08-18-16 |
| High Pass Filter 5GHz | Micro-Tronics | HPS17542 | 009 | 08-18-16 |
| High Pass Filter 6GHz | Micro-Tronics | HPM17543 | 010 | 08-18-16 |
| High Pass Filter 5GHz | Micro-Tronics | HPS17542 | 016 | 08-18-16 |
| High Pass Filter 6GHz | Micro-Tronics | HPM17543 | 015 | 08-18-16 |
| LISN | R&S | ENV-216 | 101836 | 08-19-16 |
| LISN | R&S | ENV-216 | 101837 | 08-19-16 |


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# 7. MEASUREMENT METHODS

KDB 558074 D01 DTS Meas Guidance v03r03: Measurement Procedure §9.1.1 is used for peak power and §10.2 PKPSD is used for power spectral density.

Unwanted emissions within Restricted Bands are measured using traditional radiated procedures.

Band edge emissions within Restricted Bands are measured using RMS with duty cycle factor offset method.

# 8. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

**LIMITS**

None: for reporting purposes only.

## 8.1. 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/T Minimum VBW [kHz] |
|---|---|---|---|---|---|---|
| 2400MHz Bands | | | | | | |
| BLE | 0.390 | 0.625 | 0.623 | 62.3% | 2.05 | 2.566 |

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# 9. SUMMARY TABLE

| FCC Part Section | Test Description | Test Limit | Test Condition | Test Result | Worst Case |
|---|---|---|---|---|---|
| 15.247 (a)(2) | Occupied Band width (6dB) | >500KHz | Conducted | Pass | 660.2 kHz |
| 2.1051, 15.247 (d) | Band Edge / Conducted Spurious Emission | -20dBc | | Pass | -45.989 dBm |
| 15.247 | TX conducted output power | <30dBm | | Pass | 1.28 dBm (Peak) |
| 15.247 | PSD | <8dBm | | Pass | -14.34 dBm (Peak) |
| 15.207 (a) | AC Power Line conducted emissions | Section 10 | Power Line conducted | Pass | 49.75 dBuV (QP) |
| 15.205, 15.209 | Radiated Spurious Emission | < 40dBuV/m | Radiated | Pass | 32.04 dBuV/m (QP) |


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# 10. ANTENNA PORT TEST RESULTS

## 10.1. 6 dB BANDWIDTH

**LIMITS**

FCC §15.247 (a) (2)

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 [kHz] | Minimum Limit [kHz] |
|---|---|---|---|
| Low | 2402 | 661.0 | 500.0 |
| Mid | 2440 | 660.2 | 500.0 |
| High | 2480 | 662.0 | 500.0 |
| Worst | | 660.2 | 500.0 |


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## 6 dB BANDWIDTH PLOTS

| | | | |
|---|---|---|---|
| Low CH | | | |
| Middle CH | | | |
| High CH | | | |


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## 10.2. 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 | 1.057 |
| Mid | 2440 | 1.067 |
| High | 2480 | 1.065 |
| Worst | | 1.067 |


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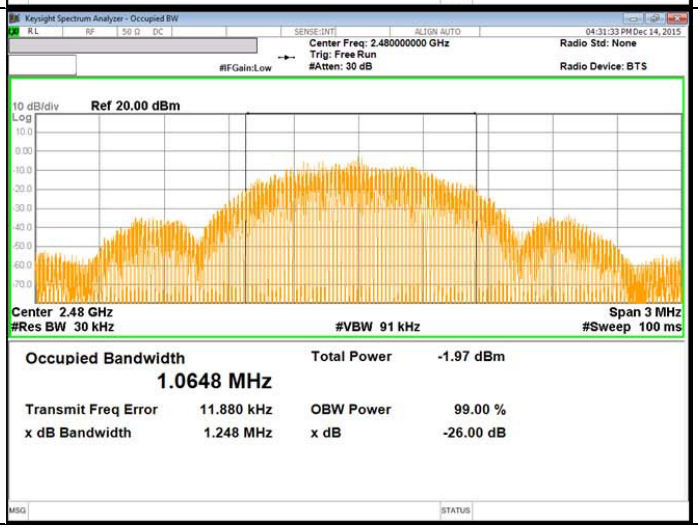
**99% BANDWIDTH PLOTS**

| | | | |
|---|---|---|---|
| Low CH | | | |
| Middle CH | | | |
| High CH | |  | |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## 10.3. OUTPUT POWER

**LIMITS**

FCC §15.247 (b)

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 under section 9.1.1 utilizing spectrum analyze.

**RESULTS**

| Channel | Frequency [MHz] | Peak Power Reading [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|
| Low | 2402 | 0.960 | 30.000 | -29.040 |
| Mid | 2440 | 1.280 | 30.000 | -28.720 |
| High | 2480 | 0.559 | 30.000 | -29.441 |
| Worst | | 1.280 | | -28.720 |


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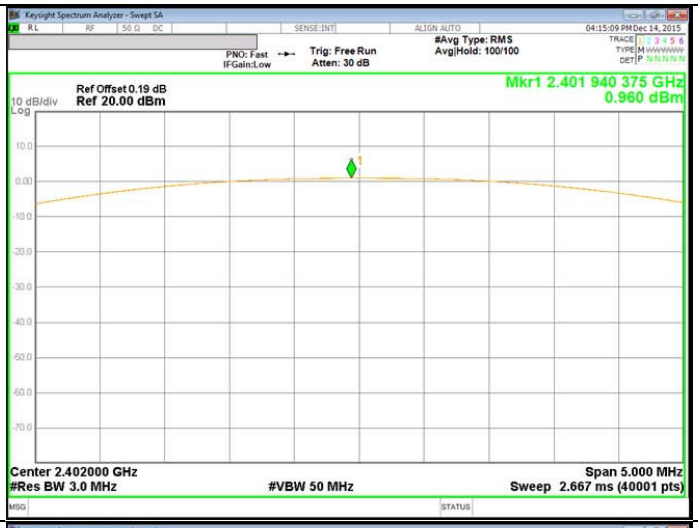
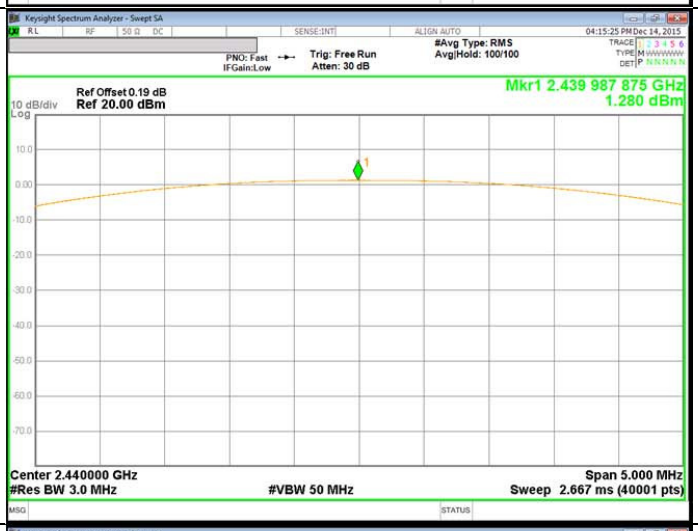
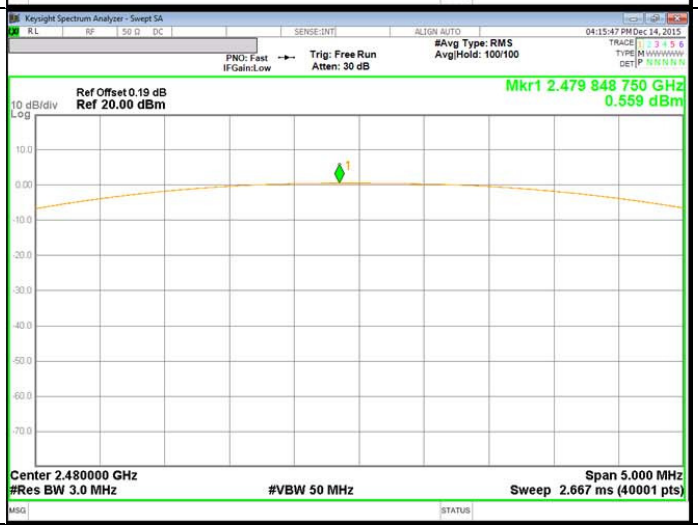
**OUTPUT POWER PLOTS**

| | | | |
|---|---|---|---|
| Low CH | |  | |
| Middle CH | |  | |
| High CH | |  | |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## 10.4. 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 10.1 dB (including 10 dB pad and 0.1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

| Channel | Frequency [MHz] | AV power [dBm] | AV power [mW] |
|---|---|---|---|
| Low | 2402 | 0.45 | 1.11 |
| Middle | 2440 | 0.78 | 1.20 |
| High | 2480 | 0.01 | 1.00 |


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## 10.5. PSD

**LIMITS**

FCC §15.247

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 | -14.59 | 8.00 | -22.59 |
| Mid | 2440 | -14.34 | 8.00 | -22.34 |
| High | 2480 | -15.07 | 8.00 | -23.07 |


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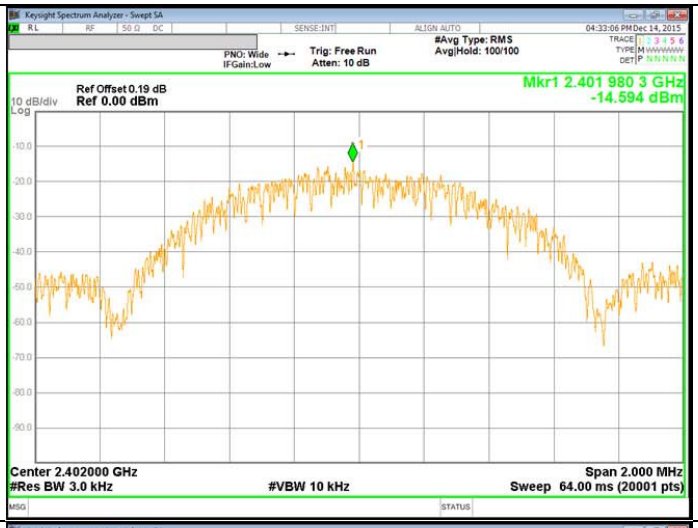
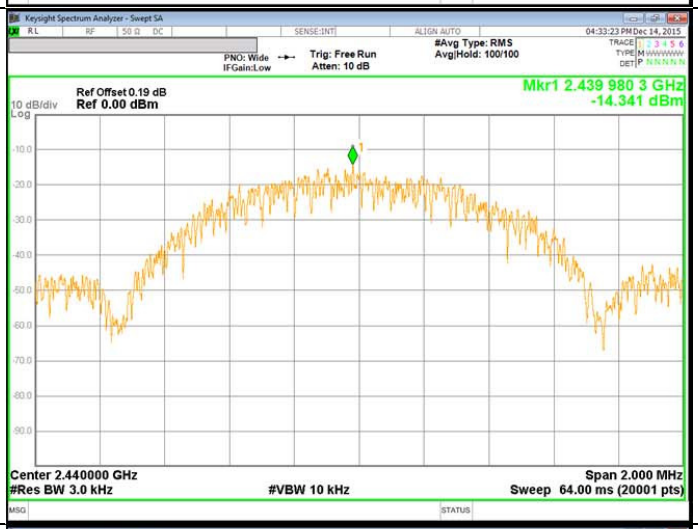
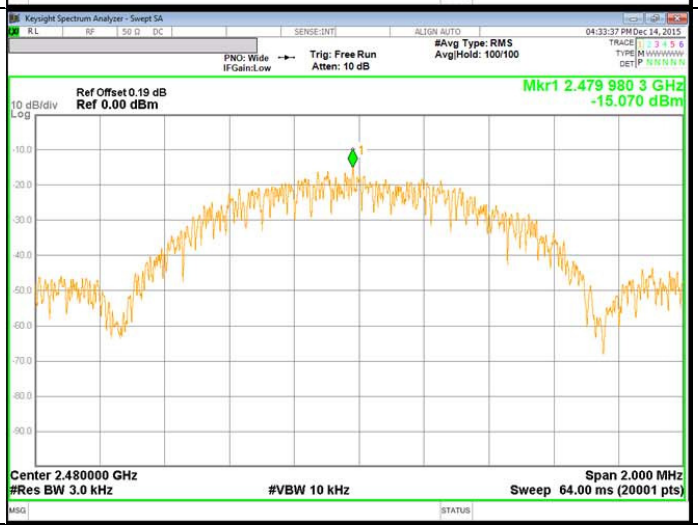
**POWER SPECTRAL DENSITY PLOTS**

| | | | |
|---|---|---|---|
| Low CH | |  | |
| Middle CH | |  | |
| High CH | |  | |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## 10.6. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)

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.


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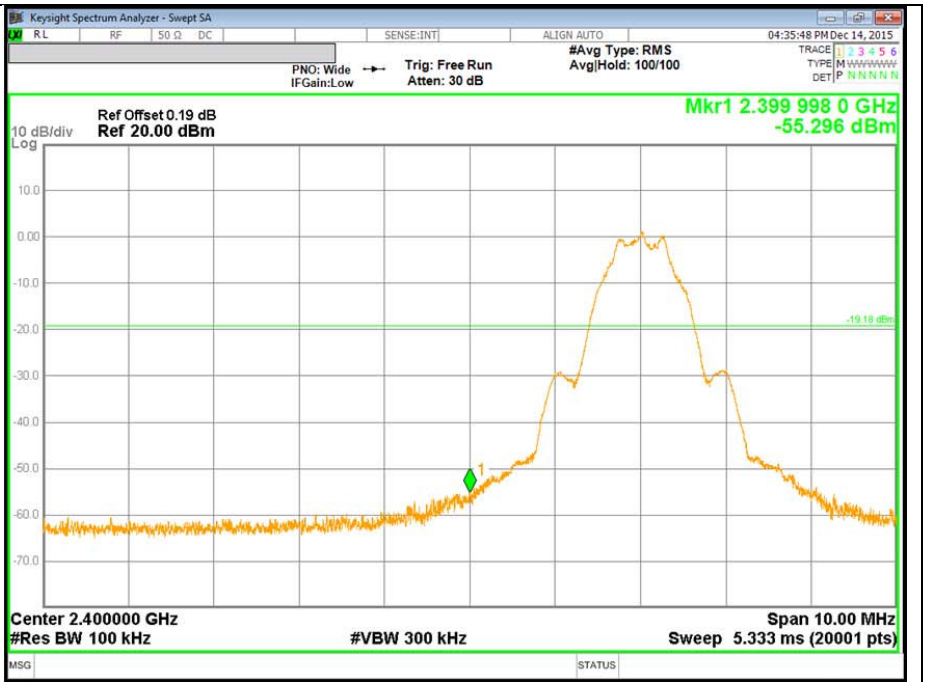
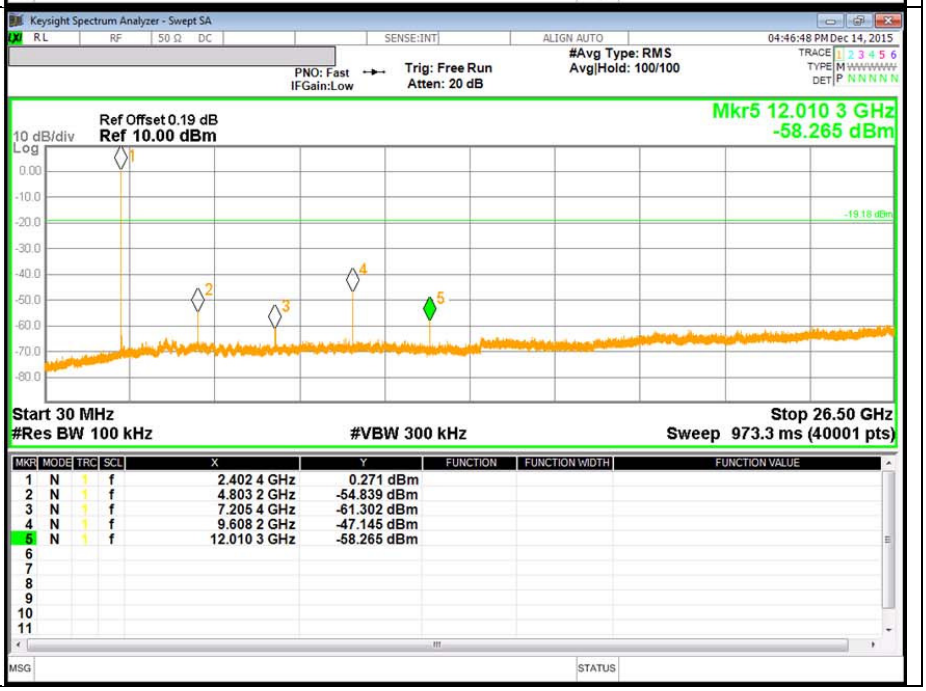
## RESULTS

## BANDEDGE & SPURIOUS EMISSIONS, LOW CHANNEL

| | |
|---|---|
| Low CH BandEdge |   |
| Low CH Spurious |   |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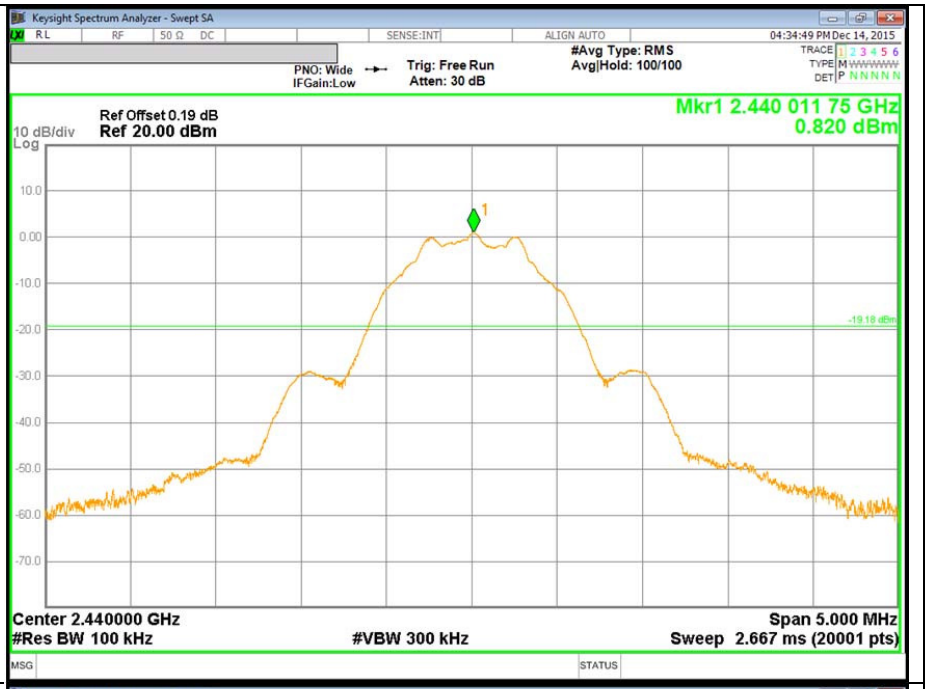
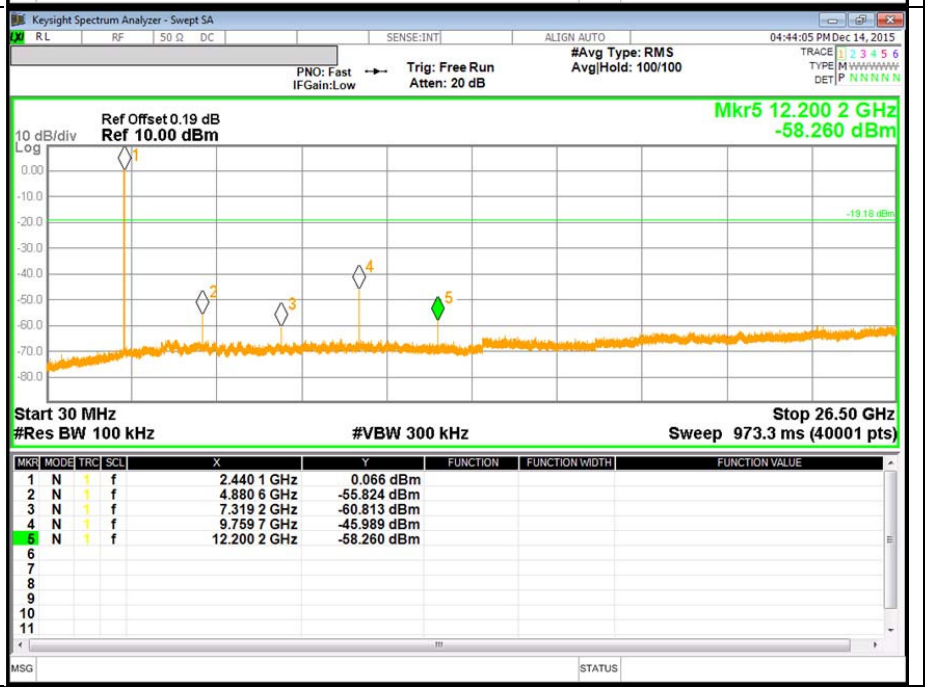
**SPURIOUS EMISSIONS, MID CHANNEL**

| | |
|---|---|
| Middle CH BandEdge |  |
| Middle CH Spurious |  |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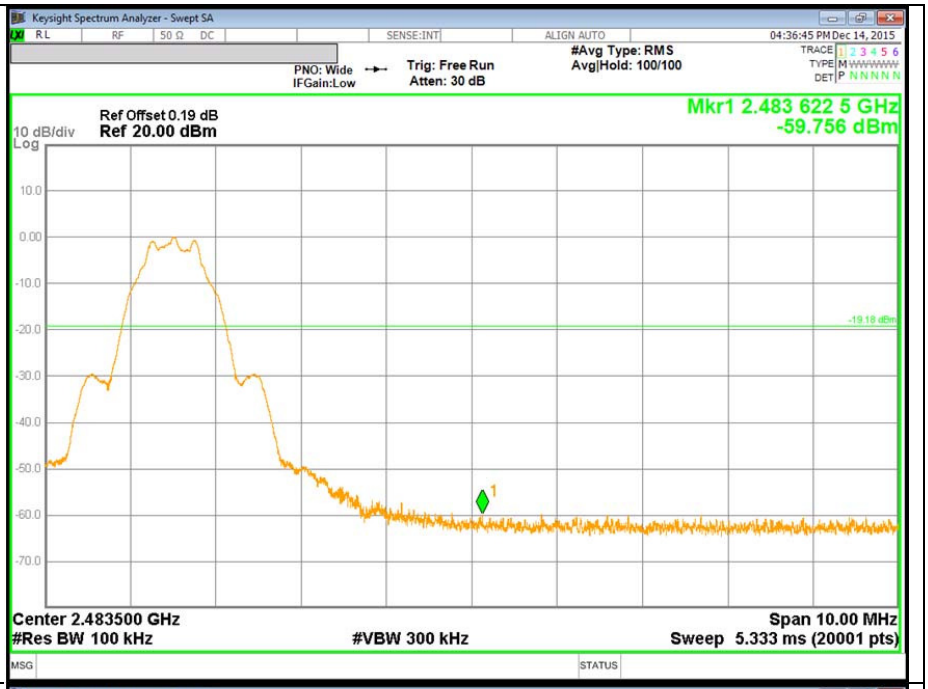
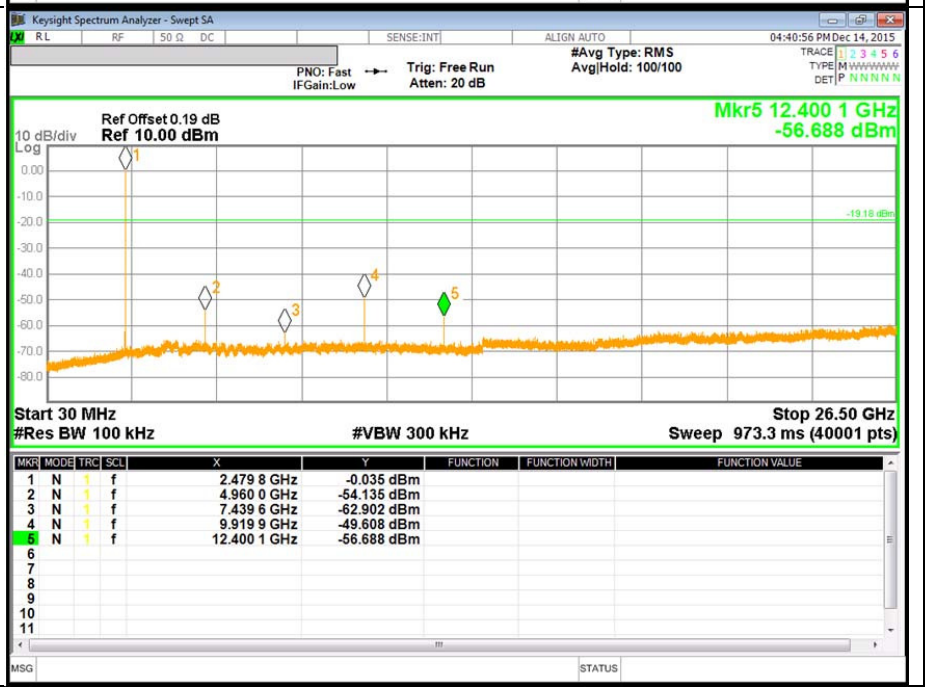
**SPURIOUS EMISSIONS, HIGH CHANNEL**

| | |
|---|---|
| High CH BandEdge |  |
| High CH Spurious |  |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# 11. RADIATED TEST RESULTS

## 11.1. LIMITS AND PROCEDURE

**LIMITS**

FCC §15.205 and §15.209

| 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. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10 - 2009. 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: DCF = 10log(1/0.623)=2.05dB (Spectrum Analyzer round it up to 2.05dB)

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 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.

Note : Emission was pre-scanned from 9KHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit. Per FCC part 15.31(o), test results were not reported.


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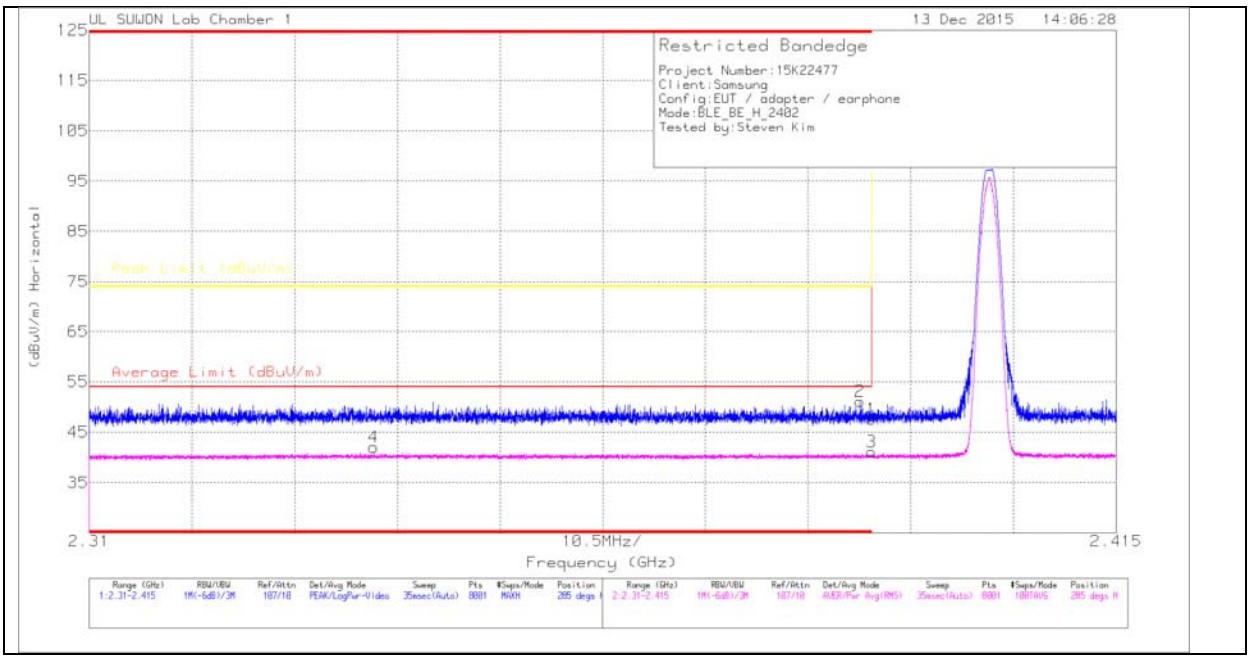
## 11.2. TRANSMITTER ABOVE 1 GHz
### RESTRICTED BANDEDGE (LOW CHANNEL)

**HORIZONTAL PEAK AND AVERAGE PLOT**




**HORIZONTAL DATA**

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117(00168717)_150619 | Path_2 | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 2.39 | 44.82 | Pk | 31.8 | -29 | 0 | 47.62 | - | - | 74 | -26.38 | 285 | 106 | H |
| 2 | * 2.389 | 48.34 | Pk | 31.8 | -29 | 0 | 51.14 | - | - | 74 | -22.86 | 285 | 106 | H |
| 3 | * 2.39 | 35.37 | RMS | 31.8 | -29 | 2.05 | 40.22 | 54 | -13.78 | - | - | 285 | 106 | H |
| 4 | * 2.339 | 36.38 | RMS | 31.7 | -29 | 2.05 | 41.13 | 54 | -12.87 | - | - | 285 | 106 | H |

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

Pk - Peak detector

RMS - RMS detection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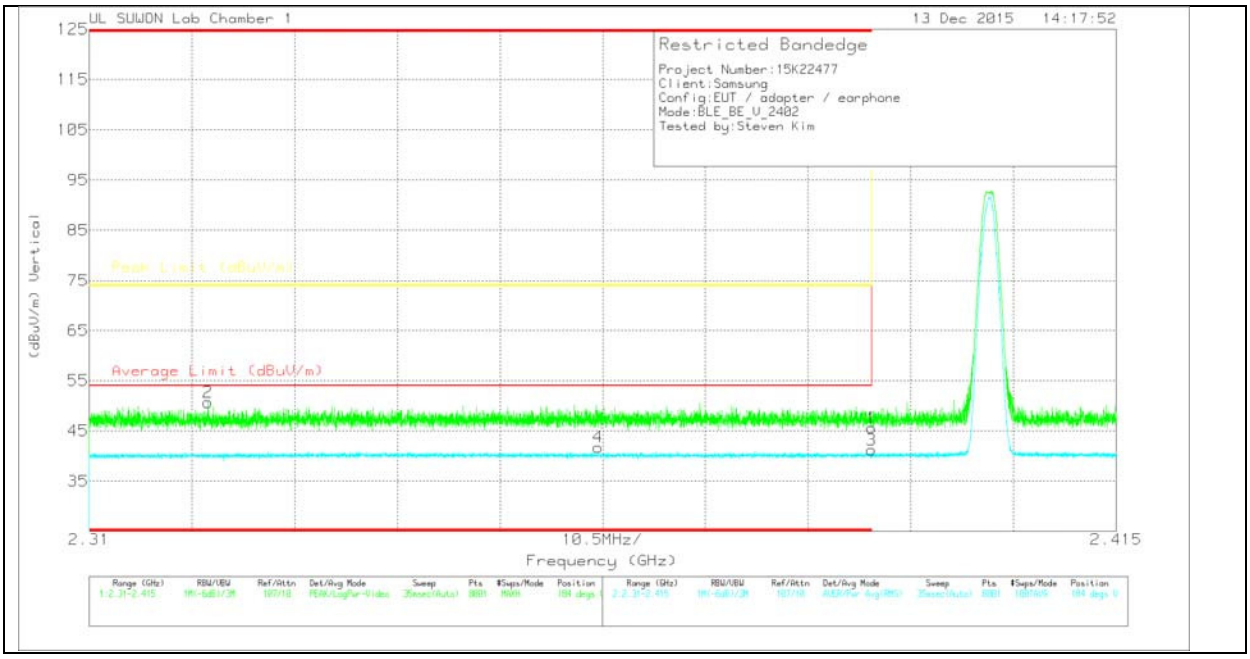
## VERTICAL PEAK AND AVERAGE PLOT




## VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117(00168717)_150619 | Path_2 | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 2.39 | 42.83 | Pk | 31.8 | -29 | 0 | 45.63 | - | - | 74 | -28.37 | 184 | 380 | V |
| 2 | * 2.322 | 47.99 | Pk | 31.7 | -29 | 0 | 50.69 | - | - | 74 | -23.31 | 184 | 380 | V |
| 3 | * 2.39 | 35.45 | RMS | 31.8 | -29 | 2.05 | 40.3 | 54 | -13.7 | - | - | 184 | 380 | V |
| 4 | * 2.362 | 36.12 | RMS | 31.7 | -29 | 2.05 | 40.87 | 54 | -13.13 | - | - | 184 | 380 | V |

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

Pk - Peak detector

RMS - RMS detection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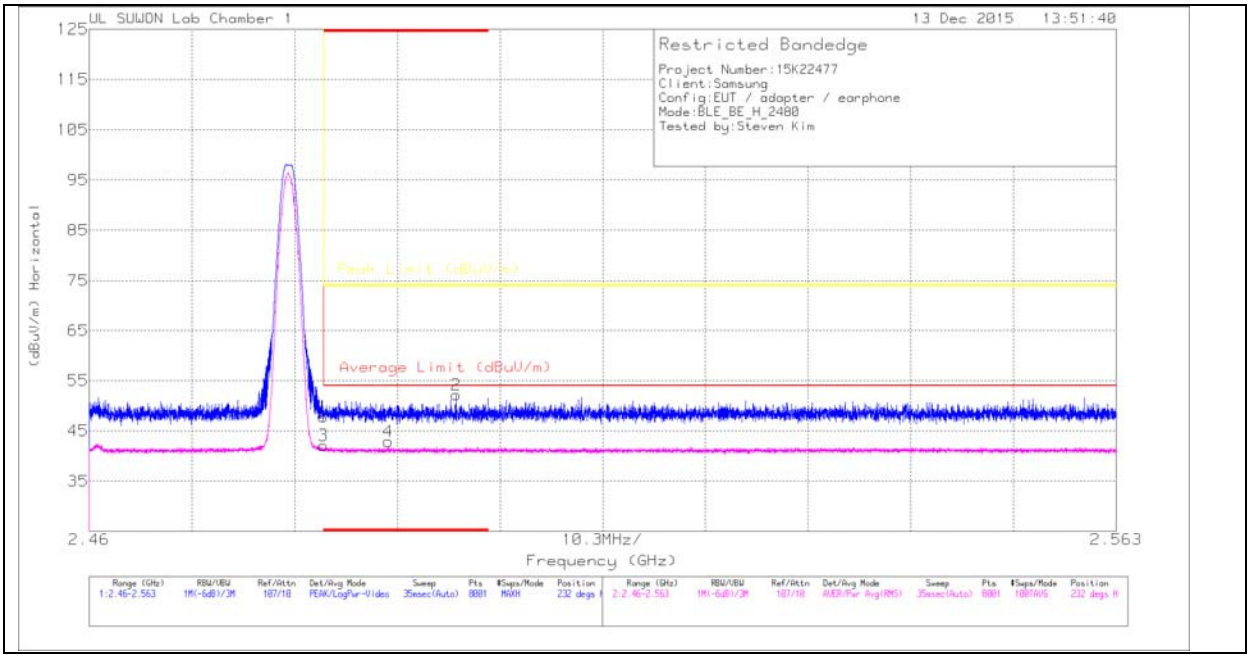
# AUTHORIZED BANDEDGE (HIGH CHANNEL)

## HORIZONTAL PEAK AND AVERAGE PLOT




## HORIZONTAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117(00168717)_150619 | Path_2 | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 2.484 | 44.16 | Pk | 32 | -28.3 | 0 | 47.86 | - | - | 74 | -26.14 | 232 | 101 | H |
| 2 | * 2.497 | 48.49 | Pk | 32 | -28.3 | 0 | 52.19 | - | - | 74 | -21.81 | 232 | 101 | H |
| 3 | * 2.484 | 35.47 | RMS | 32 | -28.3 | 2.05 | 41.22 | 54 | -12.78 | - | - | 232 | 101 | H |
| 4 | * 2.49 | 36.24 | RMS | 32 | -28.3 | 2.05 | 41.99 | 54 | -12.01 | - | - | 232 | 101 | H |

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

Pk - Peak detector

RMS - RMS detection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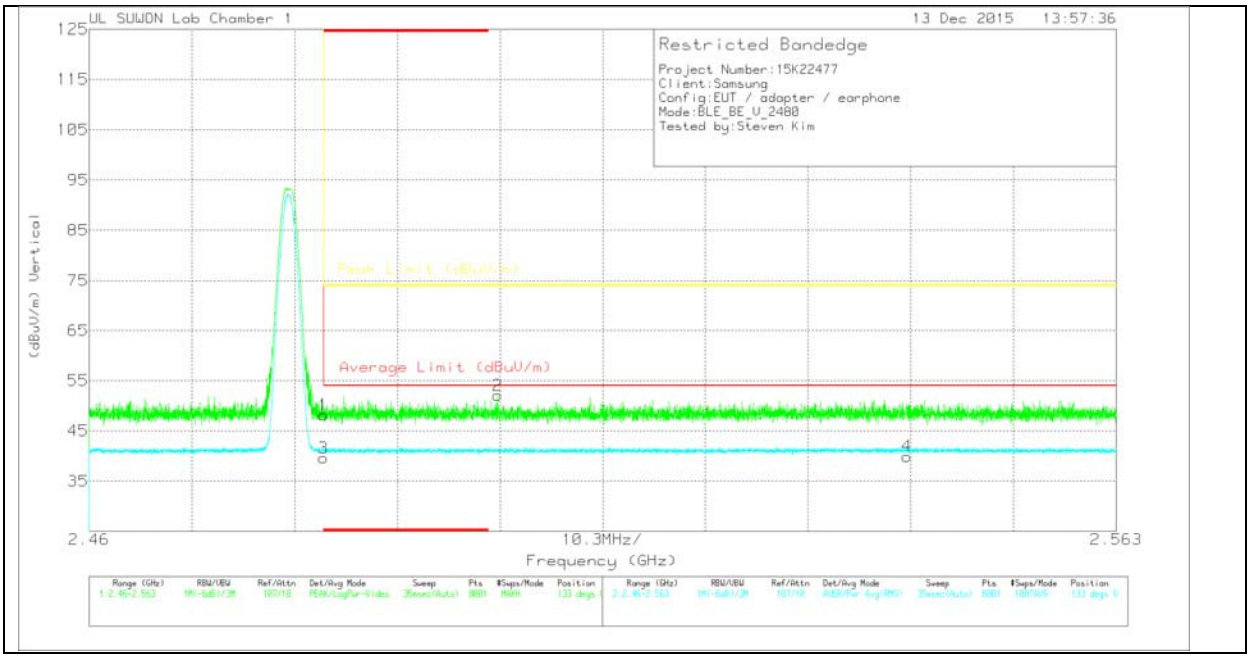
## VERTICAL PEAK AND AVERAGE PLOT




## VERTICAL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117(00168717)_150619 | Path_2 | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 2.484 | 44.49 | Pk | 32 | -28.3 | 0 | 48.19 | - | - | 74 | -25.81 | 133 | 282 | V |
| 2 | 2.501 | 48.35 | Pk | 32 | -28.3 | 0 | 52.05 | - | - | 74 | -21.95 | 133 | 282 | V |
| 3 | * 2.484 | 35.92 | RMS | 32 | -28.3 | 2.05 | 41.67 | 54 | -12.33 | - | - | 133 | 282 | V |
| 4 | 2.542 | 36.15 | RMS | 32 | -28.2 | 2.05 | 42 | 54 | -12 | - | - | 133 | 282 | V |

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

Pk - Peak detector

RMS - RMS detection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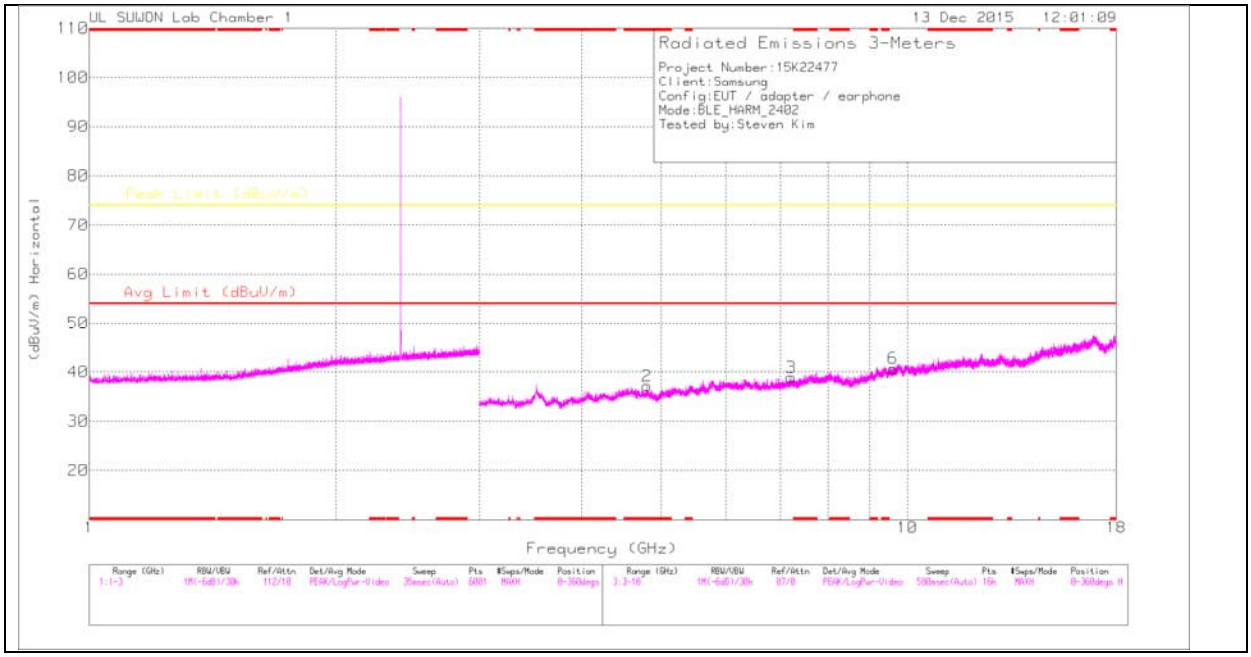
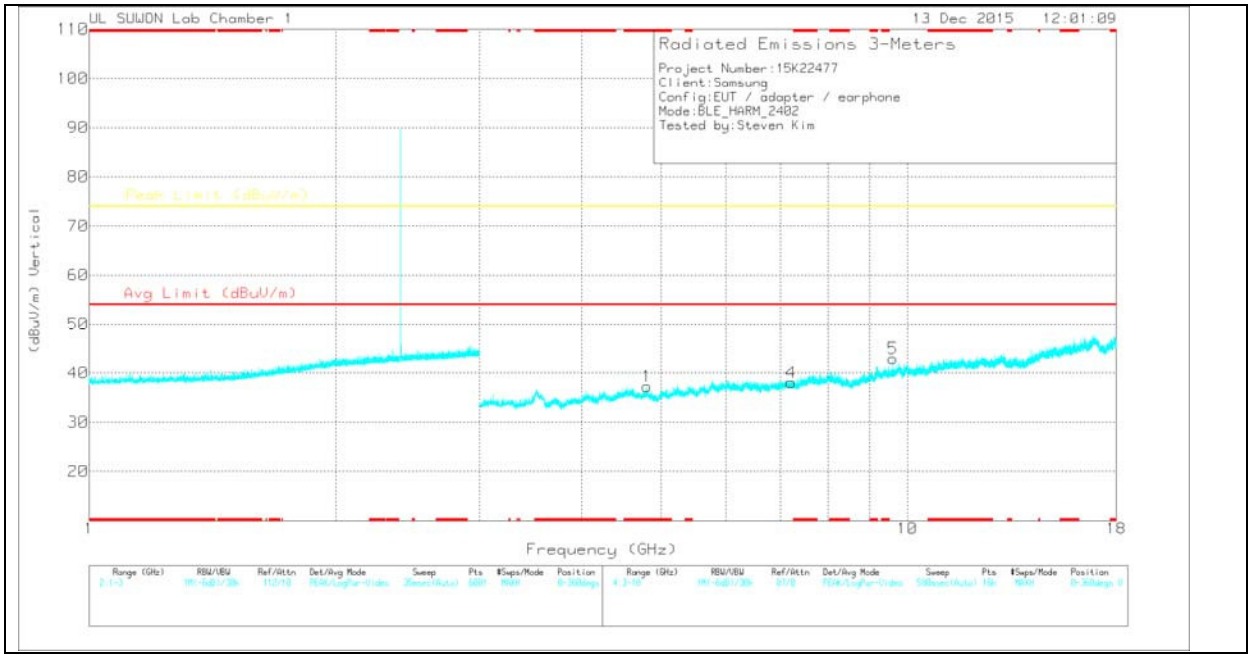
**HARMONICS AND SPURIOUS EMISSIONS**

## LOW CHANNEL HORIZONTAL




## 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.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# LOW CHANNEL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117(00168717)_150619 | Path_3 | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | * 4.804 | 36.99 | PK | 34 | -33.8 | 0 | 37.19 | - | - | 74 | -36.81 | 0-360 | 100 | H |
| 3 | 7.209 | 34.02 | PK | 35.7 | -30.8 | 0 | 38.92 | - | - | 74 | -35.08 | 0-360 | 100 | H |
| 6 | 9.607 | 31.03 | PK | 37 | -27.3 | 0 | 40.73 | - | - | 74 | -33.27 | 0-360 | 200 | H |
| 1 | * 4.804 | 37.07 | PK | 34 | -33.8 | 0 | 37.27 | - | - | 74 | -36.73 | 0-360 | 100 | V |
| 4 | 7.21 | 33.16 | PK | 35.7 | -30.8 | 0 | 38.06 | - | - | 74 | -35.94 | 0-360 | 100 | V |
| 5 | 9.608 | 33.22 | PK | 37 | -27.3 | 0 | 42.92 | - | - | 74 | -31.08 | 0-360 | 100 | V |

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

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).


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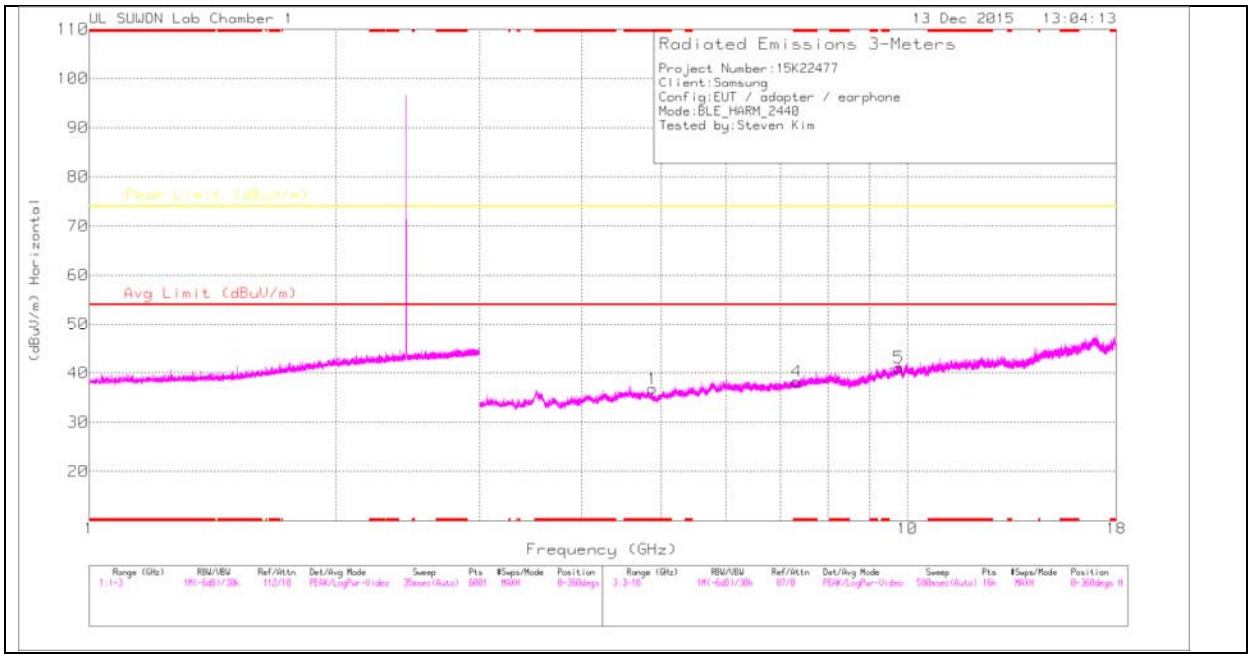
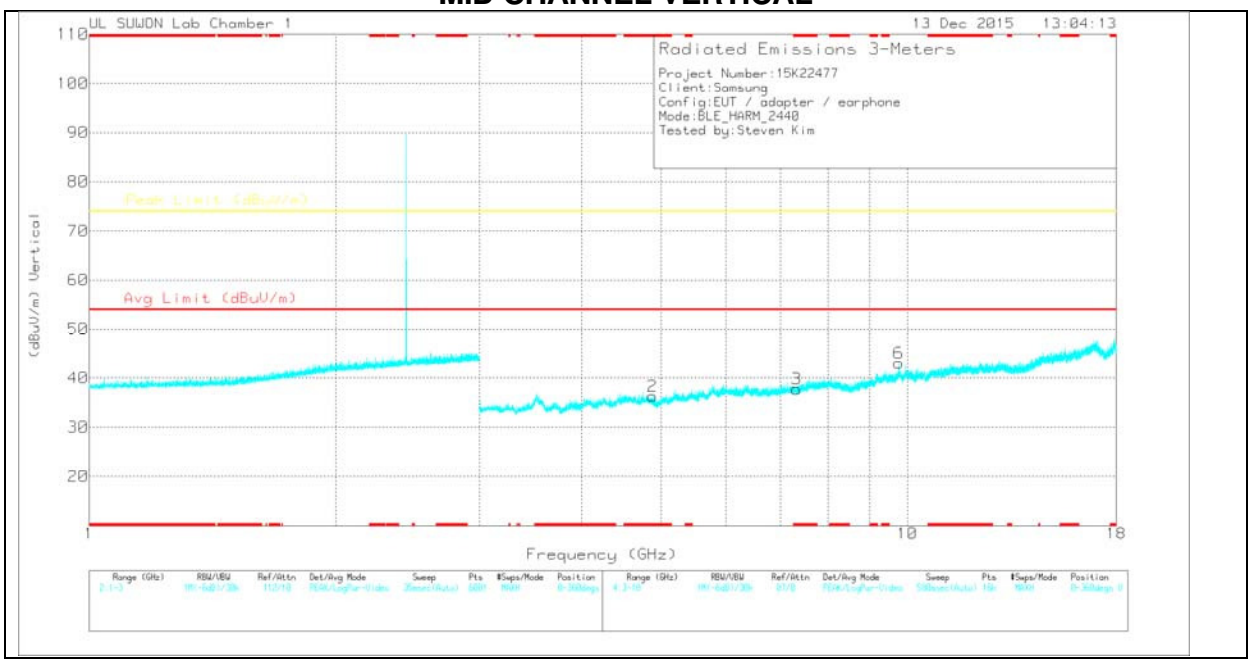
## MID CHANNEL HORIZONTAL




## 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.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# MID CHANNEL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117(00168717)_150619 | Path_3 | 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 | * 4.88 | 36.78 | PK | 34 | -34 | 0 | 36.78 | - | - | 74 | -37.22 | 0-360 | 100 | H |
| 4 | * 7.324 | 33.34 | PK | 35.8 | -30.9 | 0 | 38.24 | - | - | 74 | -35.76 | 0-360 | 100 | H |
| 5 | 9.76 | 30.49 | PK | 37.2 | -26.6 | 0 | 41.09 | - | - | 74 | -32.91 | 0-360 | 200 | H |
| 2 | * 4.88 | 36.31 | PK | 34 | -34 | 0 | 36.31 | - | - | 74 | -37.69 | 0-360 | 100 | V |
| 3 | * 7.321 | 32.85 | PK | 35.8 | -30.9 | 0 | 37.75 | - | - | 74 | -36.25 | 0-360 | 100 | V |
| 6 | 9.76 | 32.43 | PK | 37.2 | -26.6 | 0 | 43.03 | - | - | 74 | -30.97 | 0-360 | 100 | V |

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

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).


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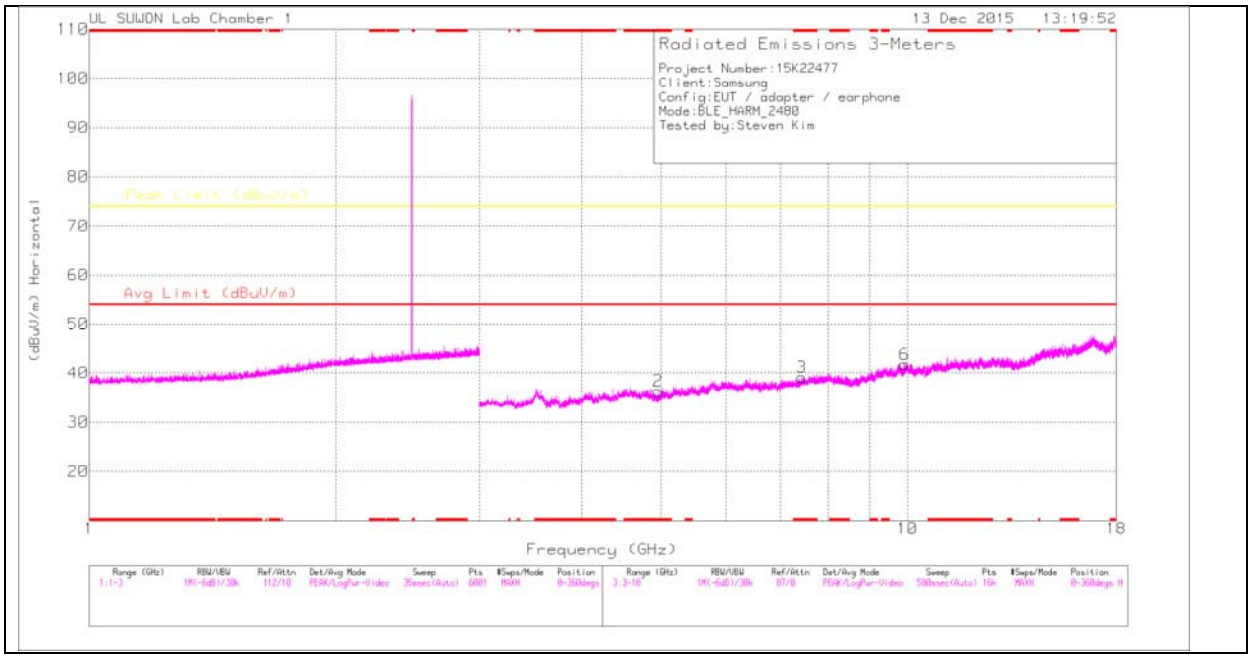
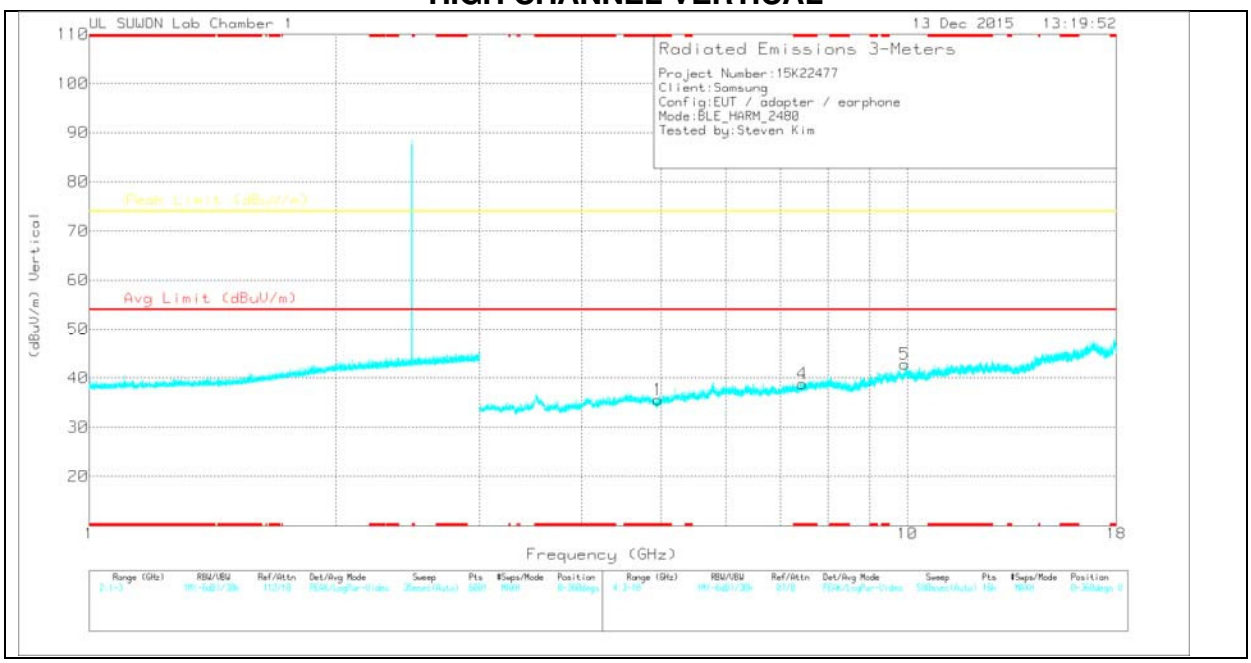
## HIGH CHANNEL HORIZONTAL




## 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.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# HIGH CHANNEL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117(00168717)_150619 | Path_3 | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | * 4.959 | 36.34 | PK | 34 | -34 | 0 | 36.34 | - | - | 74 | -37.66 | 0-360 | 100 | H |
| 3 | * 7.428 | 34.12 | PK | 35.8 | -30.8 | 0 | 39.12 | - | - | 74 | -34.88 | 0-360 | 100 | H |
| 6 | 9.925 | 31.46 | PK | 37.4 | -27.1 | 0 | 41.76 | - | - | 74 | -32.24 | 0-360 | 200 | H |
| 1 | * 4.958 | 35.59 | PK | 34 | -34 | 0 | 35.59 | - | - | 74 | -38.41 | 0-360 | 200 | V |
| 4 | * 7.439 | 33.74 | PK | 35.8 | -30.7 | 0 | 38.84 | - | - | 74 | -35.16 | 0-360 | 100 | V |
| 5 | 9.92 | 32.63 | PK | 37.4 | -27.2 | 0 | 42.83 | - | - | 74 | -31.17 | 0-360 | 100 | V |

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

PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).


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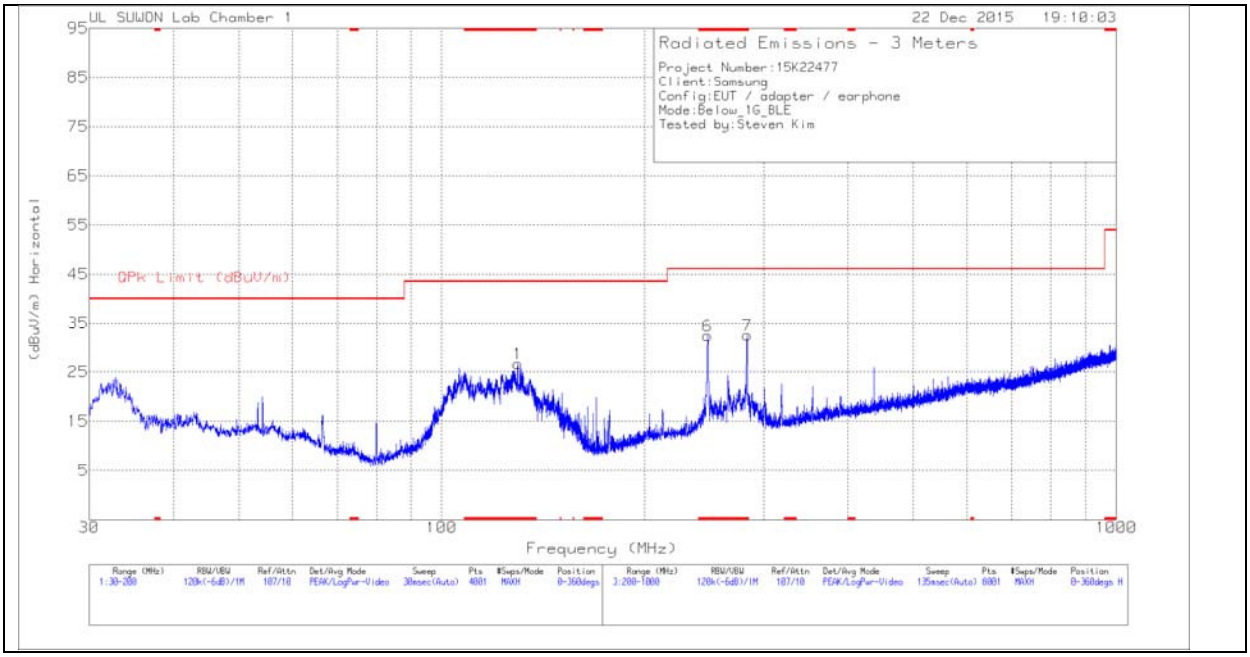
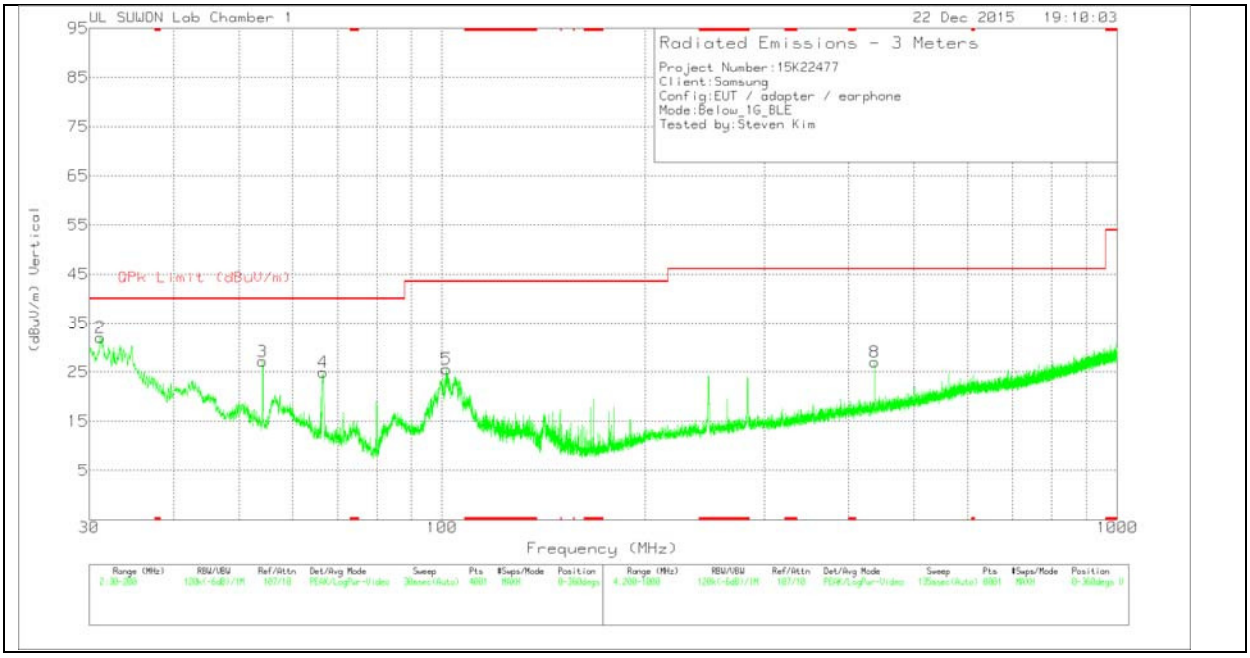
## 11.3. WORST-CASE BELOW 1 GHz

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

### HORIZONTAL PLOT




### VERTICAL PLOT





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# BELOW 1 GHz TABLE

Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | VULB9163-750 | Bi-Log | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 129.79 | 46.64 | Pk | 8.9 | -28.9 | 26.64 | 43.52 | -16.88 | 0-360 | 200 | H |
| 2 | 31.1475 | 52.24 | Pk | 10.3 | -30.5 | 32.04 | 40 | -7.96 | 0-360 | 100 | V |
| 3 | 54.225 | 43.83 | Pk | 13.3 | -30 | 27.13 | 40 | -12.87 | 0-360 | 100 | V |
| 4 | 66.5925 | 44.04 | Pk | 10.7 | -29.8 | 24.94 | 40 | -15.06 | 0-360 | 100 | V |
| 5 | 101.485 | 43.49 | Pk | 11.4 | -29.3 | 25.59 | 43.52 | -17.93 | 0-360 | 100 | V |
| 6 | * 247.7 | 47.89 | Pk | 12.3 | -27.8 | 32.39 | 46.02 | -13.63 | 0-360 | 100 | H |
| 7 | * 283.7 | 47.1 | Pk | 13 | -27.6 | 32.5 | 46.02 | -13.52 | 0-360 | 100 | H |
| 8 | 437.5 | 37.53 | Pk | 16.1 | -26.6 | 27.03 | 46.02 | -18.99 | 0-360 | 100 | V |

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

Pk - Peak detector


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# 12. AC POWER LINE CONDUCTED EMISSIONS

**LIMITS**

FCC §15.207 (a)

| 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 - 2009


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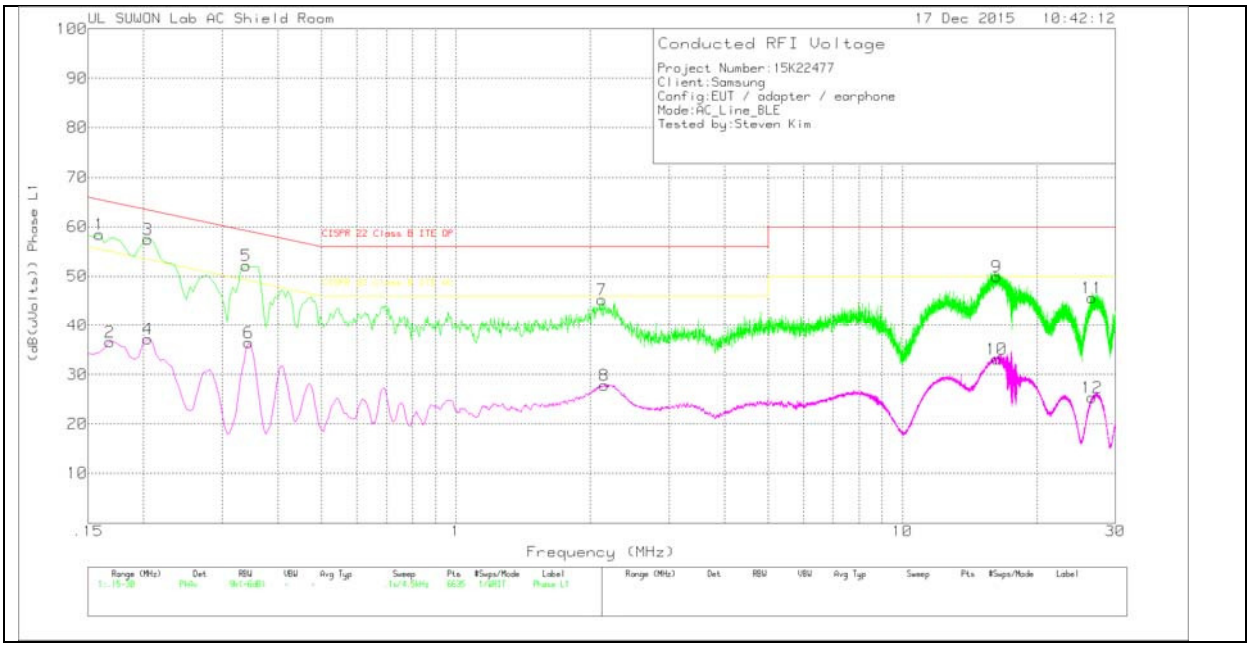
**RESULTS**

**6 WORST EMISSIONS**

## LINE 1 PLOT





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# LINE 1 RESULTS

## Trace Markers

Phase L1 .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | 101837_with ex-cord_L1 | CE Shield Room | Corrected Reading (dB(uVolts)) | CISPR 22 Class B ITE QP | Margin (dB) | CISPR 22 Class B ITE AV | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .159 | 48.44 | Pk | 10 | 0 | 58.44 | 65.52 | -7.08 | - | - |
| 2 | .168 | 26.42 | Av | 10.2 | 0 | 36.62 | - | - | 55.06 | -18.44 |
| 3 | .204 | 47.6 | Pk | 9.9 | 0 | 57.5 | 63.45 | -5.95 | - | - |
| 4 | .204 | 27.3 | Av | 9.9 | 0 | 37.2 | - | - | 53.45 | -16.25 |
| 5 | .339 | 42.21 | Pk | 10 | 0 | 52.21 | 59.23 | -7.02 | - | - |
| 6 | .3435 | 26.5 | Av | 10 | 0 | 36.5 | - | - | 49.12 | -12.62 |
| 7 | 2.1255 | 35.36 | Pk | 9.8 | .1 | 45.26 | 56 | -10.74 | - | - |
| 8 | 2.148 | 17.88 | Av | 9.8 | .1 | 27.78 | - | - | 46 | -18.22 |
| 9 | 16.2645 | 39.53 | Pk | 10.2 | .2 | 49.93 | 60 | -10.07 | - | - |
| 10 | 16.287 | 22.75 | Av | 10.2 | .2 | 33.15 | - | - | 50 | -16.85 |
| 11 | 26.6145 | 34.67 | Pk | 10.6 | .3 | 45.57 | 60 | -14.43 | - | - |
| 12 | 26.61 | 14.42 | Av | 10.6 | .3 | 25.32 | - | - | 50 | -24.68 |

Pk - Peak detector

Av - Average detection

## Quasi-Peak Emissions

Phase L1 .15 - 30MHz

| Frequency (MHz) | Meter Reading (dBuV) | Det | 101837_with ex-cord_L1 | CE Shield Room | Corrected Reading (dB(uVolts)) | CISPR 22 Class B ITE QP | Margin (dB) | CISPR 22 Class B ITE AV | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| .1635 | 32.18 | Qp | 10.1 | 0 | 42.28 | 65.28 | -23 | - | - |
| .2031 | 34.56 | Qp | 9.9 | 0 | 44.46 | 63.48 | -19.02 | - | - |
| .3399 | 35.81 | Qp | 10 | 0 | 45.81 | 59.21 | -13.4 | - | - |
| 16.2654 | 33.62 | Qp | 10.2 | .2 | 44.02 | 60 | -15.98 | - | - |

Qp – Quasi-Peak detector


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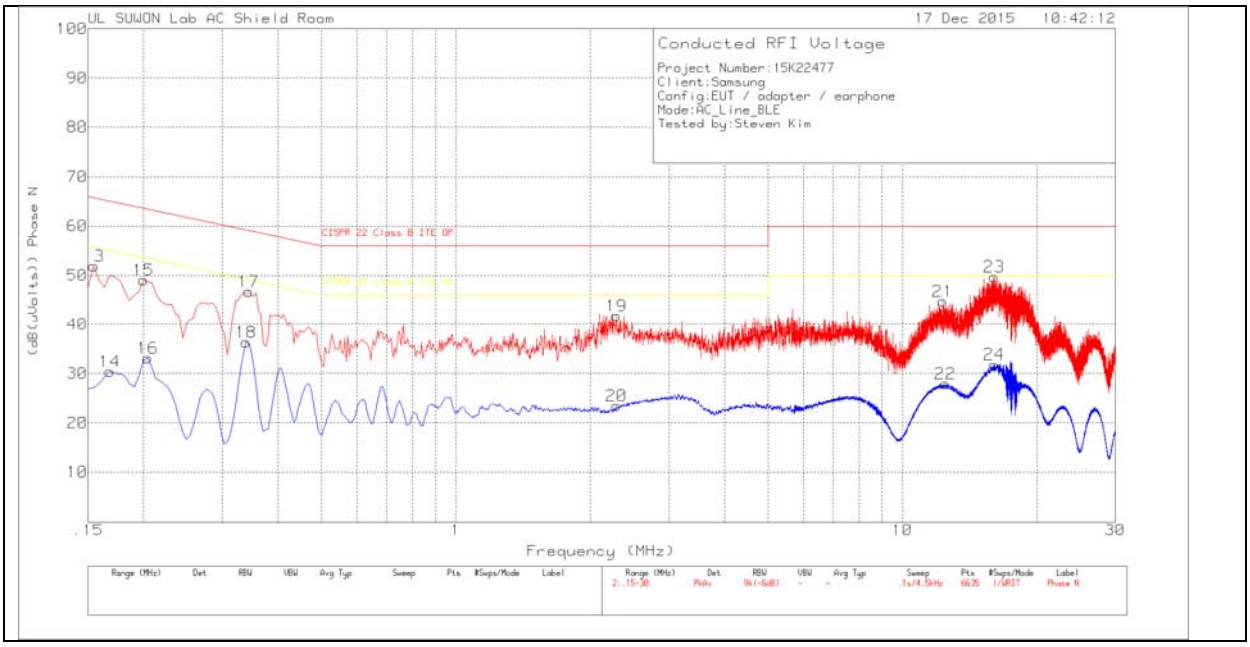
## LINE 2 PLOT




## LINE 2 RESULTS

Trace Markers

Phase N .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | 101837_with ex-cord_N | CE Shield Room | Corrected Reading (dB(uVolts)) | CISPR 22 Class B ITE QP | Margin (dB) | CISPR 22 Class B ITE AV | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | .1545 | 41.99 | Pk | 9.9 | 0 | 51.89 | 65.75 | -13.86 | - | - |
| 14 | .168 | 20.24 | Av | 10.2 | 0 | 30.44 | - | - | 55.06 | -24.62 |
| 15 | .1995 | 39.2 | Pk | 9.9 | 0 | 49.1 | 63.63 | -14.53 | - | - |
| 16 | .204 | 23.2 | Av | 9.9 | 0 | 33.1 | - | - | 53.45 | -20.35 |
| 17 | .3435 | 36.69 | Pk | 10 | 0 | 46.69 | 59.12 | -12.43 | - | - |
| 18 | .339 | 26.34 | Av | 10 | 0 | 36.34 | - | - | 49.23 | -12.89 |
| 19 | 2.2875 | 31.84 | Pk | 9.8 | .1 | 41.74 | 56 | -14.26 | - | - |
| 20 | 2.292 | 13.52 | Av | 9.8 | .1 | 23.42 | - | - | 46 | -22.58 |
| 21 | 12.3315 | 34.38 | Pk | 10.2 | .2 | 44.78 | 60 | -15.22 | - | - |
| 22 | 12.4755 | 17.47 | Av | 10.2 | .2 | 27.87 | - | - | 50 | -22.13 |
| 23 | 16.0485 | 39.15 | Pk | 10.4 | .2 | 49.75 | 60 | -10.25 | - | - |
| 24 | 16.0485 | 21.22 | Av | 10.4 | .2 | 31.82 | - | - | 50 | -18.18 |

Pk - Peak detector

Av - Average detection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