



# **CERTIFICATION TEST REPORT**

**Report Number. :** 12678288-E3V1

**Applicant :** Samsung Electronics Co., Ltd.  
129 Samsung-Ro, Yeongtong-Gu,  
Suwon-Si, Gyeonggi-Do, 16677, Korea

**Models :** SM-A305GT/DS

**FCC ID :** A3LSMA305GT

**EUT Description :** GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, and  
ANT+

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART C

**Date Of Issue:**  
February 20, 2019

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NVLAP Lab code: 200065-0

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## REPORT REVISION HISTORY

| Rev. | Issue<br>Date | Revisions     | Revised By |
|------|---------------|---------------|------------|
| V1   | 2/20/2019     | Initial Issue |            |

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**1.**

**2.**

### 3. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Samsung Electronics Co., Ltd.  
129 Samsung-Ro, Yeongtong-Gu,  
Suwon-Si, Gyeonggi-Do, 16677, Korea

**EUT DESCRIPTION:** GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, and  
ANT+

**MODEL:** SM-A305GT/DS

**SERIAL NUMBER:** R38KC08WHJE (Conducted Original)  
R38KC08WJSN, R38KC08WKGY (Radiated Original)  
R38M103M9KN (Radiated Spot Check)

**DATE TESTED:** JANUARY 11 - FEBRUARY 7, 2019 (Original)  
FEBRUARY 7 - 8, 2019 (Spot Check)

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

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

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## 4. INTRODUCTION OF TEST DATA REUSE

### 4.1. INTRODUCTION

According to the manufacturer, FCC ID: A3LSMA305F and FCC ID: A3LSMA305GT non-licensed radios are electrically identical. The FCC ID: A3LSMA305F test data shall remain representative of FCC ID: A3LSMA305GT.

The applicant takes full responsibility that the test data as referenced in this section represents compliance for this FCC ID.

### 4.2. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device A3LSMA305GT for radiated harmonic spurious and radiated band-edge. The data from the application has been verified through appropriate spot checks to demonstrate compliance for this device in accordance to FCC public KDB 484596 D01 as shown in the summary below.

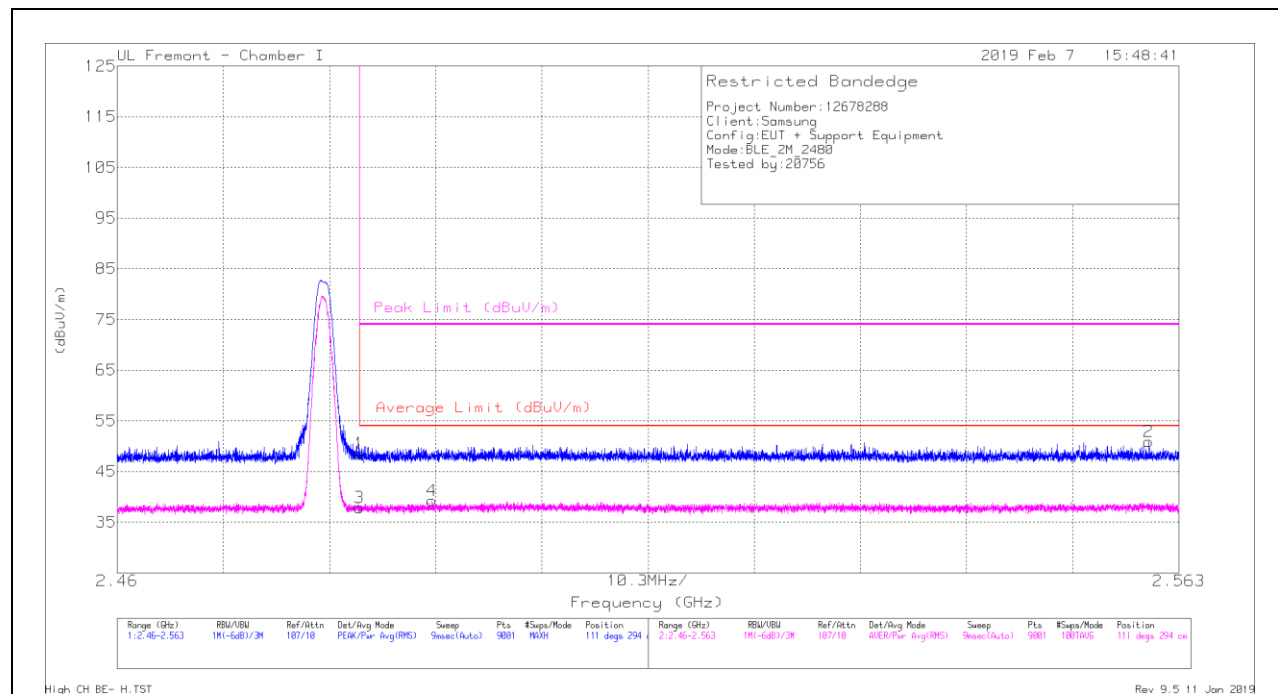
| A3LSMA305GT SPOT CHECK RESULTS |           |           |         |           |                |       |                  |       |            |       |
|--------------------------------|-----------|-----------|---------|-----------|----------------|-------|------------------|-------|------------|-------|
| Technology                     | Data Rate | Test Item | Channel | Measured  | Original model |       | Spot check model |       | Delta (dB) |       |
|                                |           |           |         |           | SM-A305F/DS    |       | SM-A305GT/DS     |       |            |       |
|                                |           |           |         |           | A3LSMA305F     |       | A3LSMA305GT      |       |            |       |
|                                |           |           |         | Frequency | Peak           | Ave   | Peak             | Ave   | Peak       | Ave   |
| BLE                            | 2Mbps     | RBE       | 39      | 2484MHz   | 60.14          | 45.25 | 50.94            | 44.25 | -9.2       | -1.2  |
|                                | 1Mbps     | RSE       | 0       | 1327MHz   | 45.74          | 37.71 | 44.49            | 36.99 | -1.25      | -0.72 |

Comparison of the models, upper deviation is within 3dB range and all tests are under FCC Technical Limits.

## SPOT CHECK DATA

### BANDEDGE (HIGH CHANNEL) – 2Mbps

### HORIZONTAL RESULT



### Trace Markers

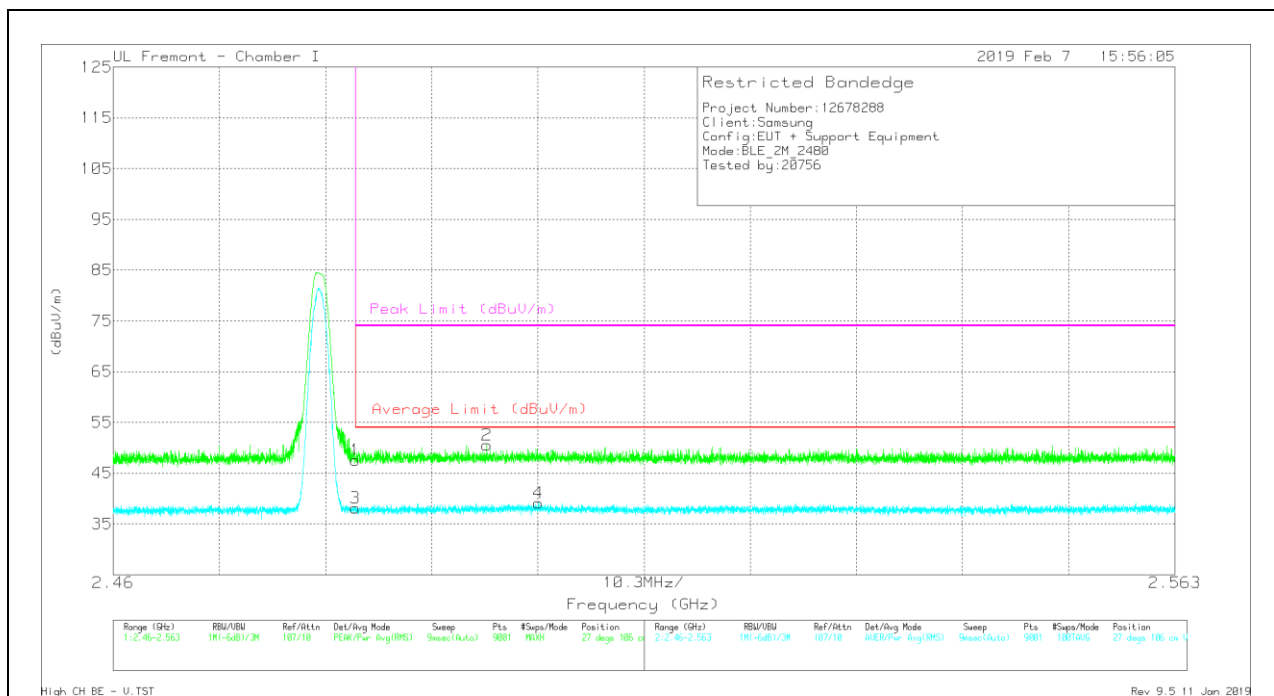
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T862 (dB/m) | Amp/Cb/Flr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|---------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.484         | 37.84                | Pk  | 32.4           | -21.7               | 0            | 48.54                      | -                      | -           | 74                  | -25.46         | 111            | 294         | H        |
| 2      | 2.56            | 40.14                | Pk  | 32.4           | -21.6               | 0            | 50.94                      | -                      | -           | 74                  | -23.06         | 111            | 294         | H        |
| 3      | * 2.484         | 27.14                | RMS | 32.4           | -21.7               | 5.04         | 42.88                      | 54                     | -11.12      | -                   | -              | 111            | 294         | H        |
| 4      | * 2.491         | 28.41                | RMS | 32.5           | -21.7               | 5.04         | 44.25                      | 54                     | -9.75       | -                   | -              | 111            | 294         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## VERTICAL RESULT



## Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T862 (dB/m) | Amp/Cbl/Ftr/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         | 36.84                | Pk  | 32.4           | -21.7                | 0            | 47.54                      | -                      | -           | 74                  | -26.46         | 27             | 106         | V        |
| 2      | * 2.496         | 39.86                | Pk  | 32.5           | -21.8                | 0            | 50.56                      | -                      | -           | 74                  | -23.44         | 27             | 106         | V        |
| 3      | * 2.484         | 27.4                 | RMS | 32.4           | -21.7                | 5.04         | 43.14                      | 54                     | -10.86      | -                   | -              | 27             | 106         | V        |
| 4      | 2.501           | 28.37                | RMS | 32.5           | -21.7                | 5.04         | 44.21                      | 54                     | -9.79       | -                   | -              | 27             | 106         | V        |

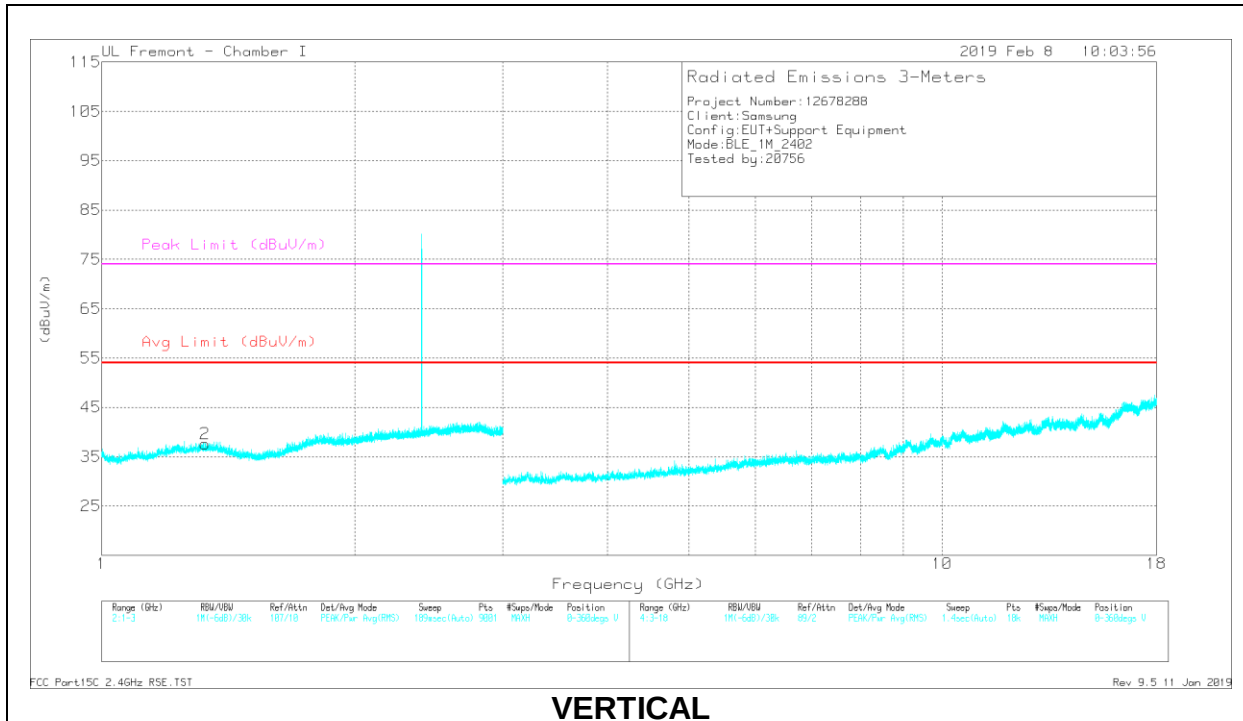
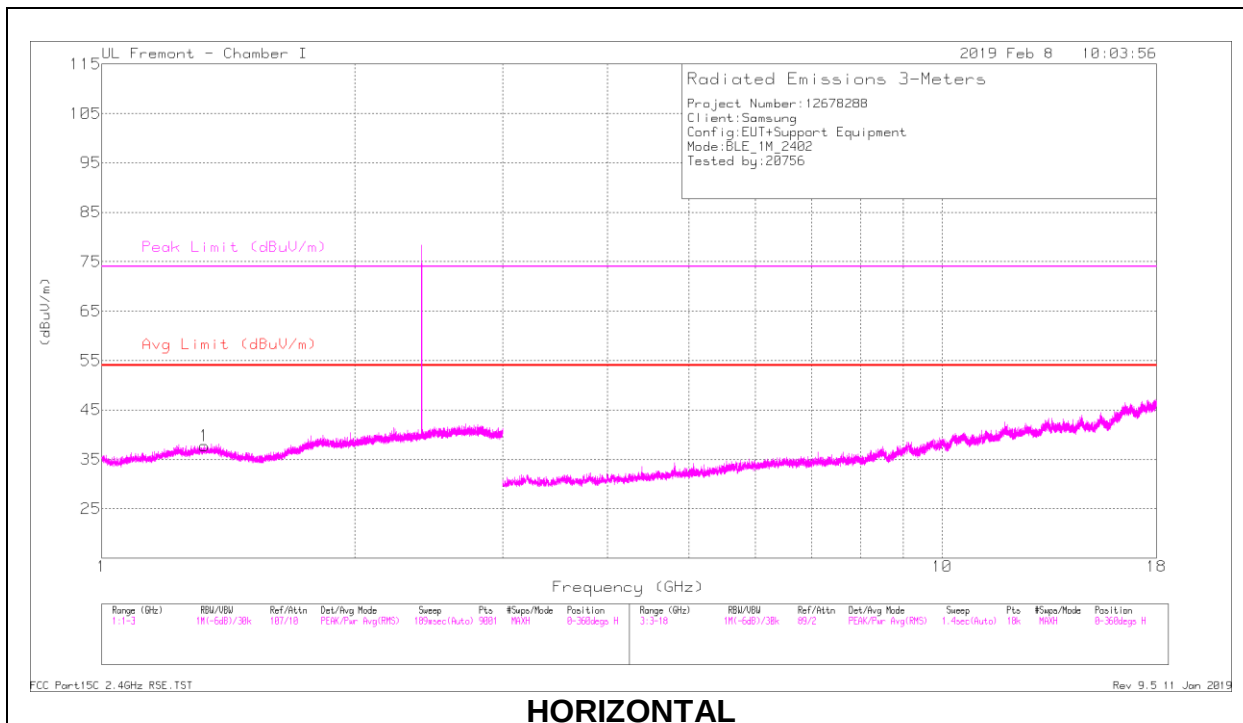
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## HARMONICS AND SPURIOUS EMISSIONS – 1Mbps

### LOW CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T862 (dB/m) | Amp/Cbl/Filtr/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      | * 1.323         | 38.09                | PK2  | 29.4           | -23                    | 0            | 44.49                      | -                  | -           | 74                  | -29.51         | 84             | 383         | H        |
|        | * 1.326         | 28.57                | MAv1 | 29.3           | -23                    | 2.12         | 36.99                      | 54                 | -17.01      | -                   | -              | 84             | 383         | H        |
| 2      | * 1.325         | 39.79                | PK2  | 29.4           | -23                    | 0            | 46.19                      | -                  | -           | 74                  | -27.81         | 37             | 354         | V        |
|        | * 1.326         | 28.46                | MAv1 | 29.3           | -23                    | 2.12         | 36.88                      | 54                 | -17.12      | -                   | -              | 37             | 354         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Av - Average detection

### 4.3. REFERENCE DETAIL

Reference application that contains the reused reference data

| Equipment Class | Reference FCC ID | Type Grant/ Permissive Change | Reference Application | Folder Test/RF Exposure | Report Title/Section          |
|-----------------|------------------|-------------------------------|-----------------------|-------------------------|-------------------------------|
| DTS             | A3LSMA305F       | Grant                         | 12678282-E3           | Test                    | FCC Report BLE / All sections |

## 5. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05.

## 6. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 47173 Benicia Street                                         | 47266 Benicia Street                              | 47658 Kato Rd                                                |
|--------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------|
| <input type="checkbox"/> Chamber A (ISED:2324B-1)            | <input type="checkbox"/> Chamber D (ISED:22541-1) | <input type="checkbox"/> Chamber I (ISED:2324A-5)            |
| <input checked="" type="checkbox"/> Chamber B (ISED:2324B-2) | <input type="checkbox"/> Chamber E (ISED:22541-2) | <input checked="" type="checkbox"/> Chamber J (ISED:2324A-6) |
| <input type="checkbox"/> Chamber C (ISED:2324B-3)            | <input type="checkbox"/> Chamber F (ISED:22541-3) | <input type="checkbox"/> Chamber K (ISED:2324A-1)            |
|                                                              | <input type="checkbox"/> Chamber G (ISED:22541-4) | <input checked="" type="checkbox"/> Chamber L (ISED:2324A-3) |
|                                                              | <input type="checkbox"/> Chamber H (ISED:22541-5) |                                                              |

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

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

## 7. CALIBRATION AND UNCERTAINTY

### 7.1. 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.

### 7.2. SAMPLE CALCULATION

#### **RADIATED EMISSIONS**

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

#### **MAINS CONDUCTED EMISSIONS**

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

36.5 dBuV + 0 dB + 10.1 dB + 0 dB = 46.6 dBuV

### 7.3. 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%.

## 8. EQUIPMENT UNDER TEST

### 8.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, and ANT+. The test report addresses the BLE operational mode.

### 8.2. MAXIMUM OUTPUT POWER

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

| Frequency Range | Mode        | Output Power (dBm) | Output Power (mW) |
|-----------------|-------------|--------------------|-------------------|
| 2402 - 2480     | BLE (1Mbps) | 6.09               | 4.06              |
| 2402 - 2480     | BLE (2Mbps) | 6.49               | 4.46              |

### 8.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -2.9 dBi.

### 8.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was A305F.001

### 8.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

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

Worst-case data rates as provided by the client were 1Mbps and 2Mbps.

## 8.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List |              |            |               |        |
|------------------------|--------------|------------|---------------|--------|
| Description            | Manufacturer | Model      | Serial Number | FCC ID |
| AC Adapter             | Samsung      | EP-TA50EWE | DW3J719AS/A-E | N/A    |
| Earphone               | Samsung      | N/A        | N/A           | 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                    | RF             | Shielded    | 0.2              | To spectrum Analyzer |
| 2              | USB     | 1                    | USB            | Un-shielded | 1                | EUT to AC Mains      |

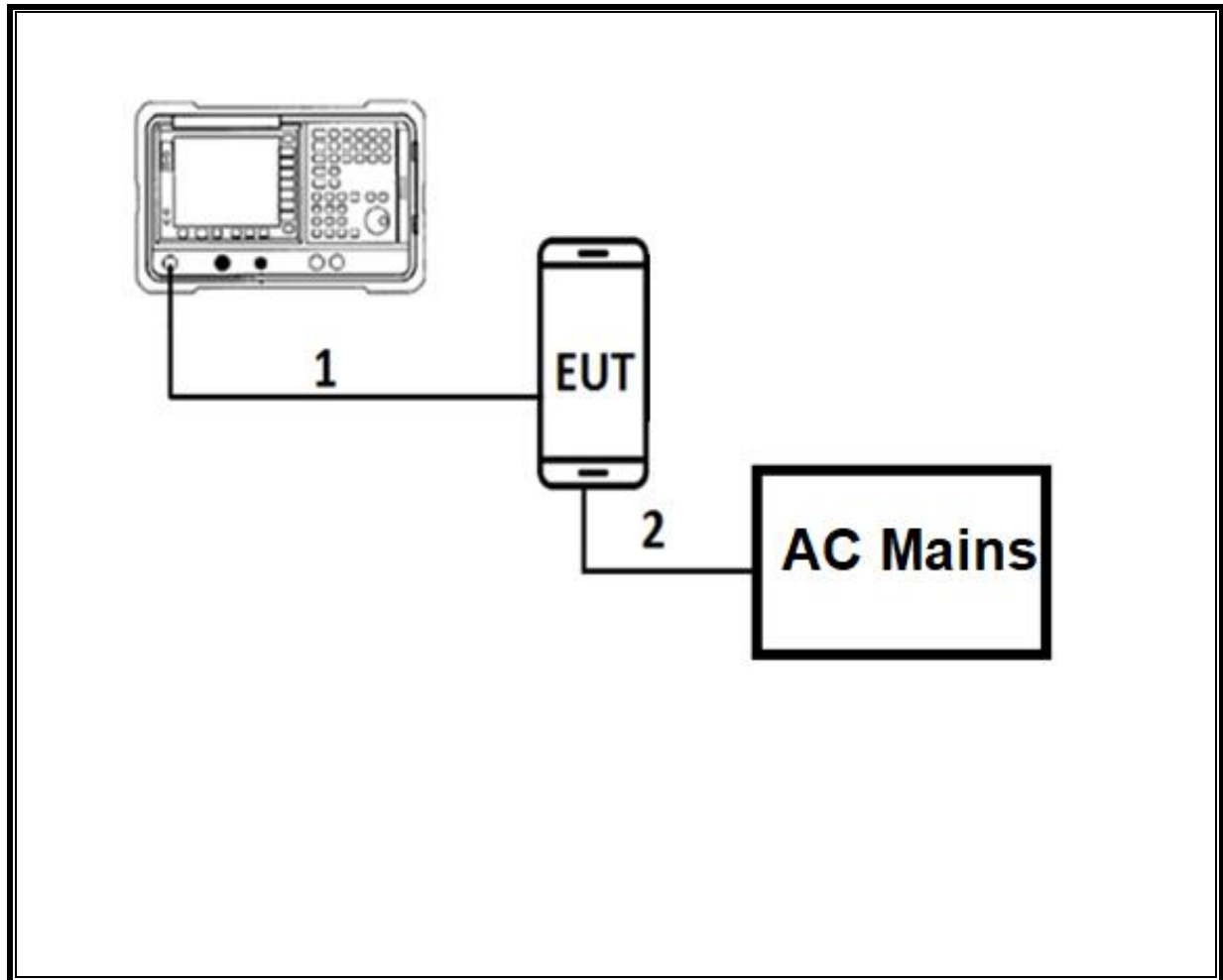
### I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

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

### TEST SETUP

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

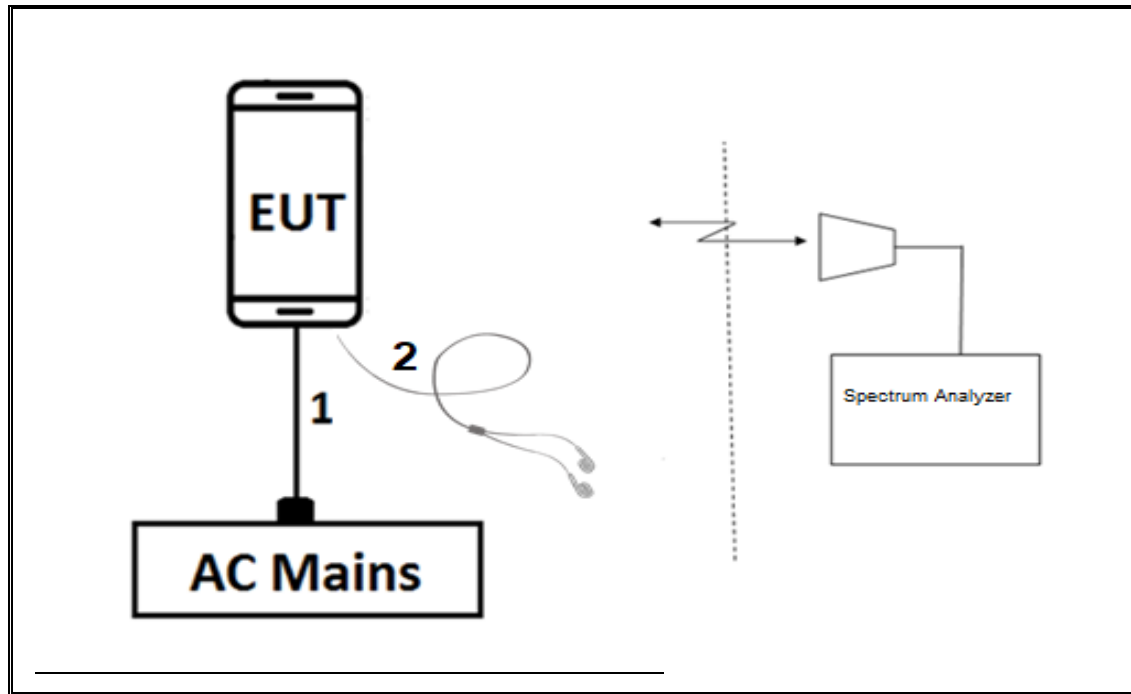
**CONDUCTED TEST SETUP DIAGRAM**



**TEST SETUP**

For conducted tests: the EUT was stand alone. The test software exercises the radio.

**RADIATED AND AC LINE CONDUCTED EMISSIONS SETUP DIAGRAM**



**TEST SETUP**

For radiated tests, the EUT is stand alone unit and the test software exercises the radio.

## 9. MEASUREMENT METHOD

On Time and Duty Cycle: KDB 558074 D01 v05, Section 6.

6 dB BW: ANSI C63.10 Subclause -11.8.1

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

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

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

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

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

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

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

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

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

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

## 10. TEST AND MEASUREMENT EQUIPMENT

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

| TEST EQUIPMENT LIST                              |                                 |                        |                         |            |
|--------------------------------------------------|---------------------------------|------------------------|-------------------------|------------|
| Description                                      | Manufacturer                    | Model                  | Asset                   | Cal Due    |
| Antenna, Passive Loop 9KHz to 1MHz               | ELETRO METRICS                  | EM-6871                | PRE0179465              | 05/22/2019 |
| Antenna, Passive Loop 9KHz to 1MHz               | ELETRO METRICS                  | EM-6872                | PRE0179467              | 05/22/2019 |
| Amplifier, 10KHz to 1GHz, 32dB                   | SONOMA INSTRUMENT               | 310                    | PRE0180175              | 07/09/2019 |
| Antenna, Horn 1-18GHz                            | ETS Lindgren                    | 3117                   | T862                    | 05/24/2019 |
| Antenna, Horn 1-18GHz                            | ETS Lindgren                    | 3117                   | T863                    | 06/21/2019 |
| Amplifier, 1 to 18GHz                            | MITEQ                           | AFS42-00101800-25-S-42 | PRE1782151              | 08/01/2019 |
| Amplifier, 1 to 18GHz                            | MITEQ                           | AFS42-00101800-25-S-42 | T493                    | 10/13/2019 |
| Antenna, Horn 1-18GHz                            | ETS Lindgren                    | 3117                   | AT0067                  | 03/06/2019 |
| Amplifier, 1 to 18GHz                            | Amplical                        | AMP1G18-35             | T1571                   | 07/30/2019 |
| Antenna, Broadband Hybrid, 30MHz to 2000MHz      | Sunol Sciences                  | JB1                    | PRE0181575              | 08/01/2019 |
| Amplifier, 10KHz to 1GHz, 32dB                   | SONOMA INSTRUMENT               | 310                    | PRE0180174              | 05/31/2019 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz             | Keysight                        | E4446A                 | T146                    | 08/13/2019 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz             | Agilent                         | N9030A                 | T1454                   | 01/23/2020 |
| Antenna Horn, 18 to 26.5GHz                      | ARA                             | MWH-1826/B             | T448                    | 03/13/2019 |
| Pre-Amp 1-26.5 GHz                               | Agilent                         | 8449B                  | T404                    | 03/09/2019 |
| EMI Test Receiver                                | Rohde&Schwarz                   | ESW44                  | PRE0179367              | 04/28/2019 |
| EMI Test Receiver                                | Rohde&Schwarz                   | ESW44                  | PRE0179375              | 05/08/2019 |
| EMI Test Receiver                                | Rohde&Schwarz                   | ESW44                  | PRE0179376              | 05/08/2019 |
| EMI Test Receiver                                | Rohde&Schwarz                   | ESW44                  | PRE0179377              | 11/02/2019 |
| Power Meter, P-series single channel             | Agilent (Keysight) Technologies | N1911A                 | T1271                   | 07/17/2019 |
| Power Sensor, P-series, 50MHz to 18GHz, Wideband | Agilent (Keysight) Technologies | N1921A                 | T1225                   | 04/10/2019 |
| AC Line Conducted                                |                                 |                        |                         |            |
| EMI Receiver                                     | Rohde & Schwarz                 | ESR                    | T1436                   | 02/21/2019 |
| LISN for Conducted Emissions CISPR-16            | FCC INC.                        | FCC LISN 50/250        | T1310                   | 06/15/2019 |
| UL AUTOMATION SOFTWARE                           |                                 |                        |                         |            |
| Radiated Software                                | UL                              | UL EMC                 | Ver 9.5, June 22, 2018  |            |
| Antenna Port Software                            | UL                              | UL RF                  | Ver 8.8.1, Sep 26, 2018 |            |
| AC Line Conducted Software                       | UL                              | UL EMC                 | Ver 9.5, May 26, 2015   |            |

### NOTES:

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

# 11. ANTENNA PORT TEST RESULTS

## 11.1. ON TIME AND DUTY CYCLE

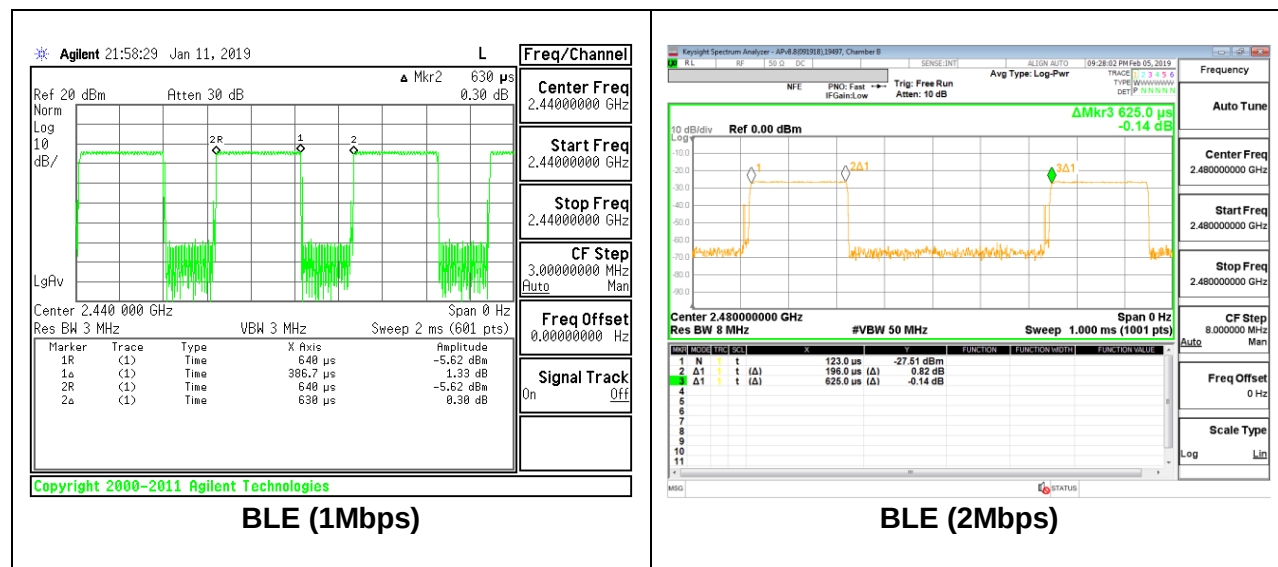
### LIMITS

None; for reporting purposes only.

### ON TIME AND DUTY CYCLE RESULTS

| Mode        | ON Time<br>B<br>(msec) | Period<br>(msec) | Duty Cycle<br>x<br>(linear) | Duty<br>Cycle<br>(%) | Duty Cycle<br>Correction Factor<br>(dB) | 1/B<br>Minimum VBW<br>(kHz) |
|-------------|------------------------|------------------|-----------------------------|----------------------|-----------------------------------------|-----------------------------|
| BLE (1Mbps) | 0.387                  | 0.630            | 0.614                       | 61.38%               | 2.12                                    | 2.586                       |
| BLE (2Mbps) | 0.196                  | 0.625            | 0.314                       | 31.36%               | 5.04                                    | 5.102                       |

### DUTY CYCLE PLOTS



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## **11.2. 99% BANDWIDTH**

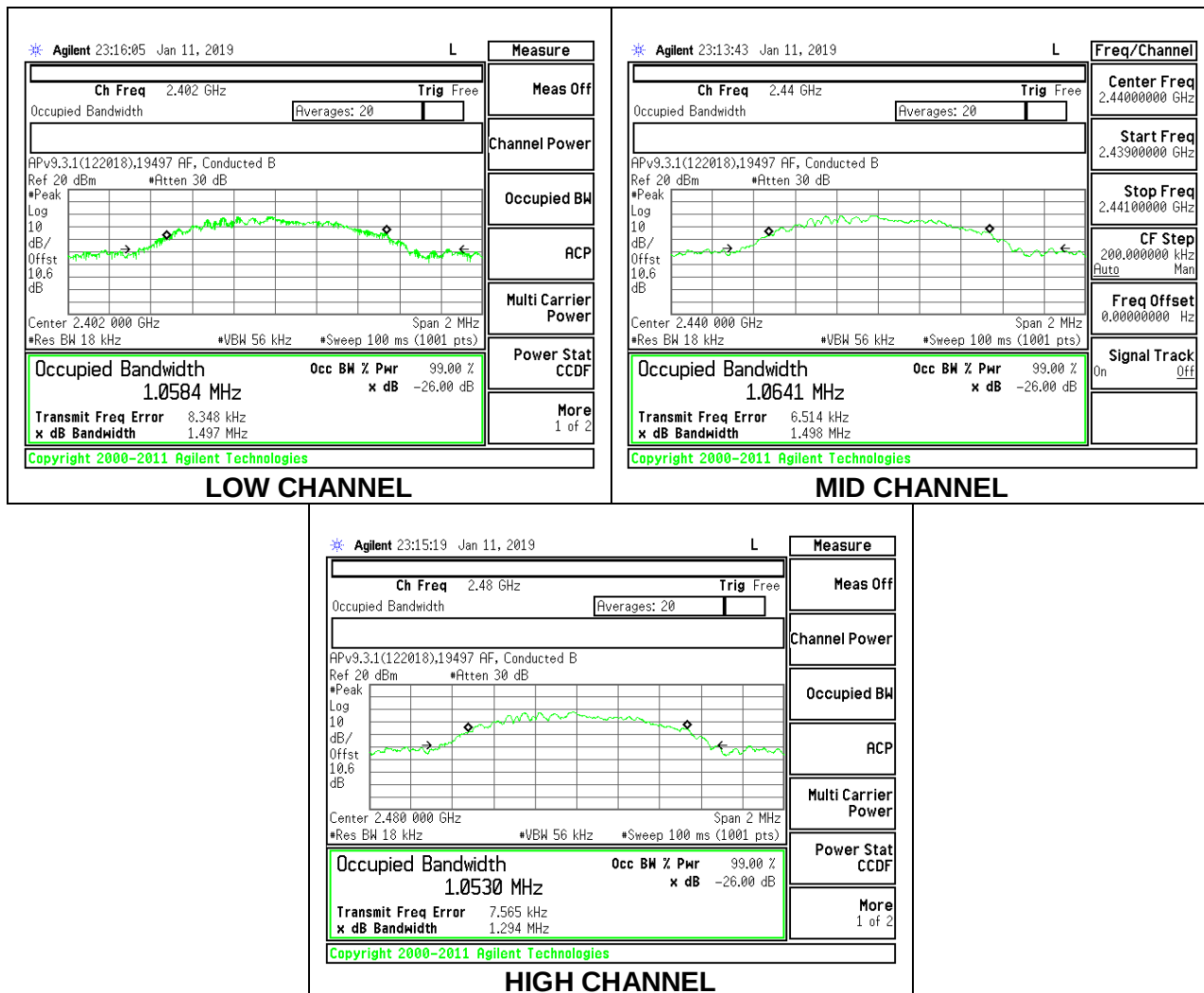
### **LIMITS**

None; for reporting purposes only.

### **RESULTS**

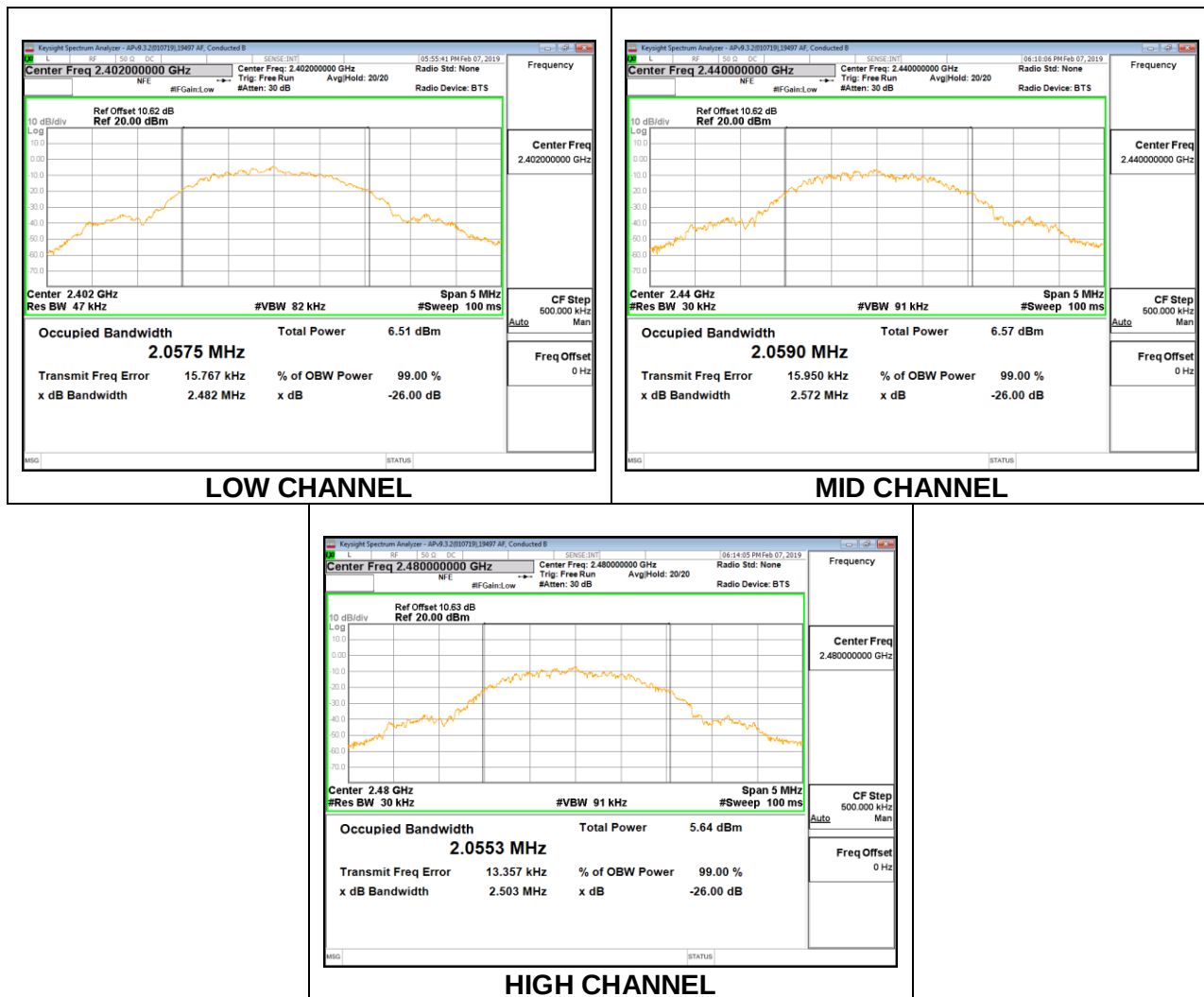
# 11.2.1. 1Mbps

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2402            | 1.0584              |
| Middle  | 2440            | 1.0641              |
| High    | 2480            | 1.0530              |



## 11.2.2. 2Mbps

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2402            | 2.0575              |
| Middle  | 2440            | 2.0590              |
| High    | 2480            | 2.0553              |



### **11.3. 6 dB BANDWIDTH**

#### **LIMITS**

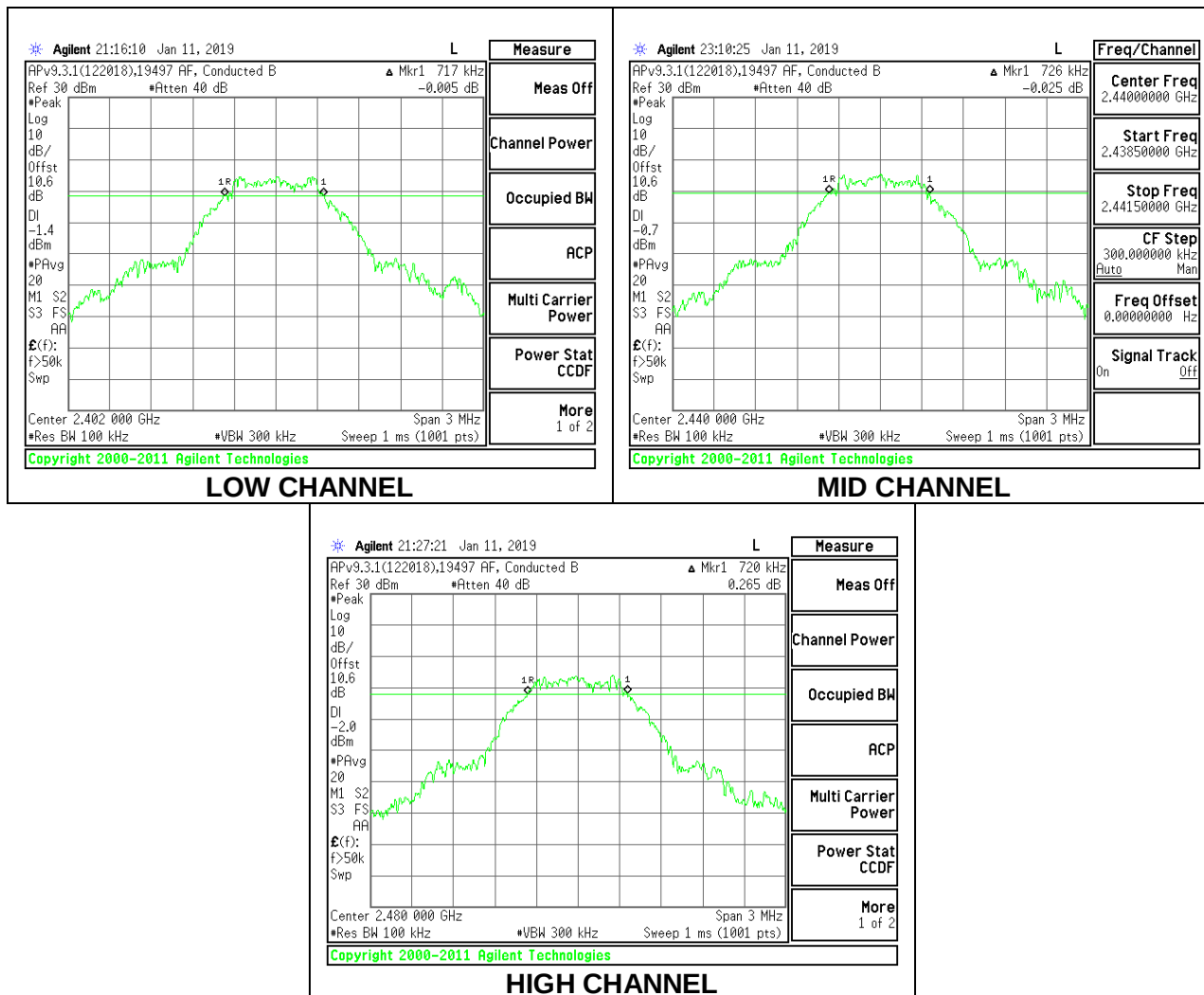
FCC §15.407 (e)

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

#### **RESULTS**

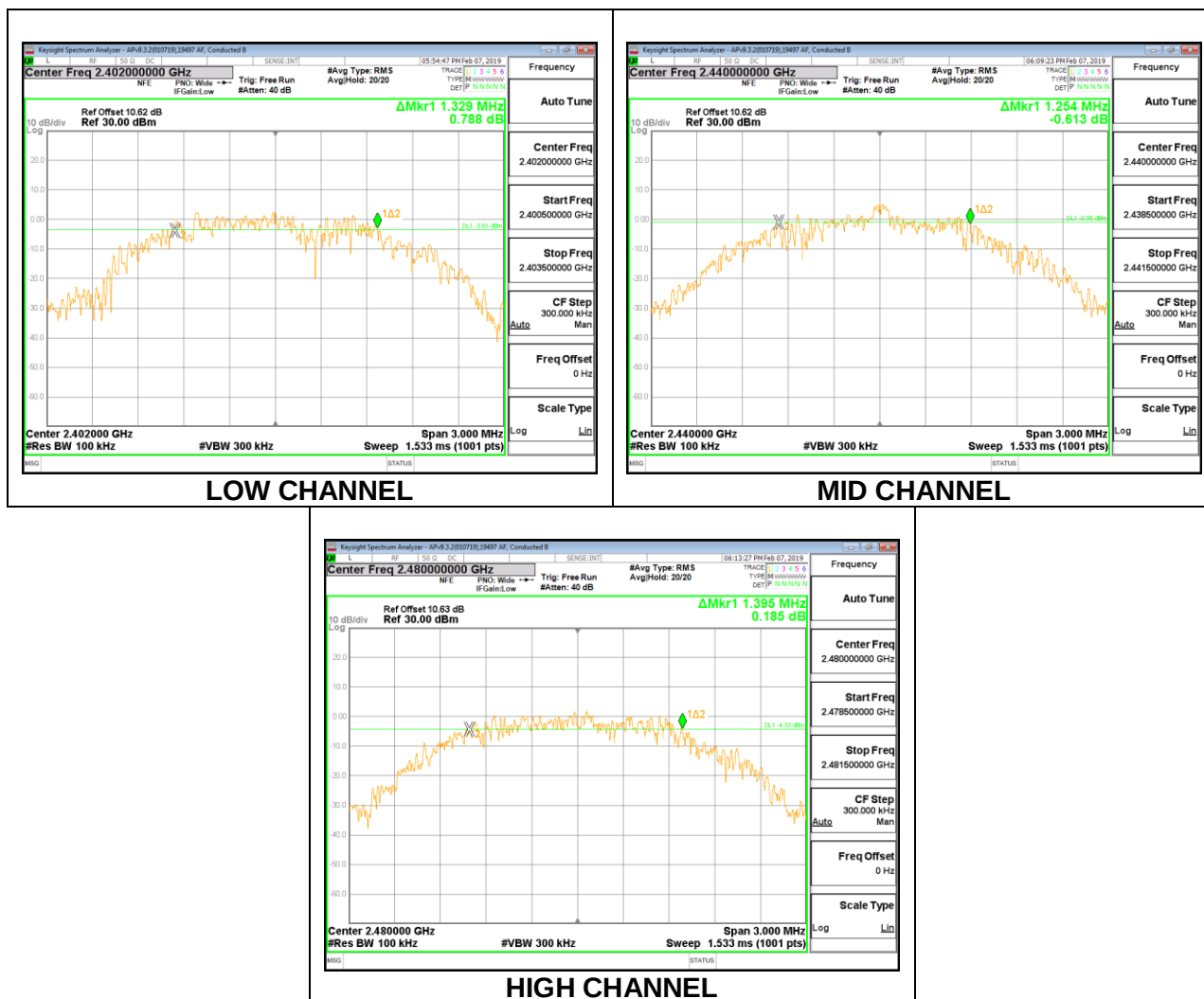
### 11.3.1. 1Mbps

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2402            | 0.717                | 0.5                 |
| Middle  | 2440            | 0.726                | 0.5                 |
| High    | 2480            | 0.720                | 0.5                 |



## 11.3.2. 2Mbps

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2402            | 1.329                | 0.5                 |
| Middle  | 2440            | 1.254                | 0.5                 |
| High    | 2480            | 1.395                | 0.5                 |



## 11.4. OUTPUT POWER

### LIMITS

FCC §15.247 (b) (3)

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

### TEST PROCEDURE

The transmitter output is connected to a power meter. The cable assembly insertion loss was entered as an offset in the power meter to allow for the peak reading of power.

### RESULTS

#### 11.4.1. 1Mbps

|                   |           |
|-------------------|-----------|
| <b>Tested By:</b> | 19497 AF  |
| <b>Date:</b>      | 1/11/2019 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2402               | 5.36                           | 30             | -24.640        |
| Middle  | 2440               | 6.09                           | 30             | -23.910        |
| High    | 2480               | 6.05                           | 30             | -23.950        |

#### 11.4.2. 2Mbps

|                   |          |
|-------------------|----------|
| <b>Tested By:</b> | 19497 AF |
| <b>Date:</b>      | 2/7/2019 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2402               | 5.63                           | 30             | -24.370        |
| Middle  | 2440               | 6.49                           | 30             | -23.506        |
| High    | 2480               | 5.46                           | 30             | -24.540        |

## 11.5. AVERAGE POWER

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter. The cable assembly insertion loss of was entered as an offset in the power meter to allow for the gated average reading of power.

### RESULTS

#### 11.5.1. 1Mbps

|                   |           |
|-------------------|-----------|
| <b>Tested By:</b> | 19497AF   |
| <b>Date:</b>      | 1/11/2019 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2402               | 4.78              |
| Middle  | 2440               | 5.51              |
| High    | 2480               | 5.51              |

#### 11.5.2. 2Mbps

|                   |          |
|-------------------|----------|
| <b>Tested By:</b> | 16080 ZS |
| <b>Date:</b>      | 2/6/2019 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2402               | 4.31              |
| Middle  | 2440               | 5.1               |
| High    | 2480               | 3.97              |

## **11.6. POWER SPECTRAL DENSITY**

### **LIMITS**

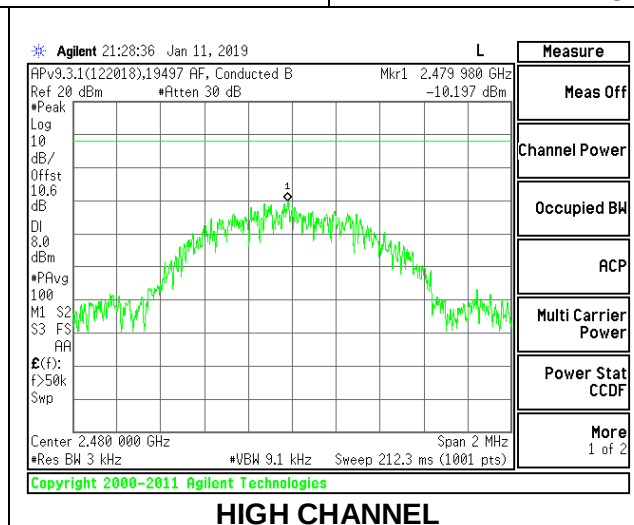
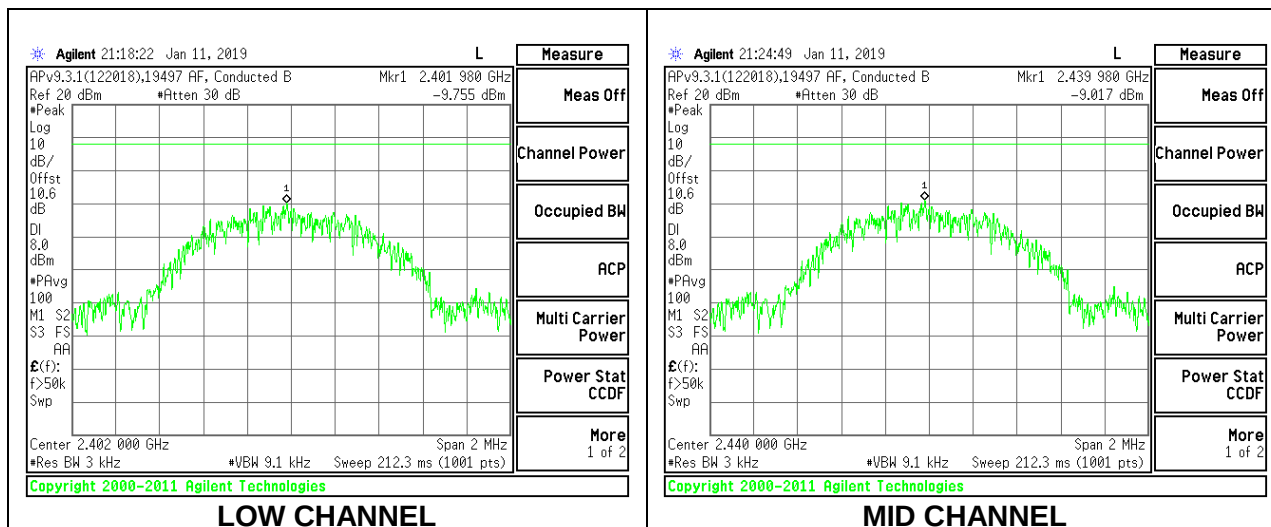
FCC §15.247 (e)

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**

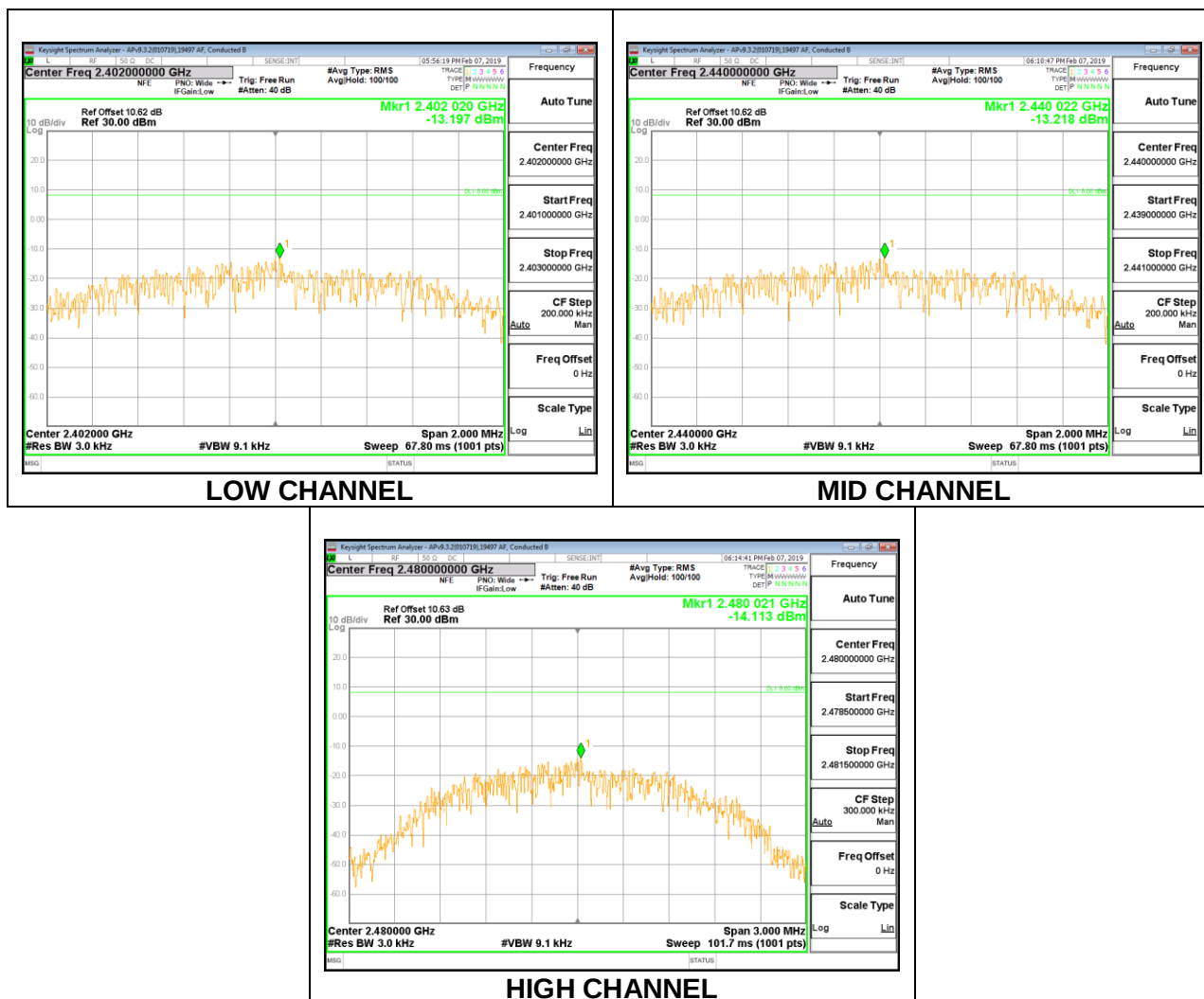
# 11.6.1. 1Mbps

| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2402            | -9.76          | 8                | -17.76      |
| Middle  | 2440            | -9.02          | 8                | -17.02      |
| High    | 2480            | -10.20         | 8                | -18.20      |



## 11.6.2. 2Mbps

| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2402            | -13.20         | 8                | -21.20      |
| Middle  | 2440            | -13.22         | 8                | -21.22      |
| High    | 2480            | -14.11         | 8                | -22.11      |



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## **11.7. CONDUCTED SPURIOUS EMISSIONS**

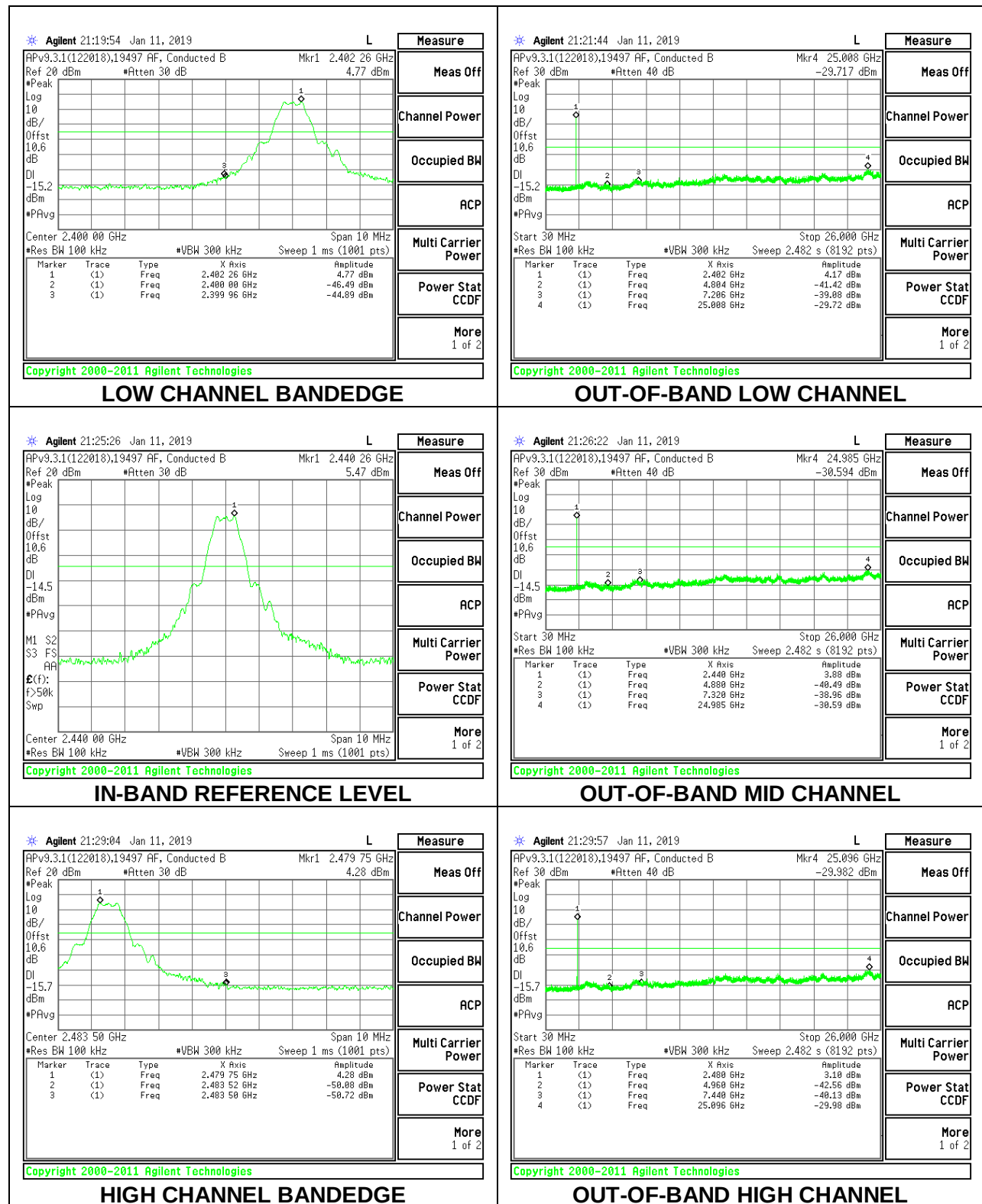
### **LIMITS**

FCC §15.247 (d)

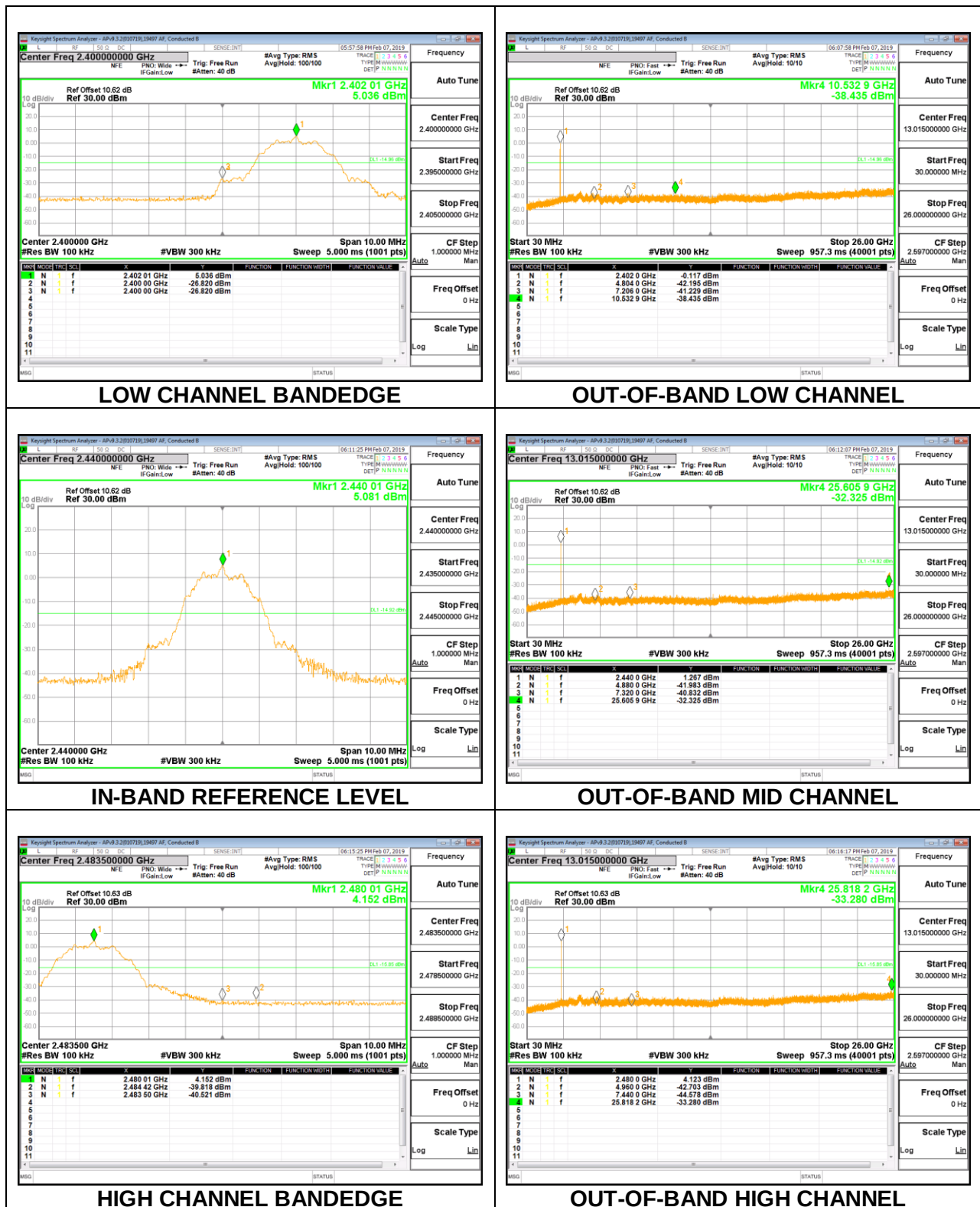
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

### **RESULTS**

**11.7.1. 1Mbps**



11.7.2. 2Mbps



## 12. RADIATED TEST RESULTS

### 12.1. 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 |
|-----------------------|------------------------------------|--------------------------------------|
| 0.009-0.490           | 2400/F(kHz) @ 300 m                | -                                    |
| 0.490-1.705           | 24000/F(kHz) @ 30 m                | -                                    |
| 1.705 - 30            | 30 @ 30m                           | -                                    |
| 30 - 88               | 100                                | 40                                   |
| 88 - 216              | 150                                | 43.5                                 |
| 216 - 960             | 200                                | 46                                   |
| Above 960             | 500                                | 54                                   |

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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

**KDB 414788 OATS and Chamber Correlation Justification**

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

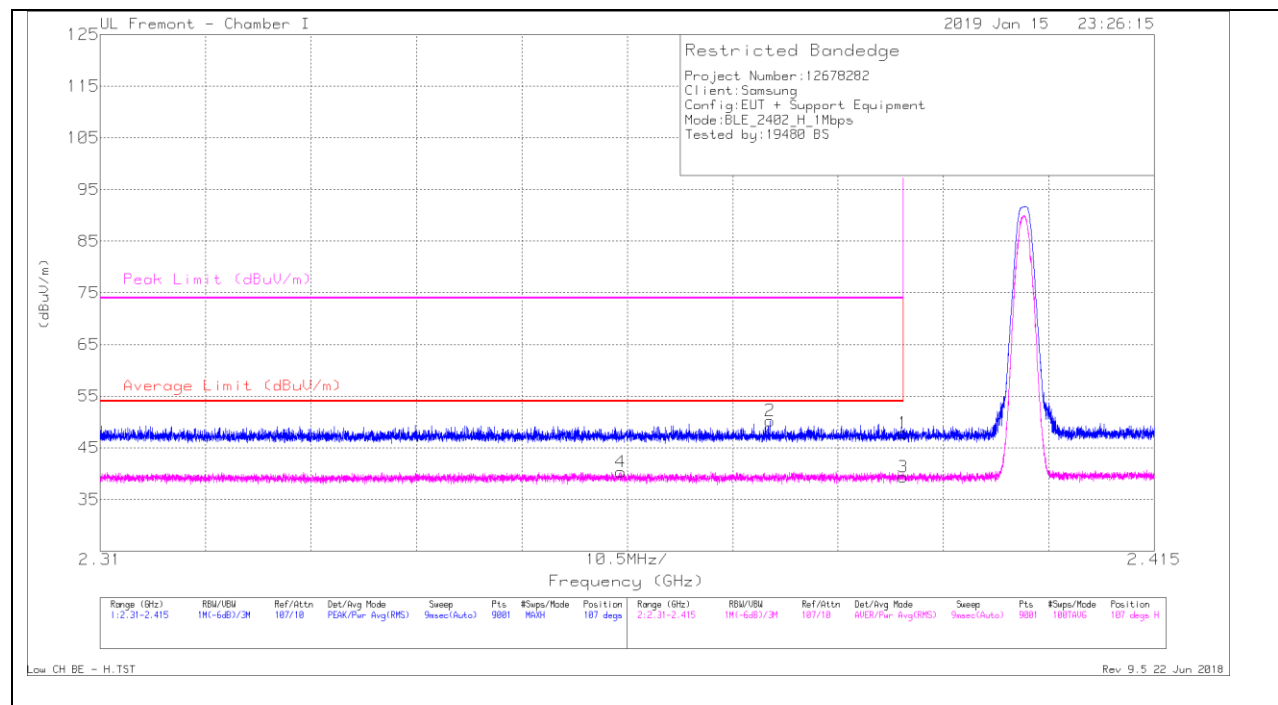
OATs and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

## 12.2. TRANSMITTER ABOVE 1 GHz

### 12.2.1. 1Mbps

#### BANDEGE (LOW CHANNEL)

#### HORIZONTAL RESULT



#### Trace Markers

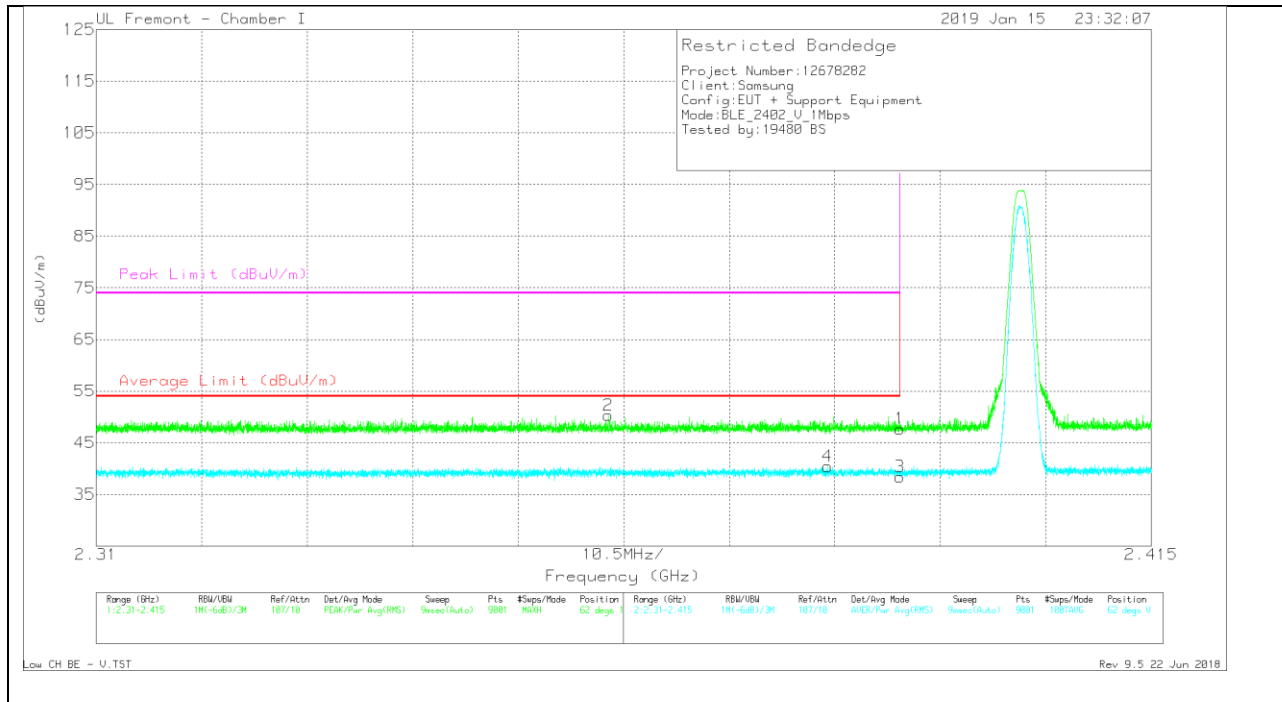
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF Tilt2 (dB/m) | Amp/Cb/Rtr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Altitude (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------------|---------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|-----------------|-------------|----------|
| 1      | * 2.39          | 37.64                | Pk  | 31.8            | -21.6               | 0            | 47.84                      | -                      | -           | 74                  | -26.16         | 107             | 389         | H        |
| 2      | * 2.377         | 40.02                | Pk  | 31.7            | -21.5               | 0            | 50.22                      | -                      | -           | 74                  | -23.78         | 107             | 389         | H        |
| 3      | * 2.39          | 27.01                | RMS | 31.8            | -21.6               | 2.12         | 39.33                      | 54                     | -14.67      | -                   | -              | 107             | 389         | H        |
| 4      | * 2.362         | 28.08                | RMS | 31.6            | -21.5               | 2.12         | 40.3                       | 54                     | -13.7       | -                   | -              | 107             | 389         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## VERTICAL RESULT



### Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF 1862 (dB/m) | Amp/Cb/Rtr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Altitude (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|---------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|-----------------|-------------|----------|
| 1      | * 2.39          | 37.49                | Pk  | 31.8           | -21.6               | 0            | 47.69                      | -                      | -           | 74                  | -26.31         | 62              | 151         | V        |
| 2      | * 2.361         | 40.21                | Pk  | 31.6           | -21.5               | 0            | 50.31                      | -                      | -           | 74                  | -23.69         | 62              | 151         | V        |
| 3      | * 2.39          | 26.07                | RMS | 31.8           | -21.6               | 2.12         | 38.39                      | 54                     | -15.61      | -                   | -              | 62              | 151         | V        |
| 4      | * 2.383         | 28.19                | RMS | 31.7           | -21.6               | 2.12         | 40.41                      | 54                     | -13.59      | -                   | -              | 62              | 151         | V        |

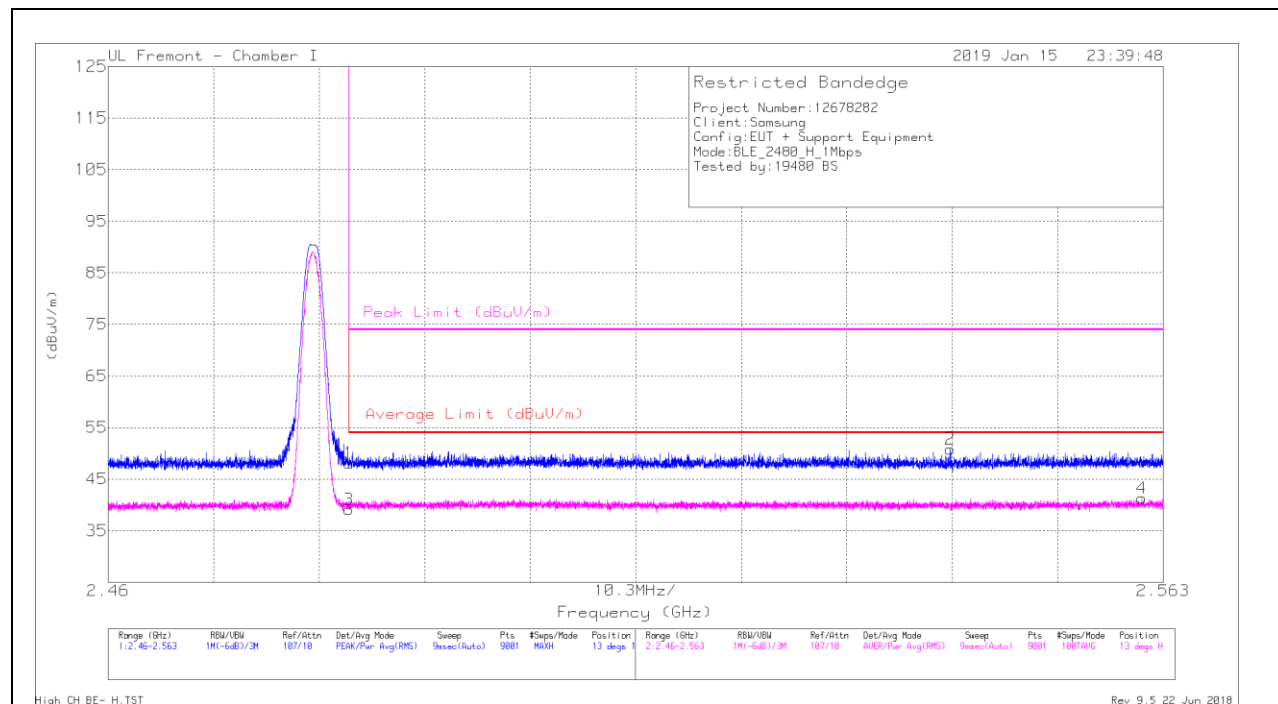
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

# BANDEDGE (HIGH CHANNEL)

## HORIZONTAL RESULT



## Trace Markers

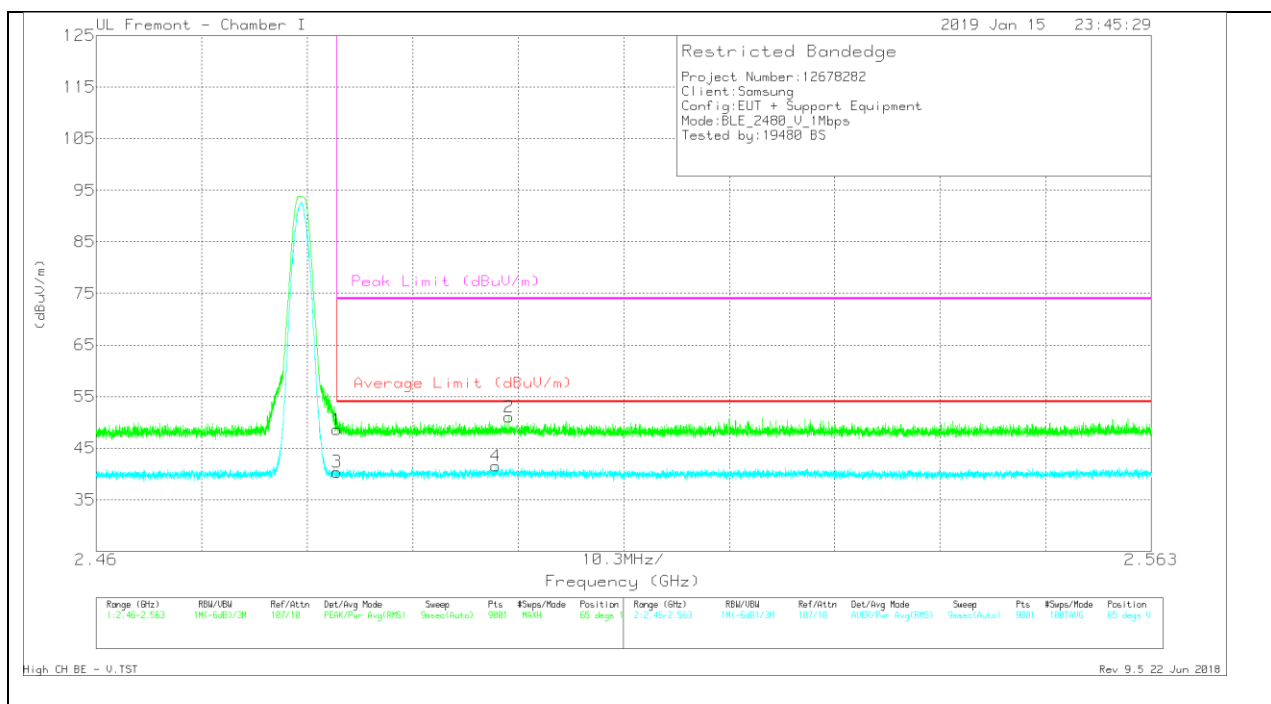
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | Af T862 (dB/m) | Amp/Cbl/Ftr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Altitude (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|----------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|-----------------|-------------|----------|
| 1      | * 2.484         | 37.42                | Pk  | 32.4           | -21.7                | 0            | 48.12                      | -                      | -           | 74                  | -25.88         | 13              | 120         | H        |
| 2      | 2.542           | 40.23                | Pk  | 32.4           | -21.8                | 0            | 50.83                      | -                      | -           | 74                  | -23.17         | 13              | 120         | H        |
| 3      | * 2.484         | 26.28                | RMS | 32.4           | -21.7                | 2.12         | 39.1                       | 54                     | -14.9       | -                   | -              | 13              | 120         | H        |
| 4      | 2.561           | 28.37                | RMS | 32.4           | -21.6                | 2.12         | 41.29                      | 54                     | -12.71      | -                   | -              | 13              | 120         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## VERTICAL RESULT



## Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF TBS2 (dB/m) | Amp/Chl/Rtr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Altitude (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|----------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|-----------------|-------------|----------|
| 1      | * 2.484         | 37.91                | Pk  | 32.4           | -21.7                | 0            | 48.61                      | -                      | -           | 74                  | -25.39         | 65              | 163         | V        |
| 2      | 2.5             | 40.25                | Pk  | 32.5           | -21.7                | 0            | 51.05                      | -                      | -           | 74                  | -22.95         | 65              | 163         | V        |
| 3      | * 2.484         | 27.54                | RMS | 32.4           | -21.7                | 2.12         | 40.36                      | 54                     | -13.64      | -                   | -              | 65              | 163         | V        |
| 4      | * 2.499         | 28.6                 | RMS | 32.5           | -21.7                | 2.12         | 41.52                      | 54                     | -12.48      | -                   | -              | 65              | 163         | V        |

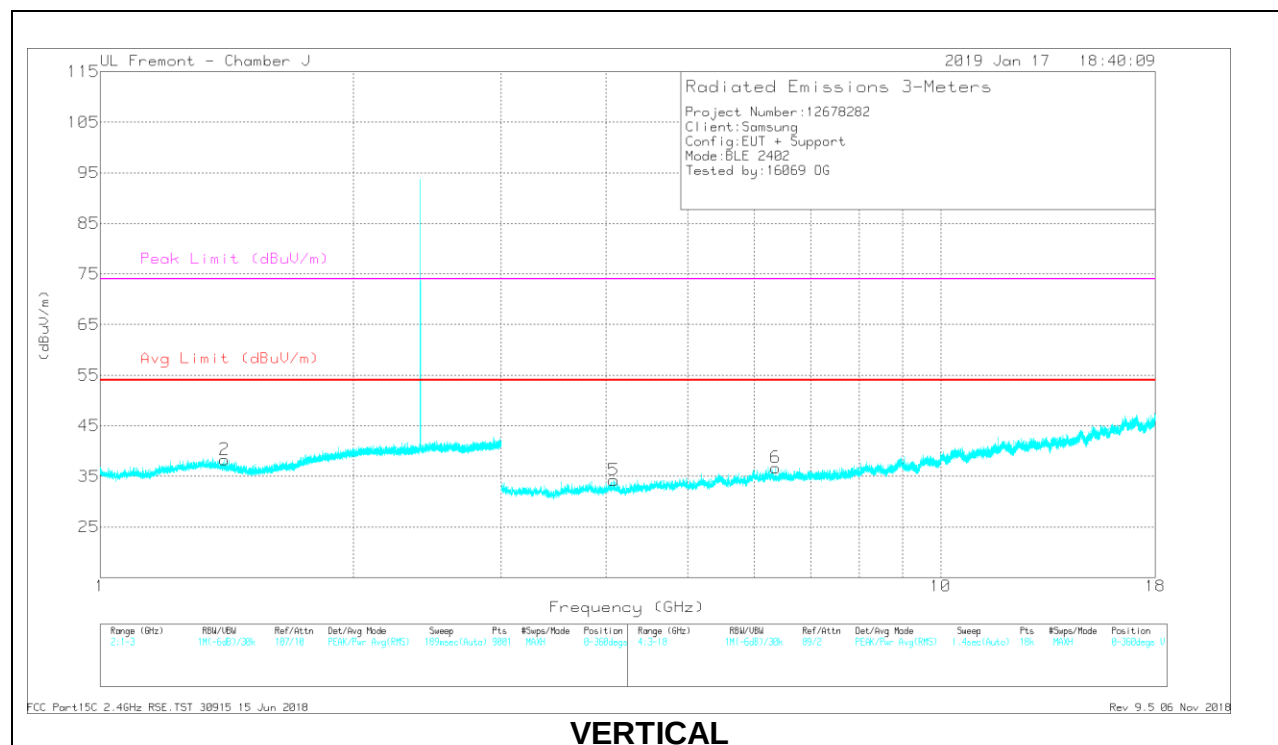
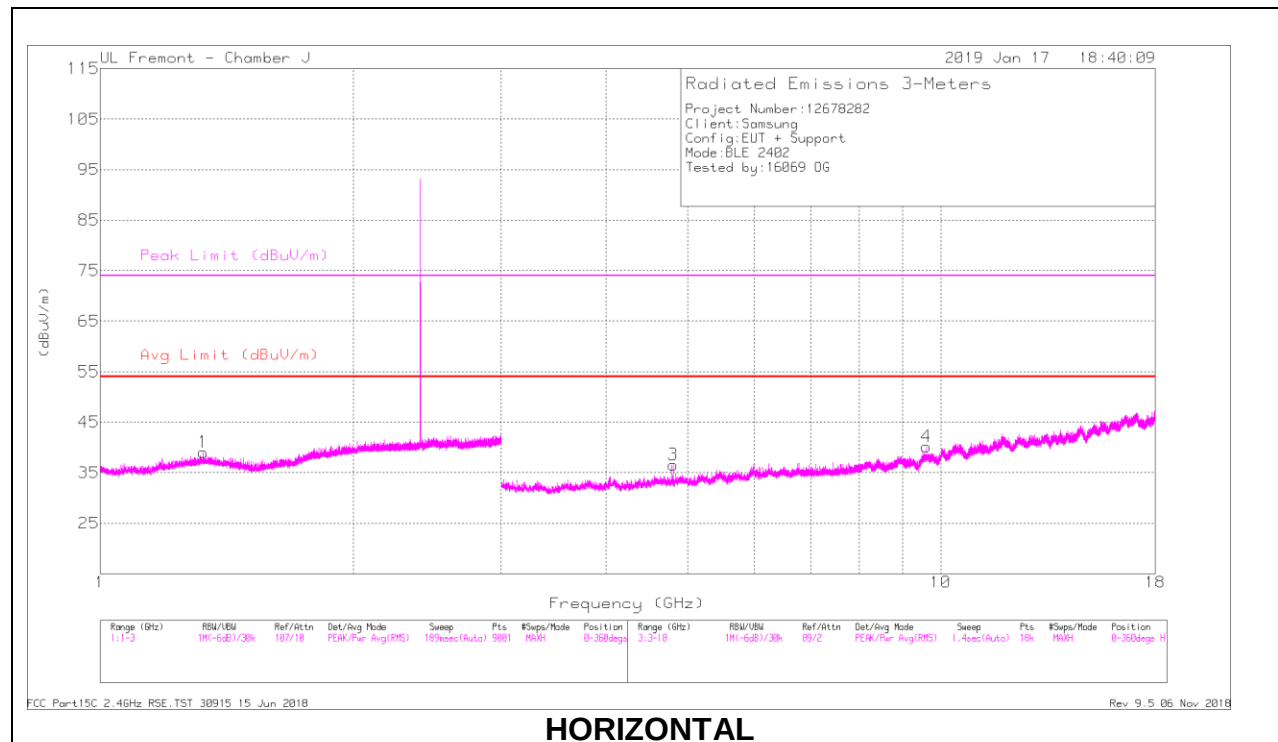
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS



## RADIATED EMISSIONS

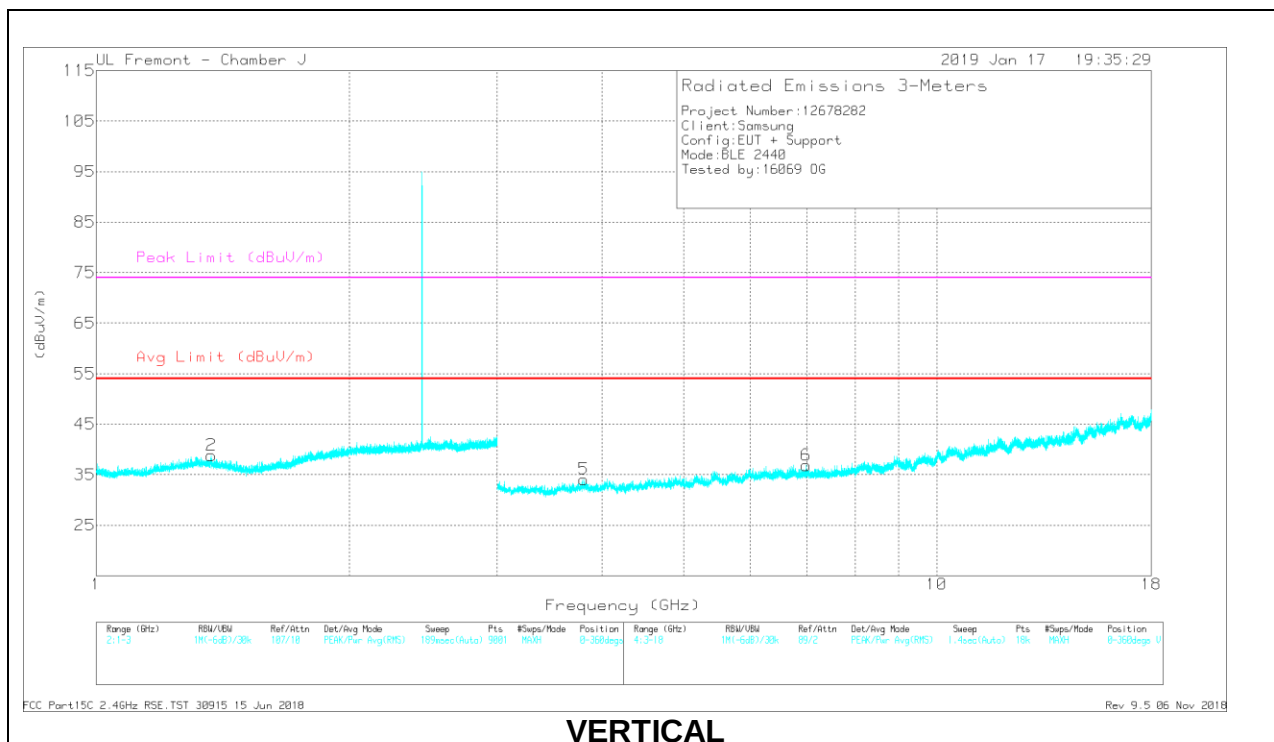
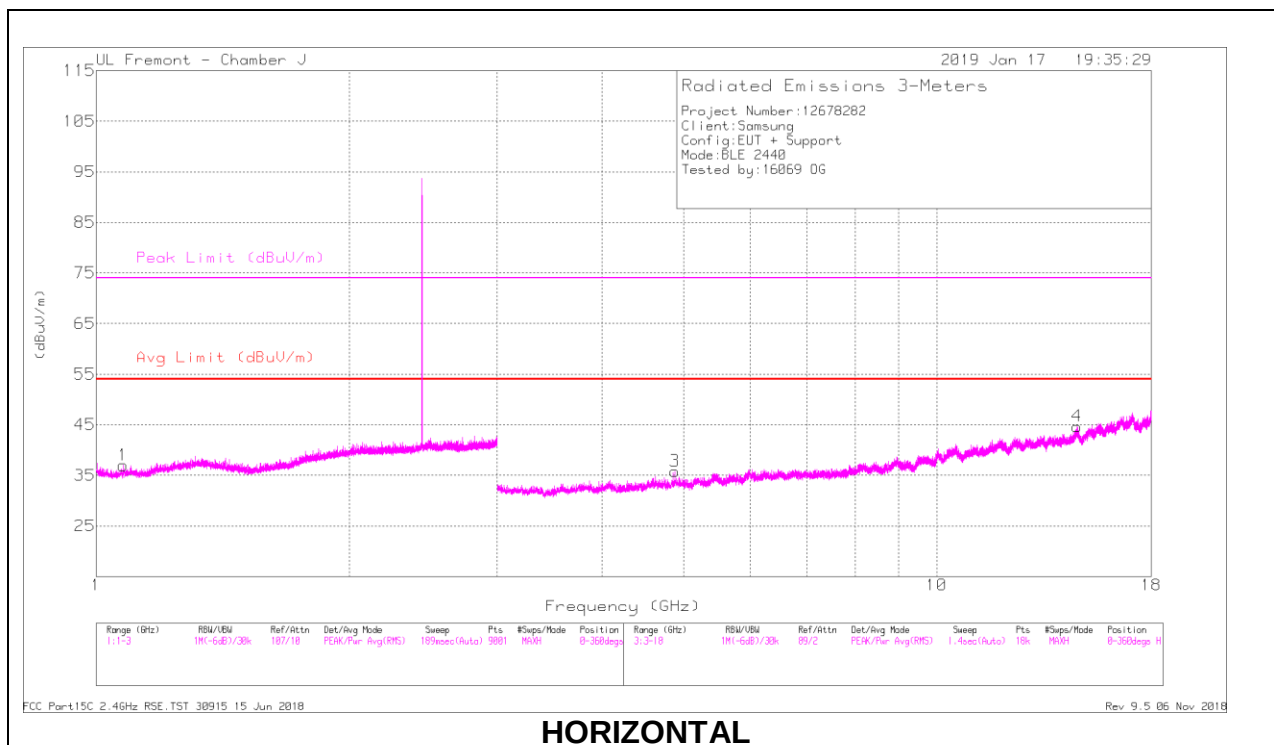
| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF AT0067 (dB/m) | Amp/Cbl/FI tr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|------|------------------|------------------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 1.324         | 42.44                | PK2  | 29.3             | -26                    | 0            | 45.74                      | -                  | -           | 74                  | -28.26         | 184            | 388         | H        |
| * 1.327         | 32.29                | MAv1 | 29.3             | -26                    | 2.12         | 37.71                      | 54                 | -16.29      | -                   | -              | 184            | 388         | H        |
| * 1.408         | 41.8                 | PK2  | 28.9             | -26.1                  | 0            | 44.6                       | -                  | -           | 74                  | -29.4          | 315            | 228         | V        |
| * 1.408         | 32.18                | MAv1 | 28.9             | -26.1                  | 2.12         | 37.1                       | 54                 | -16.9       | -                   | -              | 315            | 228         | V        |
| * 4.804         | 39.42                | PK2  | 34.1             | -31.3                  | 0            | 42.22                      | -                  | -           | 74                  | -31.78         | 81             | 220         | H        |
| * 4.804         | 31.56                | MAv1 | 34.1             | -31.3                  | 2.12         | 36.48                      | 54                 | -17.52      | -                   | -              | 81             | 220         | H        |
| 9.619           | 33.74                | PK2  | 36.6             | -24.9                  | 0            | 45.44                      | -                  | -           | -                   | -              | 253            | 182         | H        |
| * 4.083         | 39.32                | PK2  | 33.6             | -31.7                  | 0            | 41.22                      | -                  | -           | 74                  | -32.78         | 307            | 254         | V        |
| * 4.085         | 29.14                | MAv1 | 33.6             | -31.7                  | 2.12         | 33.16                      | 54                 | -20.84      | -                   | -              | 307            | 254         | V        |
| 6.362           | 35.83                | PK2  | 35.5             | -28.7                  | 0            | 42.63                      | -                  | -           | -                   | -              | 285            | 131         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

## MID CHANNEL RESULTS



## RADIATED EMISSIONS

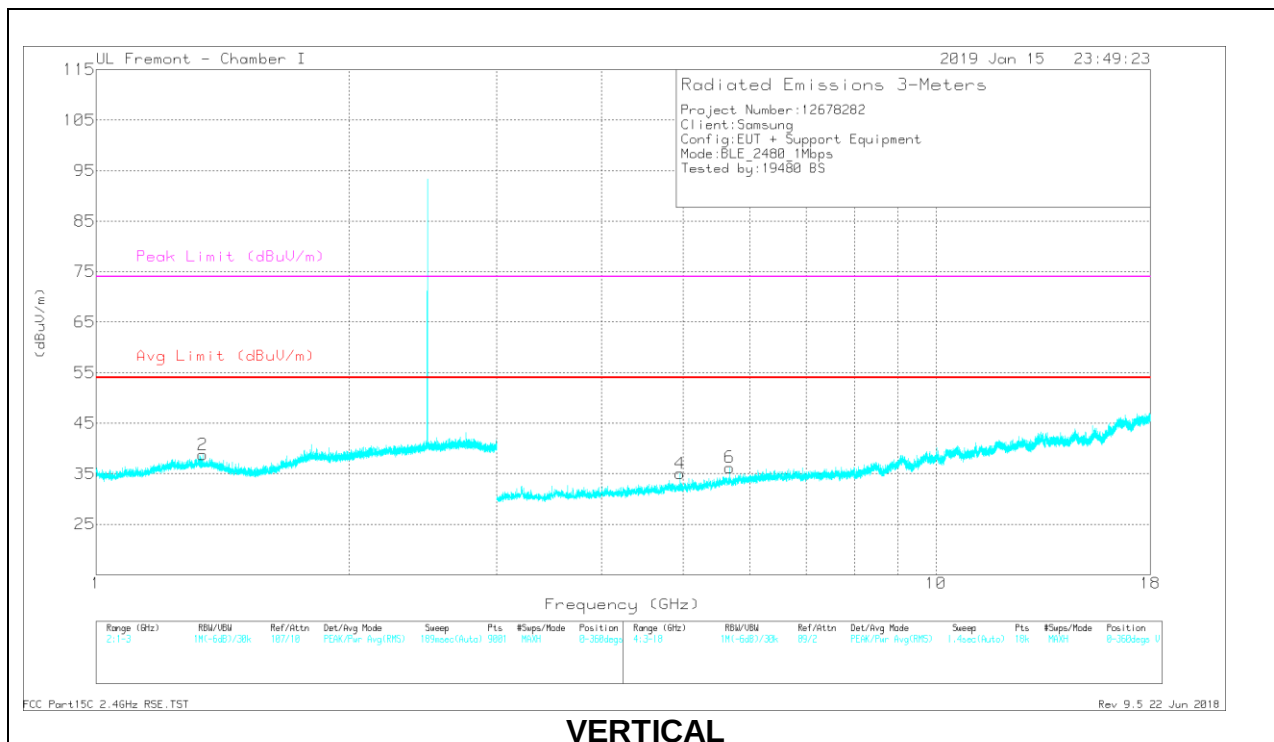
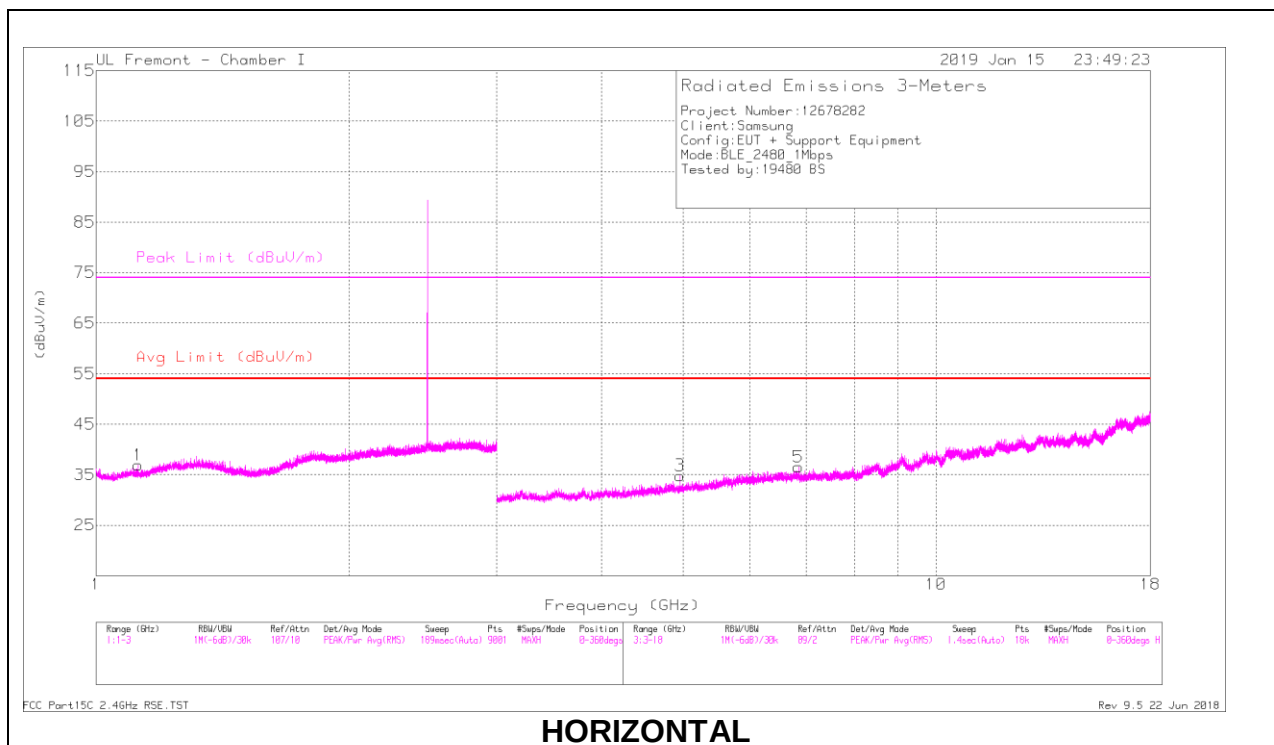
| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF AT0067 (dB/m) | Amp/Cbl/FI tr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|------|------------------|------------------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 1.078         | 41.44                | PK2  | 27.5             | -25.8                  | 0            | 43.14                      | -                  | -           | 74                  | -30.86         | 221            | 222         | H        |
| * 1.075         | 32.37                | MAv1 | 27.4             | -25.7                  | 2.12         | 36.19                      | 54                 | -17.81      | -                   | -              | 221            | 222         | H        |
| * 1.373         | 41.55                | PK2  | 29.1             | -26.1                  | 0            | 44.55                      | -                  | -           | 74                  | -29.45         | 360            | 290         | V        |
| * 1.369         | 32.18                | MAv1 | 29.2             | -26.1                  | 2.12         | 37.4                       | 54                 | -16.6       | -                   | -              | 360            | 290         | V        |
| * 4.88          | 40.14                | PK2  | 34               | -31.4                  | 0            | 42.74                      | -                  | -           | 74                  | -31.26         | 101            | 115         | H        |
| * 4.88          | 31.49                | MAv1 | 34               | -31.4                  | 2.12         | 36.21                      | 54                 | -17.79      | -                   | -              | 101            | 115         | H        |
| 14.686          | 31.28                | PK2  | 39.4             | -19.7                  | 0            | 50.98                      | -                  | -           | -                   | -              | 316            | 215         | H        |
| * 3.798         | 39.8                 | PK2  | 33.4             | -32.8                  | 0            | 40.4                       | -                  | -           | 74                  | -33.6          | 113            | 271         | V        |
| * 3.798         | 30.37                | MAv1 | 33.4             | -32.8                  | 2.12         | 33.09                      | 54                 | -20.91      | -                   | -              | 113            | 271         | V        |
| 6.991           | 34.15                | PK2  | 35.6             | -27.6                  | 0            | 42.15                      | -                  | -           | -                   | -              | 220            | 226         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

## HIGH CHANNEL RESULTS



## RADIATED EMISSIONS

| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T862 (dB/m) | Amp/Cbl/Ftr/ 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 |
|-----------------|----------------------|------|----------------|-----------------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 1.122         | 39.41                | PK2  | 27.7           | -23.5                 | 0            | 43.61                      | -                  | -           | 74                  | -30.39         | 16             | 130         | H        |
| * 1.12          | 29.47                | MAv1 | 27.6           | -23.6                 | 2.12         | 35.59                      | 54                 | -18.41      | -                   | -              | 16             | 130         | H        |
| * 1.34          | 38.19                | PK2  | 29.3           | -23.1                 | 0            | 44.39                      | -                  | -           | 74                  | -29.61         | 25             | 172         | V        |
| * 1.339         | 28.75                | MAv1 | 29.3           | -23.1                 | 2.12         | 37.07                      | 54                 | -16.93      | -                   | -              | 25             | 172         | V        |
| * 4.96          | 35.32                | PK2  | 34.2           | -29                   | 0            | 40.52                      | -                  | -           | 74                  | -33.48         | 148            | 160         | H        |
| * 4.96          | 27                   | MAv1 | 34.2           | -29                   | 2.12         | 34.32                      | 54                 | -19.68      | -                   | -              | 148            | 160         | H        |
| 6.858           | 32.7                 | PK2  | 35.6           | -25.4                 | 0            | 42.9                       | -                  | -           | -                   | -              | 53             | 189         | H        |
| * 4.96          | 35.57                | PK2  | 34.2           | -29                   | 0            | 40.77                      | -                  | -           | 74                  | -33.23         | 156            | 137         | V        |
| * 4.96          | 26.86                | MAv1 | 34.2           | -29                   | 2.12         | 34.18                      | 54                 | -19.82      | -                   | -              | 156            | 137         | V        |
| 5.68            | 33.24                | PK2  | 35             | -27.1                 | 0            | 41.14                      | -                  | -           | -                   | -              | 274            | 389         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

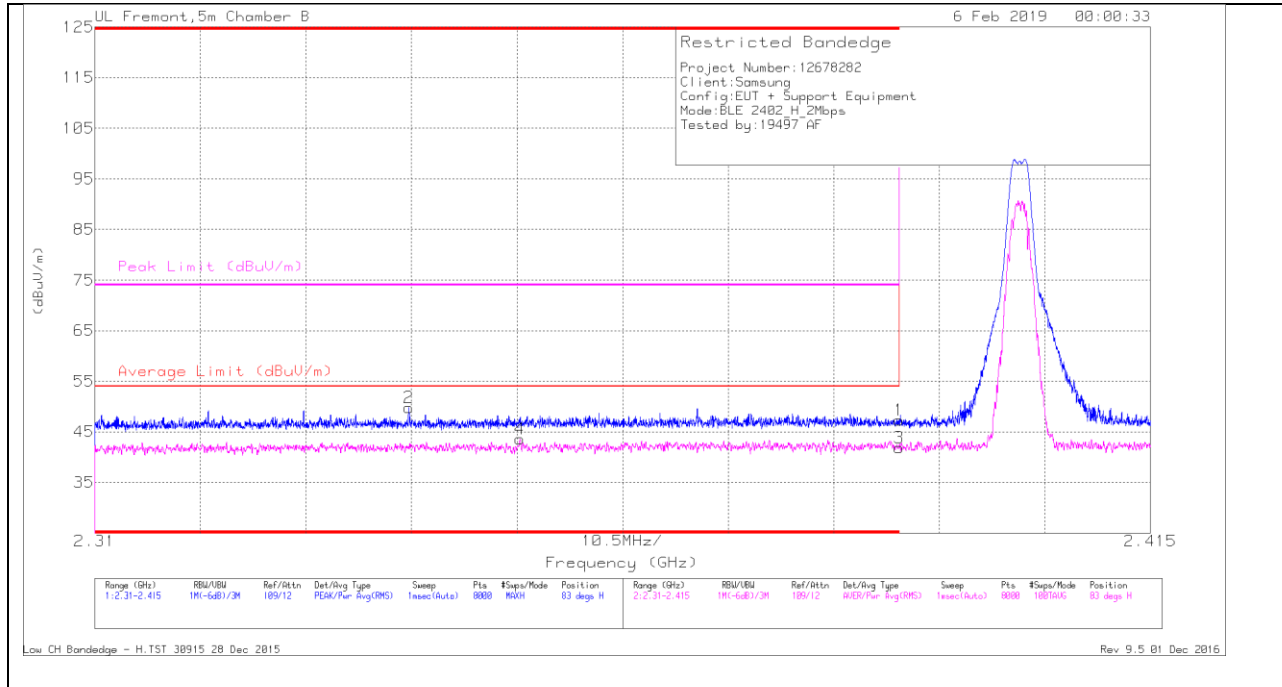
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

## 12.2.1. 2Mbps

### BANDEDGE (LOW CHANNEL)

#### HORIZONTAL RESULT



#### Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBUV) | Det | AF T863 (dBm) | Ampl/Chl/Filt/Pad (dB) | DC Corr (dB) | Corrected Reading (dBUV/m) | Average Limit (dBUV/m) | Margin (dB) | Peak Limit (dBUV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|------------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | *2.39           | 35.67                | Pk  | 32.3          | -20.7                  | 0            | 47.27                      | -                      | -           | 74                  | -26.73         | 83             | 309         | H        |
| 2      | *2.341          | 38.38                | Pk  | 32.1          | -20.7                  | 0            | 49.78                      | -                      | -           | 74                  | -24.22         | 83             | 309         | H        |
| 3      | *2.39           | 25.19                | RMS | 32.3          | -20.7                  | 5.04         | 41.83                      | 54                     | -12.17      | -                   | -              | 83             | 309         | H        |
| 4      | *2.352          | 27.03                | RMS | 32.2          | -20.7                  | 5.04         | 43.57                      | 54                     | -10.43      | -                   | -              | 83             | 309         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## VERTICAL RESULT



## Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T863 (dB/m) | Amp/Chl/Filt/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Altitude (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|-----------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|-----------------|-------------|----------|
| 1      | * 2.39          | 35.86                | Pk  | 32.3           | -20.7                 | 0            | 47.46                      | -                      | -           | 74                  | -26.54         | 83              | 309         | V        |
| 2      | * 2.38          | 38.16                | Pk  | 32.3           | -20.7                 | 0            | 49.76                      | -                      | -           | 74                  | -24.24         | 83              | 309         | V        |
| 3      | * 2.39          | 25.34                | RMS | 32.3           | -20.7                 | 5.04         | 41.98                      | 54                     | -12.02      | -                   | -              | 83              | 309         | V        |
| 4      | * 2.352         | 26.69                | RMS | 32.2           | -20.7                 | 5.04         | 43.23                      | 54                     | -10.77      | -                   | -              | 83              | 309         | V        |

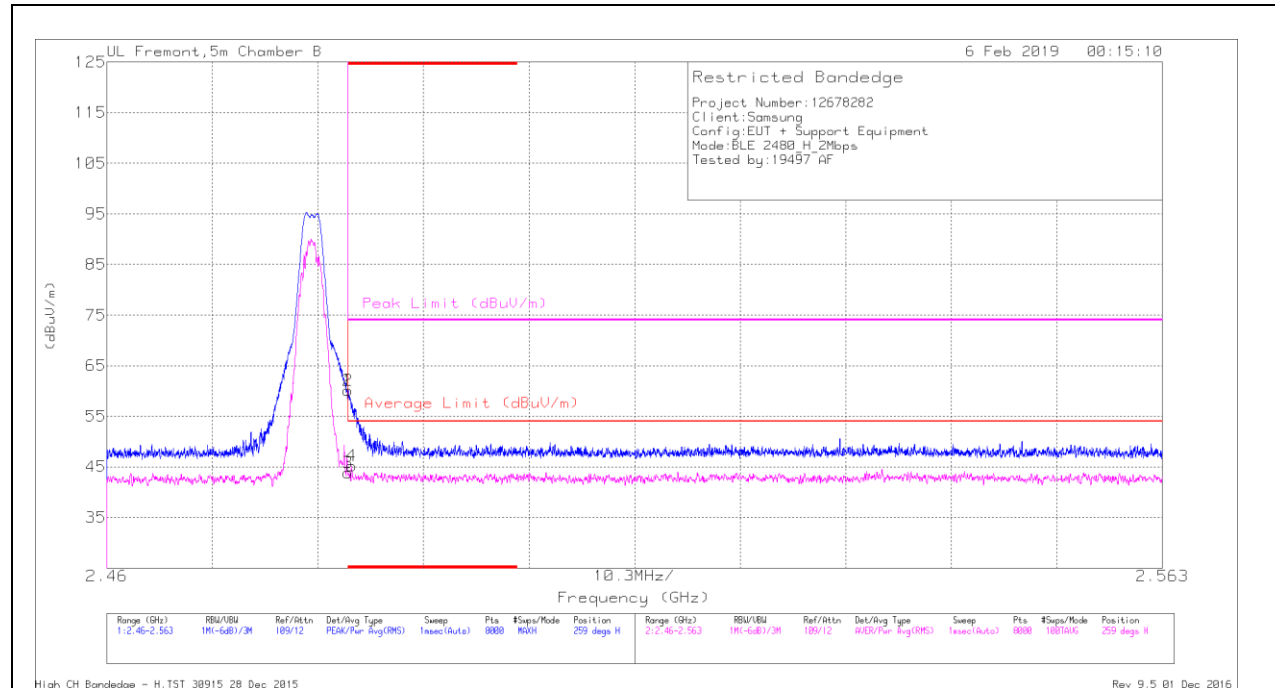
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

# BANDEDGE (HIGH CHANNEL)

## HORIZONTAL RESULT



## Trace Markers

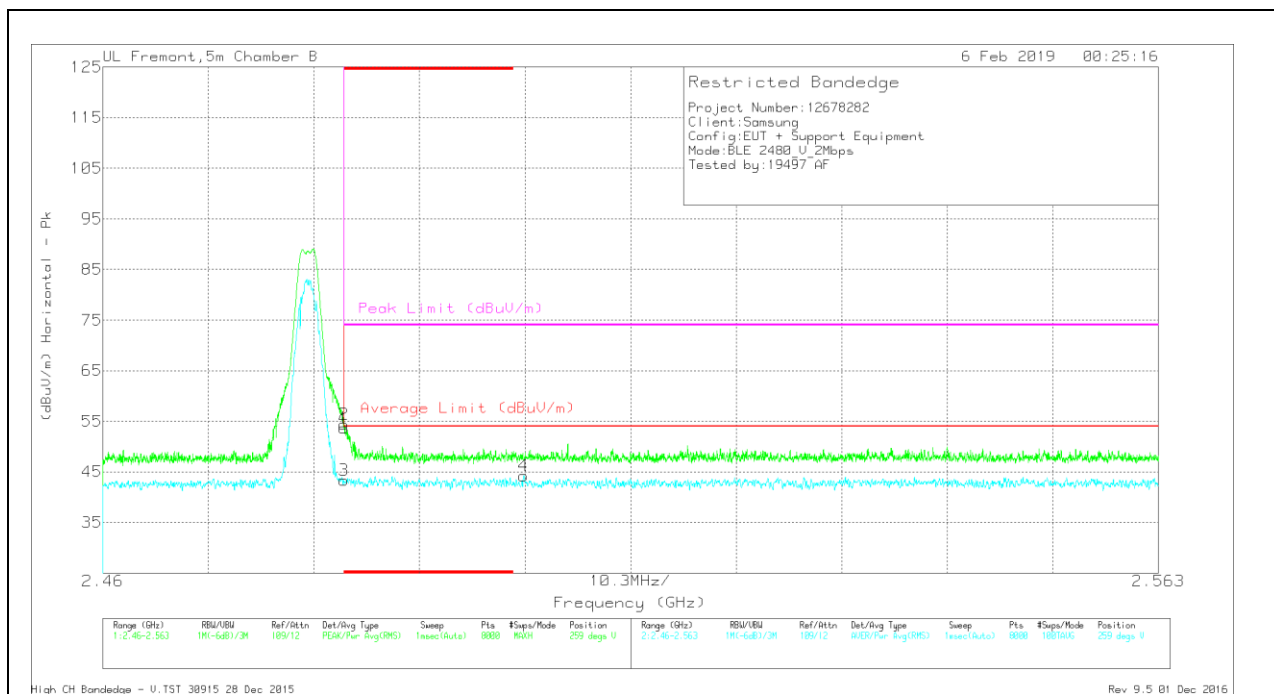
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T863 (dBm) | Ampl Chn Filt/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Altitude (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|------------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|-----------------|-------------|----------|
| 1      | *2.484          | 47.82                | PK  | 32.6          | -20.3                  | 0            | 60.12                      | -                      | -           | 74                  | -13.88         | 259             | 309         | H        |
| 2      | *2.484          | 47.84                | PK  | 32.6          | -20.3                  | 0            | 60.14                      | -                      | -           | 74                  | -13.86         | 259             | 309         | H        |
| 3      | *2.484          | 26.49                | RMS | 32.6          | -20.3                  | 5.04         | 43.83                      | 54                     | -10.17      | -                   | -              | 259             | 309         | H        |
| 4      | *2.484          | 28.01                | RMS | 32.6          | -20.4                  | 5.04         | 45.25                      | 54                     | -8.75       | -                   | -              | 259             | 309         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

## VERTICAL RESULT



### Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T863 (dBm) | Ampl/Chl/Filt/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Altitude (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|------------------------|--------------|----------------------------|------------------------|-------------|---------------------|----------------|-----------------|-------------|----------|
| 1      | * 2.484         | 41.32                | PK  | 32.6          | -20.3                  | 0            | 53.62                      | -                      | -           | 74                  | -20.38         | 259             | 316         | V        |
| 2      | * 2.484         | 42.13                | PK  | 32.6          | -20.3                  | 0            | 54.43                      | -                      | -           | 74                  | -19.57         | 259             | 316         | V        |
| 3      | * 2.484         | 25.99                | RMS | 32.6          | -20.3                  | 5.04         | 43.33                      | 54                     | -10.67      | -                   | -              | 259             | 316         | V        |
| 4      | 2.501           | 27.01                | RMS | 32.7          | -20.5                  | 5.04         | 44.25                      | 54                     | -9.75       | -                   | -              | 259             | 316         | V        |

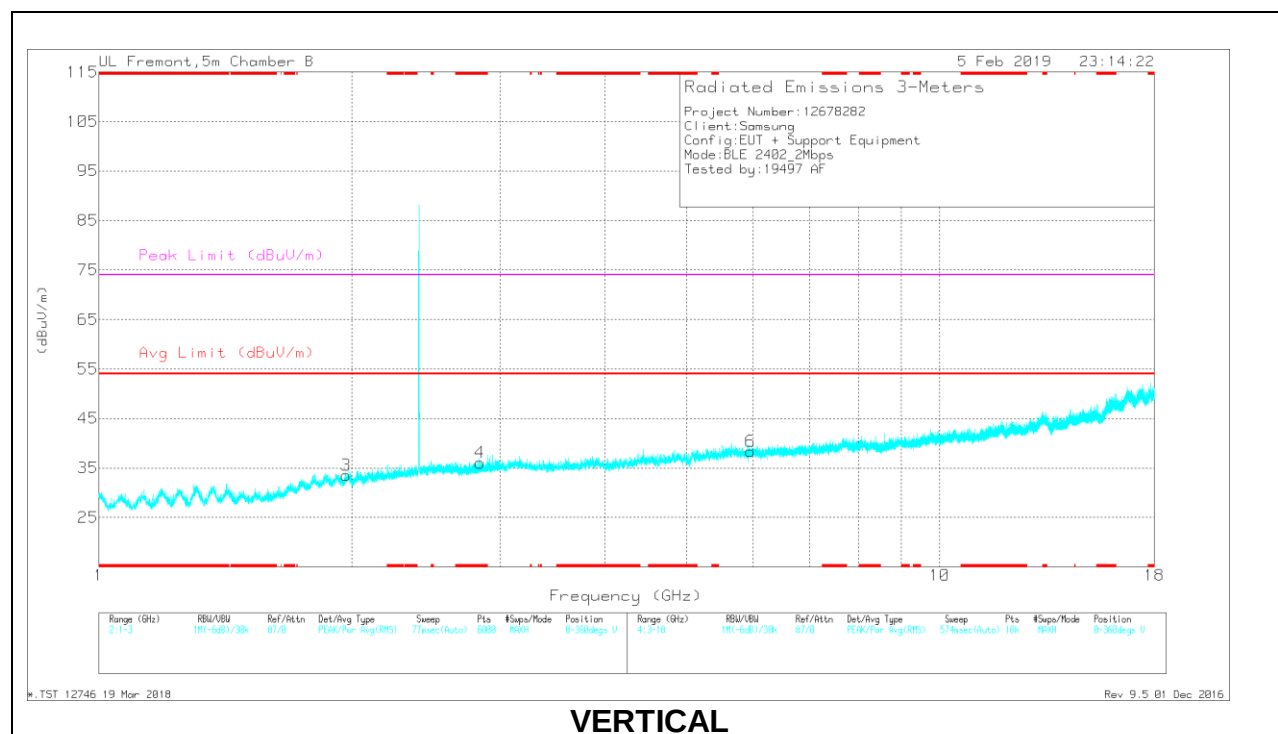
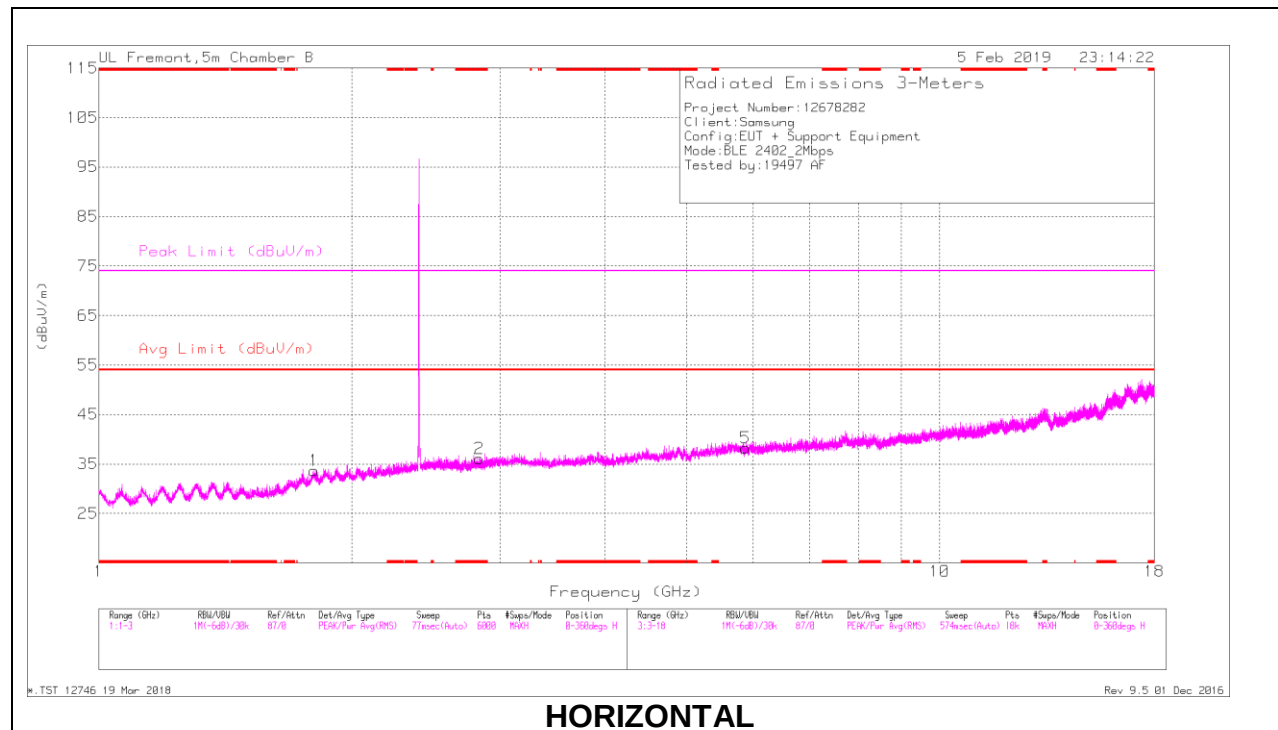
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS



## RADIATED EMISSIONS

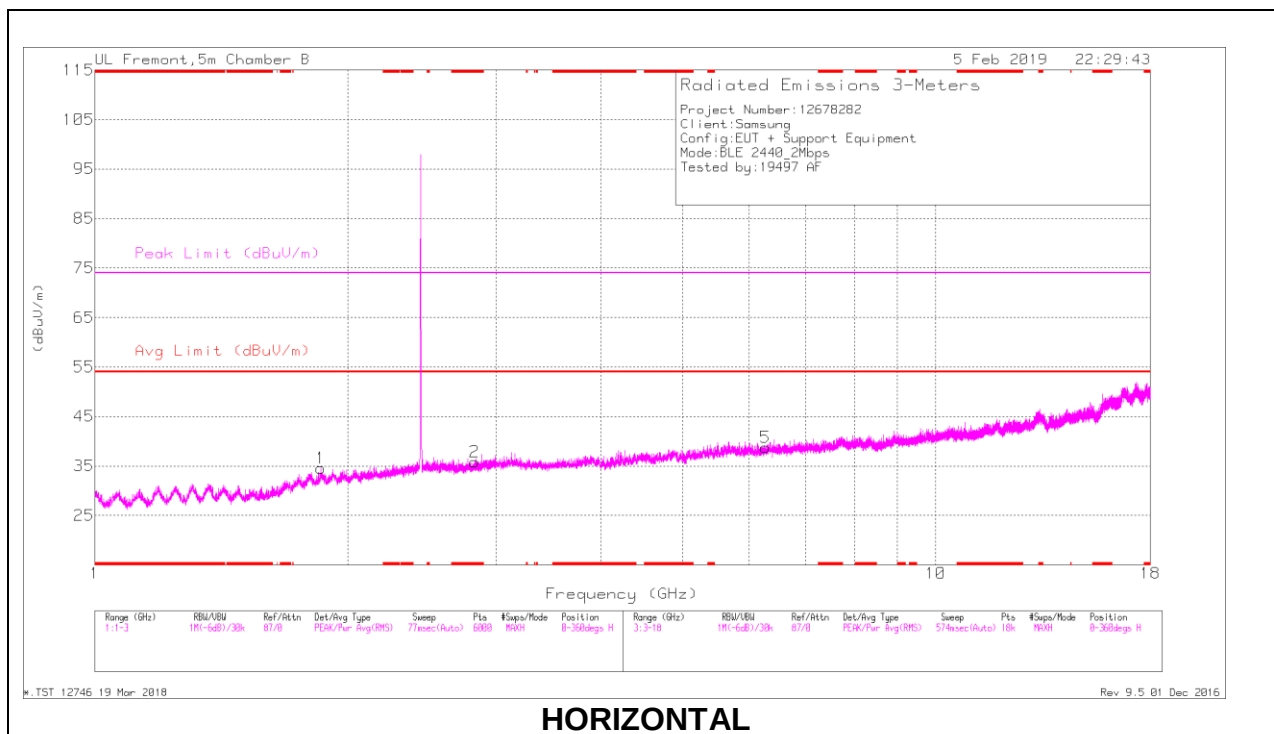
| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Filt/ Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|------|----------------|------------------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 2.831         | 29.77                | PK2  | 32.5           | -19.9                  | 0            | 42.37                      | -                  | -           | 74                  | -31.63         | 217            | 106         | H        |
| * 2.832         | 13.69                | MAV1 | 32.5           | -19.9                  | 5.04         | 31.33                      | 54                 | -22.67      | -                   | -              | 217            | 106         | H        |
| * 2.838         | 29.24                | PK2  | 32.5           | -19.8                  | 0            | 41.94                      | -                  | -           | 74                  | -32.06         | 268            | 282         | V        |
| * 2.837         | 13.49                | MAV1 | 32.5           | -19.8                  | 5.04         | 31.23                      | 54                 | -22.77      | -                   | -              | 268            | 282         | V        |
| 1.8             | 29.39                | PK2  | 30.7           | -20.6                  | 0            | 39.49                      | -                  | -           | -                   | -              | 125            | 334         | H        |
| 1.971           | 29.88                | PK2  | 30.9           | -20.5                  | 0            | 40.28                      | -                  | -           | -                   | -              | 42             | 326         | V        |
| 5.876           | 38.65                | PK2  | 35.4           | -28.8                  | 0            | 45.25                      | -                  | -           | -                   | -              | 42             | 326         | H        |
| 5.957           | 38.24                | PK2  | 35.4           | -28.4                  | 0            | 45.24                      | -                  | -           | -                   | -              | 42             | 326         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

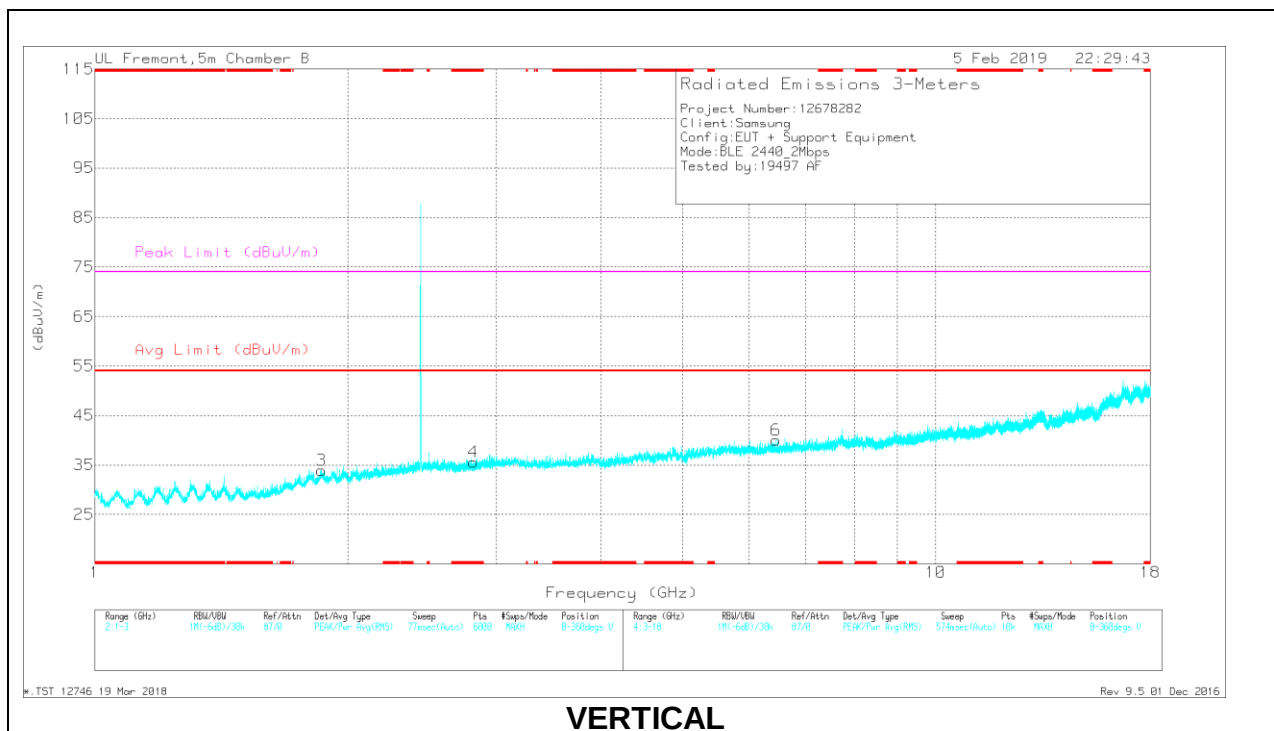
PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

## MID CHANNEL RESULTS



### HORIZONTAL



### VERTICAL

## RADIATED EMISSIONS

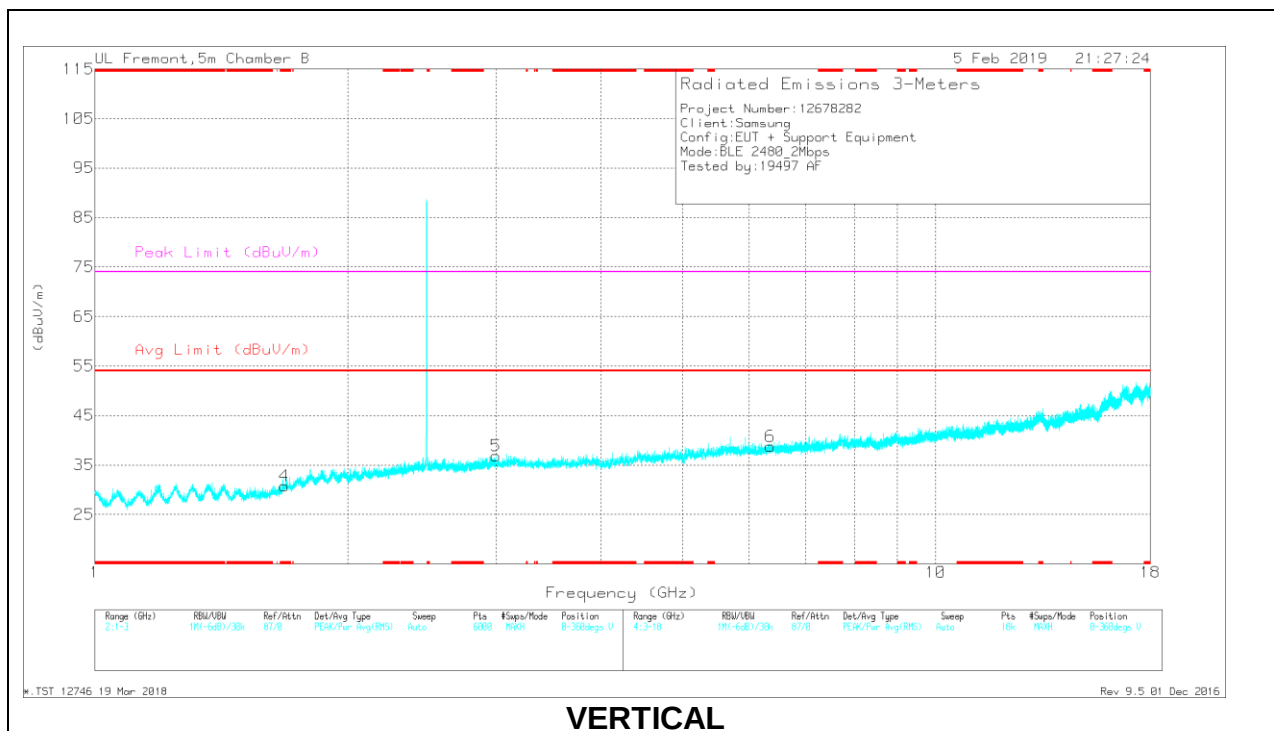
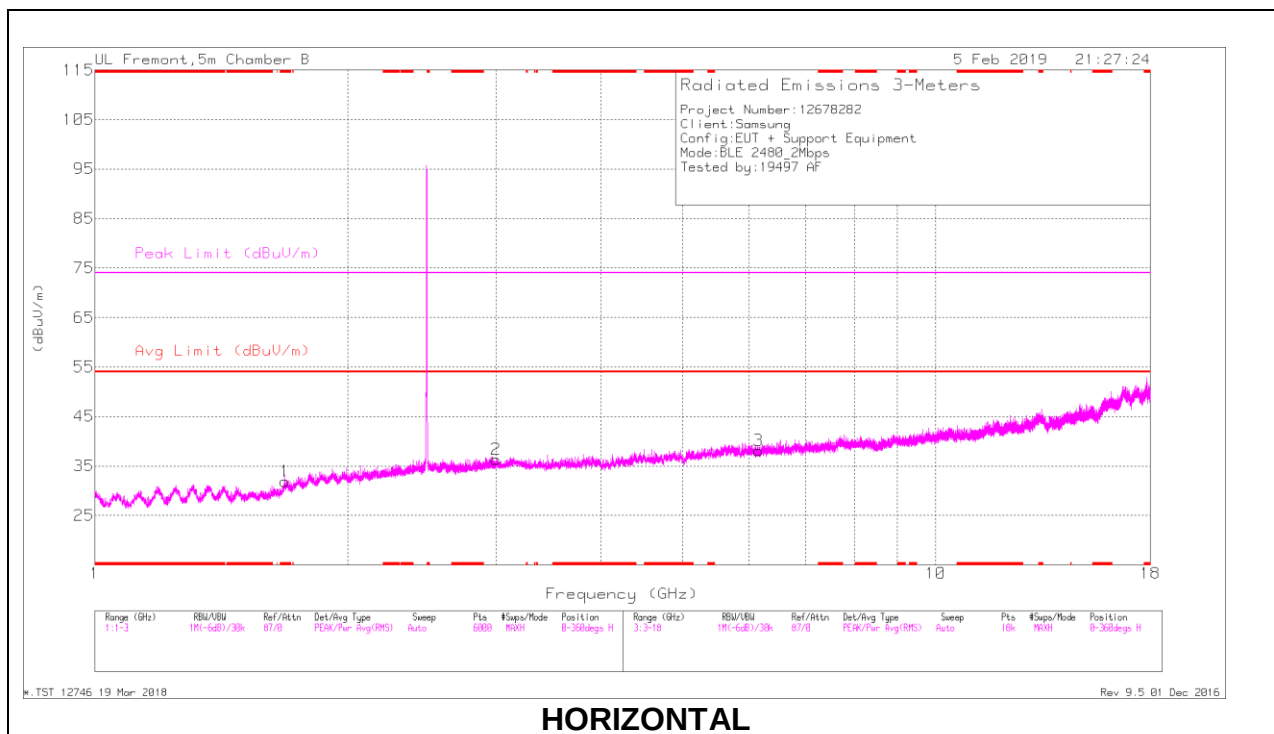
| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Filt/ Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|------|----------------|------------------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 2.831         | 29.61                | PK2  | 32.5           | -19.9                  | 0            | 42.21                      | -                  | -           | 74                  | -31.79         | 316            | 228         | H        |
| * 2.831         | 13.65                | MAV1 | 32.5           | -19.9                  | 5.04         | 31.29                      | 54                 | -22.71      | -                   | -              | 316            | 228         | H        |
| * 2.819         | 29.4                 | PK2  | 32.5           | -19.9                  | 0            | 42                         | -                  | -           | 74                  | -32            | 71             | 188         | V        |
| * 2.819         | 13.51                | MAV1 | 32.5           | -19.9                  | 5.04         | 31.15                      | 54                 | -22.85      | -                   | -              | 71             | 188         | V        |
| 1.855           | 30.31                | PK2  | 30.9           | -20.6                  | 0            | 40.61                      | -                  | -           | -                   | -              | 254            | 289         | H        |
| 1.862           | 29.8                 | PK2  | 30.9           | -20.7                  | 0            | 40                         | -                  | -           | -                   | -              | 181            | 300         | V        |
| 6.27            | 38.79                | PK2  | 35.6           | -28.5                  | 0            | 45.89                      | -                  | -           | -                   | -              | 194            | 250         | H        |
| 6.456           | 37.92                | PK2  | 35.7           | -27.8                  | 0            | 45.82                      | -                  | -           | -                   | -              | 186            | 262         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

## HIGH CHANNEL RESULTS



## RADIATED EMISSIONS

| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Filt/ 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 |
|-----------------|----------------------|------|----------------|------------------------|--------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 1.683         | 30                   | PK2  | 29.2           | -21                    | 0            | 38.2                       | -                  | -           | 74                  | -35.8          | 210            | 119         | H        |
| * 1.685         | 14.64                | MAV1 | 29.3           | -21.1                  | 5.04         | 27.88                      | 54                 | -26.12      | -                   | -              | 210            | 119         | H        |
| * 1.682         | 30.16                | PK2  | 29.2           | -21                    | 0            | 38.36                      | -                  | -           | 74                  | -35.64         | 207            | 120         | V        |
| * 1.682         | 14.71                | MAV1 | 29.2           | -21                    | 5.04         | 27.95                      | 54                 | -26.05      | -                   | -              | 207            | 120         | V        |
| 2.998           | 28.65                | PK2  | 32.7           | -19.1                  | 0            | 42.25                      | -                  | -           | -                   | -              | 14             | 366         | H        |
| 3               | 28.8                 | PK2  | 32.7           | -19.1                  | 0            | 42.4                       | -                  | -           | -                   | -              | 106            | 385         | V        |
| 6.156           | 38.42                | PK2  | 35.5           | -28.9                  | 0            | 45.02                      | -                  | -           | -                   | -              | 212            | 311         | H        |
| 6.358           | 38.66                | PK2  | 35.7           | -28.8                  | 0            | 45.56                      | -                  | -           | -                   | -              | 281            | 267         | V        |

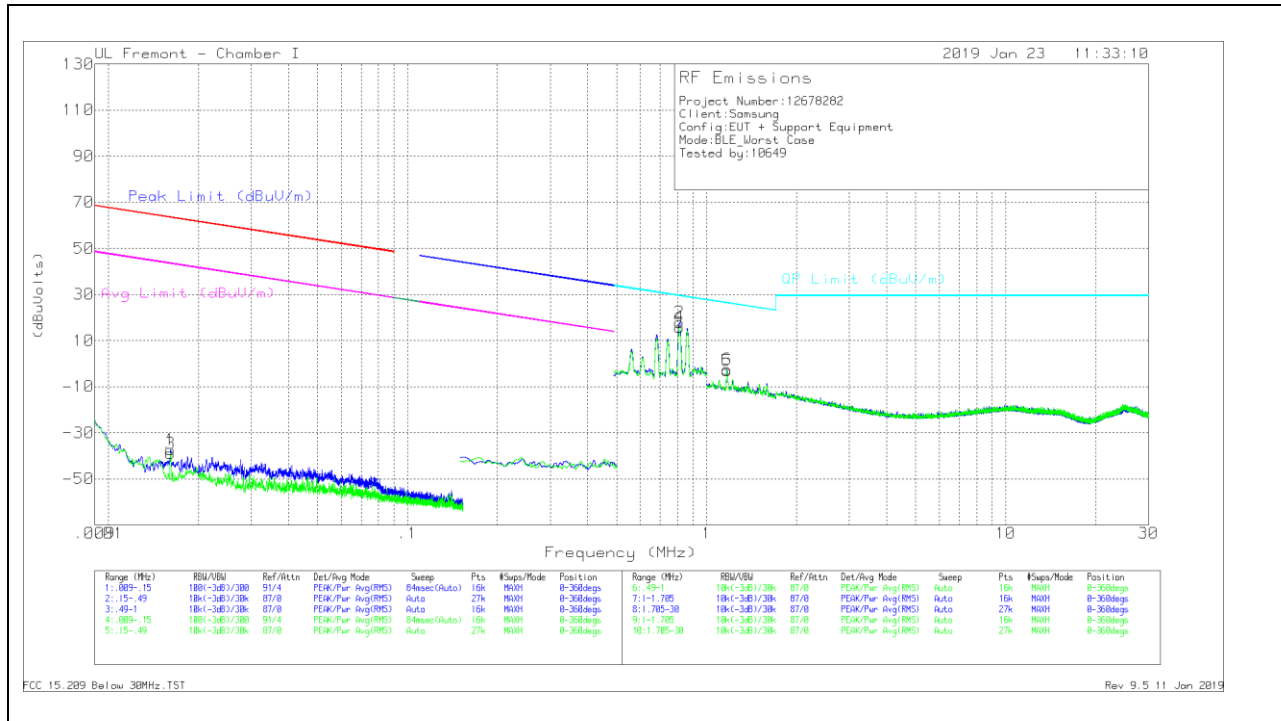
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAV1 - KDB558074 Option 1 Maximum RMS Average

## 12.3. Worst Case Below 30MHz

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



## Below 30MHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (ACF) | Cable s w/ PRE0 18017 5 (dB) | Dist Corr 300m | Corrected Reading (dBuVolts) | Peak Limit (dBuV /m) | Margin (dB) | Avg Limit (dBuV /m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|------------------------------|----------------|------------------------------|----------------------|-------------|---------------------|-------------|----------------|
| 1      | .01615          | 15.56                | Pk  | 59.5               | -32.4                        | -80            | -37.34                       | 63.42                | -100.76     | 43.42               | -80.76      | 0-360          |
| 3      | .01614          | 14.01                | Pk  | 59.5               | -32.4                        | -80            | -38.89                       | 63.43                | -102.32     | 43.43               | -82.32      | 0-360          |

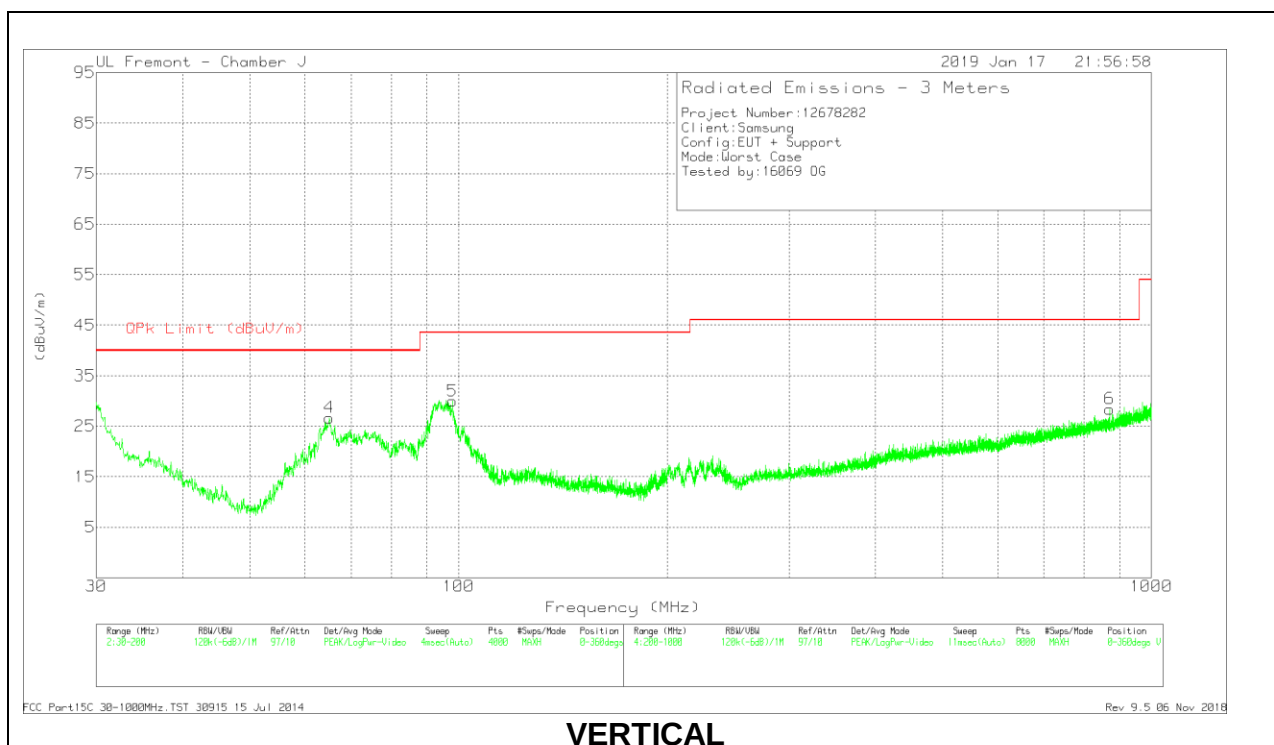
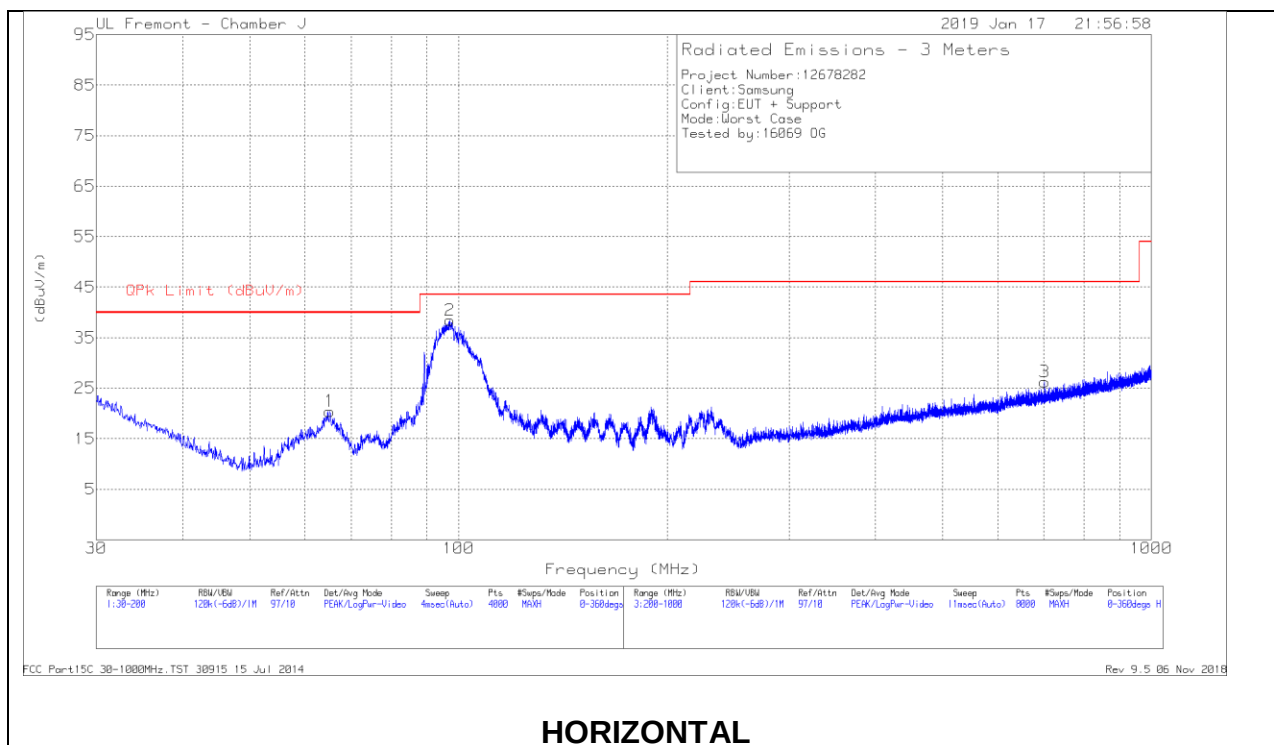
Pk - Peak detector

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (ACF) | Cable s w/ PRE0 18017 5 (dB) | Dist Corr 30m (dB) 40Log | Corrected Reading (dBuVolts) | QP Limit (dBuV /m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|------------------------------|--------------------------|------------------------------|--------------------|-------------|----------------|
| 2      | .81149          | 33.47                | Pk  | 56.3               | -31.8                        | -40                      | 17.97                        | 29.43              | -11.46      | 0-360          |
| 4      | .81178          | 31.35                | Pk  | 56.3               | -31.8                        | -40                      | 15.85                        | 29.43              | -13.58      | 0-360          |
| 6      | 1.16955         | 23.84                | Pk  | 45.5               | -31.8                        | -40                      | -2.46                        | 26.26              | -28.72      | 0-360          |
| 5      | 1.17054         | 23.24                | Pk  | 45.5               | -31.8                        | -40                      | -3.06                        | 26.26              | -29.32      | 0-360          |

Pk - Peak detector

## 12.4. Worst Case Below 1 GHz

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



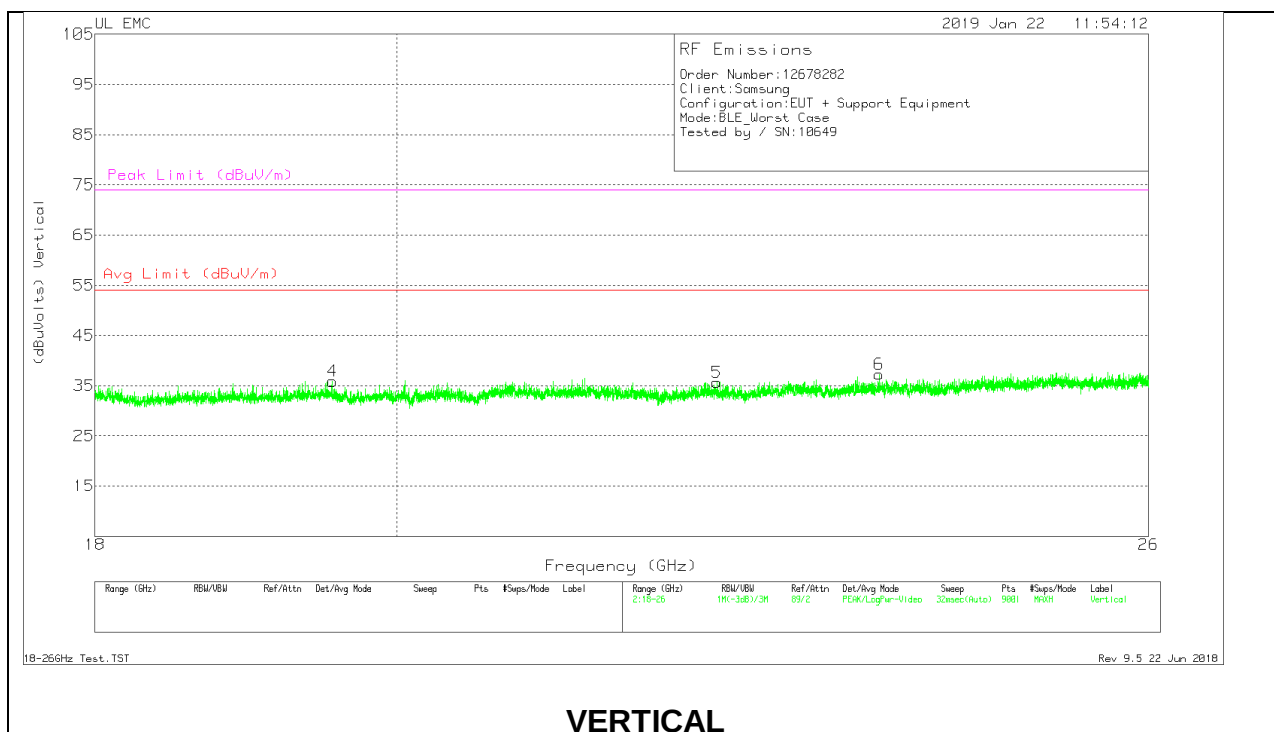
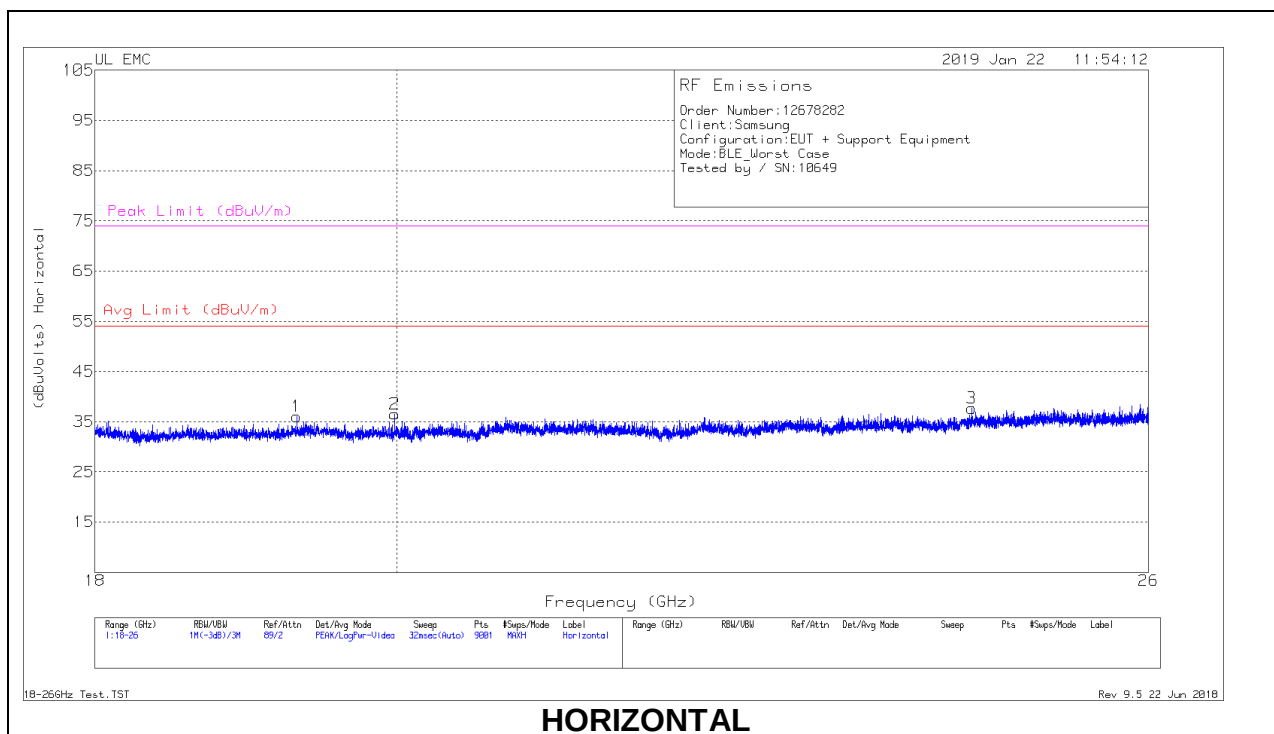
## Below 1GHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AF PRE0181575 (dB/m) | Amp Cbl (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------------|--------------|--------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 1      | 65.1566         | 37.83                | Pk  | 13.8                 | -31.2        | 0            | 20.43                      | 40                 | -19.57      | 0-360          | 299         | H        |
| 2      | 97.2099         | 53.83                | Pk  | 15.6                 | -31          | 0            | 38.43                      | 43.52              | -5.09       | 0-360          | 198         | H        |
| 4      | 65.0716         | 44.07                | Pk  | 13.8                 | -31.2        | 0            | 26.67                      | 40                 | -13.33      | 0-360          | 101         | V        |
| 5      | 98.0176         | 45.18                | Pk  | 15.8                 | -31          | 0            | 29.98                      | 43.52              | -13.54      | 0-360          | 101         | V        |
| 3      | 701.5652        | 28.95                | Pk  | 26.2                 | -28.9        | 0            | 26.25                      | 46.02              | -19.77      | 0-360          | 398         | H        |
| 6      | 871.3873        | 28.22                | Pk  | 27.8                 | -27.6        | 0            | 28.42                      | 46.02              | -17.6       | 0-360          | 199         | V        |

Pk - Peak detector

## 12.5. Worst Case 18-26 GHz

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



## 18 – 26GHz DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | T448 AF (dB/m) | Amp/Cbl (dB) | Dist Corr (dB) | Corrected Reading (dBuVolts) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) |
|--------|-----------------|----------------------|-----|----------------|--------------|----------------|------------------------------|--------------------|-------------|---------------------|----------------|
| 1      | 19.313          | 69.53                | Pk  | 32.7           | -56.7        | -9.5           | 36.03                        | 54                 | -17.97      | 74                  | -37.97         |
| 2      | 19.985          | 69.84                | Pk  | 32.7           | -56.5        | -9.5           | 36.54                        | 54                 | -17.46      | 74                  | -37.46         |
| 3      | 24.444          | 69.18                | Pk  | 34.1           | -56.1        | -9.5           | 37.68                        | 54                 | -16.32      | 74                  | -36.32         |
| 4      | 19.555          | 69.45                | Pk  | 32.6           | -56.7        | -9.5           | 35.85                        | 54                 | -18.15      | 74                  | -38.15         |
| 5      | 22.363          | 69.45                | Pk  | 33.4           | -57.7        | -9.5           | 35.65                        | 54                 | -18.35      | 74                  | -38.35         |
| 6      | 23.666          | 69.66                | Pk  | 33.9           | -56.8        | -9.5           | 37.26                        | 54                 | -16.74      | 74                  | -36.74         |

Pk - Peak detector

### 13. AC POWER LINE CONDUCTED EMISSIONS

#### LIMITS

FCC §15.207 (a)

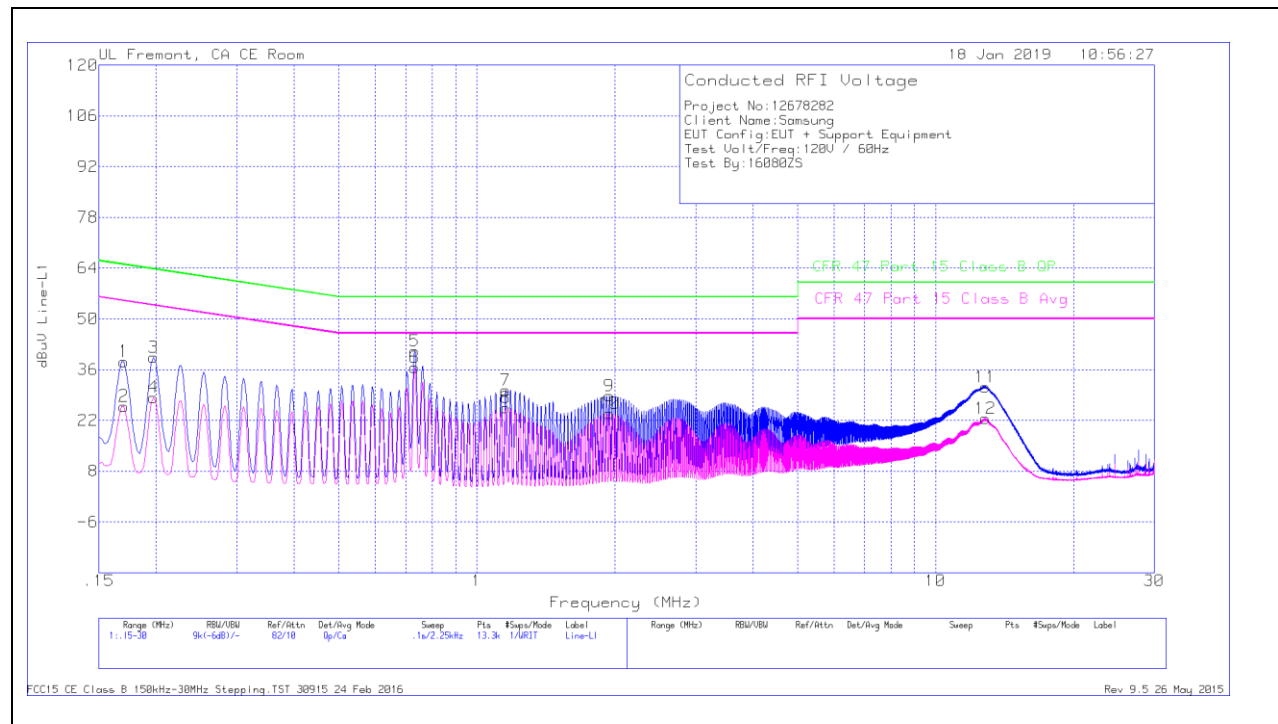
| Frequency of Emission (MHz) | Conducted Limit (dBuV) |                       |
|-----------------------------|------------------------|-----------------------|
|                             | Quasi-peak             | Average               |
| 0.15-0.5                    | 66 to 56 <sup>*</sup>  | 56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

<sup>\*</sup> Decreases with the logarithm of the frequency.

#### RESULTS

## AC Power Line Norm

### LINE 1 RESULTS

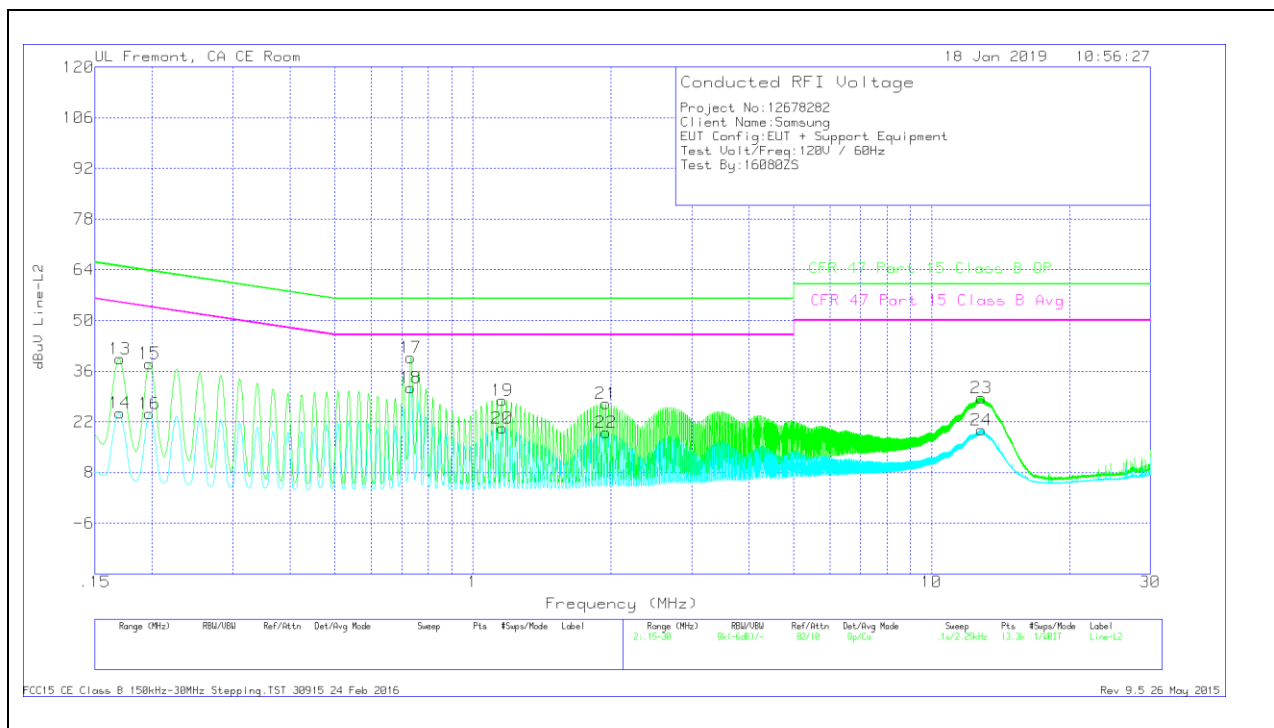


| Range 1: Line-L1 .15 - 30MHz |                 |                      |     |         |                 |              |                        |                           |                |                            |                       |
|------------------------------|-----------------|----------------------|-----|---------|-----------------|--------------|------------------------|---------------------------|----------------|----------------------------|-----------------------|
| Marker                       | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN L1 | LC Cables C1&C3 | Limiter (dB) | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | QP Margin (dB) | CFR 47 Part 15 Class B Avg | Av(CISPR) Margin (dB) |
| 1                            | .17025          | 28.16                | Qp  | 0       | 0               | 10.1         | 38.26                  | 64.95                     | -26.69         | -                          | -                     |
| 2                            | .17025          | 15.82                | Ca  | 0       | 0               | 10.1         | 25.92                  | -                         | -              | 54.95                      | -29.03                |
| 3                            | .19725          | 29.28                | Qp  | 0       | 0               | 10.1         | 39.38                  | 63.73                     | -24.35         | -                          | -                     |
| 4                            | .19725          | 18.26                | Ca  | 0       | 0               | 10.1         | 28.36                  | -                         | -              | 53.73                      | -25.37                |
| 5                            | .73275          | 31.11                | Qp  | 0       | 0               | 10.1         | 41.21                  | 56                        | -14.79         | -                          | -                     |
| 6                            | .73275          | 26.57                | Ca  | 0       | 0               | 10.1         | 36.67                  | -                         | -              | 46                         | -9.33                 |
| 7                            | 1.15575         | 20.15                | Qp  | 0       | .1              | 10.1         | 30.35                  | 56                        | -25.65         | -                          | -                     |
| 8                            | 1.15575         | 15.27                | Ca  | 0       | .1              | 10.1         | 25.47                  | -                         | -              | 46                         | -20.53                |
| 9                            | 1.9455          | 18.55                | Qp  | 0       | .1              | 10.1         | 28.75                  | 56                        | -27.25         | -                          | -                     |
| 10                           | 1.9455          | 13.75                | Ca  | 0       | .1              | 10.1         | 23.95                  | -                         | -              | 46                         | -22.05                |
| 11                           | 12.858          | 20.79                | Qp  | .1      | .2              | 10.2         | 31.29                  | 60                        | -28.71         | -                          | -                     |
| 12                           | 12.858          | 12.01                | Ca  | .1      | .2              | 10.2         | 22.51                  | -                         | -              | 50                         | -27.49                |

Qp - Quasi-Peak detector

Ca - CISPR average detection

## LINE 2 RESULTS



| Range 2: Line-L2 .15 - 30MHz |                 |                      |     |         |                 |              |                        |                           |                |                            |                       |
|------------------------------|-----------------|----------------------|-----|---------|-----------------|--------------|------------------------|---------------------------|----------------|----------------------------|-----------------------|
| Marker                       | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN L2 | LC Cables C2&C3 | Limiter (dB) | Corrected Reading dBuV | CFR 47 Part 15 Class B QP | QP Margin (dB) | CFR 47 Part 15 Class B Avg | Av(CISPR) Margin (dB) |
| 13                           | .17025          | 29.23                | Qp  | 0       | 0               | 10.1         | 39.33                  | 64.95                     | -25.62         | -                          | -                     |
| 14                           | .17025          | 14.41                | Ca  | 0       | 0               | 10.1         | 24.51                  | -                         | -              | 54.95                      | -30.44                |
| 15                           | .19725          | 27.99                | Qp  | 0       | 0               | 10.1         | 38.09                  | 63.73                     | -25.64         | -                          | -                     |
| 16                           | .19725          | 14.14                | Ca  | 0       | 0               | 10.1         | 24.24                  | -                         | -              | 53.73                      | -29.49                |
| 17                           | .73275          | 29.59                | Qp  | 0       | 0               | 10.1         | 39.69                  | 56                        | -16.31         | -                          | -                     |
| 18                           | .73275          | 21.35                | Ca  | 0       | 0               | 10.1         | 31.45                  | -                         | -              | 46                         | -14.55                |
| 19                           | 1.158           | 17.75                | Qp  | 0       | .1              | 10.1         | 27.95                  | 56                        | -28.05         | -                          | -                     |
| 20                           | 1.158           | 10.04                | Ca  | 0       | .1              | 10.1         | 20.24                  | -                         | -              | 46                         | -25.76                |
| 21                           | 1.94775         | 16.8                 | Qp  | 0       | .1              | 10.1         | 27                     | 56                        | -29            | -                          | -                     |
| 22                           | 1.94775         | 8.92                 | Ca  | 0       | .1              | 10.1         | 19.12                  | -                         | -              | 46                         | -26.88                |
| 23                           | 12.83775        | 18.09                | Qp  | .1      | .2              | 10.2         | 28.59                  | 60                        | -31.41         | -                          | -                     |
| 24                           | 12.84           | 9.25                 | Ca  | .1      | .2              | 10.2         | 19.75                  | -                         | -              | 50                         | -30.25                |

Qp - Quasi-Peak detector

Ca - CISPR average detection