



# **CERTIFICATION TEST REPORT**

**Report Number. :** 12132879-E2V3

**Applicant :** SONY MOBILE COMMUNICATIONS, INC.  
4-12-3 HIGASHI-SHINAGAWA,  
SHINAGAWA -KU, TOKYO, 140-0002, JAPAN

**FCC ID :** PY7-70663E

**EUT Description :** GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC

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

**Date Of Issue:**

April 2, 2018

**Prepared by:**

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## REPORT REVISION HISTORY

| Rev. | Issue Date | Revisions               | Revised By  |
|------|------------|-------------------------|-------------|
| V1   | 03/20/18   | Initial Issue           | Dan Coronio |
| V2   | 03/23/18   | Updated Section 5.5 & 9 | Kiya Kedida |
| V2   | 04/2/18    | Updated Section 9       | Kiya Kedida |

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SONY MOBILE COMMUNICATIONS, INC.  
4-12-3 HIGASHI-SHINAGAWA,  
SHINAGAWA -KU, TOKYO, 140-0002, JAPAN

**EUT DESCRIPTION:** GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC

**SERIAL NUMBER:** BH9000ARBG; BH9000JPBG (RADIATED)  
BH9000BCBC; BH9000HPBC (CONDUCTED)

**DATE TESTED:** February 17 – March 01, 2018

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

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013

## 3. FACILITIES AND ACCREDITATION

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

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

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through C are covered under ISED company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under ISED Canada company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                                           | UNCERTAINTY |
|-----------------------------------------------------|-------------|
| Worst Case Conducted Disturbance, 9KHz to 0.15 MHz  | 3.84 dB     |
| Worst Case Conducted Disturbance, 0.15 to 30 MHz    | 3.65 dB     |
| Worst Case Radiated Disturbance, 9KHz to 30 MHz     | 3.15 dB     |
| Worst Case Radiated Disturbance, 30 to 1000 MHz     | 5.36 dB     |
| Worst Case Radiated Disturbance, 1000 to 18000 MHz  | 4.32 dB     |
| Worst Case Radiated Disturbance, 18000 to 26000 MHz | 4.45 dB     |
| Worst Case Radiated Disturbance, 26000 to 40000 MHz | 5.24 dB     |

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

## 5. EQUIPMENT UNDER TEST

### 5.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC.

### 5.2. MAXIMUM OUTPUT POWER

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

| Frequency Range<br>(MHz) | Mode          | Output Power<br>(dBm) | Output Power<br>(mW) |
|--------------------------|---------------|-----------------------|----------------------|
| 2402 - 2480              | Basic GFSK    | 11.32                 | 13.55                |
| 2402 - 2480              | Enhanced 8PSK | 9.35                  | 8.61                 |

Note: GFSK, DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on these modes to showing compliance.

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a loop antenna, with a maximum gain of -2.65 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was s\_atp\_XXX\_0\_00375\_A\_19  
The test utility software used during testing was Tera Term Ver 4.79

## **5.5. WORST-CASE CONFIGURATION AND MODE**

Radiated emissions below 30MHz, below 1GHz, and above 18GHz, and AC 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 Harmonics and Radiated Emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the low, middle and high channels.

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

Worst-case data rates as provided by the client were:

GFSK mode: DH5

8PSK mode: 3-DH5

DQPSK mode has been verified to have the lowest power.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List |              |            |               |        |
|------------------------|--------------|------------|---------------|--------|
| Description            | Manufacturer | Model      | Serial Number | FCC ID |
| Laptop                 | Lenovo       | 20B7S0A200 | PC015REW      | NA     |
| AC Adapter             | SONY         | UCH12      | 4016W40310044 | NA     |
| DC Power Supply        | Ametek       | XT 15-4    | T463          | N/A    |

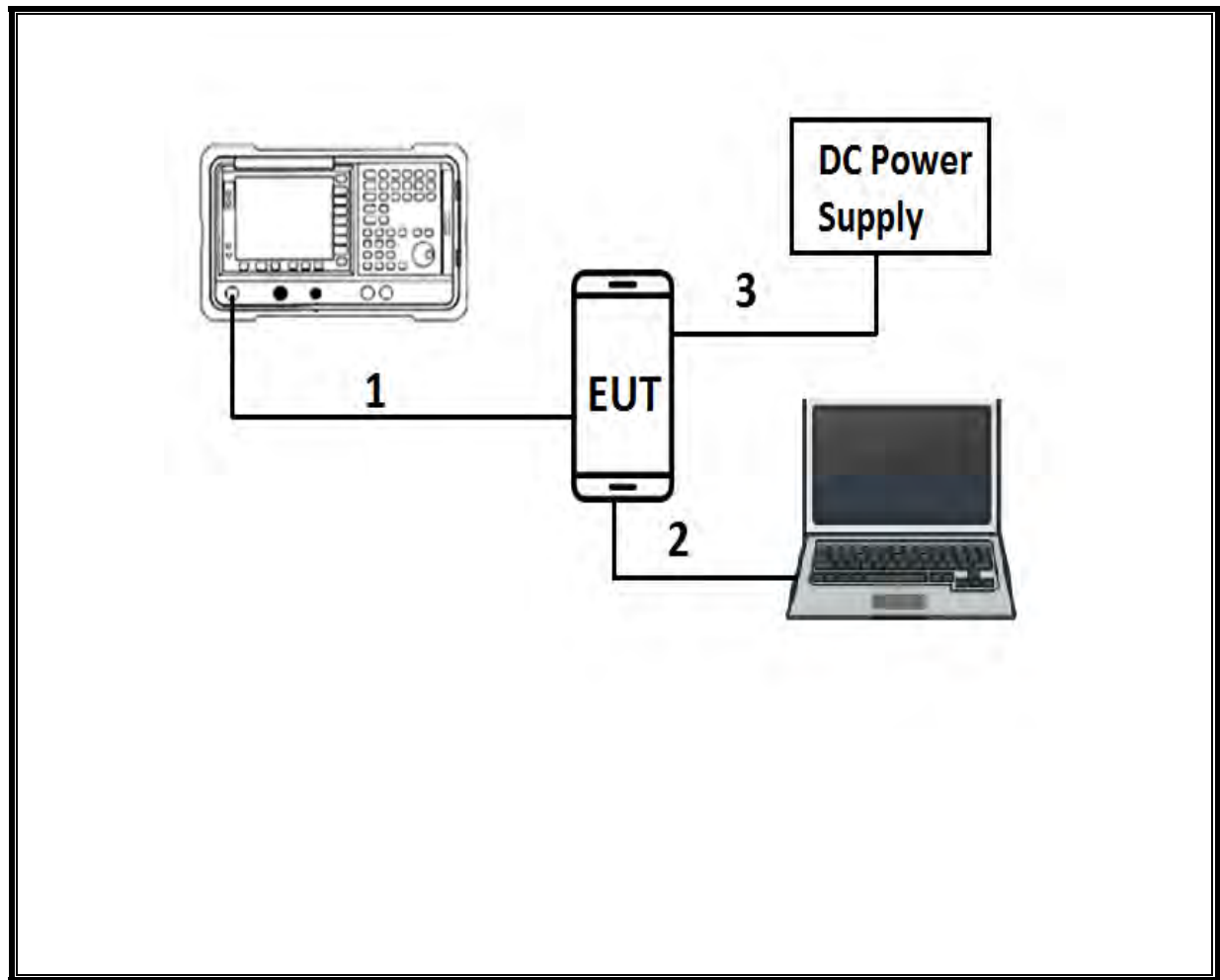
### I/O CABLES (CONDUCTED TEST)

| 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            | Shielded   | 1                | N/A                  |
| 3              | DC      | 1                    | DC             | Shielded   | 0.3              | N/A                  |

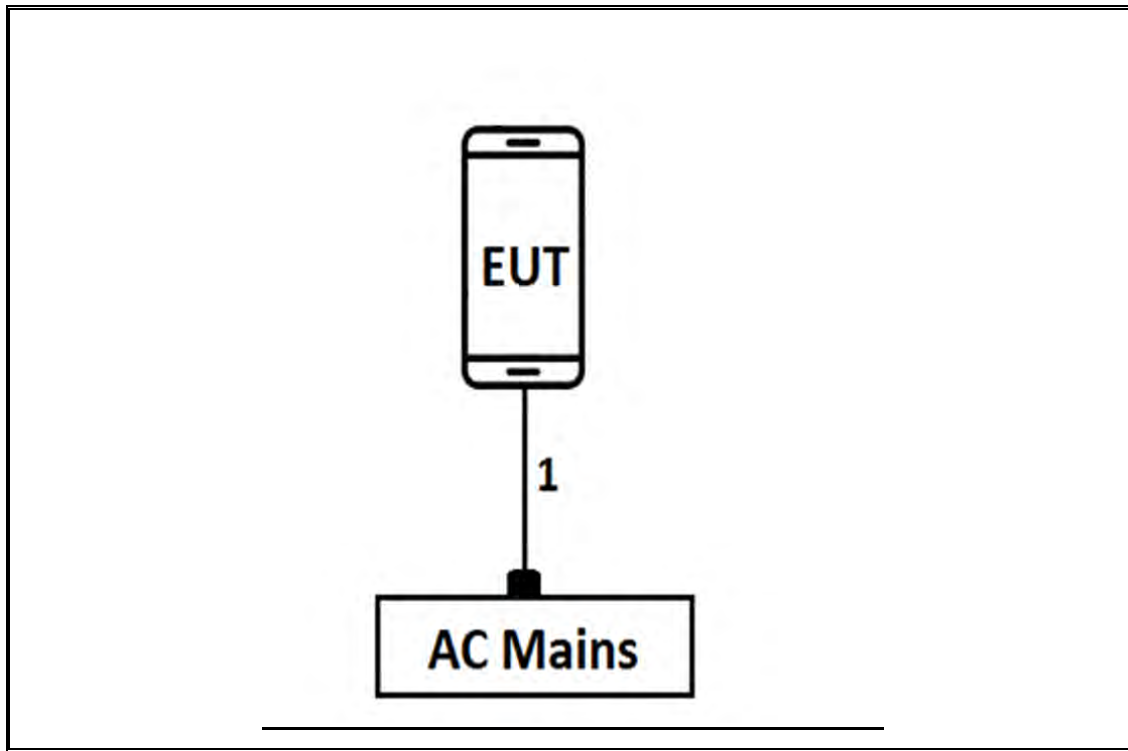
### I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

| I/O Cable List |      |                      |                |            |                  |         |
|----------------|------|----------------------|----------------|------------|------------------|---------|
| Cable No       | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1              | USB  | 1                    | USB            | Shielded   | 3                | N/A     |

**CONDCUTED TEST SETUP DIAGRAM**



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



## 6. MEASUREMENT METHODS

On Time and Duty Cycle: ANSI C63.10-2013 Section 11.6

Occupied BW (20dB): ANSI C63.10-2013 Section 6.9.2

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

Carrier Frequency Separation: ANSI C63.10-2013 Section 7.8.2

Number of Hopping Frequencies: ANSI C63.10-2013 Section 7.8.3

Time of Occupancy (Dwell Time): ANSI C63.10-2013 Section 7.8.4

Peak Output Power: ANSI C63.10-2013 Section 7.8.5

Conducted Spurious Emissions: ANSI C63.10-2013 Section 7.8.8

Conducted Band-Edge: ANSI C63.10-2013 Section 6.10.4

Radiated Spurious Emissions 30-1000MHz: ANSI C63.10-2013 Section 6.3 and 6.5

Radiated Spurious Emissions above 1GHz: ANSI C63.10-2013 Section 6.3 and 6.6

Radiated Band-edge: ANSI C63.10-2013 Section 6.10.5

AC Power-line conducted emissions: ANSI C63.10-2013, Section 6.2.

## 7. 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                   | ID Num | Cal Due     | Last Cal   |
| Amplifier, 1 - 18GHz                               | Miteq                           | AFS42-00101800-25-S-42  | T493   | 06/23/2018  | 06/23/2017 |
| Amplifier, 1 - 18GHz                               | Miteq                           | AFS42-00101800-25-S-42  | T1165  | 11/25/2018  | 11/25/2017 |
| RF Preamplifier, 1 - 26GHz                         | Agilent                         | 8449B                   | T404   | 07/23/2018  | 07/23/2017 |
| Amplifier, 10KHz to 1GHz, 32dB                     | Sonoma Instrument               | 310N                    | T835   | 06/24/2018  | 06/24/2017 |
| Antenna, Broadband Hybrid 30MHz to 2000MHz         | Sunol Science                   | JB1                     | T185   | 03/30//2018 | 03/30/2017 |
| Antenna, Horn 1-18GHz                              | ETS-Lindgren                    | 3117                    | T863   | 06/09/2018  | 06/09/2017 |
| Antenna, Horn 1-18GHz                              | ETS-Lindgren                    | 3117                    | T862   | 06/09/2018  | 06/09/2017 |
| Antenna, Horn 18-26.5GHz                           | ARA                             | MWH-1826                | T449   | 01/04/2019  | 01/04/2018 |
| Power Meter, P-series single channel               | Agilent (Keysight) Technologies | N1911A                  | T1269  | 03/29/2018  | 03/29/2017 |
| Power Sensor, P - series, 50MHz to 18GHz, Wideband | All                             | N1921A                  | T1224  | 03/29/2018  | 03/29/2017 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz               | Agilent (Keysight) Technologies | N9030A                  | T1113  | 12/21/2018  | 12/21/2017 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz               | Agilent (Keysight) Technologies | N9030A                  | T1466  | 04/11/2018  | 04/11/2017 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz               | Agilent (Keysight) Technologies | N9030A                  | T1454  | 01/08/2019  | 01/08/2018 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz               | Agilent (Keysight) Technologies | N9030A                  | T917   | 06/09/2018  | 06/09/2017 |
| Antenna, Active Loop 9kHz-30MHz                    | Com-Power Corp.                 | AL-130R                 | T1866  | 10/10/2018  | 10/10/2017 |
| Test Receiver, EMI, 10Hz-7GHz                      | Rhode&Schwarz                   | ESR                     | T1436  | 01/06/2019  | 01/06/2018 |
| LISN                                               | FISCHER                         | FCC-LISN-50/250-25-2-01 | T1310  | 01/17/2019  | 01/17/2018 |

| Test Software List    |              |        |                           |
|-----------------------|--------------|--------|---------------------------|
| Description           | Manufacturer | Model  | Version                   |
| Radiated Software     | UL           | UL EMC | Ver 9.5, December 1, 2016 |
| Antenna Port Software | UL           | UL RF  | Ver 9.1, January 25, 2018 |

## 8. ANTENNA PORT TEST RESULTS

### 8.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

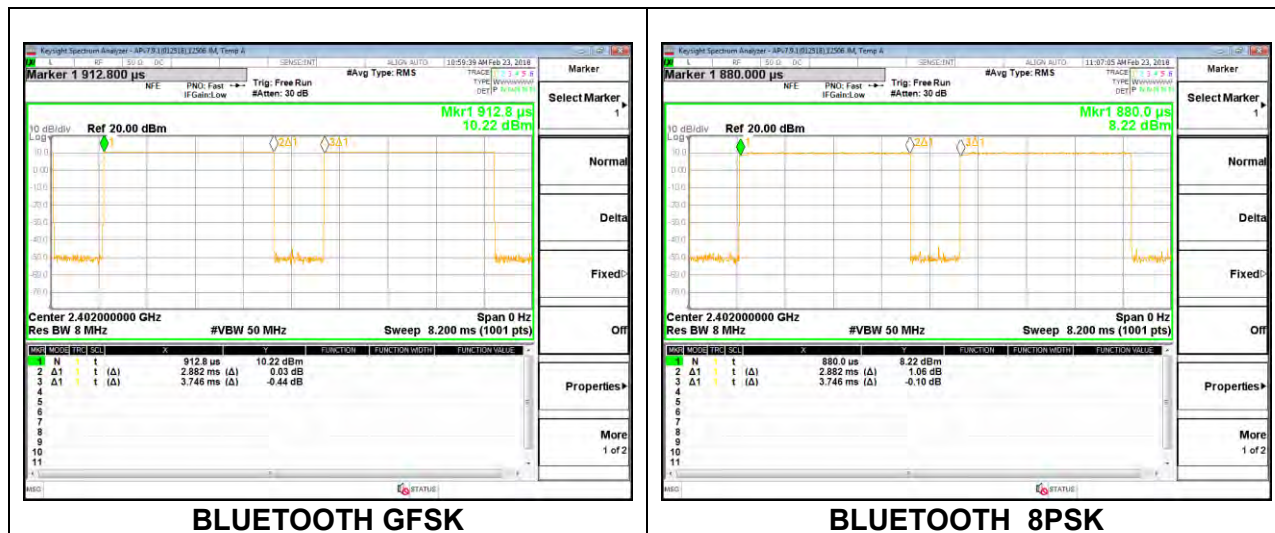
#### PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

#### 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/T<br>Minimum VBW<br>(kHz) |
|----------------|------------------------|------------------|-----------------------------|----------------------|-----------------------------------------|-----------------------------|
| Bluetooth GFSK | 2.88                   | 3.75             | 0.769                       | 76.9%                | 1.14                                    | 0.347                       |
| Bluetooth 8PSK | 2.88                   | 3.75             | 0.769                       | 76.9%                | 1.14                                    | 0.347                       |

## DUTY CYCLE PLOTS



## **8.2. 20 dB AND 99% BANDWIDTH**

### **LIMITS**

None; for reporting purposes only.

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

### **RESULTS**

## 8.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2402            | 0.885                | 0.827               |
| Mid     | 2441            | 0.885                | 0.829               |
| High    | 2480            | 0.886                | 0.827               |



## 8.2.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2402            | 1.272                | 1.184               |
| Mid     | 2441            | 1.269                | 1.184               |
| High    | 2480            | 1.273                | 1.184               |



### **8.3. HOPPING FREQUENCY SEPARATION**

#### **LIMITS**

FCC §15.247 (a) (1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

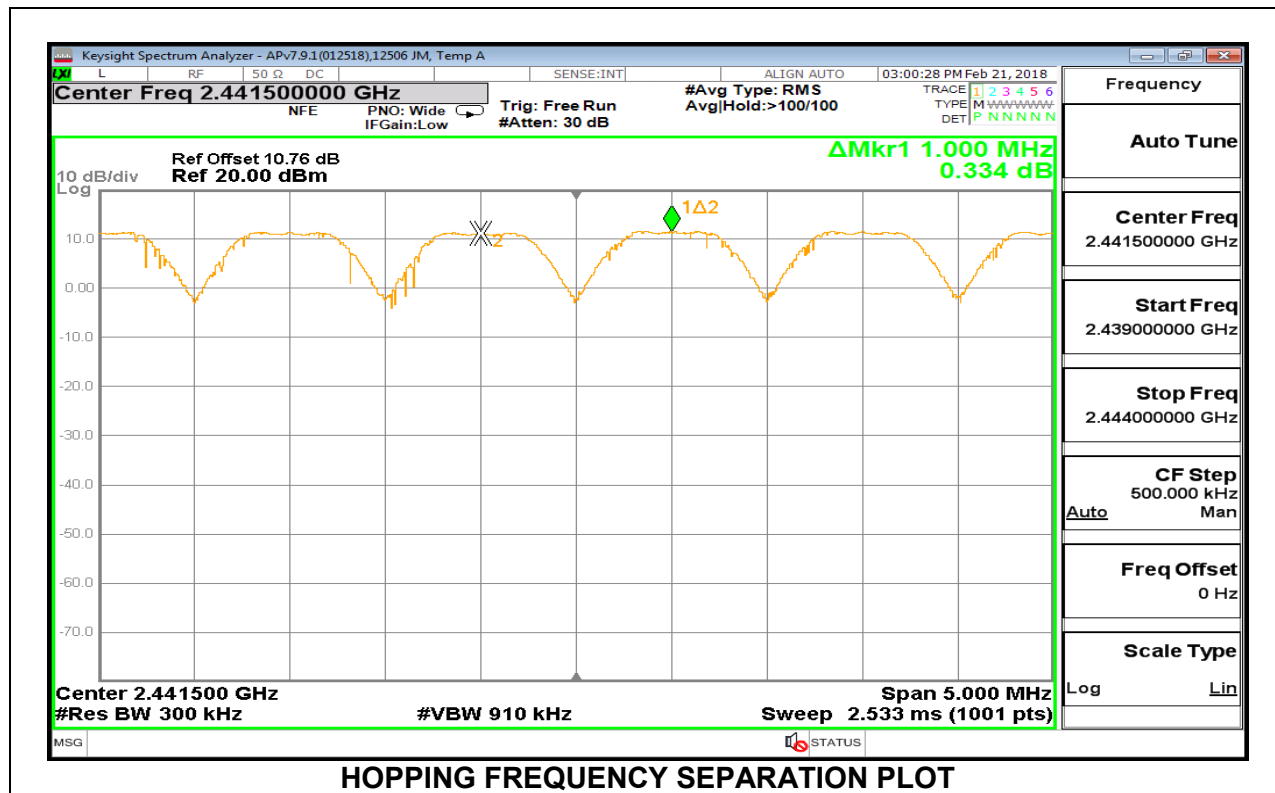
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

#### **TEST PROCEDURE**

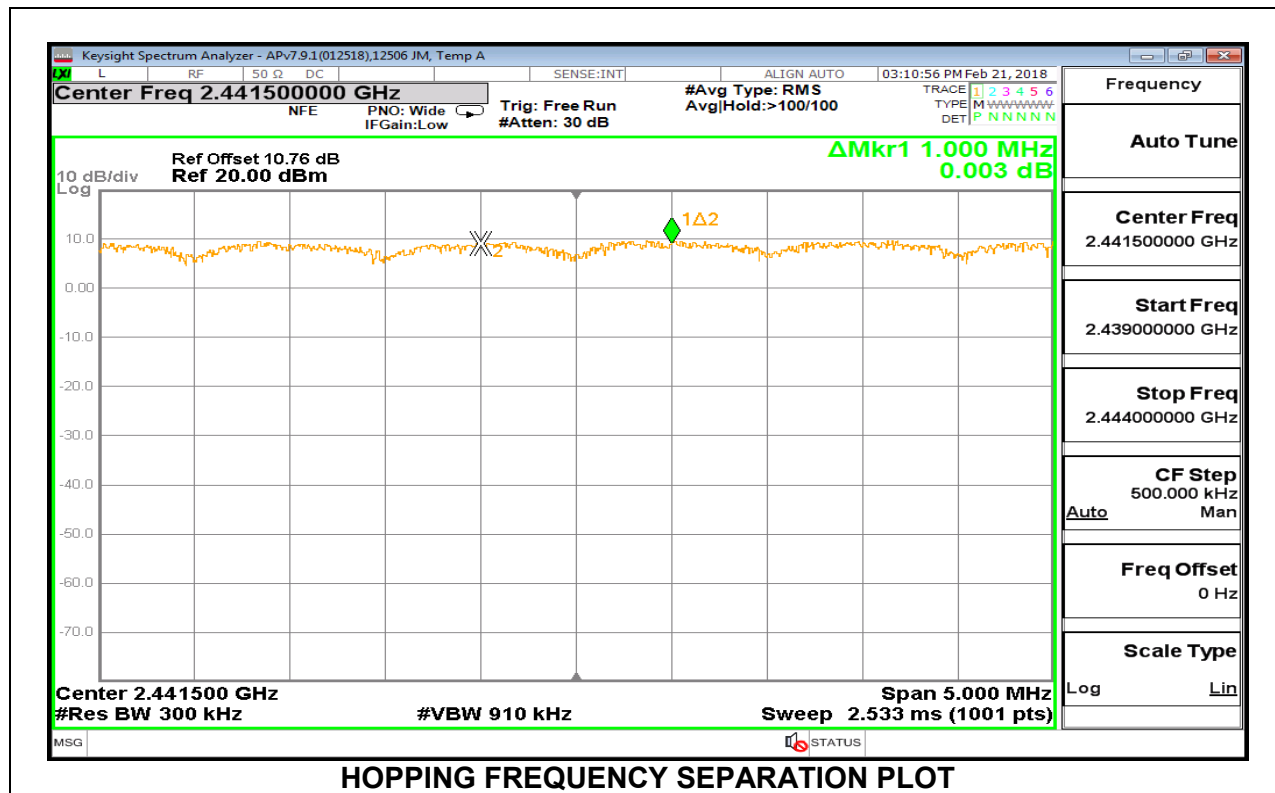
The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 910 kHz. The sweep time is coupled.

#### **RESULTS**

### 8.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



## 8.3.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION



## **8.4. NUMBER OF HOPPING CHANNELS**

### **LIMITS**

FCC §15.247 (a) (1) (iii)

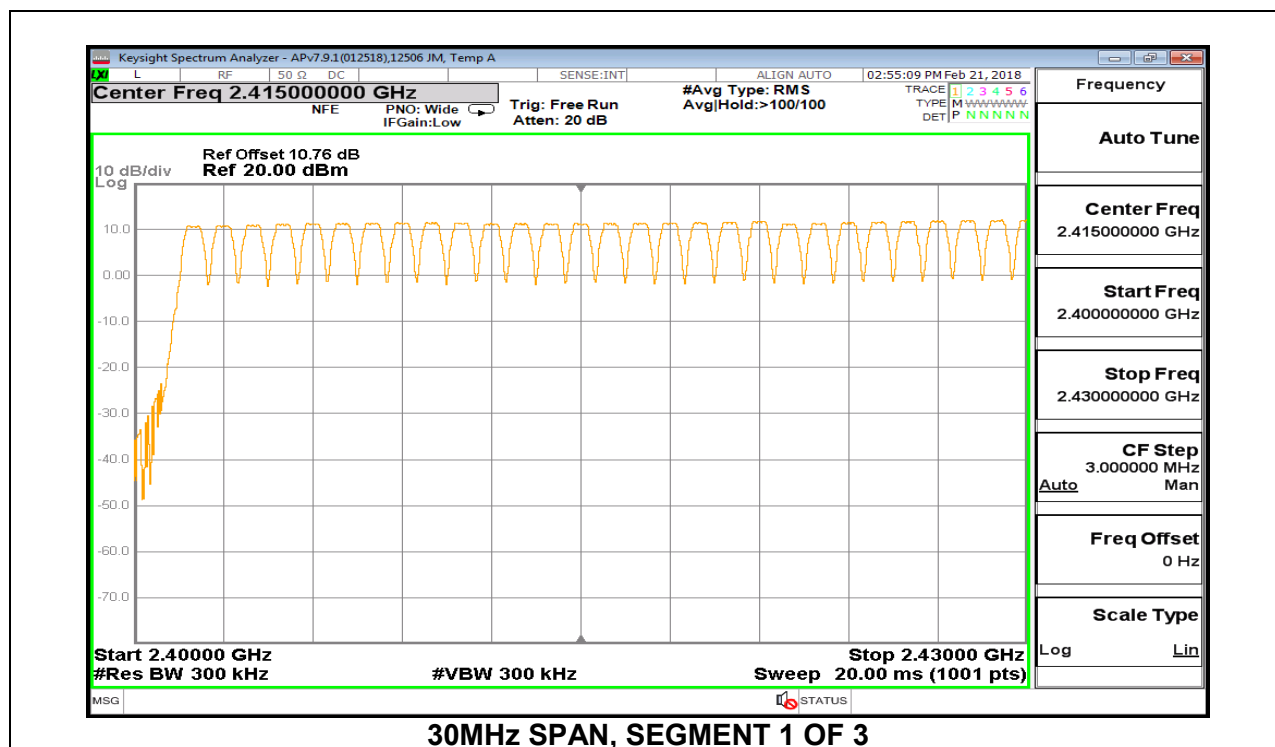
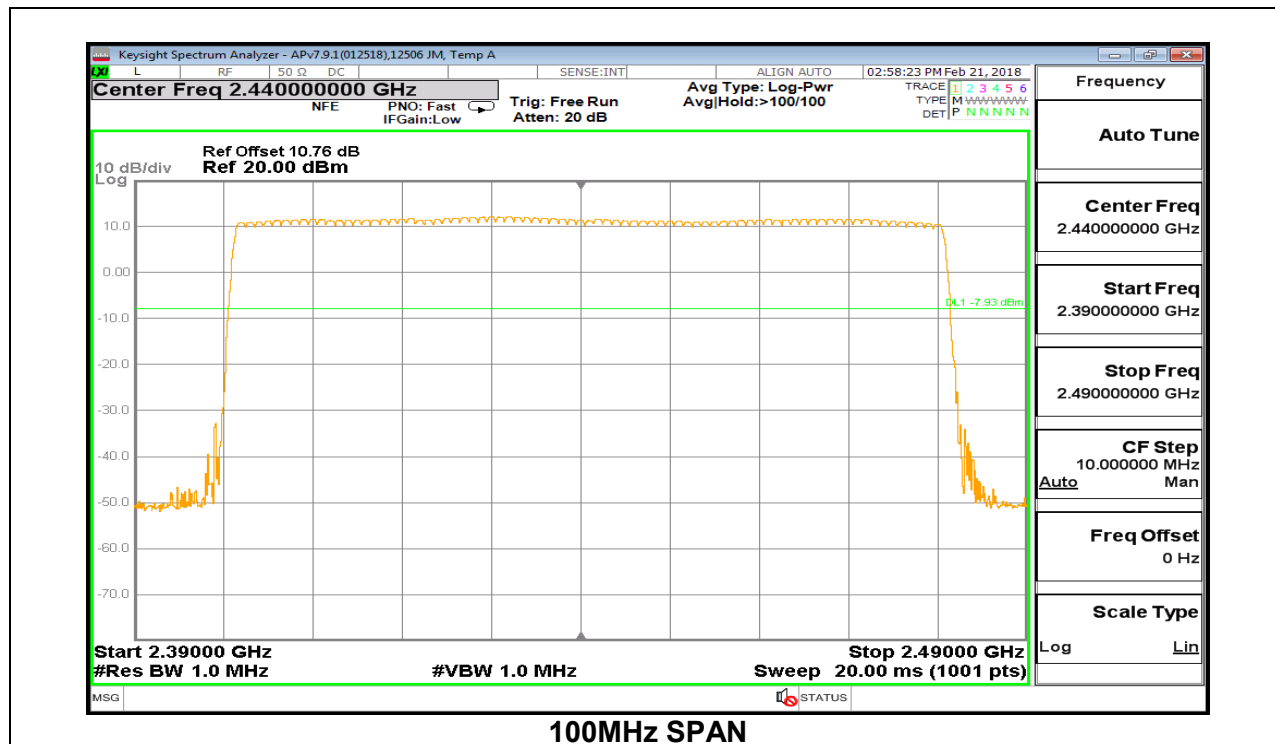
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

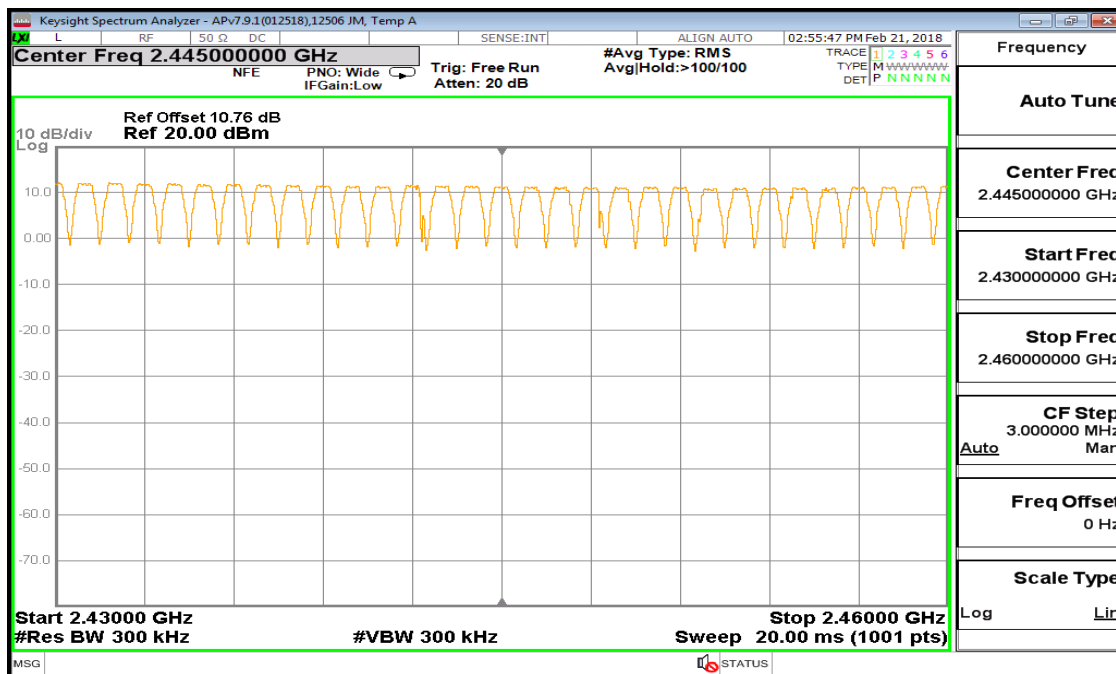
### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

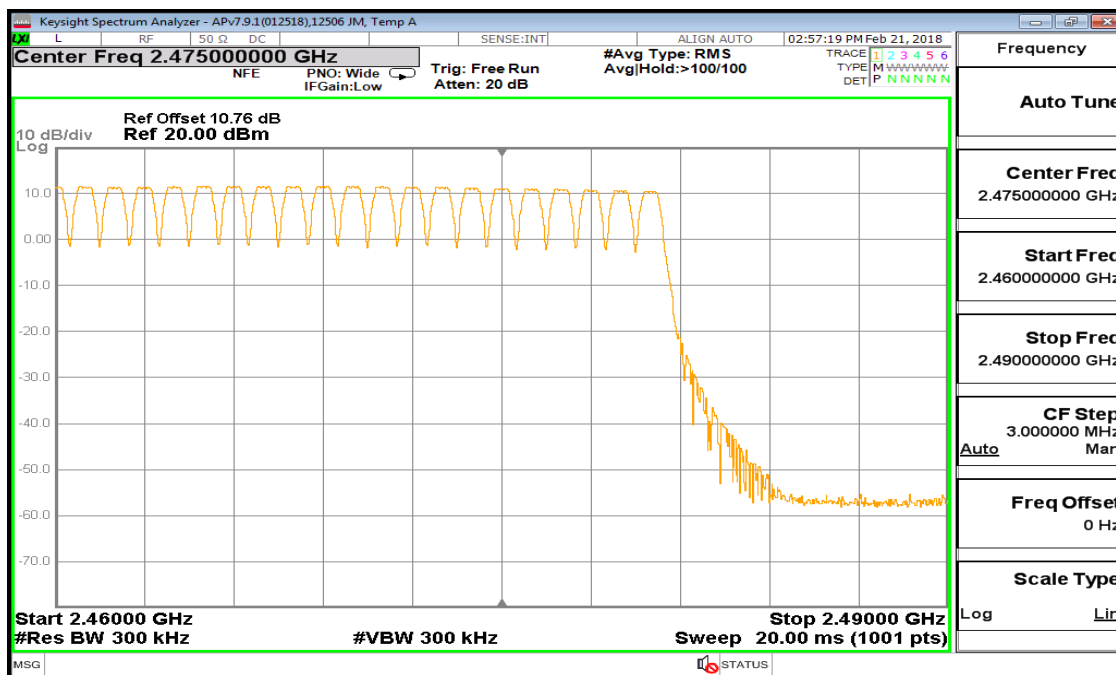
### **RESULTS**

## 8.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



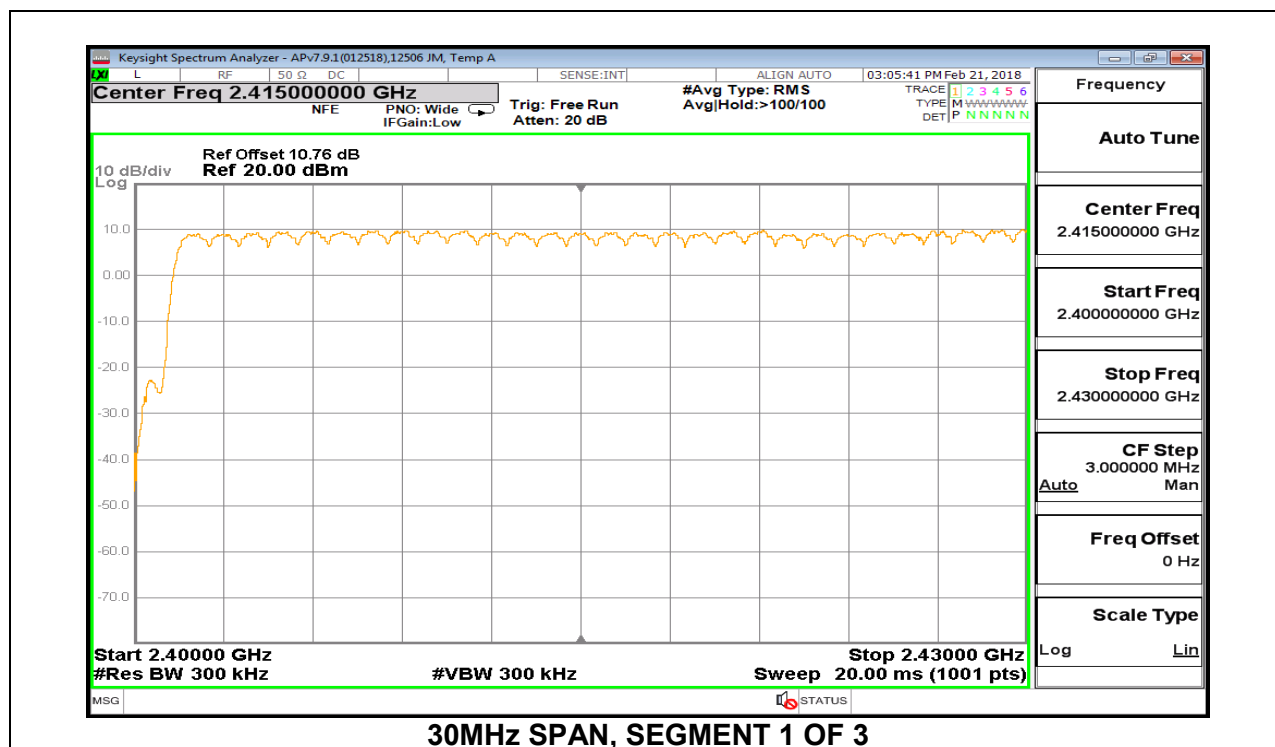
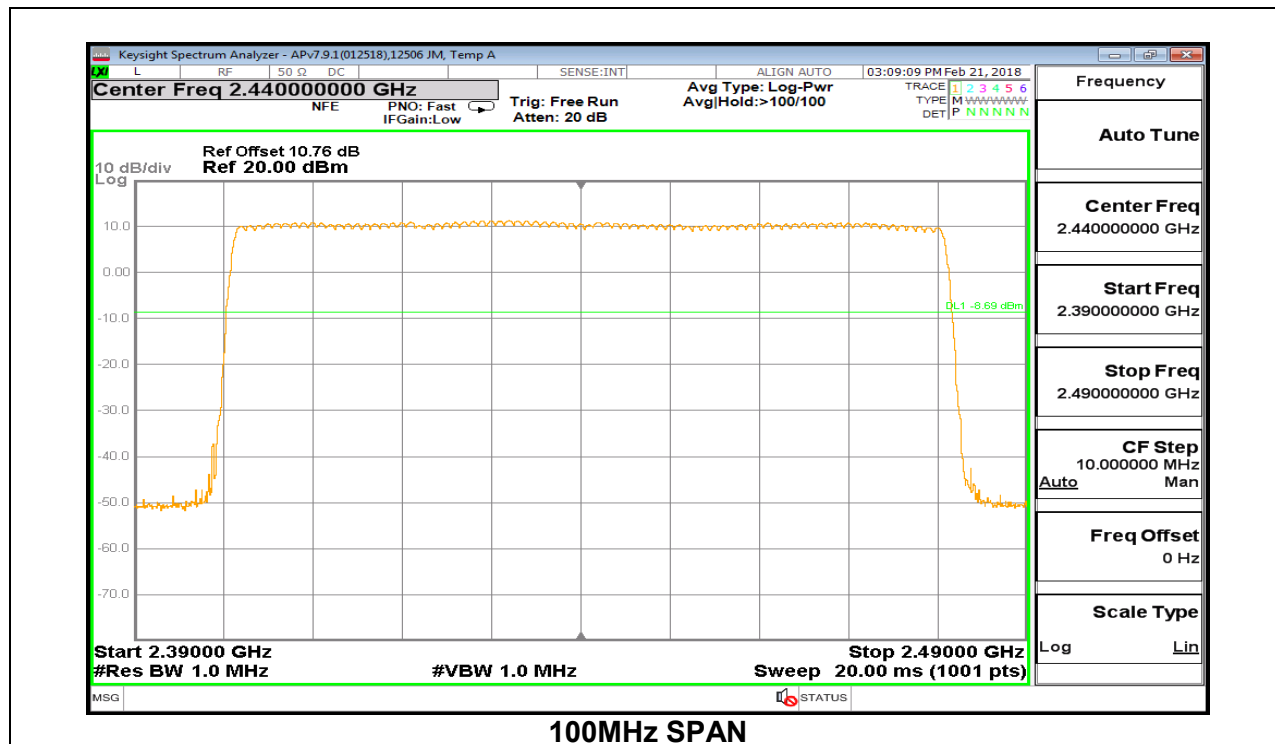


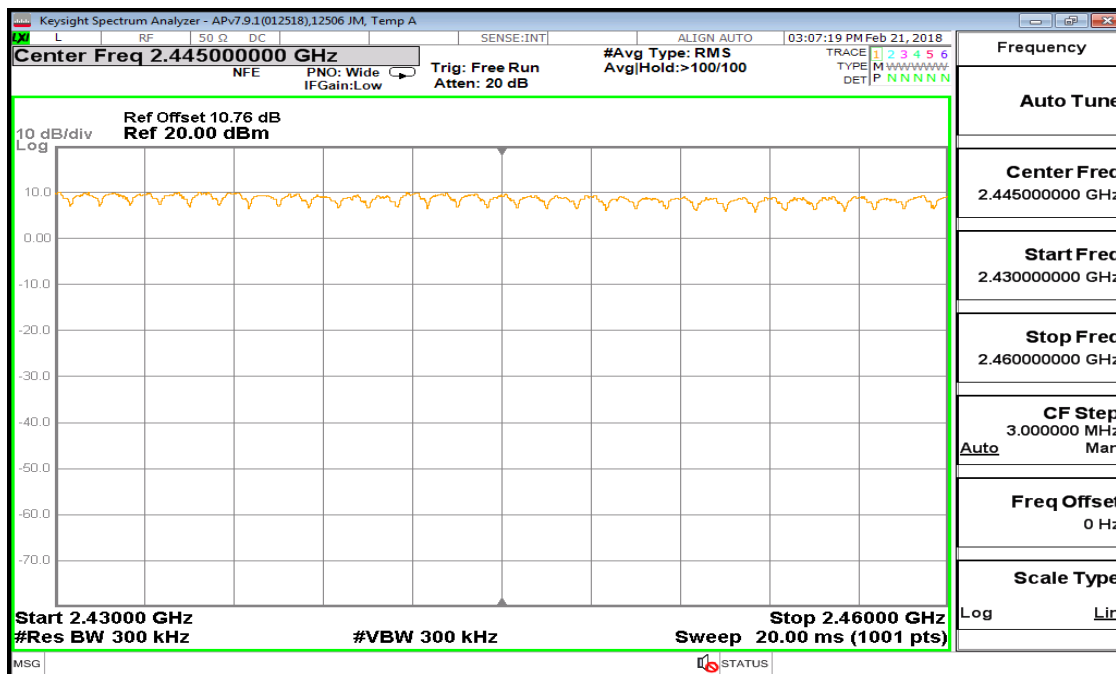
30MHz SPAN, SEGMENT 2 OF 3



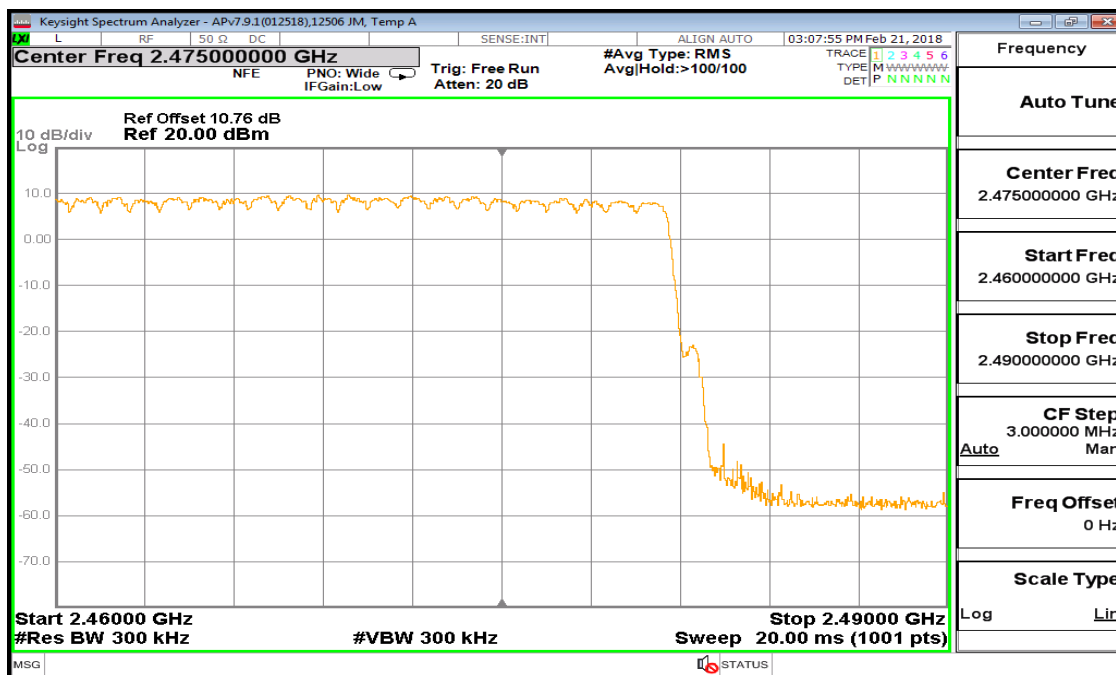
30MHz SPAN, SEGMENT 3 OF 3

## 8.4.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION





30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

## **8.5. AVERAGE TIME OF OCCUPANCY**

### **LIMITS**

FCC §15.247 (a) (1) (iii)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

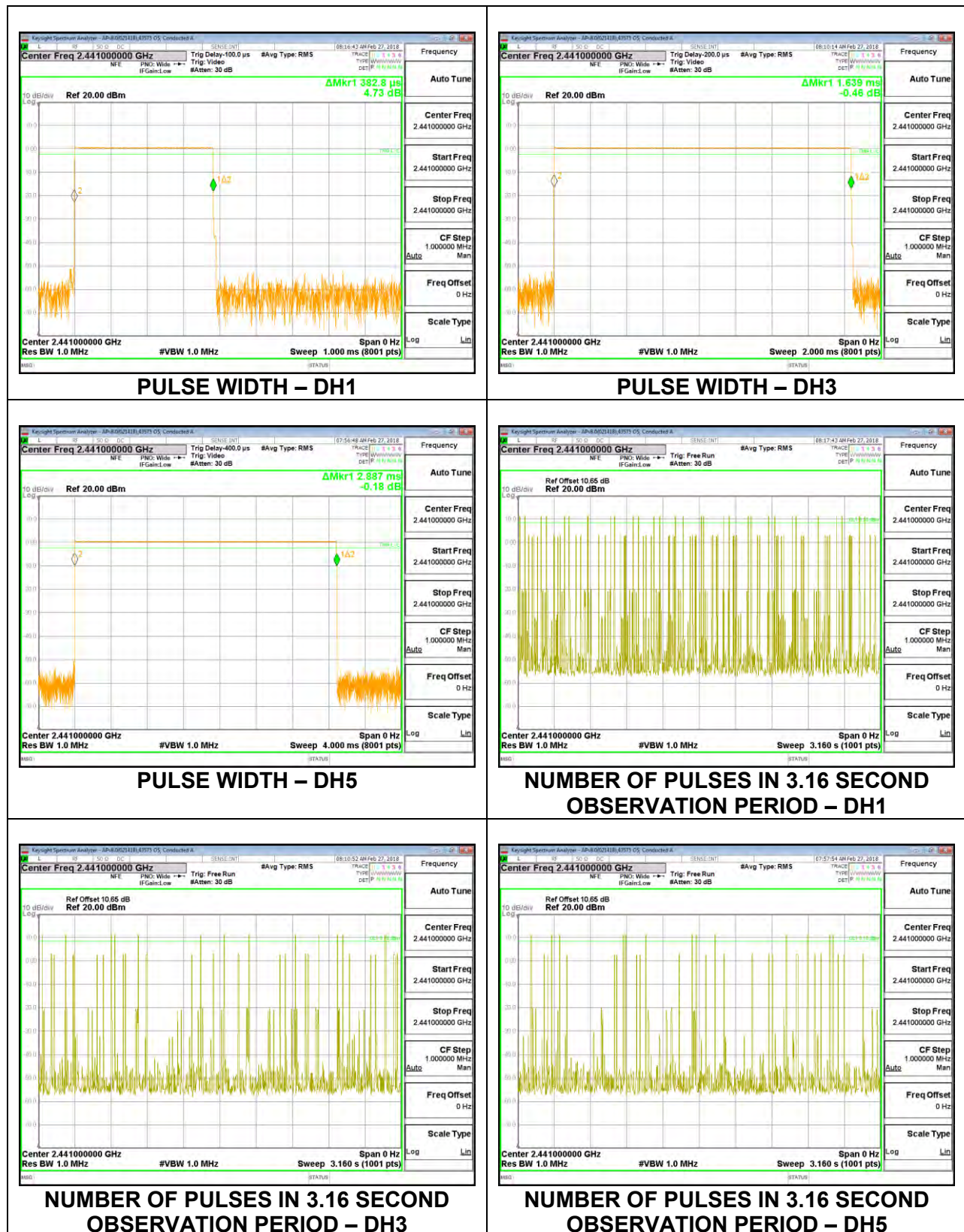
The average time of occupancy in the specified 3.16 second period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$ .

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$ .

### **RESULTS**

### 8.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

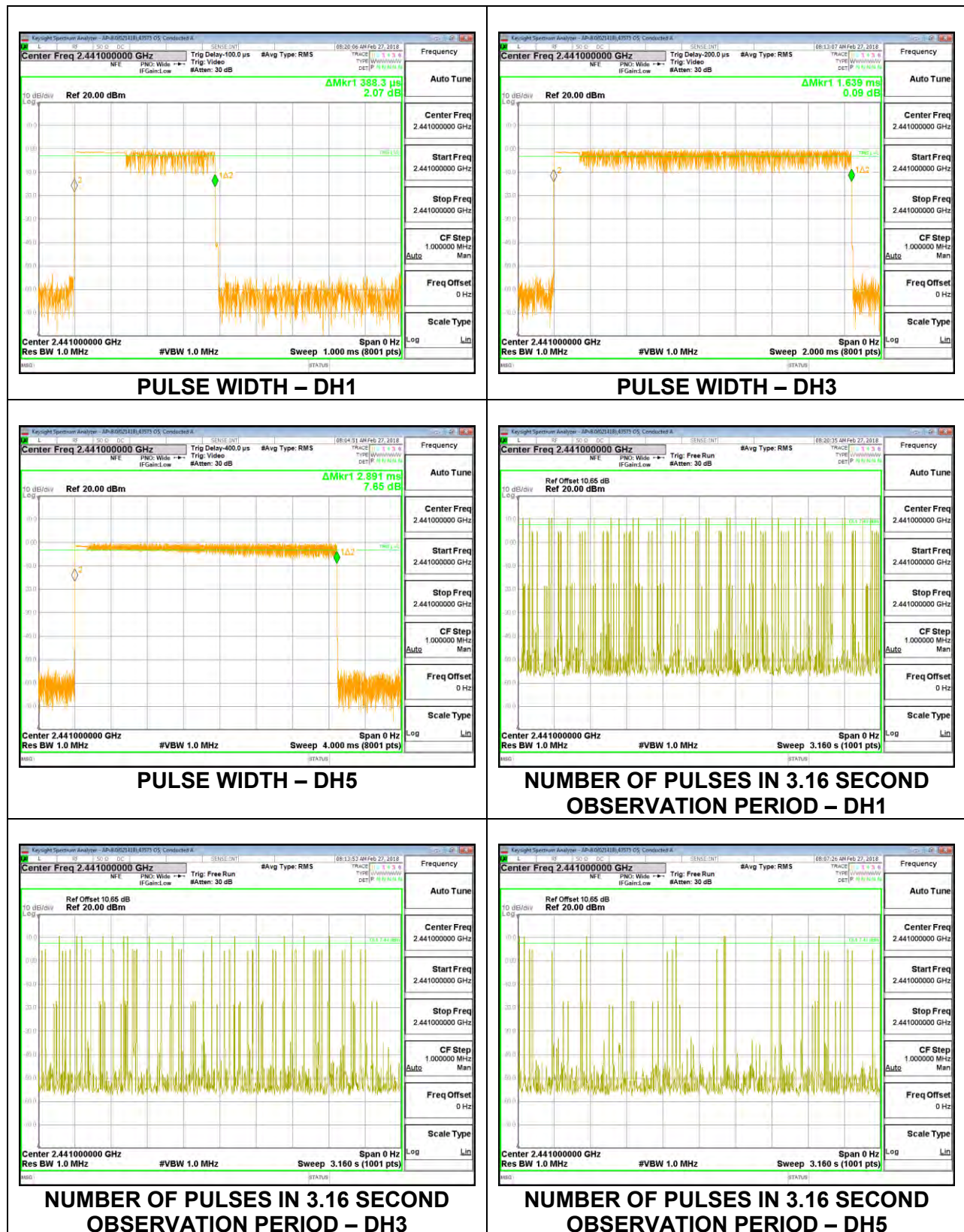
| DH Packet        | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
|------------------|--------------------|----------------------------------|---------------------------------|-------------|--------------|
| GFSK Normal Mode |                    |                                  |                                 |             |              |
| DH1              | 0.383              | 31                               | 0.1187                          | 0.4         | -0.2813      |
| DH3              | 1.639              | 13                               | 0.2131                          | 0.4         | -0.1869      |
| DH5              | 2.887              | 13                               | 0.3753                          | 0.4         | -0.0247      |
|                  |                    |                                  |                                 |             |              |
| DH Packet        | Pulse Width (sec)  | Number of Pulses in 0.8 seconds  | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
| GFSK AFH Mode    |                    |                                  |                                 |             |              |
| DH1              | 0.383              | 7.75                             | 0.02968                         | 0.4         | -0.3703      |
| DH3              | 1.639              | 3.25                             | 0.05327                         | 0.4         | -0.3467      |
| DH5              | 2.887              | 3.25                             | 0.09383                         | 0.4         | -0.3062      |



## 8.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

| DH Packet        | Pulse Width (msec) | Number of Pulses in 3.16 seconds | Average Time of Occupancy (sec) | Limit (sec) | Margin (sec) |
|------------------|--------------------|----------------------------------|---------------------------------|-------------|--------------|
| 8PSK Normal Mode |                    |                                  |                                 |             |              |
| DH1              | 0.388              | 32                               | 0.12416                         | 0.4         | -0.27584     |
| DH3              | 1.639              | 15                               | 0.24585                         | 0.4         | -0.15415     |
| DH5              | 2.89               | 9                                | 0.2601                          | 0.4         | -0.1399      |

Note: for AFH (8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate in section 4.5.1 demonstrates compliance with channel occupancy when AFH is employed.



## **8.6. OUTPUT POWER**

### **LIMITS**

§15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels the limit shall not be greater than 30dBm. For all other frequency hopping systems in the 2400-2483.5 MHz band the limit shall not be greater than 21dBm.

### **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 a gated peak reading of power.

### **RESULTS**

### 8.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

|            |           |
|------------|-----------|
| Tested By: | GE43578   |
| Date:      | 2/17/2018 |

| Channel | Frequency<br>(MHz) | Output Peak Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|----------------------------|----------------|----------------|
| Low     | 2402               | 10.95                      | 30             | -19.05         |
| Middle  | 2441               | <b>11.32</b>               | 30             | -18.68         |
| High    | 2480               | 10.39                      | 30             | -19.61         |

## 8.6.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

|            |           |
|------------|-----------|
| Tested By: | GE43578   |
| Date:      | 2/17/2018 |

| Channel | Frequency<br>(MHz) | Output Peak Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|----------------------------|----------------|----------------|
| Low     | 2402               | 8.94                       | 21             | -12.06         |
| Middle  | 2441               | <b>9.35</b>                | 21             | -11.65         |
| High    | 2480               | 8.43                       | 21             | -12.57         |

## **8.7. AVERAGE POWER**

### **LIMITS**

None; for reporting purposes only

### **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 a gated Average reading of power.

### **RESULTS**

### 8.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

|            |           |
|------------|-----------|
| Tested By: | GE43578   |
| Date       | 2/17/2018 |

| Channel | Frequency<br>(MHz) | Average Power<br>(dBm) |
|---------|--------------------|------------------------|
| Low     | 2402               | 10.71                  |
| Middle  | 2441               | <b>11.07</b>           |
| High    | 2480               | 10.27                  |

## 8.7.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

|            |           |
|------------|-----------|
| Tested By: | GE43578   |
| Date       | 2/17/2018 |

| Channel | Frequency<br>(MHz) | Average Power<br>(dBm) |
|---------|--------------------|------------------------|
| Low     | 2402               | 8.17                   |
| Middle  | 2441               | <b>8.71</b>            |
| High    | 2480               | 7.96                   |

## **8.8. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

Limit = -20 dBc

### **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.

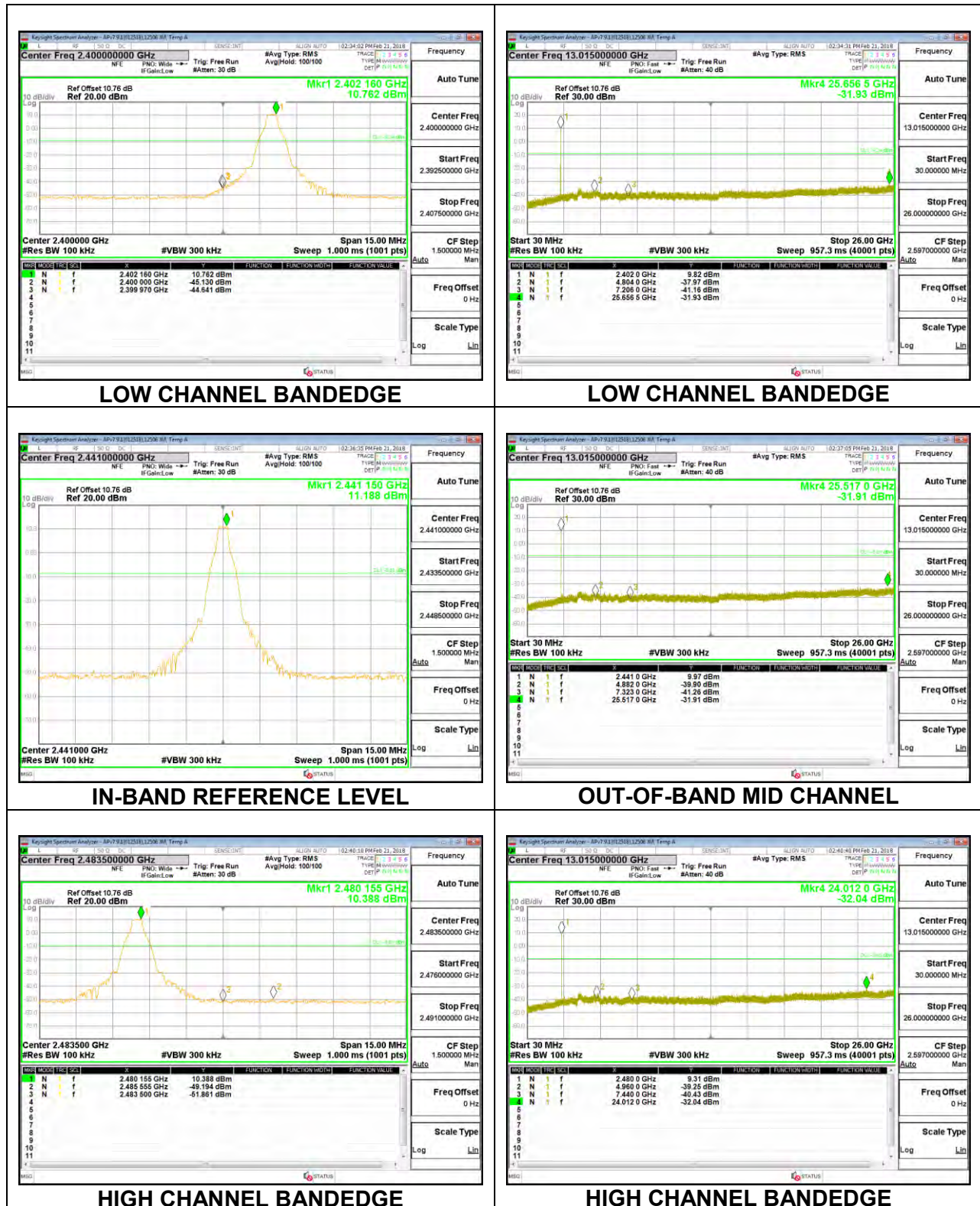
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

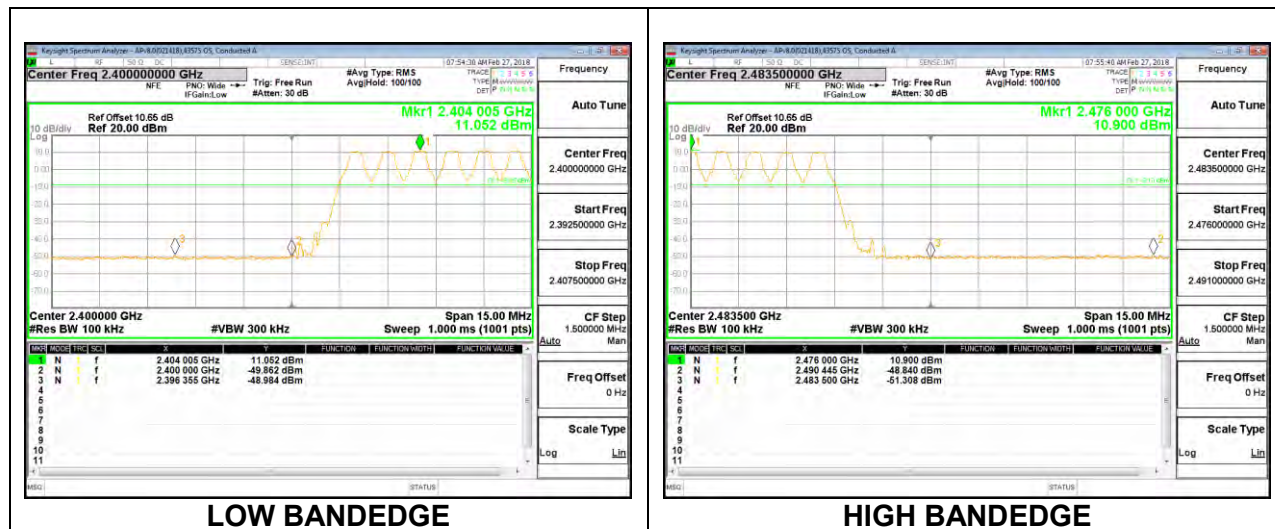
### **RESULTS**

## 8.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

### SPURIOUS EMISSIONS, NON-HOPPING

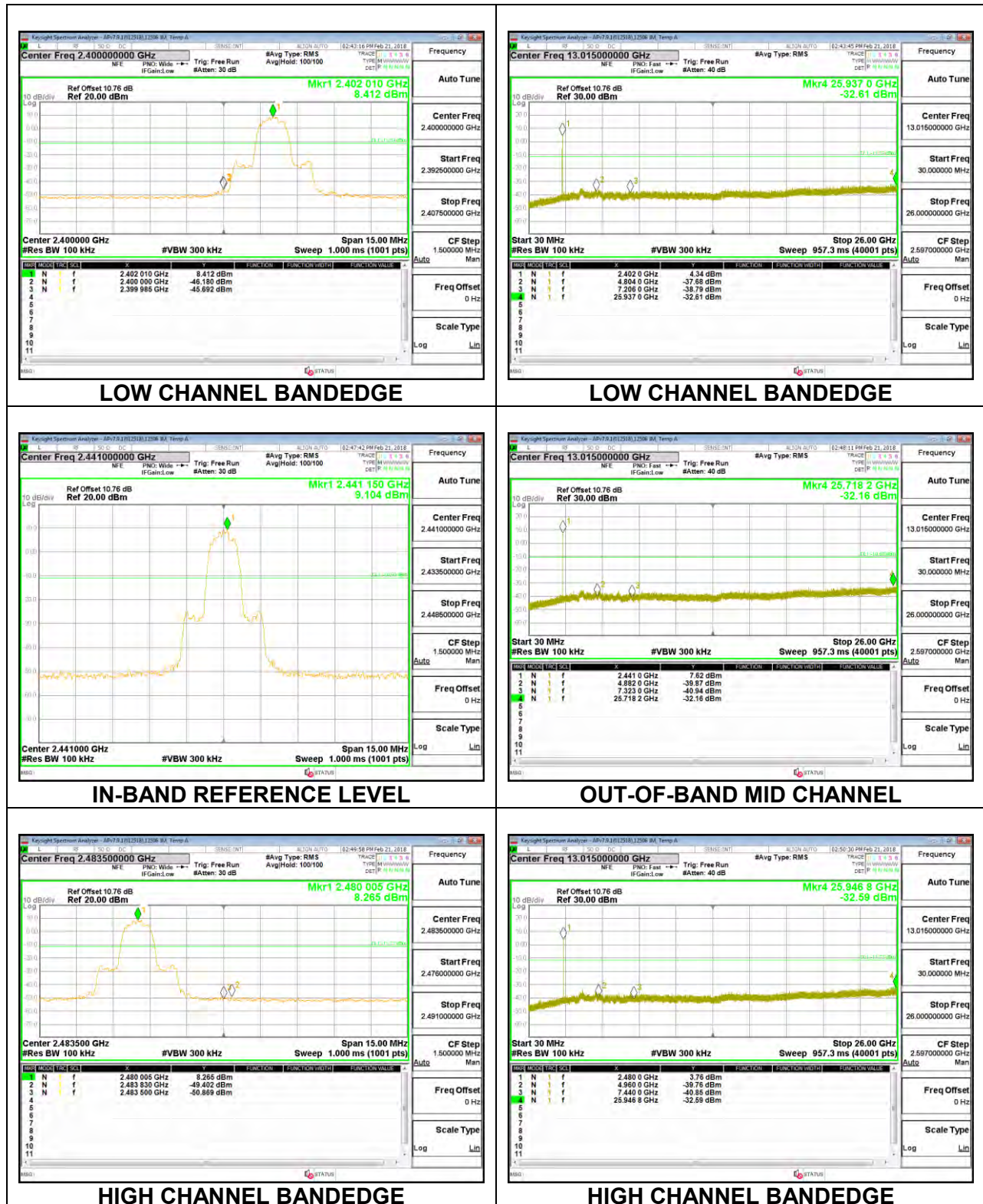


## SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



## 8.8.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

### SPURIOUS EMISSIONS, NON-HOPPING



**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**



## 9. RADIATED TEST RESULTS

### 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 measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T (360 Hz) video bandwidth with peak detector 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 30MHz, below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

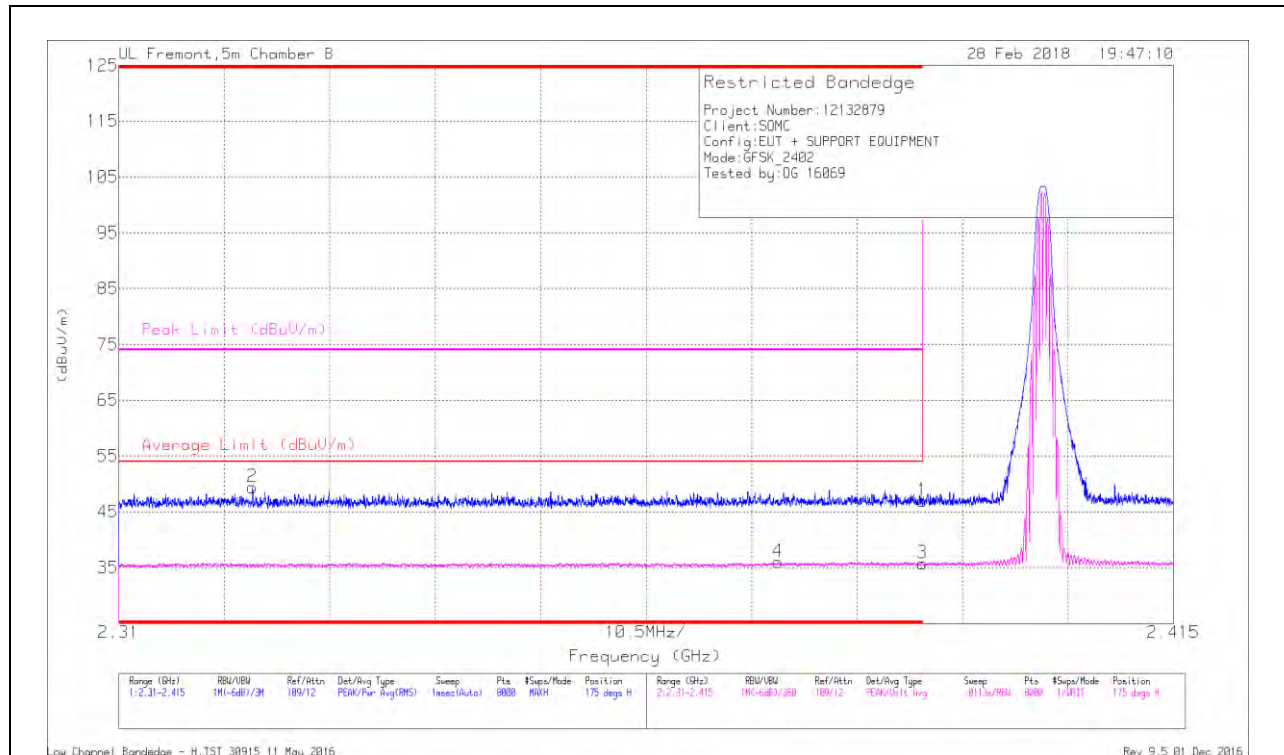
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 9.1. TRANSMITTER ABOVE 1 GHz

### 9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

#### BANDEDGE (LOW CHANNEL)

#### HORIZONTAL RESULT



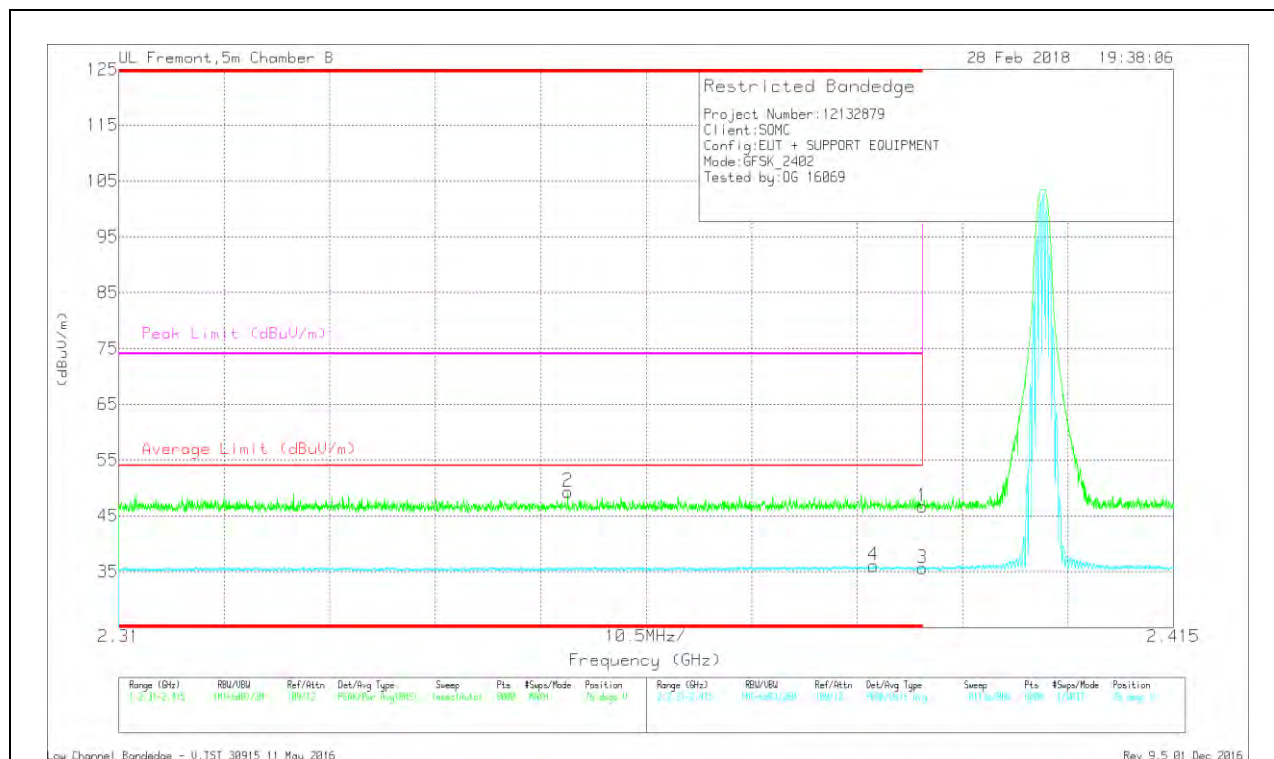
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Fitr/P ad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 36.25                | Pk   | 32             | -21.3                  | 46.95                      | -                      | -           | 74                  | -27.05         | 175            | 275         | H        |
| 2      | * 2.323         | 38.82                | Pk   | 31.9           | -21.3                  | 49.42                      | -                      | -           | 74                  | -24.58         | 175            | 275         | H        |
| 3      | * 2.39          | 25.04                | VA1T | 32             | -21.3                  | 35.74                      | 54                     | -18.26      | -                   | -              | 175            | 275         | H        |
| 4      | * 2.376         | 25.43                | VA1T | 31.9           | -21.3                  | 36.03                      | 54                     | -17.97      | -                   | -              | 175            | 275         | H        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Fitr/P ad (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          | 35.95                | Pk   | 32             | -21.3                  | 46.65                      | -                      | -           | 74                  | -27.35         | 76             | 168         | V        |
| 2      | * 2.355         | 38.76                | Pk   | 31.9           | -21.3                  | 49.36                      | -                      | -           | 74                  | -24.64         | 76             | 168         | V        |
| 3      | * 2.39          | 24.95                | VA1T | 32             | -21.3                  | 35.65                      | 54                     | -18.35      | -                   | -              | 76             | 168         | V        |
| 4      | * 2.385         | 25.38                | VA1T | 32             | -21.3                  | 36.08                      | 54                     | -17.92      | -                   | -              | 76             | 168         | V        |

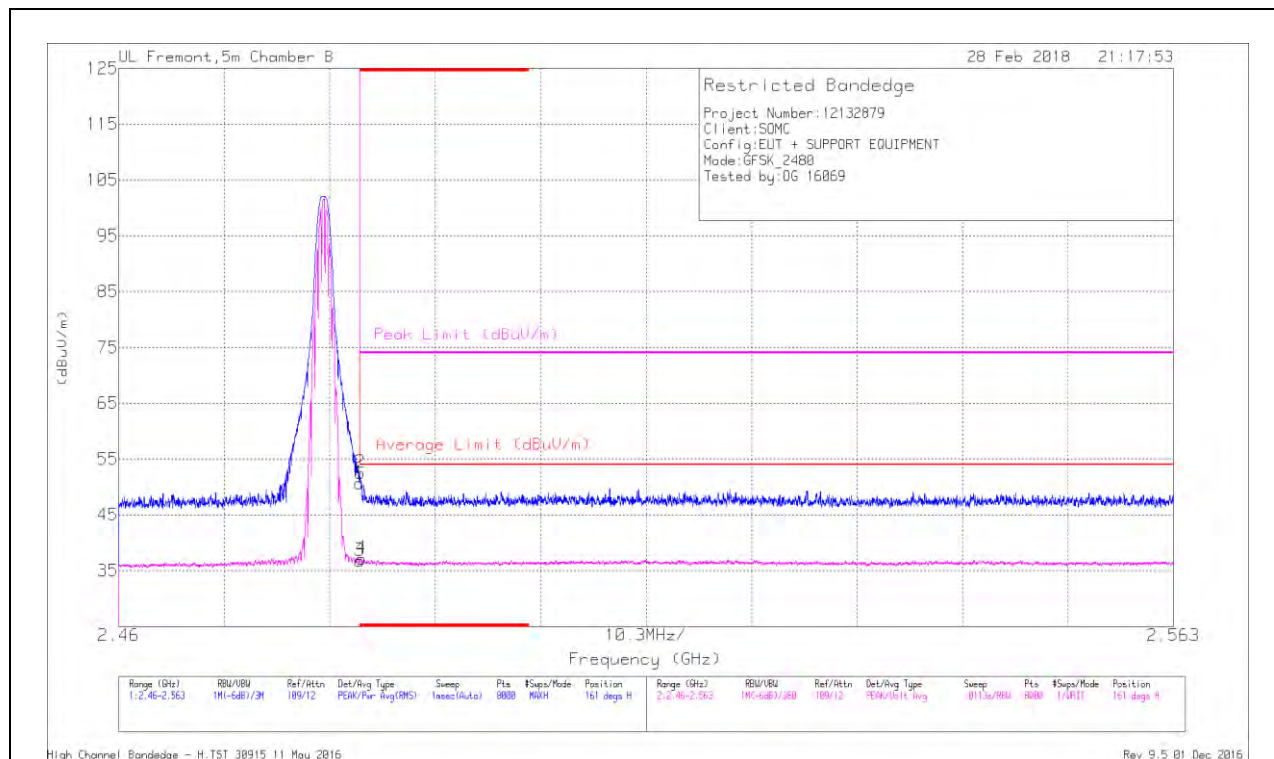
\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT



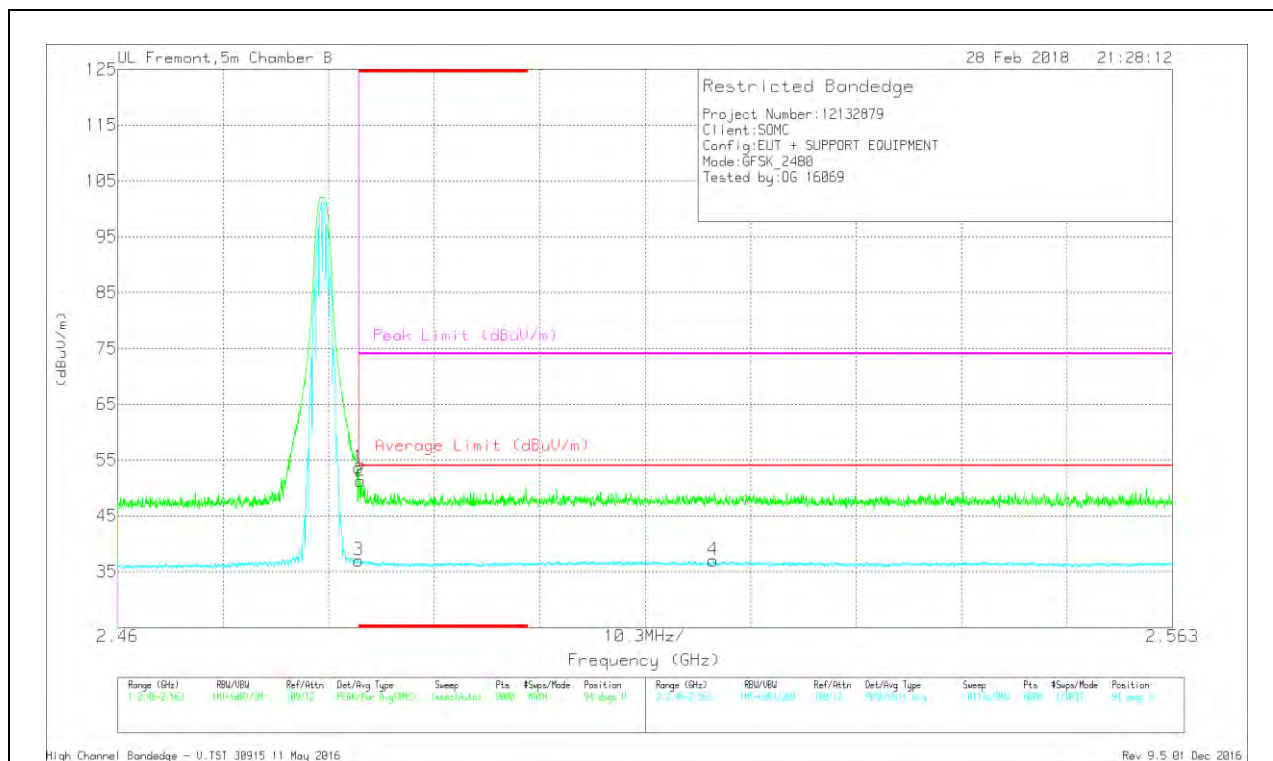
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Fitr/P ad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.484         | 39.43                | Pk   | 32.5           | -21.3                  | 50.63                      | -                      | -           | 74                  | -23.37         | 161            | 223         | H        |
| 2      | * 2.484         | 41.27                | Pk   | 32.5           | -21.3                  | 52.47                      | -                      | -           | 74                  | -21.53         | 161            | 223         | H        |
| 3      | * 2.484         | 25.55                | VA1T | 32.5           | -21.3                  | 36.75                      | 54                     | -17.25      | -                   | -              | 161            | 223         | H        |
| 4      | * 2.484         | 25.93                | VA1T | 32.5           | -21.3                  | 37.13                      | 54                     | -16.87      | -                   | -              | 161            | 223         | H        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $VB=1/T_{on}$  where:  $T_{on}$  is transmit duration

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dBm) | Amp/Cbl/Filtr/P ad (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         | 42.4                 | Pk   | 32.5          | -21.3                   | 53.6                       | -                      | -           | 74                  | -20.4          | 94             | 196         | V        |
| 2      | * 2.484         | 40.04                | Pk   | 32.5          | -21.3                   | 51.24                      | -                      | -           | 74                  | -22.76         | 94             | 196         | V        |
| 3      | * 2.484         | 25.81                | VA1T | 32.5          | -21.3                   | 37.01                      | 54                     | -16.99      | -                   | -              | 94             | 196         | V        |
| 4      | 2.518           | 25.46                | VA1T | 32.6          | -21.1                   | 36.96                      | 54                     | -17.04      | -                   | -              | 94             | 196         | V        |

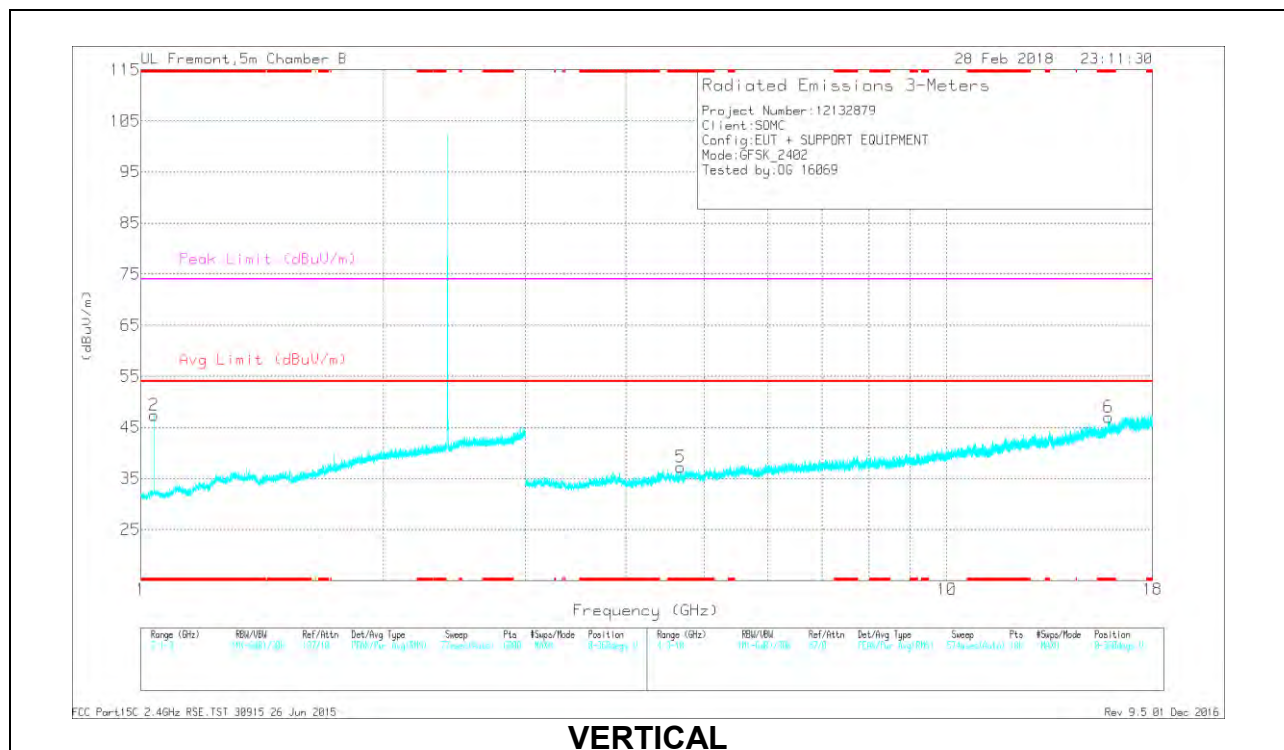
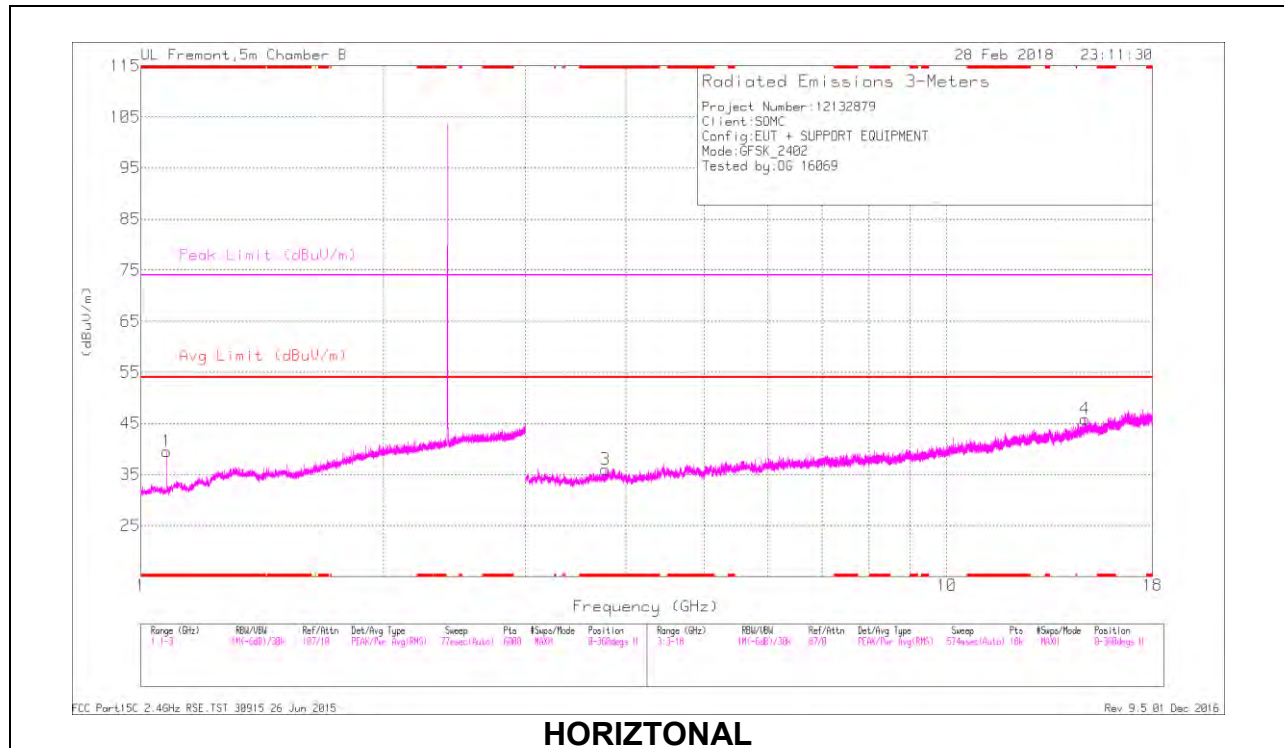
\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS



## RADIATED EMISSIONS

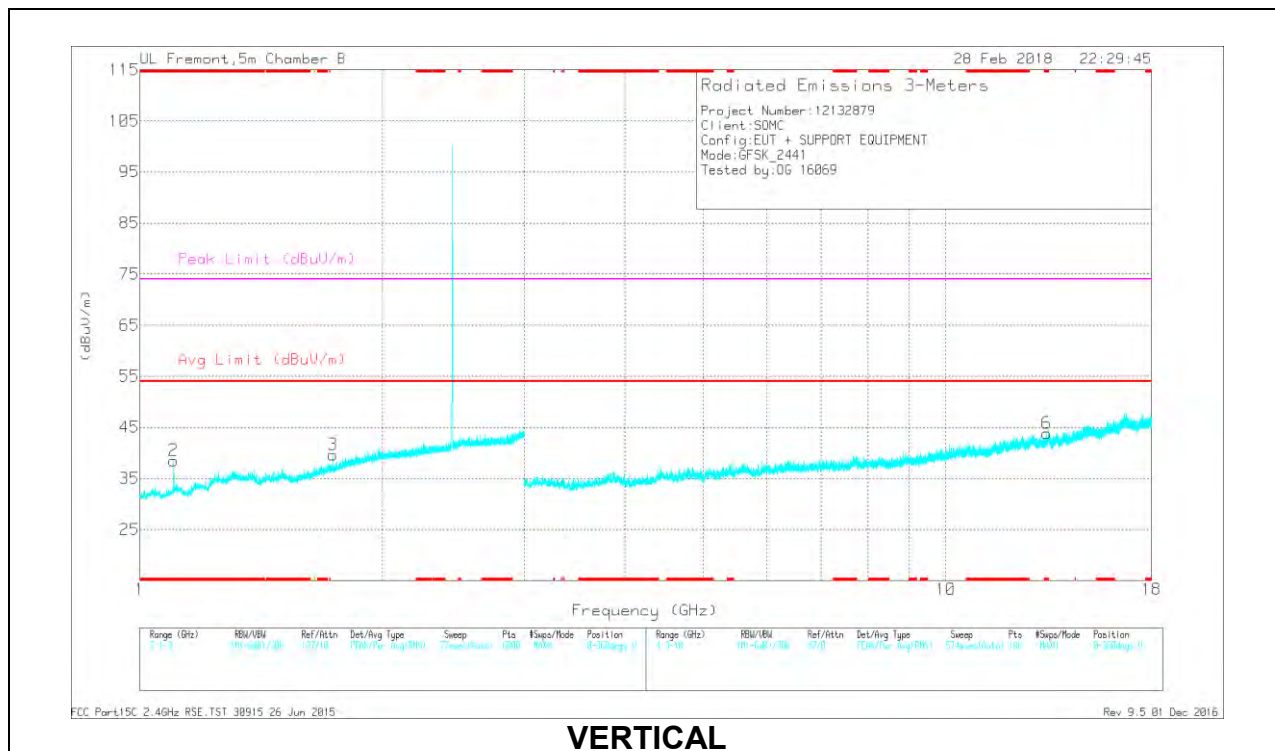
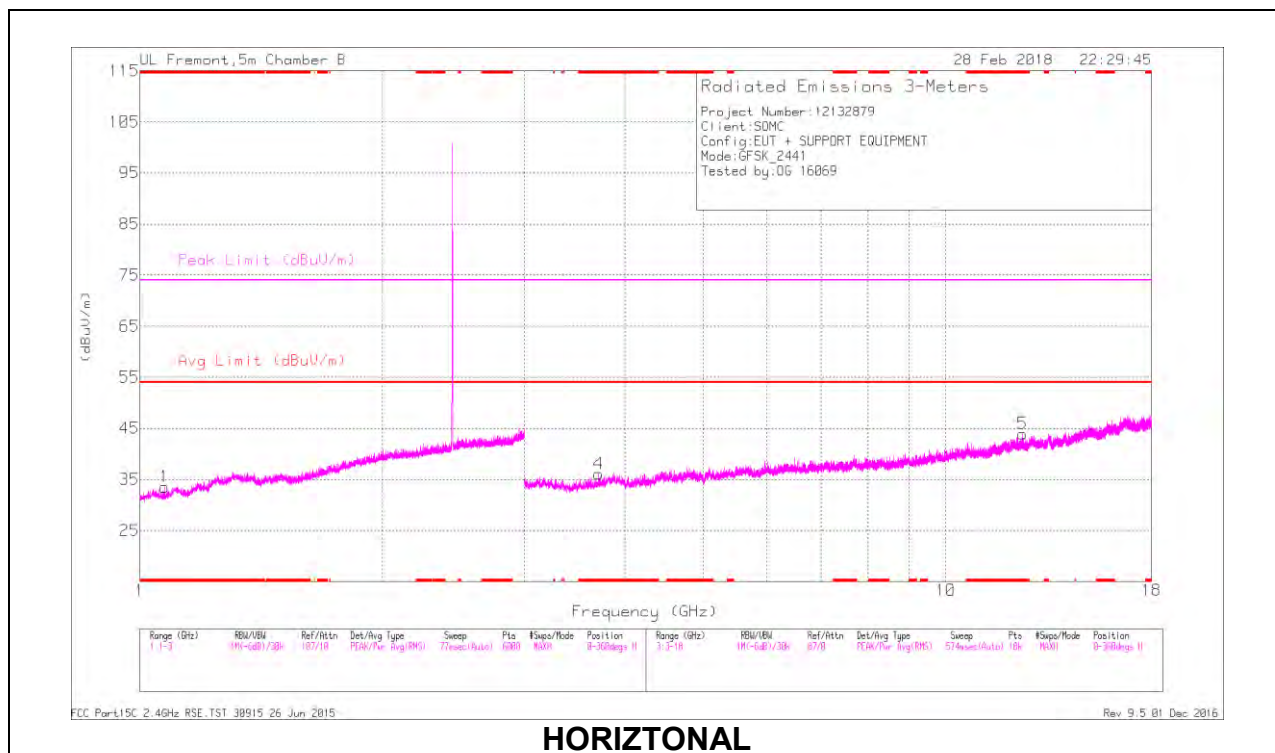
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Filtr/P ad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|-------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 1.074         | 32.38                | PKFH | 27.3           | -23                     | 36.68                      | -                  | -           | 74                  | -37.32         | 27             | 281         | H        |
| 1      | * 1.075         | 21.83                | VA1T | 27.3           | -23.1                   | 26.03                      | 54                 | -27.97      | -                   | -              | 27             | 281         | H        |
| 2      | * 1.039         | 34.11                | PKFH | 27.1           | -23.2                   | 38.01                      | -                  | -           | 74                  | -35.99         | 205            | 363         | V        |
| 2      | * 1.04          | 22.64                | VA1T | 27.1           | -23.3                   | 26.44                      | 54                 | -27.56      | -                   | -              | 205            | 363         | V        |
| 3      | * 3.773         | 38.34                | PKFH | 33.4           | -31.5                   | 40.24                      | -                  | -           | 74                  | -33.76         | 119            | 347         | H        |
| 3      | * 3.773         | 27.45                | VA1T | 33.4           | -31.5                   | 29.35                      | 54                 | -24.65      | -                   | -              | 119            | 347         | H        |
| 5      | * 4.672         | 37.73                | PKFH | 34.3           | -30.8                   | 41.23                      | -                  | -           | 74                  | -32.77         | 48             | 170         | V        |
| 5      | * 4.674         | 27.06                | VA1T | 34.3           | -30.9                   | 30.46                      | 54                 | -23.54      | -                   | -              | 48             | 170         | V        |
| 6      | * 15.865        | 31.09                | PKFH | 41             | -20.9                   | 51.19                      | -                  | -           | 74                  | -22.81         | 0              | 186         | V        |
| 6      | * 15.864        | 19.63                | VA1T | 41             | -20.9                   | 39.73                      | 54                 | -14.27      | -                   | -              | 0              | 186         | V        |
| 4      | 14.833          | 31.7                 | PKFH | 40.6           | -23.5                   | 48.8                       | -                  | -           | -                   | -              | 15             | 205         | H        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## MID CHANNEL RESULTS



## RADIATED EMISSIONS

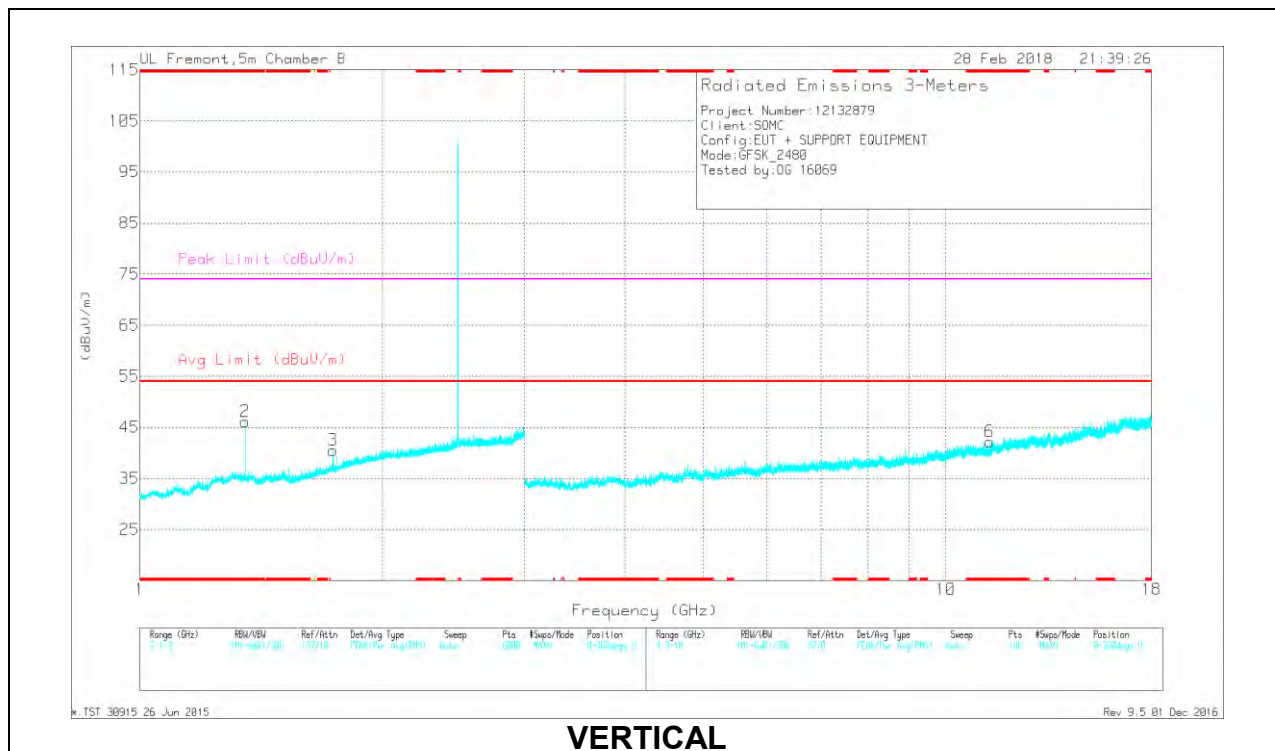
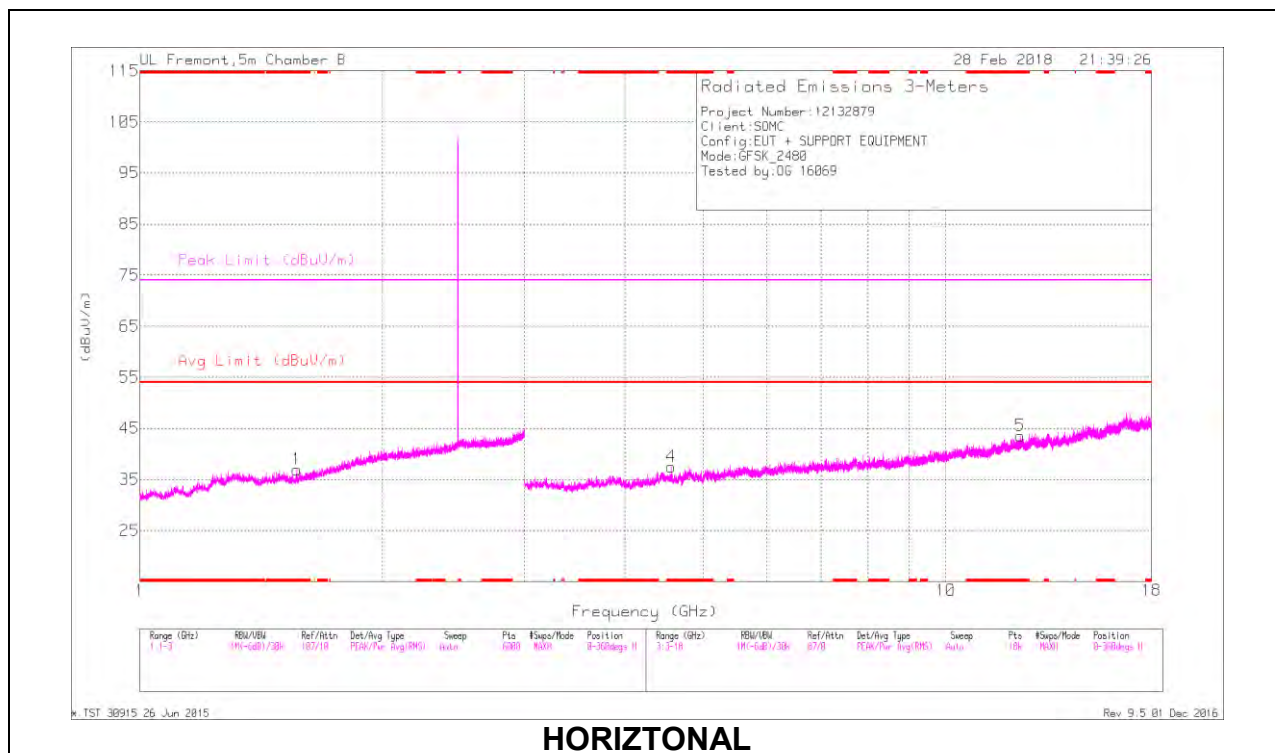
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Filtr/P ad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|-------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 1.071         | 32.22                | PKFH | 27.3           | -23.2                   | 36.32                      | -                  | -           | 74                  | -37.68         | 245            | 200         | H        |
| 1      | * 1.071         | 21.89                | VA1T | 27.3           | -23.2                   | 25.99                      | 54                 | -28.01      | -                   | -              | 245            | 200         | H        |
| 2      | * 1.102         | 33.45                | PKFH | 27.7           | -22.8                   | 38.35                      | -                  | -           | 74                  | -35.65         | 95             | 325         | V        |
| 2      | * 1.102         | 22.3                 | VA1T | 27.7           | -22.8                   | 27.2                       | 54                 | -26.8       | -                   | -              | 95             | 325         | V        |
| 4      | * 3.711         | 38.02                | PKFH | 33.3           | -31.5                   | 39.82                      | -                  | -           | 74                  | -34.18         | 189            | 350         | H        |
| 4      | * 3.709         | 27.43                | VA1T | 33.3           | -31.5                   | 29.23                      | 54                 | -24.77      | -                   | -              | 189            | 350         | H        |
| 5      | * 12.453        | 32.76                | PKFH | 39             | -23.8                   | 47.96                      | -                  | -           | 74                  | -26.04         | 209            | 255         | H        |
| 5      | * 12.452        | 21.35                | VA1T | 39             | -23.8                   | 36.55                      | 54                 | -17.45      | -                   | -              | 209            | 255         | H        |
| 6      | * 13.339        | 32.73                | PKFH | 39.3           | -24                     | 48.03                      | -                  | -           | 74                  | -25.97         | 360            | 176         | V        |
| 6      | * 13.337        | 21.57                | VA1T | 39.3           | -24                     | 36.87                      | 54                 | -17.13      | -                   | -              | 360            | 176         | V        |
| 3      | 1.738           | 39.09                | PKFH | 29.5           | -21.1                   | 47.49                      | -                  | -           | -                   | -              | 23             | 240         | V        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## HIGH CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Filtr/P ad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|-------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 1.567         | 33.28                | PKFH | 27.9           | -21.3                   | 39.88                      | -                  | -           | 74                  | -34.12         | 205            | 116         | H        |
| 1      | * 1.565         | 22.05                | VA1T | 27.9           | -21.3                   | 28.65                      | 54                 | -25.35      | -                   | -              | 205            | 116         | H        |
| 2      | * 1.349         | 32.89                | PKFH | 28.9           | -21.8                   | 39.99                      | -                  | -           | 74                  | -34.01         | 188            | 338         | V        |
| 2      | * 1.352         | 22                   | VA1T | 28.9           | -21.8                   | 29.1                       | 54                 | -24.9       | -                   | -              | 188            | 338         | V        |
| 4      | * 4.565         | 37.64                | PKFH | 34.2           | -31.1                   | 40.74                      | -                  | -           | 74                  | -33.26         | 111            | 256         | H        |
| 4      | * 4.566         | 27.17                | VA1T | 34.2           | -31.1                   | 30.27                      | 54                 | -23.73      | -                   | -              | 111            | 256         | H        |
| 5      | * 12.365        | 32.57                | PKFH | 39             | -24.2                   | 47.37                      | -                  | -           | 74                  | -26.63         | 126            | 356         | H        |
| 5      | * 12.366        | 21.32                | VA1T | 39             | -24.2                   | 36.12                      | 54                 | -17.88      | -                   | -              | 126            | 356         | H        |
| 6      | * 11.325        | 32.52                | PKFH | 37.9           | -24.7                   | 45.72                      | -                  | -           | 74                  | -28.28         | 200            | 210         | V        |
| 6      | * 11.323        | 21.54                | VA1T | 37.9           | -24.7                   | 34.74                      | 54                 | -19.26      | -                   | -              | 200            | 210         | V        |
| 3      | 1.735           | 33.91                | PKFH | 29.5           | -21.3                   | 42.11                      | -                  | -           | -                   | -              | 342            | 381         | V        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

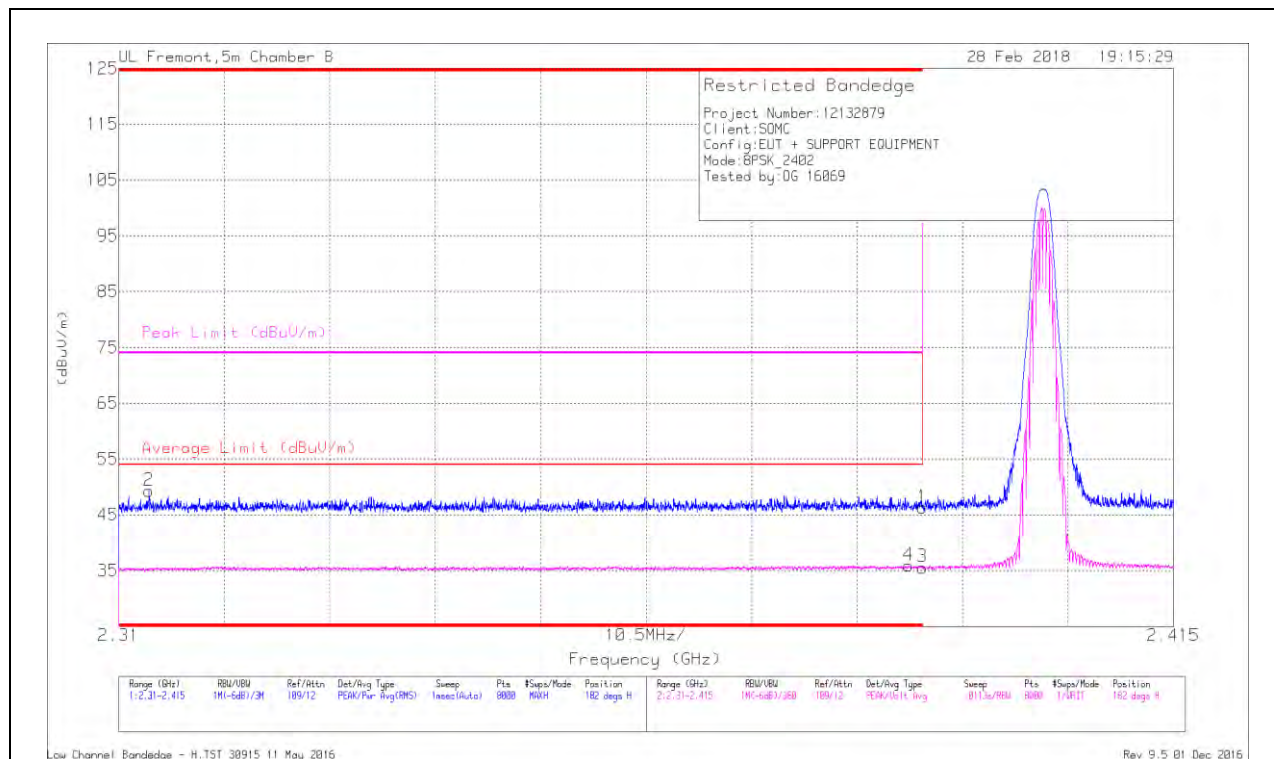
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## 9.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

### BANDEDGE (LOW CHANNEL)

#### HORIZONTAL RESULT



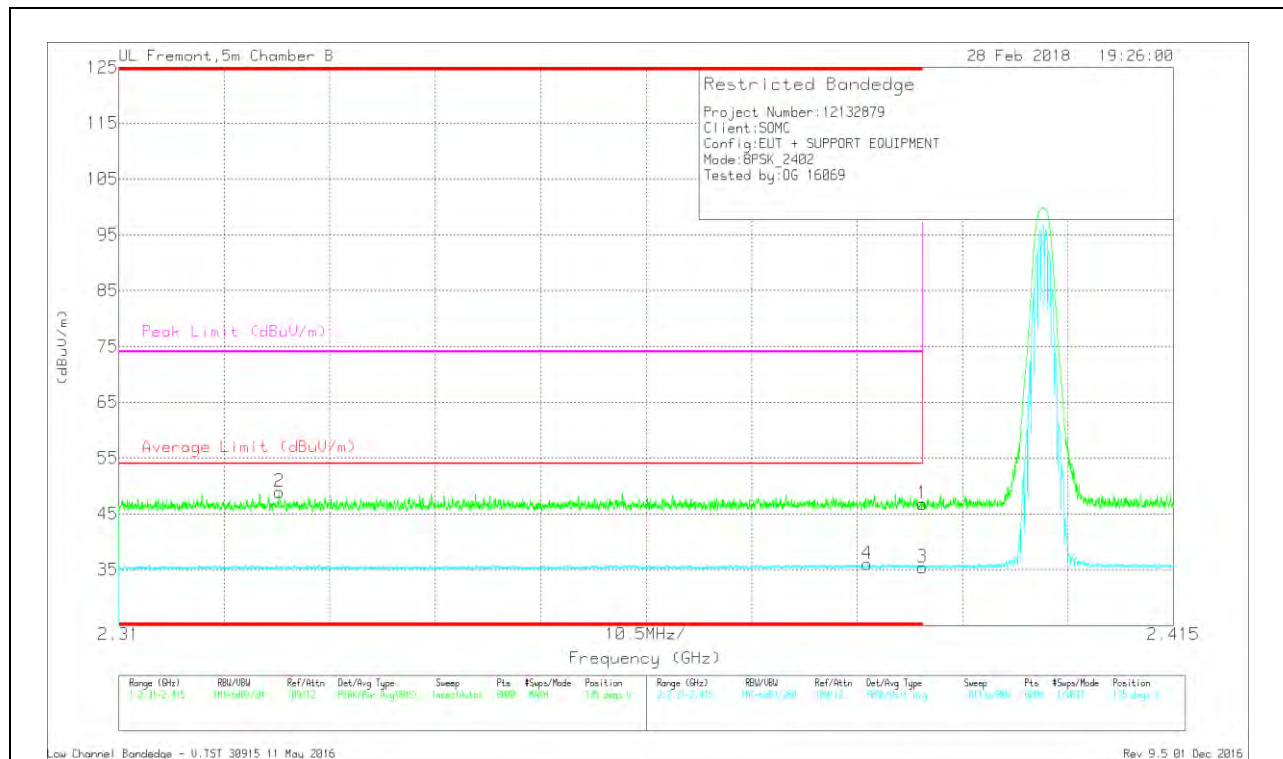
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Fitr/P ad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 35.62                | Pk   | 32             | -21.3                  | 46.32                      | -                      | -           | 74                  | -27.68         | 182            | 221         | H        |
| 2      | * 2.313         | 38.65                | Pk   | 31.9           | -21.3                  | 49.25                      | -                      | -           | 74                  | -24.75         | 182            | 221         | H        |
| 3      | * 2.39          | 24.88                | VA1T | 32             | -21.3                  | 35.58                      | 54                     | -18.42      | -                   | -              | 182            | 221         | H        |
| 4      | * 2.389         | 25.23                | VA1T | 32             | -21.3                  | 35.93                      | 54                     | -18.07      | -                   | -              | 182            | 221         | H        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $V_B = 1/T_{on}$  where:  $T_{on}$  is transmit duration

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBUV) | Det  | AF T863 (dB/m) | Amp/Cbl/Filtr/P ad (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          | 36.15                | Pk   | 32             | -21.3                   | 46.85                      | -                      | -           | 74                  | -27.15         | 135            | 178         | V        |
| 2      | * 2.326         | 38.34                | Pk   | 31.9           | -21.3                   | 48.94                      | -                      | -           | 74                  | -25.06         | 135            | 178         | V        |
| 3      | * 2.39          | 24.65                | VA1T | 32             | -21.3                   | 35.35                      | 54                     | -18.65      | -                   | -              | 135            | 178         | V        |
| 4      | * 2.385         | 25.26                | VA1T | 32             | -21.3                   | 35.96                      | 54                     | -18.04      | -                   | -              | 135            | 178         | V        |

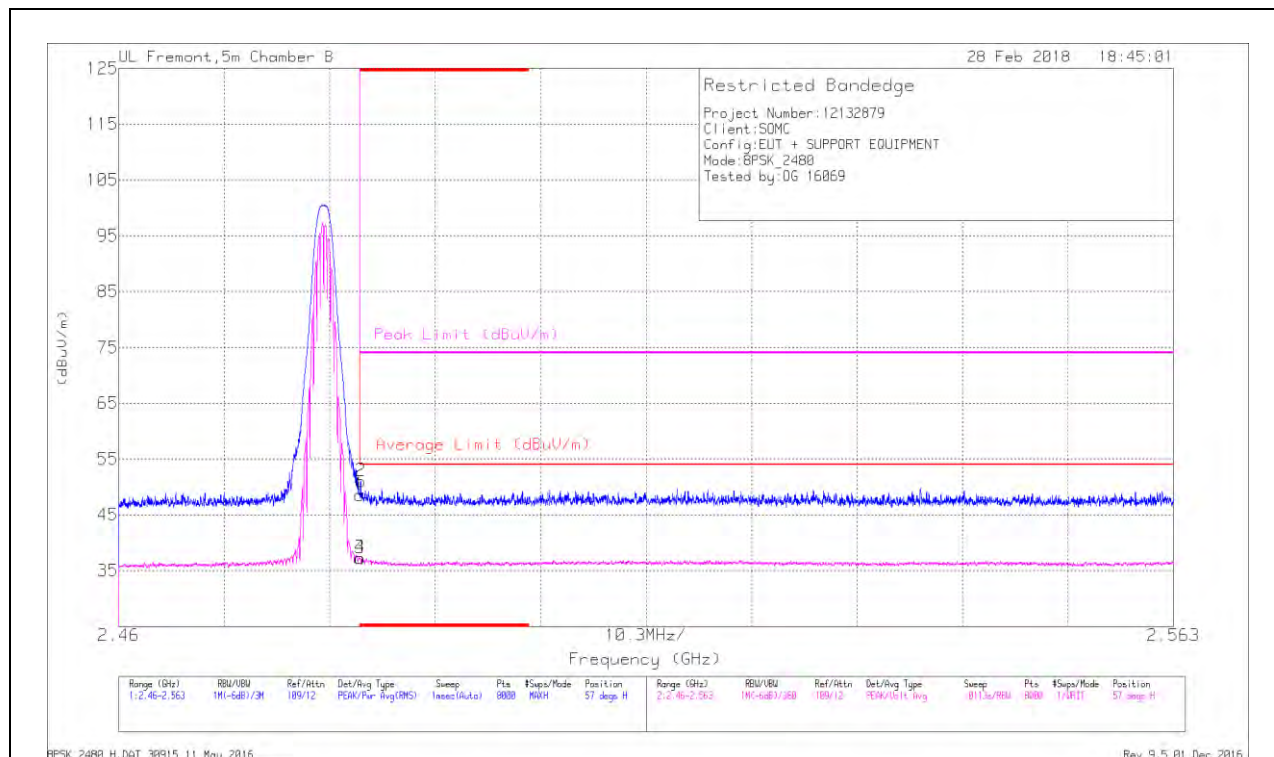
\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $V_B = 1/T_{on}$  where:  $T_{on}$  is transmit duration

## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT



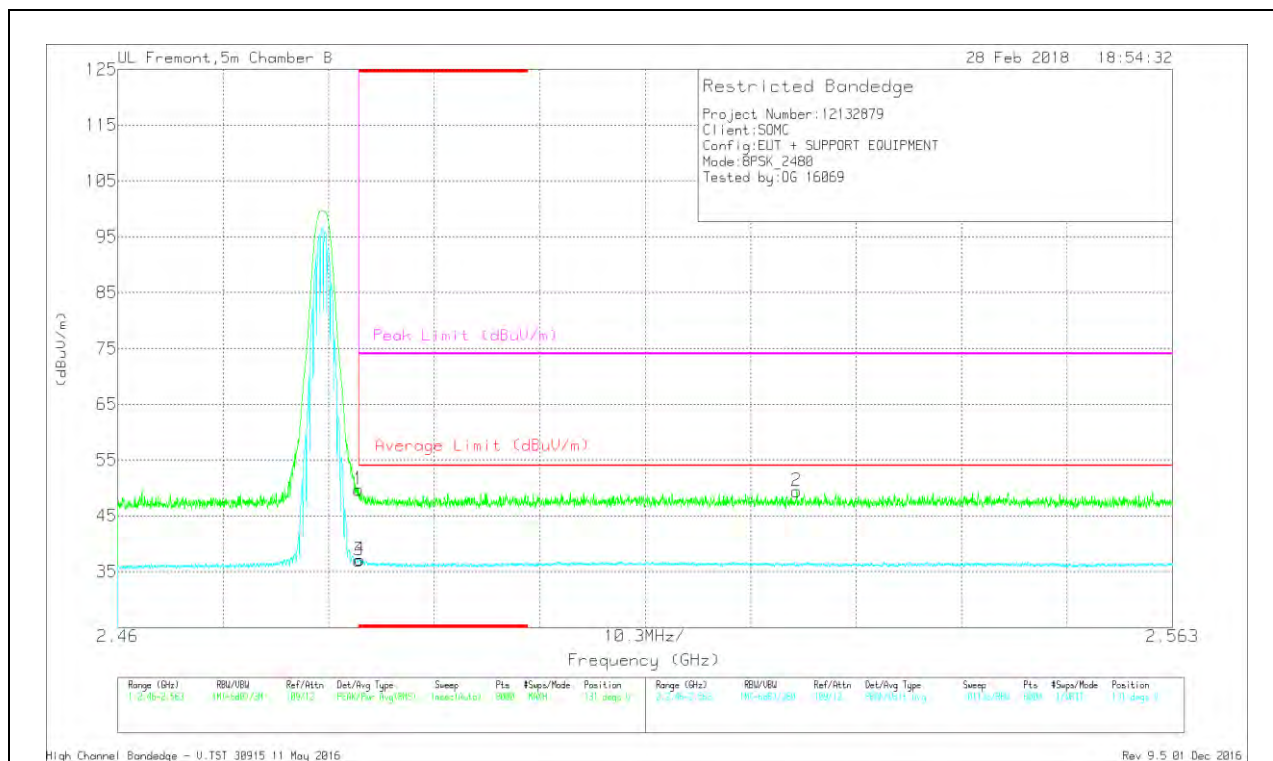
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Fitr/P ad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.484         | 37.33                | Pk   | 32.5           | -21.3                  | 48.53                      | -                      | -           | 74                  | -25.47         | 57             | 109         | H        |
| 2      | * 2.484         | 39.82                | Pk   | 32.5           | -21.3                  | 51.02                      | -                      | -           | 74                  | -22.98         | 57             | 109         | H        |
| 3      | * 2.484         | 26.09                | VA1T | 32.5           | -21.3                  | 37.29                      | 54                     | -16.71      | -                   | -              | 57             | 109         | H        |
| 4      | * 2.484         | 26.11                | VA1T | 32.5           | -21.3                  | 37.31                      | 54                     | -16.69      | -                   | -              | 57             | 109         | H        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $V_B = 1/T_{on}$  where:  $T_{on}$  is transmit duration

## VERTICAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dBm) | Amp/Cbl/Filtr/P ad (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         | 38.43                | Pk   | 32.5          | -21.3                   | 49.63                      | -                      | -           | 74                  | -24.37         | 131            | 151         | V        |
| 3      | * 2.484         | 25.75                | VA1T | 32.5          | -21.3                   | 36.95                      | 54                     | -17.05      | -                   | -              | 131            | 151         | V        |
| 4      | * 2.484         | 25.92                | VA1T | 32.5          | -21.3                   | 37.12                      | 54                     | -16.88      | -                   | -              | 131            | 151         | V        |
| 2      | 2.526           | 38.17                | Pk   | 32.5          | -21.2                   | 49.47                      | -                      | -           | 74                  | -24.53         | 131            | 151         | V        |

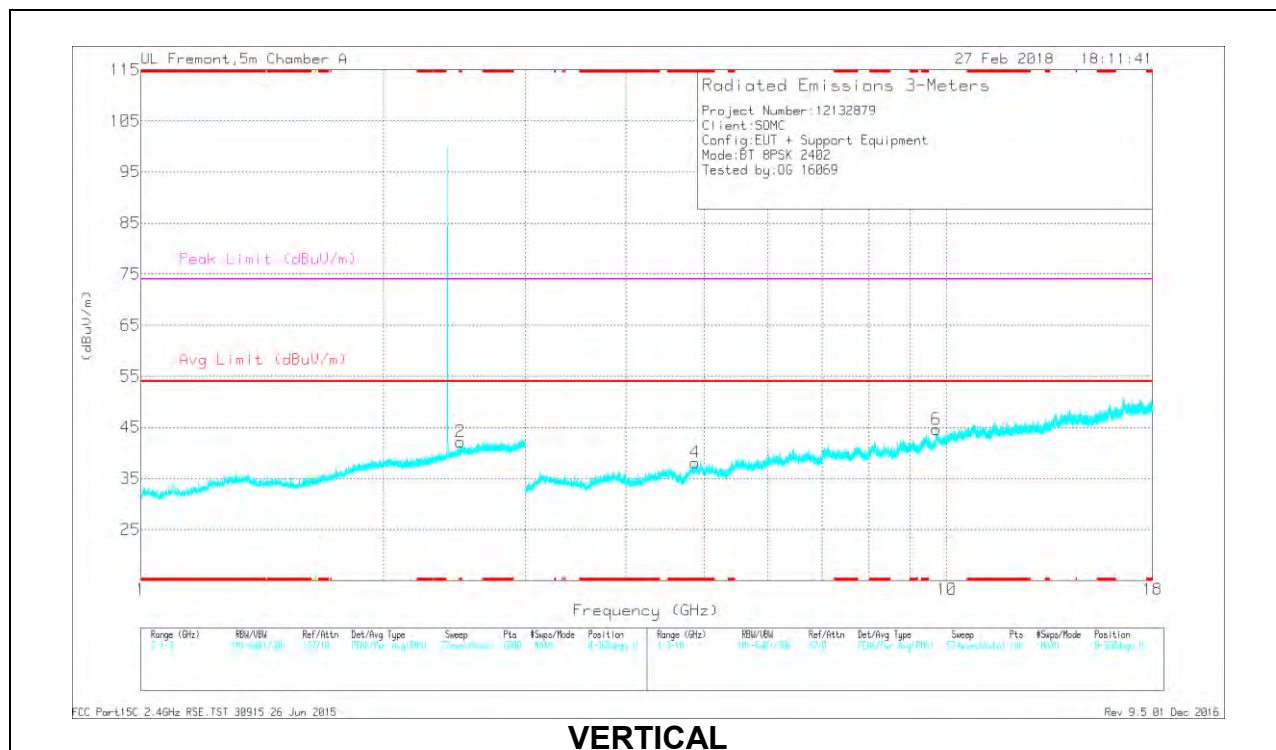
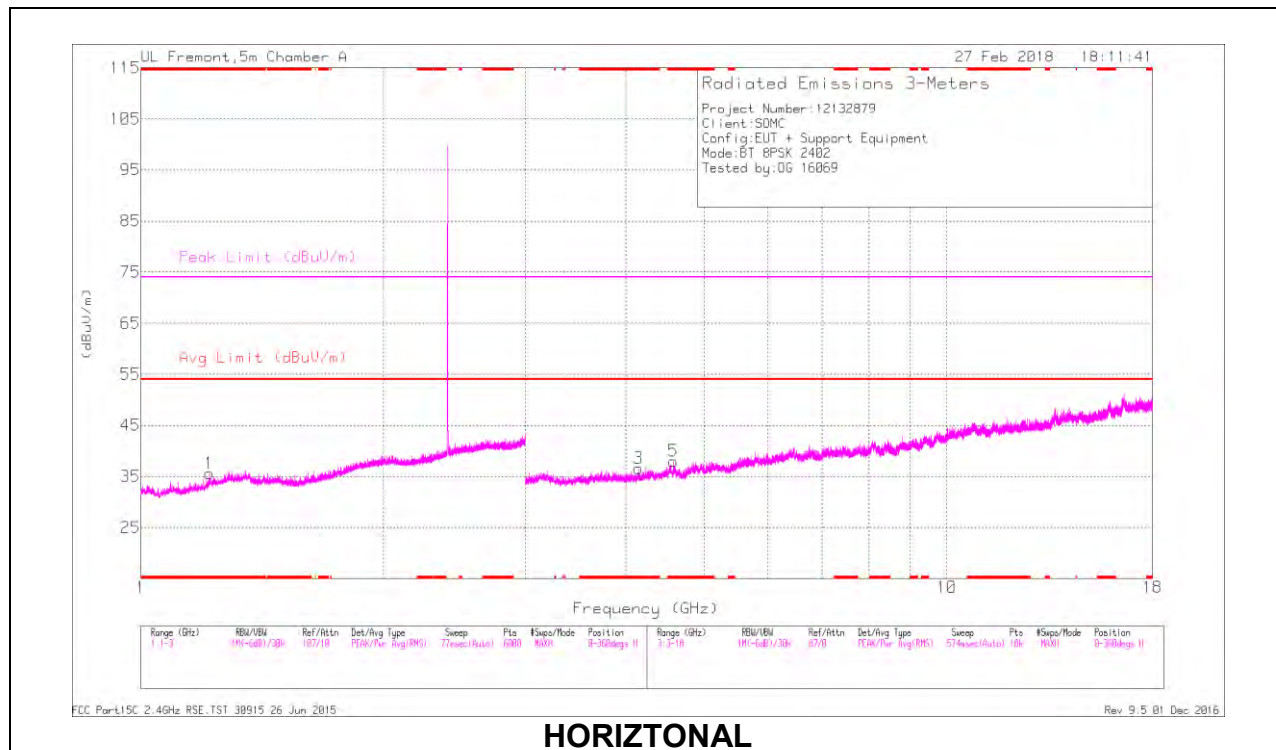
\* - indicates frequency in CFR47 Pt 15 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS



## RADIATED EMISSIONS

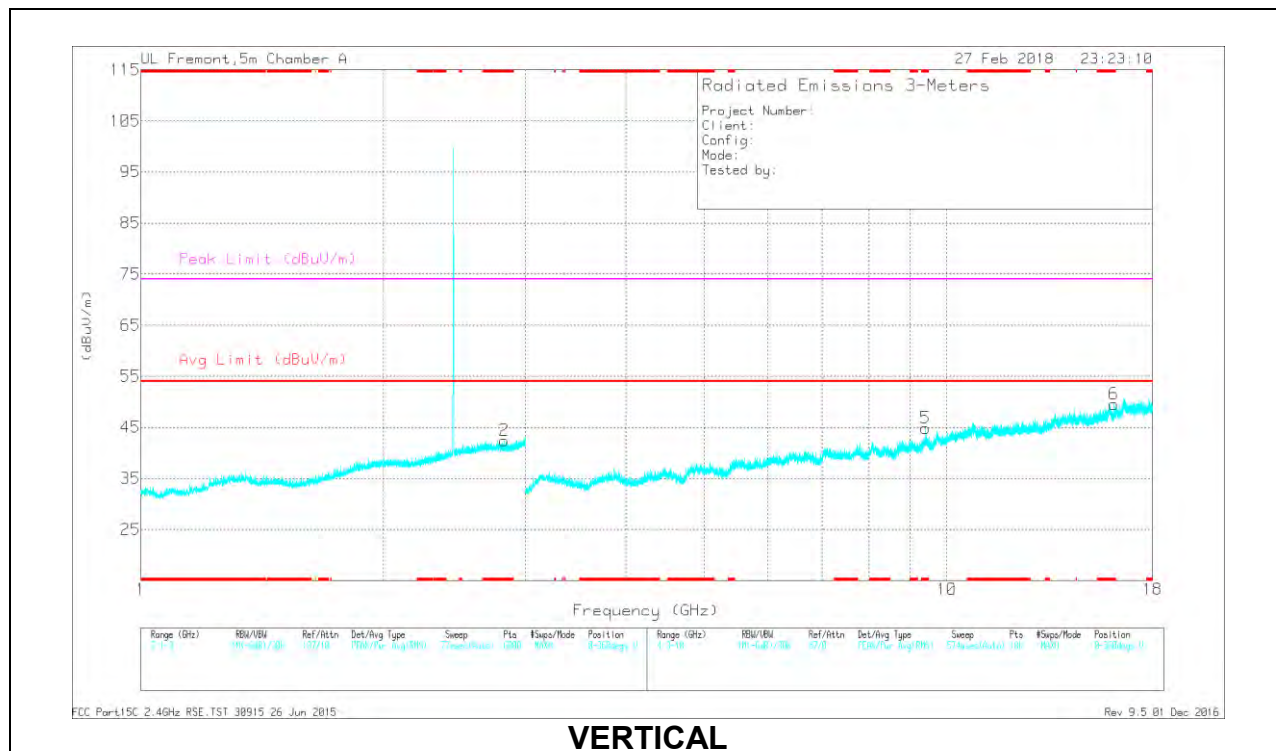
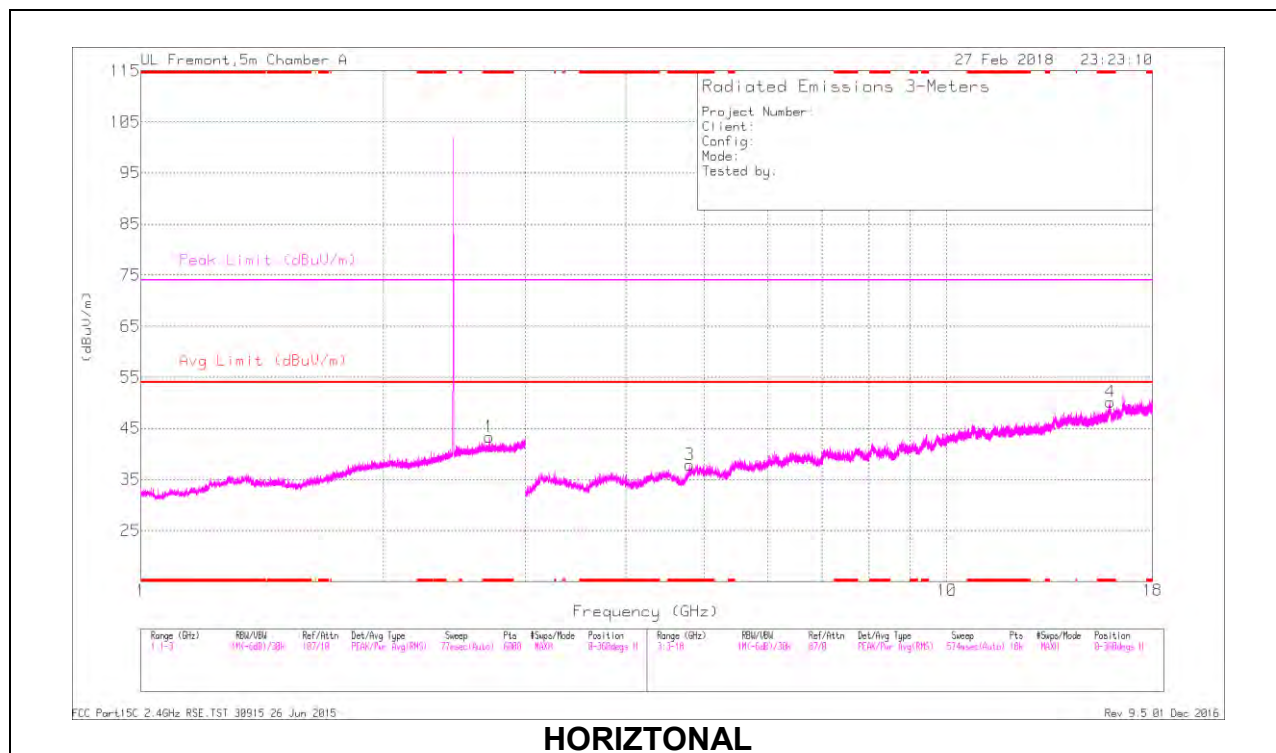
| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T862 (dB/m) | Amp/Cbl/Filtr/P ad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|------|----------------|-------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 1.217         | 34.38                | PKFH | 28.5           | -23.7                   | 39.18                      | -                  | -           | 74                  | -34.82         | 119            | 204         | H        |
| * 1.215         | 23.39                | VA1T | 28.5           | -23.8                   | 28.09                      | 54                 | -25.91      | -                   | -              | 119            | 204         | H        |
| * 2.491         | 35.75                | PKFH | 32.4           | -23.4                   | 44.75                      | -                  | -           | 74                  | -29.25         | 108            | 139         | V        |
| * 2.49          | 24.63                | VA1T | 32.4           | -23.4                   | 33.63                      | 54                 | -20.37      | -                   | -              | 108            | 139         | V        |
| * 4.147         | 34.96                | PKFH | 33.4           | -28.5                   | 39.86                      | -                  | -           | 74                  | -34.14         | 163            | 183         | H        |
| * 4.146         | 23.73                | VA1T | 33.4           | -28.5                   | 28.63                      | 54                 | -25.37      | -                   | -              | 163            | 183         | H        |
| * 4.576         | 34.43                | PKFH | 34.1           | -27.7                   | 40.83                      | -                  | -           | 74                  | -33.17         | 174            | 366         | H        |
| * 4.578         | 23.5                 | VA1T | 34.1           | -27.6                   | 30                         | 54                 | -24         | -                   | -              | 174            | 366         | H        |
| * 4.871         | 35.04                | PKFH | 34.1           | -26.5                   | 42.64                      | -                  | -           | 74                  | -31.36         | 221            | 112         | V        |
| * 4.873         | 23.79                | VA1T | 34.1           | -26.4                   | 31.49                      | 54                 | -22.51      | -                   | -              | 221            | 112         | V        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## MID CHANNEL RESULTS



## RADIATED EMISSIONS

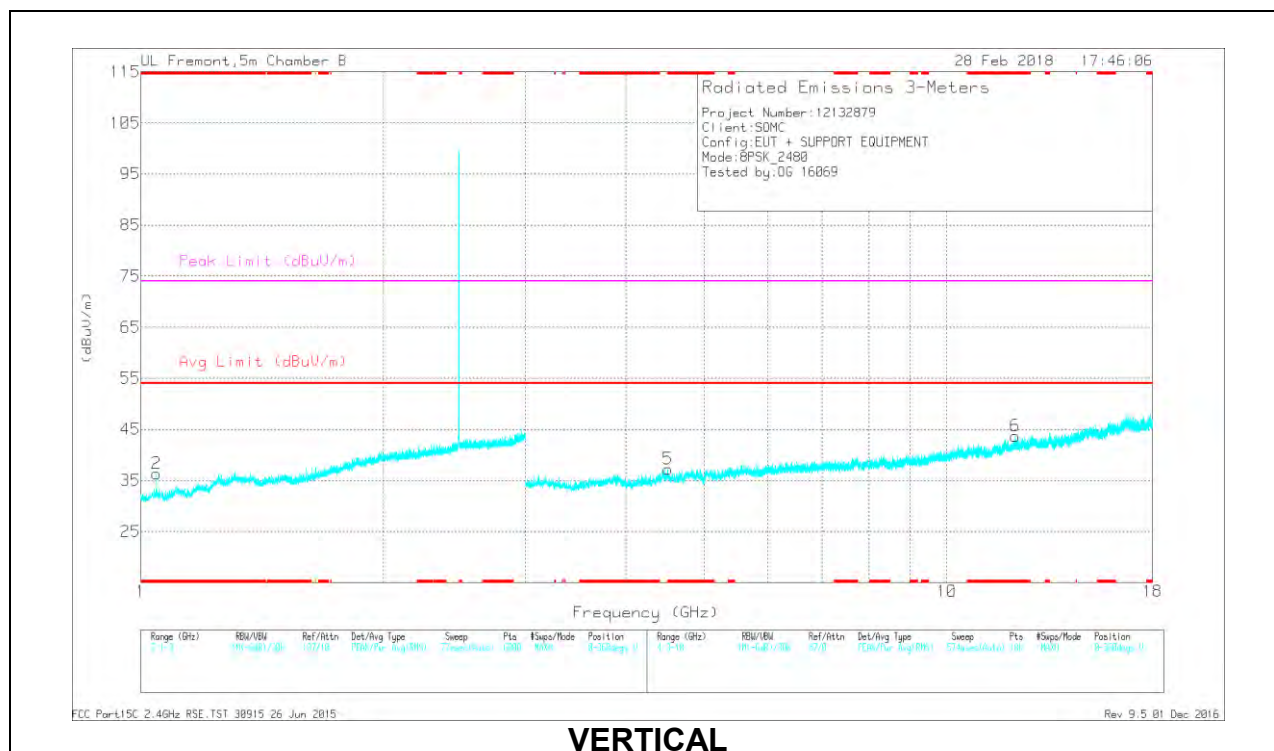
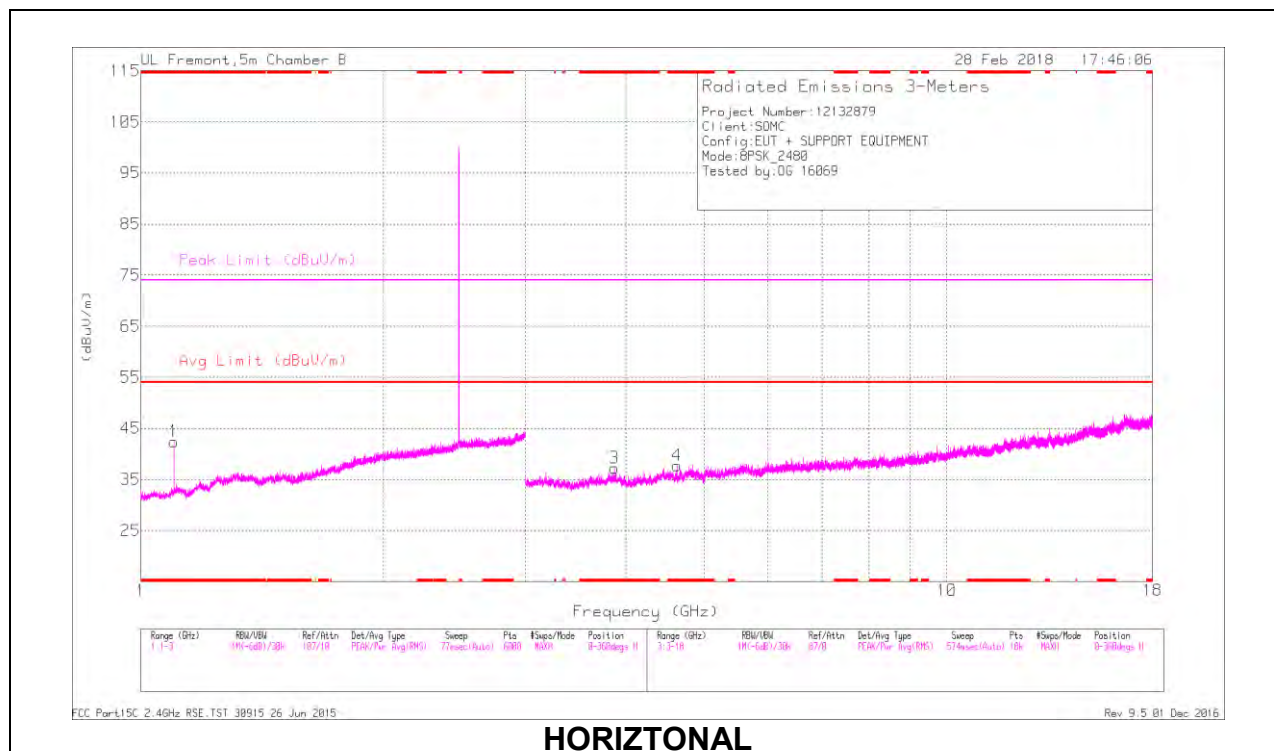
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T862 (dB/m) | Amp/Cbl/Filtr/P ad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|-------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.705         | 36.27                | PKFH | 32.5           | -22.8                   | 45.97                      | -                  | -           | 74                  | -28.03         | 220            | 316         | H        |
| 1      | * 2.704         | 24.64                | VA1T | 32.5           | -22.8                   | 34.34                      | 54                 | -19.66      | -                   | -              | 220            | 316         | H        |
| 2      | * 2.826         | 36.06                | PKFH | 32.2           | -22.3                   | 45.96                      | -                  | -           | 74                  | -28.04         | 65             | 268         | V        |
| 2      | * 2.825         | 24.43                | VA1T | 32.2           | -22.4                   | 34.23                      | 54                 | -19.77      | -                   | -              | 65             | 268         | V        |
| 3      | * 4.793         | 34.83                | PKFH | 34.2           | -27.2                   | 41.83                      | -                  | -           | 74                  | -32.17         | 236            | 166         | H        |
| 3      | * 4.794         | 23.95                | VA1T | 34.2           | -27.2                   | 30.95                      | 54                 | -23.05      | -                   | -              | 236            | 166         | H        |
| 4      | * 15.943        | 30.17                | PKFH | 40.4           | -16.6                   | 53.97                      | -                  | -           | 74                  | -20.03         | 256            | 101         | H        |
| 4      | * 15.944        | 19.64                | VA1T | 40.4           | -16.6                   | 43.44                      | 54                 | -10.56      | -                   | -              | 256            | 101         | H        |
| 5      | * 9.419         | 32.43                | PKFH | 36.6           | -20.4                   | 48.63                      | -                  | -           | 74                  | -25.37         | 3              | 211         | V        |
| 5      | * 9.416         | 20.63                | VA1T | 36.6           | -20.4                   | 36.83                      | 54                 | -17.17      | -                   | -              | 3              | 211         | V        |
| 6      | * 16.12         | 31.18                | PKFH | 40.6           | -18.9                   | 52.88                      | -                  | -           | 74                  | -21.12         | 83             | 101         | V        |
| 6      | * 16.122        | 20.43                | VA1T | 40.6           | -18.7                   | 42.33                      | 54                 | -11.67      | -                   | -              | 83             | 101         | V        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## HIGH CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T863 (dB/m) | Amp/Cbl/Filtr/P ad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|-------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 1.101         | 34.13                | PKFH | 27.7           | -22.9                   | 38.93                      | -                  | -           | 74                  | -35.07         | 283            | 370         | H        |
| 1      | * 1.1           | 22.37                | VA1T | 27.7           | -23                     | 27.07                      | 54                 | -26.93      | -                   | -              | 283            | 370         | H        |
| 2      | * 1.046         | 33.04                | PKFH | 27             | -23.2                   | 36.84                      | -                  | -           | 74                  | -37.16         | 212            | 307         | V        |
| 2      | * 1.046         | 22.46                | VA1T | 27             | -23.2                   | 26.26                      | 54                 | -27.74      | -                   | -              | 212            | 307         | V        |
| 3      | * 3.868         | 37.25                | PKFH | 33.5           | -30.4                   | 40.35                      | -                  | -           | 74                  | -33.65         | 344            | 231         | H        |
| 3      | * 3.868         | 27.25                | VA1T | 33.5           | -30.4                   | 30.35                      | 54                 | -23.65      | -                   | -              | 344            | 231         | H        |
| 4      | * 4.631         | 38.32                | PKFH | 34.3           | -31.4                   | 41.22                      | -                  | -           | 74                  | -32.78         | 8              | 116         | H        |
| 4      | * 4.629         | 27.22                | VA1T | 34.3           | -31.4                   | 30.12                      | 54                 | -23.88      | -                   | -              | 8              | 116         | H        |
| 5      | * 4.506         | 37.7                 | PKFH | 34             | -29.9                   | 41.8                       | -                  | -           | 74                  | -32.2          | 112            | 146         | V        |
| 5      | * 4.506         | 26.7                 | VA1T | 34             | -29.9                   | 30.8                       | 54                 | -23.2       | -                   | -              | 112            | 146         | V        |
| 6      | * 12.152        | 32.3                 | PKFH | 39             | -23.9                   | 47.4                       | -                  | -           | 74                  | -26.6          | 300            | 106         | V        |
| 6      | * 12.155        | 21.53                | VA1T | 39             | -23.9                   | 36.63                      | 54                 | -17.37      | -                   | -              | 300            | 106         | V        |

\* - indicates frequency in CFR47 Pt 15 Restricted Band

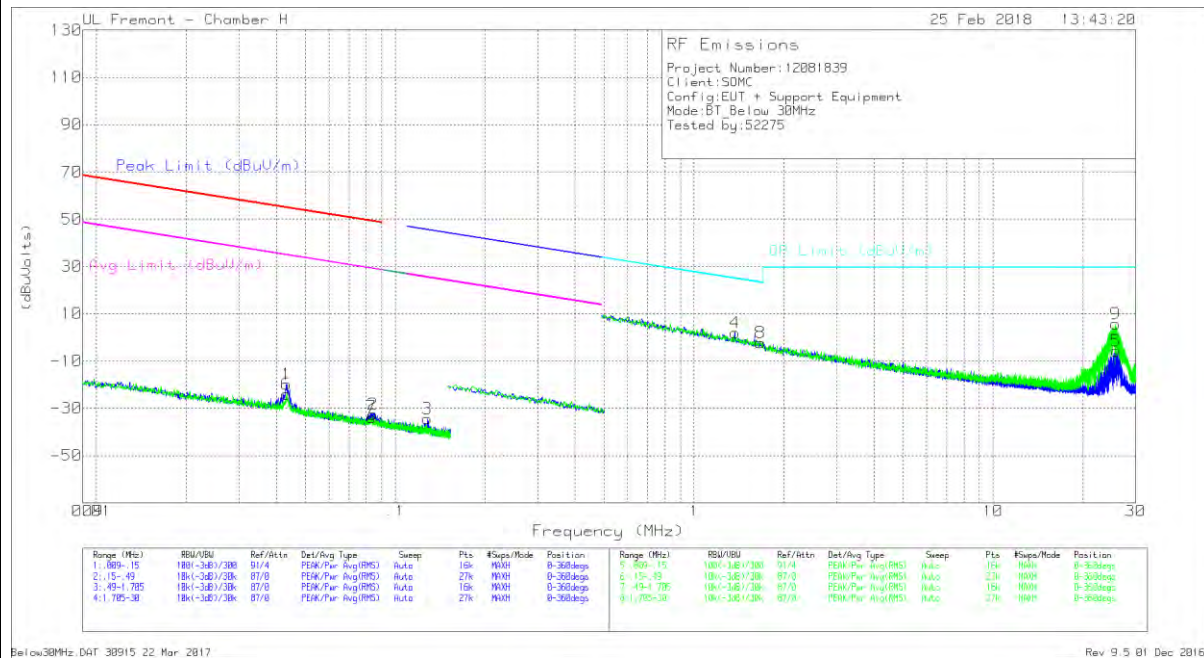
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## 9.1. WORST-CASE BELOW 30 MHz

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

#### HORIZONTAL AND VERTICAL PLOTS



#### NOTE: KDB 414788 OATS and Chamber Correlation Justification

- Based 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.

## Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dB/m) | Cables (dB) | Dist Corr 300m | Corrected Reading (dBuVolts) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|---------------------|-------------|----------------|------------------------------|---------------------|-------------|--------------------|-------------|----------------|
| 1      | .04327          | 47.58                | Pk  | 12.6                | 0           | -80            | -19.82                       | 54.86               | -74.68      | 34.86              | -54.68      | 0-360          |
| 6      | .04334          | 43.36                | Pk  | 12.6                | 0           | -80            | -24.04                       | 54.85               | -78.89      | 34.85              | -58.89      | 0-360          |
| 7      | .08339          | 34.42                | Pk  | 11.8                | 0           | -80            | -33.78                       | 49.16               | -82.94      | 29.16              | -62.94      | 0-360          |
| 2      | .08409          | 35.69                | Pk  | 11.8                | 0           | -80            | -32.51                       | 49.09               | -81.6       | 29.09              | -61.6       | 0-360          |
| 3      | .12783          | 33.9                 | Pk  | 11.6                | 0           | -80            | -34.5                        | 45.49               | -79.99      | 25.49              | -59.99      | 0-360          |

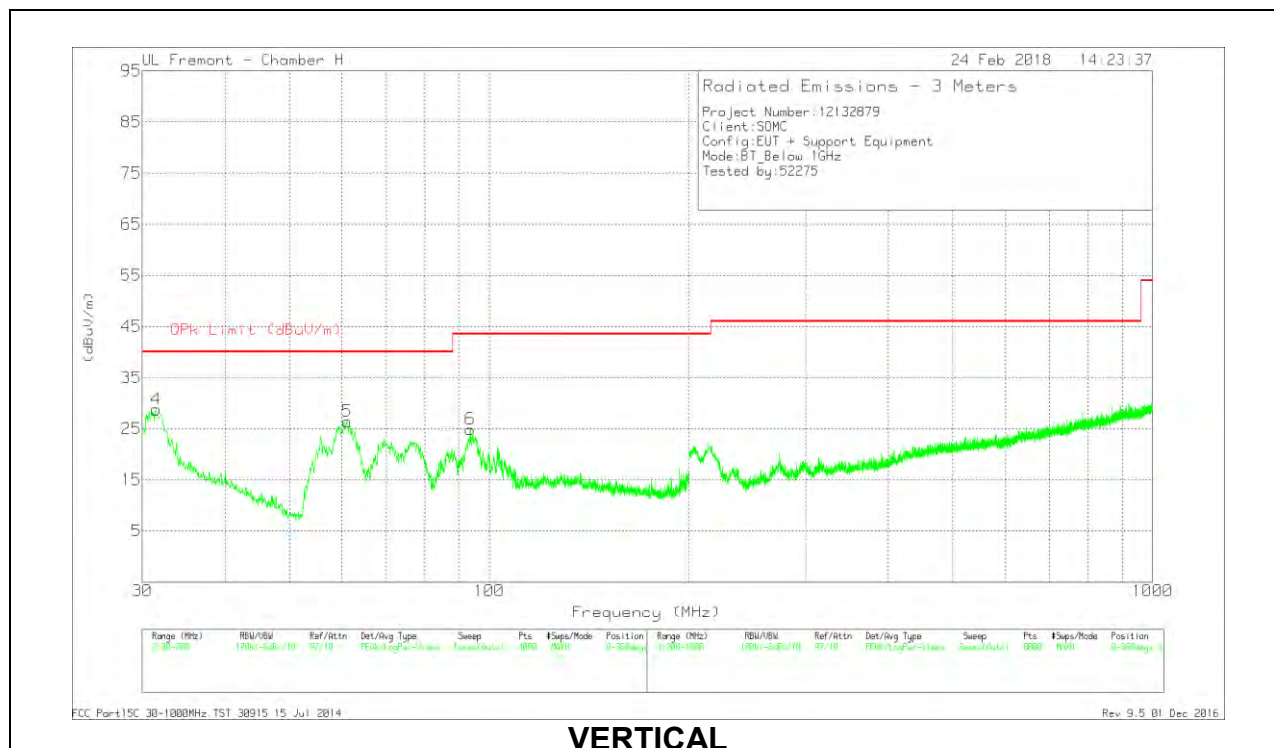
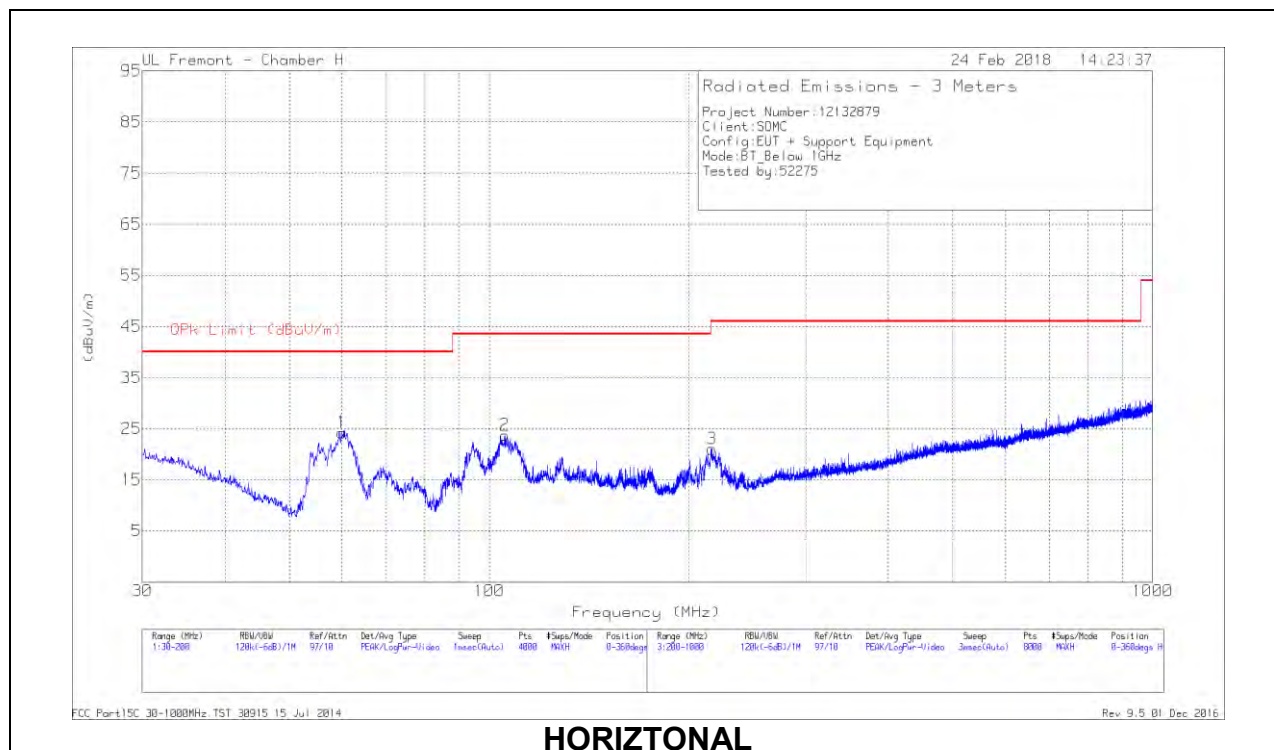
## Pk - Peak detector

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dB/m) | Cables (dB) | Dist Corr (dB) 40Log | Corrected Reading (dBuVolts) | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|---------------------|-------------|----------------------|------------------------------|-------------------|-------------|----------------|
| 4      | 1.3713          | 30.16                | Pk  | 11.6                | .1          | -40                  | 1.86                         | 24.89             | -23.03      | 0-360          |
| 8      | 1.66766         | 25.86                | Pk  | 11.7                | .1          | -40                  | -2.34                        | 23.19             | -25.53      | 0-360          |
| 9      | 25.72516        | 36.24                | Pk  | 8.9                 | .6          | -40                  | 5.74                         | 29.5              | -23.76      | 0-360          |
| 5      | 25.83834        | 24.84                | Pk  | 8.9                 | .6          | -40                  | -5.66                        | 29.5              | -35.16      | 0-360          |

## Pk - Peak detector

## 9.2. WORST-CASE BELOW 1 GHz

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



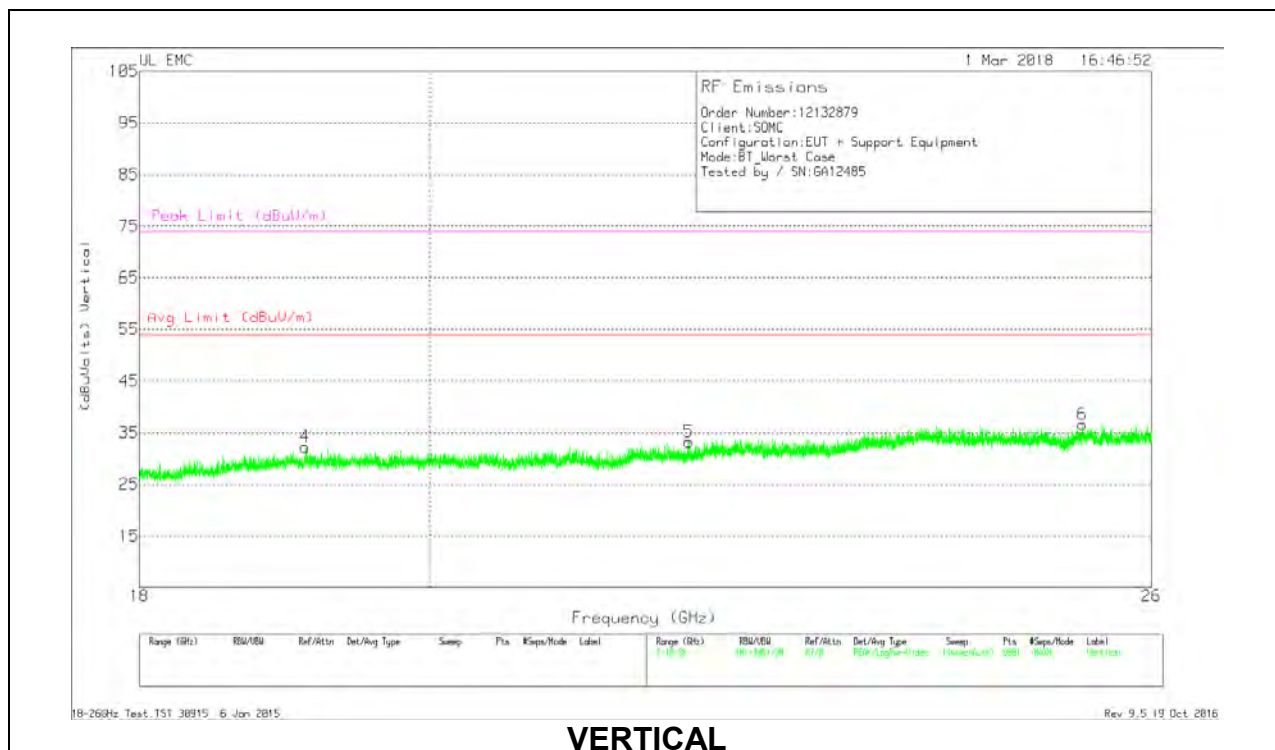
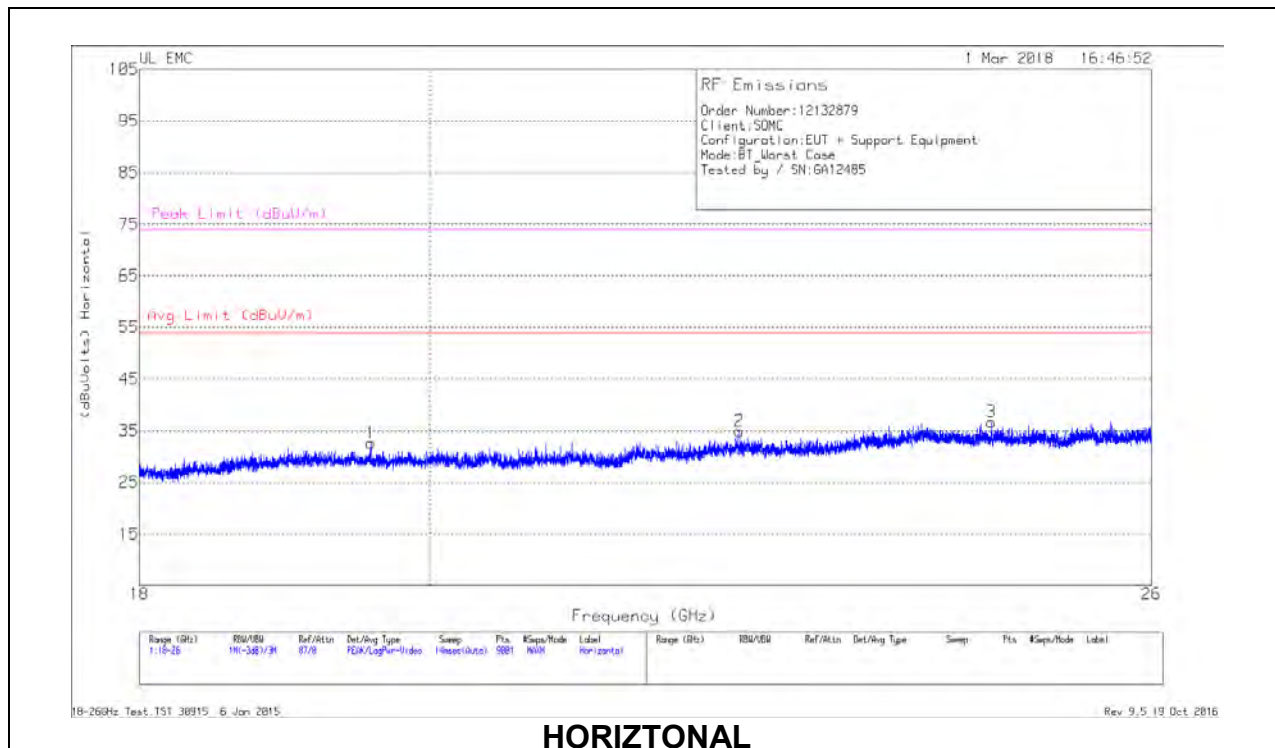
## Below 1GHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AF T185 (dB/m) | Amp/Cbl (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|--------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 4      | 31.4879         | 37.27                | Pk  | 22.8           | -31.3        | 28.77                      | 40                 | -11.23      | 0-360          | 100         | V        |
| 1      | 59.9703         | 43.83                | Pk  | 11.3           | -30.9        | 24.23                      | 40                 | -15.77      | 0-360          | 399         | H        |
| 5      | 61.0755         | 46                   | Pk  | 11.4           | -31          | 26.4                       | 40                 | -13.6       | 0-360          | 100         | V        |
| 6      | 93.6815         | 42.88                | Pk  | 12.5           | -30.5        | 24.88                      | 43.52              | -18.64      | 0-360          | 100         | V        |
| 2      | 105.5846        | 38.74                | Pk  | 15.5           | -30.5        | 23.74                      | 43.52              | -19.78      | 0-360          | 299         | H        |
| 3      | 216.6022        | 36.16                | Pk  | 14.5           | -29.6        | 21.06                      | 46.02              | -24.96      | 0-360          | 100         | H        |

Pk - Peak detector

### 9.3. WORST-CASE 18-26 GHz

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



## Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | T449 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      | 19.58           | 34.65                | Pk  | 32.7           | -25.2        | -9.5           | 32.65                        | 54                 | -21.35      | 74                  | -41.35         |
| 2      | 22.386          | 35.7                 | Pk  | 33.5           | -24.8        | -9.5           | 34.9                         | 54                 | -19.1       | 74                  | -39.1          |
| 3      | 24.53           | 36.38                | Pk  | 34             | -24.2        | -9.5           | 36.68                        | 54                 | -17.32      | 74                  | -37.32         |
| 4      | 19.117          | 33.82                | Pk  | 32.5           | -24.6        | -9.5           | 32.22                        | 54                 | -21.78      | 74                  | -41.78         |
| 5      | 21.975          | 34.44                | Pk  | 33.4           | -25.1        | -9.5           | 33.24                        | 54                 | -20.76      | 74                  | -40.76         |
| 6      | 25.355          | 36.49                | Pk  | 34.3           | -24.7        | -9.5           | 36.59                        | 54                 | -17.41      | 74                  | -37.41         |

Pk - Peak detector

## 10. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

| Frequency of Emission (MHz) | Conducted Limit (dBuV) |                       |
|-----------------------------|------------------------|-----------------------|
|                             | Quasi-peak             | Average               |
| 0.15-0.5                    | 66 to 56 <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.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

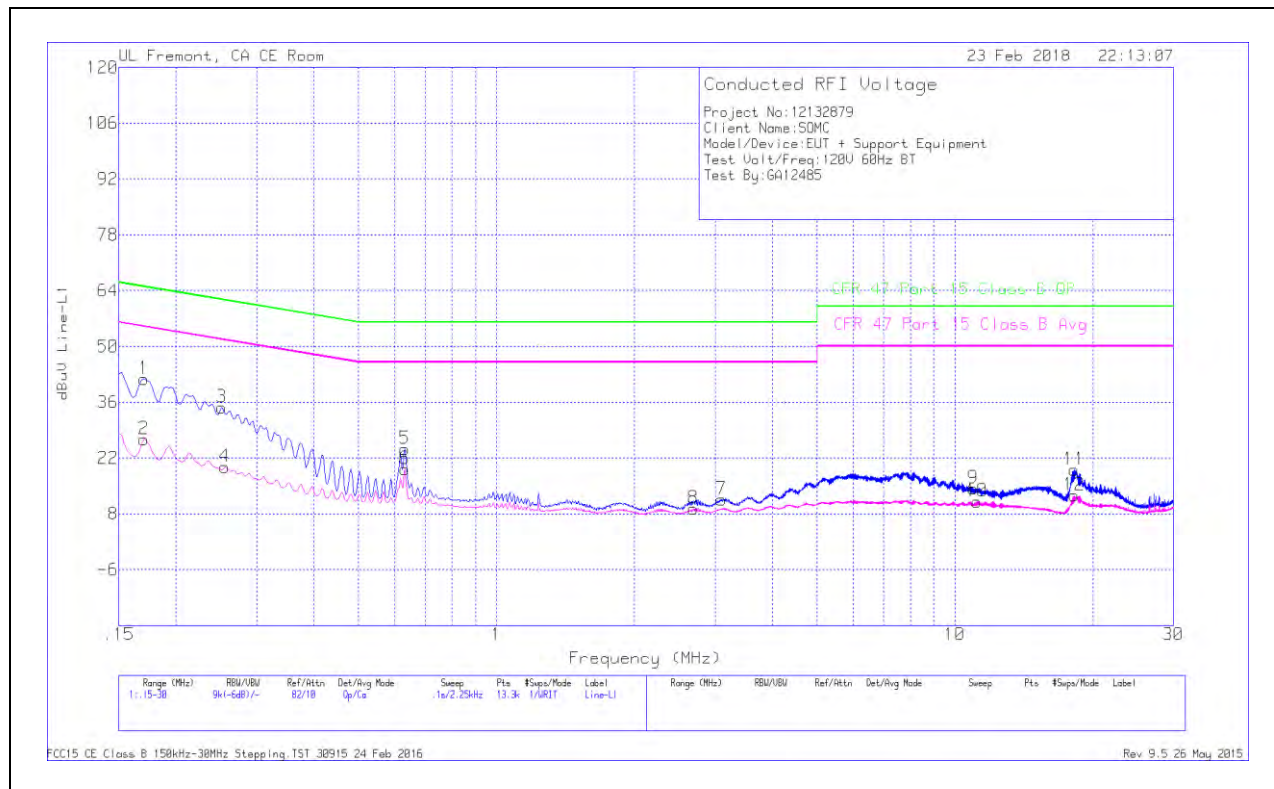
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

### RESULTS

## 10.1.1. AC Power Line Norm

### LINE 1 RESULTS



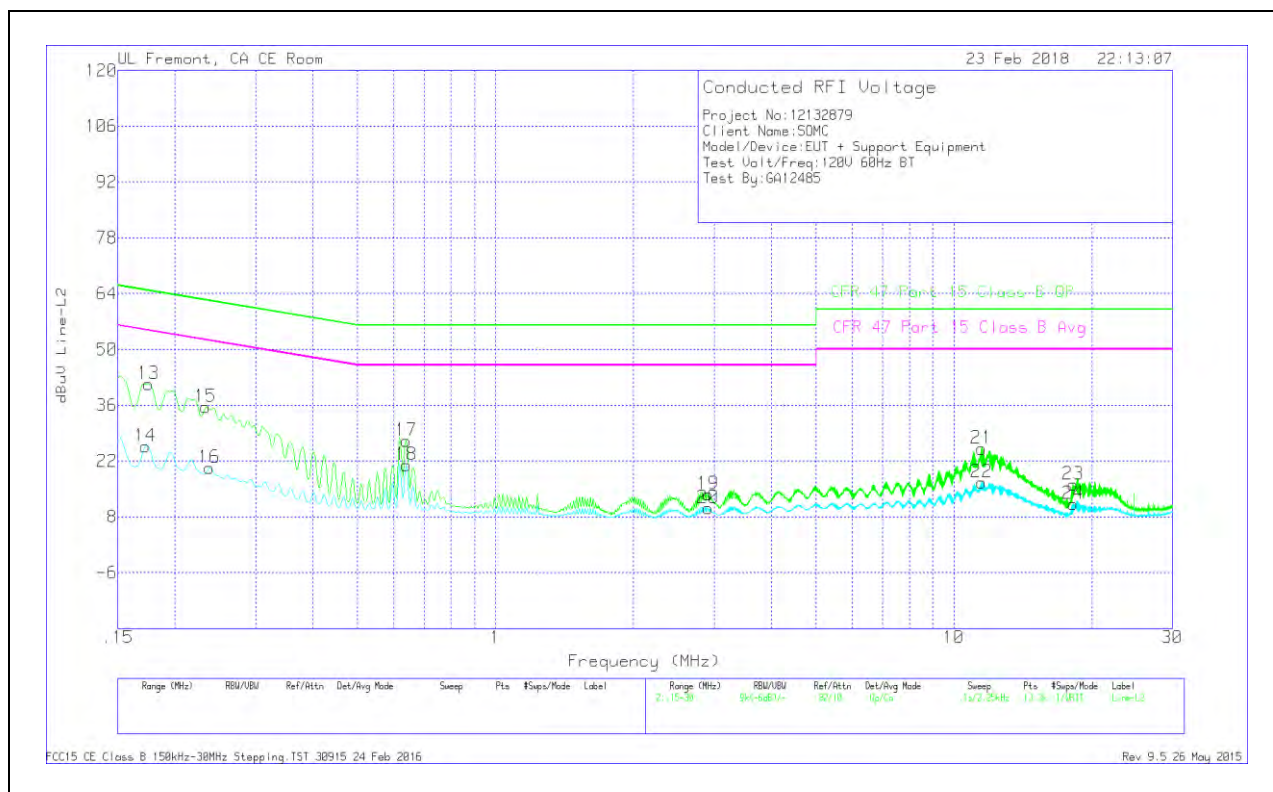
Range 1: Line-L1 .15 - 30MHz

| 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          | 31.68                | Qp  | 0       | 0               | 10.1         | 41.78                  | 64.95                     | -23.17         | -                          | -                     |
| 2      | .17025          | 16.54                | Ca  | 0       | 0               | 10.1         | 26.64                  | -                         | -              | 54.95                      | -28.31                |
| 3      | .25125          | 24.59                | Qp  | 0       | 0               | 10.1         | 34.69                  | 61.72                     | -27.03         | -                          | -                     |
| 4      | .25575          | 9.61                 | Ca  | 0       | 0               | 10.1         | 19.71                  | -                         | -              | 51.57                      | -31.86                |
| 5      | .6315           | 14.12                | Qp  | 0       | 0               | 10.1         | 24.22                  | 56                        | -31.78         | -                          | -                     |
| 6      | .6315           | 9.06                 | Ca  | 0       | 0               | 10.1         | 19.16                  | -                         | -              | 46                         | -26.84                |
| 7      | 3.09525         | 1.41                 | Qp  | 0       | .1              | 10.1         | 11.61                  | 56                        | -44.39         | -                          | -                     |
| 8      | 2.6925          | -.89                 | Ca  | 0       | .1              | 10.1         | 9.31                   | -                         | -              | 46                         | -36.69                |
| 9      | 10.968          | 4.02                 | Qp  | 0       | .2              | 10.2         | 14.42                  | 60                        | -45.58         | -                          | -                     |
| 10     | 11.1885         | .67                  | Ca  | 0       | .2              | 10.2         | 11.07                  | -                         | -              | 50                         | -38.93                |
| 11     | 18.249          | 8.42                 | Qp  | 0       | .3              | 10.3         | 19.02                  | 60                        | -40.98         | -                          | -                     |
| 12     | 18.249          | 2.03                 | Ca  | 0       | .3              | 10.3         | 12.63                  | -                         | -              | 50                         | -37.37                |

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     | .17475          | 31.26                | Qp  | 0       | 0               | 10.1         | 41.36                  | 64.73                     | -23.37         | -                          | -                     |
| 14     | .1725           | 15.62                | Ca  | 0       | 0               | 10.1         | 25.72                  | -                         | -              | 54.84                      | -29.12                |
| 15     | .23325          | 25.54                | Qp  | 0       | 0               | 10.1         | 35.64                  | 62.33                     | -26.69         | -                          | -                     |
| 16     | .23775          | 10.22                | Ca  | 0       | 0               | 10.1         | 20.32                  | -                         | -              | 52.17                      | -31.85                |
| 17     | .63825          | 16.98                | Qp  | 0       | 0               | 10.1         | 27.08                  | 56                        | -28.92         | -                          | -                     |
| 18     | .63825          | 10.85                | Ca  | 0       | 0               | 10.1         | 20.95                  | -                         | -              | 46                         | -25.05                |
| 19     | 2.91075         | 3.42                 | Qp  | 0       | .1              | 10.1         | 13.62                  | 56                        | -42.38         | -                          | -                     |
| 20     | 2.91075         | .04                  | Ca  | 0       | .1              | 10.1         | 10.24                  | -                         | -              | 46                         | -35.76                |
| 21     | 11.50125        | 14.66                | Qp  | 0       | .2              | 10.2         | 25.06                  | 60                        | -34.94         | -                          | -                     |
| 22     | 11.5035         | 6.25                 | Ca  | 0       | .2              | 10.2         | 16.65                  | -                         | -              | 50                         | -33.35                |
| 23     | 18.231          | 5.43                 | Qp  | 0       | .3              | 10.3         | 16.03                  | 60                        | -43.97         | -                          | -                     |
| 24     | 18.22875        | .64                  | Ca  | 0       | .3              | 10.3         | 11.24                  | -                         | -              | 50                         | -38.76                |

Qp - Quasi-Peak detector

Ca - CISPR average detection