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**Ademco Inc**  
**251 Little Falls Drive**  
**Wilmington, DE 19808**

# **FCC / ISED Test Report**

## **For**

## **SiXREPEATER**

**Report #: 47216**

**FCC ID: CFS8DL6RPT**

**IC ID: 573F-6RPT**

**Report Completion Date: 2018-07-26**

*Prepared by and for:*

**Ademco Inc.**

**2 Corporate Center Dr.**

**Suite 100 PO Box 9040**

**Melville, NY 11747**



**Testing**

**NVLAP Lab Code: 600110**

## **Document Introduction**

Ademco Inc. tested the above equipment in accordance with the requirements set forth in the listed standards. All indications of Pass/Fail in the report are opinions expressed by Ademco 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.

This document is a record of the FCC/ISED Test Report for Ademco Inc. products. It demonstrates the data required to be analyzed to certify a product according to the requirements of the FCC & ISED.

The results in the report reflect only the model of the items under test unless noted otherwise. This document may not be altered or revised in any way unless done so by Ademco Inc. and all revisions are duly noted in the revisions section. Any alterations of this document not carried out by Ademco Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

| <b>Test Report Revision History</b> |                    |                    |                                                    |                     |
|-------------------------------------|--------------------|--------------------|----------------------------------------------------|---------------------|
| <b>Revision</b>                     | <b>Prepared By</b> | <b>Reviewed By</b> | <b>Revision Detail</b>                             | <b>Release Date</b> |
| ---                                 | <b>M. Antola</b>   | <b>A. Roussin</b>  | <b>Original Release</b>                            | <b>2018-07-26</b>   |
| <b>A</b>                            | <b>M. Antola</b>   | <b>A. Roussin</b>  | <b>Updated Average spurious emissions results.</b> | <b>2018-07-31</b>   |
|                                     |                    |                    |                                                    |                     |

### Report Authorization

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### **Applicable Test Standards/Limits**

| <b>Test Standards/Limits</b>               | <b>Result</b> | <b>Dates Tested</b> |
|--------------------------------------------|---------------|---------------------|
| ANSI C63.4: 2014                           | Compliant     | 6/1/18 – 7/17/18    |
| ANSI C63.10: 2013                          | Compliant     | 6/1/18 – 7/17/18    |
| ICES-003 Issue 6: 2016                     | Compliant     | 6/1/18 – 7/17/18    |
| RSS-247, Issue 2, Section 5                | Compliant     | 6/1/18 – 7/17/18    |
| RSS-GEN, Issue 4                           | Compliant     | 6/1/18 – 7/17/18    |
| CFR 47 Pt 15 Subpart B, Section 15.107/109 | Compliant     | 6/1/18 – 7/17/18    |
| CFR 47 Pt 15 Subpart C, Section 15.207/209 | Compliant     | 6/1/18 – 7/17/18    |
| CFR 47 Pt 15 Subpart C, Section 15.247     | Compliant     | 6/1/18 – 7/17/18    |

### **Deviations from Test Methods**

| <b>#</b> | <b>Deviation Description</b> |
|----------|------------------------------|
| 0        | None                         |

### **Facilities and Accreditation**

The test site and measurement facility used to collect data are located at 2 Corporate Center Dr., Melville, NY 11747, USA. Ademco Inc. International is accredited by NVLAP, Laboratory Code 600110-0. The full scope of accreditation can be viewed at the NVLAP website.

### **Test Item Description**

The EUT serves as a range extended for SiX access points and devices by retransmitting any message it detects from a SiX series transmitter. It is AC powered, with battery backup, and utilizes a 2.4GHz IEEE 802.15.4-compliant transceiver. The EUT contains two integral PCB trace antennas with gains of 3.0 & 2.9 dBi.

### **Worse-Case Configuration & Mode**

Radiated emissions was performed with the EUT set to transmit at the low/mid/high channels with the highest output power as worst-case scenario. The EUT was tested in all three orthogonal planes in order to determine the worst-case emissions. It was determined that the X axis orientation was the worst-case orientation. Therefore, all final radiated test was performed with the EUT in the X axis orientation. See setup photos for details.

### **Test Sample Identification**

| <b>Sample ID Number</b> | <b>Sample Serial Number</b>    | <b>Date Received</b> |
|-------------------------|--------------------------------|----------------------|
| MEL-482                 | Non-serialized production unit | 5/30/18              |
| MEL-483                 | Non-serialized production unit | 5/30/18              |
|                         |                                |                      |
|                         |                                |                      |
|                         |                                |                      |
|                         |                                |                      |

## Calibration & Measurement Uncertainty

- Measuring Instrument Calibration – The measuring equipment utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer’s recommendations and is traceable to recognized national standards.
- Sample Calculation – Where relevant, the following sample calculation is provided:

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

[i.e.] 37 dBuV/m = 30 dBuV + 18.5 dB/m + 0.5 dB – 12 dB

- Uncertainty - Figures are valid to a confidence level of 95%.

| Test                                        | Standard Uncertainty |
|---------------------------------------------|----------------------|
| Radiated Emissions (30-200MHz Horizontal)   | +/- 5.05 dB          |
| Radiated Emissions (30-200MHz Vertical)     | +/- 5.28 dB          |
| Radiated Emissions (200-1000MHz Horizontal) | +/- 10.21 dB         |
| Radiated Emissions (200-1000MHz Vertical)   | +/- 10.36 dB         |
| Radiated Emissions (Above 1GHz)             | +/- 9.70 dB          |
| Conducted Emissions (150KHz-30MHz)          | +/- 4.36 dB          |

## Opinions / Interpretations

None

### **Test Summary**

All tests described below are required, unless otherwise noted. Notes should be described in detail in the "Additional notes" section.

| # | Test Description                         | Status |
|---|------------------------------------------|--------|
| 2 | 99% Occupied Bandwidth                   | PASS   |
| 3 | 6 dB Emission Bandwidth                  | PASS   |
| 4 | Maximum Conducted Output Power           | PASS   |
| 5 | Maximum Power Spectral Density           | PASS   |
| 6 | Band Edge / Conducted Spurious Emissions | PASS   |
| 7 | Radiated Emissions (Unintentional)       | PASS   |
| 8 | Radiated Emissions (Intentional)         | PASS   |
| 9 | Conducted Emissions (Mains)              | PASS   |

## On Time and Duty Cycle

### Test Description

Refer to KDB 558074 Zero-Span Analyzer Method.

### Test Criteria

| Reference             | Limit                    |
|-----------------------|--------------------------|
| KDB 558074, Section 6 | None, for reporting only |

### Test Information

| Tester | Test Location | Date     | Temperature (°C) | Humidity (%RH) | Pressure (mbar) | Results (P/F) |
|--------|---------------|----------|------------------|----------------|-----------------|---------------|
| CL     | RF Lab        | 06/01/18 | 23.0             | 62.6           | 1004            | P             |

### Equipment List

| Instrument Type     | ID #  | Serial #   | Manufacturer       | Model    | Cal Date  | Cal Due Date |
|---------------------|-------|------------|--------------------|----------|-----------|--------------|
| Spectrum Analyzer   | 11549 | MY46187211 | Agilent            | E4440A   | 06/06/17  | 06/06/19     |
| Attenuator          | -     | 1624       | Pasternack         | PE7087-6 | 06/06/17* | 12/31/18*    |
| Environmental Meter | 11533 | A070144    | Extech Instruments | SD700    | 08/21/17  | 08/21/20     |

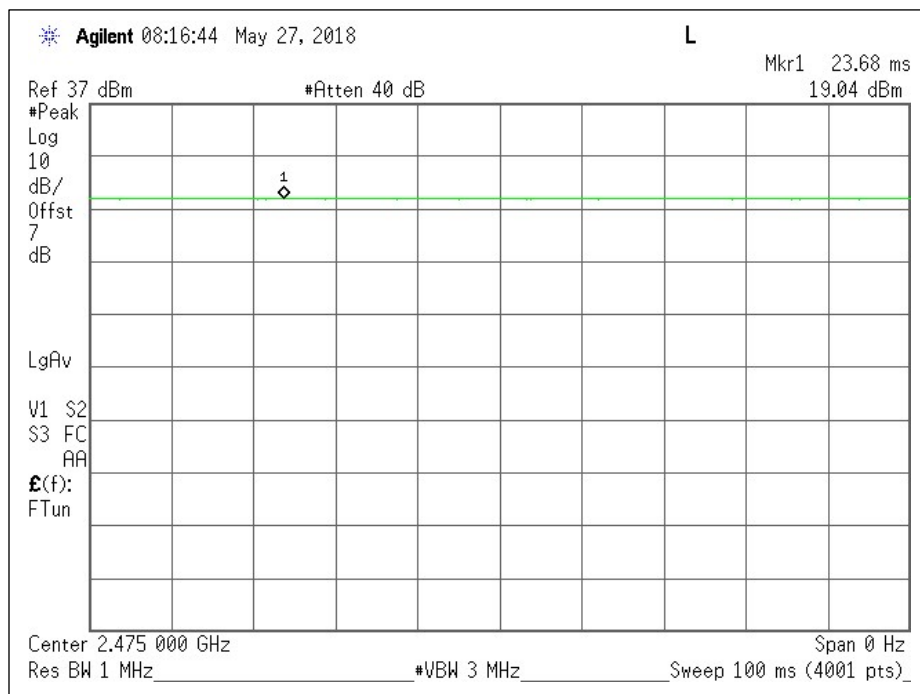
\*-Passive devices are characterized in-house, not calibrated.

### Test Results

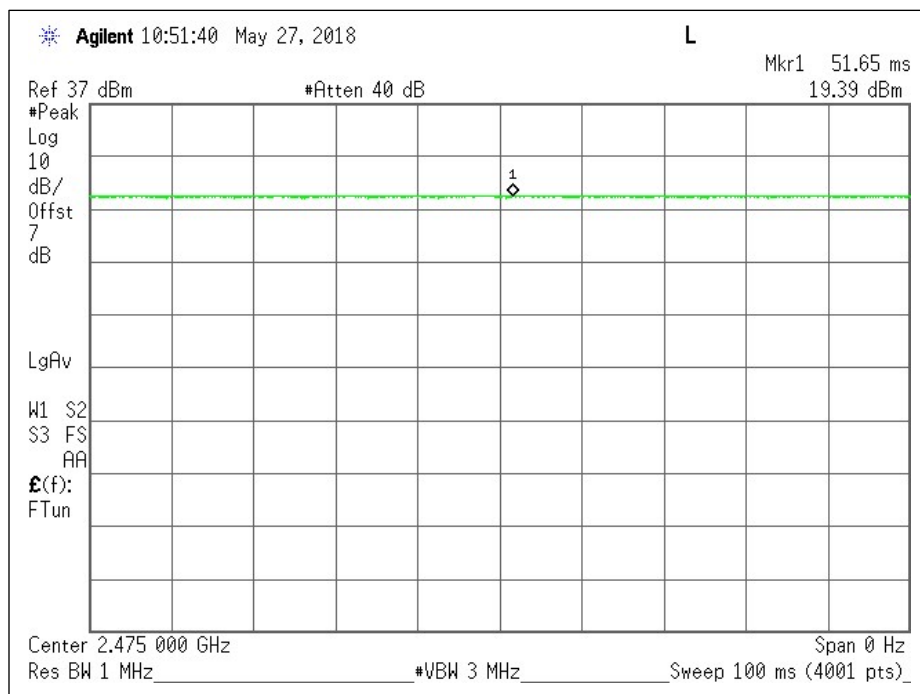
| Antenna | On Time (msec) | Period (msec) | Duty Cycle | Duty Cycle (%) |
|---------|----------------|---------------|------------|----------------|
| 1       | 23.68          | 23.68         | 1          | 100            |
| 2       | 51.65          | 51.65         | 1          | 100            |

**Note:** The duty cycle used for testing was 100%. In normal operation, the device is limited by the protocol to a maximum operational duty factor of 18.656% (refer to additional exhibits in this filing) and this value is used to determine the average level of radiated spurious emissions related to the fundamental from the measured peak level of the spurious emission using the 20log(d) factor allowed under section 12.5.2.2 (4) of KDB 558074.

Duty Cycle Plots



Antenna 1 - Plot



Antenna 2 - Plot

## 6dB Emission Bandwidth (DTS Bandwidth)

### Test Description

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Refer to KDB 558074 D01 DTS Meas Guidance v04.

### Test Criteria

| Reference                                                 | Limit                |
|-----------------------------------------------------------|----------------------|
| CFR 47 Subpart C 15.247 (a)(2)<br>RSS-247 Section 5.2 (a) | $\geq 500\text{kHz}$ |

### Test Information

| Tester | Test Location | Date     | Temperature (°C) | Humidity (%RH) | Pressure (mbar) | Results (P/F) |
|--------|---------------|----------|------------------|----------------|-----------------|---------------|
| CL     | RF Lab        | 06/01/18 | 23.0             | 62.6           | 1004            | P             |

### Equipment List

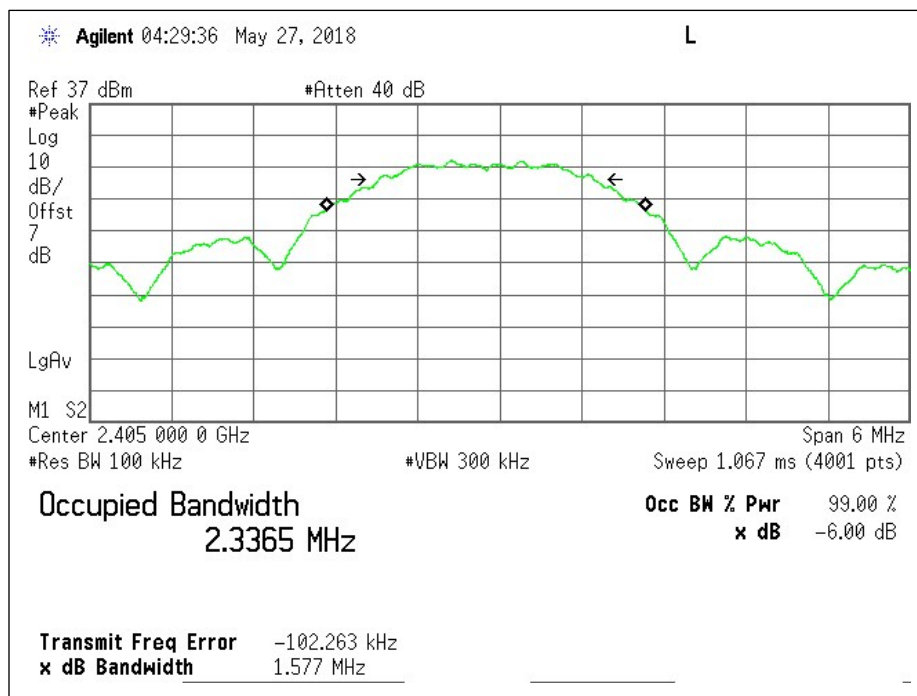
| Instrument Type     | ID #  | Serial #   | Manufacturer       | Model    | Cal Date  | Cal Due Date |
|---------------------|-------|------------|--------------------|----------|-----------|--------------|
| Spectrum Analyzer   | 11549 | MY46187211 | Agilent            | E4440A   | 06/06/17  | 06/06/19     |
| Attenuator          | -     | 1624       | Pasternack         | PE7087-6 | 06/06/17* | 12/31/18*    |
| Environmental Meter | 11533 | A070144    | Extech Instruments | SD700    | 08/21/17  | 08/21/20     |

\*-Passive devices are characterized in-house, not calibrated.

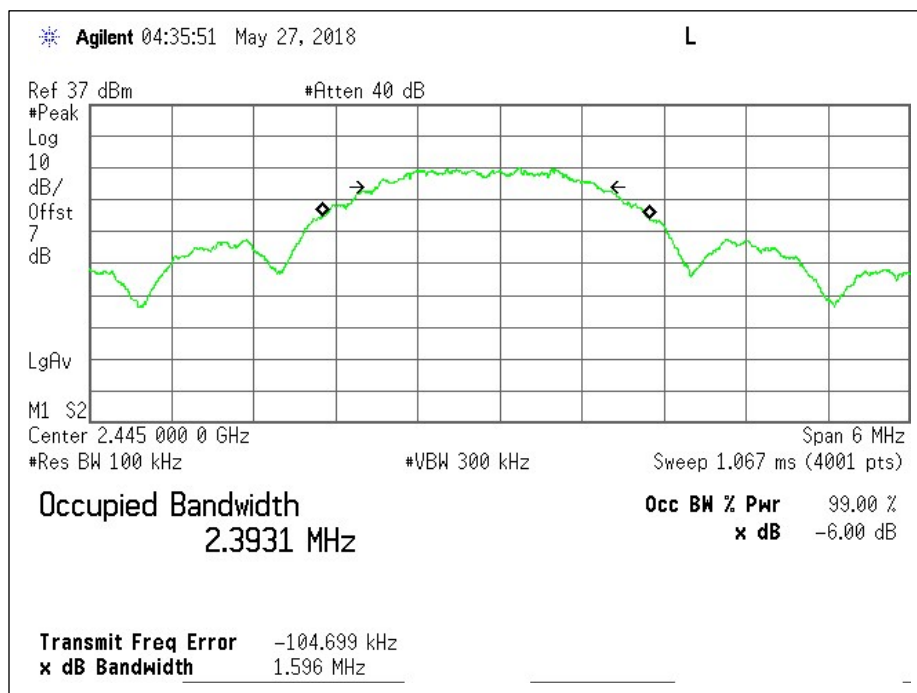
### Test Results

| Channel | Frequency (GHz) | 6dB Bandwidth (in MHz) |           |
|---------|-----------------|------------------------|-----------|
|         |                 | Antenna 1              | Antenna 2 |
| Low     | 2.405           | 1.577                  | 1.556     |
| Mid     | 2.445           | 1.596                  | 1.604     |
| High    | 2.475           | 1.594                  | 1.589     |

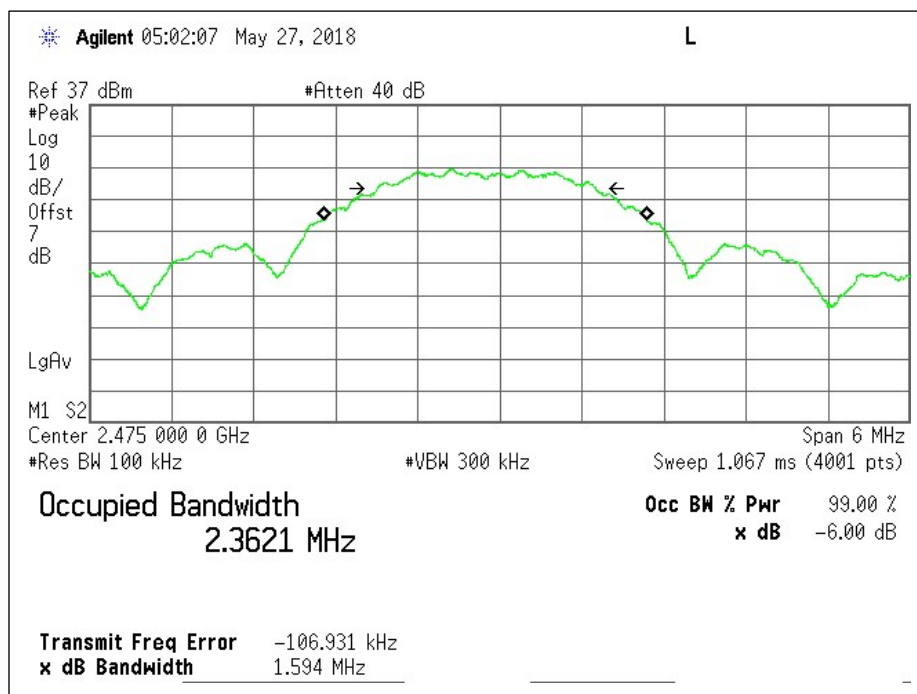
**6dB Bandwidth**



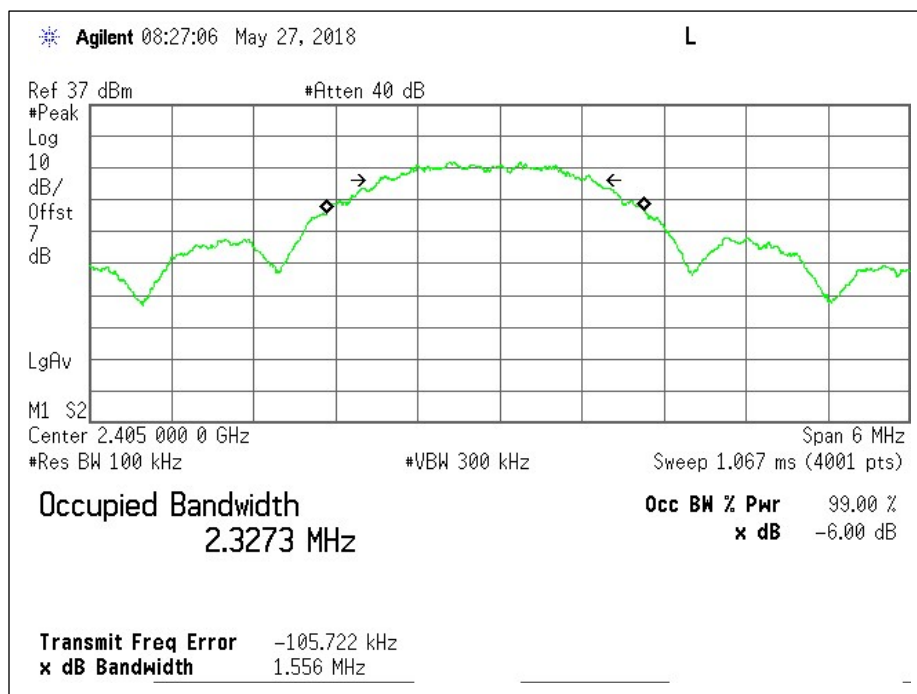
Antenna 1: Low Channel - Plot



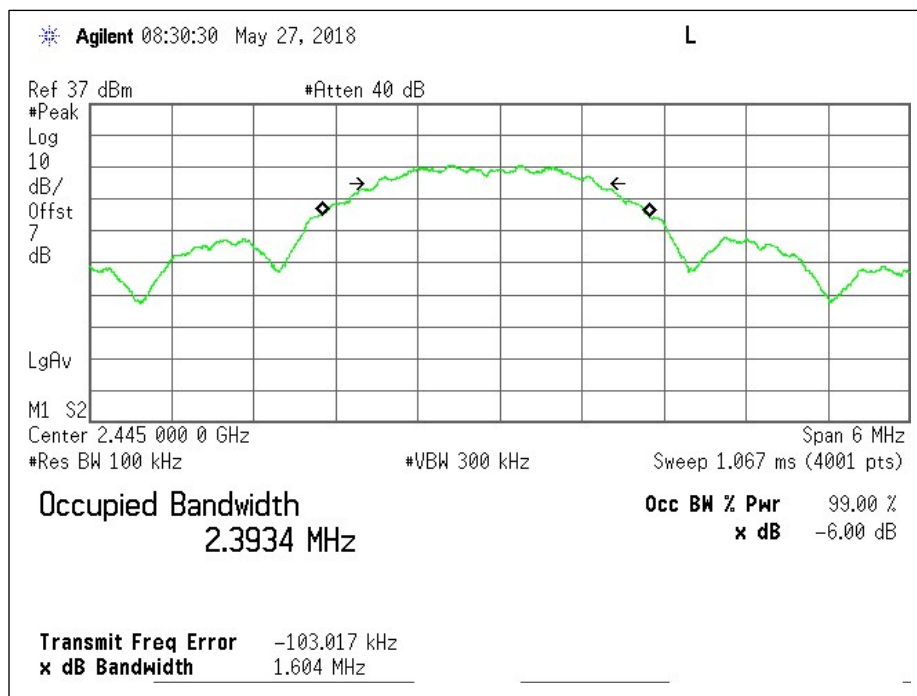
Antenna 1: Mid Channel - Plot



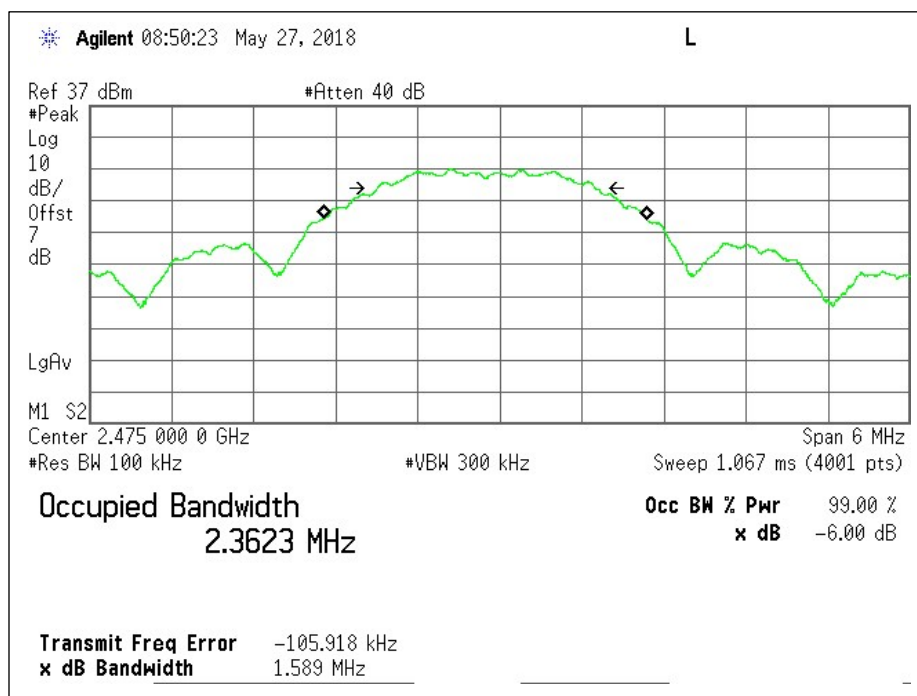
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

## 99% Occupied Bandwidth

### Test Description

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

### Test Criteria

| Reference            | Limit |
|----------------------|-------|
| RSS-GEN, Section 6.6 | N/A   |

### Test Information

| Tester | Test Location | Date     | Temperature (°C) | Humidity (%RH) | Pressure (mbar) | Results (P/F) |
|--------|---------------|----------|------------------|----------------|-----------------|---------------|
| CL     | RF Lab        | 06/01/18 | 23.0             | 62.6           | 1004            | P             |

### Equipment List

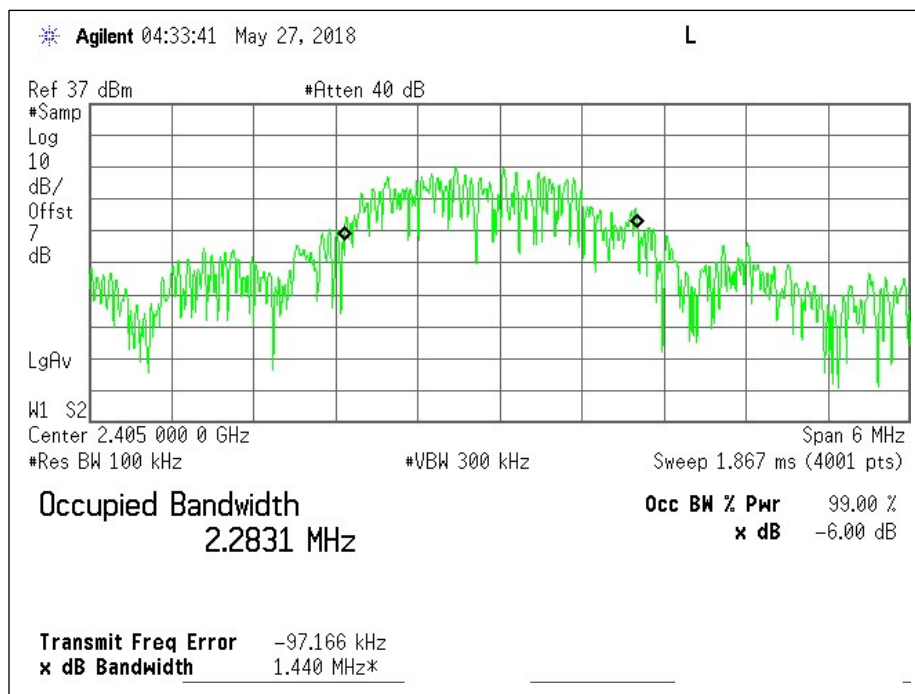
| Instrument Type     | ID #  | Serial #   | Manufacturer       | Model    | Cal Date  | Cal Due Date |
|---------------------|-------|------------|--------------------|----------|-----------|--------------|
| Spectrum Analyzer   | 11549 | MY46187211 | Agilent            | E4440A   | 06/06/17  | 06/06/19     |
| Attenuator          | -     | 1624       | Pasternack         | PE7087-6 | 06/06/17* | 12/31/18*    |
| Environmental Meter | 11533 | A070144    | Extech Instruments | SD700    | 08/21/17  | 08/21/20     |

\*-Passive devices are characterized in-house, not calibrated.

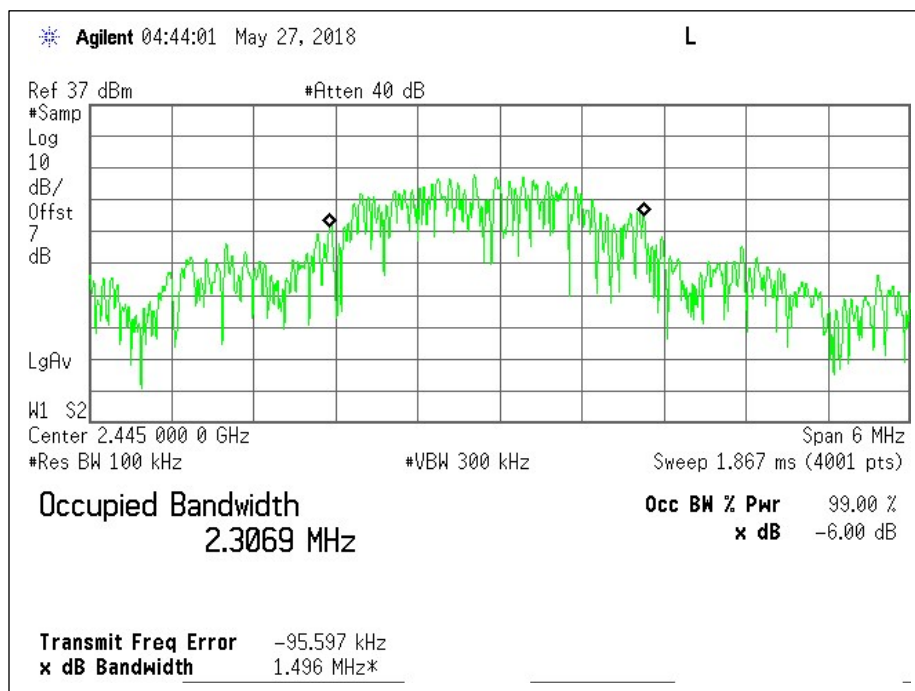
### Test Results

| Channel | Frequency (GHz) | 99% Bandwidth (in MHz) |           |
|---------|-----------------|------------------------|-----------|
|         |                 | Antenna 1              | Antenna 2 |
| Low     | 2.405           | 2.2831                 | 2.2845    |
| Mid     | 2.445           | 2.3069                 | 2.3350    |
| High    | 2.475           | 2.3068                 | 2.3077    |

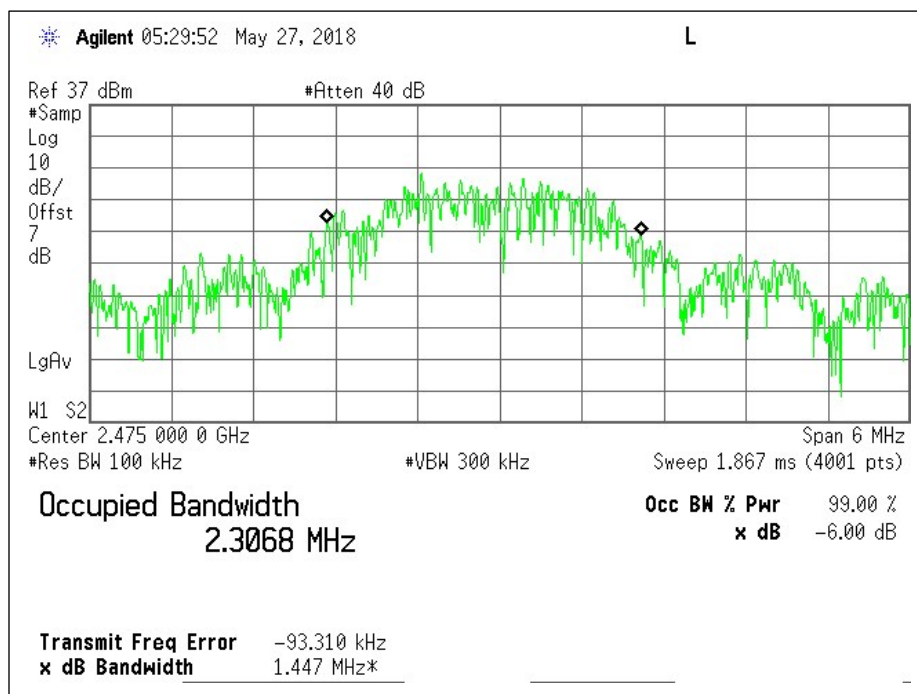
**99% Occupied Bandwidth**



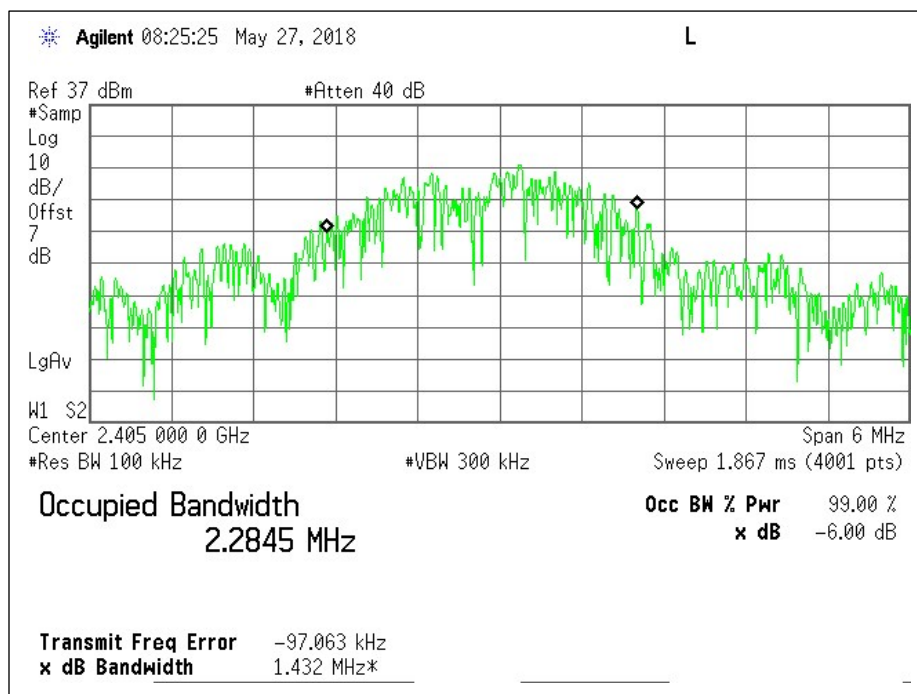
Antenna 1: Low Channel - Plot



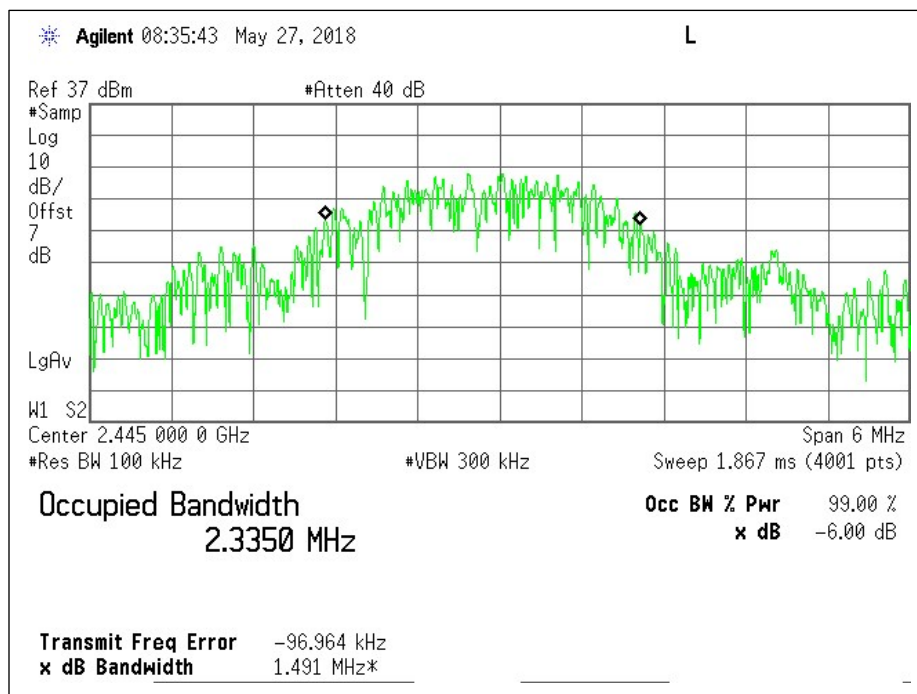
Antenna 1: Mid Channel - Plot



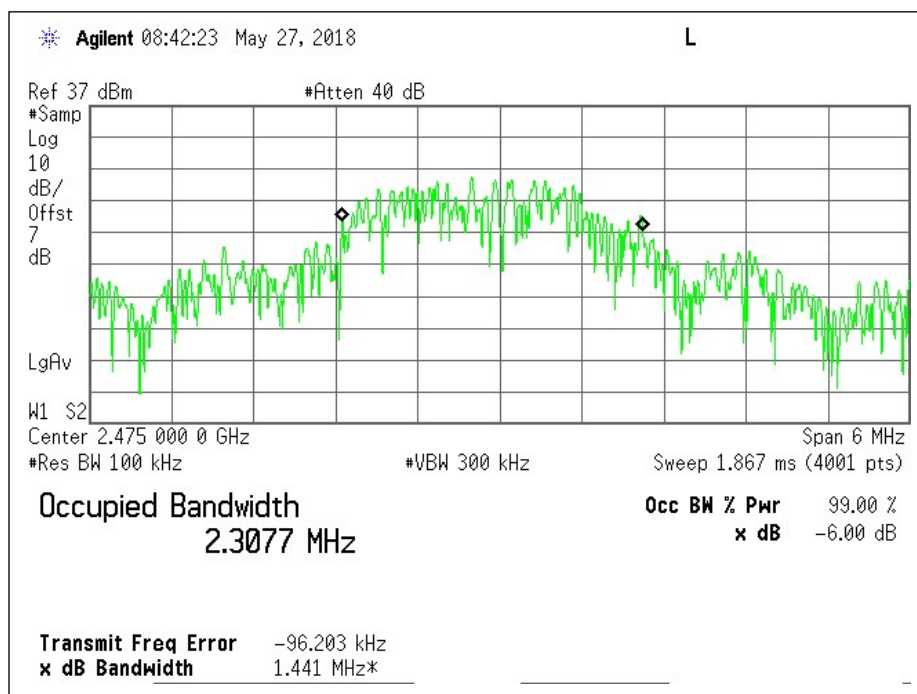
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

## Maximum Conducted Output Power

### Test Description

For systems using digital modulation in the 902-928MHz, 2400-2483,5MHz and 5725-5850MHz bands, the conducted output power limit (specified below) is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Maximum conducted (average) output power was the method employed to determine fundamental emission output power.

Method AVGSA-1 per C63.10 and KDB 558074 was utilized for this test program.

### Test Criteria

| Reference                                                 | Limit      |
|-----------------------------------------------------------|------------|
| CFR 47 Subpart C 15.247 (b)(3)<br>RSS-247 Section 5.4 (d) | 1W (30dBm) |

### Test Information

| Tester | Test Location | Date     | Temperature (°C) | Humidity (%RH) | Pressure (mbar) | Results (P/F) |
|--------|---------------|----------|------------------|----------------|-----------------|---------------|
| CL     | RF Lab        | 06/01/18 | 23.0             | 62.6           | 1004            | P             |

### Equipment List

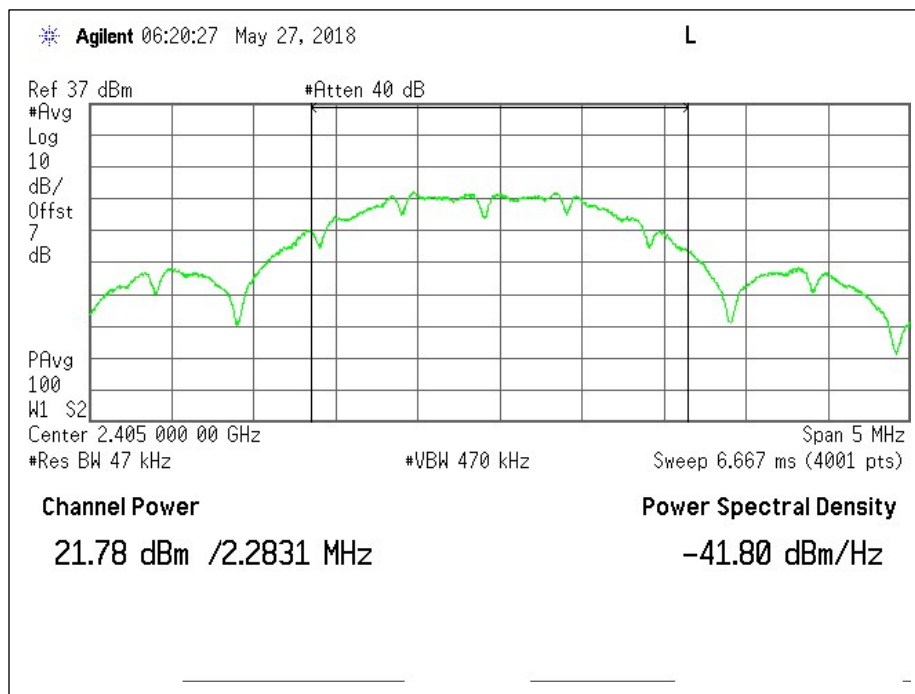
| Instrument Type     | ID #  | Serial #   | Manufacturer       | Model    | Cal Date  | Cal Due Date |
|---------------------|-------|------------|--------------------|----------|-----------|--------------|
| Spectrum Analyzer   | 11549 | MY46187211 | Agilent            | E4440A   | 06/06/17  | 06/06/19     |
| Attenuator          | -     | 1624       | Pasternack         | PE7087-6 | 06/06/17* | 12/31/18*    |
| Environmental Meter | 11533 | A070144    | Extech Instruments | SD700    | 08/21/17  | 08/21/20     |

\*-Passive devices are characterized in-house, not calibrated.

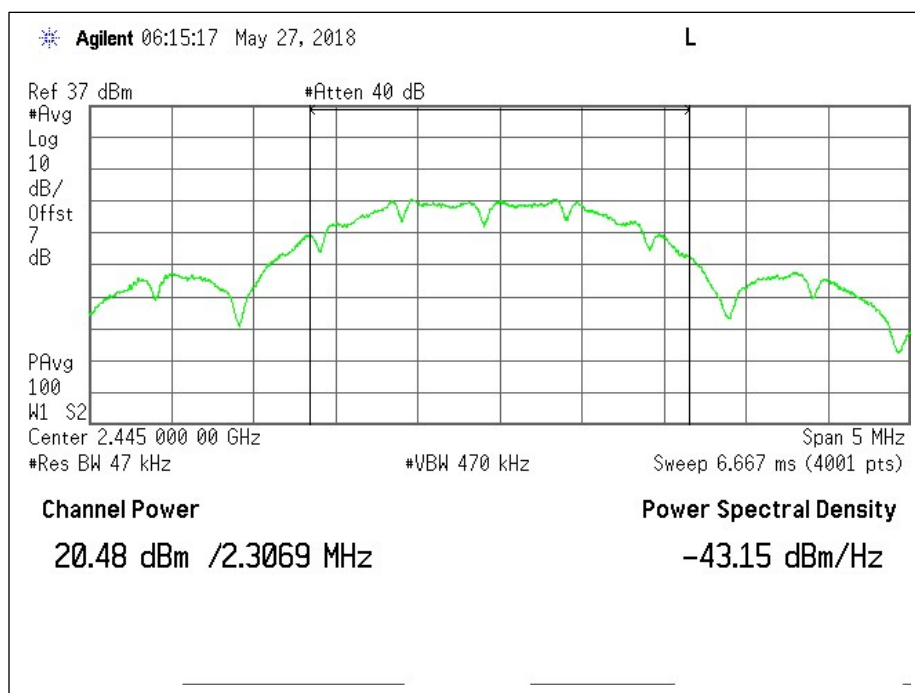
### Test Results

| Channel | Frequency (GHz) | Tx Channel BW Power (dBm) |           |
|---------|-----------------|---------------------------|-----------|
|         |                 | Antenna 1                 | Antenna 2 |
| Low     | 2.405           | 21.78                     | 21.75     |
| Mid     | 2.445           | 20.48                     | 20.79     |
| High    | 2.475           | 19.46                     | 19.91     |

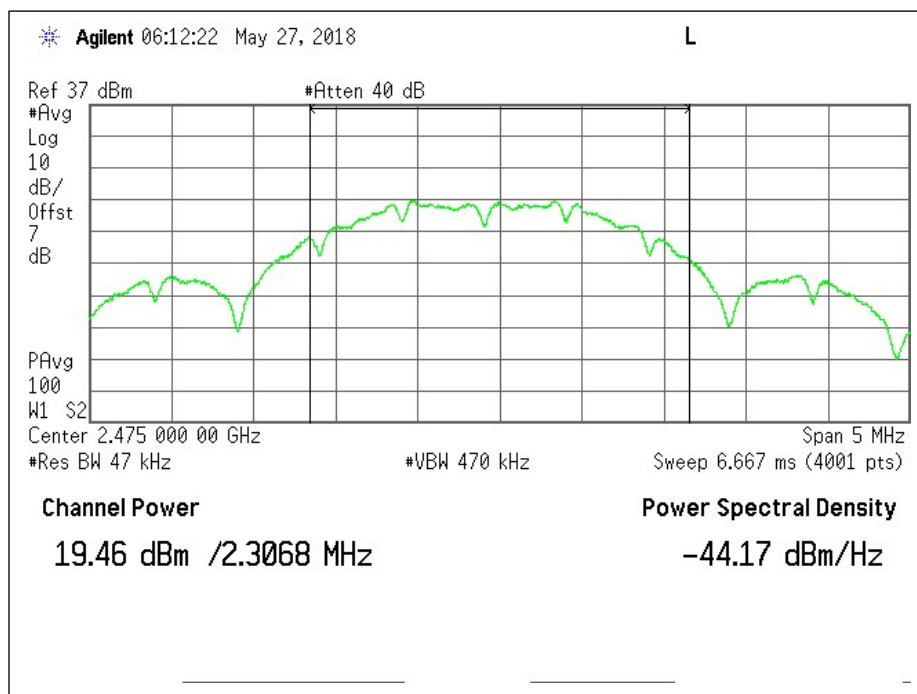
**Output Power**



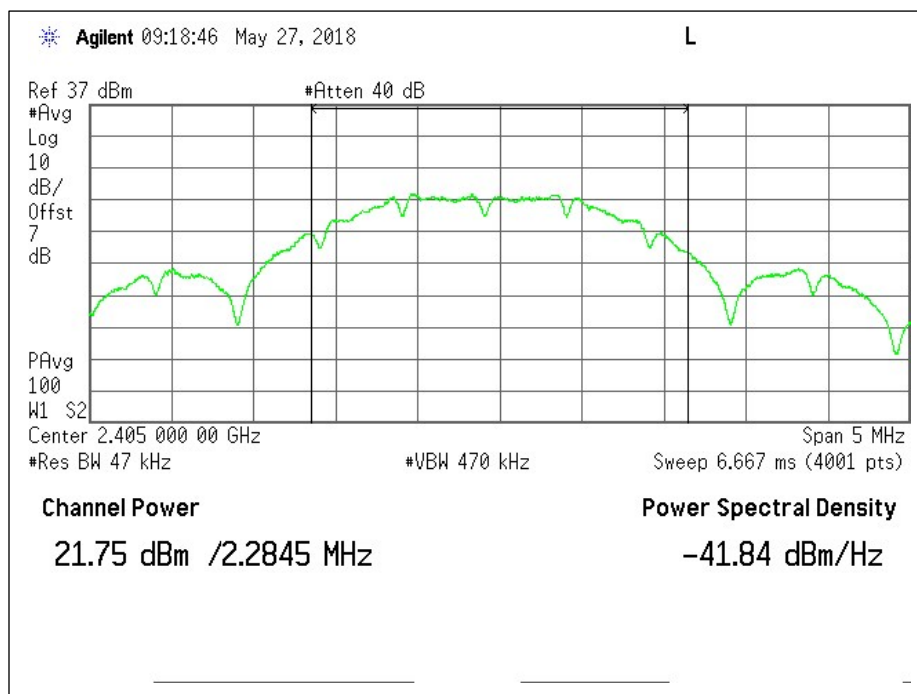
Antenna 1: Low Channel - Plot



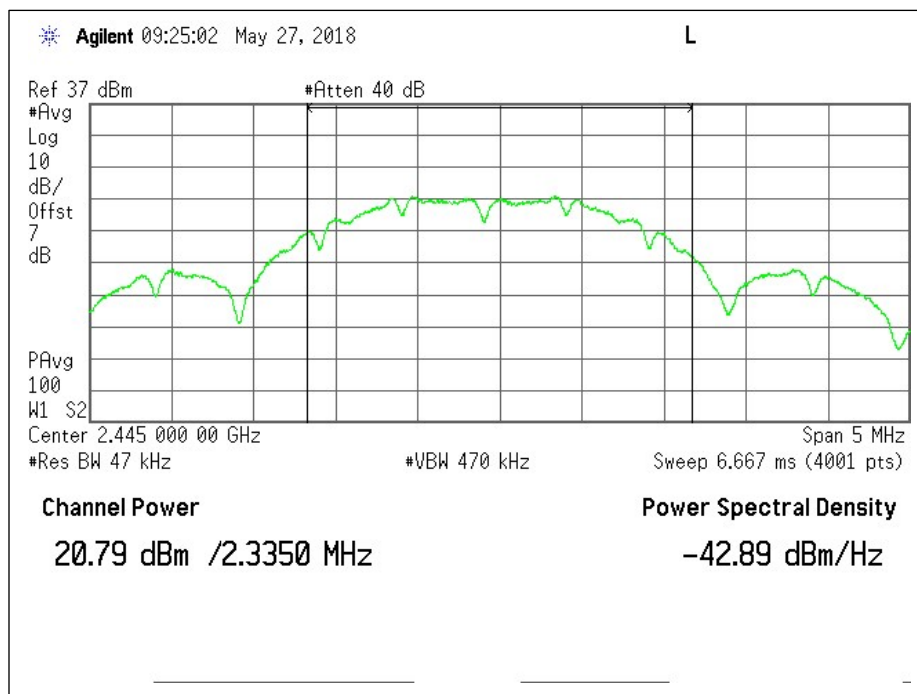
Antenna 1: Mid Channel - Plot



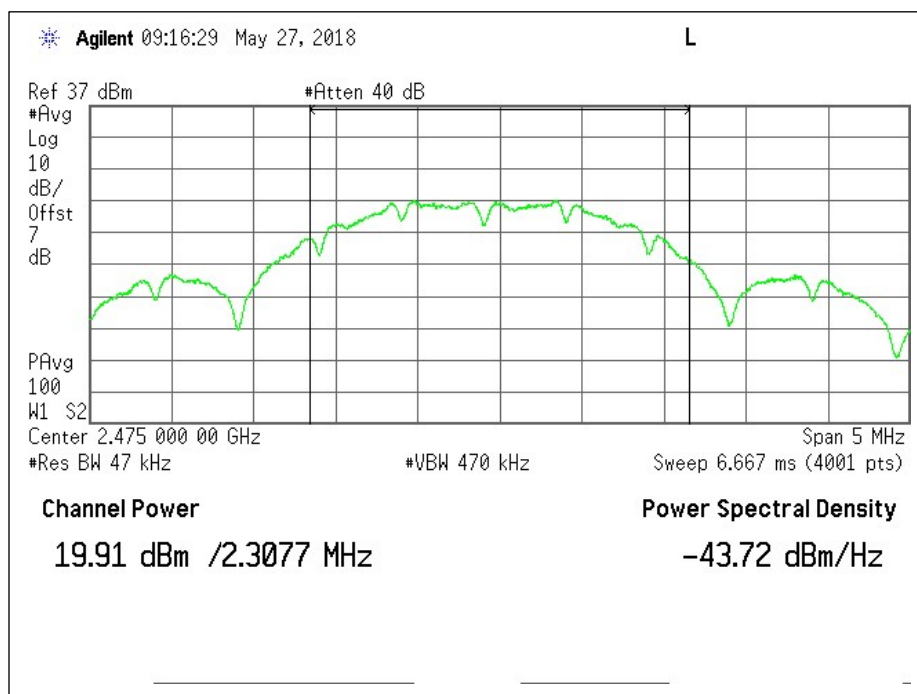
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

## Maximum Power Spectral Density

### Test Description

The DTS rules specify a conducted PSD limit within the *DTS bandwidth* during any time interval of continuous transmission. Such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. Therefore, if maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used.

Since maximum conducted (average) output power was the method employed to determine fundamental emission output power, then the average power spectral density method was utilized.

Method AVGPSD-1 per C63.10 and KDB 558074 was utilized for this test program.

### Test Criteria

| Reference                                              | Limit                     |
|--------------------------------------------------------|---------------------------|
| CFR 47 Subpart C 15.247 (e)<br>RSS-247 Section 5.2 (b) | < 8 dBm in any 3 kHz Band |

### Test Information

| Tester | Test Location | Date     | Temperature (°C) | Humidity (%RH) | Pressure (mbar) | Results (P/F) |
|--------|---------------|----------|------------------|----------------|-----------------|---------------|
| CL     | RF Lab        | 06/01/18 | 23.0             | 62.6           | 1004            | P             |

### Equipment List

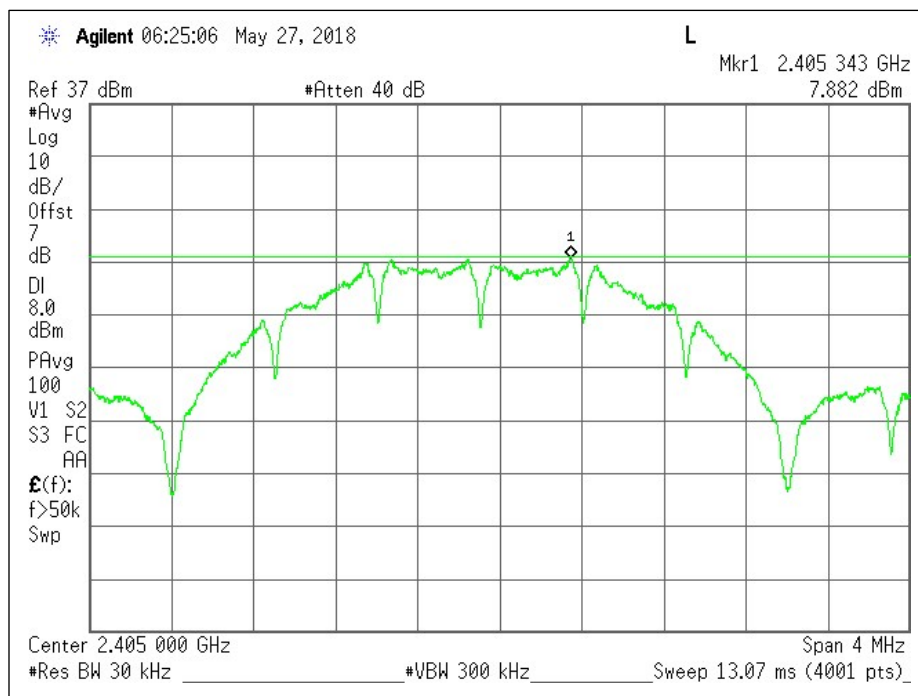
| Instrument Type     | ID #  | Serial #   | Manufacturer       | Model    | Cal Date  | Cal Due Date |
|---------------------|-------|------------|--------------------|----------|-----------|--------------|
| Spectrum Analyzer   | 11549 | MY46187211 | Agilent            | E4440A   | 06/06/17  | 06/06/19     |
| Attenuator          | -     | 1624       | Pasternack         | PE7087-6 | 06/06/17* | 12/31/18*    |
| Environmental Meter | 11533 | A070144    | Extech Instruments | SD700    | 08/21/17  | 08/21/20     |

\*-Passive devices are characterized in-house, not calibrated.

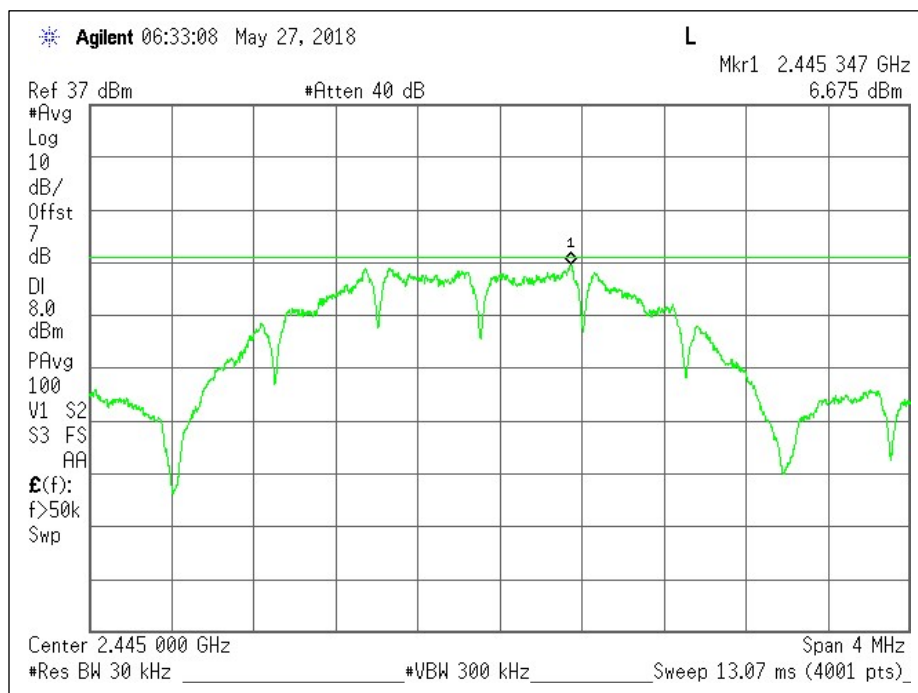
### Test Results

| Channel | Frequency (GHz) | Max Power (dBm) |           |
|---------|-----------------|-----------------|-----------|
|         |                 | Antenna 1       | Antenna 2 |
| Low     | 2.405           | 7.882           | 7.951     |
| Mid     | 2.445           | 6.675           | 6.732     |
| High    | 2.475           | 5.749           | 5.858     |

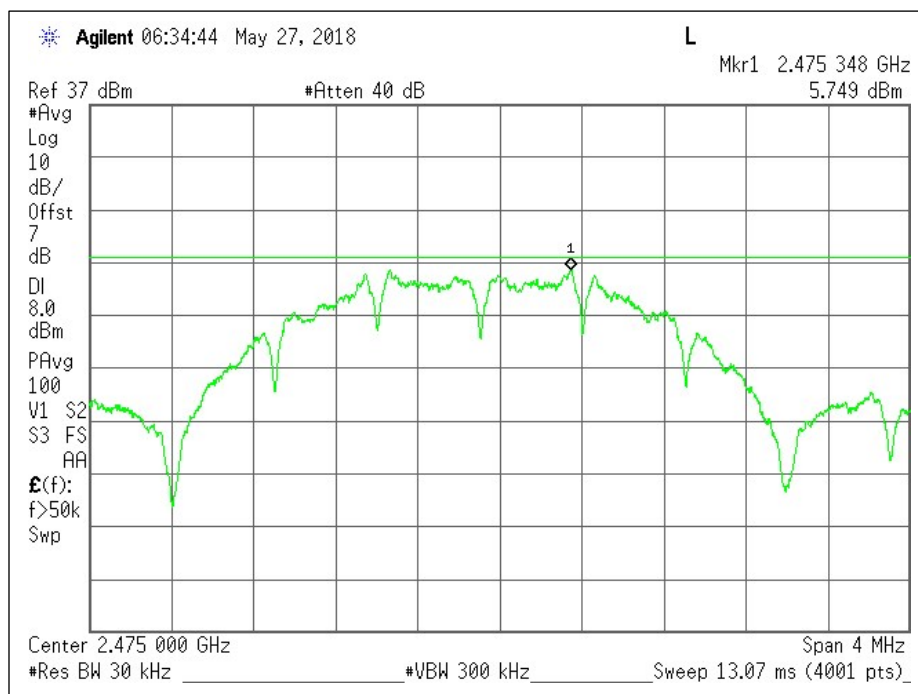
PSD



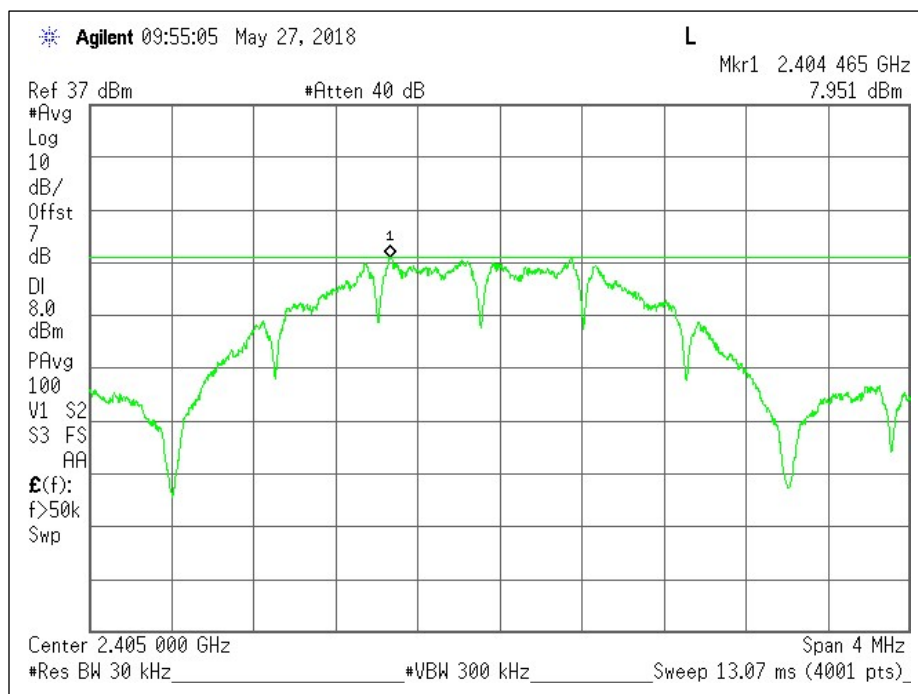
Antenna 1: Low Channel - Plot



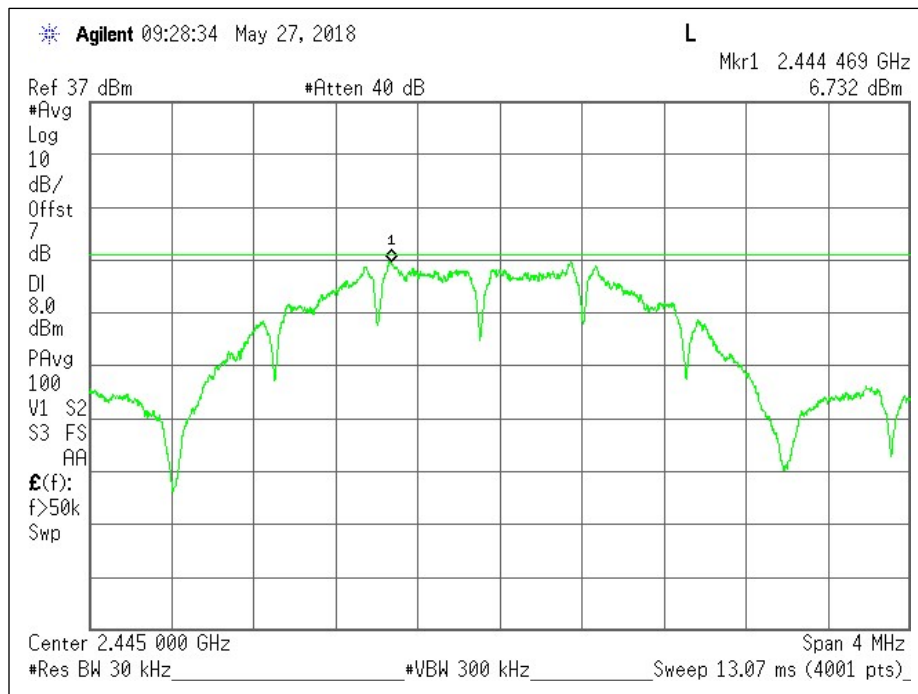
Antenna 1: Mid Channel - Plot



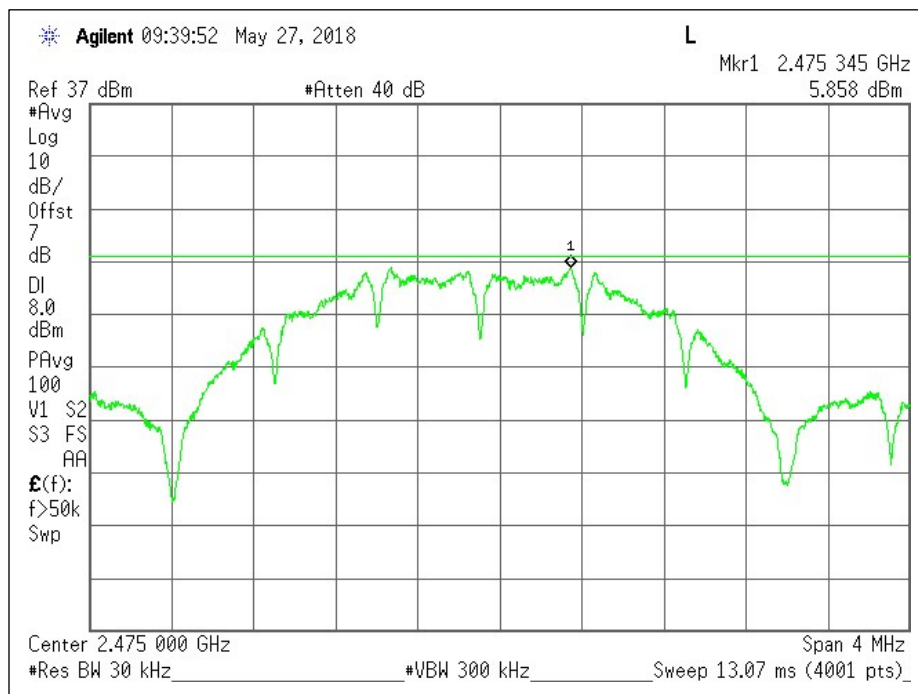
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

## Authorized Band Edge / Conducted Spurious Emissions

### Test Description

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

### Test Criteria

| Reference                                           | Limit                      |
|-----------------------------------------------------|----------------------------|
| CFR 47 Subpart C 15.247 (d)<br>RSS-247, Section 5.5 | 30dB Below the Fundamental |

### Test Information

| Tester | Test Location | Date     | Temperature (°C) | Humidity (%RH) | Pressure (mbar) | Results (P/F) |
|--------|---------------|----------|------------------|----------------|-----------------|---------------|
| CL     | RF Lab        | 06/01/18 | 23.0             | 62.6           | 1004            | P             |

### Equipment List

| Instrument Type     | ID #  | Serial #   | Manufacturer       | Model    | Cal Date  | Cal Due Date |
|---------------------|-------|------------|--------------------|----------|-----------|--------------|
| Spectrum Analyzer   | 11549 | MY46187211 | Agilent            | E4440A   | 06/06/17  | 06/06/19     |
| Attenuator          | -     | 1624       | Pasternack         | PE7087-6 | 06/06/17* | 12/31/18*    |
| Environmental Meter | 11533 | A070144    | Extech Instruments | SD700    | 08/21/17  | 08/21/20     |

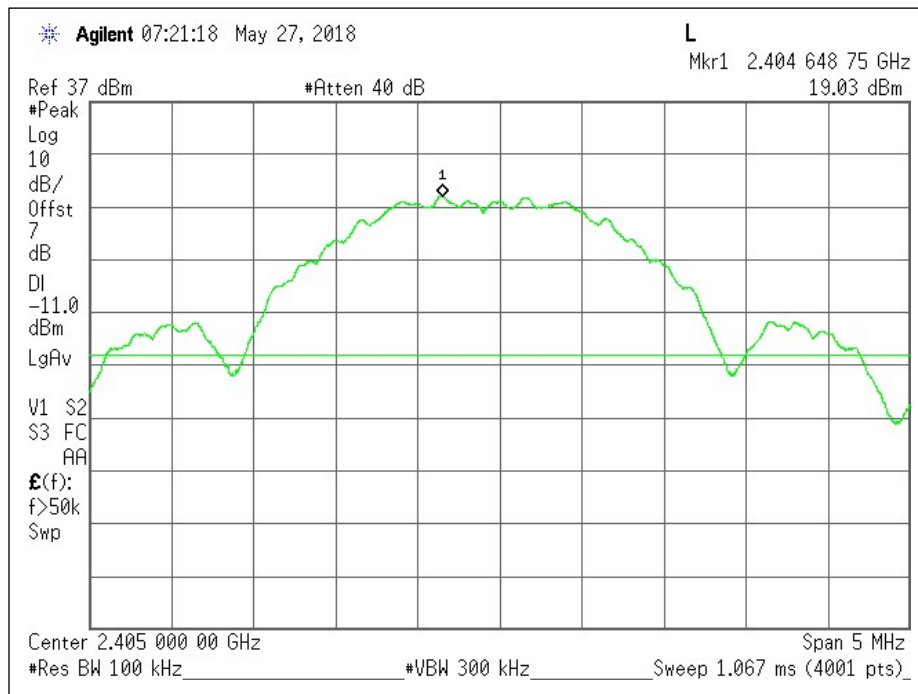
\*-Passive devices are characterized in-house, not calibrated.

### Test Results

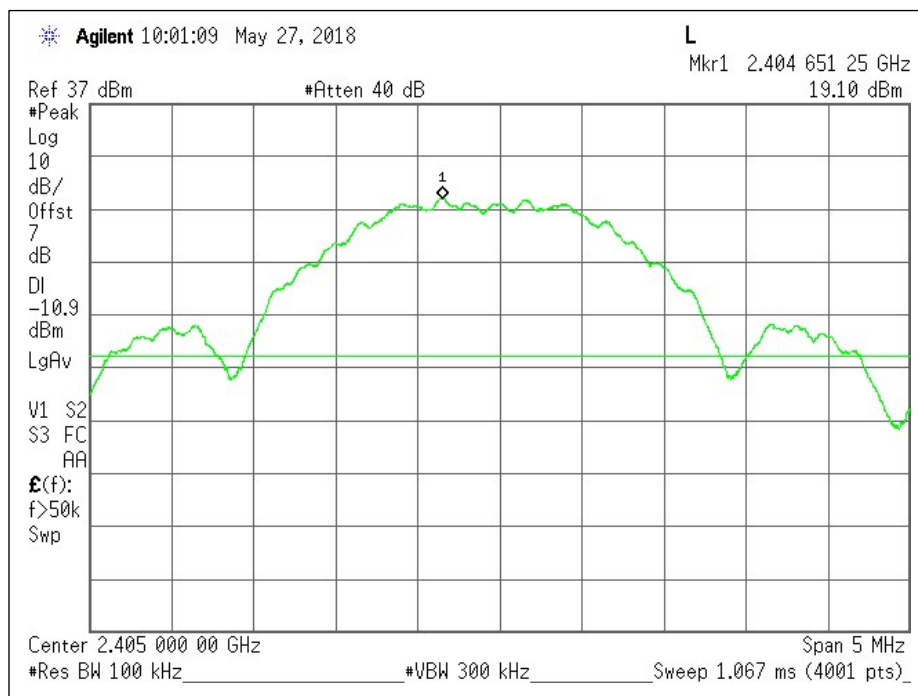
| Authorized Band Edge |         |                 |                                  |            |             |
|----------------------|---------|-----------------|----------------------------------|------------|-------------|
| Antenna              | Channel | Frequency (GHz) | Delta from Peak to Bandedge (dB) | Limit (dB) | Margin (dB) |
| 1                    | Low     | 2.405           | 42.92                            | 30         | -12.92      |
|                      | High    | 2.475           | 60.83                            | 30         | -30.83      |
| 2                    | Low     | 2.405           | 42.71                            | 30         | -12.71      |
|                      | High    | 2.475           | 60.32                            | 30         | -30.32      |

| Conducted Spurious |                 |                                                                |           |
|--------------------|-----------------|----------------------------------------------------------------|-----------|
| Channel            | Frequency (GHz) | Highest Spurious Emission Delta from the -30dB down Limit (dB) |           |
|                    |                 | Antenna 1                                                      | Antenna 2 |
| Low                | 2.405           | -34.88                                                         | -36.98    |
| Mid                | 2.445           | -36.17                                                         | -37.85    |
| High               | 2.475           | -36.06                                                         | -36.91    |

Reference Measurement

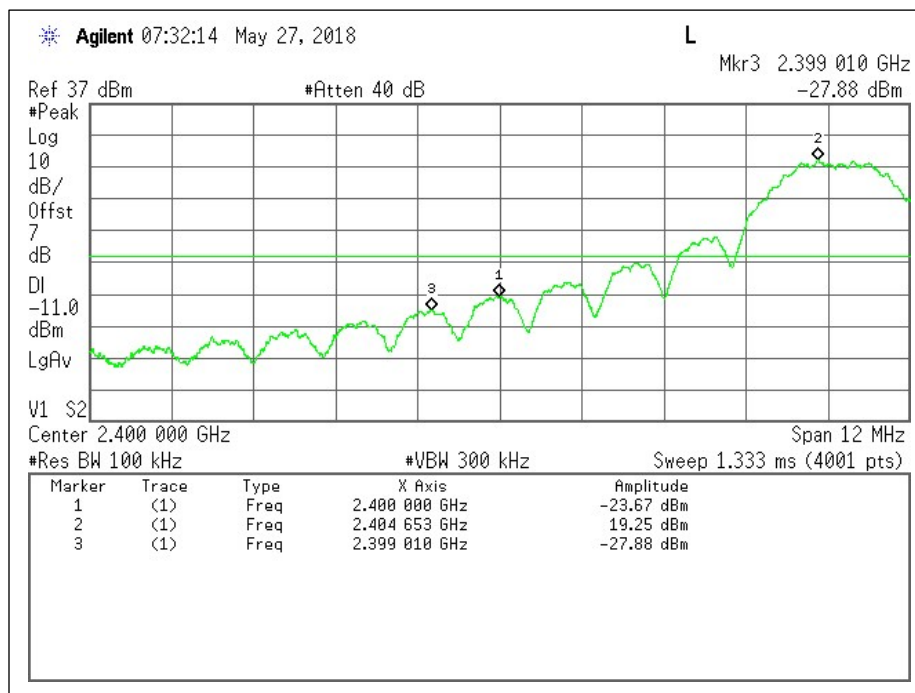


Antenna 1: Low Channel - Plot

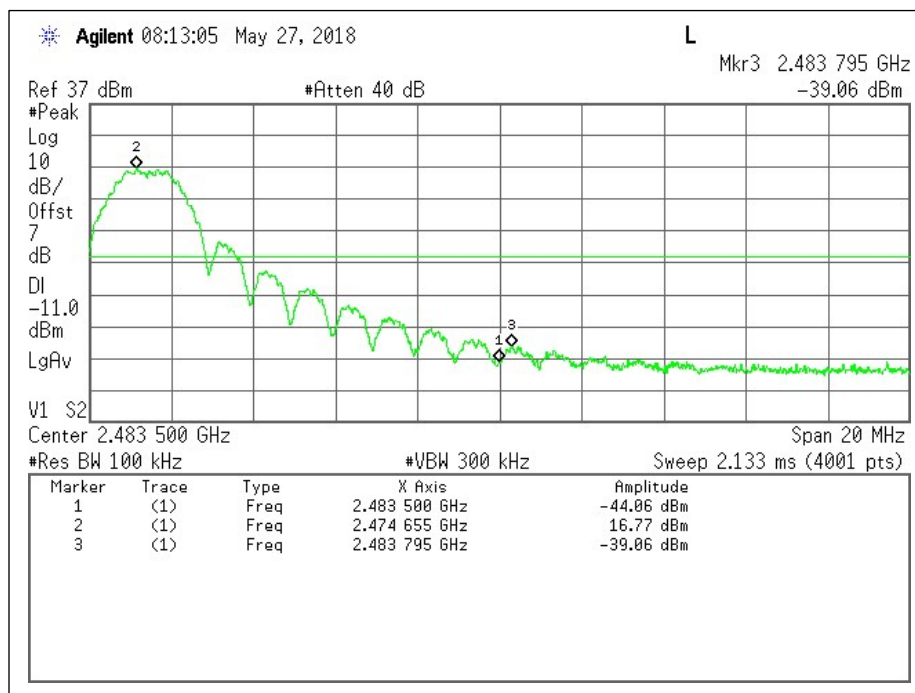


Antenna 2: Low Channel – Plot

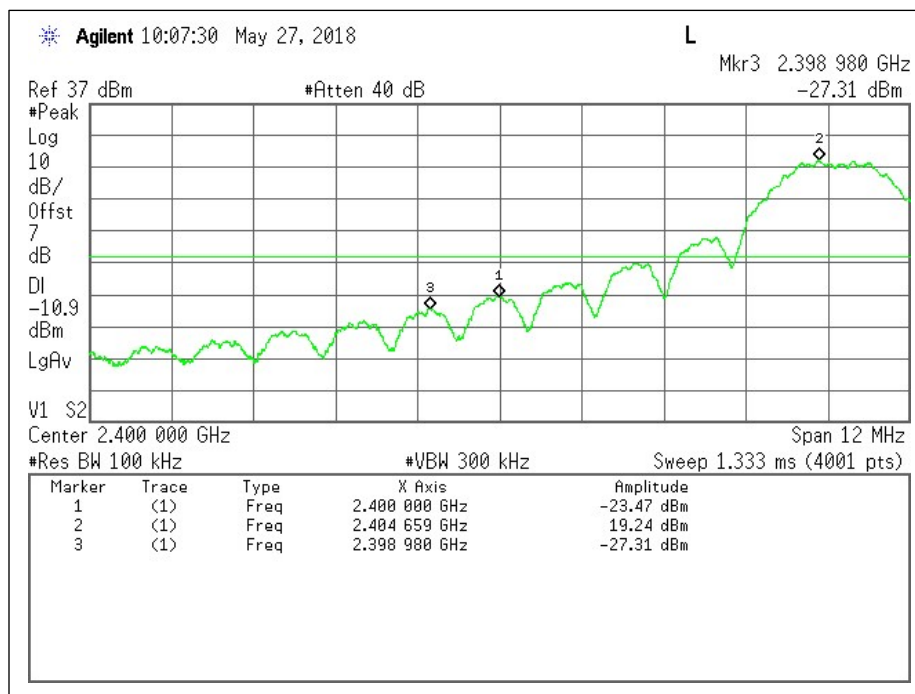
**Band Edge**



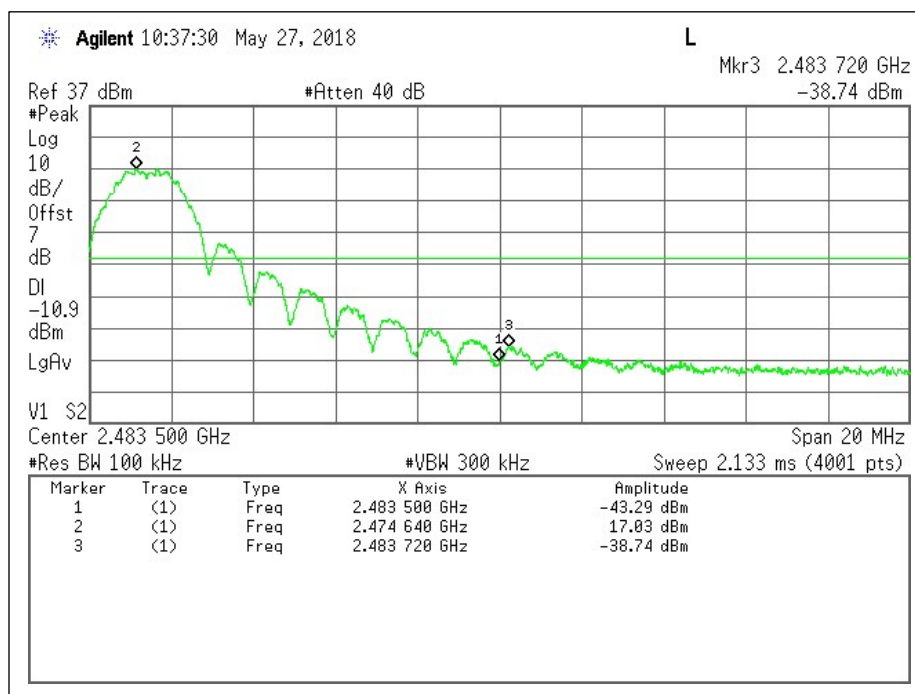
Antenna 1: Low Channel - Plot



Antenna 1: High Channel – Plot

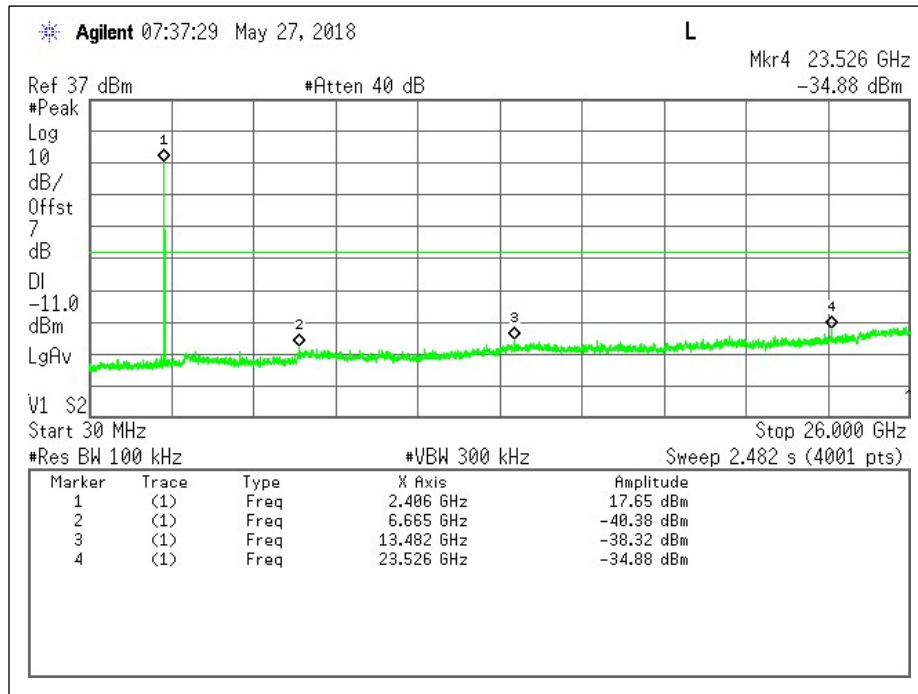


Antenna 2: Low Channel - Plot

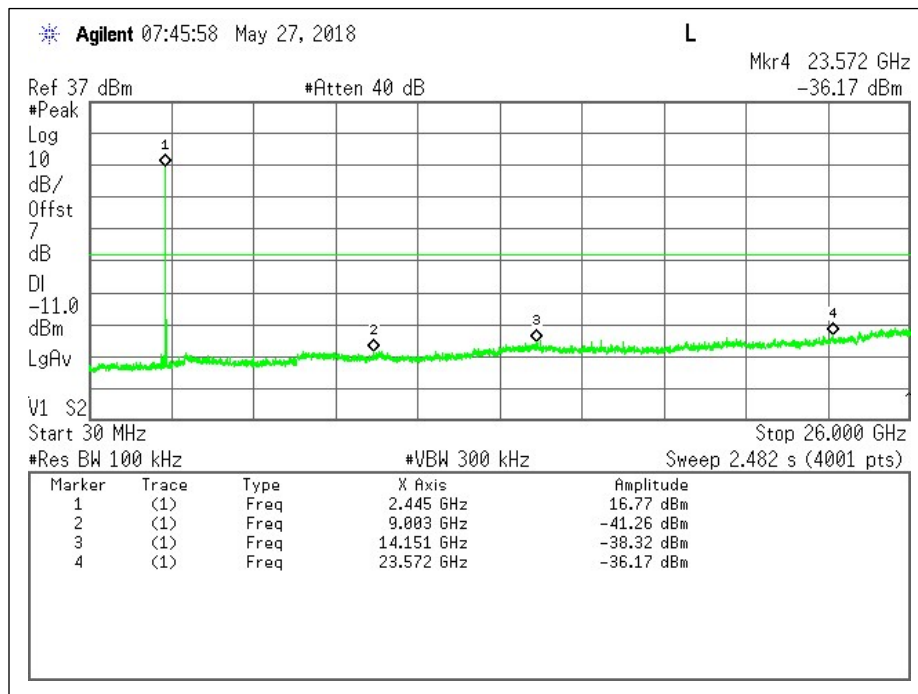


Antenna 2: High Channel - Plot

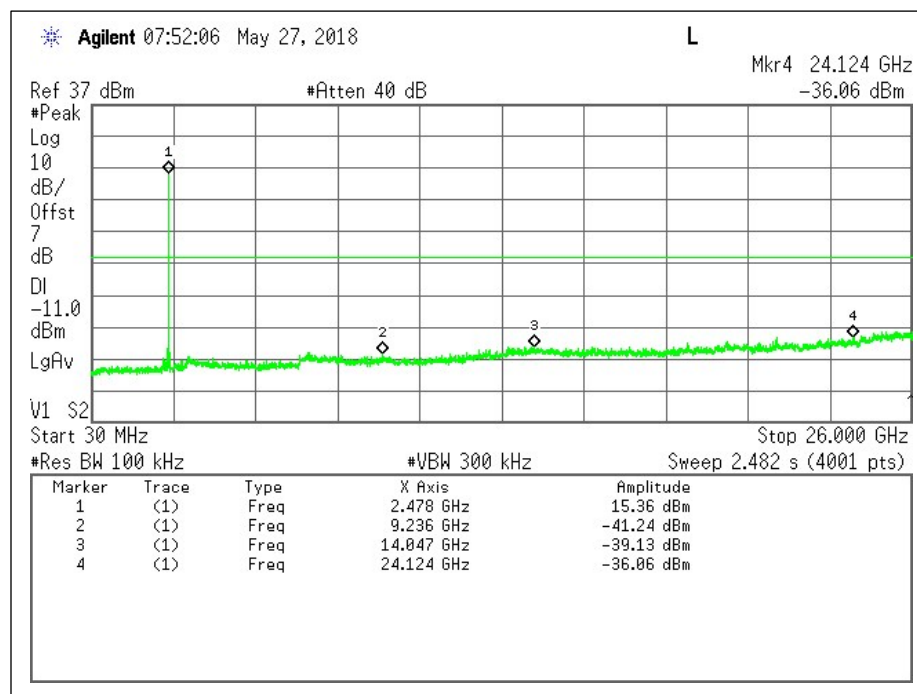
**Conducted Spurious**



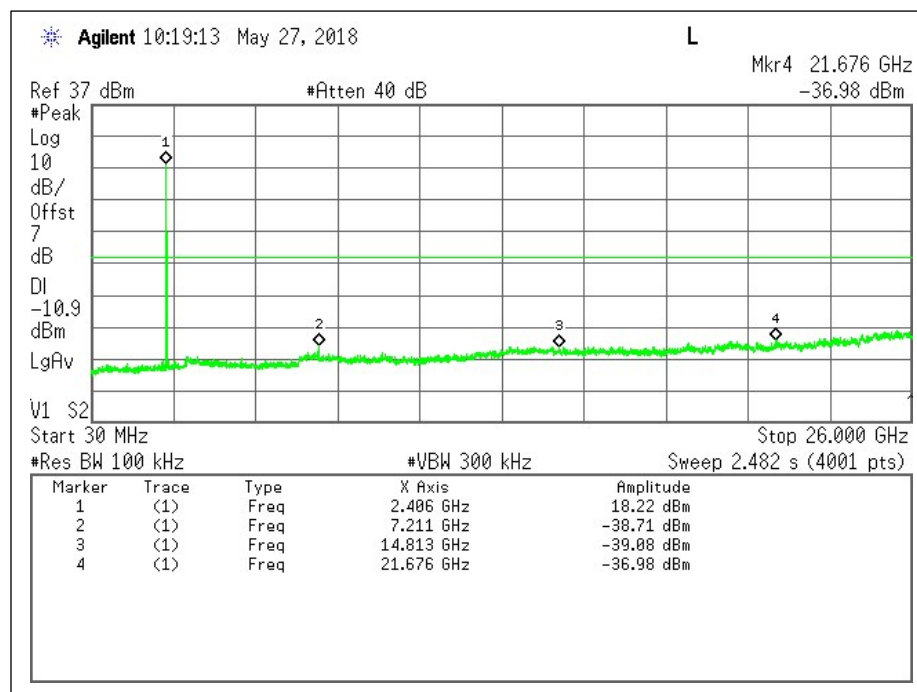
Antenna 1: Low Channel - Plot



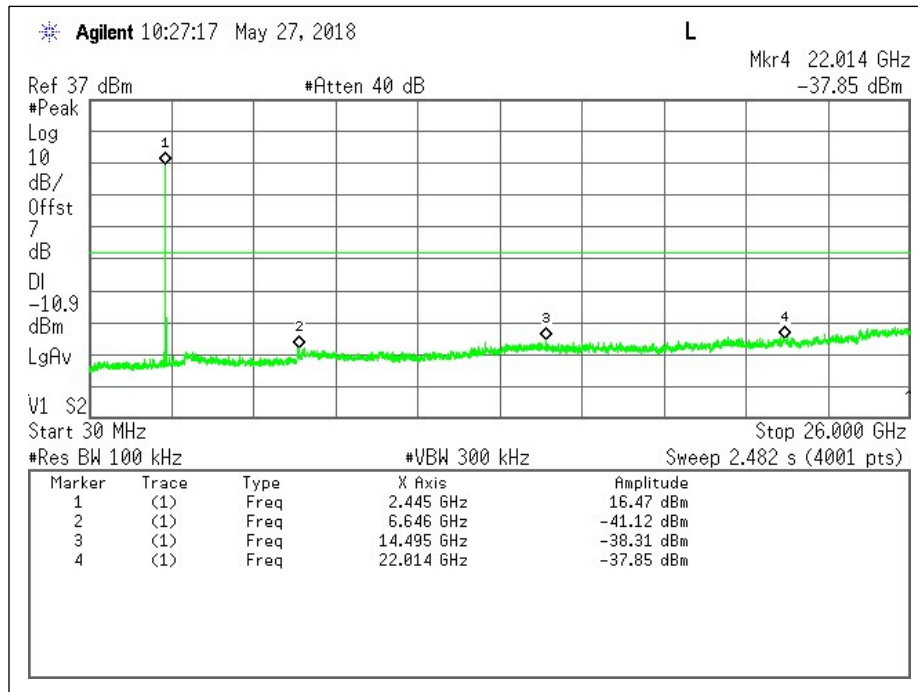
Antenna 1: Mid Channel - Plot



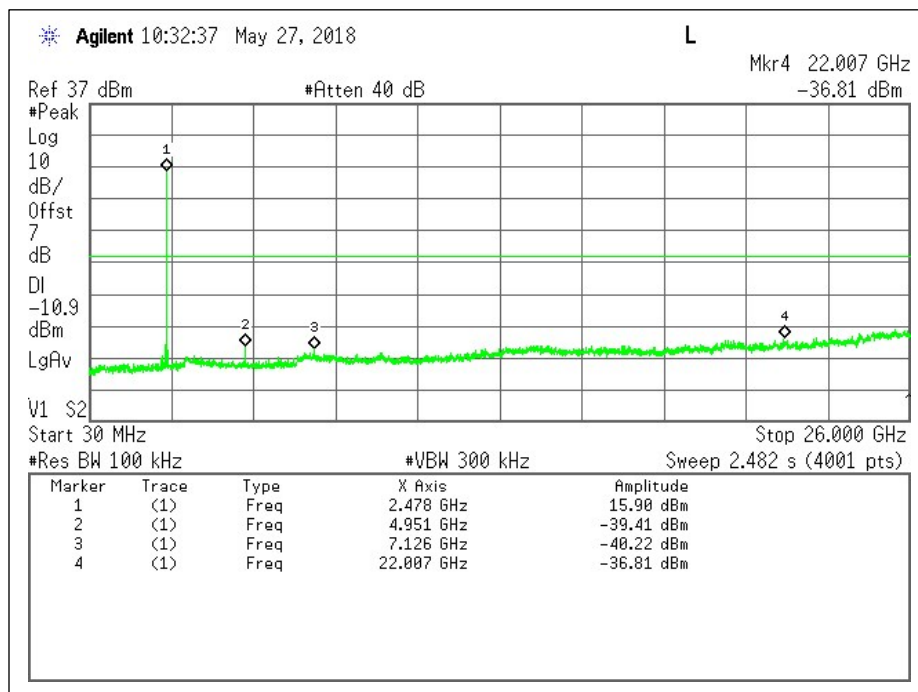
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

## Radiated Emissions (Unintentional)

### Test Description

The Radiated Emissions (Unintentional) measurement is a test of the whole EUT during normal operation. It is a Radiated Emissions measurement performed from 30 MHz to 5x the highest operating frequency of the device. Prescans are done in a 3 meter anechoic chamber, while final measurements are made on the OATS. The EUT is positioned on a turntable in the manner for which the device will be normally used, with all peripherals connected in idle, with all cables typically used with the EUT dressed appropriately.

### Test Criteria

| Reference                            | Limit           |                                      |                                        |
|--------------------------------------|-----------------|--------------------------------------|----------------------------------------|
| CFR 47 Subpart B, 15.109<br>ICES-003 | Frequency Range | Field Strength Limit<br>(uV/m) at 3M | Field Strength Limit<br>(dBuV/m) at 3M |
|                                      | 30-88           | 100                                  | 40                                     |
|                                      | 88-216          | 150                                  | 43.5                                   |
|                                      | 216-960         | 200                                  | 46                                     |
|                                      | Above 960       | 500                                  | 54                                     |

### Test Information

| Tester | Test Location   | Date              | Temperature<br>(°C) | Humidity<br>(%RH) | Pressure<br>(mbar) | Results<br>(P/F) |
|--------|-----------------|-------------------|---------------------|-------------------|--------------------|------------------|
| CL/JB  | RF Chamber/OATS | 06/02/18-07/17/18 | 22.2                | 85.0              | 1004               | P                |

### Equipment List

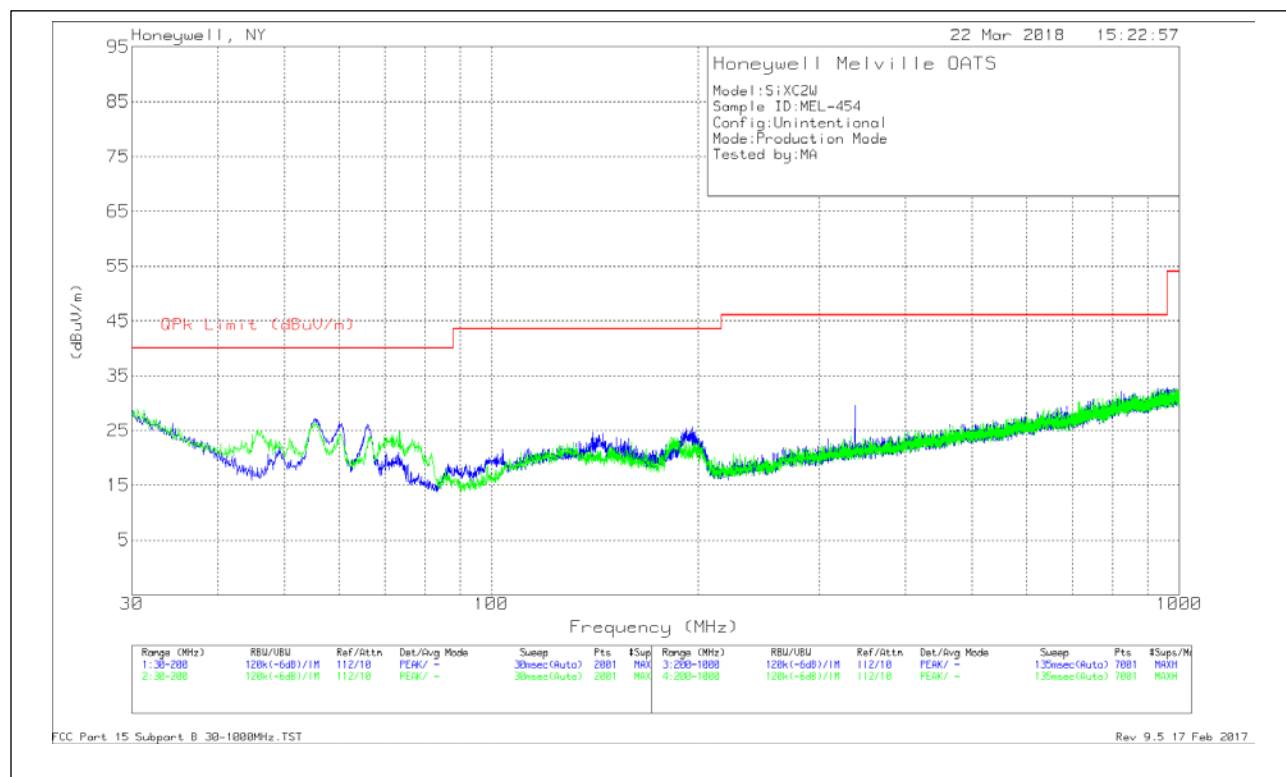
| Instrument Type            | ID #  | Serial #    | Manufacturer       | Model      | Cal Date  | Cal Due Date |
|----------------------------|-------|-------------|--------------------|------------|-----------|--------------|
| <b>RF Chamber</b>          |       |             |                    |            |           |              |
| Spectrum Analyzer          | 11496 | 100303      | Rohde & Schwarz    | FSU26      | 04/11/18  | 04/11/19     |
| Bilog Antenna (30MHz-5GHz) | 11311 | A0022406    | Sunol              | JB5        | 02/01/18  | 02/01/19     |
| Horn Antenna (1-18GHz)     | 2319  | 2317        | EMCO               | 3115       | 01/10/18  | 01/10/19     |
| Preamp (30-1000MHz)        | 11537 | 1603006     | Mini Circuits      | TVA-11-422 | N/A       | N/A          |
| Preamp (1-18GHz)           | 11539 | 160362      | Amplicial          | AMP1G18-35 | N/A       | N/A          |
| Measurement Software       | 11543 | Version 9.5 | UL                 | UL EMC     | N/A       | N/A          |
| RF Cable                   | -     | -           | Mini-Circuits      | RDE#2      | 06/06/17* | 12/31/18*    |
| RF Cable                   | -     | -           | Insulated Wire     | SMA#8      | 06/06/17* | 12/31/18*    |
| Environmental Meter        | 11533 | A070144     | Extech Instruments | SD700      | 08/21/17  | 08/21/20     |
| <b>OATS</b>                |       |             |                    |            |           |              |
| Spectrum Analyzer          | 11545 | 103125      | Rohde & Schwarz    | FSW26      | 02/21/18  | 02/21/19     |
| Bilog Antenna (30MHz-5GHz) | 11311 | A0022406    | Sunol              | JB5        | 02/01/18  | 02/01/19     |

|                           |       |                |                    |                   |           |           |
|---------------------------|-------|----------------|--------------------|-------------------|-----------|-----------|
| Horn Antenna<br>(1-18GHz) | 2973  | 3127           | EMCO               | RGA-60            | 01/22/18  | 01/22/19  |
| Preamp<br>(1-18GHz)       | 11539 | 160362         | Amplical           | AMP1G18-35        | N/A       | N/A       |
| Measurement<br>Software   | 11543 | Version<br>9.5 | UL                 | UL EMC            | N/A       | N/A       |
| RF Cable                  | -     | -              | Pasternack         | RDE#1             | 06/06/17* | 12/31/18* |
| RF Cable                  | -     | -              | MegaPhase          | EMC2-S1S1-<br>360 | 06/06/17* | 12/31/18* |
| Environmental<br>Meter    | 11533 | A070144        | Extech Instruments | SD700             | 08/21/17  | 08/21/20  |

\*-Passive devices are characterized in-house, not calibrated.

## Test Results

### Below 1GHz



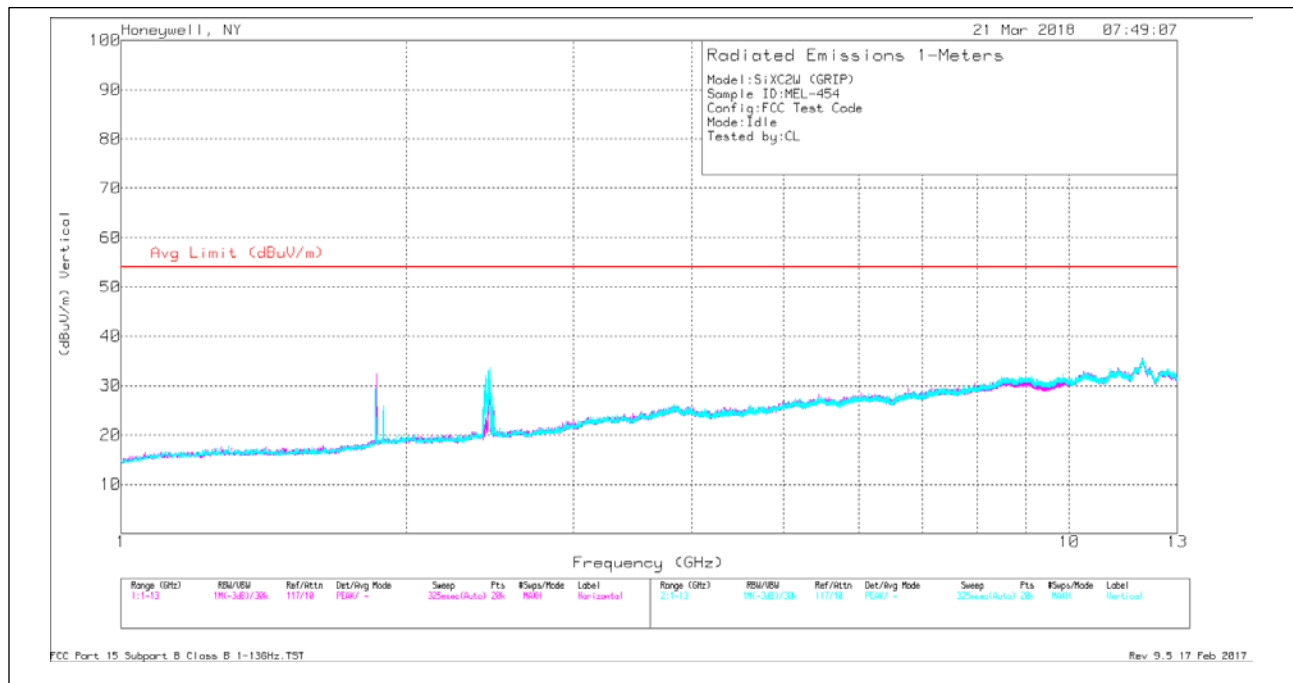
Plot

| Frequency (MHz) | Meter Reading (dBuV) | Det | AF_JB6 [dB/m] | Cable 1 [dB] | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|---------------|--------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 30.1561         | 11.08                | Qp  | 24.7          | .9           | 36.68                      | 40                 | -3.32       | 318            | 115         | H        |
| 55.1056         | 15.33                | Qp  | 12.1          | 1.1          | 28.53                      | 40                 | -11.47      | 343            | 386         | H        |
| 32.0048         | 11.67                | Qp  | 23.4          | .9           | 35.97                      | 40                 | -4.03       | 255            | 104         | V        |
| 55.54           | 18.71                | Qp  | 12            | 1.1          | 31.81                      | 40                 | -8.19       | 40             | 146         | V        |
| 956.9722        | 4.22                 | Qp  | 27.7          | 9.2          | 41.12                      | 46.02              | -4.9        | 306            | 320         | H        |
| 950.4111        | 4.18                 | Qp  | 27.7          | 9.2          | 41.08                      | 46.02              | -4.94       | 192            | 145         | V        |

Qp - Quasi-Peak detector

Data

**Above 1GHz**



Plot

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX1 [dB] | SMA7 [dB] | SMA5 [dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 3.654           | 28.12                | Av  | 31.9      | -41.9       | 3.2       | 3.1       | 24.42                      | 54                 | -29.58      | 198            | 240         | H        |
| 6.637           | 26.37                | Av  | 35.1      | -39.9       | 4.5       | 4.2       | 30.27                      | 54                 | -23.73      | 8              | 302         | H        |
| 11.953          | 23.92                | Av  | 39.5      | -38.1       | 6.8       | 5.8       | 37.92                      | 54                 | -16.08      | 358            | 105         | H        |
| 3.382           | 30.8                 | Av  | 31.4      | -42.7       | 3.1       | 3         | 25.6                       | 54                 | -28.4       | 332            | 266         | V        |
| 5.515           | 27.41                | Av  | 34.4      | -41.1       | 4         | 3.9       | 28.61                      | 54                 | -25.39      | 175            | 387         | V        |
| 9.705           | 24.74                | Av  | 38        | -39.8       | 5.6       | 5.2       | 33.74                      | 54                 | -20.26      | 178            | 278         | V        |

Av - Average detection

Data

## Radiated Emissions (Intentional)

### Test Description

Intentional Radiator Radiated Emissions are a test of the emissions, and harmonics on the EUT. The EUT is positioned to get the maximum emissions after a series of prescan measurements.

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1 GHz measurements and 1.5 m above the ground plane for above 1 GHz measurements. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 120 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; the video bandwidth is set to 1 MHz for peak measurements and as applicable for average measurements.

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

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.

### Test Criteria

| Reference                                                       | Limit                 |                             |                               |
|-----------------------------------------------------------------|-----------------------|-----------------------------|-------------------------------|
|                                                                 | Frequency Range (MHz) | Field Strength Limit (uV/m) | Measurement distance (meters) |
| CFR 47 Subpart C, 15.205<br>CFR 47 Subpart C, 15.209<br>RSS-GEN | 0.009-0.490           | 2400/F(kHz)                 | 300                           |
|                                                                 | 0.490-1.705           | 24000/F(kHz)                | 30                            |
|                                                                 | 1.705-30.0            | 30                          | 30                            |
|                                                                 | 30-88                 | 100**                       | 3                             |
|                                                                 | 88-216                | 150**                       | 3                             |
|                                                                 | 216-960               | 200**                       | 3                             |
|                                                                 | Above 960             | 500                         | 3                             |

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

### Test Information

| Tester | Test Location   | Date              | Temperature (°C) | Humidity (%RH) | Pressure (mbar) | Results (P/F) |
|--------|-----------------|-------------------|------------------|----------------|-----------------|---------------|
| CL/JB  | RF Chamber/OATS | 06/02/18-07/17/18 | 22.2             | 85.0           | 1004            | P             |

**NOTE:** Below 30MHz, pretesting showed that no emissions as a product of the EUT were detected within 20dB of the regulatory limit. Worse-case plot/data reported from 30MHz - 1GHz & above 18GHz. All plots/data are provided for each channel/antenna from 1-18GHz. Prescans performed in an anechoic chamber, final measurements performed on an OATS.

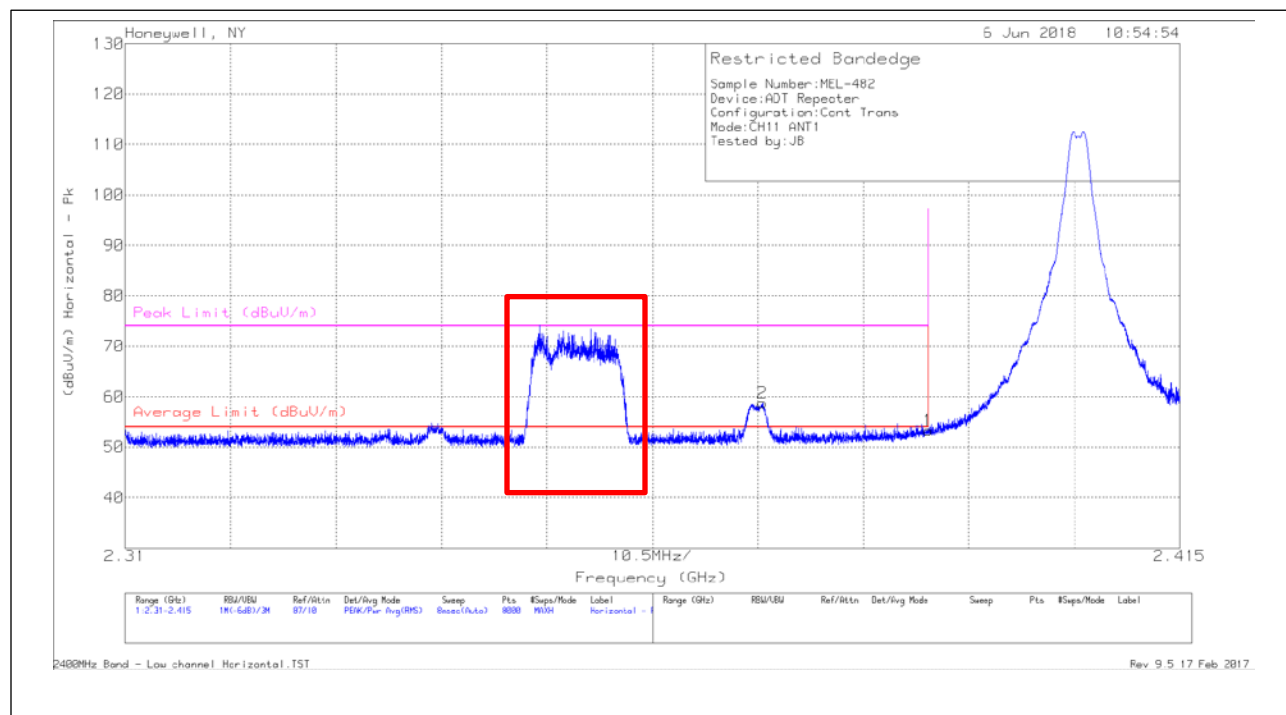
**Equipment List**

| Instrument Type            | ID #  | Serial #    | Manufacturer       | Model         | Cal Date  | Cal Due Date |
|----------------------------|-------|-------------|--------------------|---------------|-----------|--------------|
| <b>RF Chamber</b>          |       |             |                    |               |           |              |
| Spectrum Analyzer          | 11496 | 100303      | Rohde & Schwarz    | FSU26         | 04/11/18  | 04/11/19     |
| Loop Antenna (9kHz-30MHz)  | 11535 | 121080      | Com-Power          | AL-130R       | 10/17/17  | 10/17/18     |
| Bilog Antenna (30MHz-5GHz) | 11311 | A0022406    | Sunol              | JB5           | 02/01/18  | 02/01/19     |
| Horn Antenna (1-18GHz)     | 2319  | 2317        | EMCO               | 3115          | 01/10/18  | 01/10/19     |
| Horn Antenna (18-40GHz)    | 11472 | 151         | EMCO               | EM-6963       | 02/14/18  | 02/14/19     |
| Preamp (30-1000MHz)        | 11537 | 1603006     | Mini Circuits      | TVA-11-422    | N/A       | N/A          |
| Preamp (1-18GHz)           | 11539 | 160362      | Amplicial          | AMP1G18-35    | N/A       | N/A          |
| Preamp (18-40GHz)          | 11541 | 160911      | Amplicial          | AMP18G40-35   | N/A       | N/A          |
| Band Reject Filter         | 11553 | G041        | Micro-tronics      | BRM50702-01   | 06/06/17* | 12/31/18*    |
| Measurement Software       | 11543 | Version 9.5 | UL                 | UL EMC        | N/A       | N/A          |
| RF Cable                   | -     | -           | Mini-Circuits      | RDE#2         | 06/06/17* | 12/31/18*    |
| RF Cable                   | -     | -           | Insulated Wire     | SMA#8         | 06/06/17* | 12/31/18*    |
| Environmental Meter        | 11533 | A070144     | Extech Instruments | SD700         | 08/21/17  | 08/21/20     |
| <b>OATS</b>                |       |             |                    |               |           |              |
| Spectrum Analyzer          | 11545 | 103125      | Rohde & Schwarz    | FSW26         | 02/21/18  | 02/21/19     |
| Bilog Antenna (30MHz-5GHz) | 11311 | A0022406    | Sunol              | JB5           | 02/01/18  | 02/01/19     |
| Horn Antenna (1-18GHz)     | 2973  | 3127        | EMCO               | RGA-60        | 01/22/18  | 01/22/19     |
| Preamp (1-18GHz)           | 11539 | 160362      | Amplicial          | AMP1G18-35    | N/A       | N/A          |
| High Pass Filter           | 11552 | G018        | Micro-tronics      | HPM50111-01   | 06/06/17* | 12/31/18*    |
| Measurement Software       | 11543 | Version 9.5 | UL                 | UL EMC        | N/A       | N/A          |
| RF Cable                   | -     | -           | Pasternack         | RDE#1         | 06/06/17* | 12/31/18*    |
| RF Cable                   | -     | -           | MegaPhase          | EMC2-S1S1-360 | 06/06/17* | 12/31/18*    |
| Environmental Meter        | 11533 | A070144     | Extech Instruments | SD700         | 08/21/17  | 08/21/20     |

\*-Passive devices are characterized in-house, not calibrated.

## Test Results

### Restricted Band Edge



Antenna 1: Low Channel Horizontal - Plot

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m)    | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|--------------|----------------------------|------------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 19.06                | Pk  | 28.5      | .7          | 2.6       | 2.5       | -            | 53.36                      | 74                     | -20.64         | 224            | 118         | H        |
| 2      | * 2.373         | 24.55                | Pk  | 28.4      | .7          | 2.6       | 2.5       | -            | 58.75                      | 74                     | -15.25         | 224            | 118         | H        |
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB)    | Azimuth (Degs) | Height (cm) | Polarity |
| 1      | * 2.39          | 19.06                | Av  | 28.5      | .7          | 2.6       | 2.5       | -14.58       | 38.78                      | 54                     | -15.22         | 224            | 118         | H        |
| 2      | * 2.373         | 24.55                | Av  | 28.4      | .7          | 2.6       | 2.5       | -14.58       | 44.17                      | 54                     | -9.83          | 224            | 118         | H        |

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

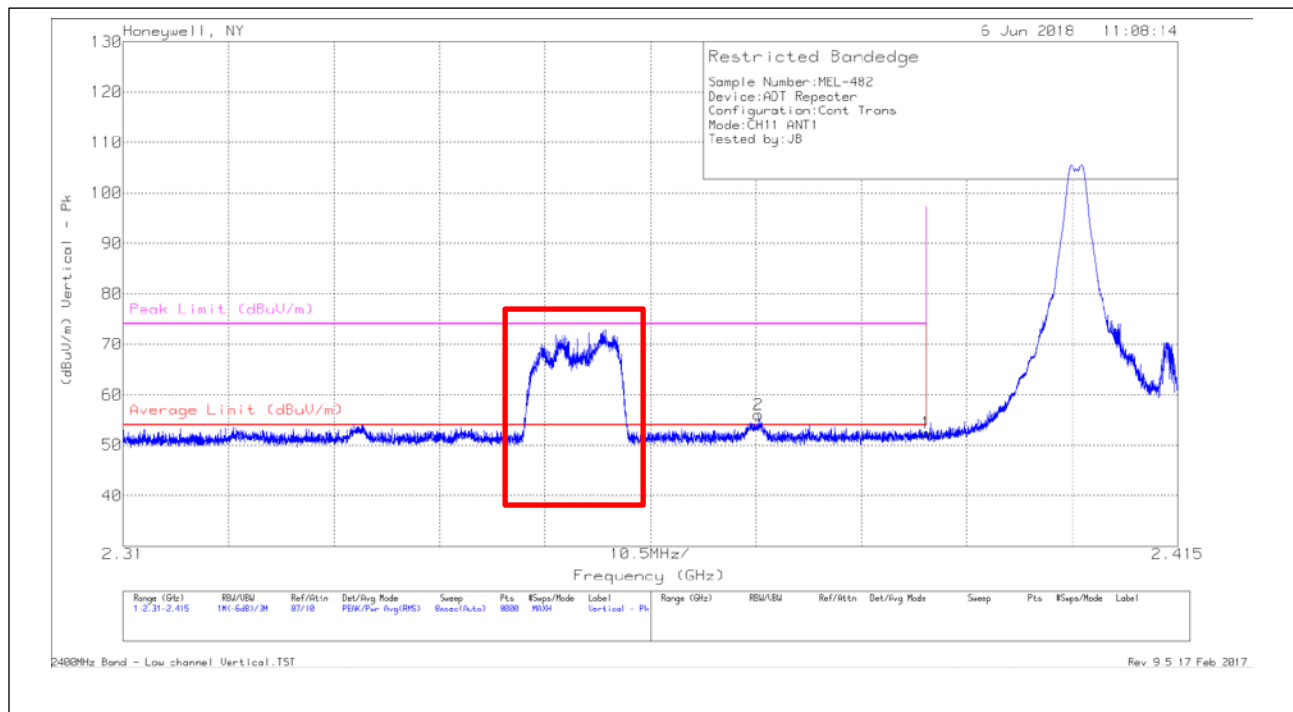
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter. Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 1: Low Channel Vertical - Plot

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m)    | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|--------------|----------------------------|------------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 18.19                | Pk  | 28.5      | .7          | 2.6       | 2.5       | -            | 52.49                      | 74                     | -21.51         | 335            | 170         | V        |
| 2      | * 2.373         | 21.78                | Pk  | 28.4      | .7          | 2.6       | 2.5       | -            | 55.98                      | 74                     | -18.02         | 335            | 170         | V        |
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB)    | Azimuth (Degs) | Height (cm) | Polarity |
| 1      | * 2.39          | 18.19                | Av  | 28.5      | .7          | 2.6       | 2.5       | -14.58       | 37.91                      | 54                     | -16.09         | 335            | 170         | V        |
| 2      | * 2.373         | 21.78                | Av  | 28.4      | .7          | 2.6       | 2.5       | -14.58       | 41.4                       | 54                     | -12.6          | 335            | 170         | V        |

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

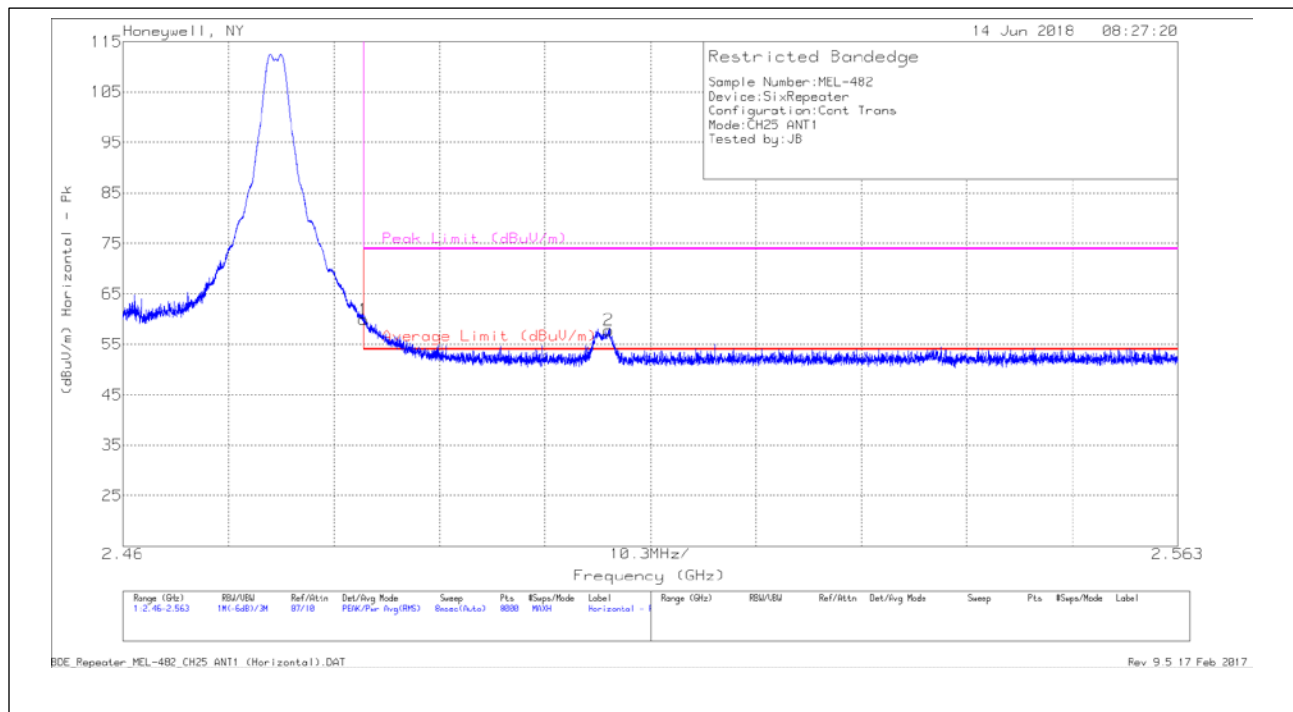
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter. Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 1: High Channel Horizontal - Plot

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m)    | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|--------------|----------------------------|------------------------|----------------|----------------|-------------|----------|
| 1      | * 2.484         | 25.34                | Pk  | 28.7      | .7          | 2.6       | 2.6       | -            | 59.94                      | 74                     | -14.06         | 33             | 114         | H        |
| 2      | 2.507           | 23.05                | Pk  | 28.8      | .7          | 2.7       | 2.6       | -            | 57.85                      | 74                     | -16.15         | 33             | 114         | H        |
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB)    | Azimuth (Degs) | Height (cm) | Polarity |
| 1      | * 2.484         | 25.34                | Av  | 28.7      | .7          | 2.6       | 2.6       | -14.58       | 45.36                      | 54                     | -8.64          | 33             | 114         | H        |
| 2      | 2.507           | 23.05                | Av  | 28.8      | .7          | 2.7       | 2.6       | -14.58       | 43.27                      | 54                     | -10.73         | 33             | 114         | H        |

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

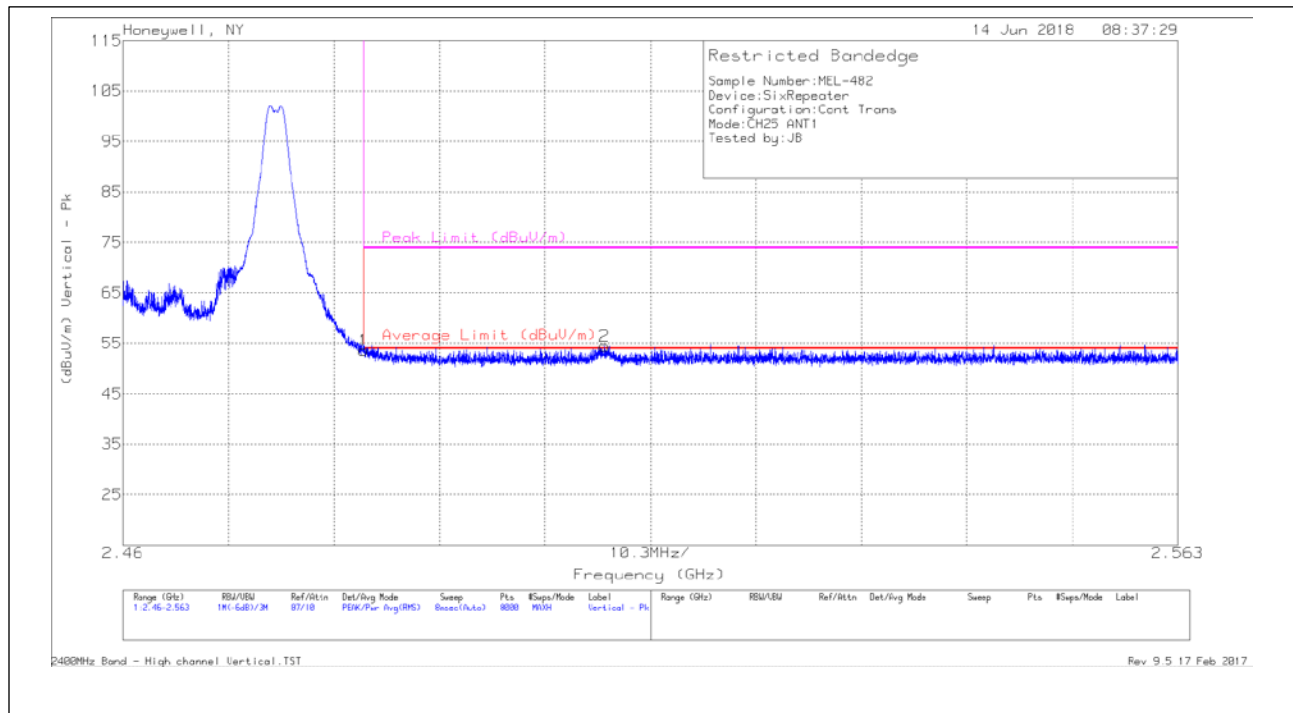
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

NOTE: Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 1: High Channel Vertical - Plot

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m)    | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|--------------|----------------------------|------------------------|----------------|----------------|-------------|----------|
| 1      | * 2.484         | 18.95                | Pk  | 28.7      | .7          | 2.6       | 2.6       | -            | 53.55                      | 74                     | -20.45         | 318            | 368         | V        |
| 2      | 2.507           | 19.65                | Pk  | 28.8      | .7          | 2.7       | 2.6       | -            | 54.45                      | 74                     | -19.55         | 318            | 368         | V        |
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB)    | Azimuth (Degs) | Height (cm) | Polarity |
| 1      | * 2.484         | 18.95                | Av  | 28.7      | .7          | 2.6       | 2.6       | -14.58       | 38.97                      | 54                     | -15.03         | 318            | 368         | V        |
| 2      | 2.507           | 19.65                | Av  | 28.8      | .7          | 2.7       | 2.6       | -14.58       | 39.87                      | 54                     | -14.13         | 318            | 368         | V        |

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

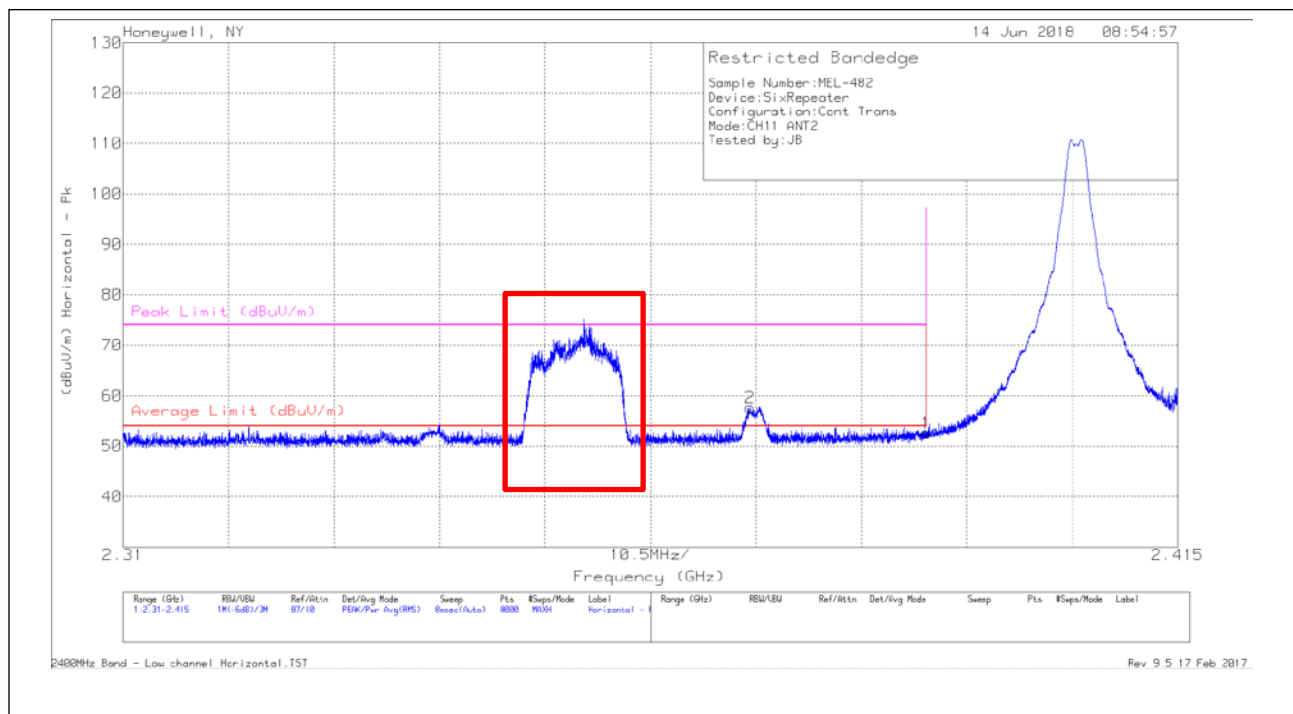
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

NOTE: Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 2: Low Channel Horizontal - Plot

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m)    | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|--------------|----------------------------|------------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 18.23                | Pk  | 28.5      | .7          | 2.6       | 2.5       | -            | 52.53                      | 74                     | -21.47         | 273            | 103         | H        |
| 2      | * 2.372         | 23.43                | Pk  | 28.4      | .7          | 2.6       | 2.5       | -            | 57.63                      | 74                     | -16.37         | 273            | 103         | H        |
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB)    | Azimuth (Degs) | Height (cm) | Polarity |
| 1      | * 2.39          | 18.23                | Av  | 28.5      | .7          | 2.6       | 2.5       | -14.58       | 37.95                      | 54                     | -16.05         | 273            | 103         | H        |
| 2      | * 2.372         | 23.43                | Av  | 28.4      | .7          | 2.6       | 2.5       | -14.58       | 43.05                      | 54                     | -10.95         | 273            | 103         | H        |

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

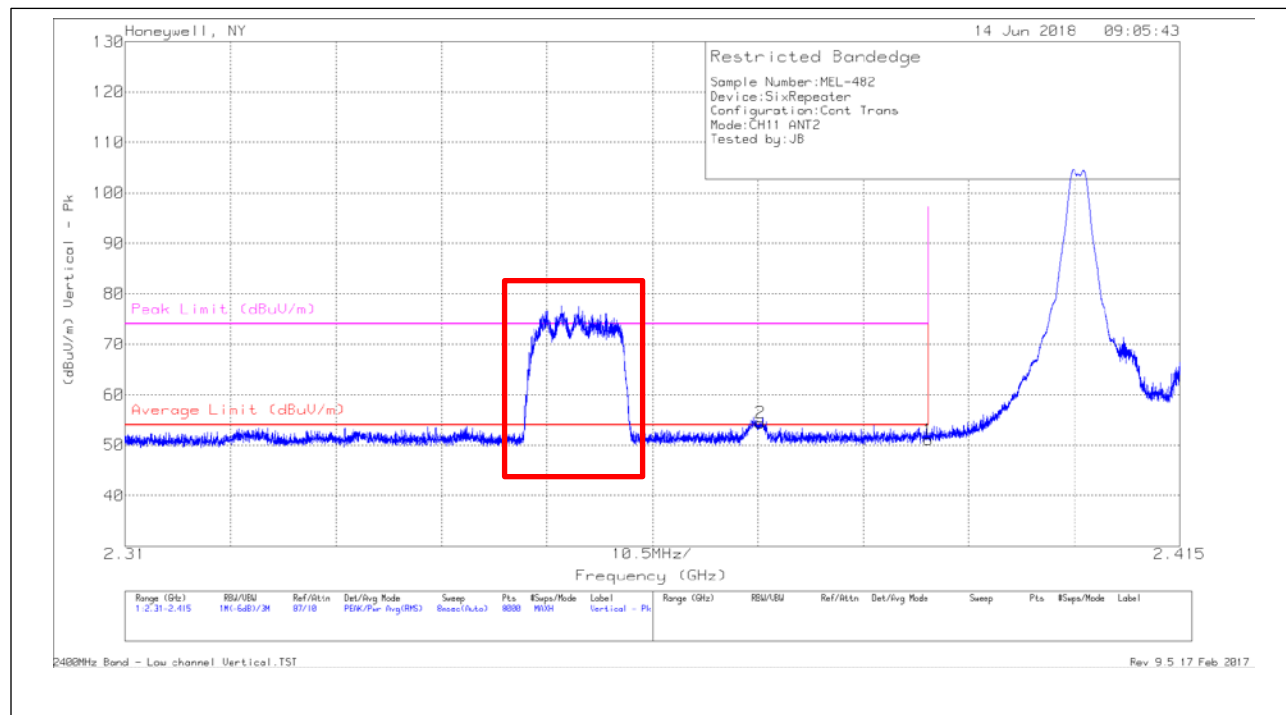
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter. Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 2: Low Channel Vertical - Plot

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m)    | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|--------------|----------------------------|------------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 16.75                | Pk  | 28.5      | .7          | 2.6       | 2.5       | -            | 51.05                      | 74                     | -22.95         | 97             | 310         | V        |
| 2      | * 2.373         | 20.24                | Pk  | 28.4      | .7          | 2.6       | 2.5       | -            | 54.44                      | 74                     | -19.56         | 97             | 310         | V        |
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB)    | Azimuth (Degs) | Height (cm) | Polarity |
| 1      | * 2.39          | 16.75                | Av  | 28.5      | .7          | 2.6       | 2.5       | -14.58       | 36.47                      | 54                     | -17.53         | 97             | 310         | V        |
| 2      | * 2.373         | 20.24                | Av  | 28.4      | .7          | 2.6       | 2.5       | -14.58       | 39.86                      | 54                     | -14.14         | 97             | 310         | V        |

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

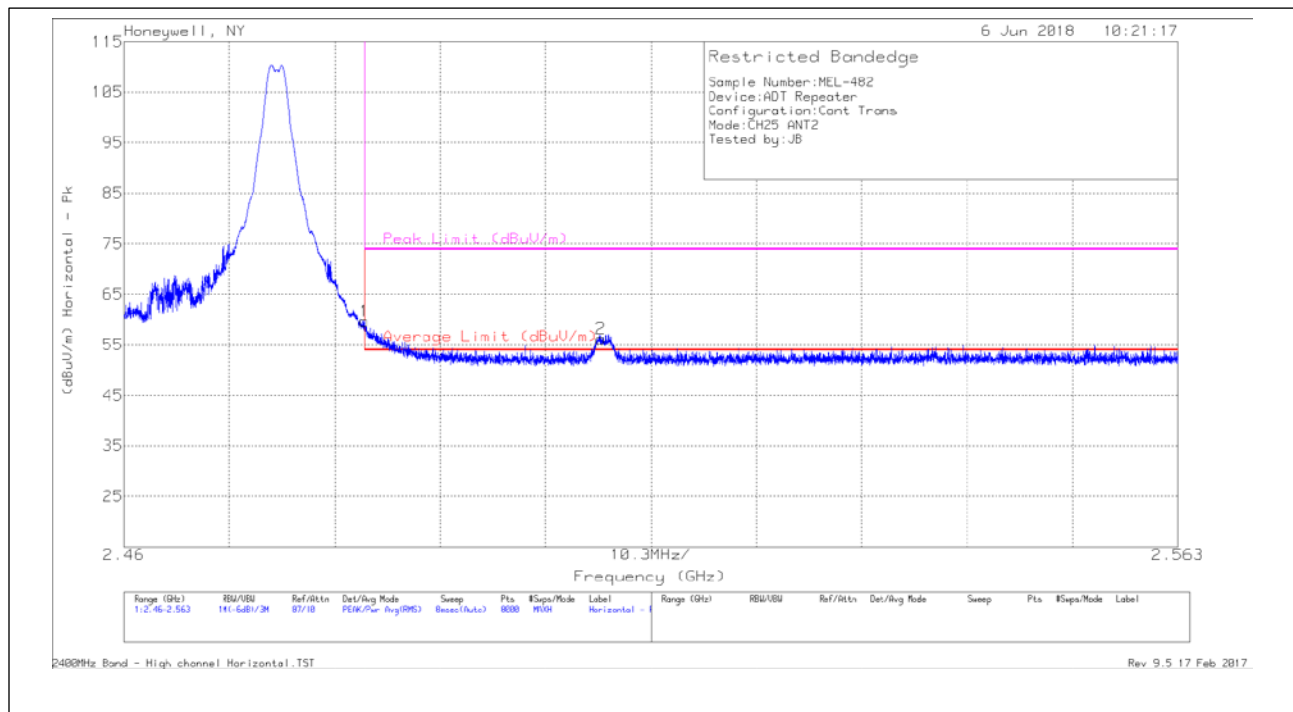
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter. Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 2: High Channel Horizontal - Plot

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m)    | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|--------------|----------------------------|------------------------|----------------|----------------|-------------|----------|
| 1      | * 2.484         | 25.04                | Pk  | 28.7      | .7          | 2.6       | 2.6       | -            | 59.64                      | 74                     | -14.36         | 337            | 115         | H        |
| 2      | 2.507           | 21.36                | Pk  | 28.8      | .7          | 2.7       | 2.6       | -            | 56.16                      | 74                     | -17.84         | 337            | 115         | H        |
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB)    | Azimuth (Degs) | Height (cm) | Polarity |
| 1      | * 2.484         | 25.04                | Av  | 28.7      | .7          | 2.6       | 2.6       | -14.58       | 45.06                      | 54                     | -8.94          | 337            | 115         | H        |
| 2      | 2.507           | 21.36                | Av  | 28.8      | .7          | 2.7       | 2.6       | -14.58       | 41.58                      | 54                     | -12.42         | 337            | 115         | H        |

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

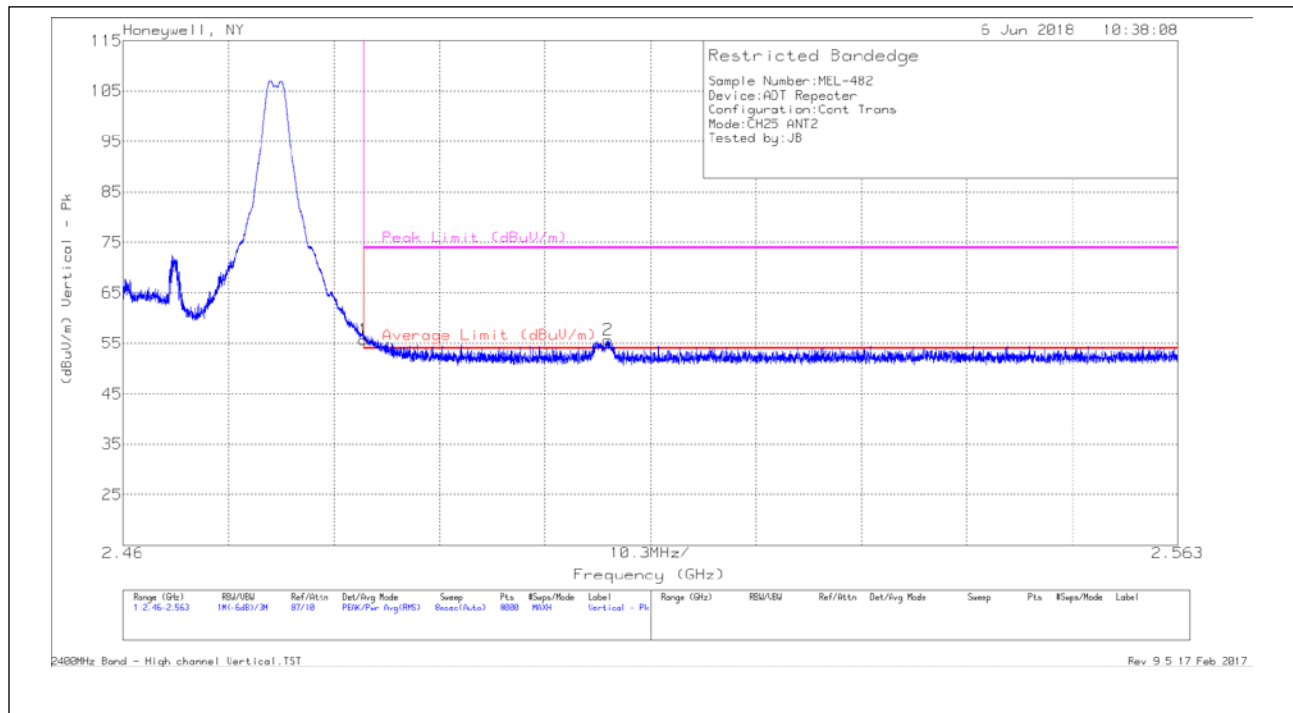
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

NOTE: Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 2: High Channel Vertical - Plot

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m)    | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|--------------|----------------------------|------------------------|----------------|----------------|-------------|----------|
| 1      | * 2.484         | 21.07                | Pk  | 28.7      | .7          | 2.6       | 2.6       | -            | 55.67                      | 74                     | -18.33         | 126            | 399         | V        |
| 2      | 2.507           | 20.94                | Pk  | 28.8      | .7          | 2.7       | 2.6       | -            | 55.74                      | 74                     | -18.26         | 126            | 399         | V        |
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX3 [dB] | SMA7 [dB] | SMA5 [dB] | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB)    | Azimuth (Degs) | Height (cm) | Polarity |
| 1      | * 2.484         | 21.07                | Av  | 28.7      | .7          | 2.6       | 2.6       | -14.58       | 41.09                      | 54                     | -12.91         | 126            | 399         | V        |
| 2      | 2.507           | 20.94                | Av  | 28.8      | .7          | 2.7       | 2.6       | -14.58       | 41.16                      | 54                     | -12.84         | 126            | 399         | V        |

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

Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

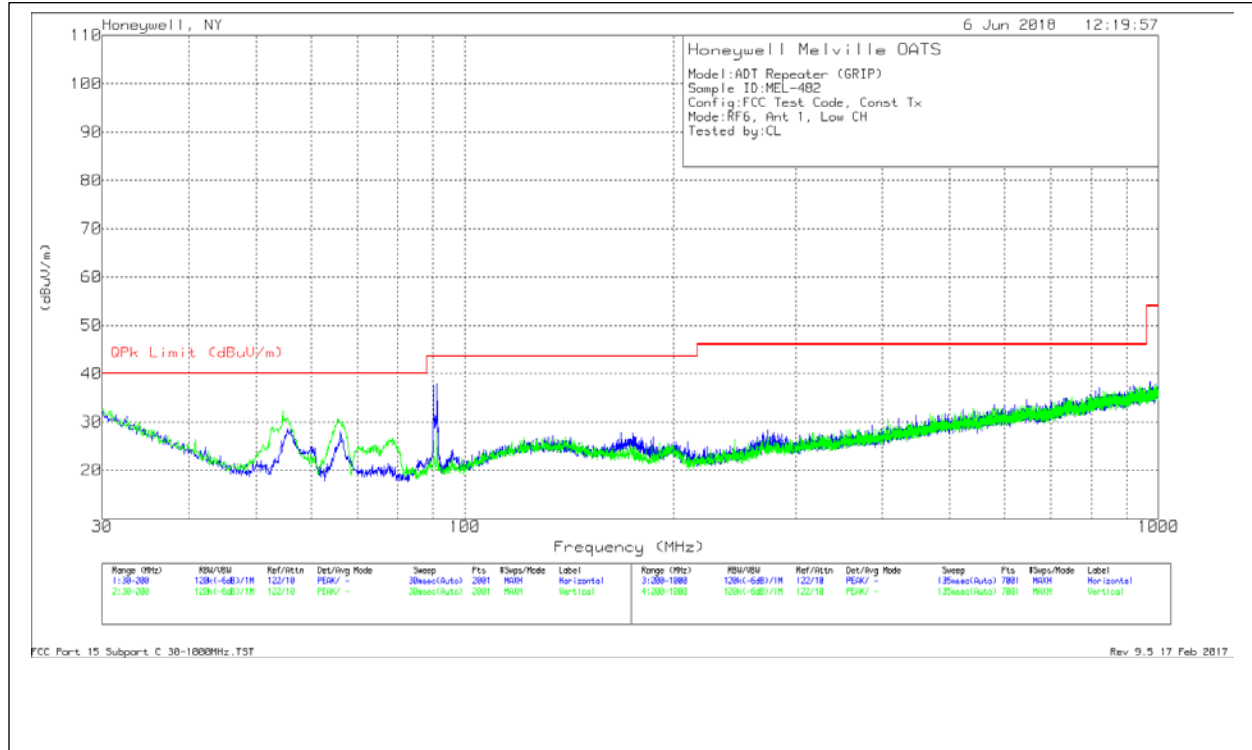
Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

NOTE: Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data

## Spurious Emissions

### Below 1GHz (Worse-case)



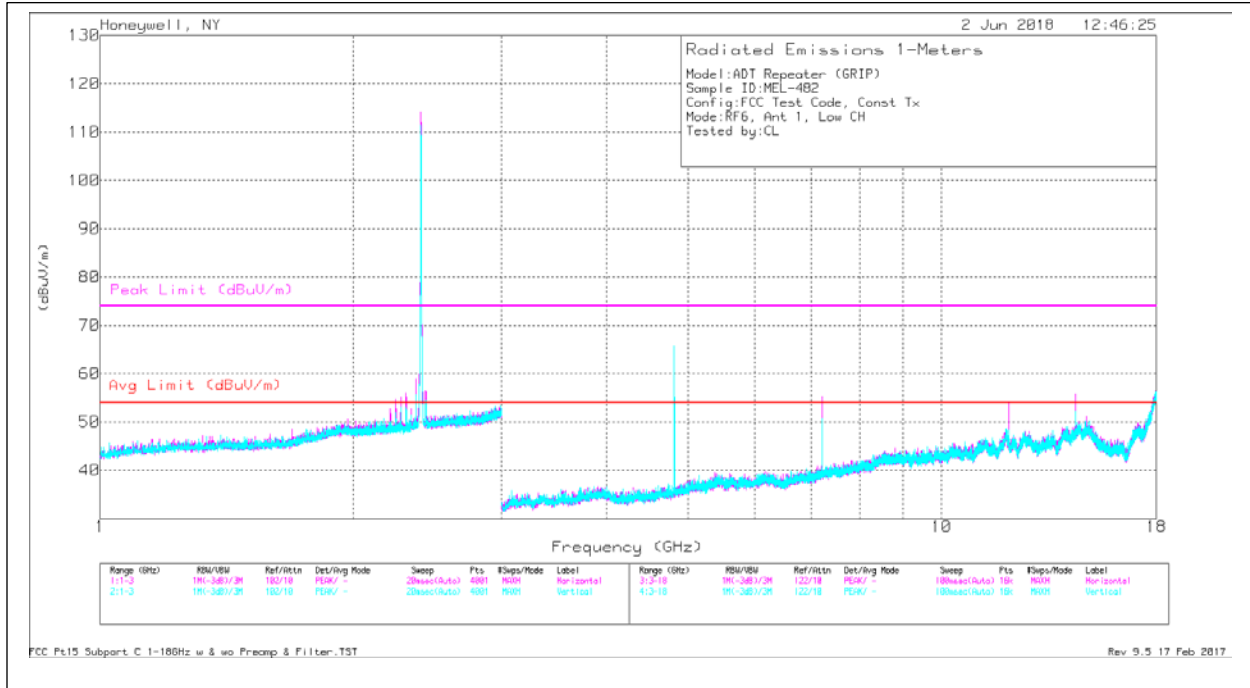
Antenna 1: Low Channel - Plot

| Frequency (MHz) | Meter Reading (dBUV) | Det | AF_JB6 [dB/m] | Cable 1 [dB] | Corrected Reading (dBUV/m) | QPk Limit (dBUV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|---------------|--------------|----------------------------|--------------------|-------------|----------------|-------------|----------|
| 31.6926         | 11.32                | Qp  | 23.6          | .9           | 35.82                      | 40                 | -4.18       | 240            | 131         | H        |
| 54.8929         | 14.32                | Qp  | 12.1          | 1.1          | 27.52                      | 40                 | -12.48      | 153            | 370         | H        |
| 91.0233         | 23.77                | Qp  | 12.2          | 1.5          | 37.47                      | 43.52              | -6.05       | 347            | 339         | H        |
| 30.2661         | 10.99                | Qp  | 24.7          | .9           | 36.59                      | 40                 | -3.41       | 222            | 300         | V        |
| 54.744          | 19.86                | Qp  | 12.1          | 1.1          | 33.06                      | 40                 | -6.94       | 306            | 237         | V        |
| 66.2265         | 13.17                | Qp  | 12            | 1.3          | 26.47                      | 40                 | -13.53      | 48             | 221         | V        |

Qp - Quasi-Peak detector

Antenna 1: Low Channel - Data

**1-18GHz**



Antenna 1: Low Channel - Plot

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------------------------|---------------------|----------------|----------------|-------------|----------|
| * 4.809         | 61.26                | PK  | 33.1      | -41.2       | 3.7       | 3.7       | 60.56                      | 74                  | -13.44         | 86             | 113         | H        |
| 7.213           | 47.1                 | PK  | 36.2      | -39.5       | 4.7       | 4.5       | 53                         | 74                  | -21            | 296            | 130         | H        |
| * 12.027        | 38.01                | PK  | 39.4      | -37.3       | 6.5       | 5.6       | 52.21                      | 74                  | -21.79         | 53             | 131         | H        |
| 14.428          | 39.35                | PK  | 42.1      | -36.9       | 6.8       | 6.4       | 57.75                      | 74                  | -16.25         | 276            | 323         | H        |
| * 4.811         | 61.93                | PK  | 33.1      | -41.2       | 3.7       | 3.7       | 61.23                      | 74                  | -12.77         | 3              | 324         | V        |
| 7.216           | 50.11                | PK  | 36.2      | -39.5       | 4.7       | 4.5       | 56.01                      | 74                  | -17.99         | 58             | 238         | V        |
| 14.432          | 40.3                 | PK  | 42.1      | -36.9       | 6.8       | 6.4       | 58.7                       | 74                  | -15.3          | 334            | 231         | V        |
| * 12.028        | 38.8                 | PK  | 39.4      | -37.3       | 6.5       | 5.6       | 53                         | 74                  | -21            | 105            | 203         | V        |

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | DCF [dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Avg Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------|----------------------------|--------------------|-----------------|----------------|-------------|----------|
| * 4.809         | 61.26                | Av  | 33.1      | -41.2       | 3.7       | 3.7       | -14.58   | 45.98                      | 54                 | -8.02           | 86             | 113         | H        |
| 7.213           | 47.1                 | Av  | 36.2      | -39.5       | 4.7       | 4.5       | -14.58   | 38.42                      | 54                 | -15.58          | 296            | 130         | H        |
| * 12.027        | 38.01                | Av  | 39.4      | -37.3       | 6.5       | 5.6       | -14.58   | 37.63                      | 54                 | -16.37          | 53             | 131         | H        |
| 14.428          | 39.35                | Av  | 42.1      | -36.9       | 6.8       | 6.4       | -14.58   | 43.17                      | 54                 | -10.83          | 276            | 323         | H        |
| * 4.811         | 61.93                | Av  | 33.1      | -41.2       | 3.7       | 3.7       | -14.58   | 46.65                      | 54                 | -7.35           | 3              | 324         | V        |
| 7.216           | 50.11                | Av  | 36.2      | -39.5       | 4.7       | 4.5       | -14.58   | 41.43                      | 54                 | -12.57          | 58             | 238         | V        |
| 14.432          | 40.3                 | Av  | 42.1      | -36.9       | 6.8       | 6.4       | -14.58   | 44.12                      | 54                 | -9.88           | 334            | 231         | V        |
| * 12.028        | 38.8                 | Av  | 39.4      | -37.3       | 6.5       | 5.6       | -14.58   | 38.42                      | 54                 | -15.58          | 105            | 203         | V        |

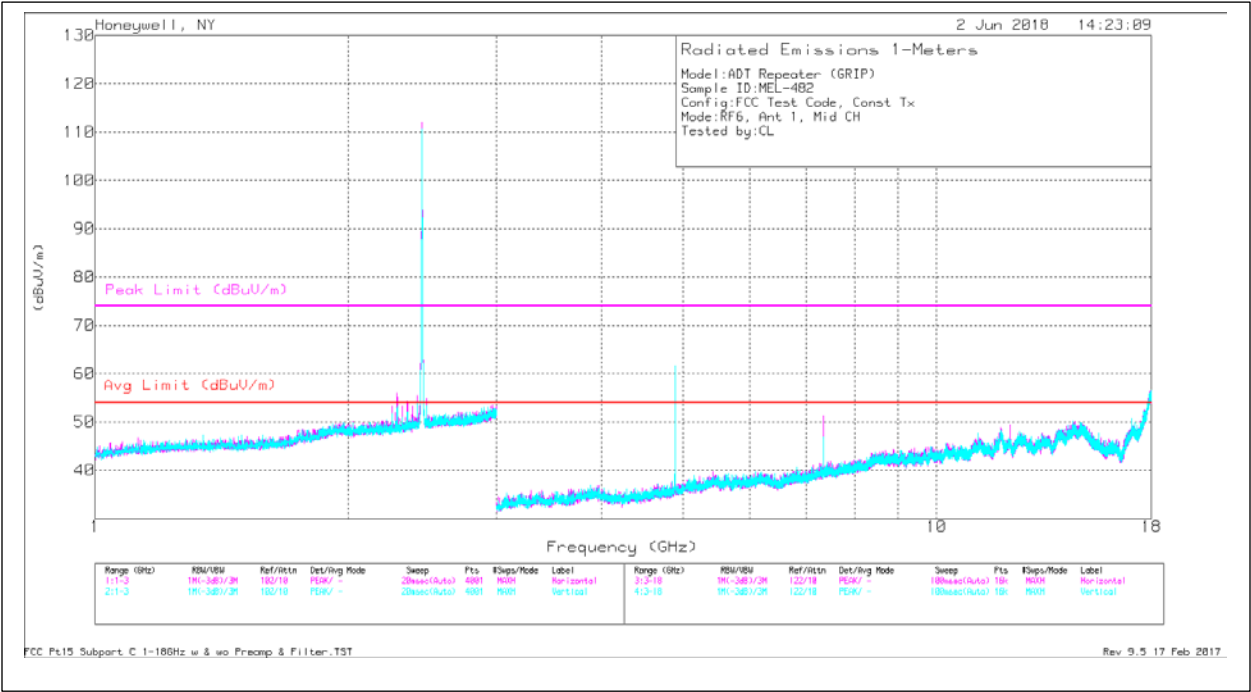
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

Antenna 1: Low Channel - Data



Antenna 1: Mid Channel - Plot

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------------------------|---------------------|----------------|----------------|-------------|----------|
| * 4.889         | 54.92                | PK  | 33.2      | -41.4       | 3.7       | 3.6       | 54.02                      | 74                  | -19.98         | 78             | 223         | H        |
| * 7.336         | 44.01                | PK  | 36.6      | -39.7       | 4.6       | 4.5       | 50.01                      | 74                  | -23.99         | 297            | 116         | H        |
| * 12.221        | 38.54                | PK  | 39.2      | -37.2       | 6.5       | 5.9       | 52.94                      | 74                  | -21.06         | 43             | 207         | H        |
| * 4.889         | 60.39                | PK  | 33.2      | -41.4       | 3.7       | 3.6       | 59.49                      | 74                  | -14.51         | 40             | 151         | V        |
| * 7.333         | 47.25                | PK  | 36.6      | -39.7       | 4.6       | 4.5       | 53.25                      | 74                  | -20.75         | 37             | 294         | V        |
| * 12.227        | 38.45                | PK  | 39.2      | -37.2       | 6.5       | 5.9       | 52.85                      | 74                  | -21.15         | 352            | 382         | V        |

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | DCF [dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Avg Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------|----------------------------|--------------------|-----------------|----------------|-------------|----------|
| * 4.889         | 54.92                | Av  | 33.2      | -41.4       | 3.7       | 3.6       | -14.58   | 39.44                      | 54                 | -14.56          | 78             | 223         | H        |
| * 7.336         | 44.01                | Av  | 36.6      | -39.7       | 4.6       | 4.5       | -14.58   | 35.43                      | 54                 | -18.57          | 297            | 116         | H        |
| * 12.221        | 38.54                | Av  | 39.2      | -37.2       | 6.5       | 5.9       | -14.58   | 38.36                      | 54                 | -15.64          | 43             | 207         | H        |
| * 4.889         | 60.39                | Av  | 33.2      | -41.4       | 3.7       | 3.6       | -14.58   | 44.91                      | 54                 | -9.09           | 40             | 151         | V        |
| * 7.333         | 47.25                | Av  | 36.6      | -39.7       | 4.6       | 4.5       | -14.58   | 38.67                      | 54                 | -15.33          | 37             | 294         | V        |
| * 12.227        | 38.45                | Av  | 39.2      | -37.2       | 6.5       | 5.9       | -14.58   | 38.27                      | 54                 | -15.73          | 352            | 382         | V        |

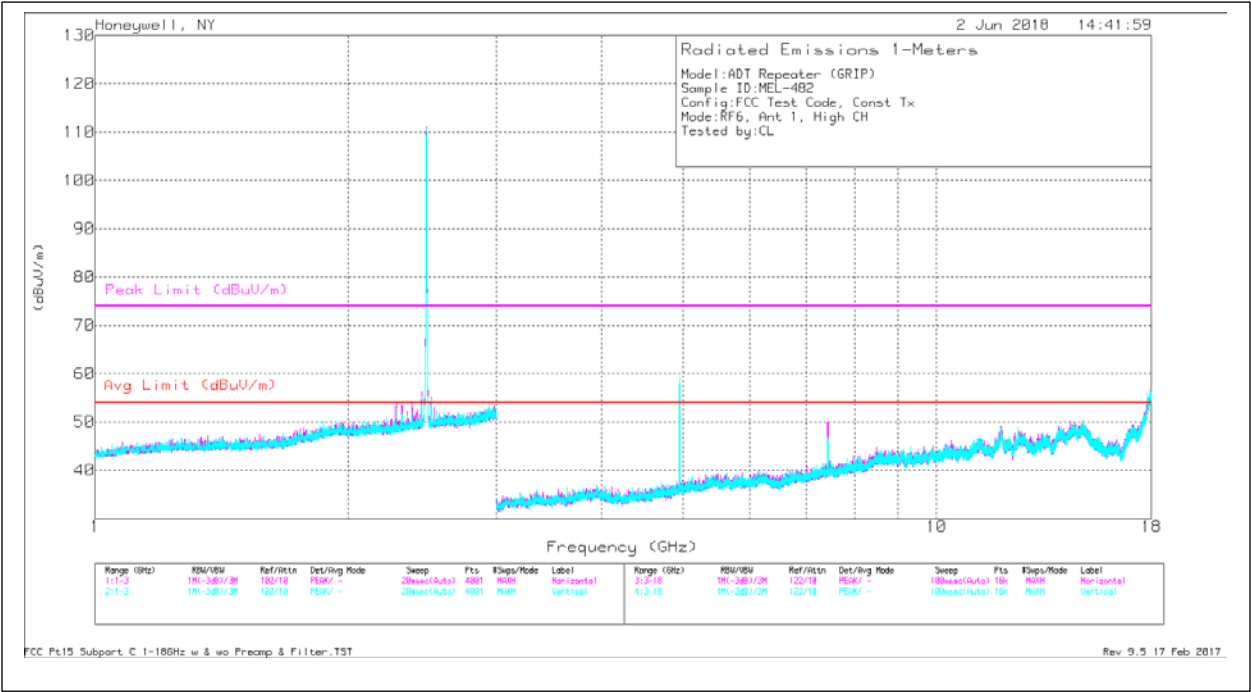
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

Antenna 1: Mid Channel - Data



Antenna 1: High Channel - Plot

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------------------------|---------------------|----------------|----------------|-------------|----------|
| * 4.949         | 47.86                | PK  | 33.2      | -41.5       | 3.8       | 3.7       | 47.06                      | 74                  | -26.94         | 312            | 100         | H        |
| * 7.333         | 40.24                | PK  | 36.6      | -39.7       | 4.6       | 4.5       | 46.24                      | 74                  | -27.76         | 62             | 141         | H        |
| 14.426          | 38.81                | PK  | 42.1      | -36.9       | 6.8       | 6.4       | 57.21                      | 74                  | -16.79         | 47             | 107         | H        |
| * 4.951         | 57.88                | PK  | 33.2      | -41.5       | 3.8       | 3.7       | 57.08                      | 74                  | -16.92         | 181            | 196         | V        |
| * 7.337         | 40.43                | PK  | 36.6      | -39.7       | 4.6       | 4.5       | 46.43                      | 74                  | -27.57         | 168            | 235         | V        |
| 14.673          | 39.06                | PK  | 42.6      | -36.9       | 6.6       | 6.4       | 57.76                      | 74                  | -16.24         | 3              | 281         | V        |

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | DCF [dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Avg Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------|----------------------------|--------------------|-----------------|----------------|-------------|----------|
| * 4.949         | 47.86                | Av  | 33.2      | -41.5       | 3.8       | 3.7       | -14.58   | 32.48                      | 54                 | -21.52          | 312            | 100         | H        |
| * 7.333         | 40.24                | Av  | 36.6      | -39.7       | 4.6       | 4.5       | -14.58   | 31.66                      | 54                 | -22.34          | 62             | 141         | H        |
| 14.426          | 38.81                | Av  | 42.1      | -36.9       | 6.8       | 6.4       | -14.58   | 42.63                      | 54                 | -11.37          | 47             | 107         | H        |
| * 4.951         | 57.88                | Av  | 33.2      | -41.5       | 3.8       | 3.7       | -14.58   | 42.5                       | 54                 | -11.5           | 181            | 196         | V        |
| * 7.337         | 40.43                | Av  | 36.6      | -39.7       | 4.6       | 4.5       | -14.58   | 31.85                      | 54                 | -22.15          | 168            | 235         | V        |
| 14.673          | 39.06                | Av  | 42.6      | -36.9       | 6.6       | 6.4       | -14.58   | 43.18                      | 54                 | -10.82          | 3              | 281         | V        |

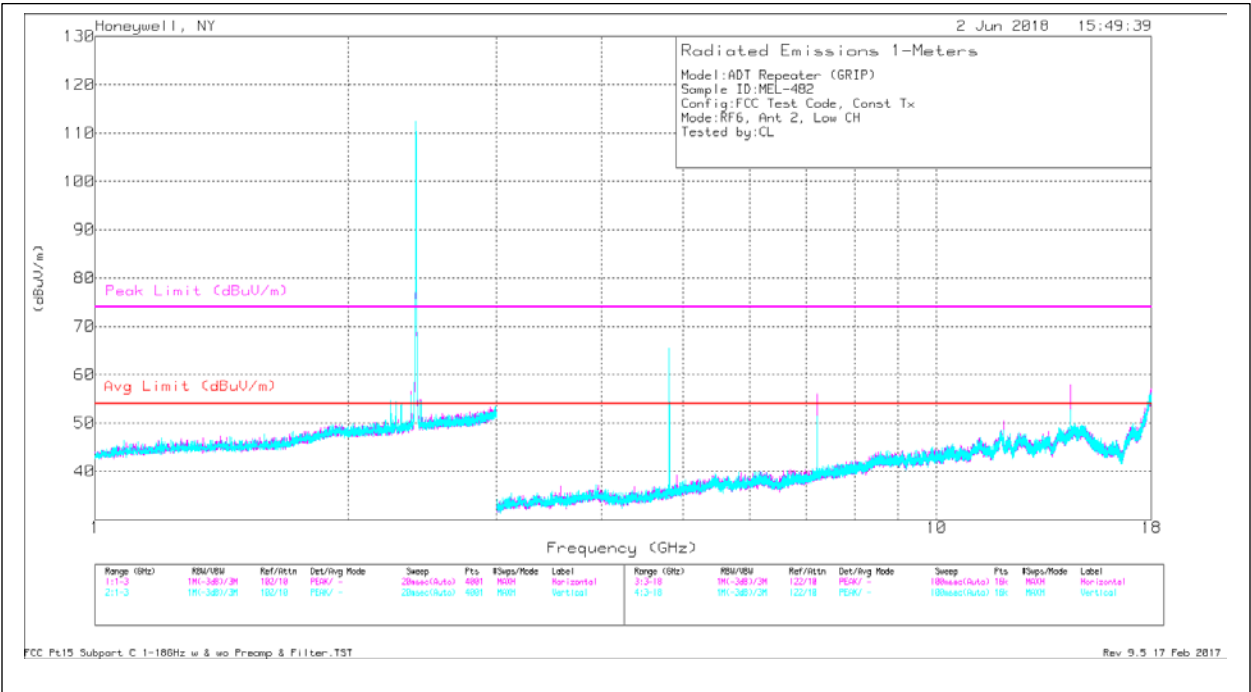
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

Antenna 1: High Channel – Data



Antenna 2: Low Channel - Plot

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------------------------|---------------------|----------------|----------------|-------------|----------|
| * 4.811         | 62.21                | PK  | 33.1      | -41.2       | 3.7       | 3.7       | 61.51                      | 74                  | -12.49         | 81             | 128         | H        |
| 7.213           | 48.26                | PK  | 36.2      | -39.5       | 4.7       | 4.5       | 54.16                      | 74                  | -19.84         | 60             | 104         | H        |
| 14.426          | 40.57                | PK  | 42.1      | -36.9       | 6.8       | 6.4       | 58.97                      | 74                  | -15.03         | 52             | 378         | H        |
| * 4.809         | 62.22                | PK  | 33.1      | -41.2       | 3.7       | 3.7       | 61.52                      | 74                  | -12.48         | 48             | 307         | V        |
| 7.216           | 53.83                | PK  | 36.2      | -39.5       | 4.7       | 4.5       | 59.73                      | 74                  | -14.27         | 42             | 304         | V        |
| 14.432          | 41.1                 | PK  | 42.1      | -36.9       | 6.8       | 6.4       | 59.5                       | 74                  | -14.5          | 275            | 322         | V        |

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | DCF [dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Avg Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------|----------------------------|--------------------|-----------------|----------------|-------------|----------|
| * 4.811         | 62.21                | Av  | 33.1      | -41.2       | 3.7       | 3.7       | -14.58   | 46.93                      | 54                 | -7.07           | 81             | 128         | H        |
| 7.213           | 48.26                | Av  | 36.2      | -39.5       | 4.7       | 4.5       | -14.58   | 39.58                      | 54                 | -14.42          | 60             | 104         | H        |
| 14.426          | 40.57                | Av  | 42.1      | -36.9       | 6.8       | 6.4       | -14.58   | 44.39                      | 54                 | -9.61           | 52             | 378         | H        |
| * 4.809         | 62.22                | Av  | 33.1      | -41.2       | 3.7       | 3.7       | -14.58   | 46.94                      | 54                 | -7.06           | 48             | 307         | V        |
| 7.216           | 53.83                | Av  | 36.2      | -39.5       | 4.7       | 4.5       | -14.58   | 45.15                      | 54                 | -8.85           | 42             | 304         | V        |
| 14.432          | 41.1                 | Av  | 42.1      | -36.9       | 6.8       | 6.4       | -14.58   | 44.92                      | 54                 | -9.08           | 275            | 322         | V        |

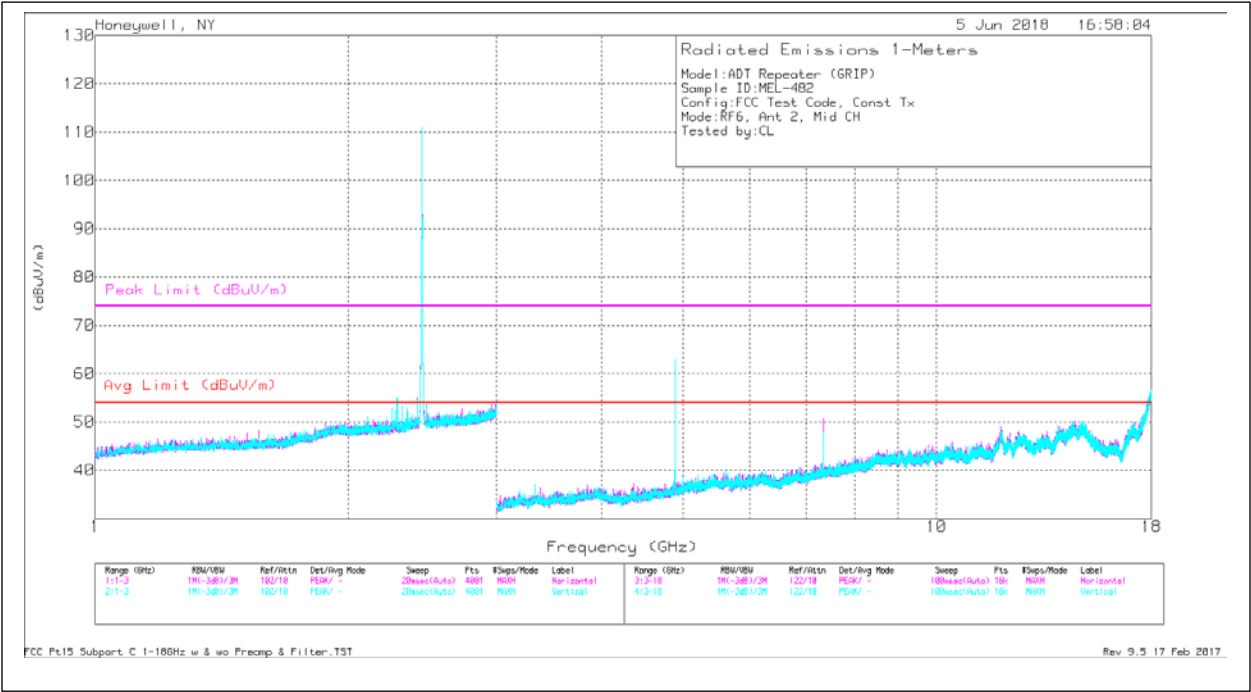
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

Antenna 2: Low Channel - Data



Antenna 2: Mid Channel - Plot

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------------------------|---------------------|----------------|----------------|-------------|----------|
| * 4.889         | 57.05                | PK  | 33.2      | -41.4       | 3.7       | 3.6       | 56.15                      | 74                  | -17.85         | 277            | 394         | H        |
| * 7.333         | 44.33                | PK  | 36.6      | -39.7       | 4.6       | 4.5       | 50.33                      | 74                  | -23.67         | 124            | 396         | H        |
| 9.777           | 38.11                | PK  | 38.1      | -39.1       | 5.5       | 5.3       | 47.91                      | 74                  | -26.09         | 123            | 178         | H        |
| * 12.228        | 38.8                 | PK  | 39.2      | -37.2       | 6.5       | 5.9       | 53.2                       | 74                  | -20.8          | 167            | 371         | H        |
| 14.675          | 38.94                | PK  | 42.6      | -36.9       | 6.6       | 6.4       | 57.64                      | 74                  | -16.36         | 116            | 279         | H        |
| 17.11           | 39.42                | PK  | 41        | -38.1       | 7.5       | 7         | 56.82                      | 74                  | -17.18         | 136            | 105         | H        |
| * 4.891         | 60.53                | PK  | 33.2      | -41.4       | 3.7       | 3.6       | 59.63                      | 74                  | -14.37         | 180            | 186         | V        |
| * 7.333         | 47.45                | PK  | 36.6      | -39.7       | 4.6       | 4.5       | 53.45                      | 74                  | -20.55         | 87             | 312         | V        |
| 9.781           | 39.01                | PK  | 38.1      | -39.1       | 5.5       | 5.3       | 48.81                      | 74                  | -25.19         | 13             | 242         | V        |
| * 12.227        | 38.53                | PK  | 39.2      | -37.2       | 6.5       | 5.9       | 52.93                      | 74                  | -21.07         | 198            | 227         | V        |
| 14.67           | 39.08                | PK  | 42.6      | -36.9       | 6.7       | 6.4       | 57.88                      | 74                  | -16.12         | 285            | 120         | V        |
| 17.118          | 39.04                | PK  | 41.1      | -38.1       | 7.5       | 7         | 56.54                      | 74                  | -17.46         | 304            | 210         | V        |

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | DCF [dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Avg Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------|----------------------------|--------------------|-----------------|----------------|-------------|----------|
| * 4.889         | 57.05                | Av  | 33.2      | -41.4       | 3.7       | 3.6       | -14.58   | 41.57                      | 54                 | -12.43          | 277            | 394         | H        |
| * 7.333         | 44.33                | Av  | 36.6      | -39.7       | 4.6       | 4.5       | -14.58   | 35.75                      | 54                 | -18.25          | 124            | 396         | H        |
| 9.777           | 38.11                | Av  | 38.1      | -39.1       | 5.5       | 5.3       | -14.58   | 33.33                      | 54                 | -20.67          | 123            | 178         | H        |
| * 12.228        | 38.8                 | Av  | 39.2      | -37.2       | 6.5       | 5.9       | -14.58   | 38.62                      | 54                 | -15.38          | 167            | 371         | H        |
| 14.675          | 38.94                | Av  | 42.6      | -36.9       | 6.6       | 6.4       | -14.58   | 43.06                      | 54                 | -10.94          | 116            | 279         | H        |
| 17.11           | 39.42                | Av  | 41        | -38.1       | 7.5       | 7         | -14.58   | 42.24                      | 54                 | -11.76          | 136            | 105         | H        |
| * 4.891         | 60.53                | Av  | 33.2      | -41.4       | 3.7       | 3.6       | -14.58   | 45.05                      | 54                 | -8.95           | 180            | 186         | V        |
| * 7.333         | 47.45                | Av  | 36.6      | -39.7       | 4.6       | 4.5       | -14.58   | 38.87                      | 54                 | -15.13          | 87             | 312         | V        |
| 9.781           | 39.01                | Av  | 38.1      | -39.1       | 5.5       | 5.3       | -14.58   | 34.23                      | 54                 | -19.77          | 13             | 242         | V        |
| * 12.227        | 38.53                | Av  | 39.2      | -37.2       | 6.5       | 5.9       | -14.58   | 38.35                      | 54                 | -15.65          | 198            | 227         | V        |
| 14.67           | 39.08                | Av  | 42.6      | -36.9       | 6.7       | 6.4       | -14.58   | 43.3                       | 54                 | -10.7           | 285            | 120         | V        |
| 17.118          | 39.04                | Av  | 41.1      | -38.1       | 7.5       | 7         | -14.58   | 41.96                      | 54                 | -12.04          | 304            | 210         | V        |

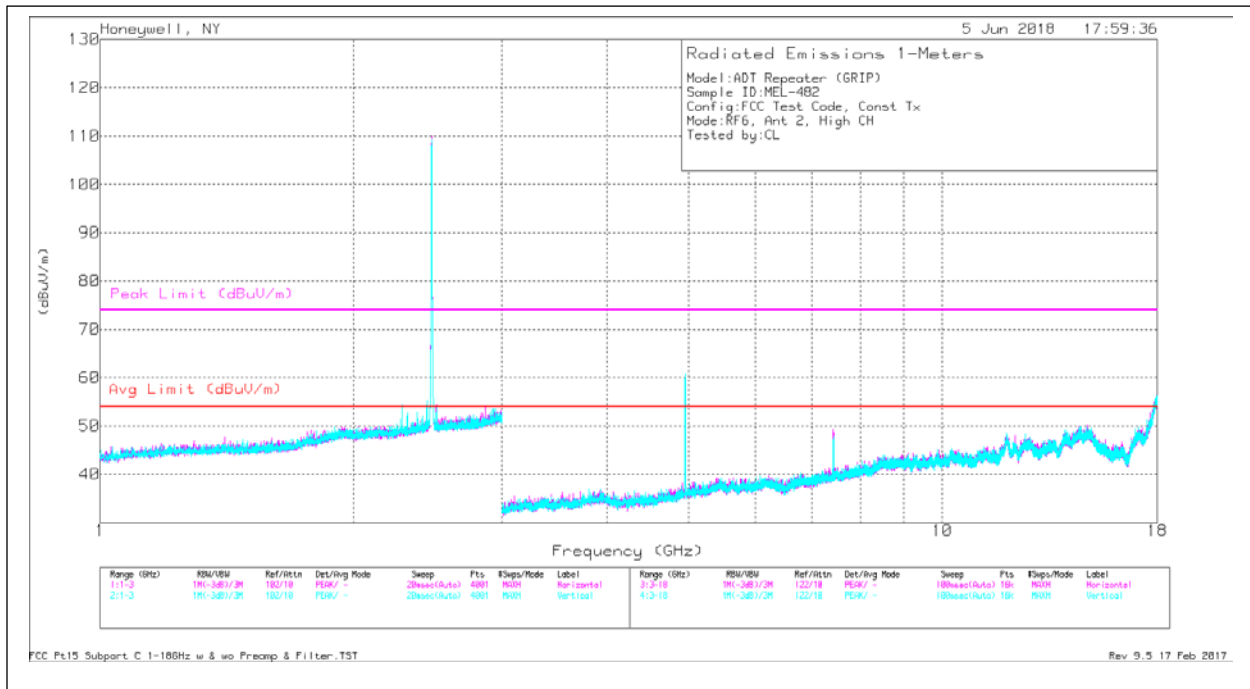
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

Antenna 2: Mid Channel - Data



Antenna 2: High Channel - Plot

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------------------------|---------------------|----------------|----------------|-------------|----------|
| * 4.949         | 57.32                | PK  | 33.2      | -41.5       | 3.8       | 3.7       | 56.52                      | 74                  | -17.48         | 120            | 102         | H        |
| * 7.426         | 45.9                 | PK  | 36.7      | -39.7       | 4.7       | 4.6       | 52.2                       | 74                  | -21.8          | 66             | 105         | H        |
| * 12.189        | 38.57                | PK  | 39.2      | -37.2       | 6.4       | 6         | 52.97                      | 74                  | -21.03         | 305            | 298         | H        |
| 14.846          | 38.44                | PK  | 42        | -36.9       | 6.8       | 6.5       | 56.84                      | 74                  | -17.16         | 113            | 339         | H        |
| * 4.951         | 57.5                 | PK  | 33.2      | -41.5       | 3.8       | 3.7       | 56.7                       | 74                  | -17.3          | 189            | 135         | V        |
| * 7.423         | 47.78                | PK  | 36.7      | -39.7       | 4.7       | 4.6       | 54.08                      | 74                  | -19.92         | 62             | 237         | V        |
| * 12.191        | 38.65                | PK  | 39.2      | -37.2       | 6.4       | 6         | 53.05                      | 74                  | -20.95         | 150            | 210         | V        |
| 14.559          | 40.35                | PK  | 42.5      | -36.9       | 7         | 6.4       | 59.35                      | 74                  | -14.65         | 300            | 185         | V        |

| Frequency (GHz) | Meter Reading (dBuV) | Det | AF [dB/m] | SWBOX2 [dB] | SMA7 [dB] | SMA5 [dB] | DCF [dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Avg Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|-----|-----------|-------------|-----------|-----------|----------|----------------------------|--------------------|-----------------|----------------|-------------|----------|
| * 4.949         | 57.32                | Av  | 33.2      | -41.5       | 3.8       | 3.7       | -14.58   | 41.94                      | 54                 | -12.06          | 120            | 102         | H        |
| * 7.426         | 45.9                 | Av  | 36.7      | -39.7       | 4.7       | 4.6       | -14.58   | 37.62                      | 54                 | -16.38          | 66             | 105         | H        |
| * 12.189        | 38.57                | Av  | 39.2      | -37.2       | 6.4       | 6         | -14.58   | 38.39                      | 54                 | -15.61          | 305            | 298         | H        |
| 14.846          | 38.44                | Av  | 42        | -36.9       | 6.8       | 6.5       | -14.58   | 42.26                      | 54                 | -11.74          | 113            | 339         | H        |
| * 4.951         | 57.5                 | Av  | 33.2      | -41.5       | 3.8       | 3.7       | -14.58   | 42.12                      | 54                 | -11.88          | 189            | 135         | V        |
| * 7.423         | 47.78                | Av  | 36.7      | -39.7       | 4.7       | 4.6       | -14.58   | 39.5                       | 54                 | -14.5           | 62             | 237         | V        |
| * 12.191        | 38.65                | Av  | 39.2      | -37.2       | 6.4       | 6         | -14.58   | 38.47                      | 54                 | -15.53          | 150            | 210         | V        |
| 14.559          | 40.35                | Av  | 42.5      | -36.9       | 7         | 6.4       | -14.58   | 44.77                      | 54                 | -9.23           | 300            | 185         | V        |

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

PK - KDB558074 Method: Maximum Peak

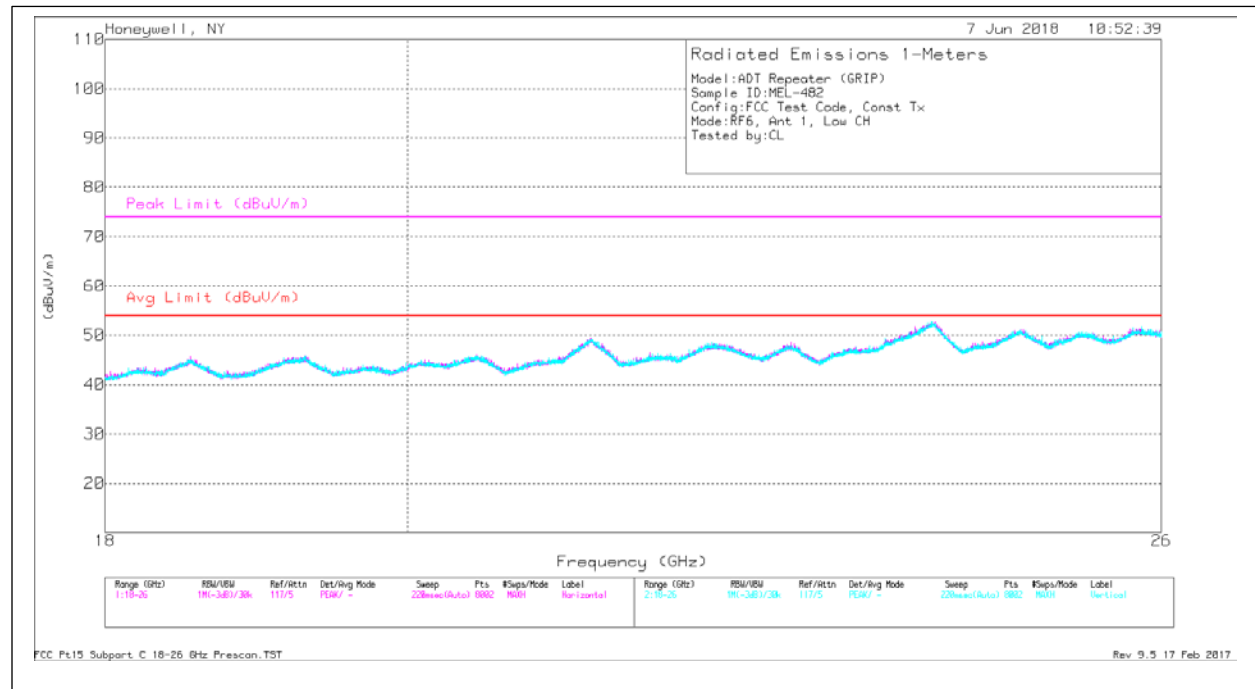
Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr =  $20\log(0.18656) = -14.58\text{dB}$

Antenna 2: High Channel – Data

**18-26GHz**

**Note:** No emissions detected above the system noise floor



Antenna 1: Low Channel - Plot

| Frequency (GHz) | Meter Reading (dBuV) | Det  | AF EM-6963 [dB/m] | Preamp [dB] | SMA7 [dB] | SMA5 [dB] | Dist Corr [dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|-----------------|----------------------|------|-------------------|-------------|-----------|-----------|----------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| * 19.274        | 28.65                | PK2  | 44.1              | -34.5       | 7.9       | 8         | -9.5           | 44.65                      | -                  | -           | 74                  | -29.35         | 0              | 100         | H        |
| * 19.276        | 20.91                | MAv1 | 44.1              | -34.5       | 7.9       | 8         | -9.5           | 36.91                      | 54                 | -17.09      | -                   | -              | 0              | 100         | H        |
| * 21.319        | 33.99                | PK2  | 44.5              | -31.9       | 8.3       | 8.1       | -9.5           | 53.49                      | -                  | -           | 74                  | -20.51         | 0              | 100         | H        |
| * 21.319        | 20.79                | MAv1 | 44.5              | -31.9       | 8.3       | 8.1       | -9.5           | 40.29                      | 54                 | -13.71      | -                   | -              | 0              | 100         | H        |
| * 21.318        | 31.03                | PK2  | 44.5              | -31.9       | 8.3       | 8.1       | -9.5           | 50.53                      | -                  | -           | 74                  | -23.47         | 193            | 166         | H        |
| * 21.318        | 20.71                | MAv1 | 44.5              | -31.9       | 8.3       | 8.1       | -9.5           | 40.21                      | 54                 | -13.79      | -                   | -              | 193            | 166         | H        |
| 24.027          | 30.98                | PK2  | 46.4              | -30.4       | 8.9       | 8.4       | -9.5           | 54.78                      | -                  | -           | 74                  | -19.22         | 140            | 354         | H        |
| 24.026          | 20.24                | MAv1 | 46.4              | -30.4       | 8.9       | 8.4       | -9.5           | 44.04                      | 54                 | -9.96       | -                   | -              | 140            | 354         | H        |
| * 19.29         | 31                   | PK2  | 44.2              | -34.3       | 7.9       | 8         | -9.5           | 47.3                       | -                  | -           | 74                  | -26.7          | 277            | 321         | V        |
| * 19.29         | 21.1                 | MAv1 | 44.2              | -34.3       | 7.9       | 8         | -9.5           | 37.4                       | 54                 | -16.6       | -                   | -              | 277            | 321         | V        |
| * 21.323        | 31.14                | PK2  | 44.5              | -32         | 8.3       | 8.1       | -9.5           | 50.54                      | -                  | -           | 74                  | -23.46         | 139            | 366         | V        |
| * 21.324        | 20.5                 | MAv1 | 44.5              | -32         | 8.3       | 8.1       | -9.5           | 39.9                       | 54                 | -14.1       | -                   | -              | 139            | 366         | V        |
| 24.018          | 30.41                | PK2  | 46.4              | -30.3       | 8.9       | 8.4       | -9.5           | 54.31                      | -                  | -           | 74                  | -19.69         | 272            | 380         | V        |
| 24.019          | 20.61                | MAv1 | 46.4              | -30.3       | 8.9       | 8.4       | -9.5           | 44.51                      | 54                 | -9.49       | -                   | -              | 272            | 380         | V        |

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

Antenna 1: Low Channel - Data

## Conducted Emissions (Mains)

### Test Description

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

### Test Criteria

| Reference                                                                   | Limit (dBuV)          |            |          |
|-----------------------------------------------------------------------------|-----------------------|------------|----------|
|                                                                             | Frequency Range (MHz) | Quasi-Peak | Average  |
| CFR 47 Subpart C, 15.207<br>RSS-GEN<br>CFR 47 Subpart B, 15.107<br>ICES-003 | 0.15-0.5              | 66 to 56   | 56 to 46 |
|                                                                             | 0.5-5                 | 56         | 46       |
|                                                                             | 5-30                  | 60         | 50       |

### Test Information

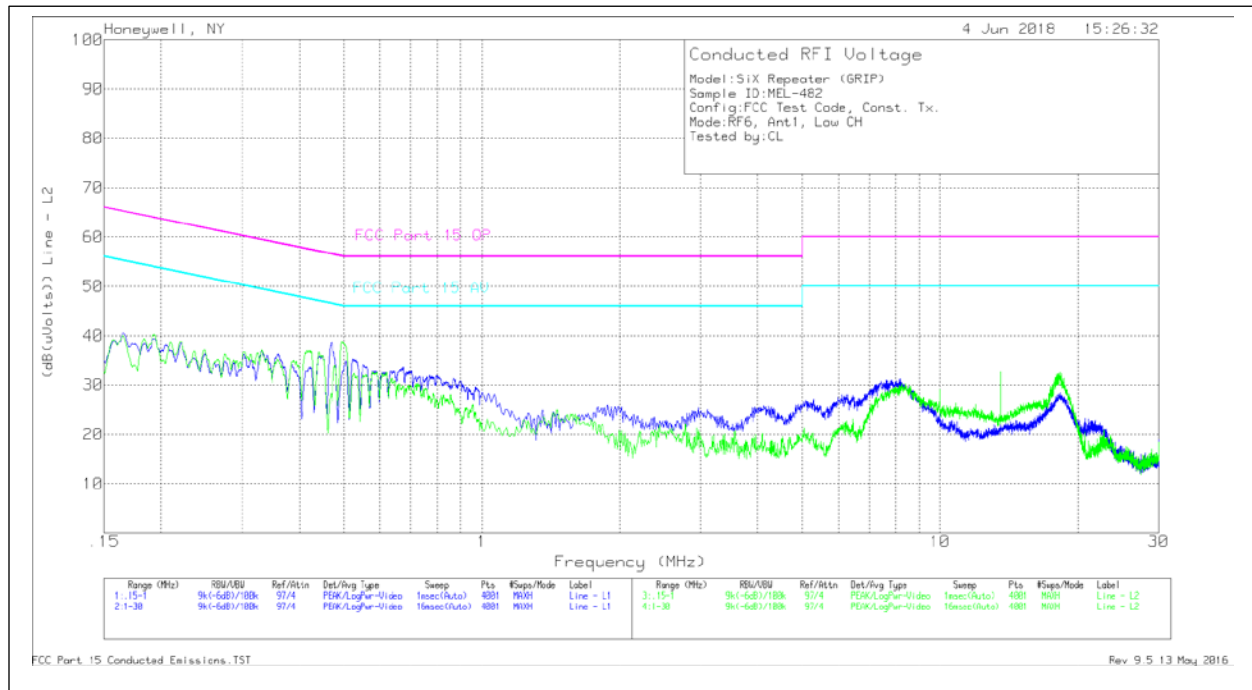
| Tester | Test Location | Date     | Temperature (°C) | Humidity (%RH) | Pressure (mbar) | Results (P/F) |
|--------|---------------|----------|------------------|----------------|-----------------|---------------|
| CL     | Shield Room   | 06/04/18 | 21.2             | 60.9           | 1005            | P             |

### Equipment List

| Instrument Type      | ID #  | Serial #    | Manufacturer       | Model        | Cal Date | Cal Due Date |
|----------------------|-------|-------------|--------------------|--------------|----------|--------------|
| Spectrum Analyzer    | 11536 | MY49431596  | Keysight           | N9030A (PXA) | 12/19/17 | 12/19/18     |
| LISN                 | 11527 | 241259      | Com-Power          | LIN-120A     | 01/10/18 | 01/10/19     |
| Measurement Software | 11543 | Version 9.5 | UL                 | UL EMC       | N/A      | N/A          |
| Environmental Meter  | 11533 | A070144     | Extech Instruments | SD700        | 08/21/17 | 08/21/20     |

## Test Results

### Unintentional Mode



Plot

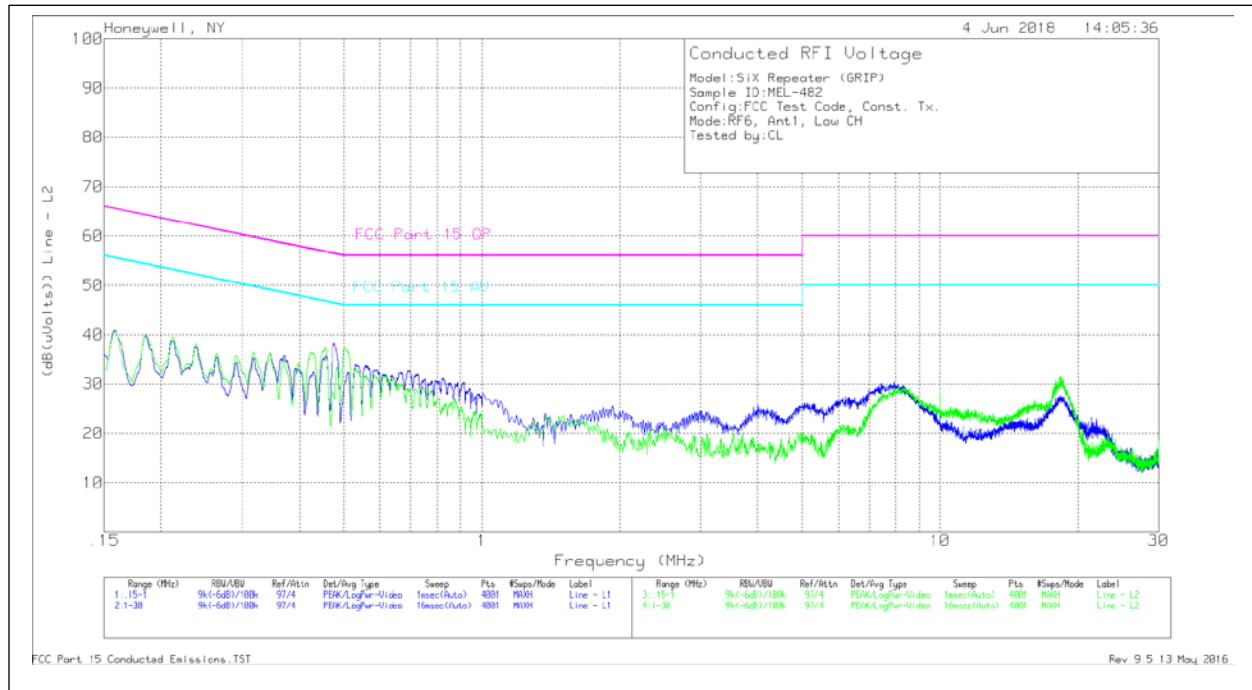
| Frequency (MHz) | Meter Reading (dBuV) | Det | LISN1 L1 [dB] | CDE Cable [dB] | Corrected Reading (dB(uVolts)) | FCC Part 15 QP | Margin (dB) | FCC Part 15 AV | Margin (dB) |
|-----------------|----------------------|-----|---------------|----------------|--------------------------------|----------------|-------------|----------------|-------------|
| .16566          | 29.89                | Pk  | 10.5          | .1             | 40.49                          | 65.18          | -24.69      | 55.18          | -14.69      |
| .46844          | 27.98                | Pk  | 10            | 0              | 37.98                          | 56.54          | -18.56      | 46.54          | -8.56       |
| .67387          | 23.8                 | Pk  | 9.9           | 0              | 33.7                           | 56             | -22.3       | 46             | -12.3       |
| 1.8845          | 15.98                | Pk  | 9.9           | 0              | 25.88                          | 56             | -30.12      | 46             | -20.12      |
| 8.163           | 20.99                | Pk  | 10            | .2             | 31.19                          | 60             | -28.81      | 50             | -18.81      |
| 18.1825         | 17.71                | Pk  | 10.2          | .3             | 28.21                          | 60             | -31.79      | 50             | -21.79      |

| Frequency (MHz) | Meter Reading (dBuV) | Det | LISN1 L2 [dB] | CDE Cable [dB] | Corrected Reading (dB(uVolts)) | FCC Part 15 QP | Margin (dB) | FCC Part 15 AV | Margin (dB) |
|-----------------|----------------------|-----|---------------|----------------|--------------------------------|----------------|-------------|----------------|-------------|
| .19313          | 29.74                | Pk  | 10.4          | .1             | 40.24                          | 63.9           | -23.66      | 53.9           | -13.66      |
| .49644          | 28.7                 | Pk  | 10            | 0              | 38.7                           | 56.06          | -17.36      | 46.06          | -7.36       |
| .72819          | 20.1                 | Pk  | 10            | 0              | 30.1                           | 56             | -25.9       | 46             | -15.9       |
| 1.45675         | 14.98                | Pk  | 9.9           | 0              | 24.88                          | 56             | -31.12      | 46             | -21.12      |
| 8.41675         | 19.98                | Pk  | 10            | .2             | 30.18                          | 60             | -29.82      | 50             | -19.82      |
| 13.557          | 22.39                | Pk  | 10.1          | .2             | 32.69                          | 60             | -27.31      | 50             | -17.31      |

Pk - Peak detector

Data

**Intentional Mode**



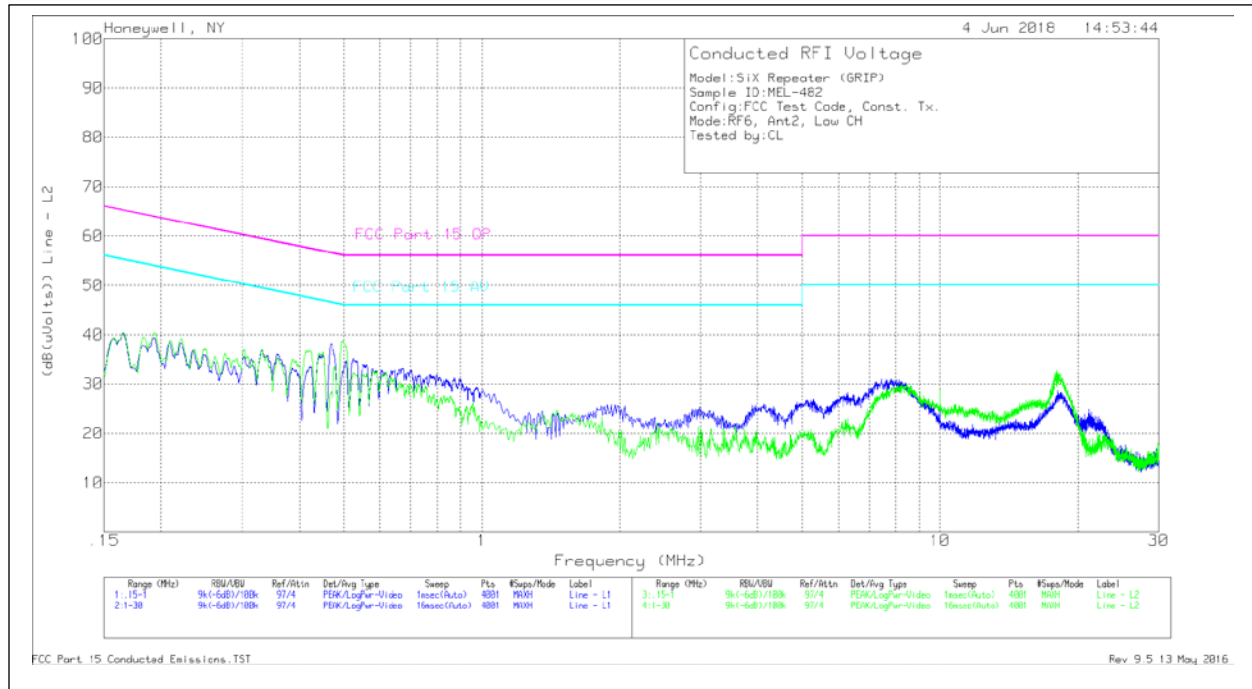
Antenna 1 - Plot

| Frequency (MHz) | Meter Reading (dBuV) | Det | LISN1 L1 [dB] | CDE Cable [dB] | Corrected Reading (dB(uVolts)) | FCC Part 15 QP | Margin (dB) | FCC Part 15 AV | Margin (dB) |
|-----------------|----------------------|-----|---------------|----------------|--------------------------------|----------------|-------------|----------------|-------------|
| .18461          | 29.22                | Pk  | 10.4          | .1             | 39.72                          | 64.28          | -24.56      | 54.28          | -14.56      |
| .4761           | 28.19                | Pk  | 10            | 0              | 38.19                          | 56.41          | -18.22      | 46.41          | -8.22       |
| .91414          | 20.46                | Pk  | 9.9           | 0              | 30.36                          | 56             | -25.64      | 46             | -15.64      |
| 1.93525         | 15.66                | Pk  | 9.9           | 0              | 25.56                          | 56             | -30.44      | 46             | -20.44      |
| 7.931           | 20.16                | Pk  | 10            | .2             | 30.36                          | 60             | -29.64      | 50             | -19.64      |
| 18.30575        | 17.14                | Pk  | 10.2          | .3             | 27.64                          | 60             | -32.36      | 50             | -22.36      |

| Frequency (MHz) | Meter Reading (dBuV) | Det | LISN1 L2 [dB] | CDE Cable [dB] | Corrected Reading (dB(uVolts)) | FCC Part 15 QP | Margin (dB) | FCC Part 15 AV | Margin (dB) |
|-----------------|----------------------|-----|---------------|----------------|--------------------------------|----------------|-------------|----------------|-------------|
| .15863          | 29.97                | Pk  | 10.6          | 0              | 40.57                          | 65.54          | -24.97      | 55.54          | -14.97      |
| .45576          | 27.37                | Pk  | 10            | 0              | 37.37                          | 56.77          | -19.4       | 46.77          | -9.4        |
| .74629          | 19.57                | Pk  | 10            | 0              | 29.57                          | 56             | -26.43      | 46             | -16.43      |
| 1.50025         | 13.69                | Pk  | 9.9           | 0              | 23.59                          | 56             | -32.41      | 46             | -22.41      |
| 8.1195          | 19.45                | Pk  | 10            | .2             | 29.65                          | 60             | -30.35      | 50             | -20.35      |
| 18.27675        | 20.98                | Pk  | 10.2          | .3             | 31.48                          | 60             | -28.52      | 50             | -18.52      |

Pk - Peak detector

Antenna 1 - Data



Antenna 2 - Plot

| Frequency (MHz) | Meter Reading (dBuV) | Det | LISN1 L1 [dB] | CDE Cable [dB] | Corrected Reading (dB(uVolts)) | FCC Part 15 QP | Margin (dB) | FCC Part 15 AV | Margin (dB) |
|-----------------|----------------------|-----|---------------|----------------|--------------------------------|----------------|-------------|----------------|-------------|
| .19292          | 29.02                | Pk  | 10.3          | .1             | 39.42                          | 63.91          | -24.49      | 53.91          | -14.49      |
| .47184          | 27.72                | Pk  | 10            | 0              | 37.72                          | 56.48          | -18.76      | 46.48          | -8.76       |
| .87271          | 21.29                | Pk  | 9.9           | 0              | 31.19                          | 56             | -24.81      | 46             | -14.81      |
| 1.957           | 15.9                 | Pk  | 9.9           | 0              | 25.8                           | 56             | -30.2       | 46             | -20.2       |
| 7.8295          | 20.82                | Pk  | 10            | .2             | 31.02                          | 60             | -28.98      | 50             | -18.98      |
| 18.3855         | 17.75                | Pk  | 10.3          | .3             | 28.35                          | 60             | -31.65      | 50             | -21.65      |

| Frequency (MHz) | Meter Reading (dBuV) | Det | LISN1 L2 [dB] | CDE Cable [dB] | Corrected Reading (dB(uVolts)) | FCC Part 15 QP | Margin (dB) | FCC Part 15 AV | Margin (dB) |
|-----------------|----------------------|-----|---------------|----------------|--------------------------------|----------------|-------------|----------------|-------------|
| .16534          | 29.85                | Pk  | 10.5          | .1             | 40.45                          | 65.19          | -24.74      | 55.19          | -14.74      |
| .49815          | 28.58                | Pk  | 10            | 0              | 38.58                          | 56.03          | -17.45      | 46.03          | -7.45       |
| .75897          | 19.32                | Pk  | 10            | 0              | 29.32                          | 56             | -26.68      | 46             | -16.68      |
| 1.45675         | 14.69                | Pk  | 9.9           | 0              | 24.59                          | 56             | -31.41      | 46             | -21.41      |
| 8.25            | 19.79                | Pk  | 10            | .2             | 29.99                          | 60             | -30.01      | 50             | -20.01      |
| 18.03025        | 22.41                | Pk  | 10.2          | .3             | 32.91                          | 60             | -27.09      | 50             | -17.09      |

Pk - Peak detector

Antenna 2 - Data

**END OF REPORT**