# CLASS 2 PERMISSIVE CHANGE TEST REPORT

**Report Number:** R12444044-E5

| | | |
|---|---|---|
| **Applicant** | : | CyberOptics Corporation<br>5900 Golden Hills Drive<br>Golden Valley, MN 55416, USA |
| **Model** | : | APS3 / APS-FPD |
| **FCC ID** | : | SPD003 |
| **IC** | : | 6210A-003 |
| **EUT Description** | : | Airborne Particle Sensor |
| **Test Standard(s)** | : | FCC 47 CFR PART 15 SUBPART C<br>ISED RSS-247 ISSUE 2<br>ISED RSS-GEN ISSUE 5 |

**Date Of Issue:**
2020-03-09

**Prepared by:**
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NVLAP TESTING
NVLAP Lab code: 200246-0

# REPORT REVISION HISTORY

| Ver. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 1 | 2020-01-14 | Initial Issue | Brian T. Kiewra |
| 2 | 2020-03-09 | Removed data reuse section. | Brian T. Kiewra |


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# TABLE OF CONTENTS

**REPORT REVISION HISTORY** ..... **2**
**TABLE OF CONTENTS** ..... **3**
**1. ATTESTATION OF TEST RESULTS** ..... **4**
**2. TEST METHODOLOGY** ..... **5**
**3. FACILITIES AND ACCREDITATION** ..... **5**
**4. CALIBRATION AND UNCERTAINTY** ..... **6**
*4.1. MEASURING INSTRUMENT CALIBRATION* ..... *6*
*4.2. SAMPLE CALCULATION* ..... *6*
*4.3. MEASUREMENT UNCERTAINTY* ..... *6*
**5. EQUIPMENT UNDER TEST** ..... **7**
*5.1. EUT DESCRIPTION* ..... *7*
*5.2. MAXIMUM OUTPUT POWER* ..... *7*
*5.3. DESCRIPTION OF AVAILABLE ANTENNAS* ..... *7*
*5.4. SOFTWARE AND FIRMWARE* ..... *7*
*5.5. WORST-CASE CONFIGURATION AND MODE* ..... *7*
*5.6. DESCRIPTION OF TEST SETUP* ..... *8*
**6. TEST AND MEASUREMENT EQUIPMENT** ..... **9**
**7. MEASUREMENT METHODS** ..... **11**
**8. ANTENNA PORT TEST RESULTS** ..... **12**
*8.1. ON TIME AND DUTY CYCLE* ..... *12*
**9. RADIATED TEST RESULTS** ..... **13**
*9.1. TRANSMITTER ABOVE 1 GHz* ..... *14*
9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION – APS3 ..... 14
9.1.2. BLUETOOTH BASIC DATA RATE GFSK MODULATION – APS-FPD ..... 24
*9.2. Worst Case Below 1 GHz* ..... *34*
*9.3. Worst Case 18-26 GHz* ..... *40*
**10. SETUP PHOTOS** ..... **44**
**END OF REPORT** ..... **44**


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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** CyberOptics Corporation
5900 Golden Hills Drive
Golden Valley, MN 55416, USA

**EUT DESCRIPTION:** Airborne Particle Sensor

**MODEL:** APS3 / APS- FPD

**SERIAL NUMBER:** APS3: JE108101
APS-FPD: FP000208

**DATE TESTED:** 2018-11-19 to 2019-11-27

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| CFR 47 Part 15 Subpart C | Compliant |
| ISED RSS-247 Issue 2 | Compliant |
| ISED RSS-GEN Issue 5 | Compliant |

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

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

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Approved & Released
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Prepared By:

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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05, RSS-GEN Issue 5, and RSS-247 Issue 2.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, North Carolina 27709, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, North Carolina 27560, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 12 Laboratory Dr. | 2800 Perimeter Park Dr. |
|---|---|
| Site Code: 2180C | |
| ☐ Chamber A | ☒ Chamber North |
| ☐ Chamber C | ☒ Chamber South |

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# 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

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

## 4.2. SAMPLE CALCULATION

**RADIATED EMISSIONS**
Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

**MAINS CONDUCTED EMISSIONS**
Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

## 4.3. MEASUREMENT UNCERTAINTY

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

| PARAMETER | UNCERTAINTY |
|---|---|
| RF output power, conducted | 1.3 dB (PK) , 0.45 dB (AV) |
| All emissions, radiated | 4.88 dB |

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


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# 5. EQUIPMENT UNDER TEST

## 5.1. EUT DESCRIPTION

The EUT is an airborne particle sensor with a Bluetooth radio. The EUT only supports GFSK modulation.

APS3 is intended to be used inside semiconductor fabrication tools, and is the shape of a wafer, that is 300 mm diameter. Whereas the APS-FPD which uses the same PCBA is targeted to the flat panel display industry. The APS-FPD housing is made of PEEK plastic and is relatively square as opposed to the standard APS3 housing.

Radiated testing performed on both models in this report.
Power measurements performed on APS-FPD.

## 5.2. MAXIMUM OUTPUT POWER

Power not measured other than to confirm correct transmit power for radiated emissions. The power is covered in report CYBR0077.1 . A default power setting was used as dictated by Cyberoptics. This power setting was for a target power of 11-12dBm.

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an inverted-F PCB antenna with a maximum gain of 1.5 dBi.

## 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was BC4 v26.4279
The test utility software used during testing was BlueTest3 v1.24

## 5.5. WORST-CASE CONFIGURATION AND MODE

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

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

The fundamentals of both EUTs were investigated in three orthogonal orientations X, Y, and Z. It was determined that Z orientation was worst-case orientation for the APS3 and X orientation was worst-case for the APS-FPD. Therefore, all final radiated testing was performed with the APS3 in Z orientation and the APS-FPD in X orientation.

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

GFSK mode: DH5


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## 5.6. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID** |
| Battery Pack | Power Bank | XT-5000 | NA | NA |

**I/O CABLES**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No.** | **Port** | **# of Identical Ports** | **Connector Type** | **Cable Type** | **Cable Length (m)** | **Remarks** |
| 1 | USB | 1 | USB | USB | <1m | Connected to battery pack |

**TEST SETUP**

The EUT was installed in a typical configuration. The customer provided test software to exercise the EUTs during test. Refer to the following diagram.

**SETUP DIAGRAMS**

Please refer to R12444044-EP5 for setup diagrams


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# 6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Wireless Conducted Measurement Equipment

| Equipment ID | Description | Manufacturer | Model Number | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| T177 (PRE0079253) | Spectrum Analyzer | Agilent Technologies | E4446A | 2018-04-12 | 2019-04-12 |
| PWM004 (PRE0137346) | RF Power Meter | Keysight Technologies | N1911A | 2018-07-30 | 2019-07-30 |
| PWS004 (PRE0126443) | Peak and Avg Power Sensor, 50MHz to 6GHz | Keysight Technologies | E9323A | 2018-07-30 | 2019-07-30 |
| SN 161024885 | Environmental Meter | Fisher Scientific | 15-077-963 | 2016-12-23 | 2018-12-23 |

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

| Equipment ID | Description | Manufacturer | Model Number | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| **0.009-30MHz (Loop Ant.)** | | | | | |
| AT0079 | Active Loop Antenna | ETS-Lindgren | 6502 | 2018-01-02 | 2019-01-02 |
| **30-1000 MHz** | | | | | |
| AT0073 | Hybrid Broadband Antenna | Sunol Sciences Corp. | JB3 | 2018-08-06 | 2019-08-06 |
| **1-18 GHz** | | | | | |
| AT0072 | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren | 3117 | 2018-04-30 | 2019-04-30 |
| **Gain-Loss Chains** | | | | | |
| N-SAC01 | Gain-loss string: 0.009-30MHz | Various | Various | 2018-09-06 | 2019-09-06 |
| N-SAC02 | Gain-loss string: 25-1000MHz | Various | Various | 2018-05-20 | 2019-05-20 |
| N-SAC03 | Gain-loss string: 1-18GHz | Various | Various | 2018-03-23 | 2019-03-23 |
| **Receiver & Software** | | | | | |
| SA0027 | Spectrum Analyzer | Agilent | N9030A | 2018-04-04 | 2019-04-04 |
| SOFTEMI | EMI Software | UL | Version 9.5 | NA | NA |
| **Additional Equipment used** | | | | | |
| s/n 161024690 | Environmental Meter | Fisher Scientific | 15-077-963 | 2016-12-21 | 2018-12-21 |


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Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

| Equipment ID | Description | Manufacturer | Model Number | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| **1-18 GHz** | | | | | |
| AT0069 | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren | 3117 | 2018-04-30 | 2019-04-30 |
| AT0072 | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren | 3117 | 2019-04-22 | 2020-04-22 |
| **18-40 GHz** | | | | | |
| AT0076 | Horn Antenna, 18-26.5GHz | ARA | MWH-1826/B | 2018-11-08 | 2019-11-08 |
| **Gain-Loss Chains** | | | | | |
| S-SAC03 | Gain-loss string: 1-18GHz | Various | Various | 2018-03-20 | 2019-03-20 |
| S-SAC03 | Gain-loss string: 1-18GHz | Various | Various | 2019-03-13 | 2020-03-13 |
| S-SAC04 | Gain-loss string: 18-40GHz | Various | Various | 2018-09-30 | 2019-03-31 |
| **Receiver & Software** | | | | | |
| SA0026 | Spectrum Analyzer | Agilent | N9030A | 2018-03-20 | 2019-03-20 |
| SA0025 | Spectrum Analyzer | Agilent | N9030A | 2018-04-30 | 2019-04-30 |
| SA0025 | Spectrum Analyzer | Agilent | N9030A | 2019-02-28 | 2020-02-28 |
| SOFTEMI | EMI Software | UL | Version 9.5 | NA | NA |
| **Additional Equipment used** | | | | | |
| s/n 161024887 | Environmental Meter | Fisher Scientific | 15-077-963 | 2016-12-23 | 2018-12-23 |
| s/n 181474409 | Environmental Meter | Fisher Scientific | 15-077-963 | 2018-07-27 | 2020-07-27 |

Note: All equipment was within calibration at time of use.


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# 7. MEASUREMENT METHODS

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

Out-of-band emissions in non-restricted bands: ANSI C63.10 Section 7.8.6 & 7.8.8

Out-of-band emissions in restricted bands: ANSI C63.10:2013 Sections 6.3-6.6


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# 8. ANTENNA PORT TEST RESULTS

## 8.1. ON TIME AND DUTY CYCLE

**LIMITS**

None; for reporting purposes only.

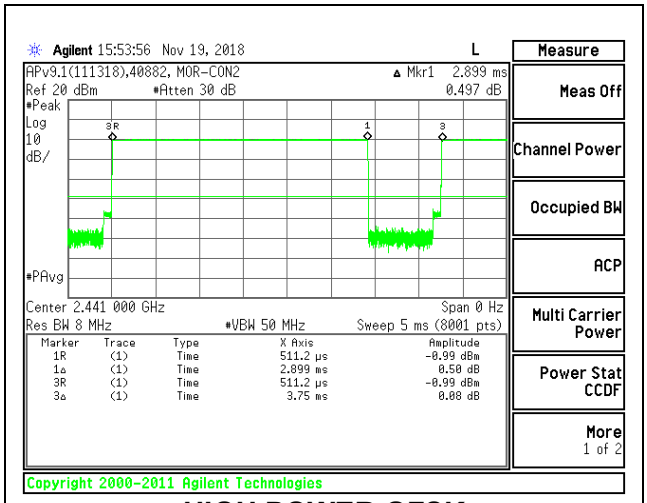
**PROCEDURE**

ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

**ON TIME AND DUTY CYCLE RESULTS**

| Mode | ON Time B (msec) | Period (msec) | Duty Cycle x (linear) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | 1/T Minimum VBW (kHz) |
|---|---|---|---|---|---|---|
| High Bluetooth GFSK | 2.90 | 3.75 | 0.773 | 77.3% | 1.12 | 0.345 |

**DUTY CYCLE PLOTS**




**HIGH POWER GFSK**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# 9. RADIATED TEST RESULTS

**LIMITS**

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

| Frequency Range (MHz) | Field Strength Limit (uV/m) at 3 m | Field Strength Limit (dBuV/m) at 3 m |
|---|---|---|
| 0.009-0.490 | 2400/F(kHz) @ 300 m | - |
| 0.490-1.705 | 24000/F(kHz) @ 30 m | - |
| 1.705 - 30 | 30 @ 30m | - |
| 30 - 88 | 100 | 40 |
| 88 - 216 | 150 | 43.5 |
| 216 - 960 | 200 | 46 |
| Above 960 | 500 | 54 |

**TEST PROCEDURE**

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

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements for the 30-1000 MHz range, 9 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements for the 0.15-30 MHz range and 200 Hz for peak detection measurements or 200 Hz for quasi-peak detection measurements for the 9 to 150 kHz range. Peak detection is used unless otherwise noted as quasi-peak.

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

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements. For this test program, average measurements were performed using Peak detection with the resolution bandwidth set for 1 MHz and the Video Bandwidth set for 1/Ton, where Ton equals the transmit on time.

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

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


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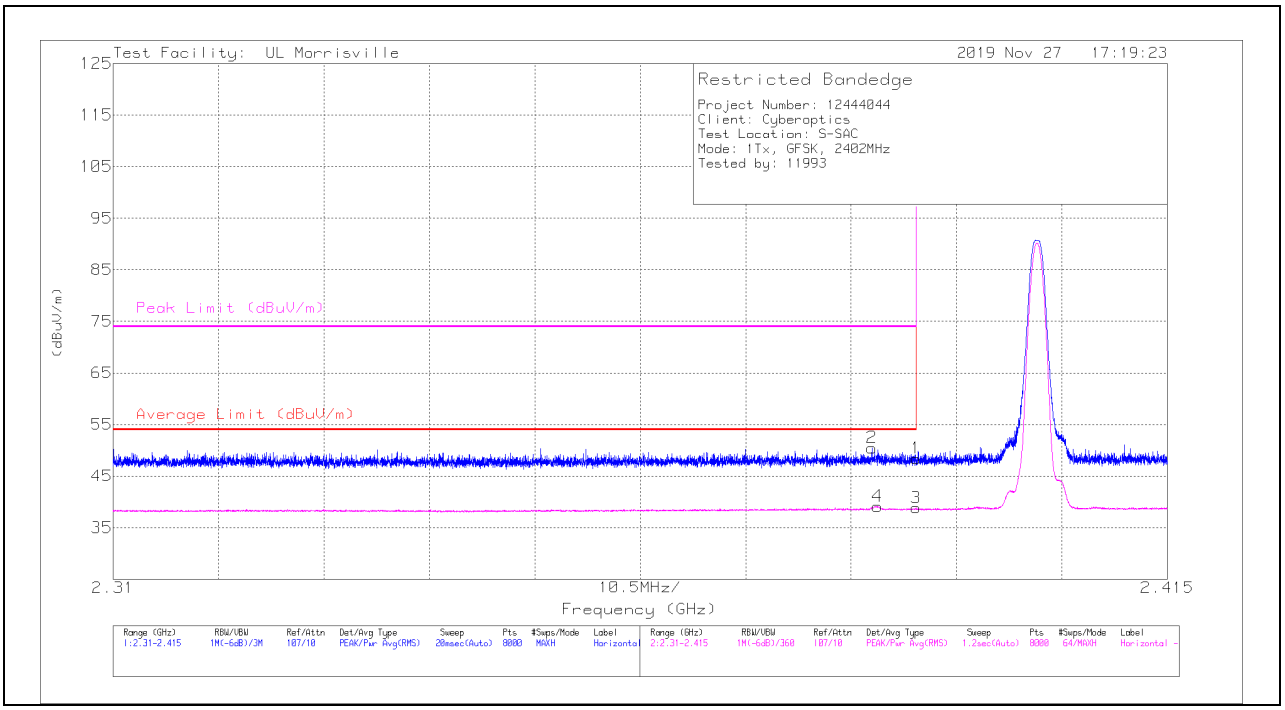
# 9.1. TRANSMITTER ABOVE 1 GHz

## 9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION – APS3

## BANDEDGE (LOW CHANNEL)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.39 | 40.63 | Pk | 31.9 | -24.1 | 48.43 | - | - | 74 | -25.57 | 172 | 323 | H |
| 2 | * ** 2.38557 | 42.7 | Pk | 31.9 | -24.1 | 50.5 | - | - | 74 | -23.5 | 172 | 323 | H |
| 3 | * ** 2.39 | 31.06 | V1TR | 31.9 | -24.1 | 38.86 | 54 | -15.14 | - | - | 172 | 323 | H |
| 4 | * ** 2.38614 | 31.33 | V1TR | 31.9 | -24.1 | 39.13 | 54 | -14.87 | - | - | 172 | 323 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration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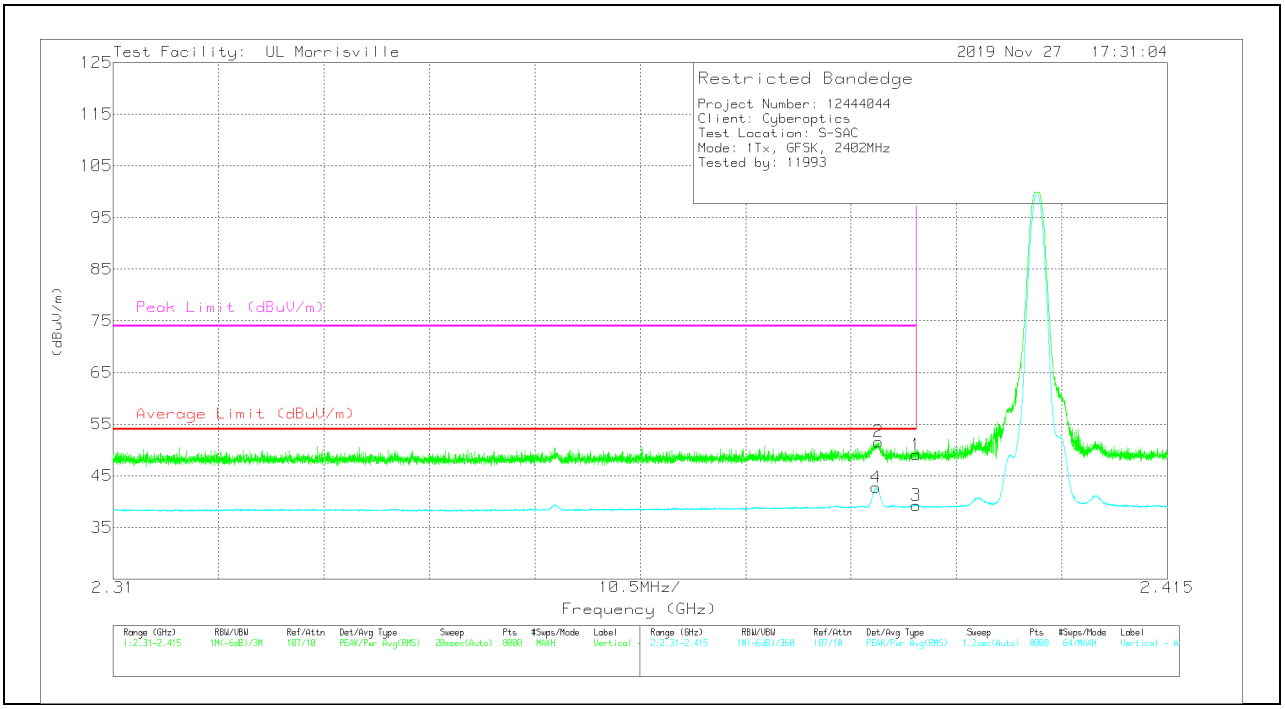
# VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.39 | 41.27 | Pk | 31.9 | -24.1 | 49.07 | - | - | 74 | -24.93 | 92 | 341 | V |
| 2 | * ** 2.38624 | 43.8 | Pk | 31.9 | -24.1 | 51.6 | - | - | 74 | -22.4 | 92 | 341 | V |
| 3 | * ** 2.39 | 31.48 | V1TR | 31.9 | -24.1 | 39.28 | 54 | -14.72 | - | - | 92 | 341 | V |
| 4 | * ** 2.38597 | 34.95 | V1TR | 31.9 | -24.1 | 42.75 | 54 | -11.25 | - | - | 92 | 341 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration



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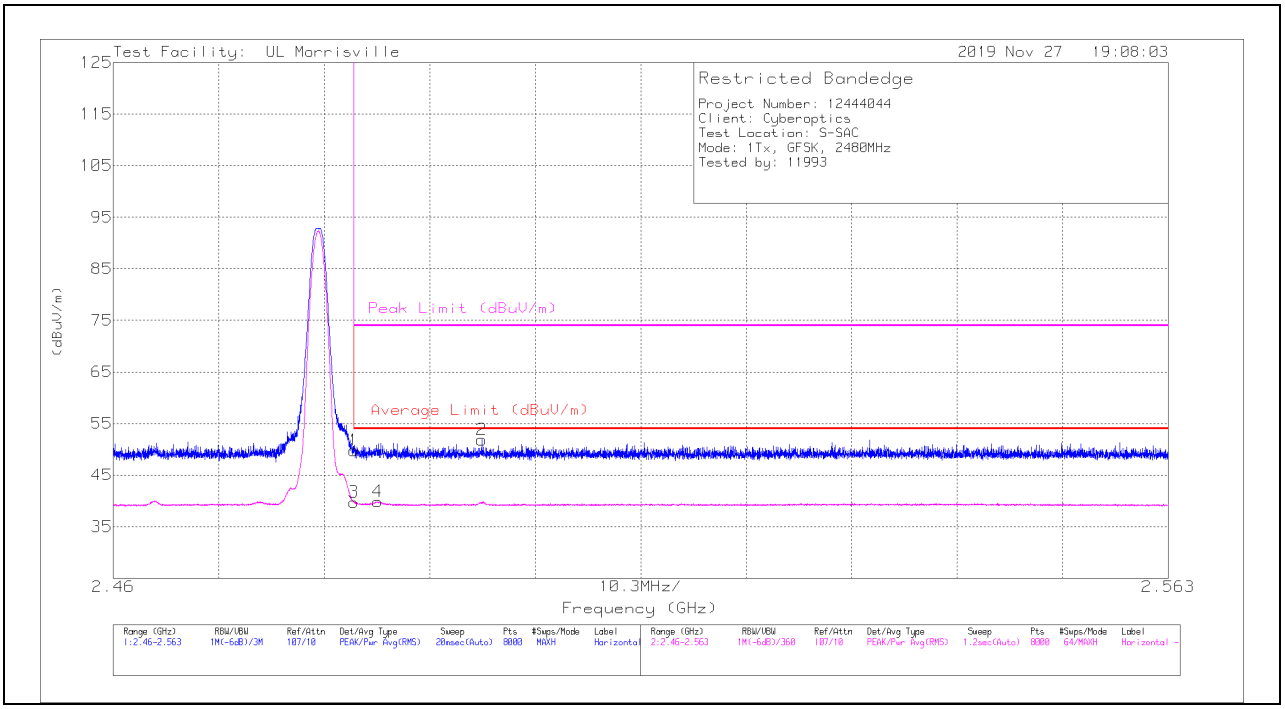
## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 41.49 | Pk | 32.3 | -24 | 49.79 | - | - | 74 | -24.21 | 286 | 396 | H |
| 2 | * ** 2.49598 | 43.56 | Pk | 32.3 | -24 | 51.86 | - | - | 74 | -22.14 | 286 | 396 | H |
| 3 | * ** 2.4835 | 31.47 | V1TR | 32.3 | -24 | 39.77 | 54 | -14.23 | - | - | 286 | 396 | H |
| 4 | * ** 2.48581 | 31.56 | V1TR | 32.3 | -24 | 39.86 | 54 | -14.14 | - | - | 286 | 396 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration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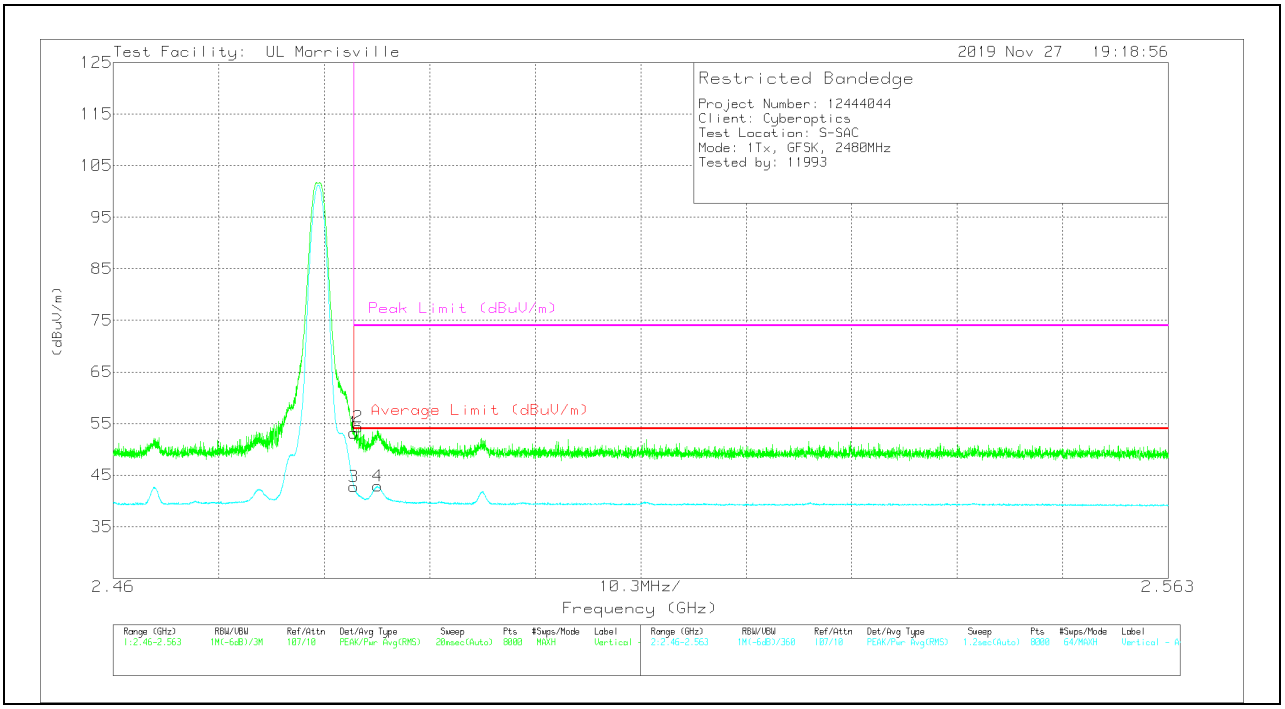
# VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 44.91 | Pk | 32.3 | -24 | 53.21 | - | - | 74 | -20.79 | 74 | 351 | V |
| 2 | * ** 2.48391 | 46.03 | Pk | 32.3 | -24 | 54.33 | - | - | 74 | -19.67 | 74 | 351 | V |
| 3 | * ** 2.4835 | 34.44 | V1TR | 32.3 | -24 | 42.74 | 54 | -11.26 | - | - | 74 | 351 | V |
| 4 | * ** 2.48583 | 34.56 | V1TR | 32.3 | -24 | 42.86 | 54 | -11.14 | - | - | 74 | 351 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration



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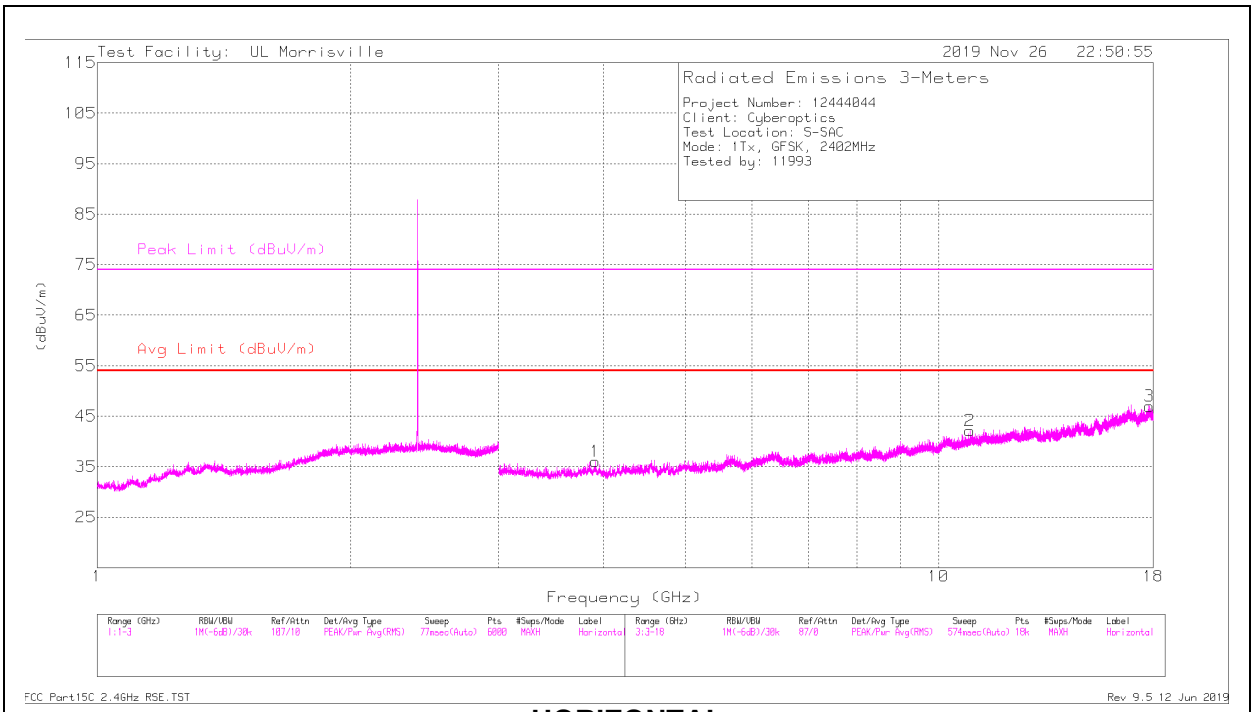
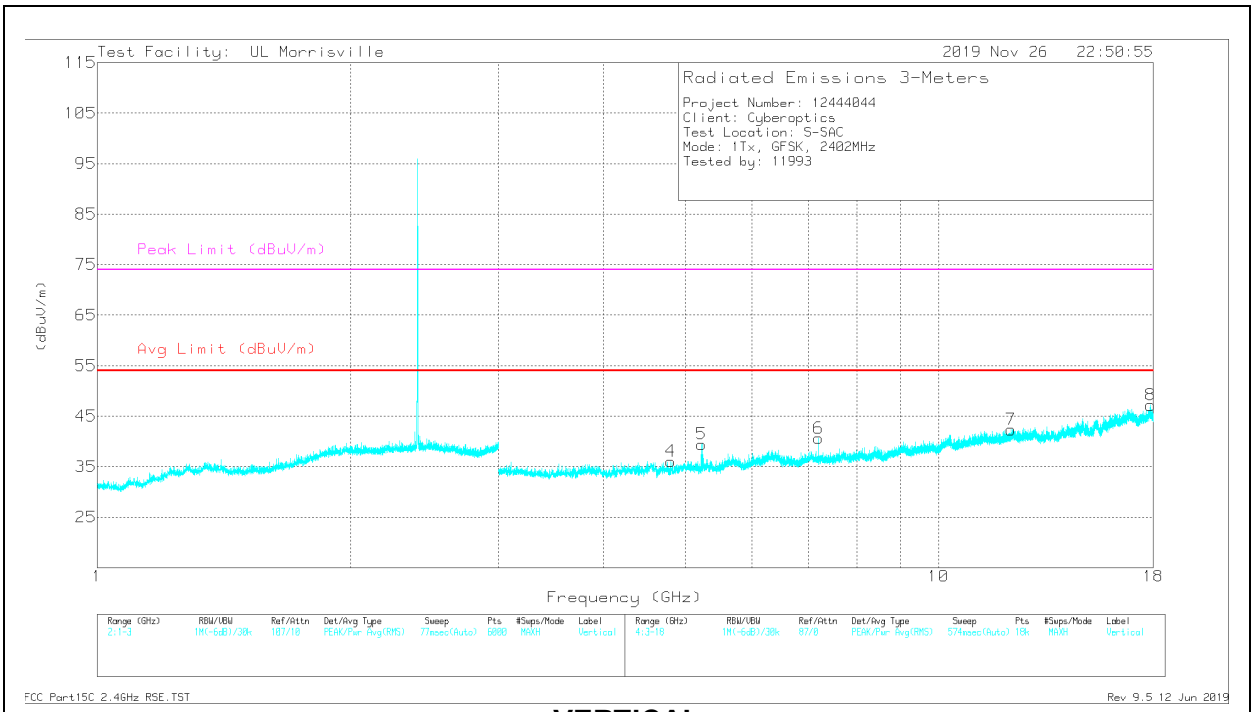
## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS




**HORIZONTAL**

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## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 3.90796 | 40.62 | PK-U | 33.4 | -31.8 | 42.22 | - | - | 74 | -31.78 | 177 | 153 | H |
| | * ** 3.90586 | 28.58 | V1TR | 33.4 | -31.8 | 30.18 | 54 | -23.82 | - | - | 177 | 153 | H |
| 2 | * ** 10.8963 | 33.74 | PK-U | 37.9 | -24.4 | 47.24 | - | - | 74 | -26.76 | 200 | 230 | H |
| | * ** 10.89627 | 22.49 | V1TR | 37.9 | -24.4 | 35.99 | 54 | -18.01 | - | - | 200 | 230 | H |
| 3 | * ** 17.80709 | 33.17 | PK-U | 41.2 | -20.8 | 53.57 | - | - | 74 | -20.43 | 147 | 358 | H |
| | * ** 17.80709 | 21.5 | V1TR | 41.2 | -20.8 | 41.9 | 54 | -12.1 | - | - | 147 | 358 | H |
| 4 | * ** 4.80406 | 40.98 | PK-U | 34.2 | -31 | 44.18 | - | - | 74 | -29.82 | 220 | 256 | V |
| | * ** 4.80401 | 33.49 | V1TR | 34.2 | -31 | 36.69 | 54 | -17.31 | - | - | 220 | 256 | V |
| 5 | ** 5.22564 | 37.7 | PK-U | 34.3 | -30.5 | 41.5 | - | - | 74 | -32.5 | 61 | 305 | V |
| | ** 5.22487 | 26.9 | V1TR | 34.3 | -30.5 | 30.7 | 54 | -23.3 | - | - | 61 | 305 | V |
| 7 | * ** 12.20651 | 33.86 | PK-U | 38.9 | -23.8 | 48.96 | - | - | 74 | -25.04 | 309 | 274 | V |
| | * ** 12.20795 | 22.49 | V1TR | 38.9 | -23.8 | 37.59 | 54 | -16.41 | - | - | 309 | 274 | V |
| 8 | * ** 17.86956 | 32.74 | PK-U | 41.2 | -20.6 | 53.34 | - | - | 74 | -20.66 | 241 | 254 | V |
| | * ** 17.86588 | 21.96 | V1TR | 41.2 | -20.7 | 42.46 | 54 | -11.54 | - | - | 241 | 255 | V |
| 6 | 7.20607 | 32.91 | Pk | 35.7 | -28 | 40.61 | - | - | - | - | 0-360 | 199 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - U-NII: Maximum Peak
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration
Pk - Peak detector


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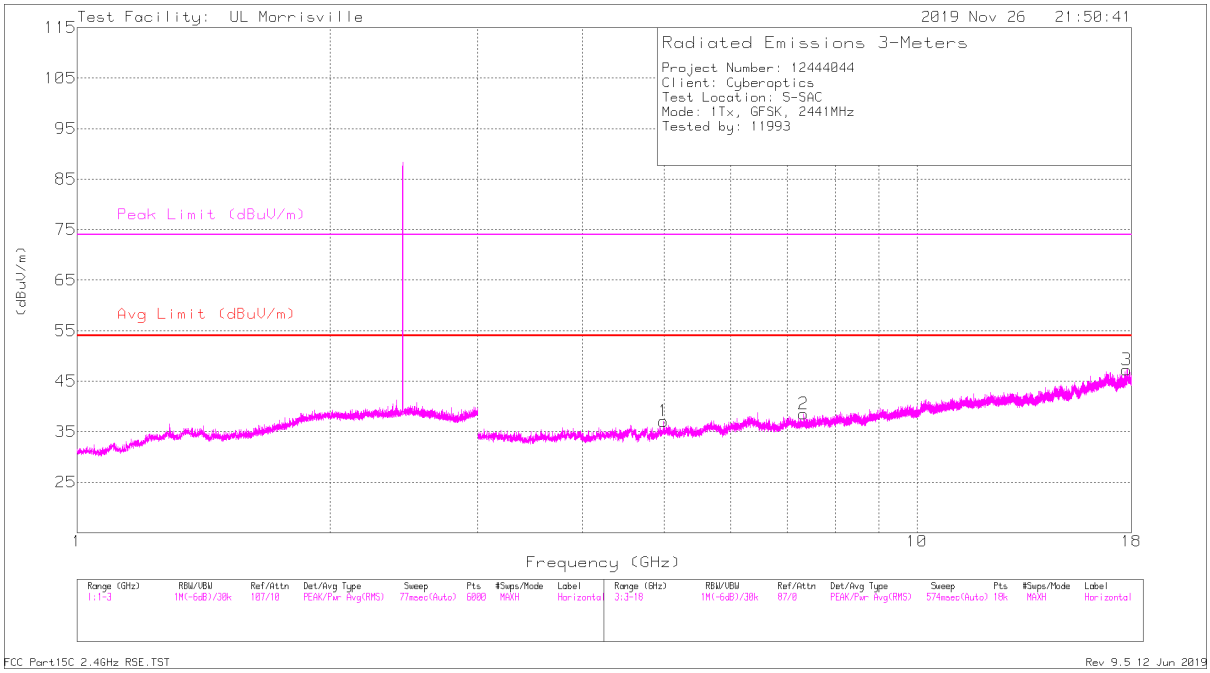
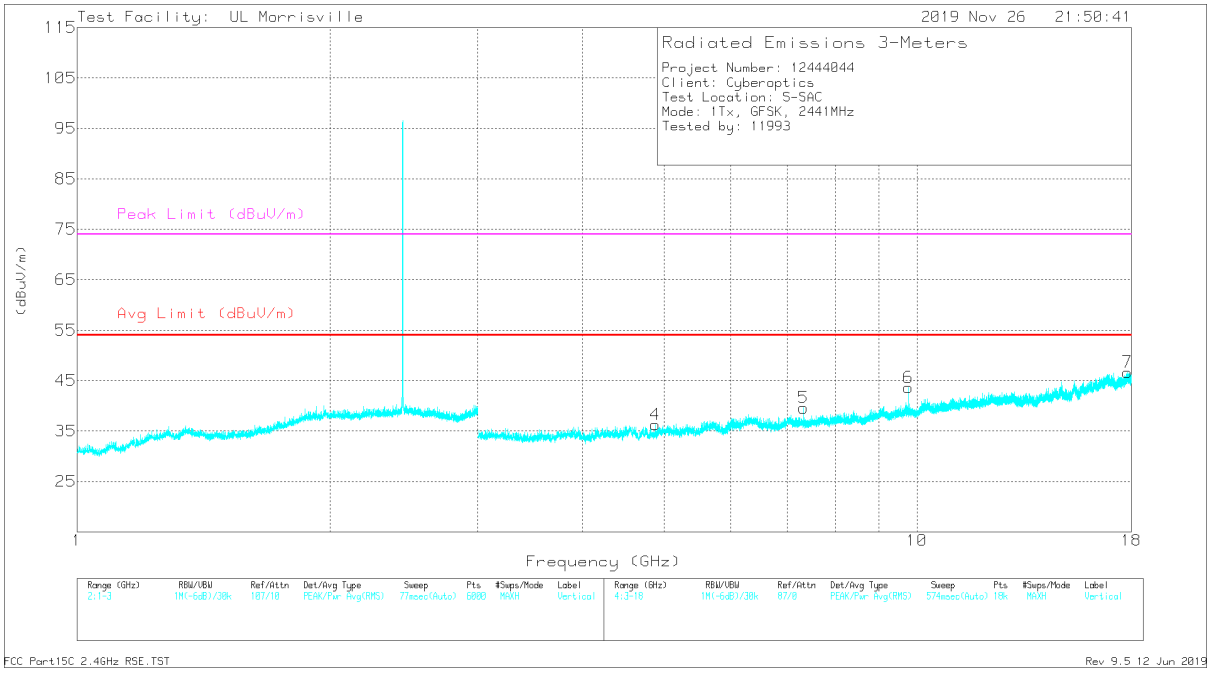
## MID CHANNEL RESULTS




**HORIZONTAL**

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## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.99291 | 40.25 | PK-U | 34.1 | -31.1 | 43.25 | - | - | 74 | -30.75 | 22 | 216 | H |
| | * ** 4.9911 | 27.72 | V1TR | 34.1 | -31.1 | 30.72 | 54 | -23.28 | - | - | 22 | 216 | H |
| 2 | * ** 7.3297 | 35.64 | PK-U | 35.7 | -27.5 | 43.84 | - | - | 74 | -30.16 | 101 | 116 | H |
| | * ** 7.3281 | 24.08 | V1TR | 35.7 | -27.5 | 32.28 | 54 | -21.72 | - | - | 101 | 116 | H |
| 3 | * ** 17.76988 | 33.02 | PK-U | 41.2 | -21.4 | 52.82 | - | - | 74 | -21.18 | 139 | 238 | H |
| | * ** 17.7703 | 22.12 | V1TR | 41.2 | -21.4 | 41.92 | 54 | -12.08 | - | - | 139 | 238 | H |
| 4 | * ** 4.88234 | 40.94 | PK-U | 34 | -30.6 | 44.34 | - | - | 74 | -29.66 | 143 | 320 | V |
| | * ** 4.88203 | 32.29 | V1TR | 34 | -30.6 | 35.69 | 54 | -18.31 | - | - | 143 | 320 | V |
| 5 | * ** 7.32349 | 39.57 | PK-U | 35.7 | -27.5 | 47.77 | - | - | 74 | -26.23 | 313 | 290 | V |
| | * ** 7.32331 | 30.65 | V1TR | 35.7 | -27.5 | 38.85 | 54 | -15.15 | - | - | 313 | 290 | V |
| 7 | * ** 17.81971 | 32.87 | PK-U | 41.2 | -20.8 | 53.27 | - | - | 74 | -20.73 | 44 | 250 | V |
| | * ** 17.81937 | 22.2 | V1TR | 41.4 | -22.5 | 41.1 | 54 | -12.9 | - | - | 44 | 251 | V |
| 6 | 9.76288 | 32.13 | Pk | 37.1 | -25.6 | 43.63 | - | - | - | - | 0-360 | 199 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - U-NII: Maximum Peak
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration
Pk - Peak detector


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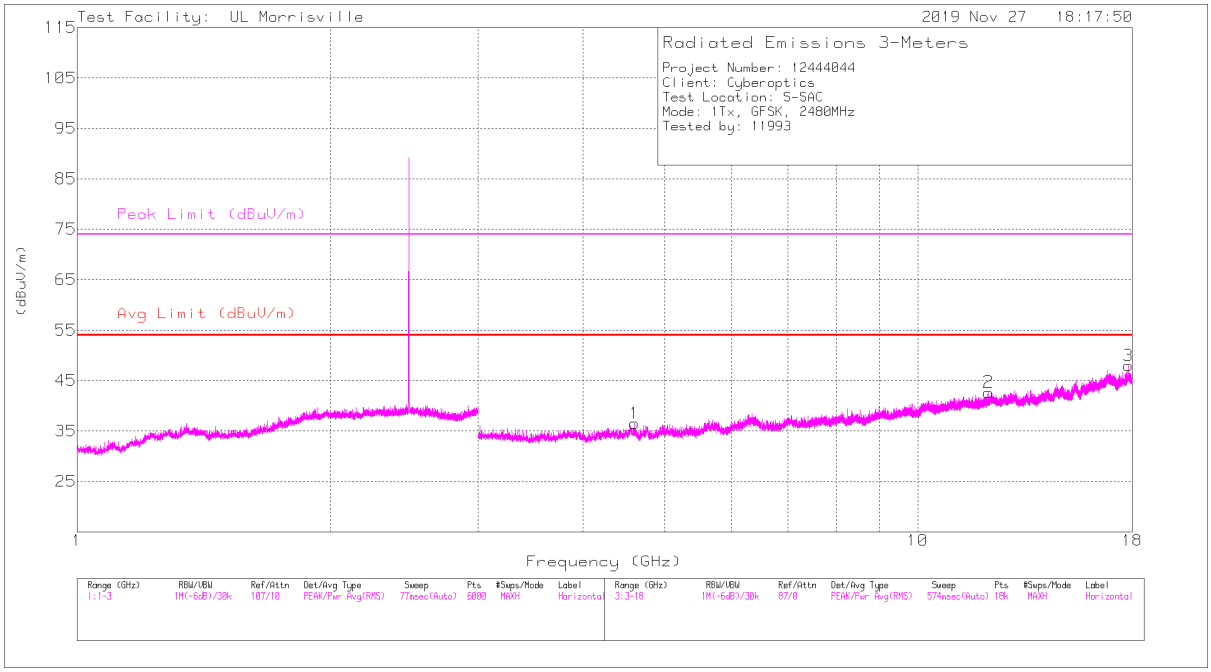
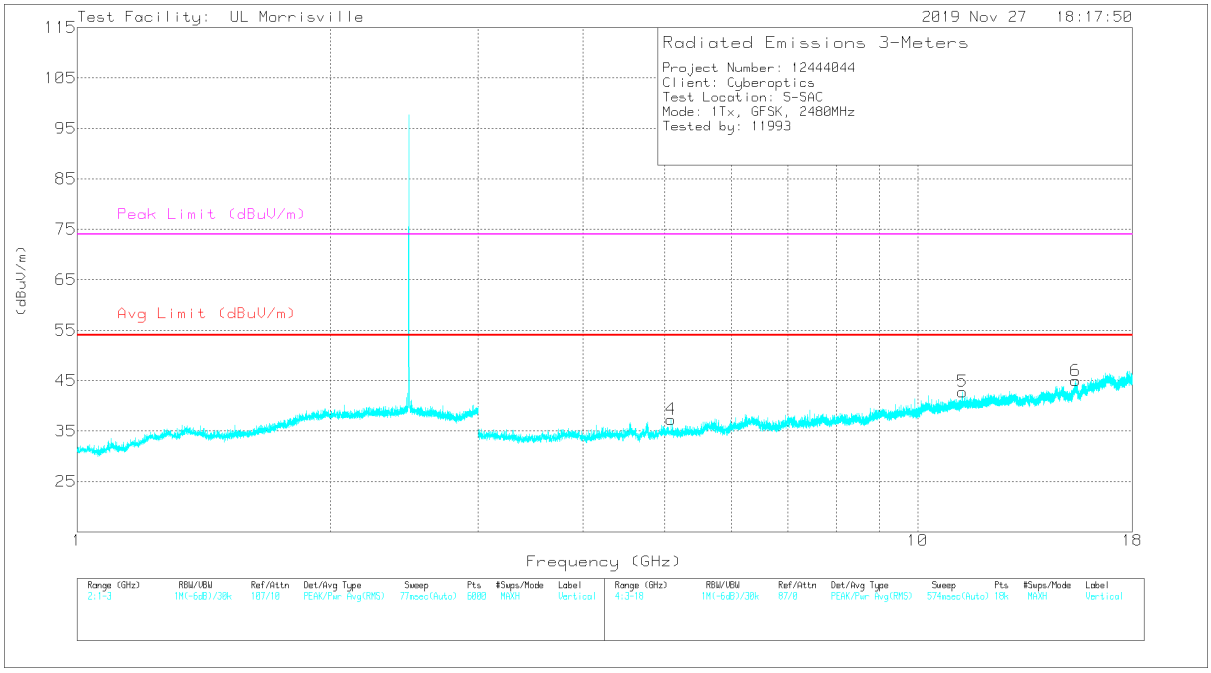
## HIGH CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**



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## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.60277 | 39.58 | PK-U | 34.1 | -31.6 | 42.08 | - | - | 74 | -31.92 | 172 | 318 | H |
| | * ** 4.59964 | 28 | V1TR | 34.1 | -31.6 | 30.5 | 54 | -23.5 | - | - | 172 | 318 | H |
| 2 | * ** 12.14263 | 33.6 | PK-U | 38.8 | -24 | 48.4 | - | - | 74 | -25.6 | 96 | 131 | H |
| | * ** 12.14392 | 22.13 | V1TR | 38.8 | -24 | 36.93 | 54 | -17.07 | - | - | 96 | 131 | H |
| 3 | * ** 17.80758 | 33.76 | PK-U | 41.2 | -20.8 | 54.16 | - | - | 74 | -19.84 | 194 | 272 | H |
| | * ** 17.80573 | 22.08 | V1TR | 41.2 | -20.8 | 42.48 | 54 | -11.52 | - | - | 194 | 272 | H |
| 4 | * ** 5.08344 | 38.88 | PK-U | 34.2 | -31.1 | 41.98 | - | - | 74 | -32.02 | 23 | 136 | V |
| | * ** 5.08367 | 27.56 | V1TR | 34.2 | -31.1 | 30.66 | 54 | -23.34 | - | - | 23 | 136 | V |
| 5 | * ** 11.31225 | 33.19 | PK-U | 38 | -22.9 | 48.29 | - | - | 74 | -25.71 | 337 | 327 | V |
| | * ** 11.31205 | 21.42 | V1TR | 38 | -22.9 | 36.52 | 54 | -17.48 | - | - | 337 | 327 | V |
| 6 | * ** 15.41708 | 32.99 | PK-U | 39.9 | -21.7 | 51.19 | - | - | 74 | -22.81 | 60 | 326 | V |
| | * ** 15.41755 | 21.64 | V1TR | 39.9 | -21.7 | 39.84 | 54 | -14.16 | - | - | 60 | 326 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - U-NII: Maximum Peak
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration


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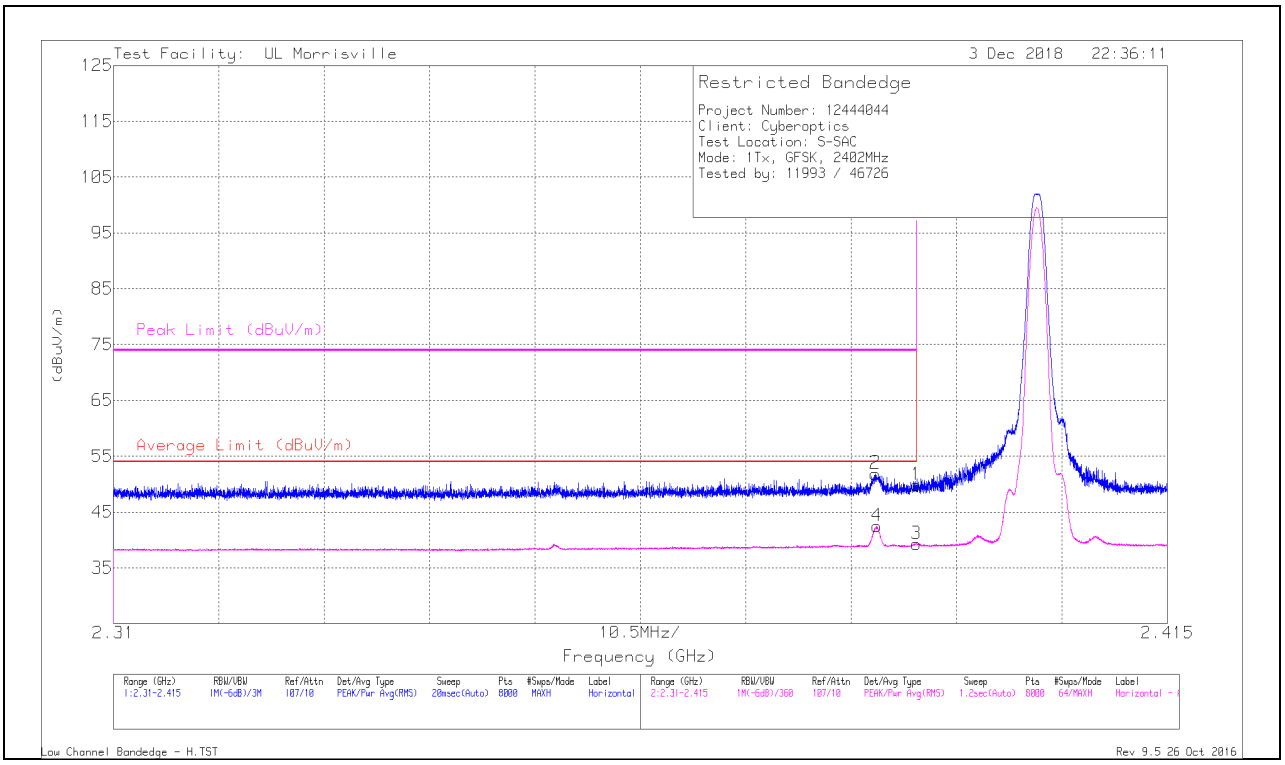
## 9.1.2. BLUETOOTH BASIC DATA RATE GFSK MODULATION – APS-FPD

## BANDEDGE (LOW CHANNEL)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 AF (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.39 | 42.01 | Pk | 32 | -24.2 | 49.81 | - | - | 74 | -24.19 | 64 | 156 | H |
| 2 | * ** 2.386 | 44.17 | Pk | 32 | -24.3 | 51.87 | - | - | 74 | -22.13 | 64 | 156 | H |
| 3 | * ** 2.39 | 31.44 | V1TR | 32 | -24.2 | 39.24 | 54 | -14.76 | - | - | 64 | 156 | H |
| 4 | * ** 2.386 | 34.64 | V1TR | 32 | -24.2 | 42.44 | 54 | -11.56 | - | - | 64 | 156 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration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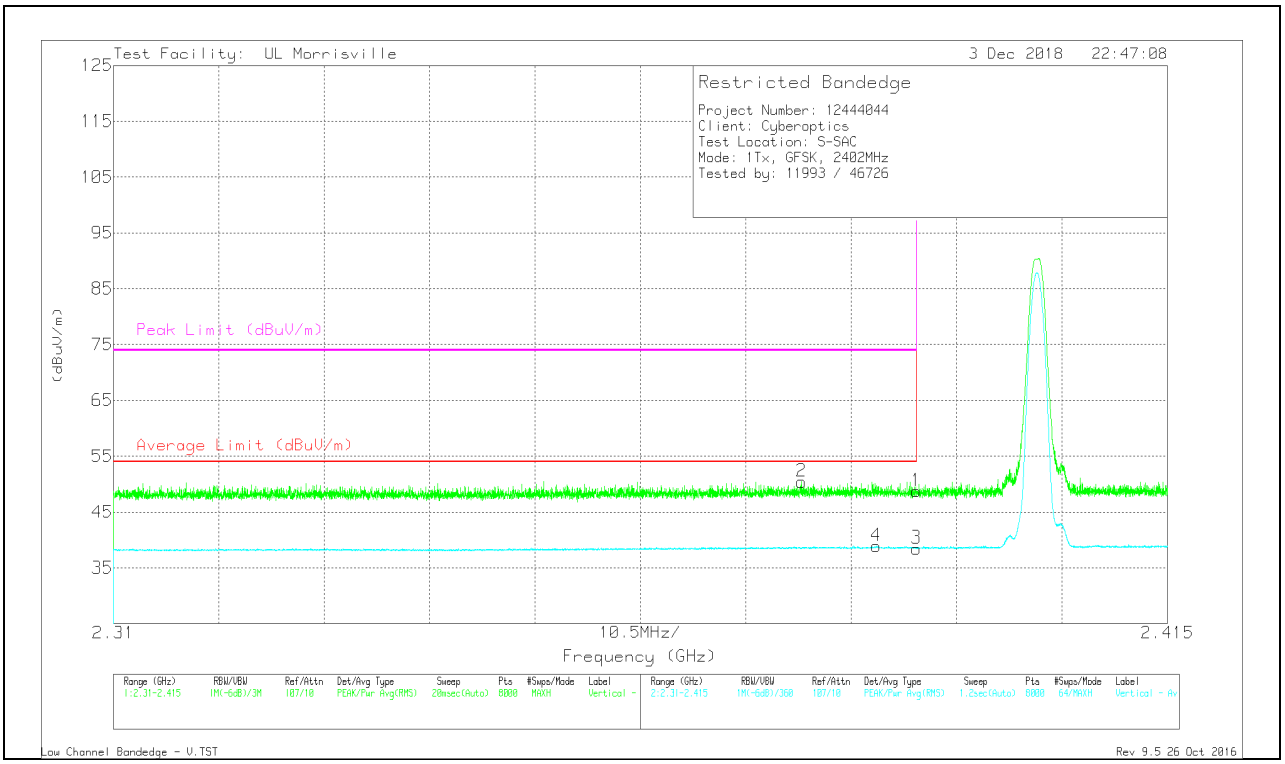
# VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0069 AF (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.39 | 40.91 | Pk | 32 | -24.2 | 48.71 | - | - | 74 | -25.29 | 260 | 288 | V |
| 2 | * ** 2.379 | 42.72 | Pk | 32 | -24.3 | 50.42 | - | - | 74 | -23.58 | 260 | 288 | V |
| 3 | * ** 2.39 | 30.67 | V1TR | 32 | -24.2 | 38.47 | 54 | -15.53 | - | - | 260 | 288 | V |
| 4 | * ** 2.386 | 31.21 | V1TR | 32 | -24.3 | 38.91 | 54 | -15.09 | - | - | 260 | 288 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration



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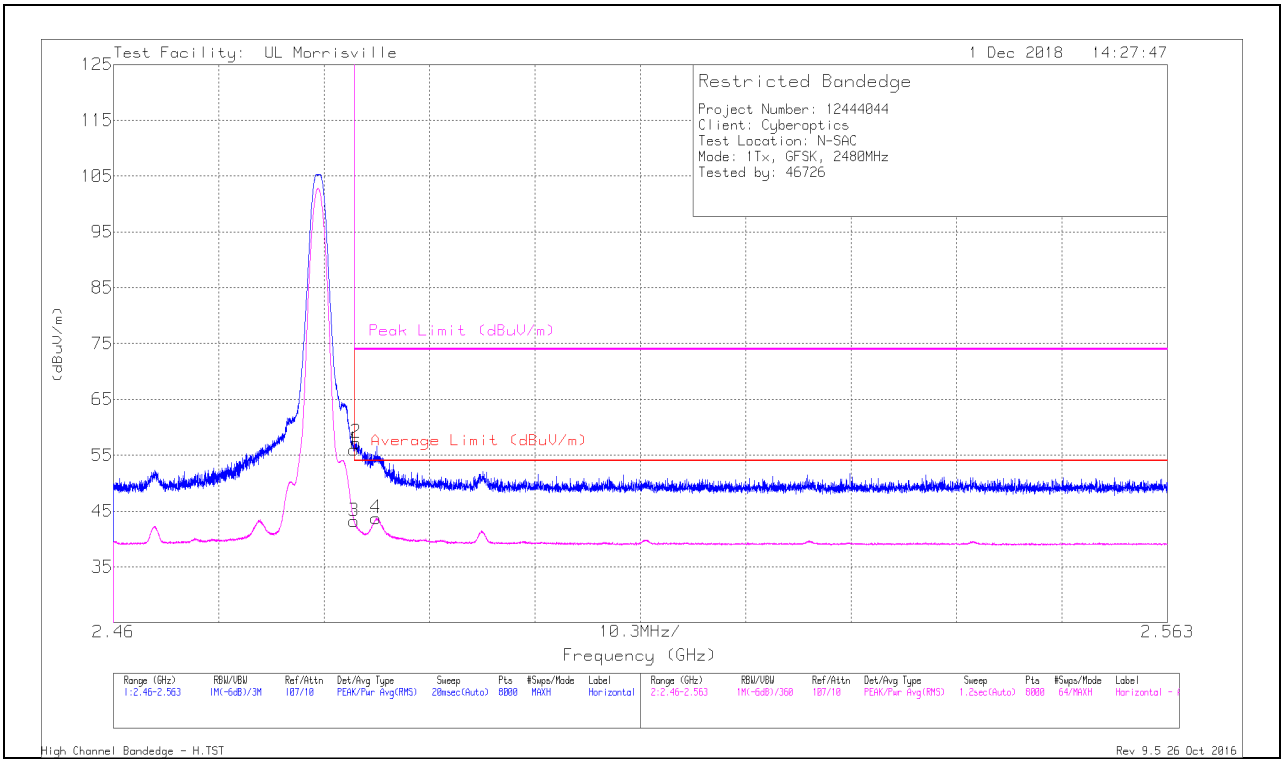
## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 AF (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.484 | 48.08 | Pk | 32.4 | -24.5 | 55.98 | - | - | 74 | -18.02 | 202 | 130 | H |
| 2 | * ** 2.484 | 49.37 | Pk | 32.4 | -24.5 | 57.27 | - | - | 74 | -16.73 | 202 | 130 | H |
| 3 | * ** 2.484 | 35.33 | V1TR | 32.4 | -24.5 | 43.23 | 54 | -10.77 | - | - | 202 | 130 | H |
| 4 | * ** 2.486 | 35.85 | V1TR | 32.4 | -24.5 | 43.75 | 54 | -10.25 | - | - | 202 | 130 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration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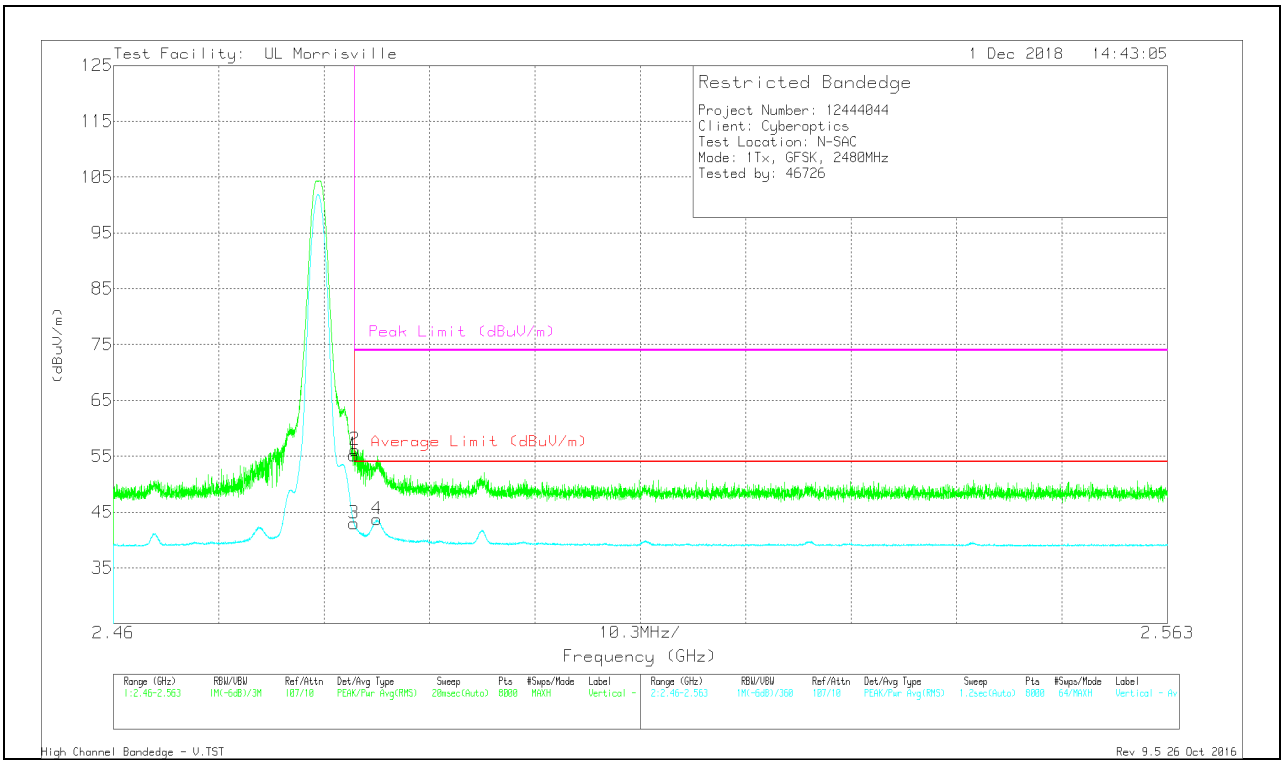
# VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 AF (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.484 | 47.31 | Pk | 32.4 | -24.5 | 55.21 | - | - | 74 | -18.79 | 6 | 322 | V |
| 2 | * ** 2.484 | 48.23 | Pk | 32.4 | -24.5 | 56.13 | - | - | 74 | -17.87 | 6 | 322 | V |
| 3 | * ** 2.484 | 35.03 | V1TR | 32.4 | -24.5 | 42.93 | 54 | -11.07 | - | - | 6 | 322 | V |
| 4 | * ** 2.486 | 35.81 | V1TR | 32.4 | -24.5 | 43.71 | 54 | -10.29 | - | - | 6 | 322 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration



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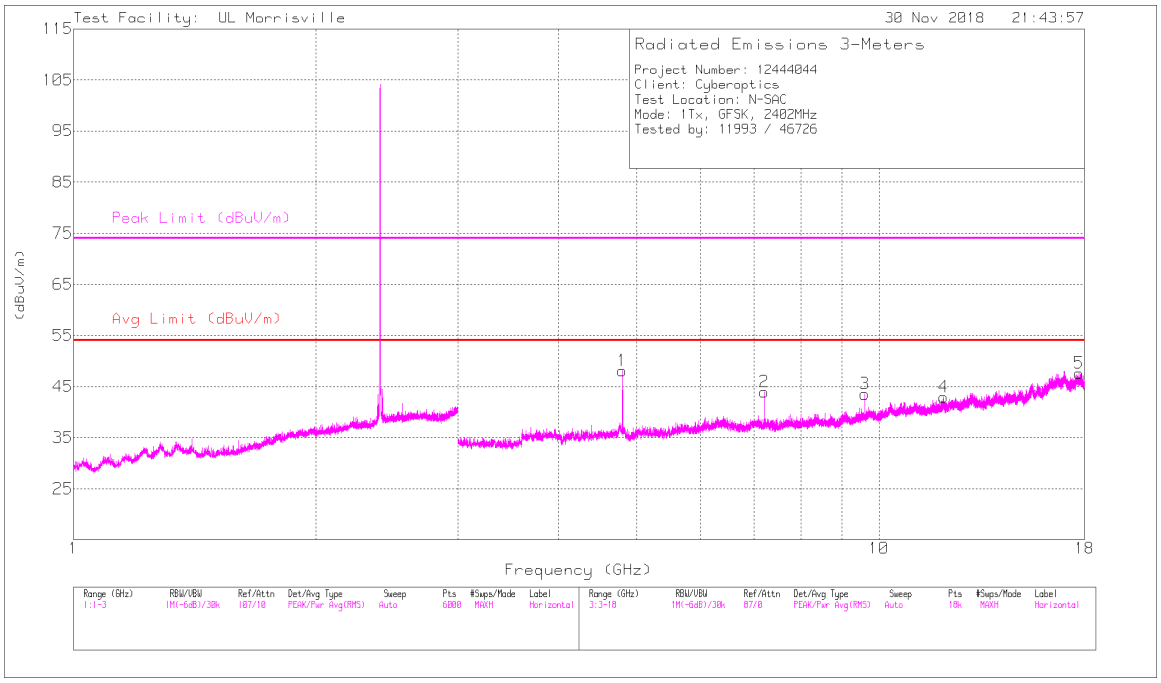
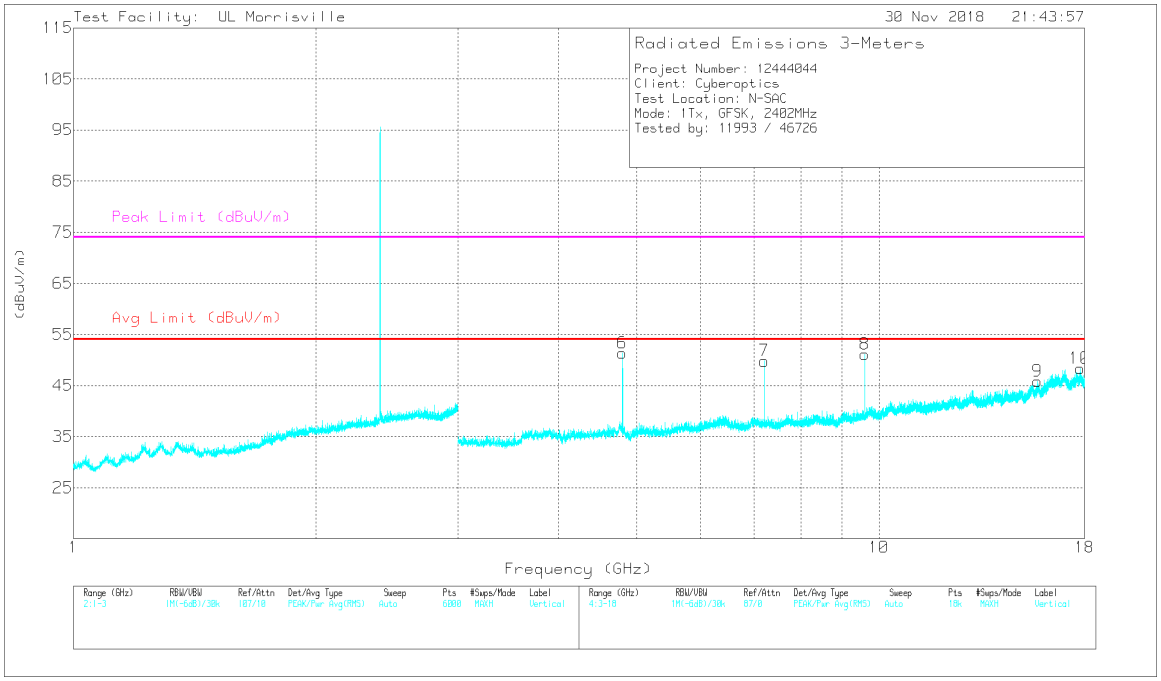
## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS




**HORIZONTAL**

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## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 AF (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.804 | 49.94 | PK-U | 34.1 | -31.8 | 52.24 | - | - | 74 | -21.76 | 0 | 103 | H |
| | * ** 4.804 | 43.01 | V1TR | 34.1 | -31.8 | 45.31 | 54 | -8.69 | - | - | 0 | 103 | H |
| 4 | * ** 12.035 | 35.05 | PK-U | 38.7 | -25.7 | 48.05 | - | - | 74 | -25.95 | 141 | 334 | H |
| | * ** 12.037 | 24.09 | V1TR | 38.7 | -25.7 | 37.09 | 54 | -16.91 | - | - | 141 | 334 | H |
| 5 | * ** 17.72 | 35.96 | PK-U | 41.6 | -23.8 | 53.76 | - | - | 74 | -20.24 | 126 | 286 | H |
| | * ** 17.716 | 24.27 | V1TR | 41.6 | -23.8 | 42.07 | 54 | -11.93 | - | - | 126 | 286 | H |
| 6 | * ** 4.804 | 52.88 | PK-U | 34.1 | -31.8 | 55.18 | - | - | 74 | -18.82 | 238 | 108 | V |
| | * ** 4.804 | 47.54 | V1TR | 34.1 | -31.8 | 49.84 | 54 | -4.16 | - | - | 238 | 108 | V |
| 9 | * ** 15.729 | 36.01 | PK-U | 40.2 | -24.5 | 51.71 | - | - | 74 | -22.29 | 325 | 178 | V |
| | * ** 15.726 | 24.88 | V1TR | 40.2 | -24.6 | 40.48 | 54 | -13.52 | - | - | 325 | 178 | V |
| 10 | * ** 17.768 | 35.99 | PK-U | 41.5 | -23.3 | 54.19 | - | - | 74 | -19.81 | 148 | 195 | V |
| | * ** 17.768 | 24.33 | V1TR | 41.5 | -23.3 | 42.53 | 54 | -11.47 | - | - | 148 | 195 | V |
| 2 | 7.205 | 38.42 | Pk | 35.6 | -30.1 | 43.92 | - | - | - | - | 0-360 | 102 | H |
| 7 | 7.205 | 44.31 | Pk | 35.6 | -30.1 | 49.81 | - | - | - | - | 0-360 | 102 | V |
| 8 | 9.608 | 42.19 | Pk | 36.9 | -28 | 51.09 | - | - | - | - | 0-360 | 102 | V |
| 3 | 9.609 | 34.63 | Pk | 36.9 | -28 | 43.53 | - | - | - | - | 0-360 | 102 | H |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - U-NII: Maximum Peak
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration
Pk - Peak detector


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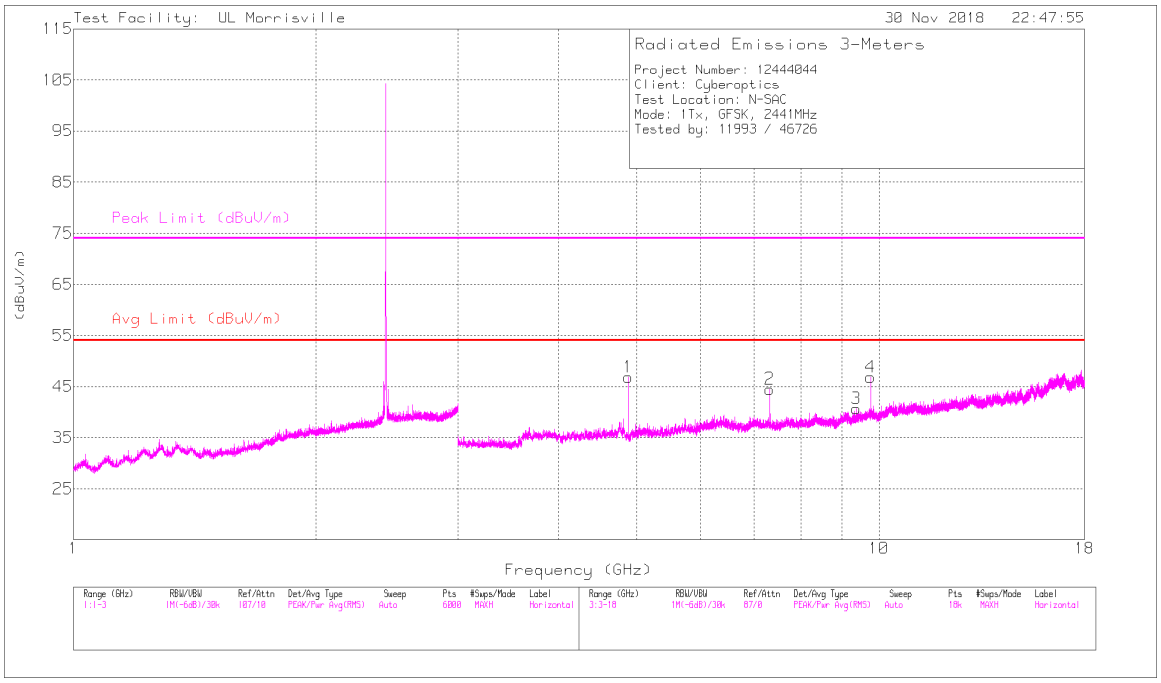
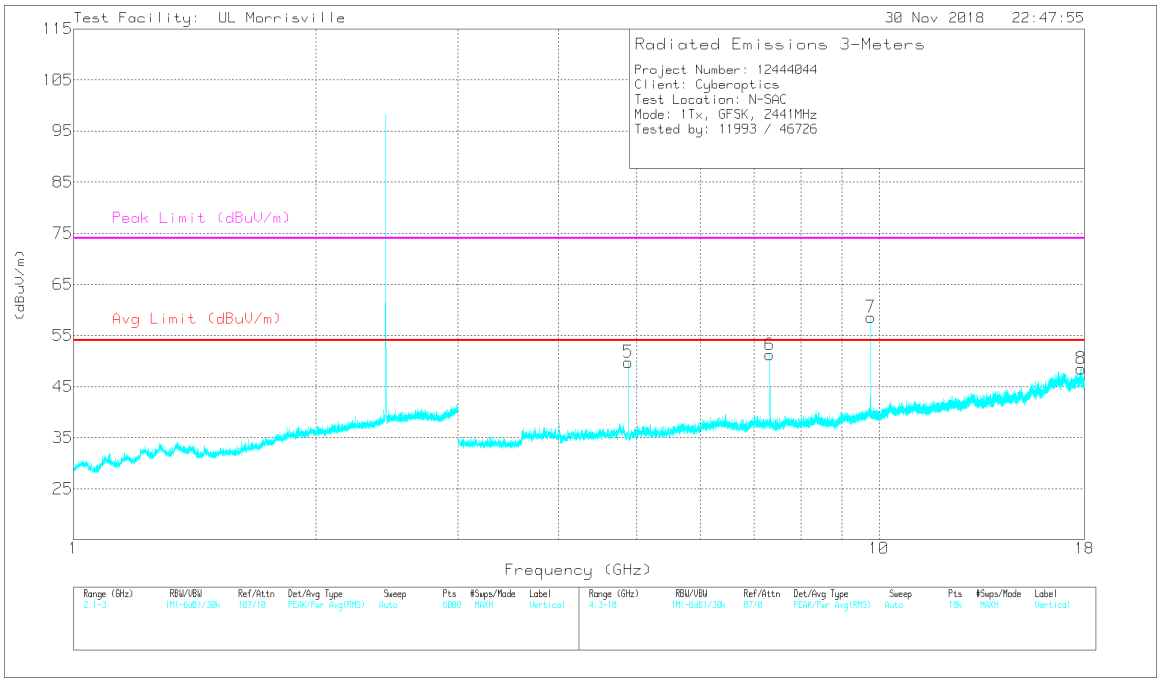
## MID CHANNEL RESULTS




**HORIZONTAL**

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## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 AF (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.882 | 47.13 | PK-U | 34.1 | -31.6 | 49.63 | - | - | 74 | -24.37 | 120 | 106 | H |
| | * ** 4.882 | 40.35 | V1TR | 34.1 | -31.6 | 42.85 | 54 | -11.15 | - | - | 120 | 106 | H |
| 2 | * ** 7.323 | 43.76 | PK-U | 35.6 | -29.2 | 50.16 | - | - | 74 | -23.84 | 11 | 110 | H |
| | * ** 7.323 | 35.04 | V1TR | 35.6 | -29.2 | 41.44 | 54 | -12.56 | - | - | 11 | 110 | H |
| 3 | * ** 9.376 | 37.69 | PK-U | 36.5 | -28.1 | 46.09 | - | - | 74 | -27.91 | 28 | 252 | H |
| | * ** 9.373 | 26.36 | V1TR | 36.5 | -28.2 | 34.66 | 54 | -19.34 | - | - | 28 | 252 | H |
| 5 | * ** 4.882 | 51.28 | PK-U | 34.1 | -31.6 | 53.78 | - | - | 74 | -20.22 | 234 | 110 | V |
| | * ** 4.882 | 45.54 | V1TR | 34.1 | -31.6 | 48.04 | 54 | -5.96 | - | - | 234 | 110 | V |
| 6 | * ** 7.323 | 49.16 | PK-U | 35.6 | -29.2 | 55.56 | - | - | 74 | -18.44 | 66 | 103 | V |
| | * ** 7.323 | 42.44 | V1TR | 35.6 | -29.2 | 48.84 | 54 | -5.16 | - | - | 66 | 103 | V |
| 8 | * ** 17.827 | 36.52 | PK-U | 41.6 | -22.6 | 55.52 | - | - | 74 | -18.48 | 141 | 112 | V |
| | * ** 17.827 | 23.86 | V1TR | 41.6 | -22.6 | 42.86 | 54 | -11.14 | - | - | 141 | 112 | V |
| 4 | 9.763 | 37.13 | Pk | 37 | -27.3 | 46.83 | - | - | - | - | 0-360 | 102 | H |
| 7 | 9.765 | 48.86 | Pk | 37 | -27.3 | 58.56 | - | - | - | - | 0-360 | 102 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - U-NII: Maximum Peak
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration
Pk - Peak detector


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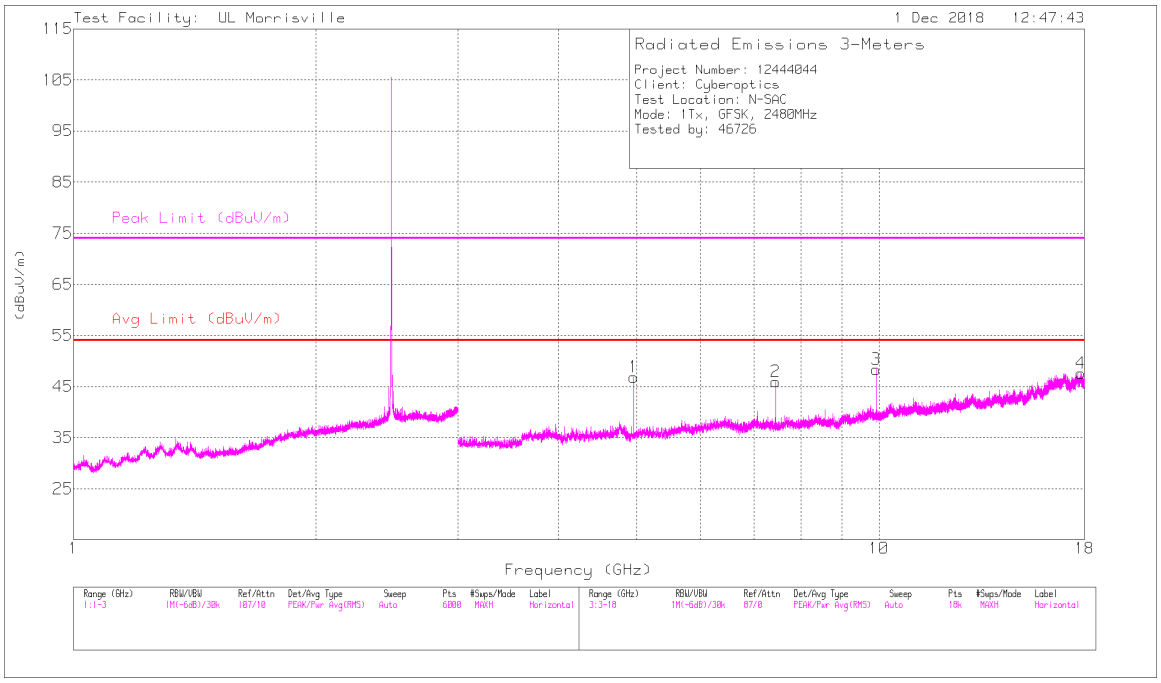
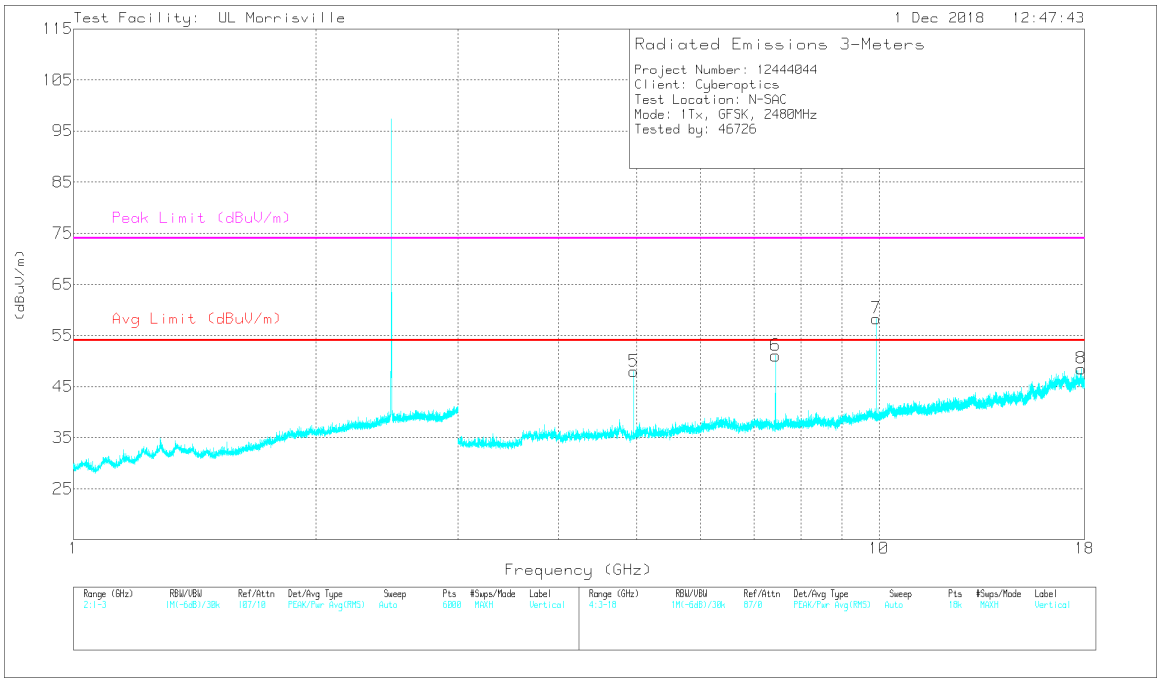
## HIGH CHANNEL RESULTS




**HORIZONTAL**

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## RADIATED EMISSIONS

| Markers | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 AF (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.96 | 47.91 | PK-U | 34.1 | -32.5 | 49.51 | - | - | 74 | -24.49 | 175 | 126 | H |
| | * ** 4.96 | 40.71 | V1TR | 34.1 | -32.5 | 42.31 | 54 | -11.69 | - | - | 175 | 126 | H |
| 2 | * ** 7.44 | 44.65 | PK-U | 35.6 | -29.2 | 51.05 | - | - | 74 | -22.95 | 15 | 115 | H |
| | * ** 7.44 | 35.4 | V1TR | 35.6 | -29.2 | 41.8 | 54 | -12.2 | - | - | 15 | 115 | H |
| 4 | * ** 17.822 | 35.72 | PK-U | 41.6 | -22.6 | 54.72 | - | - | 74 | -19.28 | 256 | 205 | H |
| | * ** 17.822 | 23.76 | V1TR | 41.6 | -22.6 | 42.76 | 54 | -11.24 | - | - | 256 | 205 | H |
| 3 | 9.92 | 45.34 | PK-U | 37.1 | -27.8 | 54.64 | - | - | - | - | 343 | 115 | H |
| | 9.92 | 35.74 | V1TR | 37.1 | -27.8 | 45.04 | - | - | - | - | 343 | 115 | H |
| 5 | * ** 4.96 | 49.81 | PK-U | 34.1 | -32.5 | 51.41 | - | - | 74 | -22.59 | 228 | 130 | V |
| | * ** 4.96 | 43.48 | V1TR | 34.1 | -32.5 | 45.08 | 54 | -8.92 | - | - | 228 | 130 | V |
| 6 | * ** 7.44 | 50.77 | PK-U | 35.6 | -29.2 | 57.17 | - | - | 74 | -16.83 | 59 | 107 | V |
| | * ** 7.44 | 43.82 | V1TR | 35.6 | -29.2 | 50.22 | 54 | -3.78 | - | - | 59 | 107 | V |
| 8 | * ** 17.829 | 35.67 | PK-U | 41.6 | -22.6 | 54.67 | - | - | 74 | -19.33 | 226 | 148 | V |
| | * ** 17.829 | 23.68 | V1TR | 41.6 | -22.6 | 42.68 | 54 | -11.32 | - | - | 226 | 148 | V |
| 7 | 9.92 | 51.6 | PK-U | 37.1 | -27.8 | 60.9 | - | - | - | - | 232 | 105 | V |
| | 9.92 | 43.01 | V1TR | 37.1 | -27.8 | 52.31 | - | - | - | - | 232 | 105 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U - U-NII: Maximum Peak
V1TR - U-NII: VB=1/Ton, RMS Average where: Ton is packet duration


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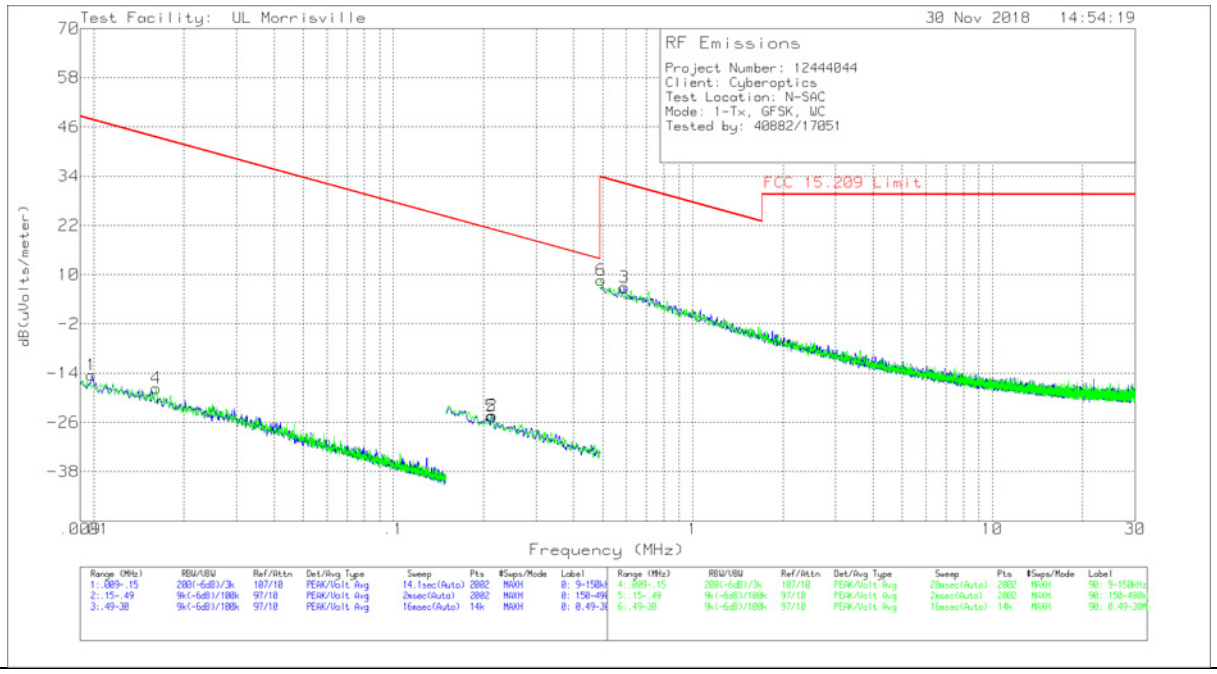
## 9.2. Worst Case Below 1 GHz

**Note**: All measurements were made at a test distance of 3 m. The spurious emissions data in the plots and tabular data are corrected from the measurement distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz). The correction factor for the limits were 40*Log (test distance / specification distance).

Although these tests were performed at a test site other than an open area test site, adequate comparison measurements were confirmed against an open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

**SPURIOUS EMISSIONS 0.009 to 30 MHz (WORST-CASE CONFIGURATION) – APS3**




## 0.009 to 30MHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0079 AF (dB/m) | Cbl (dB) | Dist. Corr. Factor (dB) | Corrected Reading dB(uV/m) | FCC 15.209 QP Limit | FCC 15.209 AV Limit | FCC 15.209 PK Limit | Worst-Case Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .00984 | 46.58 | Pk | 18.8 | .1 | -80 | -14.52 | - | 47.74 | 67.74 | -62.26 | 0-360 |
| 4 | .01614 | 46.12 | Pk | 16.1 | .1 | -80 | -17.68 | - | 43.45 | 63.45 | -61.13 | 0-360 |
| 5 | .21265 | 43.94 | Pk | 11.5 | .1 | -80 | -24.46 | - | 21.05 | 41.05 | -45.51 | 0-360 |
| 2 | .21384 | 44.03 | Pk | 11.5 | .1 | -80 | -24.37 | - | 21 | 41 | -45.37 | 0-360 |
| 6 | .49316 | 37.01 | Pk | 11.5 | .1 | -40 | 8.61 | 33.74 | - | - | -25.13 | 0-360 |
| 3 | .59118 | 35.29 | Pk | 11.5 | .1 | -40 | 6.89 | 32.17 | - | - | -25.28 | 0-360 |

Pk - Peak detector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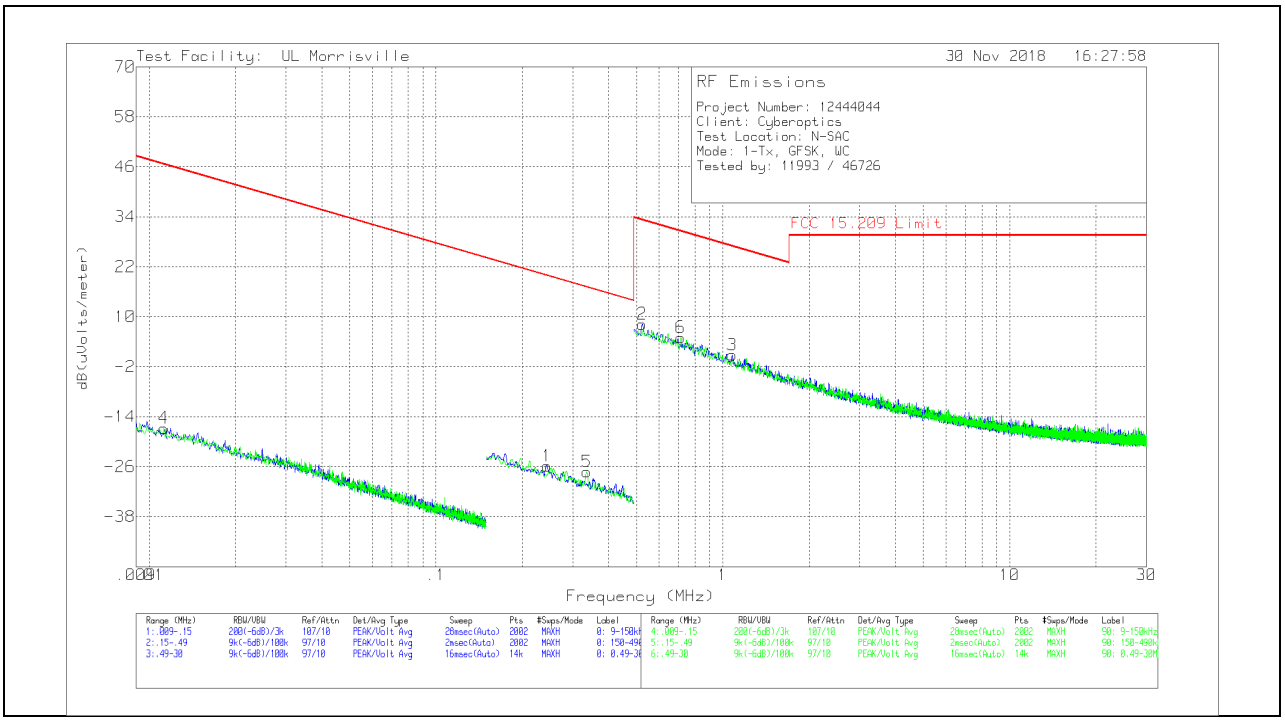
**SPURIOUS EMISSIONS 0.009 to 30 MHz (WORST-CASE CONFIGURATION) – APS-FPD**




## 0.009 to 30MHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0079 AF (dB/m) | Cbl (dB) | Dist. Corr. Factor (dB) | Corrected Reading dB(uV/m) | FCC 15.209 QP Limit | FCC 15.209 AV Limit | FCC 15.209 PK Limit | Worst-Case Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | .01124 | 44.92 | Pk | 18.2 | .1 | -80 | -16.78 | - | 46.59 | 66.59 | -63.37 | 0-360 |
| 1 | .24418 | 42.55 | Pk | 11.5 | .1 | -80 | -25.85 | - | 19.85 | 39.85 | -45.7 | 0-360 |
| 5 | .33522 | 41.13 | Pk | 11.5 | .1 | -80 | -27.27 | - | 17.1 | 37.1 | -44.37 | 0-360 |
| 2 | .52373 | 36.6 | Pk | 11.5 | .1 | -40 | 8.2 | 33.22 | - | - | -25.02 | 0-360 |
| 6 | .71345 | 33.4 | Pk | 11.5 | .1 | -40 | 5 | 30.54 | - | - | -25.54 | 0-360 |
| 3 | 1.07813 | 29.12 | Pk | 11.5 | .2 | -40 | .82 | 26.95 | - | - | -26.13 | 0-360 |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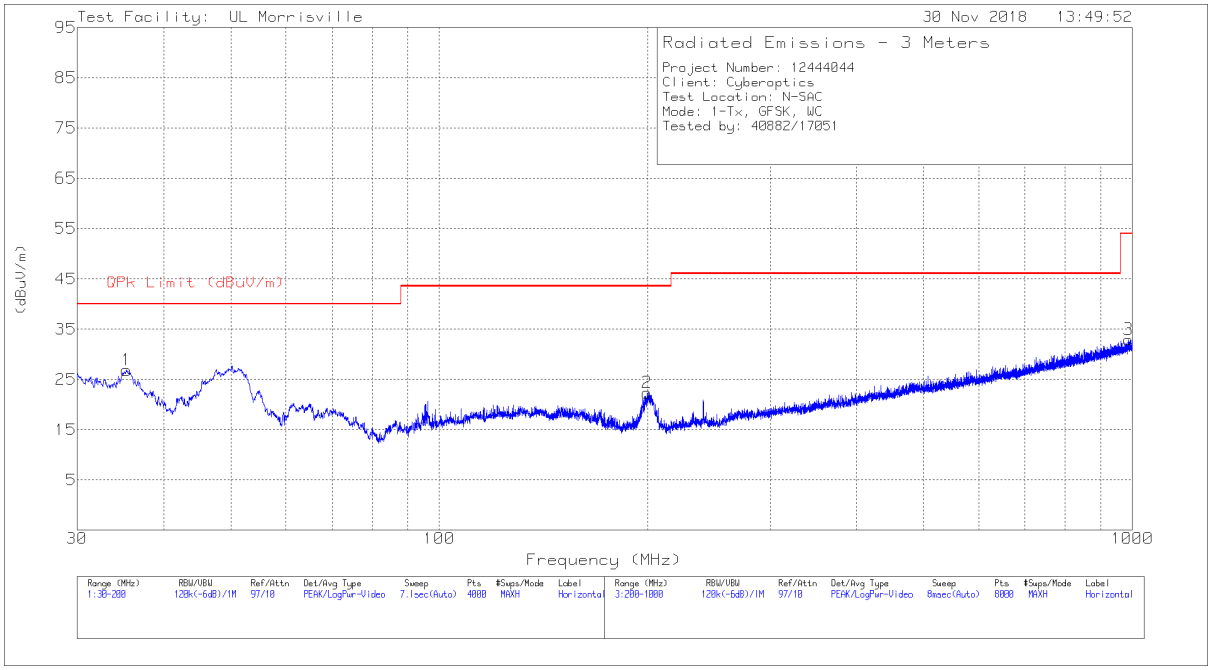
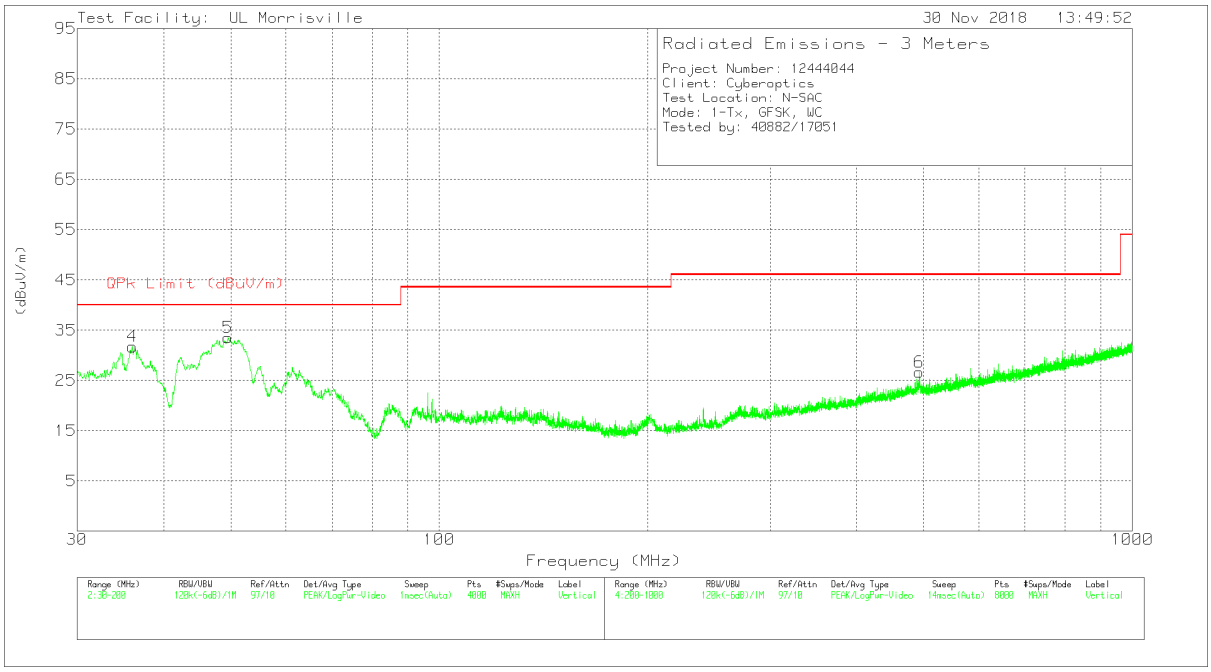
**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION) – APS3**




**HORIZONTAL**

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## 30 to 1000MHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0073 ACF (dB/m) | Amp/Cbl (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 35.3564 | 34.55 | Pk | 24 | -31.7 | 26.85 | 40 | -13.15 | 0-360 | 102 | H |
| 4 | 36.0366 | 39.93 | Pk | 23.5 | -31.7 | 31.73 | 40 | -8.27 | 0-360 | 102 | V |
| 5 | 49.5551 | 50.31 | Pk | 14.7 | -31.5 | 33.51 | 40 | -6.49 | 0-360 | 102 | V |
| 2 | 199.2788 | 33.15 | Pk | 19.4 | -30.2 | 22.35 | 43.52 | -21.17 | 0-360 | 102 | H |
| 6 | 492.9381 | 31.16 | Pk | 24.1 | -28.6 | 26.66 | 46.02 | -19.36 | 0-360 | 102 | V |
| 3 | 987.7024 | 28.33 | Pk | 29.8 | -25.2 | 32.93 | 53.97 | -21.04 | 0-360 | 102 | H |

Pk - Peak detector


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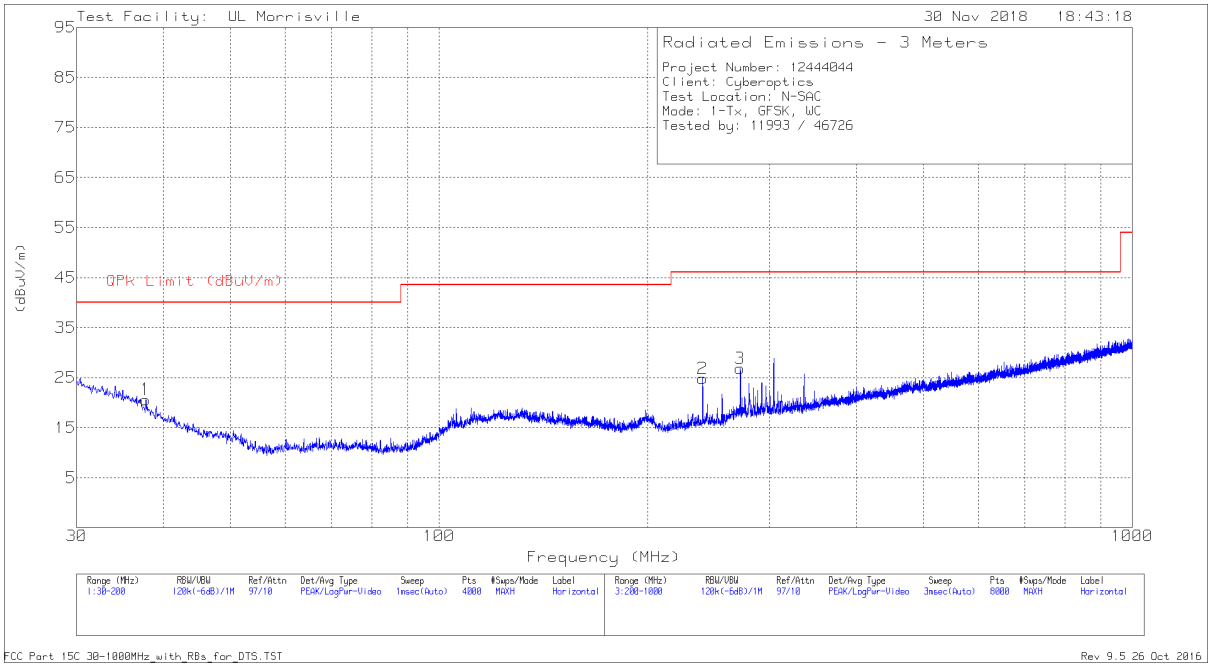
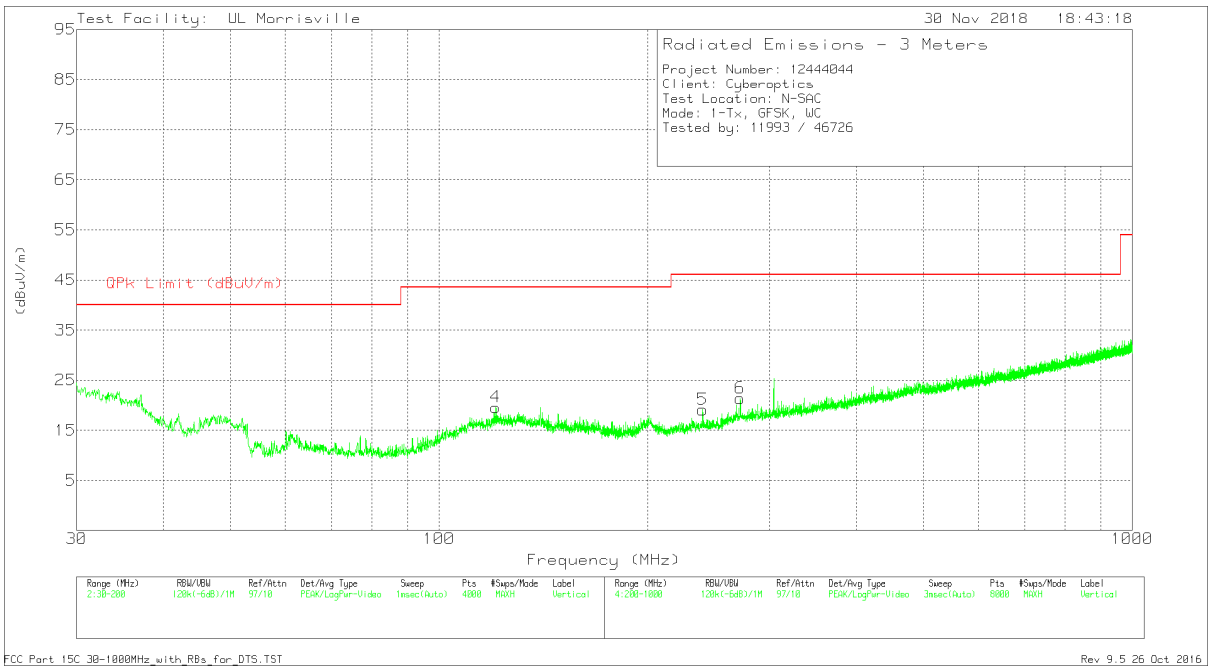
**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION) – APS-FPD**




**HORIZONTAL**

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## 30 to 1000MHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0073 ACF (dB/m) | Amp/Cbl (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 37.7583 | 30.1 | Pk | 22.2 | -31.7 | 20.6 | 40 | -19.4 | 0-360 | 399 | H |
| 4 | * ** 120.761 | 30.42 | Pk | 20 | -30.8 | 19.62 | 43.52 | -23.9 | 0-360 | 102 | V |
| 2 | * ** 240.0052 | 36.52 | Pk | 18.2 | -29.9 | 24.82 | 46.02 | -21.2 | 0-360 | 199 | H |
| 3 | * ** 272.0094 | 36.6 | Pk | 19.8 | -29.6 | 26.8 | 46.02 | -19.22 | 0-360 | 102 | H |
| 5 | * ** 240.0052 | 30.83 | Pk | 18.2 | -29.9 | 19.13 | 46.02 | -26.89 | 0-360 | 199 | V |
| 6 | * ** 272.0094 | 31.18 | Pk | 19.8 | -29.6 | 21.38 | 46.02 | -24.64 | 0-360 | 102 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector


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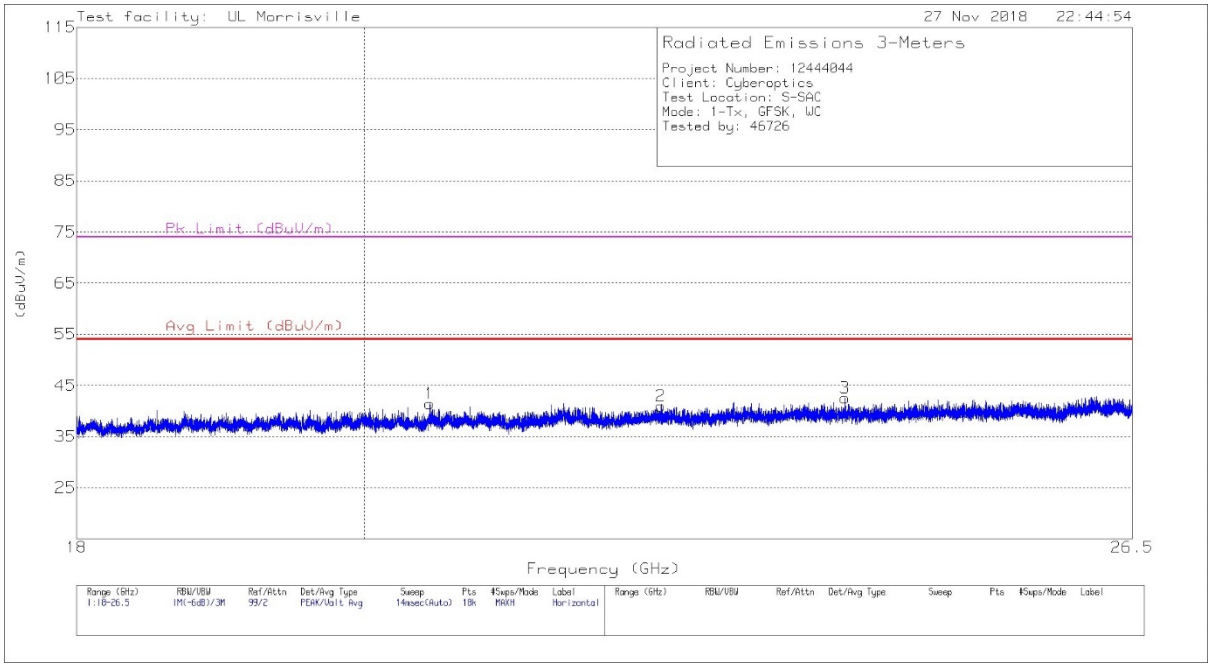
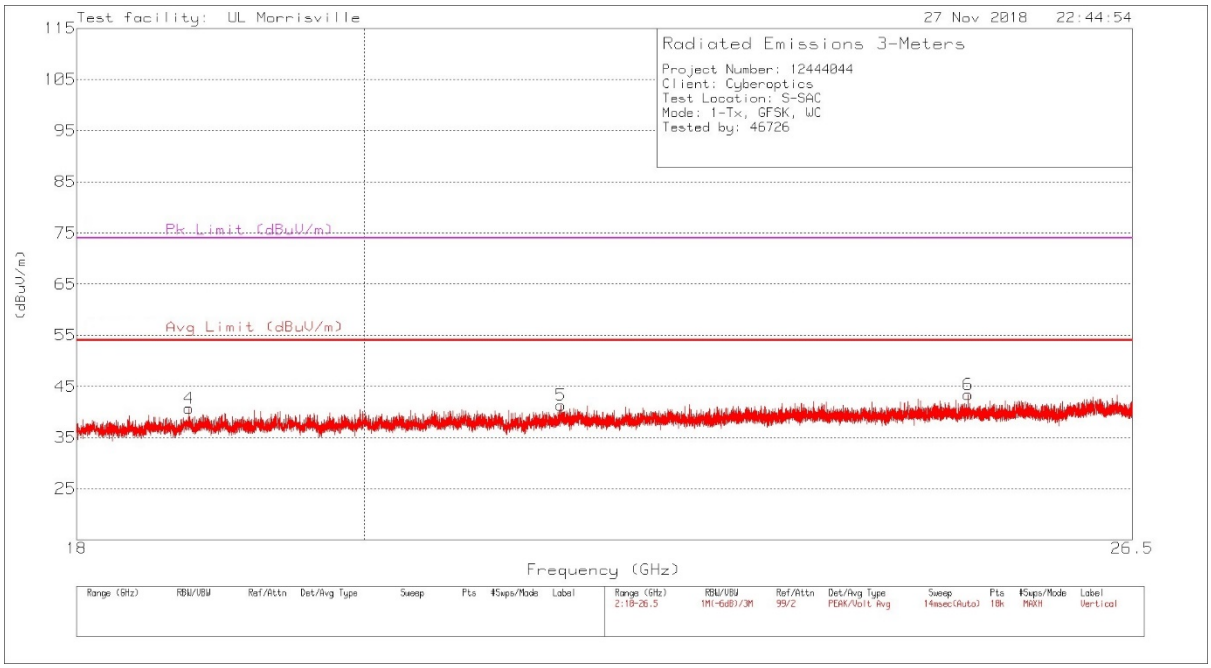
## 9.3. Worst Case 18-26 GHz

**SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION) – APS3**




**HORIZONTAL**

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## 18 – 26GHz DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0076 AF (dB/m) | Cbl/Amp (dB) | Corrected Reading (dBuV/m) | Class B Avg Limit (dBuV/m) | Margin (dB) | Class B Pk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 18.756 | 47.08 | Pk | 32.5 | -38.9 | 40.68 | 54 | -13.32 | 74 | -33.32 | 0-360 | 151 | V |
| 1 | 20.487 | 46.33 | Pk | 33.2 | -38.1 | 41.43 | 54 | -12.57 | 74 | -32.57 | 0-360 | 299 | H |
| 5 | 21.497 | 46.21 | Pk | 33.4 | -38.3 | 41.31 | 54 | -12.69 | 74 | -32.69 | 0-360 | 101 | V |
| 2 | 22.296 | 45.64 | Pk | 33.4 | -38.1 | 40.94 | 54 | -13.06 | 74 | -33.06 | 0-360 | 249 | H |
| 3 | 23.855 | 45.85 | Pk | 34 | -37.3 | 42.55 | 54 | -11.45 | 74 | -31.45 | 0-360 | 102 | H |
| 6 | 24.954 | 45.74 | Pk | 34.4 | -36.7 | 43.44 | 54 | -10.56 | 74 | -30.56 | 0-360 | 299 | V |

Pk - Peak detector


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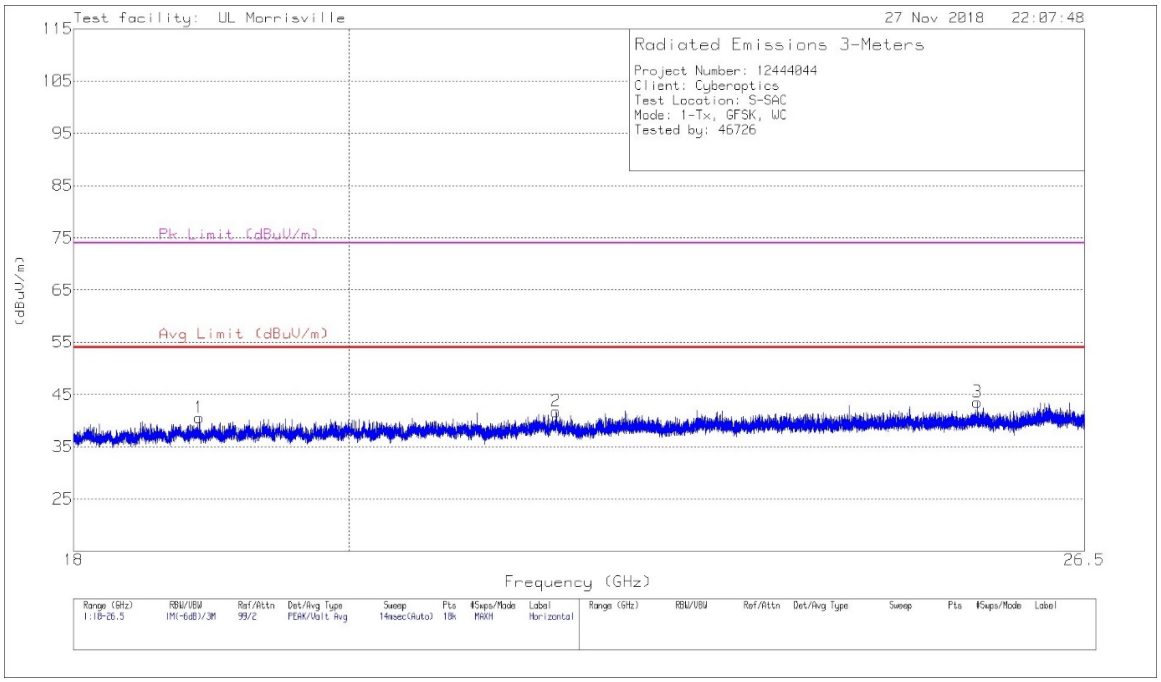
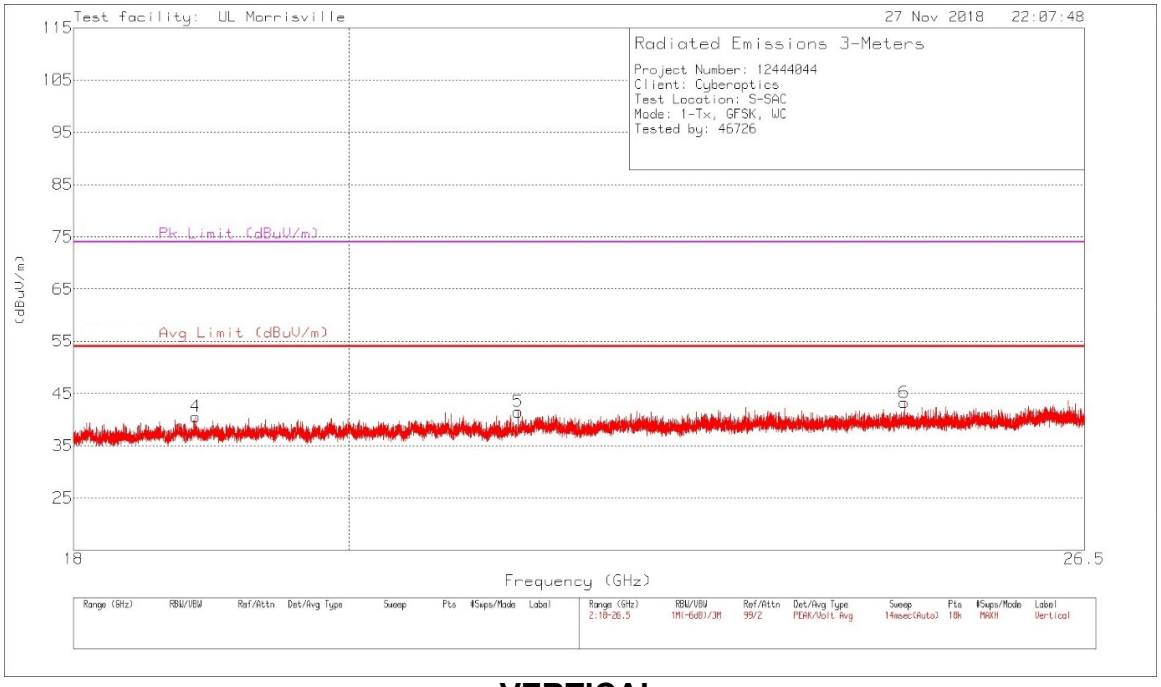
**SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION) - APS-FPD**




**HORIZONTAL**

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## 18 – 26GHz DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0076 AF (dB/m) | Cbl/Amp (dB) | Corrected Reading (dBuV/m) | Class B Avg Limit (dBuV/m) | Margin (dB) | Class B Pk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 18.859 | 46.75 | Pk | 32.6 | -38.8 | 40.55 | 54 | -13.45 | 74 | -33.45 | 0-360 | 101 | V |
| 1 | 18.887 | 46.77 | Pk | 32.7 | -38.9 | 40.57 | 54 | -13.43 | 74 | -33.43 | 0-360 | 299 | H |
| 5 | 21.339 | 46.72 | Pk | 33.1 | -38.3 | 41.52 | 54 | -12.48 | 74 | -32.48 | 0-360 | 300 | V |
| 2 | 21.65 | 46.47 | Pk | 33.3 | -38 | 41.77 | 54 | -12.23 | 74 | -32.23 | 0-360 | 249 | H |
| 6 | 24.734 | 45.81 | Pk | 34.3 | -36.8 | 43.31 | 54 | -10.69 | 74 | -30.69 | 0-360 | 251 | V |
| 3 | 25.434 | 45.57 | Pk | 34.4 | -36.4 | 43.57 | 54 | -10.43 | 74 | -30.43 | 0-360 | 249 | H |

Pk - Peak detector


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# 10. SETUP PHOTOS

Please refer to R12444044-EP5 for setup photos

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