# TEST REPORT

**Report Number. :** R13413705-E4

| | | |
|---|---|---|
| **Applicant** | : | Lutron Electronics Co Inc.<br>7200 Suter Rd.<br>Coopersburg, PA, 18036-1249, USA |
| **Model** | : | HQP7-RF-2, HQREP-RF, RR-PROC3, RR-REP3 |
| **FCC ID** | : | JPZ0129 |
| **IC** | : | 2851A-JPZ0129 |
| **EUT Description** | : | Wireless Processor |
| **Test Standard(s)** | : | FCC 47 CFR PART 15 SUBPART C<br>ISED RSS-247 ISSUE 2<br>ISED RSS-GEN ISSUE 5 + Amendment 1 |

**Date Of Issue:**
December 10, 2020

**Prepared by:**
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400

NVLAP TESTING

NVLAP Lab code: 200246-0

# REPORT REVISION HISTORY

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 1 | DRAFT | Initial Issue | Mike Antola |
| 1 | 10/9/2020 | Review | F. de Anda |
| 2 | 10/13/2020 | Editorial updated to Output Power section | Mike Antola |
| 3 | 10/23/2020 | Updated declared duty cycle / duty cycle correction factor per manufacturer and corresponding data | Mike Antola |
| 4 | 12/10/2020 | Misc. editorial updates | Mike Antola |



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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Lutron Electronics Co Inc.
7200 Suter Rd.
Coopersburg, PA 18036-1249

**EUT DESCRIPTION:** Wireless Processor

**MODEL:** HQP7-RF-2, HQREP-RF, RR-PROC3, RR-REP3

**SERIAL NUMBER:** 02D5CD8E, 02D5CD87, BR2D8

**SAMPLE RECEIVE DATE:** 2020-09-03

**DATE TESTED:** 2020-09-28 to 2020-10-06

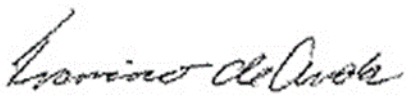
| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| CFR 47 Part 15 Subpart C | Complies |
| ISED RSS-247 Issue 2 | Complies |
| ISED RSS-GEN Issue 5 + Amendment 1 | Complies |

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.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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, or any agency of the U.S. government.

Approved & Released For
UL LLC By:



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# 2. TEST RESULTS SUMMARY

| FCC Clause | ISED Clause | Requirement | Result | Comment |
|---|---|---|---|---|
| See Comment | | Duty Cycle | Reporting purposes only | ANSI C63.10 Section 11.6. |
| - | RSS-GEN 6.7 | 99% OBW | Reporting purposes only | ANSI C63.10 Section 6.9.3. |
| 15.247 (a) (2) | RSS-247 5.2 (a) | 6dB BW | Compliant | None. |
| 15.247 (b) (3) | RSS-247 5.4 (d) | Output Power | Compliant | None. |
| See Comment | | Average power | Reporting purposes only | Per ANSI C63.10, Section 11.9.2.3.2. |
| 15.247 (e) | RSS-247 5.2 (b) | PSD | Compliant | None. |
| 15.247 (d) | RSS-247 5.5 | Conducted Spurious Emissions | Compliant | None. |
| 15.209, 15.205 | RSS-GEN 8.9, 8.10 | Radiated Emissions | Compliant | None. |
| 15.207 | RSS-Gen 8.8 | AC Mains Conducted Emissions | Compliant | None. |

# 3. 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 v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + Amendment 1, and RSS-247 Issue 2.

# 4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, North Carolina, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, NC 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 RTP | ☐ North Chamber |
| ☐ Chamber C RTP | ☒ South Chamber |

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0

# 5. DECISION RULES AND MEASUREMENT UNCERTAINTY

## 5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

## 5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

## 5.3. MEASUREMENT UNCERTAINTY

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

| PARAMETER | $U_{Lab}$ |
|---|---|
| Worst Case Conducted Disturbance, 0.15 to 30 MHz | 3.07 dB |
| Worst Case Radiated Disturbance, 9KHz to 30 MHz | 2.52 dB |
| Worst Case Radiated Disturbance, 30 to 1000 MHz | 4.88 dB |
| Worst Case Radiated Disturbance, 1000 to 18000 MHz | 4.26dB |
| Worst Case Radiated Disturbance, 18000 to 26000 MHz | 4.39 dB |

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

## 5.4. 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



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# 6. EQUIPMENT UNDER TEST

## 6.1. EUT DESCRIPTION

The EUT is a wireless processor. Model HQP7-RF-2 tested to cover models HQREP-RF, RR-PROC3, and RR-REP3.

Model differences below:

| | |
|---|---|
| HQREP-RF | Identical device marked differently for marketing purposes |
| RR-PROC3 | Identical device with the same wireless functionality but processing power removed. |
| RR-REP3 | Identical device with the same wireless functionality but processing power removed and marked differently for marketing purposes |

## 6.2. MAXIMUM OUTPUT POWER

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

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| 2405 - 2480 | 802.15.4 Ant 1 | 19.16 | 82.41 |
| 2405 - 2480 | 802.15.4 Ant 2 | 21.74 | 149.28 |

## 6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes 2 antennas for diversity, with a maximum gain of:

- ANT1: 1.0dBd (integrated Printer F Antenna)
- ANT2: 0.75dBd (SMSD Chip Antenna)

## 6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was Lutron Processor FCC Test FW

The test utility software used during testing was Lutron Wireless Command SW

## 6.5. WORST-CASE CONFIGURATION AND MODE

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

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels on both antennas. The EUT was configured to Pset-1 for all channels.



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



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## 6.6. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID** |
| PoE Power Supply | PHIHONG | POE16R-1AFG | P202200014A0 | NA |
| Laptop | HP | Elitebook 840 G3 | 5CG7256KS3 | NA |

**I/O CABLES**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| **Cable No.** | **Port** | **# of Identical Ports** | **Connector Type** | **Cable Type** | **Cable Length (m)** | **Remarks** |
| 1 | PoE | 1 | RJ45 | UTP | 0.9 | PoE out of PoE power supply |
| 2 | AC | 1 | NEMA 1-15-P | NA | NA | Wall-wart connector on PoE power supply. |

**TEST SETUP**

The EUT is connected to a test laptop during the tests. Test software exercised the radio card. Laptop removed for radiated tests after set up.

**SETUP DIAGRAMS**

Please refer to R13413705-EP1 for setup diagrams

# 7. MEASUREMENT METHOD

Duty cycle: ANSI C63.10 Subclause 11.6

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW ≥ DTS BW

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

Output Power: ANSI C63.10 Subclause -11.9.1.3 PKPM1 Peak Power Meter Method
ANSI C63.10 Subclause – 11.9.2.3.2 AVGPM-G Method.

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

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

Radiated emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1 and 6.10.5

Conducted emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.2

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

Radiated Spurious Emissions: ANSI C63.10-2013 Section 6.3 to 6.6

# 8. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

| Equipment ID | Description | Manufacturer | Model Number | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| CBL087 | Coax cable, RG223, N-male to BNC-male, 20-ft. | Pasternack | PE3W06143-240 | 2020-03-26 | 2021-03-26 |
| HI0091 | Environmental Meter | Fisher Scientific | 14-650-118 | 2020-06-26 | 2021-06-26 |
| LISN003 | LISN, 50-ohm/50-uH, 2-conductor, 25A | Fischer Custom Com. | FCC-LISN-50-25-2-01-550V | 2020-08-18 | 2021-08-18 |
| 75141 | EMI Test Receiver 9kHz-7GHz | Rohde & Schwarz | ESCI 7 | 2020-08-18 | 2021-08-18 |
| ATA222 | Transient Limiter, 0.009-100MHz | Electro-Metrics | EM-7600 | 2020-03-26 | 2021-03-26 |
| PS214 | AC Power Source | Elgar | CW2501M (s/n 1523A02396) | NA | NA |
| SOFTEMI | EMI Software | UL | Version 9.5 (2016-08-15) | | |
| CDECABLE001 | ANSI C63.4 1m extension cable. | UL | Per Annex B of ANSI C63.4 | 2020-08-08 | 2021-08-08 |

Test Equipment Used - Wireless Conducted Measurement Equipment

| Equipment ID | Description | Manufacturer | Model Number | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| SA007 | Spectrum Analyzer | Keysight Technologies | N9030A | 2020-06-10 | 2021-06-10 |
| T177 | Spectrum Analyzer | Agilent Technologies | E4446A | 2020-04-30 | 2021-04-30 |
| PWM001 | RF Power Meter | Keysight Technologies | N1912A | 2020-07-17 | 2021-07-17 |
| PWS001 | Peak and Avg Power Sensor, 50MHz to 6GHz | Keysight Technologies | N1921A | 2020-05-27 | 2021-05-27 |
| HI0090 | Environmental Meter | Fisher Scientific | 15-077-963 | 2020-06-26 | 2021-06-26 |
| 76021 | DC Regulated Power Supply | CircuitSpecialists.Com | CSI3005X5 | NA | NA |
| SOFTEMI | EMC Software | UL | Version 2020.9.1 | NA | NA |
| MM0167 | True RMS Multimeter | Agilent | U1232A | 2020-08-05 | 2021-08-05 |

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

| Equipment ID | Description | Manufacturer | Model Number | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| **0.009-30MHz (Loop Ant.)** | | | | | |
| AT0079 | Active Loop Antenna | ETS-Lindgren | 6502 | 2020-08-20 | 2021-08-20 |
| **30-1000 MHz** | | | | | |
| AT0081 | Hybrid Broadband Antenna | Sunol Sciences Corp. | JB3 | 2019-11-20 | 2020-11-20 |
| **1-18 GHz** | | | | | |
| AT0067 | Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz | ETS Lindgren | 3117 | 2020-04-28 | 2021-04-28 |
| **18-40 GHz** | | | | | |
| AT0076 | Horn Antenna, 18-26.5GHz | ARA | MWH-1826/B | 2019-11-07 | 2020-11-07 |
| **Gain-Loss Chains** | | | | | |
| S-SAC01 | Gain-loss string: 0.009-30MHz | Various | Various | 2020-07-10 | 2021-07-10 |
| S-SAC02 | Gain-loss string: 25-1000MHz | Various | Various | 2020-07-10 | 2021-07-10 |
| S-SAC03 | Gain-loss string: 1-18GHz | Various | Various | 2020-07-06 | 2021-07-06 |
| S-SAC04 | Gain-loss string: 18-40GHz | Various | Various | 2020-07-07 | 2021-07-07 |
| **Receiver & Software** | | | | | |
| SA0025 | Spectrum Analyzer | Agilent | N9030A | 2020-03-17 | 2021-03-17 |
| SA0027 | Spectrum Analyzer | Agilent | N9030A | 2020-06-10 | 2021-06-10 |
| SOFTEMI | EMI Software | UL | Version 9.5 (2020-07-07) | | |
| **Additional Equipment used** | | | | | |
| s/n 200037635 | Environmental Meter | Fisher Scientific | 06-662-4 | 2020-01-22 | 2022-01-22 |
| ATA176 (in S-SAC) | 10dB, DC-18GHz, 5W | Mini-Circuits | BW-N10W5 | 2020-08-29 | 2021-08-29 |

# 9. ANTENNA PORT TEST RESULTS

## 9.1. ON TIME AND DUTY CYCLE

**LIMITS**

None; for reporting purposes only.

**PROCEDURE**

KDB 558074 Zero-Span Spectrum Analyzer Method.

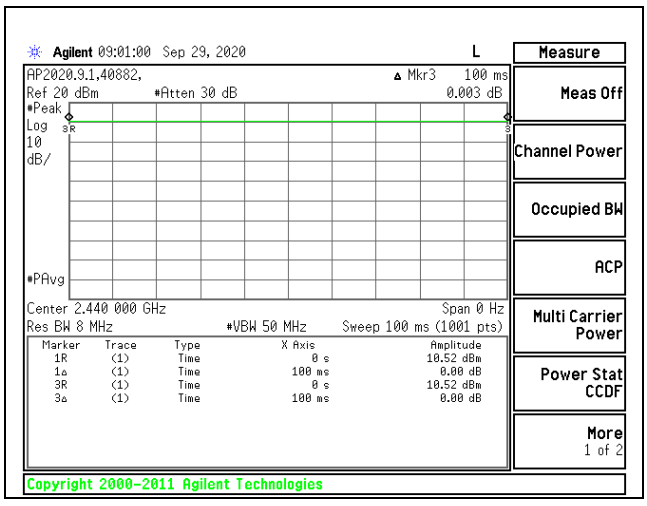
**ON TIME AND DUTY CYCLE RESULTS**

| Mode | ON Time B (msec) | Period (msec) | Duty Cycle x (linear) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | 1/B Minimum VBW (kHz) |
|---|---|---|---|---|---|---|
| **2.4GHz Band** | | | | | | |
| 802.15.4 | 100.000 | 100.000 | 1.000 | 100.00% | 0.00 | 0.010 |

Note: Worse case “real-world” duty cycle of the EUT is 30% as declared by the manufacturer. Details as to how the manufacturer implemented the protocol limitations are documented in the operational description exhibit. It is this value that is used to derive the duty cycle correction factor that is referenced throughout the report. See calculation below:

Duty Cycle Correction Factor [Linear Voltage Averaging Mode] = 20*log(DC)
= 20*log(0.30) = -10.46dB

DUTY CYCLE PLOTS



## 9.2. 99% BANDWIDTH

**LIMITS**

None; for reporting purposes only.

**RESULTS**



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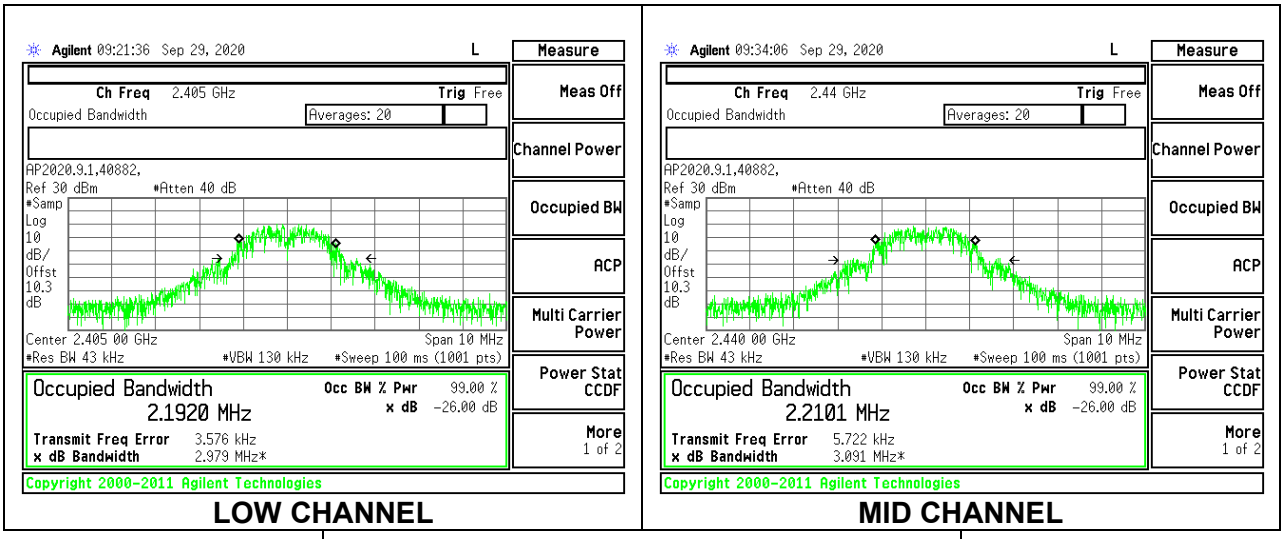
### 9.2.1. 802.15.4

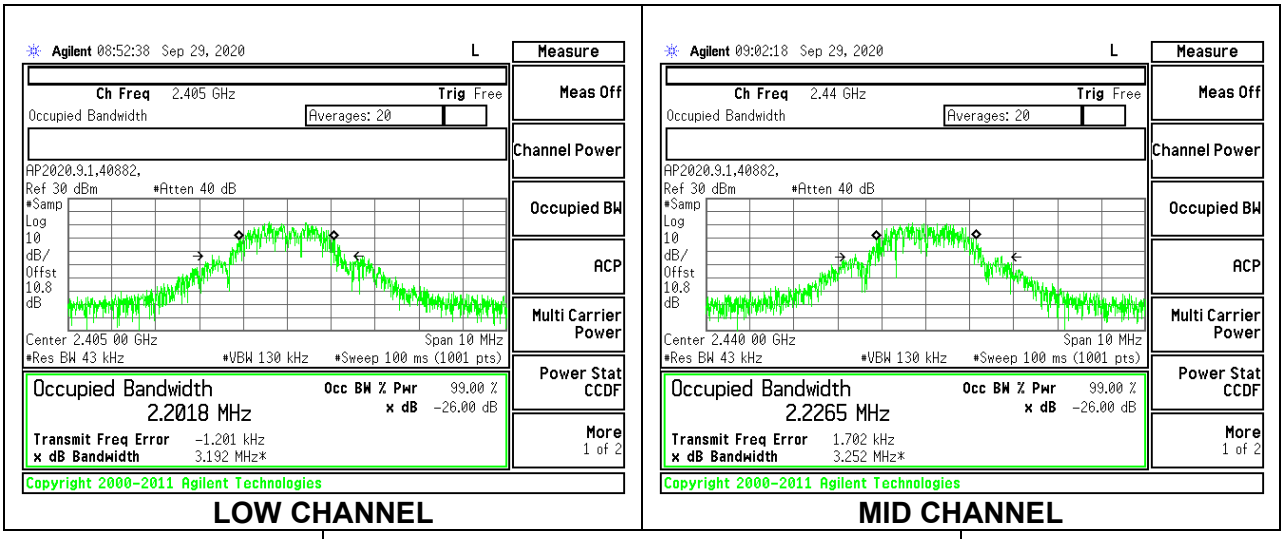
**Antenna 1**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2405 | 2.1920 |
| Middle | 2440 | 2.2101 |
| High | 2480 | 2.2191 |



**Antenna 2**

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low | 2405 | 2.2018 |
| Middle | 2440 | 2.2265 |
| High | 2480 | 2.2112 |



## 9.3. 6 dB BANDWIDTH

**LIMITS**

FCC §15.247 (a) (2)

RSS-247 5.2 (a)

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

**RESULTS**



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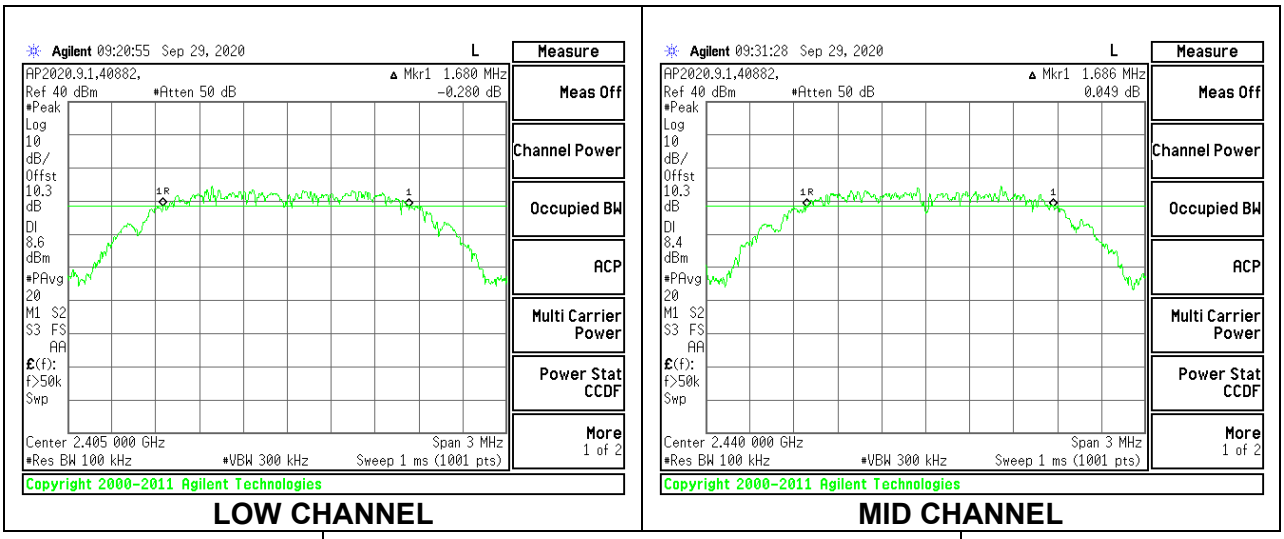
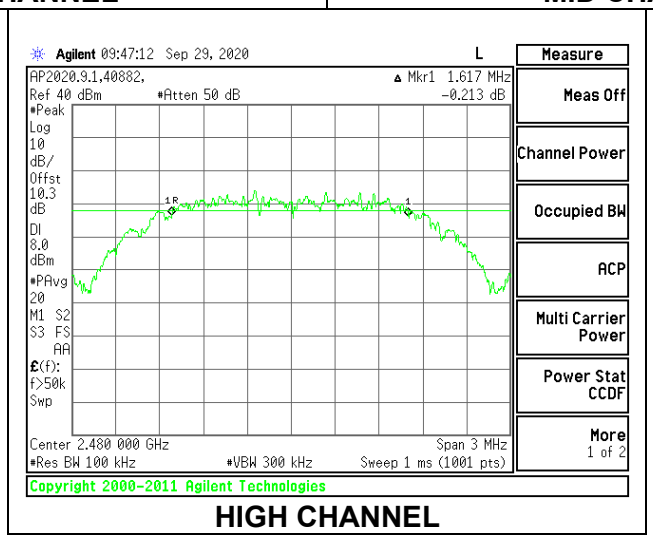
### 9.3.1. 802.15.4

**Antenna 1**

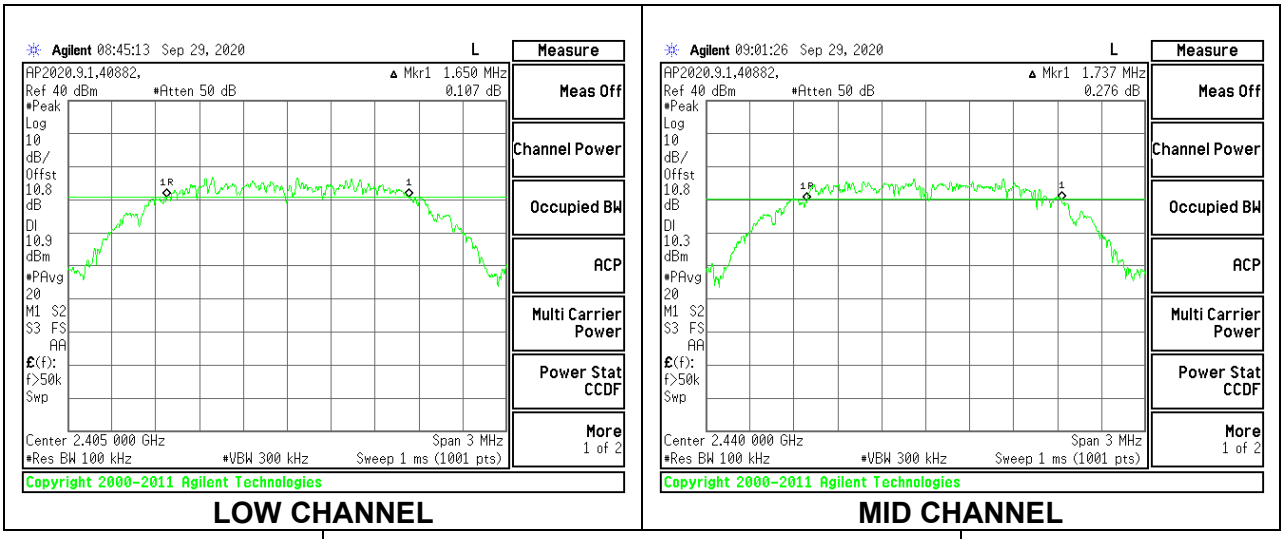
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2405 | 1.6800 | 0.5 |
| Middle | 2440 | 1.6860 | 0.5 |
| High | 2480 | 1.6170 | 0.5 |



**Antenna 2**

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---|---|---|---|
| Low | 2405 | 1.6500 | 0.5 |
| Middle | 2440 | 1.7370 | 0.5 |
| High | 2480 | 1.6260 | 0.5 |



## 9.4. OUTPUT POWER

**LIMITS**

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

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

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.3 dB (including 10 dB pad and 0.3 dB cable) was entered as an offset in the power meter to allow for a peak reading of power.

**RESULTS**



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### 9.4.1. 802.15.4

**Antenna 1**

| | |
|---|---|
| **Tested By:** | 40882 |
| **Date:** | 10/5/2020 |

| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2405 | 19.160 | 30 | -10.840 |
| Middle | 2440 | 18.850 | 30 | -11.150 |
| High (Ch 25) | 2475 | 19.050 | 30 | -10.950 |
| High (Ch 26) | 2480 | 18.940 | 30 | -11.060 |

**Antenna 2**

| | |
|---|---|
| **Tested By:** | 40882 |
| **Date:** | 10/5/2020 |

| Channel | Frequency (MHz) | Peak Power Reading (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2405 | 21.740 | 30 | -8.260 |
| Middle | 2440 | 21.280 | 30 | -8.720 |
| High (Ch 25) | 2475 | 21.070 | 30 | -8.930 |
| High (Ch 26) | 2480 | 20.970 | 30 | -9.030 |

## 9.1. AVERAGE POWER

**LIMITS**

None; for reporting purposes only

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.3 dB was entered as an offset in the power meter to allow for a gated average reading of power

**RESULTS**

### 9.1.1. 802.15.4

**Antenna 1**

| | |
|---|---|
| **Tested By:** | 40882 |
| **Date:** | 10/5/2020 |

| Channel | Frequency (MHz) | Average Power Reading (dBm) |
|---|---|---|
| Low | 2405 | 19.06 |
| Middle | 2440 | 18.73 |
| High (Ch 25) | 2475 | 18.92 |
| High (Ch 26) | 2480 | 18.80 |

**Antenna 2**

| | |
|---|---|
| **Tested By:** | 40882 |
| **Date:** | 10/5/2020 |

| Channel | Frequency (MHz) | Average Power Reading (dBm) |
|---|---|---|
| Low | 2405 | 21.65 |
| Middle | 2440 | 21.19 |
| High (Ch 25) | 2475 | 20.97 |
| High (Ch 26) | 2480 | 20.88 |

## 9.2. POWER SPECTRAL DENSITY

**LIMITS**

FCC §15.247 (e)

RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

**RESULTS**



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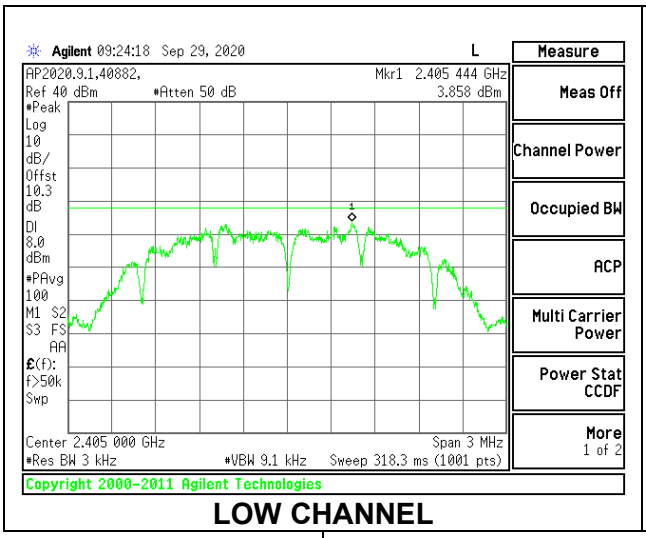
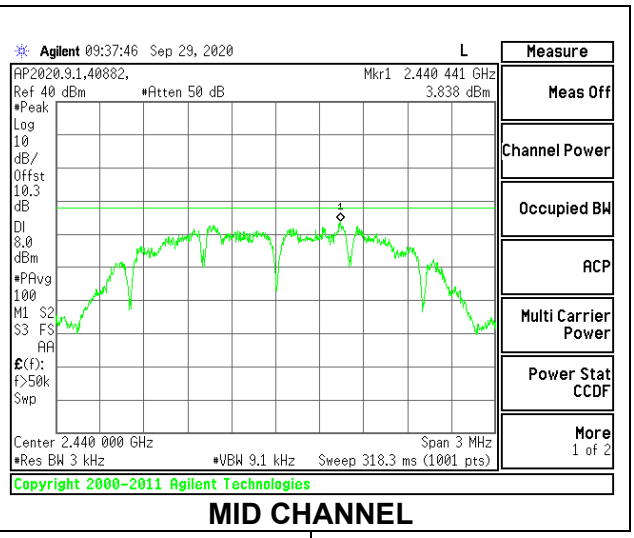
### 9.2.1. 802.15.4

**Antenna 1**

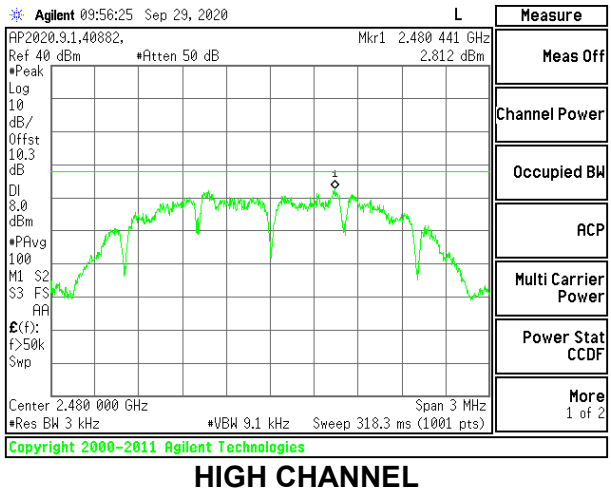
| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---|---|---|---|---|
| Low | 2405 | 3.86 | 8 | -4.14 |
| Middle | 2440 | 3.84 | 8 | -4.16 |
| High | 2480 | 2.81 | 8 | -5.19 |




LOW CHANNEL



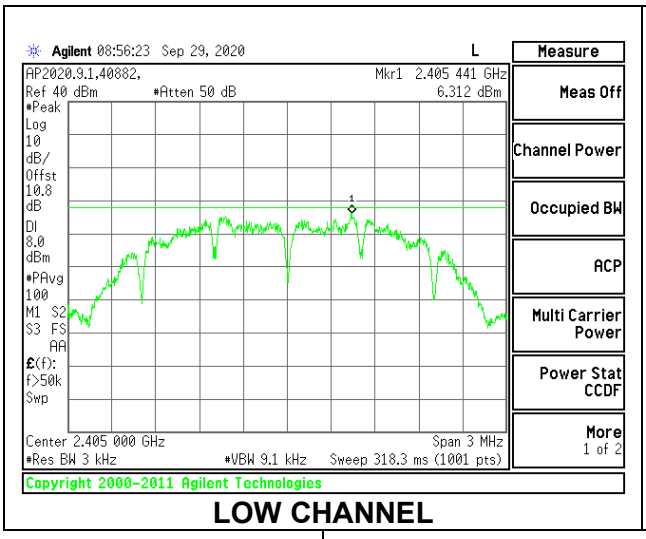

MID CHANNEL



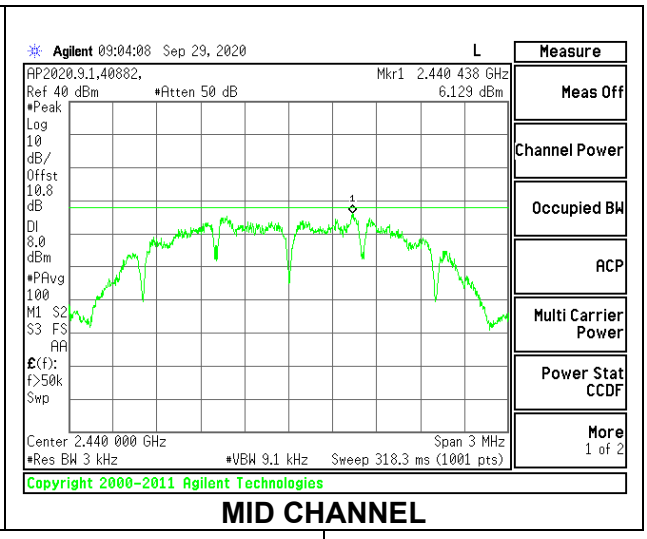

HIGH CHANNEL

**Antenna 2**

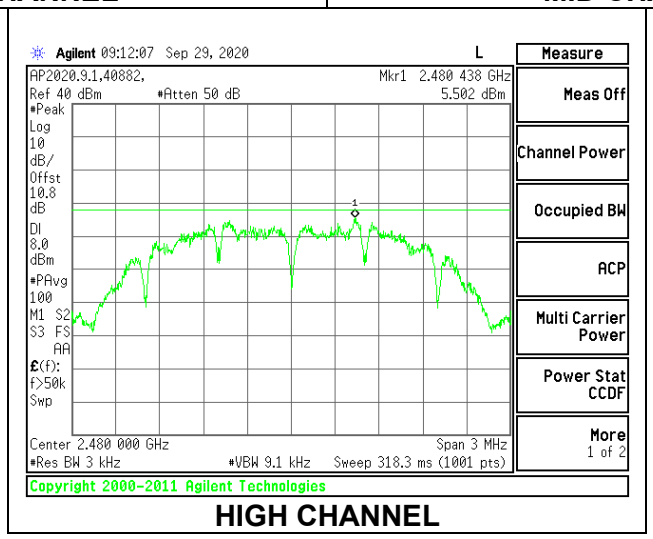
| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---|---|---|---|---|
| Low | 2405 | 6.31 | 8 | -1.69 |
| Middle | 2440 | 6.13 | 8 | -1.87 |
| High | 2480 | 5.50 | 8 | -2.50 |




**LOW CHANNEL**




**MID CHANNEL**




**HIGH CHANNEL**

## 9.3. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

FCC §15.247 (d)

RSS-247 5.5

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

**RESULTS**



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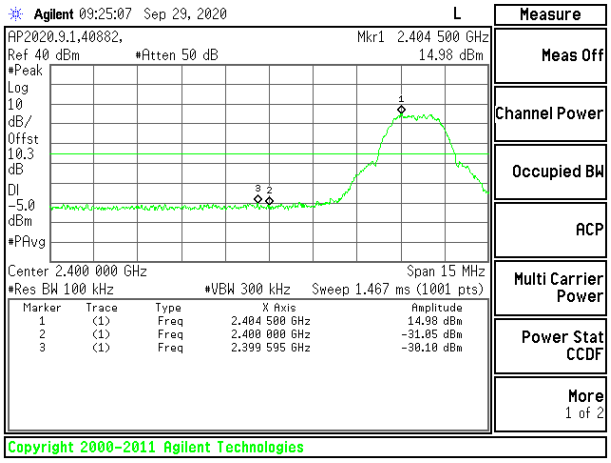
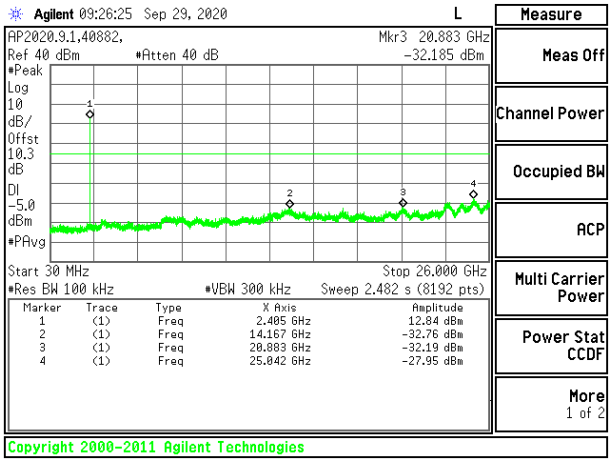
### 9.3.1. 802.15.4

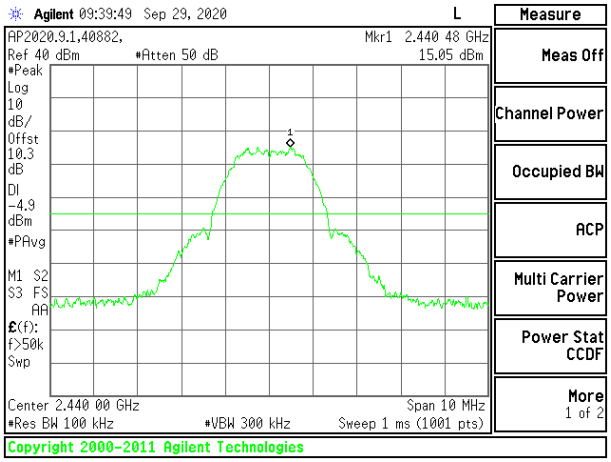
**Antenna 1**



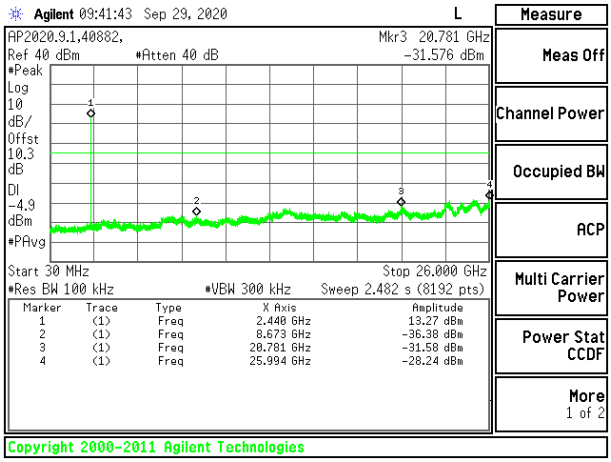

**LOW CHANNEL BANDEDGE**



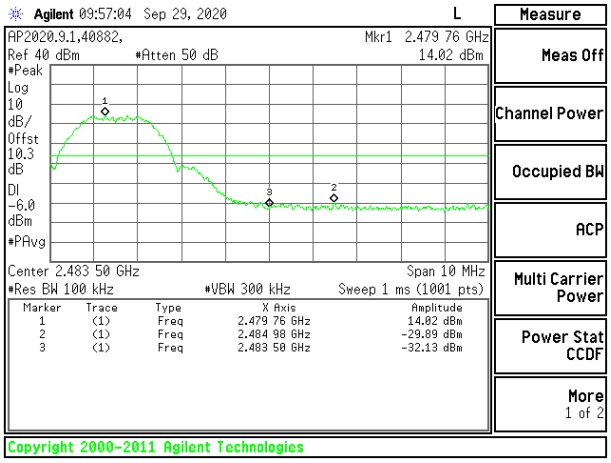

**OUT-OF-BAND LOW CHANNEL**



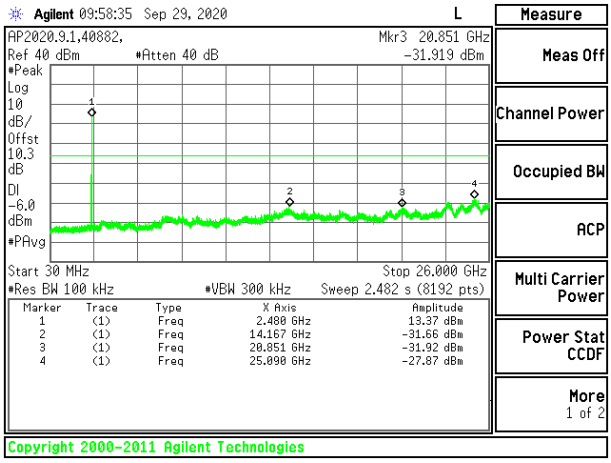

**IN-BAND REFERENCE LEVEL**




**OUT-OF-BAND MID CHANNEL**

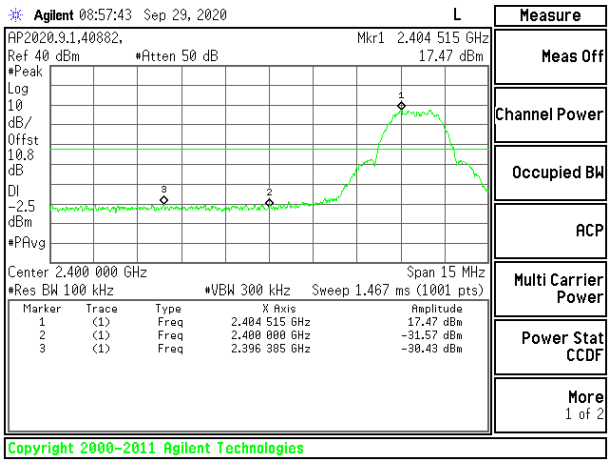



**HIGH CHANNEL BANDEDGE**

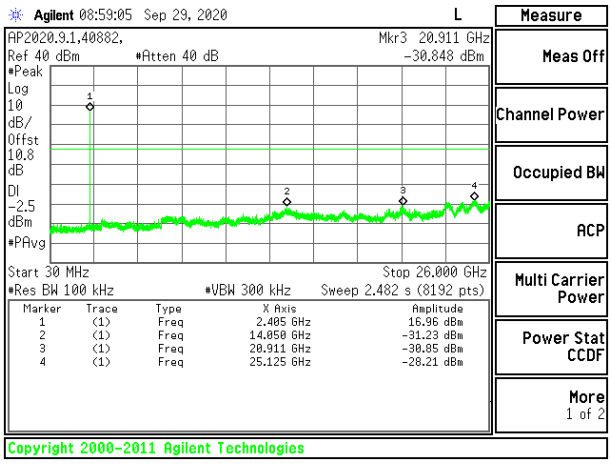



**OUT-OF-BAND HIGH CHANNEL**

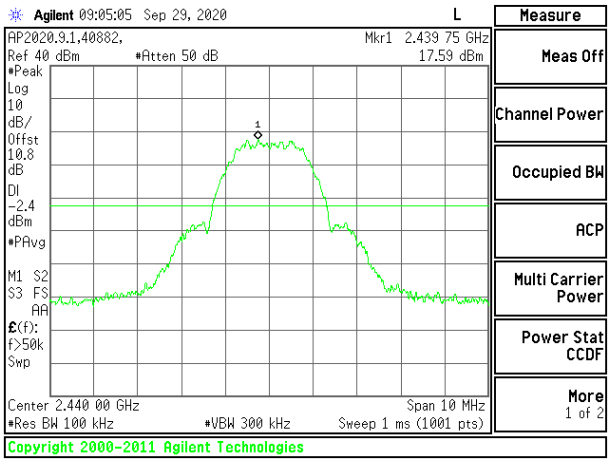
## Antenna 2



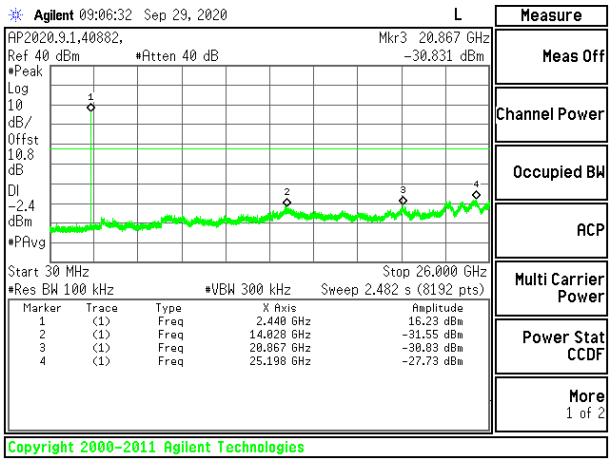

**LOW CHANNEL BANDEDGE**



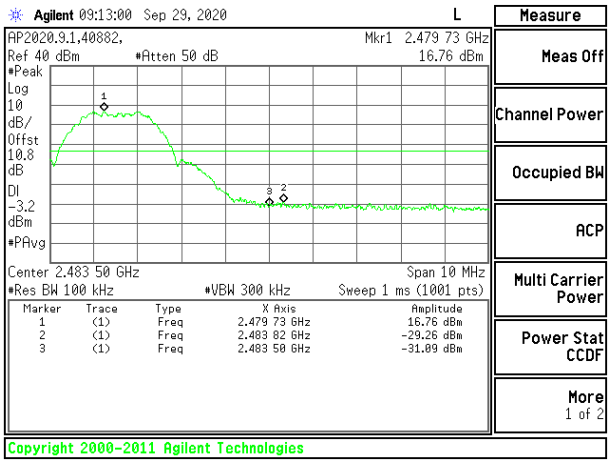

**OUT-OF-BAND LOW CHANNEL**



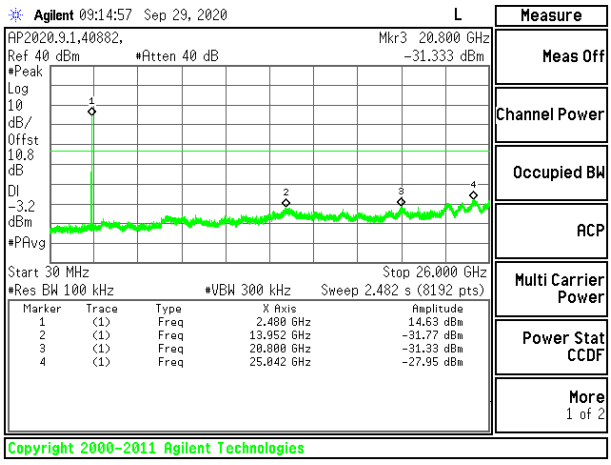

**IN-BAND REFERENCE LEVEL**




**OUT-OF-BAND MID CHANNEL**




**HIGH CHANNEL BANDEDGE**




**OUT-OF-BAND HIGH CHANNEL**



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# 10. RADIATED TEST RESULTS

## 10.1. LIMITS AND PROCEDURE

**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.

Resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9-150kHz 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 (voltage averaging).

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.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

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

**KDB 414788 Open Field Site (OFS) and Chamber Correlation Justification**

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



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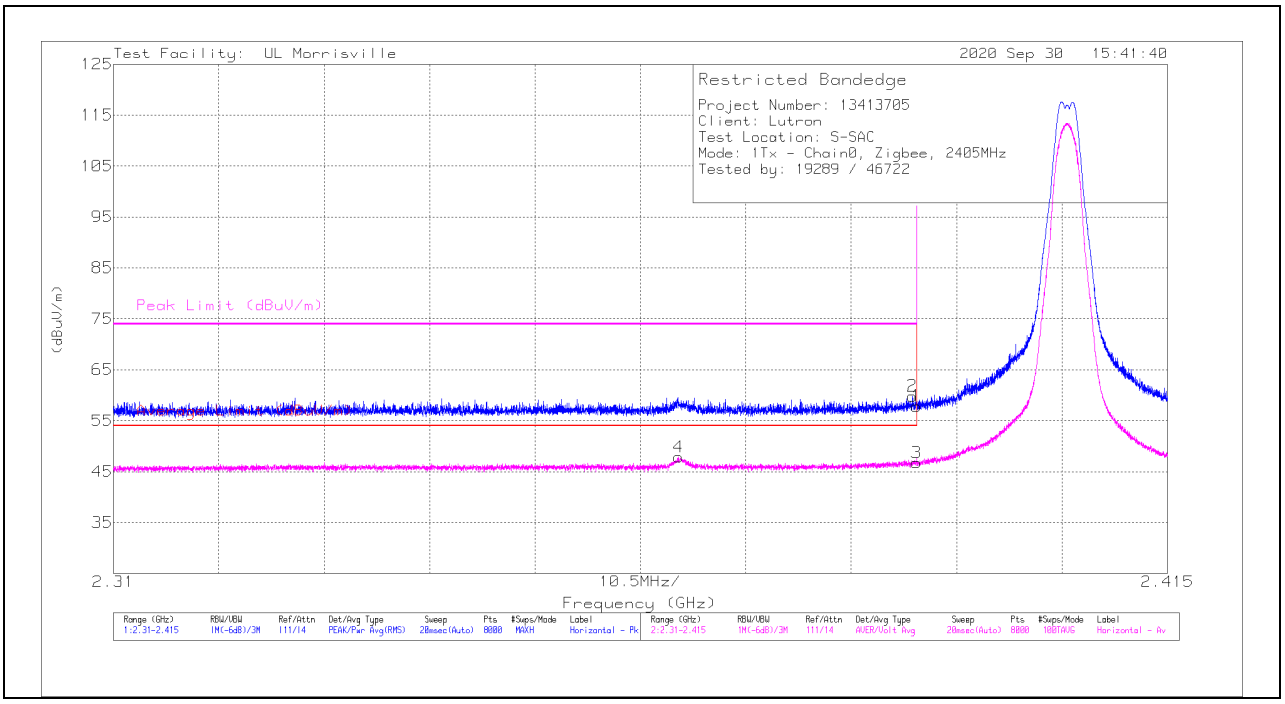
## 10.2. TRANSMITTER ABOVE 1 GHz

### 10.2.1. 802.15.4

**Antenna 1**

**BANDEDGE (LOW CHANNEL)**

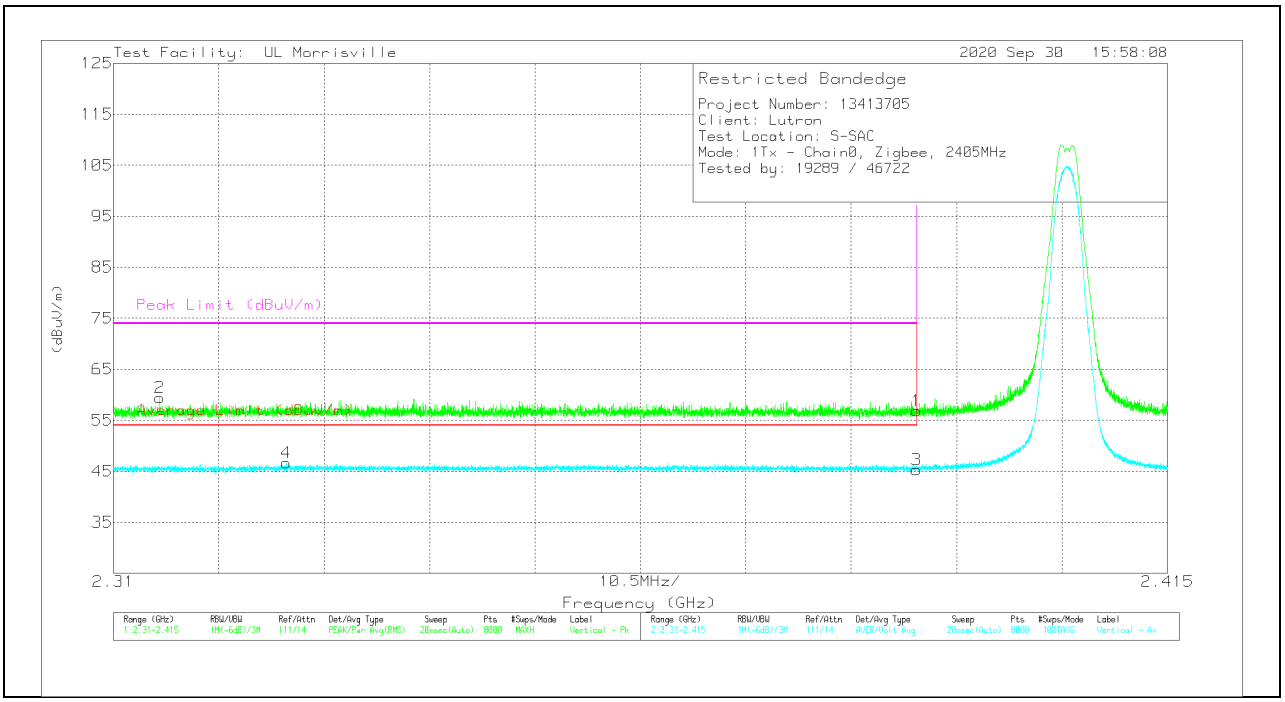
**HORIZONTAL RESULT**




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.39 | 39.78 | Pk | 32.1 | -24 | 10 | 0 | 57.88 | - | - | 74 | -16.12 | 355 | 120 | H |
| 2 | * ** 2.3896 | 41.76 | Pk | 32.1 | -24 | 10 | 0 | 59.86 | - | - | 74 | -14.14 | 355 | 120 | H |
| 3 | * ** 2.39 | 28.69 | ADV | 32.1 | -24 | 10 | -10.46 | 36.33 | 54 | -17.67 | - | - | 355 | 120 | H |
| 4 | * ** 2.3663 | 29.55 | ADV | 32.2 | -23.9 | 10 | -10.46 | 37.39 | 54 | -16.61 | - | - | 355 | 120 | H |

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

## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.39 | 38.75 | Pk | 32.1 | -24 | 10 | 0 | 56.85 | - | - | 74 | -17.15 | 158 | 223 | V |
| 2 | * ** 2.31462 | 41.01 | Pk | 32 | -23.6 | 10 | 0 | 59.41 | - | - | 74 | -14.59 | 158 | 223 | V |
| 3 | * ** 2.39 | 27.2 | ADV | 32.1 | -24 | 10 | -10.46 | 34.84 | 54 | -19.16 | - | - | 158 | 223 | V |
| 4 | * ** 2.32724 | 28.15 | ADV | 32.1 | -23.6 | 10 | -10.46 | 36.19 | 54 | -17.81 | - | - | 158 | 223 | V |

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



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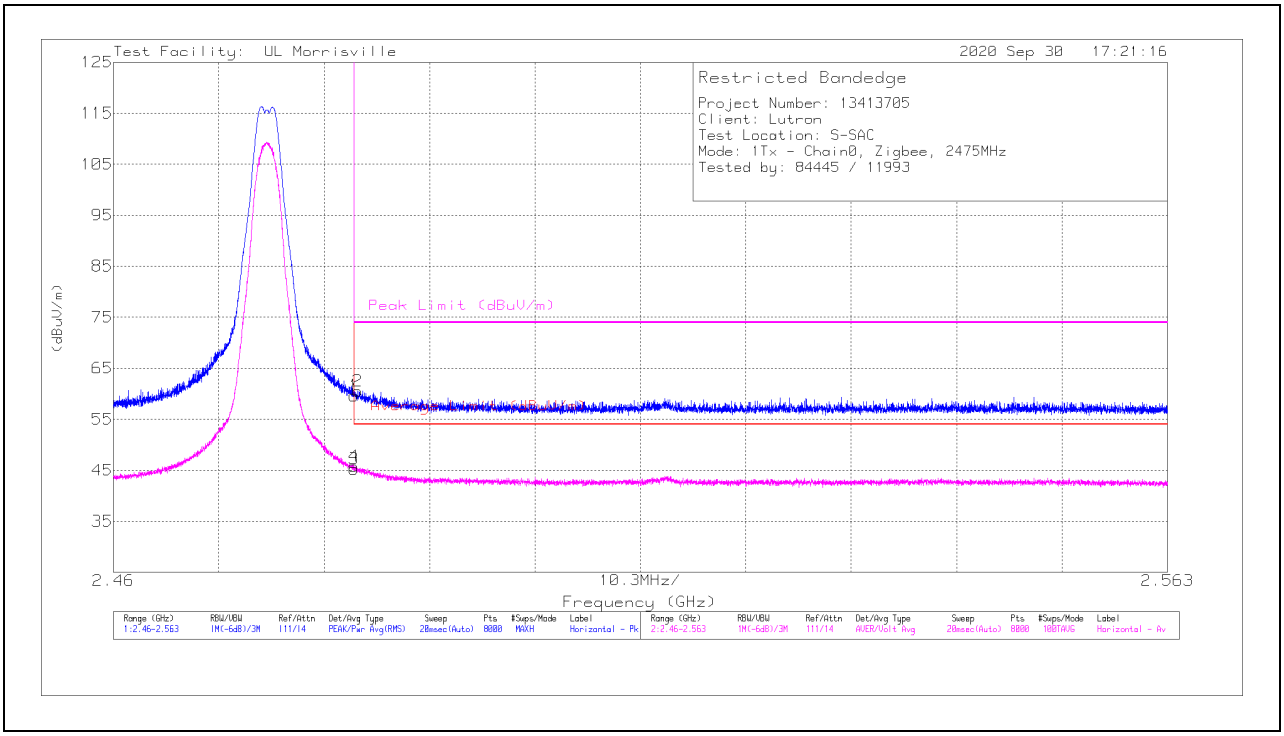
## BANDEDGE (HIGH CHANNEL, 2475MHz)

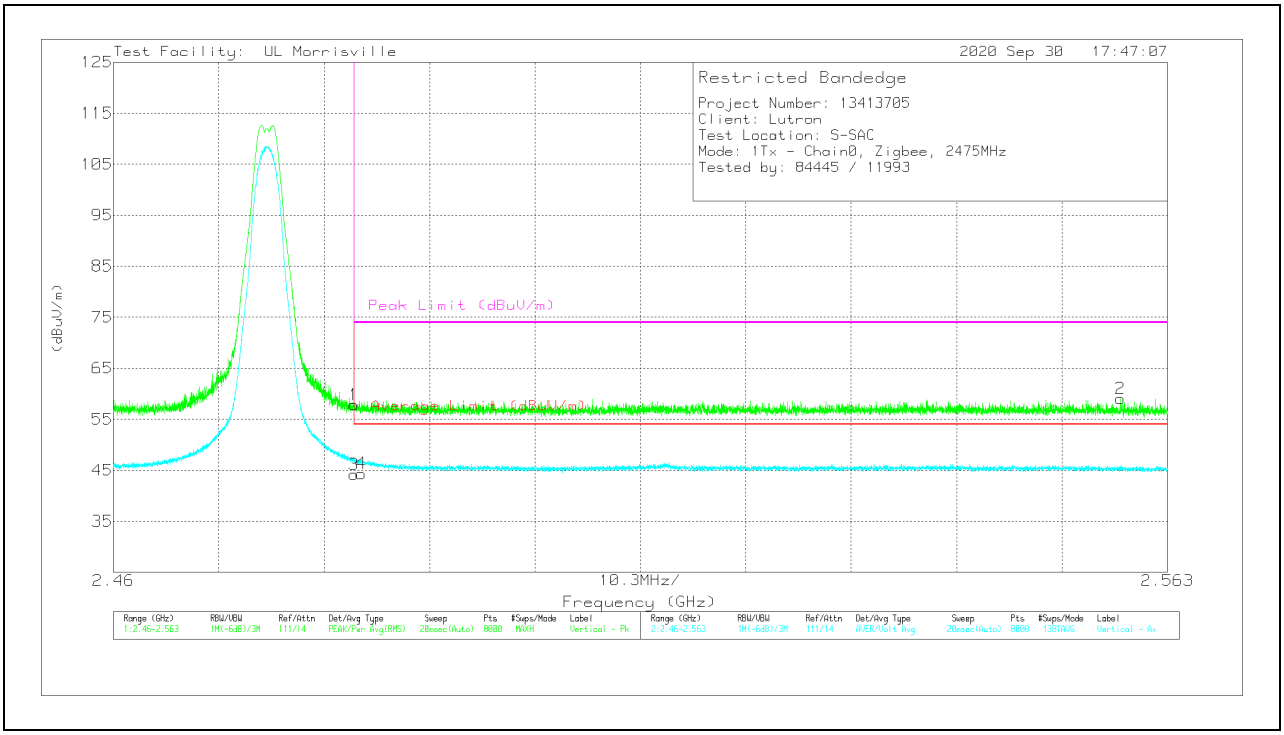
### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 41.64 | Pk | 32.4 | -24.4 | 10 | 0 | 59.64 | - | - | 74 | -14.36 | 6 | 140 | H |
| 2 | * ** 2.48386 | 42.57 | Pk | 32.4 | -24.4 | 10 | 0 | 60.57 | - | - | 74 | -13.43 | 6 | 140 | H |
| 3 | * ** 2.4835 | 30.1 | ADV | 32.4 | -24.4 | 10 | -10.46 | 37.64 | 54 | -16.36 | - | - | 6 | 140 | H |
| 4 | * ** 2.48353 | 30.66 | ADV | 32.4 | -24.4 | 10 | -10.46 | 38.2 | 54 | -15.8 | - | - | 6 | 140 | H |

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

## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/ Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 39.85 | Pk | 32.4 | -24.4 | 10 | 0 | 57.85 | - | - | 74 | -16.15 | 173 | 337 | V |
| 2 | ** 2.55841 | 41.44 | Pk | 32.6 | -25 | 10 | 0 | 59.04 | - | - | 74 | -14.96 | 173 | 337 | V |
| 3 | * ** 2.4835 | 29.04 | ADV | 32.4 | -24.4 | 10 | -10.46 | 36.58 | 54 | -17.42 | - | - | 173 | 337 | V |
| 4 | * ** 2.48421 | 29.21 | ADV | 32.4 | -24.4 | 10 | -10.46 | 36.75 | 54 | -17.25 | - | - | 173 | 337 | V |

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



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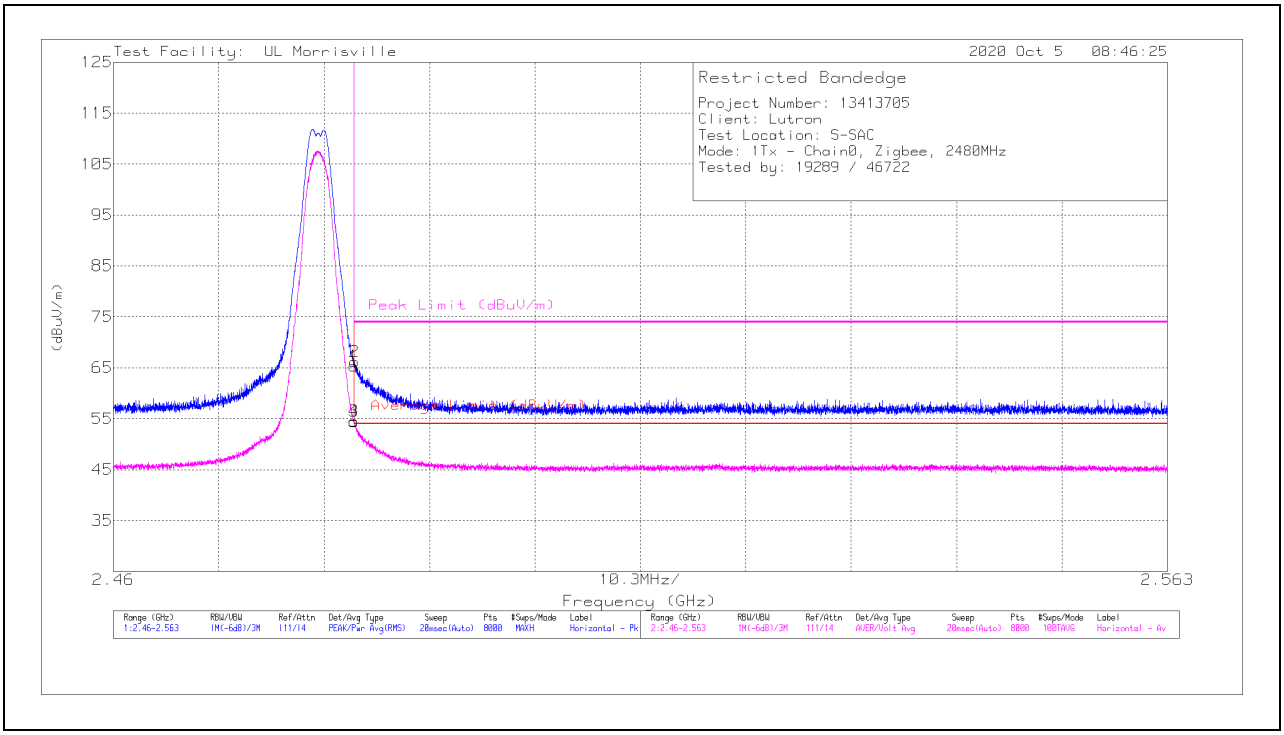
## BANDEDGE (HIGH CHANNEL, 2480MHz)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 47.36 | Pk | 32.4 | -24.4 | 10 | 0 | 65.36 | - | - | 74 | -8.64 | 46 | 110 | H |
| 2 | * ** 2.48356 | 48.2 | Pk | 32.4 | -24.4 | 10 | 0 | 66.2 | - | - | 74 | -7.8 | 46 | 110 | H |
| 3 | * ** 2.4835 | 36.5 | ADV | 32.4 | -24.4 | 10 | -10.46 | 44.04 | 54 | -9.96 | - | - | 46 | 110 | H |
| 4 | * ** 2.48353 | 36.46 | ADV | 32.4 | -24.4 | 10 | -10.46 | 44 | 54 | -10 | - | - | 46 | 110 | H |

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



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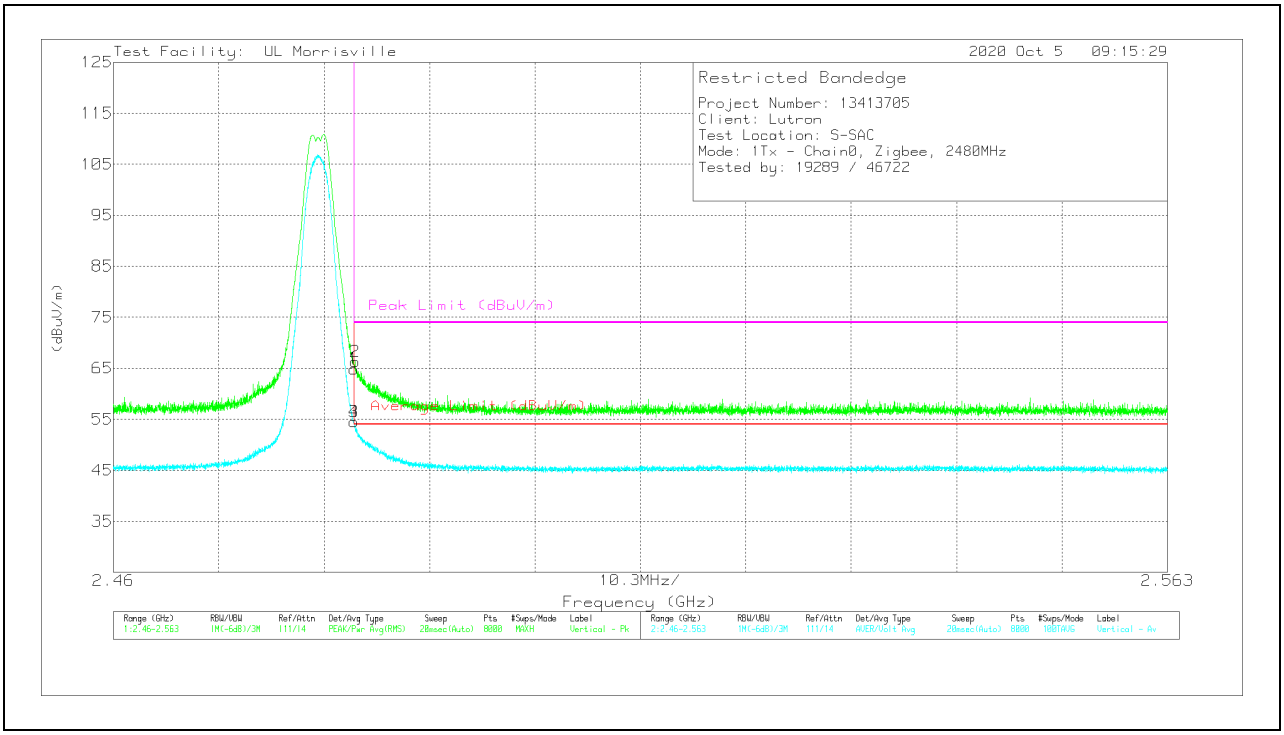
## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/ Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 46.89 | Pk | 32.4 | -24.4 | 10 | 0 | 64.89 | - | - | 74 | -9.11 | 57 | 362 | V |
| 2 | * ** 2.4836 | 48.29 | Pk | 32.4 | -24.4 | 10 | 0 | 66.29 | - | - | 74 | -7.71 | 57 | 362 | V |
| 3 | * ** 2.4835 | 36.49 | ADV | 32.4 | -24.4 | 10 | -10.46 | 44.03 | 54 | -9.97 | - | - | 57 | 362 | V |
| 4 | * ** 2.48353 | 36.54 | ADV | 32.4 | -24.4 | 10 | -10.46 | 44.08 | 54 | -9.92 | - | - | 57 | 362 | V |

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



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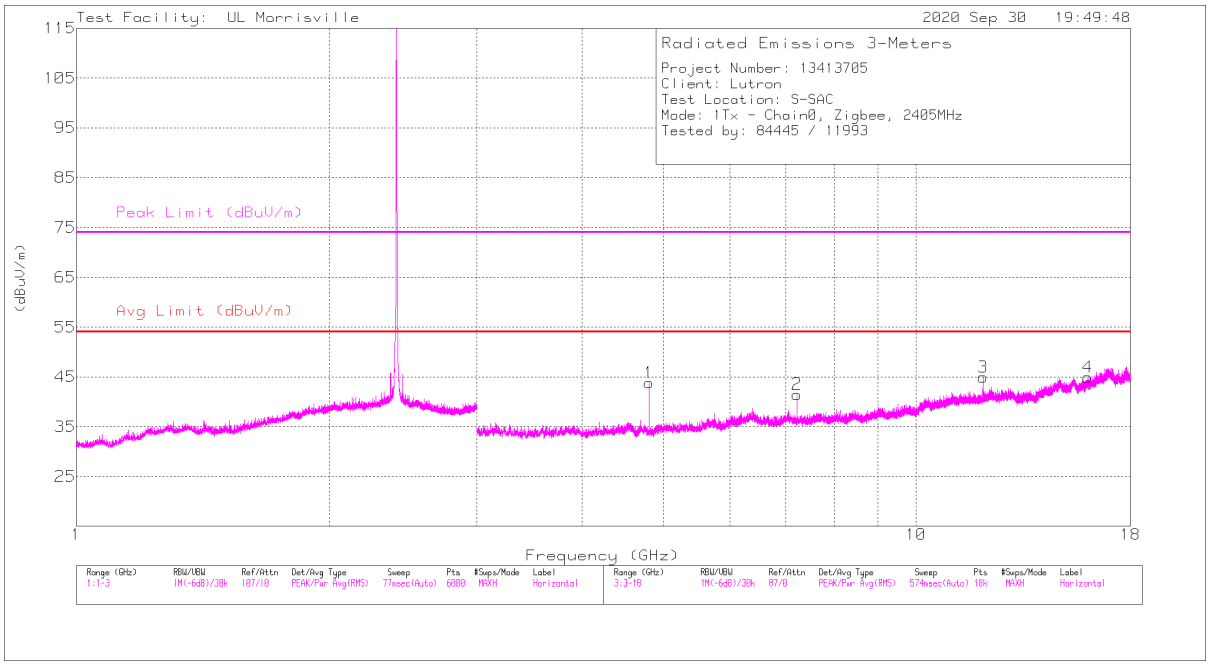
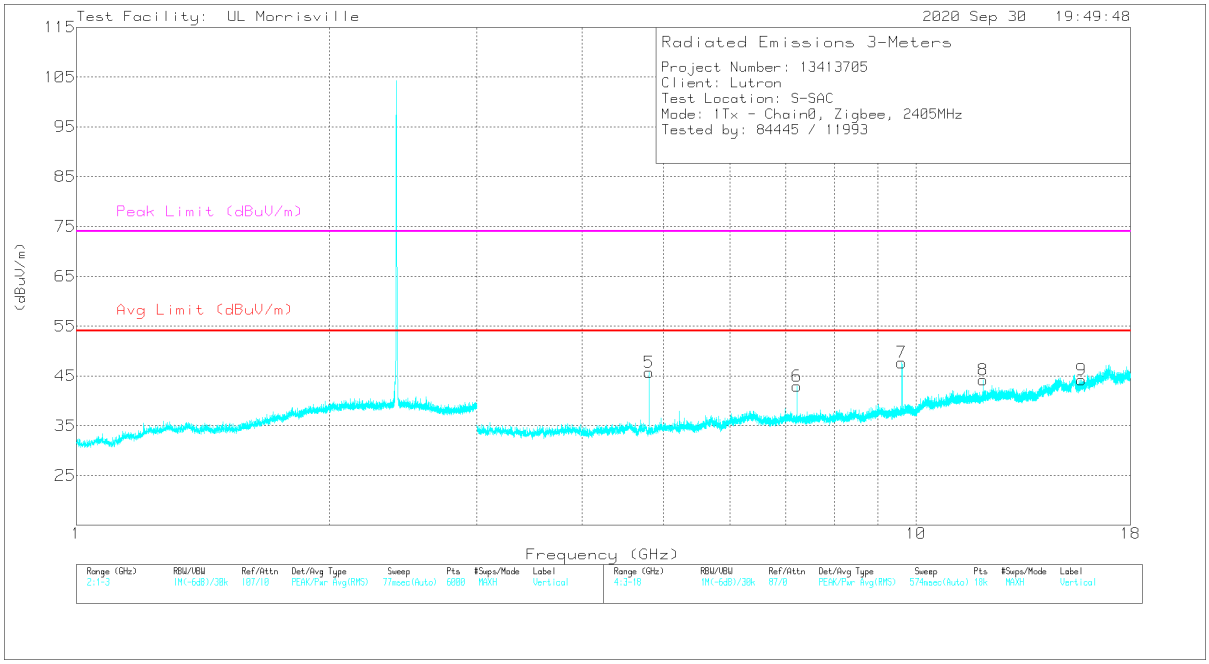
## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**



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## RADIATED EMISSIONS

| Markers | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 dB(/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.80887 | 46.71 | PK2 | 34 | -30.9 | 0 | 49.81 | - | - | 74 | -24.19 | 172 | 325 | H |
| | * ** 4.81099 | 38.17 | ADV | 34 | -30.8 | -10.46 | 30.91 | 54 | -23.09 | - | - | 172 | 325 | H |
| 3 | * ** 12.02227 | 37.02 | PK2 | 38.7 | -24.1 | 0 | 51.62 | - | - | 74 | -22.38 | 329 | 126 | H |
| | * ** 12.02222 | 26.1 | ADV | 38.7 | -24.1 | -10.46 | 30.24 | 54 | -23.76 | - | - | 329 | 126 | H |
| 4 | * ** 16.00866 | 33.67 | PK2 | 40.4 | -23.9 | 0 | 50.17 | - | - | 74 | -23.83 | 135 | 244 | H |
| | * ** 16.00872 | 21.81 | ADV | 40.4 | -23.9 | -10.46 | 27.85 | 54 | -26.15 | - | - | 135 | 244 | H |
| 5 | * ** 4.80881 | 49.06 | PK2 | 34 | -30.9 | 0 | 52.16 | - | - | 74 | -21.84 | 91 | 254 | V |
| | * ** 4.80898 | 41.56 | ADV | 34 | -30.9 | -10.46 | 34.2 | 54 | -19.8 | - | - | 91 | 254 | V |
| 8 | * ** 12.02229 | 36.92 | PK2 | 38.7 | -24.1 | 0 | 51.52 | - | - | 74 | -22.48 | 249 | 357 | V |
| | * ** 12.02225 | 25.65 | ADV | 38.7 | -24.1 | -10.46 | 29.79 | 54 | -24.21 | - | - | 249 | 357 | V |
| 9 | * ** 15.75047 | 33.21 | PK2 | 40.2 | -23.3 | 0 | 50.11 | - | - | 74 | -23.89 | 12 | 149 | V |
| | * ** 15.75053 | 20.83 | ADV | 40.2 | -23.3 | -10.46 | 27.27 | 54 | -26.73 | - | - | 12 | 149 | V |
| 6 | 7.21274 | 35.21 | Pk | 35.6 | -27.9 | 0 | 42.91 | - | - | - | - | 0-360 | 200 | V |
| 2 | 7.21607 | 33.79 | Pk | 35.6 | -27.9 | 0 | 41.49 | - | - | - | - | 0-360 | 101 | H |
| 7 | 9.61787 | 37.37 | Pk | 36.6 | -26.3 | 0 | 47.67 | - | - | - | - | 0-360 | 200 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average
Pk - Peak detector



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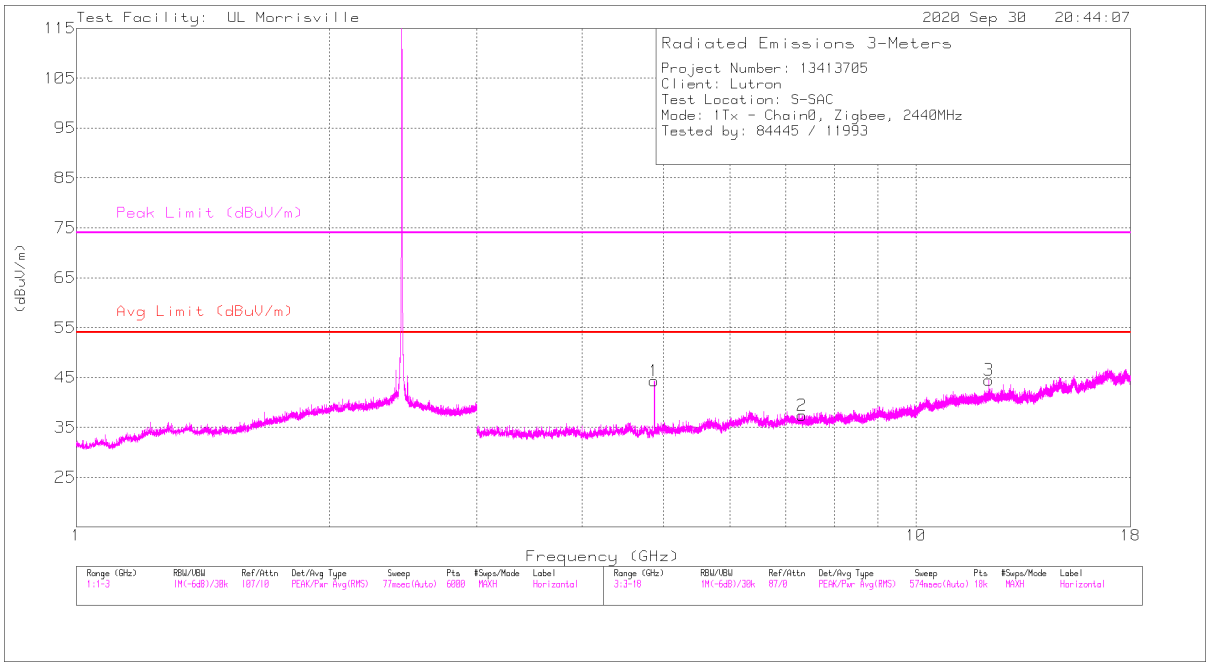
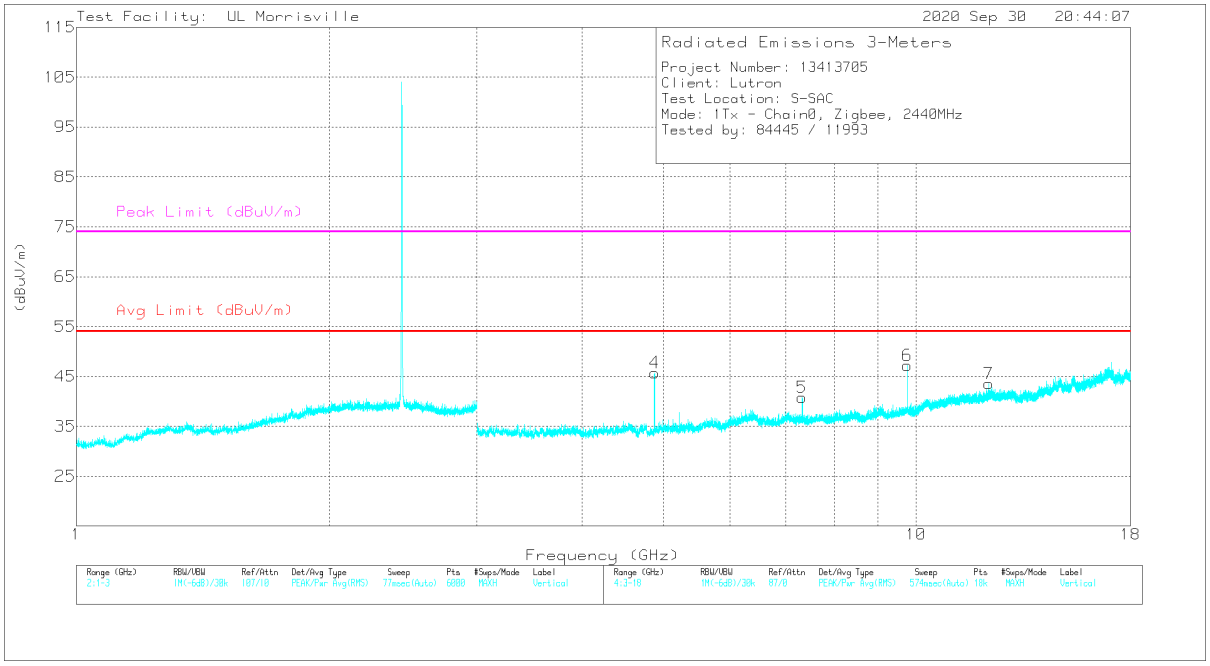
## MID CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**



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## RADIATED EMISSIONS

| Markers | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 dB(/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.87894 | 46.63 | PK2 | 34 | -30.8 | 0 | 49.83 | - | - | 74 | -24.17 | 177 | 283 | H |
| | * ** 4.87903 | 38.71 | ADV | 34 | -30.8 | -10.46 | 31.45 | 54 | -22.55 | - | - | 177 | 283 | H |
| 2 | * ** 7.31831 | 36.35 | PK2 | 35.6 | -27.4 | 0 | 44.55 | - | - | 74 | -29.45 | 60 | 371 | H |
| | * ** 7.31831 | 25.21 | ADV | 35.6 | -27.4 | -10.46 | 22.95 | 54 | -31.05 | - | - | 60 | 371 | H |
| 3 | * ** 12.20273 | 37.59 | PK2 | 38.8 | -24.2 | 0 | 52.19 | - | - | 74 | -21.81 | 340 | 337 | H |
| | * ** 12.20279 | 25.94 | ADV | 38.8 | -24.2 | -10.46 | 30.08 | 54 | -23.92 | - | - | 340 | 337 | H |
| 4 | * ** 4.88112 | 48.75 | PK2 | 34 | -30.8 | 0 | 51.95 | - | - | 74 | -22.05 | 93 | 274 | V |
| | * ** 4.88098 | 41.04 | ADV | 34 | -30.8 | -10.46 | 33.78 | 54 | -20.22 | - | - | 93 | 274 | V |
| 5 | * ** 7.31844 | 38.99 | PK2 | 35.6 | -27.4 | 0 | 47.19 | - | - | 74 | -26.81 | 279 | 206 | V |
| | * ** 7.31837 | 28.53 | ADV | 35.6 | -27.4 | -10.46 | 26.27 | 54 | -27.73 | - | - | 279 | 206 | V |
| 7 | * ** 12.2029 | 36.44 | PK2 | 38.8 | -24.2 | 0 | 51.04 | - | - | 74 | -22.96 | 253 | 228 | V |
| | * ** 12.20277 | 23.92 | ADV | 38.8 | -24.2 | -10.46 | 28.06 | 54 | -25.94 | - | - | 253 | 228 | V |
| 6 | 9.76205 | 36.4 | Pk | 36.7 | -25.9 | 0 | 47.2 | - | - | - | - | 0-360 | 200 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average
Pk - Peak detector



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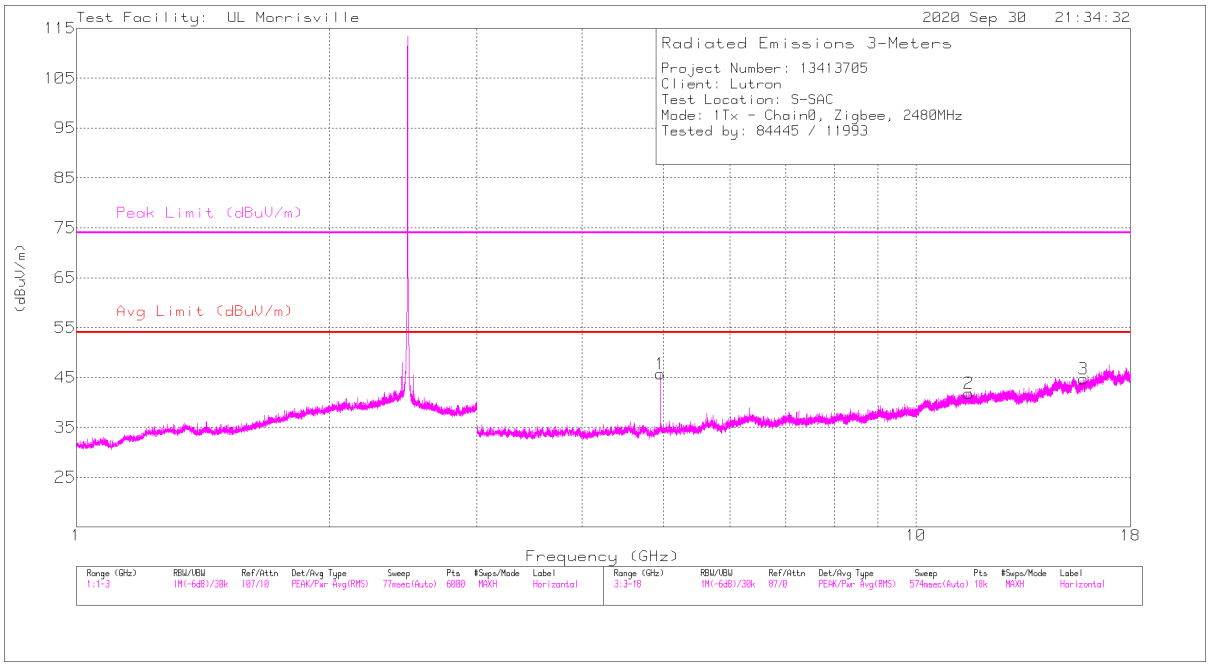
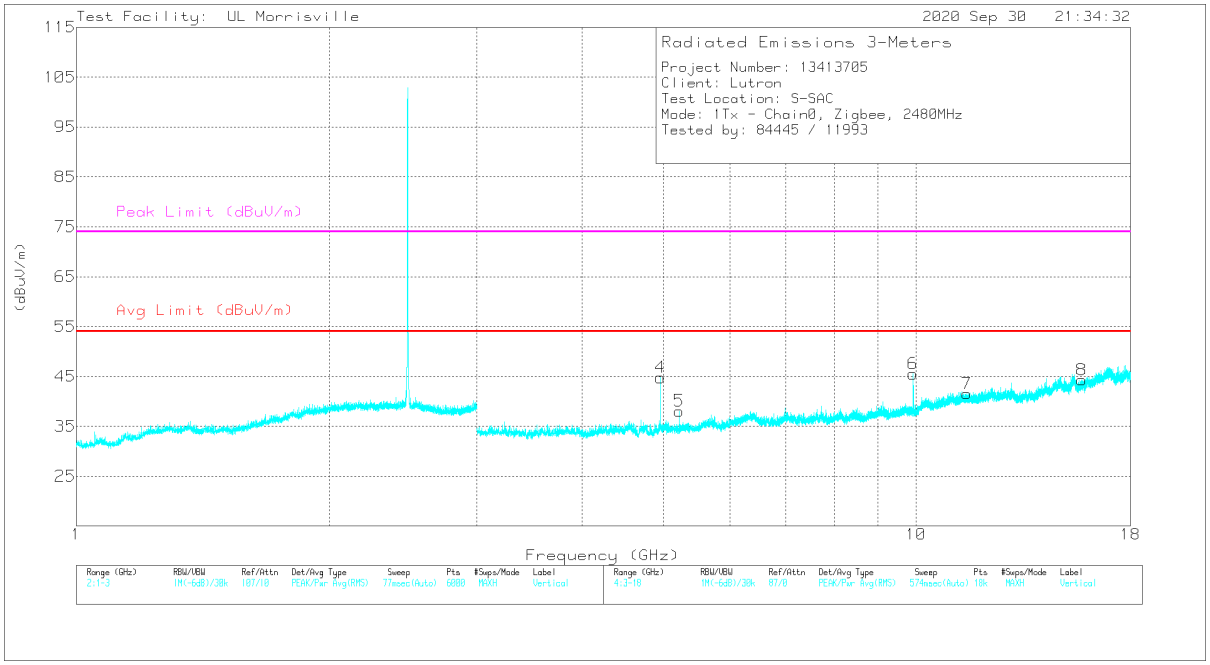
## HIGH CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**



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## RADIATED EMISSIONS

| Markers | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 dB(/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.96121 | 48.61 | PK2 | 33.9 | -31 | 0 | 51.51 | - | - | 74 | -22.49 | 166 | 287 | H |
| | * ** 4.96104 | 40.2 | ADV | 33.9 | -31 | -10.46 | 32.64 | 54 | -21.36 | - | - | 166 | 287 | H |
| 2 | * ** 11.55139 | 34.52 | PK2 | 38.3 | -24.5 | 0 | 48.32 | - | - | 74 | -25.68 | 126 | 161 | H |
| | * ** 11.55248 | 21.09 | ADV | 38.3 | -24.5 | -10.46 | 24.43 | 54 | -29.57 | - | - | 126 | 161 | H |
| 3 | * ** 15.82134 | 34.67 | PK2 | 40.3 | -23.4 | 0 | 51.57 | - | - | 74 | -22.43 | 171 | 231 | H |
| | * ** 15.82174 | 21.19 | ADV | 40.3 | -23.4 | -10.46 | 27.63 | 54 | -26.37 | - | - | 171 | 231 | H |
| 4 | * ** 4.95876 | 49.13 | PK2 | 33.9 | -31 | 0 | 52.03 | - | - | 74 | -21.97 | 90 | 361 | V |
| | * ** 4.95894 | 41 | ADV | 33.9 | -31 | -10.46 | 33.44 | 54 | -20.56 | - | - | 90 | 361 | V |
| 5 | ** 5.22118 | 41.16 | PK2 | 34.3 | -30.7 | 0 | 44.76 | - | - | 74 | -29.24 | 314 | 109 | V |
| | ** 5.22114 | 33.01 | ADV | 34.3 | -30.7 | -10.46 | 26.15 | 54 | -27.85 | - | - | 314 | 109 | V |
| 7 | * ** 11.48746 | 34.1 | PK2 | 38.2 | -24.5 | 0 | 47.8 | - | - | 74 | -26.2 | 11 | 191 | V |
| | * ** 11.48922 | 21.21 | ADV | 38.2 | -24.4 | -10.46 | 24.55 | 54 | -29.45 | - | - | 11 | 191 | V |
| 8 | * ** 15.75408 | 33.86 | PK2 | 40.2 | -23.3 | 0 | 50.76 | - | - | 74 | -23.24 | 237 | 353 | V |
| | * ** 15.75514 | 20.87 | ADV | 40.2 | -23.3 | -10.46 | 27.31 | 54 | -26.69 | - | - | 237 | 353 | V |
| 6 | 9.91705 | 34.34 | Pk | 37 | -25.8 | 0 | 45.54 | - | - | - | - | 0-360 | 200 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average
Pk - Peak detector



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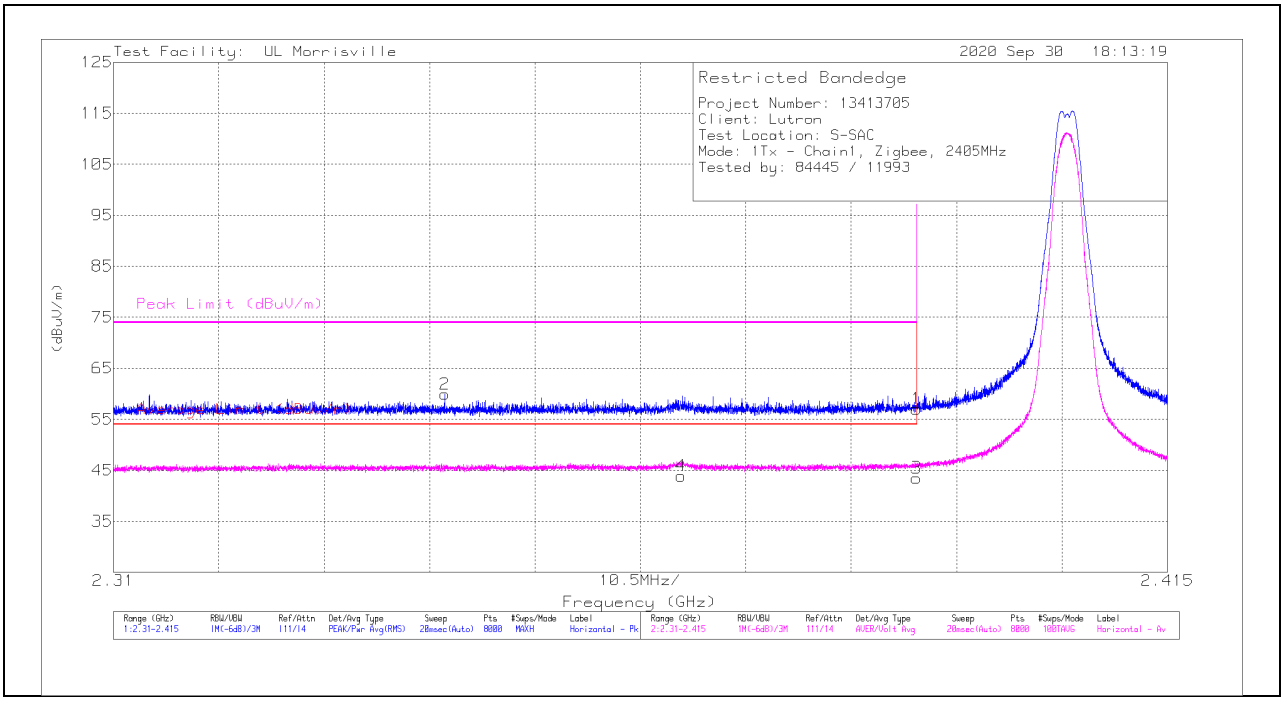
**Antenna 2**

## BANDEDGE (LOW CHANNEL)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.39 | 38.95 | Pk | 32.1 | -24 | 10 | 0 | 57.05 | - | - | 74 | -16.95 | 221 | 217 | H |
| 2 | * ** 2.34303 | 41.52 | Pk | 32.2 | -23.8 | 10 | 0 | 59.92 | - | - | 74 | -14.08 | 221 | 217 | H |
| 3 | * ** 2.39 | 28.24 | ADV | 32.1 | -24 | 10 | -10.46 | 35.88 | 54 | -18.12 | - | - | 221 | 216 | H |
| 4 | * ** 2.36656 | 28.44 | ADV | 32.2 | -23.9 | 10 | -10.46 | 36.28 | 54 | -17.72 | - | - | 221 | 216 | H |

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



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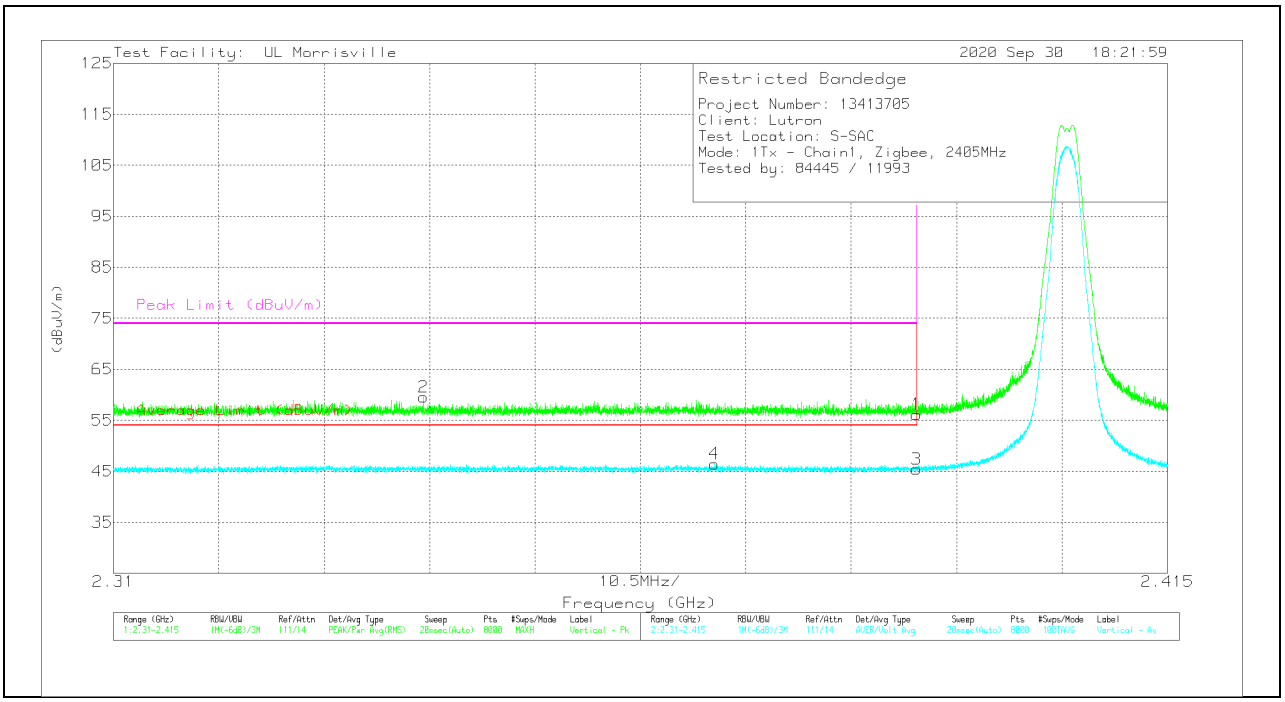
## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.39 | 38.07 | Pk | 32.1 | -24 | 10 | 0 | 56.17 | - | - | 74 | -17.83 | 255 | 351 | V |
| 2 | * ** 2.34089 | 41.15 | Pk | 32.2 | -23.8 | 10 | 0 | 59.55 | - | - | 74 | -14.45 | 255 | 351 | V |
| 3 | * ** 2.39 | 30.16 | ADV | 32.1 | -24 | 10 | -10.46 | 37.8 | 54 | -16.2 | - | - | 255 | 351 | V |
| 4 | * ** 2.36987 | 30.9 | ADV | 32.2 | -23.8 | 10 | -10.46 | 38.84 | 54 | -15.16 | - | - | 255 | 351 | V |

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



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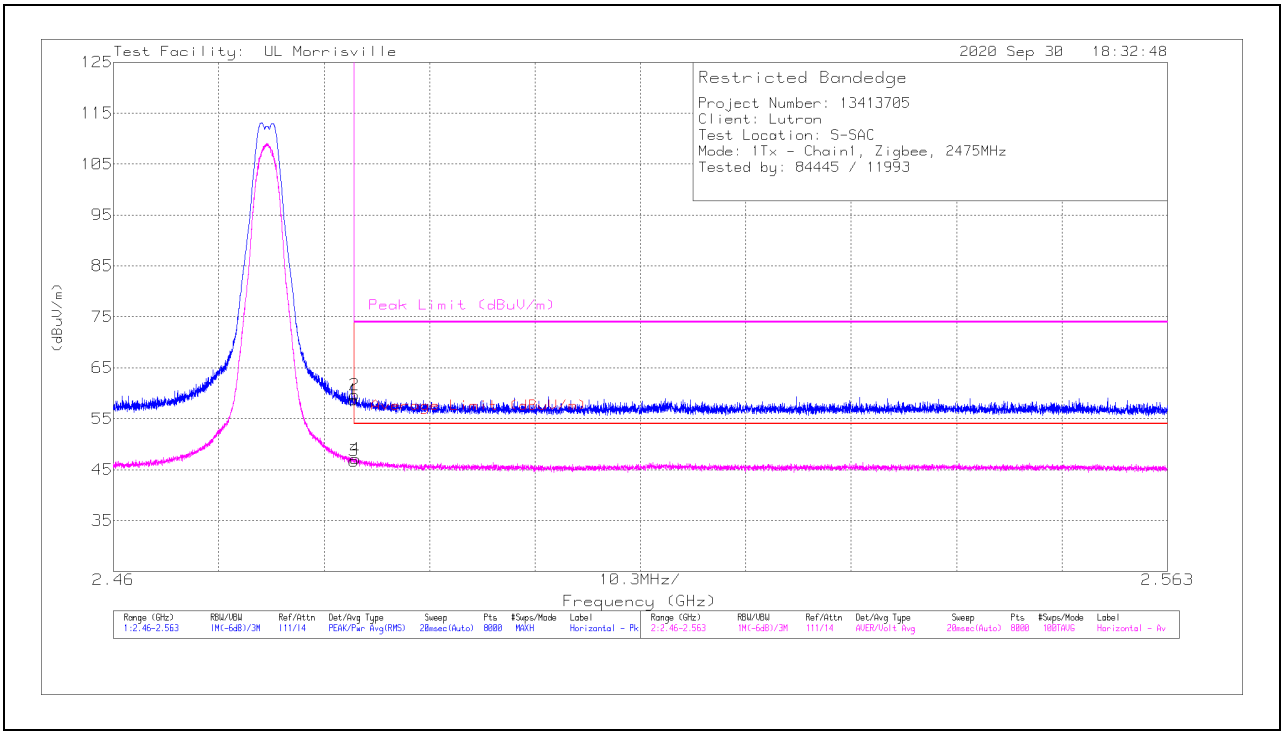
## BANDEDGE (HIGH CHANNEL 2475MHz)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 40.66 | Pk | 32.4 | -24.4 | 10 | 0 | 58.66 | - | - | 74 | -15.34 | 217 | 113 | H |
| 2 | * ** 2.48355 | 41.7 | Pk | 32.4 | -24.4 | 10 | 0 | 59.7 | - | - | 74 | -14.3 | 217 | 113 | H |
| 3 | * ** 2.4835 | 31.57 | ADV | 32.4 | -24.4 | 10 | -10.46 | 39.11 | 54 | -14.89 | - | - | 217 | 113 | H |
| 4 | * ** 2.48366 | 32.01 | ADV | 32.4 | -24.4 | 10 | -10.46 | 39.55 | 54 | -14.45 | - | - | 217 | 113 | H |

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



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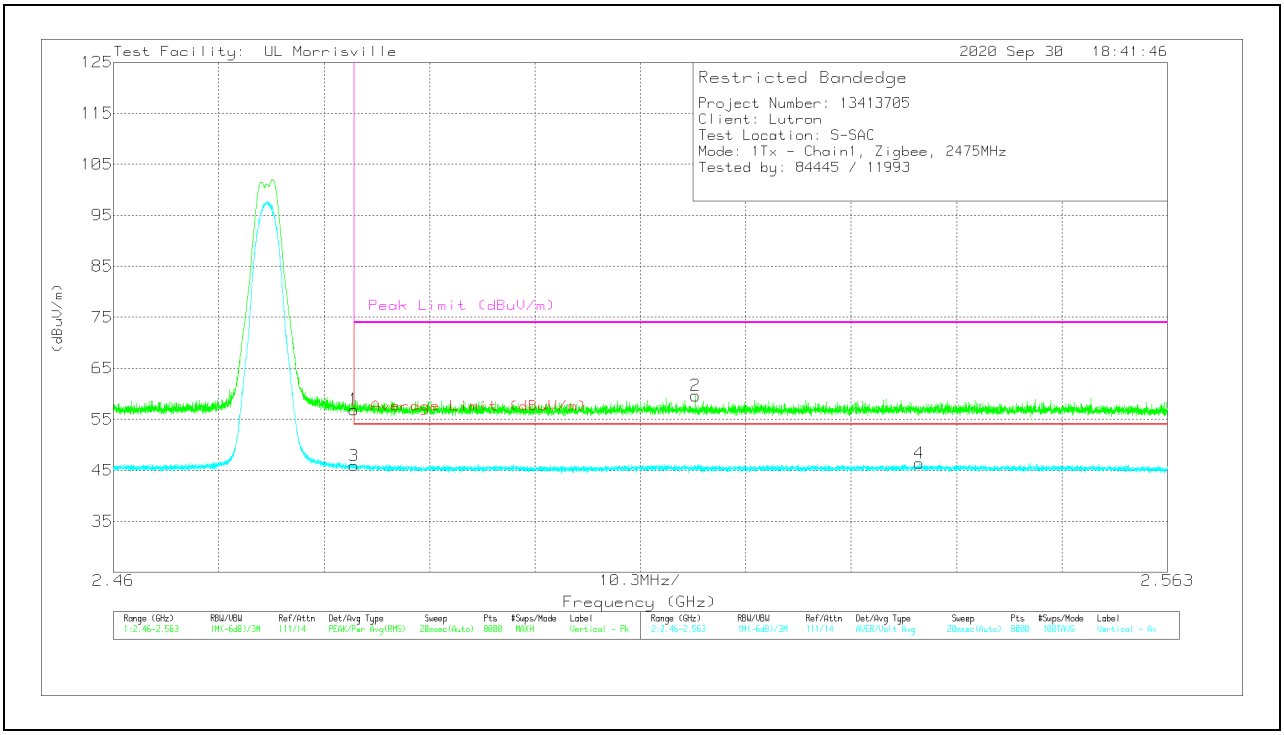
## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 38.9 | Pk | 32.4 | -24.4 | 10 | 0 | 56.9 | - | - | 74 | -17.1 | 109 | 111 | V |
| 2 | ** 2.51688 | 41.74 | Pk | 32.5 | -24.6 | 10 | 0 | 59.64 | - | - | 74 | -14.36 | 109 | 111 | V |
| 3 | * ** 2.4835 | 30.73 | ADV | 32.4 | -24.4 | 10 | -10.46 | 38.27 | 54 | -15.73 | - | - | 109 | 111 | V |
| 4 | ** 2.53873 | 31.44 | ADV | 32.6 | -24.8 | 10 | -10.46 | 38.78 | 54 | -15.22 | - | - | 109 | 111 | V |

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



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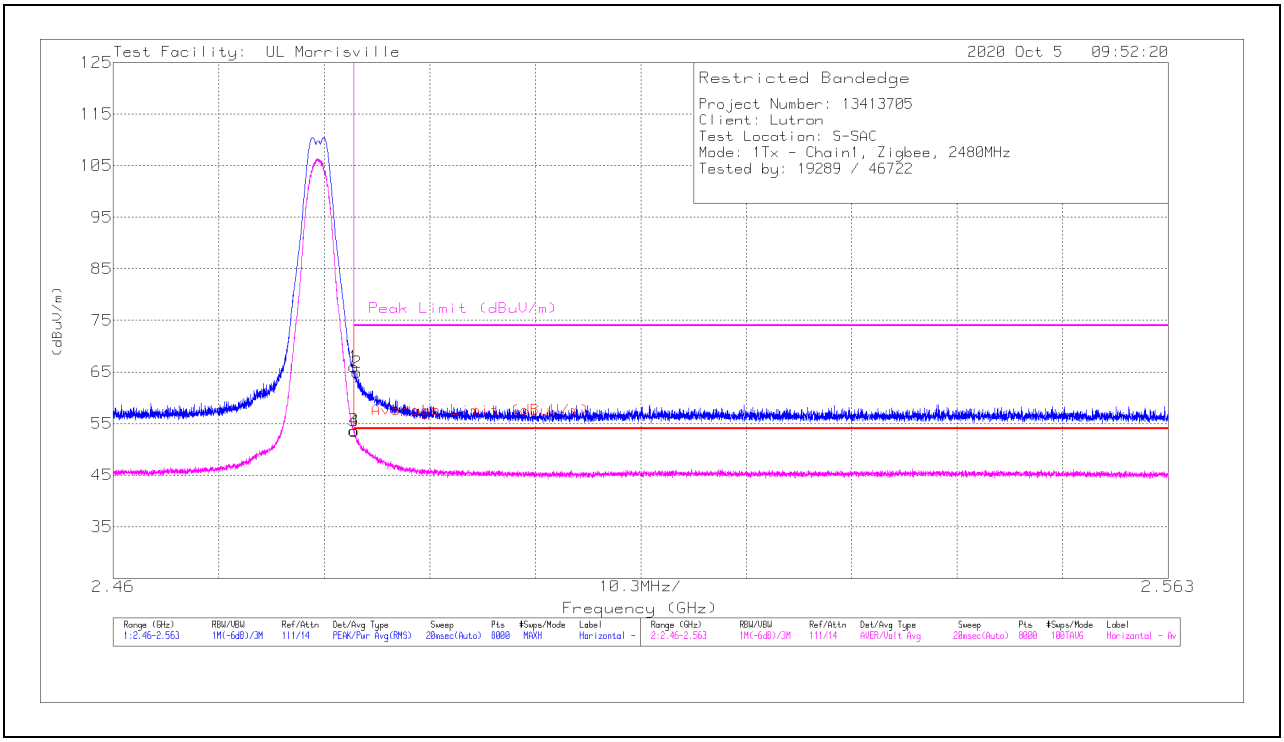
## BANDEDGE (HIGH CHANNEL 2480MHz)

### HORIZONTAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/ Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 48.03 | Pk | 32.4 | -24.4 | 10 | 0 | 66.03 | - | - | 74 | -7.97 | 208 | 184 | H |
| 2 | * ** 2.4838 | 46.91 | Pk | 32.4 | -24.4 | 10 | 0 | 64.91 | - | - | 74 | -9.09 | 208 | 184 | H |
| 3 | * ** 2.4835 | 35.65 | ADV | 32.4 | -24.4 | 10 | -10.46 | 43.19 | 54 | -10.81 | - | - | 208 | 184 | H |
| 4 | * ** 2.48353 | 35.56 | ADV | 32.4 | -24.4 | 10 | -10.46 | 43.1 | 54 | -10.9 | - | - | 208 | 184 | H |

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



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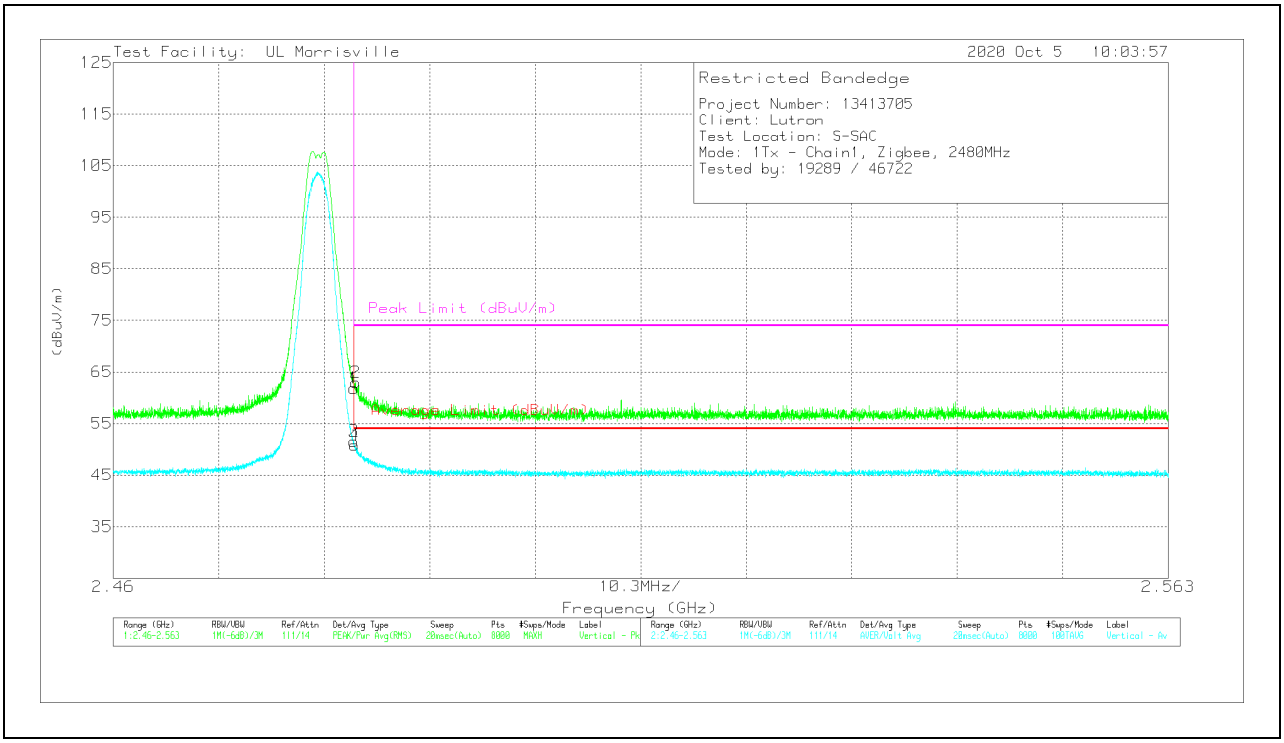
## VERTICAL RESULT




| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0067 (dB/m) | Amp/Cbl/Fltr/ Pad (dB) | Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 2.4835 | 43.85 | Pk | 32.4 | -24.4 | 10 | 0 | 61.85 | - | - | 74 | -12.15 | 268 | 379 | V |
| 2 | * ** 2.48366 | 44.97 | Pk | 32.4 | -24.4 | 10 | 0 | 62.97 | - | - | 74 | -11.03 | 268 | 379 | V |
| 3 | * ** 2.4835 | 33.55 | ADV | 32.4 | -24.4 | 10 | -10.46 | 41.09 | 54 | -12.91 | - | - | 268 | 379 | V |
| 4 | * ** 2.48354 | 32.79 | ADV | 32.4 | -24.4 | 10 | -10.46 | 40.33 | 54 | -13.67 | - | - | 268 | 379 | V |

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



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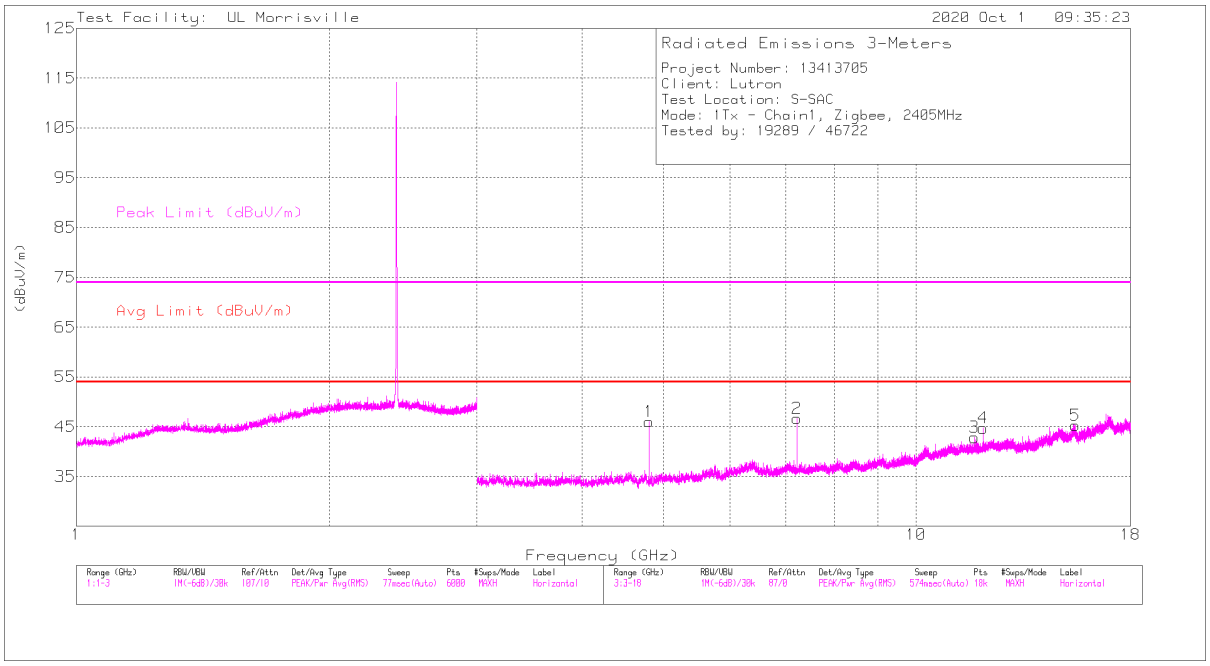
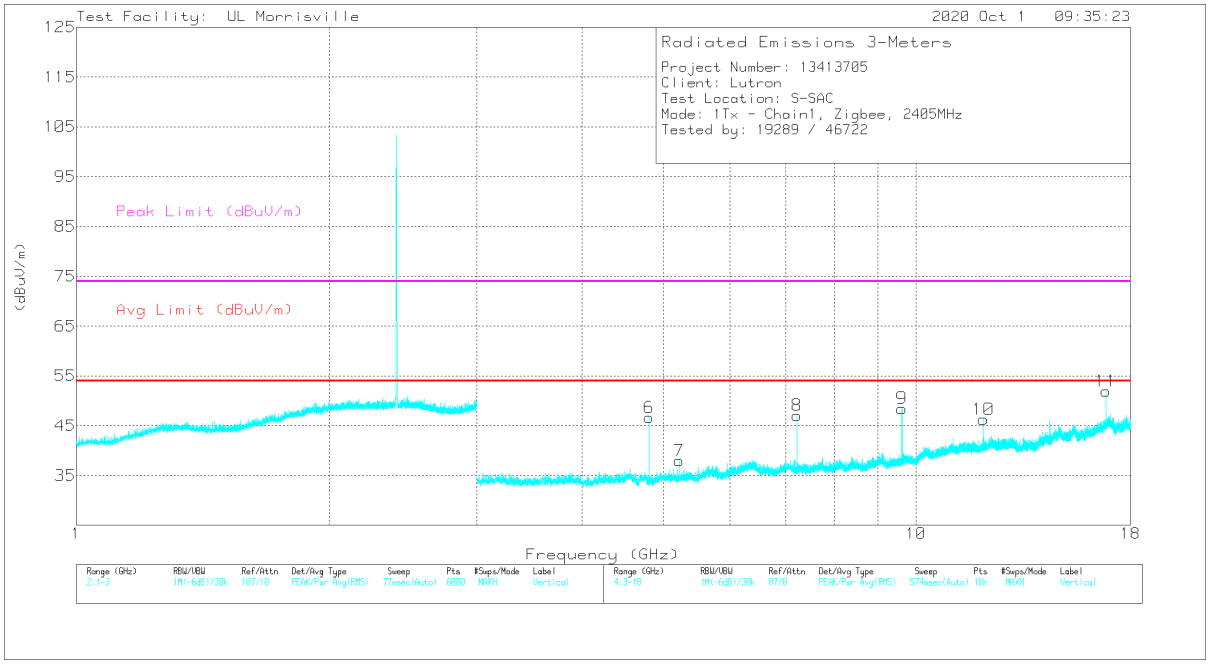
## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**



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## RADIATED EMISSIONS

| Markers | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 dB(/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.80903 | 49.2 | PK2 | 34 | -30.9 | 0 | 52.3 | - | - | 74 | -21.7 | 194 | 344 | H |
| | * ** 4.80897 | 41.25 | ADV | 34 | -30.9 | -10.46 | 33.89 | 54 | -20.11 | - | - | 194 | 344 | H |
| 3 | * ** 11.74035 | 33.81 | PK2 | 38.5 | -24.1 | 0 | 48.21 | - | - | 74 | -25.79 | 17 | 234 | H |
| | * ** 11.73934 | 20.8 | ADV | 38.5 | -24.1 | -10.46 | 24.74 | 54 | -29.26 | - | - | 17 | 234 | H |
| 4 | * ** 12.02234 | 37.86 | PK2 | 38.7 | -24.1 | 0 | 52.46 | - | - | 74 | -21.54 | 344 | 116 | H |
| | * ** 12.02216 | 26.93 | ADV | 38.7 | -24.1 | -10.46 | 31.07 | 54 | -22.93 | - | - | 344 | 116 | H |
| 5 | * ** 15.47265 | 33.12 | PK2 | 40.3 | -22.9 | 0 | 50.52 | - | - | 74 | -23.48 | 101 | 253 | H |
| | * ** 15.47429 | 20.62 | ADV | 40.3 | -22.9 | -10.46 | 27.56 | 54 | -26.44 | - | - | 101 | 253 | H |
| 6 | * ** 4.81106 | 50.48 | PK2 | 34 | -30.8 | 0 | 53.68 | - | - | 74 | -20.32 | 101 | 358 | V |
| | * ** 4.81094 | 43.01 | ADV | 34 | -30.8 | -10.46 | 35.75 | 54 | -18.25 | - | - | 101 | 358 | V |
| 7 | ** 5.22161 | 38.95 | PK2 | 34.3 | -30.7 | 0 | 42.55 | - | - | 74 | -31.45 | 170 | 302 | V |
| | ** 5.22121 | 27.83 | ADV | 34.3 | -30.7 | -10.46 | 20.97 | 54 | -33.03 | - | - | 170 | 302 | V |
| 10 | * ** 12.02797 | 32.83 | PK2 | 38.7 | -24 | 0 | 47.53 | - | - | 74 | -26.47 | 346 | 343 | V |
| | * ** 12.02757 | 20.6 | ADV | 38.7 | -24 | -10.46 | 24.84 | 54 | -29.16 | - | - | 346 | 343 | V |
| 2 | 7.21274 | 38.97 | Pk | 35.6 | -27.9 | 0 | 46.67 | - | - | - | - | 0-360 | 199 | H |
| 8 | 7.21607 | 39.38 | Pk | 35.6 | -27.9 | 0 | 47.08 | - | - | - | - | 0-360 | 101 | V |
| 9 | 9.6212 | 38.16 | Pk | 36.6 | -26.3 | 0 | 48.46 | - | - | - | - | 0-360 | 199 | V |
| 11 | 16.83911 | 33.46 | Pk | 41.9 | -23.4 | 0 | 51.96 | - | - | - | - | 0-360 | 199 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average
Pk - Peak detector



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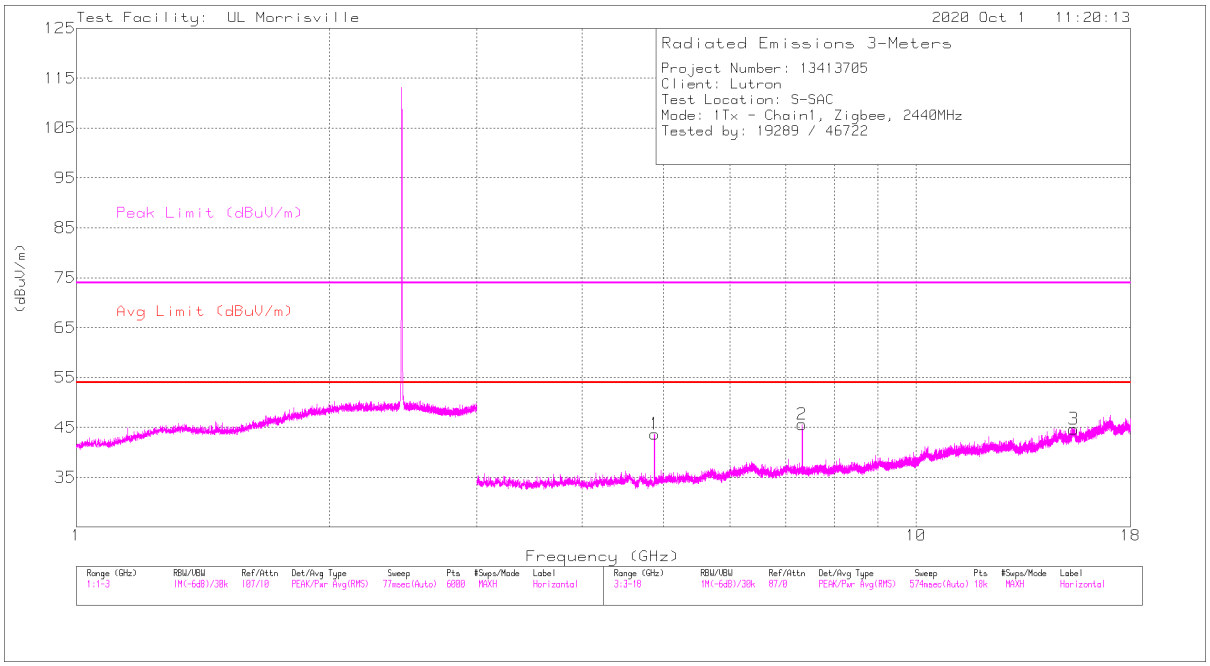
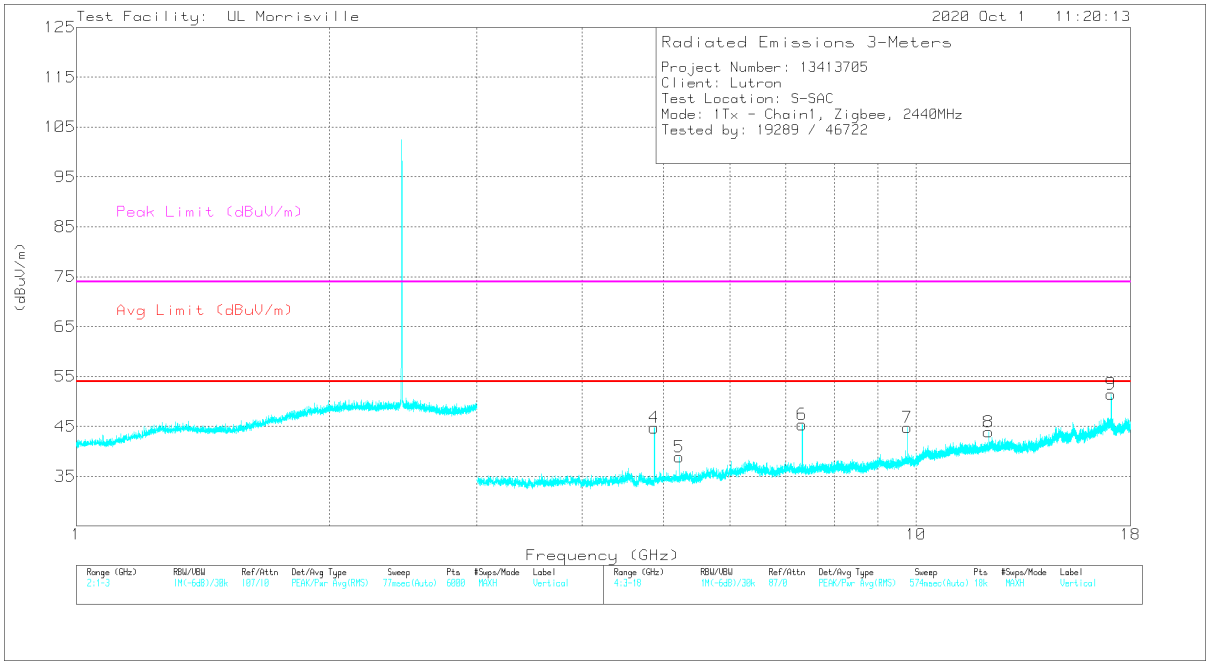
## MID CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**

## RADIATED EMISSIONS

| Markers | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 dB(/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.87895 | 46.18 | PK2 | 34 | -30.8 | 0 | 49.38 | - | - | 74 | -24.62 | 40 | 102 | H |
| | * ** 4.87899 | 36.74 | ADV | 34 | -30.8 | -10.46 | 29.48 | 54 | -24.52 | - | - | 40 | 102 | H |
| 2 | * ** 7.31824 | 43.28 | PK2 | 35.6 | -27.4 | 0 | 51.48 | - | - | 74 | -22.52 | 25 | 127 | H |
| | * ** 7.31833 | 34.11 | ADV | 35.6 | -27.4 | -10.46 | 31.85 | 54 | -22.15 | - | - | 25 | 127 | H |
| 3 | * ** 15.40639 | 32.93 | PK2 | 40.3 | -22 | 0 | 51.23 | - | - | 74 | -22.77 | 71 | 354 | H |
| | * ** 15.4064 | 20.34 | ADV | 40.3 | -22 | -10.46 | 28.18 | 54 | -25.82 | - | - | 71 | 354 | H |
| 4 | * ** 4.8789 | 48 | PK2 | 34 | -30.8 | 0 | 51.2 | - | - | 74 | -22.8 | 114 | 329 | V |
| | * ** 4.88101 | 40.09 | ADV | 34 | -30.8 | -10.46 | 32.83 | 54 | -21.17 | - | - | 114 | 329 | V |
| 5 | ** 5.22113 | 40.03 | PK2 | 34.3 | -30.7 | 0 | 43.63 | - | - | 74 | -30.37 | 355 | 104 | V |
| | ** 5.22117 | 31.69 | ADV | 34.3 | -30.7 | -10.46 | 24.83 | 54 | -29.17 | - | - | 355 | 104 | V |
| 6 | * ** 7.3184 | 41.5 | PK2 | 35.6 | -27.4 | 0 | 49.7 | - | - | 74 | -24.3 | 68 | 363 | V |
| | * ** 7.31839 | 32.05 | ADV | 35.6 | -27.4 | -10.46 | 29.79 | 54 | -24.21 | - | - | 68 | 363 | V |
| 8 | * ** 12.19702 | 37.14 | PK2 | 38.8 | -24.3 | 0 | 51.64 | - | - | 74 | -22.36 | 255 | 311 | V |
| | * ** 12.19715 | 26.35 | ADV | 38.8 | -24.3 | -10.46 | 30.39 | 54 | -23.61 | - | - | 255 | 311 | V |
| 7 | 9.76121 | 33.98 | Pk | 36.7 | -25.9 | 0 | 44.78 | - | - | - | - | 0-360 | 199 | V |
| 9 | 17.07579 | 32.99 | Pk | 41.8 | -23.3 | 0 | 51.49 | - | - | - | - | 0-360 | 199 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average
Pk - Peak detector



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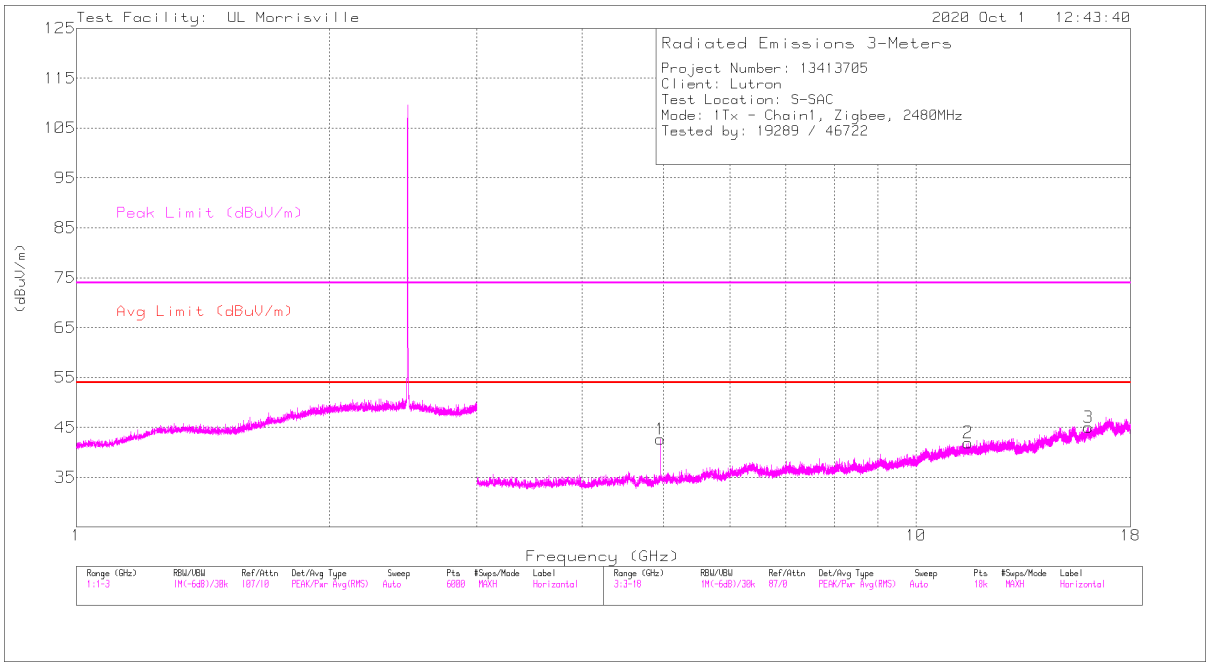
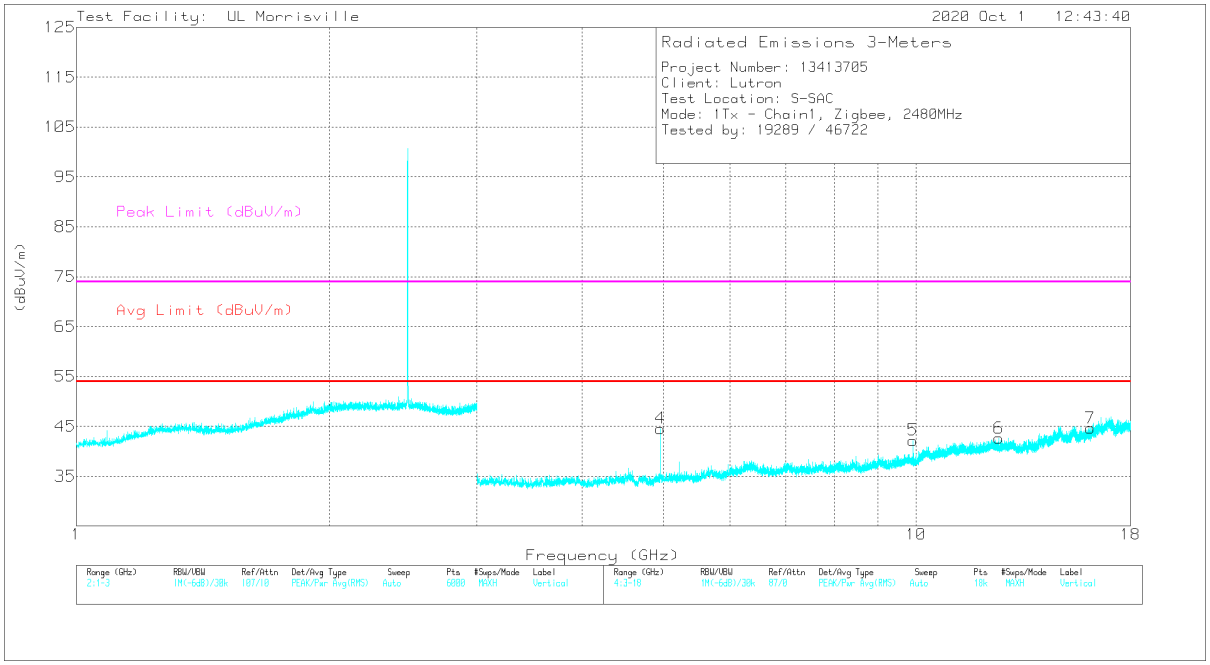
## HIGH CHANNEL RESULTS




**HORIZONTAL**




**VERTICAL**



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## RADIATED EMISSIONS

| Markers | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 dB(/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 4.95883 | 45.2 | PK2 | 33.9 | -31 | 0 | 48.1 | - | - | 74 | -25.9 | 51 | 108 | H |
| | * ** 4.95902 | 36.6 | ADV | 33.9 | -31 | -10.46 | 29.04 | 54 | -24.96 | - | - | 51 | 108 | H |
| 2 | * ** 11.53631 | 33.78 | PK2 | 38.3 | -24.5 | 0 | 47.58 | - | - | 74 | -26.42 | 87 | 197 | H |
| | * ** 11.53678 | 21.01 | ADV | 38.3 | -24.5 | -10.46 | 24.35 | 54 | -29.65 | - | - | 87 | 197 | H |
| 3 | * ** 16.03375 | 35.08 | PK2 | 40.5 | -24.1 | 0 | 51.48 | - | - | 74 | -22.52 | 177 | 323 | H |
| | * ** 16.03311 | 21.94 | ADV | 40.5 | -24.1 | -10.46 | 27.88 | 54 | -26.12 | - | - | 177 | 323 | H |
| 4 | * ** 4.96107 | 47.35 | PK2 | 33.9 | -31 | 0 | 50.25 | - | - | 74 | -23.75 | 101 | 315 | V |
| | * ** 4.96103 | 38.84 | ADV | 33.9 | -31 | -10.46 | 31.28 | 54 | -22.72 | - | - | 101 | 315 | V |
| 6 | * ** 12.55235 | 33.76 | PK2 | 39.1 | -24.6 | 0 | 48.26 | - | - | 74 | -25.74 | 280 | 101 | V |
| | * ** 12.55488 | 20.97 | ADV | 39.1 | -24.6 | -10.46 | 25.01 | 54 | -28.99 | - | - | 280 | 101 | V |
| 7 | * ** 16.12676 | 34.13 | PK2 | 40.6 | -24.4 | 0 | 50.33 | - | - | 74 | -23.67 | 346 | 251 | V |
| | * ** 16.12742 | 21.8 | ADV | 40.6 | -24.4 | -10.46 | 27.54 | 54 | -26.46 | - | - | 346 | 251 | V |
| 5 | 9.91705 | 31 | Pk | 37 | -25.8 | 0 | 42.2 | - | - | - | - | 0-360 | 199 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average
Pk - Peak detector



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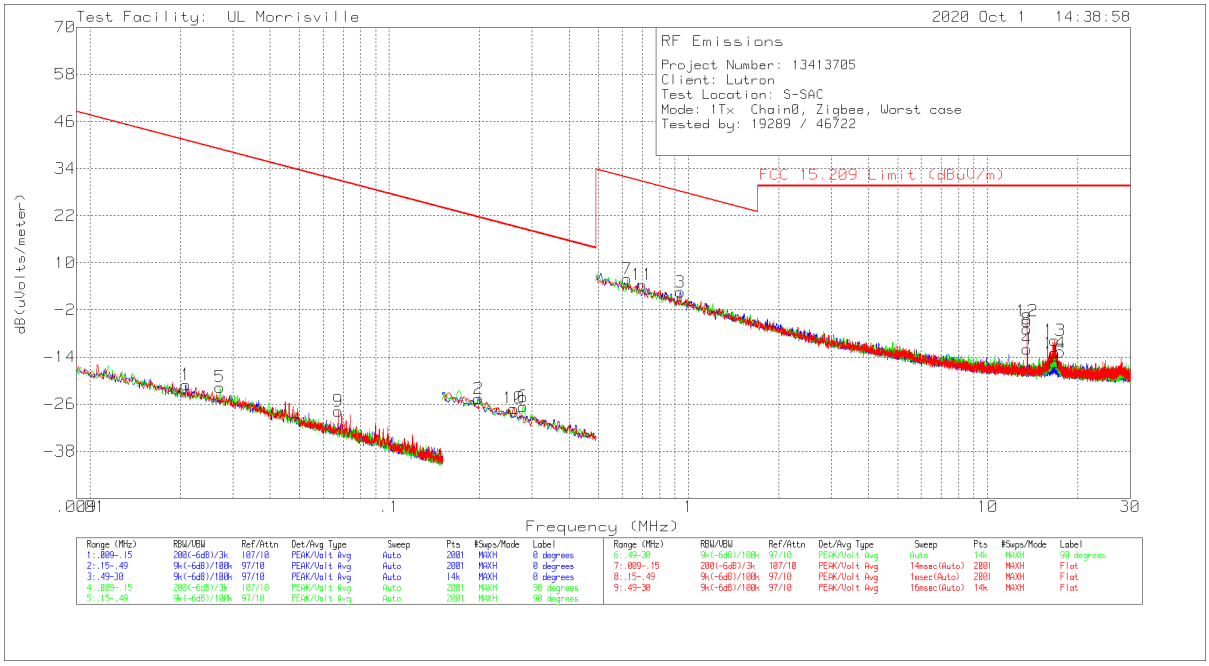
## 10.3. WORST CASE BELOW 30MHZ

Note for below 30 MHz scans: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log and 20*log (test distance / specification distance).

The below 30 MHz limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency 269 KHz resulted in a level of -28.31 dBuV/m, which is equivalent to -28.31-51.5 = -79.81 dBuA/m, which has the same margin, -47.32 dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

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




**ANTENNA- THREE ORIENTATIONS**

## Below 30MHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0079 (dB/m) | Cbl (dB) | Dist. Corr. Factor (dB) | Corrected Reading dB(uV/m) | FCC 15.209 QP/AV Limit (dBuV/m) | FCC 15.209 PK Limit (dBuV/m) | Worse -case Margin (dB) | Azimuth (Degs) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .02093 | 45.14 | Pk | 13.7 | .1 | -80 | -21.06 | 41.19 | 61.19 | -62.25 | 0-360 |
| 5 | .02718 | 44.84 | Pk | 13.4 | .1 | -80 | -21.66 | 38.92 | 58.92 | -60.58 | 0-360 |
| 9 | .0675 | 40.84 | Pk | 11.3 | .1 | -80 | -27.76 | 31.02 | 51.02 | -58.78 | 0-360 |
| 2 | .19905 | 44.51 | Pk | 10.8 | .1 | -80 | -24.59 | 21.62 | 41.62 | -46.21 | 0-360 |
| 10 | .26101 | 42.1 | Pk | 10.7 | .1 | -80 | -27.1 | 19.27 | 39.27 | -46.37 | 0-360 |
| 6 | .28065 | 42.55 | Pk | 10.7 | .1 | -80 | -26.65 | 18.64 | 38.64 | -45.29 | 0-360 |
| 7 | .62491 | 34.86 | Pk | 10.8 | .2 | -40 | 5.86 | 31.69 | - | -25.83 | 0-360 |
| 11 | .7008 | 33.37 | Pk | 10.8 | .2 | -40 | 4.37 | 30.69 | - | -26.32 | 0-360 |
| 3 | .939 | 31.4 | Pk | 10.9 | .2 | -40 | 2.5 | 28.15 | - | -25.65 | 0-360 |
| 8 | 13.5596 | 22 | Pk | 10.4 | .7 | -40 | -6.9 | 29.54 | - | -36.44 | 0-360 |
| 12 | 13.56065 | 24.02 | Pk | 10.4 | .7 | -40 | -4.88 | 29.54 | - | -34.42 | 0-360 |
| 4 | 13.56171 | 16.95 | Pk | 10.4 | .7 | -40 | -11.95 | 29.54 | - | -41.49 | 0-360 |
| 13 | 16.76165 | 19.2 | Pk | 10.2 | .8 | -40 | -9.8 | 29.54 | - | -39.34 | 0-360 |
| 14 | 16.77535 | 16 | Pk | 10.2 | .8 | -40 | -13 | 29.54 | - | -42.54 | 0-360 |
| 15 | 16.77852 | 13.58 | Pk | 10.2 | .8 | -40 | -15.42 | 29.54 | - | -44.96 | 0-360 |

Pk - Peak detector



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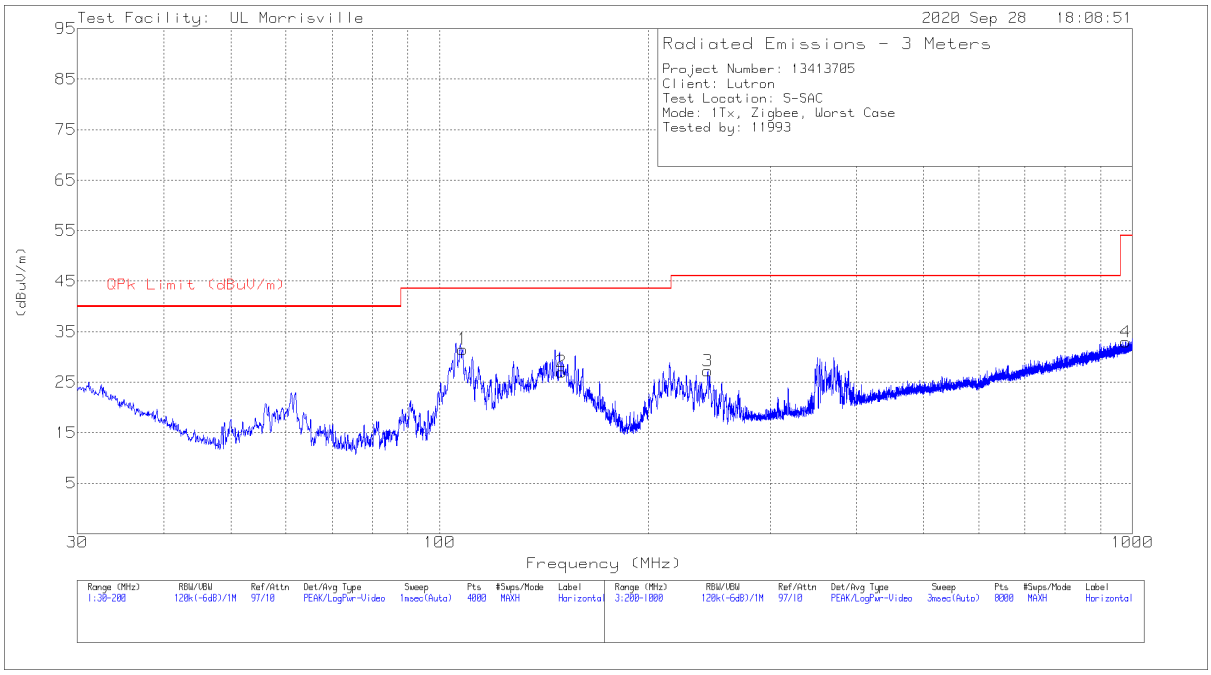
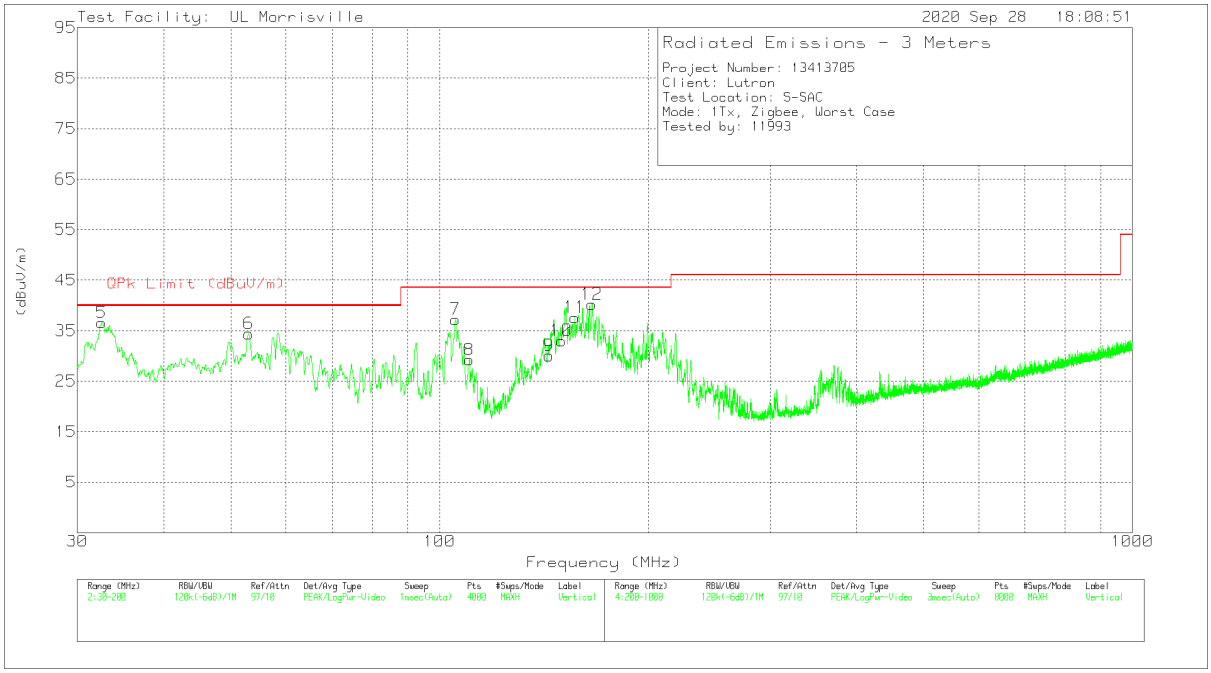
## 10.4. WORST CASE BELOW 1 GHZ

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




**HORIZONTAL**




**VERTICAL**

## Below 1GHz Data

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | AT0081 AF (dB/m) | Amp/Cbl (dB) | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 108.0077 | 43.72 | Pk | 18.3 | -30.5 | 31.52 | 43.52 | -12 | 0-360 | 198 | H |
| 2 | * ** 150.0086 | 38.35 | Pk | 18.7 | -30 | 27.05 | 43.52 | -16.47 | 0-360 | 298 | H |
| 8 | * ** 110.4733 | 40.92 | Pk | 18.8 | -30.5 | 29.22 | 43.52 | -14.3 | 0-360 | 101 | V |
| 10 | * ** 149.966 | 44.33 | Pk | 18.7 | -30 | 33.03 | 43.52 | -10.49 | 0-360 | 101 | V |
| 11 | * ** 156.8103 | 41.16 | Qp | 18.6 | -30 | 29.76 | 43.52 | -13.76 | 360 | 117 | V |
| 12 | * ** 165.8374 | 41.44 | Qp | 18.1 | -29.9 | 29.64 | 43.52 | -13.88 | 172 | 111 | V |
| 3 | * ** 243.9057 | 38.83 | Pk | 17.7 | -29.3 | 27.23 | 46.02 | -18.79 | 0-360 | 101 | H |
| 4 | * ** 978.0011 | 28.37 | Pk | 29.1 | -24.5 | 32.97 | 53.97 | -21 | 0-360 | 199 | H |
| 5 | 32.5507 | 42.77 | Pk | 25.3 | -31.5 | 36.57 | - | - | 0-360 | 101 | V |
| 6 | 53.0622 | 52.11 | Pk | 13.5 | -31.2 | 34.41 | - | - | 0-360 | 101 | V |
| 7 | 105.4995 | 49.83 | Pk | 17.9 | -30.5 | 37.23 | - | - | 0-360 | 101 | V |
| 9 | 143.8445 | 41.27 | Pk | 18.9 | -30.1 | 30.07 | - | - | 0-360 | 101 | V |

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



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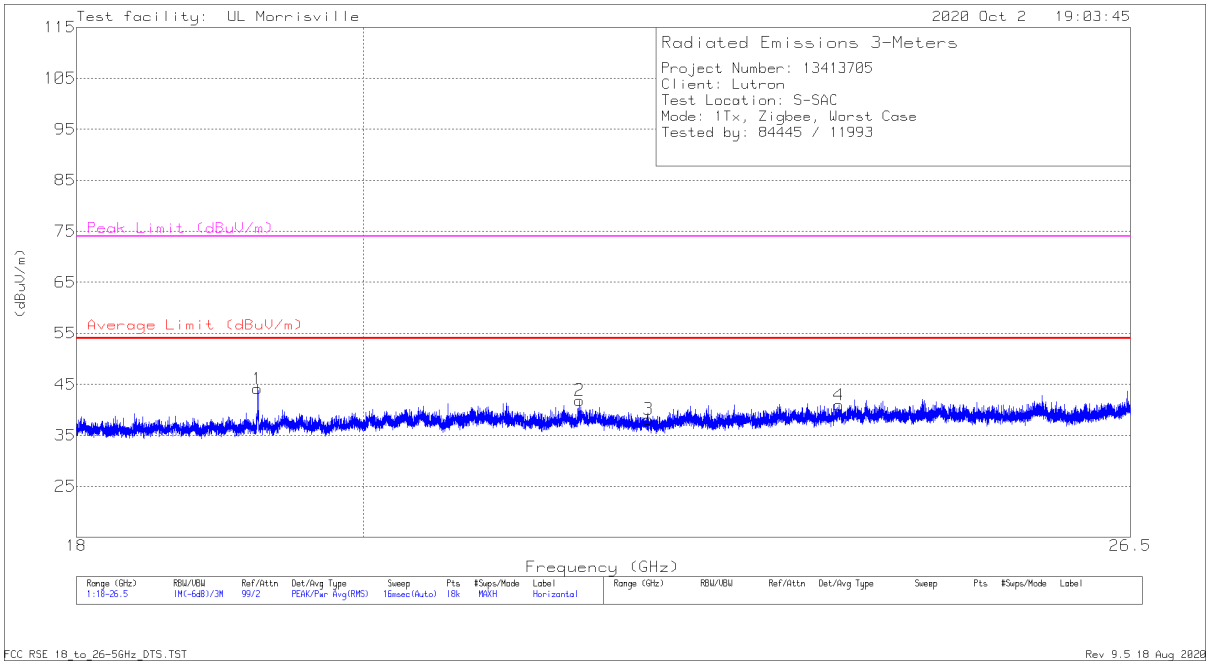
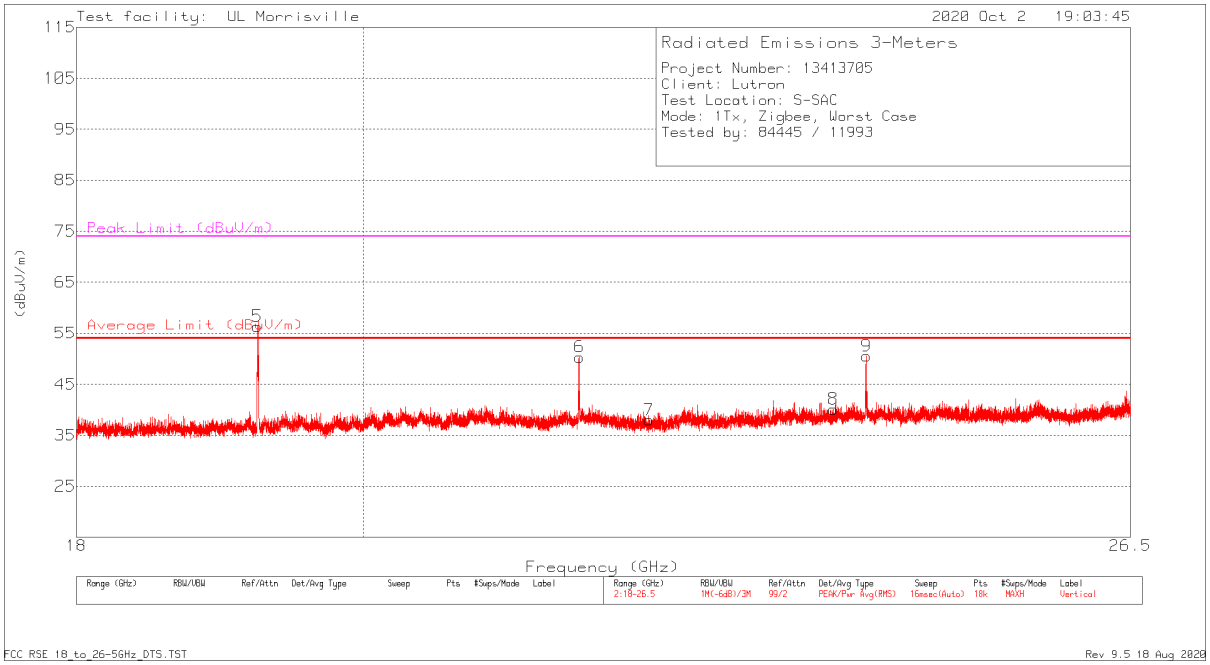
## 10.5. WORST CASE 18-26 GHZ

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




**HORIZONTAL**




**VERTICAL**

## 18 – 26GHz DATA

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0076 AF (dB/m) | Amp/Cbl (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * ** 19.23446 | 50.52 | Pk | 32.7 | -39.1 | 0 | 44.12 | 54 | -9.88 | 74 | -29.88 | 0-360 | 299 | H |
| 3 | * ** 22.20631 | 43.88 | Pk | 33.7 | -39.4 | 0 | 38.18 | 54 | -15.82 | 74 | -35.82 | 0-360 | 250 | H |
| 4 | * ** 23.81007 | 45.25 | Pk | 34.1 | -38.4 | 0 | 40.95 | 54 | -13.05 | 74 | -33.05 | 0-360 | 250 | H |
| 5 | * ** 19.23595 | 63.14 | PK2 | 32.7 | -39.1 | 0 | 56.74 | - | - | 74 | -17.26 | 178 | 222 | V |
|  | * ** 19.23549 | 53.22 | ADV | 32.7 | -39.1 | -10.46 | 36.36 | 54 | -17.64 | - | - | 178 | 222 | V |
| 7 | * ** 22.21151 | 43.62 | Pk | 33.7 | -39.3 | 0 | 38.02 | 54 | -15.98 | 74 | -35.98 | 0-360 | 101 | V |
| 8 | * ** 23.76426 | 44.74 | Pk | 34 | -38.6 | 0 | 40.14 | 54 | -13.86 | 74 | -33.86 | 0-360 | 101 | V |
| 2 | 21.65 | 47.76 | Pk | 33.4 | -39.3 | 0 | 41.86 | 54 | -12.14 | 74 | -32.14 | 0-360 | 101 | H |
| 6 | 21.65 | 56.26 | Pk | 33.4 | -39.3 | 0 | 50.36 | 54 | -3.64 | 74 | -23.64 | 0-360 | 250 | V |
| 9 | 24.05516 | 54.75 | Pk | 34.1 | -38.3 | 0 | 50.55 | 54 | -3.45 | 74 | -23.45 | 0-360 | 299 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADV - Linear Voltage Average



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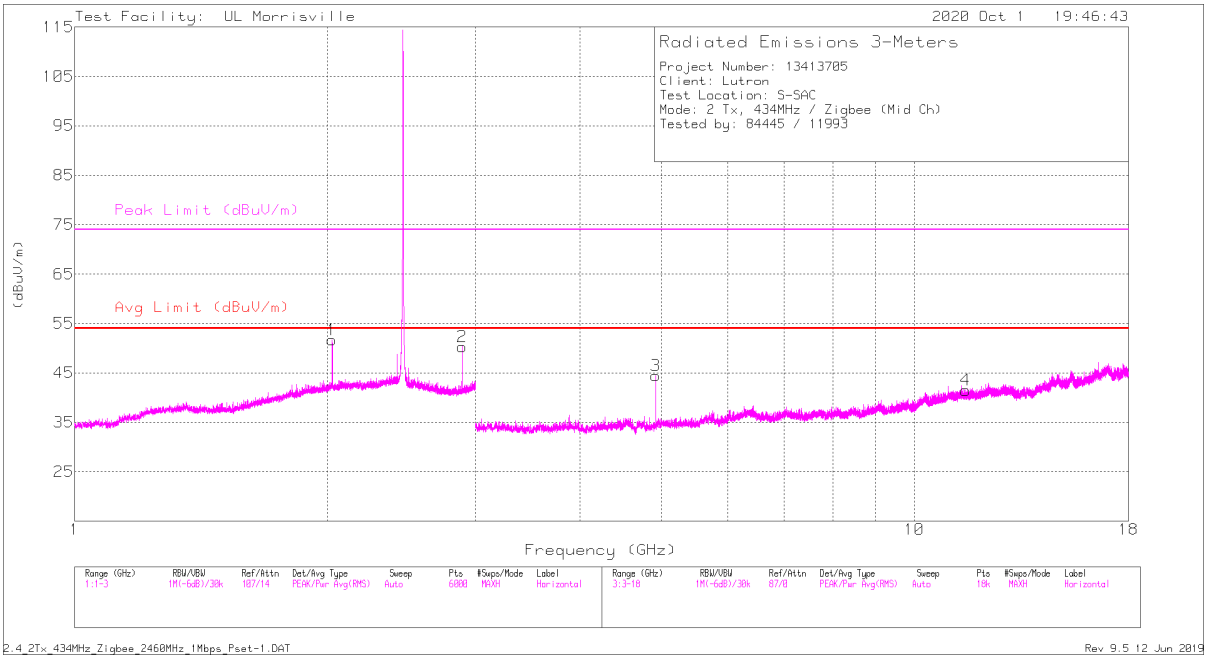
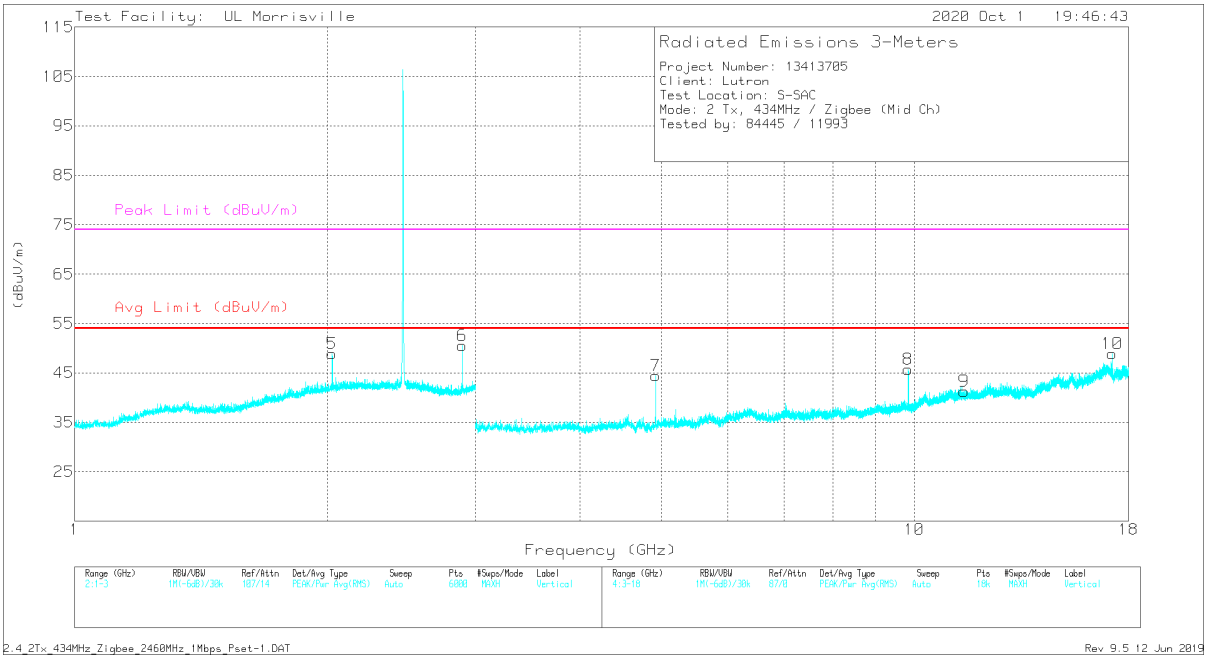
## 10.6. SIMULTANEOUS TRANSMISSION

**SPURIOUS EMISSIONS 1 TO 18 GHz (434MHz & ZIGBEE TRANSMITTERS ON CONFIGURATION)**




**HORIZONTAL**




**VERTICAL**

## Above 1GHz Data

| Markers | Frequency (GHz) | Meter Reading (dBuV) | Det | AT0072 dB(/m) | Amp/Cbl/Fltr/Pad (dB) | DC Corr (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | * ** 2.89411 | 48.62 | PK2 | 32.7 | -25.8 | 0 | 55.52 | - | - | 74 | -18.48 | 228 | 101 | H |
| | * ** 2.89358 | 41 | ADV | 32.7 | -25.8 | -10.46 | 37.44 | 54 | -16.56 | - | - | 228 | 101 | H |
| 6 | * ** 2.89301 | 48.45 | PK2 | 32.7 | -25.8 | 0 | 55.35 | - | - | 74 | -18.65 | 240 | 199 | V |
| | * ** 2.89351 | 41.04 | ADV | 32.7 | -25.8 | -10.46 | 37.48 | 54 | -16.52 | - | - | 240 | 199 | V |
| 3 | * ** 4.9189 | 46.53 | PK2 | 33.9 | -30.9 | 0 | 49.53 | - | - | 74 | -24.47 | 179 | 368 | H |
| | * ** 4.91899 | 38.29 | ADV | 33.9 | -30.9 | -10.46 | 30.83 | 54 | -23.17 | - | - | 179 | 368 | H |
| 4 | * ** 11.51211 | 34.73 | PK2 | 38.2 | -24.5 | 0 | 48.43 | - | - | 74 | -25.57 | 62 | 280 | H |
| | * ** 11.51195 | 21.15 | ADV | 38.2 | -24.5 | -10.46 | 24.39 | 54 | -29.61 | - | - | 62 | 280 | H |
| 7 | * ** 4.91902 | 48.37 | PK2 | 33.9 | -30.9 | 0 | 51.37 | - | - | 74 | -22.63 | 99 | 298 | V |
| | * ** 4.91897 | 40.75 | ADV | 33.9 | -30.9 | -10.46 | 33.29 | 54 | -20.71 | - | - | 99 | 298 | V |
| 9 | * ** 11.4661 | 34.5 | PK2 | 38.2 | -24.3 | 0 | 48.4 | - | - | 74 | -25.6 | 228 | 295 | V |
| | * ** 11.46656 | 21.01 | ADV | 38.2 | -24.3 | -10.46 | 24.45 | 54 | -29.55 | - | - | 228 | 295 | V |
| 1 | 2.02617 | 42.64 | Pk | 31.7 | -22.6 | 0 | 51.74 | - | - | - | - | 0-360 | 101 | H |
| 5 | 2.02684 | 39.82 | Pk | 31.7 | -22.6 | 0 | 48.92 | - | - | - | - | 0-360 | 200 | V |
| 8 | 9.83788 | 34.76 | Pk | 36.8 | -25.8 | 0 | 45.76 | - | - | - | - | 0-360 | 199 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average
Pk - Peak detector

Note: BLE and Zigbee radios cannot operate at the same time. Periodic operator and Zigbee radios were configured to transmit at their mid channel, Zigbee radio transmitted on ANT2 as these were the worse-case conditions.



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# 11. AC POWER LINE CONDUCTED EMISSIONS

**LIMITS**

FCC §15.207 (a)

RSS-Gen 8.8

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

* Decreases with the logarithm of the frequency.

**RESULTS**



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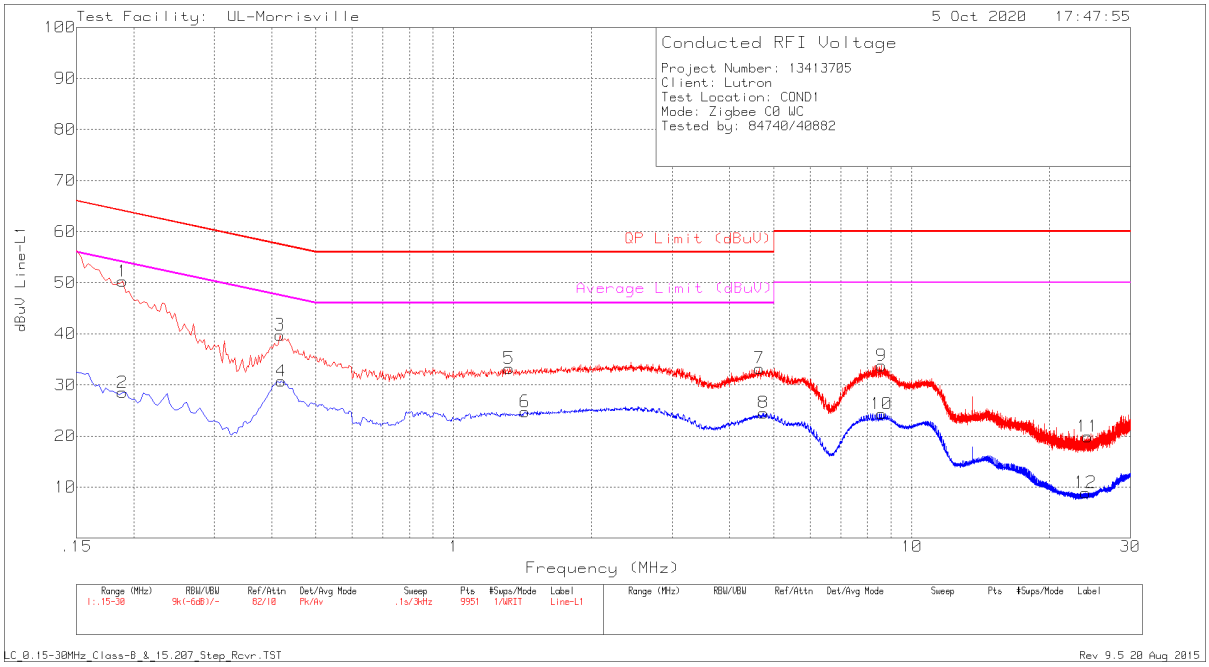
### 11.1.1. AC Power Line – Antenna 1

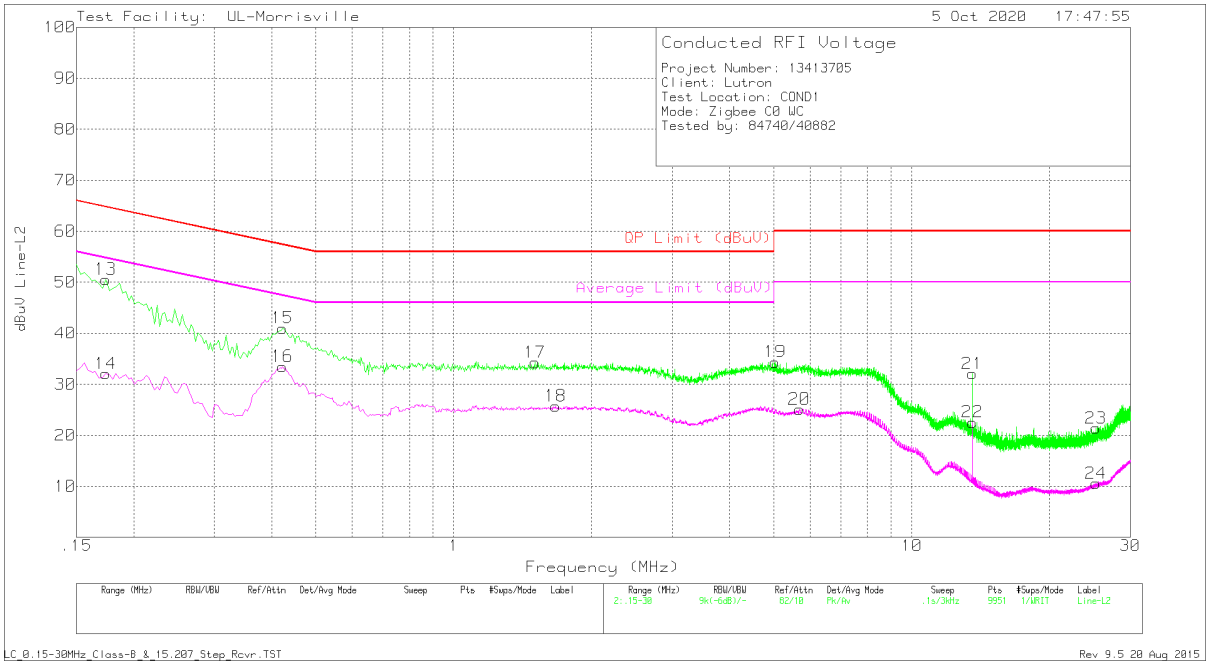
## LINE 1 RESULTS




| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .189 | 40.37 | Pk | .2 | 9.7 | 50.27 | 64.08 | -13.81 | - | - |
| 2 | .189 | 18.64 | Av | .2 | 9.7 | 28.54 | - | - | 54.08 | -25.54 |
| 3 | .417 | 29.98 | Pk | .1 | 9.7 | 39.78 | 57.51 | -17.73 | - | - |
| 4 | .42 | 20.96 | Av | .1 | 9.7 | 30.76 | - | - | 47.45 | -16.69 |
| 5 | 1.32 | 23.45 | Pk | 0 | 9.8 | 33.25 | 56 | -22.75 | - | - |
| 6 | 1.431 | 14.96 | Av | 0 | 9.8 | 24.76 | - | - | 46 | -21.24 |
| 7 | 4.641 | 23.37 | Pk | 0 | 9.9 | 33.27 | 56 | -22.73 | - | - |
| 8 | 4.743 | 14.64 | Av | 0 | 9.9 | 24.54 | - | - | 46 | -21.46 |
| 9 | 8.592 | 23.68 | Pk | .1 | 10 | 33.78 | 60 | -26.22 | - | - |
| 10 | 8.586 | 14.29 | Av | .1 | 10 | 24.39 | - | - | 50 | -25.61 |
| 11 | 24.231 | 9.48 | Pk | .2 | 10.2 | 19.88 | 60 | -40.12 | - | - |
| 12 | 23.946 | -1.49 | Av | .2 | 10.2 | 8.91 | - | - | 50 | -41.09 |

Pk - Peak detector
Av - Average detection

## LINE 2 RESULTS




| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | .174 | 40.69 | Pk | .2 | 9.7 | 50.59 | 64.77 | -14.18 | - | - |
| 14 | .174 | 22.18 | Av | .2 | 9.7 | 32.08 | - | - | 54.77 | -22.69 |
| 15 | .423 | 31.11 | Pk | .1 | 9.8 | 41.01 | 57.39 | -16.38 | - | - |
| 16 | .423 | 23.61 | Av | .1 | 9.8 | 33.51 | - | - | 47.39 | -13.88 |
| 17 | 1.503 | 24.47 | Pk | 0 | 9.8 | 34.27 | 56 | -21.73 | - | - |
| 18 | 1.668 | 15.95 | Av | 0 | 9.8 | 25.75 | - | - | 46 | -20.25 |
| 19 | 5.034 | 24.38 | Pk | .1 | 9.9 | 34.38 | 60 | -25.62 | - | - |
| 20 | 5.679 | 15.13 | Av | .1 | 9.9 | 25.13 | - | - | 50 | -24.87 |
| 21 | 13.56 | 21.98 | Pk | .1 | 10 | 32.08 | 60 | -27.92 | - | - |
| 22 | 13.56 | 12.48 | Av | .1 | 10 | 22.58 | - | - | 50 | -27.42 |
| 23 | 25.206 | 11.02 | Pk | .2 | 10.2 | 21.42 | 60 | -38.58 | - | - |
| 24 | 25.239 | .19 | Av | .2 | 10.2 | 10.59 | - | - | 50 | -39.41 |

Pk - Peak detector
Av - Average detection



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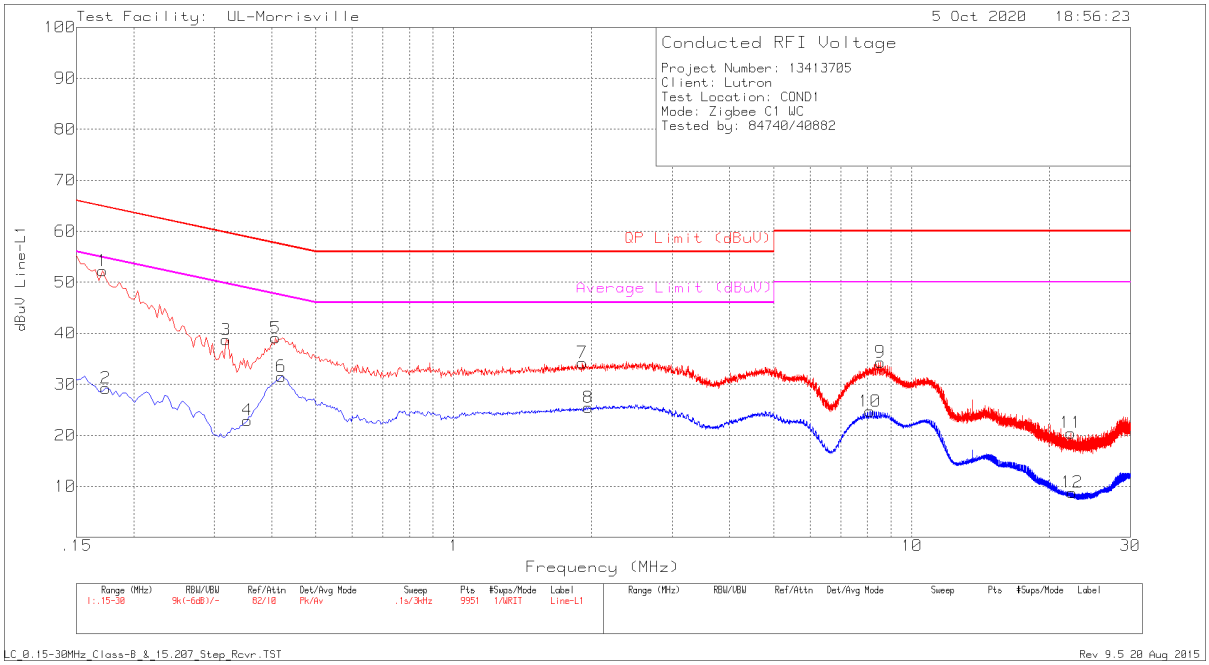
### 11.1.2. AC Power Line – Antenna 2

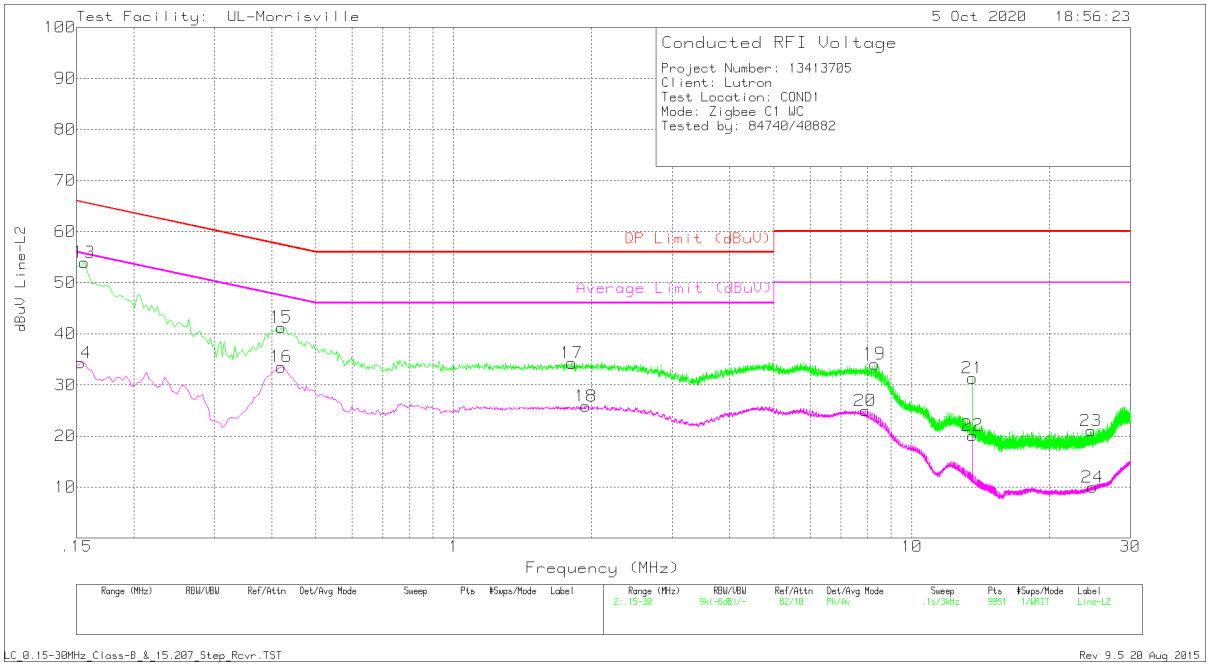
## LINE 1 RESULTS




| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .171 | 42.34 | Pk | .2 | 9.7 | 52.24 | 64.91 | -12.67 | - | - |
| 2 | .174 | 19.33 | Av | .2 | 9.7 | 29.23 | - | - | 54.77 | -25.54 |
| 3 | .318 | 28.87 | Pk | .1 | 9.8 | 38.77 | 59.76 | -20.99 | - | - |
| 4 | .354 | 13.15 | Av | .1 | 9.7 | 22.95 | - | - | 48.87 | -25.92 |
| 5 | .408 | 29.29 | Pk | .1 | 9.7 | 39.09 | 57.69 | -18.6 | - | - |
| 6 | .42 | 21.74 | Av | .1 | 9.7 | 31.54 | - | - | 47.45 | -15.91 |
| 7 | 1.908 | 24.43 | Pk | 0 | 9.8 | 34.23 | 56 | -21.77 | - | - |
| 8 | 1.968 | 15.67 | Av | 0 | 9.8 | 25.47 | - | - | 46 | -20.53 |
| 9 | 8.544 | 24.25 | Pk | .1 | 10 | 34.35 | 60 | -25.65 | - | - |
| 10 | 8.103 | 14.62 | Av | .1 | 10 | 24.72 | - | - | 50 | -25.28 |
| 11 | 22.26 | 10.19 | Pk | .2 | 10.1 | 20.49 | 60 | -39.51 | - | - |
| 12 | 22.398 | -1.49 | Av | .2 | 10.1 | 8.81 | - | - | 50 | -41.19 |

Pk - Peak detector
Av - Average detection

## LINE 2 RESULTS




| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | LISN VCF (dB) | Cbl/Limiter (dB) | Corrected Reading dBuV | QP Limit (dBuV) | Margin (dB) | Average Limit (dBuV) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | .156 | 44.11 | Pk | .2 | 9.7 | 54.01 | 65.67 | -11.66 | - | - |
| 14 | .153 | 24.38 | Av | .2 | 9.7 | 34.28 | - | - | 55.84 | -21.56 |
| 15 | .42 | 31.45 | Pk | .1 | 9.7 | 41.25 | 57.45 | -16.2 | - | - |
| 16 | .42 | 23.73 | Av | .1 | 9.7 | 33.53 | - | - | 47.45 | -13.92 |
| 17 | 1.809 | 24.47 | Pk | 0 | 9.8 | 34.27 | 56 | -21.73 | - | - |
| 18 | 1.944 | 16.06 | Av | 0 | 9.8 | 25.86 | - | - | 46 | -20.14 |
| 19 | 8.286 | 24.02 | Pk | .1 | 10 | 34.12 | 60 | -25.88 | - | - |
| 20 | 7.905 | 14.84 | Av | .1 | 10 | 24.94 | - | - | 50 | -25.06 |
| 21 | 13.563 | 21.22 | Pk | .1 | 10 | 31.32 | 60 | -28.68 | - | - |
| 22 | 13.56 | 10.01 | Av | .1 | 10 | 20.11 | - | - | 50 | -29.89 |
| 23 | 24.606 | 10.67 | Pk | .2 | 10.2 | 21.07 | 60 | -38.93 | - | - |
| 24 | 24.798 | -.43 | Av | .2 | 10.2 | 9.97 | - | - | 50 | -40.03 |

Pk - Peak detector
Av - Average detection



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# 12. SETUP PHOTOS

Please refer to R13413705-EP1 for setup photos

## END OF TEST REPORT