



**FCC CFR47 PART 15 SUBPART C  
ISED CANADA RSS-210 ISSUE 10**

**TEST REPORT**

**FOR**

**WIRELESS PROCESSOR**

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

**FCC ID: JPZ0129  
IC: 2851A-JPZ0129**

**REPORT NUMBER: R13413705-E1**

**ISSUE DATE: 2020-12-09**

**Prepared for  
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## REVISION HISTORY

Ver.	Issue Date	Revisions	Revised By
1	2020-09-22	Initial Issue	Brian T. Kiewra
2	2020-10-07	Added Simultaneous Transmitter data	Mike Antola
3	2020-11-11	Removed setup photos for submission.	Brian T. Kiewra
4	2020-11-30	Updated low channel spurious limit; removed simultaneous transmitter data; updated test procedure for Section 9.	Mike Antola
5	2020-12-09	Revised model number	Brian T. Kiewra

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Lutron Electronics Co. Inc.  
7200 Suter Road  
Coopersburg, PA 18036-1249, U.S.A.

**EUT DESCRIPTION:** Wireless Processor

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

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

**RECEIVED DATE:** 2020-08-03

**DATE TESTED:** 2020-09-11 to 2020-09-13

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Complies
ISED CANADA RSS-210 Issue 10	Complies
ISED CANADA 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.

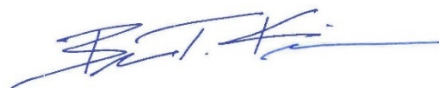
This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim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

Approved & Released  
For UL LLC by:



Francisco de Anda  
Staff Engineer  
UL Verification Services Inc.

Prepared By:



Brian T. Kiewra  
Project Engineer  
UL – Consumer Technology Division

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 5 + Amendment 1, and RSS-210 Issue 10.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, NC 27709, 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	
<input type="checkbox"/> Chamber A	<input checked="" type="checkbox"/> Chamber North
<input type="checkbox"/> Chamber C	<input checked="" type="checkbox"/> Chamber South

The above test sites and facilities are covered under FCC Test Firm Registration # 703469.

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

## 4. DECISION RULES AND MEASUREMENT UNCERTAINTY

### 4.1. 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.

### 4.2. 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.)

### 4.3. 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	$\pm 3.07$ dB
Worst Case Radiated Disturbance	$\pm 4.88$ dB
Worst Case Occupied Bandwidth	$\pm 0.08$ dB / 1.82%

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

### 4.4. SAMPLE CALCULATION

#### RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

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

#### MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Final Voltage (dBuV)} &= \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor} \\ &\text{(dB)} + \text{LISN Insertion Loss.} \\ 36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} &= 46.6 \text{ dBuV} \end{aligned}$$

## **5. EQUIPMENT UNDER TEST**

### **5.1. DESCRIPTION OF EUT**

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

### **5.2. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes a solder connected monopole antenna made by a length of wire, with a nominal gain of -4dBd.

### **5.3. SOFTWARE AND FIRMWARE**

The firmware installed in the EUT during testing was Lutron PWP FCC Test FW.

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

The EUT fundamental was investigated in two orientations, X and Y. It was determined that Y-Axis was worst-case orientation. Therefore, all radiated testing was performed with the EUT in the Y-Axis.

### **5.5. MODIFICATIONS**

No modifications were made during testing.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
PoE Power Supply	PHIHONG	POE16R-1AFG	P202200014A0	NA

### 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	Connects to PoE power supply
2	AC	1	NEMA 1-15-P	NA	NA	Wall-wart connector on PoE power supply.

### SETUP DIAGRAM FOR TESTS

Refer to exhibit R13413705-EP2 for setup diagrams and photos.

## 6. TEST AND MEASUREMENT EQUIPMENT

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

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
<b>0.009-30MHz (Loop Ant.)</b>					
AT0059	Active Loop Antenna	EMCO	6502	2020-08-06	2021-08-06
<b>30-1000 MHz</b>					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-07-27	2021-07-27
<b>1-18 GHz</b>					
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2020-04-27	2021-04-27
<b>Gain-Loss Chains</b>					
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-07-29	2021-07-29
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-07-29	2021-07-29
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-07-28	2021-07-28
<b>Receiver &amp; Software</b>					
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2020-03-27	2021-03-27
SA0026	Spectrum Analyzer	Agilent	N9030A	2020-07-16	2021-07-16
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
<b>Additional Equipment used</b>					
s/n 200037610	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22
HPF012	1GHz high-pass filter, 2W, Fhigh =18GHz	Micro-Tronics	HPM18129	2020-02-19	2021-02-19

Test Equipment Used – Occupied Bandwidth (Morrisville - North Chamber Control Room)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0026	Spectrum Analyzer	Agilent	N9030A	2020-07-16	2021-07-16
s/n 200037610	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

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 (2015-08-20)		
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2020-08-08	2021-08-08

Note: All equipment within calibration at time of use.

## 7. ANTENNA PORT TEST RESULTS

### 7.1. 20 dB AND 99% BW

#### LIMITS

FCC §15.231 (c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

RSS-210 A1.3

The 99% bandwidth of momentarily operated devices shall be less or equal to 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the 99% bandwidth shall be less or equal to 0.5% of the center frequency.

#### TEST PROCEDURE

99% BW: Per ANSI C63.10, Section 6.9.3

The transmitter output is coupled to the spectrum analyzer via an antenna connected to the spectrum analyzer.

The RBW is set to 1% to 5% of the 99 % bandwidth. The VBW is set to approximately 3 times the RBW. The sweep time is coupled. The detection mode is set to peak and the trace mode to max hold as allowed by the RSS-Gen standard for devices that do not transmit continuously. The spectrum analyzer's internal 99% bandwidth function is utilized.

20dB BW: Per ANSI C63.10, Section 6.9.2

The transmitter output is coupled to the spectrum analyzer via an antenna connected to the spectrum analyzer.

The RBW is set to 1% to 5% of the 20dB bandwidth. The VBW is set to approximately 3 times the RBW. The sweep time is coupled. The detection mode is set to peak and the trace mode to max hold. The spectrum analyzer's internal 20dB bandwidth function is utilized.

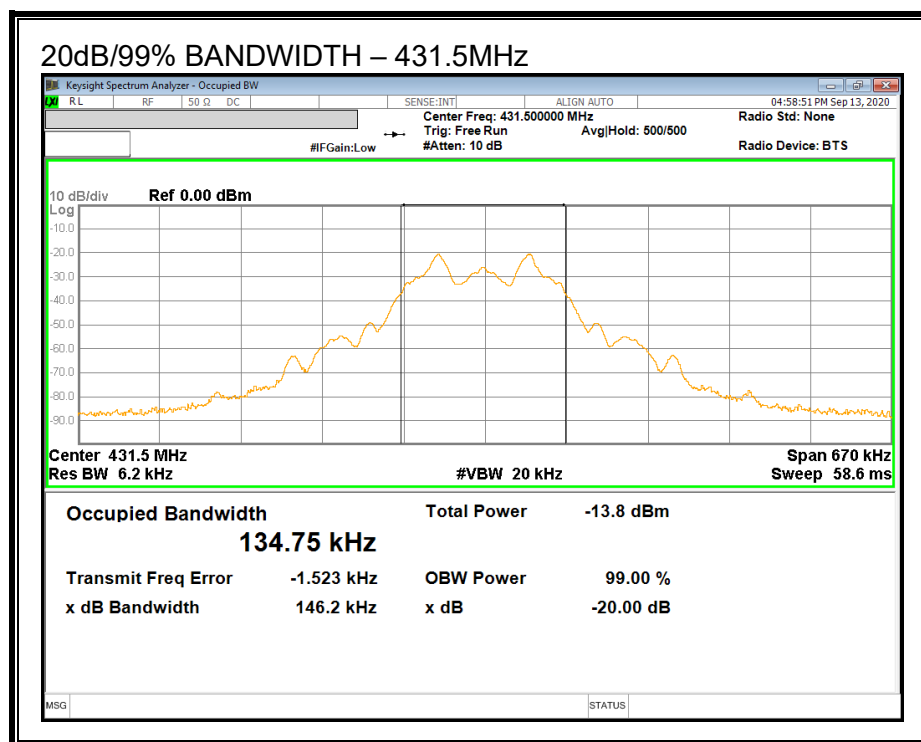
ID:	17051	Test Date:	2020-09-13
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#### 20dB Bandwidth

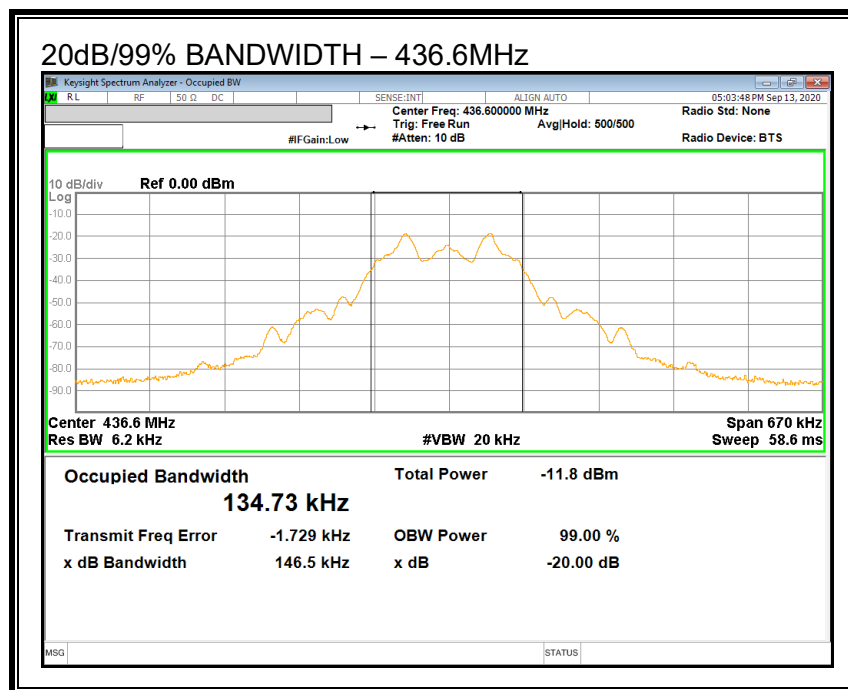
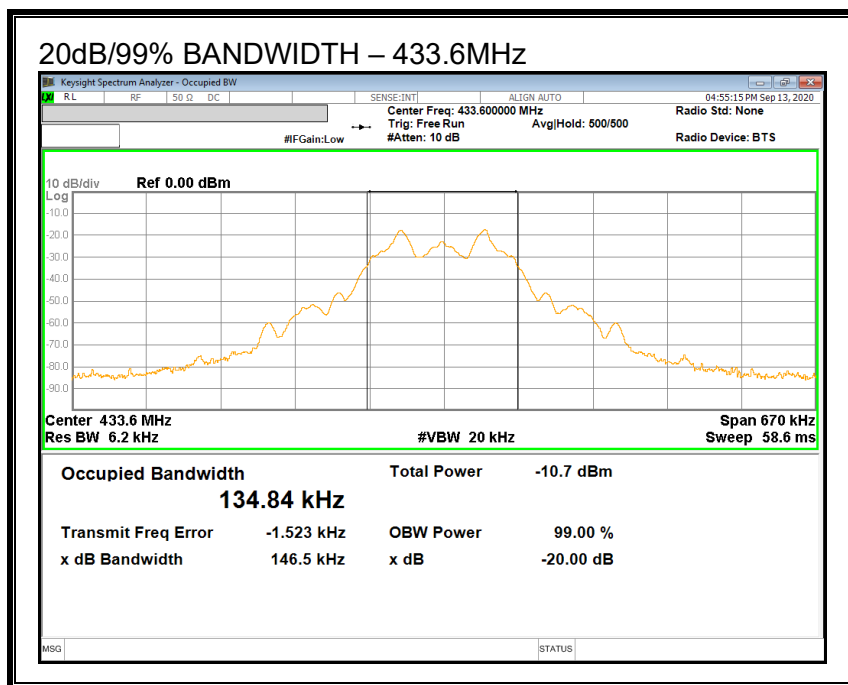
Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
431.5	146.2	1078.75	-932.55
433.6	146.5	1084	-937.5
436.6	146.5	1091.5	-945

#### 99% Bandwidth

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
431.5	134.75	1078.75	-944
433.6	134.84	1084	-949.16
436.6	134.73	1091.5	-956.77



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## 7.2. DUTY CYCLE

### LIMITS

FCC §15.35 (c)

The measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 300 kHz and the VBW is set to 1MHz. The sweep time is coupled and the span is set to 0 Hz. The number of pulses is measured and calculated in a 100 ms scan.

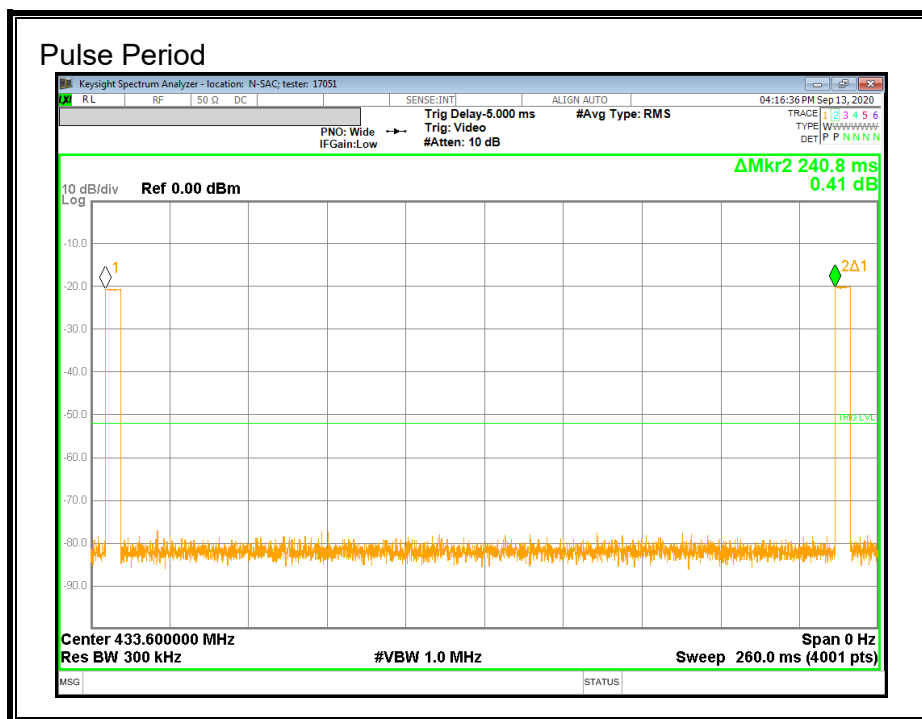
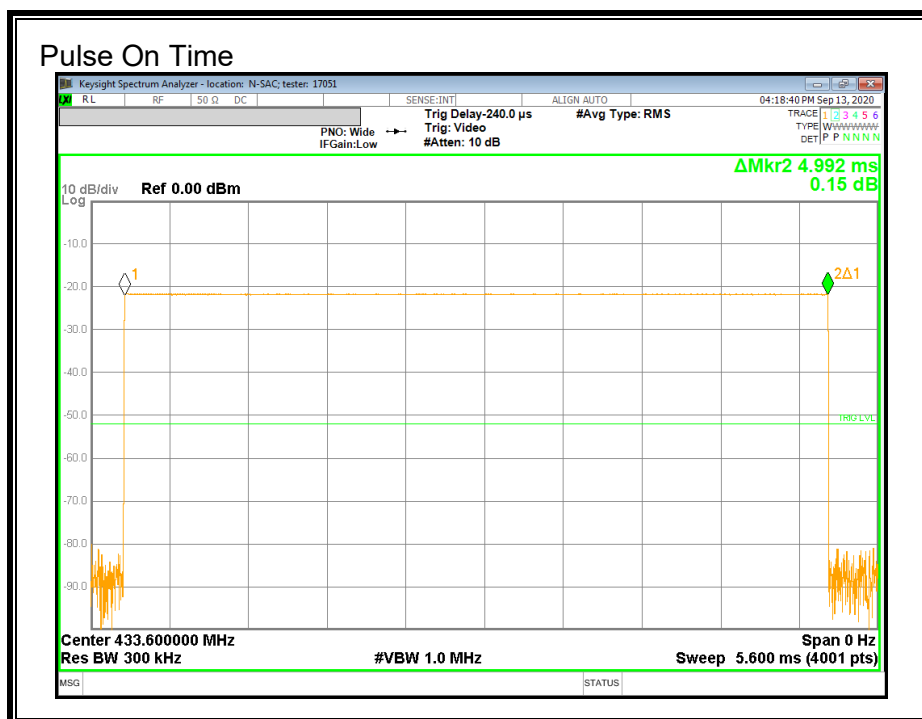
### CALCULATION

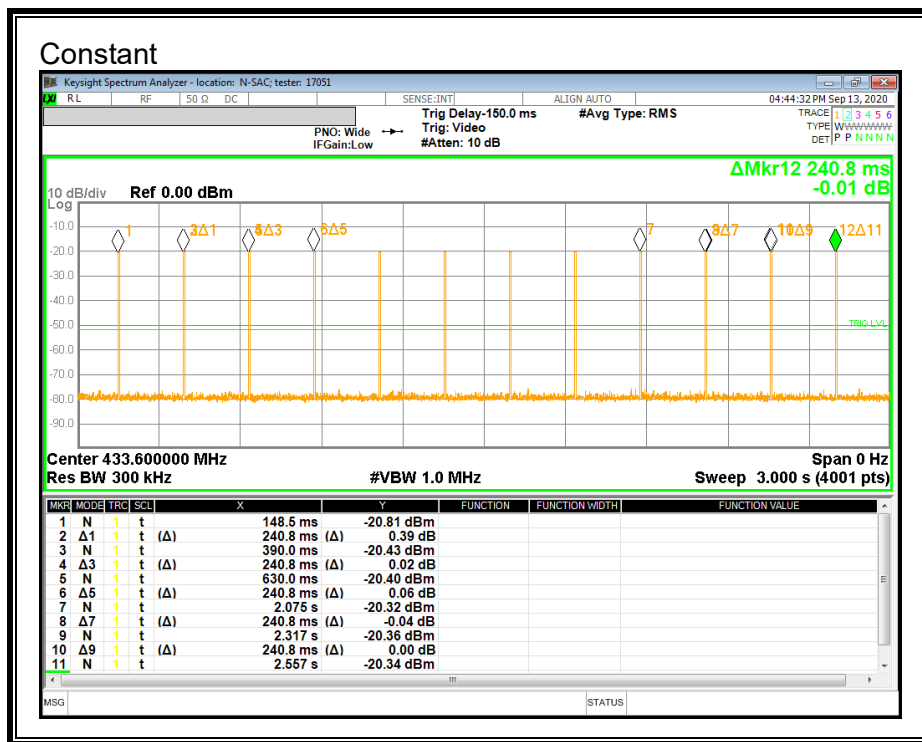
Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle), Where Duty Cycle is (# of long pulses \* long pulse width) + (# of short pulses \* short pulse width) / 100 or T

### RESULTS

Mode	One Period (ms)	Wide Pulse Width (ms)	# of Wide Pulses	Duty Cycle	20*Log Duty Cycle (dB)
Operation	240.8	4.992	1	0.0499	-26.03

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## 7.3. TRANSMISSION TIME

### LIMITS

FCC §15.231 (a) (2)

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A transmitter activated automatically shall cease transmission within 5 seconds after activation.

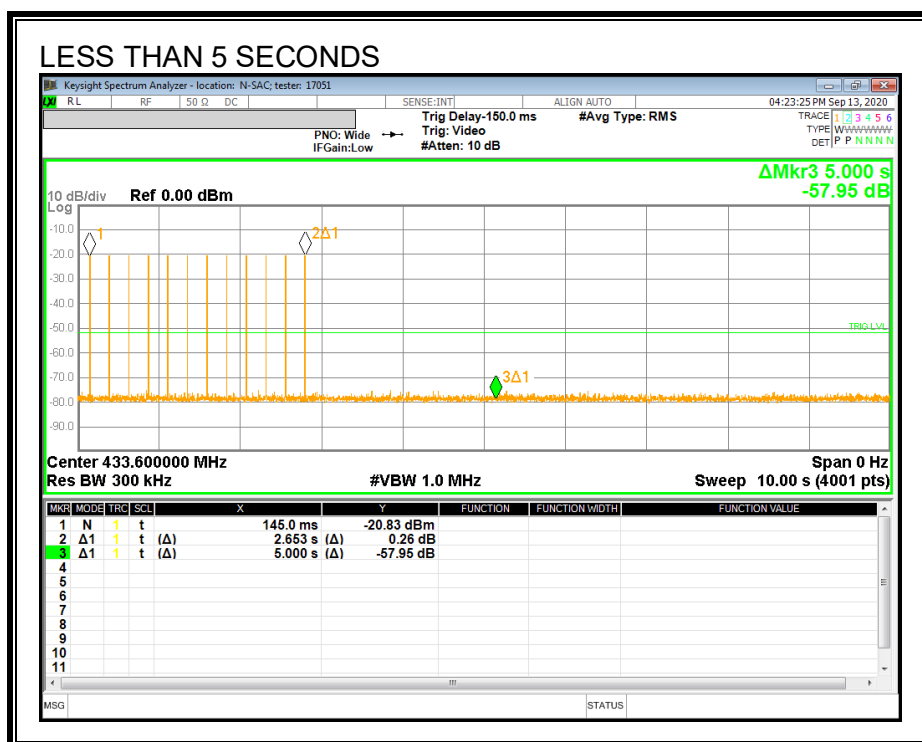
### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 300 kHz and the VBW is set to 1MHz. The sweep time is set to 10 seconds and the span is set to 0 Hz.

### RESULTS

No non-compliance noted.

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Note: Tx stops at ~2.798s

## 8. RADIATED EMISSION TEST RESULTS

### 8.1. TX RADIATED SPURIOUS EMISSION

#### LIMITS

FCC §15.231 (b)  
IC RSS 210 A.1.2

In addition to the provisions of § 15.205, the field strength of emissions from Intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental Frequency (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 <sup>1</sup>	125 to 375 <sup>1</sup>
174 - 260	3,750	375
260 - 470	3,750 to 12,500 <sup>1</sup>	375 to 1,250 <sup>1</sup>
Above 470	12,500	1,250

<sup>1</sup> Linear interpolation

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100 **	3
88 – 216	150 **	3
216 – 960	200 **	3
Above 960	500	3

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

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

#### RSS-GEN §8.9

Frequency	Magnetic Field Strength ( $\mu$ A/m)	Measurement Distance (m)
9 – 490 kHz <sup>Note 1</sup>	6.37/F (F in kHz)	300
490 – 1705kHz	63.77/F (F in kHz)	30
1.705 – 30 MHz	0.08	30

Note 1: The emissions limits for the ranges 9-90kHz and 110-490kHz are based on measurements employing a linear average detector.

## **TEST PROCEDURE**

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

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements 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 peak measurements above 1 GHz, the resolution bandwidth is set to 1 MHz and the video bandwidth is set to 3 MHz. For average measurements above 1GHz, the resolution bandwidth and video bandwidth are set as described in ANSI C63.10:2013 for the applicable measurement. For this test program, Average measurements of the fundamental and its associated harmonics were performed using a Peak detector and duty cycle correction by  $20\log(x)$  where 'x' is the duty cycle of 4.99%, as calculated in Section **Error! Reference source not found.** of this report. For all other spurious emissions, voltage averaging was used.

The spectrum from 9 kHz to 5 GHz was investigated with the transmitter on.

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).

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

## **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.

### 8.1.1. FUNDAMENTAL MEASUREMENTS

ID:	17051	Test Date:	2020-09-11
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Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Amp/Cbl (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Pk Limit (dBuV/m)	Margin (dB)	AV Corrected Reading (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
Low Channel														
431.5405	70.92	Pk	22.6	4.5	0	98.02	100.75	-2.73	-	-	-	211	100	H
431.5405	70.92	Pk	22.6	4.5	-26.03	-	-	-	71.99	80.75	-8.76	211	100	H
431.5411	73.16	Pk	22.6	4.5	0	100.26	100.75	-0.49	-	-	-	98	141	V
431.5411	73.16	Pk	22.6	4.5	-26.03	-	-	-	74.23	80.75	-6.52	98	141	V
Mid Channel														
433.5598	70.92	Pk	22.7	4.5	0	98.12	100.81	-2.69	-	-	-	209	100	H
433.5598	70.92	Pk	22.7	4.5	-26.03	-	-	-	72.09	80.81	-8.72	209	100	H
433.639	73.44	Pk	22.7	4.5	0	100.64	100.81	-0.17	-	-	-	95	140	V
433.639	73.44	Pk	22.7	4.5	-26.03	-	-	-	74.61	80.81	-6.2	95	140	V
High Channel														
436.5571	70.1	Pk	22.7	4.5	0	97.3	100.91	-3.61	-	-	-	216	100	H
436.5571	70.1	Pk	22.7	4.5	-26.03	-	-	-	71.27	80.91	-9.64	216	100	H
436.558	72.83	Pk	22.7	4.5	0	100.03	100.91	-0.88	-	-	-	97	138	V
436.558	72.83	Pk	22.7	4.5	-26.03	-	-	-	74	80.91	-6.91	97	138	V

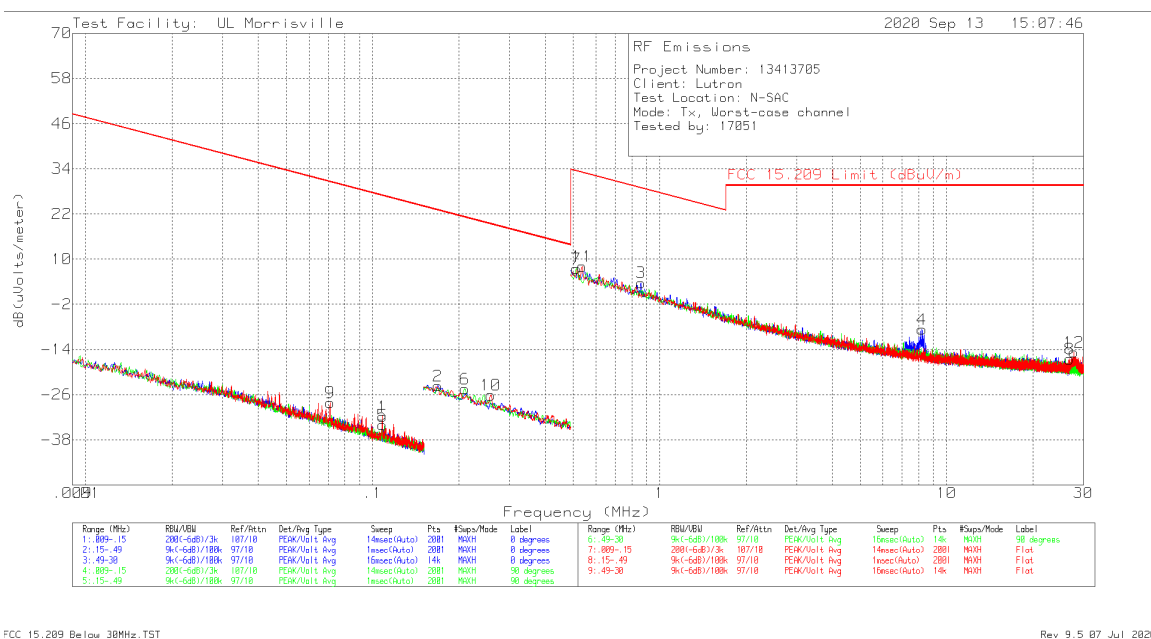
Pk - Peak detector

RBW/VBW = 300kHz/1MHz (>OBW) ; span = 300kHz; Avg type = Voltage;

### 8.1.2. TX SPURIOUS EMISSIONS (0.009-30MHz – WORST CASE)

Note: All measurements were made at a test distance of 3 m. The tabular data was extrapolated from the measurement distance 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 data was 40\*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 188.68 kHz resulted in a level of -23.34 dBuV/m, which is equivalent to  $-23.34 - 51.5 = -74.84$  dBuA/m, which has the same margin, -45.43dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

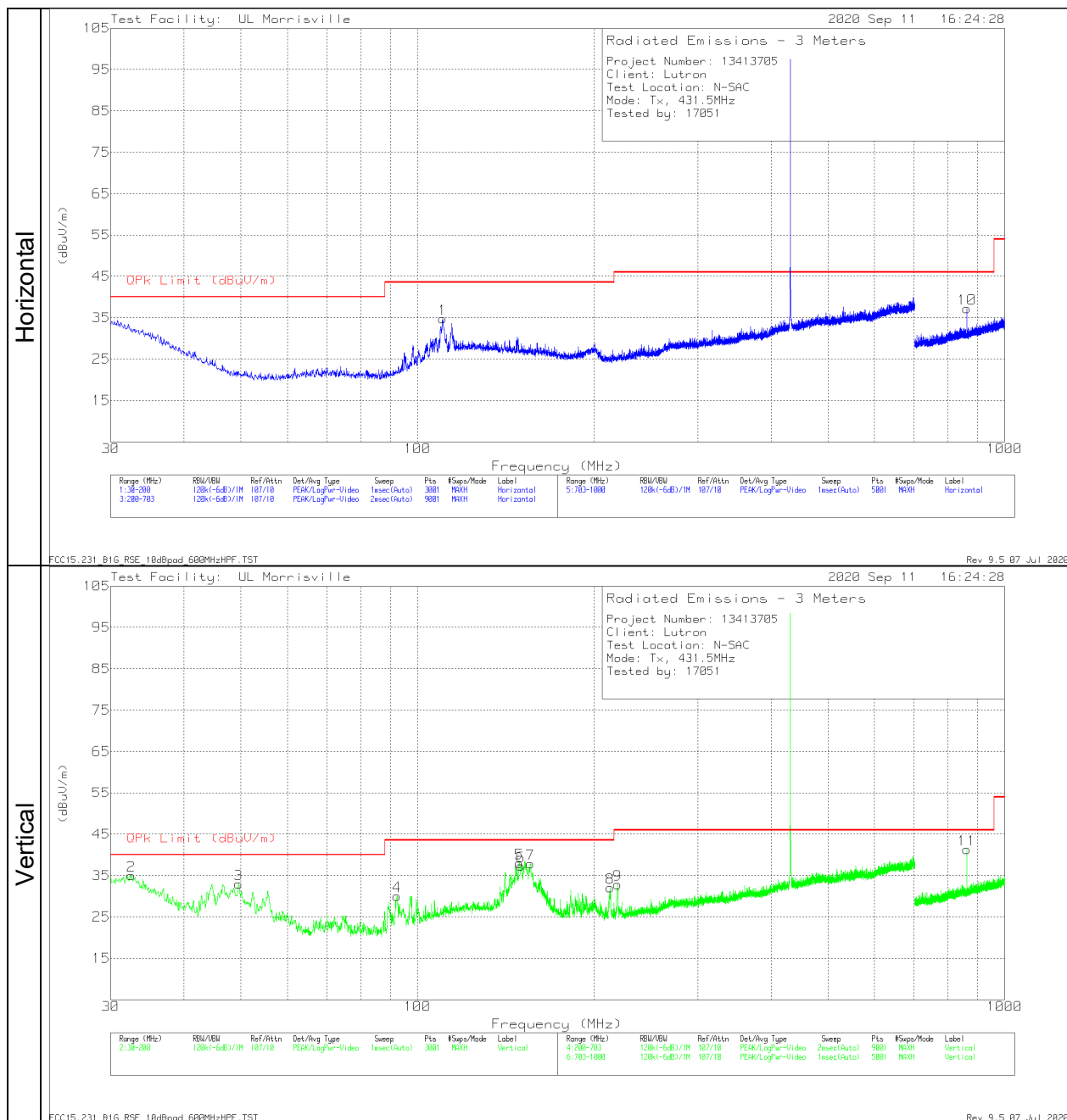


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 AV/QP Limit (dBuV/m)	FCC 15.209 PK Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)
Loop at 0°											
1	.10812	37.15	Pk	10.9	.1	-80	-31.85	26.93	46.93	-58.78	0-360
2	.16862	45.45	Pk	10.8	.1	-80	-23.65	23.07	43.07	-46.72	0-360
3	.86101	32.63	Pk	10.9	.2	-40	3.73	28.9	-	-25.17	0-360
4	8.21371	20.15	Pk	10.6	.6	-40	-8.65	29.54	-	-38.19	0-360
Loop at 90°											
5	.10812	34.92	Pk	10.9	.1	-80	-34.08	26.93	46.93	-61.01	0-360
6	.20959	44.61	Pk	10.8	.1	-80	-24.49	21.18	41.18	-45.67	0-360
7	.51319	36.52	Pk	10.8	.2	-40	7.52	33.4	-	-25.88	0-360
8	26.87373	13.77	Pk	8.6	1.1	-40	-16.53	29.54	-	-46.07	0-360
Loop Flat											
9	.07105	40.61	Pk	11.2	.1	-80	-28.09	30.57	50.57	-58.66	0-360
10	.25787	43.08	Pk	10.7	.1	-80	-26.12	19.38	39.38	-45.5	0-360
11	.53638	37.05	Pk	10.8	.2	-40	8.05	33.01	-	-24.96	0-360
12	27.80546	15.76	Pk	8.4	1.1	-40	-14.74	29.54	-	-44.28	0-360

Pk - Peak detector

### 8.1.3. HARMONICS AND TX SPURIOUS EMISSIONS (30 - 5000MHz)

#### HARMONICS AND TX SPURIOUS EMISSIONS (30-1000MHz – 431.5MHz)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Amp/Cbl (dB)	Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 110.3538	36.24	Pk	18.7	-30.2	10	0	34.74	43.52	-8.78	0-360	299	H
10	863.0236	33.34	Pk	28	-24.8	0	.7	37.24	60.75	-23.51	0-360	101	H
6	* 150.0116	33.49	Qp	18.7	-29.7	10	0	32.49	43.52	-11.03	12	102	V
2	32.55	31.21	Pk	25.2	-31.4	10	0	35.01	60.75	-25.74	0-360	101	V
3	49.6068	39.93	Pk	14.1	-31.1	10	0	32.93	60.75	-27.82	0-360	101	V
4	92.3337	36.15	Pk	14.3	-30.4	10	0	30.05	60.75	-30.7	0-360	101	V
5	149.0574	38.98	Pk	18.7	-29.7	10	0	37.98	60.75	-22.77	0-360	101	V
7	155.7441	38.81	Pk	18.6	-29.6	10	0	37.81	60.75	-22.94	0-360	101	V
8	212.8545	34.34	Pk	16.6	-29	10.1	0	32.04	60.75	-28.71	0-360	101	V
9	219.1699	35.02	Pk	16.7	-29	10.1	0	32.82	60.75	-27.93	0-360	101	V
11	862.9048	37.42	Pk	28	-24.8	0	.7	41.32	60.75	-19.43	0-360	99	V

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

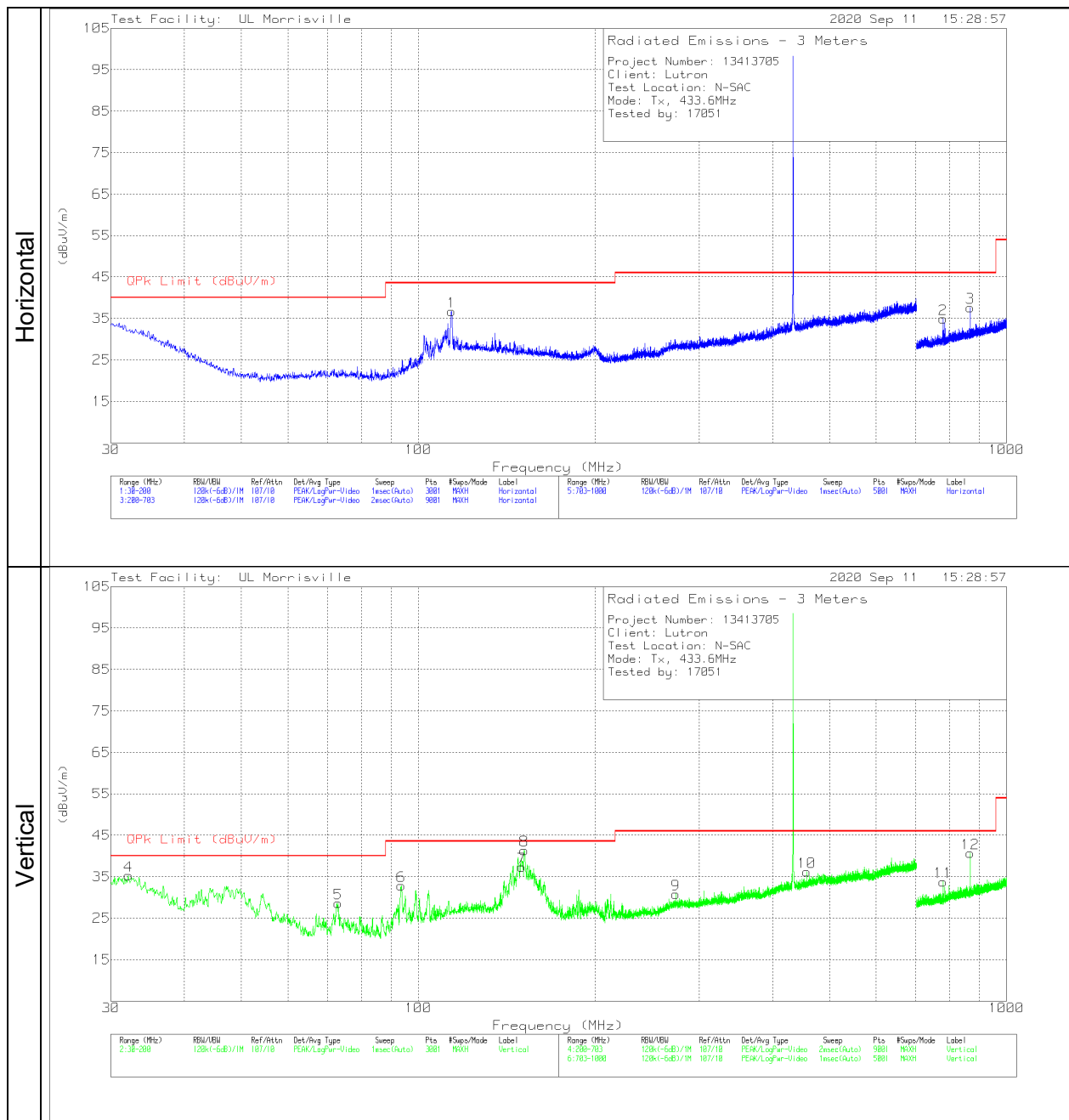
Pk - Peak detector

Qp - Quasi-Peak detector

Notes:

- (1) Peak measurement without a duty-cycle correction factor is used to satisfy the §15.209 limits in the §15.205 restricted bands or the limits given in §15.231(b) outside of the restricted bands.
- (2) The more restrictive average §15.231(b) limit is presented in the above table where applicable. Given that the peak limit is 20dB higher than the average, the data presented above demonstrates compliance to the peak limit as well.

**HARMONICS AND TX SPURIOUS EMISSIONS(30-1000MHz – 433.6MHz)**



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Amp/Cbl (dB)	Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 113.8672	37.51	Pk	19.3	-30.1	10	0	36.71	43.52	-6.81	0-360	299	H
2	780.2794	32.49	Pk	27.2	-25.6	0	.8	34.89	60.81	-25.92	0-360	199	H
3	867.1222	33.65	Pk	28.1	-24.8	0	.7	37.65	60.81	-23.16	0-360	99	H
4	32.1533	31.3	Pk	25.4	-31.4	10	0	35.3	60.81	-25.51	0-360	100	V
5	* 73.0103	35.3	Pk	14.1	-30.8	10	0	28.6	40	-11.4	0-360	100	V
6	93.5237	38.63	Pk	14.6	-30.4	10	0	32.83	60.81	-27.98	0-360	100	V
7	* 149.9957	33.57	Qp	18.7	-29.7	10	0	32.57	43.52	-10.95	18	105	V
8	151.3807	42.47	Pk	18.6	-29.7	10	0	41.37	60.81	-19.44	0-360	100	V
9	* 273.997	29.9	Pk	19.4	-28.6	10.1	0	30.8	46.02	-15.22	0-360	201	V
10	457.4806	30.24	Pk	23	-27.2	10.1	0	36.14	60.81	-24.67	0-360	201	V
11	780.3982	31.39	Pk	27.2	-25.6	0	.8	33.79	60.81	-27.02	0-360	399	V
12	867.241	36.7	Pk	28.1	-24.8	0	.7	40.7	60.81	-20.11	0-360	99	V

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

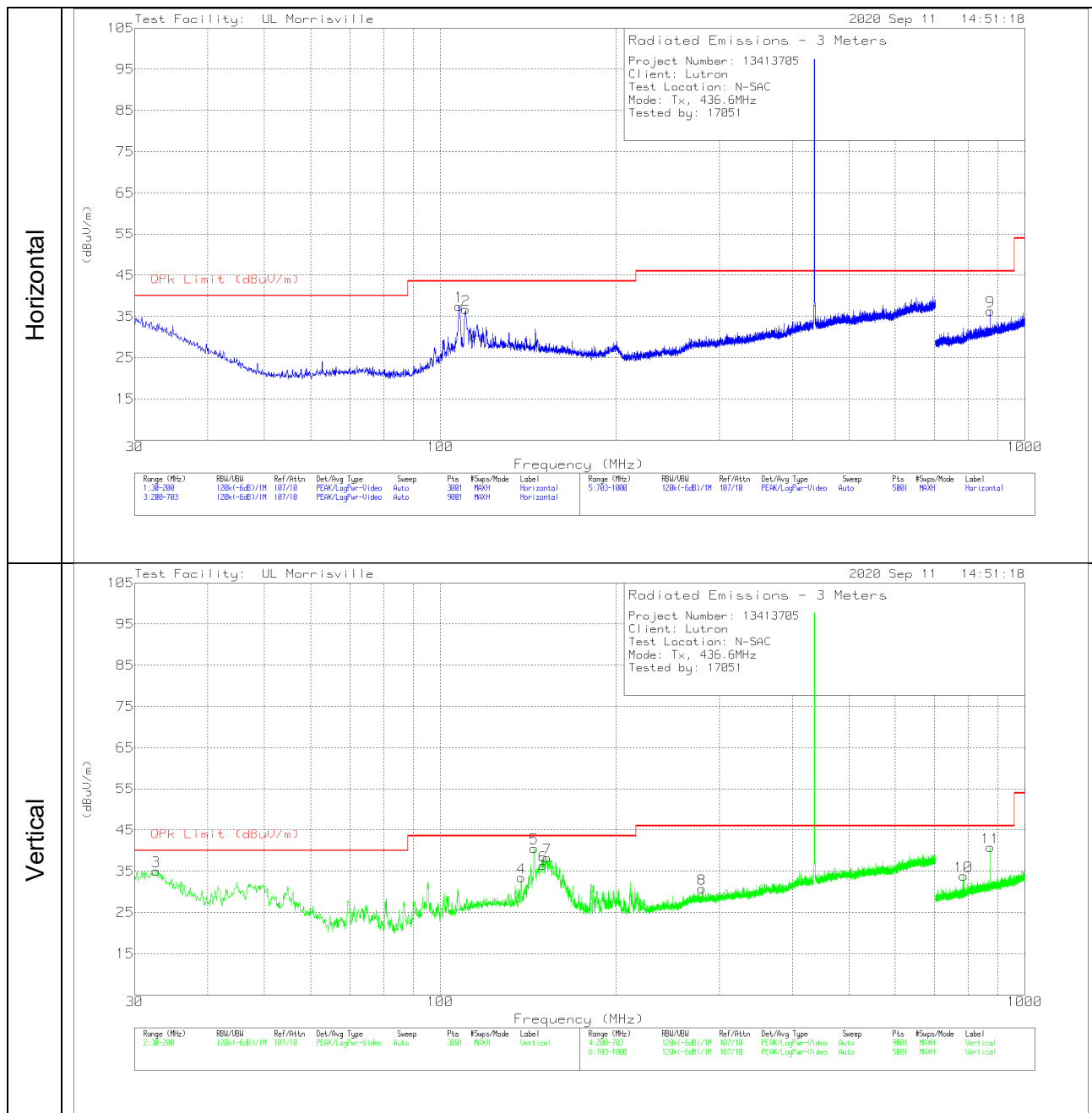
Pk - Peak detector

Qp - Quasi-Peak detector

Notes:

- (1) Peak measurement without a duty-cycle correction factor is used to satisfy the §15.209 limits in the §15.205 restricted bands or the limits given in §15.231(b) outside of the restricted bands.
- (2) The more restrictive average §15.231(b) limit is presented in the above table where applicable. Given that the peak limit is 20dB higher than the average, the data presented above demonstrates compliance to the peak limit as well.

**HARMONICS AND TX SPURIOUS EMISSIONS(30-1000MHz – 436.6MHz)**



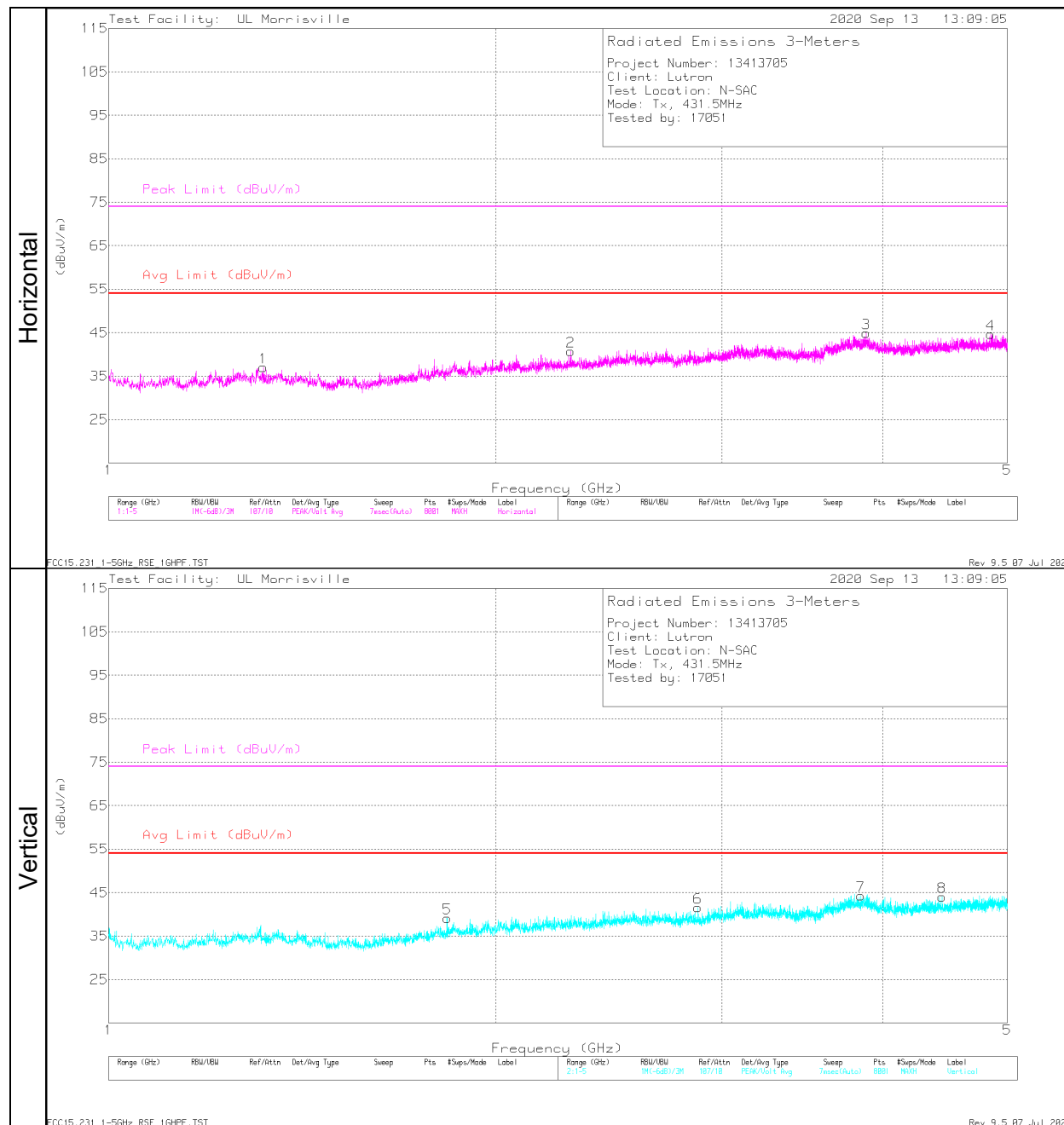
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Amp/Cbl (dB)	Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 110.5805	38.11	Pk	18.8	-30.2	10	0	36.71	43.52	-6.81	0-360	399	H
1	107.5771	39.52	Pk	18.2	-30.2	10	0	37.52	60.91	-23.39	0-360	300	H
9	873.1216	32.25	Pk	28.2	-24.8	0	.7	36.35	60.91	-24.56	0-360	300	H
4	* 137.6106	34.04	Pk	19.3	-29.9	10	0	33.44	43.52	-10.08	0-360	100	V
6	* 149.9074	37.44	Pk	18.7	-29.7	10	0	36.44	43.52	-7.08	0-360	100	V
8	* 280.536	29.76	Pk	19.4	-28.5	10.1	0	30.76	46.02	-15.26	0-360	101	V
5	144.8073	41.61	Pk	18.8	-29.8	10	0	40.61	60.91	-20.3	0-360	100	V
7	152.4007	39.25	Pk	18.6	-29.6	10	0	38.25	60.91	-22.66	0-360	100	V
3	32.6633	31.37	Pk	25.1	-31.4	10	0	35.07	60.91	-25.84	0-360	100	V
10	785.863	31.23	Pk	27.2	-25.4	0	.8	33.83	60.91	-27.08	0-360	101	V
11	873.1216	36.67	Pk	28.2	-24.8	0	.7	40.77	60.91	-20.14	0-360	198	V

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

Notes:

- (1) Peak measurement without a duty-cycle correction factor is used to satisfy the §15.209 limits in the §15.205 restricted bands or the limits given in §15.231(b) outside of the restricted bands.
- (2) The more restrictive average §15.231(b) limit is presented in the above table where applicable. Given that the peak limit is 20dB higher than the average, the data presented above demonstrates compliance to the peak limit as well.

# **HARMONICS AND TX SPURIOUS EMISSIONS (>1GHz – 431.5MHz)**

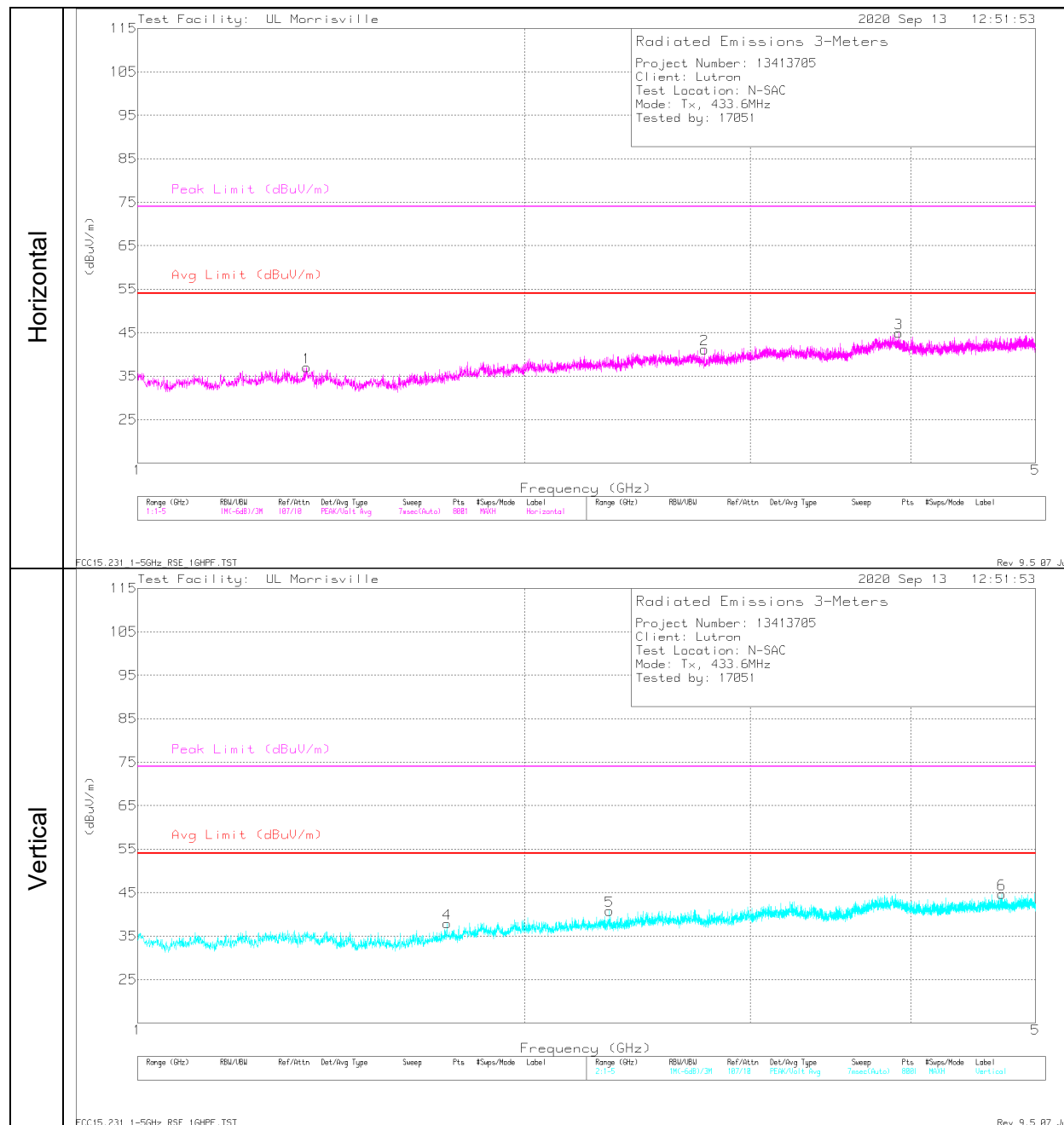


Marker	Frequency (GHz)	Meter Reading (dBUV)	Det	AT0072 dB(m)	Amp/Cbl/Filtr/Pad (dB)	Filter (dB)	Corrected Reading (dBUV/m)	Avg Limit (dBUV/m)	Margin (dB)	Peak Limit (dBUV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.319	43.69	Pk	29.1	-36.7	.9	36.99	54	-17.01	74	-37.01	0-360	101	H
2	* 2.2885	43.54	Pk	31.7	-34.9	.4	40.74	54	-13.26	74	-33.26	0-360	300	H
3	* 3.884	44.02	Pk	33.6	-33.1	.4	44.92	54	-9.08	74	-29.08	0-360	300	H
4	* 4.8555	42.55	Pk	34.1	-32.3	.3	44.65	54	-9.35	74	-29.35	0-360	101	H
5	1.8335	43.65	Pk	30.8	-35.7	.4	39.15	54	-14.85	74	-34.85	0-360	200	V
6	* 2.874	42.45	Pk	32.4	-33.8	.5	41.55	54	-12.45	74	-32.45	0-360	101	V
7	* 3.847	43.34	Pk	33.6	-33.1	.4	44.24	54	-9.76	74	-29.76	0-360	400	V
8	4.45	42.65	Pk	33.7	-32.6	.3	44.05	54	-9.95	74	-29.95	0-360	101	V

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

**Note:** The more conservative §15.209 limits were used against all spurious emissions to demonstrate compliance to both the §15.209 and §15.231(b) spurious emission requirements.

**HARMONICS AND TX SPURIOUS EMISSIONS (>1GHz – 433.6MHz)**



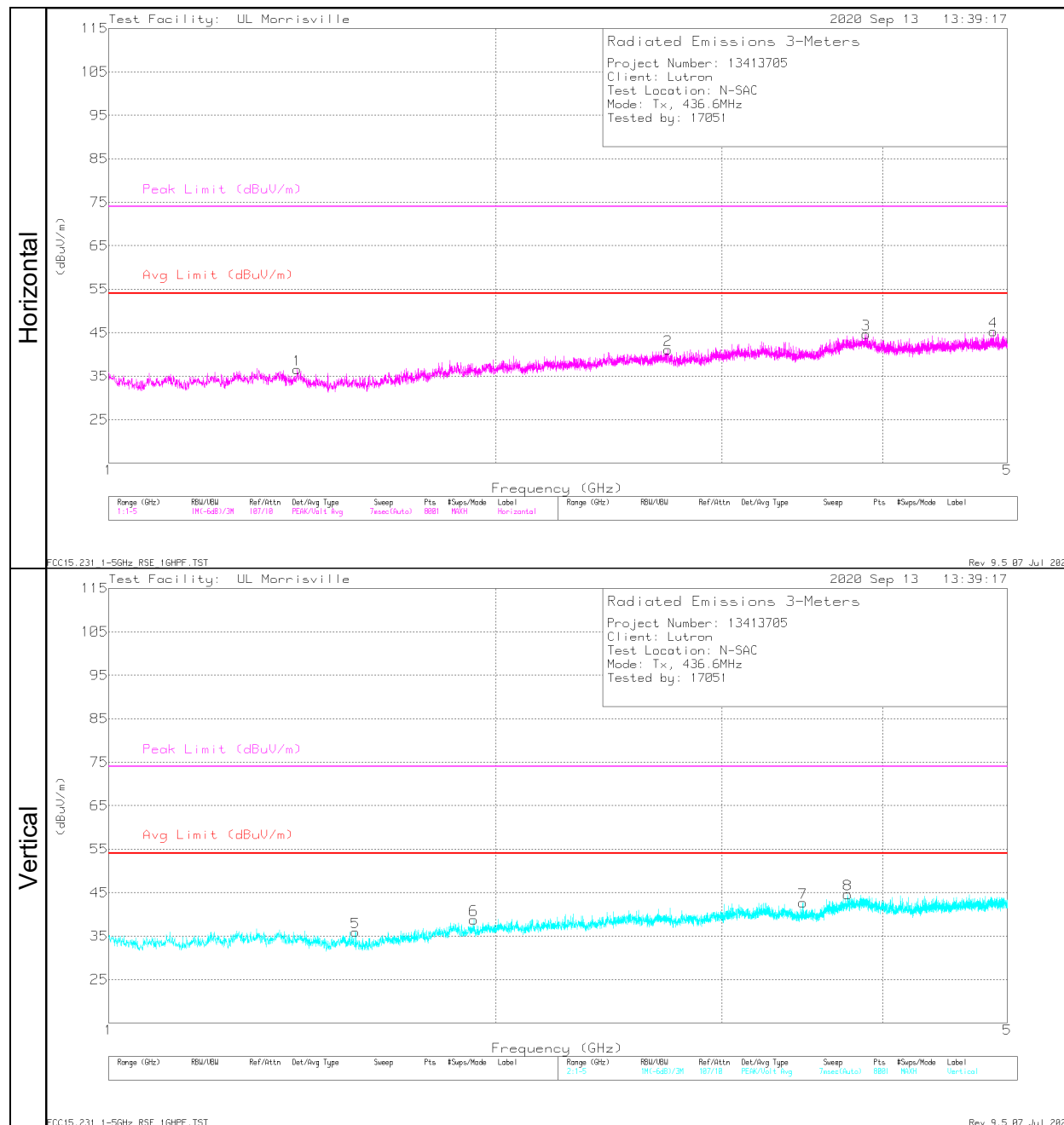
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(m)	Amp/Cbl/Filtr/Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.3545	43.42	Pk	29.5	-36.7	.8	37.02	54	-16.98	74	-36.98	0-360	101	H
2	* 2.762	42.56	Pk	32.2	-34.1	.5	41.16	54	-12.84	74	-32.84	0-360	300	H
3	* 3.912	43.92	Pk	33.7	-33.1	.4	44.92	54	-9.08	74	-29.08	0-360	300	H
4	1.741	43.75	Pk	29.5	-35.8	.4	37.85	54	-16.15	74	-36.15	0-360	400	V
5	* 2.3305	43.39	Pk	31.7	-34.7	.4	40.79	54	-13.21	74	-33.21	0-360	400	V
6	* 4.7075	42.68	Pk	34	-32.3	.3	44.68	54	-9.32	74	-29.32	0-360	101	V

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

Pk - Peak detector

**Note:** The more conservative §15.209 limits were used against all spurious emissions to demonstrate compliance to both the §15.209 and §15.231(b) spurious emission requirements.

**HARMONICS AND TX SPURIOUS EMISSIONS (>1GHz – 436.6MHz)**



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(m)	Amp/Cbl/Filtr/Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.4015	43.31	Pk	28.8	-36.5	.9	36.51	54	-17.49	74	-37.49	0-360	300	H
2	* 2.724	42.38	Pk	32.3	-34.1	.5	41.08	54	-12.92	74	-32.92	0-360	101	H
3	* 3.8845	43.75	Pk	33.6	-33.1	.4	44.65	54	-9.35	74	-29.35	0-360	200	H
4	* 4.8755	42.96	Pk	34.1	-32.1	.3	45.26	54	-8.74	74	-28.74	0-360	400	H
5	* 1.556	43.72	Pk	27.9	-36.3	.6	35.92	54	-18.08	74	-38.08	0-360	101	V
6	1.923	42.98	Pk	30.8	-35.4	.4	38.78	54	-15.22	74	-35.22	0-360	400	V
7	3.4675	42.64	Pk	32.9	-33.4	.5	42.64	54	-11.36	74	-31.36	0-360	101	V
8	* 3.7575	43.89	Pk	33.4	-33.1	.4	44.59	54	-9.41	74	-29.41	0-360	400	V

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

**Note:** The more conservative §15.209 limits were used against all spurious emissions to demonstrate compliance to both the §15.209 and §15.231(b) spurious emission requirements.

## 9. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

§15.207 (a)  
IC RSS-GEN, Section 7.2.2

Frequency of emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
* Decreases with the logarithm of the frequency.		

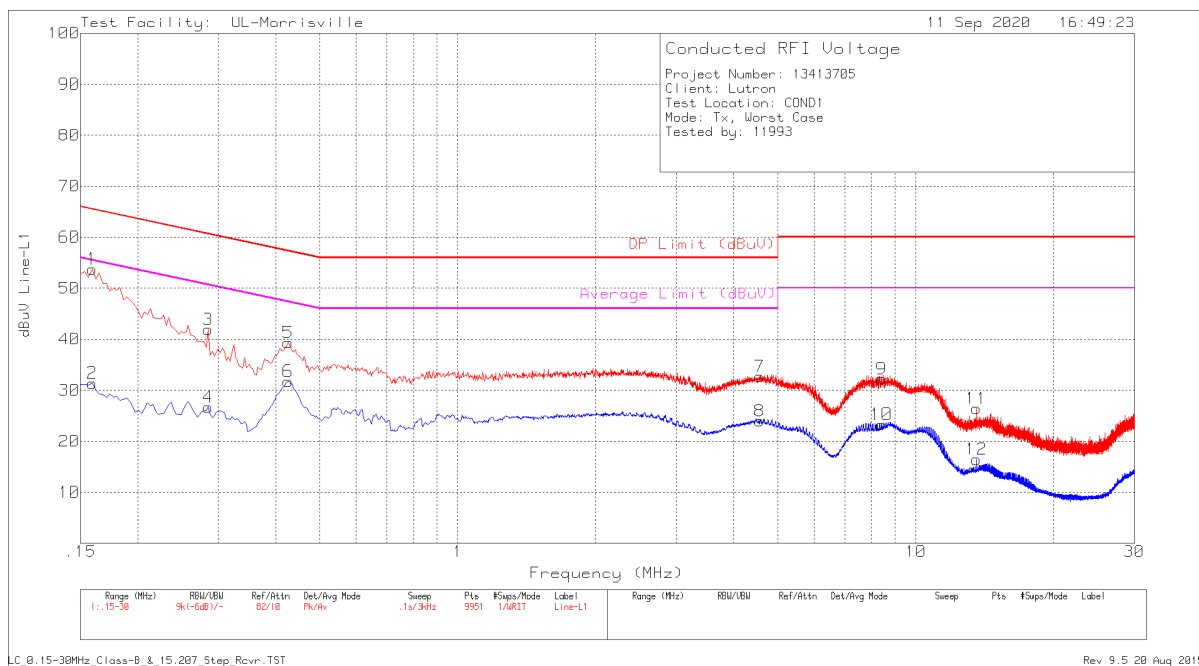
### TEST PROCEDURE

ANSI C63.10

### RESULTS

No non-compliance noted:

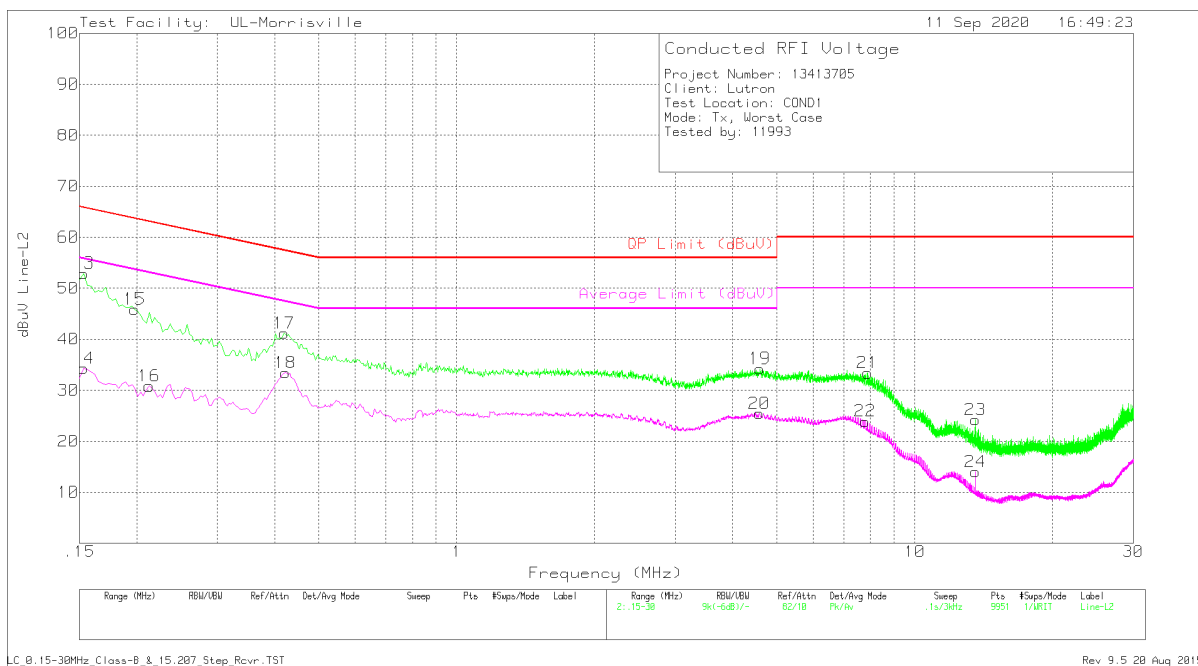
## LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
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	.159	43.88	Pk	.2	9.7	53.78	65.52	-11.74	-	-
2	.159	21.5	Av	.2	9.7	31.4	-	-	55.52	-24.12
3	.285	32.12	Pk	.1	9.7	41.92	60.67	-18.75	-	-
4	.285	16.9	Av	.1	9.7	26.7	-	-	50.67	-23.97
5	.426	29.45	Pk	.1	9.8	39.35	57.33	-17.98	-	-
6	.426	21.87	Av	.1	9.8	31.77	-	-	47.33	-15.56
7	4.56	22.79	Pk	0	9.9	32.69	56	-23.31	-	-
8	4.56	14.12	Av	0	9.9	24.02	-	-	46	-21.98
9	8.415	22.13	Pk	.1	10	32.23	60	-27.77	-	-
10	8.412	13.19	Av	.1	10	23.29	-	-	50	-26.71
11	13.56	16.37	Pk	.1	10	26.47	60	-33.53	-	-
12	13.56	6.35	Av	.1	10	16.45	-	-	50	-33.55

Qp - Quasi-Peak detector  
Ca - CISPR average detection

## LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
13	.153	43.03	Pk	.2	9.7	52.93	65.84	-12.91	-	-
14	.153	24.38	Av	.2	9.7	34.28	-	-	55.84	-21.56
15	.198	36	Pk	.2	9.7	45.9	63.69	-17.79	-	-
16	.213	21.03	Av	.1	9.7	30.83	-	-	53.09	-22.26
17	.42	31.41	Pk	.1	9.7	41.21	57.45	-16.24	-	-
18	.423	23.56	Av	.1	9.8	33.46	-	-	47.39	-13.93
19	4.59	24.24	Pk	.1	9.9	34.24	56	-21.76	-	-
20	4.572	15.49	Av	.1	9.9	25.49	-	-	46	-20.51
21	7.881	23.31	Pk	.1	10	33.41	60	-26.59	-	-
22	7.797	13.83	Av	.1	10	23.93	-	-	50	-26.07
23	13.563	14.12	Pk	.1	10	24.22	60	-35.78	-	-
24	13.56	3.92	Av	.1	10	14.02	-	-	50	-35.98

Qp - Quasi-Peak detector  
Ca - CISPR average detection

## 10. SETUP PHOTOS

Refer to exhibit R13413705-EP2 for setup diagrams and photos.

## END OF TEST REPORT