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

CERTIFICATION TEST REPORT

FOR

WIRELESS LED/FLUORESCENT LIGHT CONTROLLER

MODEL NUMBER: RMJS-5T-347

FCC ID: JPZ0127
IC: 2851A-JPZ0127

REPORT NUMBER: R13260790-E1

ISSUE DATE: 2020-07-15

Prepared for
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NVLAP LAB CODE 200246-0

REVISION HISTORY

Ver.	Issue Date	Revisions	Revised By
1	2020-06-30	Initial Issue	Brian T. Kiewra
2	2020-07-01	Revised Description of EUT	Lariah Ijames
3	2020-07-10	Changed “maximum” to “nominal” section 5.2	Niklas Haydon
4	2020-07-15	Corrected model number	Lariah Ijames

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: Wireless LED/Fluorescent Light Controller

MODEL: RMJS-5T-347

SERIAL NUMBER: 02EB289D, 02EB28A0

DATE TESTED: 2020-06-16 to 2020-06-23

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Complies
ISED CANADA RSS-210 Issue 10, Annex A	Complies
ISED CANADA RSS-GEN Issue 5	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:

Bob Delisi
Principal Engineer
UL – Consumer Technology Division

Prepared By:

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Project Engineer
UL – Consumer Technology Division

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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, 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	
☐ Chamber A	☐ Chamber North
☐ Chamber C	☒ 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.

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4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

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

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	2.00%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
RF output power, radiated (SAC)	4.52 dB
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	3.05 dB
All emissions, radiated	4.88 dB
Temperature	2.26°C
Humidity	6.79%
DC Supply voltages	1.70%
Time	3.39%

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a wireless lighting control product.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a loop antenna, with a nominal gain of -9dBd.

5.3. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 0798934 8.02.

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**
LED	Cree	LMH020-2000-30G0-00001TW	1LN112B06429	NA
LED Power Supply	OSRAM	OTi 50/347/1A4 DIM-1 L	20072G57651M	NA

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Mains	1	Quick connect	Mains	<3m	Connects to AC mains
2	Load out	1	Quick connect	single conductor	<3m	Connects to load (LED and driver)

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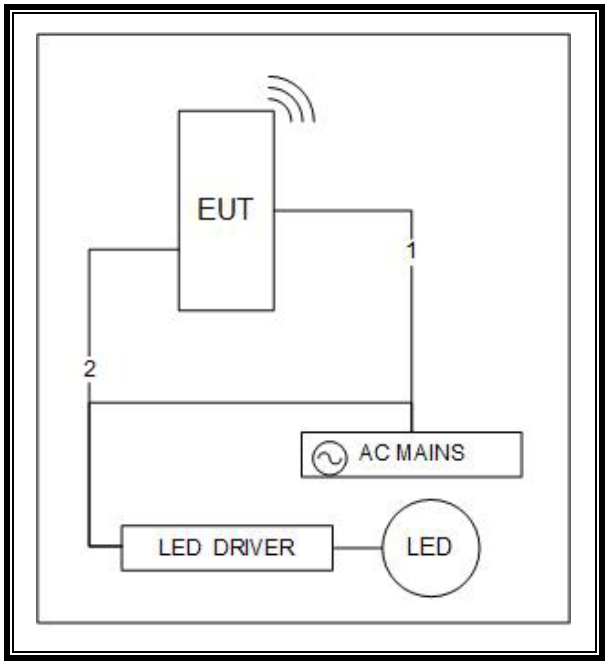
SETUP DIAGRAM FOR TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - 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	2019-08-08	2020-08-08
30-1000 MHz					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2019-07-16	2020-07-16
1-18 GHz					
AT0078	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2019-10-28	2020-10-28
Gain-Loss Chains					
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-04-23	2021-04-23
S-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-04-23	2021-04-23
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-05-15	2021-05-15
Receiver & Software					
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2020-03-27	2021-03-27
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Additional Equipment used					
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
MM0167	Multimeter	Agilent	U1232A	2019-08-23	2020-08-23
ATA176 (in S-SAC)	10dB, DC-18GHz, 5W	Mini-Circuits	BW-N10W5	2020-02-19	2021-02-19
ATTEN012	6dB, DC-18GHz, 5W	Mini-Circuits	BW-N6W5	2020-02-19	2021-02-19
HPF018	600MHz high-pass filter, 2W, F_{high} =12GHz	Micro-Tronics	HPM19984	2020-02-19	2021-02-19
HPF012	1GHz high-pass filter, 2W, F_{high} =18GHz	Micro-Tronics	HPM18129	2020-02-19	2021-02-19

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Test Equipment Used RTP - Conducted Disturbance Emissions – Voltage

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Equipment – Ground Plane E					
85496	EMI Test Receiver 9kHz-3.6GHz	Rohde & Schwarz	ESR3	2019-08-20	2020-08-20
CBL004	Coaxial cable, 20 ft., BNC -male to BNC-male	UL	RG-223	2019-07-01	2020-07-01
HI0085	Temp/Humid/Pressure Meter	Extech	SD700	2020-04-20	2021-04-30
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Transient Limiter					
ATA508	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM 7600	2019-07-01	2020-07-01
LISN (FCC & CISPR testing)					
LISN002	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2019-08-20	2020-08-20

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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.

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20dB/99% BANDWIDTH

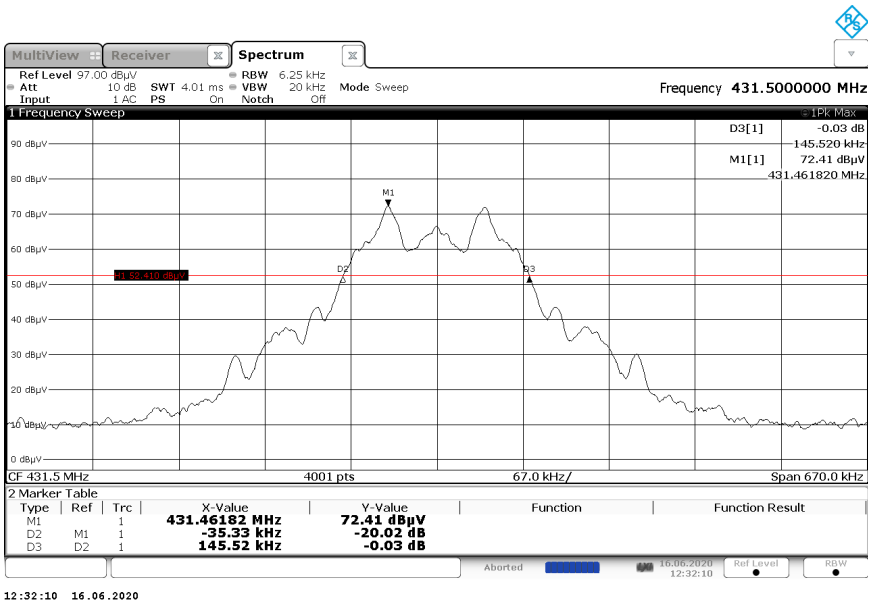
20dB Bandwidth

Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
431.5	145.52	1078.75	-933.23
433.6	145.69	1084	-938.31
436.6	146.19	1091.5	-945.31

99% Bandwidth

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
431.5	135.11	1078.75	-943.64
433.6	134.42	1084	-949.58
436.6	134.68	1091.5	-956.82

20dB BANDWIDTH – 431.5MHz



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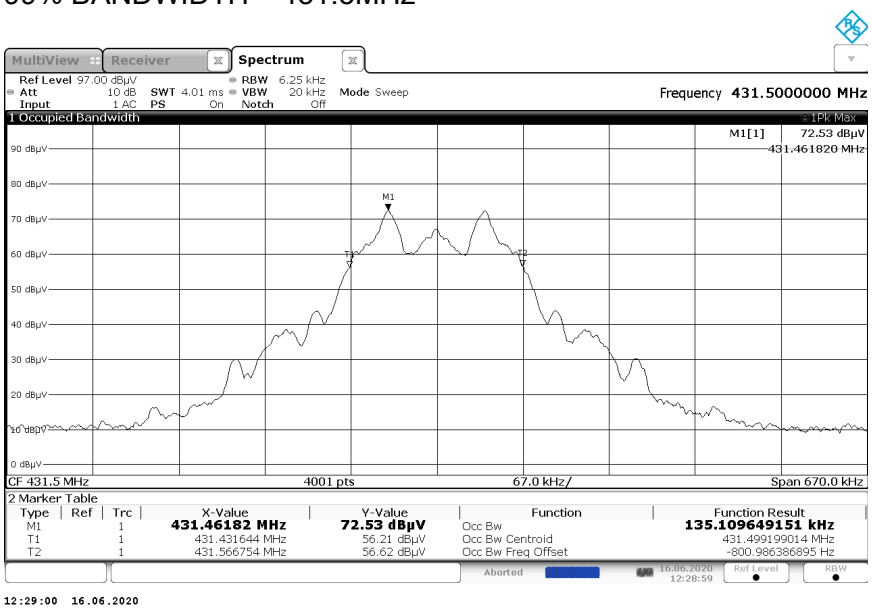
99% BANDWIDTH – 431.5MHz



Test Information

Test Date: 2020-06-16
Tested By: 17051

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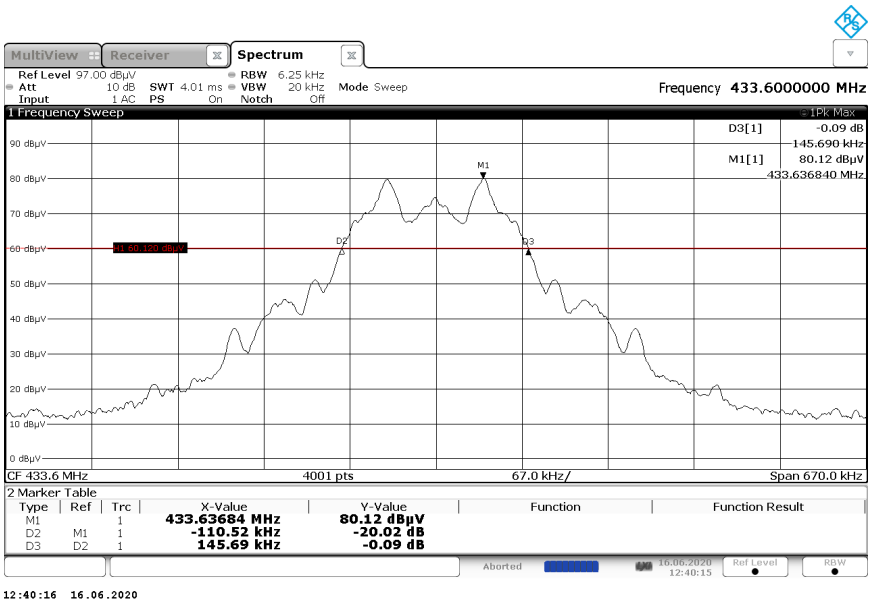
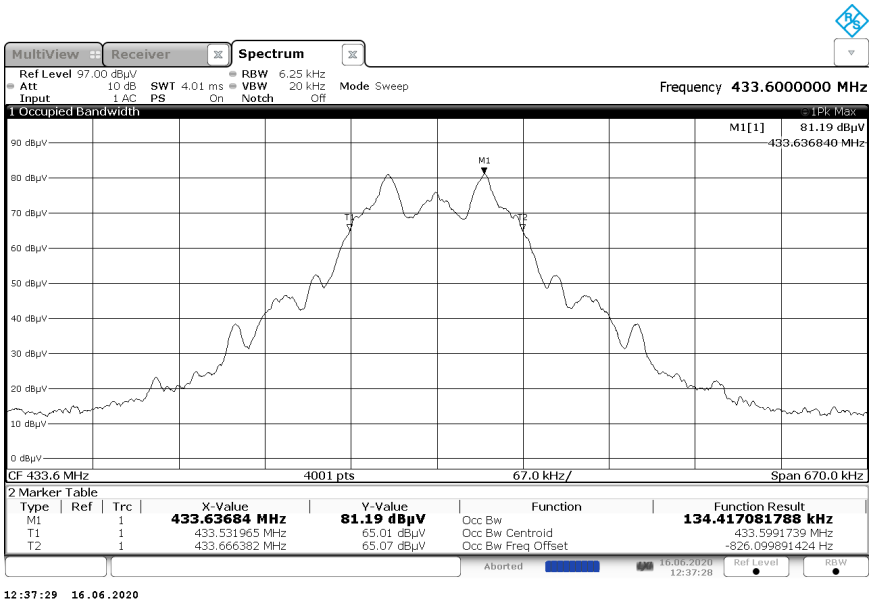
20dB BANDWIDTH – 433.6MHz



99% BANDWIDTH – 433.6MHz



Test Information

Test Date: 2020-06-16
Tested By: 17051

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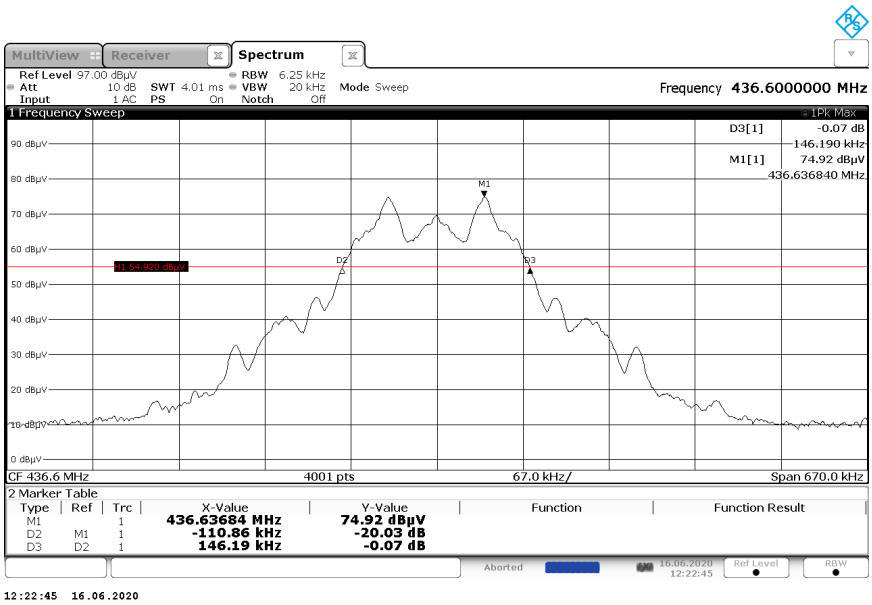
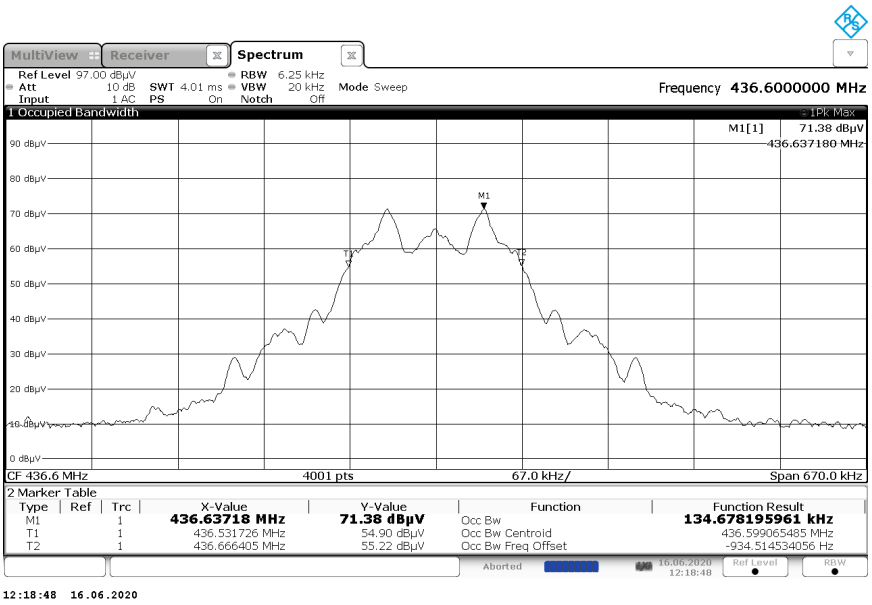
20dB BANDWIDTH – 436.6MHz



99% BANDWIDTH – 436.6MHz



Test Information

Test Date: 2020-06-16
Tested By: 17051

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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	100	4.933	2	0.0987	-20.11

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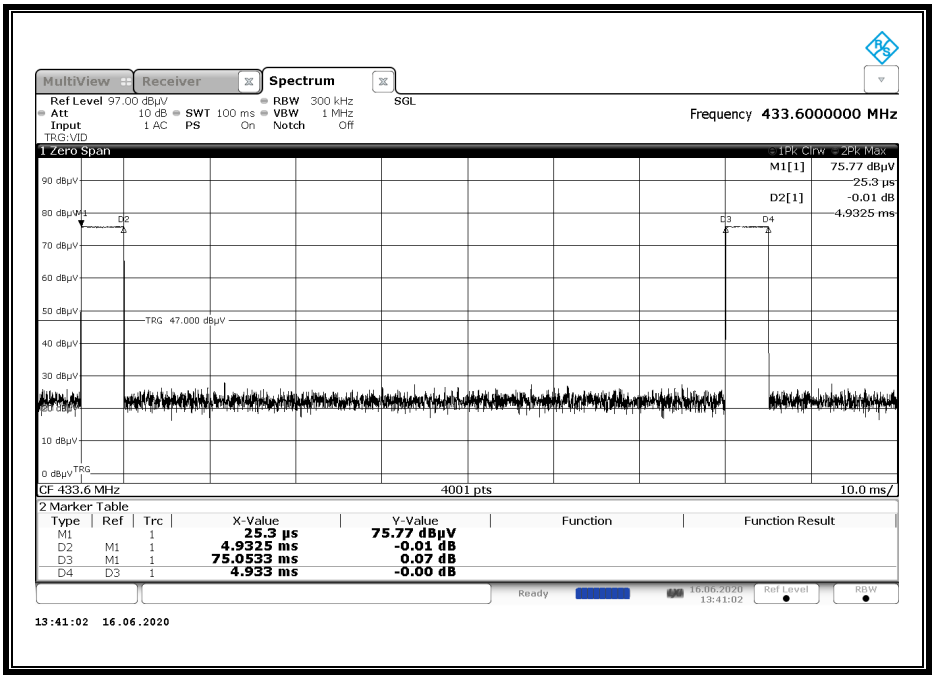

Test Information

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Tested By: 17051

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7.3. TRANSMISSION TIME

LIMITS

FCC §15.231 (a) (2)

ISED RSS-210 A1.1

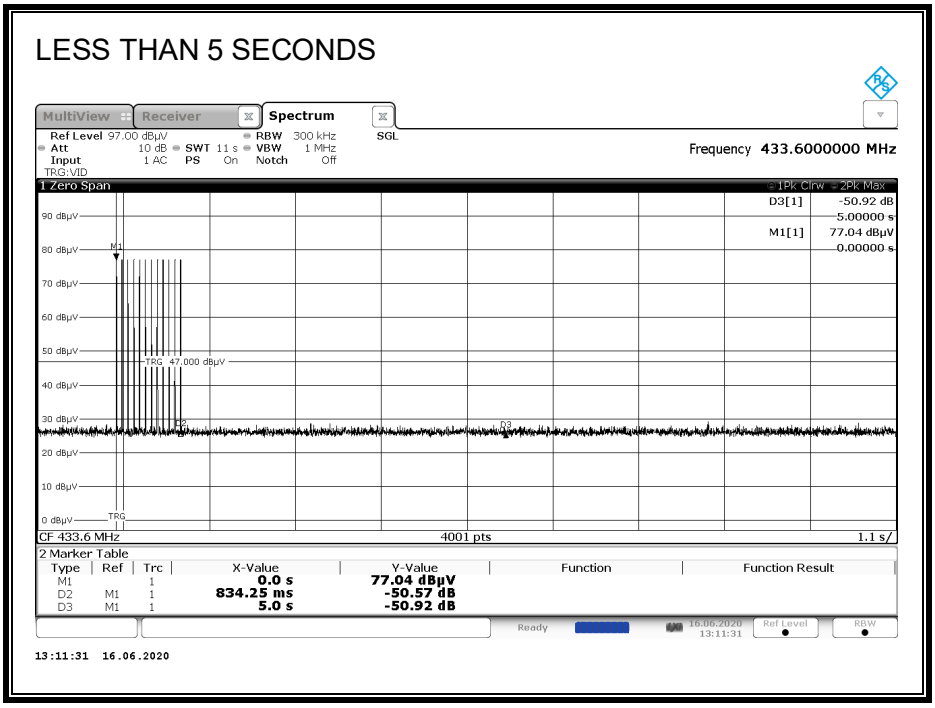
A transmitter activated automatically shall cease transmission within 5 seconds after activation.

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 11 seconds and the span is set to 0 Hz.

RESULTS

No non-compliance noted.



Note: Tx stops at ~834.25ms

Test Information
Test Date: 2020-06-16
Tested By: 17051

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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 [1]	125 to 375[1]
174 - 260	3,750	375
260 - 470	3,750 to 12,500[1]	375 to 1,250[1]
Above 470	12,500	1,250

[1] 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
[1]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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 – 13.41	322 - 335.4		

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1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
2 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 (μA/m)	Measurement Distance (m)
9 – 490 kHz Note 1	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.

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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 20log(x) where 'x' is the duty cycle of 9.87%, as calculated in Section 7.2 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.

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8.1.1. FUNDAMENTAL MEASUREMENTS

Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp (dB)	Pad (dB)	DC Corr (dB)	Pk Corrected Reading (dBuV/m)	Pk Limit (dBuV/m)	Margin (dB)	Avg Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
Low CH															
431.5165	90.3	Pk	22.6	-28.9	10	0	94	100.75	-6.75	-	-	-	20	100	H
431.5165	90.3	Pk	22.6	-28.9	10	-20.11	-	-	-	73.89	80.75	-6.86	20	100	H
431.5277	82.91	Pk	22.6	-28.9	10	0	86.61	100.75	-14.14	-	-	-	349	102	V
431.5277	82.91	Pk	22.6	-28.9	10	-20.11	-	-	-	66.5	80.75	-14.25	349	102	V
Middle CH															
433.5615	92.76	Pk	22.6	-29	10	0	96.36	100.81	-4.45	-	-	-	17	230	H
433.5615	92.76	Pk	22.6	-29	10	-20.11	-	-	-	76.25	80.81	-4.56	17	230	H
433.5623	84.69	Pk	22.6	-29	10	0	88.29	100.81	-12.52	-	-	-	347	100	V
433.5623	84.69	Pk	22.6	-29	10	-20.11	-	-	-	68.18	80.81	-12.63	347	100	V
High CH															
436.5625	87.62	Pk	22.7	-29.1	10	0	91.22	100.91	-9.69	-	-	-	18	229	H
436.5625	87.62	Pk	22.7	-29.1	10	-20.11	-	-	-	71.11	80.91	-9.8	18	229	H
436.5558	78.22	Pk	22.7	-29.1	10	0	81.82	100.91	-19.09	-	-	-	350	100	V
436.5558	78.22	Pk	22.7	-29.1	10	-20.11	-	-	-	61.71	80.91	-19.2	350	100	V

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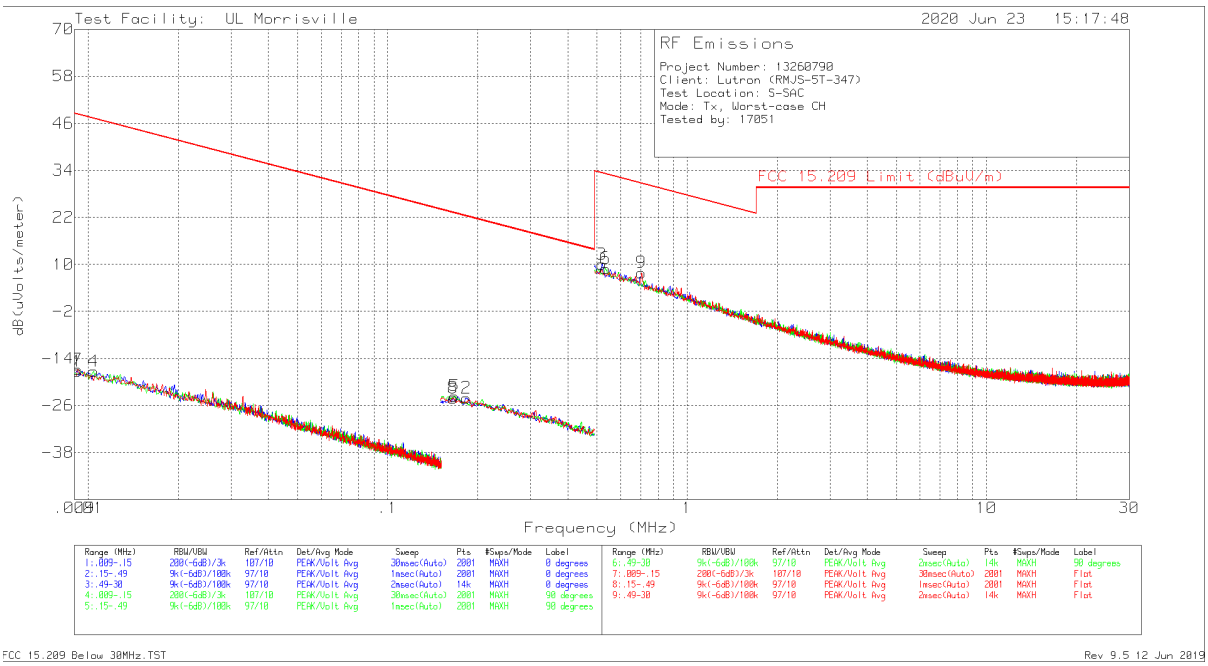
8.1.2. TX SPURIOUS EMISSIONS (0.009-30MHz – WORST CASE)

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 183.32 kHz resulted in a level of -24.08 dBuV/m, which is equivalent to -24.08-51.5 = -75.58 dBuA/m, which has the same margin, -46.42dB, 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 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/ meter)	FCC QP/AV 15.209 Limit (dBuV/m)	FCC PK 15.209 Limit (dBuV/m)	Worst Case Margin (dB)	Azimuth (Degs)
Loop @ 0 degrees.											
1	.00921	43.86	Pk	18.8	.1	-80	-17.24	48.32	68.32	-65.56	0-360
2	.18332	44.82	Pk	11	.1	-80	-24.08	22.34	42.34	-46.42	0-360
3	.51951	38.96	Pk	11	.1	-40	10.06	33.29	-	-23.23	0-360
Loop @ 90 degrees.											
4	.01042	44.58	Pk	18	.1	-80	-17.32	47.25	67.25	-64.57	0-360
5	.16709	45.32	Pk	11	.1	-80	-23.58	23.15	43.15	-46.73	0-360
6	.53427	37.88	Pk	11	.1	-40	8.98	33.05	-	-24.07	0-360
Loop flat.											
7	.00921	44.3	Pk	18.8	.1	-80	-16.8	48.32	68.32	-65.12	0-360
8	.16539	44.82	Pk	11	.1	-80	-24.08	23.23	43.23	-47.31	0-360
9	.70502	36.78	Pk	11	.1	-40	7.88	30.64	-	-22.76	0-360

Pk - Peak detector

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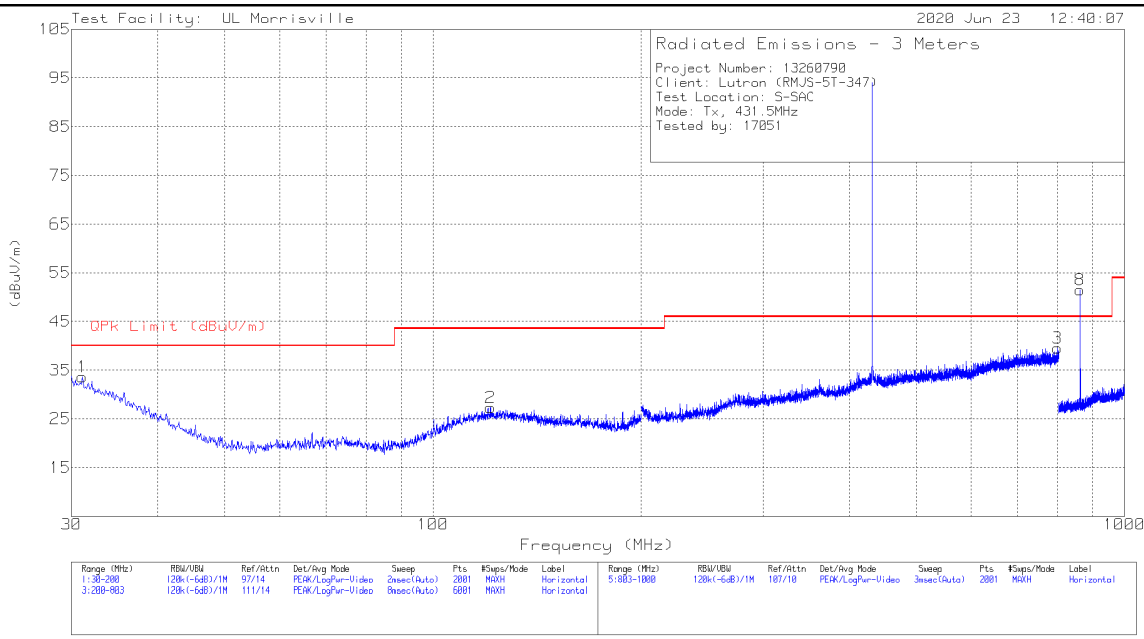
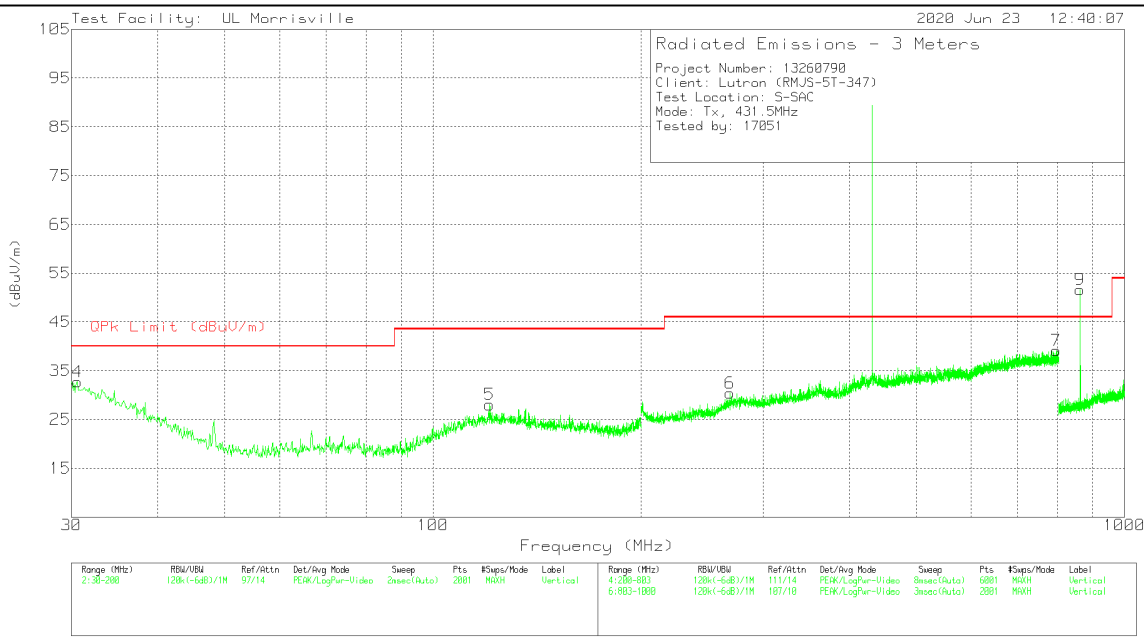
8.1.3. FUNDAMENTAL, HARMONICS AND TX SPURIOUS EMISSIONS (30 - 5000MHz)

FUNDAMENTAL AND SPURIOUS EMISSIONS (30-1000MHz – 431.5MHz)

Horizontal



Vertical



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Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp (dB)	Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.105	29.18	Pk	26.3	-31.8	9.9	0	33.58	60.75	-27.17	0-360	298	H
2	* 121.12	28.33	Pk	19.9	-30.8	9.9	0	27.33	43.52	-16.19	0-360	399	H
3	799.6835	30.11	Pk	27.2	-27.8	10	0	39.51	60.75	-21.24	0-360	398	H
8	862.9232	49.85	Qp	28	-27.4	0	.7	51.15	60.75	-9.6	30	100	H
4	30.595	28.23	Pk	26.4	-31.8	9.9	0	32.73	60.75	-28.02	0-360	101	V
5	* 120.78	29.03	Pk	19.9	-30.8	9.9	0	28.03	43.52	-15.49	0-360	101	V
6	* 268.742	30.98	Pk	19.2	-29.7	9.9	0	30.38	46.02	-15.64	0-360	101	V
7	797.372	29.96	Pk	27.1	-27.9	10	0	39.16	60.75	-21.59	0-360	101	V
9	862.9237	51.57	Qp	28	-27.4	0	.7	52.87	60.75	-7.88	122	127	V

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

Notes:

(1) Quasi-Peak measurement is used to satisfy the limits given in §15.231(b).
(2) 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.

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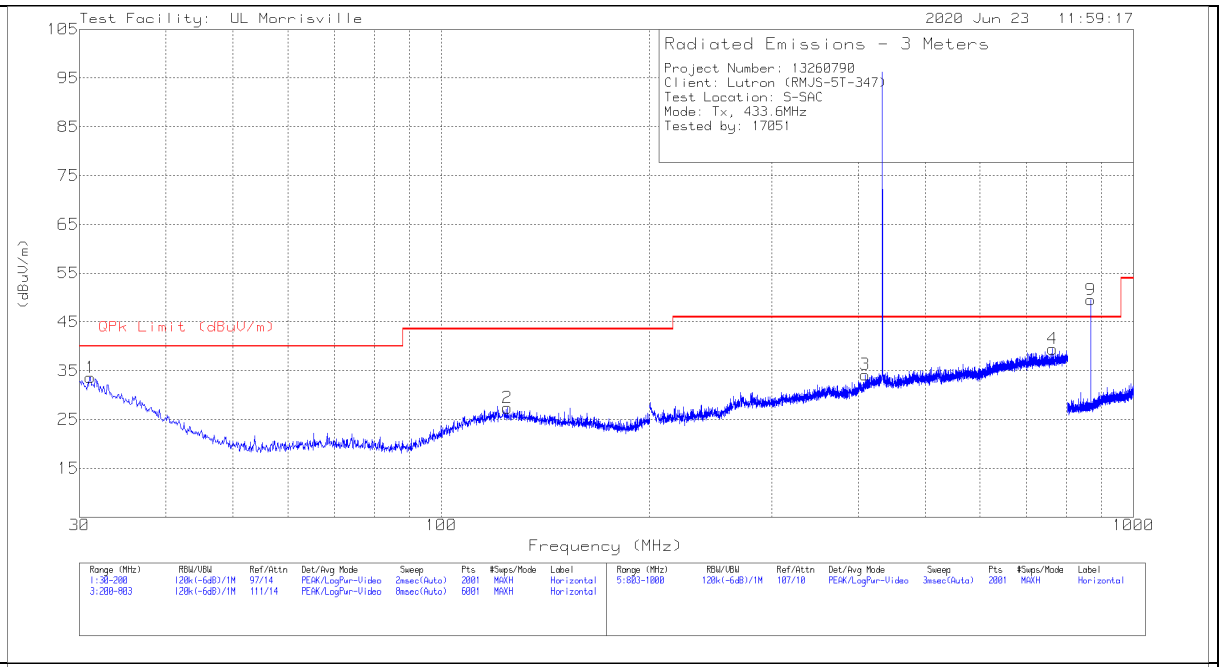
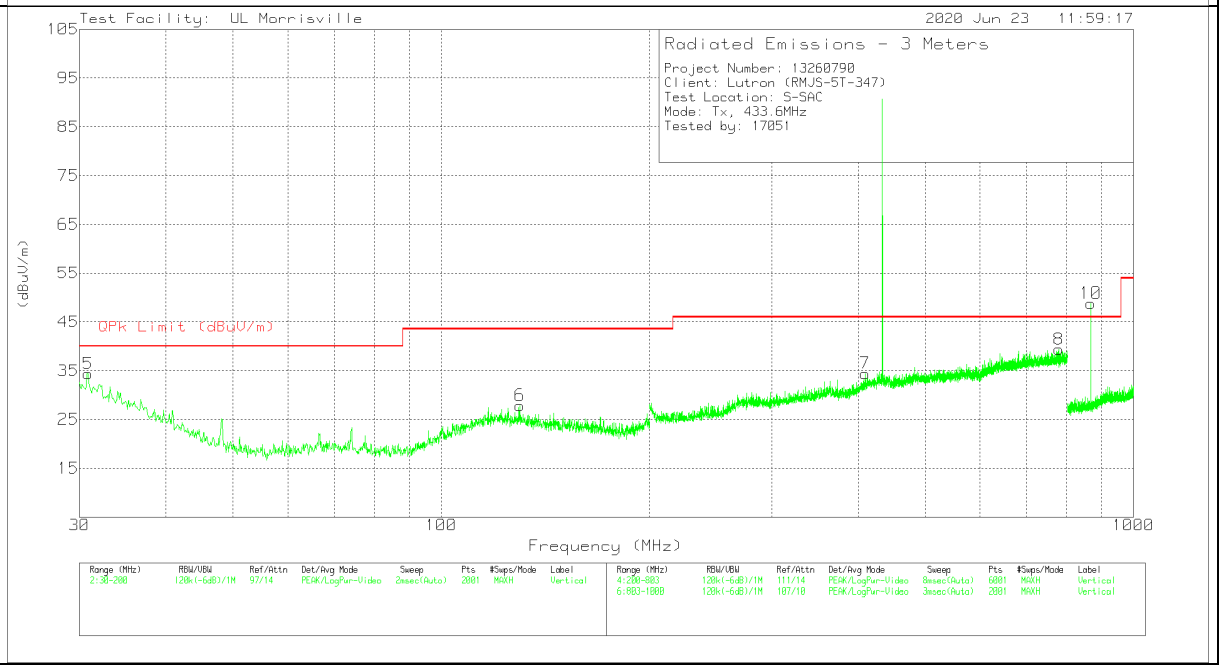
FUNDAMENTAL AND SPURIOUS EMISSIONS(30-1000MHz – 433.6MHz)

Horizontal



Vertical



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Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp (dB)	Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.105	29.19	Pk	26.3	-31.8	9.9	0	33.59	60.81	-27.22	0-360	399	H
2	* 124.605	28.39	Pk	19.9	-30.8	9.9	0	27.39	43.52	-16.13	0-360	399	H
3	* 409.9445	31.29	Pk	22.1	-29.1	9.9	0	34.19	46.02	-11.83	0-360	199	H
4	764.5085	30.67	Pk	26.9	-28.1	10	0	39.47	60.81	-21.34	0-360	199	H
9	867.1223	47.94	Qp	28	-27.3	0	.7	49.34	60.81	-11.47	27	100	H
5	30.8254	23.69	Qp	26.4	-31.8	9.9	0	28.19	60.81	-32.62	143	100	V
6	* 129.79	28.98	Pk	19.8	-30.8	9.9	0	27.88	43.52	-15.64	0-360	101	V
7	* 409.643	31.55	Pk	22.1	-29.1	9.9	0	34.45	46.02	-11.57	0-360	398	V
8	780.3875	30.27	Pk	27.2	-28.1	10	0	39.37	60.81	-21.44	0-360	398	V
10	867.1226	49.48	Qp	28	-27.3	0	.7	50.88	60.81	-9.93	141	124	V

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

Notes:

(1) Quasi-Peak measurement is used to satisfy the limits given in §15.231(b).
(2) 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.

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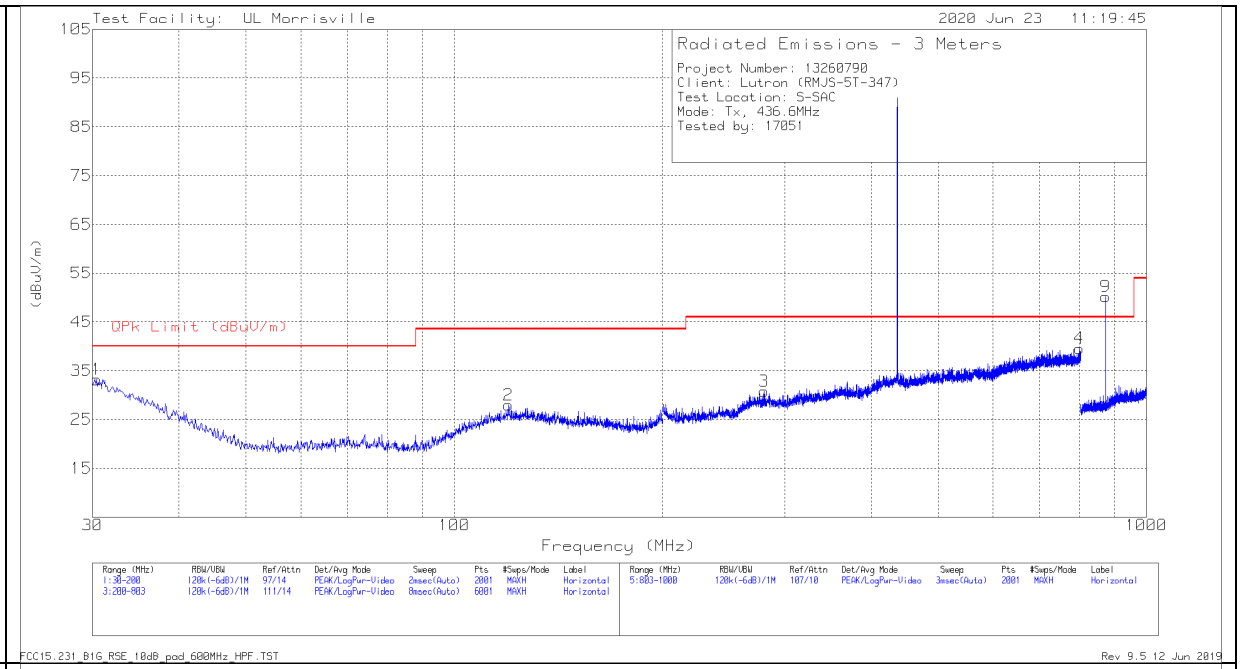
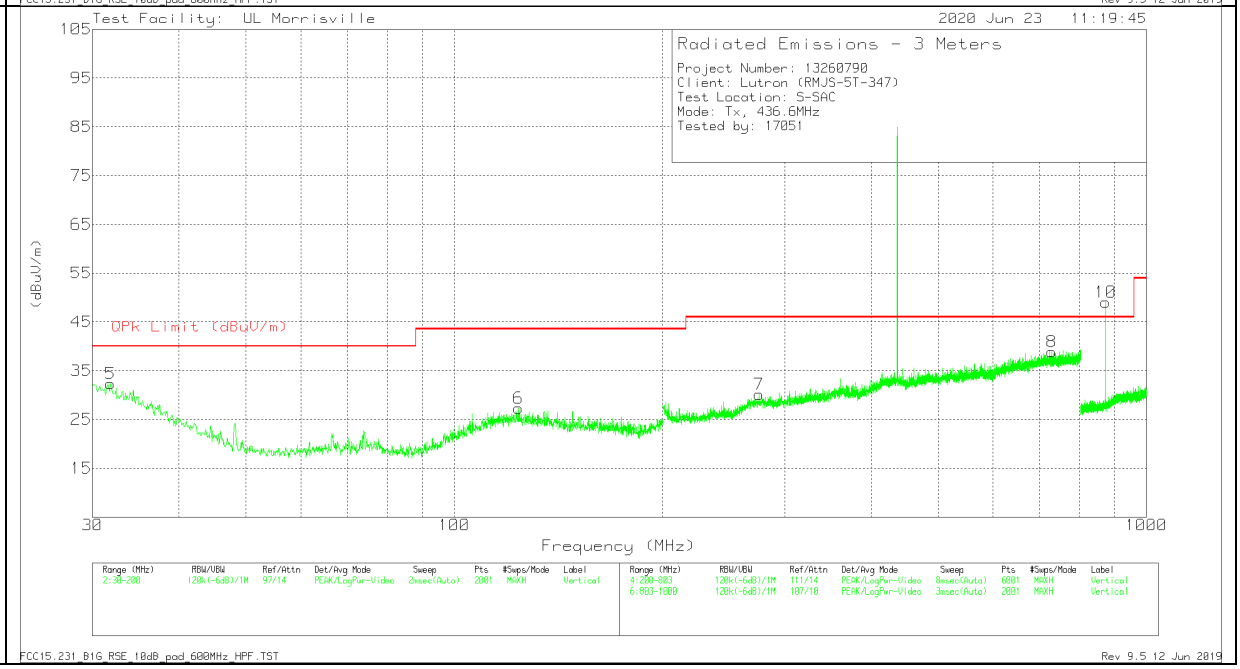
FUNDAMENTAL AND SPURIOUS EMISSIONS(30-1000MHz – 436.6MHz)

Horizontal



Vertical



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Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp (dB)	Pad (dB)	Filter (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.425	28.57	Pk	26.5	-31.8	9.9	0	33.17	60.91	-27.74	0-360	299	H
2	* 119.675	28.96	Pk	19.9	-30.8	9.9	0	27.96	43.52	-15.56	0-360	299	H
3	* 280.0985	31.15	Pk	19.4	-29.7	9.9	0	30.75	46.02	-15.27	0-360	198	H
4	800.387	30.18	Pk	27.2	-27.8	10	0	39.58	60.91	-21.33	0-360	198	H
9	873.2769	48.84	Qp	28	-27.4	0	.7	50.14	60.91	-10.77	344	100	H
5	31.87	28.35	Pk	25.8	-31.7	9.9	0	32.35	60.91	-28.56	0-360	101	V
6	* 123.84	28.29	Pk	19.9	-30.8	9.9	0	27.29	43.52	-16.23	0-360	101	V
7	* 275.576	30.5	Pk	19.4	-29.7	9.9	0	30.1	46.02	-15.92	0-360	201	V
8	729.7355	30.55	Pk	26.6	-28.3	10	0	38.85	60.91	-22.06	0-360	398	V
10	873.1209	49.72	Qp	28	-27.4	0	.7	51.02	60.91	-9.89	141	120	V

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

Notes:

(1) Quasi-Peak measurement is used to satisfy the limits given in §15.231(b).
(2) 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.

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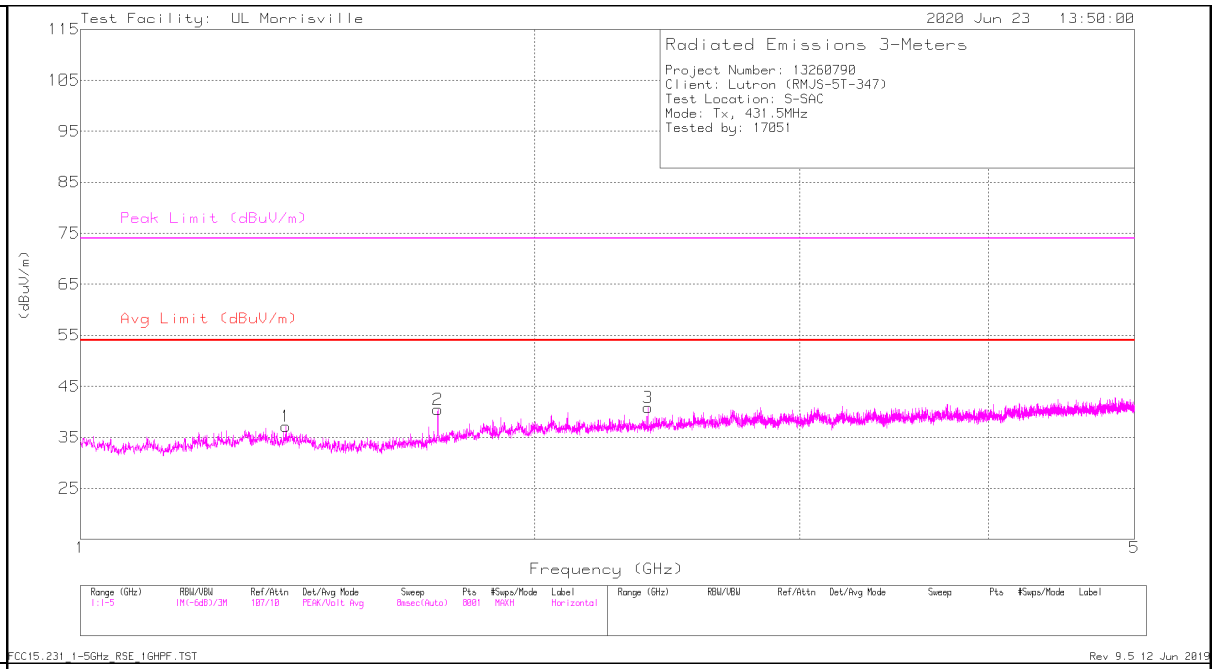
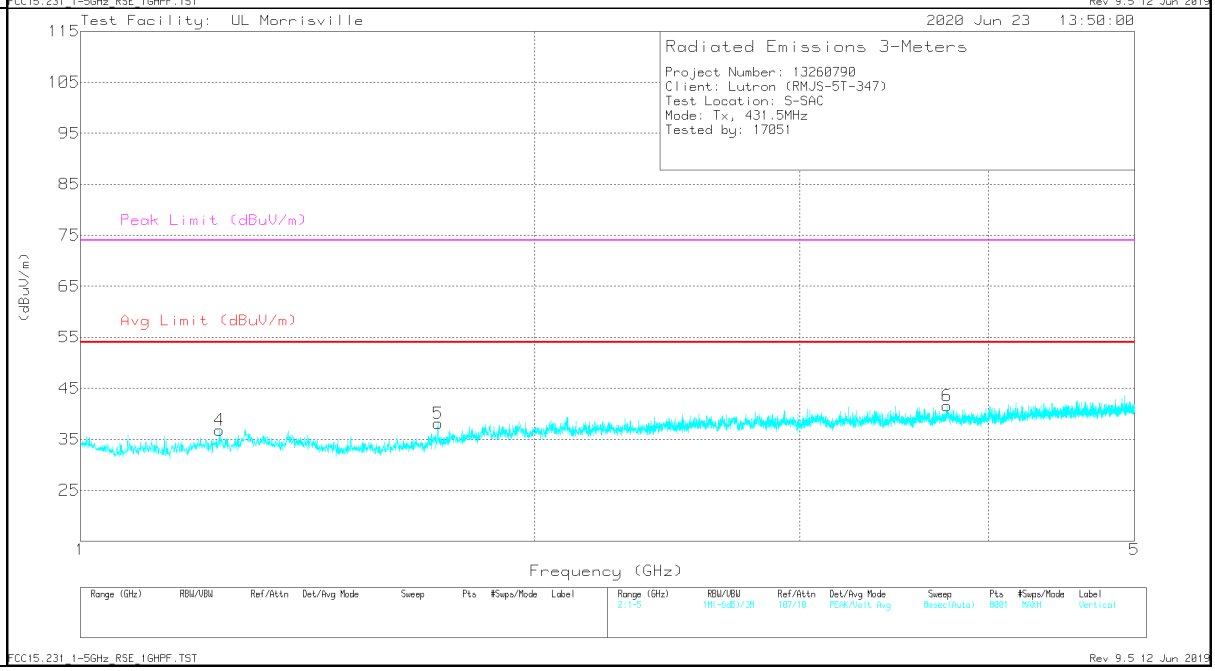
HARMONICS AND TX SPURIOUS EMISSIONS (>1GHz – 431.5MHz)

Horizontal



Vertical



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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0078 (dB/m)	Amp/Cbl/Fltr/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	* 1.369	41.93	Pk	29.5	-35.2	.9	37.13	54	-16.87	74	-36.87	0-360	199	H
2	1.726	45.34	Pk	29.6	-34.9	.4	40.44	54	-13.56	74	-33.56	0-360	199	H
3	* 2.3785	42.76	Pk	32	-34.3	.4	40.86	54	-13.14	74	-33.14	0-360	199	H
4	* 1.2365	42.31	Pk	28.9	-35.4	1	36.81	54	-17.19	74	-37.19	0-360	399	V
5	1.72625	42.96	Pk	29.6	-34.8	.4	38.16	54	-15.84	74	-35.84	0-360	101	V
6	* 3.7555	40.7	Pk	33.3	-32.8	.4	41.6	54	-12.4	74	-32.4	0-360	201	V

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

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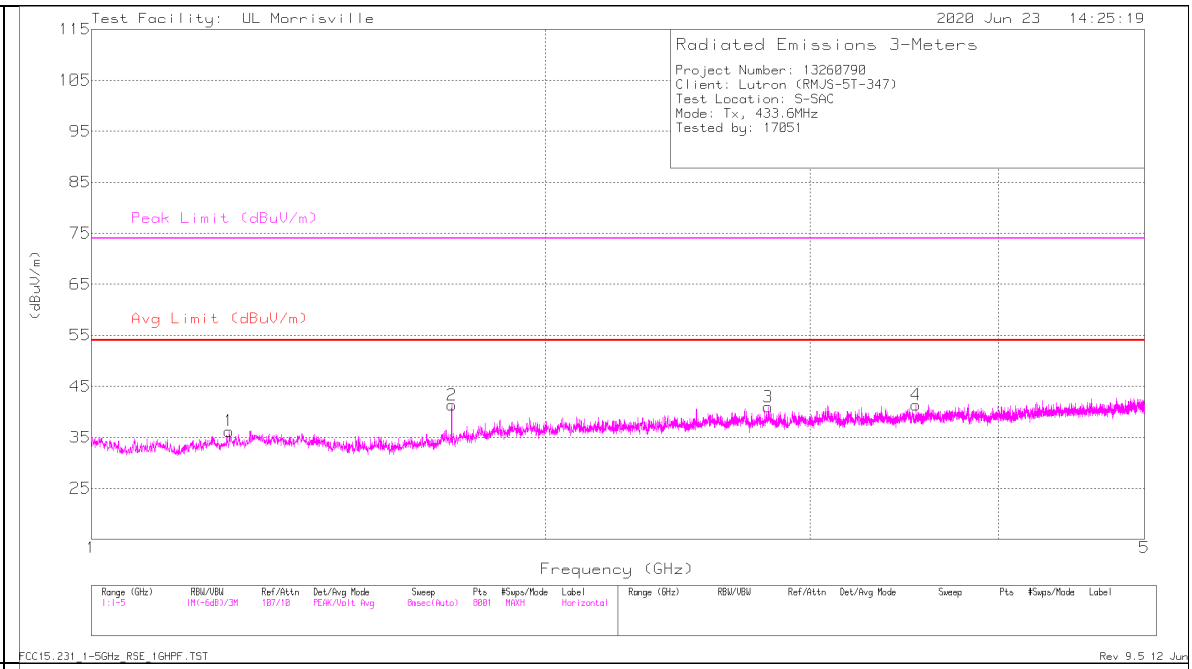
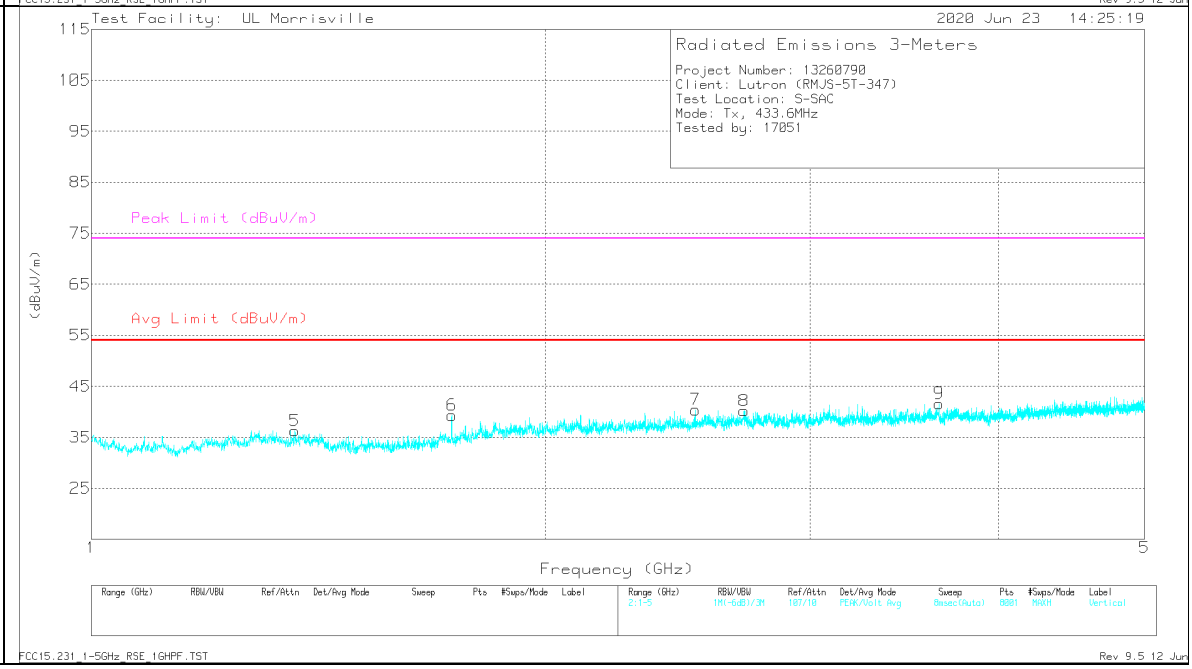
HARMONICS AND TX SPURIOUS EMISSIONS (>1GHz – 433.6MHz)

Horizontal



Vertical



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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0078 (dB/m)	Amp/Cbl/Fltr/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	* 1.2345	41.73	Pk	28.9	-35.4	1	36.23	54	-17.77	74	-37.77	0-360	101	H
2	1.7345	45.95	Pk	29.7	-34.7	.4	41.35	54	-12.65	74	-32.65	0-360	101	H
3	* 2.814	41.82	Pk	32.5	-33.9	.5	40.92	54	-13.08	74	-33.08	0-360	199	H
4	* 3.5265	40.76	Pk	33	-32.9	.5	41.36	54	-12.64	74	-32.64	0-360	399	H
5	* 1.365	41.29	Pk	29.5	-35.3	.8	36.29	54	-17.71	74	-37.71	0-360	299	V
6	1.7345	43.91	Pk	29.7	-34.7	.4	39.31	54	-14.69	74	-34.69	0-360	100	V
7	2.517	42.01	Pk	32.3	-34.3	.4	40.41	54	-13.59	74	-33.59	0-360	399	V
8	* 2.7115	40.8	Pk	32.7	-33.8	.5	40.2	54	-13.8	74	-33.8	0-360	199	V
9	* 3.6525	40.92	Pk	33.1	-32.9	.5	41.62	54	-12.38	74	-32.38	0-360	399	V

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

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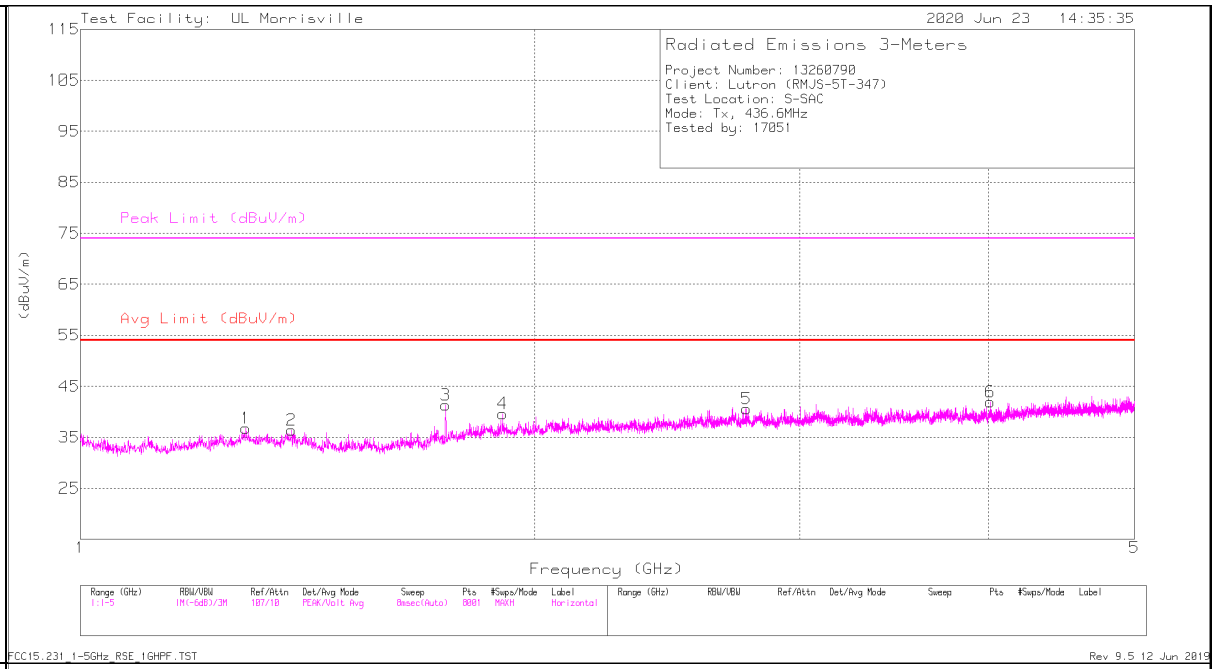
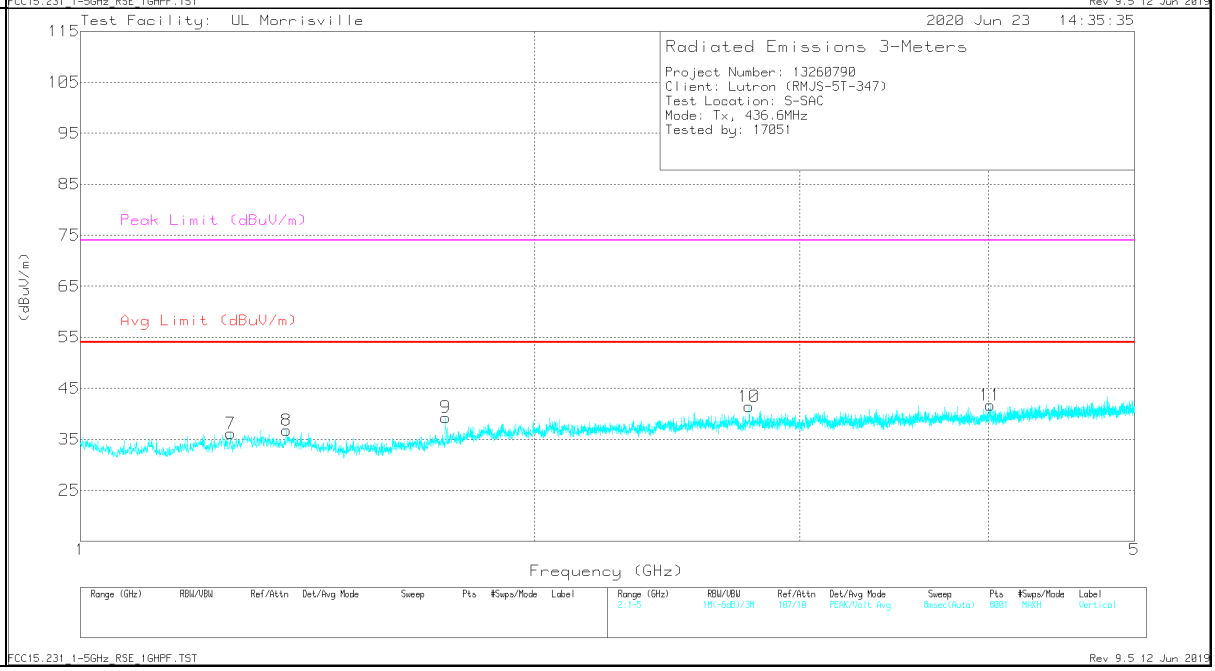
HARMONICS AND TX SPURIOUS EMISSIONS (>1GHz – 436.6MHz)

Horizontal



Vertical



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Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0078 (dB/m)	Amp/Cbl/Fltr/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	* 1.287	41.38	Pk	29.5	-35.1	1	36.78	54	-17.22	74	-37.22	0-360	399	H
2	* 1.3805	41.48	Pk	29.2	-35.2	.9	36.38	54	-17.62	74	-37.62	0-360	399	H
3	1.7465	46.1	Pk	29.8	-35	.4	41.3	54	-12.7	74	-32.7	0-360	100	H
4	1.9055	42.65	Pk	31.2	-34.6	.4	39.65	54	-14.35	74	-34.35	0-360	299	H
5	* 2.765	41.07	Pk	32.7	-33.7	.5	40.57	54	-13.43	74	-33.43	0-360	299	H
6	* 4.0115	41.05	Pk	33.2	-32.7	.4	41.95	54	-12.05	74	-32.05	0-360	399	H
7	* 1.258	41.26	Pk	29.2	-35.3	1	36.16	54	-17.84	74	-37.84	0-360	101	V
8	* 1.3695	41.58	Pk	29.5	-35.2	.9	36.78	54	-17.22	74	-37.22	0-360	101	V
9	1.7465	44.09	Pk	29.8	-35	.4	39.29	54	-14.71	74	-34.71	0-360	101	V
10	* 2.7765	42.17	Pk	32.6	-33.8	.5	41.47	54	-12.53	74	-32.53	0-360	399	V
11	* 4.011	40.79	Pk	33.2	-32.7	.4	41.69	54	-12.31	74	-32.31	0-360	399	V

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

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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 C63.4

RESULTS

No non-compliance noted:

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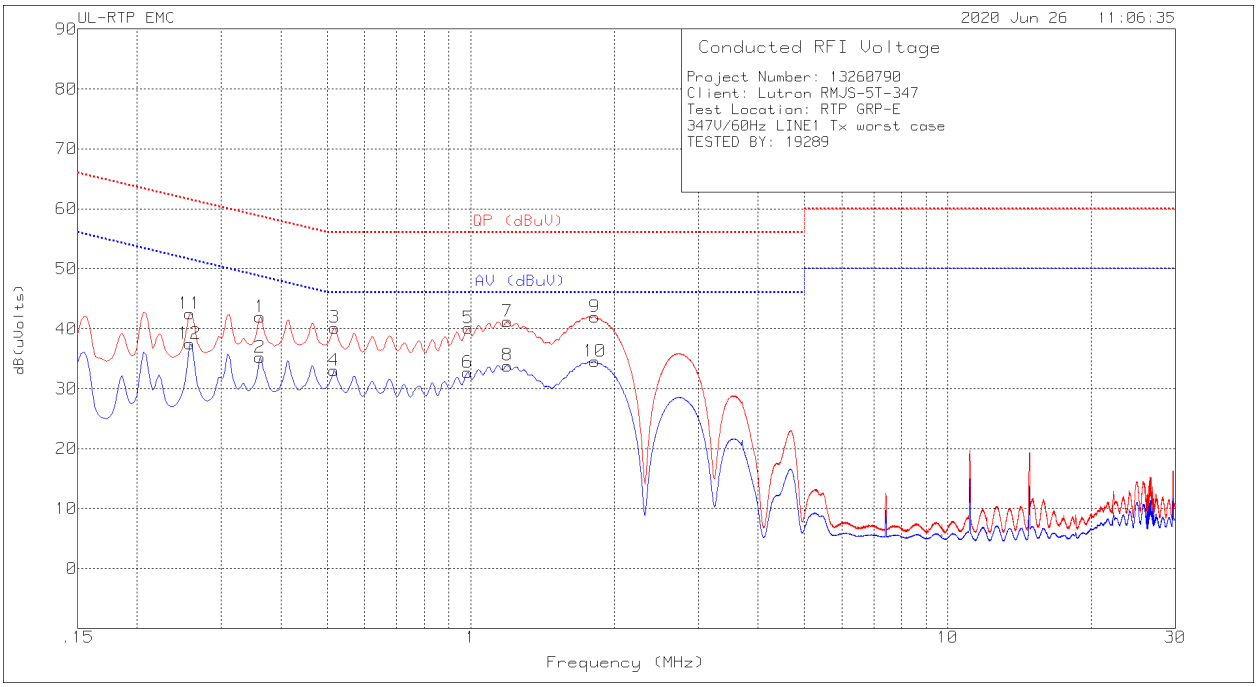
LINE 1 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002 (dB)	CBL004_ATA508 (dB)	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AV (dBuV)	Margin (dB)
2	.3615	25.83	Ca	.1	9.3	35.23	-	-	48.69	-13.46
4	.51675	23.6	Ca	.1	9.3	33	-	-	46	-13
6	.98475	23.41	Ca	0	9.3	32.71	-	-	46	-13.29
8	1.194	24.56	Ca	0	9.3	33.86	-	-	46	-12.14
10	1.8195	25.12	Ca	0	9.4	34.52	-	-	46	-11.48
12	.258	28.05	Ca	.2	9.3	37.55	-	-	51.5	-13.95
1	.3615	32.61	Qp	.1	9.3	42.01	58.69	-16.68	-	-
3	.519	30.78	Qp	.1	9.3	40.18	56	-15.82	-	-
5	.987	30.81	Qp	0	9.3	40.11	56	-15.89	-	-
7	1.194	31.88	Qp	0	9.3	41.18	56	-14.82	-	-
9	1.82175	32.6	Qp	0	9.4	42	56	-14	-	-
11	.258	33.07	Qp	.2	9.3	42.57	61.5	-18.93	-	-

Qp - Quasi-Peak detector
Ca - CISPR average detection

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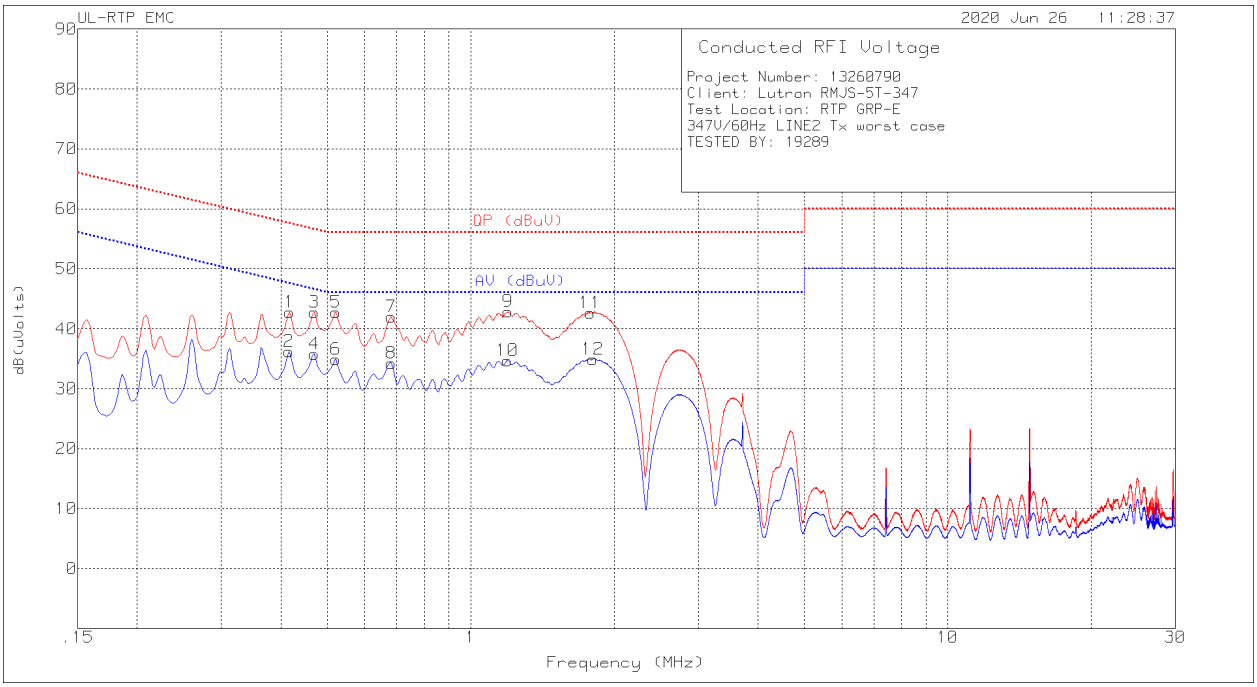
LINE 2 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002 (dB)	CBL004_ATA508 (dB)	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AV (dBuV)	Margin (dB)
2	.4155	26.79	Ca	.1	9.3	36.19	-	-	47.54	-11.35
4	.4695	26.32	Ca	.1	9.3	35.72	-	-	46.52	-10.8
6	.52125	25.51	Ca	.1	9.3	34.91	-	-	46	-11.09
8	.681	24.88	Ca	.1	9.3	34.28	-	-	46	-11.72
10	1.194	25.36	Ca	0	9.3	34.66	-	-	46	-11.34
12	1.80263	25.49	Ca	0	9.4	34.89	-	-	46	-11.11
1	.41775	33.36	Qp	.1	9.3	42.76	57.49	-14.73	-	-
3	.4695	33.34	Qp	.1	9.3	42.74	56.52	-13.78	-	-
5	.52125	33.32	Qp	.1	9.3	42.72	56	-13.28	-	-
7	.681	32.53	Qp	.1	9.3	41.93	56	-14.07	-	-
9	1.1985	33.52	Qp	0	9.3	42.82	56	-13.18	-	-
11	1.78125	33.27	Qp	0	9.4	42.67	56	-13.33	-	-

Qp - Quasi-Peak detector
Ca - CISPR average detection

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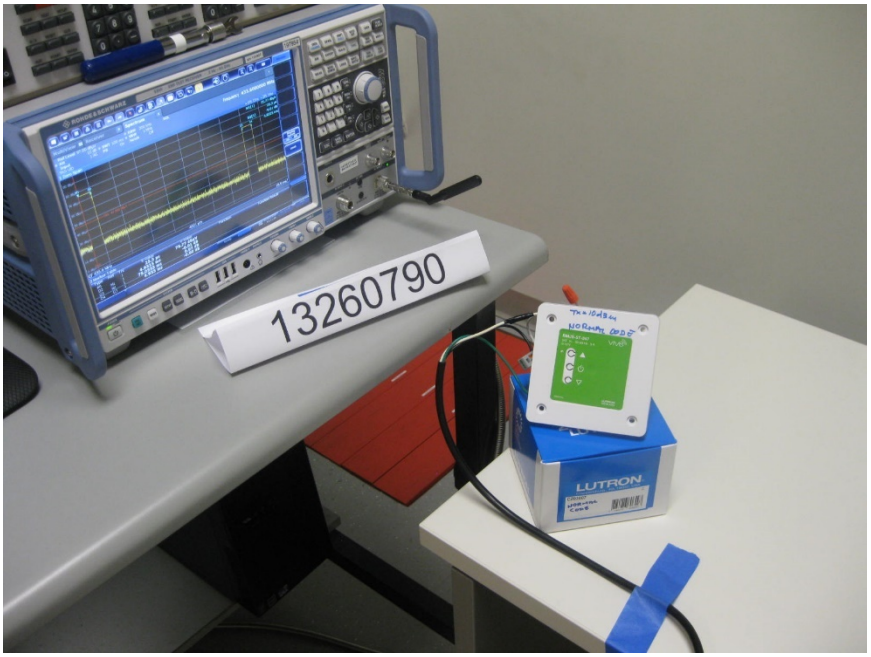
10. SETUP PHOTOS

OBW/TIMING MEASUREMENT

OBW/TIMING MEASUREMENT



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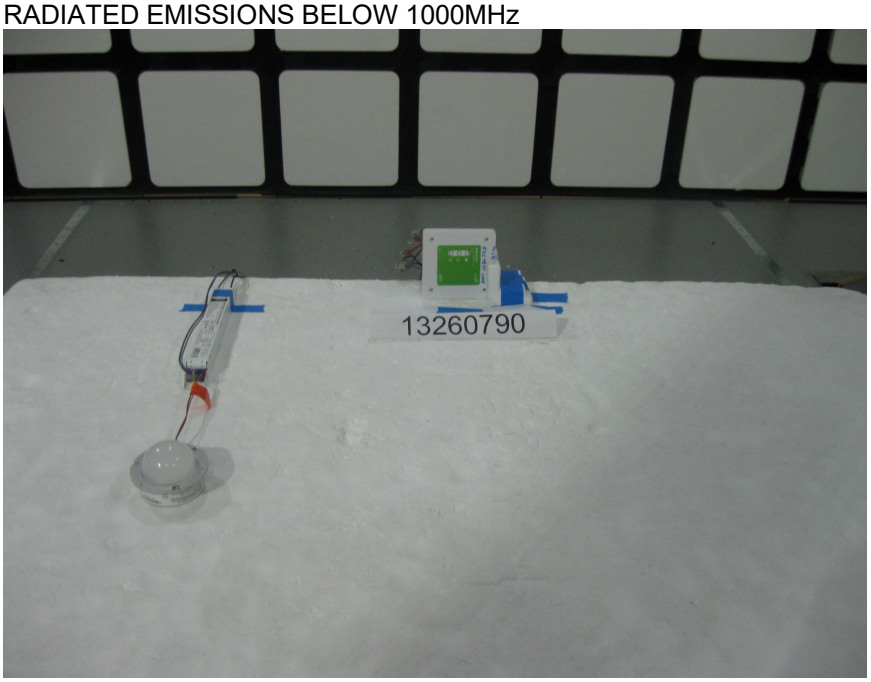
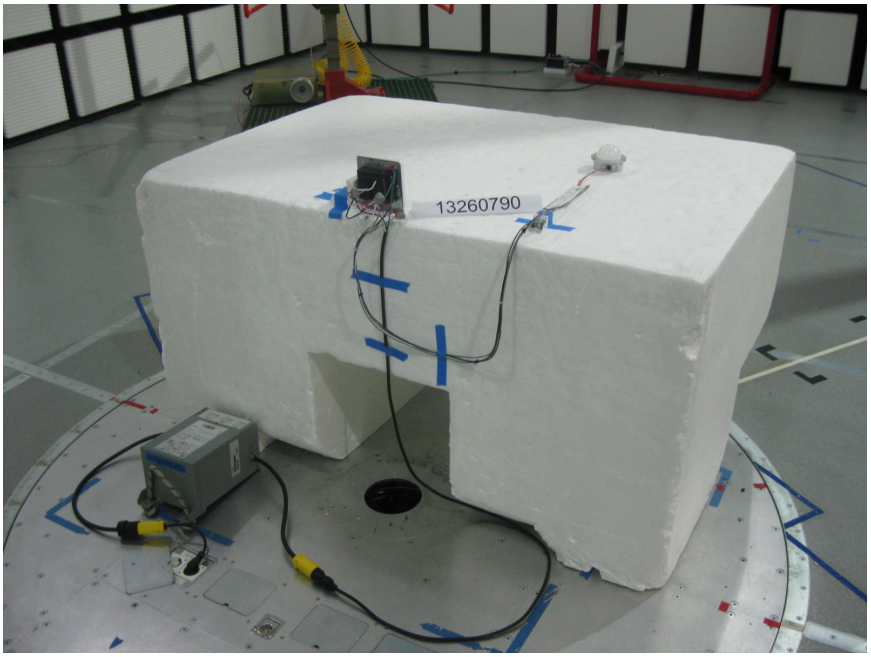
RADIATED EMISSIONS

RADIATED EMISSIONS BELOW 1000MHz





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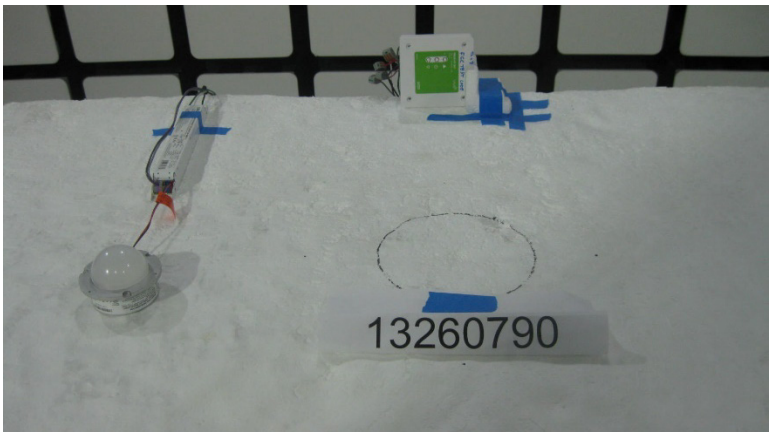
RADIATED EMISSIONS ABOVE 1000MHz



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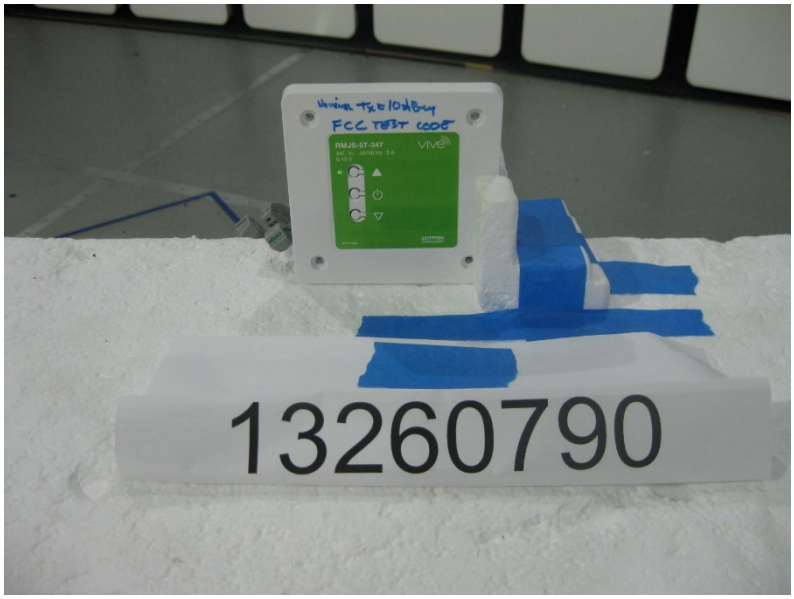
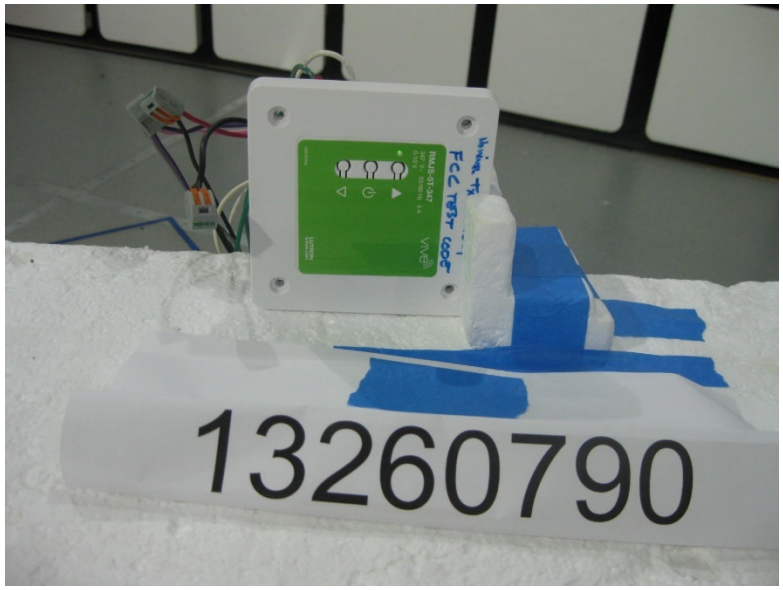
X ORIENTATION



Y ORIENTATION



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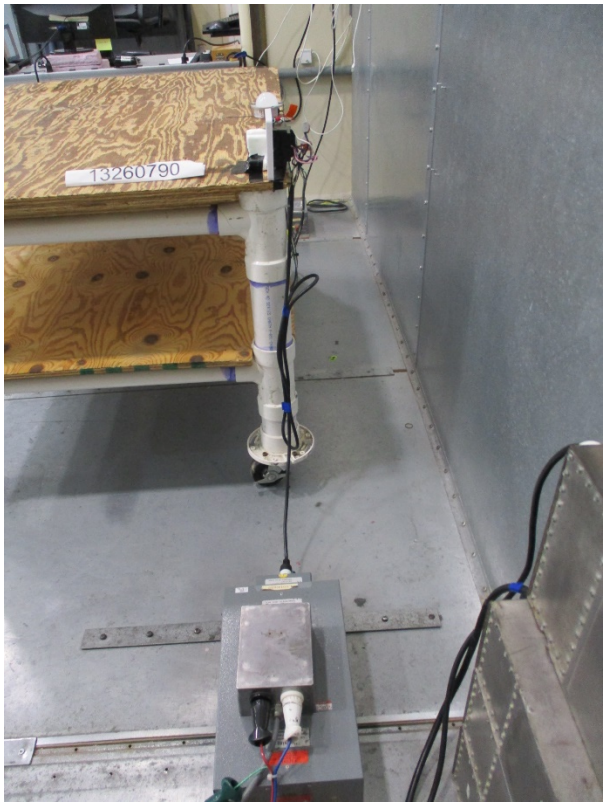
AC MAINS EMISSIONS



END OF TEST REPORT

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