



**FCC CFR47 PART 15 SUBPART C
ISED CANADA RSS-210 ISSUE 9**

CERTIFICATION TEST REPORT

FOR

RF IN-WALL OCCUPANCY DIMMER

MODEL NUMBER: MAESTRO

**FCC ID: JPZ0120
IC: 2851A-JPZ0120**

REPORT NUMBER: R12474902-E1

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**Prepared for
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Revision History

Ver.	Issue Date	Revisions	Revised By
1	2019-01-02	Initial Issue	Brian T. Kiewra
2	2019-01-02	Revised antenna gain to -14dBd (-11.86dBi).	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Lutron Electronics Co Inc.
EUT DESCRIPTION: RF in-wall occupancy dimmer
MODEL: Maestro
SERIAL NUMBER: 01948710
DATE TESTED: 2018-11-01 to 2018-12-28

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Complies
ISED CANADA RSS-210 Issue 9	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. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

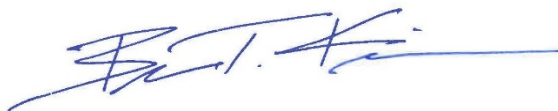
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. All samples tested were in good operating condition throughout the entire test program. This document may not be altered or revised in any way unless done so by 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:



Jeffrey Moser
Operations Leader
UL – Consumer Technology Division

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, and RSS-210 Issue 9.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, NC 27560, USA.

12 Laboratory Dr., RTP, NC 27709
☐ Chamber A
☐ Chamber C

2800 Perimeter Park Dr., Suite B, Morrisville, NC 27560
☐ Chamber NORTH
☒ Chamber SOUTH

The onsite chambers (A & C) are covered under Industry Canada company address code 2180C with site numbers 2180C -1 through 2180C-4, respectively.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at <https://www.nist.gov/>.

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:

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

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY (+/-)
Occupied Channel Bandwidth	2.00%
Line Conducted Emissions (LISN)	3.65 dB
All emissions, radiated	4.88 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an RF in-wall occupancy dimmer allowing control of 0-10V lighting loads locally and from RF controls using 433MHz transmitter. Range of the transmitter is 431.5-436.6 MHz.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB loop type antenna, with a maximum gain of -14dBd (-11.86dBi).

5.3. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was MRF2S-8SS App v. 1.00.
The test utility software used during testing was 250.18-Dimmer_FCC_TX_PCL_105.

5.4. WORST-CASE CONFIGURATION AND MODE

The EUT was investigated in three orthogonal axes, X, Y, and Z. It was determined that Z-Axis was worst-case. Therefore all radiated testing performed with the EUT in the Z orientation. AC Mains emissions was performed with the EUT transmitting on worst-case channel determined by fundamental field strength.

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
None				

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	Quick Connect	Single Conductor	<3m	Provides AC
2	Load	2	Quick Connect	Single Conductor	<3m	Connected to load
3	Load	2	Quick Connect	Single Conductor	<3m	Connected to battery pack as load.

TEST SETUP

The EUT was configured as a standalone device.

SETUP DIAGRAM FOR TESTS

Refer to UL document R12474902-EP1 for diagram.

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	2018-01-02	2019-01-02
30-1000 MHz					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2018-07-24	2019-07-24
1-18 GHz					
AT0069	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2018-04-30	2019-04-30
Gain-Loss Chains					
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2018-09-06	2019-09-06
S-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2018-05-20	2019-05-20
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2018-03-20	2019-03-20
Receiver & Software					
SA0026	Spectrum Analyzer	Agilent	N9030A	2018-03-20	2019-03-20
SOFTMI	EMI Software	UL	Version 9.5	NA	NA
Additional Equipment used					
s/n 161024887	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23
HPF004	1GHz high-pass filter, 2W, $F_{high} = 18\text{GHz}$	Micro-Tronics	HPM50115-01	2018-07-18	2019-07-18
ATA176	10dB, DC-18GHz, 5W	Mini-Circuits	BW-N10W5	2018-04-04	2019-04-04

Note – Radiated testing performed from 2018-12-05 to 2018-12-19.

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0026	Spectrum Analyzer	Agilent	N9030A	2018-03-20	2019-03-20
SN 161024885	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23
s/n 161024887	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23

Note – This testing was performed from 2018-11-01 to 2018-12-19.

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	2018-06-19	2019-06-19
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2018-08-21	2019-08-21
PRE0101521 (75141)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2018-08-22	2019-08-22
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2018-06-13	2019-06-13
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA

7. 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.

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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.

RESULTS

No non-compliance noted:

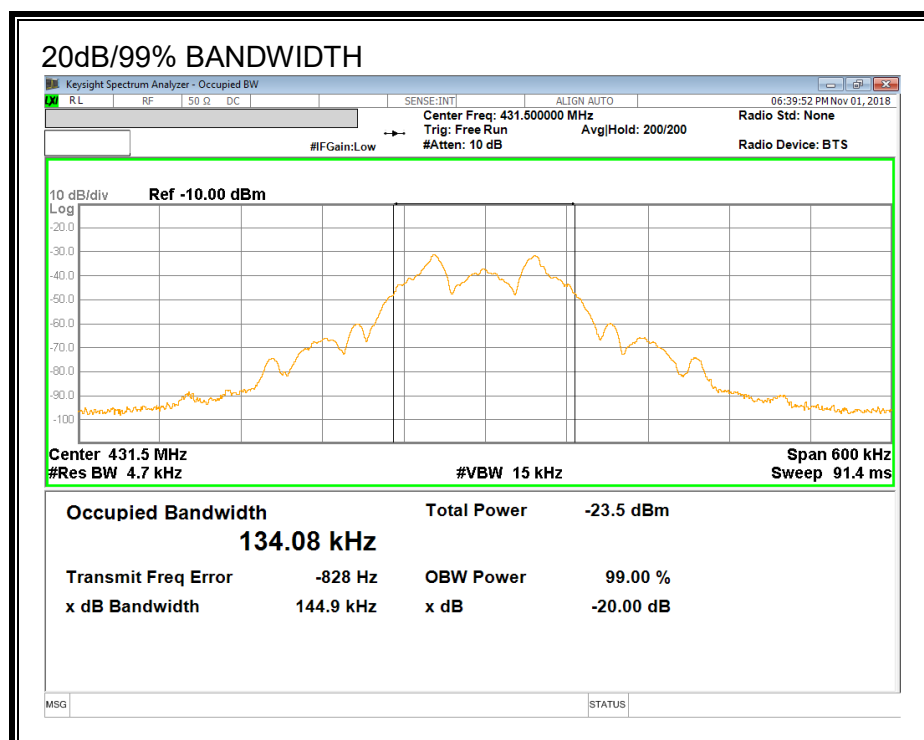
20dB Bandwidth

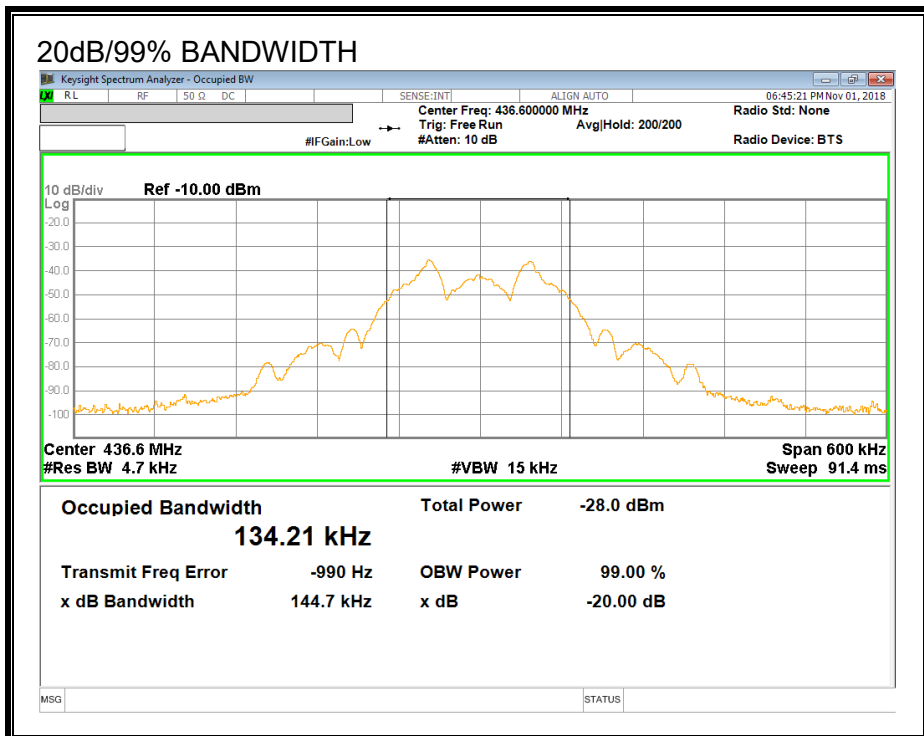
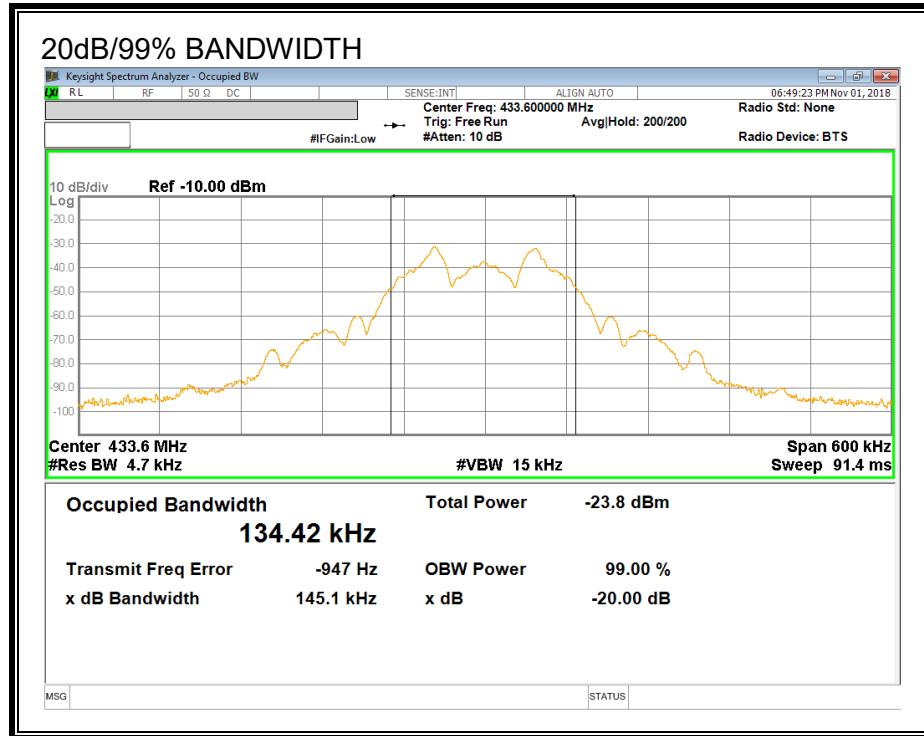
Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
431.5	144.9	1078.75	-933.85
433.6	145.1	1084	-938.9
436.6	144.7	1091.5	-946.8

99% Bandwidth

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
431.5	134.08	1078.75	-944.67
433.6	134.42	1084	-949.58
436.6	134.21	1091.5	-957.29

BANDWIDTH





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 100 kHz and the VBW is set to 100 kHz. 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

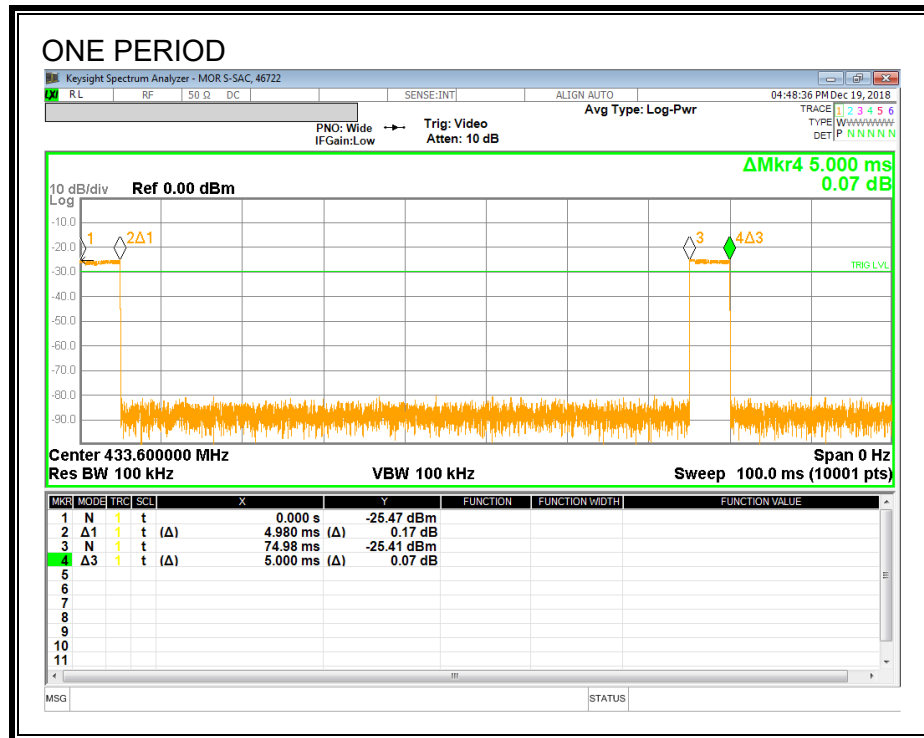
Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle), Where Duty Cycle is (# of long pulses * long pulse width) + (# of short pulses * short pulse width) / 100 or T

RESULTS

No non-compliance noted:

One Period (ms)	Pulse Width (ms)	# of Pulses	Duty Cycle	20*Log Duty Cycle (dB)
100	5	2	0.100	-20.00

ONE PERIOD



7.3. TRANSMISSION TIME

LIMITS

FCC §15.231 (a) (2)

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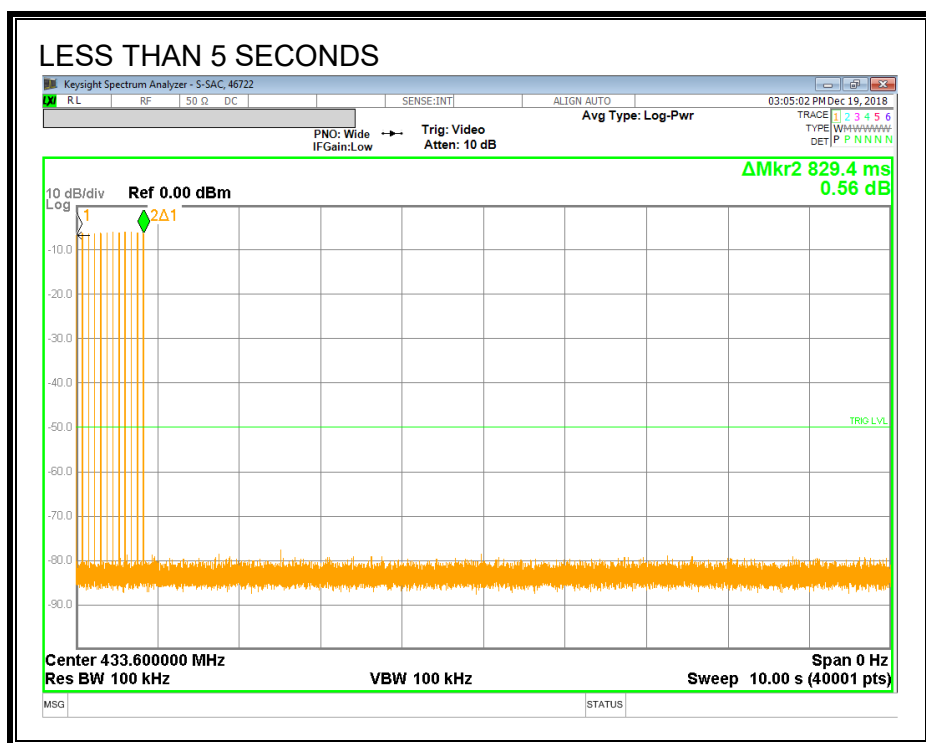
A transmitter activated automatically shall cease transmission within 5 seconds after activation.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is set to 10 seconds and the span is set to 0 Hz.

RESULTS

No non-compliance noted:



Note – The transmitter ceased transmission within 830 ms.

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
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	(²)
13.36 - 13.41			

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)
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.

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 10%, as calculated in Section 7.2 of this report. For all other spurious emissions, voltage averaging was used.

The spectrum from 9 kHz to 4.5 GHz was investigated with the transmitter on. For 9kHz to 30 MHz, the transmitter was set to the worst-case channel. For 30 MHz to 4.5 GHz, the transmitter was set to Low and High channels, as described in 15.31 (m).

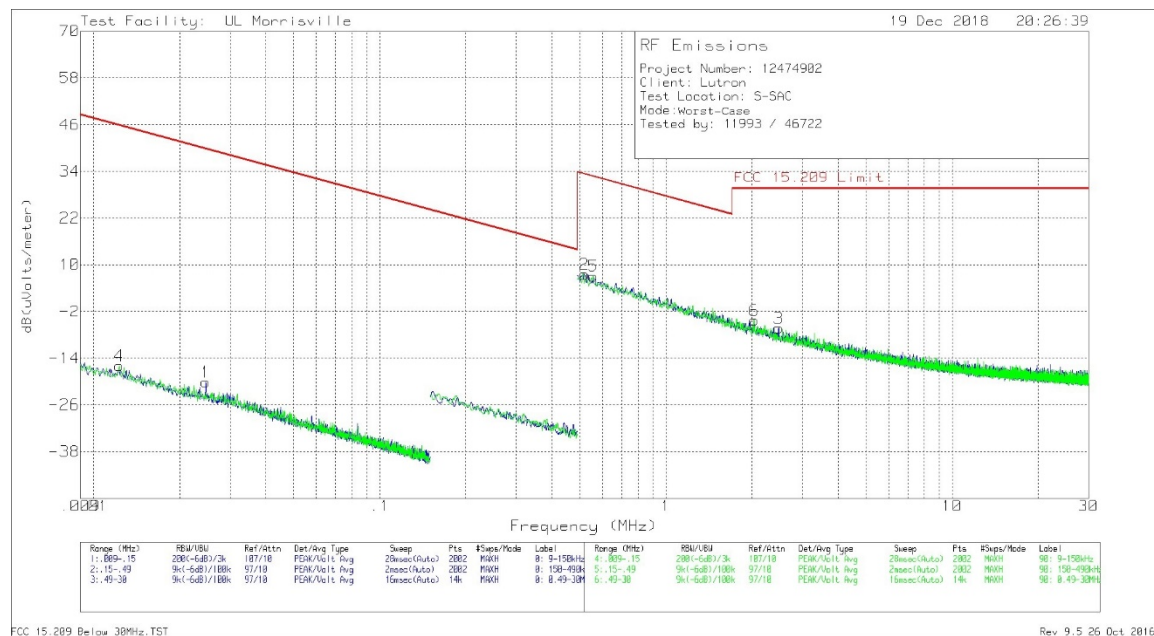
The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

RESULTS

8.1.1. 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 $40 \cdot \log(\text{test distance/specification distance})$.

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



The above plot demonstrate there were no EUT-related emissions of interest relative to the FCC 15.209 limit below 30MHz.

8.1.2. FUNDAMENTAL, HARMONICS AND TX SPURIOUS EMISSION BELOW 1GHz

FUNDAMENTAL

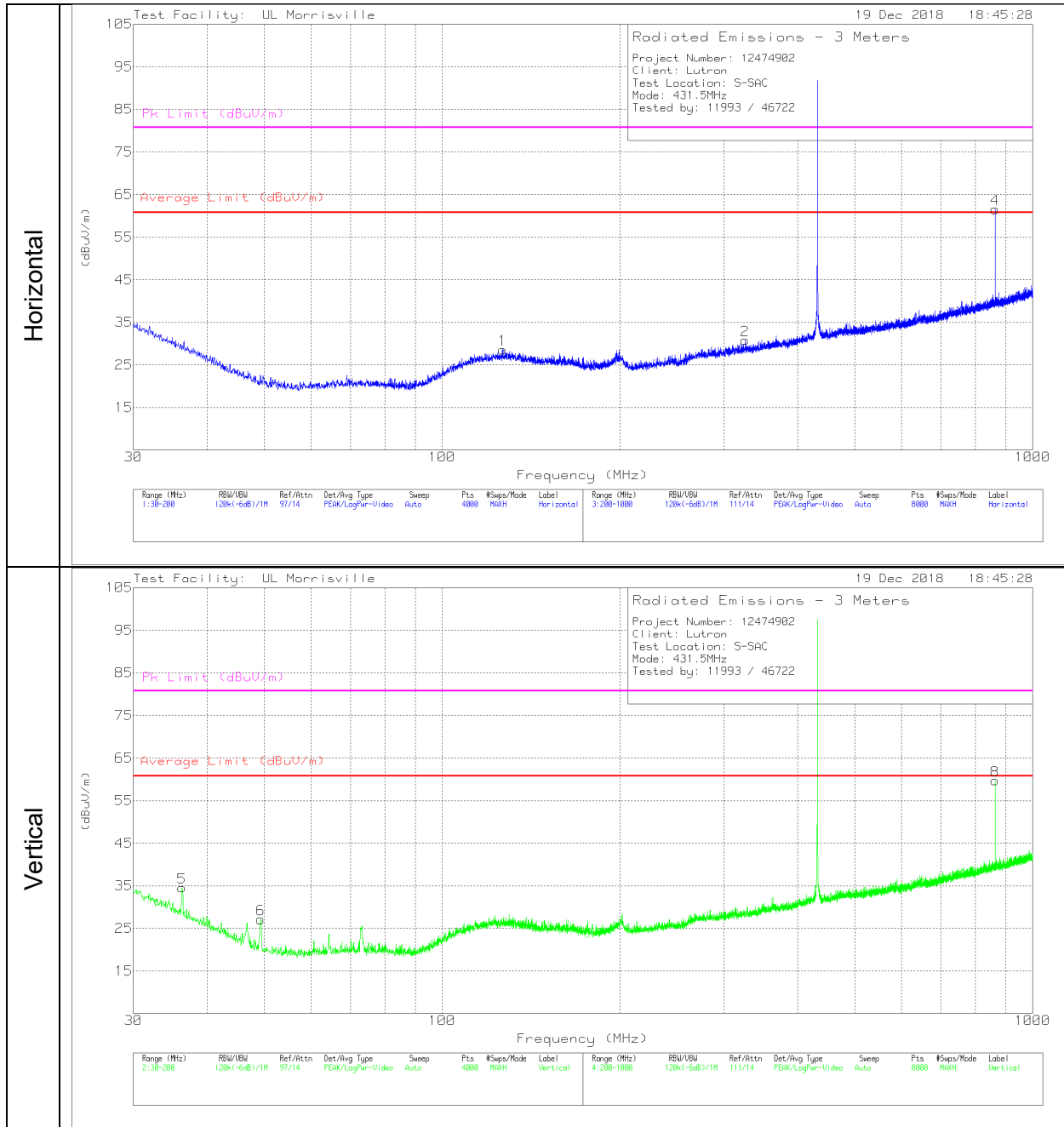
TEST LOCATION: S-SAC

TEST DATE: 2018-12-05

TESTED BY: 17051

Freq (MHz)	Detector	PK Field Reading [dBuV/m]	FCC 15.231 Peak Limit [dBuV/m]	Margin [dB]	DCF (dB)	Average Field Strength [dBuV/m]	FCC 15.231 Average Limit [dBuV/m]	Margin [dB]	In Restricted Band* **?
431.50	PK	98.26	100.75	-2.49	-20.00	78.26	80.75	-2.49	N
433.60	PK	100.14	100.81	-0.67	-20.00	80.14	80.81	-0.67	N
436.60	PK	96.99	100.91	-3.92	-20.00	76.99	80.91	-3.92	N
Average Field Strength computed as follows for the above fundamental and harmonics: PK + DCF, where DCF = $20 \cdot \log(T_{on}/100ms)$, $T_{on}=10ms$									

LOW CHANNEL (431.5MHz)

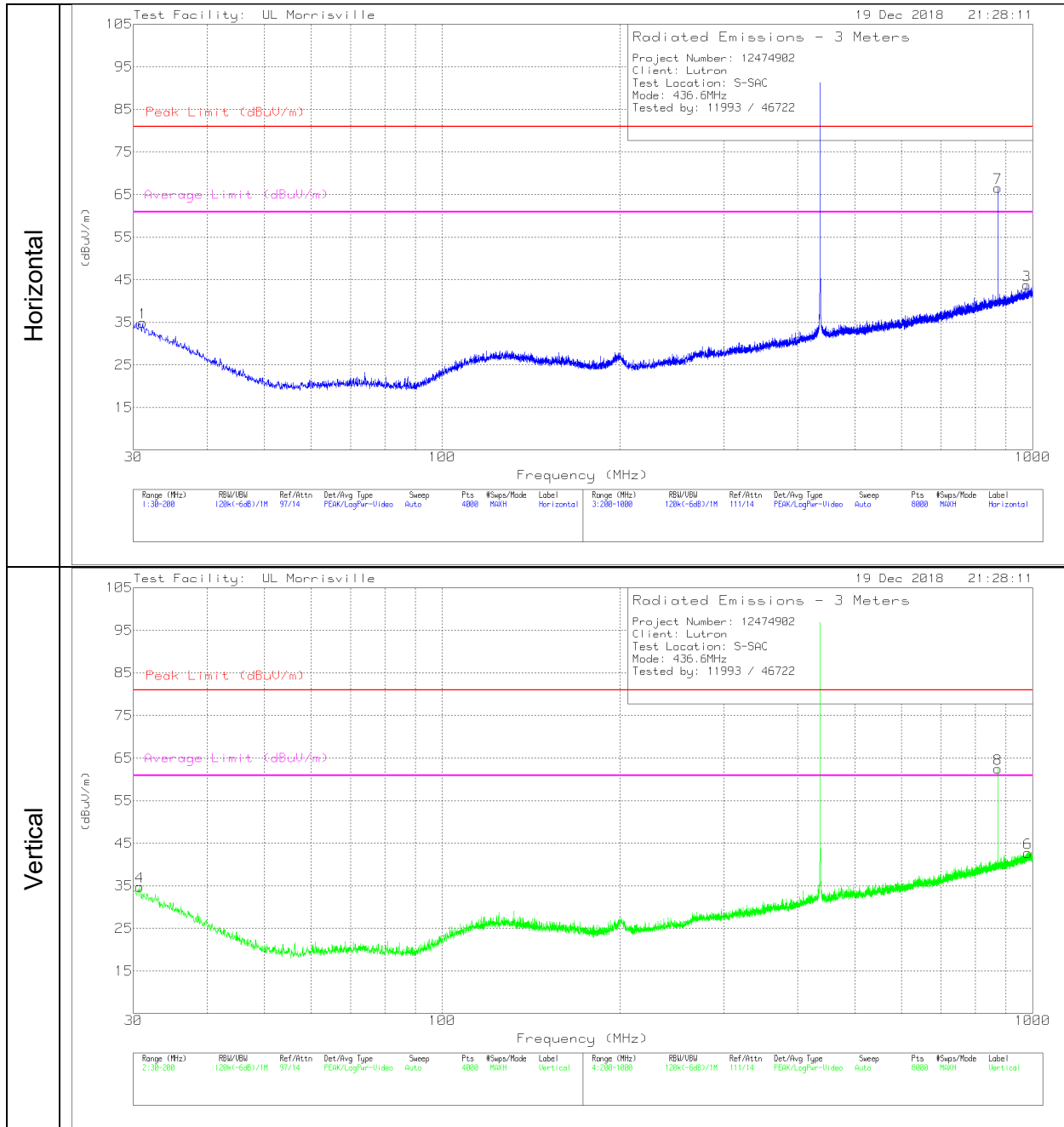


Freq (MHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	Pad (dB)	Peak Field Strength [dBuV/m]	FCC 15.231 Peak Limit ¹ [dBuV/m]	Margin [dB]	DCF (dB)	Average Field Strength [dBuV/m]	FCC 15.231 Average Limit [dBuV/m]	Margin [dB]	Antenna Polarity	In Restricted Band* **?
863.0771 (Harm)	51.01	PK	26.70	-27.50	10.00	60.21	80.75	-20.54	-20.00	40.2	60.75	-20.54	H	N
862.9259 (Harm)	51.86	PK	26.70	-27.50	10.00	61.06	80.75	-19.69	-20.00	41.1	60.75	-19.69	V	N
Note 1: Limit is a 15.209 QP Limit if frequency is within a restricted band.														
Average Field Strength computed as follows for the above fundamental and harmonics: PK + DCF, where DCF = 20*log(T_on/100ms), Ton=10ms														
Note: The following frequencies were not harmonics of the EUT's fundamental frequency.														
126.53	25.10	Qp	18.30	-30.70	9.90	22.6	43.50	-20.90	-	-	-	-	H	Y
326.02	24.77	Qp	18.70	-29.40	9.90	24.0	46.00	-22.03	-	-	-	-	H	Y
36.19	25.44	Qp	21.40	-31.70	9.90	25.0	-	-	-	-	-	-	V	N
49.44	25.31	Qp	12.90	-31.50	9.90	16.6	-	-	-	-	-	-	V	N
PK = Peak, QP = Quasi-Peak														
Note 1: Limit is a 15.209 QP Limit if frequency is within a restricted band.														

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

HIGH HANNEL (436.6MHz)



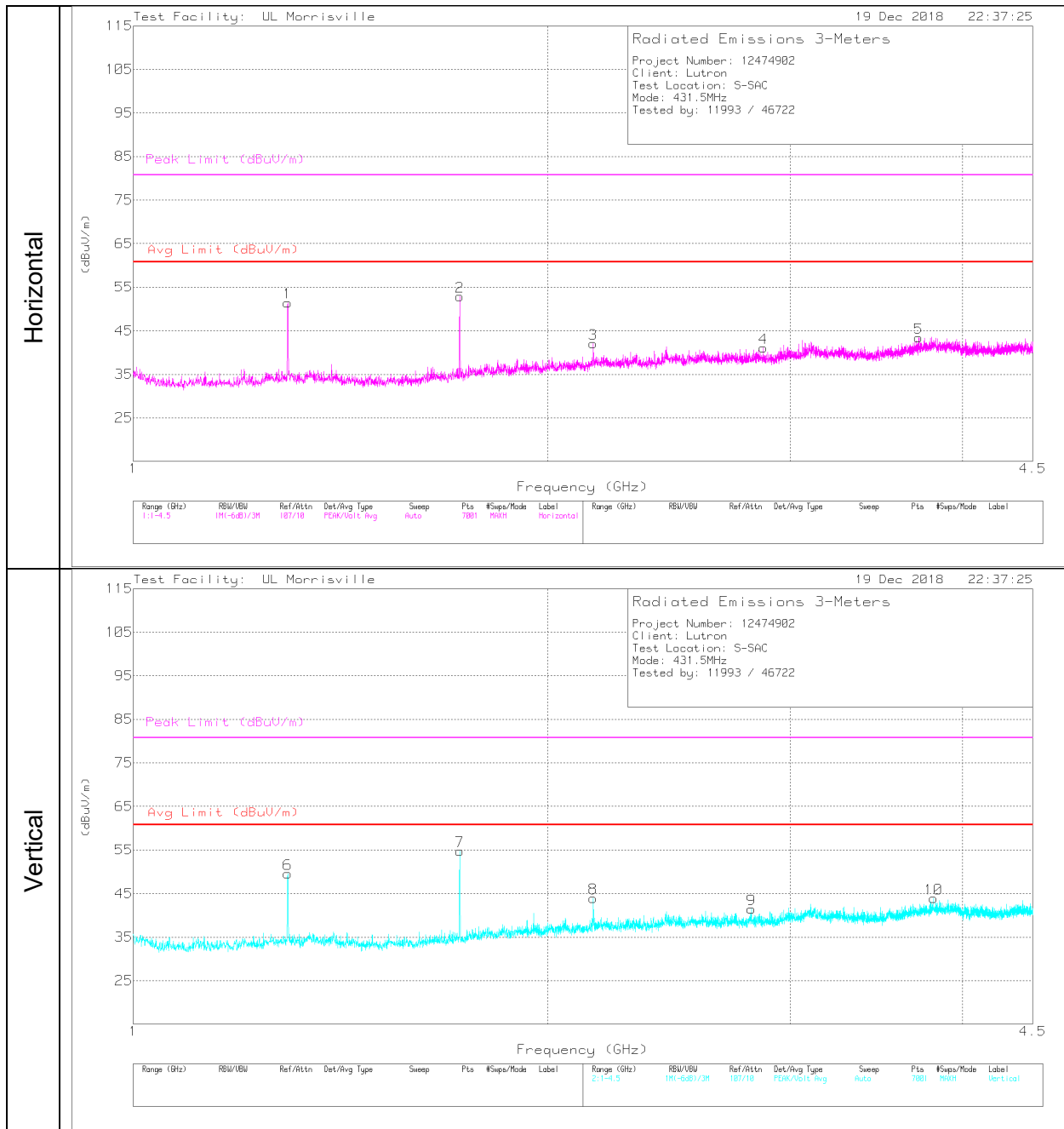
Freq (MHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	Pad (dB)	Peak Field Strength [dBuV/m]	FCC 15.231 Peak Limit ¹ [dBuV/m]	Margin [dB]	DCF (dB)	Average Field Strength [dBuV/m]	FCC 15.231 Average Limit [dBuV/m]	Margin [dB]	Antenna Polarity	In Restricted Band* **?
873.27 (Harm)	56.62	PK	26.80	-27.40	10.00	66.02	80.91	-14.89	-20.00	46.02	60.91	-14.89	H	N
873.00 (Harm)	54.65	PK	26.80	-27.40	10.00	64.05	80.91	-16.86	-20.00	44.05	60.91	-16.86	V	N
Note 1: Limit is a 15.209 QP Limit if frequency is within a restricted band.														
Average Field Strength computed as follows for the above fundamental and harmonics: PK + DCF, where DCF = 20*log(T_on/100ms), Ton=10ms														
Note: The following frequencies were not harmonics of the EUT's fundamental frequency.														
976.4404	24.47	Qp	27.80	-26.10	10.00	36.17	54.00	-17.83	-	-	34.00	2.17	H	Y
981.3726	24.43	Qp	27.80	-26.00	10.00	36.23	54.00	-17.77	-	-	34.00	2.23	V	Y
30.794	25.38	Qp	25.80	-31.80	9.90	29.28	-	-	-	-	-	-	V	N
30.895	25.42	Qp	25.70	-31.80	9.90	29.22	-	-	-	-	-	-	H	N
Note 1: Limit is a 15.209 QP Limit if frequency is within a restricted band.														
PK = Peak, QP = Quasi-Peak														

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

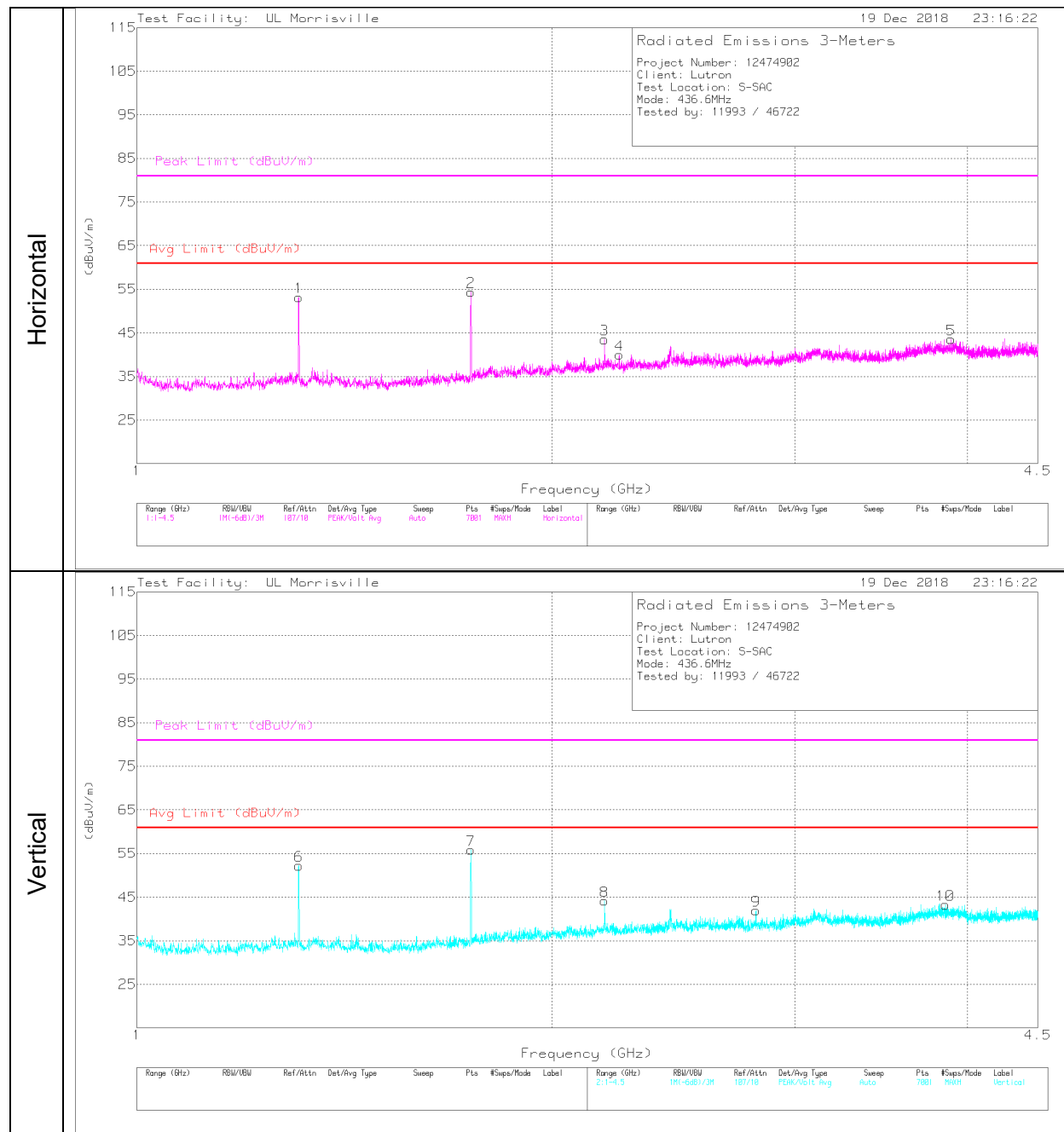
8.1.3. HARMONICS AND TX SPURIOUS EMISSIONS ABOVE 1GHz

LOW CHANNEL (431.5MHz)



Freq (GHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	Filter (dB)	Peak Field Strength [dBuV/m]	FCC 15.231 Peak Limit ¹ [dBuV/m]	Margin [dB]	DCF (dB)	Average Field Strength [dBuV/m]	FCC 15.231 Average Limit ¹ [dBuV/m]	Margin [dB]	Antenna Polarity	In Restricted Band* **?
1.294 (Harm)	57.42	Pk	28.90	-35.00	0.50	51.82	74	-22.18	-20.00	31.82	54	-22.18	H	Y
1.295 (Harm)	58.04	Pk	28.90	-35.00	0.50	52.44	74	-21.56	-20.00	32.44	54	-21.56	V	Y
1.726 (Harm)	57.75	Pk	29.30	-34.70	0.50	52.85	80.75	-27.90	-20.00	32.85	60.75	-27.90	H	N
1.726 (Harm)	59.66	Pk	29.30	-34.70	0.50	54.76	80.75	-25.99	-20.00	34.76	60.75	-25.99	V	N
2.158 (Harm)	44.67	Pk	31.50	-34.40	0.30	42.07	80.75	-38.68	-20.00	22.07	60.75	-38.68	H	N
2.158 (Harm)	46.56	Pk	31.50	-34.40	0.30	43.96	80.75	-36.79	-20.00	23.96	60.75	-36.79	V	N
Note 1: Limit is a 15.209 AV/PK Limit if frequency is within a restricted band.														
Average Field Strength computed as follows for the above harmonics: PK + DCF, where DCF = 20*log(T _{on} /100ms), T _{on} = 10ms														
Note: The following frequencies were not harmonics of the EUT's fundamental frequency.														
2.867	37.73	Pk	32.30	-33.90	0.40	36.53	74.00	-37.47	-	-	-	-	H	Y
2.867	33.69	Av	32.30	-33.90	0.40	-	-	-	-	32.49	54.00	-21.51	H	Y
3.720	37.48	Pk	33.30	-33.10	0.60	38.28	74.00	-35.72	-	-	-	-	H	Y
3.720	32.53	Av	33.30	-33.10	0.60	-	-	-	-	33.33	54.00	-20.67	H	Y
2.810	37.59	Pk	32.40	-33.80	0.50	36.69	74.00	-37.31	-	-	-	-	V	Y
2.810	32.26	Av	32.40	-33.80	0.50	-	-	-	-	31.36	54.00	-22.64	V	Y
3.813	39.48	Pk	33.40	-32.90	0.60	40.58	74.00	-33.42	-	-	-	-	V	Y
3.813	34.12	Av	33.40	-32.90	0.60	-	-	-	-	35.22	54.00	-18.78	V	Y
Note 1: Limit is a 15.209 AV/PK Limit if frequency is within a restricted band.														
Pk = Peak, Av = Average														

HIGH HANNEL (436.6MHz)



Freq (GHz)	Meter Reading [dBuV]	Detector	Antenna Factor [dB/m]	Gain/Loss [dB]	Filter (dB)	Peak Field Strength [dBuV/m]	FCC 15.231 Peak Limit ¹ [dBuV/m]	Margin [dB]	DCF (dB)	Average Field Strength [dBuV/m]	FCC 15.231 Average Limit ¹ [dBuV/m]	Margin [dB]	Antenna Polarity	In Restricted Band* **?
1.31 (Harm)	58.90	Pk	28.90	-35.10	0.50	53.20	74.00	-20.80	-20.00	33.20	54.00	-20.80	H	Y
1.31 (Harm)	58.05	Pk	28.90	-35.10	0.50	52.35	74.00	-21.65	-20.00	32.35	54.00	-21.65	V	Y
1.746 (Harm)	60.52	Pk	29.50	-34.70	0.50	55.82	80.81	-24.99	-20.00	35.82	60.81	-24.99	V	N
1.747 (Harm)	59.10	Pk	29.50	-34.70	0.50	54.40	80.81	-26.41	-20.00	34.40	60.81	-26.41	H	N
2.183 (Harm)	45.89	Pk	31.60	-34.40	0.40	43.49	80.81	-37.32	-20.00	23.49	60.81	-37.32	H	N
2.183 (Harm)	46.55	Pk	31.60	-34.40	0.40	44.15	80.81	-36.66	-20.00	24.15	60.81	-36.66	V	N
Note 1: Limit is a 15.209 AV/PK Limit if frequency is within a restricted band.														
Average Field Strength computed as follows for the above harmonics: PK + DCF, where DCF = 20*log(T_on/100ms), Ton =10ms														
Note: The following frequencies were not harmonics of the EUT's fundamental frequency.														
2.238	38.15	Pk	31.80	-34.30	0.30	35.95	74.00	-38.05	-	-	-	-	H	Y
2.238	33.18	Av	31.80	-34.30	0.30	-	-	-	-	30.98	54.00	-23.02	H	Y
3.893	39.57	Pk	33.40	-33.00	0.60	40.57	74.00	-33.43	-	-	-	-	H	Y
3.893	33.16	Av	33.40	-33.00	0.60	-	-	-	-	34.16	54.00	-19.84	H	Y
2.811	38.05	Pk	32.40	-33.80	0.50	37.15	74.00	-36.85	-	-	-	-	V	Y
2.811	33.85	Av	32.40	-33.80	0.50	-	-	-	-	32.95	54.00	-21.05	V	Y
3.858	42.51	Pk	33.40	-33.10	0.40	43.21	74.00	-30.79	-	-	-	-	V	Y
3.858	33.58	Av	33.40	-33.10	0.40	-	-	-	-	34.28	54.00	-19.72	V	Y
Note 1: Limit is a 15.209 AV/PK Limit if frequency is within a restricted band.														
Pk = Peak, Av = Average														

9. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207 (a)
IC RSS-GEN, Section 8.8

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.		

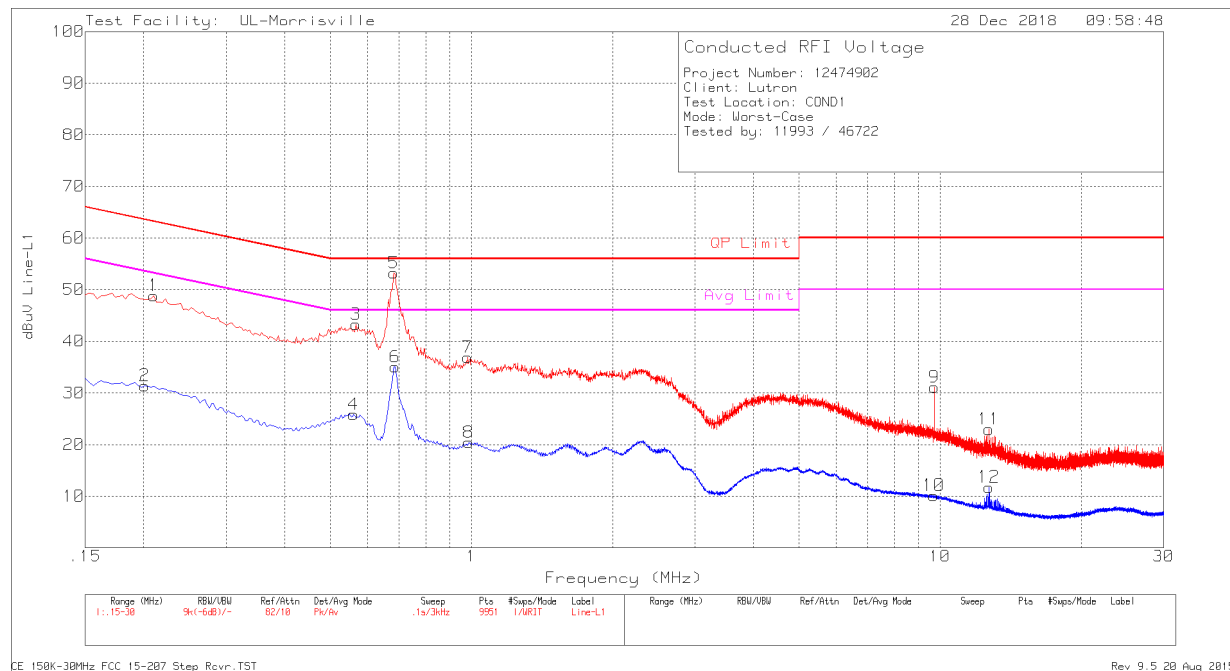
TEST PROCEDURE

ANSI C63.10

RESULTS

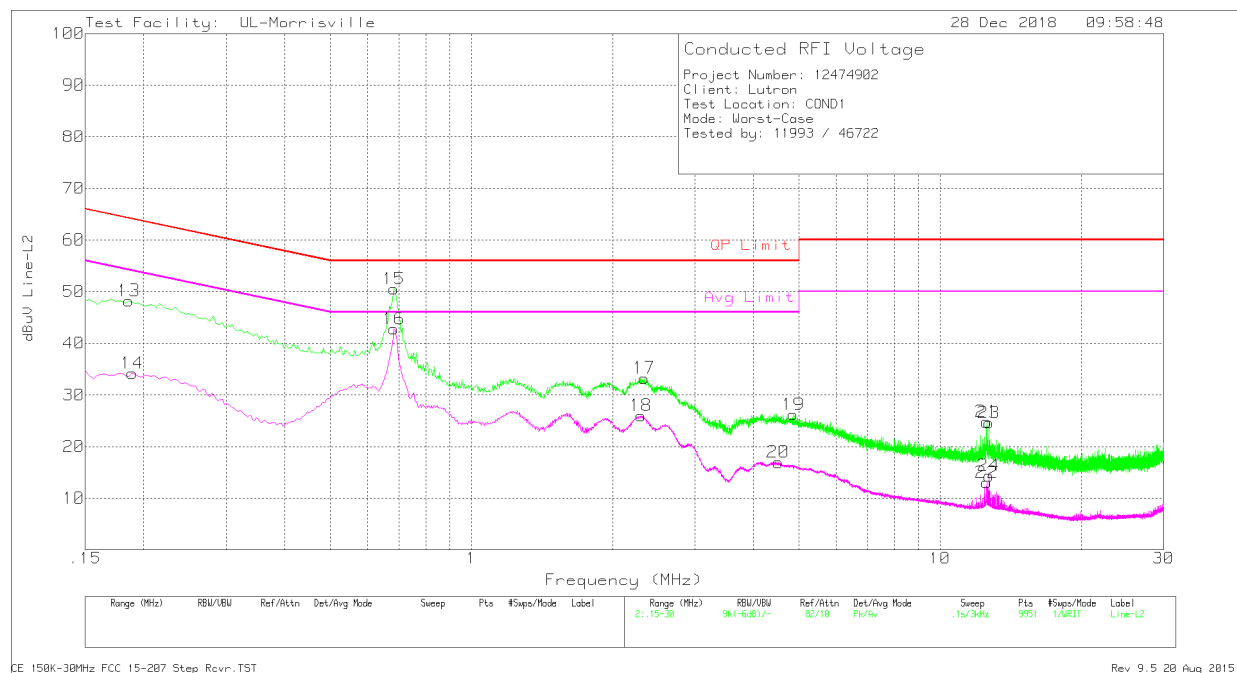
No non-compliance noted:

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	Margin (dB)	Avg Limit	Margin (dB)
1	.21	38.77	Pk	.1	10	48.87	63.21	-14.34	-	-
2	.201	21.32	Av	.1	10	31.42	-	-	53.57	-22.15
3	.567	33.27	Pk	0	10	43.27	56	-12.73	-	-
4	.561	15.84	Av	0	10	25.84	-	-	46	-20.16
5	.684	37.78	Qp	0	10	47.78	56	-8.22	-	-
6	.687	25.07	Av	0	10	35.07	-	-	46	-10.93
7	.981	26.89	Pk	0	10	36.89	56	-19.11	-	-
8	.987	10.44	Av	0	10	20.44	-	-	46	-25.56
9	9.723	20.75	Pk	.1	10.3	31.15	60	-28.85	-	-
10	9.693	-26	Av	.1	10.3	10.14	-	-	50	-39.86
11	12.705	12.46	Pk	.1	10.4	22.96	60	-37.04	-	-
12	12.705	1.25	Av	.1	10.4	11.75	-	-	50	-38.25

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	Margin (dB)	Avg Limit	Margin (dB)
13	.186	38.04	Pk	.2	10	48.24	64.21	-15.97	-	-
14	.189	24.01	Av	.2	10	34.21	-	-	54.08	-19.87
15	.684	37.82	Qp	0	10	47.82	56	-8.18	-	-
16	.684	32.79	Av	0	10	42.79	-	-	46	-3.21
17	2.34	23.16	Pk	0	10.1	33.26	56	-22.74	-	-
18	2.301	15.9	Av	0	10.1	26	-	-	46	-20
19	4.866	15.99	Pk	0	10.2	26.19	56	-29.81	-	-
20	4.515	6.84	Av	0	10.1	16.94	-	-	46	-29.06
21	12.579	14.3	Pk	.1	10.4	24.8	60	-35.2	-	-
22	12.579	2.57	Av	.1	10.4	13.07	-	-	50	-36.93
23	12.705	14.09	Pk	.1	10.4	24.59	60	-35.41	-	-
24	12.705	3.85	Av	.1	10.4	14.35	-	-	50	-35.65

10. SETUP PHOTOS

Refer to UL document R12474902-EP1 for setup photos.

END OF TEST REPORT