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Job Number: 1001345027
Project Number: 11CA09928
File Number: MC15896
Date: 2011-02-22
Model: X1019
FCC ID: JPZ0077

Electromagnetic Compatibility Test Report

For

LUTRON ELECTRONICS INC

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Job Number: 1001345027 File Number: MC15896 Page 2 of 39
Model Number: X1019
Client Name: LUTRON ELECTRONICS INC
FCC ID: JPZ0077

Test Report Details

Tests Performed By: **Underwriters Laboratories Inc.
1285 Walt Whitman Rd.
Melville, NY 11747**

Tests Performed For: **LUTRON ELECTRONICS INC
7200 SUTTER ROAD
COOPERBURG, PA 18036**

Applicant Contact: **Dan Mitchell**
Title: **Senior Engineering Technician**
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Test Report Date: **2011-02-22**

Product Type: **Low Power Periodic Transmitter**

Product standards **FCC Part 15, Subpart C, 15.231, RSS-GEN Issue 3, RSS-210
Issue 8**

Model Number: **X1019**

Sample Serial Number: **Non-serialized production unit**

EUT Category: **Periodic Low Power Transmitter**

Testing Start Date: **2011-02-15**

Date Testing Complete: **2011-02-21**

Overall Results: Compliant

Underwriters Laboratories Inc. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. Underwriters Laboratories Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from Underwriters Laboratories Inc. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any agency of the US government.

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Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
None	Original	-	-

1.0 GENERAL - Product Description

1.1 Equipment Description

The X1019 is a modular transmitter that does not contain a self-shield. Its intended use is in a thermostat for HVAC control.

Per FCC Part 2.1093 (C) this device is not required to undergo testing for radio-frequency radiation exposure.

Antenna description: Permanently attached to the RF circuit board and the transmit antenna type is a coiled dipole.

The EUT is only intended in being installed in the upright position and does not transmit at predetermined intervals.

1.2 Equipment Marking Plate

Not available at time of test

1.3 Device Configuration During Test

The device was configured by the applicant. The X1019 transmitter was installed in the host HVAC controller which was fitted with an aluminum junction box.

1.3.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Low Power Periodic Transmitter	LUTRON ELECTRONICS INC	X1019	None
Note: EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment, or SIM - Simulator (Not Subjected to Test)				

1.3.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
1	Mains	DC	N	N	Power is typically sources from the HVAC system AC/DC converter. Testing was conducted with a representative AC/DC converter.
Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

1.3.3 EUT Internal Operating Frequencies:

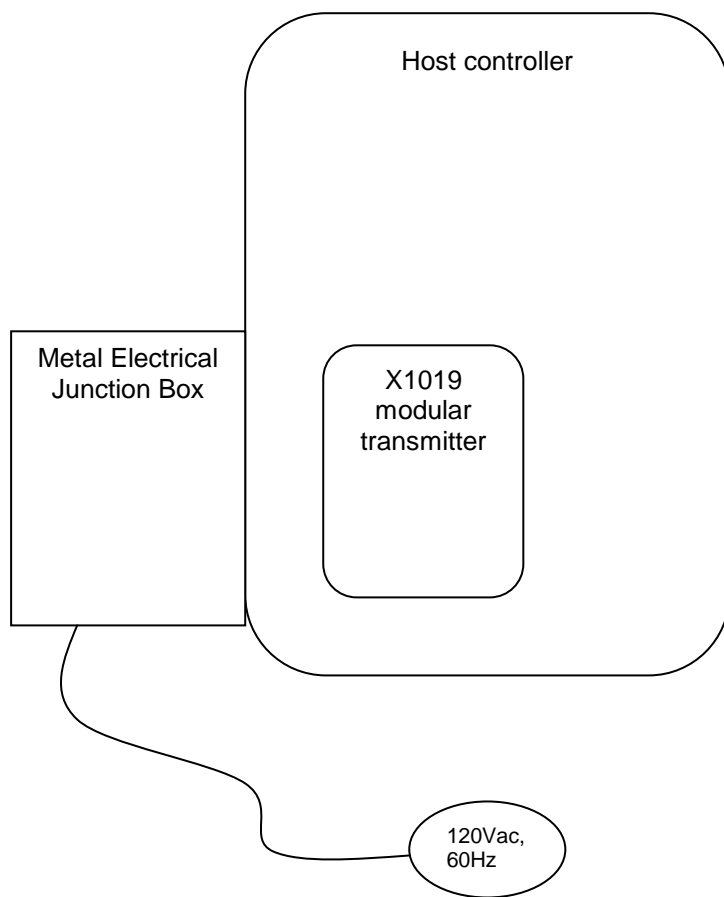
Frequency (MHz)	Description
0.203	IF
0.8125	SPI Interface
3.25	SPI Interface
13	Microcontroller
26	Crystal
431-437	Transmit frequency band

1.3.4 Power Interface:

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	120	-	-	AC – 60Hz	1	None
1	120	-	-	AC – 60Hz	1	None

1.4 Block Diagram:

The diagram below illustrates the configuration of the equipment above.



1.5 EUT Configurations

Mode #	Description
1	Stand-alone

1.6 EUT Operation Modes

Mode #	Description
1	Constant transmitting at 431MHz, packet mode
2	Constant transmitting at 437MHz, packet mode
3	433MHz, normally operating

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

2.1 Deviations from standard test methods

None

2.2 Device Modifications Necessary for Compliance

None

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
47 CFR Part 15, Subpart B	Code of Federal Regulations, Part 15, Radio Frequency Devices	2009
47 CFR Part 15, Subpart C	Code of Federal Regulations, Part 15, Radio Frequency Devices	2009
RSS-GEN, Issue 3	General Requirements and Information for the Certification of Radiocommunication Equipment	2010
RSS-210, Issue 8	Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment	2010

2.4 Results Summary

This product is considered a periodic transmitter

Requirement – Test	Result (Compliant / Non-Compliant)
Cease Operation	Compliant
Conducted Emissions - Mains	Compliant
Occupied Bandwidth	Compliant
99% Power Occupied Bandwidth	Compliant
Pulse Train - Averaging Factor	Compliant
Radiated Emissions - Intentional	Compliant
Radiated Emissions - Unintentional	Compliant

Test Engineer:



Bob DeLisi (Ext.22452)
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Reviewer:



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 Senior Project Engineer
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 Conformity Assessment Services

Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

3.0 Calibration of Equipment Used for Measurement

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST); therefore, all test data recorded in this report is traceable to NIST.

4.0 EMISSIONS TEST RESULTS

The emissions tests were performed according to following regulations:

----- United States -----

Code of Federal Regulations Title 47	Part 15, Subpart B, Radio Frequency Devices
Code of Federal Regulations Title 47	Part 15, Subpart C, Radio Frequency Devices
Industry Canada	RSS-GEN, RSS-210

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, °C	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150
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Sample Calculations

Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)
 Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)
 Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.1 Test Conditions and Results – MAINS TERMINAL – CONDUCTED EMISSIONS

Test Description	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.	
Basic Standard	FCC Part 15, Subpart C, 15.231	
UL LPG	80-EM-S0026	
	Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range	150kHz to 30MHz	Mains
Limits - Class B		
Frequency (MHz)	Limit (dB μ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50
Supplementary information: None		

Table 1 Conducted Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
1	1	2
Supplementary information: None		

Job Number: 1001345027 File Number: MC15896
 Model Number: X1019
 Client Name: LUTRON ELECTRONICS INC
 FCC ID: JPZ0077

Table 2 Conducted Emissions Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Conducted Emissions – GP 1					
EMI Receiver	Rohde & Schwarz	ESIB26	ME5B-081	2011-01-27	2012-01-31
LISN	Solar	9252-50-R-24-BNC	ME5A-636	2011-02-04	2012-02-28
Switch Driver	HP	11713A	44397	N/A	N/A
RF Switch Box	UL	4	44404	N/A	N/A
Measurement Software	UL	Version 9.3	44736	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734	2010-03-08	2010-03-08
Multimeter	Fluke	87V	44547	2011-02-01	2012-02-29

Figure 1 Test Setup for Conducted Emissions



Figure 2 Conducted Emissions Graph

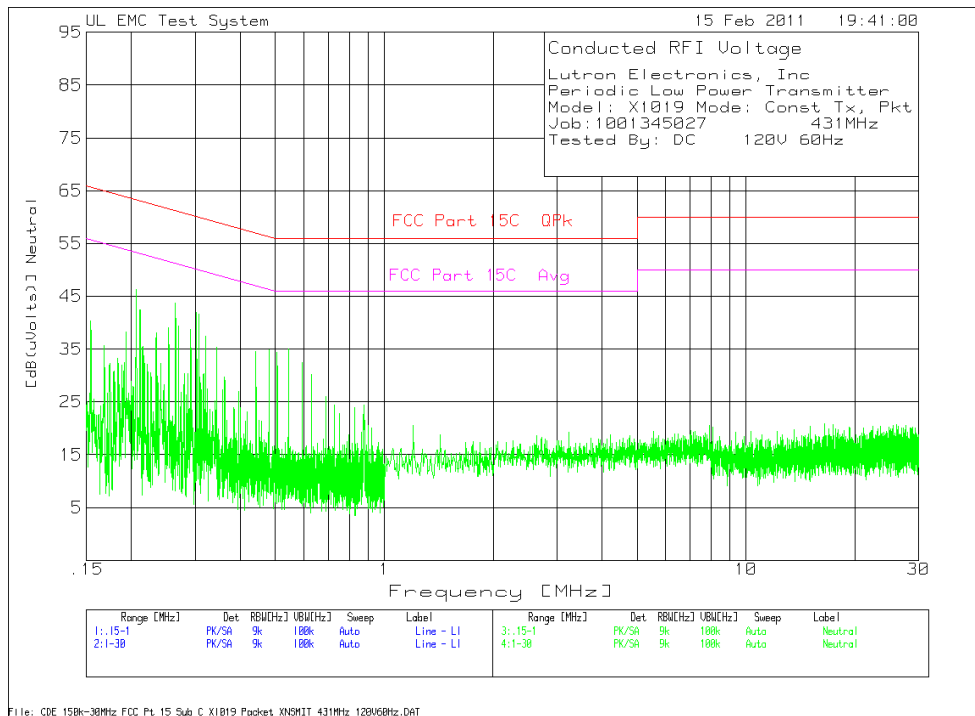
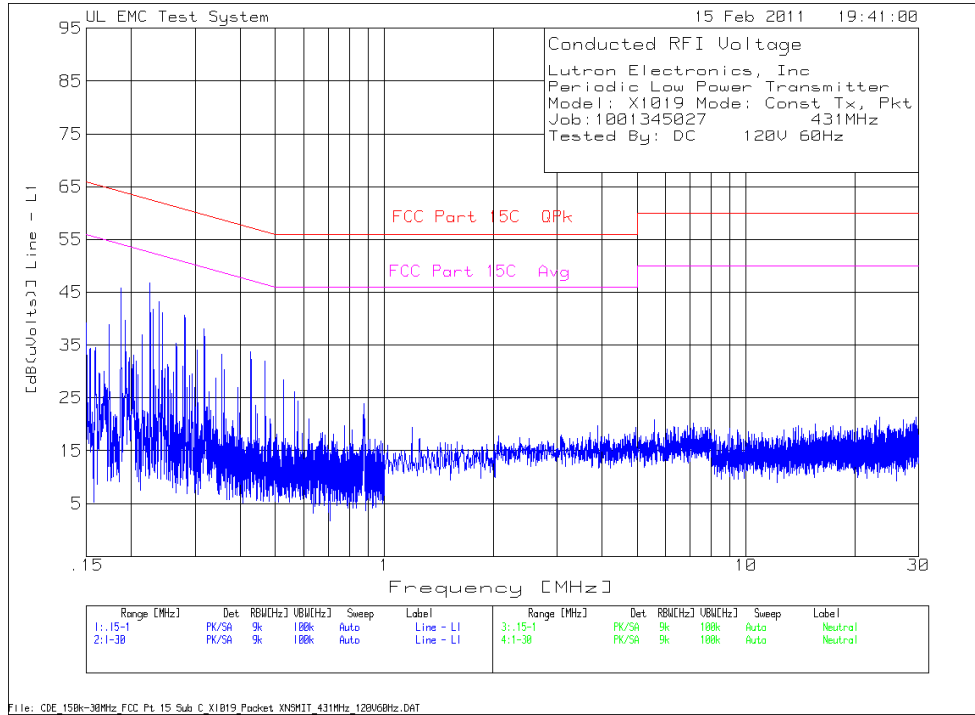
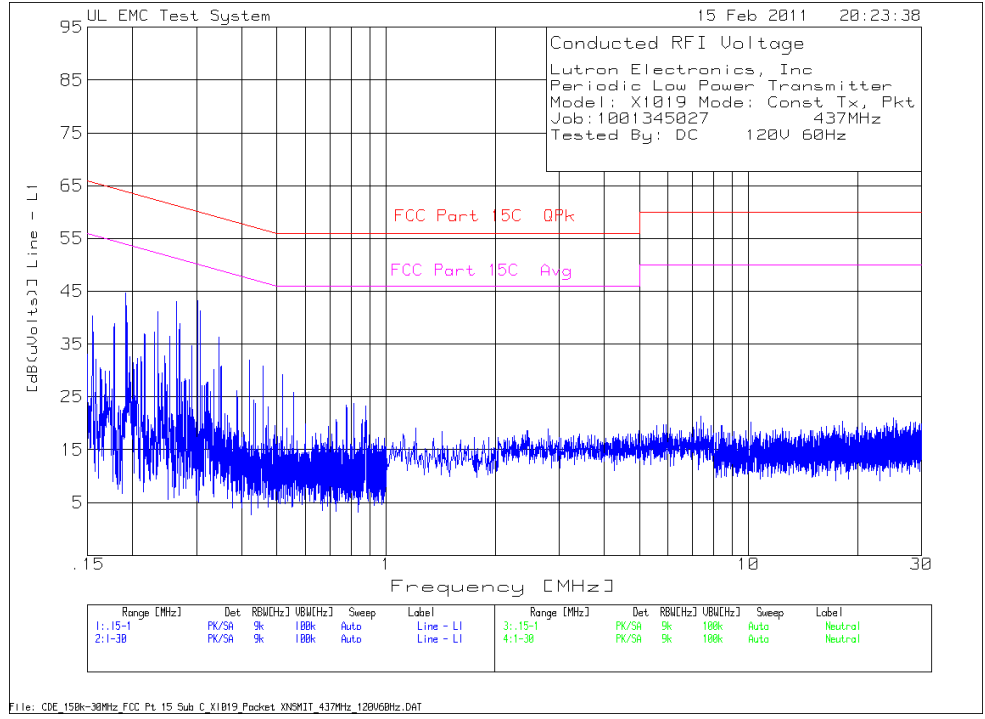


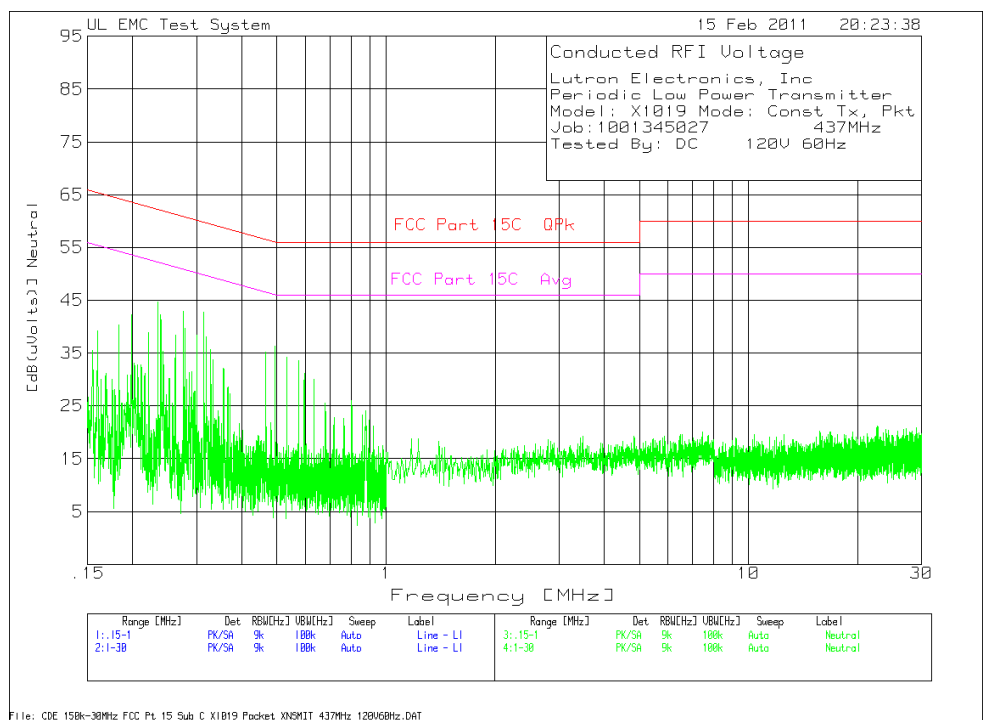
Table 3 Conducted Emissions Data Points

Lutron Electronics, Inc										
Periodic Low Power Transmitter										
Model: X1019 Mode: Const Tx, Pkt										
Job: 1001345027 431MHz										
Tested By: DC 120V 60Hz										
Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]
Number	Frequency [MHz]	Reading [dB(uV)]	Type	Factor [dB]	Factor [dB]	[dB(uVolts)]				
Line - L1 .15 - 1MHz										
1	0.1869	35.84	PK	10	0	45.84	64.2	-18.36	54.2	-8.36
2	0.22482	36.76	PK	10	0	46.76	62.6	-15.84	52.6	-5.84
3	0.23808	33.16	PK	10	0	43.16	62.2	-19.04	52.2	-9.04
4	0.28076	30.6	PK	10	0	40.6	60.8	-20.2	50.8	-10.2
Line - L1 1 - 30MHz										
5	1.19144	9.25	PK	10.1	0	19.35	56	-36.65	46	-26.65
6	23.46209	10.31	PK	11.1	0	21.41	60	-38.59	50	-28.59
Neutral .15 - 1MHz										
7	0.20594	36.34	PK	10	0	46.34	63.4	-17.06	53.4	-7.06
8	0.26443	33.64	PK	10.1	0	43.74	61.3	-17.56	51.3	-7.56
9	0.30235	31.84	PK	10.1	0	41.94	60.2	-18.26	50.2	-8.26
10	0.54329	24.9	PK	10.1	0	35	56	-21	46	-11
Neutral 1 - 30MHz										
11	1.20304	10.48	PK	10.1	0	20.58	56	-35.42	46	-25.42
12	17.39988	9.59	PK	11.2	0	20.79	60	-39.21	50	-29.21
Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]	
Frequency [MHz]	Reading [dB(uV)]	Type	Factor [dB]	Factor [dB]	[dB(uVolts)]					
Line - L1 .15 - 1MHz										
0.22485	10.49	Av	10	0	20.49	62.6	-42.11	52.6	-32.11	
Neutral .15 - 1MHz										
0.20542	13.28	Av	10	0	23.28	63.4	-40.12	53.4	-30.12	
0.26448	9.52	Av	10.1	0	19.62	61.3	-41.68	51.3	-31.68	
0.30201	9.57	Av	10.1	0	19.67	60.2	-40.53	50.2	-30.53	
NOTE: "+" - Indicates an emission level in excess of the applicable limit (s).										
PK - Peak detector										
QP - Quasi-Peak detector										
LnAv - Linear Average detector										
LgAv - Log Average detection										
Av - average detection										
CAV - CISPR average detection										
RMS - RMS detection										
CRMS - CISPR RMS detection										
LIMIT 1: FCC Part 15C QPk										
LIMIT 2: FCC Part 15C Avg										
LIMIT 3: NONE										
LIMIT 4: NONE										
LIMIT 5: NONE										
LIMIT 6: NONE										

Figure 3 Conducted Emissions Graph



File: CDE_150k-30MHz FCC Pt. 15 Sub C_X1019_Packet_XNSMIT_437MHz_120V60Hz.DAT



File: CDE_150k-30MHz FCC Pt. 15 Sub C_X1019_Packet_XNSMIT_437MHz_120V60Hz.DAT

Table 4 Conducted Emissions Data Points

Lutron Electronics, Inc											
Periodic Low Power Transmitter											
Model: X1019 Mode: Const Tx, Pkt											
Job:1001345027 437MHz											
Tested By: DC 120V 60Hz											
Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]	
Number	Frequency	Reading	Type	Factor	Factor	[dB(uVolts)]					
	[MHz]	[dB(uV)]		[dB]	[dB]						
Line - L1 .15 - 1MHz											
1	0.19132	34.61	PK	10	0	44.61	64	-19.39	54	-9.39	
2	0.26409	33.14	PK	10	0	43.14	61.3	-18.16	51.3	-8.16	
3	0.30201	33.2	PK	10	0	43.2	60.2	-17	50.2	-7	
4	0.3452	26.3	PK	10	0	36.3	59.1	-22.8	49.1	-12.8	
Line - L1 1 - 30MHz											
5	2.46189	8.55	PK	10.1	0	18.65	56	-37.35	46	-27.35	
6	7.38708	11.06	PK	10.3	0	21.36	60	-38.64	50	-28.64	
Neutral .15 - 1MHz											
7	0.23468	34.53	PK	10.1	0	44.63	62.3	-17.67	52.3	-7.67	
8	0.27583	32.88	PK	10.1	0	42.98	60.9	-17.92	50.9	-7.92	
9	0.31374	32.69	PK	10.1	0	42.79	59.9	-17.11	49.9	-7.11	
10	0.49347	26.28	PK	10.1	0	36.38	56.1	-19.72	46.1	-9.72	
Neutral 1 - 30MHz											
11	3.4829	9.04	PK	10.2	0	19.24	56	-36.76	46	-26.76	
12	22.55131	9.53	PK	11.3	0	20.83	60	-39.17	50	-29.17	
LIMIT 1: FCC Part 15C QPk											
LIMIT 2: FCC Part 15C Avg											
LIMIT 3: NONE											
LIMIT 4: NONE											
LIMIT 5: NONE											
LIMIT 6: NONE											
PK - Peak detector											
QP - Quasi-Peak detector											
LnAv - Linear Average detector											
LgAv - Log Average detector											
Av - Average detector											
CAV - CISPR Average detector											
RMS - RMS detection											
CRMS - CISPR RMS detection											

4.2 Test Conditions and Results – Occupied Bandwidth

Test Description	Measurements were made in the laboratory environment. A Dipole (or equivalent) antenna tuned to the transmit frequency was attached to the input of a spectrum analyzer. The device was operated and the spectrum analyzer resolution bandwidth set per the appropriate standard.
Basic Standard	FCC Part 15, Subpart C, 15.215; ANSI C63.10:2009, RSS-GEN
Occupied Bandwidth Limits	
0.25% of Fundamental	

Table 5 Occupied Bandwidth Configuration Settings

Power Interface Mode	EUT Configurations Mode	EUT Operation Mode
1	1	1
1	1	2
Supplementary information: None		

Table 6 Occupied Bandwidth Spectrum Analyzer Settings

Resolution Bandwidth (MHz)	Occupied Bandwidth Requirements	
	dBc	%
10kHz	-20	99
Supplementary information: None		

Table 7 Occupied Bandwidth Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E4446A	70728	2011-02-05	2012-02-05
Dipole Antenna	EMCO	3121C	3359	2010-12-08	2011-12-08
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	87V	44547	2011-02-01	2012-02-01

Figure 4 Test Setup for Occupied Bandwidth

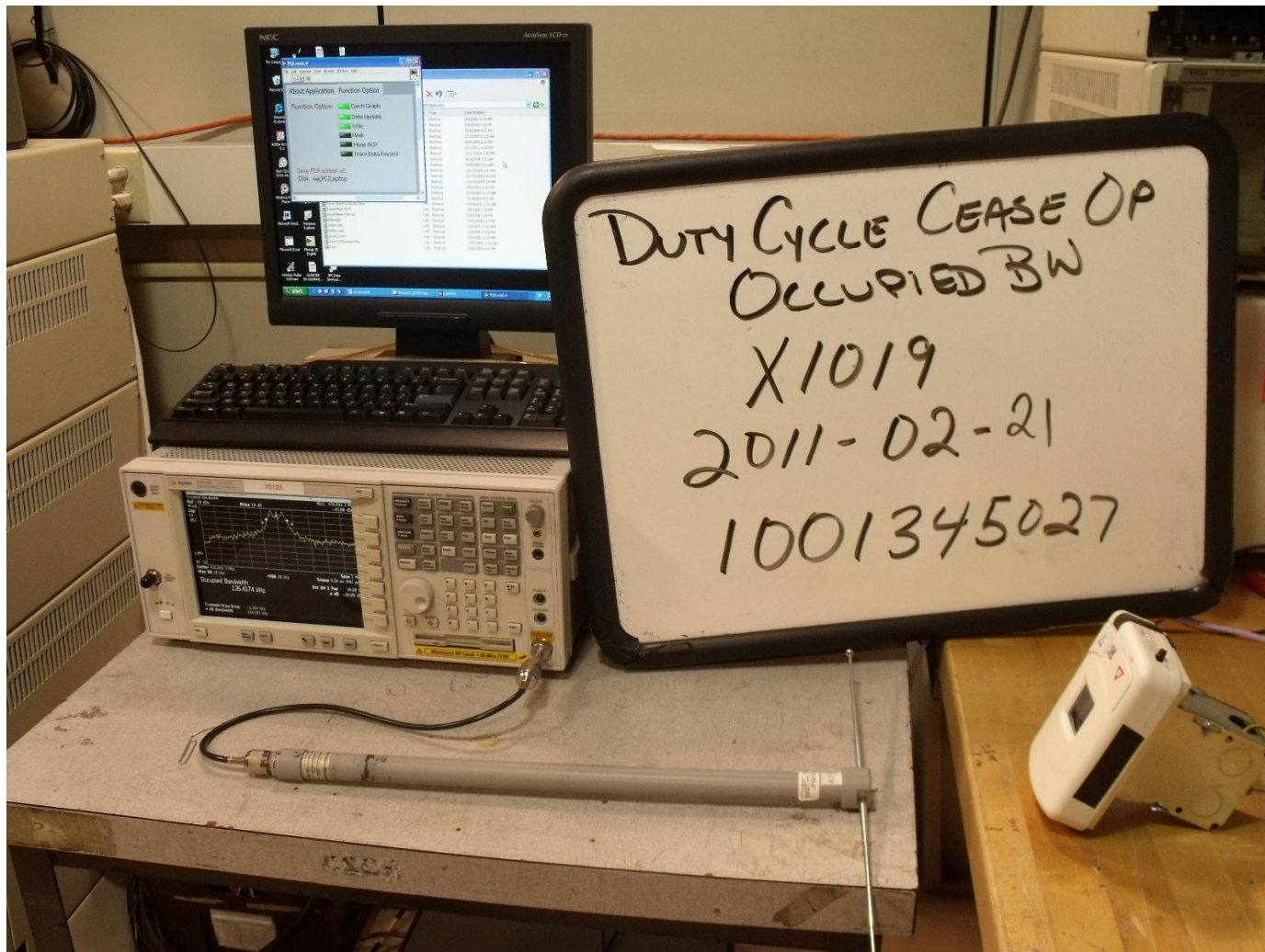
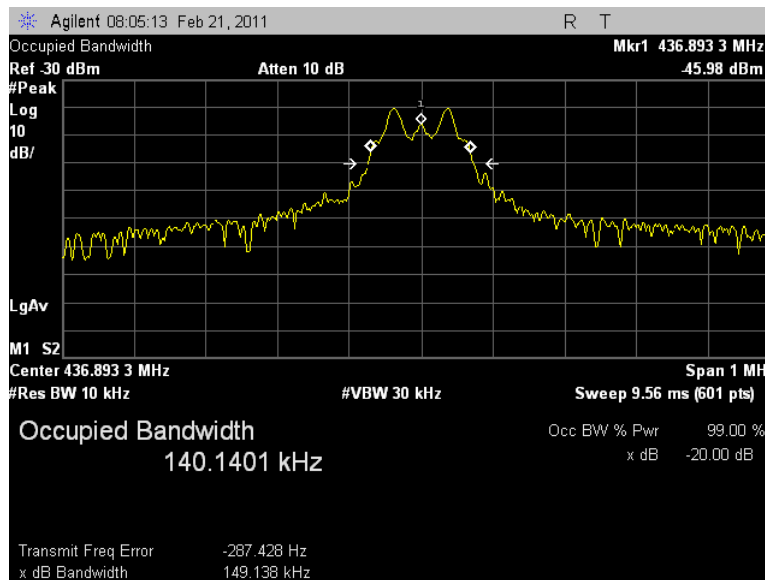
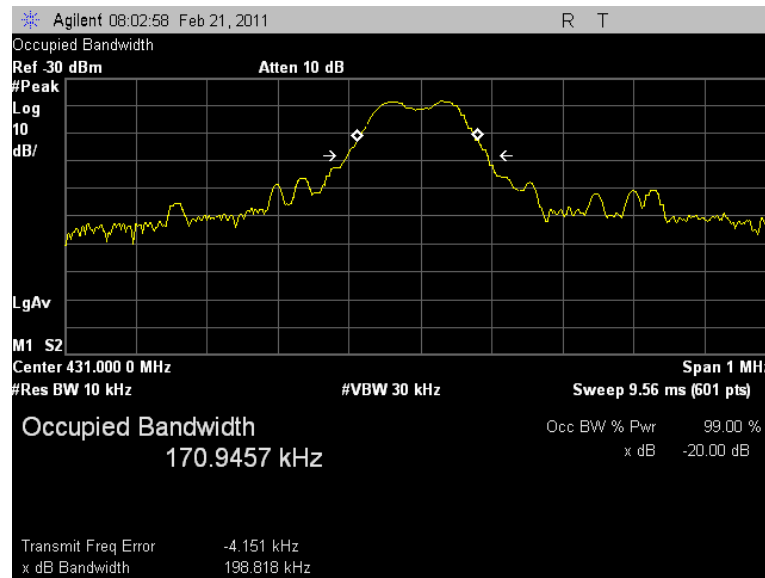


Table 8 Occupied Bandwidth Results

Power Mode	Frequency (MHz)	20dB OBW (kHz)	99% OBW (kHz)	Limit (MHz)	Result
AC	431	198.8	170.95	1.08	Pass
AC	437	149.14	140.14	1.09	Pass

Figure 5 Occupied Bandwidth Graph



4.3 Test Conditions and Results – Cease Operation

Test Description	Measurements were made in the laboratory environment. A Dipole (or equivalent) antenna tuned to the transmit frequency was attached to the input of a spectrum analyzer. The device was operated and the transmission time measured with the spectrum analyzer set to zero span at the fundamental frequency.
Basic Standard	FCC Part 15, Subpart C, 15.215; ANSI C63.10:2009, RSS-GEN
Cease Operation Limits	
The transmissions shall stop within 5 seconds of either a button being released or if automatically controlled transmissions shall be stopped 5 seconds after transmissions begin.	

Table 9 Cease Operation Configuration Settings

Power Interface Mode	EUT Configurations Mode	EUT Operation Mode
1	1	3
Supplementary information: None		

Table 10 Cease Operation Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E4446A	70728	2011-02-05	2012-02-05
Dipole Antenna	EMCO	3121C	3359	2010-12-08	2011-12-08
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	87V	44547	2011-02-01	2012-02-01

Figure 6 Test Setup for Cease Operation

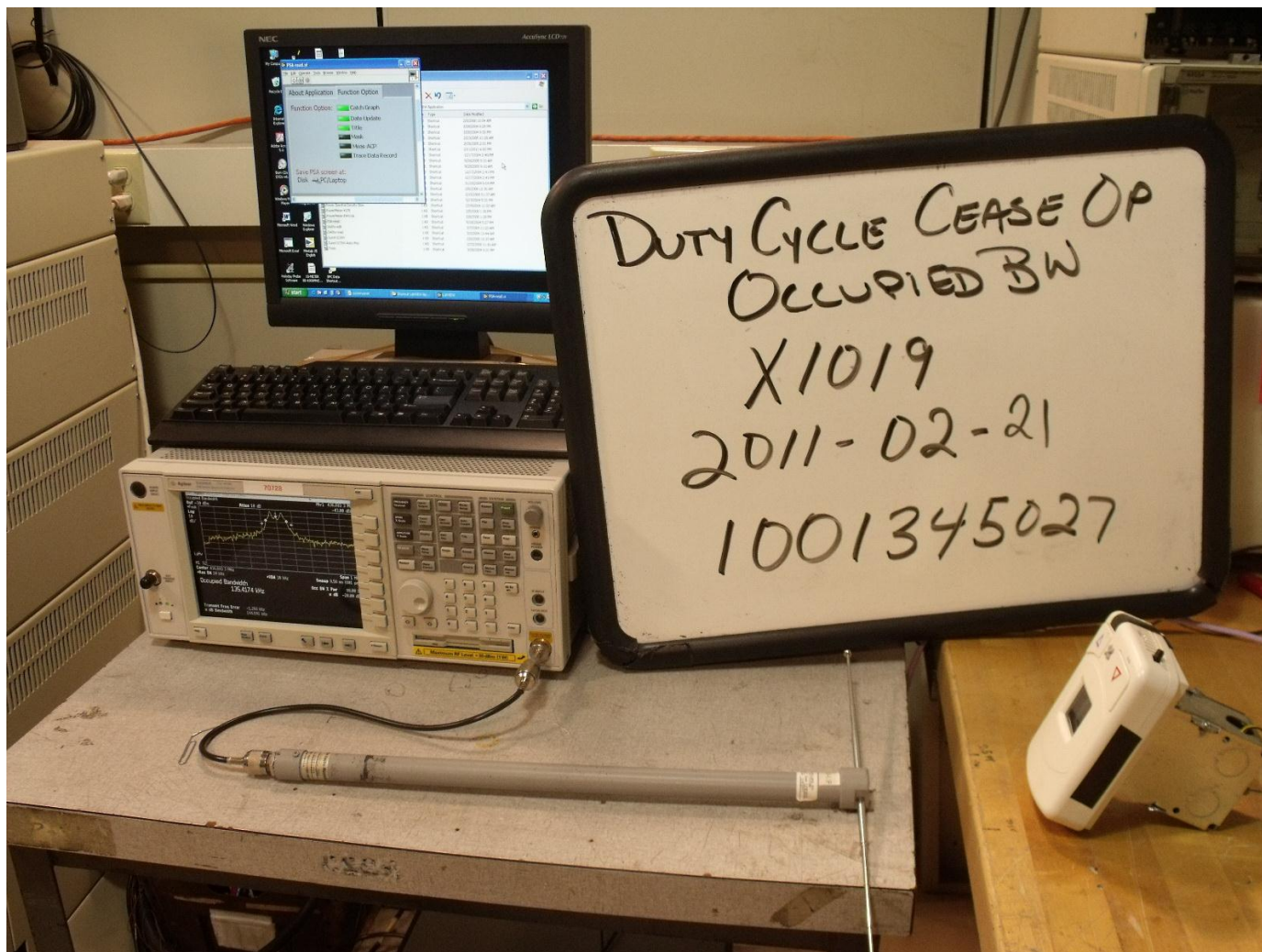
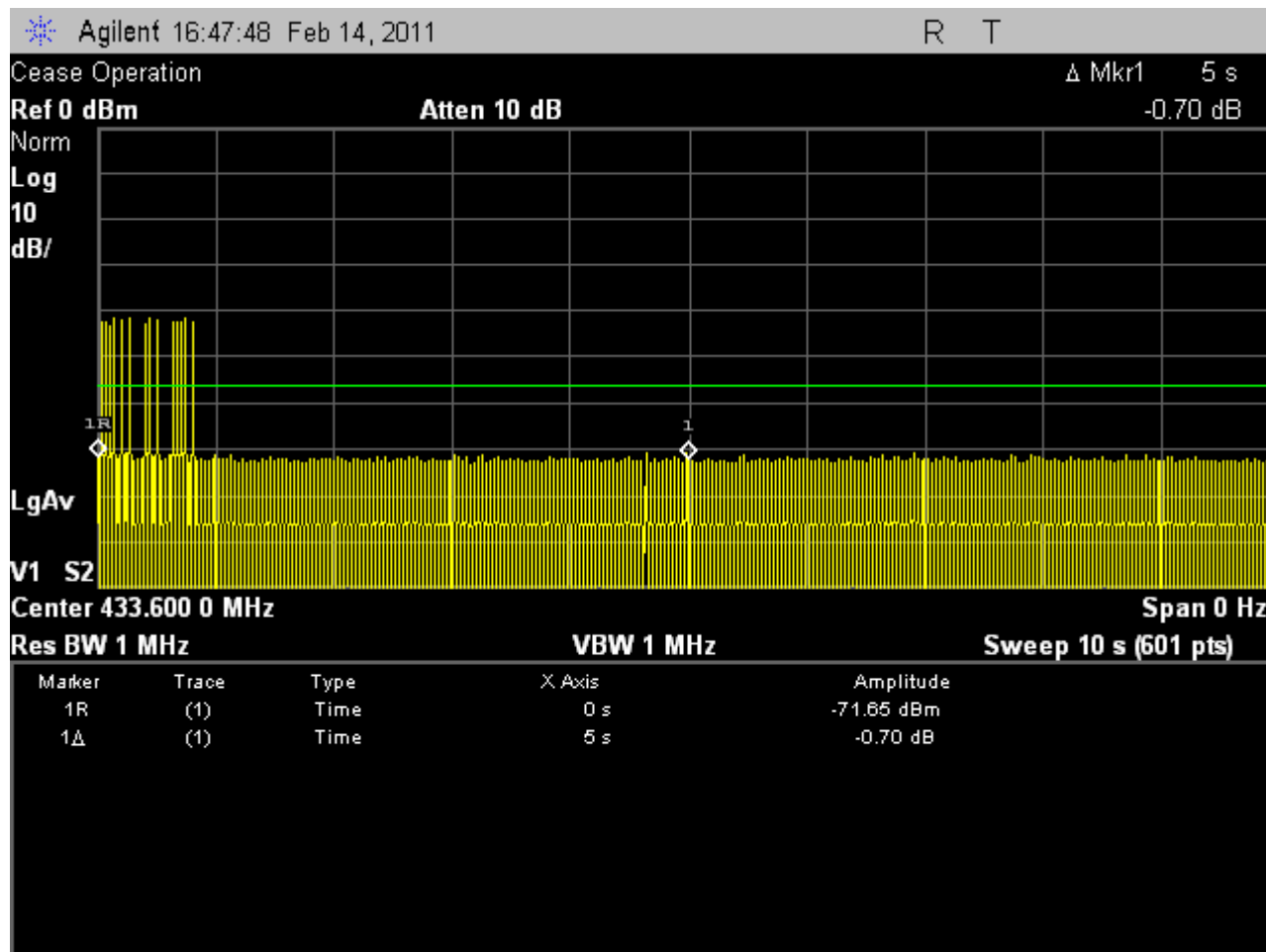


Figure 7 Cease Operation Graph



4.4 Test Conditions and Results – Pulse Train

Test Description	Measurements were made in the laboratory environment. A Dipole (or equivalent) antenna tuned to the transmit frequency was attached to the input of a spectrum analyzer. The pulse train was measured with the spectrum analyzer set to zero span at the fundamental frequency.
Basic Standard	FCC Part 15 Subpart A, 15.35
Pulse Train Limits	
There are no limits for this test. This data is used to calculate the averaging correction factor that is applied to the measured peak radiated emissions results.	

Table 11 Pulse Train Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	3
Supplementary information: None		

Table 12 Pulse Train Calculation

Pulse Width (mS)	Total Transmission time or 100ms which ever is lesser	Average Correction Factor (dB) $20 \log \left(\frac{PulseWidth}{TotalTransmissionTime} \right)$
2 pulses 8.667mS each = 17.334	100	-15.22

Table 13 Pulse Train Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E4446A	70728	2011-02-05	2012-02-05
Dipole Antenna	EMCO	3121C	3359	2010-12-08	2011-12-08
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	87V	44547	2011-02-01	2012-02-01

Figure 8 Test Setup for Pulse Train

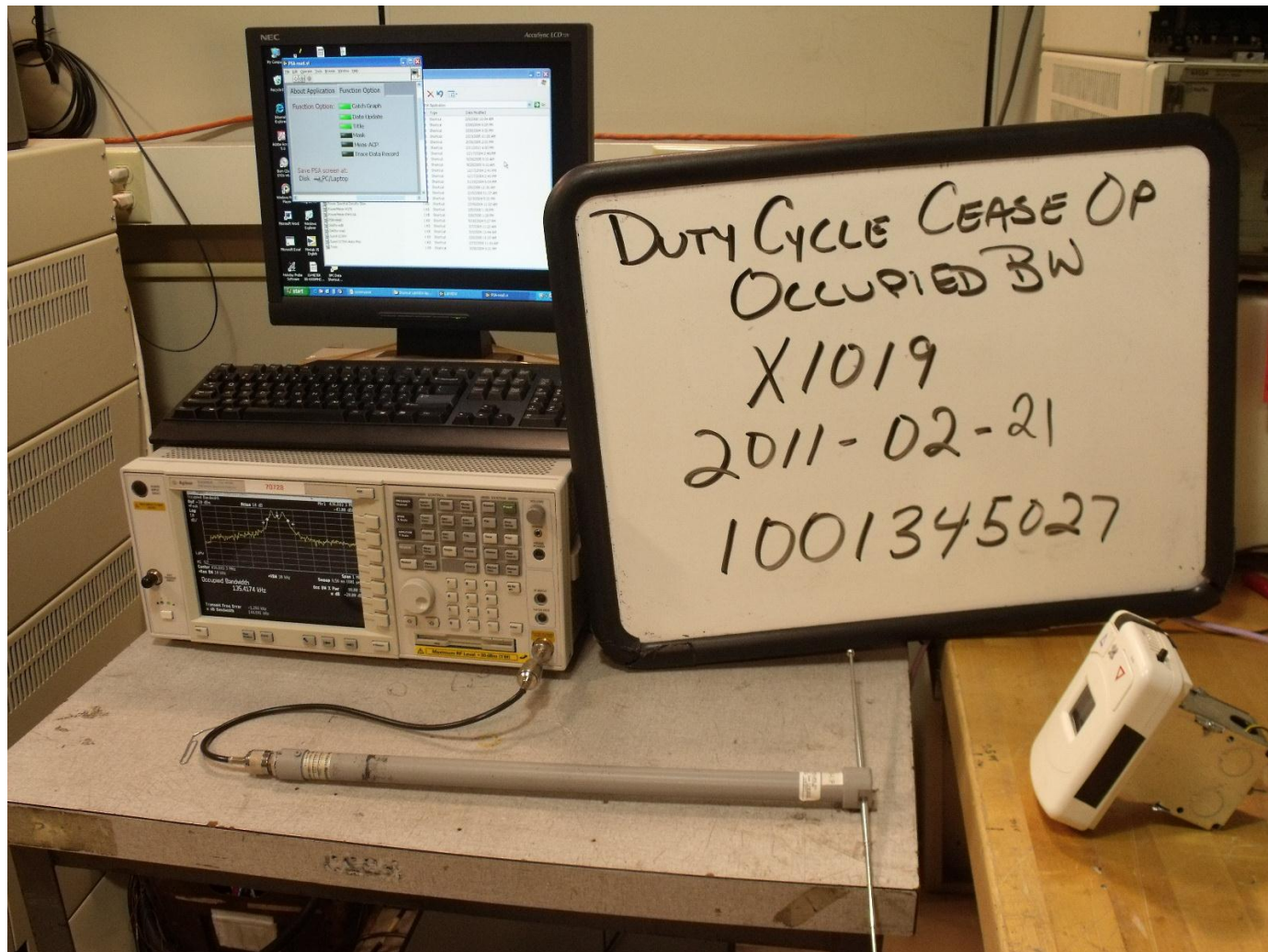
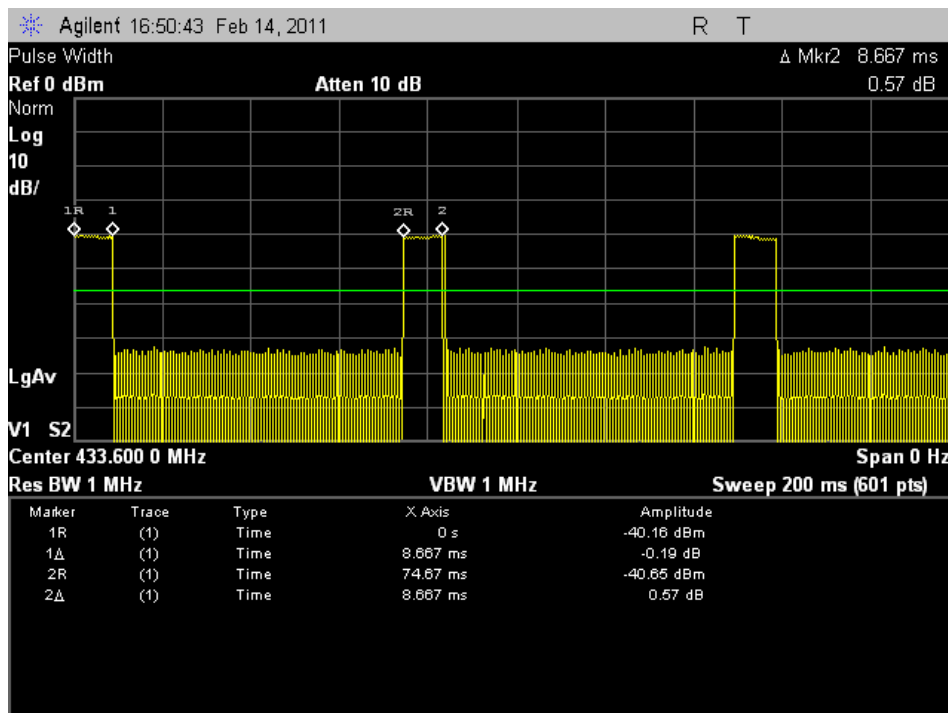
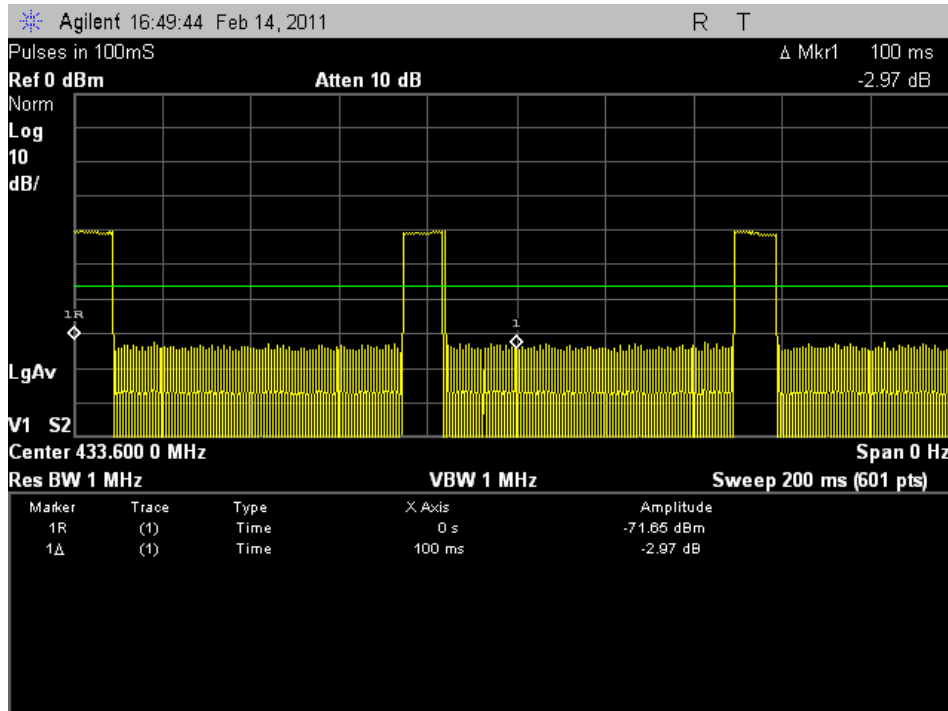


Figure 9 Pulse Train Graph



4.5 Test Conditions and Results – RADIATED EMISSIONS

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4:2003. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meters. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.		
Basic Standard	FCC Part 15, Subpart C, 15.209, 15.231; RSS-210		
UL LPG	80-EM-S0029		
	Frequency range	Measurement Point	
Fully configured sample scanned over the following frequency range	30 MHz – 1GHz	(3 meter measurement distance)	
Fully configured sample scanned over the following frequency range	1GHz – 5 GHz	(3 meter measurement distance)	
Limits			
Frequency (MHz)	Limit (dBµV/m)		
	Quasi-Peak	Average	
	General Emissions	Fundamental	Spurious
0.009 – 0.490	128.5 – 93.8	-	-
0.490 – 1.705	73.8 – 63	-	-
1.705 – 30	69.5	-	-
30 – 88	40	-	-
88 – 216	43.5	-	-
216-960	46	-	-
960-1000	54	-	-
1000-10000	-	-	54
431	-	80.7	-
437	-	80.9	-
Harmonics of the Fundamental 431	-	-	60.7
Harmonics of the Fundamental 437	-	-	60.9
Supplementary information: Spurious limits are only applied against products of the transmitter. All other emissions must meet the general limits. Emissions of clocks related to the transmit frequencies and associated harmonics below 30MHz do not fall in restricted bands.			

Table 14 Radiated Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
1	1	2
Supplementary information:None		

Table 15 Radiated Emissions Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
30-1000MHz					
EMI Receiver	Rohde & Schwarz	ESIB40	34968	2010-02-22	2011-02-22
Bicon Antenna	Schaffner	VBA6106A	43441	2010-09-09	2011-09-09
Log-P Antenna	Schaffner	UPA6109	44067	2010-04-26	2011-04-26
Switch Driver	HP	11713A	ME7A-627	N/A	N/A
System Controller	Sunol Sciences	SC99V	44396	N/A	N/A
Camera Controller	Panasonic	WV-CU254	44395	N/A	N/A
RF Switch Box	UL	1	44398	N/A	N/A
Measurement Software	UL	Version 9.3	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	87V	44547	2011-02-01	2012-02-01
Above 1GHz (Band Optimized System)					
Spectrum Analyzer	Agilent	E7405A	19695	2011-02-01	2012-02-01
Horn Antenna (1-2 GHz)	ETS	3161-01	51442	2008-03-28	See * below
Horn Antenna (2-4 GHz)	ETS	3161-02	48107	2007-09-27	See * below
Horn Antenna (4-8 GHz)	ETS	3161-03	48106	2007-09-27	See * below
Signal Path Controller	HP	11713A	50250	N/A	N/A
Gain Controller	HP	11713A	50251	N/A	N/A
RF Switch / Preamp Fixture	UL	BOMS1	50249	N/A	N/A
System Controller	UL	BOMS2	50252	N/A	N/A
Measurement Software	UL	Version 9.3	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	87V	44547	2011-02-01	2012-02-01

Job Number: 1001345027 File Number: MC15896 Page 30 of 39
Model Number: X1019
Client Name: LUTRON ELECTRONICS INC
FCC ID: JPZ0077

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
<p>* - Note: As allowed by the calibration standard ANSI C63.4 Section 4.4.2, standard gain horns need only a one-time calibration. Only if physical damage occurs will the horn antenna require re-calibration.</p> <p>* Gain standard horn antennas (sometimes called standard gain horn antennas) need not be calibrated beyond that which is provided by the manufacturer unless they are damaged or deterioration is suspected, or they are used at a distance closer than $2D^2/\lambda$. Gain standard horn antennas have gains that are fixed by their dimensions and dimensional tolerances.</p>					

Figure 10 Test setup for Radiated Emissions

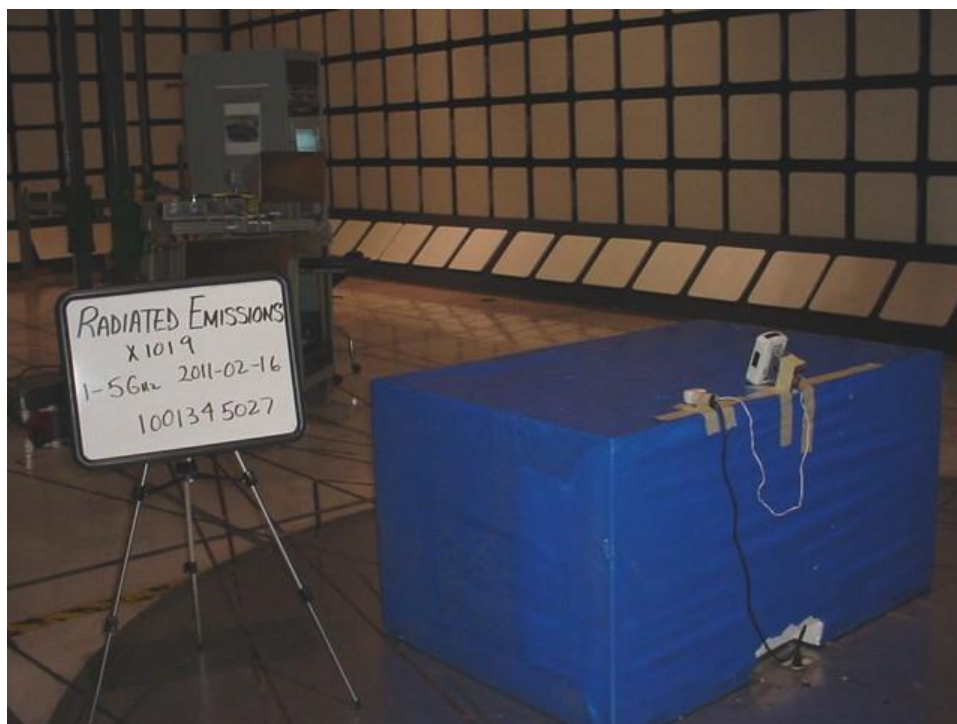
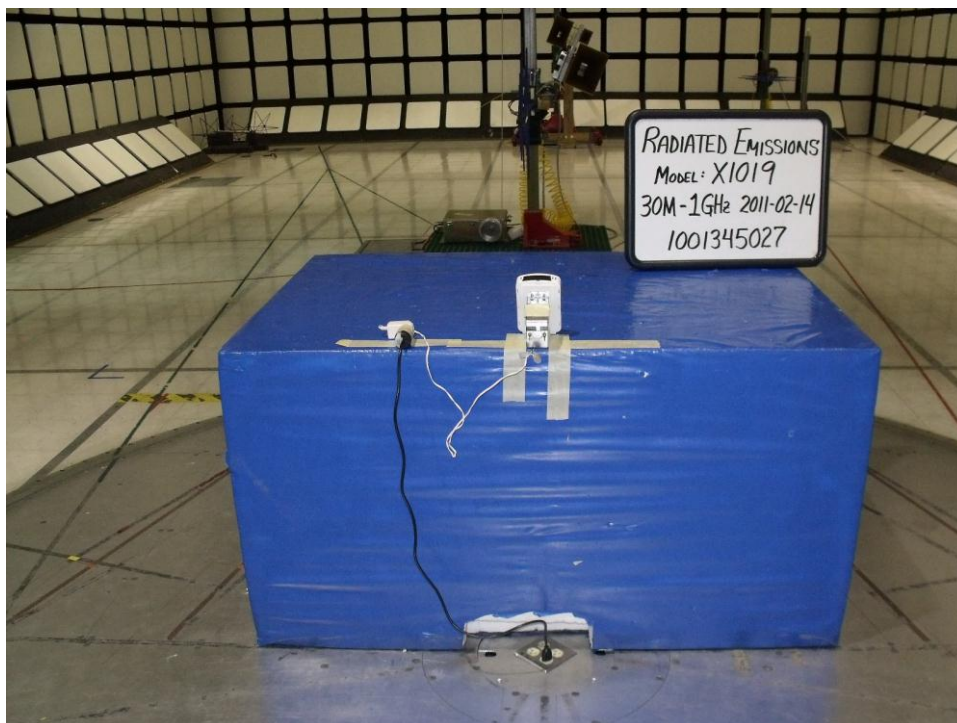


Figure 11 Radiated Emissions Graph

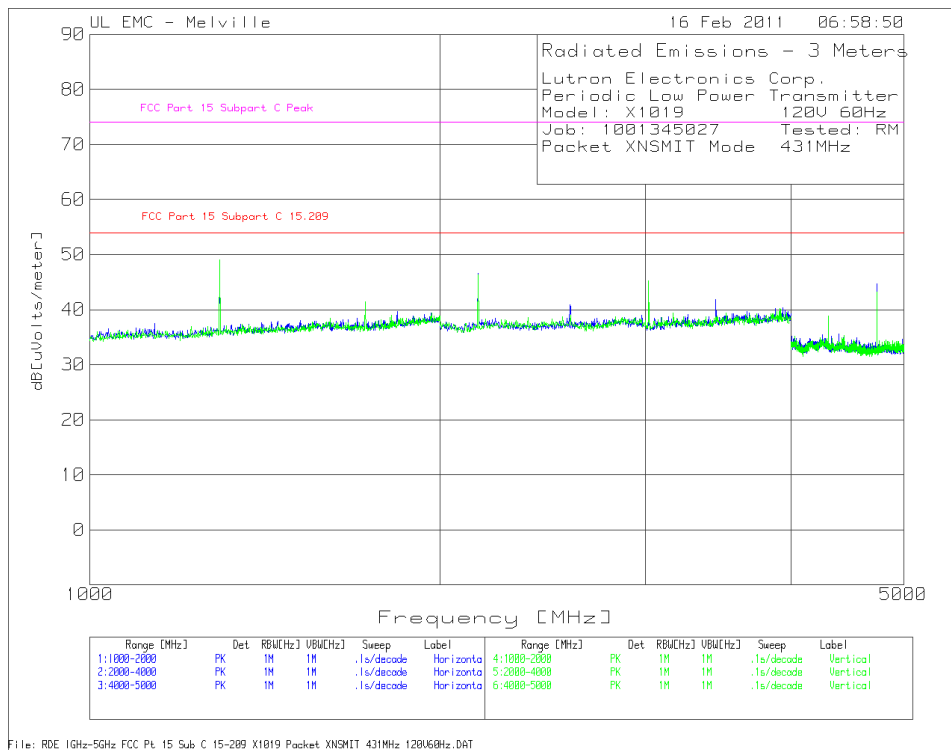
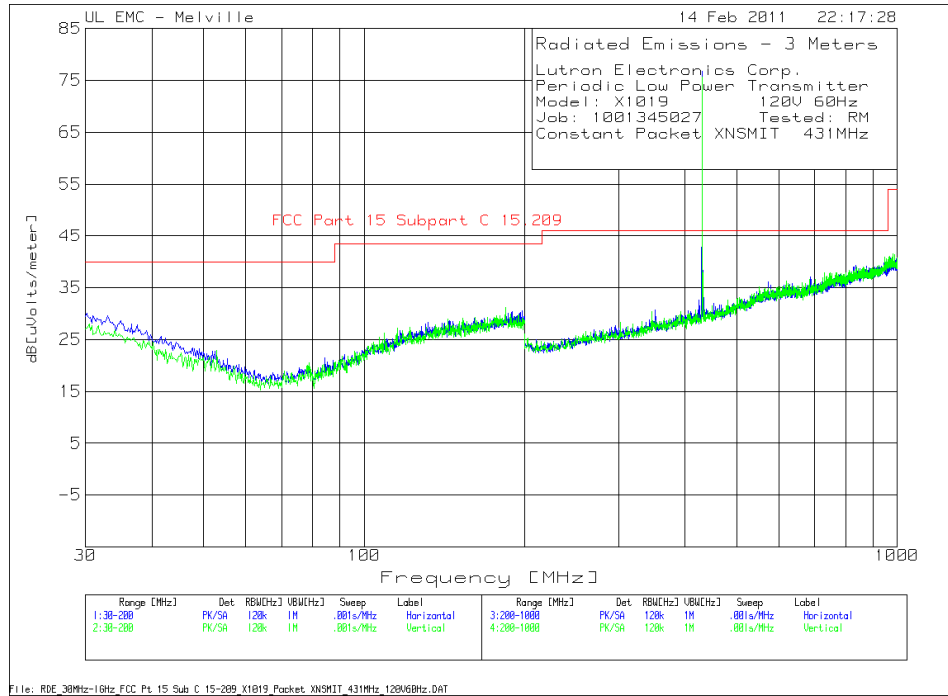


Table 16 Radiated Emissions Data Points

Lutron Electronics Corp.														
Periodic Low Power Transmitter														
Model: X1019 120V 60Hz														
Job: 1001345027 Tested: RM														
Constant Packet XNSMIT 431MHz														
Test	Meter	Detector	Gain/Loss	Transducer	Level	DCF	Corrected	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]	Azimuth	Height [cm]	Polarity
Frequency	Reading	Type	Factor	Factor	dB[uVolts/ meter]	dB	dB[uVolts/ meter]					[degs]		
[MHz]	[dB(uV)]		[dB]	[dB]										
Horizontal 200 - 1000MHz														
430.9404	64.44	PK	1.2	16.8	82.44	-15.2	67.22	-	-	80.7	-13.48	329	236	Horz
429.3147	16.48	QP	1.2	16.8	34.48	-	-	46	-11.52	-	-	337	238	Horz
862	16.78	PK	1.6	23.1	41.48	-15.2	26.26	46	-19.74	-	-	303	268	Horz
Vertical 200 - 1000MHz														
431.016	58.7	PK	1.2	16.4	76.3	-15.2	61.08	46	-	80.9	-19.82	7	232	Vert
862	17.97	PK	1.6	23.1	42.67	-15.2	27.45	46	-18.55	-	-	13	143	Vert
LIMIT 1: FCC Part 15 Subpart C 15.209														
LIMIT 2: FCC Part 15 Subpart C 15.231														
LIMIT 3: NONE														
LIMIT 4: NONE														
LIMIT 5: NONE														
LIMIT 6: NONE														
PK - Peak detector (maximized)														
QP - Quasi-Peak detector														
LnAv - Linear Average detector														
LgAv - Log Average detector														
Av - Average detector														
CAV - CISPR Average detector														
RMS - RMS detection														
CRMS - CISPR RMS detection														

Lutron Electronics Corp.												
Periodic Low Power Transmitter												
Model: X1019 120V 60Hz												
Job: 1001345027 Tested: RM												
Packet XNSMIT Mode 431MHz												
Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1 [dB]	Limit 2	Margin 2 [dB]	Azimuth	Height [cm]	Polarity
Frequency	Reading	Type	Factor	Factor	dB[uVolts/ meter]					[degs]		
[MHz]	[dB(uV)]		[dB]	[dB]								
Horizontal 1000 - 2000MHz												
1292.91	70.2	PK	-45.16	20.5	45.54	54	-8.46	74	-28.46	200	198	Horz
1724.05	66.55	PK	-44.38	20.8	42.97	54	-11.03	74	-31.03	151	201	Horz
Horizontal 2000 - 4000MHz												
2155.0125	70.03	PK	-44.21	21.4	47.22	54	-6.78	74	-26.78	247	180	Horz
2586.1	64.29	PK	-43.49	21.3	42.1	54	-11.9	74	-31.9	223	181	Horz
3016.8875	65.2	PK	-42.93	21.5	43.77	54	-10.23	74	-30.23	358	171	Horz
3448.175	61.79	PK	-42.96	22.1	40.93	54	-13.07	74	-33.07	42	154	Horz
3448	62.51	PK	-42.96	22.1	41.65	54	-12.35	74	-32.35	42	154	Horz
3879.1	60.87	PK	-42.94	22.6	40.53	54	-13.47	74	-33.47	70	126	Horz
Horizontal 4000 - 5000MHz												
4309.3475	62.55	PK	-52.64	27.7	37.61	54	-16.39	74	-36.39	82	196	Horz
4741	71.76	PK	-53.29	27.2	45.67	54	-8.33	74	-28.33	123	202	Horz
Vertical 1000 - 2000MHz												
1293.125	73.81	PK	-45.16	20.5	49.15	54	-4.85	74	-24.85	245	230	Vert
1723.86	66.42	PK	-44.39	20.8	42.83	54	-11.17	74	-31.17	71	106	Vert
Vertical 2000 - 4000MHz												
2154.67	70.78	PK	-44.22	21	47.56	54	-6.44	74	-26.44	119	399	Vert
2586	62.09	PK	-43.49	21.5	40.1	54	-13.9	74	-33.9	16	288	Vert
3017.2375	66.96	PK	-42.94	21.7	45.72	54	-8.28	74	-28.28	85	283	Vert
Vertical 4000 - 5000MHz												
4309.5825	63.88	PK	-52.64	27.8	39.04	54	-14.96	74	-34.96	80	342	Vert
4741.2	71.97	PK	-53.29	27.1	45.78	54	-8.22	74	-28.22	285	388	Vert
LIMIT 1: FCC Part 15 Subpart C 15.209												
LIMIT 2: FCC Part 15 Subpart C Peak												
LIMIT 3: NONE												
LIMIT 4: NONE												
LIMIT 5: NONE												
LIMIT 6: NONE												
PK - Peak detector (maximized)												
QP - Quasi-Peak detector												
LnAv - Linear Average detector												
LgAv - Log Average detector												
Av - Average detector												
CAV - CISPR Average detector												
RMS - RMS detection												
CRMS - CISPR RMS detection												

Figure 12 Radiated Emissions Graph

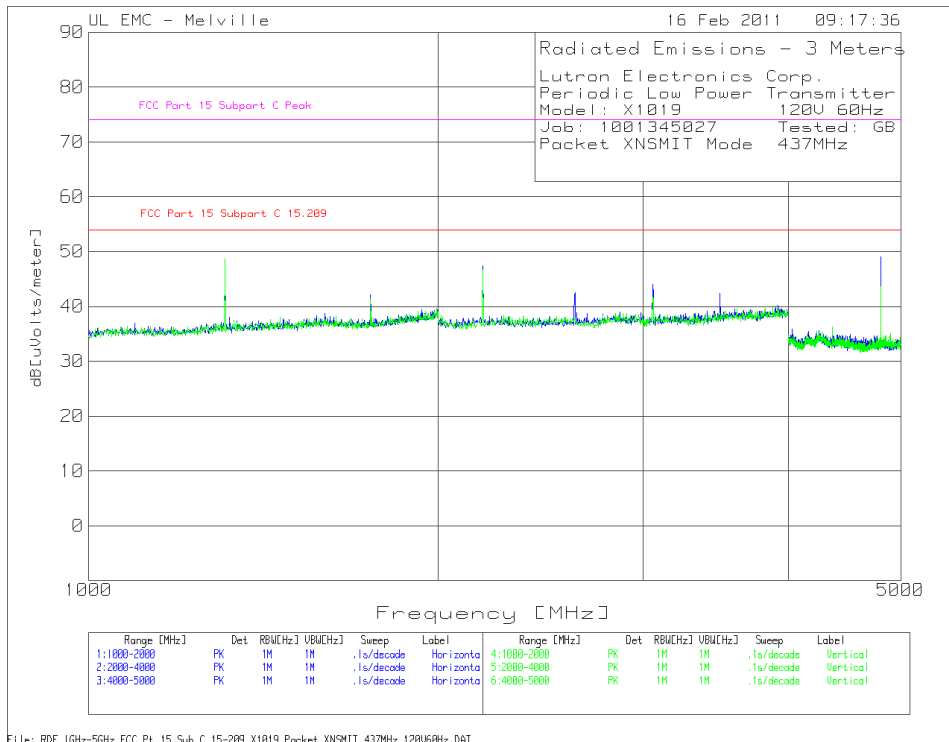
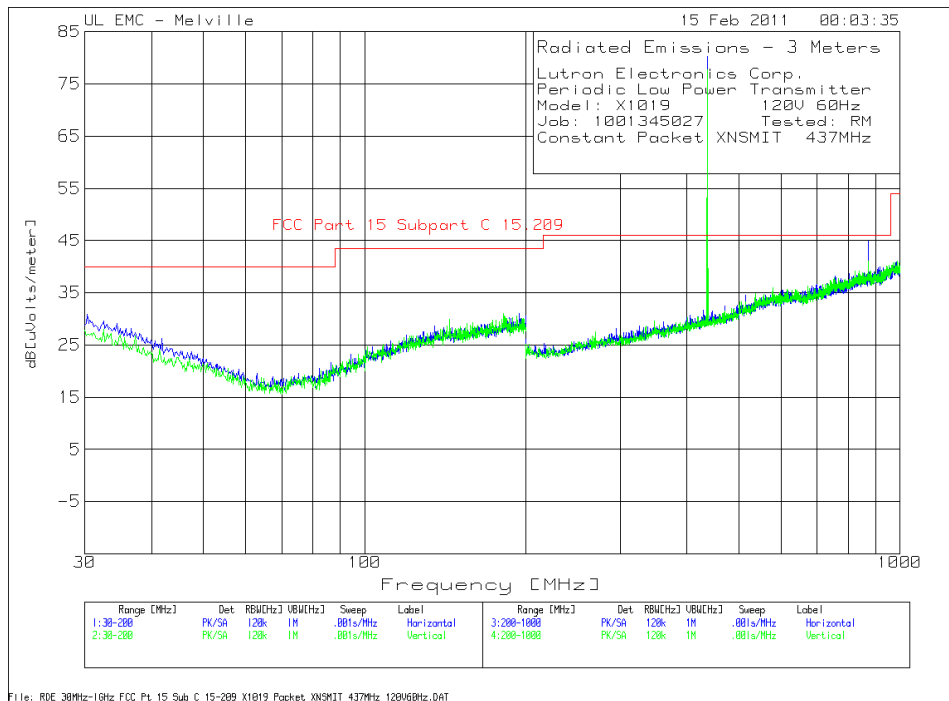


Table 17 Radiated Emissions Data Points

Lutron Electronics Corp.														
Periodic Low Power Transmitter														
Model: X1019 120V 60Hz														
Job: 1001345027 Tested: RM														
Constant Packet XNSMIT 437MHz														
Test	Meter	Detector	Gain/Loss	Transducer	Level	DCF	Corrected	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]	Azimuth	Height [cm]	Polarity
Frequency	Reading	Type	Factor	Factor	dB[uVolts/meter]	dB	dB[uVolts/meter]					[degs]		
[MHz]	[dB(uV)]		[dB]	[dB]										
Horizontal 200 - 1000MHz														
436.9188	64.7	PK	1.1	16.9	82.7	-15.22	67.48	-	-	80.9	-13.42	340	234	Horz
435.3177	16.69	QP	1.1	16.9	34.69	-	-	46	-11.31	-	-	320	249	Horz
873.8429	23.47	PK	1.6	23	48.07	-15.22	32.85	46	-13.15	-	-	180	177	Horz
Vertical 200 - 1000MHz														
436.917	64	PK	1.1	16.6	81.7	-15.22	66.48	-	-	80.9	-14.42	165	132	Vert
873.8479	21.39	PK	1.6	23.2	46.19	-15.22	30.97	46	-15.03	-	-	49	134	Vert
LIMIT 1: FCC Part 15 Subpart C 15.209														
LIMIT 2: FCC Part 15 Subpart C 15.231														
LIMIT 3: NONE														
LIMIT 4: NONE														
LIMIT 5: NONE														
LIMIT 6: NONE														
PK - Peak detector (maximized)														
QP - Quasi-Peak detector														
LnAv - Linear Average detector														
LgAv - Log Average detector														
Av - Average detector														
CAV - CISPR Average detector														
RMS - RMS detection														
CRMS - CISPR RMS detection														

Lutron Electronics Corp.												
Periodic Low Power Transmitter												
Model: X1019 120V 60Hz												
Job: 1001345027 Tested: GB												
Packet XNSMIT Mode 437MHz												
Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]	Azimuth	Height	Polarity
Frequency	Reading	Type	Factor	Factor	dB[uVolts /meter]					[degs]	[cm]	
[MHz]	[dB(uV)]		[dB]	[dB]								
Horizontal 1000 - 2000MHz												
1310.79	70.58	PK	-45.08	20.5	46	54	-8	74	-28	47	190	Horz
1747.92	66.35	PK	-44.36	20.8	42.79	54	-11.21	74	-31.21	147	114	Horz
Horizontal 2000 - 4000MHz												
2184.588	71.22	PK	-44.01	21.5	48.71	54	-5.29	74	-25.29	0	206	Horz
2621.5	66.34	PK	-43.56	21.4	44.18	54	-9.82	74	-29.82	200	250	Horz
3058.473	66.84	PK	-42.92	21.6	45.52	54	-8.48	74	-28.48	81	320	Horz
3495.25	62.9	PK	-42.87	22.2	42.23	54	-11.77	74	-31.77	135	256	Horz
Horizontal 4000 - 5000MHz												
4806.275	74.57	PK	-53.55	27.1	48.12	54	-5.88	74	-25.88	103	387	Horz
Vertical 1000 - 2000MHz												
1310.85	75.12	PK	-45.09	20.5	50.53	54	-3.47	74	-23.47	93	110	Vert
1747.763	67.28	PK	-44.35	20.8	43.73	54	-10.27	74	-30.27	73	159	Vert
Vertical 2000 - 4000MHz												
2184.5	70.56	PK	-44.01	21.2	47.75	54	-6.25	74	-26.25	224	337	Vert
3058.475	69.19	PK	-42.92	21.8	48.07	54	-5.93	74	-25.93	129	304	Vert
2621.5	62.76	PK	-43.56	21.4	40.6	54	-13.4	74	-33.4	110	309	Vert
3494.925	63.04	PK	-42.87	22.4	42.57	54	-11.43	74	-31.43	132	150	Vert
Vertical 4000 - 5000MHz												
4805.425	66.74	PK	-53.55	27.3	40.49	54	-13.51	74	-33.51	19	195	Vert
LIMIT 1: FCC Part 15 Subpart C 15.209												
LIMIT 2: FCC Part 15 Subpart C Peak												
LIMIT 3: NONE												
LIMIT 4: NONE												
LIMIT 5: NONE												
LIMIT 6: NONE												
PK - Peak detector (maximized)												
QP - Quasi-Peak detector												
LnAv - Linear Average detector												
LgAv - Log Average detector												
Av - Average detector												
CAV - CISPR Average detector												
RMS - RMS detection												
CRMS - CISPR RMS detection												

Appendix A

Accreditations and Authorizations



NVLAP Lab code: 100255-0

NVLAP: The National Institute of Standards and Technology (NIST) administers the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP is comprised of laboratory accreditation programs (LAPs) which are established on the basis of requests and demonstrated need. Each LAP includes specific calibration and/or test standards and related methods and protocols assembled to satisfy the unique needs for accreditation in a field of testing or calibration. NVLAP accredits public and private laboratories based on evaluation of their technical qualifications and competence to carry out specific calibrations or tests. Accreditation criteria are established in accordance with the U.S. Code of Federal Regulations (CFR, Title 15, Part 285), NVLAP Procedures and General Requirements, and encompass the requirements of ISO/IEC 17025. For a full scope listing see <http://ts.nist.gov/ts/htdocs/210/214/scopes/1002550.htm>



FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland (Ref. No. 91040).



Industry Canada Industrie Canada

Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3. File #: IC 2181



VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.: (Radiated Emissions) R-797, G-226 (Conducted Emissions) C-832, C-83400, and C-81879 and (Conducted Emissions - Telecommunications Ports) T-1582 and T-1583.



ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).



NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 2004/108/EC, Annex III (2-3). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.

NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).

NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6

