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Job Number: 1001494941  
Project Number: 12CA19074  
File Number: MC16433  
Date: August 17, 2012  
Model: LLC1681

# **Electromagnetic Compatibility Test Report**

**For**

**Philips Lighting Electronics N. A.**

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Job #: 1001494941    Project #: 12CA19074    File #: MC16433  
Model Number: LLC1681  
Client Name: Philips Lighting Electronics N. A.

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## Test Report Details

Tests Performed By: **UL LLC**  
**333 Pfingsten Rd.**  
**Northbrook, IL 60062**

Tests Performed For: **Philips Lighting Electronics N. A.**  
**10275 West Higgins Road**  
**Rosemont, IL 60018**

Applicant Contact: **Richard Haring**  
Phone: **(847) 390-5195**  
E-mail: **richard.haring@philips.com**

Test Report Date: **August 17, 2012**

Product Type: **Wireless Light Control**

Product standards **FCC Part 15, Subpart C, 15.249**  
**Industry Canada, RSS-210, A2.9**

Model Number: **LLC1681**

EUT Category: **Lighting Products - Ballasts**

Testing Start Date: **April 02, 2012**

Date Testing Complete: **April 23, 2012**

**Overall Results:** **Compliant**

UL LLC 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. UL LLC shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL LLC issued reports. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

This report may contain test results that are not covered by the NVLAP or A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the NVLAP and/or A2LA websites referenced at the end of this report.

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## Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
None			

**1.0 G E N E R A L - Product Description****1.1 Equipment Description**

The Equipment Under Test (EUT) is a Actilume LLC1681 2.4GHz wireless ballast control for use in fluorescent fixtures.

**1.2 Device Configuration During Test****1.2.1 Equipment Used During Test:**

Use	Product Type	Manufacturer	Model	Comments
EUT	Actilume Wireless Light Fixture Control	Philips Lighting Electronics N. A.	LLC1681	None
Note: EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment, or SIM - Simulator (Not Subjected to Test)				

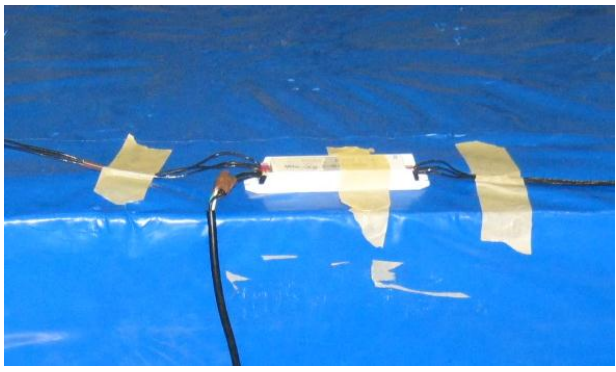
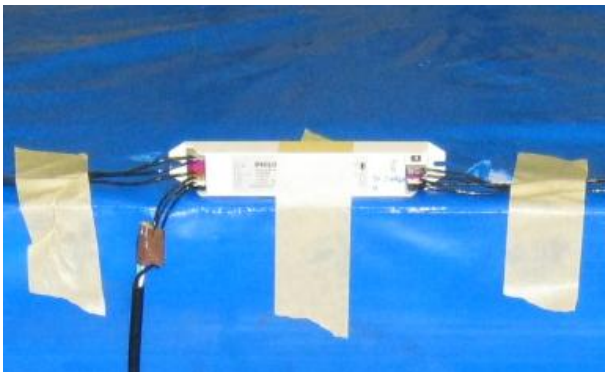
**1.2.2 Input/Output Ports:**

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
1	Mains	AC	Y	N	None
2	Various low voltage and contact outputs	AC/DC	Y	N	7 wires
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					

**1.2.3 Power Interface:**

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
1	120	-	-	60	1	None
2	277	-	-	60	1	Initial measurements showed that input voltage has no effect on the radio part of the device. All testing was conducted at 120V.

### 1.3 EUT Configurations

Mode #	Description
1	EUT was configured on 80cm support in two orientations. Axis 1 and Axis 2. Axis 2 was found to be worst case.
Axis 1	Axis 2
	

### 1.4 EUT Operation Modes

Mode #	Description
1	TX Mode on Low, middle and High channels
2	TX board removed, electronics only

### 1.5 Rational for EUT Configuration

Mode #	Description
1	The selected EUT configuration was chosen to maximize emissions. Various configuration were explored and EUT positioning. Only the worst case data is reported.

## 2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL LLC 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
FCC Part 15, Subpart C, 15.249	Code of Federal Regulations, Part 15, Radio Frequency Devices	2012
RSS-210	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment	Issue 8

### 2.4 Results Summary

This product is considered **Class A**

Requirement – Test	Result (Compliant / Non-Compliant)*
Fundamental Radiated Emissions	Compliant
Spurious Radiated Emissions	Compliant
Occupied Bandwidth (20dB and 99% power)	Compliant
Line Conducted Emissions	Compliant

Test Engineer:



Bartlomiej Mucha (Ext.41216)  
Staff Engineer  
International EMC Services  
Conformity Assessment Services

Reviewer:



Michael Ferrer(Ext.41312)  
Senior Project Engineer  
International EMC Services  
Conformity Assessment Services

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (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 C, Radio Frequency Devices
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----- Canada -----

RSS-210	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipmnet
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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 – FUNDAMENTAL 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-meter. 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	47 CFR Part 15.249 RSS-210, A2.9	
UL LPG	80-EM-S0029	
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2.4GHz – 2.4835GHz	(3 meter measurement distance)
<b>Limits</b>		
Frequency (MHz)	Limit (dB $\mu$ V/m)	
	Peak	Average
2400 – 2483.5	113.98	93.98
Supplementary information: Spurious limits are only applied against products of the transmitter. All other emissions must meet the general limits.		



Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

**Table 1 Radiated Emissions EUT Configuration Settings**

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

**Table 2 Radiated Emissions Test Equipment**

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20111227	20121231
Antenna Array	UL	BOMS	EMC4276	20111227	20121231

**Table 3 Radiated Emissions Data Points**

Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Azimuth [Degr]	Height [cm]	Polarity
<b>Axis 1</b>										
2405.478	62.62	PK	21.8	4.14	88.56	113.98	-25.42	137	101	Horz
2405.039	60.42	LnAv	21.8	4.15	86.37	93.98	-7.61	137	101	Horz
2405.448	65.65	PK	21.8	4.14	91.59	113.98	-22.39	240	100	Vert
2405.033	63.54	LnAv	21.8	4.15	89.49	93.98	-4.49	240	100	Vert
2449.462	63.01	PK	21.9	4.35	89.26	113.98	-24.72	298	100	Horz
2450.045	60.81	LnAv	22	4.34	87.15	93.98	-6.83	298	100	Horz
2449.453	65.24	PK	21.9	4.35	91.49	113.98	-22.49	215	100	Vert
2450.048	63.07	LnAv	22	4.34	89.41	93.98	-4.57	215	100	Vert
2474.498	62.98	PK	22	3.83	88.81	113.98	-25.17	215	100	Horz
2474.997	60.79	LnAv	22	3.81	86.6	93.98	-7.38	215	100	Horz
2474.498	65.75	PK	22	3.83	91.58	113.98	-22.4	215	100	Vert
2475.027	63.6	LnAv	22	3.81	89.41	93.98	-4.57	215	100	Vert
<b>Axis 2</b>										
2405.469	67.28	PK	21.8	4.14	93.22	113.98	-20.76	315	100	Horz
2405.018	65.14	LnAv	21.8	4.15	91.09	93.98	-2.89	315	100	Horz
2405.409	63.89	PK	21.8	4.14	89.83	113.98	-24.15	59	128	Vert
2405.018	61.71	LnAv	21.8	4.15	87.66	93.98	-6.32	59	128	Vert
2450.481	66.67	PK	22	4.34	93.01	113.98	-20.97	352	100	Horz
2450.024	64.46	LnAv	22	4.34	90.8	93.98	-3.18	352	100	Horz
2449.51	61.72	PK	21.9	4.35	87.97	113.98	-26.01	301	100	Vert
2450.033	59.42	LnAv	22	4.34	85.76	93.98	-8.22	301	100	Vert
2474.464	66.07	PK	22	3.83	91.9	113.98	-22.08	314	100	Horz
2475.011	63.85	LnAv	22	3.81	89.66	93.98	-4.32	314	100	Horz
2474.512	61.76	PK	22	3.83	87.59	113.98	-26.39	320	101	Vert
2474.993	59.43	LnAv	22	3.81	85.24	93.98	-8.74	320	101	Vert

**4.2 Test Conditions and Results – RADIATED SPURIOUS 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 10-meter or 3-meter as noted. 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	47 CFR Part 15.249 RSS-210, A2.9			
UL LPG	80-EM-S0029			
	Frequency range		Measurement Point	
Fully configured sample scanned over the following frequency range	30MHz – 1GHz		10m measurement distance	
	1GHz – 25GHz		3 m measurement distance	
Limits - Class A				
Frequency (MHz)	Limit (dBµV/m)			
	Class A Limits		Class B / Spurious Limits	
	Detector PK/QP	Average	Detector PK/QP	Average
30 to 88	QP 39.08 @ 10M	-	QP 29.54 @ 10M	-
88 to 216	QP 43.52 @ 10M	-	QP 33.06 @ 10M	-
216 to 960	QP 46.44 @ 10M	-	QP 35.56 @ 10M	-
960 to 1,000	QP 49.54 @ 10M	-	QP 43.52 @ 10M	-
Above 1000	PK 80 @ 3m	AV 60 @ 3m	PK 74 @ 3M	AV 54 @ 3M
Supplementary information: All emissions recorded in frequency range between 30MHz – 1GHz are product of the digital device and not product of the transmitter - compliance with class A limits only is required. Data with transmitter board removed is included for reference.				
The above limits for class B, below 1GHz were extrapolated to 10m distance using 10.46dB factor.				

Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

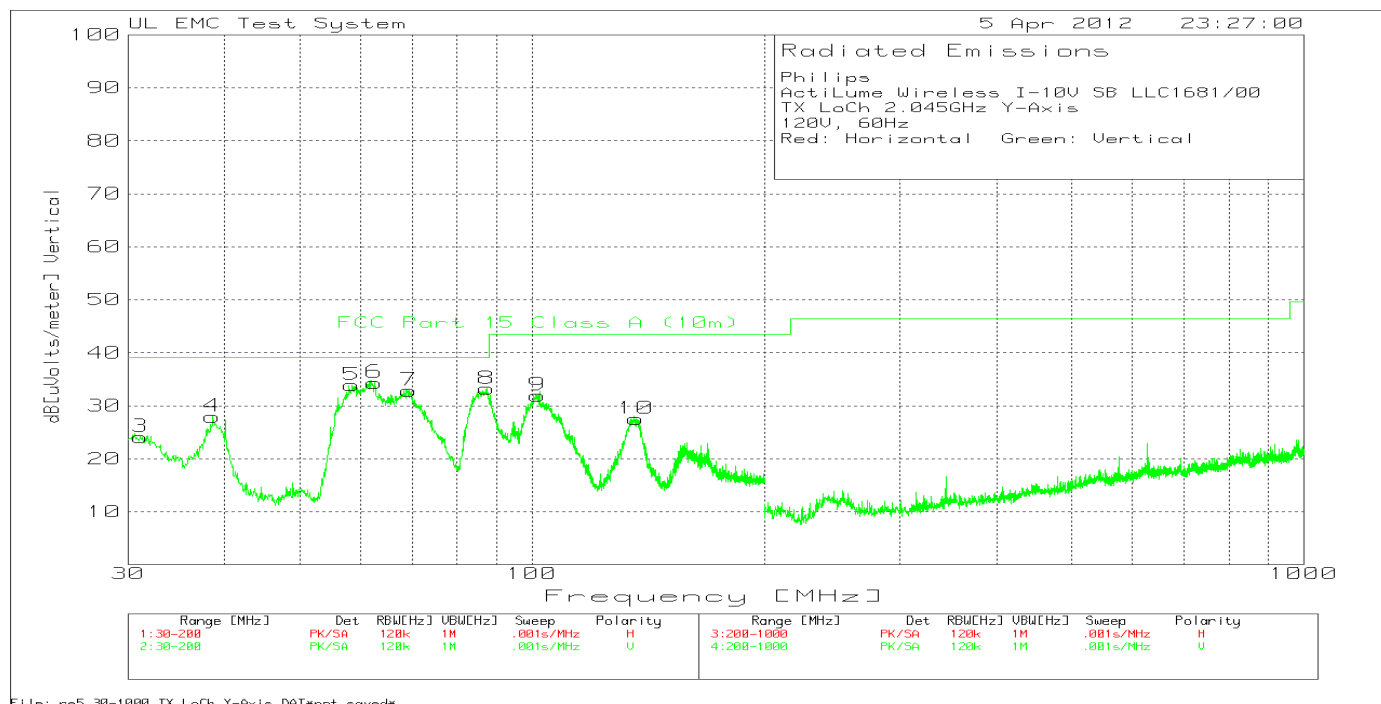
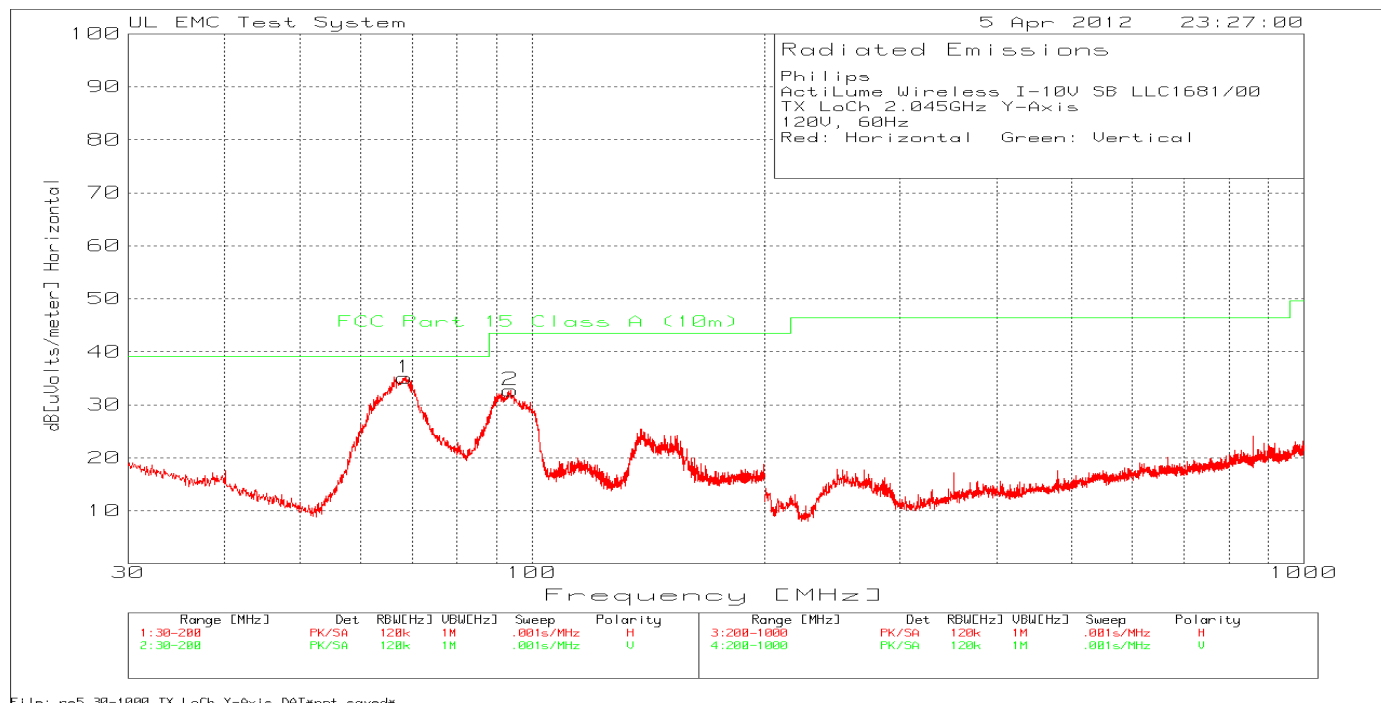
**Table 4 Radiated Emissions EUT Configuration Settings**

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

**Table 5 Radiated Emissions Test Equipment**

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20111227	20121231
Bicon Antenna	Chase	VBA6106A	EMC4078	20120117	20130131
Log-P Antenna	Chase	UPA6109	EMC4313	20110929	20120629
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20111227	20121231
Antenna Array	UL	BOMS	EMC4276	20111227	20121231

**Figure 1 Radiated Emissions Graph 30MHz-1GHz TX Low Channel**



Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

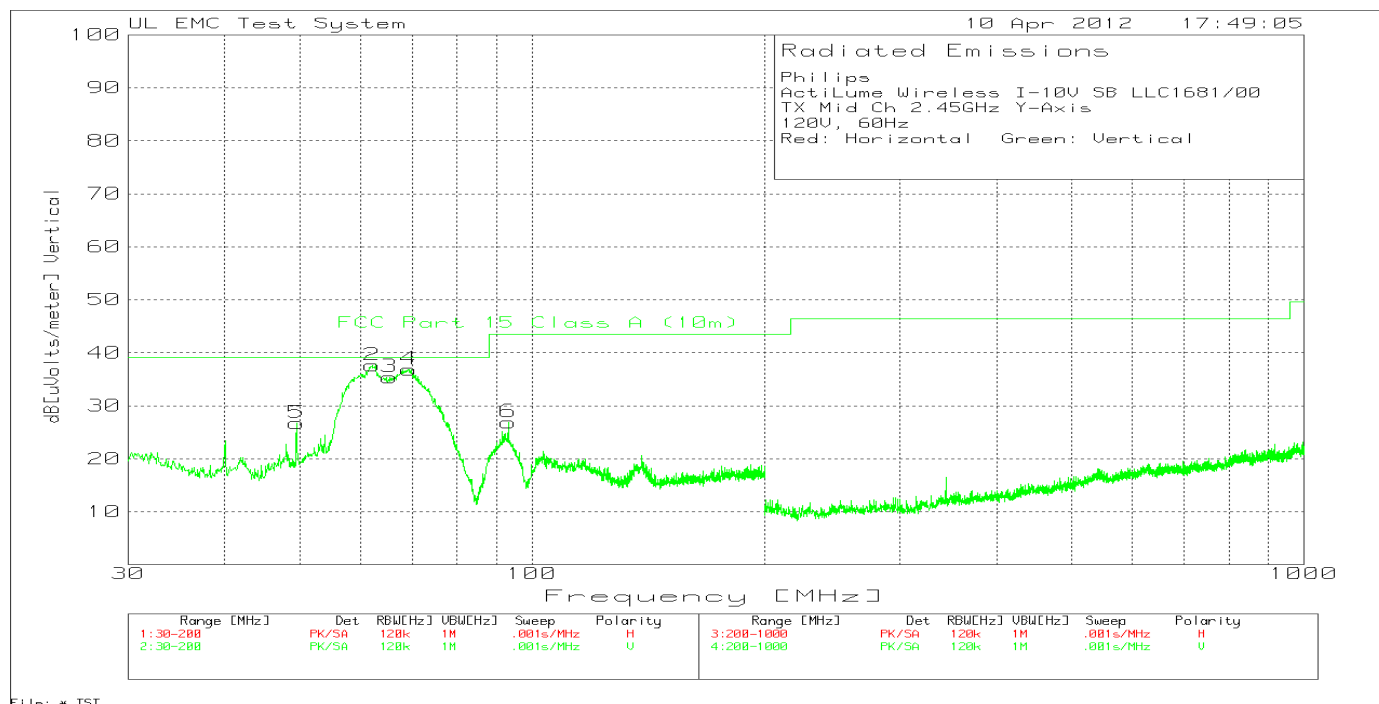
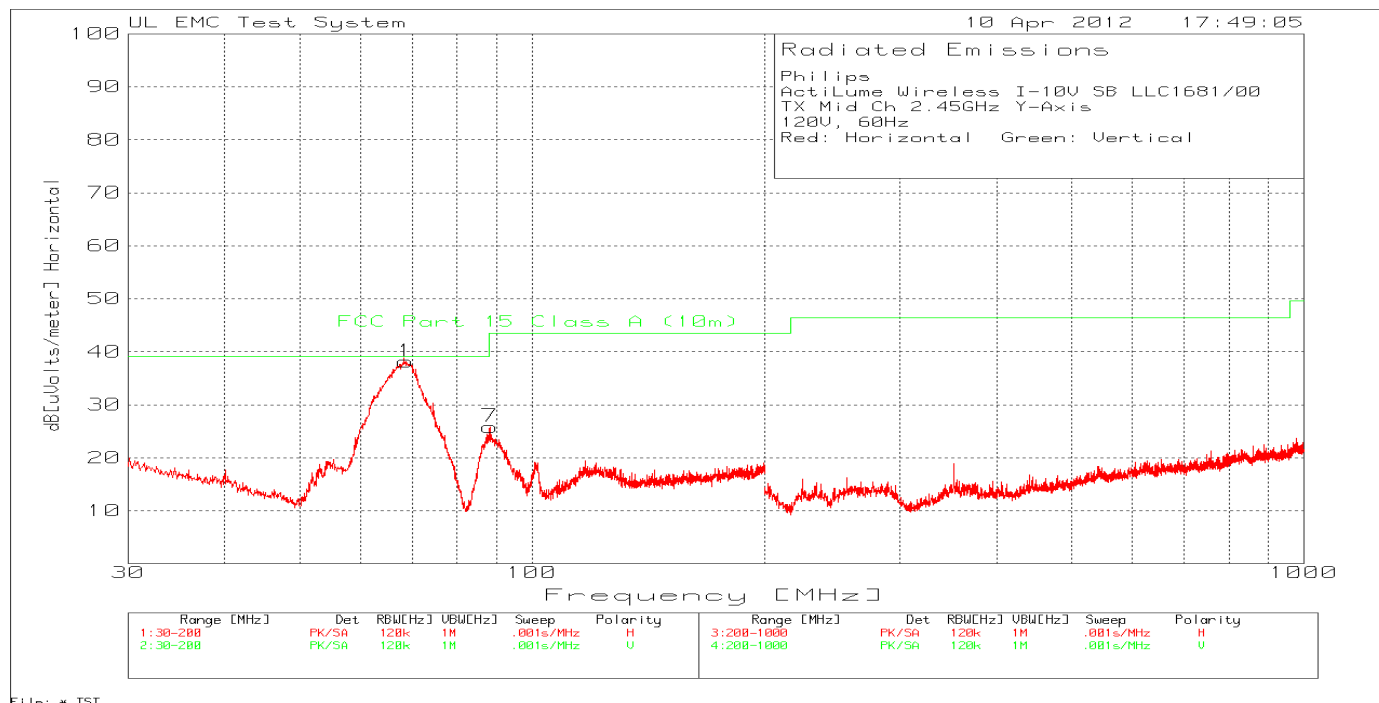
**Table 6 Radiated Emissions Data Points 30MHz – 1GHz TX Low Channel**

Philips ActiLume Wireless I-10V SB LLC1681/00 TX LoCh 2.045GHz Y-Axis 120V, 60Hz Red: Horizontal Green: Vertical										
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	FCC Part 15 Class A (10m)	Margin	Height [cm]	Polarity	
68.4858	58.27	PK	6.2	-29.4	35.07	39.1	-4.03	400	Horz	
93.8031	52.41	PK	9.6	-29.3	32.71	43.5	-10.79	250	Horz	
31.1044	35.93	PK	17.5	-29.3	24.13	39.1	-14.97	99	Vert	
38.5807	42.7	PK	14.7	-29.4	28	39.1	-11.1	99	Vert	
58.4608	55.97	PK	7.2	-29.3	33.87	39.1	-5.23	300	Vert	
62.5387	57.28	PK	6.4	-29.3	34.38	39.1	-4.72	300	Vert	
69.3353	56.14	PK	6.1	-29.4	32.84	39.1	-6.26	300	Vert	
87.5162	54	PK	8.6	-29.4	33.2	39.1	-5.9	300	Vert	
101.7041	50.52	PK	10.9	-29.5	31.92	43.5	-11.58	300	Vert	
136.2819	42.7	PK	14.2	-29.4	27.5	43.5	-16	99	Vert	
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	FCC Part 15 Class A (10m)	Margin	Azimuth [Degs]	Height [cm]	Polarity
68.3117	53.97	QP	6.2	-29.4	30.77	39.1	-8.33	183	398	Horz
67.7769	53.92	QP	6.2	-29.4	30.72	39.1	-8.38	172	396	Horz
62.05	52.59	QP	6.5	-29.3	29.79	39.1	-9.31	278	289	Vert
86.955	49.61	QP	8.5	-29.5	28.61	39.1	-10.49	269	398	Vert
58.6796	50.74	QP	7.1	-29.3	28.54	39.1	-10.56	295	260	Vert
PK - Peak detector QP - Quasi-Peak detector										

Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

Figure 2 Radiated Emissions Graph 30MHz-1GHz TX Mid Channel



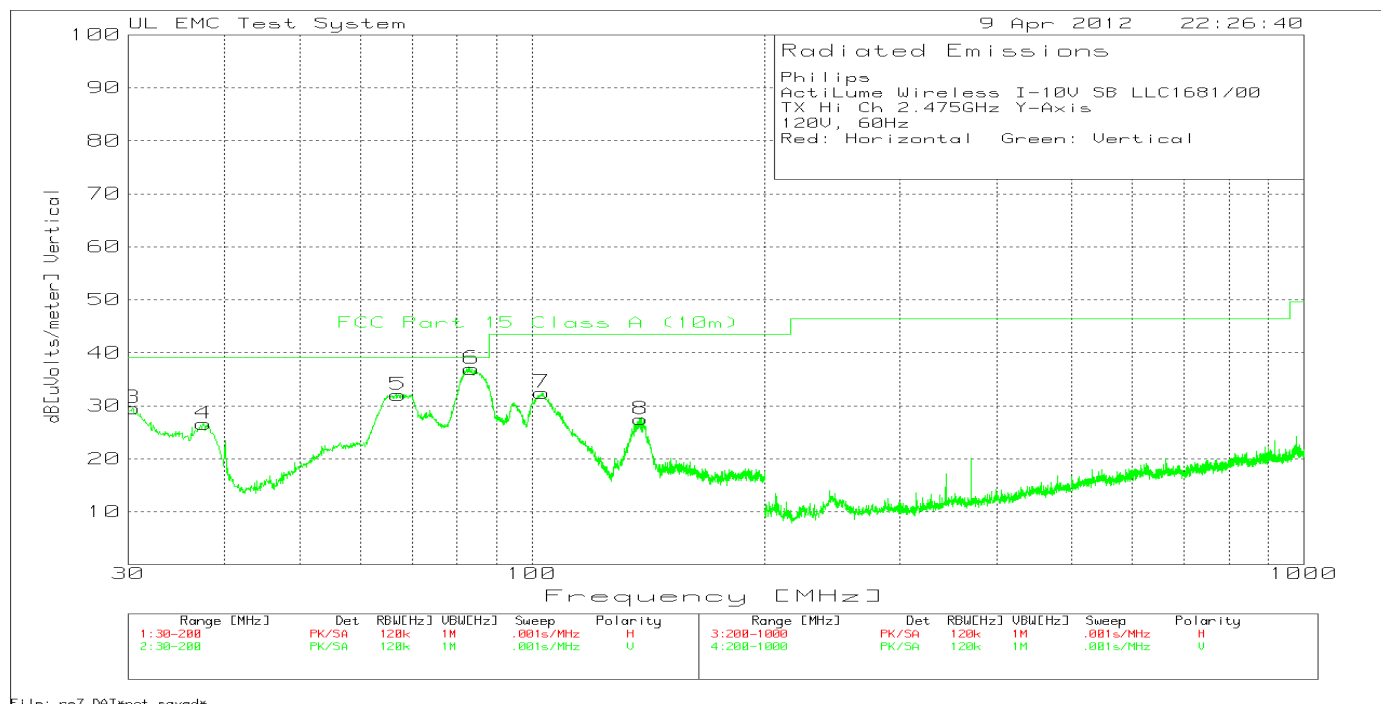
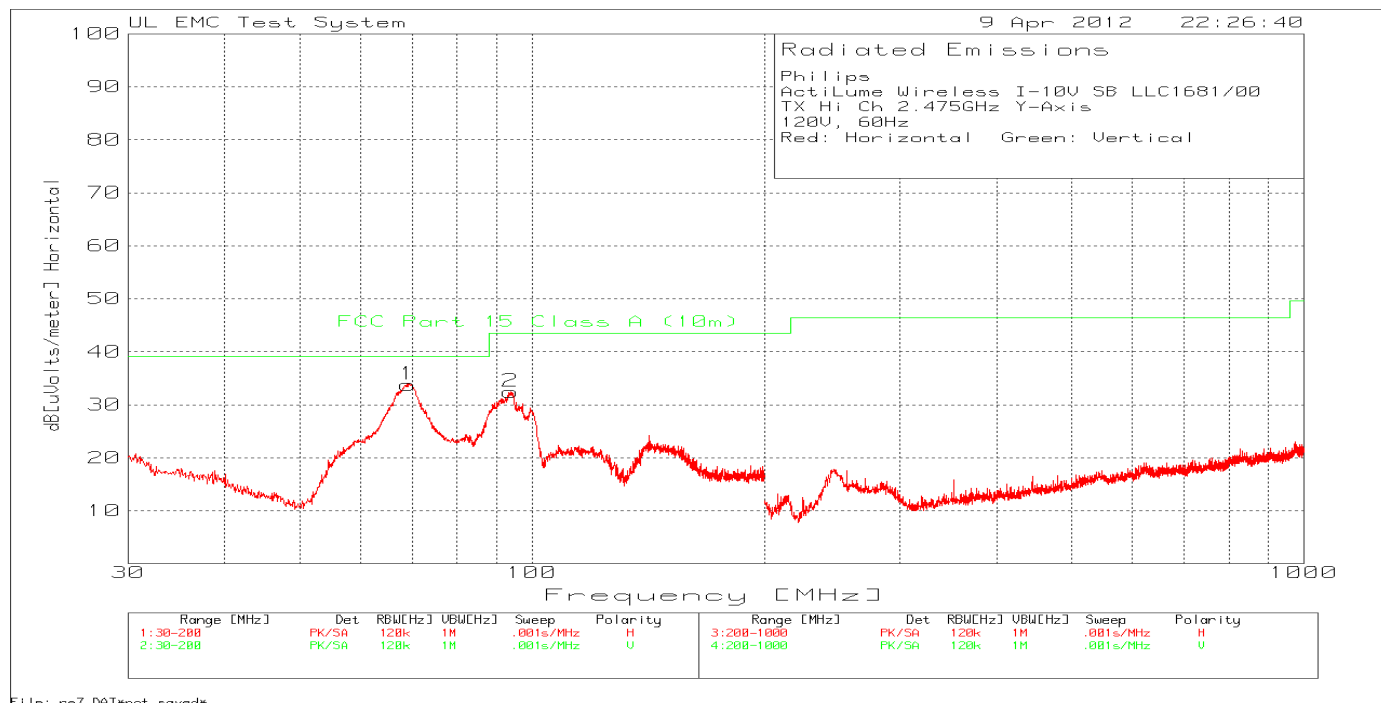
Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

**Table 7 Radiated Emissions Data Points 30MHz – 1GHz TX Mid Channel**

Philips ActiLume Wireless I-10V SB LLC1681/00 TX Mid Ch 2.45GHz Y-Axis 120V, 60Hz Red: Horizontal Green: Vertical										
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	FCC Part 15 Class A (10m)	Margin	Height [cm]	Polarity	
68.5707	61.43	PK	6.1	-29.4	38.13	39.1	-0.97	400	Horz	
88.1959	46.63	PK	8.6	-29.4	25.83	43.5	-17.67	250	Horz	
62.1139	60.39	PK	6.5	-29.3	37.59	39.1	-1.51	300	Vert	
65.4273	58.6	PK	6.2	-29.4	35.4	39.1	-3.7	400	Vert	
69.3353	60.18	PK	6.1	-29.4	36.88	39.1	-2.22	400	Vert	
49.5402	46	PK	10.1	-29.4	26.7	39.1	-12.4	101	Vert	
93.2084	46.84	PK	9.5	-29.4	26.94	43.5	-16.56	200	Vert	
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	FCC Part 15 Class A (10m)	Margin	Azimuth [Degs]	Height [cm]	Polarity
68.285	58.5	QP	6.2	-29.4	35.3	39.1	-3.8	165	398	Horz
61.71	57.67	QP	6.5	-29.3	34.87	39.1	-4.23	350	259	Vert
65.4406	54.49	QP	6.2	-29.4	31.29	39.1	-7.81	270	393	Vert
69.1477	56.9	QP	6.1	-29.4	33.6	39.1	-5.5	259	388	Vert
PK - Peak detector QP - Quasi-Peak detector										

**Figure 3 Radiated Emissions Graph 30MHz-1GHz TX High Channel**





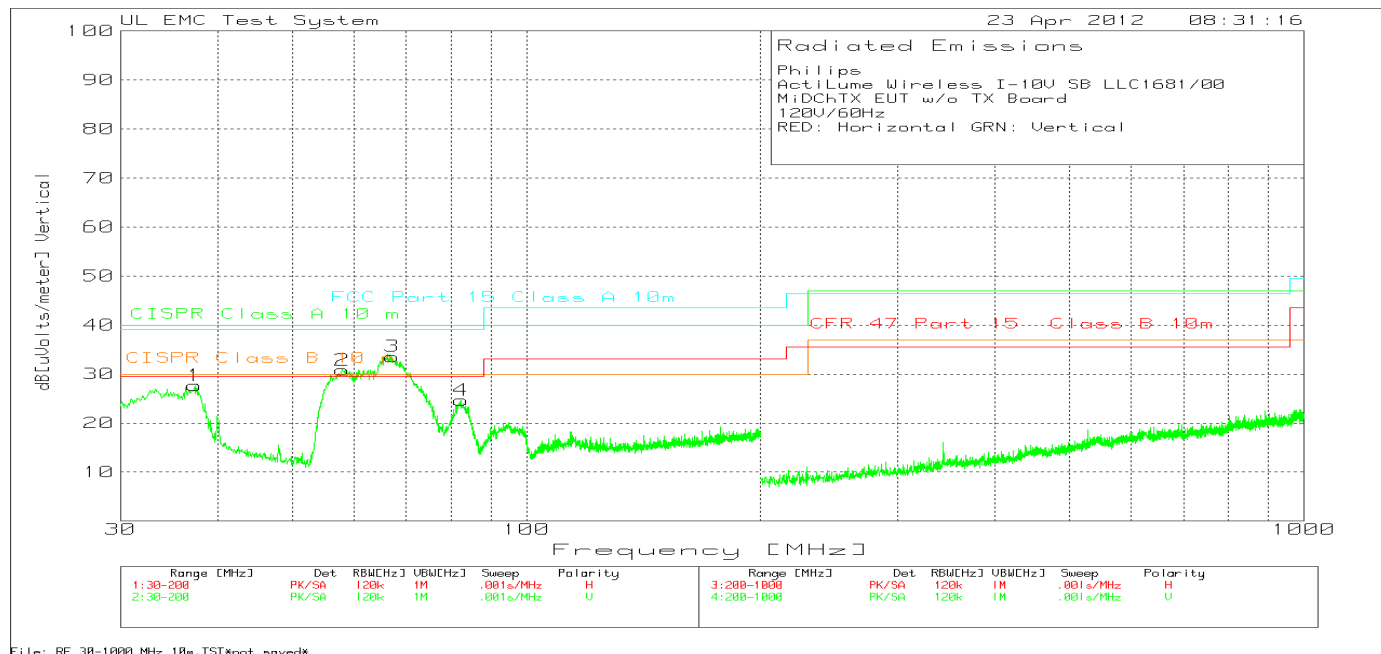
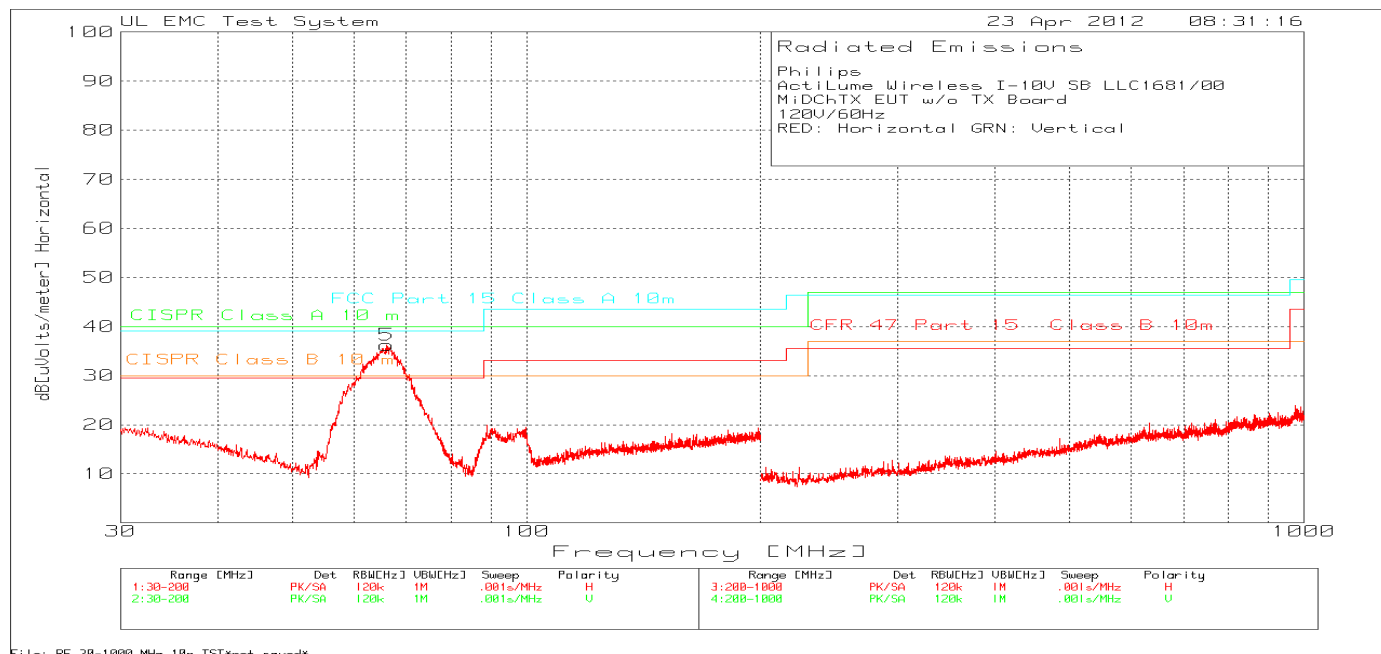
Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

**Table 8 Radiated Emissions Data Points 30MHz – 1GHz TX High Channel**

Philips ActiLume Wireless I-10V SB LLC1681/00 TX Hi Ch 2.475GHz Y-Axis 120V, 60Hz Red: Horizontal Green: Vertical										
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	FCC Part 15 Class A (10m)	Margin	Height [cm]	Polarity	
69.0805	57.15	PK	6.1	-29.4	33.85	39.1	-5.25	400	Horz	
93.7181	52.16	PK	9.6	-29.3	32.46	43.5	-11.04	250	Horz	
30.3398	41.12	PK	17.7	-29.3	29.52	39.1	-9.58	101	Vert	
37.5612	40.87	PK	15	-29.3	26.57	39.1	-12.53	101	Vert	
67.0415	55.22	PK	6.2	-29.4	32.02	39.1	-7.08	400	Vert	
83.5232	58.6	PK	7.8	-29.4	37	39.1	-2.1	400	Vert	
102.9785	50.83	PK	11.1	-29.5	32.43	43.5	-11.07	101	Vert	
138.4058	42.68	PK	14.2	-29.4	27.48	43.5	-16.02	101	Vert	
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	FCC Part 15 Class A (10m)	Margin	Azimuth [Deps]	Height [cm]	Polarity
69.26	54.09	QP	6.1	-29.4	30.79	39.1	-8.31	148	396	Horz
83.699679	54.98	QP	7.8	-29.4	33.38	39.1	-5.72	65	397	Vert
67.0121	52.4	QP	6.2	-29.4	29.2	39.1	-9.9	261	393	Vert
86.955	49.61	QP	8.5	-29.5	28.61	39.1	-10.49	269	398	Vert
58.6796	50.74	QP	7.1	-29.3	28.54	39.1	-10.56	295	260	Vert
PK - Peak detector QP - Quasi-Peak detector										

**Figure 4 Radiated Emissions Graph 30MHz-1GHz (Middle Channel Sample) TX Board Removed**



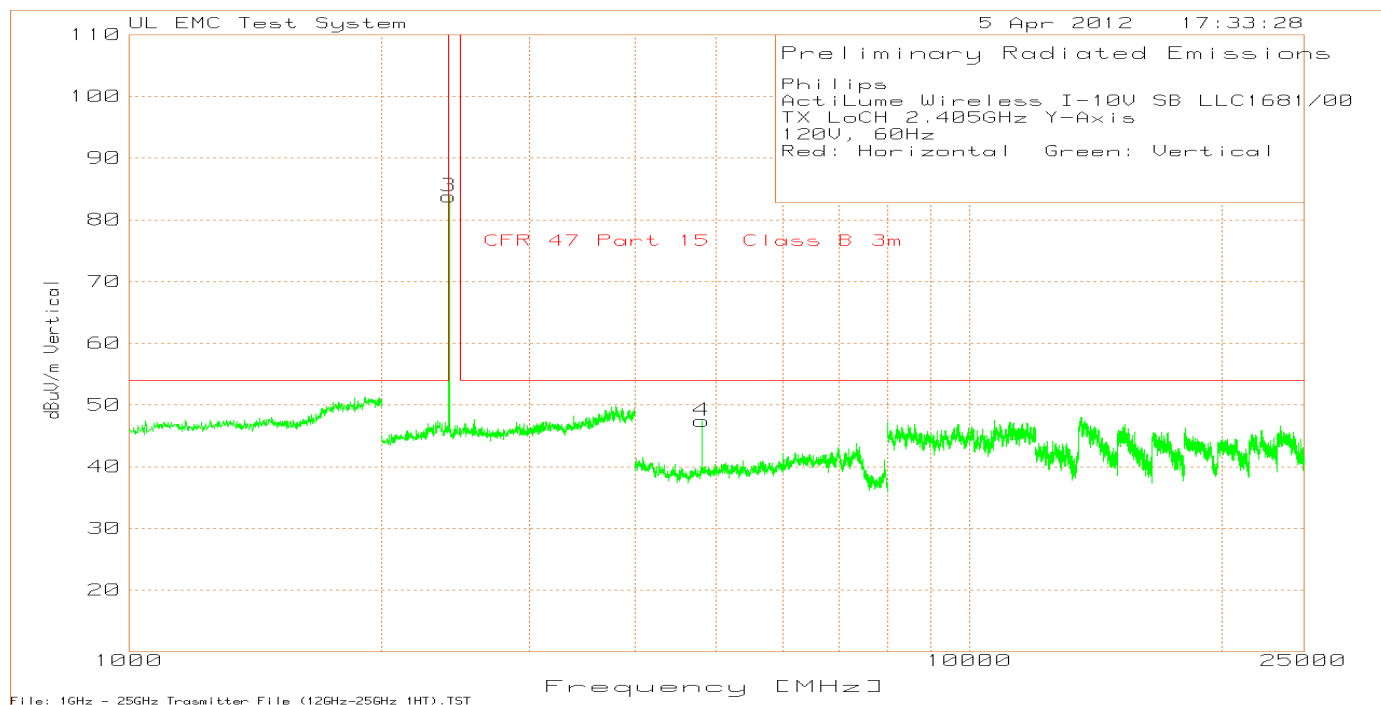
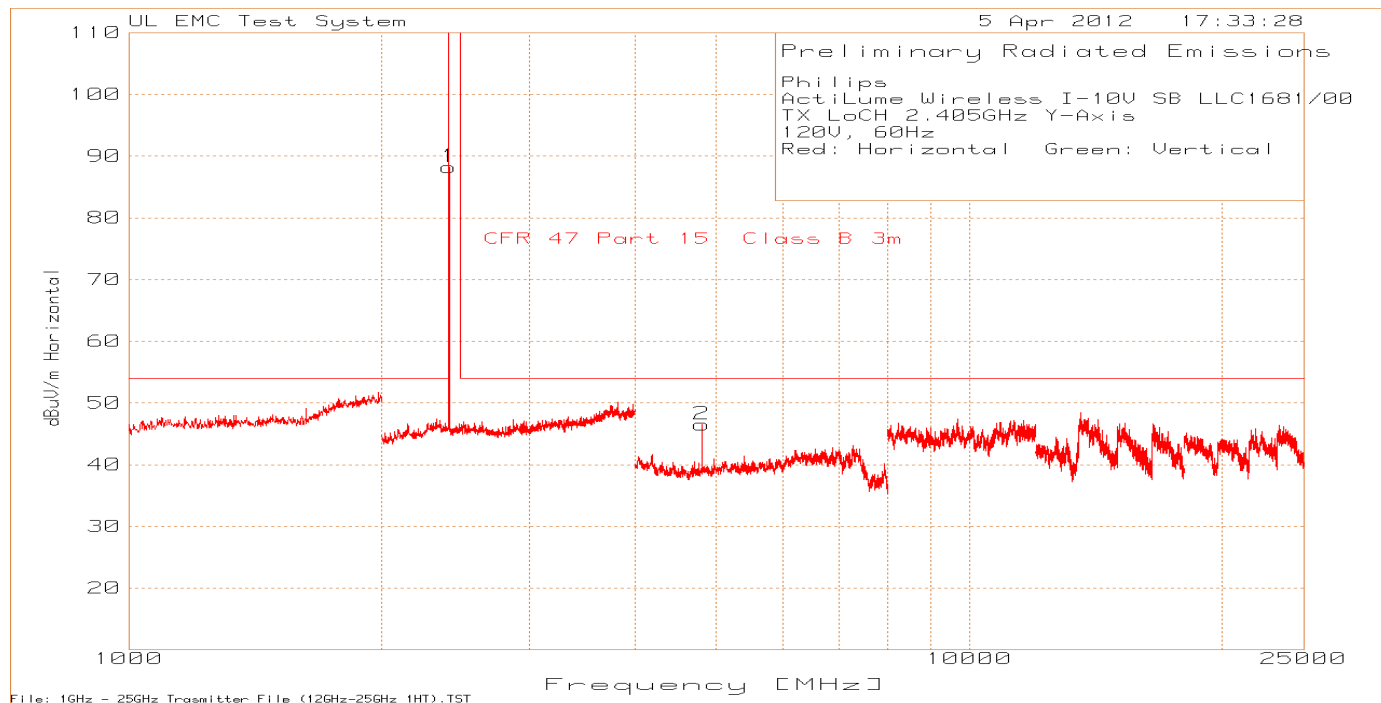
Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

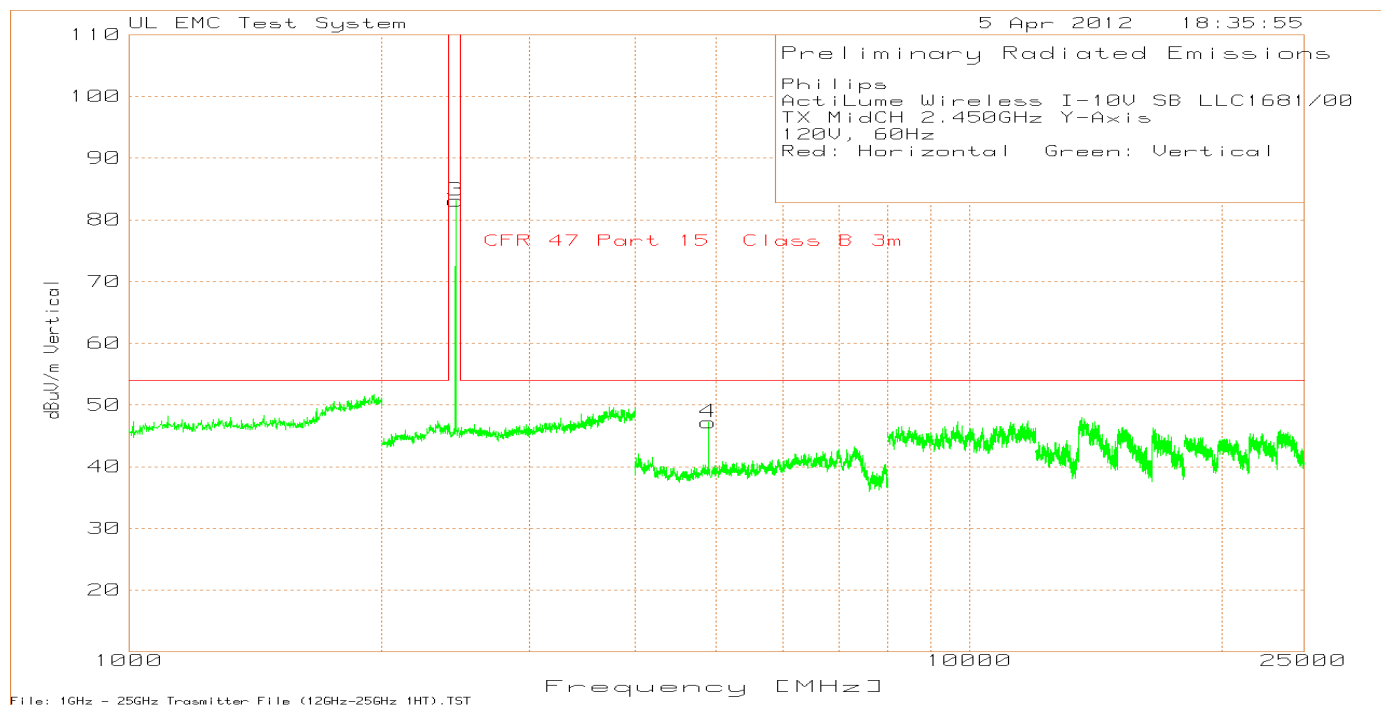
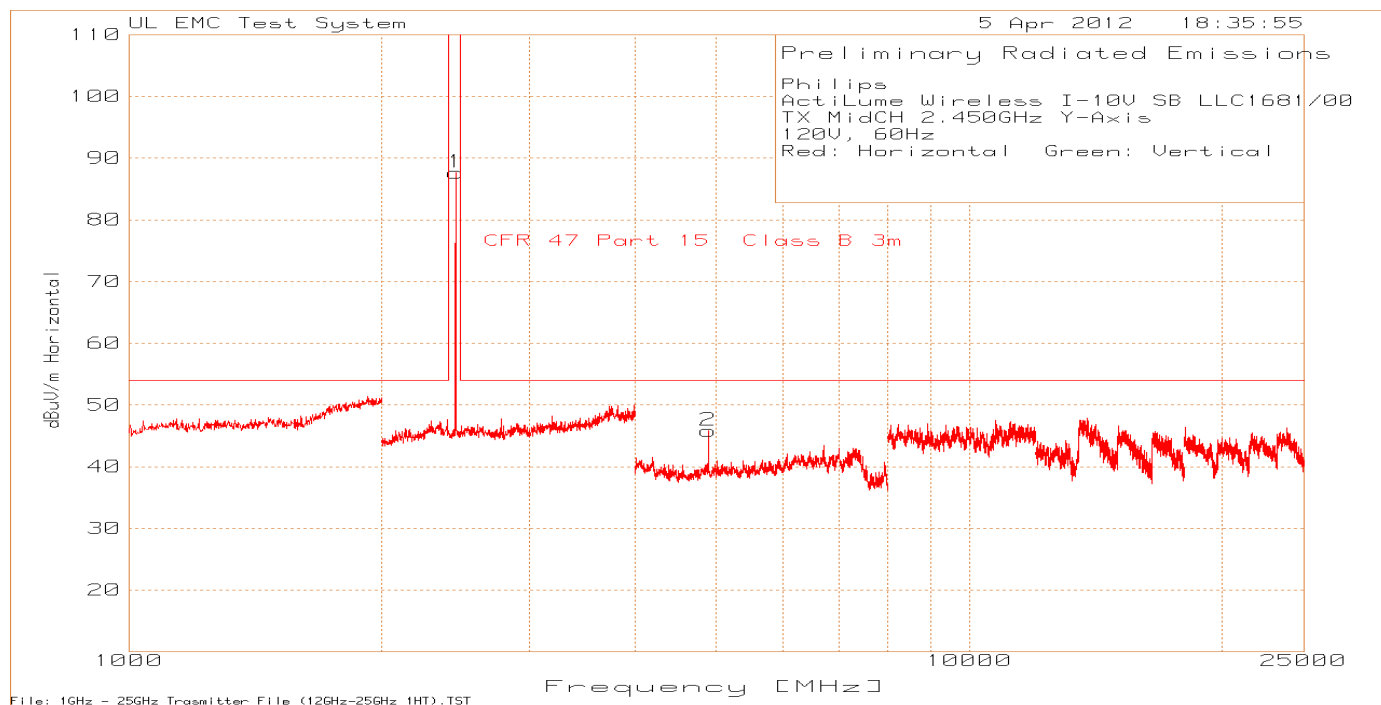
**Table 9 Radiated Emissions Data Points 30MHz – 1GHz (Middle Channel Sample) TX Board Removed**

Philips ActiLume Wireless I-10V SB LLC1681/00 MiDChTX EUT w/o TX Board 120V/60Hz RED: Horizontal GRN: Vertical										
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	FCC Part 15 Class A 10m	Margin	Height [cm]	Polarity	
66.022	59.4	PK	6.2	-29.4	36.2	39.1	-2.9	400	Horz	
37.3913	41.76	PK	15.1	-29.2	27.66	39.1	-11.44	99	Vert	
57.951	52.8	PK	7.3	-29.3	30.8	39.1	-8.3	250	Vert	
67.1264	56.78	PK	6.2	-29.4	33.58	39.1	-5.52	250	Vert	
82.3338	46.66	PK	7.5	-29.5	24.66	39.1	-14.44	400	Vert	
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	FCC Part 15 Class A 10m	Margin	Azimuth [Degs]	Height [cm]	Polarity
66.301667	53.93	QP	6.2	-29.4	30.73	39.1	-8.37	342	400	Horz
67.026154	52.4	QP	6.2	-29.4	29.2	39.1	-9.9	245	373	Vert
PK - Peak detector QP - Quasi-Peak detector										

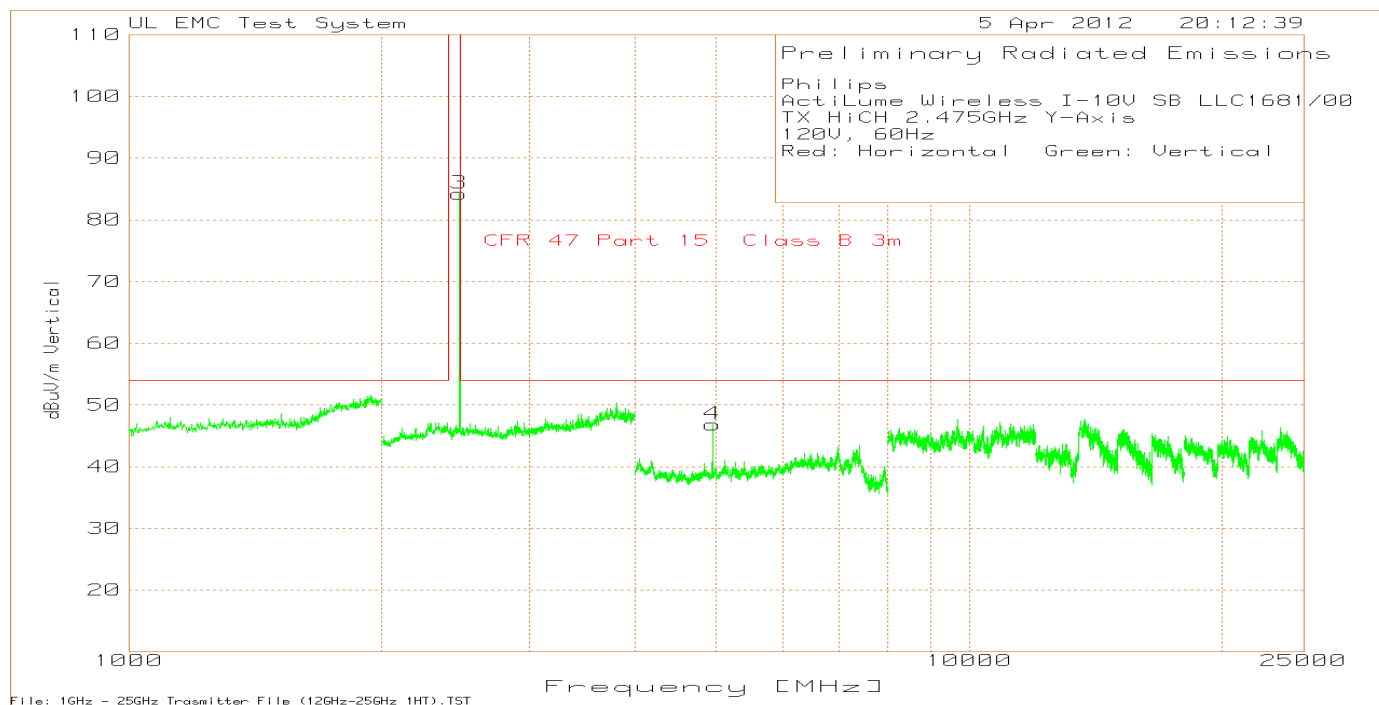
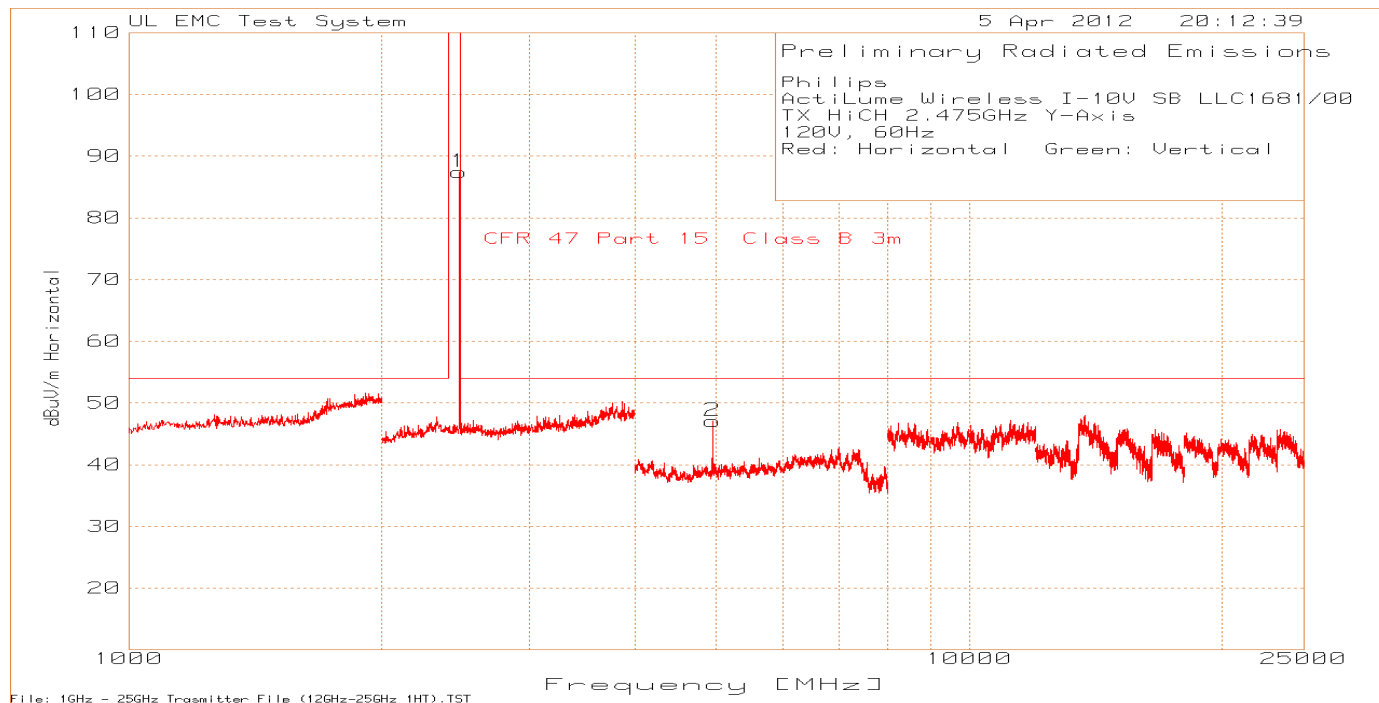
**Figure 5 Radiated Emissions Graph 1GHz-25GHz Low Channel**



**Figure 6 Radiated Emissions Graph 1GHz-25GHz Middle Channel**



**Figure 7 Radiated Emissions Graph 1GHz-25GHz High Channel**



Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

**Table 10 Radiated Emissions Data Points 1GHz-25GHz Low Channel**

Philips ActiLume Wireless I-10V SB LLC1681/00 TX LoCH 2.405GHz Y-Axis 120V, 60Hz Red: Horizontal Green: Vertical									
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
2404.404	62.27	PK	21.8	4.18	88.25	-	-	99	Horz
4808.539	70.22	PK	27.7	-51.36	46.56	54	-7.44	100	Horz
2404.404	57.79	PK	21.8	4.18	83.77	-	-	101	Vert
4808.539	71.04	PK	27.7	-51.36	47.38	54	-6.62	100	Vert
PK - Peak detector LnAv - Linear Average detector									

**Table 11 Radiated Emissions Data Points 1GHz-25GHz Middle Channel**

Philips ActiLume Wireless I-10V SB LLC1681/00 TX MidCH 2.450GHz Y-Axis 120V, 60Hz Red: Horizontal Green: Vertical									
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
2450.45	61.32	PK	22	4.34	87.66	-	-	100	Horz
4899.266	69.83	PK	27.7	-51.65	45.88	54	-8.12	100	Horz
2448.448	56.88	PK	21.9	4.37	83.15	-	-	150	Vert
4899.266	71.18	PK	27.7	-51.65	47.23	54	-6.77	100	Vert
PK - Peak detector LnAv - Linear Average detector									

**Table 12 Radiated Emissions Data Points 1GHz-25GHz High Channel**

Philips ActiLume Wireless I-10V SB LLC1681/00 TX HiCH 2.475GHz Y-Axis 120V, 60Hz Red: Horizontal Green: Vertical									
Test Frequency	Meter Reading	Detector	Antenna Factor dB	Path Loss/Gain dB	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
2474.474	61.56	PK	22	3.83	87.39	-	-	99	Horz
4949.967	70.93	PK	27.8	-51.59	47.14	54	-6.86	100	Horz
2474.474	58.4	PK	22	3.83	84.23	-	-	150	Vert
4949.967	70.69	PK	27.8	-51.59	46.9	54	-7.1	100	Vert
PK - Peak detector LnAv - Linear Average detector									

#### 4.3 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		47 CFR Part 15.215 RSS-Gen 4.6
Occupied Bandwidth		
20dB and 99% Power		

**Table 13 Occupied Bandwidth Configuration Settings**

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

**Table 14 Occupied Bandwidth Test Equipment**

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20111227	20121231
Antenna Array	UL	BOMS	EMC4276	20111227	20121231

**Table 15 Occupied Bandwidth Results**

Bandwidth	Occupied Bandwidth Results	
Measurement Point / Frequency MHz	-20 dBc (MHz)	99 % PWR (MHz)
2405	2.810	2.640
2450	2.780	2.620
2475	2.820	2.620



Figure 8 20dB Bandwidth Graph Low Channel

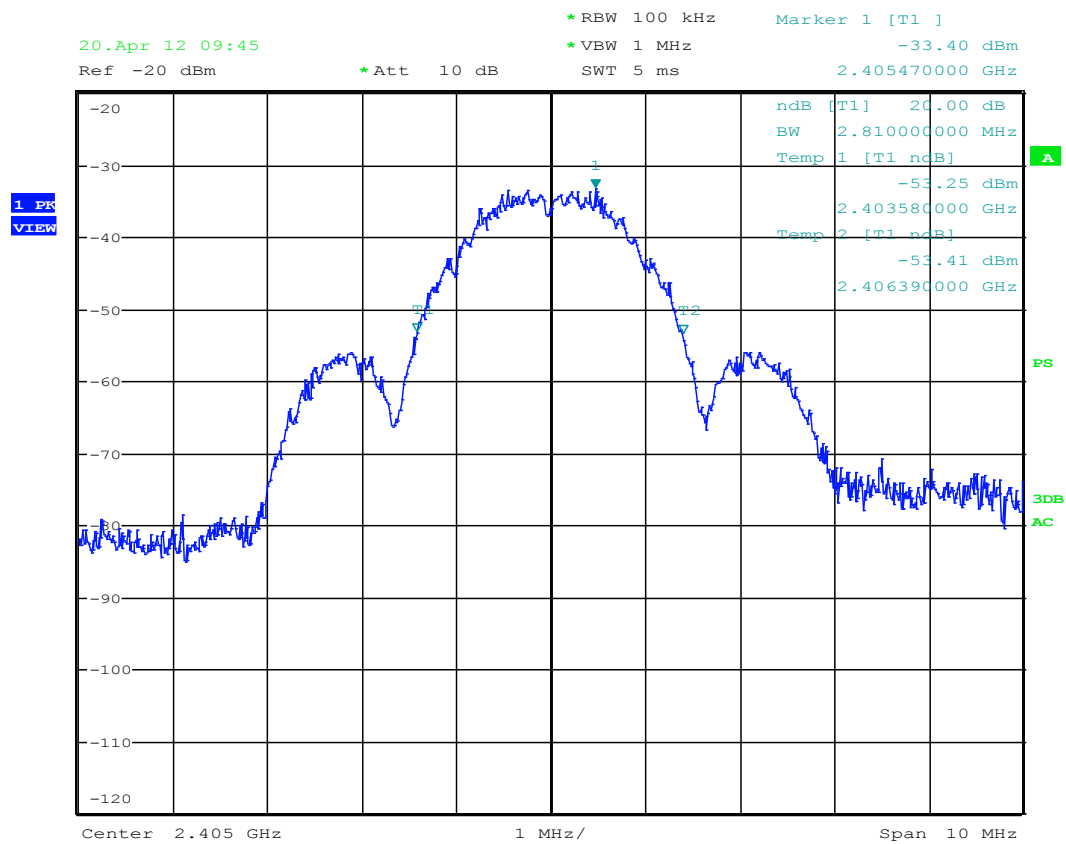


Figure 9 20dB Bandwidth Graph Middle Channel

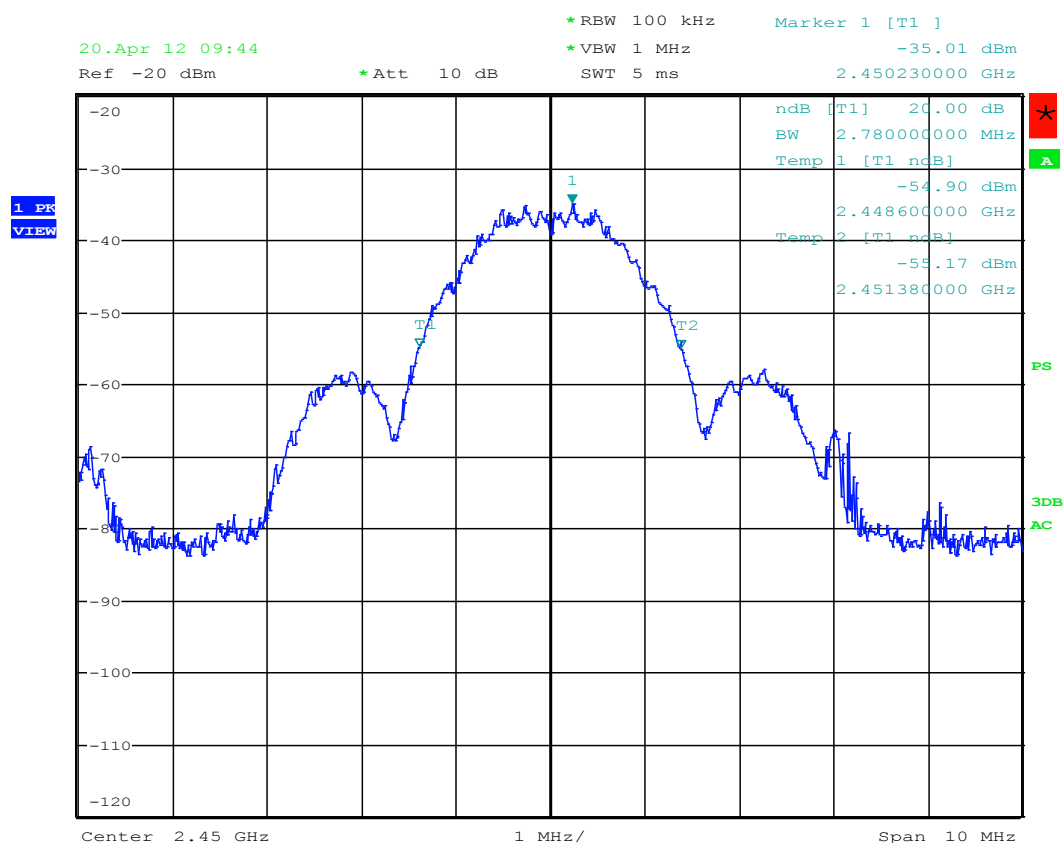
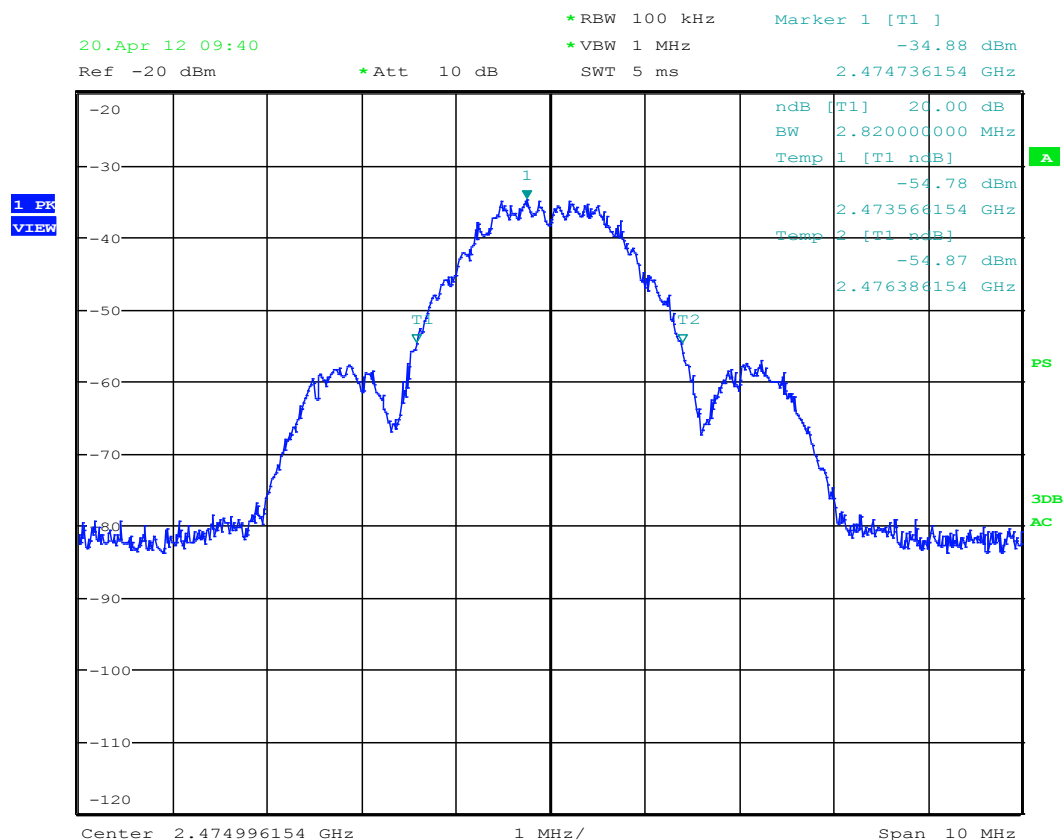


Figure 10 20dB Bandwidth Graph High Channel



**Figure 11 Power Bandwidth 99% Graph Low Channel**

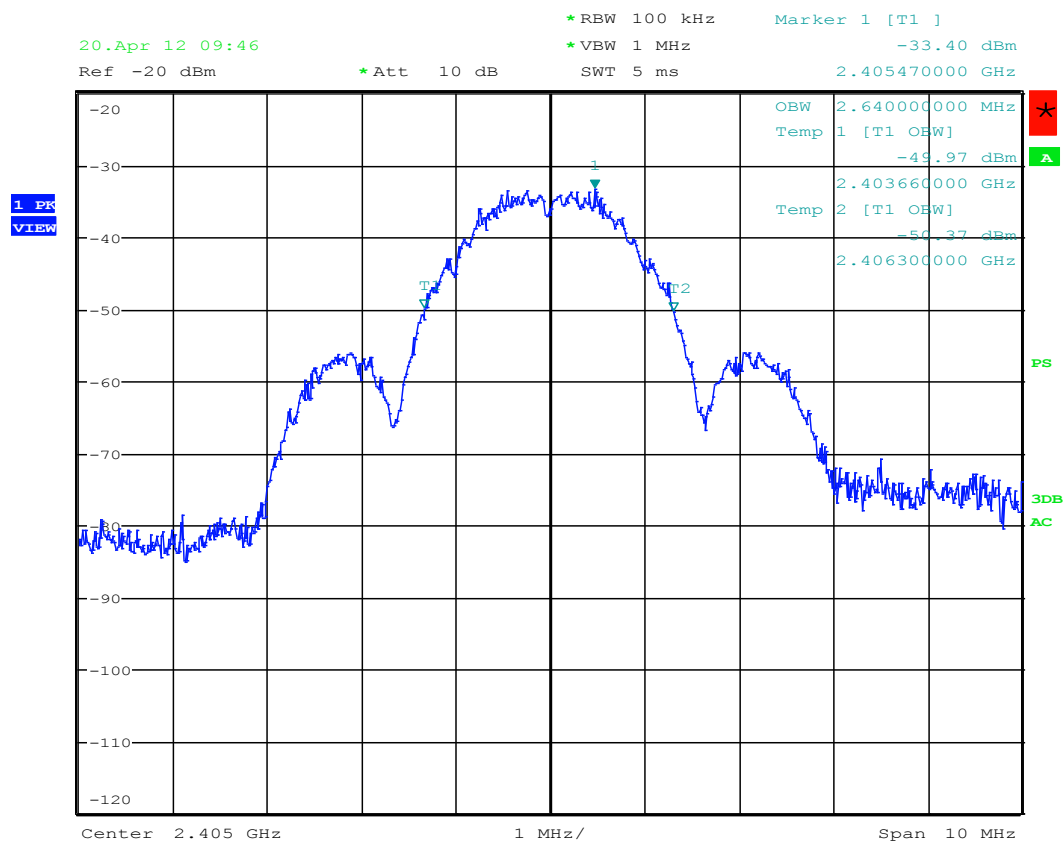


Figure 12 Power Bandwidth 99% Graph Middle Channel

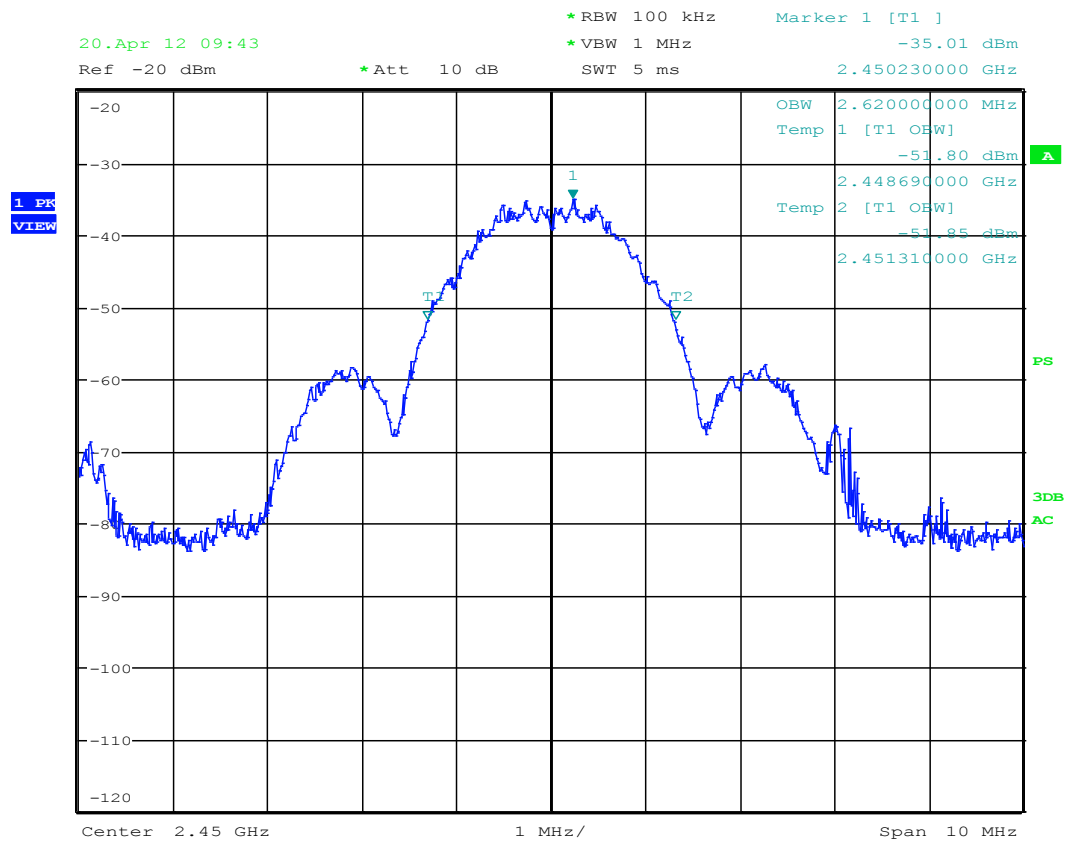
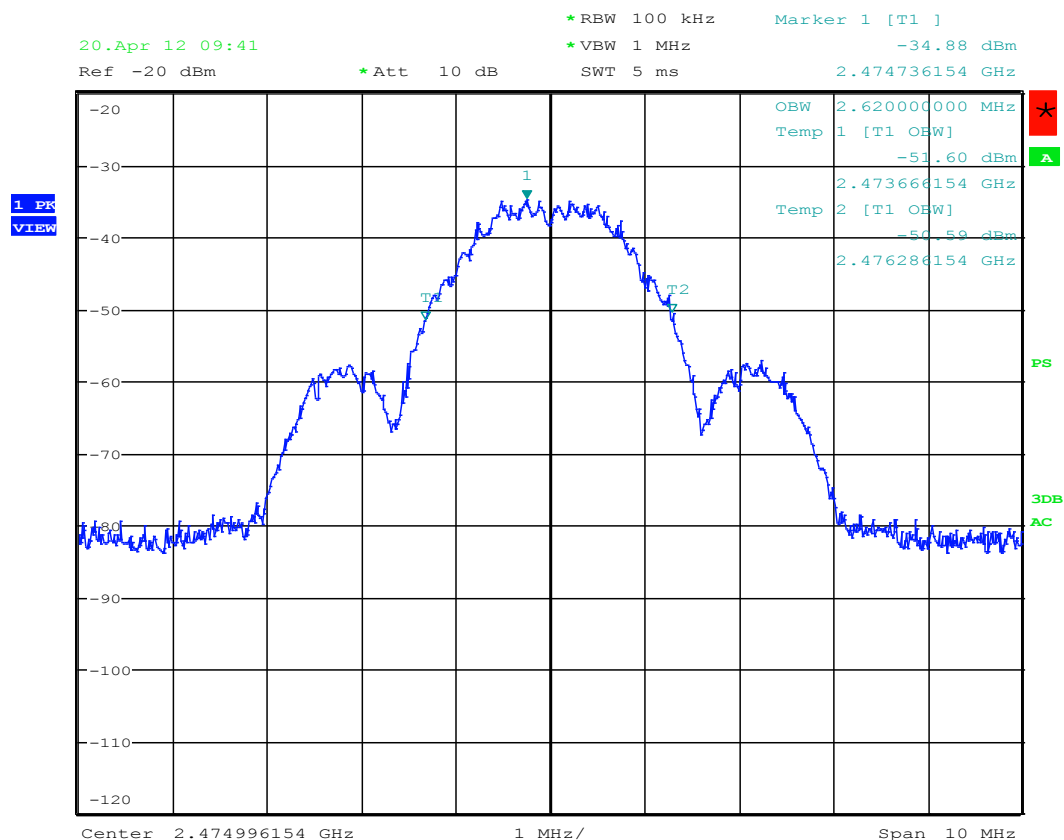


Figure 13 Power Bandwidth 99% Graph High Channel



Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

**4.4 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	47 CFR Part 15.207	
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
<b>Limits - Class A</b>		
Frequency (MHz)	Limit (dB $\mu$ V)	
	Quasi-Peak	Average
0.15 to 0.50	79	66
0.50 to 30	73	60
Supplementary information: The transmitter has no effect on line conducted emissions. See data with TX board installed and TX board removed.		

Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

**Table 16 Conducted Emissions EUT Configuration Settings**

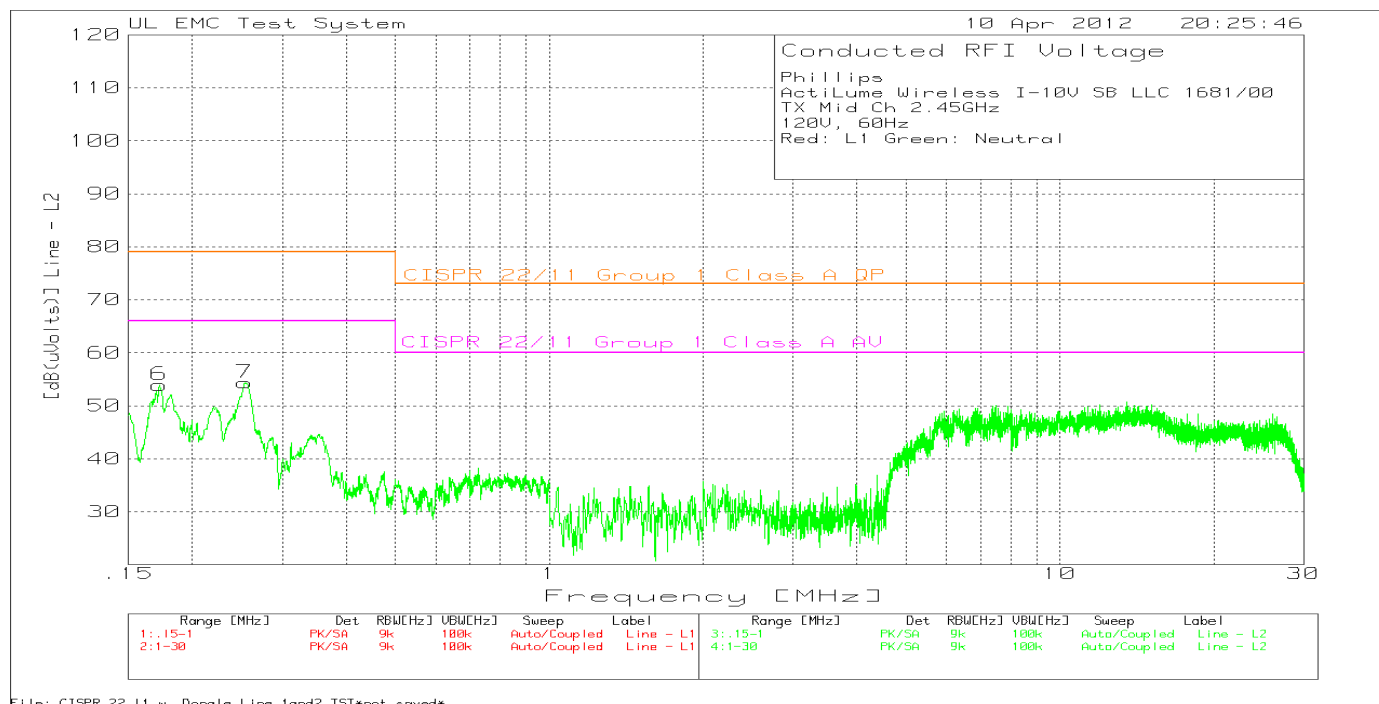
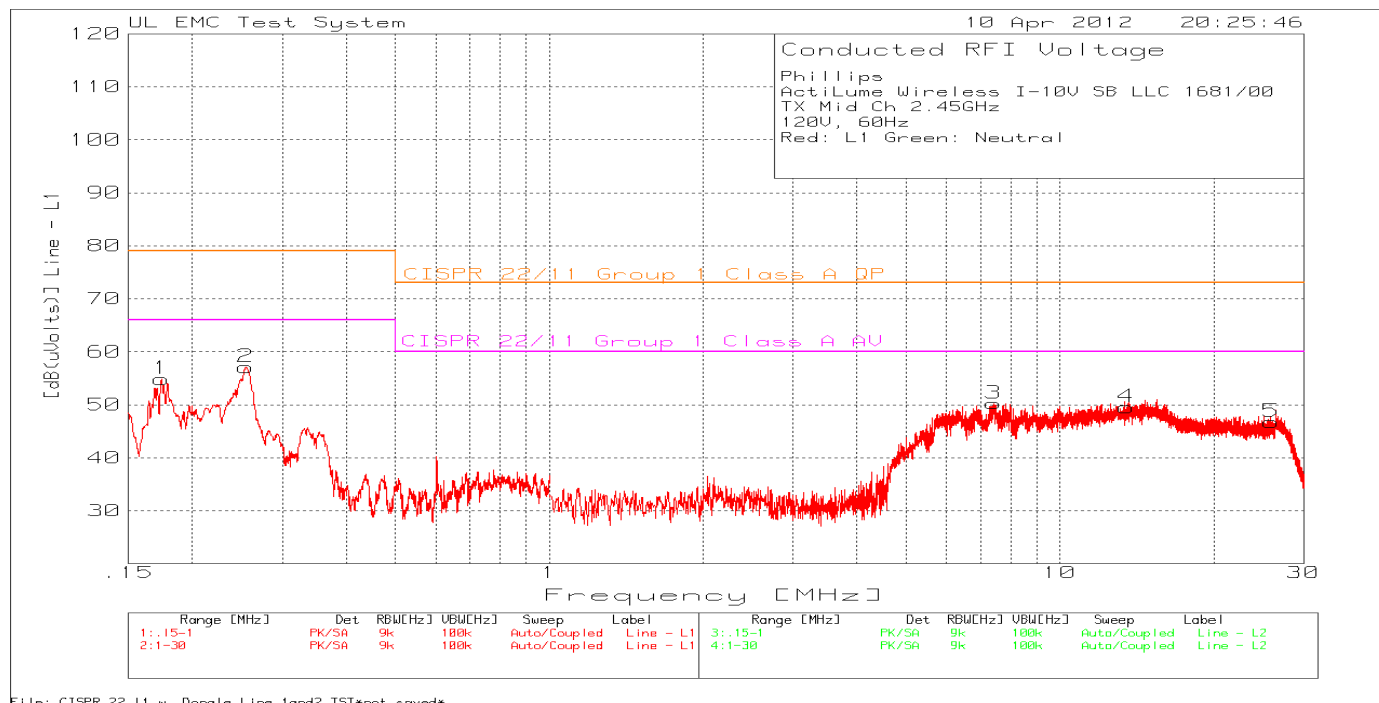
Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

**Table 17 Conducted Emissions Test Equipment**

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	Dec 28 2011	Dec 31 2012
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224	N/A	N/A
HighPass Filter	Solar Electronics	2803-150	885551	N/A	N/A
Attenuator	HP	8494B	2831A00 838	N/A	N/A
LISN - L1	Solar	8602-50-TS-50-N	EMC4052	Jan 6 2012	Jan 6 2013
LISN - L2	Solar	8602-50-TS-50-N	EMC4064	Jan 6 2012	Jan 6 2013



Figure 14 Conducted Emissions Graph TX Mid Ch



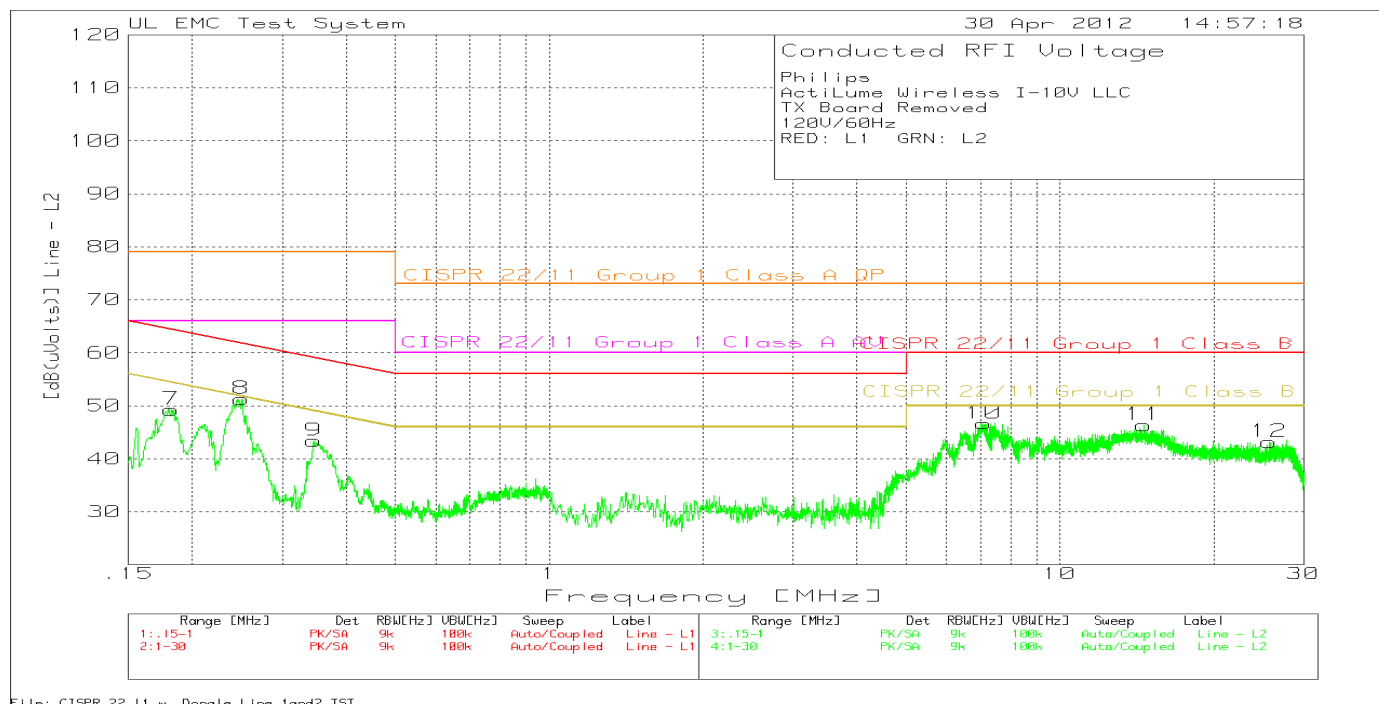
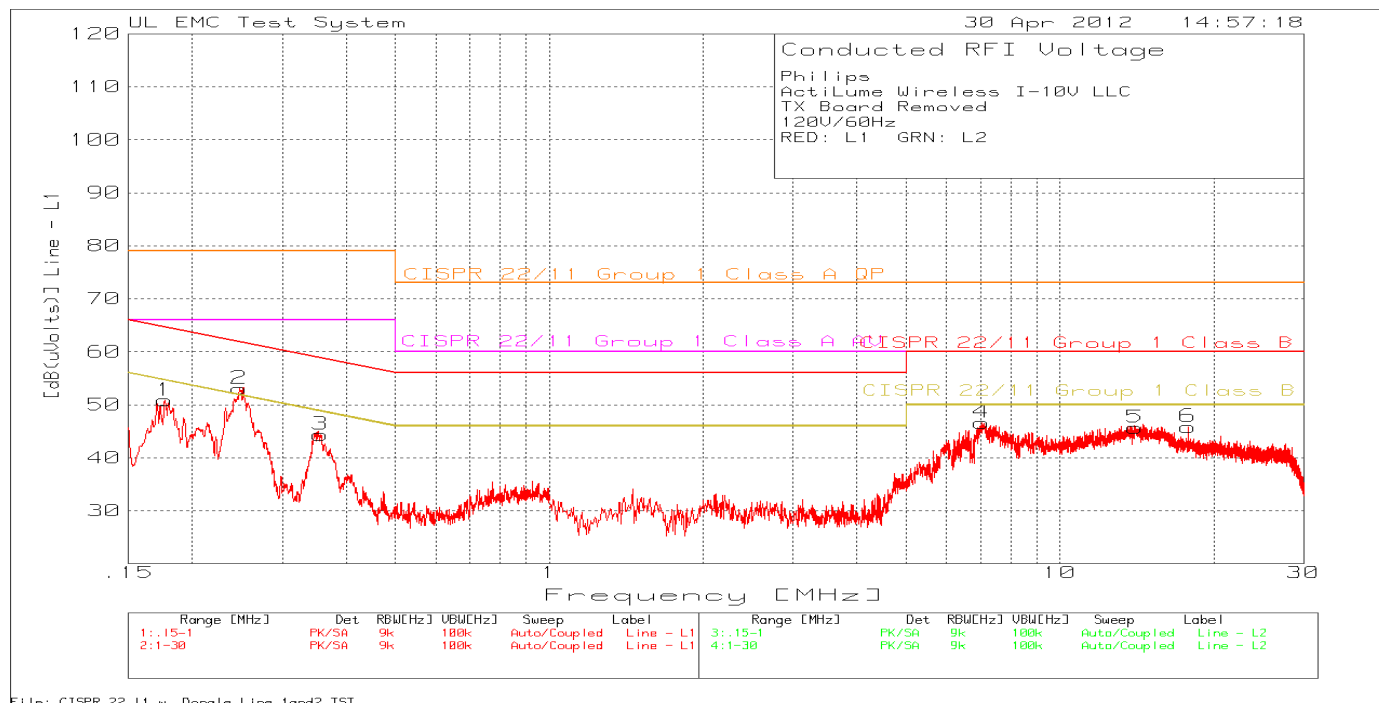
Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

**Table 18 Conducted Emissions Data Points TX Mid Ch**

Test Frequency	Meter Reading	Detector	LISN Factor dB	Path Loss dB	Level dBuV	CISPR 22/11 Group 1 Class A QP	Margin	CISPR 22/11 Group 1 Class A AV	Margin
Line 1									
0.174	42.53	PK	0.1	12.2	54.83	79	-24.17	66	-11.17
0.255	45.79	PK	0.1	11.2	57.09	79	-21.91	66	-8.91
7.41426	39.07	PK	0.3	10.9	50.27	73	-22.73	60	-9.73
13.52791	37.57	PK	0.9	11.1	49.57	73	-23.43	60	-10.43
25.91095	32.93	PK	2.1	11.7	46.73	73	-26.27	60	-13.27
Line 2									
0.17272	41.64	PK	0.1	12.2	53.94	79	-25.06	66	-12.06
0.25394	43.09	PK	0.1	11.2	54.39	79	-24.61	66	-11.61
Line 1									
0.179985	36.99	QP	0.1	12	49.09	79	-29.91	66	-16.91
0.25534	43.18	QP	0.1	11.2	54.48	79	-24.52	66	-11.52
7.416945	34.61	QP	0.3	10.9	45.81	73	-27.19	60	-14.19
13.52985	34.09	QP	0.9	11.1	46.09	73	-26.91	60	-13.91
25.914275	28.92	QP	2.1	11.7	42.72	73	-30.28	60	-17.28
Line 2									
0.17998	37.95	QP	0.1	12	50.05	79	-28.95	66	-15.95
0.25587	40.46	QP	0.1	11.2	51.76	79	-27.24	66	-14.24
Line 1									
0.179985	29.23	Av	0.1	12	41.33	79	-37.67	66	-24.67
0.25534	26.55	Av	0.1	11.2	37.85	79	-41.15	66	-28.15
7.416945	28.16	Av	0.3	10.9	39.36	73	-33.64	60	-20.64
13.52985	29.11	Av	0.9	11.1	41.11	73	-31.89	60	-18.89
25.914275	24.29	Av	2.1	11.7	38.09	73	-34.91	60	-21.91
Line 2									
0.17998	29.5	Av	0.1	12	41.6	79	-37.4	66	-24.4
0.25587	23.65	Av	0.1	11.2	34.95	79	-44.05	66	-31.05
PK - Peak detector QP - Quasi-Peak detector Av - Average detector									

### Figure 15 Conducted Emissions Graph TX Board Removed



Job #: 1001494941 Project #: 12CA19074 File #: MC16433  
 Model Number: LLC1681  
 Client Name: Philips Lighting Electronics N. A.

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**Table 19 Conducted Emissions Data Points TX Board Removed**

Philips  
 ActiLume Wireless I-10V LLC  
 TX Board Removed  
 120V/60Hz  
 RED: L1 GRN: L2

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Transducer Factor [dB]	Gain/Loss Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4	5	6
=====											
Line - L1											
1	.17662	38.61 PK	.1	12.1	50.81	79	66	64.6	54.6	-	-
				Margin [dB]		-28.19	-15.19	-13.79	-3.79	-	-
2	.24797	41.66 PK	.1	11.3	53.06	79	66	61.8	51.8	-	-
				Margin [dB]		-25.94	-12.94	-8.74	1.26	-	-
3	.35641	33.6 PK	0	10.8	44.4	79	66	58.8	48.8	-	-
				Margin [dB]		-34.6	-21.6	-14.4	-4.4	-	-
4	7.03297	35.71 PK	.1	10.8	46.61	73	60	60	50	-	-
				Margin [dB]		-26.39	-13.39	-13.39	-3.39	-	-
5	14.01059	34.44 PK	.1	11.1	45.64	73	60	60	50	-	-
				Margin [dB]		-27.36	-14.36	-14.36	-4.36	-	-
6	17.85292	34.41 PK	.1	11.3	45.81	73	60	60	50	-	-
				Margin [dB]		-27.19	-14.19	-14.19	-4.19	-	-
Line - L2											
7	.18228	37.24 PK	.1	11.9	49.24	79	66	64.4	54.4	-	-
				Margin [dB]		-29.76	-16.76	-15.16	-5.16	-	-
8	.25023	39.87 PK	.1	11.3	51.27	79	66	61.7	51.7	-	-
				Margin [dB]		-27.73	-14.73	-10.43	-4.43	-	-
9	.34594	32.57 PK	0	10.8	43.37	79	66	59.1	49.1	-	-
				Margin [dB]		-35.63	-22.63	-15.73	-5.73	-	-
10	7.09672	35.68 PK	.1	10.9	46.68	73	60	60	50	-	-
				Margin [dB]		-26.32	-13.32	-13.32	-3.32	-	-
11	14.61331	35 PK	.2	11.2	46.4	73	60	60	50	-	-
				Margin [dB]		-26.6	-13.6	-13.6	-3.6	-	-
12	25.69405	31.27 PK	.1	11.8	43.17	73	60	60	50	-	-
				Margin [dB]		-29.83	-16.83	-16.83	-6.83	-	-

LIMIT 1: CISPR 22/11 Group 1 Class A QP  
 LIMIT 2: CISPR 22/11 Group 1 Class A AV  
 LIMIT 3: CISPR 22/11 Group 1 Class B QP  
 LIMIT 4: CISPR 22/11 Group 1 Class B AV

Model Number: LLC1681

Client Name: Philips Lighting Electronics N. A.

Philips  
ActiLume Wireless I-10V LLC  
TX Board Removed  
120V/60Hz  
RED: L1 GRN: L2

Test Frequency [MHz]	Meter Reading [dB(uV)]	Transducer Factor [dB]	Gain/Loss Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4	5	6
=====										
Line - L1										
.17563	30.53 QP	.1	12.1	42.73	79	66	64.69	54.69	-	-
			Margin [dB]:		-36.27	-23.27	-21.96	-11.96	-	-
.24798	34.81 QP	.1	11.3	46.21	79	66	61.82	51.82	-	-
			Margin [dB]:		-32.79	-19.79	-15.61	-5.61	-	-
.35447	28.86 QP	0	10.8	39.66	79	66	58.86	48.86	-	-
			Margin [dB]:		-39.34	-26.34	-19.2	-9.2	-	-
7.05309	31.69 QP	.1	10.8	42.59	73	60	60	50	-	-
			Margin [dB]:		-30.41	-17.41	-17.41	-7.41	-	-
14.0244	30.68 QP	.1	11.1	41.88	73	60	60	50	-	-
			Margin [dB]:		-31.12	-18.12	-18.12	-8.12	-	-
17.85188	27.55 QP	.1	11.3	38.95	73	60	60	50	-	-
			Margin [dB]:		-34.05	-21.05	-21.05	-11.05	-	-
Line - L2 .15 - 1MHz										
.18127	31.29 QP	.1	12	43.39	79	66	64.43	54.43	-	-
			Margin [dB]:		-35.61	-22.61	-21.04	-11.04	-	-
.24875	33.47 QP	.1	11.3	44.87	79	66	61.8	51.8	-	-
			Margin [dB]:		-34.13	-21.13	-16.93	-6.93	-	-
.34751	28.58 QP	0	10.8	39.38	79	66	59.02	49.02	-	-
			Margin [dB]:		-39.62	-26.62	-19.64	-9.64	-	-
7.08544	31.7 QP	.1	10.9	42.7	73	60	60	50	-	-
			Margin [dB]:		-30.3	-17.3	-17.3	-7.3	-	-
14.60328	29.73 QP	.2	11.2	41.13	73	60	60	50	-	-
			Margin [dB]:		-31.87	-18.87	-18.87	-8.87	-	-
25.6972	25.69 QP	.1	11.8	37.59	73	60	60	50	-	-
			Margin [dB]:		-35.41	-22.41	-22.41	-12.41	-	-

NOTE: "+" - Indicates an emission level in excess of the applicable limit (s).

PK - Peak detector  
QP - Quasi-Peak detector  
Av - average detection

LIMIT 1: CISPR 22/11 Group 1 Class A QP  
LIMIT 2: CISPR 22/11 Group 1 Class A AV  
LIMIT 3: CISPR 22/11 Group 1 Class B QP  
LIMIT 4: CISPR 22/11 Group 1 Class B AV

Job #: 1001494941    Project #: 12CA19074    File #: MC16433  
 Model Number:    LLC1681  
 Client Name:    Philips Lighting Electronics N. A.

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Philips  
 ActiLume Wireless I-10V LLC  
 TX Board Removed  
 120V/60Hz  
 RED: L1    GRN: L2

Test Frequency [MHz]	Meter Reading [dB(uV)]	Transducer Factor [dB]	Gain/Loss Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4	5	6
=====										
Line - L1 .15 - 1MHz										
.17563	25.42 Av	.1	12.1	37.62	79	66	64.69	54.69	-	-
			Margin [dB]:		-41.38	-28.38	-27.07	-17.07	-	-
.24798	23.01 Av	.1	11.3	34.41	79	66	61.82	51.82	-	-
			Margin [dB]:		-44.59	-31.59	-27.41	-17.41	-	-
.35447	23.62 Av	0	10.8	34.42	79	66	58.86	48.86	-	-
			Margin [dB]:		-44.58	-31.58	-24.44	-14.44	-	-
7.05309	26.99 Av	.1	10.8	37.89	73	60	60	50	-	-
			Margin [dB]:		-35.11	-22.11	-22.11	-12.11	-	-
14.0244	26.27 Av	.1	11.1	37.47	73	60	60	50	-	-
			Margin [dB]:		-35.53	-22.53	-22.53	-12.53	-	-
17.85188	23.21 Av	.1	11.3	34.61	73	60	60	50	-	-
			Margin [dB]:		-38.39	-25.39	-25.39	-15.39	-	-
Line - L2 .15 - 1MHz										
.18127	22.61 Av	.1	12	34.71	79	66	64.43	54.43	-	-
			Margin [dB]:		-44.29	-31.29	-29.72	-19.72	-	-
.24875	20.82 Av	.1	11.3	32.22	79	66	61.8	51.8	-	-
			Margin [dB]:		-46.78	-33.78	-29.58	-19.58	-	-
.34751	25.22 Av	0	10.8	36.02	79	66	59.02	49.02	-	-
			Margin [dB]:		-42.98	-29.98	-23	-13	-	-
7.08544	26.93 Av	.1	10.9	37.93	73	60	60	50	-	-
			Margin [dB]:		-35.07	-22.07	-22.07	-12.07	-	-
14.60328	25.47 Av	.2	11.2	36.87	73	60	60	50	-	-
			Margin [dB]:		-36.13	-23.13	-23.13	-13.13	-	-
25.6972	21.47 Av	.1	11.8	33.37	73	60	60	50	-	-
			Margin [dB]:		-39.63	-26.63	-26.63	-16.63	-	-

NOTE: "+" - Indicates an emission level in excess of the  
 applicable limit (s).

PK - Peak detector  
 QP - Quasi-Peak detector  
 Av - average detection

LIMIT 1: CISPR 22/11 Group 1 Class A QP  
 LIMIT 2: CISPR 22/11 Group 1 Class A AV  
 LIMIT 3: CISPR 22/11 Group 1 Class B QP  
 LIMIT 4: CISPR 22/11 Group 1 Class B AV

## Appendix A

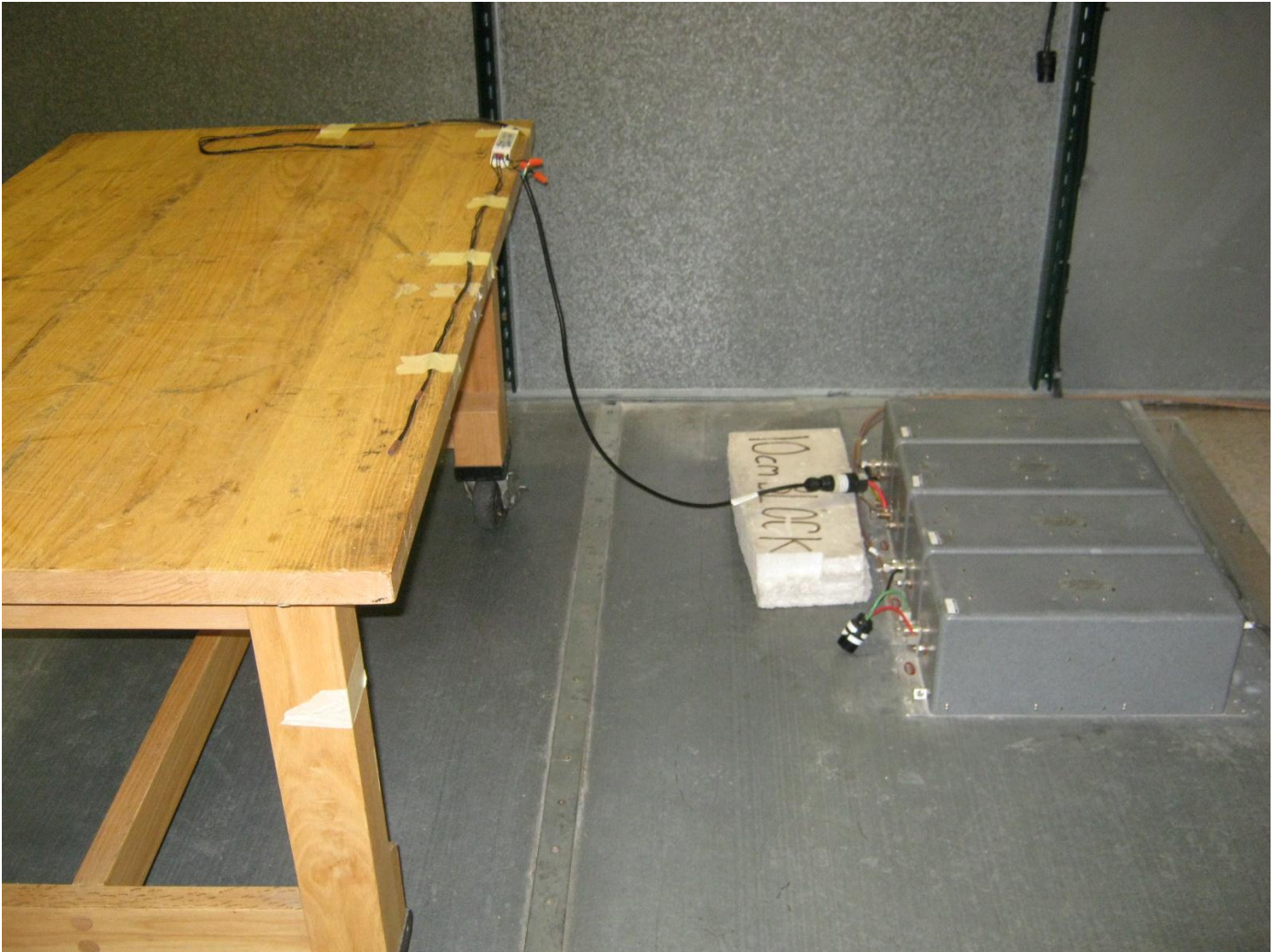
### Test Setup Photos

#### Radiated Emissions





### Line Conducted Measurements





## Appendix B

### Accreditations and Authorizations



NVLAP Lab code: 100414-0

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/standards/scopes/1004140.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. 91044).



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 2180



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-621, Conducted Emissions C-642.



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

