FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

WIRELESS LIGHT CONTROL

MODEL NUMBER: LLC1682/10

REPORT NUMBER: R10018873-RF

ISSUE DATE: JULY 11, 2013

Prepared for
PHILIPS LIGHTING ELECTRONICS NA
10275 WEST HIGGINS RD
ROSEMONT, IL 60018, USA

Prepared by
UL LLC
12 LABORATORY DR.
RESEARCH TRIANGLE PARK, NC 27709 USA
TEL: (919) 549-1400

NVLAP LAB CODE 200246-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	2013-07-11	Initial Issue	Jeff Moser
V4	2014-05-16	Fixed minor editorial issues and corrected standard	Bart Mucha

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PHILIPS LIGHTING ELECTRONICS NA
10275 WEST HIGGINS RD
ROSEMONT, IL 60018, USA

EUT DESCRIPTION: WIRELESS LIGHTING CONTROL

MODEL: LLC1682/10

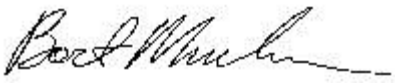
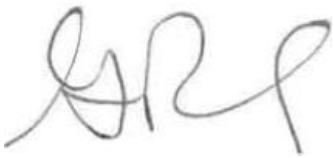
SERIAL NUMBER: Non-serialized units

DATE TESTED: 2013-06-11 through 2013-07-11

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex A.2.9	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. 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. 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, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL LLC By:	Prepared By:	Tested By:
		
Bartlomiej Mucha	Jeff Moser	Gerard Paul
EMC Staff Engineer	EMC Program Manager	Senior EMC Engineer
UL - WiSE	UL - WiSE	UL - WiSE

Wireless, **I**nteroperability, **S**ecurity/Payments & **E**MC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4:2003, ANSI, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

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.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2002460.htm.

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

Where relevant, the following sample calculation is provided:

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

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Equipment Under Test (EUT) is a Actilume LLC1682/10 2.4GHz wireless ballast control for use in fluorescent fixtures.

The radio module is manufactured by Philips Lighting Electronics NA.

5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output peak E-field as follows:

Frequency Range (MHz)	Mode	Output PK E-field Strength (dBuV/m)
2405-2475	Low Ch.	89.37

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an integrated antenna.

5.4. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest field strength based on EUT axis positioning during fundamental frequency field strength measurements. The Worst-Case Position was flat on the devices back or 'Axis 1' as described in Section 5.5 DESCRIPTION OF TEST SETUP.

5.5. DESCRIPTION OF TEST SETUP

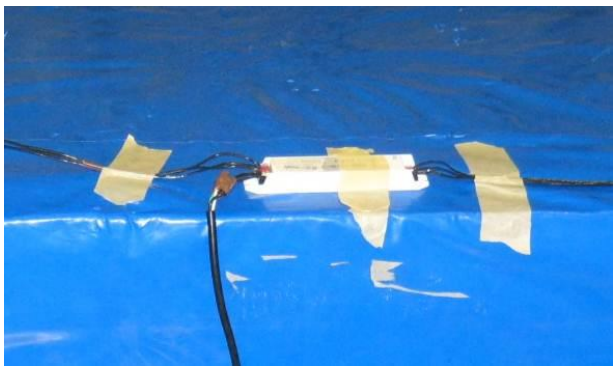
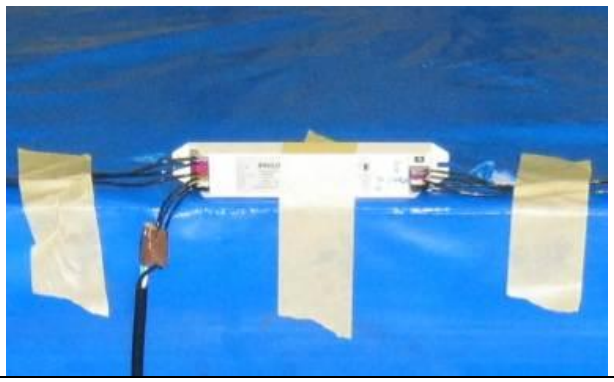
SUPPORT EQUIPMENT

The Actilume, P/N LLC1682/10 was tested as a standalone device. No other equipment was part of the configuration.

I/O CABLES

Various low voltage and contact outputs

TEST SETUP

<table>
<tr><td colspan="2">The EUT was configured on an 80cm support in two orientations, Axis 1 and Axis 2. Axis 1 was found to be worst case.</td></tr>
<tr><td>Axis 1
  </td><td>Axis 2
  </td></tr>
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SETUP FOR DIGITAL DEVICE TESTS

The Actilume, P/N LLC1682/10 was tested as a standalone device. No other equipment is a part of the configuration.

I/O CABLES

Various low voltage and contact outputs

TEST SETUP

<table>
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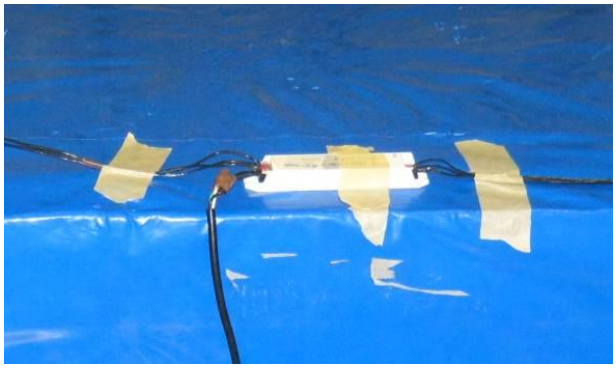
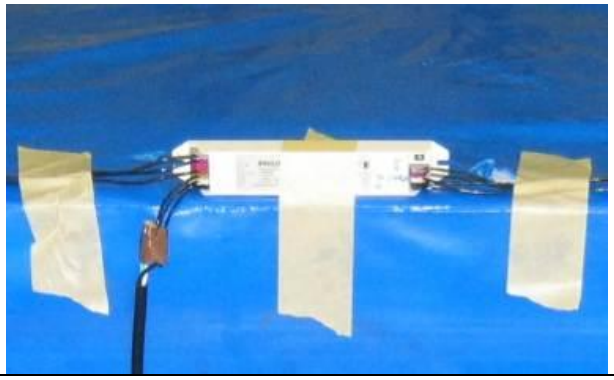
<tr><td>Axis 1
  </td><td>Axis 2
  </td></tr>
</table>

6. TEST AND MEASUREMENT EQUIPMENT

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

Radiated Disturbance Emissions (E-field)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
AT0021	Biconical Antenna, 30 to 300 MHz	Schaffner-Chase EMC Ltd.	VBA6106A	2013-05-13	2014-05-31
AT0022	Log-periodic Antenna, 200 MHz to 1000 MHz	Chase	UPA6109	2013-01-29	2014-01-31
AT0026	Horn Antenna 1 to 18 GHz	EMC Test Systems	3115	2013-02-20	2014-02-28
AT0032	Horn Antenna 1 to 18 GHz	EMC Test Systems	3115	2012-10-25	2013-10-31
AT0053	Antenna	ARA	SWH-28 (S/N 1004)	2012-09-25	2013-09-30
	Amplifier (S/Ns 859993, 860112, 859864)	Miteq	JSD42-1800400-30-5A	2012-09-25	2013-09-30
	Cable (S/N 204158-001)	Micro-coax	UFA147A-0-1181-200200	2012-09-25	2013-09-30
SAC_A (Log Periodic 10m location)	(1) ATA085: Attenuator (2) ATA125: Amplifier (3) ATA225: Cable (4) ATA106: Cable (5) ATA115: DC Bias Tee (6) ATA198: Cable	(1) Pasternack (2) Miteq (3) Eupen (4) Micro-Coax (5) Miteq (6) Micro-Coax	(1) PE7002-6 (2) AM-3A-000110-N (3) CMS/RG 214 (4) UTiFLEX (5) AM-1523-7687 (6) UFB293C-0-0720-5GU50U	2013-02-04	2013-08-31
SAC_B (Biconical 10m location)	(1) ATA084: Attenuator (2) ATA061: Amplifier (3) ATA167: Cable (4) ATA132: Cable (5) ATA229: DC Bias Tee (6) ATA199: Cable	(1) Pasternack (2) Miteq (3) Eupen (4) UL (5) Miteq (6) Micro-Coax	(1) PE7002-6 (2) AM-3A-000110-N (3) CMS/RG 214 (4) RG-214 (5) BT2000-C (6) UFB293C-0-0720-5GU50U	2012-08-01	2013-08-31
SAC_E_HORN	(1) ATA144: Amplifier (2) CBL005: Cable (3) CBL002: Cable (4) ATA199: Cable	(1) Miteq (2) MegaPhase (3) MegaPhase (4) Micro-Coax	(1) AFS42-00101800-25-N-42MF (2) GC29-NKNK-264 (3) EM18-NKNK-600 (4) UFB293C-0-0720-5GU50U	2012-08-01	2013-08-31
BRF003	Band Reject Filter - 2400 to 2500 MHz	Microtronics	BRM50702-01	2012-09-04	2013-09-30
SA0016	Spectrum Analyzer / Receiver	Agilent Technologies	N9030A	2012-10-29	2013-10-31
SAR003	Spectrum Analyzer / Receiver	Rohde & Schwarz	1088.7490K40	2012-08-28	2013-08-30
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
HI0034	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2013-01-25	2014-01-31

Power Line Conducted Disturbance

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0015	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2012-08-28	2013-08-31
ATA016	Coaxial cable, 20 ft., BNC -male to BNC-male	UL	RG-223	2012-08-31	2013-08-31
HI0069	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2012-06-25	2013-06-25
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
ATA508	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM 7600	2012-08-31	2013-08-31
ATA029	LISN, 50-ohm/50-uH, 25A	Solar Electronics	9629-50-TS-25-BNC	2012-08-30	2013-08-31
ATA063	LISN, 50-ohm/50-uH, 24A	Solar Electronics	9629-50-TS-24-BNC	2012-08-30	2013-08-31

7. TEST RESULTS

7.1.1. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measuring Radiated, the RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

120V

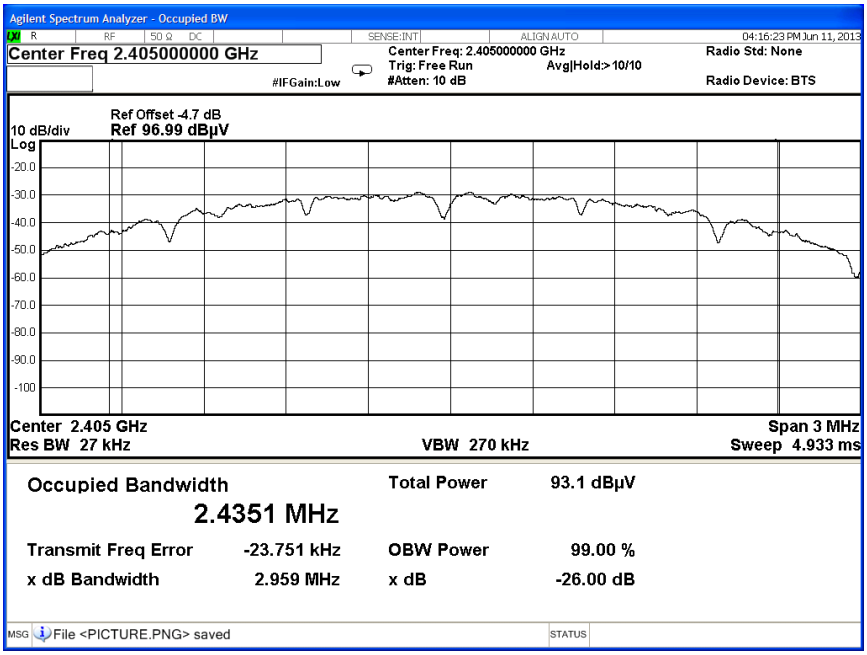
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.4351
Middle	2450	2.4389
High	2475	2.4467

277V

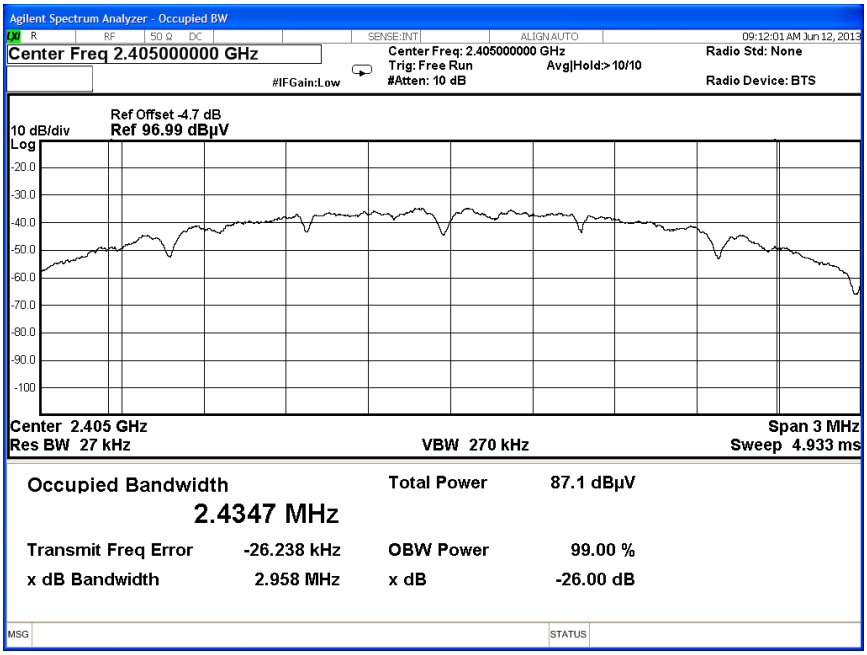
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.4347
Middle	2450	2.4306
High	2475	2.4341

99% BANDWIDTH

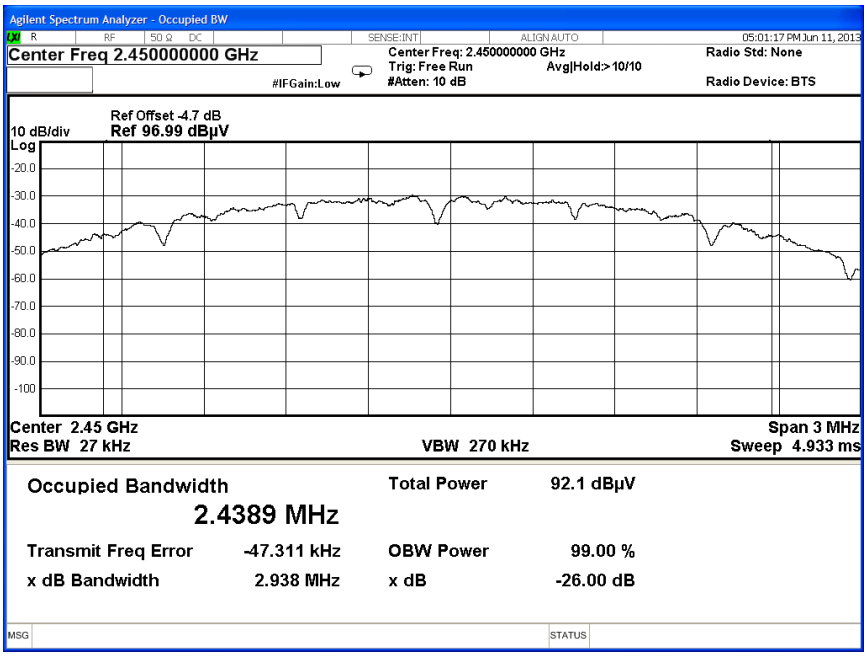
99% BANDWIDTH LOW CH 120V



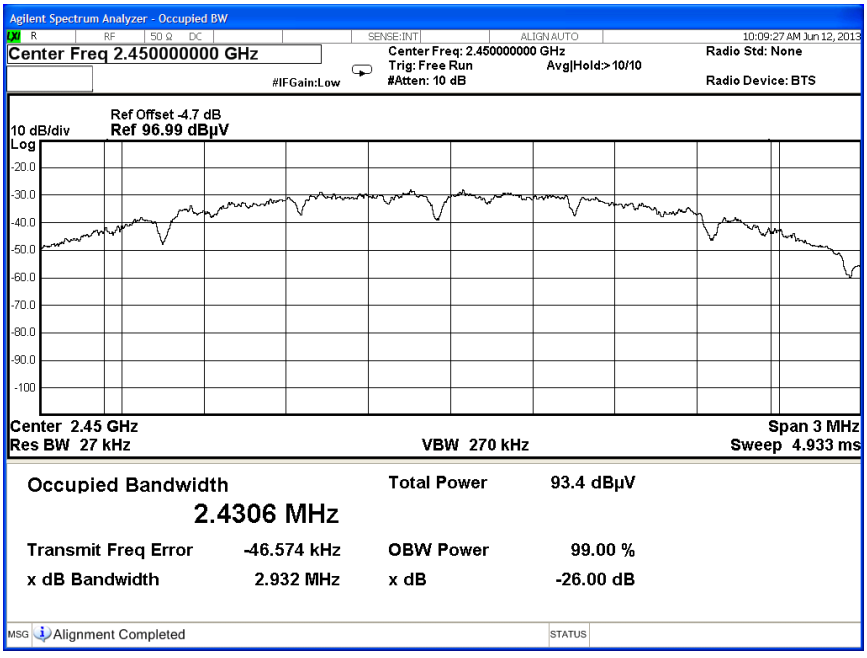
99% BANDWIDTH LOW CH 277V



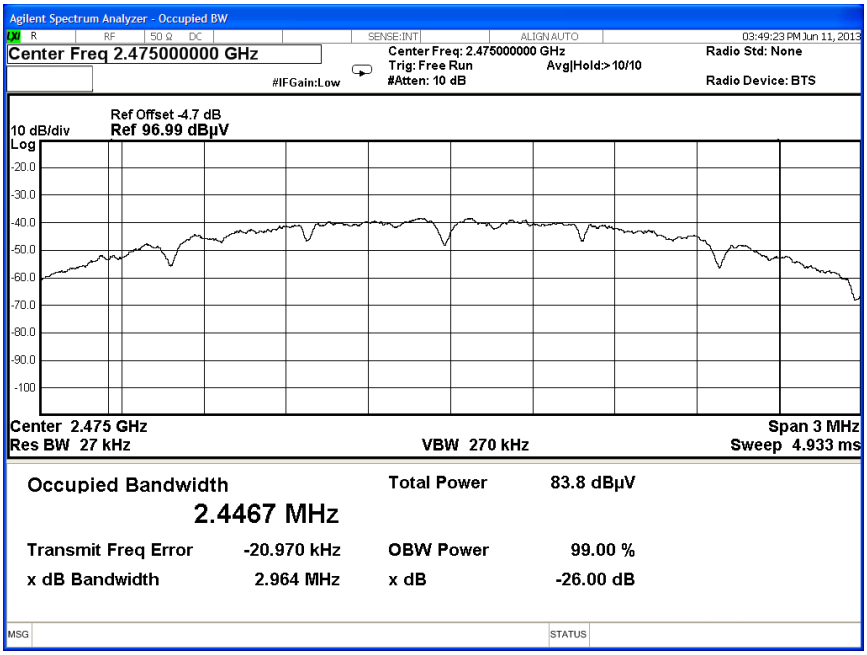
99% BANDWIDTH MID CH 120V



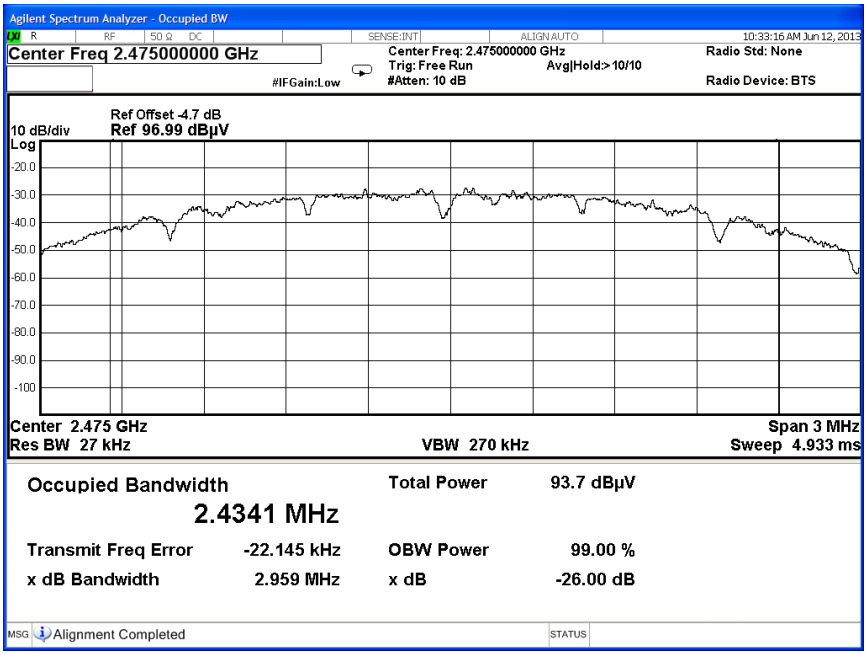
99% BANDWIDTH MID CH 277V



99% BANDWIDTH HIGH CH 120V



99% BANDWIDTH HIGH CH 277V



7.1.2. 20 dB BANDWIDTH

LIMITS

FCC §15.249

IC RSS-210 A8.2

For reporting purposes and to demonstrate compliance to FCC §15.215 (c).

TEST PROCEDURE

Measuring radiated, the RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

120V

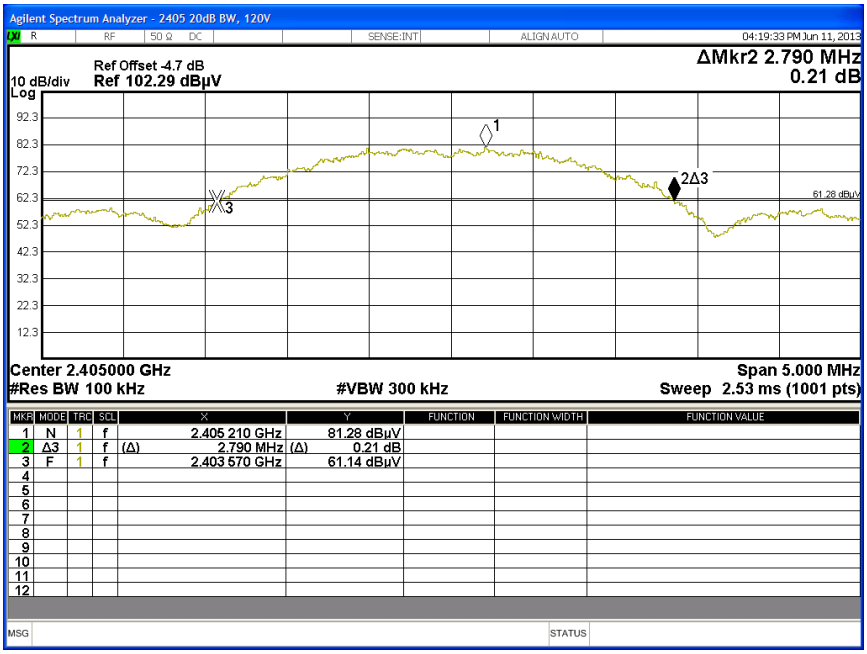
channel	Frequency	20dB BW	20dB Bandedge freq.
Low	2405	2.79MHz	2403.61MHz
Middle	2450	2.85MHz	-
High	2475	2.74MHz	2776.37MHz

277V

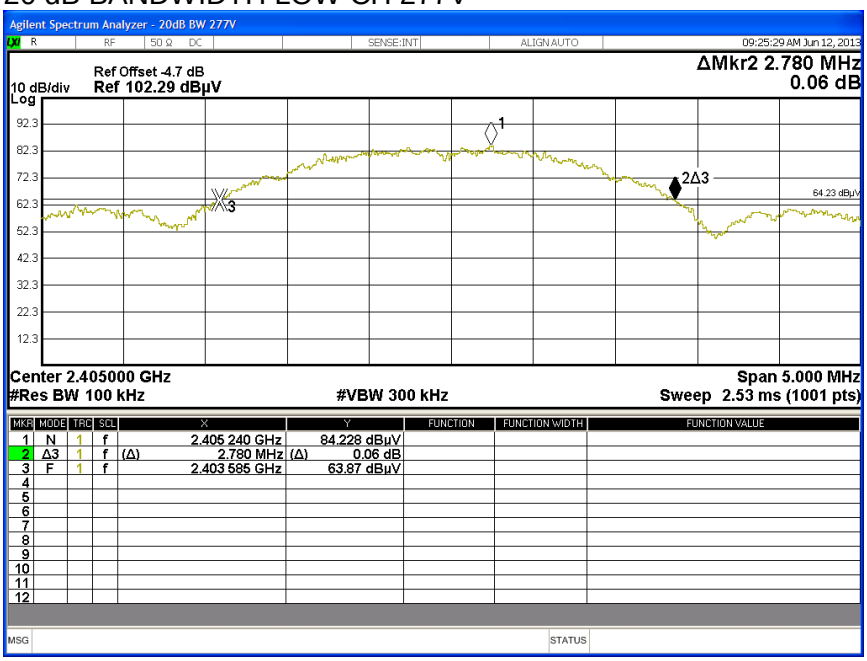
channel	Frequency	20dB BW	20dB Bandedge freq.
Low	2405	2.78MHz	2403.61MHz
Middle	2450	2.82MHz	-
High	2475	2.81MHz	2776.40MHz

20 dB BANDWIDTH

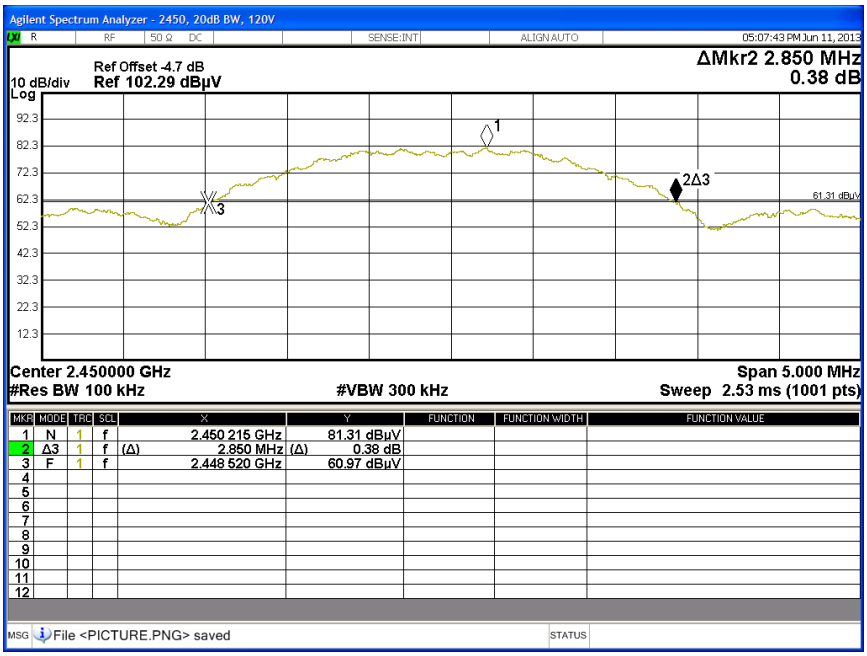
20 dB BANDWIDTH LOW CH 120V



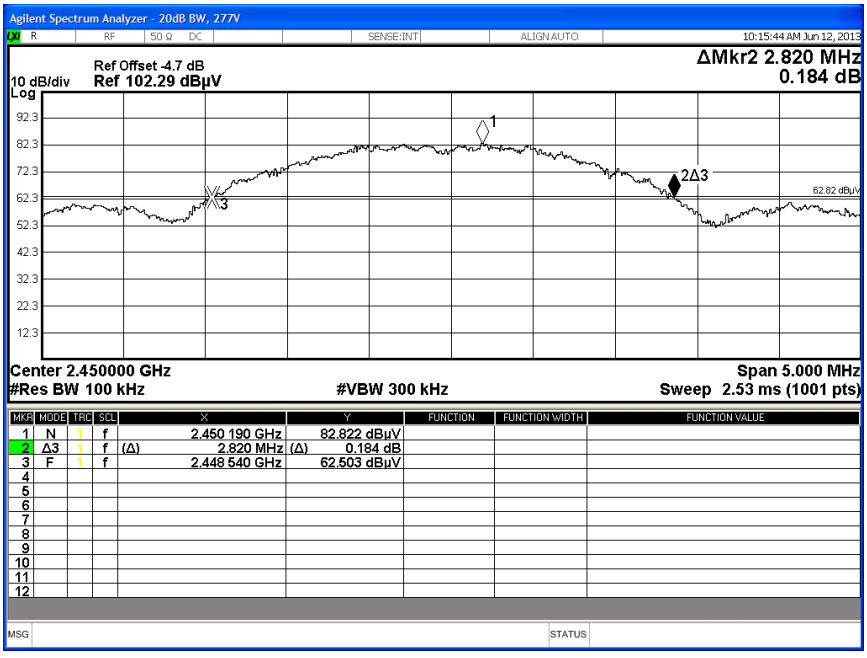
20 dB BANDWIDTH LOW CH 277V



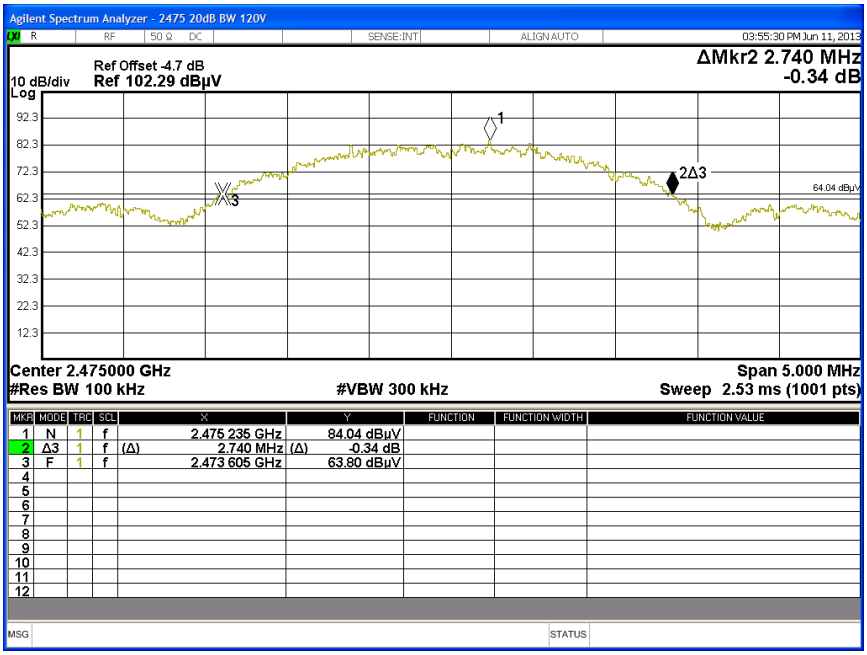
20 dB BANDWIDTH MID CH 120V



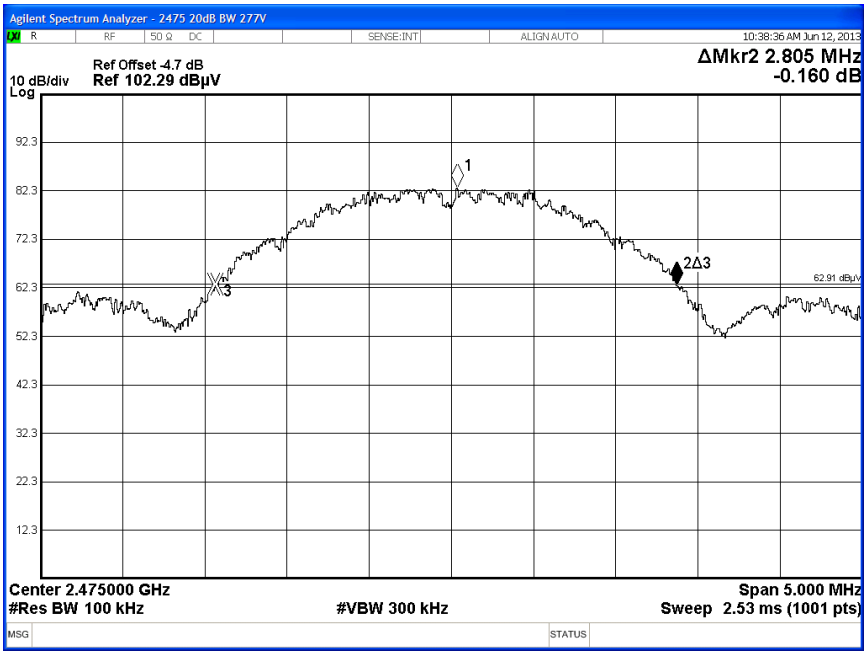
20 dB BANDWIDTH MID CH 277V



20 dB BANDWIDTH HIGH CH 120V



20 dB BANDWIDTH HIGH CH 277V



7.2. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

IC RSS-210, A2.9
FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.
(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

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

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

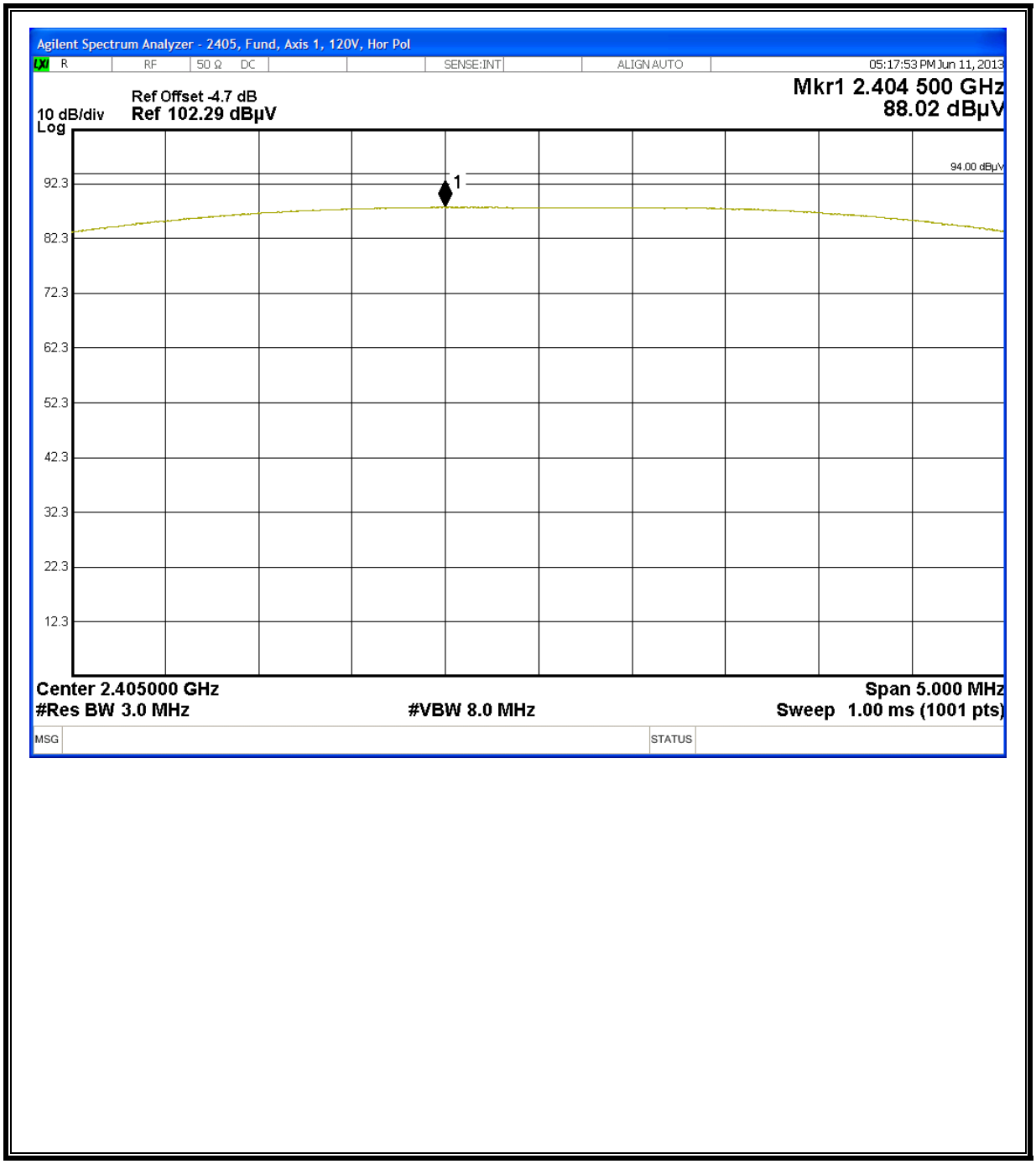
RESULTS

7.2.1. FUNDAMENTAL FREQUENCY RADIATED EMISSION DISCRETE RESULTS

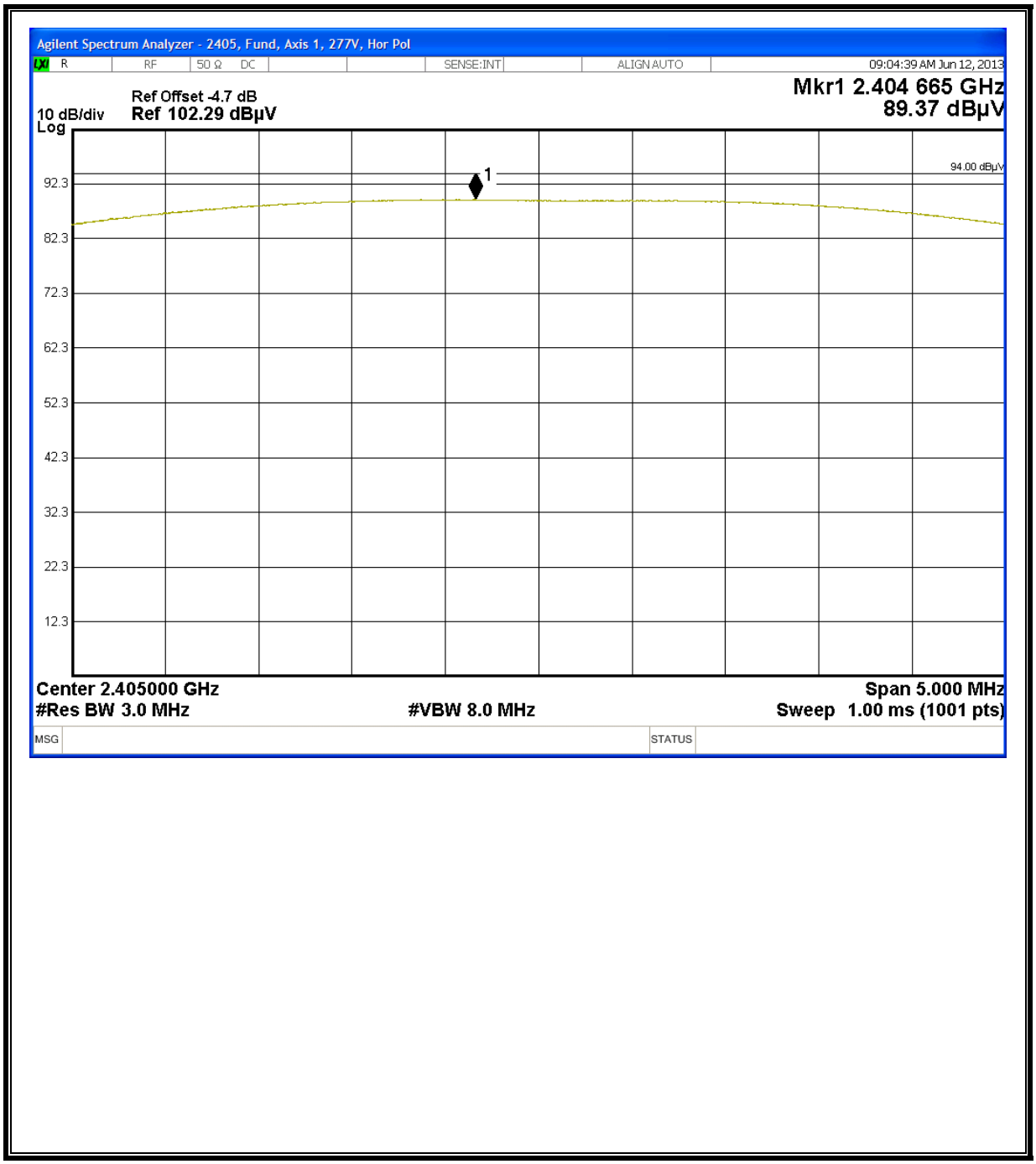
Voltage (V)	Channel	Ant. Polarity	Pk (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120	Low	V	86.32	93.9	-7.59
277	Low	V	87.32	93.9	-6.58
120	Low	H	88.02	93.9	-5.88
277	Low	H	89.37	93.9	-4.53
120	Mid	V	85.31	93.9	-8.59
277	Mid	V	86.76	93.9	-7.14
120	Mid	H	88.08	93.9	-5.82
277	Mid	H	87.61	93.9	-6.29
120	High	V	87.10	93.9	-6.80
277	High	V	86.50	93.9	-7.40
120	High	H	87.73	93.9	-6.17
277	High	H	87.86	93.9	-6.04
		Maximum:	89.37		

Note – All Peak data measurements were under the average limit. Therefore, no average measurements were made.

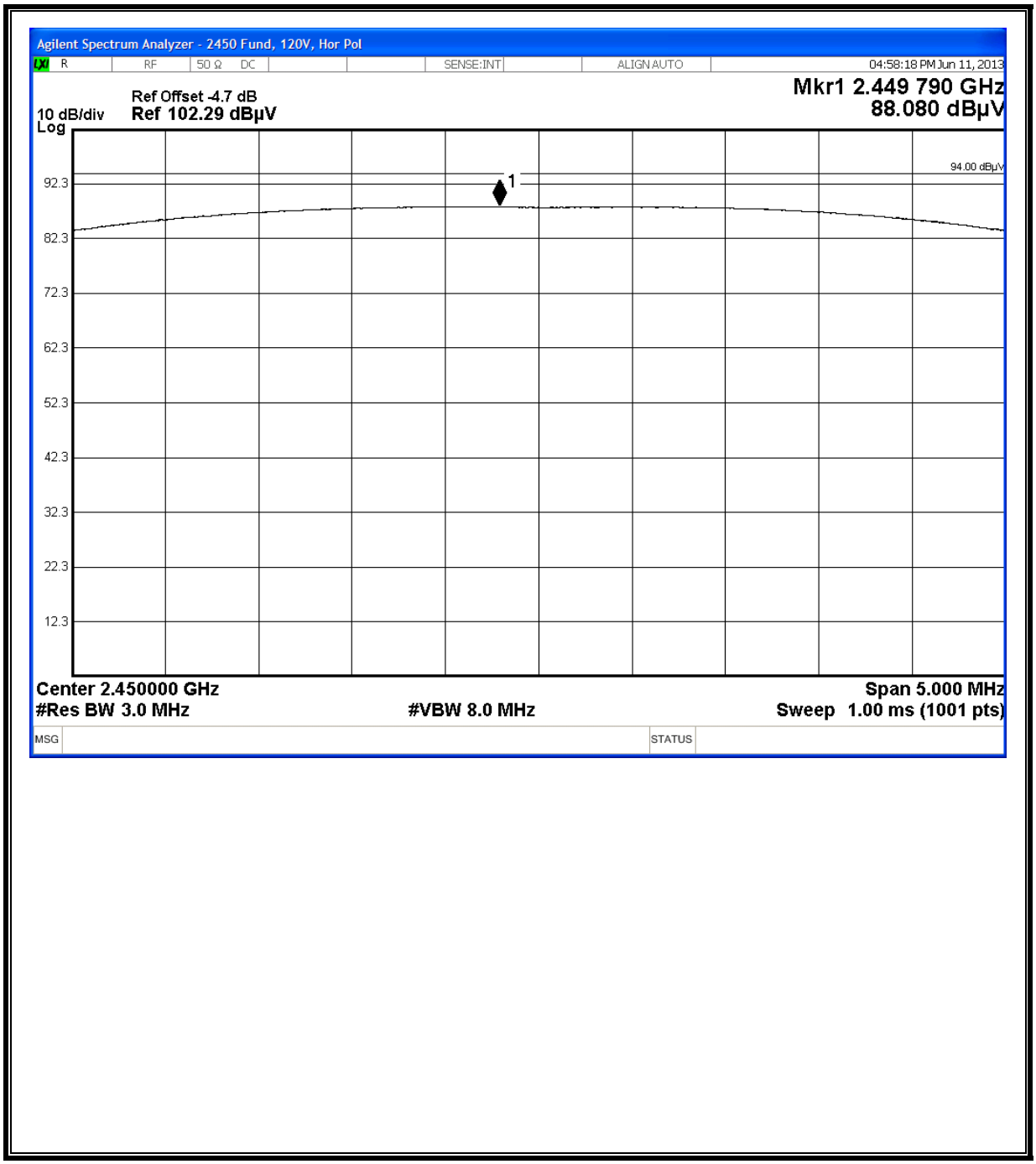
7.2.2. FUNDAMENTAL FREQUENCY RADIATED EMISSION (LOW 120V)



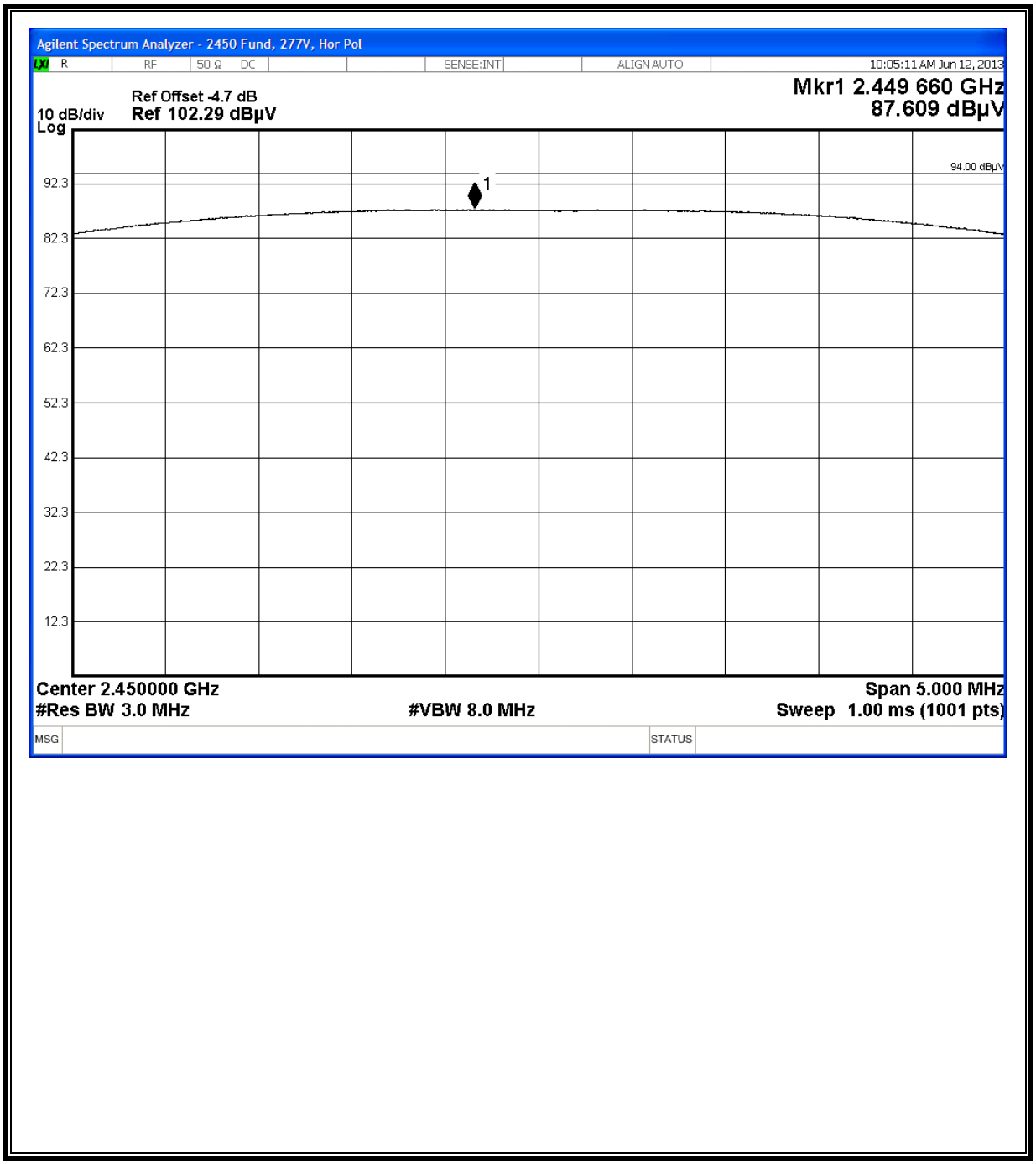
7.2.3. FUNDAMENTAL FREQUENCY RADIATED EMISSION (LOW 277V)



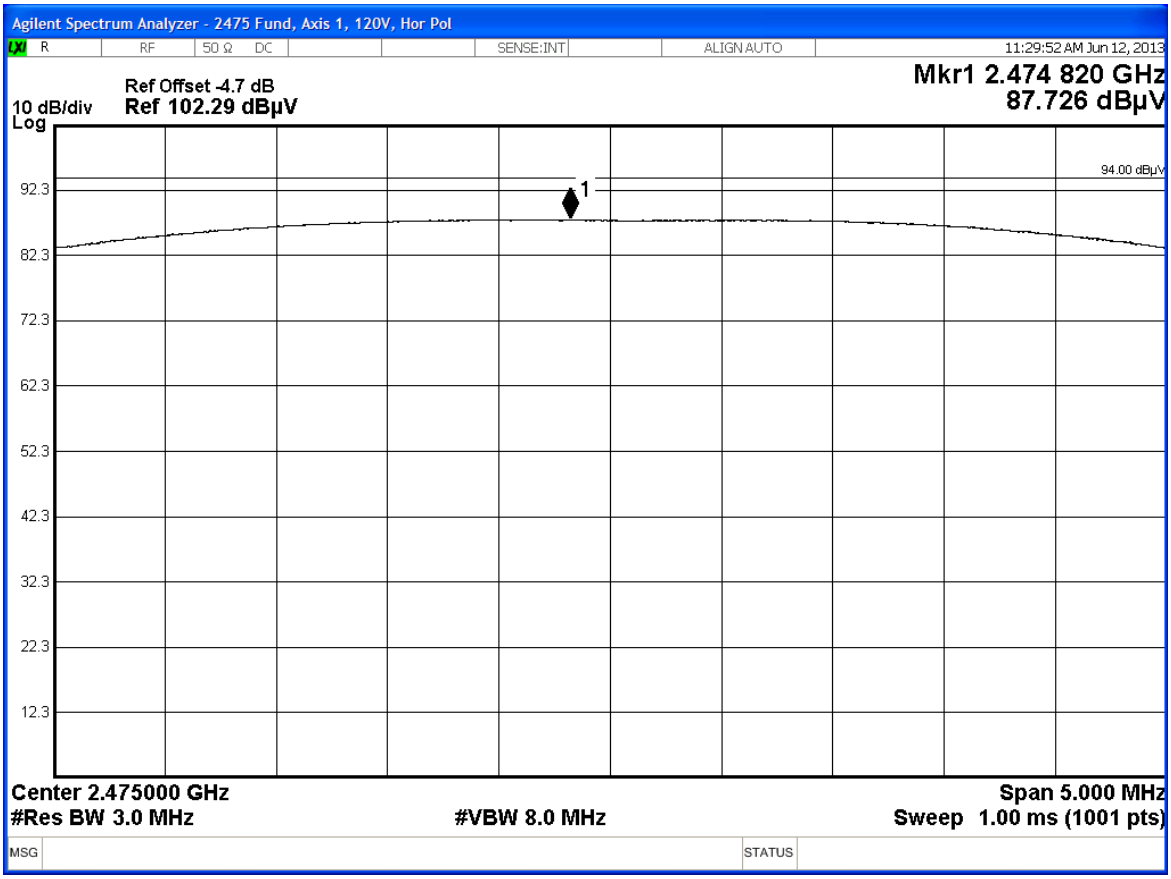
7.2.4. FUNDAMENTAL FREQUENCY RADIATED EMISSION (MID 120V)



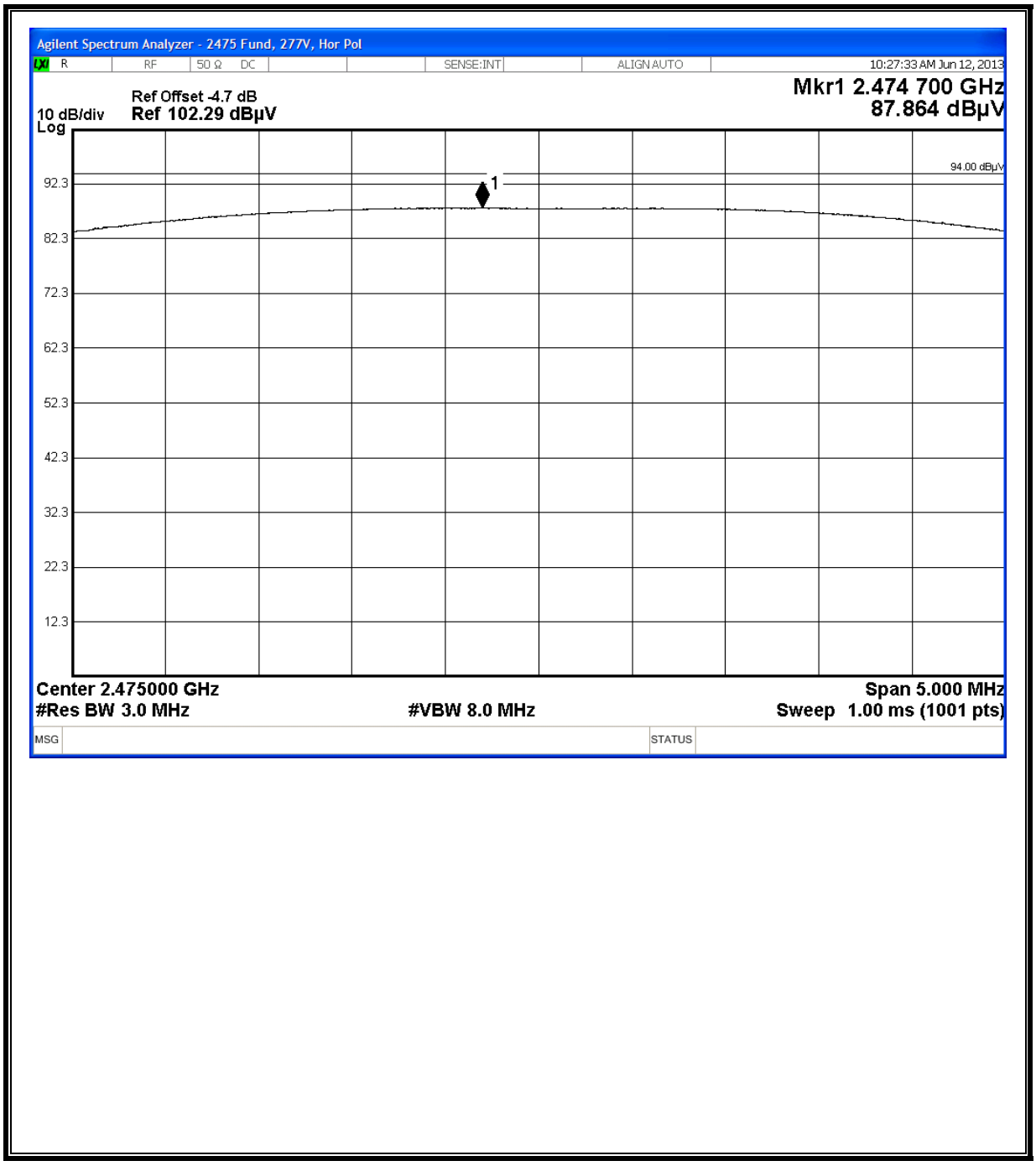
7.2.5. FUNDAMENTAL FREQUENCY RADIATED EMISSION (MID 277V)



7.2.6. FUNDAMENTAL FREQUENCY RADIATED EMISSION (HIGH 120V)



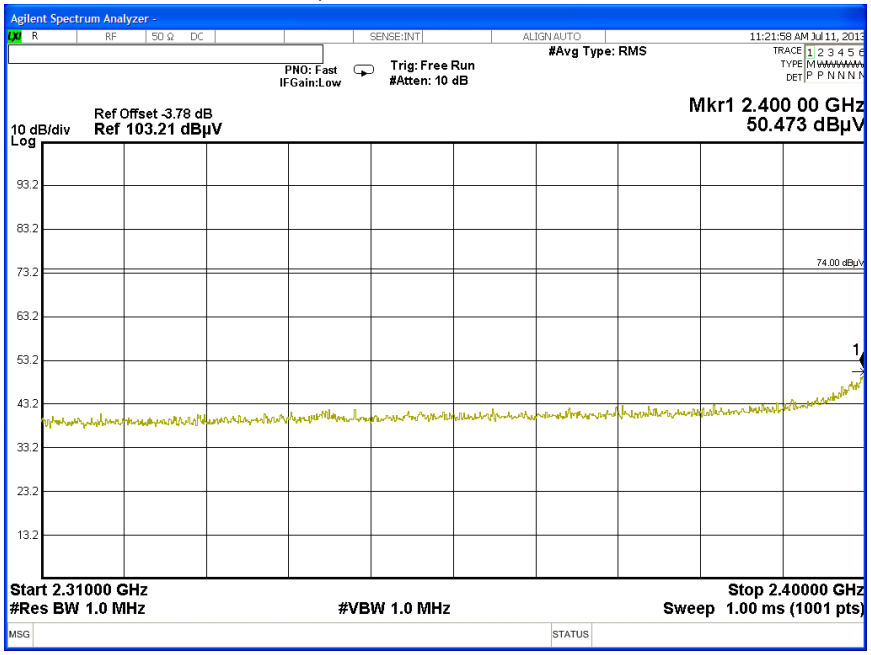
7.2.7. FUNDAMENTAL FREQUENCY RADIATED EMISSION (HIGH 277V)



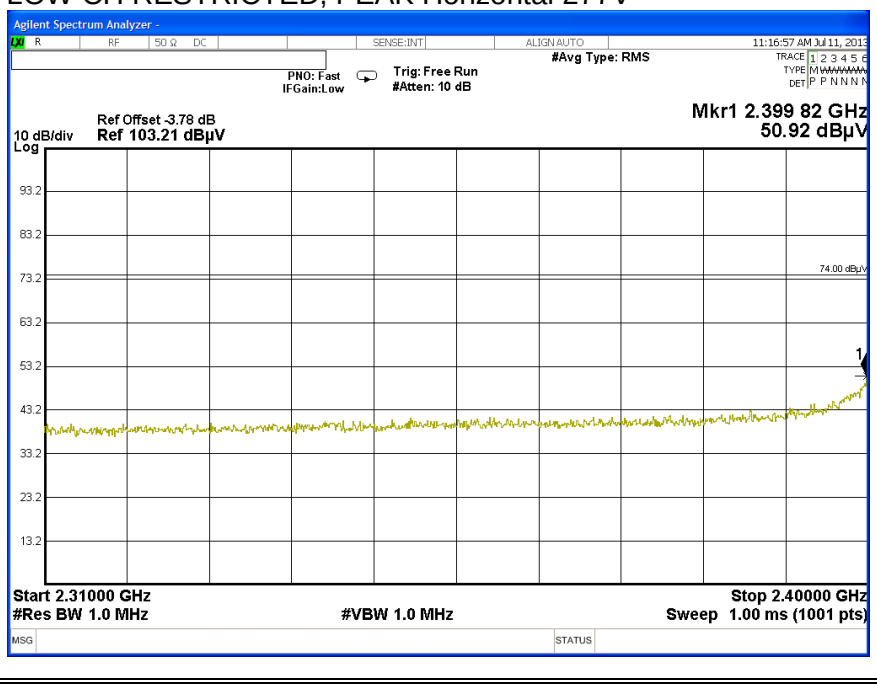
7.2.8. TRANSMITTER RESTRICTED BAND EDGES

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK Horizontal 120V



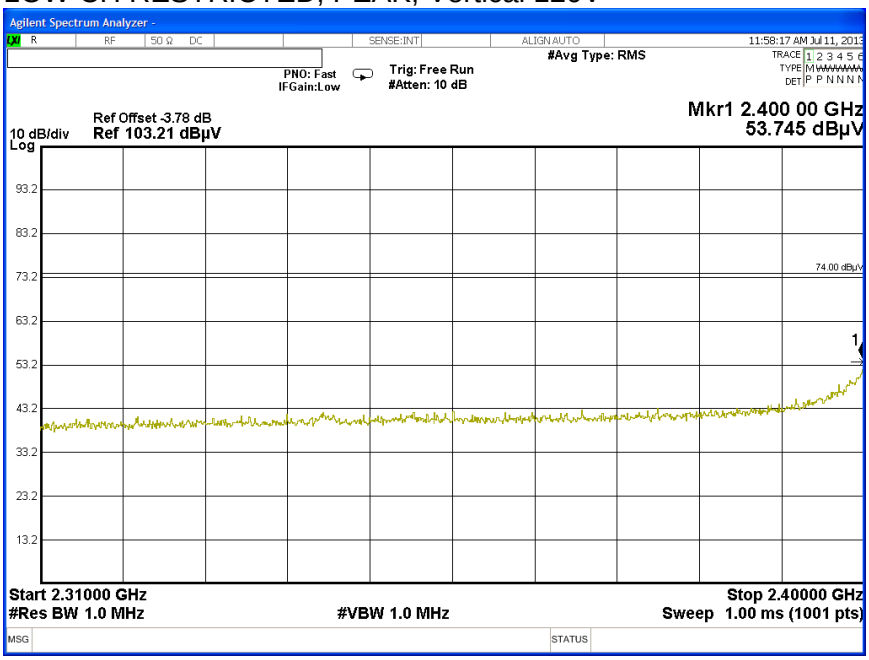
LOW CH RESTRICTED, PEAK Horizontal 277V



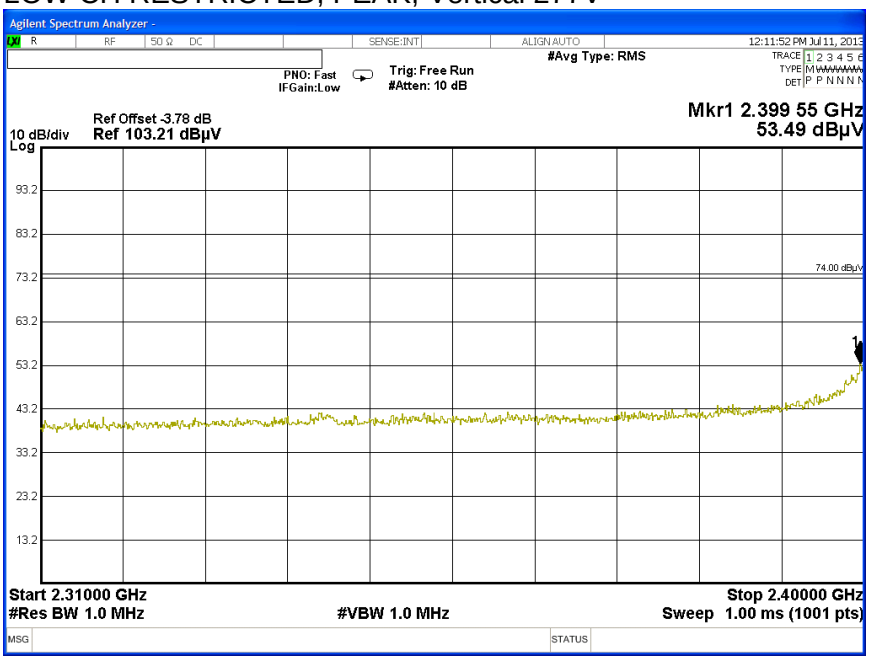
LOW CH RESTRICTED, AVG, Horizontal
See peak plot

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK, Vertical 120V



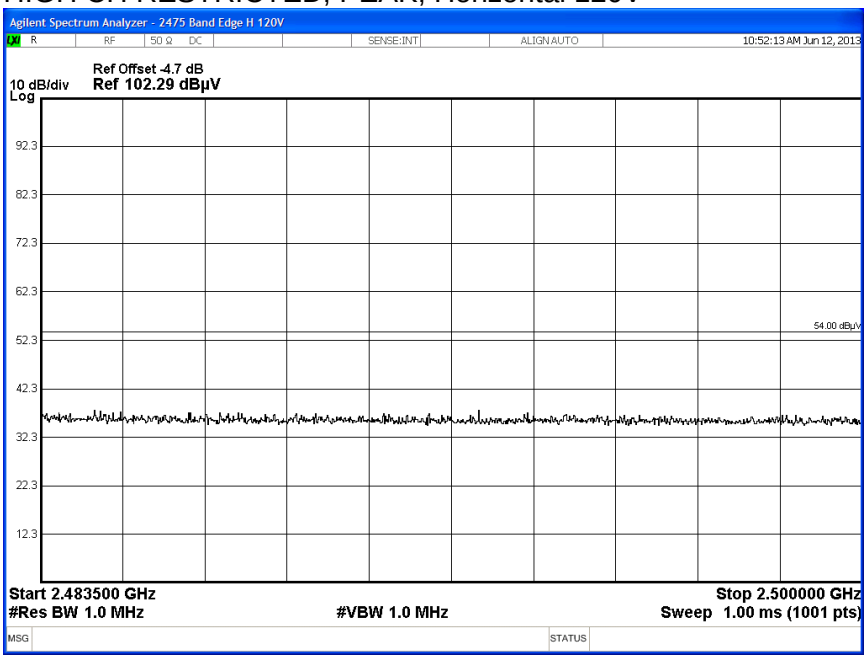
LOW CH RESTRICTED, PEAK, Vertical 277V



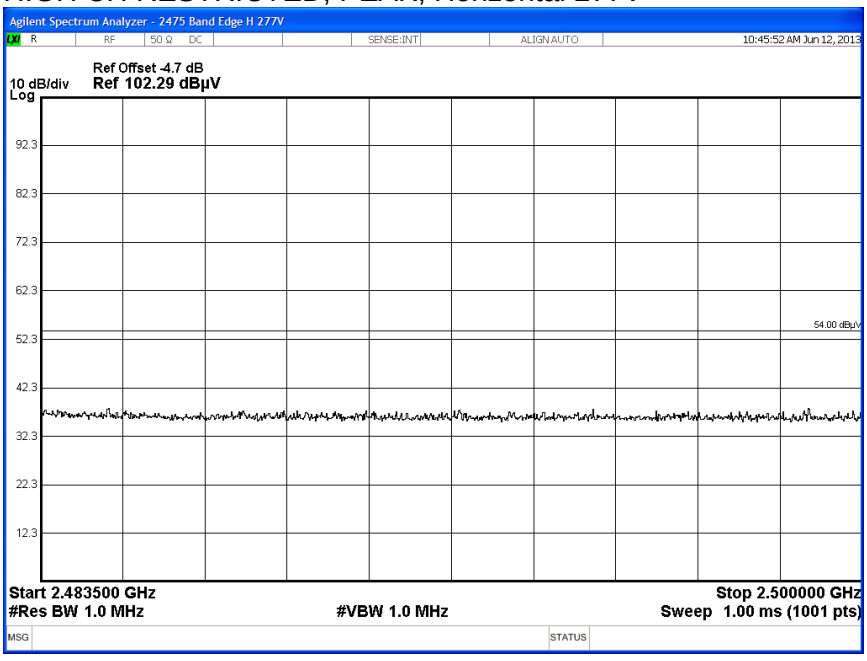
LOW CH RESTRICTED, AVG, Vertical
See peak plot

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK, Horizontal 120V



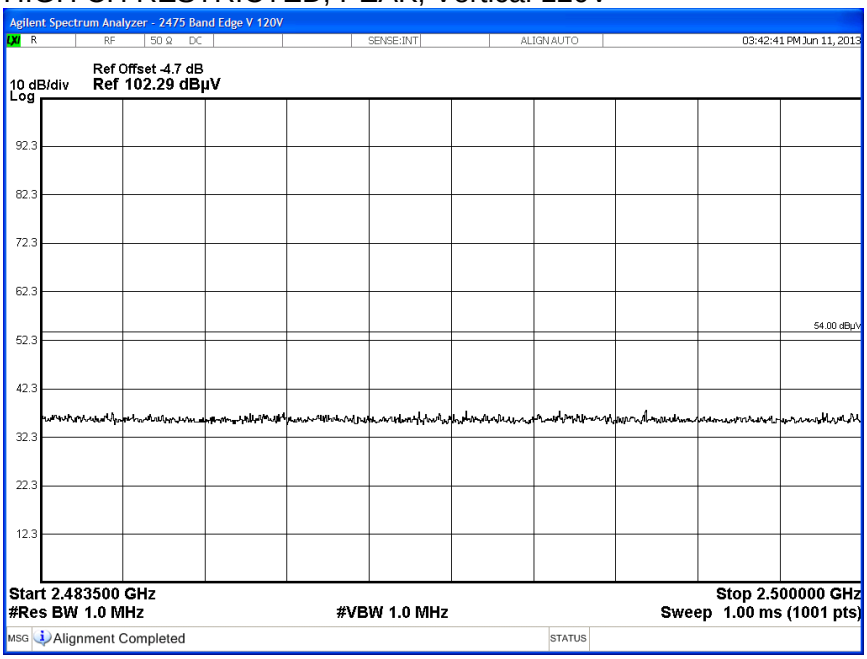
HIGH CH RESTRICTED, PEAK, Horizontal 277V



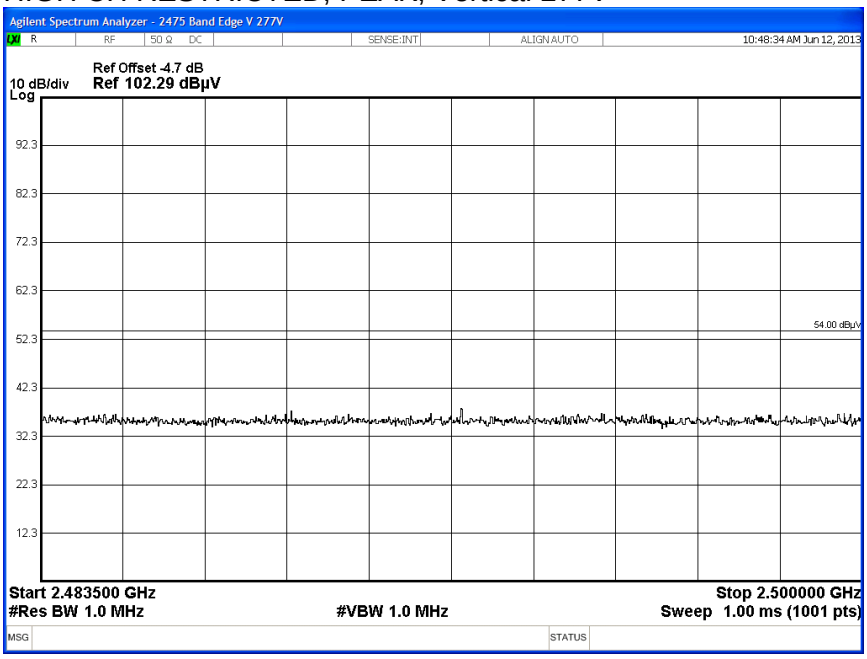
HIGH CH RESTRICTED, AVG, Horizontal
See peak plot

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK, Vertical 120V



HIGH CH RESTRICTED, PEAK, Vertical 277V

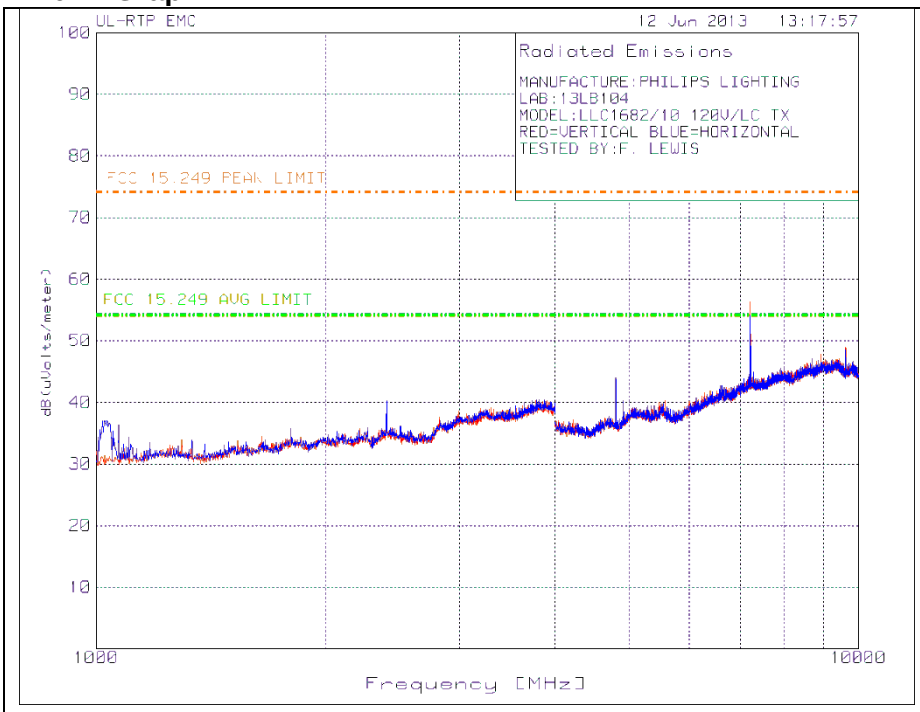


HIGH CH RESTRICTED, AVG, Vertical
See peak plot

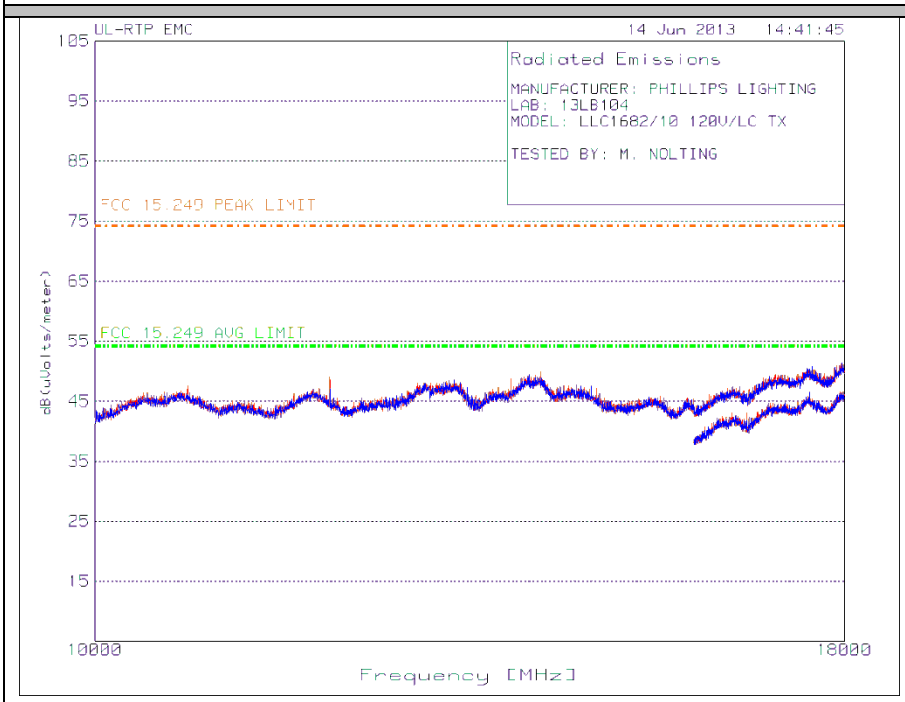
7.2.9. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

Low Channel

120V: Graph



1-10GHz



10-18GHz

Note: Lower traces between 16-18GHz are reduced VBW scans to reveal any narrow-band emissions.

120V: Discrete Data

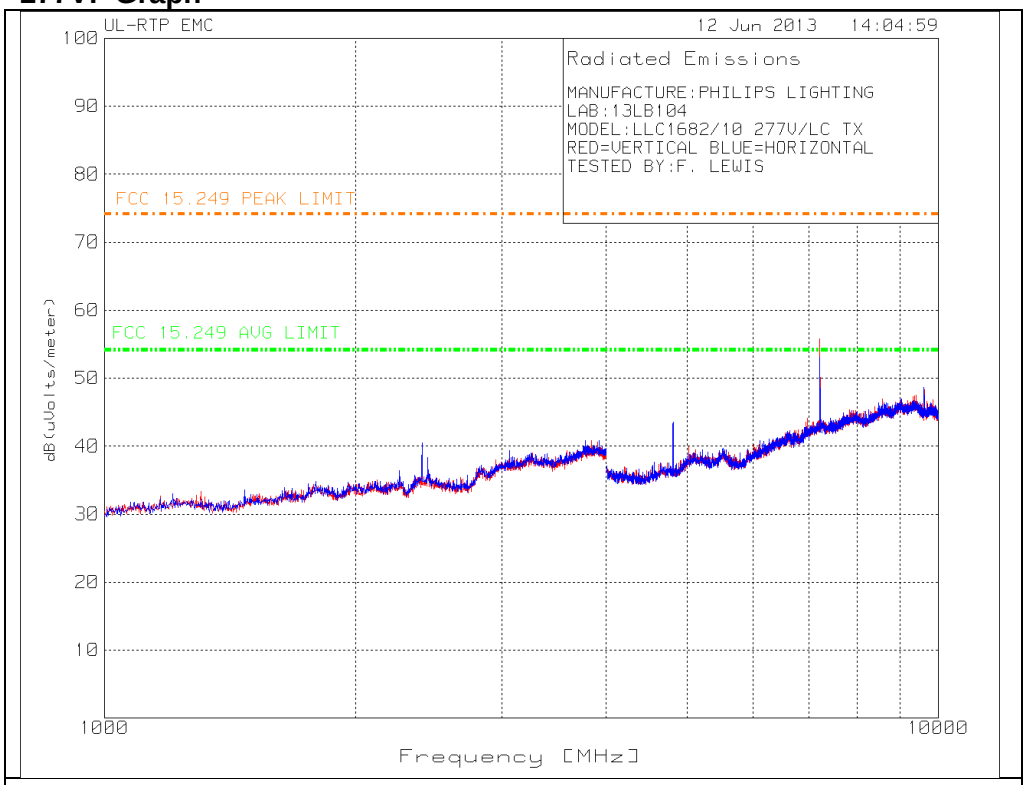
Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	Antenna Factor [dB/m]	Gain/ Loss [dB]	Field Strength [dBuV/m]	FCC 15.249 Peak [dBuV/m]	Margin [dB]	FCC 15.249 AVG [dBuV/m]	Margin [dB]	Polarity
2404.404	43.92	PK	28.30	-32.90	39.3	74.0	-34.7	54.0	-14.7	Vert
4808.269	42.07	PK	32.80	-31.50	43.4	74.0	-30.6	54.0	-10.6	Vert
7217.072	46.29	PK	36.00	-25.90	56.4	74.0	-17.6	-	-	Vert
9619.873	33.90	PK	37.50	-22.70	48.7	74.0	-25.3	-	-	Vert
12023.012	42.30	PK	38.50	-31.70	49.1	74.0	-24.9	-	-	Vert
12027.304	45.23	PK	38.50	-31.70	52.0	74.0	-22.0	-	-	Vert
14162.558	40.06	PK	40.70	-31.30	49.5	74.0	-24.5	-	-	Vert
7216.377	35.97	Av	36.00	-25.90	46.1	-	-	54.0	-7.9	Vert
9617.929	25.39	Av	37.50	-22.70	40.2	-	-	54.0	-13.8	Vert
12027.304	33.23	Av	38.50	-31.70	40.0	-	-	54.0	-14.0	Vert
14162.558	27.36	Av	40.70	-31.30	36.8	-	-	54.0	-17.2	Vert
2404.404	44.90	PK	28.30	-32.90	40.3	74.0	-33.7	54.0	-13.7	Horz
4808.269	42.65	PK	32.80	-31.50	44.0	74.0	-30.1	54.0	-10.1	Horz
7217.072	44.00	PK	36.00	-25.90	54.1	74.0	-19.9	-	-	Horz
7213.443	36.66	Av	36.00	-25.90	46.8	-	-	54.0	-7.2	Horz

* PK = Peak, Av = Average.

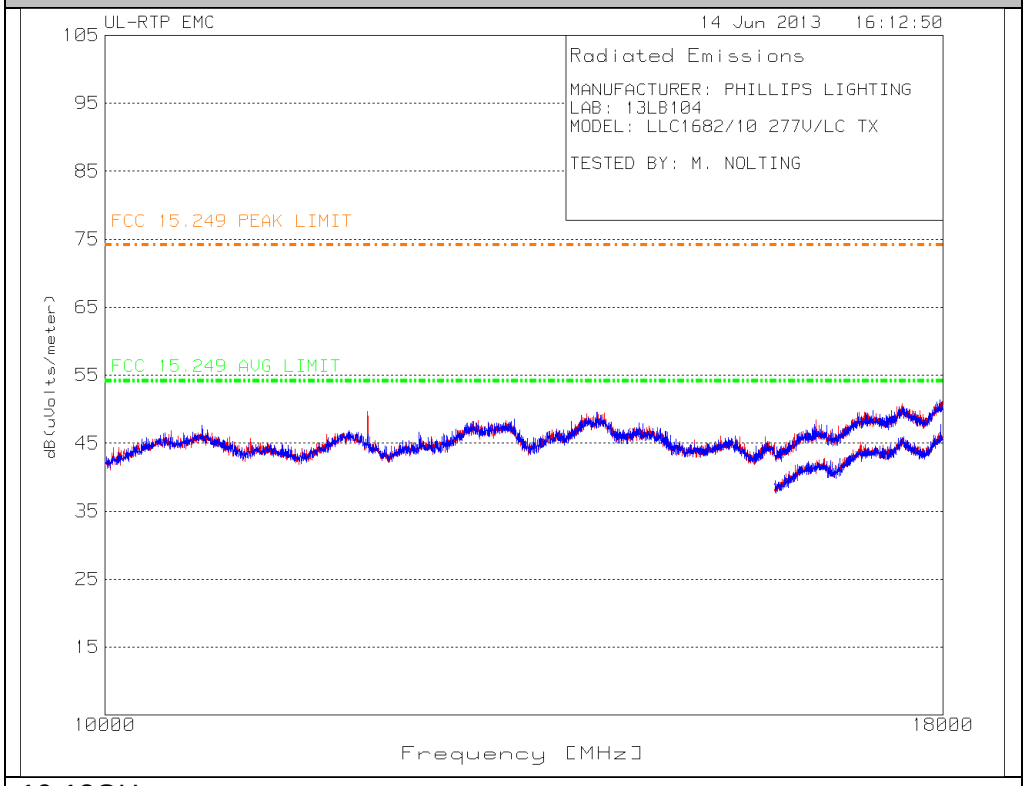
Field Strength = Meter Reading + Antenna Factor + Gain / Loss

18-26GHz frequency range: See 277V data.

277V: Graph



1-10GHz



10-18GHz

Note: Lower traces between 16-18GHz are reduced VBW scans to reveal any narrow-band emissions.

277V: Discrete Data

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	Antenna Factor [dB/m]	Gain/ Loss [dB]	Field Strength [dBuV/m]	FCC 15.249 Peak [dBuV/m]	Margin [dB]	FCC 15.249 AVG [dBuV/m]	Margin [dB]	Polarity
2404.404	44.49	PK	28.30	-32.90	39.9	74.0	-34.1	54.0	-14.1	Vert
4808.269	41.29	PK	32.80	-31.50	42.6	74.0	-31.4	54.0	-11.4	Vert
7217.072	45.53	PK	36.00	-25.90	55.6	74.0	-18.4	-	-	Vert
9621.874	33.55	PK	37.50	-22.70	48.4	74.0	-25.7	-	-	Vert
12027.383	45.66	PK	38.50	-31.70	52.5	74.0	-21.5	-	-	Vert
14130.065	39.94	PK	40.70	-31.60	49.0	74.0	-25.0	-	-	Vert
7216.251	35.13	Av	36.00	-25.90	45.2	-	-	54.0	-8.8	Vert
9617.939	21.56	Av	37.50	-22.70	36.4	-	-	54.0	-17.6	Vert
12027.383	33.23	Av	38.50	-31.70	40.0	-	-	54.0	-14.0	Vert
14130.065	27.54	Av	40.70	-31.60	36.6	-	-	54.0	-17.4	Vert
2404.404	45.12	PK	28.30	-32.90	40.5	74.0	-33.5	54.0	-13.5	Horz
4810.270	42.24	PK	32.80	-31.50	43.5	74.0	-30.5	54.0	-10.5	Horz
7217.072	43.00	PK	36.00	-25.90	53.1	74.0	-20.9	-	-	Horz
9621.874	33.87	PK	37.50	-22.70	48.7	74.0	-25.3	-	-	Horz
7213.347	35.52	Av	36.00	-25.90	45.6	-	-	54.0	-8.4	Horz
9621.982	23.85	Av	37.50	-22.70	38.7	-	-	54.0	-15.4	Horz

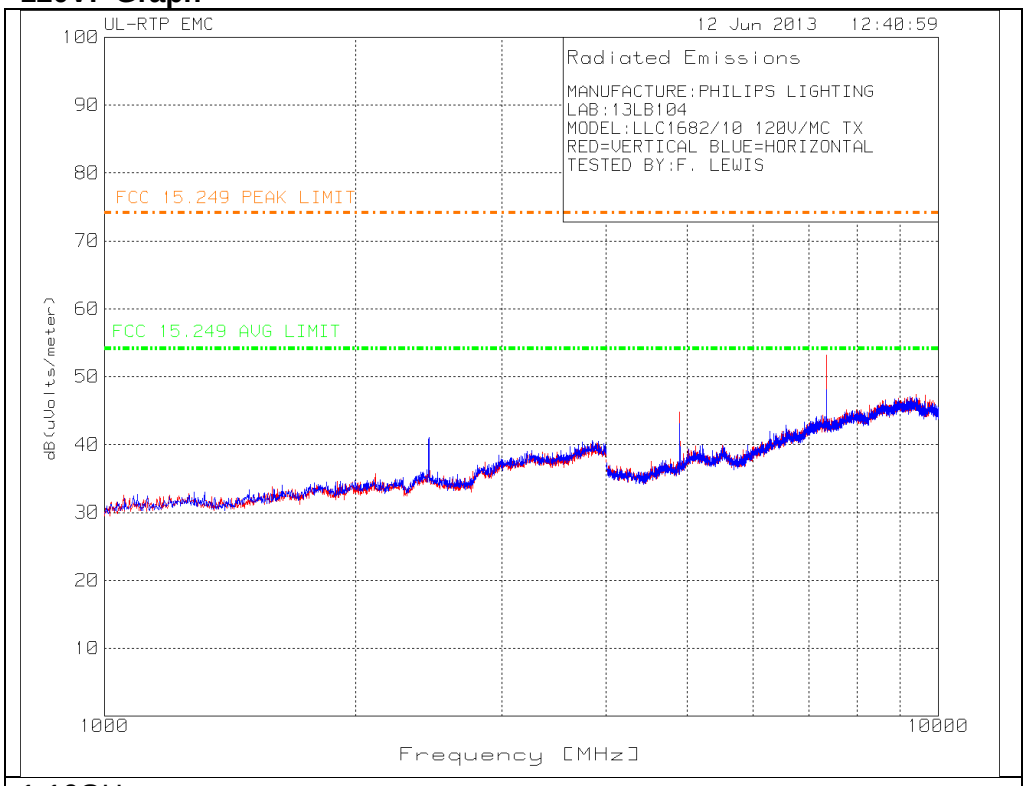
* PK = Peak, Av = Average.

Field Strength = Meter Reading + Antenna Factor + Gain / Loss

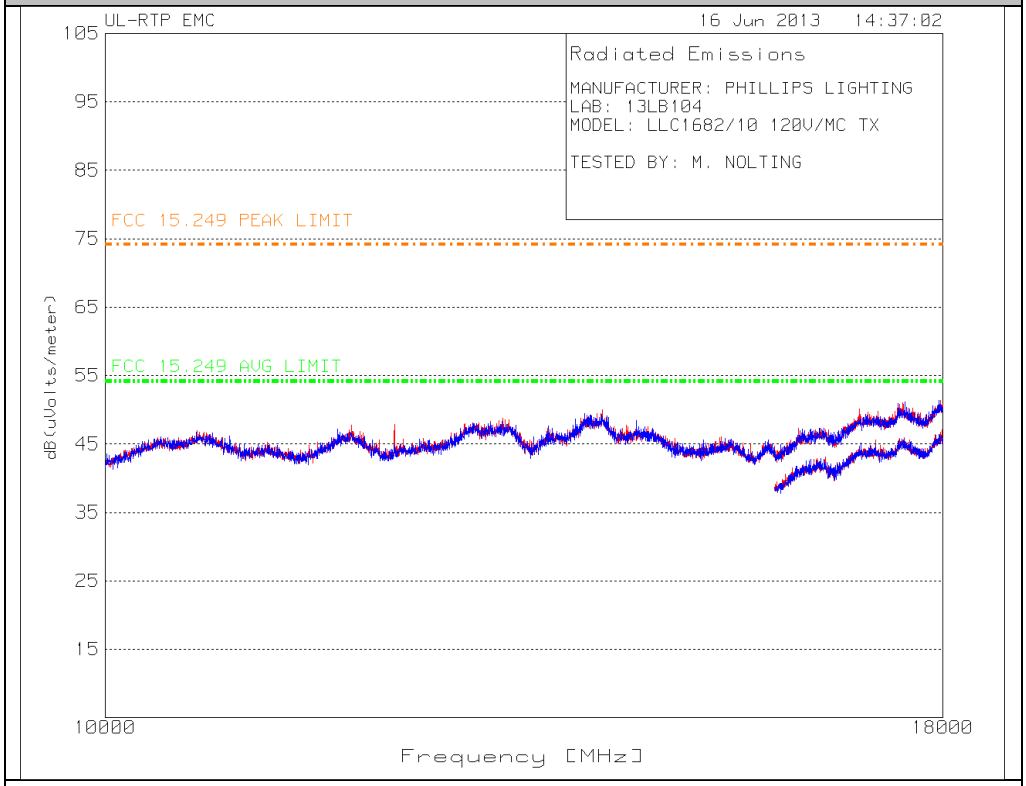
18-26GHz frequency range: An ARA SWH-28 antenna with preamp was connected to an SA and moved around the device to detect EUT-related emissions. Results: No EUT-related noise observed in this range.

Middle Channel

120V: Graph



1-10GHz



10-18GHz

Note: Lower traces between 16-18GHz are reduced VBW scans to reveal any narrow-band emissions.

Note: Lower traces between 16-18GHz are reduced VBW scans to reveal any narrow-band emissions.

120V: Discrete Data

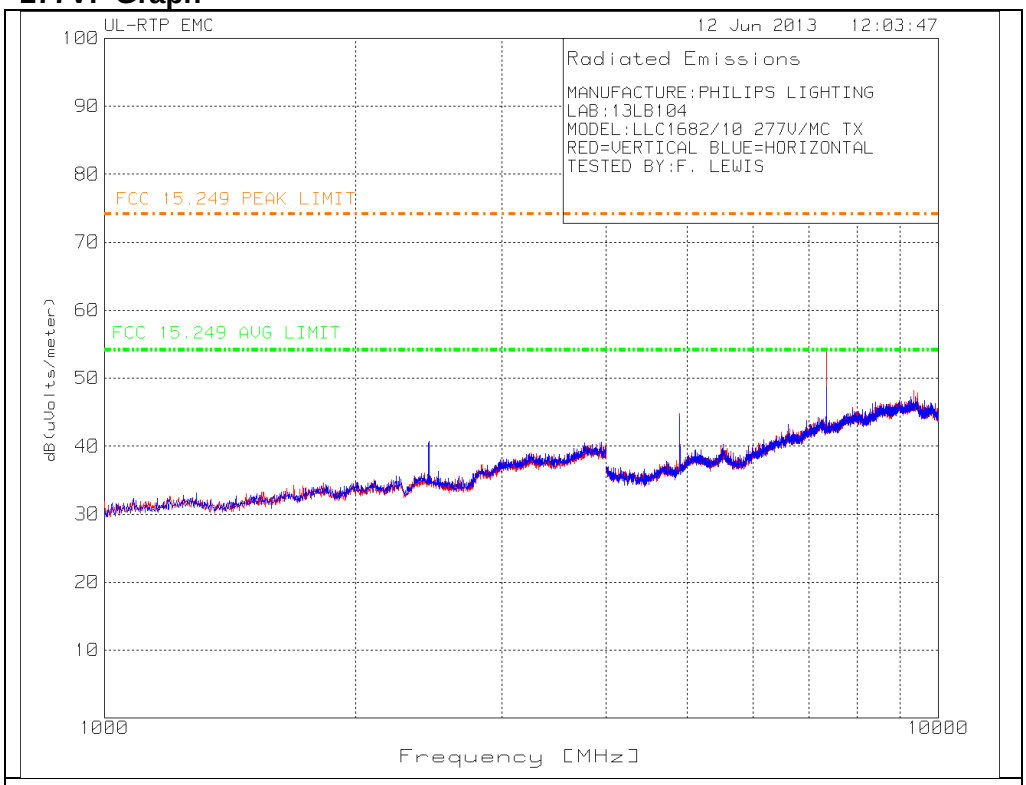
Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	Antenna Factor [dB/m]	Gain/ Loss [dB]	Field Strength [dBuV/m]	FCC 15.249 Peak [dBuV/m]	Margin [dB]	FCC 15.249 AVG [dBuV/m]	Margin [dB]	Polarity
2450.450	43.02	PK	28.50	-32.60	38.9	74.0	-35.1	54.0	-15.1	Vert
4900.300	43.15	PK	32.90	-31.30	44.8	74.0	-29.3	54.0	-9.3	Vert
7351.117	42.59	PK	36.50	-26.00	53.1	74.0	-20.9	-	-	Vert
12252.250	44.53	PK	38.60	-32.60	50.5	74.0	-23.5	-	-	Vert
14167.387	40.19	PK	40.70	-31.30	49.6	74.0	-24.4	-	-	Vert
7348.370	35.45	Av	36.50	-26.00	46.0	-	-	54.0	-8.1	Vert
12252.250	32.82	Av	38.60	-32.60	38.8	-	-	54.0	-15.2	Vert
14167.387	27.66	Av	40.70	-31.30	37.1	-	-	54.0	-16.9	Vert
2450.450	45.19	PK	28.50	-32.60	41.1	74.0	-32.9	54.0	-12.9	Horz
4898.299	41.44	PK	32.90	-31.30	43.0	74.0	-31.0	54.0	-11.0	Horz
7351.117	37.56	PK	36.50	-26.00	48.1	74.0	-25.9	-	-	Horz
7351.273	35.27	Av	36.50	-26.00	45.8	-	-	54.0	-8.2	Horz

* PK = Peak, Av = Average.

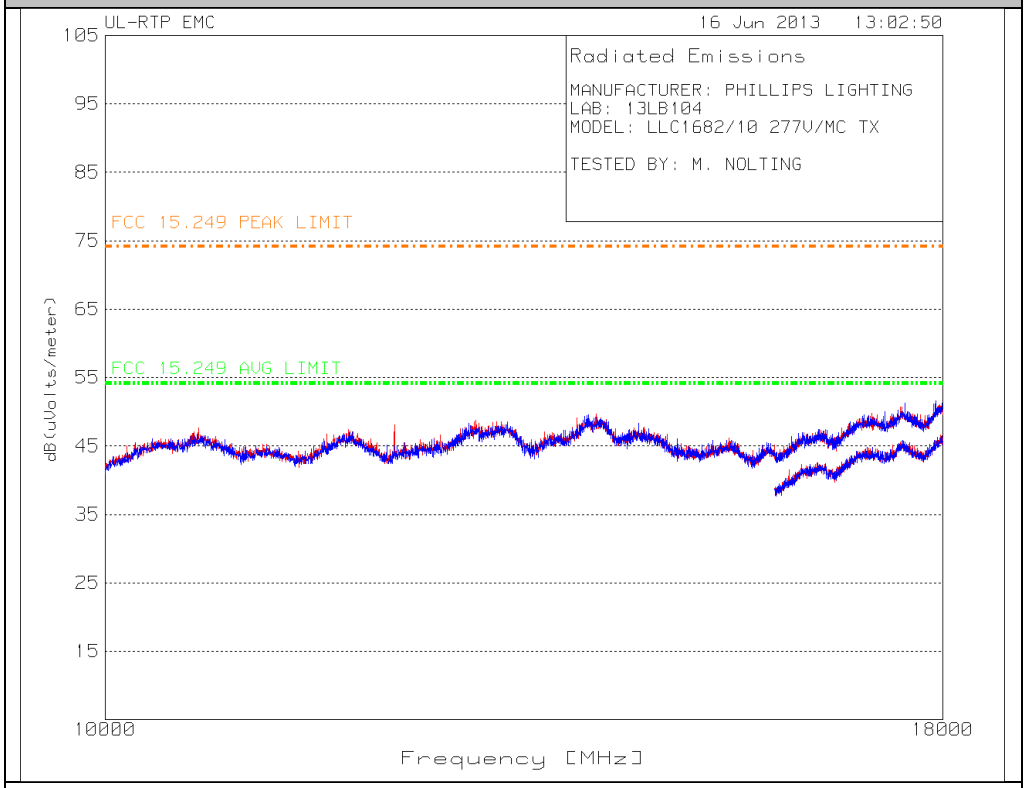
Field Strength = Meter Reading + Antenna Factor + Gain / Loss

18-26GHz frequency range: See 277V data.

277V: Graph



1-10GHz



10-18GHz

Note: Lower traces between 16-18GHz are reduced VBW scans to reveal any narrow-band emissions.

277V: Discrete Data

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	Antenna Factor [dB/m]	Gain/ Loss [dB]	Field Strength [dBuV/m]	FCC 15.249 Peak [dBuV/m]	Margin [dB]	FCC 15.249 AVG [dBuV/m]	Margin [dB]	Polarity
2450.450	44.25	PK	28.50	-32.60	40.2	74.0	-33.9	54.0	-13.9	Vert
4898.299	43.15	PK	32.90	-31.30	44.8	74.0	-29.3	54.0	-9.3	Vert
7349.116	43.77	PK	36.50	-26.00	54.3	74.0	-19.7	-	-	Vert
7348.413	34.95	Av	36.50	-26.00	45.5	-	-	54.0	-8.6	Vert
12252.250	43.85	PK	38.60	-32.60	49.9	74.0	-24.2	-	-	Vert
12252.250	33.23	Av	38.60	-32.60	39.2	-	-	54.0	-14.8	Vert
14120.493	39.34	PK	40.70	-31.70	48.3	74.0	-25.7	-	-	Vert
14120.493	27.23	Av	40.70	-31.70	36.2	-	-	54.0	-17.8	Vert
2450.450	44.78	PK	28.50	-32.60	40.7	74.0	-33.3	54.0	-13.3	Horz
4898.299	42.74	PK	32.90	-31.30	44.3	74.0	-29.7	54.0	-9.7	Horz
7351.117	38.30	PK	36.50	-26.00	48.8	74.0	-25.2	-	-	Horz
7348.442	35.18	Av	36.50	-26.00	45.7	-	-	54.0	-8.3	Horz

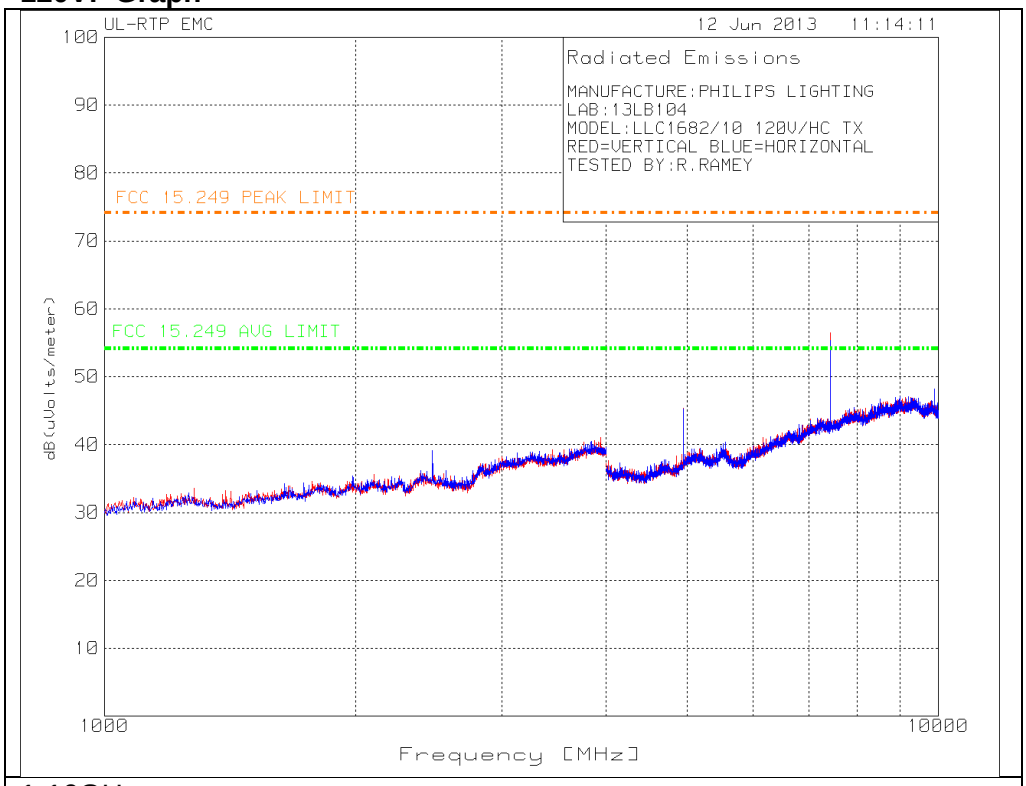
* PK = Peak, Av = Average.

Field Strength = Meter Reading + Antenna Factor + Gain / Loss

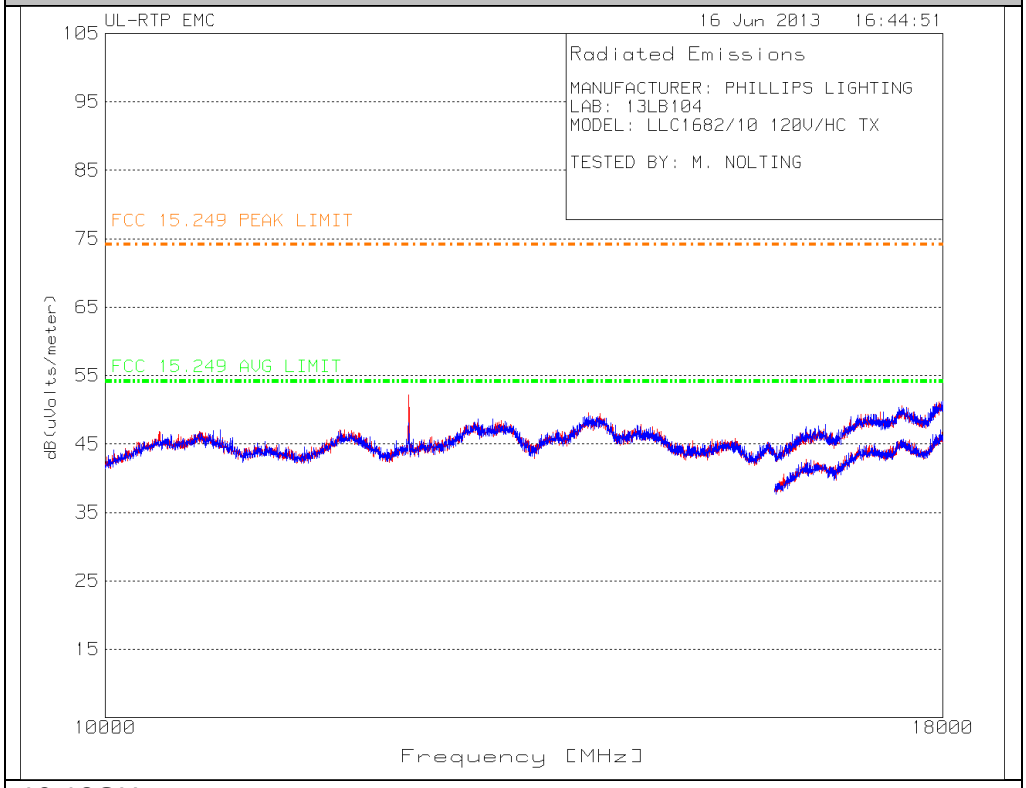
18-26GHz frequency range: An ARA SWH-28 antenna with preamp was connected to an SA and moved around the device to detect EUT-related emissions. Results: No EUT-related noise observed in this range.

High Channel

120V: Graph



1-10GHz



10-18GHz

Note: Lower traces between 16-18GHz are reduced VBW scans to reveal any narrow-band emissions.

120V: Discrete Data

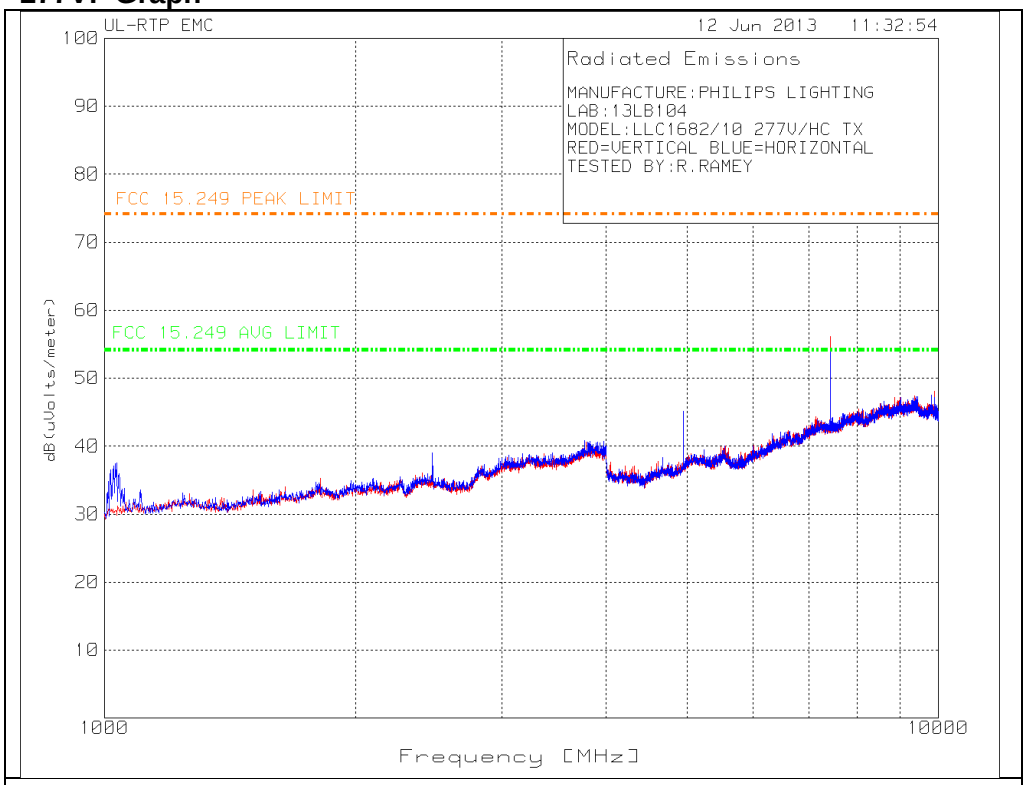
Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	Antenna Factor [dB/m]	Gain/ Loss [dB]	Field Strength [dBuV/m]	FCC 15.249 Peak [dBuV/m]	Margin [dB]	FCC 15.249 AVG [dBuV/m]	Margin [dB]	Polarity
2474.474	42.49	PK	28.50	-32.60	38.4	74.0	-35.6	54.0	-15.6	Vert
4948.316	43.61	PK	33.00	-31.20	45.4	74.0	-28.6	54.0	-8.6	Vert
7427.142	45.85	PK	36.60	-26.00	56.5	74.0	-17.6	-	-	Vert
12377.397	46.49	PK	38.80	-32.80	52.5	74.0	-21.5	-	-	Vert
14151.492	38.60	PK	40.70	-31.50	47.8	74.0	-26.2	-	-	Vert
7426.312	38.60	Av	36.60	-26.00	49.2	-	-	54.0	-4.8	Vert
12377.397	35.95	Av	38.80	-32.80	42.0	-	-	54.0	-12.1	Vert
14151.492	26.91	Av	40.70	-31.50	36.1	-	-	54.0	-17.9	Vert
2474.474	43.20	PK	28.50	-32.60	39.1	74.0	-34.9	54.0	-14.9	Horz
4948.316	43.43	PK	33.00	-31.20	45.2	74.0	-28.8	54.0	-8.8	Horz
7427.142	44.75	PK	36.60	-26.00	55.4	74.0	-18.7	-	-	Horz
7426.225	39.79	Av	36.60	-26.00	50.4	-	-	54.0	-3.6	Horz

* PK = Peak, Av = Average.

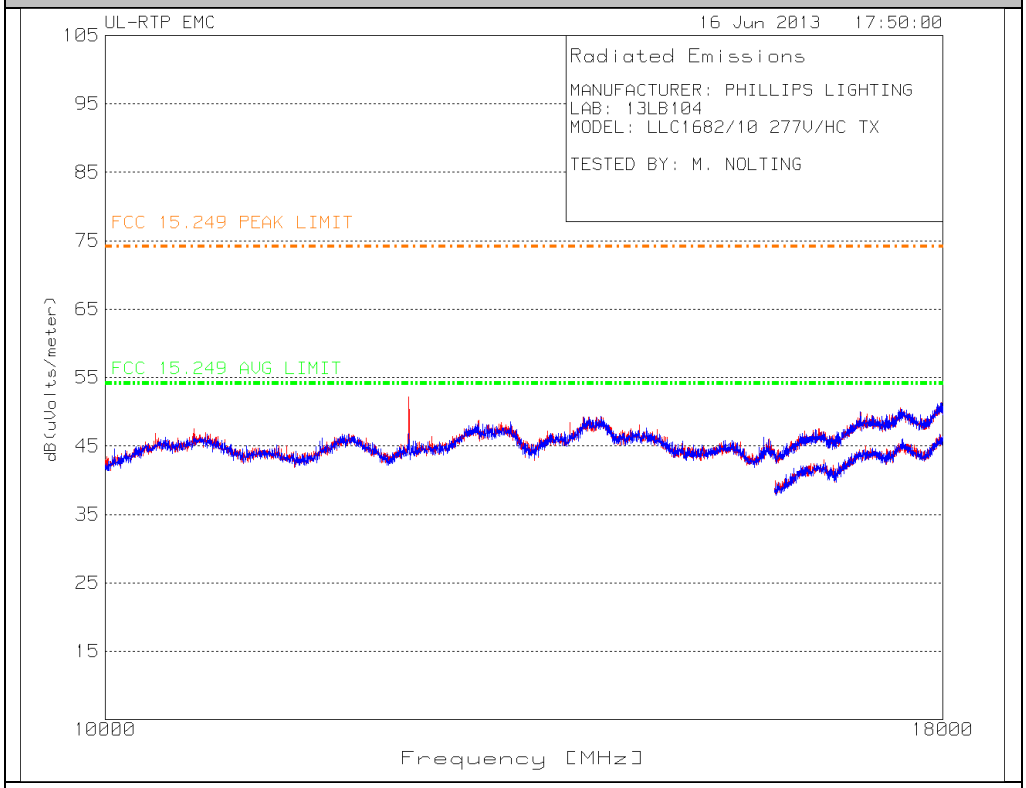
Field Strength = Meter Reading + Antenna Factor + Gain / Loss

18-26GHz frequency range: See 277V data.

277V: Graph



1-10GHz



10-18GHz

Note: Lower traces between 16-18GHz are reduced VBW scans to reveal any narrow-band emissions.

277V: Discrete Data

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	Antenna Factor [dB/m]	Gain/ Loss [dB]	Field Strength [dBuV/m]	FCC 15.249 Peak [dBuV/m]	Margin [dB]	FCC 15.249 AVG [dBuV/m]	Margin [dB]	Polarity
2474.474	42.06	PK	28.50	-32.60	38.0	74.0	-36.0	54.0	-16.0	Vert
4950.317	42.87	PK	33.10	-31.20	44.8	74.0	-29.2	54.0	-9.2	Vert
7423.141	45.55	PK	36.60	-26.00	56.2	74.0	-17.9	-	-	Vert
12377.378	47.60	PK	38.80	-32.80	53.6	74.0	-20.4	-	-	Vert
14111.903	42.27	PK	40.70	-31.80	51.2	74.0	-22.8	54.0	-	-
7423.553	38.47	Av	36.60	-26.00	49.1	-	-	54.0	-4.9	Vert
12377.378	36.85	Av	38.80	-32.80	42.9	-	-	54.0	-11.2	Vert
14111.903	29.85	Av	40.70	-31.80	38.8	-	-	54.0	-15.3	Vert
1034.068	47.59	PK	24.20	-34.30	37.5	74.0	-36.5	54.0	-16.5	Horz
2474.474	43.07	PK	28.50	-32.60	39.0	74.0	-35.0	54.0	-15.0	Horz
4950.317	43.20	PK	33.10	-31.20	45.1	74.0	-28.9	54.0	-8.9	Horz
7427.142	43.61	PK	36.60	-26.00	54.2	74.0	-19.8	-	-	Horz
7426.433	39.34	Av	36.60	-26.00	49.9	-	-	54.0	-4.1	Horz

* PK = Peak, Av = Average.

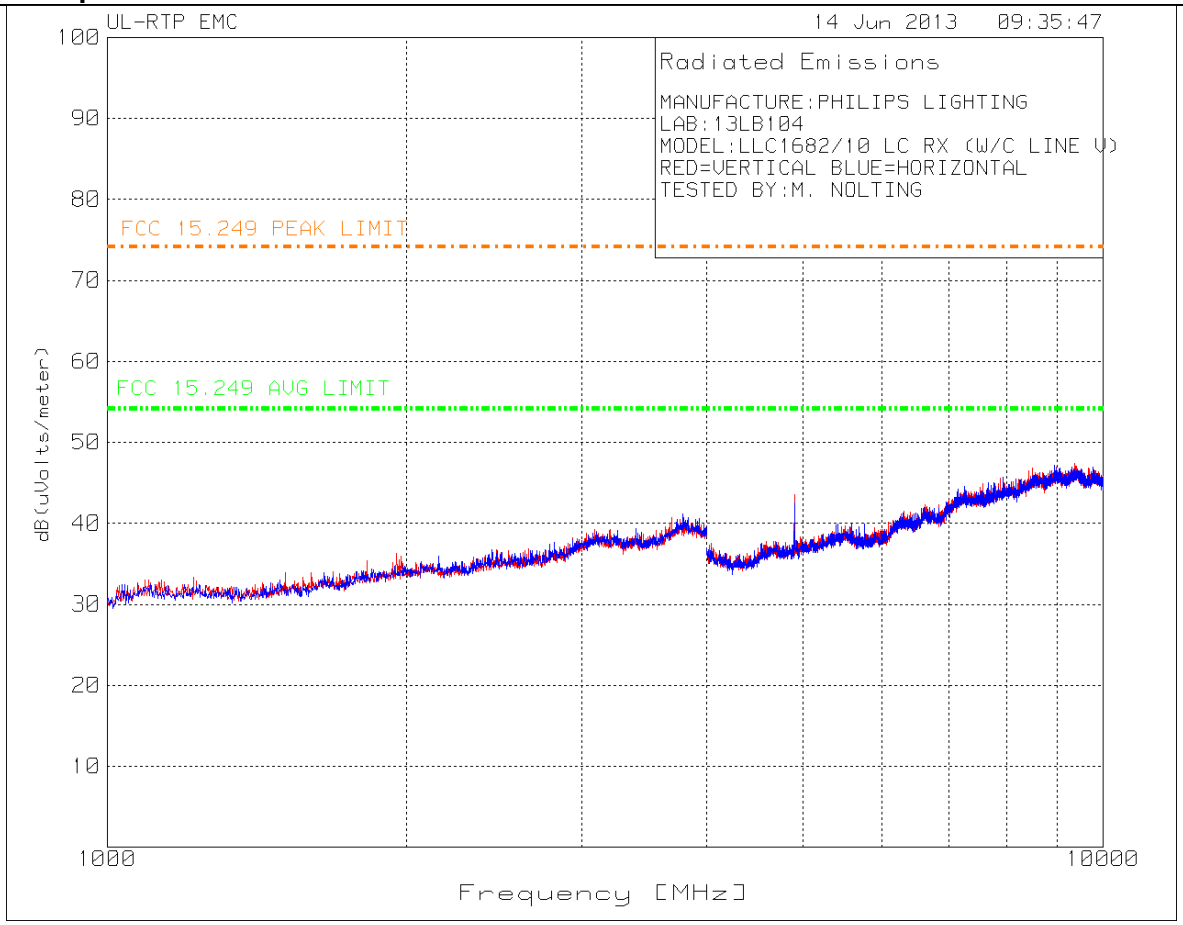
Field Strength = Meter Reading + Antenna Factor + Gain / Loss

18-26GHz frequency range: An ARA SWH-28 antenna with preamp was connected to an SA and moved around the device to detect EUT-related emissions. Results: No EUT-related noise observed in this range.

7.2.10. RECEIVE HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

Worst Case (Middle Channel)

120V: Graph



1-10GHz

120V: Discrete Data

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	Antenna Factor [dB/m]	Gain/ Loss [dB]	Field Strength [dBuV/m]	FCC 15.249 Peak [dBuV/m]	Margin [dB]	FCC 15.249 AVG [dBuV/m]	Margin [dB]	Polarity
4898.299	41.91	PK	32.90	-31.30	43.5	74.0	-30.5	54.0	-10.5	Vert
9365.789	31.18	PK	37.70	-21.50	47.4	74.0	-26.6	54.0	-6.6	Vert
4900.300	40.88	PK	32.90	-31.30	42.5	74.0	-31.5	54.0	-11.5	Horz
9495.832	31.17	PK	37.70	-22.10	46.8	74.0	-27.2	54.0	-7.2	Horz

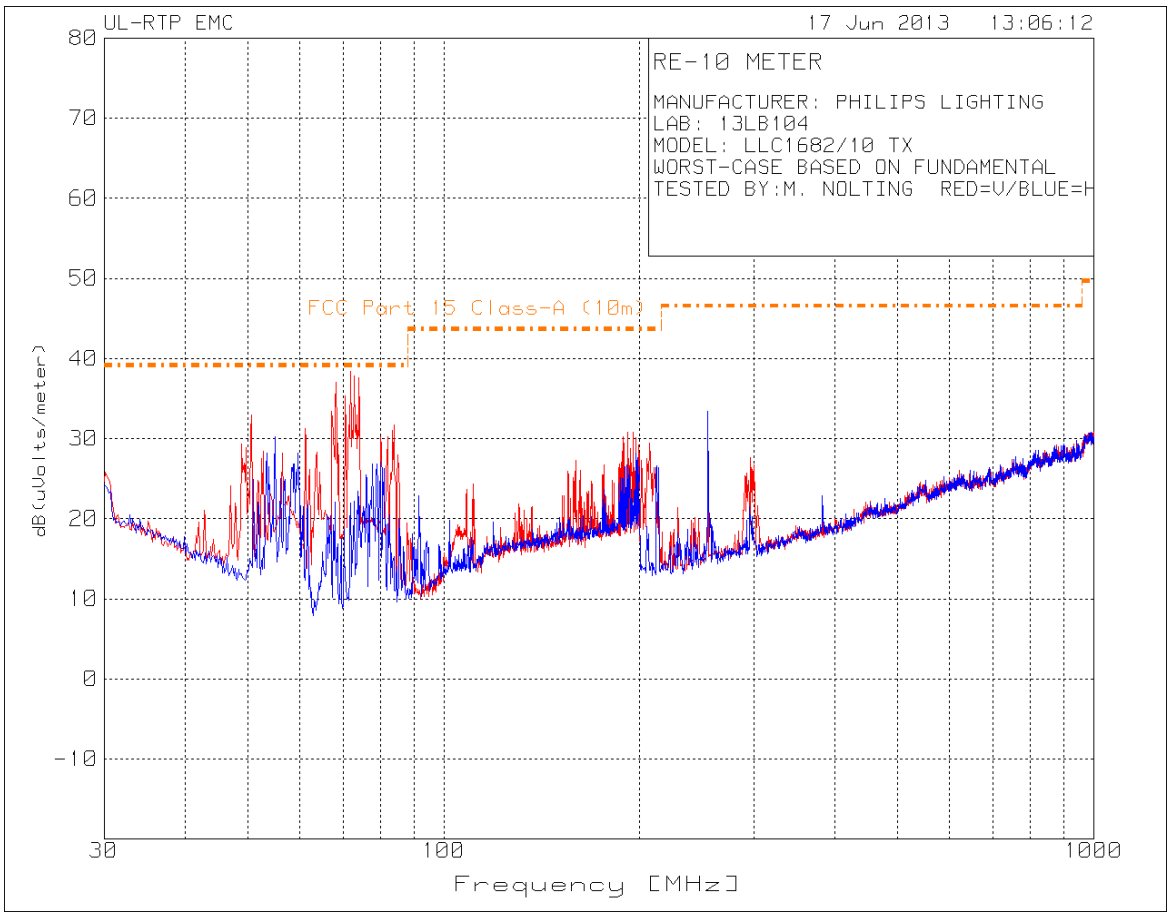
* PK = Peak, Av = Average.
Field Strength = Meter Reading + Antenna Factor + Gain / Loss

7.2.11. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz

The transmitter has no effect on Radiated Emissions from 30-1000 MHz. The device is considered a Class A device. The noise associated in the below plot is due to the Sensor, Philips model LRI-1663. Refer to UL Report# 12CA19074 for more details.

PLOT



DATA

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	Antenna Factor [dB/m]	Gain/Loss [dB]	Field Strength [dBuV/m]	FCC Class A QP Limit [dBuV/m]	Margin [dB]	Polarity
50.610	43.84	QP	10.1	-28.9	25.04	39.0	-13.96	Vert
67.989	58.42	QP	6.3	-28.8	35.92	39.0	-3.08	Vert
72.517	54.24	QP	6.4	-28.6	32.04	39.0	-6.96	Vert
83.774	52.31	PK	8.0	-28.6	31.71	39.0	-7.29	Vert
191.832	42.60	PK	15.8	-27.6	30.80	43.5	-12.70	Vert
254.970	49.39	PK	12.2	-28.2	33.39	46.4	-13.01	Horz

* PK = Peak, QP = Quasi-Peak.

Field Strength = Meter Reading + Antenna Factor + Gain / Loss

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

Note - The transmitter has no effect on Line Conducted Emissions. The device is considered a Class A device. Refer to UL Report# 12CA19074 for more details.

RESULTS Low Channel 120V

6 WORST EMISSIONS

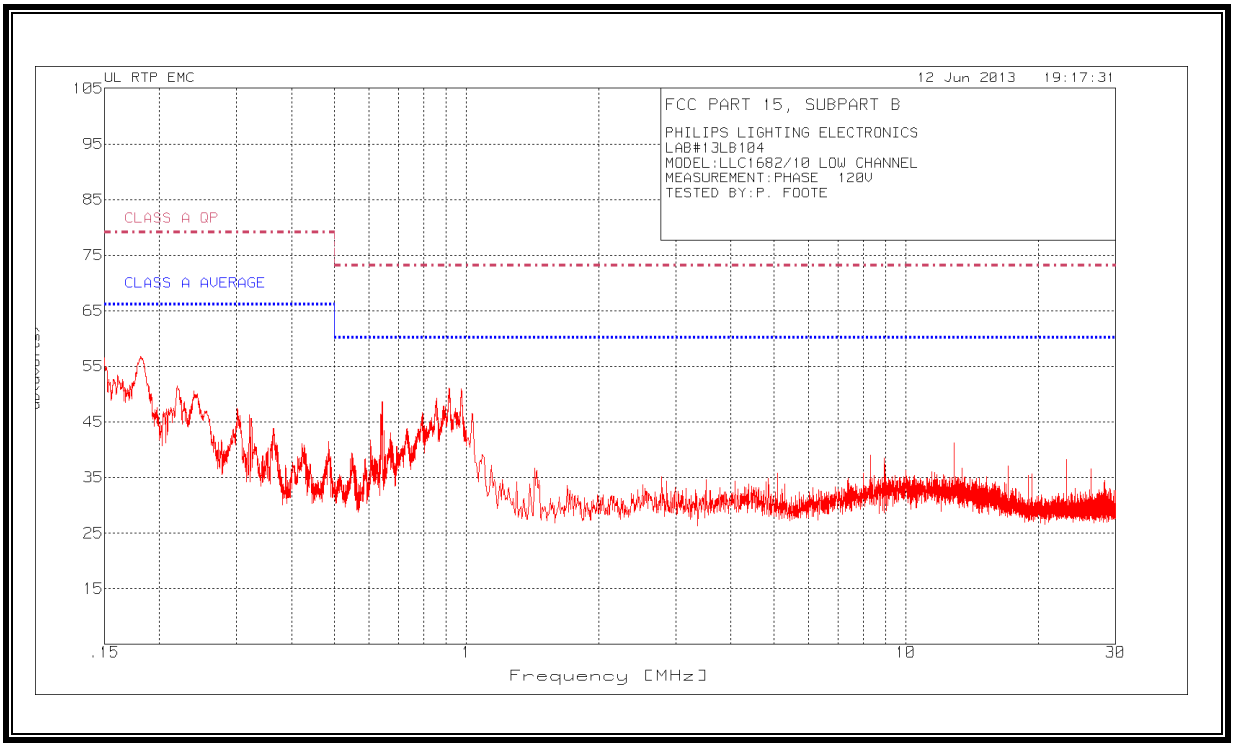
PHASE

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.181	47.1	PK	0.1	9.6	56.8	79.0	-22.2	66.0	-9.2
0.220	41.7	PK	0.1	9.6	51.4	79.0	-27.6	66.0	-14.6
0.643	38.9	PK	0.0	9.7	48.6	73.0	-24.4	60.0	-11.4
0.855	39.6	PK	0.0	9.7	49.3	73.0	-23.7	60.0	-10.7
0.914	41.4	PK	0.0	9.7	51.1	73.0	-22.0	60.0	-9.0
0.974	41.3	PK	0.0	9.7	51.0	73.0	-22.0	60.0	-9.0
*PK = Peak, QP = Quasi-Peak, Av = Average									

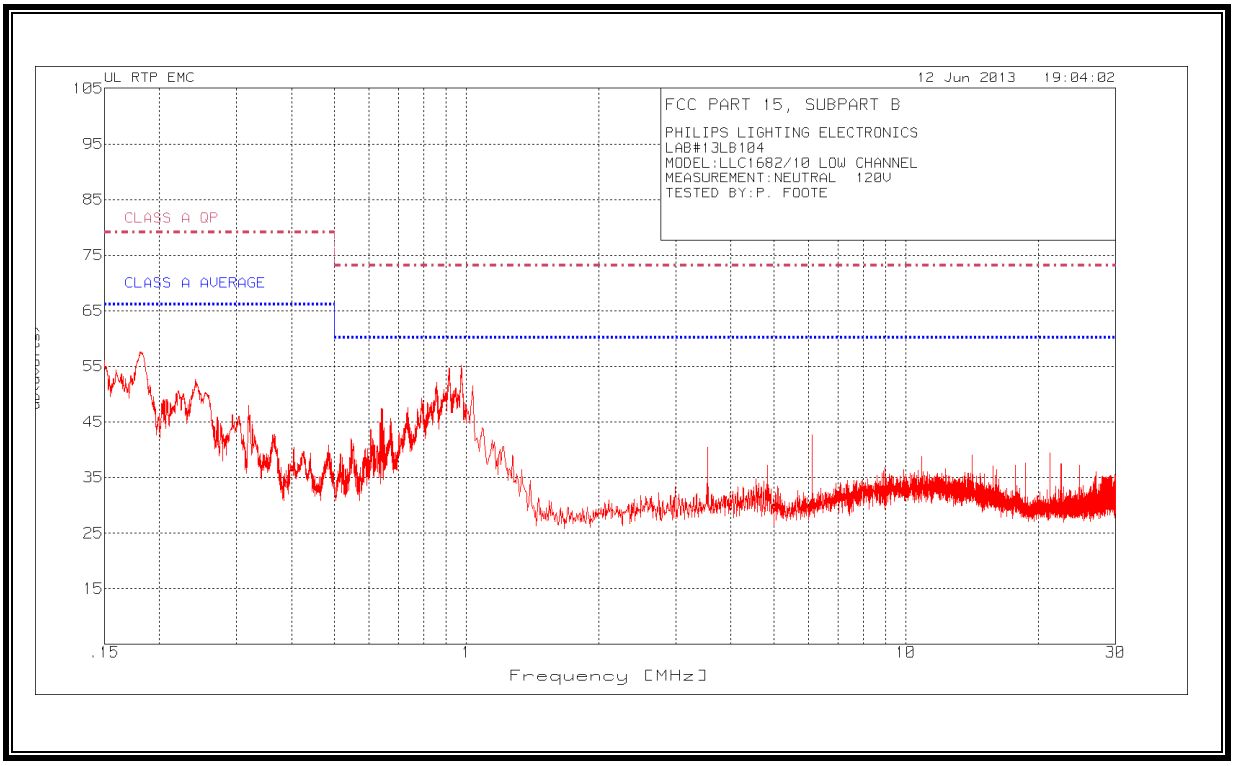
NEUTRAL

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.182	47.9	PK	0.1	9.6	57.6	79.0	-21.4	66.0	-8.4
0.242	42.9	PK	0.1	9.6	52.6	79.0	-26.4	66.0	-13.4
0.320	38.3	PK	0.0	9.6	47.9	79.0	-31.1	66.0	-18.1
0.857	42.4	PK	0.0	9.7	52.1	73.0	-20.9	60.0	-7.9
0.914	27.2	CAV	0.0	9.7	36.9	73.0	-36.2	60.0	-23.2
0.973	26.5	CAV	0.0	9.7	36.2	73.0	-36.8	60.0	-23.8
*PK = Peak, QP = Quasi-Peak, CAV = CISPR Average									

LINE 1 RESULTS



LINE 2 RESULTS



RESULTS Low Channel 277V

6 WORST EMISSIONS

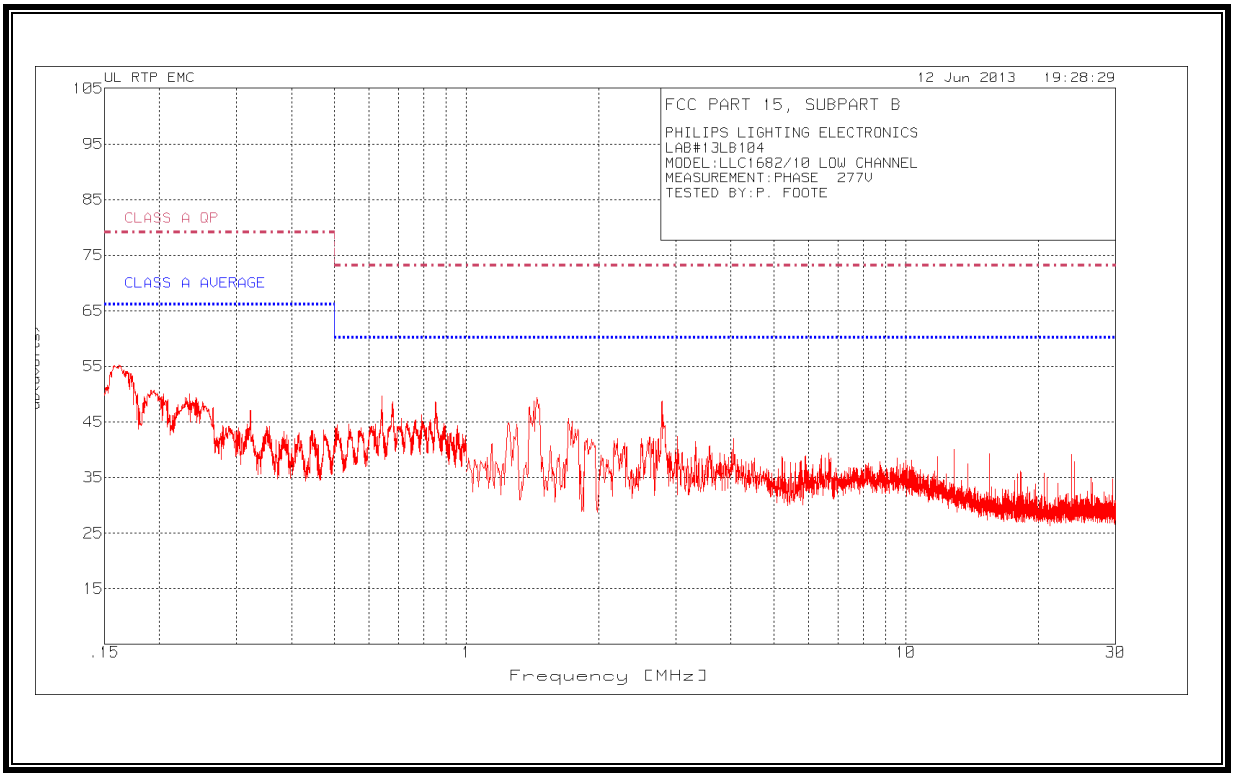
PHASE

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.162	45.5	PK	0.1	9.6	55.2	79.0	-23.8	66.0	-10.8
0.643	39.9	PK	0.0	9.7	49.6	73.0	-23.4	60.0	-10.4
0.679	38.9	PK	0.0	9.7	48.6	73.0	-24.4	60.0	-11.4
0.851	38.9	PK	0.0	9.7	48.6	73.0	-24.4	60.0	-11.4
1.446	39.7	PK	0.0	9.7	49.4	73.0	-23.6	60.0	-10.6
2.785	39.0	PK	0.0	9.8	48.8	73.0	-24.3	60.0	-11.3
*PK = Peak, QP = Quasi-Peak, Av = Average									

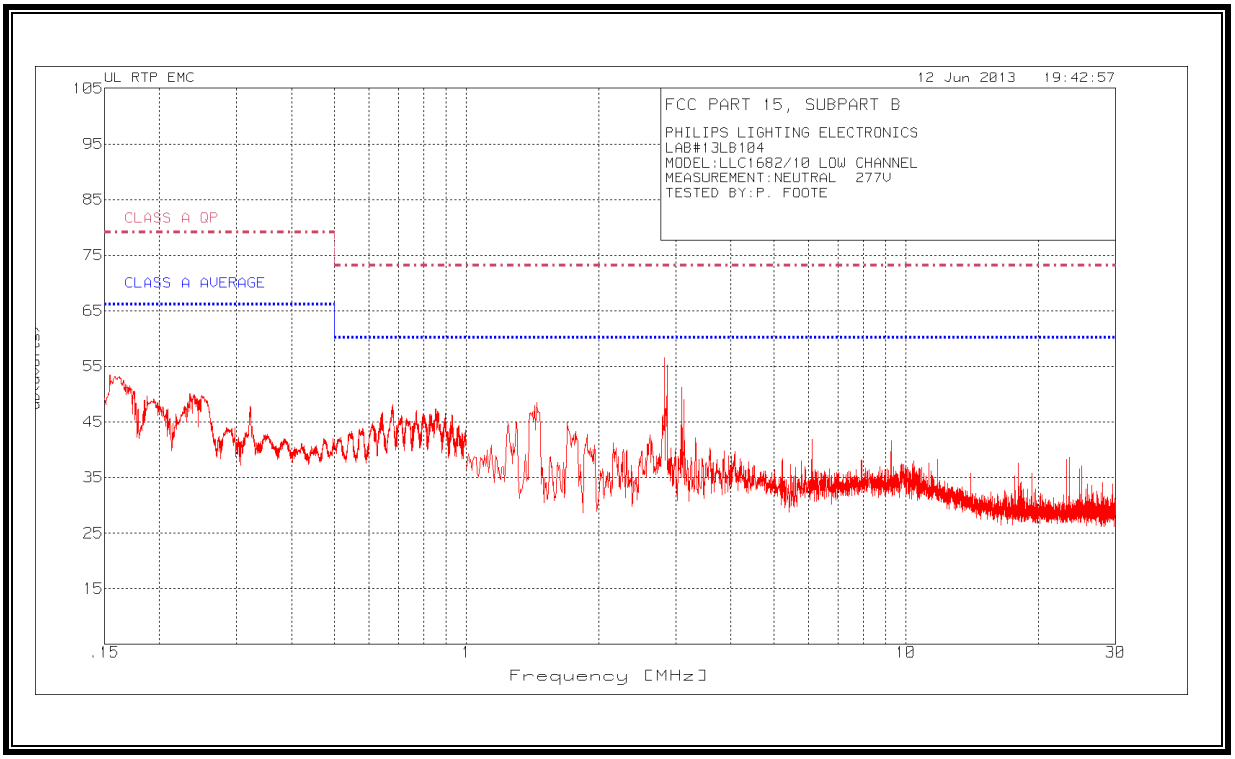
NEUTRAL

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.162	43.3	PK	0.1	9.6	53.0	79.0	-26.0	66.0	-13.0
0.240	40.2	PK	0.1	9.6	49.9	79.0	-29.1	66.0	-16.1
1.446	38.8	PK	0.0	9.7	48.5	73.0	-24.6	60.0	-11.6
2.823	18.4	CAV	0.0	9.8	28.2	73.0	-44.8	60.0	-31.8
2.862	22.4	CAV	0.0	9.8	32.2	73.0	-40.8	60.0	-27.8
3.092	41.5	PK	0.0	9.8	51.3	73.0	-21.7	60.0	-8.7
*PK = Peak, QP = Quasi-Peak, CAV = CISPR Average									

LINE 1 RESULTS



LINE 2 RESULTS



RESULTS Mid Channel 120V

6 WORST EMISSIONS

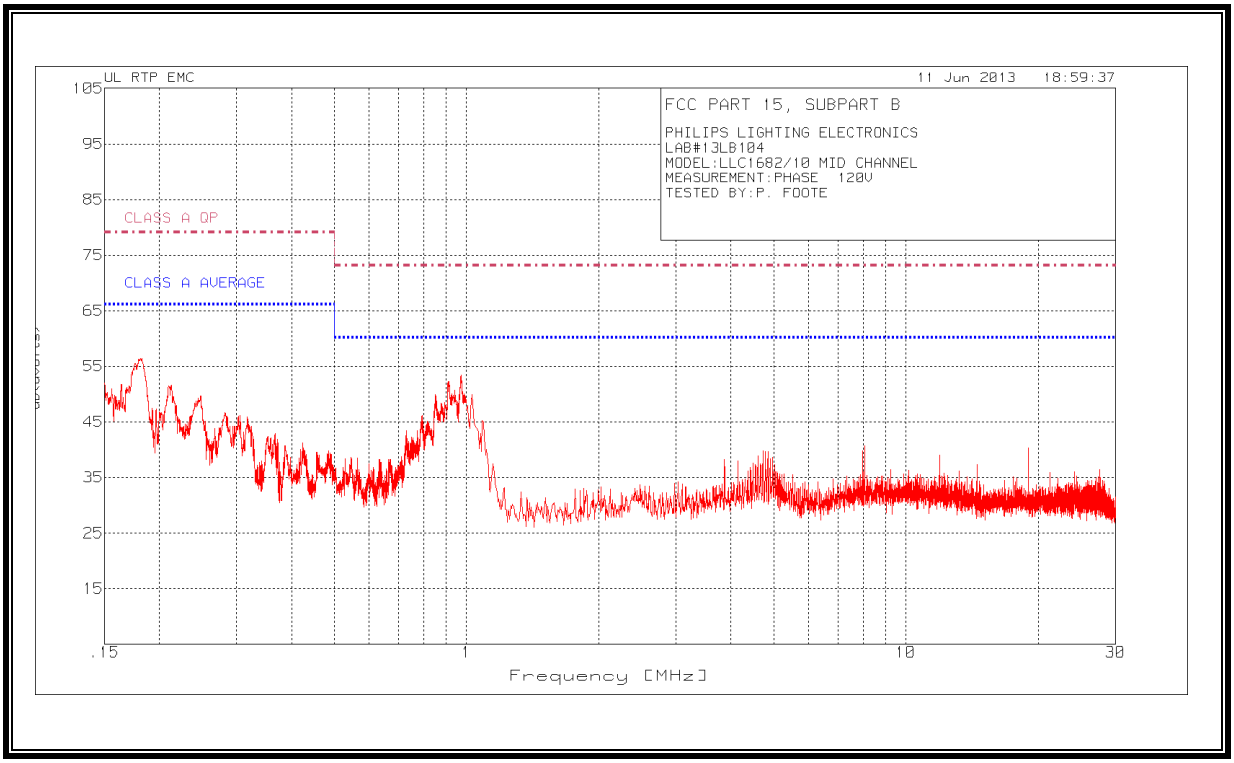
PHASE

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.181	46.8	PK	0.1	9.6	56.5	79.0	-22.5	66.0	-9.5
0.213	42.0	PK	0.1	9.6	51.7	79.0	-27.3	66.0	-14.3
0.249	39.9	PK	0.1	9.6	49.6	79.0	-29.4	66.0	-16.4
0.850	40.2	PK	0.0	9.7	49.9	73.0	-23.1	60.0	-10.1
0.909	42.6	PK	0.0	9.7	52.3	73.0	-20.7	60.0	-7.7
0.973	43.6	PK	0.0	9.7	53.3	73.0	-19.8	60.0	-6.8
*PK = Peak, QP = Quasi-Peak, Av = Average									

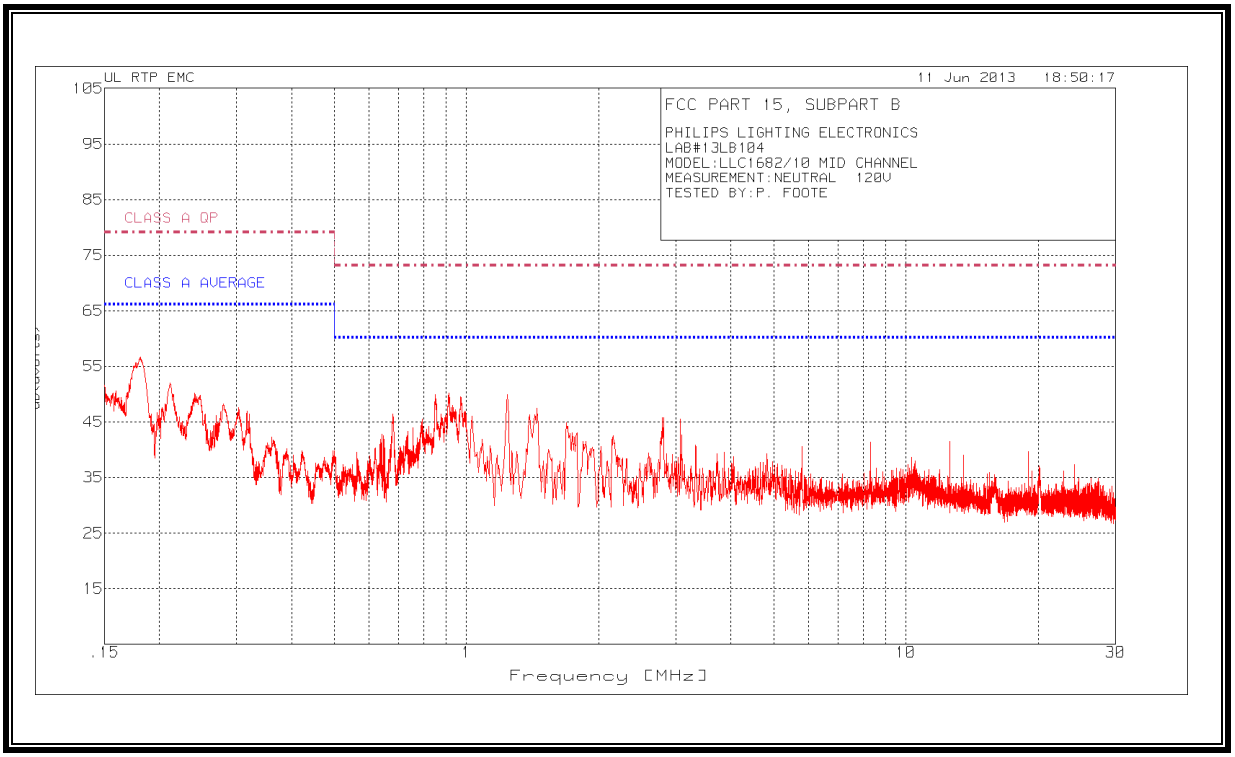
NEUTRAL

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.181	46.9	PK	0.1	9.6	56.6	79.0	-22.4	66.0	-9.4
0.212	42.3	PK	0.1	9.6	52.0	79.0	-27.1	66.0	-14.1
0.850	40.2	PK	0.0	9.7	49.9	73.0	-23.1	60.0	-10.1
0.911	40.5	PK	0.0	9.7	50.2	73.0	-22.9	60.0	-9.9
0.970	39.8	PK	0.0	9.7	49.5	73.0	-23.5	60.0	-10.5
1.238	40.2	PK	0.0	9.7	49.9	73.0	-23.1	60.0	-10.1
*PK = Peak, QP = Quasi-Peak, Av = Average									

LINE 1 RESULTS



LINE 2 RESULTS



RESULTS Mid Channel 277V

6 WORST EMISSIONS

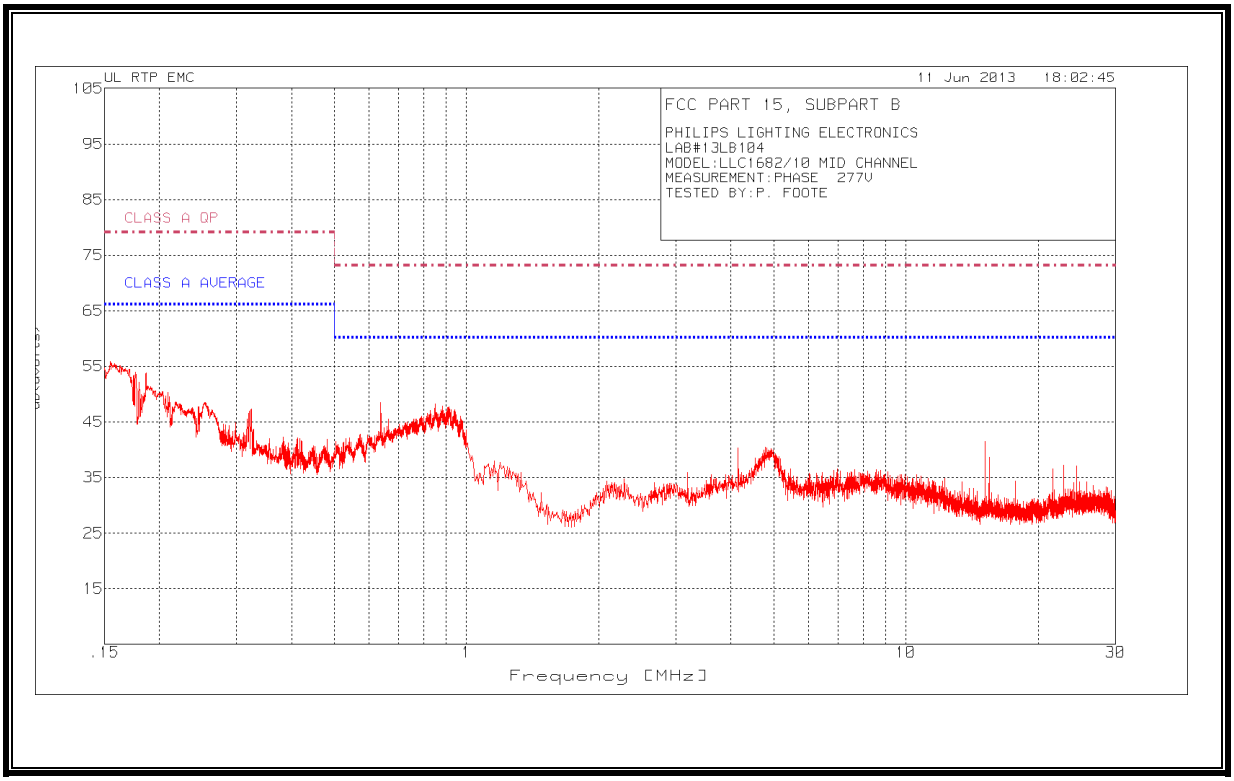
PHASE

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.155	46.1	PK	0.1	9.5	55.7	79.0	-23.4	66.0	-10.4
0.187	44.2	PK	0.1	9.5	53.8	79.0	-25.2	66.0	-12.2
0.254	38.8	PK	0.1	9.6	48.5	79.0	-30.5	66.0	-17.5
0.324	37.7	PK	0.0	9.6	47.3	79.0	-31.7	66.0	-18.7
0.638	38.9	PK	0.0	9.6	48.5	73.0	-24.5	60.0	-11.5
0.848	38.6	PK	0.0	9.6	48.2	73.0	-24.8	60.0	-11.8
*PK = Peak, QP = Quasi-Peak, Av = Average									

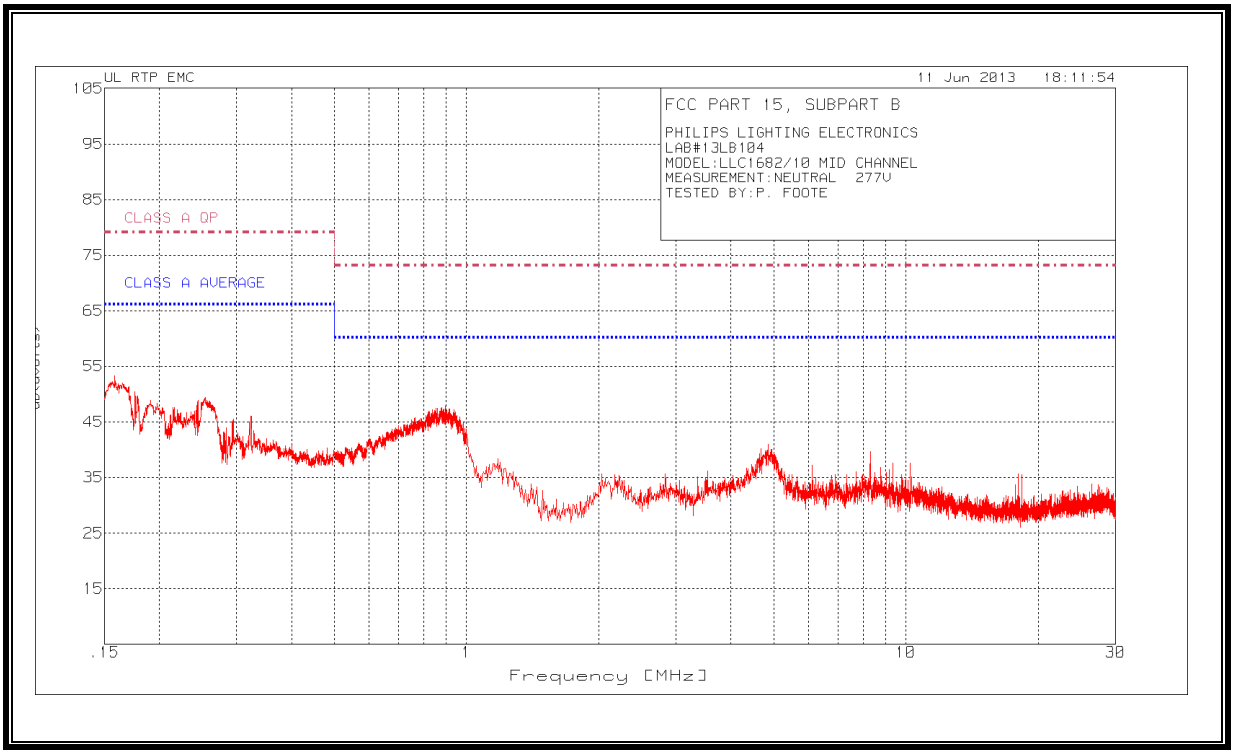
NEUTRAL

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.158	43.7	PK	0.1	9.5	53.3	79.0	-25.7	66.0	-12.7
0.178	40.1	PK	0.1	9.5	49.7	79.0	-29.3	66.0	-16.3
0.257	39.2	PK	0.1	9.6	48.9	79.0	-30.1	66.0	-17.1
0.295	35.9	PK	0.1	9.6	45.6	79.0	-33.4	66.0	-20.4
0.324	36.5	PK	0.0	9.6	46.1	79.0	-33.0	66.0	-20.0
0.895	38.2	PK	0.0	9.6	47.8	73.0	-25.2	60.0	-12.2
*PK = Peak, QP = Quasi-Peak, Av = Average									

LINE 1 RESULTS



LINE 2 RESULTS



RESULTS High Channel 120V

6 WORST EMISSIONS

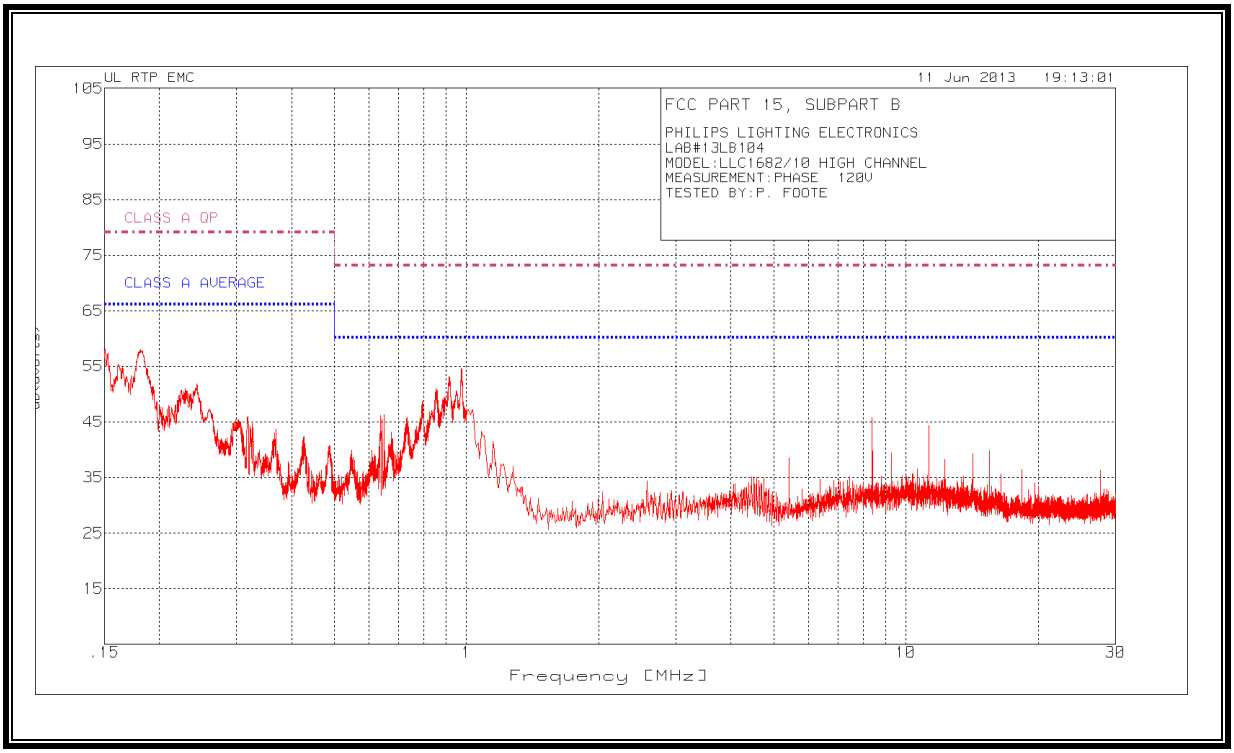
PHASE

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.153	47.7	PK	0.1	9.6	57.4	79.0	-21.6	66.0	-8.6
0.182	48.2	PK	0.1	9.6	57.9	79.0	-21.1	66.0	-8.1
0.243	42.1	PK	0.1	9.6	51.8	79.0	-27.2	66.0	-14.2
0.854	41.3	PK	0.0	9.7	51.0	73.0	-22.0	60.0	-9.0
0.914	43.4	PK	0.0	9.7	53.1	73.0	-19.9	60.0	-6.9
0.975	26.3	CAV	0.0	9.7	36.0	73.0	-37.0	60.0	-24.0
*PK = Peak, QP = Quasi-Peak, CAV = CISPR Average									

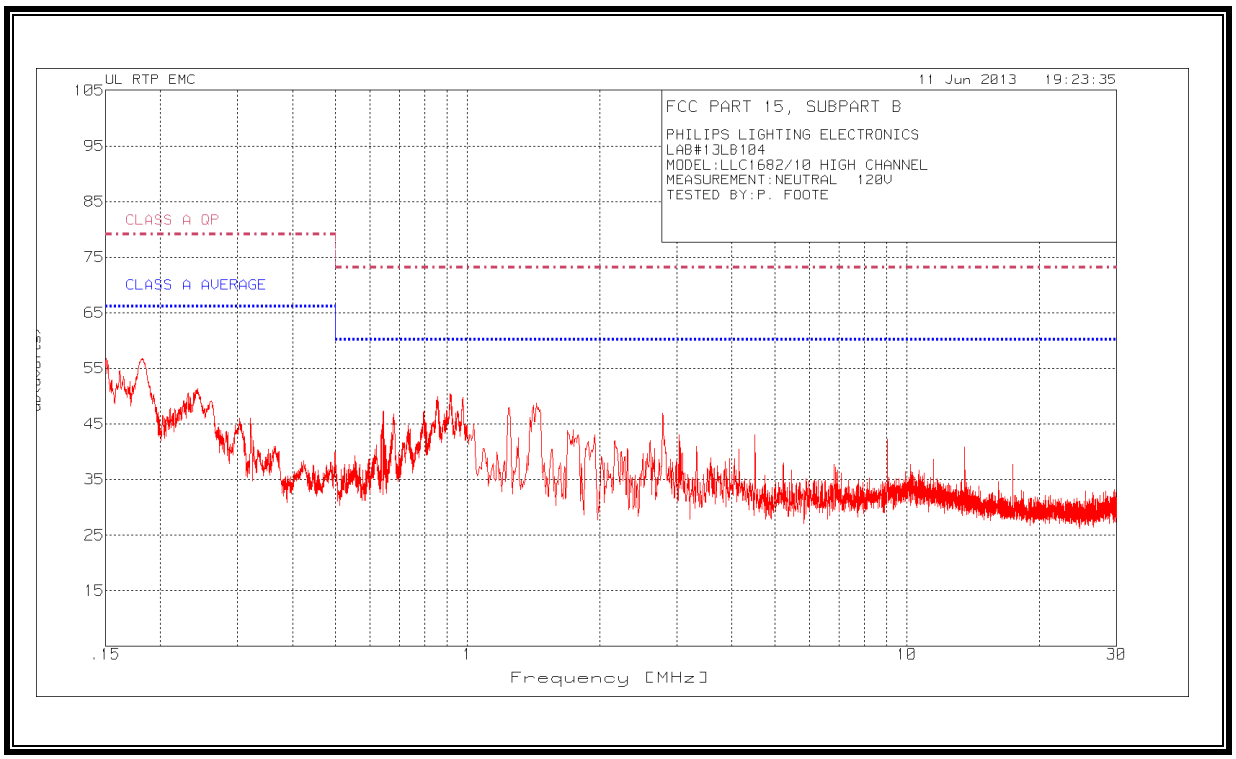
NEUTRAL

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.182	47.2	PK	0.1	9.6	56.9	79.0	-22.1	66.0	-9.1
0.243	41.6	PK	0.1	9.6	51.3	79.0	-27.7	66.0	-14.7
0.853	39.6	PK	0.0	9.7	49.3	73.0	-23.7	60.0	-10.7
0.913	40.7	PK	0.0	9.7	50.4	73.0	-22.6	60.0	-9.6
0.975	39.9	PK	0.0	9.7	49.6	73.0	-23.4	60.0	-10.4
1.435	39.0	PK	0.0	9.7	48.7	73.0	-24.3	60.0	-11.3
*PK = Peak, QP = Quasi-Peak, Av = Average									

LINE 1 RESULTS



LINE 2 RESULTS



RESULTS High Channel 277V

6 WORST EMISSIONS

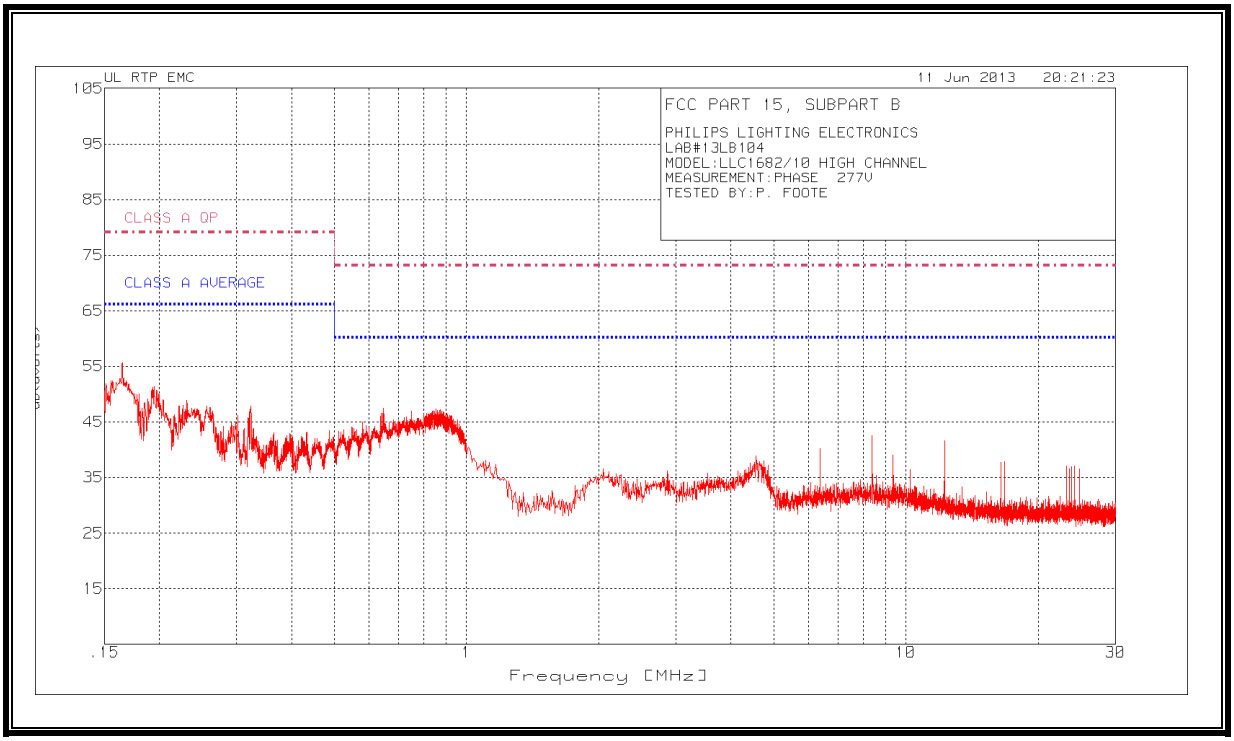
PHASE

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.165	45.9	PK	0.1	9.6	55.6	79.0	-23.4	66.0	-10.4
0.195	41.6	PK	0.1	9.6	51.3	79.0	-27.7	66.0	-14.7
0.231	39.2	PK	0.1	9.6	48.9	79.0	-30.1	66.0	-17.1
0.324	37.4	PK	0.0	9.6	47.0	79.0	-32.1	66.0	-19.1
0.646	37.7	PK	0.0	9.7	47.4	73.0	-25.6	60.0	-12.6
0.859	37.4	PK	0.0	9.7	47.1	73.0	-25.9	60.0	-12.9
*PK = Peak, QP = Quasi-Peak, Av = Average									

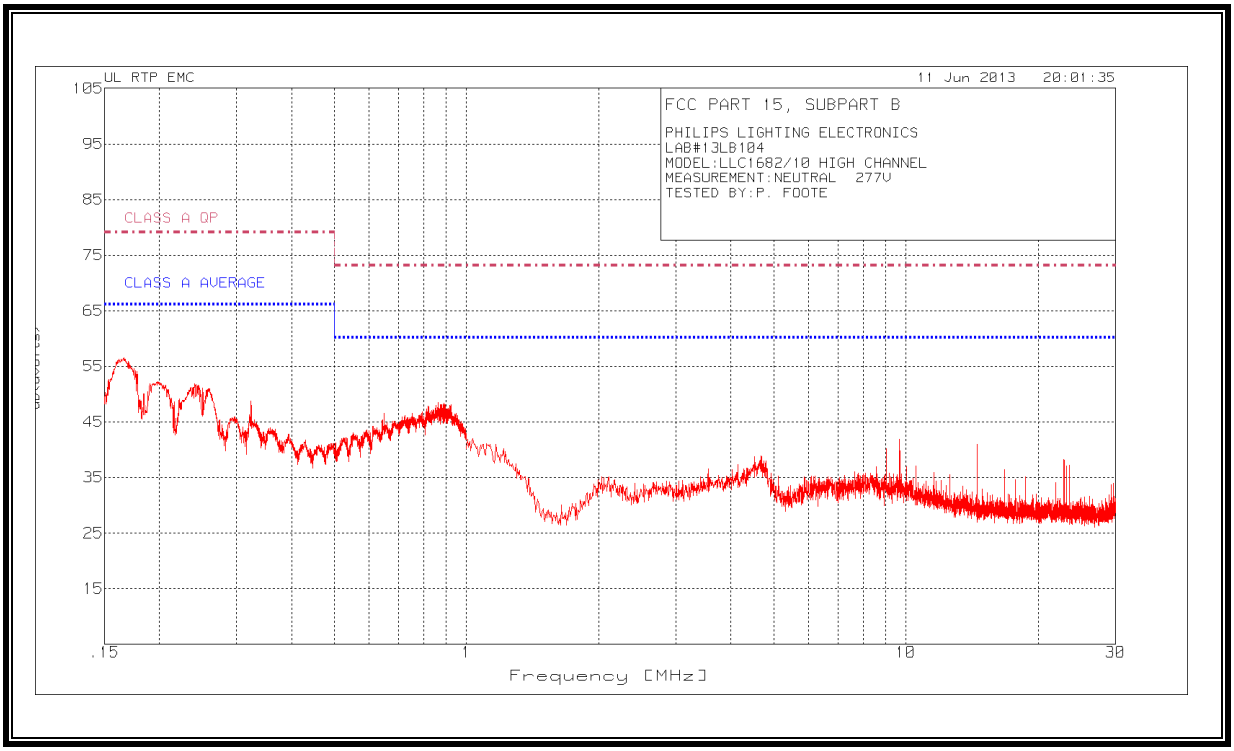
NEUTRAL

Test Frequency [MHz]	Meter Reading [dBuV]	Detector*	LISN [dB]	Cable Loss [dB]	RF Line Voltage [dBuV]	CISPR22 CLASS-A (QP) [dBuV]	Margin [dB]	CISPR22 CLASS-A (AV) [dBuV]	Margin [dB]
0.166	46.8	PK	0.1	9.6	56.5	79.0	-22.5	66.0	-9.5
0.198	42.6	PK	0.1	9.6	52.3	79.0	-26.7	66.0	-13.7
0.241	42.1	PK	0.1	9.6	51.8	79.0	-27.2	66.0	-14.2
0.323	39.2	PK	0.0	9.6	48.8	79.0	-30.2	66.0	-17.2
0.650	36.8	PK	0.0	9.7	46.5	73.0	-26.5	60.0	-13.5
0.862	38.8	PK	0.0	9.7	48.5	73.0	-24.5	60.0	-11.5
*PK = Peak, QP = Quasi-Peak, Av = Average									

LINE 1 RESULTS



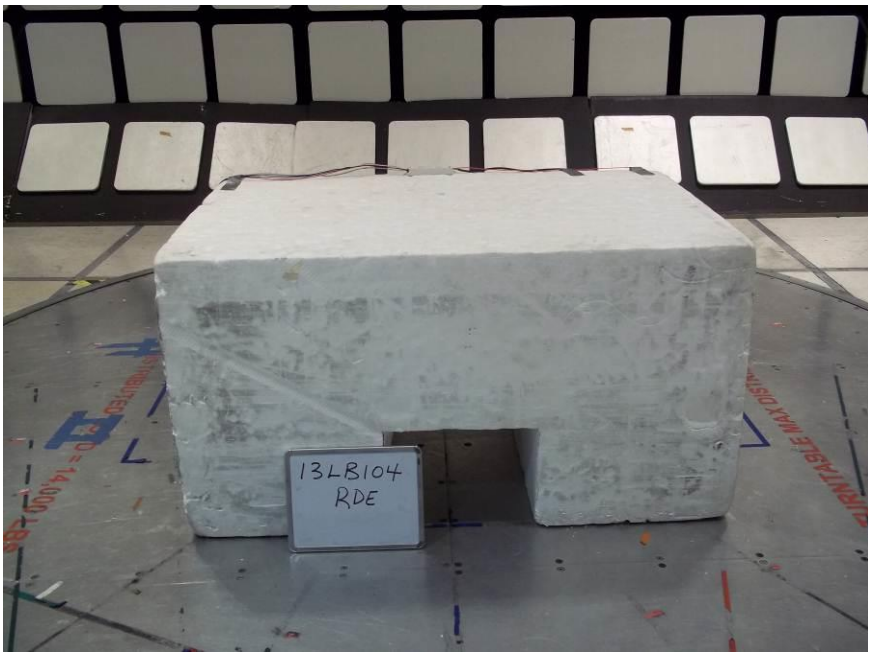
LINE 2 RESULTS



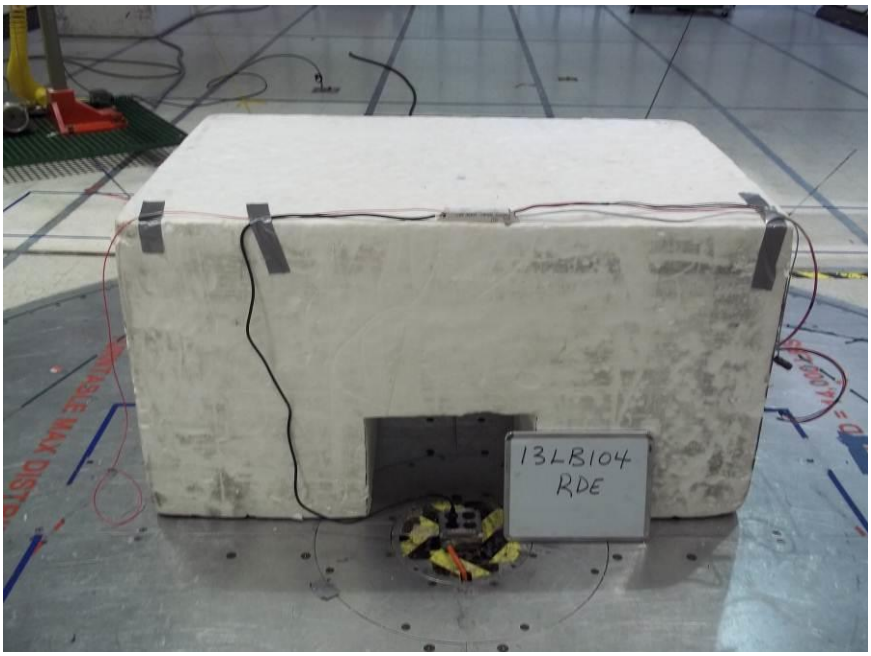
9. SETUP PHOTOS

RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION

FRONT PHOTO



BACK PHOTO



LINE CONDUCTED MEASUREMENT SETUP FOR PORTABLE CONFIGURATION

FRONT PHOTO

BACK PHOTO

END OF REPORT