CERTIFICATION TEST REPORT

Report Number. : 12229356E

Applicant	:	Philips Lighting North America Corporation 10275 W. Higgins Rd. Rosemont, IL 60018
Model	:	SNS441
FCC ID	:	2AF2N-SNSS
ISED ID	:	20659-SNSS
EUT Description	:	ceiling luminaire mounted light sensor with 2.4GHz radio
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2

Date Of Issue:
2018-07-25

Prepared by:
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NVLAP TESTING
NVLAB LAB CODE: 100414-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
1.0	2018-07-25	Original Issue	BM

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Philips Lighting North America

EUT DESCRIPTION: ceiling luminaire mounted light sensor with 2.4GHz radio

MODEL: SNS441

SERIAL NUMBER: see section 5.6

DATE TESTED: 2018-06-07 TO 2018-07-23

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Compliant
ISED RSS-247 Issue 2	Compliant
ISED RSS-GEN Issue 5	Compliant

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, or any agency of the U.S. government.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, RSS-GEN Issue 5, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, Illinois, USA.

333 Pfingsten Road
☒ Chamber 10m (ISED:2180A-1)

UL LLC is accredited by NVLAP, Laboratory Code 1004141-0. The full scope of accreditation can be viewed at https://www.nist.gov/nvlap.

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) + *Path Factor (dB)
Example: 28.9dBuV/m = 36.5 dBuV + 18.7 dB/m + (– 27.5) dB
*Path factor may include cable, preamp and attenuators. Positive path factor indicates losses only and negative path factor indicates gain (preamp).

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB

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

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5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a ceiling luminaire mounted light sensor with 2.4GHz ZigBee type radio.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range	Mode	Output Power (dBm)	Output Power (mW)
2405 - 2475	TX	4.913	3.10

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an Inverted F PCB antenna, with a maximum gain of 0.7dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was: FCC Mode V0.30

The test utility software used during testing was: none

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated Spurious Emissions between 30MHz to 25GHz were performed with the EUT set to transmit at the intended power setting on low, middle and high channels.

Radiated Emissions between 9kHz-30MHz were conducted with random channel selected.

Line Conducted Emissions between 150kHz to 30MHz were performed with the EUT set to transmit at the intended power setting on low, middle and high channels.

The EUT is Luminaire mounted only therefore all radiated spurious emissions were conducted in single orientation.

For testing purposes the EUT was set to 100% duty cycle, however in normal use the worst case pulse train will be approximately 10mS over 100mS period.

5.6. DESCRIPTION OF TEST SETUP

EUT and SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufactu**	**Model**	**Serial Number**	**FCC ID**
EUT - Antenna Port	Philips	SNS441	-	2AF2N-SNS441
EUT - Radiated Sample	Philips	SNS441	-	2AF2N-SNS441
*LED Driver	Philips	XI040C110V054VPT1	443579000431	-

Support Equipment List

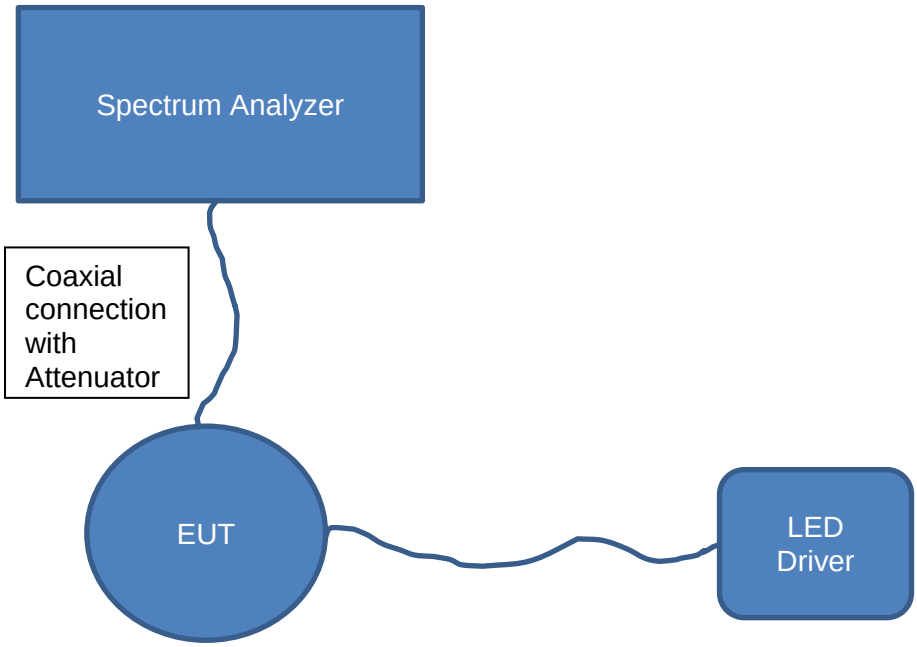
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC Input	1	Wire	solid	30cm	-

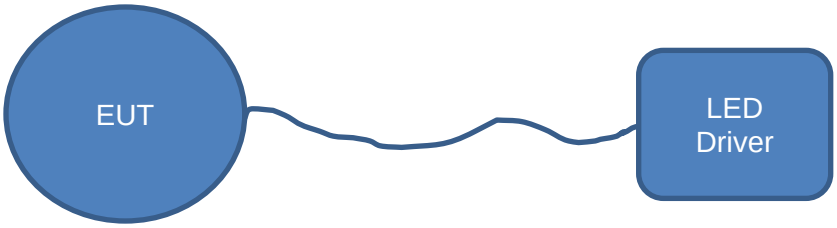
TEST SETUP

Frequencies and modes of operation are set by NFC transmitter. EUT is powered by a LED ballast.

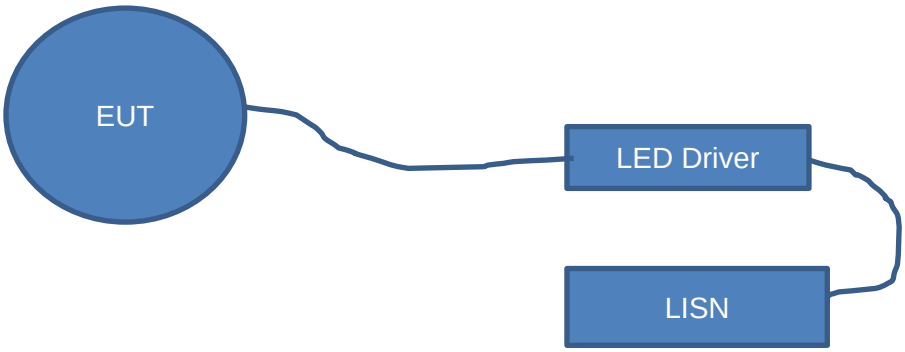
SETUP DIAGRAM FOR ANTENNA CONDUCTED TESTS



SETUP DIAGRAM FOR RADIATED TESTS



SETUP DIAGRAM FOR AC LINE CONDUCTED TEST



* note: variable power supply is only used to program the mode and frequency and its removed during conducted emissions testing.

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6. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10, section 11.6, b

6 dB BW: ANSI C63.10, section 11.8.1 (option 2)

99% Occupied Bandwidth: RSS-Gen, Issue 5, Section 6.7

Output Power: ANSI C63.10, section 11.9.1.1

Power Spectral Density: ANSI C63.10, section 11.10.2 (peak PSD)

Out-of-band emissions in non-restricted bands: ANSI C63.10, section 11.11

Out-of-band emissions in restricted bands: ANSI C63.10, section 11.12.1

Band-edge: ANSI C63.10, section 11.12.1

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

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7. TEST AND MEASUREMENT EQUIPMENT

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

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	2017-12-21	2018-12-31
BiCon Antenna	Chase	VBA6106A	EMC4078	2018-03-28	2019-03-31
Log-P Antenna	Chase	UPA6109	EMC4313	2018-04-09	2019-04-30
Loop Antenna	EMCO	6502/1	EMC4026	2018-01-10	2019-01-31
Antenna Array	UL	BOMS	EMC4276	2018-06-19	2019-06-30
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	2017-12-20	2018-12-31
Spectrum Analyzer	Agilent	N9030A (PXA)	EMC4360	2017-12-28	2018-12-31
EMI Test Receiver	Rohde & Schwarz	ESR	EMC4377	2017-12-23	2018-12-31
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224	N/A	N/A
High-Pass Filter	Solar Electronics	2803-150	EMC4327	N/A	N/A
Attenuator	HP	8494B	2831A00838	N/A	N/A
LISN - L1	Solar Electronics	8602-50-TS-50-N	EMC4066	2017-12-29	2018-12-31
LISN - L2	Solar Electronics	8602-50-TS-50-N	EMC4064	2017-12-29	2018-12-31

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
*TX Mode	100.000	100.000	1.000	100.00%	0.00	0.010

* For testing purposes the device was set to transmit with 100% duty cycle.

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8.2. 99% BANDWIDTH

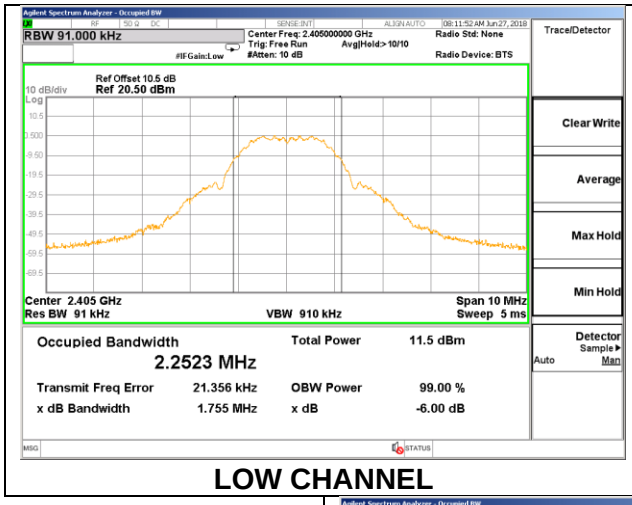
LIMITS

None; for reporting purposes only.

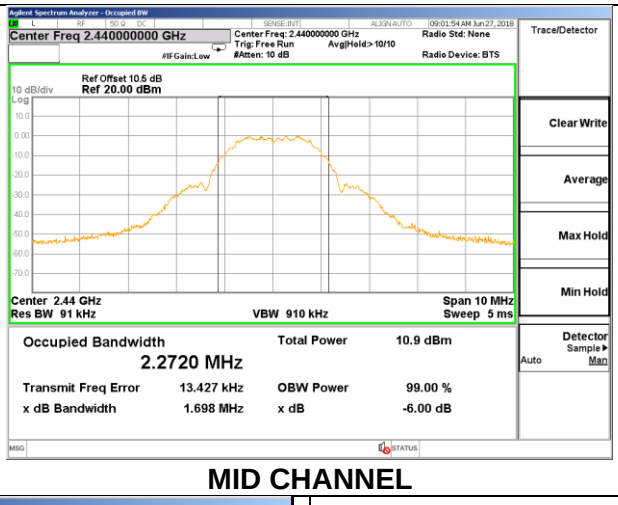
RESULTS

8.2.1. TX Mode

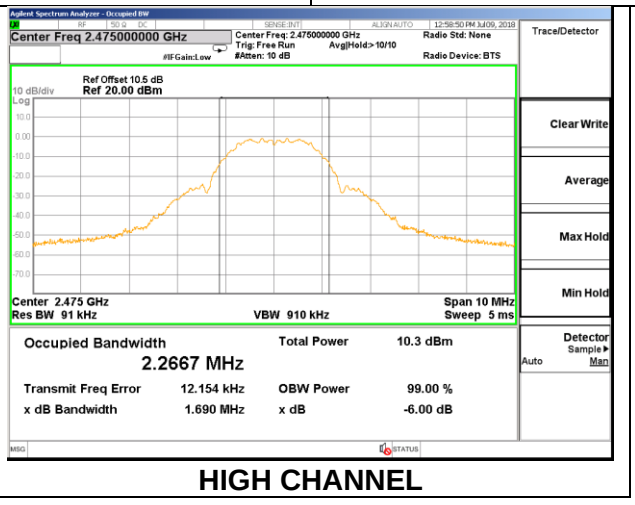
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.2523
Middle	2440	2.2720
High	2475	2.2667



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

8.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

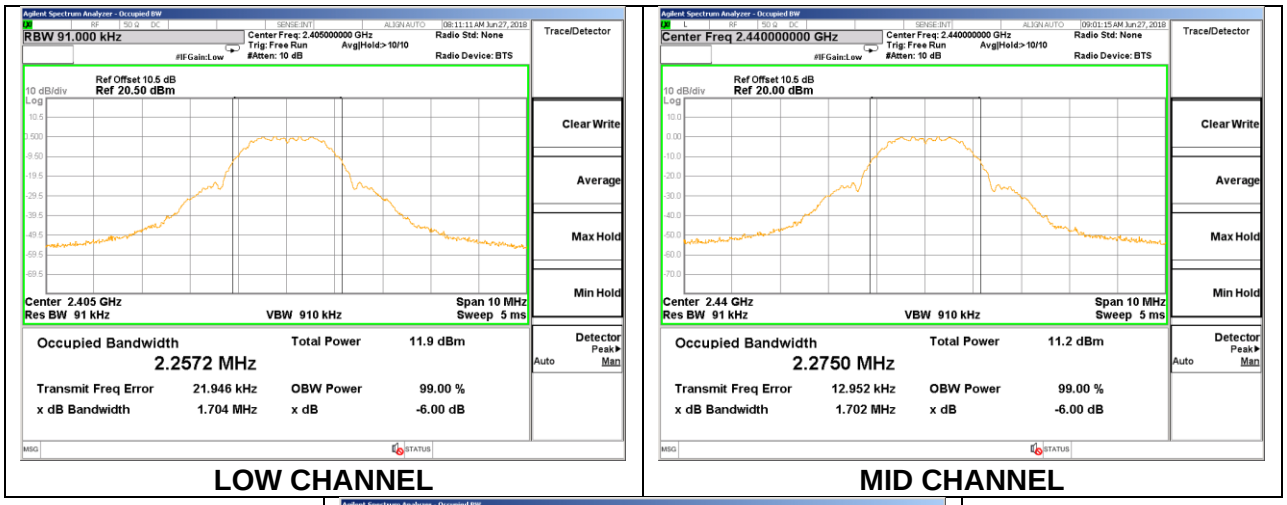
RSS-247 5.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

8.3.1. TX Mode

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.7040	0.5
Middle	2440	1.7020	0.5
High	2475	1.7030	0.5



8.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

The maximum antenna gain is less than 6dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

ANSI C63.10, section11.9.1.1

The cable assembly insertion loss of 10.5 dB (including cable and attenuator) was entered as reference offset in the spectrum analyzer.

RESULTS

8.4.1. TX Mode

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2405	4.913	30	-25.087
Middle	2440	4.286	30	-25.714
High	2475	3.533	30	-26.467

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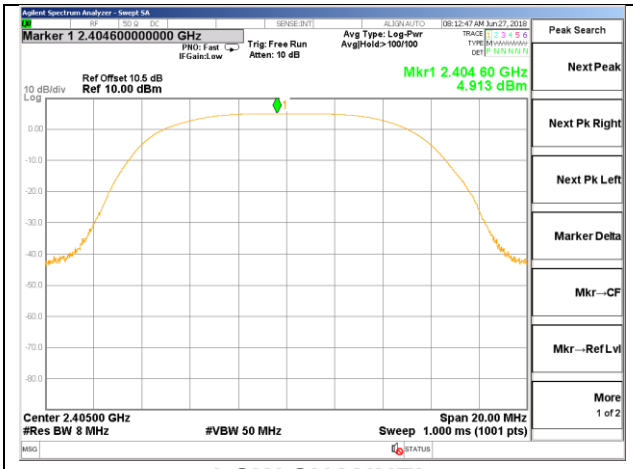
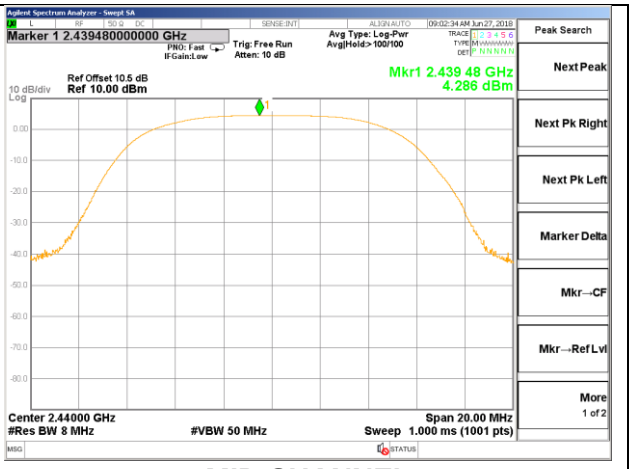
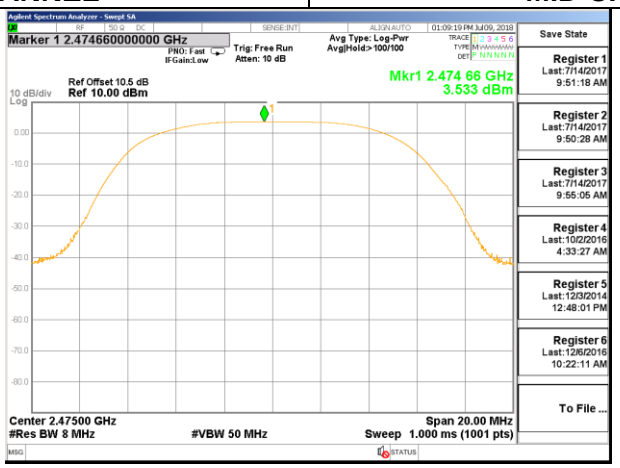


LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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8.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

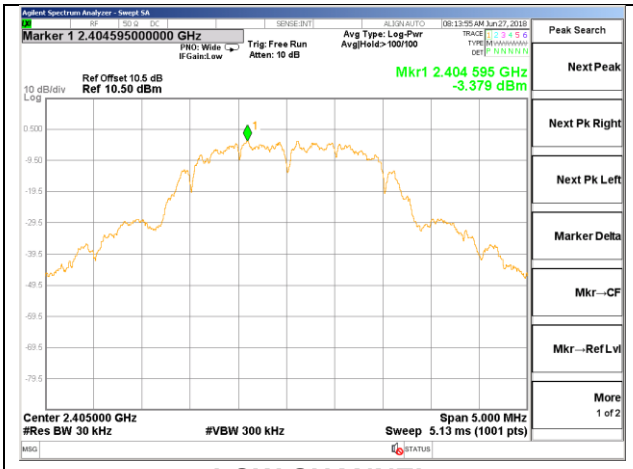
RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

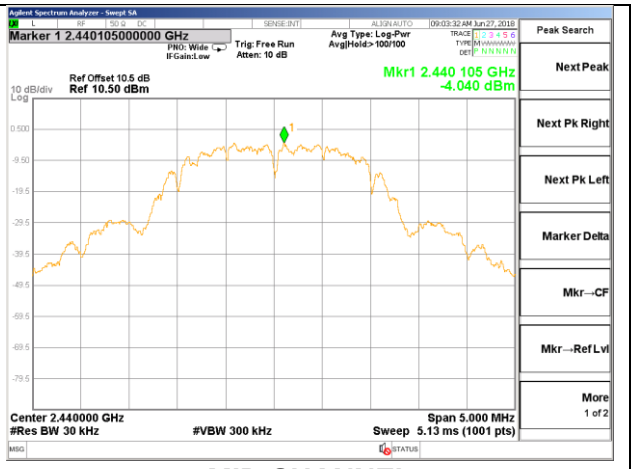
RESULTS

8.5.1. TX Mode

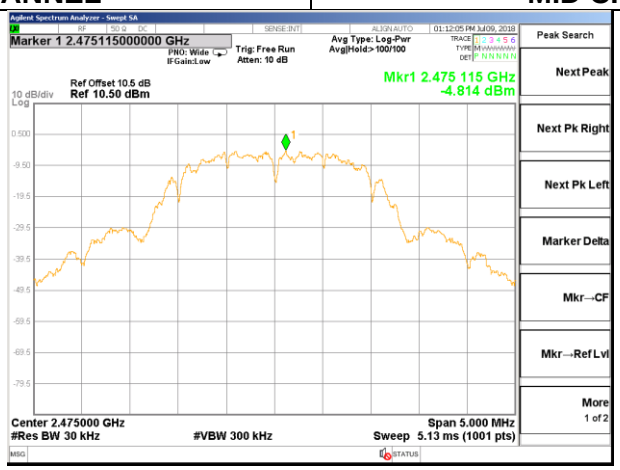
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm/3kHz)	Margin (dB)
Low	2405	-3.38	8	-11.38
Middle	2440	-4.04	8	-12.04
High	2475	-4.81	8	-12.81



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

8.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

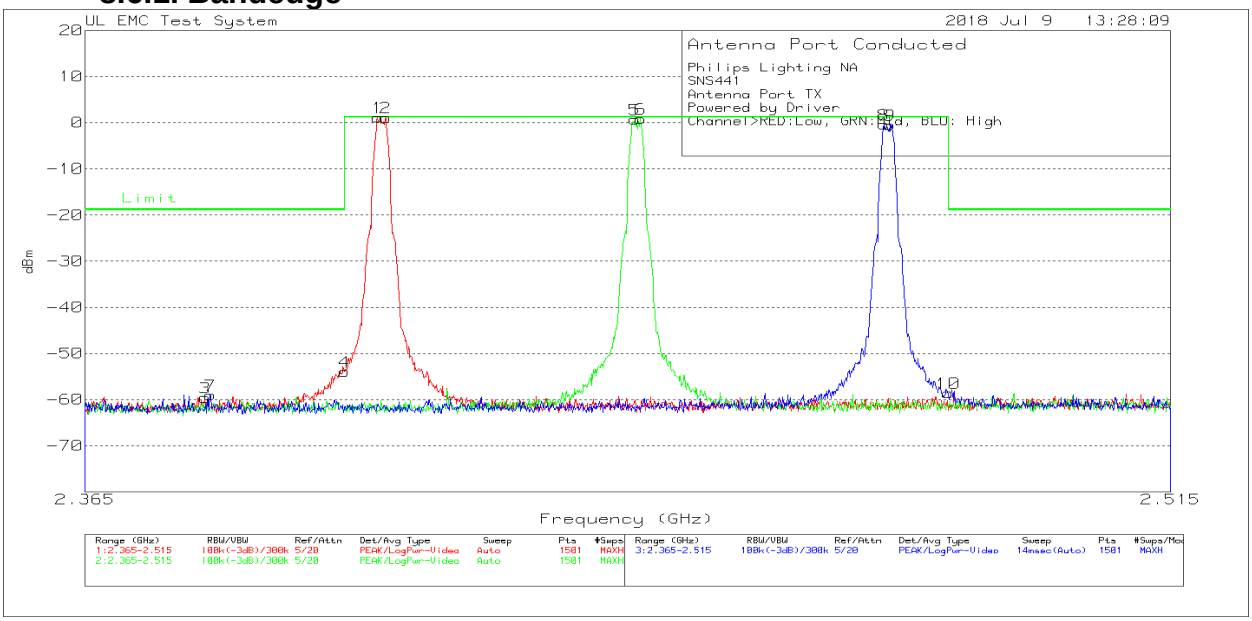
FCC §15.247 (d)

RSS-247 5.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

RESULTS

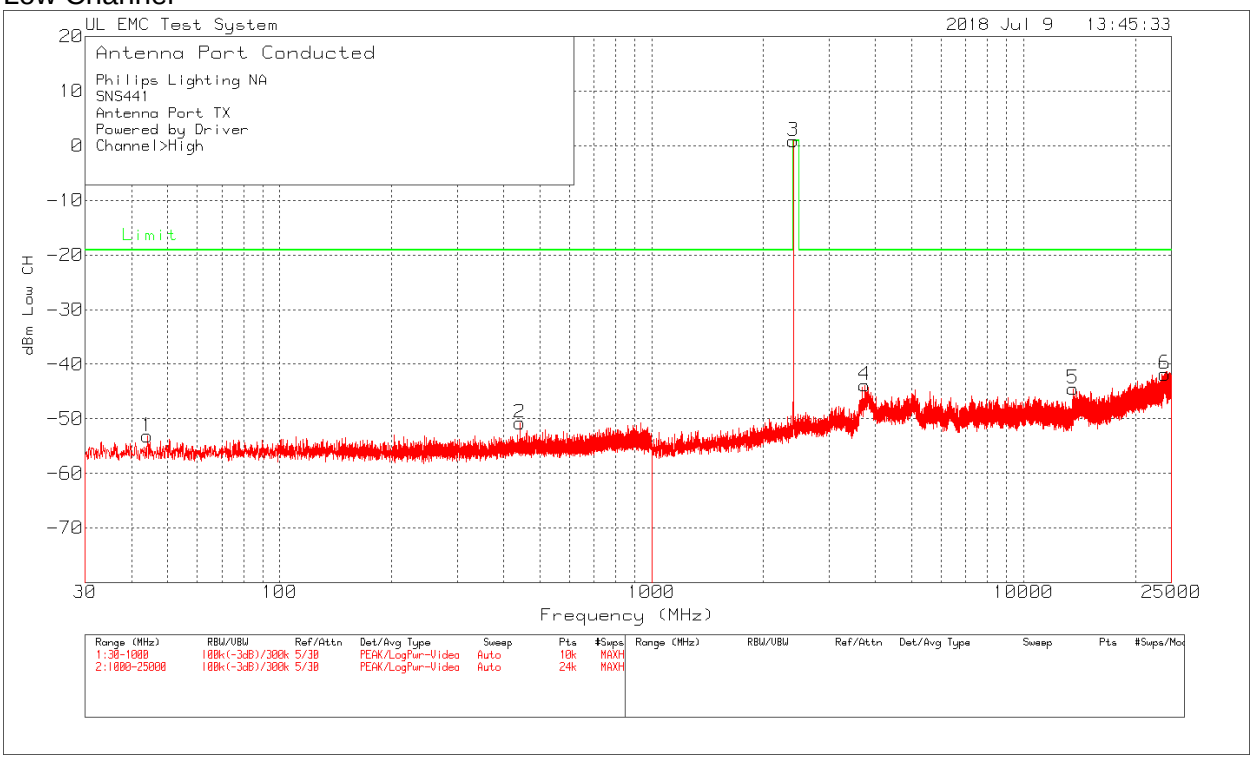
8.6.1. Bandedge



Philips Lighting NA							
SNS441							
Antenna Port TX							
Powered by Driver							
Channel>RED:Low, GRN:Mid, BLU: High							
Trace MArkers							
Marker No.	Test Frequency (GHz)	Meter Reading (dBm)	Detector	Path Factor dB	Level dBm	Limit dBm	Margin (dB)
Low Channel							
1	2.4045	-9.31	Pk	10.5	1.19	1.19	0
2	2.4056	-9.4	Pk	10.5	1.1	1.19	-0.09
3	2.3811	-70.09	Pk	10.5	-59.59	-18.81	-40.78
4	2.4	-64.44	Pk	10.5	-53.94	-18.81	-35.13
Middle Channel							
5	2.4398	-9.75	Pk	10.5	0.75	1.19	-0.44
6	2.4406	-9.65	Pk	10.5	0.85	1.19	-0.34
High Channel							
7	2.3818	-69.53	Pk	10.5	-59.03	-18.81	-40.22
8	2.4745	-10.85	Pk	10.5	-0.35	1.19	-1.54
9	2.4753	-10.97	Pk	10.5	-0.47	1.19	-1.66
10	2.4835	-69.12	Pk	10.5	-58.62	-18.81	-39.81
Pk - Peak detector							

8.6.1. 30MHz-26GHz

Low Channel



Philips Lighting NA

SNS441

Antenna Port TX

Powered by Driver

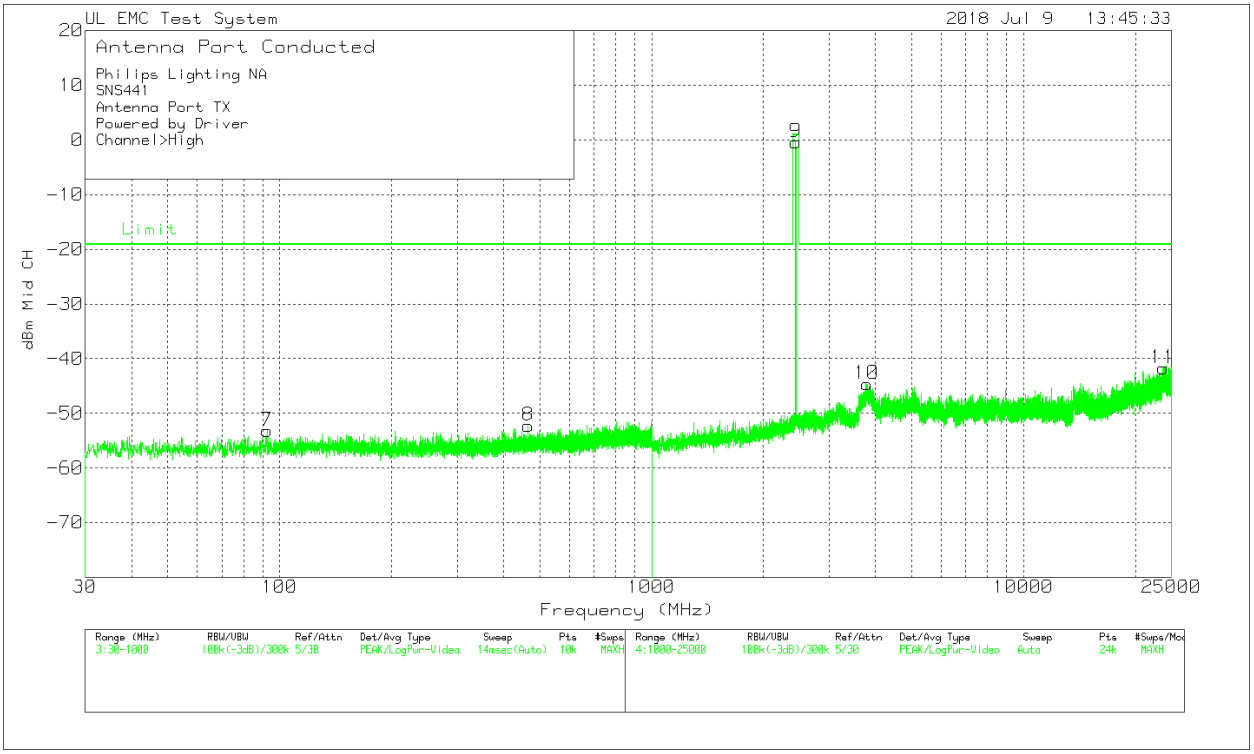
Channel>High

Trace MArkers

Marker No.	Test Frequency (MHz)	Meter Reading (dBm)	Detector	Path Factor dB	Level dBm	Limit dBm	Margin (dB)
1	44.0665	-63.25	Pk	10.1	-53.2	-19.1	-34.02
2	442.8746	-60.86	Pk	10.1	-50.8	-19.1	-31.63
3	2406	-9.63	Pk	10.5	0.87	0.87	0
4	3745	-54.66	Pk	10.8	-43.9	-19.1	-24.73
5	13608	-55.8	Pk	11.3	-44.5	-19.1	-25.37
6	23950	-53.53	Pk	11.7	-41.8	-19.1	-22.7

Pk - Peak detector

Middle Channel

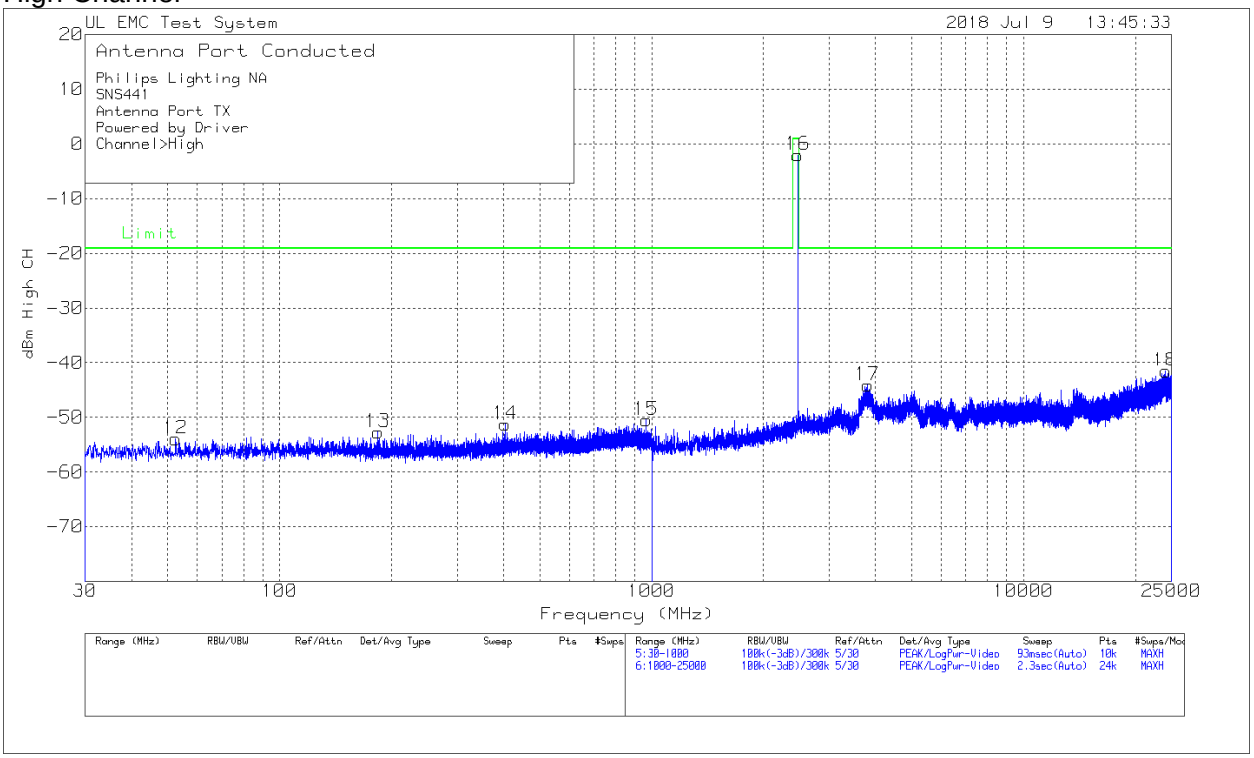


Philips Lighting NA
SNS441
Antenna Port TX
Powered by Driver
Channel>High
Trace MArkers

Marker No.	Test Frequency (MHz)	Meter Reading (dBm)	Detector	Path Factor dB	Level dBm	Limit dBm	Margin (dB)
7	92.3774	-63.28	Pk	10.1	-53.2	-19.1	-34.05
8	465.6719	-62.39	Pk	10.1	-52.3	-19.1	-33.16
9	2440	-10.88	Pk	10.5	-0.38	0.87	-1.25
10	3793	-55.43	Pk	10.8	-44.6	-19.1	-25.5
11	23726	-53.41	Pk	11.7	-41.7	-19.1	-22.58

Pk - Peak detector

High Channel



Philips Lighting NA

SNS441

Antenna Port TX

Powered by Driver

Channel>High

Trace MArkers

Marker No.	Test Frequency (MHz)	Meter Reading (dBm)	Detector	Path Factor dB	Level dBm	Limit dBm	Margin (dB)
12	52.5063	-64.04	Pk	10.1	-53.9	-19.1	-34.81
13	183.7609	-62.79	Pk	10.1	-52.7	-19.1	-33.56
14	403.9736	-61.36	Pk	10.1	-51.3	-19.1	-32.13
15	967.8927	-60.7	Pk	10.2	-50.5	-19.1	-31.37
16	2475	-12.55	Pk	10.5	-2.05	0.87	-2.92
17	3808	-54.91	Pk	10.8	-44.1	-19.1	-24.98
18	24110	-53.14	Pk	11.6	-41.5	-19.1	-22.41

Pk - Peak detector

9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters for frequencies 9kHz-30MHz and 1GHz-25GHz. For frequencies 9kHz-30MHz the limit was extrapolated to 3m distance using the 40*log(d1/d2). For frequencies 30MHz-1GHz the antenna distance is 10m and the levels are extrapolated to distance of 3m using the 20*log(d1/d2). The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

Although for 9kHz-30MHz tests were performed at a test site other than an open area test site, adequate comparison measurements were confirmed against an open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788. See data in section **Error! Reference source not found.**.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

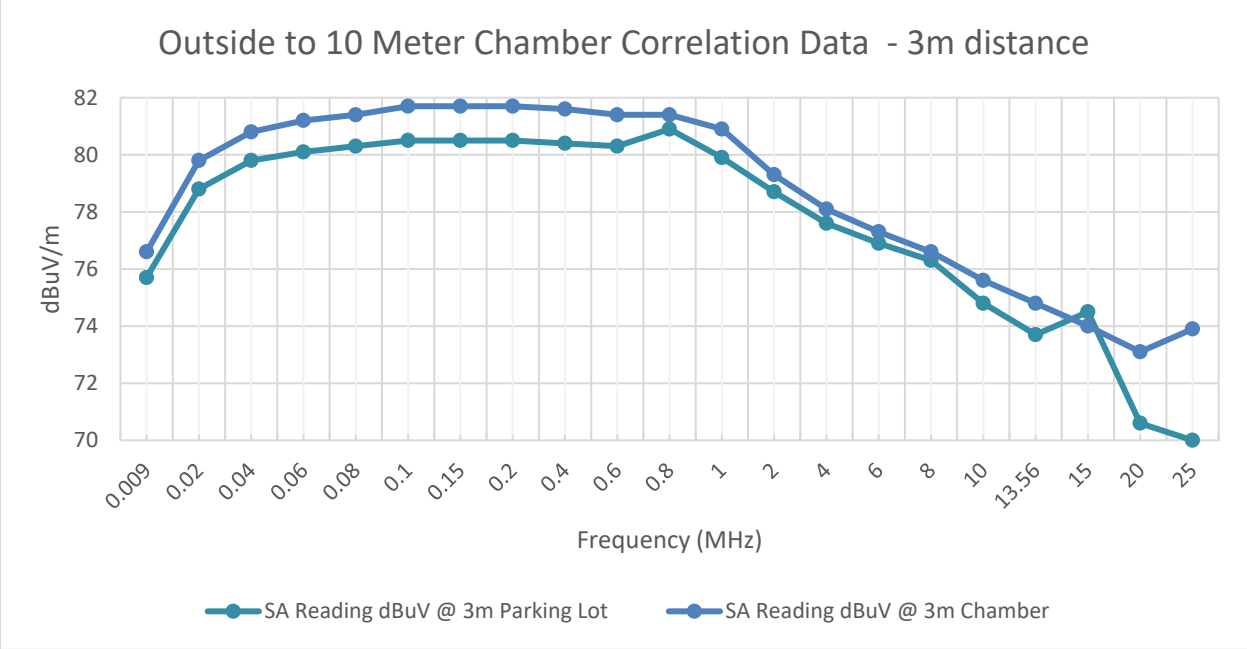
The spectrum from30MHz to 25 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. For frequencies 9kHz-30MHz random channels was used.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions. For frequencies 9kHz-30MHz no height scan was conducted.

9.2. TRANSMITTER 9kHz – 30MHz

9.2.1. Outdoor to 10m SAC Correlation Data

Correlation Data for measurements 9kHz-30MHz between Outside and 10m semi-anechoic chamber at Underwriter Laboratories in Northbrook, IL.



Correlation measurements were conducted using a signal source with an antenna outside in open area (parking lot). Immediately following the measurements the same setup was moved inside the 10 meter semi-anechoic chamber and the measurements were repeated. The above plot shows the difference in levels measured between outside and the 10 meter semi anechoic chamber.

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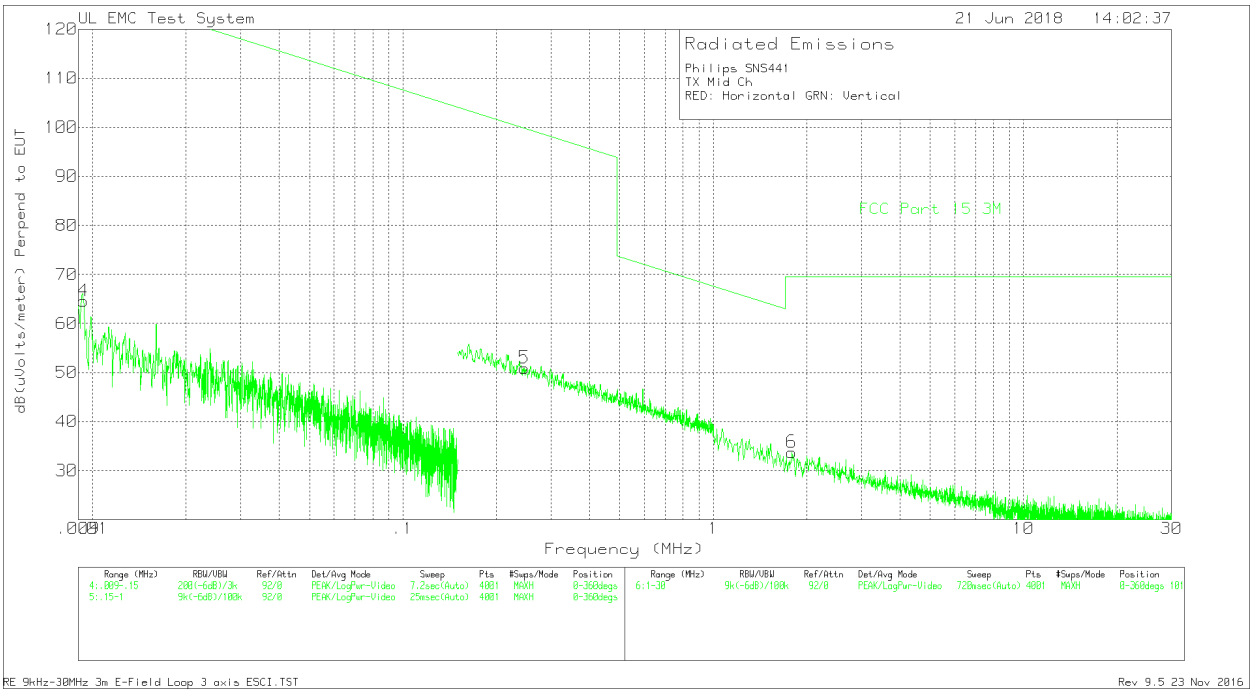
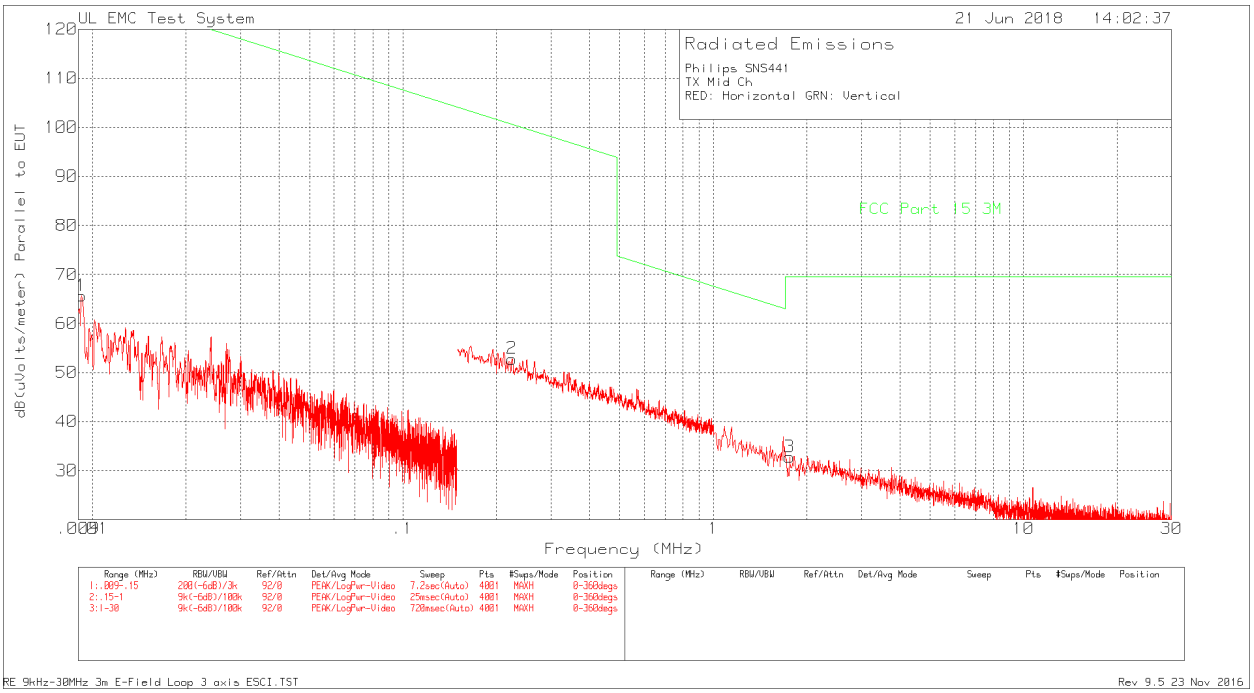
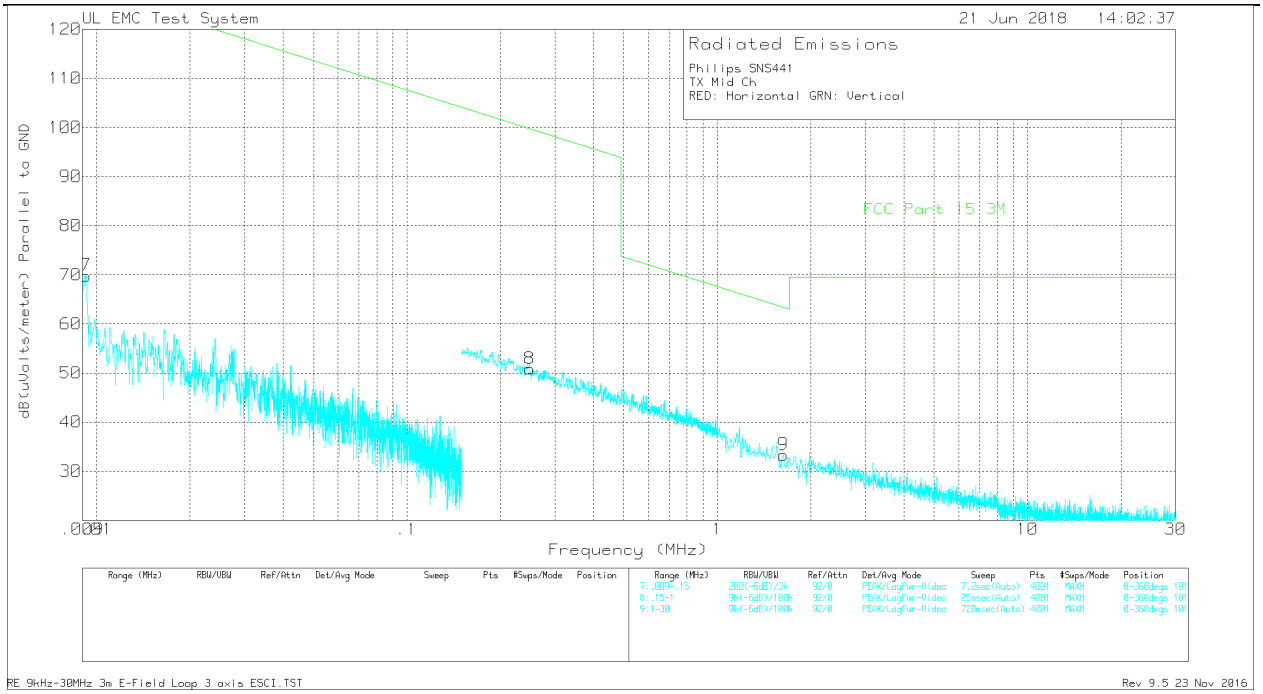
9.2.2. Radiated Emissions 9kHz-30MHz



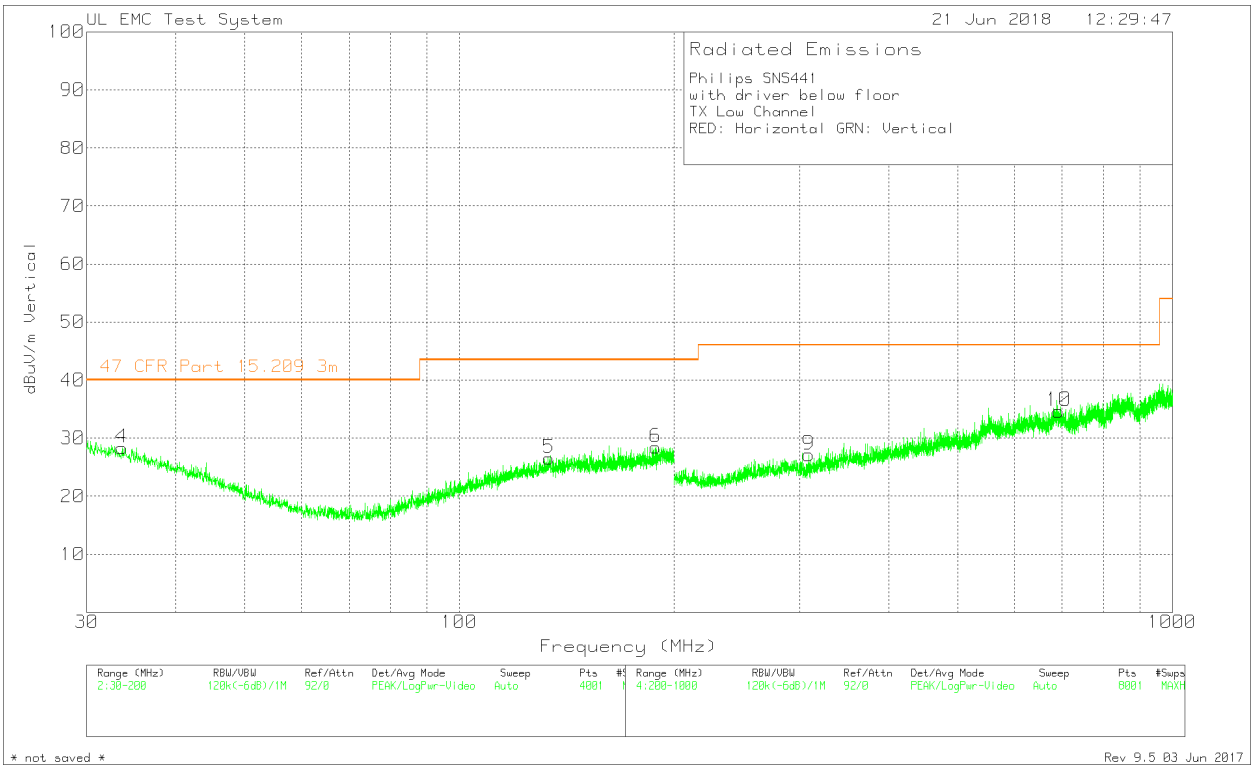


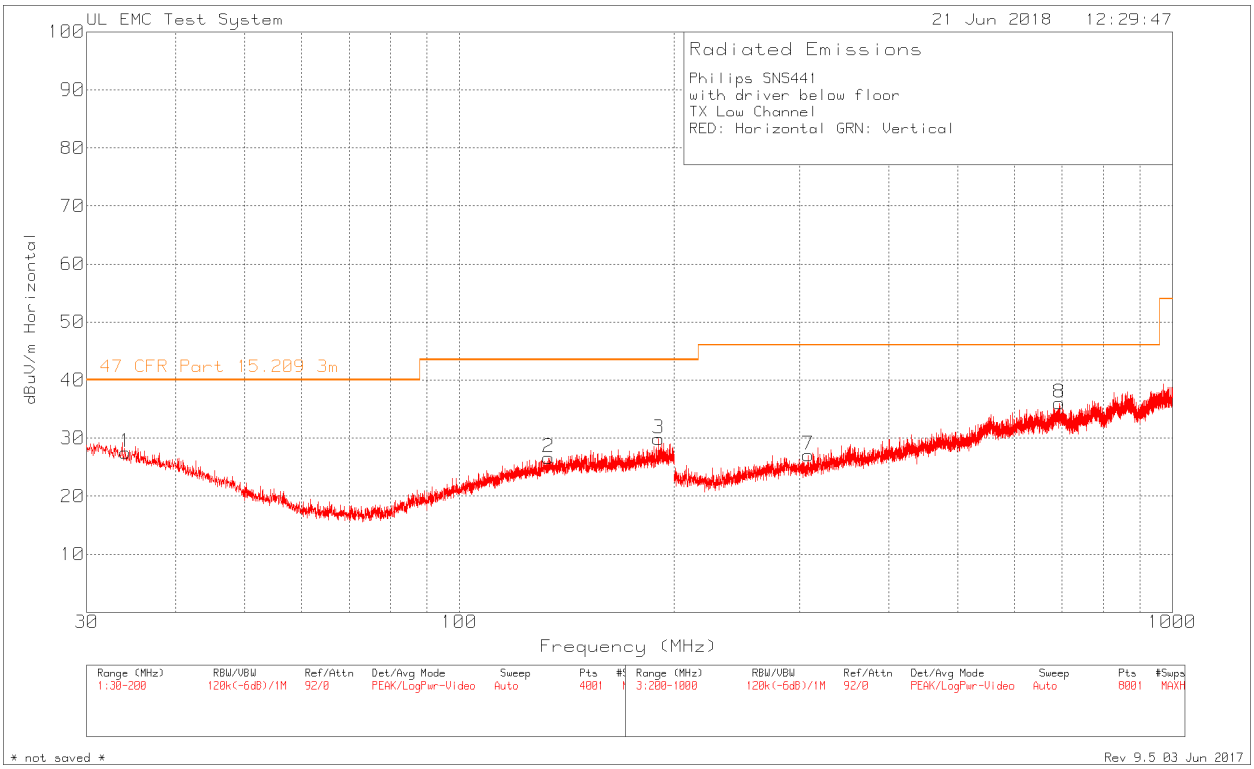


Philips SNS441										
TX Mid Ch										
RED: Horizontal GRN: Vertical										
Trace Markers										
Marker No.	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	FCC Part 15 3M	Margin (dB)	Azimuth [Degs]	Height [cm]
Parallel to EUT										
1	0.00921	42.55	Pk	23.1	0	65.65	128.3	-62.65	0-360	101
2	0.22476	40.9	Pk	11.8	0.1	52.8	100.6	-47.77	0-360	101
3	1.76125	20.43	Pk	12.2	0.1	32.73	69.54	-36.81	0-360	101
Perpendicular to EUT										
4	0.00935	41.43	Pk	23.1	0	64.53	128.2	-63.64	0-360	101
5	0.24606	39.01	Pk	11.8	0.1	50.91	99.78	-48.87	0-360	101
6	1.79025	21.44	Pk	12.2	0.1	33.74	69.54	-35.8	0-360	101
Parallel to Ground										
7	0.009245	46.73	Pk	23.1	0	69.83	128.3	-58.44	0-360	101
8	0.24883	38.99	Pk	11.8	0.1	50.89	99.68	-48.79	0-360	101
9	1.63075	21.04	Pk	12.2	0.1	33.34	63.36	-30.02	0-360	101
Pk - Peak detector										

9.3. TRANSMITTER 30MHz – 1GHz

9.3.1. Low Channel





Philips SNS441
with driver below floor
TX Low Channel
RED: Horizontal GRN: Vertical

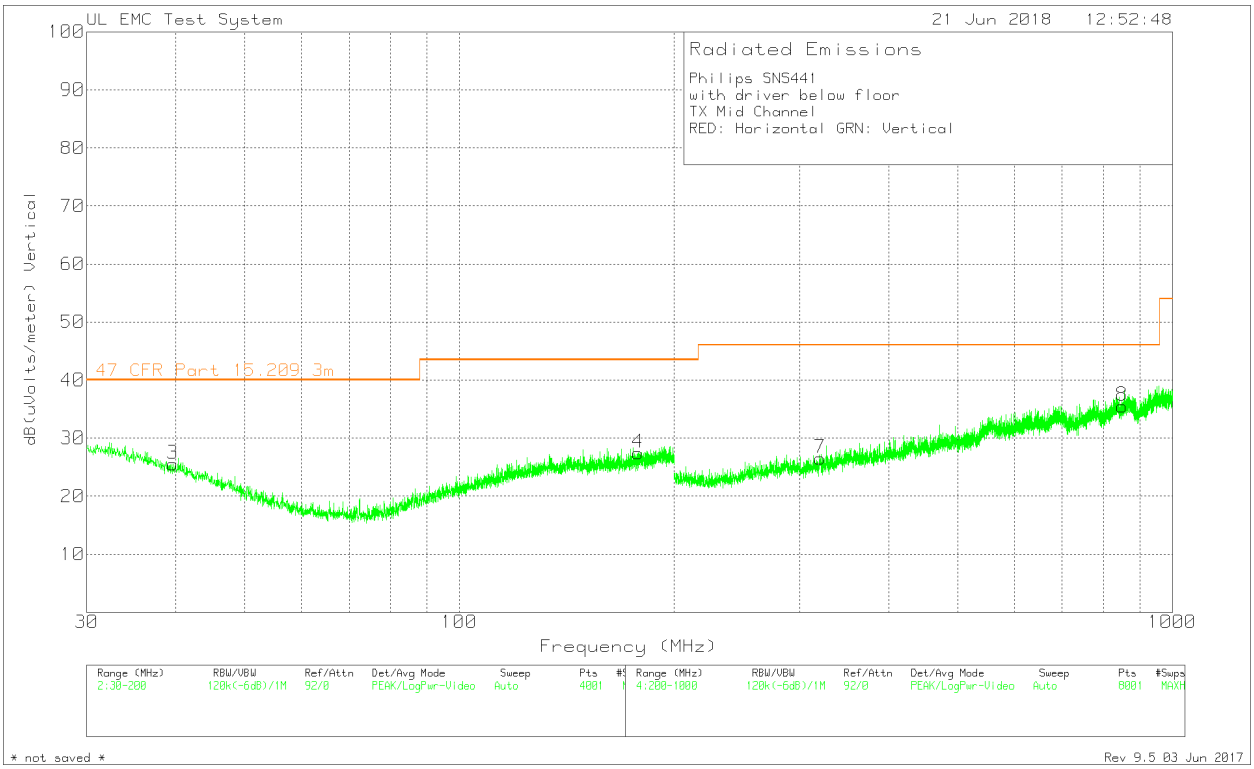
Trace Markers

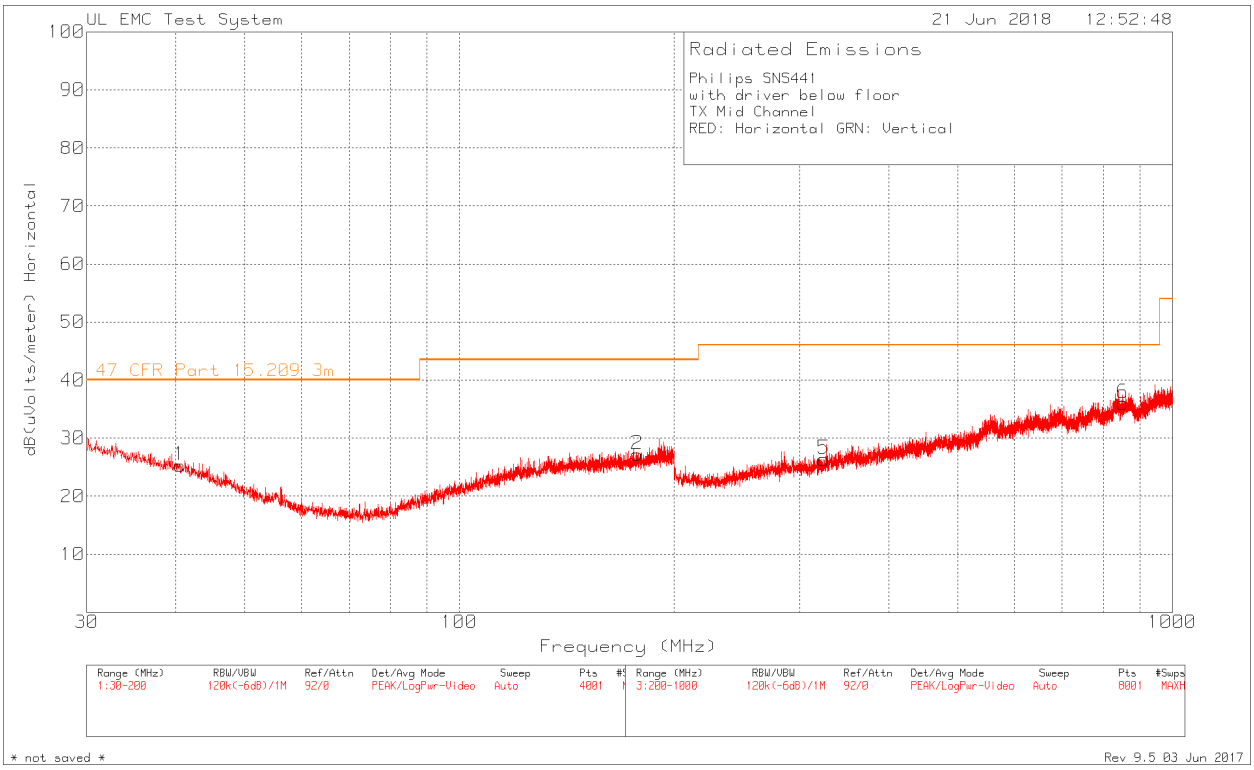
No.	Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading dBuV/m	Limit:1
1	33.995	30.75dBuV Pk	16.7	-19.9	27.55	40
		Azimuth:0-360	Height:398		Margin (dB)	-12.45
2	133.3175	31.41dBuV Pk	14.3	-19.1	26.61	43.52
		Azimuth:0-360	Height:102		Margin (dB)	-16.91
3	190.2675	32.51dBuV Pk	16	-18.6	29.91	43.52
		Azimuth:0-360	Height:398		Margin (dB)	-13.61
4	33.6125	31.13dBuV Pk	16.8	-19.6	28.33	40
		Azimuth:0-360	Height:251		Margin (dB)	-11.67
5	133.53	31.21dBuV Pk	14.3	-19	26.51	43.52
		Azimuth:0-360	Height:398		Margin (dB)	-17.01
6	188.525	31.07dBuV Pk	16	-18.6	28.47	43.52
		Azimuth:0-360	Height:102		Margin (dB)	-15.05
7	308.6	31.87dBuV Pk	13.3	-18.1	27.07	46.02
		Azimuth:0-360	Height:99		Margin (dB)	-18.95
8	694.1	31.13dBuV Pk	21.1	-16.2	36.03	46.02
		Azimuth:0-360	Height:299		Margin (dB)	-9.99
9	309	32.05dBuV Pk	13.3	-18.2	27.15	46.02
		Azimuth:0-360	Height:399		Margin (dB)	-18.87
10	692.8	30.37dBuV Pk	21.1	-16.8	34.67	46.02
		Azimuth:0-360	Height:102		Margin (dB)	-11.35

LIMIT 1: 47 CFR Part 15.209 3m
Pk - Peak detector

UL LLC
333 Pfingsten Rd, Northbrook, IL 60062, USA TEL: (847) 272-8800

9.3.2. Middle Channel





Philips SNS441
with driver below floor
TX Mid Channel
RED: Horizontal GRN: Vertical

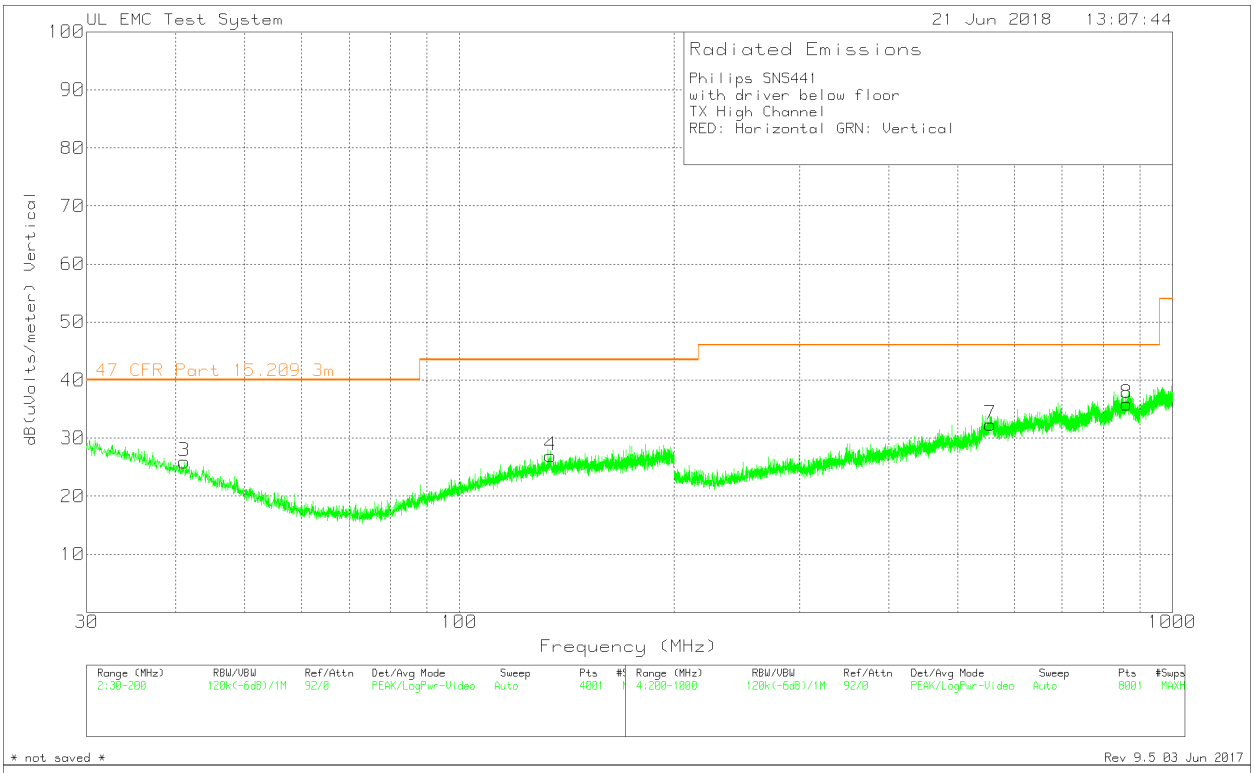
Trace Markers

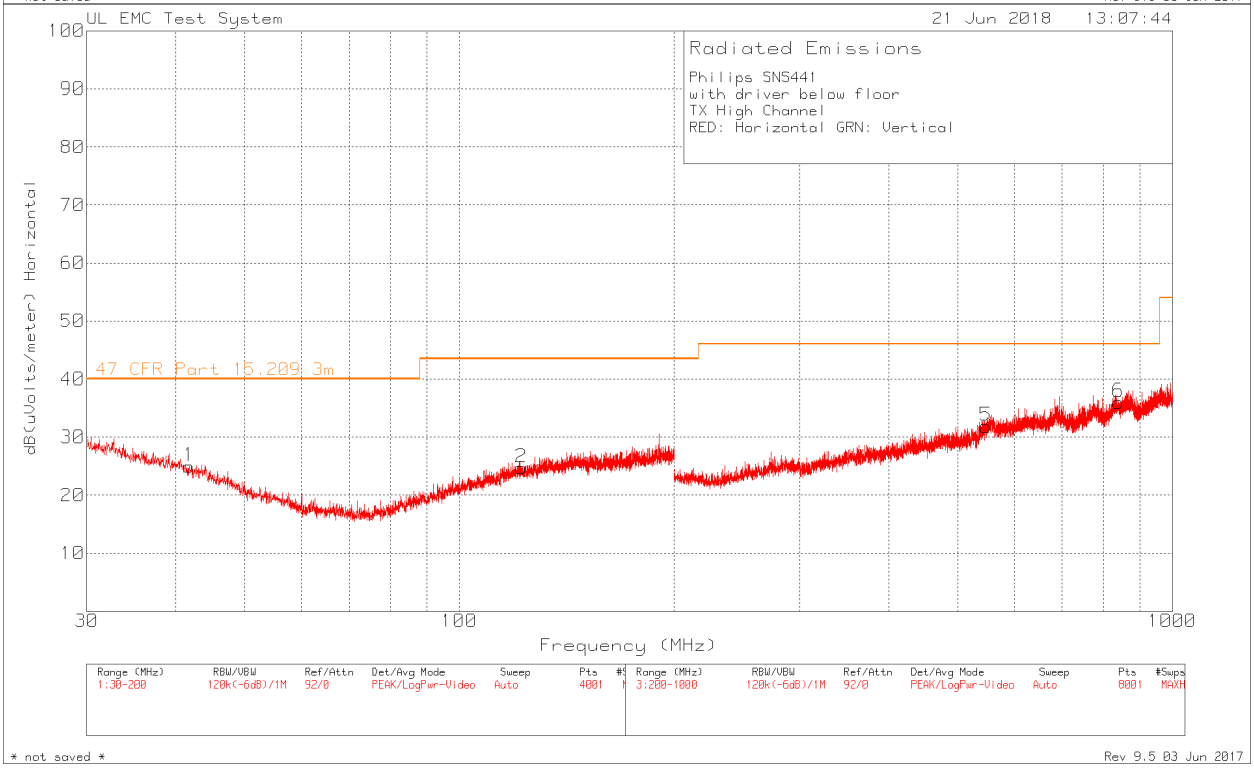
No.	Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading dB	Limit:1 (uVolts/meter)
1	40.54	30.71dBuV Pk	14	-19.4	25.31	40
		Azimuth:0-360	Height:398		Margin (dB)	-14.69
2	177.56	30.19dBuV Pk	15.6	-18.6	27.19	43.52
		Azimuth:0-360	Height:102		Margin (dB)	-16.33
3	39.605	30.94dBuV Pk	14.4	-19.8	25.54	40
		Azimuth:0-360	Height:398		Margin (dB)	-14.46
4	178.0275	30.63dBuV Pk	15.6	-18.8	27.43	43.52
		Azimuth:0-360	Height:101		Margin (dB)	-16.09
5	324.4	30.45dBuV Pk	13.9	-18	26.35	46.02
		Azimuth:0-360	Height:102		Margin (dB)	-19.67
6	851.8	29.81dBuV Pk	22.7	-16.5	36.01	46.02
		Azimuth:0-360	Height:299		Margin (dB)	-10.01
7	320.7	30.75dBuV Pk	13.9	-18.1	26.55	46.02
		Azimuth:0-360	Height:399		Margin (dB)	-19.47
8	850.8	29.94dBuV Pk	22.7	-17.1	35.54	46.02
		Azimuth:0-360	Height:399		Margin (dB)	-10.48

LIMIT 1: 47 CFR Part 15.209 3m
Pk - Peak detector

UL LLC
333 Pfingsten Rd, Northbrook, IL 60062, USA TEL: (847) 272-8800

9.3.3. High Channel





Philips SNS441
with driver below floor
TX High Channel
RED: Horizontal GRN: Vertical

Trace Markers

No.	Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading	Limit:1 dB(uVolts/meter)
1	41.7725	31.19dBuV Pk	13.5	-19.7	24.99	40
		Azimuth:0-360	Height:398		Margin (dB)	-15.01
2	122.055	30.81dBuV Pk	13.5	-19.6	24.71	43.52
		Azimuth:0-360	Height:398		Margin (dB)	-18.81
3	41.0925	31.63dBuV Pk	13.8	-19.5	25.93	40
		Azimuth:0-360	Height:102		Margin (dB)	-14.07
4	134.2525	31.88dBuV Pk	14.3	-19.2	26.98	43.52
		Azimuth:0-360	Height:398		Margin (dB)	-16.54
5	547.3	29.57dBuV Pk	19.6	-17.3	31.87	46.02
		Azimuth:0-360	Height:299		Margin (dB)	-14.15
6	839.4	30.01dBuV Pk	23.1	-17.1	36.01	46.02
		Azimuth:0-360	Height:399		Margin (dB)	-10.01
7	555.4	29.25dBuV Pk	20.1	-17	32.35	46.02
		Azimuth:0-360	Height:299		Margin (dB)	-13.67
8	863	29.51dBuV Pk	23.4	-17	35.91	46.02
		Azimuth:0-360	Height:199		Margin (dB)	-10.11

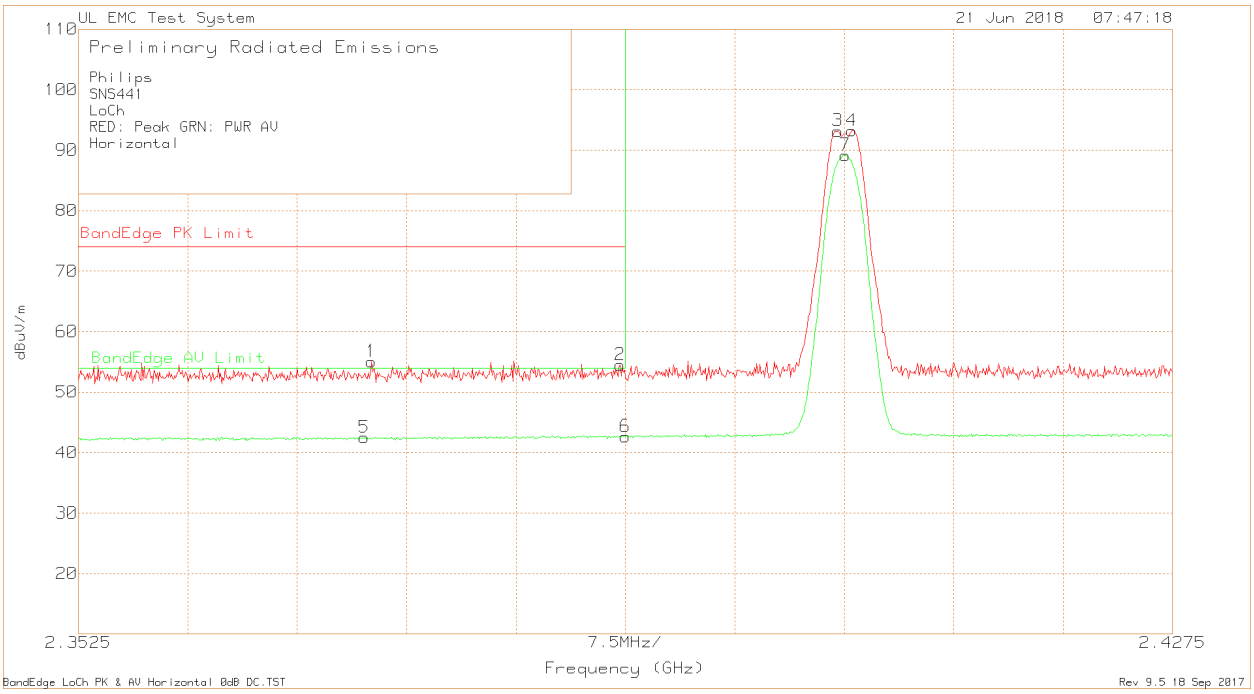
LIMIT 1: 47 CFR Part 15.209 3m
Pk - Peak detector

UL LLC
333 Pfingsten Rd, Northbrook, IL 60062, USA TEL: (847) 272-8800

9.4. TRANSMITTER 1GHz – 25GHz

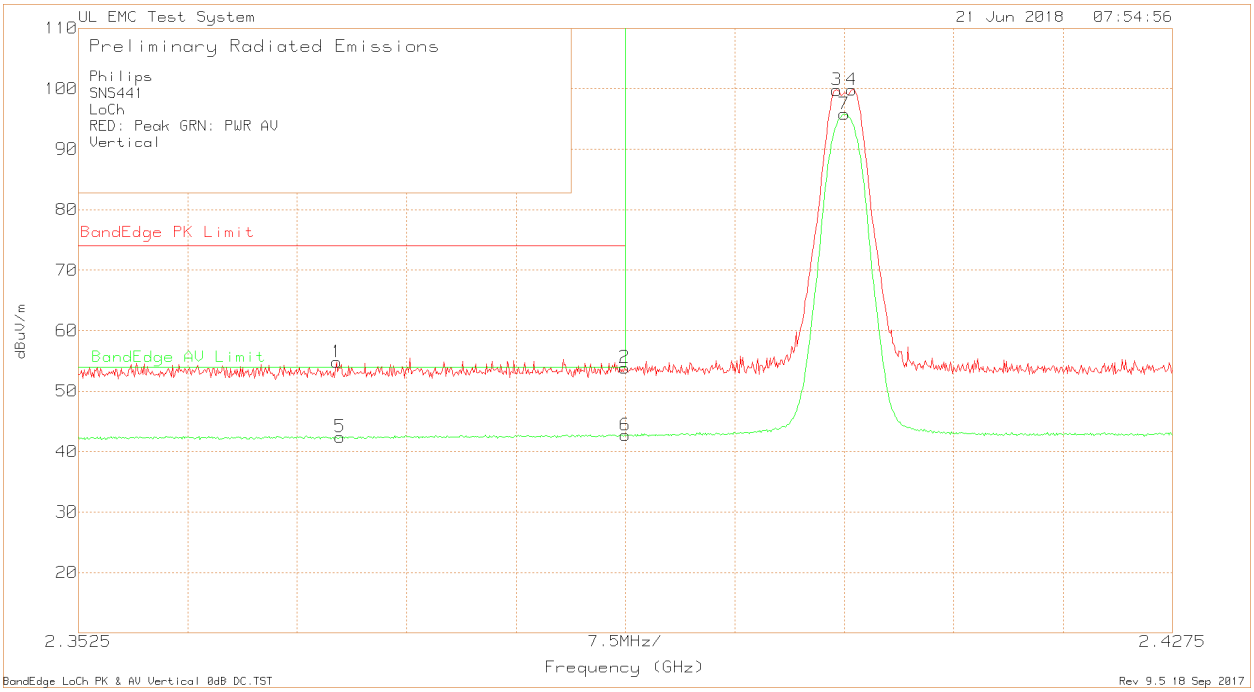
9.4.1. Low Channel

Band Edge Data – Horizontal



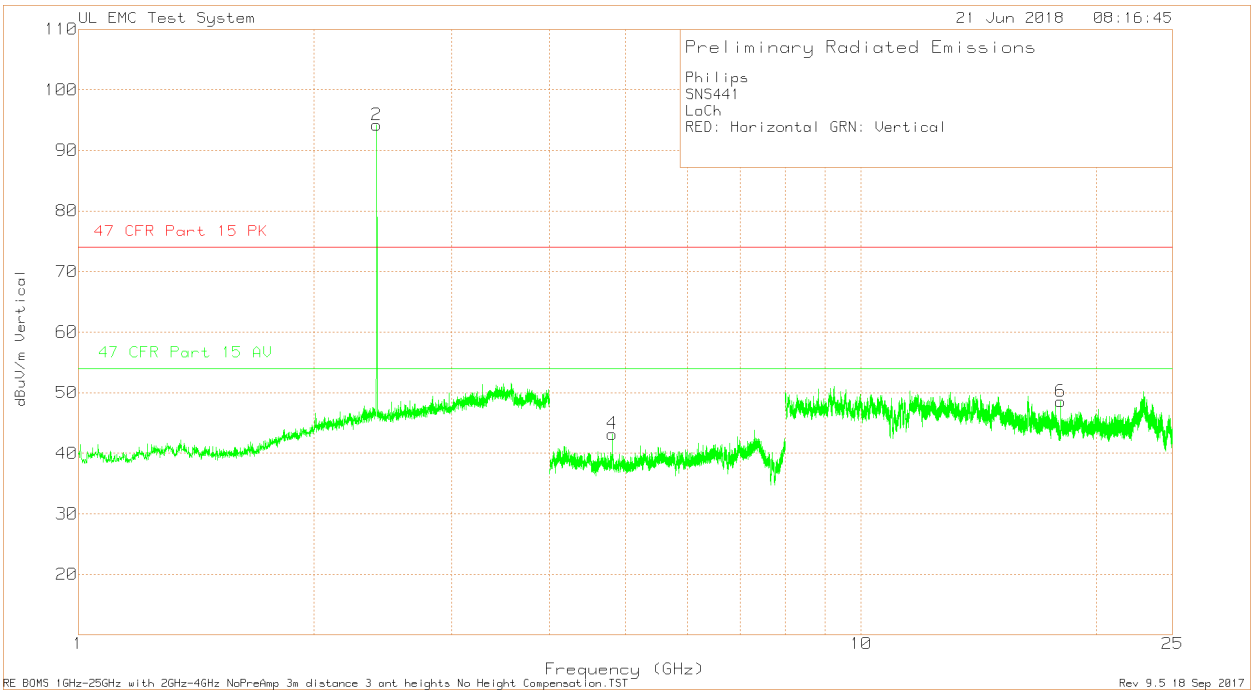
Philips													
SNS441													
LoCh													
RED: Peak GRN: PWR AV													
Horizontal													
Trace MArkers													
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	BandEdge PK Limit dBuV/m	Margin (dB)	BandEdge AV Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.3726	28.6	Pk	21.8	4.65	55.05	74	-18.95	-	-	246	110	H
2	2.3896	27.93	Pk	21.8	4.78	54.51	74	-19.49	-	-	246	110	H
3	2.4046	66.69	Pk	21.8	4.68	93.17	-	-	-	-	246	110	H
4	2.4055	66.72	Pk	21.8	4.68	93.2	-	-	-	-	246	110	H
5	2.3721	16.06	Av	21.8	4.65	42.51	-	-	54	-11.49	246	110	H
6	2.39	16.05	Av	21.8	4.79	42.64	-	-	54	-11.36	246	110	H
7	2.4051	62.69	Av	21.8	4.68	89.17	-	-	-	-	246	110	H
Pk - Peak detector													
Av - Average detector													

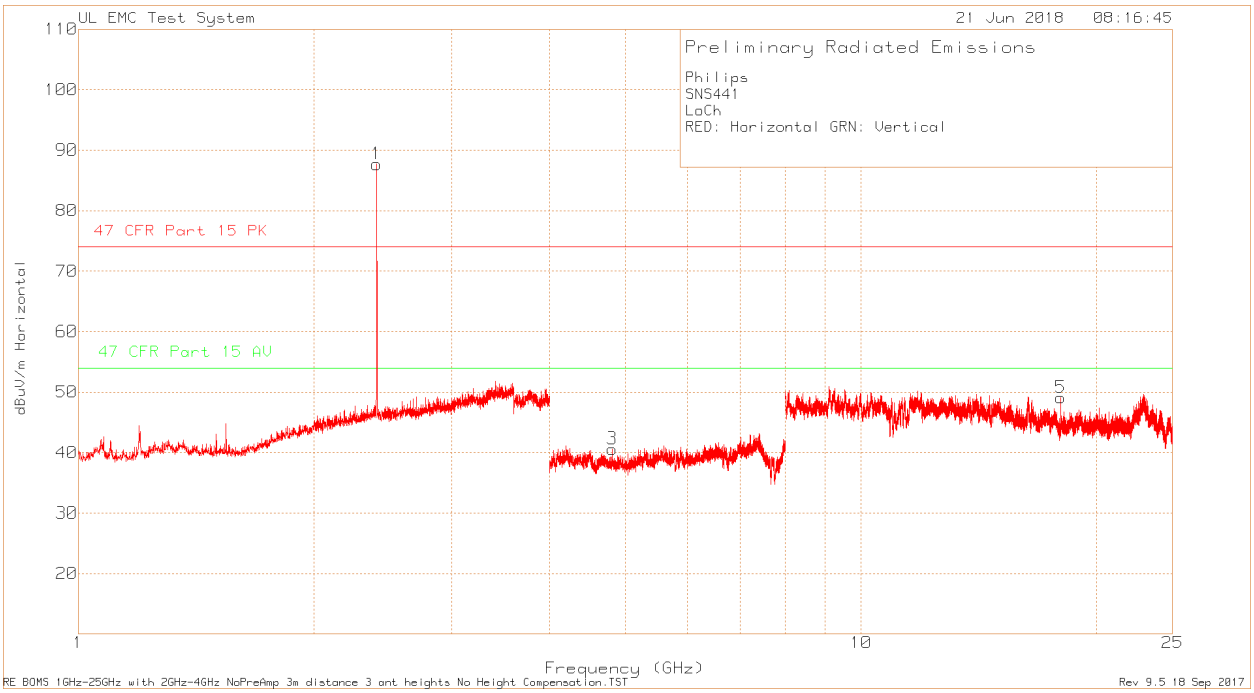
Band Edge Data - Vertical



Philips													
SNS441													
LoCh													
RED: Peak GRN: PWR AV													
Vertical													
Trace MArkers													
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	BandEdge PK Limit dBuV/m	Margin (dB)	BandEdge AV Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.3702	28.36	Pk	21.8	4.64	54.8	74	-19.2	-	-	269	119	V
2	2.3899	27.29	Pk	21.8	4.79	53.88	74	-20.12	-	-	269	119	V
3	2.4045	73.29	Pk	21.8	4.68	99.77	-	-	-	-	269	119	V
4	2.4055	73.31	Pk	21.8	4.68	99.79	-	-	-	-	269	119	V
5	2.3704	16	Av	21.8	4.64	42.44	-	-	54	-11.56	269	119	V
6	2.39	16.11	Av	21.8	4.79	42.7	-	-	54	-11.3	269	119	V
7	2.405	69.32	Av	21.8	4.68	95.8	-	-	-	-	269	119	V
Pk - Peak detector													
Av - Average Detector													

Spurious Emissions 1GHz – 25GHz

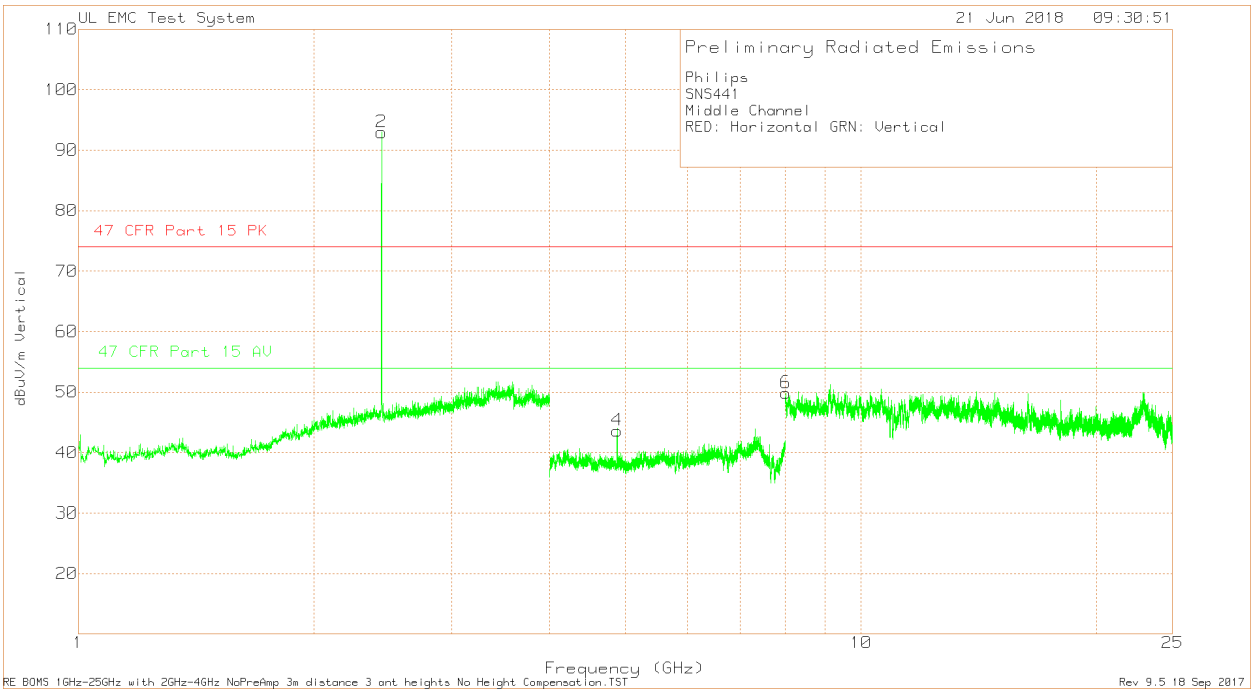


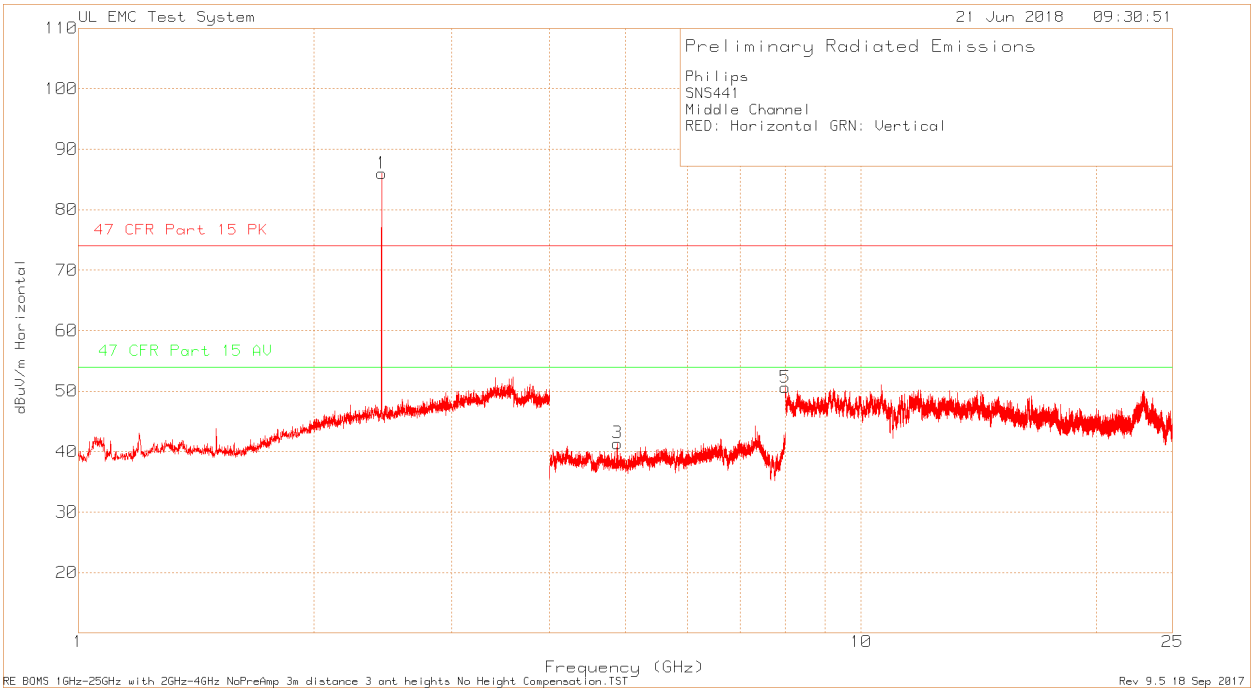


Philips													
SNS441													
LoCh													
RED: Horizontal GRN: Vertical													
Trace MArkers													
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	47 CFR Part 15.209 PK Limit dBuV/m	Margin (dB)	47 CFR Part 15.209 Limit AV dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.405	61.2	Pk	21.8	4.68	87.68	-	-	-	-	0-360	150	H
3	4.811	64.35	Pk	27.7	-51.45	40.6	74	-33.4	54	-13.4	0-360	200	H
5	17.997	48.86	Pk	40.1	-39.89	49.07	74	-24.93	54	-4.93	0-360	150	H
2	2.404	67.71	Pk	21.8	4.69	94.2	-	-	-	-	0-360	100	V
4	4.809	66.96	Pk	27.7	-51.46	43.2	74	-30.8	54	-10.8	0-360	150	V
6	17.998	48.26	Pk	40.1	-39.83	48.53	74	-25.47	54	-5.47	0-360	200	V
Pk - Peak detector													

9.4.2. Middle Channel

Spurious Emissions 1GHz – 25GHz

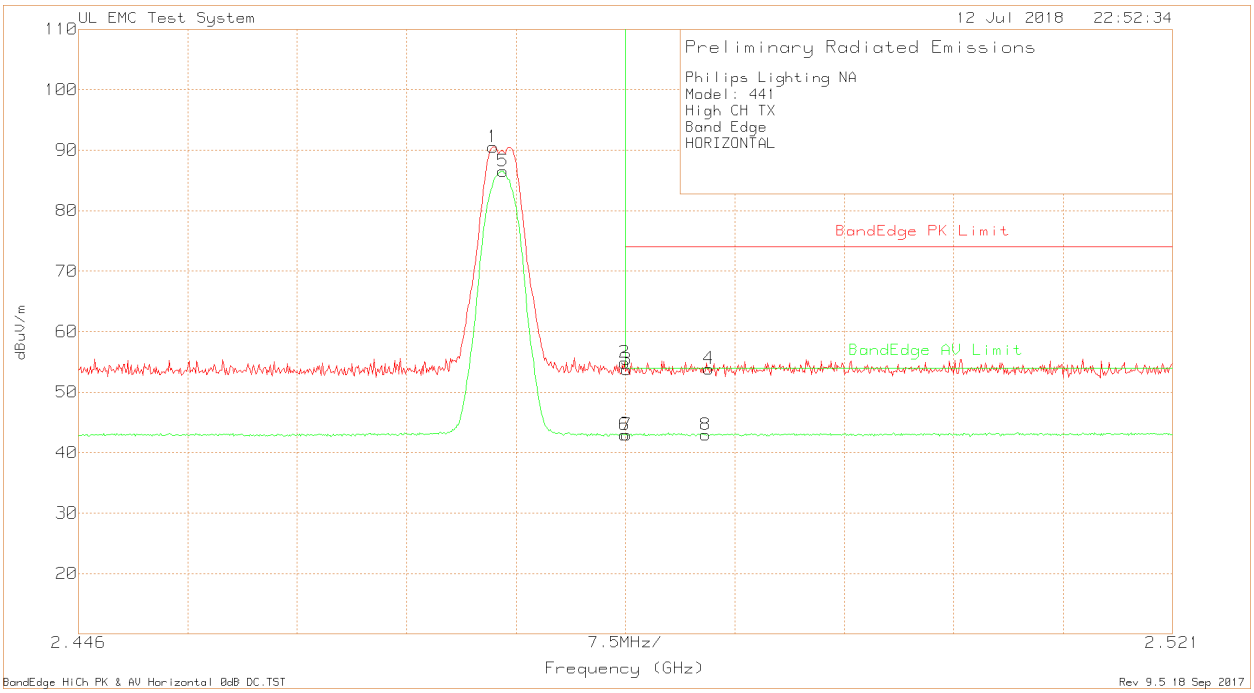




Philips													
SNS441													
Middle Channel													
RED: Horizontal GRN: Vertical													
Trace MArkers													
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	47 CFR Part 15.209 PK Limit dBuV/m	Margin (dB)	47 CFR Part 15.209 Limit AV dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.44	59.48	Pk	21.9	4.61	85.99	-	-	-	-	0-360	100	H
3	4.881	64.45	Pk	27.7	-50.78	41.37	74	-32.63	54	-12.63	0-360	200	H
5	8.005	61.25	Pk	36.1	-46.76	50.59	74	-23.41	54	-3.41	0-360	100	H
2	2.439	66.43	Pk	21.9	4.64	92.97	-	-	-	-	0-360	100	V
4	4.879	66.75	Pk	27.7	-50.81	43.64	74	-30.36	54	-10.36	0-360	150	V
6	8.009	60.42	Pk	36.1	-46.65	49.87	74	-24.13	54	-4.13	0-360	150	V
Pk - Peak detector													

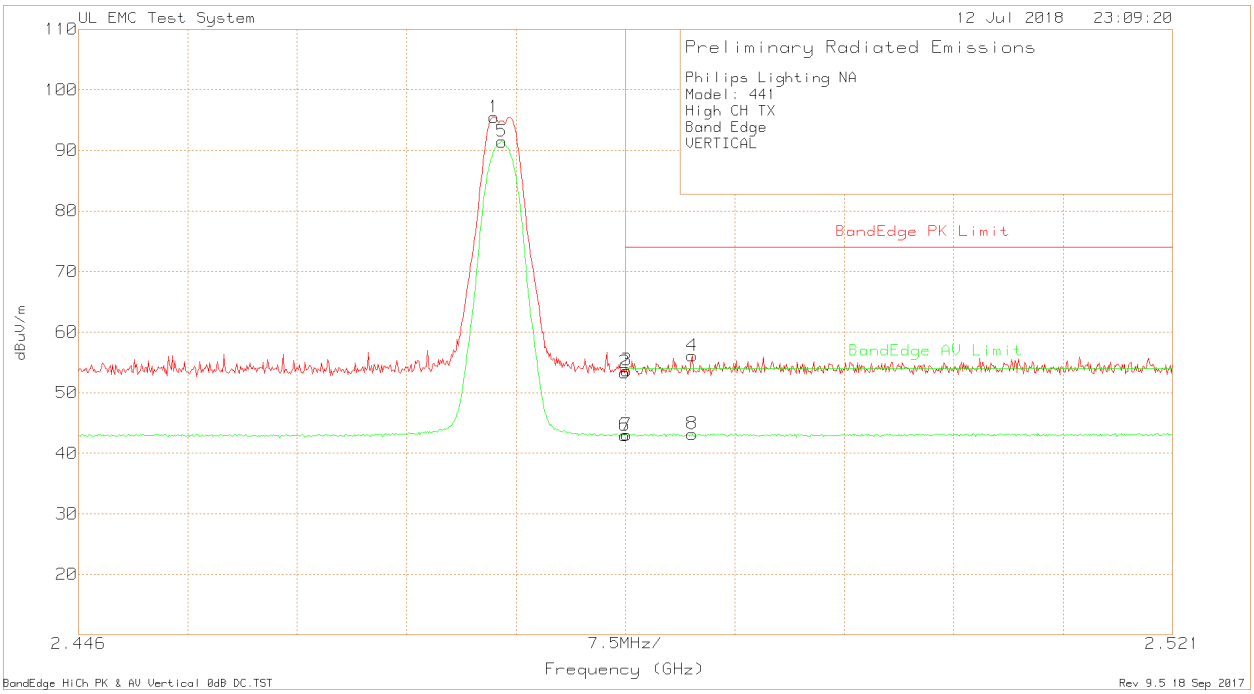
9.4.3. High Channel

Band Edge Data – Horizontal



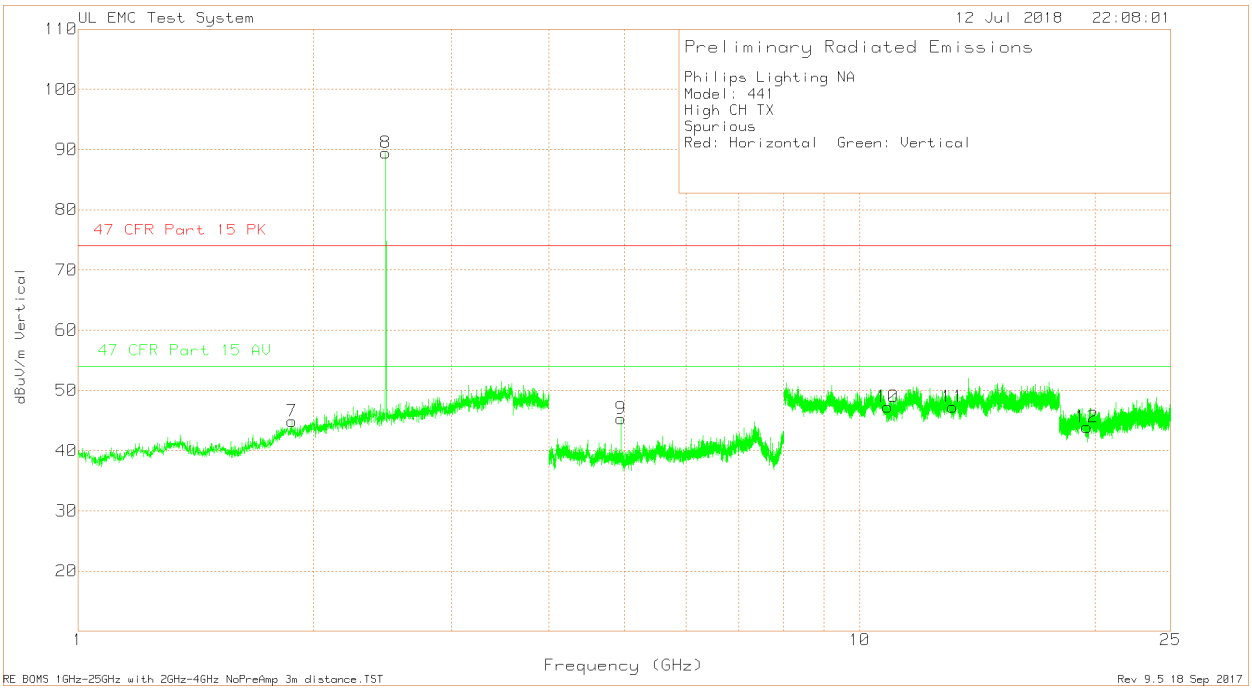
Philips Lighting NA													
Model: 441													
High CH TX													
Band Edge													
HORIZONTAL													
Trace MArkers													
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	BandEdge PK Limit dBuV/m	Margin (dB)	BandEdge AV Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.4744	63.98	Pk	22	4.56	90.54	-	-	-	-	283	234	H
2	2.4834	28.24	Pk	22.1	4.53	54.87	-	-	-	-	283	234	H
3	2.4836	27.1	Pk	22.1	4.53	53.73	74	-20.27	-	-	283	234	H
4	2.4892	27.23	Pk	22.1	4.54	53.87	74	-20.13	-	-	283	234	H
5	2.4751	59.98	Av	22	4.54	86.52	-	-	-	-	283	234	H
6	2.4834	16.34	Av	22.1	4.53	42.97	-	-	-	-	283	234	H
7	2.4836	16.32	Av	22.1	4.53	42.95	-	-	54	-11.05	283	234	H
8	2.489	16.26	Av	22.1	4.54	42.9	-	-	54	-11.1	283	234	H
Pk - Peak detector													
Av - Average Detector													

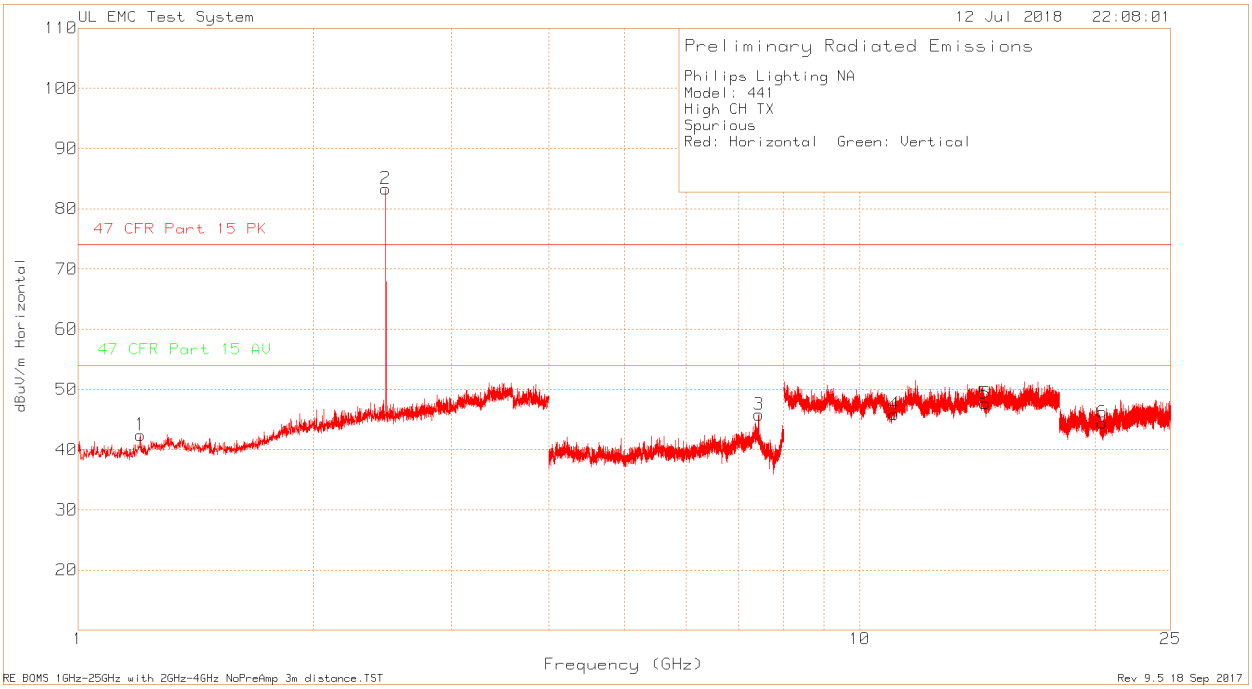
Band Edge Data Vertical



Philips Lighting NA													
Model: 441													
High CH TX													
Band Edge													
VERTICAL													
Trace MArkers													
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	BandEdge PK Limit dBuV/m	Margin (dB)	BandEdge AV Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.4745	68.94	Pk	22	4.56	95.5	-	-	-	-	85	102	V
2	2.4834	26.71	Pk	22.1	4.53	53.34	-	-	-	-	85	102	V
3	2.4836	27.04	Pk	22.1	4.53	53.67	74	-20.33	-	-	85	102	V
4	2.4881	29.44	Pk	22.1	4.54	56.08	74	-17.92	-	-	85	102	V
5	2.475	64.92	Av	22	4.54	91.46	-	-	-	-	85	102	V
6	2.4834	16.35	Av	22.1	4.53	42.98	-	-	-	-	85	102	V
7	2.4836	16.42	Av	22.1	4.53	43.05	-	-	54	-10.95	85	102	V
8	2.4881	16.56	Av	22.1	4.54	43.2	-	-	54	-10.8	85	102	V
Pk - Peak detector													
Av - Average Detector													

Spurious Emissions 1GHz – 25GHz





Philips Lighting NA
Model: 441
High CH TX
Spurious
Red: Horizontal Green: Vertical
Trace MArkers

Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	47 CFR Part 15.209 PK Limit dBuV/m	Margin (dB)	47 CFR Part 15.209 Limit AV dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.201	69.95	Pk	28.1	-55.62	42.43	74	-31.57	54	-11.57	0-360	150	H
2	2.475	56.79	Pk	22	4.55	83.34	-	-	-	-	0-360	150	H
3	7.428	61.6	Pk	30.8	-46.59	45.81	74	-28.19	54	-8.19	0-360	150	H
4	11.079	56.86	Pk	36.5	-47.51	45.85	74	-28.15	54	-8.15	0-360	150	H
5	14.462	48.9	Pk	39.8	-40.99	47.71	74	-26.29	54	-6.29	0-360	150	H
6	20.448	54.02	Pk	40.3	-49.82	44.5	74	-29.5	54	-9.5	0-360	150	H
7	1.877	67.08	Pk	31	-53.21	44.87	74	-29.13	54	-9.13	0-360	150	V
8	2.475	62.92	Pk	22	4.55	89.47	-	-	-	-	0-360	150	V
9	4.949	67	Pk	27.8	-49.51	45.29	74	-28.71	54	-8.71	0-360	150	V
10	10.859	59.01	Pk	36.4	-48.14	47.27	74	-26.73	54	-6.73	0-360	150	V
11	13.151	51.83	Pk	39.8	-44.36	47.27	74	-26.73	54	-6.73	0-360	150	V
12	19.54	55.01	Pk	40.3	-51.41	43.9	74	-30.1	54	-10.1	0-360	150	V

Pk - Peak detector

UL LLC
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10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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.

RESULTS

UL LLC
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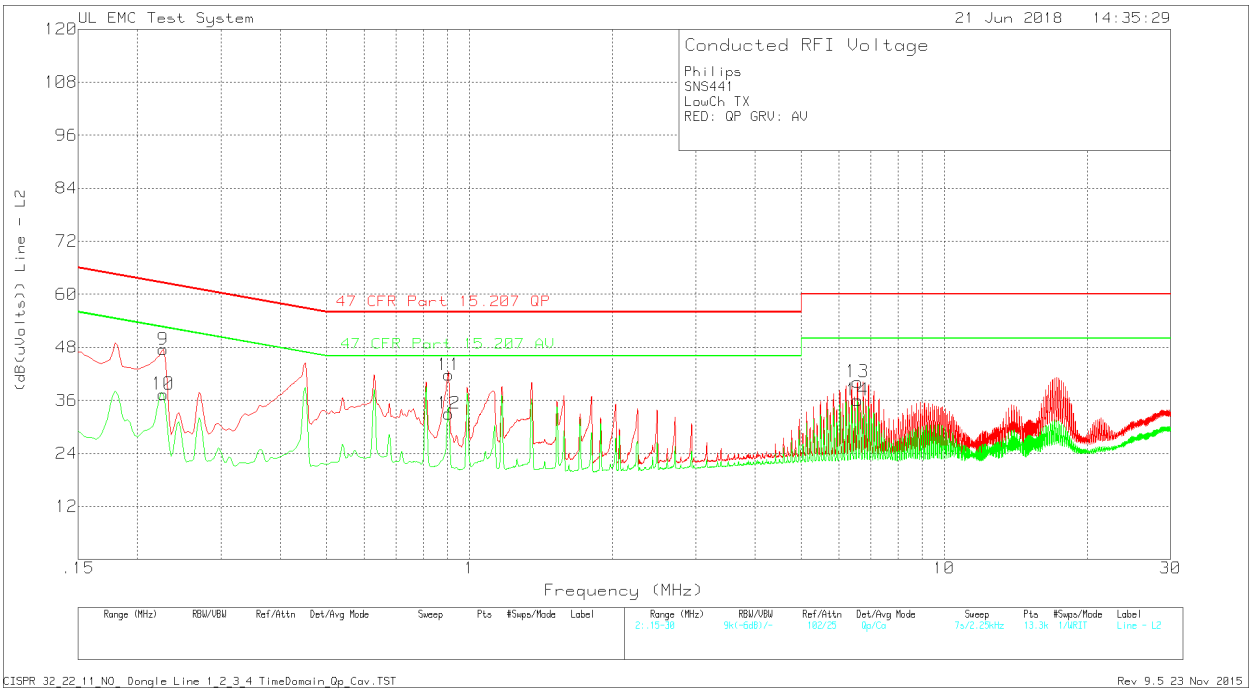
10.1.1. AC Power Line Results – TX Mode / Low Channel



Philips
SNS441
LowCh TX
RED: QP GRV: AV

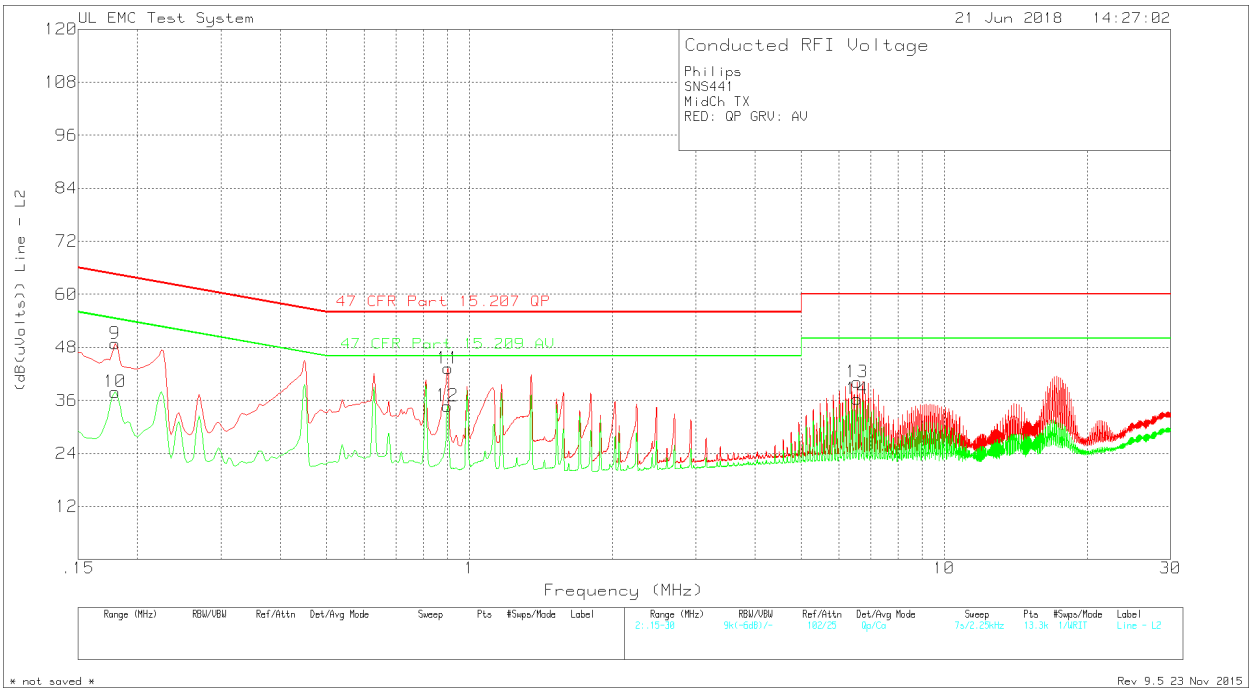
Trace Markers

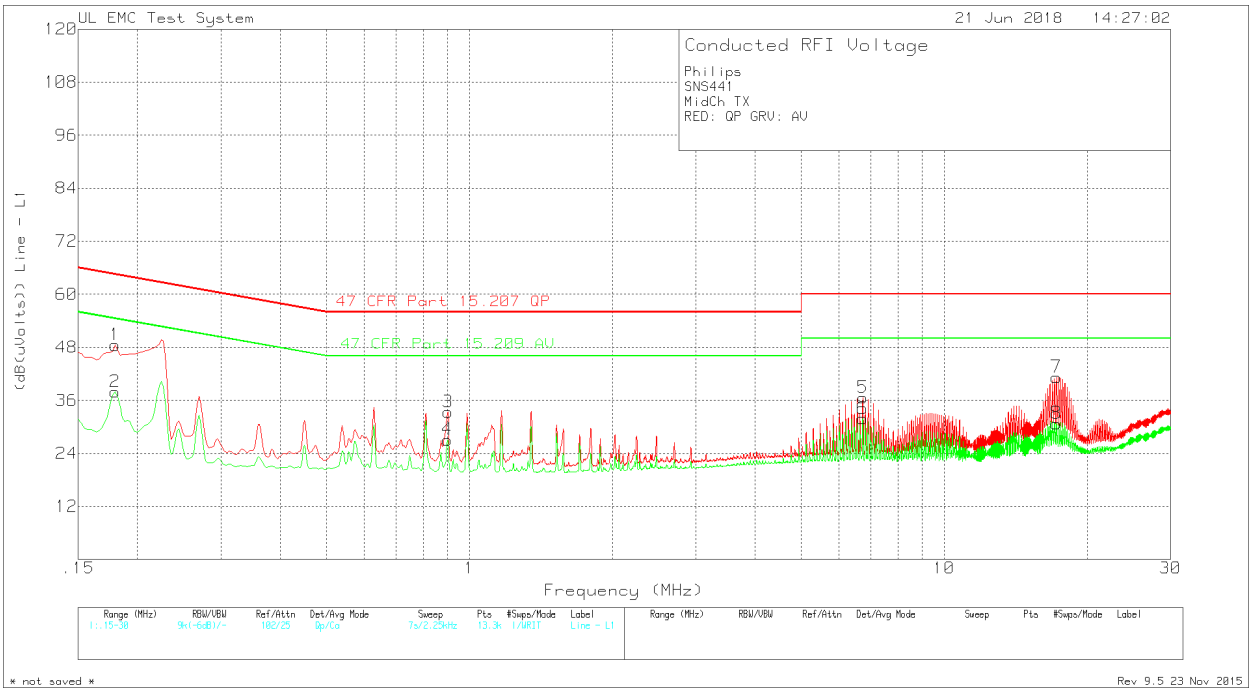
No.	Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading	Limit:1 (dB(uVolts))	2
Line 1							
1	.2265	38.03dBuV Qp	0	11.4	49.43	62.58	-
					Margin (dB)	-13.15	-
2	.22425	28.46dBuV Ca	0	11.4	39.86	-	52.66
					Margin (dB)	-	-12.8
3	.9015	22.41dBuV Qp	0	10.6	33.01	56	-
					Margin (dB)	-22.99	-
4	.9015	16.41dBuV Ca	0	10.6	27.01	-	46
					Margin (dB)	-	-18.99
5	6.56025	23.67dBuV Qp	0	10.8	34.47	60	-
					Margin (dB)	-25.53	-
6	6.56025	20.44dBuV Ca	0	10.8	31.24	-	50
					Margin (dB)	-	-18.76
7	16.908	29.83dBuV Qp	0	11.3	41.13	60	-
					Margin (dB)	-18.87	-
8	16.90688	20.53dBuV Ca	0	11.3	31.83	-	50
					Margin (dB)	-	-18.17
Neutral							
9	.2265	36.15dBuV Qp	0	11.4	47.55	62.58	-
					Margin (dB)	-15.03	-
10	.2265	26.01dBuV Ca	0	11.4	37.41	-	52.58
					Margin (dB)	-	-15.17
11	.906	31.18dBuV Qp	0	10.6	41.78	56	-
					Margin (dB)	-14.22	-
12	.906	22.4dBuV Ca	0	10.6	33	-	46
					Margin (dB)	-	-13
13	6.56925	29.4dBuV Qp	0	10.8	40.2	60	-
					Margin (dB)	-19.8	-
14	6.567	25.26dBuV Ca	0	10.8	36.06	-	50
					Margin (dB)	-	-13.94

LIMIT 1: 47 CFR Part 15.207 QP
LIMIT 2: 47 CFR Part 15.207 AV

Qp - Quasi-Peak detector
Ca - CISPR Average detection

10.1.2. AC Power Line Results – TX Mode / Middle Channel





Philips
SNS441
MidCh TX
RED: QP GRV: AV

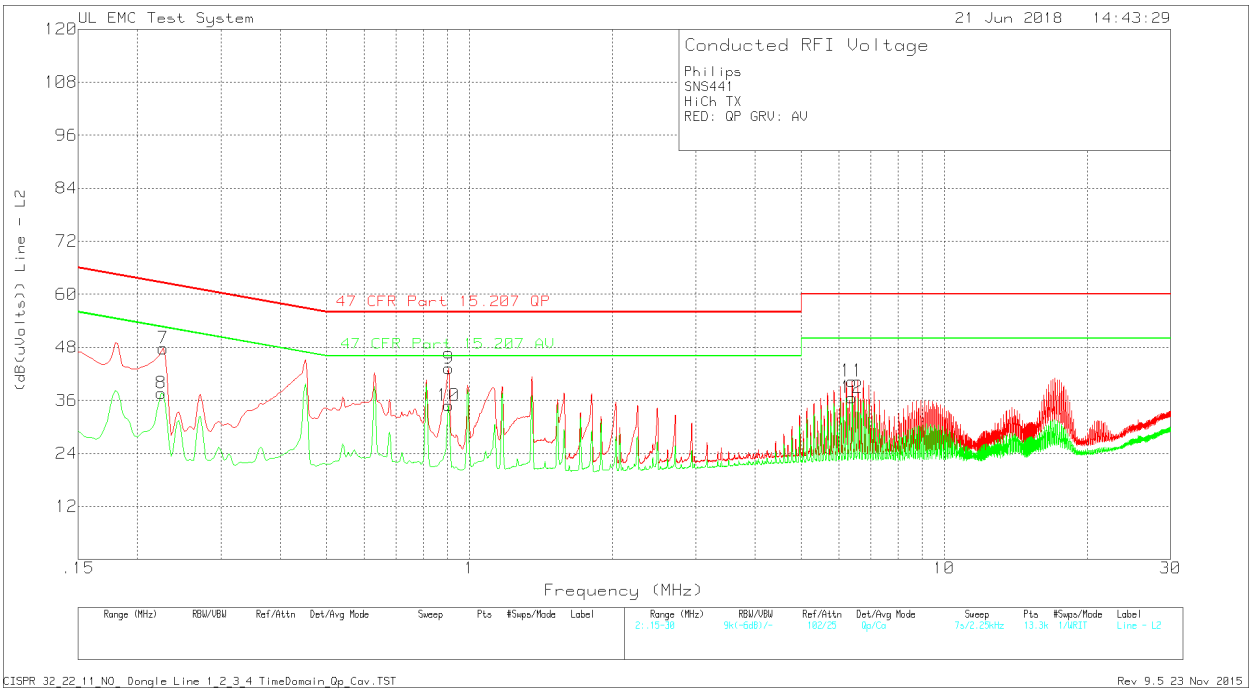
Trace Markers

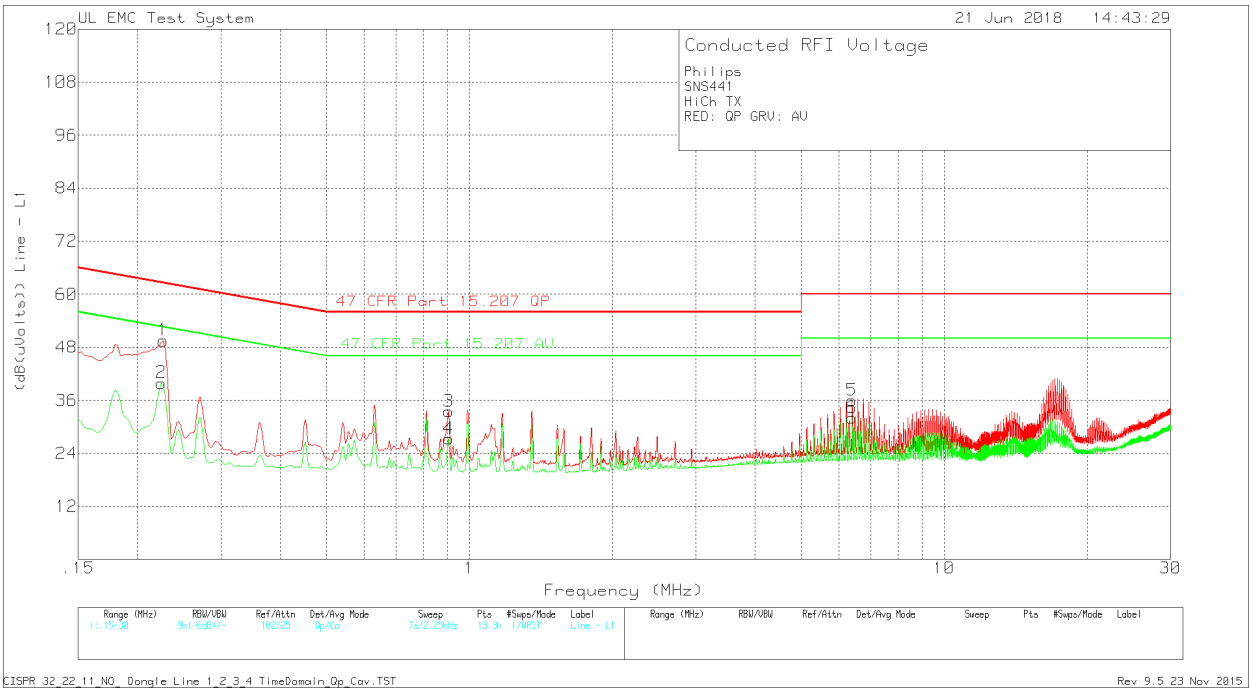
No.	Test Frequency (MHz)	Meter Reading	Transducer Factor (dB)	Gain/Loss Factor (dB)	Corrected Reading (dB(uVolts))	Limit:1	2
Line 1							
1	.17925	36.6dBuV Qp	.1	11.8	48.5	64.52	-
					Margin (dB)	-16.02	-
2	.17925	26.05dBuV Ca	.1	11.8	37.95	-	54.52
					Margin (dB)	-	-16.57
3	.9015	22.75dBuV Qp	0	10.6	33.35	56	-
					Margin (dB)	-22.65	-
4	.89925	16.48dBuV Ca	0	10.6	27.08	-	46
					Margin (dB)	-	-18.92
5	6.738	25.77dBuV Qp	0	10.8	36.57	60	-
					Margin (dB)	-23.43	-
6	6.73575	21.1dBuV Ca	0	10.8	31.9	-	50
					Margin (dB)	-	-18.1
7	17.24325	29.93dBuV Qp	0	11.3	41.23	60	-
					Margin (dB)	-18.77	-
8	17.241	19.46dBuV Ca	0	11.3	30.76	-	50
					Margin (dB)	-	-19.24
Neutral							
9	.17925	36.94dBuV Qp	.1	11.8	48.84	64.52	-
					Margin (dB)	-15.68	-
10	.17925	25.97dBuV Ca	.1	11.8	37.87	-	54.52
					Margin (dB)	-	-16.65
11	.9015	32.62dBuV Qp	0	10.6	43.22	56	-
					Margin (dB)	-12.78	-
12	.89925	24.14dBuV Ca	0	10.6	34.74	-	46
					Margin (dB)	-	-11.26
13	6.558	29.36dBuV Qp	0	10.8	40.16	60	-
					Margin (dB)	-19.84	-
14	6.558	25.5dBuV Ca	0	10.8	36.3	-	50
					Margin (dB)	-	-13.7

LIMIT 3: 47 CFR Part 15.207 QP
LIMIT 4: 47 CFR Part 15.209 AV

Qp - Quasi-Peak detector
Ca - CISPR Average detection

10.1.3. AC Power Line Results – TX Mode / High Channel





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Philips
SNS441
HiCh TX
RED: QP GRV: AV

Trace Markers

	Test (MHz)	Meter	Transducer (dB)	Gain/Loss (dB)	Corrected	Limit:1	2
Line 1							
1	.2265	38.12dBuV Qp	0	11.4	49.52	62.58	-
					Margin (dB)	-13.06	-
2	.22425	28.53dBuV Ca	0	11.4	39.93	-	52.66
					Margin (dB)	-	-12.73
3	.90375	22.93dBuV Qp	0	10.6	33.53	56	-
					Margin (dB)	-22.47	-
4	.90375	16.67dBuV Ca	0	10.6	27.27	-	46
					Margin (dB)	-	-18.73
5	6.4005	25.25dBuV Qp	0	10.8	36.05	60	-
					Margin (dB)	-23.95	-
6	6.39825	21.21dBuV Ca	0	10.8	32.01	-	50
					Margin (dB)	-	-17.99
Neutral							
7	.2265	36.36dBuV Qp	0	11.4	47.76	62.58	-
					Margin (dB)	-14.82	-
8	.22425	26.21dBuV Ca	0	11.4	37.61	-	52.66
					Margin (dB)	-	-15.05
9	.90375	32.6dBuV Qp	0	10.6	43.2	56	-
					Margin (dB)	-12.8	-
10	.90375	24.23dBuV Ca	0	10.6	34.83	-	46
					Margin (dB)	-	-11.17
11	6.4005	29.56dBuV Qp	0	10.8	40.36	60	-
					Margin (dB)	-19.64	-
12	6.4005	25.85dBuV Ca	0	10.8	36.65	-	50
					Margin (dB)	-	-13.35

LIMIT 3: 47 CFR Part 15.207 QP
LIMIT 4: 47 CFR Part 15.207 AV

Qp - Quasi-Peak detector
Ca - CISPR Average detection