



FCC Test Report

For:
Luminate Wireless

Model:
LWAP-0001

Product Description:
4G LTE Access Point

FCC ID: 2AJLI-LWAP-0002

Applied Rules and Standards:
47 CFR Parts: 15B

REPORT #: EMC_LUMIN-001-16001_FCC_15B_Rev1

DATE: 2016-11-29



A2LA Accredited

IC recognized #
3462B-1

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1 Assessment

The following device as further described in section 3 of this report was evaluated against the applicable criteria specified in the Code of Federal Regulations Title 47 parts 15B.

No deficiencies were ascertained.

Company	Description	Model #
Luminate Wireless	4G LTE Access Point	LWAP-0001

Responsible for Testing Laboratory:

2016-11-29	Compliance	Franz Engert (Compliance Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2016-11-29	Compliance	Kris Lazarov (EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Compliance Manager:	Franz Engert
Responsible Project Leader:	Kris Lazarov

2.2 Identification of the Client

Client Firm/Name:	Luminate Wireless Inc.
Street Address:	20883 Stevens Creek Blvd. S-100
City/Zip Code	Cupertino, CA 95014
Country	USA
Contact Person:	Jerry Martinson
Phone No.	650-600-3899
e-mail:	jerrym@luminatewireless.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Applicant
Manufacturers Address:	-----
City/Zip Code	-----
Country	-----

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No	LWAP-0001
HW Version	0T
SW Version	DV5.2.3
FCC-ID	2AJLI-LWAP-0002
Operating Voltage Range	44 V (min) / 48 V (nom) / 57 V (max)
Operating Temperature Range	Tmin: 0 °C / Tmax 50 °C
Radios included in the device	LTE,GPS
Sample Revision	<input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production
EUT Dimensions	265mm X 265mm X 60mm
EUT Diameter	<input checked="" type="checkbox"/> < 60 cm <input type="checkbox"/> Other _____

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Comments
1	LAPE31	0T	DV5.2.3	

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	AC/DC Adapter	Phihong	PSAC60W-480	P54607336A1
2	Ethernet Switch	HP	1920-8G-PoE	CN4BFRL20X

3.4 Test Sample Configuration

Set-up #	EUT / AE used for set-up	Comments
1	EUT #1+ AE #1 + AE #2	
2	EUT #1+ AE #2	PoE mode

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to evaluate the compliance of the EUT against the relevant requirements specified in the Code of Federal Regulations Title 47 parts 15B.

4.1 Dates of Testing:

7/01/2016 - 9/06/2016

4.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

9 kHz to 30MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)
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RF conducted measurement	±0.5 dB
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4.3 Environmental Conditions during Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25°C
- Relative humidity: 40-60%

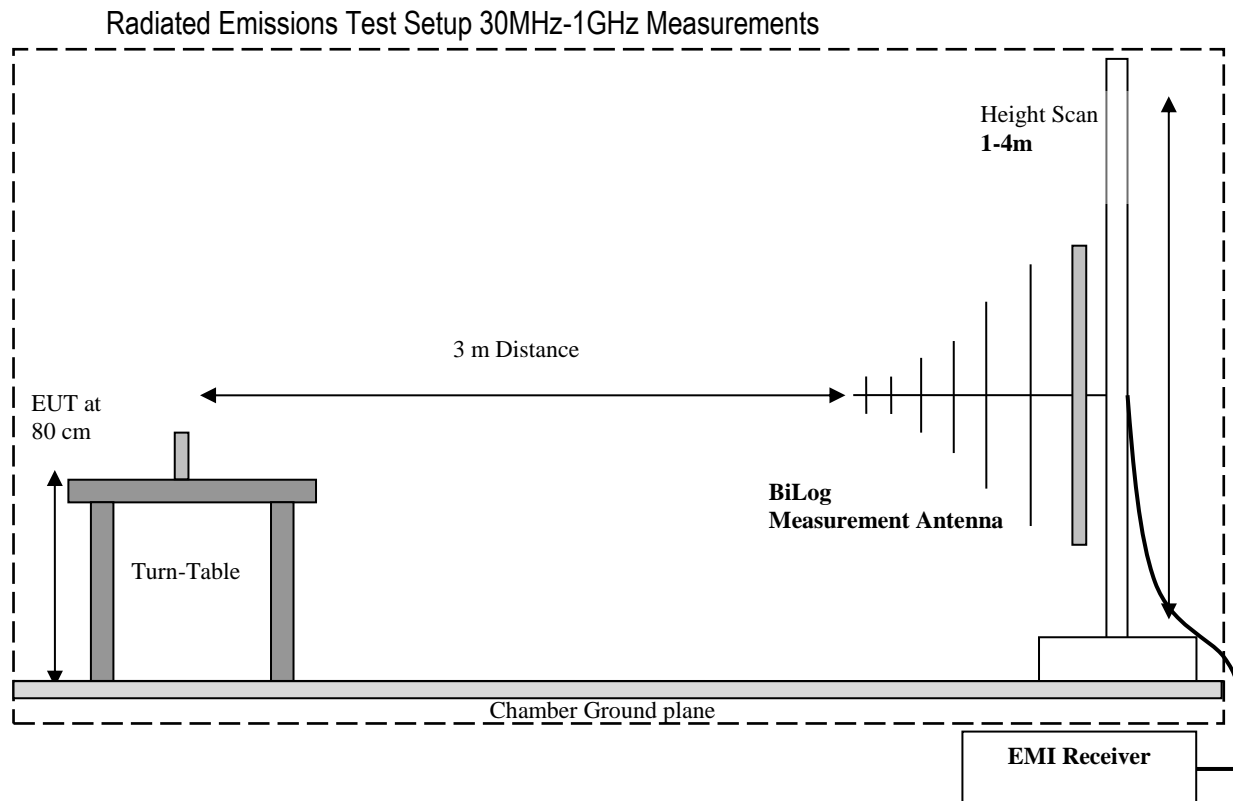
Deviating test conditions are indicated at individual test description where applicable.

5 Measurement Procedures

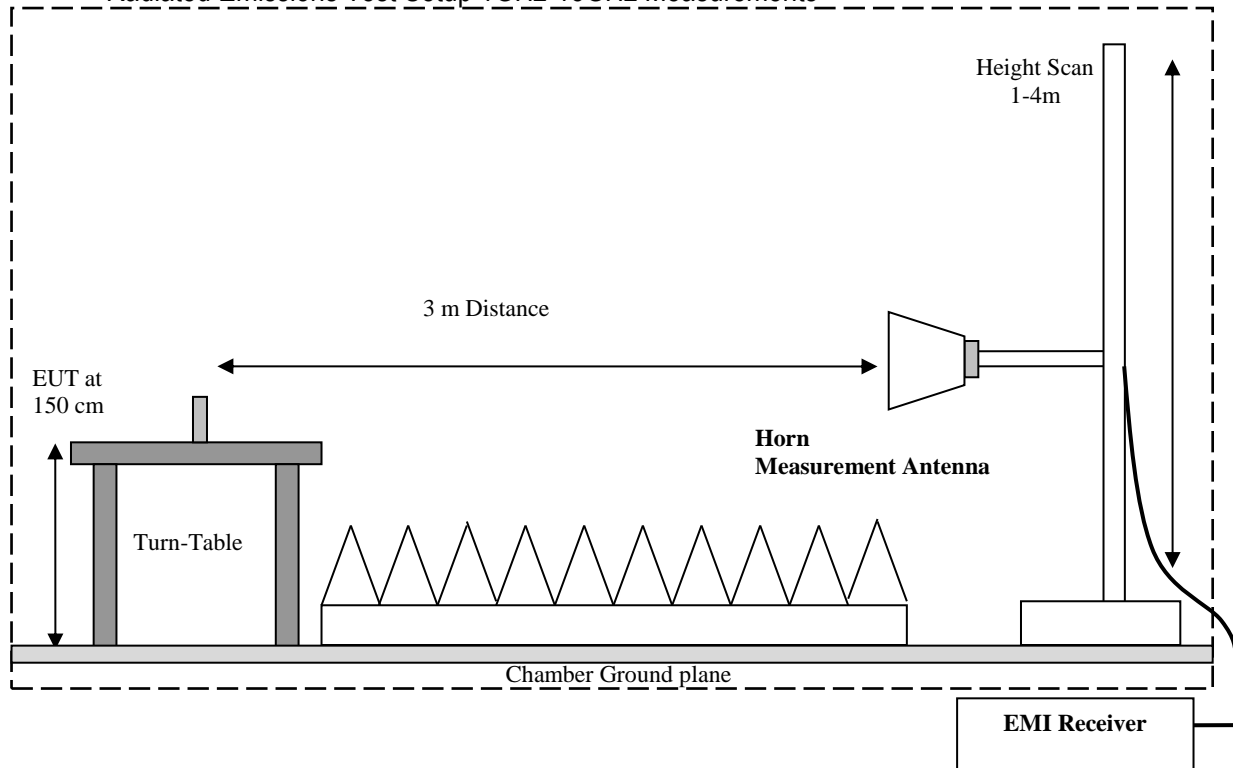
Testing is performed according to the guidelines provided in ANSI C63.4-2014 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

5.1 Radiated Measurement for EUT with diameter less than 60 cm

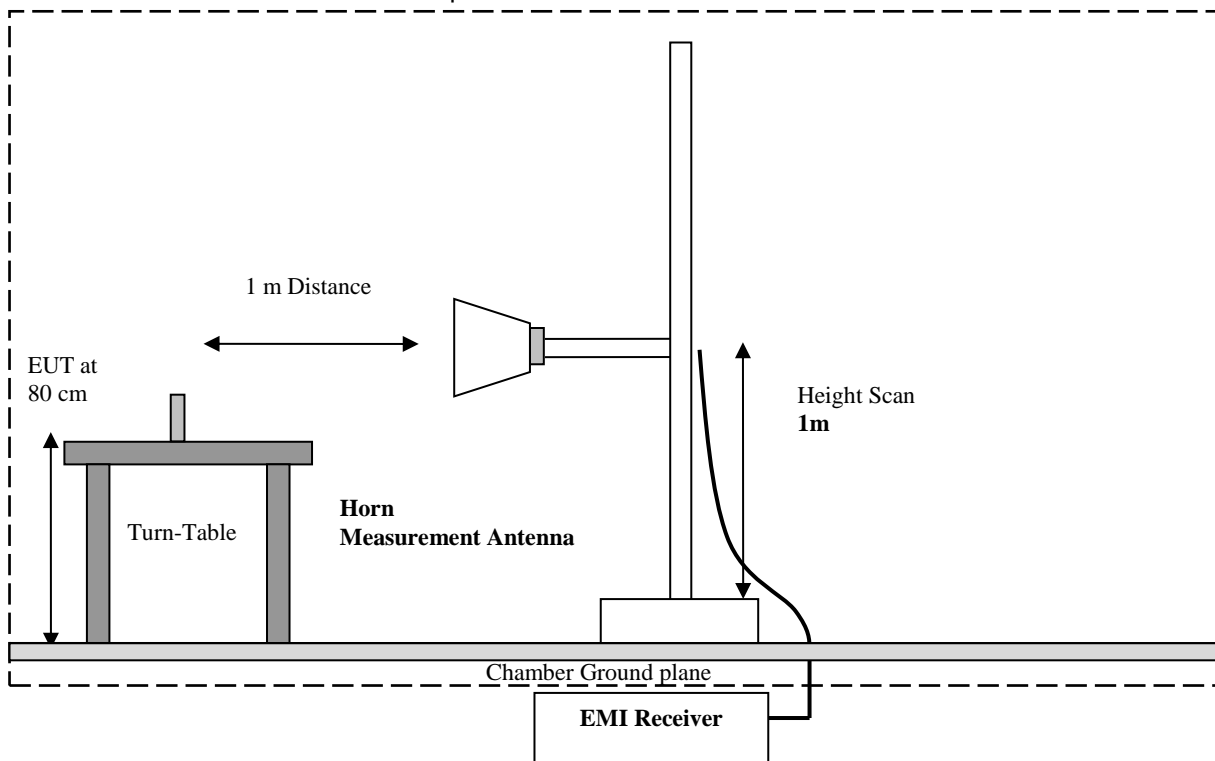
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.



Radiated Emissions Test Setup 1GHz-18GHz Measurements



Radiated Emissions Test Setup 18GHz-40GHz Measurements



5.2 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

- Measured reading in dB μ V
- Cable Loss between the receiving antenna and SA in dB and
- Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} - \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/m)
1000	80.5	3.5	14	98.0

6 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
FCC §15.109	Radiated Emissions	Nominal	RX Mode	■	□	□	□	Complies
FCC §15.107	Conducted Emissions	Nominal	RX Mode	■	□	□	□	Complies

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from module certification.

7 Test Result Data

7.1 Radiated Emissions Measurement according to CFR 47 Part 15.109

Spectrum Analyzer settings		
Sweep Frequency Range	30 MHz – 1 GHz	1 GHz – 40 GHz
Resolution Bandwidth	120 kHz	1 MHz
Detector (Exploratory Measurements)	Peak	Peak, Average
Detector (Final Measurements)	Quasi-Peak	Peak, Average
Trace Mode	Max Hold	Max Hold
Step Size	40 kHz	800 kHz
Measurement Time (Exploratory Measurements)	2 ms	2 ms
Measurement Time (Final Measurements)	100 ms	100 ms

7.1.1 Limits:

Class A Limits		
Frequency of emission (MHz)	Field Strength @ 10 m (μV/m)	Field Strength @ 3 m (dBμV/m)
30-88	90	49.5
88-216	150	54
216-960	210	56.9
Above 960	300	60

Class B Limits		
Frequency of emission (MHz)	Field Strength @ 3 m (μV/m)	Field Strength @ 3 m (dBμV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Note: For measurements below 1 GHz, the limits above use a quasi-peak detector. For measurements above 1 GHz, the limits above use an average detector.

7.1.2 Test Summary:

Environmental Conditions	
Ambient Temperature:	22° C
Relative Humidity:	45%
Atmospheric Pressure:	1013 mbar

Test Results						
Plot #	EUT Set-Up #	EUT operating mode	Scan Frequency	Power Supply Input	Comments	Result
1 - 3	1	RX Mode	30 MHz – 18 GHz	120V AC	Final measurement	Pass
4 - 6	2	RX Mode	30 GHz – 18 GHz	PoE	Final measurement	Pass

7.1.3 Measurement Plots:

Plot # 1

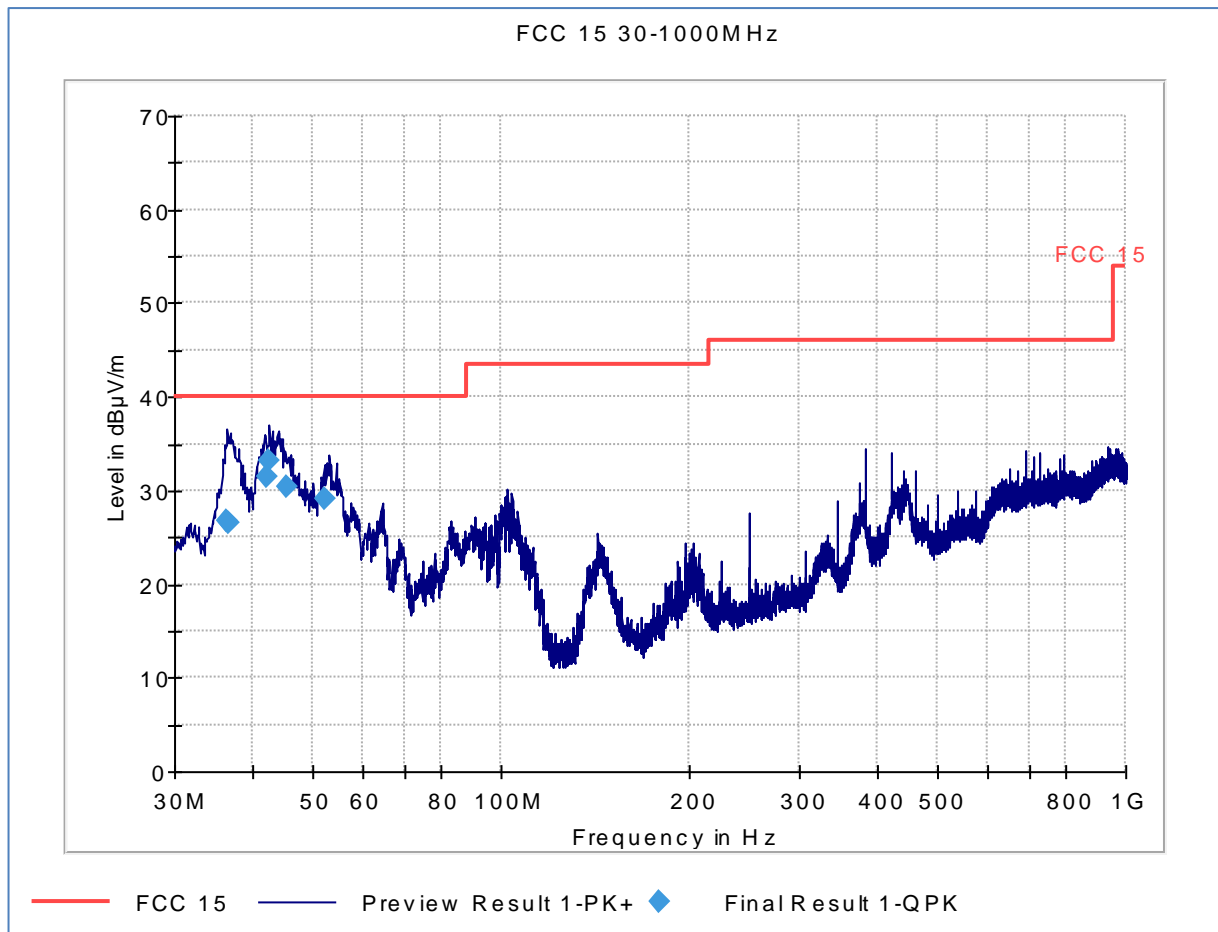
EUT Information

EUT Name: LWAP-0001
Manufacturer: Luminate Wireless
Power: 120V / 60Hz

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
36.480000	26.8	100.0	120.000	140.0	V	259.0	14.2	13.2	40.0
36.500000	26.5	100.0	120.000	140.0	V	-67.0	14.2	13.5	40.0
42.010000	31.4	100.0	120.000	140.0	V	11.0	11.3	8.6	40.0
42.560000	33.1	100.0	120.000	140.0	V	190.0	11.1	6.9	40.0
45.420000	30.5	100.0	120.000	140.0	V	-39.0	9.9	9.5	40.0
52.230000	29.2	100.0	120.000	150.0	V	205.0	7.9	10.8	40.0

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Test Date: 5/19/2016 12:55:53

Test Engineer: S Moon

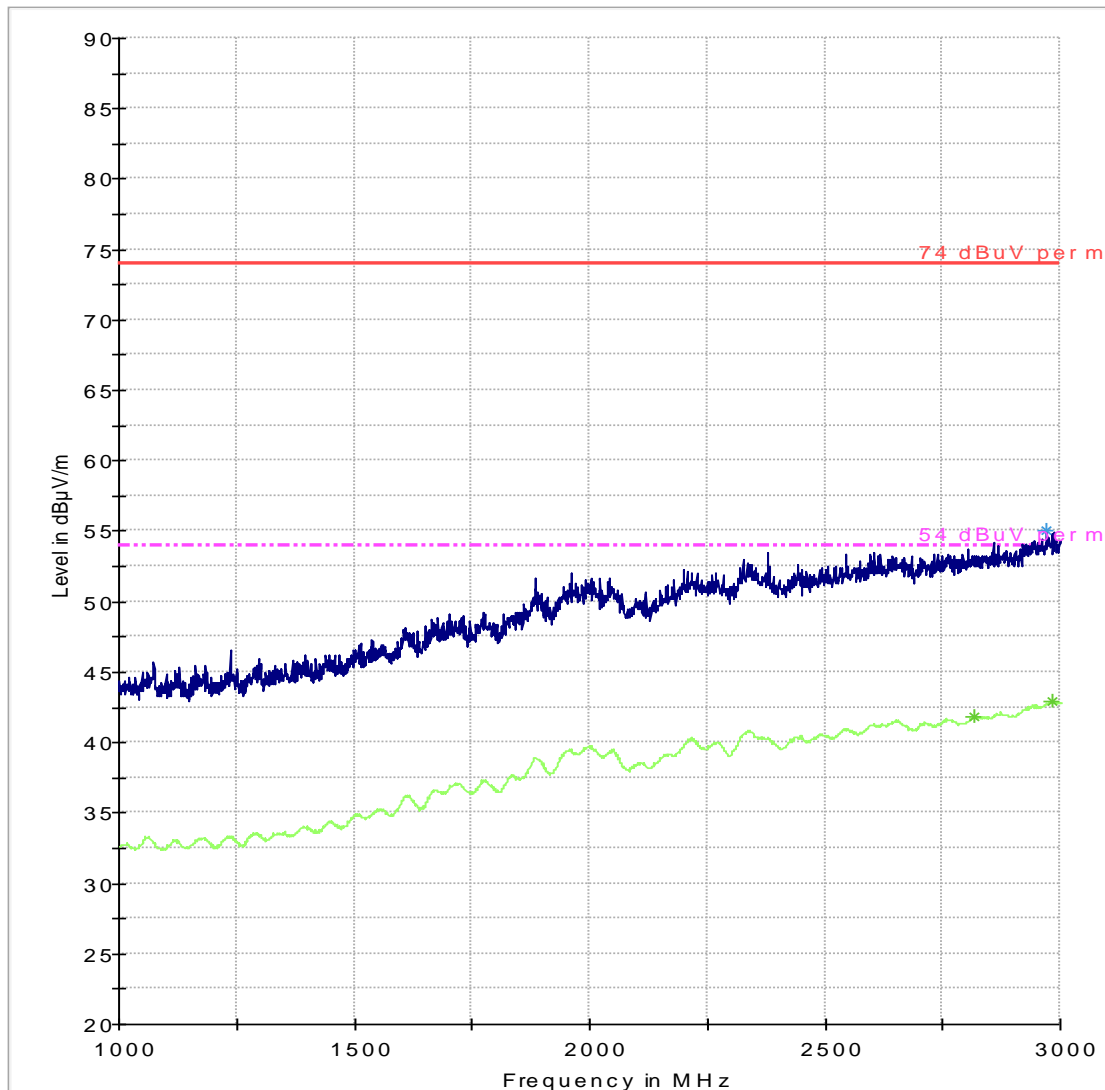
Plot # 2

EUT Information

EUT Name: LWAP-0001
Manufacturer: Luminate Wireless
Power: 120V / 60Hz

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.

FCC 15 1-3GHz



74 dBuV per m
54 dBuV per m
Preview Result 1-PK+
Preview Result 2-RMS
Data Reduction Result 1 [4]-PK+
Data Reduction Result 2 [4]-RMS

Test Date: 5/19/2016 3:26:25

Test Engineer: S Moon

Plot # 3

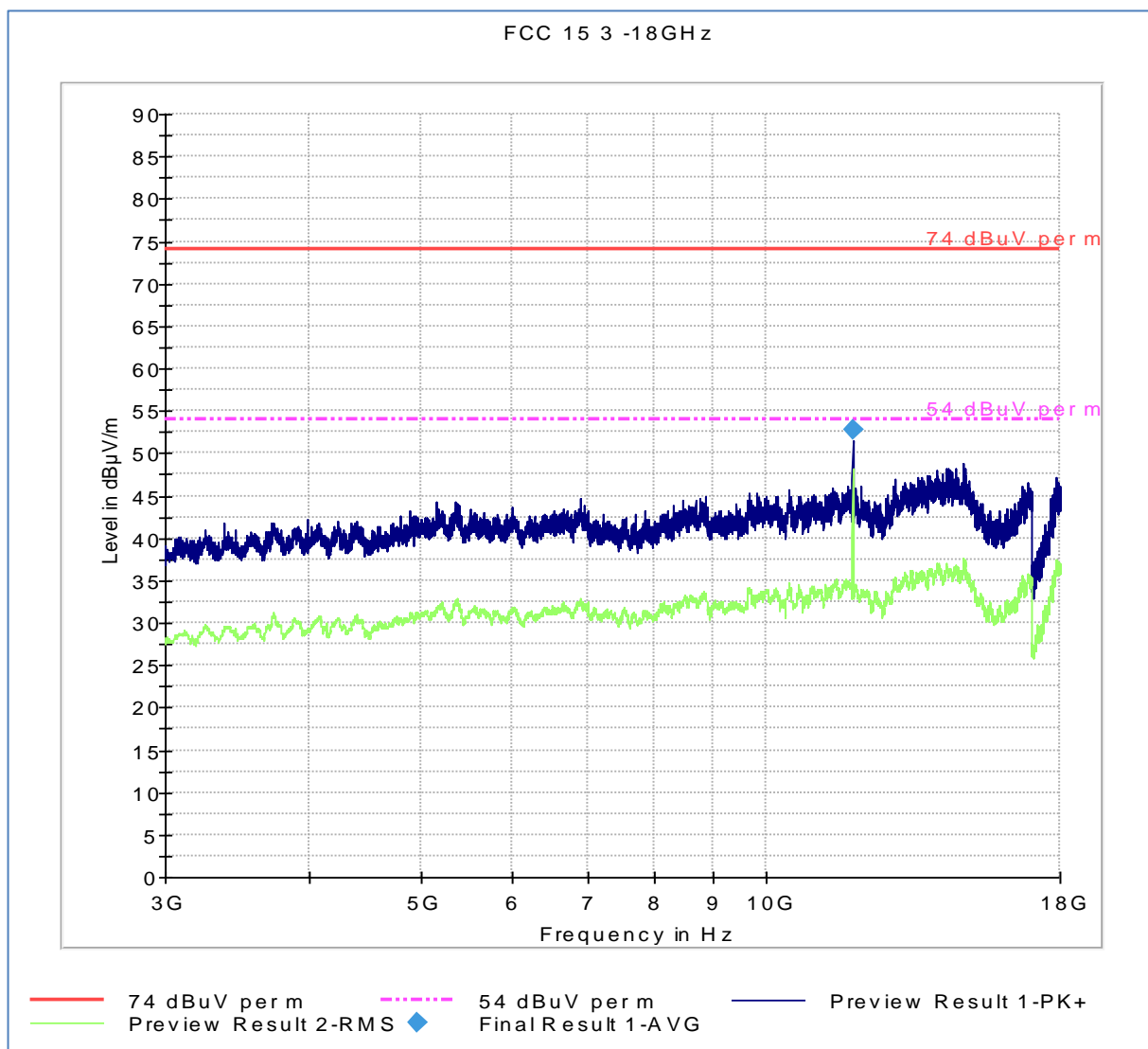
EUT Information

EUT Name: LWAP-0001
 Manufacturer: Luminate Wireless
 Power: 120V / 60Hz

Final Result

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
11878.640000	52.7	100.0	1000.000	324.0	V	181.0	0.1	21.3	74.0

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Test Date: 5/19/2016 2:37:47

Test Engineer: S Moon

Plot # 4

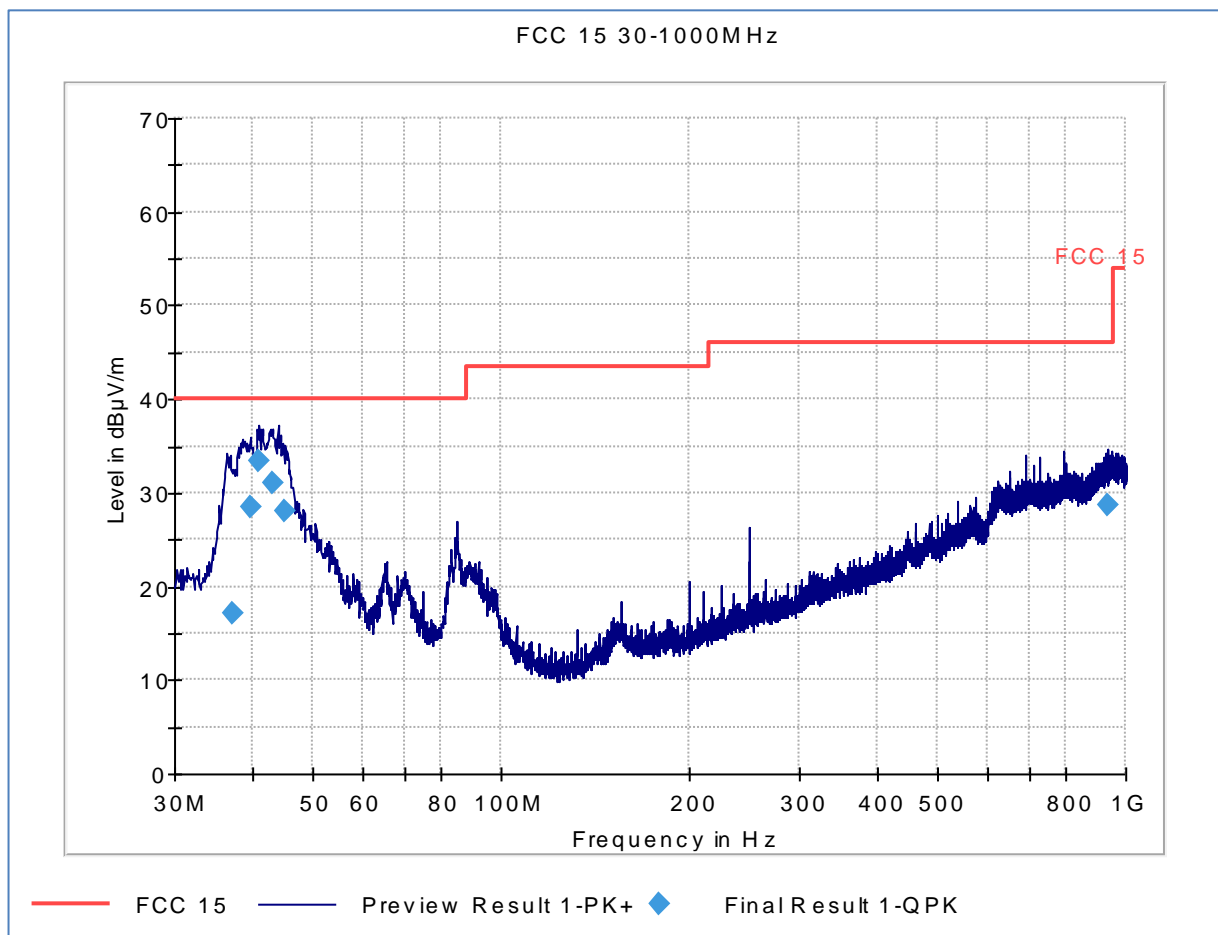
EUT Information

EUT Name: LWAP-0001
 Manufacturer: Luminate Wireless
 Power: PoE

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
37.250000	17.0	100.0	120.000	140.0	V	2.0	13.8	23.0	40.0
39.650000	28.5	100.0	120.000	140.0	V	211.0	12.4	11.5	40.0
41.000000	33.4	100.0	120.000	140.0	V	90.0	11.7	6.6	40.0
42.940000	31.1	100.0	120.000	150.0	V	301.0	10.9	8.9	40.0
44.940000	28.0	100.0	120.000	140.0	V	-61.0	10.1	12.0	40.0
935.900000	28.7	100.0	120.000	218.0	V	-62.0	28.6	17.3	46.0

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Test Date: 5/19/2016 12:09:54

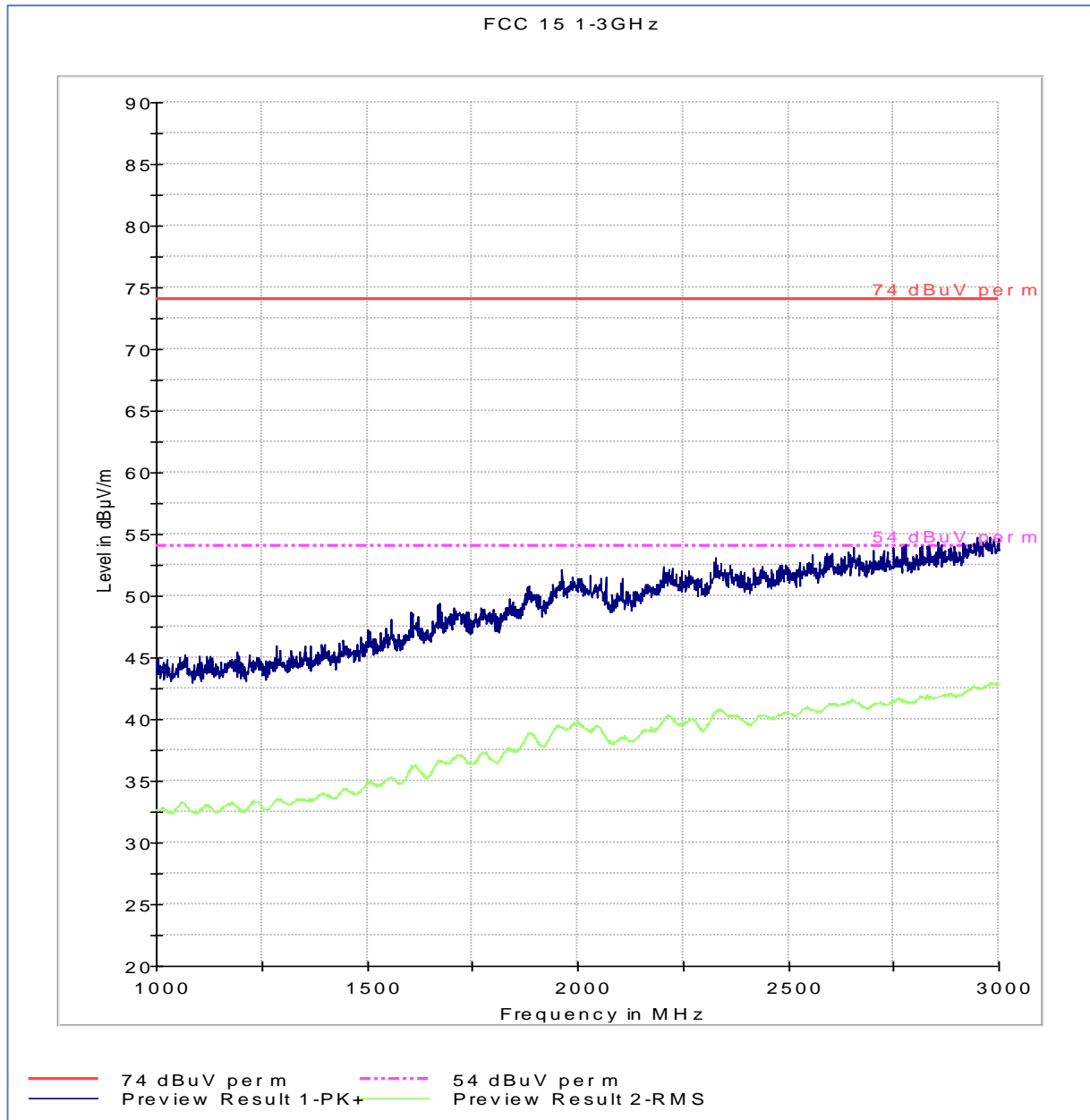
Test Engineer: S Moon

Plot # 5

EUT Information

EUT Name: LWAP-0001
Manufacturer: Luminate Wireless
Power: PoE

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Test Date: 5/19/2016 1:41:38

Test Engineer: S Moon

Plot # 6

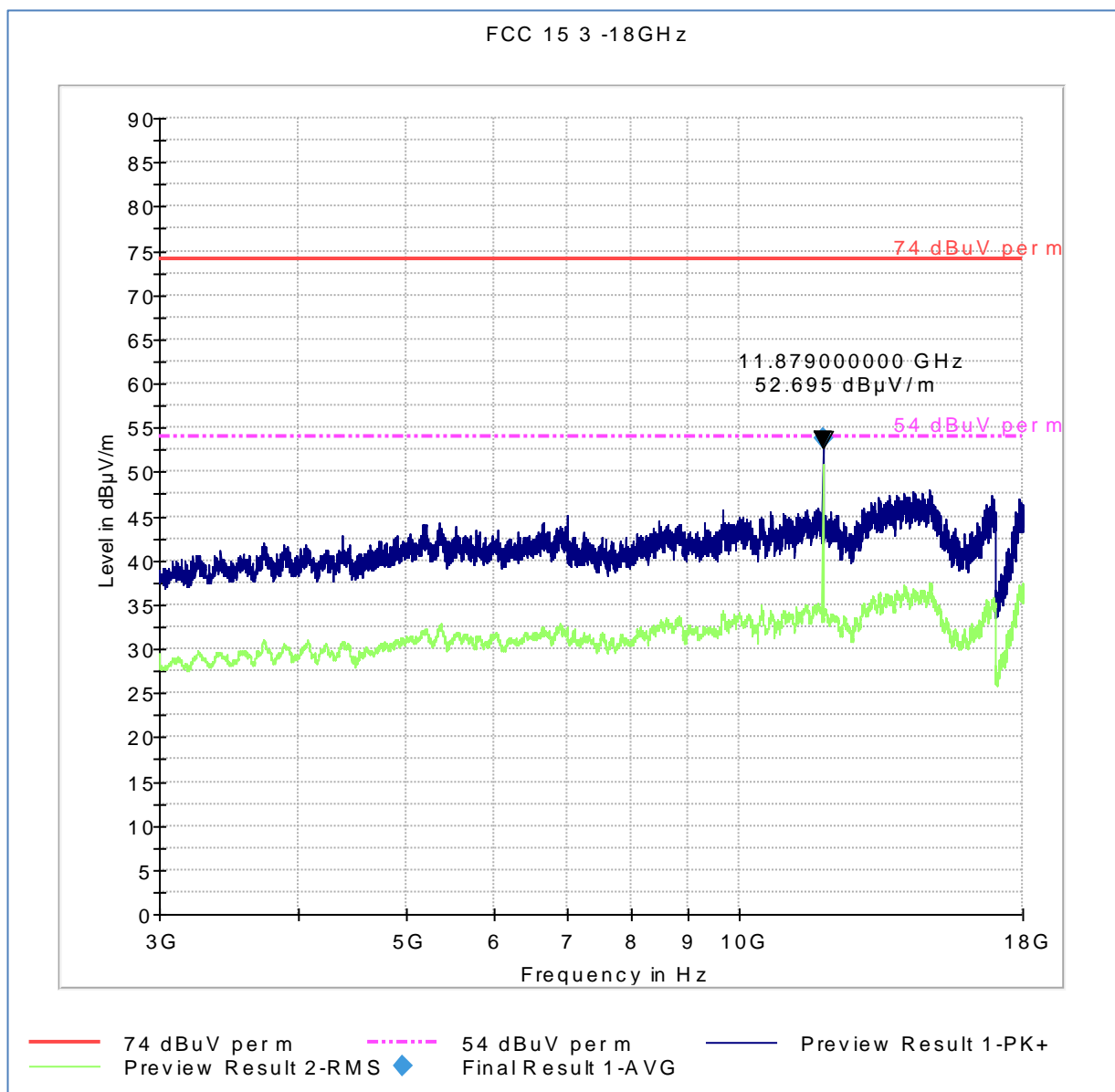
EUT Information

EUT Name: LWAP-0001
 Manufacturer: Luminate Wireless
 Power: PoE

Final Result

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
11879.160000	53.7	100.0	1000.000	221.0	V	101.0	0.1	20.3	74.0

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Test Date: 5/19/2016 2:51:20

Test Engineer: S Moon

7.2 AC Power line Conducted Emissions according to CFR 47 Part 15.107

Spectrum Analyzer Setting	
Frequency band	150 kHz – 30 MHz
Resolution Bandwidth	9 kHz
Detector (Exploratory Measurements)	Peak, Average
Detector (Final Measurements)	Quasi-Peak, Average
Trace Mode	Max Hold
Step Size	4 kHz
Measurement Time	20 ms

7.2.1 Measurement Procedure:

- The EUT and accessories are placed on a non-conducting table 80 cm above the horizontal ground plane and 40 cm from the vertical ground plane.
- Cables that hang closer than 40 cm to the ground plane are gathered into a 30 cm to 40 cm long bundle.
- The power cable of the EUT is connected to the LISN.
- The 6 highest emissions within 20 dB of the limit are noted.

7.2.2 Limits:

Class A Limits		
Frequency of emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	79	66
0.5-30	73	60

Class B Limits		
Frequency of emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency

7.2.3 Test Summary:

Environmental Conditions	
Ambient Temperature:	22° C
Relative Humidity:	45%
Atmospheric Pressure:	1013 mbar

Test Results							
Plot #	EUT Set-Up #	EUT operating mode	Detector (Peak / AVG / QP)	Line Under Test	Power Supply Input	Comments	Result
1	1	RX Mode	Peak & AVG	Line & Neutral	120V AC	Final measurement	Pass

7.2.4 Measurement Plots:

Plot # 1

EUT Information

EUT Name:	LWAP-0001
Manufacturer:	Luminate Wireless
Power:	120V / 60Hz

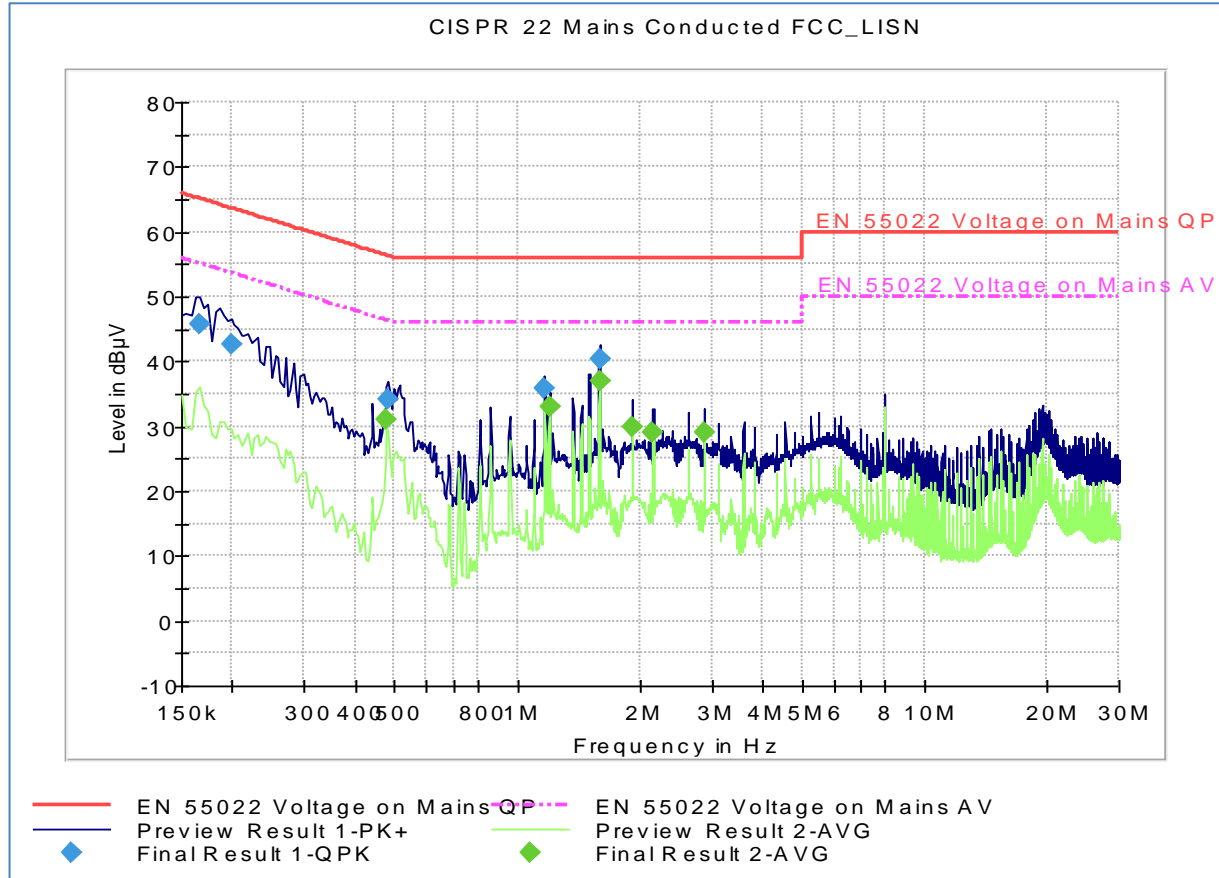
Quasipeak Measurement Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.166000	45.8	500.0	9.000	GND	L1	8.1	19.4	65.2	
0.198000	42.7	500.0	9.000	GND	L1	7.0	21.0	63.7	
0.482000	34.2	500.0	9.000	GND	L1	2.2	22.2	56.3	
1.170000	35.9	500.0	9.000	GND	N	0.8	20.1	56.0	
1.590000	40.2	500.0	9.000	GND	L1	0.8	15.8	56.0	

Average Measurement Final Result

Frequency (MHz)	Average-ClearWrite (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.478000	31.0	GND	L1	2.2	15.4	46.4	
1.198000	33.0	GND	N	0.8	13.0	46.0	
1.590000	37.1	GND	N	0.8	8.9	46.0	
1.918000	30.0	GND	N	0.8	16.0	46.0	
2.154000	29.3	GND	N	0.8	16.7	46.0	
2.874000	29.3	GND	N	0.8	16.7	46.0	

Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.



Test Date: 9/8/2016 3:19:31

Test Engineer: T Nguyen

8 Test setup photos

Setup photos are included in supporting file name: "EMC_LUMIN-001-16001_FCC_15B_Setup_Photos_Rev1.pdf"

9 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	Biconlog Antenna	EMCO	3142E	166067	3 years	6/14/2014
Antenna Horn 3115 SN 35111	Horn Antenna	EMCO	3115	35111	3 years	7/24/2015
LISN FCC-LISN-50-25-2-08	LISN	FCC	FCC-LISN-50-25-2-08	8014	2 Years	3/26/2015
Digital Barometer	Digital Barometer	Control Company	35519-055	91119547	2 Years	4/7/2015
Spectrum Analyzer FSU26 #2	Spectrum Analyzer	R&S	FSU26	200065	3 years	7/4/2015
Thermometer Humidity TM320	Thermometer Humidity	Dickson	AY1072	0528	1 Year	10/28/2016

Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.

Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

10 Revision History

Date	Report Name	Changes to report	Report prepared by
2016-09-19	EMC_LUMIN-001-16001_FCC_15B	Initial Version	Kris Lazarov
2016-11-29	EMC_LUMIN-001-16001_FCC_15B_Rev1	Changed the report name to reflect the new revision- Rev1; Updated the FCC ID to 2AJLI-LWAP-0002	Kris Lazarov