Test Report # 318065 B

Equipment Under Test:	Lumina RF Wall Switch Lumina RF Wireless Load Control 20A Switching Relay
Test Date(s):	2/12/18 – 9/9/19
Prepared for:	Dmitriy Moskovkin Leviton Manufacturing Co., Inc. Energy Management, Controls and Automation (EMC&A) 20497 SW Teton Avenue Tualatin, OR 97062

Report Issued by: Shane Dock, EMC Engineer

Signature:

Date: 3/24/2020

Report Reviewed by: Adam Alger, Quality Manager

Signature:

Date: 11/08/2019

Report Constructed by: Shane Dock, EMC Engineer

Signature:

Date: 3/21/2019

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Laird Technologies Test Services in Review

The Laird Technologies, Inc. laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:

TESTING CERT #1255.01

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope
A2LA Certificate Number: 1255.01
Scope of accreditation includes all test methods listed herein, unless otherwise noted.

Federal Communications Commission (FCC) – USA

Accredited recognition of two 3 meter Semi-Anechoic Chambers

Accredited Test Firm Registration Number: 953492

Innovation, Science and Economic Development Canada

ISED Site listing of two 3 meter Semi-Anechoic Chambers based on RSS-GEN – Issue 4
File Number: IC 3088A-2
File Number: IC 3088A-3

1 Test Report Summary

During **2/12/18 – 9/9/19** the Equipment Under Test (EUT), **Lumina RF Wall Switch**

Lumina RF Wireless Load Control 20A Switching Relay, as provided by **Leviton Manufacturing Co., Inc.** was tested to the following requirements:

Requirement	Description	Specification	Method	Result
FCC: 15.247 (a)(2) IC: RSS-247 5.2 (a)	Digital Modulation System 6 dB bandwidth	500 kHz	ANSI C63.10	Pass
FCC: 2.1049 IC: RSS-GEN 6.6	Occupied Bandwidth	Reported	ANSI C63.10	Pass
FCC: 15.247 (b)(3) IC: RSS-247 5.4 (d)	Maximum Conducted Output Power	30 dBm	ANSI C63.10	Pass
FCC: 15.247 (e) IC: RSS-247 5.2 (b)	Digital Modulation System Power Spectral Density	8 dBm / 3 kHz	ANSI C63.10	Pass
FCC: 15.247 (d) IC: RSS-247 5.5	RF Spurious Emissions at the Transmitter Antenna Terminal	20 dBc	ANSI C63.10	Pass
FCC: 15.247 (d) IC: RSS-GEN 8.10	Spurious Radiated Emissions in Restricted Bands	FCC 15.209 RSS-GEN 8.9	ANSI C63.10	Pass
FCC: 2.1055 (d) IC: RSS-GEN 6.11	Frequency Stability	Reported	ANSI C63.10	Pass
FCC: 15.207 IC: RSS-GEN 8.8	AC Power Line Conducted Emissions	0.150-30 MHz	ANSI C63.10	Pass

Notice:

The results relate only to the item tested and described in this report. Any modifications made to the equipment under test after the specified test date(s) may invalidate the data herein.

If the resulting measurement margin is seen to be within the uncertainty value, as listed in this report, the possibility exists that this unit may not meet the required limit specification if subsequently tested.

2 CLIENT INFORMATION

Company Name	Lumina RF ZB Wall Switch
Contact Person	Dmitriy Moskovkin
Address	20497 SW Teton Ave Tualatin, OR 97062

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	Lumina RF Wall Switch Lumina RF Wireless Load Control 20A Switching Relay
Model Number	ZS10S-D0Z LU20S-DNW
Serial Number	Engineering Sample
FCC/IC Number	FCC: QGH-B167602 IC: 2473A-B167602

2.2 Product Description

Zigbee 2.4GHz LuminaRF Wireless Wall Box with switch and plenum installed.

Load Controller Switching Relay 50/60Hz, 10-20A Load.

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Additional Information

Channels tested are 11, 18, 24 and 25. The full power channels (designated as Low [11], Mid [18], High [24]) have a power setting of 20, with channel 25 at a power setting of 14. EUT programmed with Simplicity Studio through a serial connection. Unit 1B uses 277VAC. Both 60 Hz frequency. In addition, a load controller (ZS10S-D0Z) was also tested, which features a different enclosure.

Low – Channel 11 – 2405 MHz

Mid – Channel 18 – 2440 MHz

High – Channel 24 – 2470 MHz

Channel 25 – 2475 MHz

3 REFERENCES

Publication	Edition	Date
CFR 47 Part 15	-	2019
ANSI C63.10	-	2013
RSS-247	2	2017
RSS GEN	5	2018

4 Uncertainty Summary

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k = 2.

References	Version / Date
CISPR 16-4-1	Ed. 2 (2009-02)
CISPR 16-4-2	Ed. 2 (2011-06)
CISPR 32	Ed. 1 (2012-01)
ANSI C63.23	2012
A2LA P103	February 4, 2016
A2LA P103c	August 10, 2015
ETSI TR 100-028	V1.3.1 (2001-03)

Measurement Type	Configuration	Uncertainty ±
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

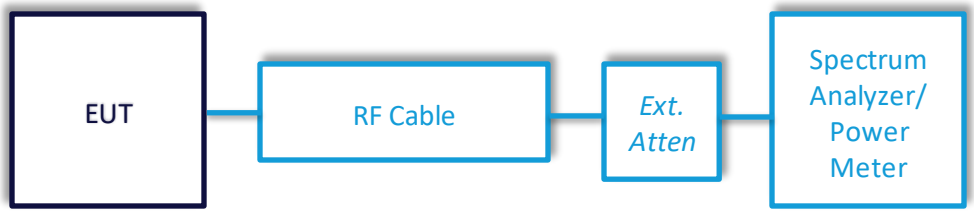
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter. The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.
Example Calculations	Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm) Margin (dB) = Limit (dBm) – Corrected Reading (dBm)

Block Diagram



5.1.1 Antenna Port Conducted Emissions – DTS/99% Bandwidth

Operator	Shane Dock
Test Date	2/27/18
Location	Conducted RF Area
Temp. / R.H.	72 degrees Fahrenheit/ 29% RH
Requirement	FCC 15.247 (a)(2) IC: RSS-247 5.2 (a)
Method	ANSI C63.10 Sections 11.8, 6.9.2

Limits:

Minimum 6 dB BW (MHz)
0.5

Test Parameters

Frequency	2405 - 2475 MHz
EUT	Unit Tested on Low, Mid, and High Channel

Instrumentation

Laird
Smart Technology. Delivered.

Date : 12-Feb-2018 Test : 1A Conducted RF Testing Job : C-2944

PE : Shane Dock Customer : Leviton LES Quote : 318065

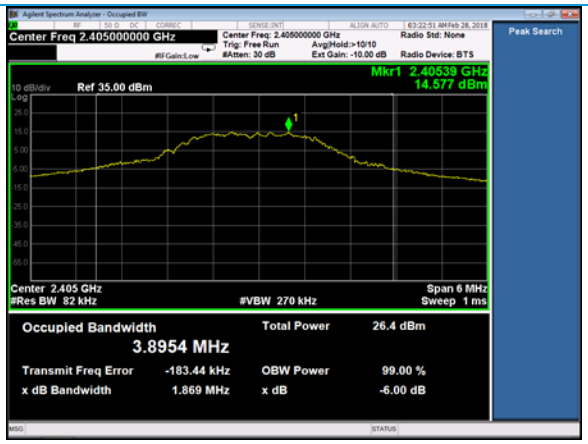
No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Cable	Gore	EKD01D01048.0	5546519	11/15/2017	11/15/2018	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	1/11/2018	1/11/2019	Active Calibration

Table

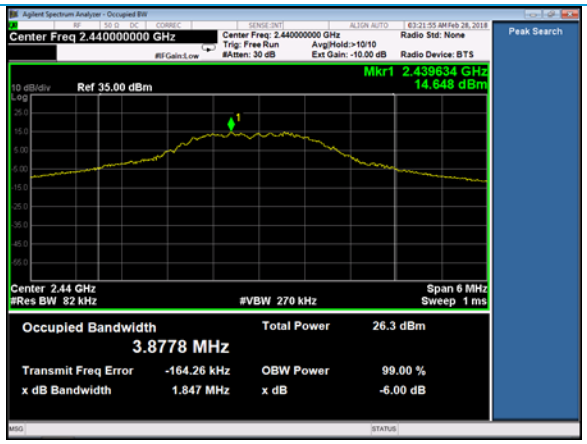
Channel	Low	Mid	High	Channel 25
6 db BW (kHz)	1882	1841	1776	1867
99% BW (kHz)	3895.4	3877.8	3923.2	3910.2

Worst Case Margin = Closest Measurement – Limit = 1776 kHz – 500kHz = 1276 kHz

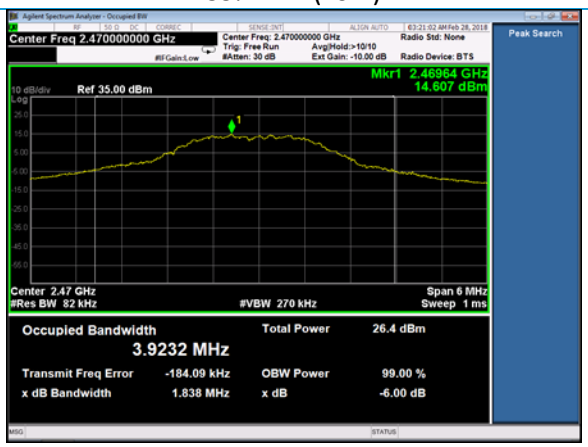
Plots



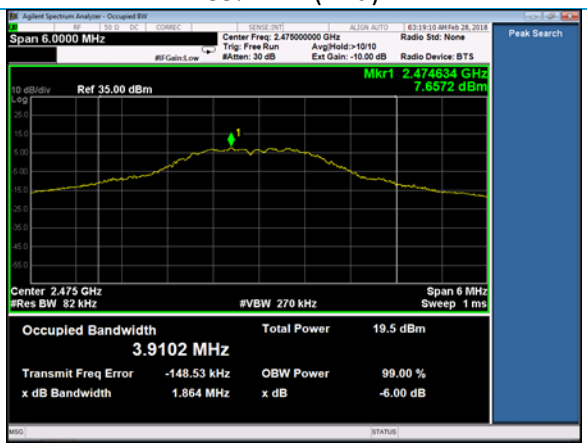
99% BW (Low)



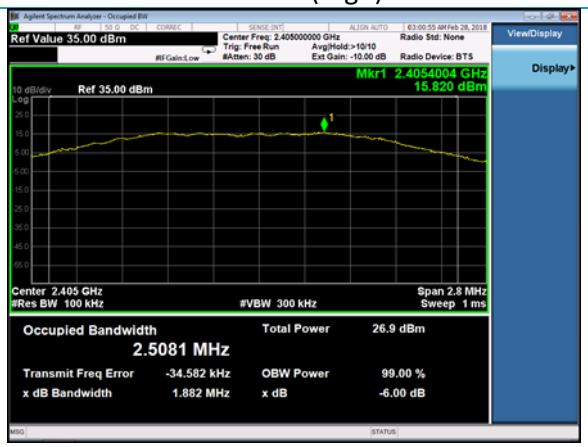
99% BW (Mid)



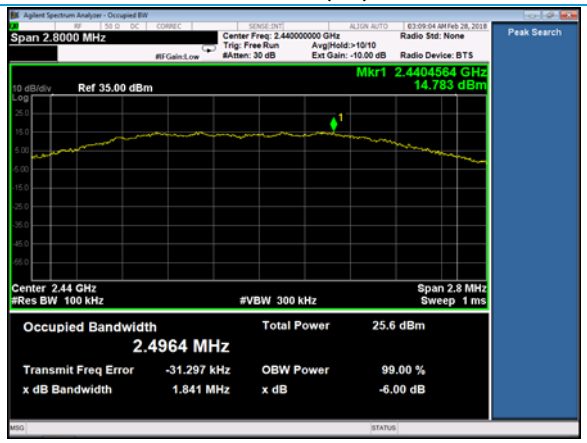
99% BW (High)



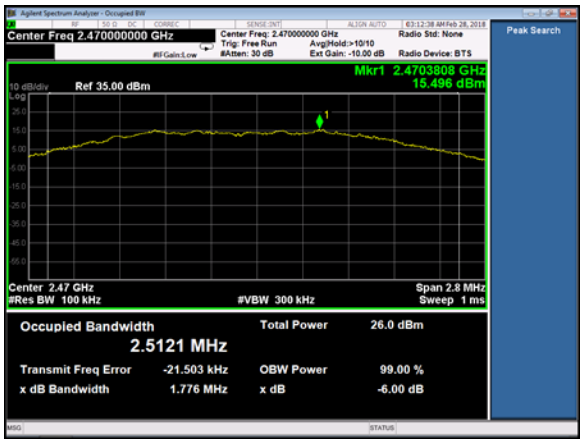
99% BW (25)



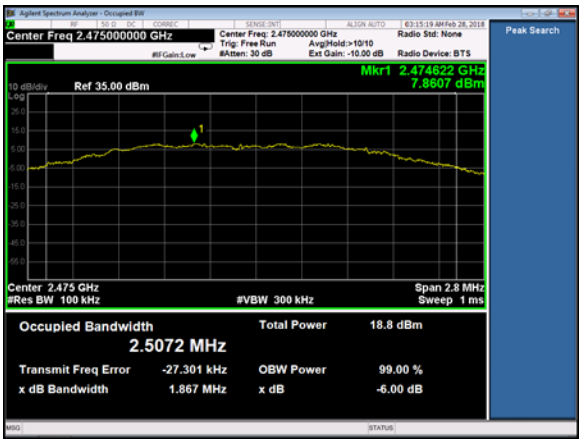
DTS BW (Low)



DTS BW (Mid)



DTS BW (High)



DTS BW (25)

5.1.2 Antenna Port Conducted Emissions – Conducted Output Power

Operator	Shane Dock
Test Date	2/27/18
Location	Conducted RF Area
Temp. / R.H.	72 degrees F/ 29% RH
Requirement	FCC: 15.247 (b)(3) IC: RSS-247 5.4 (d)
Method	ANSI C63.10 Section 11.9.1.1

Limits: (Measured as Average)

Maximum Conducted Output Power (dBm)	Maximum Conducted Output Power (watts)
30	1

Test Parameters

Frequency	2405-2475 MHz
Settings	Low, Mid, and High Channels Measured
Settings	Unit measured at full power

Table

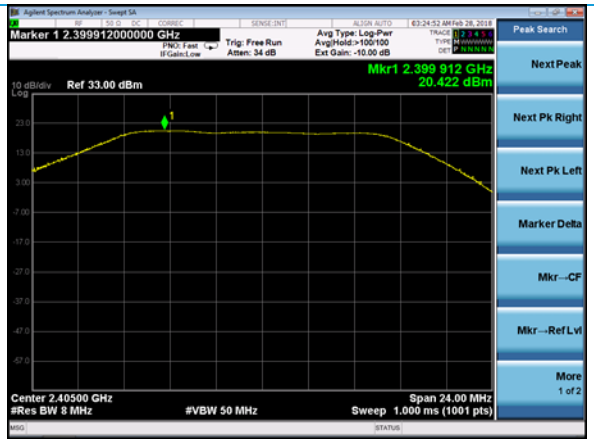
Max Power (dBm)

Channel	Low	Mid	High	Channel 25
Output Power (dBm)	20.422	20.266	20.215	13.384

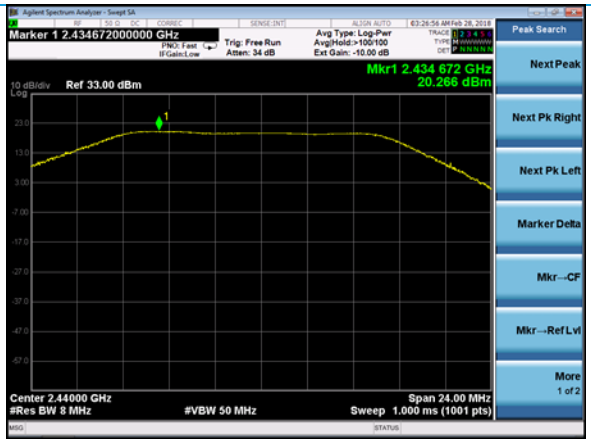
Worst Case Margin = Limit - Closest Measurement = 30.0 dBm – 20.422 dBm = 9.578 dB

Plots

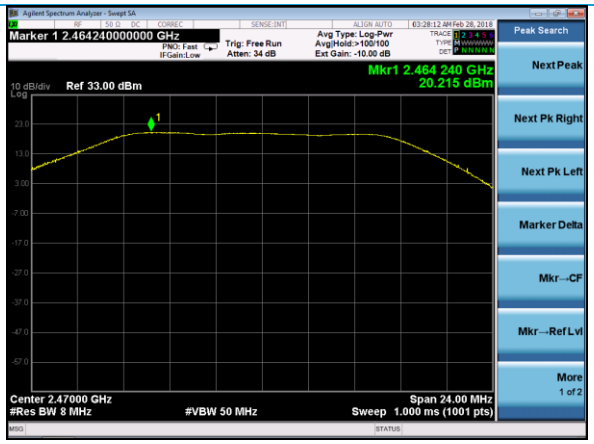
Maximum Power



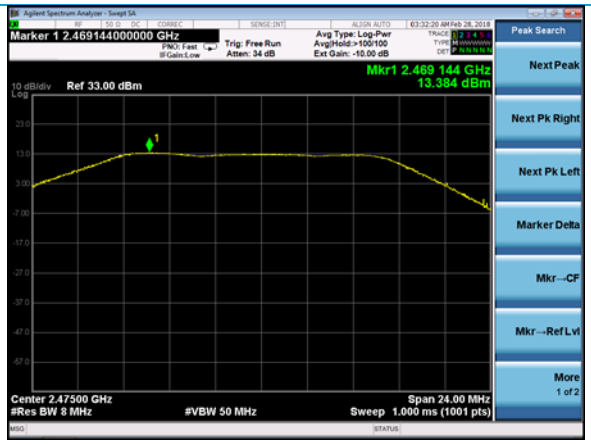
Low Channel



Mid Channel



High Channel



Channel 25

5.1.3 Antenna Port Conducted Emissions – Power Spectral Density

Operator	Shane Dock
Test Date	2/27/18
Location	Conducted RF Area
Temp. / R.H.	72 degrees F/29% RH
Requirement	FCC: 15.247 (e) IC: RSS-247 5.2 (b)
Method	ANSI C63.10 Section 11.10.2

Limits:

Power Spectral Density (dBm/ 3 kHz)
8

Test Parameters

Frequency	2405-2475 MHz
Settings	Low, Mid, and High Channels Measured
Settings	Unit measured at full power

Table

Maximum Power

Channel (dBm)	Low	Mid	High	Channel 25
PSD (dBm)	3.883	3.139	3.630	-4.023

Worst Case Margin = Limit - Closest Measurement = 8 dBm – (3.883) dBm = 4.117 dB

Maximum Power

Low Channel

Mid Channel

High Channel

Channel 25

5.1.4 Antenna Port Conducted Emissions – Tx Conducted Spurious

Operator	Shane Dock
Test Date	2/27/18
Location	Conducted RF Area
Temp. / R.H.	72 degrees F/29% RH
Requirement	FCC: 15.247 (d) IC: RSS-247 5.5
Method	ANSI C63.10 Section 11.11

Limits:

Spurious Emissions Limit (dBc from Reference Point)
20

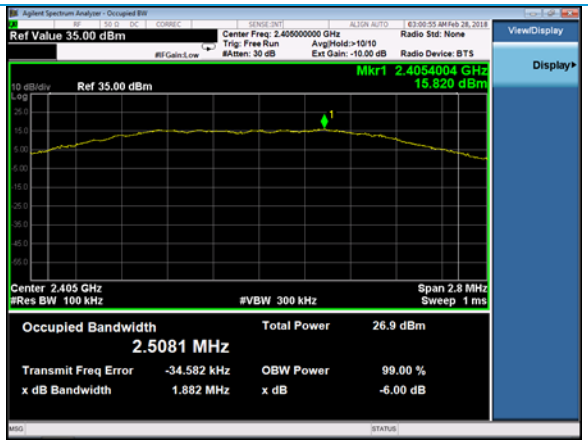
Test Parameters

Frequency	30-25000 MHz
Settings	100k RBW/ 300k RBW
EUT	Low, Mid, High Checked at Max and Min Power

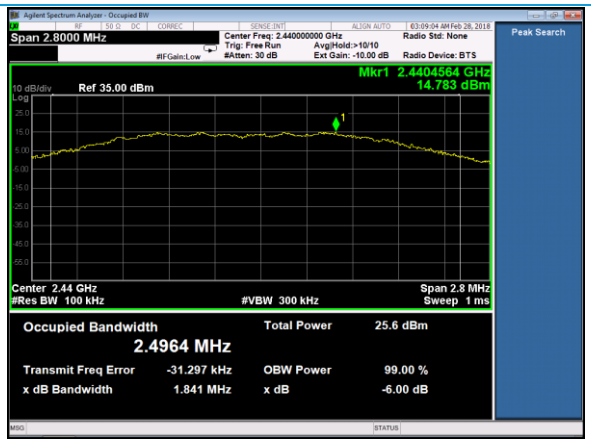
Worst Case Margin = Limit - Closest Measurement = (15.820 dBm – 20 dB) – (-13.279 dBm) = -4.180 dBm – (-13.279 dBm) = 9.099 dB

Plots

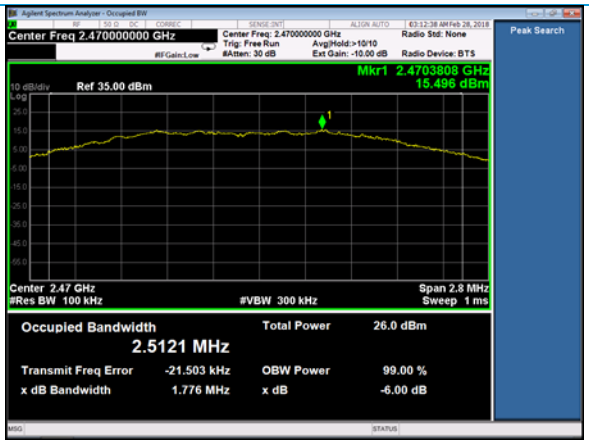
Reference Levels



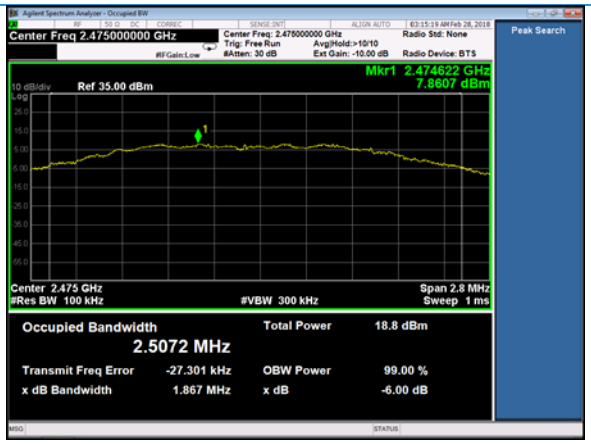
Low Channel



Mid Channel

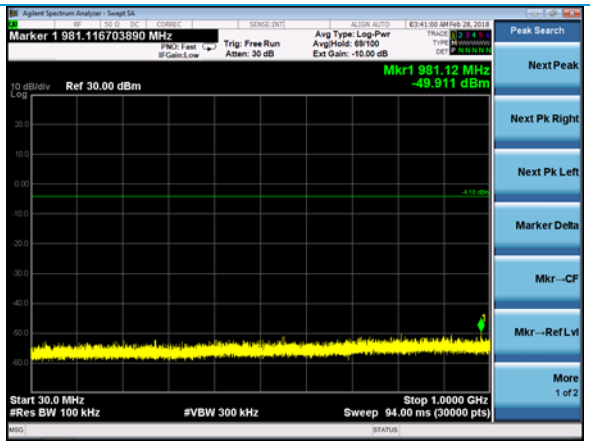


High Channel

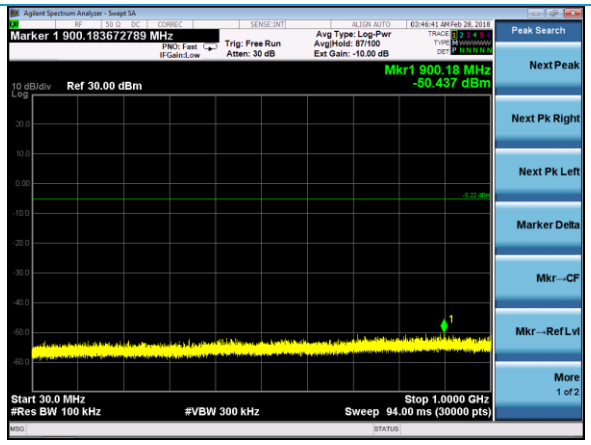


Channel 25

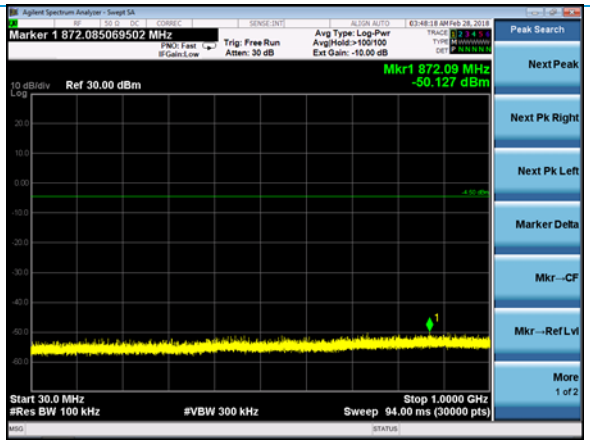
30-1000 MHz



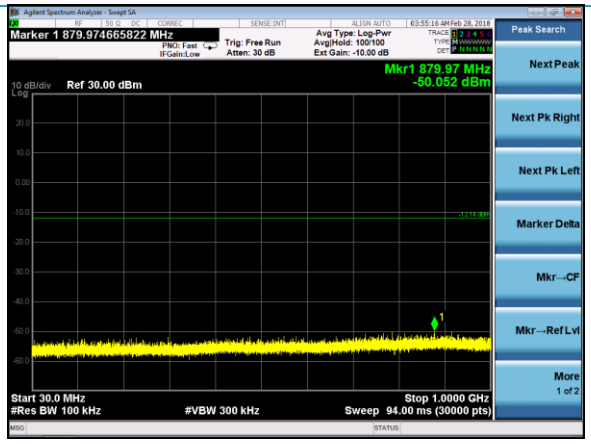
Low Channel



Mid Channel

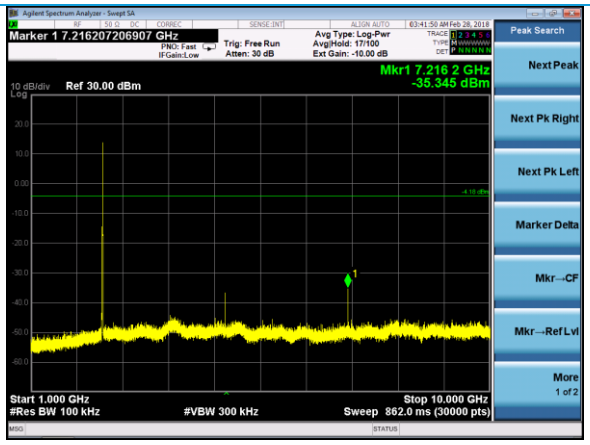


High Channel

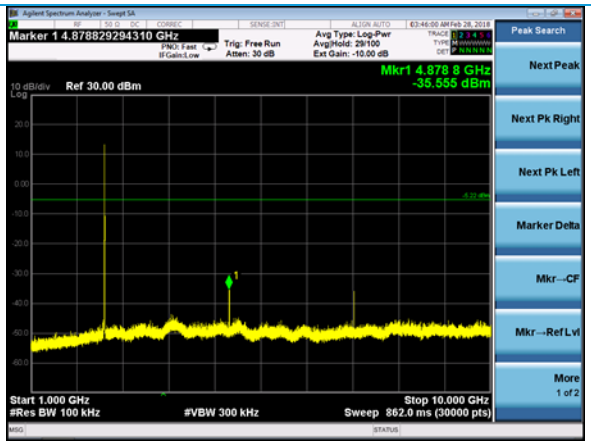


Channel 25

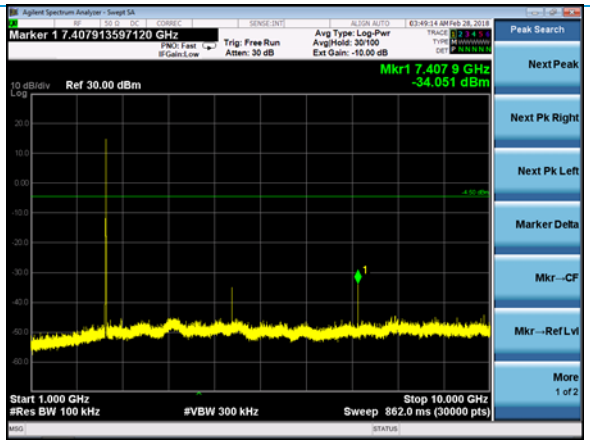
1000-10000 MHz



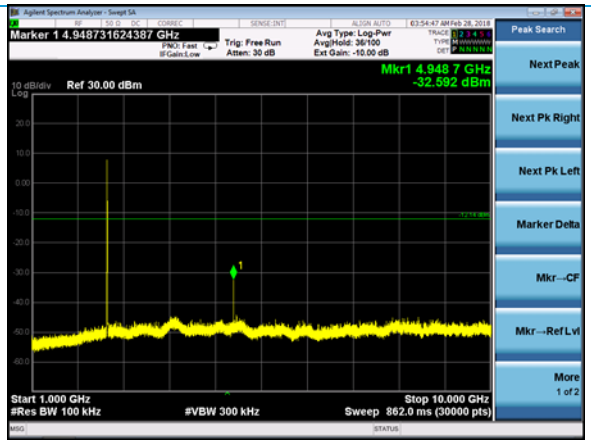
Low Channel



Mid Channel

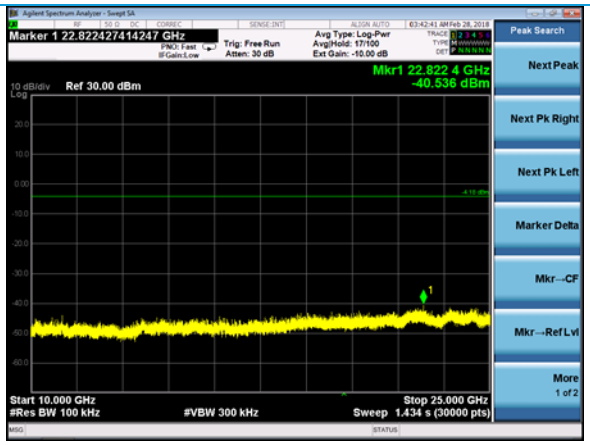


High Channel

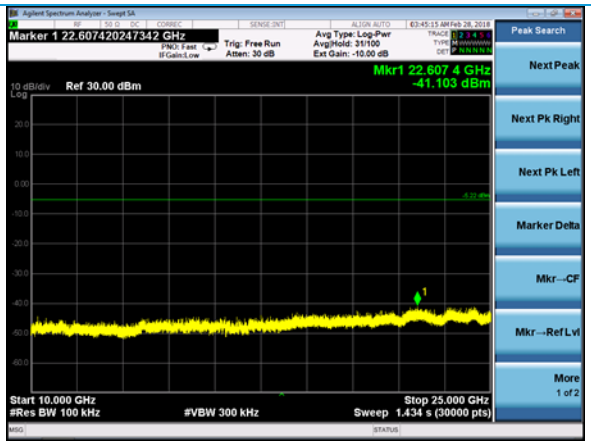


Channel 25

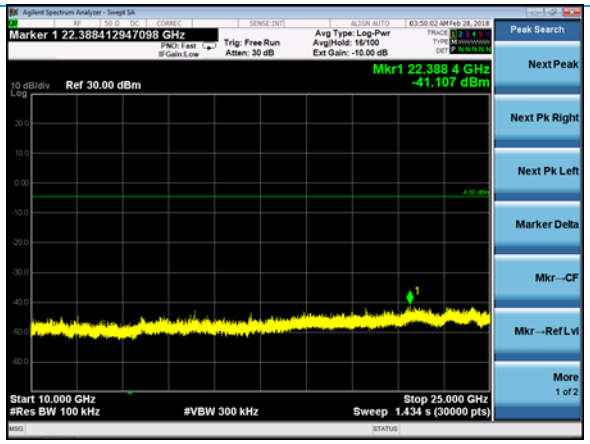
10000-25000 MHz



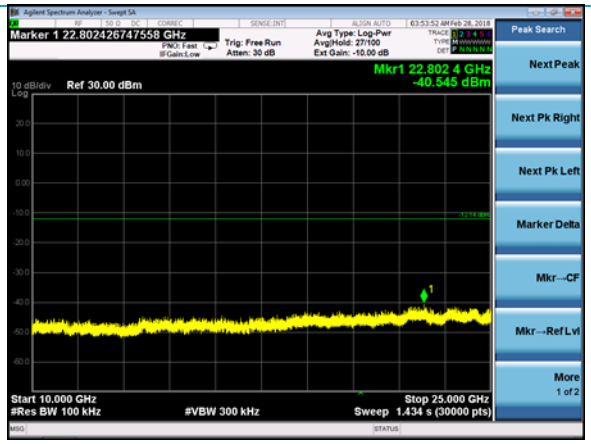
Low Channel



Mid Channel

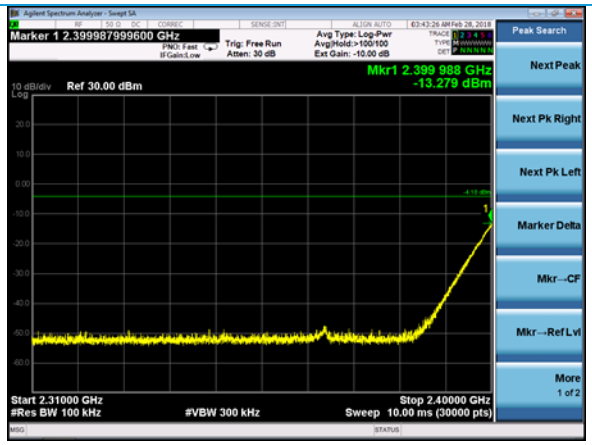


High Channel

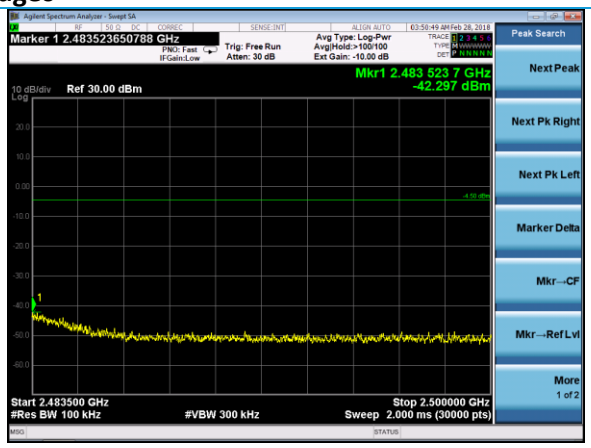


Channel 25

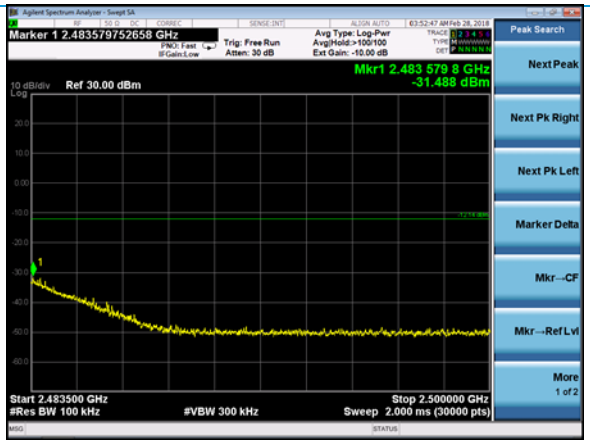
Band Edges



Low Channel



High Channel



Channel 25 UBE

5.1.5 Antenna Port Conducted Emissions – Frequency Stability

Operator	Shane Dock
Test Date	3/14/18
Location	Conducted RF Area
Temp. / R.H.	72 degrees F/ 29% RH
Requirement	FCC: 2.1055 (d) IC: RSS-GEN 6.11
Method	ANSI C63.10 Section 6.8

Test Parameters

Frequency	2405, 2440, 2475 MHz
Settings	CW Tx used to measure deviation.

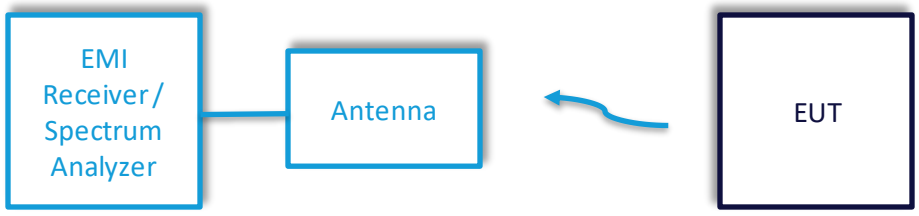
Table

Channel	102 VAC Frequency (Hz)	120 VAC Frequency (Hz)	138 VAC Frequency (Hz)	235.5 VAC Frequency (Hz)	277 VAC Frequency (Hz)	318.6 VAC Frequency (Hz)	Deviation (Hz)
Low	2404892338	2404892405	2404892505	2404892855	2404894488	2404893505	2150
Mid	2439891321	2439890505	2439890438	2439890338	2439890305	2439890238	1083
High	2474888221	2474888255	2474888271	2474888321	2474888471	2474888871	650

5.2 Radiated Emissions

Description of Measurement	The frequency spectrum is investigated for intentional and / or unintentional signals emanating from the EUT by use of a standardized test site and measurement antenna. The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed allowing the data to be gathered and reported as corrected values. The maximum emissions from the EUT are determined by turn-table azimuth rotation (360°) and scanning of the measurement antenna. Maximized levels are noted at degree values of azimuth, measurement antenna height, and measurement antenna polarity.
Example Calculations	Measurement (dBµV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBµV/m) Margin (dB) = Limit (dBµV/m) - Corrected Reading (dBµV/m) Example at 4000 MHz: Reading = 40 dBµV + 3.4 dB + 0.9 dB + 6.5 dB/m = 50.8 dBµV/m Average Limit = 20 log (500) = 54 dBµV/m Margin = 54 dBµV/m - 50.8 dBµV/m = 3.2 dB

Block Diagram



5.2.1 Radiated Emissions

Operator	Shane Dock
Test Date	2/12/18 – 9/9/19
Location	Chamber 5
Temp. / R.H.	74 degrees F/ 29% RH
Requirement	FCC: 15.247 (d) IC: RSS-GEN 8.10
Method	ANSI C63.10 Sections 6.3, 6.5, 6.6

Limits at 3m:

	30-88 MHz	88-216 MHz	216 – 960 MHz	960+ MHz
Field Strength (µV/m)	100	150	200	500
Field Strength (dBµV/m)	40.0	43.5	46.0	54.0

Test Parameters

Frequency	30-25000 MHz
Distance	3 meters
Settings	Unit tested at low, mid, and high channels. Unit has a continuous transmission.
Settings	RBW = 120kHz, VBW = 1.2 MHz (<1 GHz) RBW = 1 MHz, VBW = 3 MHZ (>1 GHz) , 10 Hz for average measurements
EUT	Unit tested and measured in three orientations.
Notes	Measurements taken in restricted bands. For measurements above 1 GHz, antenna used with a tilt gear to keep EUT within the cone of radiation. Absorbers were also added to the floor of the chamber while measuring emissions above 1 GHz. RVBW = Reduced Video Bandwidth
Example Calculation	Limit (dBµV) = 20* Log[Limit (µV)] 40 = 20* log (100) Raw Data + Antenna Factor + Cable Factor = Reported Data 19.77 dBµV + 12.50 dB/m + 0.93 dB = 38.80 dBµV/m

Instrumentation

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Date : 12-Feb-2018 Test : Radiated Emissions Job : C-2944

PE : Shane Dock Customer : Leviton LES Quote : 318065

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960081	Antenna - Double Ridge Horn	EMCO	3115	6907	3/17/2017	3/17/2018	Active Calibration
2	EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	5/12/2017	5/12/2018	Active Calibration
3	AA 960174	Antenna - Small Horn	ETS Lindgren	3116C-PA	00206880	5/1/2017	5/1/2018	Active Calibration
4	AA 960171	Cable	A.H. Systems, Inc	SAC-26G-6	386	11/15/2017	11/15/2018	Active Verification
5	AA 960154	Filter - High Pass 2.4 GHz	KWM	HPF-L-14186	7272-02	8/30/2017	8/30/2018	Active Calibration
6	AA 960195	Antenna - Log Periodic	A.H. Systems, Inc	SAS-512-2	557	1/30/2018	1/30/2019	Active Calibration
7	AA 960128	Antenna - Biconical	ETS Lindgren	3110B	00062899	4/13/2017	4/13/2018	Active Calibration
8	EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	3/2/2017	3/2/2018	Active Calibration

Laird

Date : 14-Sep-2019 Test : Radiated Emissions Job : C-3236

PE : Shane Dock Customer : Leviton Quote : 319132

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	AA 960081	Antenna - Double Ridge Horn	EMCO	3115	6907	4/16/2018	4/16/2020	Active Calibration
2	EE 960203	Analyzer - EMI Receiver	Keysight	N9038A	MY56400072	7/29/2019	7/29/2020	Active Calibration
3	AA 960174	Antenna - Small Horn	ETS Lindgren	3116C-PA	00206880	5/15/2018	5/15/2020	Active Calibration
4	AA 960171	Cable	A.H. Systems, Inc	SAC-26G-6	386	11/12/2018	11/12/2019	Active Verification
5	EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/24/2019	4/24/2020	Active Calibration
6	AA 960158	Antenna - Double Ridge Horn	ETS Lindgren	3117	109300	3/26/2018	3/26/2020	Active Calibration
7	EE 960159	Antenna - Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	691801732	3/26/2018	3/26/2020	Active Calibration

Tables – ZS10S-D0Z

Frequency (MHz)	Height (cm)	Azimuth (degree)	Quasi Peak Reading (dBµV/m)	Quasi Peak Limit (dBµV/m)	Quasi Peak Margin (dB)	Antenna Polarity	EUT orientation
152.2	222.0	107.7	39.4	43.5	14.6	H	V
151.3	100.0	119.9	38.7	43.5	15.3	V	V
62.4	100.0	354.7	33.8	40.0	20.2	V	V
34.4	100.0	77.0	32.1	40.0	21.9	V	V

Frequency (MHz)	Height (cm)	Azimuth (degree)	Peak Reading (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Average Reading (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Antenna Polarity	EUT orientation	Channel
7409.7	100.0	0.0	57.8	74.0	16.2	50.2	54.0	3.8	H	V	24
4939.8	107.0	47.4	55.4	74.0	18.7	46.5	54.0	7.5	H	V	24
4940.8	182.0	344.5	56.0	74.0	18.0	47.7	54.0	6.3	V	V	24
7409.7	186.0	8.8	54.5	74.0	19.5	46.0	54.0	8.0	V	V	24
4880.6	185.0	0.2	56.0	74.0	18.0	47.9	54.0	6.1	H	V	18
7321.4	213.0	3.6	53.7	74.0	20.3	45.2	54.0	8.8	H	V	18
4810.6	126.0	0.2	53.3	74.0	20.7	45.4	54.0	8.6	H	V	11

Table – Band Edge

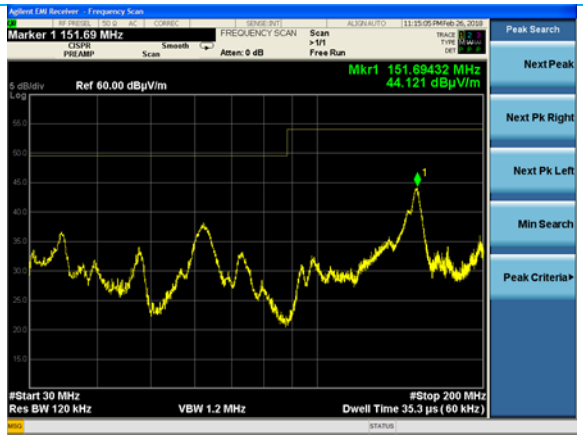
Band Edge	Peak Frequency (MHz)	Peak Reading (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Average Frequency (MHz)	Average Reading (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
Upper – CH24	2483.5	61.7	74.0	12.3	2483.5	44.5	54.0	9.5
Upper – CH25	2483.6	71.4	74.0	2.6	2483.5	45.0	54.0	9.0
Lower	2389.7	53.2	74.0	20.8	2367.3	38.0	54.0	16.0

Tables – LU20S-DNW

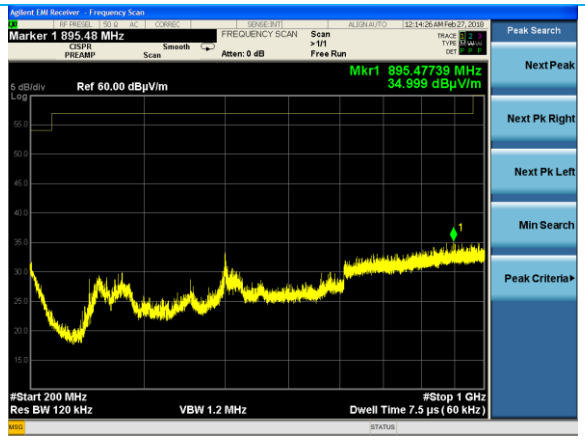
Band Edge	Peak Frequency (MHz)	Peak Reading (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Average Frequency (MHz)	Average Reading (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
Upper – CH24	2499.9	50.3	74.0	23.7	2496.1	30.2	54.0	23.8
Upper – CH25	2483.6	70.7	74.0	3.3	2483.5	40.6	54.0	13.4
Lower	2389.3	53.8	74.0	20.2	2389.8	37.4	54.0	16.6

Frequency (MHz)	Antenna Polarity	Orientation	Height (cm)	Azimuth (degree)	Peak Reading (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Average Reading (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	Channel
4940.0	Horizontal	Vertical	245	287	58.0	74.0	16.0	51.5	54.0	2.5	24
4940.0	Vertical	Vertical	103	139	57.2	74.0	16.8	50.7	54.0	3.3	24
4940.0	Vertical	Horizontal	160	273	55.4	74.0	18.6	48.9	54.0	5.1	24
4940.0	Horizontal	Horizontal	100	350	57.8	74.0	16.2	51.2	54.0	2.8	24
4940.0	Horizontal	Flat	215	90	56.7	74.0	17.3	50.1	54.0	3.9	24
4940.0	Vertical	Flat	220	215	59.1	74.0	14.9	52.8	54.0	1.2	24
7410.0	Horizontal	Vertical	244	25	54.3	74.0	19.7	46.4	54.0	7.6	24
7410.0	Vertical	Vertical	250	263	53.1	74.0	20.9	44.8	54.0	9.2	24
7410.0	Vertical	Horizontal	250	0	55.4	74.0	18.6	47.8	54.0	6.2	24
7410.0	Horizontal	Horizontal	100	316	56.5	74.0	17.5	48.9	54.0	5.2	24
7410.0	Horizontal	Flat	186	223	53.4	74.0	20.6	45.4	54.0	8.6	24
7410.0	Vertical	Flat	182	247	56.3	74.0	17.7	48.6	54.0	5.4	24
4880.0	Vertical	Flat	241	217	57.5	74.0	16.5	51.0	54.0	3.0	18
4810.0	Vertical	Flat	216	215	56.9	74.0	17.1	50.4	54.0	3.6	11
4950.0	Vertical	Flat	170	165	47.3	74.0	26.7	38.8	54.0	15.2	25
7320.0	Horizontal	Horizontal	100	310	54.4	74.0	19.6	46.7	54.0	7.3	18
7215.0	Horizontal	Horizontal	100	310	46.9	74.0	27.1	35.9	54.0	18.1	11
7425.0	Horizontal	Horizontal	100	314	46.3	74.0	27.7	37.0	54.0	17.0	25

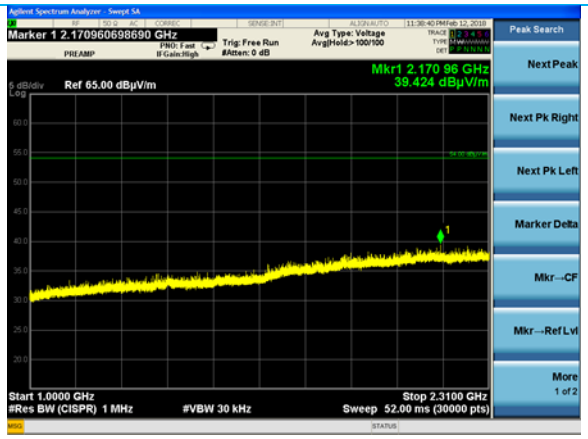
Plots - ZS10S-D0Z



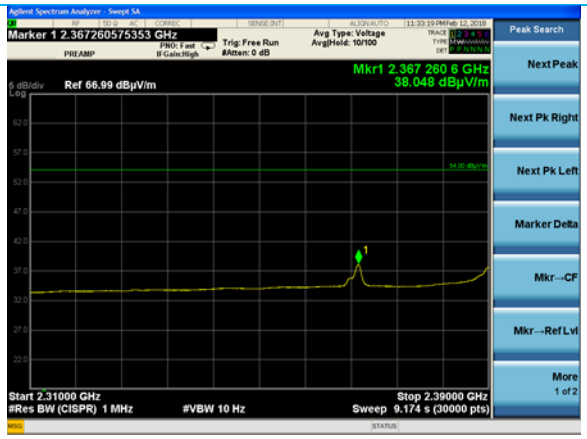
30-200 MHz Vertical Polarization



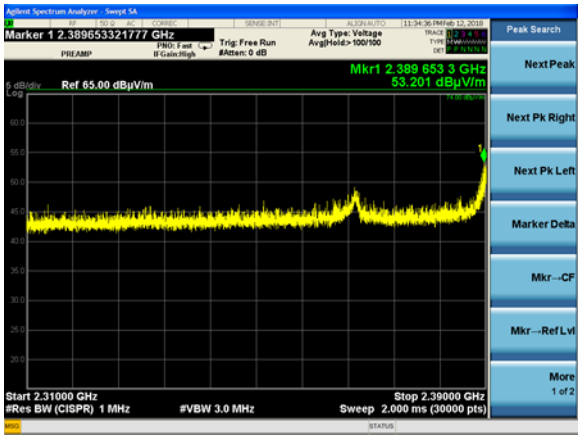
200-1000 MHz Vertical Polarization



1.00-2.31 GHz Vertical Polarization

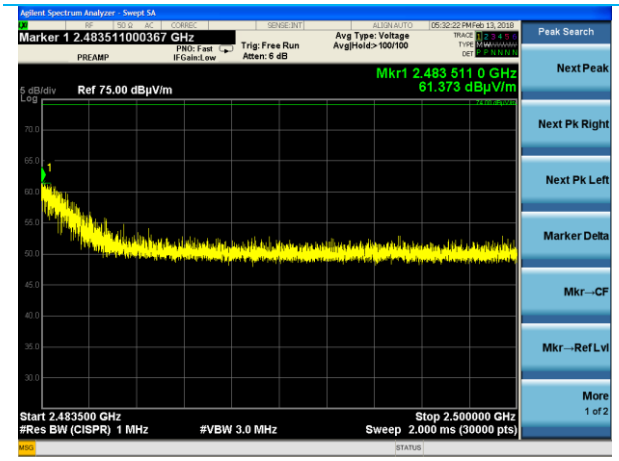


Lower Band Edge (Average)

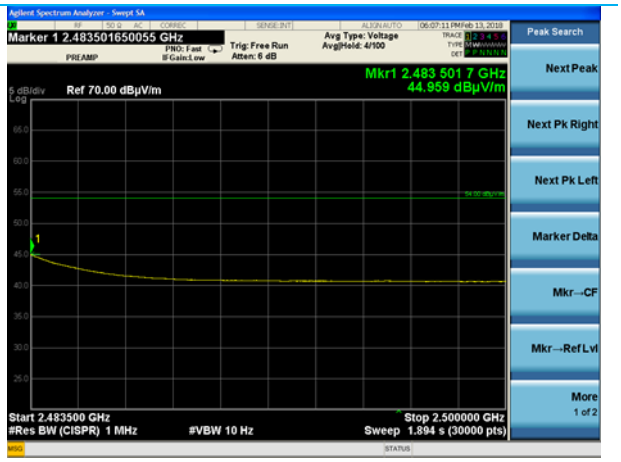


Lower Band Edge (Peak)

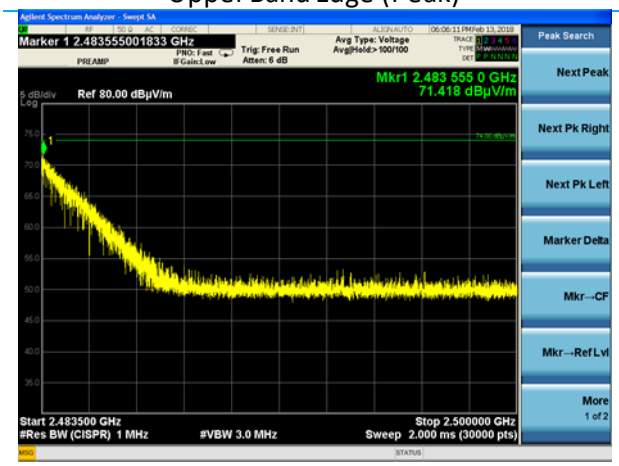
Upper Band Edge (Average)



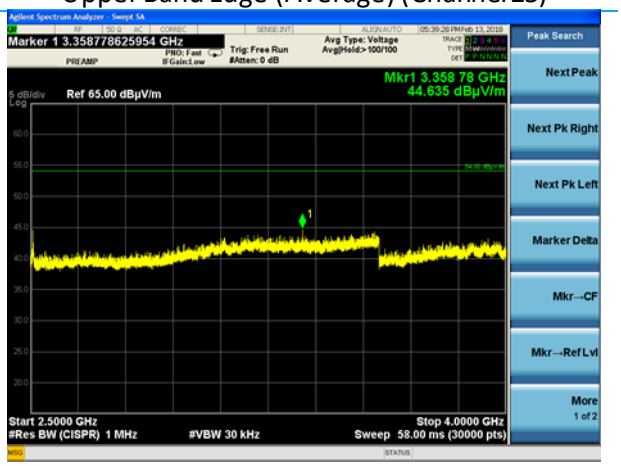
Upper Band Edge (Peak)



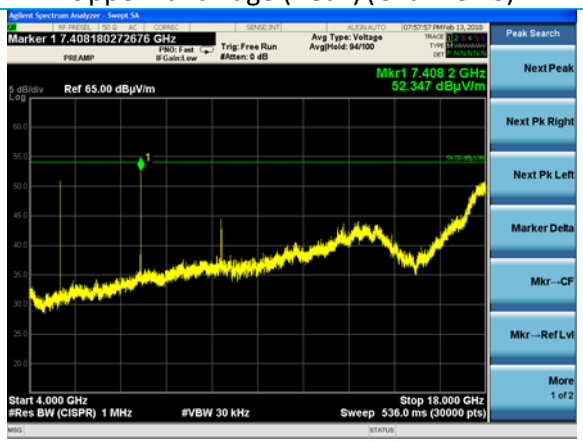
Upper Band Edge (Average) (Channel 25)



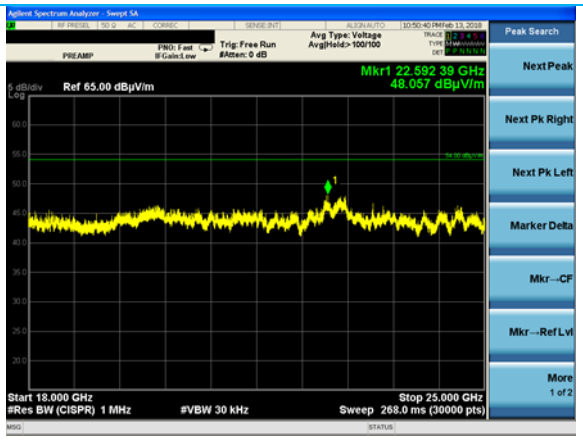
Upper Band Edge (Peak) (Channel 25)



2.5 – 4.0 GHz Vertical Polarization

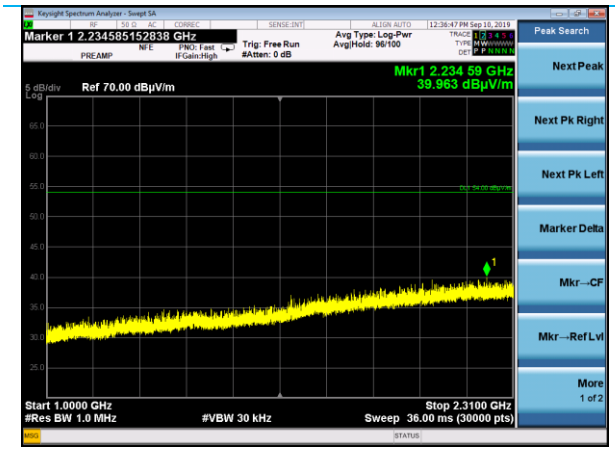


4-18 GHz Horizontal Antenna

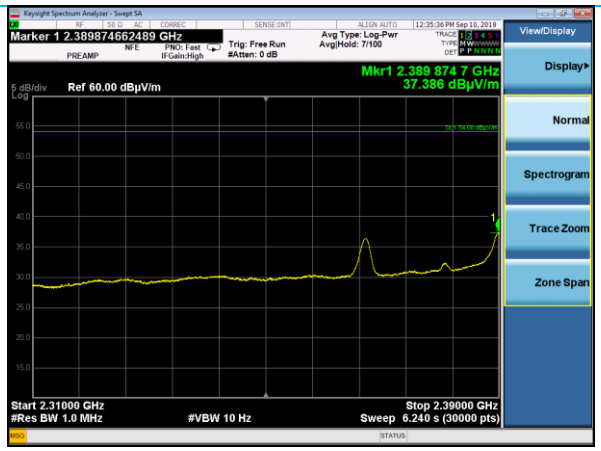


18- 25 GHz Horizontal Antenna

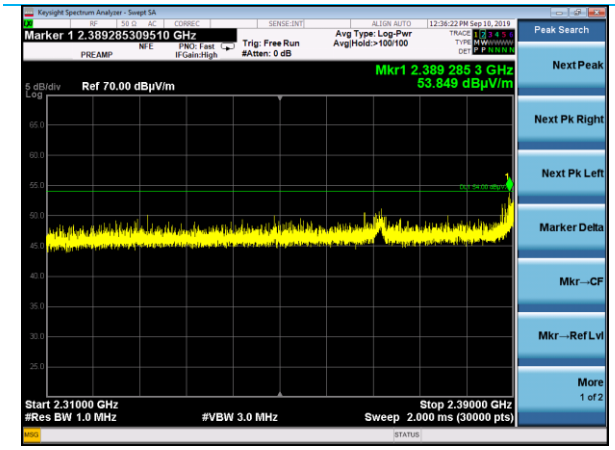
Plots - LU20S-DNW



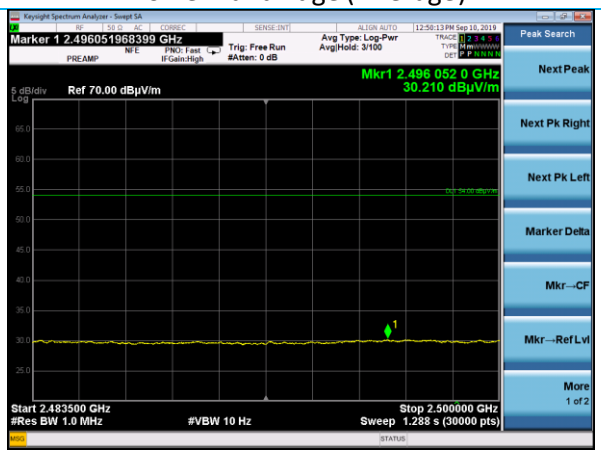
1.00-2.31 GHz Horizontal Polarization



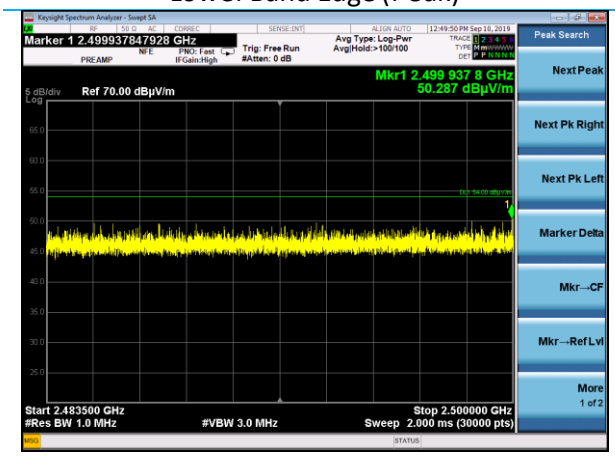
Lower Band Edge (Average)



Lower Band Edge (Peak)

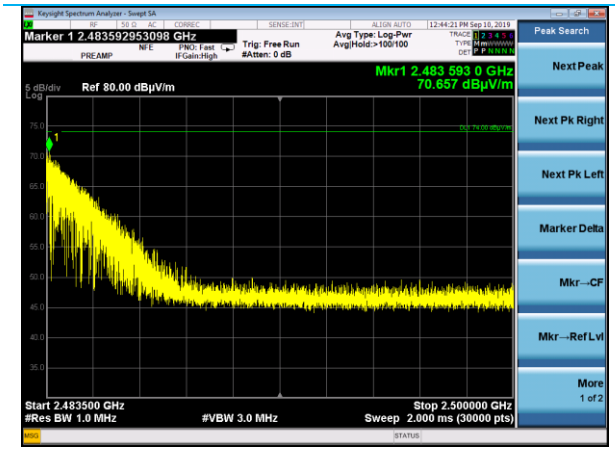


Upper Band Edge (Average)



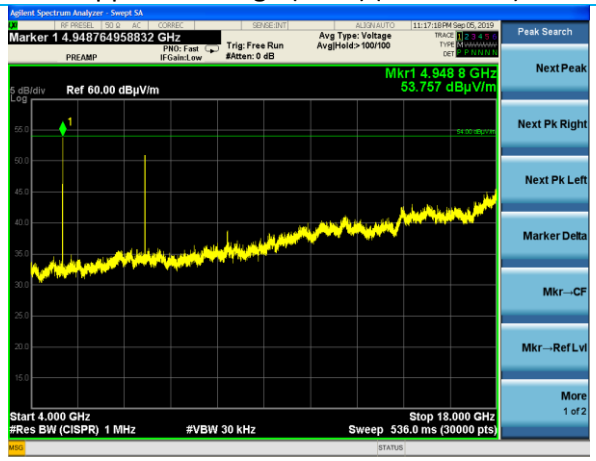
Upper Band Edge (Peak)

Upper Band Edge (Average) (Channel 25)

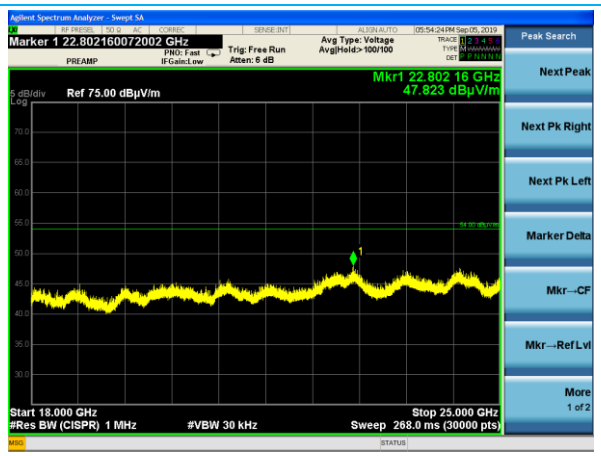


Upper Band Edge (Peak) (Channel 25)

2.5 – 4.0 GHz Horizontal Polarization



4-18 GHz Horizontal Antenna

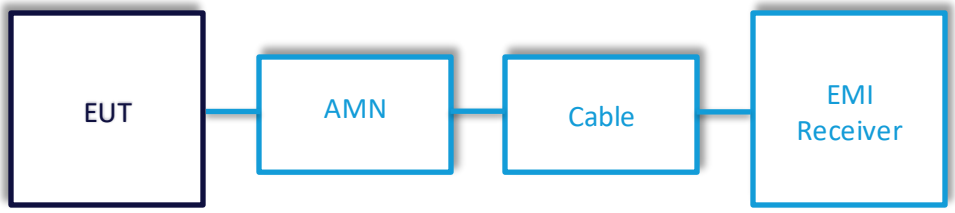


18- 25 GHz Horizontal Antenna

5.3 AC Mains Conducted Emissions

Description of Measurement	A line impedance stabilization network (LISN) or artificial mains network (AMN) allows the emissions of the power supply conductors to be measured while isolating the EUT from the supply mains. The AMN, cable, and other necessary measurement system correction factors are loaded onto the EMI receiver when the measurements are performed. The data is gathered and reported as the corrected values. Maximum emissions are determined with a peak max hold trace then measurements at a selection of the highest points are made with quasi-peak and average detectors. Results are recorded and compared to limit for each line. (e.g. line and neutral)
Example Calculations	Measurement (dBµV) + Cable factor (dB) + Other (dB) = Corrected Reading (dBµV) Margin (dB) = Limit (dBµV) - Corrected Reading (dBµV)

Block Diagram



5.3.1 AC Mains Conducted Emissions

Operator	Shane Dock
Test Date	3/14/18 – 3/16/18
Location	EMC Lab
Temp. / R.H.	72 degrees F/ 28%
Requirement	FCC: 15.207 IC: RSS-GEN 8.8
Method	ANSI C63.10 Section 6.2

Limits:

Frequency of Emission (MHz)	Quasi-Peak Limit (dBuV)	Average Limit (dBuV)
0.15 - 0.50	66 to 56	56 to 46
0.5 – 5	56	46
5-30	60	50

Test Parameters

Frequency	0.15 – 30 MHz
Detectors	Quasi-Peak, Average
Settings	RBW 9 kHz
Settings	VBW 90 kHz
EUT Power	120V 60 Hz
Channel	Mid Channel Tx mode(Found to be worst-case)
Note	ZS10S-D0Z unit tested.

Instrumentation

Laird
Smart Technology. Delivered.

Date : 12-Feb-2018 Test : Conducted Emissions Job : C-2944

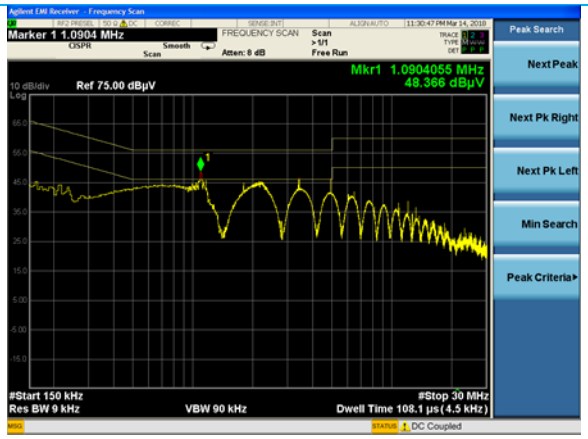
PE : Shane Dock Customer : Leviton LES Quote : 318065

No.	Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due Date	Equipment Status
1	EE 960162	LISN	COM-POWER	LI-215A	191969	8/28/2017	8/28/2018	Active Calibration
2	EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	3/2/2017	4/23/2018	Active Calibration

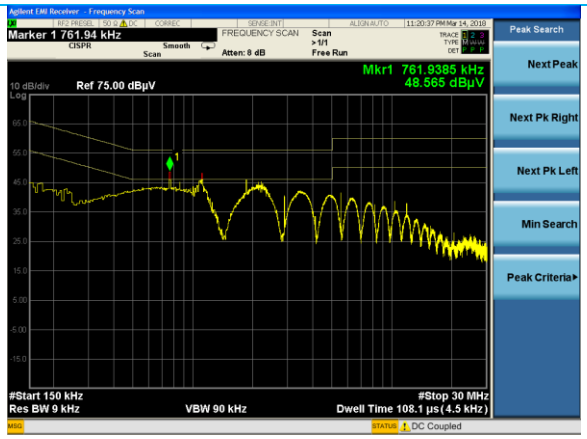
Table

Line	Frequency (MHz)	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)
1	1.090	45.4	56.0	10.6	34.6	46.0	11.4
1	2.166	42.8	56.0	13.3	31.5	46.0	14.6
1	3.426	41.0	56.0	15.0	29.5	46.0	16.5
1	4.884	40.0	56.0	16.0	28.5	46.0	17.5
1	0.630	42.7	56.0	13.3	31.1	46.0	14.9
2	0.762	41.4	56.0	14.6	30.4	46.0	15.7
2	1.113	43.5	56.0	12.5	32.6	46.0	13.4
2	2.202	41.7	56.0	14.3	30.7	46.0	15.4
2	3.471	40.5	56.0	15.5	29.0	46.0	17.0
2	4.812	39.4	56.0	16.6	27.9	46.0	18.1

Plots



Line 1



Line 2

6 Revision History

Version	Date	Notes	Person
V0	5/31/18	Rough Draft	Shane Dock
V1	1/23/19	Updated Draft	Shane Dock
V2	2/15/19	Further Revisions	Shane Dock
V3	3/21/19	Final Draft	Shane Dock
V4	11/4/19	Load Controller Added	Shane Dock
V5	11/13/19	More Load Controller information	Shane Dock
V6	3/24/20	TCB Responses Added	Shane Dock

END OF REPORT