Test Report # 317075

Equipment Under Test:	Censys
Test Date(s):	4/10/17 – 6/9/17, 7/11/17, 7/21/17
Prepared for:	Brady Corporation Attn: Gregg Haensgen 2221 W. Camden Road Glendale, WI 53209

Report Issued by: Shane Dock, EMC Engineer

Date: 7/24/17

Report Reviewed by: Adam Alger, Quality Systems Engineer

Signature: 

Date: 7/24/17

Report Constructed by: Shane Dock, EMC Engineer

Date: 7/24/17

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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:

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

Government of Canada

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 **4/10/17 to 7/11/17** the Equipment Under Test (EUT), **Censys**, as provided by **Brady Corporation** was tested to the following requirements:

Requirement	Description	Specification	Method	Result
FCC: 15.247 (a)(1) IC: RSS-247 5.1	Channel Separation, Number of Hopping frequencies, Time of Occupancy	FHS	ANSI C63.10	Pass
FCC: 2.1049 IC: RSS-GEN 6.6	Occupied Bandwidth	Reported	ANSI C63.10	Pass
FCC: 15.247 (b)(1) IC: RSS-247 5.4 (b)	Maximum Conducted Output Power	30 dBm	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: 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	Brady Corporation
Contact Person	Gregg Haensgen
Address	2221 W. Camden Road Glendale, WI 53209

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	Censys
Model Number	BCENSYS-1000
Serial Number	CENSYS1_5V & CENSYS1_12V

2.2 Product Description

The Brady Censys RFID reader is an embedded GEN2 UHF reader that periodically scans for UHF tags. The reader operates in the 905-925MHz range and employs an interrogator talks first with frequency hopping ASK pulse interval encoding. The reader is ISO-18000-6 compliant. The result of the scan is parsed by the reader to determines when tag events have occurred. Multiple tag event data are packaged into a transport layer frame with additional reader and transport layer information fields. The Censys reader has an included WiFi module to establish a connection with an existing WiFi infrastructure access point to send these tag messages. The Censys RFID reader is an easy to install device that allows for quick identification of tags for choke point and asset tracking applications.

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

Unit programmed via Serial Connection to 905 MHz, 915 MHz, 925 MHz, or hopping. 5V and 12V units tested with internal and external antennas. Worst case emissions reported. Unit uses an Abracon Ceramic Patch antenna with a gain of 5.5 dBi (Model: ARRUN-915 MHz). All measurements were done after the unit had been in a continues transmit mode for ten minutes.

The unit has 4 antenna ports which can facilitate using the unit's own antenna or an external antenna. The unit cycles between transmitting between the four antenna ports, one at a time, with a delay between each transmission.

Antenna Information:

Model: ARRUN5-915.000MHz

Manufacturer: Abracon

Type: Ceramic Patch

Gain: 5.5dBi

3 REFERENCES

Publication	Edition	Date
CFR 47 Part 15	-	2017
ANSI C63.10	-	2013
RSS-247	2	2017
RSS GEN	4	2014

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

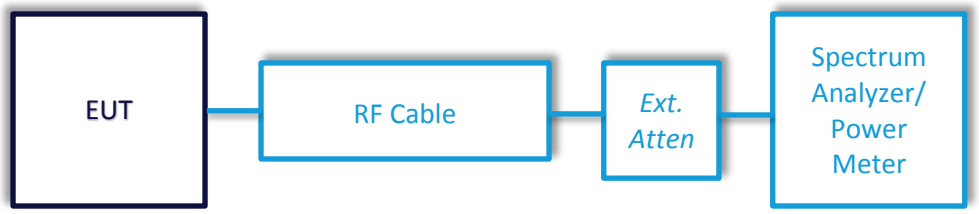
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %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

Operator	Shane Dock
QA	Kim Bay
Test Date	4/20/17, 7/21/17
Location	Conducted RF Area
Temp. / R.H.	72 degrees Fahrenheit, 33% RH
Requirement	FCC: 15.247 (a)(1) IC: RSS-247 5.1
Method	ANSI C63.10 Sections 7.8.2, 7.8.3, 7.8.4

Limits:

Frequency Separation	Number of Hopping Channels	Maximum Occupancy Time
>25 kHz or 20 dB Bandwidth	>50	0.4 seconds per 20 sec. Period

Test Parameters

Frequency	902-928 MHz
Settings	Low, Mid, and High Checked
EUT	Hopping mode Utilized on EUT

Instrumentation

Laird
Smart Technology. Delivered.

Date : 10-Apr-2017 Test : Conducted RF Job # : C-2714

PE: Shane Dock Customer : Brady Corporation Quote #: 317075

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960144	Phaseflex	Gore	EKD01D010720	5800373	6/29/2016	6/29/2017	Active Verification
2	EE 960085	EMI Receiver	Agilent	N9038A	MY51210148	5/12/2016	5/12/2017	Active Calibration
3	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	6/29/2016	6/29/2017	Active Calibration

Tested By: Shane Dock Quality Assurance: Kimberly B Bay

Sample Hop Table

MAC			
0xf8f05ffb14			
raw output			**channel**
channel	30		0
channel	37		1
channel	17		2
channel	26		3
channel	44		4
channel	29		5
channel	18		6
channel	39		7
channel	25		8
channel	20		9
channel	14		10
channel	35		11
channel	1		12
channel	41		13
channel	22		14
channel	46		15
channel	23		16
channel	19		17
channel	43		18
channel	0		19
channel	5		20
channel	38		21
channel	16		22
channel	31		23
channel	50		24
channel	47		25
channel	45		26
channel	32		27
channel	42		28
channel	15		29
channel	4		30
channel	12		31
channel	21		32
channel	40		33
channel	48		34
channel	6		35
channel	34		36
channel	27		37
channel	28		38
channel	10		39
channel	49		40
channel	9		41
channel	8		42
channel	11		43
channel	13		44
channel	2		45
channel	24		46
channel	36		47
channel	7		48
channel	3		49
channel	33		50

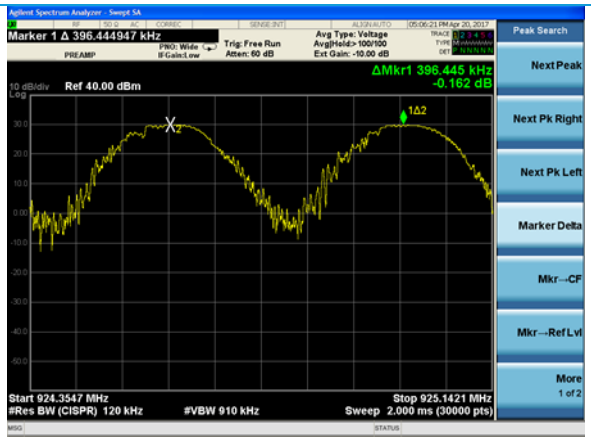
The table above is generated by the unit with the random number generator seeded y the unit's MAC address.

Table

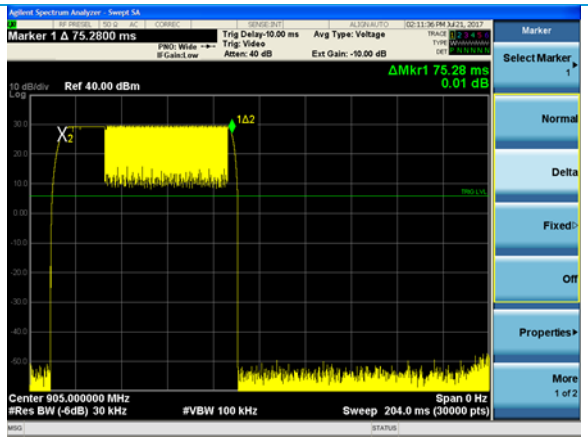
Channel Frequency (MHz)	Occupancy Time (ms)	Number of Transmissions	Occupancy time per 20s (ms)
905	75.28	3	225.84
915	75.08	3	225.24
925	75.40	3	226.20

Plots

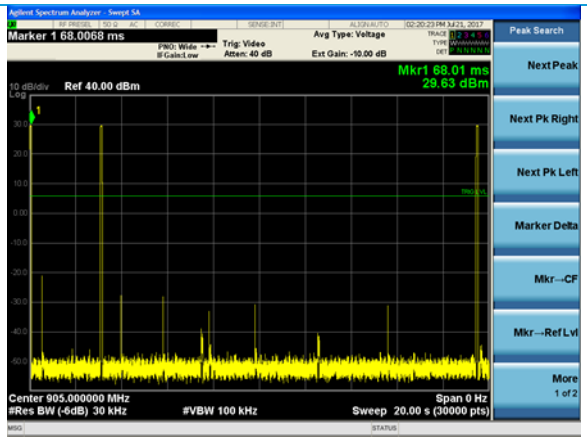
Number of Hopping Frequencies = 50



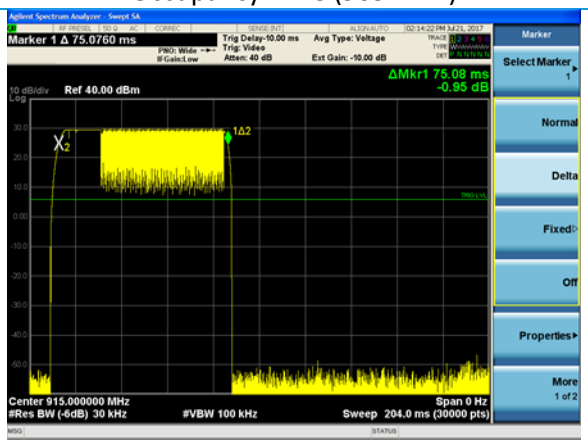
Carrier Frequency Separation = 400kHz



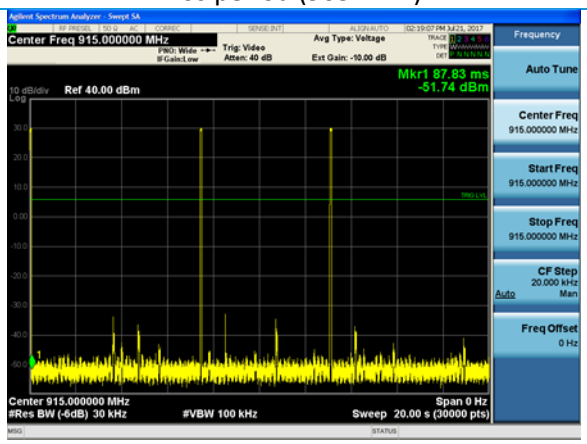
Occupancy Time (905 MHz)



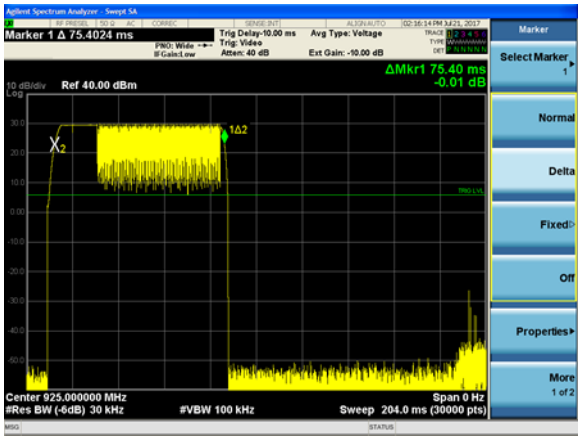
20s period (905 MHz)



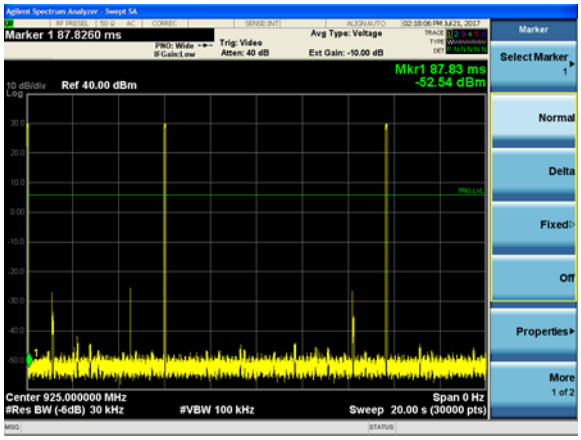
Occupancy Time (915 MHz)



20s period (915 MHz)



Occupancy Time (925 MHz)



20s period (925 MHz)

5.1.2 Antenna Port Conducted Emissions – Occupied Bandwidth

Operator	Shane Dock
QA	Kim Bay
Test Date	4/13/17, 4/20/17
Location	Conducted RF Area
Temp. / R.H.	72 degrees F, 33% RH
Requirement	FCC: 2.1049 IC: RSS-GEN 6.6
Method	ANSI C63.10 Section 7.8.7

Limits:

20 dB BW (MHz)
< 500

Test Parameters

Frequency	905, 915, 925 MHz
Settings	99% and 20 dB BW recorded

Table

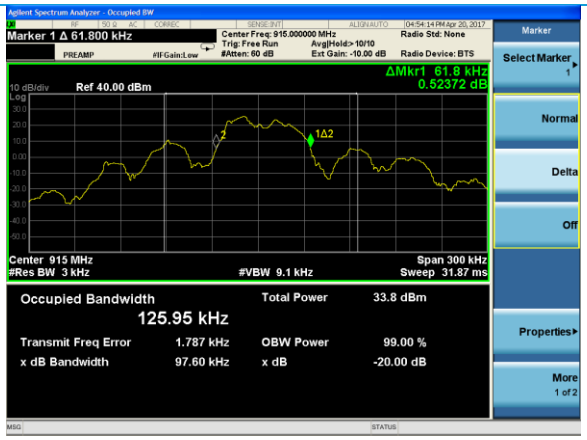
Channel Frequency (MHz)	99% BW (kHz)	20 dB BW (MHz)
905	86.370	64.20
915	124.45	61.80
925	117.89	115.8

Plots

99% BW

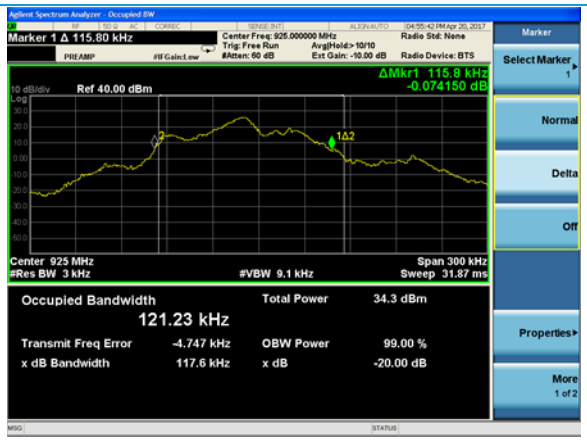
20 dB BW

99% BW



20 dB BW

99% BW



20 dB BW

5.1.3 Antenna Port Conducted Emissions – Maximum Conducted Output Power

Operator	Shane Dock
QA	Kim Bay
Test Date	4/20/17
Location	Conducted RF Area
Temp. / R.H.	72 degrees F, 33% RH
Requirement	FCC: 15.247 (b)(1) IC: RSS-247 5.4 (b)
Method	ANSI C63.10 Section 7.8.5

Limits:

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

Test Parameters

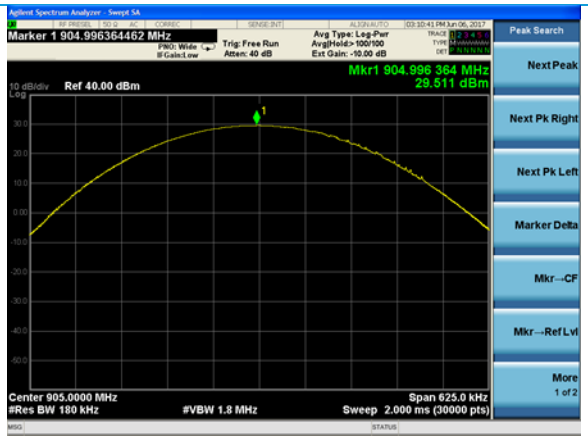
Frequency	905, 915, and 925 MHz
Settings	Units Set for maximum output power
Settings	All 4 antenna ports checked. Worst case measured. Peak Power measured.
EUT	EUT measured in thermal equilibrium

Table

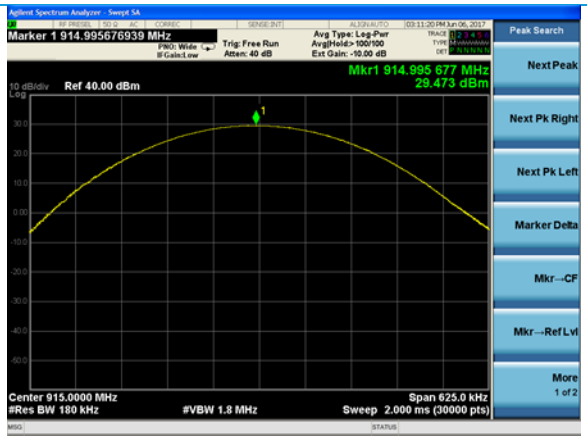
Antenna Port	Low Channel Power (dBm)	Mid Channel Power (dBm)	High Channel Power (dBm)
1	29.59	29.37	29.39
2	29.41	29.48	29.58
3	29.27	29.35	29.65
4	29.51	29.47	29.52

Plots

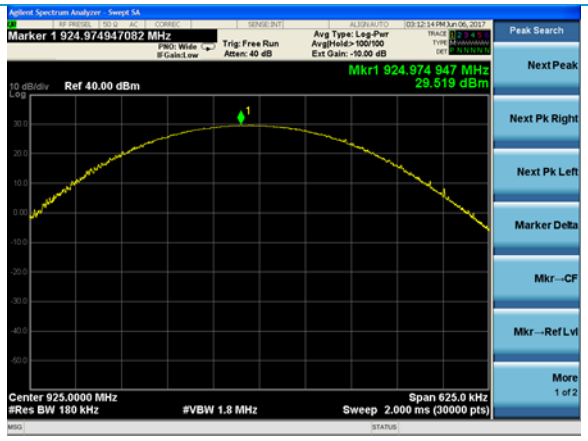
Antenna Port 4 (Worst Case)



Low



Mid



High

5.1.4 Antenna Port Conducted Emissions – RF Spurious Emissions

Operator	Shane Dock
QA	Kim Bay
Test Date	4/20/17
Location	Conducted RF Area
Temp. / R.H.	72 degrees F, 33% RH
Requirement	FCC: 15.247 (d) IC: RSS-247 5.5
Method	ANSI C63.10 Sections 7.8.6 and 7.8.8

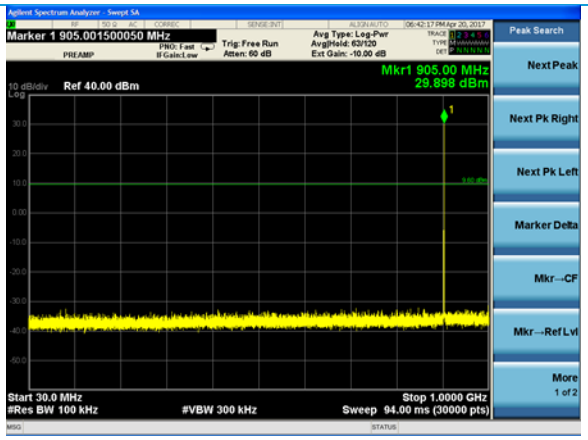
Limits:

RF Spurious Limit
20 dBc

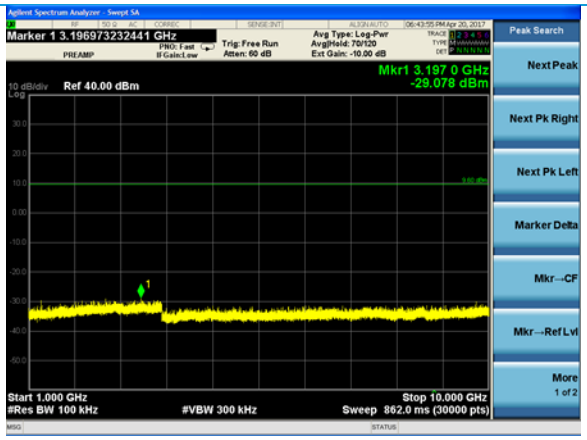
Test Parameters

Frequency	30-10000 MHz
Settings	905, 915, and 925 MHz
Notes	No emissions observed within 20 dB of limit.

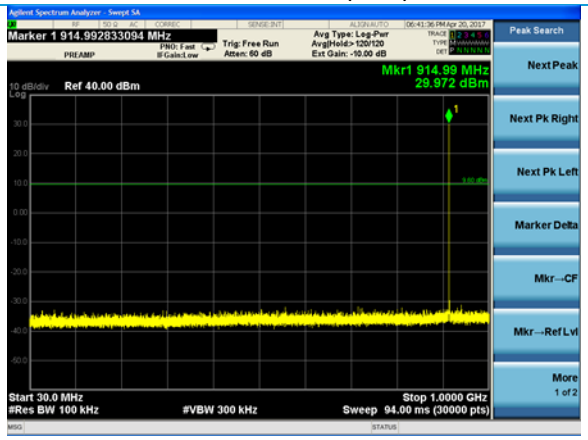
Plots



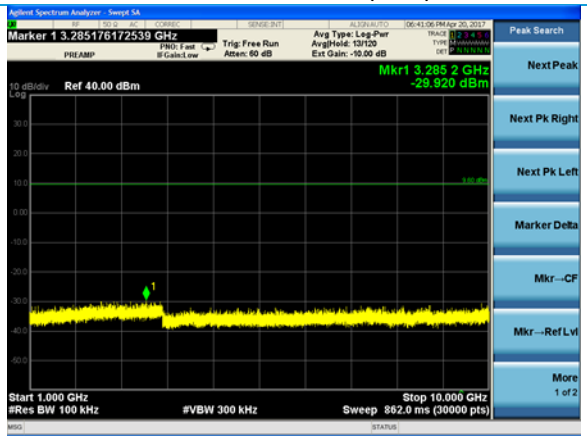
30-1000 MHz (Low)



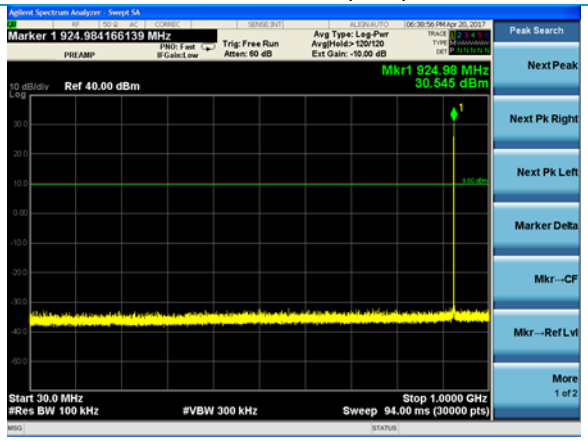
1000-10000 MHz (Low)



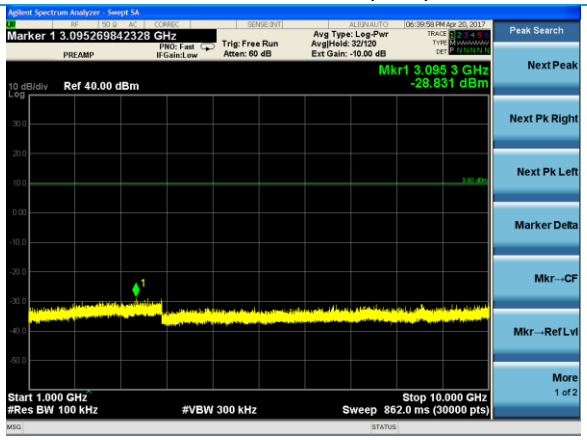
30-1000 MHz (Mid)



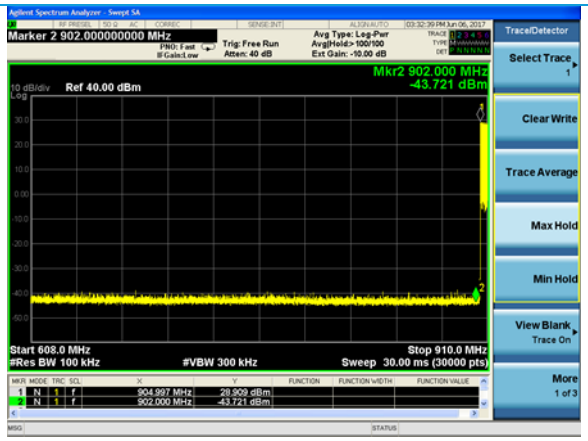
1000-10000 MHz (Mid)



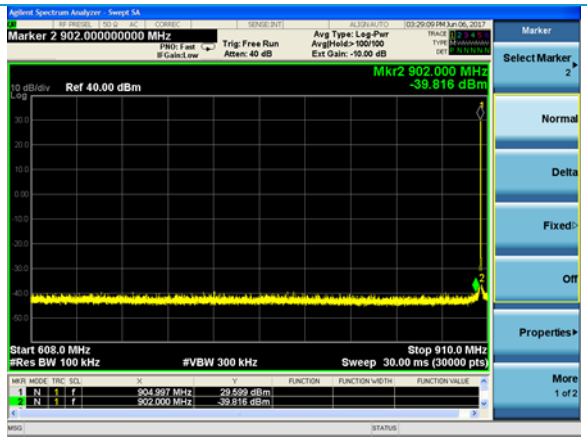
30-1000 MHz (High)



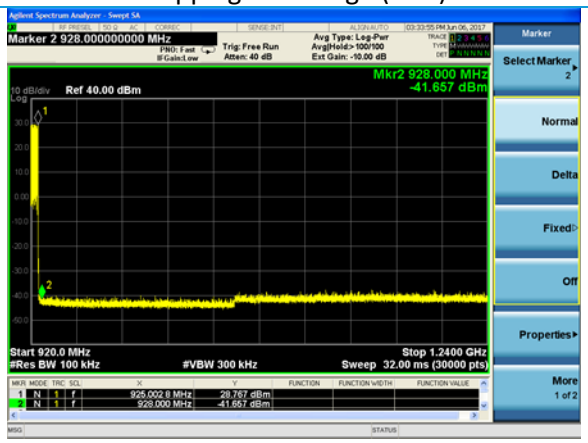
1000-10000 MHz (High)



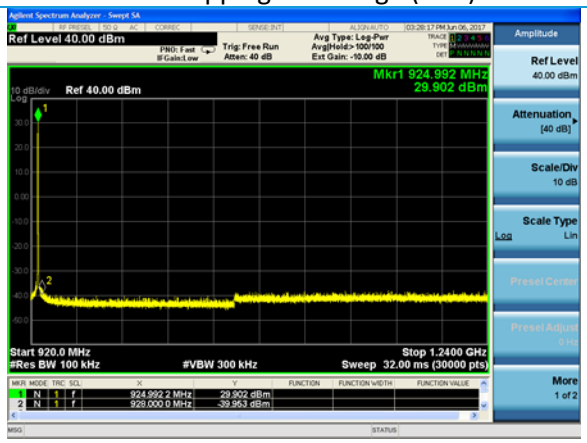
Hopping Band Edge (Low)



Non-Hopping Band Edge (Low)



Hopping Band Edge (High)



Non-Hopping Band Edge (High)

5.1.5 Antenna Port Conducted Emissions – Frequency Stability

Operator	Shane Dock
QA	Kim Bay
Test Date	4/20/17
Location	Conducted RF Area
Temp. / R.H.	72 degrees F, 33% RH
Requirement	FCC: 2.1055 (d) IC: RSS-GEN 6.11
Method	ANSI C63.10 Section 6.8

Test Parameters

Frequency	905, 915, and 925 MHz
Setting	Unit 1 = 5V; Unit 2 = 12V or 24V (Both Checked)

Table (Values below listed in Hz at the given voltages)

5V Unit	4.75 VDC	5.00 VDC	5.25 VDC	Deviation
Low Channel	905001970	905001970	905002230	260
Mid Channel	915000800	915000070	915000670	730
High Channel	925001075	925001058	925000642	433

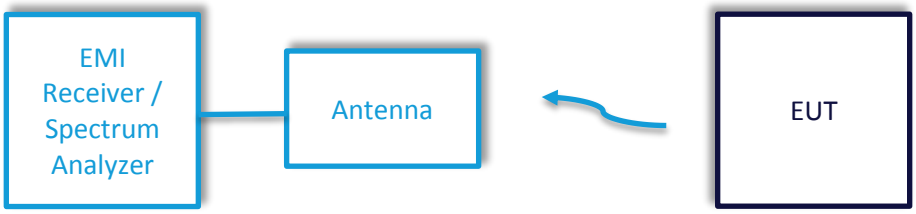
12V Unit	11.4 VDC	12.0 VDC	12.6 VDC	Deviation
Low Channel	904999975	904998858	905000042	1184
Mid Channel	914999525	915000325	914999742	800
High Channel	924999058	924998842	924999592	750

12V Unit	22.8 VDC	24.0 VDC	25.2 VDC	Deviation
Low Channel	904999658	904999725	904999958	300
Mid Channel	914999808	915000058	914998658	1400
High Channel	924999075	924999508	924999242	433

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
QA	Kim Bay
Test Date	4/10/17 – 4/18/17, 7/11/17
Location	5M Chamber
Temp. / R.H.	70-74 degrees Fahrenheit, 33-36% RH
Requirement	FCC: 15.247 (d) IC: RSS-GEN 8.10
Method	ANSI C63.10 Sections 6.5 and 6.6

Limits:

	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	30-10000
Distance	3 meters
Settings	Unit tested at 905, 915, and 925 MHz channels.
Settings	RBW = 120kHz, VBW 1.2 MHz (<1 GHz) RBW = 1 MHz, VBW = 3 MHZ (>1 GHz)
EUT	Measurements checked on antenna port 1 as determined worst case from pre-scan measurements.
EUT	Unit tested and measured in one orientation, in which the Brady B is readable on the front of the unit. (Labeled as “B”). Worst-case emissions reported as determined from pre-scan measurements.
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. Emissions below 1 GHz on the 12V unit are not a function of the EUT.
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

Laird
Smart Technology. Delivered.

Date : 10-Apr-2017 Test : Radiated Emissions Job # : C-2714

PE: Shane Dock Customer : Brady Corporation Quote #: 317075

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960085	EMI Receiver	Agilent	N9038A	MY51210148	5/12/2016	5/12/2017	Active Calibration
2	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	3/17/2017	3/17/2018	Active Calibration
3	AA 960171	Cable - low loss 6m	A.H. Systems, Inc	SAC-26G-6	386	3/31/2016	4/30/2017	Active Verification
4	AA 960150	Biconical Antenna	ETS Lindgren	3110B	0003-3346	3/3/2017	3/3/2018	Active Calibration
5	AA 960163	Log Periodic Antenna	A.H. Systems, Inc	SAS-512-2	500	3/28/2017	3/28/2018	Active Calibration
6	AA 960156	High Pass Filter 900 MHz	KWM	HPF-L-14185	unknown	7/25/2016	7/25/2017	Active Calibration
7	EE 960096	Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	40201429	3/17/2017	3/17/2018	Active Calibration
8	EE 960088	MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	3/2/2017	3/2/2018	Active Calibration

Tested By: Shane Dock Quality Assurance: Kimberly B Bay

7/11/17 Testing Instrumentation

Laird
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Date : 19-Jul-2017 Test : Radiated Emissions Job # : C-2755

PE: Shane Dock Customer : Triax Technologies Quote #: 317204

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960085	EMI Receiver	Agilent	N9038A	MY51210148	5/12/2017	5/12/2018	Active Calibration
2	AA 960150	Biconical Antenna	ETS Lindgren	3110B	0003-3346	3/3/2017	3/3/2018	Active Calibration

Tables

5V Unit

Frequency (MHz)	Height (Cm)	Azimuth (degree)	Peak Reading (dBµV/m)	Average Reading (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Peak Margin (dB)	Average Margin (dB)	Antenna Polarity	EUT orientation	Channel
2745.0	138.1	135.8	42.2	32.2	74.0	54.0	31.8	21.8	H	B	Mid
2745.0	126.4	319.8	43.6	34.9	74.0	54.0	30.4	19.1	V	B	Mid
3660.0	226.9	351.8	41.8	30.5	74.0	54.0	32.2	23.5	H	B	Mid
4575.0	141.7	161.0	40.3	27.4	74.0	54.0	33.7	26.6	H	B	Mid
4575.0	194.3	227.3	42.5	32.5	74.0	54.0	31.5	21.5	V	B	Mid
2715.0	100.4	239.0	43.8	36.3	74.0	54.0	30.2	17.7	V	B	Low
3620.0	213.2	326.0	40.4	27.6	74.0	54.0	33.6	26.4	H	B	Low
2775.0	100.1	238.0	41.6	32.2	74.0	54.0	32.4	21.8	V	B	High
4625.0	198.8	227.0	41.8	31.7	74.0	54.0	32.2	22.3	H	B	High
1138.8	173.8	0.0	56.3	41.7	74.0	54.0	17.7	12.3	V	B	High
1116.6	173.8	0.0	52.1	35.8	74.0	54.0	21.9	18.2	V	B	High

12V Unit

Frequency (MHz)	Height (Cm)	Azimuth (degree)	Peak Reading (dBµV/m)	Average Reading (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Peak Margin (dB)	Average Margin (dB)	Antenna Polarity	EUT orientation	Channel
2775.0	126.2	23.5	43.6	35.2	74.0	54.0	30.4	18.8	H	B	High

2775.0	127.2	352.0	45.8	36.8	74.0	54.0	28.2	17.2	V	B	High
2745.0	180.9	351.8	45.6	38.1	74.0	54.0	28.4	15.9	H	B	Mid
2745.0	126.3	324.3	43.3	35.6	74.0	54.0	30.7	18.4	V	B	Mid
2715.0	225.5	191.8	43.0	35.7	74.0	54.0	31.0	18.3	H	B	Low
2715.0	126.2	321.0	43.2	36.0	74.0	54.0	30.8	18.0	V	B	Low

5V Unit, External Antenna

Frequency (MHz)	Height (Cm)	Azimuth (degree)	Peak Reading (dBµV/m)	Average Reading (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Peak Margin (dB)	Average Margin (dB)	Antenna Polarity	EUT orientation	Channel
2745.0	250.3	244.8	42.4	34.8	74.0	54.0	31.6	19.2	H	B	Mid
2745.0	198.1	187.3	42.7	34.3	74.0	54.0	31.3	19.7	V	B	Mid
4575.0	239.2	123.3	42.2	32.5	74.0	54.0	31.8	21.5	V	B	Mid
2715.0	102.5	239.5	43.3	35.4	74.0	54.0	30.7	18.6	H	B	Low
2715.0	196.6	187.0	42.8	34.8	74.0	54.0	31.2	19.2	V	B	Low
2775.0	154.8	139.8	41.6	32.7	74.0	54.0	32.4	21.3	H	B	High
2775.0	212.3	194.0	43.0	34.5	74.0	54.0	31.1	19.5	V	B	High

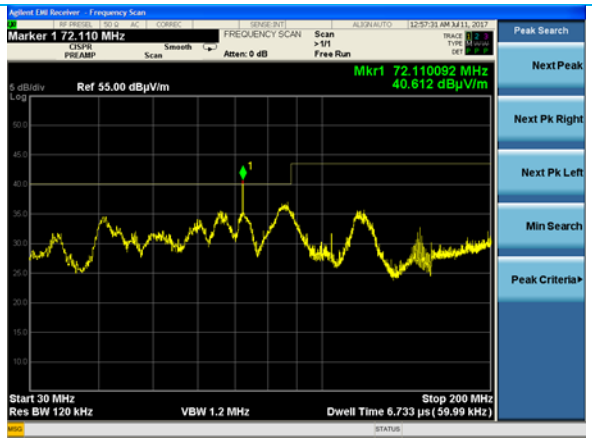
12V Unit, External Antenna

Frequency (MHz)	Height (Cm)	Azimuth (degree)	Peak Reading (dBµV/m)	Average Reading (dBµV/m)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)	Peak Margin (dB)	Avg. Margin (dB)	Antenna Polarity	EUT orientation	Channel
2775.0	202.0	0.0	47.6	40.2	74.0	54.0	26.4	13.8	V	V	High
2775.0	211.0	0.0	45.4	37.9	74.0	54.0	28.6	16.1	H	V	High
2745.0	207.0	0.1	46.6	39.9	74.0	54.0	27.4	14.1	V	V	Mid
2745.0	183.0	137.7	44.6	37.3	74.0	54.0	29.4	16.7	H	V	Mid
2715.0	178.0	340.1	46.0	39.6	74.0	54.0	28.0	14.4	V	V	Low
2715.0	198.0	134.5	46.0	39.7	74.0	54.0	28.0	14.3	H	V	Low

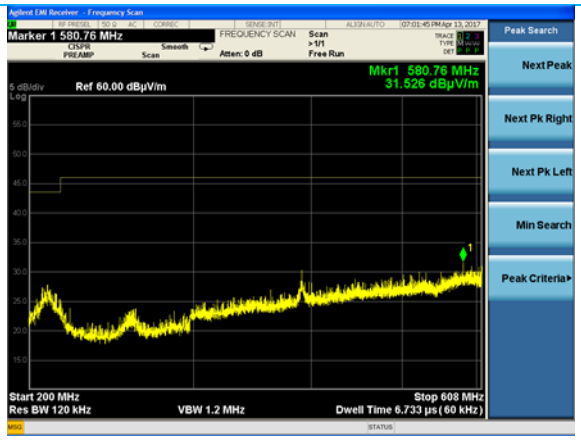
5V Unit, <1 GHz

Frequency (MHz)	Height (Cm)	Azimuth (degree)	Quasi Peak Reading (dBµV/m)	Quasi Peak Limit (dBµV/m)	Quasi Peak Margin (dB)	Antenna Polarity	EUT orientation	Channel
73.54	100.00	25.75	28.6	40.0	11.4	V	B	Low
115.26	100.00	0.00	31.8	43.5	11.8	V	B	Low
149.90	101.33	260.50	23.8	43.5	19.7	V	B	Low
119.22	271.66	99.25	32.9	43.5	10.6	H	B	Low

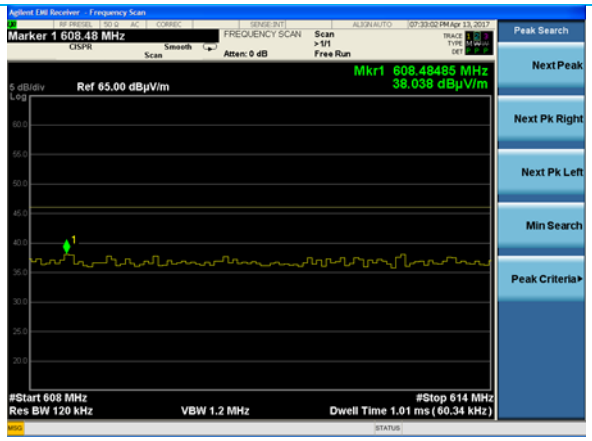
Plots (Worst Case Scenario)



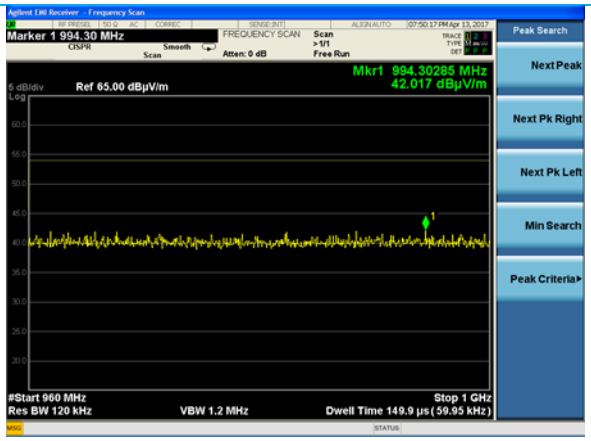
30-200 MHz



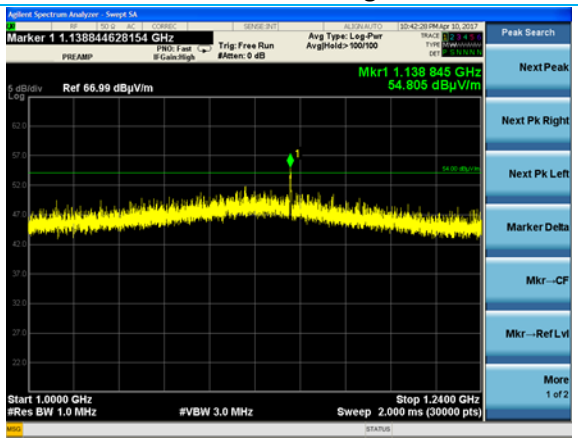
200-608 MHz



Lower Band Edge



Upper Band Edge



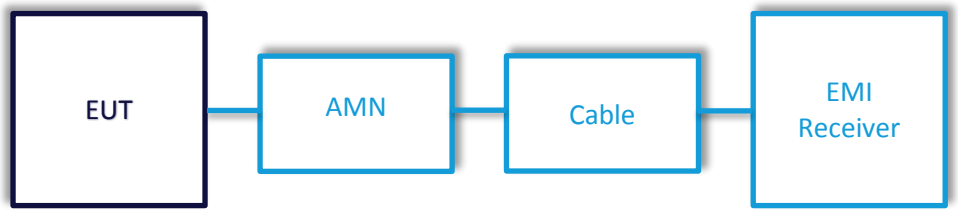
1-1.24 GHz

1.2-10.0 GHz (Reduced Bandwidth)

5.3 AC Mains Conducted Emissions

	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.
Description of Measurement	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	Zach Wilson
QA	Adam Alger
Test Date	4/21/2017
Location	CE Area
Temp. / R.H.	70 / 35
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	150 kHz - 30 MHz
Settings	RBW 9 kHz
Settings	VBW 90 kHz
EUT Power	120V 60 Hz (With an AC-DC Adapter for 5 and 12 VDC)

Instrumentation

Laird
Smart Technology. Delivered.

Date : 21-Apr-2017 Test : Conducted Emissions Job # : C-2714

PE: Shane Dock Customer : Brady Corporation Quote #: 317075

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960085	EMI Receiver	Agilent	N9038A	MY51210148	5/12/2016	5/12/2017	Active Calibration
2	EE 960089	LISN	COM-POWER	LI-215A	191943	3/13/2017	3/13/2018	Active Calibration

Tested By: Quality Assurance:

Table

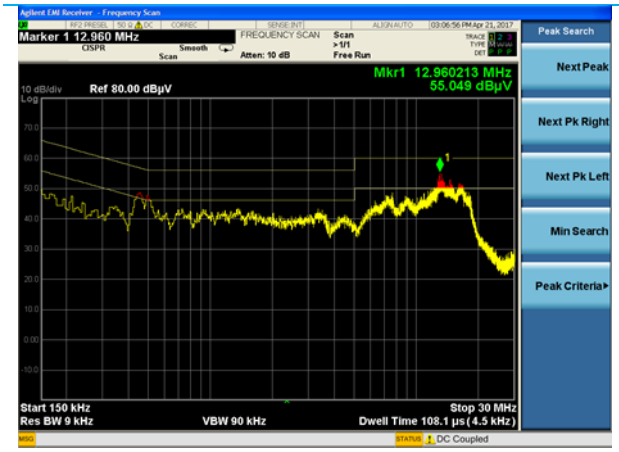
12 VDC Unit Tx on Mid Channel

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	0.175	47.5	64.7	17.3	35.2	54.7	19.5
1	0.245	41.3	61.9	20.6	32.2	51.9	19.8
1	25.580	23.1	60.0	37.0	15.2	50.0	34.8
2	0.177	47.7	64.6	16.9	32.9	54.6	21.7
2	0.369	38.5	58.5	20.1	28.6	48.5	19.9
2	0.326	38.3	59.6	21.3	26.0	49.6	23.5

5 VDC Unit Tx on Mid Channel

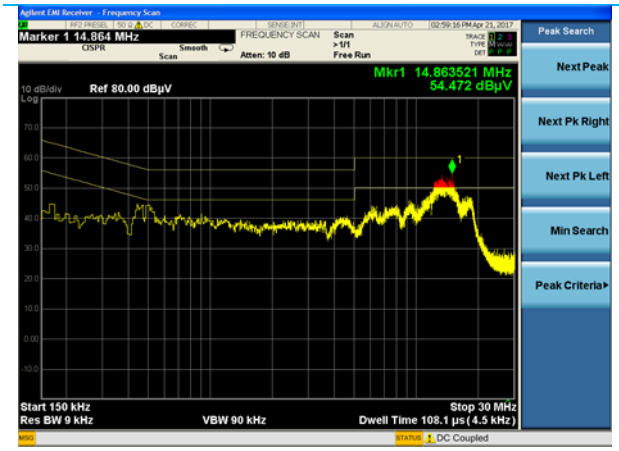
Line	Frequency (MHz)	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)
1	0.453	46.1	56.8	10.7	34.5	46.8	12.3
1	12.940	48.2	60.0	11.8	35.9	50.0	14.1
1	16.600	45.8	60.0	14.2	34.1	50.0	15.9
2	0.512	39.5	56.0	16.5	26.8	46.0	19.3
2	13.350	47.5	60.0	12.5	32.1	50.0	18.0
2	14.860	46.0	60.0	14.0	31.0	50.0	19.0

Plots



5V Tx Line 1

12V Tx Line 1



5V Tx Line 2

12V Tx Line 2

6 REVISION HISTORY

Version	Date	Notes	Person
V0	5/24/17	Rough Draft	Shane Dock
V1	6/12/17	Version 1	Shane Dock
V2	6/13/17	Version 2	Shane Dock
V3	7/6/17	Version 3	Shane Dock
V4	7/10/17	Version 4	Shane Dock
V5	7/11/17	Version 5	Shane Dock
V6	7/21/17	Version 6	Shane Dock

END OF REPORT