

Test Report # 317204 A

Equipment Under Test: Spot-r Cloud Pod

Test Date(s): 1/18/18 – 6/5/18

Prepared for: Triax Technologies
Attn: Justin Morgenthau
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Suite 205
East Hartford, CT 06108, USA


Report Issued by: Shane Dock, EMC Engineer

Signature:



Date: 11/27/2018

Report Reviewed by: Adam Alger, Quality Manager

Signature: 

Date: 08/14/2018

Report Constructed by: Shane Dock, EMC Engineer

Signature:



Date: 8/14/2018

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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

Company: Triax Technologies	Page 3 of 28	Name: Spot-r Cloud Pod
Report: 317204 A		Model: CP-2
Job: C-2755		Serial: See Section 2.1

1 TEST REPORT SUMMARY

During **1/18/18 – 6/5/18** the Equipment Under Test (EUT), **Spot-r Cloud Pod**, as provided by **Triax Technologies** 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	Triax Technologies
Contact Person	Justin Morgenthau
Address	330 Roberts Street Suite 205 East Hartford, CT 06108, USA

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	Spot-r Cloud Pod
Model Number	CP-2
Serial Number	CCP0204-00003940
FCC/IC #	FCC: 2AGHICP01 IC: 21358-CP01

2.2 Product Description

The Spot-r Cloud Pod is a key component of the Spot-r network. It allows for the communication of all Spot-r device data to our cloud platform for viewing, storage and analysis via a cellular connection. It is mounted in a fixed location on a job site, though it can be easily moved over time as construction progresses and the site is developed.

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 tested on Channels 1, 32, and 63 (902.5 MHz, 914.9 MHz, 927.3 MHz). Unit programmed via serial connection with a terminal access program like PuTTY. Power setting of 15 used.

3 REFERENCES

Publication	Edition	Date
CFR 47 Part 15	-	2018
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 \pm
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

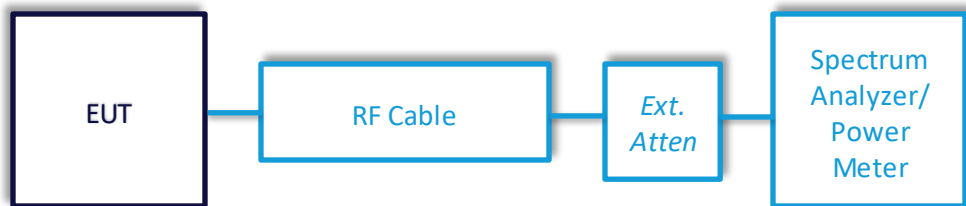
Parameter	ETSI U.C. \pm	U.C. \pm
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	<p>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.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p>
Example Calculations	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

Block Diagram



5.1.1 Antenna Port Antenna Port Conducted Emissions – Bandwidth

Operator	Shane Dock
Test Date	2/1/18
Location	Conducted RF Measurement Area
Temp. / R.H.	72 degrees F/36% RH
Requirement	OBW: FCC: 2.1049 IC: RSS-GEN 6.6 DTS BW: FCC: 15.247 (a)(2) IC: RSS-247 5.2 (a)
Method	ANSI C63.10 Section 6.9.2 and 11.8

Limits:

6 dB BW (MHz)
> 500

Test Parameters

Frequency	902.5 MHz, 914.9 MHz, 927.3 MHz
------------------	---------------------------------

Tables

Channel	Low	Mid	High
6dB BW (kHz)	507.5	507.9	508.5
99% BW (kHz)	524.0	515.2	514.4

Instrumentation

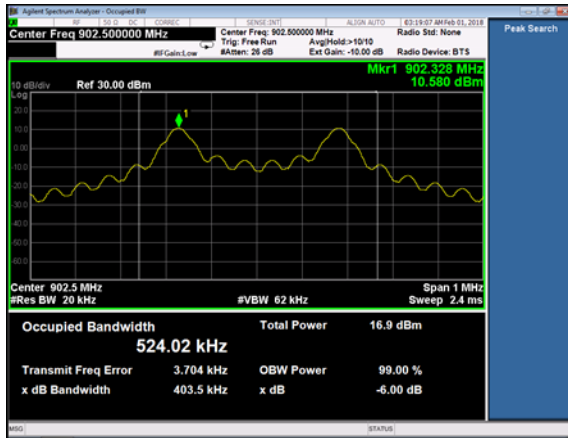


Date : 19-Jul-2017 Test : Conducted Power Output Job # : C-2755
PE: Shane Dock Customer : Triax Technologies Quote #: 317204

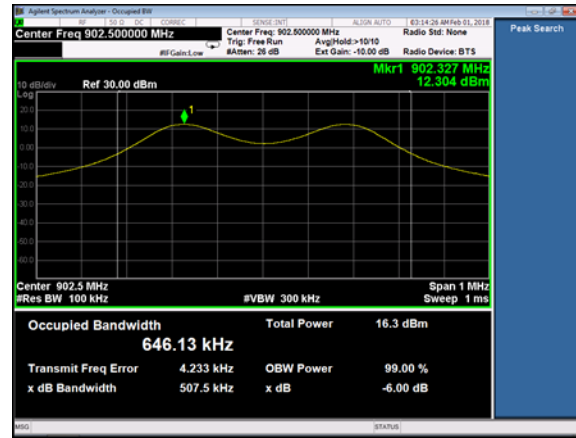
No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Cable	Gore	EKD01D01048.0	5546519	11/15/2017	11/15/2018	Active Verification
2	EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	5/12/2017	5/12/2018	Active Calibration

Company: Triax Technologies	Page 9 of 28	Name: Spot-r Cloud Pod
Report: 317204 A		Model: CP-2
Job: C-2755		Serial: See Section 2.1

Plots



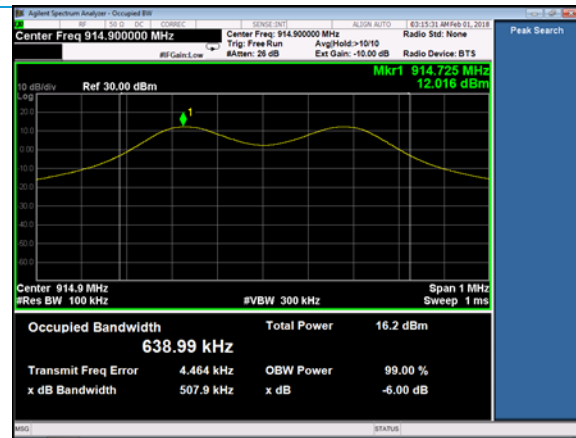
99% BW Low



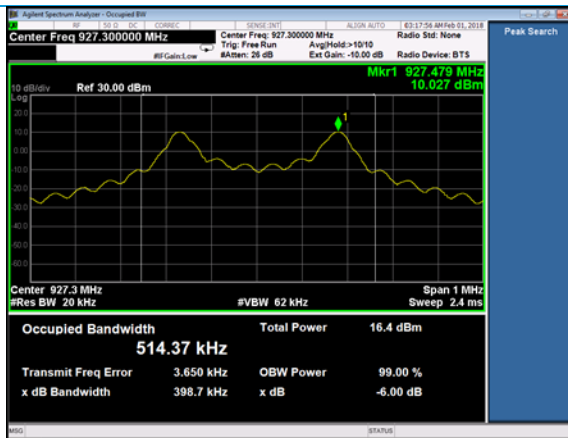
6 dB BW Low



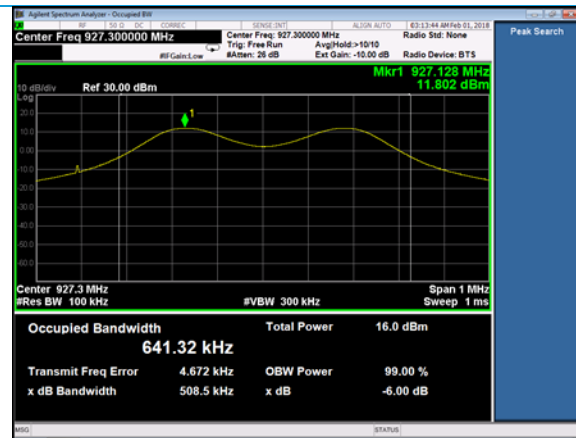
99% BW Mid



6 dB BW Mid



99% BW High



6 dB BW High

5.1.2 Antenna Port Conducted Emissions – Maximum Conducted Output Power

Operator	Shane Dock
Test Date	2/1/18
Location	Conducted RF Measurement Area
Temp. / R.H.	72 degrees F/36% RH
Requirement	FCC: 15.247 (b)(3) IC: RSS-247 5.4 (d)
Method	ANSI C63.10 Section 11.9.1.1

Limits:

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

Test Parameters

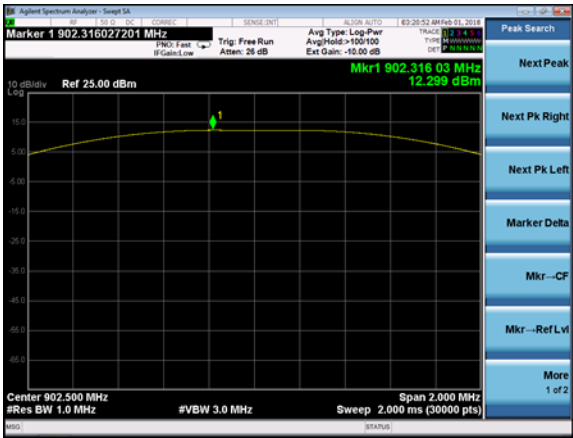
Frequency	902.5 MHz, 914.9 MHz, 927.3 MHz
RBW	1 MHz

Table

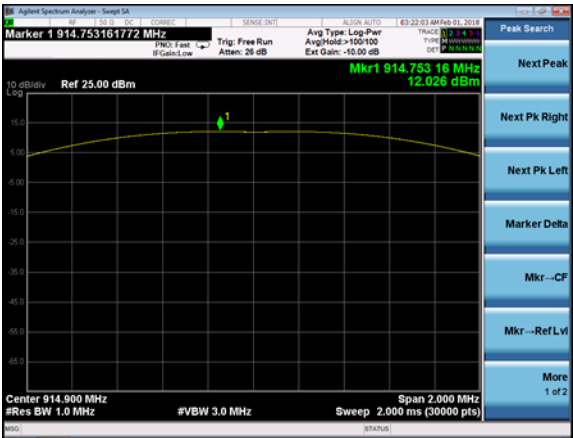
Channel	Low	Mid	High
Pout Conducted (dBm)	12.299	12.026	11.791

Worst Case Margin = 30.000 dBm – (12.299 dBm) = 17.701 dB

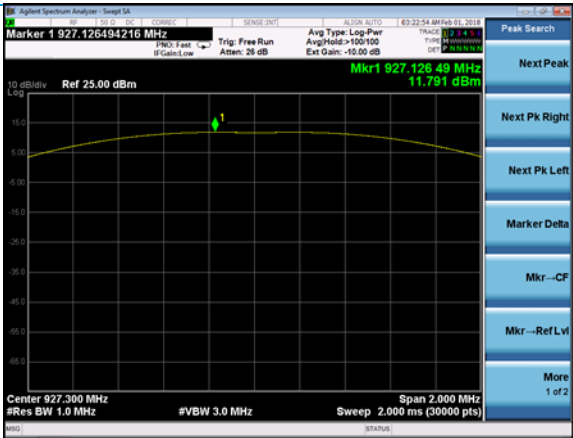
Plots



Low Channel Pout



Mid Channel Pout



High Channel Pout

5.1.3 Antenna Port Conducted Emissions – RF Spurious Emissions

Operator	Shane Dock
Test Date	2/1/18
Location	Conducted RF Measurement Area
Temp. / R.H.	72 degrees F/36% RH
Requirement	15.247 (d) IC: RSS-247 5.5
Method	ANSI C63.10 Section 11.11

Limits:

RF Spurious Limit

20 dBc

Test Parameters

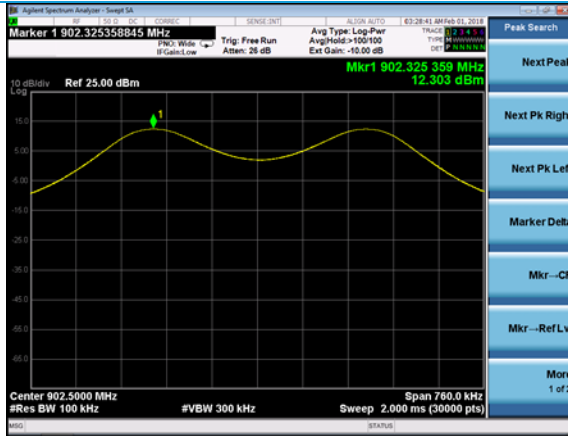
Frequency	30-25000 MHz
Settings	902.5 MHz, 914.9 MHz, 927.3 MHz
RBW	100k
VBW	300k
Trace	Max Hold
Detector	Peak

Table (Worst-Case Measurements)

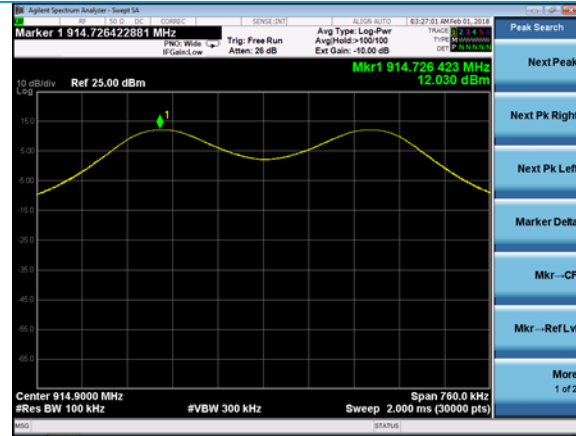
Channel	Frequency (MHz)	Peak Reading (dBm)	Peak Limit (dBm)	Peak Margin (dB)
Low	902.0	-15.3	-7.7	7.6
High	928.0	-22.3	-8.2	14.1

Plots

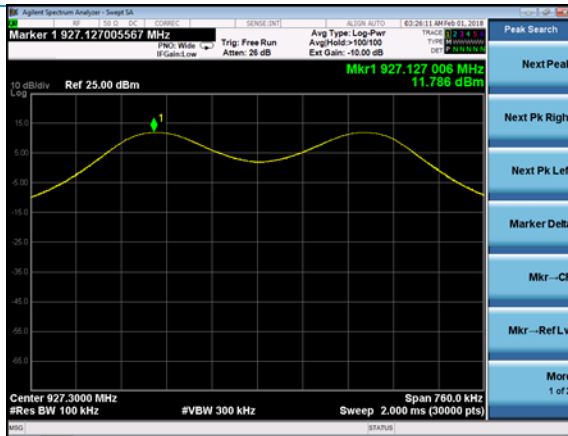
Reference Levels (Worst-Case Shown)



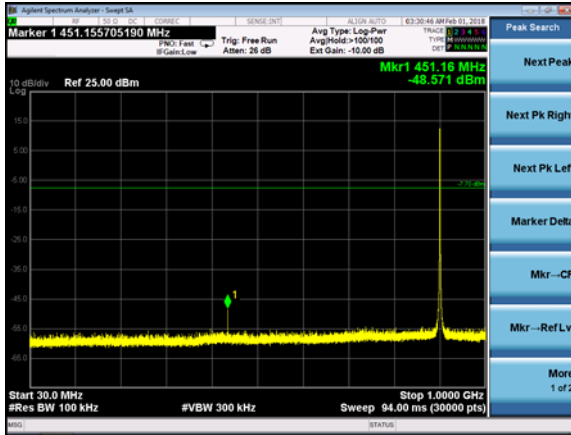
Low Channel



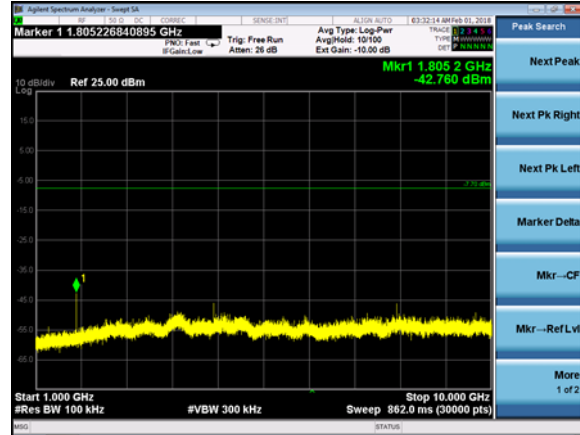
Mid Channel



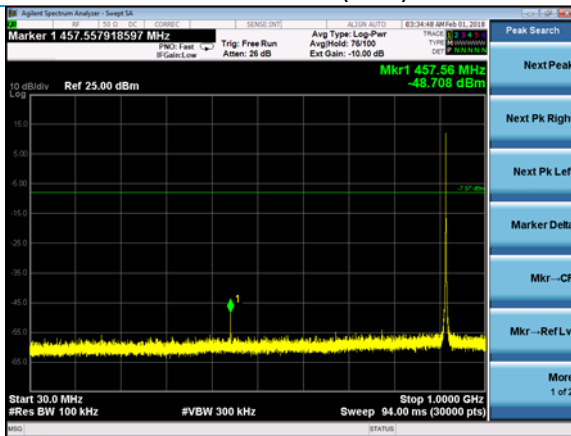
High Channel



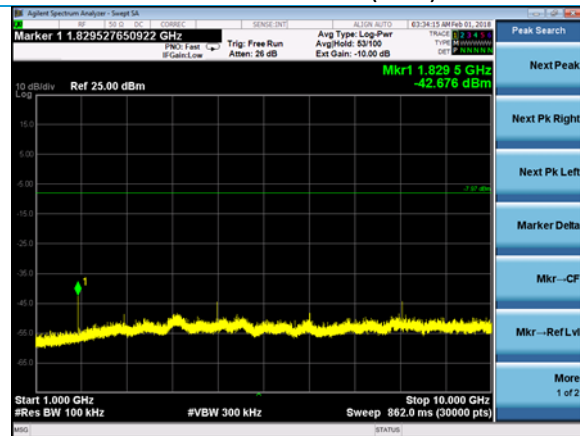
30-1000 MHz (Low)



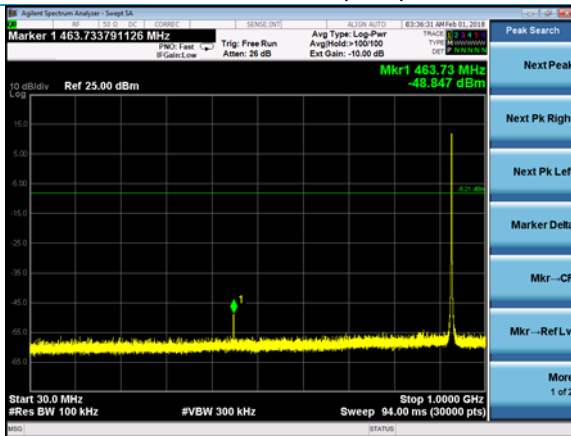
1000-10000 MHz (Low)



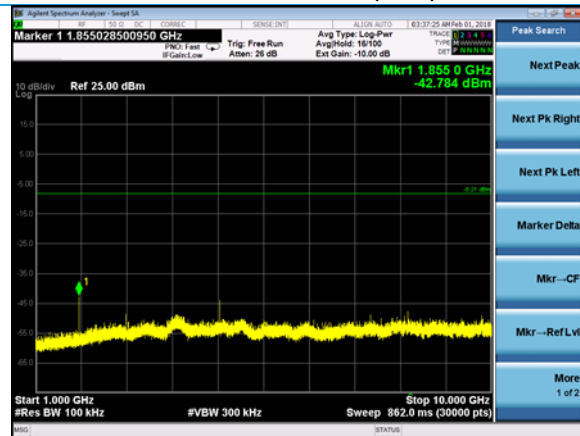
30-1000 MHz (Mid)



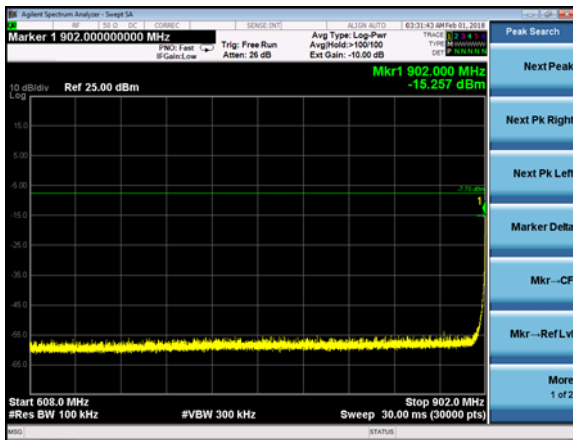
1000-10000 MHz (Mid)



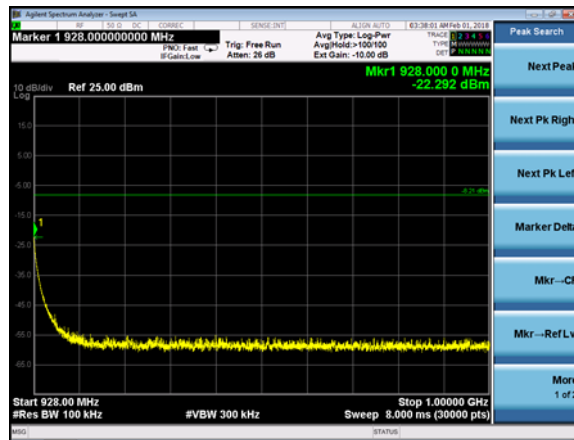
30-1000 MHz (High)



1000-10000 MHz (High)



Lower Band Edge



Upper Band Edge

5.1.4 Antenna Port Conducted Emissions – Power Spectral Density

Operator	Shane Dock
Test Date	2/1/18
Location	Conducted RF Measurement Area
Temp. / R.H.	72 degrees F/36% RH
Requirement	15.247 (e) IC: RSS-247 5.2 (b)
Method	ANSI C63.10 Section 11.10.2

Limits:

PSD (dBm/3 kHz)
< 8

Test Parameters

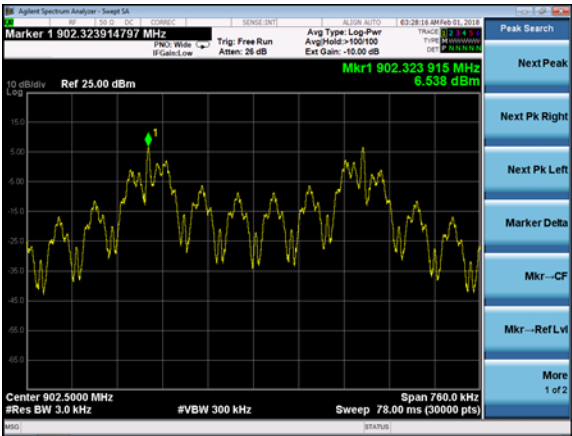
Frequency	902.5 MHz, 914.9 MHz, 927.3 MHz
RBW	3kHz
VBW	300kHz
Trace	Max Hold
Detector	Peak

Table

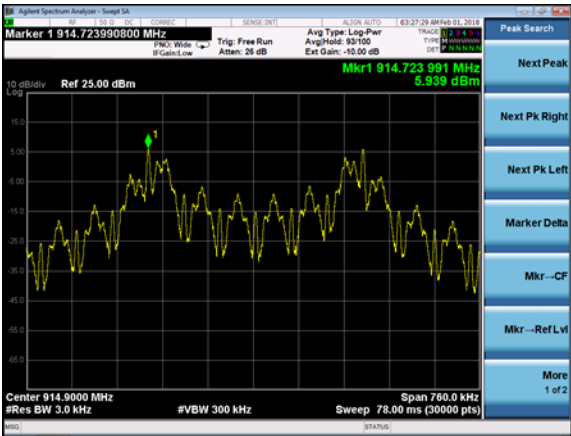
Channel	Low	Mid	High
PSD (dBm)	6.538	5.939	5.727

Worst Case Margin = 8.000 dBm – (6.538 dBm) = 1.462 dB

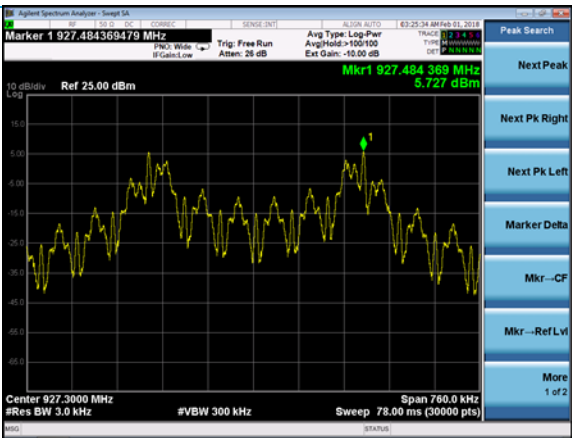
Plots



Low Channel



Mid Channel



High Channel

5.1.5 Antenna Port Conducted Emissions – Frequency Stability

Operator	Shane Dock
Test Date	6/5/18
Location	Conducted RF Measurement Area
Temp. / R.H.	74.7 degrees F/58.3% RH
Requirement	FCC: 2.1055 (d) IC: RSS-GEN 6.11
Method	ANSI C63.10 Section 6.8

Test Parameters

Channels	Low, Mid, High
Frequencies	902.5 MHz, 914.9 MHz, 927.3 MHz
Voltages	3.15, 3.70, and 4.20 VDC

Instrumentation



Date : 19-Jul-2017 Test : Frequency Stability 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	AA 960143	Cable	Gore	EKD01D01048.0	5546519	11/15/2017	11/15/2018	Active Verification
2	EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/25/2018	4/25/2019	Active Calibration

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

Channel	3.15 VDC	3.70 VDC	4.20 VDC	Deviation (Hz)
Low	902496711	902496836	902494096	2740
Mid	914894470	914896275	914894719	1805
High	927296462	927293349	927295819	3113

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

Channel	102 VAC	120 VAC	138 VAC	Deviation (Hz)
Low	902496711	902496836	902494096	2740
Mid	914894470	914896275	914894719	1805
High	927296462	927293349	927295819	3113

5.2 Radiated Emissions

Description of Measurement	<p>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.</p> <p>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.</p> <p>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.</p>
Example Calculations	<p>Measurement (dBμV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBμV/m)</p> <p>Margin (dB) = Limit (dBμV/m) - Corrected Reading (dBμV/m)</p> <p>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</p>

Block Diagram



5.2.1 Radiated Emissions

Operator	Shane Dock, Zach Wilson, Jon Dilley
Test Date	1/18/18 – 5/27/18
Location	Chamber 3, Chamber 5
Temp. / R.H.	70 degrees F/35% RH
Requirement	FCC: 15.247 (d)
Method	IC: RSS-GEN 8.10

Limits:

	30-88 MHz	88-216 MHz	216 – 960 MHz	960+ MHz
Field Strength ($\mu\text{V}/\text{m}$)	100	150	200	500
Field Strength ($\text{dB}\mu\text{V}/\text{m}$)	40.0	43.5	46.0	54.0

Test Parameters

Frequency	30-25000 MHz
Distance	3m
Settings	Unit tested at Low, Mid, High Channels
Settings	RBW = 120kHz, VBW 1.2 MHz (<1 GHz) RBW = 1 MHz, VBW = 3 MHz (>1 GHz) VBW = 30 Hz for Average measurements (Tx signal is 100%)
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 400MHz are not a function of the transmitter.
Example Calculation	Limit ($\text{dB}\mu\text{V}$) = $20 * \log[\text{Limit } (\mu\text{V})]$ $40 = 20 * \log(100)$ Raw Data + Antenna Factor + Cable Factor = Reported Data $19.77 \text{ dB}\mu\text{V} + 12.50 \text{ dB/m} + 0.93 \text{ dB} = 33.20 \text{ dB}\mu\text{V/m}$

Instrumentation



Date : 18-Jul-2017

Test : Spurious 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	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	3/17/2017	3/17/2018	Active Calibration
2	EE 960085	EMI Receiver	Agilent	N9038A	MY51210148	5/12/2017	5/12/2018	Active Calibration
3	AA 960155	High Pass Filter 900 MHz	KWM	HPF-L-14185	7272-03	5/2/2017	5/2/2018	Active Calibration
4	EE 960088	EMI Receiver	Agilent	N9038A	MY51210138	3/2/2017	3/2/2018	Active Calibration
5	AA 960150	Biconical Antenna	ETS Lindgren	3110B	0003-3346	3/3/2017	3/3/2018	Active Calibration
6	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	4/17/2017	4/17/2018	Active Calibration



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	AA 960081	Antenna - Double Ridge Horn	EMCO	3115	6907	4/16/2018	4/16/2019	Active Calibration
2	EE 960085	Analyzer - EMI Receiver	Agilent	N9038A	MY51210148	4/24/2018	4/24/2019	Active Calibration
3	AA 960155	Filter - High Pass Filter 900 MHz	KWM	HPF-L-14185	7272-03	4/25/2018	4/25/2019	Active Calibration
4	EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	4/24/2018	4/24/2019	Active Calibration
5	AA 960150	Antenna - Biconical	ETS Lindgren	3110B	0003-3346	4/20/2018	4/20/2019	Active Calibration
6	AA 960078	Antenna - Log Periodic	EMCO	93146	9701-4855	4/20/2018	4/20/2019	Active Calibration

Table

1.2-10 GHz

Frequency (GHz)	Height (m)	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
2.69	1.48	186.5	47.9	41.9	74.0	54.0	26.1	12.1	Horizontal	Vertical	1
3.58	1.00	91.7	43.1	36.4	74.0	54.0	30.9	17.6	Horizontal	Vertical	1
4.48	1.30	312.0	42.0	35.4	74.0	54.0	32.0	18.6	Horizontal	Vertical	1
5.37	1.00	325.9	38.7	31.3	74.0	54.0	35.3	22.7	Horizontal	Vertical	1
2.69	1.00	220.1	44.5	38.3	74.0	54.0	29.5	15.7	Vertical	Vertical	1
3.58	1.00	238.7	41.4	35.6	74.0	54.0	32.6	18.4	Vertical	Vertical	1
4.48	1.00	203.9	44.8	37.4	74.0	54.0	29.2	16.6	Vertical	Vertical	1
5.37	1.00	252.9	44.3	38.1	74.0	54.0	29.7	15.9	Vertical	Vertical	1
8.06	2.16	87.6	41.6	37.2	74.0	54.0	32.4	16.8	Vertical	Vertical	1
2.69	1.05	0.0	46.2	39.9	74.0	54.0	27.8	14.1	Vertical	Side	1
3.58	1.00	340.9	41.5	34.3	74.0	54.0	32.5	19.7	Vertical	Side	1
4.48	1.00	0.0	41.3	34.8	74.0	54.0	32.7	19.2	Vertical	Side	1
5.37	1.00	349.2	38.8	30.8	74.0	54.0	35.2	23.2	Vertical	Side	1
8.06	2.30	91.8	44.9	37.5	74.0	54.0	29.1	16.5	Vertical	Side	1
2.69	1.00	220.1	44.8	37.2	74.0	54.0	29.2	16.8	Horizontal	Side	1
3.58	1.55	110.9	45.5	37.4	74.0	54.0	28.5	16.6	Horizontal	Side	1
4.48	1.70	0.0	45.4	37.2	74.0	54.0	28.6	16.8	Horizontal	Side	1
5.37	2.05	130.7	47.5	39.4	74.0	54.0	26.5	14.6	Horizontal	Side	1

8.06	1.72	16.0	47.6	39.5	74.0	54.0	26.4	14.5	Horizontal	Side	1
2.69	1.56	116.8	47.5	41.4	74.0	54.0	26.5	12.6	Horizontal	Flat	1
3.58	1.00	134.2	43.8	37.4	74.0	54.0	30.2	16.6	Horizontal	Flat	1
4.48	1.40	15.1	45.1	39.0	74.0	54.0	29.0	15.0	Horizontal	Flat	1
5.37	1.35	28.4	44.4	37.8	74.0	54.0	29.6	16.2	Horizontal	Flat	1
8.06	2.20	290.8	45.0	37.6	74.0	54.0	29.0	16.4	Horizontal	Flat	1
2.69	2.80	277.8	45.4	38.5	74.0	54.0	28.6	15.5	Vertical	Flat	1
3.58	1.00	0.0	41.0	34.3	74.0	54.0	33.0	19.7	Vertical	Flat	1
4.48	1.00	70.3	43.1	35.1	74.0	54.0	30.9	18.9	Vertical	Flat	1
5.37	3.17	333.9	44.3	36.1	74.0	54.0	29.7	17.9	Vertical	Flat	1
8.06	0.00	179.3	45.0	35.9	74.0	54.0	29.0	18.1	Vertical	Flat	1
2.74	1.00	74.0	46.5	40.0	74.0	54.0	27.5	14.0	Horizontal	Vertical	32
4.48	1.00	24.4	45.5	38.6	74.0	54.0	28.5	15.4	Vertical	Vertical	32
5.49	1.70	52.1	43.5	37.0	74.0	54.0	30.5	17.0	Horizontal	Side	32
8.23	1.67	68.4	44.2	36.6	74.0	54.0	29.8	17.4	Horizontal	Side	32
3.66	1.49	106.7	42.8	36.2	74.0	54.0	31.2	17.8	Horizontal	Side	32
2.78	1.00	74.8	47.9	41.9	74.0	54.0	26.1	12.1	Horizontal	Vertical	63
4.64	1.58	325.7	50.2	44.2	74.0	54.0	23.8	9.8	Vertical	Vertical	63
5.56	1.62	190.3	43.2	36.1	74.0	54.0	30.9	17.9	Horizontal	Side	63
8.34	1.00	5.0	41.2	35.2	74.0	54.0	32.8	18.8	Horizontal	Side	63
3.71	2.18	105.1	41.4	35.2	74.0	54.0	32.6	18.8	Horizontal	Side	63

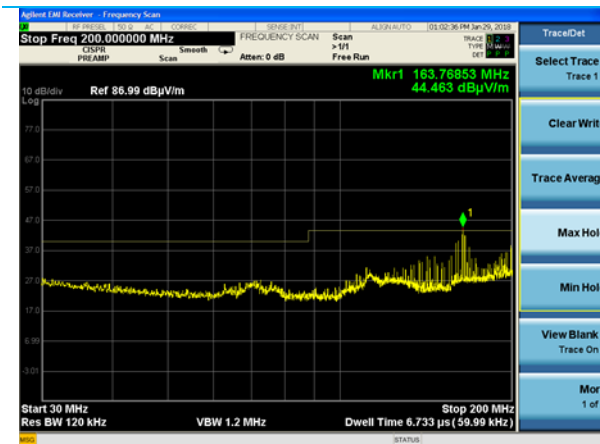
1.0 – 1.2 GHz

Frequency (GHz)	Height (m)	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
1.024	1.50	157.6	39.9	33.2	74.0	54.0	34.1	20.8	Horizontal	Side	64
1.011	1.50	155.5	40.1	33.9	74.0	54.0	33.9	20.1	Horizontal	Side	32
1.043	1.50	33.9	38.9	30.4	74.0	54.0	35.1	23.6	Horizontal	Side	1

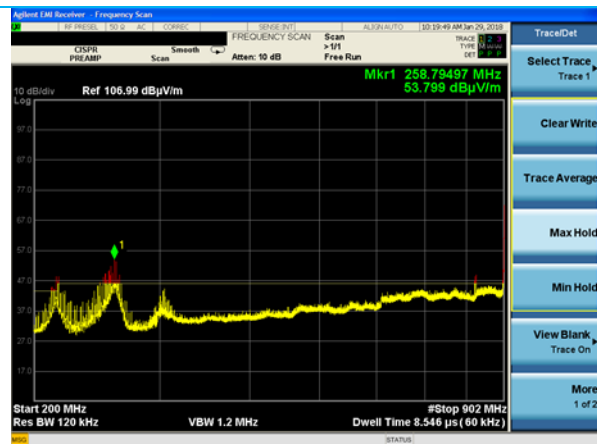
Below 1 GHz

Frequency (MHz)	Channel	Antenna Orientation	EUT Orientation	Angle (degree)	Height (m)	Quasi-peak Reading (dBuV/m)	Quasi-peak Limit (dBuV/m)	Quasi-peak Margin (dB)
975.84	63	Horizontal	Side	315.5	1.00	33.9	54.0	20.1

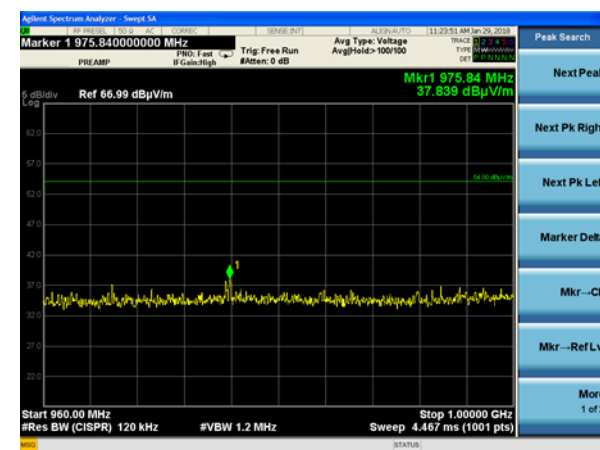
Plots – Spurious Emissions (Worst-Case Emissions Shown)



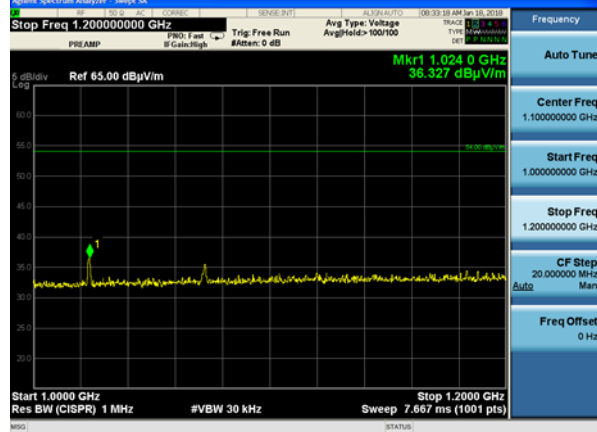
30-200 MHz (Horizontal Polarity)



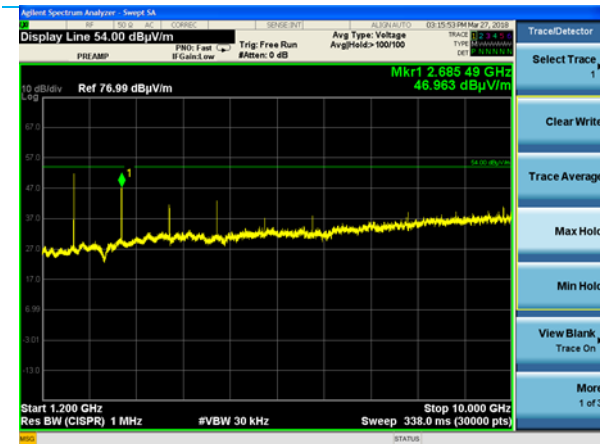
200-902 MHz (Horizontal Polarity)



960-1000 MHz (Horizontal Antenna)



1000-1200 MHz (Reduced BW) (Horizontal Antenna)



1.2-10 GHz (Reduced BW) (Vertical EUT)

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.

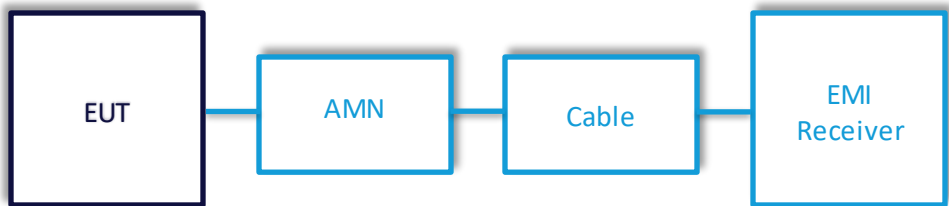
Maximum emissions are determined with a peak max hold trace then measurements at a selection of the highest points are made with quasi-peak and average detectors. Results are recorded and compared to limit for each line. (e.g. line and neutral)

Example Calculations

$$\text{Measurement (dB}\mu\text{V)} + \text{Cable factor (dB)} + \text{Other (dB)} = \text{Corrected Reading (dB}\mu\text{V)}$$

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V)} - \text{Corrected Reading (dB}\mu\text{V)}$$

Block Diagram



5.3.1 AC Mains Conducted Emissions

Operator	Jon Dilley
Test Date	5/21/18
Location	EMC Lab
Temp. / R.H.	71.1 degrees F/43.5% RH
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
Settings	RBW 9 kHz
Settings	VBW 90 kHz
EUT Power	120V 60 Hz
Channel	Low Channel Tx mode (Found to be worst-case)

Instrumentation



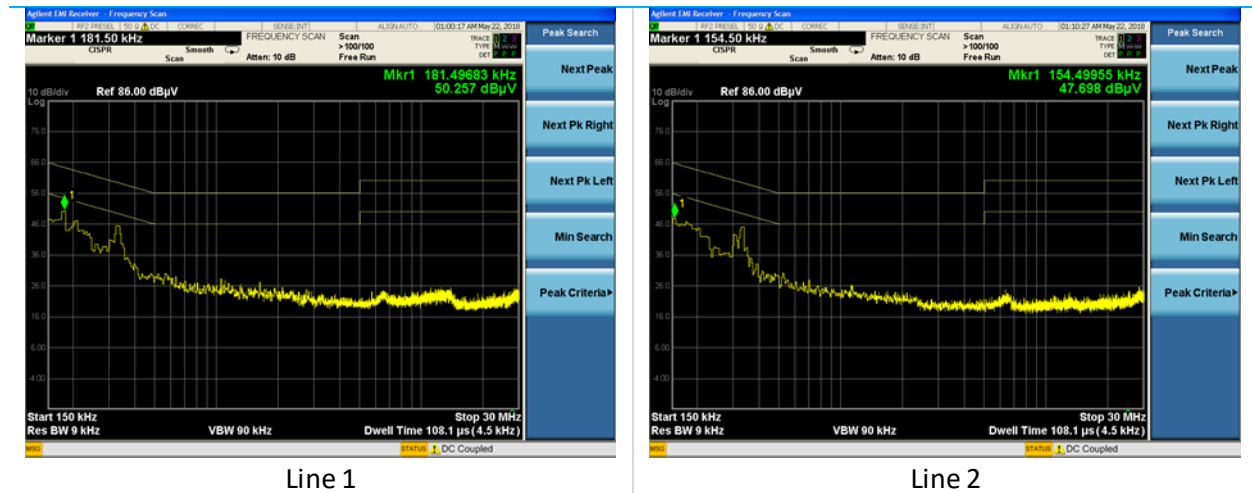
Date : 19-Jul-2017 Test : Conducted Emissions Job # : C-2755
 PE: Shane Dock Customer : Triax Technologies Quote #: 317204

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960088	Analyzer - EMI Receiver	Agilent	N9038A	MY51210138	4/24/2018	4/24/2019	Active Calibration
2	EE 960162	LISN	COM-POWER	LI-215A	191969	4/23/2018	4/23/2019	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	0.181	43.1	64.4	21.3	33.2	54.4	21.2
1	0.330	42.0	59.5	17.5	28.4	49.5	21.1
1	13.442	20.4	60.0	39.6	11.9	50.0	38.1
2	0.154	45.1	65.8	20.7	26.3	55.8	29.4
2	0.330	41.5	59.5	18.0	26.0	49.5	23.5
2	12.960	17.5	60.0	42.5	10.5	50.0	39.6

Plots



6 REVISION HISTORY

Version	Date	Notes	Person
V0	6/20/18	First Draft	Shane Dock
V1	8/13/18	Updated Draft	Shane Dock
V2	8/14/18	Final Draft	Shane Dock
V3	9/18/18	Updated References	Shane Dock
V4	11/27/18	Updated Instrumentation	Shane Dock

END OF REPORT