Project 17733-15

Triax Technologies AP

Wireless Certification Report

Prepared for:

Justin Morgenthau Triax Technologies 66 Fort Point Street Norwalk, CT 06855

By

Professional Testing (EMI), Inc. 1601 North A.W. Grimes Blvd., Suite B Round Rock, Texas 78665

14 Sep 2016

Reviewed by

Larry Finn Chief Technical Officer Written by

Eric Lifsey EMC Engineer

Revision History

Revision Number	Description	Date
00	Draft for review.	14 Sep 2016
01	Final	5 Jul 2017

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None.

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Compliance Certificate

Applicant	Device & Test Identification		
Triax Technologies (Justin Morgenthau)	FCC ID:	2AGHIAP	
66 Fort Point Street	Industry Canada ID:	21358-AP	
Norwalk, CT 06855	Model(s):	AP	
Certificate Date: 14 Sep 2016	Laboratory Project ID:	17733-15	

The device named above was tested utilizing the following documents and found to be in compliance with the required criteria:

Requirement	Reference	Detail	
FCC 47 CFR Part 15 C	15.247	Operation within the bands 902-928 MHz, <u>2400-2483.5 MHz</u> , and 5725-5850 MHz.	
FCC 47 CFR Part 15 C	15.209	Radiated emission limits; general requirements.	
FCC 47 CFR Part 15 C	15.107, 15.207	Conducted emission limits.	
FCC 47 CFR Part 15 C	15.205	Restricted Bands of Operation	
KDB 558074 D01	DR01	DTS Measurement Guidance v03r02	
KDB 412172	D01	Guidelines for Determining the ERP and EIRP of an RF Transmitting System	
OET Bulletin 65*	Edition 97-01, and Supplement C, Ed. 01-01	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields	
RSS-247	Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence- Exempt Local Area Network (LE-LAN) Devices	
RSS-Gen	Issue 4	General Requirements and Information for the Certification of Radio Apparatus	
RSS-102 Issue 4		Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)	

^{*}MPE is reported separately from this document. **Corresponding RSS references are listed in the body of the report.

I, Eric Lifsey, for Professional Testing (EMI), Inc., being familiar with the above requirements and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.



This report has been reviewed and accepted by the Applicant. The undersigned is responsible for ensuring that this device will continue to comply with the requirements listed above.

Representative of Applicant	

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States and Canada.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing.

1.2 EUT Description

Table 1.2.1: Equipment Under Test					
Manufacturer / Model Serial # Description					
Triax Technologies none		915 MHz FHSS transceiver.			

Table 1.2.2: Support Equipment				
Manufacturer / Model Serial # Description				
Samsung Q43		Laptop computer s/n ZRSG93CZ607388Z		

The EUT part of a wireless network for collecting data on a proprietary sensor network.

The EUT measures approximately 65 mm x 27 mm x 10 mm. It is powered by a USB port.

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations.

1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program. For testing purposes, the EUT had wires added to allow external input of power, and the firmware was modified to operate on the desired channels with modulation to facilitate testing.

1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

1.6 Radiated Measurements

Radiated levels are determined as follows:

Raw Measured Level + Antenna Factor + Cable Losses - Amplifier Gain = Corrected Level

Conducted RF levels, if applicable, are determined as follows:

Conducted mains levels are determined as follows:

Raw Measured Level + LISN Factor + Cable/Filter/Limiter Losses = Corrected Level

Additionally, measurement distance extrapolation factors are applied and documented where used.

1.7 Applicable Documents and Clauses

Table 1.7.1: Applicable Documents				
Document	Title			
47 CFR	Part 15 – Radio Frequency Devices			
47 CFK	Subpart C -Intentional Radiators			
DCC 247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-			
RSS-247 Issue 2	Exempt Local Area Network (LE-LAN) Devices			
RSS-Gen Issue 4	General Requirements and Information for the Certification of Radio Apparatus			
ANGLOGA 40 2042	American National Standard of Procedures for Compliance Testing of Unlicensed			
ANSI C63.10 2013	Wireless Devices			

Table 1.7.2: Applicable Clauses						
Parameter	FCC Part 15	IC RSS References				
Parameter	Rule Paragraphs	ic K33 References				
Transmitter Characteristics	15.247	RSS-247 5.2 (DTS) & 5.4, RSS-Gen				
Bandwidth	15.247(a)(1), 2.1049, KDB 558074 D01	RSS-Gen 4.6				
Spurious Emission	15.247, 15.209, 15.205	RSS-247 5.5, RSS-GEN 4.9, 4.10				
Band Edge	15.247, 15.205	RSS-247 5.5, RSS-Gen 4.9				
Antenna Requirement	15.203	RSS-Gen 8.3				

2.0 Fundamental Power

2.1 Test Procedure

Peak power is measured using conducted means with modulation. The transmitter hopping sequence is disabled to operate on a single channel for the measurement.

2.2 Test Criteria

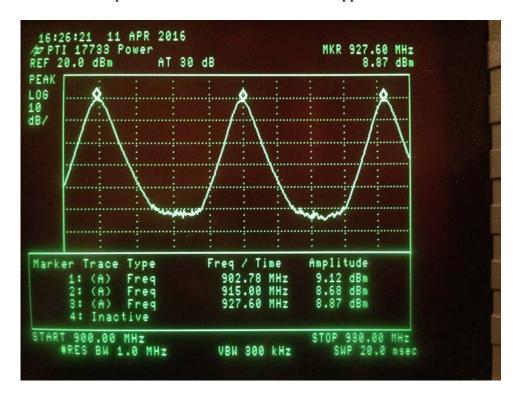
47 CFR (USA) // IC (Canada)					
Section Reference Parameter Date					
15.247(a)(3) // RSS-247 5.2	Fundamental Power Conducted Limits 1 W	11 Apr 2016			

2.3 Test Results, Peak Power

Table 2.3.1 Power, Peak, Conducted, Unmodulated						
Frequency MHz	Maximum Measured Peak Power Restated as dBm	Maximum Antenna Gain dBi	Maximum Measured Peak Power Restated as EIRP dBm	Maximum Measured Peak Power Restated as EIRP mW		
903	9.12	3	12.12	16.3		
915	8.68	3	11.68	14.7		
927	8.87	3	11.87	15.4		

Measured in 1 MHz RBW, 300 kHz VBW.

The EUT was satisfied the requirements. Plotted measurements appear below.



2.4 Test Results, Duty Cycle

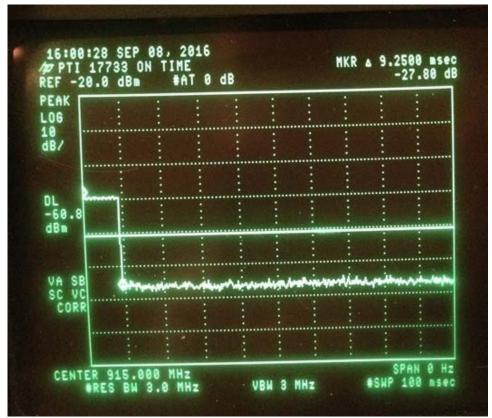
Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. This is not a pass/fail measurement.

Table 2.5.1 Duty Cycle Results and Average Duty Cycle Factor Result									
Measured On Time (msec)	Measured Time Interval (msec)	Duty Cycle Factor Calculation	Result (dB)	Duty Cycle Factor Allowed (dB)					
9.25	100 assumed	= 20 * Log ₁₀ (9.25 msec / 100 msec)	-20.7	-20.0					

The allowed duty cycle factor is applied to peak measured harmonic signals to find average levels.

Table 2.5.2 Source Averaging Factor (for exposure)										
Measured On Time (msec)	Measured Time Interval (msec)	Duty Cycle Factor Calculation	Result (dB)	Duty Cycle Factor Allowed (dB)						
9.25	100 assumed	= 10 * Log ₁₀ (9.25 msec / 100 msec)	10.3	10.3						

Plotted results appear below.



Transmit On Time in 100 msec

3.0 Power Spectral Density

3.1 Test Procedure

A spectrum analyzer is either connected directly to the EUT or used by radiated means to measure the fundamental emission. It is adjusted to measure the power spectral density in the specified resolution bandwidth.

3.2 Test Criteria

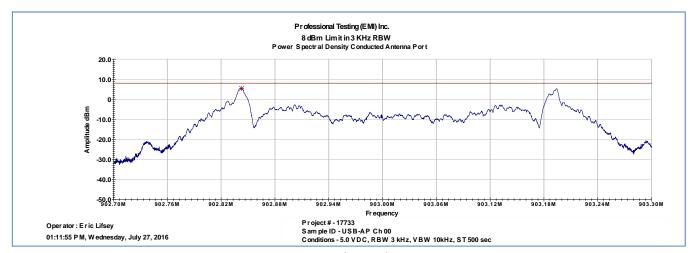
47 CFR (USA) // IC (Canada)										
Section Reference	Parameter	Date								
15.247(e) // RSS-247, 5.2	Power Spectral Density, Conducted Limit: 8 dBm / 3 kHz	27 Jul 2016								

3.3 Test Results

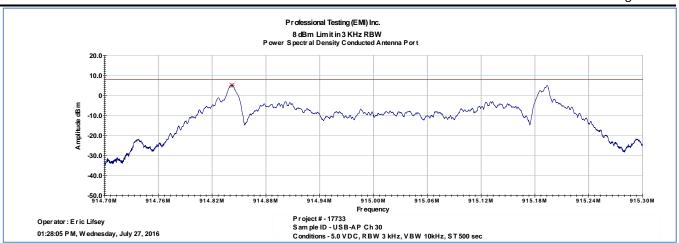
Table 3.3.1 Power Spectral Density, Conducted									
Frequency MHz	Measured Peak Power								
903	5.38								
915	4.98								
927	5.34								

Measured in 3 kHz RBW, 10 kHz VBW.

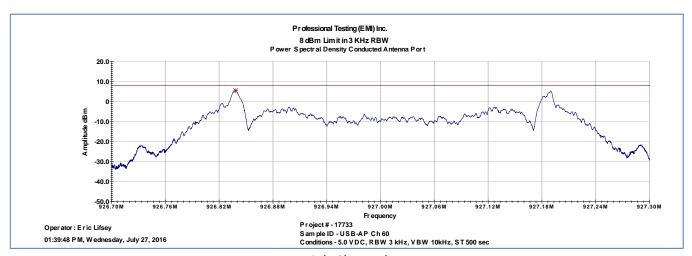
Plotted results included below.



Low Channel



Middle Channel



High Channel

4.0 Occupied Bandwidth

4.1 Test Procedure

Bandwidth is measured by radiated means. A recording of the results is included.

4.2 Test Criteria

47 CFR (USA) // IC (Canada)										
Section Reference	Parameter	Date(s)								
14.247(a)(2), 2.1049, KDB 558074 D01 // RSS-Gen 4.6	Bandwidth, 6 dB, 20 dB									

4.3 Test Results

The bandwidth measurement is used to verify DTS characteristics and/or for general reporting for agency application.

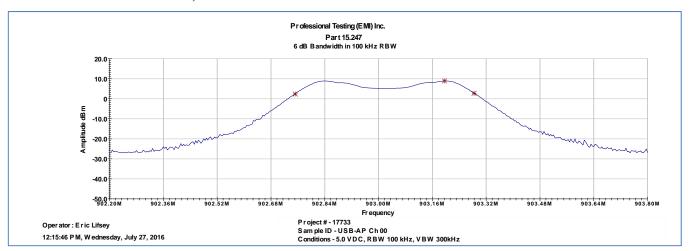
The EUT was found to be in compliance with applicable requirements.

Table 5.3.1 Bandwidth 6 dB, Minimum 500 kHz in 100 kHz RBW										
Low Channel	Mid Channel	Channel High Channel Reported								
Measured BW	Measured BW	Measured BW	Minimum BW							
(kHz)	(kHz)	(kHz)	(kHz)							
532	528	528	528							

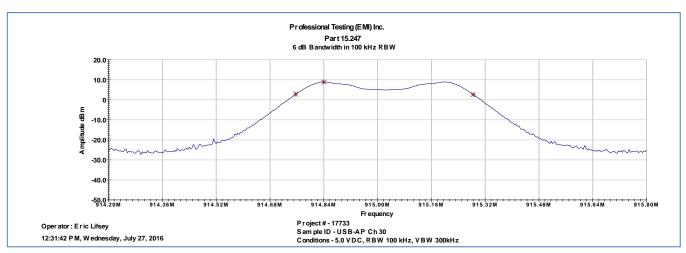
Table 5.3.2 Bandwidth 20 dB, Measure and Report										
Low Channel	Mid Channel	High Channel	Reported							
Measured BW	Measured BW	Measured BW	Maximum BW							
(kHz)	(kHz)	(kHz)	(kHz)							
476	476	472	476							

Plotted measurements appear on the following pages.

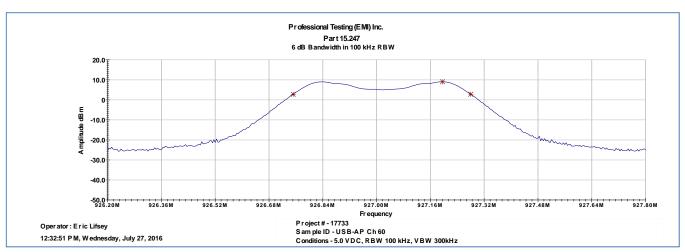
4.3.1 Bandwidth Plots, 6 dB



6 dB, Low Channel

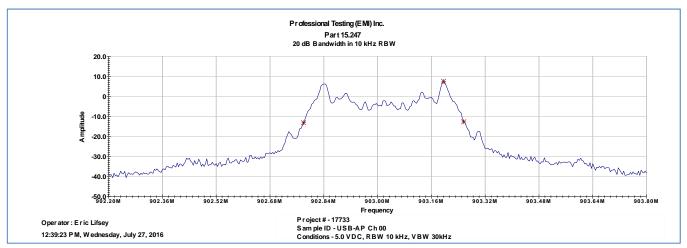


6 dB, Middle Channel



6 dB, High Channel

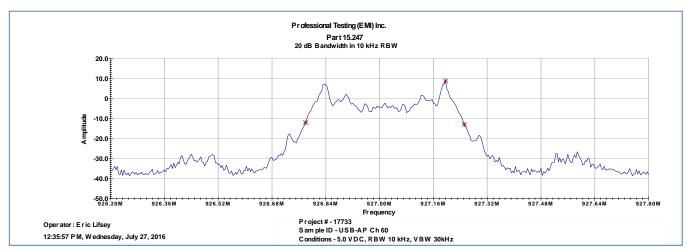
4.3.2 Bandwidth Plots, 20 dB



20 dB, Low Channel



20 dB, Middle Channel



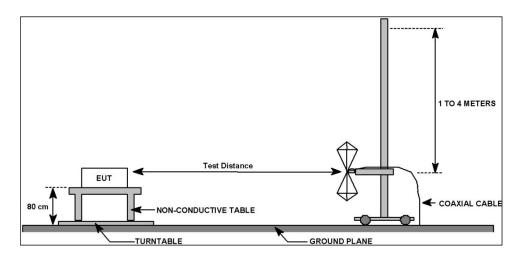
20 dB, High Channel

5.0 Radiated Spurious Emissions, Receive Mode

5.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate and 1 MHz resolution bandwidth. A diagram showing the test setup appears below.



5.2 Test Criteria

47 CFR (USA) // IC (Canada)									
Section Reference	Parameter	Date(s)							
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Receive Mode	5 Apr 2016							

5.3 Test Results

The EUT was tuned to the middle channel and placed in receive mode.

The EUT satisfied the criteria. Recorded data is presented below.

Table 6.3.1: Radiated Spurious Emissions, Receive Mode, Below 1 GHz, Vertical Polarity

			Profes	sional Te	sting, El	ΜI, I	nc.						
Test Metho	d:	ANSI C63.10 Devices	0–2013: Ameri	can National Sta	andard of Proc	edures	for Co	mpliance Te	esting o	f Unlice:	nsed Wir	reless	
In accordan	ice with:	FCC Part 15 Emissions L		Federal Regulat	ions Part 47, S	Subpart	t B - Un	intentional	Radiato	ors, Radi	iated		
Section:		15.109			1								
Test Date(s):	4/5/2016			EUT Serial			None					
Customer:		Triax Tech			EUT Part #:			SIM-G, A		oint			
Project Nur		17731-15,	17733-15		Test Techn			Eric Lifse	•				
Purchase O		NA	D		Supervisor:			Lisa Arnd	Ιτ				
Equip. Und	er Test:	SIIVI-G, AC	cess Point		Witness' N	ame:		None					
	F	Radiated E	t Results Data	Sheet			F	Page:	1	of	1		
EUT Line Voltage: 4.2, 5.0 VDC					EUT Pow	ver Fre	equen	су:	0	N/A			
Antenna	al	Frequ	ency F	Range:		301	/IHz to	1GHz					
	EUT N	/lode of Op	eration:					Receivin	g				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)		ected vel V/m)	Limit Level Margir (dBµV/m) (dB)		_	Test Results		
30.2978	10	46	1.47	Quasi-peak	24.1	12.	651	29.5	-	16.8	Pas	SS	
38.908	10	324	3.03	Quasi-peak	24	7.2	243	29.5	-:	-22.3		Pass	
416.708	10	202	3.81	Quasi-peak	22.3	15.	926	35.6		-19.7		Pass	
643.354	10	3	4.12	Quasi-peak	22	_	581	35.6		-15.0		Pass	
892.314	10	227	1.68	Quasi-peak	21.4		.28	35.6	_	9.3	Pas		
949.202	10	165	2.03	Quasi-peak	21	26.	199	35.6		9.4	Pas	SS	
Radiated	sional Testing, Emissions, 10m Di GHz Vertical Polarity	istance					∇ CorrectPeak ICorrect∇ Verifie	peak Limit Level eted Quasi-peak R .imit Level eted Peak Value d Low-PRF QP R Verification Limit			PROFESSI T E S T	IONAL I N 6	
Field Strength (dBµVm) 30	X							×	x		××		
20	ton white the strategy and the state of the	and the state of t	in the state of th	المالية والمراجع والمالية	and the state of t	the state of the s	and the second state of the second se	Mark Mark Mark Mark Mark Mark Mark Mark	A CONTRACTOR OF THE PARTY OF TH				
0 30 M	<u> </u>		100M	Ewas	Hency						1 G		
Operator: I	Eric Lifsey			Freq	uency	+		UT: SIM-G, Access			1G		

≤ 1GHz Vertical Antenna Polarity Measured Emissions

1 able 6.3.2	z: Kadiate	a Spuri		ons, Receive N	·			Horizont	ai Poi	arity			
			Profe	ssional Te	sting, El	MI, I	nc.						
Test Metho	d:	ANSI C63 Devices	3.10–2013: Ame	erican National Sta	andard of Proc	edures	for Co	mpliance Te	esting of	Unlice	nsed Wi	reless	
In accordan	ce with:	FCC Part Emission		of Federal Regulat	ions Part 47,	Subpar	t B - Un	intentional	Radiato	rs, Rad	iated		
Section:		15.109											
Test Date(s):	4/5/20:	16		EUT Serial	#:		None					
Customer:			echnologies		EUT Part #:	:		SIM-G, Ad		oint			
Project Nun		_	15, 17733-15		Test Techn			Eric Lifsey					
Purchase O		NA			Supervisor			Lisa Arnd	t				
Equip. Und	er Test:	SIM-G,	Access Point		Witness' N	ame:		None					
	F	Radiated	l Emissions To	est Results Data	a Sheet			P	age:	1	of	1	
EUT Line Voltage: 4.2, 5.0 VDC					EUT Pov	ver Fr	equen	су:	0	N/A			
Antenna	ontal	Frequ	ency F	Range:	:	30M	Hz to	1GHz					
	EUT N	lode of	Operation:					Receiving	g				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degree	on Height	Detector Function	Recorded Amplitude (dBμV)	Le	ected vel V/m)	Limit Leve		irgin IB)	Test R	esults	
32.6942	10	327	3.97	Quasi-peak	23.9	12.	419	29.5	-1	7.1	Pa	SS	
80.8125	10	284	1.29	Quasi-peak	23.3	4.	37	29.5	-2	-25.1		Pass	
620.515	10	13	1.61	Quasi-peak	22	19	.89 35.6		-1	-15.7		SS	
747.454	10	269	3.57	Quasi-peak	21.7	22.	444	35.6	-1	3.2	Pa	SS	
899.912	10	249	1.85	Quasi-peak	21.3	26.	594	35.6	_(9.0	Pa	SS	
931.088	10	5	3.5	Quasi-peak	21.1	26.	111	35.6	_9	9.5	Pa	SS	
Radiated 1	ional Testing, Emissions, 10m Di GHz Horizontal Polari	stance			 — Quasi-peak Limit Level ▽ Corrected Quasi-peak Reading — Peak Limit Level — Corrected Peak Value 								
50								ed Low-PRF QP Re	eading		PROFESS T E S T		
Field Strength (d B tr Vm) × 30 × × × × × × × × × × × × × × × × ×									x	×	*× ŸŸ		
20	Market Branch Comment of the State of the St	yardo dhakaliyinda ka	A CONTRACTOR OF THE PARTY OF TH		A CONTRACTOR OF THE PARTY OF TH	provident plante	dillems of the						
0 30 M			100	M		-			1		1G		
	Cric Lifsey 33 'R E'Run01 'R X 'S _I M , Tuesday , April 05			Free Receive, Receive :: 4.2 VDC, 5.0 VDC	Juency		P	UT: SIM-G, Access roject Number: 17	731,17733				

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

Table 6.3.	3: Radiate	d Spu	rious	Emissio	ns, Receive N	Mode, Abo	ve 1 GHz	, Verti	cal Po	olarit	у			
				Profe	ssional Te	sting, El	MI, Inc.							
Test Metho	od:	ANSI C Device		-2013: Ame	rican National Sta	andard of Proc	edures for C	ompliand	e Testi	ing of	Unlicer	nsed W	ireless	
In accordance with: FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits														
Section:		15.109)											
Test Date(s	s):	4/5/2				EUT Serial	#:	None						
Customer:		_		ologies		EUT Part #:		SIM-G		ess Po	int			
Project Nui	mber:	_	15, 1	17733-15		Test Techn	ician:	Eric Li	fsey					
Purchase O	rder #:	NA				Supervisor:		Lisa A	rndt					
Equip. Und	er Test:	SIM-G	, Acce	ess Point		Witness' N	ame:	None						
	F	Radiate	ed Em	issions Te	st Results Data	a Sheet			Pag	ge:	1	of	1	
EUT Li	EUT Line Voltage: 4.2, 5.0 VDC						ver Freque	ncy:	0)	N/A			
Antenna	Antenna Orientation: Vertical						ency Rang	e:		Ab	ove 10	ve 1GHz		
	EUT N	/lode o	f Ope	eration:				Recei	ving					
Frequency Measured (MHz)	Test Distance (Meters)	EU Direc (Degr	tion	Antenna Height (Meters)	Detector	Recorded Amplitude (dBµV)	Amplitude Level		Level Margin V/m) (dB)		_	Test Results		
1045.47	3	22	.5	1	Average	35	23.36	54	-3		0.6	5 Pass		
1469.52	3	28	0	1	Average	35.9	24.532	54			-29.4 P		iss	
1946.32	3	29	6	1	Average	40.3	31.27	54	.0	-2:	-22.7 P		ass	
3864.83	3	33	2	1	Average	33.8	28.028	54	.0	-2.	5.9	Pass		
4671.35	3	21	1	1	Average	33.1	28.936	54	.0	-2.	5.0	Pa	ess	
4814.04	3	6!	5	1	Average	33.4	29.395	54	.0	-2	4.6	Pa	iss	
Radiated	sional Testing, Emissions, 3m Dis ertical Polarity Measu			▽ Co — Pea	erage Limit Lev rrected Averag k Limit Level rrected Peak R	e Reading			PROFES:	SIONAL				
30 20 20 20 20 20 20 20 20 20 20 20 20 20	referii berkerb dhe que edin par de la com	and the part of the latest of	y Y	al egyla	The state of the s	ار المادر ا	the state of the s	Strange de la ladie	r enland, a se		and desired for your services of	y de pal les les		
Operator:	Eric Lifsey				Free	quency		EUT: SIM-G	, Access Poi	int		5('	

Mode: Receive, Receive Power: 4.2 VDC, 5.0 VDC

17731+17733 'RE'Run01 'RX 'Spurio us.til

01:02:10 PM, Tuesday, April 05, 2016

Client: Triax Technologies

Project Number: 17731,17733

Table 6.3.	1: Radiate	d Spu	rious	Emissi	ons, Receiv	⁄e N	1ode, Abo	ve 1	GHz,	Horiz	ontal	Polarity	/		
				Profe	essional	Tes	sting, EN	ΜI, I	Inc.						
		ANSI C	63.10-	-2013: Am	nerican Nationa	ıl Staı	ndard of Proc	edure	s for Co	mplian	ce Testi	ng of Unlic	ens	ed Wir	eless
Test Metho	d:	Device	s												
In accordan	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits														
Section:	Section: 15.109														
Test Date(s):	4/5/2	016				EUT Serial a	#:		None					
Customer:		Triax	Techn	ologies			EUT Part #:			SIM-C	, Acce	ss Point			
Project Nur	nber:	_	-15, 1	.7733-15			Test Techni	ician:		Eric L	ifsey				
Purchase O		NA				_	Supervisor:			Lisa A					
Equip. Und	er Test:	SIM-G	, Acce	ess Point			Witness' N	ame:		None					
	F	Radiate	d Em	issions T	Test Results [Data	Sheet				Pag	e: 1		of	1
EUT Li	ne Voltage:		4.2,	5.0 V	DC		EUT Pow	ver Fr	equen	су:	0	N/A	4		
Antenna	Orientatio	n:		Hori	izontal		Frequ	ency	Range	:		Above	1GI	Hz	
	EUT N	/lode o	f Ope	ration:			-		-	Rece	iving				
Frequency	Test	EU	т	Antenn	na		Recorded	Corr	ected						
Measured	Distance	Direc		on Height Detector		_	Amplitude		evel	Limit Level Margi			h	Γest Re	sults
(MHz)	(Meters)	(Degr	ees)	(Meter	Functio	n	(dBμV)		ιV/m)	(dBµ	V/m)	(dB)			
1497.48	3	35		1	Averag	e	35.5 24.235					-29.7			
2031.69	3	17		1	Averag		35.3	26.633		54.0		-27.3			
2978.64	3	20		1	Averag		34.4		27.923		.0		-26.0 Pa		
3712.41	3	27		1	Averag		34.4	_	.346	54		-25.6	+	Pas	
4253.29	3	21		1	Averag		33.7	_	.895	54		-25.1	+	Pas	
4821.29	3	26	8	1	Averag	e [33.5	29	.502	54		-24.5		Pas	55
	ional Testing,		c						— Avera	nge Limit Le	vel				\equiv
	Emissions, 3m Dis orizontal Polarity Me		sions						∇ Corre	ected Avera	ge Reading				ŧ
90∓ —									- Peak	Limit Level					
80									- Corre	ected Peak R	ea ding			PROFESSI T E S T	ONAL N 6
<u> </u>															
Field Strength (dBµVm)															
aff On															
21 20 -															
를 40 —					مرابع المساور ا	Marshar	and the second second	وراينا أاللغر واجور	ا مارسوسارادس	terlande la la distribuid	Mark of Barrier	According to the delivery			
30						and to a partie	- constitution of the confidence of			1-01-11					
30			7		ΙŸ				Y		7	I Y		Ĭ	
20 [±] _G					<u> </u>							+		5 G	
Operator: I	Eric Lifsey				In Dessite Dessite	Frequ	iency		E	UT: SIM-G	, Access Poin	t			
	733 'RE'Run01 'RX 'S				de: R eceiv e, R eceiv e er: 4.2 VDC, 5.0 VDC					•	ber: 17731,				
01:02:10 P	M, Tuesday, April 05	,2016							C	lient: Tria x	Technologie	s			

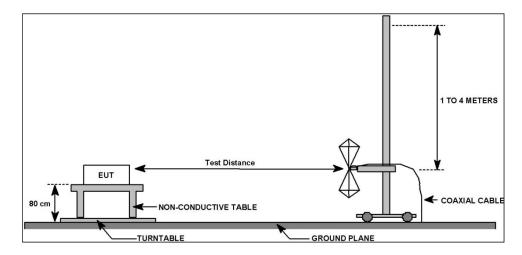
> 1GHz Horizontal Antenna Polarity Measured Emissions

6.0 Radiated Spurious Emissions, Transmit Mode

6.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate using 1 MHz resolution bandwidth. A diagram showing the test setup appears below.



6.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Transmit Mode	8 Apr 2016

6.3 Test Results

Modulation was enabled for this test and the transmitter was placed into continuous transmit mode.

The duty cycle averaging factor applies -20.0 dB to the peaks recorded for the harmonics. Therefore if the peak limit is satisfied, the average limit is also satisfied.

All measurements used peak detection.

Table 7.3.1: TX Mode, Three Channels, Below 1 GHz, Vertical Polarity

				sional Te					
Test Metho	d:	ANSI C63.10- Devices	-2013: Ameri	can National Sta	endard of Proc	edures for Co	mpliance Test	ting of Unlicer	sed Wireless
n accordan	ice with:	FCC Part 15.2 Limits	09 - Code of	Federal Regulat	ions Part 47, S	Subpart C - Int	entional Radi	ators, Radiate	d Emissions
Section:		15.209							
Test Date(s):	4/8/2016			EUT Serial	#:	None		
Customer:		Triax Techn	ologies		EUT Part #:		Access Poi	nt	
Project Nur	nber:	17731-15, 1	7733-15		Test Techni	ician:	Eric Lifsey		
Purchase O	rder #:	NA			Supervisor:		Lisa Arndt		
quip. Und	er Test:	Access Poir	nt		Witness' N	ame:	None		
	F	Radiated Em	issions Test	Results Data	Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage:	: 5	VDC		EUT Pow	ver Frequen	cy:	0 N/A	
Antenna	Orientatio	n:	Vertic	al	Frequ	ency Range:		30MHz to	1GHz
	EUT N	/lode of Ope	eration:			Tran	smit; 3 Cha	nnels	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
34.4859	10	115	1.43	Quasi-peak	23.1	11.539	29.5	-18.0	Pass
57.7947	10	145	2.84	Quasi-peak	30.3	12.334	29.5	-17.2	Pass
231.602	10	290	1.72	Quasi-peak	30.2	17.012	35.6	-18.6	Pass
758.852	10	110	1.71	Quasi-peak	33.4	34.32	35.6	-1.3	Pass
878.063	10	217	2.54	Quasi-peak	36.9	41.044	90.0	-49.0	Pass
888.824	10	130	3.28	Quasi-peak	35	39.761	90.0	-50.2	Pass
940.459	10	183	2.62	Quasi-peak	36.7	41.745	90.0	-48.3	Pass
952.368	10	103	1.49	Quasi-peak	33.5	38.744	90.0	-51.3	Pass
992.824	10	217	1.33	Quasi-peak	26.4	31.792	43.5	-11.7	Pass
Radiated 1	sional Testing, Emissions, 10m Di GHz Vertical Polarity	istance			 Quasi-peak Limit Corrected Quasi- Peak Limit Level Corrected Peak V Verified Low-PRI LPRF Verification Restricted Band M 	peak Reading alue F QP Reading n Limit		PROFESSIONAL TESTING	
80 (m) A (q B μ V/m) (10 μ V/m)	× V	×		Mary and the Company of the Company	×	and the second s		×	· × ×
0 30M		***************************************	100M	Free	uency				1G
	Eric Lifsey Run02 TX 'Spurious.t 'M, Friday, April08, 2		Mode: Tra Power: 5.0	nsmit, 3 channels		P	UT: Access Point roject Number: 1773: lient: Triax Technolog		
		≤ 10	GHz Vertica	l Antenna Po	larity Meas	ured Emissi	ons		

Table 7.3.	2: TX Mod	e, Three C	hannels, E	Below 1 GHz	, Horizont	al Polarity	7		
			Profes	sional Te	sting, El	VII, Inc.			
Test Metho	od:	ANSI C63.10- Devices	-2013: Ameri	can National Sta	andard of Proc	edures for Co	mpliance Te	sting of Unlicer	ised Wireless
In accordar	nce with:	FCC Part 15.2 Limits	109 - Code of	Federal Regulat	ions Part 47,	Subpart C - Int	entional Rac	diators, Radiate	d Emissions
Section:		15.209							
Test Date(s	s):	4/8/2016			EUT Serial	#:	None		
Customer:		Triax Techr			EUT Part #:		Access Po	int	
Project Nur		17731-15, 1	7733-15		Test Techn		Eric Lifsey		
Purchase O		NA			Supervisor		Lisa Arndt	<u> </u>	
Equip. Und	er Test:	Access Poir	nt		Witness' N	ame:	None		
	F	Radiated Em	issions Test	Results Data	Sheet		P	age: 1	of 1
	ne Voltage		VDC			ver Frequen		0 N/A	
Antenna	o Orientation	n:	Horizor	ntal	Frequ	ency Range:		30MHz to	1GHz
	EUT N	lode of Ope	eration:			Tran	smit; 3 Ch	annels	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Leve (dBµV/m)	0	Test Results
30.3978	10	247	1.73	Quasi-peak	23.9	12.495	29.5	-17.0	Pass
155.979	10	94	3.75	Quasi-peak	36.4	19.915	33.1	-13.2	Pass
200.123	10	348	3.91	Quasi-peak	33.7	19.343	33.1	-13.8	Pass
234.028	10	45	2.66	Quasi-peak	39.5	26.756	35.6	-8.8	Pass
746.809	10	356	1.12	Quasi-peak	32.4	33.008	35.6	-2.6	Pass
758.675	10	171	1.24	Quasi-peak	25.5	26.482	35.6	-9.1	Pass
771.607 878.036	10 10	175 357	2.73 3.97	Quasi-peak	31.5 43.4	32.585 47.51	35.6 90.0	-3.0 -42.5	Pass
890.791	10	352	3.86	Quasi-peak Quasi-peak	36.2	40.996	90.0	-42.5	Pass Pass
940.364	10	264	1.98	Quasi-peak	46	51.061	90.0	-38.9	Pass
952.485	10	269	2.01	Quasi-peak	47.4	52.656	90.0	-37.3	Pass
Profess Radiated 30MHz-10	sional Testing, Emissions, 10m Di GHz Horizontal Polar		s -		Quasi-peak Limit Corrected Quasi- Peak Limit Level Corrected Peak V Verified Low-PRI LPRF Verification	peak Reading alue F QP Reading n Limit		PROFESSIONAL	- +++
Field Strength (dBp.V/m) 20 20 20 20 20 20 20 20 20 20 20 20 20					Restricted Band M			××××	**************************************
10 0 30M	- Marie Carlotte Control of the Cont	and the second s	100M	F	uu an cv				1G
Operator:		_	Mode: Tra	nsmit,3 channels	uency		UT: A ccess Po int		
	Run02'TX'Spurious.t PM Friday April08-2		Power: 5.0				roject Number: 177 lient: Triax Technol		
U3:16:43 I	PM, Friday, April 08, 2	010					lient: Triax Technol	o g æs	
		≤ 1G	Hz Horizont	al Antenna P	olarity Mea	sured Emis	sions		

Table 7.5.	s: IX IVIOU	e, inree (·	bove 1 GH					
				sional Te					
Test Metho	d:	ANSI C63.10 Devices	–2013: Amerio	an National Sta	andard of Proc	edures for Co	mpliance Test	ing of Unlice	nsed Wireless
In accordan	ce with:	FCC Part 15. Limits	209 - Code of I	ederal Regulat	tions Part 47, 9	Subpart C - Int	entional Radi	ators, Radiate	ed Emissions
Section:		15.209							
Test Date(s):	4/8/2016			EUT Serial		None		
Customer:		Triax Tech			EUT Part #:		Access Poir	nt	
Project Nur		17731-15,	1//33-15		Test Techn		Eric Lifsey		
Purchase O		NA Access Poi	nt		Supervisor: Witness' N		Lisa Arndt None		
Equip. Und	er rest.	Access Pol	111		Withess in	aine.	None		
	F	Radiated En	nissions Test	Results Dat	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage:		5 VDC		EUT Pow	ver Frequen	cy:	N/A	
Antenna	Orientatio	n:	Vertic	al	Frequ	ency Range		Above 1	GHz
	EUT N	lode of Op	eration:			Tran	smit; 3 Cha	nnels	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
2708.36	3	52	1	Peak	61	53.068	74.0	-20.9	Pass
2744.46	3	80	1	Peak	61.7	53.825	74.0	-20.1	Pass
2782.81	3	273	1	Peak	62.4	54.693	74.0	-19.3	Pass
3611.2	3	51	1	Peak	58.7	52.648	74.0	-21.3	Pass
3659.37	3	253	1	Peak	62.6	56.58	74.0	-17.4	Pass
3710.32	3	236	1	Peak	58.5	52.487	74.0	-21.5	Pass
7222.24 7318.6	3	254 234	1	Peak Peak	48.8 51.3	51.945 54.702	74.0 74.0	-22.0 -19.3	Pass Pass
7420.96	3	261	1	Peak	46	49.859	74.0	-19.3	Pass
Profess Radiated	ional Testing, Emissions, 3m Dis erticalPolarity Measu	tance				— Avera▽ Corre— Peak	ige Limit Level cted Average Reading Limit Level cted Peak Reading		PROFESSIONAL TESTING
Field Strength (d B u V/m) (d		u ga del seleta aldenda de del			¥	,, dell description			106
	Eric Lifsey Run02 'TX 'Spurious.t 'M, Friday, April08,2		Mode: Tra Power: 5.0	nsmit, 3 channels	quency	P	UT: Access Point roject Number: 17733 lient: Triax Technolog		

> 1GHz Vertical Antenna Polarity Measured Emissions

Table 7.3.	4: TX Mod	e, Thr	ee C	hannels, A	bove 1 GH	z, Horizont	tal Polarity	/			
				Profess	sional Te	sting, EN	VII, Inc.			-	
Test Metho	od:	ANSI Co		-2013: Amerio	an National Sta	andard of Proc	edures for Co	mplianc	e Testi	ng of Unlicer	sed Wireless
In accordar	nce with:	FCC Par Limits	t 15.2	109 - Code of F	ederal Regulat	ions Part 47, S	Subpart C - Int	entiona	l Radia	tors, Radiate	d Emissions
Section:		15.209									
Test Date(s	s):	4/8/20				EUT Serial	#:	None			
Customer:				ologies		EUT Part #:		Access		t	
Project Nui		17731	-15, 1	7733-15		Test Techni		Eric Li			
Purchase O		NA				Supervisor:		Lisa A	rndt		
Equip. Und	er Test:	Access	Poir	nt		Witness' N	ame:	None			
	F	Radiate	d Em	issions Test	Results Dat	a Sheet			Pag	ge: 1	of 1
EUT Li	ine Voltage	:	5	VDC		EUT Pow	ver Frequen	cy:	0	N/A	
Antenna	orientation	n:		Horizon	ital	Frequ	ency Range:			Above 10	GHz
	EUT N	/lode o	f Ope	eration:			Trans	smit; 3	Chan	nels	
Frequency Measured (MHz)	Test Distance (Meters)	EU [*] Direct (Degre	ion	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit L (dBμV		Margin (dB)	Test Results
2708.51	3	32:	1	1	Peak	62.6	54.681	74.	.0	-19.3	Pass
2744.58	3	164	4	1	Peak	58.7	50.858	74.		-23.1	Pass
2782.84	3	15:		1	Peak	63.4	55.724	74.		-18.2	Pass
3611.31	3	21:		1	Peak	56.9	50.907	74.	+	-23.1	Pass
3659.33	3	21	7	1	Peak	61	54.963	74.	.0	-19.0	Pass
3710.48	3	180	6	1	Peak	60	53.892	74.	.0	-20.1	Pass
7222.64	3	43	,	1	Peak	48.3	51.471	74.	.0	-22.5	Pass
7318.32	3	210	6	1	Peak	49.1	52.514	74.	.0	-21.4	Pass
7421.18	3	49)	1	Peak	46.6	50.406	74.	.0	-23.6	Pass
Radiated	sional Testing, Emissions, 3m Dis Iorizontal Polarity Mo	tance						g e Limit Leve			
90= -							— Peak I	Limit Level			
80 -							— Corre	cted Peak Re	ading	1	PROFESSIONAL TESTING
Field Strength (d B tr V/m) 400 400 400 400 400 400 400 400 400 40		oriel, and other lands									
30	Approx 1		-								.

Mode: Transmit, 3 channels Power: 5.0 VDC Frequency

20 E

Operator: Eric Lifsey

17733 'RE'Run02 'TX 'Spurious.til

04:00:10 PM,Friday,April08,2016

10G

EUT: Access Point

Project Number: 17733-15

Client: Triax Technologies

7.0 Conducted Spurious Emissions, Transmit Mode

7.1 Test Procedure

Emissions are measured directly at the antenna port with the EUT in transmit mode. A resolution bandwidth of 100 kHz applies.

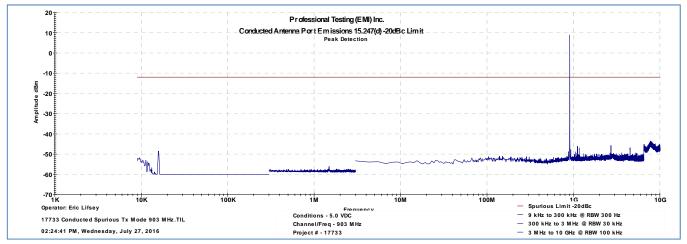
7.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Transmit Mode	27 Jul 2016

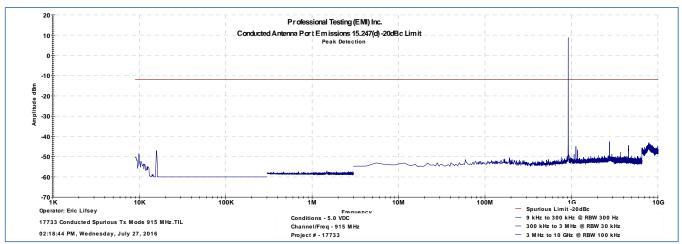
7.3 Test Results

Modulation was enabled for this test and the transmitter was placed into continuous transmit mode. The -20 dBc limit is shown.

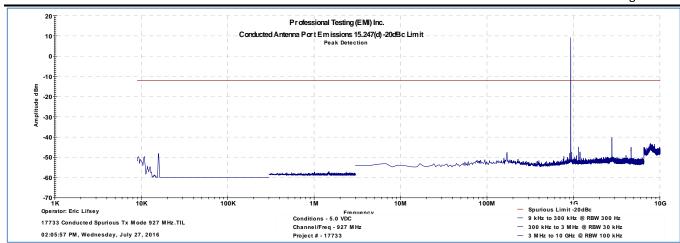
Plotted results are presented below.



Low Channel



Middle Channel



High Channel

8.0 Conducted Mains Emissions

8.1 Test Procedure

Measure mains emissions using LISN. EUT is attached directly to a USB port on the host device (laptop) and emissions from the combined system are measured.

8.2 Test Criteria

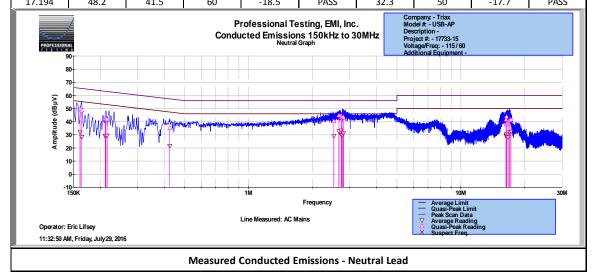
47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.107 // RSS-Gen	Conducted Emissions, Mains	29 Jul 2016

8.3 Test Results

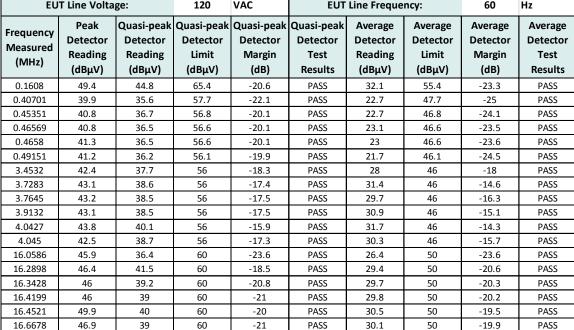
The EUT satisfied the requirements. Graphical and tabular data appears on the following pages.

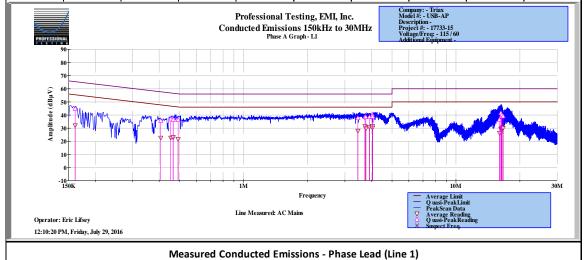
	Professional Testing, EMI, Inc.		
Test Method:	ANSI C63.10–2013: Americar Devices	n National Standard of Procedures for C	Compliance Testing of Unlicensed Wireless
In accordance with:	FCC Part 15.207 - Code of Fed Limits	deral Regulations Part 47, Subpart C - I	ntentional Radiators, Conducted Emissions
Section:	15.207		
Test Date(s):	7/29/2016	EUT Serial #:	CH30
Customer:	Triax	EUT Part #:	0
Project Number:	17733-15	Test Technician:	Eric Lifsey
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	USB-AP	Witness' Name:	UW

Cond	ducted Emiss	sions Test Re	sults Data S	heet - Neutr	al Lead; Tran	smit Mode	Pa	ge: 1	of 2
EU	T Line Volta	ge:	120	VAC	EUT	Line Freque	ncy:	60	Hz
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi-peak Detector Reading (dBµV)	Quasi-peak Detector Limit (dBµV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results
0.16079	53.8	49.5	65.4	-15.9	PASS	32.2	55.4	-23.2	PASS
0.16374	53.6	48.6	65.3	-16.6	PASS	28.4	55.3	-26.9	PASS
0.21124	45.9	42	63.2	-21.2	PASS	28.9	53.2	-24.3	PASS
0.21245	46.4	42.2	63.1	-20.9	PASS	29.3	53.1	-23.8	PASS
0.21541	46.4	41.8	63	-21.2	PASS	29.3	53	-23.7	PASS
0.4252	41.2	35.2	57.3	-22.1	PASS	21.5	47.3	-25.9	PASS
2.5208	49.4	40.4	56	-15.6	PASS	29	46	-17	PASS
2.6641	48.8	44.7	56	-11.3	PASS	32.6	46	-13.4	PASS
2.7297	49.8	44.7	56	-11.3	PASS	33.2	46	-12.8	PASS
2.7409	50.6	43.4	56	-12.6	PASS	29.9	46	-16.1	PASS
2.7638	50.2	43	56	-13	PASS	29.9	46	-16.1	PASS
2.7983	49.4	43.4	56	-12.6	PASS	31.4	46	-14.6	PASS
16.337	49	41.6	60	-18.4	PASS	29.1	50	-20.9	PASS
16.3435	50.2	38	60	-22	PASS	29.9	50	-20.1	PASS
16.4131	49.8	43.7	60	-16.3	PASS	30.3	50	-19.7	PASS
16.6834	47.3	39.4	60	-20.6	PASS	28	50	-22	PASS
16.9871	47.2	40.8	60	-19.2	PASS	31.9	50	-18.1	PASS
17 19/	48.2	41.5	60	-18 5	DΔSS	32.3	50	-17 7	PASS



								Tria	x Techno
			Profes	sional Te	esting, EN	/II, Inc.		1110	X TECHNO
Test Metho	d:	ANSI C63.10- Devices	2013: America	n National Sta	ndard of Proced	lures for Comp	oliance Testing	of Unlicensed	Wireless
In accordan	ce with:	FCC Part 15.2	07 - Code of Fe	deral Regulati	ons Part 47, Su	bpart C - Inten	tional Radiato	rs, Conducted I	Emissions
Section:		15.207							
Test Date(s)	:	7/29/2016			EUT Serial #		CH30		
Customer:		Triax			EUT Part #:		0		
Project Nun	nber:	17733-15			Test Technic	ian:	Eric Lifsey		
Purchase O	rder #:	0			Supervisor:		Lisa Arndt		
Equip. Unde	er Test:	USB-AP			Witness' Na	me:	UW		
	ted Emission	ns Test Resul	ts Data Shee	t - Phase Lea	I	ransmit Mod		ge: 2	of 2
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	1	_		Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detecto Test Results
0.1608	49.4	44.8	65.4	-20.6	PASS	32.1	55.4	-23.3	PASS
0.40701	30.0	35.6	57.7	-22.1	DΔSS	22.7	47.7	-25	PΔSS





9.0 Antenna Construction Requirements

The design was investigated for meeting the antenna construction requirements of the applicable rules.

9.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users in ways that would void their authorization to use the device.

9.2 Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.203 // RSS-Gen 8.3	Antenna Construction	14 Sep 2016

9.3 Results

Antenna Man	ufacturer a	nd Model		Specif	ications				
	Manufacturer: Pulse Electronics								
	Part Number	Frequency	Max Gain (dBi)	Mechanical Length 3	Application/Standard				
	W1063	900MHz	3.0	6.65 /169	ISM 868 & 915MHz				

- Antenna is externally pluggable.
- Manufacturer supplies the antenna.
- The external connector uses reverse polarized center pin conductor.

The antenna design above satisfies the requirements of the rules.

10.0 Equipment

10.1 Radiated Emissions 30 MHz to 10 GHz

		Profes	sional Testing, EMI, Inc.			
			erican National Standard of Procedure	es for Compliance 1	Testing of	
Test Metho	a: Unlice	ensed Wireless De	evices			
	FCC P	art 15.209 - Code	of Federal Regulations Part 47, Subpa	rt C - Intentional R	adiators.	
n accordan		ted Emissions Lim	-		•	
Section:	15.20	9				
Test Date(s)			EUT Serial #:	None		
Customer:		Technologies	EUT Part #:	Access Point		
Project Nun Purchase O		1-15, 17733-15	Test Technician:	Eric Lifsey Lisa Arndt		
quip. Unde		s Point	Supervisor: Witness' Name:	None		
.quip. Onuc	i rest. Acces		•	None		
Til	e! Software Version		ed Emissions Test Equipment List			
	e: Juliwale version	JII. 4.Z.P	, May 23, 2010, 08:38:52 AM			
	Test Profile:		Rad Emissions_ClassA - LowPRF_072 Rad Emissions_ClassB - LowPRF_072			
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date	
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	2/5/2017	
1890	НР	8447F	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	2/1/2018	
1937	Agilent	E4440A	Spectrum Analyzer, 3 Hz - 26.5 GHz, Opt. AYZ	MY44808298	12/15/201	
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	135454	1/25/2017	
C027D	none	RG214	Cable Coax, N-N, 25m	none	10/1/2016	
1327	EMCO	1050	Controller, Antenna Mast	none	N/A	
0942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A	
1969	НР	11713A	Attenuator/Switch Driver	3748A04113	N/A	
1509B	Braden	N/A	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	3/14/2017	
2004	Miteq	AFS44-00101800- 2S-10P-44	Amplifier, 40dB, .1-18GHz	0	1/11/2018	
C030	none	none	Cable Coax, N-N, 30m	none	10/1/2016	
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A	
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide	110313	2/25/2017	

Applies also to power spectral density and receive spurious equipment list.

10.2 Bandwidth, Conducted Spurious, Fundamental Power and Duty Cycle

Asset #	Manufacturer	Model #	Description	Calibration Due
2216	НР	8593E	Spectrum Analyzer	19 Jul 2017
None	B&K	1710	Adjustable Power Supply	CIU
0472	Tektronix	THS730A	DMM / Scope	7 Dec 2016

10.3 Mains Conducted Emission

In accordance with:	FCC Part 15.207 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Conducted Emissions Limits			
Section:	15.207			
Test Date(s):	7/29/2016	EUT Serial #:	CH30	
Customer:	Triax	EUT Part #:	0	
Project Number:	17733-15	Test Technician:	Eric Lifsey	
Purchase Order #:	0	Supervisor:	Lisa Arndt	
Equip. Under Test:	USB-AP	Witness' Name:	UW	

Conducted Emissions Test Equipment List

 Tile! Software Version:
 4.1.A.0, April 14, 2009, 11:01:00PM

 Test Profile:
 CE_2015_TILE4_Ver2_050316.TIL or CE_Marine_050316.TIL

Test Profile. CE_2015_TILE4_Ver2_050516.TIL 01 CE_Warmie_050516.TIL						
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date	
1145	НР	8568B	Spectrum Analyzer 100Hz-1.5GHz	2517A01821	7/20/2017	
1834	НР	85662A	Spec Anal Dsply, use with A/N 1145	2349A06182	N/A	
0990	НР	85685A	RF Preselector	3010A01119	7/20/2017	
0085	НР	85650A	Quasi-Peak Adapter CISPR	3033A01458	7/20/2017	
1173	PTI	100k HPF	Filter, High Pass, 100kHz	none	2/2/2018	
1088	PTI	PTI-ALF4	Attenuator Limiter Filter	none	10/6/2017	
C176	НР	none	Cable, RF, BNC-BNC, 24", Grey	none	1/27/2018	
C303	Coleman Cable	RG-58A/U	Cable, BNC-BNC, 36" Black	None	3/25/2018	
C107	Pomona	RG-223	Cable 9 ft BNC RG-223 (black)	none	8/6/2016	
1185	EMCO	3825/2	LISN, 10kHz-100MHz	1235	11/12/2016	
1132	AilTech	91550-1M	Probe, Current, 10kHz-100MHz	1856	2/12/2017	
0936	FCC	FCC-TLISN-T2	TLISN-T2, 9kHz-30MHz, CISPR 22	20152	3/4/2017	
0935	FCC	FCC-TLISN-T4	TLISN-T4, 9kHz-30MHz, CISPR 22	20153	3/4/2017	
1683	Teseq	ISN T800	ISN-T8, Impedance Stabilization Network	27091	6/15/2017	
0027	EMCO	3825/2	LISN, 10kHz-100MHz	9010-1708	11/12/2016	
0586	НР	8447D	Preamp, 0.1-1300MHz, 26dB	1726A01364	2/12/2018	

11.0 Measurement Bandwidths

Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan							
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range			
0.009	0.15	0.3	2	Multiple Sweeps			
0.15	30	9	6	Multiple Sweeps			
30	1000	120	2	Multiple 800 mS Sweeps			
1000	6000	1000	2	Multiple Sweeps			
6000	18000	1000	2	Multiple Sweeps			
18000	26500	1000	2	Multiple Sweeps			

*Notes:

- 1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range.
- 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz.
- 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.
- 4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz.
- 5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.

Conducted Emissions Spectrum Analyzer Bandwidth and Measurement Time						
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range		
0.01	0.15	0.3	7	Five 1 second sweeps		
0.15	30	9	20	Five 1 second sweeps		

*Notes

- 1. The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1,000 data points per range.
- 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 10-150 kHz.
- 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.

Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7

End	Λf	Rei	nort	
Lillu	VI.	1/6	սու	

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