Project 19070-15

FieldComm Group WirelessHART Access Point

Wireless Certification Report

Prepared for:

FieldComm Group 9430 Research Blvd Suite 1-120 Austin, TX 78759 USA

By

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

16 Mar 2018

Reviewed by

Larry Finn Chief Technical Officer Written by

Eric Lifsey EMC Engineer

Revision History

Revision Number	Description	Date
Final 01		16 Mar 2018

Er	ra	ta	:

None.

Table of Contents

	ion History	
Comp	bliance Certificate	5
1.0	Introduction	6
1.1	Scope	6
1.2	2 EUT Description	6
1.3		
1.4	1 I	
1.5	5 Test Site	6
1.6	5 Radiated Measurements	7
1.7	7 Applicable Documents and Clauses	7
2.0	Fundamental Power	8
2.1	Test Procedure	8
2.2	2 Test Criteria	8
2.3	3 Test Results, Peak Power	8
2.4	4 Test Results, Duty Cycle	9
3.0	Power Spectral Density	10
3.1	Test Procedure	10
3.2	2 Test Criteria	10
3.3	3 Test Results	10
4.0	Occupied Bandwidth	11
4.1	Test Procedure	11
4.2		
4.3		
	4.3.1 Bandwidth Plots, 6 dB	
	4.3.2 Bandwidth Plots, 20 dB	
5.0	Band Edge	
5.1		
5.2		
5.3		
	5.3.1 Low Channel Band Edge	
	5.3.2 High Channel Band Edge	
6.0	Radiated Spurious Emissions, Receive Mode	
6.1	1	
6.2		
6.3	3 Test Results	16
	6.3.1 Up to 1 GHz	17
	6.3.2 Up to 13 GHz	
7.0	Radiated Spurious Emissions, Transmit Mode	21
7.1	•	
7.2	2 Test Criteria	21
7.3	3 Test Results	21
	7.3.1 Center Channel Up to 1 GHz	22
	7.3.2 Three Channels Up to 18 GHz	
	7.3.3 Three Channels Up to 25 GHz	
8.0	Antenna Construction Requirements	
8.1	<u>.</u>	
8.2		
8.3	-	
	Equipment	
9.1		
9.2		
10.0	Measurement Bandwidths	
Appei	ndix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty	
	of Report	

NOTICE: (1) This Report must not be used to claim product endorsement, by NVLAP, NIST, the FCC or any other Agency. This report also does not warrant certification by NVLAP or NIST. (2) This report shall not be reproduced except in full, without the written approval of Professional Testing (EMI), Inc. (3) The significance of this report is dependent on the representative character of the test sample submitted for evaluation and the results apply only in reference to the sample tested. The manufacturer must continuously implement the changes shown herein to attain and maintain the required degree of compliance.



Compliance Certificate

FCC MRA Designation Number: US5270 NVLAP Accreditation Number: 200062-0

Applicant	Device & Test Identification	
FieldComm Group	FCC ID:	2AOZ6-TOOL091R2
9430 Research Blvd	Industry Canada ID:	23615-TOOL091R2
Suite 1-120	Model(s):	WirelessHART Access Point
Austin, TX 78759 USA	Laboratory Project ID:	19070-15
Certificate Date: 16 Mar 2018		

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	15.205	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 5	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			
FieldComm Group	AP#1, AP#2, AP#3	2400-2483.5 MHz DTS transceiver; serves as	
Model: Access Point	AP#1, AP#2, AP#3	access point demonstrator kit.	

Table 1.2.2: Support Equipment			
Manufacturer / Model Serial # Description			
None			

This device is a wireless access point for the WirelessHART protocol. It connects by USB cable to a host computer for power, data and control.

The EUT electronics are on a single circuit board. The board is housed in an extruded metal case and features a RP-SMA connector and included antenna.

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.

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

Table 1.6 1 Measurement Corrections		
Parameter From Sums Of		
Radiated Field Strength	Raw Measured Level + Antenna Factor + Cable Losses – Amplifier Gain	
Conducted Antenna Port Raw Measured Level + Attenuator Factor + Cable Losses		
Conducted Mains Port Raw Measured Level + LISN Factor + Cable/Filter/Limiter Losses		

Additionally, measurement distance extrapolation factors (such as 1/d above 30 MHz) 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	
RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-	
N33-247 ISSUE 2	Exempt Local Area Network (LE-LAN) Devices	
RSS-Gen Issue 4 General Requirements and Information for the Certification of Radio Apparatus		
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed	
AINSI C05.10.2013	Wireless Devices	

Table 1.7.2: Applicable Clauses				
Parameter	FCC Part 15 Rule Paragraphs	IC RSS 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	15.247, 15.203	RSS-Gen 8.3		

2.0 Fundamental Power

2.1 Test Procedure

Peak power is measured using conducted means and without modulation.

2.2 Test Criteria

47 CFR (USA) // IC (Canada)			
Section Reference	Date		
	Fundamental Power		
15.247(a)(3) //	Conducted Limits	12 Jun 2017	
RSS-247 5.2	1 W	12 Juli 2017	
	Limit Restated as Field: 125.23 dBμV/m @ 3 m		

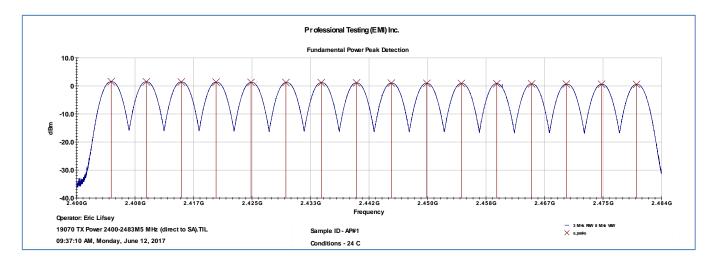
2.3 Test Results, Peak Power

The EUT was measured for conducted power by connection directly to a spectrum analyzer.

Table 2.3.1 Power, Peak, Conducted									
Frequency	•								
MHz	in dBm	in mW							
2405	1.5	1.4							
2440	1.1	1.3							
2480	0.5	1.1							

Measured in 3 MHz RBW, 8 MHz VBW.

The EUT was satisfied the requirements.



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.

The EUT power output is low and there were no transmitter spurious measurements needing the averaging factor. This measurement was not required.

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 Restated as field strength limit: 103.23 dBμV/m at 3 m	NA

3.3 Test Results

The full bandwidth fundamental peak power measured below the limit for this test. The EUT satisfies the criteria without additional measurement.

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	12 Jun 2017						

4.3 Test Results

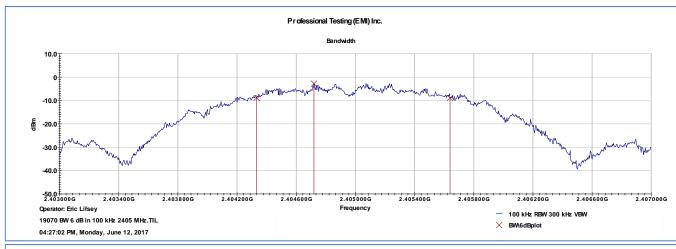
The bandwidth measurement is used to verify DTS characteristics and/or for general reporting for agency application.

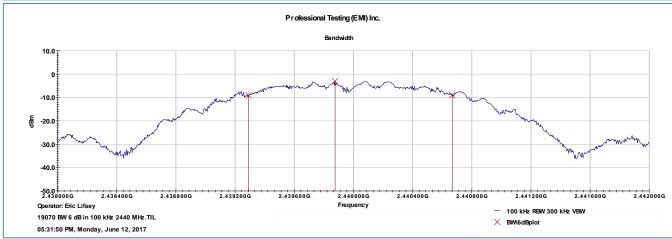
The EUT was found to be in compliance with applicable requirements.

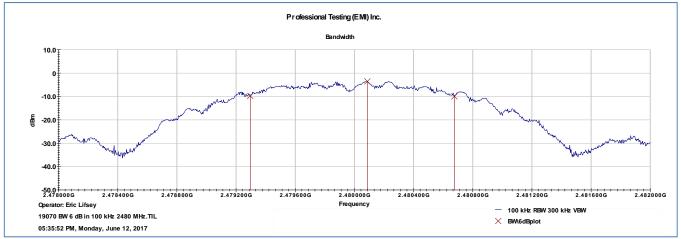
Table 4.3.1										
Bandwidth 6 dB	Bandwidth 6 dB, Minimum 500 kHz in 100 kHz RBW									
Low Channel	Mid Channel	High Channel	Reported							
Measured BW	Measured BW	Measured BW	Minimum BW							
(kHz)	(kHz)	(kHz)	(kHz)							
1308	1376	1380	1308							
Bandwidth 20 d	B, Measure and R	eport								
Low Channel	Mid Channel	High Channel	Reported							
Measured BW	Measured BW	Measured BW	Maximum BW							
(kHz)	(kHz)	(kHz)	(kHz)							
2596	2544	2568	2596							

Plotted measurements appear on the following pages.

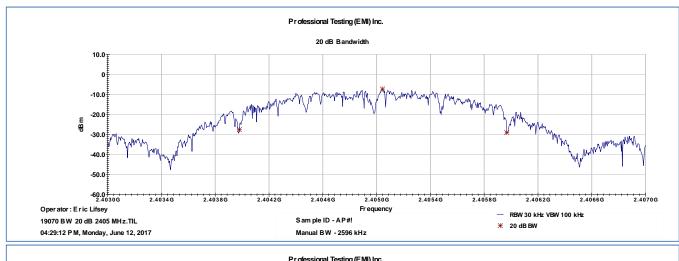
4.3.1 Bandwidth Plots, 6 dB

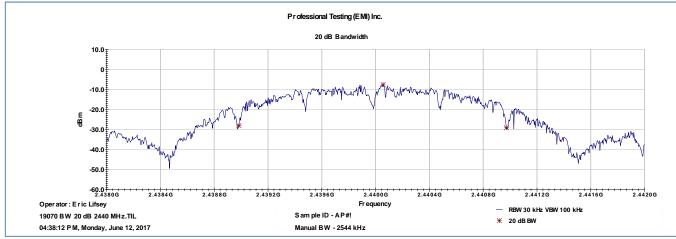


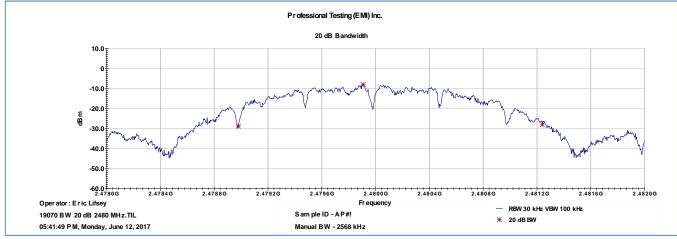




4.3.2 Bandwidth Plots, 20 dB







5.0 Band Edge

5.1 Test Procedure

EUT is placed into normal transmit operation on the nearest band edge channel. The spectrum analyzer is approximately centered on the band edge frequency with span sufficient to include the peak of the adjacent fundamental signal. Measurement includes at least two standard bandwidths from the respective band edge. If required, the band-edge marker-delta method is utilized.

5.2 Test Criteria

47 CFR (USA) // IC (Canada)							
Section Reference	Parameter	Date(s)					
15.247, 15.205 //	Unwanted Emissions Adjacent to Authorized	12 Jun 2017					
RSS-247 5.5, RSS-Gen 4.9	Band	13 Jun 2017					

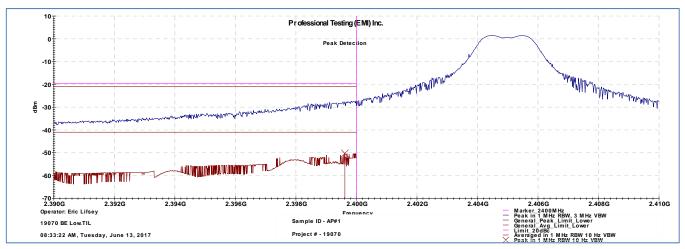
5.3 Test Results

Measurements included fundamental and more than 2 standard bandwidths (standard bandwidth 1 MHz) beyond the band edges to provide a clear view of the fundamental and the declining emission levels.

Average levels were measured outside the band using 10 Hz video bandwidth.

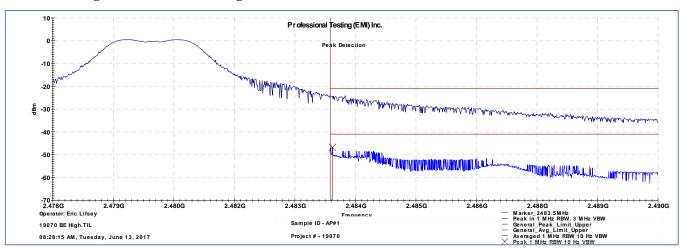
The EUT satisfied the criteria. Plotted results appear on the following pages.

5.3.1 Low Channel Band Edge



The 15.247 (-20 dBc) and general emission limits are shown.

5.3.2 High Channel Band Edge



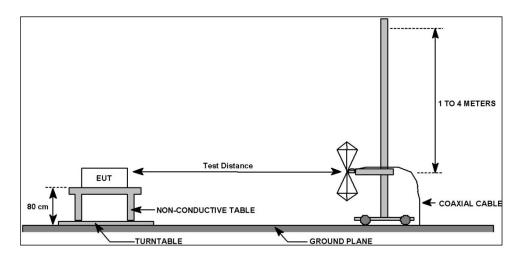
The general emission limit is shown.

6.0 Radiated Spurious Emissions, Receive 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 and 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 Receive Mode	13 Jun 2017

6.3 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.

6.3.1 Up to 1 GHz

			Profes	sional Te	sting, EN	VII, Inc.			
Test Metho	d:			an National Star Electronic Equi				dio-Noise Em	issions from
In accordan	ice with:	Emissions Lir		Federal Regulat	ions Part 47, S	Subpart B - Ur	intentional R	adiators, Radi	ated
Section:	,	15.109			FUT Code to	,	Panua		
Test Date(s):	6/13/2017			EUT Serial		AP#2 0		
Customer: Project Nur	nhor:	FieldComm 19070	i Group		EUT Part #: Test Techni		Spencer Fli	nt	
Purchase O		0			Supervisor:		Lisa Arndt	<u>.</u>	
Equip. Und		WirelessH/	ART		Witness' N		None		
	F	Radiated En	nissions Test	t Results Data	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage:	: !	5 VDC		EUT Pow	er Frequen	cy: N	/A N/A	
Antenna	Orientatio	n:	Vertic	al	Frequ	ency Range:	:	30MHz to	1GHz
	EUT N	Node of Ope	eration:			R	eceive Mod	е	
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
31.6174	10	241	2.29	Quasi-peak	33.4	21.428	29.5	-8.1	Pass
42.6152	10	65	1.18	Quasi-peak	39.8	22.69	29.5	-6.8	Pass
150.555	10	336	1.26	Quasi-peak	42.9	26.351	33.1	-6.7	Pass
906.803	10	169	3	Quasi-peak	21.3	26.099	35.6	-9.5	Pass
957.059	10 10	112 311	3.78	Quasi-peak	21	26.006	35.6	-9.6	Pass
988.435	10	311	2.1	Quasi-peak	21	26.199	43.5	-17.3	Pass
Radiated	ional Testing, Emissions, 10m Di GHz V ertical Pola rity	stance				▽ Corre ─ Corre ▽ Verifi	-peak Limit Level cted Quasi-peak Read cted Peak Value cd Low-PRF QP Read Verification Limit		PROFESSIONAL TESTING
Field Strength (dB w/m) × 10 × 10 × 10 × 10 × 10 × 10 × 10 × 1	× V		VIA.	m	·////	and the state of t			7 7
	Spencer Flint C_2016 RE_ClassB-	Roresite+Mast Low	100M EUT Mod PRF 041417	Freq e: Receive Mode Å: 5VDC /USB Powered	quency		UT: WirelessHART		1G

						Field	dComn	n Group – W	/irelessHAR	T Access Poin
			Profess	sional Te	sting, El	MI,	lnc.			
Test Metho	d:			n National Star Electronic Equi					adio-Noise E	missions from
In accordan	ce with:	FCC Part 15.1 Emissions Lin		Federal Regulat	ions Part 47,	Subpar	t B - Un	intentional R	ladiators, Ra	diated
Section:		15.109						_		
Test Date(s):	6/13/2017			EUT Serial	#:		AP#2		
Customer:		FieldComm	Group		EUT Part #:			0		
Project Nur		19070			Test Techn			Spencer Fl	int	
Purchase O		0			Supervisor			Lisa Arndt		
Equip. Und	er Test:	WirelessHA	ARI		Witness' N	ame:		None		
	F	Radiated Em	issions Test	Results Data	Sheet			Pa	ige: 1	of 1
EUT Li	ne Voltage:	: !	5 VDC		EUT Pov	ver Fr	equen	cy: N	/A N/A	\
Antenna	Orientatio	n:	Horizor	ntal	Frequ	ency l	Range:		30MHz to	1GHz
	EUT N	Node of Ope	eration:				R	eceive Mo	de	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Le	ected evel IV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
47.9945	10	336	1.4	Quasi-peak	24.4	4.0	694	29.5	-24.8	Pass
150.396	10	276	1.25	Quasi-peak	26.1	9.	595	33.1	-23.5	Pass
800.443	10	237	1.72	Quasi-peak	21.4	23.	.047	35.6	-12.6	Pass
899.839	10	256	1.2	Quasi-peak	21.3		.122	35.6	-9.5	Pass
923.335	10	24	3.86	Quasi-peak	21.2		5.03	35.6	-9.6	Pass
979.328	10	226	2.2	Quasi-peak	21	26.	.208	43.5	-17.3	Pass
Radiated 1	ional Testing, Emissions, 10m Di GHzHorizontalPolar		s	·			✓ Corre— Corre✓ Verific	-peak Limit Level cted Quasi-peak Rea cted Peak Value cd Low-PRF QP Rea Verification Limit		PROFESSIONAL TESTING
10 (48 M/m)	× × × × × × × × × × × × × × × × × × ×	MIN	100M	Free	quency	Color of the Color	e de la constante de la consta			× ×× × × × × × × × × × × × × × × × × ×
	-		EUT Mode PRF_041417EUR PROLE EUT A P#2	e: Receive Mode 1: 5VDC /USBPowered			P	UT: WirelessHART roject Number: 1907 lient: Field Comm Gr		

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

6.3.2 Up to 13 GHz

			Profess	sional Te	sting, EN	VII, Inc.				
Test Metho	d:		•	n National Star Electronic Equi				adio-Noise En	nissions fr	rom
In accordan	ice with:	FCC Part 15.1 Emissions Lin		ederal Regulat	tions Part 47, S	Subpart B - Ur	nintentional F	tadiators, Rad	iated	
Section:		15.109								
Test Date(s):	6/13/2017			EUT Serial	#:	AP#2			
Customer:		FieldComm	Group		EUT Part #:		0			
Project Nur	nber:	19070			Test Techni	ician:	Spencer Fl	int		
Purchase O	rder #:	O			Supervisor:		Lisa Arndt			
Equip. Und	er Test:	WirelessHA	RT		Witness' N	ame:	None			
	F	Radiated Em	issions Test	Results Data	a Sheet		Pa	ige: 1	of	1
EUT Li	ne Voltage	: 5	S VDC		EUT Pow	ver Frequen	cy: N	/A N/A		
Antenna	Orientatio	n:	Vertic	al	Frequ	ency Range	•	Above 1	GHz	
	EUT N	lode of Ope	eration:			R	eceive Mo	de		
Frequency Measured	Test Distance	EUT Direction	Antenna Height	Detector Function	Recorded Amplitude	Corrected Level	Limit Level (dBµV/m)	Margin (dB)	Test Re	sult
(MHz)	(Meters)	(Degrees)	(Meters)		(dBμV)	(dBµV/m)	(,,	(/		
1044.38	3	167	3.55	Average	34.9	21.725	54.0	-32.2	Pas	SS
3004.49	3	287	1.45	Average	34.9	27.823	54.0	-26.1	Pas	SS
3495	3	61	1.73	Average	35.2	28.123	54.0	-25.8	Pas	SS
5205.92	3	28	2.06	Average	33.3	30.434	54.0	-23.5	Pas	SS
5782.6	3	290	3.22	Average	32	30.728	54.0	-23.2	Pas	S
5998.46	3	22	3.78	Average	31.7	30.667	54.0	-23.3	Pas	S
6649.84	3	268	3.77	Average	30.5	32.168	54.0	-21.8	Pas	S
8768.62	3	159	1.9	Average	27.1	34.522	54.0	-19.4	Pas	SS
10725.5	3	184	2.3	Average	27.1	36.597	54.0	-17.4	Pas	SS
15111.2	3	73	2.03	Average	28.2	39.834	54.0	-14.1	Pas	S
15639.3	3	108	1.73	Average	27.6	41.036	54.0	-12.9	Pas	
17967.4	3	69	1.15	Average	26.5	42.505	54.0	-11.5	Pas	S
Radiated	sional Testing, Emissions, 3m Dis ertical Polarity Measu	tance				▽ Corre — Peak	ge Limit Level ccted Average Readin Limit Level ccted Peak Reading	g	PROFESSION TESTI	ONAL N 6
20 G G G G G G G G G G G G G G G G G G G				Marry Agent Market	7 7	V V	7 Y		18G	
Operator: S 19070_RE		· Bo resite+Mast_Low P	EUT Mode RF_04141 EUR work	Free: Receive Mode :: 5VDC /USB Powered	quency		UT: WirelessHART roject Number: 1907	0		

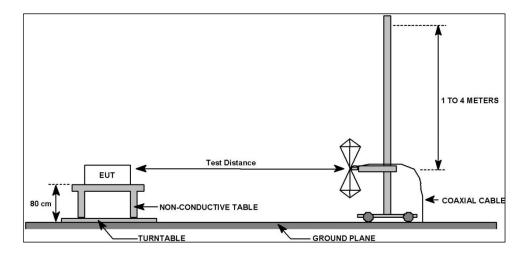
EUT Line Voltage: 5 VDC EUT Power Frequency: N/A N/A Antenna Orientation: Horizontal Frequency Range: Above 1GHz EUT Mode of Operation: Receive Mode Frequency Test EUT Antenna Detector Recorded Corrected Limit Level Margin				Profess	sional Te	sting, El	VII, Inc.			
Section: 15.109	Test Metho	od:							idio-Noise Em	nissions from
Test Date(s): 6/13/2017	In accordan	nce with:			ederal Regulat	tions Part 47, 9	Subpart B - Ur	nintentional R	adiators, Rad	iated
FieldComm Group Further FieldComm Group Further	Section:		15.109							
Customer: FieldComm Group EUT Part #: 0	Test Date(s	:):	6/13/2017			EUT Serial	#:	AP#2		
Project Number: 19070	•	<u>, </u>		Group		EUT Part #:		0		
Purchase Order #: 0 Supervisor: Lisa Arndt	Project Nur	mber:		!		Test Techn	ician:	Spencer Fli	nt	
Radiated Emissions Test Results Data Sheet Page: 1 of 1			0			Supervisor		7		
## Frequency	Equip. Und	er Test:	WirelessHA	ART		Witness' N	ame:	None		
Receive Mode Frequency Test BUT Direction Direction Height (Meters) Detector Function (Meters) Detector (Meters) (Radiated Em	issions Test	Results Data	a Sheet		Pa	ge: 1	of 1
Frequency Test BUT Antenna Height Distance (MHz) Distance Dista	EUT Li	ne Voltage	: !	5 VDC		EUT Pov	ver Frequen	cy: N	/A N/A	
Test Distance (MHz) Distance (Meters) Direction (Degrees) Height (Meters) EUT Direction (Meters) Detector Function Height (Meters) Function Amplitude (dBμV/m) (dBμV/m) (dB) Test Resu (dBμV/m) (dB) Test Resu (dBμV/m) (dB) Test Resu (dBμV/m) (dB) Test Resu (dBμV/m) Test Resu (dBμV/m) (dB) Test Resu (dBμV/m) Test Resu (dBμV/m) (dB) Test Resu (dBμV/m) Tes	Antenna	Orientatio	on:	Horizon	ıtal	Frequ	ency Range:		Above 1	GHz
Measured (MHz)		EUT N	Node of Ope	eration:		1			e	
3074.11 3 46 3.76 Average 34.9 27.608 54.0 -26.3 Pass 4322.28 3 9 3.03 Average 33.8 28.891 54.0 -25.1 Pass 4831.2 3 14 1.46 Average 33.2 29.188 54.0 -24.8 Pass 5248.87 3 284 2.02 Average 33 30.423 54.0 -23.5 Pass 5397.75 3 220 2.53 Average 32.6 29.936 54.0 -24.0 Pass 8797.55 3 215 3.14 Average 27 34.345 54.0 -19.6 Pass 10553.2 3 264 1.43 Average 26.7 36.57 54.0 -17.4 Pass 11528.7 3 294 1.36 Average 27.4 38.309 54.0 -15.6 Pass 13347.7 3 248 3.35 Average 28.9 39.688 54.0 -14.3 Pass 16017.9 3 24 1.31 Average 27.4 41.595 54.0 -12.4 Pass 17750.9 3 64 3.38 Average 26.6 42.411 54.0 -11.5 Pass Professional Testing, EMI, Inc Radiated Emissions 3 Distance 1.18.6H. Horizontal Pubrity Measured Emissions 3 Distance	Measured	Distance	Direction	Height		Amplitude	Level		_	Test Results
3074.11 3 46 3.76 Average 34.9 27.608 54.0 -26.3 Pass 4322.28 3 9 3.03 Average 33.8 28.891 54.0 -25.1 Pass 431.2 3 14 1.46 Average 33.2 29.188 54.0 -24.8 Pass 5248.87 3 284 2.02 Average 33 30.423 54.0 -23.5 Pass 5397.75 3 220 2.53 Average 32.6 29.936 54.0 -24.0 Pass 8797.55 3 215 3.14 Average 27 34.345 54.0 -19.6 Pass 10553.2 3 264 1.43 Average 26.7 36.57 54.0 -17.4 Pass 11528.7 3 294 1.36 Average 27.4 38.309 54.0 -15.6 Pass 13347.7 3 248 3.35 Average 28.9 39.688 54.0 -14.3 Pass 16017.9 3 24 1.31 Average 27.4 41.595 54.0 -12.4 Pass 17750.9 3 64 3.38 Average 26.6 42.411 54.0 -11.5 Pass Professional Testing, EMI, Inc Radiated Emissions 3 Distance I-18G/IH-Horizontal Pohrity Measured Emissions 4 Distance I-18G/IH-Horizontal Pohrity Measured Emissions 5 Distance I-18G/IH-Horizontal Pohrity Distance I-18G/IH-Horizontal Po	1957.95	3	293	2.15	Average	35.5	26.156	54.0	-27.8	Pass
4322.28 3 9 3.03 Average 33.8 28.891 54.0 -25.1 Pass 4831.2 3 14 1.46 Average 33.2 29.188 54.0 -24.8 Pass 5248.87 3 284 2.02 Average 33 30.423 54.0 -23.5 Pass 5397.75 3 220 2.53 Average 32.6 29.936 54.0 -24.0 Pass 8797.55 3 215 3.14 Average 27 34.345 54.0 -19.6 Pass 10553.2 3 264 1.43 Average 26.7 36.57 54.0 -17.4 Pass 11528.7 3 294 1.36 Average 27.4 38.309 54.0 -15.6 Pass 13347.7 3 248 3.35 Average 28.9 39.688 54.0 -14.3 Pass 16017.9 3 24 1.31 Average 27.4 41.595 54.0 -12.4 Pass 17750.9 3 64 3.38 Average 26.6 42.411 54.0 -11.5 Pass Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1.18 GHz Horizontal Polarity Measured Emissions 3 11.5 GHz Horizontal Polarity Measured Emissions 3 11.5 GHz Horizontal Polarity Measured Emissions 3 11.5 GHz Horizontal Polarity Measured Emissions 4 11.5 GHz Horizontal Polarity Measured Emission 5 11.5 GHz Horizontal Polarity Measured Emission 5 11.5 GHz Horizontal Polarity Measured Emission 5 11.5 GHz Horizontal Polarity Measured Emission	,		<u> </u>			-		/		
## 1.46	_		9				28.891			
5248.87 3 284 2.02 Average 33 30.423 54.0 -23.5 Pass	•		14	,		_	7			
Sampor	•		_			-				
8797.55 3 215 3.14 Average 27 34.345 54.0 -19.6 Pass 10553.2 3 264 1.43 Average 26.7 36.57 54.0 -17.4 Pass 11528.7 3 294 1.36 Average 27.4 38.309 54.0 -15.6 Pass 13347.7 3 248 3.35 Average 28.9 39.688 54.0 -14.3 Pass 16017.9 3 24 1.31 Average 27.4 41.595 54.0 -12.4 Pass 17750.9 3 64 3.38 Average 26.6 42.411 54.0 -11.5 Pass Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1.18GlizIndividual Pokirly Measured Emissions 90 Corrected Peak Reading Peak Limit Level Not pass 100 Peak Limit Level Peak Limit Level Not pass 100	/	3	220	2.53		32.6	29.936	54.0	-24.0	Pass
11528.7 3 294 1.36 Average 27.4 38.309 54.0 -15.6 Pass 13347.7 3 248 3.35 Average 28.9 39.688 54.0 -14.3 Pass 16017.9 3 24 1.31 Average 27.4 41.595 54.0 -12.4 Pass 17750.9 3 64 3.38 Average 26.6 42.411 54.0 -11.5 Pass Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1.18GHz Horizontal Polarity Measured Emissions 90 Corrected Average Reading PROFESSIONA Extra 196 60 Professional Testing and the state of t	8797.55	3	215	3.14		27	34.345	54.0	-19.6	Pass
13347.7 3 248 3.35 Average 28.9 39.688 54.0 -14.3 Pass 16017.9 3 24 1.31 Average 27.4 41.595 54.0 -12.4 Pass 17750.9 3 64 3.38 Average 26.6 42.411 54.0 -11.5 Pass Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions 900 Corrected Average Reading Professional Testing (Fig. 1) Peak Limit Level Corrected Peak Reading Professional Testing (Fig. 1) Peak Limit Level Corrected Peak Reading Professional Testing (Fig. 2) Pass 118GHz Horizontal Polarity Measured Emissions 100 Professional Testing (Fig. 2) Pass 118GHz Horizontal Polarity Measured Emissions 118GHz Hor	10553.2	3	264	1.43	Average	26.7	36.57	54.0	-17.4	Pass
16017.9 3 24 1.31 Average 27.4 41.595 54.0 -12.4 Pass 17750.9 3 64 3.38 Average 26.6 42.411 54.0 -11.5 Pass Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions 90 Corrected Average Reading Peak Reading Professional Testing (All Polarity Measured Emissions) Peak Limit Level Corrected Peak Reading Professional Testing (All Polarity Measured Emissions) Peak Limit Level Corrected Peak Reading Professional Testing (All Polarity Measured Emissions) Peak Limit Level Corrected Peak Reading Professional Testing (All Polarity Measured Emissions) Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions (All Pass Peak Limit Level Corrected Peak Reading Professional Testing (All Polarity Measured Emissions) Professional Testing, EMI, Inc Radiated Emissions (All Peak Peak Limit Level Corrected Peak Reading Peak Reading Peak Reading Peak Reading Peak Limit Level Corrected Peak Reading	11528.7	3	294	1.36	Average	27.4	38.309	54.0	-15.6	Pass
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHzHorizontalPohrity Measured Emissions 90 80 (III) To Corrected Peak Reading Peak Limit Level Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHzHorizontalPohrity Measured Emissions Peak Limit Level Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHzHorizontalPohrity Measured Emissions Peak Limit Level Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHzHorizontalPohrity Measured Emissions Peak Limit Level Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHzHorizontalPohrity Measured Emissions Peak Limit Level Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHzHorizontalPohrity Measured Emissions Peak Limit Level Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHzHorizontalPohrity Measured Emissions Peak Limit Level Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHzHorizontalPohrity Measured Emissions Peak Limit Level Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHzHorizontalPohrity Measured Emissions Professional Testing, EMI, Inc Radiated Emissions Peak Limit Level Professional Testing, EMI, Inc Radiated Emissions Professional T	13347.7	3	248	3.35	Average	28.9	39.688	54.0	-14.3	Pass
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions 90 80 - Peak Limit Level - Corrected Peak Reading - Peak Limit Level - Corrected Peak Reading 90 10 10 10 10 10 10 10 10 10 10 10 10 10	16017.9	3	24	1.31	Average	27.4	41.595	54.0	-12.4	Pass
Professional Testing, E.M.I., Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions 90 80 - Corrected Average Reading - Peak Limit Level - Corrected Peak Reading 18GHz Horizontal Polarity Measured Emissions 90 10 10 10 10 10 10 10 10 10 10 10 10 10	17750.9	3	64	3.38	Average	26.6	42.411	54.0	-11.5	Pass
30	Radiated 1-18GHzH 90	Emissions, 3m Dis	stance				▽ Corre — Peak	cted Average Reading Limit Level		PROFESSIONAL TESTING
30 TO THE TOTAL	Field Strength (48 µVm) 50 40					را المحمد			Alle Marie Committee Control	Y Y
Operator: Spencer Flint EUT: WirelessHART	30 20 G	Spencer Flint	Y		Free	quency	F			18G
19070_REC_2016 RE_ClassB - Boresite+Mast_LowPRF_04141 EUT Mode: Receive Mode 12:24:49 PM, Tuesday, June 13, 2017 EUT AP#2 Client: Field Comm Group	19070_RE	C_2016 RE_ClassB			: Receive Mode :: 5VDC /USBPowered		P	roject Number: 1907(

7.0 Radiated Spurious Emissions, Transmit Mode

7.1 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.



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	13 Jun 2017

7.3 Test Results

This device was tested as 3 samples with each occupying the required test frequencies.

7.3.1 Center Channel Up to 1 GHz

			Profes	sional Te	sting, El	MI, Inc.			
Test Metho	od:	ANSI C63.10- Devices	-2013 America	an National Star	ndard of Proce	dures for Con	npliance Testii	ng of Unlicen	sed Wireless
In accordar	nce with:	FCC Part 15.2 Limits	209 - Code of I	Federal Regulat	ions Part 47, 9	Subpart C - Int	entional Radia	ators, Radiato	ed Emissions
Section:		15.209			1				
Test Date(s	<u>s):</u>	6/13/2017			EUT Serial	#:	AP#1,AP#2	,AP#3	
Customer:		FieldComm	Group		EUT Part #:		0		
Project Nur		19070			Test Techn		Spencer Fli	nt	
Purchase O		0			Supervisor		Lisa Arndt		
Equip. Und	er Test:	WirelessHA	ART		Witness' N	ame:	None		
	F	Radiated Em	issions Test	t Results Data	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage		5 VDC		EUT Pov	ver Frequen	cy: N	/A N/A	
Antenna	Orientatio	n:	Vertic	al	Frequ	ency Range:	:	30MHz to	1GHz
	EUT N	/lode of Ope	eration:		Tra	ansmitting (Mid Channe	el - 2440 M	Hz)
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
42.8805	10	263	1.54	Quasi-peak	34.1	17.167	29.5	-12.3	Pass
55.831	10	34	1.47	Quasi-peak	35.3	17.432	29.5	-12.1	Pass
138.363	10	296	1.23	Quasi-peak	37.8	20.716	33.1	-12.4	Pass
143.976	10	330	1.28	Quasi-peak	44.7	28.235	33.1	-4.9	Pass
155.972	10	246	1.3	Quasi-peak	41.6	26.226	33.1	-6.9	Pass
897.106	10	183	3.08	Quasi-peak	21.4	24.478	35.6	-11.1	Pass
Radiated	sional Testing, Emissions, 10m D GHz Vertical Polarity	istance	100M	× × ×	quency	▼ Corre Corre Verifi × LPRF — ETSI	i-peak Limit Level ected Quasi-peak Read ected Peak Value ied Low-PRF QP Read V crification Limit Limit_Tx		PROFESSIONAL TESTING
Operator: 19070_FC	Spencer Flint C_2016 RE_2440M PM, Tuesday, June 13	_30M-26G_Mid Ch_	Run1.til EUTPowe	e: Transmitting CW er: 5VDC USBPowered Hz,3 EUTs GHz (B,M,T C	Ldo	F	Project Number: 1907 Client: Field Comm Gro		

						FieldCom	n Group – W	irelessHART	Access Poin
			Profes	sional Te	sting, El	VII, Inc.			
Test Method: ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices								sed Wireless	
In accordance with: FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emission Limits								ed Emissions	
Section: 15.209									
Test Date(s): 6/13/2017 EUT Serial #: AP#1,AP#2,AP#3 Customer: FieldComm Group EUT Part #: 0									
Customer:		19070	n Group		EUT Part #:		O Spanson Eli		
Project Nur Purchase O		0			Test Techni Supervisor:		Spencer Fli Lisa Arndt	nt	
Equip. Und		WirelessH	 ΔRΤ		Witness' N		None		
<u> </u>				t Results Data				ge: 1	of 1
CUT I	ne Voltage		5 VDC	r Nesults Date	1	ver Frequer		/A N/A	01 1
						<u> </u>	•		4611
Antenna	Orientatio		Horizor	ntal	•	ency Range		30MHz to	
_		/lode of Op					(Mid Chann	ei - 2440 ivi	н <i>z)</i>
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
136.925	10	98	2.84	Quasi-peak	27.6	10.461	33.1	-22.6	Pass
144.031	10	235	3.86	Quasi-peak	33.7	17.33	33.1	-15.8	Pass
156.031	10	81	3.56	Quasi-peak	34.1	18.733	33.1	-14.4	Pass
814.989 894.896	10 10	179 215	3.58 1.03	Quasi-peak Quasi-peak	21.5 21.3	21.436 24.331	35.6 35.6	-14.2 -11.3	Pass Pass
913.04	10	88	3.66	Quasi-peak Quasi-peak	21.2	24.258	35.6	-11.3	Pass
Radiated	sional Testing, Emissions, 10m D GHz Horizontal Polar	istance	100M	××		▽ Cor ─ Cor ▽ Veri × LPR	si-peak Limit Level rected Quasi-peak Rea rected Peak Value fiied Low-PRF QP Reac F Verification Limit _ Limit_Tx	Ü	PROFESSIONAL TESTING
Operator: \$	Spencer Flint C_2016 RE_2440M PM, Tuesday, June 13		_Run1.til EUT Mod	Free: Transmitting CW er: 5VDC USBPowered Hz,3 EUTs GHz (B,M,T C	quency hannek)		EUT: WirelessHART Project Number: 1907 Client: FieldComm Gro		10
		≤ 10	iHz Horizont	tal Antenna F	olarity Mea	sured Emis	sions		

7.3.2 Three Channels Up to 18 GHz

			Profess	sional Te	sting, EN	VII, Inc.			
Test Method: ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireles Devices								nsed Wireless	
n accordance with: FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissi Limits								ted Emissions	
Section:		15.209							
Test Date(s	s):	6/13/2017			EUT Serial	#:	AP#1,AP#	2,AP#3	
Customer:	<u>, </u>	FieldComm	Group		EUT Part #:		0	<u>, </u>	
Project Nur	mber:	19070	<u> </u>		Test Techni		Spencer F	lint	
Purchase O		0			Supervisor:		Lisa Arndt		
Equip. Und		WirelessHA	\RT		Witness' N		None		
	F	Radiated Em	issions Test	Results Data	a Sheet		P	age: 1	of 1
EUT Li	ine Voltage	: !	5 VDC		EUT Pow	er Frequen	cy: N	N/A N/A	
Antenna	Orientatio	on:	Vertic	al	Frequ	ency Range:		Above 1	LGHz
	EUT N	/lode of Ope	eration:		-	nitting (3 Ch		105,2440,24	80 MHz)
Erecuency		EUT			Recorded	Corrected			
Frequency Measured	Test Distance	Direction	Antenna Height	Detector	Amplitude	Level	Limit Leve	Margin	Test Resul
(MHz)	(Meters)	(Degrees)	(Meters)	Function	(dBµV)	Levei (dBμV/m)	(dBµV/m)	(dB)	rest kesur
	,			•				210	
3064.11	3	224	2.83	Average	35.6	29.035	54.0	-24.9	Pass
4711.7		3	1.55	Average	33.6	29.811	54.0	-24.1	Pass
4809.88	3	219	1.29	Average	53.5	49.826	54.0	-4.1	Pass
4879.94	3	10	1.21	Average	47.4	43.88	54.0	-10.1	Pass
4960.19	3	317	1.64	Average	40	36.83	54.0	-17.1	Pass
5846.27	3	161	1.64	Average	32.1	30.77	54.0	-23.2	Pass
7319.69	3	50	1.64	Average	41.1	44.382	54.0	-9.6	Pass
8518.49	3	326	2.17	Average	27.5	34.379	54.0	-19.6	Pass
11514.4	3	159	1.41	Average	27.6	38.667	54.0	-15.3	Pass
16282.1	3	15	3.18	Average	27.4	41.808	54.0	-12.1	Pass
17696.4	3	26	2.92	Average	27	42.99	54.0	-11.0	Pass
17858.1	3	224	1.9	Average	26.8	42.962	54.0	-11.0	Pass
Profess	sional Testing,	EMI, Inc					age Limit Level		
	Emissions, 3m Dis						ected Average Read	ing	
90 _F		urcu Emissions					Limit Level		
1							ected Peak Reading		PROFESSIONAL
80						- EISI	_Limit_Tx		TESTIN
70 E (0									
Field Strength (dBµV/m) 200 200 400 400 400 400 400 400 400 400									
ਚੁ 50						James Marie			
E 40	Ambitanta and	The state of the s	Name of the last o	And the second second second	Iγ		∇		— Y
를 30	A STATE OF THE PERSON NAMED IN COLUMN 1			 	— ∀ — '	7+	_		
20				 		+	_		
10							_ _		
q_G^{\parallel}					Щ		10G		18G
	Spencer Flint			Fre	quency		TUT: WirelessHART		100
		_30M-26G_Mid Ch_		e: Transmitting CW r: 5VDC USB Powered			roject Number: 190		
	PM, Tuesday, June 13		EC II o m c	r: 5 VDC USB Powered Iz,3 EUTs GHz (B,M,T C	hannels)		Client: Field Comm G		

			Profess	sional Te	sting, El	VII, Inc.				
Test Method: ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices									eless	
In accordan	ordance with: FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissio Limits								ions	
Section:		15.209								
Test Date(s	s):	6/13/2017			EUT Serial	#:	AP#1,AP#2	2,AP#3		
Customer:	•		FieldComm Group EUT Part #: 0							
Proiect Nur	oject Number: 19070 Test Technician: Spencer Flint									
Purchase O		0			Supervisor		Lisa Arndt			
Equip. Und		WirelessHA	ART		Witness' N		None			
	ı	Radiated Em	issions Test	Results Data	a Sheet		Pa	ige: 1	of	1
EUT Li	ne Voltage	: 5	5 VDC		EUT Pow	ver Frequen	cy: N	/A N/A		
Antenna	o Orientatio	on:	Horizor	ntal	Frequ	ency Range		Above 1	.GHz	
	EUT N	Mode of Ope	eration:		Transm	nitting (3 Ch	annels - 24	05,2440,24	80 MHz)
Frequency	Test	EUT	Antenna		Recorded	Corrected				
Measured	Distance	Direction	Height	Detector	Amplitude	Level	Limit Level	Margin	Test Re	esul
(MHz)	(Meters)	(Degrees)	(Meters)	Function	(dBμV)	(dBµV/m)	(dBµV/m)	(dB)		
3434.61	3	170	1.44	Average	35	28.982	54.0	-25.0	Pas	SS
4809.91	3	264	2.4	Average	51.4	47.727	54.0	-6.2	Pas	SS
4880.04	3	270	1.44	Average	45	41.494	54.0	-12.5	Pas	SS
5015.31	3	86	1.53	Average	32.8	29.774	54.0	-24.2	Pas	SS
5284.78	3	63	2.32	Average	33	30.501	54.0	-23.5	Pas	
5998.15	3	105	3.76	Average	31.9	31.439	54.0	-22.5	Pas	SS
11522.1	3	58	3.65	Average	27.6	38.632	54.0	-15.3	Pas	
12632.5	3	206	1.21	Average	27.9	38.601	54.0	-15.4	Pas	
14935.2	3	294	2.04	Average	28.4	40.228	54.0	-13.7	Pas	
16092	3	68	1.04	Average	27.1	41.635	54.0	-12.3	Pas	
17482	3	90	2.84	Average	26.8	40.401	54.0	-13.6	Pas	
17679.1	3	197	2.32	Average	27.1	42.884	54.0	-11.1	Pas	
Duofoss	rianal Tastina	EMI Inc				— Avera	age Limit Level			
Radiated	sional Testing, Emissions, 3m Dis	stance				∇ Corre	ected Average Readin	g		eq
1-18GHzH	Iorizontal Polarity M	easured Emissions				- Peak	Limit Level			Æ
90						- Corre	ected Peak Reading			
80						— ETSI	_Limit_Tx		PROFESSI	IUNAL I N E
<u> </u>										
20 trength (dB µV/m) 20 20 40 40 40 40 40 40 40 40 40 40 40 40 40										
9 50 ──								الله الله الله		
₹ 40 5 40				المراسي والمجاولة أحديني والعادي	Y		William William		· 7 7	
± 30 €	Mandala Hallati make had	PROPERTY OF STREET				\forall		_Y_Y		
				Y						
20										
10					_	 			-	
Q_{1G}^{\pm}		-		+	Ш		10G		18G	;
	Spencer Flint			Free	quency	F	UT: WirelessHART			
Operator: 5										
Operator: \$ 19070_FC	-	_30M-26G_Mid Ch_		e: Transmitting CW r: 5VDC USB Powered			roject Number: 1907	0-15		

7.3.3 Three Channels Up to 25 GHz

			Profess	sional Te	sting, EN	VII, Inc.			
Test Metho	d:	ANSI C63.10 Devices	-2013 America	n National Sta	ndard of Proce	dures for Con	npliance Testi	ng of Unlicen	sed Wireless
In accordance with: FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emiss								ed Emissions	
Section: 15.209									
Test Date(s): 6/13/2017 EUT Serial #: AP#1,AP#2						,AP#3			
Customer: FieldComm Group EUT Part #: 0									
Project Nur	mber:	19070			Test Techni	ician:	Spencer Fli	nt	
Purchase O		0			Supervisor:		Lisa Arndt		
Equip. Und	er Test:	WirelessHA	ART		Witness' N	ame:	None		
	F	Radiated En	nissions Test	Results Dat	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage		5 VDC		EUT Pow	er Frequen	icy: N	/A N/A	
Antenna	orientation	n:	Vertic	al	Freque	ency Range	:	Above 1	.GHz
	EUT N	Node of Op	eration:		Transm	nitting (3 Ch	annels - 24	05,2440,24	80 MHz)
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 Result
20732.5	3	84	1	Average	33.2	27.548	54.0	-26.4	Pass
22487.4	3	206	1	Average	32.5	27.334	54.0	-26.6	Pass
22681.8	3	110	1	Average	33.3	28.159	54.0	-25.8	Pass
23411.7	3	186	1	Average	33.5	28.729	54.0	-25.2	Pass
23776.3	3	186	1	Average	33.3	29.026	54.0	-24.9	Pass
23942.4	3	196	1	Average	33.3	29.177	54.0	-24.8	Pass
Radiated	sional Testing, Emissions, Measu Iz Vertical Polarity M	red at 1m and Scal	led to 3m Distance			▽ Corre	age Limit Level ected Average Reading Limit Level ected Peak Reading	3	PROFESSIONAL TESTING
Field Strength (dBpVm)	الله والمنافض والمنافض والم	and the state of t				and the state of the state of		n physical print	u y chan serim de de
30			<u> </u>				, 		
20 18.0 G									26.5G
19070_FC	Spencer Flint C_2016 RE_2440M AM, Wednesday, June	_30M-26G_3 Chan_ e14,2017	Run1.til EUT Powe	Fre :: Transmitting CW r: 5VDC USBPowered (z, 3 EUTs GHz (B,M,T C	quency hannek)	F	CUT: WirelessHART Project Number: 1907 Client: Field Comm Gro		

Profes 3.10-2013 Americ 15.209 - Code of 017 0mm Group SSHART I Emissions Tes 5 VDC Horizo Operation: Antenna	Federal Regula	EUT Serial # EUT Part #: Test Techni Supervisor: Witness' N: a Sheet	dures for Con Subpart C - Int	AP#1,AP#2 0 Spencer Flir Lisa Arndt None	,AP#3 nt ge: 1	
15.209 - Code of 017 mm Group SSHART I Emissions Tes 5 VDC Horizo Operation:	Federal Regula	EUT Serial # EUT Part #: Test Techni Supervisor: Witness' No	Gubpart C - Int	AP#1,AP#2 0 Spencer Flir Lisa Arndt None	,AP#3 nt ge: 1	ed Emissio
on on one of the control of the cont	st Results Dat	EUT Serial (EUT Part #: Test Technic Supervisor: Witness' Notes Sheet EUT Pow	#: ician: ame:	AP#1,AP#2 0 Spencer Flin Lisa Arndt None	,AP#3 nt ge: 1	
ssHART I Emissions Tes VDC Horizo Operation:		EUT Part #: Test Techni Supervisor: Witness' No a Sheet EUT Pow	ician:	Spencer Fli Lisa Arndt None	nt ge: 1	of
ssHART I Emissions Tes VDC Horizo Operation:		EUT Part #: Test Techni Supervisor: Witness' No a Sheet EUT Pow	ician:	Spencer Fli Lisa Arndt None	nt ge: 1	of
SSHART I Emissions Tes 5 VDC Horizo Operation:		Test Techni Supervisor: Witness' Na a Sheet EUT Pow	ician: ame:	Spencer Flin Lisa Arndt None	ge: 1	of
5 VDC Horizo Operation:		Supervisor: Witness' Na a Sheet EUT Pow	ame:	Lisa Arndt None Pa	ge: 1	of
5 VDC Horizo Operation:		Witness' No a Sheet EUT Pow	ame:	None Pa		of
5 VDC Horizo Operation:		a Sheet EUT Pow		Pa		of
5 VDC Horizo Operation:		EUT Pow	ver Frequen			of
Horizo Operation:	•		er Frequen	cy: N/		
Operation:	ntal	Freque			A N/A	
			ency Range		Above 10	GHz
Antenna		Transm	nitting (3 Ch	annels - 240	5,2440,248	0 MHz)
on Height es) (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Res
1	Average	32.7	26.872	54.0	-27.1	Pass
1	Average	33.4	27.697	54.0	-26.3	Pass
1	Average	33.4	28.153	54.0	-25.8	Pass
1	Average	33.5	28.406	54.0	-25.6	Pass
1	Average	33.5	28.983	54.0	-25.0	Pass
1	Average	33.2	28.909	54.0	-25.0	Pass
d Scaled to 3m Distance	e 		▽ Corre	ige Limit Level ccted Average Reading Limit Level ccted Peak Reading		PROFESSION
	Fre	quency	Y Y	UT: WirelessHART		26.5G
•	Chan_Run1.til EUTPov	EUT Mode: Transmitting CW EUT Power: 5VDC USB Powered		EUT Mode: Transmitting CW EUT Power: 5VDC USB Powered EUTTHUL 2 FUT CHA (PM T Channels)	EUT Wireless HART Chan_Run1.til EUTPower: 5VDC USB Powered FUTPUR 2 FUTF CHA (PMT Channels)	EUT: WirelessHART Chan_Run1.til EUT Mode: Transmitting CW EUT Power: SVDC USB Powered Project Number: 19070-15

> 1GHz Horizontal Antenna Polarity Measured Emissions

8.0 Antenna Construction Requirements

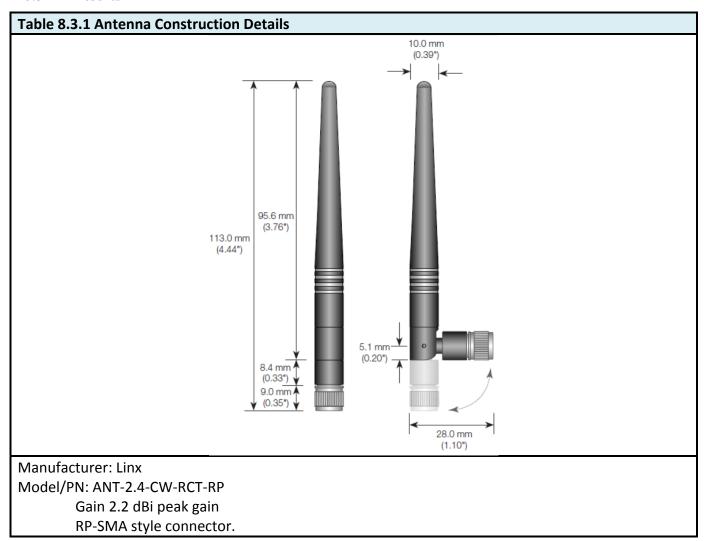
8.1 Procedure

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.

8.2 Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.203, 15.247 // RSS-Gen 8.3	Antenna Construction	21 Dec 2017

8.3 Results



The antenna system design above satisfies the requirements of the rules.

none

9510-1835

3748A04113

DAC-012915-005

0

none

9003-1461

113

9.0 Equipment

1327

0942

1969

1509B

2004

C030

1325

819

EMCO

EMCO

ΗР

Braden

Miteq

none

EMCO

EMCO

1050

11968D

11713A

N/A

AFS44-00101800-

2S-10P-44

none

1050

3115

9.1 Radiated Emissions 30 MHz to 25 GHz

	Radiated Emissions Test Equipment List									
Tile! Software Version: 4.2.A, May 23, 2010, 08:38:52 AM										
Test Profile: 2016 RE_ClassA - Boresite+Mast_LowPRF_030617.til or 2016 RE_ClassB - Boresite+Mast_LowPRF_030617.til										
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date					
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	7/10/2017					
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	11/15/2017					
2172	ETS-Lindgren	3142C	Antenna, Biconilog, 26 MHz-3GHz	49383	11/27/2018					
C027D	PTI	None	Relay	none	N/A					

Controller, Antenna Mast

Turntable, 4ft.

Attenuator/Switch Driver

TDK 10M Chamber, VSWR > 1 GHz

Amplifier, 40dB, .1-18GHz

Cable Coax, N-N, 30m

Controller, Antenna Mast

Antenna, Horn, DRG, 1-18GHz

N/A

N/A

N/A

6/19/2017

1/11/2018

10/1/2017

N/A

8/4/2018

9.2 Power, Bandwidth, Duty Cycle, Band Edge, Conducted Spurious

Asset #	Manufacturer	Model #	Description	Calibration Due
2295	Agilent	E4440A	Spectrum Analyzer	30 Sep 2017
1831	НР	6622A	Power Supply	CIU
0472	Tektronix	THS730A	DMM/Scope	15 Nov 2017

10.0 Measurement Bandwidths

Radiat	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.

Applies to the general emission measurements. Other transmitter measurements use specific bandwidths not listed above.

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
Padiated Emissions	30 to 1,000 MHz	10 m	4.8
Radiated Emissions	1 to 18 GHz	3 m	5.7

End of Report

(This page intentionally left blank.)