

TEST REPORT

Report Number: 103214064MIN-007

Project Number: G103214064

Testing performed on the
60-924-RF-TS5

FCC ID: B4Z-5INTWTTS

IC ID: 1175C-5INTWTTS

to

47 CFR, Part 15. 231:2017

RSS- 210, Issue 9, 2016 (Amendment)

RSS-Gen, Issue 4, 2014

47 CFR, Part 15:2017, §15.107 and §15.109, Class B / ICES-003, Issue 6:2016

For

UTC Fire & Security Americas Corporation, Inc.

Test Performed by:
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Date of issue: November 28, 2017

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1.0 GENERAL DESCRIPTION

Model:	60-924-RF-TS5
Product Description:	Simon 5" TouchScreen
Intertek Sample ID:	MIN1710041319-001 (Modulated signal unit) MIN1710041319-002 (Standard firmware) MIN1709271502-001 (CW unit)
FCC ID:	B4Z-5INTWTTS
IC ID:	1175C-5INTWTTS
Related Submittal(s) Grants:	None
Company:	UTC Fire & Security Americas Corporation, Inc.
Customer:	Mr. Konstantin Khrustov
Address:	2955 Redhill Ave Suite 100 Costa Mesa, CA 92626, USA
Phone:	(714)427-2020
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Test Standards:	☒ 47 CFR, Part 15:2017, §15.231 ☒ RSS-210, Issue 9, 2016 (Amendment) ☒ RSS-Gen, Issue 4, 2014 ☒ 47 CFR, Part 15:2017, §15.107 and §15.109, Class B, test method: ANSI C63.4-2014 ☒ ICES-003, Issue 6:2016
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	September 28, 2017
Test Work Started:	October 3, 2017
Test Work Completed:	October 5, 2017
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	Periodic Transmitter
Operating Frequency	319.5 MHz
Modulation:	OOK
Emission Designator:	126KK1D
Antenna(s) Info:	Transmitter antenna: integral antenna Receiver antenna: permanently attached soldered wire antenna
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter power configuration:	☒ Internal battery, 6VDC (4 x 1.5V AA-size batteries) ☒ External power source, 6VDC via 100-120VAC, 50/60Hz 0.25A / 6VDC Power Adapter, model HK-X106-A06S
Special Test Arrangement:	The EUT is a wall-mounted device, therefore was tested as a table top equipment with normal (vertical) position
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2013

1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- ☒ - Standby / receiving mode
- ☒ - Continuous transmitting mode
- ☐ - Test program (customer specific)
- ☐ -

Operating modes of the EUT:

No.	Description
1	Three units were tested: - a "standard firmware" unit was tested in standby / receiving mode for unintentional radiator testing. - a unit hardware-modified to transmit continuously was used for Fundamental and Spurious tests - a unit that sends test packets was used for all other tests.

Cables:

No.	Type	Length	Designation	Note
1	2-wire unshielded	2m	Power	

Support equipment/Services:

No.	Item	Description
1	Generator R&S SMR20	Signal source for the EUT testing in standby / receiver mode

General notes: None

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☐ Normal

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

1.4 Measurement uncertainty

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be: ± 4 dB at 10m and ± 5.4 dB at 3m

The expanded uncertainty ($k = 2$) for radiated emissions above 1GHz has been determined to be: ± 6.4 dB at 3m

The expanded uncertainty ($k = 2$) for conducted emissions from 150 kHz to 30 MHz has been determined to be: ± 2.6 dB

1.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB(m^{-1})

AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μ V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dB}$$

$$FS = RA + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V}/\text{m})$$

2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.231(a) / RSS-210 A1.1.1(a)	Transmitter deactivation time	Pass
15.231(b) / RSS-210 A1.1.2	Transmitter field strength of emissions	Pass
15.231(c) / RSS-210 A1.1.3	Bandwidth of the emission	Pass
15.207/RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	Pass
15.109/ICES-003/ RSS-Gen 4.10	Receiver/digital device radiated emissions	Pass
15.107/ ICES-003	Digital device conducted emissions	Pass

General notes: None

3.0 TEST CONDITIONS AND RESULTS

3.1 Transmitter deactivation time

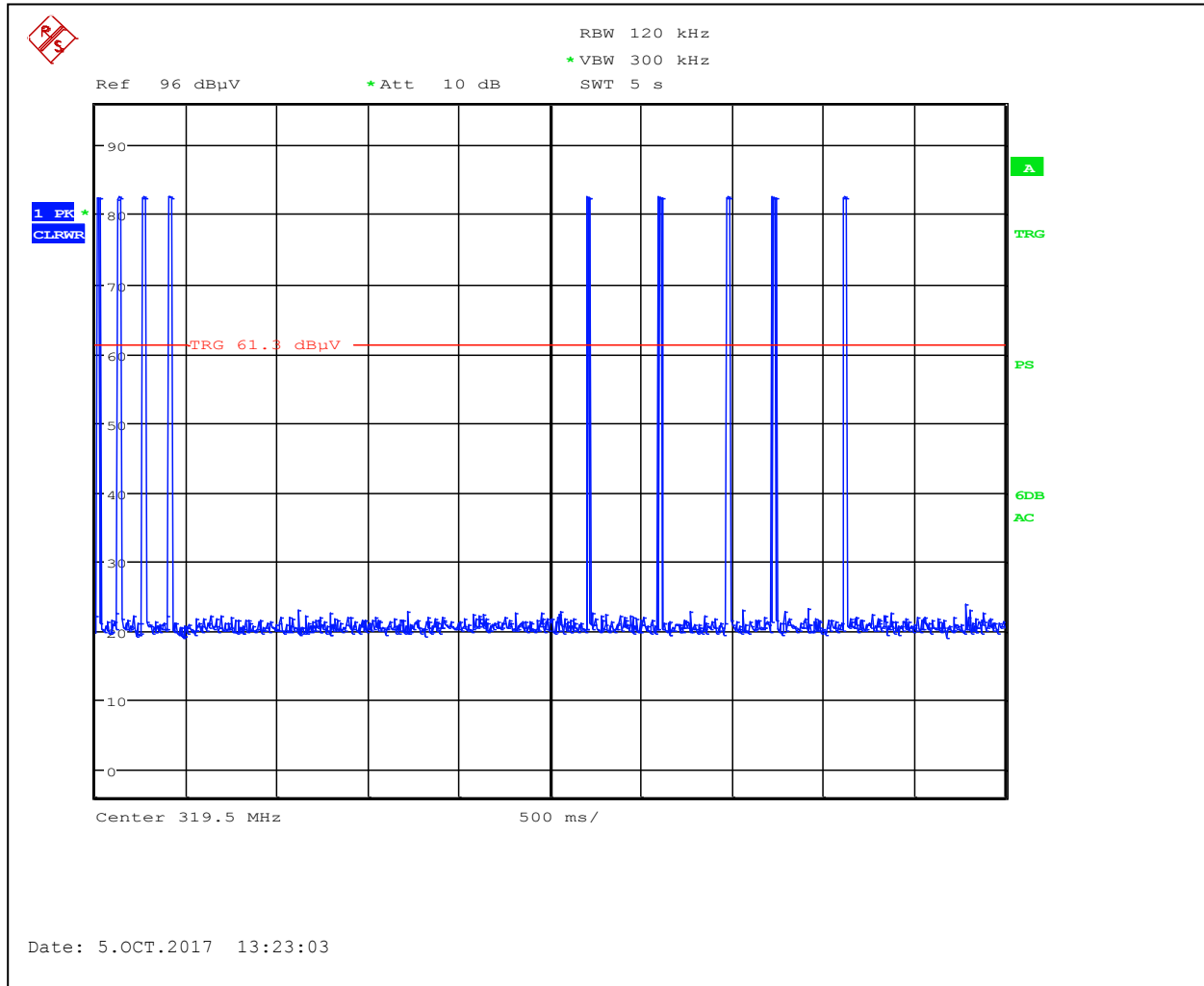
Maximum allowed deactivation time: 5 sec

Measured deactivation time: 4.1 sec

Test result: Pass

Notes:

Graph 3.1.1



3.2 Transmitter field strength of emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

Frequency range of measurements: 30MHz-4000MHz

Test result: Pass

Max. Emissions margin at fundamental: 1.5 dB below the limits

Max. margin of harmonics and spurious emissions: 5.5 dB below the limits

Notes: None

Date:	November 14, 2017	Result: Pass
Tested by:	Uri Spector	
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	22°C; 41%(RH); 98.6kPa	
Equipment Verification:	☒	
Note:	Measurements after modification on November 10, 2017	

Table 3.2.1

Radiated Emissions at Fundamental

Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Field strength	AVG CF	Total @ 3m	Limit	Margin
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBμV	dBμV/m	dB	dBμV/m	dBμV/m	dB
						Peak Value					
319.50	V	142	18.4	1.4	0.0	69.3	89.1	0.0	89.1	95.9	-6.8
319.50	H	100	18.4	1.4	0.0	74.5	94.3	0.0	94.3	95.9	-1.6
						Average Value					
319.50	V	142	18.4	1.4	0.0	69.3	89.1	19.9	69.2	75.9	-6.7
319.50	H	100	18.4	1.4	0.0	74.5	94.3	19.9	74.4	75.9	-1.5

Date:	November 20, 2017	Result: Pass
Tested by:	Richard Blonigen	
Standard:	FCC 15.231(b) / RSS-210 A1.1.2	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	21°C; 40%(RH); 98kPa	
Equipment Verification:	☒	
Note:	Measurements after modification on November 10, 2017	

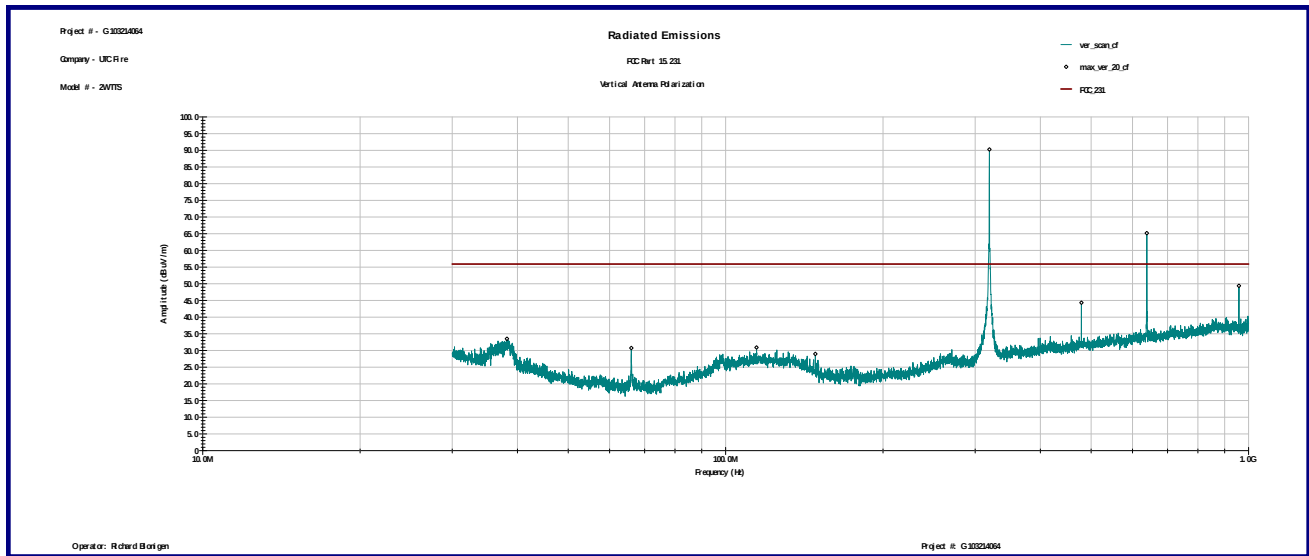
Table 3.2.2

Spurious Radiated Emissions

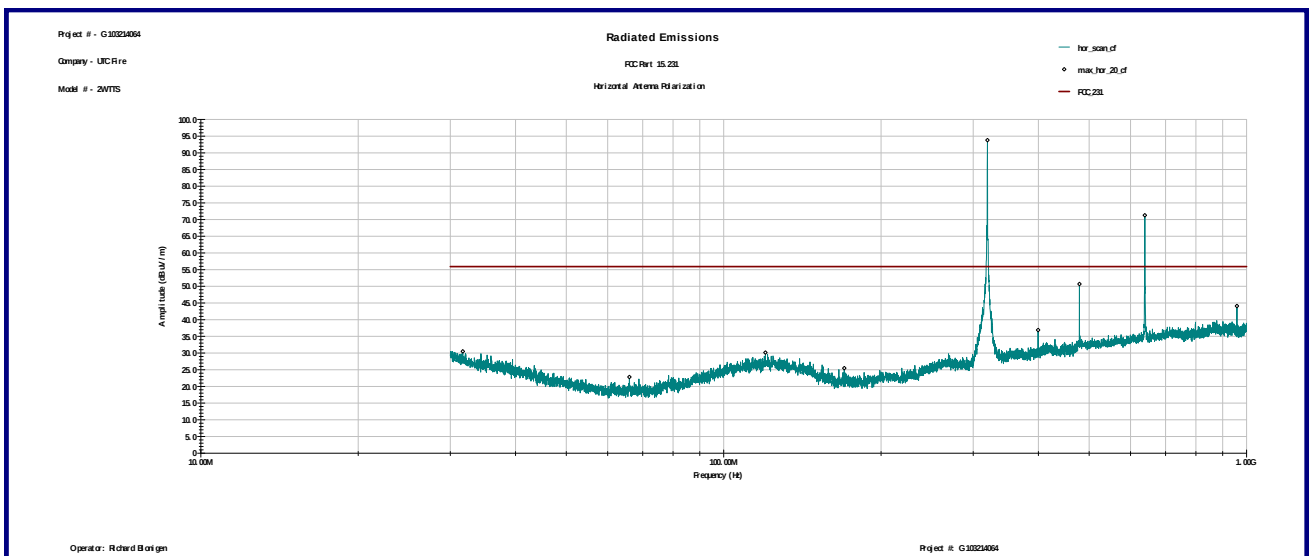
Frequency	Antenna		Ant. CF	Cable loss	Pre-amp	Reading	Total @ 3m	Corr Factor	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	dB1/m	dB	Gain (dB)	dBμV	dBμV/m	dB	dBμV/m	dB	
Peak Reading											
639.00	V	172	23.6	1.3	0.0	39.4	64.3	0.0	75.9	-11.6	
958.50	V	127	26.1	2.7	0.0	21.0	49.8	0.0	75.9	-26.1	
1278.00	V	107	24.7	2.1	41.8	56.4	41.4	0.0	75.9	-34.5	
1597.60	V	120	25.6	2.4	41.5	56.3	42.8	0.0	75.9	-33.1	
1916.80	V	119	26.9	2.6	41.0	49.4	37.9	0.0	75.9	-38.0	
2236.00	V	135	27.8	2.8	40.6	49.3	39.3	0.0	75.9	-36.6	
639.00	H	135	23.6	1.3	0.0	45.5	70.4	0.0	75.9	-5.5	
958.50	H	100	26.1	2.7	0.0	15.7	44.5	0.0	75.9	-31.4	
1278.00	H	120	24.7	2.1	41.8	53.3	38.3	0.0	75.9	-37.6	
1597.60	H	105	25.6	2.4	41.5	58.4	44.9	0.0	75.9	-31.0	
1916.80	H	111	26.9	2.6	41.0	36.2	24.7	0.0	75.9	-51.2	
2236.00	H	112	27.8	2.8	40.6	40.5	30.5	0.0	75.9	-45.4	
2552.00	H	100	28.6	3.0	40.3	40.3	31.6	0.0	75.9	-44.3	
Average Reading											
639.00	V	172	23.6	1.3	0.0	39.0	63.9	19.9	55.9	-11.9	
958.50	V	127	26.1	2.7	0.0	17.4	46.2	19.9	55.9	-29.6	
1278.00	V	107	24.7	2.1	41.8	52.4	37.4	19.9	55.9	-38.4	
1597.60	V	120	25.6	2.4	41.5	51.1	37.6	19.9	55.9	-38.2	
1916.80	V	119	26.9	2.6	41.0	46.6	35.1	19.9	55.9	-40.7	
2236.00	V	135	27.8	2.8	40.6	45.8	35.8	19.9	55.9	-40.0	
639.00	H	135	23.6	1.3	0.0	45.2	70.1	19.9	55.9	-5.7	
958.50	H	100	26.1	2.7	0.0	12.3	41.1	19.9	55.9	-34.7	
1278.00	H	120	24.7	2.1	41.8	49.9	34.9	19.9	55.9	-40.9	
1597.60	H	105	25.6	2.4	41.5	55.1	41.6	19.9	55.9	-34.2	
1916.80	H	111	26.9	2.6	41.0	29.9	18.4	19.9	55.9	-57.4	
2236.00	H	112	27.8	2.8	40.6	32.5	22.5	19.9	55.9	-53.3	
2552.00	H	100	28.6	3.0	40.3	33.3	24.6	19.9	55.9	-51.2	

Graph 3.2.1

Vertical antenna polarization

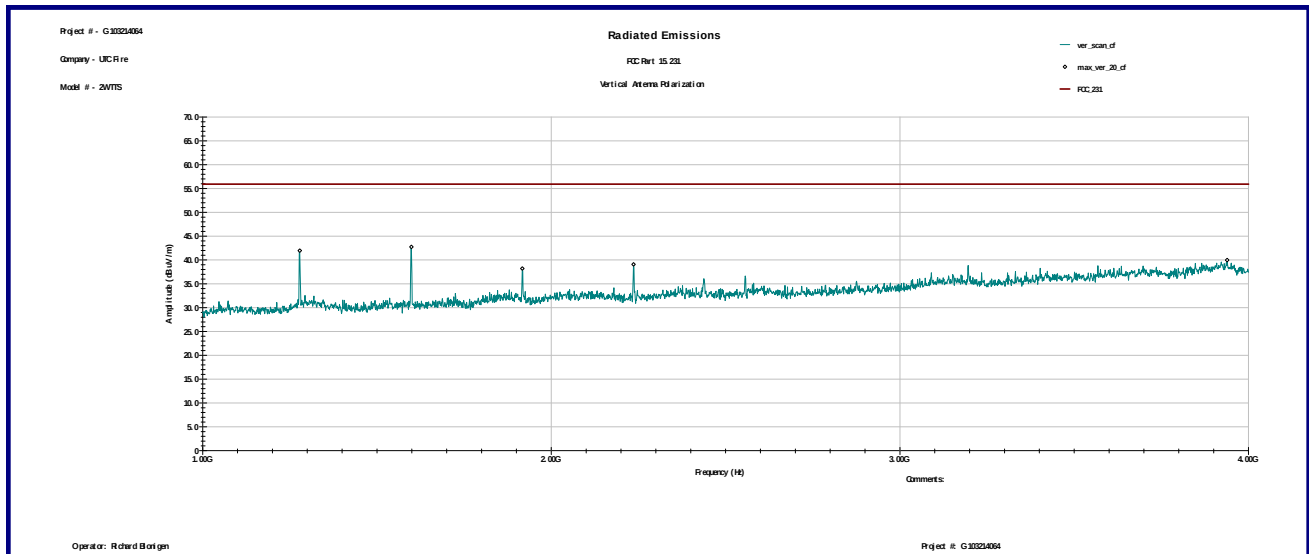


Horizontal antenna polarization

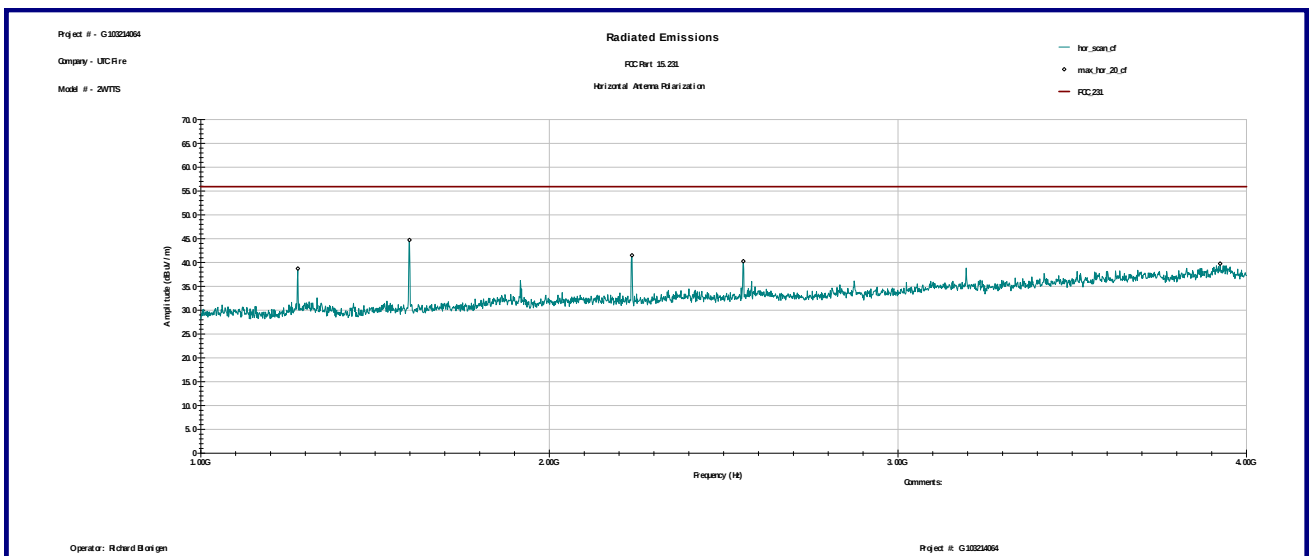


Graph 3.2.2

Vertical antenna polarization



Horizontal antenna polarization



3.2.1 Average correction factor calculation

An Average correction factor is calculated by averaging one complete pulse train.

One complete cycle is more than 100ms with pulse train length less than 100ms, so averaging will be performed over 100ms time.

Time with field strength is in its maximum value (length of pulses) = $125\mu\text{s} \times 81 \text{ packets} = 10.125\text{ms}$

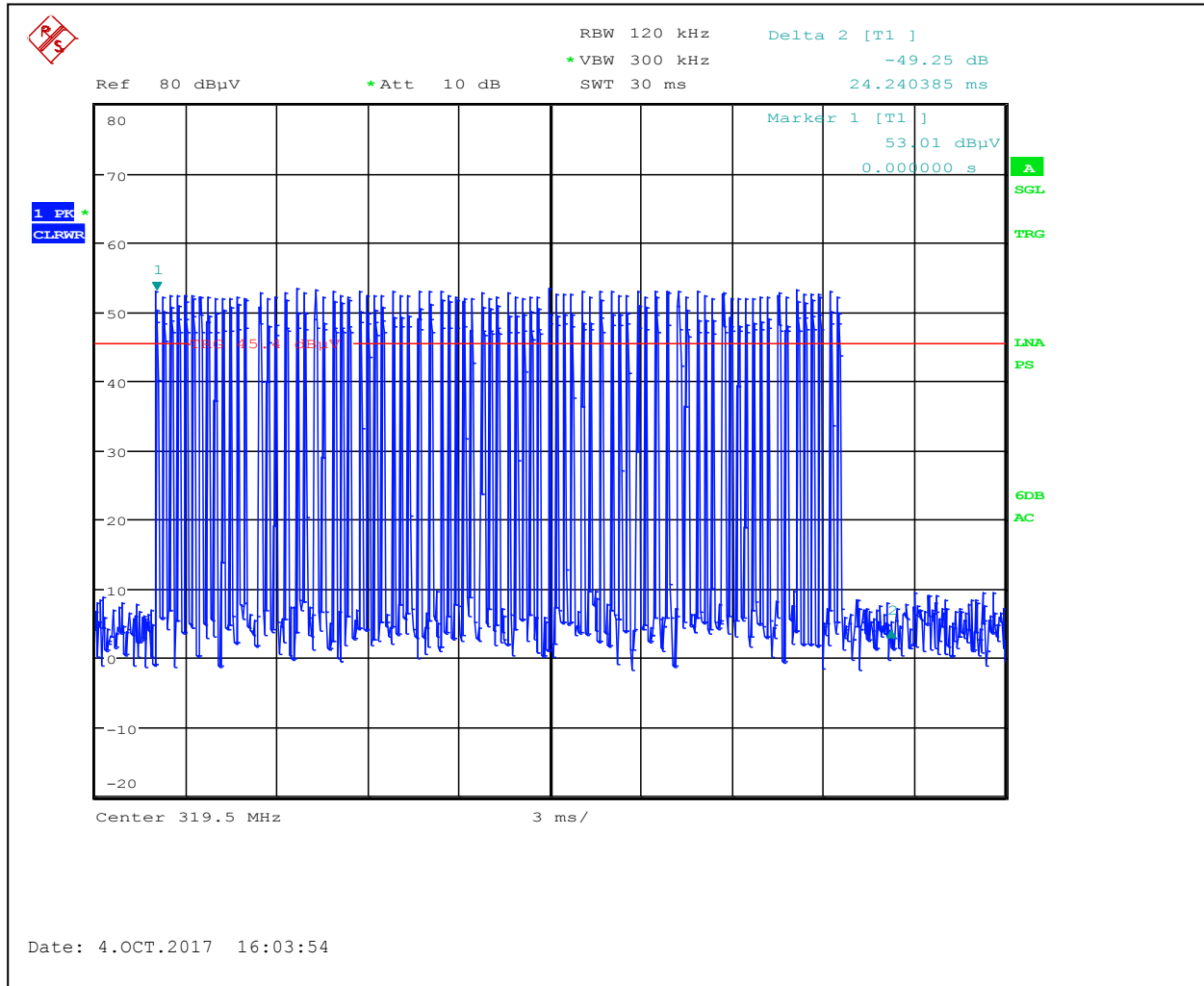
Average Correction Factor = $20\text{Log}(10.125\text{ms}/100\text{ms}) = -19.9\text{dB}$

Graphs 3-2-3 to 3-2-5 show pulse train timing.

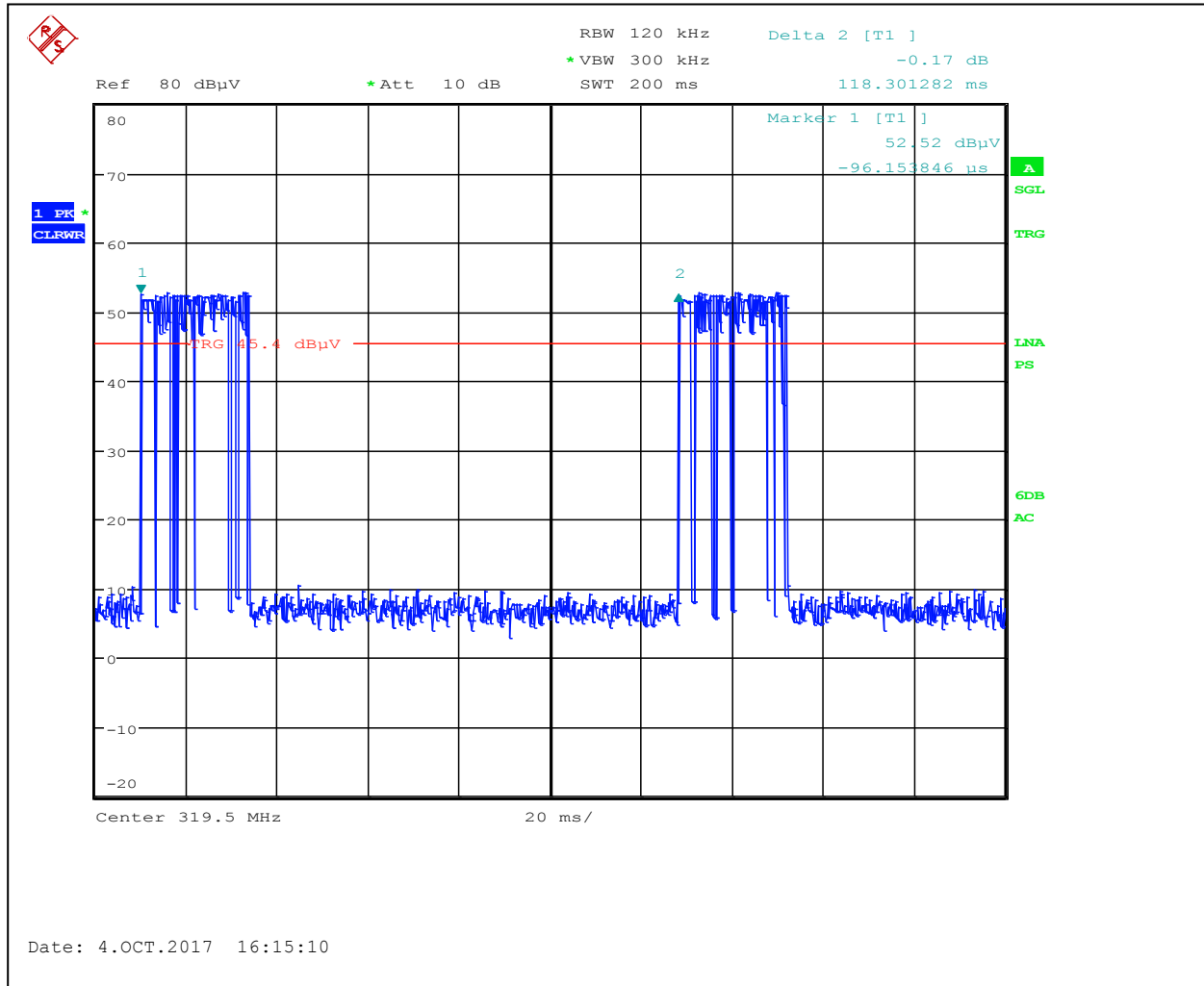
Graph 3.2.3



Graph 3.2.4



Graph 3.2.5



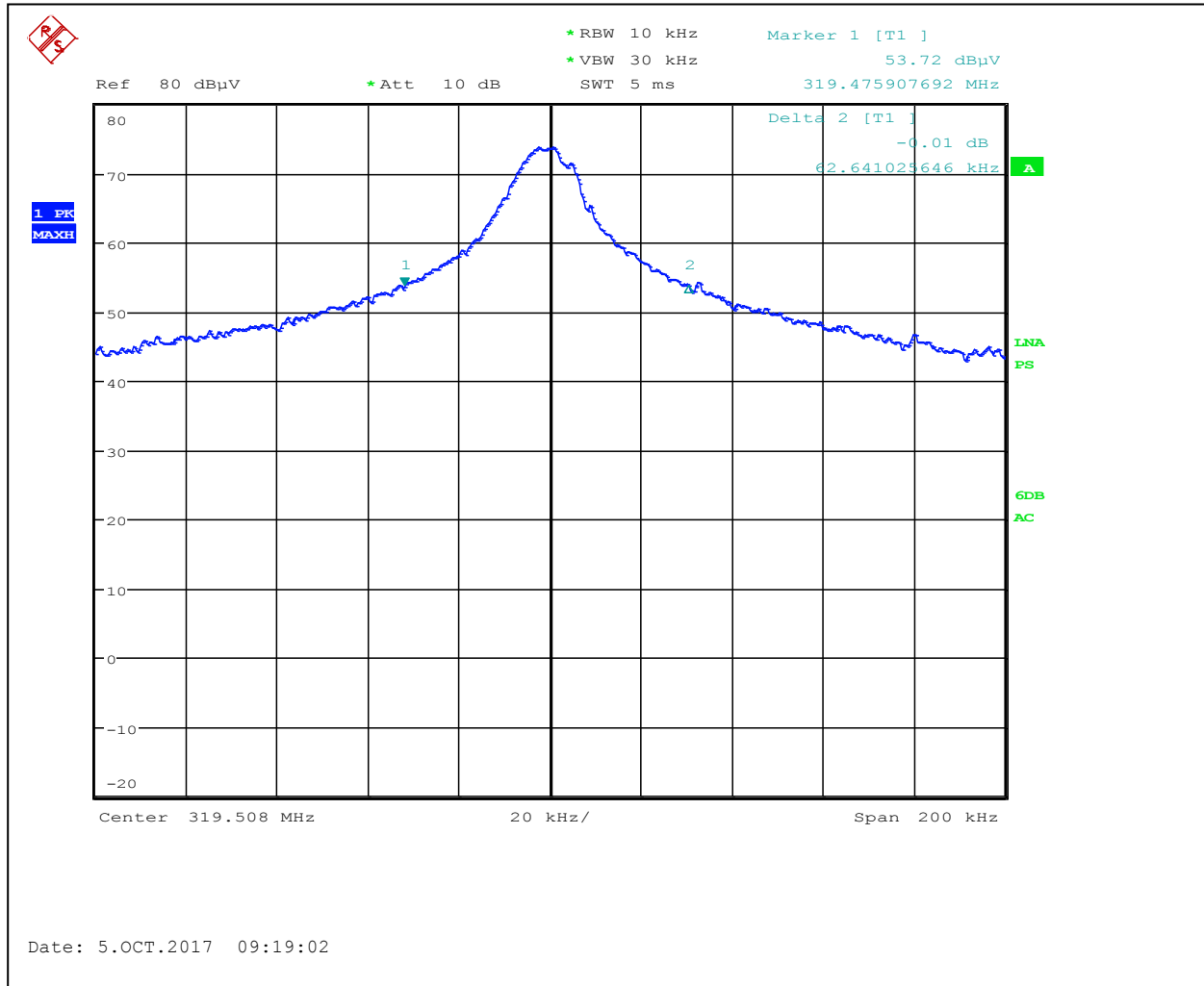
3.3 Bandwidth of Emissions

Center Frequency of operation MHz	Maximum allowed bandwidth kHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz	Result
319.5	798.8	62.6	126.4	Pass
Maximum allowed bandwidth:	☒ 0.25% of the centre operating frequency ☐ 0.5% of the centre operating frequency			
RBW:	☒ 10kHz ☐ 100kHz ☐ other	kHz		
VBW:	☒ 30kHz ☐ 300kHz ☐ other	kHz		

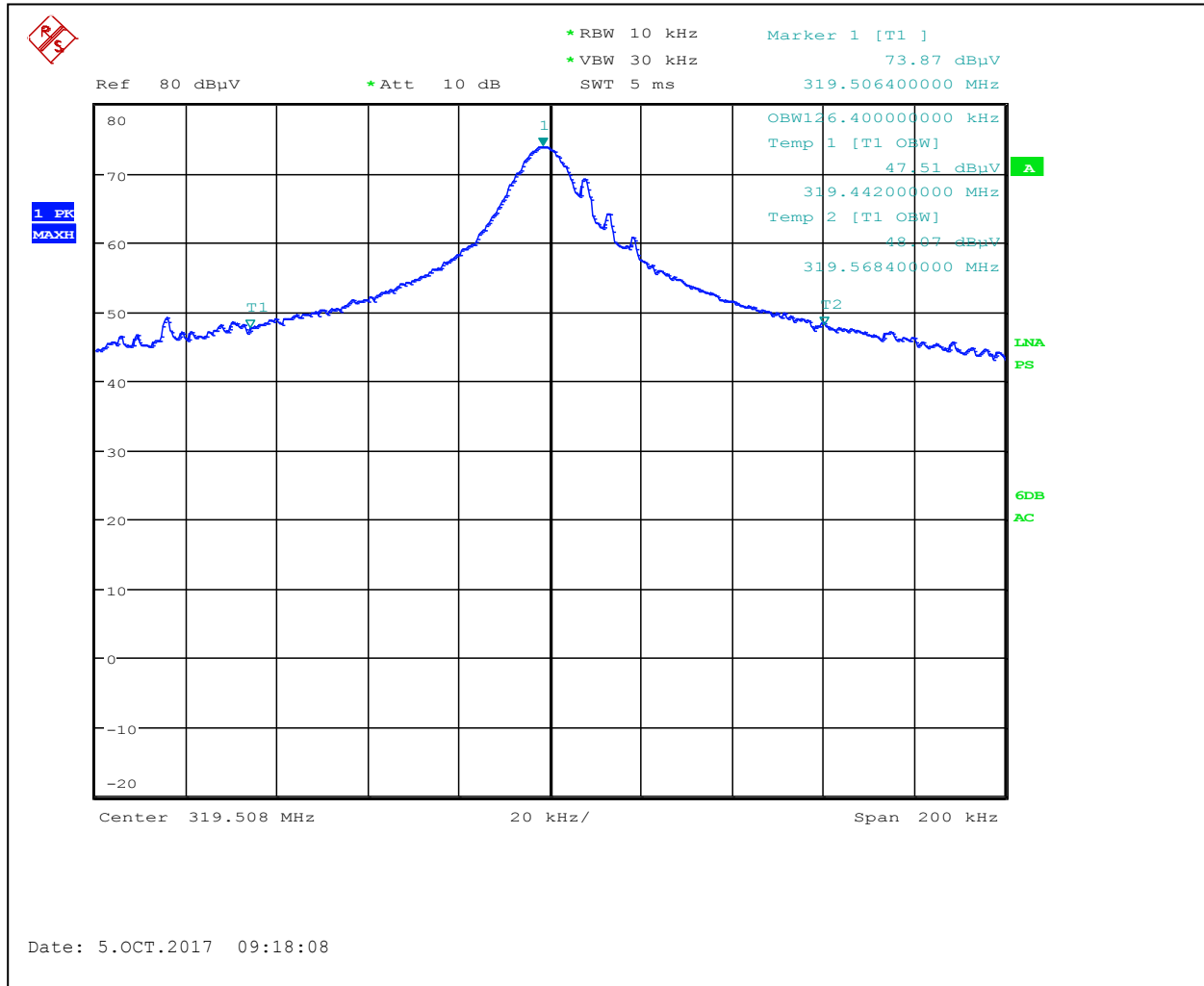
Graphs 3-3-1 and 3-3-2 show bandwidth of emissions

Notes:

Graph 3.3.1



Graph 3.3.2



3.4 Transmitter power line conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 8.2 dB below the limits

Notes: Test was performed at 120VAC 60Hz

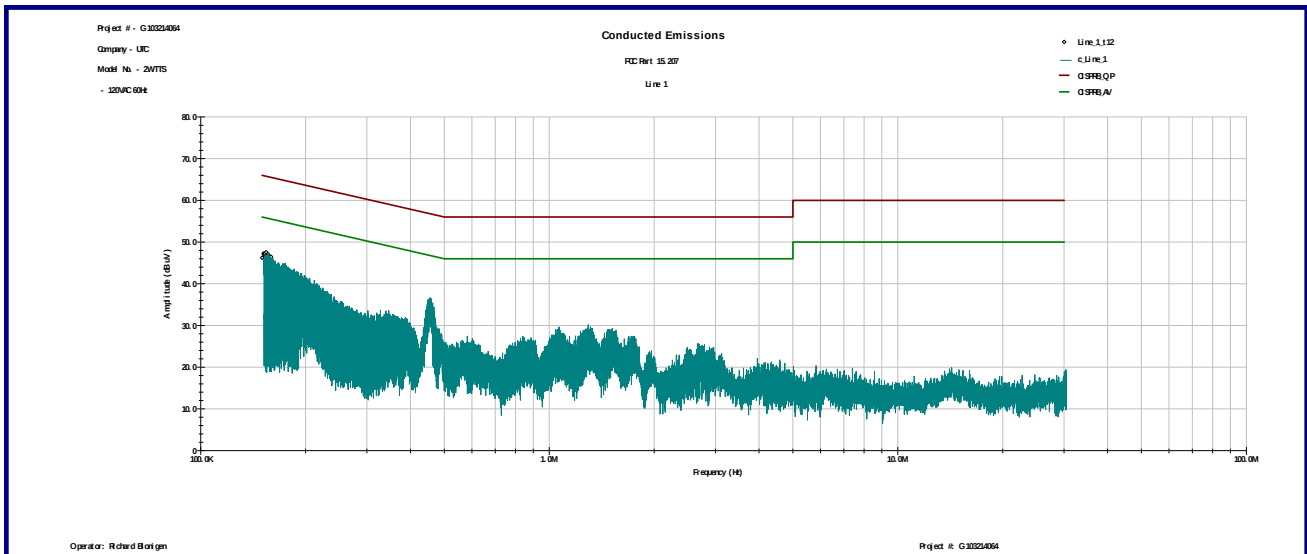
Date:	November 20, 2017	Result: Pass
Tested by:	Richard Blonigen	
Standard:	FCC 15.207	
Test Point:	Power Line	
Operation mode:	See page 5	
Environmental Conditions:	21°C; 38%(RH); 98kPa	
Equipment Verification:	☒	
Note:	Measurements after modification on November 10, 2017	

Table 3.4.1

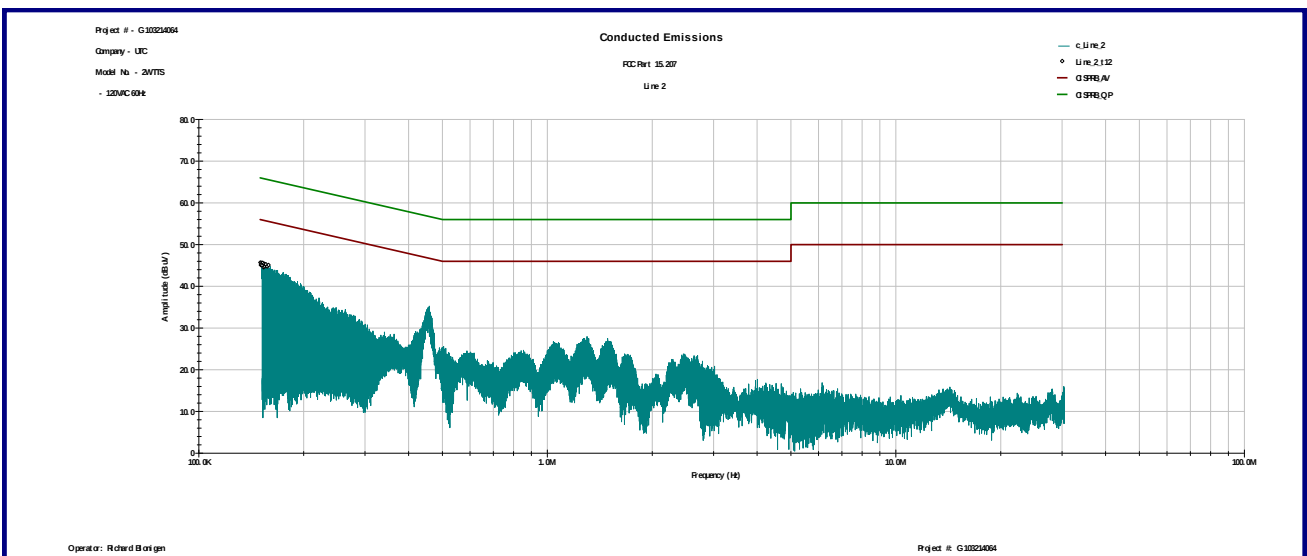
Line 1					
Frequency	Peak dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
150.16 KHz	46.2	66.0	56.0	-19.8	-9.8
151.48 KHz	47.3	65.9	55.9	-18.7	-8.7
151.94 KHz	46.9	65.9	55.9	-19.0	-9.0
152.76 KHz	47.2	65.9	55.9	-18.7	-8.7
153.26 KHz	46.6	65.8	55.8	-19.2	-9.2
154.04 KHz	47.6	65.8	55.8	-18.2	-8.2
154.58 KHz	46.6	65.8	55.8	-19.1	-9.1
155.32 KHz	46.6	65.7	55.7	-19.1	-9.1
155.9 KHz	47.1	65.7	55.7	-18.6	-8.6
157.19 KHz	46.6	65.6	55.6	-19.0	-9.0
157.77 KHz	46.4	65.6	55.6	-19.1	-9.1
159.24 KHz	46.5	65.5	55.5	-19.1	-9.1
Line 2					
Frequency	Peak dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
150.19 KHz	45.7	66.0	56.0	-20.3	-10.3
150.74 KHz	45.1	66.0	56.0	-20.9	-10.9
151.24 KHz	45.6	65.9	55.9	-20.3	-10.3
152.02 KHz	45.0	65.9	55.9	-20.9	-10.9
152.52 KHz	45.6	65.9	55.9	-20.2	-10.2
153.3 KHz	44.6	65.8	55.8	-21.2	-11.2
154.08 KHz	45.4	65.8	55.8	-20.4	-10.4
154.58 KHz	44.8	65.8	55.8	-21.0	-11.0
155.13 KHz	45.2	65.7	55.7	-20.5	-10.5
155.83 KHz	45.3	65.7	55.7	-20.4	-10.4
157.19 KHz	44.8	65.6	55.6	-20.9	-10.9
158.51 KHz	45.1	65.5	55.5	-20.4	-10.4

Graph 3.4.1

Vertical antenna polarization



Horizontal antenna polarization



3.5 Receiver/digital device radiated emissions

Test location: ☐ OATS ☒ Anechoic Chamber

Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

Frequency range: 30MHz-2000MHz

Max. Emissions margin: 8.0 dB below the limits

Notes: The Radiated Emissions test was performed in the Anechoic chamber at 3m measurement distance (see Table 3.5.1 and Graphs 3.5.1 and 3.5.2)

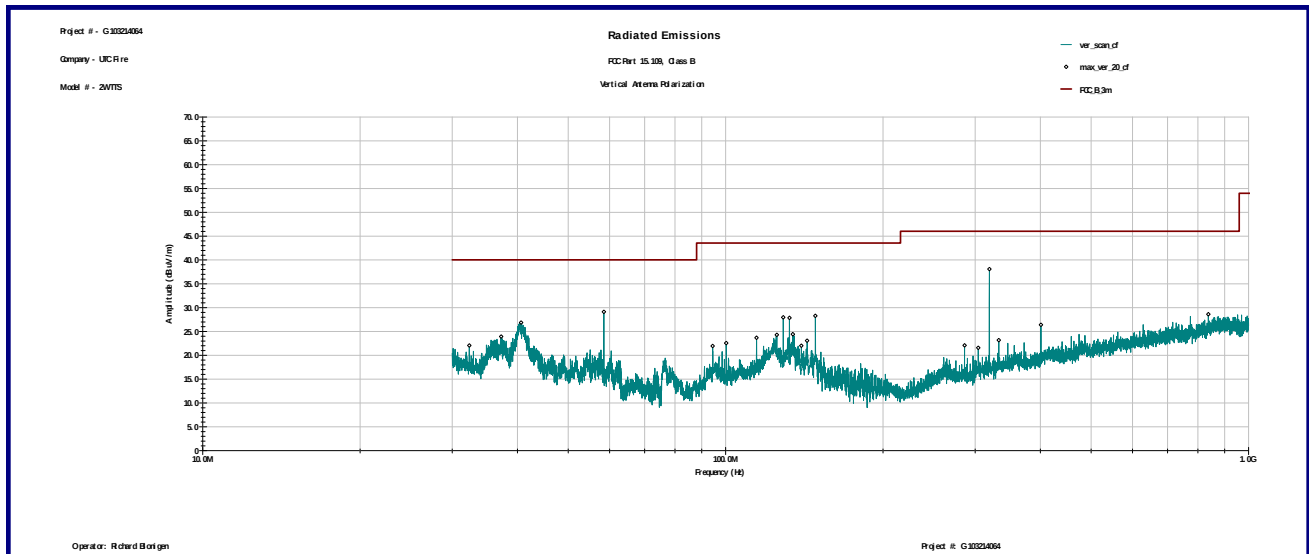
Date:	October 5, 2017	Result: Pass
Tested by:	Richard Blonigen	
Standard:	FCC 15.109, Class B	
Test Point:	Enclosure	
Operation mode:	See page 5	
Environmental Conditions:	20°C; 38%(RH); 98kPa	
Equipment Verification:	☒	
Note:	None	

Table 3.5.1

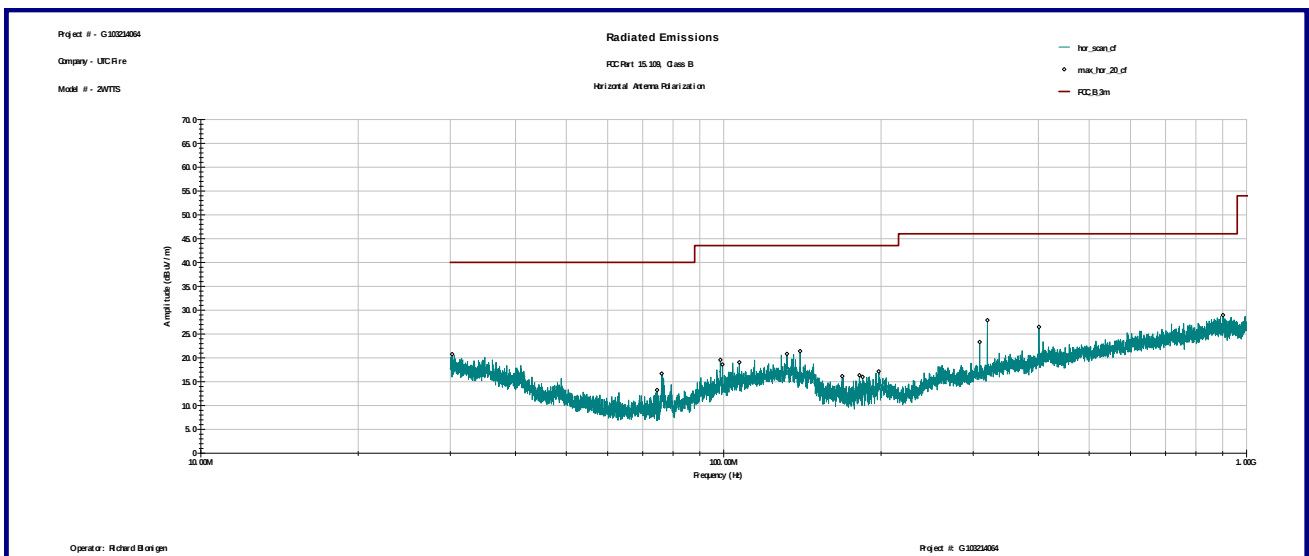
Frequency MHz	Antenna Polarity	Peak Reading dBμV	Total C.F. dB1/m	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
32.351 MHz	V	-1.2	23.2	22.0	40.0	-18.0
37.229 MHz	V	3.7	20.2	23.9	40.0	-16.1
40.633 MHz	V	8.4	18.4	26.9	40.0	-13.2
58.504 MHz	V	17.8	11.3	29.1	40.0	-10.9
94.485 MHz	V	6.7	15.3	22.0	43.5	-21.6
100.3 MHz	V	6.2	16.4	22.6	43.5	-21.0
114.58 MHz	V	5.7	18.0	23.7	43.5	-19.9
125.3 MHz	V	6.2	18.1	24.3	43.5	-19.2
128.93 MHz	V	10.4	17.6	27.9	43.5	-15.6
132.5 MHz	V	10.3	17.6	27.9	43.5	-15.7
134.45 MHz	V	7.1	17.3	24.4	43.5	-19.1
139.62 MHz	V	5.0	17.0	22.0	43.5	-21.5
143.18 MHz	V	6.2	16.9	23.1	43.5	-20.5
148.49 MHz	V	11.8	16.5	28.3	43.5	-15.3
286.38 MHz	V	3.1	19.0	22.1	46.0	-24.0
304.21 MHz	V	1.9	19.6	21.6	46.0	-24.5
319.48 MHz	V	18.0	20.1	38.1	46.0	-8.0
332.99 MHz	V	2.9	20.3	23.2	46.0	-22.9
400.89 MHz	V	4.1	22.3	26.4	46.0	-19.6
837.85 MHz	V	0.8	27.8	28.6	46.0	-17.4
30.246 MHz	H	-3.6	24.3	20.8	40.0	-19.3
74.578 MHz	H	1.5	11.7	13.2	40.0	-26.8
76.106 MHz	H	4.8	11.9	16.7	40.0	-23.3
98.584 MHz	H	3.5	16.1	19.6	43.5	-24.0
99.466 MHz	H	2.4	16.2	18.6	43.5	-24.9
107.14 MHz	H	1.7	17.4	19.1	43.5	-24.5
132.15 MHz	H	3.1	17.8	20.8	43.5	-22.7
140.04 MHz	H	4.2	17.2	21.4	43.5	-22.1
168.61 MHz	H	0.7	15.4	16.2	43.5	-27.4
181.81 MHz	H	1.4	14.9	16.3	43.5	-27.2
184.4 MHz	H	1.1	14.9	16.0	43.5	-27.5
197.92 MHz	H	1.9	15.3	17.2	43.5	-26.4
308.77 MHz	H	3.5	19.9	23.3	46.0	-22.7
319.48 MHz	H	7.8	20.1	27.9	46.0	-18.1
400.89 MHz	H	4.2	22.3	26.5	46.0	-19.6
901.18 MHz	H	0.3	28.6	29.0	46.0	-17.1

Graph 3.5.1

Vertical antenna polarization

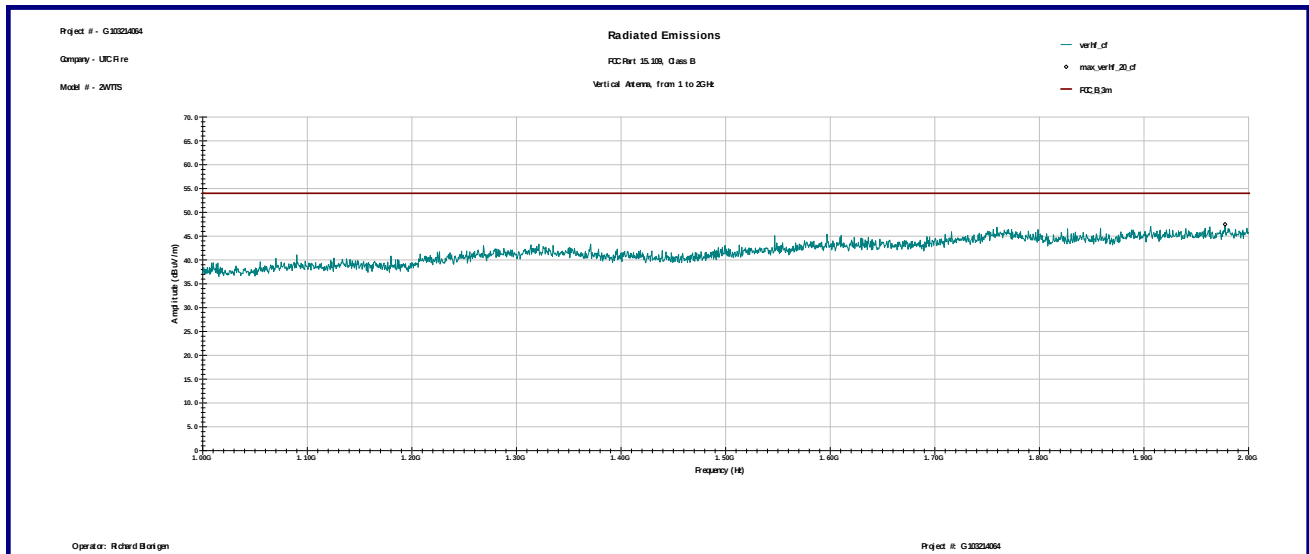


Horizontal antenna polarization

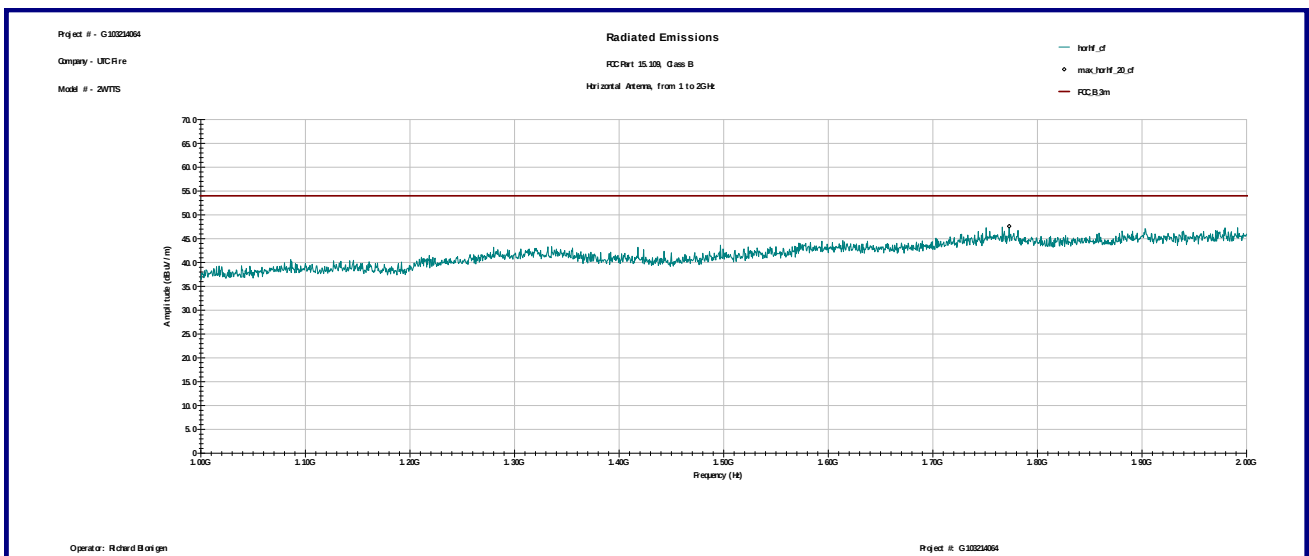


Graph 3.5.2

Vertical antenna polarization



Horizontal antenna polarization



3.6 Digital device conducted emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test result: **Pass**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: 8.9dB below the limits

Notes: None

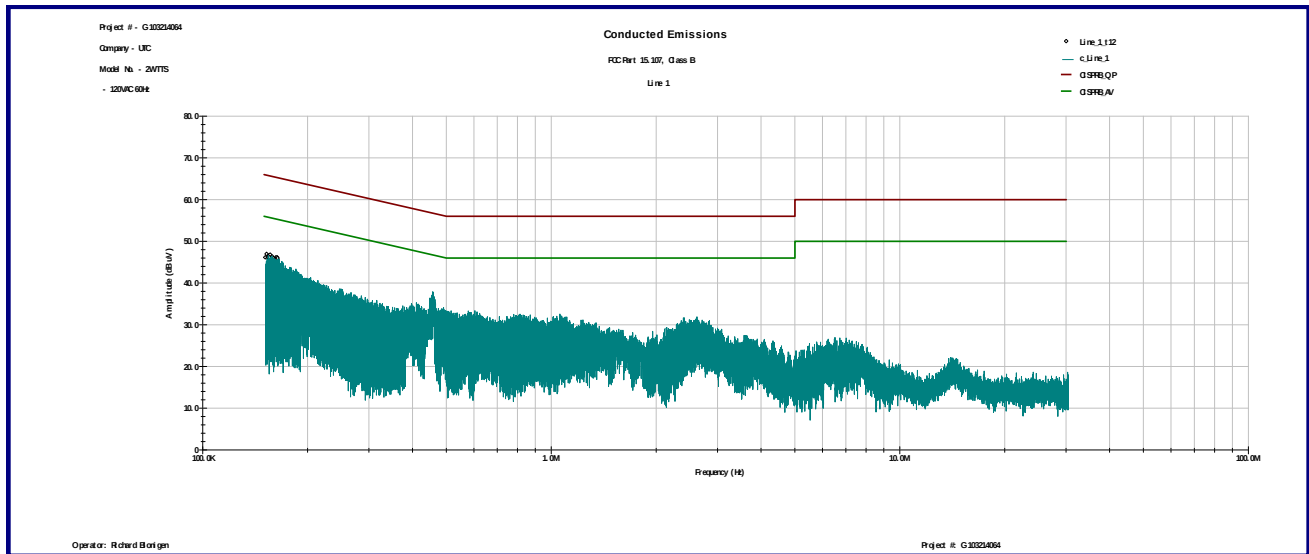
Date:	October 5, 2017	Result: Pass
Tested by:	Richard Blonigen	
Standard:	FCC 15.107, Class B	
Test Point:	Line 1 and Line 2	
Operation mode:	See page 5	
Environmental Conditions:	20°C; 38%(RH); 98.2kPa	
Equipment Verification:	☒	
Note:	None	

Table 3.6.1

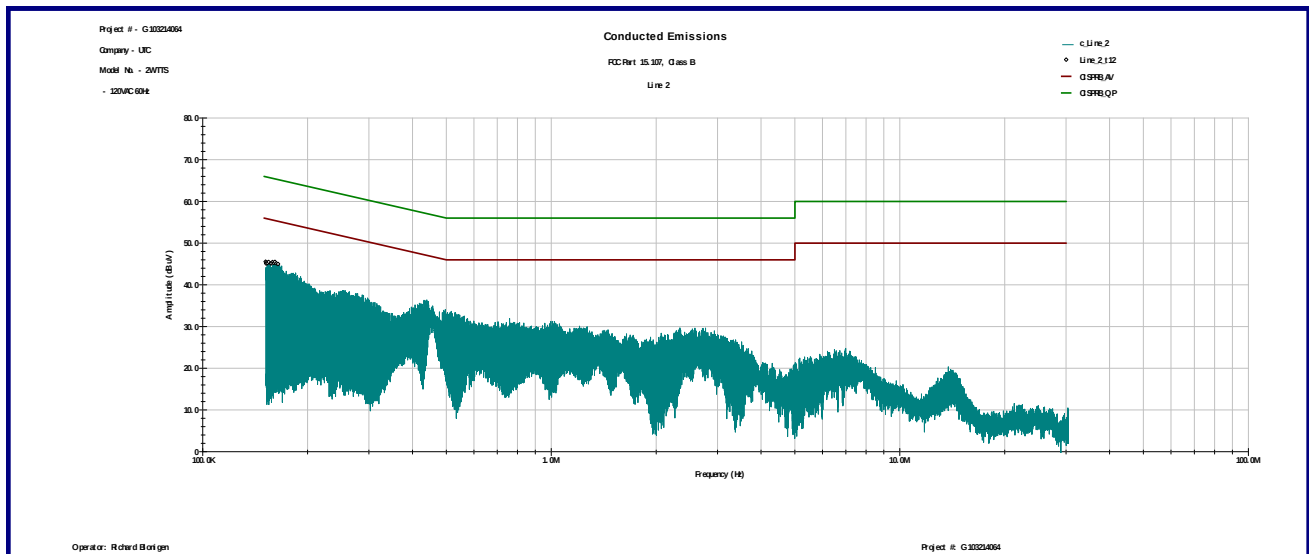
Line 1					
Frequency	Peak dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
151.24 KHz	46.2	65.9	55.9	-19.8	-9.8
152.56 KHz	47.0	65.9	55.9	-18.9	-8.9
153.61 KHz	46.2	65.8	55.8	-19.6	-9.6
154.39 KHz	46.5	65.8	55.8	-19.3	-9.3
154.93 KHz	46.6	65.7	55.7	-19.1	-9.1
155.71 KHz	46.2	65.7	55.7	-19.5	-9.5
156.21 KHz	46.8	65.7	55.7	-18.9	-8.9
158.23 KHz	46.4	65.6	55.6	-19.2	-9.2
159.55 KHz	46.0	65.5	55.5	-19.5	-9.5
162.12 KHz	46.1	65.4	55.4	-19.2	-9.2
163.4 KHz	46.2	65.3	55.3	-19.1	-9.1
163.98 KHz	46.0	65.3	55.3	-19.3	-9.3
Line 2					
Frequency	Peak dBμV	QP Limit dBμV	AVG Limit dBμV	QP Margin dB	AVG Margin dB
151.55 KHz	45.6	65.9	55.9	-20.4	-10.4
152.14 KHz	45.1	65.9	55.9	-20.8	-10.8
152.8 KHz	45.4	65.9	55.9	-20.5	-10.5
153.38 KHz	45.2	65.8	55.8	-20.6	-10.6
154.7 KHz	45.5	65.7	55.7	-20.3	-10.3
156.68 KHz	45.1	65.6	55.6	-20.5	-10.5
157.3 KHz	45.2	65.6	55.6	-20.5	-10.5
158.54 KHz	45.5	65.5	55.5	-20.1	-10.1
160.06 KHz	45.3	65.5	55.5	-20.2	-10.2
161.19 KHz	45.5	65.4	55.4	-19.9	-9.9
162.66 KHz	45.2	65.3	55.3	-20.2	-10.2
164.49 KHz	45.0	65.2	55.2	-20.2	-10.2

Graph 3.6.1

Line 1



Line 2



4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	LAST CAL DATE	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	01/26/2017	01/26/2018	☒
Spectrum Analyzer	R & S	ESU	100398	25283	03/21/2017	03/21/2018	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	05/18/2017	05/18/2018	☒
Horn Antenna	EMCO	3115	9507-4513	9936	07/27/2017	07/27/2018	☒
LISN	COM-Power	Li-215A	191970	172315	06/27/2017	06/27/2018	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	VBU	☒

5.0 Revision History

REVISION LEVEL	DATE	REPORT NUMBER	PREPARED	REVIEWED	NOTES
0	11-28-2017	103214064MIN-007	RB	NS	Original Issue
1	1-4-2018	103214064MIN-007	RB <i>Richard Blay</i>	NS <i>Nan Heist</i>	Changed Model number and added FCC ID, IC ID, and product description