REGULATORY COMPLIANCE REPORT

TITLE: FCC & ISED Test Report for Part 15.249 and RSS-210 for RIVAW external. antenna on Metal Lid
AUTHOR: Roger Mulcahy

REV	CCO	DESCRIPTION OF CHANGE	DATE	APPROVALS	
001c		upload c	04apr17	Engineering	Roger Mulcahy
				Regulatory	

REVISION HISTORY

				Engineering	
				Regulatory	
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				Engineering	
				Regulatory	

Test Data Summary
FCC Part 15.249 / ISED RSS-210 Annex 2
Field strength of Low Power Transmitters,
RIVAW Water endpoint, 908 MHz for EUT – Metal Lid Antenna
FCC ID:EWQRIVAWA; IC:864D-RIVAWA HVINs: RIVAWA and RIVAWRA

Rule	Description	Spec Limit	Max. Reading	Pass/Fail
15.249(d) / 15.209 RSS Gen 6.13,8.9, 8.10 and RSS 210 A2.9(b)	Out of band non-harmonic radiated emissions	table	No Emissions	Pass
15.249(a) / RSS-210 A2.9(a)	Radiated emissions of transmitter fundamental and harmonics	Fundamental ; 94 dbuV/m Avg Harmonics ; Peak 74 dbuV/m Avg 54 dbuV/m	80.32dBuV/m @908 MHz peak 33.60 dBuV/m @ 1816MHz	Pass

Rule versions: FCC Part 1; FCC Part 2; FCC Part 15; RSS-102 Issue 5 (03-2015); RSS-210 Issue 8en (05-2015); RSS-Gen Issue 4 (12-2014).
Method of Measurement: ANSI C63.4-2014; ANSI C63.10-2013;
Reference docs: DA 00-705 (03-30-2000); OET65 (08-1997); OET65C (06-2001); IEEE C95.3-2002.(2003, 2010); RSP100 issue11; SDR KDB 442812 D01 (07-2014); Exposure KDB 227498D01 (02-2014)

Cognizant Personnel			
Roger Mulcahy	Name	Test Technician	Title
Nate Van Roekel	Name	Project Engineer	Title
Jay Holcomb	Name	Regulatory	Title

CONDITIONS DURING TESTING

No Modifications to the EUT were necessary during the testing.

FCC 15.31(m) – ISED _n/a_; Number of Channel
This device operates and was tested on one channel.

ANSI C63.4 - Temperature and Humidity during Testing
The temperature during testing was within +10º C and +40º C.
The Relative humidity was between 10% and 90%.
RSS-Gen 4.3: Tests shall be performed at ambient temperature

EQUIPMENT UNDER TEST (EUT) DESCRIPTION
Itron declares that the EUT tested was representative of a production unit.

EQUIPMENT UNDER TEST

EUT Module

Manuf:	Itron, Inc.
Itron Model:	Itron RIVAW Endpoint
Serial Number(s)	Antenna 12203676, RIVAWA 123456789
Power source	Fresh Batteries were used

Plot Information
In the zero span measurements, the line in the display is the trigger level.

Test Conditions Setup
The external antenna EUT was mounted in a Metal water meter pit lid above the endpoint device, on the test site turntable.

15.249(d)/ 15.209 / RSS Gen 6.13, 8.9, 8.10 and RSS 210 A2.9(b)

Out of band non-harmonic emissions

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (microvolts/meter)	in dBuV/m	Measurement Distance (meters)*
0.009-0.490	2440F (kHz)		300
0.490-1.705	2400F (kHz)		30
1.705-30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

FS (dBuV/) = 20 * log (FS(uV/m))

* Adjust when measuring at different distances than specified; 40dB/decade <30MHz and 20dB/decade >=30MHz. (At 30MHz depends on the antenna used)

note: 15.249(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Measure the field strength of all spurious emissions that are not harmonics according to the procedure in Appendix A.

For emissions measurements below 30MHz, rotate the loop antenna about its horizontal and vertical positions to maximize emissions.

DUT is endpoint 65, battery was new.

Equipment Used	Serial Number	Cal Date	Due
Agilent E4440A Spectrum Analyzer	MY45305142	4/18/2016	4/18/2017
Emco 6502 Loop (9kHz to 30MHz)	9509-2970	3/3/2016	3/3/2018
Emco 3110B Biconical (30MHz-to 300MHz)	9203-2455	1/10/2017	1/10/2019
Emco 3115 waveguide (1Ghz - 18GHz)	9205-3878	3/7/2016	3/7/2018
EMCO 3146 Log periodic (200MHz to 1GHz)	9203-3358	1/10/2017	4/29/2017
Huber Suhner 40 foot cable	N/A	4/29/2016	12/16/2017
1.3Ghz high pass filter	405734	12/16/2016	12/16/2017
AH systems preamplifer model number PAM 0126	146	1/12/2017	1/12/2018
Microcoax 3 foot cable	N/A	12/16/2016	12/16/2017
Date	Tested by		
March 18 through 19, 2017	Roger Mulcahy		

Frequency range investigated was 9 kHz to 9.28GHz. (part 15.33 (a))

No Emissions found

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5**15.249(a)/RSS-210 Sec. A2.9,(a)**

Transmitter Fundamental and Harmonics

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following: (table below)

(c) Field strength limits are specified at a distance of 3 meters.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Measure the field strength of the transmitter fundamental and harmonic emissions at three meters according to the procedure in Appendix A. Record emissions levels with the transmitter near its lowest, middle, and highest frequencies. The maximum field strength of emissions may not exceed:

Fundamental (□V/m)	in (dBuV/m)	Harmonics (□V/m)	in (dBuV/m)
50,000	94	500	54

FS (dBuV/m) = 20 * log (FS(uV/m))

Equipment Used	Serial Number	Cal Date	Due
Agilent E4440A Spectrum Analyzer	MY45305142	4/18/2016	4/18/2017
Emco 6502 Loop (9kHz to 30MHz)	9509-2970	3/3/2016	3/3/2018
Emco 3110B Biconical (30MHz-to 300MHz)	9203-2455	1/10/2017	1/10/2019
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Date	Tested by		
March 19, 2017	Roger Mulcahy		

Unit tested with a fresh Battery: 65

Frequency Mhz	rbw=120KHz vbw=300KHz peak Reading dbm	rbw=120 Khz Quasi Peak reading dbm	antenna correction factor db/m	cable loss db	amplifier gain db	rbw=120KHz vbw=300KHz peak corrected level dbuv/m(3)	rbw=120 Khz Quasi Peak corrected level dbuv/m (4)
908	-51.87	N/A	22.22	2.97	0	80.32	N/A

(3) Level (dBuV/m)=peak Level (dbm)+107 – Amplifier Gain (db) +Ant. Factor (db/m) + Cable Loss (db)

Frequency Mhz/polarity	rbw=1MHz vbw=1MHz peak Reading dbm	rbw=1MHz vbw=10hz Average reading dbm	antenna correction factor db/m	cable loss db	amplifier gain db	rbw=1MHz vbw=1MHz peak corrected level dbuv/m (3)	rbw=1MHz vbw=10hz Duty Cycle 5.02dB average corrected dbuv/m
1816/Vertical	-67.82	N/A	26.82	4.39	36.79	**33.60**	**27.95**
1816/Horizontal	-68.12	N/A	26.82	4.39	36.79	33.30	27.65

(3) Level (dBuV/m) = peak Level (dbm)+107 – Amplifier Gain (db) +Ant. Factor (db/m) + Cable Loss (db)

*For harmonics, adjust for the proper duty cycle correction in accordance with the results from pulsed operation section above.
The rest are below the noise floor.

Appendix A

Field Strength Measurement Procedure

This test measures the field strength of radiated emissions using a spectrum analyzer and a receiving antenna in accordance with ANSI C63.4-2003. During the test, the EUT is to be placed on a non-conducting support at 80 cm above the horizontal ground plane of the OATS. The horizontal distance between the antenna and the EUT is to be exactly 3 meters. The bandwidths used shall be per ANSI C63.4-2003; 200 Hz from 9 kHz to 150 kHz, 9 kHz from 150 kHz to 30 MHz, 100 kHz from 30 MHz to 1000 MHz, and 1 MHz from 1 GHz to 40 GHz, with the detector set to peak hold or quasi peak.

1) The antenna correction factor, preamplifier gain (if the preamplifier is installed), and cable loss are stored in tables in the EMC analyzer and the level at the analyzer is the corrected level in dBuV/m.
2) Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.
3) If appropriate, manipulate the system cables to produce the highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.
4) Rotate the EUT 360° to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat step 3). Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.
5) Move the antenna over its fully allowed range of travel to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to step 3) with the antenna fixed at this height. Otherwise, move the antenna to the height that repeats the highest amplitude observation and proceed.
6) Change the polarity of the antenna and repeat step 3), step 4), and step 5). Compare the resulting suspected highest amplitude signal with that found for the other polarity. Select and note the higher of the two signals.
7) The final maximized level displayed on the EMC analyzer is the field strength.