



# RF Exposure Test Report

**FCC ID: SK9ACT2  
IC: 864G-ACT2**

**FCC Rule Part: 1.1310  
ISED Canada Radio Standards Specification: RSS-102**

**Report Number: AT72139651-4C0**

**Manufacturer: Itron, Inc.  
Model: ACT2**

**Test Begin Date: June 8, 2018  
Test End Date: June 8, 2018**

**Report Issue Date: July 27, 2018**



FOR THE SCOPE OF ACCREDITATION UNDER Certificate Number: 2955.09

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

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**This report contains 12 pages**

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## 1 GENERAL

### 1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 1 Subpart I of the FCC's Code of Federal Regulations and Innovation, Science, and Economic Development Canada's Radio Standards Specification RSS-102 Certification for Maximum Permissible Exposure.

### 1.2 Manufacturer Information

Itron, Inc.  
313 N Hwy 11  
West Union, SC 29696

### 1.3 Product Description

The Itron ACT2 is an electricity metering module which includes a 902.8 MHz to 926.8 MHz transmitter as well as 2.4GHz WLAN. The module operates on AC as well as DC voltage which is supplied by a host device.

This test report documents the compliance of the maximum permissible exposure for uncontrolled exposure of a fixed device.

#### 2.4GHz WiFi Technical Information:

Detail	Description
Frequency Range	2412 – 2462 MHz
Number of Channels	802.11b/g/n (HT 20): 11 802.11n (HT 40): 7
Modulation Format	802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11g/n (HT 20/40): OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rates	802.11b: 1 – 11 Mbps 802.11g: 6 – 54 Mbps 802.11n (HT 20): 6.5 – 72 Mbps 802.11n (HT 40): 13.5 – 150 Mbps
Number of Inputs/Outputs	1T1R
Operating Voltage	24 Vdc
Antenna Type / Gain	¼ Wave Embedded Slot Antenna / 4.5 dBi

#### 900MHz FHSS Radio Technical Information:

Detail	Description
Frequency Range	902.4 – 927.6 MHz
Number of Channels	64
Modulation Format	FSK, OFDM, DSSS
Data Rates	FSK: 50kbps, 150kbps OFDM: 200kbps, 600kbps DSSS: 6.25kbps, 12.5kbps
Operating Voltage	24Vdc
Antenna Type(s) / Gain(s)	¼ Wave Embedded Slot Antenna / 2.5 dBi

## 900MHz Hybrid Radio Technical Information

<b>Detail</b>	<b>Description</b>
Frequency Range	902.8 – 926.8 MHz
Number of Channels	31
Modulation Format	OFDM
Data Rates	1200kbps
Operating Voltage	24Vdc
Antenna Type / Gain	¼ Wave Embedded Slot Antenna / 2.5 dBi

Test Sample Serial Number: RF Conducted Emissions: 105900002047

Test Sample Condition: The test samples were provided in good working order with no visible defects.

#### **1.4 Test Methodology and Considerations**

The data presented in this report represents the worst case where applicable. The worst-case data rate for the 2.4GHz WiFi radio was 802.11b mode at 11Mbps. The worst-case data rate for the 900MHz radio was OFDM at 200kbps. The EUT is not capable of operating in frequency hopping mode and the Hybrid mode simultaneously.

The EUT was evaluated for maximum permissible exposure in three orthogonal orientations. The data presented in this report represents the worst-case mode of operation.

**2 TEST FACILITIES****2.1 Location**

The radiated and conducted emissions test sites are located at the following addresses:

TÜV SÜD America, Inc.  
5945 Cabot Pkwy, Suite 100  
Alpharetta, GA 30005  
Phone: (678) 341-5900

**2.2 Laboratory Accreditations/Recognitions/Certifications**

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by the American Association for Laboratory Accreditation/A2LA accreditation program and has been issued certificate number 2955.09 in recognition of this accreditation.

Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scopes of accreditation.

The Semi-Anechoic Chamber Test Sites and Conducted Emissions Sites have been fully described, submitted to, and accepted by the FCC, ISED Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number:	967699
ISED Canada Lab Code:	23932
VCCI Member Number:	1831
• VCCI Registration Number	A-0295

**2.3 Radiated Emissions Test Site Description**

**2.3.1 Semi-Anechoic Chamber Test Site**

The Semi-Anechoic Chamber Test Site consists of a 20'W x 30'L x 20'H shielded enclosure. The chamber is lined with ETS-Lindgren Ferrite Absorber, model number FT-1500. The ferrite tile 600 mm x 600 mm (2.62 in x 23.62 in) panels and are mounted directly on the inner walls of the chamber shield.

The specular regions of the chamber are lined with additional ETS-Lindgren PS-600 hybrid absorber to extend its frequency range up to 18GHz and beyond.

The turntable is a 2m ETS-Lindgren Model 2170, and installed off the center axis is located 5'6" from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the shield using #8 solid copper wire.

The antenna mast is an EMCO 1060 and is remotely controlled from the control room for both antenna height and polarization.

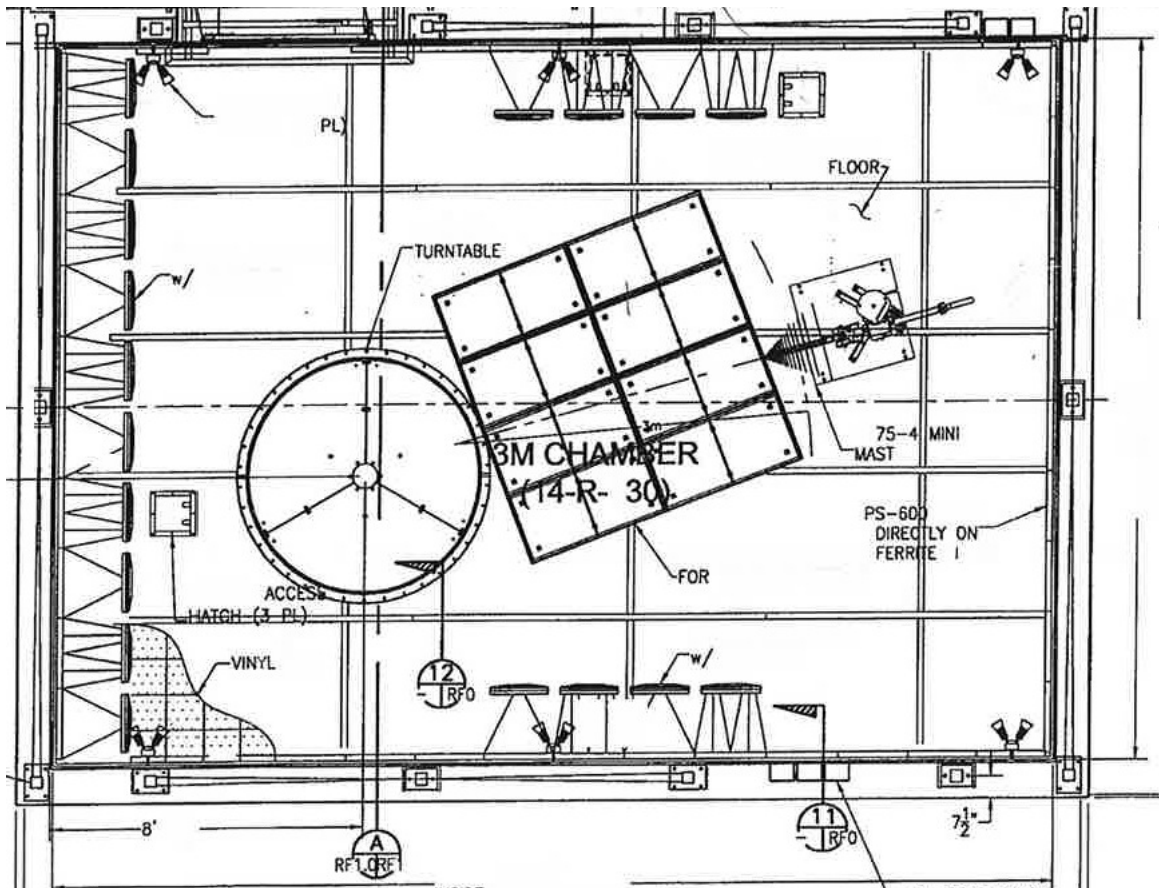


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

### 3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ❖ ANSI C63.4-2014: American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- ❖ ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ❖ IEEE C95.3-2002: IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields with Respect to Human Exposure to Such Fields, 100 kHz to 300 GHz.
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 1, Subpart I: Procedures Implementing the National Environmental Policy Act of 1969, 2017
- ❖ FCC KDB 447498 D01 General RF Exposure Guidance v06, Oct. 23, 2015.
- ❖ ISED Canada Radio Standards Specification: RSS-102 – Radio Frequency (RF) Exposure Compliance of Radiocommunications Apparatus (All Frequency Bands), Issue 5, March 2015.

### 4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

**Table 4-1: Test Equipment**

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
RE137	ETS-Lindgren	HI-6005	Probes	23667	8/11/2017	8/11/2018

**NOTE: All test equipment was used only during active calibration cycles.**

**5 SUPPORT EQUIPMENT**

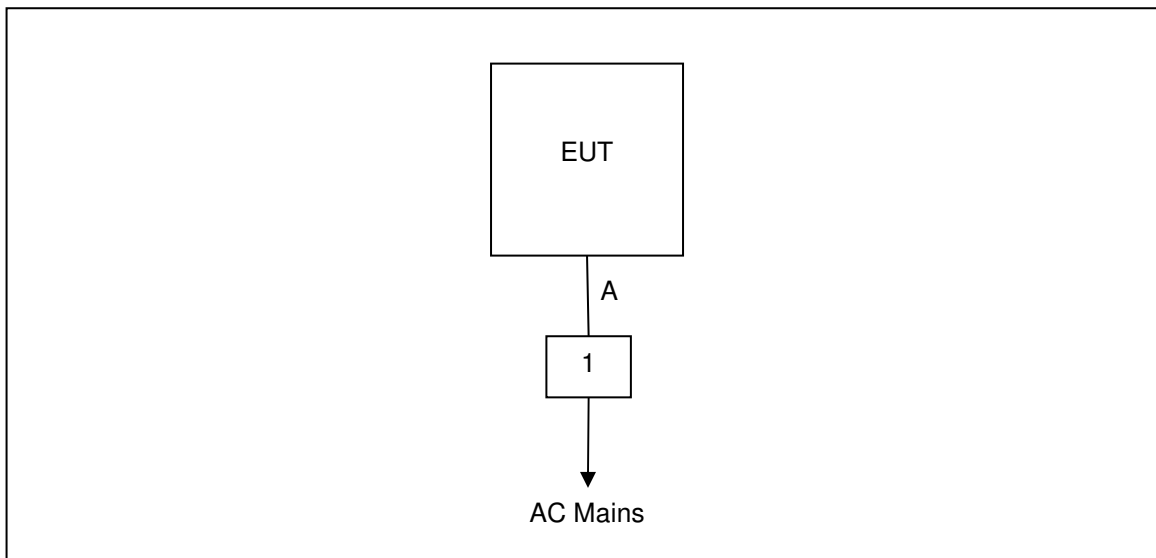
**Table 5-1: Support Equipment**

Item	Equipment Type	Manufacturer	Model/Part Number	Serial Number
1	AC/DC Adapter	Cincon Electronics	TRG1524-A	N/A

**Table 5-2: Cable Description**

Cable	Cable Type	Length	Shield	Termination
A	DC Power Cable	1.75 m	No	EUT to Power Supply

**6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM**



**Figure 6-1: Test Setup Block Diagram**



## 7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

### 7.1 Maximum Permissible Exposure – FCC: Section 1.1310; ISED Canada: RSS-102 4

#### 7.1.1 Measurement Procedure

The EUT was placed on a non-conductive platform in the center of the turntable at a height of 1.5 meters above the ground plane. The measurement probe was located 20 centimeters away from the EUT on an adjustable antenna mast. The EUT was rotated through 360 degrees so that the maximum radiated emissions level would be detected. The mast was adjusted until the evaluated results are less than 10% of the applicable limit. Once a stable reading was obtained, the maximum was recorded. The azimuth and elevation leading to the direction of maximum exposure was identified. The evaluation points in the horizontal plane were along radials extending from the antenna axis 45 degrees apart starting from the direction of maximum exposure.

#### 7.1.2 Measurement Results

Performed by: Ryan McGann

**Table 7.1.2-1: Maximum Permissible Exposure – 900MHz Radio – X-orientation**

Frequency (MHz)	Distance cm	Azimuth degrees	Elevation cm	Probe Display V/m	Probe Factor	Field Strength V/m	Power Density mW/cm <sup>2</sup>	FCC Limit mW/cm <sup>2</sup>	ISED Canada Limit mW/cm <sup>2</sup>	Result
927.6	20	315	159	8.234	1.26	10.3748	0.028551	0.6184	0.27927356	PASS
927.6	20	270	147	8.134	1.26	10.2488	0.027862	0.6184	0.27927356	PASS
927.6	20	225	165	6.88	1.26	8.6688	0.019933	0.6184	0.27927356	PASS
927.6	20	180	152	8.256	1.26	10.4026	0.028704	0.6184	0.27927356	PASS
927.6	20	135	153	6.244	1.26	7.86744	0.016418	0.6184	0.27927356	PASS
927.6	20	90	175	6.296	1.26	7.93296	0.016693	0.6184	0.27927356	PASS
927.6	20	45	151	6.567	1.26	8.27442	0.018161	0.6184	0.27927356	PASS
927.6	20	0	149	8.35	1.26	10.521	0.029361	0.6184	0.27927356	PASS
927.6	20	315	157	8.236	1.26	10.3774	0.028565	0.6184	0.27927356	PASS

**Table 7.1.2-2: Maximum Permissible Exposure – 900MHz Radio – Y-orientation**

Frequency (MHz)	Distance cm	Azimuth degrees	Elevation cm	Probe Display V/m	Probe Factor	Field Strength V/m	Power Density mW/cm <sup>2</sup>	FCC Limit mW/cm <sup>2</sup>	ISED Canada Limit mW/cm <sup>2</sup>	Result
927.6	20	330	156	9.952	1.26	12.5395	0.041708	0.6184	0.27927356	PASS
927.6	20	15	157	8.654	1.26	10.904	0.031538	0.6184	0.27927356	PASS
927.6	20	60	150	5.577	1.26	7.02702	0.013098	0.6184	0.27927356	PASS
927.6	20	105	161	5.299	1.26	6.67674	0.011825	0.6184	0.27927356	PASS
927.6	20	150	158	6.415	1.26	8.0829	0.01733	0.6184	0.27927356	PASS
927.6	20	195	160	6.93	1.26	8.7318	0.020224	0.6184	0.27927356	PASS
927.6	20	240	161	8.031	1.26	10.1191	0.027161	0.6184	0.27927356	PASS
927.6	20	285	162	9.285	1.26	11.6991	0.036305	0.6184	0.27927356	PASS
927.6	20	330	157	9.981	1.26	12.5761	0.041952	0.6184	0.27927356	PASS

**Table 7.1.2-3: Maximum Permissible Exposure – 900MHz Radio – Z-orientation**

Frequency (MHz)	Distance cm	Azimuth degrees	Elevation cm	Probe Display V/m	Probe Factor	Field Strength V/m	Power Density mW/cm <sup>2</sup>	FCC Limit mW/cm <sup>2</sup>	ISED Canada Limit mW/cm <sup>2</sup>	Result
927.6	20	348	152	8.537	1.26	10.7566	0.030691	0.6184	0.27927356	PASS
927.6	20	303	158	8.788	1.26	11.0729	0.032522	0.6184	0.27927356	PASS
927.6	20	258	152	6.709	1.26	8.45334	0.018955	0.6184	0.27927356	PASS
927.6	20	213	129	6.318	1.26	7.96068	0.01681	0.6184	0.27927356	PASS
927.6	20	168	130	6.511	1.26	8.20386	0.017852	0.6184	0.27927356	PASS
927.6	20	123	153	5.901	1.26	7.43526	0.014664	0.6184	0.27927356	PASS
927.6	20	78	148	4.793	1.26	6.03918	0.009674	0.6184	0.27927356	PASS
927.6	20	33	149	7.185	1.26	9.0531	0.02174	0.6184	0.27927356	PASS
927.6	20	348	154	8.533	1.26	10.7516	0.030662	0.6184	0.27927356	PASS

**Table 7.1.2-4: Maximum Permissible Exposure – 802.11 Radio – X-orientation**

Frequency (MHz)	Distance cm	Azimuth degrees	Elevation cm	Probe Display V/m	Probe Factor	Field Strength V/m	Power Density mW/cm <sup>2</sup>	FCC Limit mW/cm <sup>2</sup>	ISED Canada Limit mW/cm <sup>2</sup>	Result
2437	20	71.6	150	2.963	1.38	4.08894	0.004435	1	0.54039655	PASS
2437	20	116.6	150	2.79	1.38	3.8502	0.003932	1	0.54039655	PASS
2437	20	161.6	146	2.422	1.38	3.34236	0.002963	1	0.54039655	PASS
2437	20	206.6	144	1.295	1.38	1.7871	0.000847	1	0.54039655	PASS
2437	20	251.6	139	1.114	1.38	1.53732	0.000627	1	0.54039655	PASS
2437	20	296.6	147	1.067	1.38	1.47246	0.000575	1	0.54039655	PASS
2437	20	341.6	141	1.772	1.38	2.44536	0.001586	1	0.54039655	PASS
2437	20	26.6	148	2.61	1.38	3.6018	0.003441	1	0.54039655	PASS
2437	20	71.6	150	2.945	1.38	4.0641	0.004381	1	0.54039655	PASS

**Table 7.1.2-5: Maximum Permissible Exposure – 802.11 Radio – Y-orientation**

Frequency (MHz)	Distance cm	Azimuth degrees	Elevation cm	Probe Display V/m	Probe Factor	Field Strength V/m	Power Density mW/cm <sup>2</sup>	FCC Limit mW/cm <sup>2</sup>	ISED Canada Limit mW/cm <sup>2</sup>	Result
2437	20	25.1	164	2.307	1.38	3.18366	0.002689	1	0.54039655	PASS
2437	20	70.1	158	1.718	1.38	2.37084	0.001491	1	0.54039655	PASS
2437	20	115.1	162	1.863	1.38	2.57094	0.001753	1	0.54039655	PASS
2437	20	160.1	163	1.762	1.38	2.43156	0.001568	1	0.54039655	PASS
2437	20	205.1	149	1.346	1.38	1.85748	0.000915	1	0.54039655	PASS
2437	20	250.1	150	1.68	1.38	2.3184	0.001426	1	0.54039655	PASS
2437	20	295.1	159	1.456	1.38	2.00928	0.001071	1	0.54039655	PASS
2437	20	340.1	163	1.486	1.38	2.05068	0.001115	1	0.54039655	PASS
2437	20	25.1	162	2.34	1.38	3.2292	0.002766	1	0.54039655	PASS

**Table 7.1.2-6: Maximum Permissible Exposure – 802.11 Radio – Z-orientation**

Frequency (MHz)	Distance cm	Azimuth degrees	Elevation cm	Probe Display V/m	Probe Factor	Field Strength V/m	Power Density mW/cm <sup>2</sup>	FCC Limit mW/cm <sup>2</sup>	ISED Canada Limit mW/cm <sup>2</sup>	Result
2437	20	0	120	2.006	1.38	2.76828	0.002033	1	0.54039655	PASS
2437	20	45	117	2.091	1.38	2.88558	0.002209	1	0.54039655	PASS
2437	20	90	125	1.823	1.38	2.51574	0.001679	1	0.54039655	PASS
2437	20	135	144	1.624	1.38	2.24112	0.001332	1	0.54039655	PASS
2437	20	180	137	0.999	1.38	1.37862	0.000504	1	0.54039655	PASS
2437	20	225	163	1.377	1.38	1.90026	0.000958	1	0.54039655	PASS
2437	20	270	157	1.588	1.38	2.19144	0.001274	1	0.54039655	PASS
2437	20	315	142	1.49	1.38	2.0562	0.001121	1	0.54039655	PASS
2437	20	360	151	2.048	1.38	2.82624	0.002119	1	0.54039655	PASS

### 7.1.3 Summation of MPE Ratios – Simultaneous Transmissions

Performed by: Jeremy Pickens

This device contains multiple transmitters which can operate simultaneously; therefore, the maximum RF exposure is determined by the summation of MPE ratios. The limit is such that the summation of MPE ratios is  $\leq 1.0$ .

**Table 7.1.3-1: Summation of MPE Ratios – FCC**

	Scenario 1
900MHz ISM	x
2.4GHz ISM	x
900MHz ISM MPE Ratio	0.0678
2.4GHz ISM MPE Ratio	0.0044
MPE Ratio Summation:	0.0722

**Table 7.1.3-2: Summation of MPE Ratios – ISED Canada**

	Scenario 1
900MHz ISM	x
2.4GHz ISM	x
900MHz ISM MPE Ratio	0.1502
2.4GHz ISM MPE Ratio	0.0082
MPE Ratio Summation:	0.1584

**8 ESTIMATION OF MEASUREMENT UNCERTAINTY**

The expanded laboratory measurement uncertainty figures ( $U_{\text{Lab}}$ ) provided below correspond to an expansion factor (coverage factor)  $k = 1.96$  which provide confidence levels of 95%.

<b>Parameter</b>	<b><math>U_{\text{Lab}}</math></b>
Electric Field	39.12%

**9 CONCLUSION**

In the opinion of TÜV SÜD America, Inc. the ACT2, manufactured by Itron, Inc. meets the requirements of FCC Part 1 subpart I and Innovation, Science, and Economic Development Canada's Radio Standards Specification RSS-102 for the tests documented in this test report.

**END REPORT**