

# Itron, Inc.

REVISED TEST REPORT TO 102014-5

## AMR Transceiver Device For Communicating With Utility Meters Model: IMRB

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.249

Report No.: 102014-5A

Date of issue: May 30, 2019



Test Certificate # 803.05

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

Itron, Inc.  
2111 N. Molter Road  
Liberty Lake WA 99019

Representative: Jay Holcomb  
Customer Reference Number: 165609

**DATE OF EQUIPMENT RECEIPT:****DATE(S) OF TESTING:****REPORT PREPARED BY:**

Terri Rayle  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Project Number: 102014

December 10, 2018

December 10-13, 2018 and February 23, 2019

### Revision History

**Original:** Testing of the AMR Transceiver Device For Communicating With Utility Meters, Model: IMRB to FCC Part 15 Subpart C Section(s) and 15.207 & 15.249.

**Revision A:** To replace data in 15.249(a) Radiated Emissions and Band Edge and correct the BE summary table.

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



**Steve Behm**  
*Director of Quality Assurance & Engineering Services*  
CKC Laboratories, Inc.

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
22116 23rd Drive S.E., Suite A  
Canyon Park, Bothell, WA 98021

## Software Versions

| CKC Laboratories Proprietary Software | Version |
|---------------------------------------|---------|
| EMITest Emissions                     | 5.03.11 |

## Site Registration & Accreditation Information

| Location                   | NIST CB # | TAIWAN         | CANADA  | FCC    | JAPAN  |
|----------------------------|-----------|----------------|---------|--------|--------|
| Canyon Park<br>Bothell, WA | US0081    | SL2-IN-E-1145R | 3082C-1 | US1022 | A-0148 |

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part 15 Subpart C - 15.249

| Test Procedure | Description                      | Modifications | Results |
|----------------|----------------------------------|---------------|---------|
| 15.215(c)      | Occupied Bandwidth               | NA            | Pass    |
| 15.249(a)      | Field Strength of Fundamental    | NA            | Pass    |
| 15.249(a)      | Radiated Emissions and Band Edge | NA            | Pass    |
| 15.207         | AC Conducted Emissions           | NA            | Pass    |

NA = Not Applicable

#### ISO/IEC 17025 Decision Rule

The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

## Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

#### Summary of Conditions

No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

## Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

#### Summary of Conditions

None

## EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

### Configuration 1

#### *Equipment Tested:*

| Device   | Manufacturer | Model # | S/N       |
|--|--------------|---------|-----------|
| AMR transceiver device for communicating with utility meters | Ittron, Inc. | IMRB    | IMR007894 |

#### *Support Equipment:*

| Device                | Manufacturer | Model #     | S/N     |
|-----------------------|--------------|-------------|---------|
| Laptop                | Dell         | E6410       | 46TXXN1 |
| AC Adapter for Laptop | Dell         | DA130PE1-00 | NA      |
| AC Adapter            | DVE          | DV-51AR     | NA      |

## General Product Information:

| Product Information                | Manufacturer-Provided Details                                 |
|------------------------------------|---|
| Equipment Type:                    | Stand-Alone Equipment   |
| Modulation Type(s):                | FSK   |
| Maximum Duty Cycle:                | 100%  |
| Antenna Type(s) and Gain:          | Internal PIFA 1.2dBi  |
| Antenna Connection Type:           | Integral  |
| Nominal Input Voltage:             | 120VAC, 60Hz  |
| Firmware / Software used for Test: | DSP Version 85.75.00.02/FPGA Version 3.02 / MC3 Test v4.0.2.2 |

## FCC Part 15 Subpart C

### 15.215(c) Occupied Bandwidth (20dB BW)

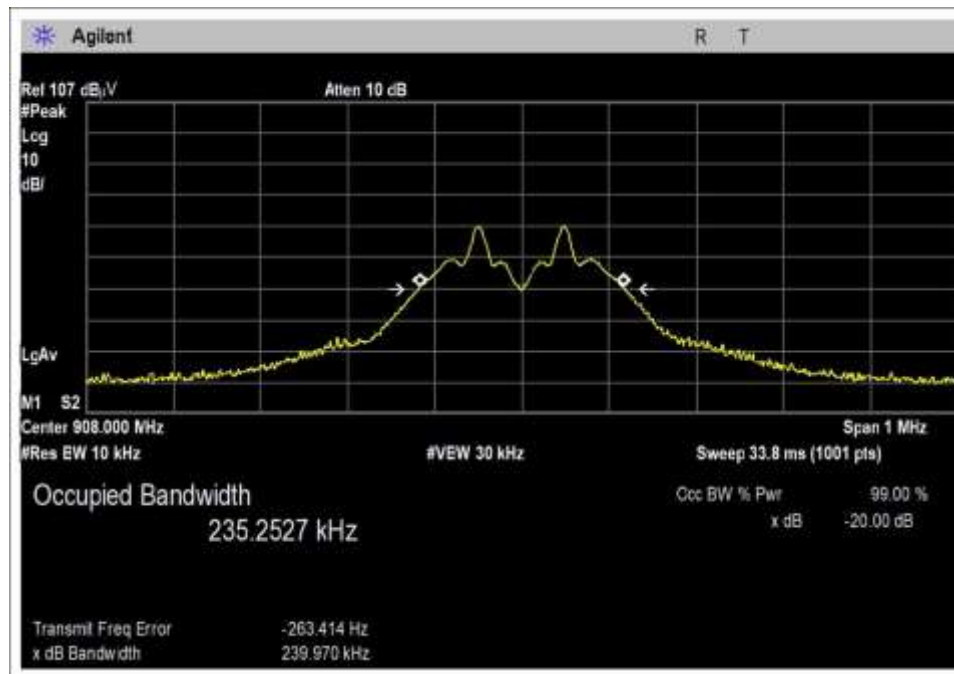
| Test Setup/Conditions |  |                |              |
|-----------------------|--|----------------|--------------|
| Test Location:        | Canyon Park Lab C3   | Test Engineer: | S. Pittsford |
| Test Method:          | ANSI C63.10 (2013)   | Test Date(s):  | 2/23/2019    |
| Configuration:        | 1  |                |              |
| Test Conditions:      | <p>Frequency Range: 908-923.8MHz<br/> Frequency tested: 908, 916 and 923.8MHz<br/> Firmware power setting: Low Power<br/> Protocol /MCS/Modulation: FSK</p> <p>Antenna type: Internal PIFA<br/> Antenna Gain: 1.2 dBi.</p> <p>Duty Cycle: 100% (Test Mode)</p> <p>Test Mode: Continuously transmitting<br/> Test Setup: EUT is transmitting sitting on foam table high.<br/> Modifications Added: None</p> |                |              |

| Environmental Conditions |    |                        |    |
|--------------------------|----|------------------------|----|
| Temperature (°C)         | 21 | Relative Humidity (%): | 26 |

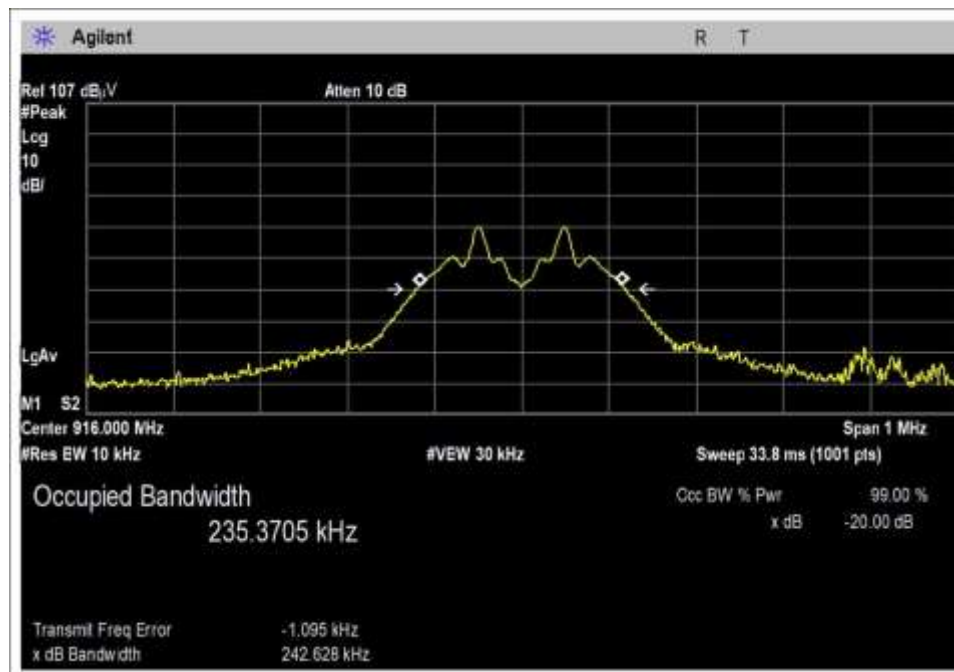
| Test Equipment |                   |              |          |            |            |
|----------------|-------------------|--------------|----------|------------|------------|
| Asset#         | Description       | Manufacturer | Model    | Cal Date   | Cal Due    |
| 02307          | Preamplifier      | HP           | 8447D    | 1/15/2018  | 1/15/2020  |
| P05305         | Cable             | Andrews      | ETSI-50T | 10/24/2017 | 10/24/2019 |
| P05360         | Cable             | Belden       | RG214    | 1/31/2018  | 1/31/2020  |
| 02673          | Spectrum Analyzer | Agilent      | E4446A   | 2/3/2017   | 2/3/2019   |
| P06123         | Attenuator        | Aeroflex     | 18N-6    | 5/5/2017   | 5/5/2019   |
| P06540         | Cable             | Andrews      | Helix    | 10/30/2017 | 10/30/2019 |
| 03628          | Biconilog Antenna | ETS          | 3142E    | 6/7/2017   | 6/7/2019   |

| Test Data Summary |              |            |                |             |         |
|-------------------|--------------|------------|----------------|-------------|---------|
| Frequency (MHz)   | Antenna Port | Modulation | Measured (kHz) | Limit (kHz) | Results |
| 908               | 1            | FSK        | 240.0          | None        | NA      |
| 916               | 1            | FSK        | 242.6          | None        | NA      |
| 923.8             | 1            | FSK        | 248.9          | None        | NA      |

## Plot(s)

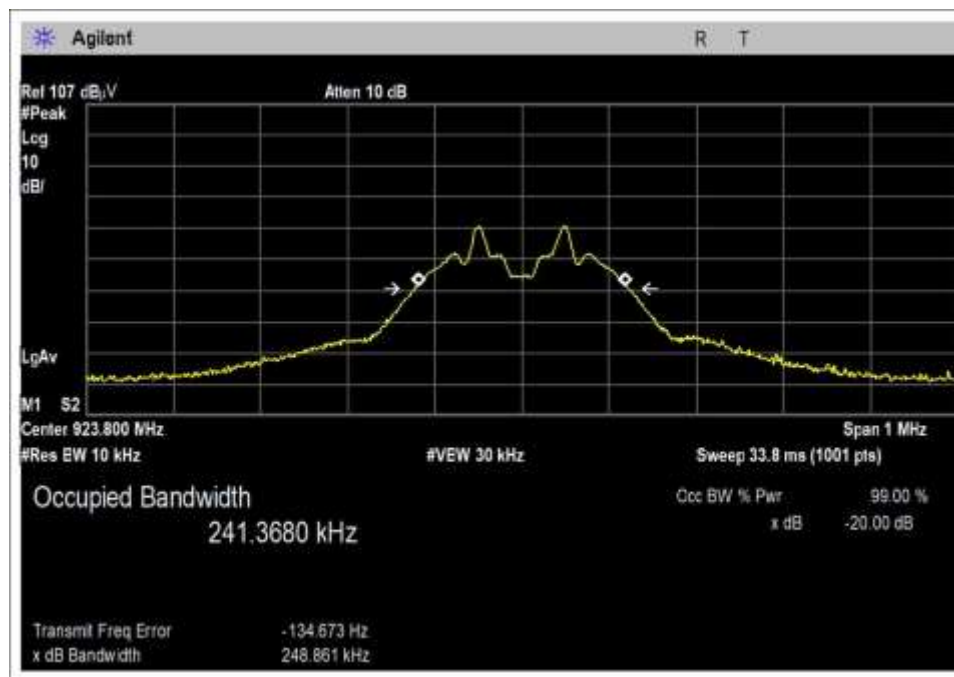


Low Channel



Middle Channel





High Channel

### Test Setup Photo(s)



## 15.249(a) Field Strength of Fundamental

### Test Data Summary - Voltage Variations

| Frequency (MHz) | Modulation / Ant Port | V <sub>Minimum</sub> (dBuV/m) | V <sub>Nominal</sub> (dBuV/m) | V <sub>Maximum</sub> (dBuV/m) | Max Deviation from V <sub>Nominal</sub> (dB) |
|-----------------|-----------------------|-------------------------------|-------------------------------|-------------------------------|--|
| 908             | FSK                   | 74.8                          | 74.7                          | 74.6                          | 0.2  |
| 916             | FSK                   | 74.9                          | 74.7                          | 74.9                          | 0.2  |
| 923.8           | FSK                   | 74.8                          | 75.0                          | 74.8                          | 0.2  |

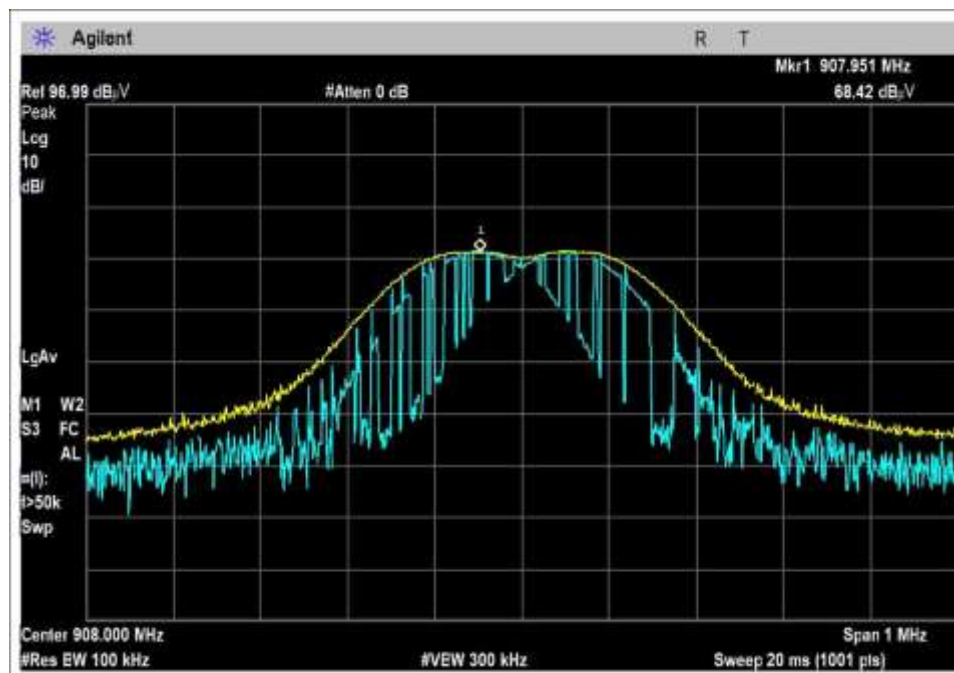
Test performed using operational mode with the highest output power, representing worst case.

### Parameter Definitions:

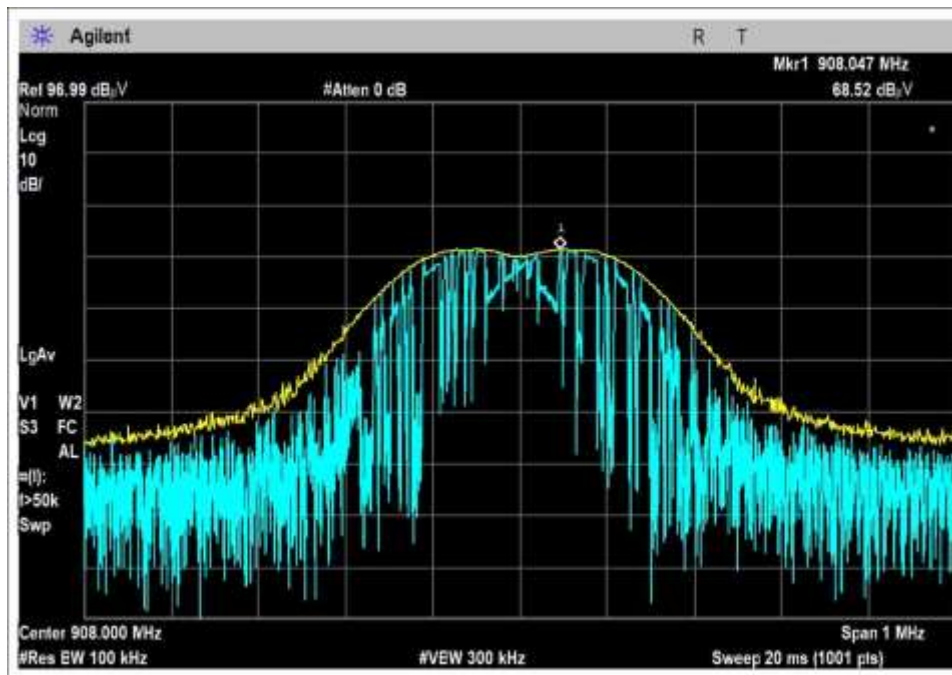
Measurements performed at input voltage V<sub>Nominal</sub> ± 15%.

| Parameter              | Value      |
|------------------------|------------|
| V <sub>Nominal</sub> : | 120 VAC    |
| V <sub>Minimum</sub> : | 102.00 VAC |
| V <sub>Maximum</sub> : | 138.00 VAC |

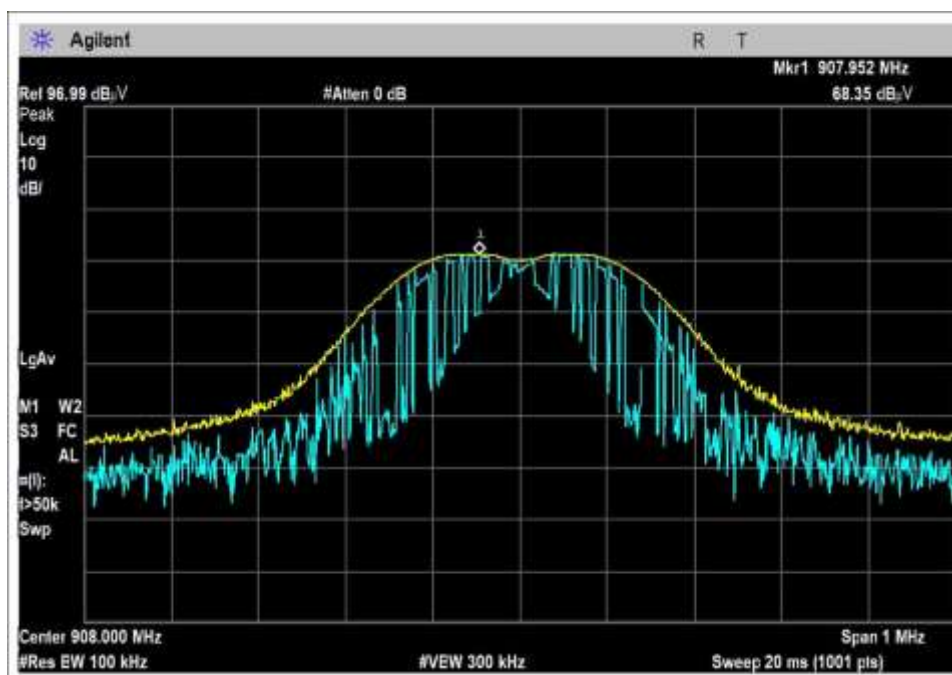
### Plot(s)



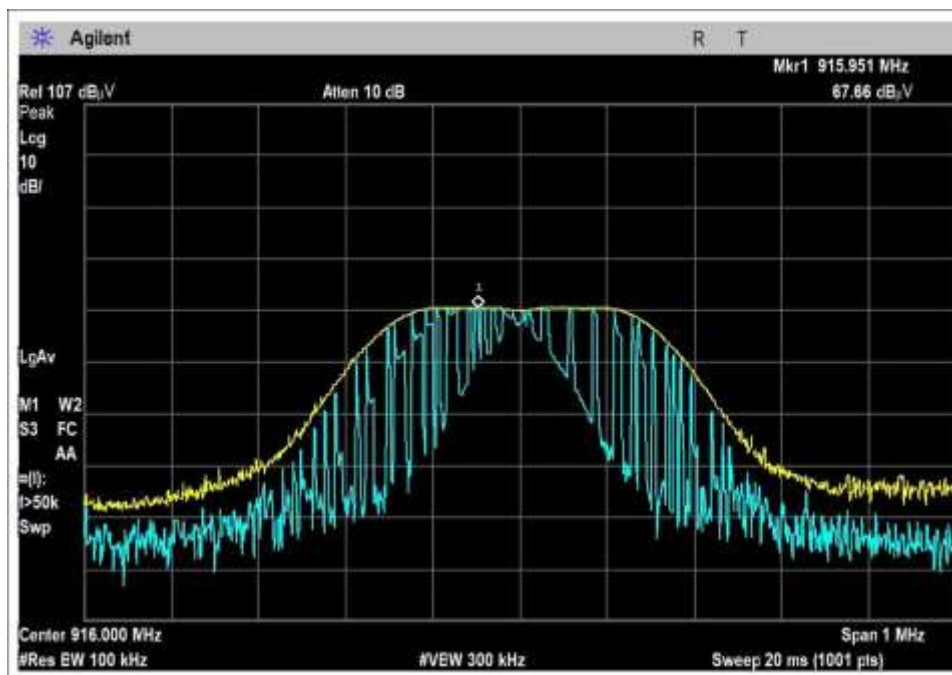
Low Channel, Z Axis, V<sub>nom</sub>



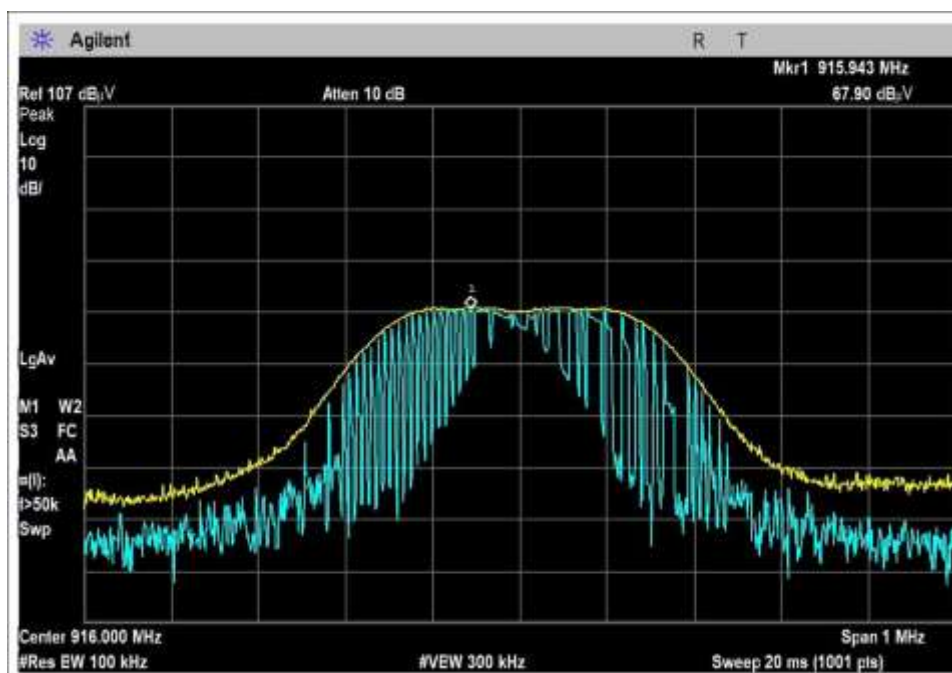
Low Channel, Z Axis, Vmin



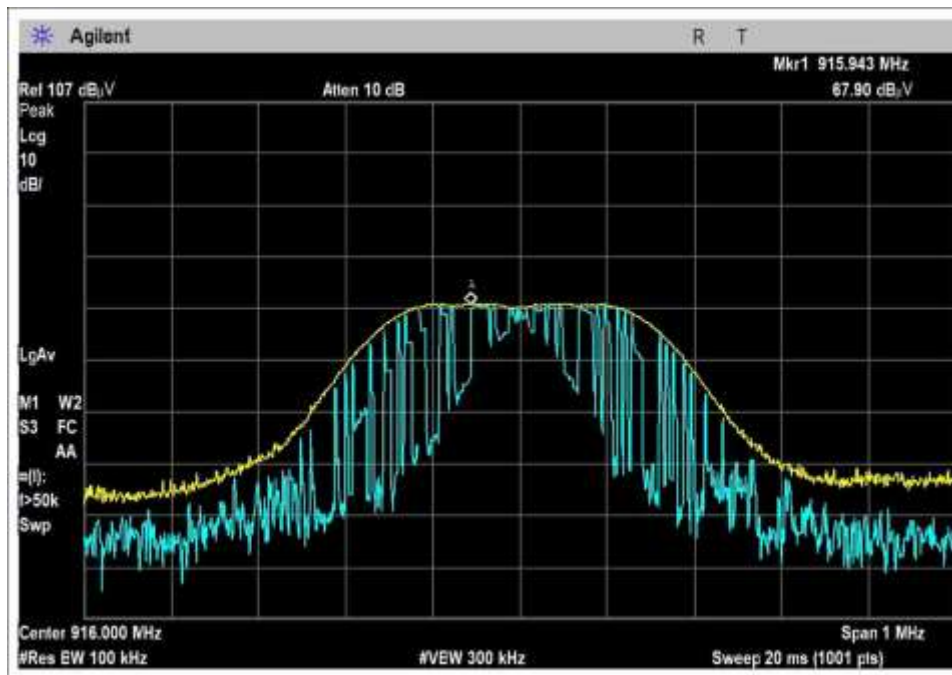
High Channel, Z Axis, Vmax



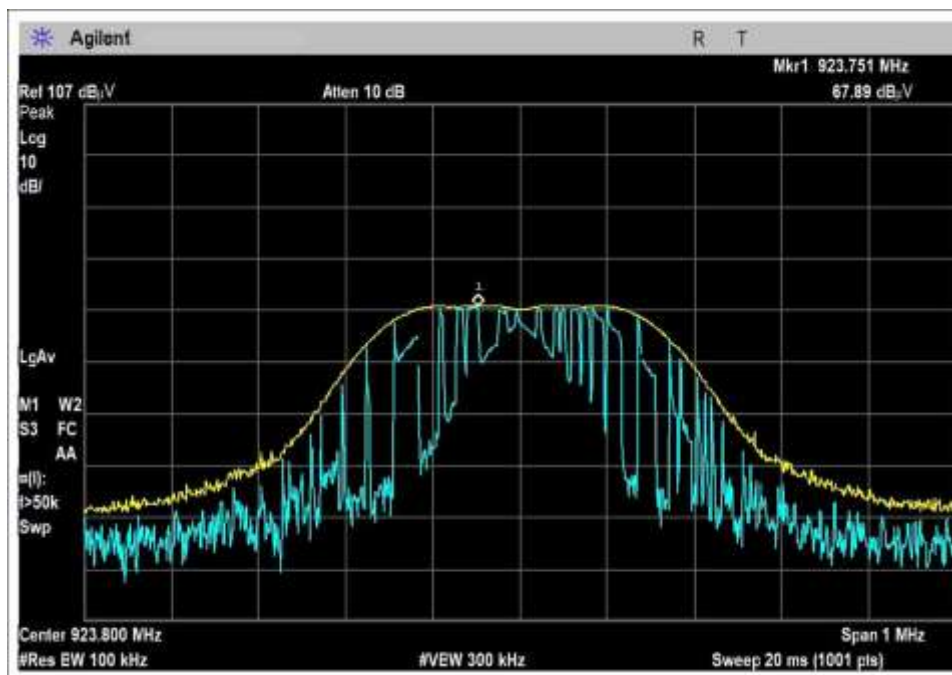
Middle Channel, Z Axis, Vnom



Middle Channel, Z Axis, Vmin

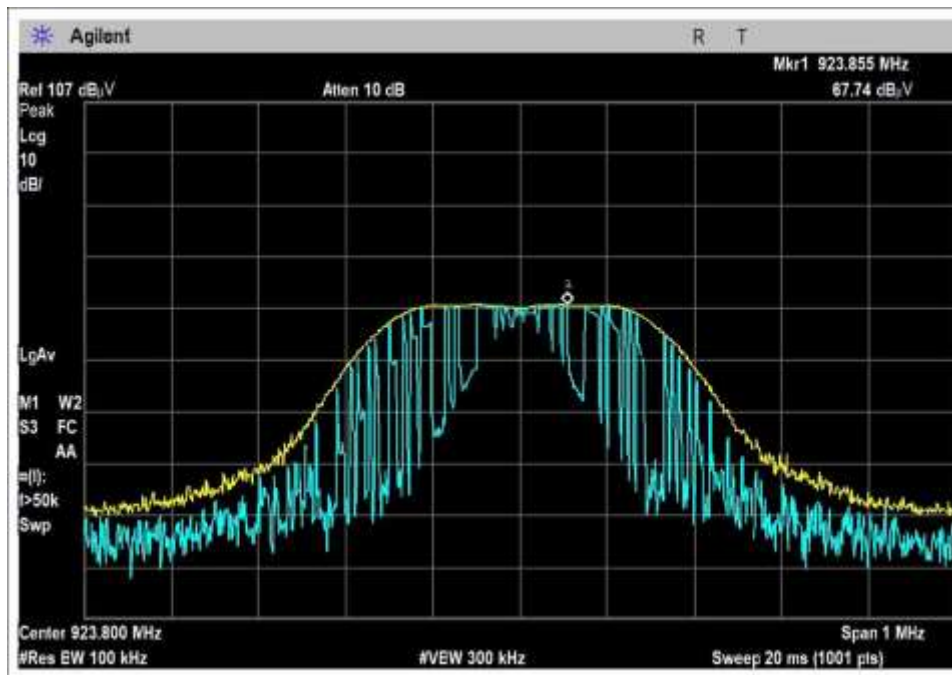


Middle Channel, Z Axis, Vmax

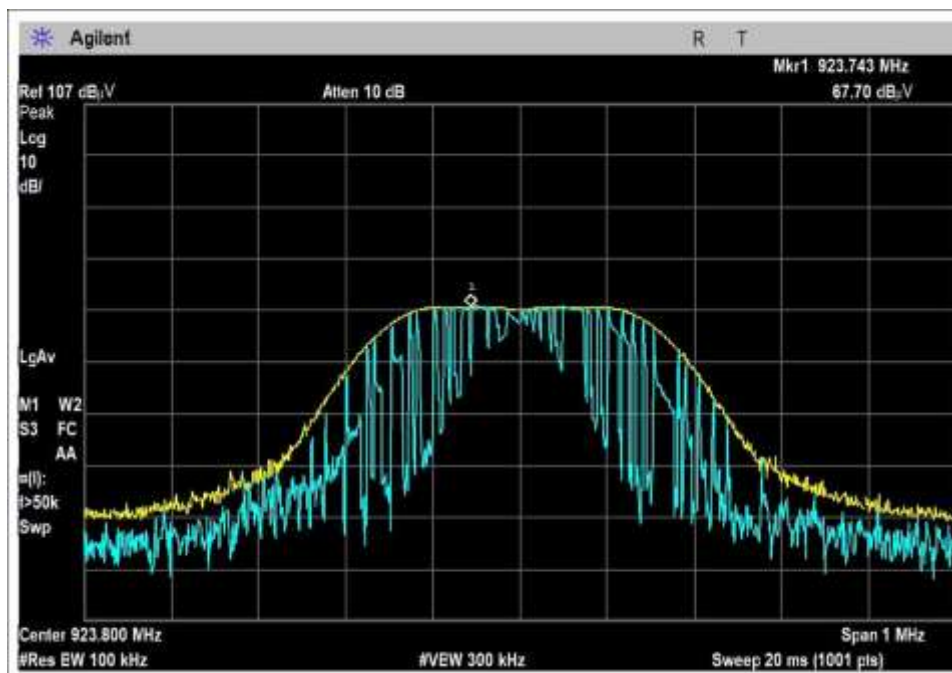


High Channel, Z Axis, Vnom





High Channel, Z Axis, Vmin



High Channel, Z Axis, Vmax

## Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC  
 Customer: **Itron, Inc**  
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**  
 Work Order #: **102014** Date: 2/23/2019  
 Test Type: **Maximized Emissions** Time: 08:57:45  
 Tested By: Matthew Harrison / Steven Pittsford Sequence#: 18  
 Software: EMITest 5.03.11

### Equipment Tested:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

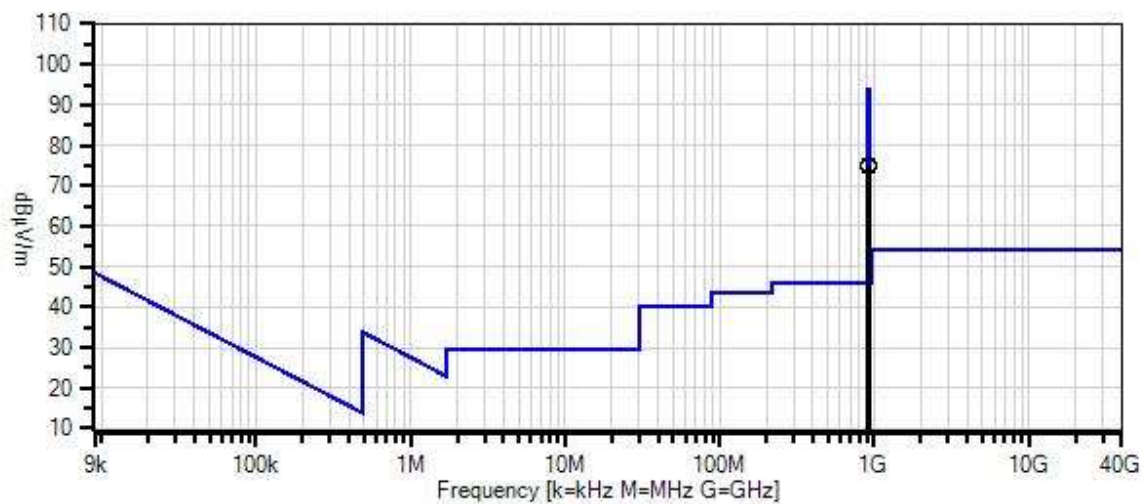
### Support Equipment:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

### Test Conditions / Notes:

|  |
|--|
| Temperature: 20-23°C<br>Humidity: 26-32%<br>Pressure: 100.8-102.7kPa<br><br>Frequency Range: 9kHz to 10GHz<br>Frequency tested: 908, 916 & 923.8MHz<br>Firmware power setting: Low Power<br><br>Protocol /MCS/Modulation: Continuous FSK<br><br>Duty Cycle: 100% (Test Mode)<br><br>Test Mode: Continuously transmitting FSK on single channel, worst case data reported.<br>Test Setup: EUT is transmitting sitting on foam table. X, Y, Z axis investigated, both antenna polarities investigated, worst case data reported.<br>Modifications Added: None<br>Test Method: ANSI C63.10 (2013)<br>Plots are uncorrected/raw data |
|--|

Ittron, Inc WO#: 102014 Sequence#: 18 Date: 2/23/2019  
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Vert



- Readings
- Peak Readings
- × QP Readings
- \* Average Readings
- ▼ Ambient
- Software Version: 5.03.11
- 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)



**Test Equipment:**

| ID | Asset #  | Description       | Model    | Calibration Date | Cal Due Date |
|----|----------|-------------------|----------|------------------|--------------|
| T1 | AN03628  | Biconilog Antenna | 3142E    | 6/7/2017         | 6/7/2019     |
| T2 | ANP06123 | Attenuator        | 18N-6    | 5/5/2017         | 5/5/2019     |
| T3 | ANP05305 | Cable             | ETSI-50T | 10/24/2017       | 10/24/2019   |
| T4 | ANP05360 | Cable             | RG214    | 1/31/2018        | 1/31/2020    |
| T5 | ANP06540 | Cable             | Heliac   | 10/30/2017       | 10/30/2019   |
| T6 | AN02673  | Spectrum Analyzer | E4446A   | 2/3/2017         | 2/3/2019     |
| T7 | AN02307  | Preamplifier      | 8447D    | 1/15/2018        | 1/15/2020    |
| T8 | AN02872  | Spectrum Analyzer | E4440A   | 11/3/2017        | 11/3/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq     | Rdng | T1<br>T5      | T2<br>T6     | T3<br>T7      | T4<br>T8     | Dist        | Corr   | Spec                 | Margin | Polar       |
|---|----------|------|---------------|--------------|---------------|--------------|-------------|--------|----------------------|--------|-------------|
|   | MHz      | dBμV | dB            | dB           | dB            | dB           | Table       | dBμV/m | dBμV/m               | dB     | Ant         |
| 1 | 923.751M | 67.9 | +24.5<br>+0.4 | +5.9<br>+0.0 | +1.6<br>-27.3 | +2.0<br>+0.0 | +0.0<br>211 | 75.0   | 94.0<br>Z-Axis, Vnom | -19.0  | Vert<br>99  |
| 2 | 915.943M | 67.9 | +24.4<br>+0.4 | +5.9<br>+0.0 | +1.6<br>-27.3 | +2.0<br>+0.0 | +0.0<br>182 | 74.9   | 94.0<br>Z-Axis, Vmax | -19.1  | Vert<br>99  |
| 3 | 915.943M | 67.9 | +24.4<br>+0.4 | +5.9<br>+0.0 | +1.6<br>-27.3 | +2.0<br>+0.0 | +0.0<br>170 | 74.9   | 94.0<br>Z-Axis, Vmin | -19.1  | Vert<br>99  |
| 4 | 908.047M | 68.5 | +24.0<br>+0.3 | +5.9<br>+0.0 | +1.5<br>-27.4 | +2.0<br>+0.0 | +0.0<br>360 | 74.8   | 94.0<br>Z-Axis, Vmin | -19.2  | Vert<br>101 |
| 5 | 923.855M | 67.7 | +24.5<br>+0.4 | +5.9<br>+0.0 | +1.6<br>-27.3 | +2.0<br>+0.0 | +0.0<br>211 | 74.8   | 94.0<br>Z-Axis, Vmin | -19.2  | Vert<br>99  |
| 6 | 923.743M | 67.7 | +24.5<br>+0.4 | +5.9<br>+0.0 | +1.6<br>-27.3 | +2.0<br>+0.0 | +0.0<br>211 | 74.8   | 94.0<br>Z-Axis, Vmax | -19.2  | Vert<br>99  |
| 7 | 907.951M | 68.4 | +24.0<br>+0.3 | +5.9<br>+0.0 | +1.5<br>-27.4 | +2.0<br>+0.0 | +0.0<br>360 | 74.7   | 94.0<br>Z Axis, Vnom | -19.3  | Vert<br>101 |
| 8 | 915.951M | 67.7 | +24.4<br>+0.4 | +5.9<br>+0.0 | +1.6<br>-27.3 | +2.0<br>+0.0 | +0.0<br>187 | 74.7   | 94.0<br>Z-Axis, Vnom | -19.3  | Vert<br>99  |
| 9 | 907.952M | 68.3 | +24.0<br>+0.3 | +5.9<br>+0.0 | +1.5<br>-27.4 | +2.0<br>+0.0 | +0.0<br>360 | 74.6   | 94.0<br>Z-Axis, Vmax | -19.4  | Vert<br>101 |

Test Setup Photo(s)



Below 1GHz



X Axis



Y Axis



Z Axis

## 15.249(a) Radiated Emissions and Band Edge

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC (4362)  
 Customer: **Itron, Inc**  
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**  
 Work Order #: **102014** Date: 2/23/2019  
 Test Type: **Maximized Emissions** Time: 11:12:40  
 Tested By: Matthew Harrison / Steven Pittsford Sequence#: 17  
 Software: EMITest 5.03.11

#### Equipment Tested:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

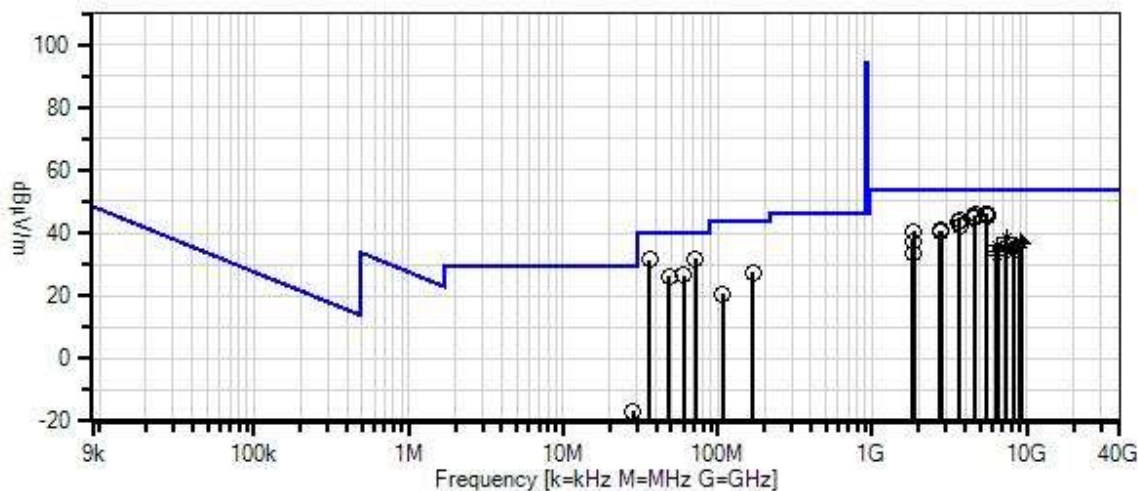
#### Support Equipment:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

#### Test Conditions / Notes:

Temperature: 21-22°C  
 Humidity: 26-33%  
 Pressure: 100.8-102.7kPa  
  
 Frequency Range: 9kHz to 10GHz  
 Frequency tested: 908, 916 & 923.8MHz  
 Firmware power setting: Low Power  
  
 Protocol /MCS/Modulation: Continuous FSK  
  
 Duty Cycle: 100% (Test Mode)  
  
 Test Mode: Continuously transmitting FSK on single channel, worst case data reported.  
 Test Setup: EUT is transmitting sitting on foam table. X, Y, Z axis investigated, both antenna polarities investigated, worst case data reported.  
 Modifications Added: None  
 Test Method: ANSI C63.10 (2013)

Ittron, Inc WO#: 102014 Sequence#: 17 Date: 2/23/2019  
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Vert



— Readings  
○ Peak Readings  
× QP Readings  
\* Average Readings  
▼ Ambient  
Software Version: 5.03.11  
1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

#### Test Equipment:

| ID  | Asset #/Serial # | Description                                | Model                    | Calibration Date | Cal Due Date |
|-----|------------------|--|--------------------------|------------------|--------------|
| T1  | AN03628          | Biconilog Antenna                          | 3142E                    | 6/7/2017         | 6/7/2019     |
| T2  | ANP06123         | Attenuator                                 | 18N-6                    | 5/5/2017         | 5/5/2019     |
| T3  | ANP05305         | Cable                                      | ETSI-50T                 | 10/24/2017       | 10/24/2019   |
| T4  | ANP05360         | Cable                                      | RG214                    | 1/31/2018        | 1/31/2020    |
| T5  | ANP06540         | Cable                                      | Helix                    | 10/30/2017       | 10/30/2019   |
| T6  | AN02673          | Spectrum Analyzer                          | E4446A                   | 2/3/2017         | 2/3/2019     |
| T7  | AN00052          | Loop Antenna                               | 6502                     | 5/7/2018         | 5/7/2020     |
| T8  | ANP06515         | Cable                                      | Helix                    | 6/29/2018        | 6/29/2020    |
| T9  | AN03170          | High Pass Filter                           | HM1155-11SS              | 11/27/2017       | 11/27/2019   |
| T10 | AN01467          | Horn Antenna-<br>ANSI C63.5<br>Calibration | 3115                     | 7/21/2017        | 7/21/2019    |
| T11 | AN03540          | Preamp                                     | 83017A                   | 5/2/2017         | 5/2/2019     |
| T12 | ANP06503         | Cable                                      | 32026-29801-<br>29801-36 | 3/13/2018        | 3/13/2020    |
| T13 | AN02307          | Preamp                                     | 8447D                    | 1/15/2018        | 1/15/2020    |
| T14 | AN02872          | Spectrum Analyzer                          | E4440A                   | 11/3/2017        | 11/3/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| #  | Freq      | Rdng | T1<br>T5<br>T9<br>T13          | T2<br>T6<br>T10<br>T14        | T3<br>T7<br>T11              | T4<br>T8<br>T12              | Dist        | Corr   | Spec         | Margin | Polar       |
|----|-----------|------|--------------------------------|-------------------------------|------------------------------|------------------------------|-------------|--------|--------------|--------|-------------|
|    | MHz       | dBμV | dB                             | dB                            | dB                           | dB                           | Table       | dBμV/m | dBμV/m       | dB     | Ant         |
| 1  | 5447.870M | 37.3 | +0.0<br>+0.7<br>+1.0<br>+0.0   | +0.0<br>+0.0<br>+34.0<br>+0.0 | +0.0<br>+0.0<br>-33.1        | +0.0<br>+4.5<br>+1.8         | +0.0        | 46.2   | 54.0<br>Low  | -7.8   | Vert<br>153 |
| 2  | 5496.092M | 36.9 | +0.0<br>+0.7<br>+0.9<br>+0.0   | +0.0<br>+0.0<br>+34.2<br>+0.0 | +0.0<br>+0.0<br>-33.1        | +0.0<br>+4.5<br>+1.8         | +0.0<br>360 | 45.9   | 54.0<br>Mid  | -8.1   | Vert<br>156 |
| 3  | 4618.770M | 40.1 | +0.0<br>+0.5<br>+0.8<br>+0.0   | +0.0<br>+0.0<br>+32.1<br>+0.0 | +0.0<br>+0.0<br>-33.1        | +0.0<br>+4.0<br>+1.5         | +0.0<br>265 | 45.9   | 54.0<br>High | -8.1   | Vert<br>141 |
| 4  | 71.920M   | 45.8 | +7.0<br>+0.1<br>+0.0<br>-27.9  | +5.9<br>+0.0<br>+0.0<br>+0.0  | +0.4<br>+0.0<br>+0.0<br>+0.0 | +0.5<br>+0.0<br>+0.0<br>+0.0 | +0.0<br>330 | 31.8   | 40.0         | -8.2   | Vert<br>100 |
| 5  | 5542.366M | 36.6 | +0.0<br>+0.7<br>+0.8<br>+0.0   | +0.0<br>+0.0<br>+34.3<br>+0.0 | +0.0<br>+0.0<br>-33.2        | +0.0<br>+4.5<br>+1.8         | +0.0<br>67  | 45.5   | 54.0<br>High | -8.5   | Vert<br>148 |
| 6  | 35.951M   | 40.2 | +12.6<br>+0.1<br>+0.0<br>-28.0 | +5.9<br>+0.0<br>+0.0<br>+0.0  | +0.3<br>+0.0<br>+0.0<br>+0.0 | +0.3<br>+0.0<br>+0.0<br>+0.0 | +0.0        | 31.4   | 40.0         | -8.6   | Vert<br>99  |
| 7  | 4579.810M | 39.3 | +0.0<br>+0.5<br>+0.8<br>+0.0   | +0.0<br>+0.0<br>+32.0<br>+0.0 | +0.0<br>+0.0<br>-33.1        | +0.0<br>+4.0<br>+1.5         | +0.0<br>350 | 45.0   | 54.0<br>Mid  | -9.0   | Vert<br>156 |
| 8  | 4539.970M | 38.8 | +0.0<br>+0.5<br>+0.8<br>+0.0   | +0.0<br>+0.0<br>+32.0<br>+0.0 | +0.0<br>+0.0<br>-33.1        | +0.0<br>+3.9<br>+1.5         | +0.0        | 44.4   | 54.0<br>Low  | -9.6   | Vert<br>166 |
| 9  | 3694.600M | 40.4 | +0.0<br>+0.4<br>+0.9<br>+0.0   | +0.0<br>+0.0<br>+30.8<br>+0.0 | +0.0<br>+0.0<br>-33.4        | +0.0<br>+3.8<br>+1.3         | +0.0<br>332 | 44.2   | 54.0<br>High | -9.8   | Vert<br>132 |
| 10 | 3632.894M | 39.6 | +0.0<br>+0.4<br>+0.9<br>+0.0   | +0.0<br>+0.0<br>+30.8<br>+0.0 | +0.0<br>+0.0<br>-33.4        | +0.0<br>+3.7<br>+1.3         | +0.0        | 43.3   | 54.0<br>Low  | -10.7  | Vert<br>166 |
| 11 | 3664.276M | 38.4 | +0.0<br>+0.4<br>+0.9<br>+0.0   | +0.0<br>+0.0<br>+30.8<br>+0.0 | +0.0<br>+0.0<br>-33.4        | +0.0<br>+3.7<br>+1.3         | +0.0<br>11  | 42.1   | 54.0<br>Mid  | -11.9  | Vert<br>143 |

|    |                  |      |       |       |       |      |      |      |      |       |      |
|----|------------------|------|-------|-------|-------|------|------|------|------|-------|------|
| 12 | 2771.776M        | 40.8 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 40.7 | 54.0 | -13.3 | Vert |
|    |                  |      | +0.5  | +0.0  | +0.0  | +2.6 | 210  |      | High |       | 142  |
|    |                  |      | +0.6  | +28.9 | -33.8 | +1.1 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |
| 13 | 2747.396M        | 40.7 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 40.5 | 54.0 | -13.5 | Vert |
|    |                  |      | +0.5  | +0.0  | +0.0  | +2.6 |      |      | Mid  |       | 143  |
|    |                  |      | +0.6  | +28.8 | -33.8 | +1.1 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |
| 14 | 59.997M          | 40.8 | +6.7  | +5.9  | +0.4  | +0.4 | +0.0 | 26.4 | 40.0 | -13.6 | Vert |
|    |                  |      | +0.1  | +0.0  | +0.0  | +0.0 | 360  |      |      |       | 100  |
|    |                  |      | +0.0  | +0.0  | +0.0  | +0.0 |      |      |      |       |      |
|    |                  |      | -27.9 | +0.0  |       |      |      |      |      |       |      |
| 15 | 1848.270M        | 44.0 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 40.4 | 54.0 | -13.6 | Vert |
|    |                  |      | +0.4  | +0.0  | +0.0  | +2.3 | 155  |      | High |       | 142  |
|    |                  |      | +0.7  | +26.8 | -34.5 | +0.7 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |
| 16 | 2724.622M        | 40.5 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 40.3 | 54.0 | -13.7 | Vert |
|    |                  |      | +0.5  | +0.0  | +0.0  | +2.6 | 244  |      | Low  |       | 142  |
|    |                  |      | +0.6  | +28.8 | -33.8 | +1.1 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |
| 17 | 48.090M          | 40.1 | +7.2  | +5.9  | +0.4  | +0.4 | +0.0 | 26.2 | 40.0 | -13.8 | Vert |
|    |                  |      | +0.1  | +0.0  | +0.0  | +0.0 | 75   |      |      |       | 100  |
|    |                  |      | +0.0  | +0.0  | +0.0  | +0.0 |      |      |      |       |      |
|    |                  |      | -27.9 | +0.0  |       |      |      |      |      |       |      |
| 18 | 7390.534M<br>Ave | 26.7 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 38.2 | 54.0 | -15.8 | Vert |
|    |                  |      | +1.0  | +0.0  | +0.0  | +5.4 | 360  |      | High |       | 150  |
|    |                  |      | +0.5  | +36.7 | -34.3 | +2.2 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |
| ^  | 7390.534M        | 38.9 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 50.4 | 54.0 | -3.6  | Vert |
|    |                  |      | +1.0  | +0.0  | +0.0  | +5.4 | 23   |      | High |       | 138  |
|    |                  |      | +0.5  | +36.7 | -34.3 | +2.2 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |
| 20 | 168.040M         | 38.3 | +9.3  | +5.9  | +0.6  | +0.7 | +0.0 | 27.5 | 43.5 | -16.0 | Vert |
|    |                  |      | +0.2  | +0.0  | +0.0  | +0.0 | 360  |      |      |       | 100  |
|    |                  |      | +0.0  | +0.0  | +0.0  | +0.0 |      |      |      |       |      |
|    |                  |      | -27.5 | +0.0  |       |      |      |      |      |       |      |
| 21 | 1831.326M        | 41.2 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 37.4 | 54.0 | -16.6 | Vert |
|    |                  |      | +0.4  | +0.0  | +0.0  | +2.3 |      |      | Mid  |       | 143  |
|    |                  |      | +0.7  | +26.6 | -34.5 | +0.7 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |
| 22 | 9160.324M<br>Ave | 24.0 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 37.3 | 54.0 | -16.7 | Vert |
|    |                  |      | +0.8  | +0.0  | +0.0  | +6.2 | 360  |      | Mid  |       | 137  |
|    |                  |      | +0.6  | +37.2 | -33.9 | +2.4 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |
| ^  | 9160.324M        | 36.0 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 49.3 | 54.0 | -4.7  | Vert |
|    |                  |      | +0.8  | +0.0  | +0.0  | +6.2 | 360  |      | Mid  |       | 137  |
|    |                  |      | +0.6  | +37.2 | -33.9 | +2.4 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |
| 24 | 9238.320M<br>Ave | 23.1 | +0.0  | +0.0  | +0.0  | +0.0 | +0.0 | 36.7 | 54.0 | -17.3 | Vert |
|    |                  |      | +0.9  | +0.0  | +0.0  | +6.2 | 360  |      | High |       | 150  |
|    |                  |      | +0.6  | +37.2 | -33.8 | +2.5 |      |      |      |       |      |
|    |                  |      | +0.0  | +0.0  |       |      |      |      |      |       |      |



|                  |      |      |       |       |      |      |      |      |       |      |
|------------------|------|------|-------|-------|------|------|------|------|-------|------|
| ^ 9238.320M      | 38.4 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 52.0 | 54.0 | -2.0  | Vert |
|                  |      | +0.9 | +0.0  | +0.0  | +6.2 | 272  |      | High |       | 150  |
|                  |      | +0.6 | +37.2 | -33.8 | +2.5 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| 26 9079.838M Ave | 23.5 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 36.6 | 54.0 | -17.4 | Vert |
|                  |      | +0.7 | +0.0  | +0.0  | +6.2 |      |      | Low  |       | 153  |
|                  |      | +0.6 | +37.1 | -33.9 | +2.4 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| ^ 9079.838M      | 37.1 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 50.2 | 54.0 | -3.8  | Vert |
|                  |      | +0.7 | +0.0  | +0.0  | +6.2 |      |      | Low  |       | 153  |
|                  |      | +0.6 | +37.1 | -33.9 | +2.4 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| 28 6466.194M Ave | 25.6 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 36.1 | 54.0 | -17.9 | Vert |
|                  |      | +0.6 | +0.0  | +0.0  | +5.5 | 360  |      | High |       | 150  |
|                  |      | +0.6 | +35.5 | -33.6 | +1.9 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| ^ 6466.194M      | 38.5 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 49.0 | 54.0 | -5.0  | Vert |
|                  |      | +0.6 | +0.0  | +0.0  | +5.5 |      |      | High |       | 148  |
|                  |      | +0.6 | +35.5 | -33.6 | +1.9 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| 30 7327.844M Ave | 24.4 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 35.7 | 54.0 | -18.3 | Vert |
|                  |      | +0.9 | +0.0  | +0.0  | +5.4 |      |      | Mid  |       | 140  |
|                  |      | +0.5 | +36.5 | -34.1 | +2.1 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| ^ 7327.844M      | 38.5 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 49.8 | 54.0 | -4.2  | Vert |
|                  |      | +0.9 | +0.0  | +0.0  | +5.4 | 360  |      | Mid  |       | 137  |
|                  |      | +0.5 | +36.5 | -34.1 | +2.1 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| 32 8314.844M Ave | 23.8 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 35.6 | 54.0 | -18.4 | Vert |
|                  |      | +0.8 | +0.0  | +0.0  | +5.8 | 360  |      | High |       | 150  |
|                  |      | +0.5 | +37.0 | -34.6 | +2.3 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| ^ 8314.844M      | 39.3 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 51.1 | 54.0 | -2.9  | Vert |
|                  |      | +0.8 | +0.0  | +0.0  | +5.8 | 112  |      | High |       | 138  |
|                  |      | +0.5 | +37.0 | -34.6 | +2.3 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| 34 7263.280M Ave | 24.1 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 35.4 | 54.0 | -18.6 | Vert |
|                  |      | +0.8 | +0.0  | +0.0  | +5.4 | 360  |      | Low  |       | 149  |
|                  |      | +0.6 | +36.3 | -33.9 | +2.1 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| ^ 7263.280M      | 37.8 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 49.1 | 54.0 | -4.9  | Vert |
|                  |      | +0.8 | +0.0  | +0.0  | +5.4 |      |      | Low  |       | 153  |
|                  |      | +0.6 | +36.3 | -33.9 | +2.1 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| 36 8244.324M Ave | 23.6 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 34.9 | 54.0 | -19.1 | Vert |
|                  |      | +0.7 | +0.0  | +0.0  | +5.7 | 208  |      | Mid  |       | 140  |
|                  |      | +0.5 | +36.9 | -34.8 | +2.3 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |
| ^ 8244.324M      | 36.6 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 47.9 | 54.0 | -6.1  | Vert |
|                  |      | +0.7 | +0.0  | +0.0  | +5.7 | 360  |      | Mid  |       | 137  |
|                  |      | +0.5 | +36.9 | -34.8 | +2.3 |      |      |      |       |      |
|                  |      | +0.0 | +0.0  |       |      |      |      |      |       |      |

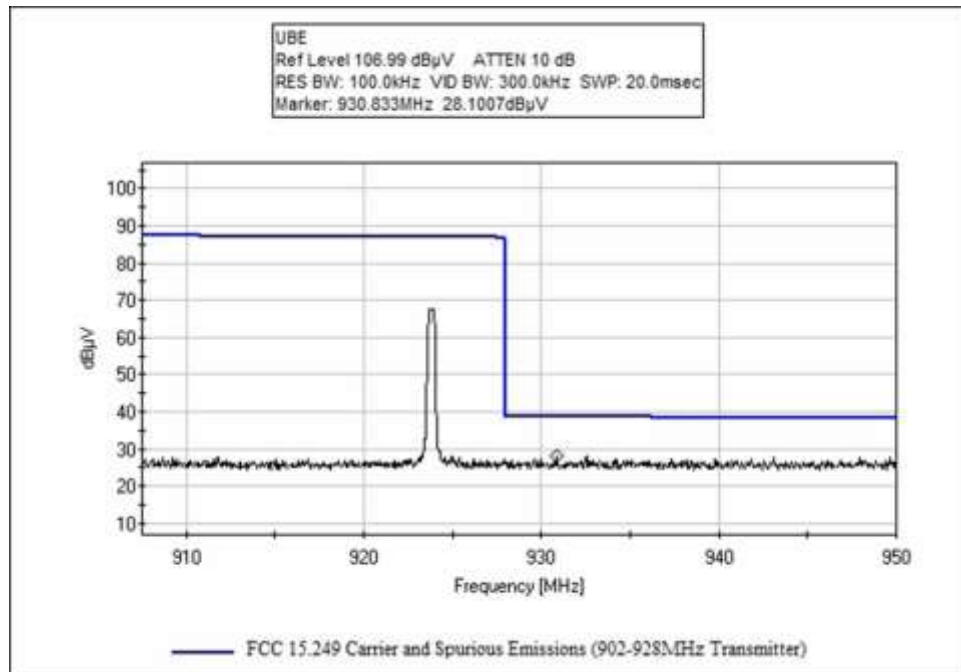
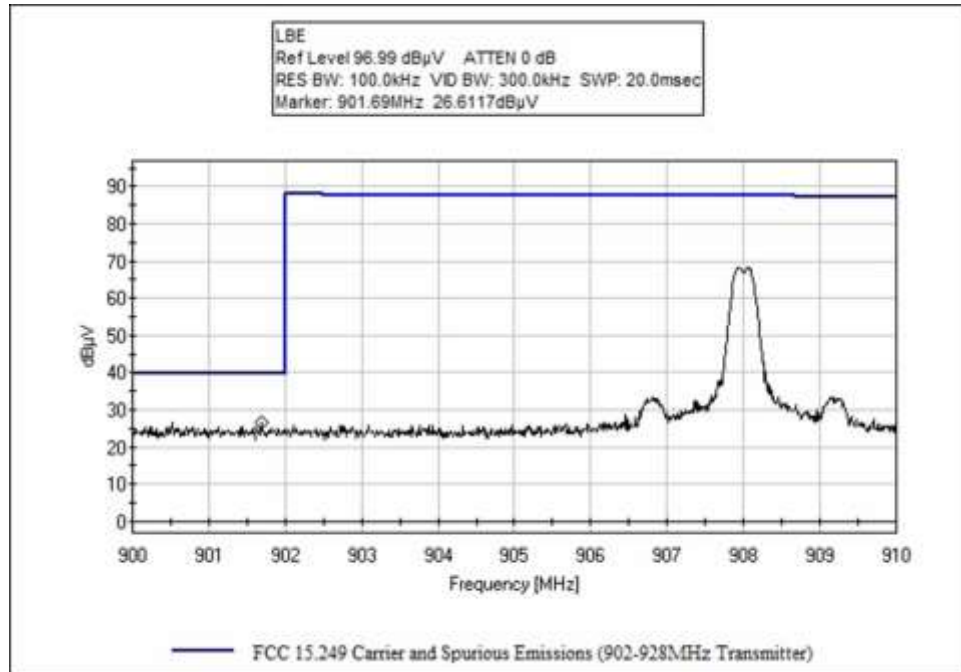


|    |                  |      |                               |                               |                               |                      |             |       |             |       |             |
|----|------------------|------|-------------------------------|-------------------------------|-------------------------------|----------------------|-------------|-------|-------------|-------|-------------|
| 38 | 6412.616M<br>Ave | 24.0 | +0.0<br>+0.6<br>+0.5<br>+0.0  | +0.0<br>+0.0<br>+35.4<br>+0.0 | +0.0<br>+0.0<br>-33.6<br>+0.0 | +0.0<br>+5.4<br>+1.9 | +0.0        | 34.2  | 54.0<br>Mid | -19.8 | Vert<br>145 |
| ^  | 6412.616M        | 37.3 | +0.0<br>+0.6<br>+0.5<br>+0.0  | +0.0<br>+0.0<br>+35.4<br>+0.0 | +0.0<br>+0.0<br>-33.6<br>+0.0 | +0.0<br>+5.4<br>+1.9 | +0.0<br>360 | 47.5  | 54.0<br>Mid | -6.5  | Vert<br>143 |
| 40 | 8172.102M<br>Ave | 22.4 | +0.0<br>+0.7<br>+0.5<br>+0.0  | +0.0<br>+0.0<br>+36.9<br>+0.0 | +0.0<br>+0.0<br>-34.7<br>+0.0 | +0.0<br>+5.7<br>+2.3 | +0.0<br>360 | 33.8  | 54.0        | -20.2 | Vert<br>149 |
| ^  | 8172.102M        | 37.2 | +0.0<br>+0.7<br>+0.5<br>+0.0  | +0.0<br>+0.0<br>+36.9<br>+0.0 | +0.0<br>+0.0<br>-34.7<br>+0.0 | +0.0<br>+5.7<br>+2.3 | +0.0<br>134 | 48.6  | 54.0<br>Low | -5.4  | Vert<br>149 |
| 42 | 1815.430M        | 37.1 | +0.0<br>+0.4<br>+0.7<br>+0.0  | +0.0<br>+0.0<br>+26.5<br>+0.0 | +0.0<br>+0.0<br>-34.5<br>+0.0 | +0.0<br>+2.3<br>+0.7 | +0.0<br>360 | 33.2  | 54.0<br>Low | -20.8 | Vert<br>145 |
| 43 | 6355.276M<br>Ave | 23.0 | +0.0<br>+0.6<br>+0.5<br>+0.0  | +0.0<br>+0.0<br>+35.3<br>+0.0 | +0.0<br>+0.0<br>-33.5<br>+0.0 | +0.0<br>+5.3<br>+1.9 | +0.0<br>360 | 33.1  | 54.0<br>Low | -20.9 | Vert<br>149 |
| ^  | 6355.276M        | 37.0 | +0.0<br>+0.6<br>+0.5<br>+0.0  | +0.0<br>+0.0<br>+35.3<br>+0.0 | +0.0<br>+0.0<br>-33.5<br>+0.0 | +0.0<br>+5.3<br>+1.9 | +0.0        | 47.1  | 54.0<br>Low | -6.9  | Vert<br>153 |
| 45 | 107.719M         | 33.1 | +8.2<br>+0.1<br>+0.0<br>-27.7 | +5.9<br>+0.0<br>+0.0<br>+0.0  | +0.5<br>+0.0<br>+0.0<br>+0.0  | +0.6<br>+0.0<br>+0.0 | +0.0<br>360 | 20.7  | 43.5        | -22.8 | Vert<br>100 |
| 46 | 28.227M          | 16.6 | +0.0<br>+0.1<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+6.1<br>+0.0          | +0.0<br>+0.3<br>+0.1 | -40.0       | -16.8 | 29.5        | -46.3 | Perp<br>102 |
| 47 | 16.473k          | 44.8 | +0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+0.0<br>+0.0<br>+0.0  | +0.0<br>+12.5<br>+0.0         | +0.0<br>+0.0<br>+0.0 | -80.0       | -22.7 | 43.3        | -66.0 | Perp<br>102 |

## Band Edge

| Band Edge Summary |            |                      |                             |                    |         |
|-------------------|------------|----------------------|-----------------------------|--------------------|---------|
| Frequency (MHz)   | Modulation | Ant. Type            | Field Strength (dBuV/m @3m) | Limit (dBuV/m @3m) | Results |
| 901.69            | FSK        | Internal PIFA 1.2dBi | 32.7                        | <46                | Pass    |
| 930.8             | FSK        | Internal PIFA 1.2dBi | 35.3                        | <46                | Pass    |
| 902.0             | FSK        | Internal PIFA 1.2dBi | 30.6                        | <46                | Pass    |
| 928.0             | FSK        | Internal PIFA 1.2dBi | 33.5                        | <46                | Pass    |

## Band Edge Plots



## Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC  
 Customer: **Itron, Inc**  
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**  
 Work Order #: **102014** Date: 2/23/2019  
 Test Type: **Maximized Emissions** Time: 09:29:51  
 Tested By: Matthew Harrison / Steven Pittsford Sequence#: 19  
 Software: EMITest 5.03.11

### Equipment Tested:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

### Support Equipment:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

### Test Conditions / Notes:

Temperature: 21-22°C  
 Humidity: 26-33%  
 Pressure: 100.8kPa  
  
 Frequency Range: Band Edge  
 Frequency tested: 908, 916 & 923.8MHz  
 Firmware power setting: Low Power  
  
 Protocol /MCS/Modulation: Continuous FSK  
  
 Duty Cycle: 100% (Test Mode)  
  
 Test Mode: Continuously transmitting GFSK on single channel, worst case data reported.  
 Test Setup: EUT is transmitting sitting on foam table 80cm high. X, Y, Z axis investigated, both antenna polarities investigated, worst case data reported.  
 Modifications Added: None  
 Test Method: ANSI C63.10 (2013)  
 Plots are uncorrected/raw data

**Test Equipment:**

| ID | Asset #  | Description       | Model    | Calibration Date | Cal Due Date |
|----|----------|-------------------|----------|------------------|--------------|
| T1 | AN03628  | Biconilog Antenna | 3142E    | 6/7/2017         | 6/7/2019     |
| T2 | ANP06123 | Attenuator        | 18N-6    | 5/5/2017         | 5/5/2019     |
| T3 | ANP05305 | Cable             | ETSI-50T | 10/24/2017       | 10/24/2019   |
| T4 | ANP05360 | Cable             | RG214    | 1/31/2018        | 1/31/2020    |
| T5 | ANP06540 | Cable             | Helix    | 10/30/2017       | 10/30/2019   |
|    | AN02673  | Spectrum Analyzer | E4446A   | 2/3/2017         | 2/3/2019     |
| T6 | AN02307  | Preamp            | 8447D    | 1/15/2018        | 1/15/2020    |
|    | AN02872  | Spectrum Analyzer | E4440A   | 11/3/2017        | 11/3/2019    |

**Measurement Data:**

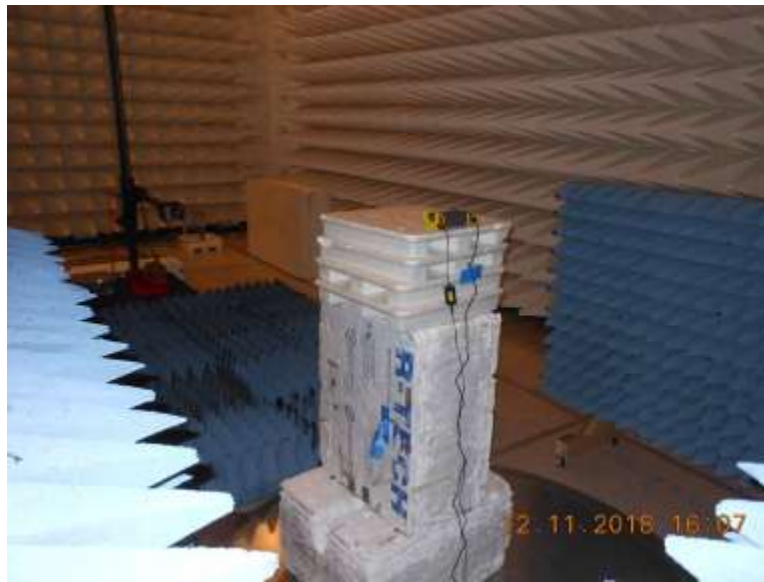
Reading listed by margin.

Test Distance: 3 Meters

| # | Freq     | Rdng | T1            | T2           | T3            | T4   | Dist        | Corr   | Spec   | Margin | Polar       |
|---|----------|------|---------------|--------------|---------------|------|-------------|--------|--------|--------|-------------|
|   | MHz      | dBμV | T5<br>dB      | T6<br>dB     | T7<br>dB      | dB   | Table       | dBμV/m | dBμV/m | dB     | Ant         |
| 1 | 930.833M | 28.1 | +24.6<br>+0.4 | +5.9<br>+0.0 | +1.6<br>-27.3 | +2.0 | +0.0<br>211 | 35.3   | 46.0   | -10.7  | Vert<br>99  |
| 2 | 928.000M | 26.3 | +24.6<br>+0.4 | +5.9<br>+0.0 | +1.6<br>-27.3 | +2.0 | +0.0<br>211 | 33.5   | 46.0   | -12.5  | Vert<br>100 |
| 3 | 901.690M | 26.6 | +23.8<br>+0.3 | +5.9<br>+0.0 | +1.5<br>-27.4 | +2.0 | +0.0<br>360 | 32.7   | 46.0   | -13.3  | Vert<br>101 |
| 4 | 902.000M | 24.5 | +23.8<br>+0.3 | +5.9<br>+0.0 | +1.5<br>-27.4 | +2.0 | +0.0<br>360 | 30.6   | 46.0   | -15.4  | Vert<br>101 |

**Test Setup Photo(s)**


Below 1GHz



Above 1GHz, Cone placement



X Axis



Y Axis



Z Axis

## 15.207 AC Conducted Emissions

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC  
 Customer: **Itron, Inc.**  
 Specification: **15.207 AC Mains - Quasi-peak**  
 Work Order #: **102014** Date: 12/11/2018  
 Test Type: **Conducted Emissions** Time: 10:52:26  
 Tested By: Steven Pittsford Sequence#: 9  
 Software: EMITest 5.03.11 115VAC 60Hz

#### Equipment Tested:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

#### Support Equipment:

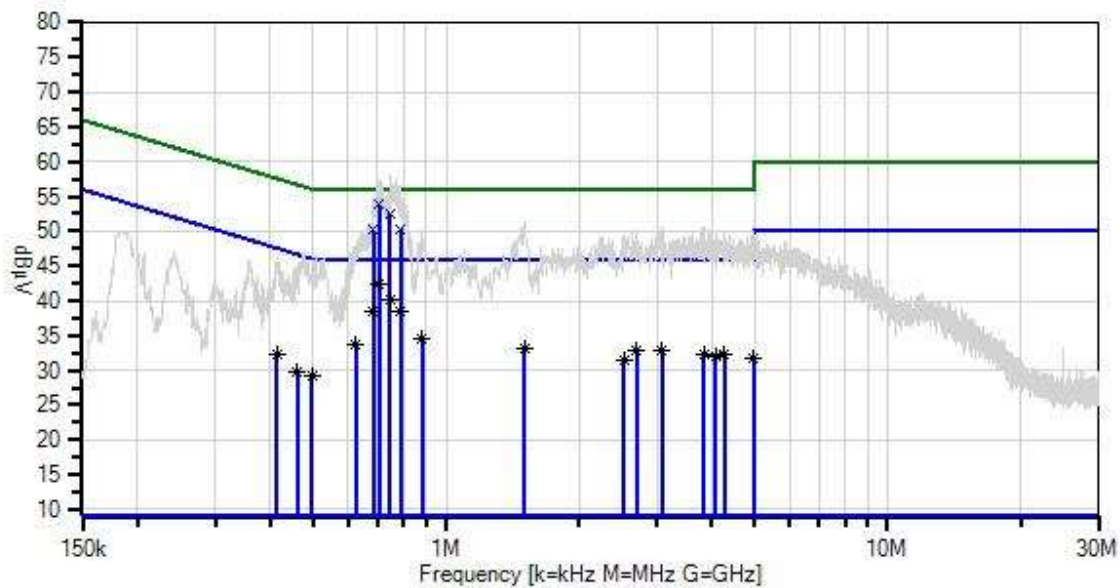
| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

#### Test Conditions / Notes:

Temperature: 22°C  
 Humidity: 33%  
 Pressure: 101.4kPa  
  
 Frequency Range: 0.15-30MHz  
  
 Frequency tested: 908MHz  
 Firmware power setting: Low Power  
 Protocol /MCS/Modulation: FSK  
  
 Duty Cycle: 100% (Test Mode)  
  
 Test Mode: Continuously transmitting  
 Test Setup: EUT connected to USB AC Adapter via USB cable. USB AC Adapter connected to AC mains through LISN.  
 Modifications Added: None  
 Test Method: ANSI C63.10 (2013)



Itron, Inc W/O#: 102014 Sequence#: 9 Date: 12/11/2018  
15.207 AC Mains - Quasi-peak Test Lead: 115VAC 60Hz Line



— Sweep Data  
x QP Readings  
Software Version: 5.03.11

— Readings  
\* Average Readings  
— 1 - 15.207 AC Mains - Average

○ Peak Readings  
▼ Ambient  
— 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

| ID | Asset #  | Description         | Model               | Calibration Date | Cal Due Date |
|----|----------|---------------------|---------------------|------------------|--------------|
| T1 | ANP06219 | Attenuator          | 768-10              | 4/13/2018        | 4/13/2020    |
| T2 | ANP06515 | Cable               | Heliac              | 6/29/2018        | 6/29/2020    |
| T3 | ANP06540 | Cable               | Heliac              | 10/30/2017       | 10/30/2019   |
| T4 | AN01311  | 50uH LISN-Line1 (L) | 3816/2              | 3/16/2018        | 3/16/2020    |
|    | AN01311  | 50uH LISN-Line2 (N) | 3816/2              | 3/16/2018        | 3/16/2020    |
|    | AN02673  | Spectrum Analyzer   | E4446A              | 2/3/2017         | 2/3/2019     |
| T5 | AN02611  | High Pass Filter    | HE9615-150K-50-720B | 1/15/2018        | 1/15/2020    |

**Measurement Data:**

Reading listed by margin.

Test Lead: Line

| #  | Freq     | Rdng | T1<br>T5     | T2   | T3   | T4   | Dist  | Corr | Spec | Margin | Polar |
|----|----------|------|--------------|------|------|------|-------|------|------|--------|-------|
|    | MHz      | dBμV | dB           | dB   | dB   | dB   | Table | dBμV | dBμV | dB     | Ant   |
| 1  | 706.313k | 44.2 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 53.8 | 56.0 | -2.2   | Line  |
|    | QP       |      |              |      |      |      |       |      |      |        |       |
| 2  | 746.309k | 43.0 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 52.6 | 56.0 | -3.4   | Line  |
|    | QP       |      |              |      |      |      |       |      |      |        |       |
| 3  | 706.313k | 32.8 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 42.4 | 46.0 | -3.6   | Line  |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 706.312k | 47.8 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 57.4 | 46.0 | +11.4  | Line  |
| 5  | 790.668k | 40.7 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 50.3 | 56.0 | -5.7   | Line  |
|    | QP       |      |              |      |      |      |       |      |      |        |       |
| 6  | 683.769k | 40.6 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 50.2 | 56.0 | -5.8   | Line  |
|    | QP       |      |              |      |      |      |       |      |      |        |       |
| 7  | 746.309k | 30.5 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 40.1 | 46.0 | -5.9   | Line  |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 746.308k | 48.5 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 58.1 | 46.0 | +12.1  | Line  |
| 9  | 683.769k | 28.9 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 38.5 | 46.0 | -7.5   | Line  |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 683.769k | 45.3 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 54.9 | 46.0 | +8.9   | Line  |
| 11 | 790.668k | 28.7 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 38.3 | 46.0 | -7.7   | Line  |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 790.668k | 46.1 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 55.7 | 46.0 | +9.7   | Line  |
| 13 | 881.458k | 25.0 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 34.6 | 46.0 | -11.4  | Line  |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 881.457k | 40.7 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 50.3 | 46.0 | +4.3   | Line  |

|    |                 |      |              |      |      |      |      |      |      |       |      |
|----|-----------------|------|--------------|------|------|------|------|------|------|-------|------|
| 15 | 624.100k<br>Ave | 23.9 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.4 | +0.0 | 33.6 | 46.0 | -12.4 | Line |
| ^  | 624.100k        | 38.5 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.4 | +0.0 | 48.2 | 46.0 | +2.2  | Line |
| 17 | 1.507M<br>Ave   | 23.5 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 33.1 | 46.0 | -12.9 | Line |
| ^  | 1.507M          | 41.7 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 51.3 | 46.0 | +5.3  | Line |
| 19 | 3.089M<br>Ave   | 23.2 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 32.8 | 46.0 | -13.2 | Line |
| ^  | 3.089M          | 41.0 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 50.6 | 46.0 | +4.6  | Line |
| 21 | 2.702M<br>Ave   | 23.1 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 32.7 | 46.0 | -13.3 | Line |
| ^  | 2.702M          | 40.8 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 50.4 | 46.0 | +4.4  | Line |
| 23 | 3.829M<br>Ave   | 22.8 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 32.4 | 46.0 | -13.6 | Line |
| ^  | 3.829M          | 41.2 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 50.8 | 46.0 | +4.8  | Line |
| 25 | 4.275M<br>Ave   | 22.7 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 32.3 | 46.0 | -13.7 | Line |
| ^  | 4.275M          | 40.2 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 49.8 | 46.0 | +3.8  | Line |
| 27 | 4.080M<br>Ave   | 22.3 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 31.9 | 46.0 | -14.1 | Line |
| ^  | 4.080M          | 40.1 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 49.7 | 46.0 | +3.7  | Line |
| 29 | 4.968M<br>Ave   | 22.1 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 31.7 | 46.0 | -14.3 | Line |
| ^  | 4.968M          | 40.5 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 50.1 | 46.0 | +4.1  | Line |
| 31 | 2.532M<br>Ave   | 21.9 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 31.5 | 46.0 | -14.5 | Line |
| ^  | 2.532M          | 39.8 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 49.4 | 46.0 | +3.4  | Line |
| 33 | 413.300k<br>Ave | 22.6 | +9.1<br>+0.1 | +0.0 | +0.0 | +0.5 | +0.0 | 32.3 | 47.6 | -15.3 | Line |
| ^  | 413.300k        | 36.5 | +9.1<br>+0.1 | +0.0 | +0.0 | +0.5 | +0.0 | 46.2 | 47.6 | -1.4  | Line |
| 35 | 497.200k<br>Ave | 19.5 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.4 | +0.0 | 29.2 | 46.0 | -16.8 | Line |
| ^  | 497.200k        | 37.7 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.4 | +0.0 | 47.4 | 46.0 | +1.4  | Line |
| 37 | 459.600k<br>Ave | 19.9 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.5 | +0.0 | 29.7 | 46.7 | -17.0 | Line |
| ^  | 459.600k        | 37.6 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.5 | +0.0 | 47.4 | 46.7 | +0.7  | Line |



Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC  
Customer: **Itron, Inc.**  
Specification: **RSS GEN 8.8 AC Power Line Conducted Emission Limit - Average**  
Work Order #: **102014** Date: 12/11/2018  
Test Type: **Conducted Emissions** Time: 11:10:51  
Tested By: Steven Pittsford Sequence#: 10  
Software: EMITest 5.03.11 115VAC 60Hz

***Equipment Tested:***

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

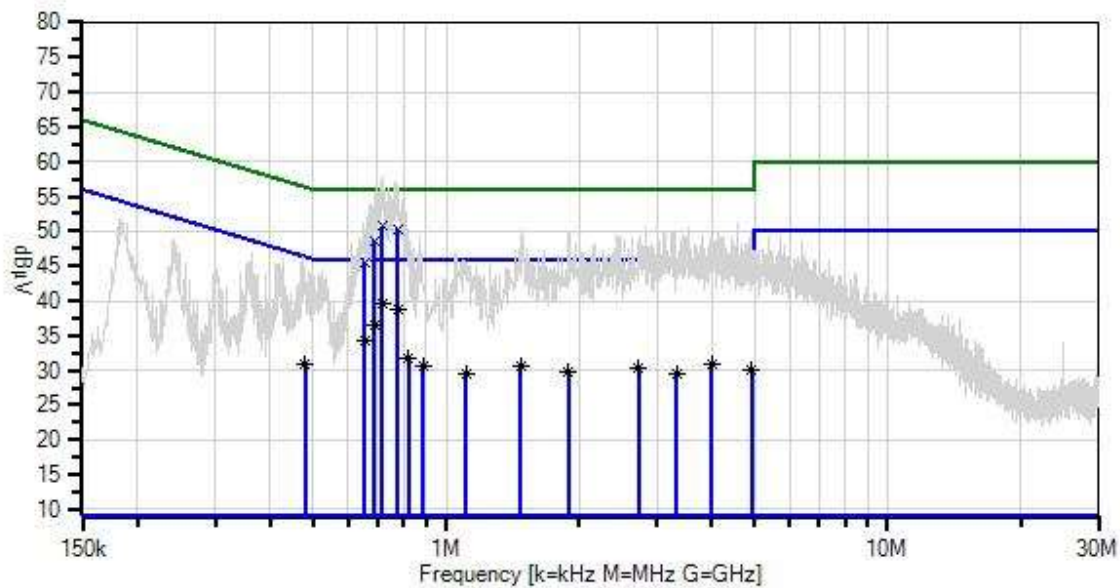
***Support Equipment:***

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 1 |              |         |     |

***Test Conditions / Notes:***

|  |
|--|
| Temperature: 22°C<br>Humidity: 33%<br>Pressure: 101.4kPa<br><br>Frequency Range: 0.15-30MHz<br><br>Frequency tested: 908MHz<br>Firmware power setting: Low Power<br>Protocol /MCS/Modulation: FSK<br><br>Duty Cycle: 100% (Test Mode)<br><br>Test Mode: Continuously transmitting<br>Test Setup: EUT connected to USB AC Adapter via USB cable. USB AC Adapter connected to AC mains through LISN.<br>Modifications Added: None<br>Test Method: ANSI C63.10 (2013) |
|--|

Ittron, Inc WO#: 102014 Sequence#: 10 Date: 12/11/2018  
RSS GEN 8.8 AC Power Line Conducted Emission Limit - Average Test Lead: 115VAC 60Hz Neutral



— Sweep Data  
 x QP Readings  
 Software Version: 5.03.11

— Readings  
 \* Average Readings  
 — 1 - 15.207 AC Mains - Average

○ Peak Readings  
 ▼ Ambient  
 — 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

| ID | Asset #  | Description         | Model               | Calibration Date | Cal Due Date |
|----|----------|---------------------|---------------------|------------------|--------------|
| T1 | ANP06219 | Attenuator          | 768-10              | 4/13/2018        | 4/13/2020    |
| T2 | ANP06515 | Cable               | Heliac              | 6/29/2018        | 6/29/2020    |
| T3 | ANP06540 | Cable               | Heliac              | 10/30/2017       | 10/30/2019   |
|    | AN01311  | 50uH LISN-Line1 (L) | 3816/2              | 3/16/2018        | 3/16/2020    |
| T4 | AN01311  | 50uH LISN-Line2 (N) | 3816/2              | 3/16/2018        | 3/16/2020    |
|    | AN02673  | Spectrum Analyzer   | E4446A              | 2/3/2017         | 2/3/2019     |
| T5 | AN02611  | High Pass Filter    | HE9615-150K-50-720B | 1/15/2018        | 1/15/2020    |

**Measurement Data:**

Reading listed by margin.

Test Lead: Neutral

| #  | Freq     | Rdng | T1<br>T5     | T2   | T3   | T4   | Dist  | Corr | Spec | Margin | Polar |
|----|----------|------|--------------|------|------|------|-------|------|------|--------|-------|
|    | MHz      | dBμV | dB           | dB   | dB   | dB   | Table | dBμV | dBμV | dB     | Ant   |
| 1  | 717.100k | 41.1 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 50.7 | 56.0 | -5.3   | Neutr |
|    | QP       |      |              |      |      |      |       |      |      |        |       |
| 2  | 779.000k | 40.7 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 50.3 | 56.0 | -5.7   | Neutr |
|    | QP       |      |              |      |      |      |       |      |      |        |       |
| 3  | 717.100k | 30.0 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 39.6 | 46.0 | -6.4   | Neutr |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 717.100k | 49.0 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 58.6 | 46.0 | +12.6  | Neutr |
|    |          |      |              |      |      |      |       |      |      |        |       |
| 5  | 779.000k | 29.1 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 38.7 | 46.0 | -7.3   | Neutr |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 779.000k | 47.6 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 57.2 | 46.0 | +11.2  | Neutr |
|    |          |      |              |      |      |      |       |      |      |        |       |
| 7  | 688.700k | 39.0 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 48.6 | 56.0 | -7.4   | Neutr |
|    | QP       |      |              |      |      |      |       |      |      |        |       |
| 8  | 688.700k | 26.9 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 36.5 | 46.0 | -9.5   | Neutr |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 688.700k | 45.0 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 54.6 | 46.0 | +8.6   | Neutr |
|    |          |      |              |      |      |      |       |      |      |        |       |
| 10 | 653.400k | 35.9 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.4 | +0.0  | 45.6 | 56.0 | -10.4  | Neutr |
|    | QP       |      |              |      |      |      |       |      |      |        |       |
| 11 | 653.400k | 24.4 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.4 | +0.0  | 34.1 | 46.0 | -11.9  | Neutr |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 653.400k | 43.0 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.4 | +0.0  | 52.7 | 46.0 | +6.7   | Neutr |
|    |          |      |              |      |      |      |       |      |      |        |       |
| 13 | 820.600k | 22.2 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 31.8 | 46.0 | -14.2  | Neutr |
|    | Ave      |      |              |      |      |      |       |      |      |        |       |
| ^  | 820.600k | 40.2 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0  | 49.8 | 46.0 | +3.8   | Neutr |
|    |          |      |              |      |      |      |       |      |      |        |       |

|    |          |      |              |      |      |      |      |      |      |       |       |
|----|----------|------|--------------|------|------|------|------|------|------|-------|-------|
| 15 | 3.998M   | 21.3 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 30.9 | 46.0 | -15.1 | Neutr |
| ^  | 3.998M   | 40.5 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 50.1 | 46.0 | +4.1  | Neutr |
| 17 | 1.471M   | 21.1 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 30.7 | 46.0 | -15.3 | Neutr |
| ^  | 1.471M   | 41.6 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 51.2 | 46.0 | +5.2  | Neutr |
| 19 | 888.800k | 21.0 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0 | 30.6 | 46.0 | -15.4 | Neutr |
| ^  | 888.800k | 39.1 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0 | 48.7 | 46.0 | +2.7  | Neutr |
| 21 | 479.800k | 21.1 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.4 | +0.0 | 30.8 | 46.3 | -15.5 | Neutr |
| ^  | 479.800k | 37.3 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.4 | +0.0 | 47.0 | 46.3 | +0.7  | Neutr |
| 23 | 2.726M   | 20.8 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 30.4 | 46.0 | -15.6 | Neutr |
| ^  | 2.726M   | 41.3 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 50.9 | 46.0 | +4.9  | Neutr |
| 25 | 4.916M   | 20.4 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 30.0 | 46.0 | -16.0 | Neutr |
| ^  | 4.916M   | 40.7 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 50.3 | 46.0 | +4.3  | Neutr |
| 27 | 1.890M   | 20.2 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 29.8 | 46.0 | -16.2 | Neutr |
| ^  | 1.890M   | 41.7 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 51.3 | 46.0 | +5.3  | Neutr |
| 29 | 3.323M   | 20.0 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 29.6 | 46.0 | -16.4 | Neutr |
| ^  | 3.323M   | 41.5 | +9.1<br>+0.1 | +0.1 | +0.0 | +0.3 | +0.0 | 51.1 | 46.0 | +5.1  | Neutr |
| 31 | 1.112M   | 20.0 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0 | 29.6 | 46.0 | -16.4 | Neutr |
| ^  | 1.112M   | 40.5 | +9.1<br>+0.2 | +0.0 | +0.0 | +0.3 | +0.0 | 50.1 | 46.0 | +4.1  | Neutr |

**Test Setup Photo(s)**





## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

| Uncertainty Value | Parameter                 |
|-------------------|---------------------------|
| 4.73 dB           | Radiated Emissions        |
| 3.34 dB           | Mains Conducted Emissions |
| 3.30 dB           | Disturbance Power         |

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ . Compliance is deemed to occur provided measurements are below the specified limits.

### Emissions Test Details

#### TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

#### CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in  $\text{dB}\mu\text{V}/\text{m}$ , the spectrum analyzer reading in  $\text{dB}\mu\text{V}$  was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

| SAMPLE CALCULATIONS |                     |                                     |
|---------------------|---------------------|-------------------------------------|
|                     | Meter reading       | ( $\text{dB}\mu\text{V}$ )          |
| +                   | Antenna Factor      | ( $\text{dB}/\text{m}$ )            |
| +                   | Cable Loss          | ( $\text{dB}$ )                     |
| -                   | Distance Correction | ( $\text{dB}$ )                     |
| -                   | Preamplifier Gain   | ( $\text{dB}$ )                     |
| =                   | Corrected Reading   | ( $\text{dB}\mu\text{V}/\text{m}$ ) |

## TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

| MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE |                     |                  |                   |
|--|---------------------|------------------|-------------------|
| TEST   | BEGINNING FREQUENCY | ENDING FREQUENCY | BANDWIDTH SETTING |
| CONDUCTED EMISSIONS  | 150 kHz             | 30 MHz           | 9 kHz             |
| RADIATED EMISSIONS   | 9 kHz               | 150 kHz          | 200 Hz            |
| RADIATED EMISSIONS   | 150 kHz             | 30 MHz           | 9 kHz             |
| RADIATED EMISSIONS   | 30 MHz              | 1000 MHz         | 120 kHz           |
| RADIATED EMISSIONS   | 1000 MHz            | >1 GHz           | 1 MHz             |

## SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

### Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

### Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

### Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.