

# ltron, Inc.

## TEST REPORT FOR

**Gas Endpoint  
Model: Intelis-Gas**

### Tested to The Following Standards:

**FCC Part 15 Subpart C Section(s)**

**15.207 & 15.247  
(FHSS AND HYBRID 902-928 MHz)**

**Report No.: 101080-26**

**Date of issue: December 24, 2018**



**Test Certificate # 803.02**

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: 163788

**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: 101080

November 19, 2018

November 19-20, 2018

### 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.  
110 Olinda Place  
Brea, CA 92823

## Software Versions

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

## Site Registration & Accreditation Information

| Location   | NIST CB # | TAIWAN         | CANADA  | FCC    | JAPAN  |
|------------|-----------|----------------|---------|--------|--------|
| Brea A, CA | US0060    | SL2-IN-E-1146R | 3082D-1 | US1025 | A-0147 |

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part 15 Subpart C - 15.247 (FHSS 902-928MHz)

| Test Procedure              | Description                        | Modifications | Results |
|-----------------------------|------------------------------------|---------------|---------|
| 15.247(a)(1)(i)             | Occupied Bandwidth                 | NA            | Pass    |
| 15.247(a)(1)                | Carrier Separation                 | NA            | Pass    |
| 15.247(a)(1)(i)             | Number of Hopping Channels         | NA            | Pass    |
| 15.247(a)(1)(iii)/15.247(f) | Average Time of Occupancy          | NA            | NP      |
| 15.247 (f)                  | Hybrid Systems                     | NA            | Pass    |
| 15.247(f)                   | Power Spectral Density             | NA            | Pass    |
| 15.247(b)(2)                | Output Power                       | NA            | Pass    |
| 15.247(d)                   | RF Conducted Emissions & Band Edge | NA            | Pass    |
| 15.247(d)                   | Radiated Emissions & Band Edge     | NA            | Pass    |
| 15.207                      | AC Conducted Emissions             | NA            | NA1     |

NA = Not Applicable

NA1 = Not applicable because the EUT operates on battery power.

NP = CKC Laboratories was not contracted to perform test. See Manufacturer Declaration in Average Time of Occupancy section.

#### 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         |
|--------------|--------------|-------------|-------------|
| Gas Endpoint | Itron, Inc.  | Intelis-Gas | 101080-cond |

#### *Support Equipment:*

| Device                | Manufacturer | Model #        | S/N    |
|-----------------------|--------------|----------------|--------|
| Laptop                | Dell         | Latitude E6410 | NA     |
| Laptop AC/DC Adapter  | Dell         | LA65NS0-00     | NA     |
| USB to Serial Adapter | Itron, Inc.  | PCB-TEMP-0007  | NA     |
| Power Supply          | Topward      | 6306D          | 988614 |

### Configuration 2

#### *Equipment Tested:*

| Device       | Manufacturer | Model #     | S/N        |
|--------------|--------------|-------------|------------|
| Gas Endpoint | Itron, Inc.  | Intelis-Gas | 101080-rad |

#### *Support Equipment:*

| Device                | Manufacturer | Model #        | S/N |
|-----------------------|--------------|----------------|-----|
| Laptop                | Dell         | Latitude E6410 | NA  |
| Laptop AC/DC Adapter  | Dell         | LA65NS0-00     | NA  |
| USB to Serial Adapter | Itron, Inc.  | PCB-TEMP-0007  | NA  |

## General Product Information:

| Product Information                | Manufacturer-Provided Details                                                                                                                              |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment Type:                    | Stand-Alone Equipment                                                                                                                                      |
| Type of Wideband System:           | Proprietary FHSS                                                                                                                                           |
| Operating Frequency Range:         | 902.3 to 926.9MHz (100kbps FSK power level 3)<br>902.4 to 927.6 MHz (300kbps GFSK/Hybrid power level 2)<br>902.4 to 927.6 MHz (300kbps GFSK power level 3) |
| Number of Hopping Channels:        | 83 (100kbps FSK)<br>64 (300kbps GFSK)                                                                                                                      |
| Modulation Type(s):                | 100kbps FSK<br>300kbps GFSK<br>300kbps GFSK Hybrid                                                                                                         |
| Maximum Duty Cycle:                | 100%                                                                                                                                                       |
| Number of TX Chains:               | 1                                                                                                                                                          |
| Antenna Gain:                      | 4.9 dBi Integral Omni power level 2<br>5.8 dBi integral Omni power level 3                                                                                 |
| Beamforming Type:                  | NA                                                                                                                                                         |
| Antenna Connection Type:           | Integral (External connector provided to facilitate testing)                                                                                               |
| Nominal Input Voltage:             | 6.0Vdc                                                                                                                                                     |
| Firmware / Software used for Test: | Command Line Interface (CLI) Tool 2.0.0.11                                                                                                                 |

## FCC Part 15 Subpart C

### 15.247(a) Transmitter Characteristics

| Test Setup/Conditions |                                                                                                                                                                                                                                                                                                                                                       |                |            |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|
| Test Location:        | Brea Lab A                                                                                                                                                                                                                                                                                                                                            | Test Engineer: | Don Nguyen |
| Test Method:          | ANSI C63.10 (2013)                                                                                                                                                                                                                                                                                                                                    | Test Date(s):  | 11/19/2018 |
| Configuration:        | 1                                                                                                                                                                                                                                                                                                                                                     |                |            |
| Test Setup:           | <p>The EUT is placed on test bench. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from 6.0Vdc external power supply.</p> <p>Frequency of measurement: 902.3 to 927.6MHz</p> <p>RBW=2kHz and 3.9kHz, VBW=6kHz and 12kHz</p> |                |            |

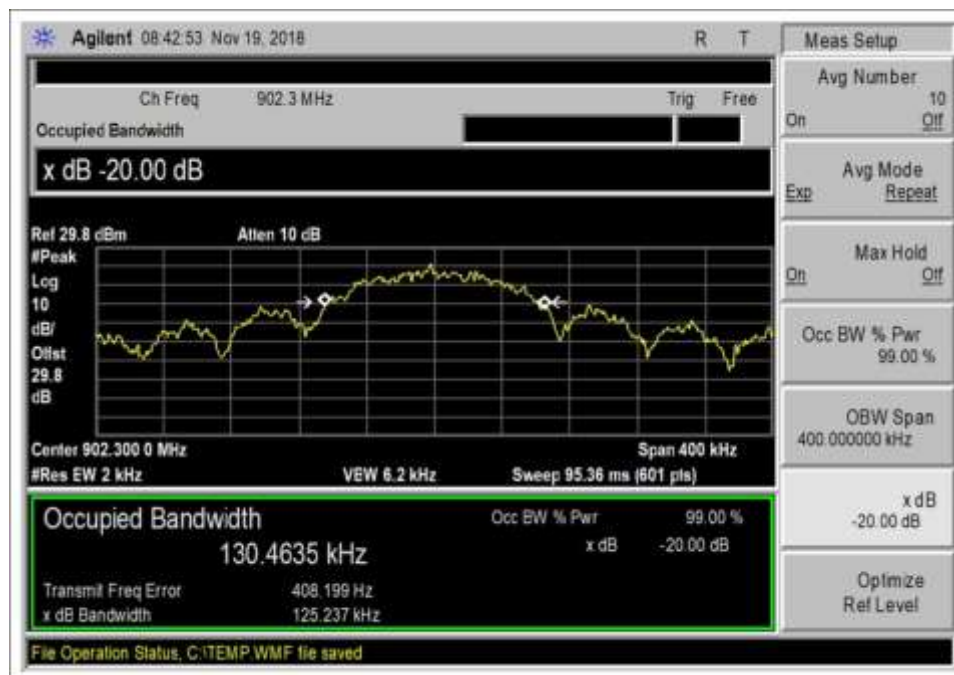
| Environmental Conditions |      |                        |      |
|--------------------------|------|------------------------|------|
| Temperature (°C)         | 21.0 | Relative Humidity (%): | 32.0 |

| Test Equipment |                   |                        |                              |            |            |
|----------------|-------------------|------------------------|------------------------------|------------|------------|
| Asset#         | Description       | Manufacturer           | Model                        | Cal Date   | Cal Due    |
| 02672          | Spectrum Analyzer | Agilent                | E4446A                       | 3/2/2017   | 3/2/2019   |
| 03432          | Attenuator        | Aeroflex/Weinsche<br>I | 90-30-34                     | 10/27/2017 | 10/27/2019 |
| P07244         | Cable             | H&S                    | 32022-29094K-<br>29094K-24TC | 7/5/2018   | 7/5/2020   |

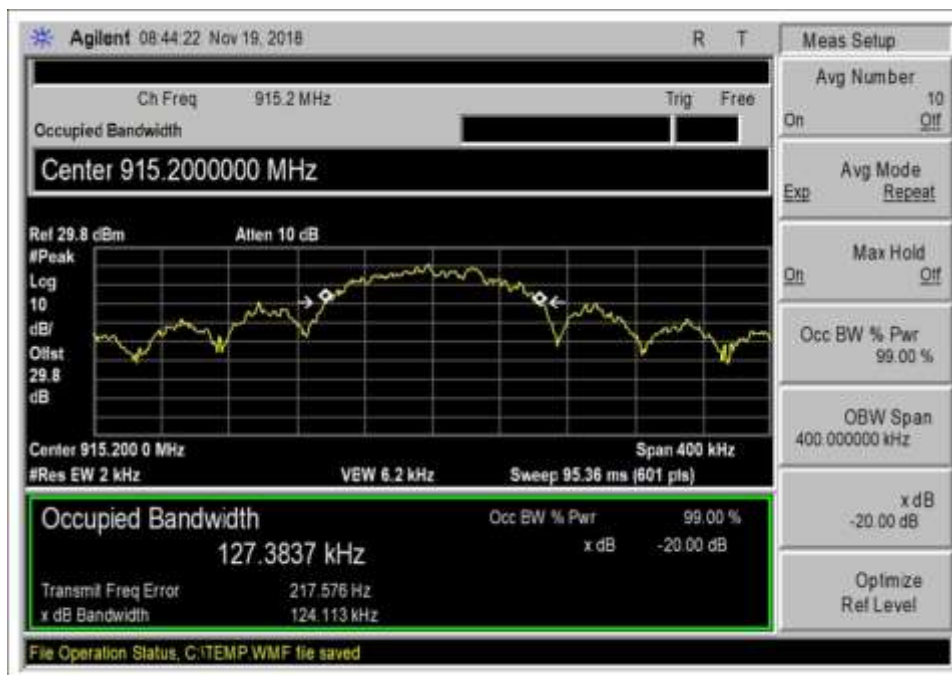
## 15.247(a)(1) 20 dB Bandwidth

| Test Data Summary |              |                       |                |             |         |
|-------------------|--------------|-----------------------|----------------|-------------|---------|
| Frequency (MHz)   | Antenna Port | Modulation            | Measured (kHz) | Limit (kHz) | Results |
| 902.3             | 1            | 100kbps FSK lv3       | 125.237        | ≤500        | Pass    |
| 914.9             | 1            | 100kbps FSK lv3       | 124.113        | ≤500        | Pass    |
| 926.9             | 1            | 100kbps FSK lv3       | 125.681        | ≤500        | Pass    |
| 902.4             | 1            | 300kbps GFSK lv2, lv3 | 364.330        | ≤500        | Pass    |
| 914.8             | 1            | 300kbps GFSK lv2, lv3 | 366.049        | ≤500        | Pass    |
| 927.6             | 1            | 300kbps GFSK lv2, lv3 | 363.954        | ≤500        | Pass    |

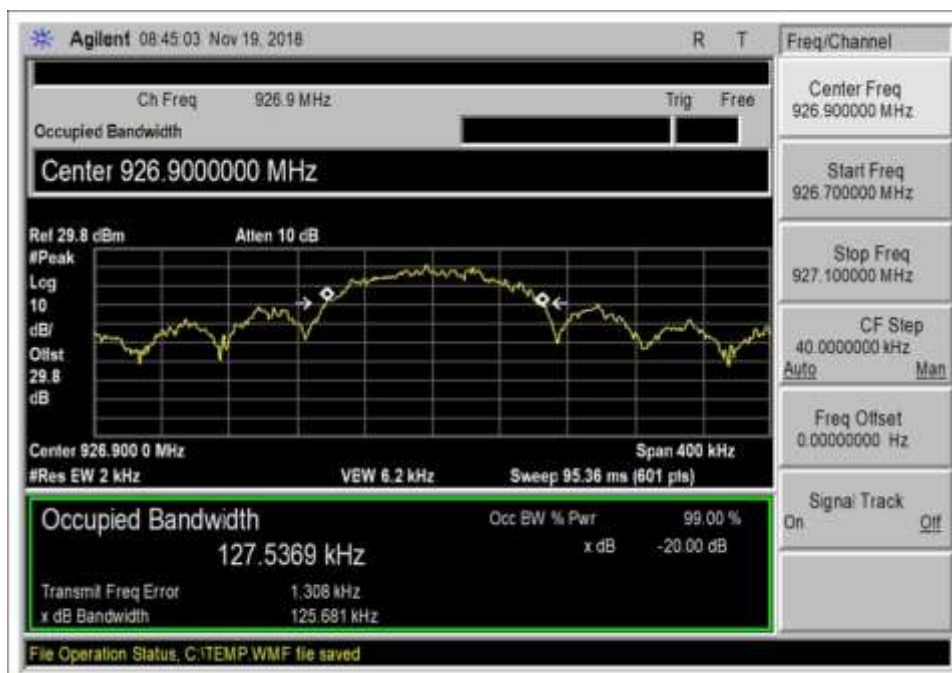
## Plots



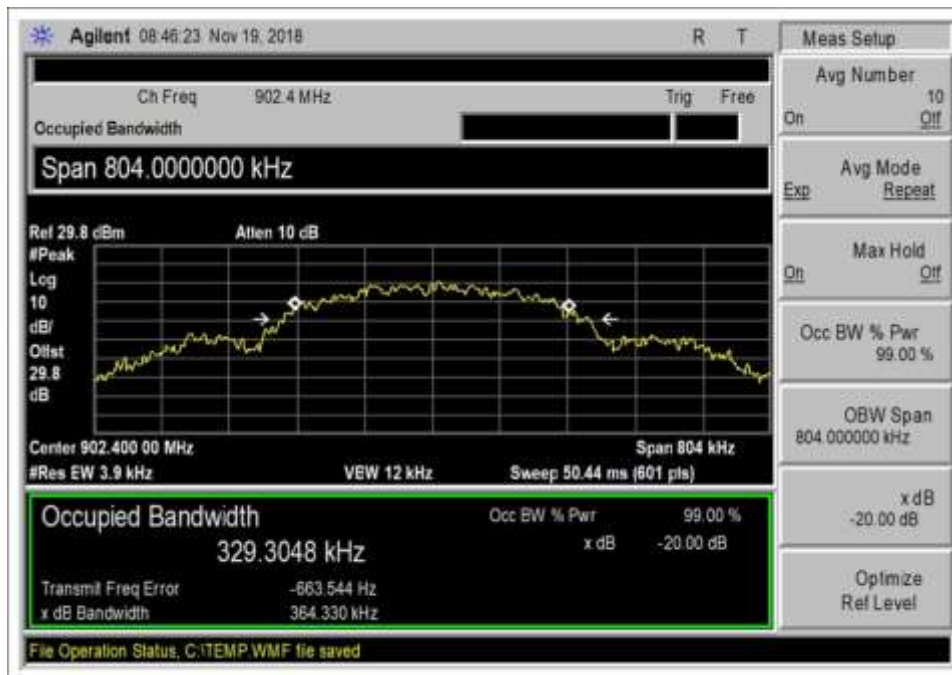
Low Channel, 100kbps, Power level 3



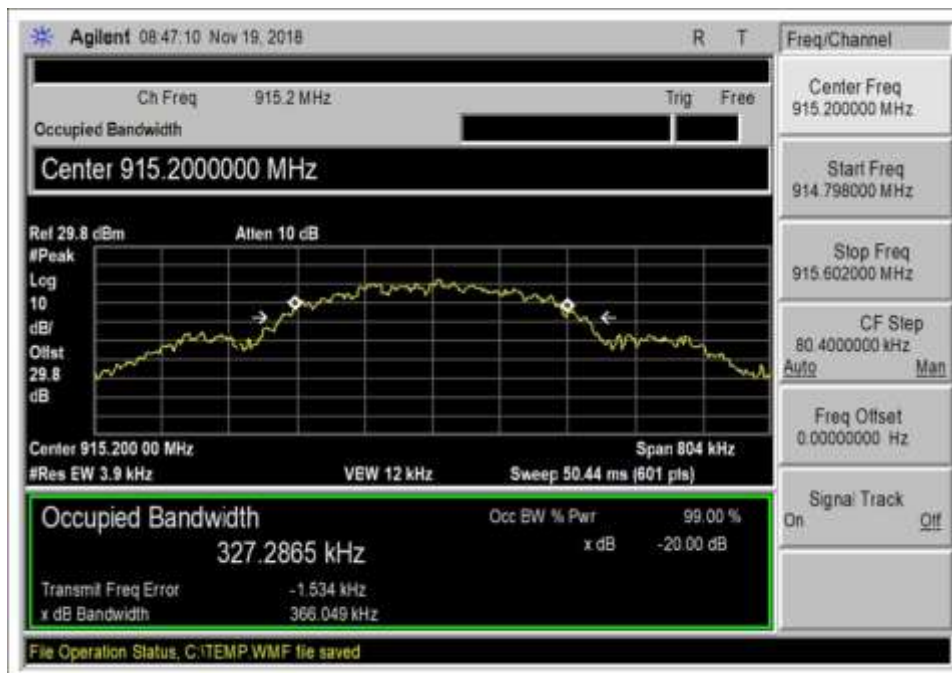
Middle Channel, 100kbps, Power level 3



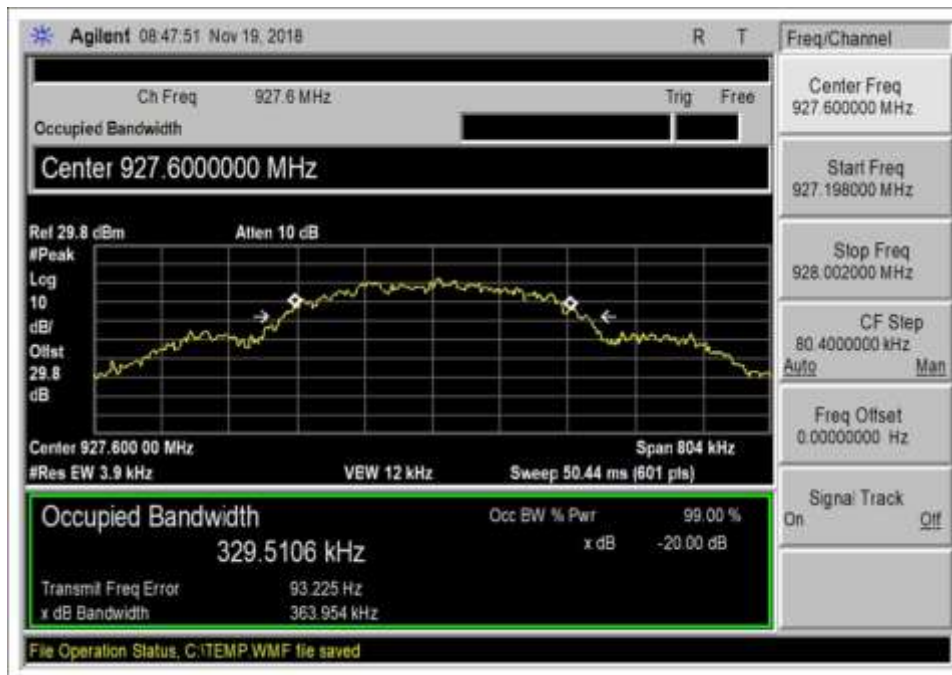
High Channel, 100kbps, Power level 3



Low Channel, 300kbps, Power level 2 and 3



Middle Channel, 300kbps, Power level 2 and 3

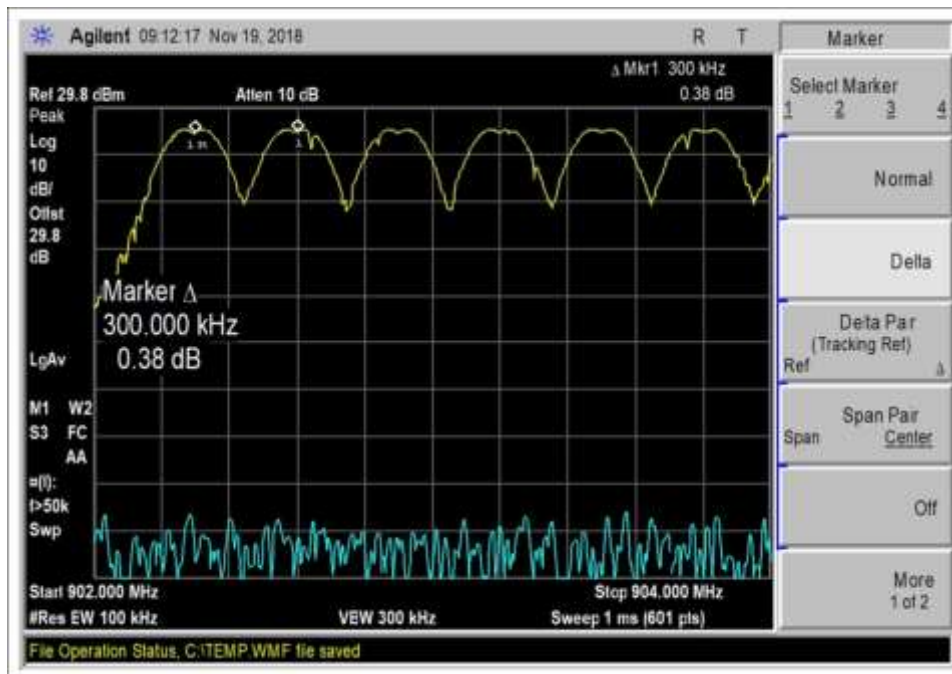


High Channel, 300kbps, Power level 2 and 3

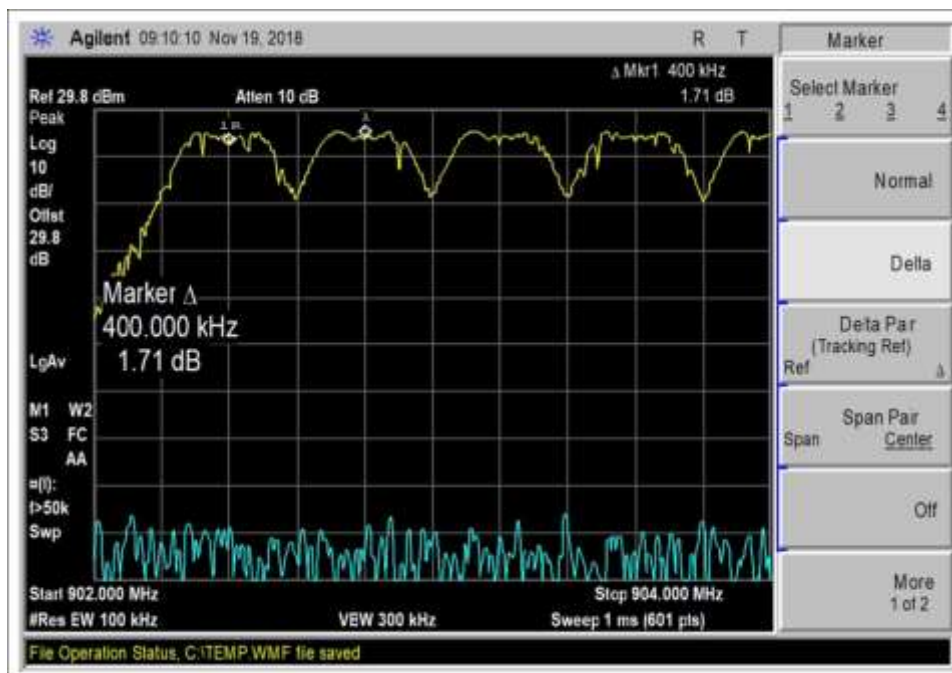
### 15.247(a)(1) Carrier Separation

| Test Data Summary                                     |                       |                |             |         |
|-------------------------------------------------------|-----------------------|----------------|-------------|---------|
| Limit applied: 20dB bandwidth of the hopping channel. |                       |                |             |         |
| Antenna Port                                          | Operational Mode      | Measured (kHz) | Limit (kHz) | Results |
| 1                                                     | 100kbps FSK lv3       | 300            | > 125.681   | Pass    |
| 1                                                     | 300kbps GFSK lv2, lv3 | 400            | > 366.049   | Pass    |

## Plots



100kbps, Power level 3

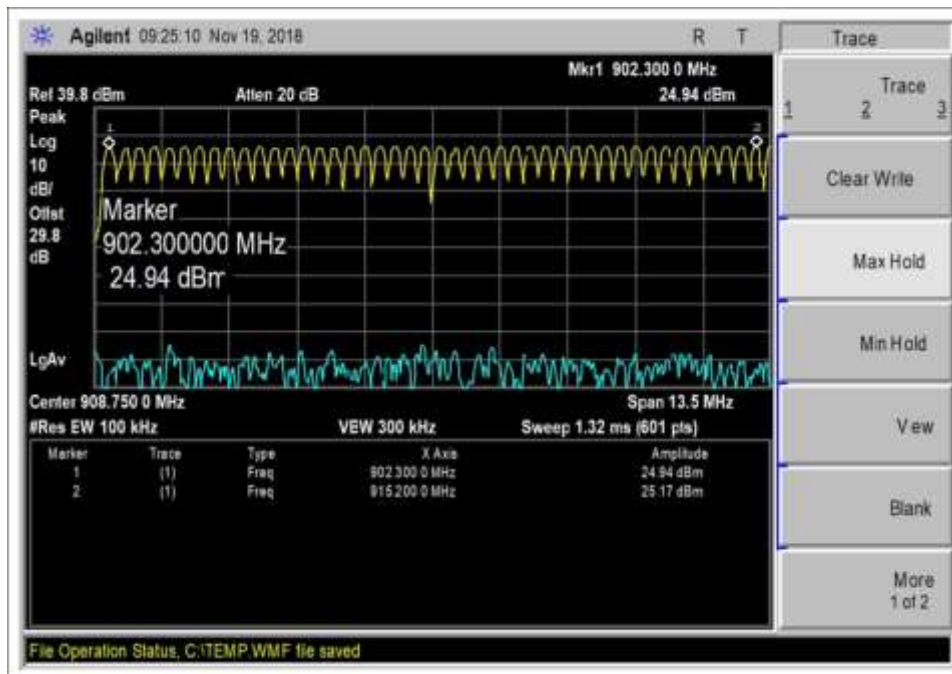


300kbps, Power level 2 and 3

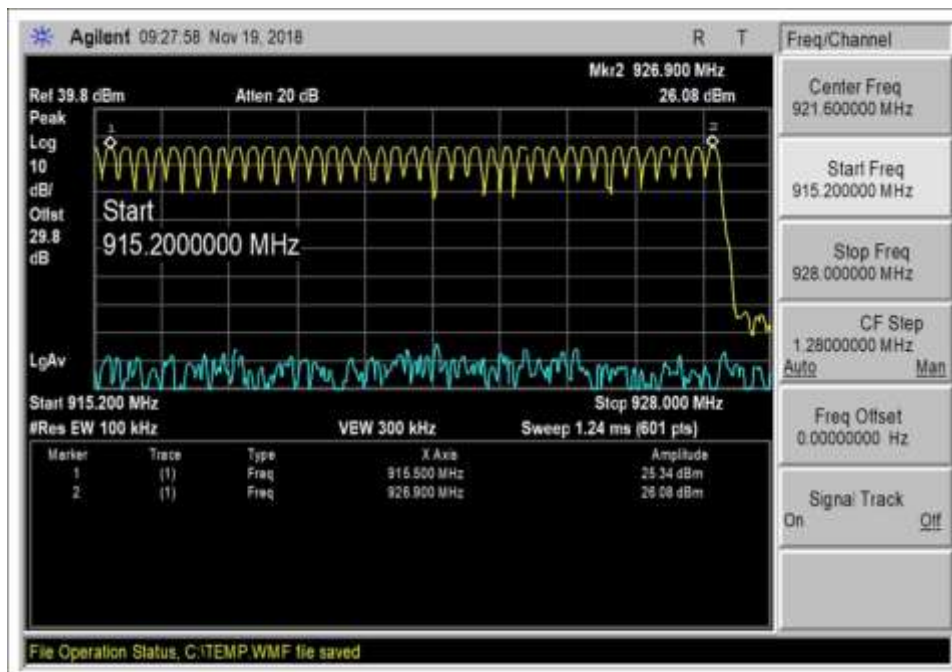
### 15.247(a)(1)(iii) Number of Hopping Channels

| Test Data Summary                                                                                                                                                  |                       |                     |                  |         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|------------------|---------|
| $\text{Limit} = \begin{cases} 50 \text{ Channels} &   20 \text{ dB BW} < 250\text{kHz} \\ 25 \text{ Channels} &   20 \text{ dB BW} \geq 250\text{kHz} \end{cases}$ |                       |                     |                  |         |
| Antenna Port                                                                                                                                                       | Operational Mode      | Measured (Channels) | Limit (Channels) | Results |
| 1                                                                                                                                                                  | 100kbps FSK lv3       | 83                  | $\geq 50$        | Pass    |
| 1                                                                                                                                                                  | 300kbps GFSK lv2, lv3 | 64                  | $\geq 25$        | Pass    |

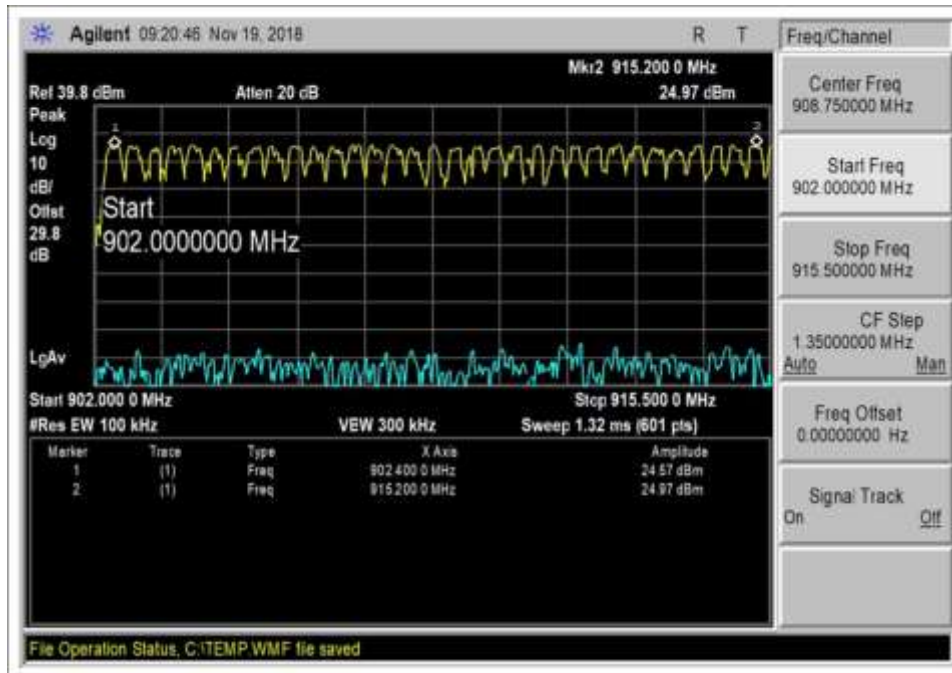
## Plots



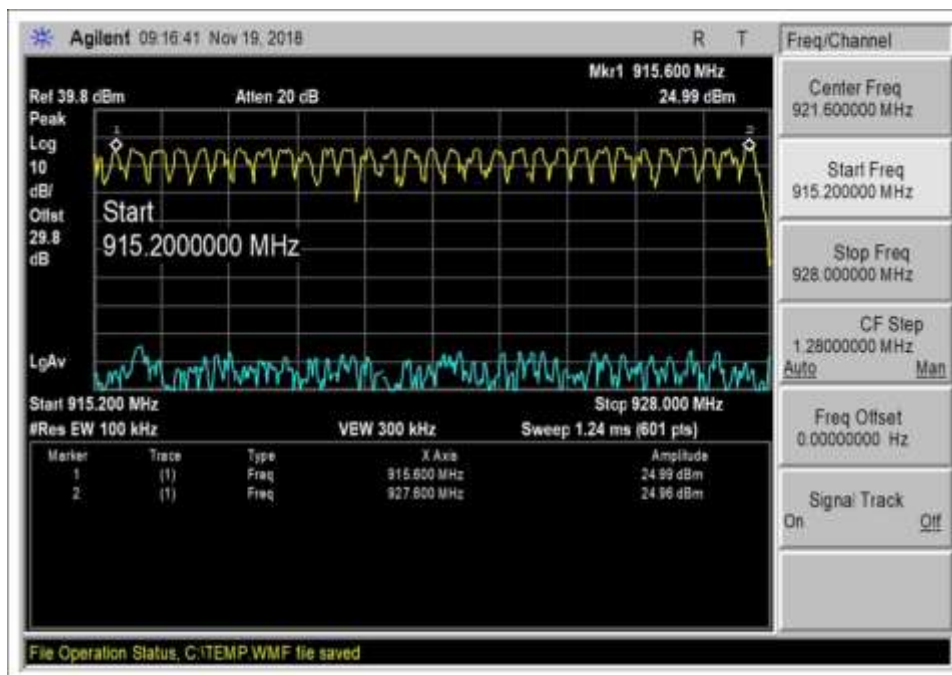
100kbps, Power level 3, #1



100kbps, Power level 3, #2



300kbps, Power level 2 and 3, #1



300kbps, Power level 2 and 3, #2

### **15.247(a)(1)(iii)/15.247(f) Time of Occupancy**

CKC laboratories was not contracted to perform the testing due to the required equipment and firmware to exercise the EUT's multiple pseudo-random hopping sequences was not available and that the complexity of the different modulations and modes depend on the device to be in a fully operating network environment.

Therefore, the manufacturer declares the following:

With the multiple modulations, modes and hop tables, the mode with the worst-case Time of Occupancy to demonstrate 400mS compliance is 399.9 mS in 20 seconds, since this modulation is less than 250kHz Occupied Band Width. Each session of multiple short transmissions takes place on channels out of a minimum of 50 channels in a pseudorandom sequence. The algorithm that determines the pseudo-random hop sequence ensures all active channels are used equally on the average.

Ittron employs hopping patterns based on pseudo-random sequence generators or pseudo-random hop tables.

The firmware uses the channels in the prescribed pseudo random order, therefore it maintains equal channel usage.

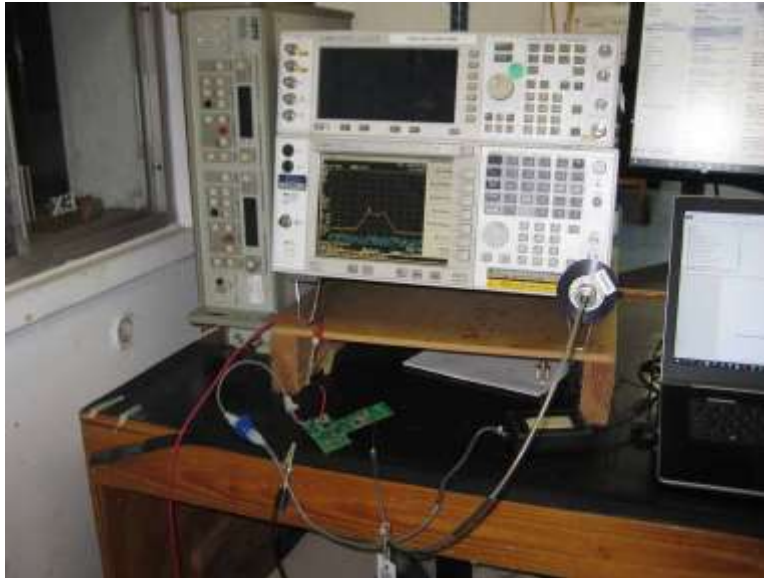
The system has receiver channel bandwidths that match the transmitter's modulation bandwidth that is enabled.

With the transmitter and receiver in synchronization within the network, transmitters switch frequencies in synchronization with the receiver.

When the transmitter needs to send a continuous or long data stream, total time of the packet transmissions is monitored to comply with dwell time requirement of 400ms in the appropriate 10s or 20s window depending on the modulation/mode enabled.

This device does not employ any hopping avoidance techniques.

Test Setup Photo



## 15.247(f) Hybrid Systems

| Test Setup/Conditions |                                                                                                                                                                                                                                                                                                                                                     |                |            |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|
| Test Location:        | Brea Lab A                                                                                                                                                                                                                                                                                                                                          | Test Engineer: | Don Nguyen |
| Test Method:          | ANSI C63.10 (2013)                                                                                                                                                                                                                                                                                                                                  | Test Date(s):  | 11/19/2018 |
| Configuration:        | 1                                                                                                                                                                                                                                                                                                                                                   |                |            |
| Test Setup:           | <p>The EUT is placed on test bench. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX at 100% duty cycle. The EUT is powered from 6.0Vdc external power supply.</p> <p>Frequency of measurement: 902.4 to 927.6MHz</p> <p>RBW=3kHz, VBW=9kHz</p> |                |            |

| Environmental Conditions |      |                        |      |
|--------------------------|------|------------------------|------|
| Temperature (°C)         | 21.0 | Relative Humidity (%): | 32.0 |

| Test Equipment |                   |                    |                          |            |            |
|----------------|-------------------|--------------------|--------------------------|------------|------------|
| Asset#         | Description       | Manufacturer       | Model                    | Cal Date   | Cal Due    |
| 02672          | Spectrum Analyzer | Agilent            | E4446A                   | 3/2/2017   | 3/2/2019   |
| 03432          | Attenuator        | Aeroflex/Weinschel | 90-30-34                 | 10/27/2017 | 10/27/2019 |
| P07244         | Cable             | H&S                | 32022-29094K-29094K-24TC | 7/5/2018   | 7/5/2020   |

## 15.247 (f) Power Spectral Density

### Power Spectral Density

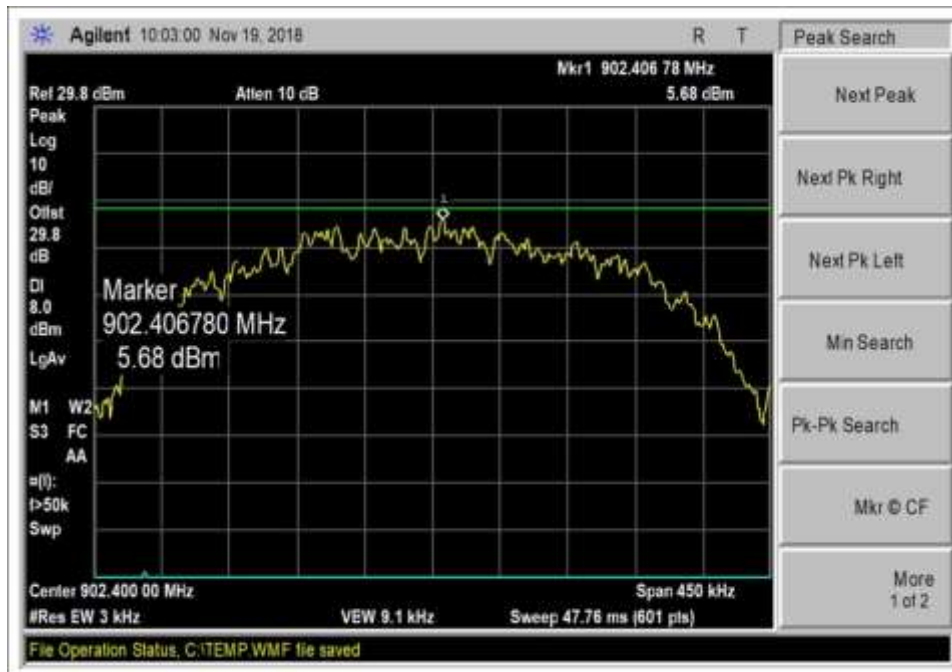
| Test Data Summary - RF Conducted Measurement |                         |                     |                  |         |
|----------------------------------------------|-------------------------|---------------------|------------------|---------|
| Measurement Method: PKPSD                    |                         |                     |                  |         |
| Frequency (MHz)                              | Modulation              | Measured (dBm/3kHz) | Limit (dBm/3kHz) | Results |
| 902.4                                        | 300kbps GFSK lv2 Hybrid | 5.68                | ≤8               | Pass    |
| 914.8                                        | 300kbps GFSK lv2 Hybrid | 6.30                | ≤8               | Pass    |
| 927.6                                        | 300kbps GFSK lv2 Hybrid | 6.89                | ≤8               | Pass    |

### 6dB Occupied Bandwidth (required for PSD measurement)

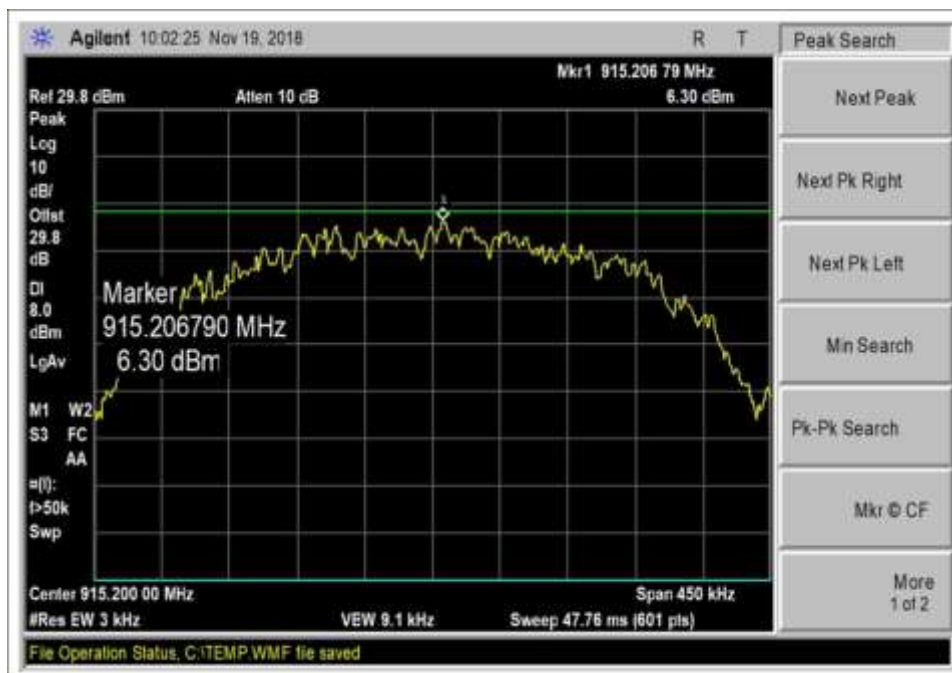
| Test Data Summary |              |                         |                |             |         |
|-------------------|--------------|-------------------------|----------------|-------------|---------|
| Frequency (MHz)   | Antenna Port | Modulation              | Measured (kHz) | Limit (kHz) | Results |
| 902.4             | 1            | 300kbps GFSK lv2 Hybrid | 309.033        | None        | Pass    |
| 914.8             | 1            | 300kbps GFSK lv2 Hybrid | 302.328        |             |         |
| 927.6             | 1            | 300kbps GFSK lv2 Hybrid | 299.909        |             |         |

## Plots

### Power Spectral Density



Low Channel

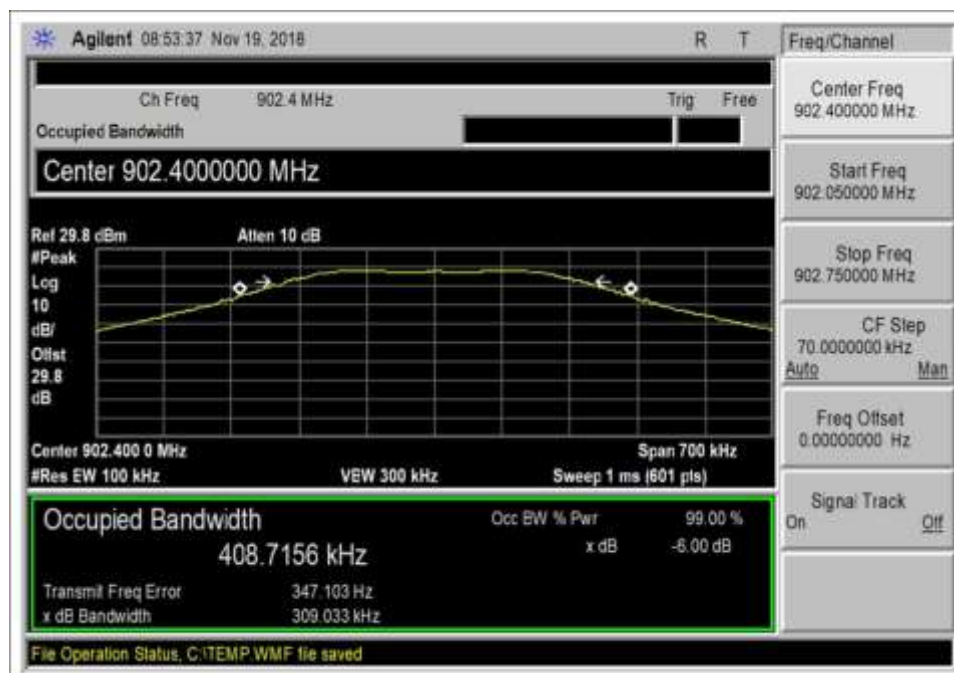


Middle Channel

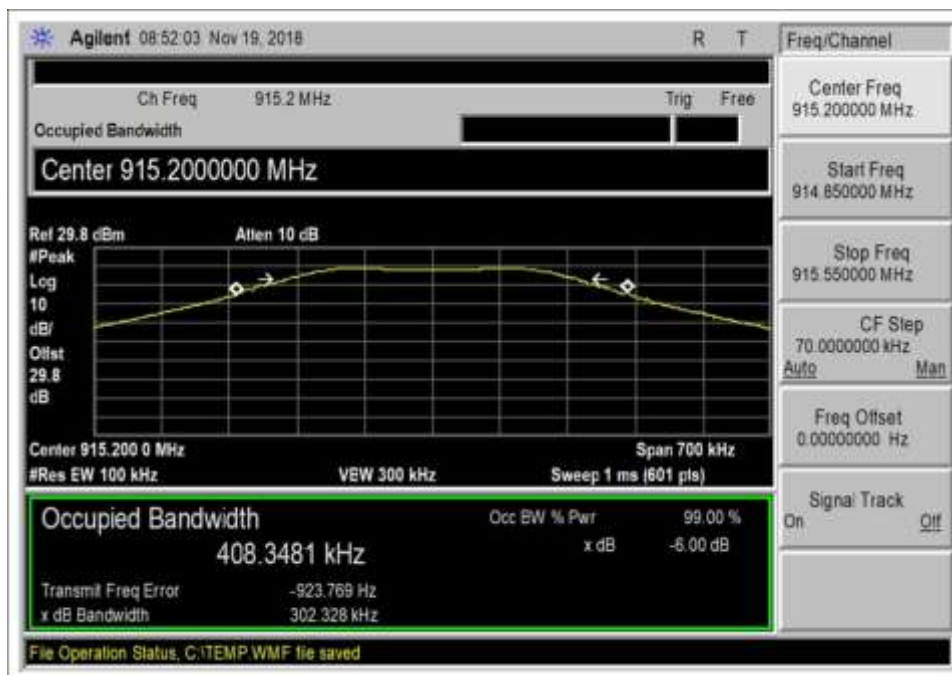


High Channel

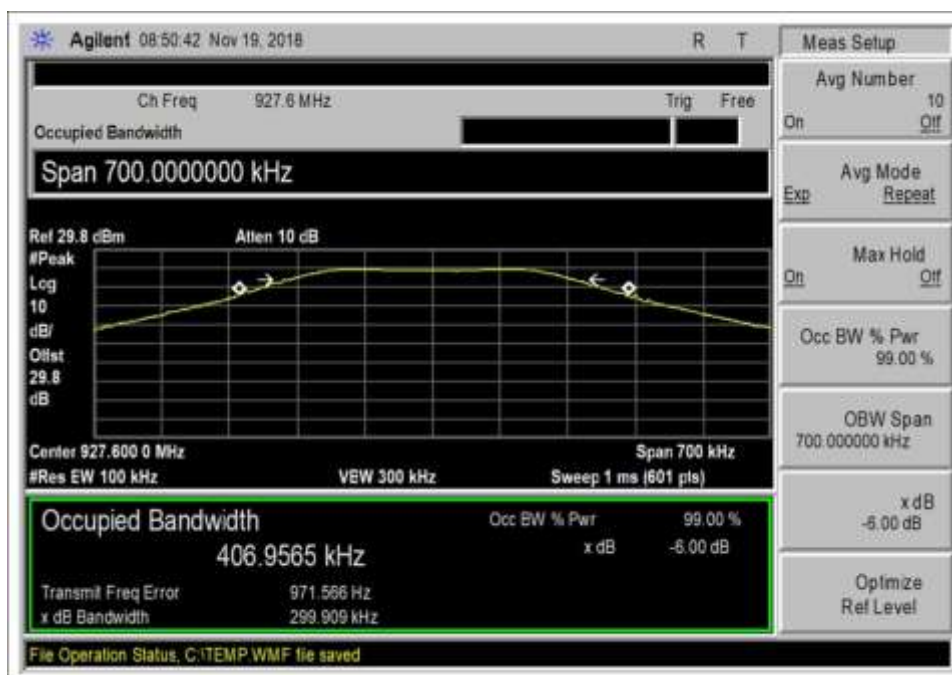
### 6dB Occupied Bandwidth



Low Channel

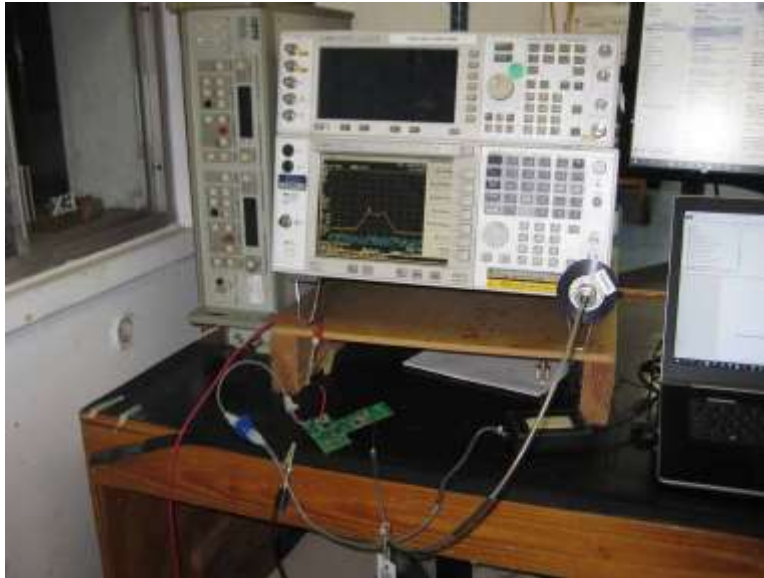


Middle Channel



High Channel

Test Setup Photo



## 15.247(b)(1) Output Power

| Test Setup/Conditions |                                                                                                                                                                                                                                                                                                                   |                |            |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|
| Test Location:        | Brea Lab A                                                                                                                                                                                                                                                                                                        | Test Engineer: | Don Nguyen |
| Test Method:          | ANSI C63.10 (2013)                                                                                                                                                                                                                                                                                                | Test Date(s):  | 11/19/2018 |
| Configuration:        | 1                                                                                                                                                                                                                                                                                                                 |                |            |
| Test Setup:           | The EUT is placed on test bench. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX. The EUT is powered from 6.0Vdc external power supply.<br>Frequency of measurement: 902.3 to 927.6MHz<br>RBW=2MHz, VBW=6MHz |                |            |

| Environmental Conditions |      |                        |      |
|--------------------------|------|------------------------|------|
| Temperature (°C)         | 22.8 | Relative Humidity (%): | 54.2 |

| Test Equipment |                   |                    |                          |            |            |
|----------------|-------------------|--------------------|--------------------------|------------|------------|
| Asset#         | Description       | Manufacturer       | Model                    | Cal Date   | Cal Due    |
| 02672          | Spectrum Analyzer | Agilent            | E4446A                   | 3/2/2017   | 3/2/2019   |
| 03432          | Attenuator        | Aeroflex/Weinschel | 90-30-34                 | 10/27/2017 | 10/27/2019 |
| P07244         | Cable             | H&S                | 32022-29094K-29094K-24TC | 7/5/2018   | 7/5/2020   |

### Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

| Parameter              | Value  |
|------------------------|--------|
| V <sub>Nominal</sub> : | 6.0Vdc |
| V <sub>Minimum</sub> : | 6.0Vdc |
| V <sub>Maximum</sub> : | 6.0Vdc |

### Test Data Summary - Voltage Variations

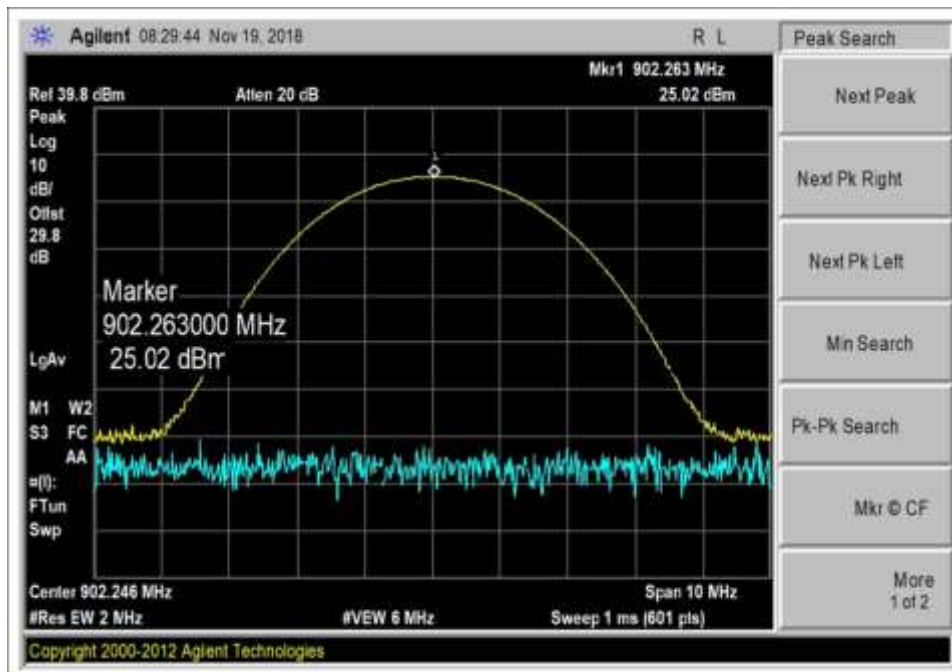
This equipment is battery powered. Power output tests were performed using a 6.0Vdc external power supply to simulate fresh battery.

### Test Data Summary - RF Conducted Measurement

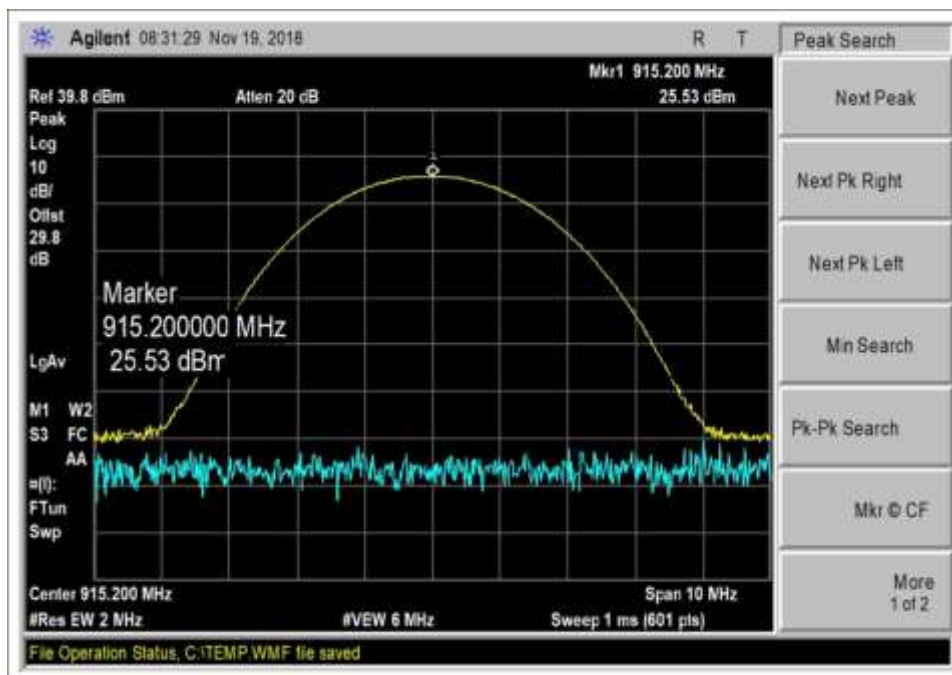
Limit =  $\begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} & | \geq 50 \text{ Channels} \\ 24\text{dBm Conducted}/30\text{dBm EIRP} & | < 50 \text{ Channels (min 25)} \end{cases}$

| Frequency (MHz) | Modulation           | Ant. Type / Max Gain (dBi) | Measured (dBm) | Limit (dBm) | Results |
|-----------------|----------------------|----------------------------|----------------|-------------|---------|
| 902.3           | 100kbps FSK pwr lv3  | Integral/5.8               | 25.02          | $\leq 30$   | Pass    |
| 914.9           | 100kbps FSK pwr lv3  | Integral/5.8               | 25.53          | $\leq 30$   | Pass    |
| 926.9           | 100kbps FSK pwr lv3  | Integral/5.8               | 25.92          | $\leq 30$   | Pass    |
| 902.4           | 300kbps GFSK pwr lv2 | Integral/4.9               | 14.10          | $\leq 30$   | Pass    |
| 914.8           | 300kbps GFSK pwr lv2 | Integral/4.9               | 14.73          | $\leq 30$   | Pass    |
| 927.6           | 300kbps GFSK pwr lv2 | Integral/4.9               | 15.35          | $\leq 30$   | Pass    |
| 902.4           | 300kbps GFSK pwr lv3 | Integral/5.8               | 25.03          | $\leq 30$   | Pass    |
| 914.8           | 300kbps GFSK pwr lv3 | Integral/5.8               | 25.52          | $\leq 30$   | Pass    |
| 927.6           | 300kbps GFSK pwr lv3 | Integral/5.8               | 25.92          | $\leq 30$   | Pass    |

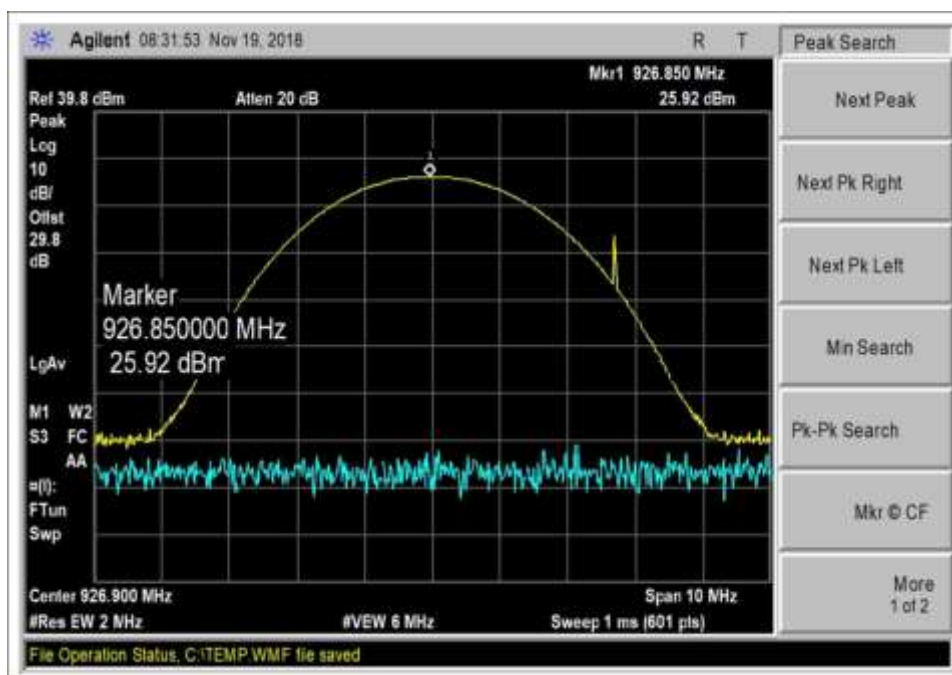
### Plots



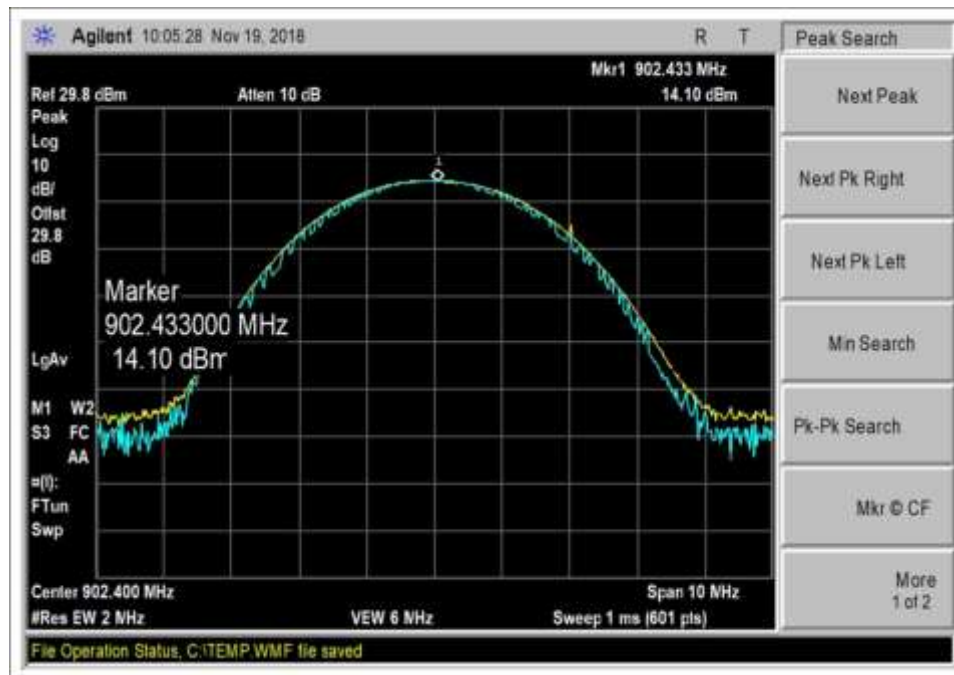
Low Channel, 100kbps, Power level 3



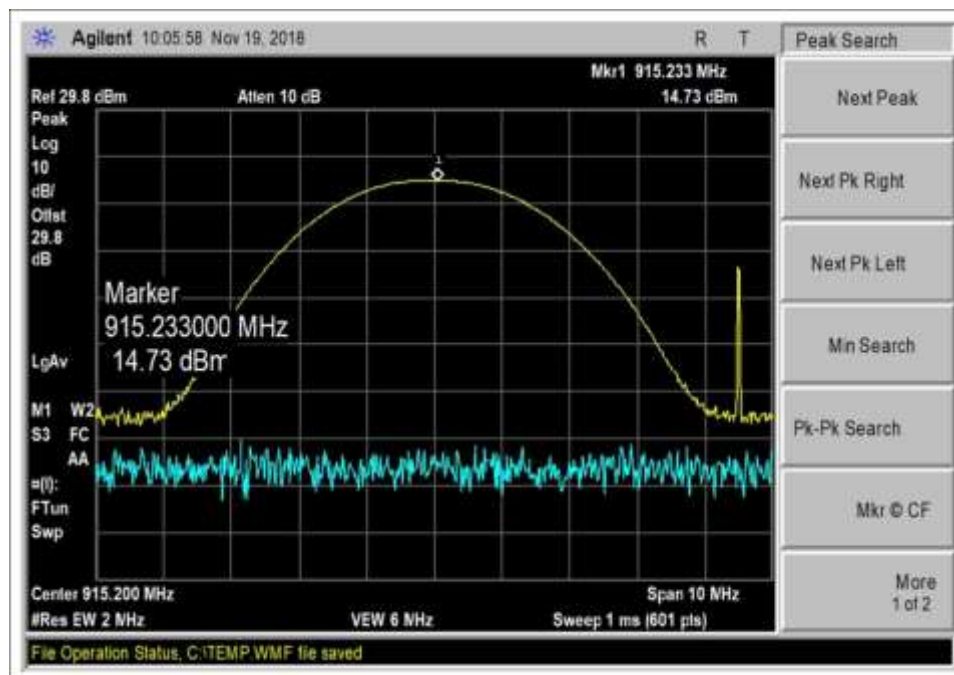
Middle Channel, 100kbps, Power level 3



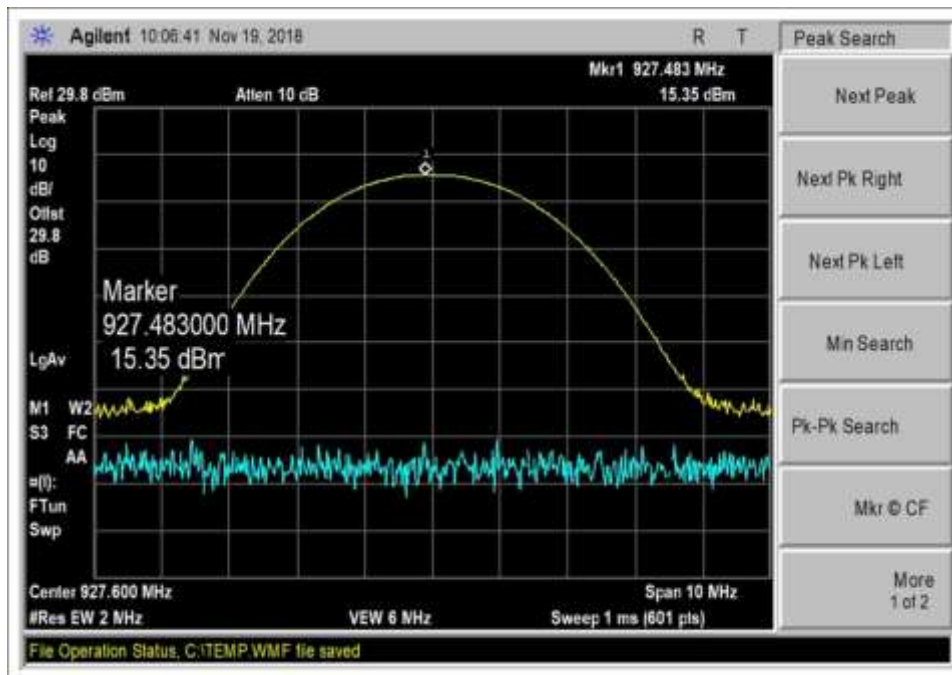
High Channel, 100kbps, Power level 3



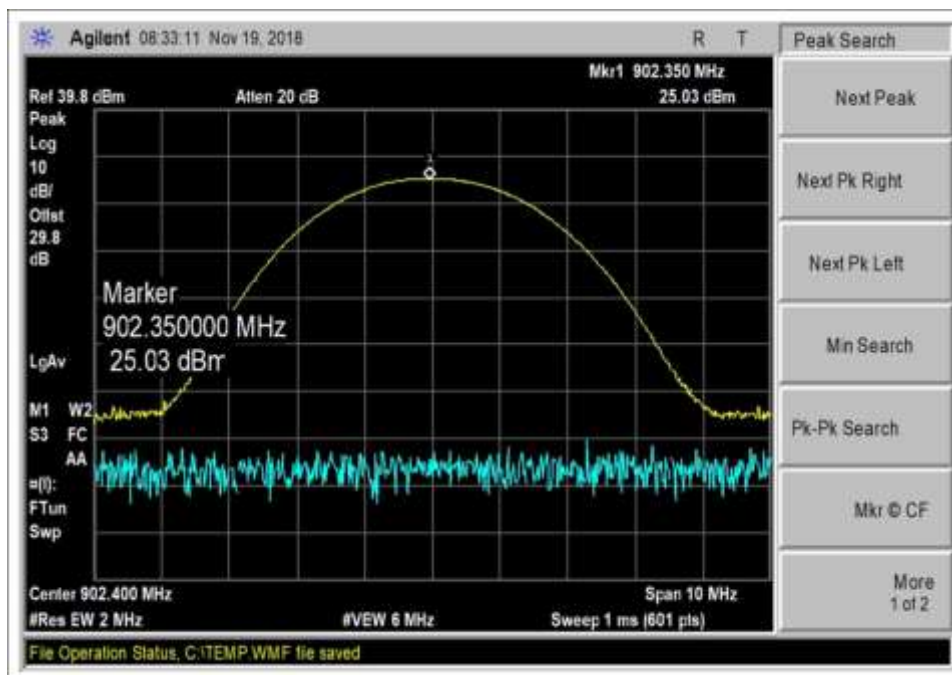
Low Channel, 300kbps, Power level 2



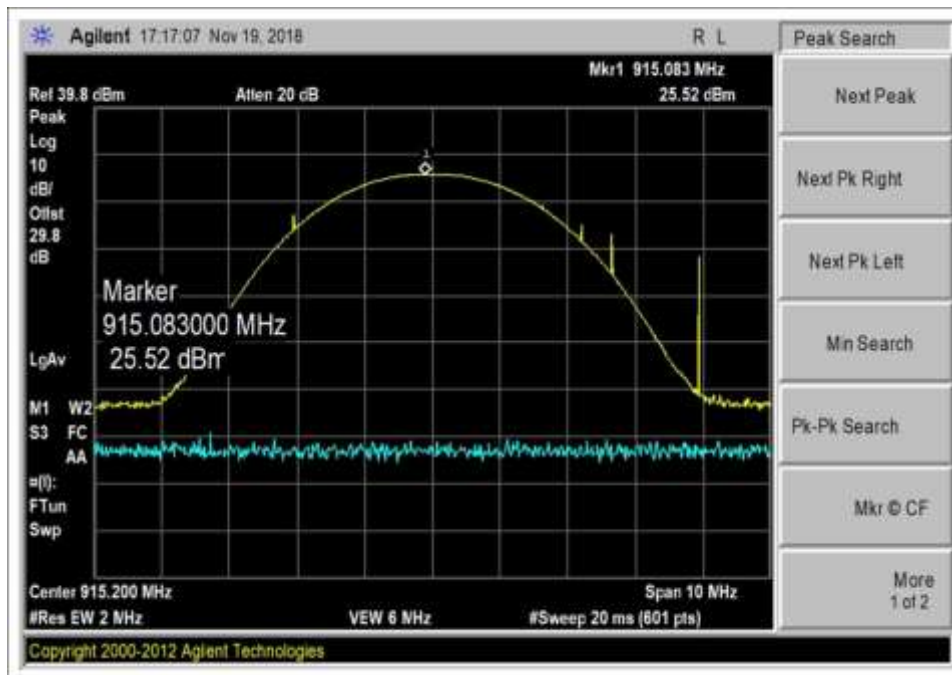
Middle Channel, 300kbps, Power level 2



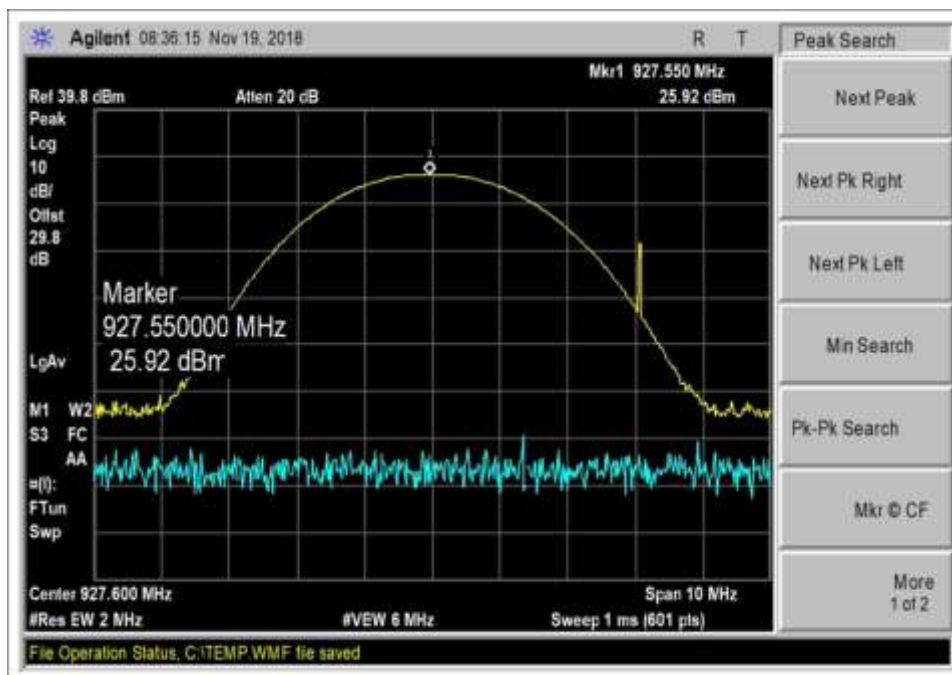
High Channel, 300kbps, Power level 2



Low Channel, 300kbps, Power level 3

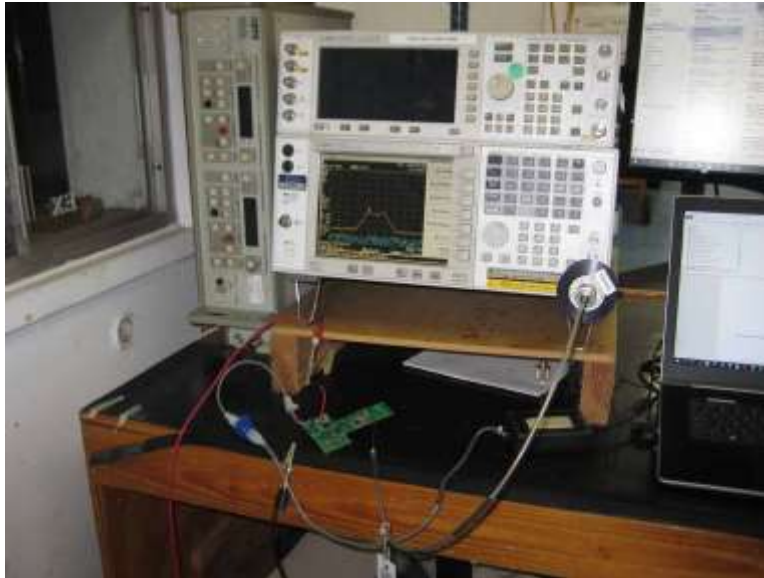


Middle Channel, 300kbps, Power level 3



High Channel, 300kbps, Power level 3

Test Setup Photo



## 15.247(d) RF Conducted Emissions & Band Edge

### Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
 Customer: **Itron, Inc.**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **101080** Date: 11/19/2018  
 Test Type: **Conducted Emissions** Time: 10:57:39  
 Tested By: Don Nguyen Sequence#: 0  
 Software: EMITest 5.03.11 6Vdc

#### Equipment Tested:

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

#### Support Equipment:

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

#### Test Conditions / Notes:

The EUT is placed on test bench. Antenna port is connected to spectrum analyzer. The laptop is connected to serial port of the EUT via USB to Serial adapter. The software CLI Tools is set to turn on TX continuously at 100% duty cycle.

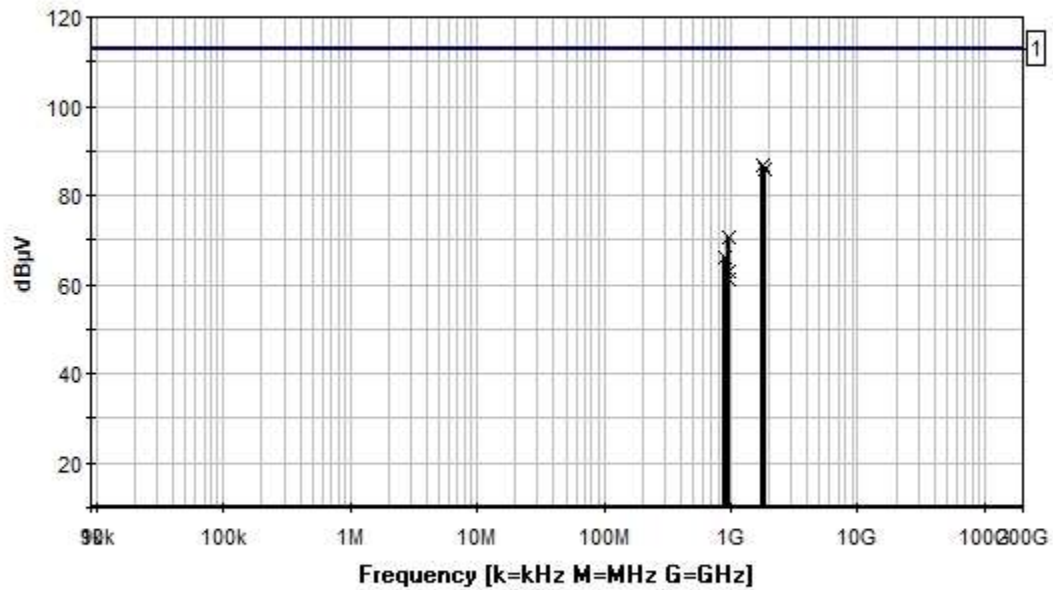
Operating frequency:  
**902.3 - 926.9, FSK, 100kpbs, power level 3**

Scanned frequency range: 9kHz-9280MHz  
 RBW=100kHz, VBW=300kHz

Test Location: Brea Lab A  
 Test Method: ANSI C63.10 (2013)

**Data represent worst case emissions.**

Itron, Inc. WO#: 101080 Sequence#: 0 Date: 11/19/2018  
 15.247(d) Conducted Spurious Emissions Test Lead: 6Vdc Antenna Port



— Readings  
 x Peak Readings

— 1 - 15.247(d) Conducted Spurious Emissions  
 Software Version: 5.03.11

**Test Equipment:**

| ID | Asset #  | Description       | Model                    | Calibration Date | Cal Due Date |
|----|----------|-------------------|--------------------------|------------------|--------------|
| T1 | AN03432  | Attenuator        | 90-30-34                 | 10/27/2017       | 10/27/2019   |
| T2 | ANP07244 | Cable             | 32022-29094K-29094K-24TC | 7/5/2018         | 7/5/2020     |
|    | AN02672  | Spectrum Analyzer | E4446A                   | 3/2/2017         | 3/2/2019     |

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

| # | Freq<br>MHz | Rdng<br>dBμV | T1<br>dB | T2<br>dB |  | Dist<br>dB | Table | Corr<br>dBμV | Spec<br>dBμV | Margin<br>dB | Polar<br>Ant |
|---|-------------|--------------|----------|----------|--|------------|-------|--------------|--------------|--------------|--------------|
| 1 | 1804.652M   | 57.0         | +29.7    | +0.2     |  |            | +0.0  | 86.9         | 112.9        | -26.0        | Anten        |
| 2 | 1830.349M   | 56.0         | +29.7    | +0.2     |  |            | +0.0  | 85.9         | 112.9        | -27.0        | Anten        |
| 3 | 1853.847M   | 55.8         | +29.7    | +0.2     |  |            | +0.0  | 85.7         | 112.9        | -27.2        | Anten        |
| 4 | 955.500M    | 40.8         | +29.6    | +0.2     |  |            | +0.0  | 70.6         | 112.9        | -42.3        | Anten        |
| 5 | 885.000M    | 36.2         | +29.6    | +0.2     |  |            | +0.0  | 66.0         | 112.9        | -46.9        | Anten        |
| 6 | 952.970M    | 33.1         | +29.6    | +0.2     |  |            | +0.0  | 62.9         | 112.9        | -50.0        | Anten        |
| 7 | 978.870M    | 31.3         | +29.6    | +0.2     |  |            | +0.0  | 61.1         | 112.9        | -51.8        | Anten        |



Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112  
Customer: **Itron, Inc.**  
Specification: **15.247(d) Conducted Spurious Emissions**  
Work Order #: **101080** Date: 11/19/2018  
Test Type: **Conducted Emissions** Time: 11:03:11  
Tested By: Don Nguyen Sequence#: 1  
Software: EMITest 5.03.11 6Vdc

***Equipment Tested:***

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

***Support Equipment:***

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

***Test Conditions / Notes:***

The EUT is placed on test bench. Antenna port is connected to spectrum analyzer. The laptop is connected to serial port of the EUT via USB to Serial adapter. The software CLI Tools is set to turn on TX continuously at 100% duty cycle.

Operating frequency:

**902.4 - 927.6, GFSK, 300kpbs, power level 2**

**902.4 - 927.6, GFSK, 300kpbs, power level 3**

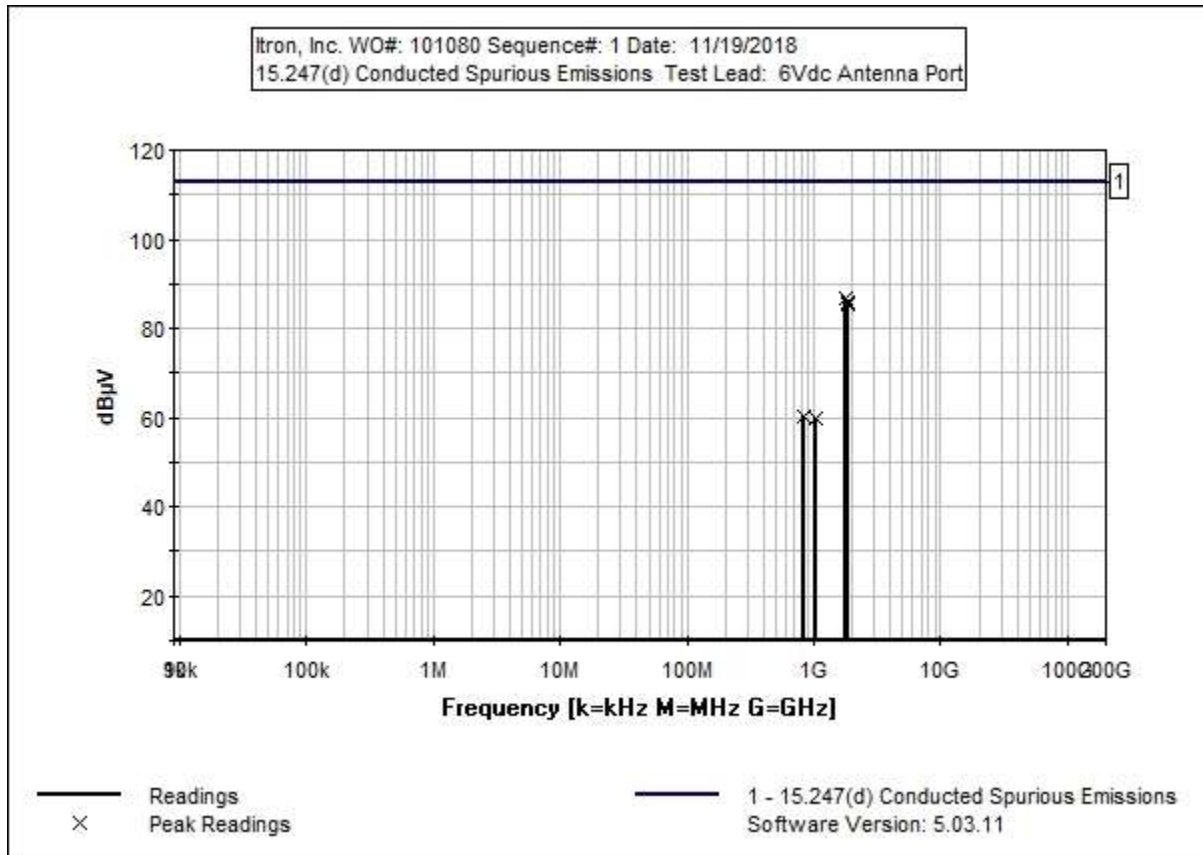
Scanned frequency range: 9kHz-9280MHz

RBW=100kHz, VBW=300kHz

Test Location: Brea Lab A

Test Method: ANSI C63.10 (2013)

**Data represent worst case emissions.**



**Test Equipment:**

| ID | Asset #  | Description       | Model                    | Calibration Date | Cal Due Date |
|----|----------|-------------------|--------------------------|------------------|--------------|
| T1 | AN03432  | Attenuator        | 90-30-34                 | 10/27/2017       | 10/27/2019   |
| T2 | ANP07244 | Cable             | 32022-29094K-29094K-24TC | 7/5/2018         | 7/5/2020     |
|    | AN02672  | Spectrum Analyzer | E4446A                   | 3/2/2017         | 3/2/2019     |

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna Port

| # | Freq<br>MHz | Rdng<br>dBμV | T1<br>dB | T2<br>dB | dB | dB | Dist<br>Table | Corr<br>dBμV | Spec<br>dBμV | Margin<br>dB | Polar<br>Ant |
|---|-------------|--------------|----------|----------|----|----|---------------|--------------|--------------|--------------|--------------|
| 1 | 1804.643M   | 56.7         | +29.7    | +0.2     |    |    | +0.0          | 86.6         | 112.9        | -26.3        | Anten        |
| 2 | 1830.243M   | 55.8         | +29.7    | +0.2     |    |    | +0.0          | 85.7         | 112.9        | -27.2        | Anten        |
| 3 | 1855.040M   | 55.7         | +29.7    | +0.2     |    |    | +0.0          | 85.6         | 112.9        | -27.3        | Anten        |
| 4 | 823.700M    | 30.6         | +29.6    | +0.2     |    |    | +0.0          | 60.4         | 112.9        | -52.5        | Anten        |
| 5 | 1031.400M   | 29.9         | +29.6    | +0.2     |    |    | +0.0          | 59.7         | 112.9        | -53.2        | Anten        |

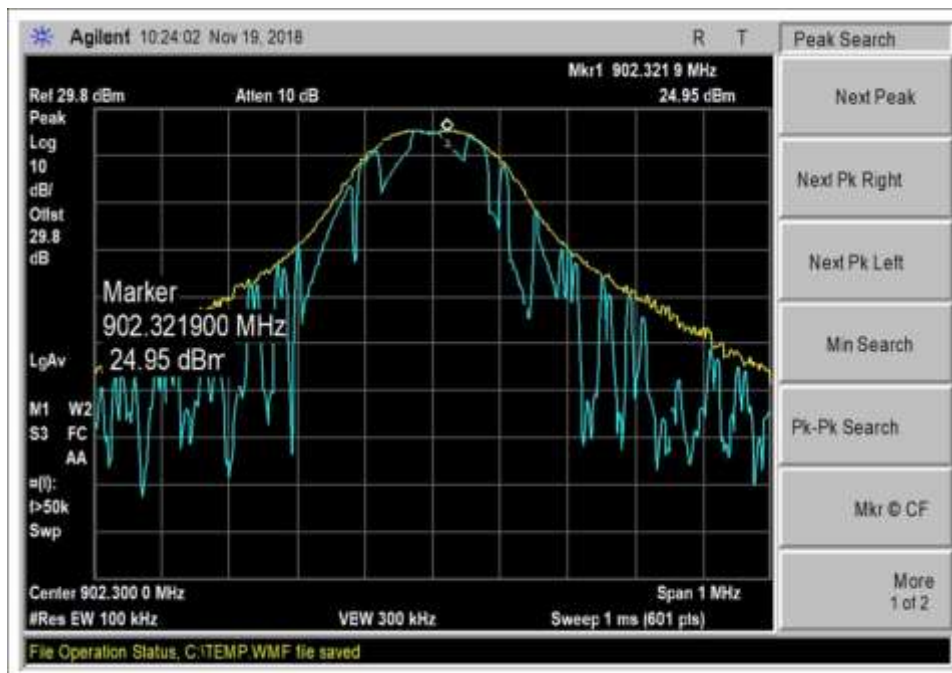
## Band Edge

### Band Edge Summary

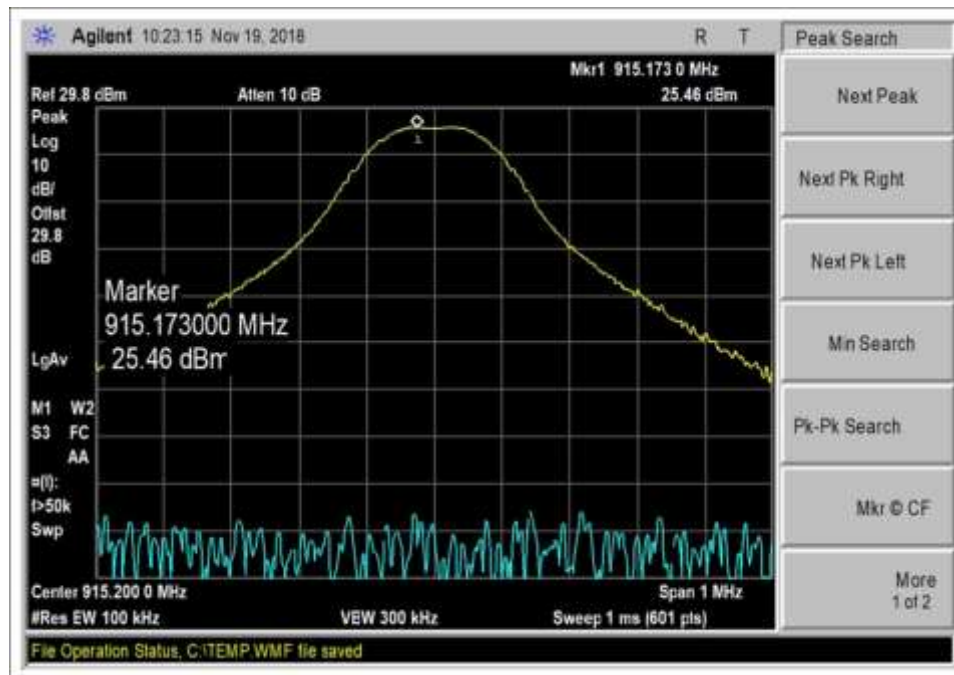
Limit applied: Max Power/100kHz - 20dB.

| Frequency (MHz) | Modulation                   | Measured (dBm) | Limit (dBm) | Results |
|-----------------|------------------------------|----------------|-------------|---------|
| 902             | 100kbps FSK pwr lv3          | -6.07          | <5.9        | Pass    |
| 928             | 100kbps FSK pwr lv3          | -35.95         | <5.9        | Pass    |
| 902             | 100kbps FSK pwr lv3 hopping  | -7.87          | <5.9        | Pass    |
| 928             | 100kbps FSK pwr lv3 hopping  | -36.81         | <5.9        | Pass    |
| 902             | 300kbps GFSK pwr lv2         | -19.07         | <-4.7       | Pass    |
| 928             | 300kbps GFSK pwr lv2         | -17.17         | <-4.7       | Pass    |
| 902             | 300kbps GFSK pwr lv2 hopping | -19.20         | <-4.7       | Pass    |
| 928             | 300kbps GFSK pwr lv2 hopping | -17.23         | <-4.7       | Pass    |
| 902             | 300kbps GFSK pwr lv3         | -8.05          | <5.9        | Pass    |
| 928             | 300kbps GFSK pwr lv3         | -6.44          | <5.9        | Pass    |
| 902             | 300kbps GFSK pwr lv3 hopping | -10.90         | <5.9        | Pass    |
| 928             | 300kbps GFSK pwr lv3 hopping | -10.79         | <5.9        | Pass    |

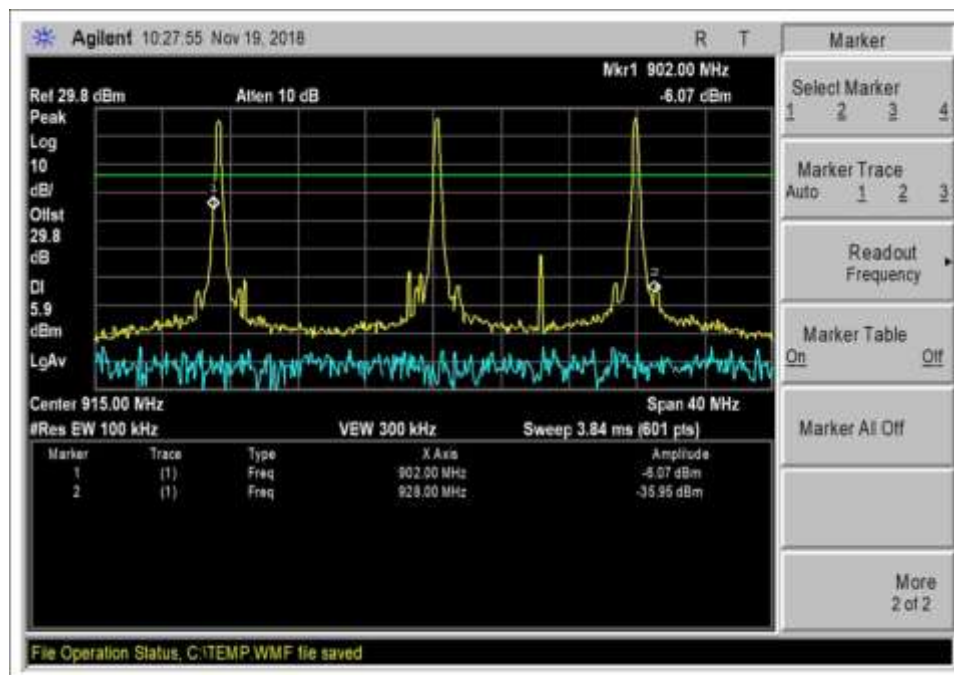
### Band Edge Plots



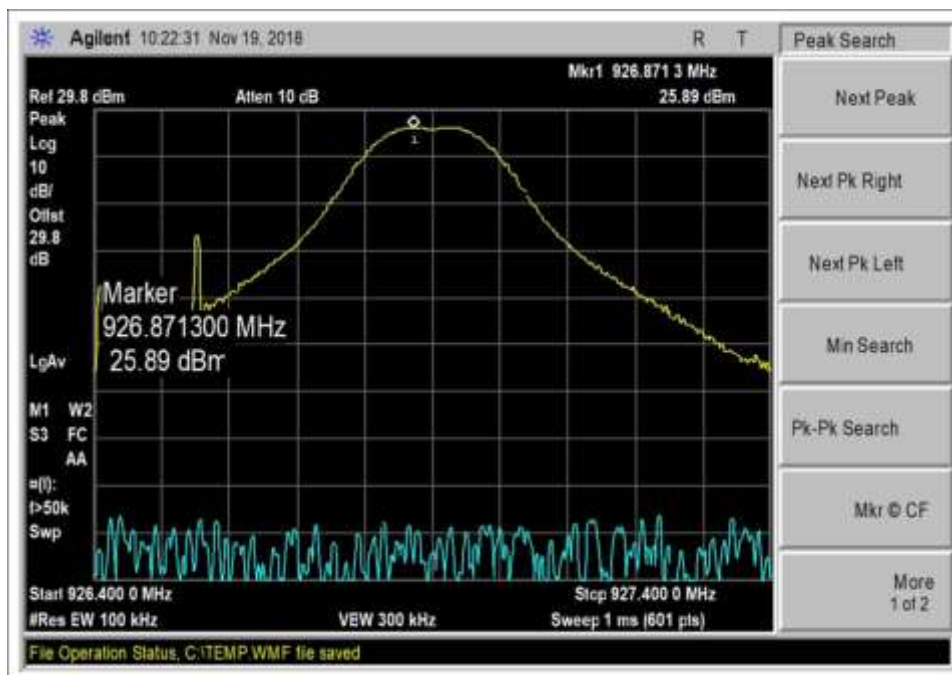
Peak, 100kbps, Power level 3



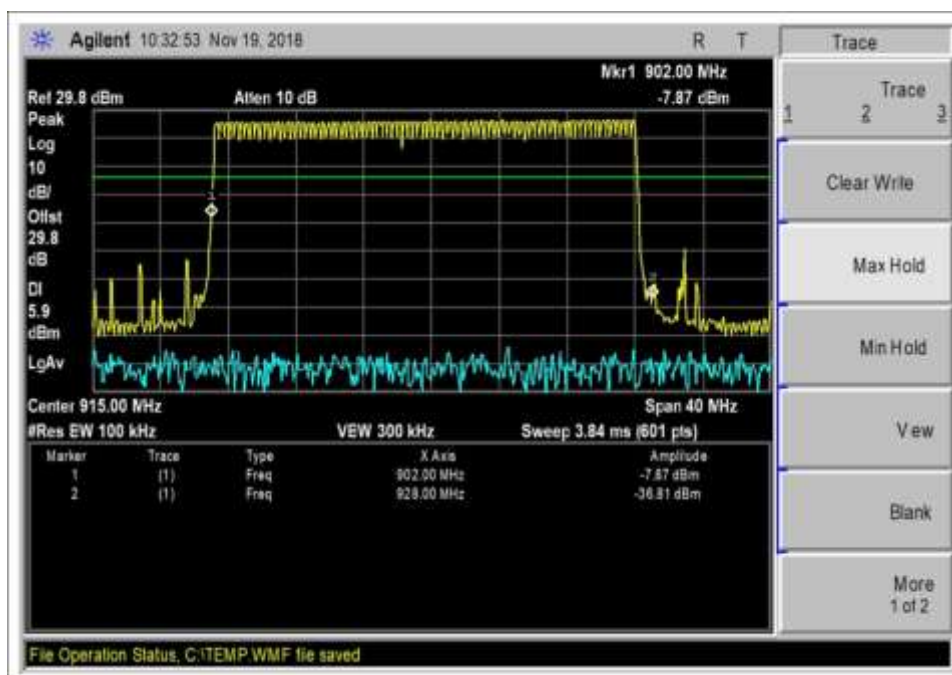
Peak, Middle Channel, 100kbps, Power level 3



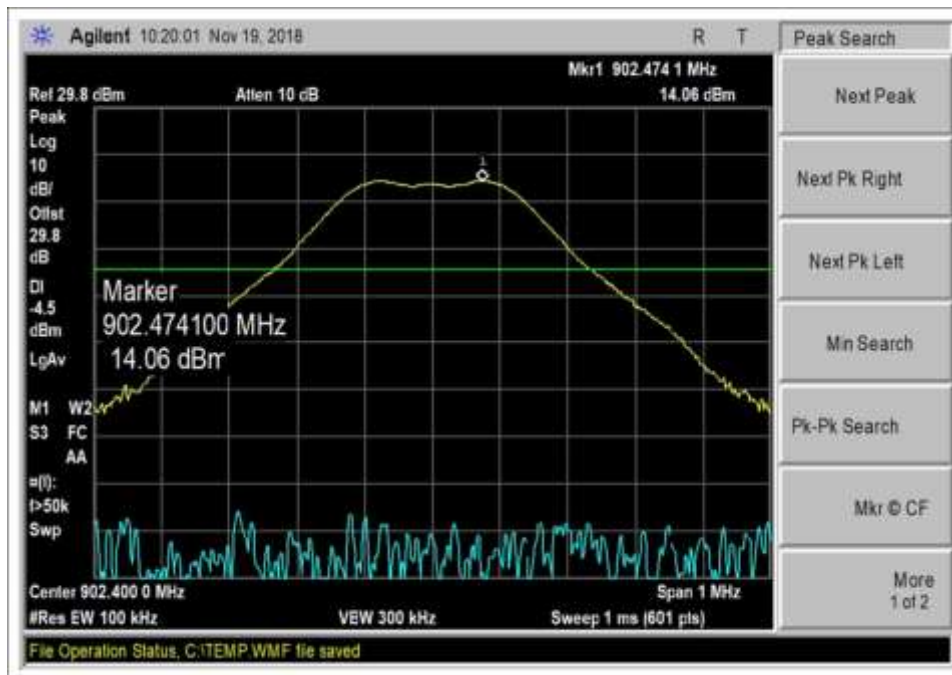
Middle Channel, 100kbps, Power level 3



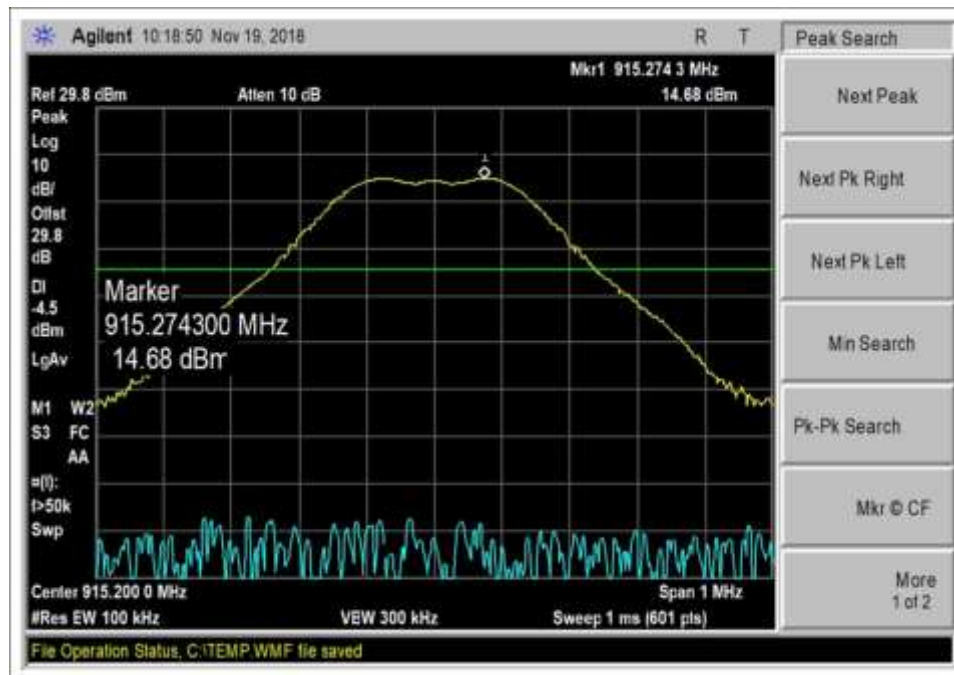
Peak, High Channel, 100kbps, Power level 3



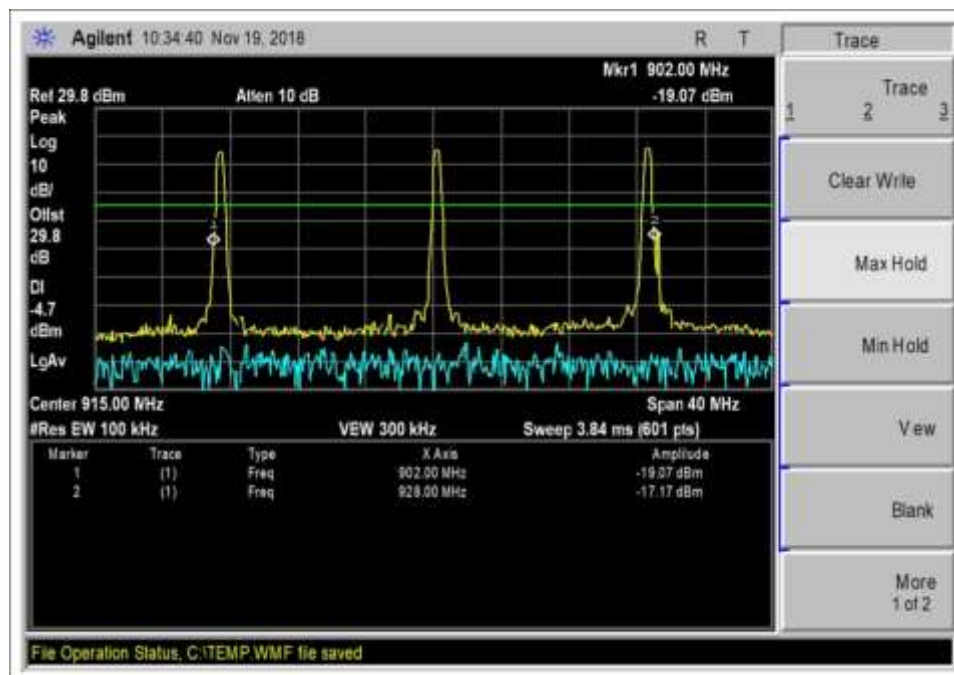
Hopping, 100kbps, Power level 3



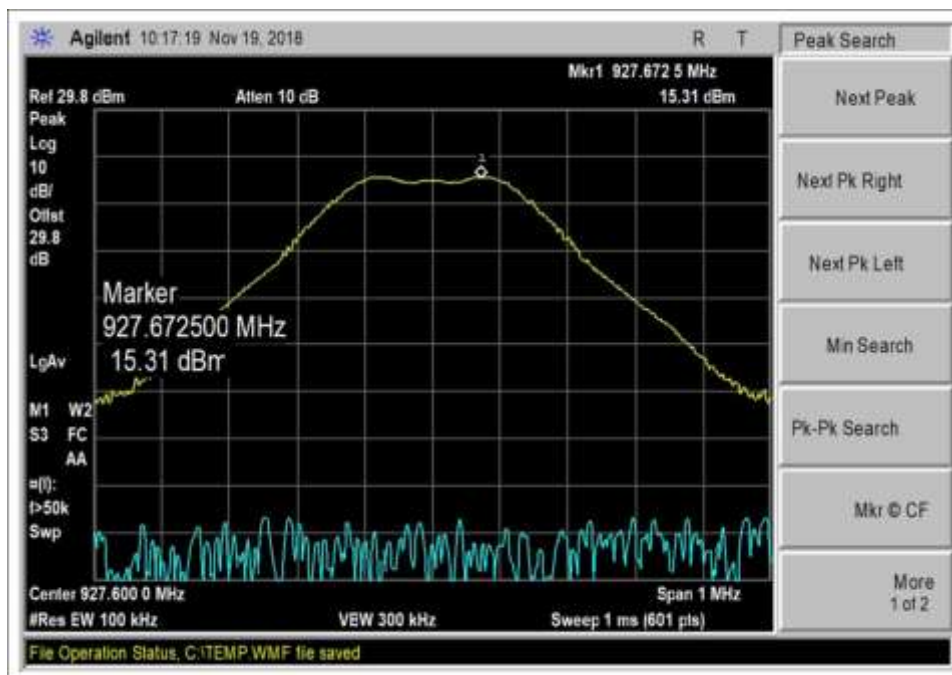
Peak, Low Channel, 300kbps, Power level 2



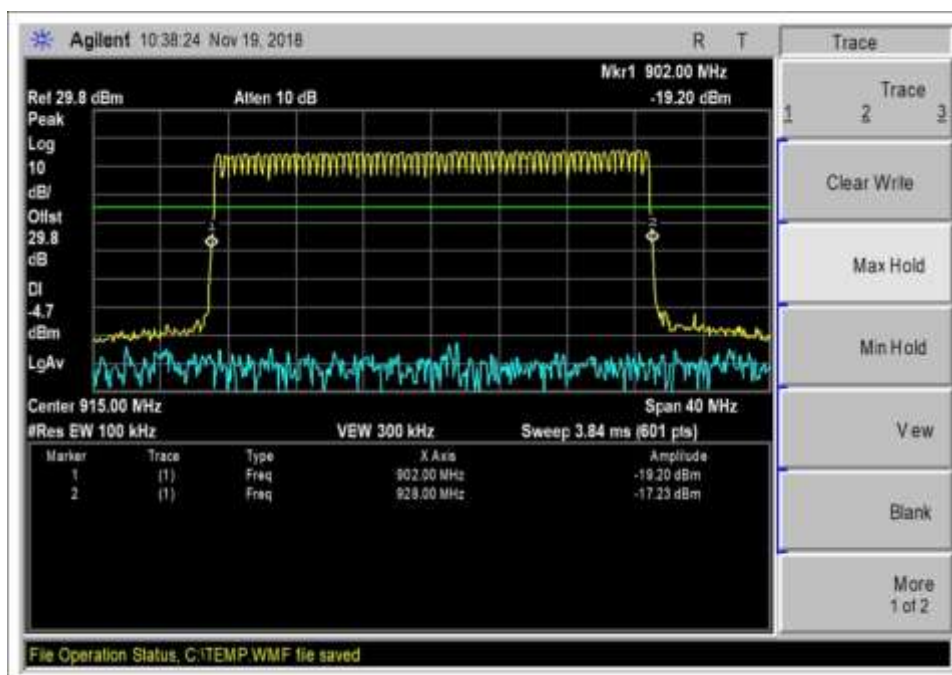
Peak, Middle Channel, 300kbps, Power level 2



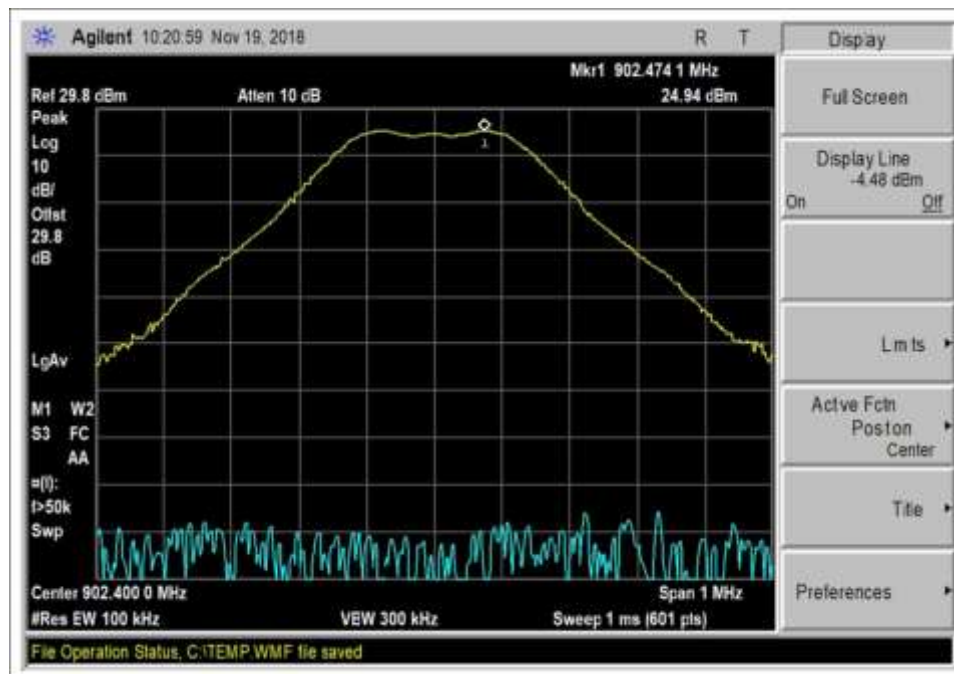
Middle Channel, 300kbps, Power level 2



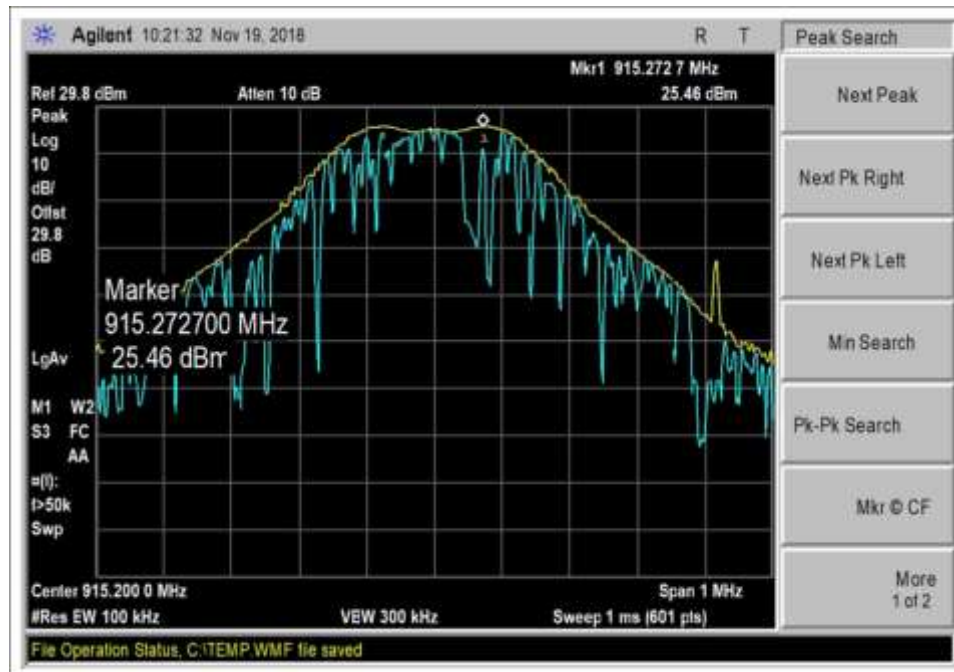
Peak, High Channel, 300kbps, Power level 2



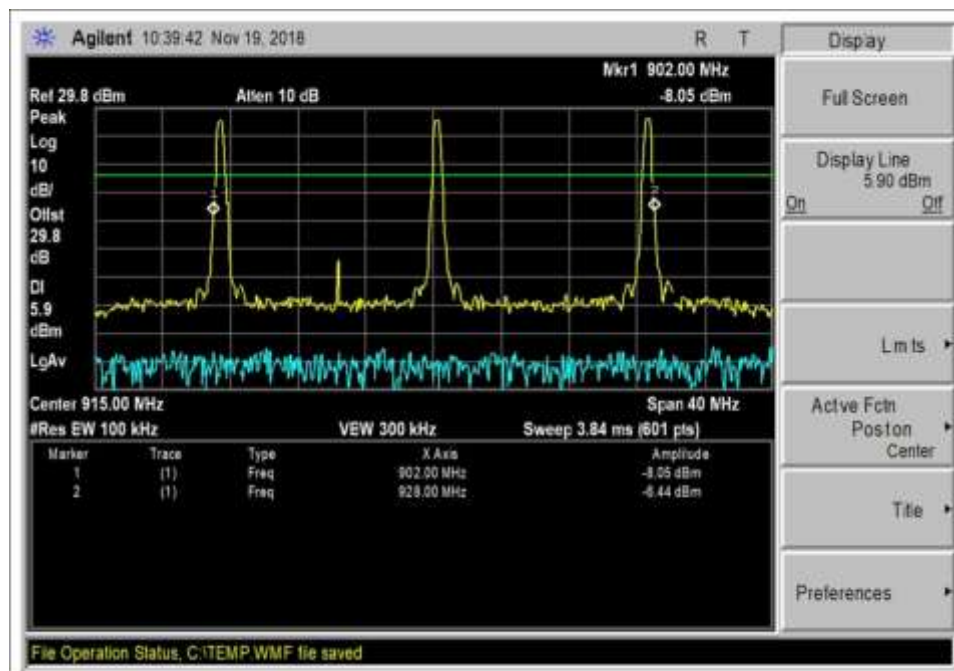
Hopping, 300kbps, Power level 2



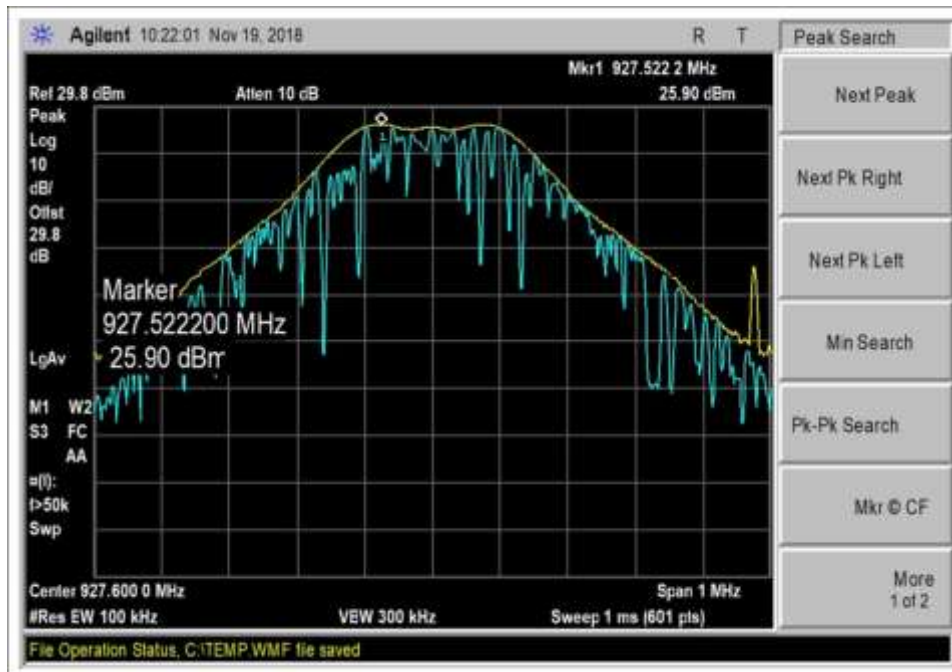
Peak, Low Channel, 300kbps, Power level 3



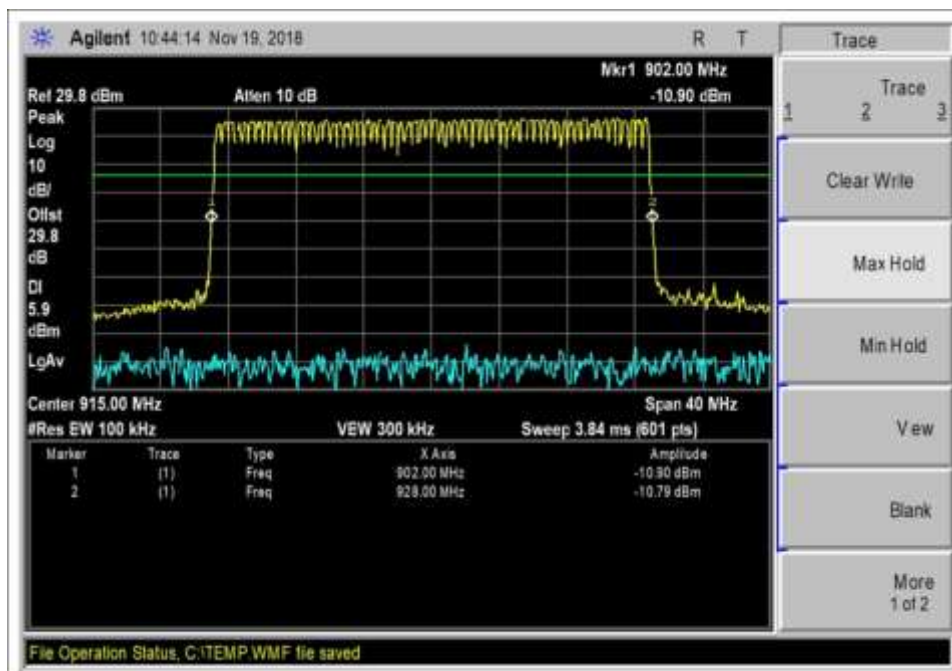
Peak, Middle Channel, 300kbps, Power level 3



Middle Channel, 300kbps, Power level 3

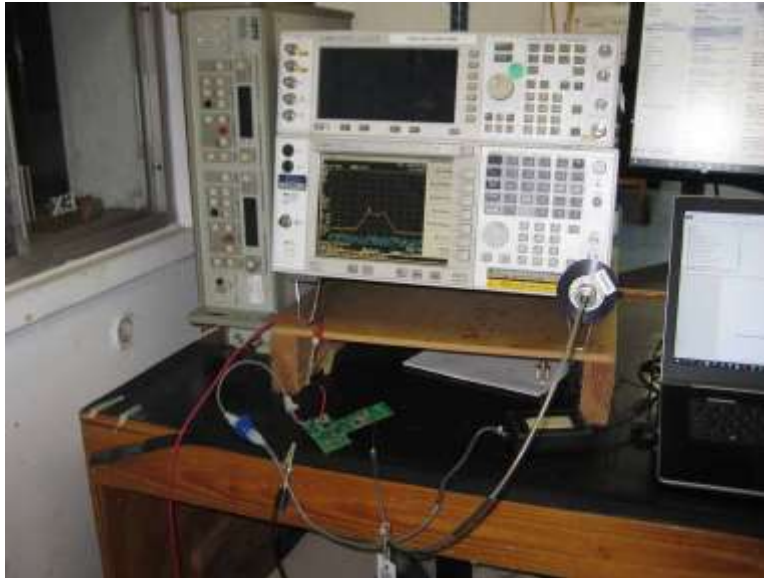


Peak, High Channel, 300kbps, Power level 3



Hopping, 300kbps, Power level 3

Test Setup Photo



## 15.247(d) Radiated Emissions & Band Edge

### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112 x 2300  
 Customer: **Itron, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **101080** Date: 11/20/2018  
 Test Type: **Maximized Emissions** Time: 11:00:52  
 Tested By: Don Nguyen Sequence#: 4  
 Software: EMITest 5.03.11

#### Equipment Tested:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

#### Support Equipment:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

#### Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter.  
 The laptop is running software Command Line Interface Tool to turn on TX at 100% duty cycle.  
 The EUT is powered from fresh battery 6.0Vdc. Support equipment is removed during test.

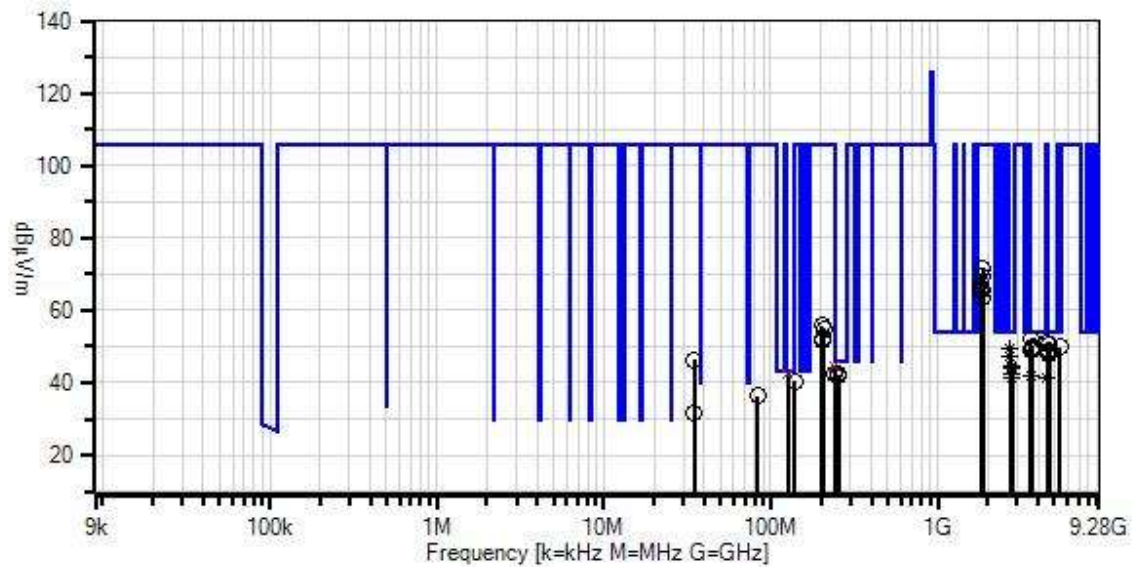
#### Modulation: FSK 100k power level 3

Scanned frequency range: 9kHz-9280MHz  
 9 kHz -150 kHz;RBW=200 Hz,VBW=600 Hz;  
 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz;  
 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz,  
 1000 MHz-9280MHz;RBW=1 MHz,VBW=3 MHz.  
 RBW=100kHz, VBW=300kHz (-20dbc limit)

Test Method: ANSI C63.10 (2013)  
 Temperature: 22.1°C  
 Relative Humidity: 35.0%  
 Site A

**Data represents worst case emissions.**

Itron, Inc. W/O#: 101080 Sequence#: 4 Date: 11/20/2018  
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



— Readings  
 × QP Readings  
 ▼ Ambient  
 — 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

○ Peak Readings  
 \* Average Readings  
 Software Version: 5.03.11

**Test Equipment:**

| ID  | Asset #  | Description                          | Model                        | Calibration Date | Cal Due Date |
|-----|----------|--------------------------------------|------------------------------|------------------|--------------|
|     | AN00314  | Loop Antenna                         | 6502                         | 5/13/2018        | 5/13/2020    |
| T1  | AN00309  | Preamp                               | 8447D                        | 2/19/2018        | 2/19/2020    |
| T2  | AN01995  | Biconilog Antenna                    | CBL6111C                     | 4/23/2018        | 4/23/2020    |
| T3  | ANP05275 | Attenuator                           | 1W                           | 4/5/2018         | 4/5/2020     |
| T4  | ANP05198 | Cable-Amplitude<br>+15C to +45C (dB) | 8268                         | 12/7/2016        | 12/7/2018    |
| T5  | ANP05050 | Cable                                | RG223/U                      | 1/20/2017        | 1/20/2019    |
| T6  | AN02672  | Spectrum Analyzer                    | E4446A                       | 3/2/2017         | 3/2/2019     |
| T7  | AN00786  | Preamp                               | 83017A                       | 5/12/2018        | 5/12/2020    |
| T8  | AN00849  | Horn Antenna                         | 3115                         | 3/14/2018        | 3/14/2020    |
| T9  | ANP07139 | Cable                                | ANDL1-<br>PNMNM-48           | 3/1/2017         | 3/1/2019     |
| T10 | ANP07244 | Cable                                | 32022-29094K-<br>29094K-24TC | 7/5/2018         | 7/5/2020     |
| T11 | AN03169  | High Pass Filter                     | HM1155-11SS                  | 6/15/2017        | 6/15/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq      | Rdng | T1<br>T5<br>T9 | T2<br>T6<br>T10 | T3<br>T7<br>T11 | T4<br>T8 | Dist  | Corr   | Spec   | Margin | Polar |
|---|-----------|------|----------------|-----------------|-----------------|----------|-------|--------|--------|--------|-------|
|   | MHz       | dBμV | dB             | dB              | dB              | dB       | Table | dBμV/m | dBμV/m | dB     | Ant   |
| 1 | 126.125M  | 22.6 | +0.0           | +11.9           | +6.0            | +1.9     | +0.0  | 42.5   | 43.5   | -1.0   | Horiz |
|   | QP        |      | +0.1           | +0.0            | +0.0            | +0.0     |       |        |        |        |       |
|   |           |      | +0.0           | +0.0            | +0.0            |          |       |        |        |        |       |
| ^ | 126.125M  | 26.4 | +0.0           | +11.9           | +6.0            | +1.9     | +0.0  | 46.3   | 43.5   | +2.8   | Horiz |
|   |           |      | +0.1           | +0.0            | +0.0            | +0.0     |       |        |        |        |       |
|   |           |      | +0.0           | +0.0            | +0.0            |          |       |        |        |        |       |
| 3 | 240.150M  | 23.5 | +0.0           | +12.2           | +6.0            | +2.7     | +0.0  | 44.6   | 46.0   | -1.4   | Horiz |
|   | QP        |      | +0.2           | +0.0            | +0.0            | +0.0     |       |        |        |        |       |
|   |           |      | +0.0           | +0.0            | +0.0            |          |       |        |        |        |       |
| ^ | 240.150M  | 28.4 | +0.0           | +12.2           | +6.0            | +2.7     | +0.0  | 49.5   | 46.0   | +3.5   | Horiz |
|   |           |      | +0.2           | +0.0            | +0.0            | +0.0     |       |        |        |        |       |
|   |           |      | +0.0           | +0.0            | +0.0            |          |       |        |        |        |       |
| 5 | 3609.183M | 54.6 | +0.0           | +0.0            | +0.0            | +0.0     | +0.0  | 51.9   | 54.0   | -2.1   | Horiz |
|   |           |      | +0.0           | +0.0            | -38.4           | +31.1    |       |        |        |        |       |
|   |           |      | +3.8           | +0.6            | +0.2            |          |       |        |        |        |       |
| 6 | 4511.483M | 51.2 | +0.0           | +0.0            | +0.0            | +0.0     | +0.0  | 51.2   | 54.0   | -2.8   | Vert  |
|   |           |      | +0.0           | +0.0            | -37.8           | +32.9    |       |        |        |        |       |
|   |           |      | +4.1           | +0.7            | +0.1            |          |       |        |        |        |       |
| 7 | 241.340M  | 21.3 | +0.0           | +12.3           | +6.0            | +2.7     | +0.0  | 42.5   | 46.0   | -3.5   | Vert  |
|   |           |      | +0.2           | +0.0            | +0.0            | +0.0     |       |        |        |        |       |
|   |           |      | +0.0           | +0.0            | +0.0            |          |       |        |        |        |       |
| 8 | 4576.000M | 50.3 | +0.0           | +0.0            | +0.0            | +0.0     | +0.0  | 50.4   | 54.0   | -3.6   | Vert  |
|   |           |      | +0.0           | +0.0            | -37.8           | +33.0    |       |        |        |        |       |
|   |           |      | +4.1           | +0.7            | +0.1            |          |       |        |        |        |       |
| 9 | 249.990M  | 20.4 | +0.0           | +12.9           | +6.0            | +2.8     | +0.0  | 42.3   | 46.0   | -3.7   | Vert  |
|   |           |      | +0.2           | +0.0            | +0.0            | +0.0     |       |        |        |        |       |
|   |           |      | +0.0           | +0.0            | +0.0            |          |       |        |        |        |       |

|    |                  |      |                      |                       |                       |                      |      |      |      |       |       |
|----|------------------|------|----------------------|-----------------------|-----------------------|----------------------|------|------|------|-------|-------|
| 10 | 255.820M         | 19.9 | +0.0<br>+0.2<br>+0.0 | +13.0<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.8<br>+0.0<br>+0.0 | +0.0 | 41.9 | 46.0 | -4.1  | Horiz |
| 11 | 5413.783M        | 48.4 | +0.0<br>+0.0<br>+4.6 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-37.5<br>+0.1 | +0.0<br>+33.9        | +0.0 | 49.9 | 54.0 | -4.1  | Horiz |
| 12 | 3707.600M        | 51.7 | +0.0<br>+0.0<br>+3.8 | +0.0<br>+0.0<br>+0.5  | +0.0<br>-38.3<br>+0.2 | +0.0<br>+31.9        | +0.0 | 49.8 | 54.0 | -4.2  | Vert  |
| 13 | 2706.883M<br>Ave | 55.4 | +0.0<br>+0.0<br>+3.2 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.1        | +0.0 | 49.7 | 54.0 | -4.3  | Horiz |
| ^  | 2706.883M        | 66.9 | +0.0<br>+0.0<br>+3.2 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.1        | +0.0 | 61.2 | 54.0 | +7.2  | Horiz |
| 15 | 3660.800M        | 51.7 | +0.0<br>+0.0<br>+3.8 | +0.0<br>+0.0<br>+0.5  | +0.0<br>-38.3<br>+0.2 | +0.0<br>+31.6        | +0.0 | 49.5 | 54.0 | -4.5  | Horiz |
| 16 | 3707.600M        | 51.2 | +0.0<br>+0.0<br>+3.8 | +0.0<br>+0.0<br>+0.5  | +0.0<br>-38.3<br>+0.2 | +0.0<br>+31.9        | +0.0 | 49.3 | 54.0 | -4.7  | Horiz |
| 17 | 4634.500M        | 48.9 | +0.0<br>+0.0<br>+4.2 | +0.0<br>+0.0<br>+0.6  | +0.0<br>-37.7<br>+0.2 | +0.0<br>+32.8        | +0.0 | 49.0 | 54.0 | -5.0  | Vert  |
| 18 | 3660.800M        | 51.0 | +0.0<br>+0.0<br>+3.8 | +0.0<br>+0.0<br>+0.5  | +0.0<br>-38.3<br>+0.2 | +0.0<br>+31.6        | +0.0 | 48.8 | 54.0 | -5.2  | Vert  |
| 19 | 4576.000M        | 48.5 | +0.0<br>+0.0<br>+4.1 | +0.0<br>+0.0<br>+0.7  | +0.0<br>-37.8<br>+0.1 | +0.0<br>+33.0        | +0.0 | 48.6 | 54.0 | -5.4  | Horiz |
| 20 | 4634.500M        | 47.9 | +0.0<br>+0.0<br>+4.2 | +0.0<br>+0.0<br>+0.6  | +0.0<br>-37.7<br>+0.2 | +0.0<br>+32.8        | +0.0 | 48.0 | 54.0 | -6.0  | Horiz |
| 21 | 2706.883M<br>Ave | 52.8 | +0.0<br>+0.0<br>+3.2 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.1        | +0.0 | 47.1 | 54.0 | -6.9  | Vert  |
| ^  | 2706.883M        | 63.9 | +0.0<br>+0.0<br>+3.2 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.1        | +0.0 | 58.2 | 54.0 | +4.2  | Vert  |
| 23 | 2745.600M<br>Ave | 49.8 | +0.0<br>+0.0<br>+3.2 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.4        | +0.0 | 44.4 | 54.0 | -9.6  | Horiz |
| ^  | 2745.600M        | 61.5 | +0.0<br>+0.0<br>+3.2 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.4        | +0.0 | 56.1 | 54.0 | +2.1  | Horiz |
| 25 | 2780.700M<br>Ave | 49.2 | +0.0<br>+0.0<br>+3.3 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.5        | +0.0 | 44.0 | 54.0 | -10.0 | Horiz |
| ^  | 2780.700M        | 60.1 | +0.0<br>+0.0<br>+3.3 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.5        | +0.0 | 54.9 | 54.0 | +0.9  | Horiz |

|    |                  |      |                      |                      |                       |               |      |      |       |       |       |
|----|------------------|------|----------------------|----------------------|-----------------------|---------------|------|------|-------|-------|-------|
| 27 | 2780.700M<br>Ave | 47.6 | +0.0<br>+0.0<br>+3.3 | +0.0<br>+0.0<br>+0.4 | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.5 | +0.0 | 42.4 | 54.0  | -11.6 | Vert  |
| ^  | 2780.700M        | 59.7 | +0.0<br>+0.0<br>+3.3 | +0.0<br>+0.0<br>+0.4 | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.5 | +0.0 | 54.5 | 54.0  | +0.5  | Vert  |
| 29 | 3609.183M<br>Ave | 44.5 | +0.0<br>+0.0<br>+3.8 | +0.0<br>+0.0<br>+0.6 | +0.0<br>-38.4<br>+0.2 | +0.0<br>+31.1 | +0.0 | 41.8 | 54.0  | -12.2 | Vert  |
| ^  | 3609.183M        | 56.5 | +0.0<br>+0.0<br>+3.8 | +0.0<br>+0.0<br>+0.6 | +0.0<br>-38.4<br>+0.2 | +0.0<br>+31.1 | +0.0 | 53.8 | 54.0  | -0.2  | Vert  |
| 31 | 2745.600M<br>Ave | 46.7 | +0.0<br>+0.0<br>+3.2 | +0.0<br>+0.0<br>+0.4 | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.4 | +0.0 | 41.3 | 54.0  | -12.7 | Vert  |
| ^  | 2745.600M        | 58.8 | +0.0<br>+0.0<br>+3.2 | +0.0<br>+0.0<br>+0.4 | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.4 | +0.0 | 53.4 | 54.0  | -0.6  | Vert  |
| 33 | 4511.483M<br>Ave | 41.1 | +0.0<br>+0.0<br>+4.1 | +0.0<br>+0.0<br>+0.7 | +0.0<br>-37.8<br>+0.1 | +0.0<br>+32.9 | +0.0 | 41.1 | 54.0  | -12.9 | Horiz |
| ^  | 4511.483M        | 53.1 | +0.0<br>+0.0<br>+4.1 | +0.0<br>+0.0<br>+0.7 | +0.0<br>-37.8<br>+0.1 | +0.0<br>+32.9 | +0.0 | 53.1 | 54.0  | -0.9  | Horiz |
| 35 | 1853.800M        | 79.9 | +0.0<br>+0.0<br>+2.6 | +0.0<br>+0.0<br>+0.2 | +0.0<br>-38.9<br>+0.3 | +0.0<br>+27.2 | +0.0 | 71.3 | 105.9 | -34.6 | Vert  |
| 36 | 1830.400M        | 78.3 | +0.0<br>+0.0<br>+2.5 | +0.0<br>+0.0<br>+0.2 | +0.0<br>-38.9<br>+0.3 | +0.0<br>+27.1 | +0.0 | 69.5 | 105.9 | -36.4 | Vert  |
| 37 | 1804.583M        | 76.7 | +0.0<br>+0.0<br>+2.5 | +0.0<br>+0.0<br>+0.2 | +0.0<br>-38.9<br>+0.3 | +0.0<br>+27.0 | +0.0 | 67.8 | 105.9 | -38.1 | Vert  |
| 38 | 1804.583M        | 74.7 | +0.0<br>+0.0<br>+2.5 | +0.0<br>+0.0<br>+0.2 | +0.0<br>-38.9<br>+0.3 | +0.0<br>+27.0 | +0.0 | 65.8 | 105.9 | -40.1 | Horiz |
| 39 | 1853.800M        | 74.0 | +0.0<br>+0.0<br>+2.6 | +0.0<br>+0.0<br>+0.2 | +0.0<br>-38.9<br>+0.3 | +0.0<br>+27.2 | +0.0 | 65.4 | 105.9 | -40.5 | Horiz |
| 40 | 1830.400M        | 72.0 | +0.0<br>+0.0<br>+2.5 | +0.0<br>+0.0<br>+0.2 | +0.0<br>-38.9<br>+0.3 | +0.0<br>+27.1 | +0.0 | 63.2 | 105.9 | -42.7 | Horiz |
| 41 | 203.780M         | 37.8 | +0.0<br>+0.2<br>+0.0 | +9.4<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.4<br>+0.0  | +0.0 | 55.8 | 105.9 | -50.1 | Horiz |
| 42 | 208.520M         | 36.5 | +0.0<br>+0.2<br>+0.0 | +9.8<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.5<br>+0.0  | +0.0 | 55.0 | 105.9 | -50.9 | Horiz |
| 43 | 201.400M         | 34.5 | +0.0<br>+0.2<br>+0.0 | +9.2<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.4<br>+0.0  | +0.0 | 52.3 | 105.9 | -53.6 | Vert  |

|    |          |      |                       |                       |                      |              |      |      |       |       |       |
|----|----------|------|-----------------------|-----------------------|----------------------|--------------|------|------|-------|-------|-------|
| 44 | 202.588M | 33.7 | +0.0<br>+0.2<br>+0.0  | +9.3<br>+0.0<br>+0.0  | +6.0<br>+0.0<br>+0.0 | +2.4<br>+0.0 | +0.0 | 51.6 | 105.9 | -54.3 | Vert  |
| 45 | 34.800M  | 23.4 | +0.0<br>+0.0<br>+0.0  | +16.1<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0 | +0.9<br>+0.0 | +0.0 | 46.4 | 105.9 | -59.5 | Vert  |
| 46 | 139.520M | 20.5 | +0.0<br>+0.1<br>+0.0  | +11.7<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0 | +2.0<br>+0.0 | +0.0 | 40.3 | 105.9 | -65.6 | Horiz |
| 47 | 83.150M  | 20.8 | +0.0<br>+0.1<br>+0.0  | +8.1<br>+0.0<br>+0.0  | +6.0<br>+0.0<br>+0.0 | +1.4<br>+0.0 | +0.0 | 36.4 | 105.9 | -69.5 | Vert  |
| 48 | 35.000M  | 37.1 | -28.1<br>+0.0<br>+0.0 | +16.0<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0 | +0.9<br>+0.0 | +0.0 | 31.9 | 105.9 | -74.0 | Horiz |



Test Location: CKC Laboratories, Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112 x 2300  
 Customer: **Itron, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **101080** Date: 11/20/2018  
 Test Type: **Maximized Emissions** Time: 11:45:46  
 Tested By: Don Nguyen Sequence#: 5  
 Software: EMITest 5.03.11

**Equipment Tested:**

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

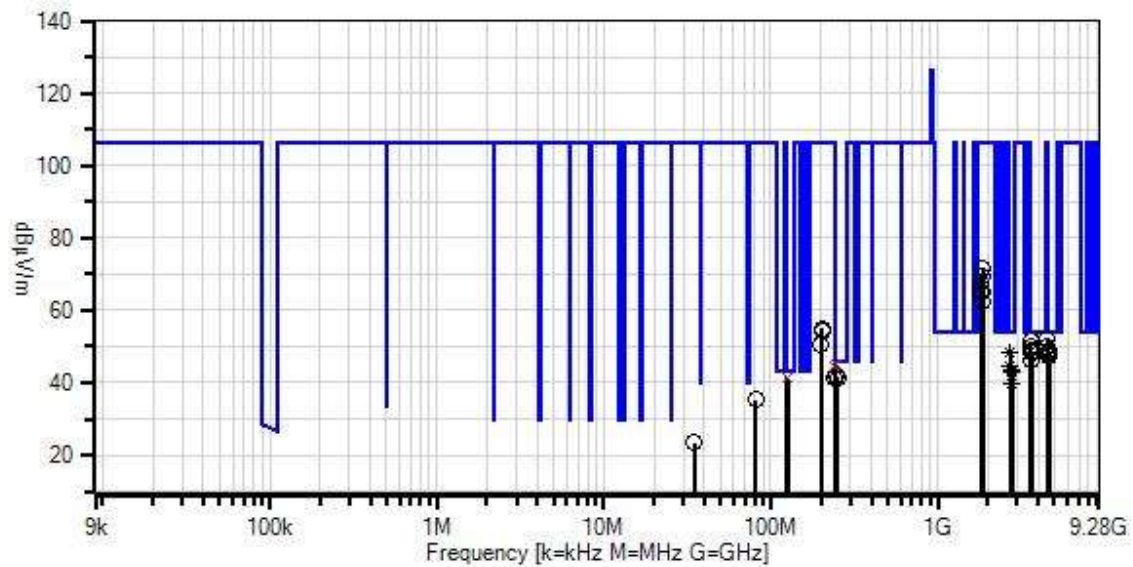
**Support Equipment:**

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

**Test Conditions / Notes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter. The laptop is running software Command Line Interface Tool to turn on TX at 100% duty cycle. The EUT is powered from fresh battery 6.0Vdc. Support equipment is removed during test.</p> <p><b>Modulation: GFSK 300k power level 2, GFSK 300k power level 3</b></p> <p>Scanned frequency range: 9kHz-9280MHz<br/>           9 kHz -150 kHz;RBW=200 Hz,VBW=600 Hz;<br/>           150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz;<br/>           30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz,<br/>           1000 MHz-9280MHz;RBW=1 MHz,VBW=3 MHz.<br/>           RBW=100kHz, VBW=300kHz (-20dbc limit)</p> <p>Test Method: ANSI C63.10 (2013)<br/>           Temperature: 23.9°C<br/>           Relative Humidity: 49.9%<br/>           Site A</p> <p><b>Data represents worst case emissions.</b></p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Ittron, Inc. WO#: 101080 Sequence#: 5 Date: 11/20/2018  
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



- Readings
  - × QP Readings
  - ▼ Ambient
  - 1 - 15.247(d) / 15.209 Radiated Spurious Emissions
  - Peak Readings
  - \* Average Readings
- Software Version: 5.03.11

**Test Equipment:**

| ID  | Asset #  | Description                          | Model                        | Calibration Date | Cal Due Date |
|-----|----------|--------------------------------------|------------------------------|------------------|--------------|
|     | AN00314  | Loop Antenna                         | 6502                         | 5/13/2018        | 5/13/2020    |
|     | AN00309  | Preamp                               | 8447D                        | 2/19/2018        | 2/19/2020    |
| T1  | AN01995  | Biconilog Antenna                    | CBL6111C                     | 4/23/2018        | 4/23/2020    |
| T2  | ANP05275 | Attenuator                           | 1W                           | 4/5/2018         | 4/5/2020     |
| T3  | ANP05198 | Cable-Amplitude<br>+15C to +45C (dB) | 8268                         | 12/7/2016        | 12/7/2018    |
| T4  | ANP05050 | Cable                                | RG223/U                      | 1/20/2017        | 1/20/2019    |
| T5  | AN02672  | Spectrum Analyzer                    | E4446A                       | 3/2/2017         | 3/2/2019     |
| T6  | AN00786  | Preamp                               | 83017A                       | 5/12/2018        | 5/12/2020    |
| T7  | AN00849  | Horn Antenna                         | 3115                         | 3/14/2018        | 3/14/2020    |
| T8  | ANP07139 | Cable                                | ANDL1-<br>PNMNM-48           | 3/1/2017         | 3/1/2019     |
| T9  | ANP07244 | Cable                                | 32022-29094K-<br>29094K-24TC | 7/5/2018         | 7/5/2020     |
| T10 | AN03169  | High Pass Filter                     | HM1155-11SS                  | 6/15/2017        | 6/15/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq      | Rdng       | T1<br>T5<br>T9        | T2<br>T6<br>T10       | T3<br>T7             | T4<br>T8             | Dist  | Corr         | Spec         | Margin | Polar |
|---|-----------|------------|-----------------------|-----------------------|----------------------|----------------------|-------|--------------|--------------|--------|-------|
|   | MHz       | dB $\mu$ V | dB                    | dB                    | dB                   | dB                   | Table | dB $\mu$ V/m | dB $\mu$ V/m | dB     | Ant   |
| 1 | 245.020M  | 23.6       | +12.6<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.8<br>+0.0<br>+0.0 | +0.2<br>+0.0<br>+0.0 | +0.0  | 45.2         | 46.0         | -0.8   | Horiz |
| ^ | 245.020M  | 27.4       | +12.6<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.8<br>+0.0<br>+0.0 | +0.2<br>+0.0<br>+0.0 | +0.0  | 49.0         | 46.0         | +3.0   | Horiz |
| 3 | 240.145M  | 23.4       | +12.2<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.7<br>+0.0<br>+0.0 | +0.2<br>+0.0<br>+0.0 | +0.0  | 44.5         | 46.0         | -1.5   | Horiz |
| ^ | 240.145M  | 28.3       | +12.2<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.7<br>+0.0<br>+0.0 | +0.2<br>+0.0<br>+0.0 | +0.0  | 49.4         | 46.0         | +3.4   | Horiz |
| 5 | 124.915M  | 21.6       | +11.9<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +1.9<br>+0.0<br>+0.0 | +0.1<br>+0.0<br>+0.0 | +0.0  | 41.5         | 43.5         | -2.0   | Horiz |
| ^ | 124.915M  | 25.6       | +11.9<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +1.9<br>+0.0<br>+0.0 | +0.1<br>+0.0<br>+0.0 | +0.0  | 45.5         | 43.5         | +2.0   | Horiz |
| 7 | 4512.000M | 51.9       | +0.0<br>+0.0<br>+0.7  | +0.0<br>-37.8<br>+0.1 | +0.0<br>+32.9        | +0.0<br>+4.1         | +0.0  | 51.9         | 54.0         | -2.1   | Horiz |
| 8 | 126.132M  | 21.2       | +11.9<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +1.9<br>+0.0<br>+0.0 | +0.1<br>+0.0<br>+0.0 | +0.0  | 41.1         | 43.5         | -2.4   | Horiz |
| ^ | 126.132M  | 25.8       | +11.9<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +1.9<br>+0.0<br>+0.0 | +0.1<br>+0.0<br>+0.0 | +0.0  | 45.7         | 43.5         | +2.2   | Horiz |

|    |                  |      |                       |                       |               |              |      |      |      |      |       |
|----|------------------|------|-----------------------|-----------------------|---------------|--------------|------|------|------|------|-------|
| 10 | 3609.600M        | 54.2 | +0.0<br>+0.0<br>+0.6  | +0.0<br>-38.4<br>+0.2 | +0.0<br>+31.1 | +0.0<br>+3.8 | +0.0 | 51.5 | 54.0 | -2.5 | Vert  |
| 11 | 3609.600M        | 52.8 | +0.0<br>+0.0<br>+0.6  | +0.0<br>-38.4<br>+0.2 | +0.0<br>+31.1 | +0.0<br>+3.8 | +0.0 | 50.1 | 54.0 | -3.9 | Horiz |
| 12 | 4512.000M        | 50.0 | +0.0<br>+0.0<br>+0.7  | +0.0<br>-37.8<br>+0.1 | +0.0<br>+32.9 | +0.0<br>+4.1 | +0.0 | 50.0 | 54.0 | -4.0 | Vert  |
| 13 | 247.490M         | 20.0 | +12.7<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.8<br>+0.0  | +0.2<br>+0.0 | +0.0 | 41.7 | 46.0 | -4.3 | Vert  |
| 14 | 241.390M         | 20.0 | +12.3<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.7<br>+0.0  | +0.2<br>+0.0 | +0.0 | 41.2 | 46.0 | -4.8 | Vert  |
| 15 | 251.090M         | 19.2 | +12.9<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +2.8<br>+0.0  | +0.2<br>+0.0 | +0.0 | 41.1 | 46.0 | -4.9 | Vert  |
| 16 | 3710.425M        | 50.7 | +0.0<br>+0.0<br>+0.5  | +0.0<br>-38.3<br>+0.2 | +0.0<br>+31.9 | +0.0<br>+3.8 | +0.0 | 48.8 | 54.0 | -5.2 | Vert  |
| 17 | 4638.025M        | 48.6 | +0.0<br>+0.0<br>+0.6  | +0.0<br>-37.7<br>+0.2 | +0.0<br>+32.8 | +0.0<br>+4.2 | +0.0 | 48.7 | 54.0 | -5.3 | Vert  |
| 18 | 3660.800M        | 50.7 | +0.0<br>+0.0<br>+0.5  | +0.0<br>-38.3<br>+0.2 | +0.0<br>+31.6 | +0.0<br>+3.8 | +0.0 | 48.5 | 54.0 | -5.5 | Horiz |
| 19 | 2707.200M<br>Ave | 54.2 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.1 | +0.0<br>+3.2 | +0.0 | 48.5 | 54.0 | -5.5 | Horiz |
| ^  | 2707.200M        | 65.0 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.1 | +0.0<br>+3.2 | +0.0 | 59.3 | 54.0 | +5.3 | Horiz |
| 21 | 4576.000M        | 48.3 | +0.0<br>+0.0<br>+0.7  | +0.0<br>-37.8<br>+0.1 | +0.0<br>+33.0 | +0.0<br>+4.1 | +0.0 | 48.4 | 54.0 | -5.6 | Horiz |
| 22 | 3710.400M        | 50.1 | +0.0<br>+0.0<br>+0.5  | +0.0<br>-38.3<br>+0.2 | +0.0<br>+31.9 | +0.0<br>+3.8 | +0.0 | 48.2 | 54.0 | -5.8 | Horiz |
| 23 | 4638.000M        | 47.9 | +0.0<br>+0.0<br>+0.6  | +0.0<br>-37.7<br>+0.2 | +0.0<br>+32.8 | +0.0<br>+4.2 | +0.0 | 48.0 | 54.0 | -6.0 | Horiz |
| 24 | 4576.000M        | 47.1 | +0.0<br>+0.0<br>+0.7  | +0.0<br>-37.8<br>+0.1 | +0.0<br>+33.0 | +0.0<br>+4.1 | +0.0 | 47.2 | 54.0 | -6.8 | Vert  |
| 25 | 3660.800M        | 48.4 | +0.0<br>+0.0<br>+0.5  | +0.0<br>-38.3<br>+0.2 | +0.0<br>+31.6 | +0.0<br>+3.8 | +0.0 | 46.2 | 54.0 | -7.8 | Vert  |
| 26 | 2707.200M<br>Ave | 50.3 | +0.0<br>+0.0<br>+0.4  | +0.0<br>-38.6<br>+0.2 | +0.0<br>+29.1 | +0.0<br>+3.2 | +0.0 | 44.6 | 54.0 | -9.4 | Vert  |

|    |                  |      |      |       |       |      |      |      |       |       |       |
|----|------------------|------|------|-------|-------|------|------|------|-------|-------|-------|
| ^  | 2707.200M        | 61.9 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 56.2 | 54.0  | +2.2  | Vert  |
|    |                  |      | +0.0 | -38.6 | +29.1 | +3.2 |      |      |       |       |       |
|    |                  |      | +0.4 | +0.2  |       |      |      |      |       |       |       |
| 28 | 2782.800M<br>Ave | 48.6 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 43.4 | 54.0  | -10.6 | Horiz |
|    |                  |      | +0.0 | -38.6 | +29.5 | +3.3 |      |      |       |       |       |
|    |                  |      | +0.4 | +0.2  |       |      |      |      |       |       |       |
| ^  | 2782.800M        | 60.0 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 54.8 | 54.0  | +0.8  | Horiz |
|    |                  |      | +0.0 | -38.6 | +29.5 | +3.3 |      |      |       |       |       |
|    |                  |      | +0.4 | +0.2  |       |      |      |      |       |       |       |
| 30 | 2745.600M<br>Ave | 48.6 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 43.2 | 54.0  | -10.8 | Horiz |
|    |                  |      | +0.0 | -38.6 | +29.4 | +3.2 |      |      |       |       |       |
|    |                  |      | +0.4 | +0.2  |       |      |      |      |       |       |       |
| ^  | 2745.600M        | 60.5 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 55.1 | 54.0  | +1.1  | Horiz |
|    |                  |      | +0.0 | -38.6 | +29.4 | +3.2 |      |      |       |       |       |
|    |                  |      | +0.4 | +0.2  |       |      |      |      |       |       |       |
| 32 | 2782.800M<br>Ave | 48.2 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 43.0 | 54.0  | -11.0 | Vert  |
|    |                  |      | +0.0 | -38.6 | +29.5 | +3.3 |      |      |       |       |       |
|    |                  |      | +0.4 | +0.2  |       |      |      |      |       |       |       |
| ^  | 2782.800M        | 59.6 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 54.4 | 54.0  | +0.4  | Vert  |
|    |                  |      | +0.0 | -38.6 | +29.5 | +3.3 |      |      |       |       |       |
|    |                  |      | +0.4 | +0.2  |       |      |      |      |       |       |       |
| 34 | 2745.600M<br>Ave | 45.1 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 39.7 | 54.0  | -14.3 | Vert  |
|    |                  |      | +0.0 | -38.6 | +29.4 | +3.2 |      |      |       |       |       |
|    |                  |      | +0.4 | +0.2  |       |      |      |      |       |       |       |
| ^  | 2745.600M        | 57.8 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 52.4 | 54.0  | -1.6  | Vert  |
|    |                  |      | +0.0 | -38.6 | +29.4 | +3.2 |      |      |       |       |       |
|    |                  |      | +0.4 | +0.2  |       |      |      |      |       |       |       |
| 36 | 1855.200M        | 79.8 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 71.3 | 106.1 | -34.8 | Vert  |
|    |                  |      | +0.0 | -38.9 | +27.3 | +2.6 |      |      |       |       |       |
|    |                  |      | +0.2 | +0.3  |       |      |      |      |       |       |       |
| 37 | 1830.400M        | 78.1 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 69.3 | 106.1 | -36.8 | Vert  |
|    |                  |      | +0.0 | -38.9 | +27.1 | +2.5 |      |      |       |       |       |
|    |                  |      | +0.2 | +0.3  |       |      |      |      |       |       |       |
| 38 | 1804.800M        | 76.4 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 67.5 | 106.1 | -38.6 | Vert  |
|    |                  |      | +0.0 | -38.9 | +27.0 | +2.5 |      |      |       |       |       |
|    |                  |      | +0.2 | +0.3  |       |      |      |      |       |       |       |
| 39 | 1855.200M        | 73.4 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 64.9 | 106.1 | -41.2 | Horiz |
|    |                  |      | +0.0 | -38.9 | +27.3 | +2.6 |      |      |       |       |       |
|    |                  |      | +0.2 | +0.3  |       |      |      |      |       |       |       |
| 40 | 1804.800M        | 73.8 | +0.0 | +0.0  | +0.0  | +0.0 | +0.0 | 64.9 | 106.1 | -41.2 | Horiz |
|    |                  |      | +0.0 | -38.9 | +27.0 | +2.5 |      |      |       |       |       |
|    |                  |      | +0.2 | +0.3  |       |      |      |      |       |       |       |

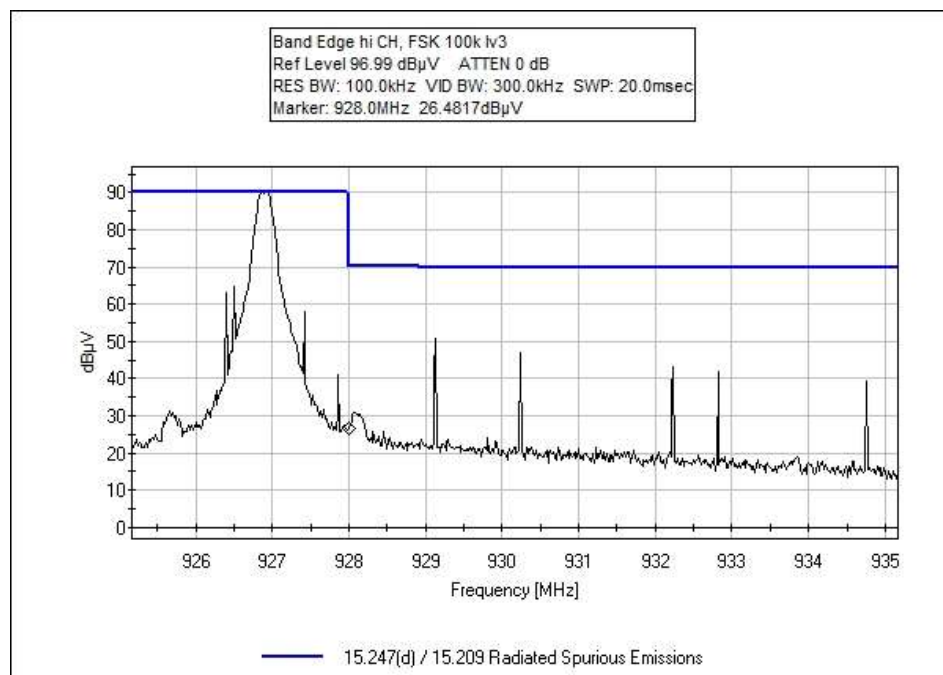
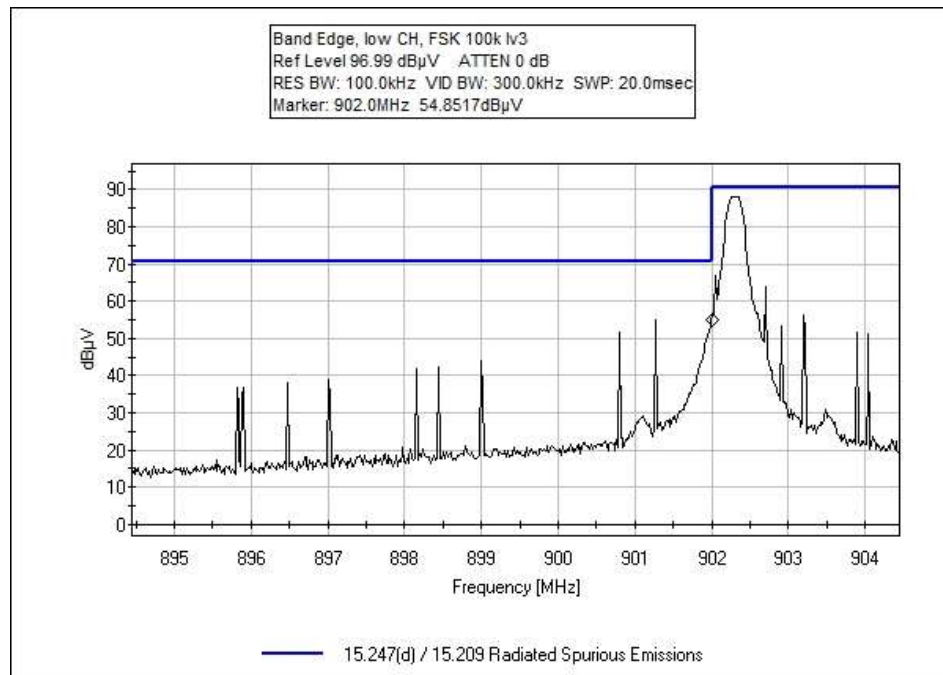
|    |           |      |                       |                       |               |              |      |      |       |       |       |
|----|-----------|------|-----------------------|-----------------------|---------------|--------------|------|------|-------|-------|-------|
| 41 | 1830.400M | 71.2 | +0.0<br>+0.0<br>+0.2  | +0.0<br>-38.9<br>+0.3 | +0.0<br>+27.1 | +0.0<br>+2.5 | +0.0 | 62.4 | 106.1 | -43.7 | Horiz |
| 42 | 203.720M  | 37.0 | +9.4<br>+0.0<br>+0.0  | +6.0<br>+0.0<br>+0.0  | +2.4<br>+0.0  | +0.2<br>+0.0 | +0.0 | 55.0 | 106.1 | -51.1 | Horiz |
| 43 | 201.320M  | 36.7 | +9.2<br>+0.0<br>+0.0  | +6.0<br>+0.0<br>+0.0  | +2.4<br>+0.0  | +0.2<br>+0.0 | +0.0 | 54.5 | 106.1 | -51.6 | Horiz |
| 44 | 200.090M  | 32.7 | +9.1<br>+0.0<br>+0.0  | +6.0<br>+0.0<br>+0.0  | +2.4<br>+0.0  | +0.2<br>+0.0 | +0.0 | 50.4 | 106.1 | -55.7 | Vert  |
| 45 | 81.740M   | 19.8 | +8.0<br>+0.0<br>+0.0  | +6.0<br>+0.0<br>+0.0  | +1.4<br>+0.0  | +0.1<br>+0.0 | +0.0 | 35.3 | 106.1 | -70.8 | Vert  |
| 46 | 34.790M   | 23.5 | +16.1<br>+0.0<br>+0.0 | +6.0<br>+0.0<br>+0.0  | +0.9<br>+0.0  | +0.0<br>+0.0 | +0.0 | 23.5 | 106.1 | -82.6 | Vert  |

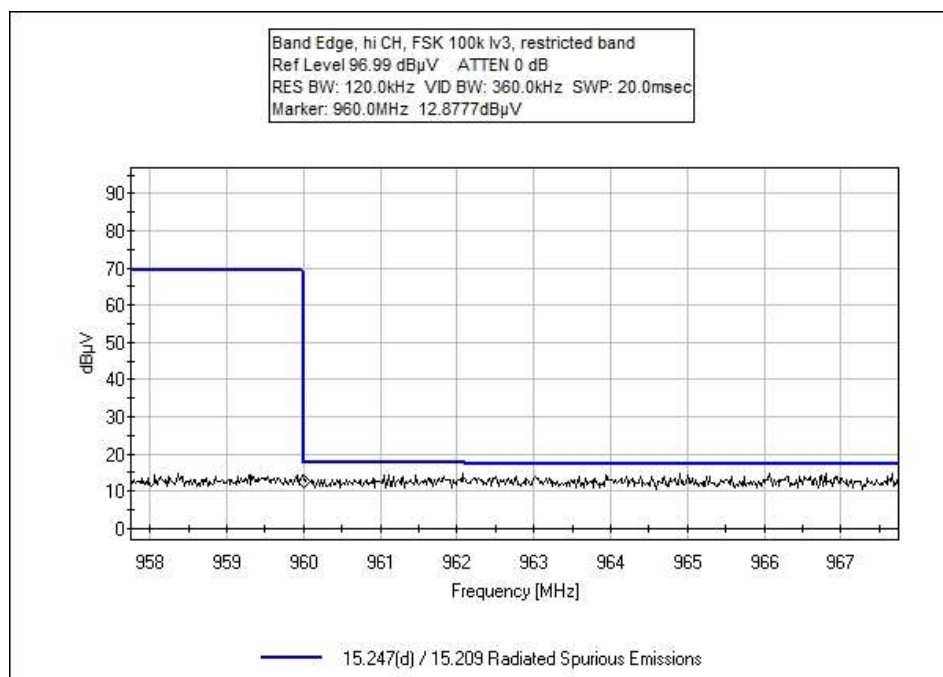
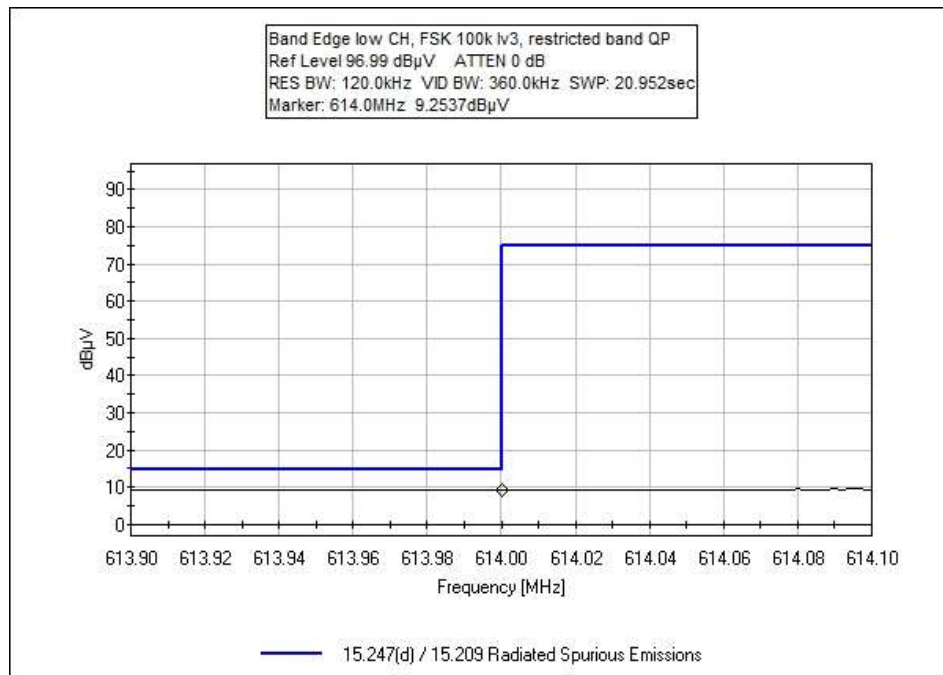
## Band Edge

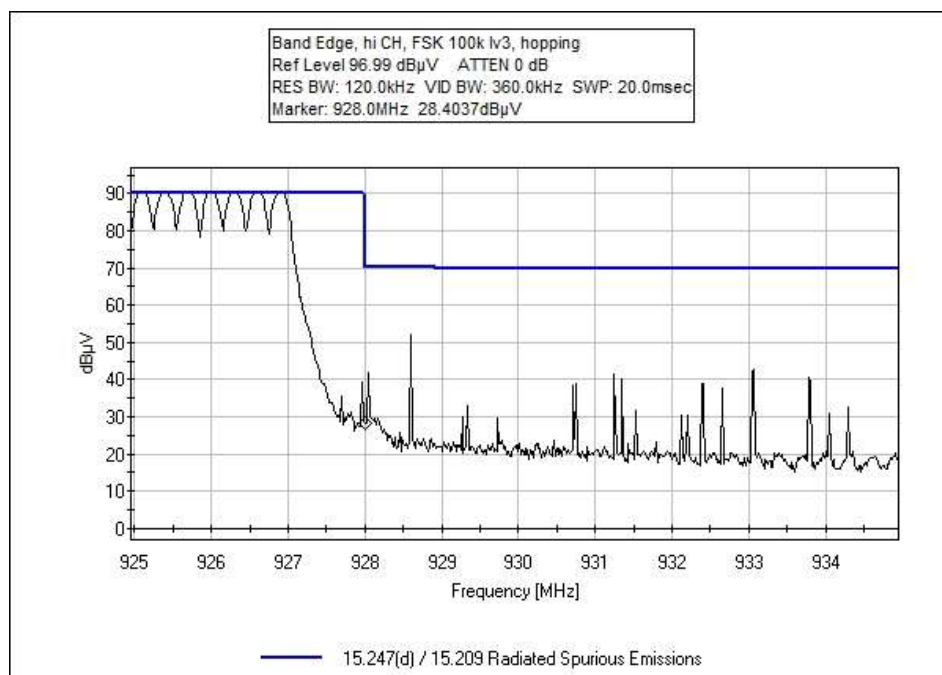
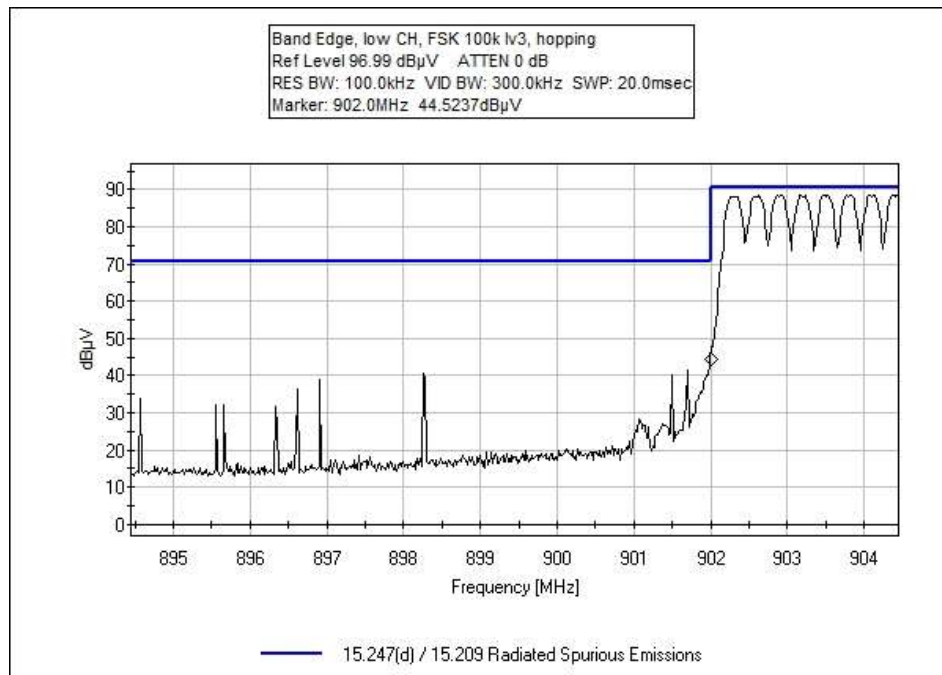
| Band Edge Summary |                              |           |                             |                    |         |
|-------------------|------------------------------|-----------|-----------------------------|--------------------|---------|
| Frequency (MHz)   | Modulation                   | Ant. Type | Field Strength (dBuV/m @3m) | Limit (dBuV/m @3m) | Results |
| 614               | 100kbps FSK pwr lv3          | Integral  | 40.4*                       | <46                | Pass    |
| 902               | 100kbps FSK pwr lv3          | Integral  | 90.2                        | <105.9             | Pass    |
| 928               | 100kbps FSK pwr lv3          | Integral  | 62.3                        | <105.9             | Pass    |
| 960               | 100kbps FSK pwr lv3          | Integral  | 49.3                        | <54                | Pass    |
| 902               | 100kbps FSK pwr lv3 Hopping  | Integral  | 79.8                        | <105.9             | Pass    |
| 928               | 100kbps FSK pwr lv3 Hopping  | Integral  | 64.2                        | <105.9             | Pass    |
| 614               | 300kbps GFSK pwr lv2         | Integral  | 40.4*                       | <46                | Pass    |
| 902               | 300kbps GFSK pwr lv2         | Integral  | 74.5                        | <94.2              | Pass    |
| 928               | 300kbps GFSK pwr lv2         | Integral  | 76.6                        | <94.2              | Pass    |
| 960               | 300kbps GFSK pwr lv2         | Integral  | 49.0                        | <54                | Pass    |
| 902               | 300kbps GFSK pwr lv2 Hopping | Integral  | 72.5                        | <94.2              | Pass    |
| 928               | 300kbps GFSK pwr lv2 Hopping | Integral  | 73.0                        | <94.2              | Pass    |
| 614               | 300kbps GFSK pwr lv3         | Integral  | 40.4*                       | <46                | Pass    |
| 902               | 300kbps GFSK pwr lv3         | Integral  | 85.0                        | <106.1             | Pass    |
| 928               | 300kbps GFSK pwr lv3         | Integral  | 88.6                        | <106.1             | Pass    |
| 960               | 300kbps GFSK pwr lv3         | Integral  | 49.8                        | <54                | Pass    |
| 902               | 300kbps GFSK pwr lv3 Hopping | Integral  | 89.3                        | <106.1             | Pass    |
| 928               | 300kbps GFSK pwr lv3 Hopping | Integral  | 87.5                        | <106.1             | Pass    |

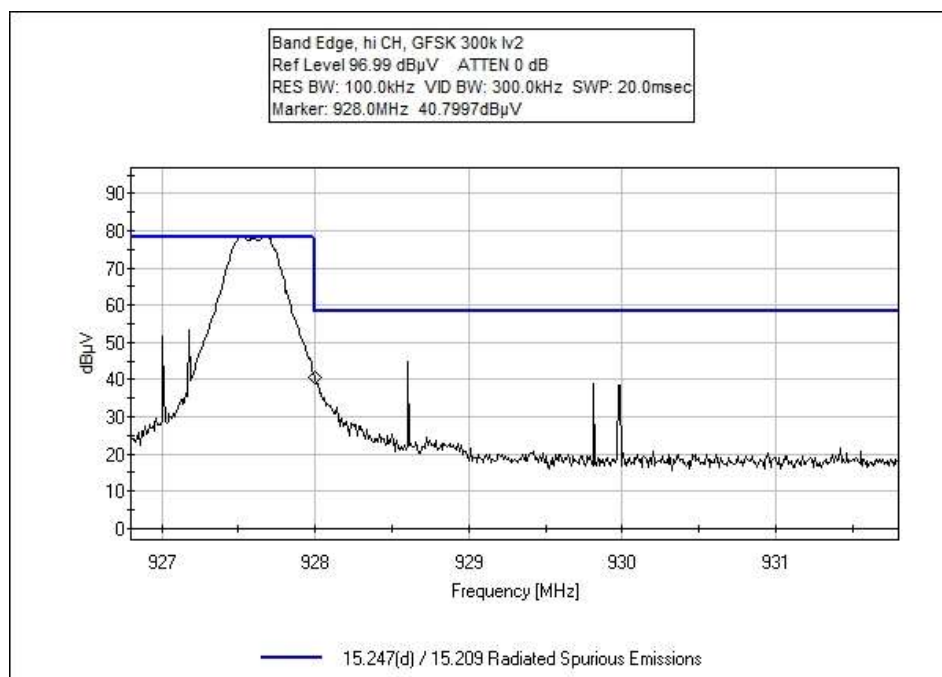
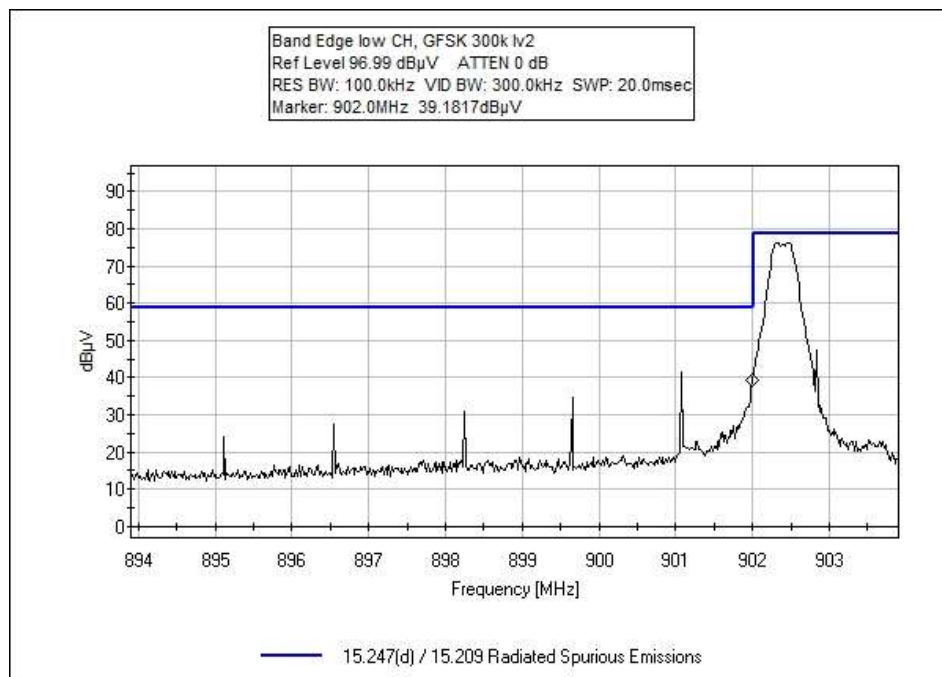
\* QP detector

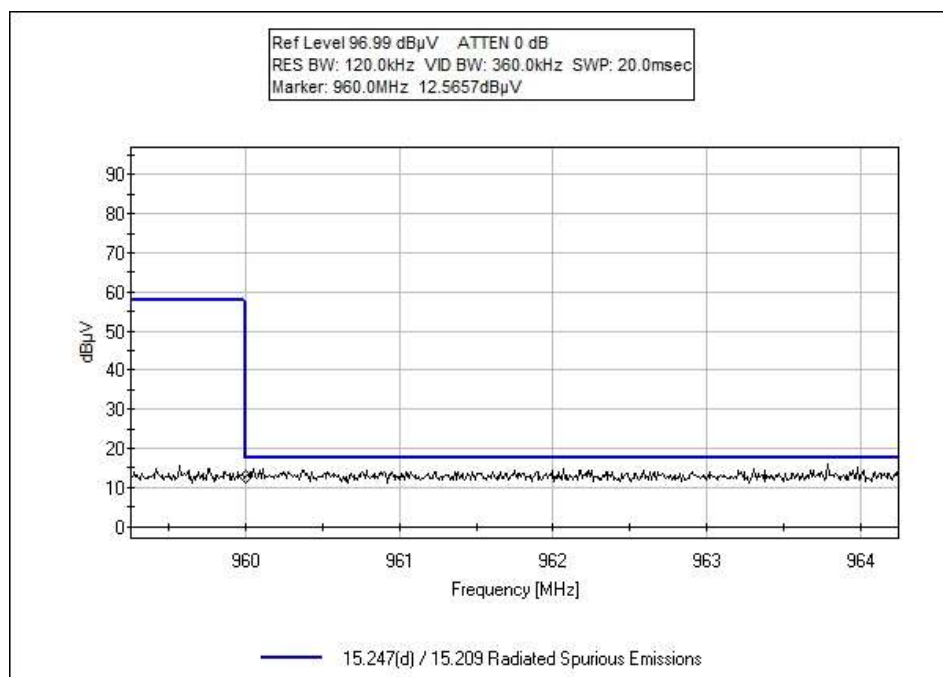
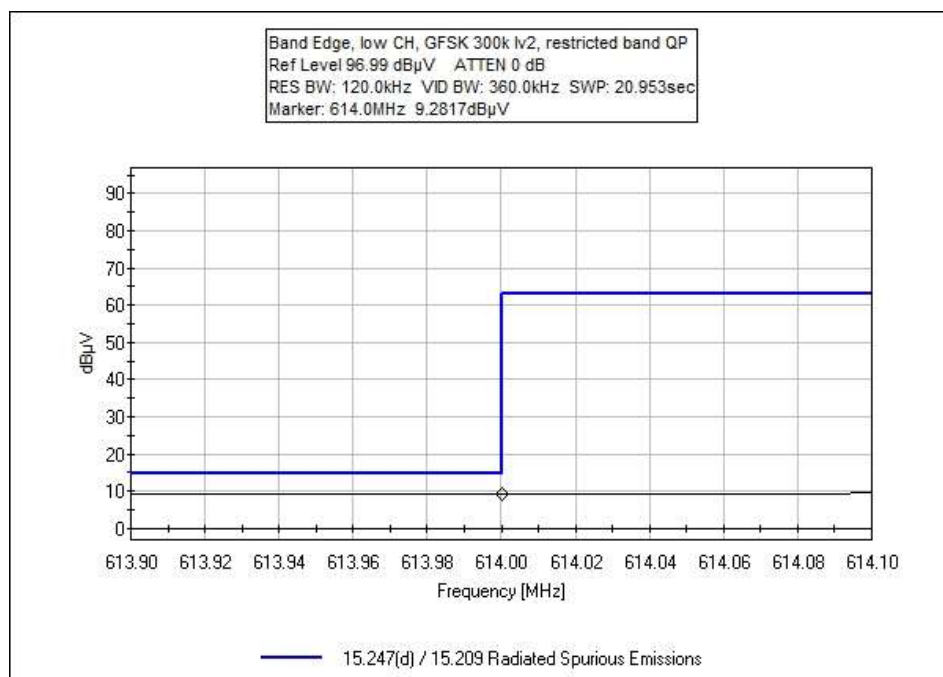
## Band Edge Plots

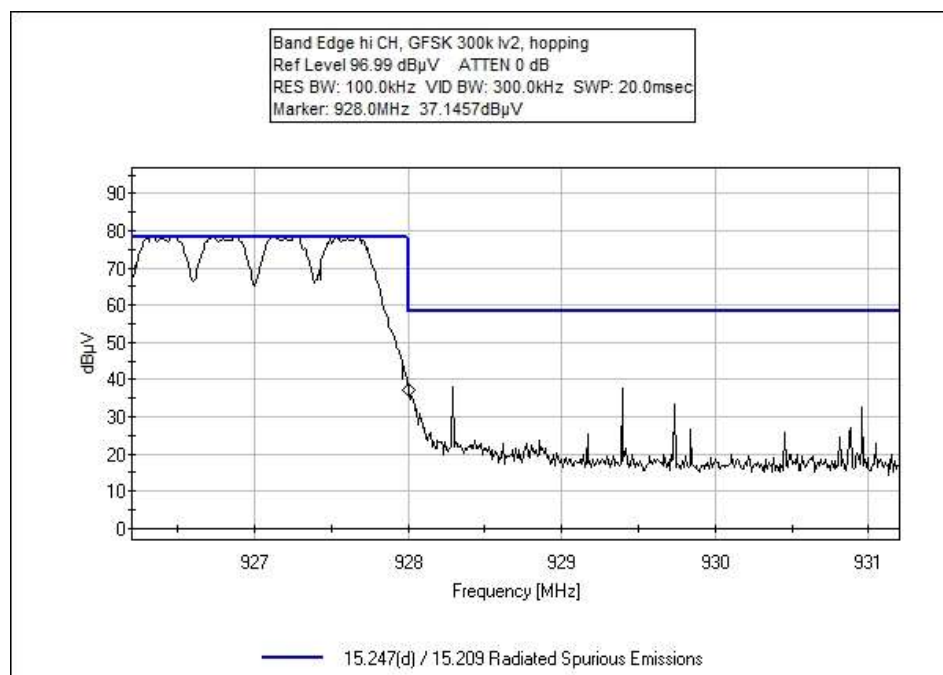
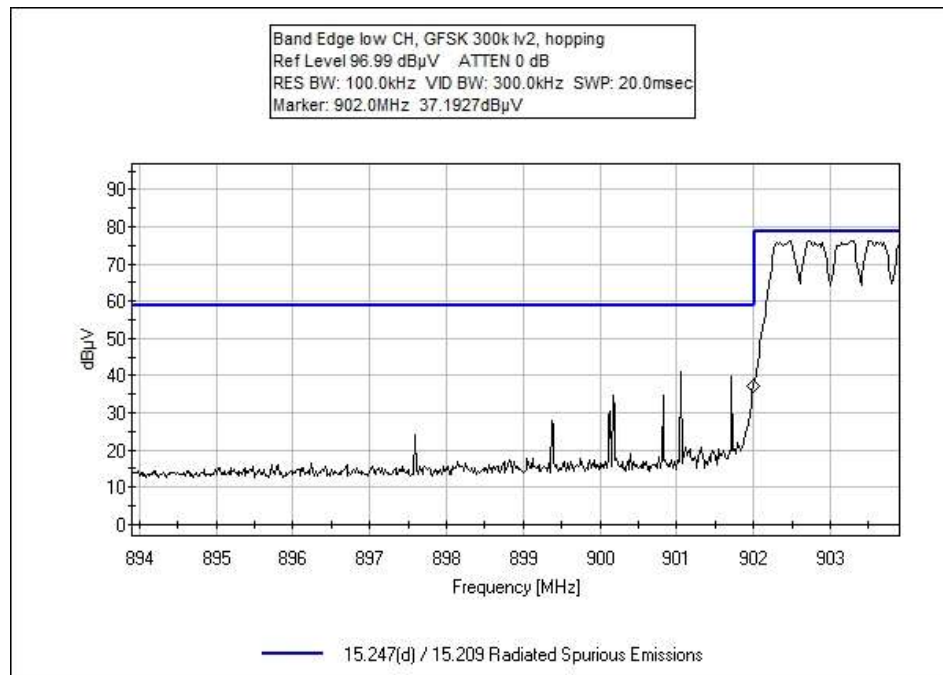


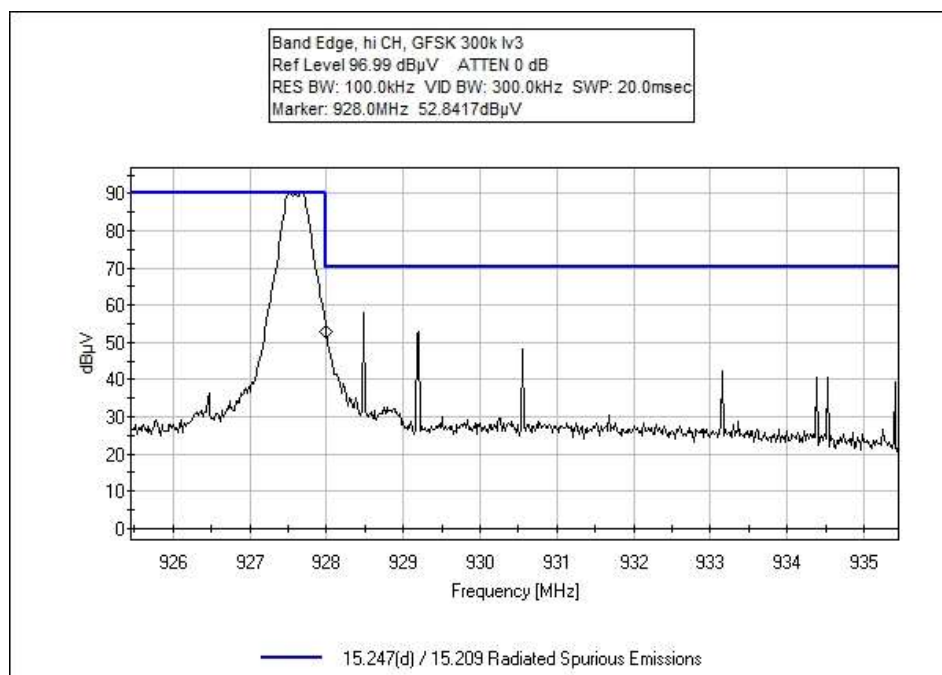
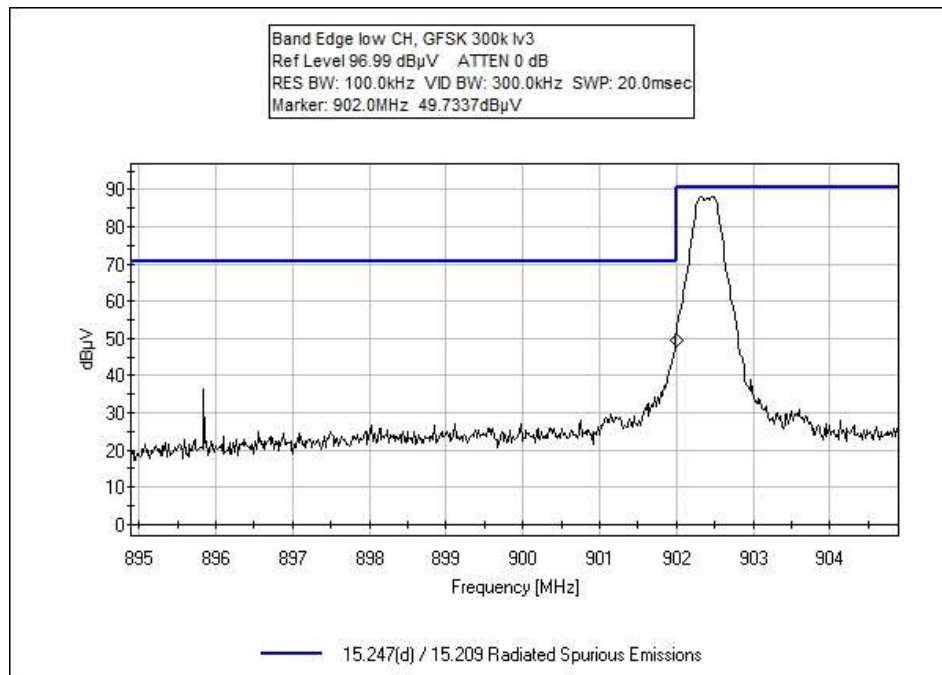


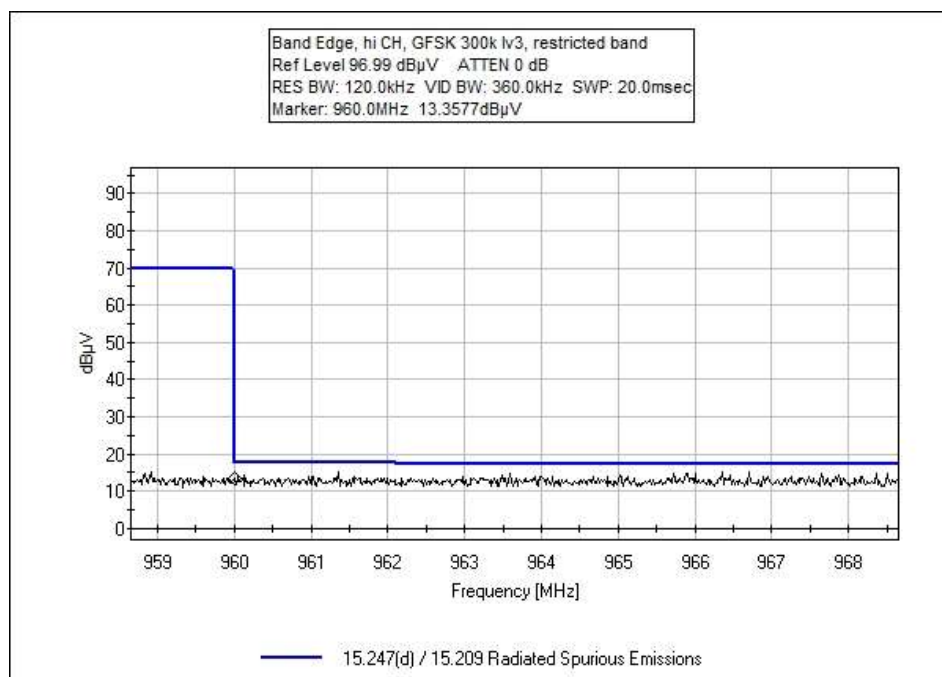
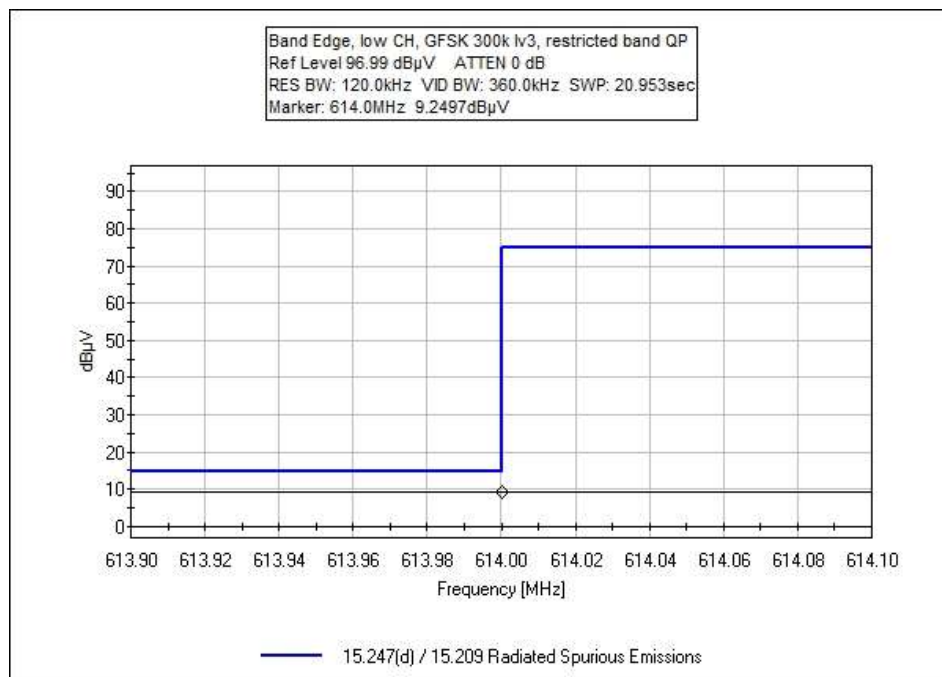


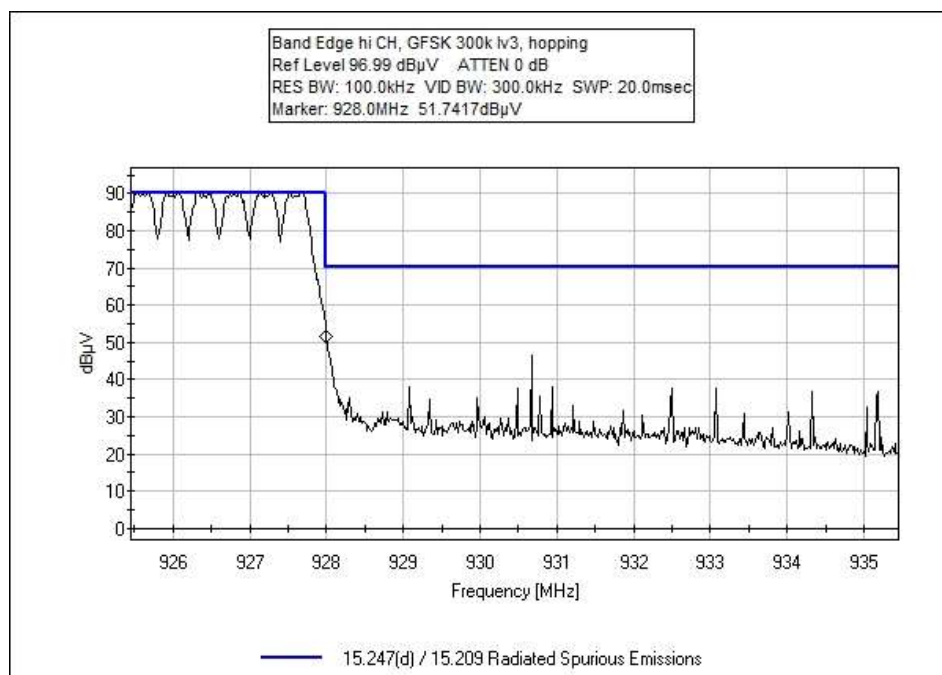
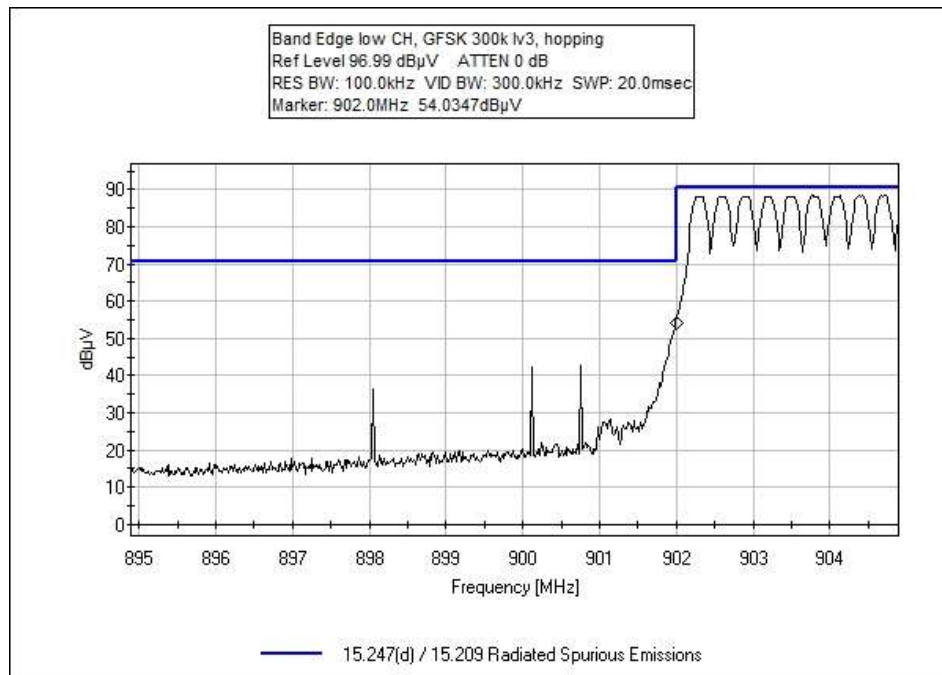












## Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112 x 2300  
 Customer: **Itron, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **101080** Date: 11/19/2018  
 Test Type: **Maximized Emissions** Time: 14:52:10  
 Tested By: Don Nguyen Sequence#: 3  
 Software: EMITest 5.03.11

### Equipment Tested:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

### Support Equipment:

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

### Test Conditions / Notes:

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter.  
 The laptop is running software Command Line Interface Tool to turn on TX at 100% duty cycle.  
 The EUT is powered from fresh battery 6.0Vdc.  
 Support equipment is removed during test.

### Modulation: FSK 100k power level 3

Frequency of measurement: 902-928MHz  
 RBW=100kHz, VBW=300kHz  
 RBW=120kHz, VBW=360kHz (restricted band)

Test Method: ANSI C63.10 (2013)  
 Temperature: 21.8°C  
 Relative Humidity: 21.3%  
 Site A

**Test Equipment:**

| ID | Asset #  | Description                          | Model    | Calibration Date | Cal Due Date |
|----|----------|--------------------------------------|----------|------------------|--------------|
| T1 | AN01995  | Biconilog Antenna                    | CBL6111C | 4/23/2018        | 4/23/2020    |
| T2 | ANP05275 | Attenuator                           | 1W       | 4/5/2018         | 4/5/2020     |
| T3 | ANP05198 | Cable-Amplitude<br>+15C to +45C (dB) | 8268     | 12/7/2016        | 12/7/2018    |
| T4 | AN02672  | Spectrum Analyzer                    | E4446A   | 3/2/2017         | 3/2/2019     |
| T5 | ANP05050 | Cable                                | RG223/U  | 1/20/2017        | 1/20/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq           | Rdng       | T1<br>T5      | T2   | T3   | T4   | Dist  | Corr         | Spec             | Margin | Polar |
|---|----------------|------------|---------------|------|------|------|-------|--------------|------------------|--------|-------|
|   | MHz            | dB $\mu$ V | dB            | dB   | dB   | dB   | Table | dB $\mu$ V/m | dB $\mu$ V/m     | dB     | Ant   |
| 1 | 960.000M       | 12.9       | +23.7<br>+0.5 | +6.1 | +6.1 | +0.0 | +0.0  | 49.3         | 54.0             | -4.7   | Horiz |
| 2 | 614.000M<br>QP | 9.3        | +20.0<br>+0.4 | +6.0 | +4.7 | +0.0 | +0.0  | 40.4         | 46.0             | -5.6   | Horiz |
| 3 | 902.000M       | 54.9       | +22.8<br>+0.5 | +6.1 | +5.9 | +0.0 | +0.0  | 90.2         | 105.9            | -15.7  | Horiz |
| 4 | 902.000M       | 44.5       | +22.8<br>+0.5 | +6.1 | +5.9 | +0.0 | +0.0  | 79.8         | 105.9<br>hopping | -26.1  | Horiz |
| 5 | 928.000M       | 28.4       | +23.2<br>+0.5 | +6.1 | +6.0 | +0.0 | +0.0  | 64.2         | 105.9<br>hopping | -41.7  | Horiz |
| 6 | 928.000M       | 26.5       | +23.2<br>+0.5 | +6.1 | +6.0 | +0.0 | +0.0  | 62.3         | 105.9            | -43.6  | Horiz |



Test Location: CKC Laboratories, Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112 x 2300  
 Customer: **Itron, Inc.**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **101080** Date: 11/19/2018  
 Test Type: **Maximized Emissions** Time: 14:19:22  
 Tested By: Don Nguyen Sequence#: 1  
 Software: EMITest 5.03.11

**Equipment Tested:**

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

**Support Equipment:**

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

**Test Conditions / Notes:**

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter.  
 The laptop is running software Command Line Interface Tool to turn on TX at 100% duty cycle.  
 The EUT is powered from fresh battery 6.0Vdc.  
 Support equipment is removed during test.

**Modulation: GFSK 300k power level 2**

Frequency of measurement: 902-928MHz  
 RBW=100kHz, VBW=300kHz  
 RBW=120kHz, VBW=360kHz (restricted band)

Test Method: ANSI C63.10 (2013)  
 Temperature: 21.8°C  
 Relative Humidity: 21.3%  
 Site A

**Test Equipment:**

| ID | Asset ## | Description                          | Model    | Calibration Date | Cal Due Date |
|----|----------|--------------------------------------|----------|------------------|--------------|
| T1 | AN01995  | Biconilog Antenna                    | CBL6111C | 4/23/2018        | 4/23/2020    |
| T2 | ANP05275 | Attenuator                           | 1W       | 4/5/2018         | 4/5/2020     |
| T3 | ANP05198 | Cable-Amplitude<br>+15C to +45C (dB) | 8268     | 12/7/2016        | 12/7/2018    |
| T4 | AN02672  | Spectrum Analyzer                    | E4446A   | 3/2/2017         | 3/2/2019     |
| T5 | ANP05050 | Cable                                | RG223/U  | 1/20/2017        | 1/20/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq           | Rdng       | T1<br>T5      | T2   | T3   | T4   | Dist  | Corr         | Spec            | Margin | Polar |
|---|----------------|------------|---------------|------|------|------|-------|--------------|-----------------|--------|-------|
|   | MHz            | dB $\mu$ V | dB            | dB   | dB   | dB   | Table | dB $\mu$ V/m | dB $\mu$ V/m    | dB     | Ant   |
| 1 | 960.000M       | 12.6       | +23.7<br>+0.5 | +6.1 | +6.1 | +0.0 | +0.0  | 49.0         | 54.0            | -5.0   | Horiz |
| 2 | 614.000M<br>QP | 9.3        | +20.0<br>+0.4 | +6.0 | +4.7 | +0.0 | +0.0  | 40.4         | 46.0            | -5.6   | Horiz |
| 3 | 928.000M       | 40.8       | +23.2<br>+0.5 | +6.1 | +6.0 | +0.0 | +0.0  | 76.6         | 94.2            | -17.6  | Horiz |
| 4 | 902.000M       | 39.2       | +22.8<br>+0.5 | +6.1 | +5.9 | +0.0 | +0.0  | 74.5         | 94.2            | -19.7  | Horiz |
| 5 | 928.000M       | 37.2       | +23.2<br>+0.5 | +6.1 | +6.0 | +0.0 | +0.0  | 73.0         | 94.2<br>hopping | -21.3  | Horiz |
| 6 | 902.000M       | 37.2       | +22.8<br>+0.5 | +6.1 | +5.9 | +0.0 | +0.0  | 72.5         | 94.2<br>hopping | -21.7  | Horiz |



Test Location: CKC Laboratories, Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112 x 2300  
Customer: **Itron, Inc.**  
Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
Work Order #: **101080** Date: 11/19/2018  
Test Type: **Maximized Emissions** Time: 14:13:14  
Tested By: Don Nguyen Sequence#: 2  
Software: EMITest 5.03.11

***Equipment Tested:***

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

***Support Equipment:***

| Device          | Manufacturer | Model # | S/N |
|-----------------|--------------|---------|-----|
| Configuration 2 |              |         |     |

***Test Conditions / Notes:***

The EUT is placed on table top. The serial port is connected to a support laptop via serial to USB adapter.  
The laptop is running software Command Line Interface Tool to turn on TX at 100% duty cycle.  
The EUT is powered from fresh battery 6.0Vdc.  
Support equipment is removed during test.

**Modulation: GFSK 300k power level 3**

Frequency of measurement: 902-928MHz  
RBW=100kHz, VBW=300kHz  
RBW=120kHz, VBW=360kHz (restricted band)

Test Method: ANSI C63.10 (2013)  
Temperature: 21.8°C  
Relative Humidity: 21.3%  
Site A

**Test Equipment:**

| ID | Asset #  | Description                          | Model    | Calibration Date | Cal Due Date |
|----|----------|--------------------------------------|----------|------------------|--------------|
| T1 | AN01995  | Biconilog Antenna                    | CBL6111C | 4/23/2018        | 4/23/2020    |
| T2 | ANP05275 | Attenuator                           | 1W       | 4/5/2018         | 4/5/2020     |
| T3 | ANP05198 | Cable-Amplitude<br>+15C to +45C (dB) | 8268     | 12/7/2016        | 12/7/2018    |
| T4 | AN02672  | Spectrum Analyzer                    | E4446A   | 3/2/2017         | 3/2/2019     |
| T5 | ANP05050 | Cable                                | RG223/U  | 1/20/2017        | 1/20/2019    |

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

| # | Freq           | Rdng       | T1<br>T5      | T2   | T3   | T4   | Dist  | Corr         | Spec             | Margin | Polar |
|---|----------------|------------|---------------|------|------|------|-------|--------------|------------------|--------|-------|
|   | MHz            | dB $\mu$ V | dB            | dB   | dB   | dB   | Table | dB $\mu$ V/m | dB $\mu$ V/m     | dB     | Ant   |
| 1 | 960.000M       | 13.4       | +23.7<br>+0.5 | +6.1 | +6.1 | +0.0 | +0.0  | 49.8         | 54.0             | -4.2   | Horiz |
| 2 | 614.000M<br>QP | 9.3        | +20.0<br>+0.4 | +6.0 | +4.7 | +0.0 | +0.0  | 40.4         | 46.0             | -5.6   | Horiz |
| 3 | 902.000M       | 54.0       | +22.8<br>+0.5 | +6.1 | +5.9 | +0.0 | +0.0  | 89.3         | 106.1<br>hopping | -16.8  | Horiz |
| 4 | 928.000M       | 52.8       | +23.2<br>+0.5 | +6.1 | +6.0 | +0.0 | +0.0  | 88.6         | 106.1            | -17.5  | Horiz |
| 5 | 928.000M       | 51.7       | +23.2<br>+0.5 | +6.1 | +6.0 | +0.0 | +0.0  | 87.5         | 106.1<br>hopping | -18.6  | Horiz |
| 6 | 902.000M       | 49.7       | +22.8<br>+0.5 | +6.1 | +5.9 | +0.0 | +0.0  | 85.0         | 106.1            | -21.1  | Horiz |

**Test Setup Photos**



Below 1GHz



Below 1GHz



Above 1GHz, Cone placement



Above 1GHz, Cone placement

## 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.