

Itron, Inc.

TEST REPORT FOR

**Mobile Collection Device, MC3Lite
Model: DCU-5310-3**

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

**15.247
(FHSS 902-928 MHz)**

Report No.: 100728-11

Date of issue: January 26, 2018



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 EMC 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:

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

Representative: Jay Holcomb
Customer Reference Number: 138781

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: 100728

January 9, 2018

January 9-15, 2018

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment 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.

A handwritten signature in black ink that reads "Steve Behm".

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)(i)	Average Time of Occupancy	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	Mod. #1*	Pass

NA = Not Applicable

* = No modification was in place for the Band Edge testing.

Modifications During Testing

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

Summary of Conditions
Modification #1 on Configuration 2: Installed a ferrite with no loop on the DC cable connected to MC3Lite. The ferrite manufacturer is Fair-Rite, PN: 0443164151.

Modifications satisfying what is 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
Mobile Collection Device, MC3Lite	Itron, Inc.	DCU-5310-3	10000006
5dBi Antenna	PCTEL	Generic	NA
Tablet	Panasonic	FZ-M1	NA
Automobile Adapter	Lind Electronics, Inc.	PA1555-2155 FB	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
Power Supply	Topward	6306D	988614

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
Mobile Collection Device, MC3Lite	Itron, Inc.	DCU-5310-3	10000006
5dBi Antenna	PCTEL	Generic	NA
Automobile Adapter	Lind Electronics, Inc.	PA1555-4190 X	NA
Tablet	Panasonic	FZ-G1	NA
Power Distribution Box	Itron, Inc.	Generic	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
Power Supply	Topward	6306D	988614

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Operating Frequency Range:	908-924MHz
Number of Hopping Channels:	81
Modulation Type(s):	12.5kbps FM
Maximum Duty Cycle:	45mS
Number of TX Chains:	1
Antenna Gain:	5dbi
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	12.8Vdc from car battery
Firmware / Software used for Test:	MC3 SuperRaptor Test ver.4.0.2.2
FCC ID:	7" tablet – Panasonic FZ-M1 FCC ID: ACJ9TGWL15B IC: 216A-CFWL15B contains: FCC ID: ACJ9TGWW13B3 IC: 216A-CFWW13B 10" tablet – Panasonic FZ-G1 FCC ID: ACJ9TGWL15A IC: 216A-CFWL15A contains: FCC ID: ACJ9TGWW13B1 IC: 216A-CFWW13B

FCC Part 15 Subpart C

15.247(a)(1)(i) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	Stuart Yamamoto/Don Nguyen
Test Method:	ANSI C63.10 (2013)	Test Date(s):	1/9/2018
Configuration:	1		
Test Setup:	The EUT is placed on test bench. Input voltage is 12.8Vdc from external power supply. GPS antenna port is connected to a GPS antenna. USB port is connected to a touchscreen computer. The computer is sending command to the EUT using software MC3 SuperRaptor Test ver.4.0.2.2 The EUT is set to continuously transmit. Each single channel has two peaks which are 100kHz apart. Center frequency of each channel is placed on the middle of the two peaks. Hence, each channel is separated by 200kHz as shown in the plot. Operating frequency: 908-924MHz Frequency of measurement: 902-928MHz RBW=3kHz, VBW=10kHz		

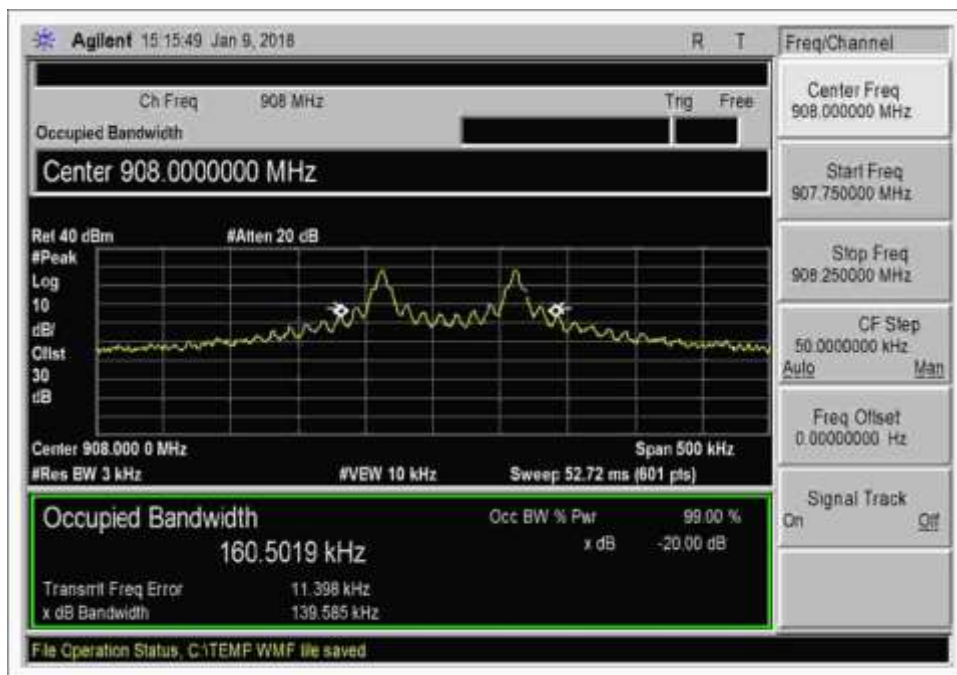
Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	55

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
P06660	Cable	Gore	PHASEFLEX FJR01N01036.0	4/5/2016	4/5/2018

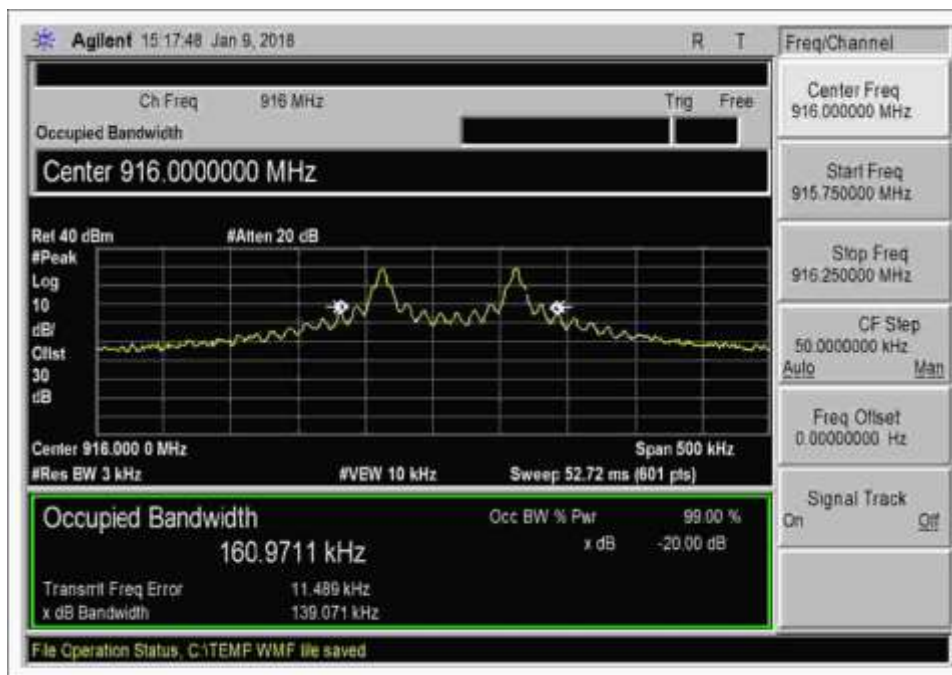
15.247(a)(1) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
908	1	12.5kbps FM	139.585	≤500	Pass
916	1	12.5kbps FM	139.071	≤500	Pass
924	1	12.5kbps FM	140.186	≤500	Pass

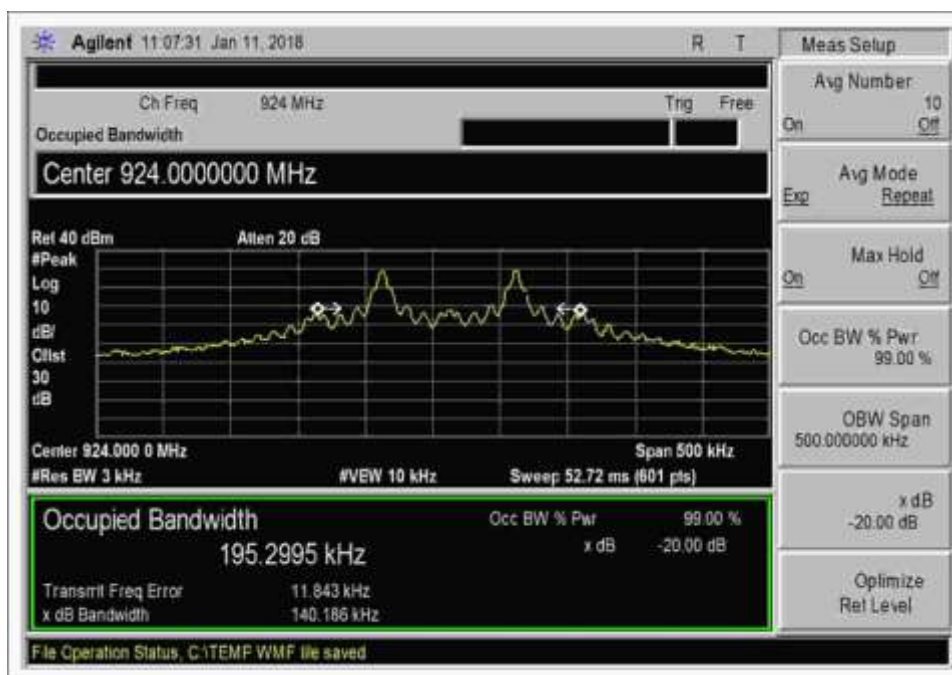
Plots



Low Channel



Middle Channel

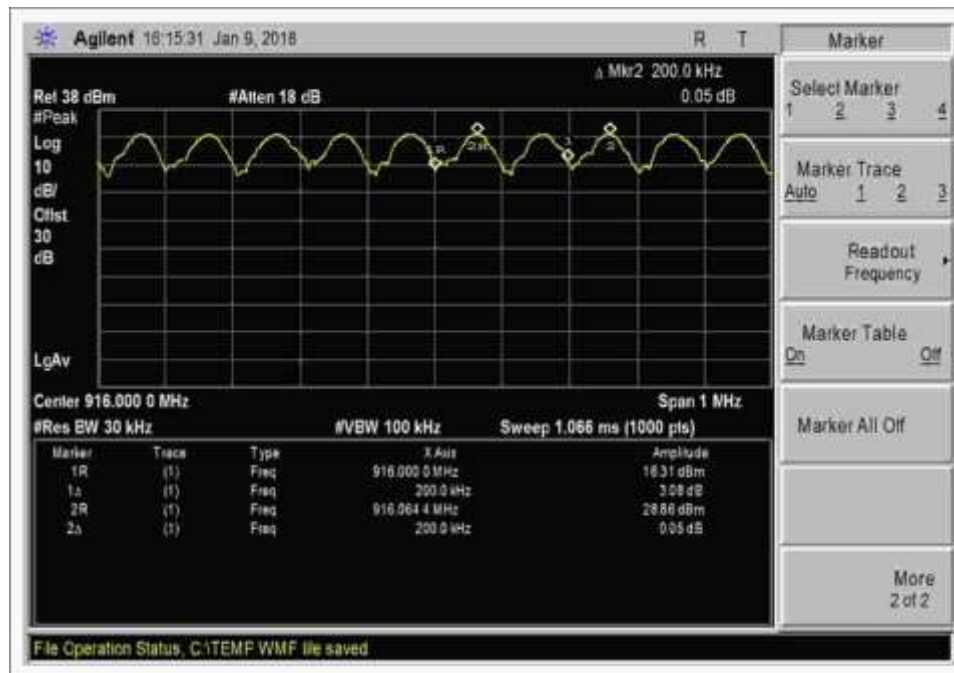


High Channel

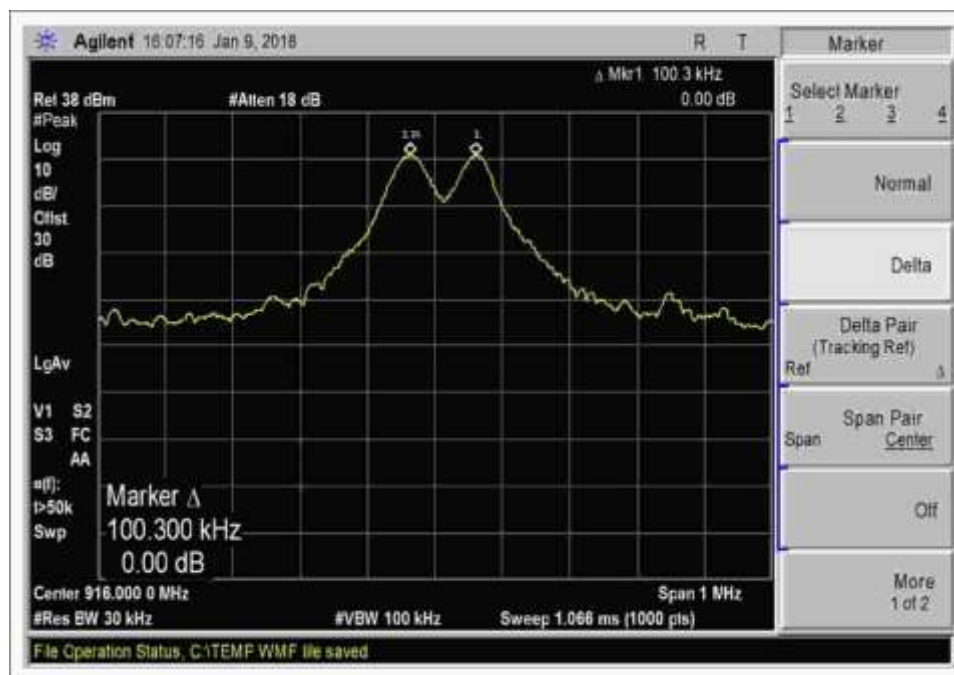
15.247(a)(1) Carrier Separation

Test Data Summary				
Limit applied: 20dB bandwidth of the hopping channel.				
Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	Hopping	200	>140.186	Pass

Plots



Frequency Separation

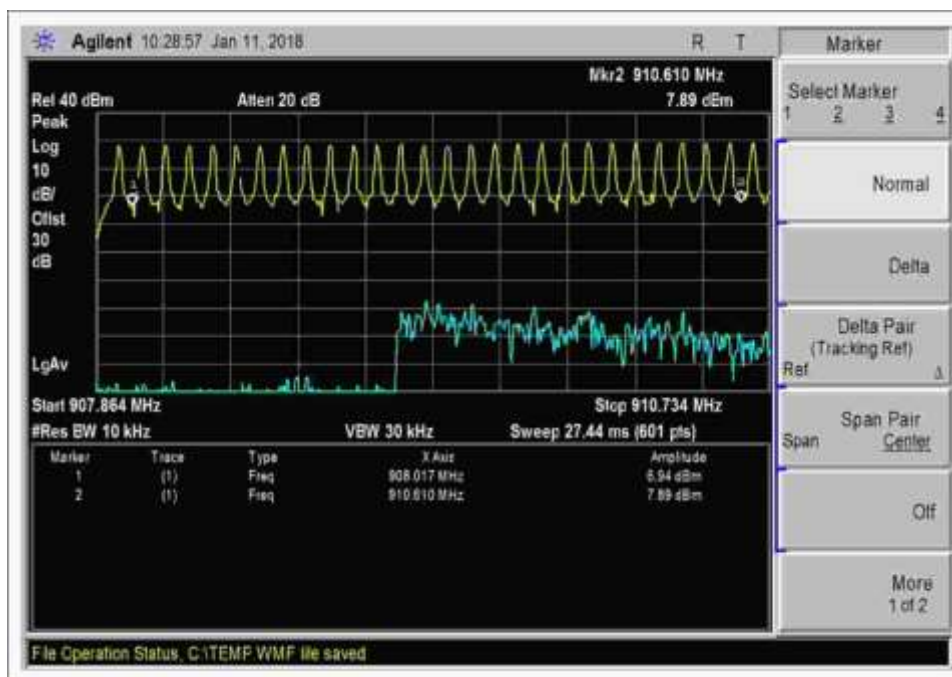


Single Channel

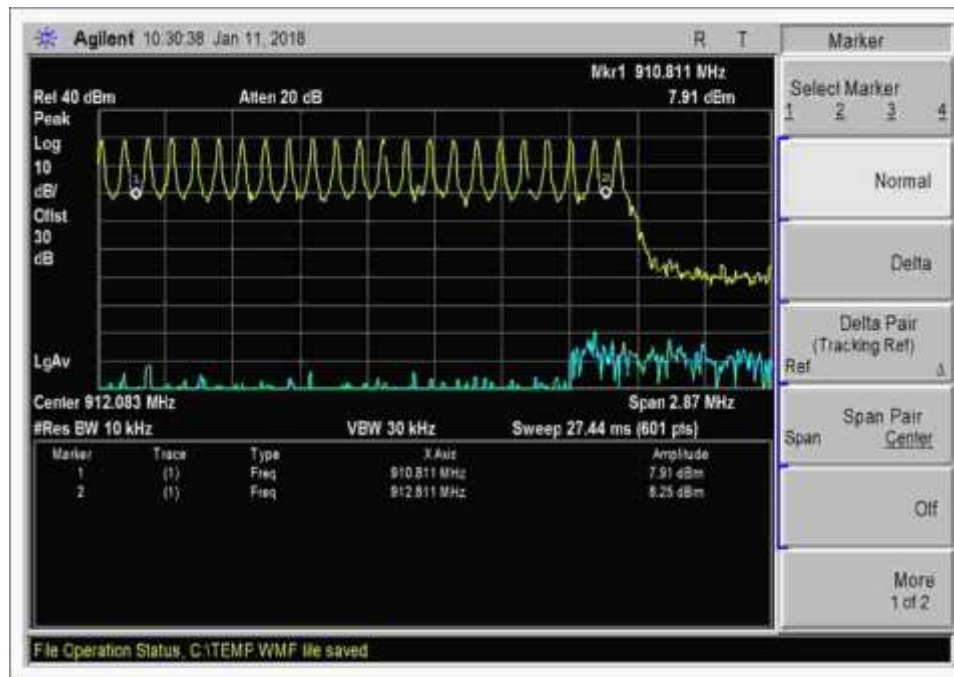
15.247(a)(1)(i) Number of Hopping Channels

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	Hopping	81	≥ 50	Pass

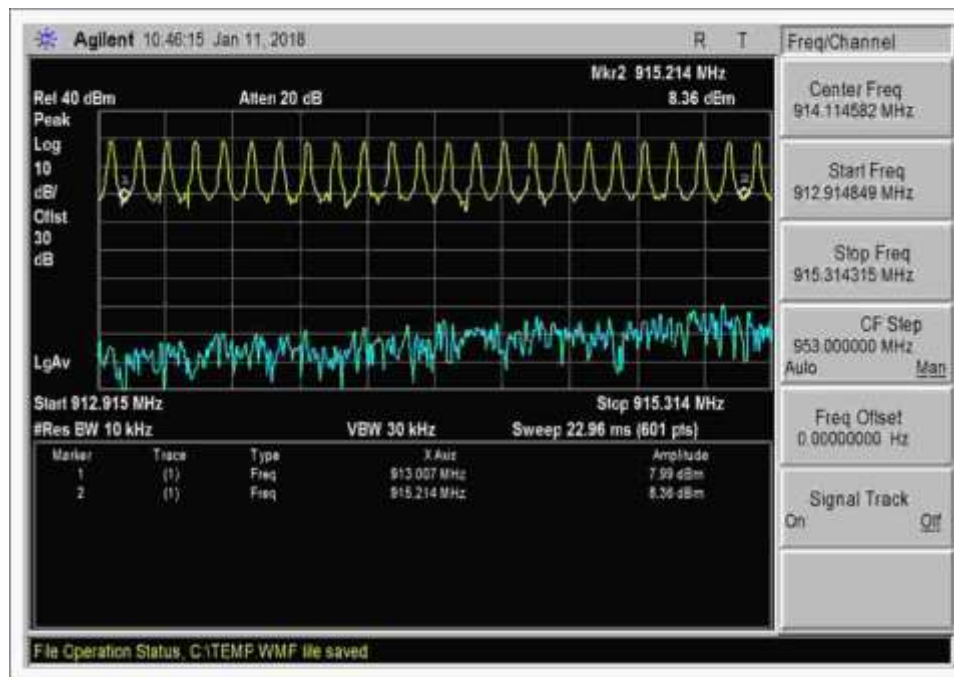
Plots



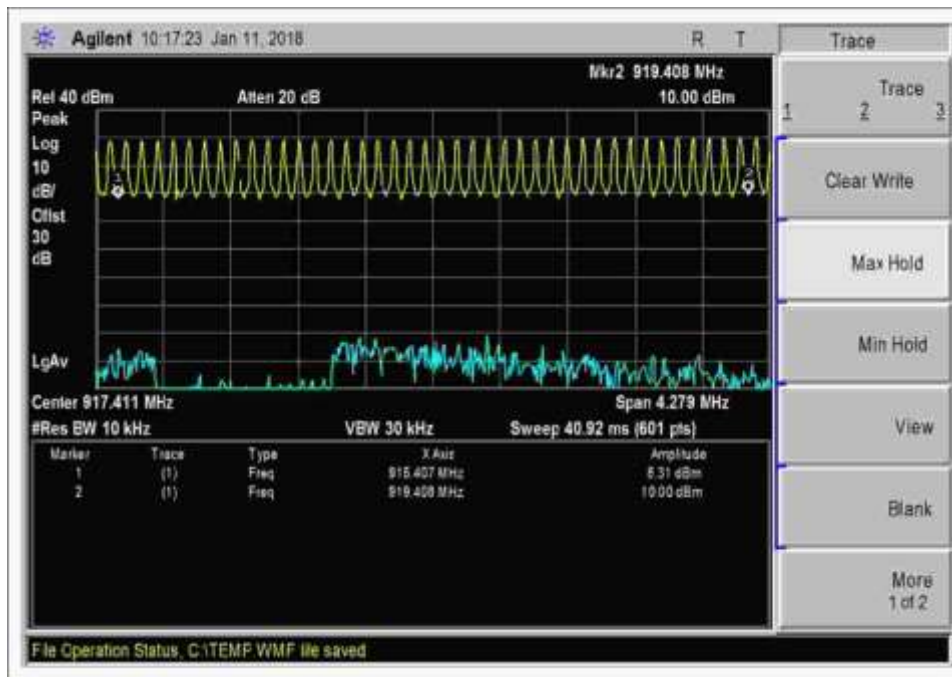
908-910.6MHz_14 channels



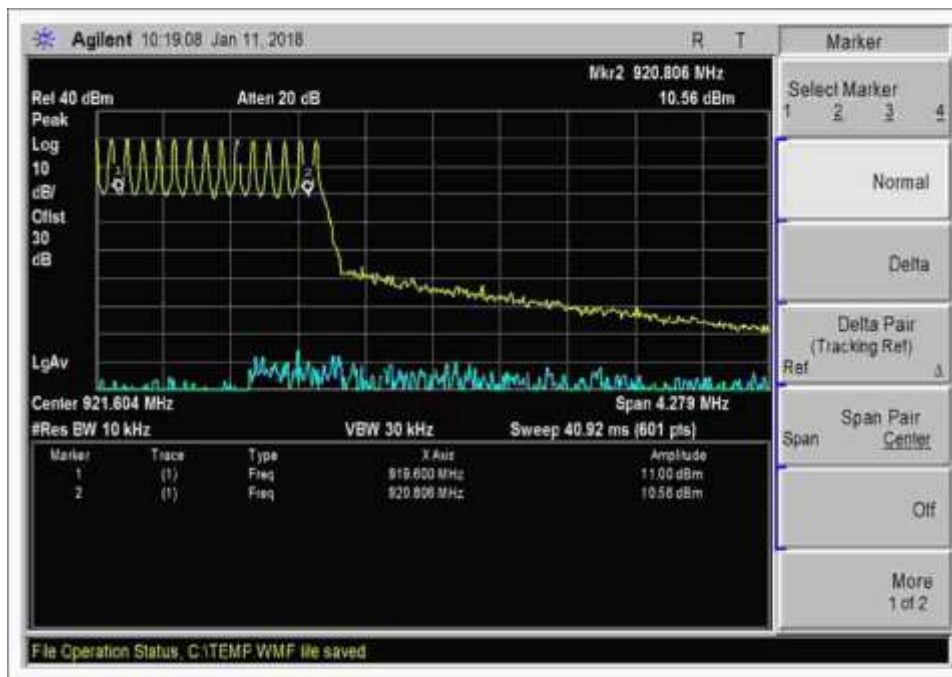
910.8-912.8MHz_11 channels



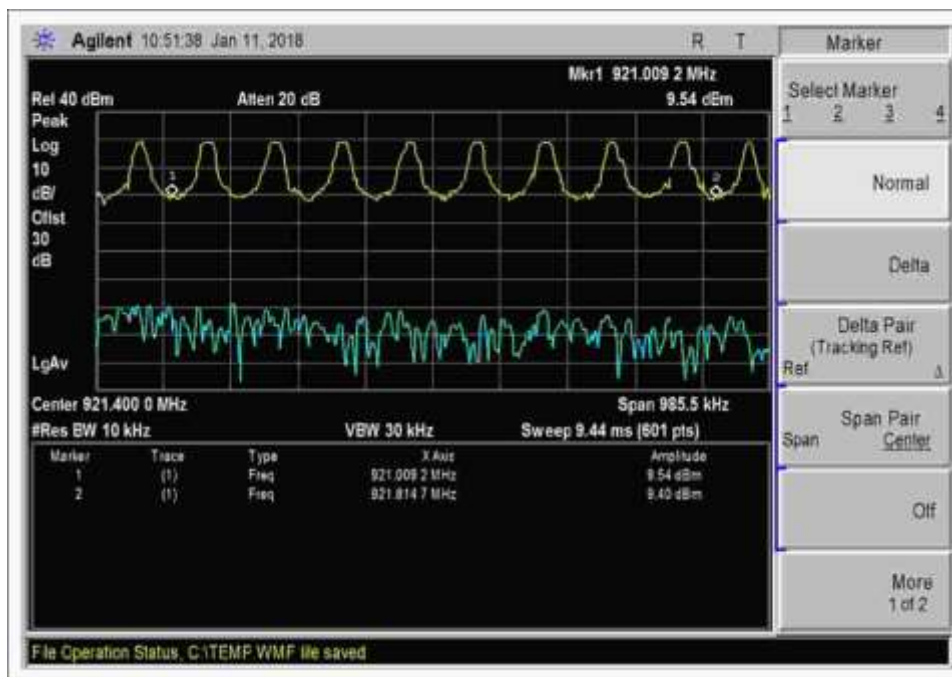
913.0-915.2MHz_12 channels



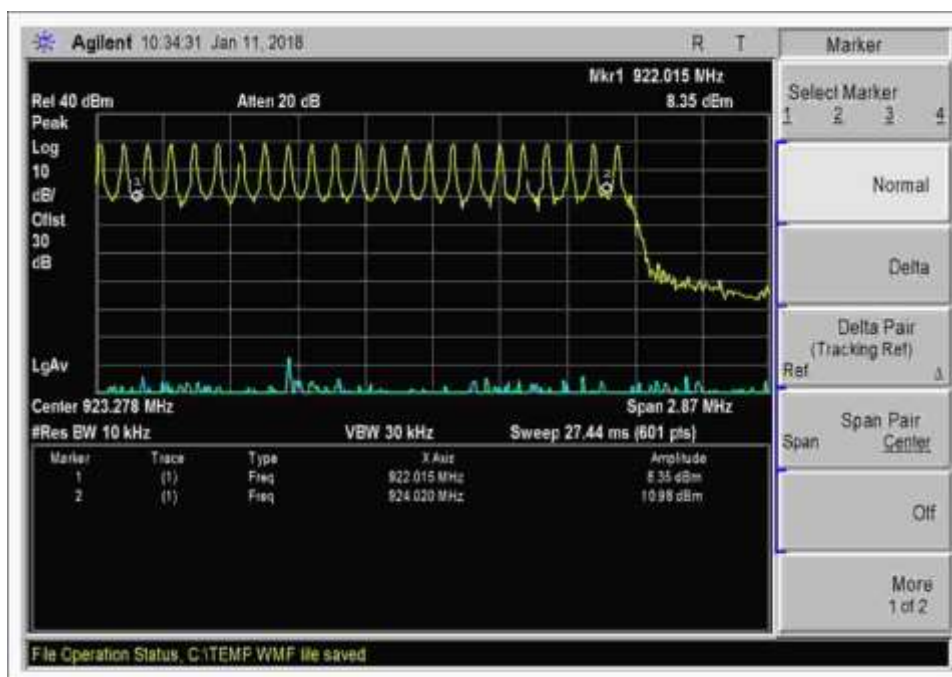
915.4-919.4MHz_21 channels



919.6-920.8MHz_7 channels



921.0-921.8MHz_5 channels



922.0-924MHz_11 channels

15.247(a)(1)(i) Time of Occupancy

Test Data Summary				
Observation Period, P_{obs} is derived from the following:				
$P_{obs} = \begin{cases} 20 \text{ Seconds} & 20 \text{ dB BW} < 250\text{kHz} \\ 10 \text{ Seconds} & 20 \text{ dB BW} \geq 250\text{kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (ms)	Limit (ms/ P_{obs})	Results
1	Hopping	360	≤ 400	Pass

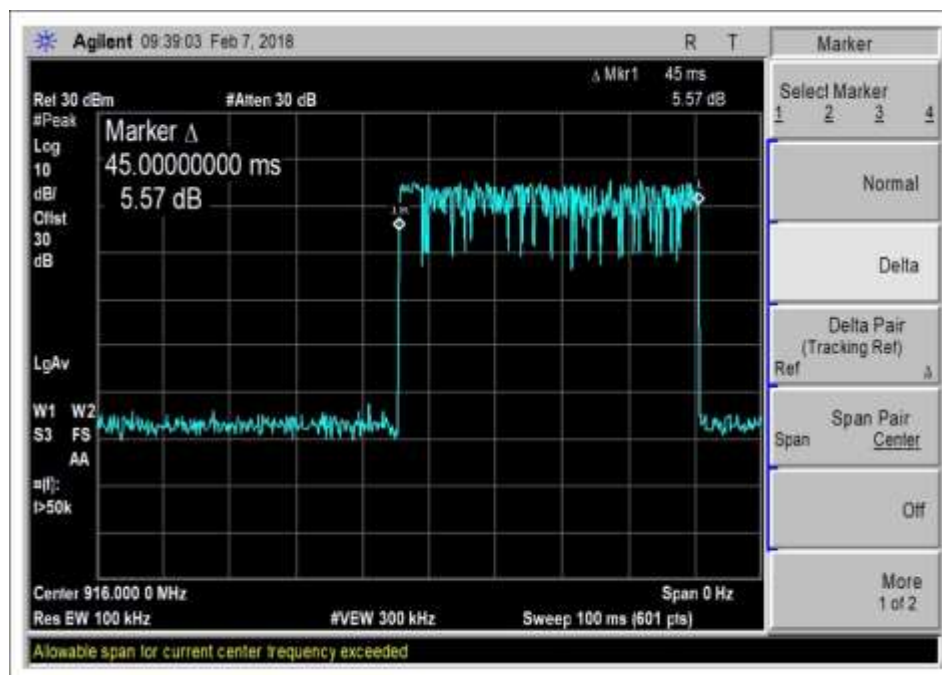
Measured results are calculated as follows:

$$Dwell\ time = \left(\sum_{Bursts} RF\ Burst\ On\ Time + \sum_{Control} Control\ Signal\ On\ time \right) \Big|_{P_{obs}}$$

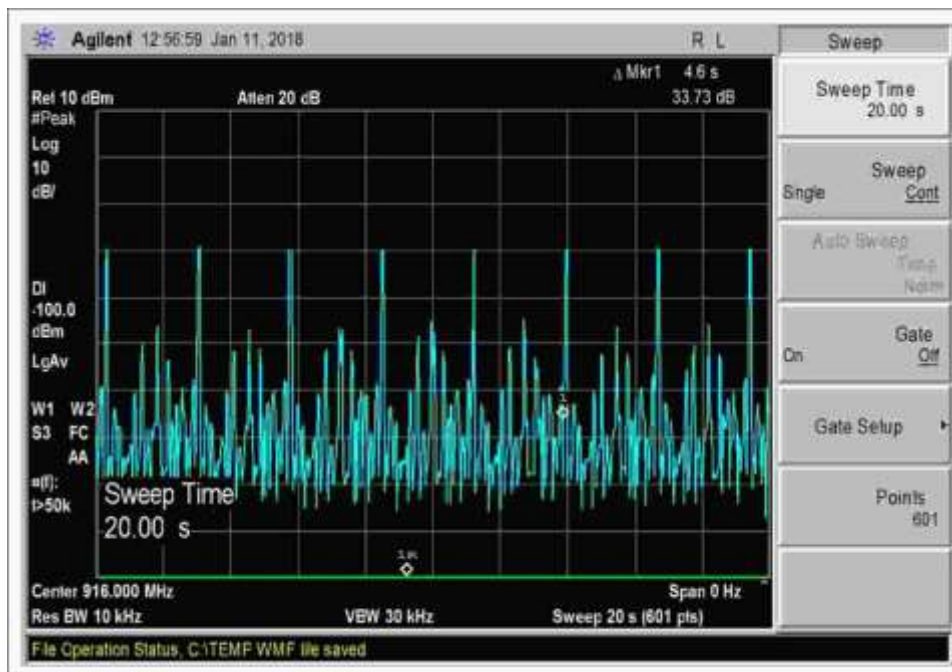
Actual Calculated Values:

Parameter	Value
Observation Period (P_{obs}):	20 seconds
Number of RF Bursts / P_{obs} :	8
On time of RF Burst:	45ms
Number of Control or other signals / P_{obs} :	0
On time of Control or other Signals:	0
Total Measured On Time:	360ms

Plots



1 Transmission



20Second_8 Transmission

Test Setup Photo



15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	Don Nguyen
Test Method:	ANSI C63.10 (2013)	Test Date(s):	1/10/2018
Configuration:	1		
Test Setup:	The EUT is placed on test bench. Input voltage is 12.8Vdc from external power supply. GPS antenna port is connected to a GPS antenna. USB port is connected to a touchscreen computer. The computer is sending command to the EUT using software MC3 SuperRaptor Test ver.4.0.2.2 The EUT is set to continuously transmit. Operating frequency: 908-924MHz Frequency of measurement: 902-928MHz RBW=200kHz, VBW=620kHz		

Environmental Conditions			
Temperature (°C)	19	Relative Humidity (%):	55

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
P06660	Cable	Gore	PHASEFLEX FJR01N01036.0	4/5/2016	4/5/2018

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V _{Minimum} (dBm)	V _{Nominal} (dBm)	V _{Maximum} (dBm)	Max Deviation from V _{Nominal} (dB)
908	12.5kbps FM	NA	27.90	NA	NA
916	12.5kbps FM	NA	28.85	NA	NA
924	12.5kbps FM	NA	28.68	NA	NA

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

NA = Not applicable because the EUT is battery powered. Power output tests were performed using an external power supply to simulate a fresh battery.

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V _{Nominal} :	12.8Vdc
V _{Minimum} :	NA
V _{Maximum} :	NA

NA: This equipment is battery powered. Power output tests were performed using an external power supply to simulate a fresh battery.

Test Data Summary - Voltage Variations

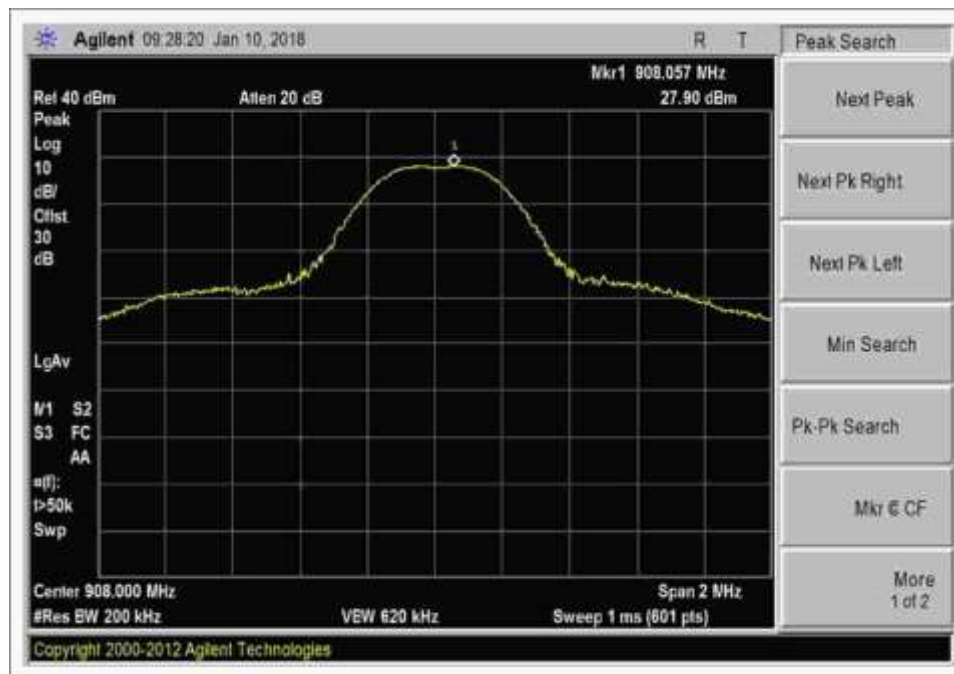
This equipment is battery powered. Power output tests were performed using an external power supply to simulate a fresh battery.

Test Data Summary - RF Conducted Measurement

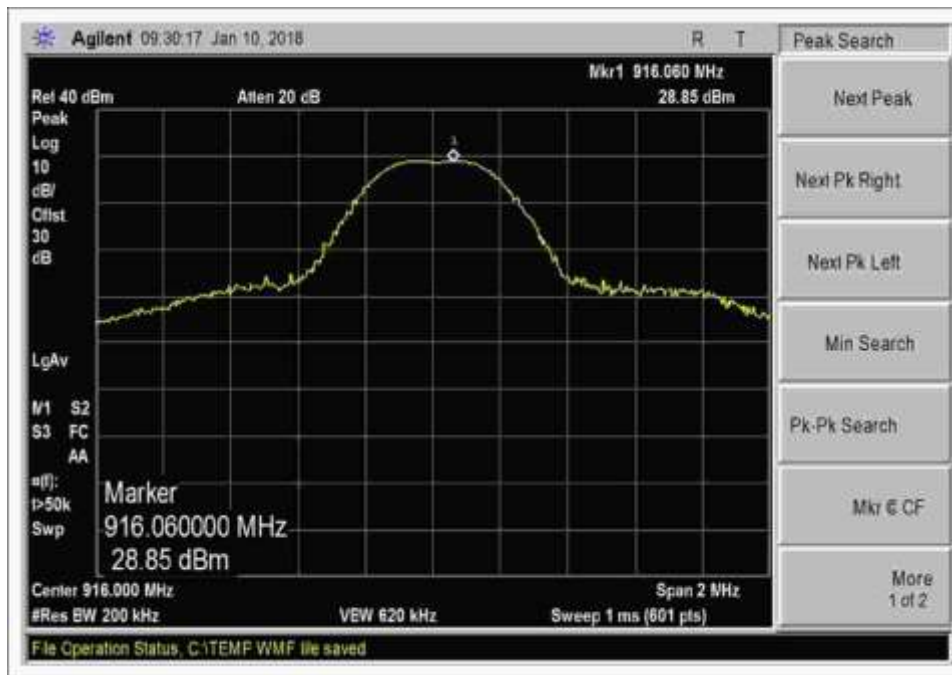
Limit = $\begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} & \geq 50 \text{ Channels} \\ 24\text{dBm Conducted}/30\text{dBm EIRP} & < 50 \text{ Channels (min 25)} \end{cases}$

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
908	12.5kbps FM	5	27.90	≤ 30	Pass
916	12.5kbps FM	5	28.85	≤ 30	Pass
924	12.5kbps FM	5	28.68	≤ 30	Pass

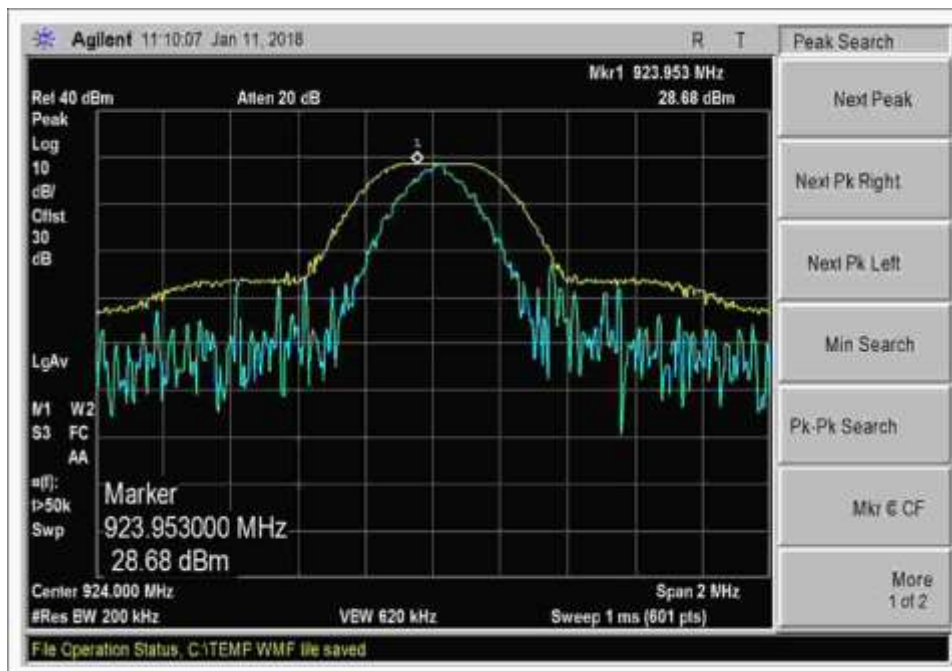
Plots



Low Channel



Middle Channel



High Channel

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 #: **100728** Date: 1/11/2018
 Test Type: **Conducted Emissions** Time: 11:21:44
 Tested By: Don Nguyen Sequence#: 5
 Software: EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is placed on test bench. Input voltage is 12.8Vdc from external power supply. GPS antenna port is connected to a GPS antenna. USB port is connected to a touchscreen computer. The computer is sending command to the EUT using software MC3 SuperRaptor Test ver.4.0.2.2 The EUT is set to continuously transmit.

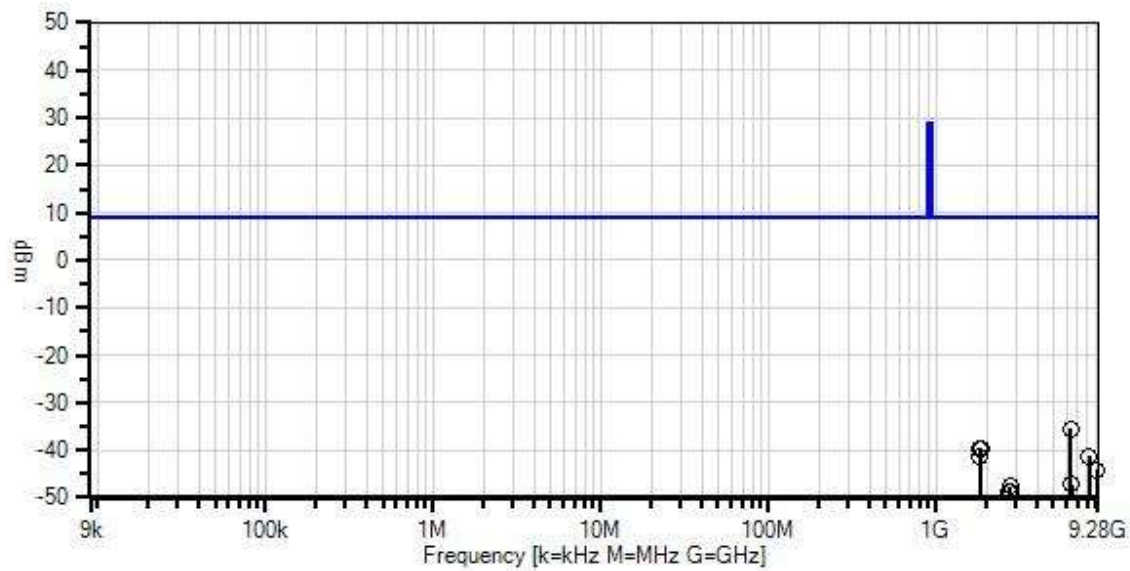
Operating frequency: 908-924MHz
 Frequency of measurement: 9kHz-9.28GHz
 RBW=100kHz, VBW=300kHz

Temperature (°C): 22
 Relative Humidity (%): 46

Test Location: Brea Lab A

Test Method: ANSI C63.10 (2013)

Itron, Inc. W/O#: 100728 Sequence#: 5 Date: 1/11/2018
 15.247(d) Conducted Spurious Emissions Test Distance: None Antenna Port



— Readings
 × QP Readings
 ▼ Ambient
 — 1 - 15.247(d) Conducted Spurious Emissions
 ○ Peak Readings
 * Average Readings
 Software Version: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06660	Cable	PHASEFLEX FJR01N01036.0	4/5/2016	4/5/2018
	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
T2	AN03432	Attenuator	90-30-34	10/27/2017	10/27/2019

Measurement Data:

Reading listed by margin.

Test Distance: None

#	Freq MHz	Rdng dBm	T1 dB	T2 dB			Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	6355.727M	-66.2	+0.8	+30.0			+0.0	-35.4	8.9	-44.3	Anten
2	1848.125M	-69.8	+0.5	+29.7			+0.0	-39.6	8.9	-48.5	Anten
3	1831.917M	-70.0	+0.5	+29.7			+0.0	-39.8	8.9	-48.7	Anten
4	8172.560M	-72.0	+1.0	+29.7			+0.0	-41.3	8.9	-50.2	Anten
5	1816.133M	-71.7	+0.5	+29.7			+0.0	-41.5	8.9	-50.4	Anten
6	9080.613M	-75.3	+1.1	+30.0			+0.0	-44.2	8.9	-53.1	Anten
7	6411.733M	-77.9	+0.7	+30.0			+0.0	-47.2	8.9	-56.1	Anten
8	2747.883M	-77.8	+0.5	+29.6			+0.0	-47.7	8.9	-56.6	Anten
9	2724.190M	-78.8	+0.5	+29.6			+0.0	-48.7	8.9	-57.6	Anten
10	2772.175M	-79.0	+0.6	+29.6			+0.0	-48.8	8.9	-57.7	Anten

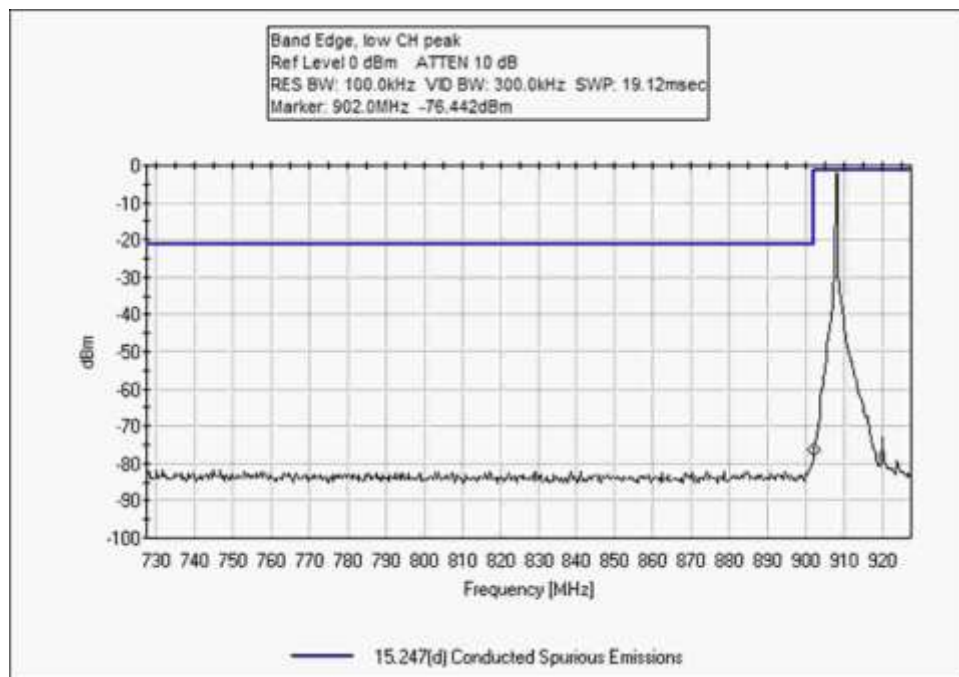
Band Edge

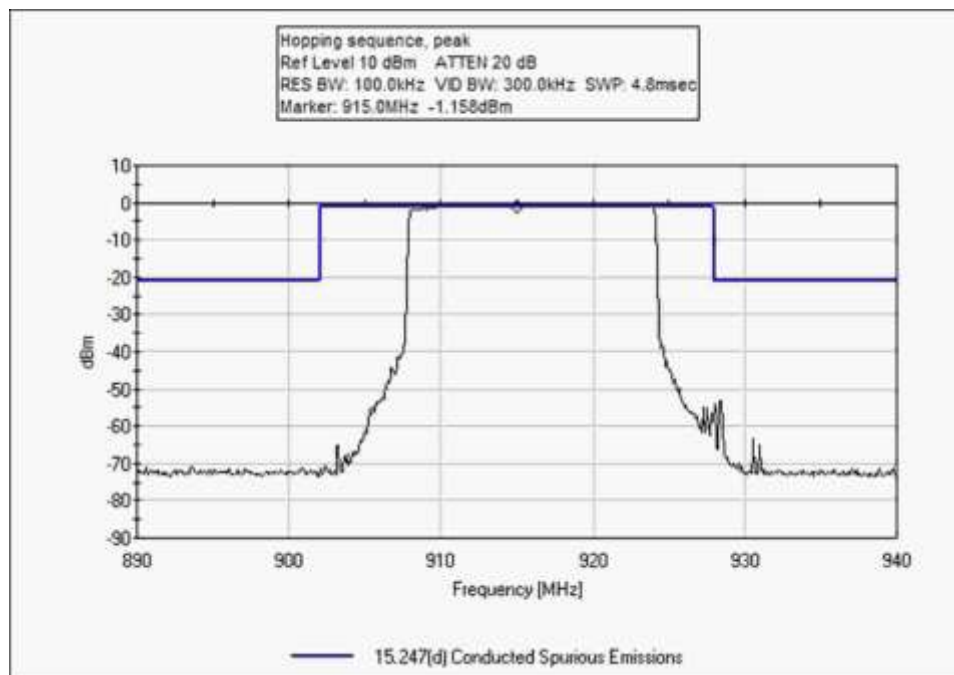
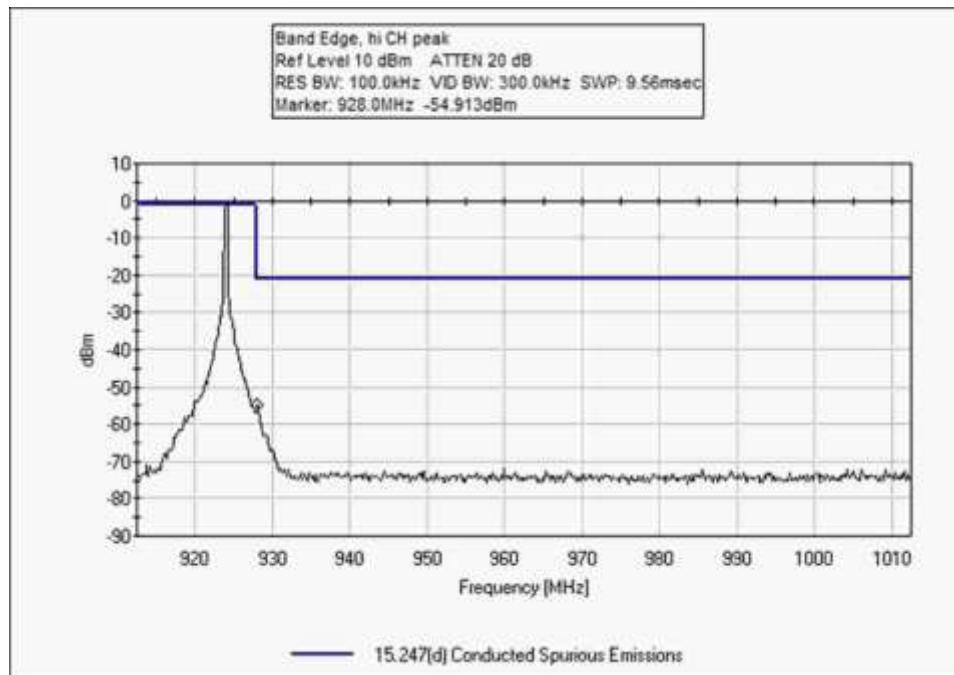
Band Edge Summary

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

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	12.5kbps FM	-46.4	< 8.9	Pass
928	12.5kbps FM	-24.9	< 8.9	Pass

Band Edge Plots





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 #: **100728** Date: 1/11/2018
 Test Type: **Conducted Emissions** Time: 11:16:55
 Tested By: Don Nguyen Sequence#: 4
 Software: EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is placed on test bench. Input voltage is 12.8Vdc from external power supply. GPS antenna port is connected to a GPS antenna. USB port is connected to a touchscreen computer. The computer is sending command to the EUT using software MC3 SuperRaptor Test ver.4.0.2.2 The EUT is set to continuously transmit.

Operating frequency: 908-924MHz
 Frequency of measurement: 902-928MHz
 RBW=100kHz, VBW=300kHz

Temperature (°C): 22
 Relative Humidity (%): 46

Test Location: Brea Lab A

Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06660	Cable	PHASEFLEX FJR01N01036.0	4/5/2016	4/5/2018
T2	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
T3	AN03432	Attenuator	90-30-34	10/27/2017	10/27/2019

Measurement Data:

Reading listed by margin.

Test Distance: None

#	Freq MHz	Rdng dBm	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	928.000M	-54.9	+0.4	+0.0	+29.6	+0.0		-24.9	8.9	-33.8	Anten
2	902.000M	-76.4	+0.4	+0.0	+29.6	+0.0		-46.4	8.9	-55.3	Anten

Test Setup Photo



15.247(d) Radiated Emissions & Band Edge

15.35(c) Duty Cycle Correction Factor

Test Data Summary			
Antenna Port	Operational Mode	Measured On Time (mS / P _{obs})	Calculated DCCF (dB)
1	FHSS	45ms/100ms	6.9

Observation Period, P_{obs} is the duration of the pulse train or maximum 100mS

Measured results are calculated as follows:

$$On\ Time = \left(\sum_{Bursts} RF\ Burst\ On\ Time + \sum_{Control} Control\ Signal\ On\ time \right) \Big|_{P_{obs} \text{ (max 100ms)}}$$

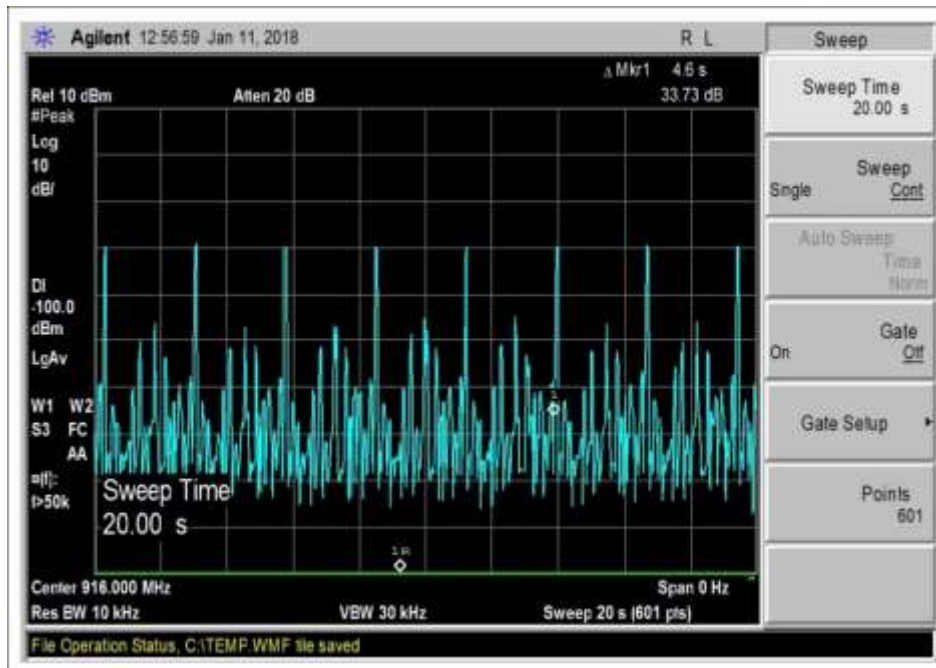
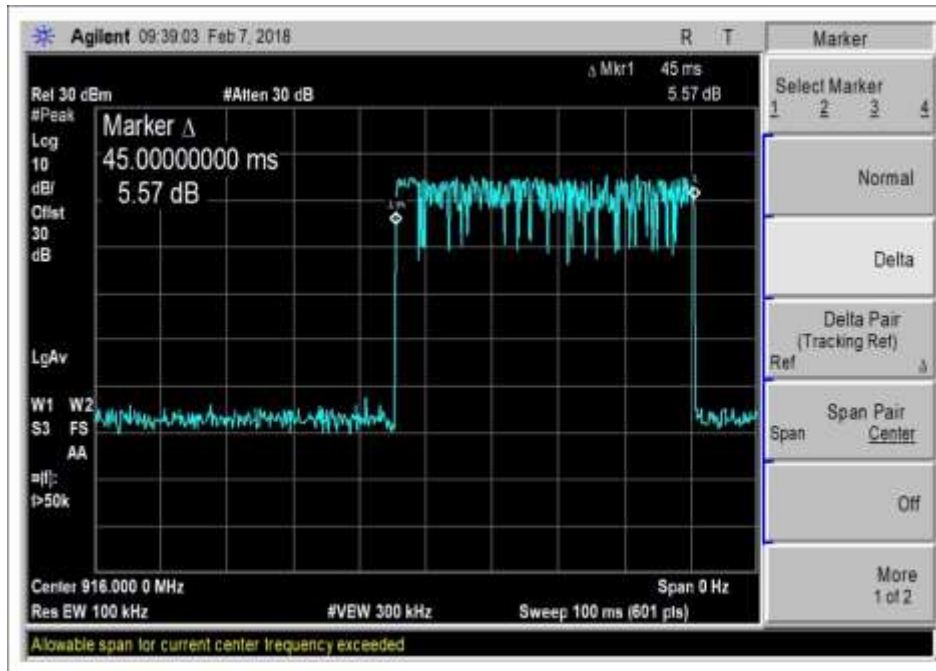
Measured Values:

Parameter	Value
Observation Period (P _{obs}):	100ms
Number of RF Bursts / P _{obs} :	1
On time of RF Burst:	45 ms
Number of Control or other signals / P _{obs} :	0
On time of Control or other Signals:	0
Total Measured On Time:	45

Duty Cycle Correction Factor (DCCF) is calculated in accordance with ANSI C63.10:

$$DCCF = 20 \cdot \log \left(\frac{On\ Time}{P_{obs}} \right)$$

Duty Cycle Correction Factor Test Data



Test Setup Photo



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) / 15.209 Radiated Spurious Emissions**
 Work Order #: **100728** Date: 1/15/2018
 Test Type: **Maximized Emissions** Time: 14:57:14
 Tested By: Don Nguyen Sequence#: 6
 Software: EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

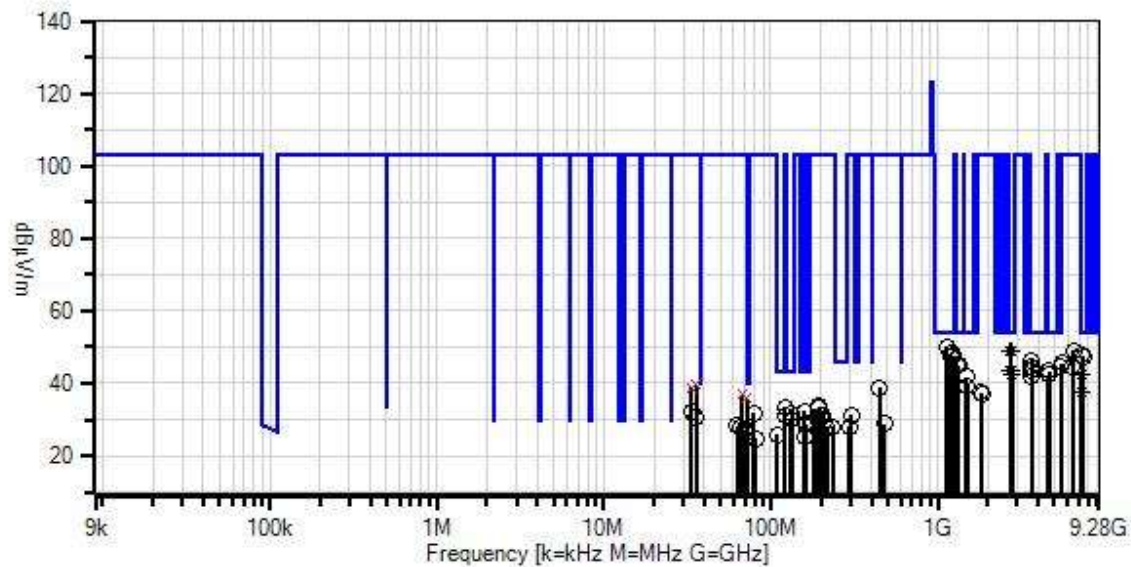
The EUT is placed on turn table. Input voltage is 12.8Vdc from external power supply. GPS and main antenna ports are connected to an external antenna. USB port is connected to a touchscreen computer. The computer is sending command to the EUT using software MC3 SuperRaptor Test ver.4.0.2.2 The EUT is set into transmitter mode. The EUT is rotated in three orthogonal orientation. Data represents the worst case orientation. The antenna of the EUT is mounted to a 52" diameter aluminum plate to represent a vehicle roof. The aluminum plate is supported by foam blocks on the 80cm test table; the plate is ~ 129cm above the ground plane. The EUT is directly below the plate, on the test table.

Operating frequency: 908-924MHz
 Frequency of measurement: 9k-9280MHz
 9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz.
 150kHz to 30MHz RBW=9kHz, VBW=27kHz.
 30-1000MHz, RBW=120kHz, VBW=360kHz
 1000-9280MHz, RBW=1MHz, VBW=3MHz

Temperature (°C): 19
 Relative Humidity (%): 40
 Site A
 Test Method: ANSI C63.10 (2013)

Note: Duty correction factor is applied to average reading above 1GHz per FCC part 15.35c
 Correction factor = $20\log(45\text{ms}/100\text{ms}) = -6.8\text{dB}$

Itron, Inc. WO#: 100728 Sequence#: 6 Date: 1/15/2018
 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	5/20/2016	5/20/2018
T1	AN01995	Biconilog Antenna	CBL6111C	5/10/2016	5/10/2018
T2	ANP05275	Attenuator	1W	5/5/2016	5/5/2018
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
T4	AN00309	Preamp	8447D	3/14/2016	3/14/2018
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	5/9/2016	5/9/2018
T8	AN00849	Horn Antenna	3115	3/4/2016	3/4/2018
T9	ANP06544	Cable	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
T10	AN03169	High Pass Filter	HM1155-11SS	6/15/2017	6/15/2019
T11	ANP07138	Cable	ANDL1-PNMNM-60	3/1/2017	3/1/2019
T12	ANDuty Cycle Correction Factor	Test Data Adjustment	NA	1/15/2018	1/15/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	1138.600M	61.6	+0.0 +0.0 +0.6	+0.0 +0.0 +2.8	+0.0 -39.9 +2.6	+0.0 +22.0 +0.0	+0.0	49.7	54.0	-4.3	Horiz
2	2724.000M Ave	62.6	+0.0 +0.0 +0.9	+0.0 +0.0 +0.2	+0.0 -38.1 +4.3	+0.0 +25.9 -6.8	+0.0	49.0	54.0	-5.0	Vert
^	2724.000M	63.7	+0.0 +0.0 +0.9	+0.0 +0.0 +0.2	+0.0 -38.1 +4.3	+0.0 +25.9 +0.0	+0.0	56.9	54.0	+2.9	Vert
4	2748.050M Ave	62.3	+0.0 +0.0 +0.9	+0.0 +0.0 +0.2	+0.0 -38.0 +4.3	+0.0 +26.0 -6.8	+0.0	48.9	54.0	-5.1	Vert
^	2748.050M	63.6	+0.0 +0.0 +0.9	+0.0 +0.0 +0.2	+0.0 -38.0 +4.3	+0.0 +26.0 +0.0	+0.0	57.0	54.0	+3.0	Vert
6	1187.600M	61.5	+0.0 +0.0 +0.6	+0.0 +0.0 +0.9	+0.0 -39.7 +2.7	+0.0 +22.1 +0.0	+0.0	48.1	54.0	-5.9	Horiz
7	7328.100M	42.7	+0.0 +0.0 +1.9	+0.0 +0.0 +0.1	+0.0 -37.3 +7.6	+0.0 +32.8 +0.0	+0.0	47.8	54.0	-6.2	Vert
8	1237.600M	60.9	+0.0 +0.0 +0.6	+0.0 +0.0 +0.7	+0.0 -39.5 +2.7	+0.0 +22.2 +0.0	+0.0	47.6	54.0	-6.4	Horiz

9	7392.050M	42.1	+0.0	+0.0	+0.0	+0.0	+0.0	47.4	54.0	-6.6	Vert
			+0.0	+0.0	-37.3	+32.9					
			+1.9	+0.1	+7.7	+0.0					
10	1188.150M	60.6	+0.0	+0.0	+0.0	+0.0	+0.0	47.2	54.0	-6.8	Vert
			+0.0	+0.0	-39.7	+22.1					
			+0.6	+0.9	+2.7	+0.0					
11	3664.050M	50.0	+0.0	+0.0	+0.0	+0.0	+0.0	46.4	54.0	-7.6	Vert
			+0.0	+0.0	-37.9	+27.7					
			+1.2	+0.2	+5.2	+0.0					
12	1336.600M	57.7	+0.0	+0.0	+0.0	+0.0	+0.0	44.9	54.0	-9.1	Horiz
			+0.0	+0.0	-39.2	+22.4					
			+0.6	+0.6	+2.8	+0.0					
13	5448.050M	42.6	+0.0	+0.0	+0.0	+0.0	+0.0	44.6	54.0	-9.4	Horiz
			+0.0	+0.0	-37.4	+31.3					
			+1.5	+0.1	+6.5	+0.0					
14	3664.050M	48.0	+0.0	+0.0	+0.0	+0.0	+0.0	44.4	54.0	-9.6	Horiz
			+0.0	+0.0	-37.9	+27.7					
			+1.2	+0.2	+5.2	+0.0					
15	3696.050M	47.7	+0.0	+0.0	+0.0	+0.0	+0.0	44.2	54.0	-9.8	Vert
			+0.0	+0.0	-37.9	+27.8					
			+1.2	+0.2	+5.2	+0.0					
16	121.890M	41.9	+11.6	+6.0	+1.8	-28.1	+0.0	33.3	43.5	-10.2	Vert
			+0.1	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
17	2748.050M Ave	57.0	+0.0	+0.0	+0.0	+0.0	+0.0	43.6	54.0	-10.4	Horiz
			+0.0	+0.0	-38.0	+26.0					
			+0.9	+0.2	+4.3	-6.8					
^	2748.050M	58.7	+0.0	+0.0	+0.0	+0.0	+0.0	52.1	54.0	-1.9	Horiz
			+0.0	+0.0	-38.0	+26.0					
			+0.9	+0.2	+4.3	+0.0					
19	4620.050M	44.4	+0.0	+0.0	+0.0	+0.0	+0.0	43.5	54.0	-10.5	Vert
			+0.0	+0.0	-37.6	+29.2					
			+1.6	+0.1	+5.8	+0.0					
20	3632.000M	47.2	+0.0	+0.0	+0.0	+0.0	+0.0	43.4	54.0	-10.6	Vert
			+0.0	+0.0	-37.9	+27.6					
			+1.2	+0.2	+5.1	+0.0					
21	2724.050M Ave	57.0	+0.0	+0.0	+0.0	+0.0	+0.0	43.4	54.0	-10.6	Horiz
			+0.0	+0.0	-38.1	+25.9					
			+0.9	+0.2	+4.3	-6.8					
^	2724.050M	58.6	+0.0	+0.0	+0.0	+0.0	+0.0	51.8	54.0	-2.2	Horiz
			+0.0	+0.0	-38.1	+25.9					
			+0.9	+0.2	+4.3	+0.0					

23	2772.050M Ave	55.6	+0.0 +0.0 +0.9	+0.0 +0.0 +0.2	+0.0 -38.0 +4.4	+0.0 +26.1 -6.8	+0.0	42.4	54.0	-11.6	Vert
^	2772.050M	57.9	+0.0 +0.0 +0.9	+0.0 +0.0 +0.2	+0.0 -38.0 +4.4	+0.0 +26.1 +0.0	+0.0	51.5	54.0	-2.5	Vert
25	7264.100M Ave	44.2	+0.0 +0.0 +1.9	+0.0 +0.0 +0.1	+0.0 -37.4 +7.5	+0.0 +32.7 -6.8	+0.0	42.2	54.0	-11.8	Vert
^	7264.100M	50.3	+0.0 +0.0 +1.9	+0.0 +0.0 +0.1	+0.0 -37.4 +7.5	+0.0 +32.7 +0.0	+0.0	55.1	54.0	+1.1	Vert
27	4580.050M	43.2	+0.0 +0.0 +1.6	+0.0 +0.0 +0.1	+0.0 -37.6 +5.8	+0.0 +29.1 +0.0	+0.0	42.2	54.0	-11.8	Vert
28	133.190M	40.1	+11.7 +0.1 +0.0	+6.0 +0.0 +0.0	+1.9 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	31.7	43.5	-11.8	Horiz
29	3632.050M	45.8	+0.0 +0.0 +1.2	+0.0 +0.0 +0.2	+0.0 -37.9 +5.1	+0.0 +27.6 +0.0	+0.0	42.0	54.0	-12.0	Horiz
30	121.690M	39.9	+11.6 +0.1 +0.0	+6.0 +0.0 +0.0	+1.8 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	31.3	43.5	-12.2	Horiz
31	1484.600M	53.7	+0.0 +0.0 +0.6	+0.0 +0.0 +0.5	+0.0 -38.8 +3.0	+0.0 +22.7 +0.0	+0.0	41.7	54.0	-12.3	Horiz
32	132.340M	38.5	+11.7 +0.1 +0.0	+6.0 +0.0 +0.0	+1.9 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	30.1	43.5	-13.4	Vert
33	1509.200M	51.1	+0.0 +0.0 +0.6	+0.0 +0.0 +0.5	+0.0 -38.7 +3.0	+0.0 +22.7 +0.0	+0.0	39.2	54.0	-14.8	Vert
34	163.890M	38.1	+10.3 +0.1 +0.0	+6.0 +0.0 +0.0	+2.2 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	28.7	43.5	-14.8	Horiz
35	7264.050M Ave	39.7	+0.0 +0.0 +1.9	+0.0 +0.0 +0.1	+0.0 -37.4 +7.5	+0.0 +32.7 -6.8	+0.0	37.7	54.0	-16.3	Horiz
^	7264.050M	46.6	+0.0 +0.0 +1.9	+0.0 +0.0 +0.1	+0.0 -37.4 +7.5	+0.0 +32.7 +0.0	+0.0	51.4	54.0	-2.6	Horiz
37	109.540M	35.1	+10.9 +0.1 +0.0	+6.0 +0.0 +0.0	+1.7 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	25.7	43.5	-17.8	Vert
38	162.090M	34.8	+10.4 +0.1 +0.0	+6.0 +0.0 +0.0	+2.1 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	25.4	43.5	-18.1	Vert
39	6468.050M	46.2	+0.0 +0.0 +1.7	+0.0 +0.0 +0.2	+0.0 -37.5 +7.1	+0.0 +31.4 +0.0	+0.0	49.1	103.0	-53.9	Vert

40	5496.050M	43.4	+0.0	+0.0	+0.0	+0.0	+0.0	45.5	103.0	-57.5	Horiz
			+0.0	+0.0	-37.5	+31.4					
			+1.6	+0.1	+6.5	+0.0					
41	1286.600M	58.4	+0.0	+0.0	+0.0	+0.0	+0.0	45.4	103.0	-57.6	Horiz
			+0.0	+0.0	-39.3	+22.3					
			+0.6	+0.6	+2.8	+0.0					
42	6412.100M	41.5	+0.0	+0.0	+0.0	+0.0	+0.0	44.6	103.0	-58.4	Vert
			+0.0	+0.0	-37.4	+31.5					
			+1.7	+0.2	+7.1	+0.0					
43	35.985M	45.4	+15.5	+6.0	+0.9	-28.2	+0.0	39.6	103.0	-63.4	Vert
	QP		+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	35.985M	50.2	+15.5	+6.0	+0.9	-28.2	+0.0	44.4	103.0	-58.6	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
45	33.650M	43.2	+16.8	+6.0	+0.9	-28.2	+0.0	38.7	103.0	-64.3	Vert
	QP		+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	33.650M	46.5	+16.8	+6.0	+0.9	-28.2	+0.0	42.0	103.0	-61.0	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
47	448.070M	39.5	+17.0	+6.0	+3.8	-27.9	+0.0	38.7	103.0	-64.3	Vert
			+0.3	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
48	1816.000M	47.7	+0.0	+0.0	+0.0	+0.0	+0.0	37.5	103.0	-65.5	Vert
			+0.0	+0.0	-38.5	+23.9					
			+0.7	+0.3	+3.4	+0.0					
49	67.610M	51.2	+6.4	+6.0	+1.3	-28.1	+0.0	36.9	103.0	-66.1	Vert
	QP		+0.1	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	67.610M	56.2	+6.4	+6.0	+1.3	-28.1	+0.0	41.9	103.0	-61.1	Vert
			+0.1	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
51	1832.050M	46.9	+0.0	+0.0	+0.0	+0.0	+0.0	36.8	103.0	-66.2	Vert
			+0.0	+0.0	-38.5	+24.0					
			+0.7	+0.3	+3.4	+0.0					
52	72.050M	49.8	+6.8	+6.0	+1.3	-28.1	+0.0	35.9	103.0	-67.1	Vert
	QP		+0.1	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	72.050M	54.6	+6.8	+6.0	+1.3	-28.1	+0.0	40.7	103.0	-62.3	Vert
			+0.1	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
54	195.090M	43.9	+9.1	+6.0	+2.4	-28.0	+0.0	33.6	103.0	-69.4	Vert
			+0.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
55	194.190M	43.4	+9.1	+6.0	+2.4	-28.0	+0.0	33.1	103.0	-69.9	Horiz
			+0.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
56	33.250M	36.7	+17.0	+6.0	+0.9	-28.2	+0.0	32.4	103.0	-70.6	Horiz
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					

57	160.090M	41.5	+10.6 +0.1 +0.0	+6.0 +0.0 +0.0	+2.1 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	32.3	103.0	-70.7	Horiz
58	79.100M	45.0	+7.4 +0.1 +0.0	+6.0 +0.0 +0.0	+1.4 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	31.8	103.0	-71.2	Vert
59	206.390M	40.9	+9.6 +0.2 +0.0	+6.0 +0.0 +0.0	+2.5 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	31.2	103.0	-71.8	Horiz
60	301.490M	36.7	+13.2 +0.2 +0.0	+6.0 +0.0 +0.0	+3.1 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	31.2	103.0	-71.8	Horiz
61	197.590M	41.1	+9.1 +0.2 +0.0	+6.0 +0.0 +0.0	+2.4 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	30.8	103.0	-72.2	Horiz
62	185.690M	41.1	+9.1 +0.1 +0.0	+6.0 +0.0 +0.0	+2.3 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	30.6	103.0	-72.4	Horiz
63	36.000M	36.2	+15.5 +0.0 +0.0	+6.0 +0.0 +0.0	+0.9 +0.0 +0.0	-28.2 +0.0 +0.0	+0.0	30.4	103.0	-72.6	Horiz
64	209.440M	38.9	+9.8 +0.2 +0.0	+6.0 +0.0 +0.0	+2.5 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	29.4	103.0	-73.6	Vert
65	180.490M	39.5	+9.1 +0.1 +0.0	+6.0 +0.0 +0.0	+2.3 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	29.0	103.0	-74.0	Horiz
66	478.060M	28.6	+17.6 +0.3 +0.0	+6.0 +0.0 +0.0	+4.0 +0.0 +0.0	-27.8 +0.0 +0.0	+0.0	28.7	103.0	-74.3	Horiz
67	160.990M	38.0	+10.5 +0.1 +0.0	+6.0 +0.0 +0.0	+2.1 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	28.7	103.0	-74.3	Horiz
68	63.200M	42.9	+6.1 +0.1 +0.0	+6.0 +0.0 +0.0	+1.2 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	28.2	103.0	-74.8	Horiz

69	235.190M	35.6	+11.6 +0.2 +0.0	+6.0 +0.0 +0.0	+2.7 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	28.1	103.0	-74.9	Horiz
70	295.890M	33.6	+13.1 +0.2 +0.0	+6.0 +0.0 +0.0	+3.1 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	28.0	103.0	-75.0	Horiz
71	66.200M	42.4	+6.3 +0.1 +0.0	+6.0 +0.0 +0.0	+1.3 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	28.0	103.0	-75.0	Horiz
72	217.190M	36.9	+10.4 +0.2 +0.0	+6.0 +0.0 +0.0	+2.5 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	28.0	103.0	-75.0	Horiz
73	69.100M	41.4	+6.5 +0.1 +0.0	+6.0 +0.0 +0.0	+1.3 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	27.2	103.0	-75.8	Horiz
74	72.000M	39.9	+6.8 +0.1 +0.0	+6.0 +0.0 +0.0	+1.3 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	26.0	103.0	-77.0	Horiz
75	81.100M	37.7	+7.6 +0.1 +0.0	+6.0 +0.0 +0.0	+1.4 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	24.7	103.0	-78.3	Horiz

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **100728** Date: 1/15/2018
 Test Type: **Maximized Emissions** Time: 16:09:39
 Tested By: Don Nguyen Sequence#: 7
 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 turn table. Input voltage is 12.8Vdc from external power supply. GPS and main antenna ports are connected to an external antenna. USB port is connected to a touchscreen computer. The computer is sending command to the EUT using software MC3 SuperRaptor Test ver.4.0.2.2 The EUT is set into receiver mode. The EUT is rotated in three orthogonal orientation. Data represents the worst case orientation. The antenna of the EUT is mounted to a 52" diameter aluminum plate to represent a vehicle roof. The aluminum plate is supported by foam blocks on the 80cm test table; the plate is ~ 129cm above the ground plane. The EUT is directly below the plate, on the test table.

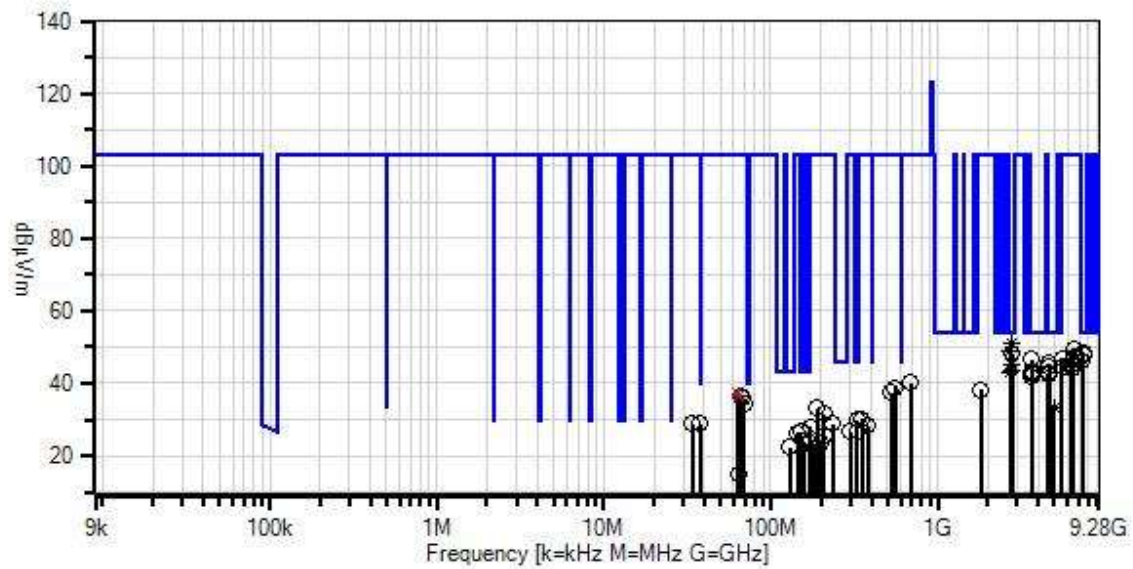
Operating frequency: 908-924MHz
 Frequency of measurement: 9k-9280MHz
 9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz.
 150kHz to 30MHz RBW=9kHz, VBW=27kHz.
 30-1000MHz, RBW=120kHz, VBW=360kHz
 1000-9280MHz, RBW=1MHz, VBW=3MHz

Temperature (°C): 19
 Relative Humidity (%): 40
 Site A
 Test Method: ANSI C63.10 (2013)

Modification #1 was in place during testing.

Note: Duty correction factor is applied to average reading above 1GHz per FCC part 15.35c
 Correction factor = $20\log(45\text{ms}/100\text{ms}) = -6.8\text{dB}$

Itron, Inc. W/O#: 100728 Sequence#: 7 Date: 1/15/2018
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	5/20/2016	5/20/2018
T1	AN01995	Biconilog Antenna	CBL6111C	5/10/2016	5/10/2018
T2	ANP05275	Attenuator	1W	5/5/2016	5/5/2018
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
T4	AN00309	Preamp	8447D	3/14/2016	3/14/2018
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	5/9/2016	5/9/2018
T8	AN00849	Horn Antenna	3115	3/4/2016	3/4/2018
T9	ANP06544	Cable	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
T10	ANP07138	Cable	ANDL1-PNMM-60	3/1/2017	3/1/2019
T11	AN03169	High Pass Filter	HM1155-11SS	6/15/2017	6/15/2019
T12	ANDuty Cycle Correction Factor	Test Data Adjustment	NA	1/15/2018	1/15/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	2748.050M Ave	64.2	+0.0 +0.0 +0.9	+0.0 +0.0 +4.3	+0.0 -38.0 +0.2	+0.0 +26.0 -6.8	+0.0	50.8	54.0	-3.2	Vert
^	2748.050M	65.2	+0.0 +0.0 +0.9	+0.0 +0.0 +4.3	+0.0 -38.0 +0.2	+0.0 +26.0 +0.0	+0.0	58.6	54.0	+4.6	Vert
3	2724.000M Ave	62.6	+0.0 +0.0 +0.9	+0.0 +0.0 +4.3	+0.0 -38.1 +0.2	+0.0 +25.9 -6.8	+0.0	49.0	54.0	-5.0	Vert
^	2724.000M	63.8	+0.0 +0.0 +0.9	+0.0 +0.0 +4.3	+0.0 -38.1 +0.2	+0.0 +25.9 +0.0	+0.0	57.0	54.0	+3.0	Vert
5	2772.100M	54.5	+0.0 +0.0 +0.9	+0.0 +0.0 +4.4	+0.0 -38.0 +0.2	+0.0 +26.1 +0.0	+0.0	48.1	54.0	-5.9	Horiz
6	7392.100M	42.8	+0.0 +0.0 +1.9	+0.0 +0.0 +7.7	+0.0 -37.3 +0.1	+0.0 +32.9 +0.0	+0.0	48.1	54.0	-5.9	Horiz
7	7392.100M	42.6	+0.0 +0.0 +1.9	+0.0 +0.0 +7.7	+0.0 -37.3 +0.1	+0.0 +32.9 +0.0	+0.0	47.9	54.0	-6.1	Vert
8	3664.050M	50.2	+0.0 +0.0 +1.2	+0.0 +0.0 +5.2	+0.0 -37.9 +0.2	+0.0 +27.7 +0.0	+0.0	46.6	54.0	-7.4	Vert

9	7328.150M	41.3	+0.0	+0.0	+0.0	+0.0	+0.0	46.4	54.0	-7.6	Vert
			+0.0	+0.0	-37.3	+32.8					
			+1.9	+7.6	+0.1	+0.0					
10	4620.100M	46.5	+0.0	+0.0	+0.0	+0.0	+0.0	45.6	54.0	-8.4	Horiz
			+0.0	+0.0	-37.6	+29.2					
			+1.6	+5.8	+0.1	+0.0					
11	2748.050M	58.4	+0.0	+0.0	+0.0	+0.0	+0.0	45.0	54.0	-9.0	Horiz
	Ave		+0.0	+0.0	-38.0	+26.0					
			+0.9	+4.3	+0.2	-6.8					
^	2748.050M	60.1	+0.0	+0.0	+0.0	+0.0	+0.0	53.5	54.0	-0.5	Horiz
			+0.0	+0.0	-38.0	+26.0					
			+0.9	+4.3	+0.2	+0.0					
13	4620.100M	45.5	+0.0	+0.0	+0.0	+0.0	+0.0	44.6	54.0	-9.4	Vert
			+0.0	+0.0	-37.6	+29.2					
			+1.6	+5.8	+0.1	+0.0					
14	2772.000M	56.7	+0.0	+0.0	+0.0	+0.0	+0.0	43.5	54.0	-10.5	Vert
	Ave		+0.0	+0.0	-38.0	+26.1					
			+0.9	+4.4	+0.2	-6.8					
^	2772.000M	58.5	+0.0	+0.0	+0.0	+0.0	+0.0	52.1	54.0	-1.9	Vert
			+0.0	+0.0	-38.0	+26.1					
			+0.9	+4.4	+0.2	+0.0					
16	3664.050M	46.7	+0.0	+0.0	+0.0	+0.0	+0.0	43.1	54.0	-10.9	Horiz
			+0.0	+0.0	-37.9	+27.7					
			+1.2	+5.2	+0.2	+0.0					
17	2724.050M	56.6	+0.0	+0.0	+0.0	+0.0	+0.0	43.0	54.0	-11.0	Horiz
	Ave		+0.0	+0.0	-38.1	+25.9					
			+0.9	+4.3	+0.2	-6.8					
^	2724.050M	58.3	+0.0	+0.0	+0.0	+0.0	+0.0	51.5	54.0	-2.5	Horiz
			+0.0	+0.0	-38.1	+25.9					
			+0.9	+4.3	+0.2	+0.0					
19	3696.000M	46.4	+0.0	+0.0	+0.0	+0.0	+0.0	42.9	54.0	-11.1	Vert
			+0.0	+0.0	-37.9	+27.8					
			+1.2	+5.2	+0.2	+0.0					
20	3632.000M	46.7	+0.0	+0.0	+0.0	+0.0	+0.0	42.9	54.0	-11.1	Vert
			+0.0	+0.0	-37.9	+27.6					
			+1.2	+5.1	+0.2	+0.0					
21	4580.050M	43.9	+0.0	+0.0	+0.0	+0.0	+0.0	42.9	54.0	-11.1	Horiz
			+0.0	+0.0	-37.6	+29.1					
			+1.6	+5.8	+0.1	+0.0					
22	37.950M	35.4	+14.5	+6.0	+1.0	-28.2	+0.0	28.7	40.0	-11.3	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
23	4580.050M	43.5	+0.0	+0.0	+0.0	+0.0	+0.0	42.5	54.0	-11.5	Vert
			+0.0	+0.0	-37.6	+29.1					
			+1.6	+5.8	+0.1	+0.0					
24	3696.100M	45.9	+0.0	+0.0	+0.0	+0.0	+0.0	42.4	54.0	-11.6	Horiz
			+0.0	+0.0	-37.9	+27.8					
			+1.2	+5.2	+0.2	+0.0					
25	3632.050M	45.8	+0.0	+0.0	+0.0	+0.0	+0.0	42.0	54.0	-12.0	Horiz
			+0.0	+0.0	-37.9	+27.6					
			+1.2	+5.1	+0.2	+0.0					

26	172.615M	37.9	+9.7 +0.1 +0.0	+6.0 +0.0 +0.0	+2.3 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	28.0	43.5	-15.5	Vert
27	327.660M	34.3	+14.1 +0.2 +0.0	+6.0 +0.0 +0.0	+3.3 +0.0 +0.0	-27.9 +0.0 +0.0	+0.0	30.0	46.0	-16.0	Horiz
28	149.965M	35.1	+11.3 +0.1 +0.0	+6.0 +0.0 +0.0	+2.1 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	26.6	43.5	-16.9	Vert
29	173.140M	34.6	+9.6 +0.1 +0.0	+6.0 +0.0 +0.0	+2.3 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	24.6	43.5	-18.9	Horiz
30	327.665M	30.9	+14.1 +0.2 +0.0	+6.0 +0.0 +0.0	+3.3 +0.0 +0.0	-27.9 +0.0 +0.0	+0.0	26.6	46.0	-19.4	Vert
31	5000.050M Ave	33.3	+0.0 +0.0 +1.5	+0.0 +0.0 +6.1	+0.0 -37.5 +0.1	+0.0 +30.0 +0.0	+0.0	33.5	54.0	-20.5	Horiz
^	5000.050M	53.5	+0.0 +0.0 +1.5	+0.0 +0.0 +6.1	+0.0 -37.5 +0.1	+0.0 +30.0 +0.0	+0.0	53.7	54.0	-0.3	Horiz
33	4990.000M Ave	32.9	+0.0 +0.0 +1.5	+0.0 +0.0 +6.1	+0.0 -37.5 +0.1	+0.0 +30.0 +0.0	+0.0	33.1	54.0	-20.9	Vert
^	4990.000M	51.6	+0.0 +0.0 +1.5	+0.0 +0.0 +6.1	+0.0 -37.5 +0.1	+0.0 +30.0 +0.0	+0.0	51.8	54.0	-2.2	Vert
35	130.615M	30.7	+11.7 +0.1 +0.0	+6.0 +0.0 +0.0	+1.9 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	22.3	43.5	-21.2	Vert
36	6468.100M	46.5	+0.0 +0.0 +1.7	+0.0 +0.0 +7.1	+0.0 -37.5 +0.2	+0.0 +31.4 +0.0	+0.0	49.4	103.0	-53.6	Horiz
37	6468.100M	44.3	+0.0 +0.0 +1.7	+0.0 +0.0 +7.1	+0.0 -37.5 +0.2	+0.0 +31.4 +0.0	+0.0	47.2	103.0	-55.8	Vert
38	5496.150M	44.5	+0.0 +0.0 +1.6	+0.0 +0.0 +6.5	+0.0 -37.5 +0.1	+0.0 +31.4 +0.0	+0.0	46.6	103.0	-56.4	Horiz
39	6356.000M	43.1	+0.0 +0.0 +1.6	+0.0 +0.0 +7.0	+0.0 -37.3 +0.2	+0.0 +31.5 +0.0	+0.0	46.1	103.0	-56.9	Vert
40	6412.150M	42.1	+0.0 +0.0 +1.7	+0.0 +0.0 +7.1	+0.0 -37.4 +0.2	+0.0 +31.5 +0.0	+0.0	45.2	103.0	-57.8	Vert
41	5496.050M	42.3	+0.0 +0.0 +1.6	+0.0 +0.0 +6.5	+0.0 -37.5 +0.1	+0.0 +31.4 +0.0	+0.0	44.4	103.0	-58.6	Vert
42	6356.050M	41.0	+0.0 +0.0 +1.6	+0.0 +0.0 +7.0	+0.0 -37.3 +0.2	+0.0 +31.5 +0.0	+0.0	44.0	103.0	-59.0	Horiz

43	692.310M	35.2	+21.0 +0.4 +0.0	+6.0 +0.0 +0.0	+5.0 +0.0 +0.0	-27.4 +0.0 +0.0	+0.0	40.2	103.0	-62.8	Vert
44	554.335M	37.0	+19.1 +0.3 +0.0	+6.0 +0.0 +0.0	+4.3 +0.0 +0.0	-27.8 +0.0 +0.0	+0.0	38.9	103.0	-64.1	Vert
45	1816.000M	48.5	+0.0 +0.0 +0.7	+0.0 +0.0 +3.4	+0.0 -38.5 +0.3	+0.0 +23.9 +0.0	+0.0	38.3	103.0	-64.7	Vert
46	63.320M QP	52.4	+6.1 +0.1 +0.0	+6.0 +0.0 +0.0	+1.2 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	37.7	103.0	-65.3	Vert
47	528.060M	36.1	+18.6 +0.3 +0.0	+6.0 +0.0 +0.0	+4.2 +0.0 +0.0	-27.8 +0.0 +0.0	+0.0	37.4	103.0	-65.6	Vert
48	66.295M	50.9	+6.4 +0.1 +0.0	+6.0 +0.0 +0.0	+1.3 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	36.6	103.0	-66.4	Vert
49	63.350M QP	51.0	+6.1 +0.1 +0.0	+6.0 +0.0 +0.0	+1.2 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	36.3	103.0	-66.7	Vert
^	63.330M	54.1	+6.1 +0.1 +0.0	+6.0 +0.0 +0.0	+1.2 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	39.4	103.0	-63.6	Vert
^	63.320M	53.3	+6.1 +0.1 +0.0	+6.0 +0.0 +0.0	+1.2 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	38.6	103.0	-64.4	Vert
^	63.350M	51.7	+6.1 +0.1 +0.0	+6.0 +0.0 +0.0	+1.2 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	37.0	103.0	-66.0	Vert
53	67.800M	50.1	+6.5 +0.1 +0.0	+6.0 +0.0 +0.0	+1.3 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	35.9	103.0	-67.1	Vert
54	69.100M	48.8	+6.5 +0.1 +0.0	+6.0 +0.0 +0.0	+1.3 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	34.6	103.0	-68.4	Vert
55	189.815M	43.5	+9.1 +0.2 +0.0	+6.0 +0.0 +0.0	+2.4 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	33.2	103.0	-69.8	Vert
56	207.710M	41.0	+9.7 +0.2 +0.0	+6.0 +0.0 +0.0	+2.5 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	31.4	103.0	-71.6	Horiz
57	351.415M	33.4	+14.7 +0.2 +0.0	+6.0 +0.0 +0.0	+3.4 +0.0 +0.0	-27.9 +0.0 +0.0	+0.0	29.8	103.0	-73.2	Vert
58	34.050M	33.5	+16.6 +0.0 +0.0	+6.0 +0.0 +0.0	+0.9 +0.0 +0.0	-28.2 +0.0 +0.0	+0.0	28.8	103.0	-74.2	Vert
59	233.410M	36.4	+11.5 +0.2 +0.0	+6.0 +0.0 +0.0	+2.7 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	28.8	103.0	-74.2	Horiz

60	383.110M	30.8	+15.6 +0.3 +0.0	+6.0 +0.0 +0.0	+3.5 +0.0 +0.0	-27.9 +0.0 +0.0	+0.0	28.3	103.0	-74.7	Horiz
61	300.015M	32.1	+13.2 +0.2 +0.0	+6.0 +0.0 +0.0	+3.1 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	26.6	103.0	-76.4	Vert
62	145.640M	34.7	+11.5 +0.1 +0.0	+6.0 +0.0 +0.0	+2.0 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	26.3	103.0	-76.7	Horiz
63	207.815M	35.1	+9.7 +0.2 +0.0	+6.0 +0.0 +0.0	+2.5 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	25.5	103.0	-77.5	Vert
64	156.415M	33.0	+10.8 +0.1 +0.0	+6.0 +0.0 +0.0	+2.1 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	24.0	103.0	-79.0	Vert
65	196.940M	33.8	+9.1 +0.2 +0.0	+6.0 +0.0 +0.0	+2.4 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	23.5	103.0	-79.5	Horiz
66	182.240M	32.5	+9.1 +0.1 +0.0	+6.0 +0.0 +0.0	+2.3 +0.0 +0.0	-28.0 +0.0 +0.0	+0.0	22.0	103.0	-81.0	Horiz
67	64.475M	29.5	+6.2 +0.1 +0.0	+6.0 +0.0 +0.0	+1.2 +0.0 +0.0	-28.1 +0.0 +0.0	+0.0	14.9	103.0	-88.1	Horiz

Band Edge

Band Edge Summary – Configuration 1

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	12.5kbps FM	External	29.6	< 46	Pass
902	12.5kbps FM	External	65.1	< 103	Pass
928	12.5kbps FM	External	68.7	< 103	Pass
960	12.5kbps FM	External	44.1*	< 54	Pass

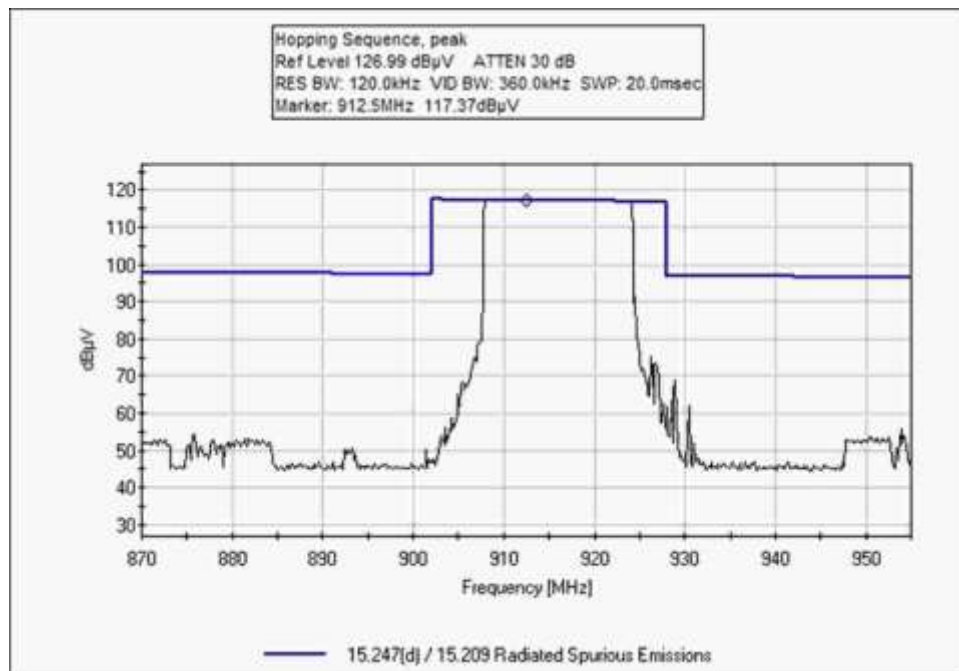
*QP detector

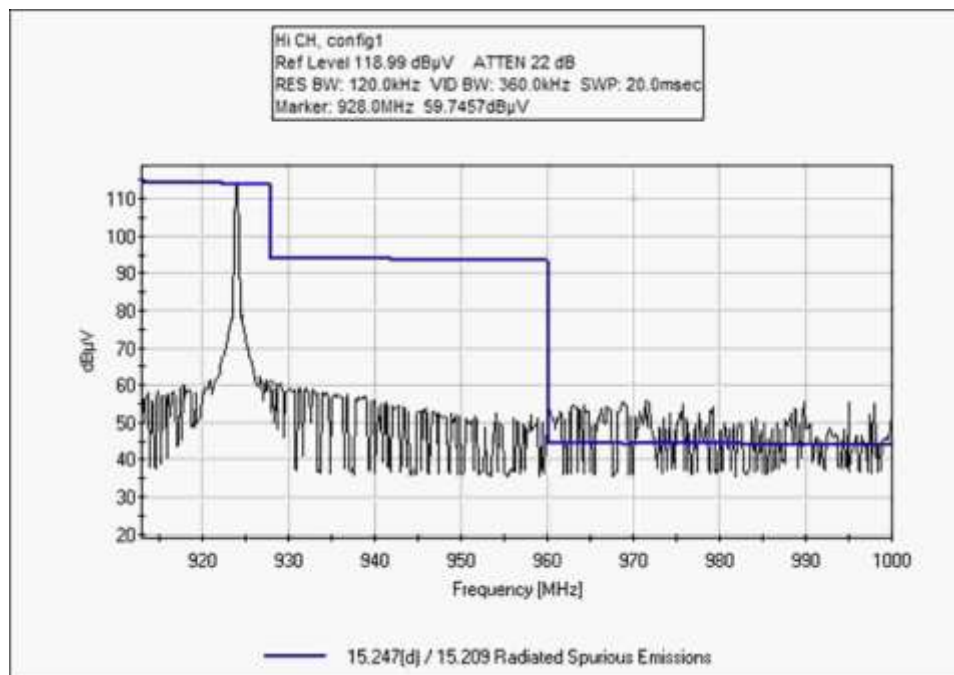
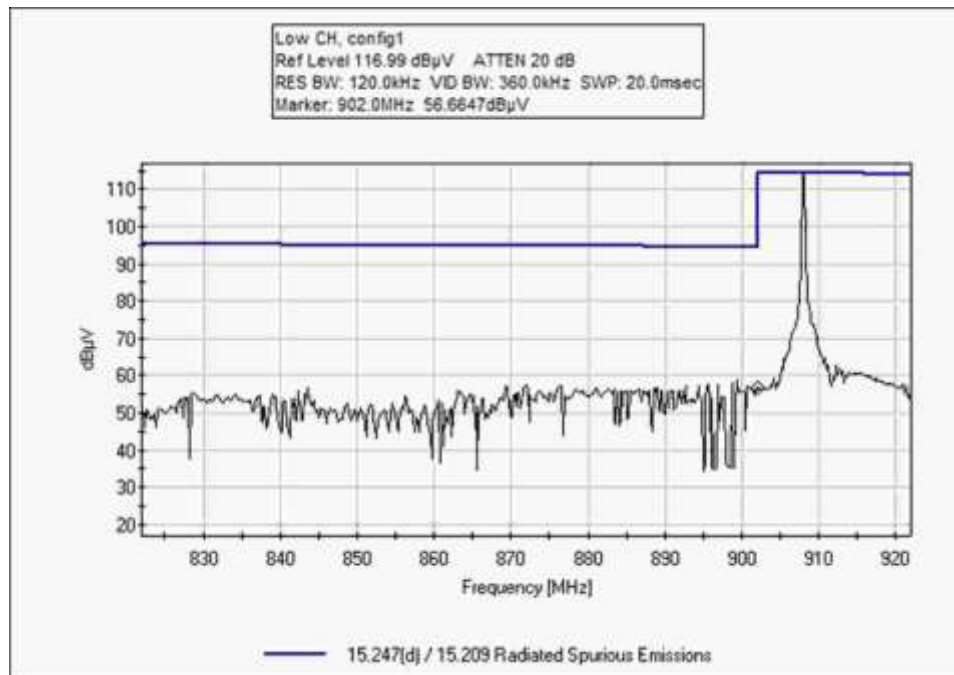
Band Edge Summary - Configuration 2

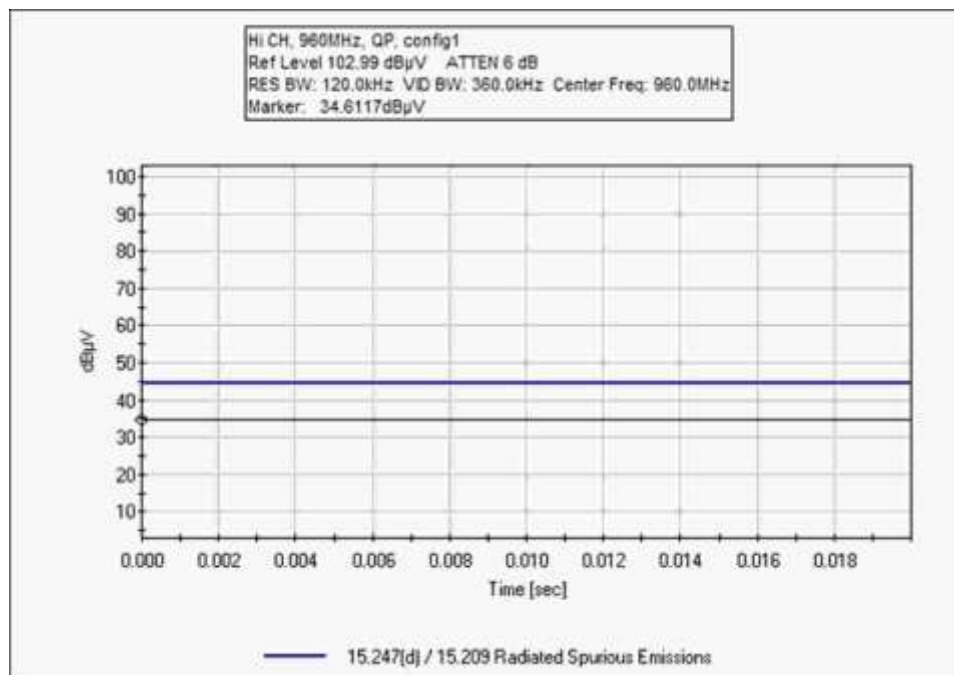
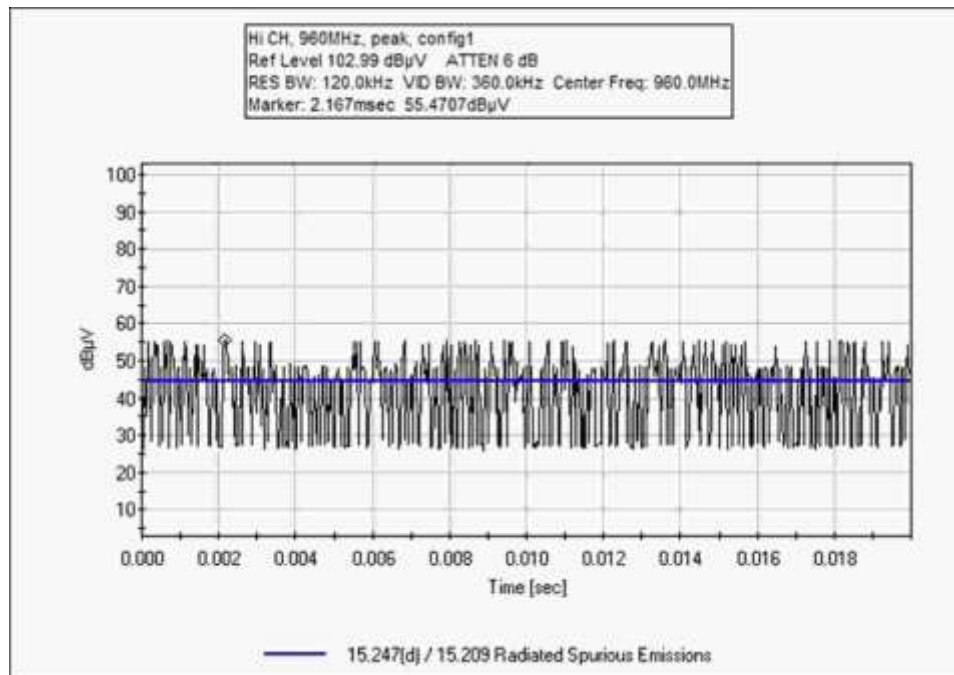
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	12.5kbps FM	External	32.1	< 46	Pass
902	12.5kbps FM	External	66.3	< 103	Pass
928	12.5kbps FM	External	69.5	< 103	Pass
960	12.5kbps FM	External	48.5*	< 54	Pass

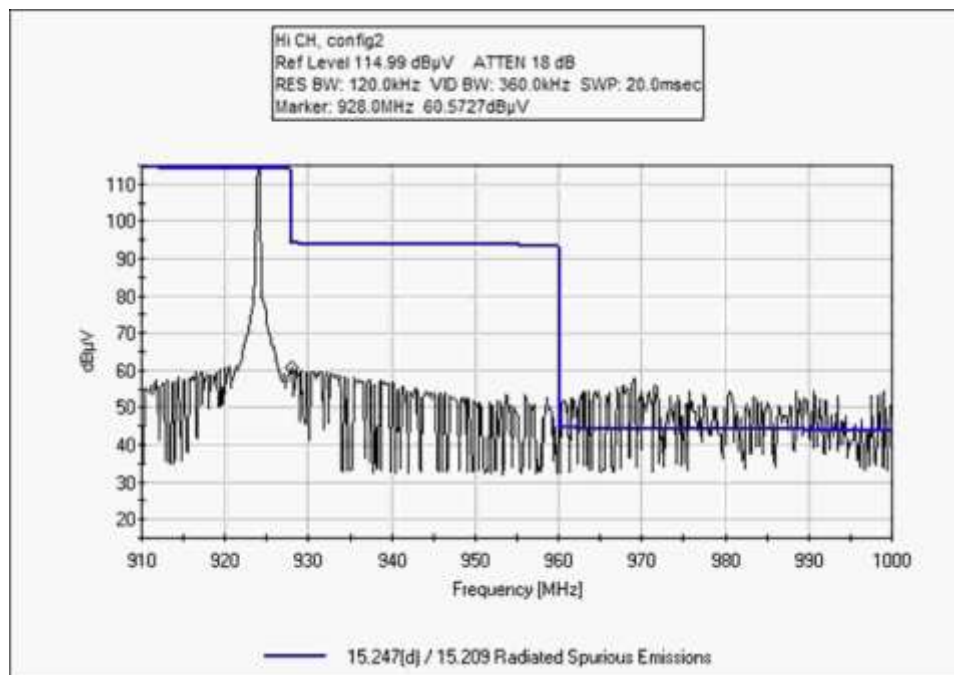
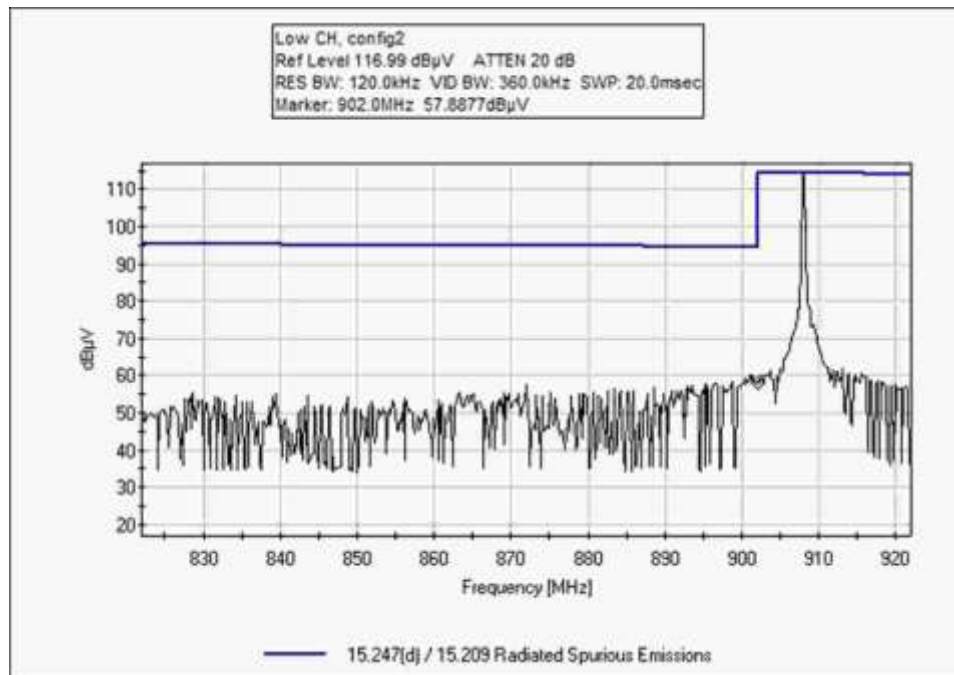
*QP detector

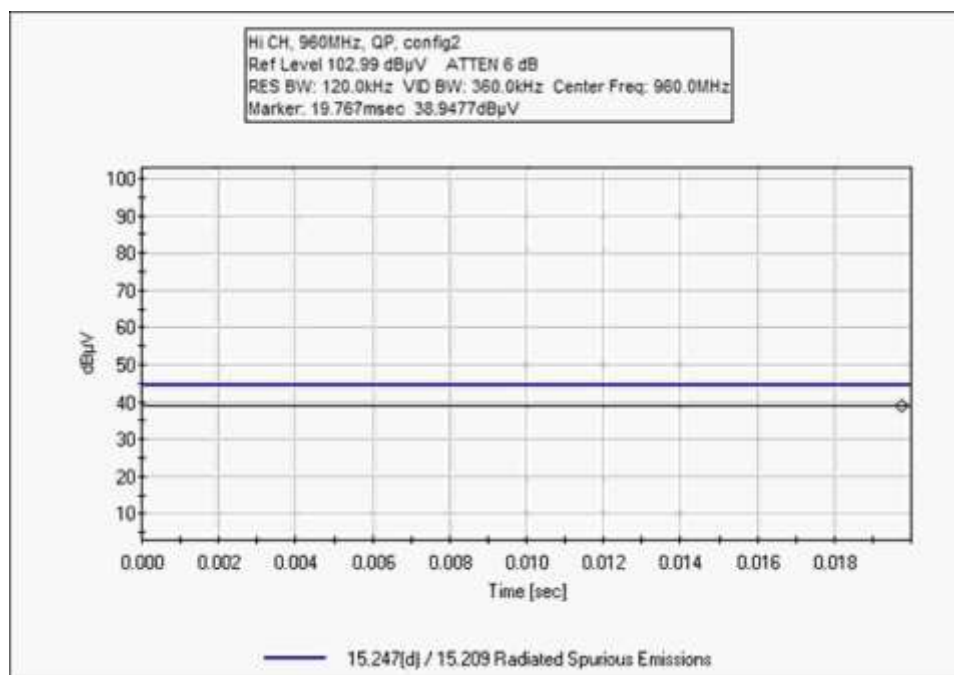
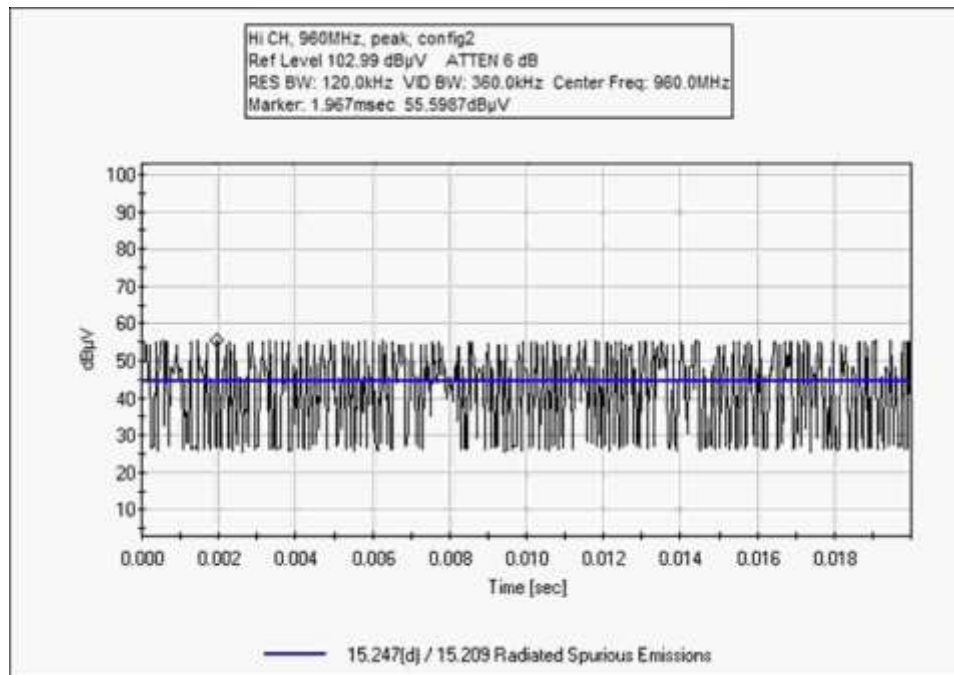
Band Edge Plots











Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **100728** Date: 1/12/2018
 Test Type: **Maximized Emissions** Time: 16:27:24
 Tested By: Don Nguyen Sequence#: 5
 Software: EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is placed on turn table. Input voltage is 12.8Vdc from external power supply. GPS and main antenna ports are connected to an external antenna. USB port is connected to a touchscreen computer. The computer is sending command to the EUT using software MC3 SuperRaptor Test ver.4.0.2.2 The EUT is set to continuously transmit. The EUT is rotated in three orthogonal orientation. Data represents the worst case orientation. The antenna of the EUT is mounted to a 52" diameter aluminum plate to represent a vehicle roof. The aluminum plate is supported by foam blocks on the 80cm test table; the plate is ~ 129cm above the ground plane. The EUT is directly below the plate, on the test table.

Operating frequency: 908-924MHz
 Frequency of measurement: 614-960MHz
 RBW=120kHz, VBW=360kHz

Temperature (°C): 19
 Relative Humidity (%): 40
 Site A
 Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
T2	AN01995	Biconilog Antenna	CBL6111C	5/10/2016	5/10/2018
T3	ANP05275	Attenuator	1W	5/5/2016	5/5/2018
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
T5	AN00309	Preamp	8447D	3/14/2016	3/14/2018
T6	ANP05050	Cable	RG223/U	1/20/2017	1/20/2019

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	960.000M	34.6	+0.0	+24.2	+6.1	+6.1	+0.0	44.1	54.0	-9.9	Vert
	QP		-27.4	+0.5							
^	960.000M	55.5	+0.0	+24.2	+6.1	+6.1	+0.0	65.0	54.0	+11.0	Vert
			-27.4	+0.5							
3	614.000M	25.9	+0.0	+20.2	+6.0	+4.7	+0.0	29.6	46.0	-16.4	Vert
			-27.6	+0.4							
4	928.000M	59.8	+0.0	+23.7	+6.1	+6.0	+0.0	68.7	103.0	-34.4	Vert
			-27.4	+0.5							
5	902.000M	56.7	+0.0	+23.3	+6.0	+5.9	+0.0	65.1	103.0	-37.9	Vert
			-27.3	+0.5							



Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
Customer: **Itron, Inc.**
Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
Work Order #: **100728** Date: 1/12/2018
Test Type: **Maximized Emissions** Time: 16:19:09
Tested By: Don Nguyen Sequence#: 6
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 turn table. Input voltage is 12.8Vdc from external power supply. GPS and main antenna ports are connected to an external antenna. USB port is connected to a touchscreen computer. The computer is sending command to the EUT using software MC3 SuperRaptor Test ver.4.0.2.2 The EUT is set to continuously transmit. The EUT is rotated in three orthogonal orientation. Data represents the worst case orientation. The antenna of the EUT is mounted to a 52" diameter aluminum plate to represent a vehicle roof. The aluminum plate is supported by foam blocks on the 80cm test table; the plate is ~ 129cm above the ground plane. The EUT is directly below the plate, on the test table.

Operating frequency: 908-924MHz
Frequency of measurement: 614-960MHz
RBW=120kHz, VBW=360kHz

Temperature (°C): 19
Relative Humidity (%): 40
Site A
Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	3/2/2017	3/2/2019
T2	AN01995	Biconilog Antenna	CBL6111C	5/10/2016	5/10/2018
T3	ANP05275	Attenuator	1W	5/5/2016	5/5/2018
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/7/2016	12/7/2018
T5	AN00309	Preamp	8447D	3/14/2016	3/14/2018
T6	ANP05050	Cable	RG223/U	1/20/2017	1/20/2019

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	960.000M	39.0	+0.0 -27.4	+24.2 +0.5	+6.1	+6.1	+0.0	48.5	54.0	-5.5	Vert
^	960.000M	55.6	+0.0 -27.4	+24.2 +0.5	+6.1	+6.1	+0.0	65.1	54.0	+11.1	Vert
3	614.000M	28.4	+0.0 -27.6	+20.2 +0.4	+6.0	+4.7	+0.0	32.1	46.0	-13.9	Vert
4	928.000M	60.6	+0.0 -27.4	+23.7 +0.5	+6.1	+6.0	+0.0	69.5	103.0	-33.5	Vert
5	902.000M	57.9	+0.0 -27.3	+23.3 +0.5	+6.0	+5.9	+0.0	66.3	103.0	-36.7	Vert

Test Setup Photos



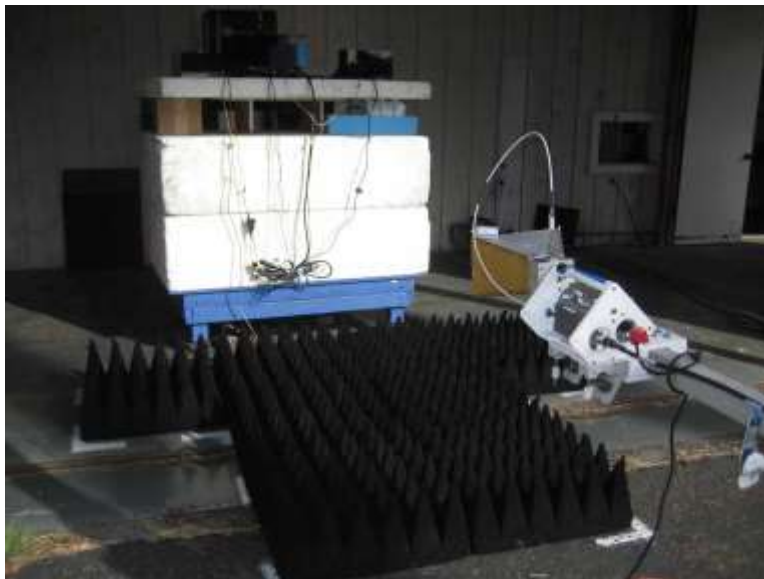
Configuration 1, Below 1GHz



Configuration 1, Below 1GHz



Configuration 1, Above 1GHz Cone placement



Configuration 1, Above 1GHz Cone placement



Configuration 2, Below 1GHz



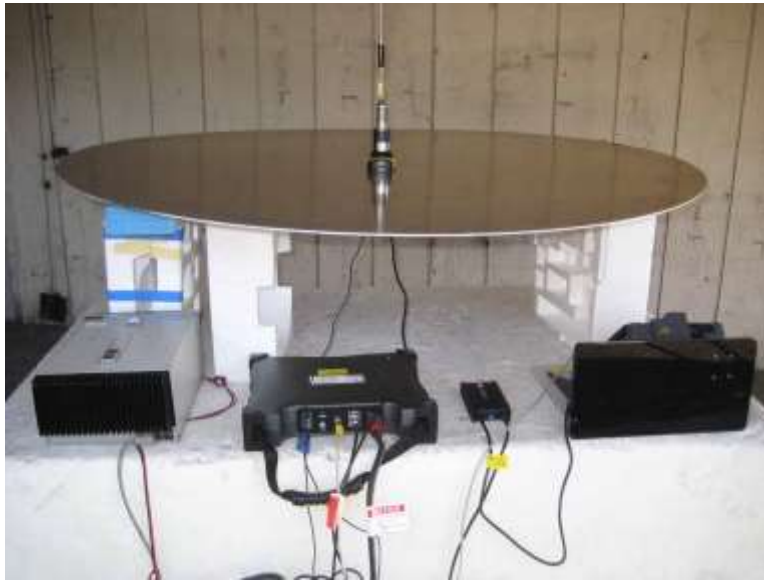
Configuration 2, Below 1GHz



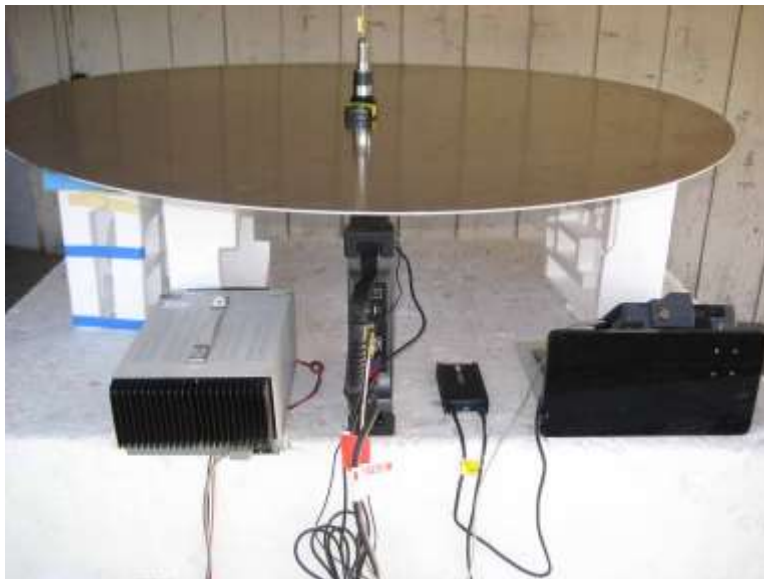
Configuration 2, Above 1GHz Cone placement



Configuration 2, Above 1GHz Cone placement



X Axis



Y Axis



Z Axis

APPENDIX A: MODIFICATION PHOTO



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.