Itron, Inc.

TEST REPORT FOR

OpenWay Riva Gas Remote Disconnect
Model: OWRGRD

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(FHSS 902-928 MHz)

Report No.: 103184-2

Date of issue: November 25, 2019

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.

Test Certificate # 803.01

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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: 191323

REPORT PREPARED BY:

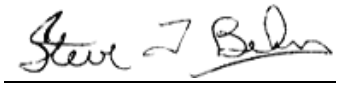
Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 103184

DATE OF EQUIPMENT RECEIPT: October 3, 2019
DATE(S) OF TESTING: October 3-28, 2019

Report Authorization

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



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

Test Facility Information

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

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

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Japan
Canyon Park, Bothell, WA	US0081	US1022	A-0136
Brea, CA	US0060	US1025	A-0136
Fremont, CA	US0082	US1023	A-0136
Mariposa, CA	US0103	US1024	A-0136

*CKC's list of NIST designated countries can be found at: https://standards.gov/cabs/designations.html

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	NP
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 is battery powered.
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
OpenWay Riva Gas Remote Disconnect	Itron, Inc.	OWRGRD	103184-cond

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E6410	3XG40P1
AC/DC Adapter (for Laptop)	Dell	DA130PE1-00	NA
USB Interface Board	Itron, Inc.	PCB-TEMP-0007 Rev3	NA

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
OpenWay Riva Gas Remote Disconnect	Itron, Inc.	OWRGRD	103184-rad

Support Equipment:

Device	Manufacturer	Model #	S/N
Flood Sensor	Itron, Inc.	TEL-7103-008	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Operating Frequency Range:	902.2 - 927.75MHz (GFSK 25kbps) 902.2 – 927.8MHz (GFSK 50 kbps)
Number of Hopping Channels:	512 channels (GFSK 25 kbps, previously tested channel plan) 129 channels (GFSK 50 kbps, new channel plan)
Receiver Bandwidth and Synchronization:	The manufacturer declares the receiver input bandwidth matches the transmit channel bandwidth and shifts frequencies in synchronization with the transmitter.
Modulation Type(s):	GFSK 25kbps and 50kbps
Maximum Duty Cycle:	100%
Number of TX Chains:	1 (there are 2 internal antennas but does not support simultaneous transmission)
Antenna Type(s) and Gain:	Integral Antenna 1: H port: -0.4dBi (PCB Trace) Integral Antenna 2: V port: 3.67dBi (Stamped Metal)
Beamforming Type:	NA
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	6.0VDC battery
Firmware / Software used for Test:	Command Line Interface (CLI) Tool (dated Feb 21, 2019) App Version 5.04.0, CSL Version: 16.0.5.0

FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	10/3/2019 to 10/20/2019
Configuration:	1		
Test Setup:	The equipment under test (EUT) is placed on the tabletop. The output of the EUT is connected to the spectrum analyzer using a coaxial cable and attenuator. The EUT is transmitting at max power. Measurements were performed with a fresh battery installed.		

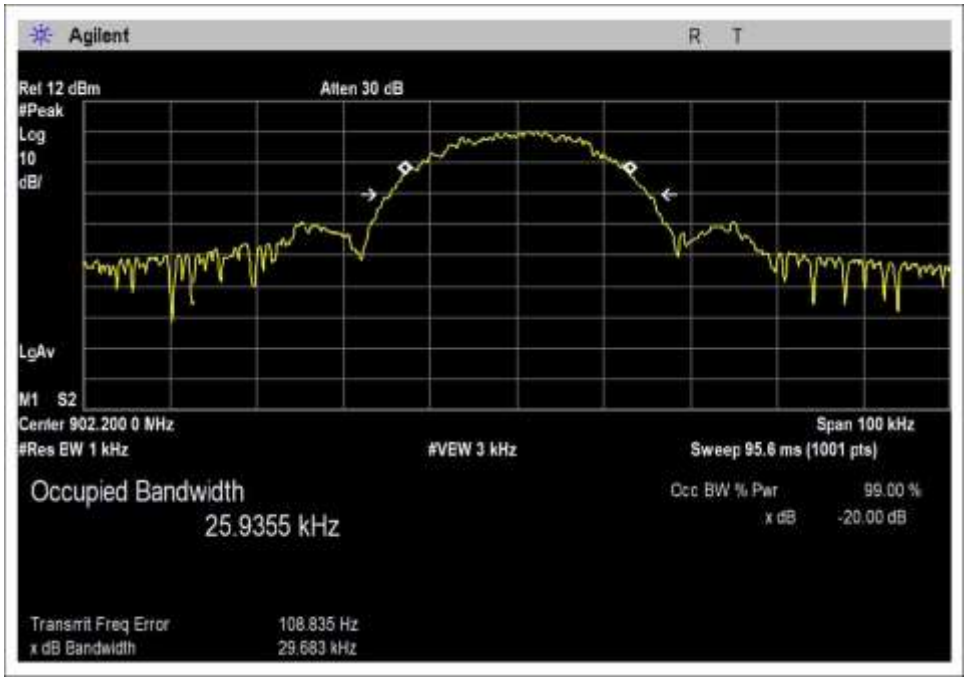
Environmental Conditions			
Temperature (ºC)	19-23	Relative Humidity (%):	30-50

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/3/2017	11/3/2019
P05748	Attenuator	Pasternack	PE7004-20	4/24/2018	4/24/2020
P05959	Cable	Andrews	Heliax	4/11/2018	4/11/2020

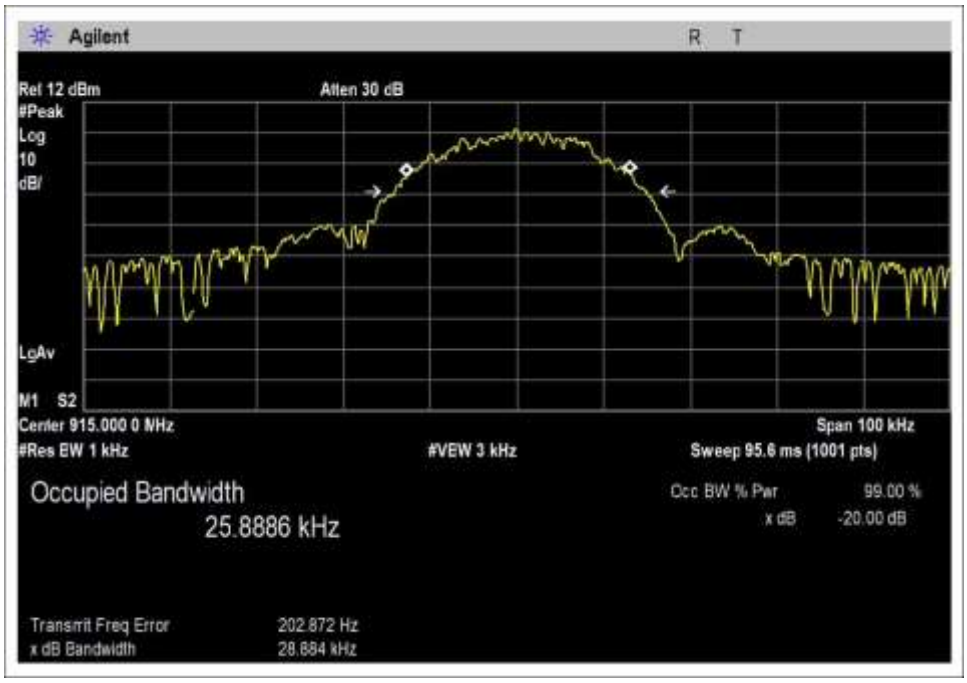
15.247(a)(1)(i) 20 dB Bandwidth

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
902.2	V	GFSK 25kbps	29.683	≤500	Pass
915	V	GFSK 25kbps	28.884	≤500	Pass
927.75	V	GFSK 25kbps	29.829	≤500	Pass
902.2	V	GFSK 50 kbps	101.668	≤500	Pass
915	V	GFSK 50 kbps	100.720	≤500	Pass
927.8	V	GFSK 50 kbps	86.861	≤500	Pass
902.2	H	GFSK 25kbps	29.969	≤500	Pass
915	H	GFSK 25kbps	28.398	≤500	Pass
927.75	H	GFSK 25kbps	29.638	≤500	Pass
902.2	H	GFSK 50 kbps	102.425	≤500	Pass
915	H	GFSK 50 kbps	96.730	≤500	Pass
927.8	H	GFSK 50 kbps	92.790	≤500	Pass

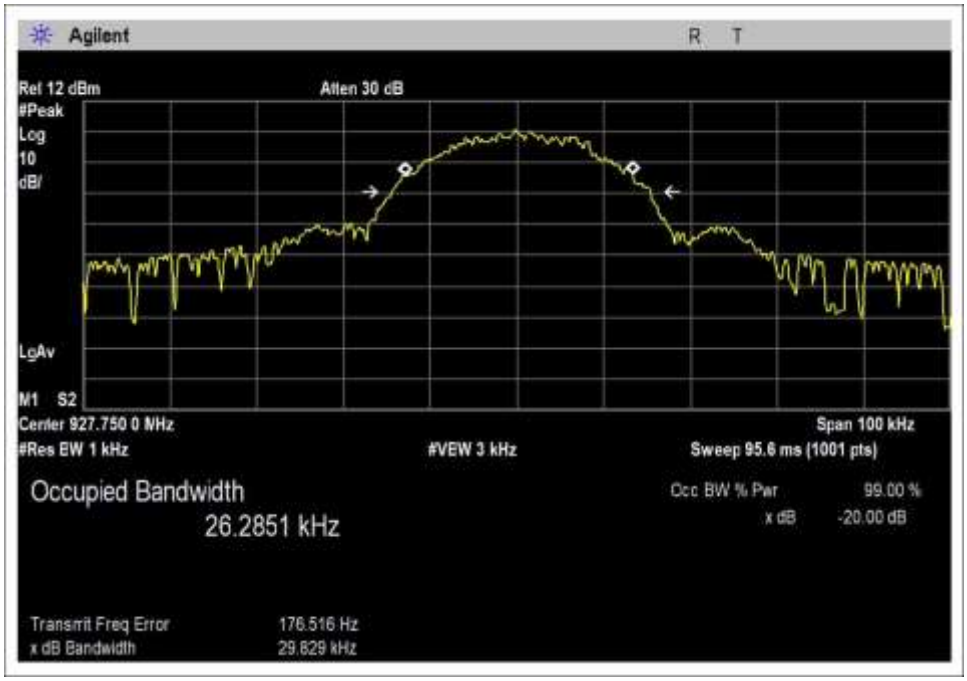
Plot(s)



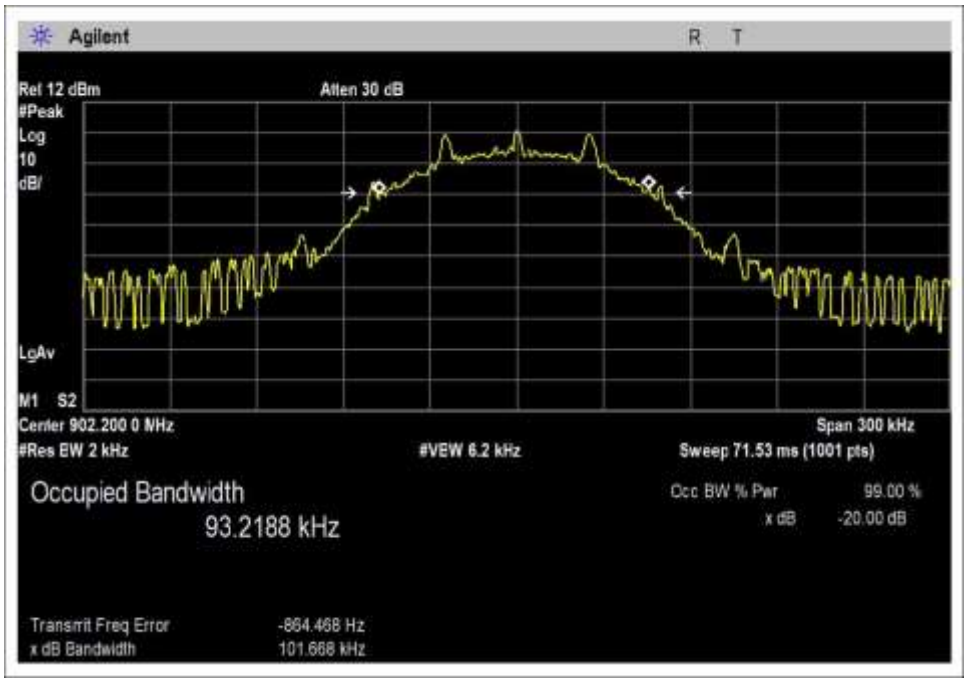
GFSK 25kbps Port V (Low)



GFSK 25kbps Port V (Mid)



GFSK 25kbps Port V (High)



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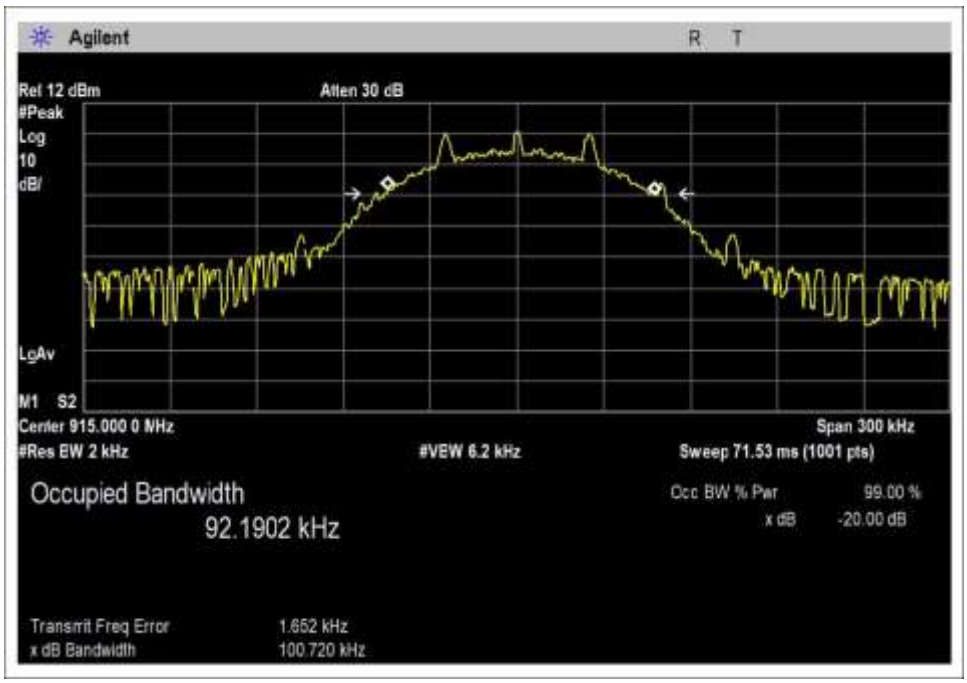
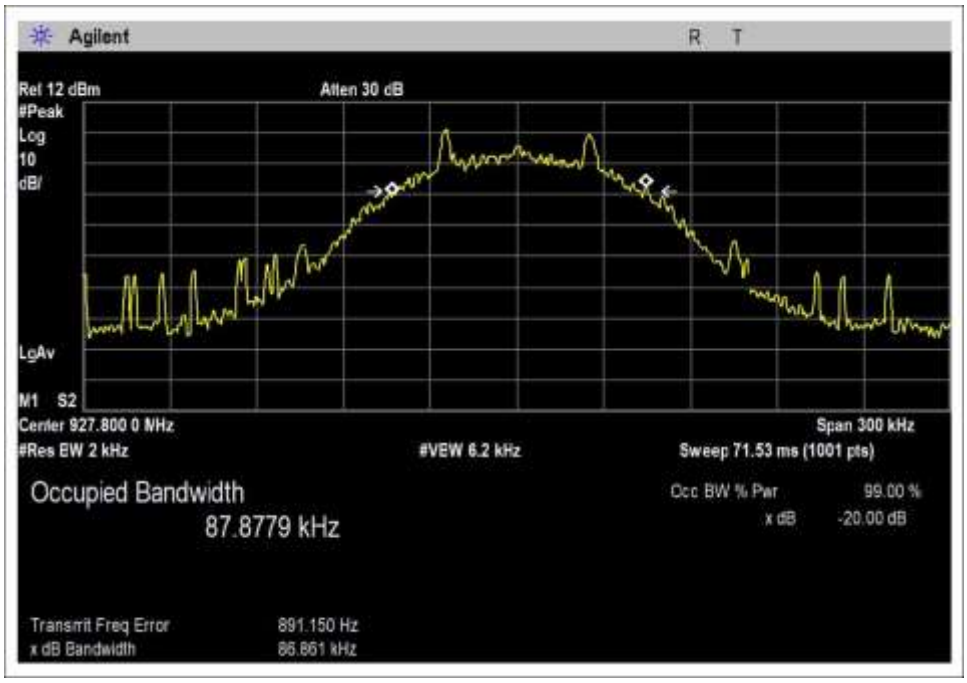
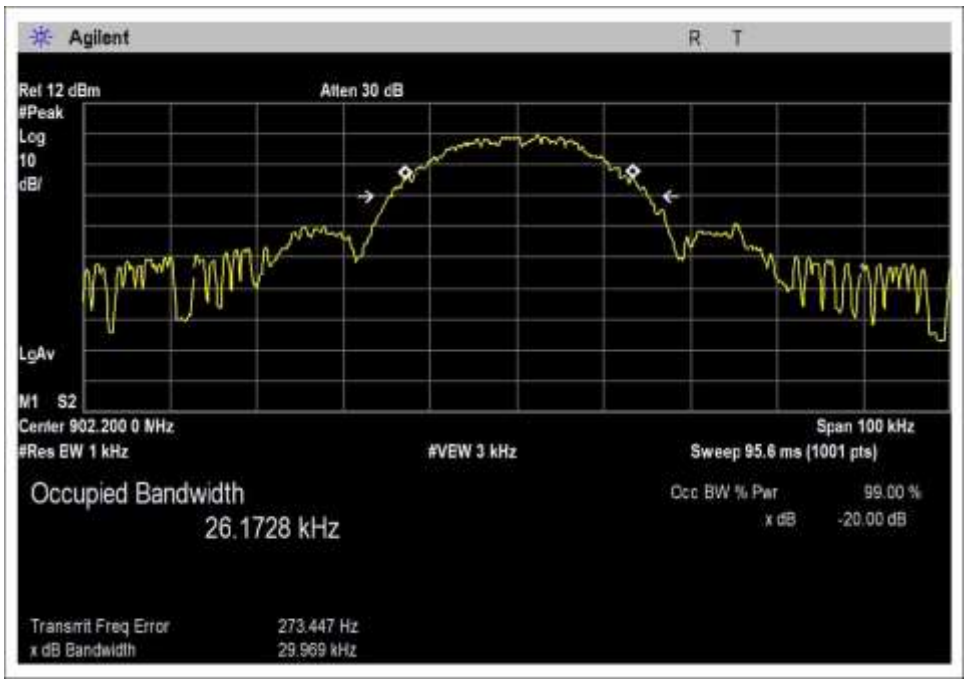


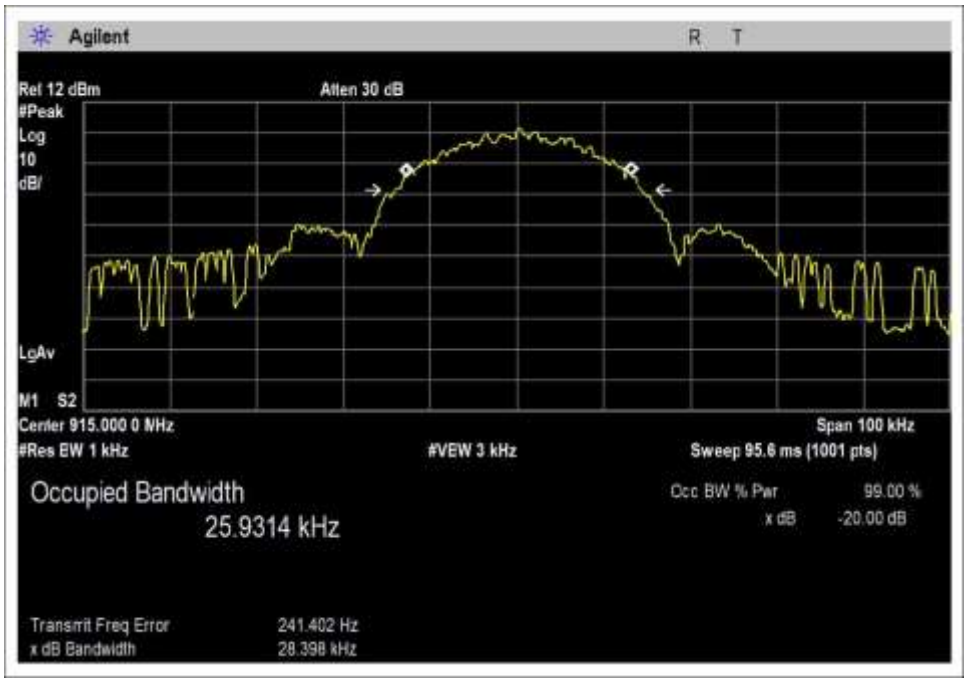
OBW GFSK 50kbps Port V (Mid)



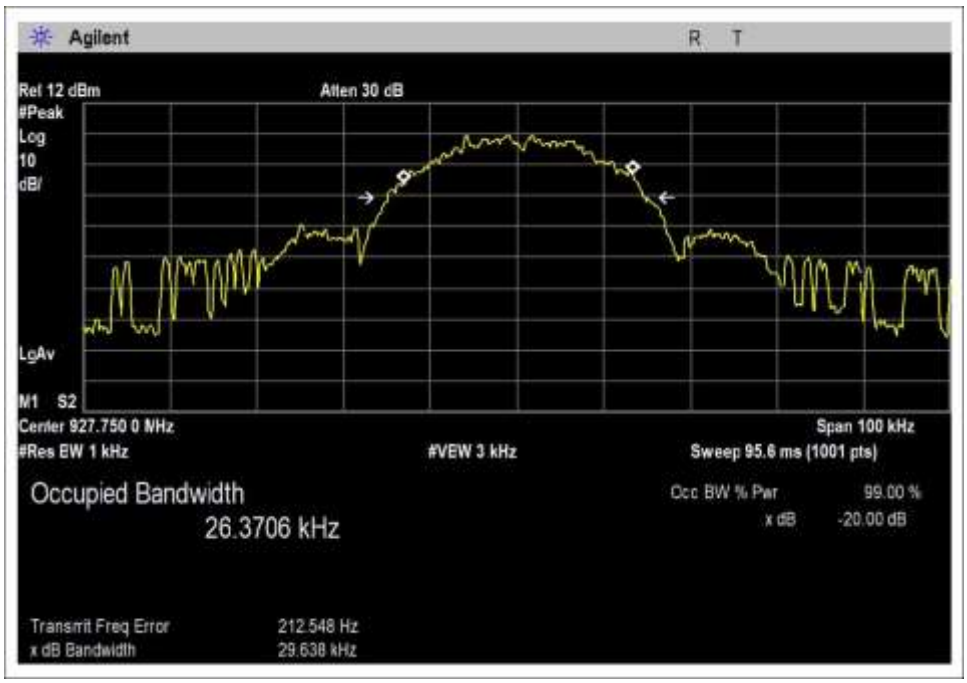
GFSK 50kbps Port V (High)



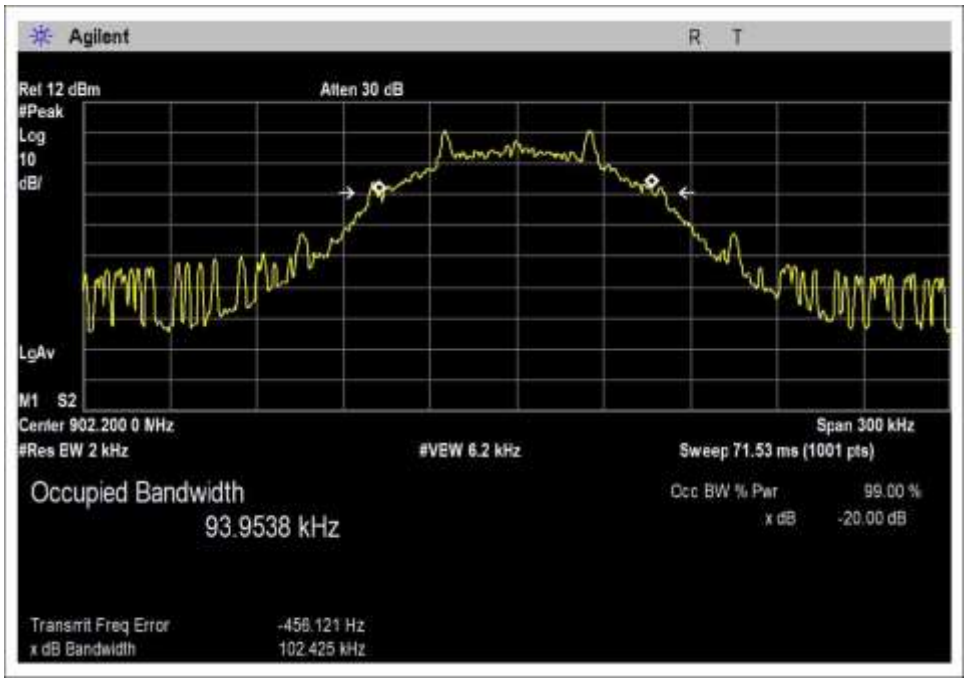
GFSK 25kbps Port H (Low)



GFSK 25kbps Port H (Mid)



GFSK 25kbps Port H (High)



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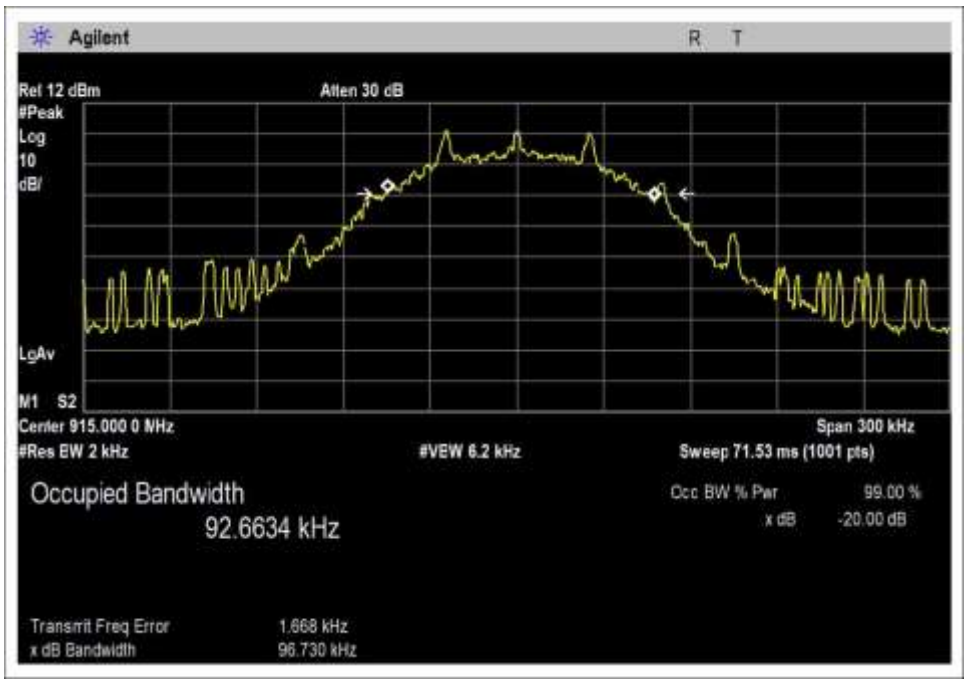

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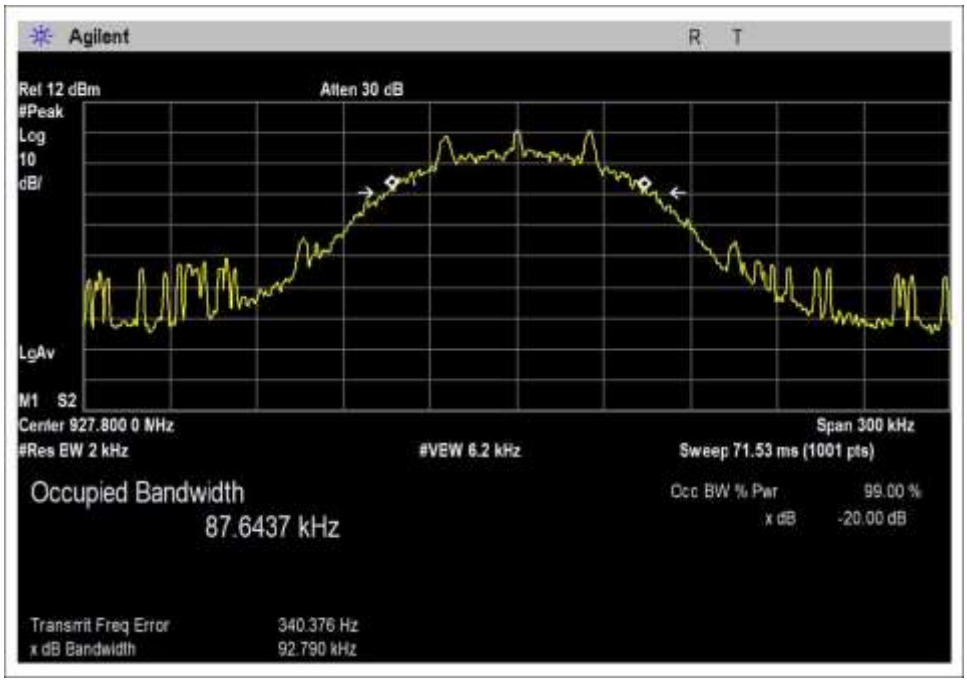
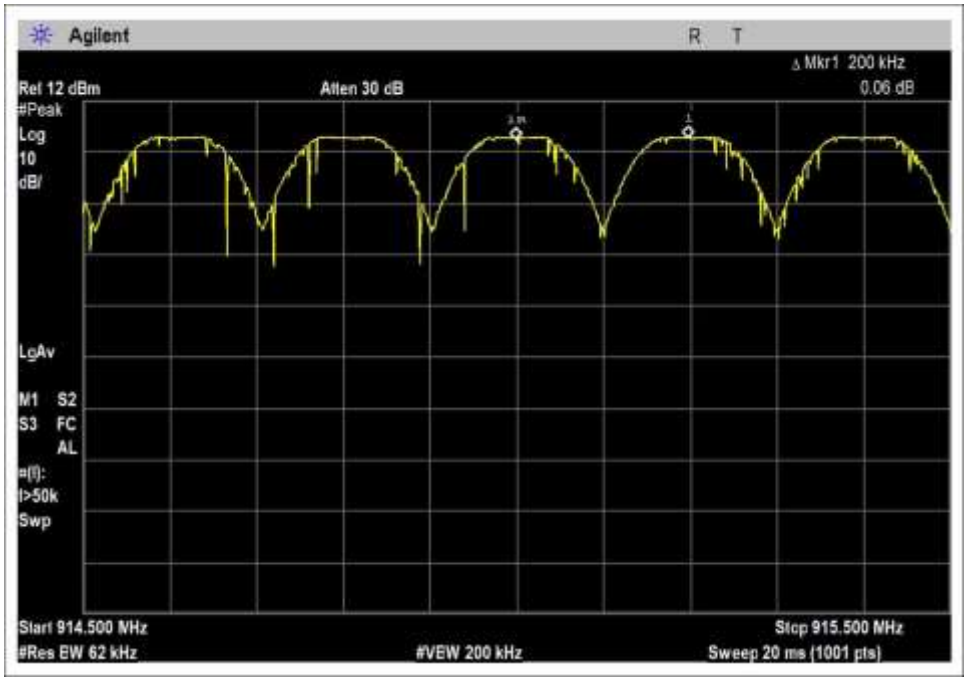


GFSK 50kbps Port H (High)

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**
V	GFSK 50 kbps , Continually Hopping Channels	200.0	≥102.425	Pass

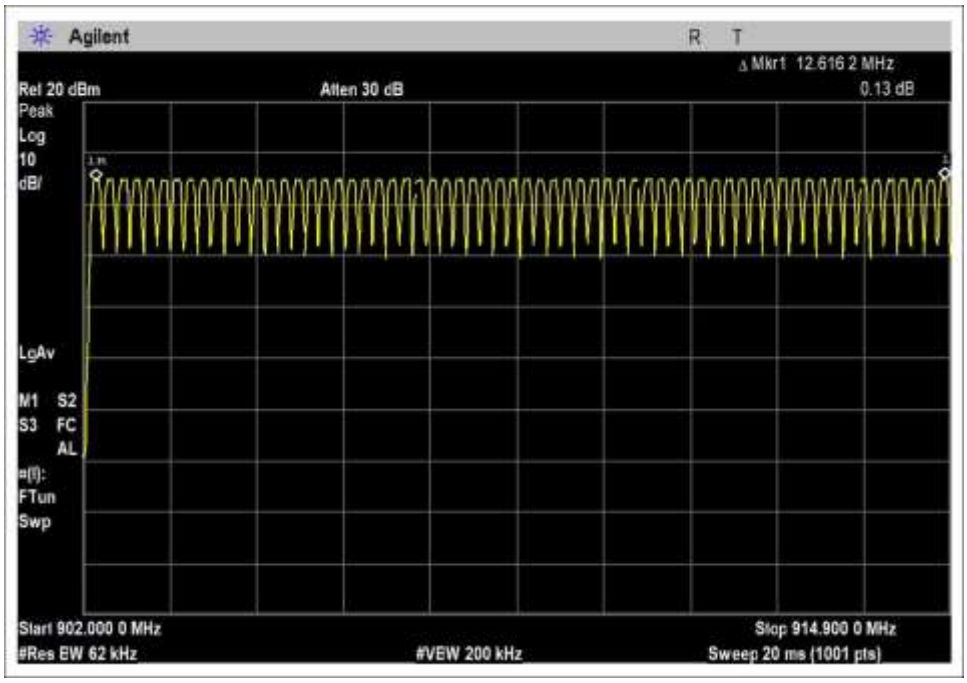
Plot(s)



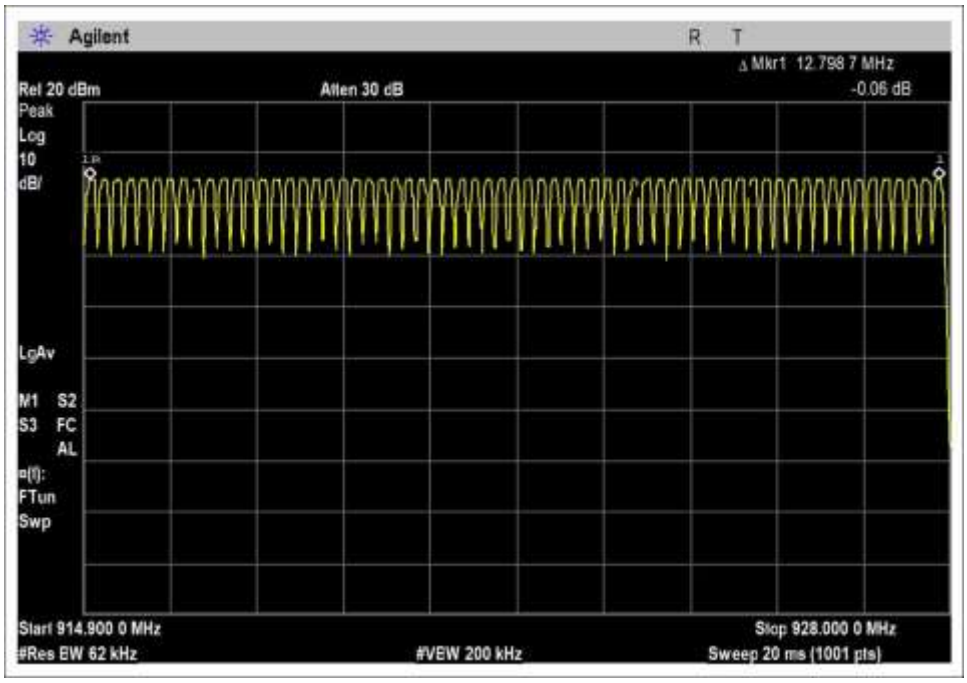
15.247(a)(1)(i) Number of Hopping Channels

Test Data Summary				
$Limit = \begin{cases} 50\ Channels \mid 20\ dB\ BW < 250kHz \\ 25\ Channels \mid 20\ dB\ BW \geq 250kHz \end{cases}$				
Antenna Port	**Operational Mode**	**Measured (Channels)**	**Limit (Channels)**	**Results**
V	GFSK 50 kbps , Continually Hopping Channels	129	≥50	Pass

Plot(s)



Channels 1-64



Channels 65-129

Test Setup Photo(s)

Port V

Port H

15.247(a)(1)(i) 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.

Itron, Inc. 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.

15.247(b)(1) Output Power

Test Data Summary - Voltage Variations

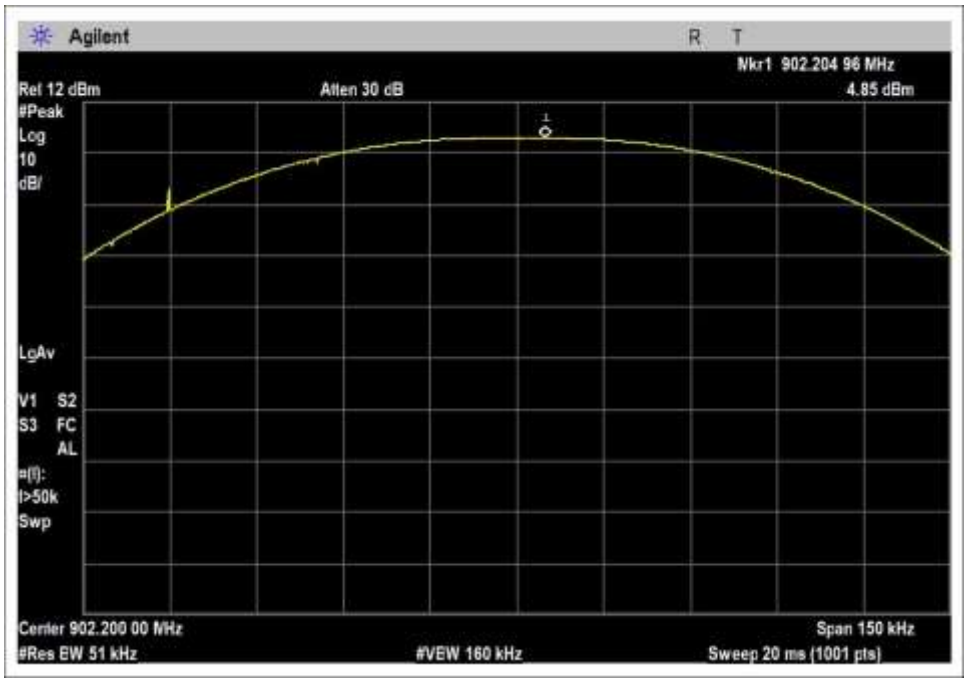
This equipment is battery powered. Power output tests were performed using a fresh battery.

Test Data Summary - RF Conducted Measurement

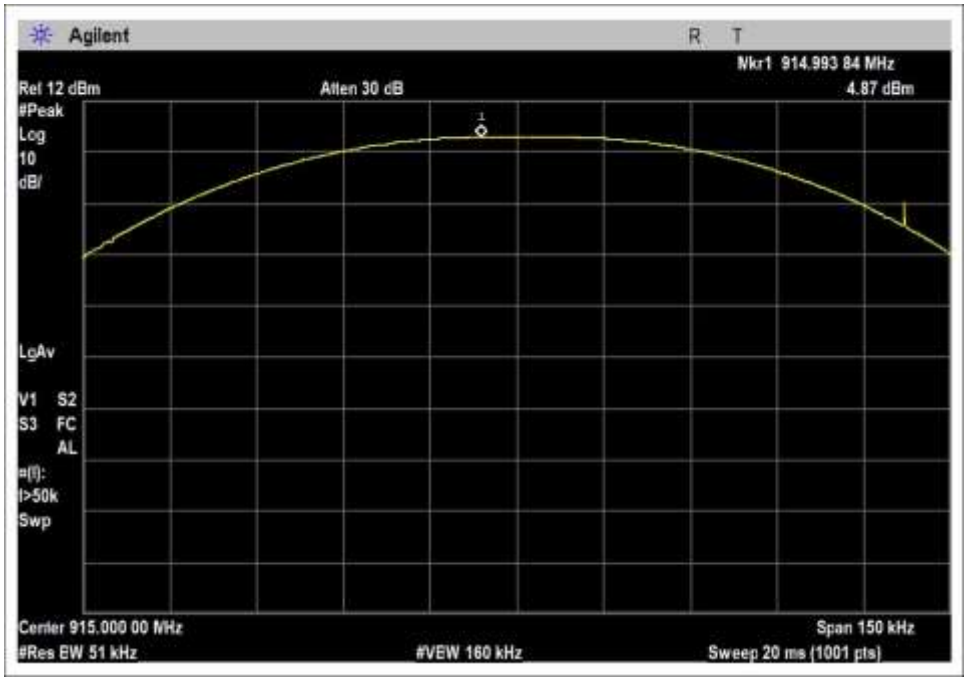
$$Limit = \begin{cases} 30dBm\ Conducted/36dBm\ EIRP \mid \geq 50\ Channels \\ 24dBm\ Conducted/30dBm\ EIRP \mid < 50\ Channels\ (\min 25) \end{cases}$$

Frequency (MHz)	Port	Modulation	Gain (dBi)	Measured (dBm)	Conducted Limit (dBm)	Results
902.2	V	GFSK 25kbps	3.67	25.5	≤30	Pass
915	V	GFSK 25kbps	3.67	25.5	≤30	Pass
927.75	V	GFSK 25kbps	3.67	25.4	≤30	Pass
902.2	V	GFSK 50 kbps	3.67	25.4	≤30	Pass
915	V	GFSK 50 kbps	3.67	25.5	≤30	Pass
927.8	V	GFSK 50 kbps	3.67	25.4	≤30	Pass
902.2	H	GFSK 25kbps	-0.4	25.5	≤30	Pass
915	H	GFSK 25kbps	-0.4	25.5	≤30	Pass
927.75	H	GFSK 25kbps	-0.4	25.5	≤30	Pass
902.2	H	GFSK 50 kbps	-0.4	25.5	≤30	Pass
915	H	GFSK 50 kbps	-0.4	25.5	≤30	Pass
927.8	H	GFSK 50 kbps	-0.4	25.5	≤30	Pass

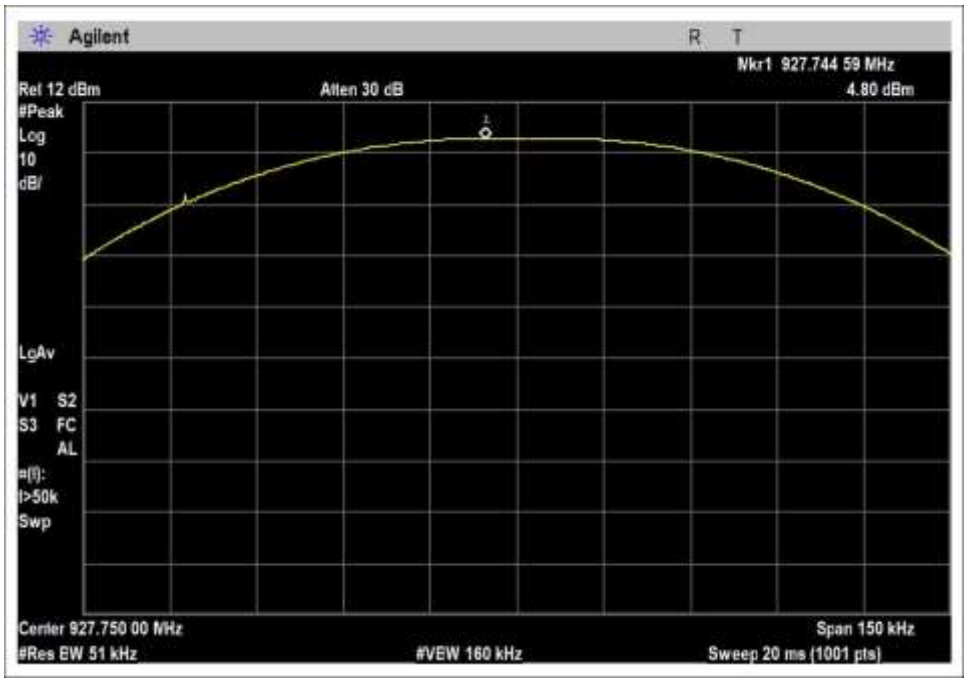
Plots



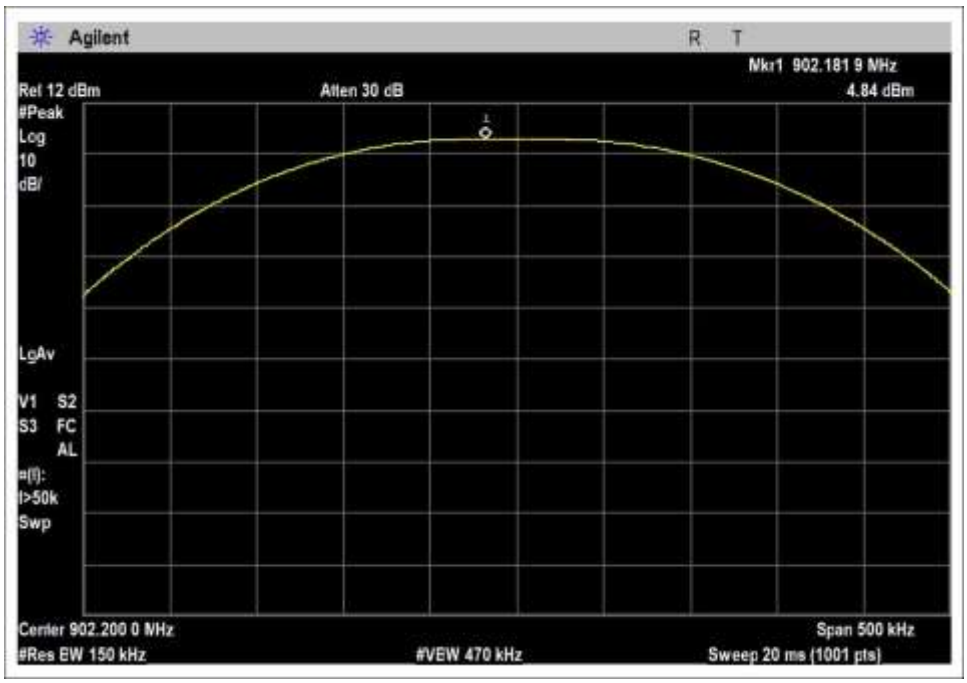
GFSK 25kbps Port V (Low)



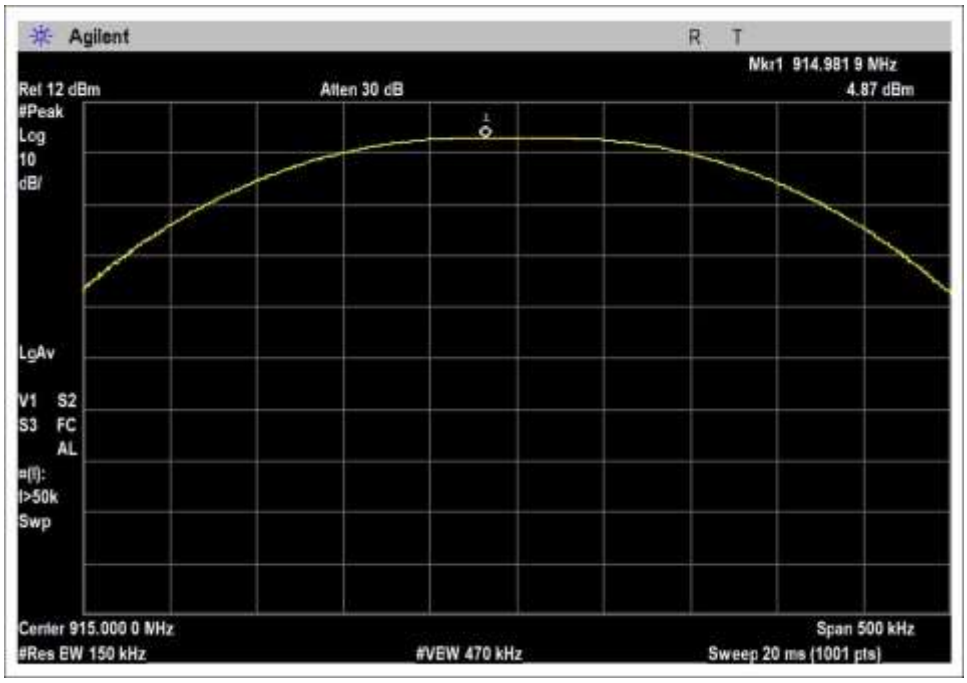
GFSK 25kbps Port V (Mid)



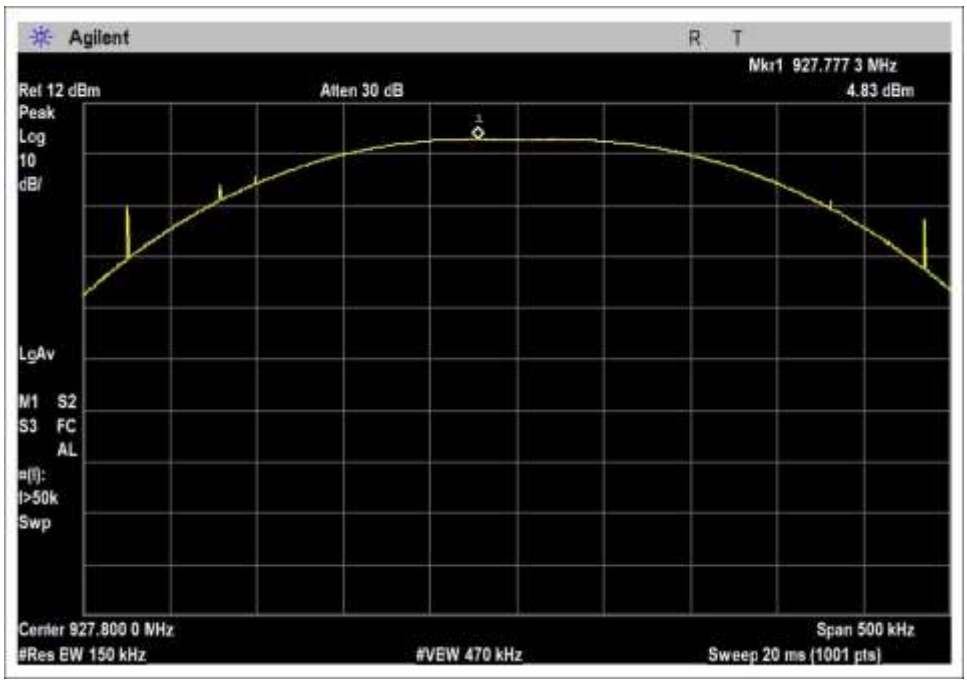
GFSK 25kbps Port V (High)



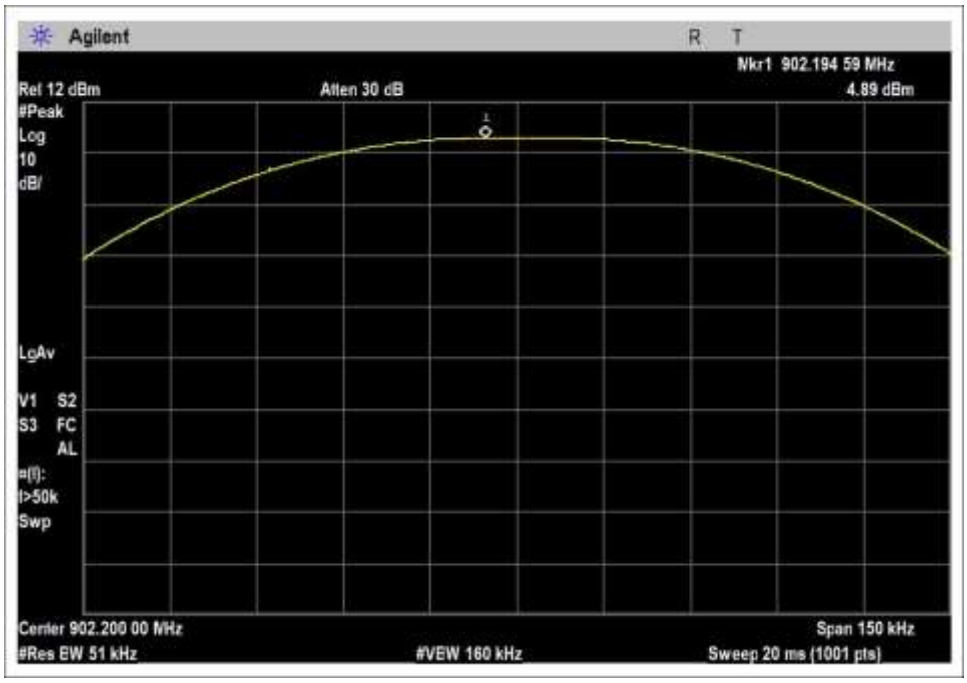
GFSK 50kbps Port V (Low)



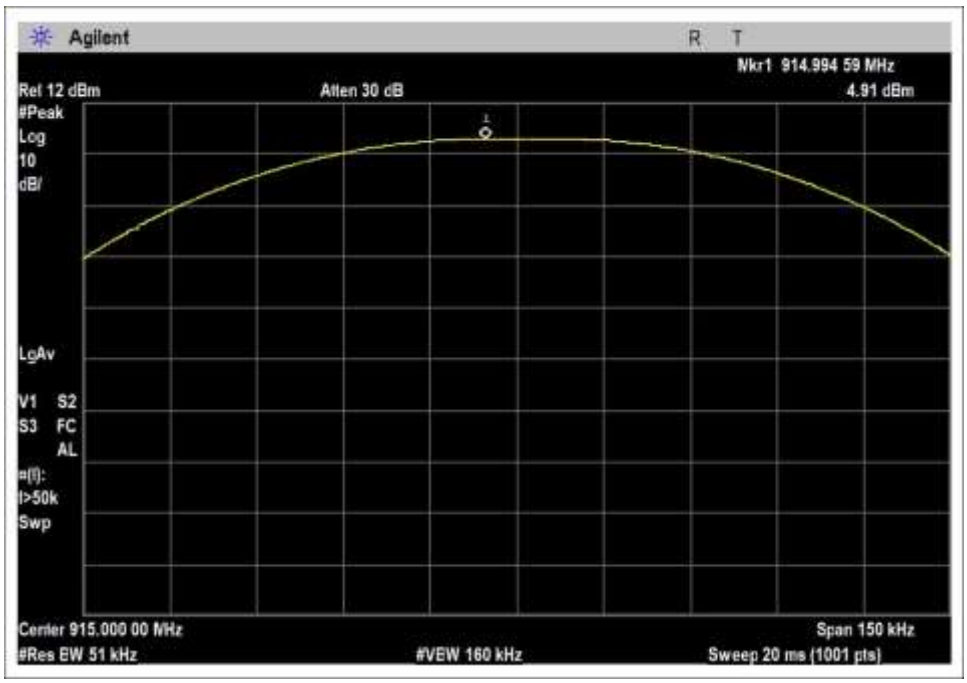
GFSK 50kbps Port V (Mid)



GFSK 50kbps Port V (High)



GFSK 25kbps Port H (Low)



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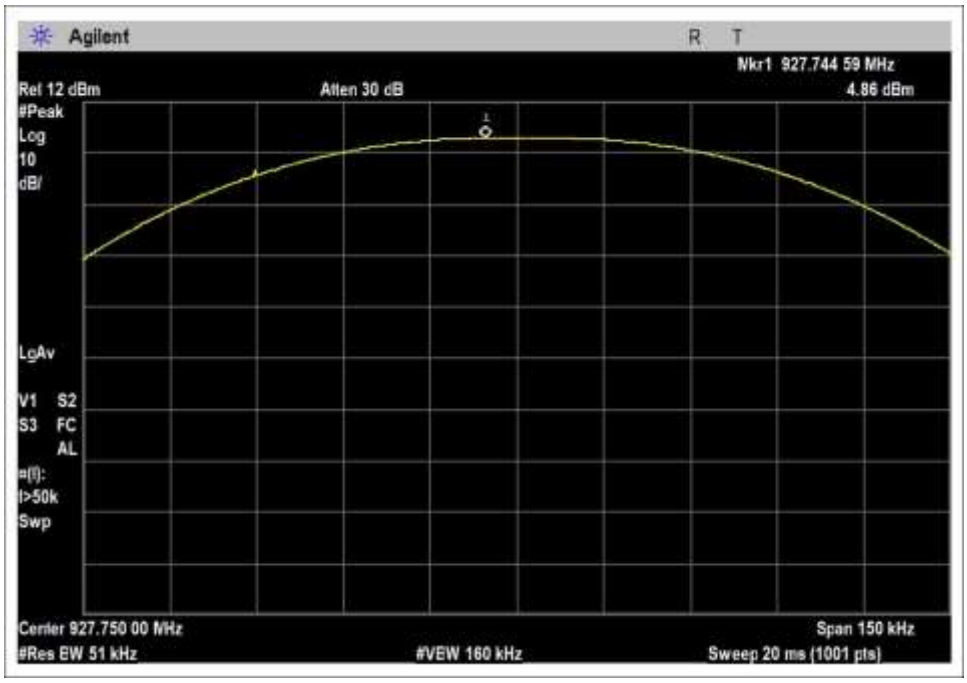
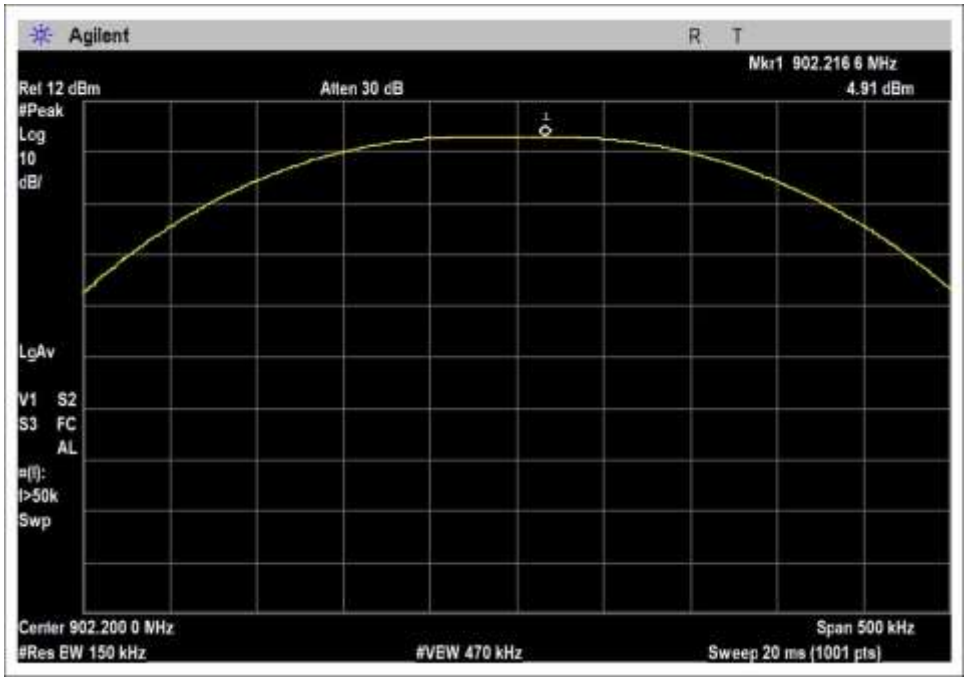
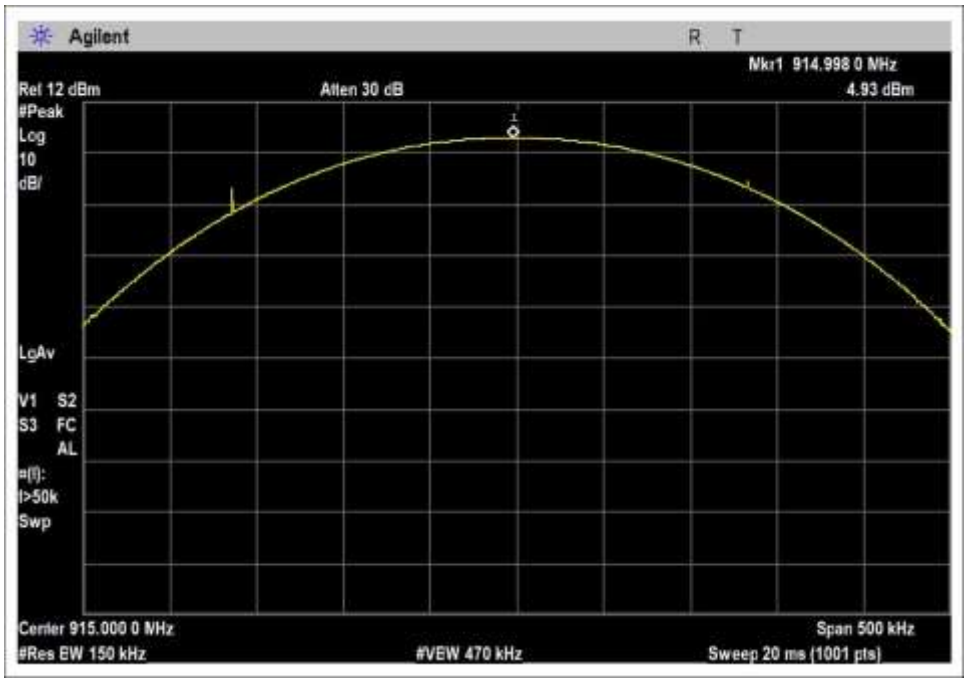


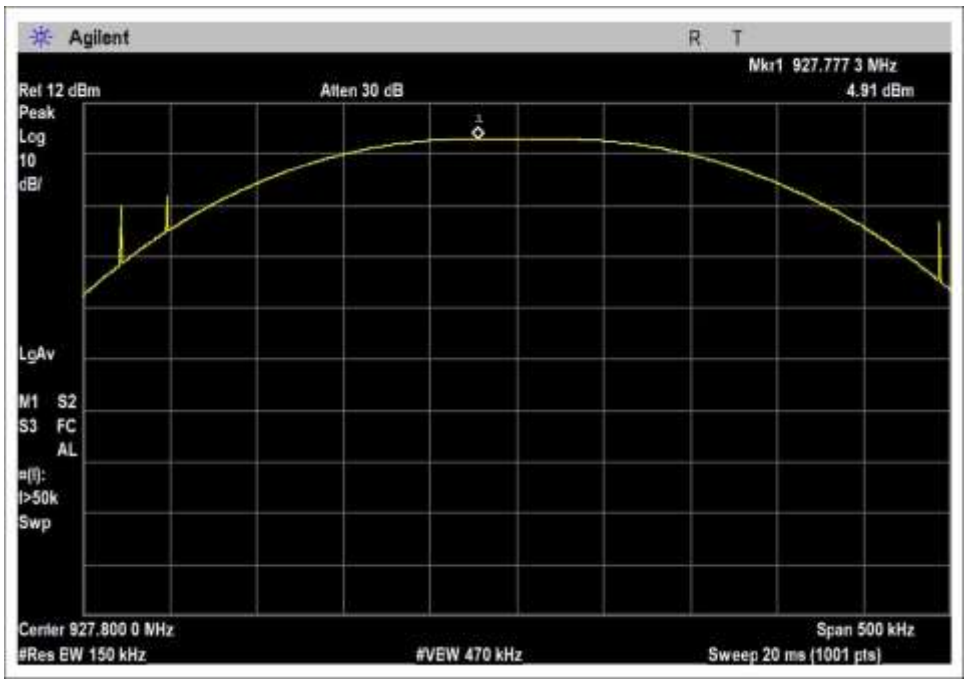
GFSK 25kbps Port H (High)



GFSK 50kbps Port H (Low)



GFSK 50kbps Port H (Mid)



GFSK 50kbps Port H (High)

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**		
Work Order #:	**103184**	Date:	10/3/2019
Test Type:	**Conducted Emissions**	Time:	15:08:38
Tested By:	Michael Atkinson	Sequence#:	1
Software:	EMITest 5.03.12		Battery

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

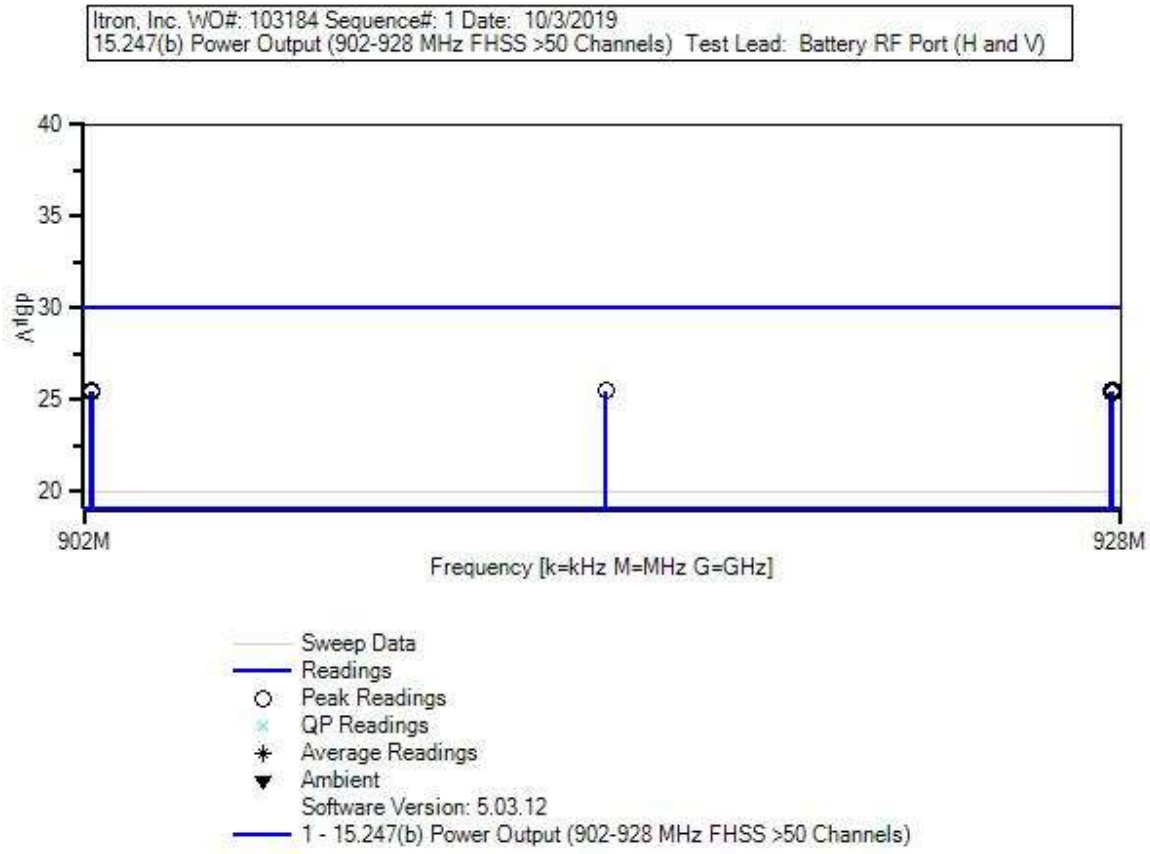
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Setup: The equipment under test (EUT) is placed on the tabletop.
The output of the EUT is connected to the spectrum analyzer using a coaxial cable and attenuator.
The EUT is transmitting at max power.
Measurements were performed with a fresh battery installed.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)


Itron, Inc. WO#: 103184 Sequence#: 1 Date: 10/3/2019
15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: Battery RF Port (H and V)
40
35
30
25
20
dBµV
902M
928M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.12
1 - 15.247(b) Power Output (902-928 MHz FHSS >50 Channels)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/3/2017	11/3/2019
T2	ANP05748	Attenuator	PE7004-20	4/24/2018	4/24/2020
T3	ANP05959	Cable	Heliax	4/11/2018	4/11/2020

Measurement Data: Reading listed by margin. Test Lead: RF Port (H and V)

#	Freq MHz	Rdng dBm	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	902.205M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	30.0 GFSK 25kbps	-4.5	RF Po
2	902.195M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	30.0 GFSK 25 kbps	-4.5	RF Po
3	914.994M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	30.0 GFSK 25kbps	-4.5	RF Po
4	914.982M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	30.0 GFSK 50kbps	-4.5	RF Po
5	914.995M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	30.0 GFSK 25 kbps	-4.5	RF Po
6	914.998M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	30.0 GFSK 50kbps	-4.5	RF Po
7	927.777M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	30.0 GFSK 50kbps	-4.5	RF Po
8	927.745M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	30.0 GFSK 25 kbps	-4.5	RF Po
9	902.217M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	30.0 GFSK 50kbps	-4.5	RF Po
10	927.777M	4.8	+0.0	+20.0	+0.6		+0.0	25.4	30.0 GFSK 50kbps	-4.6	RF Po
11	902.182M	4.8	+0.0	+20.0	+0.6		+0.0	25.4	30.0 GFSK 50kbps	-4.6	RF Po
12	927.745M	4.8	+0.0	+20.0	+0.6		+0.0	25.4	30.0 GFSK 25kbps	-4.6	RF Po

Test Setup Photo(s)

Port V

Port H

15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**103184**	Date:	10/24/2019
Test Type:	**Conducted Emissions**	Time:	11:53:47
Tested By:	Michael Atkinson	Sequence#:	3
Software:	EMITest 5.03.12		Battery

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

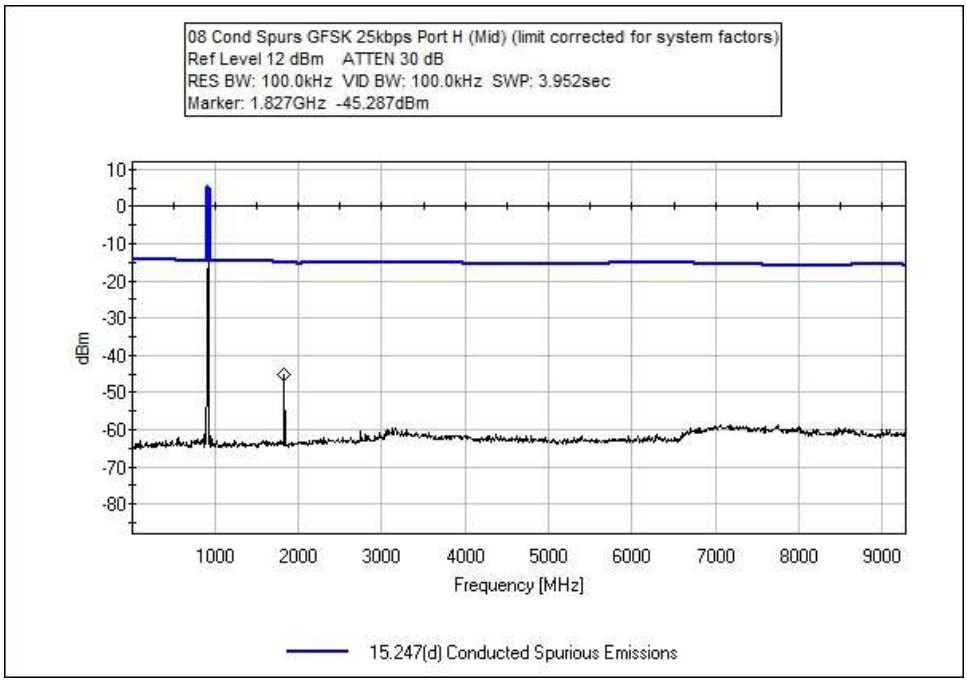
Test Conditions / Notes:

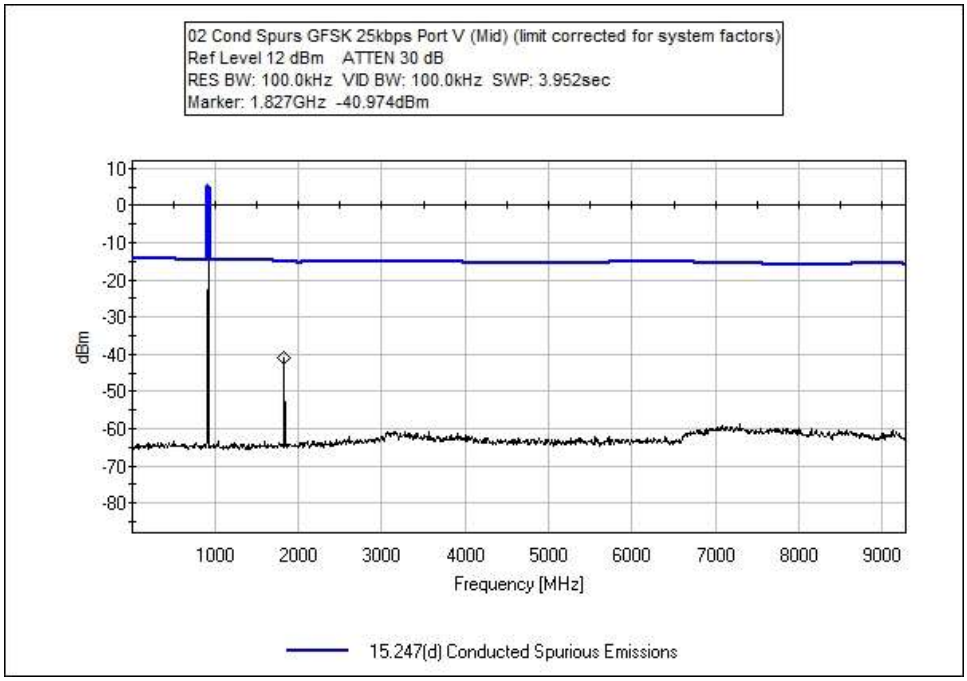
Frequency: 9kHz-9280MHz.

Setup: The equipment under test (EUT) is placed on the tabletop.
The output of the EUT is connected to the spectrum analyzer using a coaxial cable and attenuator.
The EUT is transmitting at max power.
Measurements were performed with a fresh battery installed. L, M, H channels investigated.
25k and 50k data rates investigated.
H and V EUT ports investigated.

Worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)


08 Cond Spurs GFSK 25kbps Port H (Mid) (limit corrected for system factors)
Ref Level 12 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 3.952sec
Marker: 1.827GHz -45.287dBm
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


02 Cond Spurs GFSK 25kbps Port V (Mid) (limit corrected for system factors)
Ref Level 12 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 3.952sec
Marker: 1.827GHz -40.974dBm
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/3/2017	11/3/2019
T2	ANP05748	Attenuator	PE7004-20	4/24/2018	4/24/2020
T3	ANP05959	Cable	Heliax	4/11/2018	4/11/2020

Measurement Data: Reading listed by margin. Test Lead: RF Port V

#	Freq MHz	Rdng dBm	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	1855.500M	-40.2	+0.0	+20.0	+1.1		+0.0	-19.1	6.0	-25.1	RF Po
									25kbps GFSK		
2	1855.600M	-40.4	+0.0	+20.0	+1.1		+0.0	-19.3	6.0	-25.3	RF Po
									50kbps GFSK		
3	1830.000M	-40.9	+0.0	+20.0	+1.1		+0.0	-19.8	6.0	-25.8	RF Po
									50kbps GFSK		
4	1830.000M	-41.0	+0.0	+20.0	+1.1		+0.0	-19.9	6.0	-25.9	RF Po
									25kbps GFSK		
5	1804.400M	-41.4	+0.0	+20.0	+1.1		+0.0	-20.3	6.0	-26.3	RF Po
									25kbps GFSK		
6	1804.400M	-41.6	+0.0	+20.0	+1.1		+0.0	-20.5	6.0	-26.5	RF Po
									50kbps GFSK		
7	1855.600M	-42.5	+0.0	+20.0	+1.1		+0.0	-21.4	6.0	-27.4	RF Po
									50kbps GFSK		
8	1830.000M	-45.3	+0.0	+20.0	+1.1		+0.0	-24.2	6.0	-30.2	RF Po
									25kbps GFSK		
9	1855.500M	-45.3	+0.0	+20.0	+1.1		+0.0	-24.2	6.0	-30.2	RF Po
									25kbps GFSK		
10	1804.400M	-45.4	+0.0	+20.0	+1.1		+0.0	-24.3	6.0	-30.3	RF Po
									25kbps GFSK		
11	1804.400M	-45.6	+0.0	+20.0	+1.1		+0.0	-24.5	6.0	-30.5	RF Po
									50kbps GFSK		
12	1830.000M	-45.7	+0.0	+20.0	+1.1		+0.0	-24.6	6.0	-30.6	RF Po
									50kbps GFSK		

Band Edge

Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB. Operating Mode: H port, Single Channel (Low and High)				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
902	GFSK 25kbps	-23.0	<6.0	Pass
928	GFSK 25kbps	-24.5	<6.0	Pass

Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB. Operating Mode: H Port, Single Channel (Low and High)				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
902	GFSK 50kbps	-22.6	<6.0	Pass
928	GFSK 50kbps	-30.8	<6.0	Pass

Band Edge Summary							
Limit applied: Max Power/100kHz - 20dB. (Using Marker Delta Method) Operating Mode: H port, Hopping							
Freq (MHz)	**Modulation**	**100kHz Band Edge Measurement (dBm)**	**100kHz Fundamental Measurement (dBm)**	**30kHz Band Edge Measurement (dBm)**	**30kHz Fundamental Measurement (dBm)**	**Band Edge Limit (30kHz) (dBm)**	**Results**
902	Hopping GSFK 25k	7.7	25.4	**-3.5**	25.4	<6.0	Pass
928	Hopping GSFK 25k	5.0	25.6	**-6.0**	25.6	<6.0	Pass
902	Hopping GSFK 50k	8.3	25.4	**-2.8**	25.4	<6.0	Pass
928	Hopping GSFK 50k	6.8	25.5	**-4.5**	25.6	<6.0	Pass

Note: Marker delta limit was applied per ANSI C63.10 (2013) section 6.10.6.2. The final value to consider against the limit is the worst case 30kHz Band Edge measurement, underlined and bold in the table above.

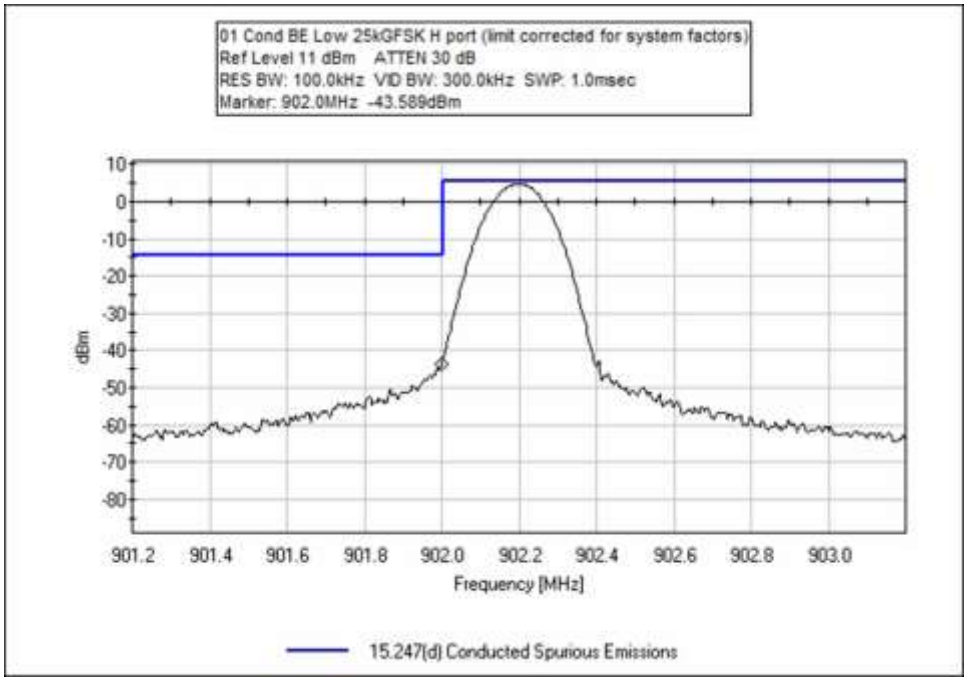
Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB. Operating Mode: V port, Single Channel (Low and High)				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
902	GFSK 25kbps	-22.6	<6.0	Pass
928	GFSK 25kbps	-26.6	<6.0	Pass

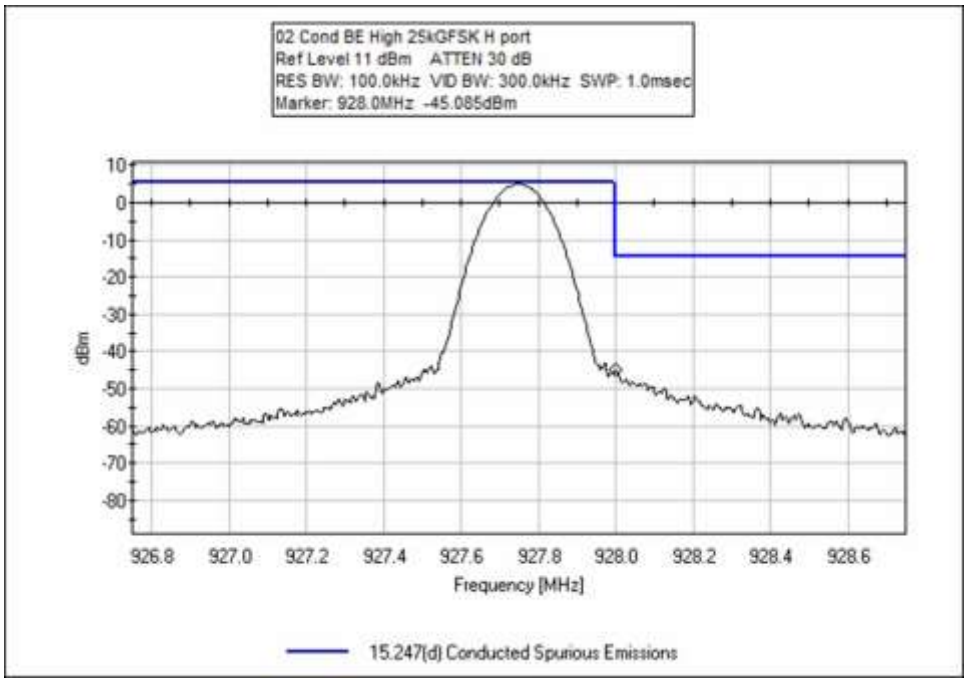
Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB. Operating Mode: V Port, Single Channel (Low and High)				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
902	GFSK 50kbps	-21.0	<6.0	Pass
928	GFSK 50kbps	-23.3	<6.0	Pass

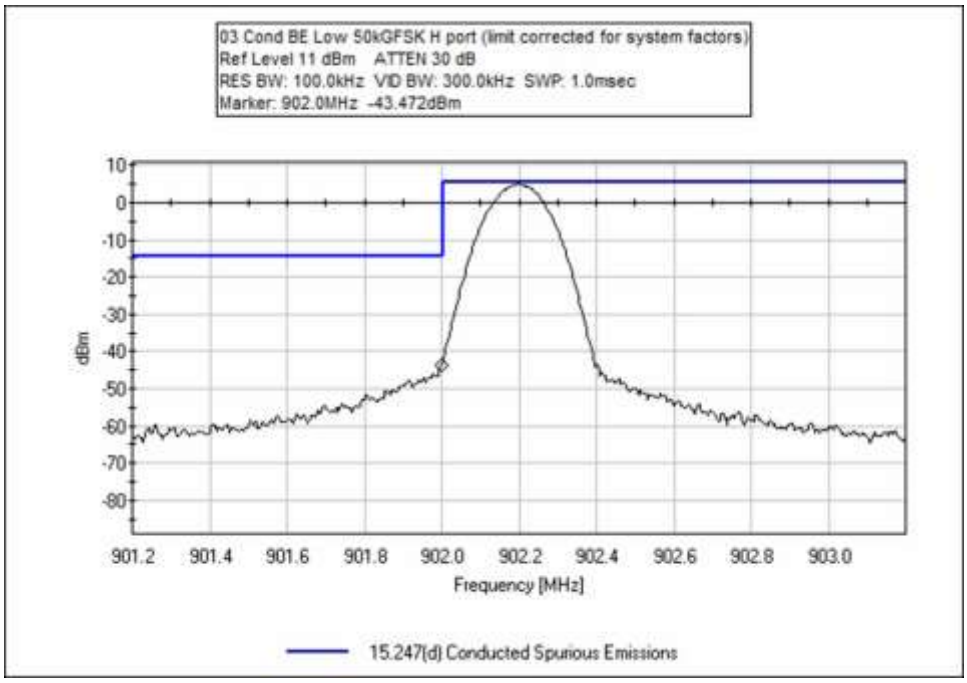
Band Edge Summary							
Limit applied: Max Power/100kHz - 20dB. (Using Marker Delta Method) Operating Mode: V port, Hopping							
Freq (MHz)	**Modulation**	**100kHz Band Edge Measurement (dBm)**	**100kHz Fundamental Measurement (dBm)**	**30kHz Band Edge Measurement (dBm)**	**30kHz Fundamental Measurement (dBm)**	**Band Edge Limit (30kHz) (dBm)**	**Results**
902	Hopping GSFK 25k	7.6	25.4	**-3.5**	25.4	<6.0	Pass
928	Hopping GSFK 25k	4.6	25.5	**-6.0**	25.5	<6.0	Pass
902	Hopping GSFK 50k	8.5	25.4	**-2.8**	25.4	<6.0	Pass
928	Hopping GSFK 50k	6.5	25.5	**-4.5**	25.5	<6.0	Pass

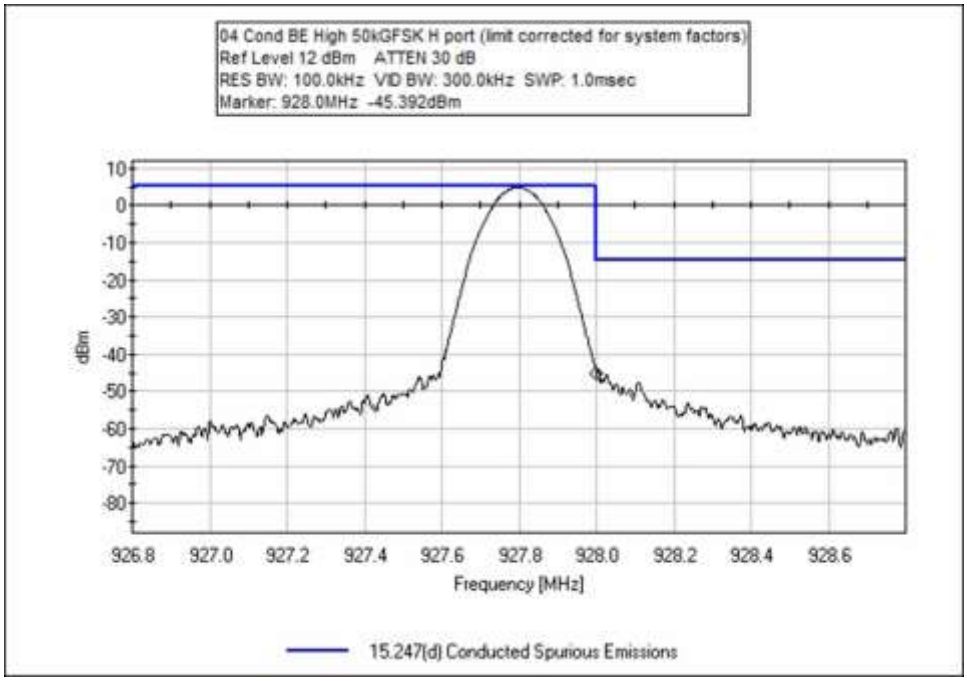
Note: Marker delta limit was applied per ANSI C63.10 (2013) section 6.10.6.2. The final value to consider against the limit is the worst case 30kHz Band Edge measurement, underlined and bold in the table above.

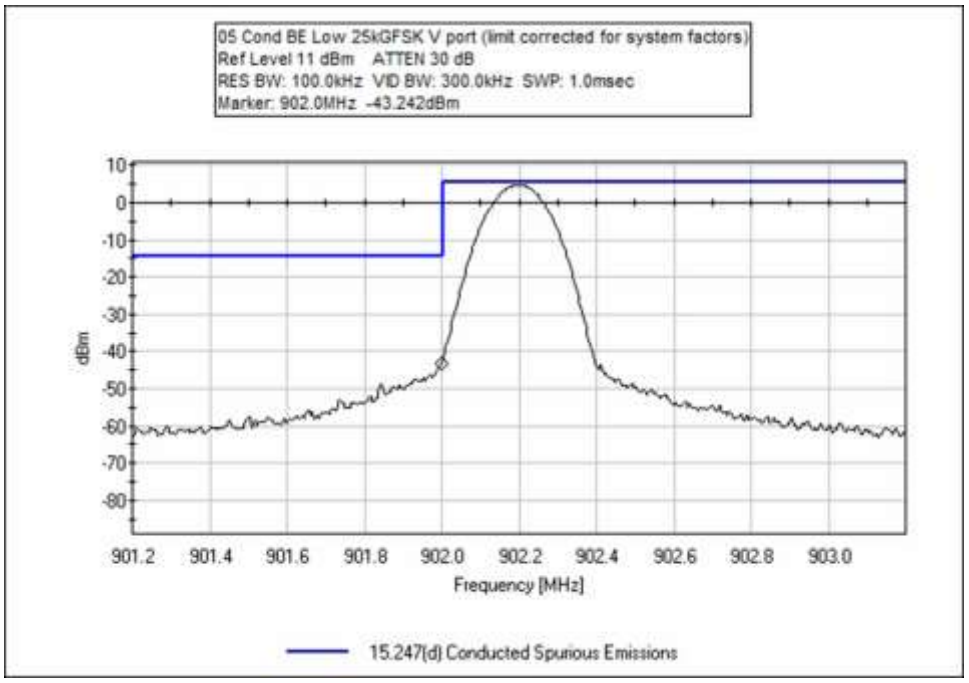
Band Edge Plots

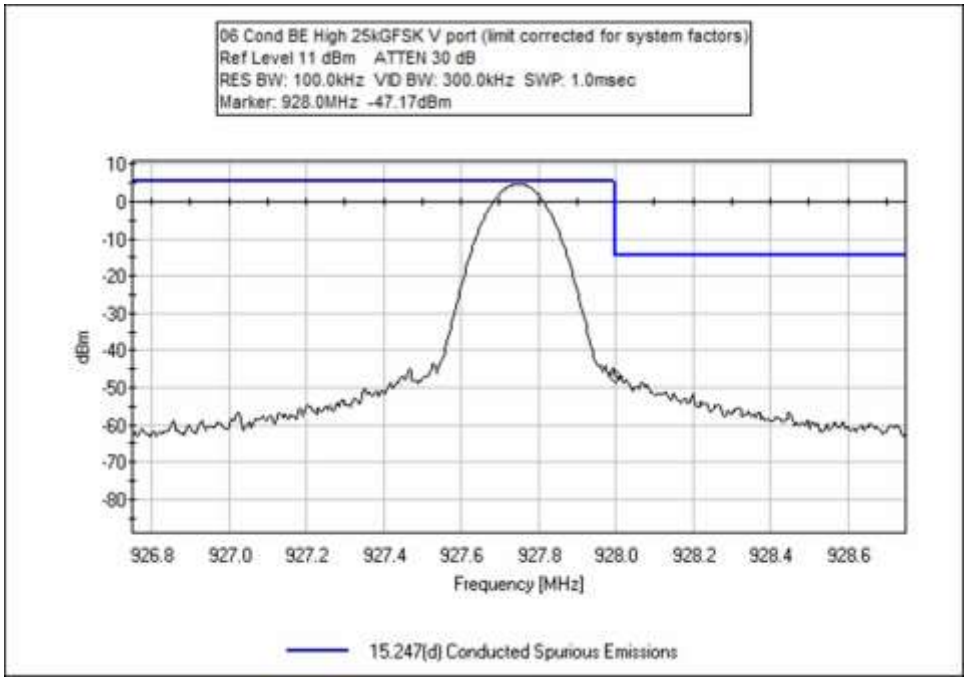


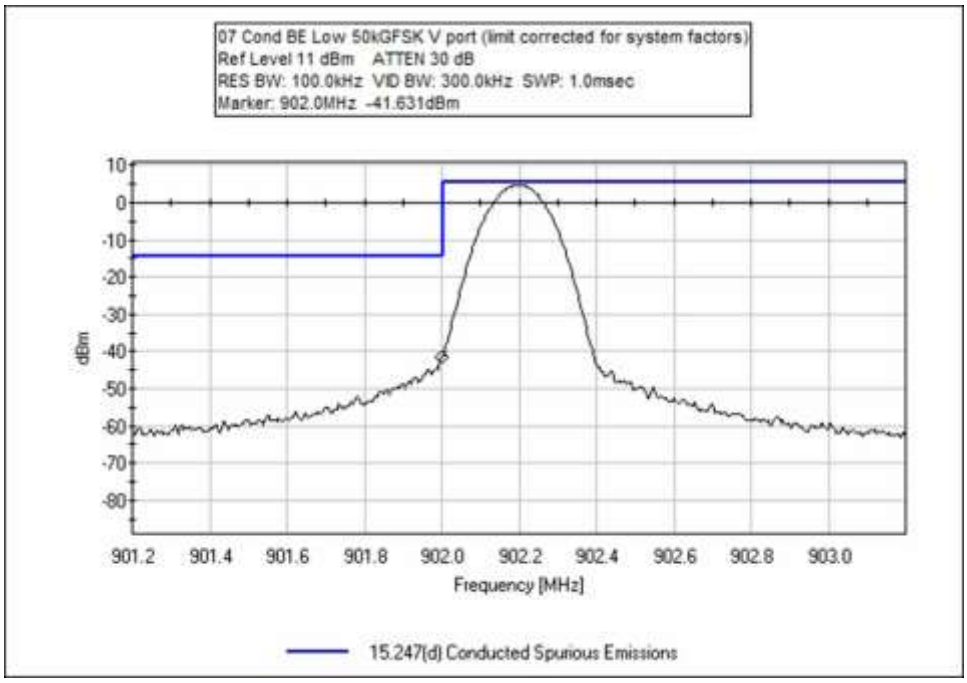


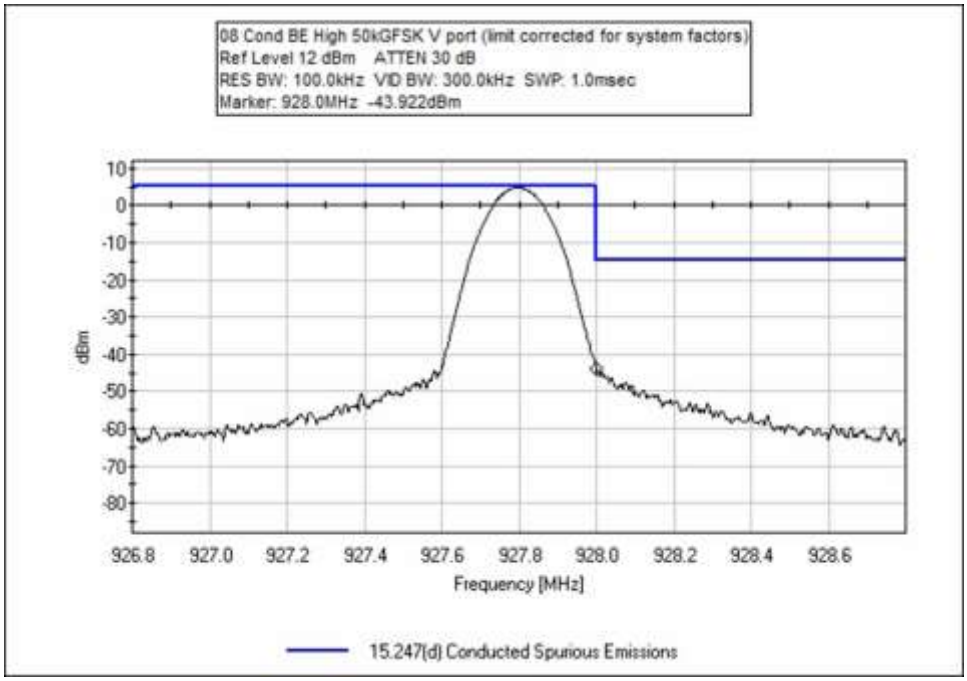

03 Cond BE Low 50kGFSK H port (limit corrected for system factors)
Ref Level 11 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 902.0MHz -43.472dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
dBm
901.2
901.4
901.6
901.8
902.0
902.2
902.4
902.6
902.8
903.0
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

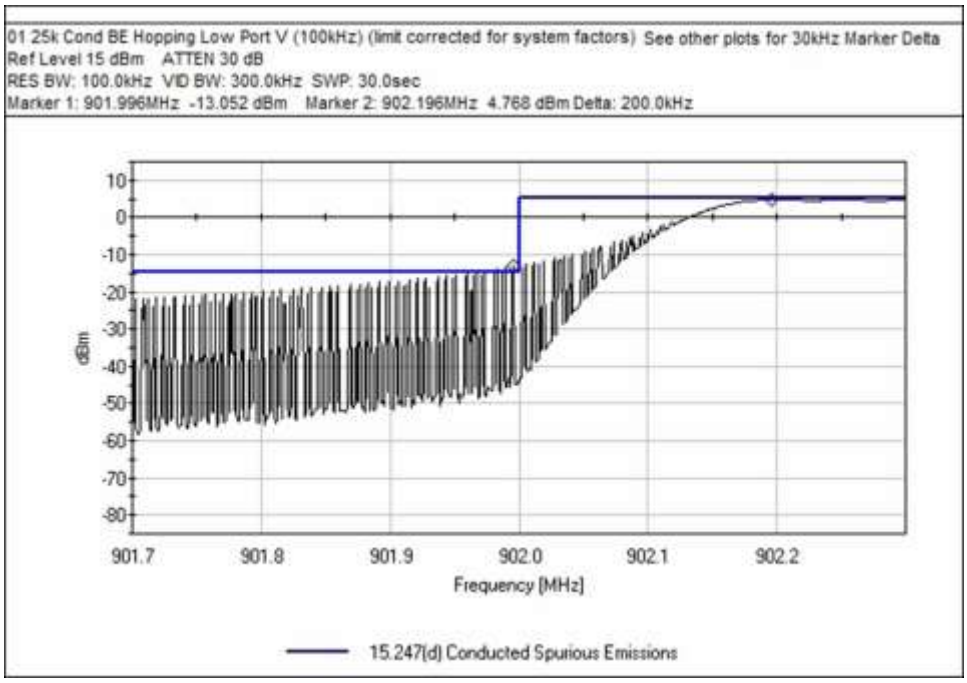

04 Cond BE High 50kGFSK H port (limit corrected for system factors)
Ref Level 12 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 928.0MHz -45.392dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
dBm
926.8
927.0
927.2
927.4
927.6
927.8
928.0
928.2
928.4
928.6
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

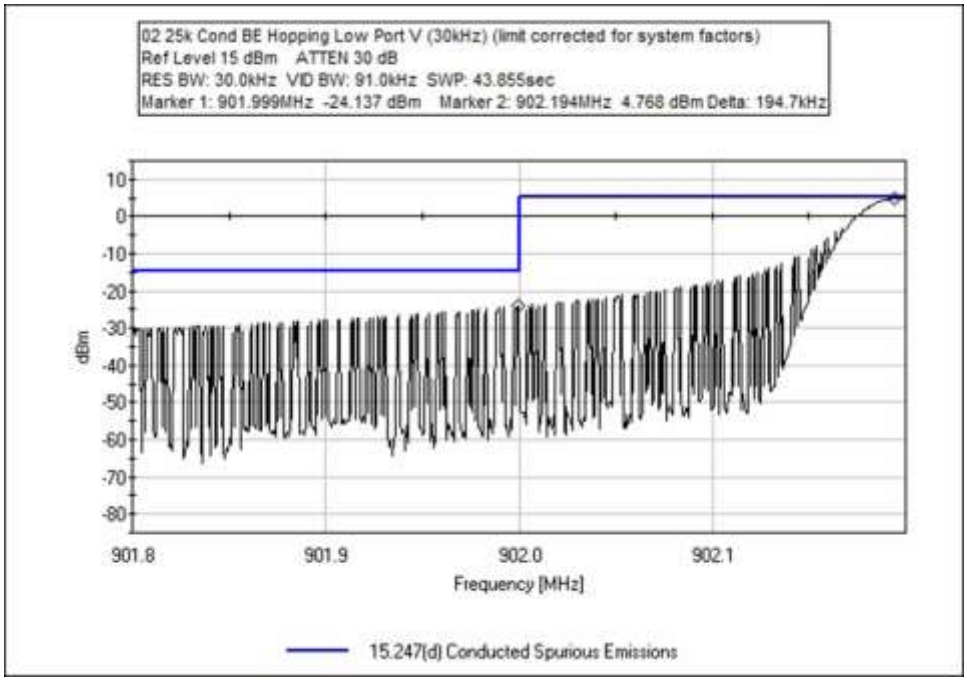

05 Cond BE Low 25kGFSK V port (limit corrected for system factors)
Ref Level 11 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 902.0MHz -43.242dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
dBm
901.2
901.4
901.6
901.8
902.0
902.2
902.4
902.6
902.8
903.0
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

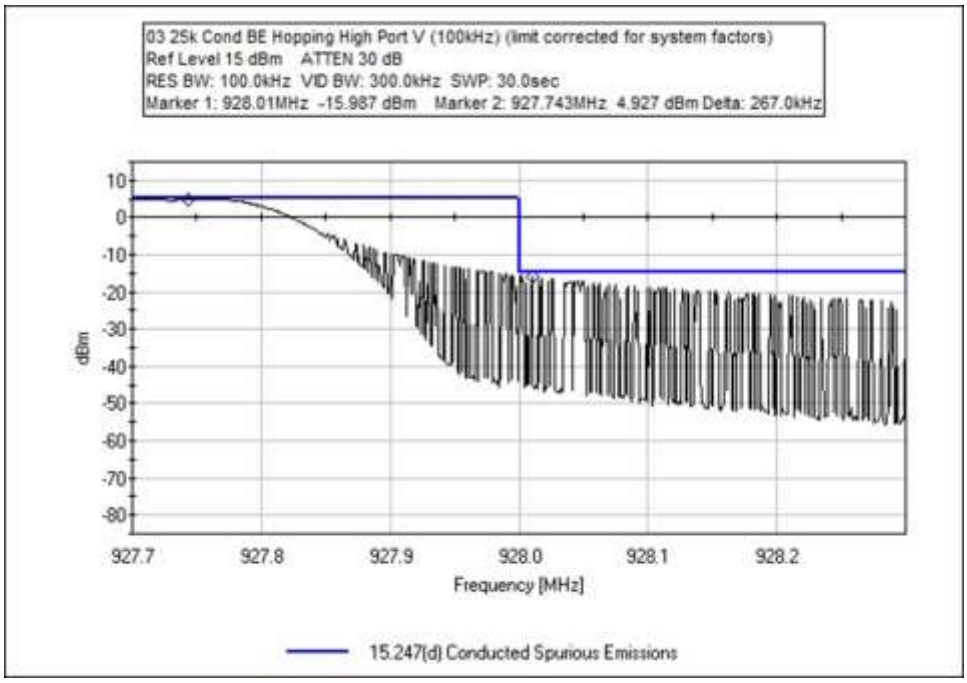

06 Cond BE High 25kGFSK V port (limit corrected for system factors)
Ref Level 11 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 928.0MHz -47.17dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
dBm
926.8
927.0
927.2
927.4
927.6
927.8
928.0
928.2
928.4
928.6
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

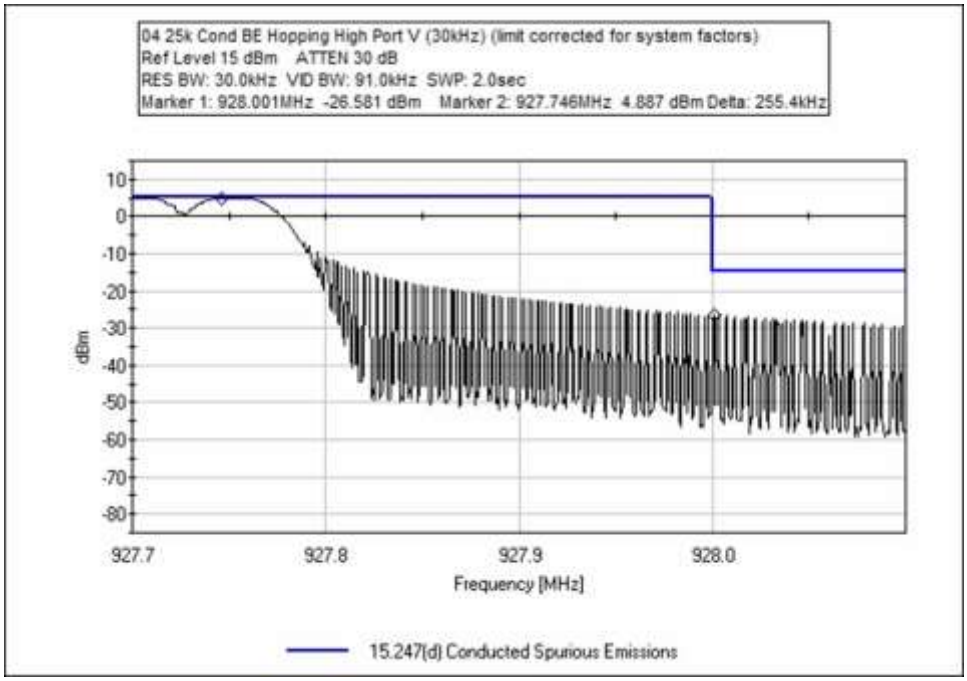

07 Cond BE Low 50kGFSK V port (limit corrected for system factors)
Ref Level 11 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 902.0MHz -41.631dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
dBm
901.2
901.4
901.6
901.8
902.0
902.2
902.4
902.6
902.8
903.0
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

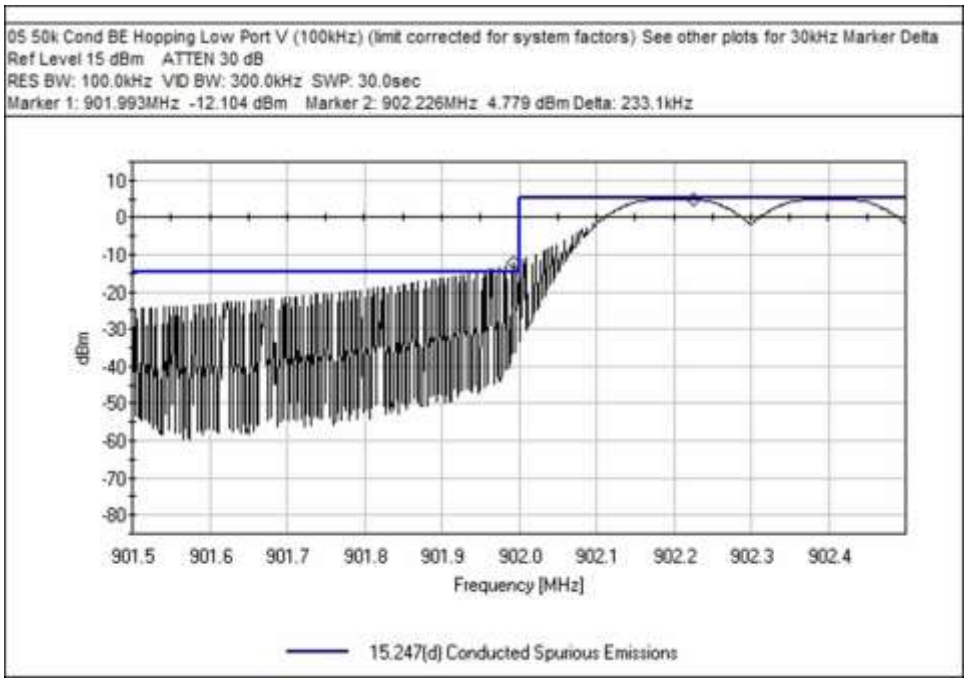

08 Cond BE High 50kGFSK V port (limit corrected for system factors)
Ref Level 12 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 928.0MHz -43.922dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
dBm
926.8
927.0
927.2
927.4
927.6
927.8
928.0
928.2
928.4
928.6
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

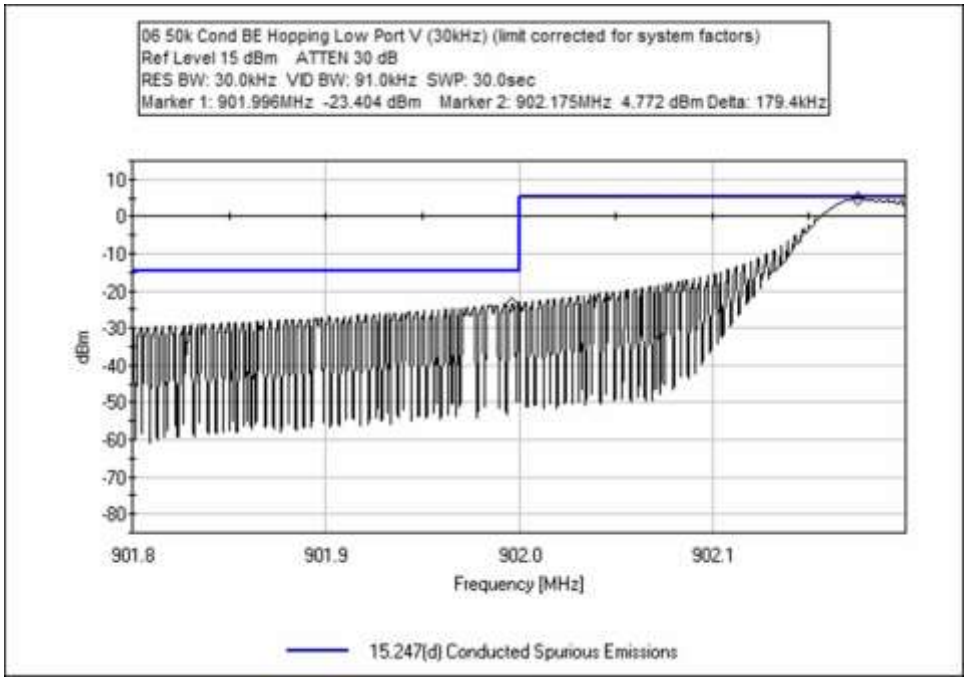

01 25k Cond BE Hopping Low Port V (100kHz) (limit corrected for system factors) See other plots for 30kHz Marker Delta
Ref Level 15 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 901.996MHz -13.052 dBm Marker 2: 902.196MHz 4.768 dBm Delta: 200.0kHz
10
0
-10
-20
-30
-40
-50
-60
-70
-80
dBm
901.7
901.8
901.9
902.0
902.1
902.2
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

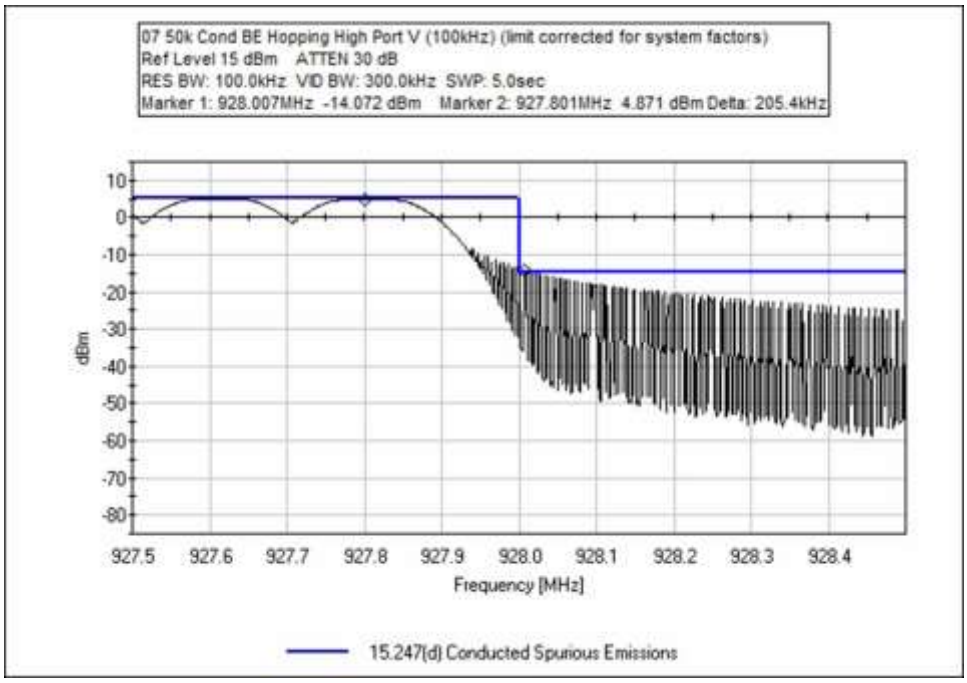

02 25k Cond BE Hopping Low Port V (30kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 43.855sec
Marker 1: 901.999MHz -24.137 dBm Marker 2: 902.194MHz 4.768 dBm Delta: 194.7kHz
10
0
-10
-20
-30
-40
-50
-60
-70
-80
dBm
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

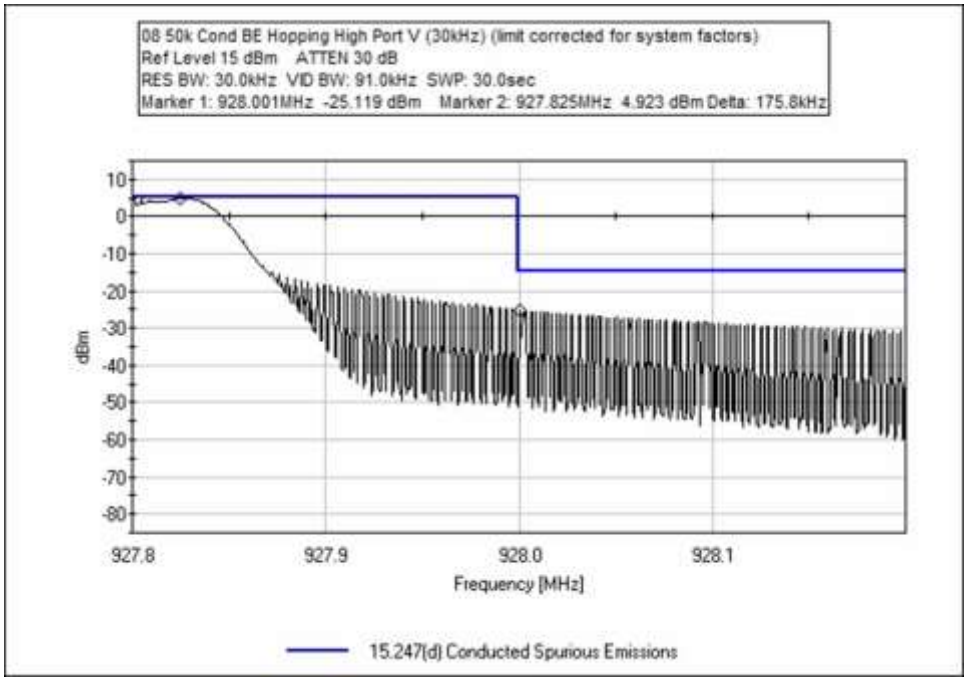

03 25k Cond BE Hopping High Port V (100kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 928.01MHz -15.987 dBm Marker 2: 927.743MHz 4.927 dBm Delta: 267.0kHz
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

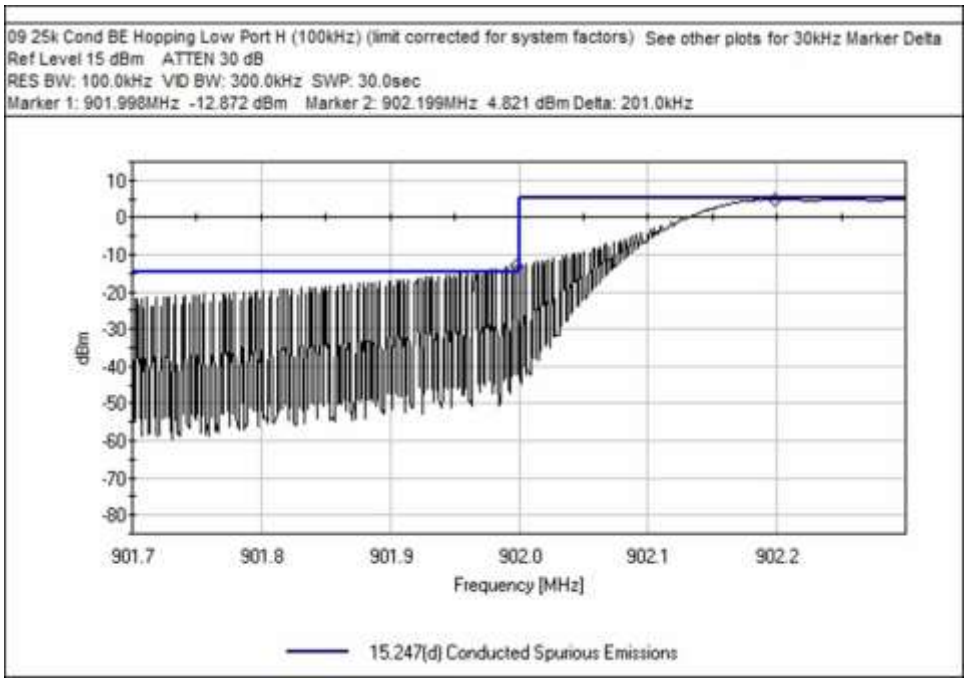

04 25k Cond BE Hopping High Port V (30kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 2.0sec
Marker 1: 928.001MHz -26.581 dBm Marker 2: 927.746MHz 4.887 dBm Delta: 255.4kHz
dBm
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

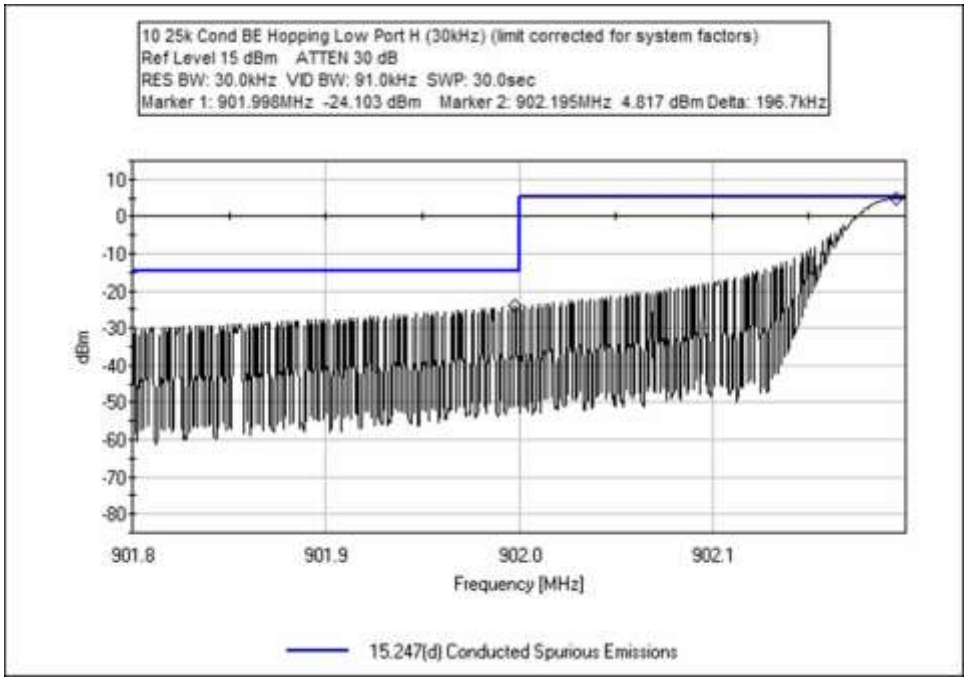

05 50k Cond BE Hopping Low Port V (100kHz) (limit corrected for system factors) See other plots for 30kHz Marker Delta
Ref Level 15 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 901.993MHz -12.104 dBm Marker 2: 902.226MHz 4.779 dBm Delta: 233.1kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
901.5
901.6
901.7
901.8
901.9
902.0
902.1
902.2
902.3
902.4
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

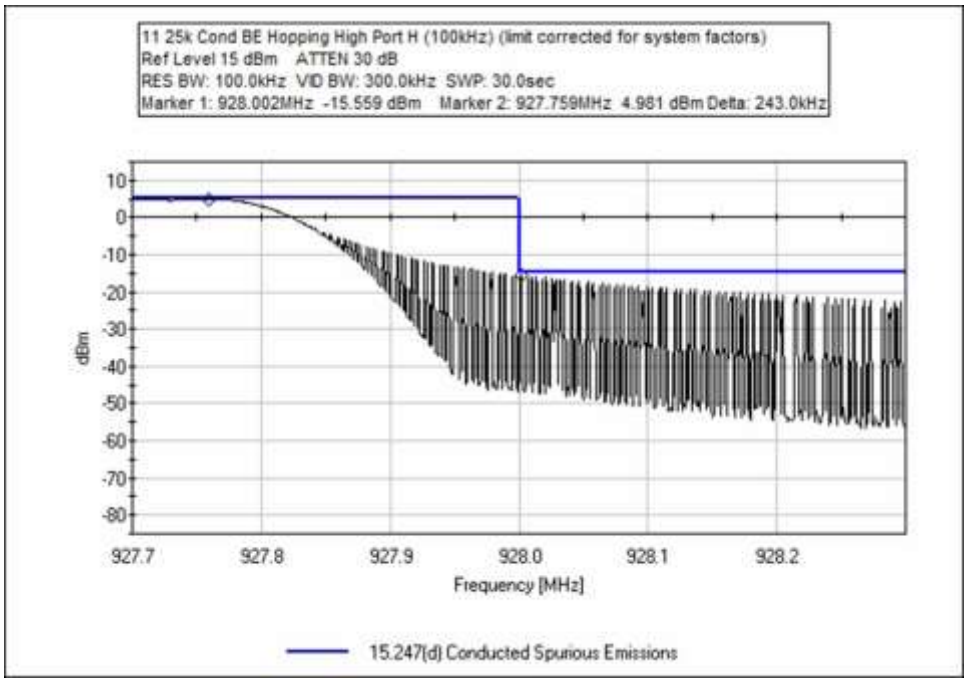

06 50k Cond BE Hopping Low Port V (30kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 901.996MHz -23.404 dBm Marker 2: 902.175MHz 4.772 dBm Delta: 179.4kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

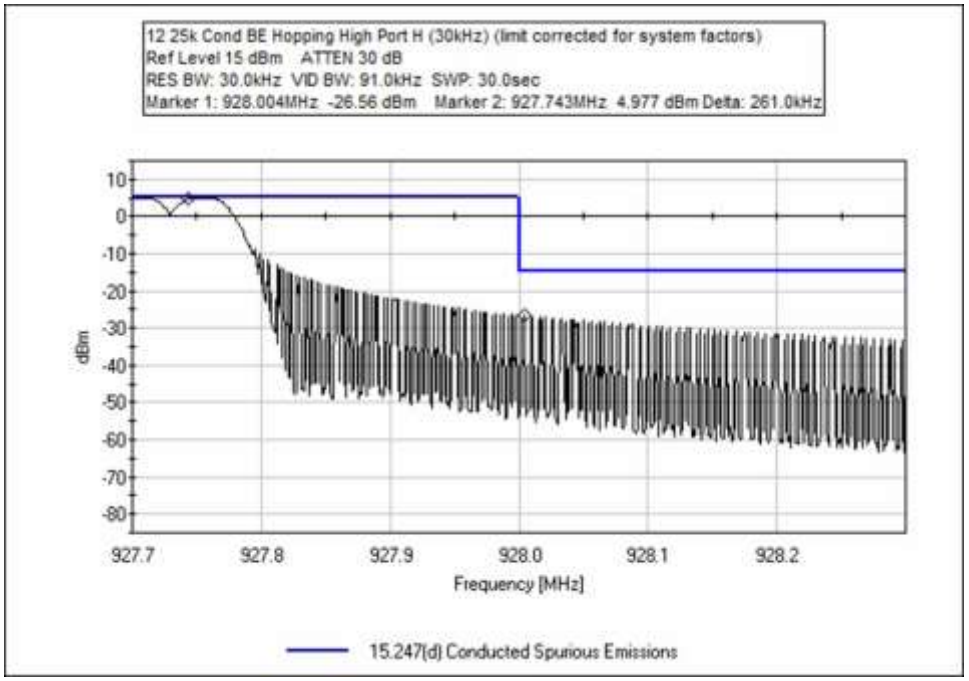

07 50k Cond BE Hopping High Port V (100kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 5.0sec
Marker 1: 928.007MHz -14.072 dBm Marker 2: 927.801MHz 4.871 dBm Delta: 205.4kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
927.5
927.6
927.7
927.8
927.9
928.0
928.1
928.2
928.3
928.4
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

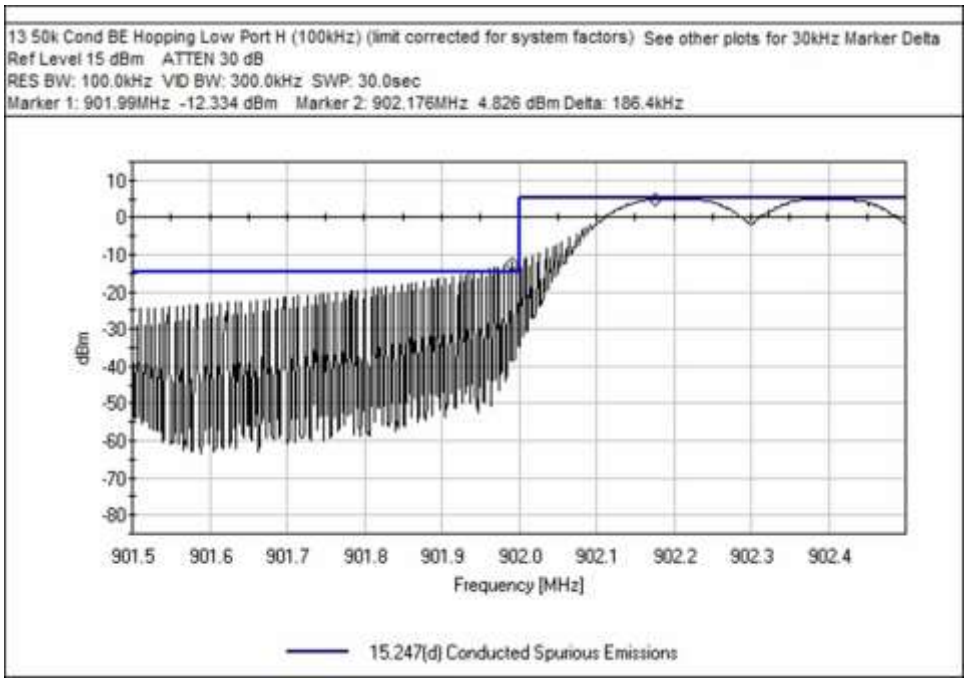

08 50k Cond BE Hopping High Port V (30kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 928.001MHz -25.119 dBm Marker 2: 927.825MHz 4.923 dBm Delta: 175.8kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
927.8
927.9
928.0
928.1
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

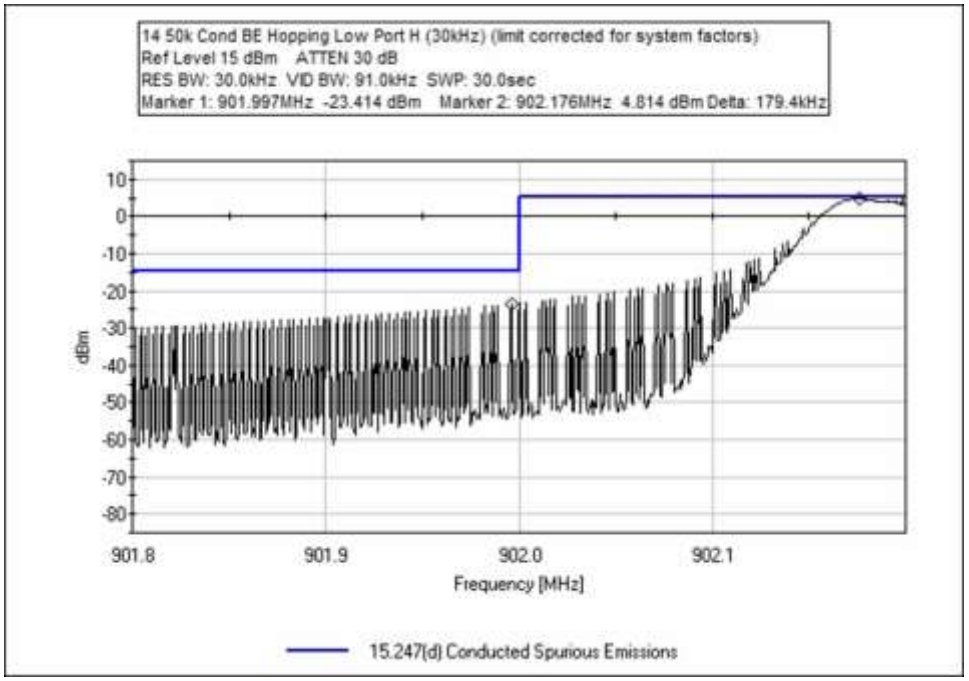

09 25k Cond BE Hopping Low Port H (100kHz) (limit corrected for system factors) See other plots for 30kHz Marker Delta
Ref Level 15 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 901.998MHz -12.872 dBm Marker 2: 902.199MHz 4.821 dBm Delta: 201.0kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
901.7
901.8
901.9
902.0
902.1
902.2
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

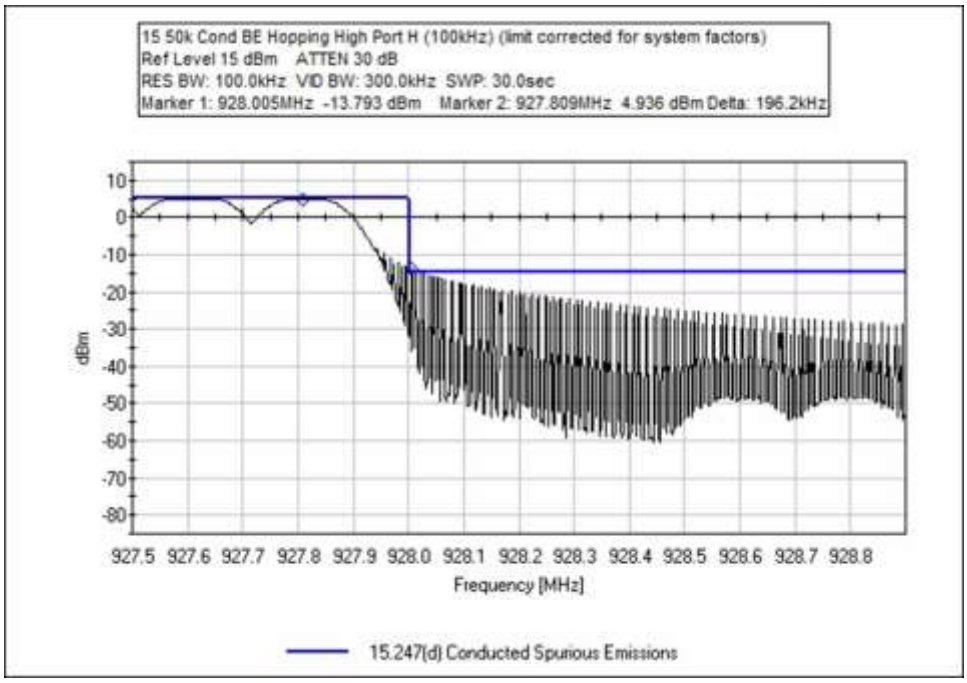

10 25k Cond BE Hopping Low Port H (30kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 901.998MHz -24.103 dBm Marker 2: 902.195MHz 4.817 dBm Delta: 196.7kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

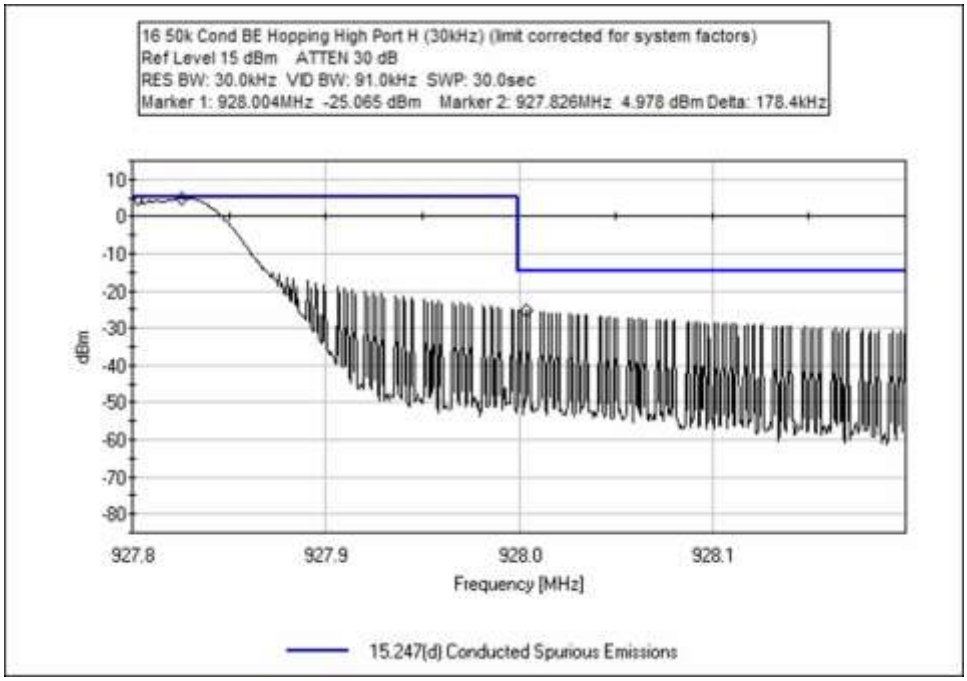

11 25k Cond BE Hopping High Port H (100kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 928.002MHz -15.559 dBm Marker 2: 927.759MHz 4.981 dBm Delta: 243.0kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
927.7
927.8
927.9
928.0
928.1
928.2
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


12 25k Cond BE Hopping High Port H (30kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 928.004MHz -26.56 dBm Marker 2: 927.743MHz 4.977 dBm Delta: 261.0kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
927.7
927.8
927.9
928.0
928.1
928.2
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


13 50k Cond BE Hopping Low Port H (100kHz) (limit corrected for system factors) See other plots for 30kHz Marker Delta
Ref Level 15 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 901.99MHz -12.334 dBm Marker 2: 902.176MHz 4.826 dBm Delta: 186.4kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
901.5
901.6
901.7
901.8
901.9
902.0
902.1
902.2
902.3
902.4
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


14 50k Cond BE Hopping Low Port H (30kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 901.997MHz -23.414 dBm Marker 2: 902.176MHz 4.814 dBm Delta: 179.4kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


15 50k Cond BE Hopping High Port H (100kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 928.005MHz -13.793 dBm Marker 2: 927.809MHz 4.936 dBm Delta: 196.2kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
927.5 927.6 927.7 927.8 927.9 928.0 928.1 928.2 928.3 928.4 928.5 928.6 928.7 928.8
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


16 50k Cond BE Hopping High Port H (30kHz) (limit corrected for system factors)
Ref Level 15 dBm ATTEN 30 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 928.004MHz -25.065 dBm Marker 2: 927.826MHz 4.978 dBm Delta: 178.4kHz
dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
927.8
927.9
928.0
928.1
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**103184**	Date:	10/16/2019
Test Type:	**Conducted Emissions**	Time:	15:33:12
Tested By:	Michael Atkinson	Sequence#:	4
Software:	EMITest 5.03.12		Battery

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency: Band Edge

Setup: The equipment under test (EUT) is placed on the tabletop.
The output of the EUT is connected to the spectrum analyzer using a coaxial cable and attenuator.
The EUT is transmitting at max power..
Measurements were performed with a fresh battery installed. L and H channels investigated.
25k and 50k data rates investigated.
H and V EUT ports investigated. Worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/3/2017	11/3/2019
T2	ANP05748	Attenuator	PE7004-20	4/24/2018	4/24/2020
T3	ANP05959	Cable	Heliax	4/11/2018	4/11/2020

Measurement Data: Reading listed by margin. Test Lead: RF Port V + H

#	Freq MHz	Rdng dBm	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
1	902.000M	-41.6	+0.0	+20.0	+0.6		+0.0	-21.0	6.0 50k GFSK	-27.0	RF Po
2	902.000M	-43.2	+0.0	+20.0	+0.6		+0.0	-22.6	6.0 50k GFSK	-28.6	RF Po
3	902.000M	-43.2	+0.0	+20.0	+0.6		+0.0	-22.6	6.0 25k GFSK	-28.6	RF Po
4	902.000M	-43.6	+0.0	+20.0	+0.6		+0.0	-23.0	6.0 25k GFSK	-29.0	RF Po
5	928.000M	-43.9	+0.0	+20.0	+0.6		+0.0	-23.3	6.0 50k GFSK	-29.3	RF Po
6	928.000M	-45.1	+0.0	+20.0	+0.6		+0.0	-24.5	6.0 25k GFSK	-30.5	RF Po
7	928.000M	-45.4	+0.0	+20.0	+0.6		+0.0	-24.8	6.0 50k GFSK	-30.8	RF Po
8	928.000M	-47.2	+0.0	+20.0	+0.6		+0.0	-26.6	6.0 25k GFSK	-32.6	RF Po

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**103184**	Date:	10/24/2019
Test Type:	**Conducted Emissions**	Time:	19:31:36
Tested By:	Michael Atkinson	Sequence#:	4
Software:	EMITest 5.03.12		Battery

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency: Band Edge

Setup: The equipment under test (EUT) is placed on the tabletop.
The output of the EUT is transmitter through the selected internal antenna.
The EUT is transmitting at max power.
Measurements were performed with a fresh battery installed. Hopping mode investigated.
25k and 50k data rates investigated.

Worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/3/2017	11/3/2019
T1	ANP05748	Attenuator	PE7004-20	4/24/2018	4/24/2020
T2	ANP05959	Cable	Heliax	4/11/2018	4/11/2020

Measurement Data: Reading listed by margin. Test Lead: RF Port H

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	927.759M	5.0	+20.0	+0.6			+0.0	25.6	26.0 25k High	-0.4	RF Po
2	927.826M	5.0	+20.0	+0.6			+0.0	25.6	26.0 50k High	-0.4	RF Po
3	927.743M	5.0	+20.0	+0.6			+0.0	25.6	26.0 25k High	-0.4	RF Po
4	927.809M	4.9	+20.0	+0.6			+0.0	25.5	26.0 50k High	-0.5	RF Po
5	902.176M	4.8	+20.0	+0.6			+0.0	25.4	26.0 50k Low	-0.6	RF Po
6	902.199M	4.8	+20.0	+0.6			+0.0	25.4	26.0 25k Low	-0.6	RF Po
7	902.195M	4.8	+20.0	+0.6			+0.0	25.4	26.0 25k Low	-0.6	RF Po
8	902.176M	4.8	+20.0	+0.6			+0.0	25.4	26.0 50k Low	-0.6	RF Po
9	901.997M	-23.4	+20.0	+0.6			+0.0	-2.8	6.0 50k Low	-8.8	RF Po
10	901.998M	-24.1	+20.0	+0.6			+0.0	-3.5	6.0 25k Low	-9.5	RF Po
11	928.004M	-25.1	+20.0	+0.6			+0.0	-4.5	6.0 50k High	-10.5	RF Po
12	928.004M	-26.6	+20.0	+0.6			+0.0	-6.0	6.0 25k High	-12.0	RF Po

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**103184**	Date:	10/24/2019
Test Type:	**Conducted Emissions**	Time:	18:44:50
Tested By:	Michael Atkinson	Sequence#:	4
Software:	EMITest 5.03.12		Battery

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency: Band Edge

Setup: The equipment under test (EUT) is placed on the tabletop.
The output of the EUT is transmitter through the selected internal antenna.
The EUT is transmitting at max power.
Measurements were performed with a fresh battery installed. Hopping mode investigated.
25k and 50k data rates investigated.

Worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/3/2017	11/3/2019
T2	ANP05748	Attenuator	PE7004-20	4/24/2018	4/24/2020
T3	ANP05959	Cable	Heliax	4/11/2018	4/11/2020

Measurement Data: Reading listed by margin. Test Lead: RF Port V

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	927.746M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	26.0 25k High	-0.5	RF Po
2	927.743M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	26.0 25k High	-0.5	RF Po
3	927.801M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	26.0 50k High	-0.5	RF Po
4	927.825M	4.9	+0.0	+20.0	+0.6		+0.0	25.5	26.0 50k High	-0.5	RF Po
5	902.196M	4.8	+0.0	+20.0	+0.6		+0.0	25.4	26.0 25k Low	-0.6	RF Po
6	902.194M	4.8	+0.0	+20.0	+0.6		+0.0	25.4	26.0 25k Low	-0.6	RF Po
7	902.226M	4.8	+0.0	+20.0	+0.6		+0.0	25.4	26.0 50k Low	-0.6	RF Po
8	902.175M	4.8	+0.0	+20.0	+0.6		+0.0	25.4	26.0 50k Low	-0.6	RF Po
9	901.996M	-23.4	+0.0	+20.0	+0.6		+0.0	-2.8	6.0 50k Low	-8.8	RF Po
10	901.999M	-24.1	+0.0	+20.0	+0.6		+0.0	-3.5	6.0 25k Low	-9.5	RF Po
11	928.001M	-25.1	+0.0	+20.0	+0.6		+0.0	-4.5	6.0 50k High	-10.5	RF Po
12	928.001M	-26.6	+0.0	+20.0	+0.6		+0.0	-6.0	6.0 25k High	-12.0	RF Po

Test Setup Photo(s)

Port V

Port H

15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.209 Radiated Emissions**		
Work Order #:	**103183**	Date:	10/23/2019
Test Type:	**Maximized Emissions**	Time:	09:21:26
Tested By:	Michael Atkinson	Sequence#:	3
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

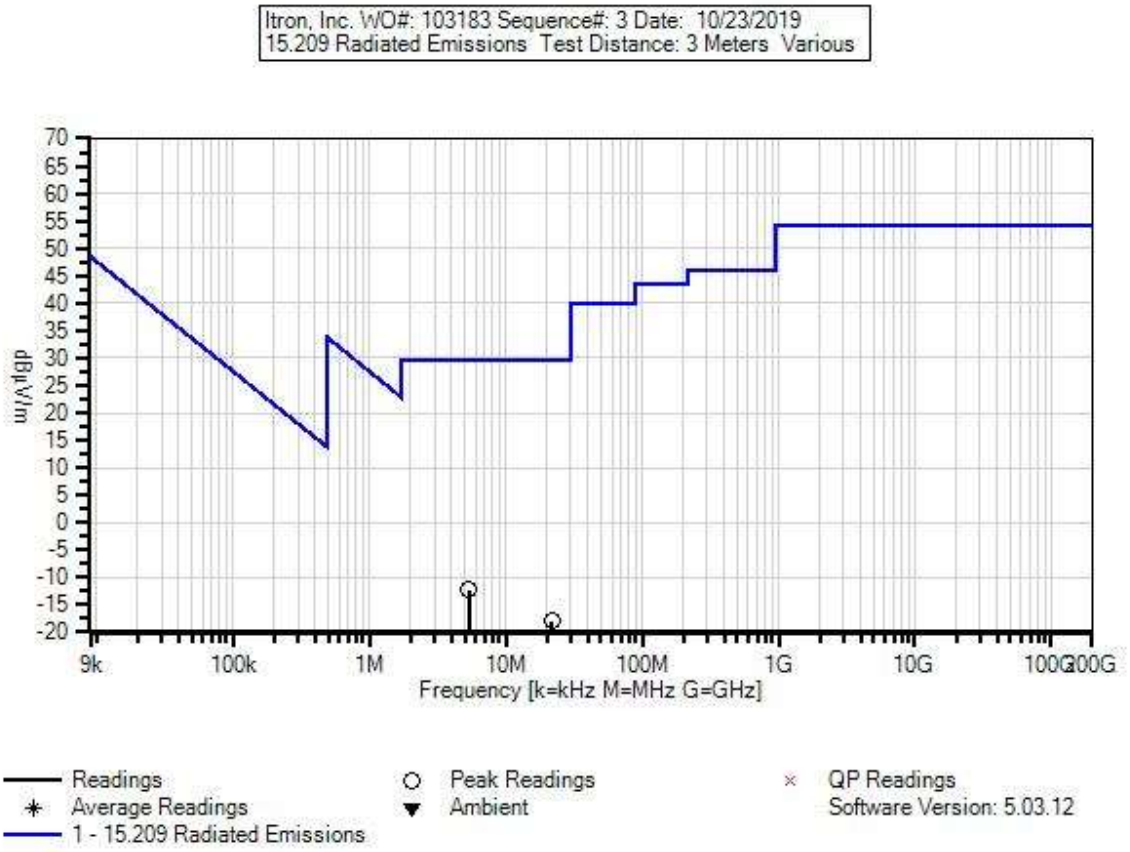
Test Conditions / Notes:

Frequency Range: 9kHz-30MHz

Test Mode: Continuously transmitting

Test Setup: EUT is continuously transmitting through integral antenna.
Low, Mid, High channels investigated, worst case reported.
25kbps and 50kbps modulations investigated, worst case reported.
X, Y, Z EUT axes investigated, worst case reported.
3 orthogonal antenna orientations investigated below 30MHz, worst case reported.
H and V EUT antenna ports investigated, worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	5.408M	18.1	+0.0	+0.1	+9.6		-40.0	-12.2	29.5	-41.7	Para
2	21.706M	14.0	+0.1	+0.3	+7.6		-40.0	-18.0	29.5	-47.5	Groun
3	18.806M QP	8.8	+0.1	+0.2	+8.2		-40.0	-22.7	29.5	-52.2	Para
^	18.806M	14.8	+0.1	+0.2	+8.2		-40.0	-16.7	29.5	-46.2	Para
5	22.587k	43.8	+0.0	+0.0	+11.6		-80.0	-24.6	40.5	-65.1	Perp

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.209 Radiated Emissions**		
Work Order #:	**103183**	Date:	10/25/2019
Test Type:	**Maximized Emissions**	Time:	16:45:38
Tested By:	Michael Atkinson	Sequence#:	4
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

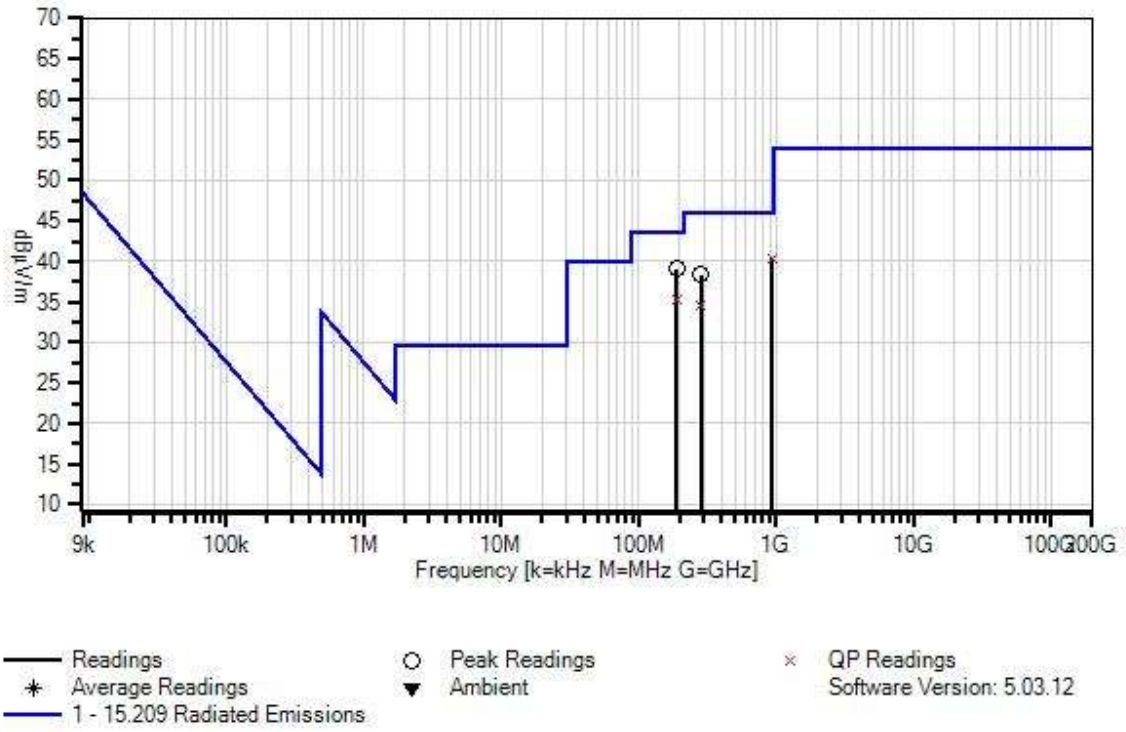
Frequency Range: 30-1000MHz

Test Mode: Continuously transmitting, **Port H**

Test Setup: EUT is continuously transmitting through integral antenna.
25 and 50kbps data rate investigated.
Low, Mid, High channels as well as hopping mode investigated, worst case reported.
X, Y, Z EUT axes investigated, worst case reported.
Horizontal and Vertical measurement antenna polarities investigated, worst case reported.

Test Location: Bothell Lab Bench Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)

Itron, Inc. WO#: 103183 Sequence#: 4 Date: 10/25/2019
15.209 Radiated Emissions Test Distance: 3 Meters Vert



Readings
Average Readings
1 - 15.209 Radiated Emissions
Peak Readings
Ambient
QP Readings
Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T2	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T5	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T6	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	188.100M	21.7	+0.0 +5.8	+0.2 +9.9	+0.7	+0.8	+0.0	39.1	43.5	-4.4	Horiz
2	939.900M QP	6.4	+0.0 +5.8	+0.4 +24.3	+1.5	+2.0	+0.0	40.4	46.0	-5.6	Vert
^	939.900M	23.5	+0.0 +5.8	+0.4 +24.3	+1.5	+2.0	+0.0	57.5	46.0	+11.5	Vert
4	283.200M	17.8	+0.0 +5.8	+0.2 +12.8	+0.8	+1.0	+0.0	38.4	46.0	-7.6	Horiz
5	187.866M QP	18.0	+0.0 +5.8	+0.2 +9.9	+0.7	+0.8	+0.0	35.4	43.5	-8.1	Horiz
6	282.977M QP	14.0	+0.0 +5.8	+0.2 +12.8	+0.8	+1.0	+0.0	34.6	46.0	-11.4	Horiz

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.209 Radiated Emissions**		
Work Order #:	**103183**	Date:	10/25/2019
Test Type:	**Maximized Emissions**	Time:	16:41:21
Tested By:	Michael Atkinson	Sequence#:	3
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

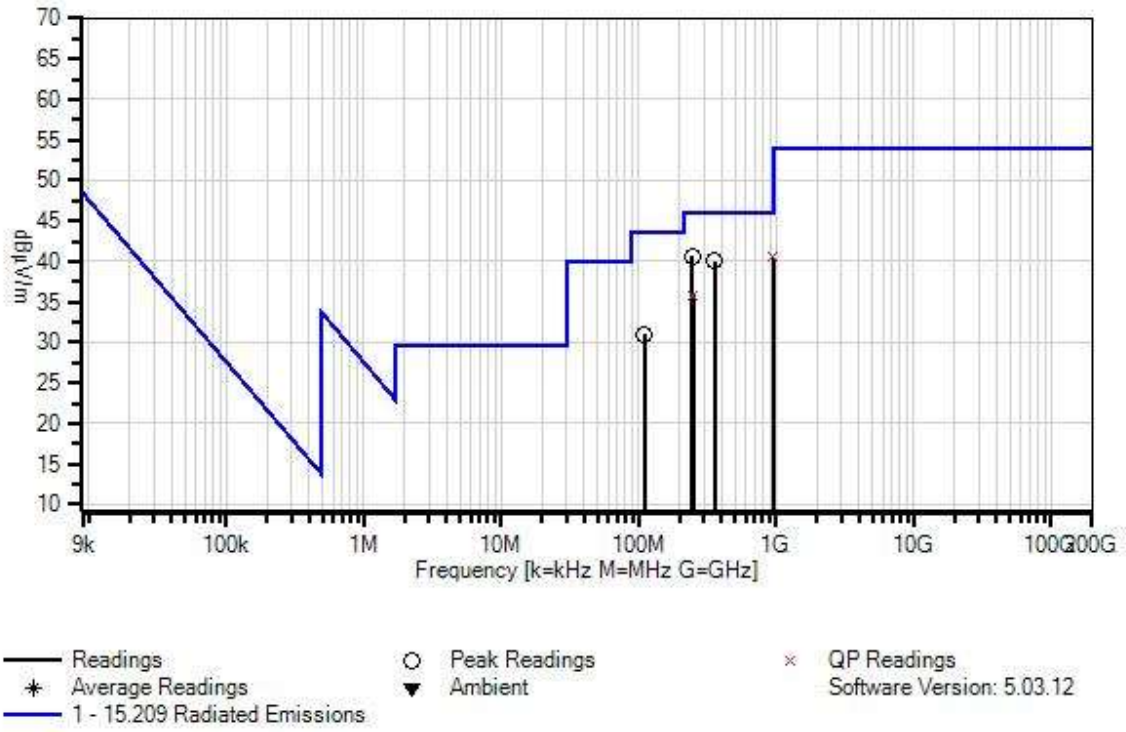
Frequency Range: 30-1000MHz

Test Mode: Continuously transmitting, **Port V**

Test Setup: EUT is continuously transmitting through integral antenna.
25 and 50kbps data rate investigated.
Low, Mid, High channels as well as hopping mode investigated, worst case reported.
X, Y, Z EUT axes investigated, worst case reported.
Horizontal and Vertical measurement antenna polarities investigated, worst case reported.

Test Location: Bothell Lab Bench Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)

Itron, Inc. WO#: 103183 Sequence#: 3 Date: 10/25/2019
15.209 Radiated Emissions Test Distance: 3 Meters Horiz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T2	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T5	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T6	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	247.300M	20.8	+0.0 +5.8	+0.2 +12.1	+0.8	+0.9	+0.0	40.6	46.0	-5.4	Horiz
2	950.500M QP	6.3	+0.0 +5.8	+0.4 +24.5	+1.5	+2.0	+0.0	40.5	46.0	-5.5	Vert
^	950.500M	22.0	+0.0 +5.8	+0.4 +24.5	+1.5	+2.0	+0.0	56.2	46.0	+10.2	Vert
4	357.900M	16.2	+0.0 +5.8	+0.2 +15.8	+0.9	+1.1	+0.0	40.0	46.0	-6.0	Vert
5	247.632M QP	16.0	+0.0 +5.8	+0.2 +12.1	+0.8	+0.9	+0.0	35.8	46.0	-10.2	Horiz
6	109.500M	15.9	+0.0 +5.8	+0.1 +8.1	+0.5	+0.6	+0.0	31.0	43.5	-12.5	Vert

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**103183**	Date:	10/20/2019
Test Type:	**Maximized Emissions**	Time:	10:11:54
Tested By:	Michael Atkinson	Sequence#:	5
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

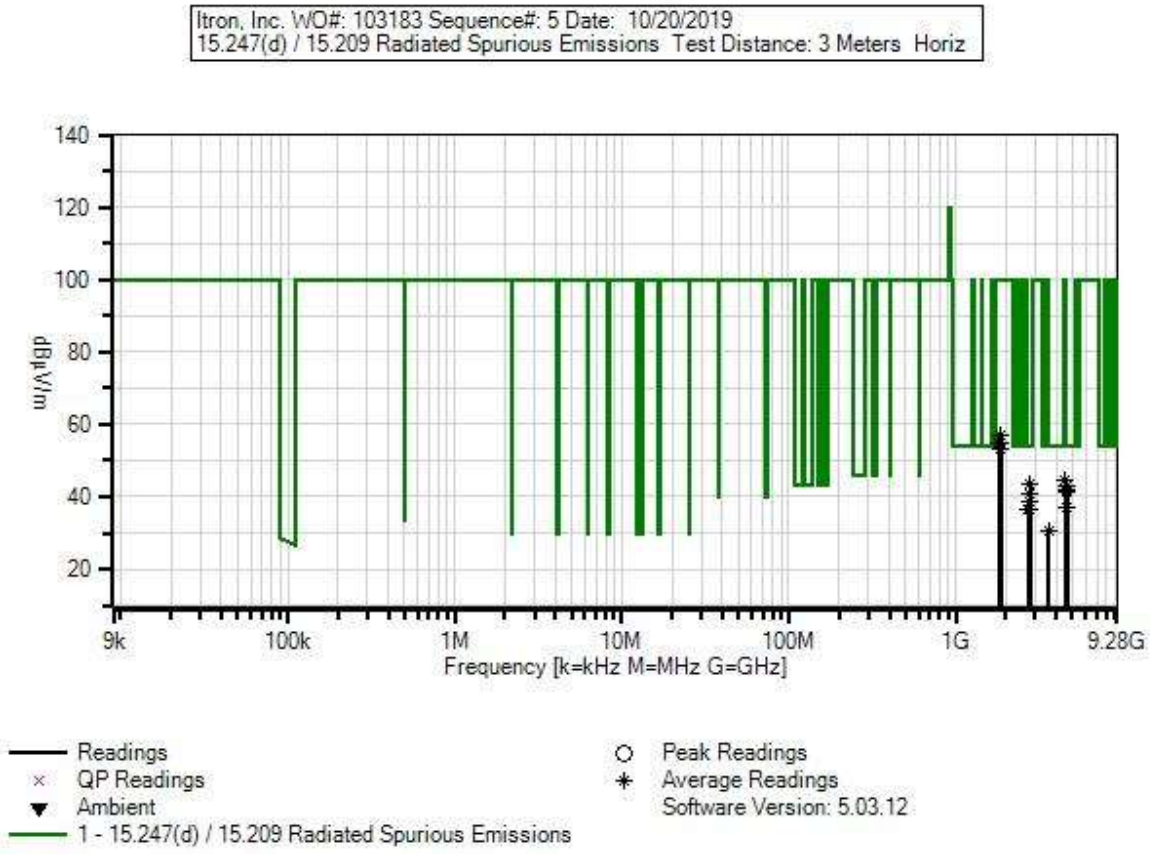
Test Conditions / Notes:

Frequency Range: 1-10GHz

Test Mode: Continuously transmitting, Port H

Test Setup: EUT is continuously transmitting through integral antenna, **EUT H port investigated.**
25kbps and 50kbps data rate investigated.
Low, Mid, High channels as well as hopping mode investigated, worst case reported.
X, Y, Z EUT axes investigated, worst case reported.
Horizontal and Vertical measurement antenna polarities investigated, worst case reported.

Test Location: Bothell Lab Bench Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)


Itron, Inc. WO#: 103183 Sequence#: 5 Date: 10/20/2019
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz
140
120
100
80
60
40
20
dBµV/m
9k
100k
1M
10M
100M
1G
9.28G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T2	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T3	AN03170	High Pass Filter	HM1155-11SS	11/27/2017	11/27/2019
T4	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T5	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T6	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020
T7	ANP06515	Cable	Heliax	6/29/2018	6/29/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T6 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	4511.085M	39.4	+0.0 +31.8 +0.9 +1.5 +0.8 +3.9	-33.7	+0.0	44.6	54.0 Y	-9.4	Horiz
	Ave								
2	2783.320M	44.3	+0.0 +28.5 +0.7 +1.1 +0.6 +2.6	-34.1	+0.0	43.7	54.0 X	-10.3	Horiz
	Ave								
^	2783.320M	51.7	+0.0 +28.5 +0.7 +1.1 +0.6 +2.6	-34.1	+0.0	51.1	54.0 X	-2.9	Horiz
4	4575.020M	37.6	+0.0 +31.9 +0.9 +1.5 +0.8 +4.0	-33.7	+0.0	43.0	54.0 Y	-11.0	Horiz
	Ave								
^	4575.020M	47.9	+0.0 +31.9 +0.9 +1.5 +0.8 +4.0	-33.7	+0.0	53.3	54.0 Y	-0.7	Horiz
6	4638.740M	36.2	+0.0 +32.1 +0.9 +1.5 +0.8 +4.0	-33.6	+0.0	41.9	54.0 Y	-12.1	Horiz
	Ave								
^	4638.750M	48.1	+0.0 +32.1 +0.9 +1.5 +0.8 +4.0	-33.6	+0.0	53.8	54.0 Y	-0.2	Horiz
8	4637.980M	35.6	+0.0 +32.1 +0.9 +1.5 +0.8 +4.0	-33.6	+0.0	41.3	54.0 Y, 50k GFSK	-12.7	Horiz
	Ave								
^	4637.980M	46.6	+0.0 +32.1 +0.9 +1.5 +0.8 +4.0	-33.6	+0.0	52.3	54.0 Y, 50k GFSK	-1.7	Horiz
10	2783.420M	41.4	+0.0 +28.5 +0.7 +1.1 +0.6 +2.6	-34.1	+0.0	40.8	54.0 X, 50k GFSK	-13.2	Horiz
	Ave								
^	2783.400M	50.3	+0.0 +28.5 +0.7 +1.1 +0.6 +2.6	-34.1	+0.0	49.7	54.0 X, 50k GFSK	-4.3	Horiz
12	2744.980M	39.3	+0.0 +28.4 +0.7 +1.1 +0.6 +2.6	-34.1	+0.0	38.6	54.0 X	-15.4	Horiz
	Ave								
^	2745.010M	49.0	+0.0 +28.4 +0.7 +1.1 +0.6 +2.6	-34.1	+0.0	48.3	54.0 X	-5.7	Horiz
14	4639.090M	31.5	+0.0 +32.1 +0.9 +1.5 +0.8 +4.0	-33.6	+0.0	37.2	54.0 Y, 50k GFSK	-16.8	Horiz
	Ave								
^	4639.020M	41.8	+0.0 +32.1 +0.9 +1.5 +0.8 +4.0	-33.6	+0.0	47.5	54.0 Y, 50k GFSK	-6.5	Horiz
16	2706.520M	37.5	+0.0 +28.3 +0.7 +1.1 +0.6 +2.6	-34.1	+0.0	36.7	54.0 X	-17.3	Horiz
	Ave								
^	2706.520M	48.5	+0.0 +28.3 +0.7 +1.1 +0.6 +2.6	-34.1	+0.0	47.7	54.0 X	-6.3	Horiz

18	2782.830M	37.2	+0.0	+0.7	+0.6	-34.1	+0.0	36.6	54.0	-17.4	Horiz	
	Ave		+28.5	+1.1	+2.6				X, 50k GFSK			
^	2782.830M	47.4	+0.0	+0.7	+0.6	-34.1	+0.0	46.8	54.0	-7.2	Horiz	
			+28.5	+1.1	+2.6				X, 50k GFSK			
20	3608.720M	27.8	+0.0	+0.8	+0.8	-33.8	+0.0	30.8	54.0	-23.2	Horiz	
	Ave		+30.3	+1.3	+3.6				X			
^	3608.720M	41.4	+0.0	+0.8	+0.8	-33.8	+0.0	44.4	54.0	-9.6	Horiz	
			+30.3	+1.3	+3.6				X			
22	1855.500M	61.1	+0.0	+0.5	+0.7	-34.7	+0.0	57.2	100.0	-42.8	Horiz	
	Ave		+26.6	+0.7	+2.3				X			
^	1855.490M	69.7	+0.0	+0.5	+0.7	-34.7	+0.0	65.8	100.0	-34.2	Horiz	
			+26.6	+0.7	+2.3				X			
24	1855.180M	59.0	+0.0	+0.5	+0.7	-34.7	+0.0	55.0	100.0	-45.0	Horiz	
	Ave		+26.5	+0.7	+2.3				X, 50k GFSK			
^	1855.090M	67.8	+0.0	+0.5	+0.7	-34.7	+0.0	63.8	100.0	-36.2	Horiz	
			+26.5	+0.7	+2.3				X, 50k GFSK			
26	1804.360M	59.7	+0.0	+0.5	+0.7	-34.8	+0.0	55.0	100.0	-45.0	Horiz	
	Ave		+26.0	+0.7	+2.2				X			
^	1804.360M	69.0	+0.0	+0.5	+0.7	-34.8	+0.0	64.3	100.0	-35.7	Horiz	
			+26.0	+0.7	+2.2				X			
28	1855.600M	58.6	+0.0	+0.5	+0.7	-34.7	+0.0	54.7	100.0	-45.3	Horiz	
	Ave		+26.6	+0.7	+2.3				X, 50k GFSK			
^	1855.600M	68.0	+0.0	+0.5	+0.7	-34.7	+0.0	64.1	100.0	-35.9	Horiz	
			+26.6	+0.7	+2.3				X, 50k GFSK			
30	1830.010M	57.6	+0.0	+0.5	+0.7	-34.8	+0.0	53.3	100.0	-46.7	Horiz	
	Ave		+26.3	+0.7	+2.3				X			
^	1830.010M	67.0	+0.0	+0.5	+0.7	-34.8	+0.0	62.7	100.0	-37.3	Horiz	
			+26.3	+0.7	+2.3				X			

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**103183**	Date:	10/20/2019
Test Type:	**Maximized Emissions**	Time:	09:59:58
Tested By:	Michael Atkinson	Sequence#:	4
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

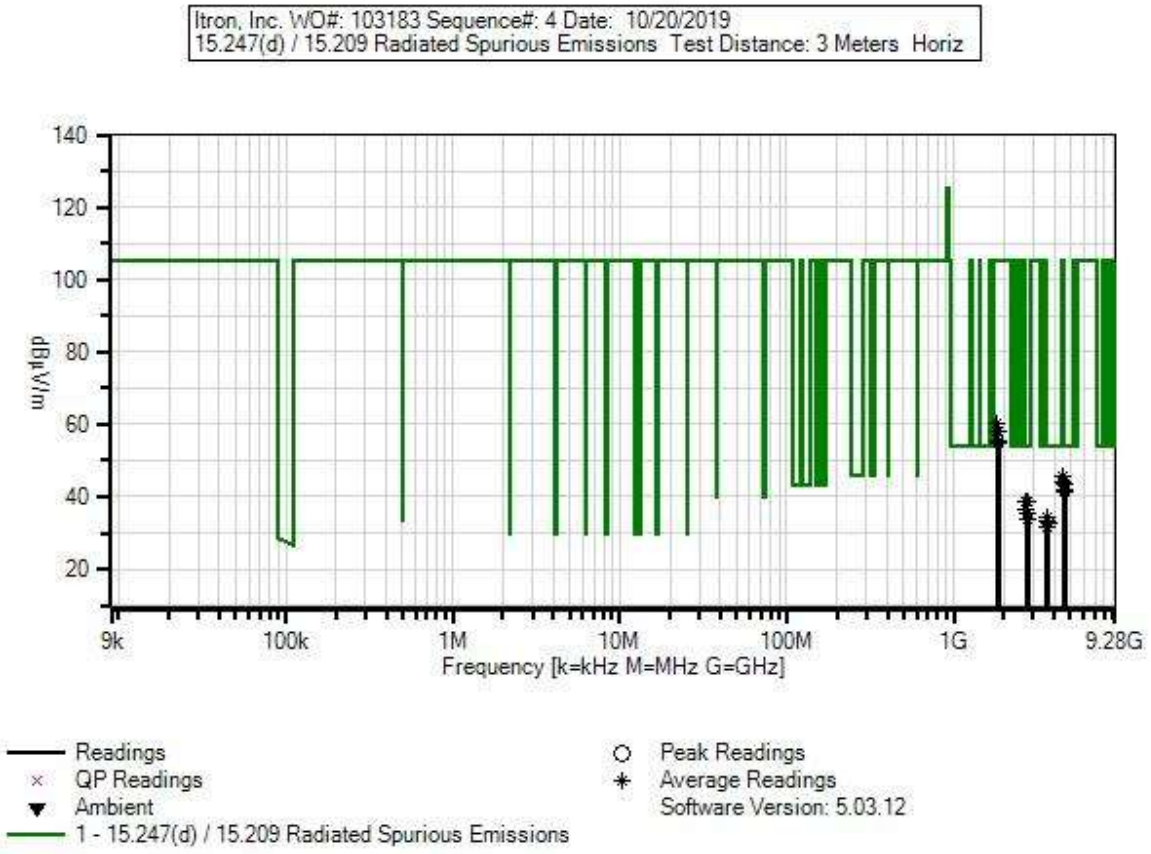
Test Conditions / Notes:

Frequency Range: 1-10GHz

Test Mode: Continuously transmitting

Test Setup: EUT is continuously transmitting through integral antenna, **EUT V port investigated.**
25kbps and 50kbps data rate investigated.
Low, Mid, High channels as well as hopping mode investigated, worst case reported.
X, Y, Z EUT axes investigated, worst case reported.
Horizontal and Vertical measurement antenna polarities investigated, worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)


Itron, Inc. WO#: 103183 Sequence#: 4 Date: 10/20/2019
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz
140
120
100
80
60
40
20
dBµV/m
9k
100k
1M
10M
100M
1G
9.28G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T2	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T3	AN03170	High Pass Filter	HM1155-11SS	11/27/2017	11/27/2019
T4	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T5	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T6	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020
T7	ANP06515	Cable	Heliax	6/29/2018	6/29/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	4511.009M	40.5	+0.0	+0.9	+0.8	-33.7	+0.0	45.7	54.0	-8.3	Horiz
	Ave		+31.8	+1.5	+3.9				Y		
2	4511.050M	39.1	+0.0	+0.9	+0.8	-33.7	+0.0	44.3	54.0	-9.7	Horiz
	Ave		+31.8	+1.5	+3.9				Y, 50k GFSK		
^	4511.050M	50.1	+0.0	+0.9	+0.8	-33.7	+0.0	55.3	54.0	+1.3	Horiz
			+31.8	+1.5	+3.9				Y		
^	4511.050M	49.1	+0.0	+0.9	+0.8	-33.7	+0.0	54.3	54.0	+0.3	Horiz
			+31.8	+1.5	+3.9				Y, 50k GFSK		
5	4575.040M	38.3	+0.0	+0.9	+0.8	-33.7	+0.0	43.7	54.0	-10.3	Horiz
	Ave		+31.9	+1.5	+4.0				Y		
^	4575.040M	47.5	+0.0	+0.9	+0.8	-33.7	+0.0	52.9	54.0	-1.1	Horiz
			+31.9	+1.5	+4.0				Y		
7	4638.730M	36.4	+0.0	+0.9	+0.8	-33.6	+0.0	42.1	54.0	-11.9	Horiz
	Ave		+32.1	+1.5	+4.0				Y		
^	4638.660M	47.0	+0.0	+0.9	+0.8	-33.6	+0.0	52.7	54.0	-1.3	Horiz
			+32.1	+1.5	+4.0				Y		
9	4639.000M	35.9	+0.0	+0.9	+0.8	-33.6	+0.0	41.6	54.0	-12.4	Horiz
	Ave		+32.1	+1.5	+4.0				Y, 50k GFSK		
^	4639.000M	46.1	+0.0	+0.9	+0.8	-33.6	+0.0	51.8	54.0	-2.2	Horiz
			+32.1	+1.5	+4.0				Y, 50k GFSK		
11	2706.620M	39.5	+0.0	+0.7	+0.6	-34.1	+0.0	38.7	54.0	-15.3	Horiz
	Ave		+28.3	+1.1	+2.6				X		
12	2744.880M	39.2	+0.0	+0.7	+0.6	-34.1	+0.0	38.5	54.0	-15.5	Horiz
	Ave		+28.4	+1.1	+2.6				X		
^	2744.880M	49.7	+0.0	+0.7	+0.6	-34.1	+0.0	49.0	54.0	-5.0	Horiz
			+28.4	+1.1	+2.6				X		
14	2706.560M	37.4	+0.0	+0.7	+0.6	-34.1	+0.0	36.6	54.0	-17.4	Horiz
	Ave		+28.3	+1.1	+2.6				X, 50k GFSK		
^	2706.530M	49.9	+0.0	+0.7	+0.6	-34.1	+0.0	49.1	54.0	-4.9	Horiz
			+28.3	+1.1	+2.6				X		
^	2706.560M	48.2	+0.0	+0.7	+0.6	-34.1	+0.0	47.4	54.0	-6.6	Horiz
			+28.3	+1.1	+2.6				X, 50k GFSK		

17	2783.190M	36.0	+0.0	+0.7	+0.6	-34.1	+0.0	35.4	54.0	-18.6	Horiz
	Ave		+28.5	+1.1	+2.6				X		
^	2783.190M	46.4	+0.0	+0.7	+0.6	-34.1	+0.0	45.8	54.0	-8.2	Horiz
			+28.5	+1.1	+2.6				X		
^	2783.150M	45.6	+0.0	+0.7	+0.6	-34.1	+0.0	45.0	54.0	-9.0	Horiz
			+28.5	+1.1	+2.6				X, 50k GFSK		
20	3608.869M	31.1	+0.0	+0.8	+0.8	-33.8	+0.0	34.1	54.0	-19.9	Horiz
	Ave		+30.3	+1.3	+3.6				X		
21	2783.530M	34.2	+0.0	+0.7	+0.6	-34.1	+0.0	33.6	54.0	-20.4	Horiz
	Ave		+28.5	+1.1	+2.6				X, 50k GFSK		
22	3660.070M	29.6	+0.0	+0.9	+0.9	-33.7	+0.0	33.2	54.0	-20.8	Horiz
	Ave		+30.5	+1.3	+3.7				X		
^	3660.070M	43.5	+0.0	+0.9	+0.9	-33.7	+0.0	47.1	54.0	-6.9	Horiz
			+30.5	+1.3	+3.7				X		
24	3710.940M	29.1	+0.0	+0.9	+0.9	-33.7	+0.0	32.9	54.0	-21.1	Horiz
	Ave		+30.6	+1.3	+3.8				X		
^	3710.940M	40.4	+0.0	+0.9	+0.9	-33.7	+0.0	44.2	54.0	-9.8	Horiz
			+30.6	+1.3	+3.8				X		
26	3608.780M	28.7	+0.0	+0.8	+0.8	-33.8	+0.0	31.7	54.0	-22.3	Horiz
	Ave		+30.3	+1.3	+3.6				X, 50k GFSK		
^	3608.840M	42.7	+0.0	+0.8	+0.8	-33.8	+0.0	45.7	54.0	-8.3	Horiz
			+30.3	+1.3	+3.6				X		
^	3608.780M	41.0	+0.0	+0.8	+0.8	-33.8	+0.0	44.0	54.0	-10.0	Horiz
			+30.3	+1.3	+3.6				X, 50k GFSK		
29	1804.399M	64.7	+0.0	+0.5	+0.7	-34.8	+0.0	60.1	105.0	-44.9	Vert
	Ave		+26.1	+0.7	+2.2				Z		
30	1804.350M	62.8	+0.0	+0.5	+0.7	-34.8	+0.0	58.1	105.0	-46.9	Vert
	Ave		+26.0	+0.7	+2.2				Z, 50k GFSK		
^	1804.370M	73.8	+0.0	+0.5	+0.7	-34.8	+0.0	69.1	105.0	-35.9	Vert
			+26.0	+0.7	+2.2				Z		
^	1804.350M	72.3	+0.0	+0.5	+0.7	-34.8	+0.0	67.6	105.0	-37.4	Vert
			+26.0	+0.7	+2.2				Z, 50k GFSK		
33	1829.980M	62.1	+0.0	+0.5	+0.7	-34.8	+0.0	57.8	105.0	-47.2	Vert
	Ave		+26.3	+0.7	+2.3				Z		
^	1829.980M	72.0	+0.0	+0.5	+0.7	-34.8	+0.0	67.7	105.0	-37.3	Vert
			+26.3	+0.7	+2.3				Z		
35	1855.540M	59.4	+0.0	+0.5	+0.7	-34.7	+0.0	55.5	105.0	-49.5	Vert
	Ave		+26.6	+0.7	+2.3				Z		
36	1855.550M	58.9	+0.0	+0.5	+0.7	-34.7	+0.0	55.0	105.0	-50.0	Vert
	Ave		+26.6	+0.7	+2.3				Z, 50 GFSK		
^	1855.470M	68.9	+0.0	+0.5	+0.7	-34.7	+0.0	65.0	105.0	-40.0	Vert
			+26.6	+0.7	+2.3				Z		
^	1855.550M	68.4	+0.0	+0.5	+0.7	-34.7	+0.0	64.5	105.0	-40.5	Vert
			+26.6	+0.7	+2.3				Z, 50 GFSK		

Band Edge

Band Edge Summary				
Operating Mode: Single Channel (Low and High) V Port (3.67dBi)				
Frequency (MHz)	**Modulation**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614	GFSK 25kbps	39.4	46.0	Pass
902	GFSK 25kbps	78.0	105.0	Pass
928	GFSK 25kbps	75.3	105.0	Pass
960	GFSK 25kbps	43.8	54.0	Pass

Band Edge Summary				
Operating Mode: Single Channel (Low and High) V Port (3.67dBi)				
Frequency (MHz)	**Modulation**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614	GFSK 50kbps	39.4	46.0	Pass
902	GFSK 50kbps	76.7	105.0	Pass
928	GFSK 50kbps	76.2	105.0	Pass
960	GFSK 50kbps	43.9	54.0	Pass

Band Edge Summary							
Operating Mode: Single Channel (Low and High) V Port (3.67dBi)							
Freq (MHz)	**Modulation**	**100kHz Band Edge Measurement (dBuV/m @3m)**	**100kHz Fundamental Field Strength (dBuV/m @3m)**	**30kHz Band Edge Measurement (dBuV/m @3m)**	**30kHz Fundamental Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
902	GFSK 25kbps	106.2	123.8	**94.8**	123.8	105.0	Pass
928	GFSK 25kbps	101.7	122.4	**90.8**	122.4	105.0	Pass
902	GFSK 50kbps	108.1	124.6	**96.6**	124.6	105.0	Pass
928	GFSK 50kbps	105.0	123.6	**93.0**	123.6	105.0	Pass

Note: Marker delta limit was applied per ANSI C63.10 (2013) section 6.10.6.2. The final value to consider against the limit is the worst case 30kHz Band Edge measurement, underlined and bold in the table above.

Note: Single channel data at 614MHz and 960MHz is representative of data collected in hopping mode.

Band Edge Summary				
Operating Mode: Single Channel (Low and High) H Port (-0.4dBi)				
Frequency (MHz)	**Modulation**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614	GFSK 25kbps	39.4	46.0	Pass
902	GFSK 25kbps	71.1	100.0	Pass
928	GFSK 25kbps	69.4	100.0	Pass
960	GFSK 25kbps	43.8	54.0	Pass

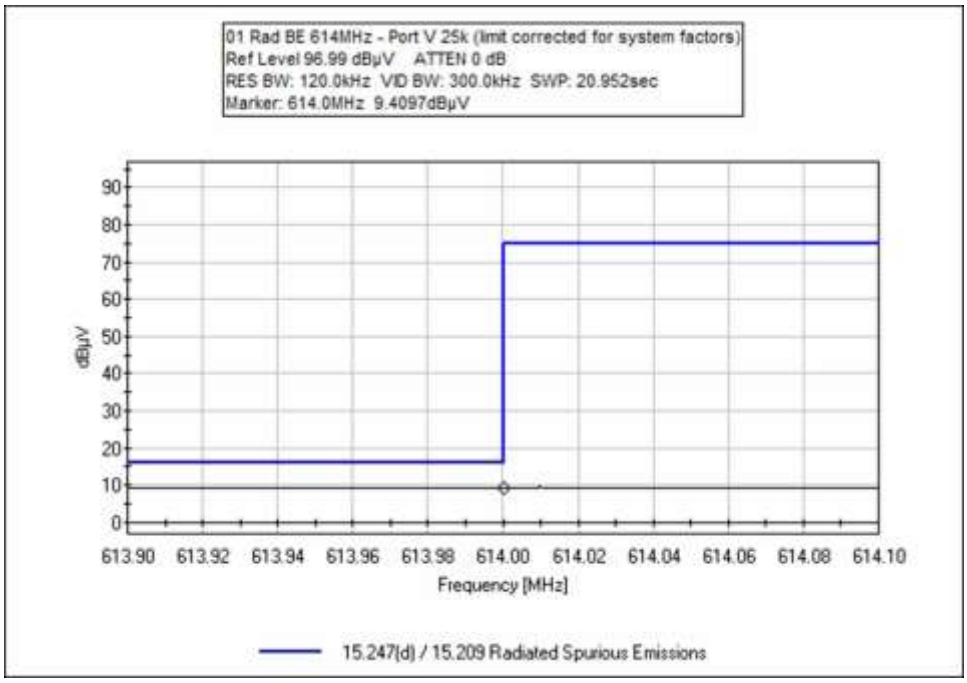
Band Edge Summary				
Operating Mode: Single Channel (Low and High) H Port (-0.4dBi)				
Frequency (MHz)	**Modulation**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614	GFSK 50kbps	39.3	46.0	Pass
902	GFSK 50kbps	71.7	100.0	Pass
928	GFSK 50kbps	72.1	100.0	Pass
960	GFSK 50kbps	43.8	54.0	Pass

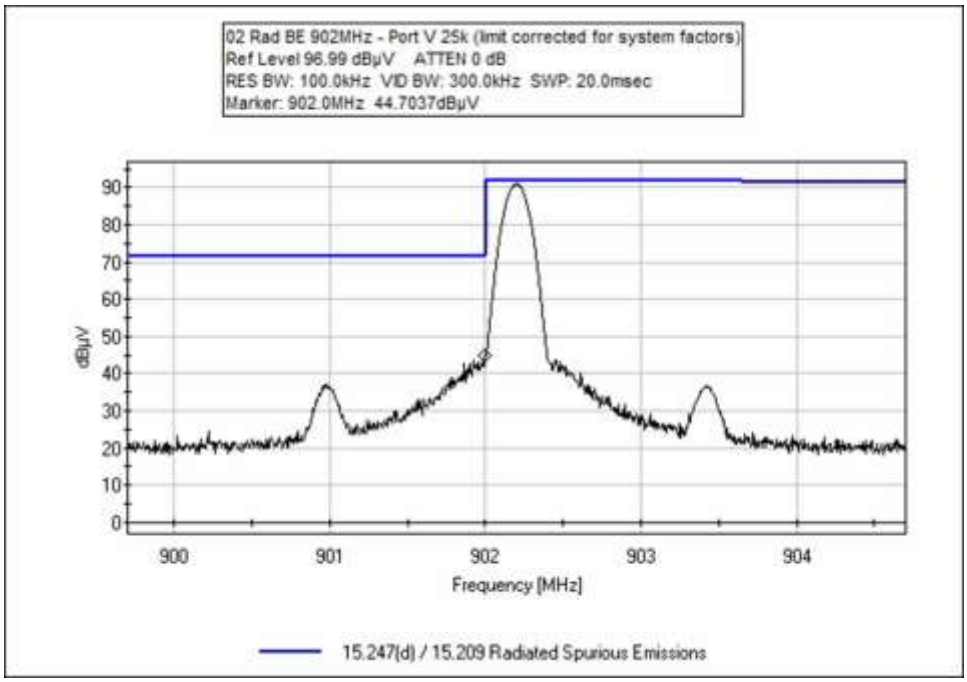
Band Edge Summary							
Operating Mode: Single Channel (Low and High) H Port (-0.4dBi)							
Freq (MHz)	**Modulation**	**100kHz Band Edge Measurement (dBuV/m @3m)**	**100kHz Fundamental Field Strength (dBuV/m @3m)**	**30kHz Band Edge Measurement (dBuV/m @3m)**	**30kHz Fundamental Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
902	GFSK 25kbps	101.6	119.6	**90.3**	119.6	100.0	Pass
928	GFSK 25kbps	99.3	119.9	**88.5**	119.9	100.0	Pass
902	GFSK 50kbps	102.0	118.9	**90.2**	118.5	100.0	Pass
928	GFSK 50kbps	100.5	119.6	**89.0**	119.5	100.0	Pass

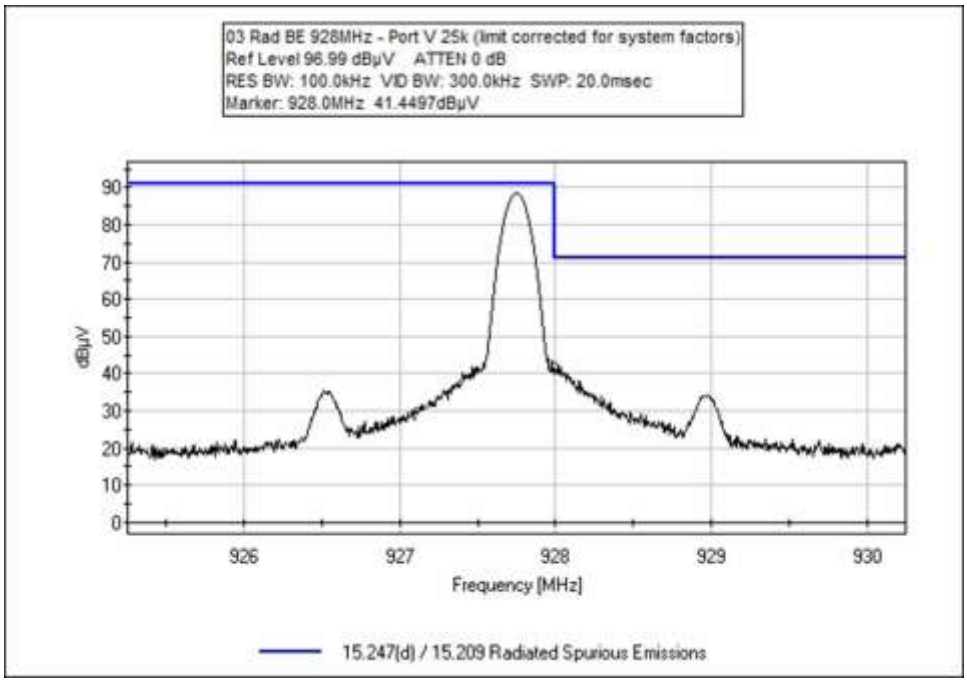
Note: Marker delta limit was applied per ANSI C63.10 (2013) section 6.10.6.2. The final value to consider against the limit is the worst case 30kHz Band Edge measurement, underlined and bold in the table above.

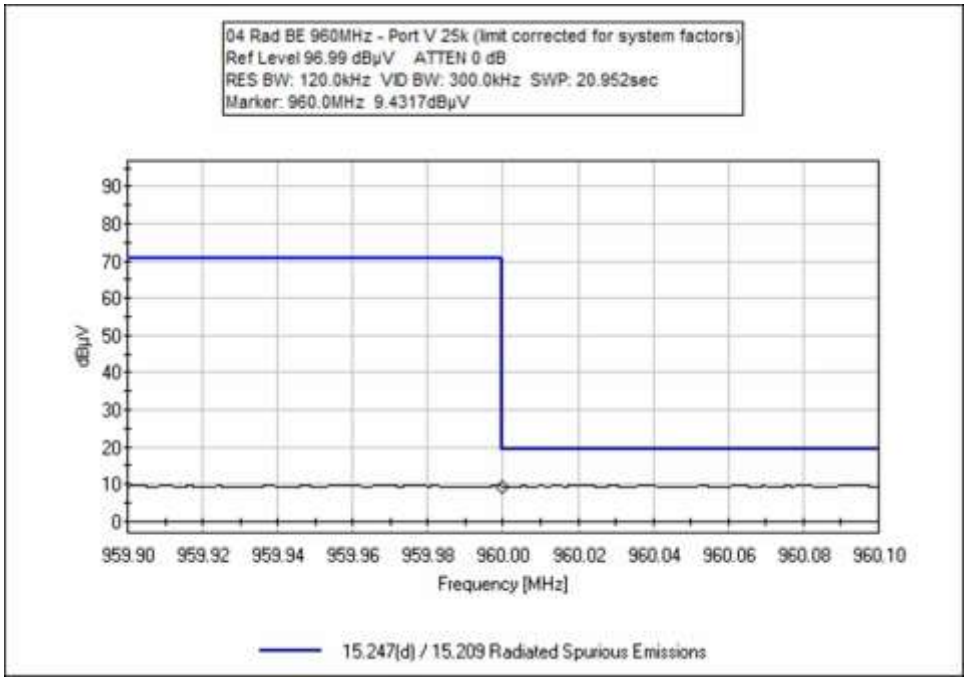
Note: Single channel data at 614MHz and 960MHz is representative of data collected in hopping mode.

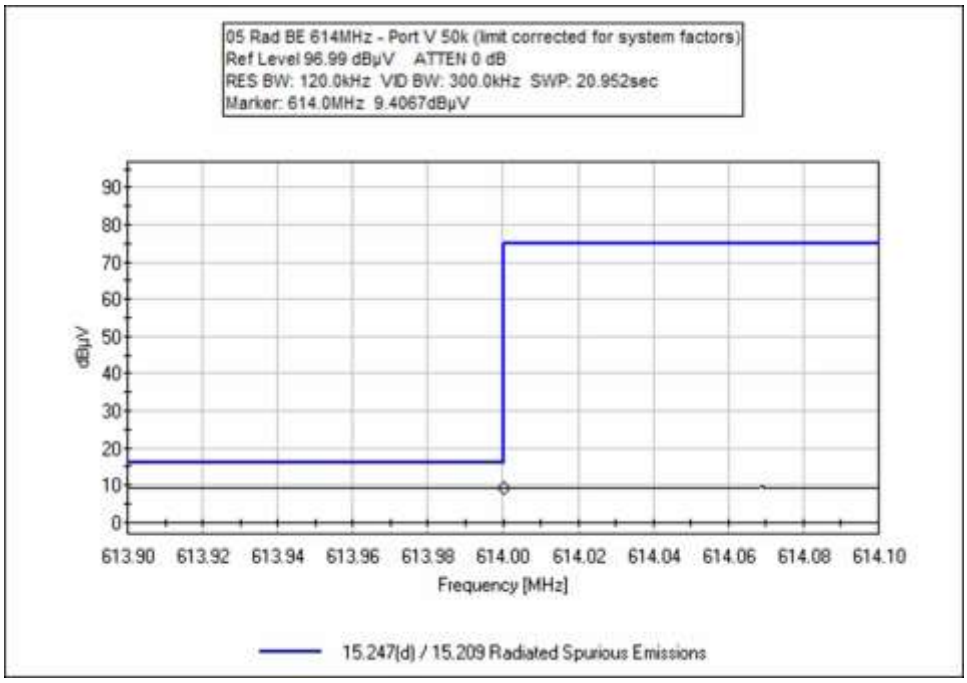
Band Edge Plots

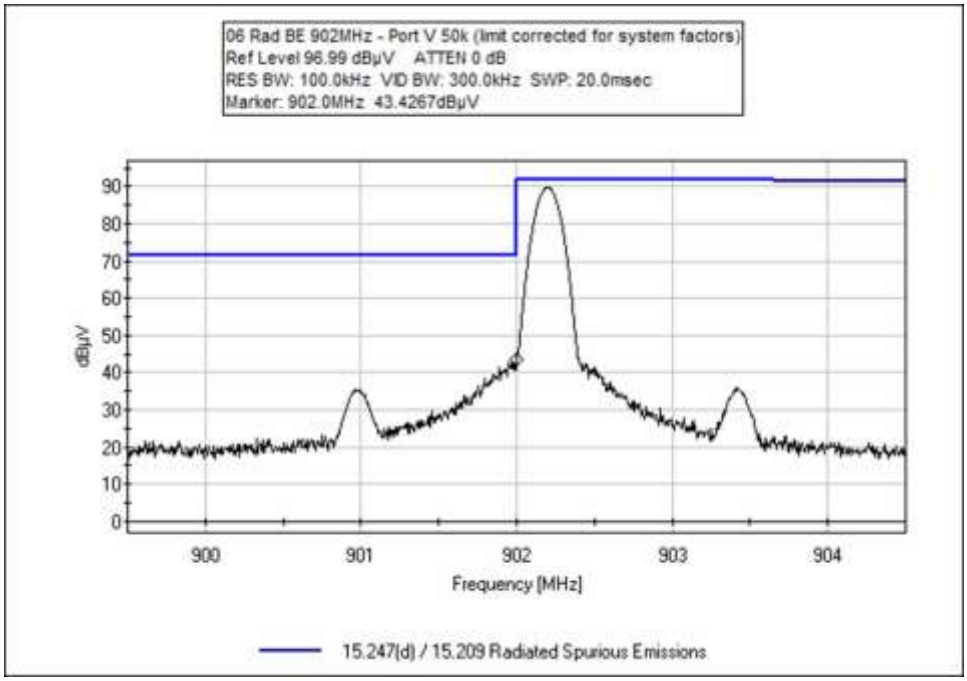


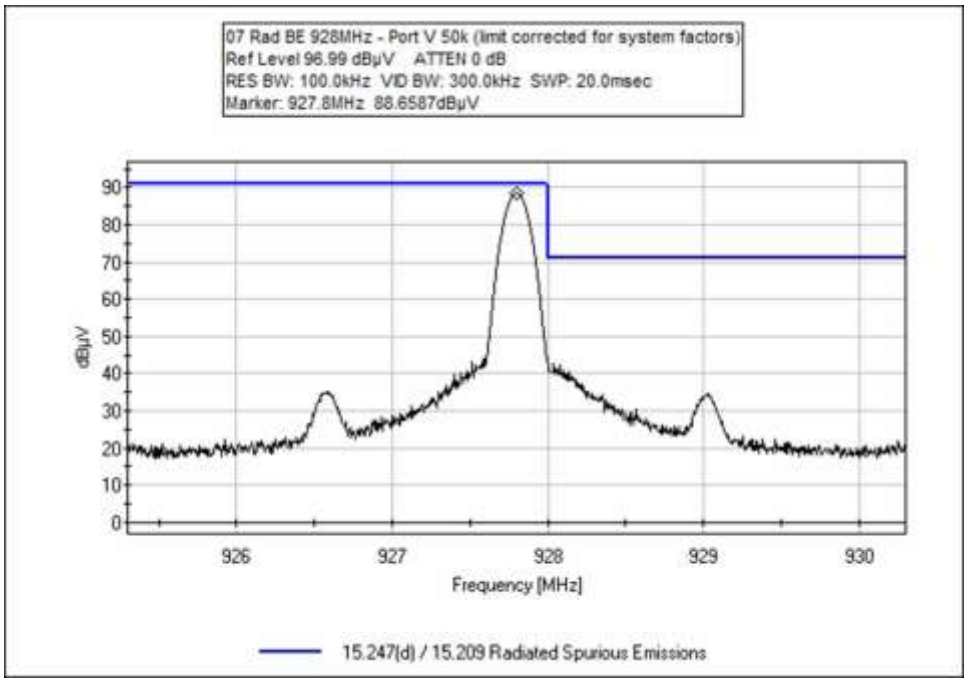


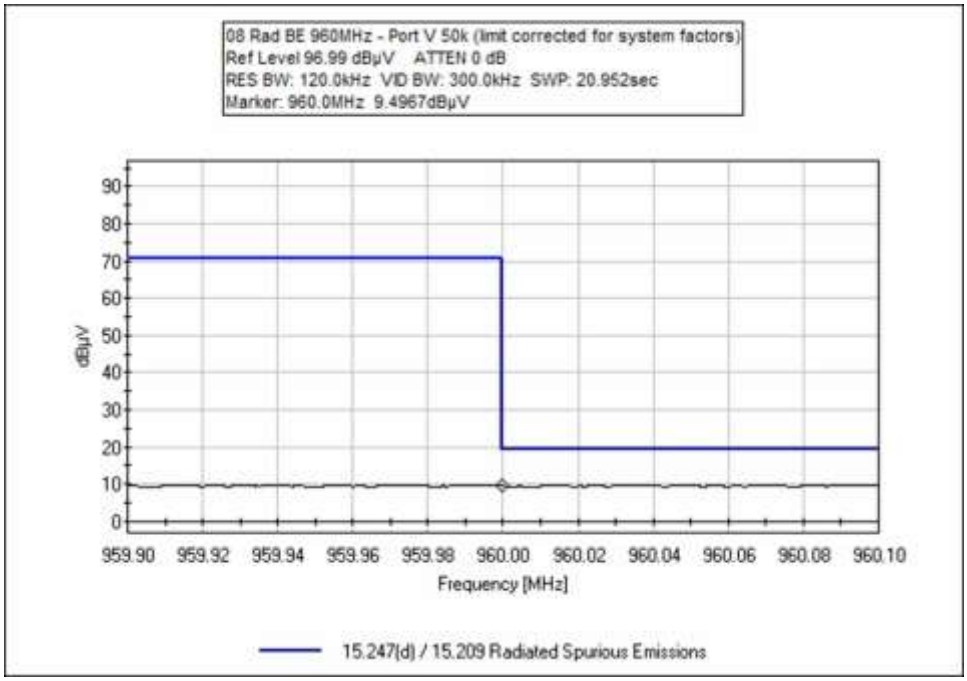

03 Rad BE 928MHz - Port V 25k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 20.0msec
Marker: 928.0MHz 41.4497dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

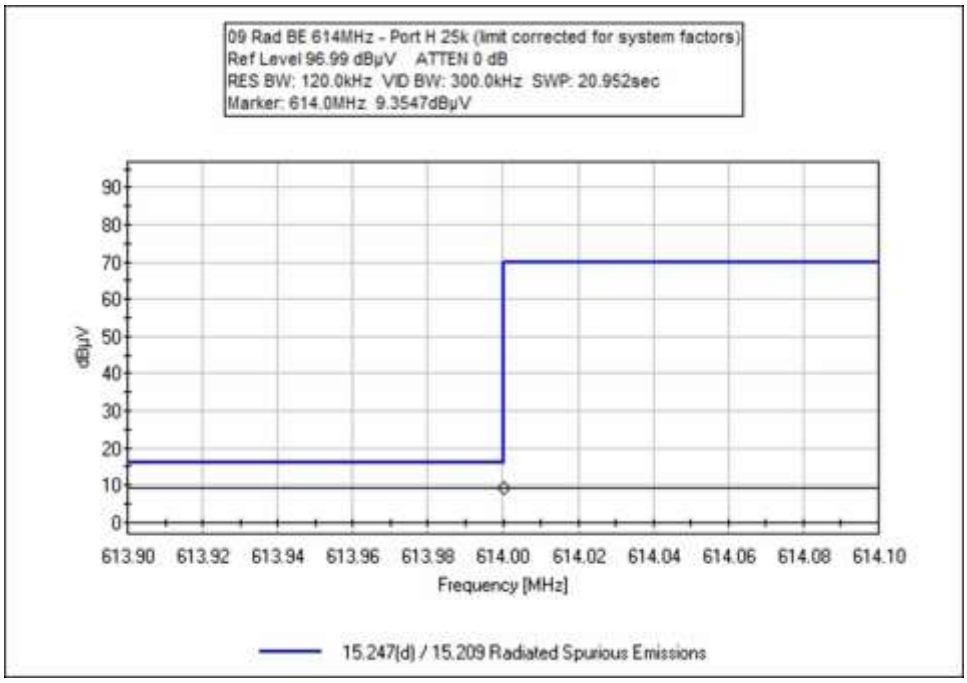

04 Rad BE 960MHz - Port V 25k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 300.0kHz SWP: 20.952sec
Marker: 960.0MHz 9.4317dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

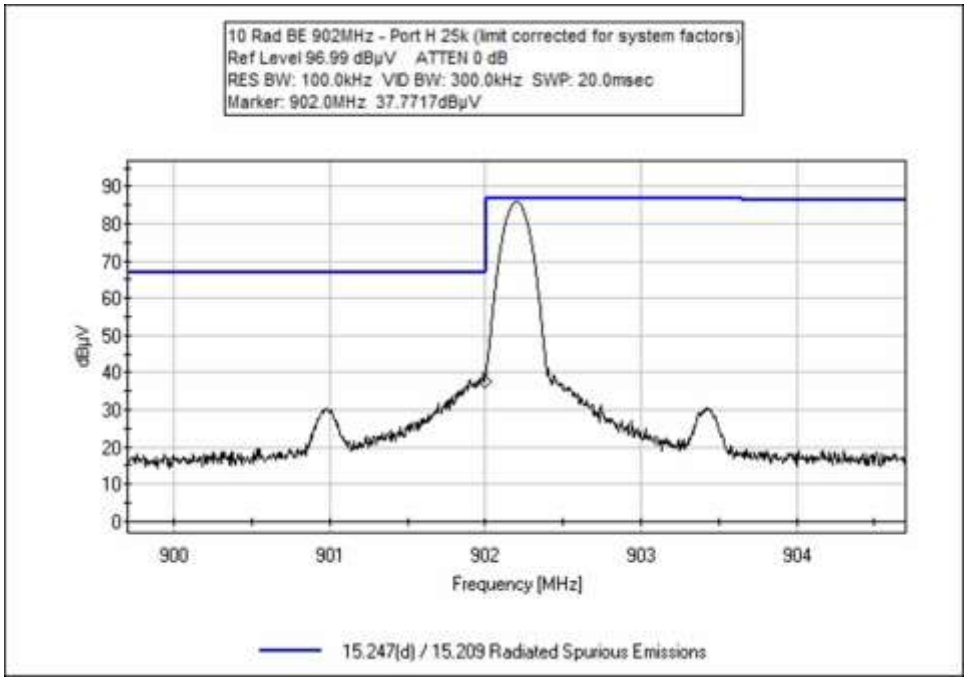

05 Rad BE 614MHz - Port V 50k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 300.0kHz SWP: 20.952sec
Marker: 614.0MHz 9.4067dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

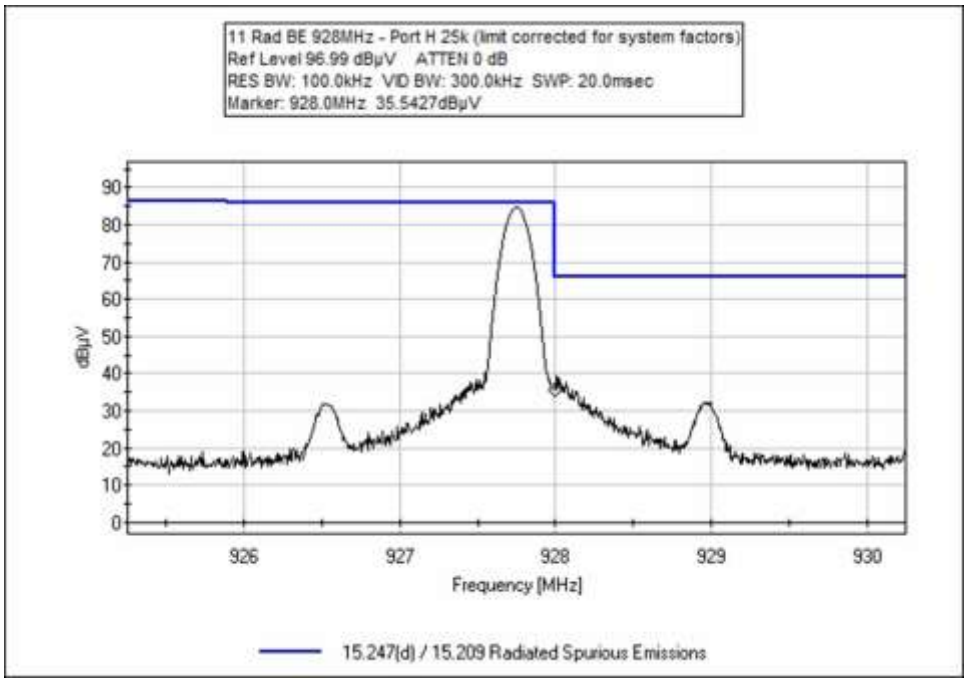

06 Rad BE 902MHz - Port V 50k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 20.0msec
Marker: 902.0MHz 43.4267dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

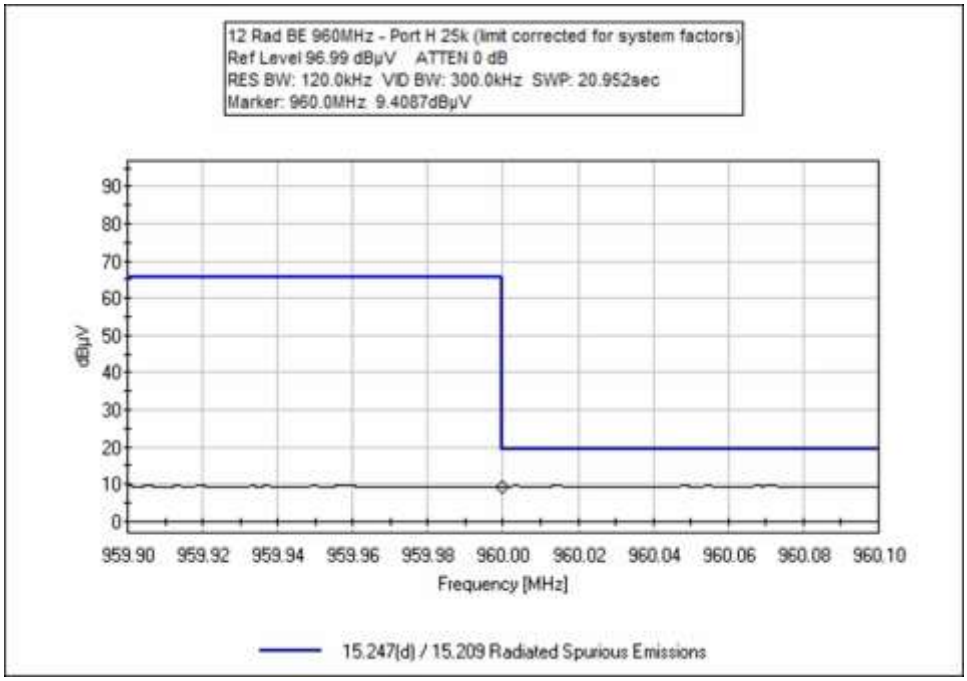

07 Rad BE 928MHz - Port V 50k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 20.0msec
Marker: 927.8MHz 88.6587dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

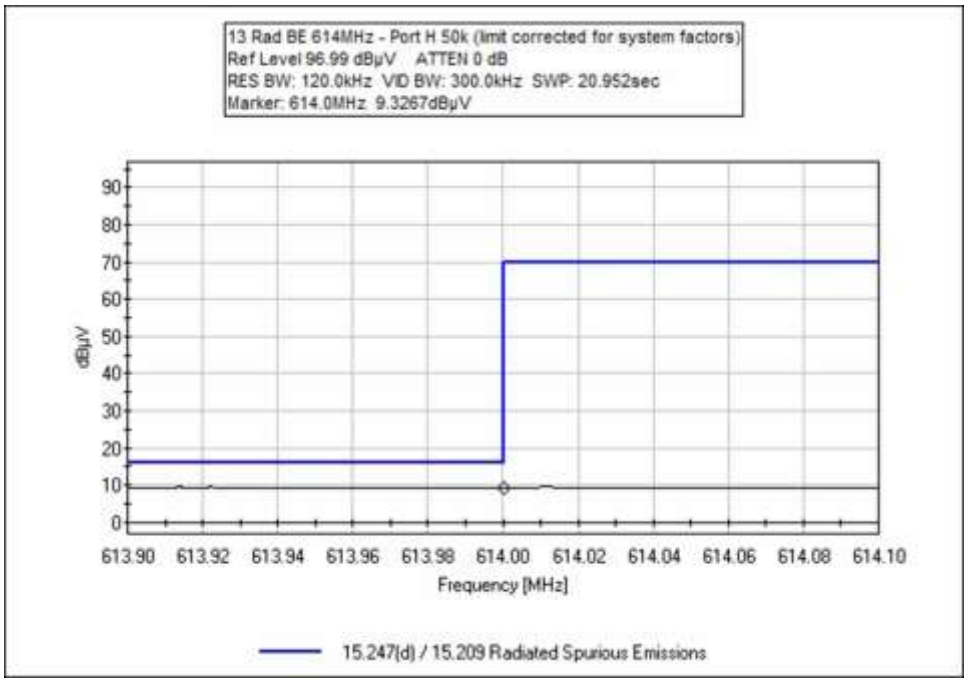

08 Rad BE 960MHz - Port V 50k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 300.0kHz SWP: 20.952sec
Marker: 960.0MHz 9.4967dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

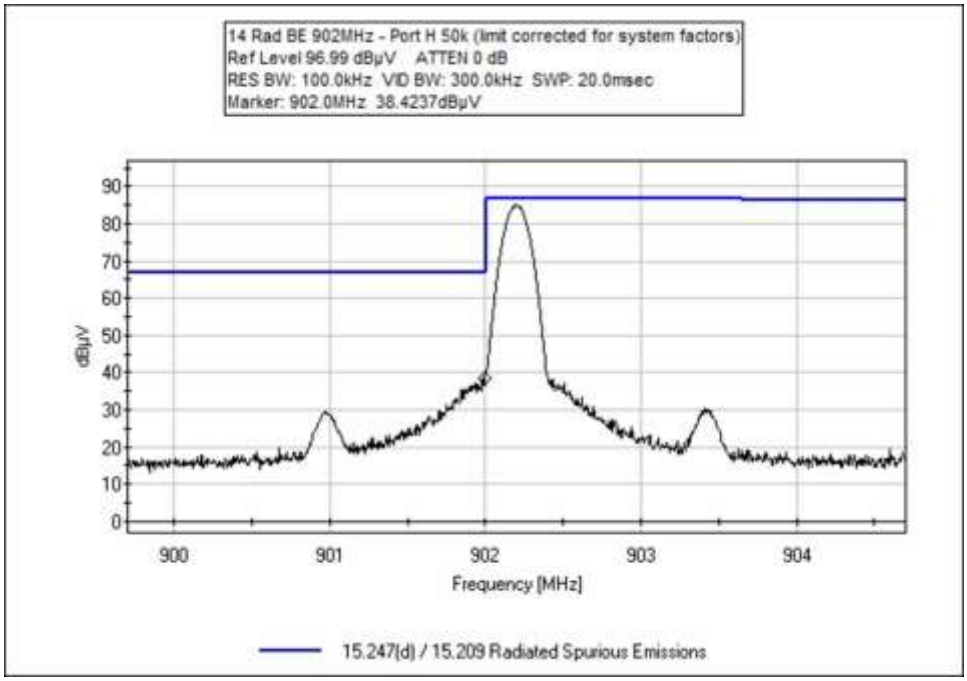

09 Rad BE 614MHz - Port H 25k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 300.0kHz SWP: 20.952sec
Marker: 614.0MHz 9.3547dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.90 613.92 613.94 613.96 613.98 614.00 614.02 614.04 614.06 614.08 614.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

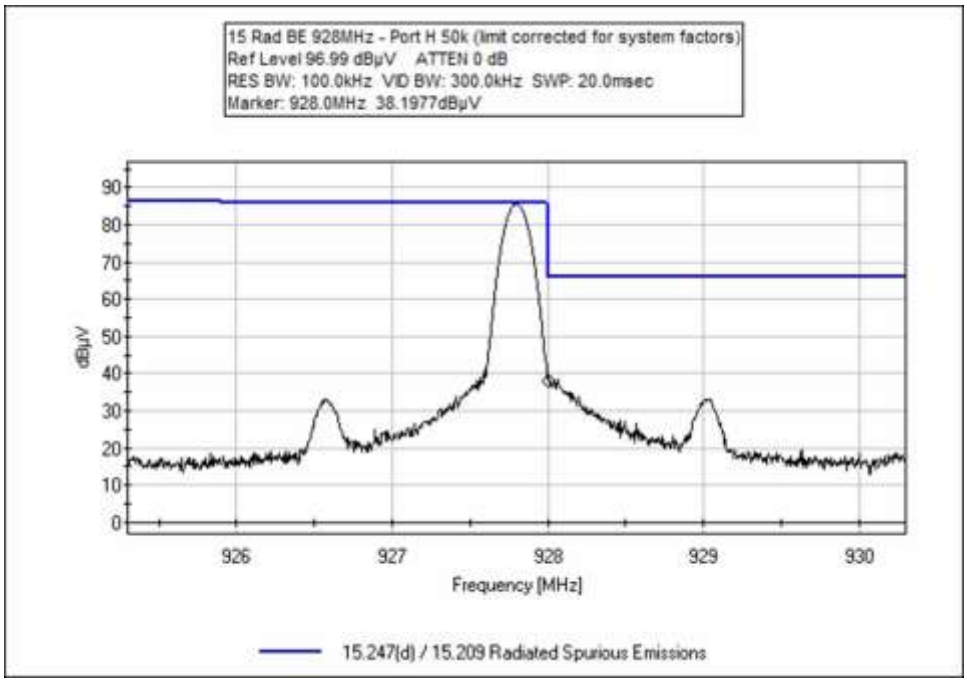

10 Rad BE 902MHz - Port H 25k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 20.0msec
Marker: 902.0MHz 37.7717dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
900 901 902 903 904
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

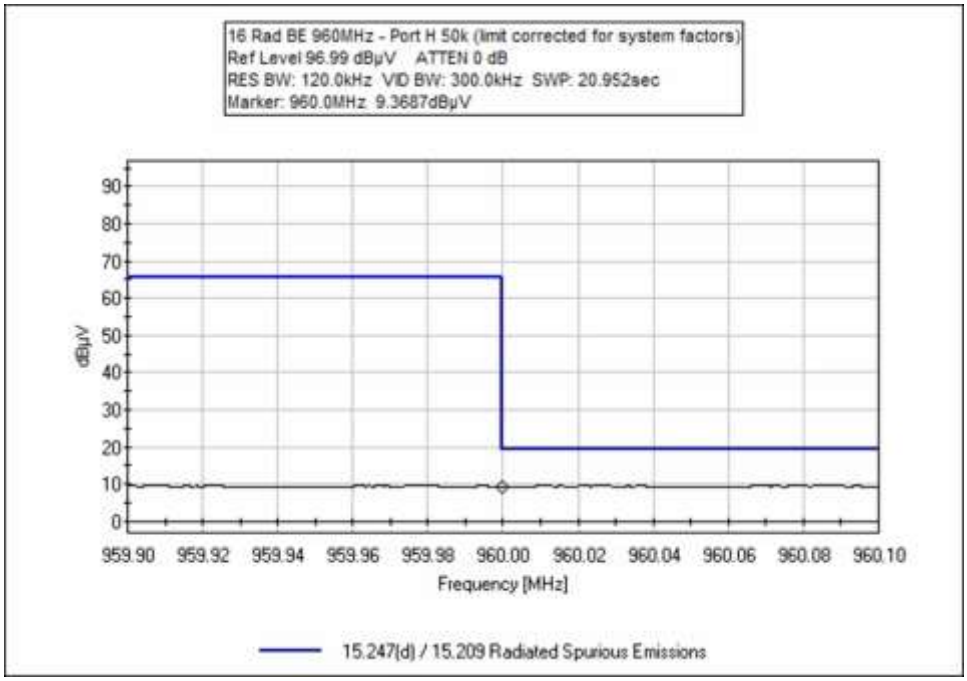

11 Rad BE 928MHz - Port H 25k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 20.0msec
Marker: 928.0MHz 35.5427dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

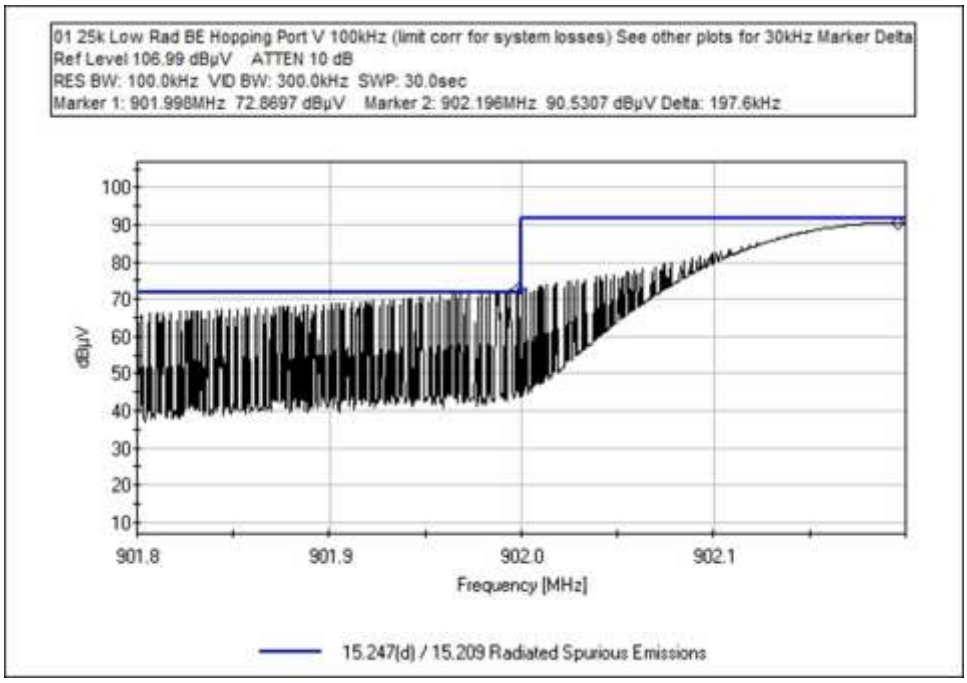

12 Rad BE 960MHz - Port H 25k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 300.0kHz SWP: 20.952sec
Marker: 960.0MHz 9.4087dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

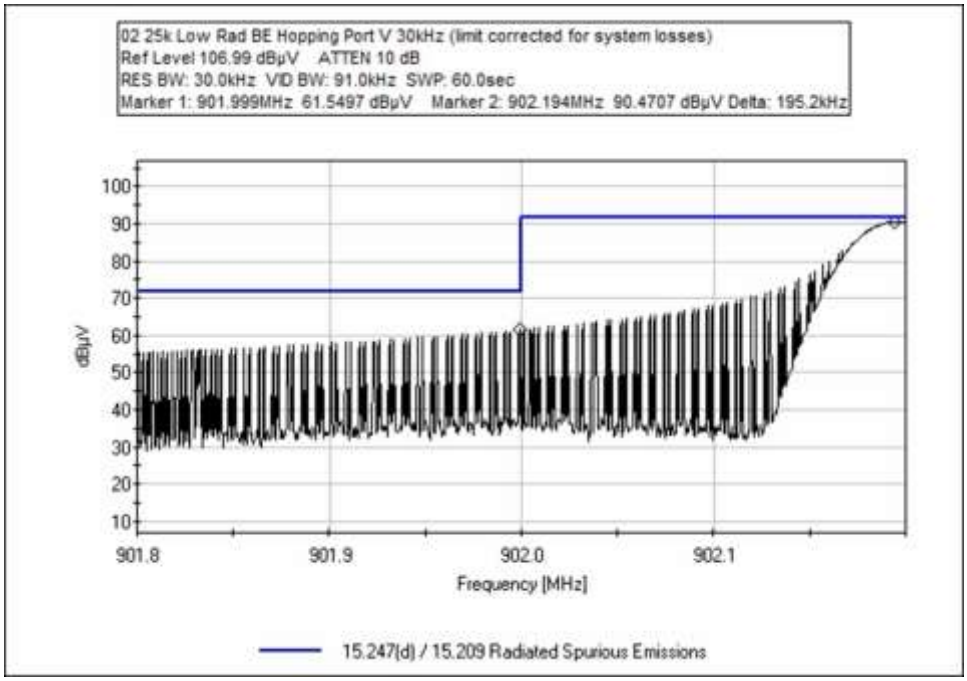

13 Rad BE 614MHz - Port H 50k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 300.0kHz SWP: 20.952sec
Marker: 614.0MHz 9.3267dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.90 613.92 613.94 613.96 613.98 614.00 614.02 614.04 614.06 614.08 614.10
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

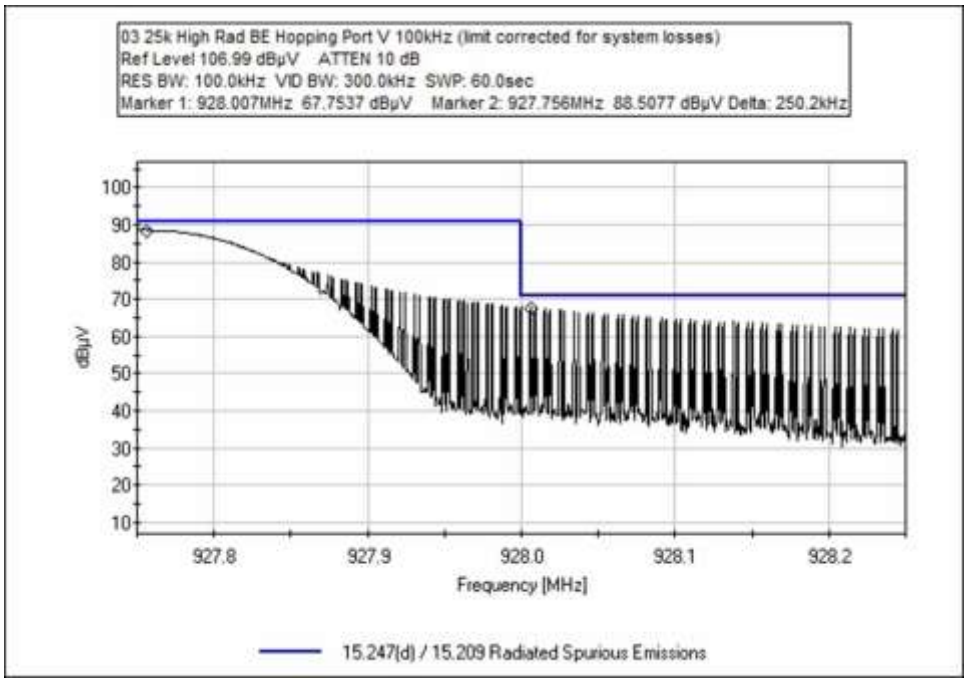

14 Rad BE 902MHz - Port H 50k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 20.0msec
Marker: 902.0MHz 38.4237dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
900 901 902 903 904
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

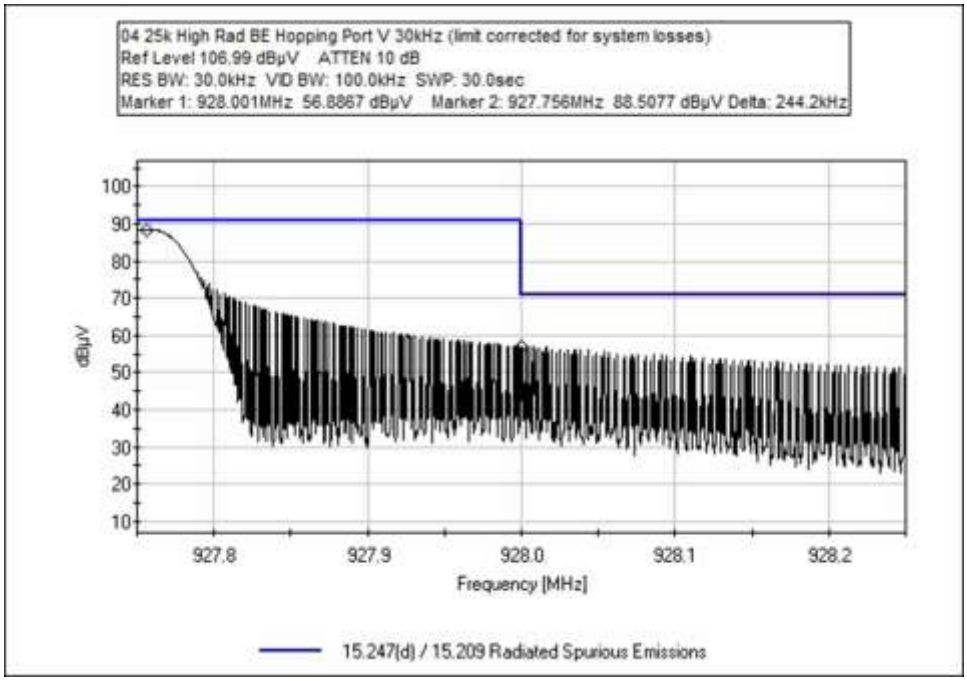

15 Rad BE 928MHz - Port H 50k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 20.0msec
Marker: 928.0MHz 38.1977dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

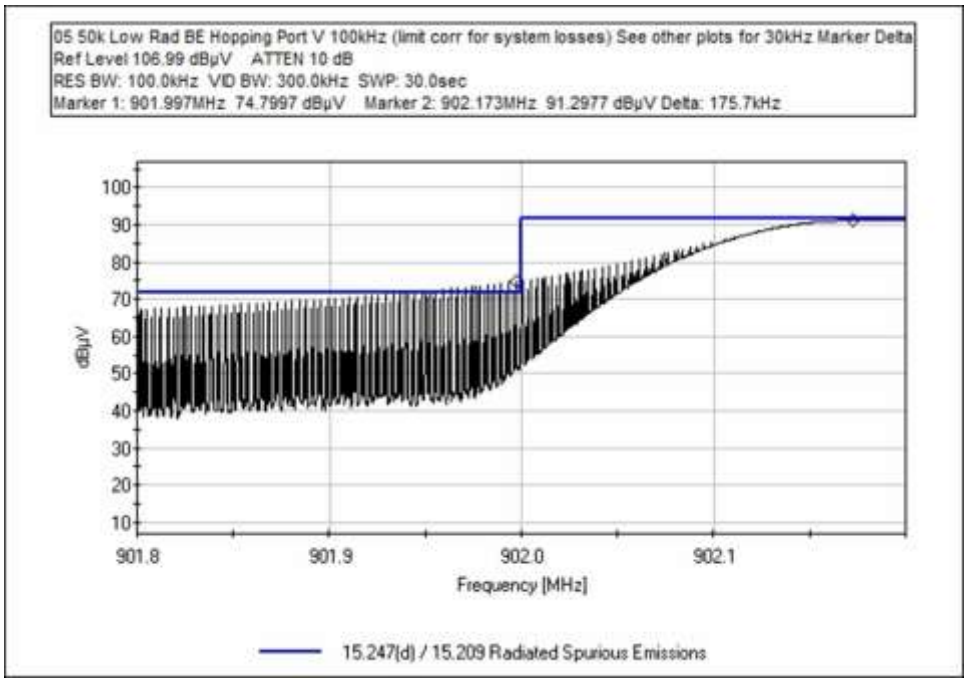

16 Rad BE 960MHz - Port H 50k (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 300.0kHz SWP: 20.952sec
Marker: 960.0MHz 9.3687dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

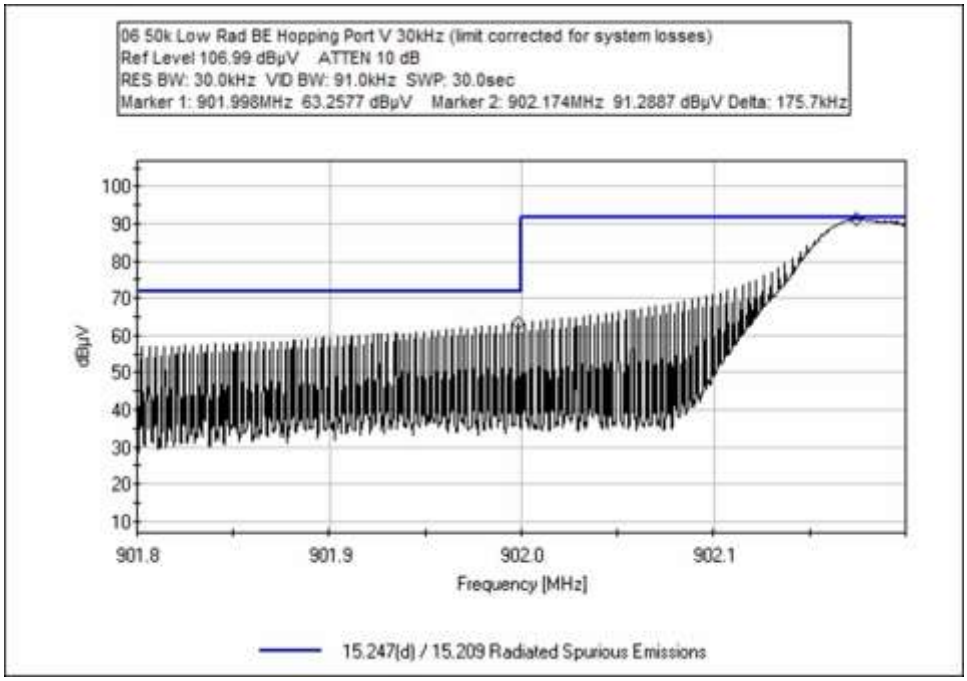

01 25k Low Rad BE Hopping Port V 100kHz (limit corr for system losses) See other plots for 30kHz Marker Delta
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 901.998MHz 72.8697 dBµV Marker 2: 902.196MHz 90.5307 dBµV Delta: 197.6kHz
100
90
80
70
60
50
40
30
20
10
dBµV
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

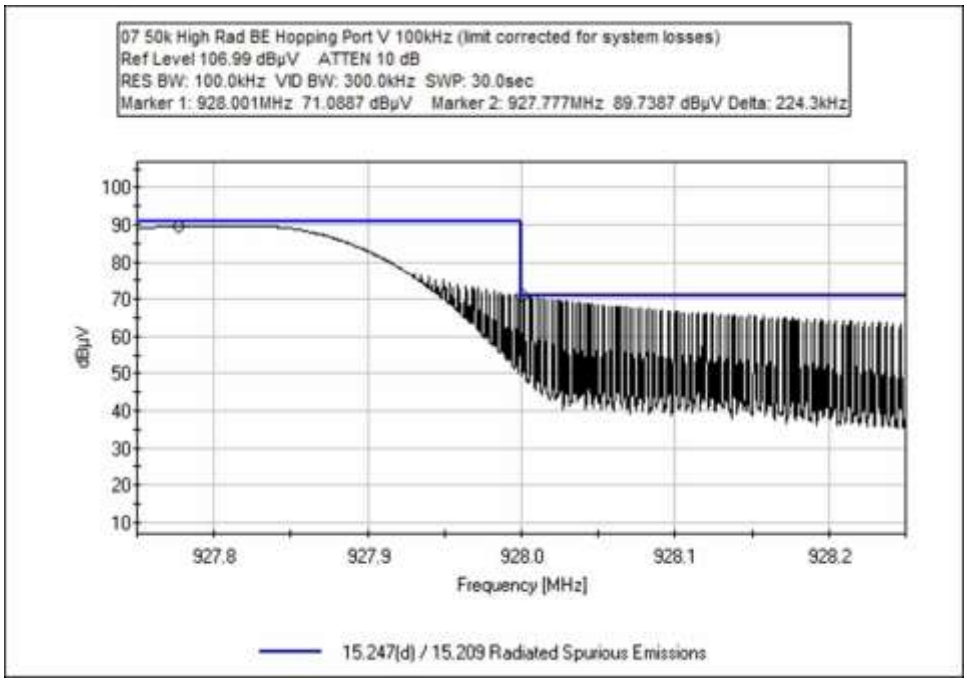

02 25k Low Rad BE Hopping Port V 30kHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 60.0sec
Marker 1: 901.999MHz 61.5497 dBµV Marker 2: 902.194MHz 90.4707 dBµV Delta: 195.2kHz
100
90
80
70
60
50
40
30
20
10
dBµV
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

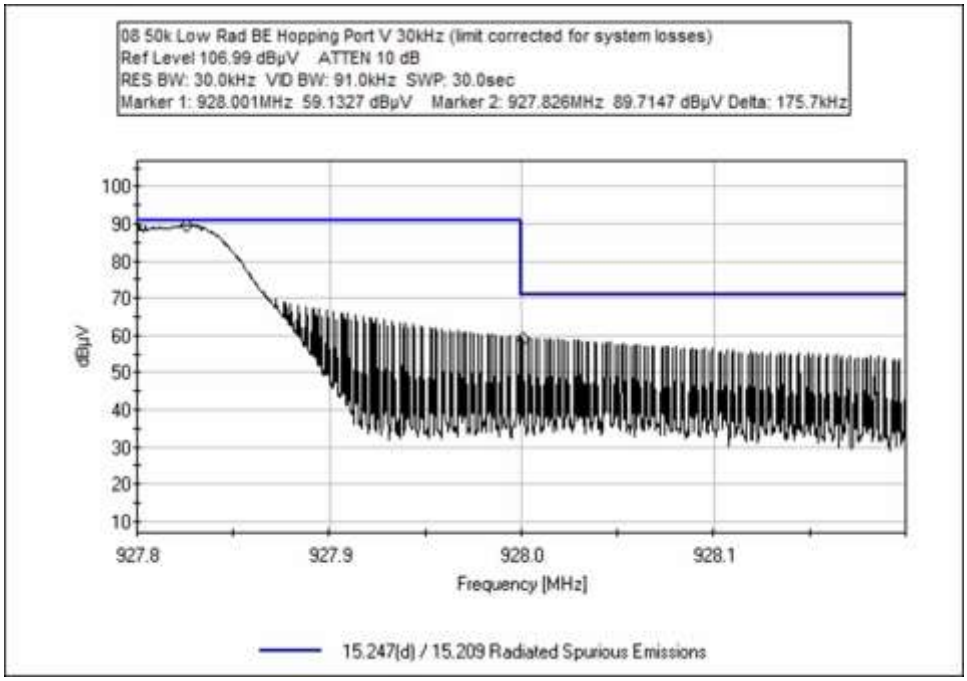

03 25k High Rad BE Hopping Port V 100kHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 60.0sec
Marker 1: 928.007MHz 67.7537 dBµV Marker 2: 927.756MHz 88.5077 dBµV Delta: 250.2kHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

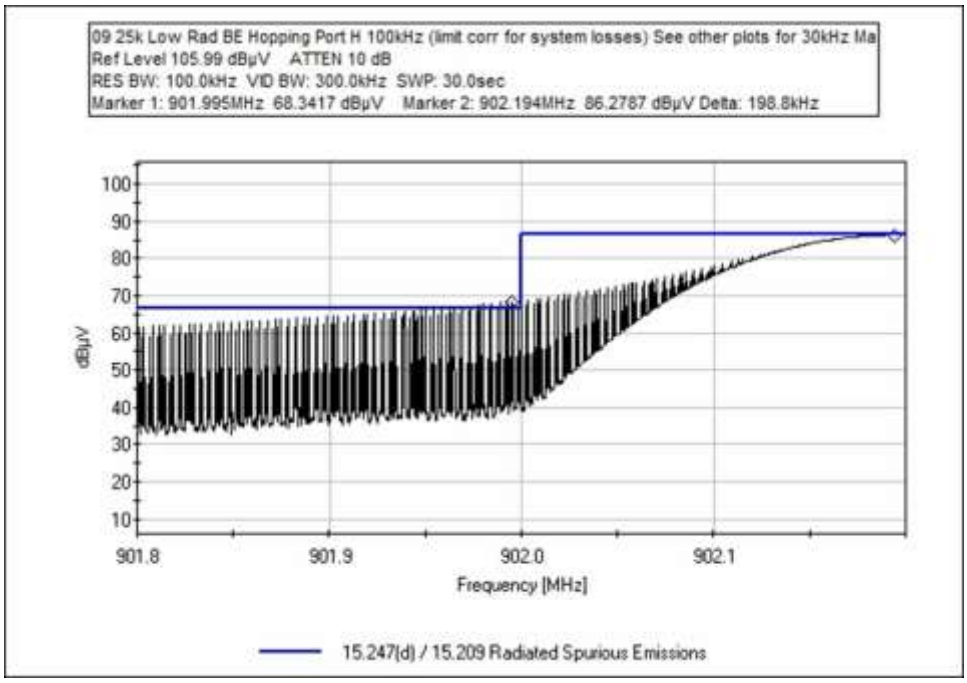

04 25k High Rad BE Hopping Port V 30kHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 100.0kHz SWP: 30.0sec
Marker 1: 928.001MHz 56.8867 dBµV Marker 2: 927.756MHz 88.5077 dBµV Delta: 244.2kHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

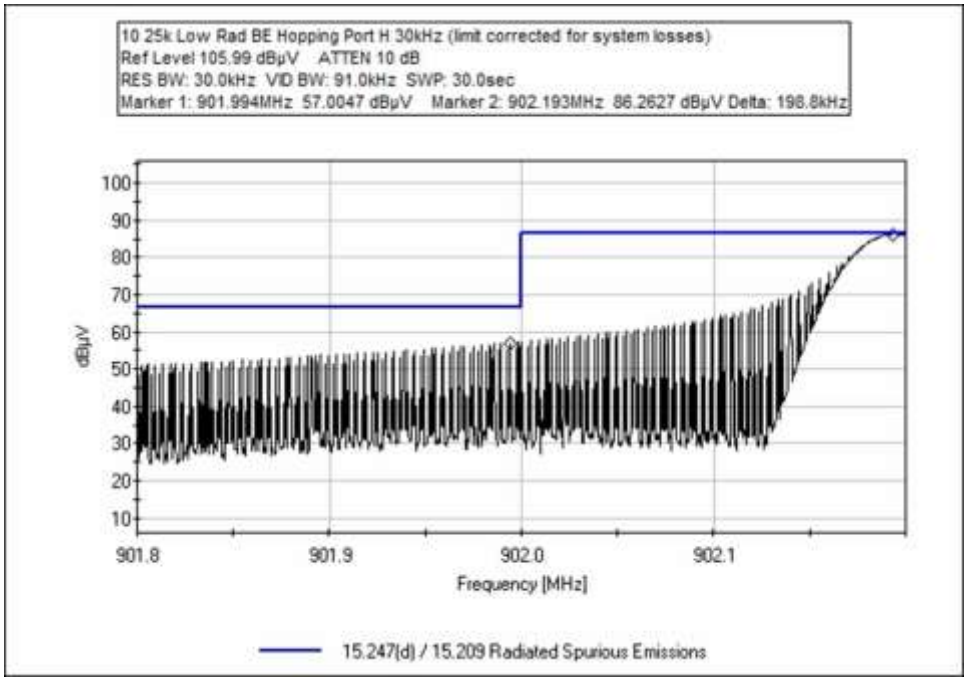

05 50k Low Rad BE Hopping Port V 100kHz (limit corr for system losses) See other plots for 30kHz Marker Delta
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 901.997MHz 74.7997 dBµV Marker 2: 902.173MHz 91.2977 dBµV Delta: 175.7kHz
dBµV
100
90
80
70
60
50
40
30
20
10
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

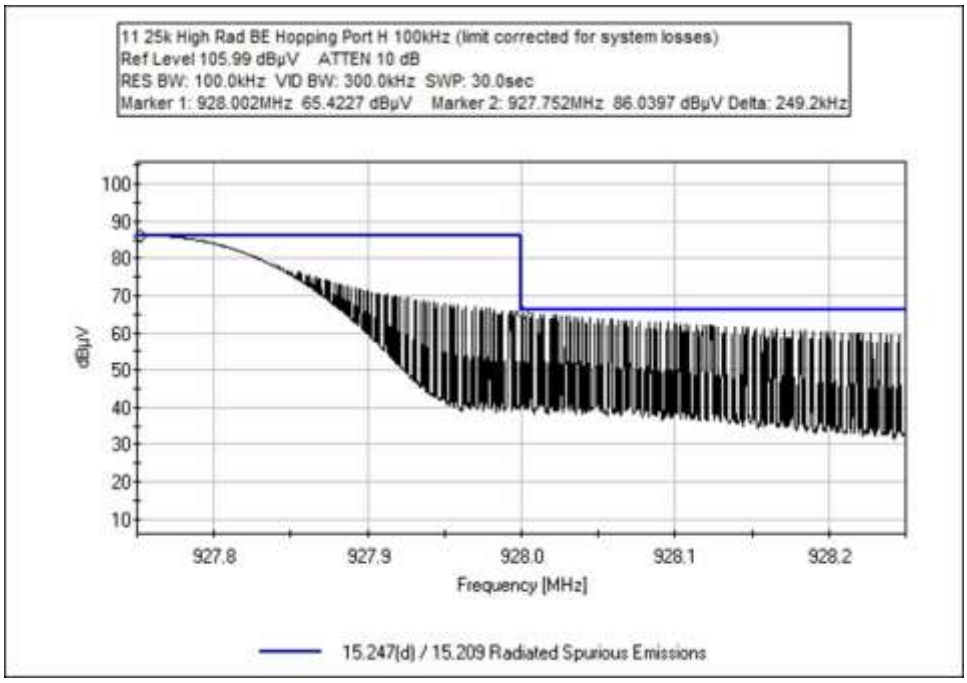

06 50k Low Rad BE Hopping Port V 30kHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 901.998MHz 63.2577 dBµV Marker 2: 902.174MHz 91.2887 dBµV Delta: 175.7kHz
dBµV
100
90
80
70
60
50
40
30
20
10
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

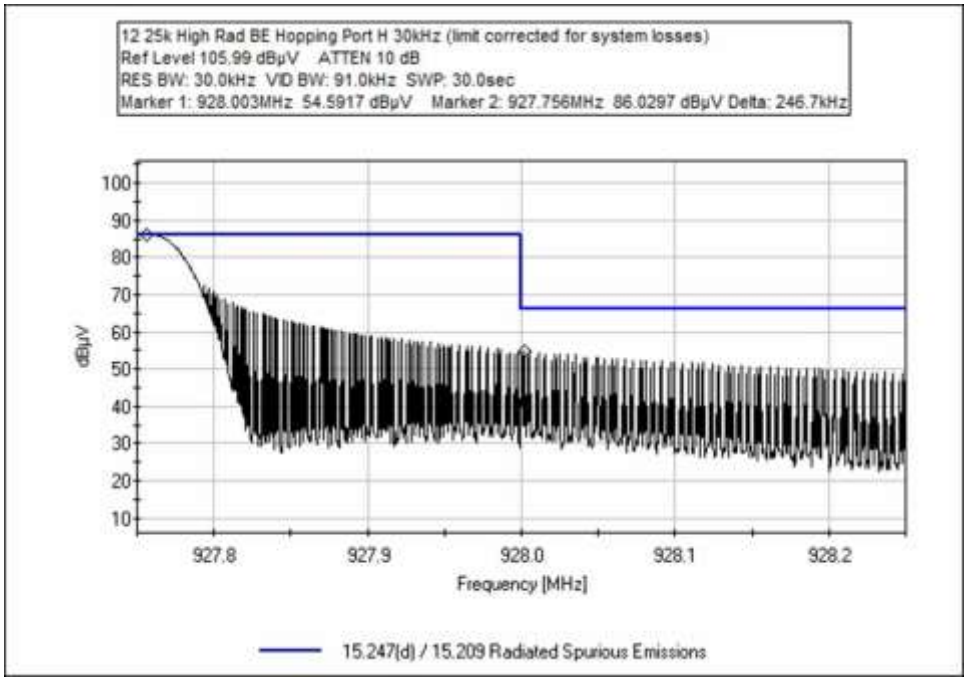

07 50k High Rad BE Hopping Port V 100kHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 928.001MHz 71.0887 dBµV Marker 2: 927.777MHz 89.7387 dBµV Delta: 224.3kHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

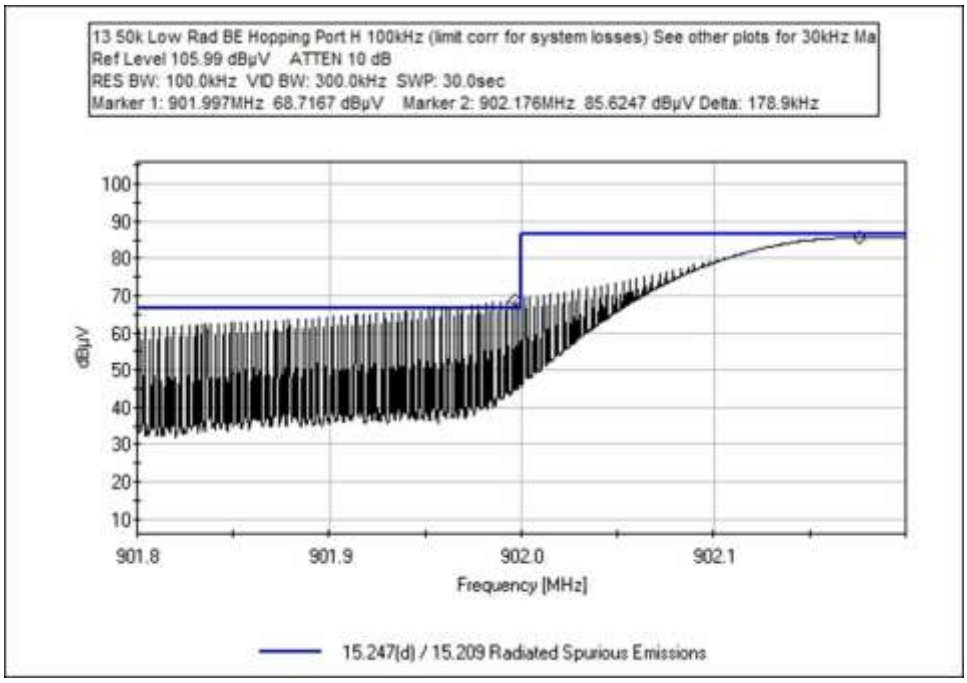

08 50k Low Rad BE Hopping Port V 30kHz (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 928.001MHz 59.1327 dBµV Marker 2: 927.826MHz 89.7147 dBµV Delta: 175.7kHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

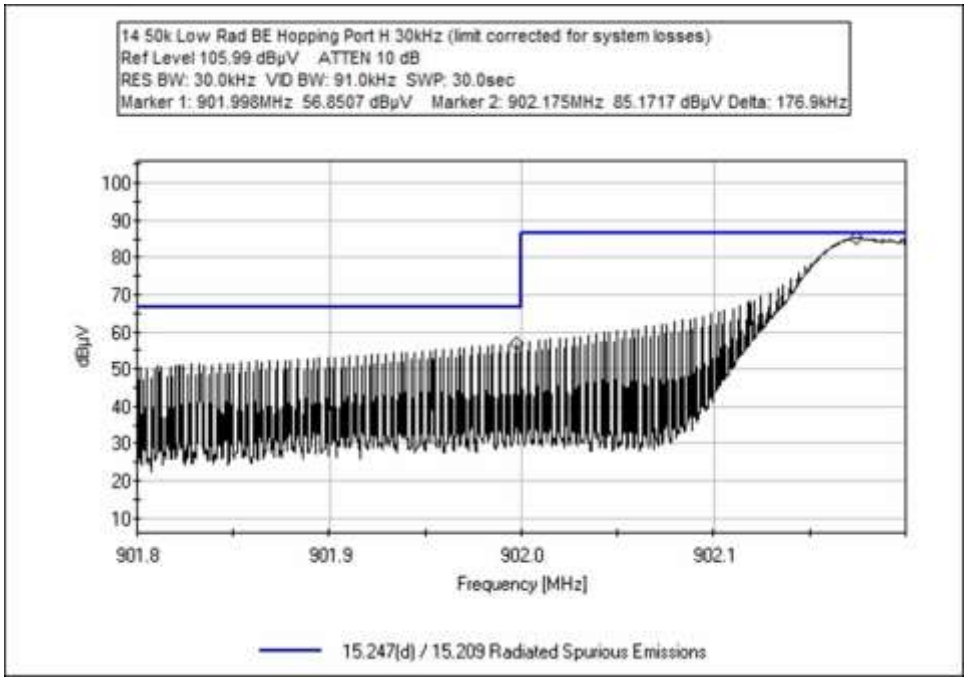

09 25k Low Rad BE Hopping Port H 100kHz (limit corr for system losses) See other plots for 30kHz Ma
Ref Level 105.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 901.995MHz 68.3417 dBµV Marker 2: 902.194MHz 86.2787 dBµV Delta: 198.8kHz
100
90
80
70
60
50
40
30
20
10
dBµV
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

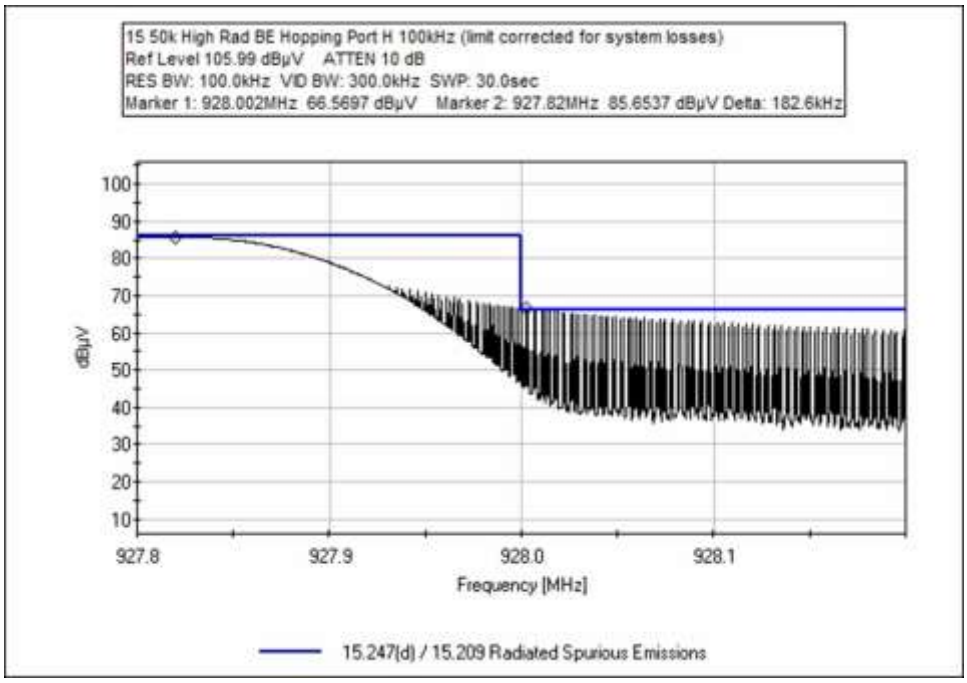

10 25k Low Rad BE Hopping Port H 30kHz (limit corrected for system losses)
Ref Level 105.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 901.994MHz 57.0047 dBµV Marker 2: 902.193MHz 86.2627 dBµV Delta: 198.8kHz
100
90
80
70
60
50
40
30
20
10
dBµV
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

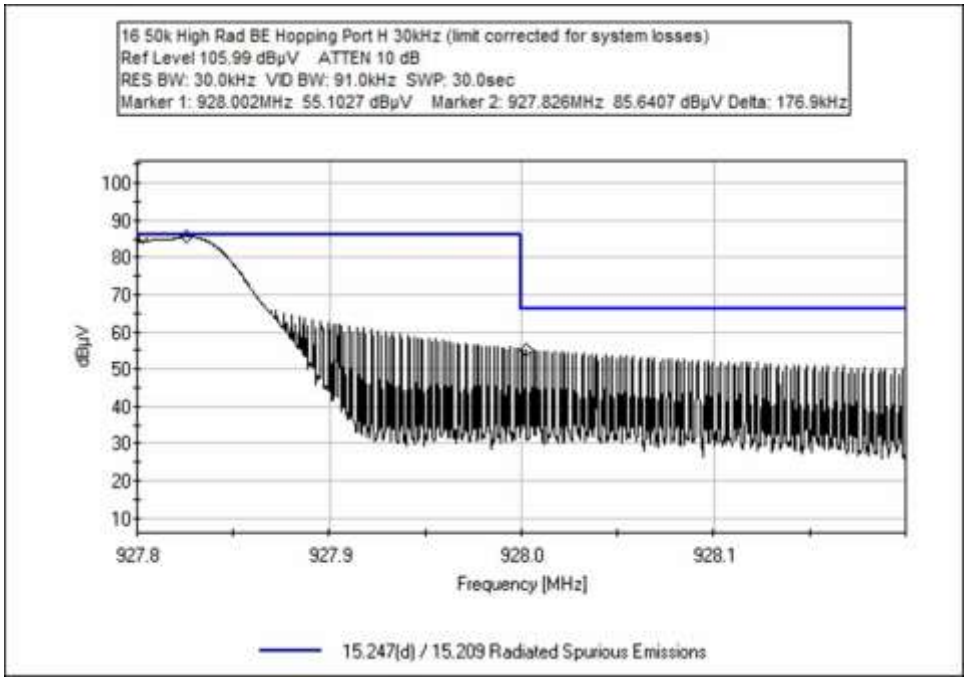

11 25k High Rad BE Hopping Port H 100kHz (limit corrected for system losses)
Ref Level 105.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 928.002MHz 65.4227 dBµV Marker 2: 927.752MHz 86.0397 dBµV Delta: 249.2kHz
100
90
80
70
60
50
40
30
20
10
dBµV
927.8
927.9
928.0
928.1
928.2
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


12 25k High Rad BE Hopping Port H 30kHz (limit corrected for system losses)
Ref Level 105.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 928.003MHz 54.5917 dBµV Marker 2: 927.756MHz 86.0297 dBµV Delta: 246.7kHz
100
90
80
70
60
50
40
30
20
10
dBµV
927.8
927.9
928.0
928.1
928.2
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


13 50k Low Rad BE Hopping Port H 100kHz (limit corr for system losses) See other plots for 30kHz Ma
Ref Level 105.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 901.997MHz 68.7167 dBµV Marker 2: 902.176MHz 85.6247 dBµV Delta: 178.9kHz
100
90
80
70
60
50
40
30
20
10
dBµV
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


14 50k Low Rad BE Hopping Port H 30kHz (limit corrected for system losses)
Ref Level 105.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 901.998MHz 56.8507 dBµV Marker 2: 902.175MHz 85.1717 dBµV Delta: 176.9kHz
100
90
80
70
60
50
40
30
20
10
dBµV
901.8
901.9
902.0
902.1
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


15 50k High Rad BE Hopping Port H 100kHz (limit corrected for system losses)
Ref Level 105.99 dBµV ATTEN 10 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 30.0sec
Marker 1: 928.002MHz 66.5697 dBµV Marker 2: 927.82MHz 85.6537 dBµV Delta: 182.6kHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


16 50k High Rad BE Hopping Port H 30kHz (limit corrected for system losses)
Ref Level 105.99 dBµV ATTEN 10 dB
RES BW: 30.0kHz VID BW: 91.0kHz SWP: 30.0sec
Marker 1: 928.002MHz 55.1027 dBµV Marker 2: 927.826MHz 85.6407 dBµV Delta: 176.9kHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**103183**	Date:	10/23/2019
Test Type:	**Maximized Emissions**	Time:	12:27:08
Tested By:	Michael Atkinson	Sequence#:	6
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Frequency: Band Edge

Setup: The equipment under test (EUT) is placed on the tabletop.
The output of the EUT is transmitter through the selected internal antenna.
The EUT is transmitting at max power.
Measurements were performed with a fresh battery installed.
L and H channels investigated.
25k and 50k data rates investigated.

Worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T2	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T3	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T4	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T5	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	614.000M QP	9.4	+0.3 +21.2	+1.2	+1.5	+5.8	+0.0	39.4	46.0 25K	-6.6	Vert
2	614.000M QP	9.3	+0.3 +21.2	+1.2	+1.5	+5.8	+0.0	39.3	46.0	-6.7	Vert
3	960.000M QP	9.4	+0.4 +24.6	+1.5	+2.1	+5.8	+0.0	43.8	54.0	-10.2	Vert
4	960.000M QP	9.4	+0.4 +24.6	+1.5	+2.1	+5.8	+0.0	43.8	54.0 25K	-10.2	Vert
5	928.000M	38.2	+0.4 +24.2	+1.5	+2.0	+5.8	+0.0	72.1	100.0	-27.9	Vert
6	902.000M	38.4	+0.3 +23.8	+1.4	+2.0	+5.8	+0.0	71.7	100.0	-28.3	Vert
7	902.000M	37.8	+0.3 +23.8	+1.4	+2.0	+5.8	+0.0	71.1	100.0 25K	-28.9	Vert
8	928.000M	35.5	+0.4 +24.2	+1.5	+2.0	+5.8	+0.0	69.4	100.0 25K	-30.6	Vert

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**103183**	Date:	10/23/2019
Test Type:	**Maximized Emissions**	Time:	11:21:37
Tested By:	Michael Atkinson	Sequence#:	5
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Frequency: Band Edge

Setup: The equipment under test (EUT) is placed on the tabletop.
The output of the EUT is transmitter through the selected internal antenna.
The EUT is transmitting at max power.
Measurements were performed with a fresh battery installed. L and H channels investigated.
25k and 50k data rates investigated.

Worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T2	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T3	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T4	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T5	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	614.000M	9.4	+0.3	+1.2	+1.5	+5.8	+0.0	39.4	46.0	-6.6	Vert
	QP		+21.2						50k		
2	614.000M	9.4	+0.3	+1.2	+1.5	+5.8	+0.0	39.4	46.0	-6.6	Vert
	QP		+21.2						25k		
3	960.000M	9.5	+0.4	+1.5	+2.1	+5.8	+0.0	43.9	54.0	-10.1	Vert
	QP		+24.6						50k		
4	960.000M	9.4	+0.4	+1.5	+2.1	+5.8	+0.0	43.8	54.0	-10.2	Vert
	QP		+24.6						25k		
5	902.000M	44.7	+0.3	+1.4	+2.0	+5.8	+0.0	78.0	105.0	-27.0	Vert
			+23.8						25k		
6	902.000M	43.4	+0.3	+1.4	+2.0	+5.8	+0.0	76.7	105.0	-28.3	Vert
			+23.8						50k		
7	928.000M	42.3	+0.4	+1.5	+2.0	+5.8	+0.0	76.2	105.0	-28.8	Vert
			+24.2						50k		
8	928.000M	41.4	+0.4	+1.5	+2.0	+5.8	+0.0	75.3	105.0	-29.7	Vert
			+24.2						25k		

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**103183**	Date:	10/28/2019
Test Type:	**Maximized Emissions**	Time:	09:14:57
Tested By:	Michael Atkinson	Sequence#:	7
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Frequency: Band Edge

Setup: The equipment under test (EUT) is placed on the tabletop.
The output of the EUT is transmitter through the selected internal antenna.
The EUT is transmitting at max power.
Measurements were performed with a fresh battery installed. Hopping channels investigated.
25k and 50k data rates investigated.

Worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T2	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T3	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T4	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T5	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	927.752M	86.0	+0.4 +24.2	+1.5	+2.0	+5.8	+0.0	119.9	120.0 High 25k	-0.1	Vert
2	927.756M	86.0	+0.4 +24.2	+1.5	+2.0	+5.8	+0.0	119.9	120.0 High 25k	-0.1	Vert
3	902.194M	86.3	+0.3 +23.8	+1.4	+2.0	+5.8	+0.0	119.6	120.0 Low 25k	-0.4	Vert
4	902.193M	86.3	+0.3 +23.8	+1.4	+2.0	+5.8	+0.0	119.6	120.0 Low 25k	-0.4	Vert
5	927.820M	85.7	+0.4 +24.2	+1.5	+2.0	+5.8	+0.0	119.6	120.0 50k High	-0.4	Vert
6	927.826M	85.6	+0.4 +24.2	+1.5	+2.0	+5.8	+0.0	119.5	120.0 50k High	-0.5	Vert
7	902.176M	85.6	+0.3 +23.8	+1.4	+2.0	+5.8	+0.0	118.9	120.0 50k Low	-1.1	Vert
8	902.175M	85.2	+0.3 +23.8	+1.4	+2.0	+5.8	+0.0	118.5	120.0 50k Low	-1.5	Vert
9	901.994M	57.0	+0.3 +23.8	+1.4	+2.0	+5.8	+0.0	90.3	100.0 Low 25k	-9.7	Vert
10	901.998M	56.9	+0.3 +23.8	+1.4	+2.0	+5.8	+0.0	90.2	100.0 50k Low	-9.8	Vert
11	928.002M	55.1	+0.4 +24.2	+1.5	+2.0	+5.8	+0.0	89.0	100.0 50k High	-11.0	Vert
12	928.003M	54.6	+0.4 +24.2	+1.5	+2.0	+5.8	+0.0	88.5	100.0 High 25k	-11.5	Vert

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**103183**	Date:	10/25/2019
Test Type:	**Maximized Emissions**	Time:	16:32:56
Tested By:	Michael Atkinson	Sequence#:	6
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Frequency: Band Edge

Setup: The equipment under test (EUT) is placed on the tabletop.
The output of the EUT is transmitter through the selected internal antenna.
The EUT is transmitting at max power.
Measurements were performed with a fresh battery installed. Hopping channels investigated.
25k and 50k data rates investigated.

Worst case reported.

Test Location: Bothell Lab Bench
Temperature (ºC): 19-23
Relative Humidity (%): 30-50
Test Method: ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T2	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T5	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T6	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	902.174M	91.3	+0.0 +5.8	+0.3 +23.8	+1.4	+2.0	+0.0	124.6	125.0 50k Low	-0.4	Vert
2	902.173M	91.3	+0.0 +5.8	+0.3 +23.8	+1.4	+2.0	+0.0	124.6	125.0 50k Low	-0.4	Vert
3	902.196M	90.5	+0.0 +5.8	+0.3 +23.8	+1.4	+2.0	+0.0	123.8	125.0 25k Low	-1.2	Vert
4	902.194M	90.5	+0.0 +5.8	+0.3 +23.8	+1.4	+2.0	+0.0	123.8	125.0 25k Low	-1.2	Vert
5	927.826M	89.7	+0.0 +5.8	+0.4 +24.2	+1.5	+2.0	+0.0	123.6	125.0 50k High	-1.4	Vert
6	927.777M	89.7	+0.0 +5.8	+0.4 +24.2	+1.5	+2.0	+0.0	123.6	125.0 50k High	-1.4	Vert
7	927.748M	88.5	+0.0 +5.8	+0.4 +24.2	+1.5	+2.0	+0.0	122.4	125.0 25k High	-2.6	Vert
8	927.756M	88.5	+0.0 +5.8	+0.4 +24.2	+1.5	+2.0	+0.0	122.4	125.0 25k High	-2.6	Vert
9	901.998M	63.3	+0.0 +5.8	+0.3 +23.8	+1.4	+2.0	+0.0	96.6	105.0 50k Low	-8.4	Vert
10	901.999M	61.5	+0.0 +5.8	+0.3 +23.8	+1.4	+2.0	+0.0	94.8	105.0 25k Low	-10.2	Vert
11	928.001M	59.1	+0.0 +5.8	+0.4 +24.2	+1.5	+2.0	+0.0	93.0	105.0 50k High	-12.0	Vert
12	928.001M	56.9	+0.0 +5.8	+0.4 +24.2	+1.5	+2.0	+0.0	90.8	105.0 25k High	-14.2	Vert

Test Setup Photo(s)

Below 1GHz

Above 1GHz

X Axis

Y Axis

Z Axis

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 dBµV/m, the spectrum analyzer reading in dBµV 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	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/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.