

Itron, Inc.

REVISED TEST REPORT TO 104631-2

ORRNC
Model: RN-EGM

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(FHSS 902-928 MHz)

Report No.: 104631-2A

Date of issue: April 6, 2022

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

This report contains a total of 104 pages and may be reproduced in full only. Partial reproduction may only be done with the written consent of CKC Laboratories, Inc.



TABLE OF CONTENTS

Administrative Information	3
Test Report Information	3
Revision History	3
Report Authorization	3
Test Facility Information	4
Software Versions	4
Site Registration & Accreditation Information	4
Summary of Results	5
Modifications During Testing	5
Conditions During Testing	5
Equipment Under Test	6
General Product Information	6
FCC Part 15 Subpart C	10
15.247(a) Transmitter Characteristics	10
15.247(a)(1)(i) 20 dB Bandwidth	11
15.247(a)(1) Carrier Separation	21
15.247(a)(1)(i) Number of Hopping Channels	23
15.247(a)(1)(i) Time of Occupancy	25
15.247(b)(2) Output Power	29
15.247(d) RF Conducted Emissions & Band Edge	48
15.247(d) Radiated Emissions & Band Edge	63
15.207 AC Conducted Emissions	94
Supplemental Information	103
Measurement Uncertainty	103
Emissions Test Details	103

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

ITRON, INC.
2111 N. Molter Road
Liberty Lake, WA 99019

Representative: Jay Holcomb
Customer Reference Number: 224127

REPORT PREPARED BY:

Darcy Thompson
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 104631

DATE OF EQUIPMENT RECEIPT:
DATE(S) OF TESTING:

January 6, 2021
January 6-8 and 18, 2021

Revision History

Original: Testing of the ORRNC, Model: RN-EGM to FCC Part 15 Subpart C Section(s) 15.207 & 15.247 (FHSS 902-928 MHz).

Revision A: To replace 15.207 AC Conducted Emissions data.

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.
 Canyon Park
 22116 23rd Drive S.E., Suite A
 Bothell, WA 98021-4413

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.19

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	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	Pass
15.247(b)(2)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

ISO/IEC 17025 Decision Rule

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

Modifications During Testing

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

Summary of Conditions

No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions

None

EQUIPMENT UNDER TEST (EUT)

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

Configuration 1

Device	Manufacturer	Model #	S/N
ORRNC	Itron	RN-EGM	335579339

Support Equipment:

Device	Manufacturer	Model #	S/N
Antenna	PCTEL	BOA9022NM-ITR	181489
Laptop	Dell	Latitude E6400	DQ8W1M1

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Proprietary FHSS
Operating Frequency Range:	902.3 – 926.9 MHz (83 channels, FSK 100kbps, GFSK 150kbps, 200kbps) 902.4 – 927.6 MHz (64 channels, FSK 150kbps, GFSK 300kbps, OFDM 600kbps)
Number of Hopping Channels:	83 or 64
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):	FSK 100kbps, 150kbps GFSK 150kbps, 200kbps, 300kbps OFDM 600kbps
Maximum Duty Cycle:	Assume 100% as worst case
Number of TX Chains:	1
Antenna Type(s) and Gain:	Omnidirectional, 2.6dBi
Beamforming Type:	NA
Antenna Connection Type:	External Connector (Professional Installation)
Nominal Input Voltage:	115VAC Nominal (85-264VAC supported)
Firmware / Software used for Test:	BrLoader v4.8.5.4 Certification GUI vUpdate2 Test FW11.0.51.1 GEN5EGM_REL1_BETA

EUT and Accessory Photo(s)



EUT

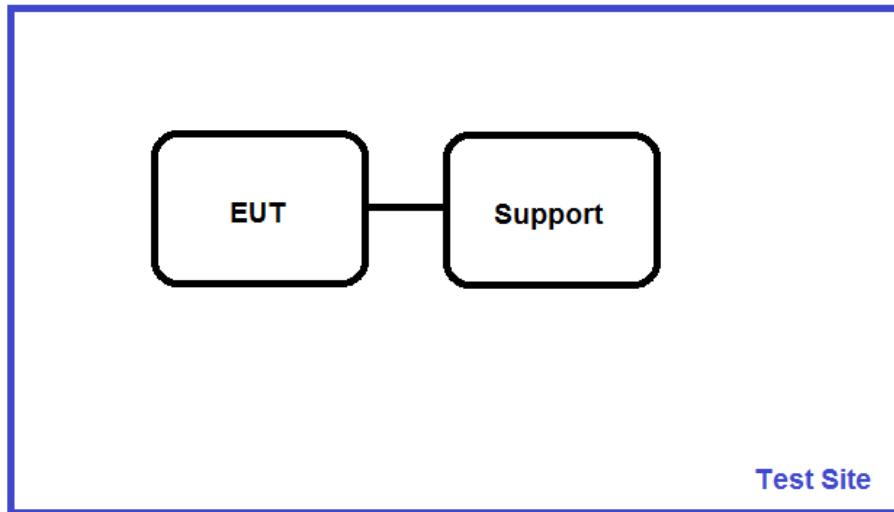


Support Equipment Photo(s)



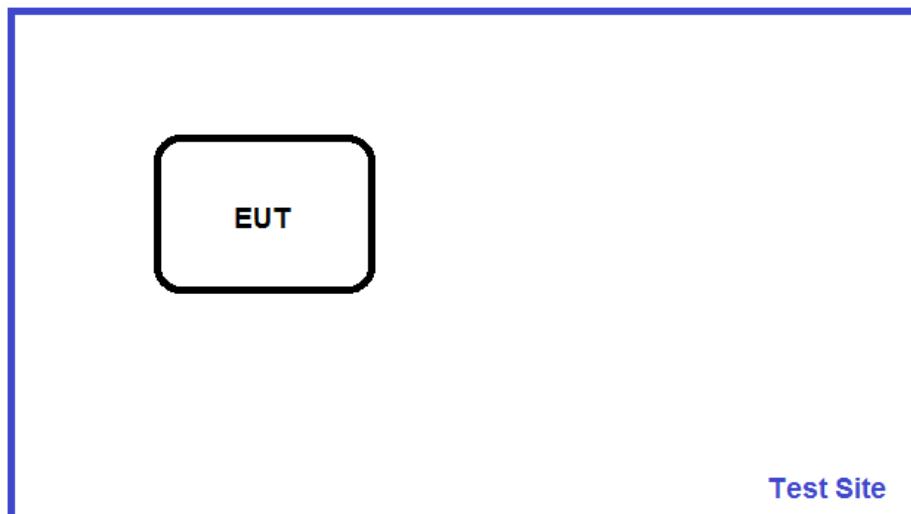
Block Diagram of Test Setup(s)

Test Setup Block Diagram



Conducted

Test Setup Block Diagram



Radiated

FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013)	Test Date(s):	1/5/2021
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 its rated output power.		

Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	41

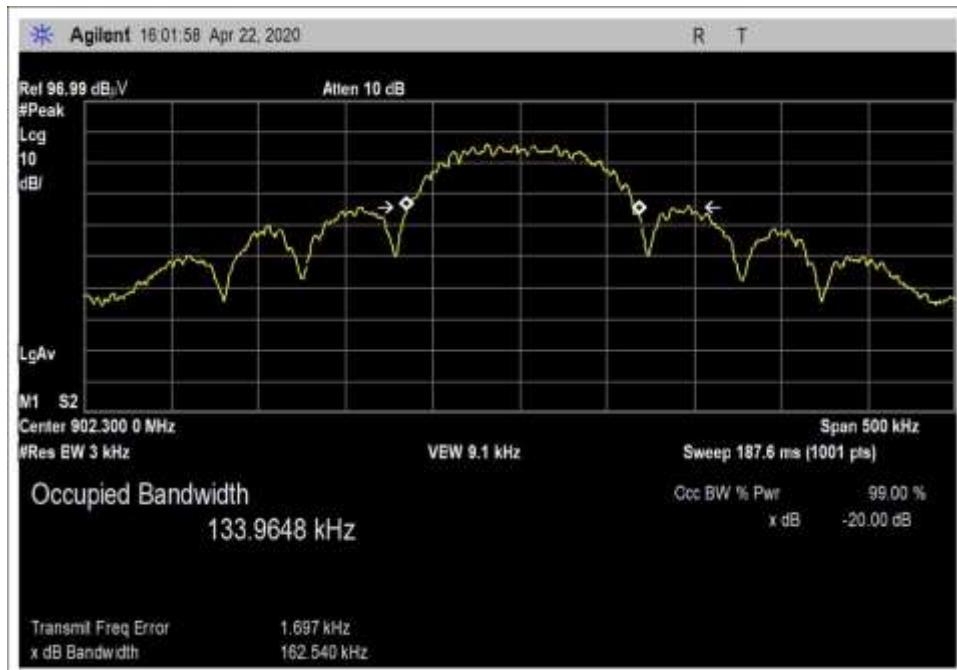
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2019	11/18/2021
P05748	Attenuator	Patternack	PE7004-20	3/4/2020	3/4/2022

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

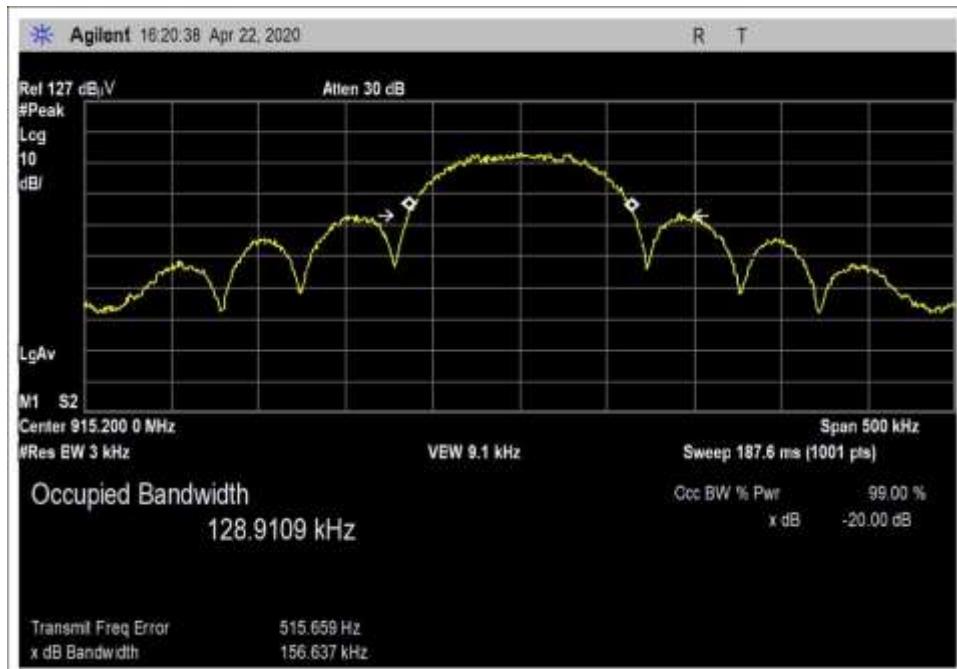
Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.3	1	FSK 100 kbps	165.5	≤500	Pass
915.2	1	FSK 100 kbps	156.6	≤500	Pass
926.9	1	FSK 100 kbps	161.1	≤500	Pass
902.4	1	FSK 150 kbps	192.8	≤500	Pass
915.2	1	FSK 150 kbps	193.1	≤500	Pass
927.6	1	FSK 150 kbps	191.2	≤500	Pass
902.3	1	GFSK 150 kbps	182.6	≤500	Pass
915.2	1	GFSK 150 kbps	180.6	≤500	Pass
926.9	1	GFSK 150 kbps	183.3	≤500	Pass
902.3	1	GFSK 200 kbps	241.7	≤500	Pass
915.2	1	GFSK 200 kbps	241.8	≤500	Pass
926.9	1	GFSK 200 kbps	241.8	≤500	Pass
902.4	1	GFSK 300 kbps	368.9	≤500	Pass
915.2	1	GFSK 300 kbps	364.2	≤500	Pass
927.6	1	GFSK 300 kbps	367.7	≤500	Pass
902.4	1	OFDM 600kbps	332.2	≤500	Pass
915.2	1	OFDM 600kbps	333.1	≤500	Pass
927.6	1	OFDM 600kbps	336.8	≤500	Pass

Plot(s)

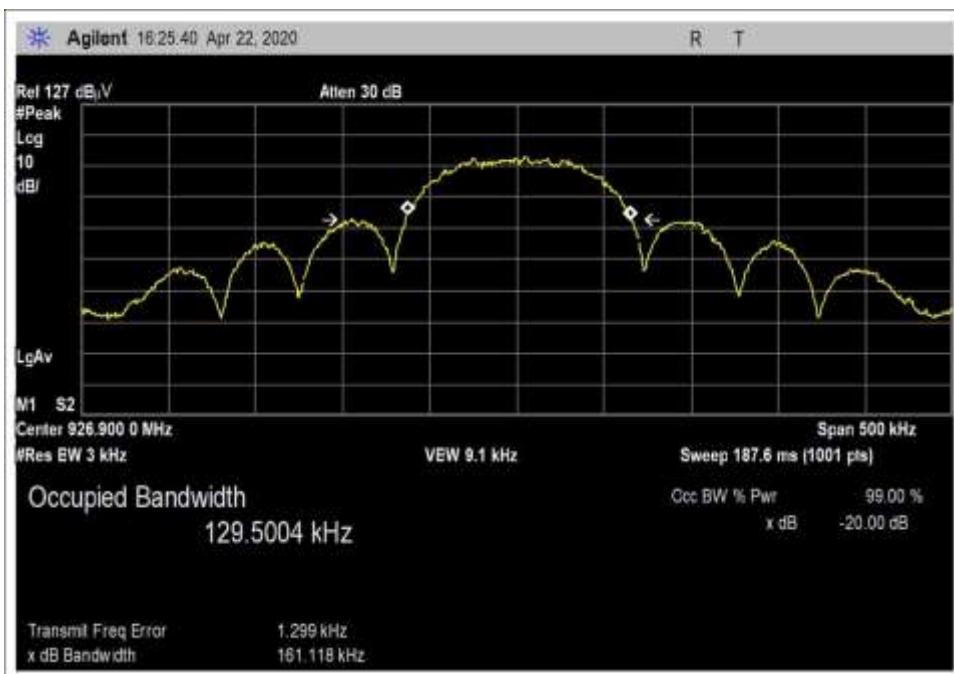
Note: At the time of testing, the date stamp on the plots below was set on a default setting and should read 1/5/2021



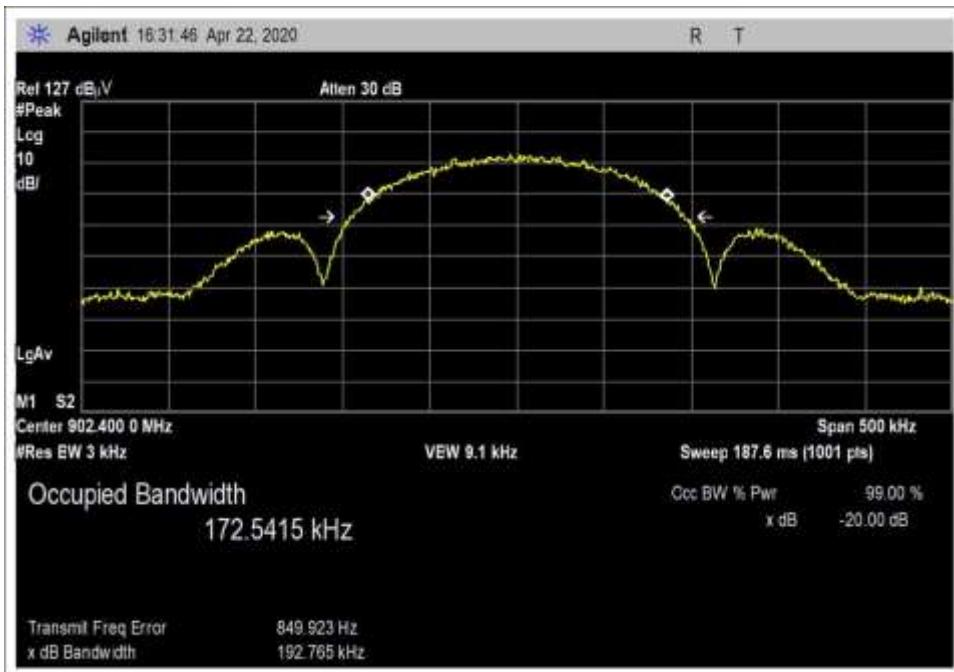
Low Channel, FSK, 100kbps



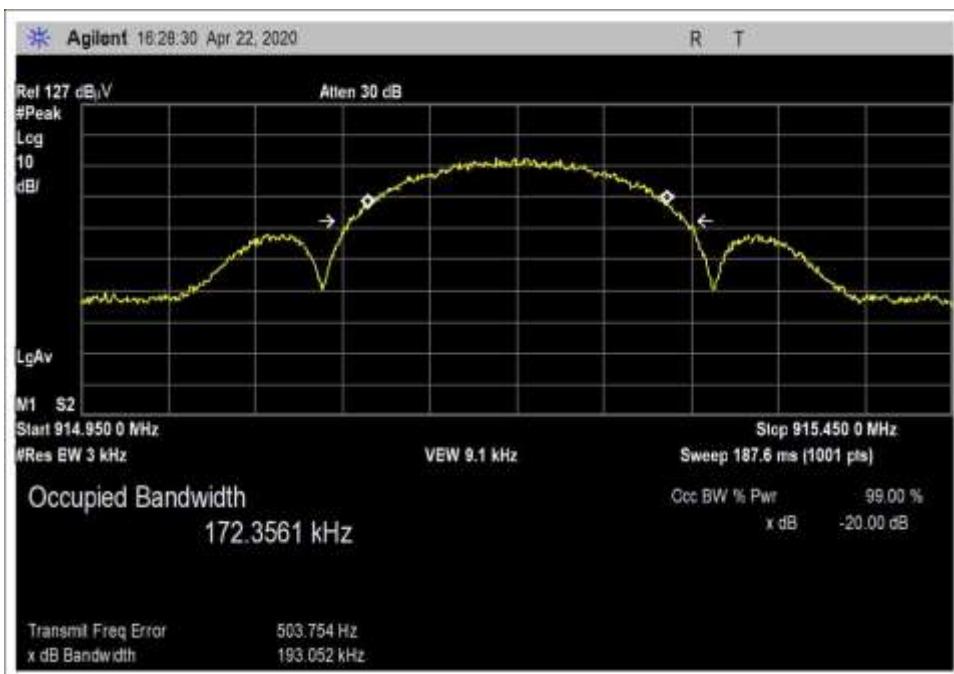
Middle Channel, FSK, 100kbps



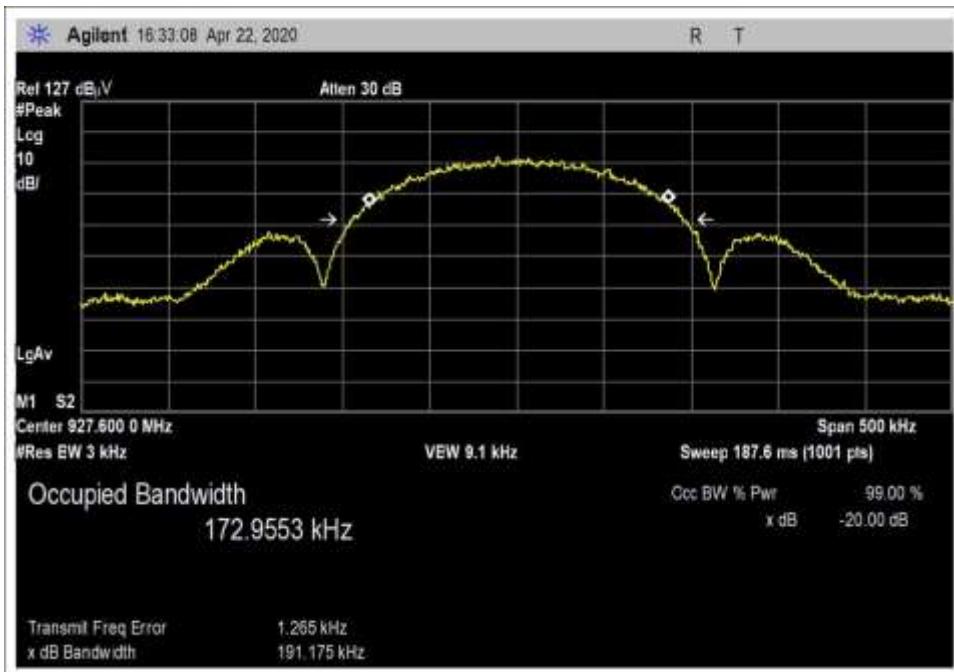
High Channel, FSK, 100kbps



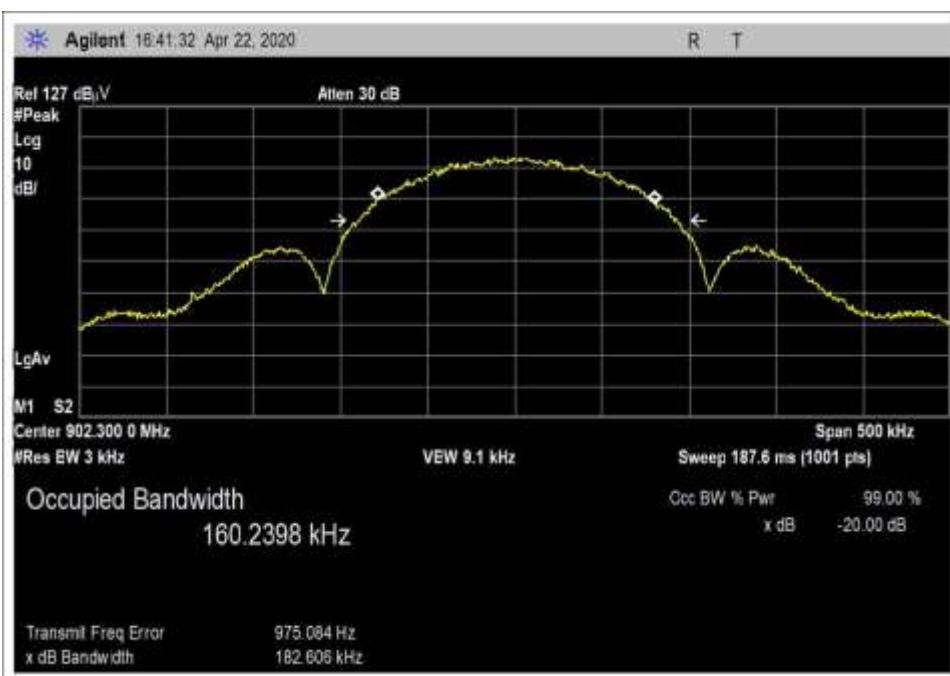
Low Channel, FSK, 150kbps



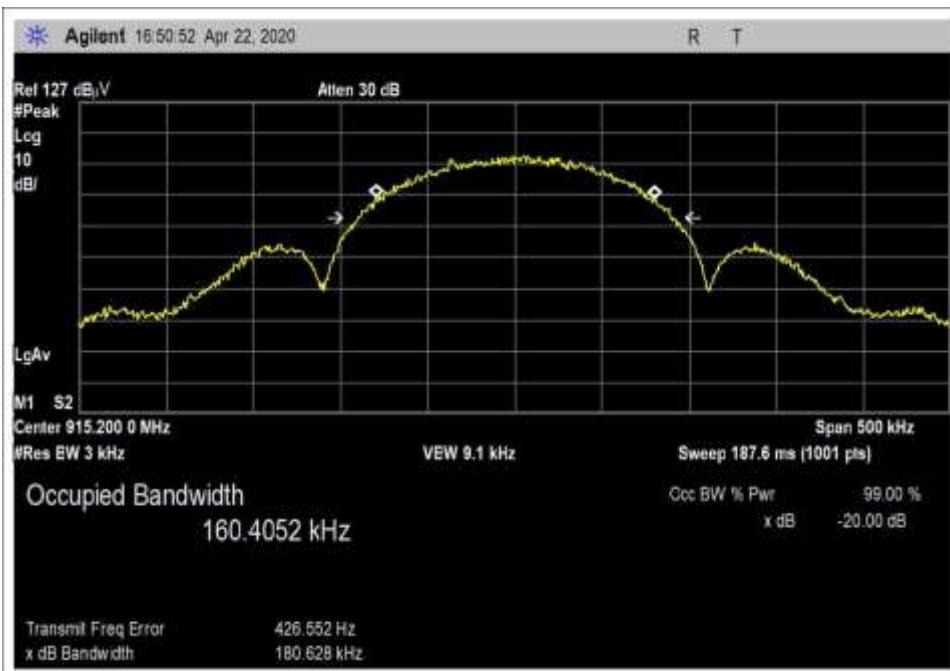
Middle Channel, FSK, 150kbps



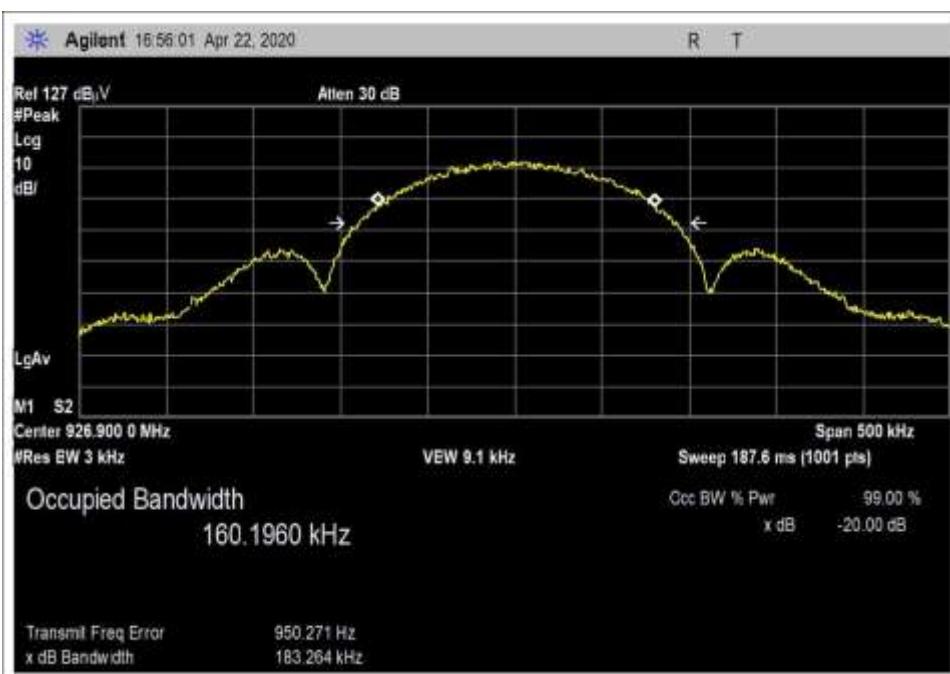
High Channel FSK, 150kbps



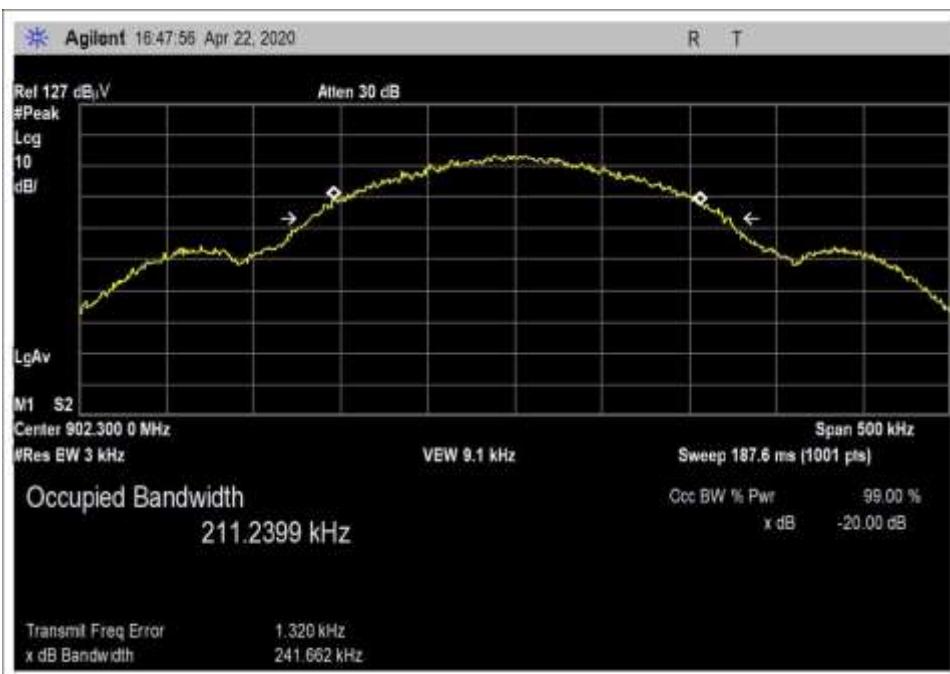
Low Channel, GFSK, 150kbps



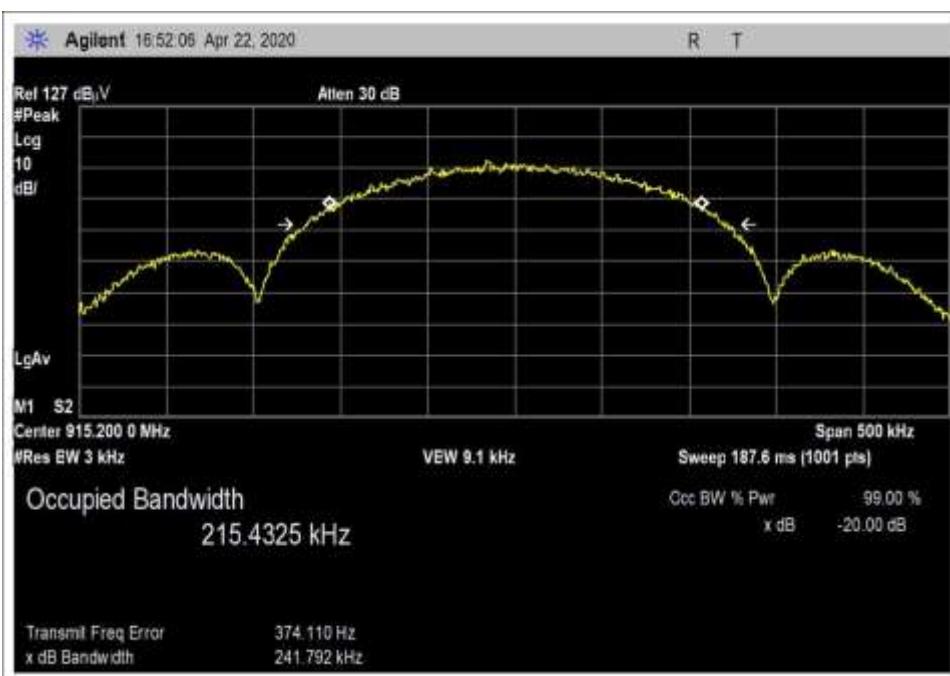
Middle Channel, GFSK, 150kbps



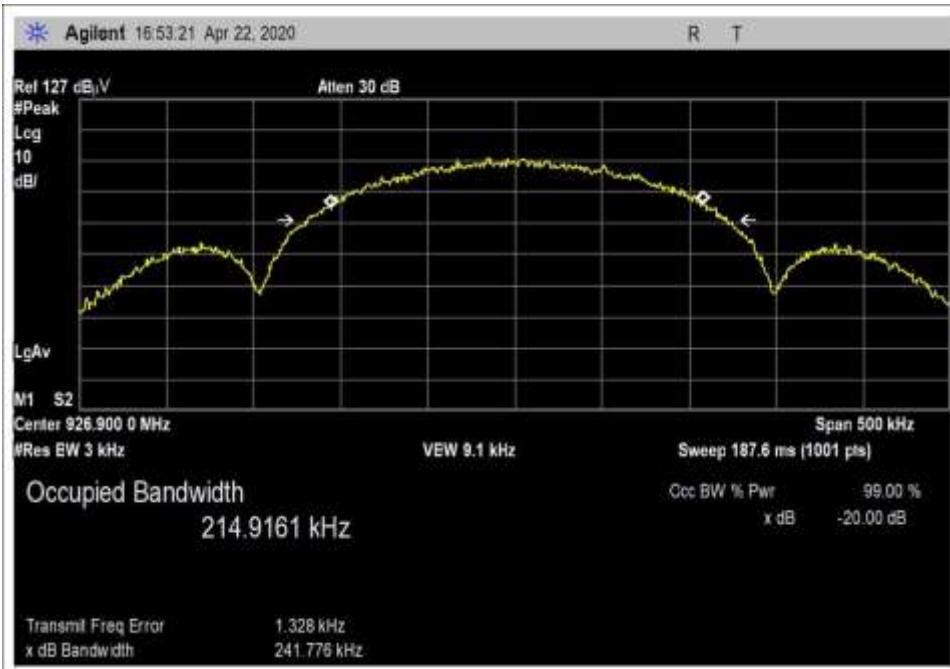
High Channel, GFSK, 150kbps



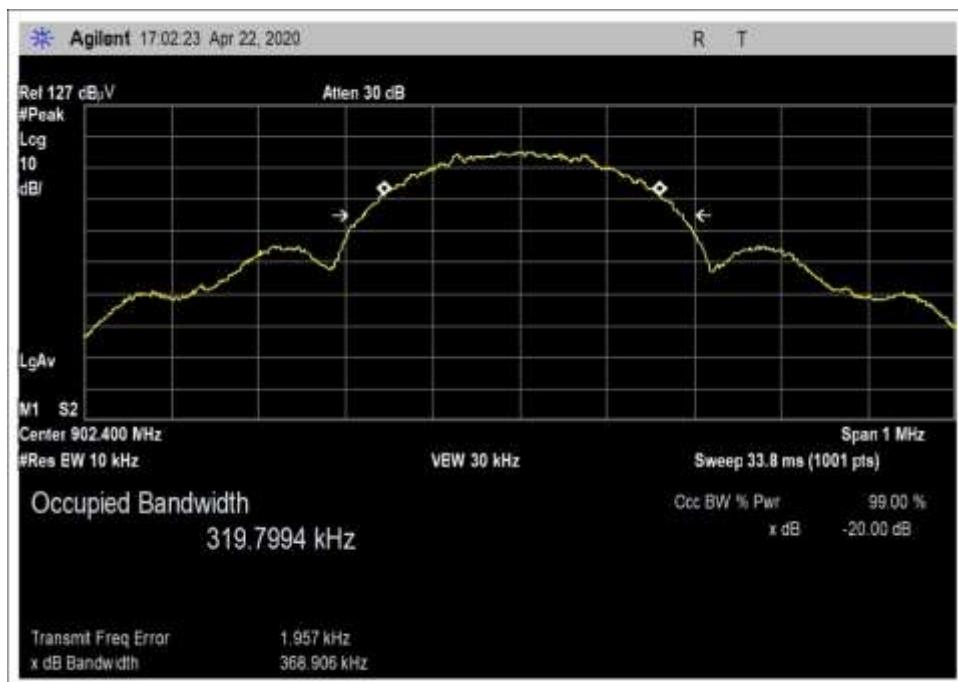
Low Channel, GFSK, 200kbps



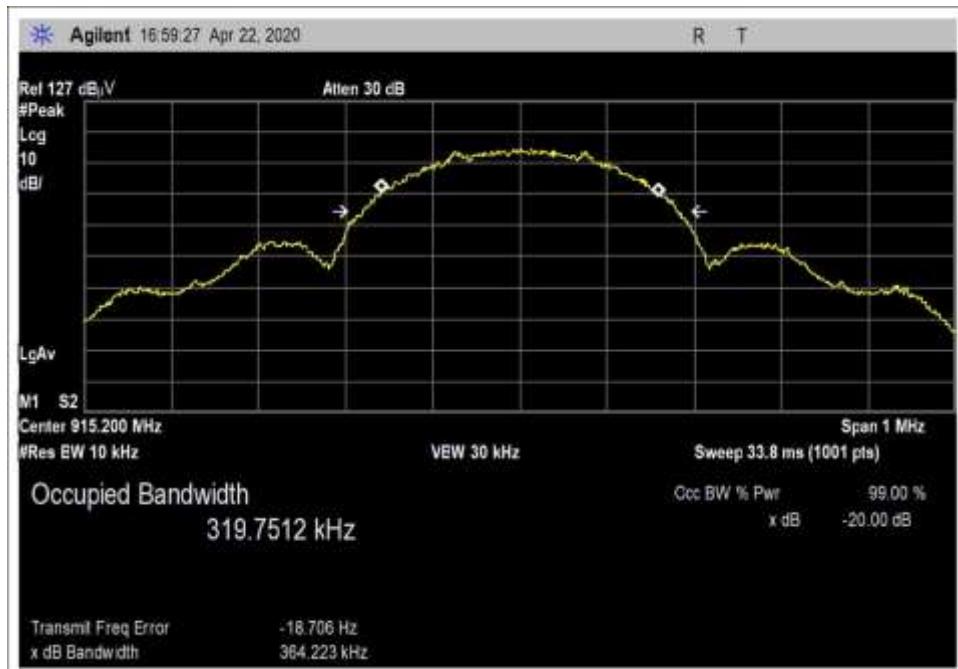
Middle Channel, GFSK, 200kbps



High Channel, GFSK,200kbps



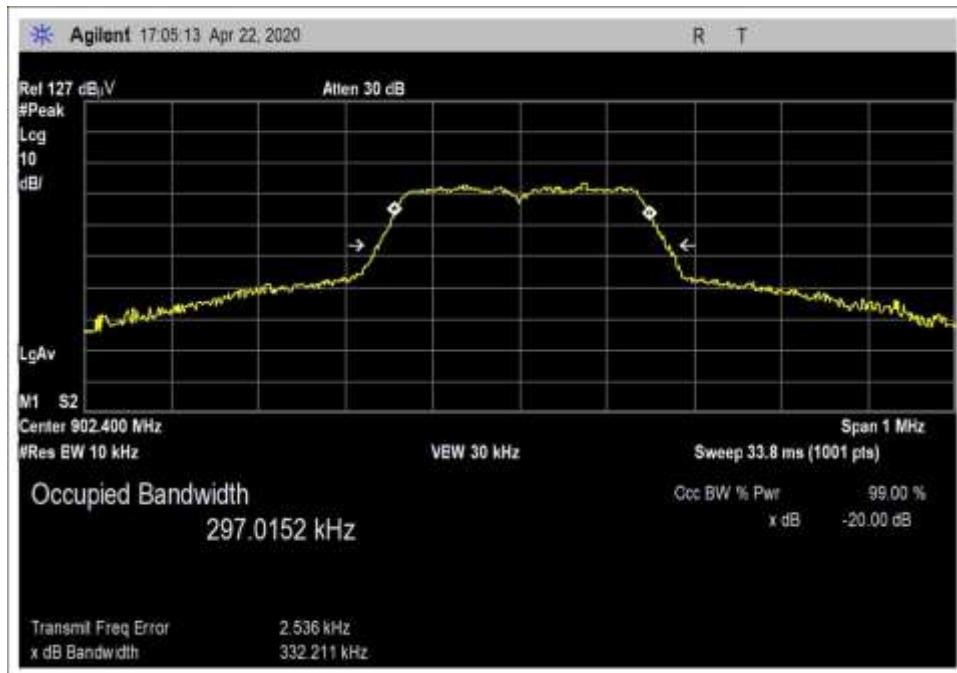
Low Channel, GFSK, 300kbps



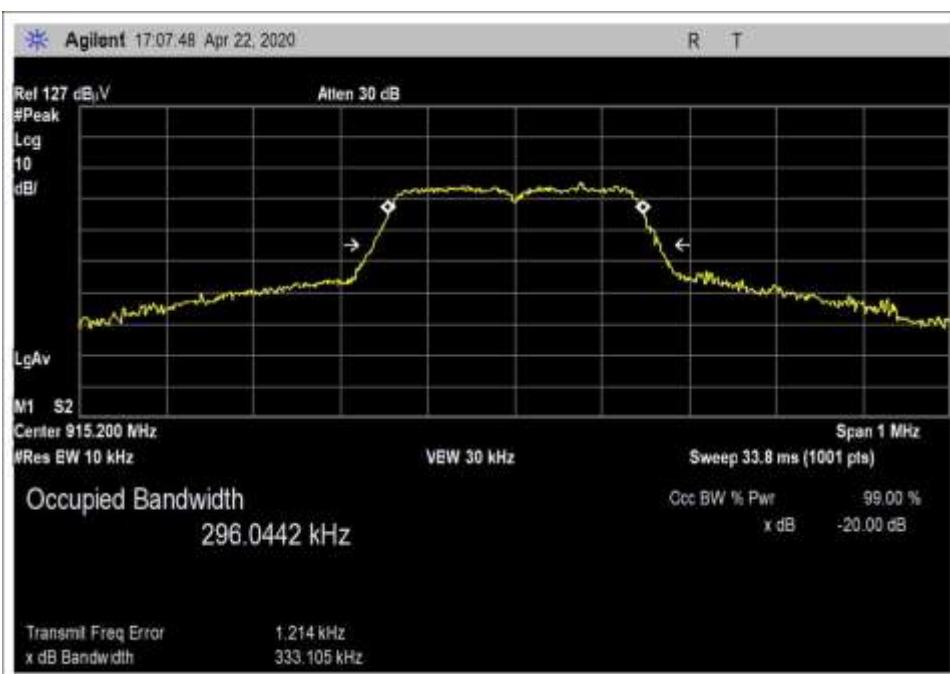
Middle Channel, GFSK, 300kbps



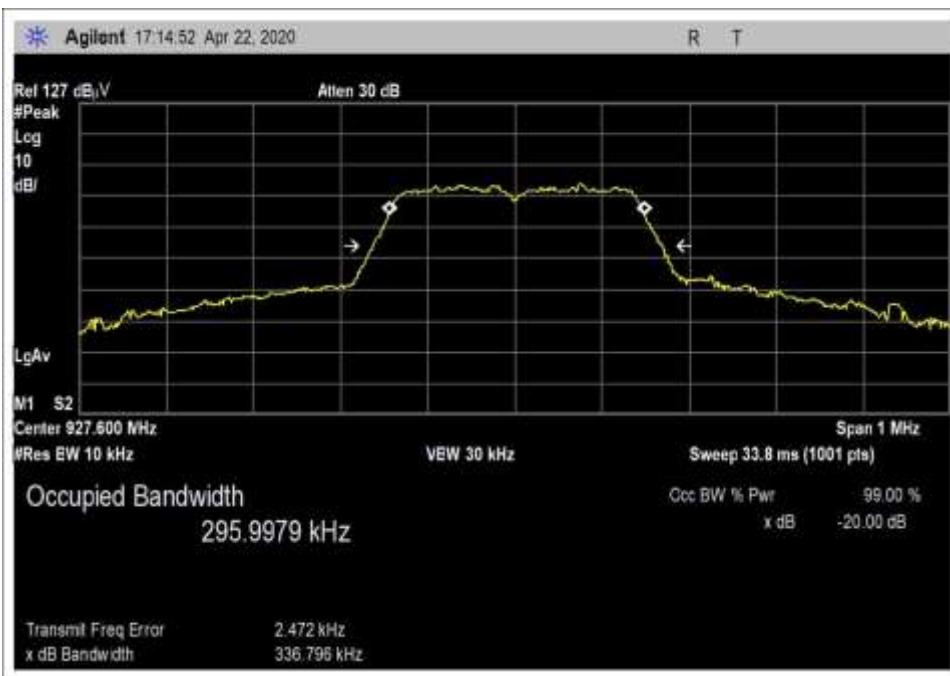
High Channel, GFSK, 300kbps



Low Channel, OFDM, 600kbps



Middle Channel, OFDM, 600kbps



High Channel, OFDM, 600kbps

15.247(a)(1) Carrier Separation

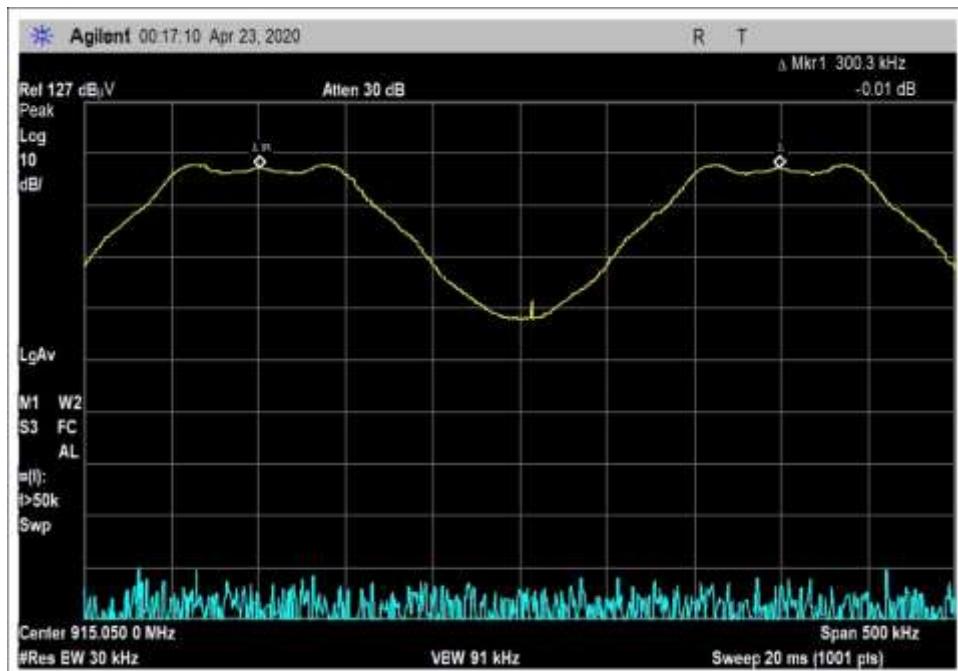
Test Data Summary

Limit applied: 20dB bandwidth of the hopping channel.

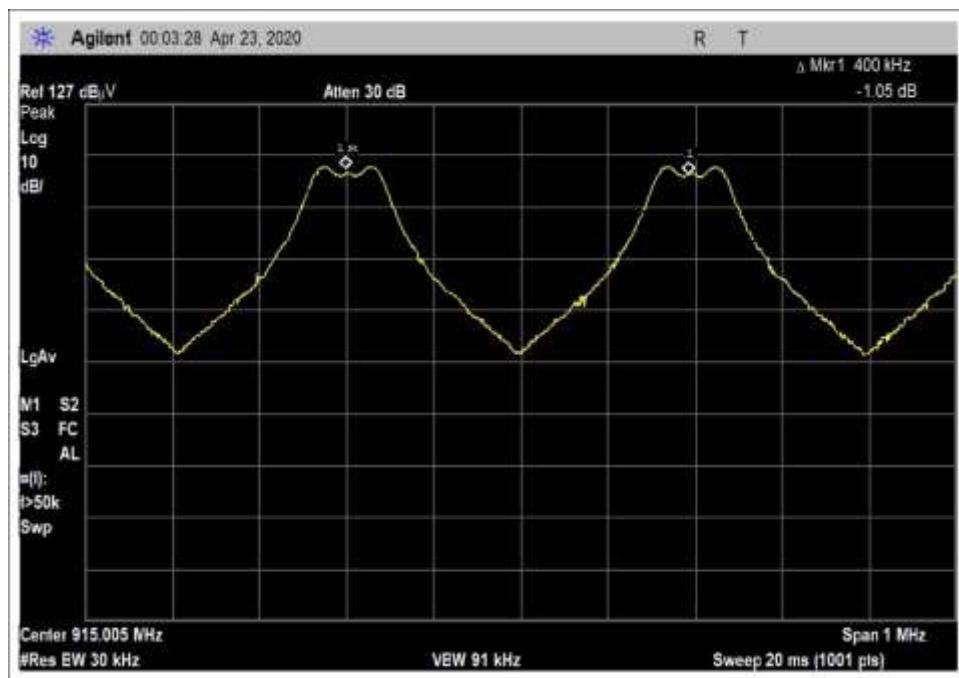
Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	FSK 100kbps / GFSK 150kbps, 200kbps	300	> 193.1	Pass
1	FSK 150kbps / GFSK 300kbps / OFDM 600kbps	400	> 368.9	Pass

*Note: Limit is worst case bandwidth for modes listed.

Plot(s)



300kHz

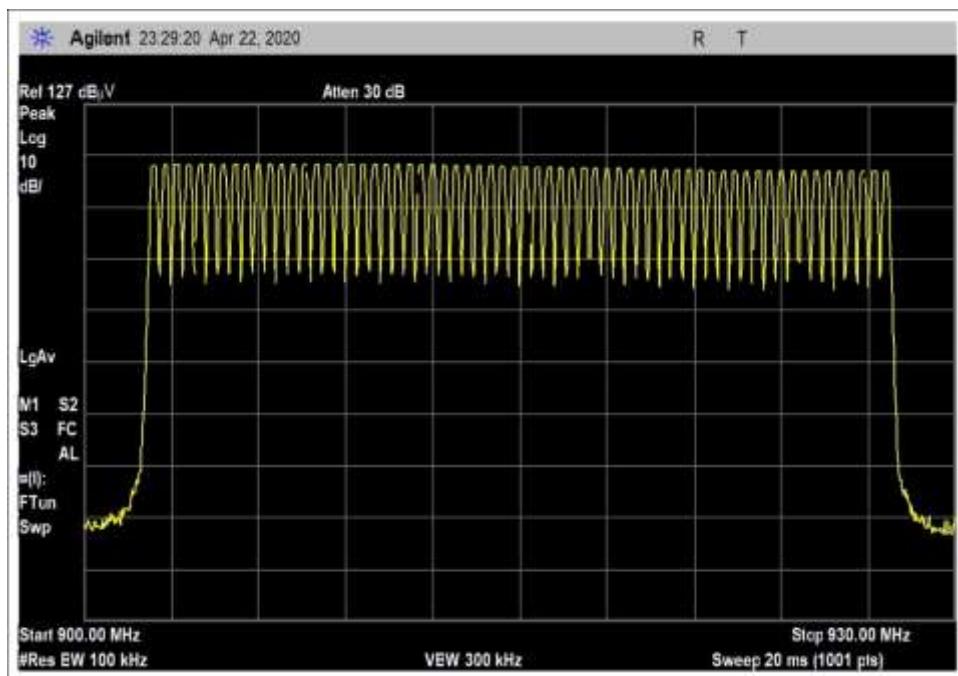


400kHz

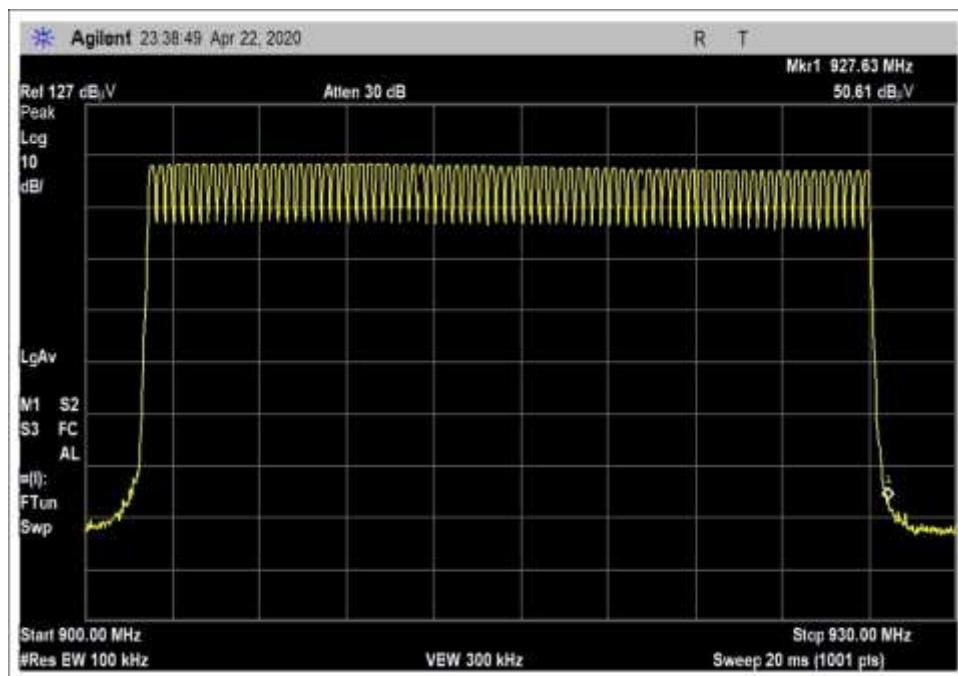
15.247(a)(1)(i) Number of Hopping Channels

Test Data Summary				
$Limit = \begin{cases} 50 \text{ Channels} & 20 \text{ dB BW} < 250 \text{ kHz} \\ 25 \text{ Channels} & 20 \text{ dB BW} \geq 250 \text{ kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
1	FSK 100kbps, 150kbps / GFSK 150kbps, 200kbps	83	≥ 50	Pass
1	GFSK 300kbps / OFDM 600KBPS	64	≥ 25	Pass

Plot(s)



64 Channel



83 Channel

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

Test Data Summary				
Observation Period, P_{obs} is derived from the following:				
$P_{obs} = \begin{cases} 20 \text{ Seconds} & 20 \text{ dB BW} < 250 \text{ kHz} \\ 10 \text{ Seconds} & 20 \text{ dB BW} \geq 250 \text{ kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (ms)	Limit (ms/ P_{obs})	Results
1	300kHz Spacing/83 Channel	140.2	≤ 400	Pass
1	400kHz Spacing/64 Channel	259.7	≤ 400	Pass

Note: Worst case reported.

Measured results are calculated as follows:

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

Actual Calculated Values: (300kHz/83 Channel):

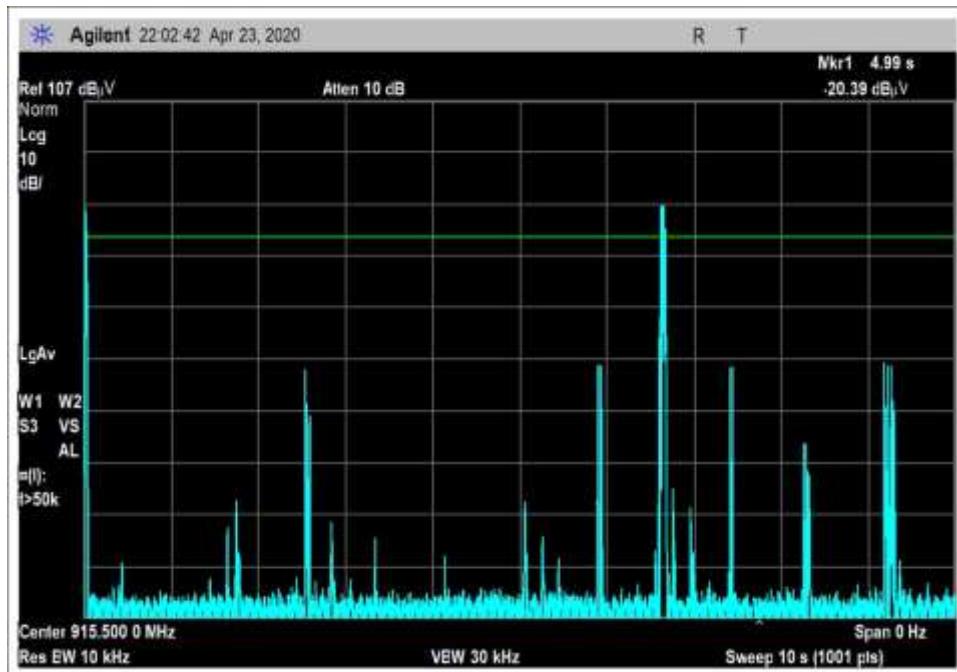
Parameter	Value
Observation Period (P_{obs}):	10s
Number of RF Bursts / P_{obs} :	2
On time of RF Burst:	70.1ms
Number of Control or other signals / P_{obs} :	0
On time of Control or other Signals:	0
Total Measured On Time:	140.2ms

Actual Calculated Values: (400kHz/64 Channel):

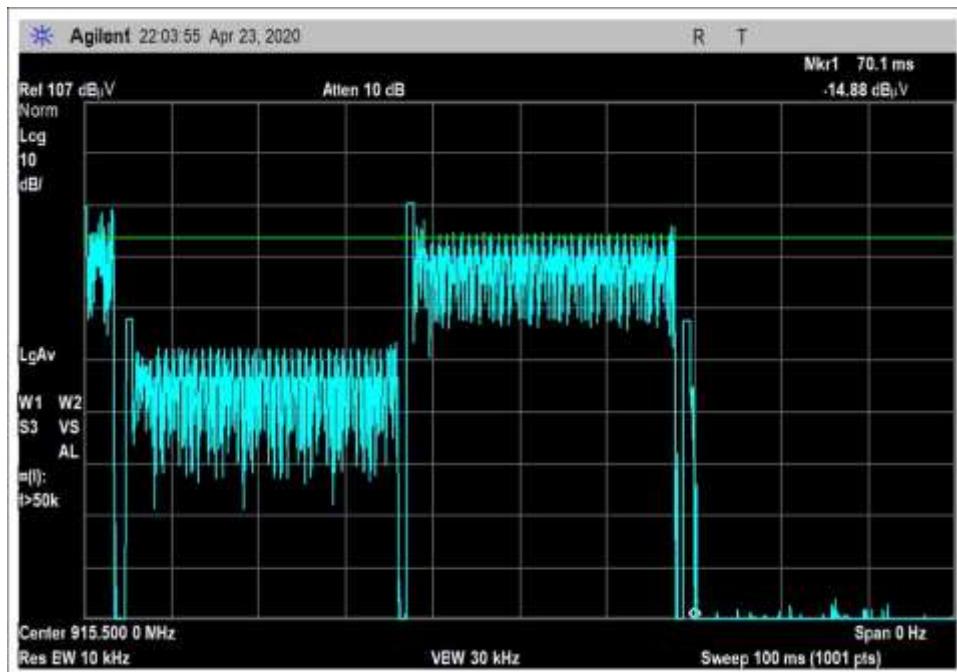
Parameter	Value
Observation Period (P_{obs}):	20s
Number of RF Bursts / P_{obs} :	7
On time of RF Burst:	37.1ms
Number of Control or other signals / P_{obs} :	0
On time of Control or other Signals:	0
Total Measured On Time:	259.7

Plot(s)

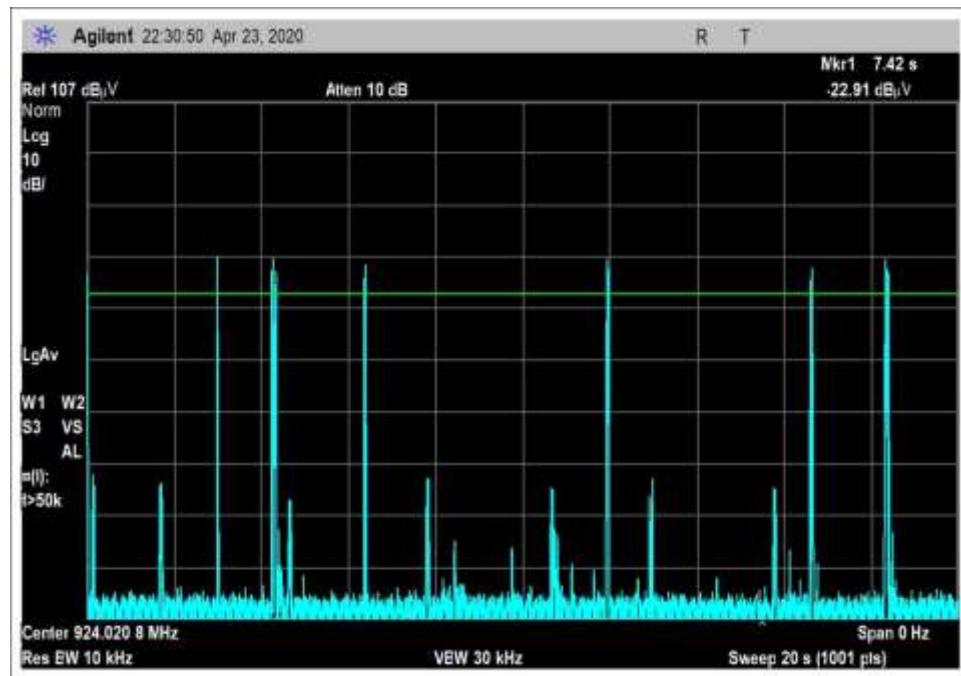
Note: At the time of testing, the date stamp on the plots below was set on a default setting and should read 1/5/2021



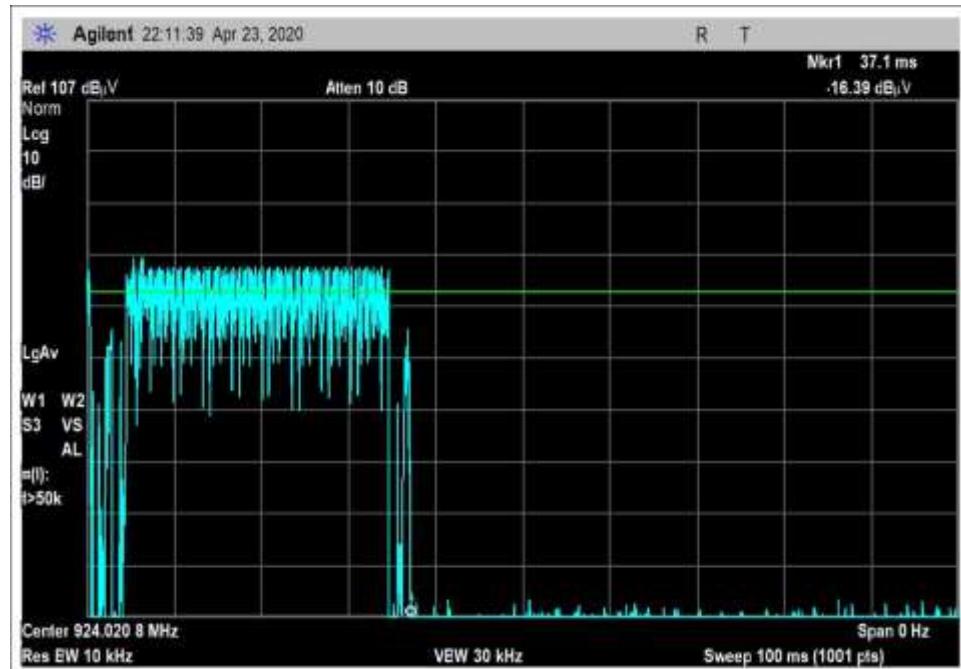
300kHz



300kHz



400kHz

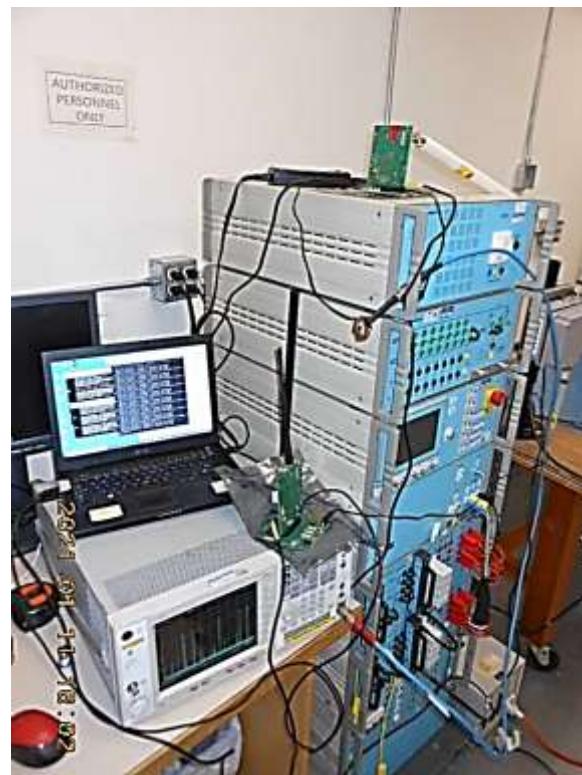


400kHz

Test Setup Photo(s)



Conducted Measurements



Time of Occupancy

15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013)	Test Date(s):	1/5/2021
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 its rated output power.		

Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	41

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2019	11/18/2021
P05748	Attenuator	Pasternack	PE7004-20	3/4/2020	3/4/2022

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V _{Minimum} (dBm)	V _{Nominal} (dBm)	V _{Maximum} (dBm)	Max Deviation from V _{Nominal} (dB)
902.3	FSK 100 kbps / 1	28.8	28.8	28.7	0.1
915.2	FSK 100 kbps / 1	28.4	28.4	28.4	0
926.9	FSK 100 kbps / 1	27.7	27.7	27.6	0.1
902.4	FSK 150 kbps / 1	28.7	28.8	28.8	0.1
915.2	FSK 150 kbps / 1	28.3	28.3	28.2	0.1
927.6	FSK 150 kbps / 1	27.6	27.7	27.7	0.1
902.3	GFSK 150 kbps / 1	28.7	28.8	28.8	0.1
915.2	GFSK 150 kbps / 1	28.3	28.3	28.3	0
926.9	GFSK 150 kbps / 1	27.7	27.6	27.6	0.1
902.3	GFSK 200 kbps / 1	28.7	28.7	28.7	0
915.2	GFSK 200 kbps / 1	28.2	28.2	28.1	0.1
926.9	GFSK 200 kbps / 1	27.6	27.6	27.5	0.1
902.4	GFSK 300 kbps / 1	28.7	28.7	28.8	0.1
915.2	GFSK 300 kbps / 1	28.1	28.2	28.1	0.1
927.6	GFSK 300 kbps / 1	27.7	27.7	27.7	0
902.4	OFDM 600 kbps / 1	28.4	28.5	28.5	0.1
915.2	OFDM 600 kbps / 1	28.2	28.2	28.2	0
927.6	OFDM 600 kbps / 1	27.4	27.4	27.4	0

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

Parameter Definitions:

Measurements performed at input voltage Vnominal $\pm 15\%$.

Parameter	Value
V _{Nominal} :	115
V _{Minimum} :	98
V _{Maximum} :	132

Test Data Summary - RF Conducted Measurement					
$Limit = \begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} & \geq 50 \text{ Channels} \\ 24\text{dBm Conducted}/30\text{dBm EIRP} & < 50 \text{ Channels} \text{ (min 25)} \end{cases}$					
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.3	FSK 100 kbps	Omnidirectional / 2.6dBi	28.8	≤ 30	Pass
915.2	FSK 100 kbps	Omnidirectional / 2.6dBi	28.4	≤ 30	Pass
926.9	FSK 100 kbps	Omnidirectional / 2.6dBi	27.7	≤ 30	Pass
902.4	FSK 150 kbps	Omnidirectional / 2.6dBi	28.8	≤ 30	Pass
915.2	FSK 150 kbps	Omnidirectional / 2.6dBi	28.3	≤ 30	Pass
927.6	FSK 150 kbps	Omnidirectional / 2.6dBi	27.7	≤ 30	Pass
902.3	GFSK 150 kbps	Omnidirectional / 2.6dBi	28.8	≤ 30	Pass
915.2	GFSK 150 kbps	Omnidirectional / 2.6dBi	28.3	≤ 30	Pass
926.9	GFSK 150 kbps	Omnidirectional / 2.6dBi	27.6	≤ 30	Pass
902.3	GFSK 200 kbps	Omnidirectional / 2.6dBi	28.7	≤ 30	Pass
915.2	GFSK 200 kbps	Omnidirectional / 2.6dBi	28.2	≤ 30	Pass
926.9	GFSK 200 kbps	Omnidirectional / 2.6dBi	27.6	≤ 30	Pass
902.4	GFSK 300 kbps	Omnidirectional / 2.6dBi	28.7	≤ 30	Pass
915.2	GFSK 300 kbps	Omnidirectional / 2.6dBi	28.2	≤ 30	Pass
927.6	GFSK 300 kbps	Omnidirectional / 2.6dBi	27.7	≤ 30	Pass
902.4	OFDM 600 kbps	Omnidirectional / 2.6dBi	28.5	≤ 30	Pass
915.2	OFDM 600 kbps	Omnidirectional / 2.6dBi	28.2	≤ 30	Pass
927.6	OFDM 600 kbps	Omnidirectional / 2.6dBi	27.4	≤ 30	Pass

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 #: **104631** Date: 1/18/2021
 Test Type: **Conducted Emissions** Time: 10:10:36
 Tested By: Matt Harrison Sequence#: 7
 Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
 Temperature: 23°C
 Relative Humidity: 41%
 Pressure: 101.6kPa

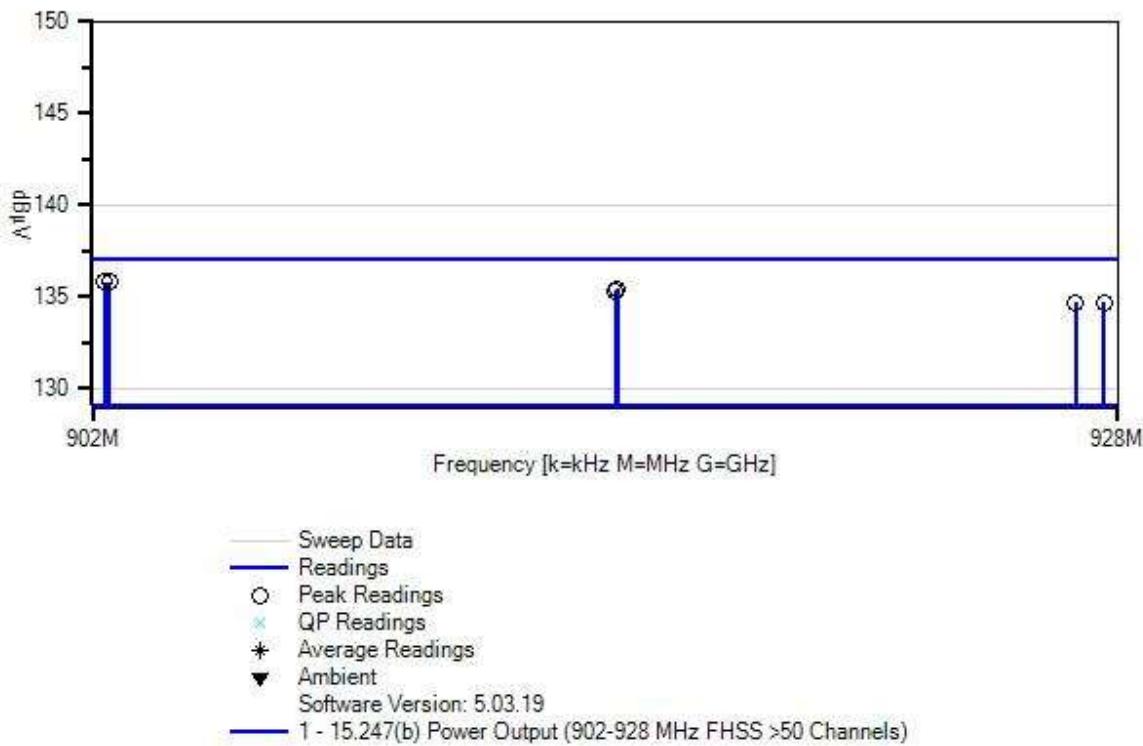
Test Method: ANSI C63.10 (2013)

Frequency Range: 902-928MHz

Test Setup:

The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power.

FSK Fixed RBW

Itron, Inc. WO#: 104631 Sequence#: 7 Date: 1/18/2021
 15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 120V 60Hz Antenna Port

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
T2	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T3	ANP07229	Attenuator	PE7004-20	10/2/2019	10/2/2021

Measurement Data:

Reading listed by margin.							Test Lead: Antenna Port				
#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant	
1	902.315M	115.2	+0.5	+0.0	+20.1		+0.0	135.8	137.0	-1.2	Anten
								FSK 100			
2	902.425M	115.2	+0.5	+0.0	+20.1		+0.0	135.8	137.0	-1.2	Anten
								FSK 150			
3	915.225M	114.8	+0.5	+0.0	+20.1		+0.0	135.4	137.0	-1.6	Anten
								FSK 100			
4	915.170M	114.7	+0.5	+0.0	+20.1		+0.0	135.3	137.0	-1.7	Anten
								FSK 150			
5	926.920M	114.1	+0.5	+0.0	+20.1		+0.0	134.7	137.0	-2.3	Anten
								FSK 100			
6	927.645M	114.1	+0.5	+0.0	+20.1		+0.0	134.7	137.0	-2.3	Anten
								FSK 150			



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 #: **104631** Date: 1/18/2021
Test Type: **Conducted Emissions** Time: 11:29:03
Tested By: Matt Harrison Sequence#: 8
Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

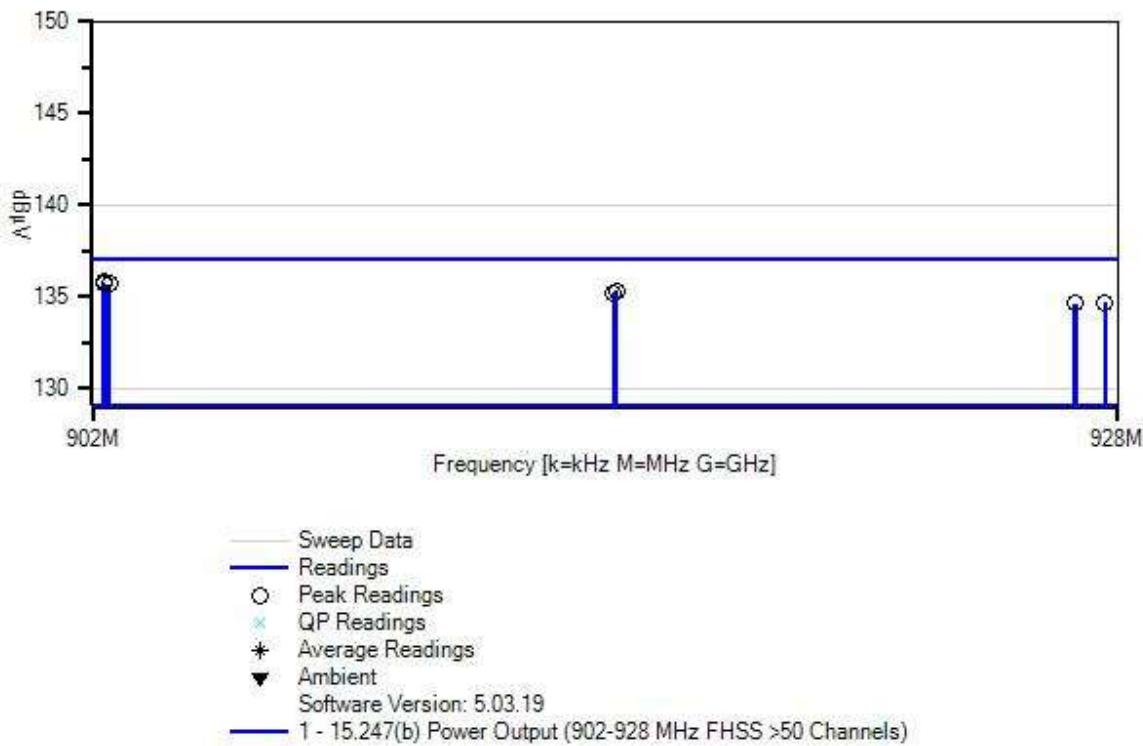
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 23°C Relative Humidity: 41% Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 902-928MHz
Test Setup: The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power.

GFSK Fixed RBW

Itron, Inc. WO#: 104631 Sequence#: 8 Date: 1/18/2021
 15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 120V 60Hz Antenna Port

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
T2	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T3	ANP07229	Attenuator	PE7004-20	10/2/2019	10/2/2021

Measurement Data:			Reading listed by margin.				Test Lead: Antenna Port				
#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	902.270M	115.2	+0.5	+0.0	+20.1		+0.0	135.8	137.0	-1.2	Anten
									GFSK150		
2	902.300M	115.1	+0.5	+0.0	+20.1		+0.0	135.7	137.0	-1.3	Anten
									GFSK200		
3	902.420M	115.1	+0.5	+0.0	+20.1		+0.0	135.7	137.0	-1.3	Anten
									GFSK300		
4	915.185M	114.7	+0.5	+0.0	+20.1		+0.0	135.3	137.0	-1.7	Anten
									GFSK150		
5	915.130M	114.6	+0.5	+0.0	+20.1		+0.0	135.2	137.0	-1.8	Anten
									GFSK200		
6	915.110M	114.6	+0.5	+0.0	+20.1		+0.0	135.2	137.0	-1.8	Anten
									GFSK300		
7	927.665M	114.1	+0.5	+0.0	+20.1		+0.0	134.7	137.0	-2.3	Anten
									GFSK300		
8	926.915M	114.0	+0.5	+0.0	+20.1		+0.0	134.6	137.0	-2.4	Anten
									GFSK200		
9	926.885M	114.0	+0.5	+0.0	+20.1		+0.0	134.6	137.0	-2.4	Anten
									GFSK150		



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 #: **104631** Date: 1/18/2021
Test Type: **Conducted Emissions** Time: 12:27:34
Tested By: Matt Harrison Sequence#: 9
Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

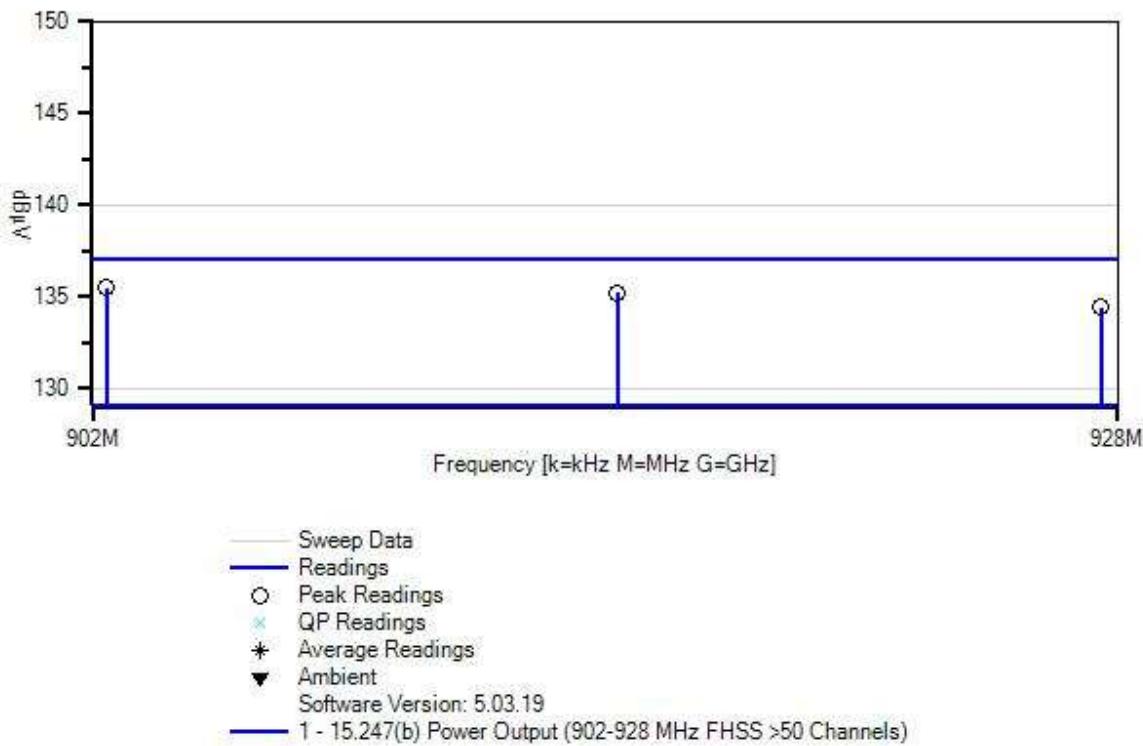
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 23°C Relative Humidity: 41% Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 902-928MHz
Test Setup: The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power.

OFDM FHSS Fixed RBW

Itron, Inc. WO#: 104631 Sequence#: 9 Date: 1/18/2021
 15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 120V 60Hz Antenna Port

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T2	ANP07229	Attenuator	PE7004-20	10/2/2019	10/2/2021

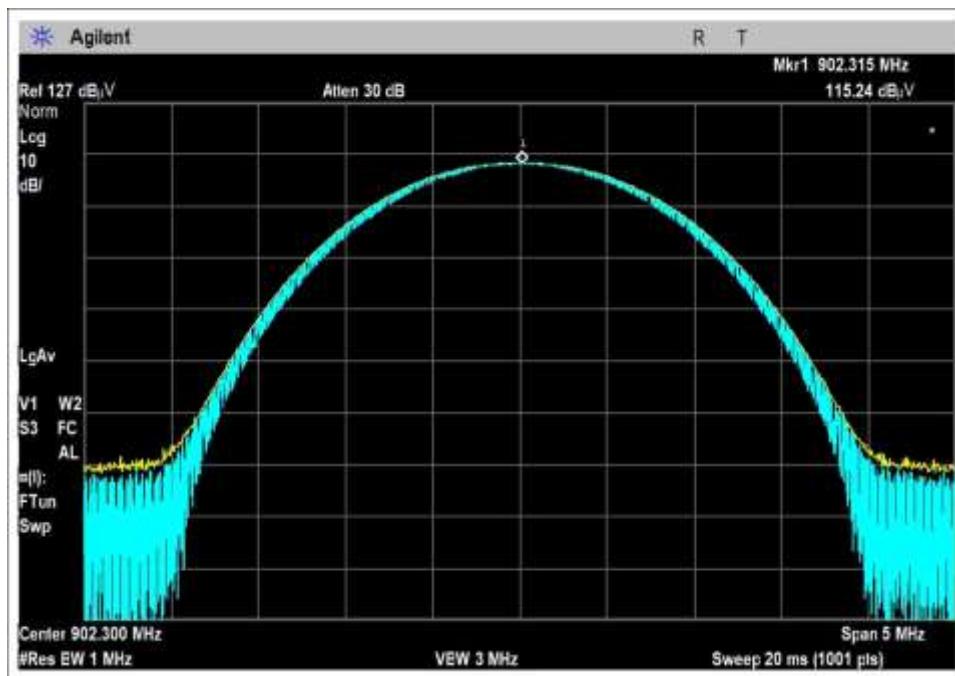
Measurement Data:

Reading listed by margin.

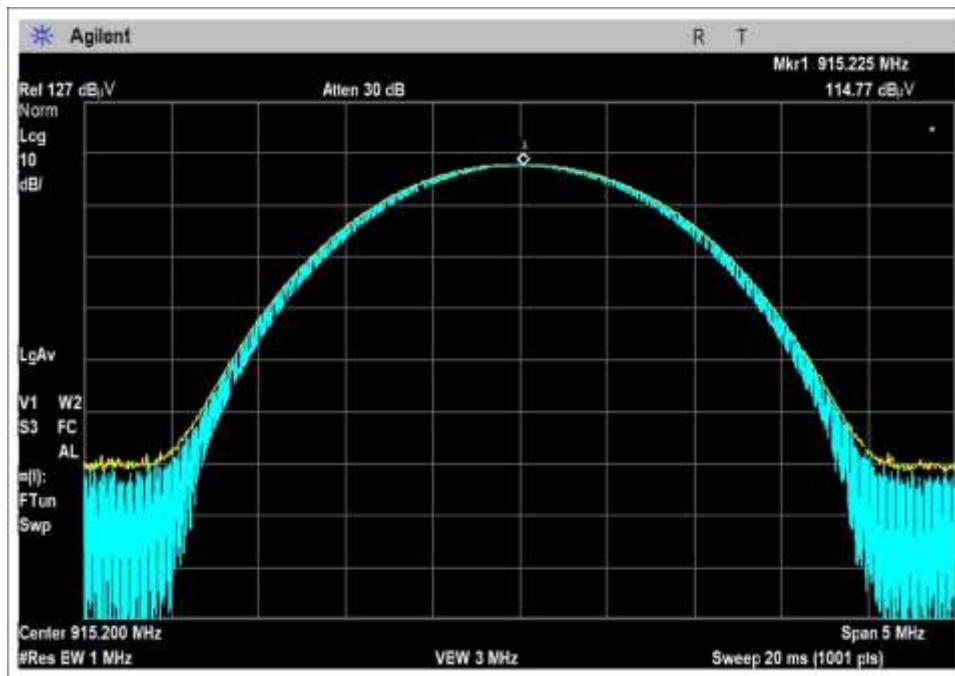
Test Lead: Antenna Port

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	902.350M	114.9	+0.5	+20.1		+0.0	135.5	137.0	-1.5	Anten
2	915.205M	114.6	+0.5	+20.1		+0.0	135.2	137.0	-1.8	Anten
3	927.550M	113.8	+0.5	+20.1		+0.0	134.4	137.0	-2.6	Anten

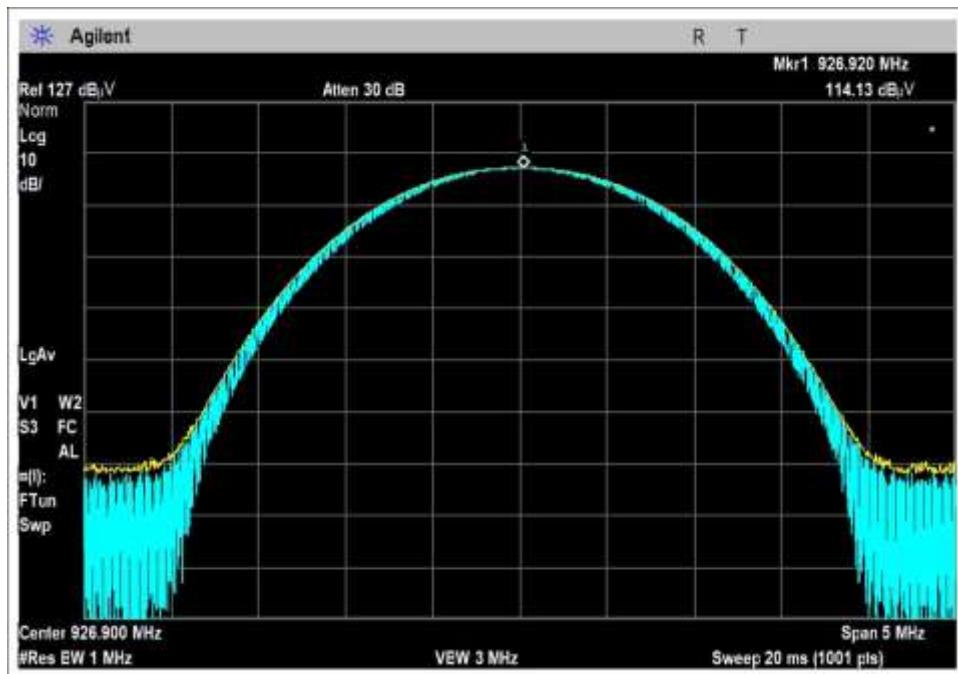
Plots



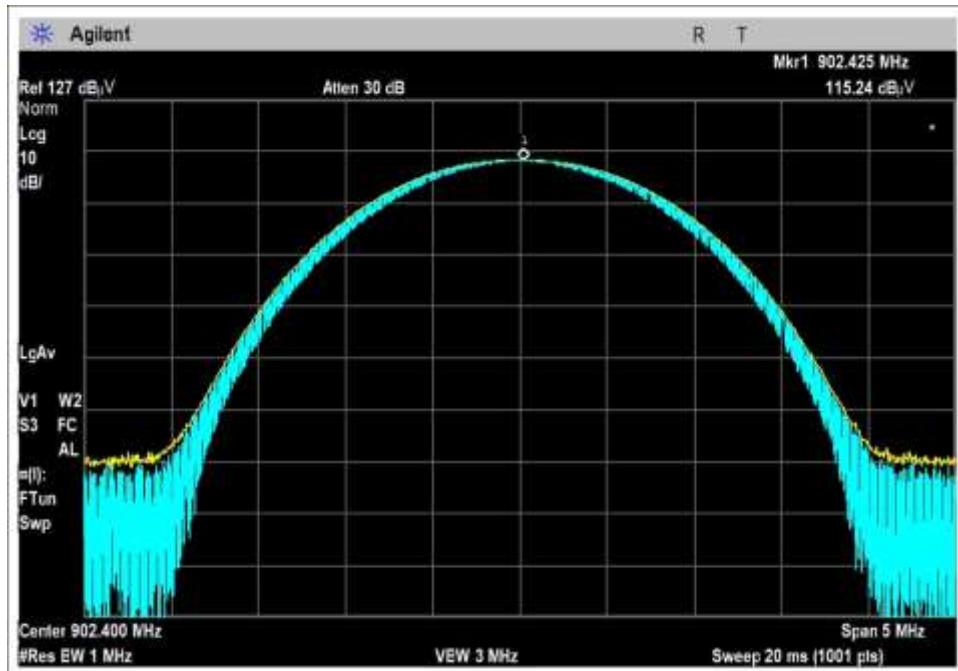
Low Channel, FSK, 100kbps



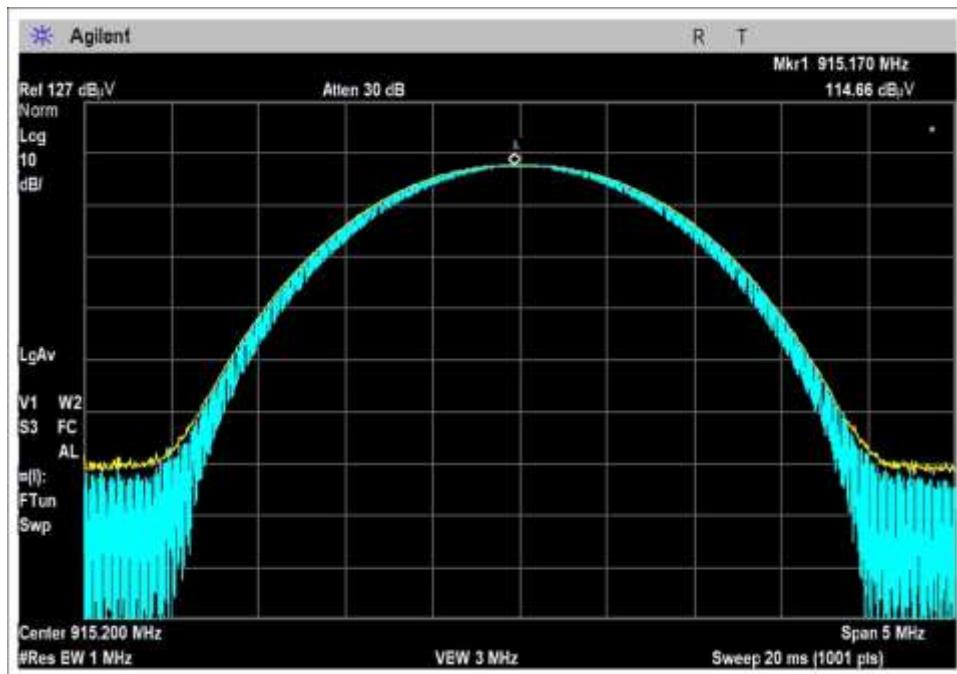
Middle Channel, FSK, 100kbps



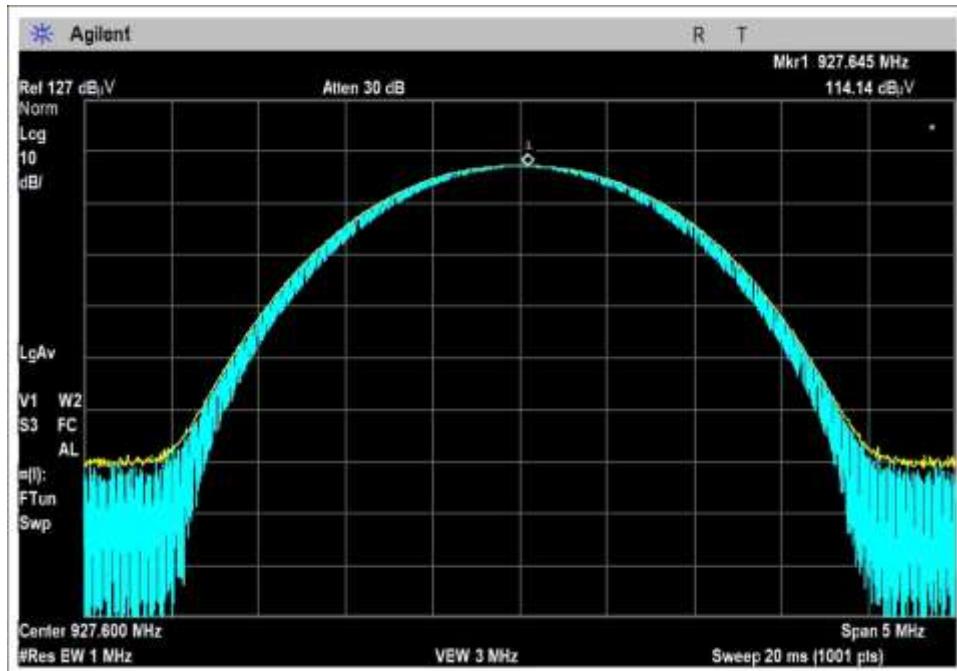
High Channel, FSK, 100kbps



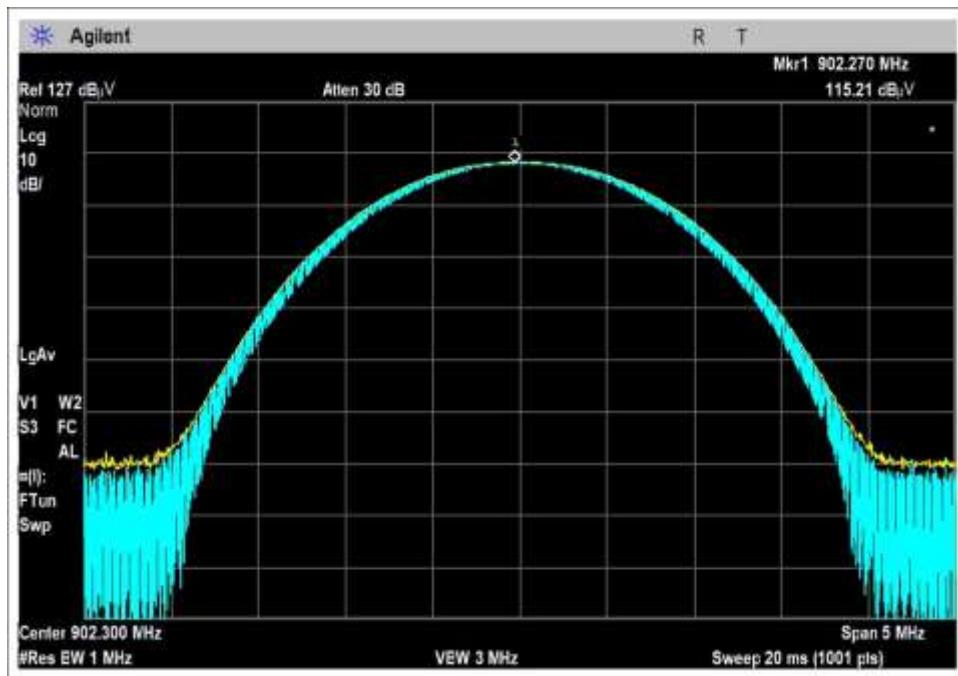
Low Channel, FSK, 150kbps



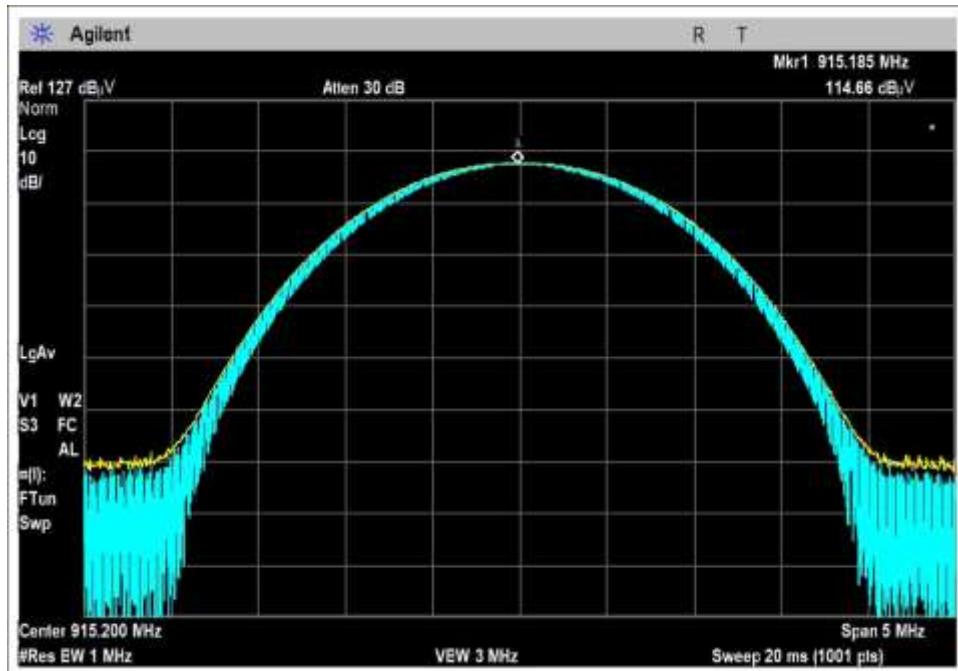
Middle Channel, FSK, 150kbps



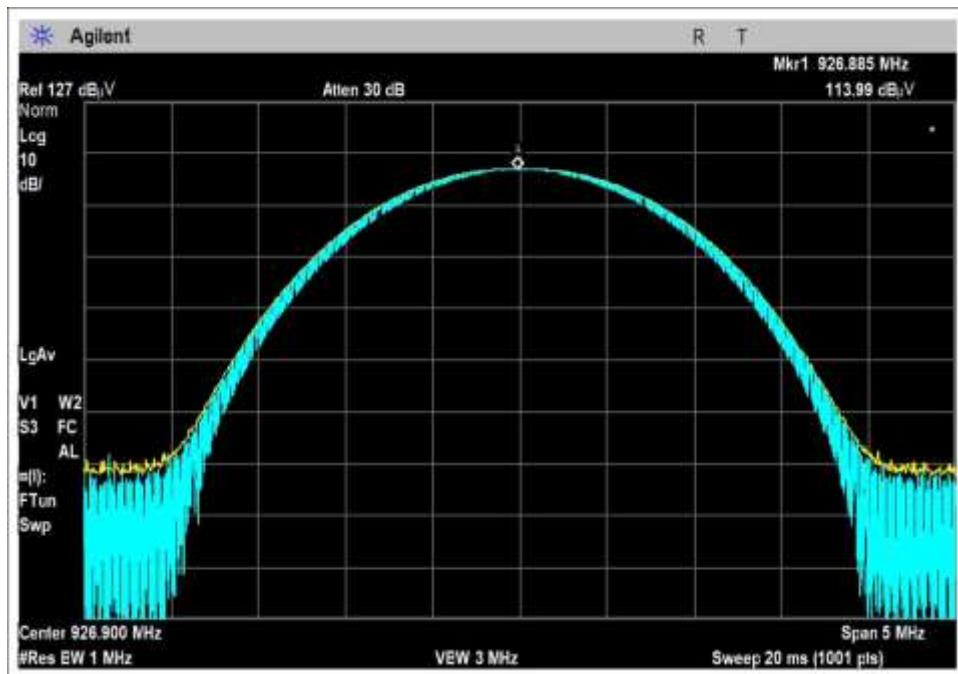
High Channel, FSK, 150kbps



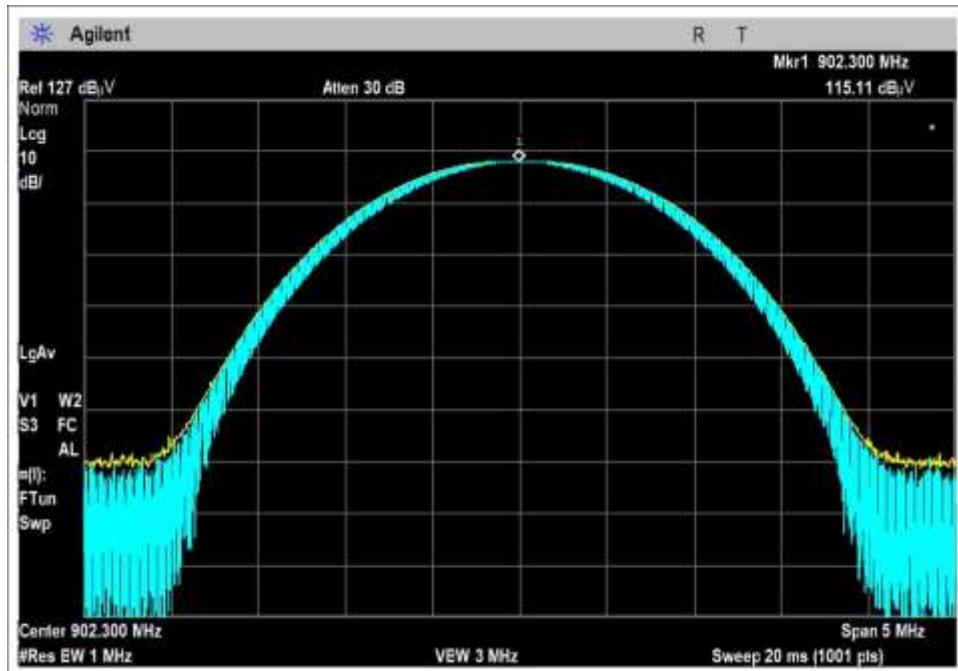
Low Channel, GFSK, 150kbps



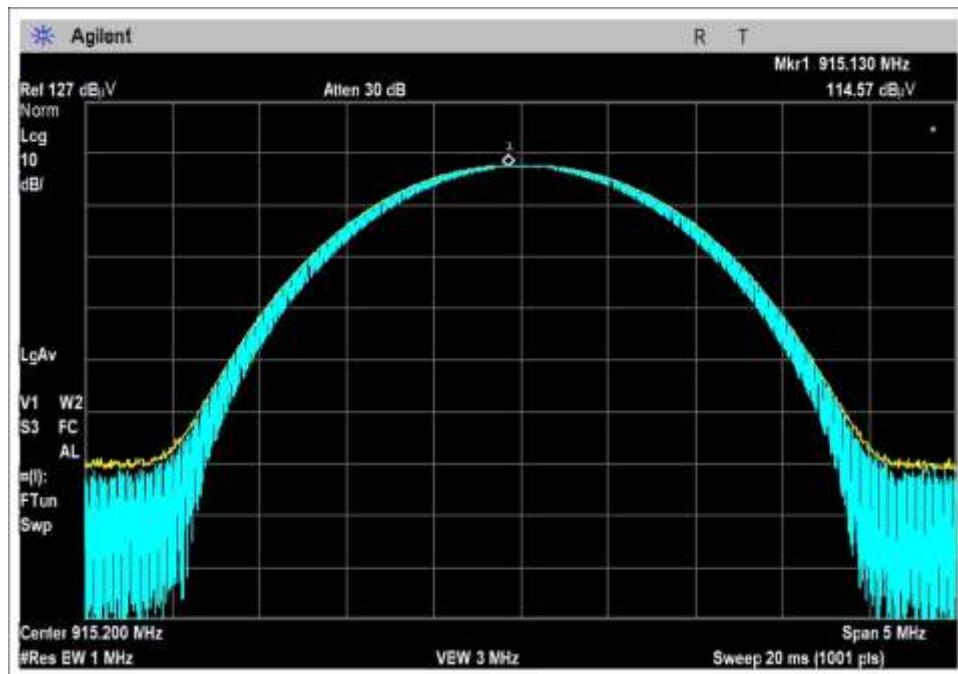
Middle Channel, GFSK, 150kbps



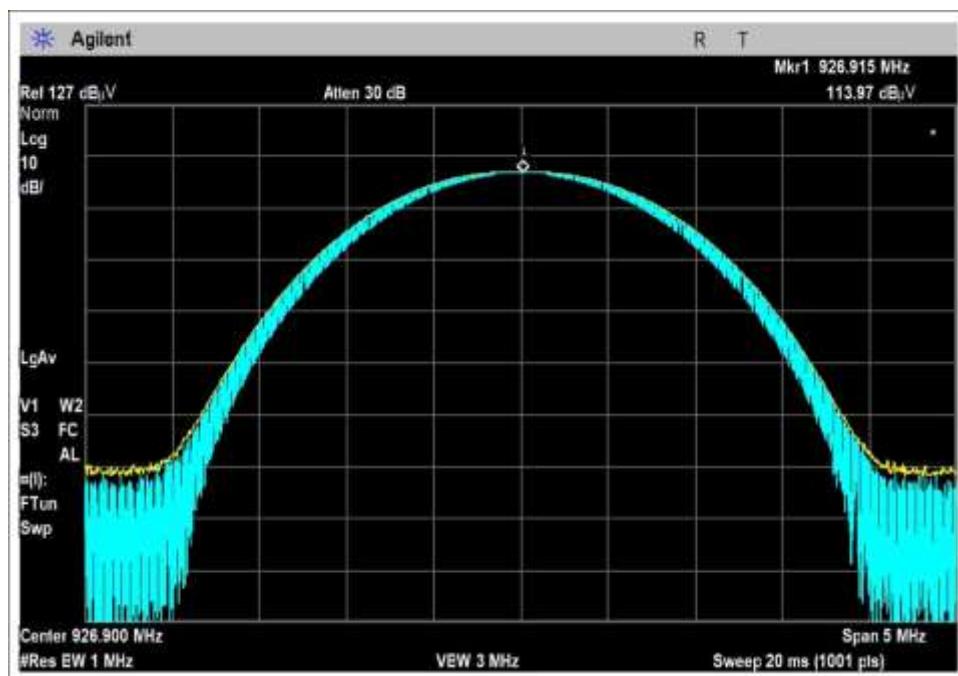
High Channel, GFSK, 150kbps



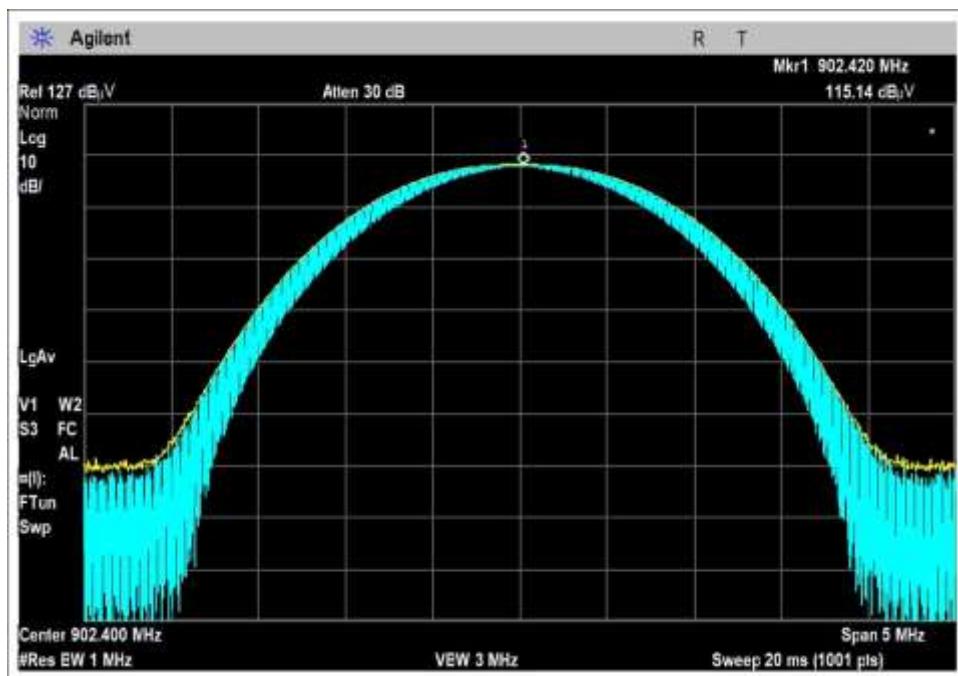
Low Channel, GFSK, 200kbps



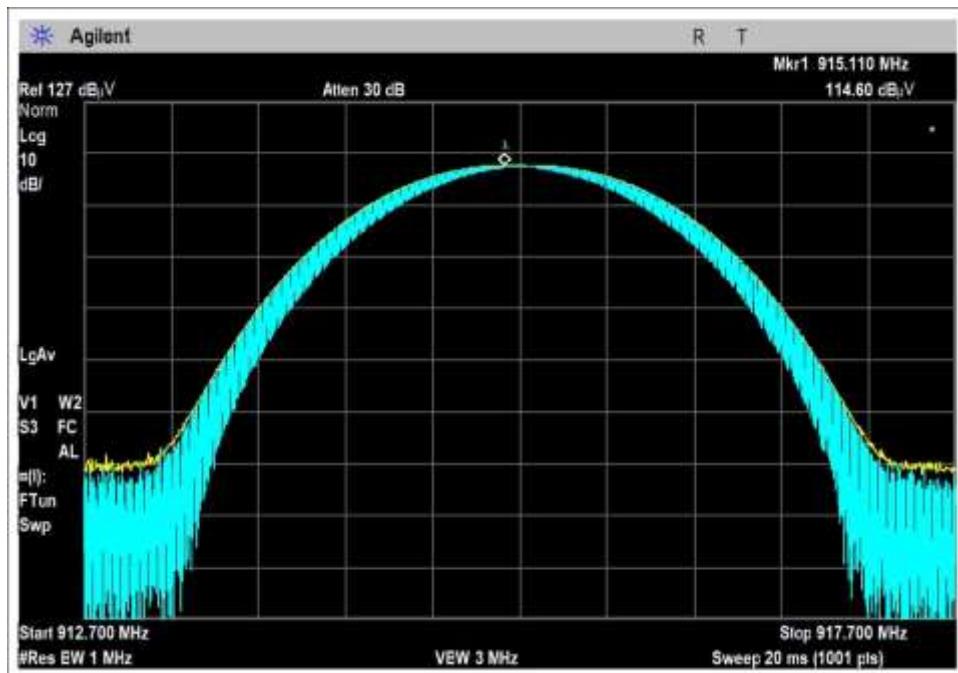
Middle Channel, GFSK, 200kbps



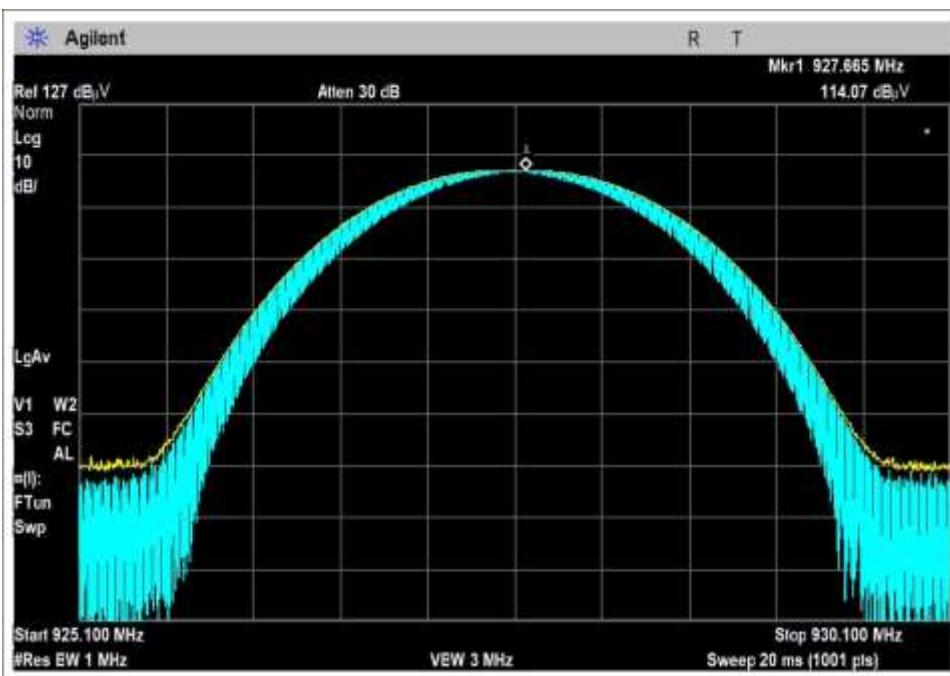
High Channel, GFSK, 200kbps



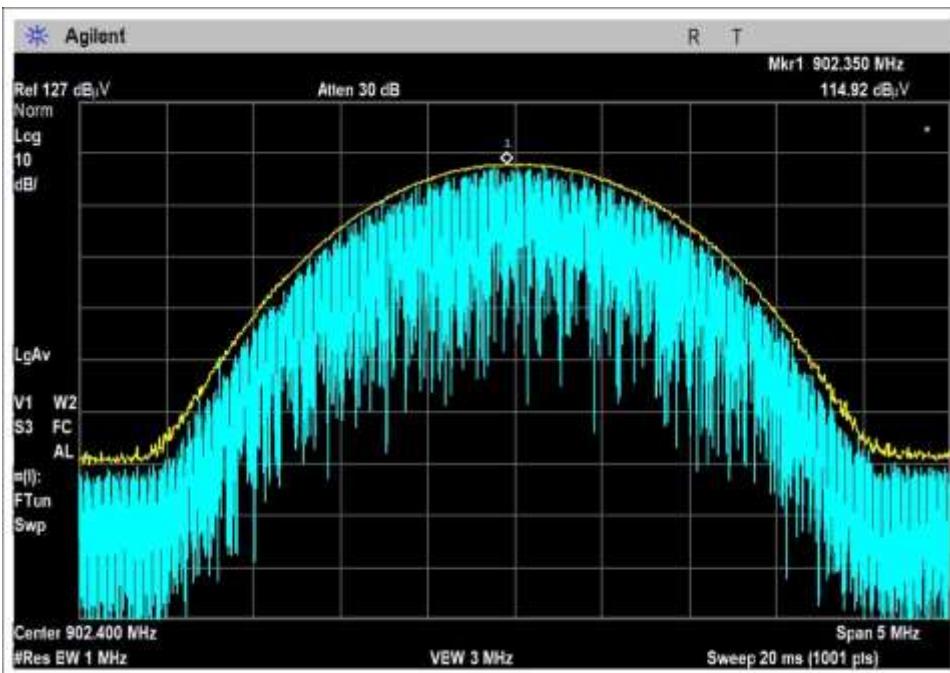
Low Channel, GFSK, 300kbps



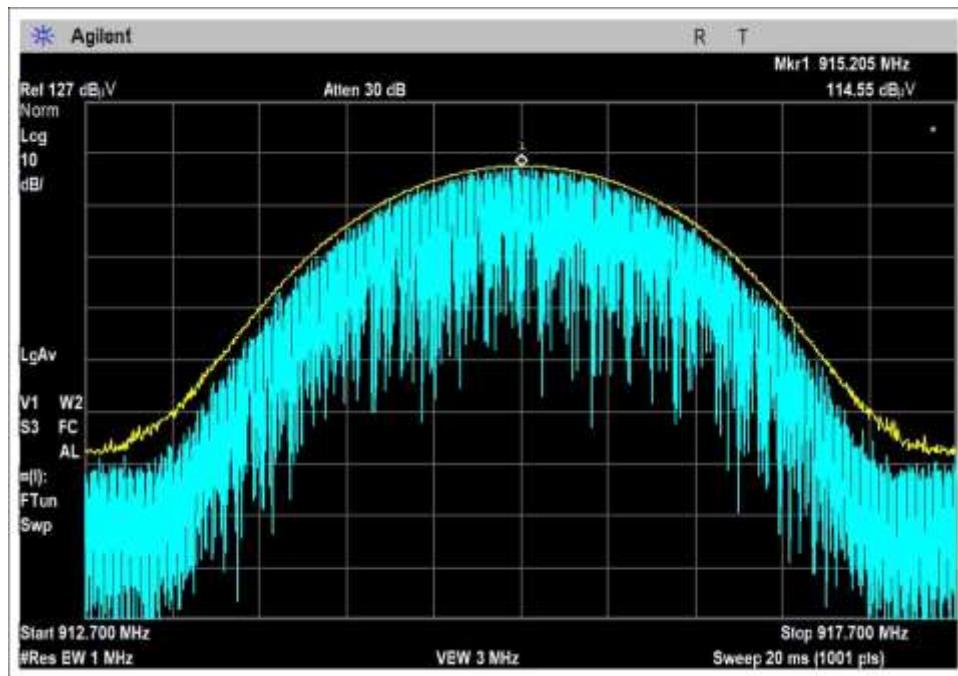
Middle Channel, GFSK, 300kbps



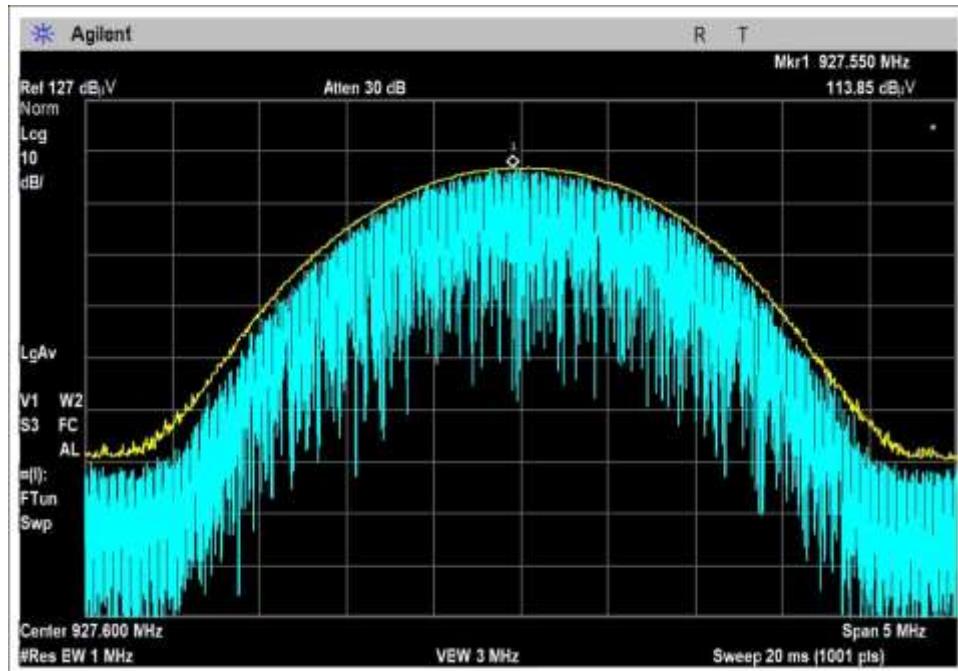
High Channel, GFSK, 300kbps



Low Channel, OFDM

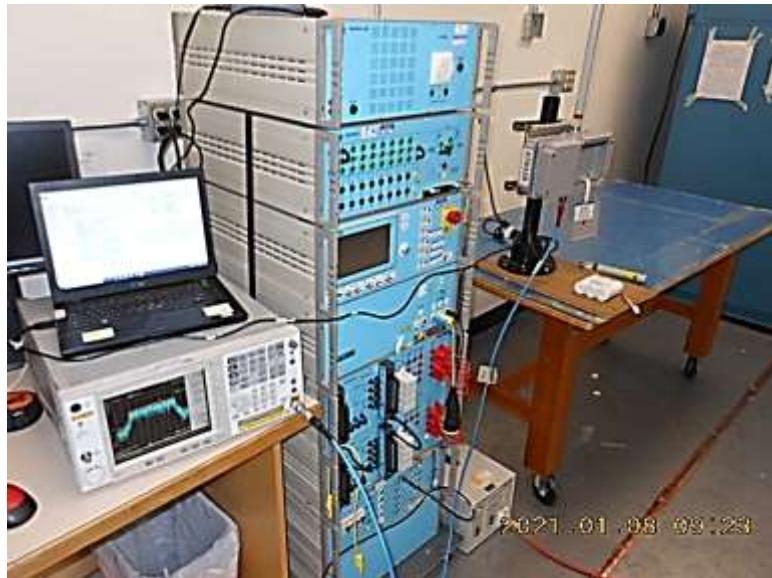


Middle Channel, OFDM



High Channel, OFDM

Test Setup Photo(s)



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 #: **104631** Date: 1/8/2021
 Test Type: **Conducted Emissions** Time: 14:27:51
 Tested By: Matt Harrison Sequence#: 22
 Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

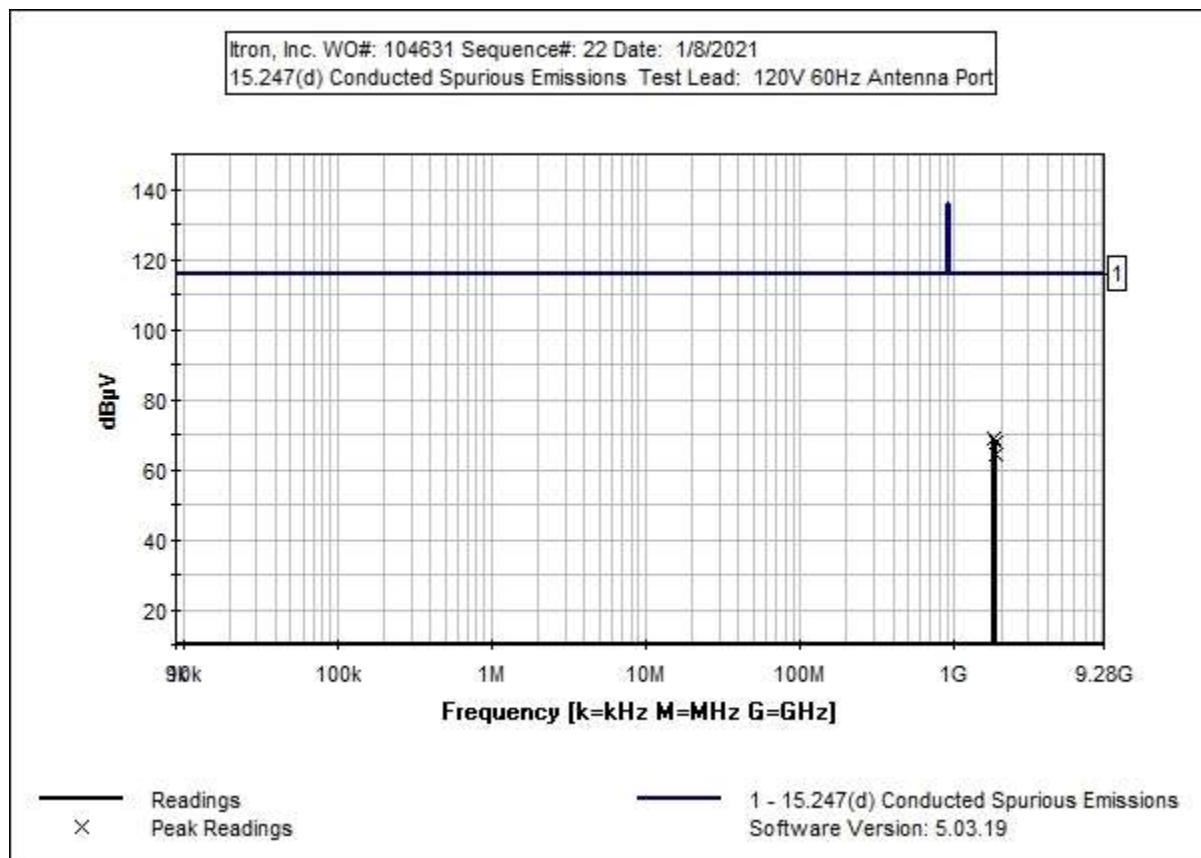
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 23°C Relative Humidity: 41 % Atmospheric Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 902-928MHz
Test Setup: The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power. FSK Modulation


Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05748	Attenuator	PE7004-20	3/4/2020	3/4/2022
T2	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	Dist. Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	1801.000M	48.3	+20.0	+0.6		+0.0	68.9	115.5	-46.6	Anten
2	1828.000M	47.0	+20.0	+0.6		+0.0	67.6	115.5	-47.9	Anten
3	1855.000M	43.3	+20.0	+0.7		+0.0	64.0	115.5	-51.5	Anten



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 #: **104631** Date: 1/8/2021
Test Type: **Conducted Emissions** Time: 14:30:55
Tested By: Matt Harrison Sequence#: 23
Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 41%
Atmospheric Pressure: 101.6kPa

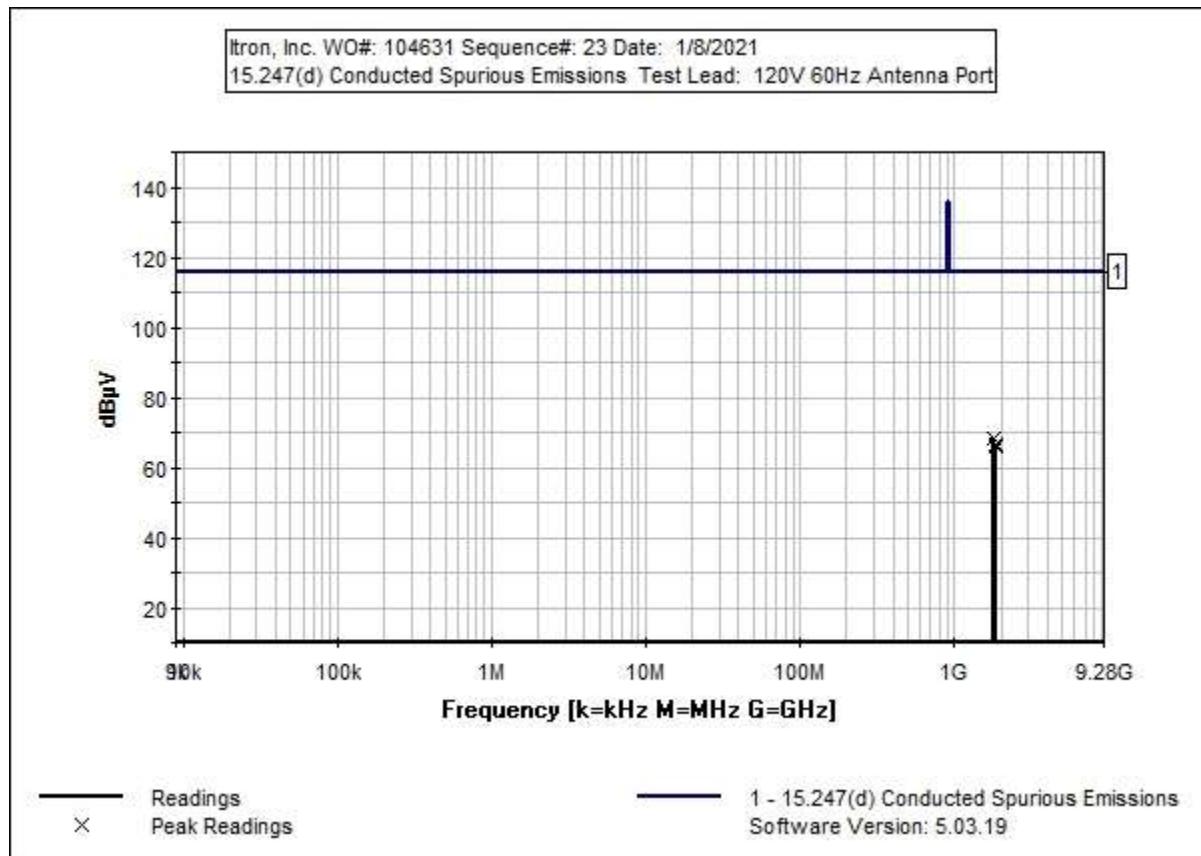
Test Method: ANSI C63.10 (2013)

Frequency Range: 902-928MHz

Test Setup:

The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power.

GFSK Modulation


Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05748	Attenuator	PE7004-20	3/4/2020	3/4/2022
T2	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	Dist. Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	1801.000M	47.8	+20.0	+0.6		+0.0	68.4	115.7	-47.3	Anten
2	1828.000M	46.1	+20.0	+0.6		+0.0	66.7	115.7	-49.0	Anten
3	1855.000M	45.3	+20.0	+0.7		+0.0	66.0	115.7	-49.7	Anten



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 #: **104631** Date: 1/8/2021
Test Type: **Conducted Emissions** Time: 14:33:33
Tested By: Matt Harrison Sequence#: 24
Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 41%
Atmospheric Pressure: 101.6kPa

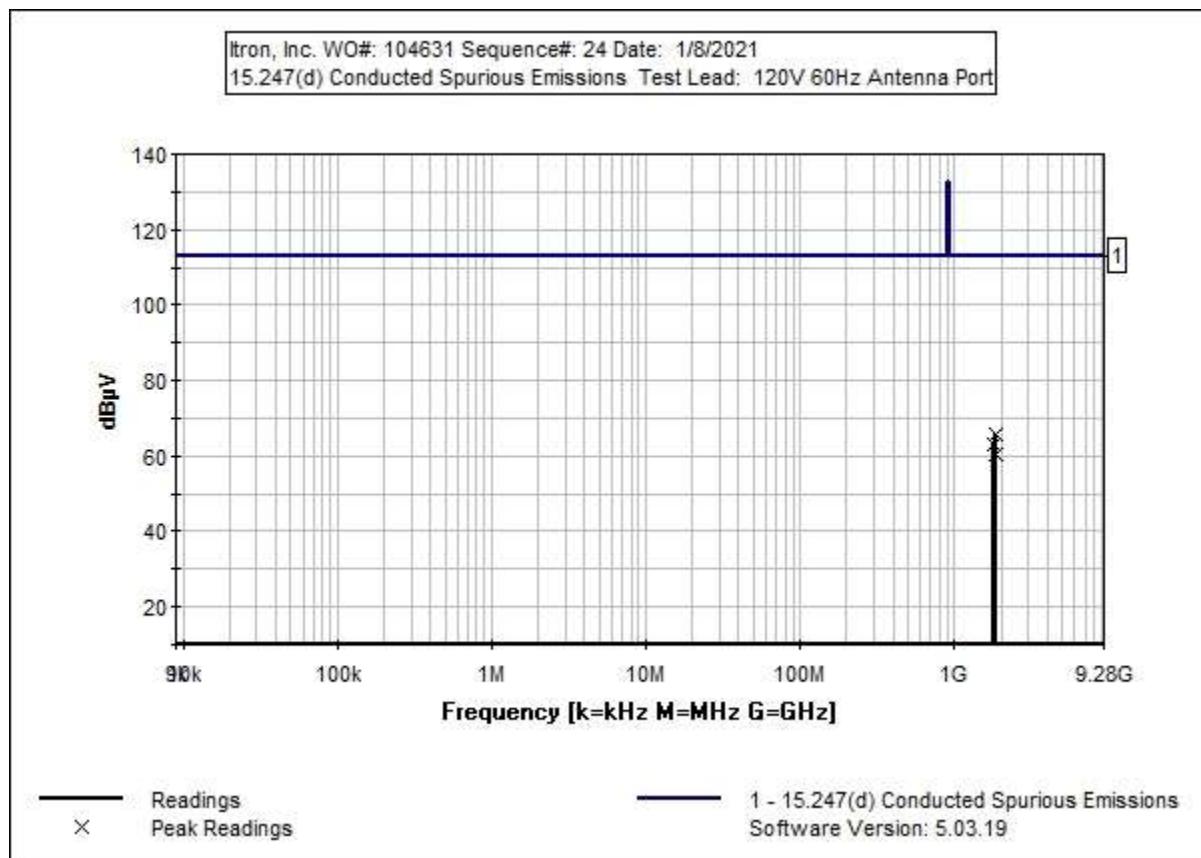
Test Method: ANSI C63.10 (2013)

Frequency Range: 902-928MHz

Test Setup:

The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power.

OFDM FHSS Modulation


Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05748	Attenuator	PE7004-20	3/4/2020	3/4/2022
T2	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021

Measurement Data: Reading listed by margin.

Test Lead: Antenna Port

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	Dist. Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	1835.000M	45.0	+20.0	+0.7		+0.0	65.7	112.8	-47.1	Anten
2	1805.000M	42.4	+20.0	+0.6		+0.0	63.0	112.8	-49.8	Anten
3	1855.000M	39.7	+20.0	+0.7		+0.0	60.4	112.8	-52.4	Anten

Band Edge

Band Edge Summary

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

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	FSK	94.7	< 115.5	Pass
928	FSK	79.2	< 115.5	Pass
902	GFSK	97	< 115.7	Pass
928	GFSK	96.3	< 115.7	Pass
902	OFDM	99.1	< 112.8	Pass
928	OFDM	102.2	< 112.8	Pass

Note: All modulations and baud rates were checked, worst case provided.

Band Edge Summary

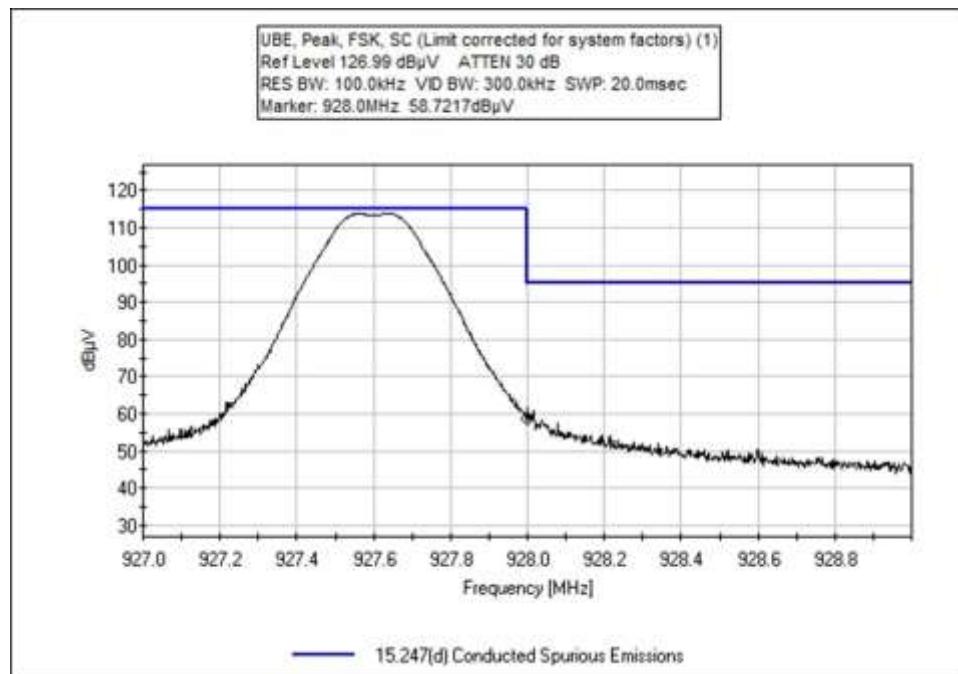
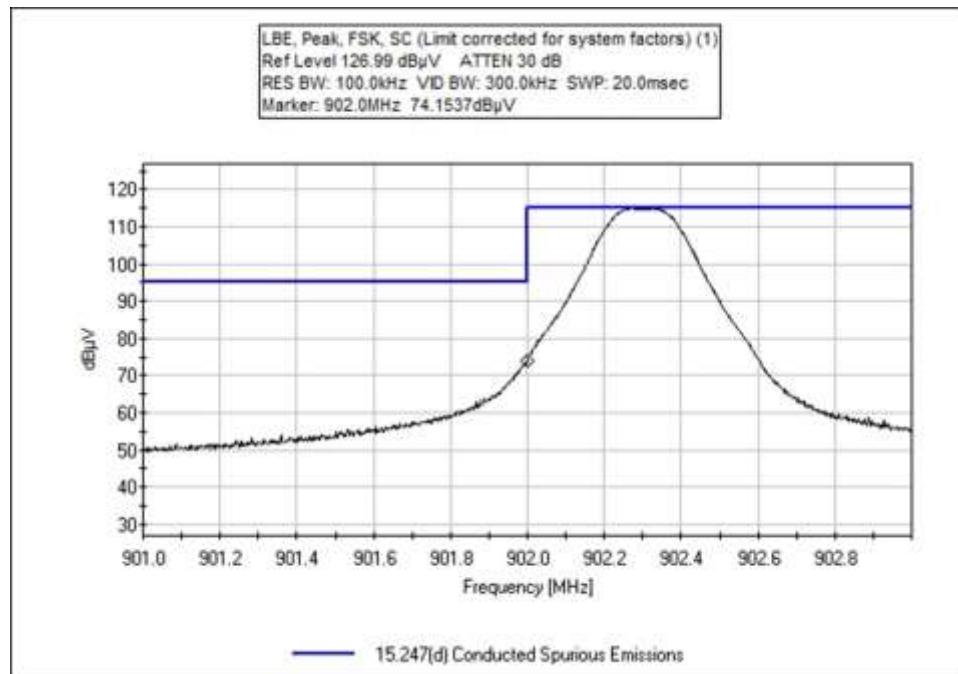
Limit applied: Max Power/100kHz - 20dB.

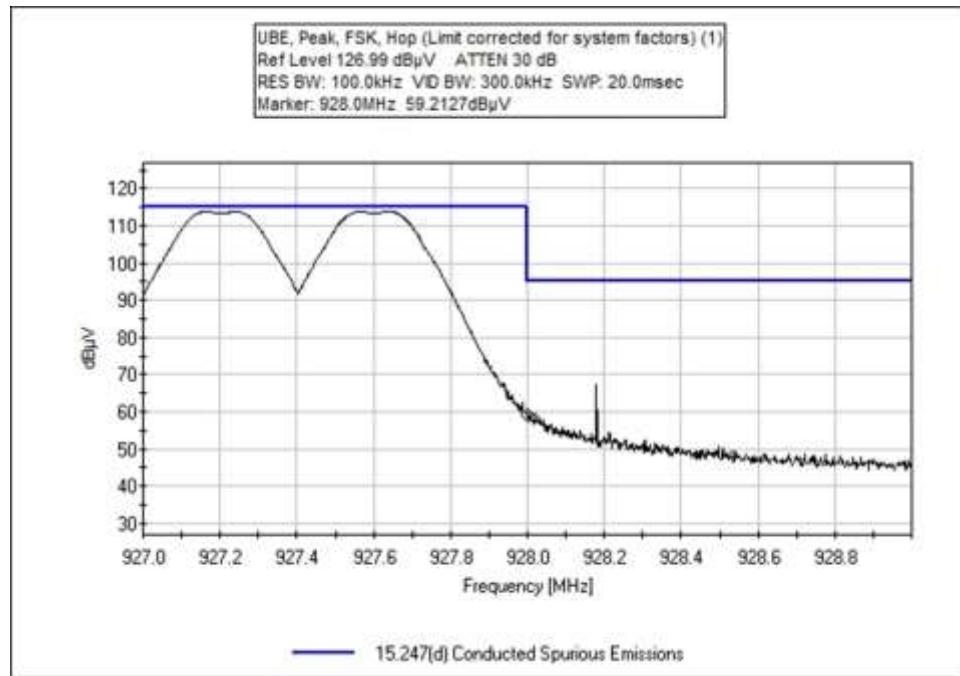
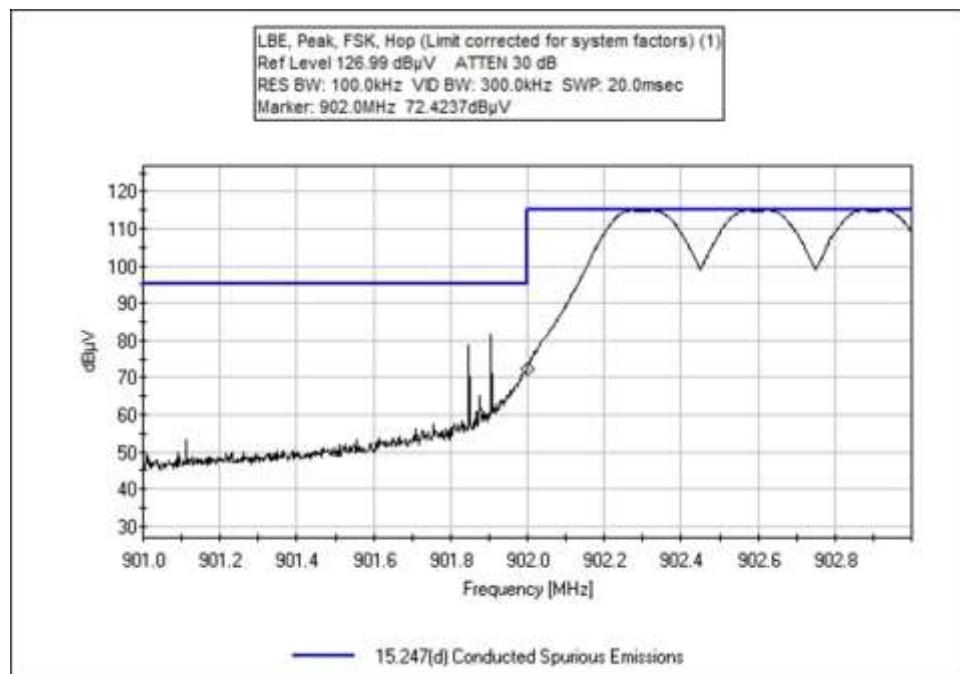
Operating Mode: Hopping

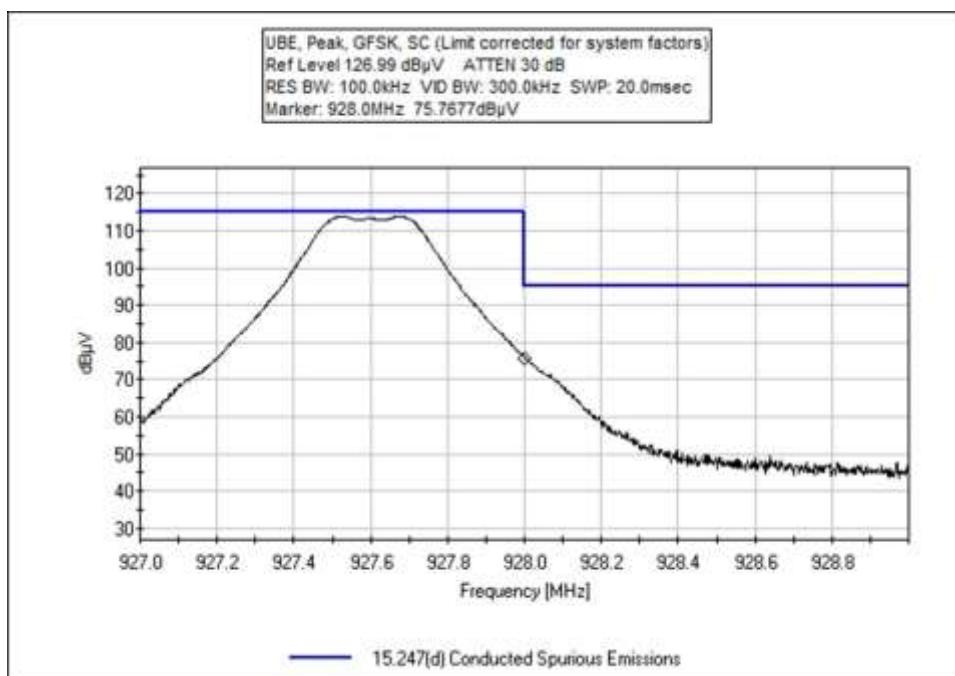
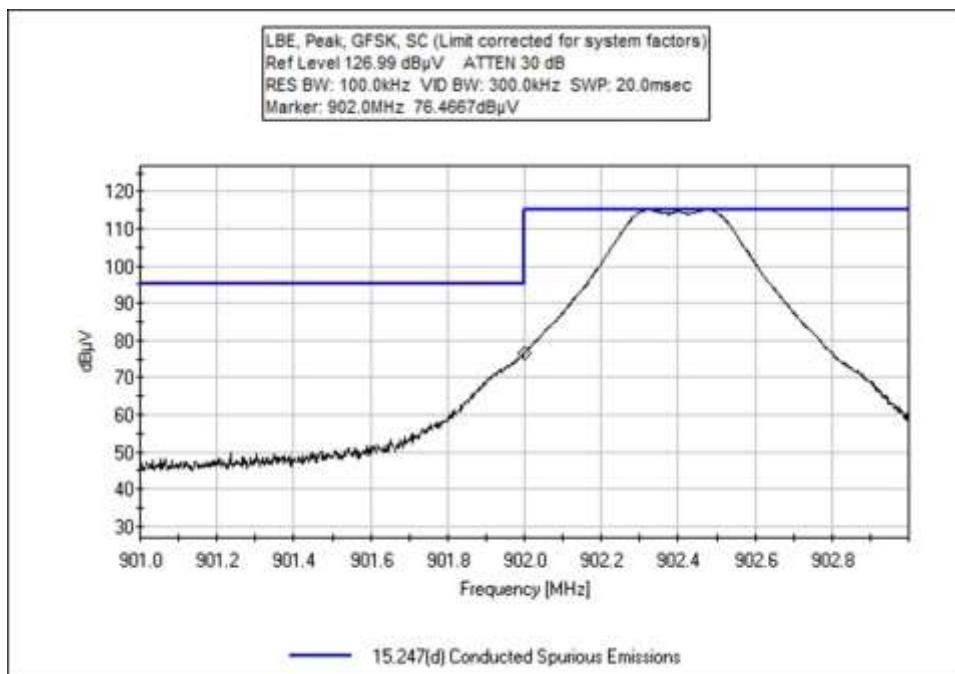
Frequency (MHz)	Modulation	Measured (dB μ V)	Limit (dB μ V)	Results
902	FSK	92.9	< 115.5	Pass
928	FSK	79.7	< 115.5	Pass
902	GFSK	97.3	< 115.7	Pass
928	GFSK	96.6	< 115.7	Pass
902	OFDM	97.9	< 112.8	Pass
928	OFDM	99.4	< 112.8	Pass

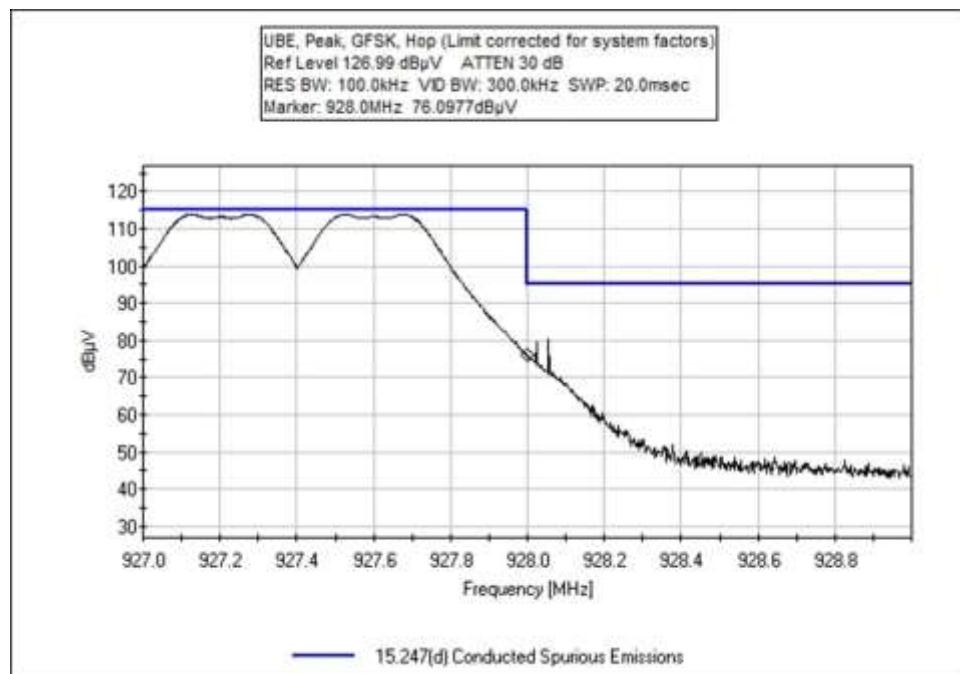
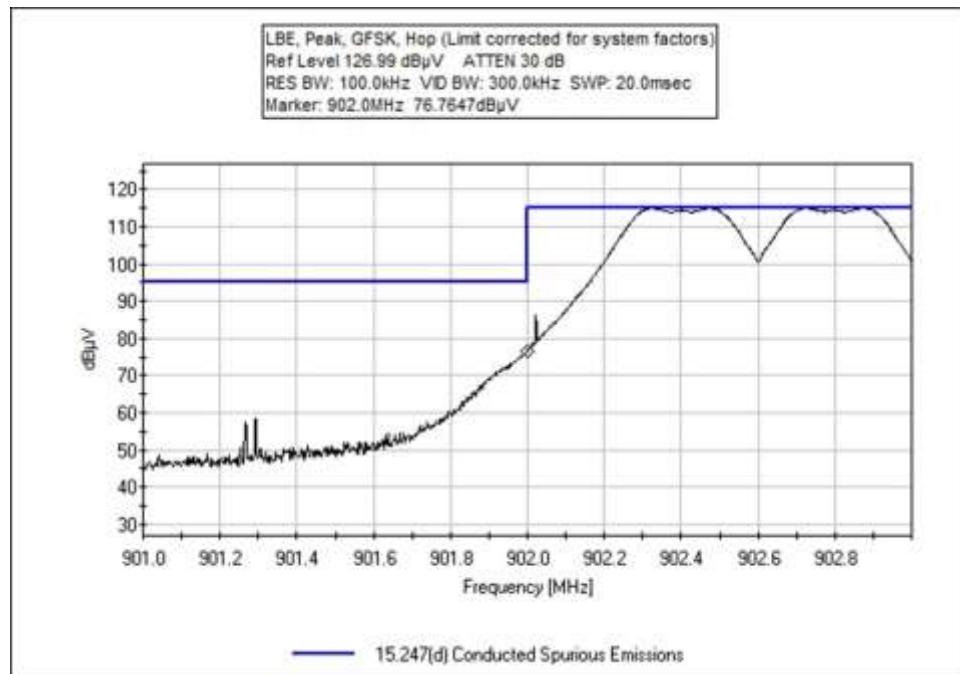
Note: All modulations and baud rates were checked, worst case provided.

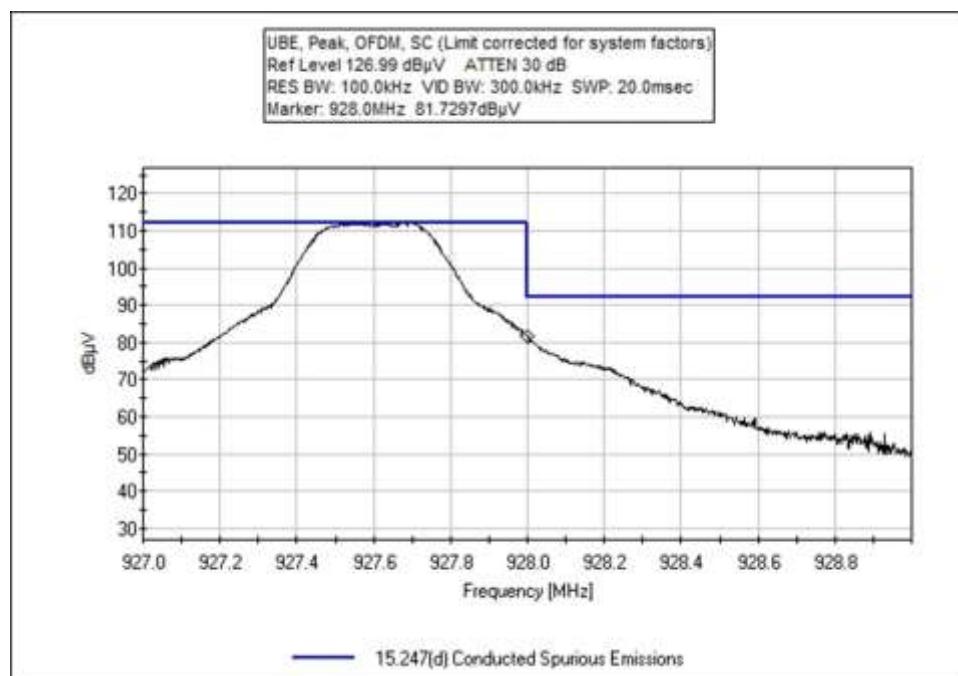
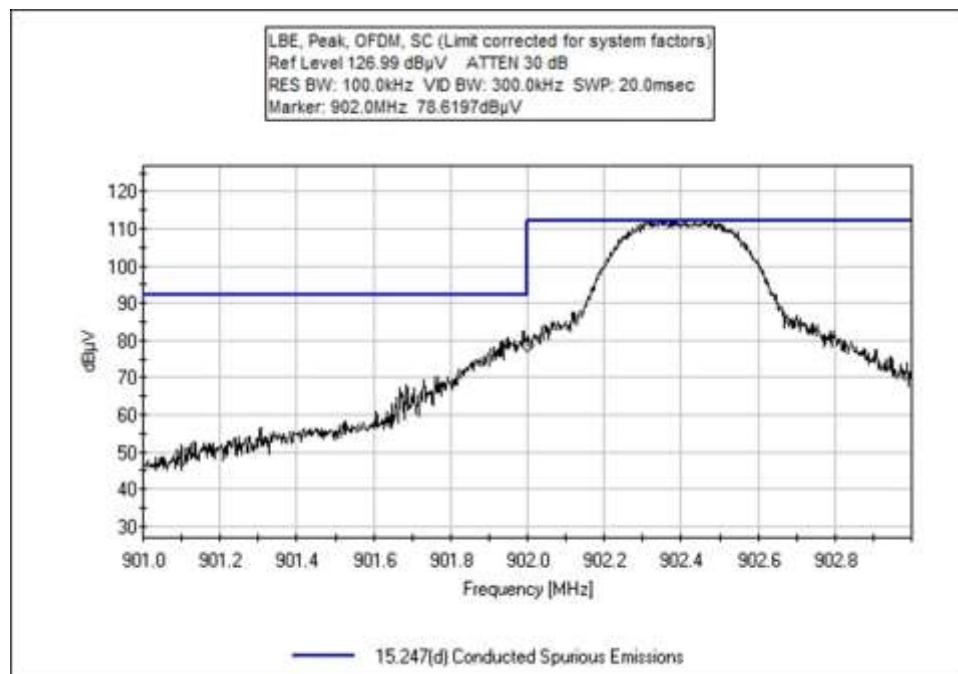
Band Edge Plots

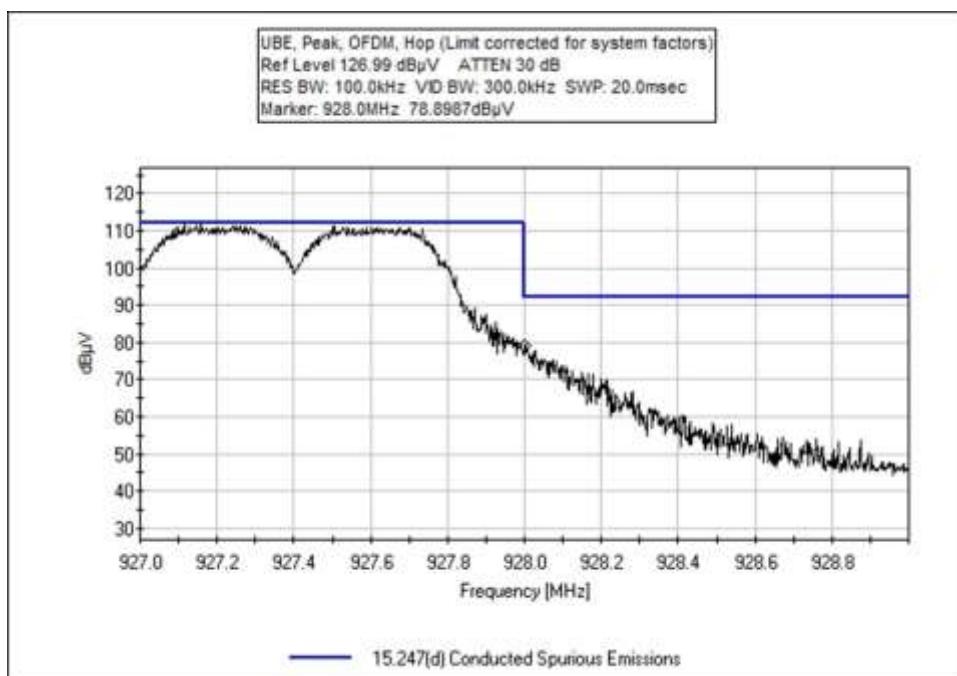
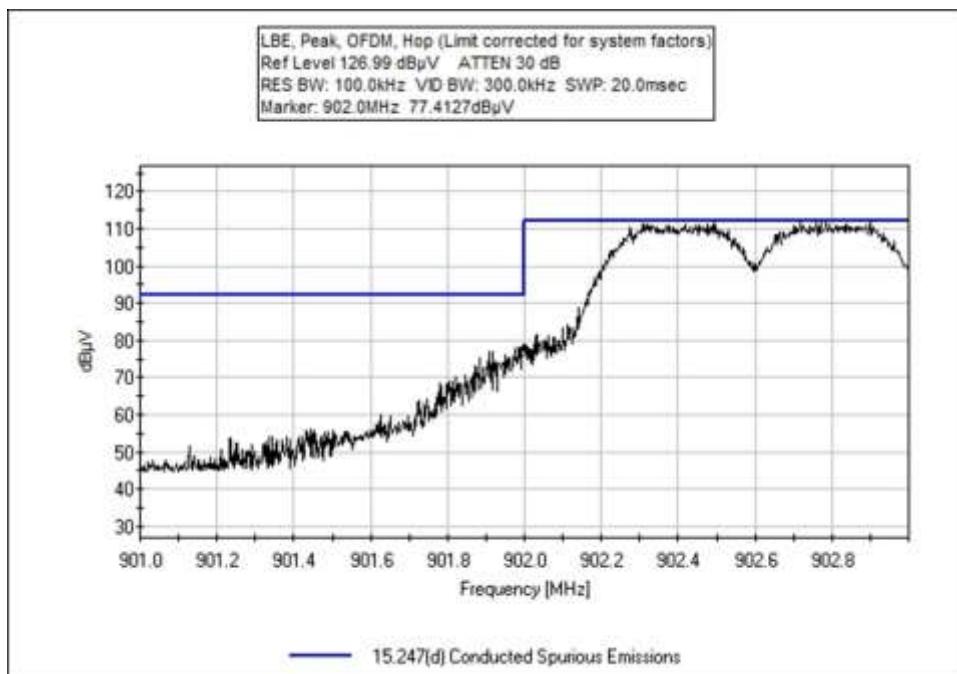












Test Setup / Conditions / Data

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 #: **104631** Date: 1/6/2021
 Test Type: **Conducted Emissions** Time: 14:03:18
 Tested By: Matt Harrison Sequence#: 11
 Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 41%
Atmospheric Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 902-928MHz
Test Setup: The equipment under test (EUT) is setup for direct antenna port measurements. The EUT is transmitting continuous wave at its rated output power.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05748	Attenuator	PE7004-20	3/4/2020	3/4/2022
T2	ANP06007	Cable	Heliax	1/20/2020	1/20/2022
T3	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021

Measurement Data:

Reading listed by margin.							Test Lead: Antenna Port			
#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	Dist. Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	902.328M	115.0	+20.0	+0.5	+0.0	+0.0	135.5	135.5	+0.0	Anten SC
2	902.000M	74.2	+20.0	+0.5	+0.0	+0.0	94.7	115.5	-20.8	Anten SC
3	902.000M	72.4	+20.0	+0.5	+0.0	+0.0	92.9	115.5	-22.6	Anten Hop
4	928.000M	59.2	+20.0	+0.5	+0.0	+0.0	79.7	115.5	-35.8	Anten Hop
5	928.000M	58.7	+20.0	+0.5	+0.0	+0.0	79.2	115.5	-36.3	Anten SC

Test Setup Photo(s)



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: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **104631** Date: 1/7/2021
 Test Type: **Radiated Scan** Time: 15:06:28
 Tested By: Matt Harrison Sequence#: 1
 Software: EMITest 5.03.19

Equipment Tested:

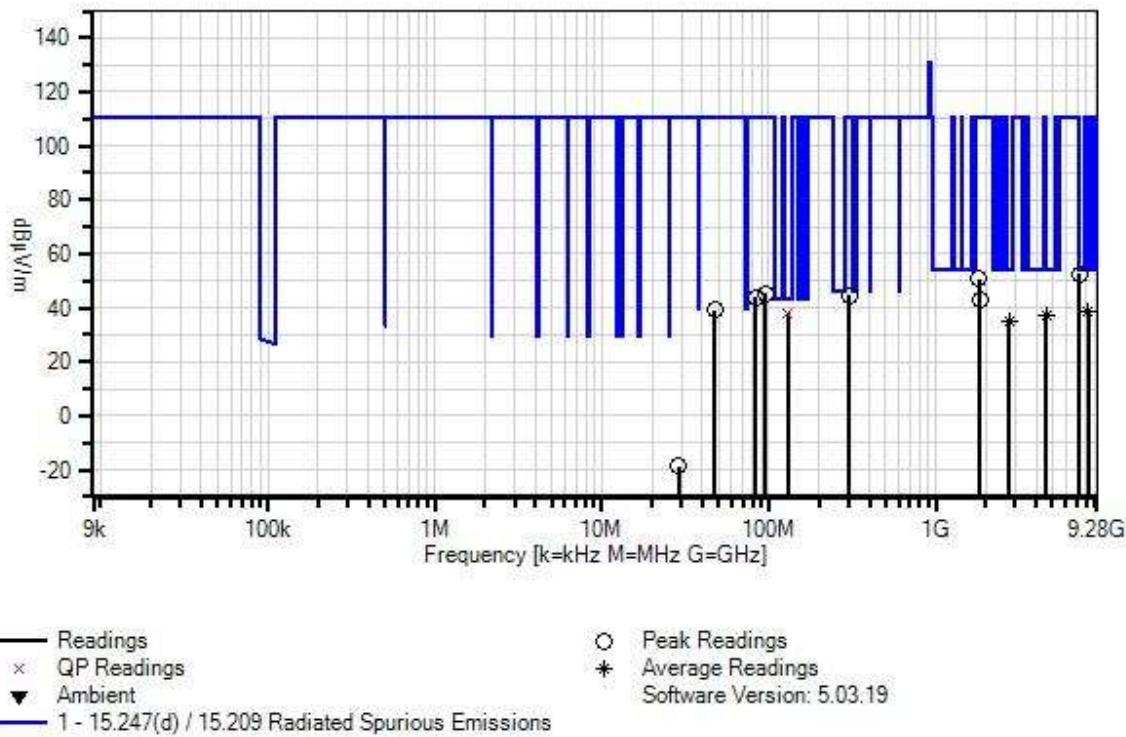
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 41%
Atmospheric Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 9kHz-9.28GHz
Test Setup:
The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.
FSK Modulation

Itron, Inc. WO#: 104631 Sequence#: 1 Date: 1/7/2021
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert/Horz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T3	ANP06243	Attenuator	54A-10	1/27/2020	1/27/2022
T4	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T5	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T6	ANP07505	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021
T7	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021
T8	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T9	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T10	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T11	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T12	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist.	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12					
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	129.625M	23.1	+0.0	+0.0	+0.0	+0.0	+0.0	38.2	43.5	-5.3	Vert/
	QP		+0.1	+0.0	+0.0	+8.0					
			+5.8	+0.5	+0.7	+0.0					
^	129.625M	26.0	+0.0	+0.0	+0.0	+0.0	+0.0	41.1	43.5	-2.4	Vert/
			+0.1	+0.0	+0.0	+8.0					
			+5.8	+0.5	+0.7	+0.0					
3	8120.435M	19.1	-35.0	+37.0	+9.8	+5.3	+0.0	38.6	54.0	-15.4	Vert/
	Ave		+1.3	+0.3	+0.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	8120.435M	33.9	-35.0	+37.0	+9.8	+5.3	+0.0	53.4	54.0	-0.6	Vert/
			+1.3	+0.3	+0.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
5	4576.140M	23.2	-33.7	+31.9	+9.8	+3.8	+0.0	37.0	54.0	-17.0	Vert/
	Ave		+0.9	+0.5	+0.6	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	4576.140M	35.4	-33.7	+31.9	+9.8	+3.8	+0.0	49.2	54.0	-4.8	Vert/
			+0.9	+0.5	+0.6	+0.0					
			+0.0	+0.0	+0.0	+0.0					
7	2745.600M	26.2	-34.1	+28.4	+10.0	+2.9	+0.0	34.8	54.0	-19.2	Vert/
	Ave		+0.7	+0.3	+0.4	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	2745.600M	38.2	-34.1	+28.4	+10.0	+2.9	+0.0	46.8	54.0	-7.2	Vert/
			+0.7	+0.3	+0.4	+0.0					
			+0.0	+0.0	+0.0	+0.0					
9	7218.525M	33.5	-34.5	+36.5	+9.9	+5.1	+0.0	52.4	110.8	-58.4	Vert/
			+1.1	+0.4	+0.4	+0.0					
			+0.0	+0.0	+0.0	+0.0					
10	1804.545M	46.1	-34.8	+26.1	+10.0	+2.3	+0.0	50.9	110.8	-59.9	Vert/
			+0.5	+0.2	+0.5	+0.0					
			+0.0	+0.0	+0.0	+0.0					
11	96.000M	30.6	+0.0	+0.0	+0.0	+0.0	+0.0	45.3	110.8	-65.5	Vert/
			+0.1	+0.0	+0.0	+7.7					
			+5.8	+0.5	+0.6	+0.0					
12	302.600M	23.3	+0.0	+0.0	+0.0	+0.0	+0.0	44.5	110.8	-66.3	Vert/
			+0.2	+0.0	+0.0	+13.2					
			+5.8	+0.9	+1.1	+0.0					
13	83.400M	30.3	+0.0	+0.0	+0.0	+0.0	+0.0	43.9	110.8	-66.9	Vert/
			+0.1	+0.0	+0.0	+6.8					
			+5.8	+0.4	+0.5	+0.0					

14	1830.555M	37.7	-34.8	+26.3	+10.0	+2.4	+0.0	42.7	110.8	-68.1	Vert/
			+0.5	+0.2	+0.4	+0.0					
			+0.0	+0.0	+0.0	+0.0					
15	47.500M	23.9	+0.0	+0.0	+0.0	+0.0	+0.0	39.1	110.8	-71.7	Vert/
			+0.1	+0.0	+0.0	+8.5					
			+5.8	+0.4	+0.4	+0.0					
16	28.806M	16.4	+0.0	+0.0	+0.0	+0.3	-40.0	-18.5	110.8	-129.3	Vert/
			+0.1	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+4.7					
17	132.516k	36.4	+0.0	+0.0	+0.0	+0.0	-80.0	-34.1	110.8	-144.9	Vert/
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+9.5					



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 #: **104631** Date: 1/7/2021
Test Type: **Radiated Scan** Time: 14:59:34
Tested By: Matt Harrison Sequence#: 2
Software: EMITest 5.03.19

Equipment Tested:

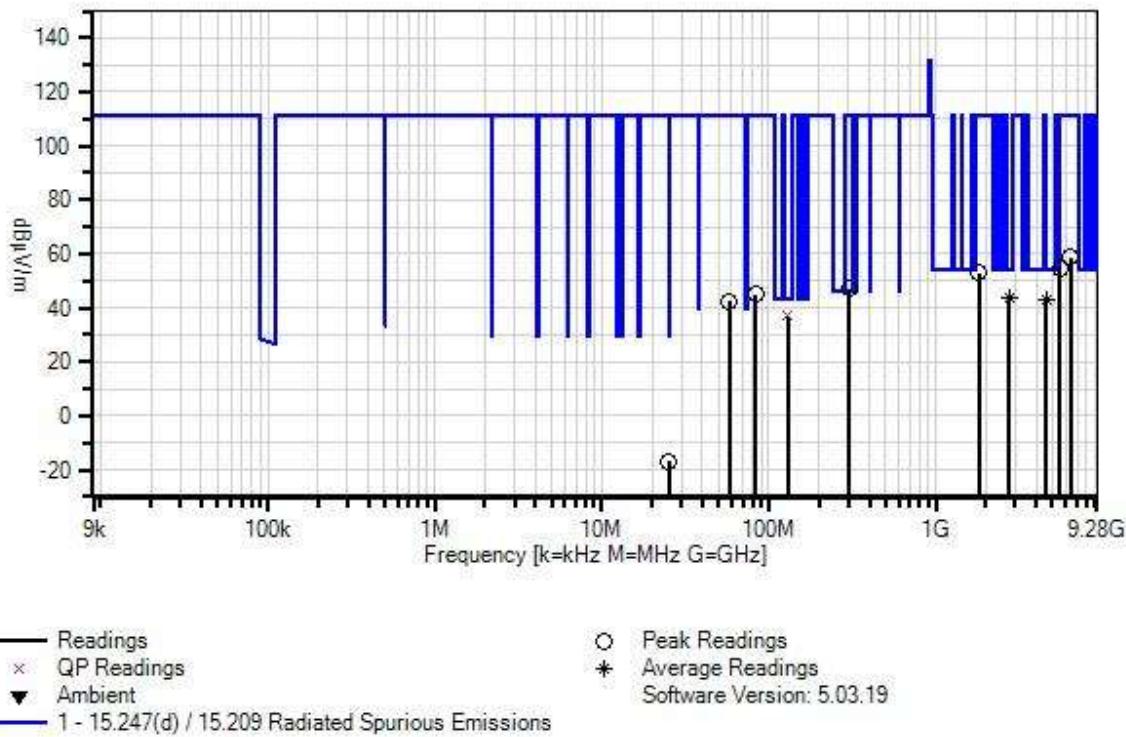
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 23°C Relative Humidity: 41% Atmospheric Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 9kHz-9.28GHz
Test Setup: The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported. GFSK Modulation

Itron, Inc. WO#: 104631 Sequence#: 2 Date: 1/7/2021
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert/Horz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T2	AN01467	Horn Antenna- ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T3	ANP06243	Attenuator	54A-10	1/27/2020	1/27/2022
T4	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T5	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T6	ANP07505	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021
T7	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021
T8	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T9	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T10	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T11	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T12	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist.	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12					
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	129.518M	21.6	+0.0	+0.0	+0.0	+0.6	+0.0	37.2	43.5	-6.3	Vert/
	QP		+0.0	+0.0	+0.0	+8.0					
		+5.8	+0.5	+0.7	+0.0						
^	129.518M	24.6	+0.0	+0.0	+0.0	+0.6	+0.0	40.2	43.5	-3.3	Vert/
			+0.0	+0.0	+0.0	+8.0					
		+5.8	+0.5	+0.7	+0.0						
3	2745.600M	35.0	-34.1	+28.4	+10.0	+2.9	+0.0	43.6	54.0	-10.4	Vert/
	Ave		+0.7	+0.3	+0.4	+0.0					
		+0.0	+0.0	+0.0	+0.0						
^	2745.600M	43.3	-34.1	+28.4	+10.0	+2.9	+0.0	51.9	54.0	-2.1	Vert/
			+0.7	+0.3	+0.4	+0.0					
		+0.0	+0.0	+0.0	+0.0						
5	4576.000M	29.2	-33.7	+31.9	+9.8	+3.8	+0.0	43.0	54.0	-11.0	Vert/
	Ave		+0.9	+0.5	+0.6	+0.0					
		+0.0	+0.0	+0.0	+0.0						
^	4576.000M	40.3	-33.7	+31.9	+9.8	+3.8	+0.0	54.1	54.0	+0.1	Vert/
			+0.9	+0.5	+0.6	+0.0					
		+0.0	+0.0	+0.0	+0.0						
7	6406.420M	41.0	-34.2	+34.6	+10.0	+5.3	+0.0	58.8	111.4	-52.6	Vert/
			+1.1	+0.5	+0.5	+0.0					
		+0.0	+0.0	+0.0	+0.0						
8	5559.820M	38.6	-33.7	+33.7	+9.8	+4.4	+0.0	54.7	111.4	-56.7	Vert/
			+1.0	+0.5	+0.4	+0.0					
		+0.0	+0.0	+0.0	+0.0						
9	1804.560M	48.3	-34.8	+26.1	+10.0	+2.3	+0.0	53.1	111.4	-58.3	Vert/
			+0.5	+0.2	+0.5	+0.0					
		+0.0	+0.0	+0.0	+0.0						
10	302.600M	25.2	+0.0	+0.0	+0.0	+0.9	+0.0	47.1	111.4	-64.3	Vert/
			+0.0	+0.0	+0.0	+13.2					
		+5.8	+0.9	+1.1	+0.0						
11	83.400M	30.9	+0.0	+0.0	+0.0	+0.5	+0.0	44.9	111.4	-66.5	Vert/
			+0.0	+0.0	+0.0	+6.8					
		+5.8	+0.4	+0.5	+0.0						
12	58.100M	27.9	+0.0	+0.0	+0.0	+0.4	+0.0	42.5	111.4	-68.9	Vert/
			+0.0	+0.0	+0.0	+7.6					
		+5.8	+0.4	+0.4	+0.0						
13	25.284M	16.2	+0.0	+0.0	+0.0	+0.3	-40.0	-17.0	111.4	-128.4	Vert/
			+0.1	+0.0	+0.0	+0.0					
		+0.0	+0.0	+0.0	+6.4						
14	132.516k	36.4	+0.0	+0.0	+0.0	+0.0	-80.0	-34.1	111.4	-145.5	Vert/
			+0.0	+0.0	+0.0	+0.0					
		+0.0	+0.0	+0.0	+9.5						



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 #: **104631** Date: 1/7/2021
Test Type: **Radiated Scan** Time: 14:55:26
Tested By: Matt Harrison Sequence#: 3
Software: EMITest 5.03.19

Equipment Tested:

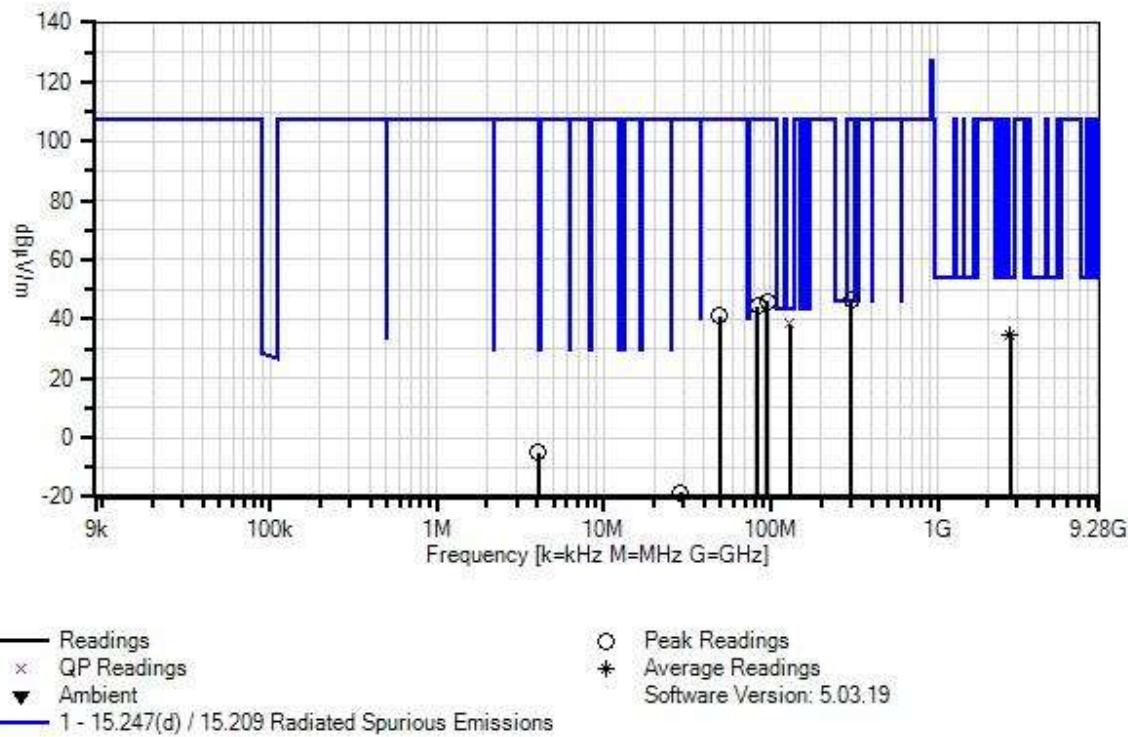
Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 23°C Relative Humidity: 41% Atmospheric Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 9kHz-9.28GHz
Test Setup: The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported. OFDM FHSS Modulation

Itron, Inc. WO#: 104631 Sequence#: 3 Date: 1/7/2021
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert/Horz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T1	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T2	AN01467	Horn Antenna- ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T3	ANP06243	Attenuator	54A-10	1/27/2020	1/27/2022
T4	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T5	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T6	ANP07505	Cable	CLU40-KMKM- 02.00F	1/17/2019	1/17/2021
T7	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021
T8	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T9	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T10	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T11	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T12	AN00052	Loop Antenna	6502	5/4/2020	5/4/2022

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist.	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	129.776M	22.7	+0.0	+0.0	+0.0	+0.6	+0.0	38.3	43.5	-5.2	Vert/
	QP		+0.0	+0.0	+0.0	+8.0					
		+5.8	+0.5	+0.7	+0.0						
^	129.776M	26.1	+0.0	+0.0	+0.0	+0.6	+0.0	41.7	43.5	-1.8	Vert/
			+0.0	+0.0	+0.0	+8.0					
		+5.8	+0.5	+0.7	+0.0						
3	2707.200M	26.2	-34.1	+28.3	+10.0	+2.9	+0.0	34.7	54.0	-19.3	Vert/
	Ave		+0.7	+0.3	+0.4	+0.0					
		+0.0	+0.0	+0.0	+0.0						
^	2707.200M	41.0	-34.1	+28.3	+10.0	+2.9	+0.0	49.5	54.0	-4.5	Vert/
			+0.7	+0.3	+0.4	+0.0					
		+0.0	+0.0	+0.0	+0.0						
5	302.600M	24.9	+0.0	+0.0	+0.0	+0.9	+0.0	46.8	107.3	-60.5	Vert/
			+0.0	+0.0	+0.0	+13.2					
		+5.8	+0.9	+1.1	+0.0						
6	96.000M	30.9	+0.0	+0.0	+0.0	+0.5	+0.0	46.0	107.3	-61.3	Vert/
			+0.0	+0.0	+0.0	+7.7					
		+5.8	+0.5	+0.6	+0.0						
7	83.400M	30.2	+0.0	+0.0	+0.0	+0.5	+0.0	44.2	107.3	-63.1	Vert/
			+0.0	+0.0	+0.0	+6.8					
		+5.8	+0.4	+0.5	+0.0						
8	49.400M	26.6	+0.0	+0.0	+0.0	+0.4	+0.0	41.2	107.3	-66.1	Vert/
			+0.0	+0.0	+0.0	+7.6					
		+5.8	+0.4	+0.4	+0.0						
9	4.060M	25.7	+0.0	+0.0	+0.0	+0.1	-40.0	-4.9	107.3	-112.2	Vert/
			+0.0	+0.0	+0.0	+0.0					
		+0.0	+0.0	+0.0	+9.3						
10	28.687M	16.3	+0.0	+0.0	+0.0	+0.3	-40.0	-18.5	107.3	-125.8	Vert/
			+0.1	+0.0	+0.0	+0.0					
		+0.0	+0.0	+0.0	+4.8						
11	22.113k	46.5	+0.0	+0.0	+0.0	+0.0	-80.0	-21.2	107.3	-128.5	Vert/
			+0.0	+0.0	+0.0	+0.0					
		+0.0	+0.0	+0.0	+12.3						

Band Edge

Band Edge Summary

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	FSK	Omnidirectional / 2.6dBi	39.8	<46	Pass
902	FSK	Omnidirectional / 2.6dBi	88.9	< 110.8	Pass
928	FSK	Omnidirectional / 2.6dBi	75.2	< 110.8	Pass
960	FSK	Omnidirectional / 2.6dBi	46.3	<54	Pass
614	GFSK	Omnidirectional / 2.6dBi	39.6	<46	Pass
902	GFSK	Omnidirectional / 2.6dBi	93.3	< 111.4	Pass
928	GFSK	Omnidirectional / 2.6dBi	93.3	< 111.4	Pass
960	GFSK	Omnidirectional / 2.6dBi	47.2	<54	Pass
614	OFDM	Omnidirectional / 2.6dBi	39.5	<46	Pass
902	OFDM	Omnidirectional / 2.6dBi	91.7	< 107.3	Pass
928	OFDM	Omnidirectional / 2.6dBi	95.4	< 107.3	Pass
960	OFDM	Omnidirectional / 2.6dBi	46.1	<54	Pass

Note: All modulations and baud rates were checked, worst case provided.

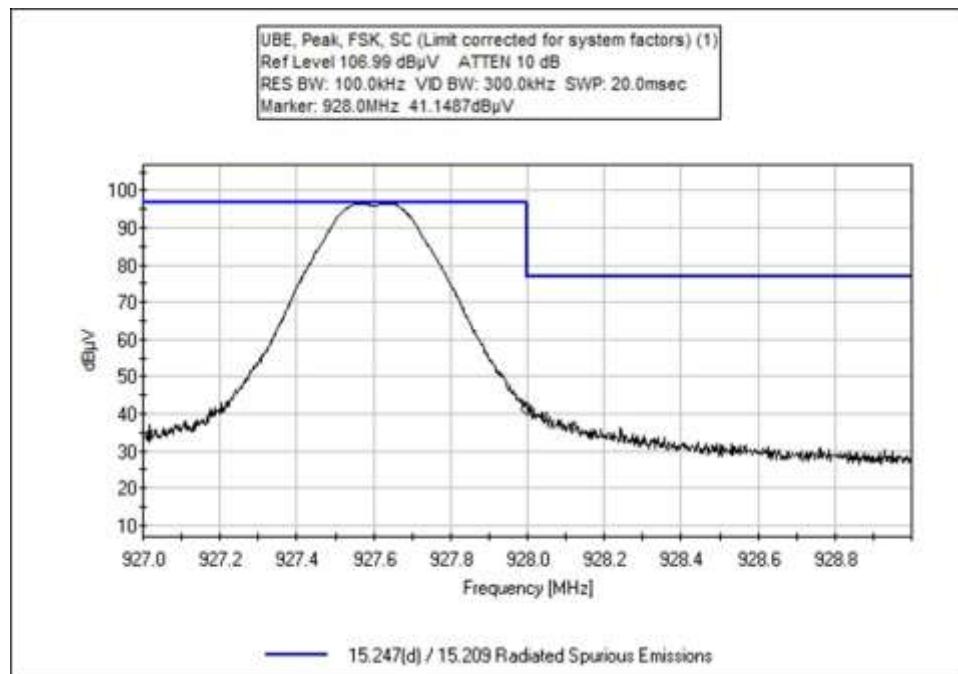
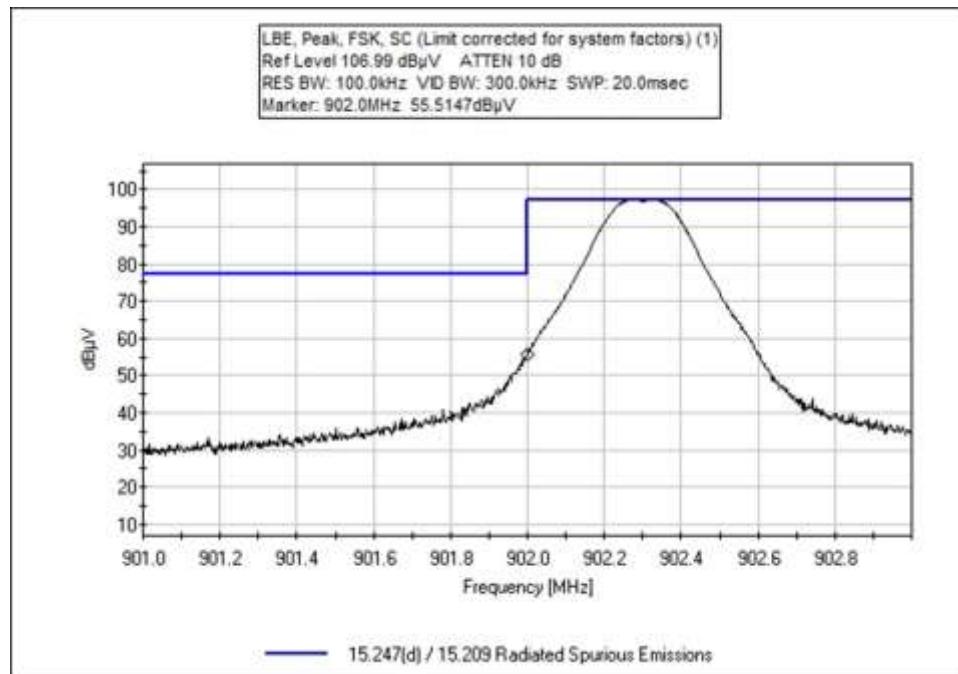
Band Edge Summary

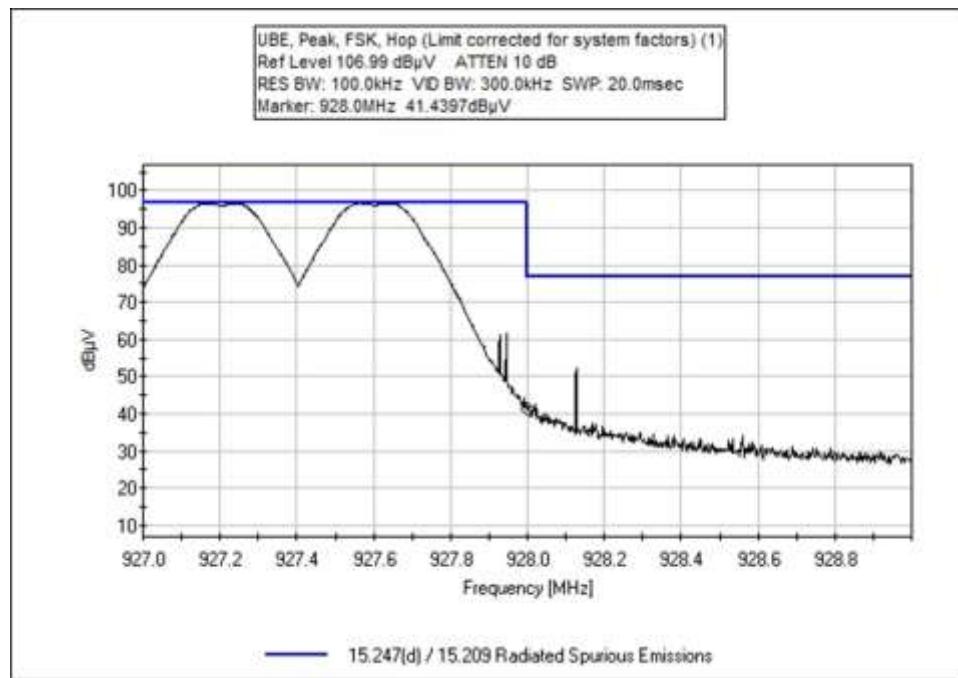
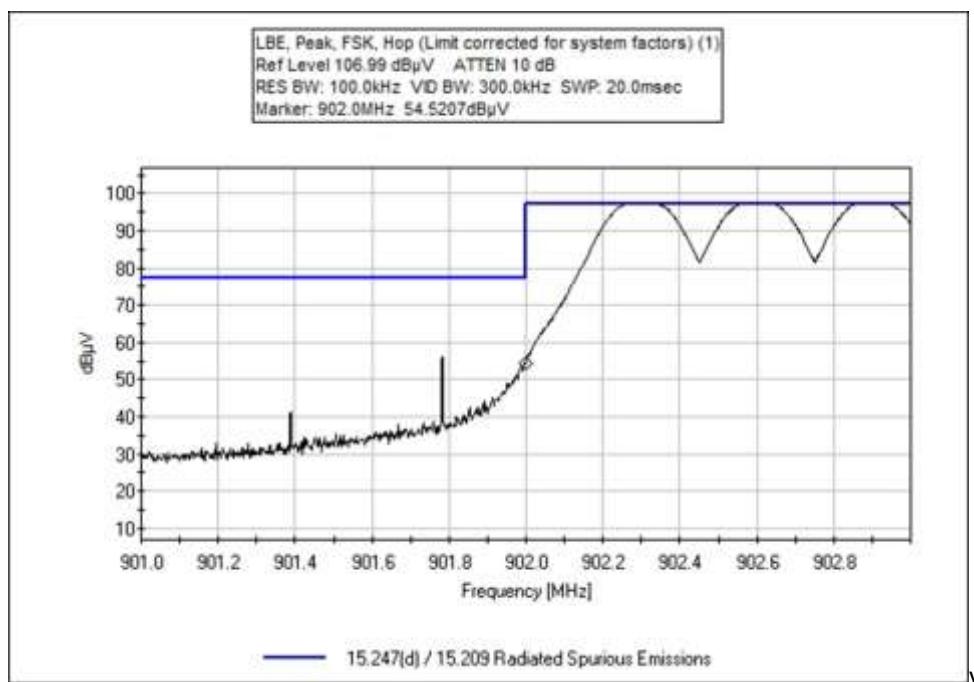
Operating Mode: Hopping

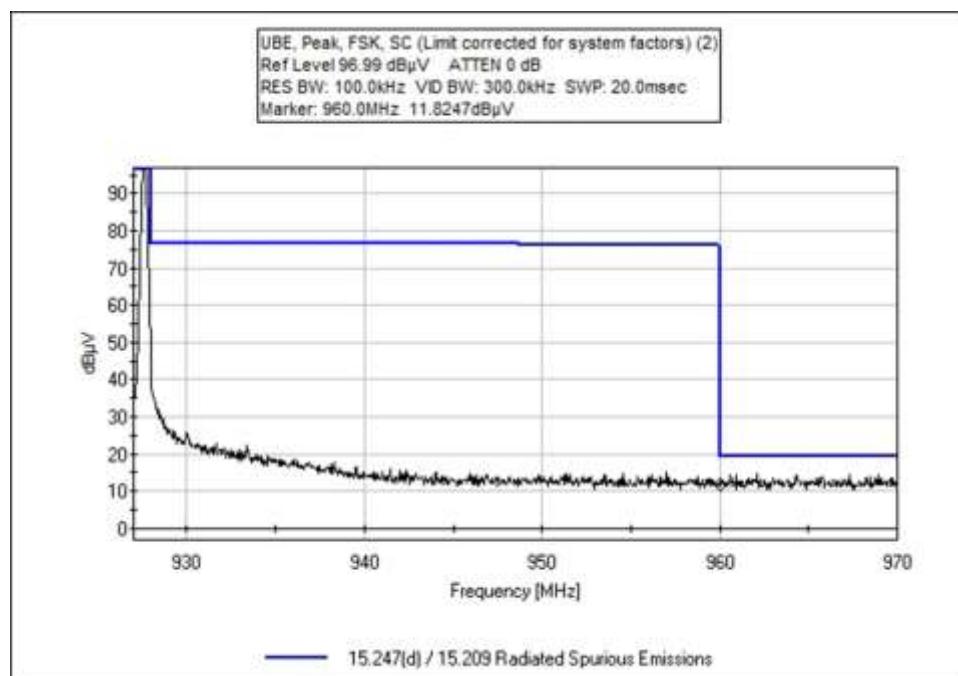
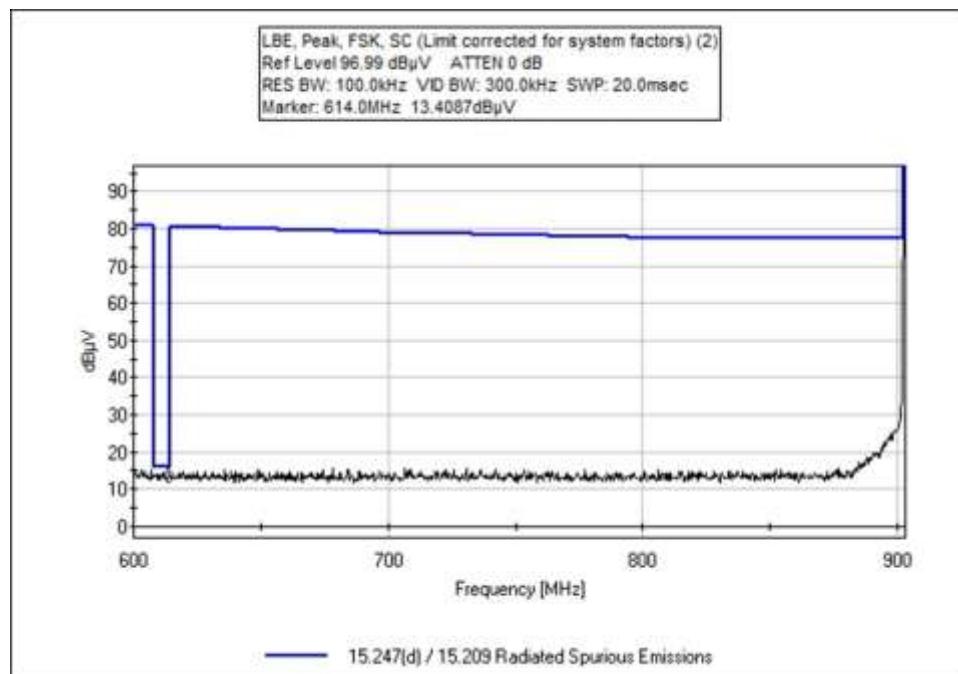
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	FSK	Omnidirectional / 2.6dBi	39.6	<46	Pass
902	FSK	Omnidirectional / 2.6dBi	87.9	< 110.8	Pass
928	FSK	Omnidirectional / 2.6dBi	75.5	< 110.8	Pass
960	FSK	Omnidirectional / 2.6dBi	39.7	<54	Pass
614	GFSK	Omnidirectional / 2.6dBi	44.8	<46	Pass
902	GFSK	Omnidirectional / 2.6dBi	92.1	< 111.4	Pass
928	GFSK	Omnidirectional / 2.6dBi	93.5	< 111.4	Pass
960	GFSK	Omnidirectional / 2.6dBi	47.9	<54	Pass
614	OFDM	Omnidirectional / 2.6dBi	44	<46	Pass
902	OFDM	Omnidirectional / 2.6dBi	89.6	< 107.3	Pass
928	OFDM	Omnidirectional / 2.6dBi	93	< 107.3	Pass
960	OFDM	Omnidirectional / 2.6dBi	48.2	<54	Pass

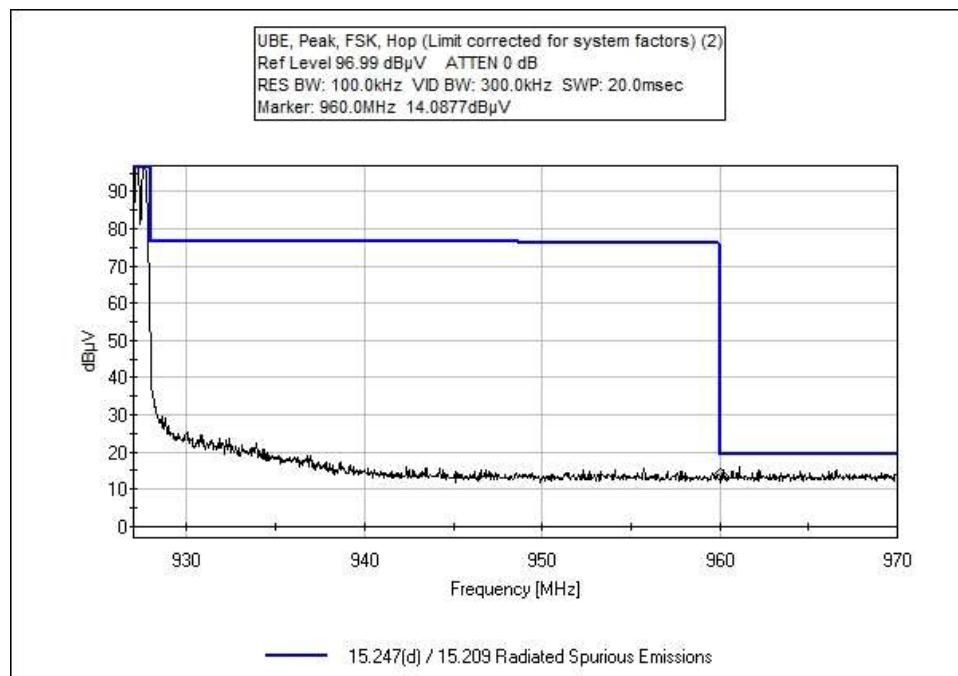
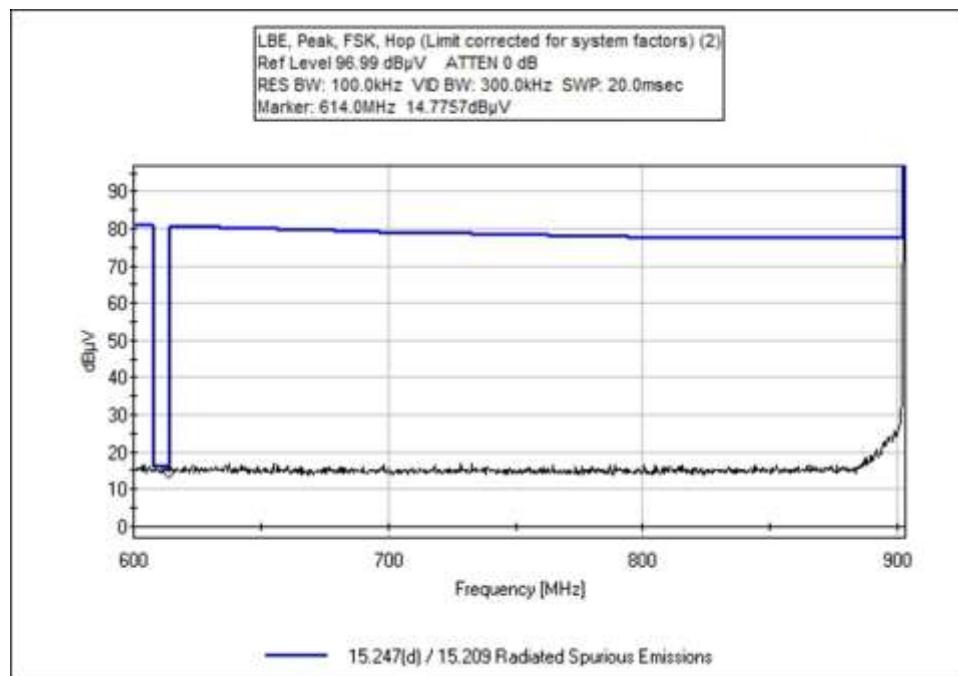
Note: All modulations and baud rates were checked, worst case provided.

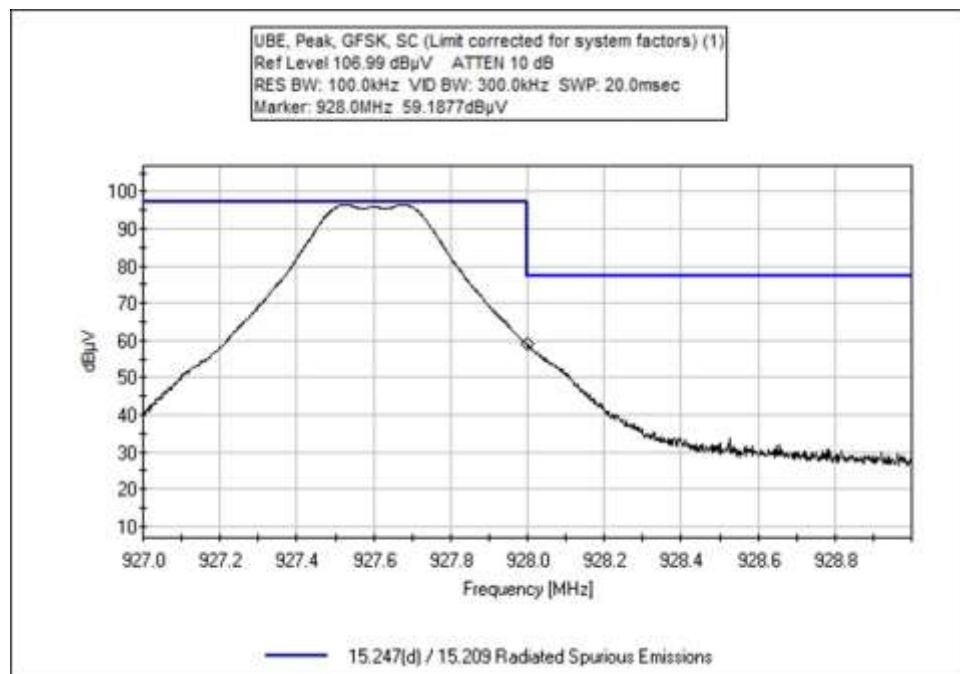
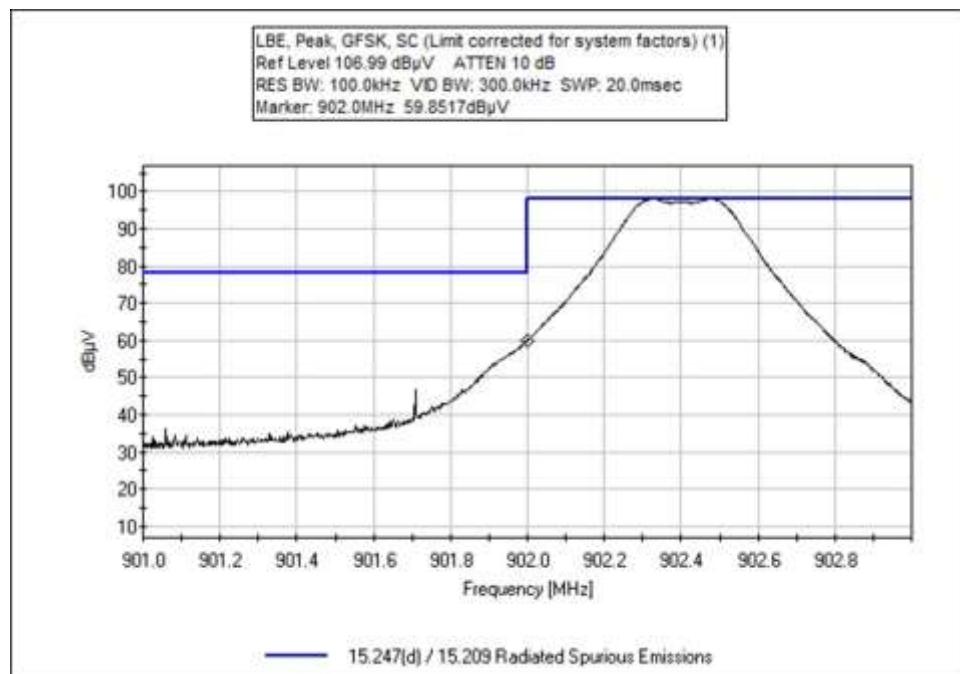
Band Edge Plots

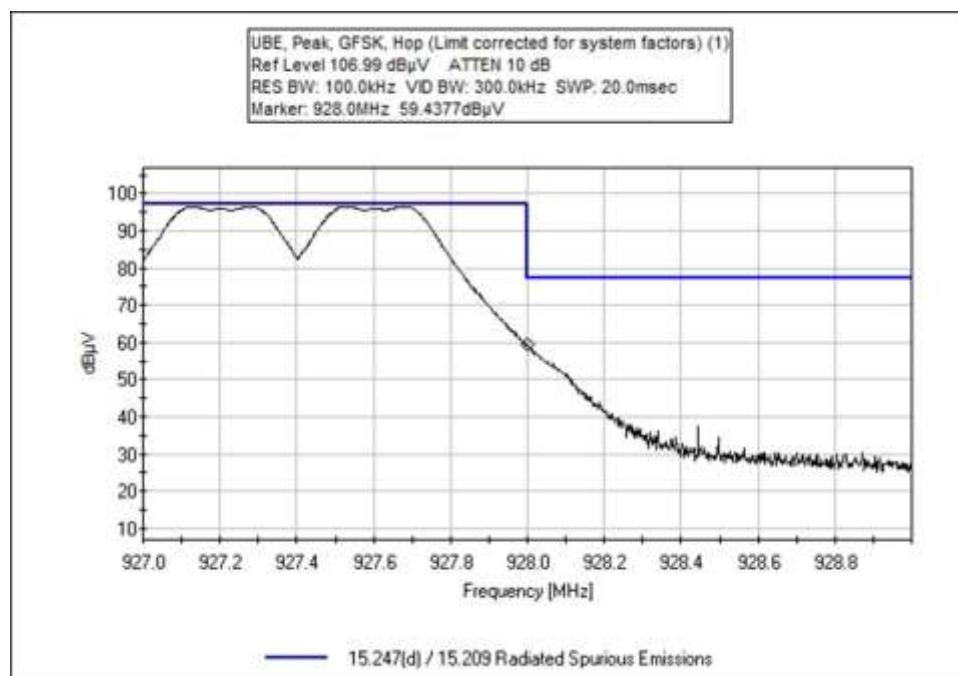
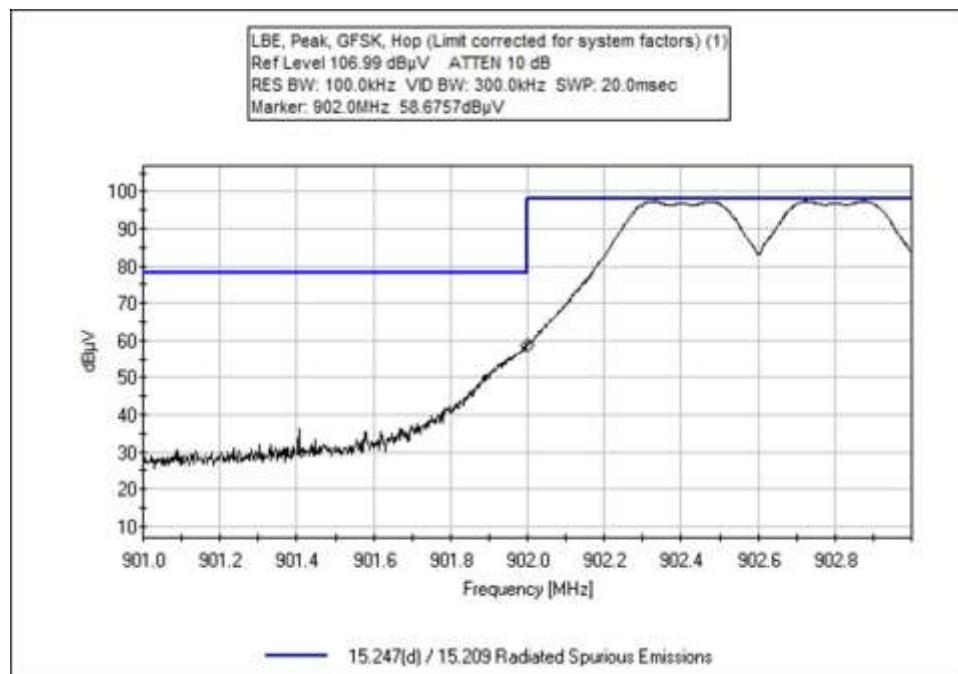


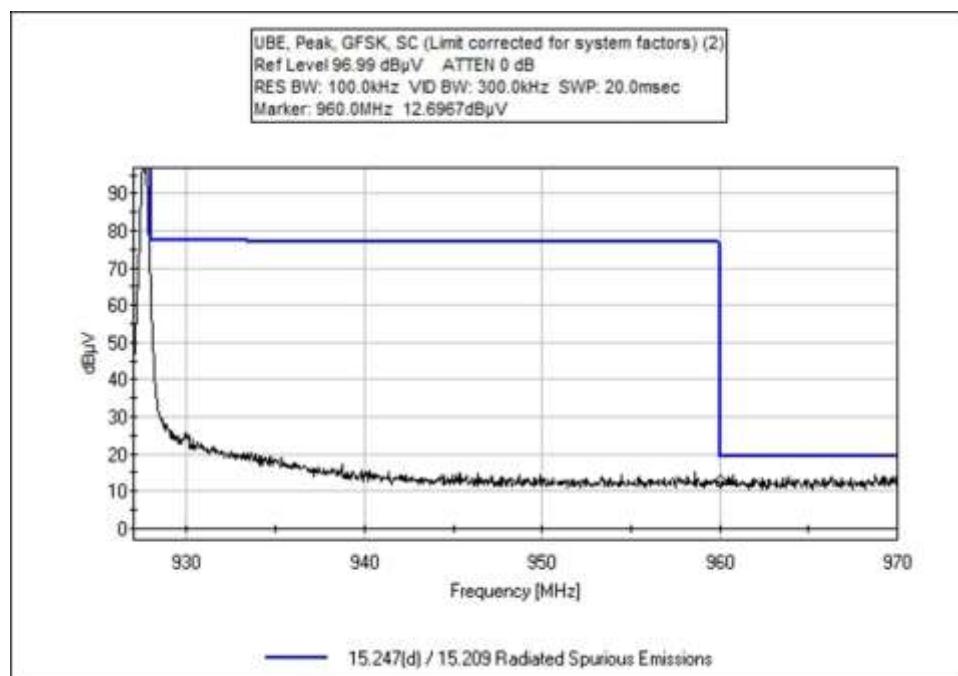
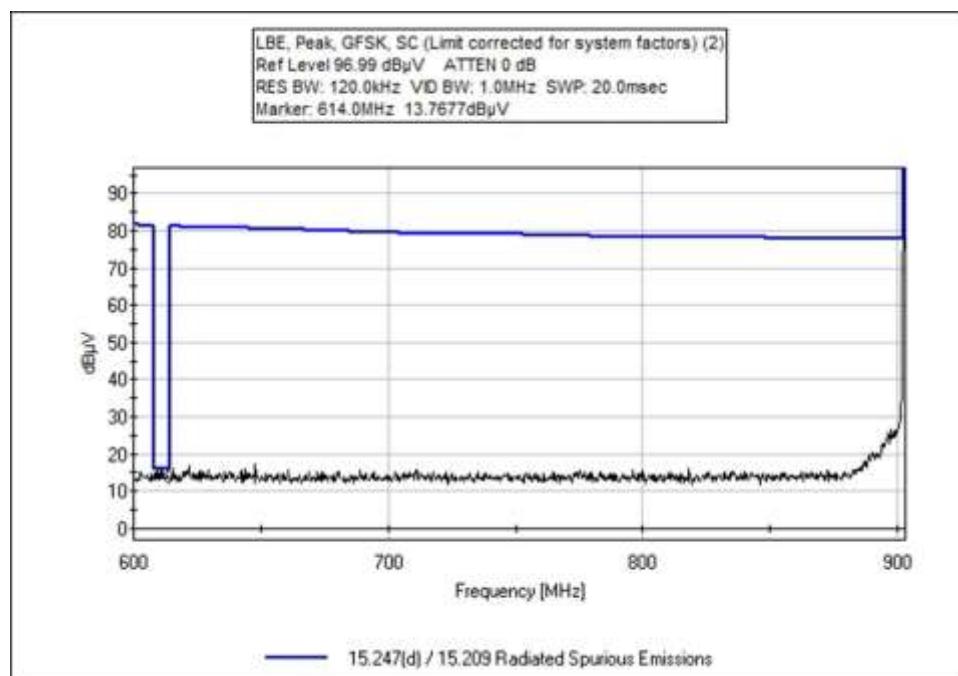


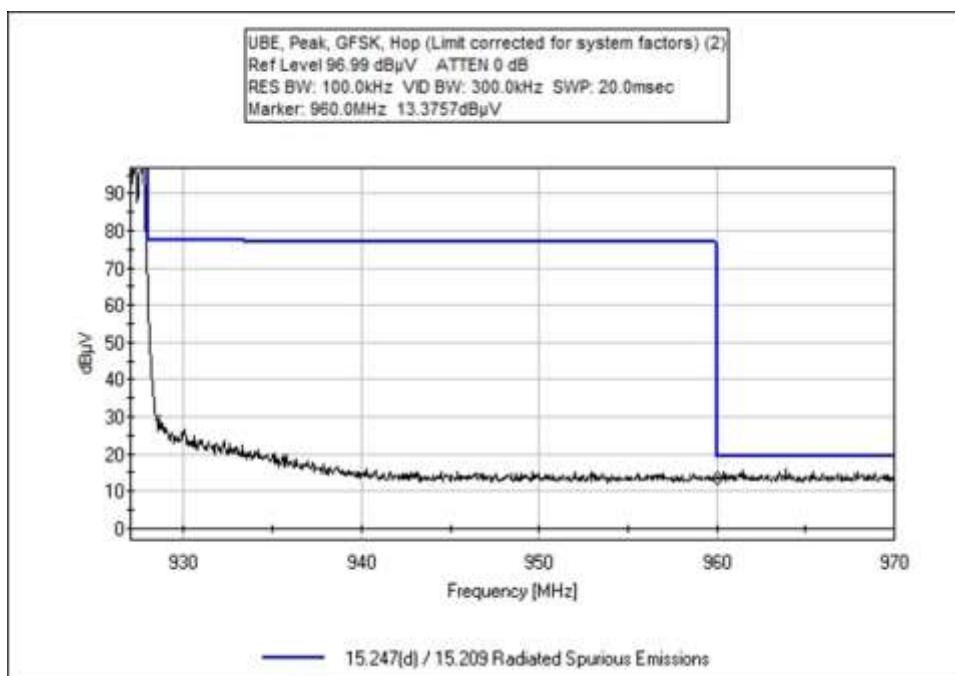
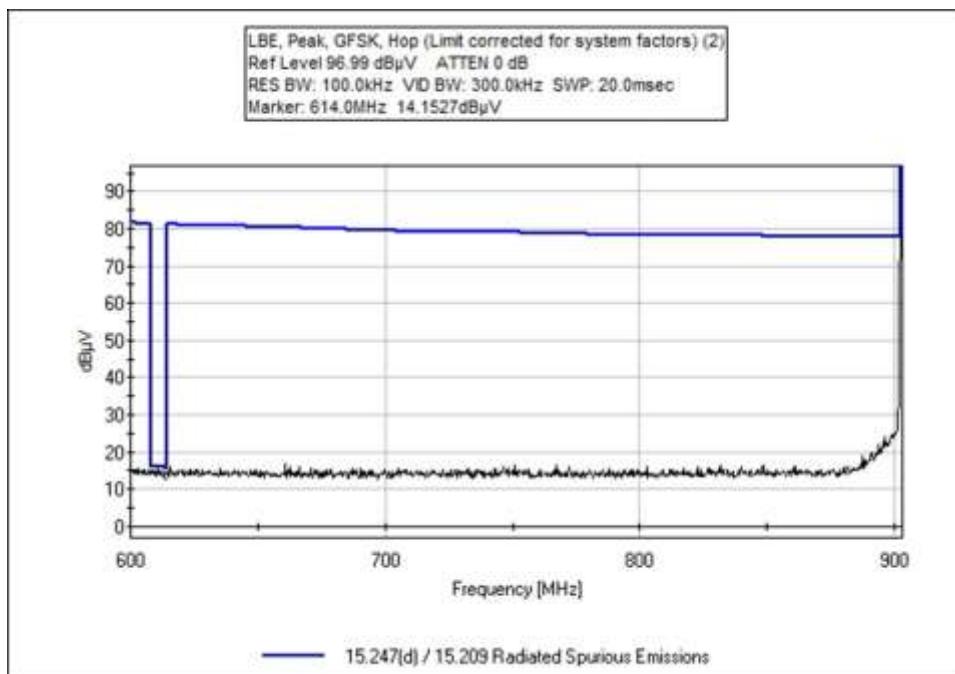


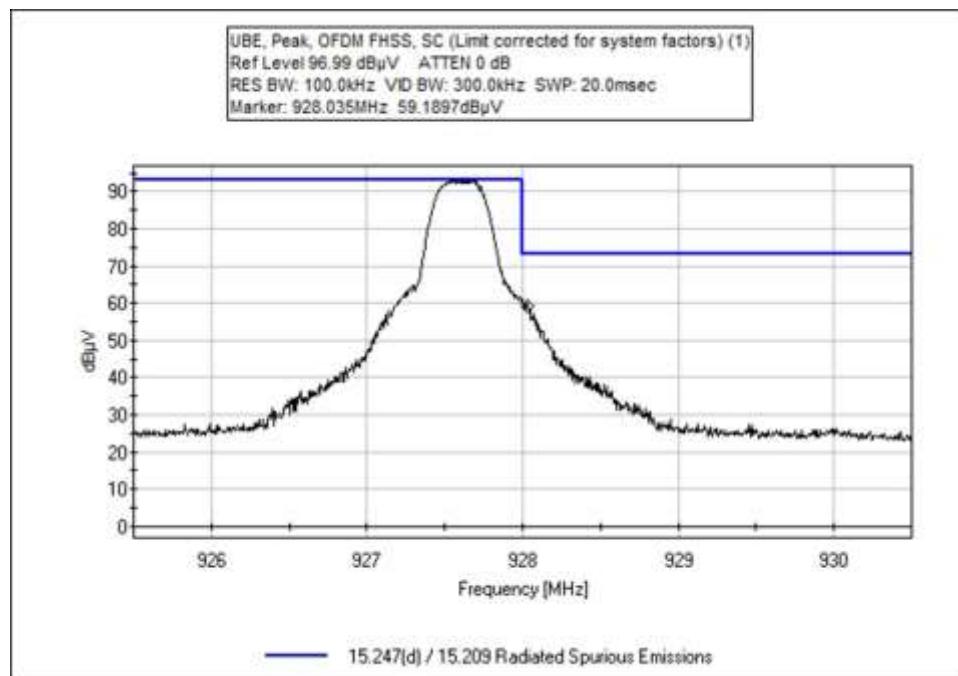
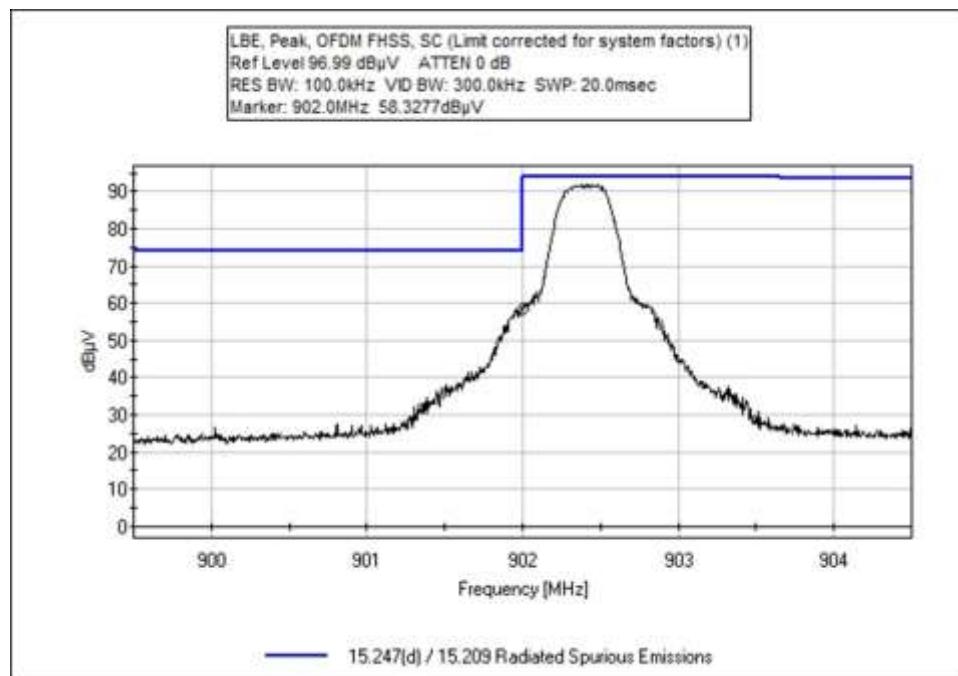


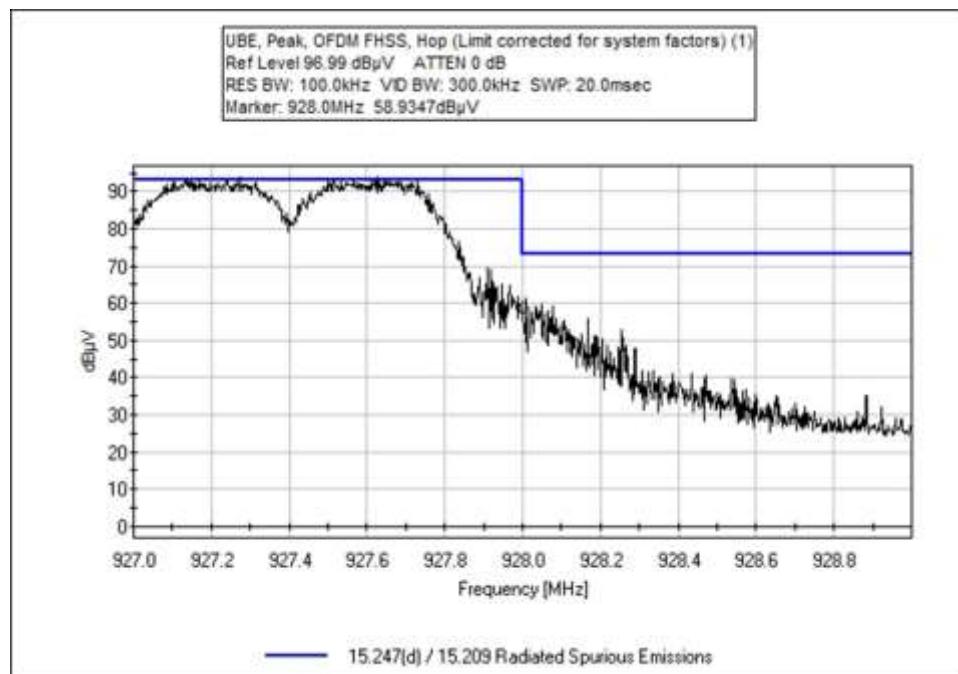
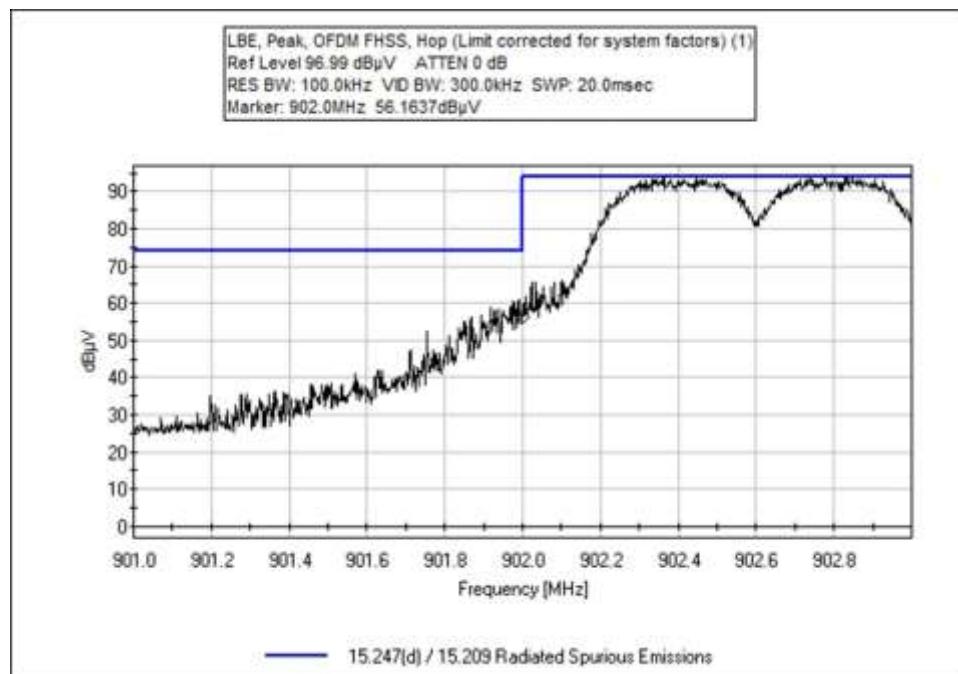


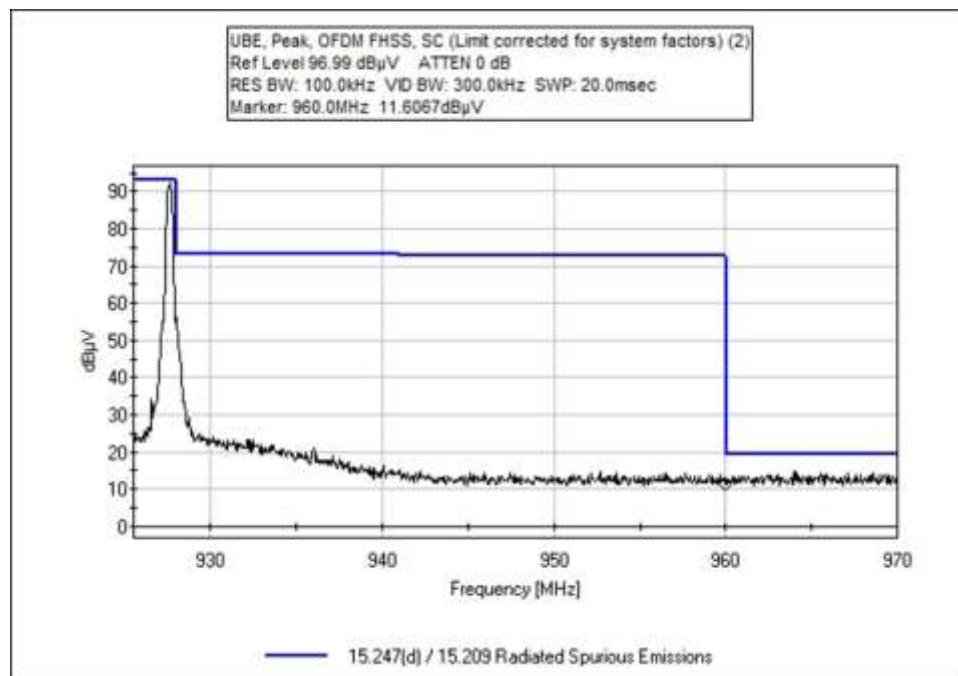
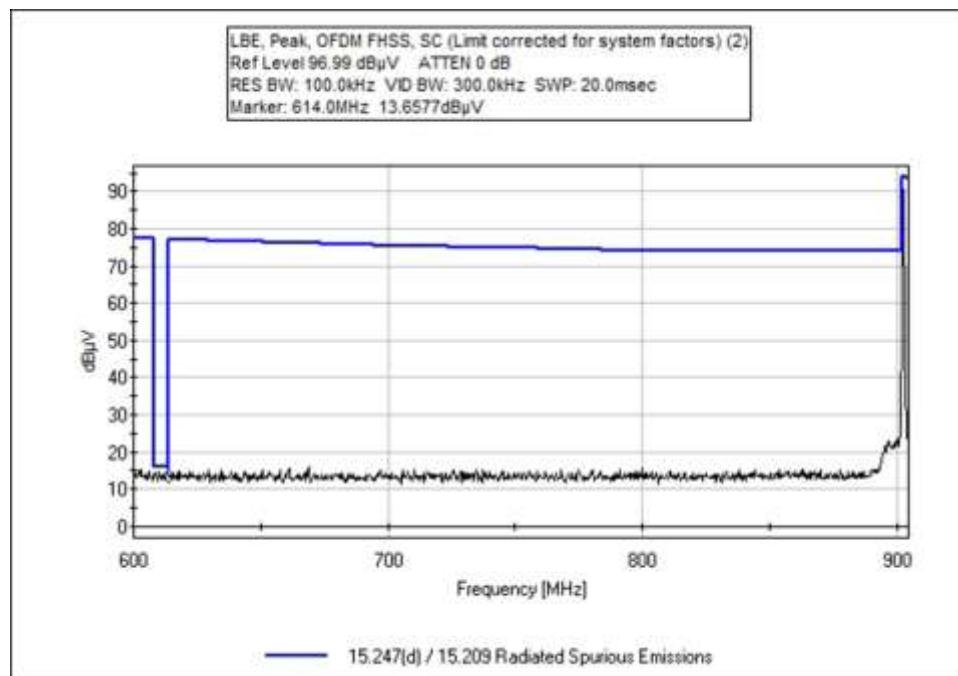


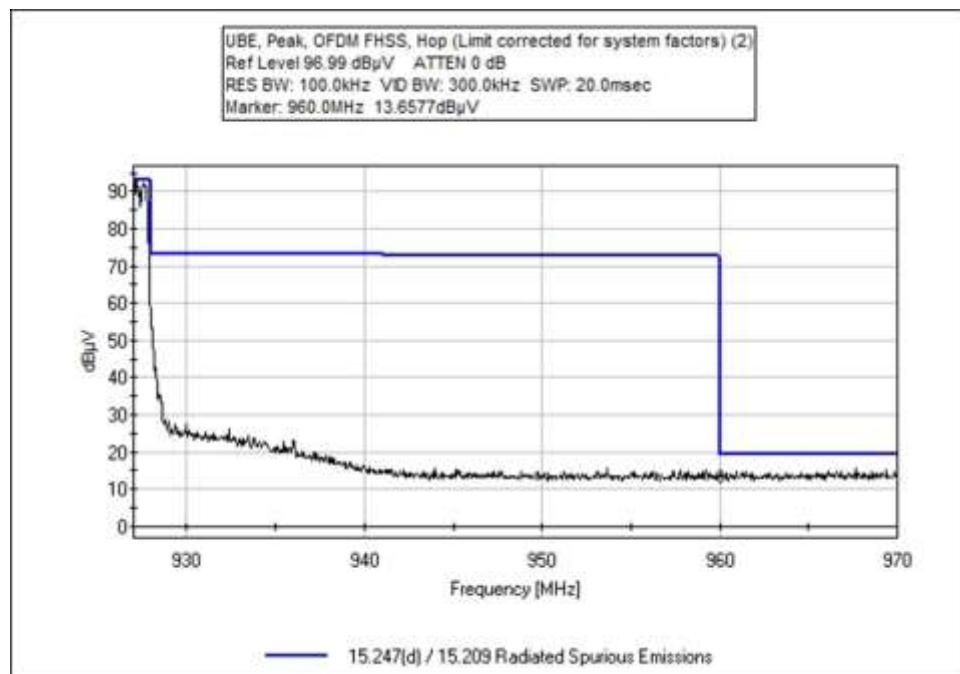
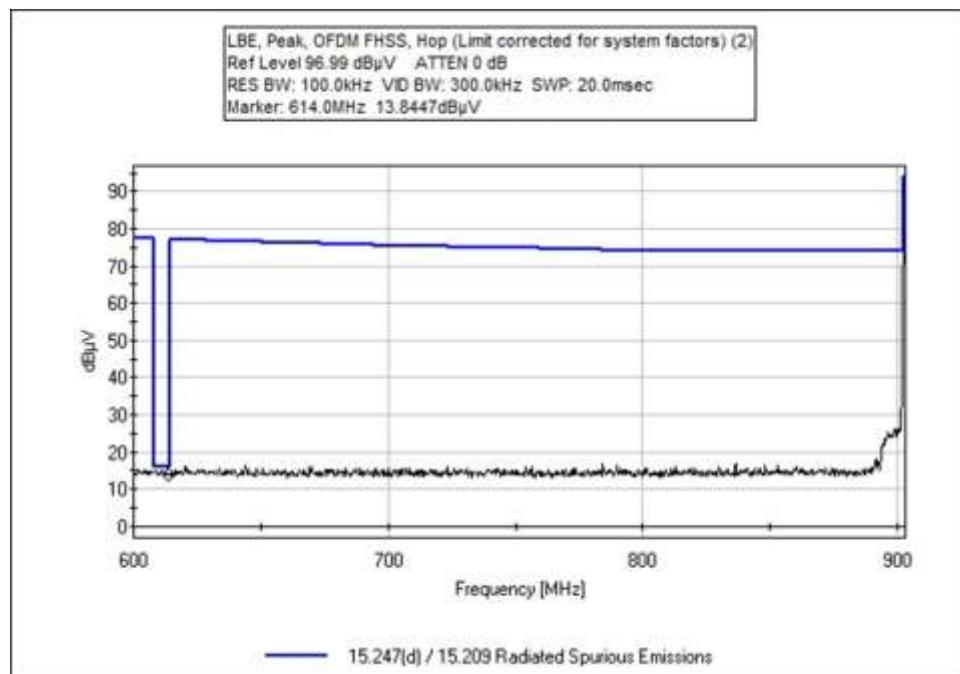












Test Setup / Conditions / Data

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 #: **104631** Date: 1/7/2021
 Test Type: **Radiated Scan** Time: 11:53:59
 Tested By: Matt Harrison Sequence#: 6
 Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 23°C Relative Humidity: 41% Atmospheric Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 600-970MHz
Test Setup: The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T2	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T5	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T6	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist.	Corr	Spec	Margin	Polar
			MHz	dB μ V	dB	dB	dB	Table	dB μ V/m	dB μ V/m	
											Ant
1	927.685M	93.2	+24.2 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	127.3 HopSC	127.3	+0.0	Vert/ HopSC
2	960.000M	13.7	+24.6 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	48.2 Hop	54.0	-5.8	Vert/ Hop
3	614.000M QP	9.4	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	39.6 Hop	46.0	-6.4	Vert/ Hop
4	614.000M QP	9.3	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	39.5 SC	46.0	-6.5	Vert/ SC
^	614.000M	13.8	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	44.0 Hop	46.0	-2.0	Vert/ Hop
^	614.000M	13.7	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	43.9 SC	46.0	-2.1	Vert/ SC
7	960.000M	11.6	+24.6 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	46.1 SC	54.0	-7.9	Vert/ SC
8	928.000M	61.3	+24.2 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	95.4 SC	107.3	-11.9	Vert/ SC
9	928.000M	58.9	+24.2 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	93.0 Hop	107.3	-14.3	Vert/ Hop
10	902.000M	58.3	+23.8 +0.3	+5.8 +0.0	+1.4	+2.1	+0.0	91.7 SC	107.3	-15.6	Vert/ SC
11	902.000M	56.2	+23.8 +0.3	+5.8 +0.0	+1.4	+2.1	+0.0	89.6 Hop	107.3	-17.7	Vert/ Hop



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 #: **104631** Date: 1/7/2021
Test Type: **Radiated Scan** Time: 09:44:28
Tested By: Matt Harrison Sequence#: 14
Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:

Temperature: 23°C

Relative Humidity: 41%

Atmospheric Pressure: 101.6kPa

Test Method: ANSI C63.10 (2013)

Frequency Range: 600-970MHz

Test Setup:

The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T2	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T5	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T6	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters					
#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist.	Corr	Spec	Margin	Polar	
			MHz	dB μ V	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	902.326M	98.0	+23.8 +0.3	+5.8 +0.0	+1.4	+2.1	+0.0	131.4	131.4	+0.0	Vert/	
2	960.000M	13.4	+24.6 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	47.9	54.0	-6.1	Vert/	
3	614.000M QP	9.4	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	39.6	46.0	-6.4	Vert/	
^	614.000M	14.6	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	44.8	46.0	-1.2	Vert/	
^	614.000M	13.8	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	44.0	46.0	-2.0	Vert/	
6	960.000M	12.7	+24.6 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	47.2	54.0	-6.8	Vert/	
7	928.000M	59.4	+24.2 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	93.5	111.4	-17.9	Vert/	
8	902.000M	59.9	+23.8 +0.3	+5.8 +0.0	+1.4	+2.1	+0.0	93.3	111.4	-18.1	Vert/	
9	928.000M	59.2	+24.2 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	93.3	111.4	-18.1	Vert/	
10	902.000M	58.7	+23.8 +0.3	+5.8 +0.0	+1.4	+2.1	+0.0	92.1	111.4	-19.3	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 #: **104631** Date: **1/7/2021**
 Test Type: **Radiated Scan** Time: **11:16:07**
 Tested By: Matt Harrison Sequence#: **15**
 Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions: Temperature: 23°C Relative Humidity: 41% Atmospheric Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 600-970MHz
Test Setup: The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T2	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T5	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T6	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist.	Corr	Spec	Margin	Polar
			MHz	dB μ V	dB	dB	dB	Table	dB μ V/m	dB μ V/m	
1	902.274M	97.4	+23.8 +0.3	+5.8 +0.0	+1.4	+2.1	+0.0	130.8	130.8	+0.0	Vert/
2	960.000M	14.1	+24.6 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	48.6	54.0	-5.4	Vert/
3	614.000M QP	9.4	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	39.6	46.0	-6.4	Vert/
^	614.000M	14.8	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	45.0	46.0	-1.0	Vert/
^	614.000M	13.4	+21.2 +0.3	+5.8 +0.0	+1.2	+1.7	+0.0	43.6	46.0	-2.4	Vert/
6	960.000M	11.8	+24.6 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	46.3	54.0	-7.7	Vert/
7	902.000M	55.5	+23.8 +0.3	+5.8 +0.0	+1.4	+2.1	+0.0	88.9	110.8	-21.9	Vert/
8	902.000M	54.5	+23.8 +0.3	+5.8 +0.0	+1.4	+2.1	+0.0	87.9	110.8	-22.9	Vert/
9	928.000M	41.4	+24.2 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	75.5	110.8	-35.3	Vert/
10	928.000M	41.1	+24.2 +0.4	+5.8 +0.0	+1.5	+2.2	+0.0	75.2	110.8	-35.6	Vert/
											SC

Test Setup Photo(s)



Below 1GHz



Below 1GHz



Above 1GHz



Above 1GHz

15.207 AC Conducted 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: **15.207 AC Mains - Average**
 Work Order #: **104631** Date: 1/7/2021
 Test Type: **Conducted Emissions** Time: 15:32:38
 Tested By: Matt Harrison Sequence#: 16
 Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

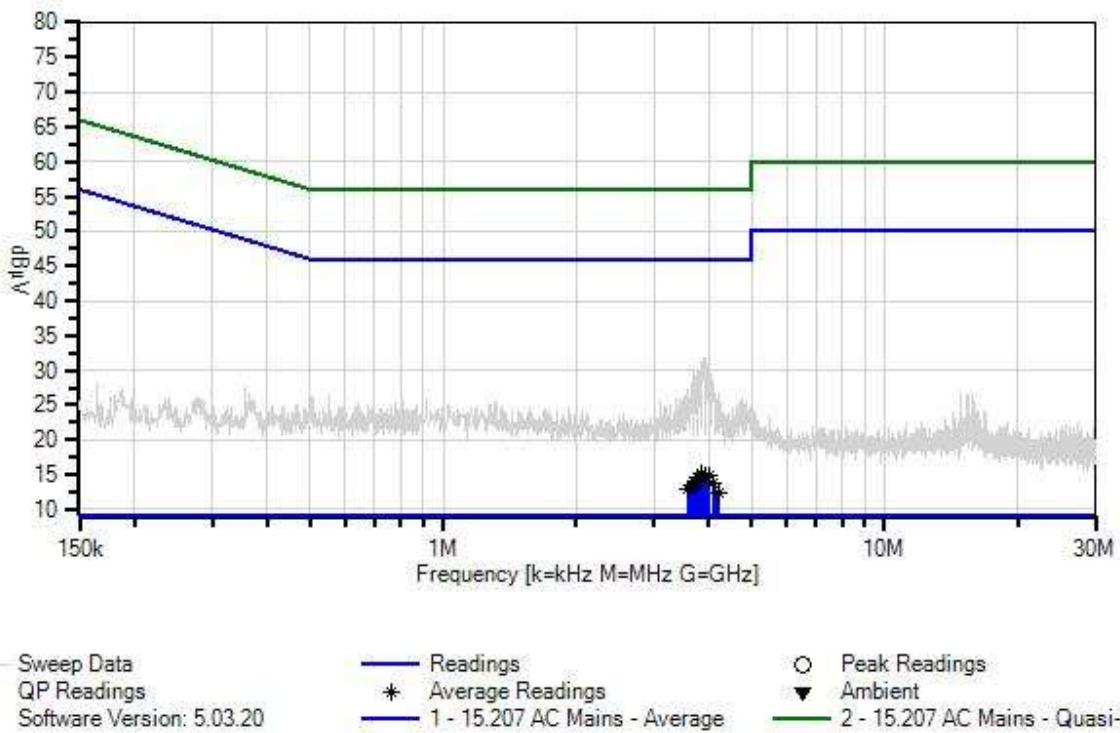
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 41%
Atmospheric Pressure: 101.6kPa
Test Method: ANSI C63.10 (2013)
Frequency Range: 600-970MHz
Test Setup: The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.

Itron, Inc. WO#: 104631 Sequence#: 16 Date: 1/7/2021
 15.207 AC Mains - Average Test Lead: 120V 60Hz Line


Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/7/2020	4/7/2022
T2	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T4	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022

Measurement Data:			Reading listed by margin.				Test Lead: Line				
#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar
1	3.837M Ave	5.5 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	15.1	46.0	-30.9	Line
^	3.837M	22.0 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	31.6	46.0	-14.4	Line
3	3.999M Ave	5.4 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	15.0	46.0	-31.0	Line
^	3.999M	21.7 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	31.3	46.0	-14.7	Line
5	3.943M Ave	5.4 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	15.0	46.0	-31.0	Line
^	3.943M	22.0 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	31.6	46.0	-14.4	Line
7	3.905M Ave	5.3 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	14.9	46.0	-31.1	Line
^	3.905M	22.9 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	32.5	46.0	-13.5	Line
9	3.922M Ave	5.0 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	14.6	46.0	-31.4	Line
^	3.922M	20.0 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	29.6	46.0	-16.4	Line
11	3.786M Ave	4.9 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	14.5	46.0	-31.5	Line
^	3.786M	20.9 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	30.5	46.0	-15.5	Line
13	3.761M Ave	4.5 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	14.1	46.0	-31.9	Line
^	3.761M	21.0 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	30.6	46.0	-15.4	Line
15	4.092M Ave	4.0 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	13.7	46.0	-32.3	Line
^	4.092M	19.6 +0.1	+9.1	+0.1	+0.0	-0.4	+0.0	29.3	46.0	-16.7	Line
17	3.731M Ave	4.0 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	13.6	46.0	-32.4	Line
^	3.731M	20.2 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	29.8	46.0	-16.2	Line
19	3.650M Ave	3.8 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	13.4	46.0	-32.6	Line
^	3.650M	19.0 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	28.6	46.0	-17.4	Line
21	3.710M Ave	3.8 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	13.4	46.0	-32.6	Line
^	3.710M	18.6 +0.1	+9.1	+0.1	+0.0	-0.3	+0.0	28.2	46.0	-17.8	Line

23	3.680M	3.7	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	13.3	46.0	-32.7	Line
Ave											
^	3.680M	19.5	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	29.1	46.0	-16.9	Line
25	3.693M	3.6	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	13.2	46.0	-32.8	Line
Ave											
^	3.693M	20.8	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	30.4	46.0	-15.6	Line
27	3.590M	3.4	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	13.0	46.0	-33.0	Line
Ave											
^	3.590M	18.2	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	27.8	46.0	-18.2	Line
29	4.211M	2.9	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	12.5	46.0	-33.5	Line
Ave											
^	4.211M	17.8	+9.1 +0.1	+0.1	+0.0	-0.3	+0.0	27.4	46.0	-18.6	Line



Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
Customer: **Itron, Inc.**
Specification: **15.207 AC Mains - Average**
Work Order #: **104631** Date: 1/7/2021
Test Type: **Conducted Emissions** Time: 15:52:17
Tested By: Matt Harrison Sequence#: 17
Software: EMITest 5.03.19 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

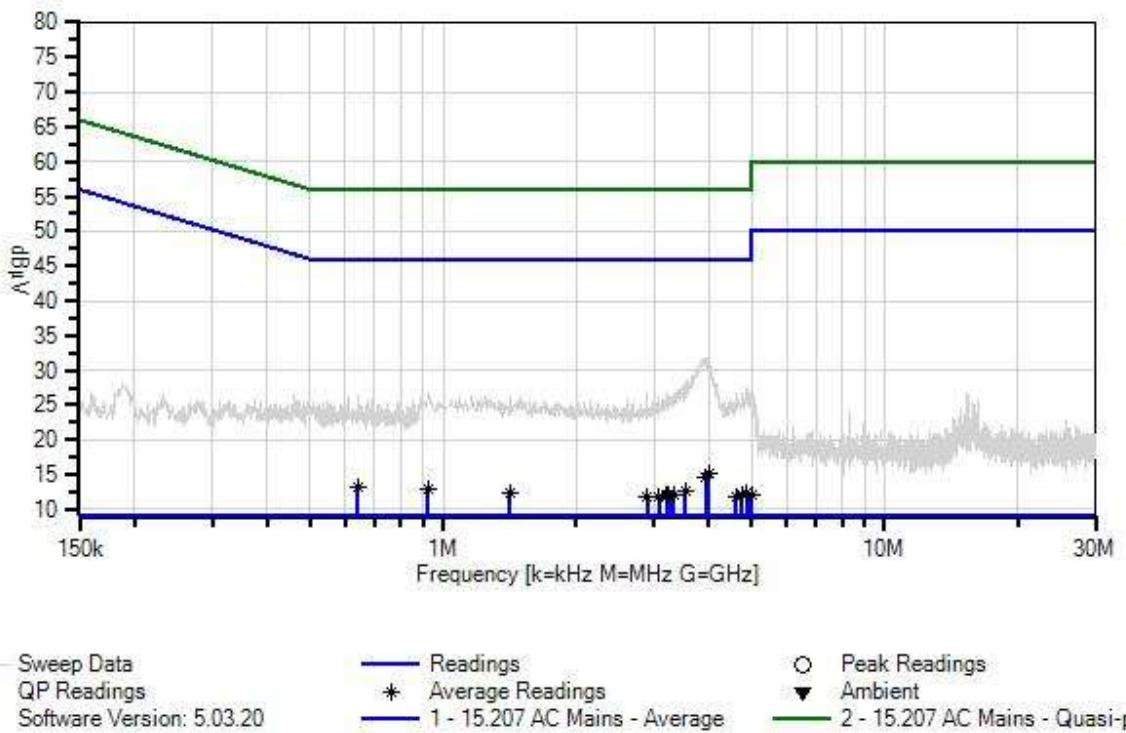
Temperature: 23°C
Relative Humidity: 41%
Atmospheric Pressure: 101.6kPa

Test Method: ANSI C63.10 (2013)

Frequency Range: 600-970MHz

Test Setup:

The equipment under test (EUT) is placed on the tabletop. The EUT is transmitting continuous wave at its rated output power. Low, Mid, High channels investigated, worst case reported. Horizontal and Vertical antenna polarities investigated above 30MHz, worst case reported. 3 x orthogonal axes investigated below 30MHz, worst case reported.

Itron, Inc. WO#: 104631 Sequence#: 17 Date: 1/7/2021
 15.207 AC Mains - Average Test Lead: 120V 60Hz Neutral

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	4/7/2020	4/7/2022
T2	ANP06515	Cable	Heliax	7/1/2020	7/1/2022
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
T4	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022

Measurement Data:			Reading listed by margin.				Test Lead: Neutral				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5				Table	dB μ V	dB μ V		
			MHz	dB μ V	dB	dB	dB	Table	dB μ V	dB	Ant
1	3.994M	5.5	+9.1	+0.1	+0.0	-0.3	+0.0	15.1	46.0	-30.9	Neutr
	Ave		+0.1								
^	3.994M	22.8	+9.1	+0.1	+0.0	-0.3	+0.0	32.4	46.0	-13.6	Neutr
			+0.1								
3	3.926M	5.1	+9.1	+0.1	+0.0	-0.3	+0.0	14.7	46.0	-31.3	Neutr
	Ave		+0.1								
^	3.926M	22.9	+9.1	+0.1	+0.0	-0.3	+0.0	32.5	46.0	-13.5	Neutr
			+0.1								
5	641.590k	3.5	+9.1	+0.0	+0.0	-0.4	+0.0	13.3	46.0	-32.7	Neutr
	Ave		+0.3								
^	641.590k	17.3	+9.1	+0.0	+0.0	-0.4	+0.0	27.1	46.0	-18.9	Neutr
			+0.3								
7	923.985k	3.3	+9.1	+0.0	+0.0	-0.3	+0.0	12.9	46.0	-33.1	Neutr
	Ave		+0.2								
^	923.984k	17.8	+9.1	+0.0	+0.0	-0.3	+0.0	27.4	46.0	-18.6	Neutr
			+0.2								
9	3.544M	3.1	+9.1	+0.1	+0.0	-0.3	+0.0	12.7	46.0	-33.3	Neutr
	Ave		+0.1								
^	3.544M	19.5	+9.1	+0.1	+0.0	-0.3	+0.0	29.1	46.0	-16.9	Neutr
			+0.1								
11	4.862M	2.6	+9.1	+0.1	+0.0	-0.4	+0.0	12.3	46.0	-33.7	Neutr
	Ave		+0.1								
^	4.862M	18.6	+9.1	+0.1	+0.0	-0.4	+0.0	28.3	46.0	-17.7	Neutr
			+0.1								
13	1.417M	2.7	+9.1	+0.0	+0.0	-0.3	+0.0	12.3	46.0	-33.7	Neutr
	Ave		+0.2								
^	1.417M	17.4	+9.1	+0.0	+0.0	-0.3	+0.0	27.0	46.0	-19.0	Neutr
			+0.2								
15	3.237M	2.6	+9.1	+0.1	+0.0	-0.3	+0.0	12.2	46.0	-33.8	Neutr
	Ave		+0.1								
^	3.237M	17.4	+9.1	+0.1	+0.0	-0.3	+0.0	27.0	46.0	-19.0	Neutr
			+0.1								
17	3.216M	2.6	+9.1	+0.1	+0.0	-0.3	+0.0	12.2	46.0	-33.8	Neutr
	Ave		+0.1								
^	3.216M	17.7	+9.1	+0.1	+0.0	-0.3	+0.0	27.3	46.0	-18.7	Neutr
			+0.1								
19	3.327M	2.6	+9.1	+0.1	+0.0	-0.3	+0.0	12.2	46.0	-33.8	Neutr
	Ave		+0.1								
^	3.327M	17.7	+9.1	+0.1	+0.0	-0.3	+0.0	27.3	46.0	-18.7	Neutr
			+0.1								
21	4.751M	2.4	+9.1	+0.1	+0.0	-0.4	+0.0	12.1	46.0	-33.9	Neutr
	Ave		+0.1								
^	4.751M	17.9	+9.1	+0.1	+0.0	-0.4	+0.0	27.6	46.0	-18.4	Neutr
			+0.1								

23	4.990M	2.3	+9.1	+0.1	+0.0	-0.4	+0.0	12.0	46.0	-34.0	Neutr
Ave			+0.1								
^	4.990M	18.0	+9.1	+0.1	+0.0	-0.4	+0.0	27.7	46.0	-18.3	Neutr
			+0.1								
25	3.084M	2.3	+9.1	+0.1	+0.0	-0.3	+0.0	11.9	46.0	-34.1	Neutr
Ave			+0.1								
^	3.084M	17.3	+9.1	+0.1	+0.0	-0.3	+0.0	26.9	46.0	-19.1	Neutr
			+0.1								
27	4.607M	2.2	+9.1	+0.1	+0.0	-0.4	+0.0	11.9	46.0	-34.1	Neutr
Ave			+0.1								
^	4.607M	17.8	+9.1	+0.1	+0.0	-0.4	+0.0	27.5	46.0	-18.5	Neutr
			+0.1								
29	2.902M	2.1	+9.1	+0.1	+0.0	-0.3	+0.0	11.7	46.0	-34.3	Neutr
Ave			+0.1								
^	2.902M	17.7	+9.1	+0.1	+0.0	-0.3	+0.0	27.3	46.0	-18.7	Neutr
			+0.1								

Test Setup Photo(s)



SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

SAMPLE CALCULATIONS	
Meter reading	(dB μ V)
+ Antenna Factor	(dB/m)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	(dB μ V/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.