

Ittron, Inc.

TEST REPORT FOR
500C
Models: WPITC, WRMTC, and GRMTC

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(HYBRID 902-928MHz)

Report No.: 105380-16

Date of issue: August 13, 2021



Test Certificate # 803.01

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

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

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Jay Holcomb
Customer Reference Number: 240357

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

Kim Romero
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 105380

May 21, 2021

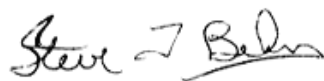
May 21, 2021

June 7 and 9, 2021

July 13 and 19, 2021

Report Authorization

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



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

Test Facility Information



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

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.19

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 (Hybrid 902-928MHz)

Test Procedure	Description	Modifications	Results
15.247(a)(1)(i)	Occupied Bandwidth	NA	NA1
15.247(a)(1)	Carrier Separation	NA	PASS
15.247(a)(1)(i)	Number of Hopping Channels	NA	NA1
15.247(a)(1)(i)	Average Time of Occupancy	NA	NA1
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
15.247 (f)	Hybrid Systems Time of Occupancy	NA	NP
15.247 (f)	Hybrid Systems Power Spectral Density	NA	PASS
15.207	AC Conducted Emissions	NA	NA2

NA = Not Applicable

NA1 = This test is not applicable under Hybrid System requirements section 15.247 (f).

NA2 = Not Applicable because the manufacturer declares the EUT is battery operated.

NP = CKC Laboratories was not contracted to perform test.

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
500C	Itron, Inc.	GRMTC	RAD2

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	Latitude E6420	8P954R1
Laptop Power Supply	Dell	ADP-65JB	NA
Power Supply	Extech Instruments	382225	P99250026

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
500C	Itron, Inc.	WRMTC	RAD2

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	Latitude E6420	8P954R1
Power Supply	Extech Instruments	382225	P99250026

Configuration 3

Equipment Tested:

Device	Manufacturer	Model #	S/N
500C	Itron, Inc.	WPITC	RAD2

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	Latitude E6420	8P954R1
Laptop Power Supply	Dell	ADP-65JB	NA
Power Supply	Extech Instruments	382225	P99250026

Configuration 4

Equipment Tested:

Device	Manufacturer	Model #	S/N
500C	Itron, Inc.	WPITC	CON2

Support Equipment:

Device	Manufacturer	Model #	S/N
Power Supply	Extech Instruments	382225	P99250026
Laptop	Dell	Latitude E6420	8P954R1
Laptop Power Supply	Dell	ADP-65JB	NA
Power Supply	Extech Instruments	382225	P99250026

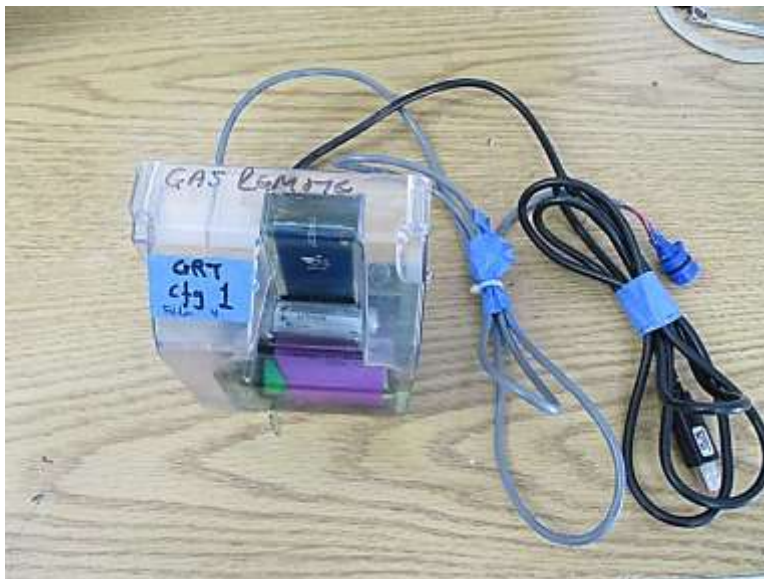
General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Proprietary Low power and FHSS
Operating Frequency Range:	902.4 – 927.6MHz, 400kHz steps, 64 channels, 300kbps GFSK LV2 Hybrid
Number of Hopping Channels:	64 (GFSK)
Modulation Type(s):	300kbps GFSK
Maximum Duty Cycle:	45%
Number of TX Chains:	1
Antenna Type(s) and Gain:	PCB Trace/1.1dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	3.6Vdc battery
Firmware / Software used for Test:	App Version: 0.0.25.0, CSL version: 8.1.3.0 Hardware Rev: 12
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT Photo(s)



Configuration 1; View 1



Configuration 1; View 2



Configuration 2; View 1



Configuration 2; View 2



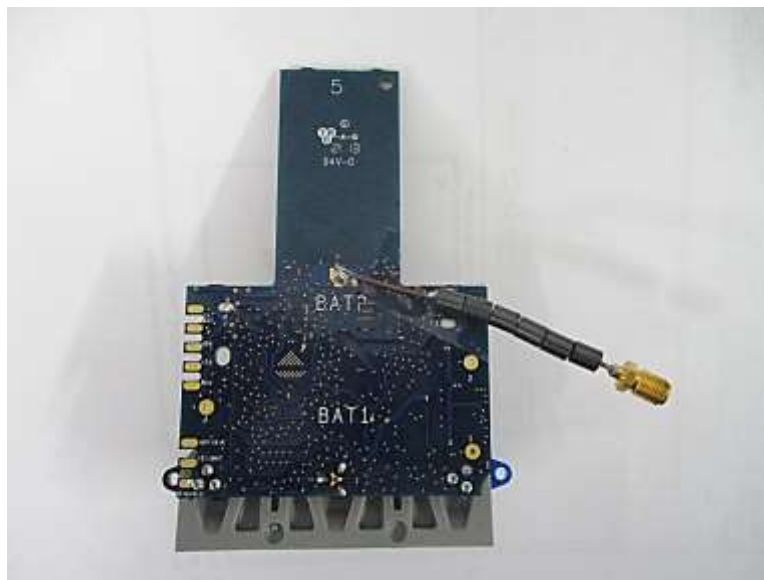
Configuration 3; View 1



Configuration 3, View 2



Configuration 4, View 1

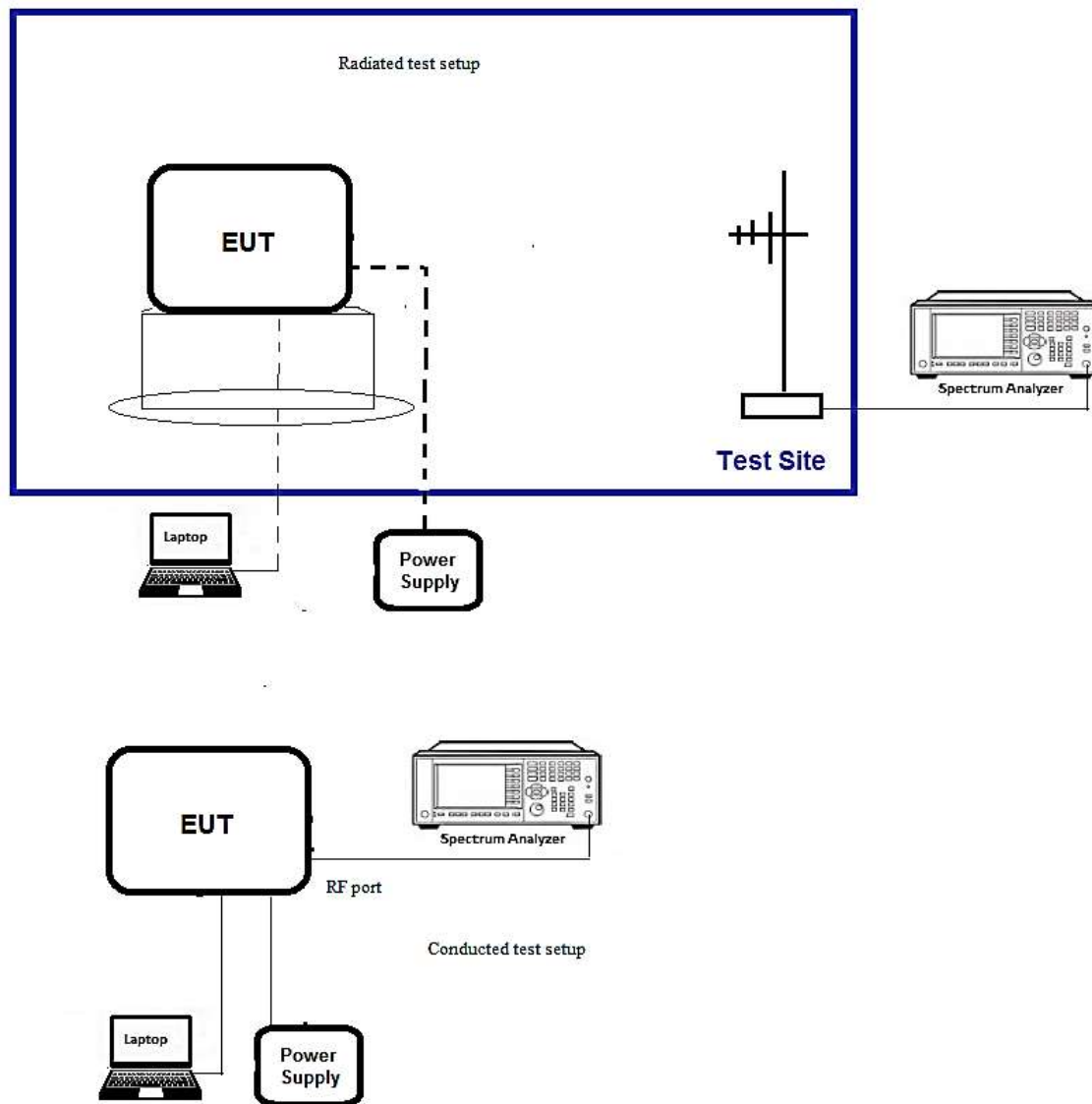


Configuration 4, View 2

Support Equipment Photo(s)



Block Diagram of Test Setup(s)



FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	7/13/2021
Configuration:	Configuration 4		
Test Setup:	The EUT is placed on test bench and the Blue port receives power from remotely located support power supply set 3.6Vdc to simulate a fresh battery. The EUT's data port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable for configuration purposes. Note: Three EUTs have the same internal hardware. Conducted data measured on one EUT represents for all three EUTs.		

Environmental Conditions			
Temperature (°C)	28	Relative Humidity (%):	51

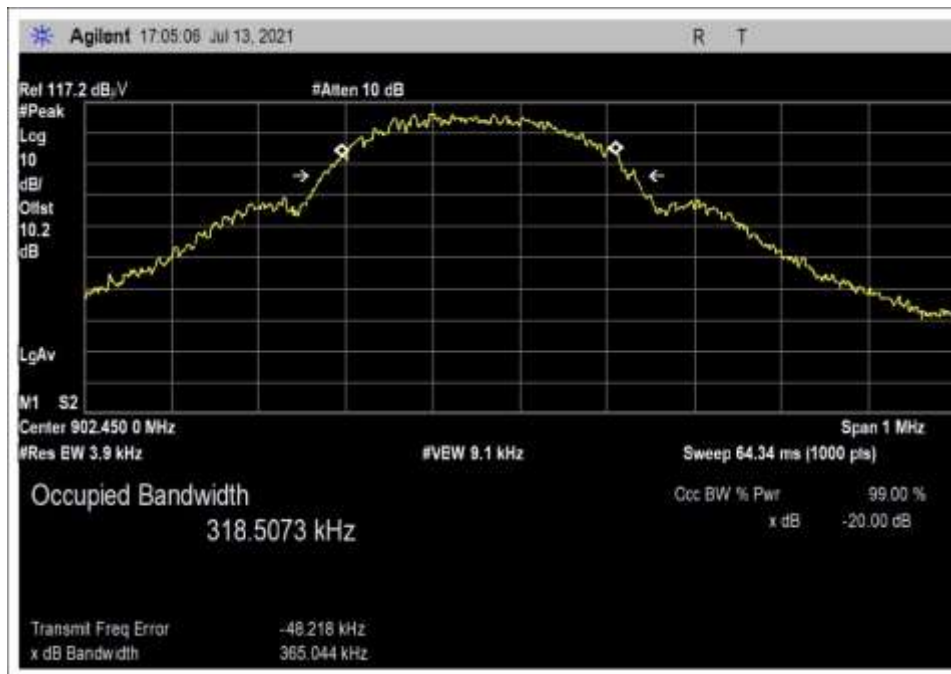
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	4/29/2020	4/29/2022
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	12/20/2019	12/20/2021
07659	Astrolab, Inc.	Astrolab, Inc.	32022-29094K-29094K-24TC	7/30/2020	7/30/2022

15.215(c) 20 dB Bandwidth 20dB Occupied Bandwidth

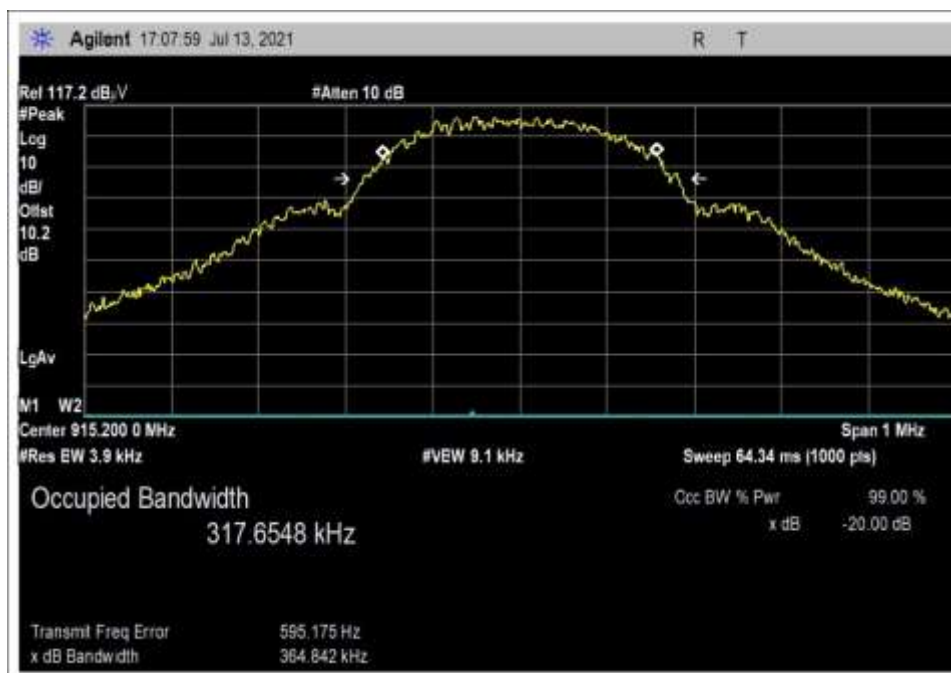
Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
902.4	1	300kbps GFSK LV2	365.04	*See Note	NA
915.2	1	300kbps GFSK LV2	364.84		
927.6	1	300kbps GFSK LV2	364.77		

*For this Hybrid mode there is no requirement to meet the FHSS or DTS bandwidth limits.

Plot(s)



Low Channel



Middle Channel

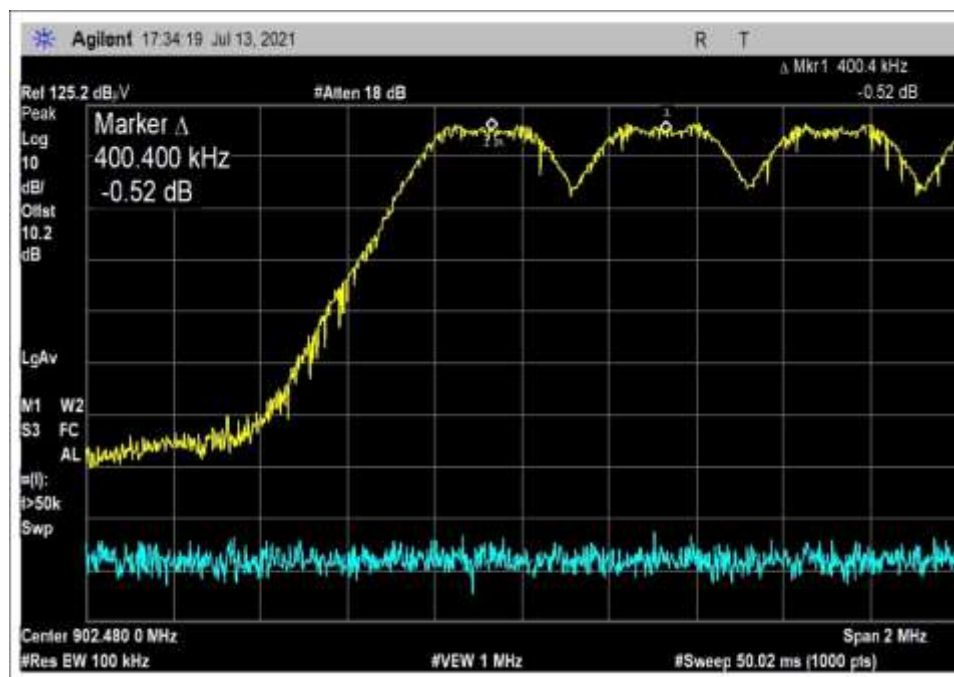


High Channel

15.247(a)(1) Carrier Separation

Test Data Summary				
Limit applied: 20dB bandwidth of the hopping channel.				
Antenna Port	Operational Mode	Measured (kHz)	Limit (kHz)	Results
1	300kbps GFSK LV2	400	>364.84	Pass

Plot(s)

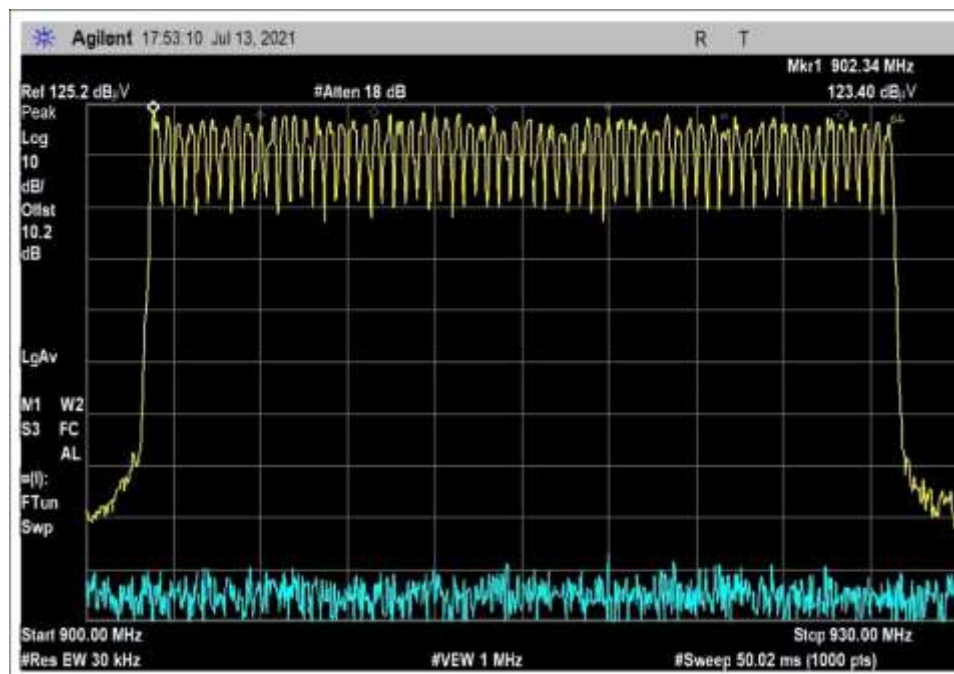


15.247(a)(1)(i) Number of Channels

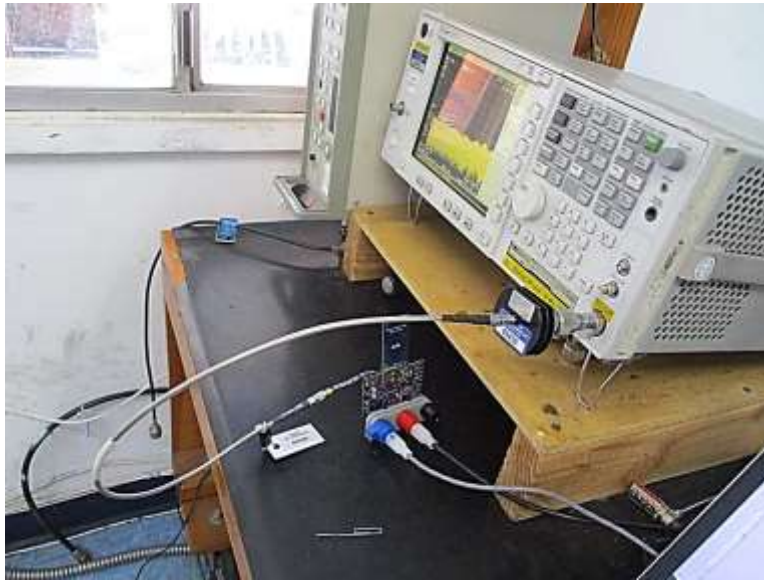
Test Data Summary				
$\text{Limit} = \begin{cases} 50 \text{ Channels} & 20 \text{ dB BW} < 250\text{kHz} \\ 25 \text{ Channels} & 20 \text{ dB BW} \geq 250\text{kHz} \end{cases}$				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
1	300kbps GFSK LV2	64	*See Note	NA

*For this Hybrid Mode there is no minimum number of hopping channels.

Plot(s)



Test Setup Photo(s)



15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	7/13/2021
Configuration:	4		
Test Setup:	The EUT is placed on test bench and the Blue port receives power from remotely located support power supply set 3.6Vdc to simulate a fresh battery. The EUT's data port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable for configuration purposes. Note: Three EUTs have the same internal hardware. Conducted data measured on one EUT represents for all three EUTs. Correction factor is compensated for.		

Environmental Conditions			
Temperature (°C)	25	Relative Humidity (%):	30

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	4/29/2020	4/29/2022
03430	Attenuator	Aeroflex/ Weinschel	75A-10-12	12/20/2019	12/20/2021
07659	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	7/30/2020	7/30/2022

Test Data Summary - Voltage Variations

This equipment is battery powered. Power output tests were performed with a DC power supply set at 3.6V to simulate a fresh battery.

Test Data Summary - RF Conducted Measurement					
<i>Limit = 30dBm Conducted/36dBm EIRP</i>					
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.4	300kbps GFSK LV2	PCB trace / 1.1 dB	15.2	≤ 30	Pass
915.2	300kbps GFSK LV2	PCB trace / 1.1 dB	15.4	≤ 30	Pass
927.6	300kbps GFSK LV2	PCB trace / 1.1 dB	15.4	≤ 30	Pass

Folder 3

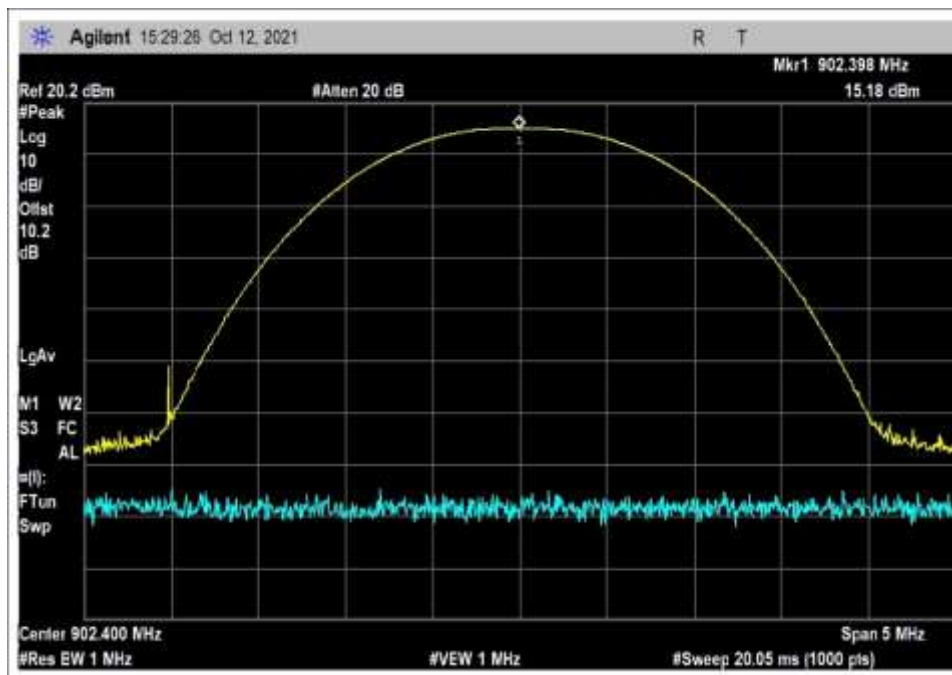
Test Data Summary - RF Conducted Measurement

Limit = 30dBm Conducted/36dBm EIRP

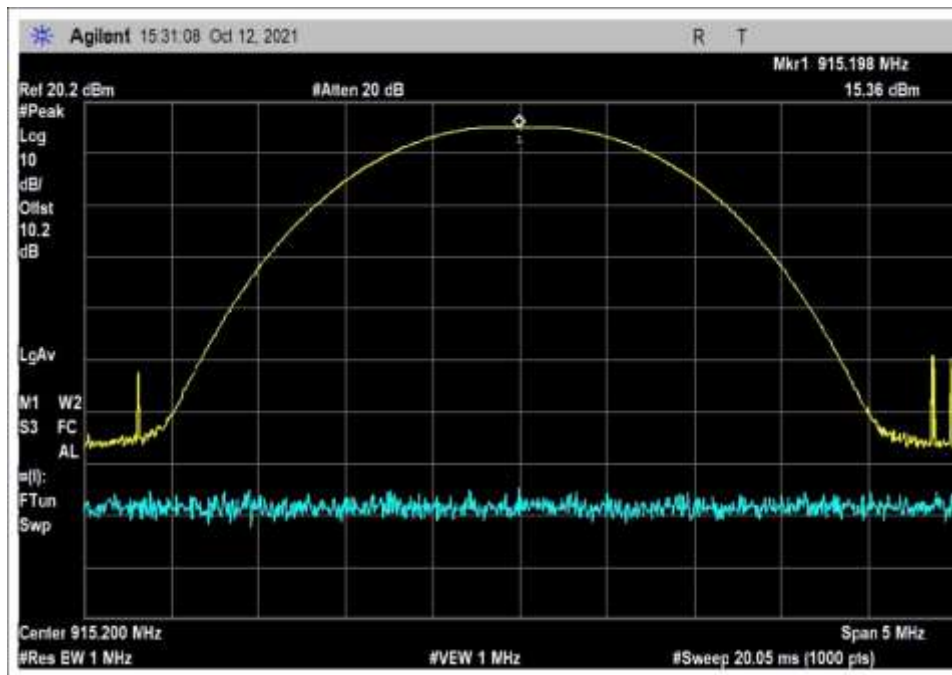
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.4	300kbps GFSK LV2	PCB trace / 1.1 dB	15.2	≤ 30	Pass
915.2	300kbps GFSK LV2	PCB trace / 1.1 dB	15.4	≤ 30	Pass
927.6	300kbps GFSK LV2	PCB trace / 1.1 dB	15.4	≤ 30	Pass
Folder 4					

*For this Hybrid Mode there is no minimum number of hopping channels required for the 1 Watt (30dBm) limit.

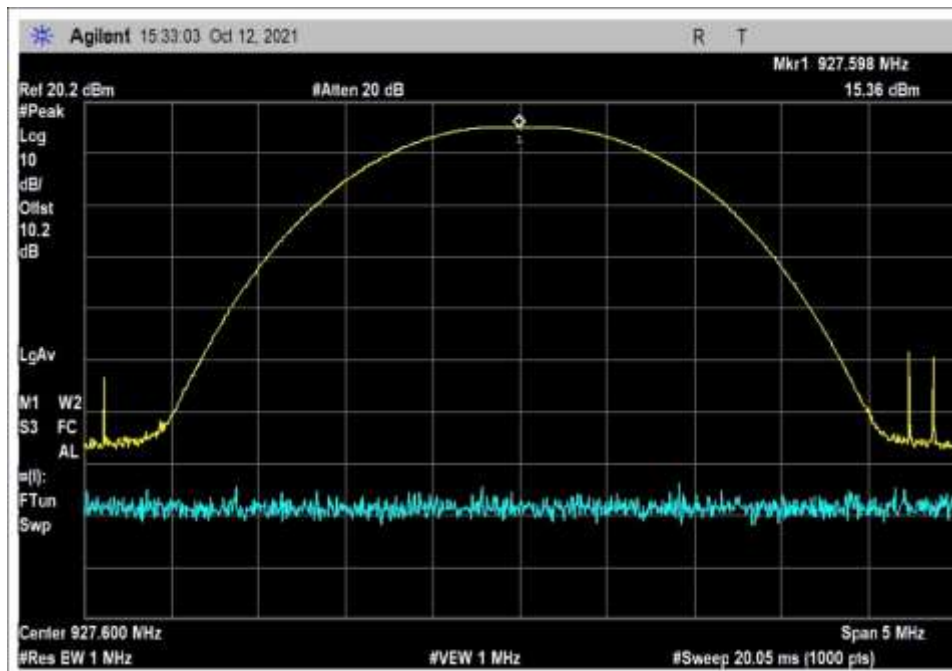
Plot(s) – Folder 3



Low Channel

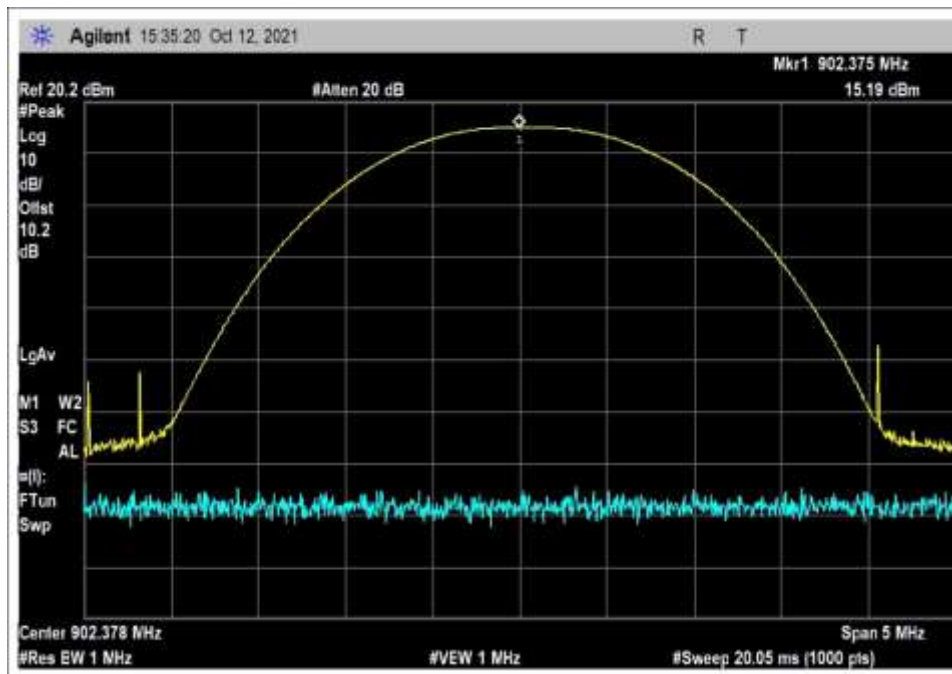


Middle Channel

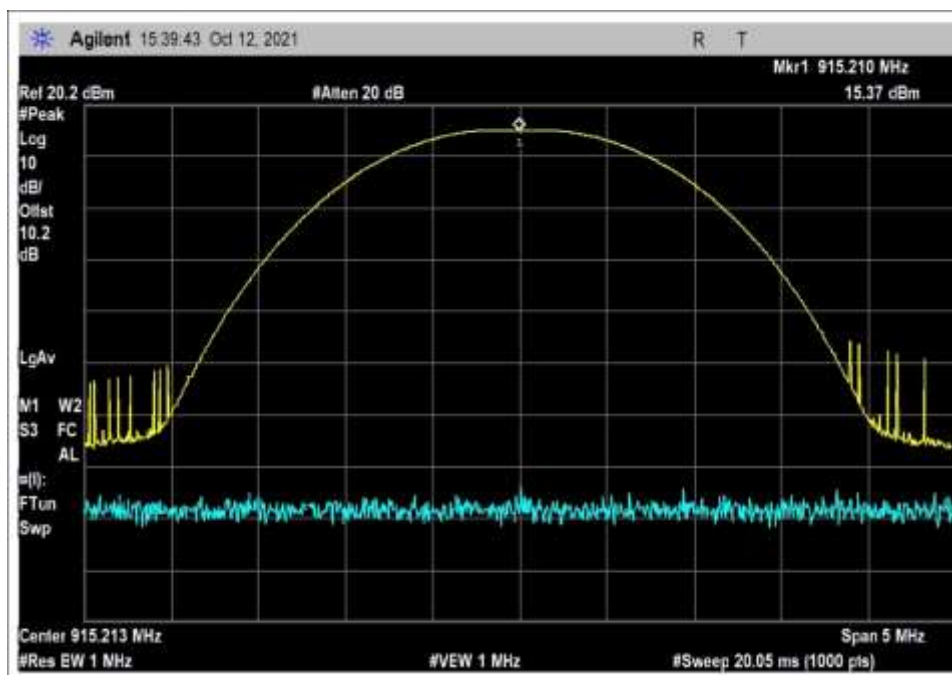


High Channel

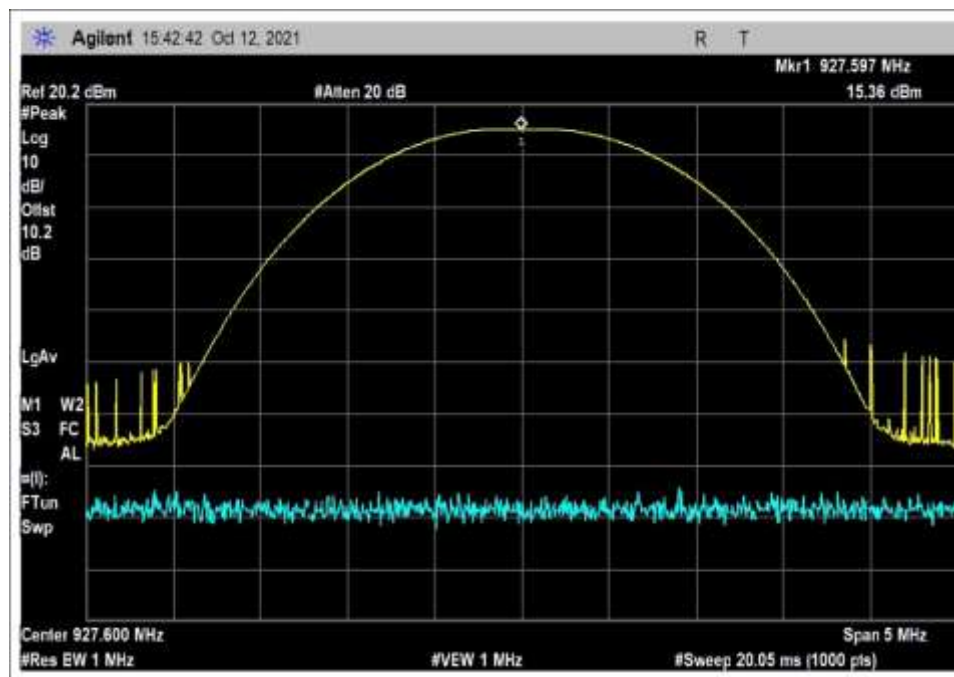
Plot(s) – Folder 4



Low Channel

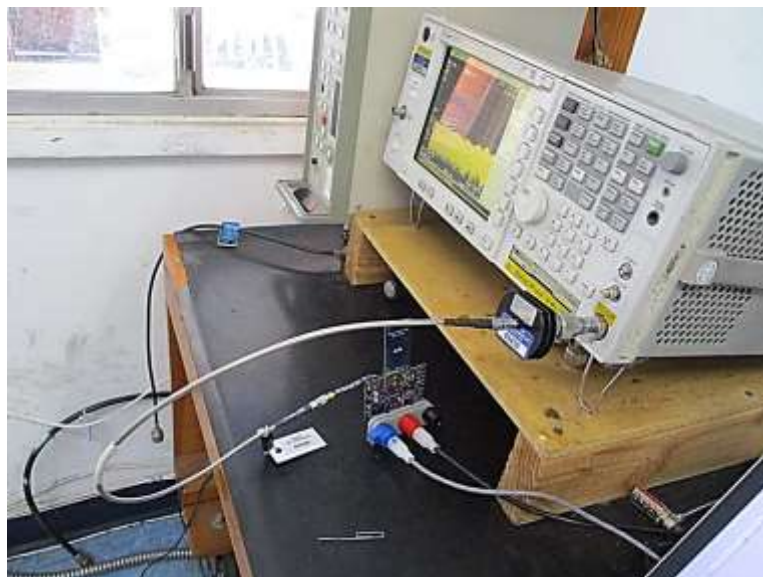


Middle Channel



High Channel

Test Setup Photo(s)



15.35(c) Duty Cycle Correction Factor

Summary

300k GFSK LV2 _Hybrid

The manufacturer declares the worst-case duty cycle is 45ms per 100ms. Duty cycle correction factor=
 $20\log(45\text{ms}/100\text{ms}) = -6.9\text{dB}$.

* The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.

15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **105380** Date: 7/19/2021
 Test Type: **Conducted Emissions** Time: 18:40:59
 Tested By: E. Wong Sequence#: 44
 Software: EMITest 5.03.19 3.6VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 4			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 4			

Test Conditions / Notes:

The EUT is placed on Styrofoam platform and the Blue port receives power from remotely located support power supply set 3.6Vdc to simulate a fresh battery. The EUT's red port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable. All port fill, black port is connected to a section of unterminated cable. EUT has fixed orientation per manufacture's specification.

Operating Frequency / Mode:

902.4 MHz, 915.2MHz, 927.6MHz, 400kHz steps, 64 channels, 300k GFSK LV2 Folder 3

Frequency of Measurement: 9k-9280MHz

-20dBc limit, RBW=100kHz, VBW=300kHz

Test Environment Conditions:

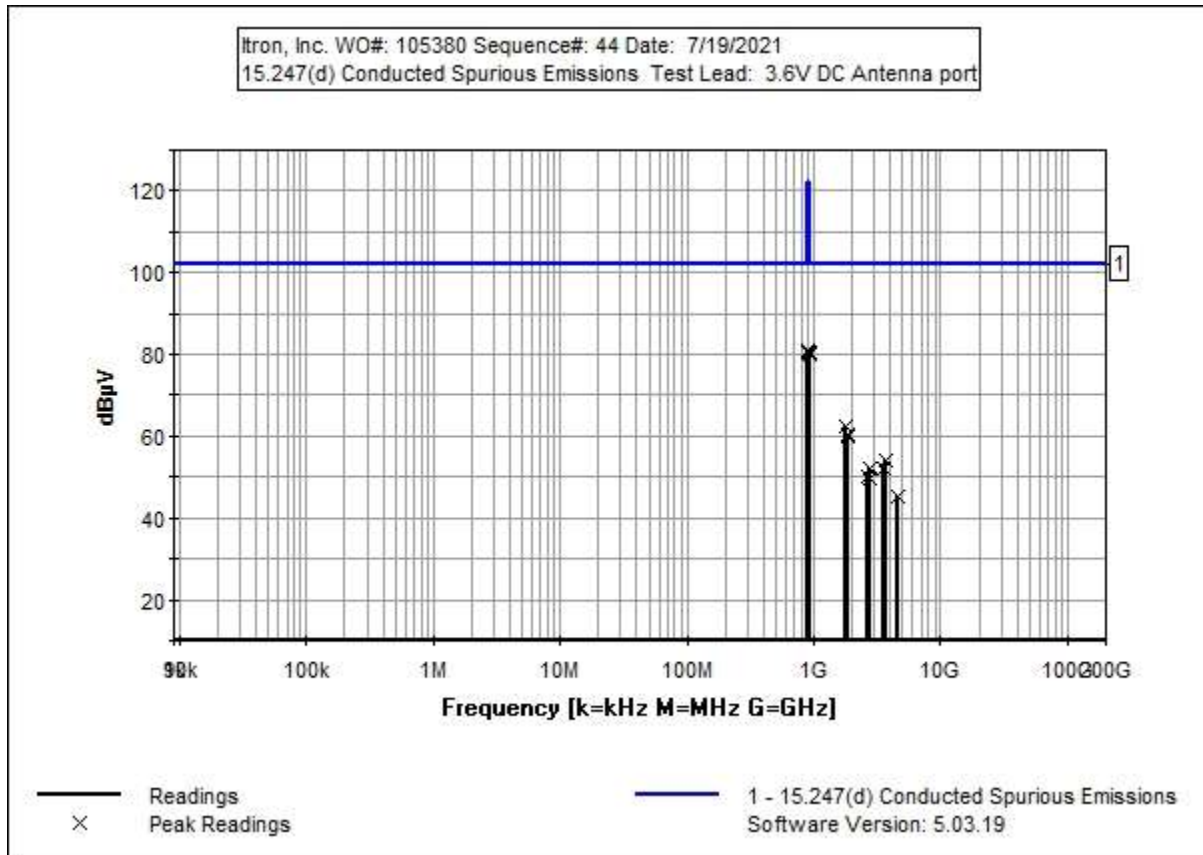
Temperature: 22°C

Relative Humidity: 54%

Pressure: 100kPa

Site A

Test Method: ANSI C63.10-2013 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	4/29/2020	4/29/2022
T2	AN03430	Attenuator	75A-10-12	12/20/2019	12/20/2021
T3	ANP07659	Cable	32022-29094K- 29094K-24TC	7/30/2020	7/30/2022

Measurement Data:

Reading listed by margin.

Test Lead: Antenna port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	902.000M	70.7	+0.0	+10.0	+0.2		+0.0	80.9	102.0 Bandedge L	-21.1	Anten
2	902.000M	70.5	+0.0	+10.0	+0.2		+0.0	80.7	102.0 bandedge_L_hoppi ng	-21.3	Anten
3	928.000M	70.2	+0.0	+10.0	+0.2		+0.0	80.4	102.0 Bandedge_H_	-21.6	Anten
4	928.000M	70.0	+0.0	+10.0	+0.2		+0.0	80.2	102.0 bandedge_H_hoppi ng	-21.8	Anten
5	1804.650M	52.2	+0.0	+9.8	+0.3		+0.0	62.3	102.0 L	-39.7	Anten
6	1855.050M	50.3	+0.0	+9.8	+0.3		+0.0	60.4	102.0 H	-41.6	Anten
7	1830.400M	50.1	+0.0	+9.8	+0.3		+0.0	60.2	102.0 M	-41.8	Anten
8	3661.083M	43.7	+0.0	+10.1	+0.5		+0.0	54.3	102.0 M	-47.7	Anten
9	3710.100M	43.3	+0.0	+10.1	+0.5		+0.0	53.9	102.0 H	-48.1	Anten
10	3609.300M	41.6	+0.0	+10.1	+0.5		+0.0	52.2	102.0 L	-49.8	Anten
11	2745.367M	41.9	+0.0	+10.0	+0.3		+0.0	52.2	102.0 M	-49.8	Anten
12	2706.975M	40.1	+0.0	+10.0	+0.3		+0.0	50.4	102.0 L	-51.6	Anten
13	2782.575M	39.5	+0.0	+10.0	+0.3		+0.0	49.8	102.0 H	-52.2	Anten
14	4637.625M	34.5	+0.0	+10.2	+0.5		+0.0	45.2	102.0 H	-56.8	Anten

Band Edge

Band Edge Summary

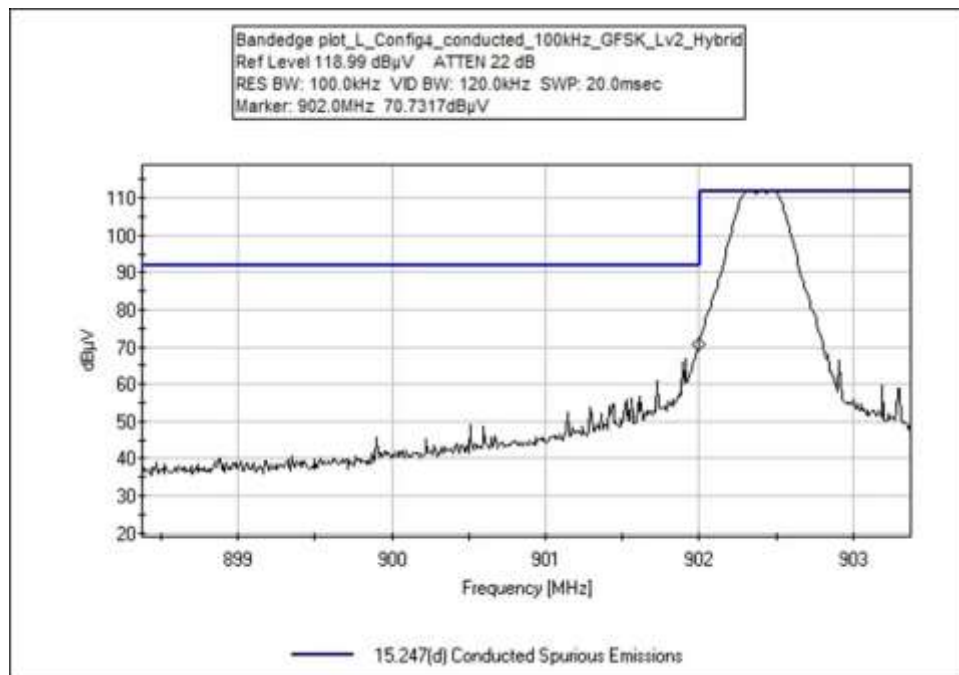
Limit applied: Max Power/100kHz - 20dB.

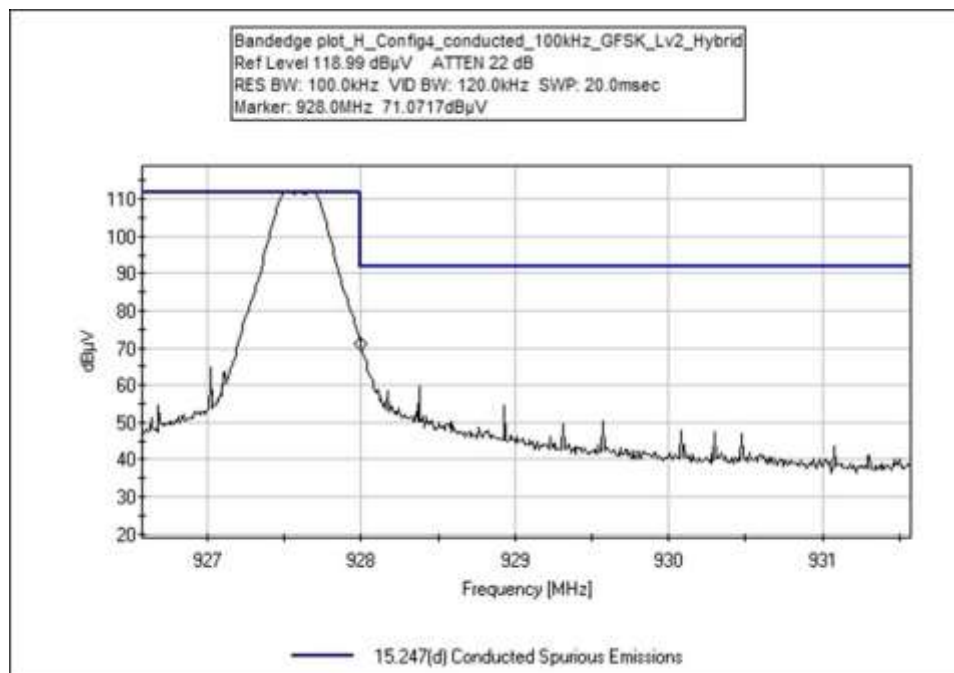
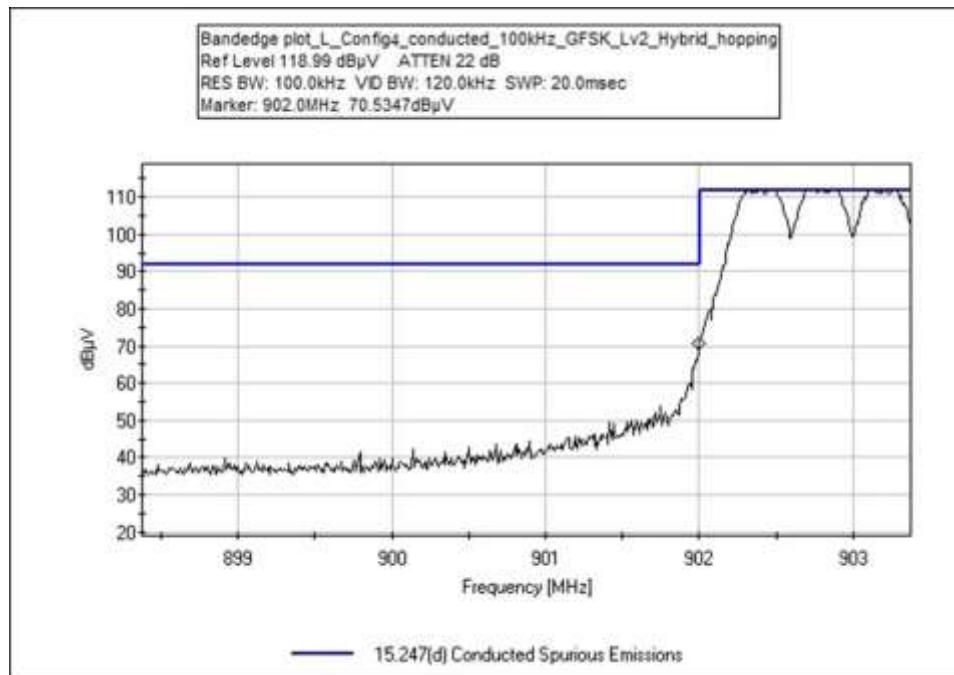
Worst Case

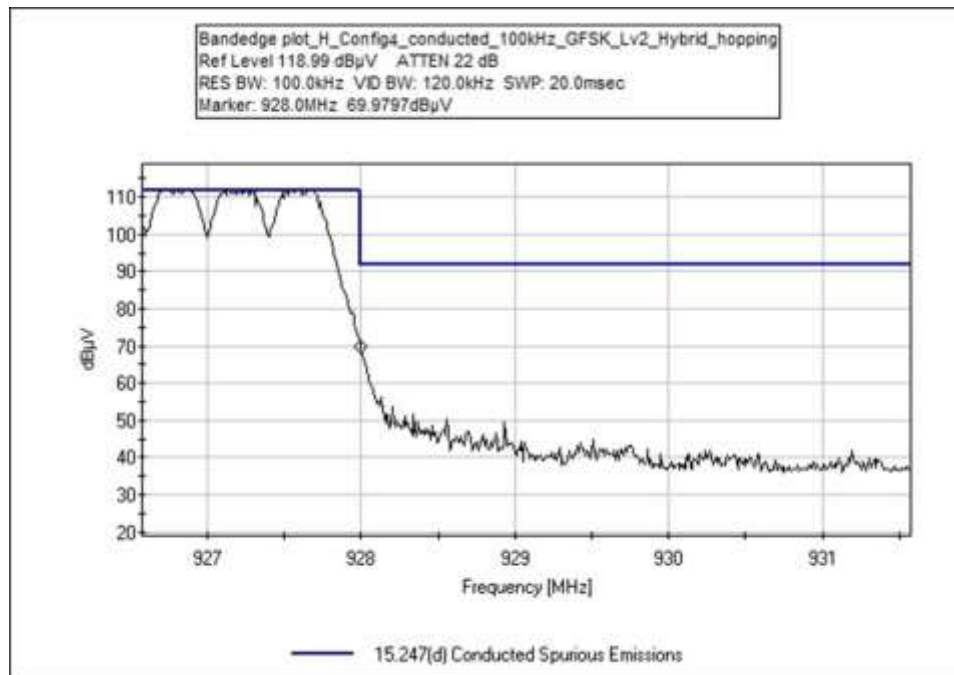
Folder 3

Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
902	300kbps GFSK LV2 (Single Channel)	-26.1	-5	Pass
928		-26.6	-5	Pass
902	300kbps GFSK LV2 (Hopping)	-26.3	-5	Pass
928		-26.8	-5	Pass

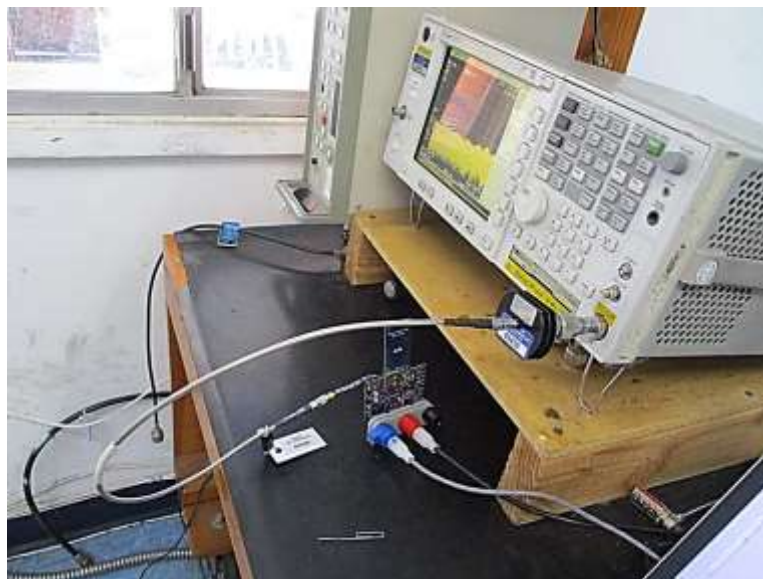
Band Edge Plots







Test Setup Photo(s)



15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **105380** Date: 5/21/2021
 Test Type: **Radiated Scan** Time: 13:23:27
 Tested By: E. Wong Sequence#: 11
 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:

The EUT is placed on Styrofoam platform and the Blue port is connected to a section of wire with a shorting tip to activate internal battery. The EUT's data port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable for configuration purposes, once configured, the laptop is removed from remote connection during course of testing. Fresh battery is used.
 EUT has fixed orientation per manufacture's specification.

Operating Frequency / Mode:

902.4MHz, 915.2MHz, 927.6MHz, 400kHz steps, 64 channels, 300k GFSK LV2_Hybrid. Folder 4

Frequency of Measurement: 9k-9280MHz

9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz

150kHz to 30MHz RBW=9kHz, VBW=27kHz

30-1000MHz, RBW=120kHz, VBW=360kHz

1000-9280MHz, RBW=1MHz, VBW=3MHz

-20dBc limit, RBW=100kHz, VBW=300kHz

Note: The manufacturer declares the worst case duty cycle is 45ms per 100ms. Duty cycle correction factor= $20\log(45\text{ms}/100\text{ms}) = -6.9\text{dB}$. Average readings in restricted band are calculated from peak readings with duty cycle correction factor.

Test Environment Conditions:

Temperature: 22°C

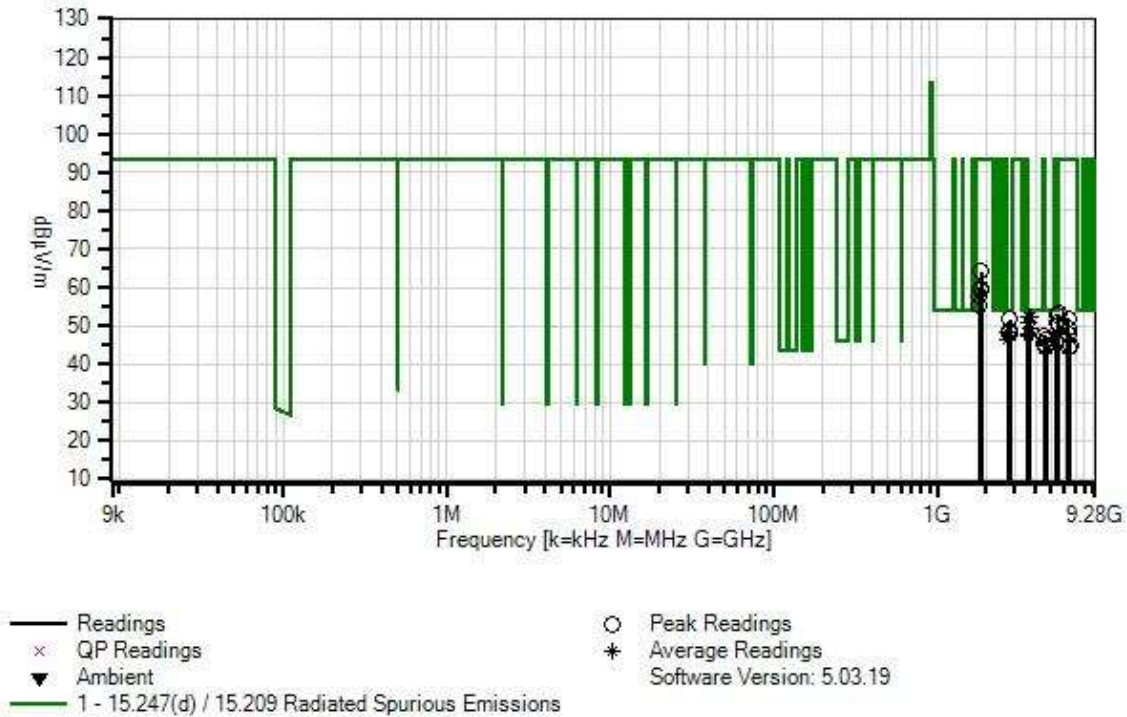
Relative Humidity: 54%

Pressure: 100kPa

Site A

Test Method: ANSI C63.10-2013 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

Itron, Inc. W/O#: 105380 Sequence#: 11 Date: 5/21/2021
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	4/29/2020	4/29/2022
T2	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T3	ANP07659	Cable	32022-29094K- 29094K-24TC	7/30/2020	7/30/2022
T4	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T5	ANP06360	Cable	L1-PNMNM-48	8/8/2019	8/8/2021
T6	AN02749	High Pass Filter	9SH10- 1000/T10000-O/O	7/15/2019	7/15/2021
T7	AN03385	High Pass Filter	11SH10- 3000/T10000-O/O	5/17/2021	5/17/2023
T8	ANDCCF	Duty Cycle Correction Factor		1/1/2021	1/1/2025
	AN00851	Biconilog Antenna	CBL6111C	4/14/2020	4/14/2022
	ANP05505	Attenuator	NAT-6	5/26/2021	5/26/2023
	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
	AN00309	Preamp	8447D	12/24/2019	12/24/2021
	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 T8 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	3710.600M Ave	60.0	+0.0 +4.0	+32.2 +0.0	+0.5 +0.5	-38.1 -6.9	+0.0 360	52.2 H	54.0	-1.8	Vert 223
^	3710.600M	60.0	+0.0 +4.0	+32.2 +0.0	+0.5 +0.5	-38.1 +0.0	+0.0 360	59.1 H	54.0	+5.1	Vert 223
3	3661.073M Ave	60.0	+0.0 +4.0	+32.0 +0.0	+0.5 +0.6	-38.1 -6.9	+0.0	52.1 M	54.0	-1.9	Vert 220
^	3661.073M	60.0	+0.0 +4.0	+32.0 +0.0	+0.5 +0.6	-38.1 +0.0	+0.0	59.0 M	54.0	+5.0	Vert 220
5	2782.950M	50.4	+0.0 +3.5	+29.8 +0.0	+0.3 +6.1	-38.5 +0.0	+0.0 28	51.6 H	54.0	-2.4	Vert 169
6	3609.767M Ave	58.9	+0.0 +4.0	+31.8 +0.0	+0.5 +0.6	-38.1 -6.9	+0.0	50.8 L	54.0	-3.2	Vert 212
^	3609.767M	58.9	+0.0 +4.0	+31.8 +0.0	+0.5 +0.6	-38.1 +0.0	+0.0	57.7 L	54.0	+3.7	Vert 212
8	3709.933M Ave	57.0	+0.0 +4.0	+32.2 +0.0	+0.5 +0.5	-38.1 -6.9	+0.0 246	49.2 H	54.0	-4.8	Horiz 100
^	3709.933M	57.0	+0.0 +4.0	+32.2 +0.0	+0.5 +0.5	-38.1 +0.0	+0.0 246	56.1 H	54.0	+2.1	Horiz 100
10	2745.780M	44.9	+0.0 +3.4	+29.7 +0.0	+0.3 +9.1	-38.5 +0.0	+0.0 290	48.9 M	54.0	-5.1	Horiz 177
11	5414.117M Ave	52.4	+0.0 +5.1	+34.0 +0.0	+0.7 +0.3	-37.2 -6.9	+0.0 10	48.4 L	54.0	-5.6	Horiz 219
^	5414.117M	52.4	+0.0 +5.1	+34.0 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 10	55.3 L	54.0	+1.3	Horiz 219
13	2707.100M Ave	48.2	+0.0 +3.4	+29.5 +0.0	+0.3 +12.4	-38.5 -6.9	+0.0 55	48.4 L	54.0	-5.6	Horiz 216
^	2707.100M	48.0	+0.0 +3.4	+29.5 +0.0	+0.3 +12.4	-38.5 +0.0	+0.0 55	55.1 L	54.0	+1.1	Horiz 216
15	2745.580M	44.3	+0.0 +3.4	+29.7 +0.0	+0.3 +9.1	-38.5 +0.0	+0.0 207	48.3 M	54.0	-5.7	Vert 176
16	5413.833M Ave	51.9	+0.0 +5.1	+34.0 +0.0	+0.7 +0.3	-37.2 -6.9	+0.0 98	47.9 L	54.0	-6.1	Vert 211
^	5413.833M	51.9	+0.0 +5.1	+34.0 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 98	54.8 L	54.0	+0.8	Vert 211
18	3609.383M Ave	55.8	+0.0 +4.0	+31.8 +0.0	+0.5 +0.6	-38.1 -6.9	+0.0 40	47.7 L	54.0	-6.3	Horiz 111
^	3609.383M	55.8	+0.0 +4.0	+31.8 +0.0	+0.5 +0.6	-38.1 +0.0	+0.0 40	54.6 L	54.0	+0.6	Horiz 111
20	3660.813M Ave	55.4	+0.0 +4.0	+32.0 +0.0	+0.5 +0.6	-38.1 -6.9	+0.0 341	47.5 M	54.0	-6.5	Horiz 142
^	3660.813M	55.4	+0.0 +4.0	+32.0 +0.0	+0.5 +0.6	-38.1 +0.0	+0.0 341	54.4 M	54.0	+0.4	Horiz 142
22	2782.950M Ave	52.8	+0.0 +3.5	+29.8 +0.0	+0.3 +6.1	-38.5 -6.9	+0.0 157	47.1 H	54.0	-6.9	Horiz 100
^	2782.950M	52.5	+0.0 +3.5	+29.8 +0.0	+0.3 +6.1	-38.5 +0.0	+0.0 157	53.7 H	54.0	-0.3	Horiz 100

24	4511.750M	46.7	+0.0 +4.5	+32.5 +0.0	+0.5 +0.3	-37.4 +0.0	+0.0 359	47.1 L	54.0	-6.9	Vert 212
25	2707.100M Ave	46.3	+0.0 +3.4	+29.5 +0.0	+0.3 +12.4	-38.5 -6.9	+0.0 220	46.5 L	54.0	-7.5	Vert 204
^	2707.100M	46.3	+0.0 +3.4	+29.5 +0.0	+0.3 +12.4	-38.5 +0.0	+0.0 220	53.4 L	54.0	-0.6	Vert 204
27	4638.250M	45.7	+0.0 +4.5	+32.7 +0.0	+0.5 +0.3	-37.4 +0.0	+0.0 228	46.3 H	54.0	-7.7	Vert 203
28	4511.750M	45.0	+0.0 +4.5	+32.5 +0.0	+0.5 +0.3	-37.4 +0.0	+0.0 245	45.4 L	54.0	-8.6	Horiz 200
29	4575.866M	44.6	+0.0 +4.5	+32.6 +0.0	+0.5 +0.3	-37.4 +0.0	+0.0 -1	45.1 M	54.0	-8.9	Vert 185
30	4637.883M	44.4	+0.0 +4.5	+32.7 +0.0	+0.5 +0.3	-37.4 +0.0	+0.0 246	45.0 H	54.0	-9.0	Horiz 186
31	4576.166M	44.0	+0.0 +4.5	+32.6 +0.0	+0.5 +0.3	-37.4 +0.0	+0.0 127	44.5 M	54.0	-9.5	Horiz 142
32	1855.300M	72.3	+0.0 +2.9	+27.0 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 25	64.1 H	90.5	-26.4	Vert 152
33	1830.387M	68.0	+0.0 +2.8	+26.9 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 42	59.6 M	90.5	-30.9	Horiz 100
34	1830.387M	68.0	+0.0 +2.8	+26.9 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 360	59.6 M	90.5	-30.9	Vert 100
35	1855.300M	67.7	+0.0 +2.9	+27.0 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 226	59.5 H	90.5	-31.0	Horiz 164
36	1804.733M	66.2	+0.0 +2.8	+26.7 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 161	57.6 L	90.5	-32.9	Horiz 135
37	1804.733M	63.8	+0.0 +2.8	+26.7 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 358	55.2 L	90.5	-35.3	Vert 135
38	5565.900M	50.4	+0.0 +5.1	+34.1 +0.0	+0.7 +0.3	-37.3 +0.0	+0.0 117	53.3 H	90.5	-37.2	Vert 161
39	5490.760M	49.6	+0.0 +5.1	+34.1 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 293	52.6 M	90.5	-37.9	Vert 185
40	6316.483M	48.0	+0.0 +5.7	+34.4 +0.0	+0.7 +0.2	-37.0 +0.0	+0.0 88	52.0 L	90.5	-38.5	Horiz 219
41	5491.360M	47.8	+0.0 +5.1	+34.1 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 296	50.8 M	90.5	-39.7	Horiz 152
42	5565.533M	47.3	+0.0 +5.1	+34.1 +0.0	+0.7 +0.3	-37.3 +0.0	+0.0 148	50.2 H	90.5	-40.3	Horiz 204
43	6316.200M	45.2	+0.0 +5.7	+34.4 +0.0	+0.7 +0.2	-37.0 +0.0	+0.0 346	49.2 L	90.5	-41.3	Vert 211
44	6406.553M	43.9	+0.0 +5.8	+34.4 +0.0	+0.7 +0.2	-37.1 +0.0	+0.0 153	47.9 M	90.5	-42.6	Horiz 152
45	6493.183M	41.1	+0.0 +5.8	+34.4 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 115	45.1 H	90.5	-45.4	Horiz 204
46	6493.550M	41.0	+0.0 +5.8	+34.4 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 301	45.0 H	90.5	-45.5	Vert 161
47	6405.953M	40.2	+0.0 +5.8	+34.4 +0.0	+0.7 +0.2	-37.1 +0.0	+0.0 103	44.2 M	90.5	-46.3	Vert 162



Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **105380** Date: 6/9/2021
 Test Type: **Radiated Scan** Time: 13:59:19
 Tested By: E. Wong Sequence#: 23
 Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

The EUT is placed on Styrofoam platform and the Blue port is connected to a section of wire with a shorting tip to activate internal battery. The EUT's data port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable for configuration purposes, once configured, the laptop is removed from remote connection during course of testing. Fresh battery is used.
 EUT has fixed orientation per manufacture's specification.

Operating Frequency / Mode:
 902.4MHz, 915.2MHz, 927.6MHz, 400kHz steps, 64 channels, 300k GFSK LV2 _Hybrid Folder 4

Frequency of Measurement: 9k-9280MHz
 9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz
 150kHz to 30MHz RBW=9kHz, VBW=27kHz
 30-1000MHz, RBW=120kHz, VBW=360kHz
 1000-9280MHz, RBW=1MHz, VBW=3MHz
 -20dBc limit, RBW=100kHz, VBW=300kHz

Note: The manufacturer declares the worst case duty cycle is 45ms per 100ms. Duty cycle correction factor=
 $20\log(45\text{ms}/100\text{ms}) = -6.9\text{dB}$. Average readings in restricted band are calculated from peak readings with duty cycle correction factor.

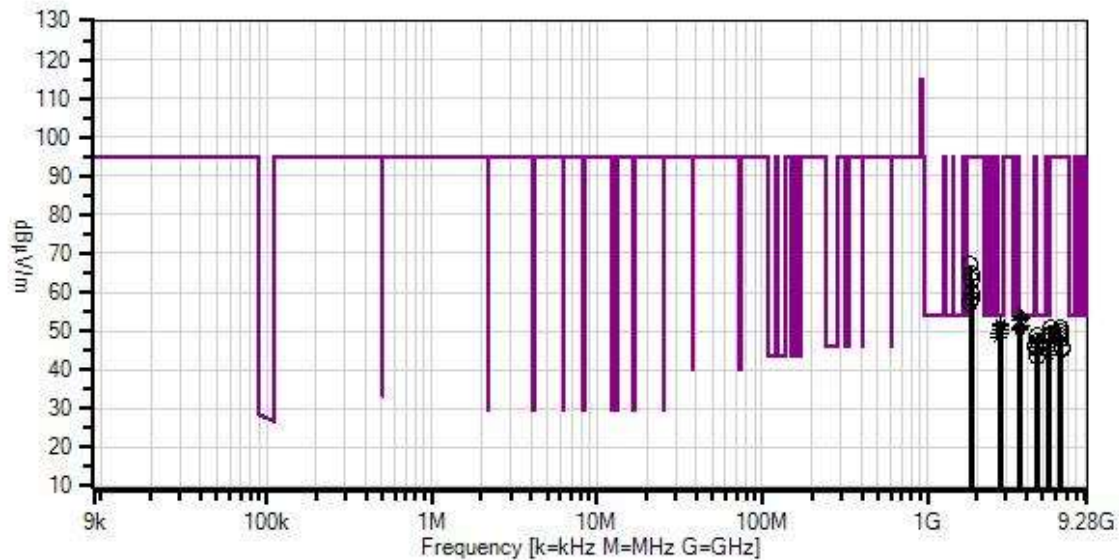
Test Environment Conditions:

Temperature: 22°C
 Relative Humidity: 54%
 Pressure: 100kPa

Site A

Test Method: ANSI C63.10-2013 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

Itron, Inc. WO#: 105380 Sequence#: 23 Date: 6/9/2021
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	4/29/2020	4/29/2022
T2	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T3	ANP07659	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
T4	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T5	ANP06360	Cable	L1-PNMNM-48	8/8/2019	8/8/2021
T6	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	7/15/2019	7/15/2021
T7	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	5/17/2021	5/17/2023
T8	ANDCCF	Duty Cycle Correction Factor		1/1/2021	1/1/2025
	AN00851	Biconilog Antenna	CBL6111C	4/14/2020	4/14/2022
	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
	AN00309	Preamp	8447D	12/24/2019	12/24/2021
	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
	AN05505	Attenuator		5/26/2021	5/26/2023
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 T8 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	3660.800M Ave	61.8	+0.0 +4.0	+32.0 +0.0	+0.5 +0.6	-38.1 -6.9	+0.0 1	53.9	54.0 M	-0.1	Vert 219
^	3660.800M	61.8	+0.0 +4.0	+32.0 +0.0	+0.5 +0.6	-38.1 +0.0	+0.0 1	60.8	54.0 M	+6.8	Vert 219
3	3710.067M Ave	61.2	+0.0 +4.0	+32.2 +0.0	+0.5 +0.5	-38.1 -6.9	+0.0	53.4	54.0 H	-0.6	Vert 233
^	3710.067M	61.2	+0.0 +4.0	+32.2 +0.0	+0.5 +0.5	-38.1 +0.0	+0.0 364	60.3	54.0 H	+6.3	Vert 233
5	3609.600M Ave	61.1	+0.0 +4.0	+31.8 +0.0	+0.5 +0.6	-38.1 -6.9	+0.0 -3	53.0	54.0 L	-1.0	Vert 218
^	3609.600M	61.1	+0.0 +4.0	+31.8 +0.0	+0.5 +0.6	-38.1 +0.0	+0.0 -3	59.9	54.0 L	+5.9	Vert 218
7	2745.600M Ave	54.6	+0.0 +3.4	+29.7 +0.0	+0.3 +9.1	-38.5 -6.9	+0.0 37	51.7	54.0 M	-2.3	Vert 158
^	2745.600M	54.6	+0.0 +3.4	+29.7 +0.0	+0.3 +9.1	-38.5 +0.0	+0.0 37	58.6	54.0 M	+4.6	Vert 158
9	2782.483M Ave	56.9	+0.0 +3.5	+29.8 +0.0	+0.3 +6.1	-38.5 -6.9	+0.0 216	51.2	54.0 H	-2.8	Vert 226
^	2782.483M	56.7	+0.0 +3.5	+29.8 +0.0	+0.3 +6.1	-38.5 +0.0	+0.0 216	57.9	54.0 H	+3.9	Vert 226
11	3710.450M Ave	58.9	+0.0 +4.0	+32.2 +0.0	+0.5 +0.5	-38.1 -6.9	+0.0 254	51.1	54.0 H	-2.9	Horiz 235
^	3710.450M	58.7	+0.0 +4.0	+32.2 +0.0	+0.5 +0.5	-38.1 +0.0	+0.0 254	57.8	54.0 H	+3.8	Horiz 235
13	3609.600M Ave	58.8	+0.0 +4.0	+31.8 +0.0	+0.5 +0.6	-38.1 -6.9	+0.0 360	50.7	54.0 L	-3.3	Horiz 180
^	3609.600M	58.8	+0.0 +4.0	+31.8 +0.0	+0.5 +0.6	-38.1 +0.0	+0.0 360	57.6	54.0 L	+3.6	Horiz 180
15	3660.600M Ave	58.3	+0.0 +4.0	+32.0 +0.0	+0.5 +0.6	-38.1 -6.9	+0.0 241	50.4	54.0 M	-3.6	Horiz 228
^	3660.600M	58.3	+0.0 +4.0	+32.0 +0.0	+0.5 +0.6	-38.1 +0.0	+0.0 241	57.3	54.0 M	+3.3	Horiz 228
17	2782.733M Ave	55.9	+0.0 +3.5	+29.8 +0.0	+0.3 +6.1	-38.5 -6.9	+0.0 150	50.2	54.0 H	-3.8	Horiz 231
^	2782.733M	55.9	+0.0 +3.5	+29.8 +0.0	+0.3 +6.1	-38.5 +0.0	+0.0 150	57.1	54.0 H	+3.1	Horiz 231
19	2707.200M Ave	49.1	+0.0 +3.4	+29.5 +0.0	+0.3 +12.4	-38.5 -6.9	+0.0 331	49.3	54.0 L	-4.7	Vert 144
^	2707.200M	49.1	+0.0 +3.4	+29.5 +0.0	+0.3 +12.4	-38.5 +0.0	+0.0 331	56.2	54.0 L	+2.2	Vert 144
21	2745.400M Ave	52.1	+0.0 +3.4	+29.7 +0.0	+0.3 +9.1	-38.5 -6.9	+0.0 193	49.2	54.0 M	-4.8	Horiz 217
^	2745.400M	52.1	+0.0 +3.4	+29.7 +0.0	+0.3 +9.1	-38.5 +0.0	+0.0 193	56.1	54.0 M	+2.1	Horiz 217
23	4637.783M	48.4	+0.0 +4.5	+32.7 +0.0	+0.5 +0.3	-37.4 +0.0	+0.0 195	49.0	54.0 H	-5.0	Vert 156

24	2707.200M	48.3	+0.0	+29.5	+0.3	-38.5	+0.0	48.5	54.0	-5.5	Horiz
	Ave		+3.4	+0.0	+12.4	-6.9	214	L			204
^	2707.200M	48.3	+0.0	+29.5	+0.3	-38.5	+0.0	55.4	54.0	+1.4	Horiz
			+3.4	+0.0	+12.4	+0.0	214	L			204
26	5414.400M	44.6	+0.0	+34.0	+0.7	-37.2	+0.0	47.5	54.0	-6.5	Horiz
			+5.1	+0.0	+0.3	+0.0	257	L			208
27	4576.350M	46.9	+0.0	+32.6	+0.5	-37.4	+0.0	47.4	54.0	-6.6	Vert
			+4.5	+0.0	+0.3	+0.0	246	M			193
28	4512.000M	46.0	+0.0	+32.5	+0.5	-37.4	+0.0	46.4	54.0	-7.6	Vert
			+4.5	+0.0	+0.3	+0.0	360	L			206
29	4512.000M	45.2	+0.0	+32.5	+0.5	-37.4	+0.0	45.6	54.0	-8.4	Horiz
			+4.5	+0.0	+0.3	+0.0	221	L			180
30	4638.167M	44.6	+0.0	+32.7	+0.5	-37.4	+0.0	45.2	54.0	-8.8	Horiz
			+4.5	+0.0	+0.3	+0.0	348	H			235
31	5414.400M	47.9	+0.0	+34.0	+0.7	-37.2	+0.0	43.9	54.0	-10.1	Vert
	Ave		+5.1	+0.0	+0.3	-6.9	155	L			166
^	5414.400M	47.6	+0.0	+34.0	+0.7	-37.2	+0.0	50.5	54.0	-3.5	Vert
			+5.1	+0.0	+0.3	+0.0	155	L			166
33	4575.800M	43.0	+0.0	+32.6	+0.5	-37.4	+0.0	43.5	54.0	-10.5	Horiz
			+4.5	+0.0	+0.3	+0.0	291	M			228
34	1804.800M	75.7	+0.0	+26.7	+0.3	-38.8	+0.0	67.1	95.0	-27.9	Vert
			+2.8	+0.4	+0.0	+0.0	173	L			188
35	1830.400M	73.3	+0.0	+26.9	+0.3	-38.8	+0.0	64.9	95.0	-30.1	Vert
			+2.8	+0.4	+0.0	+0.0	170	M			155
36	1855.433M	71.6	+0.0	+27.0	+0.3	-38.8	+0.0	63.4	95.0	-31.6	Vert
			+2.9	+0.4	+0.0	+0.0	193	H			172
37	1830.400M	68.3	+0.0	+26.9	+0.3	-38.8	+0.0	59.9	95.0	-35.1	Horiz
			+2.8	+0.4	+0.0	+0.0	108	M			150
38	1855.433M	66.3	+0.0	+27.0	+0.3	-38.8	+0.0	58.2	95.0	-36.9	Horiz
			+2.9	+0.4	+0.0	+0.0	326	H			184
39	1804.800M	66.0	+0.0	+26.7	+0.3	-38.8	+0.0	57.4	95.0	-37.6	Horiz
			+2.8	+0.4	+0.0	+0.0	200	L			188
40	6316.800M	47.0	+0.0	+34.4	+0.7	-37.0	+0.0	51.0	95.0	-44.0	Vert
			+5.7	+0.0	+0.2	+0.0	284	L			166
41	5565.883M	48.0	+0.0	+34.1	+0.7	-37.3	+0.0	50.9	95.0	-44.1	Horiz
			+5.1	+0.0	+0.3	+0.0	229	H			176
42	6316.800M	45.7	+0.0	+34.4	+0.7	-37.0	+0.0	49.7	95.0	-45.3	Horiz
			+5.7	+0.0	+0.2	+0.0	260	L			208
43	5565.500M	46.2	+0.0	+34.1	+0.7	-37.3	+0.0	49.1	95.0	-45.9	Vert
			+5.1	+0.0	+0.3	+0.0		H			156
44	6406.750M	45.0	+0.0	+34.4	+0.7	-37.1	+0.0	49.0	95.0	-46.0	Vert
			+5.8	+0.0	+0.2	+0.0	6	M			193
45	5491.000M	45.7	+0.0	+34.1	+0.7	-37.2	+0.0	48.7	95.0	-46.3	Horiz
			+5.1	+0.0	+0.3	+0.0	113	M			198
46	5491.550M	45.4	+0.0	+34.1	+0.7	-37.2	+0.0	48.4	95.0	-46.6	Vert
			+5.1	+0.0	+0.3	+0.0	184	M			193
47	6406.200M	44.0	+0.0	+34.4	+0.7	-37.1	+0.0	48.0	95.0	-47.0	Horiz
			+5.8	+0.0	+0.2	+0.0	49	M			198
48	6493.217M	41.6	+0.0	+34.4	+0.7	-37.2	+0.0	45.6	95.0	-49.4	Vert
			+5.8	+0.0	+0.3	+0.0	59	H			156
49	6493.600M	41.4	+0.0	+34.4	+0.7	-37.2	+0.0	45.4	95.0	-49.6	Horiz
			+5.8	+0.0	+0.3	+0.0	47	H			141

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **105380** Date: 6/7/2021
 Test Type: **Radiated Scan** Time: 10:45:23
 Tested By: E. Wong Sequence#: 6
 Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

The EUT is placed on Styrofoam platform and the Blue port receives power from remotely located support power supply set 3.6Vdc to simulate a fresh battery. The EUT's red port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable. All port fill, black port is connected to a section of unterminated cable. EUT has fixed orientation per manufacture's specification.

Operating Frequency / Mode:

902.4MHz, 915.2MHz, 927.6MHz, 400kHz steps, 64 channels, 300k GFSK LV2 _Hybrid, folder 3

Frequency of Measurement: 9k-9280MHz

9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz

150kHz to 30MHz RBW=9kHz, VBW=27kHz

30-1000MHz, RBW=120kHz, VBW=360kHz

1000-9280MHz, RBW=1MHz, VBW=3MHz

-20dBc limit, RBW=100kHz, VBW=300kHz

Note: The manufacturer declares the worst case duty cycle is 45ms per 100ms. Duty cycle correction factor= $20\log(45\text{ms}/100\text{ms}) = -6.9\text{dB}$. Average readings in restricted band are calculated from peak readings with duty cycle correction factor.

Test Environment Conditions:

Temperature: 22°C

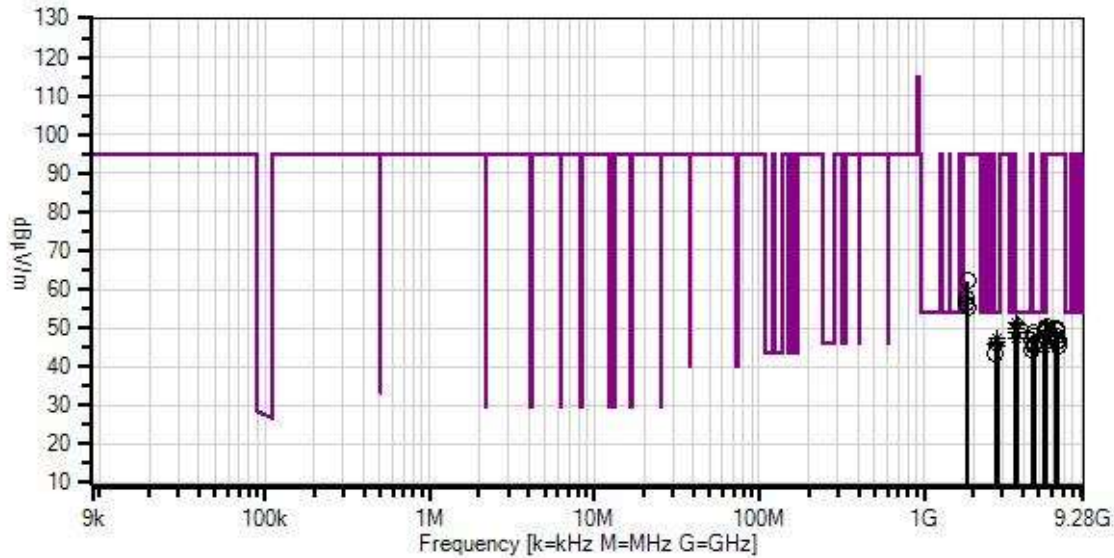
Relative Humidity: 54%

Pressure: 100kPa

Site A

Test Method: ANSI C63.10-2013 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

Itron, Inc. WO#: 105380 Sequence#: 6 Date: 6/7/2021
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



— Readings
x QP Readings
▼ Ambient
○ Peak Readings
* Average Readings
Software Version: 5.03.19

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	4/29/2020	4/29/2022
T2	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
T3	ANP07659	Cable	32022-29094K- 29094K-24TC	7/30/2020	7/30/2022
T4	AN00786	Preamp	83017A	5/20/2020	5/20/2022
T5	ANP06360	Cable	L1-PNMNM-48	8/8/2019	8/8/2021
T6	AN02749	High Pass Filter	9SH10- 1000/T10000-O/O	7/15/2019	7/15/2021
T7	AN03385	High Pass Filter	11SH10- 3000/T10000-O/O	5/17/2021	5/17/2023
T8	ANDCCF	Duty Cycle Correction Factor		1/1/2021	1/1/2025
	AN00851	Biconilog Antenna	CBL6111C	4/14/2020	4/14/2022
	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
	AN00309	Preamp	8447D	12/24/2019	12/24/2021
	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
	AN05505	Attenuator		5/26/2021	5/26/2023
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	T5	T6	T7	T8	Table	dBμV/m	dBμV/m	dB	Ant
1	3660.800M	59.1	+0.0	+32.0	+0.5	-38.1	+0.0	51.2	54.0	-2.8	Vert
	Ave		+4.0	+0.0	+0.6	-6.9	335		M		168
^	3660.800M	58.7	+0.0	+32.0	+0.5	-38.1	+0.0	57.7	54.0	+3.7	Vert
			+4.0	+0.0	+0.6	+0.0	335		M		168
3	3710.400M	58.8	+0.0	+32.2	+0.5	-38.1	+0.0	51.0	54.0	-3.0	Vert
	Ave		+4.0	+0.0	+0.5	-6.9	330		H		215
^	3710.400M	58.8	+0.0	+32.2	+0.5	-38.1	+0.0	57.9	54.0	+3.9	Vert
			+4.0	+0.0	+0.5	+0.0	330		H		215
5	3710.400M	58.5	+0.0	+32.2	+0.5	-38.1	+0.0	50.7	54.0	-3.3	Horiz
	Ave		+4.0	+0.0	+0.5	-6.9	247		H		174
^	3710.400M	58.5	+0.0	+32.2	+0.5	-38.1	+0.0	57.6	54.0	+3.6	Horiz
			+4.0	+0.0	+0.5	+0.0	247		H		174
7	3609.940M	57.8	+0.0	+31.8	+0.5	-38.1	+0.0	49.7	54.0	-4.3	Vert
	Ave		+4.0	+0.0	+0.6	-6.9	331		L		131
^	3609.940M	57.8	+0.0	+31.8	+0.5	-38.1	+0.0	56.6	54.0	+2.6	Vert
			+4.0	+0.0	+0.6	+0.0	331		L		131
9	5414.060M	46.6	+0.0	+34.0	+0.7	-37.2	+0.0	49.5	54.0	-4.5	Horiz
			+5.1	+0.0	+0.3	+0.0	91		L		140
10	3660.800M	56.7	+0.0	+32.0	+0.5	-38.1	+0.0	48.8	54.0	-5.2	Horiz
	Ave		+4.0	+0.0	+0.6	-6.9	240		M		213
^	3660.800M	56.7	+0.0	+32.0	+0.5	-38.1	+0.0	55.7	54.0	+1.7	Horiz
			+4.0	+0.0	+0.6	+0.0	240		M		213
12	4637.950M	48.1	+0.0	+32.7	+0.5	-37.4	+0.0	48.7	54.0	-5.3	Vert
			+4.5	+0.0	+0.3	+0.0			H		163
13	4576.000M	47.3	+0.0	+32.6	+0.5	-37.4	+0.0	47.8	54.0	-6.2	Vert
			+4.5	+0.0	+0.3	+0.0	-1		M		170
14	3609.260M	55.3	+0.0	+31.8	+0.5	-38.1	+0.0	47.2	54.0	-6.8	Horiz
	Ave		+4.0	+0.0	+0.6	-6.9	241		L		178
^	3609.260M	55.3	+0.0	+31.8	+0.5	-38.1	+0.0	54.1	54.0	+0.1	Horiz
			+4.0	+0.0	+0.6	+0.0	241		L		178
16	2782.750M	52.8	+0.0	+29.8	+0.3	-38.5	+0.0	47.1	54.0	-6.9	Vert
	Ave		+3.5	+0.0	+6.1	-6.9	49		H		163
^	2782.750M	52.7	+0.0	+29.8	+0.3	-38.5	+0.0	53.9	54.0	-0.1	Vert
			+3.5	+0.0	+6.1	+0.0	49		H		163
18	4512.340M	46.5	+0.0	+32.5	+0.5	-37.4	+0.0	46.9	54.0	-7.1	Vert
			+4.5	+0.0	+0.3	+0.0	30		L		141
19	2745.600M	49.0	+0.0	+29.7	+0.3	-38.5	+0.0	46.1	54.0	-7.9	Vert
	Ave		+3.4	+0.0	+9.1	-6.9	75		M		166
^	2745.600M	48.5	+0.0	+29.7	+0.3	-38.5	+0.0	52.5	54.0	-1.5	Vert
			+3.4	+0.0	+9.1	+0.0	75		M		166
21	2707.200M	45.5	+0.0	+29.5	+0.3	-38.5	+0.0	45.7	54.0	-8.3	Horiz
	Ave		+3.4	+0.0	+12.4	-6.9	52		L		169
^	2707.200M	44.3	+0.0	+29.5	+0.3	-38.5	+0.0	51.4	54.0	-2.6	Horiz
			+3.4	+0.0	+12.4	+0.0	52		L		169
23	4637.950M	45.0	+0.0	+32.7	+0.5	-37.4	+0.0	45.6	54.0	-8.4	Horiz
			+4.5	+0.0	+0.3	+0.0	109		H		127

24	4576.000M	44.9	+0.0 +4.5	+32.6 +0.0	+0.5 +0.3	-37.4 +0.0	+0.0 274	45.4 M	54.0	-8.6	Horiz 186
25	2745.600M Ave	48.2	+0.0 +3.4	+29.7 +0.0	+0.3 +9.1	-38.5 -6.9	+0.0 49	45.3 M	54.0	-8.7	Horiz 139
^	2745.600M	47.7	+0.0 +3.4	+29.7 +0.0	+0.3 +9.1	-38.5 +0.0	+0.0 49	51.7 M	54.0	-2.3	Horiz 139
27	2782.750M Ave	51.0	+0.0 +3.5	+29.8 +0.0	+0.3 +6.1	-38.5 -6.9	+0.0 224	45.3 H	54.0	-8.7	Horiz 144
^	2782.750M	51.0	+0.0 +3.5	+29.8 +0.0	+0.3 +6.1	-38.5 +0.0	+0.0 224	52.2 H	54.0	-1.8	Horiz 144
29	5414.740M Ave	48.7	+0.0 +5.1	+34.0 +0.0	+0.7 +0.3	-37.2 -6.9	+0.0	44.7	54.0	-9.3	Vert 100
^	5414.740M	48.7	+0.0 +5.1	+34.0 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 133	51.6 L	54.0	-2.4	Vert 141
31	4511.660M	43.9	+0.0 +4.5	+32.5 +0.0	+0.5 +0.3	-37.4 +0.0	+0.0 137	44.3 L	54.0	-9.7	Horiz 178
32	2707.200M	47.6	+0.0 +3.4	+29.5 +0.9	+0.3 +0.0	-38.5 +0.0	+0.0 282	43.2 L	54.0	-10.8	Vert 152
33	1830.400M	70.5	+0.0 +2.8	+26.9 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 76	62.1 M	90.5	-28.4	Vert 127
34	1804.800M	66.6	+0.0 +2.8	+26.7 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 115	58.0 L	90.5	-32.5	Horiz 152
35	1804.800M	65.1	+0.0 +2.8	+26.7 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 229	56.5 L	90.5	-34.0	Vert 152
36	1830.400M	63.5	+0.0 +2.8	+26.9 +0.4	+0.3 +0.0	-38.8 +0.0	+0.0 300	55.1 M	90.5	-35.4	Horiz 146
37	5565.550M	47.6	+0.0 +5.1	+34.1 +0.0	+0.7 +0.3	-37.3 +0.0	+0.0 55	50.5 H	90.5	-40.0	Vert 163
38	5565.550M	47.4	+0.0 +5.1	+34.1 +0.0	+0.7 +0.3	-37.3 +0.0	+0.0 234	50.3 H	90.5	-40.2	Horiz 127
39	6317.140M	45.9	+0.0 +5.7	+34.4 +0.0	+0.7 +0.2	-37.0 +0.0	+0.0 355	49.9 L	90.5	-40.6	Vert 143
40	5491.200M	46.8	+0.0 +5.1	+34.1 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 80	49.8 M	90.5	-40.7	Vert 170
41	6316.460M	45.2	+0.0 +5.7	+34.4 +0.0	+0.7 +0.2	-37.0 +0.0	+0.0 85	49.2 L	90.5	-41.3	Horiz 140
42	5491.200M	45.8	+0.0 +5.1	+34.1 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 186	48.8 M	90.5	-41.7	Horiz 186
43	6406.400M	43.8	+0.0 +5.8	+34.4 +0.0	+0.7 +0.2	-37.1 +0.0	+0.0 226	47.8 M	90.5	-42.7	Vert 170
44	6493.150M	42.6	+0.0 +5.8	+34.4 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 297	46.6 H	90.5	-43.9	Vert 163
45	6406.400M	42.5	+0.0 +5.8	+34.4 +0.0	+0.7 +0.2	-37.1 +0.0	+0.0 223	46.5 M	90.5	-44.0	Horiz 152
46	6406.400M	42.1	+0.0 +5.8	+34.4 +0.0	+0.7 +0.2	-37.1 +0.0	+0.0 223	46.1 M	90.5	-44.4	Horiz 186
47	6493.150M	41.4	+0.0 +5.8	+34.4 +0.0	+0.7 +0.3	-37.2 +0.0	+0.0 351	45.4 H	90.5	-45.1	Horiz 127

Band Edge

Band Edge Summary Configuration 1 GRT

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK Level2	PCB trace / 1.1 dB	28.6	<46	Pass
902	GFSK Level2	PCB trace / 1.1 dB	75.3	<93.5	Pass
928	GFSK Level2	PCB trace / 1.1 dB	73.2	< 93.5	Pass
960	GFSK Level2	PCB trace / 1.1 dB	37.7	<54	Pass

Band Edge Summary Configuration 1 GRT

Operating Mode: Hopping

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK Level2	PCB trace / 1.1 dB	31.6	<46	Pass
902	GFSK Level2	PCB trace / 1.1 dB	73.6	< 93.5	Pass
928	GFSK Level2	PCB trace / 1.1 dB	71.3	< 93.5	Pass
960	GFSK Level2	PCB trace / 1.1 dB	39.4	<54	Pass

Band Edge Summary Configuration 2 WRT

Operating Mode: Single Channel (Low and High)

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK Level2	PCB trace / 1.1 dB	31.1	<46	Pass
902	GFSK Level2	PCB trace / 1.1 dB	76.3	<95	Pass
928	GFSK Level2	PCB trace / 1.1 dB	75.7	< 95	Pass
960	GFSK Level2	PCB trace / 1.1 dB	45.1	<54	Pass

Band Edge Summary Configuration 2 WRT

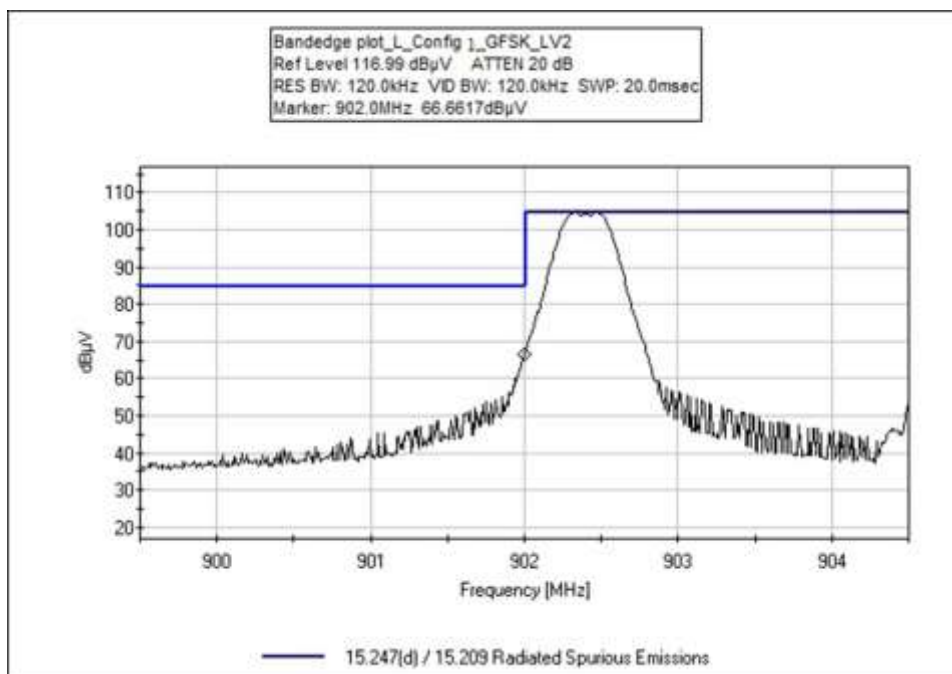
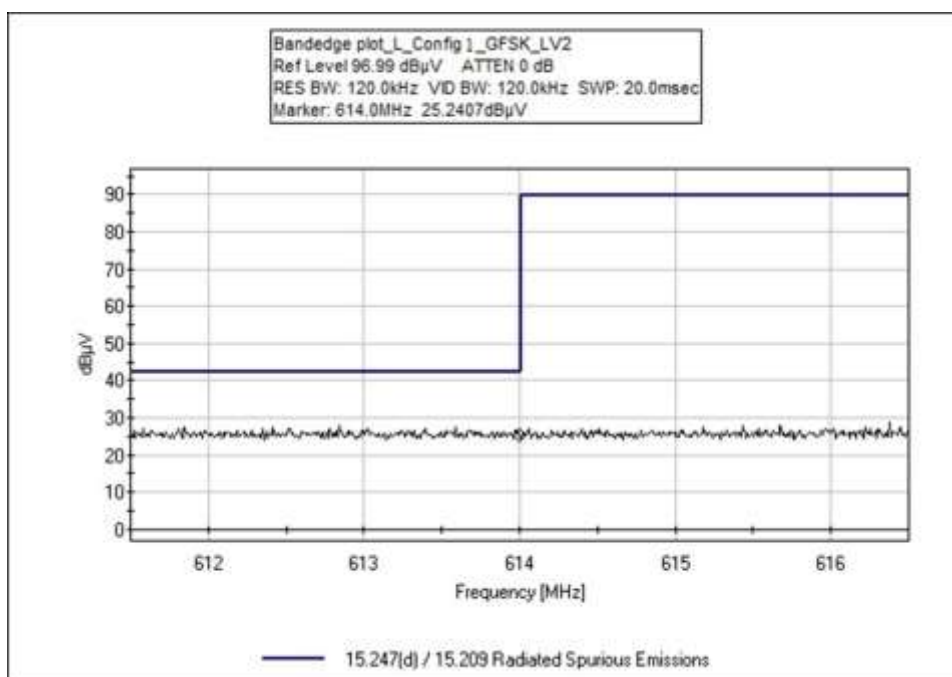
Operating Mode: Hopping

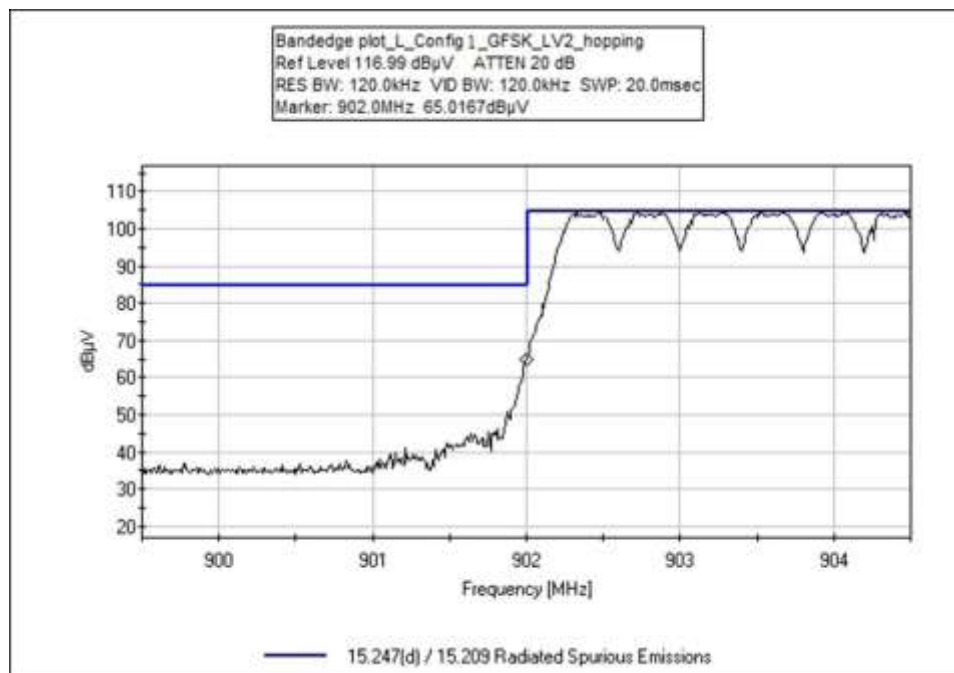
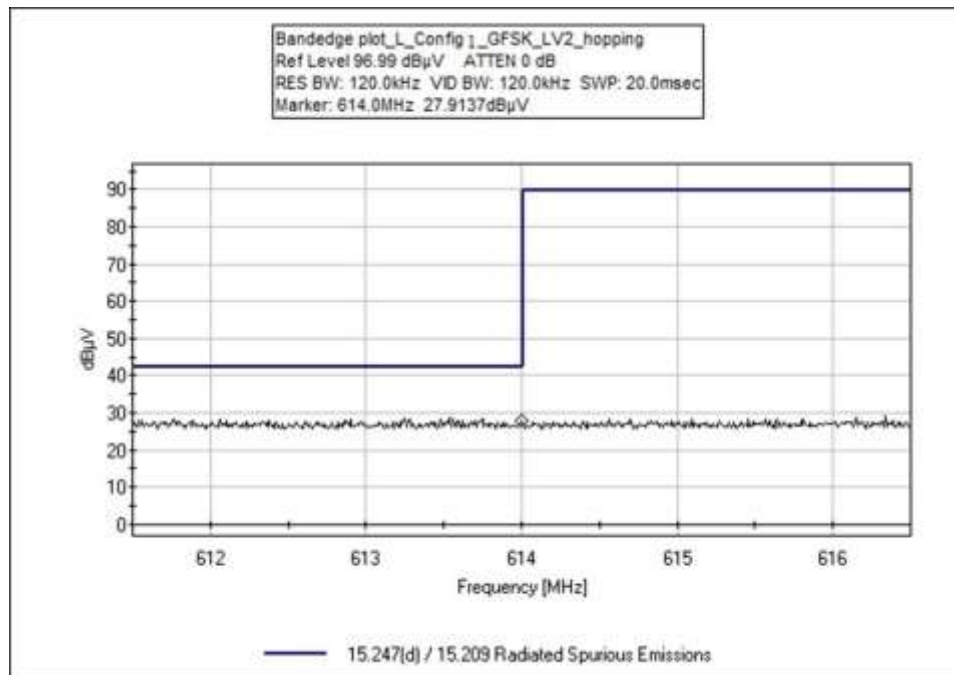
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK Level2	PCB trace / 1.1 dB	31.5	<46	Pass
902	GFSK Level2	PCB trace / 1.1 dB	75.1	<95	Pass
928	GFSK Level2	PCB trace / 1.1 dB	74.6	< 95	Pass
960	GFSK Level2	PCB trace / 1.1 dB	45.0	<54	Pass

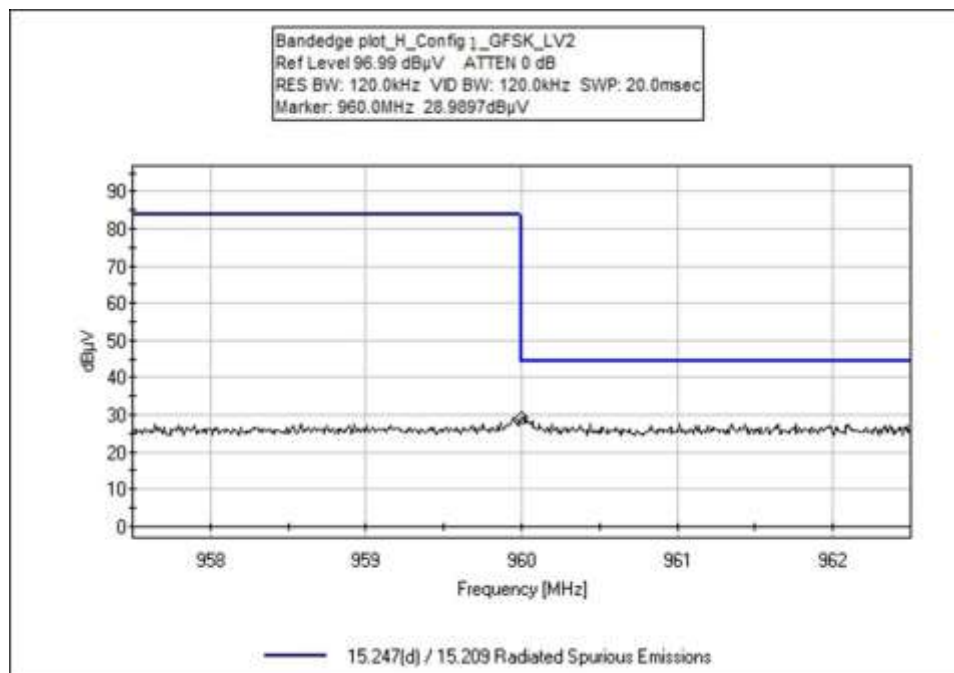
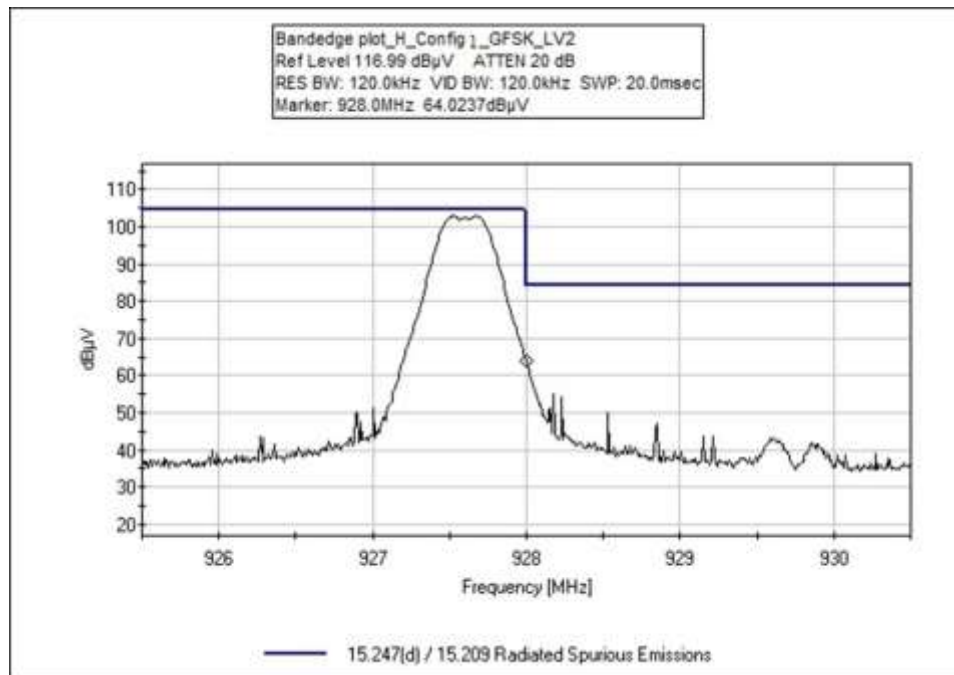
Band Edge Summary Configuration 3 PIT					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK Level2	PCB trace / 1.1 dB	30.9	<46	Pass
902	GFSK Level2	PCB trace / 1.1 dB	76.4	<95	Pass
928	GFSK Level2	PCB trace / 1.1 dB	74.9	< 95	Pass
960	GFSK Level2	PCB trace / 1.1 dB	38.2	<54	Pass

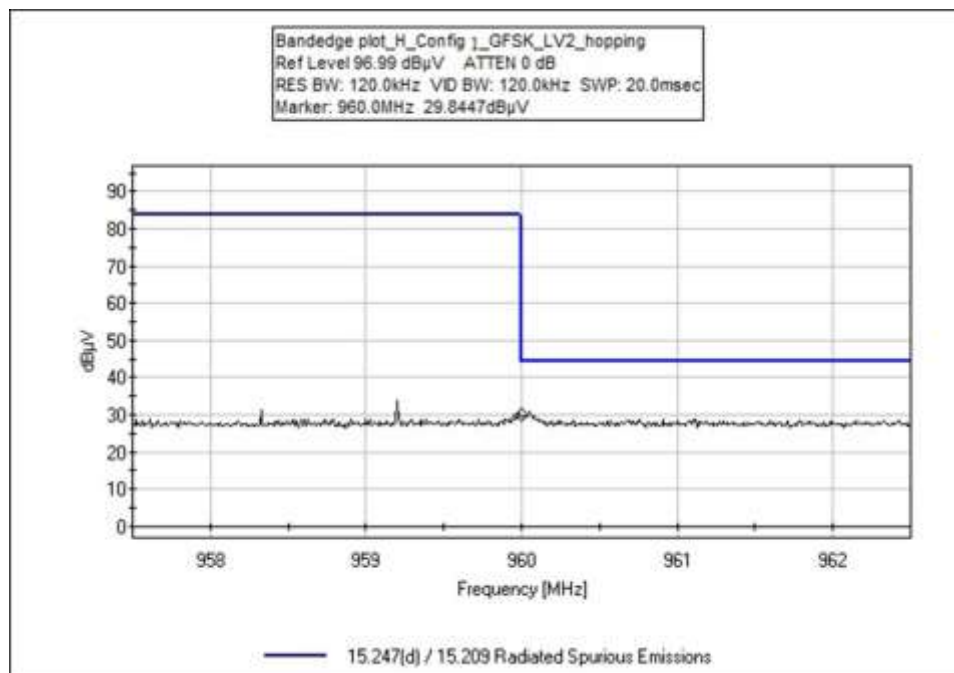
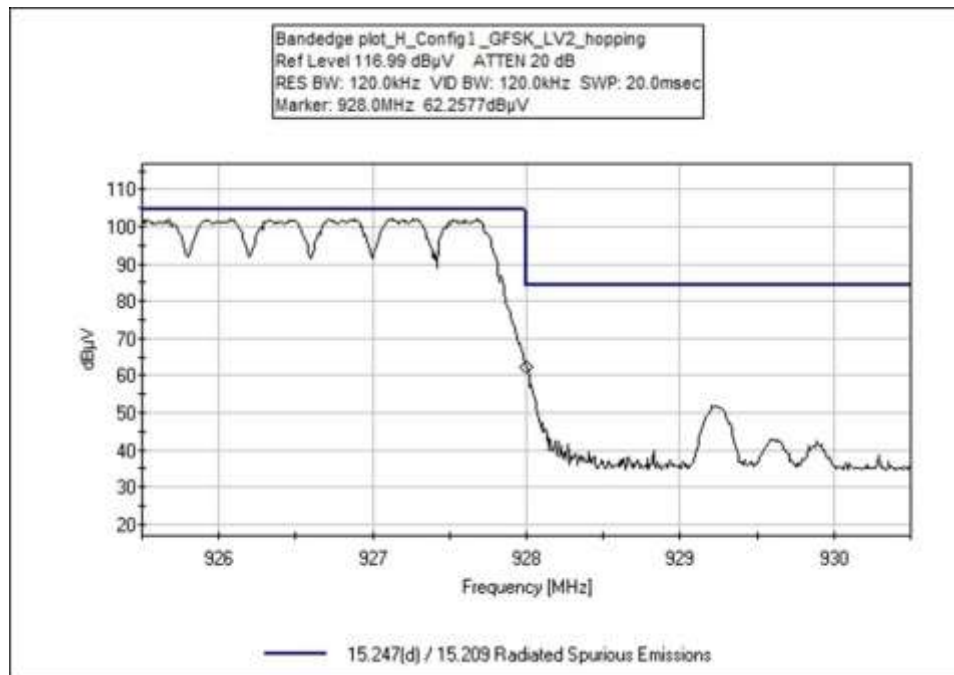
Band Edge Summary Configuration 3 PIT					
Operating Mode: Hopping					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK Level2	PCB trace / 1.1 dB	31.3	<46	Pass
902	GFSK Level2	PCB trace / 1.1 dB	76.7	<95	Pass
928	GFSK Level2	PCB trace / 1.1 dB	74.9	< 95	Pass
960	GFSK Level2	PCB trace / 1.1 dB	38.4	<54	Pass

Configuration 1 Band Edge Plots

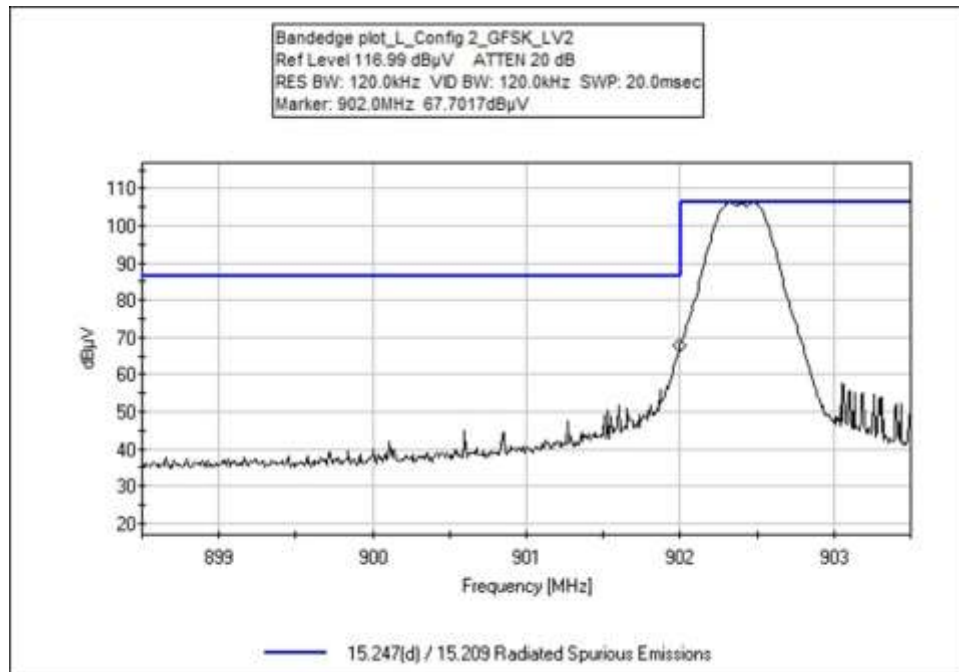
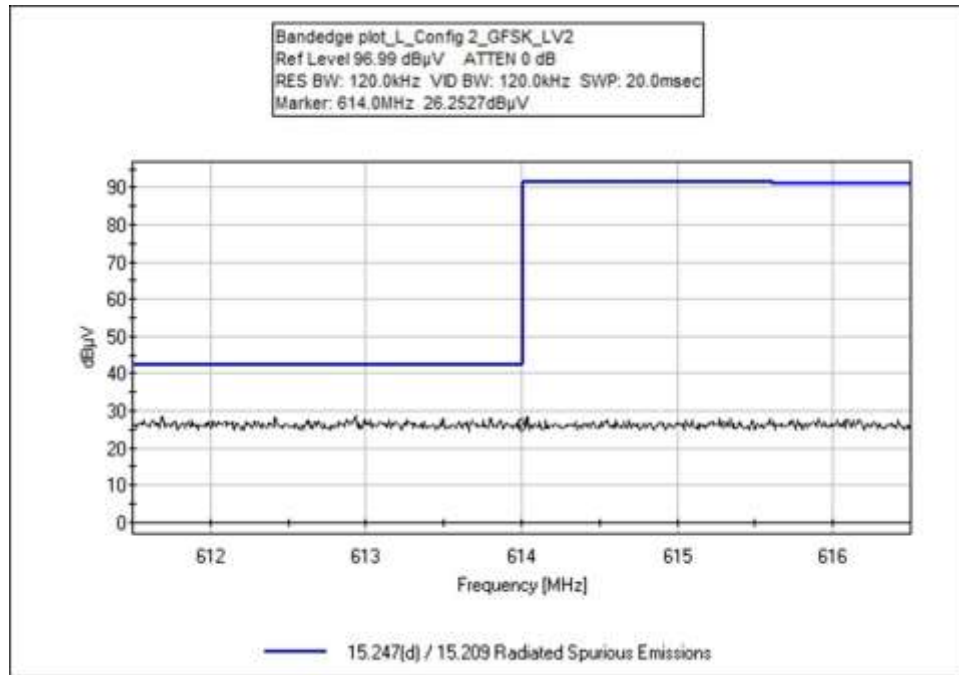


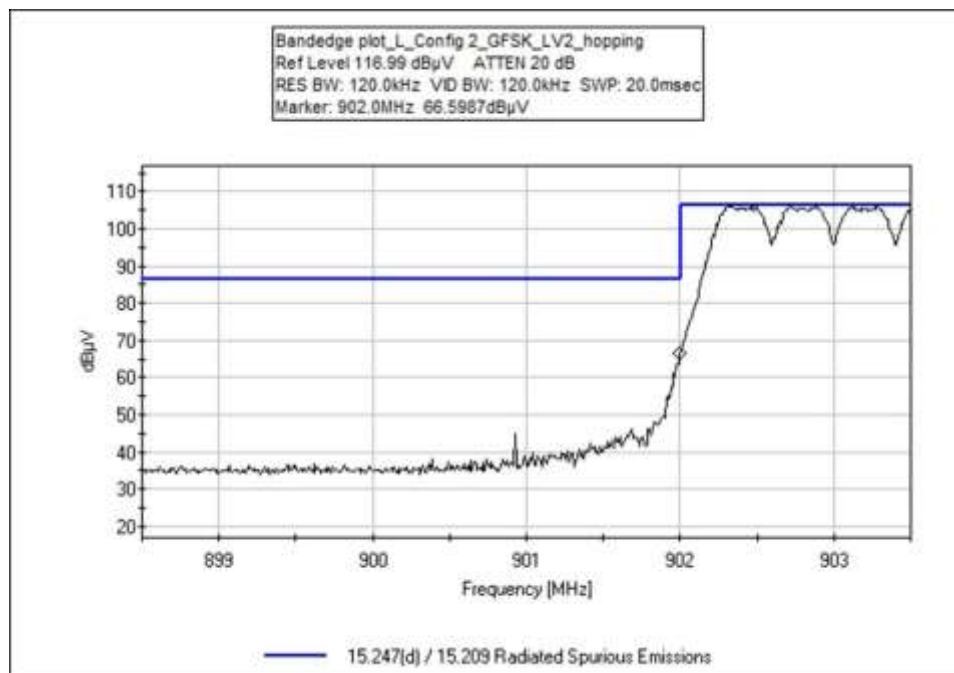
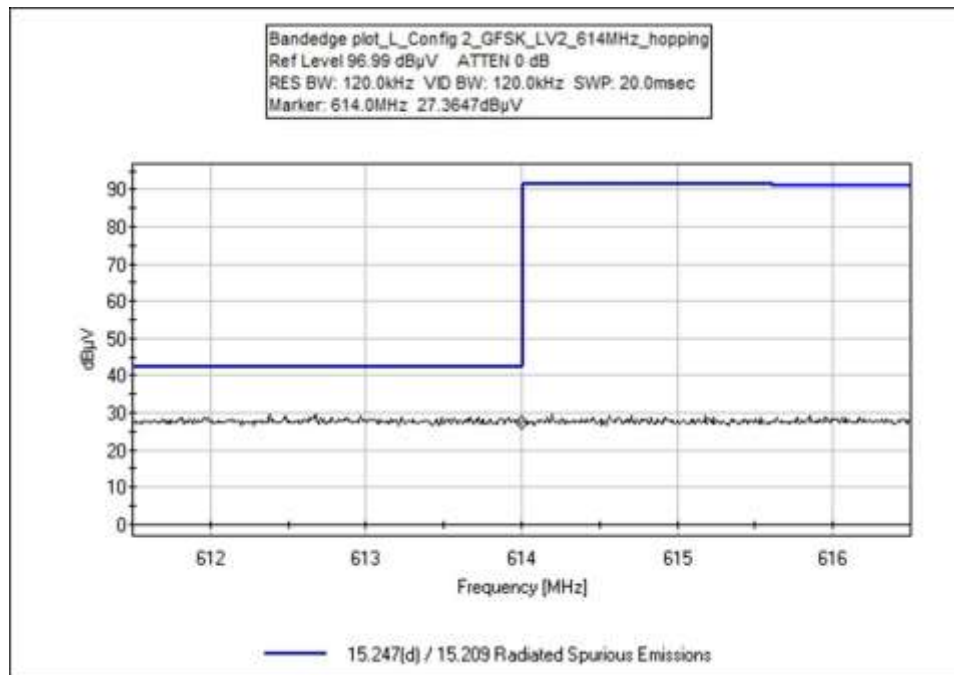


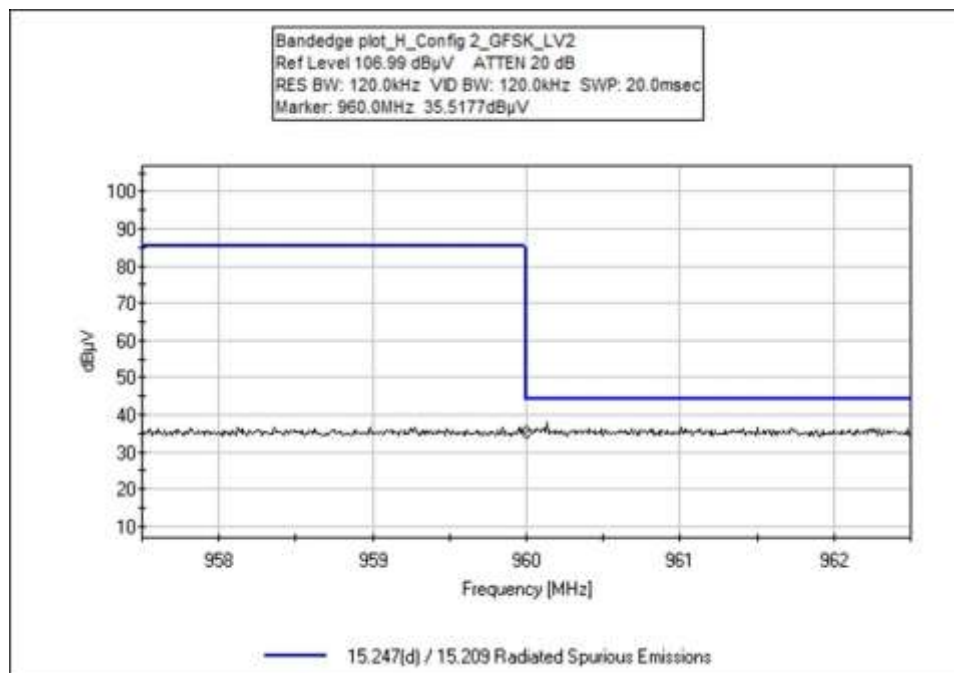
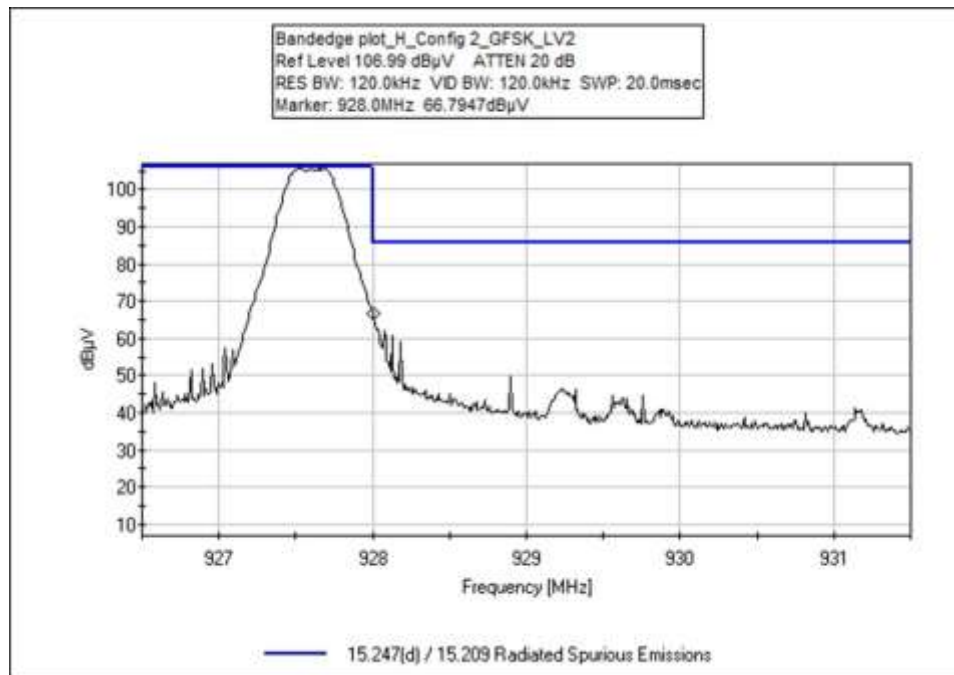


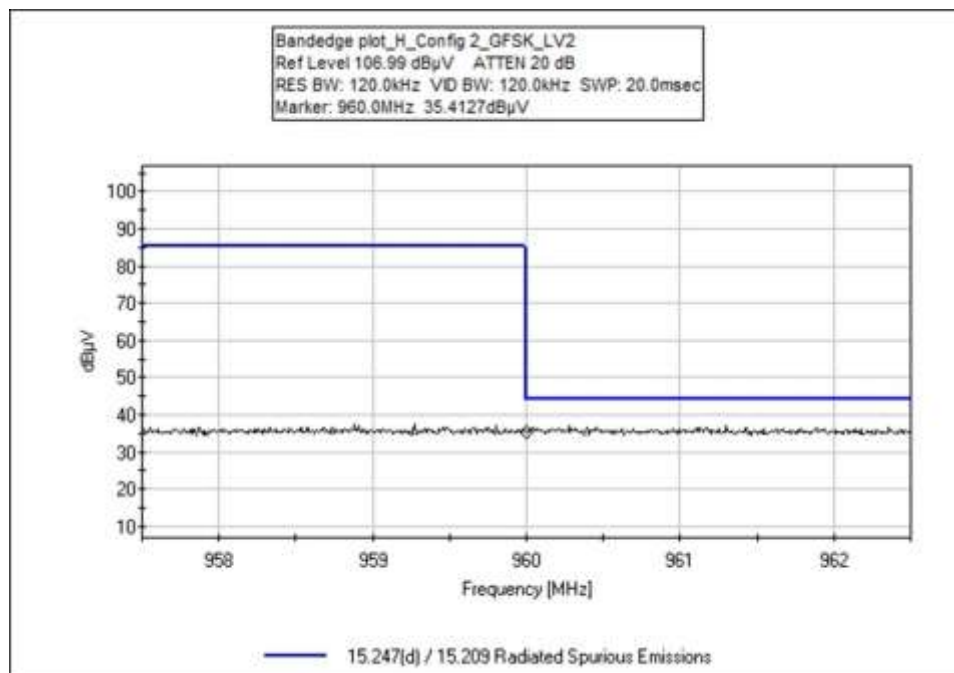
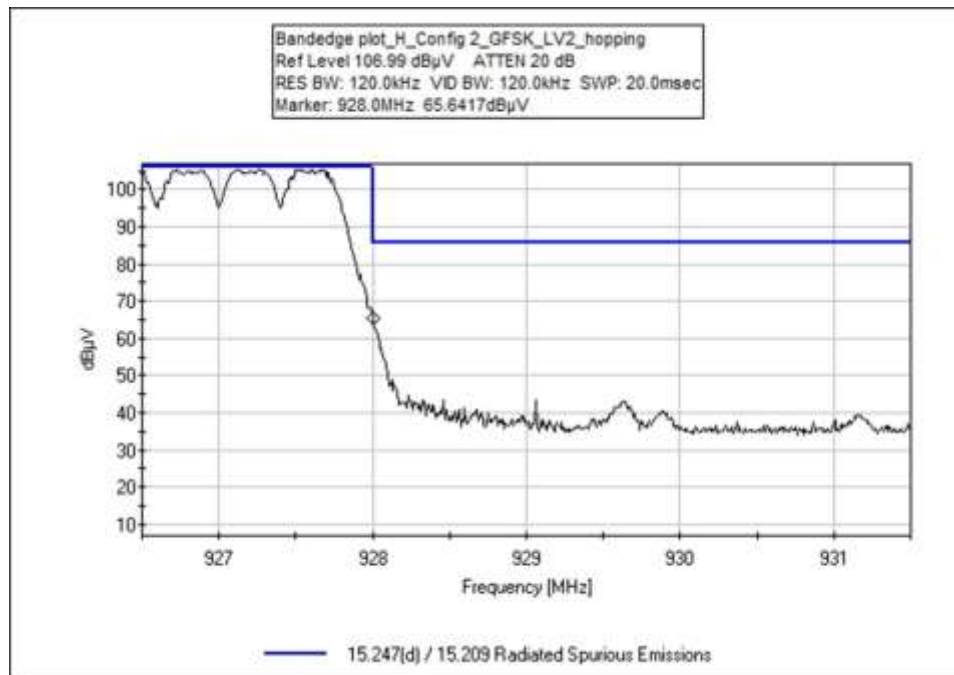


Configuration 3 Band Edge Plots

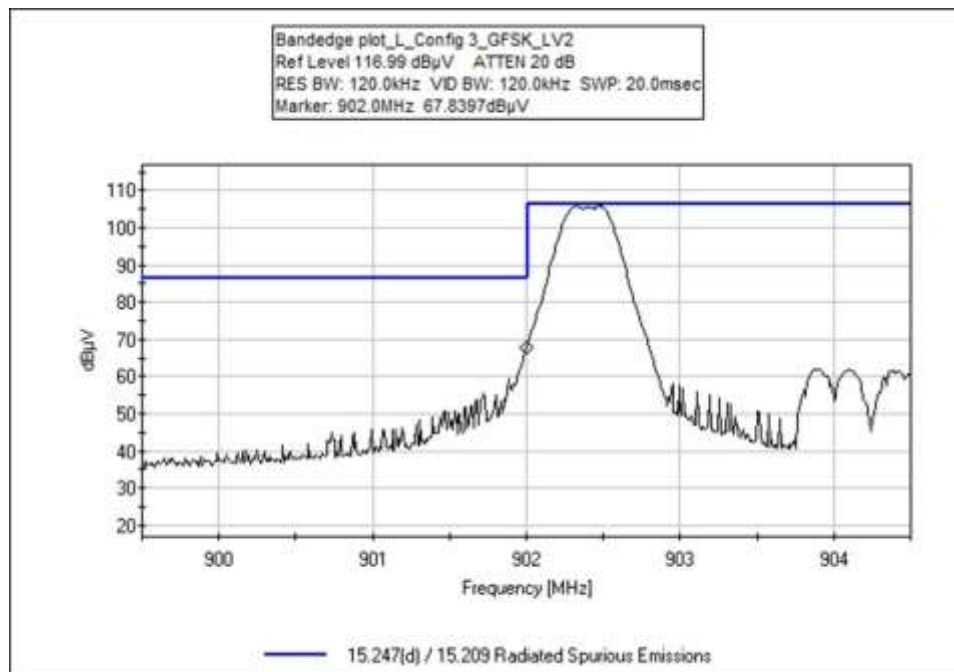
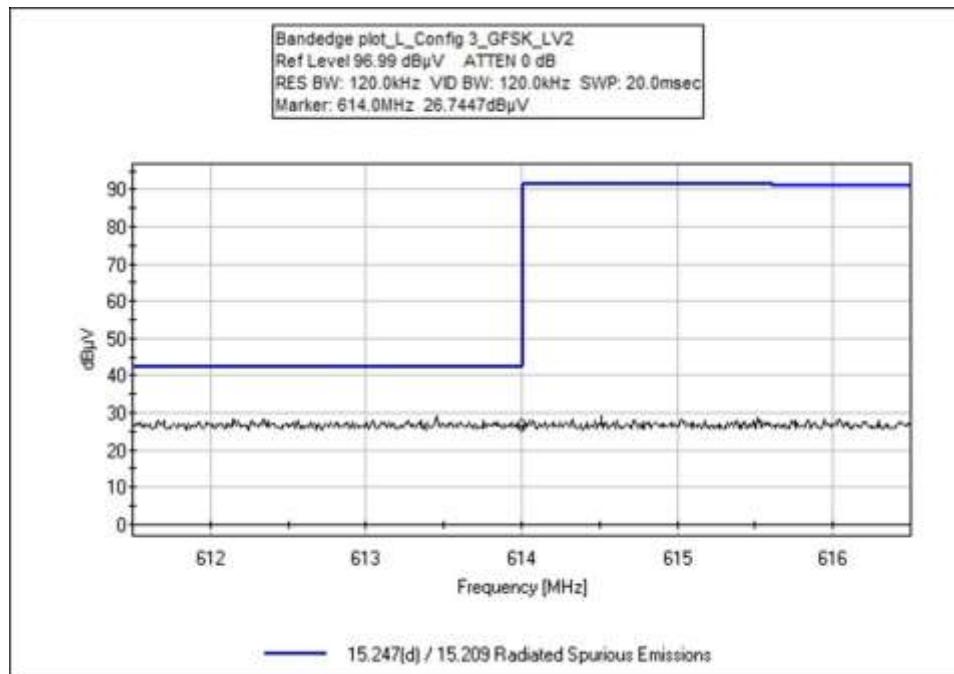


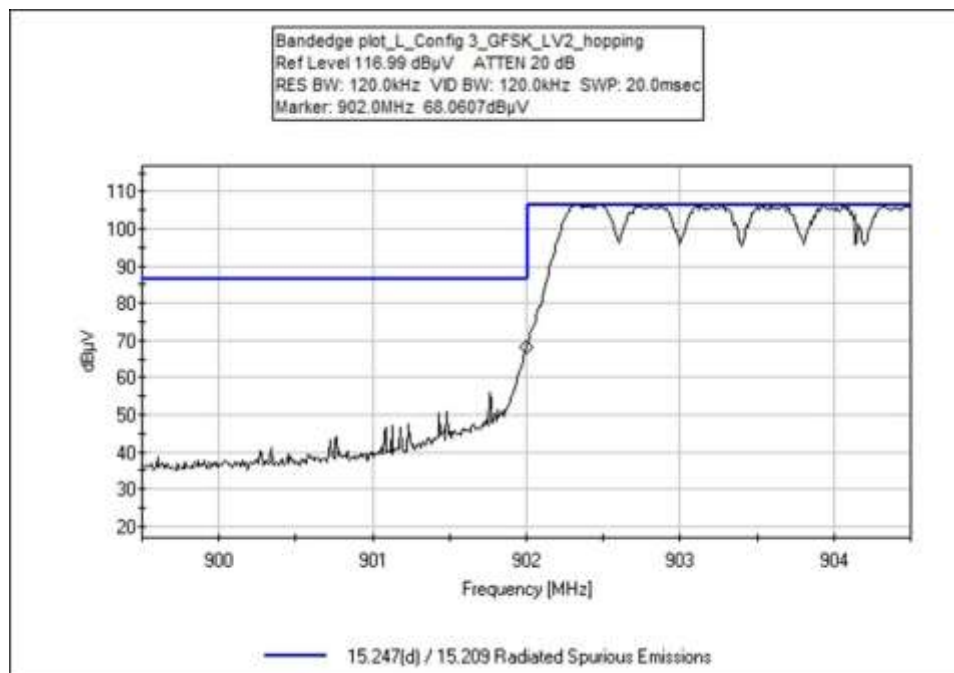
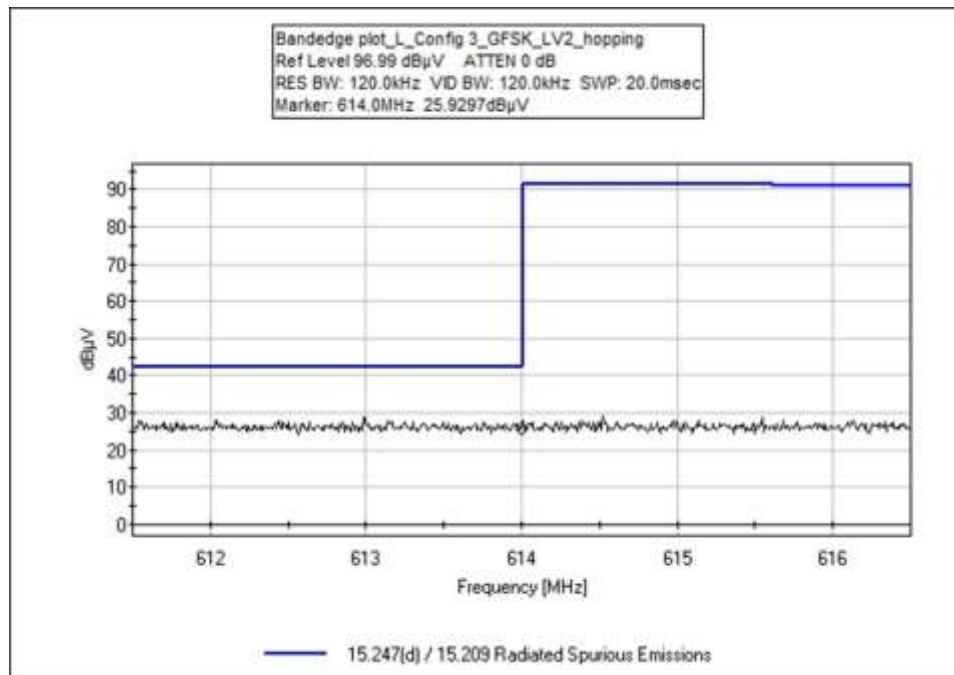


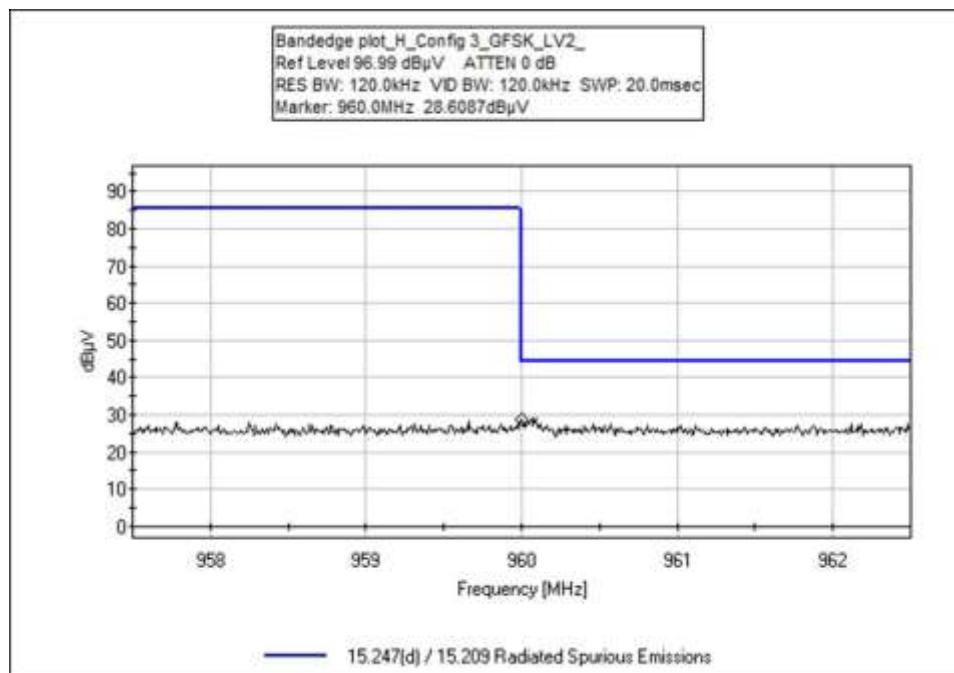
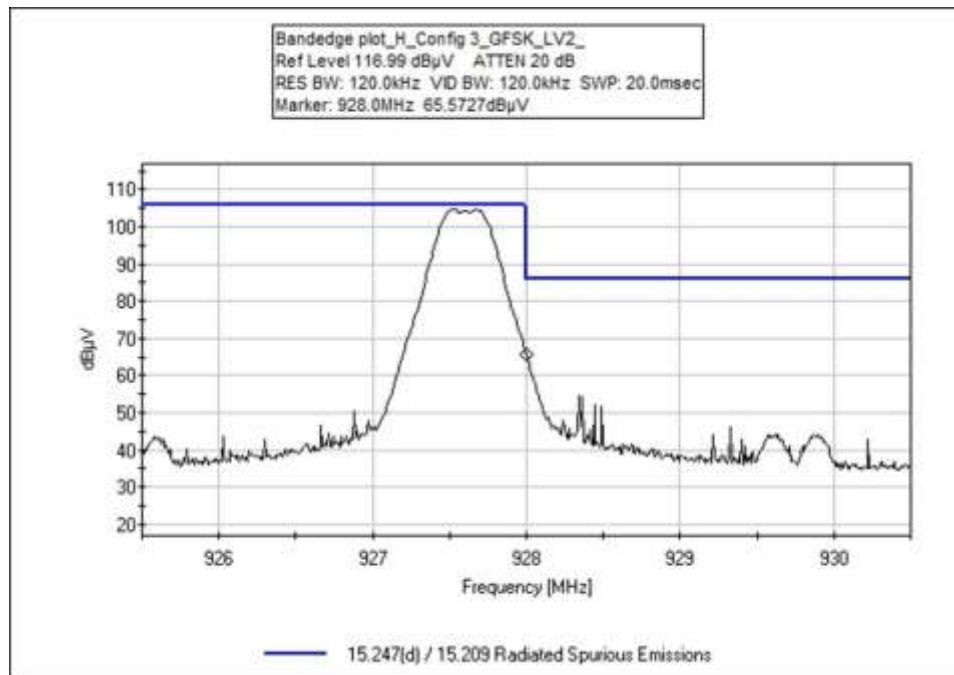


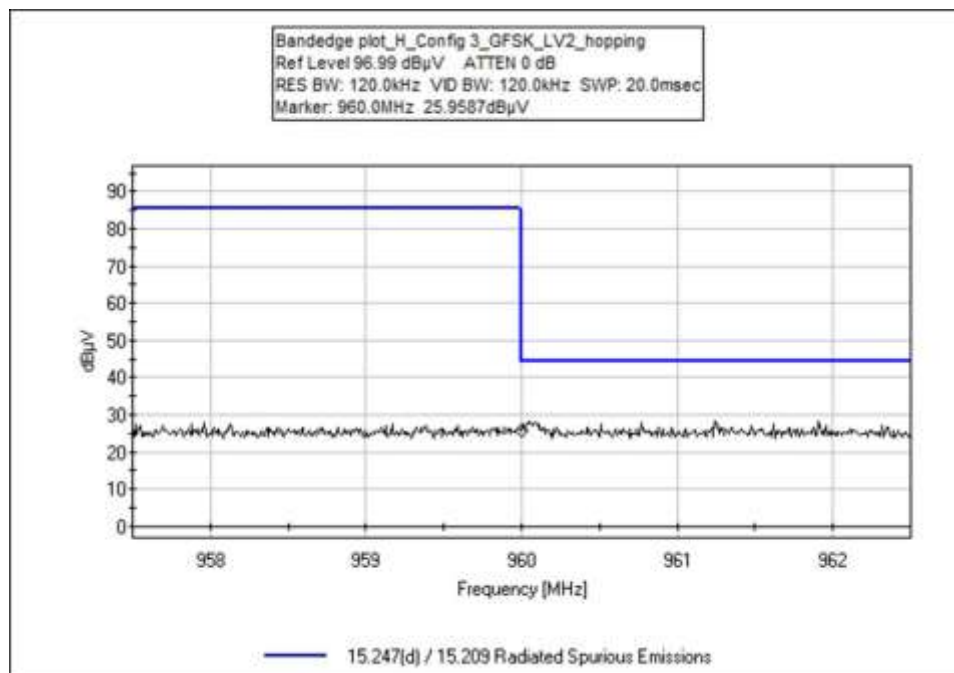
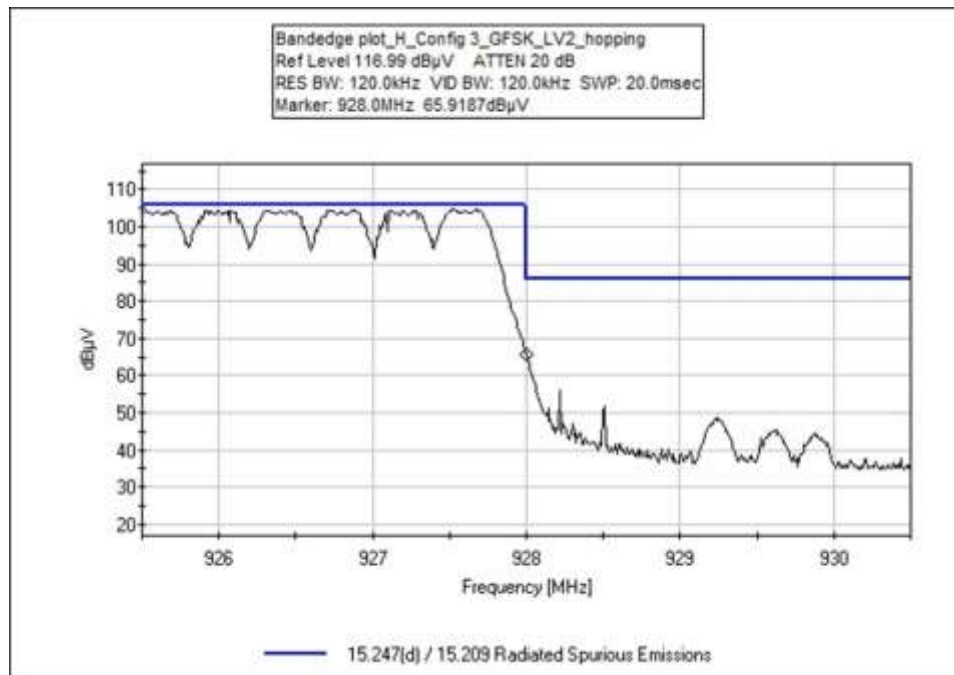


Configuration 3 Band Edge Plots









Test Setup / Conditions / Data

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **105380** Date: 5/21/2021
 Test Type: **Radiated Scan** Time: 13:23:27
 Tested By: E. Wong Sequence#: 11
 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:

The EUT is placed on Styrofoam platform and the Blue port is connected to a section of wire with a shorting tip to activate internal battery. The EUT's data port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable for configuration purposes, once configured, the laptop is removed from remote connection during course of testing. Fresh battery is used.

EUT has fixed orientation per manufacture's specification.

Operating Frequency / Mode:

902.4MHz, 915.2MHz, 927.6MHz, 400kHz steps, 64 channels, 300k GFSK LV2_Hybrid. Folder 4

Frequency of Measurement: 9k-9280MHz

9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz

150kHz to 30MHz RBW=9kHz, VBW=27kHz

30-1000MHz, RBW=120kHz, VBW=360kHz

1000-9280MHz, RBW=1MHz, VBW=3MHz

-20dBc limit, RBW=100kHz, VBW=300kHz

Note: The manufacturer declares the worst case duty cycle is 45ms per 100ms. Duty cycle correction factor= $20\log(45\text{ms}/100\text{ms}) = -6.9\text{dB}$. Average readings in restricted band are calculated from peak readings with duty cycle correction factor.

Test Environment Conditions:

Temperature: 22°C

Relative Humidity: 54%

Pressure: 100kPa

Site A

Test Method: ANSI C63.10-2013 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	4/29/2020	4/29/2022
	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
	ANP07659	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
	AN00786	Preamp	83017A	5/20/2020	5/20/2022
	ANP06360	Cable	L1-PNMMN-48	8/8/2019	8/8/2021
	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	7/15/2019	7/15/2021
	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	5/17/2021	5/17/2023
	ANDCCF	Duty Cycle Correction Factor		1/1/2021	1/1/2025
T2	AN00851	Biconilog Antenna	CBL6111C	4/14/2020	4/14/2022
T3	ANP05505	Attenuator	NAT-6	5/26/2021	5/26/2023
T4	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
T5	AN00309	Preamp	8447D	12/24/2019	12/24/2021
T6	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	614.000M	27.9	+0.0 -27.4	+20.0 +0.3	+6.2	+4.6	+0.0 109	31.6	46.0 Bandedge_L_hoppi ng	-14.4	Vert 116
2	960.000M	29.8	+0.0 -27.2	+24.0 +0.5	+6.3	+6.0	+0.0 109	39.4	54.0 Bandedge_H_hoppi ng	-14.6	Vert 116
3	960.000M	28.1	+0.0 -27.2	+24.0 +0.5	+6.3	+6.0	+0.0 109	37.7	54.0 Bandedge_H	-16.3	Vert 116
4	614.000M	24.9	+0.0 -27.4	+20.0 +0.3	+6.2	+4.6	+0.0 109	28.6	46.0 Bandedge_L	-17.4	Vert 116
5	902.000M	66.7	+0.0 -27.1	+23.1 +0.5	+6.3	+5.8	+0.0 109	75.3	93.5 Bandedge_L	-18.2	Vert 116
6	902.000M	65.0	+0.0 -27.1	+23.1 +0.5	+6.3	+5.8	+0.0 109	73.6	93.5 Bandedge_L_hoppi ng	-19.9	Vert 116
7	928.000M	64.2	+0.0 -27.2	+23.5 +0.5	+6.3	+5.9	+0.0 109	73.2	93.5 Bandedge_H	-20.3	Vert 116
8	928.000M	62.3	+0.0 -27.2	+23.5 +0.5	+6.3	+5.9	+0.0 109	71.3	93.5 Bandedge_H_hoppi ng	-22.2	Vert 116



Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **105380** Date: 6/9/2021
 Test Type: **Radiated Scan** Time: 13:59:19
 Tested By: E. Wong Sequence#: 23
 Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

The EUT is placed on Styrofoam platform and the Blue port is connected to a section of wire with a shorting tip to activate internal battery. The EUT's data port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable for configuration purposes, once configured, the laptop is removed from remote connection during course of testing. Fresh battery is used.
 EUT has fixed orientation per manufacture's specification.

Operating Frequency / Mode:
 902.4 MHz, 915.2MHz, 927.6MHz, 400kHz steps, 64 channels, 300k GFSK LV2 _Hybrid Folder 4

Frequency of Measurement: 9k-9280MHz
 9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz
 150kHz to 30MHz RBW=9kHz, VBW=27kHz
 30-1000MHz, RBW=120kHz, VBW=360kHz
 1000-9280MHz, RBW=1MHz, VBW=3MHz
 -20dBc limit, RBW=100kHz, VBW=300kHz

Note: The manufacturer declares the worst case duty cycle is 45ms per 100ms. Duty cycle correction factor= $20\log(45\text{ms}/100\text{ms}) = -6.9\text{dB}$. Average readings in restricted band are calculated from peak readings with duty cycle correction factor.

Test Environment Conditions:

Temperature: 22°C
 Relative Humidity: 54%
 Pressure: 100kPa

Site A

Test Method: ANSI C63.10-2013 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	4/29/2020	4/29/2022
	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
	ANP07659	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
	AN00786	Preamp	83017A	5/20/2020	5/20/2022
	ANP06360	Cable	L1-PNMNM-48	8/8/2019	8/8/2021
	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	7/15/2019	7/15/2021
	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	5/17/2021	5/17/2023
	ANDCCF	Duty Cycle Correction Factor		1/1/2021	1/1/2025
T2	AN00851	Biconilog Antenna	CBL6111C	4/14/2020	4/14/2022
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
T4	AN00309	Preamp	8447D	12/24/2019	12/24/2021
T5	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
T6	AN05505	Attenuator		5/26/2021	5/26/2023
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	902.317M	106.2	+0.0 +0.5	+23.1 +6.3	+5.8	-27.1	+0.0 334	114.8	115.0 Fundamental	-0.2	Vert 130
2	960.000M	35.5	+0.0 +0.5	+24.0 +6.3	+6.0	-27.2	+0.0 75	45.1	54.0 Bandedge_H	-8.9	Vert 130
3	960.000M	35.4	+0.0 +0.5	+24.0 +6.3	+6.0	-27.2	+0.0 75	45.0	54.0 Bandedge_H_hoppi ng	-9.0	Vert 130
4	614.000M	27.8	+0.0 +0.3	+20.0 +6.2	+4.6	-27.4	+0.0 334	31.5	46.0 Bandedge_L_hoppp ing	-14.5	Vert 130
5	614.000M	27.4	+0.0 +0.3	+20.0 +6.2	+4.6	-27.4	+0.0 334	31.1	46.0 Bandedge_L	-14.9	Vert 130
6	902.000M	67.7	+0.0 +0.5	+23.1 +6.3	+5.8	-27.1	+0.0 334	76.3	95.0 Bandedge_L	-18.7	Vert 130
7	928.000M	66.7	+0.0 +0.5	+23.5 +6.3	+5.9	-27.2	+0.0 75	75.7	95.0 Bandedge_H	-19.3	Vert 130
8	902.000M	66.5	+0.0 +0.5	+23.1 +6.3	+5.8	-27.1	+0.0 334	75.1	95.0 Bandedge_L_hoppi ng	-19.9	Vert 130
9	928.000M	65.6	+0.0 +0.5	+23.5 +6.3	+5.9	-27.2	+0.0 75	74.6	95.0 Bandedge_H_hoppi ng	-20.4	Vert 130

Test Location: CKC Laboratories Inc. • 110 N. Olinda Pl. • Brea, CA 92823 • 714-993-6112
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **105380** Date: 6/7/2021
 Test Type: **Radiated Scan** Time: 10:45:23
 Tested By: E. Wong Sequence#: 6
 Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

The EUT is placed on Styrofoam platform and the Blue port receives power from remotely located support power supply set 3.6Vdc to simulate a fresh battery. The EUT's red port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable. All port fill, black port is connected to a section of unterminated cable. EUT has fixed orientation per manufacture's specification.

Operating Frequency / Mode:

902.4MHz, 915.2MHz, 927.6MHz, 400kHz steps, 64 channels, 300k GFSK LV2 _Hybrid, folder 3

Frequency of Measurement: 9k-9280MHz

9kHz to 150kHz RBW=0.2kHz, VBW=0.6kHz

150kHz to 30MHz RBW=9kHz, VBW=27kHz

30-1000MHz, RBW=120kHz, VBW=360kHz

1000-9280MHz, RBW=1MHz, VBW=3MHz

-20dBc limit, RBW=100kHz, VBW=300kHz

Note: The manufacturer declares the worst case duty cycle is 45ms per 100ms. Duty cycle correction factor= $20\log(45\text{ms}/100\text{ms}) = -6.9\text{dB}$. Average readings in restricted band are calculated from peak readings with duty cycle correction factor.

Test Environment Conditions:

Temperature: 22°C

Relative Humidity: 54%

Pressure: 100kPa

Site A

Test Method: ANSI C63.10-2013 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	4/29/2020	4/29/2022
	AN00849	Horn Antenna	3115	3/17/2020	3/17/2022
	ANP07659	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
	AN00786	Preamp	83017A	5/20/2020	5/20/2022
	ANP06360	Cable	L1-PNMNM-48	8/8/2019	8/8/2021
	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	7/15/2019	7/15/2021
	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	5/17/2021	5/17/2023
	ANDCCF	Duty Cycle Correction Factor		1/1/2021	1/1/2025
T2	AN00851	Biconilog Antenna	CBL6111C	4/14/2020	4/14/2022
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
T4	AN00309	Preamp	8447D	12/24/2019	12/24/2021
T5	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
T6	AN05505	Attenuator		5/26/2021	5/26/2023
	AN00314	Loop Antenna	6502	4/13/2020	4/13/2022

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	614.000M	27.4	+0.0 +0.3	+20.0 +6.2	+4.6	-27.4	+0.0 187	31.1	46.0 Bandedge_L_hoppi ng	-14.9	Vert 149
2	614.000M	27.2	+0.0 +0.3	+20.0 +6.2	+4.6	-27.4	+0.0 185	30.9	46.0 Bandedge_L	-15.1	Vert 152
3	960.000M	28.8	+0.0 +0.5	+24.0 +6.3	+6.0	-27.2	+0.0 230	38.4	54.0 Bandedge_H_hoppi ng	-15.6	Vert 149
4	960.000M	28.6	+0.0 +0.5	+24.0 +6.3	+6.0	-27.2	+0.0 230	38.2	54.0 Bandedge_H	-15.8	Vert 149
5	902.000M	68.1	+0.0 +0.5	+23.1 +6.3	+5.8	-27.1	+0.0 187	76.7	95.0 Bandedge_L_hoppi ng	-18.3	Vert 149
6	902.000M	67.8	+0.0 +0.5	+23.1 +6.3	+5.8	-27.1	+0.0 185	76.4	95.0 Bandedge_L	-18.6	Vert 152
7	928.000M	65.9	+0.0 +0.5	+23.5 +6.3	+5.9	-27.2	+0.0 230	74.9	95.0 Bandedge_H_hoppi ping	-20.1	Vert 149
8	928.000M	65.6	+0.0 +0.5	+23.5 +6.3	+5.9	-27.2	+0.0 230	74.6	95.0 Bandedge_H	-20.4	Vert 149

Test Setup Photo(s)



Configuration 1; Below 1GHz, View 1



Configuration 1; Below 1GHz, View 2



Configuration 1; Above 1GHz, View 1



Configuration 1; Above 1GHz, View 2



Configuration 2, Below 1GHz, View 1



Configuration 2, Below 1GHz, View 2



Configuration 2; Above 1GHz, View 1



Configuration 2; Above 1GHz, View 2



Configuration 3; Below 1GHz, View 1



Configuration 3; Below 1GHz, View 2



Configuration 3; Above 1GHz, View 1



Configuration 3; Above 1GHz, View 2



Above 1GHz; View 1



Above 1GHz; View 2

15.247(f) Hybrid Power Spectral Density

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	7/13/2021
Configuration:	4		
Test Setup:	The EUT is placed on test bench and the Blue port receives power from remotely located support power supply set 3.6Vdc to simulate a fresh battery. The EUT's data port is connected to a remote located laptop running CLI Tool ver.2.0.1.24 via USB cable for configuration purposes. Note: Three EUTs have the same internal hardware. Conducted data measured on one EUT represents for all three EUTs. Correction factor is compensated for.		

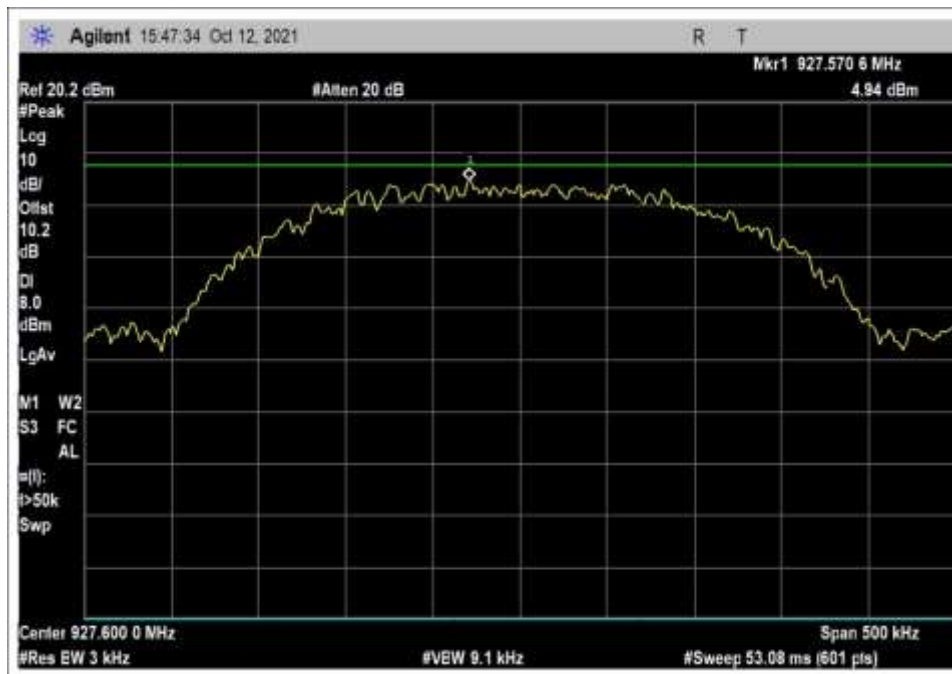
Environmental Conditions			
Temperature (°C)	25	Relative Humidity (%):	30

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	4/29/2020	4/29/2022
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	12/20/2019	12/20/2021
07659	Astrolab, Inc.	Astrolab, Inc.	32022-29094K-29094K-24TC	7/30/2020	7/30/2022

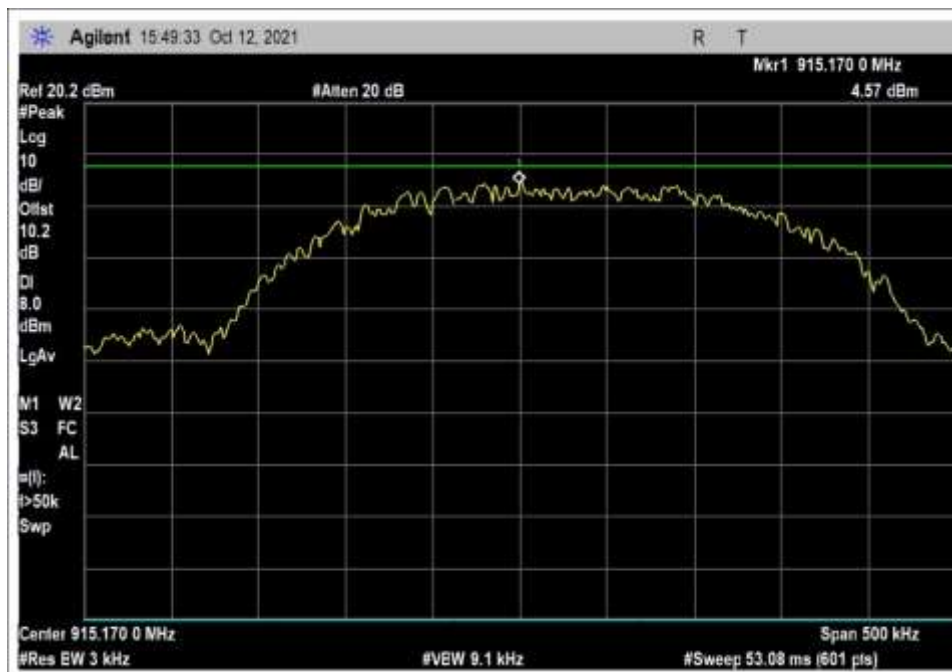
Test Data Summary - RF Conducted Measurement				
Measurement Method: PKPSD				
Frequency (MHz)	Modulation	Measured (dBm/3kHz)	Limit (dBm/3kHz)	Results
902.4	300kbps GFSK LV2	4.9	≤8	Pass
915.2	300kbps GFSK LV2	4.6	≤8	Pass
927.6	300kbps GFSK LV2	5.0	≤8	Pass
Folder 3				

Test Data Summary - RF Conducted Measurement				
Measurement Method: PKPSD				
Frequency (MHz)	Modulation	Measured (dBm/3kHz)	Limit (dBm/3kHz)	Results
902.4	300kbps GFSK LV2	4.8	≤8	Pass
915.2	300kbps GFSK LV2	5.0	≤8	Pass
927.6	300kbps GFSK LV2	5.0	≤8	Pass
Folder 4				

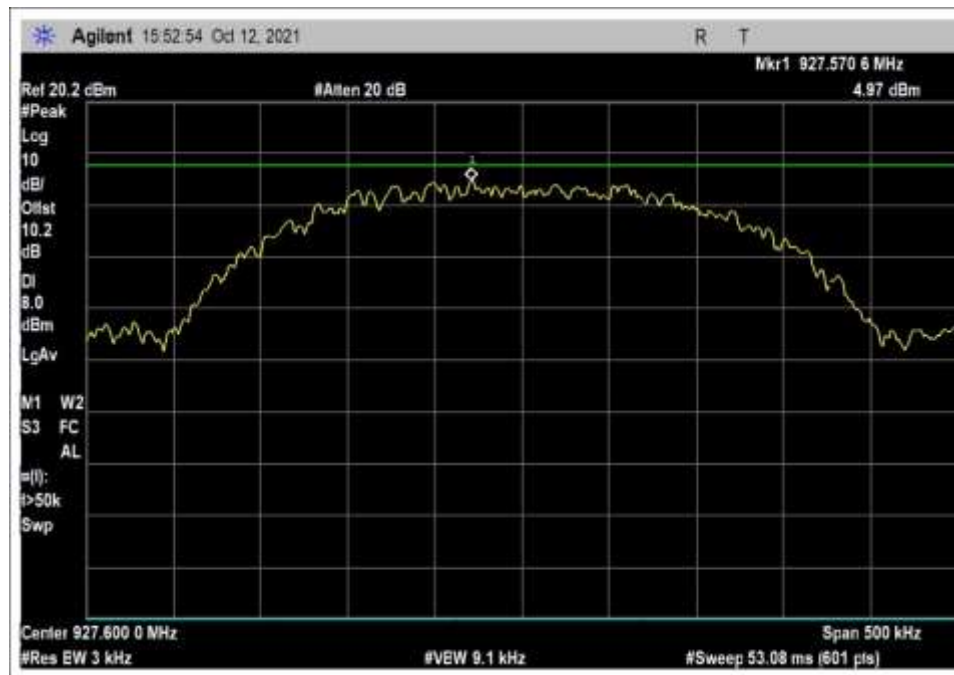
Plot(s) – Folder 3



Low Channel

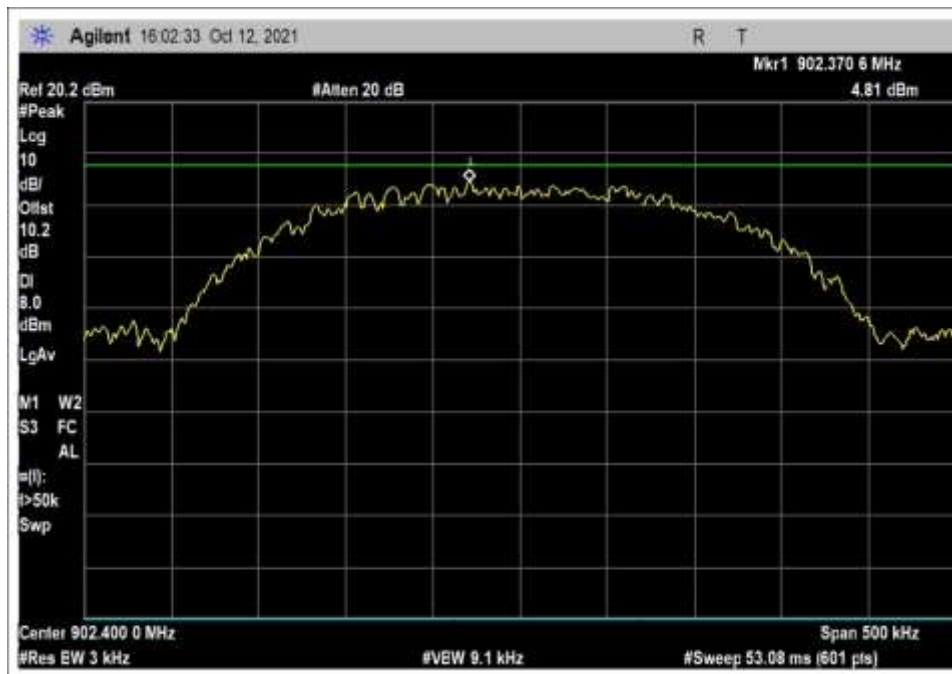


Middle Channel

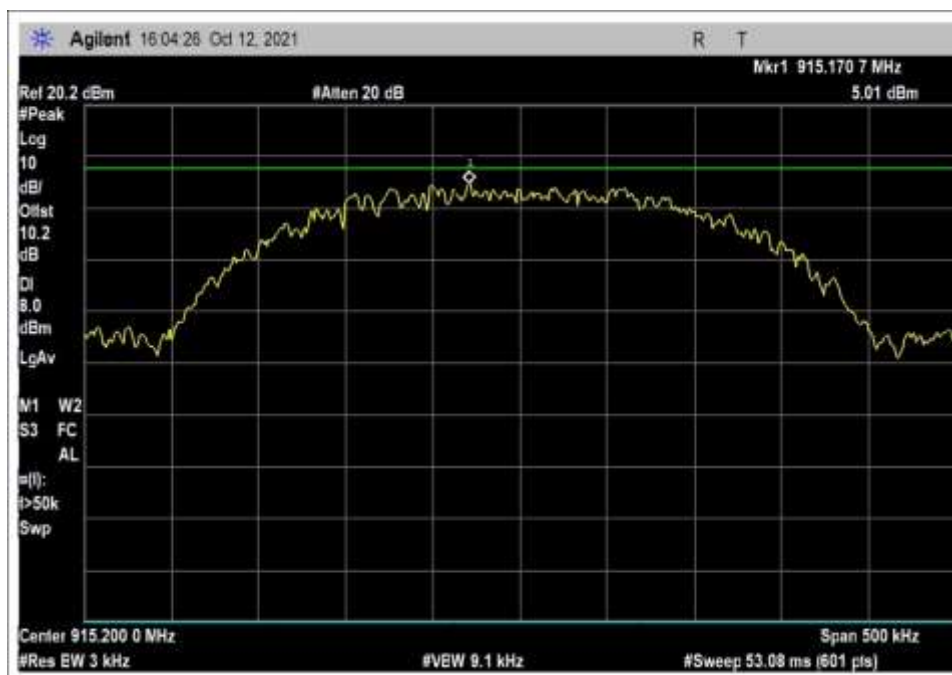


High Channel

Plot(s) – Folder 4



Low Channel

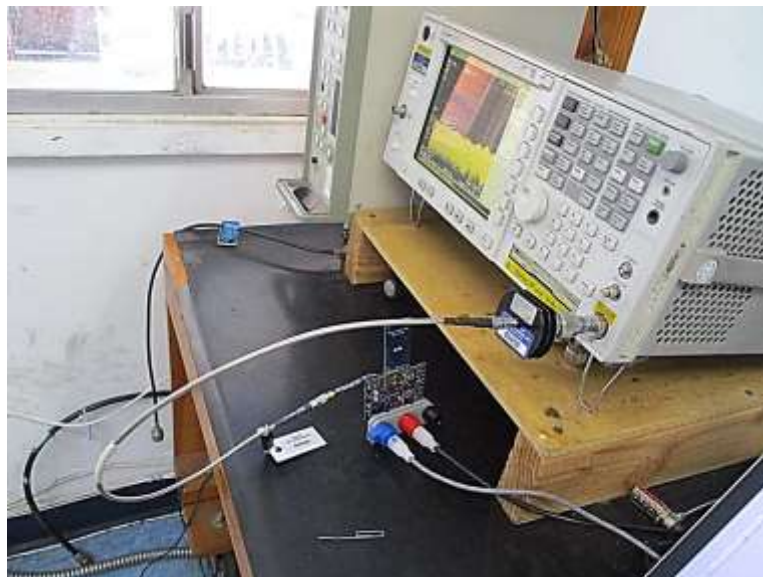


Middle Channel



High Channel

Test Setup Photo(s)



SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

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

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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