

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98201 • 435-402-1717
 Customer: **Itron, Inc.**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **103786** Date: 5/15/2020
 Test Type: **Conducted Emissions** Time: 14:34:36
 Tested By: Michael Atkinson Sequence#: 7
 Software: EMITest 5.03.12 115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Frequency: Band Edge
Low and High channels investigated, as well as hopping mode.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05748	Attenuator	PE7004-20	3/4/2020	3/4/2022
T2	ANP05546	Cable	Helix	8/24/2018	8/24/2020
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

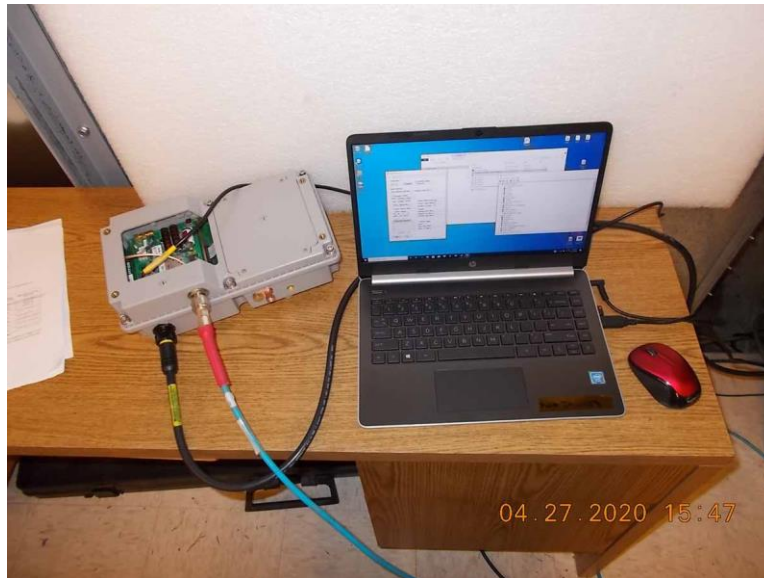
Measurement Data:

Reading listed by margin.

Test Lead: RF Port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	902.000M	82.8	+20.0	+0.5			+0.0	103.3	116.0	-12.7	RF Po
									Hop OFDM 600k		
2	902.000M	81.9	+20.0	+0.5			+0.0	102.4	116.0	-13.6	RF Po
									OFDM 600k		
3	901.988M	81.0	+20.0	+0.5			+0.0	101.5	116.0	-14.5	RF Po
									Hop OFDM 200k		
4	928.000M	80.8	+20.0	+0.5			+0.0	101.3	116.0	-14.7	RF Po
									OFDM 600k		
5	902.000M	79.9	+20.0	+0.5			+0.0	100.4	116.0	-15.6	RF Po
									OFDM 200k		
6	928.000M	78.7	+20.0	+0.5			+0.0	99.2	116.0	-16.8	RF Po
									OFDM 200k		
7	928.000M	78.6	+20.0	+0.5			+0.0	99.1	116.0	-16.9	RF Po
									Hop OFDM 600k		
8	928.000M	77.2	+20.0	+0.5			+0.0	97.7	116.0	-18.3	RF Po
									Hop OFDM 200k		
9	902.000M	61.8	+20.0	+0.5			+0.0	82.3	116.0	-33.7	RF Po
									12.5k OQPSK		
10	902.000M	60.8	+20.0	+0.5			+0.0	81.3	116.0	-34.7	RF Po
									Hop 6.25k OQPSK		
11	901.988M	60.0	+20.0	+0.5			+0.0	80.5	116.0	-35.5	RF Po
									Hop 50k FSK		
12	902.000M	59.9	+20.0	+0.5			+0.0	80.4	116.0	-35.6	RF Po
									Hop 150k FSK		
13	928.000M	59.6	+20.0	+0.5			+0.0	80.1	116.0	-35.9	RF Po
									150k FSK		
14	902.000M	59.6	+20.0	+0.5			+0.0	80.1	116.0	-35.9	RF Po
									50k FSK		
15	928.000M	58.9	+20.0	+0.5			+0.0	79.4	116.0	-36.6	RF Po
									Hop 6.25k OQPSK		
16	928.000M	58.5	+20.0	+0.5			+0.0	79.0	116.0	-37.0	RF Po
									Hop 50k FSK		
17	928.000M	58.4	+20.0	+0.5			+0.0	78.9	116.0	-37.1	RF Po
									6.25k OQPSK		
18	902.000M	58.1	+20.0	+0.5			+0.0	78.6	116.0	-37.4	RF Po
									Hop 12.5k OQPSK		
19	902.000M	58.1	+20.0	+0.5			+0.0	78.6	116.0	-37.4	RF Po
									6.25k OQPSK		
20	928.000M	57.7	+20.0	+0.5			+0.0	78.2	116.0	-37.8	RF Po
									12.5k OQPSK		
21	902.000M	57.0	+20.0	+0.5			+0.0	77.5	116.0	-38.5	RF Po
									150k FSK		
22	928.000M	56.8	+20.0	+0.5			+0.0	77.3	116.0	-38.7	RF Po
									Hop 150k FSK		
23	928.006M	56.7	+20.0	+0.5			+0.0	77.2	116.0	-38.8	RF Po
									Hop 12.5k OQPSK		
24	928.000M	56.7	+20.0	+0.5			+0.0	77.2	116.0	-38.8	RF Po
									50k FSK		

Test Setup Photo(s)



15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98201 • 435-402-1717
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103786** Date: 5/5/2020
 Test Type: **Maximized Emissions** Time: 19:48:32
 Tested By: Steven Pittsford Sequence#: 5
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

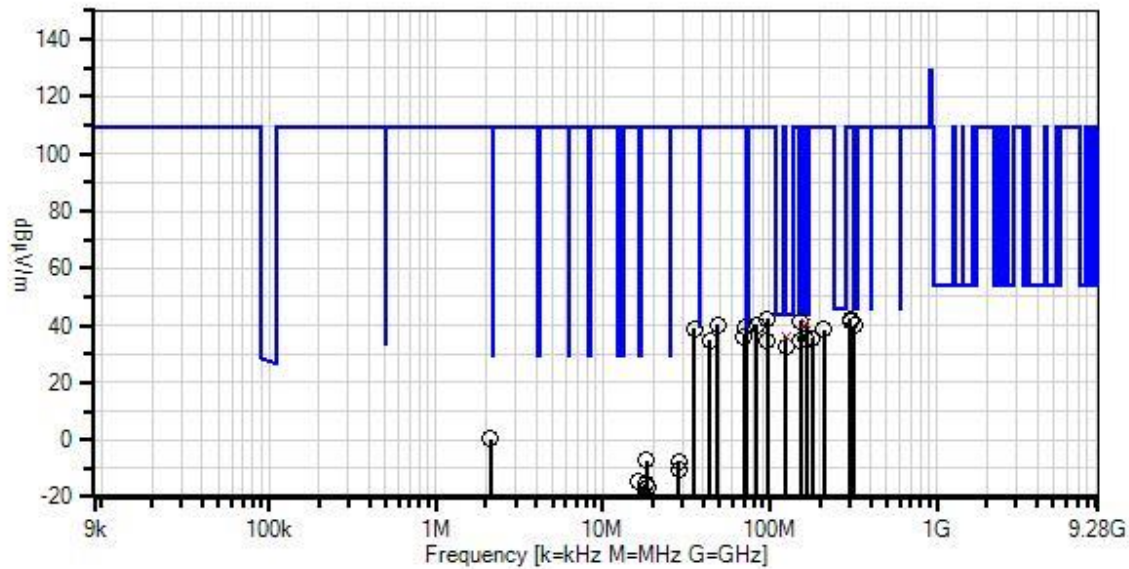
Temperature: 22°C
 Pressure: 102.0kPa
 Humidity: 35%

 Frequency: 9kHz-1GHz

 Test Method: ANSI 63.10 (2013)

 Set up:
 3 x orthogonal axes investigated below 30MHz.
 EUT is on the test bench mounted on a pole stand.
 Transmitting continuously.
 Low, Middle, and High channels investigated, as well as multiple modulations investigated and hopping mode investigated, worst case reported.

Itron, Inc. WO#: 103786 Sequence#: 5 Date: 5/5/2020
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Various



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T2	ANP06540	Cable	Helix	8/23/2019	8/23/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T5	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T6	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T7	ANP06515	Cable	Helix	6/29/2018	6/29/2020
T8	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5	T6	T7	T8	Table	dB μ V/m	dB μ V/m	dB	Ant
1	166.312M	23.3	+0.0	+0.2	+0.6	+0.8	+0.0	40.7	43.5	-2.8	Vert
	QP		+5.8	+10.0	+0.0	+0.0					
^	166.312M	24.4	+0.0	+0.2	+0.6	+0.8	+0.0	41.8	43.5	-1.7	Vert
			+5.8	+10.0	+0.0	+0.0					
3	124.759M	21.1	+0.0	+0.1	+0.5	+0.7	+0.0	36.0	43.5	-7.5	Vert
	QP		+5.8	+7.8	+0.0	+0.0					
^	124.759M	25.1	+0.0	+0.1	+0.5	+0.7	+0.0	40.0	43.5	-3.5	Vert
			+5.8	+7.8	+0.0	+0.0					
5	166.300M	17.9	+0.0	+0.2	+0.6	+0.8	+0.0	35.3	43.5	-8.2	Horiz
			+5.8	+10.0	+0.0	+0.0					
6	124.600M	17.9	+0.0	+0.1	+0.5	+0.7	+0.0	32.8	43.5	-10.7	Horiz
			+5.8	+7.8	+0.0	+0.0					
7	97.200M	27.5	+0.0	+0.1	+0.5	+0.6	+0.0	42.3	109.5	-67.2	Vert
			+5.8	+7.8	+0.0	+0.0					
8	304.800M	20.7	+0.0	+0.2	+0.9	+1.1	+0.0	42.0	109.5	-67.5	Horiz
			+5.8	+13.3	+0.0	+0.0					
9	152.200M	25.0	+0.0	+0.2	+0.6	+0.7	+0.0	41.5	109.5	-68.0	Vert
			+5.8	+9.2	+0.0	+0.0					
10	304.480M	19.9	+0.0	+0.2	+0.9	+1.1	+0.0	41.2	109.5	-68.3	Vert
			+5.8	+13.3	+0.0	+0.0					
11	83.110M	26.8	+0.0	+0.1	+0.4	+0.5	+0.0	40.4	109.5	-69.1	Vert
			+5.8	+6.8	+0.0	+0.0					
12	48.400M	25.6	+0.0	+0.1	+0.4	+0.4	+0.0	40.3	109.5	-69.2	Vert
			+5.8	+8.0	+0.0	+0.0					
13	318.300M	18.0	+0.0	+0.2	+0.9	+1.1	+0.0	40.0	109.5	-69.5	Horiz
			+5.8	+14.0	+0.0	+0.0					
14	71.700M	25.2	+0.0	+0.1	+0.4	+0.5	+0.0	39.3	109.5	-70.2	Vert
			+5.8	+7.3	+0.0	+0.0					
15	35.170M	18.2	+0.0	+0.1	+0.3	+0.3	+0.0	38.9	109.5	-70.6	Vert
			+5.8	+14.2	+0.0	+0.0					
16	211.000M	20.7	+0.0	+0.2	+0.7	+0.9	+0.0	38.7	109.5	-70.8	Horiz
			+5.8	+10.4	+0.0	+0.0					
17	70.420M	21.8	+0.0	+0.1	+0.4	+0.5	+0.0	36.0	109.5	-73.5	Vert
			+5.8	+7.4	+0.0	+0.0					
18	179.930M	18.1	+0.0	+0.2	+0.6	+0.8	+0.0	35.5	109.5	-74.0	Vert
			+5.8	+10.0	+0.0	+0.0					
19	43.630M	18.0	+0.0	+0.1	+0.3	+0.3	+0.0	34.9	109.5	-74.6	Vert
			+5.8	+10.4	+0.0	+0.0					
20	96.800M	20.0	+0.0	+0.1	+0.5	+0.6	+0.0	34.8	109.5	-74.7	Horiz
			+5.8	+7.8	+0.0	+0.0					
21	152.400M	18.2	+0.0	+0.2	+0.6	+0.7	+0.0	34.8	109.5	-74.7	Horiz
			+5.8	+9.3	+0.0	+0.0					
22	2.138M	30.6	+0.0	+0.0	+0.0	+0.0	-40.0	0.4	109.5	-109.1	Para
			+0.0	+0.0	+0.1	+9.7					
23	18.363M	24.1	+0.0	+0.1	+0.0	+0.0	-40.0	-7.3	109.5	-116.8	Groun
			+0.0	+0.0	+0.2	+8.3					
24	28.321M	26.0	+0.0	+0.1	+0.0	+0.0	-40.0	-7.6	109.5	-117.1	Groun
			+0.0	+0.0	+0.3	+6.0					

25	28.620M	23.1	+0.0 +0.0	+0.1 +0.0	+0.0 +0.3	+0.0 +6.0	-40.0	-10.5	109.5	-120.0	Para
26	16.294M	16.3	+0.0 +0.0	+0.1 +0.0	+0.0 +0.2	+0.0 +8.8	-40.0	-14.6	109.5	-124.1	Perp
27	18.064M	16.0	+0.0 +0.0	+0.1 +0.0	+0.0 +0.2	+0.0 +8.4	-40.0	-15.3	109.5	-124.8	Perp
28	18.843M	14.8	+0.0 +0.0	+0.1 +0.0	+0.0 +0.2	+0.0 +8.2	-40.0	-16.7	109.5	-126.2	Para

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98201 • 435-402-1717
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103786** Date: 5/5/2020
 Test Type: **Maximized Emissions** Time: 17:04:59
 Tested By: Steven Pittsford Sequence#: 4
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

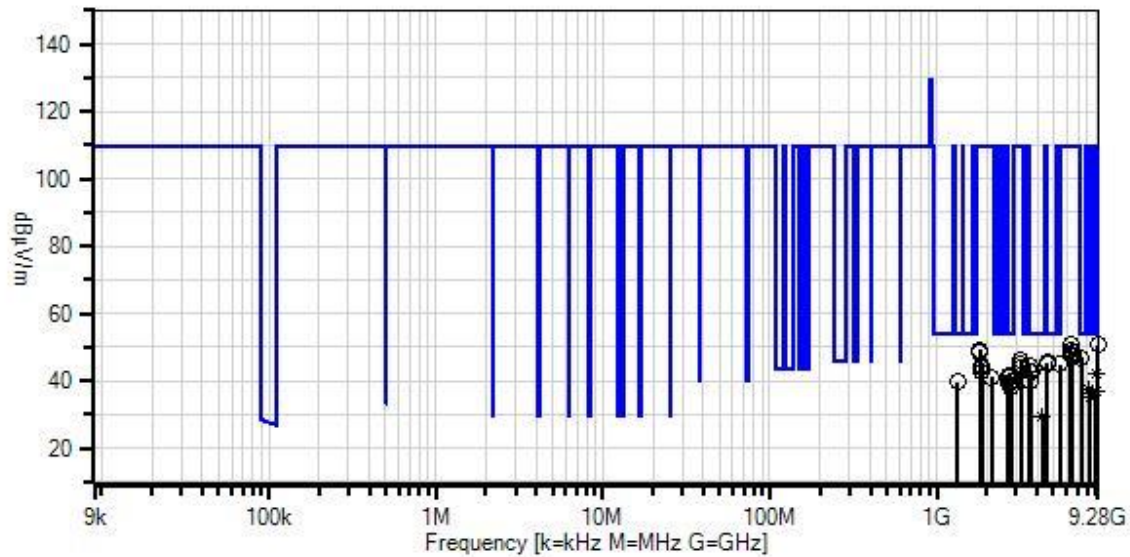
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 22°C Pressure: 102.0kPa Humidity: 35% Frequency: 1-10GHz Test Method: ANSI 63.10 (2013) Set up: Vertical and horizontal polarity investigated. EUT is on the test bench mounted on a pole stand. Transmitting continuously. 50kbps and 150kbps FSK modulations investigated.
--

Ittron, Inc. WO#: 103786 Sequence#: 4 Date: 5/5/2020
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



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

○ Peak Readings
* Average Readings
Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
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	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T4	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T5	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021
T6	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T7	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	7321.670M	36.9	-34.6 +0.4	+36.8 +0.0	+5.4 +0.6	+1.3	+0.0	46.8	54.0 50k FSK	-7.2	Vert 139
2	4575.575M	41.1	-33.7 +0.7	+31.9 +0.0	+4.0 +0.6	+0.9	+0.0	45.5	54.0 150k FSK	-8.5	Vert 147
3	4575.800M	40.7	-33.7 +0.7	+31.9 +0.0	+4.0 +0.6	+0.9	+0.0	45.1	54.0 50k FSK	-8.9	Vert 139
4	3609.725M	42.4	-33.8 +0.6	+30.3 +0.0	+3.6 +0.5	+0.8	+0.0	44.4	54.0 150k FSK	-9.6	Vert 147
5	3710.105M	40.3	-33.7 +0.5	+30.6 +0.0	+3.8 +0.5	+0.9	+0.0	42.9	54.0 150k FSK	-11.1	Vert 151
6	3660.975M	40.4	-33.7 +0.5	+30.5 +0.0	+3.7 +0.5	+0.9	+0.0	42.8	54.0 150k FSK	-11.2	Vert 147
7	3707.960M	40.2	-33.7 +0.5	+30.6 +0.0	+3.8 +0.5	+0.9	+0.0	42.8	54.0 50k FSK	-11.2	Vert 139
8	3609.609M	40.6	-33.8 +0.6	+30.3 +0.0	+3.6 +0.5	+0.8	+0.0	42.6	54.0 150k FSK	-11.4	Vert 145
9	9152.000M Ave	30.0	-34.2 +0.4	+37.5 +0.0	+6.2 +0.5	+1.5	+0.0	41.9	54.0 150k FSK	-12.1	Vert 147
^	9152.000M	40.5	-34.2 +0.4	+37.5 +0.0	+6.2 +0.5	+1.5	+0.0	52.4	54.0 150k FSK	-1.6	Vert 147
11	2664.000M	43.9	-34.2 +0.2	+28.1 +0.0	+2.6 +0.4	+0.7	+0.0	41.7	54.0	-12.3	Horiz
12	2707.145M	43.4	-34.1 +0.2	+28.3 +0.0	+2.6 +0.4	+0.7	+0.0	41.5	54.0 50k FSK	-12.5	Vert 139
13	2745.200M	43.1	-34.1 +0.2	+28.4 +0.0	+2.6 +0.4	+0.7	+0.0	41.3	54.0 150k FSK	-12.7	Vert 147
14	2706.420M	42.6	-34.1 +0.2	+28.3 +0.0	+2.6 +0.4	+0.7	+0.0	40.7	54.0 150k FSK	-13.3	Vert 147
15	2745.540M	41.8	-34.1 +0.2	+28.4 +0.0	+2.6 +0.4	+0.7	+0.0	40.0	54.0 50k FSK	-14.0	Vert 139
16	2783.390M	41.5	-34.1 +0.2	+28.5 +0.0	+2.6 +0.4	+0.7	+0.0	39.8	54.0 150k FSK	-14.2	Vert 151
17	3660.740M	37.2	-33.7 +0.5	+30.5 +0.0	+3.7 +0.5	+0.9	+0.0	39.6	54.0 50k FSK	-14.4	Vert 139
18	1328.000M	47.0	-35.8 +0.1	+25.2 +0.0	+1.9 +0.8	+0.4	+0.0	39.6	54.0	-14.4	Horiz
19	2707.209M	41.1	-34.1 +0.2	+28.3 +0.0	+2.6 +0.4	+0.7	+0.0	39.2	54.0 150k FSK	-14.8	Vert 121
20	2782.595M	39.6	-34.1 +0.2	+28.5 +0.0	+2.6 +0.4	+0.7	+0.0	37.9	54.0 50k FSK	-16.1	Vert 139
21	8121.550M Ave	27.3	-35.0 +0.6	+37.0 +0.0	+5.7 +0.8	+1.3	+0.0	37.7	54.0 50k FSK	-16.3	Vert 147
^	8121.550M	39.1	-35.0 +0.6	+37.0 +0.0	+5.7 +0.8	+1.3	+0.0	49.5	54.0 50k FSK	-4.5	Vert 139
23	9025.555M Ave	25.1	-34.2 +0.3	+37.5 +0.0	+6.2 +0.5	+1.4	+0.0	36.8	54.0 50k FSK	-17.2	Vert 147
^	9025.555M	37.6	-34.2 +0.3	+37.5 +0.0	+6.2 +0.5	+1.4	+0.0	49.3	54.0 50k FSK	-4.7	Vert 139

25	8236.690M	24.3	-35.0	+37.0	+5.7	+1.7	+0.0	35.1	54.0	-18.9	Vert
	Ave		+0.5	+0.0	+0.9				150k FSK		147
^	8236.690M	38.2	-35.0	+37.0	+5.7	+1.7	+0.0	49.0	54.0	-5.0	Vert
			+0.5	+0.0	+0.9				150k FSK		147
27	4259.751M	25.8	-33.7	+31.6	+3.8	+0.8	+0.0	29.3	54.0	-24.7	Vert
	Ave		+0.4	+0.0	+0.6						
^	4259.751M	44.9	-33.7	+31.6	+3.8	+0.8	+0.0	48.4	54.0	-5.6	Vert
			+0.4	+0.0	+0.6						
29	9277.675M	38.6	-34.1	+37.6	+6.2	+1.5	+0.0	50.7	109.5	-58.8	Vert
			+0.4	+0.0	+0.5				50k FSK		151
30	6316.895M	42.9	-34.1	+34.6	+5.2	+1.0	+0.0	50.6	109.5	-58.9	Horiz
			+0.5	+0.0	+0.5				50k FSK		139
31	6316.555M	41.6	-34.1	+34.6	+5.2	+1.0	+0.0	49.3	109.5	-60.2	Vert
			+0.5	+0.0	+0.5				150k FSK		145
32	1804.900M	54.4	-34.8	+26.1	+2.2	+0.5	+0.0	49.1	109.5	-60.4	Vert
			+0.2	+0.0	+0.5				150k FSK		147
33	6316.925M	41.3	-34.1	+34.6	+5.2	+1.0	+0.0	49.0	109.5	-60.5	Vert
			+0.5	+0.0	+0.5				150k FSK		147
34	6406.470M	41.0	-34.2	+34.6	+5.4	+1.1	+0.0	49.0	109.5	-60.5	Horiz
			+0.6	+0.0	+0.5				50k FSK		139
35	1804.750M	54.2	-34.8	+26.1	+2.2	+0.5	+0.0	48.9	109.5	-60.6	Vert
			+0.2	+0.0	+0.5				50k FSK		155
36	1804.809M	54.0	-34.8	+26.1	+2.2	+0.5	+0.0	48.7	109.5	-60.8	Vert
			+0.2	+0.0	+0.5				150k FSK		121
37	6493.430M	40.0	-34.2	+34.5	+5.6	+1.2	+0.0	48.2	109.5	-61.3	Vert
			+0.6	+0.0	+0.5				150k FSK		151
38	6406.580M	40.0	-34.2	+34.6	+5.4	+1.1	+0.0	48.0	109.5	-61.5	Vert
			+0.6	+0.0	+0.5				150k FSK		147
39	6493.435M	39.0	-34.2	+34.5	+5.6	+1.2	+0.0	47.2	109.5	-62.3	Horiz
			+0.6	+0.0	+0.5				50k FSK		151
40	3189.000M	46.0	-34.0	+29.5	+3.1	+0.8	+0.0	46.2	109.5	-63.3	Vert
			+0.5	+0.0	+0.3						
41	3189.000M	44.9	-34.0	+29.5	+3.1	+0.8	+0.0	45.1	109.5	-64.4	Horiz
			+0.5	+0.0	+0.3						
42	5490.975M	38.7	-33.7	+33.5	+4.5	+1.0	+0.0	44.8	109.5	-64.7	Vert
			+0.4	+0.0	+0.4				150k FSK		147
43	5490.635M	38.6	-33.7	+33.5	+4.5	+1.0	+0.0	44.7	109.5	-64.8	Vert
			+0.4	+0.0	+0.4				50k FSK		139
44	1854.995M	49.2	-34.7	+26.5	+2.3	+0.5	+0.0	44.4	109.5	-65.1	Vert
			+0.2	+0.0	+0.4				50k FSK		139
45	1855.270M	48.8	-34.7	+26.5	+2.3	+0.5	+0.0	44.0	109.5	-65.5	Vert
			+0.2	+0.0	+0.4				150k FSK		151
46	3196.000M	43.5	-34.0	+29.5	+3.1	+0.8	+0.0	43.7	109.5	-65.8	Vert
			+0.5	+0.0	+0.3						
47	1830.395M	47.8	-34.8	+26.3	+2.3	+0.5	+0.0	42.7	109.5	-66.8	Vert
			+0.2	+0.0	+0.4				150k FSK		128
48	1830.340M	47.5	-34.8	+26.3	+2.3	+0.5	+0.0	42.4	109.5	-67.1	Vert
			+0.2	+0.0	+0.4				50k FSK		139
49	2126.000M	43.9	-34.4	+27.8	+2.4	+0.6	+0.0	41.0	109.5	-68.5	Horiz
			+0.2	+0.0	+0.5						

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98201 • 435-402-1717
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103786** Date: 5/5/2020
 Test Type: **Maximized Emissions** Time: 17:48:53
 Tested By: Steven Pittsford Sequence#: 7
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

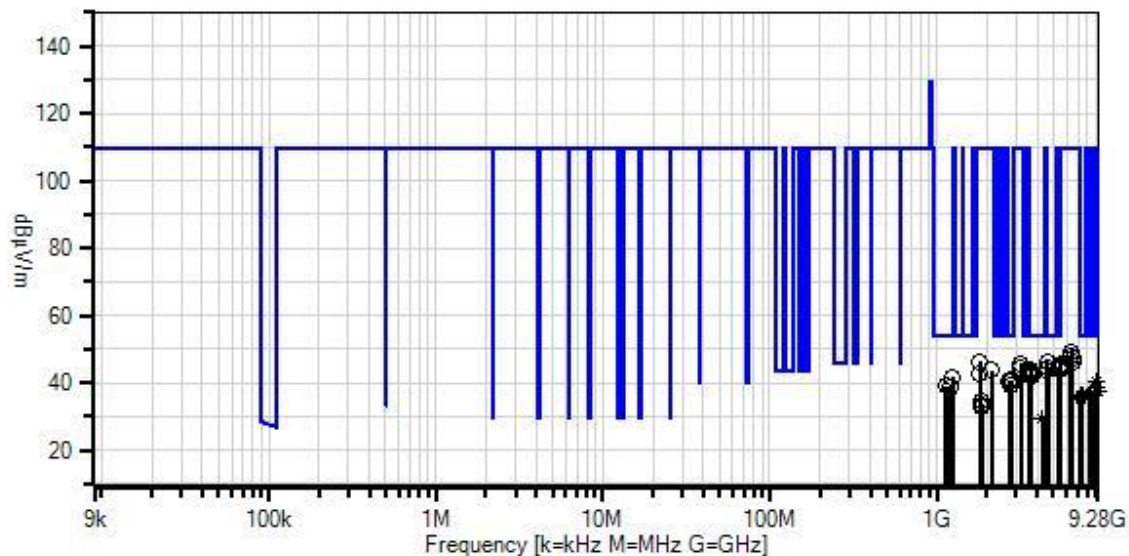
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 22°C Pressure: 102.0kPa Humidity: 35% Frequency: 1-10GHz Test Method: ANSI 63.10 (2013) Set up: Vertical and horizontal polarity investigated. EUT is on the test bench mounted on a pole stand. Transmitting continuously. 200kbps and 600kbps OFDM investigated. (Note, 1.2M OFDM is covered under a separate Hybrid system report)
--

Ittron, Inc. WO#: 103786 Sequence#: 7 Date: 5/5/2020
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	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	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T4	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T5	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T6	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021

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	4575.996M	41.7	-33.7 +0.7	+31.9 +0.6	+4.0	+0.9	+0.0	46.1	54.0 600k OFDM	-7.9	Vert
2	5414.403M	38.8	-33.7 +0.4	+33.4 +0.4	+4.5	+1.0	+0.0	44.8	54.0 600k OFDM	-9.2	Vert
3	5414.400M	38.5	-33.7 +0.4	+33.4 +0.4	+4.5	+1.0	+0.0	44.5	54.0 200k OFDM	-9.5	Vert
4	4638.001M	39.9	-33.6 +0.6	+32.1 +0.6	+4.0	+0.9	+0.0	44.5	54.0 200k OFDM	-9.5	Vert
5	4576.183M	40.0	-33.7 +0.7	+31.9 +0.6	+4.0	+0.9	+0.0	44.4	54.0 200k OFDM	-9.6	Vert
6	4638.002M	39.8	-33.6 +0.6	+32.1 +0.6	+4.0	+0.9	+0.0	44.4	54.0 600k OFDM	-9.6	Vert
7	3660.371M	41.5	-33.7 +0.5	+30.5 +0.5	+3.7	+0.9	+0.0	43.9	54.0 200k OFDM	-10.1	Vert
8	4512.000M	39.4	-33.7 +0.7	+31.8 +0.6	+3.9	+0.9	+0.0	43.6	54.0 200k OFDM	-10.4	Vert
9	4511.995M	39.4	-33.7 +0.7	+31.8 +0.6	+3.9	+0.9	+0.0	43.6	54.0 600k OFDM	-10.4	Vert
10	3660.802M	40.8	-33.7 +0.5	+30.5 +0.5	+3.7	+0.9	+0.0	43.2	54.0 600k OFDM	-10.8	Vert
11	3710.400M	40.0	-33.7 +0.5	+30.6 +0.5	+3.8	+0.9	+0.0	42.6	54.0 600k OFDM	-11.4	Vert
12	3609.600M	40.6	-33.8 +0.6	+30.3 +0.5	+3.6	+0.8	+0.0	42.6	54.0 200k OFDM	-11.4	Vert
13	3710.386M	39.6	-33.7 +0.5	+30.6 +0.5	+3.8	+0.9	+0.0	42.2	54.0 200k OFDM	-11.8	Vert
14	3609.598M	40.0	-33.8 +0.6	+30.3 +0.5	+3.6	+0.8	+0.0	42.0	54.0 600k OFDM	-12.0	Vert
15	2745.610M	42.7	-34.1 +0.2	+28.4 +0.4	+2.6	+0.7	+0.0	40.9	54.0 600k OFDM	-13.1	Vert
16	2782.808M	42.3	-34.1 +0.2	+28.5 +0.4	+2.6	+0.7	+0.0	40.6	54.0 200k OFDM	-13.4	Vert
17	2707.200M	42.1	-34.1 +0.2	+28.3 +0.4	+2.6	+0.7	+0.0	40.2	54.0 200k OFDM	-13.8	Vert
18	9151.998M Ave	28.3	-34.2 +0.4	+37.5 +0.5	+6.2	+1.5	+0.0	40.2	54.0 600k OFDM	-13.8	Vert
19	2707.175M	42.1	-34.1 +0.2	+28.3 +0.4	+2.6	+0.7	+0.0	40.2	54.0 600k OFDM	-13.8	Vert
20	2745.444M	41.9	-34.1 +0.2	+28.4 +0.4	+2.6	+0.7	+0.0	40.1	54.0 200k OFDM	-13.9	Vert
21	2782.799M	41.1	-34.1 +0.2	+28.5 +0.4	+2.6	+0.7	+0.0	39.4	54.0 600k OFDM	-14.6	Vert
22	1130.000M	47.3	-36.6 +0.1	+24.8 +1.3	+1.8	+0.4	+0.0	39.1	54.0	-14.9	Horiz
23	1196.000M	46.6	-36.2 +0.1	+25.0 +1.1	+1.8	+0.4	+0.0	38.8	54.0	-15.2	Horiz

24	9151.948M Ave	26.5	-34.2 +0.4	+37.5 +0.5	+6.2	+1.5	+0.0	38.4	54.0 200k OFDM	-15.6	Vert
^	9151.998M	41.0	-34.2 +0.4	+37.5 +0.5	+6.2	+1.5	+0.0	52.9	54.0 600k OFDM	-1.1	Vert
^	9151.948M	40.7	-34.2 +0.4	+37.5 +0.5	+6.2	+1.5	+0.0	52.6	54.0 200k OFDM	-1.4	Vert
27	9024.000M Ave	25.5	-34.2 +0.3	+37.5 +0.5	+6.2	+1.4	+0.0	37.2	54.0 200k OFDM	-16.8	Vert
28	9023.999M Ave	25.5	-34.2 +0.3	+37.5 +0.5	+6.2	+1.4	+0.0	37.2	54.0 600k OFDM	-16.8	Vert
^	9023.999M	39.6	-34.2 +0.3	+37.5 +0.5	+6.2	+1.4	+0.0	51.3	54.0 600k OFDM	-2.7	Vert
^	9024.000M	38.0	-34.2 +0.3	+37.5 +0.5	+6.2	+1.4	+0.0	49.7	54.0 200k OFDM	-4.3	Vert
31	8348.399M Ave	26.0	-34.9 +0.5	+37.0 +0.8	+5.8	+1.7	+0.0	36.9	54.0 600k OFDM	-17.1	Vert
32	8348.398M Ave	25.9	-34.9 +0.5	+37.0 +0.8	+5.8	+1.7	+0.0	36.8	54.0 200k OFDM	-17.2	Vert
^	8348.399M	41.0	-34.9 +0.5	+37.0 +0.8	+5.8	+1.7	+0.0	51.9	54.0 600k OFDM	-2.1	Vert
^	8348.398M	40.1	-34.9 +0.5	+37.0 +0.8	+5.8	+1.7	+0.0	51.0	54.0 200k OFDM	-3.0	Vert
35	8236.799M Ave	25.7	-35.0 +0.5	+37.0 +0.9	+5.7	+1.7	+0.0	36.5	54.0 600k OFDM	-17.5	Vert
36	8236.769M Ave	25.6	-35.0 +0.5	+37.0 +0.9	+5.7	+1.7	+0.0	36.4	54.0 200k OFDM	-17.6	Vert
^	8236.799M	40.4	-35.0 +0.5	+37.0 +0.9	+5.7	+1.7	+0.0	51.2	54.0 600k OFDM	-2.8	Vert
^	8236.769M	40.0	-35.0 +0.5	+37.0 +0.9	+5.7	+1.7	+0.0	50.8	54.0 200k OFDM	-3.2	Vert
39	8121.601M Ave	25.9	-35.0 +0.6	+37.0 +0.8	+5.7	+1.3	+0.0	36.3	54.0 600k OFDM	-17.7	Vert
^	8121.601M	39.3	-35.0 +0.6	+37.0 +0.8	+5.7	+1.3	+0.0	49.7	54.0 600k OFDM	-4.3	Vert
^	8121.600M	38.7	-35.0 +0.6	+37.0 +0.8	+5.7	+1.3	+0.0	49.1	54.0 200k OFDM	-4.9	Vert
42	7420.800M Ave	25.8	-34.6 +0.4	+37.1 +0.6	+5.5	+1.5	+0.0	36.3	54.0 200k OFDM	-17.7	Vert
43	8121.720M Ave	25.9	-35.0 +0.6	+37.0 +0.8	+5.7	+1.3	+0.0	36.3	54.0 200k OFDM	-17.7	Vert
44	7420.797M Ave	25.8	-34.6 +0.4	+37.1 +0.6	+5.5	+1.5	+0.0	36.3	54.0 600k OFDM	-17.7	Vert
^	7420.800M	39.6	-34.6 +0.4	+37.1 +0.6	+5.5	+1.5	+0.0	50.1	54.0 200k OFDM	-3.9	Vert
^	7420.797M	39.2	-34.6 +0.4	+37.1 +0.6	+5.5	+1.5	+0.0	49.7	54.0 600k OFDM	-4.3	Vert
47	7321.603M Ave	26.1	-34.6 +0.4	+36.8 +0.6	+5.4	+1.3	+0.0	36.0	54.0 600k OFDM	-18.0	Vert

48	7321.573M Ave	26.0	-34.6 +0.4	+36.8 +0.6	+5.4	+1.3	+0.0	35.9	54.0 200k OFDM	-18.1	Vert
^	7321.573M	41.1	-34.6 +0.4	+36.8 +0.6	+5.4	+1.3	+0.0	51.0	54.0 200k OFDM	-3.0	Vert
^	7321.603M	40.4	-34.6 +0.4	+36.8 +0.6	+5.4	+1.3	+0.0	50.3	54.0 600k OFDM	-3.7	Vert
51	4260.000M Ave	25.8	-33.7 +0.4	+31.6 +0.6	+3.8	+0.8	+0.0	29.3	54.0	-24.7	Vert
^	4260.000M	47.9	-33.7 +0.4	+31.6 +0.6	+3.8	+0.8	+0.0	51.4	54.0	-2.6	Vert
53	6381.000M	41.3	-34.2 +0.6	+34.6 +0.5	+5.4	+1.1	+0.0	49.3	109.5	-60.2	Horiz
54	6406.399M	40.9	-34.2 +0.6	+34.6 +0.5	+5.4	+1.1	+0.0	48.9	109.5 600k OFDM	-60.6	Vert
55	6406.394M	40.8	-34.2 +0.6	+34.6 +0.5	+5.4	+1.1	+0.0	48.8	109.5 200k OFDM	-60.7	Vert
56	6316.794M	40.4	-34.1 +0.5	+34.6 +0.5	+5.2	+1.0	+0.0	48.1	109.5 600k OFDM	-61.4	Vert
57	6316.800M	40.3	-34.1 +0.5	+34.6 +0.5	+5.2	+1.0	+0.0	48.0	109.5 200k OFDM	-61.5	Vert
58	6493.200M	39.2	-34.2 +0.6	+34.5 +0.5	+5.6	+1.2	+0.0	47.4	109.5 600k OFDM	-62.1	Vert
59	1804.800M	51.5	-34.8 +0.2	+26.1 +0.5	+2.2	+0.5	+0.0	46.2	109.5 200k OFDM	-63.3	Vert
60	6493.201M	37.9	-34.2 +0.6	+34.5 +0.5	+5.6	+1.2	+0.0	46.1	109.5 200k OFDM	-63.4	Vert
61	1804.823M	51.3	-34.8 +0.2	+26.1 +0.5	+2.2	+0.5	+0.0	46.0	109.5 600k OFDM	-63.5	Vert
62	5565.602M	39.5	-33.7 +0.4	+33.7 +0.4	+4.5	+1.0	+0.0	45.8	109.5 600k OFDM	-63.7	Vert
63	3196.000M	45.5	-34.0 +0.5	+29.5 +0.3	+3.1	+0.8	+0.0	45.7	109.5	-63.8	Vert
64	5491.196M	38.8	-33.7 +0.4	+33.5 +0.4	+4.5	+1.0	+0.0	44.9	109.5 600k OFDM	-64.6	Vert
65	5565.602M	38.2	-33.7 +0.4	+33.7 +0.4	+4.5	+1.0	+0.0	44.5	109.5 200k OFDM	-65.0	Vert
66	3196.000M	44.0	-34.0 +0.5	+29.5 +0.3	+3.1	+0.8	+0.0	44.2	109.5	-65.3	Horiz
67	5491.146M	37.9	-33.7 +0.4	+33.5 +0.4	+4.5	+1.0	+0.0	44.0	109.5 200k OFDM	-65.5	Vert
68	2126.000M	46.6	-34.4 +0.2	+27.8 +0.5	+2.4	+0.6	+0.0	43.7	109.5	-65.8	Horiz
69	1808.000M	48.2	-34.8 +0.2	+26.1 +0.4	+2.2	+0.5	+0.0	42.8	109.5	-66.7	Vert
70	1248.000M	49.1	-36.0 +0.1	+25.2 +0.9	+1.8	+0.4	+0.0	41.5	109.5	-68.0	Vert
71	9276.002M Ave	25.6	-34.1 +0.4	+37.6 +0.5	+6.2	+1.5	+0.0	37.7	109.5 200k OFDM	-71.8	Vert

72	9275.999M Ave	25.6	-34.1 +0.4	+37.6 +0.5	+6.2	+1.5	+0.0	37.7	109.5 600k OFDM	-71.8	Vert
^	9275.999M	39.8	-34.1 +0.4	+37.6 +0.5	+6.2	+1.5	+0.0	51.9	109.5 600k OFDM	-57.6	Vert
^	9276.002M	39.0	-34.1 +0.4	+37.6 +0.5	+6.2	+1.5	+0.0	51.1	109.5 200k OFDM	-58.4	Vert
75	7219.196M Ave	25.7	-34.5 +0.5	+36.5 +0.4	+5.3	+1.1	+0.0	35.0	109.5 600k OFDM	-74.5	Vert
^	7219.196M	39.7	-34.5 +0.5	+36.5 +0.4	+5.3	+1.1	+0.0	49.0	109.5 600k OFDM	-60.5	Vert
^	7219.200M	37.5	-34.5 +0.5	+36.5 +0.4	+5.3	+1.1	+0.0	46.8	109.5 200k OFDM	-62.7	Vert
78	1830.400M	39.6	-34.8 +0.2	+26.3 +0.4	+2.3	+0.5	+0.0	34.5	109.5 600k OFDM	-75.0	Vert
79	1855.197M	38.4	-34.7 +0.2	+26.5 +0.4	+2.3	+0.5	+0.0	33.6	109.5 600k OFDM	-75.9	Vert
80	1830.705M	38.1	-34.8 +0.2	+26.3 +0.4	+2.3	+0.5	+0.0	33.0	109.5 200k OFDM	-76.5	Vert
81	1855.200M	37.7	-34.7 +0.2	+26.5 +0.4	+2.3	+0.5	+0.0	32.9	109.5 200k OFDM	-76.6	Vert

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98201 • 435-402-1717
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **103786** Date: 5/5/2020
 Test Type: **Maximized Emissions** Time: 17:34:36
 Tested By: Steven Pittsford Sequence#: 5
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

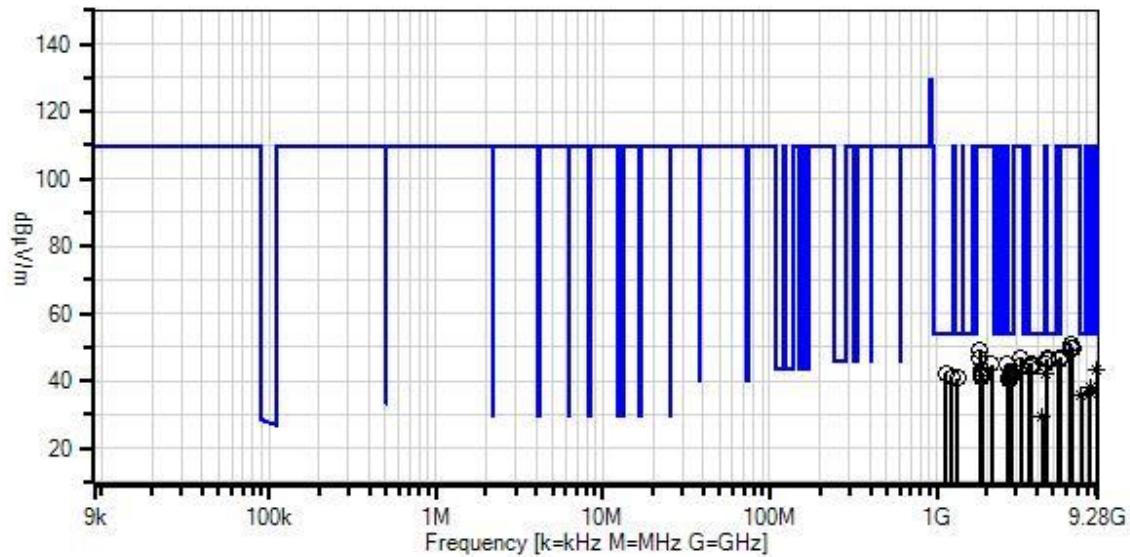
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 22°C Pressure: 102.0kPa Humidity: 35% Frequency: 1-10GHz Test Method: ANSI 63.10 (2013) Set up: Vertical and horizontal polarity investigated. 6.25kbps and 12.5kbps QPSK modulations investigated. EUT is on the test bench mounted on a pole stand. Transmitting continuously

Itron, Inc. WO#: 103786 Sequence#: 5 Date: 5/5/2020
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
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	ANP06515	Cable	Heliac	6/29/2018	6/29/2020
T4	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
T5	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021
T6	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T7	AN03170	High Pass Filter	HM1155-11SS	10/23/2019	10/23/2021

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	4576.105M	42.1	-33.7 +0.7	+31.9 +0.0	+4.0 +0.6	+0.9	+0.0	46.5	54.0 12.5k	-7.5	Vert 153
2	4576.075M	41.9	-33.7 +0.7	+31.9 +0.0	+4.0 +0.6	+0.9	+0.0	46.3	54.0 6.25k	-7.7	Vert 145
3	5413.800M	40.3	-33.7 +0.4	+33.4 +0.0	+4.5 +0.4	+1.0	+0.0	46.3	54.0 6.25k	-7.7	Vert 145
4	2656.000M	47.4	-34.2 +0.2	+28.1 +0.0	+2.6 +0.4	+0.7	+0.0	45.2	54.0	-8.8	Vert
5	3711.800M	42.4	-33.7 +0.5	+30.6 +0.0	+3.8 +0.5	+0.9	+0.0	45.0	54.0 6.25k	-9.0	Vert 153
6	4510.180M	40.7	-33.7 +0.7	+31.8 +0.0	+3.9 +0.6	+0.9	+0.0	44.9	54.0 6.25k	-9.1	Vert 145
7	3712.405M	42.0	-33.7 +0.5	+30.6 +0.0	+3.8 +0.5	+0.9	+0.0	44.6	54.0 12.5k	-9.4	Vert 153
8	3661.175M	41.7	-33.7 +0.5	+30.5 +0.0	+3.7 +0.5	+0.9	+0.0	44.1	54.0 12.5k	-9.9	Vert 153
9	3660.490M	41.7	-33.7 +0.5	+30.5 +0.0	+3.7 +0.5	+0.9	+0.0	44.1	54.0 6.25k	-9.9	Vert 145
10	3609.615M	41.9	-33.8 +0.6	+30.3 +0.0	+3.6 +0.5	+0.8	+0.0	43.9	54.0 12.5k	-10.1	Vert 134
11	3609.410M	41.8	-33.8 +0.6	+30.3 +0.0	+3.6 +0.5	+0.8	+0.0	43.8	54.0 6.25k	-10.2	Vert 145
12	9151.685M Ave	31.5	-34.2 +0.4	+37.5 +0.0	+6.2 +0.5	+1.5	+0.0	43.4	54.0 12.5k	-10.6	Vert 134
^	9151.685M	42.3	-34.2 +0.4	+37.5 +0.0	+6.2 +0.5	+1.5	+0.0	54.2	54.0 12.5k	+0.2	Vert 153
14	9151.400M Ave	31.5	-34.2 +0.4	+37.5 +0.0	+6.2 +0.5	+1.5	+0.0	43.4	54.0 6.25k	-10.6	Vert 145
^	9151.400M	42.0	-34.2 +0.4	+37.5 +0.0	+6.2 +0.5	+1.5	+0.0	53.9	54.0 6.25k	-0.1	Vert 145
16	2747.590M	44.7	-34.1 +0.2	+28.4 +0.0	+2.6 +0.4	+0.7	+0.0	42.9	54.0 12.5k	-11.1	Vert 153
17	1126.000M	50.2	-36.6 +0.1	+24.8 +0.0	+1.8 +1.6	+0.4	+0.0	42.3	54.0	-11.7	Vert
18	4540.000M Ave	37.8	-33.7 +0.7	+31.9 +0.0	+3.9 +0.6	+0.9	+0.0	42.1	54.0	-11.9	Vert
^	4540.000M	43.3	-33.7 +0.7	+31.9 +0.0	+3.9 +0.6	+0.9	+0.0	47.6	54.0	-6.4	Vert
20	2745.560M	43.9	-34.1 +0.2	+28.4 +0.0	+2.6 +0.4	+0.7	+0.0	42.1	54.0 6.25k	-11.9	Vert 145
21	2782.355M	43.4	-34.1 +0.2	+28.5 +0.0	+2.6 +0.4	+0.7	+0.0	41.7	54.0 12.5k	-12.3	Vert 153
22	2782.265M	42.8	-34.1 +0.2	+28.5 +0.0	+2.6 +0.4	+0.7	+0.0	41.1	54.0 6.25k	-12.9	Vert 153
23	2707.585M	42.9	-34.1 +0.2	+28.3 +0.0	+2.6 +0.4	+0.7	+0.0	41.0	54.0 12.5k	-13.0	Vert 134
24	1332.000M	48.3	-35.8 +0.1	+25.2 +0.0	+1.9 +0.8	+0.4	+0.0	40.9	54.0	-13.1	Vert

25	1224.000M	48.5	-36.1 +0.1	+25.1 +0.0	+1.8 +1.0	+0.4	+0.0	40.8	54.0	-13.2	Horiz
26	2707.030M	42.4	-34.1 +0.2	+28.3 +0.0	+2.6 +0.4	+0.7	+0.0	40.5	54.0 6.25k	-13.5	Vert 145
27	8236.345M Ave	27.5	-35.0 +0.5	+37.0 +0.0	+5.7 +0.9	+1.7	+0.0	38.3	54.0 6.25k	-15.7	Vert 120
^	8236.345M	40.8	-35.0 +0.5	+37.0 +0.0	+5.7 +0.9	+1.7	+0.0	51.6	54.0 6.25k	-2.4	Vert 145
29	8237.895M Ave	25.5	-35.0 +0.5	+37.0 +0.0	+5.7 +0.9	+1.7	+0.0	36.3	54.0 12.5k	-17.7	Vert 134
^	8237.895M	41.0	-35.0 +0.5	+37.0 +0.0	+5.7 +0.9	+1.7	+0.0	51.8	54.0 12.5k	-2.2	Vert 153
31	7320.565M Ave	25.9	-34.6 +0.4	+36.8 +0.0	+5.4 +0.6	+1.3	+0.0	35.8	54.0 6.25k	-18.2	Vert 153
^	7320.565M	42.0	-34.6 +0.4	+36.8 +0.0	+5.4 +0.6	+1.3	+0.0	51.9	54.0 6.25k	-2.1	Vert 145
33	7323.875M Ave	25.8	-34.6 +0.4	+36.8 +0.0	+5.4 +0.6	+1.3	+0.0	35.7	54.0 12.5k	-18.3	Vert 134
^	7323.875M	42.1	-34.6 +0.4	+36.8 +0.0	+5.4 +0.6	+1.3	+0.0	52.0	54.0 12.5k	-2.0	Vert 153
35	4267.000M Ave	25.9	-33.7 +0.4	+31.6 +0.0	+3.8 +0.6	+0.8	+0.0	29.4	54.0	-24.6	Vert
^	4267.000M	45.7	-33.7 +0.4	+31.6 +0.0	+3.8 +0.6	+0.8	+0.0	49.2	54.0	-4.8	Vert
37	4260.000M Ave	25.8	-33.7 +0.4	+31.6 +0.0	+3.8 +0.6	+0.8	+0.0	29.3	54.0	-24.7	Horiz
^	4260.000M	44.4	-33.7 +0.4	+31.6 +0.0	+3.8 +0.6	+0.8	+0.0	47.9	54.0	-6.1	Horiz
39	6317.095M	43.1	-34.1 +0.5	+34.6 +0.0	+5.2 +0.5	+1.0	+0.0	50.8	109.5 6.25k	-58.7	Vert 145
40	6316.945M	42.1	-34.1 +0.5	+34.6 +0.0	+5.2 +0.5	+1.0	+0.0	49.8	109.5 12.5k	-59.7	Vert 134
41	6406.985M	41.8	-34.2 +0.6	+34.6 +0.0	+5.4 +0.5	+1.1	+0.0	49.8	109.5 6.25k	-59.7	Vert 145
42	6406.620M	41.8	-34.2 +0.6	+34.6 +0.0	+5.4 +0.5	+1.1	+0.0	49.8	109.5 12.5k	-59.7	Vert 153
43	6492.900M	41.4	-34.2 +0.6	+34.5 +0.0	+5.6 +0.5	+1.2	+0.0	49.6	109.5 12.5k	-59.9	Vert 153
44	6493.055M	41.2	-34.2 +0.6	+34.5 +0.0	+5.6 +0.5	+1.2	+0.0	49.4	109.5 6.25k	-60.1	Vert 153
45	1804.915M	54.5	-34.8 +0.2	+26.1 +0.0	+2.2 +0.5	+0.5	+0.0	49.2	109.5 6.25k	-60.3	Vert 145
46	5491.295M	40.7	-33.7 +0.4	+33.5 +0.0	+4.5 +0.4	+1.0	+0.0	46.8	109.5 12.5k	-62.7	Vert 153
47	1804.780M	51.9	-34.8 +0.2	+26.1 +0.0	+2.2 +0.5	+0.5	+0.0	46.6	109.5 12.5k	-62.9	Vert 134
48	3189.000M	46.4	-34.0 +0.5	+29.5 +0.0	+3.1 +0.3	+0.8	+0.0	46.6	109.5	-62.9	Vert
49	5490.545M	40.2	-33.7 +0.4	+33.5 +0.0	+4.5 +0.4	+1.0	+0.0	46.3	109.5 6.25k	-63.2	Vert 145
50	2124.000M	47.8	-34.4 +0.2	+27.8 +0.0	+2.4 +0.5	+0.6	+0.0	44.9	109.5	-64.6	Vert

51	3189.000M	44.2	-34.0 +0.5	+29.5 +0.0	+3.1 +0.3	+0.8	+0.0	44.4	109.5	-65.1	Horiz
52	1830.395M	48.2	-34.8 +0.2	+26.3 +0.0	+2.3 +0.4	+0.5	+0.0	43.1	109.5 6.25k	-66.4	Vert 145
53	1855.200M	47.1	-34.7 +0.2	+26.5 +0.0	+2.3 +0.4	+0.5	+0.0	42.3	109.5 6.25k	-67.2	Vert 153
54	1850.000M	47.0	-34.7 +0.2	+26.5 +0.0	+2.3 +0.4	+0.5	+0.0	42.2	109.5	-67.3	Vert
55	1855.225M	46.5	-34.7 +0.2	+26.5 +0.0	+2.3 +0.4	+0.5	+0.0	41.7	109.5 12.5k	-67.8	Vert 153
56	1830.635M	46.2	-34.8 +0.2	+26.3 +0.0	+2.3 +0.4	+0.5	+0.0	41.1	109.5 12.5k	-68.4	Vert 153

Band Edge

Band Edge Summary

Operating Mode: Single Channel (Low and High)

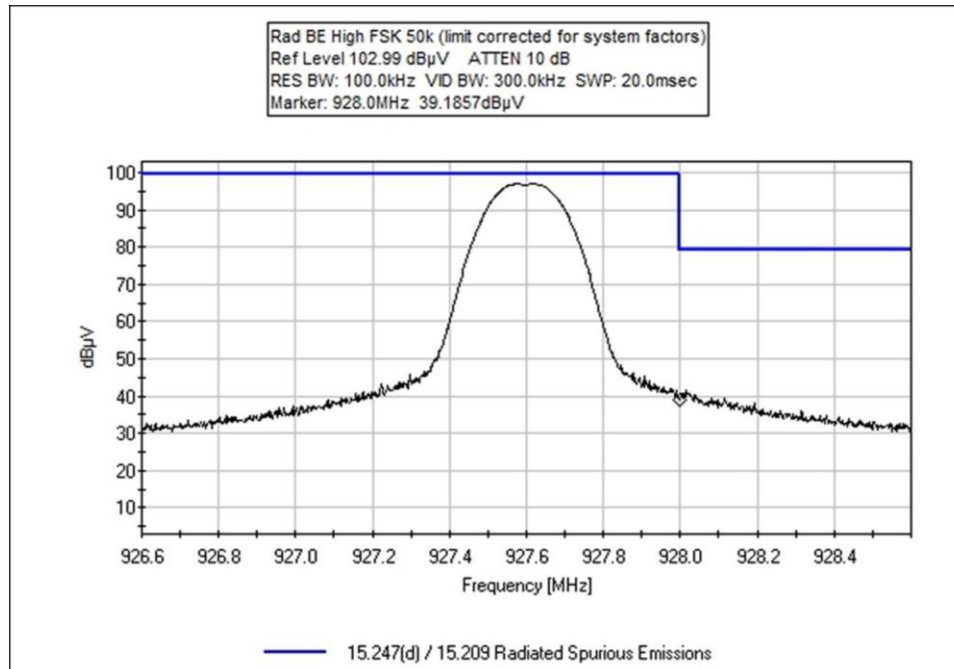
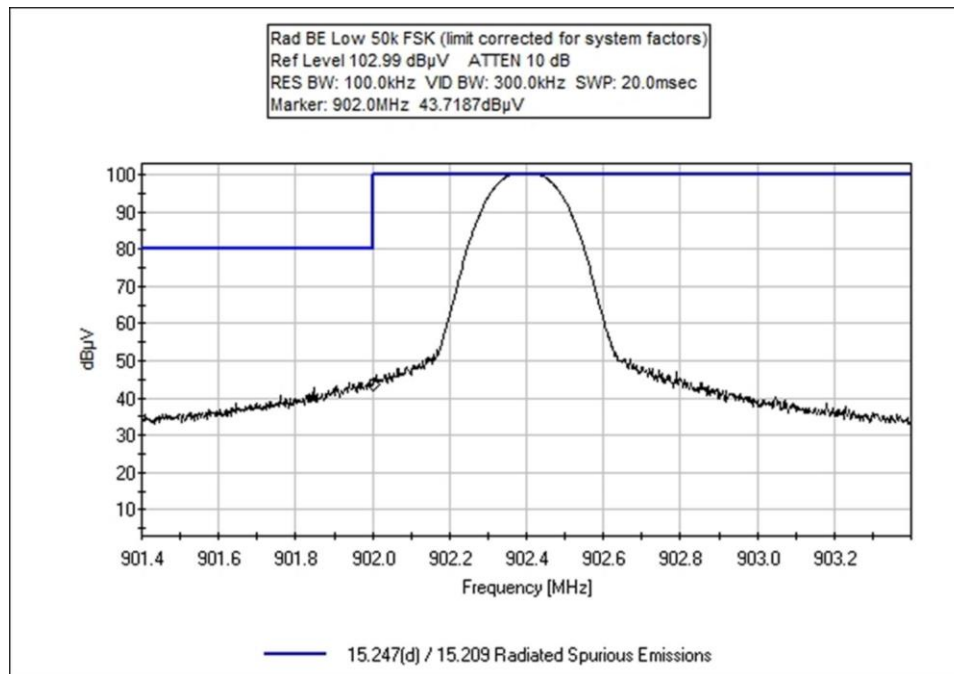
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
902	FSK 50k	Omnidirectional	77.1	<113.5	Pass
928	FSK 50k	Omnidirectional	73.3	<113.5	Pass
902	FSK 150k	Omnidirectional	77.2	<113.5	Pass
928	FSK 150k	Omnidirectional	74.2	<113.5	Pass
902	OQPSK 6.25k	Omnidirectional	78.6	<113.5	Pass
928	OQPSK 6.25k	Omnidirectional	74.5	<113.5	Pass
902	OQPSK 12.5k	Omnidirectional	78.4	<113.5	Pass
928	OQPSK 12.5k	Omnidirectional	74.1	<113.5	Pass
902	OFDM 200k	Omnidirectional	100.7	<113.5	Pass
928	OFDM 200k	Omnidirectional	96.9	<113.5	Pass
902	OFDM 600k	Omnidirectional	100.7	<113.5	Pass
928	OFDM 600k	Omnidirectional	97.9	<113.5	Pass
614 (QP)	OFDM 600k (Worst case)	Omnidirectional	38.3	<46	Pass
960 (QP)	OFDM 600k (Worst case)	Omnidirectional	43.1	<54	Pass

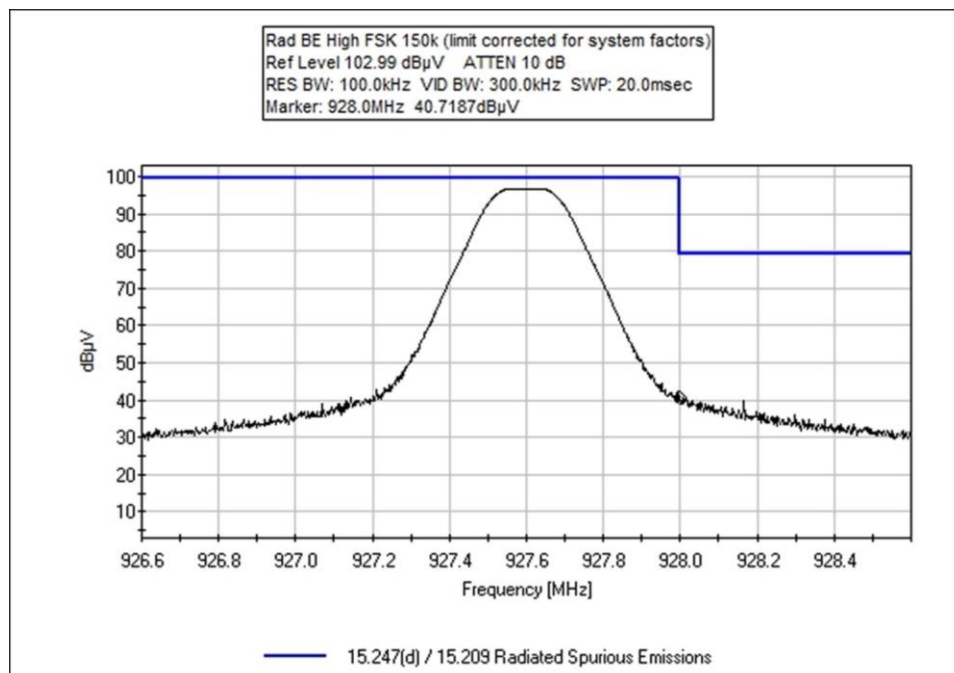
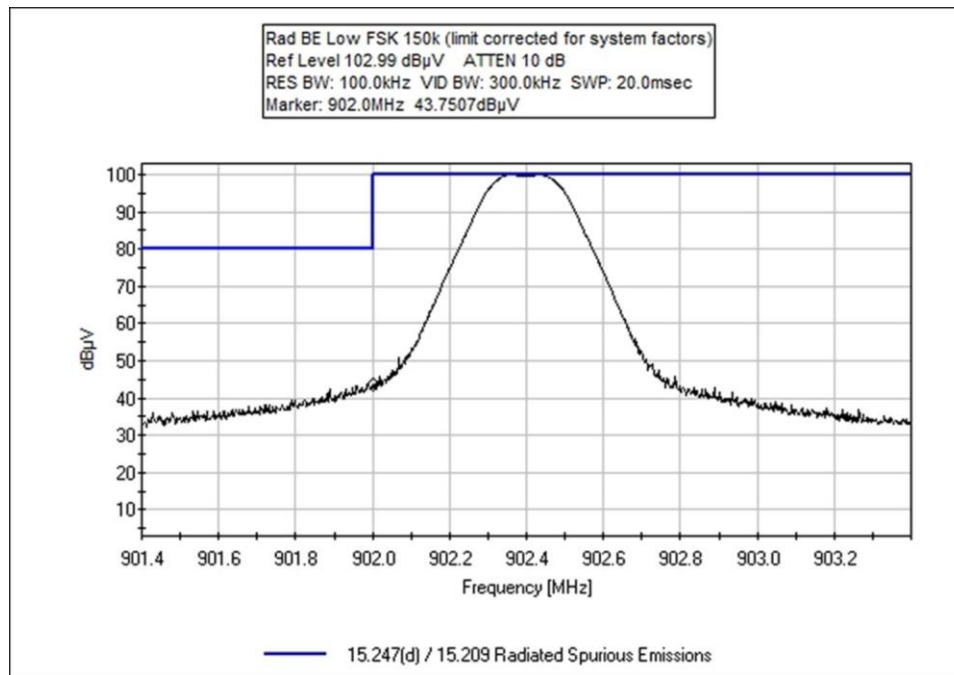
Band Edge Summary

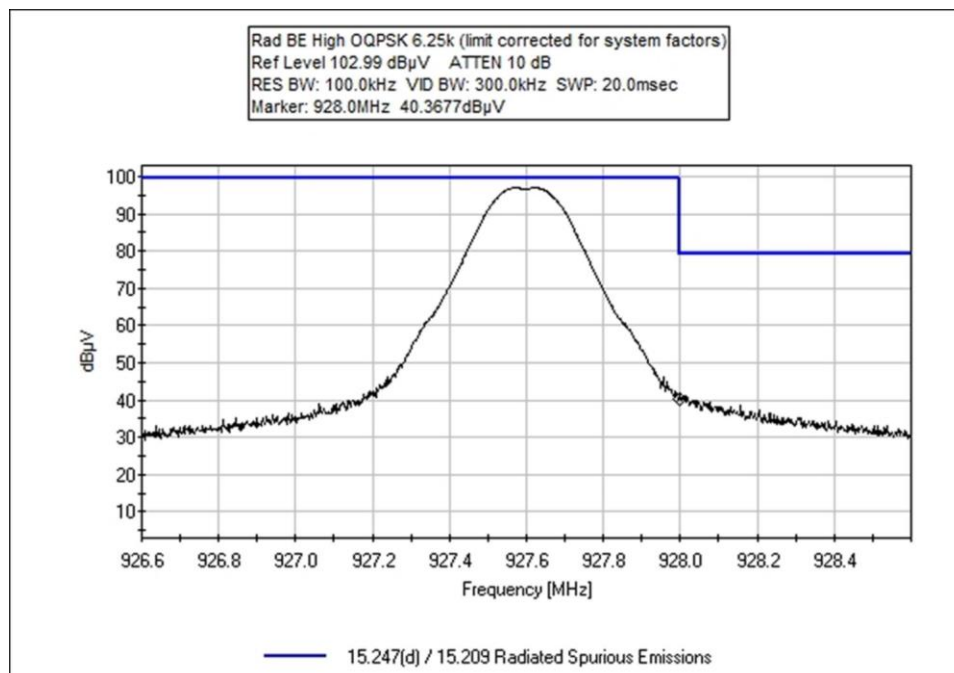
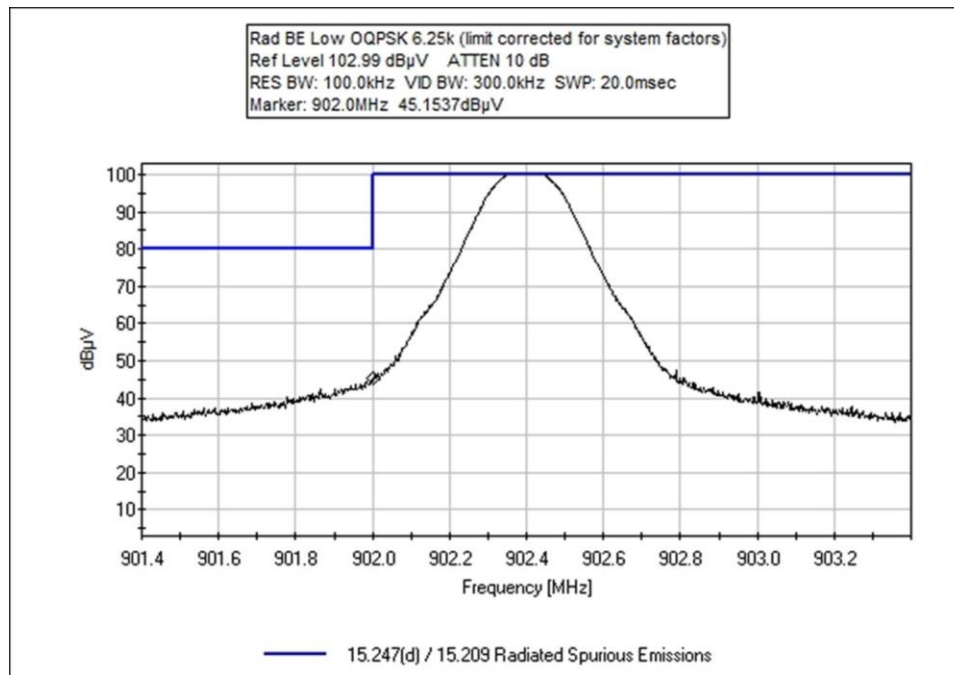
Operating Mode: Hopping

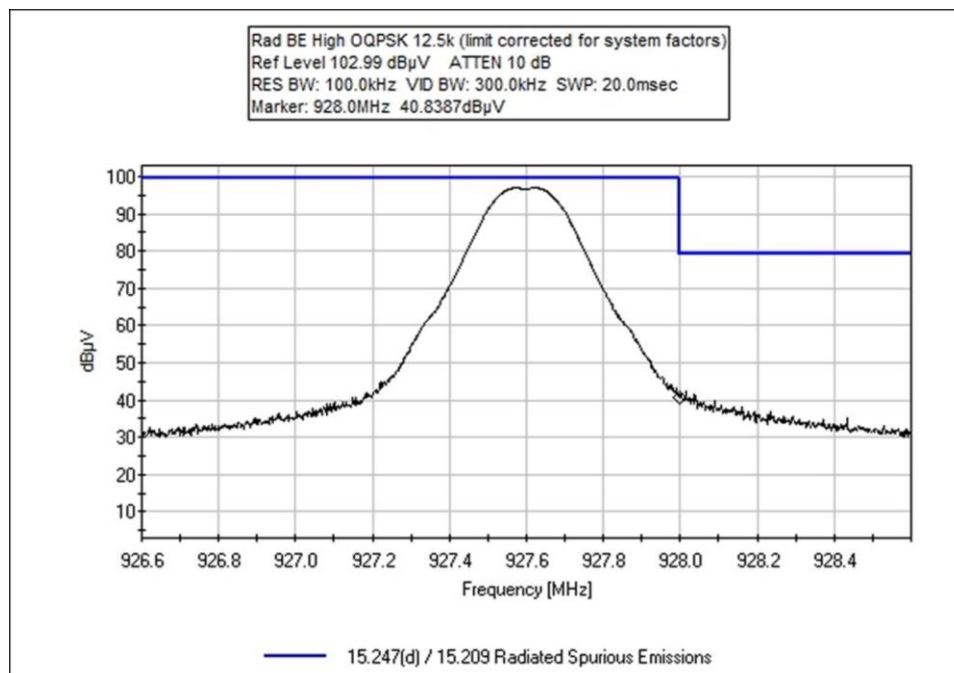
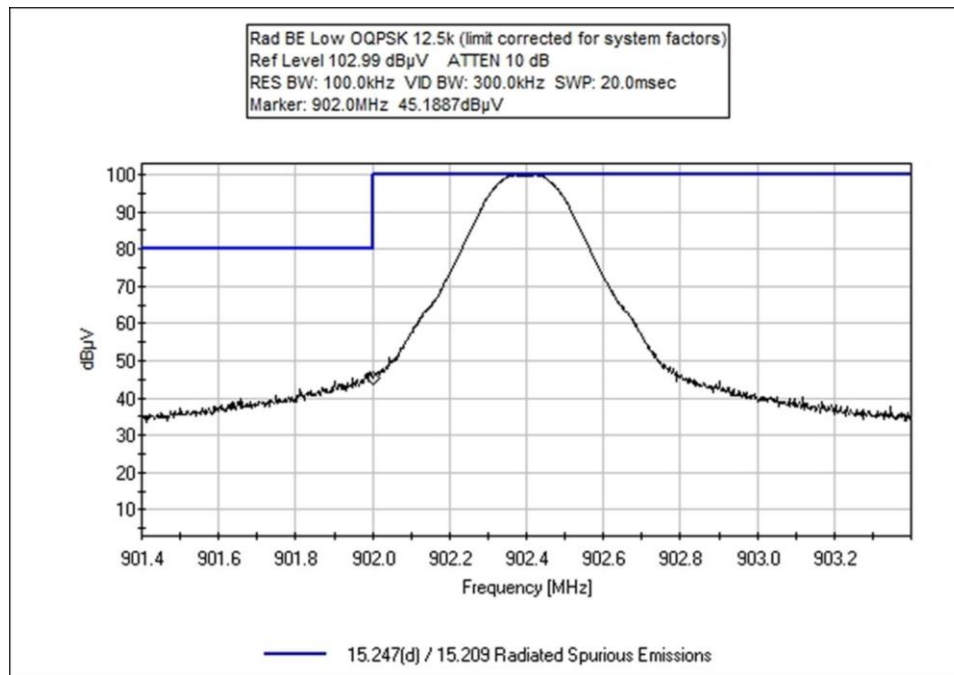
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614 (QP)	OFDM 600k (Worst case)	Omnidirectional	38.3	<46	Pass
902	OFDM 600k (Worst case)	Omnidirectional	100.6	<113.5	Pass
928	OFDM 600k (Worst case)	Omnidirectional	97.8	<113.5	Pass
960 (QP)	OFDM 600k (Worst case)	Omnidirectional	42.8	<54	Pass

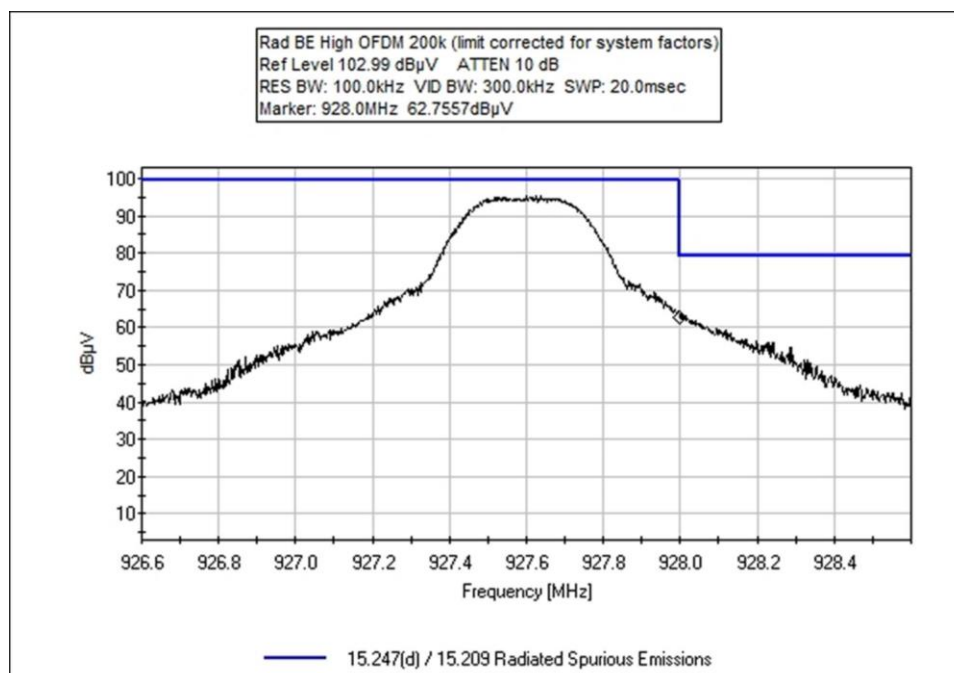
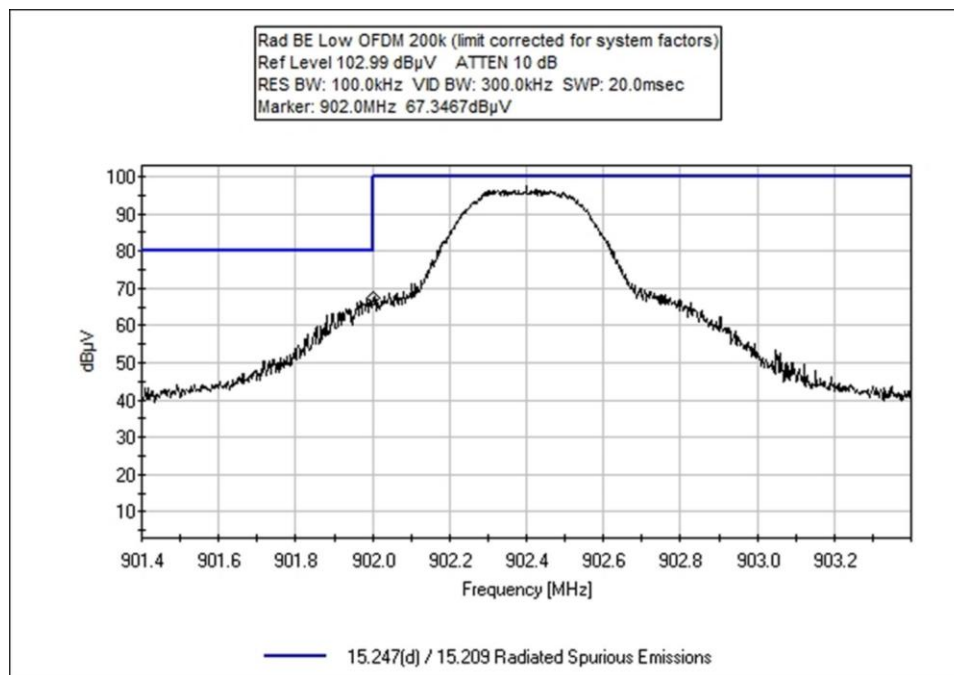
Band Edge Plots

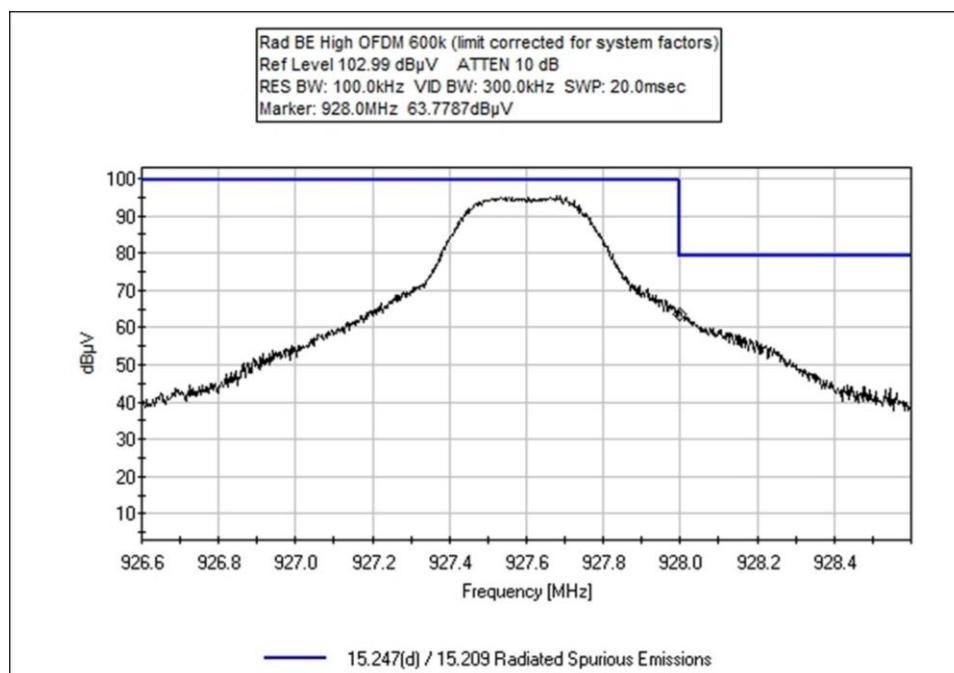
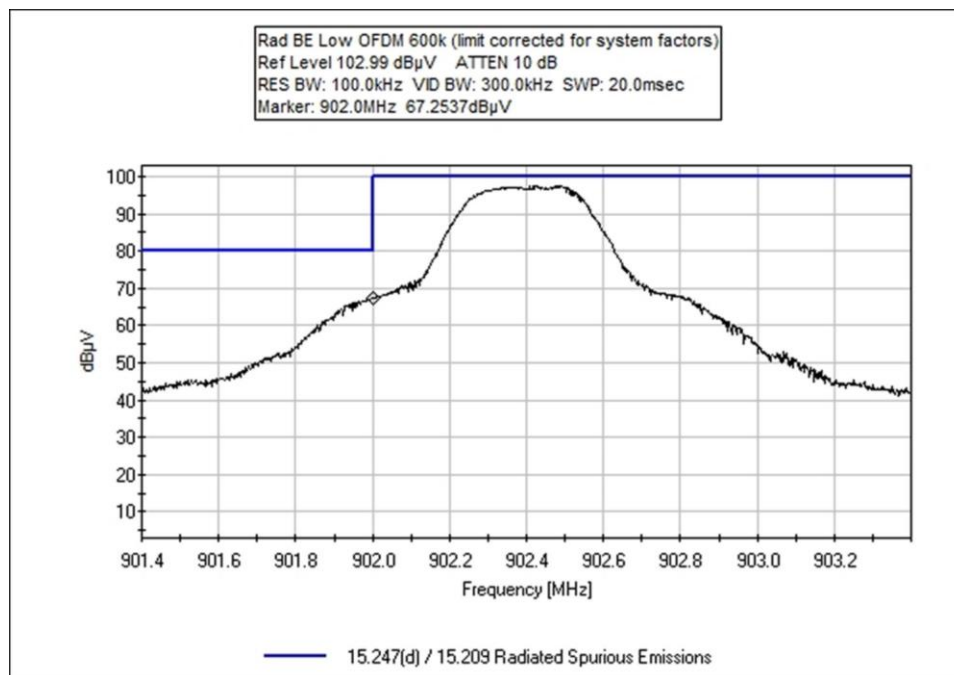


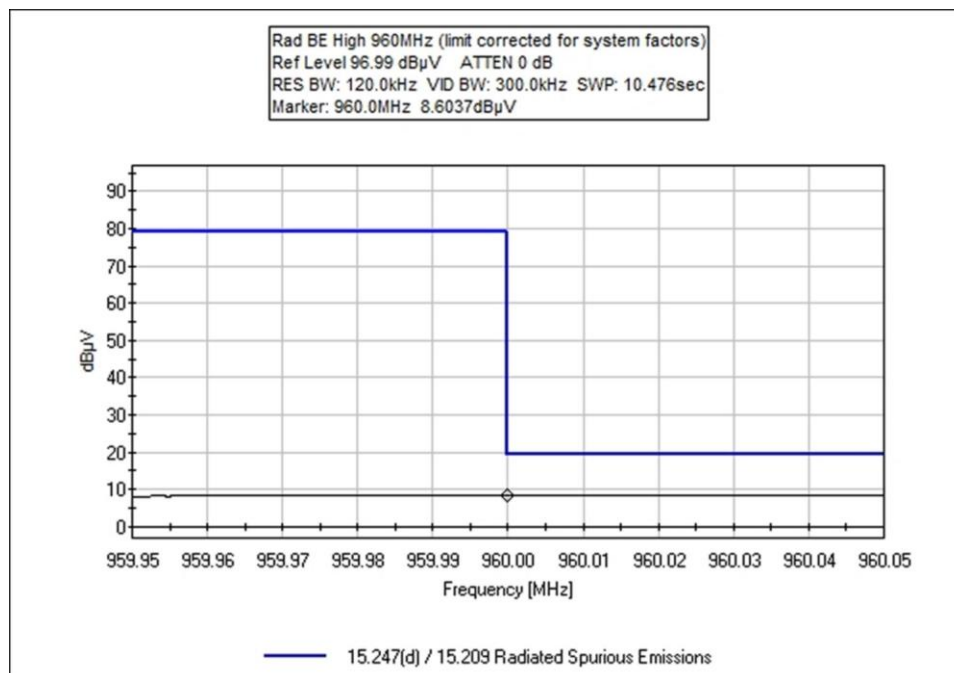
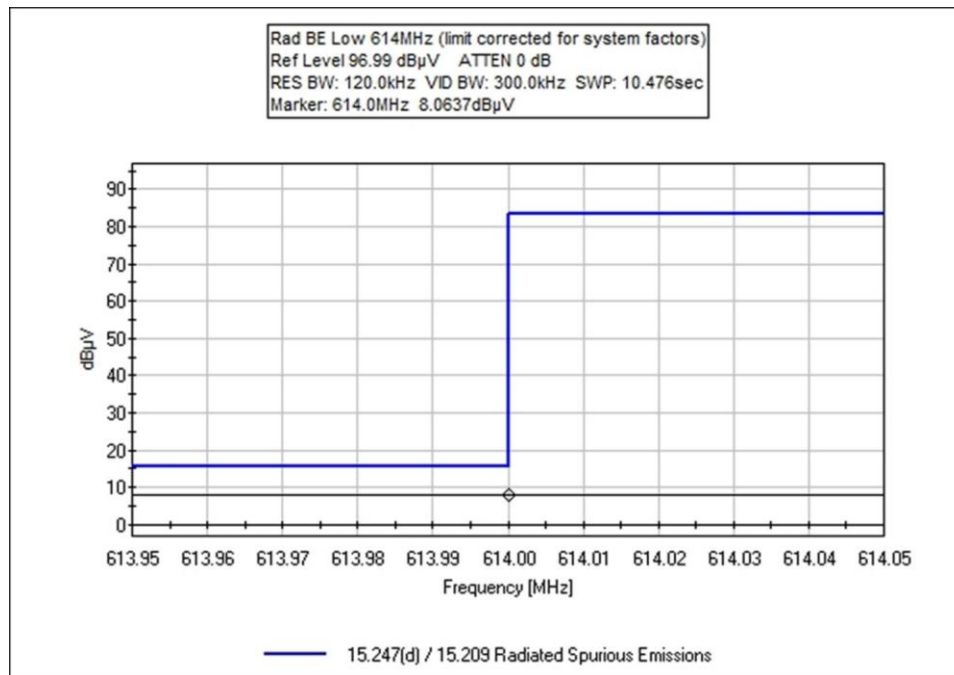


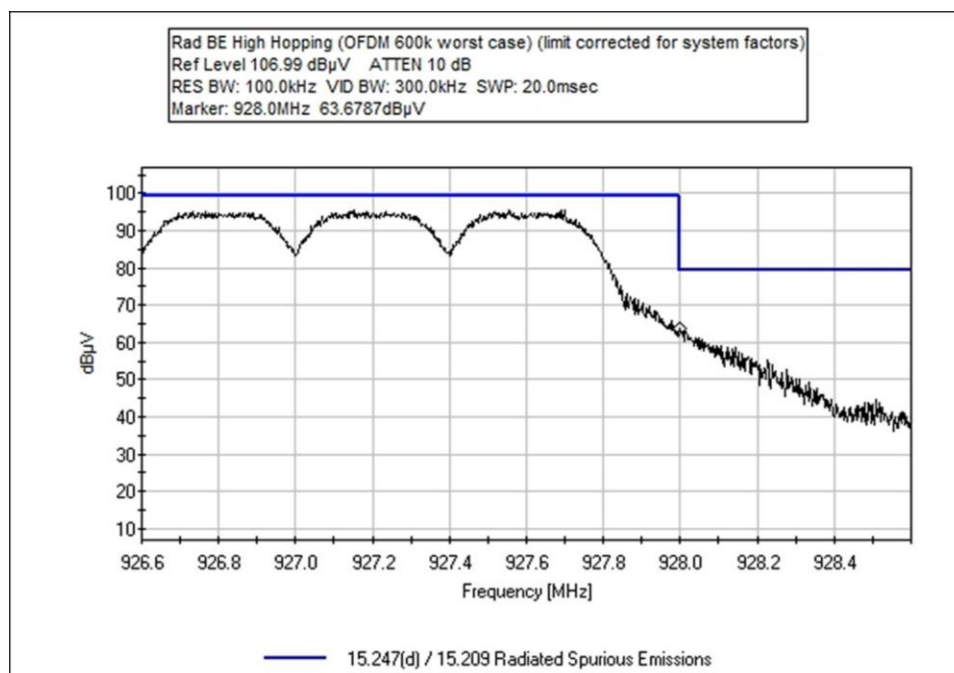
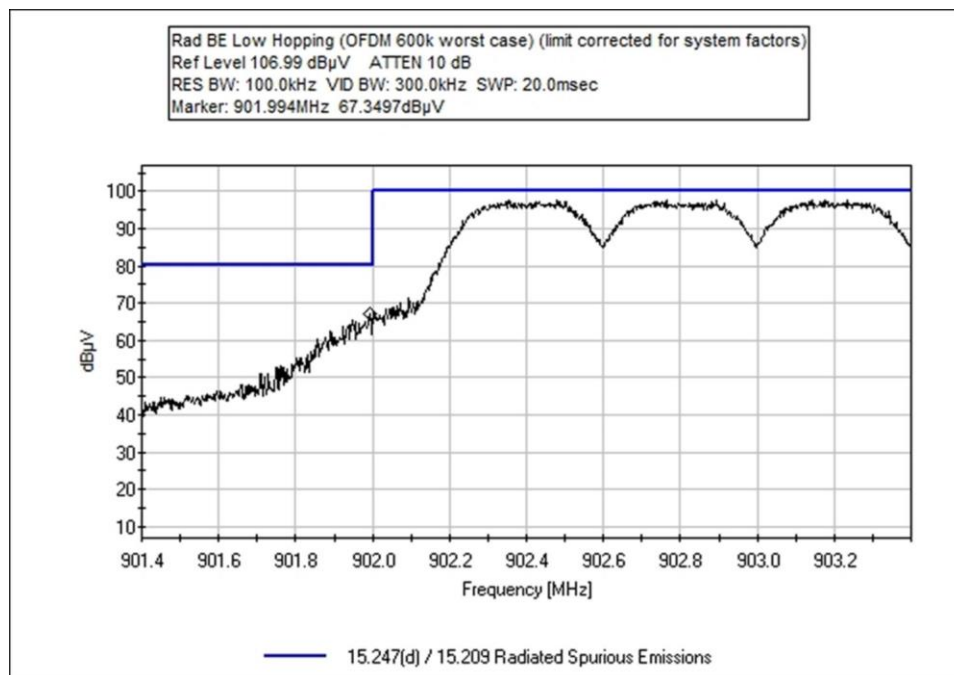


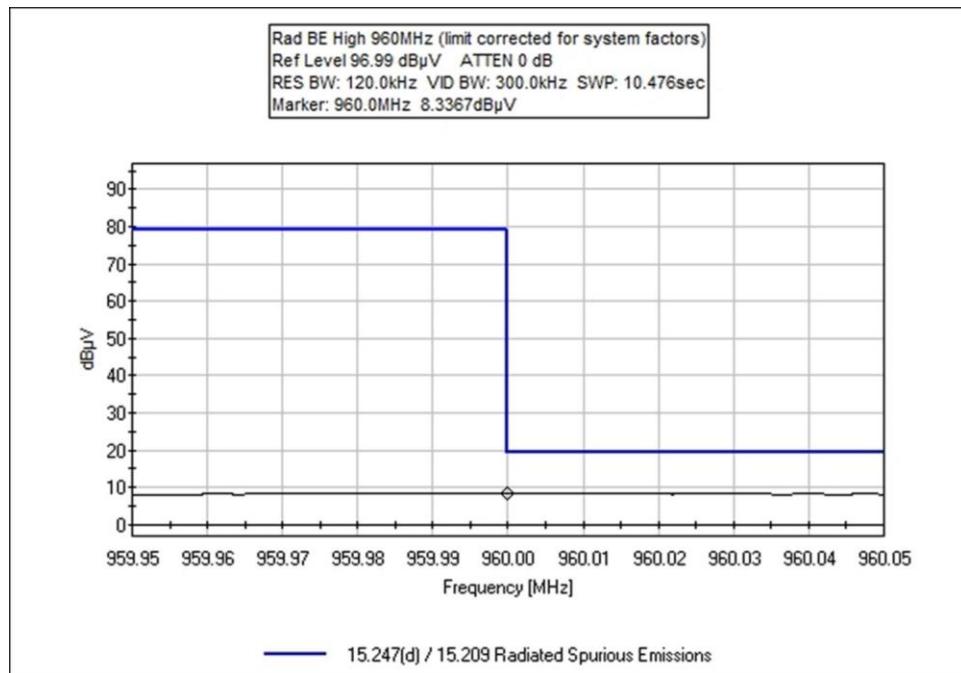
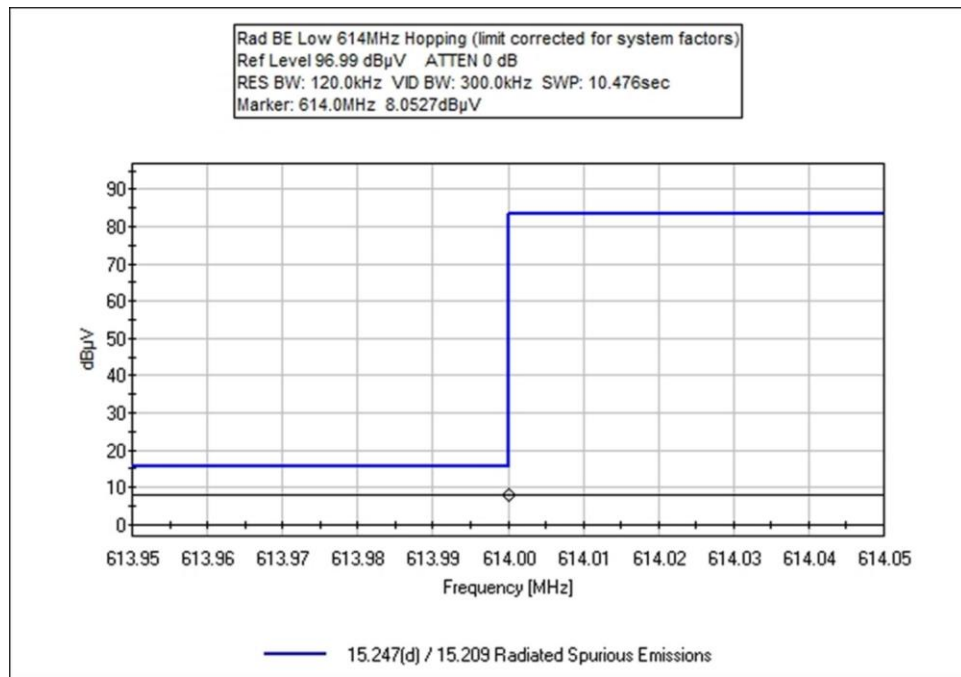












Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98201 • 435-402-1717
 Customer: **Itron, Inc.**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **100138** Date: 5/4/2020
 Test Type: **Maximized Emissions** Time: 20:57:20
 Tested By: Michael Atkinson Sequence#: 2
 Software: EMITest 5.03.12

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Note: 1.2M OFDM is covered under a separate report as a Hybrid System.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T2	ANP06540	Cable	Helix	8/23/2019	8/23/2021
T3	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T4	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T5	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T6	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq 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 QP	8.1	+0.0 +5.8	+0.3 +21.2	+1.2	+1.7	+0.0	38.3	46.0 Hopping (OFDM 600k worst case)	-7.7	Vert
2	614.000M QP	8.1	+0.0 +5.8	+0.3 +21.2	+1.2	+1.7	+0.0	38.3	46.0 OFDM 600k Worst Case	-7.7	Vert
^	613.995M	11.1	+0.0 +5.8	+0.3 +21.2	+1.2	+1.7	+0.0	41.3	46.0 OFDM 600k Worst Case	-4.7	Vert
^	614.000M	10.6	+0.0 +5.8	+0.3 +21.2	+1.2	+1.7	+0.0	40.8	46.0 Hopping (OFDM 600k worst case)	-5.2	Vert
5	960.000M QP	8.6	+0.0 +5.8	+0.4 +24.6	+1.5	+2.2	+0.0	43.1	54.0 OFDM 600k Worst Case	-10.9	Vert
6	960.000M QP	8.3	+0.0 +5.8	+0.4 +24.6	+1.5	+2.2	+0.0	42.8	54.0 Hopping (OFDM 600k worst case)	-11.2	Vert
^	960.000M	10.9	+0.0 +5.8	+0.4 +24.6	+1.5	+2.2	+0.0	45.4	54.0 Hopping (OFDM 600k worst case)	-8.6	Vert
^	960.000M	10.6	+0.0 +5.8	+0.4 +24.6	+1.5	+2.2	+0.0	45.1	54.0 OFDM 600k Worst Case	-8.9	Vert
9	902.000M	67.3	+0.0 +5.8	+0.3 +23.8	+1.4	+2.1	+0.0	100.7	113.5 OFDM 600k	-12.8	Vert
10	902.000M	67.3	+0.0 +5.8	+0.3 +23.8	+1.4	+2.1	+0.0	100.7	113.5 OFDM 200k	-12.8	Vert
11	901.994M	67.2	+0.0 +5.8	+0.3 +23.8	+1.4	+2.1	+0.0	100.6	113.5 Hopping (OFDM 600k worst case)	-12.9	Vert
12	928.000M	63.8	+0.0 +5.8	+0.4 +24.2	+1.5	+2.2	+0.0	97.9	113.5 OFDM 600k	-15.6	Vert
13	928.000M	63.7	+0.0 +5.8	+0.4 +24.2	+1.5	+2.2	+0.0	97.8	113.5 Hopping (OFDM 600k worst case)	-15.7	Vert
14	928.000M	62.8	+0.0 +5.8	+0.4 +24.2	+1.5	+2.2	+0.0	96.9	113.5 OFDM 200k	-16.6	Vert
15	902.000M	45.2	+0.0 +5.8	+0.3 +23.8	+1.4	+2.1	+0.0	78.6	113.5 OQPSK 6.25k	-34.9	Vert
16	902.000M	45.0	+0.0 +5.8	+0.3 +23.8	+1.4	+2.1	+0.0	78.4	113.5 OQPSK 12.5k	-35.1	Vert
17	902.000M	43.8	+0.0 +5.8	+0.3 +23.8	+1.4	+2.1	+0.0	77.2	113.5 FSK 150k	-36.3	Vert
18	902.000M	43.7	+0.0 +5.8	+0.3 +23.8	+1.4	+2.1	+0.0	77.1	113.5 FSK 50k	-36.4	Vert
19	928.000M	40.4	+0.0 +5.8	+0.4 +24.2	+1.5	+2.2	+0.0	74.5	113.5 OQPSK 6.25k	-39.0	Vert

20	928.000M	40.1	+0.0 +5.8	+0.4 +24.2	+1.5	+2.2	+0.0	74.2	113.5 FSK 150k	-39.3	Vert
21	928.000M	40.0	+0.0 +5.8	+0.4 +24.2	+1.5	+2.2	+0.0	74.1	113.5 OQPSK 12.5k	-39.4	Vert
22	928.000M	39.2	+0.0 +5.8	+0.4 +24.2	+1.5	+2.2	+0.0	73.3	113.5 FSK 50k	-40.2	Vert

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, Inc. • 22116 23rd Drive SE • Bothell, WA 98201 • 435-402-1717
 Customer: **Itron, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **103786** Date: 5/7/2020
 Test Type: **Conducted Emissions** Time: 7:00:10 AM
 Tested By: Steven Pittsford Sequence#: 7
 Software: EMITest 5.03.12 115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

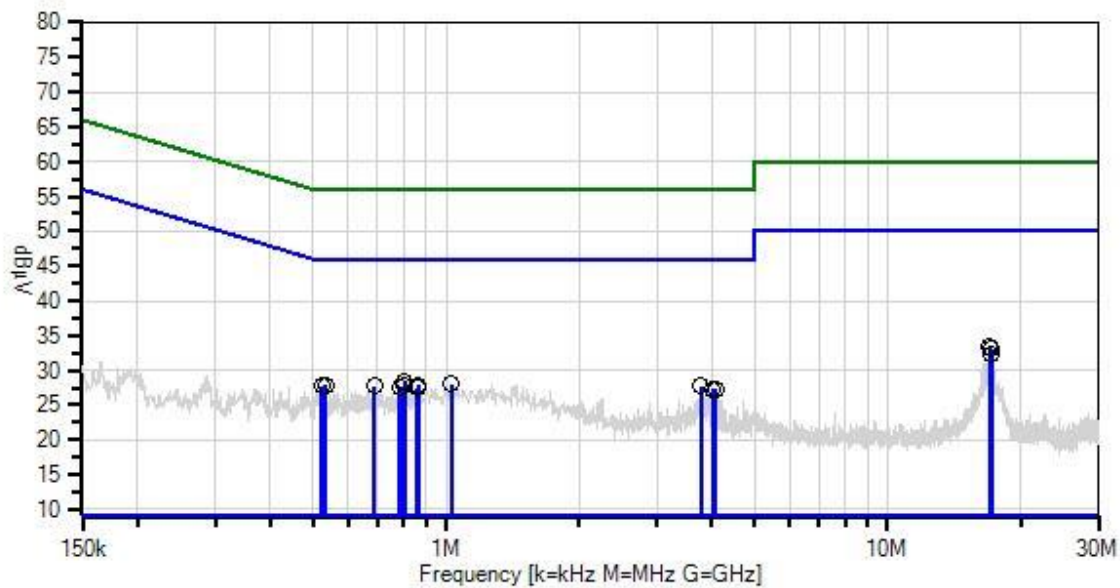
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 21°C Pressure: 102.7kPa Humidity: 33% Frequency: 0.15-30MHz Test Method: ANSI 63.10 (2013) Set up: EUT is on the test bench mounted on a pole stand. Transmitting continuously at 915MHz & 2437MHz
--

Itron, Inc. WO#: 103786 Sequence#: 7 Date: 5/7/2020
15.207 AC Mains - Average Test Lead: 115V 60Hz Line



— Sweep Data
× QP Readings
Software Version: 5.03.12

— Readings
* Average Readings
— 1 - 15.207 AC Mains - Average

○ Peak Readings
▼ Ambient
— 2 - 15.207 AC Mains - Quasi-peak

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	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T4	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022
T5	AN01492	50uH LISN-Line (L1)	3816/2NM	10/14/2019	10/14/2021
	AN01492	50uH LISN-Neutral (L2)	3816/2NM	10/14/2019	10/14/2021

Measurement Data:

Reading listed by margin.

Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	17.040M	23.2	+9.1 +0.5	+0.2	+0.1	+0.2	+0.0	33.3	50.0	-16.7	Line
2	17.202M	22.9	+9.1 +0.6	+0.2	+0.1	+0.2	+0.0	33.1	50.0	-16.9	Line
3	805.212k	18.5	+9.1 +0.5	+0.0	+0.0	+0.2	+0.0	28.3	46.0	-17.7	Line
4	17.076M	22.1	+9.1 +0.5	+0.2	+0.1	+0.2	+0.0	32.2	50.0	-17.8	Line
5	1.026M	18.3	+9.1 +0.4	+0.0	+0.0	+0.2	+0.0	28.0	46.0	-18.0	Line
6	533.237k	18.0	+9.1 +0.5	+0.0	+0.0	+0.3	+0.0	27.9	46.0	-18.1	Line
7	862.661k	18.2	+9.1 +0.4	+0.0	+0.0	+0.2	+0.0	27.9	46.0	-18.1	Line
8	523.783k	17.9	+9.1 +0.6	+0.0	+0.0	+0.2	+0.0	27.8	46.0	-18.2	Line
9	688.132k	17.8	+9.1 +0.5	+0.0	+0.0	+0.3	+0.0	27.7	46.0	-18.3	Line
10	803.030k	17.9	+9.1 +0.5	+0.0	+0.0	+0.2	+0.0	27.7	46.0	-18.3	Line
11	3.782M	18.0	+9.1 +0.4	+0.1	+0.0	+0.1	+0.0	27.7	46.0	-18.3	Line
12	787.032k	17.8	+9.1 +0.4	+0.0	+0.0	+0.2	+0.0	27.5	46.0	-18.5	Line
13	858.298k	17.7	+9.1 +0.4	+0.0	+0.0	+0.2	+0.0	27.4	46.0	-18.6	Line
14	4.020M	17.6	+9.1 +0.4	+0.1	+0.0	+0.1	+0.0	27.3	46.0	-18.7	Line
15	4.084M	17.5	+9.1 +0.5	+0.1	+0.0	+0.1	+0.0	27.3	46.0	-18.7	Line

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE • Bothell, WA 98201 • 435-402-1717
 Customer: **Itron, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **103786** Date: 5/7/2020
 Test Type: **Conducted Emissions** Time: 7:09:29 AM
 Tested By: Steven Pittsford Sequence#: 6
 Software: EMITest 5.03.12 115V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

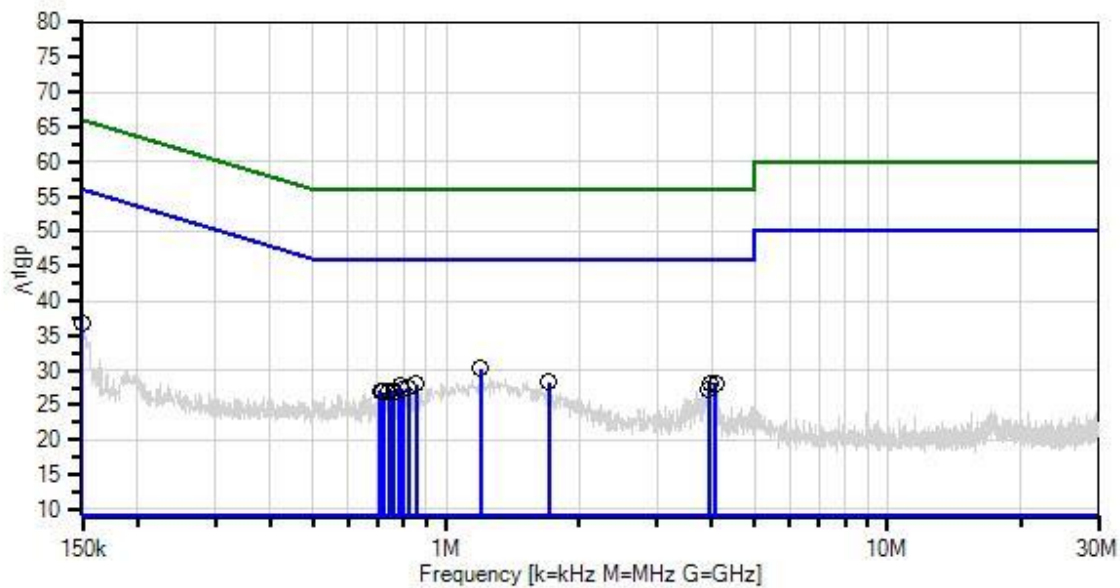
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 21°C Pressure: 102.7kPa Humidity: 33% Frequency: 0.15-30MHz Test Method: ANSI 63.10 (2013) Set up: EUT is on the test bench mounted on a pole stand. Transmitting continuously at 915MHz & 2437MHz
--

Itron, Inc. WD#: 103786 Sequence#: 6 Date: 5/7/2020
15.207 AC Mains - Average Test Lead: 115V 60Hz Neutral



— Sweep Data
× QP Readings
Software Version: 5.03.12

— Readings
* Average Readings
— 1 - 15.207 AC Mains - Average

○ Peak Readings
▼ Ambient
— 2 - 15.207 AC Mains - Quasi-peak

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	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	8/23/2019	8/23/2021
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T4	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022
	AN01492	50uH LISN-Line (L1)	3816/2NM	10/14/2019	10/14/2021
T5	AN01492	50uH LISN-Neutral (L2)	3816/2NM	10/14/2019	10/14/2021

Measurement Data:

Reading listed by margin.

Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	1.196M	20.5	+9.1 +0.4	+0.0	+0.0	+0.2	+0.0	30.2	46.0	-15.8	Neutr
2	1.706M	18.5	+9.1 +0.4	+0.1	+0.0	+0.2	+0.0	28.3	46.0	-17.7	Neutr
3	3.948M	18.3	+9.1 +0.5	+0.1	+0.0	+0.1	+0.0	28.1	46.0	-17.9	Neutr
4	4.071M	18.3	+9.1 +0.5	+0.1	+0.0	+0.1	+0.0	28.1	46.0	-17.9	Neutr
5	854.662k	18.3	+9.1 +0.4	+0.0	+0.0	+0.2	+0.0	28.0	46.0	-18.0	Neutr
6	787.032k	18.0	+9.1 +0.5	+0.0	+0.0	+0.2	+0.0	27.8	46.0	-18.2	Neutr
7	820.483k	17.7	+9.1 +0.4	+0.0	+0.0	+0.2	+0.0	27.4	46.0	-18.6	Neutr
8	3.939M	17.5	+9.1 +0.5	+0.1	+0.0	+0.1	+0.0	27.3	46.0	-18.7	Neutr
9	792.850k	17.5	+9.1 +0.4	+0.0	+0.0	+0.2	+0.0	27.2	46.0	-18.8	Neutr
10	797.940k	17.5	+9.1 +0.4	+0.0	+0.0	+0.2	+0.0	27.2	46.0	-18.8	Neutr
11	707.767k	17.1	+9.1 +0.5	+0.0	+0.0	+0.3	+0.0	27.0	46.0	-19.0	Neutr
12	761.580k	17.2	+9.1 +0.5	+0.0	+0.0	+0.2	+0.0	27.0	46.0	-19.0	Neutr
13	150.000k	23.3	+9.1 +2.0	+0.0	+0.0	+2.5	+0.0	36.9	56.0	-19.1	Neutr
14	721.583k	17.0	+9.1 +0.5	+0.0	+0.0	+0.3	+0.0	26.9	46.0	-19.1	Neutr
15	741.218k	17.1	+9.1 +0.5	+0.0	+0.0	+0.2	+0.0	26.9	46.0	-19.1	Neutr

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.