Itron, Inc.

TEST REPORT FOR

MC4Pro
Model: MC4C*

***(See Appendix A for Manufacturer's Declaration)**

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(FHSS 902-928MHz)

Report No.: 107795-7

Date of issue: January 26, 2023

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

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

Test Certificate # 803.01

CKC LABORATORIES, INC. Testing the Future

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:	**REPORT PREPARED BY:**
Itron, Inc. 2111 N. Molter Road Liberty Lake, WA 99019	Viviana Prado CKC Laboratories, Inc. 5046 Sierra Pines Drive Mariposa, CA 95338
Representative: Jack McPeck Customer Reference Number: 269629	Project Number: 107795
DATE OF EQUIPMENT RECEIPT:	December 2, 2022
DATE(S) OF TESTING:	December 2-12 and 16-23, 2022

Report Authorization

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

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

Test Facility Information

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

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

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.20

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	A-0136

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

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.247 (FHSS 902-928MHz)

Test Procedure	Description	Modifications	Results
15.247(a)(1)(i)	Occupied Bandwidth	NA	NP
15.247(a)(1)	Carrier Separation	NA	NP
15.247(a)(1)(i)	Number of Hopping Channels	NA	NP
15.247(a)(1)(i)	Average Time of Occupancy	NA	NP
15.247(b)(2)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	NP
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	NA1

NA = Not applicable
NA1 = Not applicable because the unit is battery powered from a vehicle only.
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 (Radiated Laptop)

Equipment Tested:

Device	Manufacturer	Model #	S/N
MC4Pro	Itron, Inc.	MC4C	74008260

Support Equipment:

Device	Manufacturer	Model #	S/N
12VDC Power Supply	Lamda	LUS-10A-12	91K121691
5dBi Antenna	PCTEL	Generic	NA
Receiver Antenna	PCTEL	SUB-0275-001/H	S15180005
Laptop	Panasonic	CF-33	1GTSA65082

Configuration 2 (Radiated Tablet)

Equipment Tested:

Device	Manufacturer	Model #	S/N
MC4Pro	Itron, Inc.	MC4C	74008260

Support Equipment:

Device	Manufacturer	Model #	S/N
12VDC Power Supply	Lamda	LUS-10A-12	91K121691
5dBi Antenna	PCTEL	Generic	NA
Receiver Antenna	PCTEL	SUB-0275-001/H	S15180005
Tablet	Panasonic	FZ-G1	990005071111034

Configuration 3 (Conducted Laptop)

Equipment Tested:

Device	Manufacturer	Model #	S/N
MC4Pro	Itron, Inc.	MC4C	74008260

Support Equipment:

Device	Manufacturer	Model #	S/N
12VDC Power Supply	Lamda	LUS-10A-12	91K121691
Laptop	Panasonic	CF-33	1GTSA65082

General Product Information:

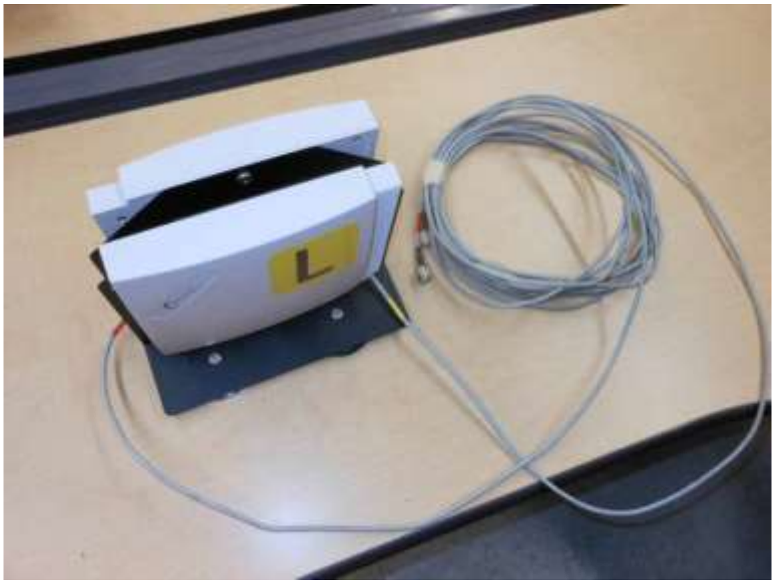
Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Operating Frequency Range:	908-924MHz
Number of Hopping Channels:	81
Receiver Bandwidth and Synchronization:	The manufacturer declares the receiver input bandwidth matches the transmit channel bandwidth and shifts frequencies in synchronization with the transmitter.
Modulation Type(s):	12.5kbps FM
Maximum Duty Cycle:	45mS
Number of TX Chains:	1
Antenna Type(s) and Gain:	External Omni / 5dbi
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	13.8VDC from car battery
Firmware / Software used for Test:	ARM version: 7.73.00.09 DSP version: 5.76.00.13 FPGA version: 3.02 MC3 Test 4.2.0.0 and 4.0.2.3
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT Photo(s)

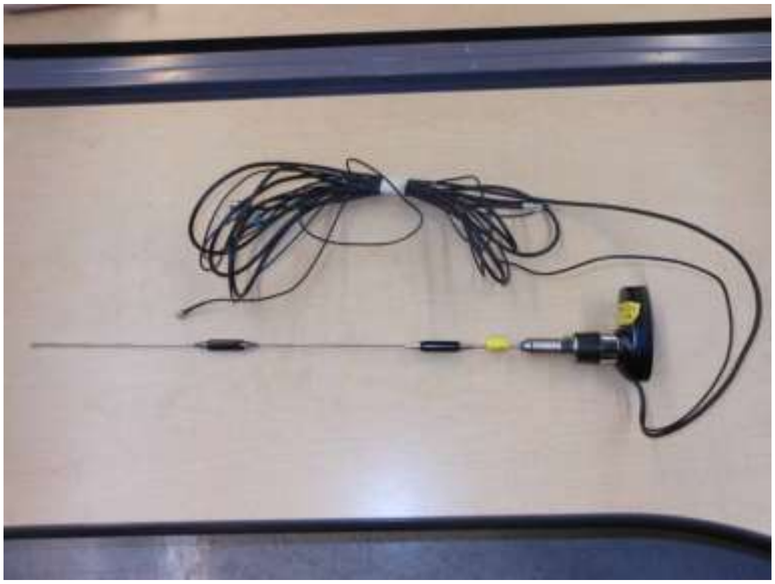
Support Equipment Photo(s)

Laptop

Tablet

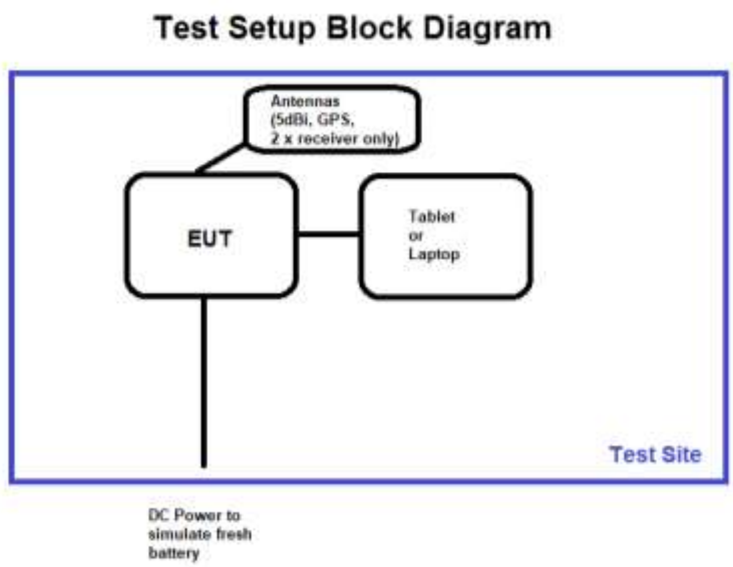


2xReceiver Antenna

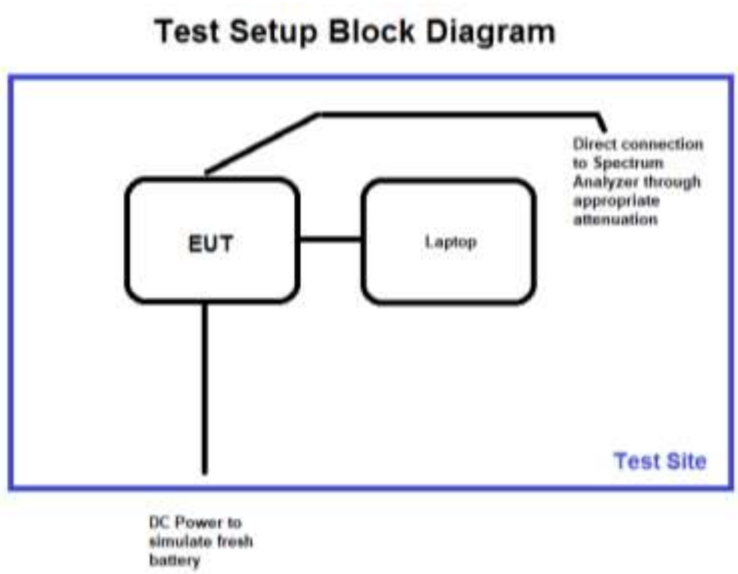


5dBi and GPS Antenna

Block Diagram of Test Setup(s)



Radiated (Configuration 1 & 2)



RF Conducted (Configuration 3)

FCC Part 15 Subpart C

15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	12/2/2022 – 12/12/2022
Configuration:	3		
Test Setup:	The EUT is placed on test bench. Powered from external power supply. USB port is connected to support computer. The EUT is continuously transmitting. The EUT is connected to a spectrum analyzer through appropriate cables and attenuation.		

Environmental Conditions			
Temperature (ºC)	20.5-22	Relative Humidity (%):	31-42

Test Data Summary - Voltage Variations

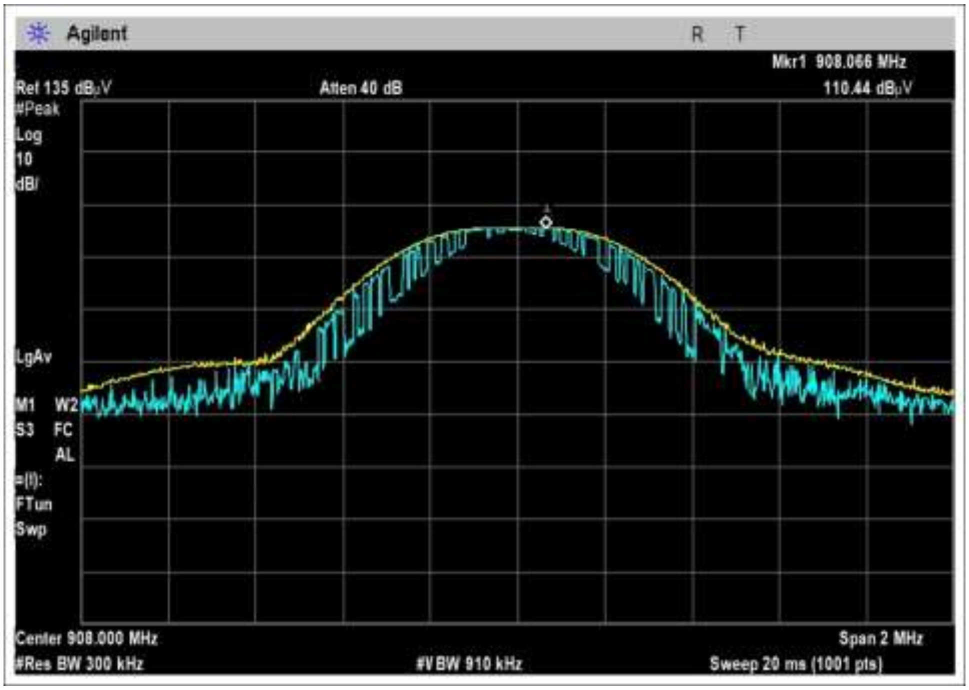
This equipment is battery powered. Power output tests were performed using an external power supply to simulate a fresh battery (13.8VDC).

Test Data Summary - RF Conducted Measurement

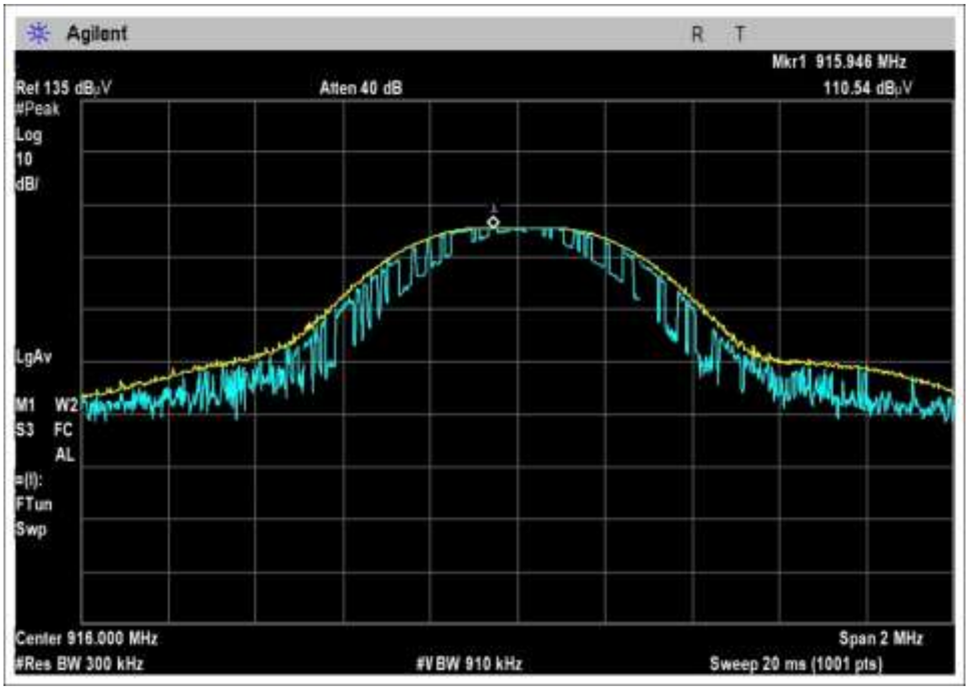
$$Limit = \begin{cases} 30dBm\ Conducted/36dBm\ EIRP \mid \geq 50\ Channels \\ 24dBm\ Conducted/30dBm\ EIRP \mid < 50\ Channels\ (\text{min } 25) \end{cases}$$

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
908	12.5k FM	Omni, 5dBi	29.6	≤30	Pass
916	12.5k FM	Omni, 5dBi	29.8	≤30	Pass
924	12.5k FM	Omni, 5dBi	29.8	≤30	Pass

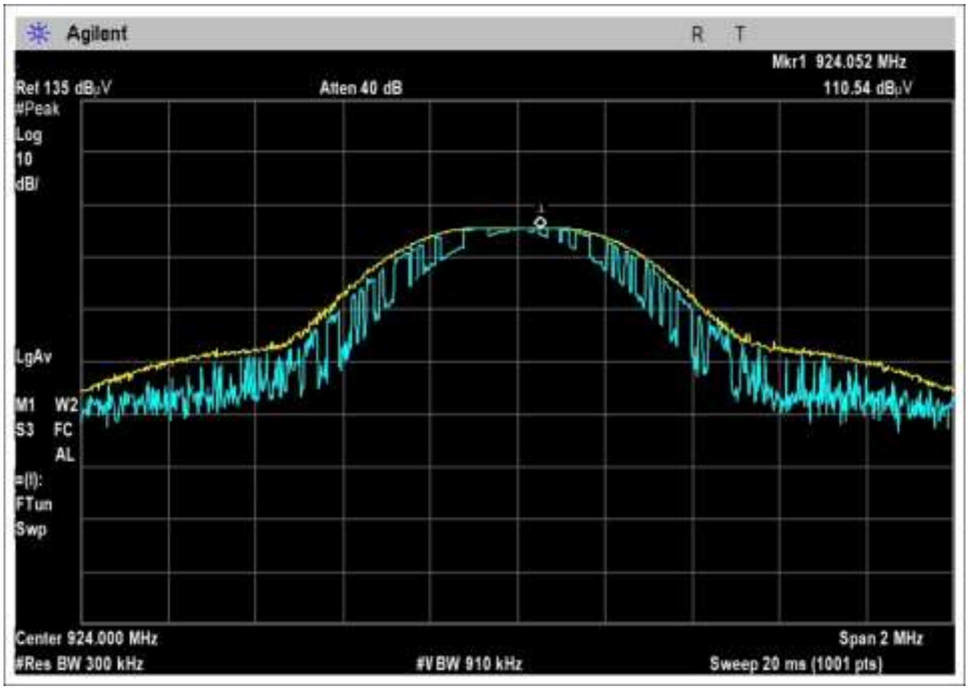
Plots



Low Channel



Middle Channel



High Channel

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Itron, Inc.**		
Specification:	**15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**		
Work Order #:	**107795**	Date:	12/12/2022
Test Type:	**Conducted Emissions**	Time:	13:57:59
Tested By:	Michael Atkinson	Sequence#:	2
Software:	EMITest 5.03.20		13.8VDC

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

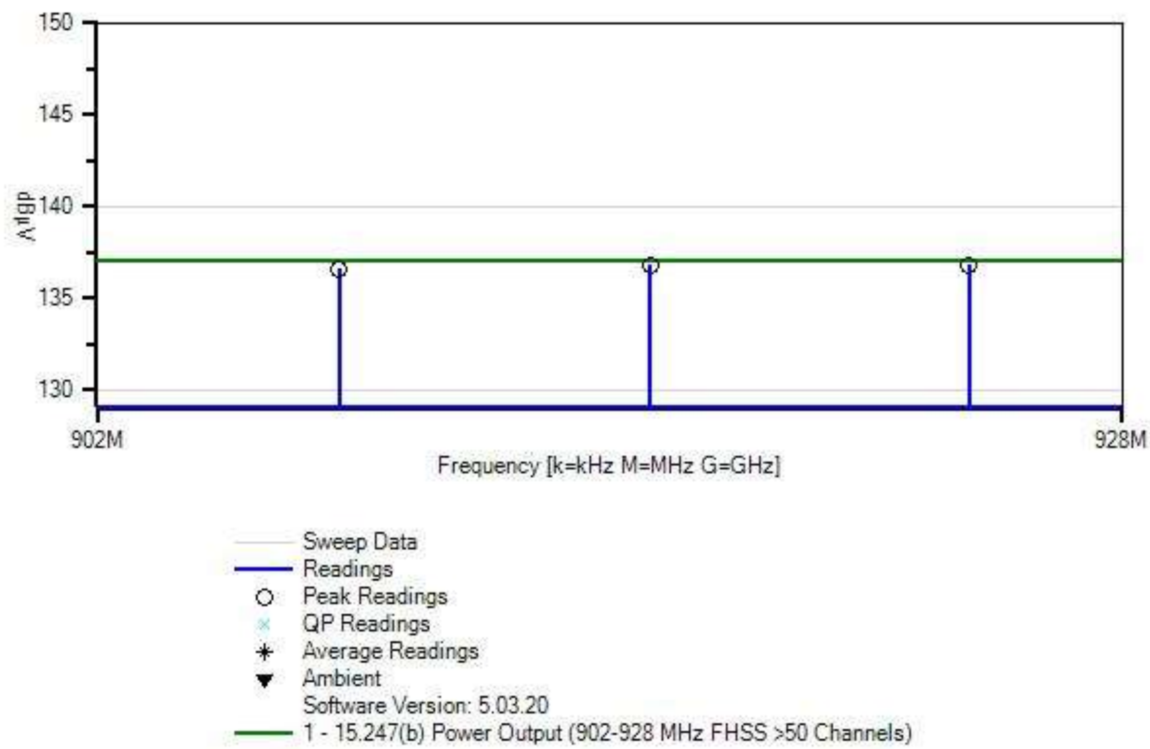
Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Frequency: Fundamental

Test Setup: Conducted Measurement, LMH channels.

Itron, Inc. WO#: 107795 Sequence#: 2 Date: 12/12/2022
15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: 13.8VDC RF Port



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07623	Attenuator	47-20-34	3/16/2022	3/16/2024
T2	ANP07746	Attenuator	PE7004-6	2/11/2021	2/11/2023
T3	ANP06452	Cable	Heliax	1/17/2022	1/17/2024
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023

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

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	915.946M	110.5	+19.7	+5.8	+0.8		+0.0	136.8	137.0	-0.2	RF Po
2	924.052M	110.5	+19.7	+5.8	+0.8		+0.0	136.8	137.0	-0.2	RF Po
3	908.066M	110.4	+19.7	+5.8	+0.7		+0.0	136.6	137.0	-0.4	RF Po

Test Setup Photo(s)

15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**107795**	Date:	12/21/2022
Test Type:	**Maximized Emissions**	Time:	18:50:51
Tested By:	Michael Atkinson	Sequence#:	43
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 20°C
Humidity: 37%
Pressure: 102.2kPa

Test Method: ANSI C63.10 (2013)

Frequency: 9kHz-10GHz

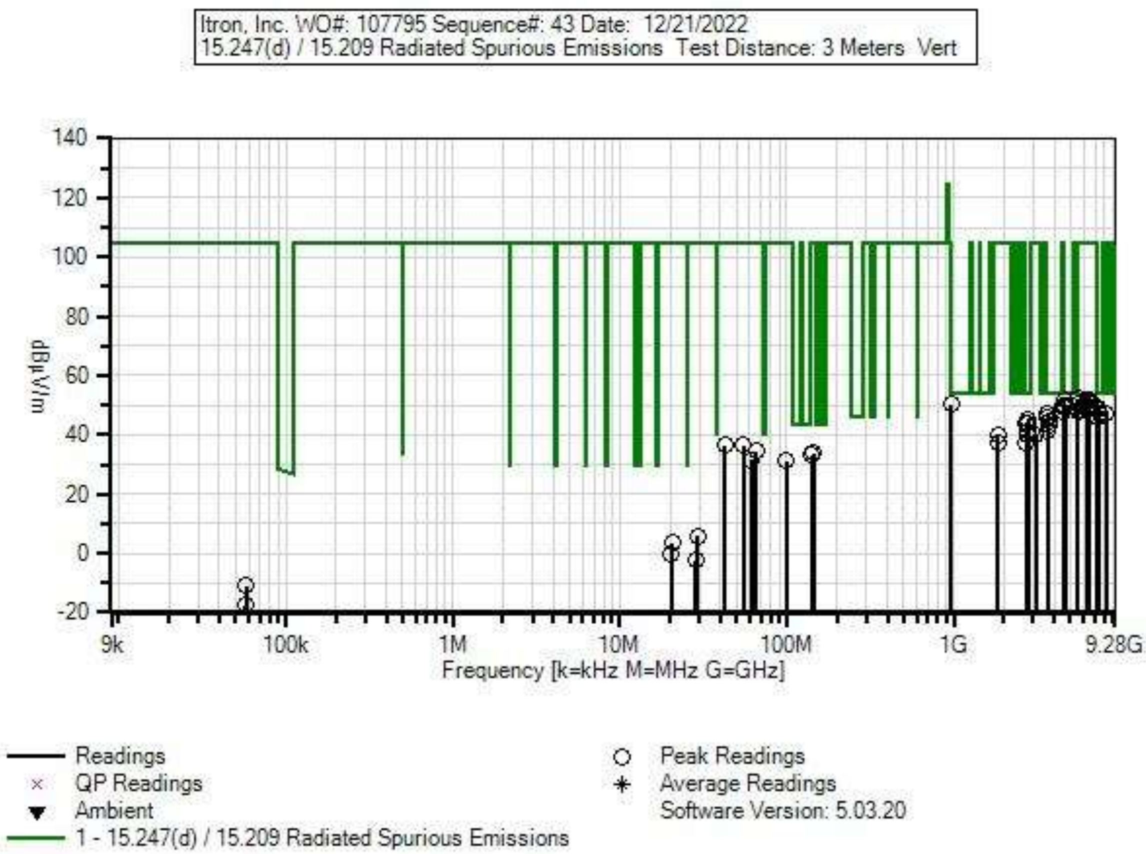
Test Setup: EUT is continuously transmitting with modulation. Horizontal and vertical measurement antenna polarities investigated above 30MHz, 3 x orthogonal axes investigated below 30MHz, worst-case reported. EUT XYZ axes investigated, worst-case reported. Also investigated with receiver only boards removed, the fully loaded unit is representative of worst-case.

Power supply is remotely located outside of chamber with filter caps at chamber wall.

Investigated with antenna at 1.5m height, as well as moving the entire setup so the EUT is at 1.5m height, worst-case reported.

MC4Pro with Laptop

Duty correction factor is applied to harmonics of the fundamental above 1GHz.
Correction factor = 20log(44.67ms/100ms) = -7.0dB



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T1	ANP06540	Cable	Heliax	1/17/2022	1/17/2024
T2	ANP05305	Cable	ETSI-50T	9/15/2021	9/15/2023
T3	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T4	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T5	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T6	AN03540	Preamp	83017A	5/14/2021	5/14/2023
T7	ANP07504	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
T8	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
T9	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023

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

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	5448.500M	45.2	+0.8 +0.0 +0.4	+4.0 -33.6	+0.0 +0.5	+0.0 +34.7	+0.0	52.0	54.0 908	-2.0	Horiz
2	4580.400M	47.8	+0.6 +0.0 +0.5	+3.5 -33.6	+0.0 +0.4	+0.0 +32.3	+0.0	51.5	54.0 916	-2.5	Horiz
3	4539.670M	46.6	+0.6 +0.0 +0.6	+3.5 -33.6	+0.0 +0.3	+0.0 +32.1	+0.0	50.1	54.0 908	-3.9	Vert
4	4620.140M	46.0	+0.6 +0.0 +0.4	+3.5 -33.6	+0.0 +0.4	+0.0 +32.4	+0.0	49.7	54.0 924	-4.3	Horiz
5	7327.450M	39.6	+1.3 +0.0 +0.6	+4.5 -34.9	+0.0 +0.7	+0.0 +37.5	+0.0	49.3	54.0 916	-4.7	Horiz
6	4619.900M	45.4	+0.6 +0.0 +0.4	+3.5 -33.6	+0.0 +0.4	+0.0 +32.4	+0.0	49.1	54.0 924	-4.9	Vert
7	4580.090M	45.4	+0.6 +0.0 +0.5	+3.5 -33.6	+0.0 +0.4	+0.0 +32.2	+0.0	49.0	54.0 916	-5.0	Vert
8	7263.580M	40.0	+1.2 +0.0 +0.3	+4.5 -34.9	+0.0 +0.7	+0.0 +37.2	+0.0	49.0	54.0 908	-5.0	Horiz
9	7264.190M	39.6	+1.2 +0.0 +0.3	+4.5 -34.9	+0.0 +0.7	+0.0 +37.2	+0.0	48.6	54.0 908	-5.4	Vert
10	4540.020M	44.3	+0.6 +0.0 +0.6	+3.5 -33.6	+0.0 +0.3	+0.0 +32.1	+0.0	47.8	54.0 908	-6.2	Horiz
11	3664.210M	45.1	+0.6 +0.0 +0.2	+3.3 -33.8	+0.0 +0.4	+0.0 +31.7	+0.0	47.5	54.0 916	-6.5	Vert
12	8171.840M	36.2	+1.2 +0.0 +0.7	+5.1 -35.0	+0.0 +0.7	+0.0 +38.6	+0.0	47.5	54.0 908	-6.5	Horiz
13	8172.190M	36.1	+1.2 +0.0 +0.7	+5.1 -35.0	+0.0 +0.7	+0.0 +38.6	+0.0	47.4	54.0 908	-6.6	Vert
14	7391.910M	37.5	+1.3 +0.0 +0.7	+4.5 -34.9	+0.0 +0.7	+0.0 +37.4	+0.0	47.2	54.0 924	-6.8	Vert

15	5448.360M Ave	40.3	+0.8 +0.0 +0.4	+4.0 -33.6	+0.0 +0.5	+0.0 +34.7	+0.0	47.1	54.0 908	-6.9	Vert
^	5448.360M	47.0	+0.8 +0.0 +0.4	+4.0 -33.6	+0.0 +0.5	+0.0 +34.7	+0.0	53.8	54.0 908	-0.2	Vert
17	7327.860M	36.3	+1.3 +0.0 +0.6	+4.5 -34.9	+0.0 +0.7	+0.0 +37.5	+0.0	46.0	54.0 916	-8.0	Vert
18	3664.160M	43.1	+0.6 +0.0 +0.2	+3.3 -33.8	+0.0 +0.4	+0.0 +31.7	+0.0	45.5	54.0 916	-8.5	Horiz
19	2771.890M	46.0	+0.5 +0.0 +0.3	+2.7 -34.1	+0.0 +0.5	+0.0 +29.3	+0.0	45.2	54.0 924	-8.8	Vert
20	3695.840M	42.2	+0.6 +0.0 +0.2	+3.3 -33.8	+0.0 +0.3	+0.0 +31.9	+0.0	44.7	54.0 924	-9.3	Vert
21	2723.810M	44.5	+0.5 +0.0 +0.2	+2.7 -34.1	+0.0 +0.5	+0.0 +29.4	+0.0	43.7	54.0 908	-10.3	Vert
22	2748.250M	44.5	+0.5 +0.0 +0.3	+2.7 -34.1	+0.0 +0.5	+0.0 +29.3	+0.0	43.7	54.0 916	-10.3	Vert
23	3695.860M	40.9	+0.6 +0.0 +0.2	+3.3 -33.8	+0.0 +0.3	+0.0 +31.9	+0.0	43.4	54.0 924	-10.6	Horiz
24	2747.730M	42.1	+0.5 +0.0 +0.3	+2.7 -34.1	+0.0 +0.5	+0.0 +29.3	+0.0	41.3	54.0 916	-12.7	Horiz
25	3631.940M	38.7	+0.6 +0.0 +0.3	+3.3 -33.8	+0.0 +0.4	+0.0 +31.7	+0.0	41.2	54.0 908	-12.8	Vert
26	2772.110M	41.0	+0.5 +0.0 +0.3	+2.7 -34.1	+0.0 +0.5	+0.0 +29.3	+0.0	40.2	54.0 924	-13.8	Horiz
27	2724.090M	38.0	+0.5 +0.0 +0.2	+2.7 -34.1	+0.0 +0.5	+0.0 +29.4	+0.0	37.2	54.0 908	-16.8	Horiz
28	5543.930M	45.5	+0.8 +0.0 +0.5	+4.0 -33.6	+0.0 +0.5	+0.0 +34.6	+0.0	52.3	104.5 924	-52.2	Vert
29	6411.470M	44.5	+0.9 +0.0 +0.5	+4.5 -34.0	+0.0 +0.6	+0.0 +35.0	+0.0	52.0	104.5 916	-52.5	Vert
30	6467.710M	43.9	+0.9 +0.0 +0.6	+4.5 -34.0	+0.0 +0.7	+0.0 +34.9	+0.0	51.5	104.5 924	-53.0	Vert
31	6356.370M	43.9	+0.9 +0.0 +0.4	+4.4 -34.0	+0.0 +0.6	+0.0 +35.1	+0.0	51.3	104.5 908	-53.2	Vert

32	5495.990M	43.7	+0.8 +0.0 +0.4	+4.0 -33.6	+0.0 +0.5	+0.0 +34.7	+0.0	50.5	104.5 916	-54.0	Horiz
33	6467.990M	42.8	+0.9 +0.0 +0.6	+4.5 -34.0	+0.0 +0.7	+0.0 +34.9	+0.0	50.4	104.5 924	-54.1	Horiz
34	957.300M	15.2	+0.3 +0.0 +0.0	+1.5 +0.0	+2.4 +0.0	+30.8 +0.0	+0.0	50.2	104.5	-54.3	Vert
35	6355.690M	42.5	+0.9 +0.0 +0.4	+4.4 -34.0	+0.0 +0.6	+0.0 +35.1	+0.0	49.9	104.5 908	-54.6	Horiz
36	6412.530M	42.2	+0.9 +0.0 +0.5	+4.5 -34.0	+0.0 +0.6	+0.0 +35.0	+0.0	49.7	104.5 916	-54.8	Horiz
37	5496.600M	41.9	+0.8 +0.0 +0.4	+4.0 -33.6	+0.0 +0.5	+0.0 +34.7	+0.0	48.7	104.5 916	-55.8	Vert
38	5544.170M	41.0	+0.8 +0.0 +0.5	+4.0 -33.6	+0.0 +0.5	+0.0 +34.6	+0.0	47.8	104.5 924	-56.7	Horiz
39	3090.000M	39.0	+0.5 +0.0 +0.6	+2.9 -34.0	+0.0 +0.3	+0.0 +30.8	+0.0	40.1	104.5	-64.4	Vert
40	1848.110M	43.8	+0.4 +0.0 +0.6	+2.1 -34.7	+0.0 +0.3	+0.0 +27.6	+0.0	40.1	104.5 924	-64.4	Vert
41	1831.850M	41.3	+0.4 +0.0 +0.6	+2.1 -34.7	+0.0 +0.3	+0.0 +27.5	+0.0	37.5	104.5 916	-67.0	Vert
42	55.200M	23.2	+0.1 +0.0 +0.0	+0.3 +0.0	+0.5 +0.0	+12.3 +0.0	+0.0	36.4	104.5	-68.1	Vert
43	42.600M	20.8	+0.1 +0.0 +0.0	+0.3 +0.0	+0.5 +0.0	+14.7 +0.0	+0.0	36.4	104.5	-68.1	Vert
44	65.900M	20.5	+0.1 +0.0 +0.0	+0.4 +0.0	+0.5 +0.0	+12.9 +0.0	+0.0	34.4	104.5	-70.1	Vert
45	144.500M	18.5	+0.1 +0.0 +0.0	+0.5 +0.0	+0.8 +0.0	+14.0 +0.0	+0.0	33.9	104.5	-70.6	Horiz
46	141.600M	17.8	+0.1 +0.0 +0.0	+0.5 +0.0	+0.8 +0.0	+13.9 +0.0	+0.0	33.1	104.5	-71.4	Vert
47	61.000M	18.0	+0.1 +0.0 +0.0	+0.4 +0.0	+0.5 +0.0	+12.6 +0.0	+0.0	31.6	104.5	-72.9	Horiz
48	98.900M	16.4	+0.1 +0.0 +0.0	+0.5 +0.0	+0.6 +0.0	+13.7 +0.0	+0.0	31.3	104.5	-73.2	Vert

49	29.217M	41.6	+0.1 +3.9 +0.0	+0.3 +0.0	+0.0 +0.0	+0.0 +0.0	-40.0	5.9	104.5	-98.6	Groun
50	20.662M	36.9	+0.1 +6.3 +0.0	+0.2 +0.0	+0.0 +0.0	+0.0 +0.0	-40.0	3.5	104.5	-101.0	Groun
51	20.401M	33.4	+0.1 +6.3 +0.0	+0.2 +0.0	+0.0 +0.0	+0.0 +0.0	-40.0	0.0	104.5	-104.5	Para
52	28.463M	32.9	+0.1 +4.3 +0.0	+0.2 +0.0	+0.0 +0.0	+0.0 +0.0	-40.0	-2.5	104.5	-107.0	Para
53	57.597k	59.3	+0.1 +9.7 +0.0	+0.0 +0.0	+0.0 +0.0	+0.0 +0.0	-80.0	-10.9	104.5	-115.4	Para
54	57.506k	52.8	+0.1 +9.7 +0.0	+0.0 +0.0	+0.0 +0.0	+0.0 +0.0	-80.0	-17.4	104.5	-121.9	Groun

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
Customer:	**Itron, Inc.**
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**
Work Order #:	**107795**
Test Type:	**Maximized Emissions**
Tested By:	Michael Atkinson
Software:	EMITest 5.03.20

Date:	12/21/2022
Time:	19:28:01
Sequence#:	44

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 20°C
Humidity: 37%
Pressure: 102.2kPa

Test Method: ANSI C63.10 (2013)

Frequency: 9kHz-10GHz

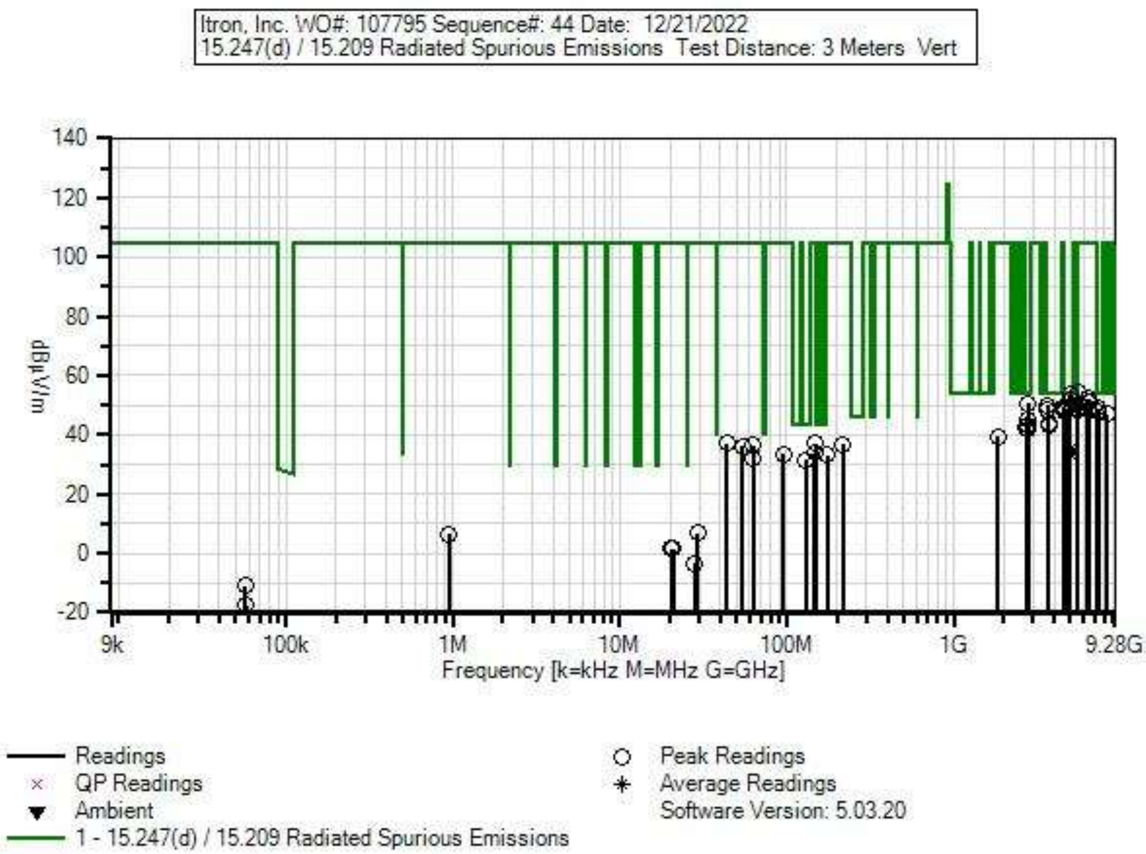
Test Setup: EUT is continuously transmitting with modulation. Horizontal and vertical measurement antenna polarities investigated above 30MHz, 3 x orthogonal axes investigated below 30MHz, worst-case reported. EUT XYZ axes investigated, worst-case reported. Also investigated with receiver only boards removed, the fully loaded unit is representative of worst-case.

Power supply is remotely located outside of chamber with filter caps at chamber wall.

Investigated with antenna at 1.5m height, as well as moving the entire setup so the EUT is at 1.5m height, worst-case reported.

MC4Pro with Tablet

Duty correction factor is applied to harmonics of the fundamental above 1GHz.
Correction factor = 20log(44.67ms/100ms) = -7.0dB



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T2	ANP06540	Cable	Heliax	1/17/2022	1/17/2024
T3	ANP05305	Cable	ETSI-50T	9/15/2021	9/15/2023
T4	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T5	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023
T6	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T7	AN03540	Preamp	83017A	5/14/2021	5/14/2023
T8	ANP07504	Cable	CLU40-KMKM-02.00F	1/26/2021	1/26/2023
T9	AN02374ANSI	Horn Antenna	RGA-60	5/25/2021	5/25/2023
T10	AN03170	High Pass Filter	HM1155-11SS	9/16/2021	9/16/2023

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

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10							
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	4980.000M	47.4	+0.0	+0.7	+3.8	+0.0	+0.0	53.6	54.0	-0.4	Horiz
			+0.0	+0.0	-33.4	+0.7					
			+33.8	+0.6							
2	4983.000M	45.8	+0.0	+0.7	+3.8	+0.0	+0.0	52.0	54.0	-2.0	Vert
			+0.0	+0.0	-33.4	+0.7					
			+33.8	+0.6							
3	2772.210M	51.5	+0.0	+0.5	+2.7	+0.0	+0.0	50.7	54.0	-3.3	Vert
			+0.0	+0.0	-34.1	+0.5			924		
			+29.3	+0.3							
4	3664.180M	47.6	+0.0	+0.6	+3.3	+0.0	+0.0	50.0	54.0	-4.0	Vert
			+0.0	+0.0	-33.8	+0.4			916		
			+31.7	+0.2							
5	4539.330M	45.9	+0.0	+0.6	+3.5	+0.0	+0.0	49.4	54.0	-4.6	Vert
			+0.0	+0.0	-33.6	+0.3			908		
			+32.1	+0.6							
6	4580.440M	45.6	+0.0	+0.6	+3.5	+0.0	+0.0	49.3	54.0	-4.7	Vert
			+0.0	+0.0	-33.6	+0.4			916		
			+32.3	+0.5							
7	4540.400M	45.6	+0.0	+0.6	+3.5	+0.0	+0.0	49.1	54.0	-4.9	Horiz
			+0.0	+0.0	-33.6	+0.3			908		
			+32.1	+0.6							
8	7264.460M	40.0	+0.0	+1.2	+4.5	+0.0	+0.0	49.0	54.0	-5.0	Horiz
			+0.0	+0.0	-34.9	+0.7			908		
			+37.2	+0.3							
9	7327.760M	39.2	+0.0	+1.3	+4.5	+0.0	+0.0	48.9	54.0	-5.1	Vert
			+0.0	+0.0	-34.9	+0.7			916		
			+37.5	+0.6							
10	5448.400M	41.9	+0.0	+0.8	+4.0	+0.0	+0.0	48.7	54.0	-5.3	Horiz
			+0.0	+0.0	-33.6	+0.5			908		
			+34.7	+0.4							
11	4619.940M	44.9	+0.0	+0.6	+3.5	+0.0	+0.0	48.6	54.0	-5.4	Vert
			+0.0	+0.0	-33.6	+0.4			924		
			+32.4	+0.4							
12	3664.080M	46.1	+0.0	+0.6	+3.3	+0.0	+0.0	48.5	54.0	-5.5	Horiz
			+0.0	+0.0	-33.8	+0.4			916		
			+31.7	+0.2							
13	4620.110M	44.7	+0.0	+0.6	+3.5	+0.0	+0.0	48.4	54.0	-5.6	Horiz
			+0.0	+0.0	-33.6	+0.4			924		
			+32.4	+0.4							
14	5447.730M	41.4	+0.0	+0.8	+4.0	+0.0	+0.0	48.2	54.0	-5.8	Vert
	Ave		+0.0	+0.0	-33.6	+0.5			908		
			+34.7	+0.4							
^	5447.730M	46.6	+0.0	+0.8	+4.0	+0.0	+0.0	53.4	54.0	-0.6	Vert
			+0.0	+0.0	-33.6	+0.5			908		
			+34.7	+0.4							

16	7263.440M	38.9	+0.0 +0.0 +37.2	+1.2 +0.0 +0.3	+4.5 -34.9	+0.0 +0.7	+0.0	47.9	54.0 908	-6.1	Vert
17	4580.160M	44.3	+0.0 +0.0 +32.2	+0.6 +0.0 +0.5	+3.5 -33.6	+0.0 +0.4	+0.0	47.9	54.0 916	-6.1	Horiz
18	8316.060M	35.1	+0.0 +0.0 +38.7	+1.2 +0.0 +0.9	+5.2 -34.9	+0.0 +0.7	+0.0	46.9	54.0 924	-7.1	Horiz
19	2748.190M	46.0	+0.0 +0.0 +29.3	+0.5 +0.0 +0.3	+2.7 -34.1	+0.0 +0.5	+0.0	45.2	54.0 916	-8.8	Vert
20	3696.320M	41.6	+0.0 +0.0 +31.9	+0.6 +0.0 +0.2	+3.3 -33.8	+0.0 +0.3	+0.0	44.1	54.0 924	-9.9	Horiz
21	2771.970M	43.7	+0.0 +0.0 +29.3	+0.5 +0.0 +0.3	+2.7 -34.1	+0.0 +0.5	+0.0	42.9	54.0 924	-11.1	Horiz
22	3696.070M	40.4	+0.0 +0.0 +31.9	+0.6 +0.0 +0.2	+3.3 -33.8	+0.0 +0.3	+0.0	42.9	54.0 924	-11.1	Vert
23	2723.950M	43.5	+0.0 +0.0 +29.4	+0.5 +0.0 +0.2	+2.7 -34.1	+0.0 +0.5	+0.0	42.7	54.0 908	-11.3	Vert
24	129.900M	16.8	+0.0 +13.5 +0.0	+0.1 +0.0 +0.0	+0.5 +0.0	+0.7 +0.0	+0.0	31.6	43.5	-11.9	Vert
25	2747.770M	42.4	+0.0 +0.0 +29.3	+0.5 +0.0 +0.3	+2.7 -34.1	+0.0 +0.5	+0.0	41.6	54.0 916	-12.4	Horiz
26	4989.574M Ave	29.1	+0.0 +0.0 +33.8	+0.7 +0.0 +0.6	+3.8 -33.4	+0.0 +0.7	+0.0	35.3	54.0	-18.7	Horiz
27	4989.574M Ave	27.1	+0.0 +0.0 +33.8	+0.7 +0.0 +0.6	+3.8 -33.4	+0.0 +0.7	+0.0	33.3	54.0	-20.7	Vert
28	5544.190M	47.3	+0.0 +0.0 +34.6	+0.8 +0.0 +0.5	+4.0 -33.6	+0.0 +0.5	+0.0	54.1	104.5 924	-50.4	Vert
29	6355.440M	44.7	+0.0 +0.0 +35.1	+0.9 +0.0 +0.4	+4.4 -34.0	+0.0 +0.6	+0.0	52.1	104.5 908	-52.4	Vert
30	6411.510M	44.6	+0.0 +0.0 +35.0	+0.9 +0.0 +0.5	+4.5 -34.0	+0.0 +0.6	+0.0	52.1	104.5 916	-52.4	Vert
31	6468.510M	43.6	+0.0 +0.0 +34.9	+0.9 +0.0 +0.6	+4.5 -34.0	+0.0 +0.7	+0.0	51.2	104.5 924	-53.3	Vert
32	6468.410M	43.5	+0.0 +0.0 +34.9	+0.9 +0.0 +0.6	+4.5 -34.0	+0.0 +0.7	+0.0	51.1	104.5 924	-53.4	Horiz

33	6412.410M	43.3	+0.0 +0.0 +35.0	+0.9 +0.0 +0.5	+4.5 -34.0	+0.0 +0.6	+0.0	50.8	104.5 916	-53.7	Horiz
34	5543.460M	43.5	+0.0 +0.0 +34.6	+0.8 +0.0 +0.5	+4.0 -33.6	+0.0 +0.5	+0.0	50.3	104.5 924	-54.2	Horiz
35	5495.570M	41.9	+0.0 +0.0 +34.7	+0.8 +0.0 +0.4	+4.0 -33.6	+0.0 +0.5	+0.0	48.7	104.5 916	-55.8	Vert
36	6356.400M	40.8	+0.0 +0.0 +35.1	+0.9 +0.0 +0.4	+4.4 -34.0	+0.0 +0.6	+0.0	48.2	104.5 908	-56.3	Horiz
37	5496.080M	41.4	+0.0 +0.0 +34.7	+0.8 +0.0 +0.4	+4.0 -33.6	+0.0 +0.5	+0.0	48.2	104.5 916	-56.3	Horiz
38	1847.840M	43.1	+0.0 +0.0 +27.6	+0.4 +0.0 +0.6	+2.1 -34.7	+0.0 +0.3	+0.0	39.4	104.5 924	-65.1	Vert
39	43.600M	21.8	+0.0 +14.3 +0.0	+0.1 +0.0 +0.0	+0.3 +0.0	+0.5 +0.0	+0.0	37.0	104.5	-67.5	Vert
40	148.300M	20.9	+0.0 +14.6 +0.0	+0.1 +0.0 +0.0	+0.6 +0.0	+0.8 +0.0	+0.0	37.0	104.5	-67.5	Horiz
41	217.200M	18.5	+0.0 +16.5 +0.0	+0.1 +0.0 +0.0	+0.7 +0.0	+1.0 +0.0	+0.0	36.8	104.5	-67.7	Horiz
42	216.200M	18.3	+0.0 +16.5 +0.0	+0.1 +0.0 +0.0	+0.7 +0.0	+1.0 +0.0	+0.0	36.6	104.5	-67.9	Vert
43	63.000M	22.7	+0.0 +12.7 +0.0	+0.1 +0.0 +0.0	+0.4 +0.0	+0.5 +0.0	+0.0	36.4	104.5	-68.1	Vert
44	54.200M	23.0	+0.0 +12.3 +0.0	+0.1 +0.0 +0.0	+0.3 +0.0	+0.5 +0.0	+0.0	36.2	104.5	-68.3	Vert
45	147.400M	17.8	+0.0 +14.4 +0.0	+0.1 +0.0 +0.0	+0.6 +0.0	+0.8 +0.0	+0.0	33.7	104.5	-70.8	Vert
46	96.000M	19.1	+0.0 +13.3 +0.0	+0.1 +0.0 +0.0	+0.5 +0.0	+0.6 +0.0	+0.0	33.6	104.5	-70.9	Vert
47	173.600M	16.1	+0.0 +15.6 +0.0	+0.1 +0.0 +0.0	+0.6 +0.0	+0.9 +0.0	+0.0	33.3	104.5	-71.2	Vert
48	63.000M	18.3	+0.0 +12.7 +0.0	+0.1 +0.0 +0.0	+0.4 +0.0	+0.5 +0.0	+0.0	32.0	104.5	-72.5	Horiz
49	29.246M	42.4	+0.0 +0.0 +0.0	+0.1 +3.9 +0.0	+0.3 +0.0	+0.0 +0.0	-40.0	6.7	104.5	-97.8	Groun

50	950.100k	36.9	+0.0 +0.0 +0.0	+0.1 +9.5 +0.0	+0.1 +0.0	+0.0 +0.0	-40.0	6.6	104.5	-97.9	Groun
51	20.836M	35.2	+0.0 +0.0 +0.0	+0.1 +6.2 +0.0	+0.2 +0.0	+0.0 +0.0	-40.0	1.7	104.5	-102.8	Groun
52	20.401M	34.9	+0.0 +0.0 +0.0	+0.1 +6.3 +0.0	+0.2 +0.0	+0.0 +0.0	-40.0	1.5	104.5	-103.0	Para
53	28.115M	31.9	+0.0 +0.0 +0.0	+0.1 +4.5 +0.0	+0.2 +0.0	+0.0 +0.0	-40.0	-3.3	104.5	-107.8	Para
54	57.415k	59.1	+0.0 +0.0 +0.0	+0.1 +9.7 +0.0	+0.0 +0.0	+0.0 +0.0	-80.0	-11.1	104.5	-115.6	Para
55	57.597k	52.6	+0.0 +0.0 +0.0	+0.1 +9.7 +0.0	+0.0 +0.0	+0.0 +0.0	-80.0	-17.6	104.5	-122.1	Groun

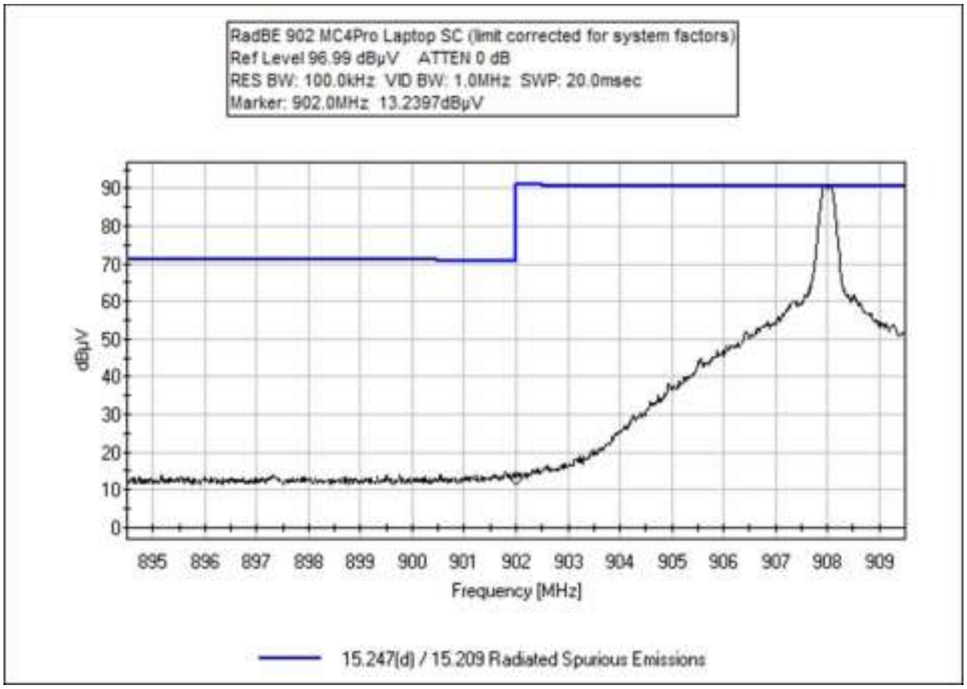
Band Edge

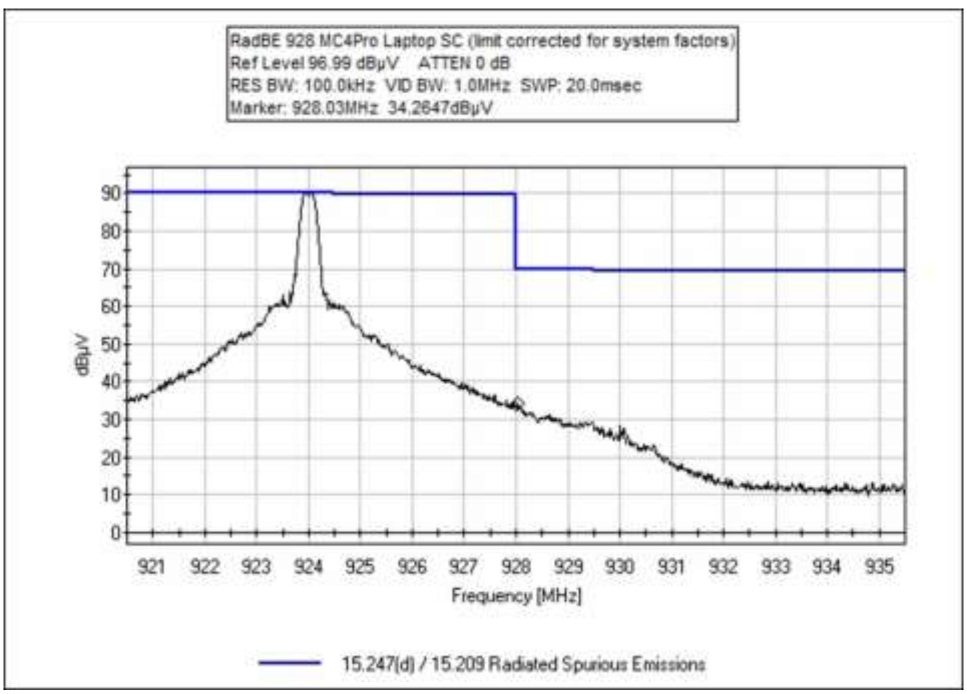
Band Edge Summary					
Configuration 1 (MC4Pro and Laptop)					
Frequency (MHz)	**SC or Hopping**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
902	SC	Omni	46.8	104.5	Pass
928	SC	Omni	69.1	104.5	Pass
902	Hopping	Omni	45.4	104.5	Pass
928	Hopping	Omni	66.9	104.5	Pass
614	SC	Omni	38.4	46	Pass
960	SC	Omni	42.8	54	Pass
614	Hopping	Omni	38.5	46	Pass
960	Hopping	Omni	42.8	54	Pass

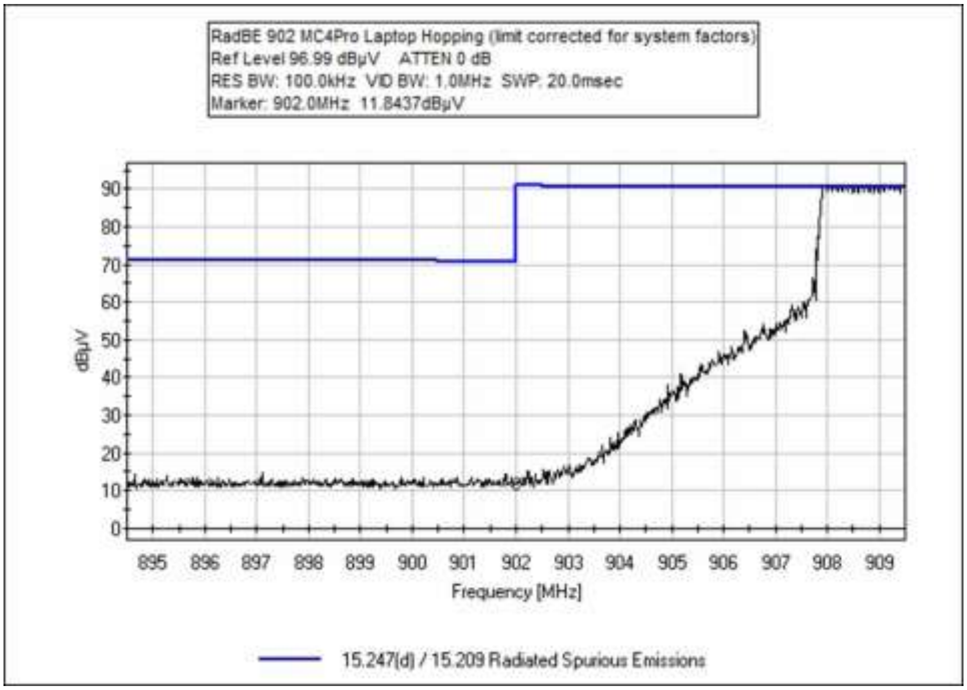
Band Edge Summary					
Configuration 2 (MC4Pro and Tablet)					
Frequency (MHz)	**SC or Hopping**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
902	SC	Omni	45.9	104.5	Pass
928	SC	Omni	67.9	104.5	Pass
902	Hopping	Omni	46.5	104.5	Pass
928	Hopping	Omni	63.9	104.5	Pass
614	SC	Omni	38.5	46	Pass
960	SC	Omni	42.8	54	Pass
614	Hopping	Omni	38.5	46	Pass
960	Hopping	Omni	42.8	54	Pass

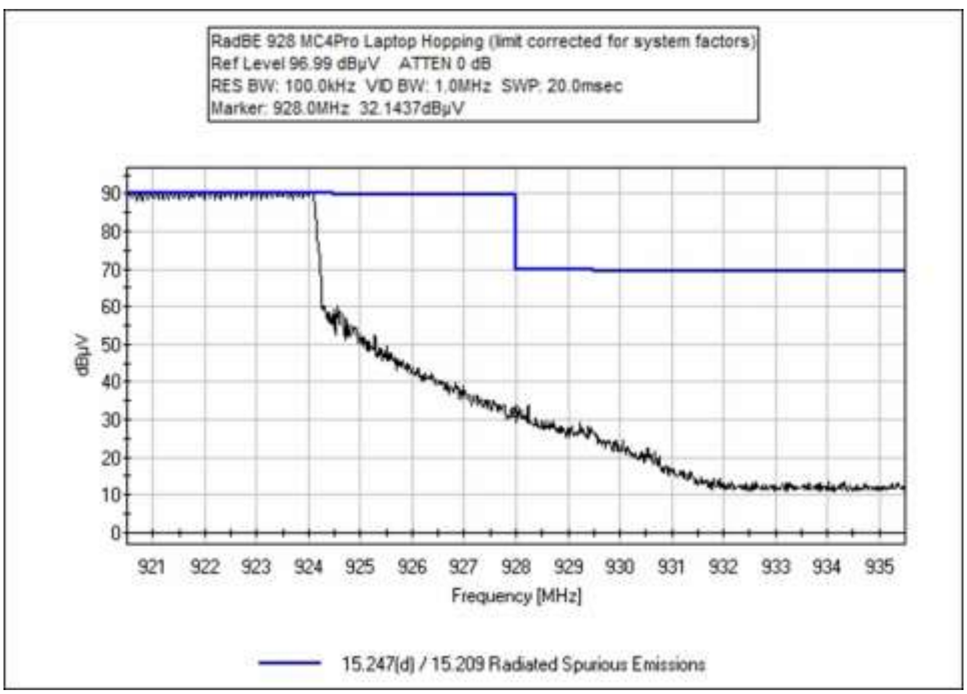
Band Edge Plots

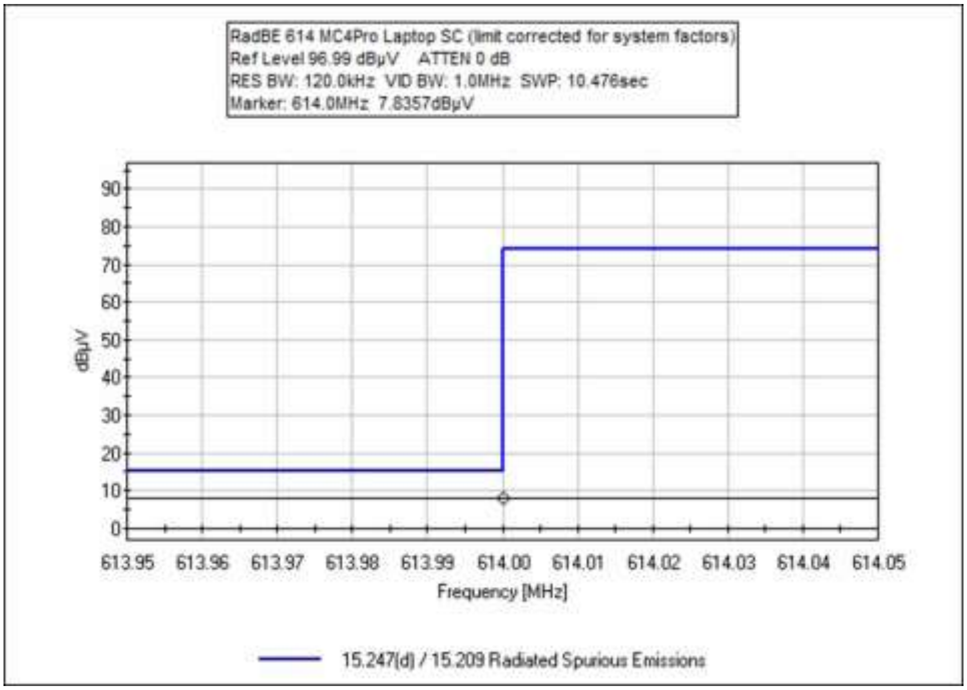
Configuration 1

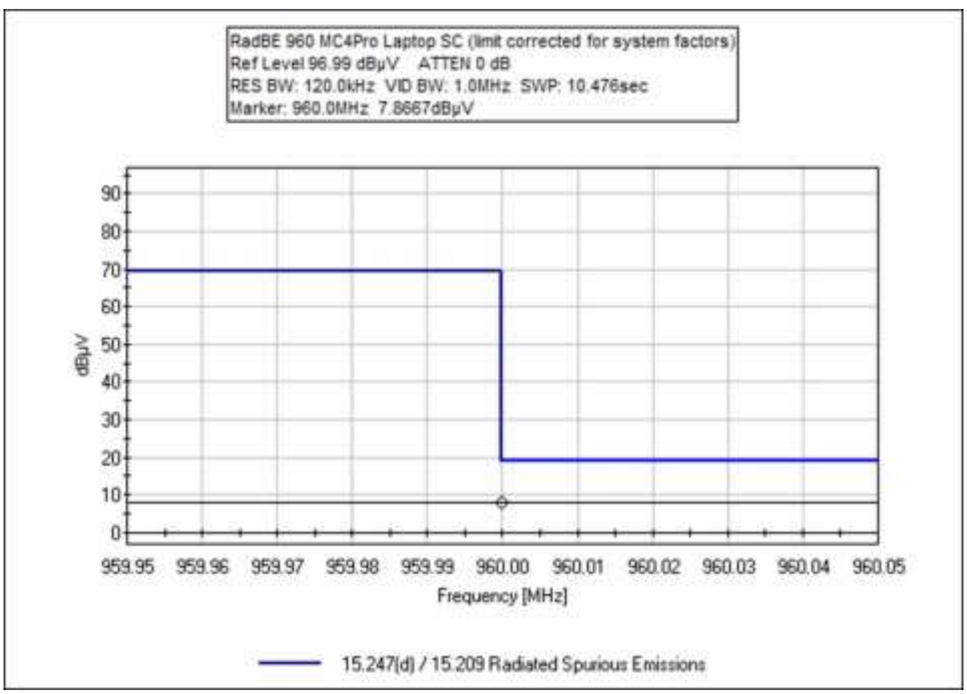


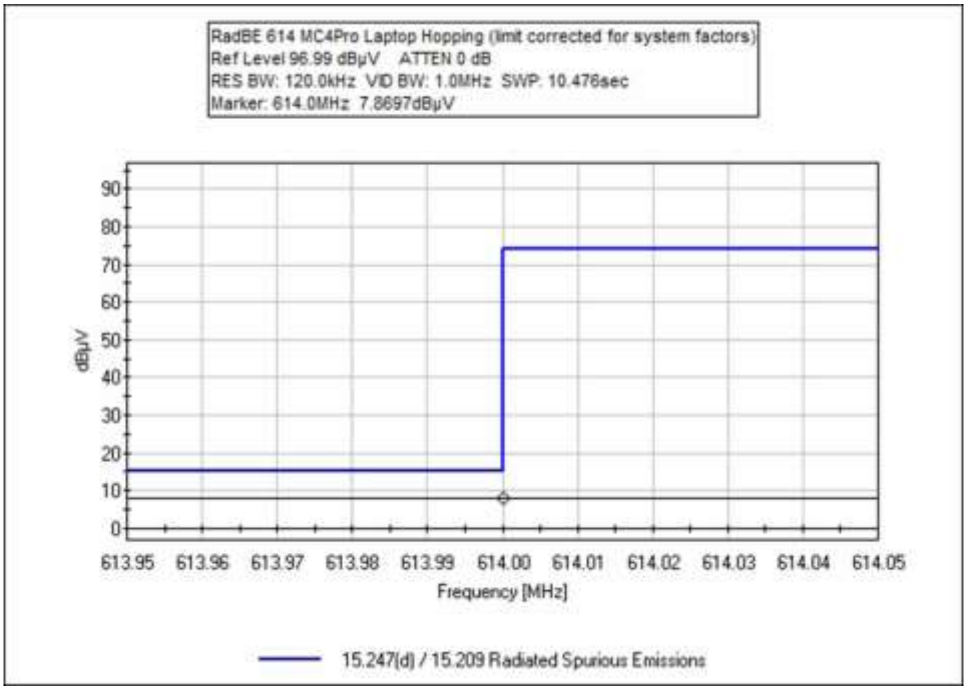


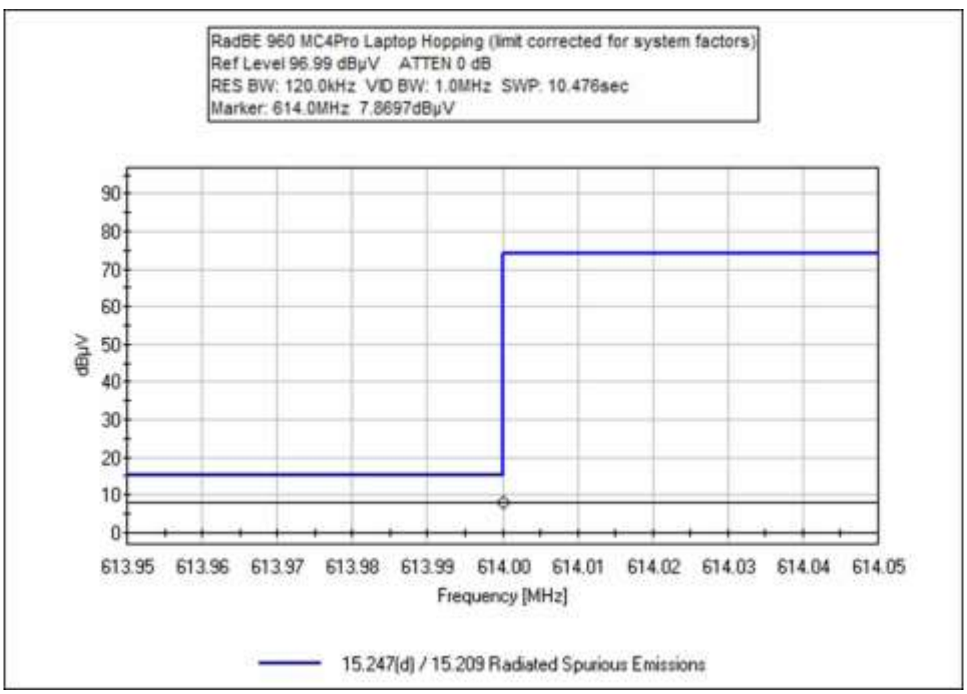

RadBE 902 MC4Pro Laptop Hopping (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 902.0MHz 11.8437dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


RadBE 928 MC4Pro Laptop Hopping (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 928.0MHz 32.1437dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

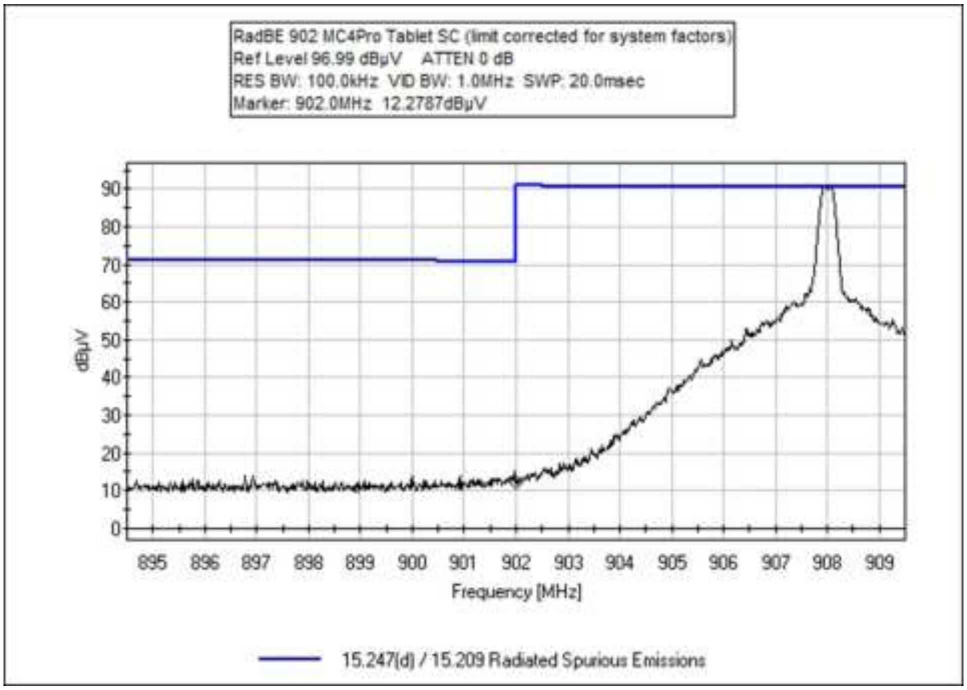

RadBE 614 MC4Pro Laptop SC (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 10.476sec
Marker: 614.0MHz 7.8357dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.95 613.96 613.97 613.98 613.99 614.00 614.01 614.02 614.03 614.04 614.05
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

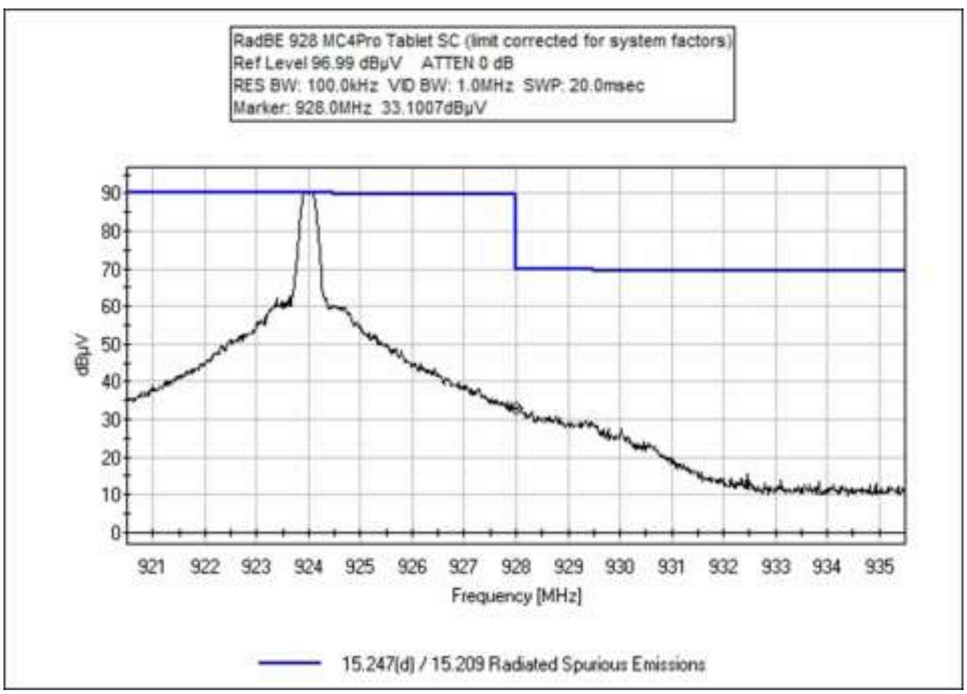

RadBE 960 MC4Pro Laptop SC (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 10.476sec
Marker: 960.0MHz 7.8667dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
959.95 959.96 959.97 959.98 959.99 960.00 960.01 960.02 960.03 960.04 960.05
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

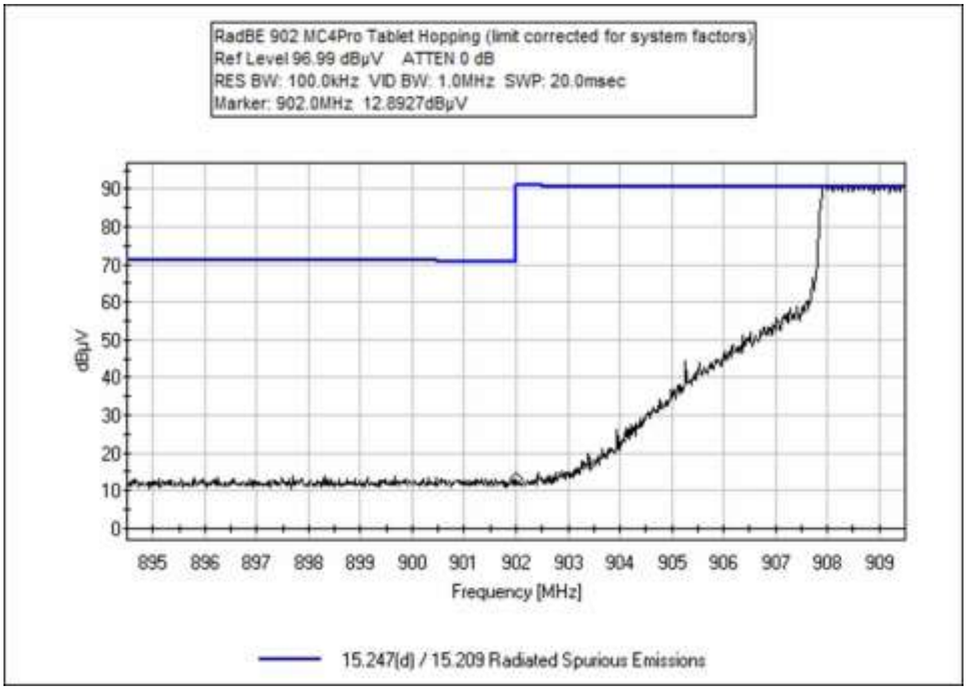

RadBE 614 MC4Pro Laptop Hopping (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 10.476sec
Marker: 614.0MHz 7.8697dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.95 613.96 613.97 613.98 613.99 614.00 614.01 614.02 614.03 614.04 614.05
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

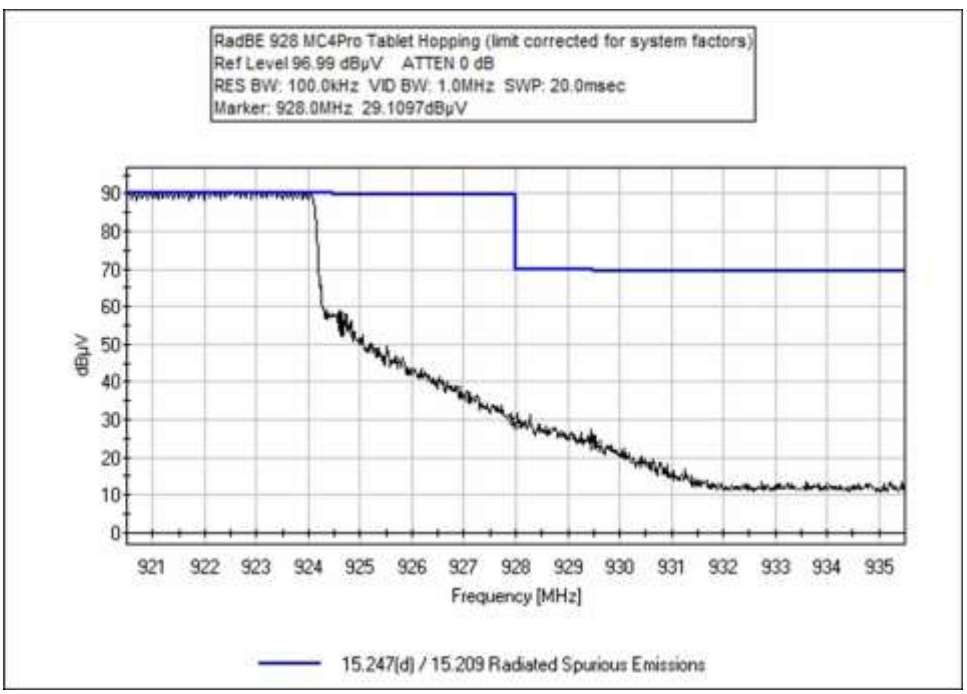

RadBE 960 MC4Pro Laptop Hopping (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 10.476sec
Marker: 614.0MHz 7.8697dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.95 613.96 613.97 613.98 613.99 614.00 614.01 614.02 614.03 614.04 614.05
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

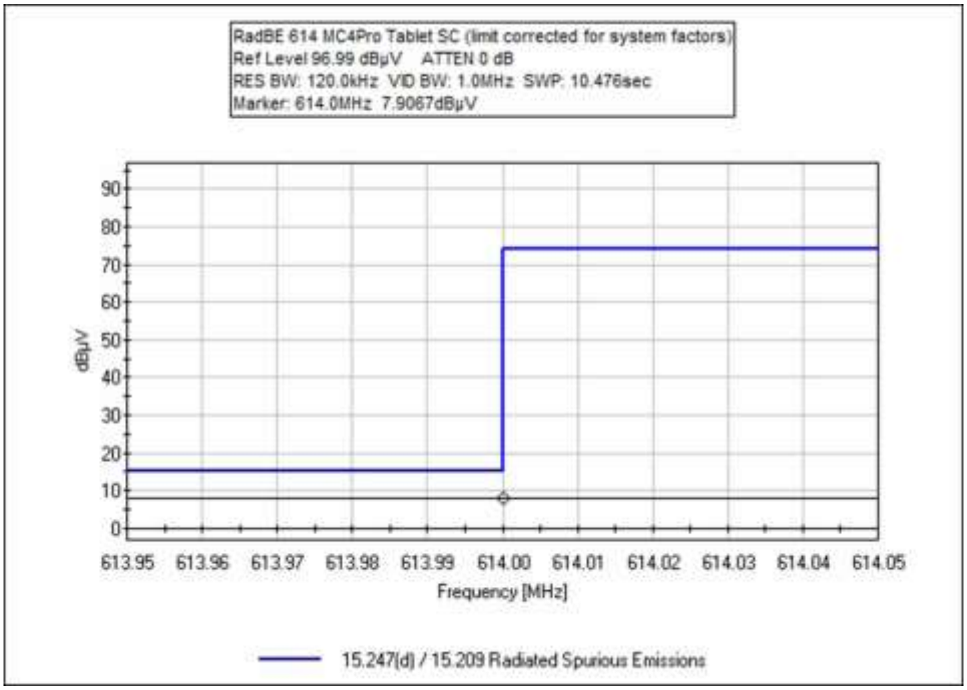
Configuration 2

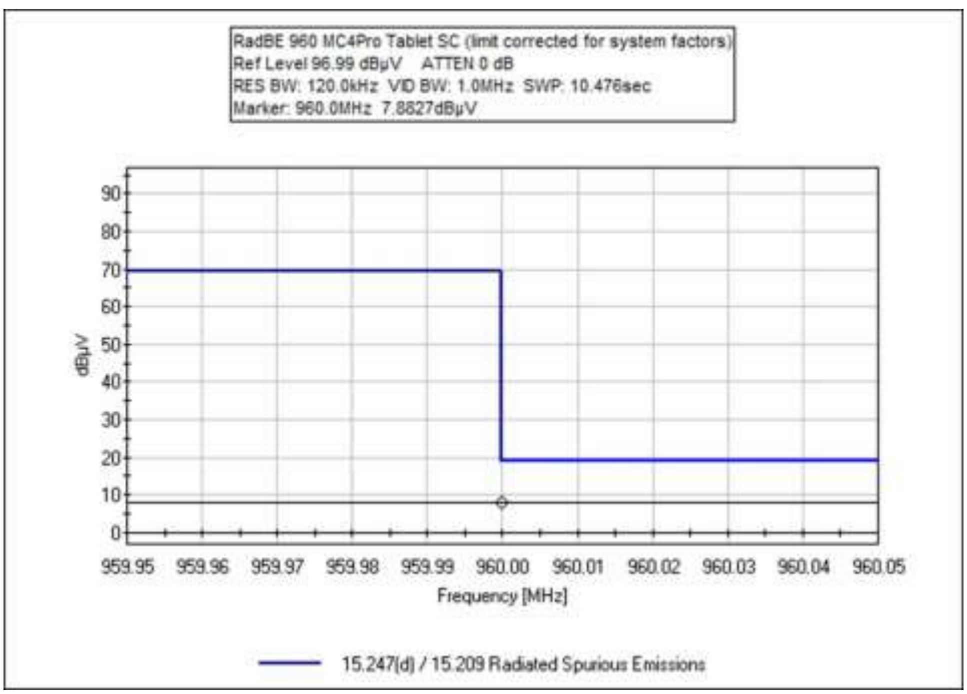


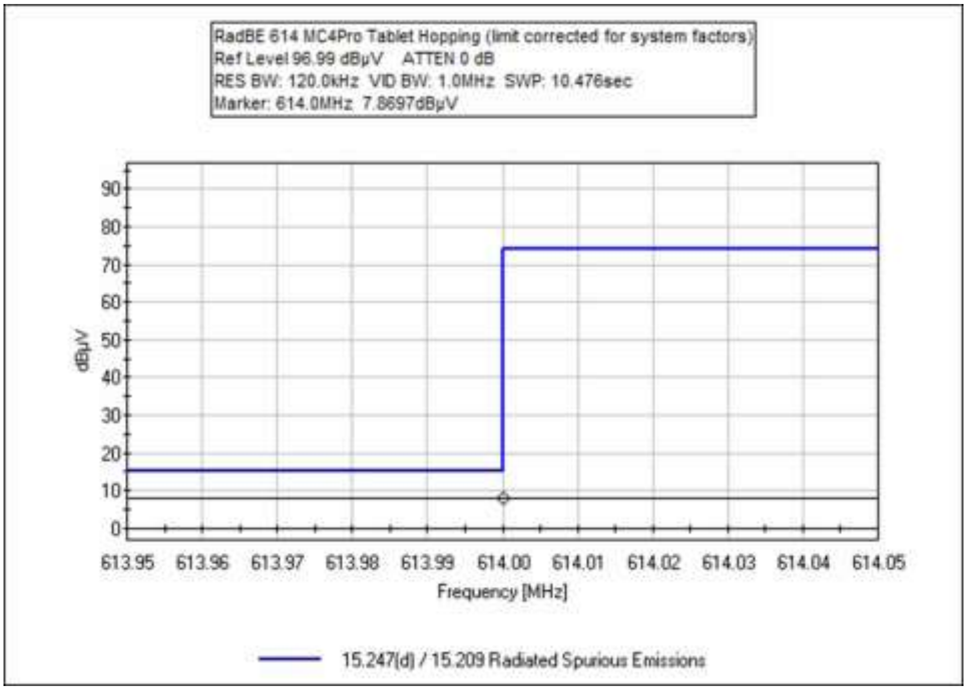


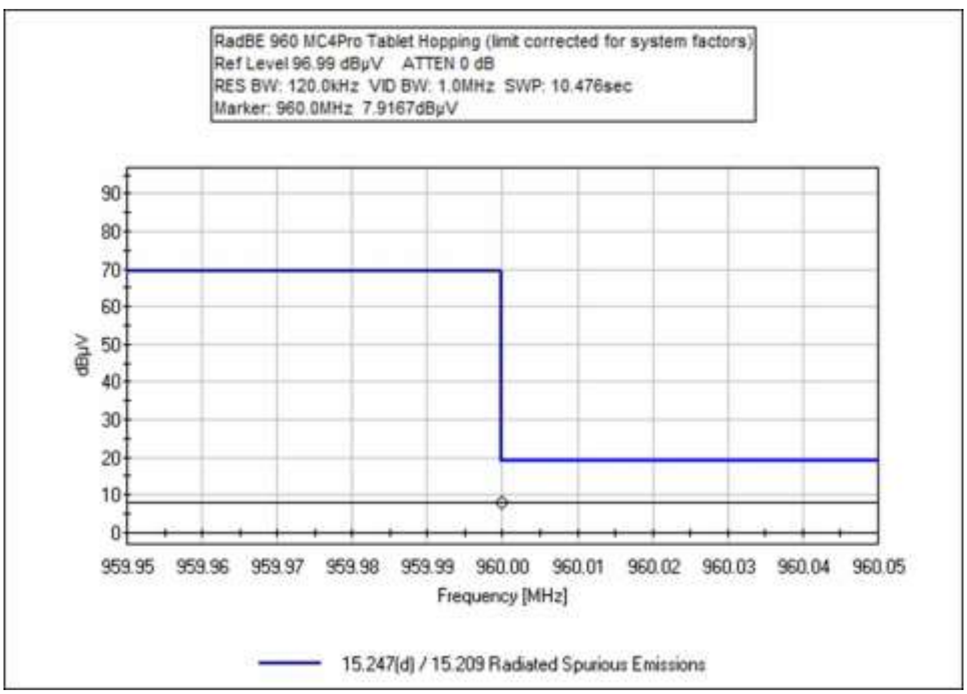

RadBE 902 MC4Pro Tablet Hopping (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 902.0MHz 12.8927dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


RadBE 928 MC4Pro Tablet Hopping (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 928.0MHz 29.1097dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


RadBE 614 MC4Pro Tablet SC (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 10.476sec
Marker: 614.0MHz 7.9067dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.95 613.96 613.97 613.98 613.99 614.00 614.01 614.02 614.03 614.04 614.05
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


RadBE 960 MC4Pro Tablet SC (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 10.476sec
Marker: 960.0MHz 7.8827dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
959.95 959.96 959.97 959.98 959.99 960.00 960.01 960.02 960.03 960.04 960.05
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


RadBE 614 MC4Pro Tablet Hopping (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 10.476sec
Marker: 614.0MHz 7.8697dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
613.95
613.96
613.97
613.98
613.99
614.00
614.01
614.02
614.03
614.04
614.05
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


RadBE 960 MC4Pro Tablet Hopping (limit corrected for system factors)
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 10.476sec
Marker: 960.0MHz 7.9167dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
959.95
959.96
959.97
959.98
959.99
960.00
960.01
960.02
960.03
960.04
960.05
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Itron, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**107795**	Date:	12/16/2022
Test Type:	**Maximized Emissions**	Time:	18:10:19
Tested By:	Michael Atkinson	Sequence#:	33
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 20°C
Humidity: 37%
Pressure: 102.2kPa

Frequency: Band Edge

Test Setup: EUT is continuously transmitting with modulation. Horizontal and vertical measurement antenna polarities investigated, worst-case reported. EUT XYZ axes investigated, worst-case reported. Also investigated with MAS boards removed, as well as receiver only boards removed, the fully loaded unit is representative of worst-case.

Power supply is remotely located outside of chamber with filter caps at chamber wall.

MC4Pro with Laptop

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T1	ANP06540	Cable	Heliax	1/17/2022	1/17/2024
T2	ANP05305	Cable	ETSI-50T	9/15/2021	9/15/2023
T3	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T4	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023

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

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	614.000M QP	7.9	+0.3	+1.2	+1.9	+27.2	+0.0	38.5	46.0	-7.5	Vert
2	614.000M QP	7.8	+0.3	+1.2	+1.9	+27.2	+0.0	38.4	46.0	-7.6	Vert
3	960.000M QP	7.9	+0.3	+1.5	+2.4	+30.7	+0.0	42.8	54.0	-11.2	Vert
4	960.000M QP	7.9	+0.3	+1.5	+2.4	+30.7	+0.0	42.8	54.0	-11.2	Vert
5	928.030M	34.3	+0.3	+1.5	+2.4	+30.6	+0.0	69.1	104.5	-35.4	Vert
6	928.000M	32.1	+0.3	+1.5	+2.4	+30.6	+0.0	66.9	104.5	-37.6	Vert
7	902.000M	13.2	+0.3	+1.4	+2.3	+29.6	+0.0	46.8	104.5	-57.7	Vert
8	902.000M	11.8	+0.3	+1.4	+2.3	+29.6	+0.0	45.4	104.5	-59.1	Vert

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717
Customer:	**Itron, Inc.**
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**
Work Order #:	**107795**
Date:	12/16/2022
Test Type:	**Maximized Emissions**
Time:	17:35:49
Tested By:	Michael Atkinson
Sequence#:	34
Software:	EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Test Environment Conditions:
Temperature: 20°C
Humidity: 37%
Pressure: 102.2kPa

Frequency: Band Edge

Test Setup: EUT is continuously transmitting with modulation. Horizontal and vertical measurement antenna polarities investigated, worst-case reported. EUT XYZ axes investigated, worst-case reported. Also investigated with MAS boards removed, as well as receiver only boards removed, the fully loaded unit is representative of worst-case.

Power supply is remotely located outside of chamber with filter caps at chamber wall.

MC4Pro with Tablet

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/29/2021	11/29/2023
T1	ANP06540	Cable	Heliax	1/17/2022	1/17/2024
T2	ANP05305	Cable	ETSI-50T	9/15/2021	9/15/2023
T3	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T4	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023

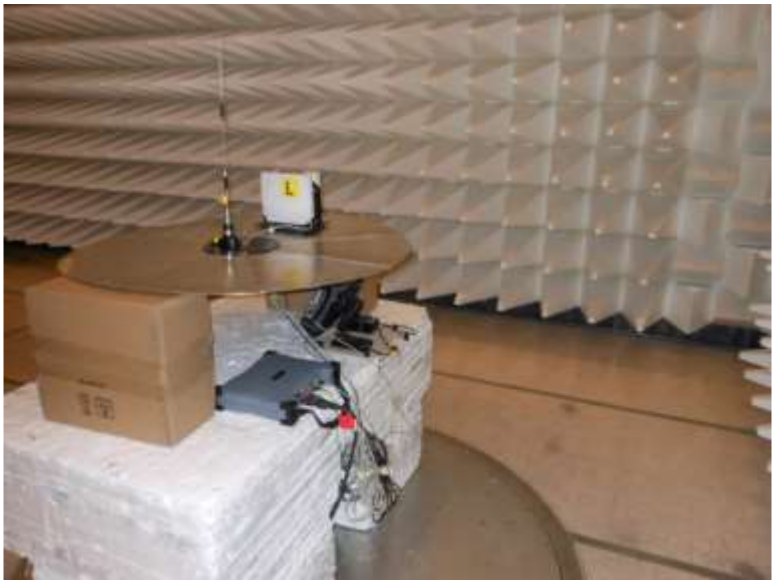
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	614.000M QP	7.9	+0.3	+1.2	+1.9	+27.2	+0.0	38.5	46.0 Hopping	-7.5	Vert
2	614.000M QP	7.9	+0.3	+1.2	+1.9	+27.2	+0.0	38.5	46.0 SC	-7.5	Vert
3	960.000M QP	7.9	+0.3	+1.5	+2.4	+30.7	+0.0	42.8	54.0 SC	-11.2	Vert
4	960.000M QP	7.9	+0.3	+1.5	+2.4	+30.7	+0.0	42.8	54.0 Hopping	-11.2	Vert
5	928.000M	33.1	+0.3	+1.5	+2.4	+30.6	+0.0	67.9	104.5 SC	-36.6	Vert
6	928.000M	29.1	+0.3	+1.5	+2.4	+30.6	+0.0	63.9	104.5 Hopping	-40.6	Vert
7	902.000M	12.9	+0.3	+1.4	+2.3	+29.6	+0.0	46.5	104.5 Hopping	-58.0	Vert
8	902.000M	12.3	+0.3	+1.4	+2.3	+29.6	+0.0	45.9	104.5 SC	-58.6	Vert

Test Setup Photo(s)

Below 1GHz; Laptop

Above 1GHz; Laptop


Below 1GHz; Tablet


Above 1GHz; Laptop

X-Axis

Y-Axis

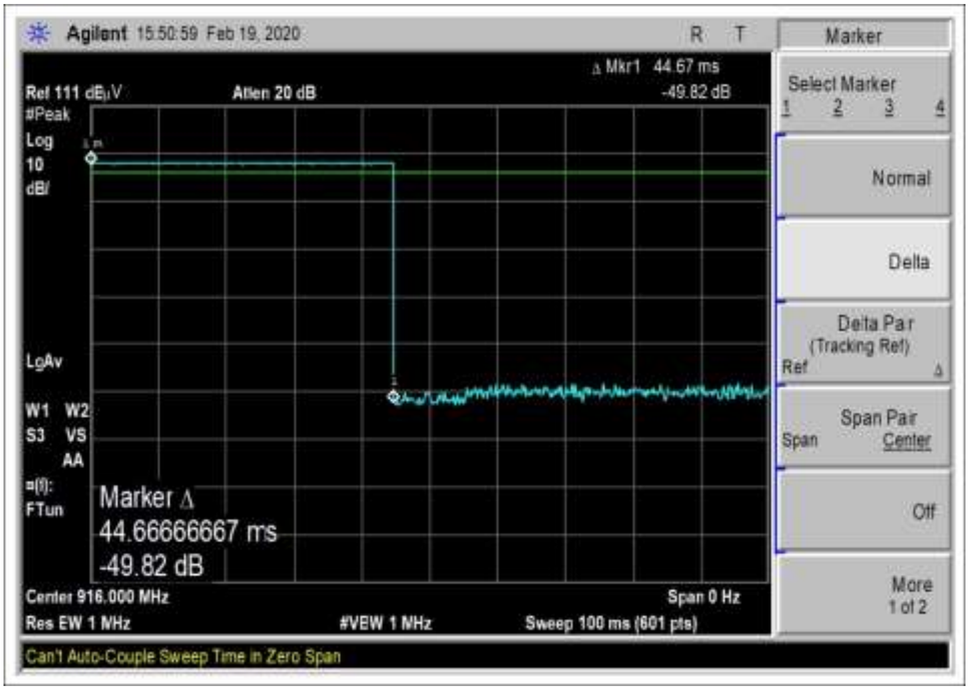
Z-Axis

Appendix A: Manufacturer Declaration

The manufacturer declares that the **MC4Pro** model: **MC4C** tested is representative of the **MC4Core** model: **MC4C1**.

Appendix B: Manufacturer Provided Data

Duty Cycle Plot



SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

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

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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