

Maiden Rock Communications

ADDENDUM TO TEST REPORT 95510-4

Packet Data Radio
Model: MRC565-40-43

Tested To The Following Standards:

FCC Part 90I

Report No.: 95510-4A

Date of issue: July 18, 2014



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 EMC testing for CKC Laboratories, Inc.

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

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Maiden Rock Communications
586 Double Arrow Road
Seeley Lake, MT 59868

REPRESENTATIVE: Fred Cleveland
Customer Reference Number: CKC 04152014

REPORT PREPARED BY:

Morgan Tramontin
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 95510

DATE OF EQUIPMENT RECEIPT:

April 14, 2014

DATE(S) OF TESTING:

April 14 - 16, 2014

Revision History

Original: Testing of Packet Data Radio Model: MRC565-40-43 to FCC Part 90I.

Addendum A: To correct the test conditions for section 2.1046 / 90.205 RF Power Output and to correct the test equipment and test conditions for section 2.1053 / 90.210(c) Field Strength of Spurious Radiation.

Report Authorization

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



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

Test Facility Information



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

TEST LOCATION(S):
CKC Laboratories, Inc.
22116 23rd Drive S.E., Suite A
Bothell, WA 98021-4413

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.00.14

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Bothell	US0081	SL2-IN-E-1145R	3082C-1	318736	A-0148

SUMMARY OF RESULTS

Standard / Specification: FCC Part(s) 2 / 90I

Test Procedure/Method	Description	Results
2.1046 / 90.205	RF Power Output	Pass
2.1047	Modulation Characteristics	NA ²
2.1049 / 90.209	Occupied Bandwidth	Pass
2.1051 / 90.210(c)	Spurious Emissions at Antenna Terminals	Pass
2.1053 / 90.210(c)	Field Strength of Spurious Radiation	Pass
2.1055 / 90.213	Frequency Stability	Pass

NA² = Not applicable. See the section in the report for the reason.

Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
During Testing, Support laptop is connected through a shielded cat5 and wrapped 3 times through a ferrite bead. Antenna port is terminated through a characteristic load.

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Packet Data Radio

Manuf: Maiden Rock Communications
Model: MRC565-40-43
Serial: 1002

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Laptop

Manuf: Dell
Model: Inspiration N5110
Serial: 56ZMQR1

EUT power Supply

Manuf: Precision
Model: 1901
Serial: None

30dB Attenuator

Manuf: BIRD
Model: 50-A-FFN-30
Serial: None

10 dB Attenuator 50 Ohm

Manuf: None
Model: None
Serial: None

FCC PART(S) 2 / 90I

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) requirements for 47 CFR Part 2: Frequency Allocations and Radio Treaty Matters, General Rules and Regulations and Licensed Device falling under Part 90: Private Land Mobile Radio Services.

2.1046 / 90.205 RF Power Output

Test Equipment					
Asset #	Description	Model	Manufacturer	Cal Date	Cal Due
P05749	Attenuator	PE7010-20	Pasternack	1/27/2014	1/27/2016
P05759	Attenuator	PE7010-20	Pasternack	1/27/2014	1/27/2016
P05979	Attenuator	40-6-34	Weinschel	2/13/2014	2/13/2016
P06505	Cable	32026-29080-29080-84	Astrolab	10/18/2013	10/18/2015
2871	Spectrum Analyzer	E4440A	Agilent	7/19/2013	7/19/2015

Test Conditions / Setup

TX OUTPUT POWER

Customer:	Maiden Rock Communications		
WO#:	95510		
Date:	14-Apr-14		
Test Engineer:	S. Pittsford		
Test Specification	2.1046/90.205		
 Device Model #:	MRC565-40-43		
Operating Voltage:	12 VDC		
Power Limit	300 Watts		
	54.7 dBm		

Channel	Frequency	Power (dBm)	Result
Low BPSK	40MHz	50.1	PASS
Mid BPSK	41.5MHz	50.2	PASS
High BPSK	43MHz	50.4	PASS
Low GMSK	40MHz	50.1	PASS
Mid GMSK	41.5MHz	50.2	PASS
High GMSK	43MHz	50.3	PASS

Temp: 24°C

Humidity: 31%

Pressure: 102.3kPa

EUT is located on a table.

EUT is connected to a support laptop through a CAT 5 cable.

Antenna port is connected to the Spectrum analyzer through 45.6dB of attenuation.

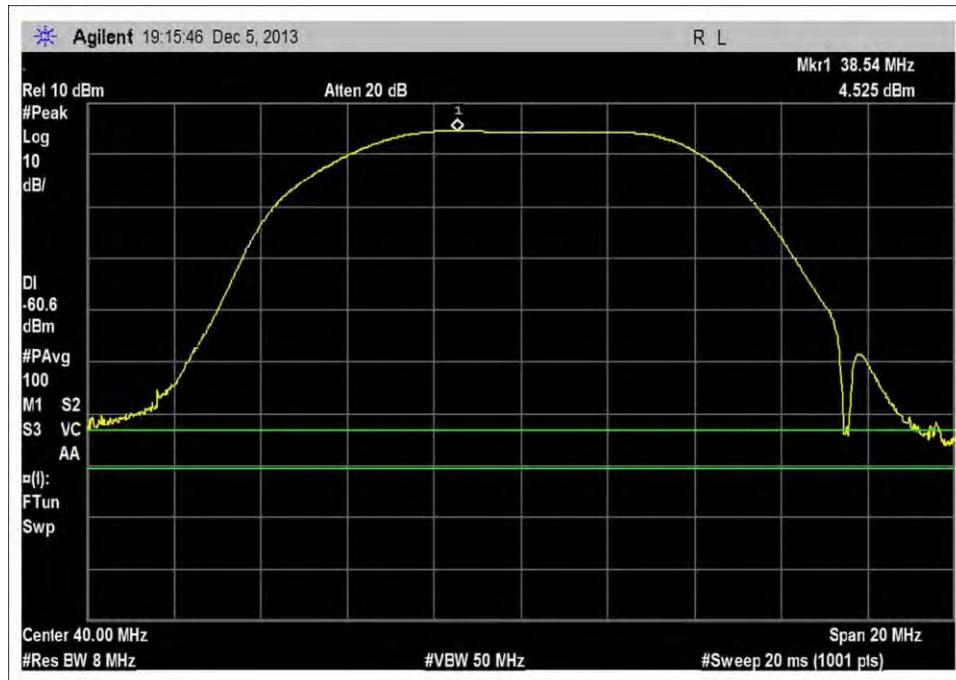
The measured power in the table has this 45.6dB of measurement system loss added to the plot readings.

EUT is connected to a DC power supply.

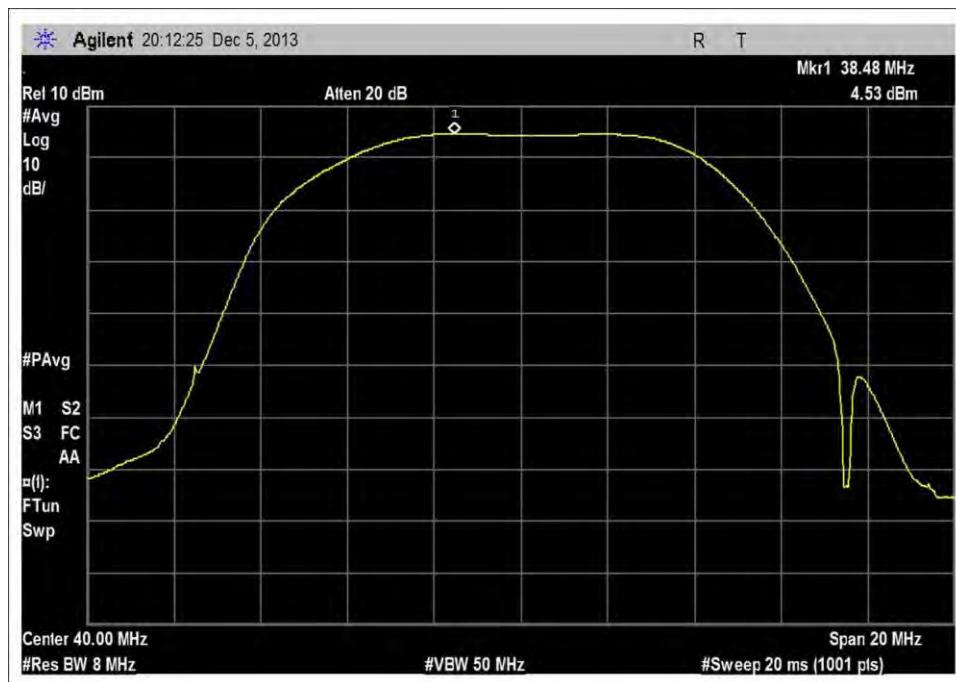
EUT will be in transmit mode.

Testing performed per TIA-603C

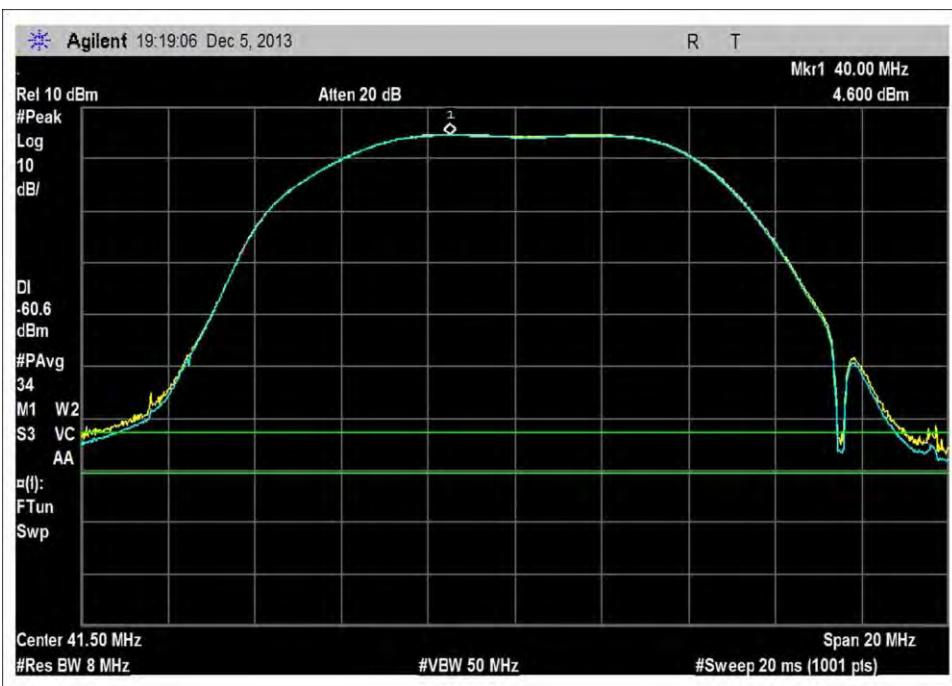
Test Data



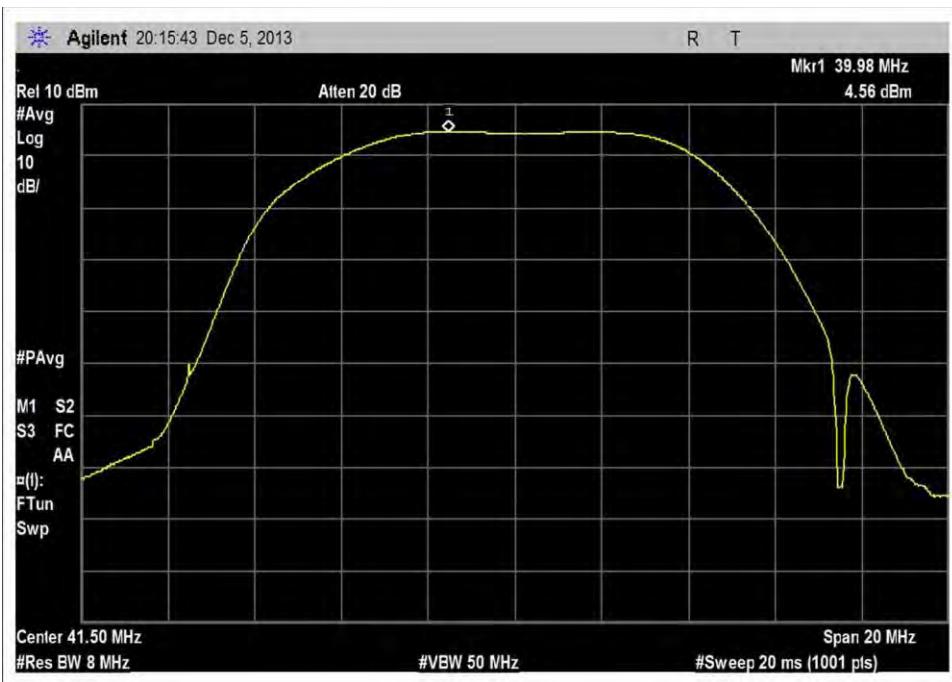
40MHz, BPSK



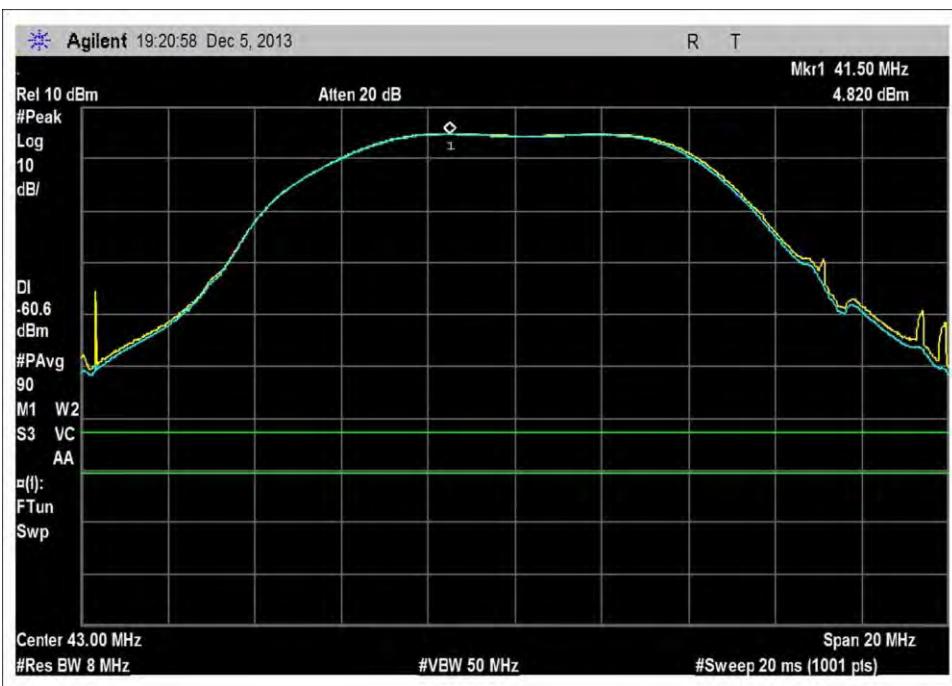
40MHz, GMSK



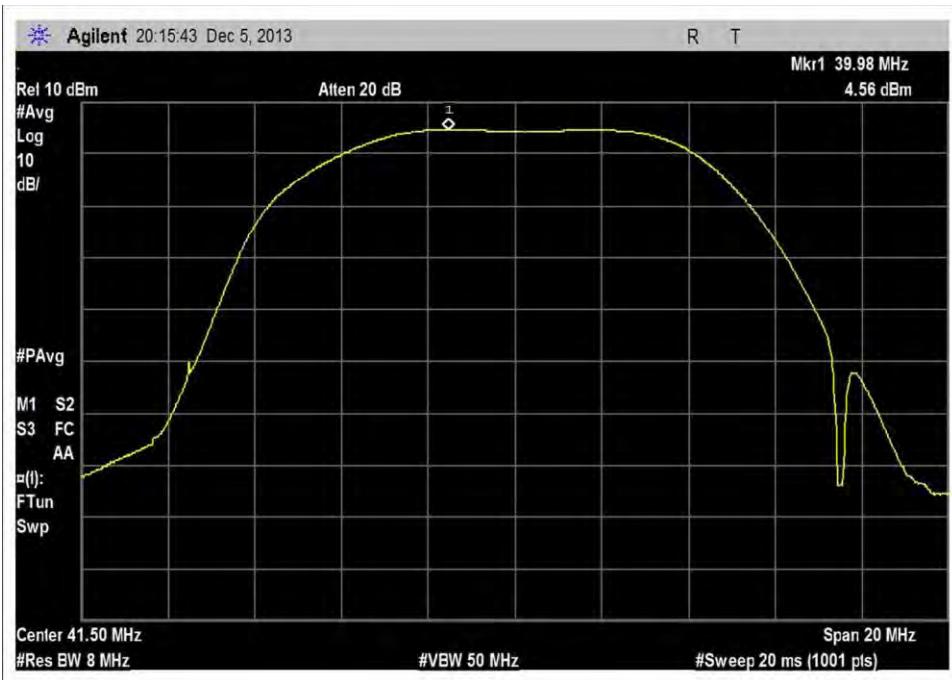
41.5MHz, BPSK



41.5MHz, GMSK



43MHz, BPSK



43MHz, GMSK

Test Setup Photo



2.1047 Modulation Characteristics

Not applicable because the software that generates the digital modulation types emitted by the EUT implements modulation limiting.

2.1049 / 90.209 Occupied Bandwidth

Test Equipment

Asset #	Description	Model	Manufacturer	Cal Date	Cal Due
P05749	Attenuator	PE7010-20	Pasternack	1/27/2014	1/27/2016
P05759	Attenuator	PE7010-20	Pasternack	1/27/2014	1/27/2016
P05979	Attenuator	40-6-34	Weinschel	2/13/2014	2/13/2016
P06505	Cable	32026-29080-29080-84	Astrolab	10/18/2013	10/18/2015
2871	Spectrum Analyzer	E4440A	Agilent	7/19/2013	7/19/2015
P05749	Attenuator	PE7010-20	Pasternack	1/27/2014	1/27/2016

Test Conditions / Setup

BW Limitations

Customer:	Maiden Rock Communications
WO#:	95510
Date:	14-Apr-14
Test Engineer:	S. Pittsford
Test Specification	2.1049/90.209
Device Model #:	MRC565-40-43
Operating Voltage:	12 VDC
BW Limit	20 kHz

Channel	Frequency	BW (kHz)	Result
Low BPSK	40MHz	16.36	PASS
Mid BPSK	41.5MHz	14.76	PASS
High BPSK	43MHz	14.6	PASS
Low GMSK	40MHz	11.79	PASS
Mid GMSK	41.5MHz	10.74	PASS
High GMSK	43MHz	12.24	PASS

Temp: 24°C

Humidity: 31%

Pressure: 102.3kPa

EUT is located on a table.

EUT is connected to a support laptop through a CAT 5 cable.

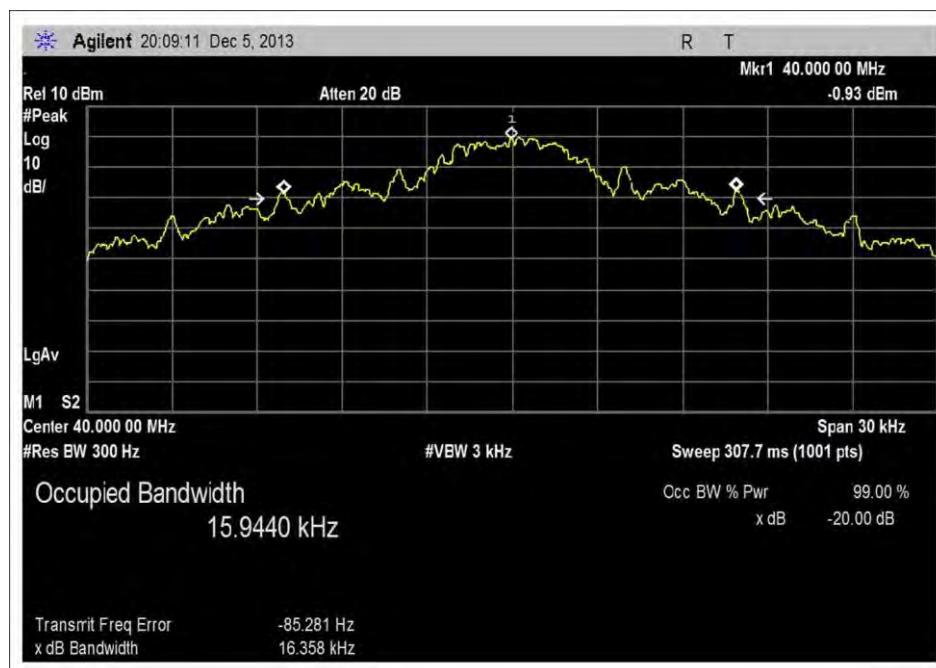
Antenna port is connected to the Spectrum analyser through 45.6dB of attenuation.

EUT is connected to a DC power supply.

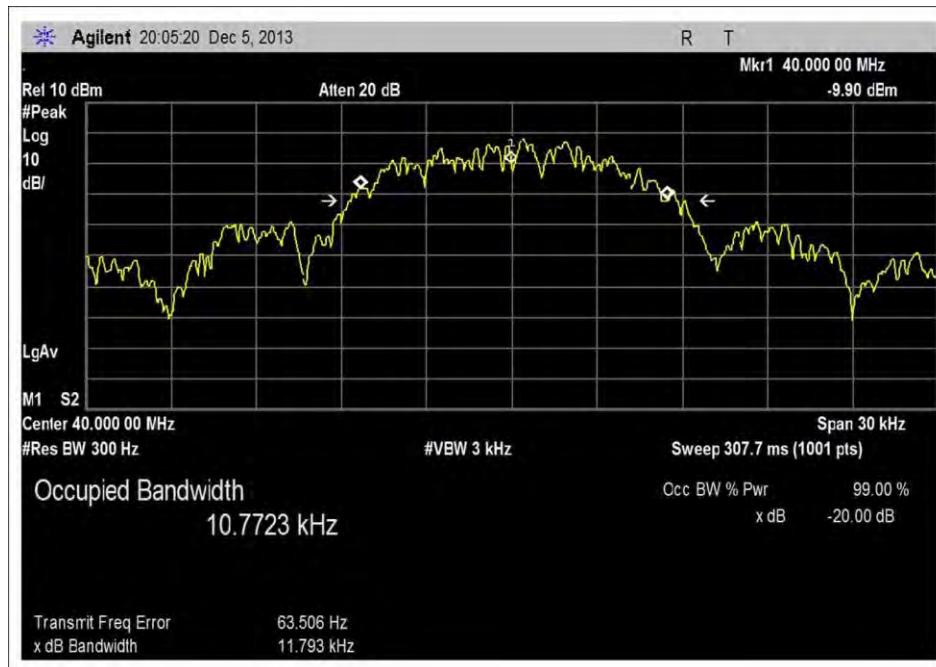
EUT will be in transmit mode.

Testing performed per TIA-603C

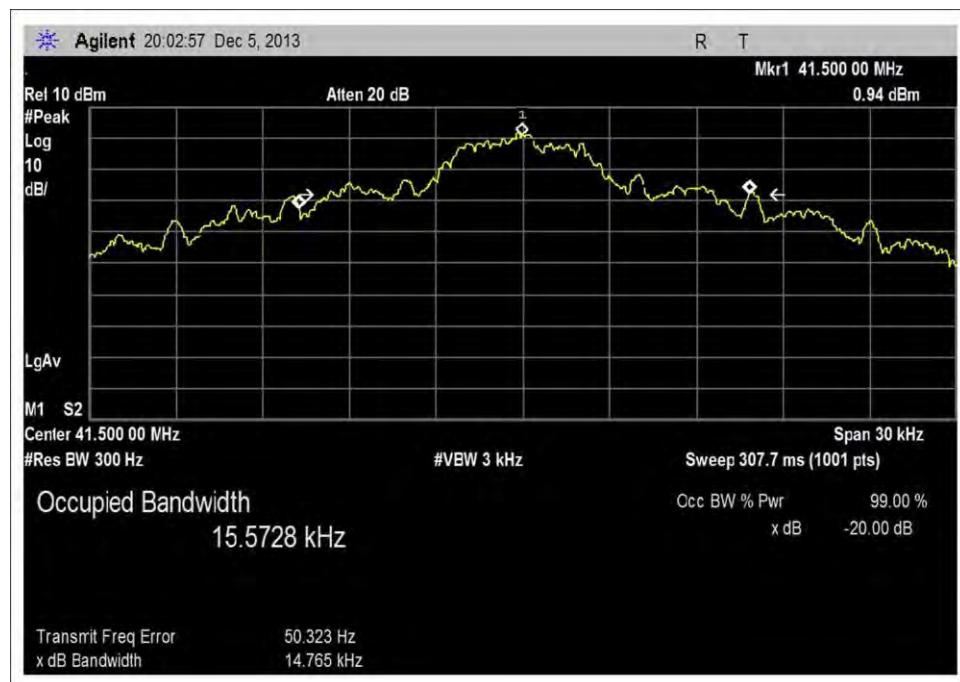
Test Data



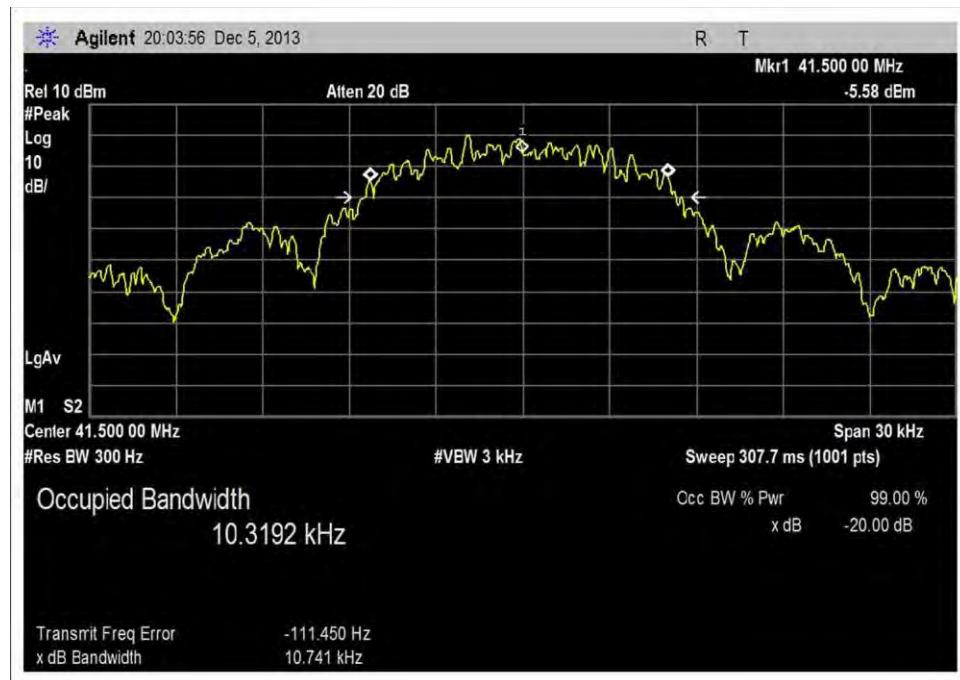
40MHz, BPSK



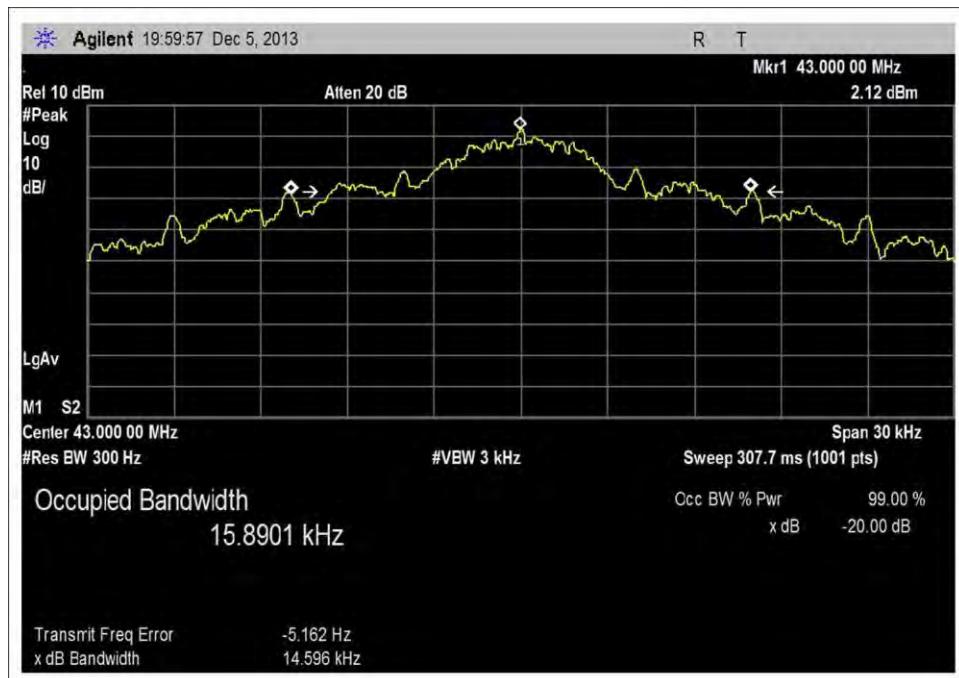
40MHz, GMSK



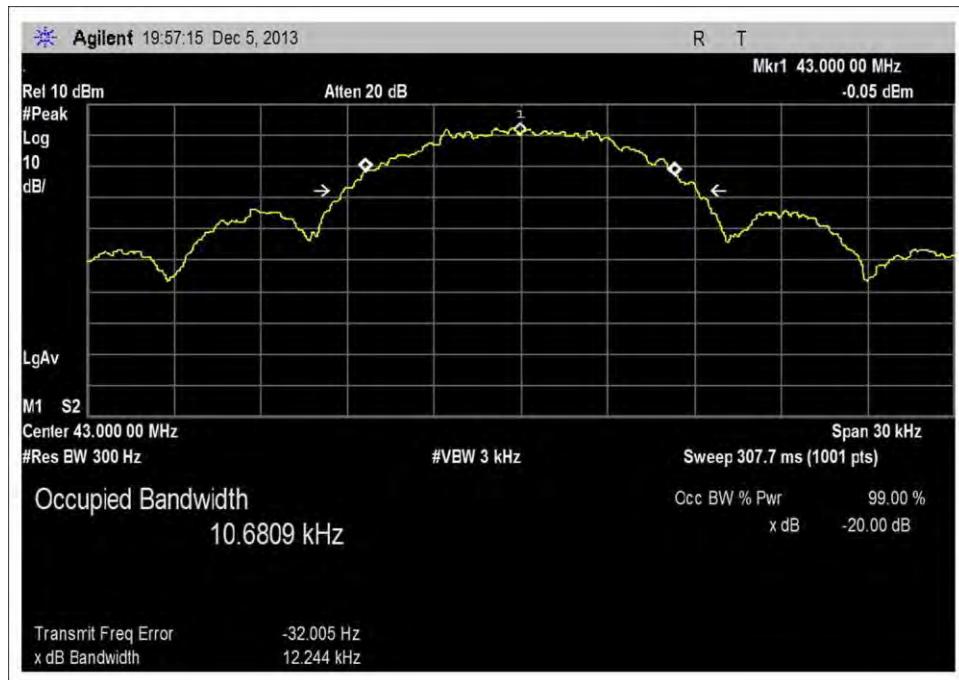
41.5MHz, BPSK



41.5MHz, GMSK



43MHz, BPSK



43MHz, GMSK

Test Setup Photo



2.1051 / 90.210(c) Spurious Emissions at Antenna Terminals

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717

Customer: **Maiden Rock Communications**
 Specification: **47 CFR 2.1051/§ 90.210(c) Spurious Emissions**
 Work Order #: **95510** Date: **4/14/2014**
 Test Type: **Conducted Emissions** Time: **16:34:28**
 Equipment: **Packet Data Radio** Sequence#: **25**
 Manufacturer: Maiden Rock Communications Tested By: Steven Pittsford
 Model: MRC565-40-43 120V 60Hz
 S/N: 1002

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05749	Attenuator	PE7010-20	1/27/2014	1/27/2016
T2	ANP05759	Attenuator	PE7010-20	1/27/2014	1/27/2016
T3	ANP05979	Attenuator	40-6-34	2/13/2014	2/13/2016
T4	ANP06505	Cable	32026-29080-29080-84	10/18/2013	10/18/2015
T5	AN02871	Spectrum Analyzer	E4440A	4/11/2013	4/11/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Packet Data Radio*	Maiden Rock Communications	MRC565-40-43	1002

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop	Dell	Inspiration N5110	56ZMQR1
EUT power Supply	Precision	1901	

Test Conditions / Notes:

Temperature: 21°C

Pressure: 101.9kPa

Humidity: 32%

Freq: 9k-1GHz

Transmit mode only at 40, 41.5 & 43MHz. GMSK & BPSK

Support laptop is connected through a shielded cat5 and wrapped 3 times through a ferrite bead.

Antenna port is terminated through a characteristic load.

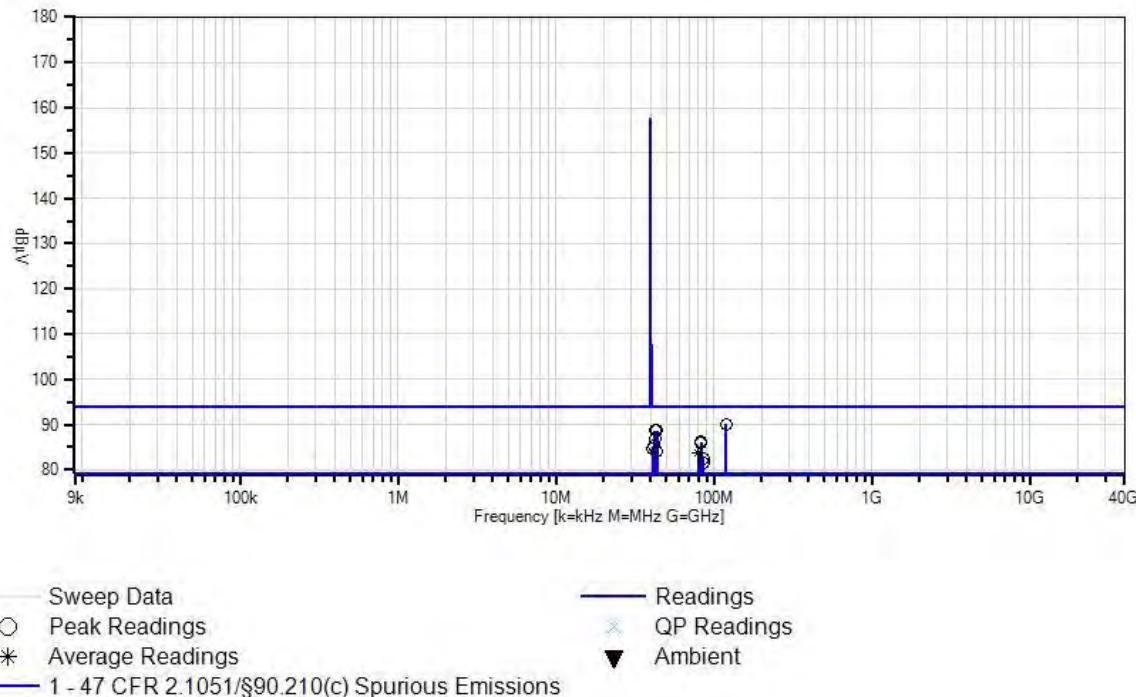
100W 10% duty cycle

Ext Attn: 0 dB

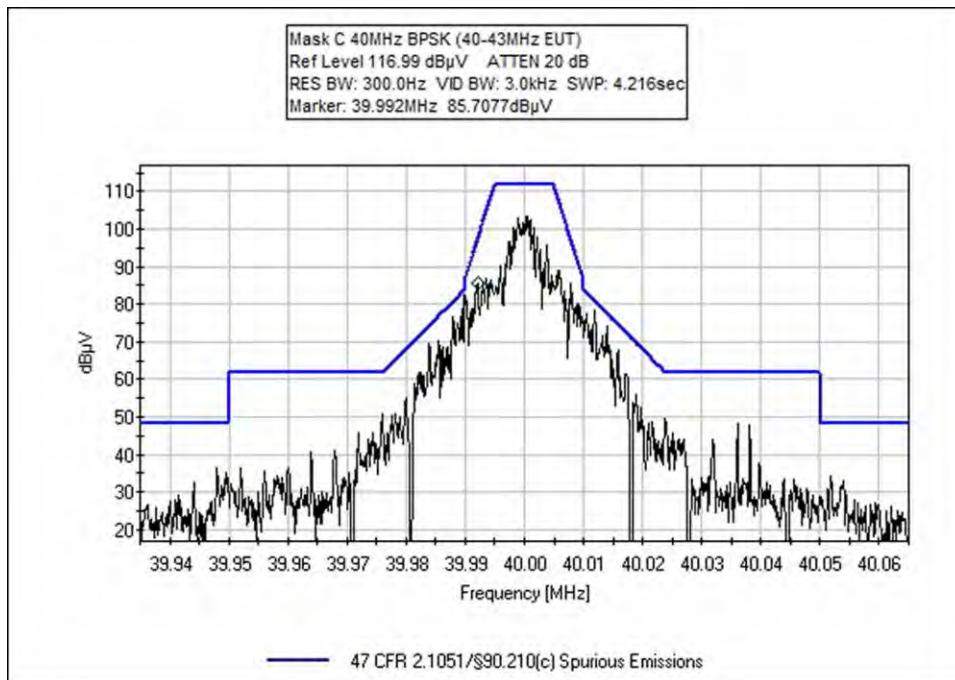
Measurement Data:			Reading listed by margin.				Test Lead: Antenna				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5				Table				
			MHz	dB μ V	dB	dB	dB	Table	dB μ V	dB	Ant
1	120.008M	44.3	+19.5 +0.0	+20.3	+5.6	+0.4	+0.0	90.1	94.0	-3.9	Anten
											40MHz GMSK
2	42.506M	43.1	+19.5 +0.0	+20.3	+5.6	+0.2	+0.0	88.7	94.0	-5.3	Anten
											43MHz BPSK
3	43.546M	43.1	+19.5 +0.0	+20.3	+5.6	+0.2	+0.0	88.7	94.0	-5.3	Anten
											43MHz BPSK
4	42.502M	41.2	+19.5 +0.0	+20.3	+5.6	+0.2	+0.0	86.8	94.0	-7.2	Anten
											43MHz GMSK
5	82.996M	40.4	+19.5 +0.0	+20.3	+5.6	+0.3	+0.0	86.1	94.0	-7.9	Anten
											41.5MHz GMSK
6	83.002M	40.2	+19.5 +0.0	+20.3	+5.6	+0.3	+0.0	85.9	94.0	-8.1	Anten
											41.5MHz BPSK
7	42.008M	39.7	+19.5 +0.0	+20.3	+5.6	+0.2	+0.0	85.3	94.0	-8.7	Anten
											41.5MHz GMSK
8	41.006M	39.0	+19.5 +0.0	+20.3	+5.6	+0.2	+0.0	84.6	94.0	-9.4	Anten
											41.5MHz GMSK
9	43.514M	38.3	+19.5 +0.0	+20.3	+5.6	+0.2	+0.0	83.9	94.0	-10.1	Anten
											43MHz GMSK
10	79.998M	38.0	+19.5 +0.0	+20.3	+5.6	+0.3	+0.0	83.7	94.0	-10.3	Anten
	Ave										40MHz GMSK
11	85.997M	36.8	+19.5 +0.0	+20.3	+5.6	+0.3	+0.0	82.5	94.0	-11.5	Anten
											43MHz BPSK
12	86.006M	35.7	+19.5 +0.0	+20.3	+5.6	+0.3	+0.0	81.4	94.0	-12.6	Anten
											43MHz GMSK
13	129.001M	32.4	+19.4 +0.0	+20.3	+5.6	+0.4	+0.0	78.1	94.0	-15.9	Anten
											43MHz BPSK
14	80.000M	31.8	+19.5 +0.0	+20.3	+5.6	+0.3	+0.0	77.5	94.0	-16.5	Anten
	Ave										40MHz BPSK
^	79.998M	51.3	+19.5 +0.0	+20.3	+5.6	+0.3	+0.0	97.0	94.0	+3.0	Anten
											40MHz GMSK
^	80.000M	44.5	+19.5 +0.0	+20.3	+5.6	+0.3	+0.0	90.2	94.0	-3.8	Anten
											40MHz BPSK
17	119.998M	30.5	+19.5 +0.0	+20.3	+5.6	+0.4	+0.0	76.3	94.0	-17.7	Anten
											40MHz BPSK
18	171.992M	28.8	+19.4 +0.0	+20.3	+5.6	+0.4	+0.0	74.5	94.0	-19.5	Anten
											43MHz GMSK
19	165.991M	27.7	+19.4 +0.0	+20.3	+5.6	+0.4	+0.0	73.4	94.0	-20.6	Anten
											41.5MHz GMSK
20	166.001M	27.2	+19.4 +0.0	+20.3	+5.6	+0.4	+0.0	72.9	94.0	-21.1	Anten
											41.5MHz BPSK
21	172.003M	27.0	+19.4 +0.0	+20.3	+5.6	+0.4	+0.0	72.7	94.0	-21.3	Anten
											43MHz BPSK
22	124.500M	26.7	+19.4 +0.0	+20.3	+5.6	+0.4	+0.0	72.4	94.0	-21.6	Anten
											41.5MHz BPSK
23	159.999M	26.5	+19.4 +0.0	+20.3	+5.6	+0.4	+0.0	72.2	94.0	-21.8	Anten
											40MHz BPSK

24	124.496M	25.8	+19.4 +0.0	+20.3	+5.6	+0.4	+0.0	71.5	94.0	-22.5	Anten
									41.5MHz GMSK		
25	159.992M	24.7	+19.4 +0.0	+20.3	+5.6	+0.4	+0.0	70.4	94.0	-23.6	Anten
								40MHz GMSK			
26	415.057M	23.7	+19.5 +0.0	+20.3	+5.6	+0.6	+0.0	69.7	94.0	-24.3	Anten
								41.5MHz BPSK			
27	200.013M	23.3	+19.5 +0.0	+20.3	+5.6	+0.4	+0.0	69.1	94.0	-24.9	Anten
								40MHz GMSK			
28	386.994M	23.0	+19.5 +0.0	+20.3	+5.6	+0.6	+0.0	69.0	94.0	-25.0	Anten
								43MHz BPSK			
29	199.999M	23.2	+19.5 +0.0	+20.3	+5.6	+0.4	+0.0	69.0	94.0	-25.0	Anten
								40MHz BPSK			
30	9.450M	22.5	+19.4 +0.0	+20.3	+5.6	+0.1	+0.0	67.9	94.0	-26.1	Anten
31	730.000k	21.9	+19.4 +0.0	+20.3	+5.6	+0.0	+0.0	67.2	94.0	-26.8	Anten
32	38.040M	20.6	+19.5 +0.0	+20.3	+5.6	+0.2	+0.0	66.2	94.0	-27.8	Anten
33	18.520M	20.6	+19.5 +0.0	+20.3	+5.6	+0.1	+0.0	66.1	94.0	-27.9	Anten
34	279.984M	17.9	+19.5 +0.0	+20.3	+5.6	+0.5	+0.0	63.8	94.0	-30.2	Anten
								40MHz GMSK			
35	519.972M	17.1	+19.5 +0.0	+20.4	+5.7	+0.7	+0.0	63.4	94.0	-30.6	Anten
								40MHz GMSK			
36	319.978M	16.2	+19.5 +0.0	+20.3	+5.6	+0.5	+0.0	62.1	94.0	-31.9	Anten
								40MHz GMSK			
37	559.964M	15.0	+19.5 +0.0	+20.4	+5.7	+0.7	+0.0	61.3	94.0	-32.7	Anten
								40MHz GMSK			
38	360.016M	14.5	+19.5 +0.0	+20.3	+5.6	+0.6	+0.0	60.5	94.0	-33.5	Anten
								40MHz GMSK			
39	399.977M	14.3	+19.5 +0.0	+20.3	+5.6	+0.6	+0.0	60.3	94.0	-33.7	Anten
								40MHz GMSK			

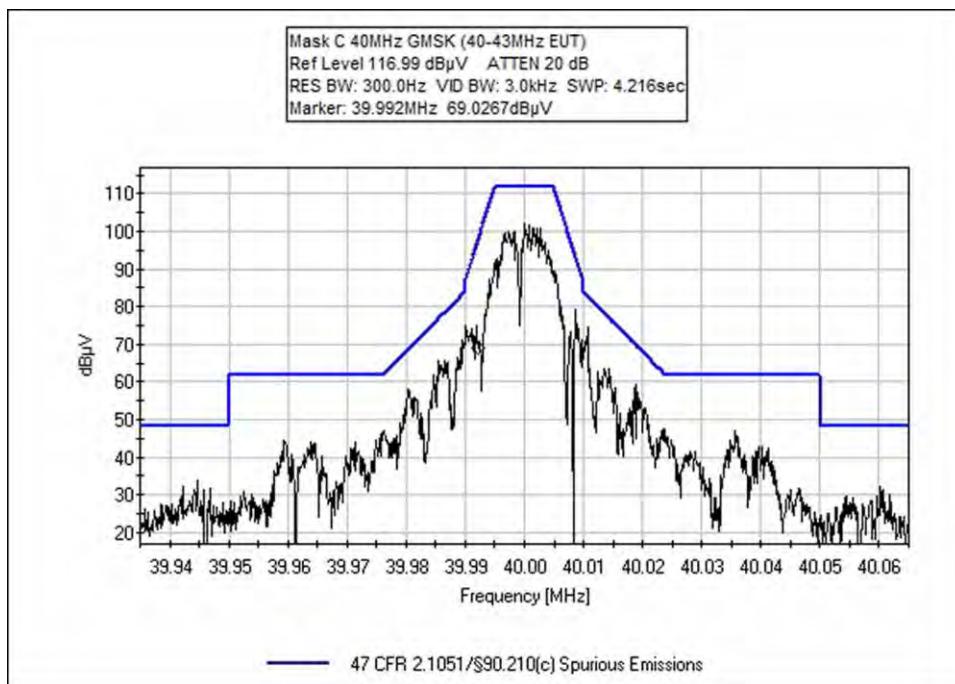
CKC Laboratories, Inc. Date: 4/14/2014 Time: 16:34:28 Maiden Rock Communications WO#: 95510
Test Lead: Antenna 120V 60Hz Sequence#: 25 Antenna
Maiden Rock Communications Packet Data Radio P/N: MRC565-40-43



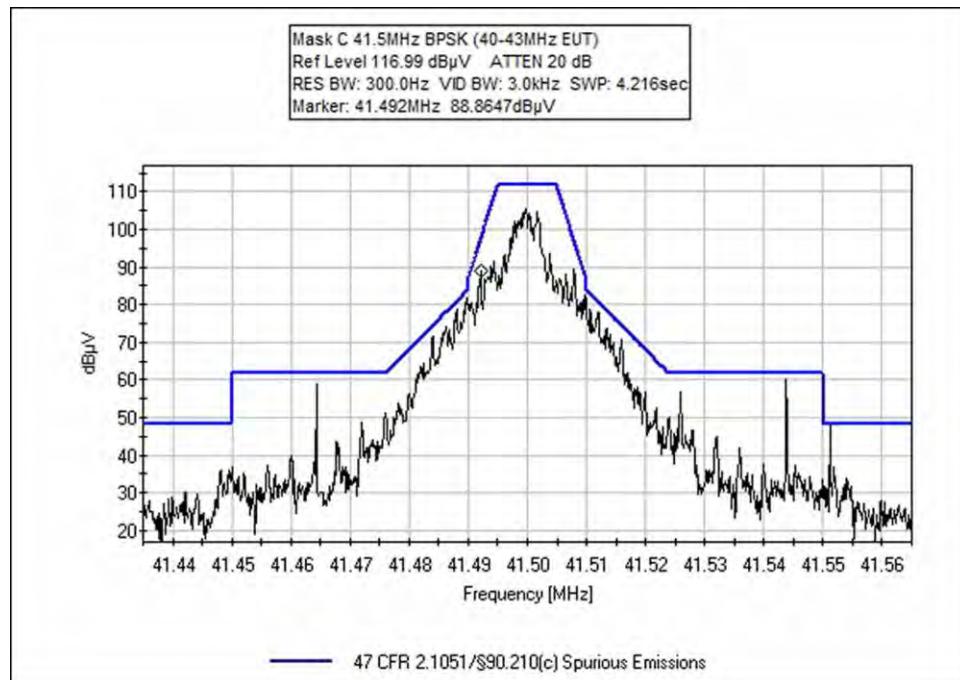
Test Data



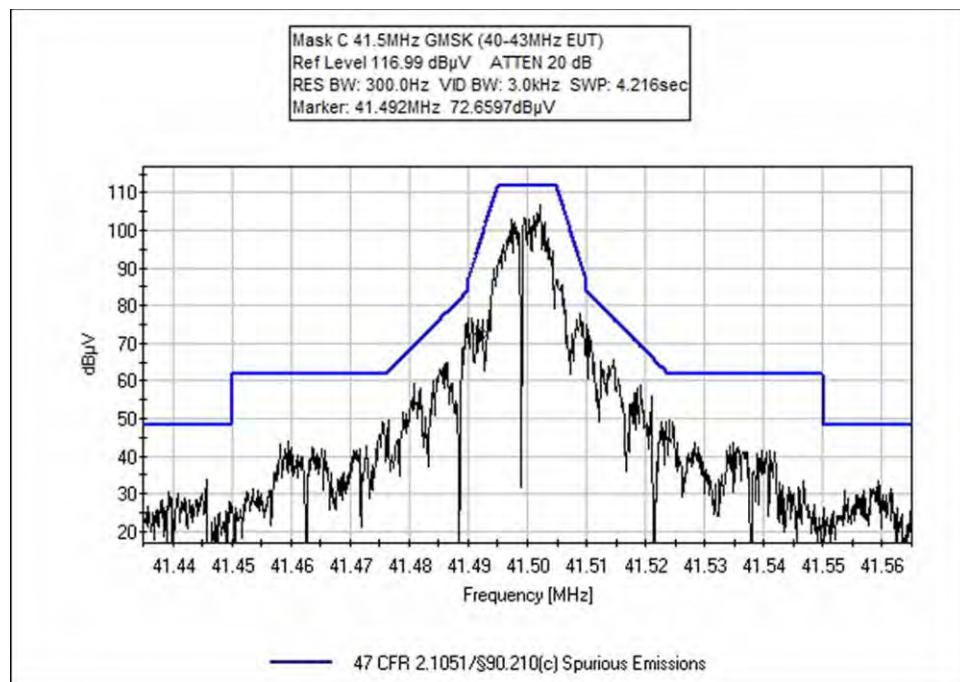
40MHz, BPSK



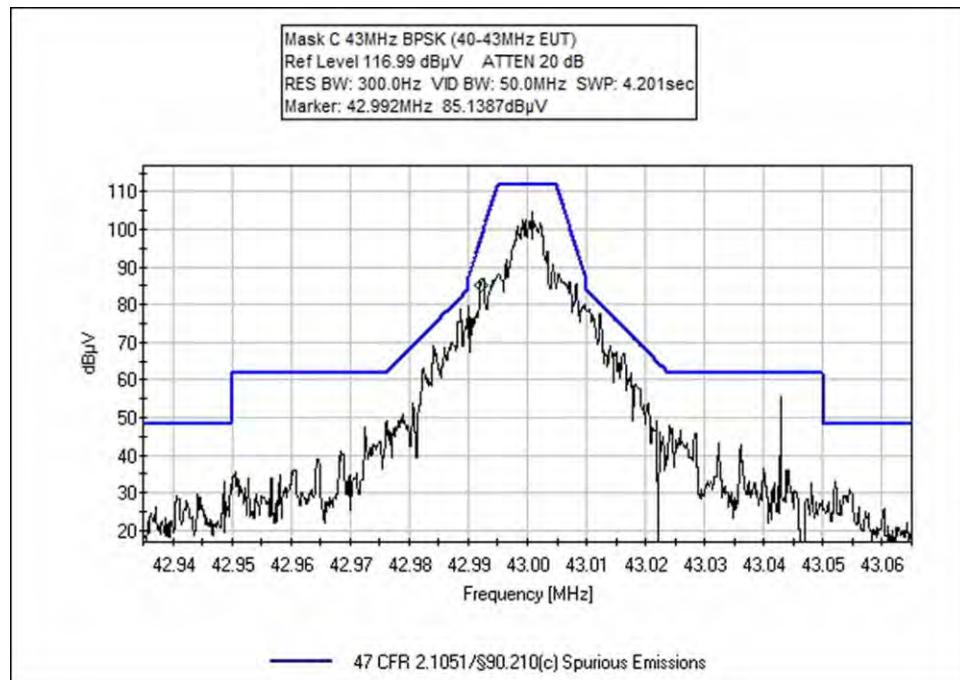
40MHz, GMSK



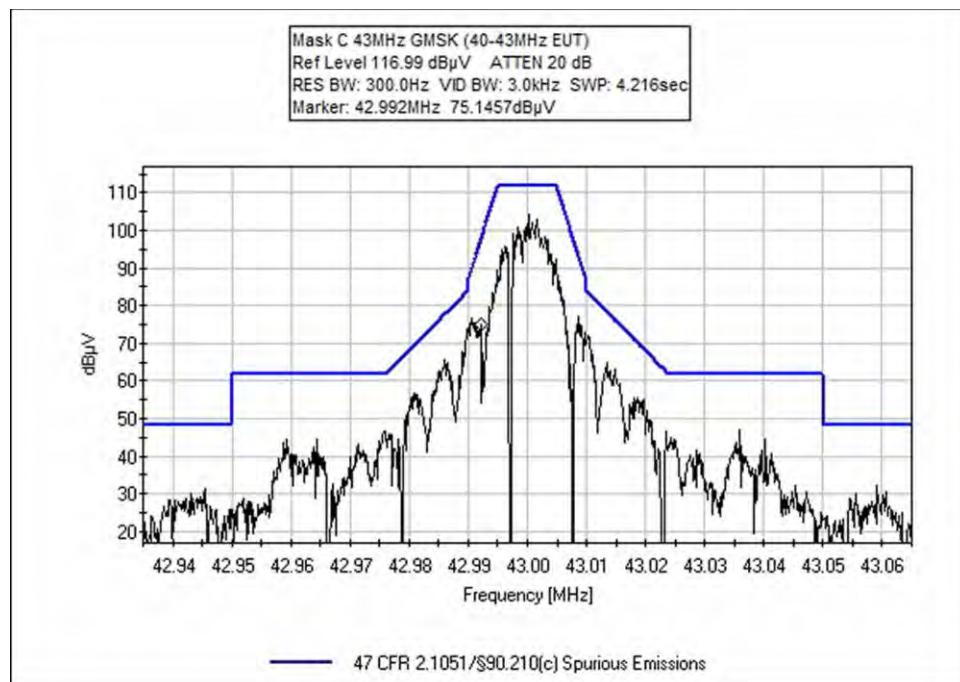
41.5MHz, BPSK



41.5MHz, GMSK



43MHz, BPSK



43MHz, GMSK

Test Setup Photo



2.1053 / 90.210(c) Field Strength of Spurious Radiation

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • (425) 402-1717

Customer: **Maiden Rock Communications**
 Specification: **47 CFR § 90.210(c) Spurious Emissions**
 Work Order #: **95510** Date: **4/15/2014**
 Test Type: **Maximized Emissions** Time: **11:33:37**
 Equipment: **Packet Data Radio** Sequence#: **2**
 Manufacturer: Maiden Rock Communications Tested By: Steven Pittsford
 Model: MRC565-40-43
 S/N: 1002

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02307	Preamp	8447D	3/14/2014	3/14/2016
T2	AN01993	Biconilog Antenna	CBL6111C	3/7/2014	3/7/2016
T3	ANP05360	Cable	RG214	12/3/2012	12/3/2014
T4	ANP05963	Cable	RG-214	2/21/2014	2/21/2016
T5	ANP06505	Cable	32026-29080-29080-84	10/18/2013	10/18/2015
T6	AN02872	Spectrum Analyzer	E4440A	7/19/2013	7/19/2015
	AN00052	Loop Antenna	6502	5/20/2014	5/20/2016

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Packet Data Radio*	Maiden Rock Communications	MRC565-40-43	1002

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop	Dell	Inspiration N5110	56ZMQR1
30dB Attenuator	BIRD	50-A-FFN-30	
EUT power Supply	Precision	1901	
10 dB Attenuator 50 Ohm			

Test Conditions / Notes:

Temperature: 21°C
 Pressure: 101.9kPa
 Humidity: 32%
 Freq:9k-1000MHz
 No Emissions we observed within 20dB of the limit from 9k-30MHz

Notes:

Transmit mode only at 40, 41.5 & 43 MHz. GMSK & BPSK Investigated. (BPSK is worst case)
 Support laptop is connected through a shielded cat5 and wrapped 3 times through a ferrite bead
 Antenna port is terminated through a characteristic load.
 100W 10% duty cycle

Operating Frequency(ies):	40, 41.5 & 43MHz	
Operational Mode(s):	GMSK & BPSK(BPSK is worst case)	
Highest Measured Power:	50.4	dBm
Measurement Distance:	3	meters

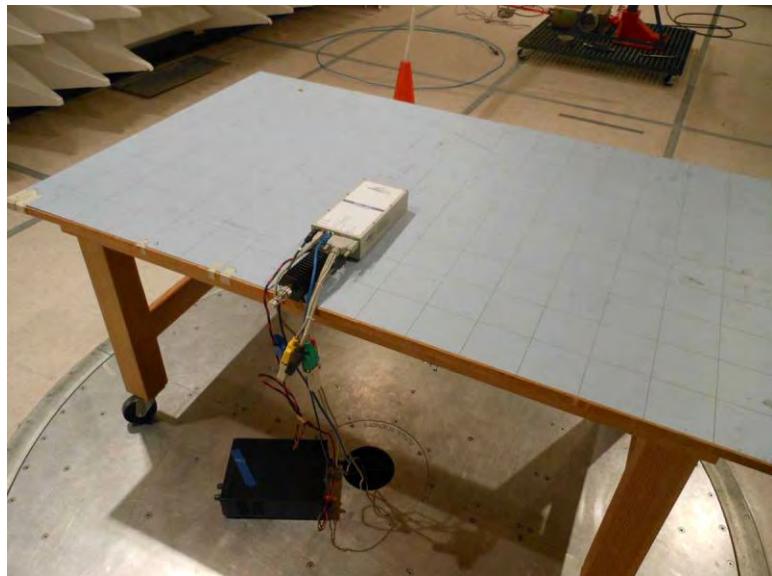
Limit Definition:

Frequency Range	Limit (dBc)	Limit Calculation
9kHz - 1GHz	63.4	$43+10^*\log(P)$

Frequency (MHz)	Reference Level (dBm)	Measured (dBc)	Margin	Antenna Polarity
41.489	-17.9	68.3	-4.9	Vertical
129.015	-30.9	81.3	-17.9	Horizontal
86.039	-34.0	84.4	-21.0	Horizontal
79.985	-34.2	84.6	-21.2	Vertical
120.008	-34.7	85.1	-21.7	Horizontal
83.005	-34.9	85.3	-21.9	Horizontal
119.997	-35.0	85.4	-22.0	Horizontal
124.465	-36.2	86.6	-23.2	Vertical
42.962	-38.8	89.2	-25.8	Horizontal
128.993	-38.9	89.3	-25.9	Vertical
124.493	-39.0	89.4	-26.0	Horizontal
86.006	-39.2	89.6	-26.2	Horizontal
479.971	-40.9	91.3	-27.9	Vertical
500.000	-42.9	93.3	-29.9	Horizontal
79.997	-43.0	93.4	-30.0	Horizontal
83.004	-43.7	94.1	-30.7	Horizontal
159.996	-46.6	97.0	-33.6	Horizontal
46.876	-46.8	97.2	-33.8	Horizontal
166.026	-46.9	97.3	-33.9	Horizontal
560.014	-47.4	97.8	-34.4	Vertical
900.000	-48.0	98.4	-35.0	Vertical
960.014	-50.4	100.8	-37.4	Horizontal
520.028	-50.6	101.0	-37.6	Horizontal
43.046	-51.5	101.9	-38.5	Vertical
600.000	-51.6	102.0	-38.6	Horizontal
171.992	-52.1	102.5	-39.1	Vertical

Frequency (MHz)	Reference Level (dBm)	Measured (dBc)	Margin	Antenna Polarity
999.786	-52.5	102.9	-39.5	Horizontal
174.906	-54.0	104.4	-41.0	Horizontal
949.964	-54.5	104.9	-41.5	Vertical
199.991	-54.9	105.3	-41.9	Horizontal
539.365	-56.0	106.4	-43.0	Horizontal
549.874	-56.7	107.1	-43.7	Horizontal
497.914	-57.3	107.7	-44.3	Horizontal
399.900	-57.6	108.0	-44.6	Horizontal

Test Setup Photos



2.1055 / 90.213 Frequency Stability

Test Equipment

Asset #	Description	Model	Manufacturer	Cal Date	Cal Due
2757	Temperature Chamber	F100/350-8	Bemco	1/22/2013	1/22/2015
2871	Spectrum Analyzer	E4440A	Agilent	7/19/2013	7/19/2015
3029	Thermometer, Digital Infrared	566	Fluke	2/1/2013	2/1/2015
P05749	Attenuator	PE7010-20	Pasternack	1/27/2014	1/27/2016
P05759	Attenuator	PE7010-20	Pasternack	1/27/2014	1/27/2016
P05979	Attenuator	40-6-34	Weinschel	2/13/2014	2/13/2016

Test Conditions / Setup

Frequency Stability

Customer:	Maiden Rock Communications
WO#:	95510
Date:	15-Apr-14
Test Engineer:	S. Pittsford
Test Specification	90.213
Device Model #:	MRC565-40-43
Operating Voltage:	12 VDC/VAC
Frequency Limit:	20 PPM

Temperature Variations

Channel Frequency:		Channel 1 (MHz)	Dev. (PPM)	Channel 2 (MHz)	Dev. (PPM)	Channel 3 (MHz)	Dev. (PPM)
Temp (C)	Voltage	40		41.5		43	
-30	12	39.99998	0.42500	41.49998	0.43373	42.99998	0.44186
-20	12	39.99999	0.30000	41.49999	0.28916	42.99999	0.27907
-10	12	39.99999	0.17500	41.49999	0.16867	42.99999	0.16279
0	12	39.99999	0.27500	41.49999	0.26506	42.99999	0.23256
10	12	39.99998	0.42500	41.49998	0.40964	42.99998	0.41860
20	12	39.99997	0.67500	41.49997	0.72289	42.99997	0.76744
30	12	39.99997	0.75000	41.49997	0.74699	42.99997	0.69767
40	12	39.99997	0.72500	41.49997	0.77108	42.99997	0.74419
50	12	39.99997	0.87500	41.49997	0.84337	42.99996	0.83721

Voltage Variations ($\pm 15\%$)

20	10.2	39.99997	0.75000	41.49997	0.79518	42.99997	0.69767
20	12	39.99997	0.67500	41.49997	0.72289	42.99997	0.76744
20	13.8	39.99997	0.67500	41.49997	0.72289	42.99997	0.62791

Max Deviation (PPM)	0.87500	0.84337	0.83721
	PASS	PASS	PASS

Test Conditions:

Three EUTs are located inside the temperature chamber. Each has its own power cord to the power supply. The EUTs are connected to the support laptop via cat 5 cables that are routed through a CISCO ethernet hub. Each EUT's antenna port will be connected to the spectrum analyser via 46dB of attenuation.

Test Setup Photos



SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties 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.

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

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") 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.