

Digital Control, Inc.

DigiRadio

Report No. DIGC0139

Report Prepared By



www.nwemc.com
1-888-EMI-CERT

© 2011 Northwest EMC, Inc

EMC Test Report

Certificate of Test
Last Date of Test: April 7, 2011
Digital Control, Inc.
Model: DigiRadio

Emissions			
Test Description	Specification	Test Method	Pass/Fail
Emission Mask	FCC 90I:2011	ANSI/TIA/EIA-603-C-2004	Pass
Occupied Bandwidth	FCC 90I:2011	ANSI/TIA/EIA-603-C-2004	Pass
Output Power	FCC 90I:2011	ANSI/TIA/EIA-603-C-2004	Pass
Frequency Stability	FCC 90I:2011	ANSI/TIA/EIA-603-C-2004	Pass
Spurious Conducted Emissions	FCC 90I:2011	ANSI/TIA/EIA-603-C-2004	Pass
Receiver Spurious Emissions	FCC 15.109:2011	ANSI C63.4:2003	Pass
Transmitter Spurious Emissions	FCC 90I:2011	ANSI/TIA/EIA-603-C-2004	Pass

Modifications made to the product

See the Modifications section of this report

Test Facility

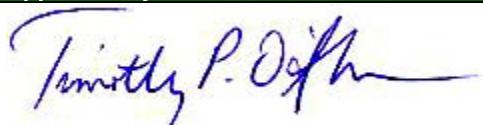
The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124

Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834D-1).

Approved By:



Tim O'Shea, Operations Manager



NVLAP Lab Code: 200630-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.



Accreditations and Authorizations

FCC

Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP

Northwest EMC, Inc. is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. NVLAP is administered by the National Institute of Standards and Technology (NIST), an agency of the U.S. Commerce Department. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 2004/108/EC, and ANSI C63.4. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

Industry Canada

Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS-Gen, Issue 2 and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements. (Site Filing Numbers - Hillsboro: 2834D-1, 2834D-2, Sultan: 2834C-1, Irvine: 2834B-1, 2834B-2, Brooklyn Park: 2834E-1)

CAB

Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

Australia/New Zealand

The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).



Accreditations and Authorizations

VCCI

Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. (*Registration Numbers. - Hillsboro: C-1071, R-1025, G-84, C-2687, T-1658, and R-2318, Irvine: R-1943, G-85, C-2766, and T-1659, Sultan: R-871, G-83, C-1784, and T-1511, Brooklyn Park: R-3125, G-86, G-141, C-3464, and T-1634*).

BSMI

Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement (US0017).

GOST

Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

KCC

Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (*Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157, Brooklyn Park: US0175*)

VIETNAM

Vietnam MIC has approved Northwest EMC as an accredited test lab. Per Decision No. 194/QD-QLCL (dated December 15, 2009), Northwest EMC test reports can be used for Vietnam approval submissions.

SCOPE

For details on the Scopes of our Accreditations, please visit:
<http://www.nwemc.com/accreditations/>



Northwest EMC Locations



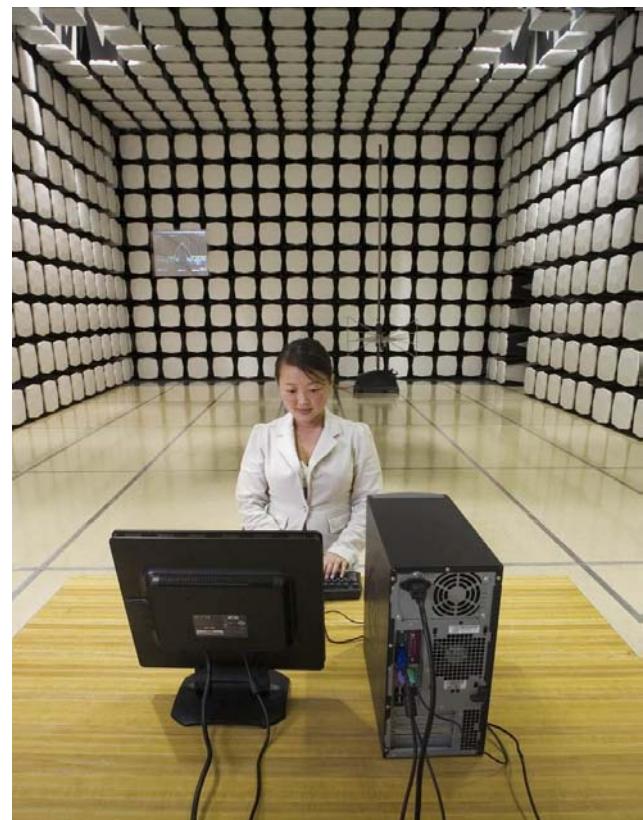
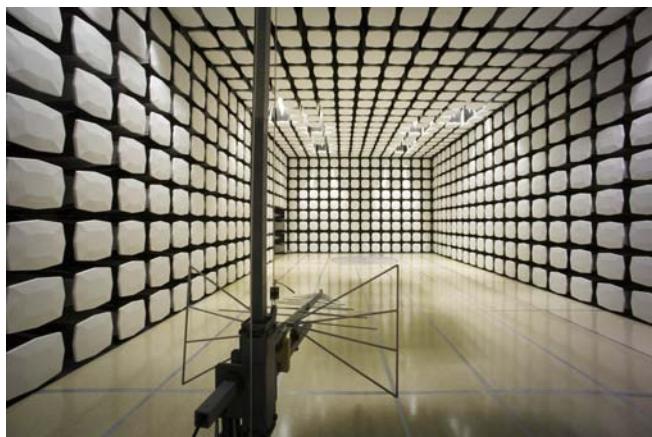
Oregon
Labs EV01-EV12
22975 NW Evergreen Pkwy
Suite 400
Hillsboro, OR 97124
(503) 844-4066

California
Labs OC01-OC13
41 Tesla
Irvine, CA 92618
(949) 861-8918

Minnesota
Labs MN01-MN08
9349 W Broadway Ave.
Brooklyn Park,
MN 55445
(763) 425-2281

Washington
Labs SU01-SU07
14128 339th Ave. SE
Sultan, WA 98294
(360) 793-8675

New York
Labs WA01-WA04
4939 Jordan Rd.
Elbridge, NY 13060
(315) 685-0796



Party Requesting the Test

Company Name:	Digital Control, Inc.
Address:	19625 62nd Avenue South, Suite B103
City, State, Zip:	Kent, WA 98032
Test Requested By:	Amanda Hamm
Model:	DigiRadio
First Date of Test:	March 28, 2011
Last Date of Test:	April 7, 2011
Receipt Date of Samples:	March 28, 2011
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test**Functional Description of the EUT (Equipment Under Test):**

FM at 4800 bps with an output power of 100mW. Operating at 464.5-469.55 MHz

Testing Objective:

FCC Part 90.217 certification of UHF transmitter module.

CONFIGURATION 1 DIGC0136

Software/Firmware Running during test	
Description	Version
Radio Board Firmware	1.00.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Radio Board	Digital Control, Inc.	UHF Radio	3
Antenna	Digital Control, Inc.	None	None

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
9VDC Battery	Duracell	None	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power	No	0.07m	No	Radio Board	Battery
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

CONFIGURATION 1 DIGC0139

Software/Firmware Running during test	
Description	Version
Radio Board Firmware	1.00.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Radio Board	Digital Control, Inc.	DigiRadio	3

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
DC Power Supply	Topward Electric	TPS-2000	TPD

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
USB / Serial adapter	Silicon Laboratories IDE	USB Debug Adapter	KK

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power	No	1.3m	No	Radio Board	DC Power Supply
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	3/28/2011	Transmitter Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	4/5/2011	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	4/5/2011	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	4/5/2011	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	4/5/2011	Emission Mask	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	4/5/2011	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	4/7/2011	Receiver Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

EMISSION MASK

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	24
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/7/2010	24
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	24
Attenuator, 6 dB, 'SMA'	N/A	93459 3330A-6	AUF	3/28/2011	12
Signal Generator	Agilent	E8257D	TGX	3/22/2011	12

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The emission mask defined by 90.217(b) for 12.5 kHz channel bandwidth devices is shown on each plot. The 0 dB reference for the mask is the measured output power of the un-modulated carrier at that frequency.

A 20 dB external attenuator was used. The attenuator and coaxial cable loss were compensated in the spectrum analyzer. A 300Hz resolution bandwidth with no video filtering and a peak detector were used.

EMISSION MASK

EUT: DigiRadio	Work Order: DIGC0139
Serial Number: 3	Date: 04/05/11
Customer: Digital Control, Inc.	Temperature: 22°C
Attendees: None	Humidity: 32%
Project: None	Barometric Pres.: 30.15 in
Tested by: Rod Peloquin	Job Site: EV06

TEST SPECIFICATIONS

TEST METHOD

FCC 90I:2011	ANSI/TIA/EIA-603-C-2004

COMMENTS

Normal 'Sine' modulation.

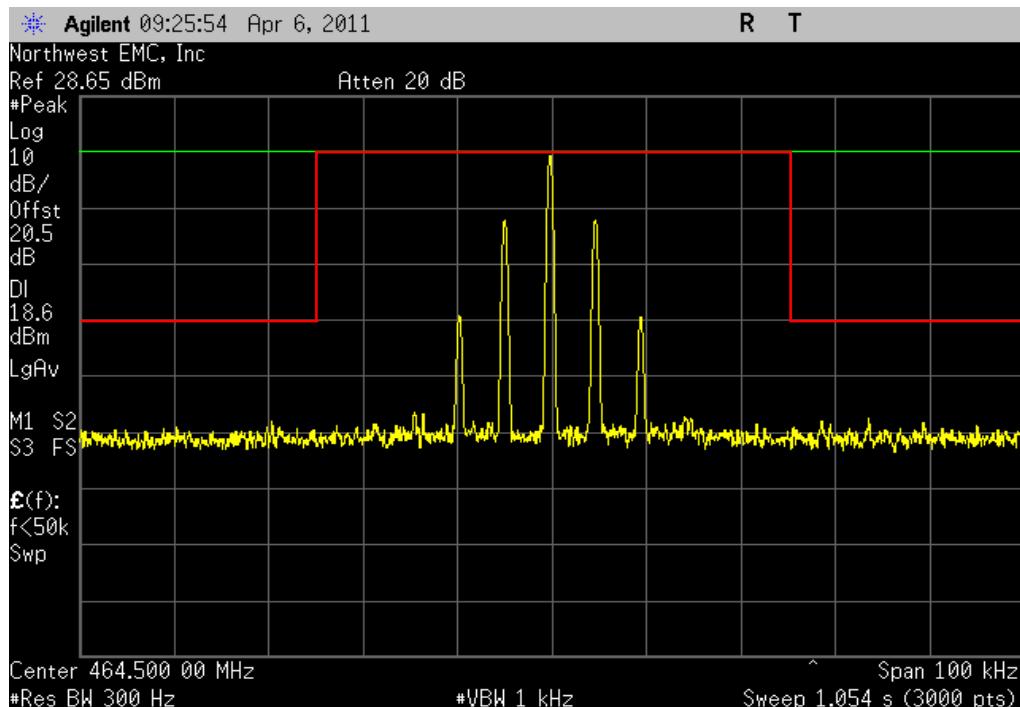
DEVIATIONS FROM TEST STANDARD

None

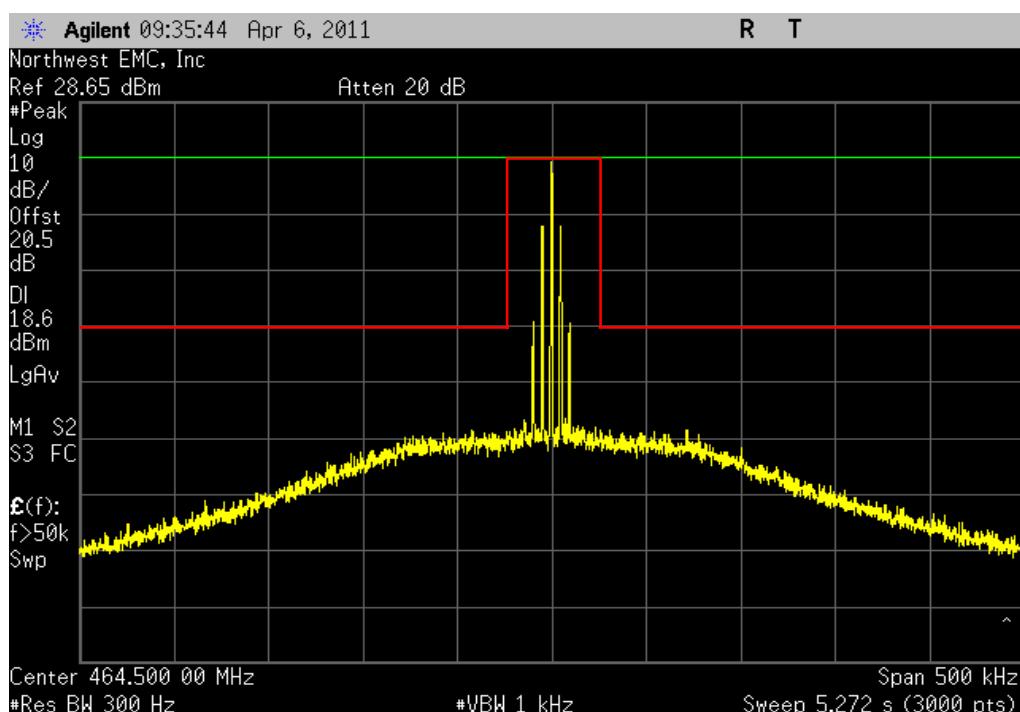
Configuration #	1	 Signature

		Value	Limit	Results
Low Channel, 464.5 MHz	fC ± 50 kHz fC ± 250 kHz	See Graph See Graph	See Mask See Mask	Pass Pass
High Channel, 469.55 MHz	fC ± 50 kHz fC ± 250 kHz	See Graph See Graph	See Mask See Mask	Pass Pass

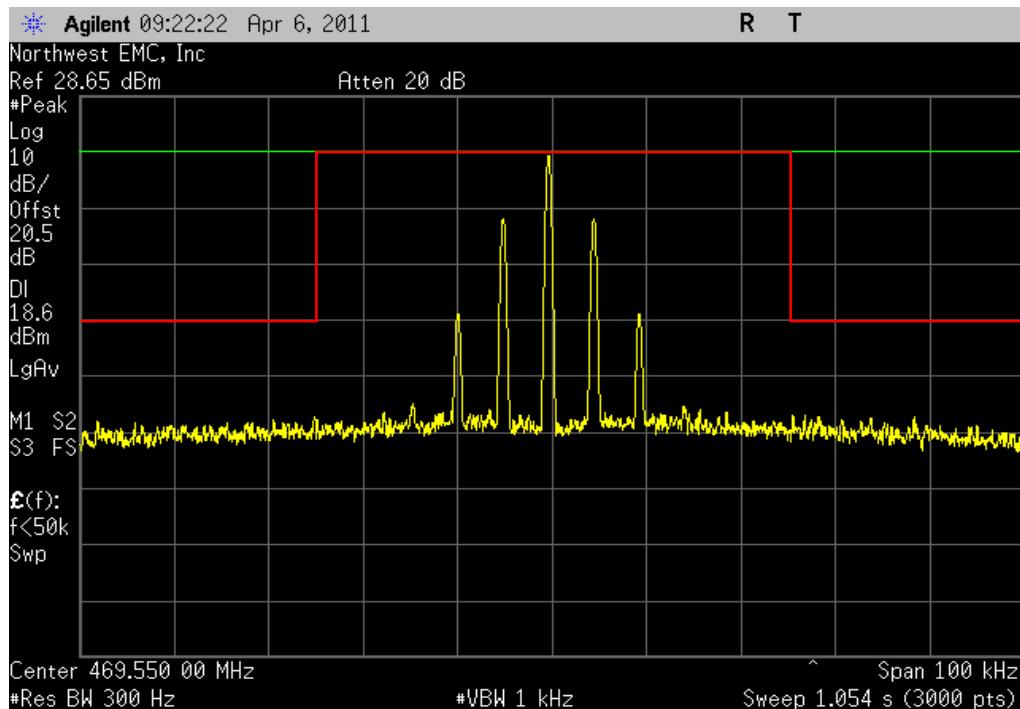
Low Channel, 464.5 MHz, $f_C \pm 50$ kHz		
Result: Pass	Value: See Graph	Limit: See Mask



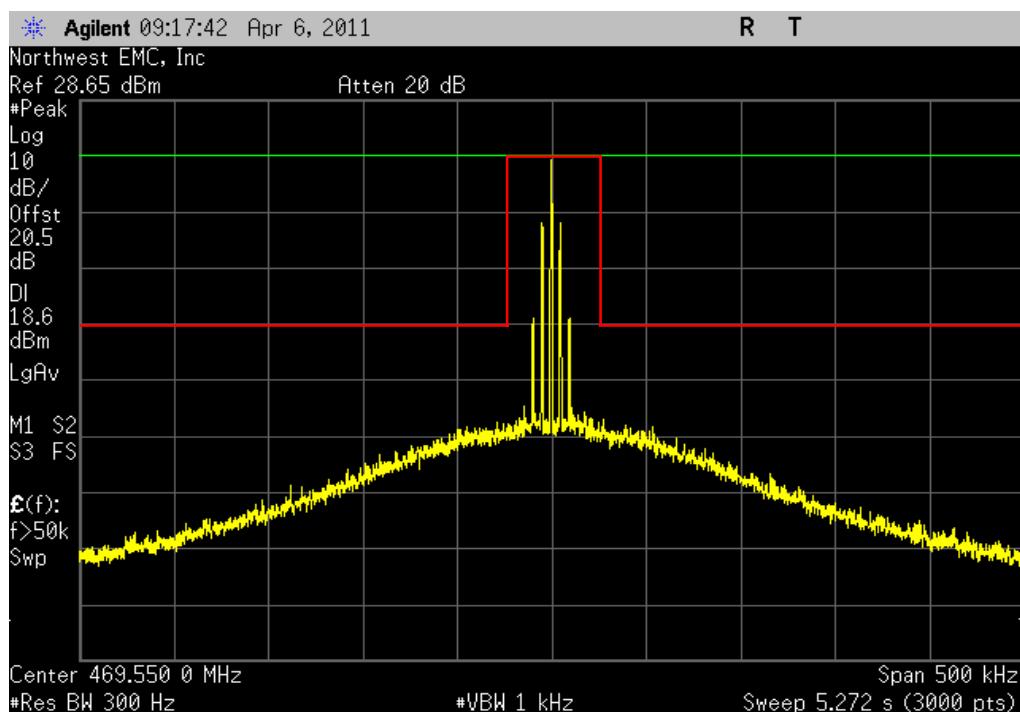
Low Channel, 464.5 MHz, $f_C \pm 250$ kHz		
Result: Pass	Value: See Graph	Limit: See Mask



High Channel, 469.55 MHz, fC \pm 50 kHz		
Result: Pass	Value: See Graph	Limit: See Mask



High Channel, 469.55 MHz, fC \pm 250 kHz		
Result: Pass	Value: See Graph	Limit: See Mask



OCCUPIED BANDWIDTH

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	24
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Power Meter	Gigatronics	8651A	SPM	1/7/2010	24
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	24
Signal Generator	Agilent	E8257D	TGX	3/22/2011	12

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The 99% occupied bandwidth was measured with the EUT configured for continuous modulated operation at its lowest and highest transmit frequency.

The spectrum analyzer's resolution bandwidth was set to between 1% and 3% of the 20dB bandwidth and the video bandwidth was at least 3 times the resolution bandwidth. A peak detector was used.

OCCUPIED BANDWIDTH

EUT: DigiRadio	Work Order: DIGC0139
Serial Number: 3	Date: 04/05/11
Customer: Digital Control, Inc.	Temperature: 22°C
Attendees: None	Humidity: 32%
Project: None	Barometric Pres.: 30.15 in
Tested by: Rod Peloquin	Job Site: EV06

TEST SPECIFICATIONS

TEST METHOD

FCC 90I:2011	ANSI/TIA/EIA-603-C-2004

COMMENTS

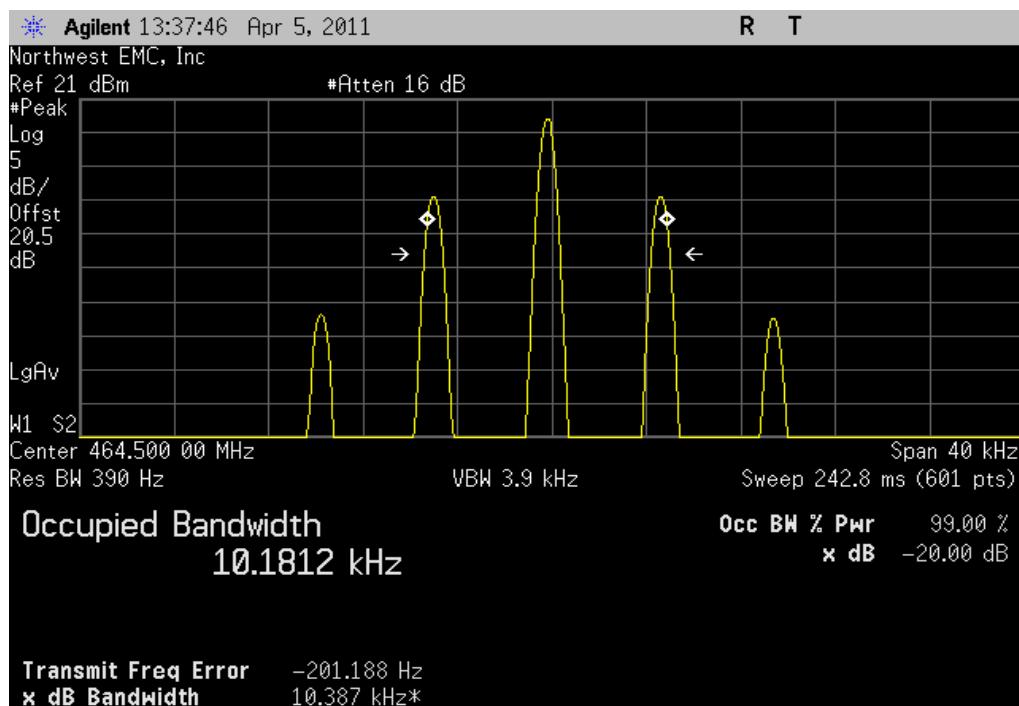
Normal 'Sine' modulation.

DEVIATIONS FROM TEST STANDARD

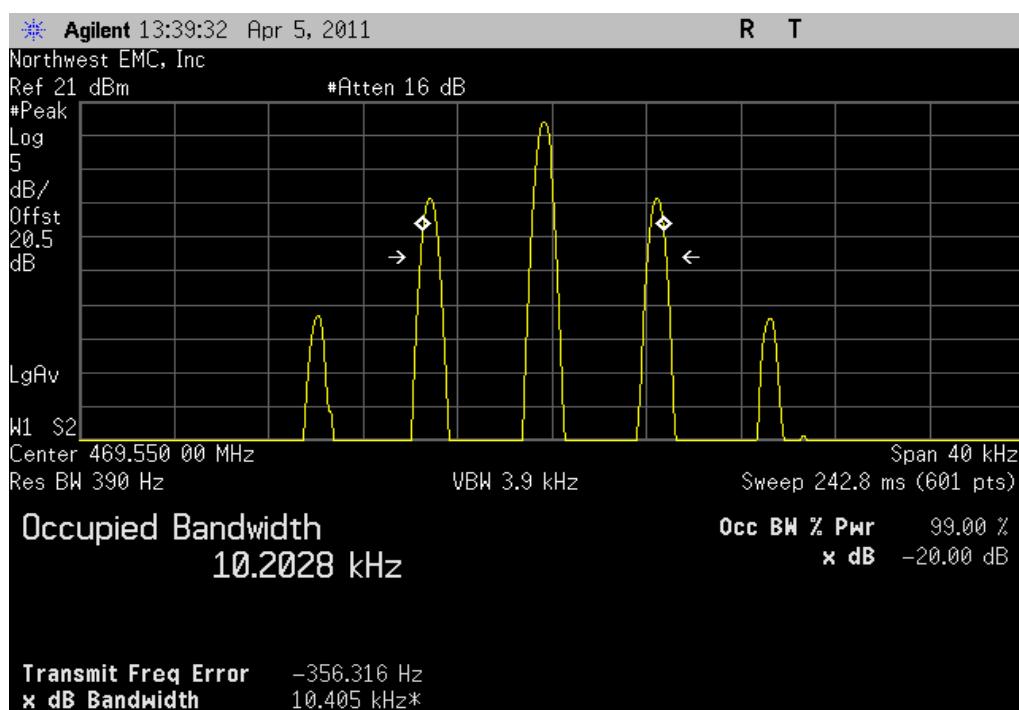
None

Configuration #	1	Signature	Value	Limit	Results
Low Channel, 464.5 MHz			10.181 kHz	12.5 kHz	Pass
High Channel, 469.55 MHz			10.203 kHz	12.5 kHz	Pass

Low Channel, 464.5 MHz		
Result: Pass	Value: 10.181 kHz	Limit: 12.5 kHz



High Channel, 469.55 MHz		
Result: Pass	Value: 10.203 kHz	Limit: 12.5 kHz



OUTPUT POWER

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT						
Description	Manufacturer	Model	ID	Last Cal.	Interval	
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	24	
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13	
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12	
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0	
Attenuator, 6 dB, 'SMA'	N/A	93459 3330A-6	AUF	3/28/2011	12	
Power Meter	Gigatronics	8651A	SPM	1/7/2010	24	
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	24	
Signal Generator	Agilent	E8257D	TGX	3/22/2011	12	

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The peak output power was measured with the EUT set to low and high transmit frequencies. The EUT was transmitting with its normal modulation.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer in a linear mode.

OUTPUT POWER

EUT: DigiRadio	Work Order: DIGC0139
Serial Number: 3	Date: 04/05/11
Customer: Digital Control, Inc.	Temperature: 22°C
Attendees: None	Humidity: 32%
Project: None	Barometric Pres.: 30.15 in

Tested by: Rod Peloquin

Power: 7.2 VDC Nominal

Job Site: EV06

TEST SPECIFICATIONS

TEST METHOD

FCC 90I:2011

ANSI/TIA/EIA-603-C-2004

COMMENTS

Normal 'Sine' modulation.

DEVIATIONS FROM TEST STANDARD

None

Configuration #

1

Signature



Low Channel, 464.5 MHz

Value

Limit

Results

High Channel, 469.55 MHz

73.1 mW

120 mW

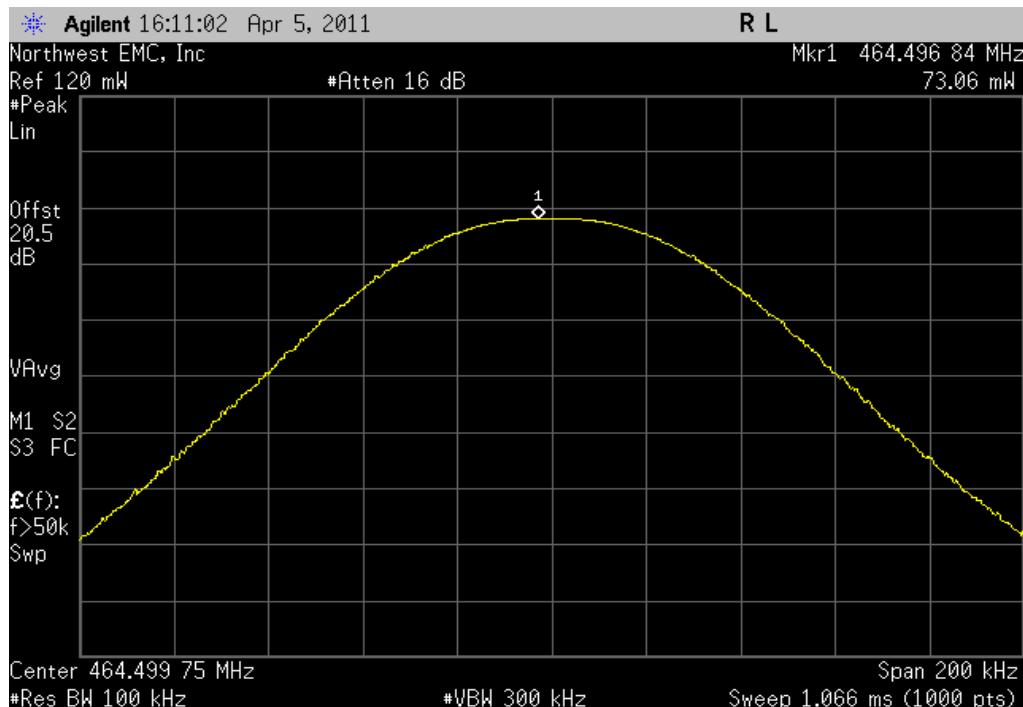
Pass

73.2 mW

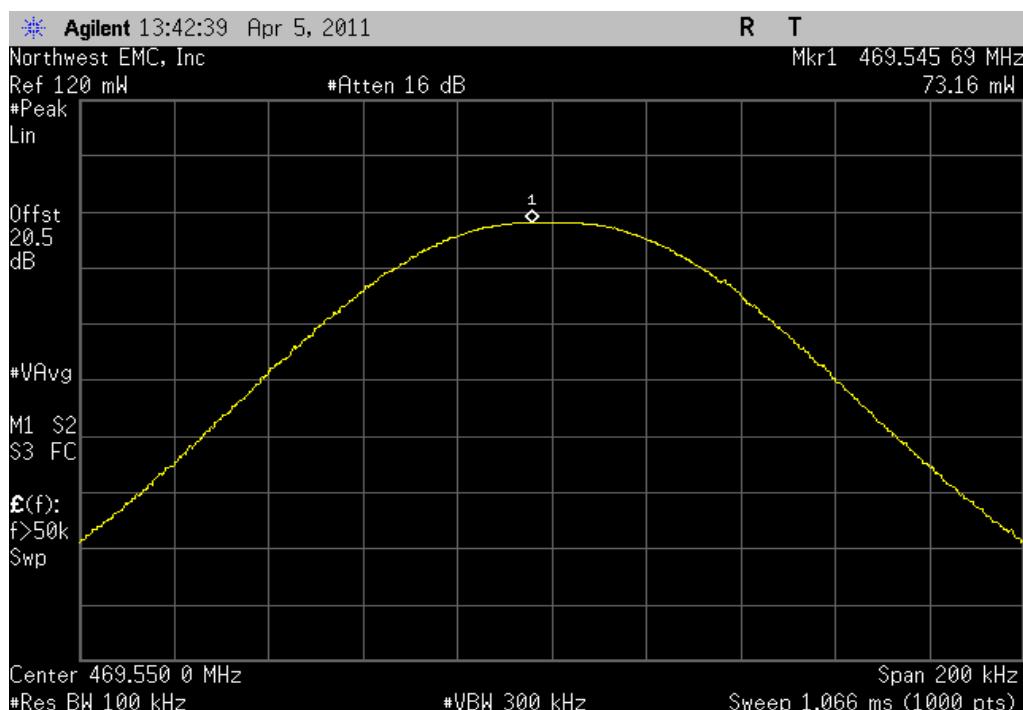
120 mW

Pass

Low Channel, 464.5 MHz		
Result: Pass	Value: 73.1 mW	Limit: 120 mW



High Channel, 469.55 MHz		
Result: Pass	Value: 73.2 mW	Limit: 120 mW



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION

Tx

POWER SETTINGS INVESTIGATED

Battery

FREQUENCY RANGE INVESTIGATED

Start Frequency 464.5MHz Stop Frequency 469.55MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	7/9/2010	12
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	7/9/2010	12
Antenna, Horn	EMCO	3115	AHC	7/8/2010	24
Spectrum Analyzer	Agilent	E4446A	AAQ	1/10/2011	12
Pre-Amplifier	Miteq	AM-1616-1000	AOL	8/9/2010	12
EV01 Cables	N/A	Bilog Cables	EVA	7/9/2010	12
Antenna, Bilog	Teseq	CBL 6141B	AXR	11/29/2010	12
Power Meter	Gigatronics	8651A	SPM	1/7/2010	24
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	16
Signal Generator	Agilent	E8257D	TGX	3/22/2011	12
Antenna, Dipole	ETS	3121C-DB4	ADH	3/6/2009	36

MEASUREMENT BANDWIDTHS

	Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

MEASUREMENT UNCERTAINTY

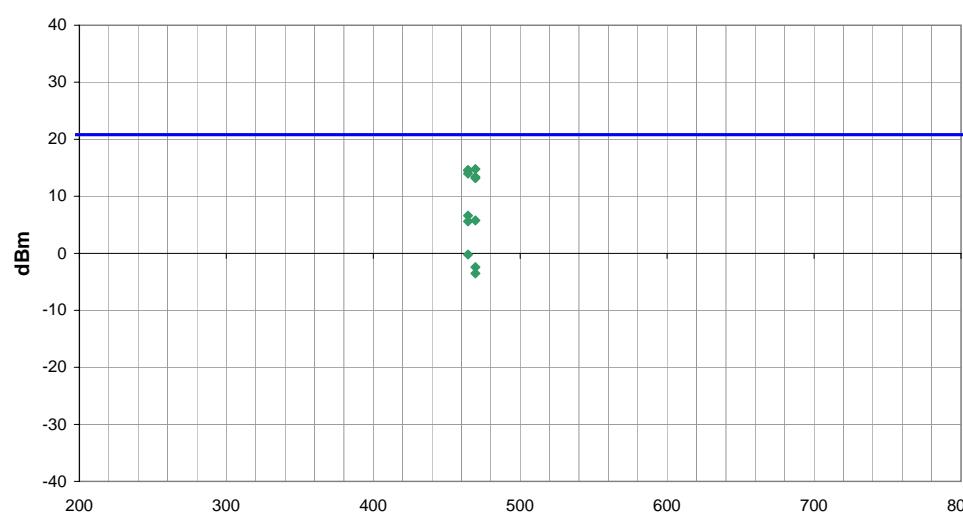
A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. The measurement uncertainty estimation is available upon request.

TEST DESCRIPTION

Spectrum analyzer, signal generator, and linearly polarized antennas were used to measure output power emissions. The orientation of the EUT and measurement antenna were manipulated to maximize the level of emissions. The EUT was configured to transmit at the highest output power.

For licensed transmitters, the FCC references TIA/EIA-603 as the measurement procedure standard. TIA/EIA-603 Section 2.2.12 describes a method for measuring radiated spurious emissions that utilizes an antenna substitution method:

At an approved test site, the transmitter is placed on a remotely controlled turntable, and the measurement antenna is placed 3 meters from the transmitter. The turntable azimuth is varied to maximize the level of spurious emissions. The height of the measurement antenna is also varied from 1 to 4 meters. The amplitude and frequency of the highest emissions are noted. The transmitter is then replaced with a 1/2 wave dipole that is successively tuned to each of the highest spurious emissions. A signal generator is connected to the dipole (horn antenna for frequencies above 1 GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the dipole antenna and its gain; the power (dBm) into an ideal 1/2 wave dipole antenna is determined for each radiated spurious emission.

EMC OUTPUT POWER - RADIATED										PSA 2008.07.21 EMI 2008.1.9		
EUT: DigiRadio Serial Number: 3 Customer: Digital Control, Inc. Attendees: Mike Na, Tim Bayliss Project: None Tested by: Jennifer Herrett					Work Order: DIGC0136 Date: 03/29/11 Temperature: 22 Humidity: 33% Barometric Pres.: 30.14 Power: Battery Job Site: EV01							
TEST SPECIFICATIONS					TEST METHOD							
FCC 901:2011					ANSI/TIA/EIA-603-C-2004							
TEST PARAMETERS												
Antenna Height(s) (m)		1 - 4		Test Distance (m)		3						
COMMENTS												
UHF Radio - Modular. Antenna installed.												
EUT OPERATING MODES												
Tx												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
Run #	6		Signature									
Configuration #	1											
Results	Pass											
												
Freq (MHz)		Azimuth (degrees)	Height (meters)			Polarity	Detector	ERP (Watts)	ERP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
469.551		-1.0	1.0			V-Bilog	PK	3.01E-02	14.8	20.8	-6.0	High channel, EUT vertical.
464.497		154.0	1.0			H-Bilog	PK	2.88E-02	14.6	20.8	-6.2	Low channel, EUT horizontal.
464.500		255.0	1.0			H-Bilog	PK	2.82E-02	14.5	20.8	-6.3	Low channel, EUT radio board above antenna.
464.501		294.0	1.2			V-Bilog	PK	2.51E-02	14.0	20.8	-6.8	Low channel, EUT vertical.
469.546		156.0	1.0			H-Bilog	PK	2.18E-02	13.4	20.8	-7.4	High channel, EUT horizontal.
469.545		73.0	1.0			H-Bilog	PK	2.08E-02	13.2	20.8	-7.6	High channel, EUT radio board above antenna.
464.497		10.0	1.1			V-Bilog	PK	4.57E-03	6.6	20.8	-14.2	Low channel, EUT radio board above antenna.
469.546		221.0	1.0			V-Bilog	PK	3.78E-03	5.8	20.8	-15.0	High channel, EUT horizontal.
464.497		225.0	1.1			V-Bilog	PK	3.63E-03	5.6	20.8	-15.2	Low channel, EUT horizontal.
464.500		227.0	1.0			H-Bilog	PK	9.55E-04	-0.2	20.8	-21.0	Low channel, EUT vertical.
469.551		12.0	1.0			V-Bilog	PK	5.73E-04	-2.4	20.8	-23.2	High channel, EUT radio board above antenna.
469.551		226.0	1.0			H-Bilog	PK	4.45E-04	-3.5	20.8	-24.3	High channel, EUT vertical.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT						
Description	Manufacturer	Model	ID	Last Cal.	Interval	
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	24	
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13	
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12	
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0	
Chamber, Temp./Humidity Chamber	Cincinnati Sub Zero (CSZ)	ZH-32-2-2-H/AC	TBA	8/20/2010	24	
Chamber Temp. & Humidity Controller	ESZ / Eurotherm	Dimension II	TBC	NCR	0	
Multimeter	Tektronix	DMM912	MMH	1/28/2011	24	
DC Power Supply	Topward	TPS-2000	TPD	NCR	0	

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

Variation of Supply Voltage

The primary supply voltage was varied from 85% to 115% of the nominal voltage. A DC lab supply was used to vary the supply voltage.

Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (-30° to +50° C) and at 10°C intervals.

The measurement was made with a direct connection between the EUT antenna port and the test equipment. The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

FREQUENCY STABILITY

EUT: DigiRadio	Work Order: DIGC0139
Serial Number: 3	Date: 04/05/11
Customer: Digital Control, Inc.	Temperature: 22°C
Attendees: None	Humidity: 32%
Project: None	Barometric Pres.: 30.15 in
Tested by: Rod Peloquin	Job Site: EV06 & EV09
TEST SPECIFICATIONS	
TEST METHOD	
FCC 90I:2011	ANSI/TIA/EIA-603-C-2004
COMMENTS	
Unmodulated carrier	
DEVIATIONS FROM TEST STANDARD	
None	
Configuration #	1
Signature 	

FREQUENCY STABILITY TABLE

Frequency Stability with Variation of DC Voltage (Ambient Temperature = 22°C)

Voltage (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
8.3 (115%)	464.500000	464.499767	0.50	n/a
7.2 (100%)	464.500000	464.499770	0.50	n/a
6.1 (85%)	464.500000	464.499772	0.49	n/a

Frequency Stability with Variation of Ambient Temperature (Primary Supply = 7.2 VDC)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
50	464.500000	464.499690	0.67	n/a
40	464.500000	464.499707	0.63	n/a
30	464.500000	464.499764	0.51	n/a
20	464.500000	464.499788	0.46	n/a
10	464.500000	464.499712	0.62	n/a
0	464.500000	464.499675	0.70	n/a
-10	464.500000	464.499790	0.45	n/a
-20	464.500000	464.499842	0.34	n/a
-30	464.500000	464.499707	0.63	n/a

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT						
Description	Manufacturer	Model	ID	Last Cal.	Interval	
Spectrum Analyzer	Agilent	E4440A	AFD	6/1/2009	24	
40GHz DC Block	Miteq	DCB4000	AMD	8/5/2010	13	
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	8/6/2010	12	
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0	
Attenuator, 6 dB, 'SMA'	N/A	93459 3330A-6	AUF	3/28/2011	12	
Power Meter	Gigatronics	8651A	SPM	1/7/2010	24	
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	24	
Signal Generator	Agilent	E8257D	TGX	3/22/2011	12	

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The antenna port spurious conducted emissions were measured at the RF output terminal of the EUT with 20dB of external attenuation on the RF input of the spectrum analyzer. Analyzer plots were made from 30 MHz to 5 GHz. The peak conducted power of spurious emissions, up to the 10th harmonic of the transmit frequency, were investigated to ensure they were less than or equal to the -30 dBc emission mask limit of -11.4 dBm.

SPURIOUS CONDUCTED EMISSIONS

EUT: DigiRadio	Work Order: DIGC0139
Serial Number: 3	Date: 04/05/11
Customer: Digital Control, Inc.	Temperature: 22°C
Attendees: None	Humidity: 32%
Project: None	Barometric Pres.: 30.15 in
Tested by: Rod Peloquin	Job Site: EV06

TEST SPECIFICATIONS

TEST METHOD

FCC 90I:2011	ANSI/TIA/EIA-603-C-2004

COMMENTS

Normal 'Sine' modulation.

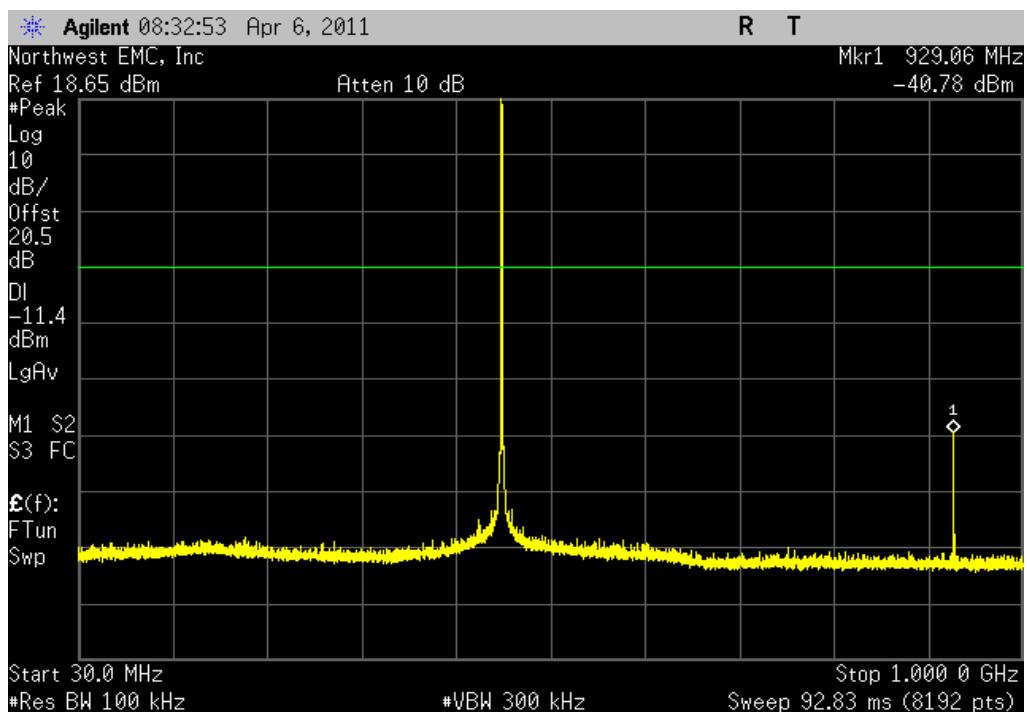
DEVIATIONS FROM TEST STANDARD

None

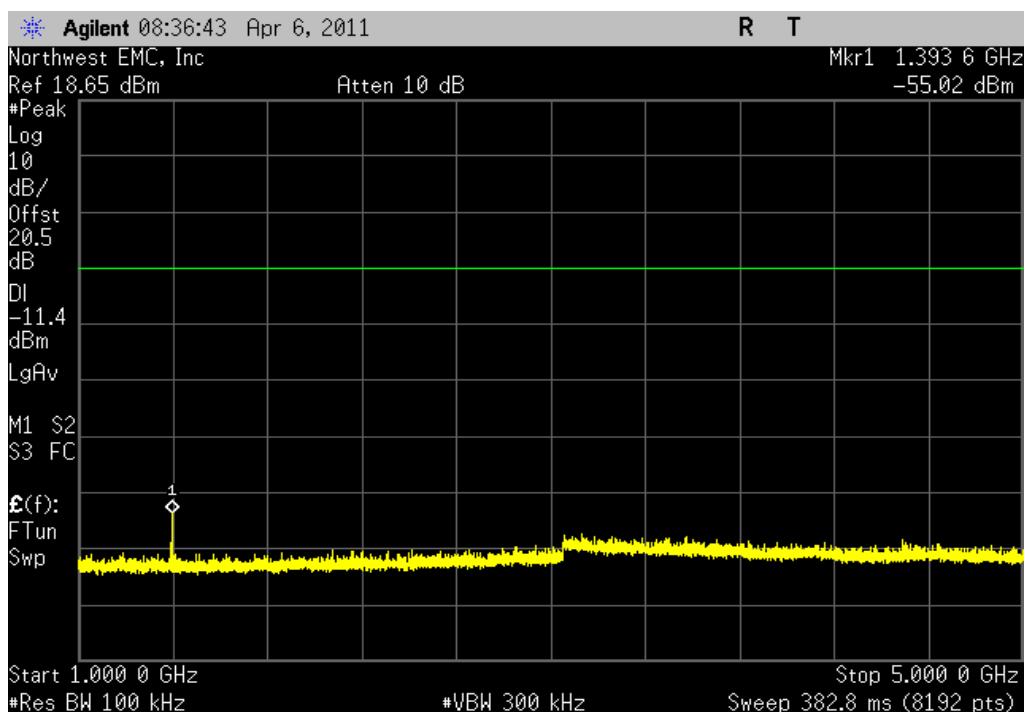
Configuration #	1	 Signature

		Value	Limit	Results
Low Channel, 465.5 MHz	30 MHz - 1 GHz	-40.8 dBm	-11.4 dBm	Pass
	1 GHz - 5 GHz	-55.0 dBm	-11.4 dBm	Pass
High Channel, 469.55 MHz	30 MHz - 1 GHz	-41.3 dBm	-11.4 dBm	Pass
	1 GHz - 5 GHz	-55.5 dBm	-11.4 dBm	Pass

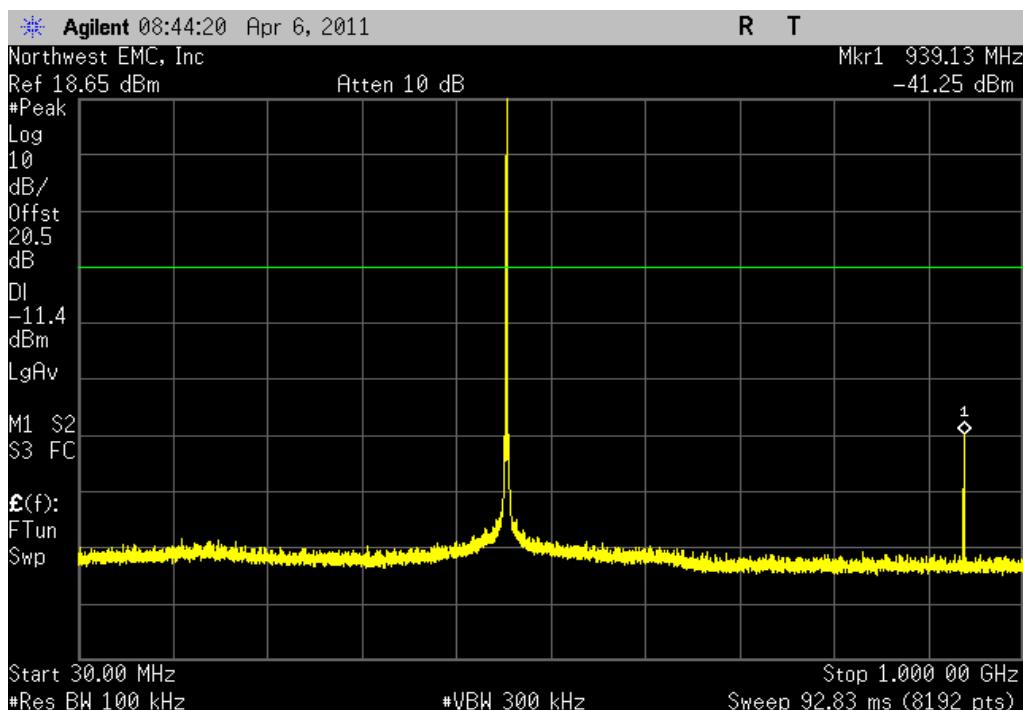
Low Channel, 465.5 MHz, 30 MHz - 1 GHz		
Result: Pass	Value: -40.8 dBm	Limit: -11.4 dBm



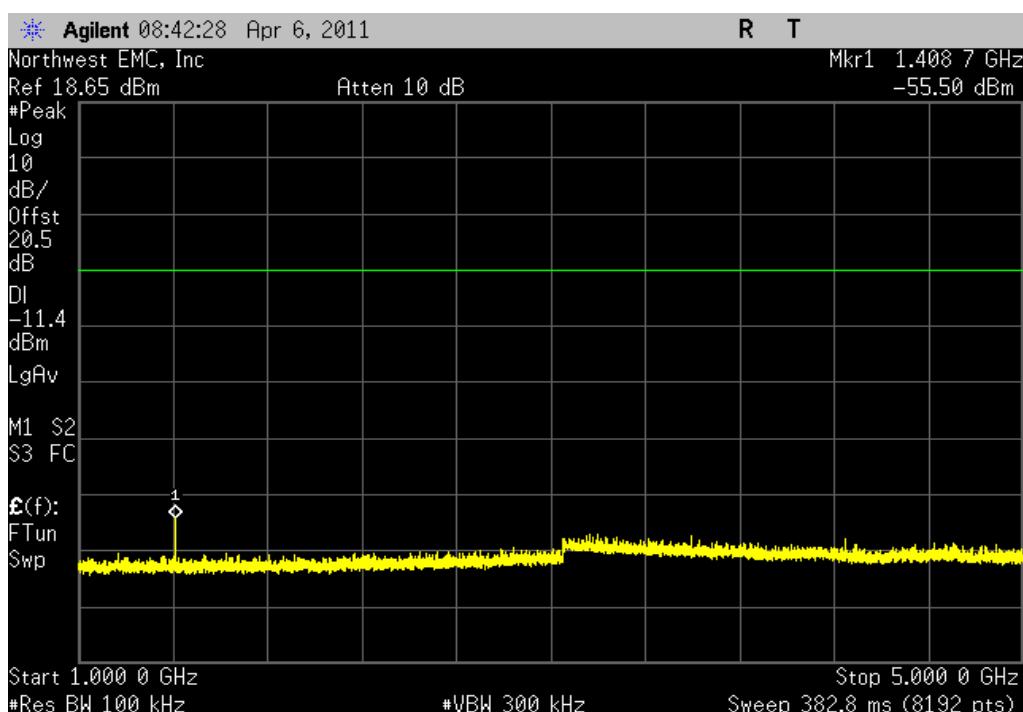
Low Channel, 465.5 MHz, 1 GHz - 5 GHz		
Result: Pass	Value: -55.0 dBm	Limit: -11.4 dBm



High Channel, 469.55 MHz, 30 MHz - 1 GHz		
Result: Pass	Value: -41.3 dBm	Limit: -11.4 dBm



High Channel, 469.55 MHz, 1 GHz - 5 GHz		
Result: Pass	Value: -55.5 dBm	Limit: -11.4 dBm



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION

Receive mode

CHANNELS TESTED

Low Channel, 464.5 MHz

Mid Channel, 469.5 MHz

High Channel, 469.55 MHz

POWER SETTINGS INVESTIGATED

7.2 VDC Nominal

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	5 GHz
-----------------	--------	----------------	-------

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Antenna, Bilog	Teseq	CBL 6141B	AXR	11/29/2010	12
Spectrum Analyzer	Agilent	E4446A	AAQ	1/10/2011	12
Pre-Amplifier	Miteq	AM-1616-1000	AOL	8/9/2010	12
EV01 Cables	N/A	Bilog Cables	EVA	7/9/2010	12
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	7/9/2010	12
Antenna, Horn	EMCO	3115	AHC	7/8/2010	24
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	7/9/2010	12

MEASUREMENT BANDWIDTHS

	Frequency Range	Peak Data	Quasi-Peak Data	Average Data
	(MHz)	(kHz)	(kHz)	(kHz)
0.01 - 0.15	1.0	0.2	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0	120.0
Above 1000	1000.0	N/A	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. The measurement uncertainty estimation is available upon request.

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth and antenna height such that the maximum radiated emissions level was detected. This required the use of a turntable and an antenna positioner. The preferred method of a continuous azimuth search was utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna. A calibrated, linearly polarized antenna was positioned at the specified distance from the periphery of the EUT.

Tests were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Though specified in the report, the measurement distance was 3 meters or 10 meters. At any measurement distance, the antenna height was varied from 1 meter to 4 meters. These height scans apply for both horizontal and vertical polarization, except that for vertical polarization the minimum height of the center of the antenna was increased so that the lowest point of the bottom of the antenna cleared the ground surface by at least 25 cm.

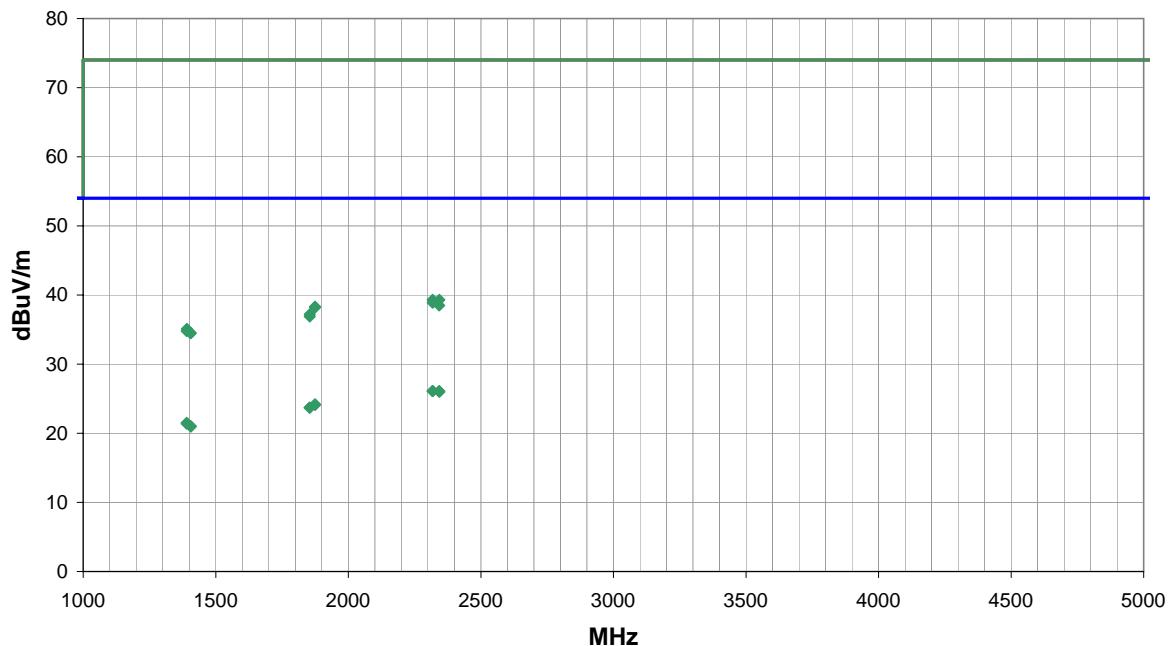
If measurements above 1 GHz were required, the test setup was modified to meet the regulatory requirements for higher frequency measurements. If required, RF absorber was placed on the floor between the measurement antenna and EUT. Measurements were made at a 3 meter test distance with the EUT placed on a 0.8 meter high table. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.

NORTHWEST
EMC

RECEIVER SPURIOUS EMISSIONS DATA SHEET

PSA 2008.07.21
EMI 2008.1.9

EUT: DigiRadio	Work Order: DIGC0139
Serial Number: 3	Date: 04/06/11
Customer: Digital Control, Inc.	Temperature: 22°C
Attendees: None	Humidity: 34%
Project: None	Barometric Pres.: 29.96
Tested by: Rod Peloquin	Job Site: EV01
TEST SPECIFICATIONS	
TEST METHOD	
FCC 15.109:2011	ANSI C63.4:2003
TEST PARAMETERS	
Antenna Height(s) (m)	1 - 4
Test Distance (m)	3
COMMENTS	
EUT on stand in vertical orientation with antenna vertical	
EUT OPERATING MODES	
Receive mode	
DEVIATIONS FROM TEST STANDARD	
No deviations.	
Run #	1
Configuration #	1
Results	Pass
Signature: <i>Rodney L. Peloquin</i>	



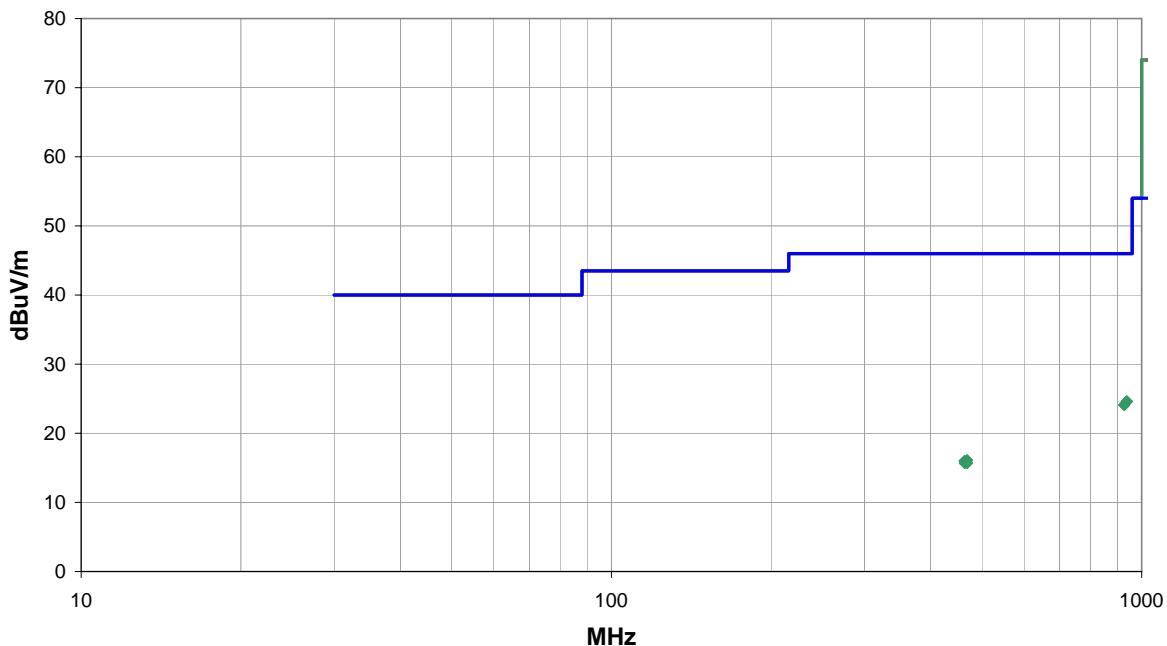
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2317.870	24.2	1.9	317.0	1.0	3.0	0.0	H-Horn	AV	0.0	26.1	54.0	-27.9	Low Channel
2317.911	24.2	1.9	218.0	1.0	3.0	0.0	V-Horn	AV	0.0	26.1	54.0	-27.9	Low Channel
2343.019	24.3	1.8	213.0	1.0	3.0	0.0	H-Horn	AV	0.0	26.1	54.0	-27.9	High Channel
2343.168	24.2	1.8	303.0	1.0	3.0	0.0	V-Horn	AV	0.0	26.0	54.0	-28.0	High Channel
1874.432	24.5	-0.3	170.0	1.0	3.0	0.0	V-Horn	AV	0.0	24.2	54.0	-29.8	High Channel
1874.461	24.4	-0.3	69.0	1.0	3.0	0.0	H-Horn	AV	0.0	24.1	54.0	-29.9	High Channel
1854.201	24.1	-0.4	17.0	1.0	3.0	0.0	V-Horn	AV	0.0	23.7	54.0	-30.3	Low Channel
1854.378	24.1	-0.4	187.0	1.0	3.0	0.0	H-Horn	AV	0.0	23.7	54.0	-30.3	Low Channel
1390.681	24.3	-2.8	116.0	1.0	3.0	0.0	H-Horn	AV	0.0	21.5	54.0	-32.5	Low Channel
1390.681	24.2	-2.8	45.0	1.0	3.0	0.0	V-Horn	AV	0.0	21.4	54.0	-32.6	Low Channel
1405.827	23.7	-2.7	197.0	1.0	3.0	0.0	H-Horn	AV	0.0	21.0	54.0	-33.0	High Channel
1405.890	23.7	-2.7	259.0	1.5	3.0	0.0	V-Horn	AV	0.0	21.0	54.0	-33.0	High Channel
2317.807	37.4	1.9	317.0	1.0	3.0	0.0	H-Horn	PK	0.0	39.3	74.0	-34.7	Low Channel
2343.159	37.5	1.8	213.0	1.0	3.0	0.0	H-Horn	PK	0.0	39.3	74.0	-34.7	High Channel
2317.801	37.0	1.9	218.0	1.0	3.0	0.0	V-Horn	PK	0.0	38.9	74.0	-35.1	Low Channel
2342.970	36.7	1.8	303.0	1.0	3.0	0.0	V-Horn	PK	0.0	38.5	74.0	-35.5	High Channel
1874.487	38.6	-0.3	69.0	1.0	3.0	0.0	H-Horn	PK	0.0	38.3	74.0	-35.7	High Channel
1874.416	38.5	-0.3	170.0	1.0	3.0	0.0	V-Horn	PK	0.0	38.2	74.0	-35.8	High Channel
1854.317	37.6	-0.4	17.0	1.0	3.0	0.0	V-Horn	PK	0.0	37.2	74.0	-36.8	Low Channel
1854.279	37.3	-0.4	187.0	1.0	3.0	0.0	H-Horn	PK	0.0	36.9	74.0	-37.1	Low Channel

NORTHWEST
EMC

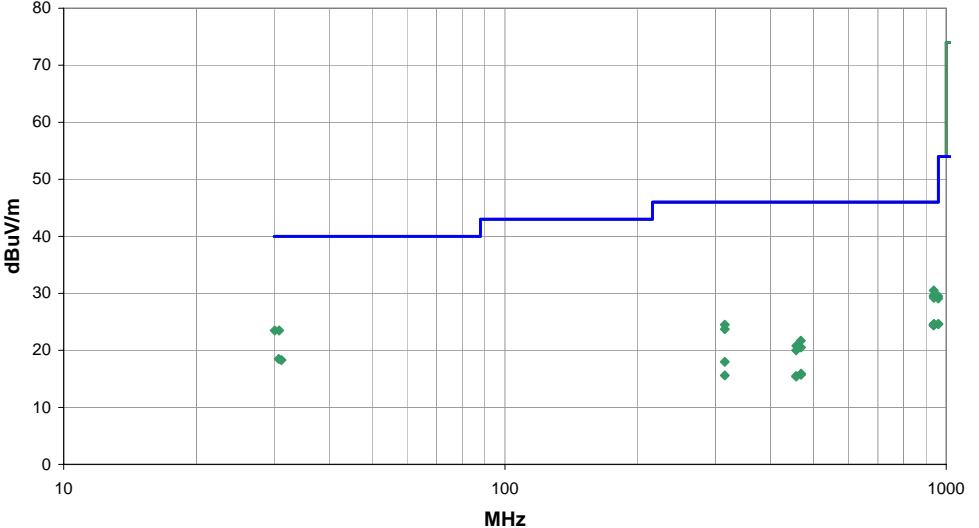
RECEIVER SPURIOUS EMISSIONS DATA SHEET

PSA 2008.07.21
EMI 2008.1.9

EUT: DigiRadio	Work Order: DIGC0139
Serial Number: 3	Date: 04/06/11
Customer: Digital Control, Inc.	Temperature: 22°C
Attendees: None	Humidity: 34%
Project: None	Barometric Pres.: 29.96
Tested by: Rod Peloquin	Job Site: EV01
TEST SPECIFICATIONS	
TEST METHOD	
FCC 15.109:2011	ANSI C63.4:2003
TEST PARAMETERS	
Antenna Height(s) (m)	1 - 4
Test Distance (m)	
3	
COMMENTS	
None	
EUT OPERATING MODES	
Receive mode	
DEVIATIONS FROM TEST STANDARD	
No deviations.	
Run #	2
Configuration #	1
Results	Pass
Signature <i>Roddy L. Peloquin</i>	



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
937.207	16.9	7.7	30.0	1.0	3.0	0.0	V-Bilog	QP	0.0	24.6	46.0	-21.4	High Channel
937.348	16.9	7.7	241.0	1.0	3.0	0.0	H-Bilog	QP	0.0	24.6	46.0	-21.4	High Channel
927.071	17.0	7.1	357.0	1.0	3.0	0.0	V-Bilog	QP	0.0	24.1	46.0	-21.9	Low Channel
927.126	17.0	7.1	211.0	1.0	3.0	0.0	H-Bilog	QP	0.0	24.1	46.0	-21.9	Low Channel
468.623	17.4	-1.3	189.0	1.0	3.0	0.0	V-Bilog	QP	0.0	16.1	46.0	-29.9	High Channel
463.563	17.5	-1.5	79.0	1.0	3.0	0.0	V-Bilog	QP	0.0	16.0	46.0	-30.0	Low Channel
463.765	17.2	-1.5	41.0	1.0	3.0	0.0	H-Bilog	QP	0.0	15.7	46.0	-30.3	Low Channel
468.500	17.0	-1.3	67.0	1.0	3.0	0.0	H-Bilog	QP	0.0	15.7	46.0	-30.3	High Channel

RECEIVER SPURIOUS EMISSIONS DATA SHEET												PSA 2008.07.21	EMI 2008.1.9		
NORTHWEST							EMC								
EUT:	DigiRadio						Work Order:	DIGC0136							
Serial Number:	3						Date:	03/28/11							
Customer:	Digital Control, Inc.						Temperature:	22							
Attendees:	Mike Na, Tim Bayliss						Humidity:	33%							
Project:	None						Barometric Pres.:	30.14							
Tested by:	Jennifer Herrett						Power:	Battery							
TEST SPECIFICATIONS							TEST METHOD								
FCC 15.109:2010							ANSI C63.4:2003								
TEST PARAMETERS															
Antenna Height(s) (m)		1 - 4		Test Distance (m)		3									
COMMENTS															
UHF Radio - Modular. Antenna installed.															
EUT OPERATING MODES															
Rx, Mid Channel.															
DEVIATIONS FROM TEST STANDARD															
No deviations.															
Run #	4		Signature												
Configuration #	1														
Results	Pass														
 <p>dBuV/m</p> <p>10 100 1000 MHz</p>															
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments		
936.625	22.8	7.7	157.0	1.2	3.0	0.0	H-Bilog	PK	0.0	30.5	46.0	-15.5	Mid channel, EUT vertical.		
936.818	21.9	7.7	41.0	1.0	3.0	0.0	V-Bilog	PK	0.0	29.6	46.0	-16.4	Mid channel, EUT vertical.		
30.087	22.4	1.1	205.0	1.0	3.0	0.0	V-Bilog	PK	0.0	23.5	40.0	-16.5	Mid channel, EUT vertical.		
30.778	22.4	1.1	319.0	1.0	3.0	0.0	H-Bilog	PK	0.0	23.5	40.0	-16.5	Mid channel, EUT vertical.		
959.351	21.8	7.7	270.0	1.0	3.0	0.0	H-Bilog	PK	0.0	29.5	46.0	-16.5	Mid channel, EUT vertical.		
936.687	21.8	7.7	110.0	1.0	3.0	0.0	V-Bilog	PK	0.0	29.5	46.0	-16.5	Mid channel, EUT horizontal.		
937.397	21.8	7.7	136.0	1.0	3.0	0.0	H-Bilog	PK	0.0	29.5	46.0	-16.5	Mid channel, EUT antenna above radio board.		
937.375	21.7	7.7	110.0	1.0	3.0	0.0	V-Bilog	PK	0.0	29.4	46.0	-16.6	Mid channel, EUT antenna above radio board.		
937.491	21.5	7.7	306.0	1.0	3.0	0.0	H-Bilog	PK	0.0	29.2	46.0	-16.8	Mid channel, EUT horizontal.		
958.946	21.4	7.7	119.0	1.0	3.0	0.0	V-Bilog	PK	0.0	29.1	46.0	-16.9	Mid channel, EUT vertical.		
959.372	16.9	7.7	119.0	1.0	3.0	0.0	V-Bilog	QP	0.0	24.6	46.0	-21.4	Mid channel, EUT vertical.		
937.592	16.9	7.7	110.0	1.0	3.0	0.0	V-Bilog	QP	0.0	24.6	46.0	-21.4	Mid channel, EUT antenna above radio board.		
937.990	16.9	7.7	157.0	1.2	3.0	0.0	H-Bilog	QP	0.0	24.6	46.0	-21.4	Mid channel, EUT vertical.		
315.030	29.5	-5.0	344.0	1.0	3.0	0.0	V-Bilog	PK	0.0	24.5	46.0	-21.5	Mid channel, EUT vertical.		
30.716	17.5	1.0	205.0	1.0	3.0	0.0	V-Bilog	QP	0.0	18.5	40.0	-21.5	Mid channel, EUT vertical.		
937.242	16.8	7.7	306.0	1.0	3.0	0.0	H-Bilog	QP	0.0	24.5	46.0	-21.5	Mid channel, EUT horizontal.		
936.496	16.8	7.6	41.0	1.0	3.0	0.0	V-Bilog	QP	0.0	24.4	46.0	-21.6	Mid channel, EUT vertical.		
936.602	16.8	7.6	110.0	1.0	3.0	0.0	V-Bilog	QP	0.0	24.4	46.0	-21.6	Mid channel, EUT horizontal.		
936.817	16.8	7.6	136.0	1.0	3.0	0.0	H-Bilog	QP	0.0	24.4	46.0	-21.6	Mid channel, EUT antenna above radio board.		
31.156	17.5	0.8	319.0	1.0	3.0	0.0	H-Bilog	QP	0.0	18.3	40.0	-21.7	Mid channel, EUT vertical.		

RECEIVER SPURIOUS EMISSIONS DATA SHEET

EUT: DigiRadio	Work Order: DIGC0136
Serial Number: 3	Date: 04/07/11
Customer: Digital Control, Inc.	Temperature: 22
Attendees: None	Humidity: 32%
Project: None	Barometric Pres.: 29.95
Tested by: Jennifer Herrett	Power: Battery
	Job Site: EV01

TEST SPECIFICATIONS

TEST METHOD

FCC 15.109:2010 | ANSI C63.4:2003

TEST PARAMETERS

Antenna Height(s) (m) | 1 - 4 | Test Distance (m) | 3

COMMENTS

UHF Radio - Modular. Antenna installed.

EUT OPERATING MODES

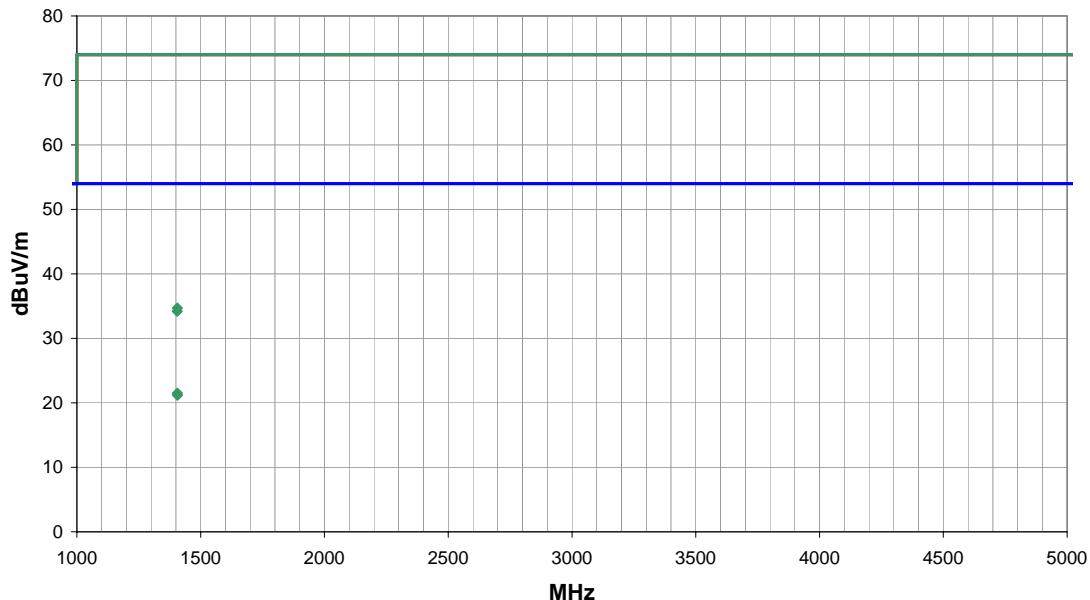
Rx, Mid Channel.

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	7
Configuration #	1
Results	Pass

Signature

Jennifer Herrett

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
1405.751	24.2	-2.7	177.0	1.1	3.0	0.0	V-Horn	AV	0.0	21.5	54.0	-32.5	Mid channel, EUT vertical.
1406.363	23.9	-2.7	198.0	3.2	3.0	0.0	H-Horn	AV	0.0	21.2	54.0	-32.8	Mid channel, EUT vertical.
1405.943	37.4	-2.7	177.0	1.1	3.0	0.0	V-Horn	PK	0.0	34.7	74.0	-39.3	Mid channel, EUT vertical.
1405.533	36.9	-2.7	198.0	3.2	3.0	0.0	H-Horn	PK	0.0	34.2	74.0	-39.8	Mid channel, EUT vertical.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION

Tx, Modulated.

POWER SETTINGS INVESTIGATED

Battery

FREQUENCY RANGE INVESTIGATED

Start Frequency 30MHz Stop Frequency 6GHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	7/9/2010	12
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	7/9/2010	12
Antenna, Horn	EMCO	3115	AHC	7/8/2010	24
Spectrum Analyzer	Agilent	E4446A	AAQ	1/10/2011	12
Pre-Amplifier	Miteq	AM-1616-1000	AOL	8/9/2010	12
EV01 Cables	N/A	Bilog Cables	EVA	7/9/2010	12
Antenna, Bilog	Teseq	CBL 6141B	AXR	11/29/2010	12
Power Meter	Gigatronics	8651A	SPM	1/7/2010	24
Power Sensor	Gigatronics	80701A	SPL	1/7/2010	24
Signal Generator	Agilent	E8257D	TGX	3/22/2011	12
Antenna, Dipole	ETS	3121C-DB4	ADH	3/6/2009	36

MEASUREMENT BANDWIDTHS

	Frequency Range	Peak Data	Quasi-Peak Data	Average Data
	(MHz)	(kHz)	(kHz)	(kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. The measurement uncertainty estimation is available upon request.

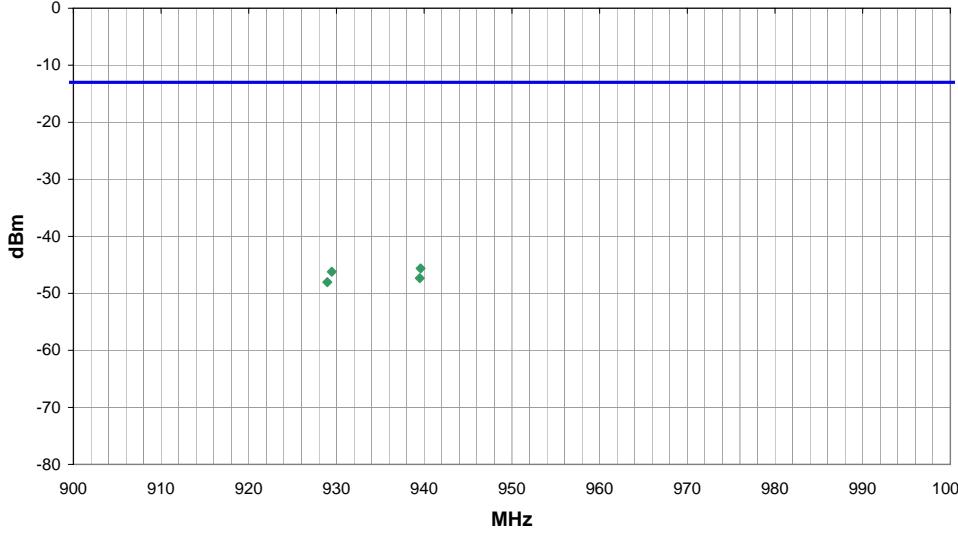
TEST DESCRIPTION

The Field Strength of Spurious Radiation was measured in the far-field at an FCC Listed OATS up to 6 GHz. Spectrum analyzer, signal generator, and linearly polarized antennas were used to measure radiated harmonics and spurious emissions. The orientation of the EUT and measurement antenna were manipulated to maximize the level of emissions. The EUT was configured to transmit at the highest output power.

For licensed transmitters, the FCC references TIA/EIA-603 as the measurement procedure standard. TIA/EIA-603 Section 2.2.12 describes a method for measuring radiated spurious emissions that utilizes an antenna substitution method:

At an approved test site, the transmitter is placed on a remotely controlled turntable, and the measurement antenna is placed 3 meters from the transmitter. The turntable azimuth is varied to maximize the level of spurious emissions. The height of the measurement antenna is also varied from 1 to 4 meters. The amplitude and frequency of the highest emissions are noted. The transmitter is then replaced with a 1/2 wave dipole that is successively tuned to each of the highest spurious emissions. A signal generator is connected to the dipole (horn antenna for frequencies above 1 GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the dipole antenna and its gain; the power (dBm) into an ideal 1/2 wave dipole antenna is determined for each radiated spurious emission.

NORTHWEST EMC		TRANSMITTER SPURIOUS EMISSIONS										PSA 2008.07.21 EMI 2008.1.9	
EUT: DigiRadio Serial Number: 3 Customer: Digital Control, Inc. Attendees: Mike Na, Tim Bayliss Project: None Tested by: Jennifer Herrett					Work Order: DIGC0136 Date: 03/28/11 Temperature: 22 Humidity: 33% Barometric Pres.: 30.14 Power: Battery Job Site: EV01								
TEST SPECIFICATIONS					TEST METHOD								
FCC 901:2011					ANSI/TIA/EIA-603-C-2004								
TEST PARAMETERS													
Antenna Height(s) (m)		1 - 4		Test Distance (m)		3							
COMMENTS													
UHF Radio - Modular. Antenna installed.													
EUT OPERATING MODES													
Tx, Modulated.													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
Run #	2		Configuration #	1		Signature		<i>Jennifer Herrett</i>					
Results	Pass												
Freq (MHz)			Azimuth (degrees)	Height (meters)			Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
2786.984			115.0	1.0			V-Horn	PK	4.24E-07	-33.7	-13.0	-20.7	Low channel, EUT horizontal.
2787.001			115.0	1.0			V-Horn	AV	3.95E-07	-34.0	-13.0	-21.0	Low channel, EUT horizontal.
2786.988			25.0	1.0			H-Horn	PK	3.44E-07	-34.6	-13.0	-21.6	Low channel, EUT antenna above radio board.
2787.002			25.0	1.0			H-Horn	AV	3.21E-07	-34.9	-13.0	-21.9	Low channel, EUT antenna above radio board.
2817.304			79.0	1.0			H-Horn	PK	3.14E-07	-35.0	-13.0	-22.0	High channel, EUT antenna above radio board.
2817.301			79.0	1.0			H-Horn	AV	2.86E-07	-35.4	-13.0	-22.4	High channel, EUT antenna above radio board.
2817.285			102.0	1.0			V-Horn	PK	2.80E-07	-35.5	-13.0	-22.5	High channel, EUT horizontal.
2817.301			102.0	1.0			V-Horn	AV	2.61E-07	-35.8	-13.0	-22.8	High channel, EUT horizontal.
2817.315			78.0	1.0			H-Horn	PK	1.89E-07	-37.2	-13.0	-24.2	High channel, EUT horizontal.
2817.301			78.0	1.0			H-Horn	AV	1.73E-07	-37.6	-13.0	-24.6	High channel, EUT horizontal.
2817.305			64.0	1.0			V-Horn	PK	1.54E-07	-38.1	-13.0	-25.1	High channel, EUT vertical.
2817.301			64.0	1.0			V-Horn	AV	1.40E-07	-38.5	-13.0	-25.5	High channel, EUT vertical.
1878.198			179.0	1.0			H-Horn	PK	1.19E-07	-39.2	-13.0	-26.2	High channel, EUT antenna above radio board.
1878.202			179.0	1.0			H-Horn	AV	1.11E-07	-39.5	-13.0	-26.5	High channel, EUT antenna above radio board.
2817.311			240.0	1.0			H-Horn	PK	9.71E-08	-40.1	-13.0	-27.1	High channel, EUT vertical.
2817.302			240.0	1.0			H-Horn	AV	8.65E-08	-40.6	-13.0	-27.6	High channel, EUT vertical.
2817.308			299.0	1.0			V-Horn	PK	5.99E-08	-42.2	-13.0	-29.2	High channel, EUT antenna above radio board.
1858.009			114.0	1.3			V-Horn	PK	5.46E-08	-42.6	-13.0	-29.6	Low channel, EUT horizontal.
2817.300			299.0	1.0			V-Horn	AV	5.09E-08	-42.9	-13.0	-29.9	High channel, EUT antenna above radio board.
1858.003			114.0	1.3			V-Horn	AV	4.98E-08	-43.0	-13.0	-30.0	Low channel, EUT horizontal.

TRANSMITTER SPURIOUS EMISSIONS													
NORTHWEST EMC													
PSA 2008.07.21 EMI 2008.1.9													
EUT: DigiRadio Serial Number: 3 Customer: Digital Control, Inc. Attendees: Mike Na, Tim Bayliss Project: None Tested by: Jennifer Herrett						Work Order: DIGC0136 Date: 03/28/11 Temperature: 22 Humidity: 33% Barometric Pres.: 30.14 Power: Battery Job Site: EV01							
TEST SPECIFICATIONS						TEST METHOD							
FCC 901:2011						ANSI/TIA/EIA-603-C-2004							
TEST PARAMETERS													
Antenna Height(s) (m)			1 - 4			Test Distance (m)			3				
COMMENTS													
UHF Radio - Modular. Antenna installed.													
EUT OPERATING MODES													
Tx, Modulated.													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
Run #	3		Signature										
Configuration #	1												
Results	Pass												
 <p>The plot shows a flat line at -10 dBm across the frequency range from 900 MHz to 1000 MHz. There are two small peaks at approximately -48 dBm, one at 939.587 MHz and another at 929.464 MHz. The y-axis is labeled 'dBm' and ranges from 0 to -80. The x-axis is labeled 'MHz' and ranges from 900 to 1000.</p>													
Freq (MHz)			Azimuth (degrees)	Height (meters)			Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
939.587			5.0	1.0			V-Bilog	PK	2.74E-08	-45.6	-13.0	-32.6	High channel, EUT horizontal.
929.464			95.0	1.0			H-Bilog	PK	2.38E-08	-46.2	-13.0	-33.2	Low channel, EUT antenna above radio board.
939.503			119.0	1.2			H-Bilog	PK	1.85E-08	-47.3	-13.0	-34.3	High channel, EUT antenna above radio board.
928.949			237.0	1.0			V-Bilog	PK	1.57E-08	-48.0	-13.0	-35.0	Low channel, EUT horizontal.