

# Digital Control, Inc.

## DigiRadio

Report No. DIGC0139

Report Prepared By



[www.nwemc.com](http://www.nwemc.com)  
1-888-EMI-CERT

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EMC Test Report



22975 NW Evergreen Parkway  
Suite 400  
Hillsboro, Oregon 97124

## 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 901:2011	ANSI/TIA/EIA-603-C-2004	Pass
Occupied Bandwidth	FCC 901:2011	ANSI/TIA/EIA-603-C-2004	Pass
Output Power	FCC 901:2011	ANSI/TIA/EIA-603-C-2004	Pass
Frequency Stability	FCC 901:2011	ANSI/TIA/EIA-603-C-2004	Pass
Spurious Conducted Emissions	FCC 901:2011	ANSI/TIA/EIA-603-C-2004	Pass
Receiver Spurious Emissions	FCC 15.109:2011	ANSI C63.4:2003	Pass
Transmitter Spurious Emissions	FCC 901:2011	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

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## 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.

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## 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.

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## 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*)

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## 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.

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## 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).

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# Accreditations and Authorizations

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## 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).*

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## 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).

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## 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

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## 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)*

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## 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.

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## SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>



# Northwest EMC Locations



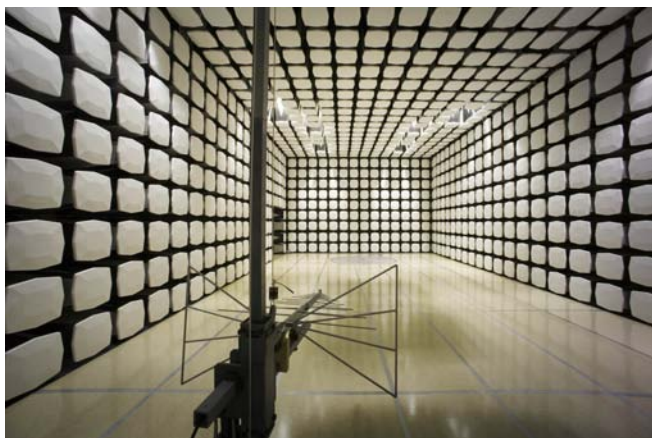
Oregon  
Labs EV01-EV12  
22975 NW Evergreen Pkwy  
Suite 400  
Hillsboro, OR 97124  
(503) 844-4066

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 339<sup>th</sup> 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**

<b>Company Name:</b>	Digital Control, Inc.
<b>Address:</b>	19625 62nd Avenue South, Suite B103
<b>City, State, Zip:</b>	Kent, WA 98032
<b>Test Requested By:</b>	Amanda Hamm
<b>Model:</b>	DigiRadio
<b>First Date of Test:</b>	March 28, 2011
<b>Last Date of Test:</b>	April 7, 2011
<b>Receipt Date of Samples:</b>	March 28, 2011
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	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.

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.

## EMC

## 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	Power:	7.2 VDC Nominal
		Job Site:	EV06

## TEST SPECIFICATIONS

## TEST METHOD

FCC 901:2011

ANSI/TIA/EIA-603-C-2004

## COMMENTS

Normal 'Sine' modulation.

## DEVIATIONS FROM TEST STANDARD

None

Configuration #	1	Signature 
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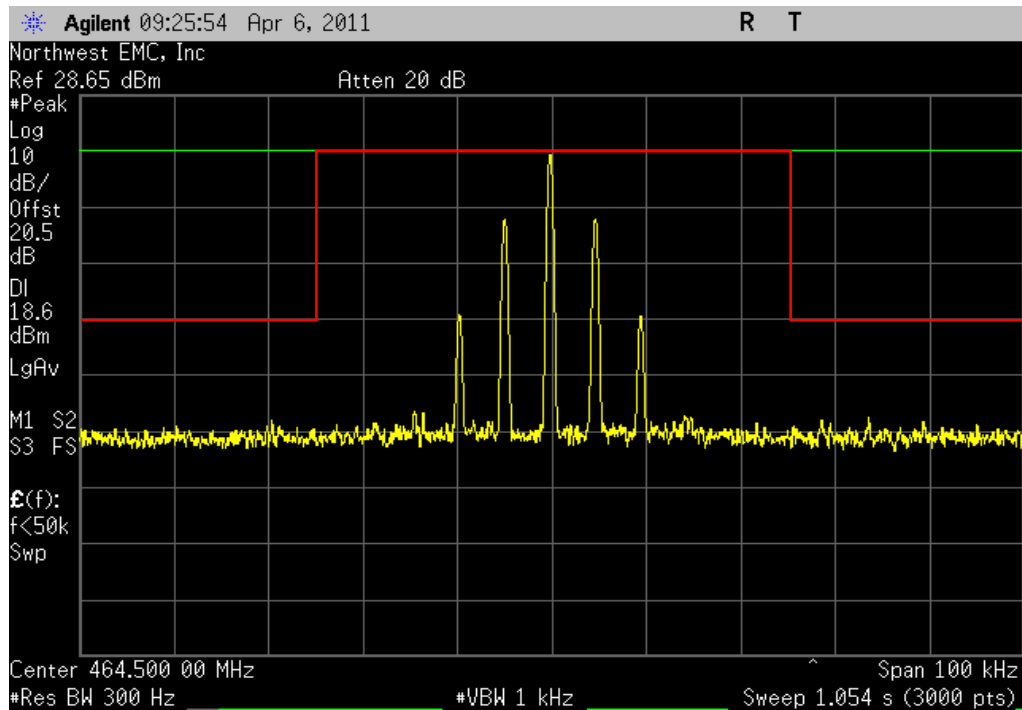
	Value	Limit	Results
Low Channel, 464.5 MHz			
fC ± 50 kHz	See Graph	See Mask	Pass
fC ± 250 kHz	See Graph	See Mask	Pass
High Channel, 469.55 MHz			
fC ± 50 kHz	See Graph	See Mask	Pass
fC ± 250 kHz	See Graph	See Mask	Pass

Low Channel, 464.5 MHz, fC  $\pm$  50 kHz

Result: Pass

Value: See Graph

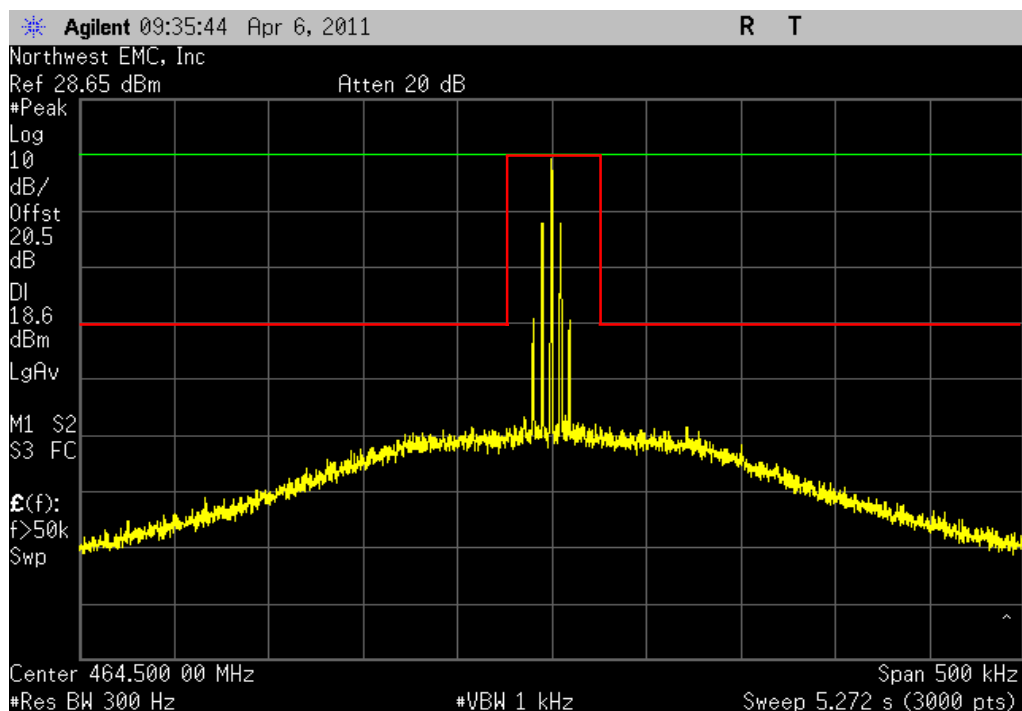
Limit: See Mask

Low Channel, 464.5 MHz, fC  $\pm$  250 kHz

Result: Pass

Value: See Graph

Limit: See Mask

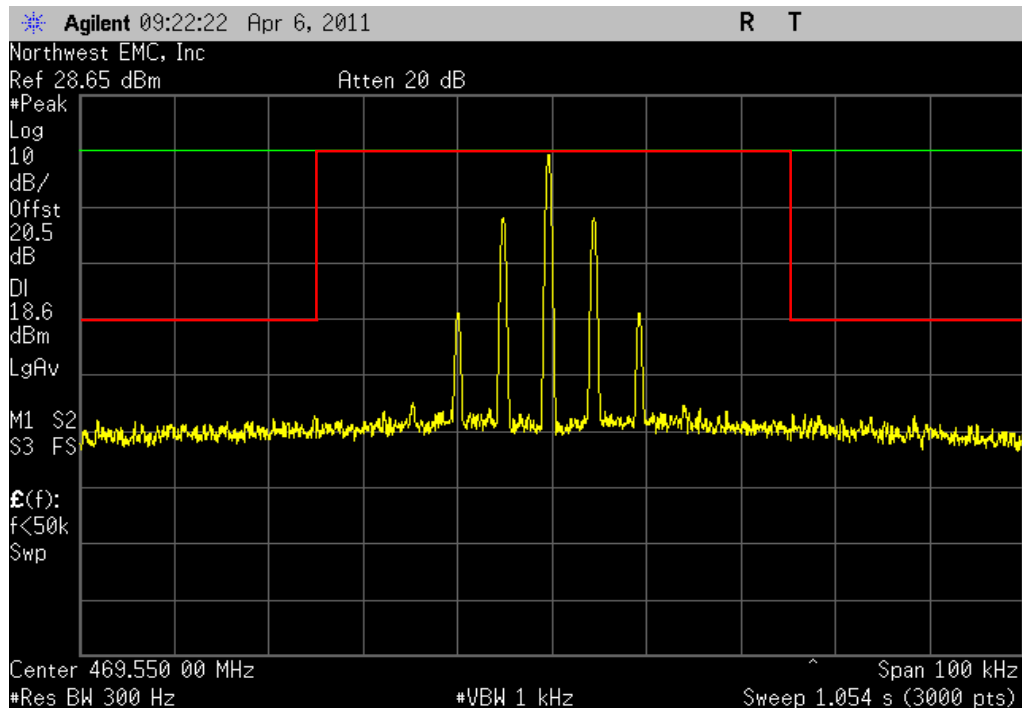


High Channel, 469.55 MHz, fC  $\pm$  50 kHz

Result: Pass

Value: See Graph

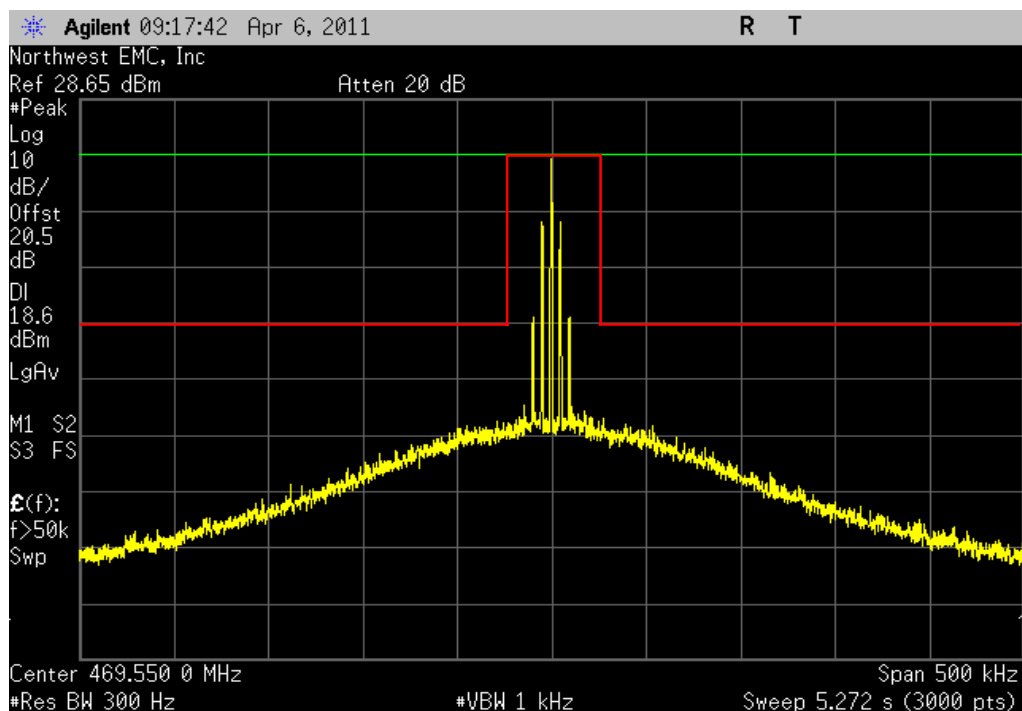
Limit: See Mask

High Channel, 469.55 MHz, fC  $\pm$  250 kHz

Result: Pass

Value: See Graph

Limit: See Mask



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.

## EMC

## 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		Power: 7.2 VDC Nominal	
		Job Site: EV06	
TEST SPECIFICATIONS		TEST METHOD	
FCC 901:2011		ANSI/TIA/EIA-603-C-2004	
COMMENTS			
Normal 'Sine' modulation.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit
Low Channel, 464.5 MHz		10.181 kHz	12.5 kHz
High Channel, 469.55 MHz		10.203 kHz	12.5 kHz
			Results
			Pass
			Pass

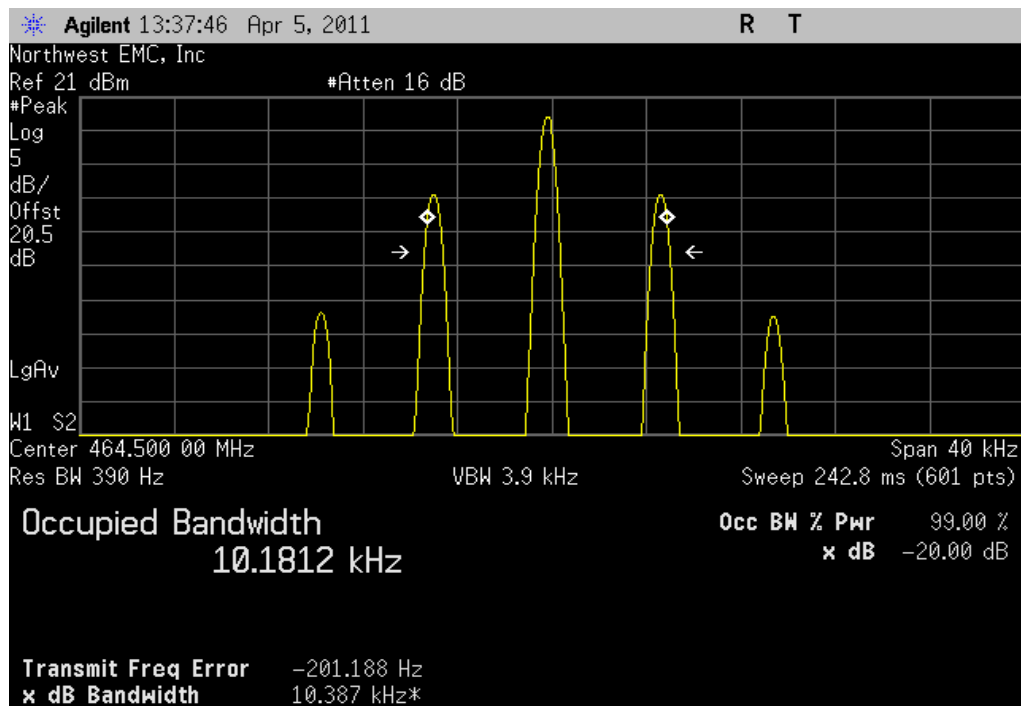


Low Channel, 464.5 MHz

Result: Pass

Value: 10.181 kHz

Limit: 12.5 kHz

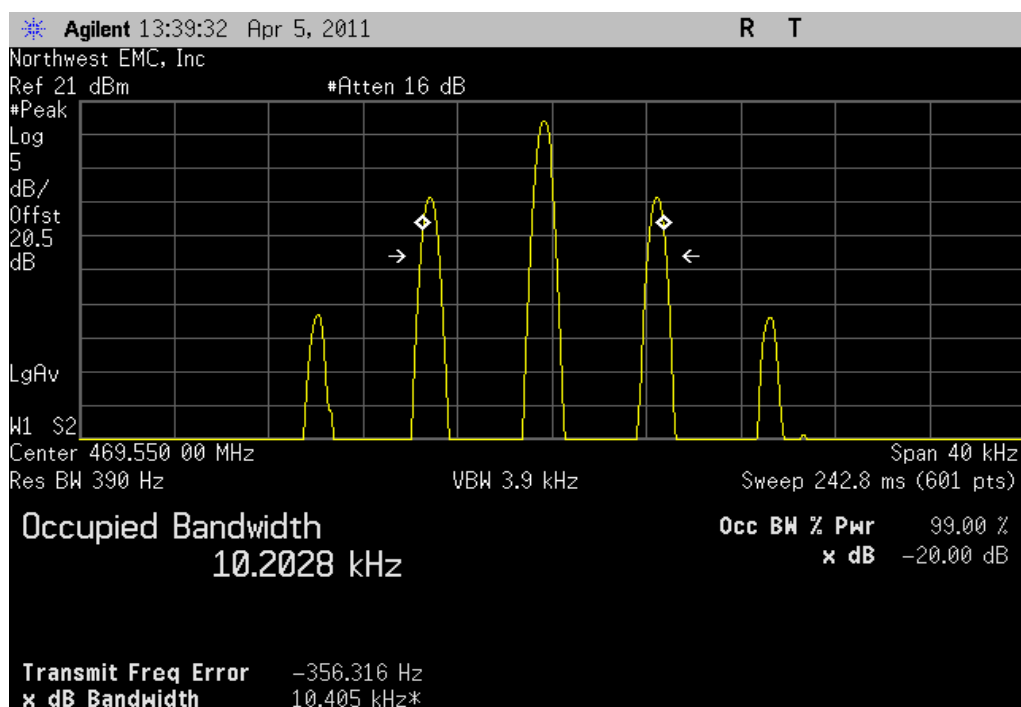


High Channel, 469.55 MHz

Result: Pass

Value: 10.203 kHz

Limit: 12.5 kHz



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.

## EMC

## OUTPUT POWER

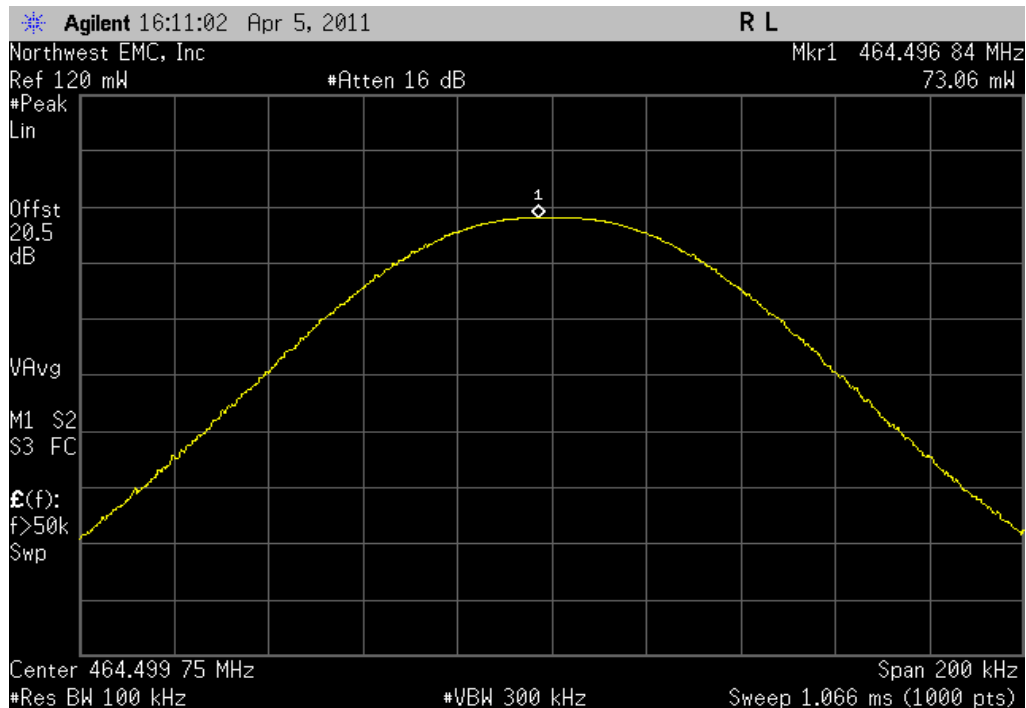
EUT: DigiRadio		Work Order: DIGC0139	
Serial Number: 3		Date: 04/05/11	
Customer: Digital Control, Inc.		Temperature: 22°C	
Attendees: None		Humidity: 32%	
Project: None		Barometric Pres.: 30.15 in	
Tested by: Rod Peloquin		Power: 7.2 VDC Nominal	Job Site: EV06
TEST SPECIFICATIONS		TEST METHOD	
FCC 901:2011		ANSI/TIA/EIA-603-C-2004	
COMMENTS			
Normal 'Sine' modulation.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit
Low Channel, 464.5 MHz		73.1 mW	120 mW
High Channel, 469.55 MHz		73.2 mW	120 mW
			Results
			Pass
			Pass

Low Channel, 464.5 MHz

Result: Pass

Value: 73.1 mW

Limit: 120 mW

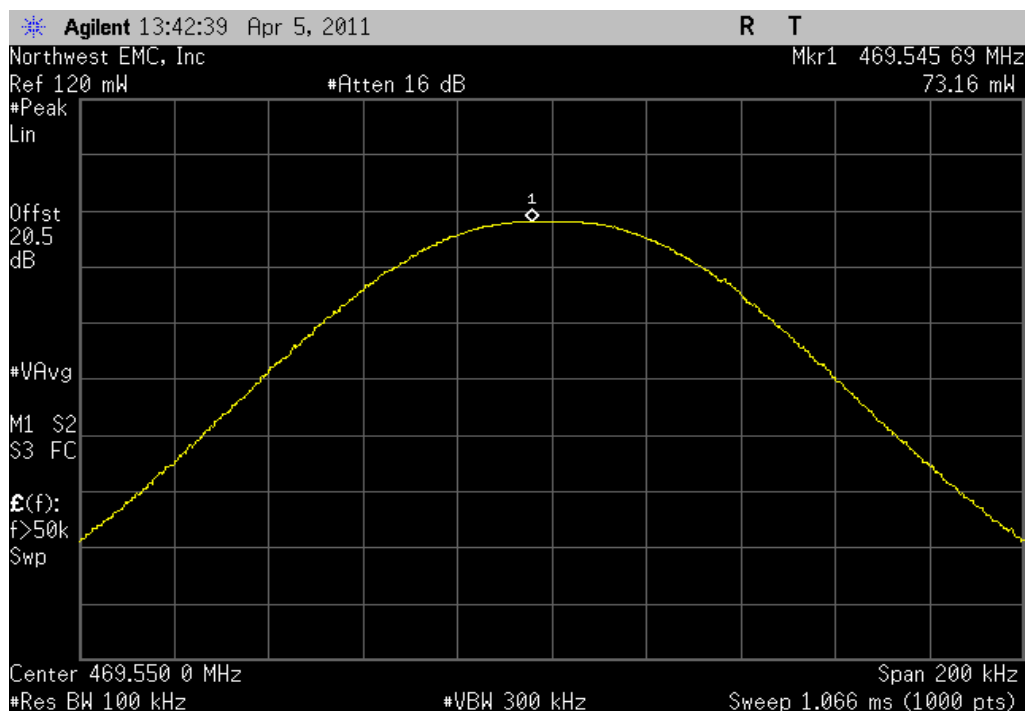


High Channel, 469.55 MHz

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
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#### 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	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

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 ½ 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 ½ wave dipole antenna is determined for each radiated spurious emission.

NORTHWEST		PSA 2008.07.21 EMI 2008.1.9																																																																																																																																																																																							
<b>EMC</b>		<b>OUTPUT POWER - RADIATED</b>																																																																																																																																																																																							
EUT: DigiRadio		Work Order: DIGC0136																																																																																																																																																																																							
Serial Number: 3		Date: 03/29/11																																																																																																																																																																																							
Customer: Digital Control, Inc.		Temperature: 22																																																																																																																																																																																							
Attendees: Mike Na, Tim Bayliss		Humidity: 33%																																																																																																																																																																																							
Project: None		Barometric Pres.: 30.14																																																																																																																																																																																							
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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.



## EMC

## 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		Power: 7.2 VDC Nominal	Job Site: EV06 & EV09
TEST SPECIFICATIONS		TEST METHOD	
FCC 901:2011		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.

## EMC

## 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	Power:	7.2 VDC Nominal
		Job Site:	EV06

## TEST SPECIFICATIONS

## TEST METHOD

FCC 901:2011

ANSI/TIA/EIA-603-C-2004

## COMMENTS

Normal 'Sine' modulation.

## DEVIATIONS FROM TEST STANDARD

None

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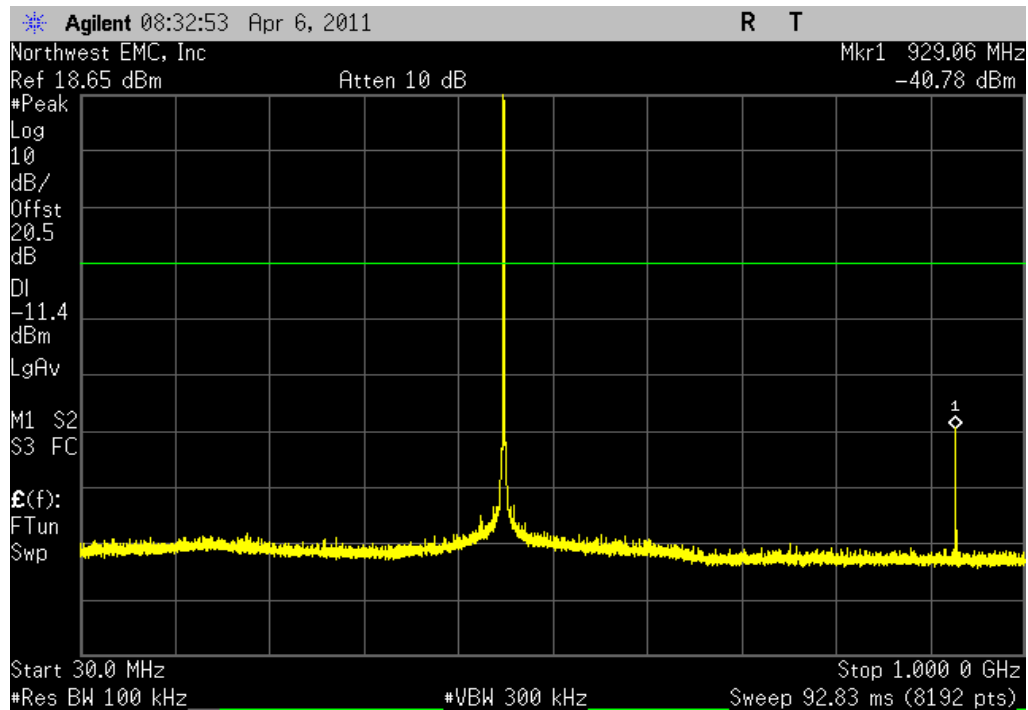
		Value	Limit	Results
Low Channel, 465.5 MHz				
	30 MHz - 1 GHz	-40.8 dBm	-11.4 dBm	Pass
	1 GHz - 5 GHz	-55.0 dBm	-11.4 dBm	Pass
High Channel, 469.55 MHz				
	30 MHz - 1 GHz	-41.3 dBm	-11.4 dBm	Pass
	1 GHz - 5 GHz	-55.5 dBm	-11.4 dBm	Pass

Low Channel, 465.5 MHz, 30 MHz - 1 GHz

Result: Pass

Value: -40.8 dBm

Limit: -11.4 dBm

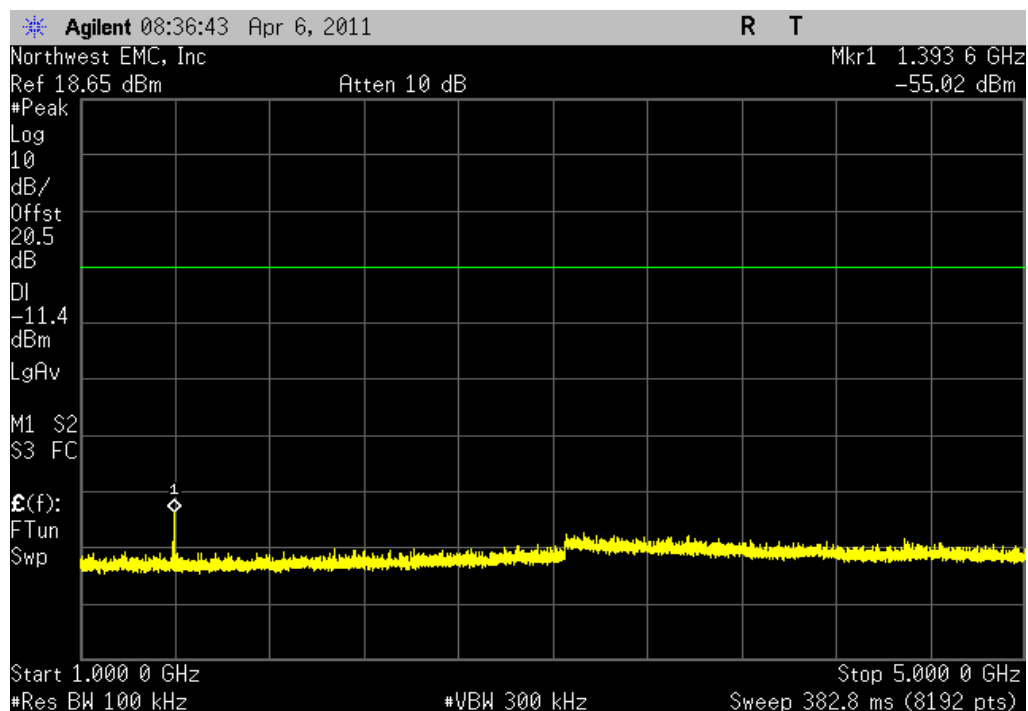


Low Channel, 465.5 MHz, 1 GHz - 5 GHz

Result: Pass

Value: -55.0 dBm

Limit: -11.4 dBm

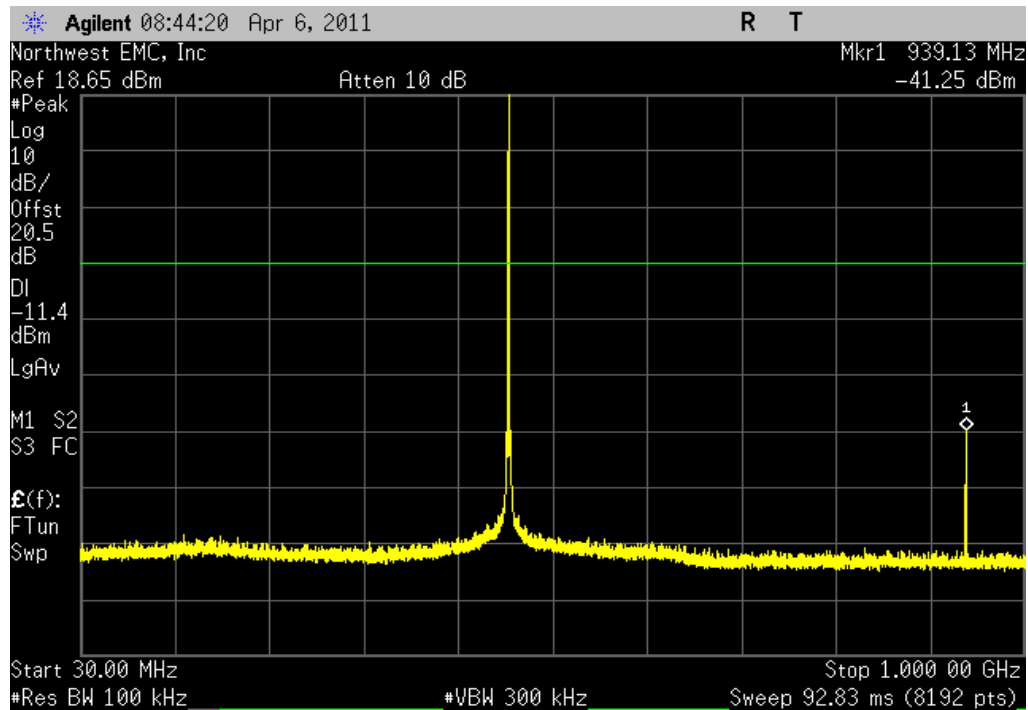


High Channel, 469.55 MHz, 30 MHz - 1 GHz

Result: Pass

Value: -41.3 dBm

Limit: -11.4 dBm

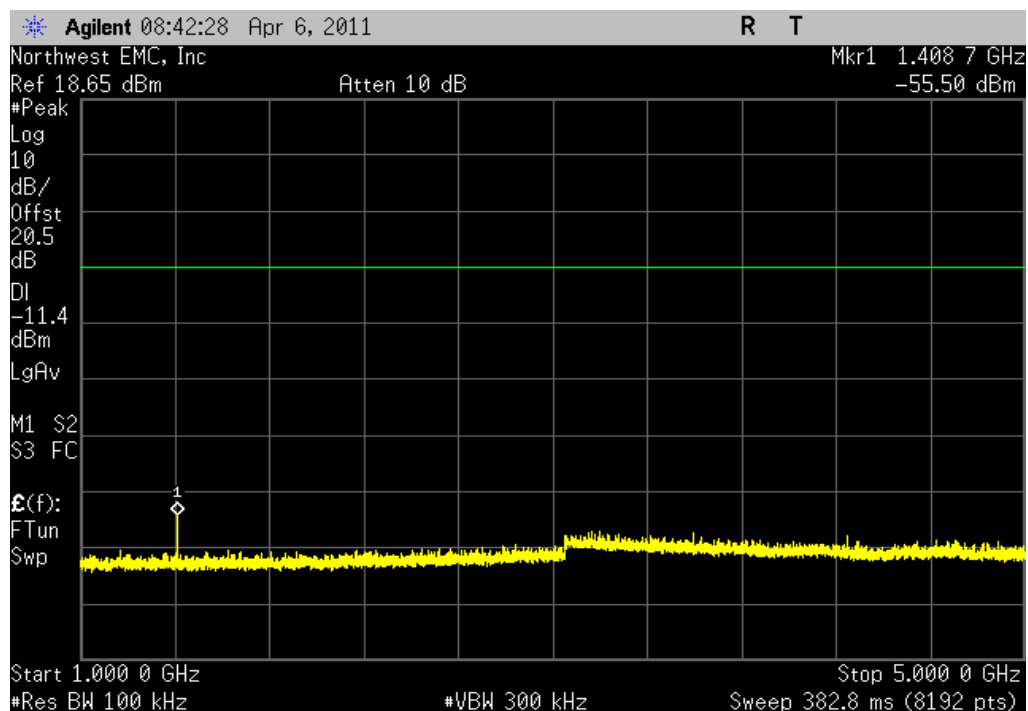


High Channel, 469.55 MHz, 1 GHz - 5 GHz

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
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#### 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
	0.15 - 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

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.

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	Power:	7.2 VDC Nominal
		Job Site:	EV01

## TEST SPECIFICATIONS

FCC 15.109:2011

## TEST METHOD

ANSI C63.4:2003

## TEST PARAMETERS

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

EUT on stand in vertical orientation with antenna vertical

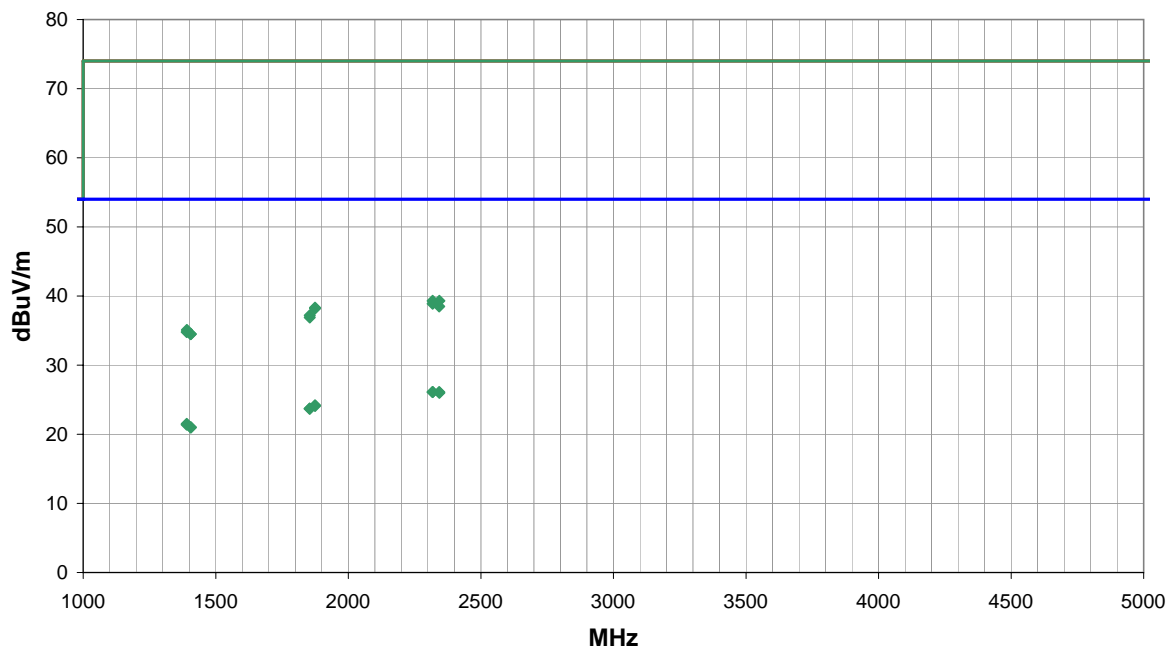
## EUT OPERATING MODES

Receive mode

## DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	1	 Signature
Configuration #	1	
Results	Pass	



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



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	Power:	7.2 VDC Nominal
		Job Site:	EV01

## TEST SPECIFICATIONS

FCC 15.109:2011

## TEST METHOD

ANSI C63.4:2003

## TEST PARAMETERS

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

## COMMENTS

None

## EUT OPERATING MODES

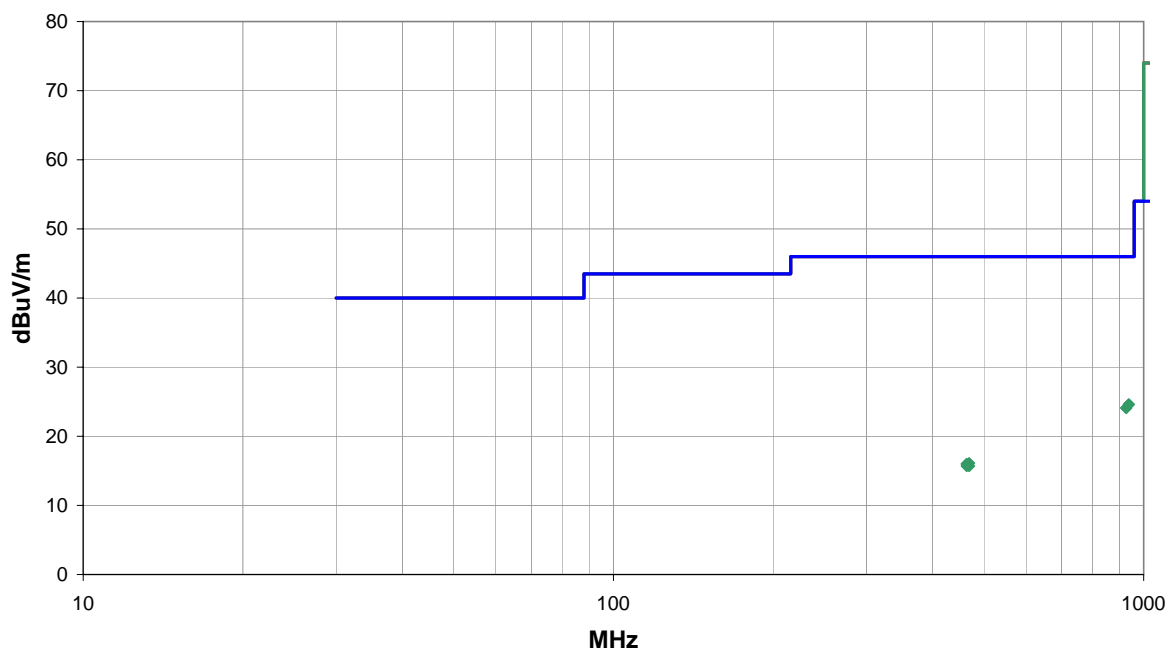
Receive mode

## DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	2
Configuration #	1
Results	Pass

Signature

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

NORTHWEST		PSA 2008.07.21											
<b>EMC</b>		<b>RECEIVER SPURIOUS EMISSIONS DATA SHEET</b>											
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											
		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 #	4	<i>Jennifer Herrett</i> Signature											
Configuration #	1												
Results	Pass												
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.

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

FCC 15.109:2010

## TEST METHOD

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

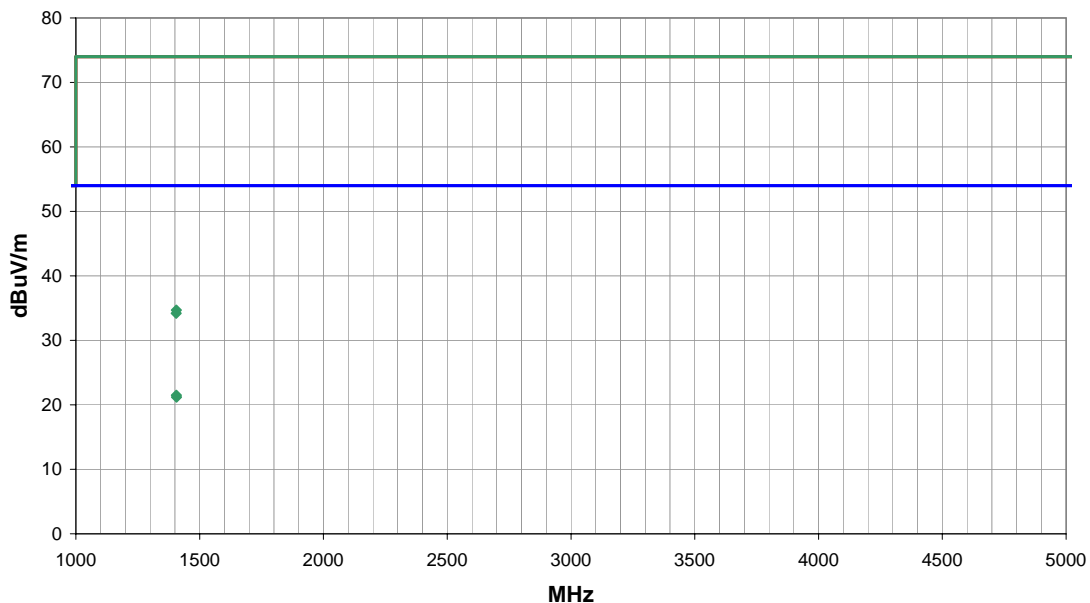
Rx, Mid Channel.

## 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
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#### 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 ½ 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 ½ wave dipole antenna is determined for each radiated spurious emission.

NORTHWEST		PSA 2008.07.21 EMI 2008.1.9											
<b>EMC</b>		<b>TRANSMITTER SPURIOUS EMISSIONS</b>											
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											
		Job Site: EV01											
<b>TEST SPECIFICATIONS</b>		<b>TEST METHOD</b>											
FCC 901:2011		ANSI/TIA/EIA-603-C-2004											
<b>TEST PARAMETERS</b>													
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3										
<b>COMMENTS</b>													
UHF Radio - Modular. Antenna installed.													
<b>EUT OPERATING MODES</b>													
Tx, Modulated.													
<b>DEVIATIONS FROM TEST STANDARD</b>													
No deviations.													
Run #	2	<i>Jennifer Herrett</i> Signature											
Configuration #	1												
Results	Pass												
<b>Freq (MHz)</b>			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.

NORTHWEST		PSA 2008.07.21 EMI 2008.1.9												
<b>EMC</b>		<b>TRANSMITTER SPURIOUS EMISSIONS</b>												
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												
		Job Site: EV01												
<b>TEST SPECIFICATIONS</b>		<b>TEST METHOD</b>												
FCC 901:2011		ANSI/TIA/EIA-603-C-2004												
<b>TEST PARAMETERS</b>														
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3											
<b>COMMENTS</b>														
UHF Radio - Modular. Antenna installed.														
<b>EUT OPERATING MODES</b>														
Tx, Modulated.														
<b>DEVIATIONS FROM TEST STANDARD</b>														
No deviations.														
Run #	3	<i>Jennifer Herrett</i> Signature												
Configuration #	1													
Results	Pass													
<b>Freq (MHz)</b>														
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.