

# NORTHWEST EMC

**IrriGreen, Inc**

**IrriGreen Genius System - Controller**

**FCC 15.207:2015**

**FCC 15.231:2015**

**Report # IRRI0006**



NVLAP Lab Code: 200881-0

*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. This Report may only be duplicated in its entirety*

# CERTIFICATE OF TEST

Last Date of Test: June 16, 2015  
IrriGreen, Inc  
Model: IrriGreen Genius System - Controller

## Radio Equipment Testing

### Standards

Specification	Method
FCC 15.207:2015	ANSI C63.10:2009
FCC 15.231:2015	ANSI C63.10:2009

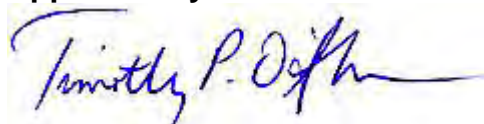
### Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.5, 6.6	Field Strength of Fundamental	Yes	Pass	
6.9.1	Occupied Bandwidth	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	

### Deviations From Test Standards

None

### Approved By:



Tim O'Shea, Operations Manager

*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. 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. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.*

# REVISION HISTORY

Revision Number		Description	Date	Page Number
00		None		

# ACCREDITATIONS AND AUTHORIZATIONS

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## United States

**FCC** - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

**A2LA** - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

**NVLAP** - Each laboratory is accredited by NVLAP to ISO 17025

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## Canada

**IC** - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

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## European Union

**European Commission** – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

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## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

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## Korea

**MSIP / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

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## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

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## Taiwan

**BSMI** – Recognized by BSMI as a CAB for the acceptance of test data.

**NCC** - Recognized by NCC as a CAB for the acceptance of test data.

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## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

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## Israel

**MOC** – Recognized by MOC as a CAB for the acceptance of test data.

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## Hong Kong

**OFCA** – Recognized by OFCA as a CAB for the acceptance of test data.

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## Vietnam

**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

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## SCOPE

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

<http://www.nwemc.com/accreditations/>  
<http://gsi.nist.gov/global/docs/cabs/designations.html>

# MEASUREMENT UNCERTAINTY

## Measurement Uncertainty

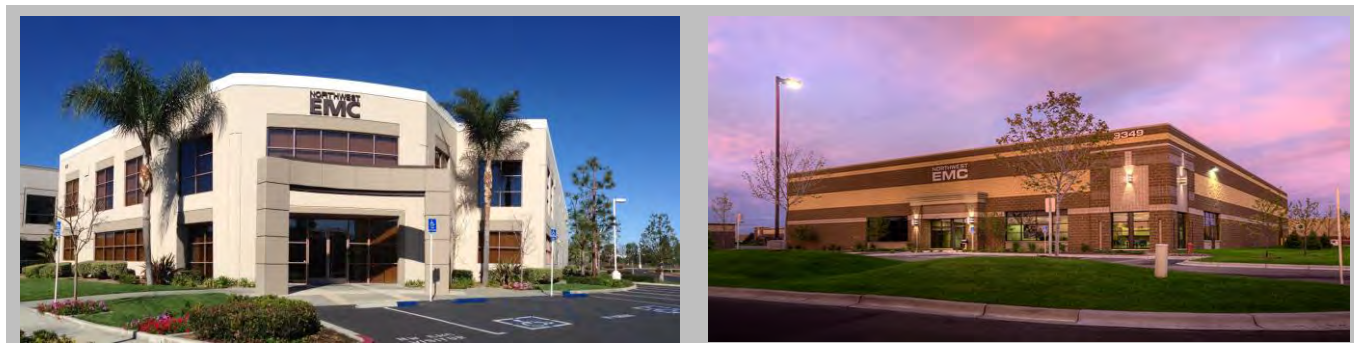
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

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 (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

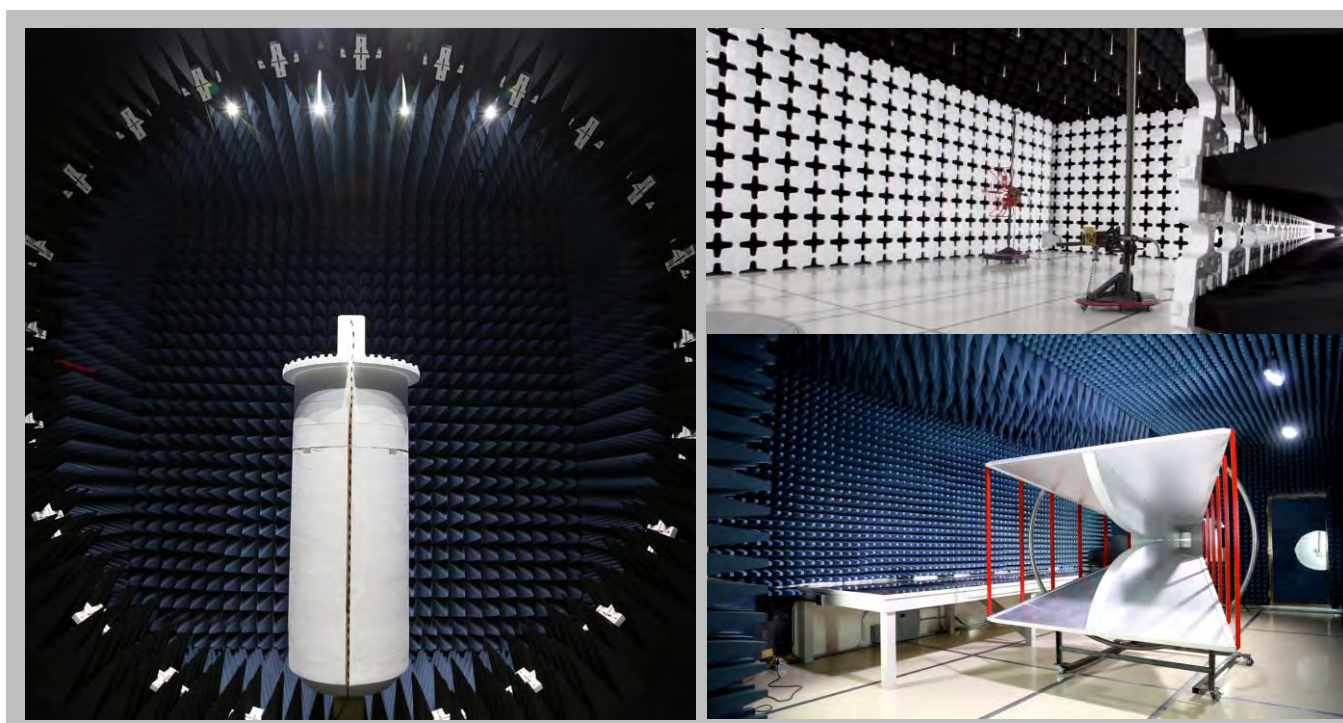
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

<b>Test</b>	<b>+ MU</b>	<b>- MU</b>
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	4.7 dB	-4.7 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

# FACILITIES



<b>California</b> Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	<b>Minnesota</b> Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	<b>New York</b> Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	<b>Oregon</b> Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	<b>Texas</b> Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	<b>Washington</b> Labs NC01-05 19201 120 <sup>th</sup> Ave NE Bothell, WA 9801 (425)984-6600
<b>NVLAP</b>					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
<b>Industry Canada</b>					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
<b>BSMI</b>					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
<b>VCCI</b>					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
<b>Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA</b>					
US0158	US0175	N/A	US0017	US0191	US0157



# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

<b>Company Name:</b>	IrriGreen, Inc
<b>Address:</b>	5250 West 73rd Street, Suite I
<b>City, State, Zip:</b>	Edina, MN 55439
<b>Test Requested By:</b>	Gary Klinefelter
<b>Model:</b>	IrriGreen Genius System - Controller
<b>First Date of Test:</b>	June 15, 2015
<b>Last Date of Test:</b>	June 16, 2015
<b>Receipt Date of Samples:</b>	June 15, 2015
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage

## Information Provided by the Party Requesting the Test

<b>Functional Description of the EUT:</b>
IrriGreen has developed a new box to add to their irrigation system. This box has a 433MHz radio that talks to their IrriGreen Server and also a TI CC3100 WiFi module to talk to a phone. It also has a connection for a flow sensor and a 24 VAC transformer.
<b>Testing Objective:</b>
To demonstrate compliance to FCC 15.231 specifications for the 433.92 MHz transceiver.



# CONFIGURATIONS

## Configuration IRR10006- 1

Software/Firmware Running during test					
Description			Version		
TeraTerm			4.86		
EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Controller	IrriGreen, Inc.	501101	None		
Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
Sensor	Data Industrial	735PV10	04/15		
Transformer	MG Electronics	MGT2420	2014C		
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	2.0m	No	Controller	Transformer
Sensor Leads	No	2.7m	No	Controller	Sensor
AC Power	No	1.8m	No	Transformer	AC Mains

## Configuration IRR10006- 2

Software/Firmware Running during test					
Description			Version		
TeraTerm			4.86		
EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Controller	IrriGreen, Inc.	501101	None		
Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
Sensor	Data Industrial	735PV10	04/15		
Transformer	MG Electronics	MGT2420	2014C		
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	2.0m	No	Controller	Transformer
Sensor Leads	No	2.7m	No	Controller	Sensor
AC Power	No	1.8m	No	Transformer	AC Mains



# MODIFICATIONS

## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	6/15/2015	Field Strength of Fundamental	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	6/15/2015	Spurious Radiated 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.
3	6/15/2015	Duty Cycle	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	6/15/2015	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.
5	6/16/2015	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

# POWERLINE CONDUCTED EMISSIONS

## TEST DESCRIPTION

The EUT will be powered either directly or indirectly from the AC power line. Therefore, conducted emissions measurements were made on the AC input of the EUT, or on the AC input of the device used to power the EUT. The AC power line conducted emissions were measured with the EUT operating at the lowest and the highest channel in the operational band. The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.10-2009.

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
High Pass Filter	TTE	H97-100K-50-720B	HGN	5/11/2015	05/11/2016
Attenuator 20dB, BNC	Fairview Microwave	SA01B-20	AQP	7/22/2014	07/22/2015
Cable	ESM Cable Corp.	Conducted Cables	MNC	5/13/2015	05/13/2016
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/23/2015	03/23/2016
Receiver	Rohde & Schwarz	ESR7	ARI	5/21/2015	05/21/2016

## MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

## CONFIGURATIONS INVESTIGATED

IRRI0006-2

## MODES INVESTIGATED

Transmitting High Ch, 443.92 MHz  
Transmitting Low Ch, 433.92 MHz

# POWERLINE CONDUCTED EMISSIONS

EUT:	Irrigreen Genius System - Controller	Work Order:	IRRI0006
Serial Number:	None	Date:	06/16/2015
Customer:	Irrigreen, Inc	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	44%
Customer Project:	None	Bar. Pressure:	993.1 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	IRRI0006-2

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

## TEST PARAMETERS

Run #:	7	Line:	Neutral	Ext. Attenuation (dB):	0
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## COMMENTS

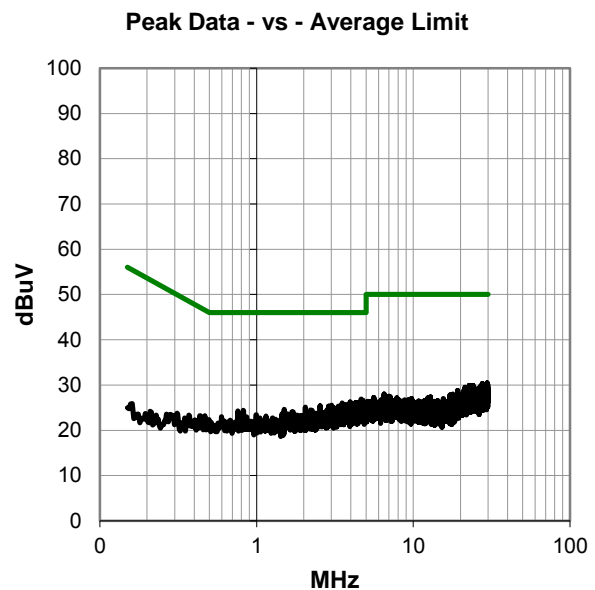
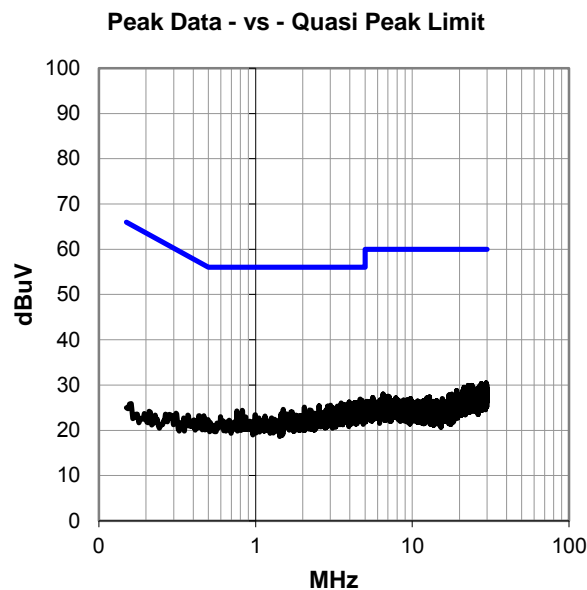
None

## EUT OPERATING MODES

Transmitting High Ch, 443.92 MHz

## DEVIATIONS FROM TEST STANDARD

None



# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #7

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.657	6.4	20.5	26.9	56.0	-29.1
4.787	6.1	20.5	26.6	56.0	-29.4
29.646	8.0	22.5	30.5	60.0	-29.5
27.549	8.0	22.3	30.3	60.0	-29.7
3.952	5.8	20.4	26.2	56.0	-29.8
29.966	7.6	22.5	30.1	60.0	-29.9
4.571	5.6	20.5	26.1	56.0	-29.9
4.411	5.6	20.5	26.1	56.0	-29.9
4.302	5.6	20.5	26.1	56.0	-29.9
3.511	5.7	20.4	26.1	56.0	-29.9
28.105	7.6	22.4	30.0	60.0	-30.0
24.061	8.0	21.9	29.9	60.0	-30.1
22.781	8.1	21.8	29.9	60.0	-30.1
28.903	7.4	22.4	29.8	60.0	-30.2
4.444	5.3	20.5	25.8	56.0	-30.2
4.246	5.3	20.5	25.8	56.0	-30.2
26.937	7.5	22.2	29.7	60.0	-30.3
3.728	5.3	20.4	25.7	56.0	-30.3
4.183	5.2	20.5	25.7	56.0	-30.3
4.093	5.2	20.5	25.7	56.0	-30.3
28.191	7.2	22.4	29.6	60.0	-30.4
29.489	7.1	22.5	29.6	60.0	-30.4
3.649	5.2	20.4	25.6	56.0	-30.4
3.019	5.2	20.3	25.5	56.0	-30.5
27.627	7.2	22.3	29.5	60.0	-30.5
28.739	7.1	22.4	29.5	60.0	-30.5

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.657	6.4	20.5	26.9	46.0	-19.1
4.787	6.1	20.5	26.6	46.0	-19.4
29.646	8.0	22.5	30.5	50.0	-19.5
27.549	8.0	22.3	30.3	50.0	-19.7
3.952	5.8	20.4	26.2	46.0	-19.8
29.966	7.6	22.5	30.1	50.0	-19.9
4.571	5.6	20.5	26.1	46.0	-19.9
4.411	5.6	20.5	26.1	46.0	-19.9
4.302	5.6	20.5	26.1	46.0	-19.9
3.511	5.7	20.4	26.1	46.0	-19.9
28.105	7.6	22.4	30.0	50.0	-20.0
24.061	8.0	21.9	29.9	50.0	-20.1
22.781	8.1	21.8	29.9	50.0	-20.1
28.903	7.4	22.4	29.8	50.0	-20.2
4.444	5.3	20.5	25.8	46.0	-20.2
4.246	5.3	20.5	25.8	46.0	-20.2
26.937	7.5	22.2	29.7	50.0	-20.3
3.728	5.3	20.4	25.7	46.0	-20.3
4.183	5.2	20.5	25.7	46.0	-20.3
4.093	5.2	20.5	25.7	46.0	-20.3
28.191	7.2	22.4	29.6	50.0	-20.4
29.489	7.1	22.5	29.6	50.0	-20.4
3.649	5.2	20.4	25.6	46.0	-20.4
3.019	5.2	20.3	25.5	46.0	-20.5
27.627	7.2	22.3	29.5	50.0	-20.5
28.739	7.1	22.4	29.5	50.0	-20.5

## CONCLUSION

Pass

*Trevor Bults*  
Tested By

# POWERLINE CONDUCTED EMISSIONS

EUT:	Irrigreen Genius System - Controller	Work Order:	IRRI0006
Serial Number:	None	Date:	06/16/2015
Customer:	Irrigreen, Inc	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	44%
Customer Project:	None	Bar. Pressure:	993.1 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	IRRI0006-2

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

## TEST PARAMETERS

Run #:	8	Line:	High Line	Ext. Attenuation (dB):	0
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## COMMENTS

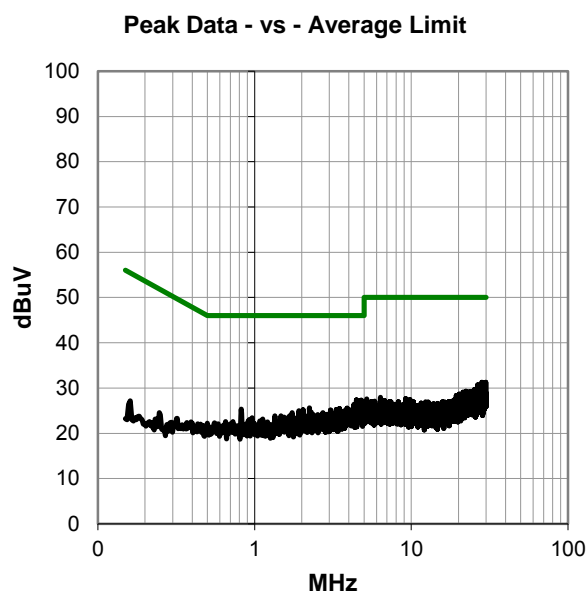
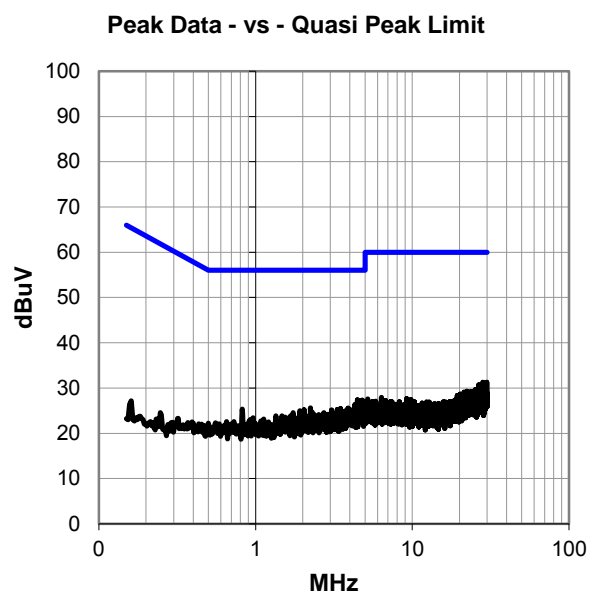
None

## EUT OPERATING MODES

Transmitting High Ch, 443.92 MHz

## DEVIATIONS FROM TEST STANDARD

None



# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #8

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.470	6.9	20.5	27.4	56.0	-28.6
4.795	6.8	20.5	27.3	56.0	-28.7
29.888	8.8	22.5	31.3	60.0	-28.7
28.228	8.9	22.4	31.3	60.0	-28.7
4.765	6.7	20.5	27.2	56.0	-28.8
4.504	6.4	20.5	26.9	56.0	-29.1
26.564	8.5	22.2	30.7	60.0	-29.3
4.940	6.1	20.5	26.6	56.0	-29.4
29.194	8.1	22.4	30.5	60.0	-29.5
4.299	5.9	20.5	26.4	56.0	-29.6
29.422	7.7	22.5	30.2	60.0	-29.8
4.429	5.6	20.5	26.1	56.0	-29.9
27.810	7.7	22.3	30.0	60.0	-30.0
26.870	7.7	22.2	29.9	60.0	-30.1
4.370	5.4	20.5	25.9	56.0	-30.1
4.713	5.3	20.5	25.8	56.0	-30.2
29.560	7.3	22.5	29.8	60.0	-30.2
29.149	7.3	22.4	29.7	60.0	-30.3
25.542	7.6	22.1	29.7	60.0	-30.3
29.444	7.2	22.5	29.7	60.0	-30.3
25.281	7.6	22.1	29.7	60.0	-30.3
2.243	5.3	20.3	25.6	56.0	-30.4
3.899	5.1	20.4	25.5	56.0	-30.5
29.634	7.0	22.5	29.5	60.0	-30.5
3.485	5.1	20.3	25.4	56.0	-30.6
26.732	7.2	22.2	29.4	60.0	-30.6

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.470	6.9	20.5	27.4	46.0	-18.6
4.795	6.8	20.5	27.3	46.0	-18.7
29.888	8.8	22.5	31.3	50.0	-18.7
28.228	8.9	22.4	31.3	50.0	-18.7
4.765	6.7	20.5	27.2	46.0	-18.8
4.504	6.4	20.5	26.9	46.0	-19.1
26.564	8.5	22.2	30.7	50.0	-19.3
4.940	6.1	20.5	26.6	46.0	-19.4
29.194	8.1	22.4	30.5	50.0	-19.5
4.299	5.9	20.5	26.4	46.0	-19.6
29.422	7.7	22.5	30.2	50.0	-19.8
4.429	5.6	20.5	26.1	46.0	-19.9
27.810	7.7	22.3	30.0	50.0	-20.0
26.870	7.7	22.2	29.9	50.0	-20.1
4.370	5.4	20.5	25.9	46.0	-20.1
4.713	5.3	20.5	25.8	46.0	-20.2
29.560	7.3	22.5	29.8	50.0	-20.2
29.149	7.3	22.4	29.7	50.0	-20.3
25.542	7.6	22.1	29.7	50.0	-20.3
29.444	7.2	22.5	29.7	50.0	-20.3
25.281	7.6	22.1	29.7	50.0	-20.3
2.243	5.3	20.3	25.6	46.0	-20.4
3.899	5.1	20.4	25.5	46.0	-20.5
29.634	7.0	22.5	29.5	50.0	-20.5
3.485	5.1	20.3	25.4	46.0	-20.6
26.732	7.2	22.2	29.4	50.0	-20.6

## CONCLUSION

Pass

*Trevor Buls*

Tested By

# POWERLINE CONDUCTED EMISSIONS

EUT:	Irrigreen Genius System - Controller	Work Order:	IRRI0006
Serial Number:	None	Date:	06/16/2015
Customer:	Irrigreen, Inc	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	44%
Customer Project:	None	Bar. Pressure:	993.1 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	IRRI0006-2

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

## TEST PARAMETERS

Run #:	9	Line:	High Line	Ext. Attenuation (dB):	0
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## COMMENTS

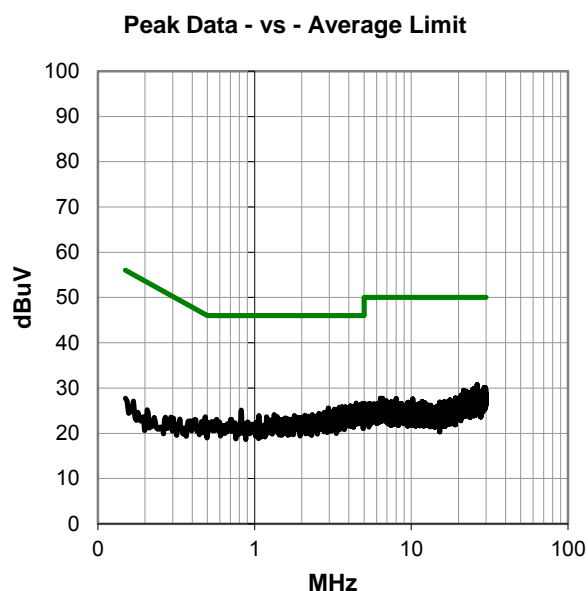
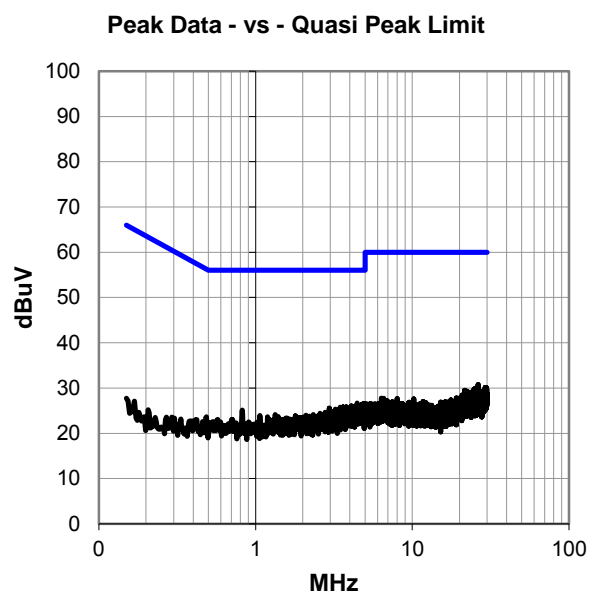
None

## EUT OPERATING MODES

Transmitting Low Ch, 433.92 MHz

## DEVIATIONS FROM TEST STANDARD

None





# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #9

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
26.321	8.6	22.2	30.8	60.0	-29.2
4.459	6.2	20.5	26.7	56.0	-29.3
4.910	6.1	20.5	26.6	56.0	-29.4
4.769	5.9	20.5	26.4	56.0	-29.6
29.187	7.7	22.4	30.1	60.0	-29.9
4.970	5.6	20.5	26.1	56.0	-29.9
4.672	5.6	20.5	26.1	56.0	-29.9
29.750	7.6	22.5	30.1	60.0	-29.9
4.090	5.6	20.5	26.1	56.0	-29.9
25.254	7.9	22.1	30.0	60.0	-30.0
4.276	5.4	20.5	25.9	56.0	-30.1
3.623	5.5	20.4	25.9	56.0	-30.1
29.959	7.3	22.5	29.8	60.0	-30.2
3.791	5.4	20.4	25.8	56.0	-30.2
29.653	7.3	22.5	29.8	60.0	-30.2
3.463	5.4	20.3	25.7	56.0	-30.3
24.740	7.7	22.0	29.7	60.0	-30.3
3.855	5.2	20.4	25.6	56.0	-30.4
4.134	5.1	20.5	25.6	56.0	-30.4
29.418	7.1	22.5	29.6	60.0	-30.4
2.959	5.2	20.3	25.5	56.0	-30.5
21.651	7.8	21.7	29.5	60.0	-30.5
4.246	5.0	20.5	25.5	56.0	-30.5
29.101	7.0	22.4	29.4	60.0	-30.6
3.952	5.0	20.4	25.4	56.0	-30.6
29.049	7.0	22.4	29.4	60.0	-30.6

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
26.321	8.6	22.2	30.8	50.0	-19.2
4.459	6.2	20.5	26.7	46.0	-19.3
4.910	6.1	20.5	26.6	46.0	-19.4
4.769	5.9	20.5	26.4	46.0	-19.6
29.187	7.7	22.4	30.1	50.0	-19.9
4.970	5.6	20.5	26.1	46.0	-19.9
4.672	5.6	20.5	26.1	46.0	-19.9
29.750	7.6	22.5	30.1	50.0	-19.9
4.090	5.6	20.5	26.1	46.0	-19.9
25.254	7.9	22.1	30.0	50.0	-20.0
4.276	5.4	20.5	25.9	46.0	-20.1
3.623	5.5	20.4	25.9	46.0	-20.1
29.959	7.3	22.5	29.8	50.0	-20.2
3.791	5.4	20.4	25.8	46.0	-20.2
29.653	7.3	22.5	29.8	50.0	-20.2
3.463	5.4	20.3	25.7	46.0	-20.3
24.740	7.7	22.0	29.7	50.0	-20.3
3.855	5.2	20.4	25.6	46.0	-20.4
4.134	5.1	20.5	25.6	46.0	-20.4
29.418	7.1	22.5	29.6	50.0	-20.4
2.959	5.2	20.3	25.5	46.0	-20.5
21.651	7.8	21.7	29.5	50.0	-20.5
4.246	5.0	20.5	25.5	46.0	-20.5
29.101	7.0	22.4	29.4	50.0	-20.6
3.952	5.0	20.4	25.4	46.0	-20.6
29.049	7.0	22.4	29.4	50.0	-20.6

## CONCLUSION

Pass

*Trevor Buls*

Tested By

# POWERLINE CONDUCTED EMISSIONS

EUT:	Irrigreen Genius System - Controller	Work Order:	IRRI0006
Serial Number:	None	Date:	06/16/2015
Customer:	Irrigreen, Inc	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	44%
Customer Project:	None	Bar. Pressure:	993.1 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	IRRI0006-2

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

## TEST PARAMETERS

Run #:	10	Line:	Neutral	Ext. Attenuation (dB):	0
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## COMMENTS

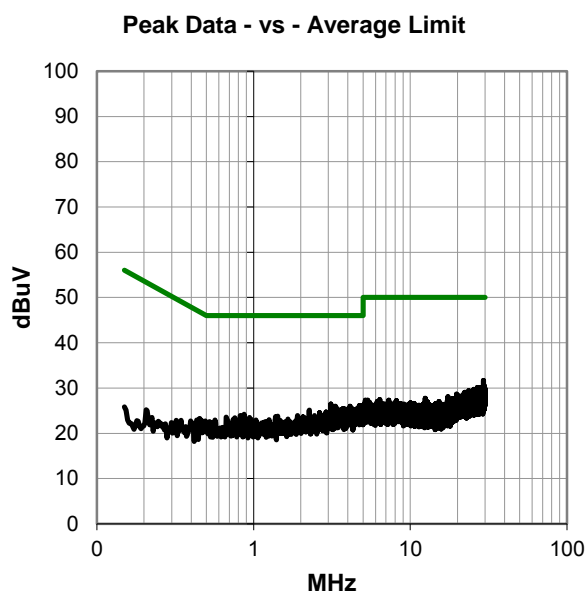
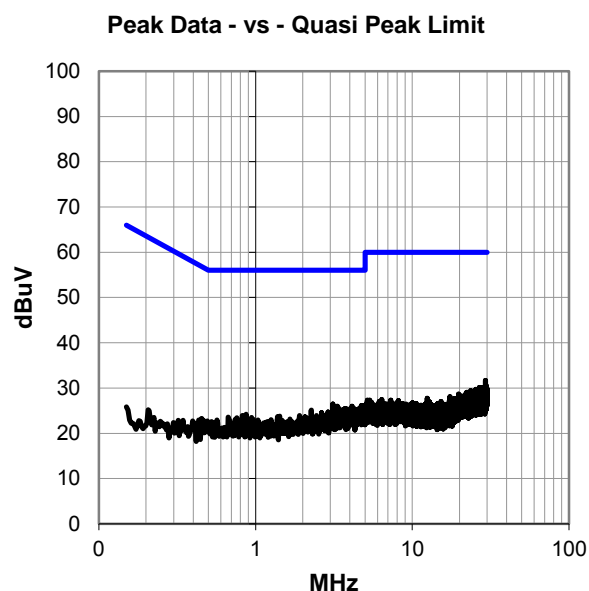
None

## EUT OPERATING MODES

Transmitting Low Ch, 433.92 MHz

## DEVIATIONS FROM TEST STANDARD

None



# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #10

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
29.399	9.2	22.5	31.7	60.0	-28.3
29.537	8.2	22.5	30.7	60.0	-29.3
3.112	6.1	20.3	26.4	56.0	-29.6
29.668	7.9	22.5	30.4	60.0	-29.6
26.788	7.9	22.2	30.1	60.0	-29.9
4.828	5.6	20.5	26.1	56.0	-29.9
4.735	5.6	20.5	26.1	56.0	-29.9
28.030	7.7	22.4	30.1	60.0	-29.9
29.280	7.6	22.5	30.1	60.0	-29.9
29.851	7.5	22.5	30.0	60.0	-30.0
4.131	5.5	20.5	26.0	56.0	-30.0
27.881	7.6	22.4	30.0	60.0	-30.0
29.209	7.5	22.4	29.9	60.0	-30.1
3.325	5.6	20.3	25.9	56.0	-30.1
29.873	7.4	22.5	29.9	60.0	-30.1
29.806	7.4	22.5	29.9	60.0	-30.1
29.616	7.4	22.5	29.9	60.0	-30.1
27.459	7.4	22.3	29.7	60.0	-30.3
25.523	7.6	22.1	29.7	60.0	-30.3
25.654	7.5	22.1	29.6	60.0	-30.4
29.910	7.1	22.5	29.6	60.0	-30.4
26.027	7.4	22.1	29.5	60.0	-30.5
28.933	7.1	22.4	29.5	60.0	-30.5
4.918	5.0	20.5	25.5	56.0	-30.5
3.724	5.1	20.4	25.5	56.0	-30.5
4.086	5.0	20.5	25.5	56.0	-30.5

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
29.399	9.2	22.5	31.7	50.0	-18.3
29.537	8.2	22.5	30.7	50.0	-19.3
3.112	6.1	20.3	26.4	46.0	-19.6
29.668	7.9	22.5	30.4	50.0	-19.6
26.788	7.9	22.2	30.1	50.0	-19.9
4.828	5.6	20.5	26.1	46.0	-19.9
4.735	5.6	20.5	26.1	46.0	-19.9
28.030	7.7	22.4	30.1	50.0	-19.9
29.280	7.6	22.5	30.1	50.0	-19.9
29.851	7.5	22.5	30.0	50.0	-20.0
4.131	5.5	20.5	26.0	46.0	-20.0
27.881	7.6	22.4	30.0	50.0	-20.0
29.209	7.5	22.4	29.9	50.0	-20.1
3.325	5.6	20.3	25.9	46.0	-20.1
29.873	7.4	22.5	29.9	50.0	-20.1
29.806	7.4	22.5	29.9	50.0	-20.1
29.616	7.4	22.5	29.9	50.0	-20.1
27.459	7.4	22.3	29.7	50.0	-20.3
25.523	7.6	22.1	29.7	50.0	-20.3
25.654	7.5	22.1	29.6	50.0	-20.4
29.910	7.1	22.5	29.6	50.0	-20.4
26.027	7.4	22.1	29.5	50.0	-20.5
28.933	7.1	22.4	29.5	50.0	-20.5
4.918	5.0	20.5	25.5	46.0	-20.5
3.724	5.1	20.4	25.5	46.0	-20.5
4.086	5.0	20.5	25.5	46.0	-20.5

## CONCLUSION

Pass

*Trevor Buls*

Tested By

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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

## MODES OF OPERATION

Transmitting 433.92 MHz, 443.92 MHz, continuous modulated

## POWER SETTINGS INVESTIGATED

110VAC/60Hz

## CONFIGURATIONS INVESTIGATED

IRRI0006 - 1

## 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
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REN	3/2/2015	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	3/2/2015	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	5/5/2015	12 mo
Antenna, Horn	ETS Lindgren	3115	AJA	6/3/2014	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAD	3/2/2015	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/30/2015	12 mo
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2015	12 mo

## 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

## TEST DESCRIPTION

The single, integral antenna to be used with the EUT was tested. The EUT was configured for un-modulated. The field strength of the transmit frequency was maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT in 3 orthogonal planes (per ANSI C63.10:2009).

A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

To derive average emission measurements, a duty cycle correction factor per 15.35(c) was utilized:

Duty Cycle = On time/100 milliseconds (or the period, whichever is less)

Where "On time" = N1L1 + N2L2 + ...

Where N1 is the number of type 1 pulses, L1 is length of type 1 pulses, N2 is the number of type 2 pulses, L2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle = (N1L1 + N2L2 + ...)/100mS or T, whichever is less. Where T is the period of the pulse train.

The measured values for the EUT's pulse train are as follows:

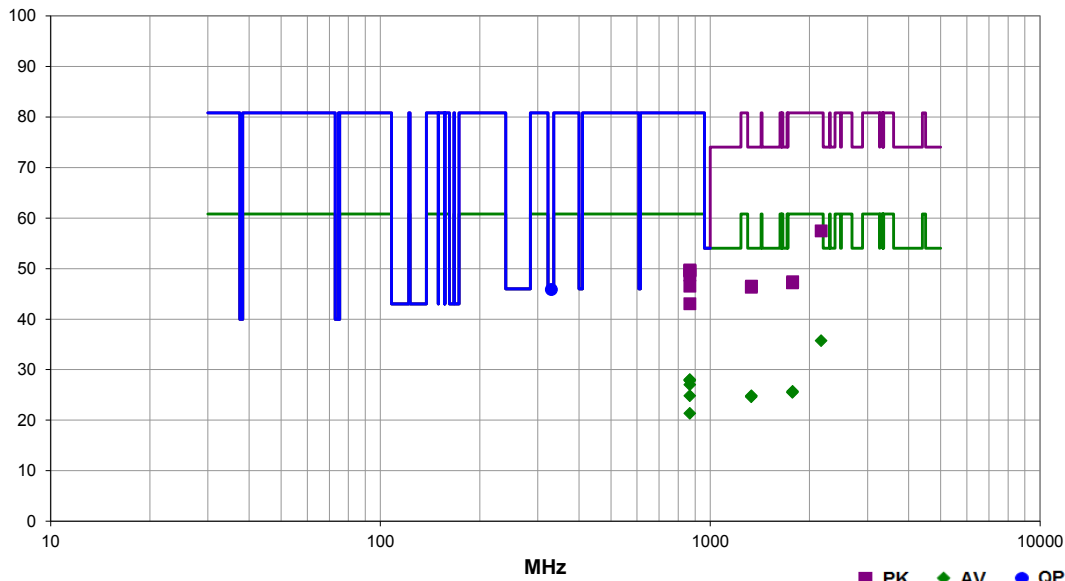
Period = 100 mSec  
Pulsewidth of Type 1 Pulse = 8.222 mSec  
Number of Type 1 Pulses = 1  
Duty Cycle =  $20 \log \left[ \frac{(1)(8.222)}{100} \right] = -21.7 \text{ dB}$

The duty cycle correction factor of -21.7dB was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz for measurements at or below 1GHz. Above 1GHz, a resolution bandwidth of 1MHz and a video bandwidth of 3MHz was used.

The field strength of the spurious emissions meet the limits as defined in 47 CFR 15.231(b). The spurious emissions also meet the provisions in 15.35 for averaging pulsed emissions and for limiting peak emissions. Further, spurious emissions meet the provisions of 15.205 using the measurement instrumentation specified in that section.

Work Order:	IRRI0006	Date:	06/15/15	<i>Trevor Buls</i>
Project:	None	Temperature:	23 °C	
Job Site:	MN05	Humidity:	53.5% RH	
Serial Number:	None	Barometric Pres.:	983.3 mbar	
EUT:	IrrGreen Genius System - Controller			
Configuration:	1			
Customer:	IrrGreen, Inc			
Attendees:	Gary Klinefelter			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 433.92 MHz, continuous modulated			
Deviations:	None			
Comments:	None			

Test Specifications				Test Method			
FCC 15.231(b):2015				ANSI C63.10:2009			
Run #	7	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass

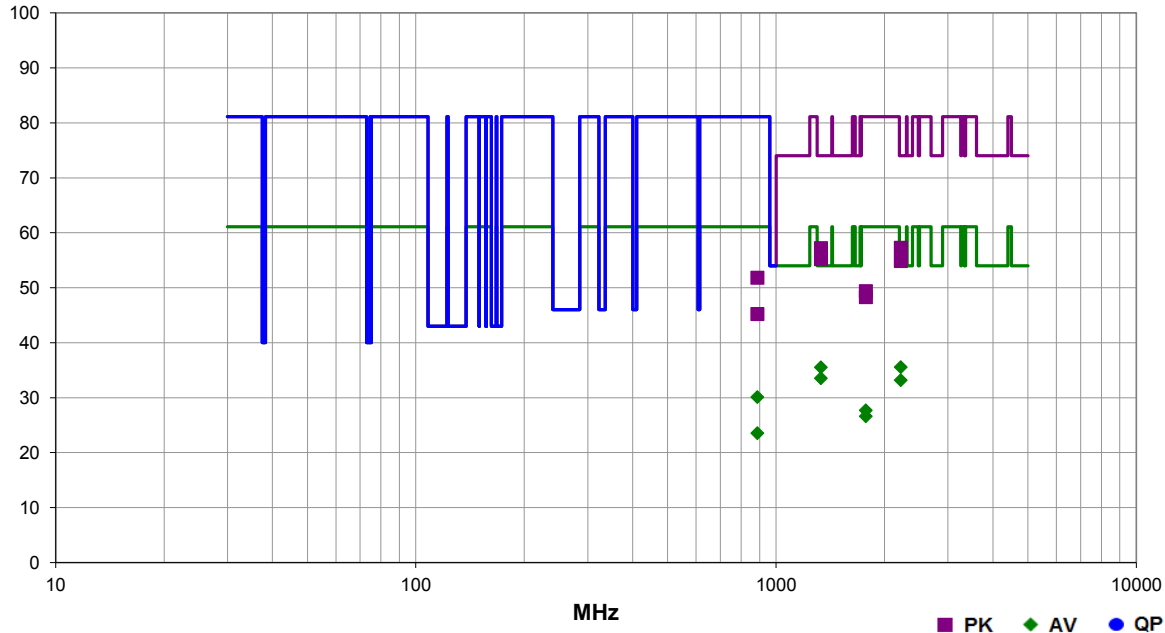


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
329.810	37.7	-1.8	1.0	196.1		10.0	Horz	QP	0.0	45.9	46.0	-0.1	EUT Horizontal, Low Ch, normal operation
2169.425	48.3	-0.9	1.1	167.1		10.0	Vert	PK	0.0	57.4	80.8	-23.4	EUT Horizontal, Low Ch
2169.425	48.3	-0.9	1.1	167.1	-21.7	10.0	Vert	AV	0.0	35.7	60.6	-24.9	EUT Horizontal, Low Ch
1333.593	41.2	-4.7	1.0	355.9		10.0	Vert	PK	0.0	46.5	74.0	-27.5	EUT Horizontal, Low Ch
1332.127	41.0	-4.7	1.0	90.0		10.0	Horz	PK	0.0	46.3	74.0	-27.7	EUT Horizontal, Low Ch
1333.593	41.2	-4.7	1.0	355.9	-21.7	10.0	Vert	AV	0.0	24.8	54.0	-29.2	EUT Horizontal, Low Ch
1332.127	41.0	-4.7	1.0	90.0	-21.7	10.0	Horz	AV	0.0	24.6	54.0	-29.4	EUT Horizontal, Low Ch
867.837	29.7	10.0	1.0	151.0		10.0	Vert	PK	0.0	49.7	80.8	-31.1	EUT Horizontal, Low Ch
867.912	29.6	10.0	1.0	56.0		10.0	Horz	PK	0.0	49.6	80.8	-31.2	EUT Horizontal, Low Ch
867.902	29.5	10.0	1.0	57.0		10.0	Horz	PK	0.0	49.5	80.8	-31.3	EUT on Side, Low Ch
867.880	28.7	10.0	1.0	133.0		10.0	Vert	PK	0.0	48.7	80.8	-32.1	EUT on Side, Low Ch
867.837	29.7	10.0	1.0	151.0	-21.7	10.0	Vert	AV	0.0	28.0	60.6	-32.6	EUT Horizontal, Low Ch
867.912	29.6	10.0	1.0	56.0	-21.7	10.0	Horz	AV	0.0	27.9	60.6	-32.7	EUT Horizontal, Low Ch
867.902	29.5	10.0	1.0	57.0	-21.7	10.0	Horz	AV	0.0	27.8	60.6	-32.8	EUT on Side, Low Ch
1777.888	41.5	-4.1	1.0	10.0		10.0	Horz	PK	0.0	47.4	80.8	-33.4	EUT Horizontal, Low Ch
867.880	28.7	10.0	1.0	133.0	-21.7	10.0	Vert	AV	0.0	27.0	60.6	-33.6	EUT on Side, Low Ch
1777.263	41.3	-4.1	1.0	286.9		10.0	Vert	PK	0.0	47.2	80.8	-33.6	EUT Horizontal, Low Ch
867.773	26.5	10.0	1.0	127.1		10.0	Vert	PK	0.0	46.5	80.8	-34.3	EUT Vertical, Low Ch
1777.888	41.5	-4.1	1.0	10.0	-21.7	10.0	Horz	AV	0.0	25.7	60.6	-34.9	EUT Horizontal, Low Ch
1777.263	41.3	-4.1	1.0	286.9	-21.7	10.0	Vert	AV	0.0	25.5	60.6	-35.1	EUT Horizontal, Low Ch
867.773	26.5	10.0	1.0	127.1	-21.7	10.0	Vert	AV	0.0	24.8	60.6	-35.8	EUT Vertical, Low Ch
867.907	23.0	10.0	1.0	261.0		10.0	Horz	PK	0.0	43.0	80.8	-37.8	EUT Vertical, Low Ch
867.907	23.0	10.0	1.0	261.0	-21.7	10.0	Horz	AV	0.0	21.3	60.6	-39.3	EUT Vertical, Low Ch

Work Order:	IRRI0006	Date:	06/15/15	<i>Trevor Buls</i>
Project:	None	Temperature:	23 °C	
Job Site:	MN05	Humidity:	53.5% RH	
Serial Number:	None	Barometric Pres.:	983.3 mbar	
		Tested by:		Trevor Buls
EUT:	IrriGreen Genius System - Controller			
Configuration:	1			
Customer:	IrriGreen, Inc			
Attendees:	Gary Klinefelter			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 443.92 MHz, continuous modulated			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.231(b):2015	ANSI C63.10:2009

Run #	8	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBμV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBμV/m)	Spec. Limit (dBμV/m)	Compared to Spec. (dB)	Comments
2219.650	48.5	-1.2	1.0	160.1		10.0	Vert	PK	0.0	57.3	74.0	-16.7	EUT Horizontal, High Ch
1331.677	51.9	-4.7	2.4	170.1		10.0	Vert	PK	0.0	57.2	74.0	-16.8	EUT Horizontal, High Ch
2219.650	48.5	-1.2	1.0	160.1	-21.7	10.0	Vert	AV	0.0	35.6	54.0	-18.4	EUT Horizontal, High Ch
1331.677	51.9	-4.7	2.4	170.1	-21.7	10.0	Vert	AV	0.0	35.5	54.0	-18.5	EUT Horizontal, High Ch
1332.018	49.9	-4.7	1.0	141.1		10.0	Horz	PK	0.0	55.2	74.0	-18.8	EUT Horizontal, High Ch
2219.958	46.1	-1.2	1.0	181.1		10.0	Horz	PK	0.0	54.9	74.0	-19.1	EUT Horizontal, High Ch
1332.018	49.9	-4.7	1.0	141.1	-21.7	10.0	Horz	AV	0.0	33.5	54.0	-20.5	EUT Horizontal, High Ch
2219.958	46.1	-1.2	1.0	181.1	-21.7	10.0	Horz	AV	0.0	33.2	54.0	-20.8	EUT Horizontal, High Ch
887.798	31.5	10.3	1.0	58.1		10.0	Horz	PK	0.0	51.8	81.1	-29.3	EUT Horizontal, High Ch
887.798	31.5	10.3	1.0	58.1	-21.7	10.0	Horz	AV	0.0	30.1	61.1	-31.0	EUT Horizontal, High Ch
1775.822	43.5	-4.1	1.0	18.0		10.0	Vert	PK	0.0	49.4	80.8	-31.4	EUT Horizontal, High Ch
1775.480	42.4	-4.1	1.0	75.0		10.0	Horz	PK	0.0	48.3	80.8	-32.5	EUT Horizontal, High Ch
1775.822	43.5	-4.1	1.0	18.0	-21.7	10.0	Vert	AV	0.0	27.7	61.1	-33.4	EUT Horizontal, High Ch
1775.480	42.4	-4.1	1.0	75.0	-21.7	10.0	Horz	AV	0.0	26.6	61.1	-34.5	EUT Horizontal, High Ch
887.827	24.9	10.3	1.0	97.0		10.0	Vert	PK	0.0	45.2	81.1	-35.9	EUT Horizontal, High Ch
887.827	24.9	10.3	1.0	97.0	-21.7	10.0	Vert	AV	0.0	23.5	61.1	-37.6	EUT Horizontal, High Ch

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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

## MODES OF OPERATION

Transmitting 443.92 MHz, continuous modulated  
Transmitting 433.92 MHz, continuous modulated

## POWER SETTINGS INVESTIGATED

110VAC/60Hz

## CONFIGURATIONS INVESTIGATED

IRRI0006 - 1

## FREQUENCY RANGE INVESTIGATED

Start Frequency 430 MHz Stop Frequency 450 MHz

## 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
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/30/2015	12 mo
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2015	12 mo

## 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

## TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was configured for continuous unmodulated operation. The field strength of the transmit frequency was maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT in 3 orthogonal planes (per ANSI C63.10:2009).

To derive average emission measurements, a duty cycle correction factor per 15.35(c) was utilized:

Duty Cycle = On time/100 milliseconds (or the period, whichever is less)

Where "On time" =  $N1L1 + N2L2 + \dots$

Where N1 is the number of type 1 pulses, L1 is length of type 1 pulses, N2 is the number of type 2 pulses, L2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle =  $(N1L1 + N2L2 + \dots)/100\text{ms}$  or T, whichever is less. Where T is the period of the pulse train.

The measured values for the EUT's pulse train are as follows:

Period = 100 mSec  
Pulsewidth of Type 1 Pulse = 8.222 mSec  
Number of Type 1 Pulses = 1  
Duty Cycle =  $20 \log [(1)(8.222)/100] = -21.7\text{dB}$

The duty cycle correction factor of -21.7dB was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz.

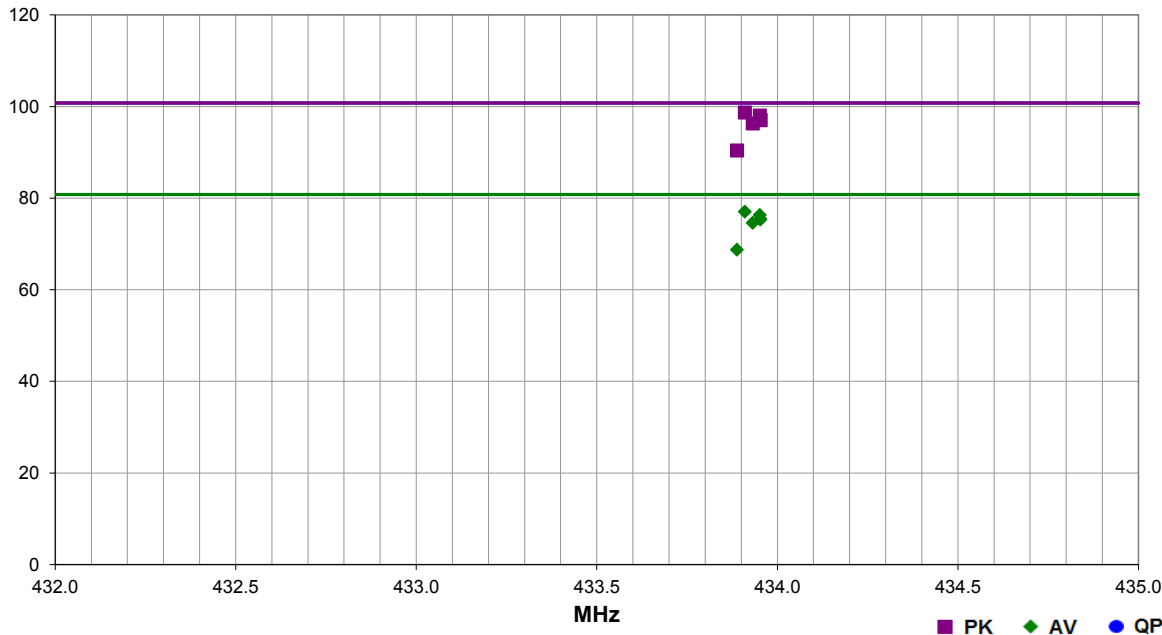
The field strength of the fundamental (transmit) frequency meets the limits as defined in 47 CFR 15.231(b). It also meets the provisions in 15.35 for averaging pulsed emissions and for limiting peak emissions.



Work Order:	IRRI0006	Date:	06/15/15	<i>Trevor Buls</i>
Project:	None	Temperature:	23 °C	
Job Site:	MN05	Humidity:	53.5% RH	
Serial Number:	None	Barometric Pres.:	983.3 mbar	
EUT:	Irrigreen Genius System - Controller			
Configuration:	1			
Customer:	Irrigreen, Inc			
Attendees:	Gary Klinefelter			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 433.92 MHz, continuous modulated			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.231:2015	ANSI C63.10:2009

Run #	3	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
433.910	75.6	23.1	1.0	167.2		0.0	Vert	PK	0.0	98.7	100.8	-2.1	EUT on Side, Low Ch
433.952	74.9	23.1	1.0	167.1		0.0	Vert	PK	0.0	98.0	100.8	-2.8	EUT Horizontal, Low Ch
433.953	74.0	23.1	1.0	123.1		0.0	Horz	PK	0.0	97.1	100.8	-3.7	EUT Horizontal, Low Ch
433.953	73.9	23.1	1.0	153.0		0.0	Horz	PK	0.0	97.0	100.8	-3.8	EUT on Side, Low Ch
433.910	75.6	23.1	1.0	167.2	-21.7	0.0	Vert	AV	0.0	77.0	80.8	-3.8	EUT on Side, Low Ch
433.952	74.9	23.1	1.0	167.1	-21.7	0.0	Vert	AV	0.0	76.3	80.8	-4.5	EUT Horizontal, Low Ch
433.932	73.2	23.1	1.0	136.0		0.0	Vert	PK	0.0	96.3	100.8	-4.5	EUT Vertical, Low Ch
433.953	74.0	23.1	1.0	123.1	-21.7	0.0	Horz	AV	0.0	75.4	80.8	-5.4	EUT Horizontal, Low Ch
433.953	73.9	23.1	1.0	153.0	-21.7	0.0	Horz	AV	0.0	75.3	80.8	-5.5	EUT on Side, Low Ch
433.932	73.2	23.1	1.0	136.0	-21.7	0.0	Vert	AV	0.0	74.6	80.8	-6.2	EUT Vertical, Low Ch
433.888	67.3	23.1	1.0	153.0		0.0	Horz	PK	0.0	90.4	100.8	-10.4	EUT Vertical, Low Ch
433.888	67.3	23.1	1.0	153.0	-21.7	0.0	Horz	AV	0.0	68.7	80.8	-12.1	EUT Vertical, Low Ch



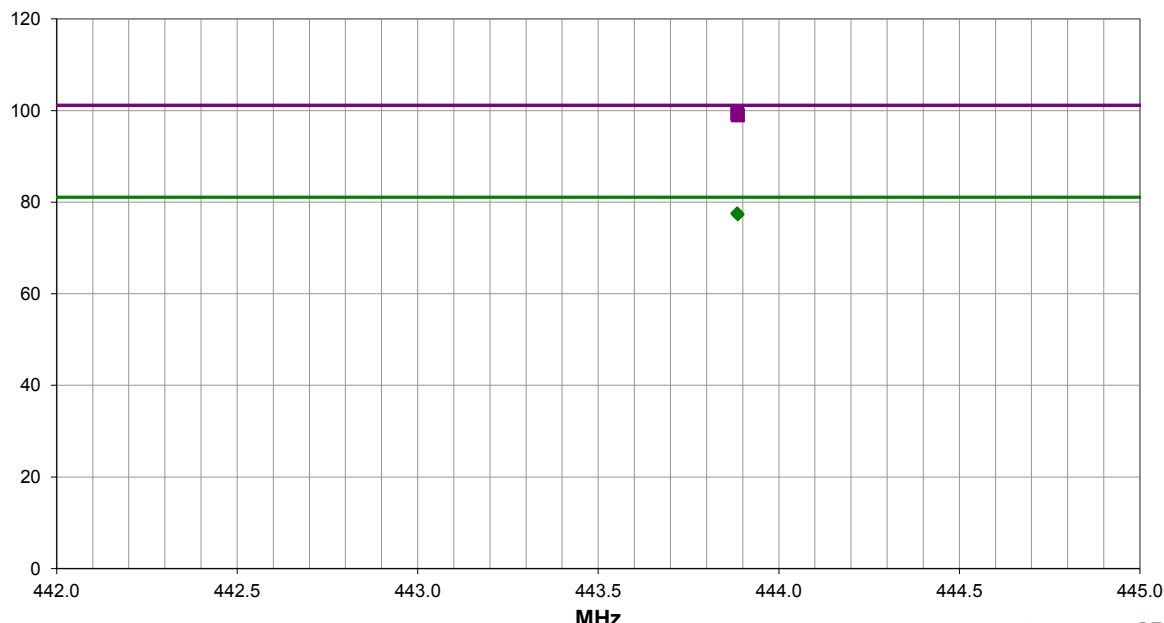
# FIELD STRENGTH OF FUNDAMENTAL

PSA-ESCI 2015.03.03  
EmiR5 2015.05.29

Work Order:	IRRI0006	Date:	06/15/15	<i>Trevor Buls</i>
Project:	None	Temperature:	23 °C	
Job Site:	MN05	Humidity:	53.5% RH	
Serial Number:	None	Barometric Pres.:	983.3 mbar	
EUT:				IrriGreen Genius System - Controller
Configuration:	1			
Customer:	IrriGreen, Inc			
Attendees:	Gary Klinefelter			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 443.92 MHz, continuous modulated			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.231:2015	ANSI C63.10:2009

Run #	4	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
443.885	76.0	23.3	1.0	94.1		0.0	Vert	PK	0.0	99.3	101.1	-1.8	EUT on Side, High Ch
443.887	75.7	23.3	1.0	58.1		0.0	Horz	PK	0.0	99.0	101.1	-2.1	EUT Horizontal, High Ch
443.885	76.0	23.3	1.0	94.1	-21.7	0.0	Vert	AV	0.0	77.6	81.1	-3.5	EUT on Side, High Ch
443.887	75.7	23.3	1.0	58.1	-21.7	0.0	Horz	AV	0.0	77.3	81.1	-3.8	EUT Horizontal, High Ch

# 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 (mo)
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/30/2015	12
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2015	12

## TEST DESCRIPTION

The occupied bandwidth was measured with the EUT configured for continuous modulated operation at its single transmit frequency. The spectrum analyzer's resolution bandwidth was  $\geq 1\%$  of the 20dB bandwidth and the video bandwidth was greater than or equal to the resolution bandwidth.

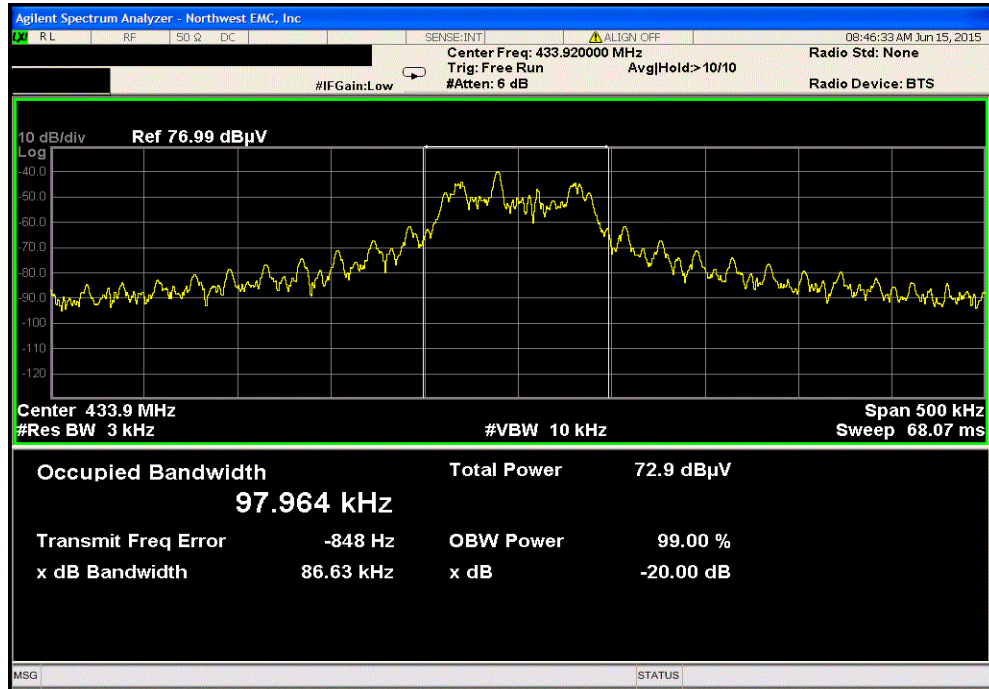
The 20 dB bandwidth of the transmit frequency is less than 0.25% of the center frequency.

# OCCUPIED BANDWIDTH

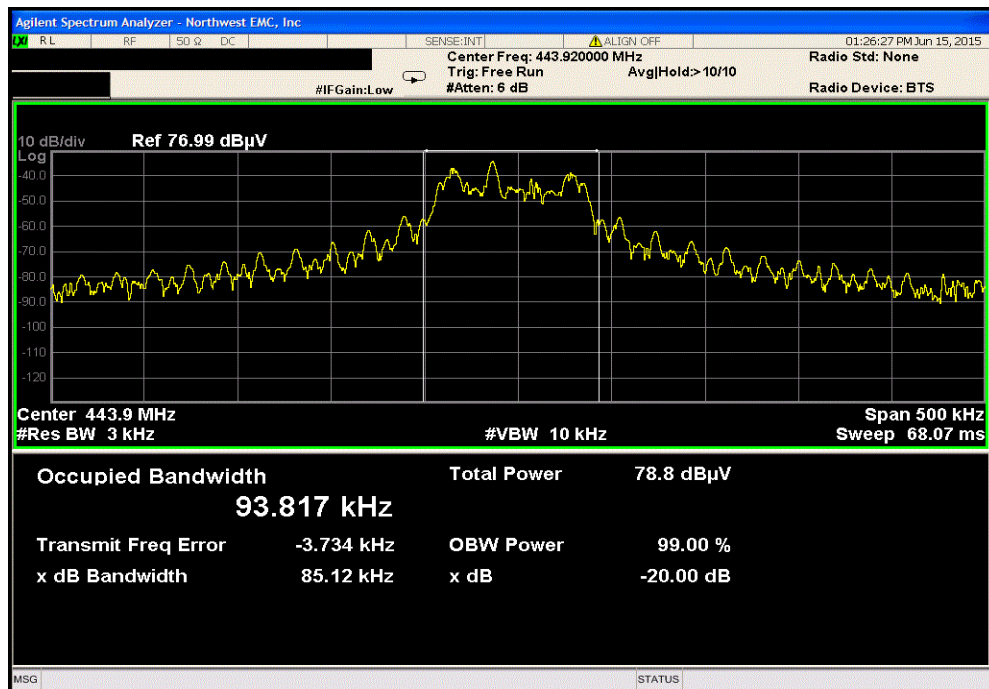
EUT: IrriGreen Genius System - Controller		Work Order: IRR10006	
Serial Number: None		Date: 06/15/15	
Customer: IrriGreen, Inc		Temperature: 23.1°C	
Attendees: Gary Klinefelter		Humidity: 51%	
Project: None		Barometric Pres.: 985.9	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN05	
TEST SPECIFICATIONS			
FCC 15.231:2015		Test Method	
		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature	<i>Trevor Buls</i>
		Value (kHz)	Limit (kHz) Result
Low Ch 433.92 MHz		86.63	1084.8 Pass
High Ch 443.92 MHz		85.12	1109.8 Pass

# OCCUPIED BANDWIDTH

Low Ch 433.92 MHz						
				Value (kHz)	Limit (kHz)	Result
				86.63	1084.8	Pass



High Ch 443.92 MHz						
				Value (kHz)	Limit (kHz)	Result
				85.12	1109.8	Pass



# DUTY CYCLE

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 (mo)
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/30/2015	12
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2015	12

## TEST DESCRIPTION

For software controlled or pre-programmed devices, the manufacturer shall declare the duty cycle class or classes for the equipment under test. For manually operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the device once triggered, follows a pre-programmed cycle, or whether the transmission is constant until the trigger is released or manually reset. The manufacturer shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the duty cycle and hence the duty class.

Where an acknowledgement is required, the additional transmitter on-time shall be included and declared by the manufacturer.

To derive average emission measurements, a duty cycle correction factor per 15.35(c) was utilized:

Duty Cycle = On time/100 milliseconds (or the period, whichever is less)

Where "On time" =  $N1L1 + N2L2 + \dots$

Where N1 is the number of type 1 pulses, L1 is length of type 1 pulses, N2 is the number of type 2 pulses, L2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle =  $(N1L1 + N2L2 + \dots)/100\text{mS}$  or T, whichever is less. Where T is the period of the pulse train.

The measured values for the EUT's pulse train are as follows:

Period = 100 mSec

Pulsewidth of Type 1 Pulse = 8.222 mSec

Number of Type 1 Pulses = 1

Duty Cycle =  $20 \log [(1)(8.222)/100] = -21.7\text{dB}$

The duty cycle correction factor of -21.7dB was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz.

The field strength of the fundamental (transmit) frequency meets the limits as defined in 47 CFR 15.231(b). It also meets the provisions in 15.35 for averaging pulsed emissions and for limiting peak emissions.

# DUTY CYCLE

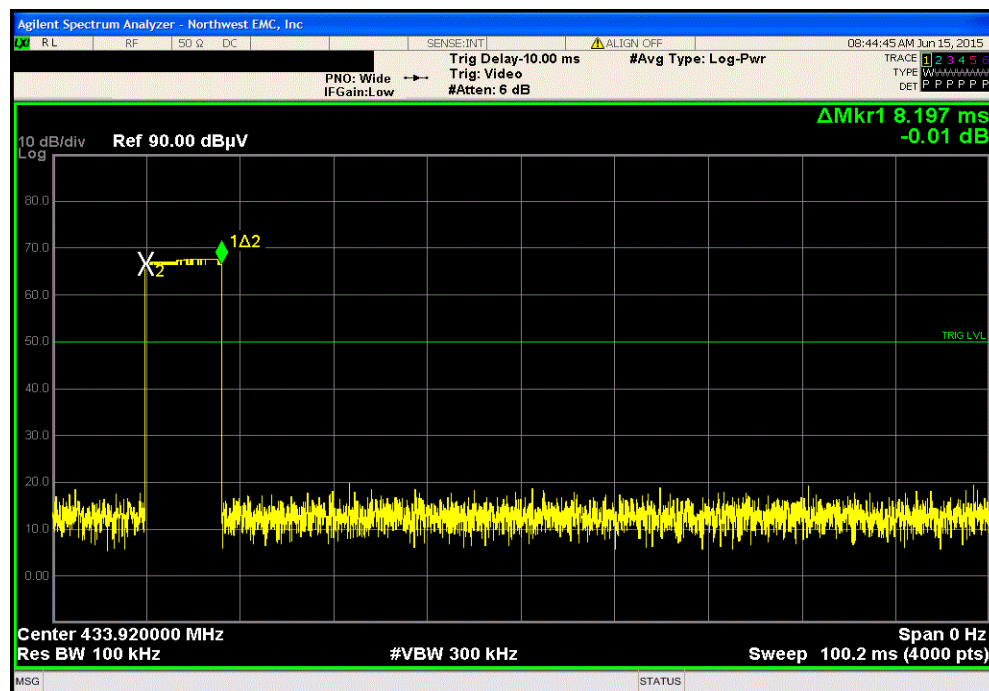
EUT: IrriGreen Genius System - Controller		Work Order: IRR10006	
Serial Number: None		Date: 06/15/15	
Customer: IrriGreen, Inc		Temperature: 23.1°C	
Attendees: Gary Klinefelter		Humidity: 51%	
Project: None		Barometric Pres.: 985.9	
Tested by: Trevor Buls	Power: 110VAC/60Hz	Job Site: MN05	
TEST SPECIFICATIONS			
FCC 15.231:2015		Test Method	
		ANSI C63.10:2009	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature <i>Trevor Buls</i>	
		Pulse Width (ms)	Limit
Low Channel, 433.92 MHz			
	100 ms Window	8.197	N/A
	1 s Window	N/A	N/A
	10 s Window	N/A	N/A
High Channel, 443.92 MHz			
	100 ms Window	8.222	N/A
	1 s Window	N/A	N/A
	10 s Window	N/A	N/A



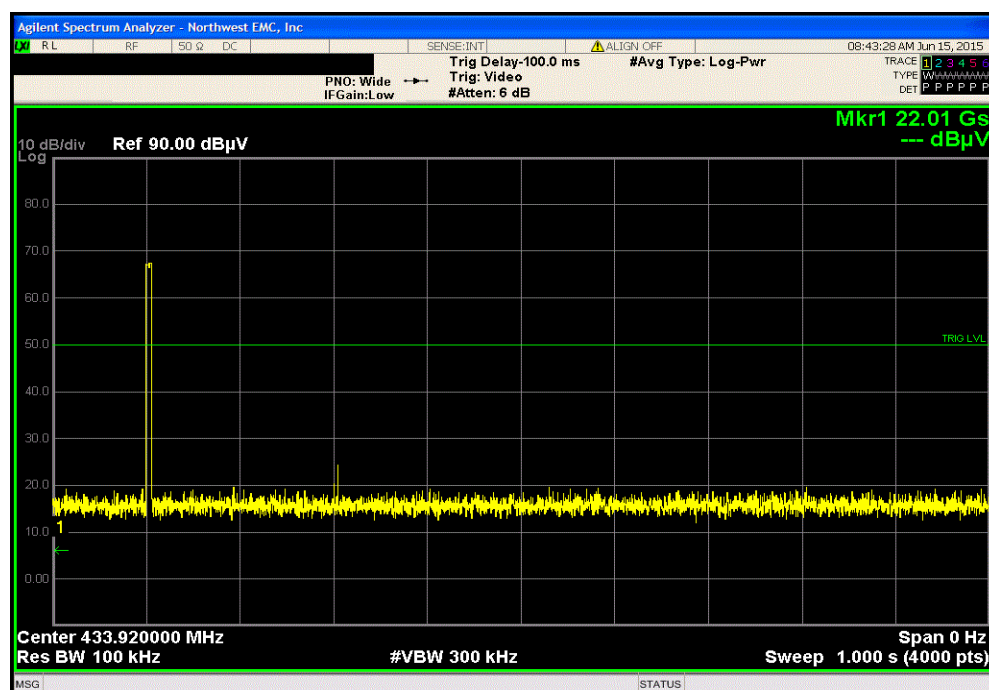
**NORTHWEST  
EMC**

XMit 2015.01.14

Low Channel, 433.92 MHz, 100 ms Window						
				Pulse Width (ms)	Limit	Result
				8.197	N/A	N/A

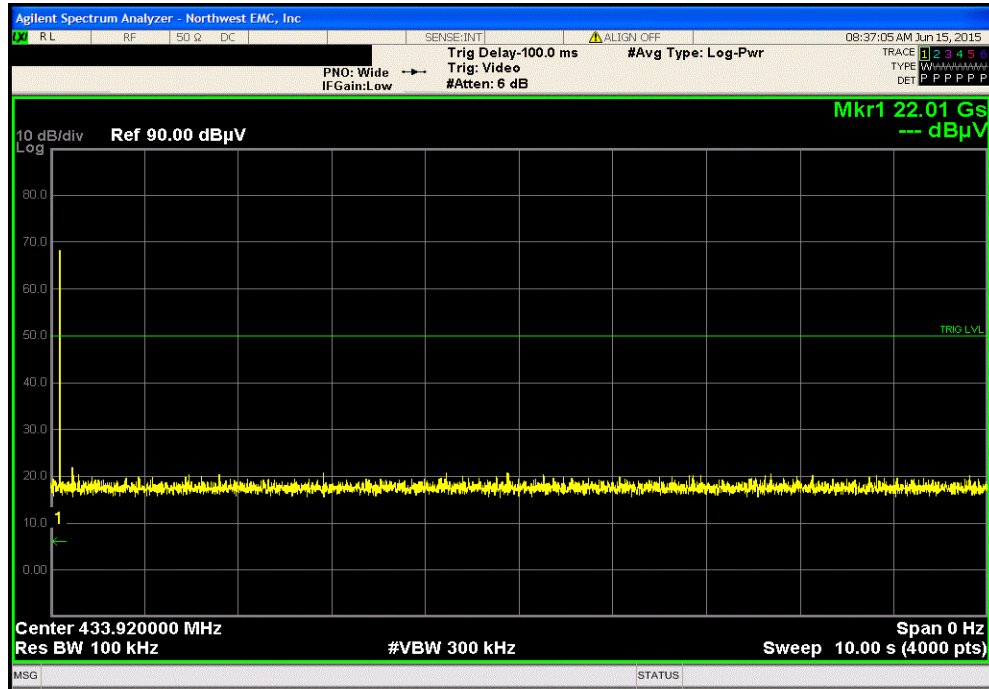


Low Channel, 433.92 MHz, 1 s Window						
				Pulse Width (ms)	Limit	Result
				N/A	N/A	N/A

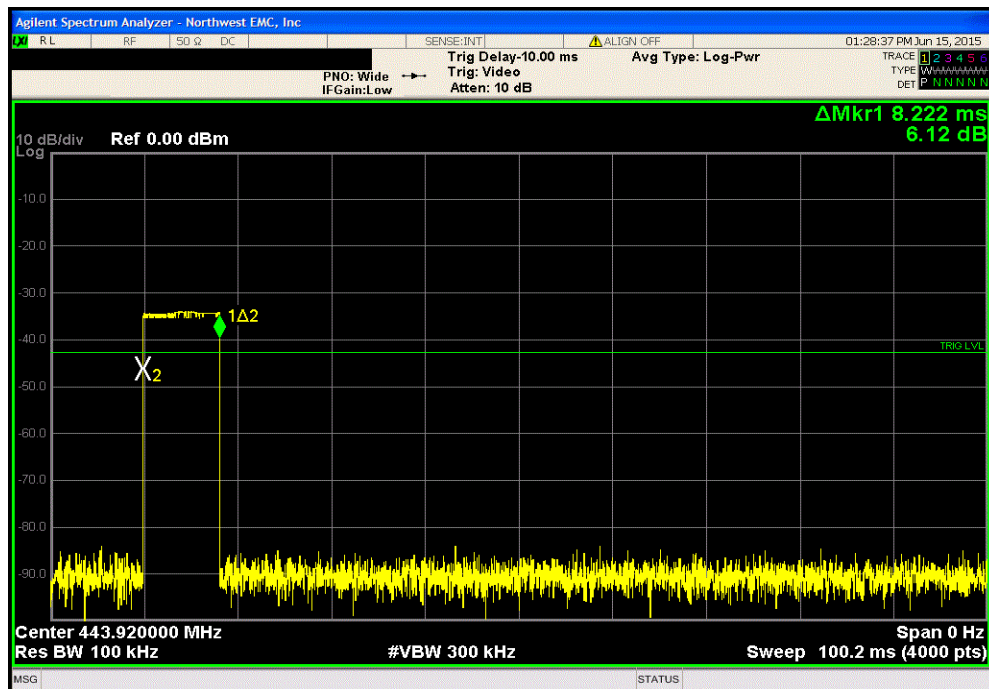


# DUTY CYCLE

Low Channel, 433.92 MHz, 10 s Window						
				Pulse Width (ms)	Limit	Result
				N/A	N/A	N/A

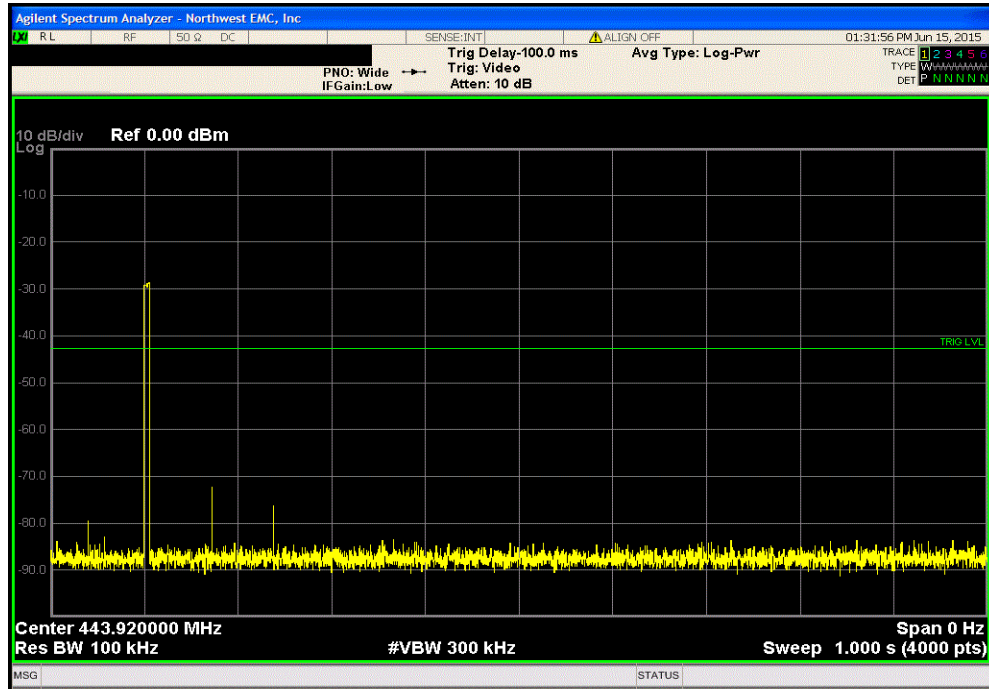


High Channel, 443.92 MHz, 100 ms Window						
				Pulse Width (ms)	Limit	Result
				8.222	N/A	N/A



# DUTY CYCLE

High Channel, 443.92 MHz, 1 s Window						
				Pulse Width (ms)	Limit	Result
				N/A	N/A	N/A



High Channel, 443.92 MHz, 10 s Window						
				Pulse Width (ms)	Limit	Result
				N/A	N/A	N/A

