

**FCC PART 15 SUBPART B & SUBPART C SECTION 15.249
&
RSS GEN & RSS 210**

TEST REPORT

for

**Z-WAVE IRRIGATION CONTROLLER
Model: WI15VZ-1**

Prepared for

**NORTEK SECURITY & CONTROL
1950 CAMINO VIDA ROBLE, SUITE 150
CARLSBAD, CA 92008**

Prepared by: _____

TOREY OLIVER

Approved by: _____

MATT HARRISON

**COMPATIBLE ELECTRONICS INC.
20621 PASCAL WAY
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DATE: DECEMBER 13, 2015

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	18	2	2	2	17	17	58

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1	Plot Map And Layout of Test Site Below 1GHz
2	Plot Map And Layout of Test Site Above 1GHz
3	Conducted Emissions Test Setup



GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

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

Device Tested: Z-Wave Irrigation Controller
Model: WI15VZ-1
S/N: None

Product Description: The WI15VZ-1 is a wireless Z-Wave irrigation controller utilizing a 500 series Z-Wave chip. The irrigation controller can be wirelessly connected to a compatible Z-Wave controller/hub and controlled via your home automation software.

Modifications: The EUT was not modified in order to comply with specifications.

Manufacturer: Nortek Security & Control
1950 Camino Vida Roble, Suite 150
Carlsbad, CA 92008

Test Date: November 20, December 11, & 12, 2015

Test Specifications: EMI requirements

CFR Title 47, Part 15 Subpart B Sections 15.107, 15.109, Subpart C Sections 15.205, 15.207, 15.209 and 15.249.

RSS GEN & RSS 210

Test Procedure: ANSI C63.4 & C63.10



SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz - 30 MHz.	Complies with the limits of CFR Title 47 Part 15 Subpart B, Section 15.107 and Subpart C Sections 15.207, RSS GEN, and RSS 210
2	Radiated RF Spurious Emissions 9 kHz – 10,000 MHz.	Complies with the limits of CFR Title 47 Part 15 Subpart B Section 15.109 & Subpart C Section 15.205, 15.209, & 15.249, RSS GEN, and RSS 210
3	Radiated RF Fundamental & Harmonic Emissions 9 kHz – 10,000 MHz.	Complies with the limits of CFR Title 47 Part 15 Subpart B Section 15.109 & Subpart C Section 15.205, 15.209, & 15.249, RSS GEN, and RSS 210



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**1.****PURPOSE**

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Z-Wave Irrigation Controller Model: WI15VZ-1. The EMI measurements were performed according to the measurement procedure described in ANSI. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT (equipment under test) hereafter, are within the specification limits defined by RSS GEN, RSS210, and the Code of Federal Regulations Title 47, Part 15 Subpart B sections 15.107, 15.109, & Part 15 Subpart C sections 15.205, 15.207, 15.209 and 15.249.



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The tests described herein were performed at the test facility of Compatible Electronics, 20621 Pascal Way Lake Forest, California 92630.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Nortek Security & Control

Josh Hansen Regulatory Engineer

Compatible Electronics, Inc.

Torey Oliver Test Technician

Matt Harrison Lab Manager

2.4 Date Test Sample was Received

The test sample was received on November 11, 2015.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics, Inc. as of the date of this test report.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
NVLAP	National Voluntary Laboratory Accreditation Program
CFR	Code of Federal Regulations
PCB	Printed Circuit Board
TX	Transmit
RX	Receive



3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this Test Report.

SPEC	TITLE
RSS 210	License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS GEN	General Requirements for Compliance of Radio Apparatus
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 2014	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
ANSI C63.10: 2013	American National Standard for Testing Unlicensed Wireless Devices



4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration

The Z-Wave Irrigation Controller Model: WI15VZ-1 (EUT) was setup in a tabletop configuration. The EUT was connected to the EUT PSU and various load simulators via hardwired connection for the spurious emissions tests. For the fundamental tests the worst case was without the load simulators. The EUT was checked all 3 axis. The worst case was found to be the Y-Axis. The EUT was continuously transmitting a data stream during transmit tests and continuously receiving during receiver tests.

The voltage was varied $\pm 15\%$; the transmitting signal amplitude and frequency did not vary.

It was determined that the emissions were at their highest level when the EUT was transmitting in the configuration described above for Radiated Emissions. The final radiated data was taken in the above configuration. Please see Appendix E for the test data.

4.1.1 Photograph Test Configuration (Fundamental Emissions Y-Axis)



4.1.2 Cable Construction and Termination

Cables 1-7

These are 1-meter, unshielded cables. They are connecting the EUT to an open to simulate a load. It was hardwired into the power supply. The cables were bundled to a length of 40 centimeters.

Cable 8

This is a 2-meter, unshielded cable. It is connecting the EUT to the Power Supply. It is hardwired at the both ends. The cable was bundled to a length of 1 meter.



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT**5.1 EUT and Accessory List**

#	EQUIPMENT TYPE	MANU-FACTURER	MODEL	SERIAL NUMBER
1	Z-WAVE IRRIGATION CONTROLLER (EUT)	NORTEK	WI15VZ-1	NONE
2	EUT POWER SUPPLY	NCE	CE200B0180V1000U	NONE



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Computer	Compatible Electronics	NONE	NONE	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESIB40	100219	9/3/2015	9/3/2016
EMI Receiver	Rohde & Schwarz	ESIB40	100712	9/22/2015	9/22/2016
Antenna, Loop	Com Power	AL-130	121049	12/06/2013	12/06/2016
Antenna, CombiLog	Com Power	AC-220	003	5/21/2014	5/21/2016
Antenna, CombiLog	Com Power	AC-220	25857	5/21/2014	5/21/2016
Antenna, Horn 1-18GHz	Com Power	AH-118	071225	7/01/2014	7/01/2016
Pre-Amp, 1-18GHz	Com Power	PAM-118	551033	8/25/2015	8/25/2016
Notch Filter	AMTI Microwave Circuits	N03019-01	3709-01 DC0415	01/06/2015	01/06/2016
Mast, Antenna Positioner	Sunol Science Corporation	TWR 95-4	020808-3	N/A	N/A
Antenna Mast	Sunol Science Corporation	TWR 95-4	020808-3	N/A	N/A
Turntable	Sunol Science Corporation	FM 2001	N/A	N/A	N/A
Mast and Turntable Controller	Sunol Science Corporation	SC104V	020808-1	N/A	N/A
LISN	Com-Power	LI-150	191937	4/7/2015	4/7/2016



6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and the figures in Appendix D of this report for test location.

6.2 EUT Mounting, Bonding and Grounding

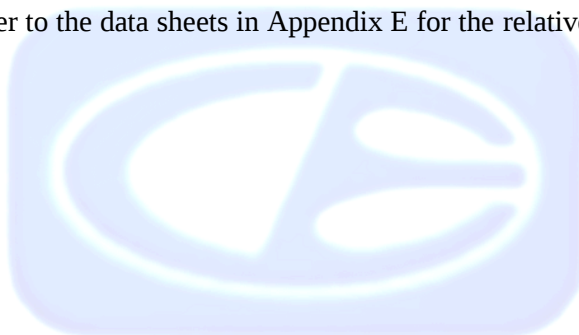
The EUT was mounted on a 1.0 by 1.5 by 0.8 meter high non-conductive table, which was placed on the ground plane.

For above 1GHz the EUT was mounted 1.5 meters high.

The EUT was not grounded.

6.3 Facility Environmental Characteristics

When applicable refer to the data sheets in Appendix E for the relative humidity, air temperature, and barometric pressure.



7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Channel Number and Frequencies

There are 2 operating channels and the EUT uses 2-key FSK/GFSK modulation schemes. The 908.4MHz channel uses the FSK modulation with a 40kbps or a 9kbps data rate. The 40kbps data rate was used for all testing since it was found to be the worst case. The 916MHz channel uses GFSK at a data rate of 100kbps. The gain settings were preset for all units.

7.2 Antenna

The antenna is made up of a trace located on the PCB.



8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

8.1 RF Emissions

8.1.1 Conducted Emissions Test

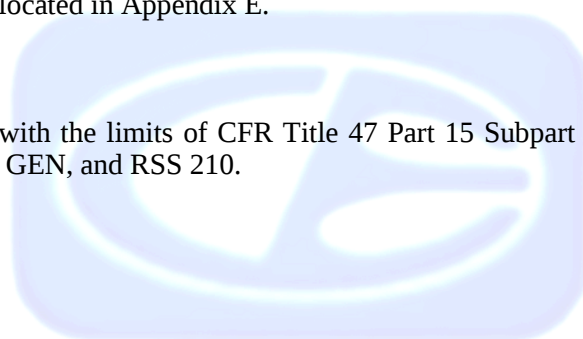
The EMI receiver was used as a measuring meter. A quasi-peak and/or average reading was taken only where indicated in the data sheets. The LISN output was measured using the EMI receiver. The output of the second LISN was terminated by a 50-ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The EUT received its power through the LISN, which was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI 63.4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the computer software. The final qualification data is located in Appendix E.

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart B section 15.107, & Subpart C section 15.207, RSS GEN, and RSS 210.



8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The EMI receiver was used as a measuring meter. The receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the receiver records the highest measured reading over all the sweeps. Amplifiers were used to increase the sensitivity of the instrument. There were preamplifiers used for frequencies above 1 GHz.

For spurious emissions the quasi-peak detector was used for frequencies below 1GHz and the average detector was used for frequencies above 1 GHz.

For the Harmonic emissions a linear average detector was used.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE (MHz)	TRANSDUCER	EFFECTIVE MEASUREMENT BANDWIDTH
.009 to .150	Active Loop Antenna	200 Hz
.150 to 30	Active Loop Antenna	9 kHz
30 to 1000	Combilog Antenna	100 kHz (120kHz for QP Measurements)
1000 to 10000	Horn Antenna	1 MHz

The TDK FAC-3 shielded test chamber of Compatible Electronics, Inc. was used for radiated emissions testing. This test site is in full compliance with ANSI C63.4 & ANSI C63.10. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters in both vertical and horizontal polarizations (for E field radiated field strength).

Test Results:

The EUT complies with the limits of CFR Title 47 Part 15 Subpart B section 15.109, & Part 15 Subpart C sections 15.205, 15.209 and 15.249, RSS GEN, and RSS 210.



8.1.3 Fundamental Field Strength

The Peak Transmit Radiated Field Strength was measured at a 3-meter test distance. The EMI Receiver was used to obtain the final test data. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15 Subpart C, Section 15.249, and RSS 210.

8.1.4 Emissions Radiated Outside of the Fundamental Frequency Band

The Band Edge measurement was measured using the EMI Receiver at a 3-meter test distance to obtain the final test data. The lower and upper channels were tuned during the low and high band edge tests. The final qualification data sheets are located in Appendix E.

Test Results:

The EUT complies with Part 15 Subpart C, Section 15.205 & 15.249, and RSS 210.



9. TEST PROCEDURE DEVIATIONS

The test procedures were not deviated from throughout all tests.

10. CONCLUSIONS

The Z-Wave Irrigation Controller Model: WI15VZ-1 meets all of the relevant specification requirements defined in the Code of Federal Regulations Title 47, Part 15 Subpart B section 15.107, 15.109, & Subpart C sections 15.205, 15.207, 15.209, 15.249, RSS GEN, and RSS 210.



APPENDIX A**LABORATORY ACCREDITATIONS AND
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LABORATORY ACCREDITATIONS AND RECOGNITIONS



NVLAP LAB CODES 200063-0,
200528-0, 200527-0

For US, Canada, Australia/New Zealand, Taiwan and the European Union, Compatible Electronics is currently accredited by NVLAP to ISO/IEC 17025 and ISO 9002 equivalent. Please follow the link to the NIST site for each of our facilities NVLAP certificate and scope of accreditation.

NVLAP listing links

Agoura Division - <http://ts.nist.gov/Standards/scopes/2000630.htm>

Brea Division - <http://ts.nist.gov/Standards/scopes/2005280.htm>

Silverado/Lake Forest Division - <http://ts.nist.gov/Standards/scopes/2005270.htm>



ANSI listing

[CETCB](http://www.ansica.org/wwwversion2/outside/ALLdirectoryDetails.asp?menuID=1&prgID=3&orgID=123&status=4)

<https://www.ansica.org/wwwversion2/outside/ALLdirectoryDetails.asp?menuID=1&prgID=3&orgID=123&status=4>



Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for EMC under the US/EU Mutual Recognition Agreement (MRA).



Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for Taiwan/BSMI under the US/APEC (Asia-Pacific Economic Cooperation) Mutual Recognition Agreement (MRA).

We are also certified/listed for IT products by the following country/agency:



VCCI Listing, from VCCI site

[Enter "Compatible" in search form](http://www.vcci.or.jp/vcci_e/activity/registration/setsubi.html) http://www.vcci.or.jp/vcci_e/activity/registration/setsubi.html



FCC Listing, from FCC OET site

[FCC test lab search](https://fjallfoss.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm) <https://fjallfoss.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm>



Compatible Electronics IC listing can be found at:

<http://www.ic.gc.ca/eic/site/ic1.nsf/eng/home>



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APPENDIX B***MODIFICATIONS TO THE EUT***

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MODIFICATIONS TO THE EUT

There were no modifications were made during testing.



APPENDIX C***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***

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ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Z-WAVE IRRIGATION CONTROLLER

Model: WI15VZ-1

S/N: None

No additional models were tested.





APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS



FIGURE 1: PLOT MAP AND LAYOUT OF TEST SITE BELOW 1GHZ

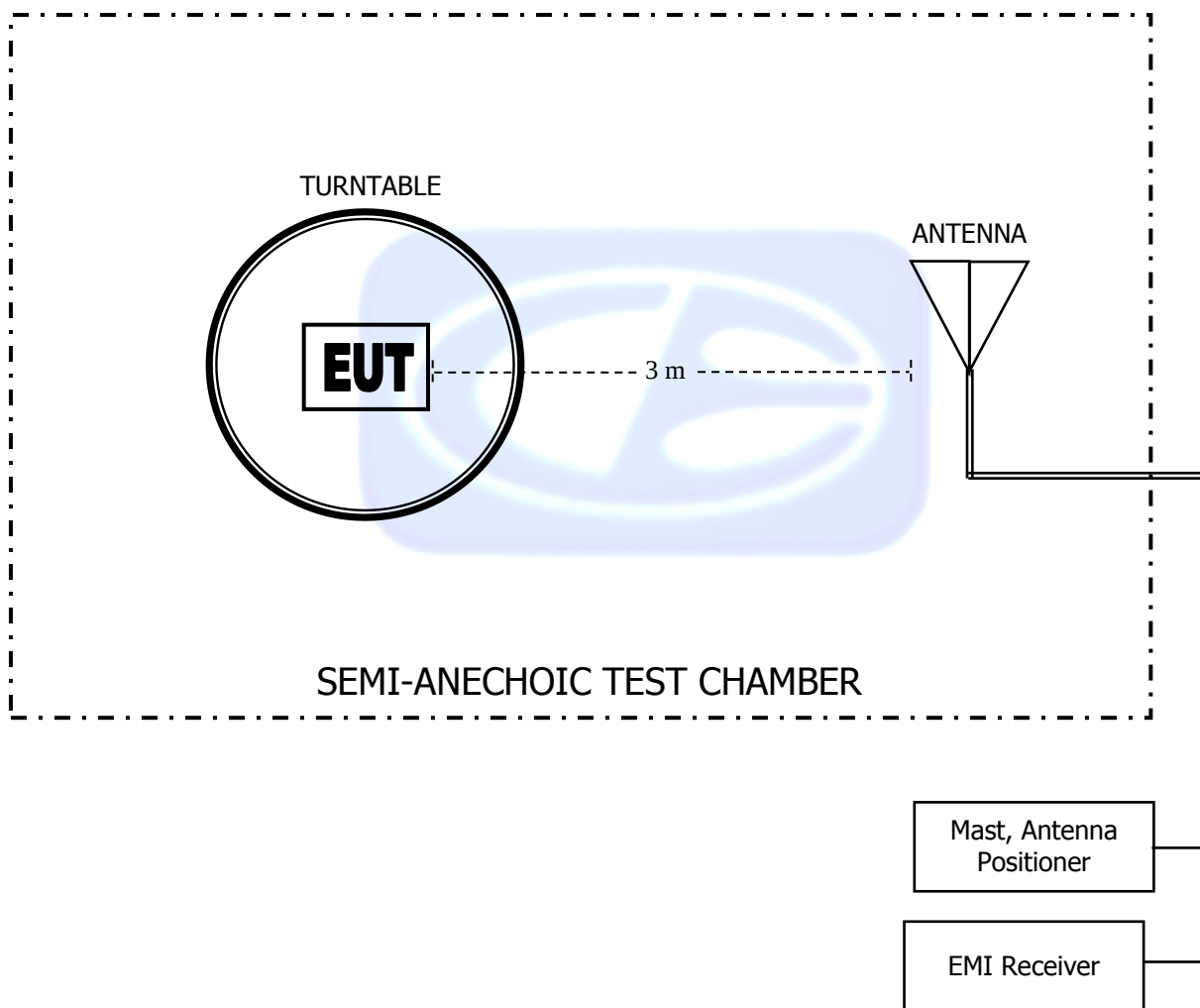


FIGURE 2: PLOT MAP AND LAYOUT OF TEST SITE ABOVE 1GHZ

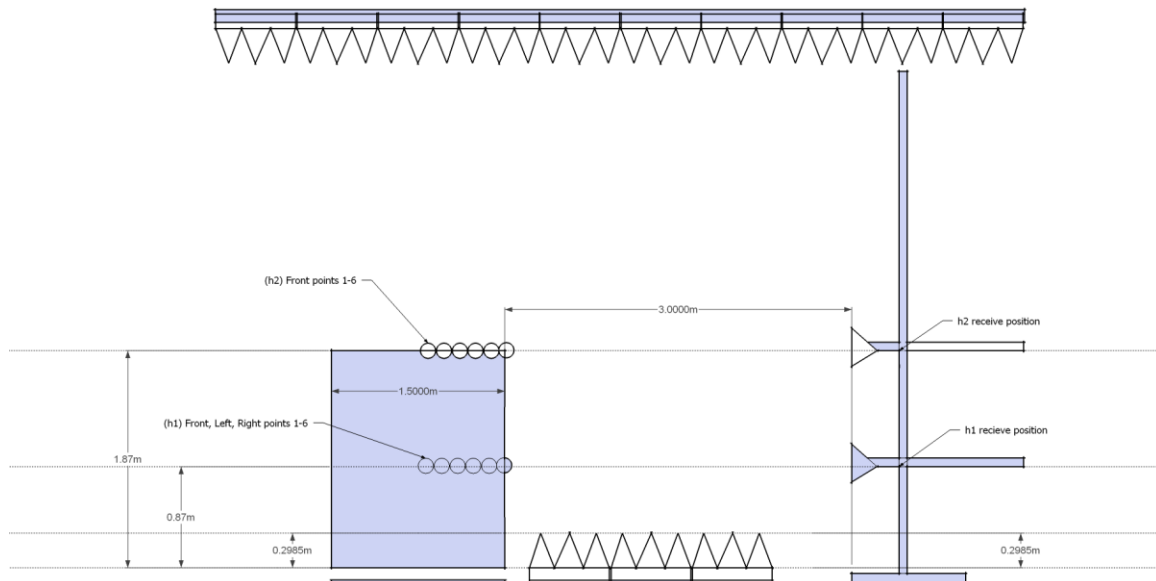
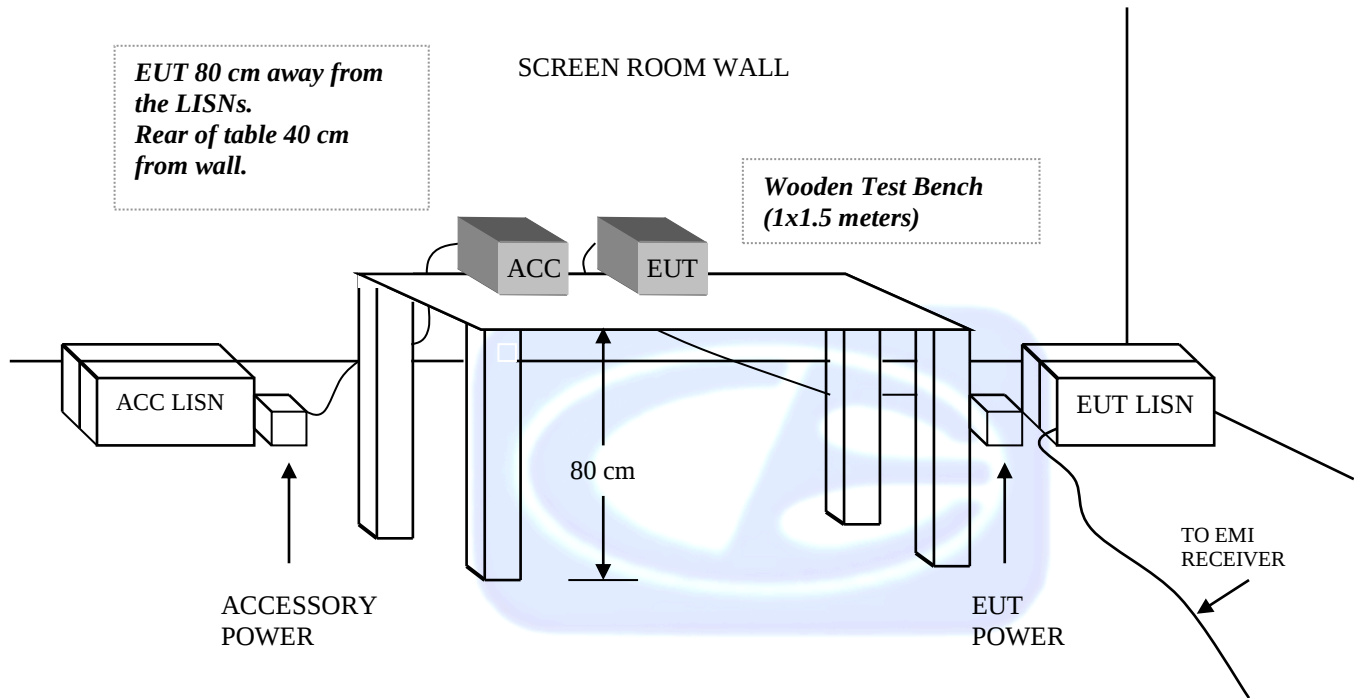


FIGURE 3: CONDUCTED EMISSIONS TEST SETUP

COM-POWER AL-130**LOOP ANTENNA****S/N: 121049****CALIBRATION DUE: DECEMBER 6, 2016**

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)	FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-34.64	16.86	0.8	-36.32	15.18
0.01	-34.78	16.72	0.9	-36.22	15.28
0.02	-35.91	15.59	1.0	-36.22	15.28
0.03	-35.48	16.02	2.0	-35.91	15.59
0.04	-35.82	15.68	3.0	-35.91	15.59
0.05	-36.49	15.01	4.0	-36.01	15.49
0.06	-36.30	15.20	5.0	-35.80	15.70
0.07	-36.43	15.07	6.0	-36.00	15.50
0.08	-36.30	15.20	7.0	-35.90	15.60
0.09	-36.39	15.11	8.0	-35.70	15.80
0.1	-36.41	15.09	9.0	-35.70	15.80
0.2	-36.61	14.89	10.0	-35.60	15.90
0.3	-36.63	14.87	15.0	-36.52	14.98
0.4	-36.52	14.99	20.0	-35.75	15.75
0.5	-36.63	14.87	25.0	-37.78	13.72
0.6	-36.62	14.88	30.0	-38.62	12.88
0.7	-36.53	14.97			



COM-POWER AC-220**LAB P - COMBILOG ANTENNA****S/N: 003****CALIBRATION DUE: MAY 21, 2016**

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	22.90	160	15.20
35	22.80	180	14.40
40	23.50	200	14.10
45	21.90	250	15.90
50	22.00	300	18.20
60	18.10	400	19.40
70	12.80	500	21.50
80	12.10	600	22.00
90	12.70	700	23.90
100	13.00	800	25.80
120	15.50	900	27.00
140	14.40	1000	27.90



COM-POWER AC-220**LAB R - COMBILOG ANTENNA****S/N: 25857****CALIBRATION DUE: MAY 21, 2016**

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	22.5	160	13.3
35	22.5	180	15.0
40	23.0	200	14.6
45	21.5	250	16.5
50	21.3	300	18.1
60	18.2	400	19.4
70	13.2	500	21.4
80	11.6	600	21.6
90	11.9	700	23.7
100	12.6	800	26.0
120	15.1	900	26.6
140	13.6	1000	28.5



COM-POWER AH-118**HORN ANTENNA****S/N: 071225****CALIBRATION DUE: JULY 1, 2016**

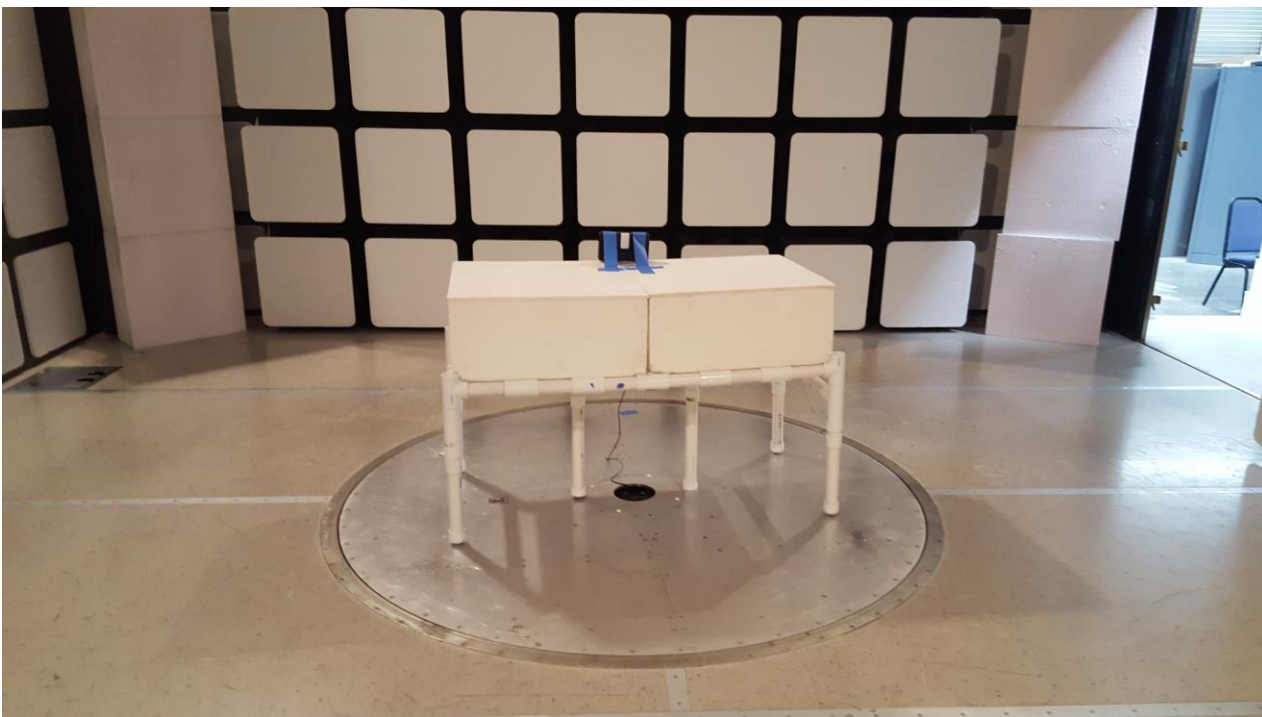
FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
1000	30.2	9500	43.86
1500	29.46	10000	43.85
2000	31.81	10500	43.54
2500	35.95	11000	45.28
3000	33.6	11500	45.18
3500	36.43	12000	45.03
4000	35.85	12500	44.33
4500	36.32	13000	45.71
5000	40.11	13500	46.89
5500	38.7	14000	46.88
6000	39.33	14500	45.89
6500	40.08	15000	49.59
7000	41.17	15500	46.49
7500	43.58	16000	45.01
8000	41.55	16500	44.57
8500	42.63	17000	48.28
9000	43.5	17500	49.88
		18000	49.94



COM-POWER PAM-118A**1-18GHz - PREAMPLIFIER****S/N: 551033****CALIBRATION DUE: AUGUST 25, 2016**

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
500	36.57	5500	40.23
1000	38.49	6000	38.68
1100	38.83	6500	39.16
1200	39.05	7000	35.30
1300	39.06	7500	36.25
1400	38.83	8000	36.08
1500	38.52	8500	36.03
1600	38.69	9000	36.9
1700	39.54	9500	37.29
1800	39.66	10000	37.56
1900	40.49	11000	37.23
2000	40.03	12000	37.05
2500	39.30	13000	36.15
3000	41.29	14000	33.80
3500	40.61	15000	37.41
4000	41.49	16000	37.98
4500	41.51	17000	35.82
5000	40.41	18000	32.01



**FRONT VIEW**

Nortek
Z-WAVE IRRIGATION CONTROLLER
Model: WI15VZ-1

FCC SUBPART C – FUNDAMENTAL RADIATED EMISSIONS < 1GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

**REAR VIEW**

Nortek
Z-WAVE IRRIGATION CONTROLLER
Model: WI15VZ-1
FCC SUBPART C – FUNDAMENTAL RADIATED EMISSIONS < 1GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

**FRONT VIEW**

Nortek
Z-WAVE IRRIGATION CONTROLLER
Model: WI15VZ-1
FCC SUBPART B - RADIATED EMISSIONS < 1GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



REAR VIEW

Nortek
Z-WAVE IRRIGATION CONTROLLER
Model: WI15VZ-1
FCC SUBPART B - RADIATED EMISSIONS < 1GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600

Silverado Division
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

**FRONT VIEW**

Nortek
Z-WAVE IRRIGATION CONTROLLER
Model: WI15VZ-1
FCC SUBPART B & C - RADIATED EMISSIONS > 1GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

Brea Division
114 Olinda Drive
Brea, CA 92823
(714) 579-0500

Agoura Division
2337 Troutdale Drive
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(818) 597-0600

Silverado Division
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Silverado, CA 92676
(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

**REAR VIEW**

Nortek
Z-WAVE IRRIGATION CONTROLLER
Model: WI15VZ-1
FCC SUBPART B & C - RADIATED EMISSIONS > 1GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

**FRONT VIEW**

Nortek
Z-WAVE IRRIGATION CONTROLLER
Model: WI15VZ-1
FCC SUBPART B & C - CONDUCTED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

**REAR VIEW**

Nortek
Z-WAVE IRRIGATION CONTROLLER
Model: WI15VZ-1
FCC SUBPART B & C - CONDUCTED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

APPENDIX E***RADIATED EMISSIONS DATA SHEETS***

Brea Division
114 Olinda Drive
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(714) 579-0500

Agoura Division
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Silverado Division
19121 El Toro Road
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(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



Title: FCC 15.209

12/11/2015 2:52:30 PM

File: Radiated Pre-Scan 30-1000Mhz.set

Sequence: Preliminary Scan

Operator: Torey Oliver

EUT Type: Irrigation Controller / WI15VZ-1

EUT Condition: The EUT is in a loop.

Comments: The loop was in a faster than normal operation for worst case scenario.

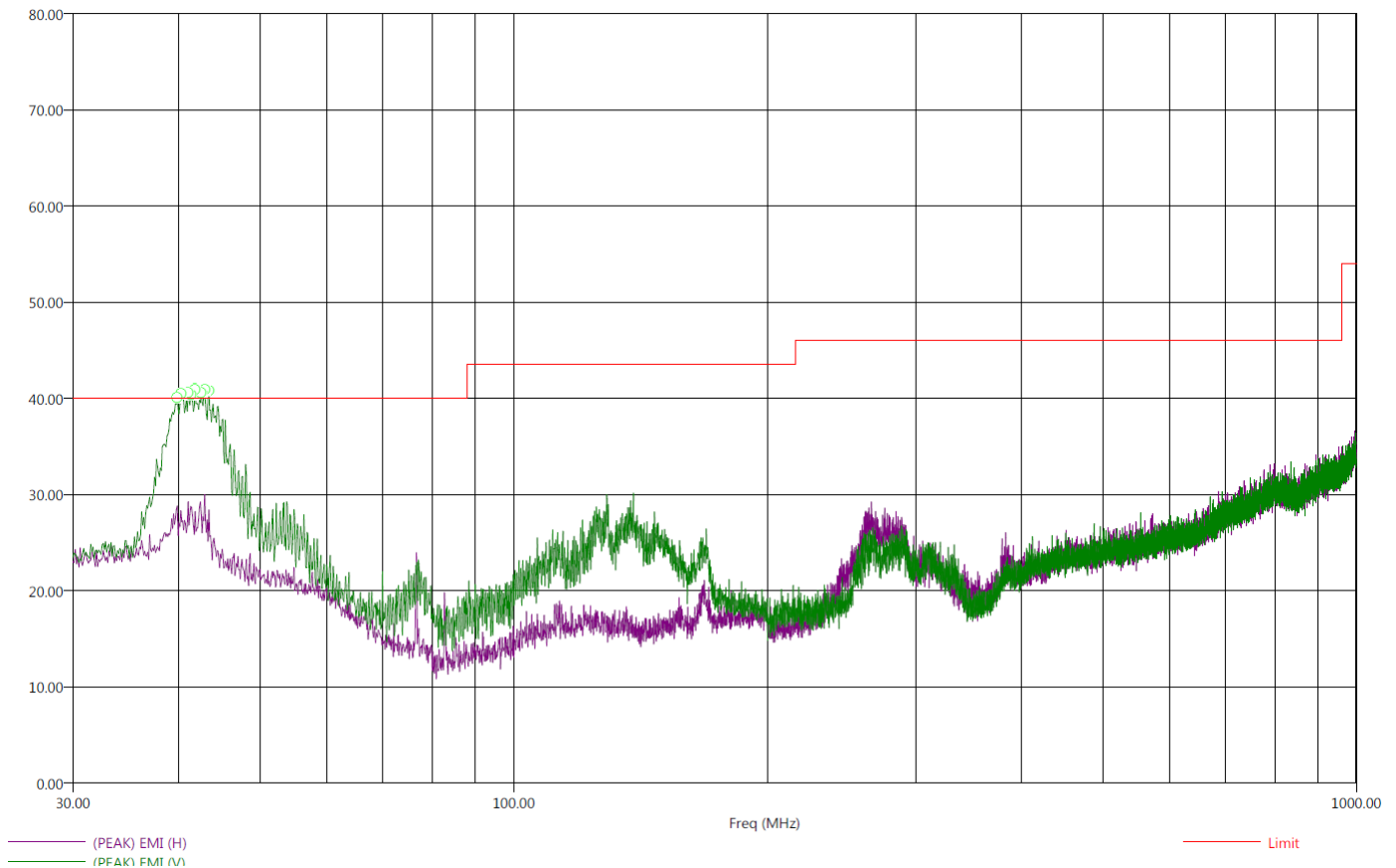
Temp: 71f

Hum: 38%

120V 60Hz

Compatible Electronics, Inc. FAC-3 (Lab R)

Electric Field Strength (dB μ V/m)



***There were no radiated emissions other than harmonics found below 30 MHz or above 1GHz.
This is worst case channel and mode.***



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19121 El Toro Road
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(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.209

12/11/2015 3:26:19 PM

File: Radiated Final 30-1000Mhz.set

Sequence: Final Measurements

Operator: Torey Oliver

EUT Type: Irrigation Controller / WI15VZ-1

EUT Condition: The EUT is in a loop.

Comments: The loop was in a faster than normal operation for worst case scenario.

Temp: 71f

Hum: 38%

120V 60Hz

Compatible Electronics, Inc. FAC-3 (Lab R)

Freq (MHz)	(QP) Margin (dB)	(QP) EMI (dBμV/m)	(PEAK) EMI (dBμV/m)	Limit (dBμV/m)	Pol	Ttbl Agl (deg)	Twr Ht (cm)	Transducer(dB)	Cable(dB)
39.90	-5.78	34.22	40.59	40.00	V	300.25	141.91	22.99	1.29
40.30	-2.10	37.90	40.72	40.00	V	262.00	99.28	22.87	1.25
41.10	-5.48	34.52	39.08	40.00	V	165.00	139.64	22.68	1.16
41.40	-2.23	37.77	42.43	40.00	V	287.50	108.59	22.56	1.11
41.90	-3.54	36.46	41.34	40.00	V	230.75	104.89	22.41	1.05
42.60	-5.64	34.36	39.53	40.00	V	73.75	136.23	22.23	0.98
43.00	-3.05	36.95	41.83	40.00	V	264.00	111.10	22.09	0.92
43.50	-3.69	36.31	41.31	40.00	V	309.25	104.95	21.94	0.85

*There were no radiated emissions other than harmonics found below 30 MHz or above 1GHz.**This is worst case channel and mode.*

Brea Division
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CONDUCTED EMISSIONS
DATA SHEETS

Brea Division
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(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400



Title: FCC 15.207

File: Conducted Pre-Line.set

Operator: Torey Oliver

EUT Type: Irrigation Controller / WI15VZ-1

EUT Condition: The EUT is in a loop.

Comments: The loop was in a faster than normal operation for worst case scenario.

Temp: 71f

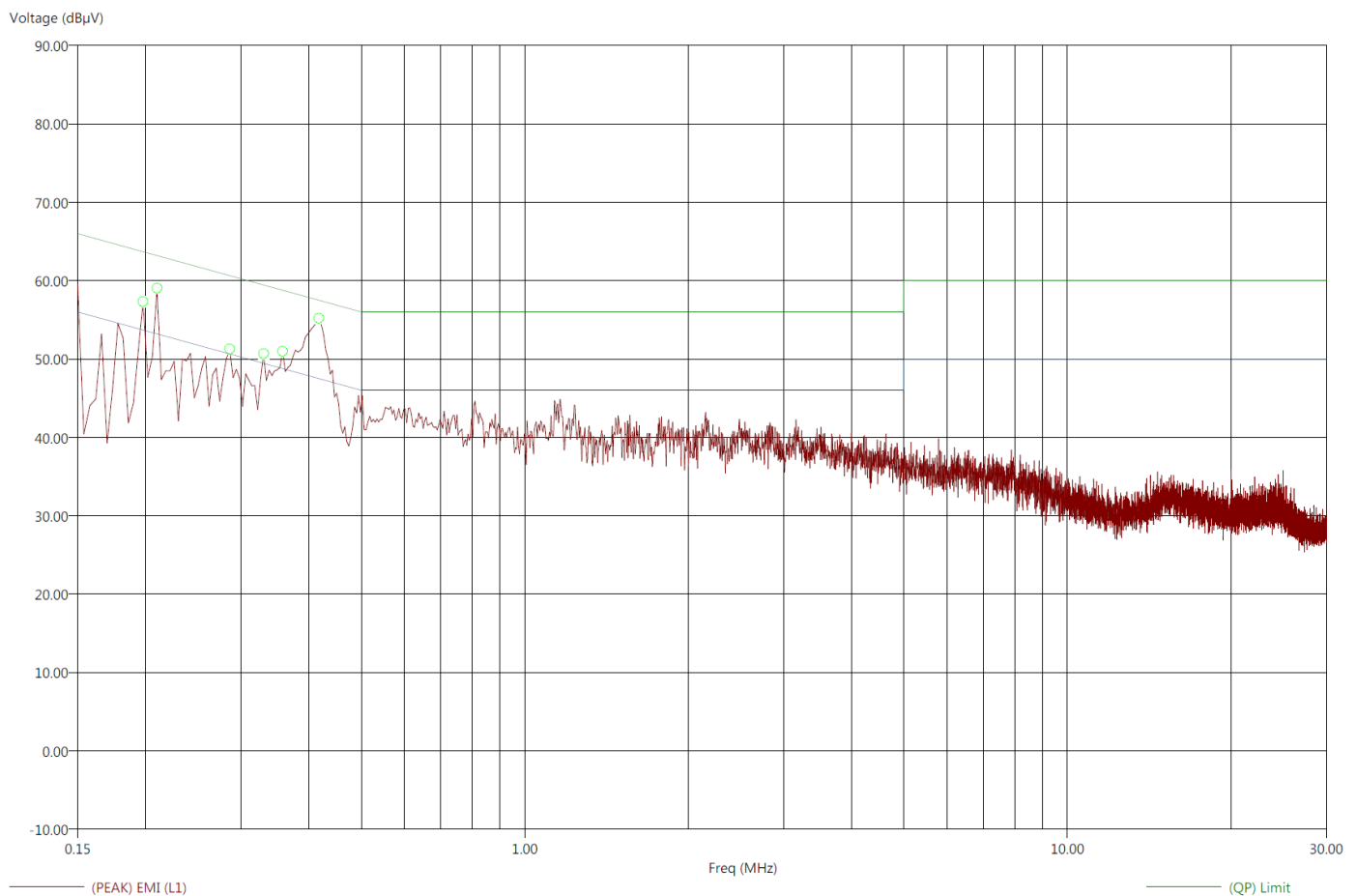
Hum: 38%

120V 60Hz

12/13/2015 12:46:07 PM

Sequence: Preliminary Scan

Compatible Electronics, Inc. FAC-3 (LAB R)



This is worst case mode.



Brea Division
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(949) 589-0700

Lake Forest Division
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.207

12/13/2015 12:49:04 PM

File: Conducted Final-Line.set

Sequence: Final Measurements

Operator: Torey Oliver

EUT Type: Irrigation Controller / WI15VZ-1

EUT Condition: The EUT is in a loop.

Comments: The loop was in a faster than normal operation for worst case scenario.

Temp: 71f

Hum: 38%

120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)

Freq (MHz)	(AVG) Margin AVL (dB)	(QP) Margin QPL (dB)	(AVG) EMI (dB V)	(QP) EMI (dB μ V)	(PEAK) EMI (dB μ V)	(AVG) Limit (dB μ V)	(QP) Limit (dB μ V)	Transducer (dB)	Cable (dB)
0.20	-24.93	-13.13	28.77	50.56	60.33	53.69	63.69	0.32	0.30
0.21	-24.89	-14.37	28.31	48.83	59.51	53.21	63.21	0.29	0.28
0.29	-21.35	-16.46	29.29	44.18	50.97	50.64	60.64	0.14	0.18
0.33	-21.07	-15.63	28.38	43.82	50.81	49.45	59.45	0.07	0.14
0.36	-18.47	-13.15	30.30	45.63	51.29	48.77	58.77	0.04	0.11
0.42	-9.65	-4.68	37.83	52.81	55.82	47.49	57.49	0.04	0.06

This is worst case mode.

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Lake Forest Division
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(949) 587-0400

Title: FCC 15.207

12/13/2015 12:54:58 PM

File: Conducted Pre-Neutral.set

Sequence: Preliminary Scan

Operator: Torey Oliver

EUT Type: Irrigation Controller / WI15VZ-1

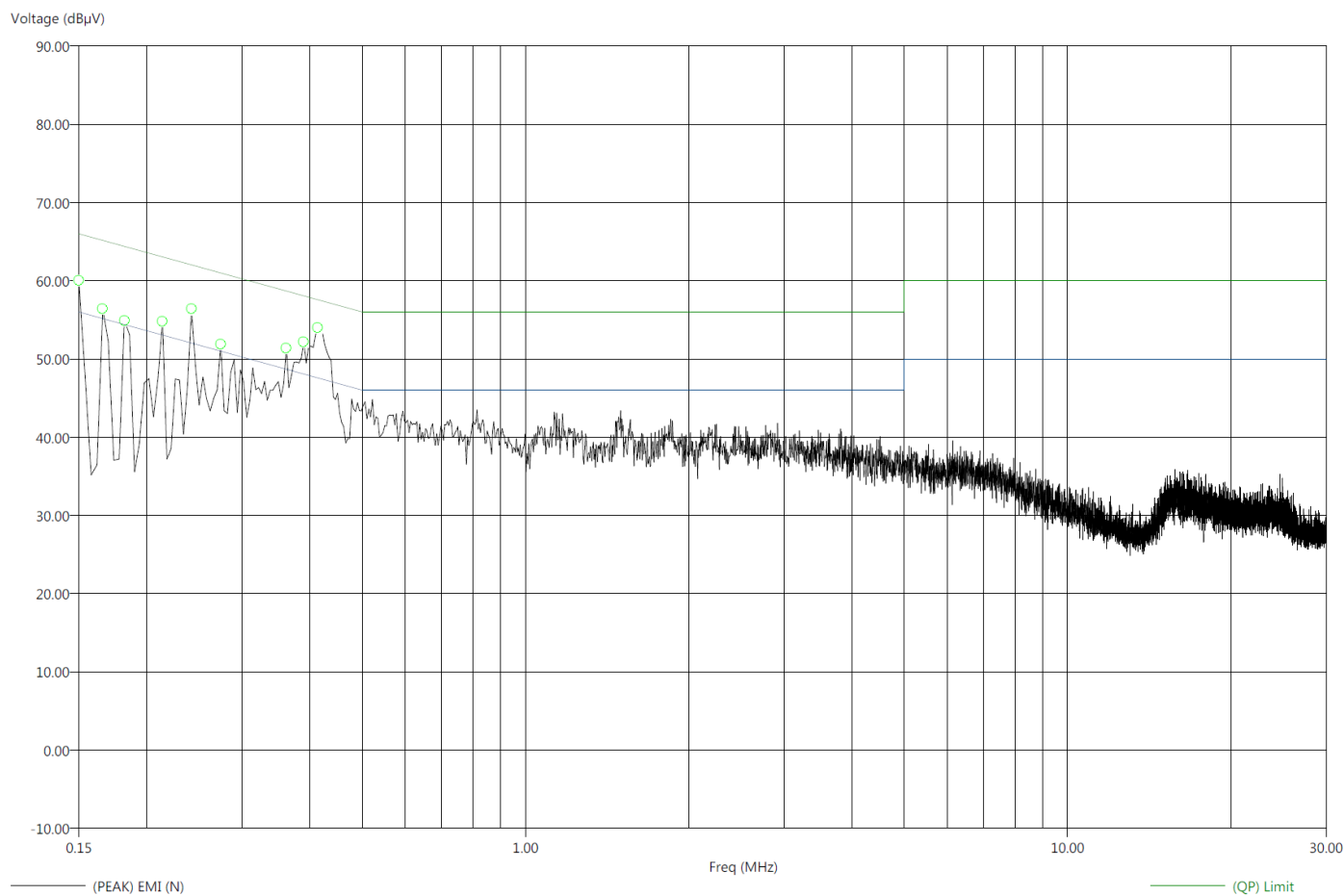
EUT Condition: The EUT is in a loop.

Comments: The loop was in a faster than normal operation for worst case scenario.

Temp: 71f

Hum: 38%

120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)***This is worst case mode.*****Brea Division**
114 Olinda Drive
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(714) 579-0500**Agoura Division**
2337 Troutdale Drive
Agoura, CA 91301
(818) 597-0600**Silverado Division**
19121 El Toro Road
Silverado, CA 92676
(949) 589-0700**Lake Forest Division**
20621 Pascal Way
Lake Forest, CA 92630
(949) 587-0400

Title: FCC 15.207

12/13/2015 1:00:53 PM

File: Conducted Final-Neutral.set

Sequence: Final Measurements

Operator: Torey Oliver

EUT Type: Irrigation Controller / WI15VZ-1

EUT Condition: The EUT is in a loop.

Comments: The loop was in a faster than normal operation for worst case scenario.

Temp: 71f

Hum: 38%

120V 60Hz

Compatible Electronics, Inc. FAC-3 (LAB R)

Freq (MHz)	(AVG) Margin AVL (dB)	(QP) Margin QPL (dB)	(AVG) EMI (dB V)	(QP) EMI (dB μ V)	(PEAK) EMI (dB μ V)	(AVG) Limit (dB μ V)	(QP) Limit (dB μ V)	Transducer (dB)	Cable (dB)
0.15	-32.21	-16.23	23.79	49.77	60.31	56.00	66.00	0.44	0.18
0.17	-28.78	-12.36	26.38	52.80	61.70	55.16	65.16	0.39	0.22
0.18	-29.89	-17.58	24.50	46.82	60.08	54.39	64.39	0.35	0.26
0.21	-27.53	-15.64	25.52	47.41	58.93	53.05	63.05	0.27	0.28
0.24	-24.06	-15.60	27.97	46.43	57.15	52.03	62.03	0.21	0.24
0.27	-22.94	-16.35	28.06	44.65	53.16	51.00	61.00	0.16	0.20
0.36	-18.37	-13.72	30.32	44.96	51.69	48.68	58.68	0.04	0.11
0.39	-14.45	-9.23	33.61	48.83	54.78	48.06	58.06	0.03	0.08
0.41	-11.15	-5.81	36.42	51.76	56.97	47.57	57.57	0.03	0.06

This is worst case mode.**Brea Division**
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Brea, CA 92823
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Agoura, CA 91301
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(949) 589-0700**Lake Forest Division**
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***FUNDAMENTAL & HARMONICS
DATA SHEETS***



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FUNDAMENTAL FIELD STRENGTH

FCC 15.249

Company: Nortek
EUT: Z-Wave Irrigation Controller
Model: WI15VZ-1

Date: 11/20/15
Lab: R
Tested: Matt
By: Harrison

Compatible Electronics, Inc. FAC-3

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table	Tower	Comments
908.42	90.94	H	113.97	-23.03	Peak	40.00	1.00	
908.42	86.98	H	93.97	-6.99	QP	40.00	1.00	
908.42	93.66	V	113.97	-20.31	Peak	45.00	1.50	
908.42	93.17	V	93.97	-0.80	QP	45.00	1.50	
916.00	89.39	H	113.97	-24.58	Peak	40.00	1.00	
916.00	87.07	H	93.97	-6.90	QP	40.00	1.00	
916.00	94.73	V	113.97	-19.24	Peak	45.00	1.50	
916.00	93.32	V	93.97	-0.65	QP	45.00	1.50	

Test
distance
3 meter



HARMONIC EMISSIONS LOW CHANNEL HORIZONTAL

FCC 15.249

Company: Nortek
Z-Wave Irrigation
EUT: Controller
Model: WI15VZ-1

Date: 11/20/2015

Lab: P
Tested By: Matt Harrison

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
1816.8	43.75	H	73.98	-30.23	Peak	1.10	182	
1816.8	31.05	H	53.98	-22.93	Avg	1.10	182	
2725.3	53.39	H	73.98	-20.59	Peak	1.47	231	
2725.3	41.15	H	53.98	-12.83	Avg	1.47	231	
3633.7		H	73.98		Peak			No Emissions Found
3633.7		H	53.98		Avg			No Emissions Found
4542.1	49.37	H	73.98	-24.61	Peak	1.41	61	
4542.1	36.96	H	53.98	-17.02	Avg	1.41	61	
5450.5		H	73.98		Peak			No Emissions Found
5450.5		H	53.98		Avg			No Emissions Found
6358.9	49.82	H	73.98	-24.16	Peak	1.80	360	
6358.9	37.16	H	53.98	-16.82	Avg	1.80	360	
7267.4		H	73.98		Peak			No Emissions Found
7267.4		H	53.98		Avg			No Emissions Found
8175.8		H	73.98		Peak			No Emissions Found
8175.8		H	53.98		Avg			No Emissions Found
9084.2		H	73.98		Peak			No Emissions Found
9084.2		H	53.98		Avg			No Emissions Found

Test distance
3 meter



HARMONIC EMISSIONS LOW CHANNEL VERTICAL

FCC 15.249

Company: Nortek
Z-Wave Irrigation
EUT: Controller
Model: WI15VZ-1

Date: 11/20/2015
Lab: P
Tested By: Matt Harrison

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
1816.8	41.85	V	73.98	-32.13	Peak	1.54	288	
1816.8	28.75	V	53.98	-25.23	Avg	1.54	288	
2725.3	50.88	V	73.98	-23.10	Peak	1.89	286	
2725.3	38.02	V	53.98	-15.96	Avg	1.89	286	
3633.7		V	73.98		Peak			No Emissions Found
3633.7		V	53.98		Avg			No Emissions Found
4542.1	52.23	V	73.98	-21.75	Peak	1.46	223	
4542.1	39.53	V	53.98	-14.45	Avg	1.46	223	
5450.5		V	73.98		Peak			No Emissions Found
5450.5		V	53.98		Avg			No Emissions Found
6358.9	53.92	V	73.98	-20.06	Peak	1.33	170	
6358.9	40.80	V	53.98	-13.18	Avg	1.33	170	
7267.4		V	73.98		Peak			No Emissions Found
7267.4		V	53.98		Avg			No Emissions Found
8175.8		V	73.98		Peak			No Emissions Found
8175.8		V	53.98		Avg			No Emissions Found
9084.2		V	73.98		Peak			No Emissions Found
9084.2		V	53.98		Avg			No Emissions Found

Test
distance
3 meter



HARMONIC EMISSIONS HIGH CHANNEL HORIZONTAL

FCC 15.249

Company: Nortek
Z-Wave Irrigation
EUT: Controller
Model: WI15VZ-1

Date: 11/20/2015

Lab: P
Tested By: Matt Harrison

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
1832.0	37.66	H	73.98	-36.32	Peak	1.73	177	
1832.0	25.09	H	53.98	-28.89	Avg	1.73	177	
2748.0	50.59	H	73.98	-23.39	Peak	1.05	247	
2748.0	34.39	H	53.98	-19.59	Avg	1.05	247	
3664.0		H	73.98		Peak			No Emissions Found
3664.0		H	53.98		Avg			No Emissions Found
4580.0	42.28	H	73.98	-31.70	Peak	1.45	54	
4580.0	29.89	H	53.98	-24.09	Avg	1.45	54	
5496.0		H	73.98		Peak			No Emissions Found
5496.0		H	53.98		Avg			No Emissions Found
6412.0		H	73.98		Peak			No Emissions Found
6412.0		H	53.98		Avg			No Emissions Found
7328.0		H	73.98		Peak			No Emissions Found
7328.0		H	53.98		Avg			No Emissions Found
8244.0		H	73.98		Peak			No Emissions Found
8244.0		H	53.98		Avg			No Emissions Found
9160.0		H	73.98		Peak			No Emissions Found
9160.0		H	53.98		Avg			No Emissions Found

Test distance
3 meter



HARMONIC EMISSIONS HIGH CHANNEL VERTICAL

FCC 15.249

Company: Nortek
EUT: Z-Wave Irrigation Controller
Model: WI15VZ-1

Date: 11/20/2015
Lab: P
Tested By: Matt Harrison

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
1832.0	41.39	V	73.98	-32.59	Peak	1.27	267	
1832.0	26.92	V	53.98	-27.06	Avg	1.27	267	
2748.0	49.51	V	73.98	-24.47	Peak	2.19	311	
2748.0	33.71	V	53.98	-20.27	Avg	2.19	311	
3664.0		V	73.98		Peak			No Emissions Found
3664.0		V	53.98		Avg			No Emissions Found
4580.0	42.21	V	73.98	-31.77	Peak	1.48	204	
4580.0	29.89	V	53.98	-24.09	Avg	1.48	204	
5496.0		V	73.98		Peak			No Emissions Found
5496.0		V	53.98		Avg			No Emissions Found
6412.0		V	73.98		Peak			No Emissions Found
6412.0		V	53.98		Avg			No Emissions Found
7328.0		V	73.98		Peak			No Emissions Found
7328.0		V	53.98		Avg			No Emissions Found
8244.0		V	73.98		Peak			No Emissions Found
8244.0		V	53.98		Avg			No Emissions Found
9160.0		V	73.98		Peak			No Emissions Found
9160.0		V	53.98		Avg			No Emissions Found

Test distance
3 meter



EMISSIONS RADIATED OUTSIDE OF THE FUNDAMENTAL FREQUENCY BAND

DATA SHEETS



Brea Division
114 Olinda Drive
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(714) 579-0500

Agoura Division
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Lake Forest Division
20621 Pascal Way
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BAND EDGES LOW CHANNEL

FCC 15.249

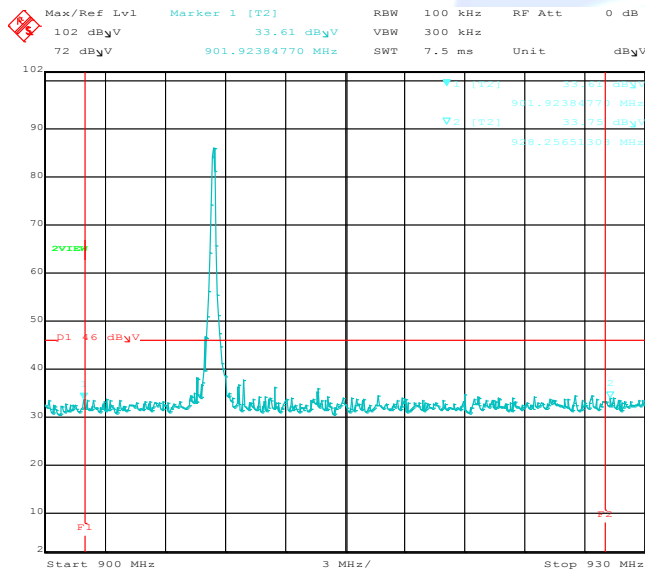
Company: Nortek
EUT: Z-Wave Irrigation Controller
Model: WI15VZ-1

Date: 11/20/2015
Lab: P
Test ENG: Matt Harrison

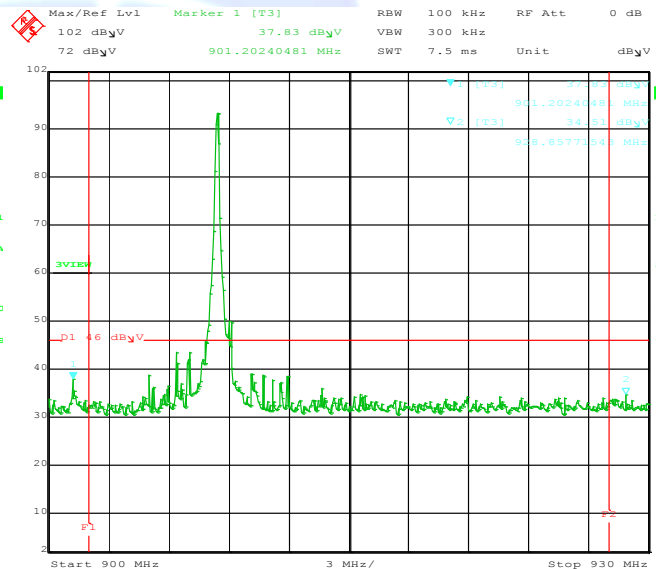
Compatible Electronics, Inc. FAC-3 (Lab P)

Freq. (MHz)	Level (dBμV/m)	Pol	Limit (dBμV)	Margin (dB)	Peak / QP / Avg	Table Angle (Deg)	Tower Height (m)	Comments
901.2	37.83	V	46.00	-8.17	Peak	45.00	1.50	No Marker Delta
928.85	34.51	V	46.00	-11.49	Peak	45.00	1.50	Method Used
901.92	33.61	H	46.00	-12.39	Peak	40.00	1.00	No Marker Delta
928.25	33.75	H	46.00	-12.25	Peak	40.00	1.00	Method Used

Test distance
3 meter



Comment A: Band Edges, Horizontal.
Date: 20.NOV.2015 10:07:55



Comment A: Band Edges, Vertical.
Date: 20.NOV.2015 10:05:56



Brea Division
114 Olinda Drive
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BAND EDGES HIGH CHANNEL

FCC 15.249

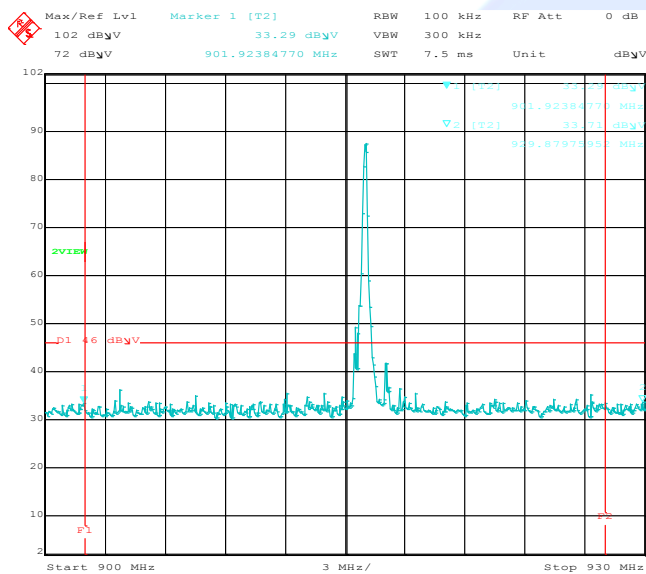
Company: Nortek
EUT: Z-Wave Irrigation Controller
Model: WI15VZ-1

Date: 11/20/2015
Lab: P
Test ENG: Matt Harrison

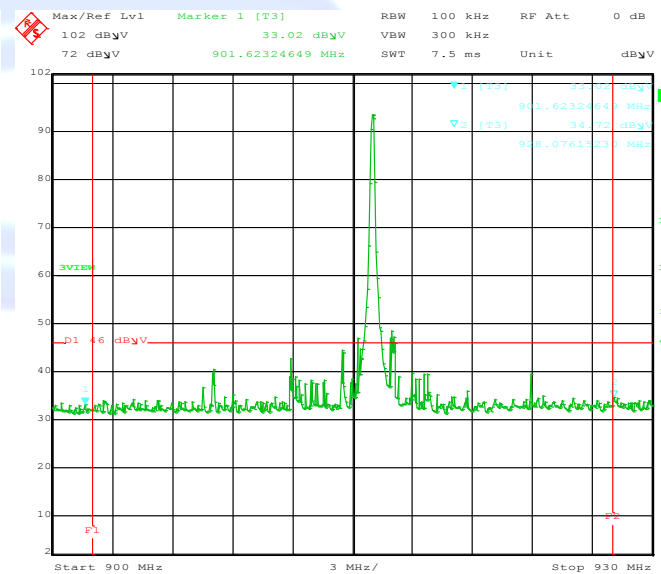
Compatible Electronics, Inc. FAC-3 (Lab P)

Freq. (MHz)	Level (dBμV/m)	Pol	Limit (dBμV)	Margin (dB)	Peak / QP / Avg	Table Angle (Deg)	Tower Height (m)	Comments
901.62	33.02	V	46.00	-12.98	Peak	45.00	1.50	No Marker Delta
928.07	34.72	V	46.00	-11.28	Peak	45.00	1.50	Method Used
901.92	33.29	H	46.00	-12.71	Peak	40.00	1.00	No Marker Delta
929.88	33.72	H	46.00	-12.28	Peak	40.00	1.00	Method Used

Test distance
3 meter



Comment A: Band Edges, Horizontal.
Date: 20.NOV.2015 10:10:44



Comment A: Band Edges, Vertical.
Date: 20.NOV.2015 10:12:58



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