

**Application for Certification of
WRS Control Interface**

Rain Bird Corporation

Model: WR2-RC, WR2-RFI, WR2-RFC

FCC ID: QVP0001WRS
IC ID: 4748A-0001WRS

REPORT # RV88032A-001

This report was prepared in accordance with the requirements of the FCC Rules and Regulations Part 2, Subpart J, 2.1033, Part 15.249 and other applicable sections of the rules as indicated herein.

Prepared By:

DNB Engineering, Inc.
5969 Robinson Avenue
Riverside, CA 92503

Table of contents

Paragraph numbers in this report follow the application section numbers found in the FCC Rules and Regulations, Part 2, Subpart J for Certification of electronic equipment.

Table of contents.....	2
1.0 ADMINISTRATIVE DATA	3
1.1 Certifications and Qualifications	3
1.2 Measurement Repeatability Information	3
FCC 2.1033 (b) (1) Application for Certification.....	4
FCC 2.1033 (b) (2) FCC and IC Identifiers	5
FCC 2.1033 (b) (3) Installation and Operating Instructions	6
FCC 2.1033 (b) (4) Brief Description of Circuit Function	7
FCC 2.1033 (b) (5) Block Diagram	8
FCC 2.1033 (b) (6) Report of Measurements	9
Conducted Output Power for MPE calculations.....	10
FCC 15.207 Conducted Emissions (General Provisions)	12
FCC 15.209, IC RSS-Gen 8.9 Radiated Emissions	15
FCC 15.249(d), IC RSS-210 B.10(a) Harmonics	20
FCC 15.249(a), IC RSS-210 B.10(a) Field Strength	21
FCC 15.249(d), IC RSS-210 B.10(b) Band Edge Measurements.....	22
FCC 2.1033 (b) (7) Equipment Photographs	24

1.0 ADMINISTRATIVE DATA

1.1 Certifications and Qualifications

I certify that DNB Engineering, Inc conducted the tests performed in order to obtain the technical data presented in this application. Also, based on the results of the enclosed data, I have concluded that the equipment tested meets or exceeds the requirements of the Rules and Regulations governing this application.

1.2 Measurement Repeatability Information

The test data presented in this report has been acquired using the guidelines set forth in FCC Part 2.1031 through 2.1057, Part 15. The test results presented in this document are valid only for the equipment identified herein under the test conditions described. Repeatability of these test results will only be achieved with identical measurement conditions. These conditions include: The made test distance, EUT Height, Measurement Sit Characteristics, and the same EUT System Components. The system must have the same interconnecting Cables arranged in identical placement to that in the test setup, with the system and/or EUT functioning in the identical mode of operation (i.e. software and so on) as on the date of the test. Any deviation from the test conditions and the environment on the date of the test may result in measurement repeatability difficulties.

All changes made to the EUT during the course of testing as identified in this test report must be incorporated into the EUT or identical models to ensure compliance with the FCC regulations.

Thomas Elders

Thomas Elders
Facility Manager
Riverside Branch
DNB Engineering, Inc.
Tel. (951) 637-2630
FAX (951) 637-2704

FCC 2.1033 (b) (1) Application for Certification

Name of Applicant:	Rain Bird Corporation
Applicant is:	Manufacturer
Name of Manufacturer:	Rain Bird Corporation
Description:	Control Interface
Model Number:	WR2-RC, WR2-RFI, WR2-RFC
Anticipated Production Quantity:	Multiple Units
15.249 Frequency Bands:	902 – 928 MHz
15.249 Rated Power:	.5mW
Type of Signal:	DXT
Test Procedure:	ANSI C63.10-2013, C63.4-2014

FCC 2.1033 (b) (2) FCC and IC Identifiers

FCC ID: QVP0001WRS

IC: 4748A-0001WRS

FCC 2.1033 (b) (3) Installation and Operating Instructions

To be filed as a separate attachment

FCC 2.1033 (b) (4) Brief Description of Circuit Function

To be filed as a separate attachment.

FCC 2.1033 (b) (5) Block Diagram

To be filed as a separate attachment.

FCC 2.1033 (b) (6) Report of Measurements

Conducted Output Power for MPE calculations
ANSI C63.10-2013

Equipment List:

Asset #	Equipment	Manufacturer	Model #	Serial #	Location	Cal date	Interval	Due date
2264	Analyzer	Agilent	E4407B	MY45103462	Riverside	16 Aug 16	730	16 Aug 18

Test Procedure:

Connect the spectrum analyzer directly to antenna terminals. Use peak detector on max hold. Allow trace to stabilize. Use marker to peak function to set the marker on the peak emission. Record analyzer plot.

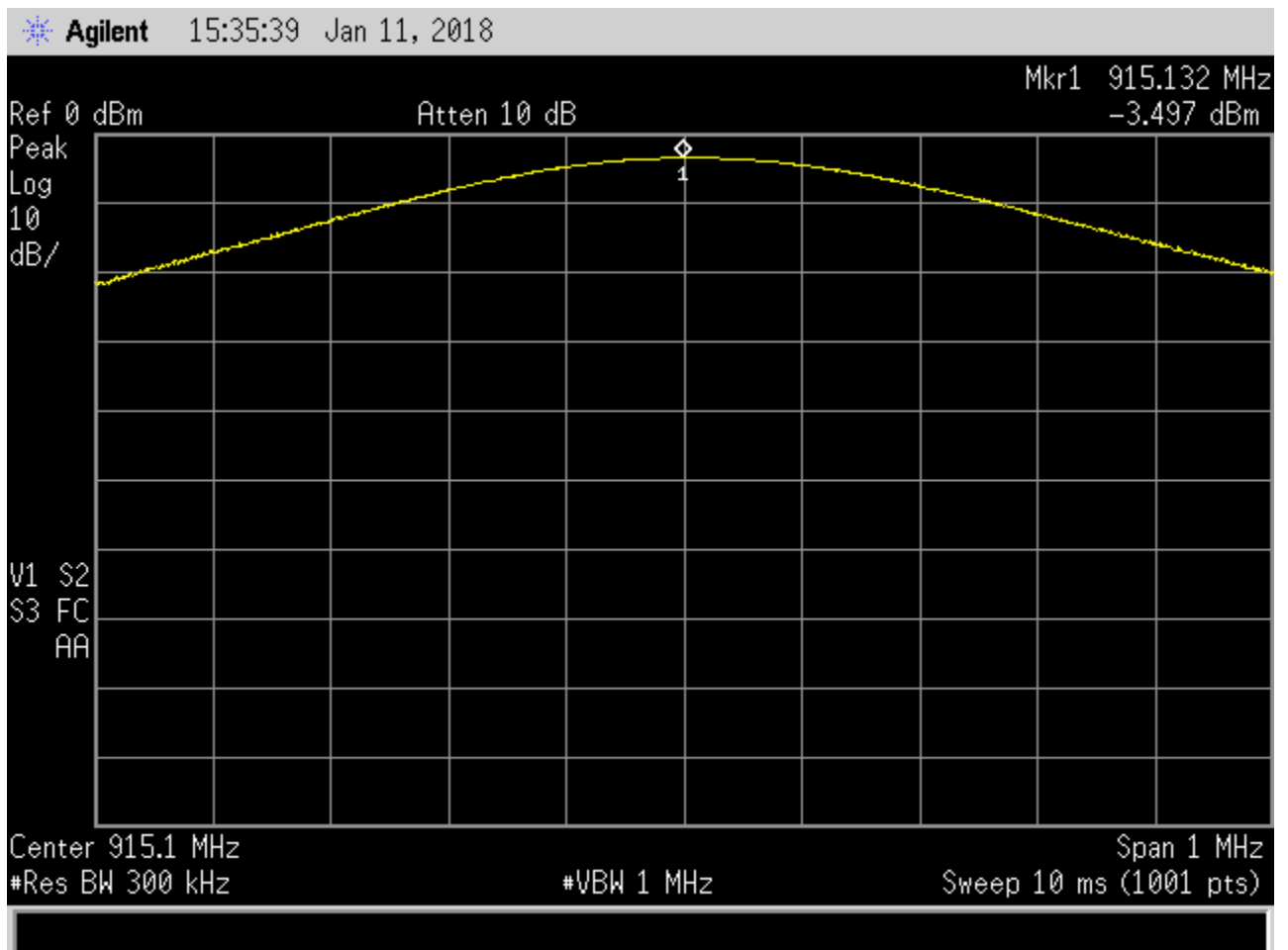
Use the following analyzer settings:

Span = approximately five times 20dB bandwidth
RBW = > 20dB bandwidth
VBW = > the RBW
Sweep = auto
Trace = max hold

Test Setup:



	5969 Robinson Ave. Riverside, CA 92503 (951)637-2630	Peak Power (Conducted)	
DNB Job Number:	88032A	Date:	1-11-2018
Customer:	Rain Bird Corporation		RSS-210 B.10 FCC 15.249
Model Number:	WR2-RC, WR2-RFI, WR2-RFC	Specification:	
Description:	Control Interface		
Peak Output Power		Single Channel 915 MHz	



FCC 15.207 Conducted Emissions (General Provisions)

ANSI C63.10-2013, C63.4-2014

Equipment List

Asset No	Item	Manufacturer	Model No	Serial No	Calibration Date	Calibration Interval	Calibration Due
844	QP Adapter	H/P	85650A	2811A01240	15-Aug-17	730	15-Aug-19
1109	Spect Analyzer Display	H/P	85662A	2318A05282	15-Aug-17	730	15-Aug-19
1242	Spectrum Analyzer	H/P	8568B	2503A01257	15-Aug-17	730	15-Aug-19
2180	LISN	Fischer	FCC-LISN-50-50-4-02	04077	06-Jun-17	730	06-Jun-19

Procedure:

The EUT was placed on a wooden support .8m above the ground plane and connected to an Artificial Mains Network (AMN). The equipment was powered by 115Vac 60Hz. The emissions were measured from 150 kHz to 30 MHz

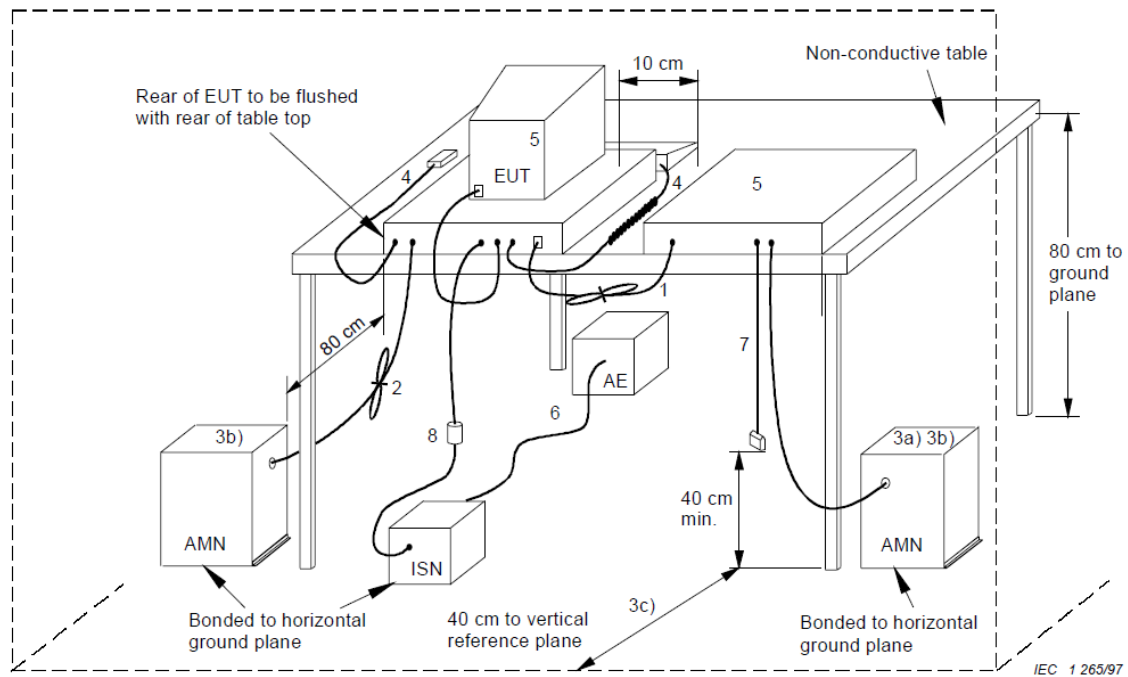
Analyzer settings:

RBW = 9kHz
VBW = 100kHz
Detector = Peak
Trace = Max Hold

EUT Operating Conditions:

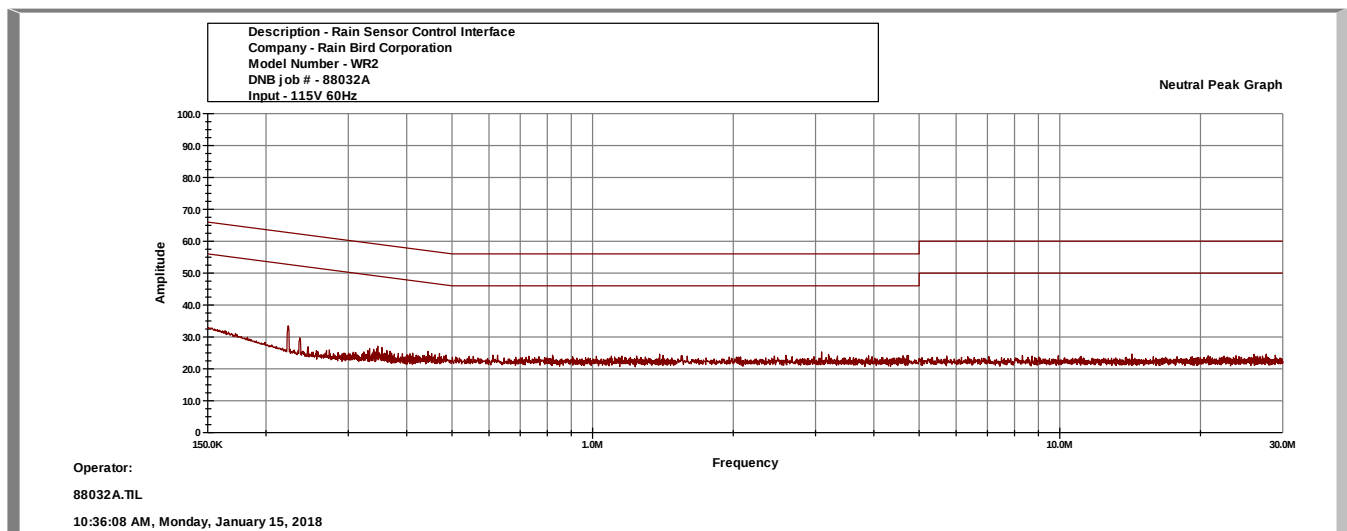
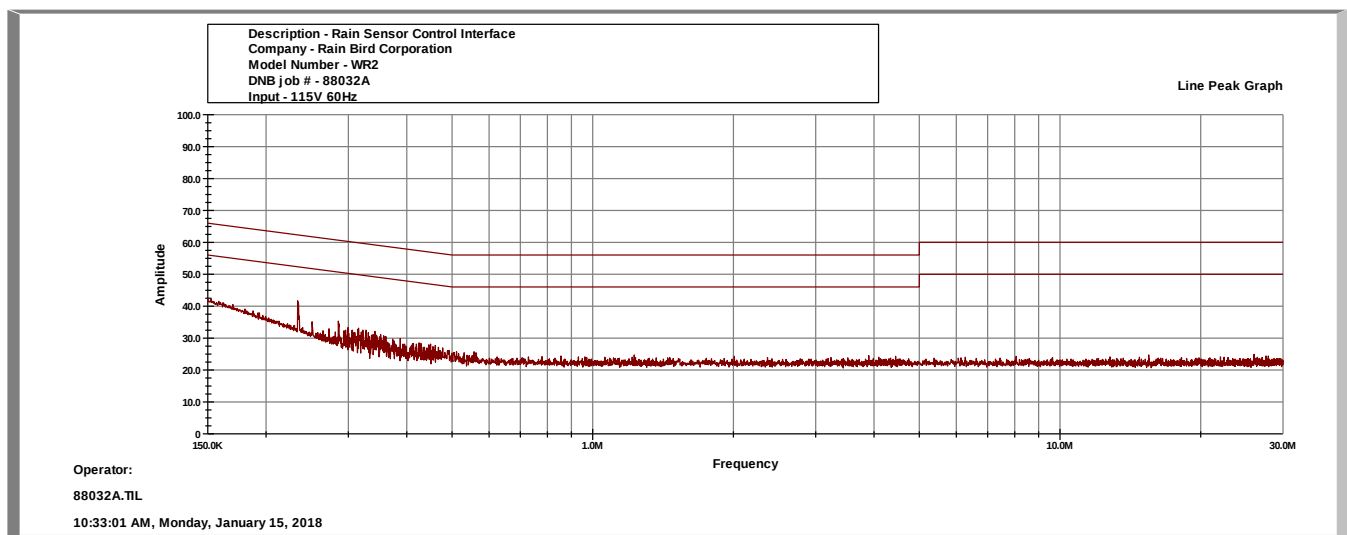
Transmitting, frequency hopping enabled.

Test Setup:



AMN = Artificial mains network
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

	5969 Robinson Ave. Riverside, CA 92503 (951)637-2630	Conducted Emissions	
DNB Job Number:	68056	Date:	1-15-2018
Customer:	Quest Technical Sales and Marketing, Inc.		FCC 15.207
Model Number:		Specification:	
Description:	RS-485 Wireless Transceiver		
Conducted Emissions 150kHz-30MHz	Normal operation		



FCC 15.209, IC RSS-Gen 8.9 Radiated Emissions
ANSI C63.10-2013, C63.4-2014

Equipment List:

Asset	Equipment	Manufacturer	Model #	Serial #	Location	Cal date	Days	Due date
1965	QP Adapter	HP	85650A	2043A00277	Riverside	03 Nov 16	730	03 Nov 18
1234	CRT Display	HP	85662A	238AG5252	Riverside	03 Nov 16	730	03 Nov 18
1430	Analyzer	HP	8568B	2732A03600	Riverside	03 Nov 16	730	03 Nov 18
2264	Analyzer	Agilent	E4407B	MY45103462	Riverside	16 Aug 16	730	16 Aug 18
1758	Biconical Antenna	AH Systems	2052	524	Riverside	22 Oct 17	730	22 Oct 19
31	Log-periodic Antenna	EMCO	3146	1284	Riverside	22 Oct 17	730	22 Oct 19
11	DRG Antenna	EMCO	3115	2281	Riverside	25 Jul 17	730	25 Jul 19

Test Procedure:

The EUT was measured on an open area test site (OATS)

A measuring distance of 3m was used for measurements.

The EUT shall be placed upon a non-conductive table .8 meters above the ground plane for measurements in the 30MHz to 1GHz range and 1.5 meters for measurements above 1GHz. For measurements above 1GHz RF absorbent material shall be placed on the ground plane as described in ANSI C63.4-2014. The EUT shall be placed in the “worst case” transmitting mode. The EUT shall be rotated 360 degrees to find the azimuth maxima. The receive antenna shall then be raised and lowered between 1 to 4 meters taking into account the antenna beam width above 1GHz. The maximum signal emanating from the EUT shall then be recorded on the data sheets.

Analyzer settings 30MHz to 1GHz:

Quasi Peak RBW = 120kHz
 Analyzer RBW = 1MHz
 Analyzer VBW = 1MHz
 Frequency Span = 1MHz
 Sweep Time = auto

Analyzer setting above 1GHz:

RBW = 1MHz
 VBW = 1MHz
 Span = 1MHz
 Sweep Time = auto

EUT Operating Conditions:
Continuously transmitting single channel.

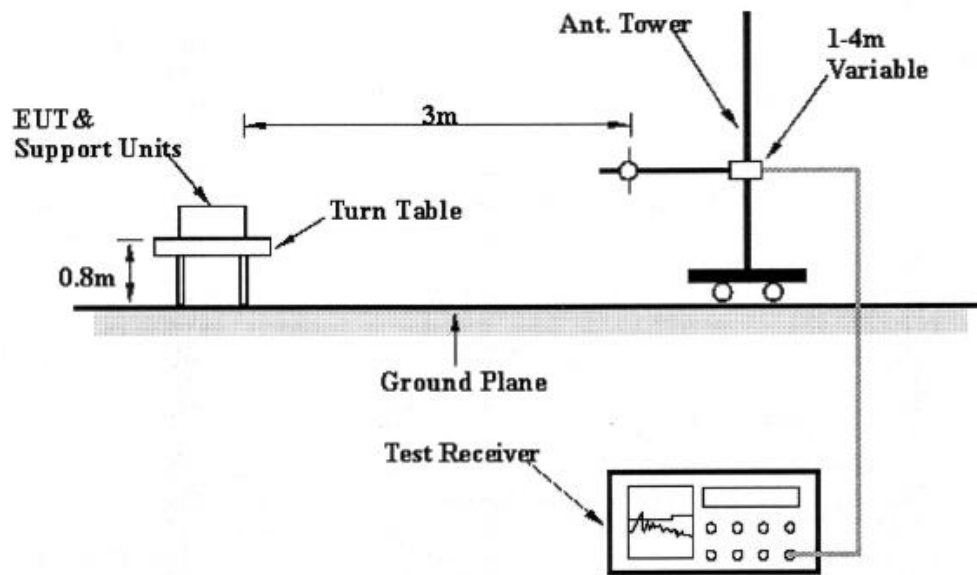
Limits:

Frequency (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measurement Distance (meters)
.009 – 0.490	2400/f(kHz)	20*(Log10(2400/f(kHz)	300
0.490 – 1.705	24000/f(kHz)	20*(Log10(24000/f(kHz)	30
1.705 – 30.0	30	29.5	30
30 – 88	100	40	3
88 – 216	150	43.5	3
216 – 960	200	46.0	3
Above 960	500	54.0	3

Sample Calculation:

Corrected = Meter Reading + Cable1 Loss + Cable2 Loss + Antenna Factor – Amp Gain
Margin = Corrected – Limit

Test Setup:



	5969 Robinson Ave. Riverside, CA 92503 (951)637-2630		Radiated Emissions (spurious)	
DNB Job Number:	88032A		Date:	11-27-2017
Customer:	Rain Bird Corporation			FCC 15.209 RSS-GEN sect. 8.9
Model Number:	WR2-RC, WR2-RFI, WR2-RFC		Specification:	
Description:	Control Interface			
30MHz – 1000MHz		Single Channel 915MHz		

Frequency (MHz)	Meter (dBuV/m)	Antenna (dB)	Cable (dB)	Amp (dB)	Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Polarity
31.762	29.5	13	1.3	-21.9	21.9	40	-18.1	PK	H
33.762	29.1	12.9	1.3	-21.9	21.4	40	-18.6	PK	H
49.871	35.6	10.3	1.5	-21.8	25.6	40	-14.4	PK	H
49.853	32.1	10.3	1.5	-21.8	22.1	40	-17.9	PK	H
83.262	39.2	9.2	1.8	-21.9	28.3	40	-11.7	PK	H
110.9	36.6	10.3	2.1	-21.9	27.1	43.5	-16.4	PK	H
124.175	35.3	11.2	2.2	-21.9	26.8	43.5	-16.7	PK	H
138.717	33.2	11.8	2.4	-21.9	25.5	43.5	-18	PK	H
159.912	33.4	12.8	2.6	-21.8	27	43.5	-16.5	PK	H
161.428	33.9	12.9	2.6	-21.8	27.6	43.5	-15.9	PK	H
171.426	37.8	13.3	2.7	-21.8	32	43.5	-11.5	PK	H
193.606	32.1	14.3	2.9	-21.8	27.5	43.5	-16	PK	H
216.277	30.8	10.6	3.1	-21.8	22.7	46	-23.3	PK	H
250.466	32.4	11.7	3.4	-21.7	25.8	46	-20.2	PK	H
300.14	31.5	13.7	3.7	-21.6	27.3	46	-18.7	PK	H
400.044	32.2	15	4.5	-21.4	30.3	46	-15.7	PK	H
500.265	31.1	17.4	5.2	-21.2	32.5	46	-13.5	PK	H
602.012	32.1	18.7	5.6	-21.2	35.2	46	-10.8	PK	H
699.754	31.8	21.2	6	-21.2	37.8	46	-8.2	PK	H
799.734	32.2	20.2	6.3	-21.3	37.4	46	-8.6	PK	H
900.012	32.3	21.5	6.7	-21.3	39.2	46	-6.8	PK	H
31.057	34.6	13.1	1.2	-21.9	27	40	-13	PK	V
33.136	36.2	13	1.3	-21.9	28.6	40	-11.4	PK	V
49.877	37.4	10.3	1.5	-21.8	27.4	40	-12.6	PK	V
67.988	34.7	9.4	1.7	-21.8	24	40	-16	PK	V
72.977	36.6	9.3	1.7	-21.8	25.8	40	-14.2	PK	V
78.477	38.6	9.2	1.8	-21.9	27.7	40	-12.3	PK	V
79.992	37.4	9.1	1.8	-21.9	26.4	40	-13.6	PK	V
124.172	35.6	11.2	2.2	-21.9	27.1	43.5	-16.4	PK	V
138.686	34.3	11.8	2.4	-21.9	26.6	43.5	-16.9	PK	V
166.255	35.3	13.1	2.7	-21.8	29.3	43.5	-14.2	PK	V
193.755	28.4	14.3	2.9	-21.8	23.8	43.5	-19.7	PK	V
216.684	34.4	10.6	3.1	-21.8	26.3	46	-19.7	PK	V
249.854	37.5	11.7	3.4	-21.7	30.9	46	-15.1	PK	V
300.912	35	13.8	3.7	-21.6	30.9	46	-15.1	PK	V

Frequency (MHz)	Meter (dBuV/m)	Antenna (dB)	Cable (dB)	Amp (dB)	Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Polarity
400.01	41.2	15	4.5	-21.4	39.3	46	-6.7	PK	V
400.2	28.9	15	4.5	-21.4	27	46	-19	PK	V
501.916	37.3	17.5	5.2	-21.2	38.8	46	-7.2	PK	V
608.554	31.7	18.8	5.6	-21.2	34.9	46	-11.1	PK	V
701.324	31.6	21.1	6	-21.2	37.5	46	-8.5	PK	V
800.32	32.5	20.2	6.3	-21.3	37.7	46	-8.3	PK	V
899.6	32	21.5	6.7	-21.3	38.9	46	-7.1	PK	V

FCC 15.249(d), IC RSS-210 B.10(a) Harmonics
ANSI C63.10-2013, C63.4-2014

		Radiated Emissions (Harmonics)	
DNB Job Number:	88032A	Date:	11-28-2017
Customer:	Rain Bird Corporation		FCC 15.249(d) IC RSS-210 B.10(a)
Model Number:	WR2-RC, WR2-RFI, WR2-RFC	Specification:	
Description:	Control Interface		
Above 1 GHz		Single Channel 915MHz	

Frequency (MHz)	Meter (dBuV/m)	Antenna (dB)	Cable (dB)	Amp (dB)	Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Polarity
1830	44.9	27.49	1.4	-31.9	41.89	54	-12.11	PK	H
2745	47.4	29.15	1.8	-31.7	46.65	54	-7.35	PK	H
3660	41.1	31.83	2	-31.2	43.73	54	-10.27	PK	H
4575	43	32.49	2.3	-28.6	49.19	54	-4.81	PK	H
5490	29.6	34.22	2.6	-29	37.42	54	-16.58	PK	H
6405	32.5	34.52	2.9	-28.9	41.02	54	-12.98	PK	H
7320	29.8	36.73	3.1	-29.1	40.53	54	-13.47	PK	H
8235	30.3	37.21	3.2	-28.7	42.01	54	-11.99	PK	H
9150	31.4	37.5	3.4	-28.5	43.8	54	-10.2	PK	H
1830	43.3	27.49	1.4	-31.9	40.29	54	-13.71	PK	V
2745	49.9	29.15	1.8	-31.7	49.15	54	-4.85	PK	V
3660	37.2	31.83	2	-31.2	39.83	54	-14.17	PK	V
4575	40.8	32.49	2.3	-28.6	46.99	54	-7.01	PK	V
5490	29.3	34.22	2.6	-29	37.12	54	-16.88	PK	V
6405	30.1	34.52	2.9	-28.9	38.62	54	-15.38	PK	V
7320	29.4	36.73	3.1	-29.1	40.13	54	-13.87	PK	V
8235	29.6	37.21	3.2	-28.7	41.31	54	-12.69	PK	V
9150	30.5	37.5	3.4	-28.5	42.9	54	-11.1	PK	V

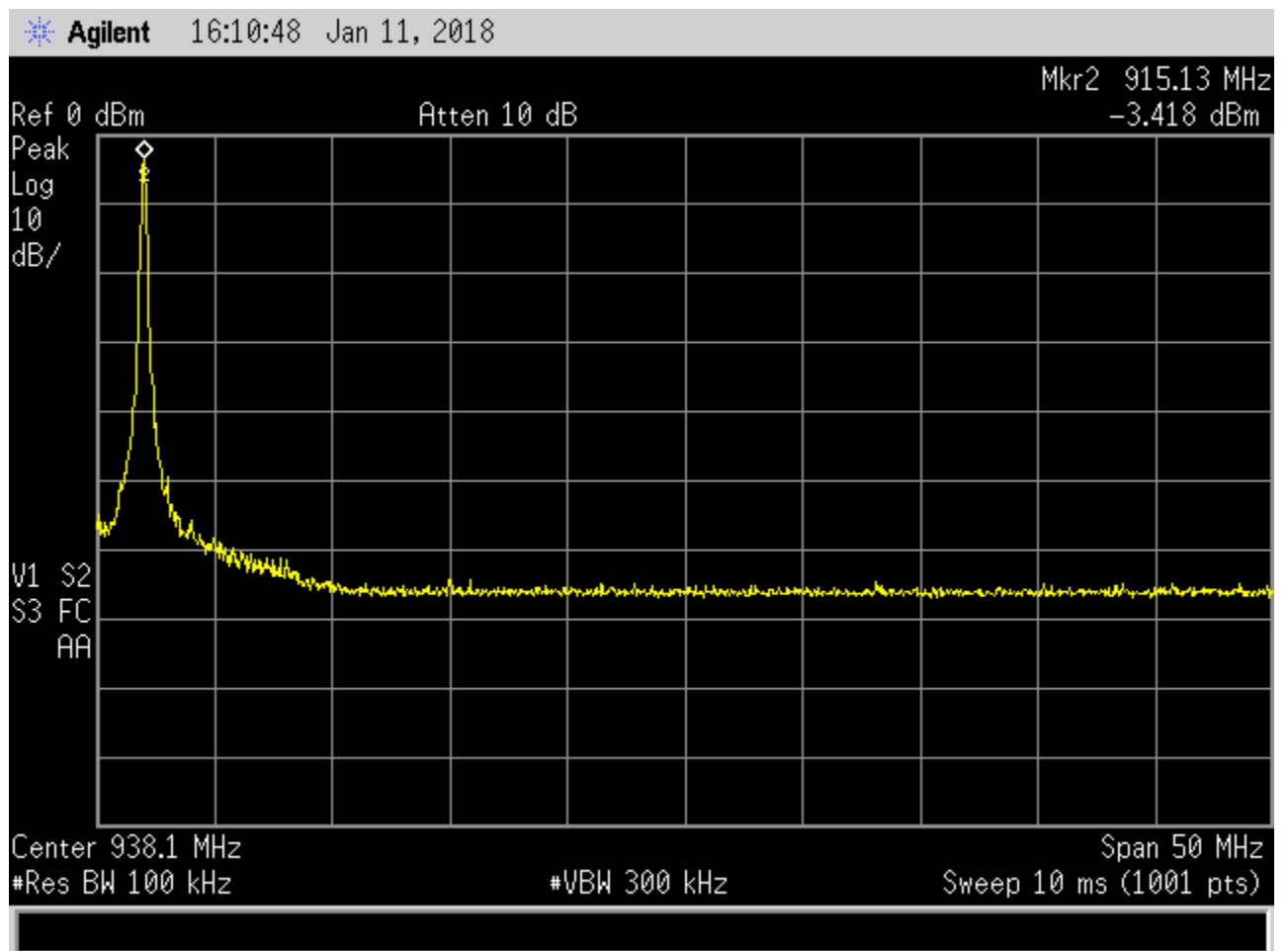
FCC 15.249(a), IC RSS-210 B.10(a) Field Strength
ANSI C63.10-2013, C63.4-2014

	5969 Robinson Ave. Riverside, CA 92503 (951)637-2630		Radiated Emissions (Field Strength)	
DNB Job Number:	88032A		Date:	11-28-2017
Customer:	Rain Bird Corporation			FCC 15.249(a) IC RSS-210 B.10(a)
Model Number:	WR2-RC, WR2-RFI, WR2-RFC	Specification:		
Description:	Control Interface			
Fundamental		Single Channel 915MHz		

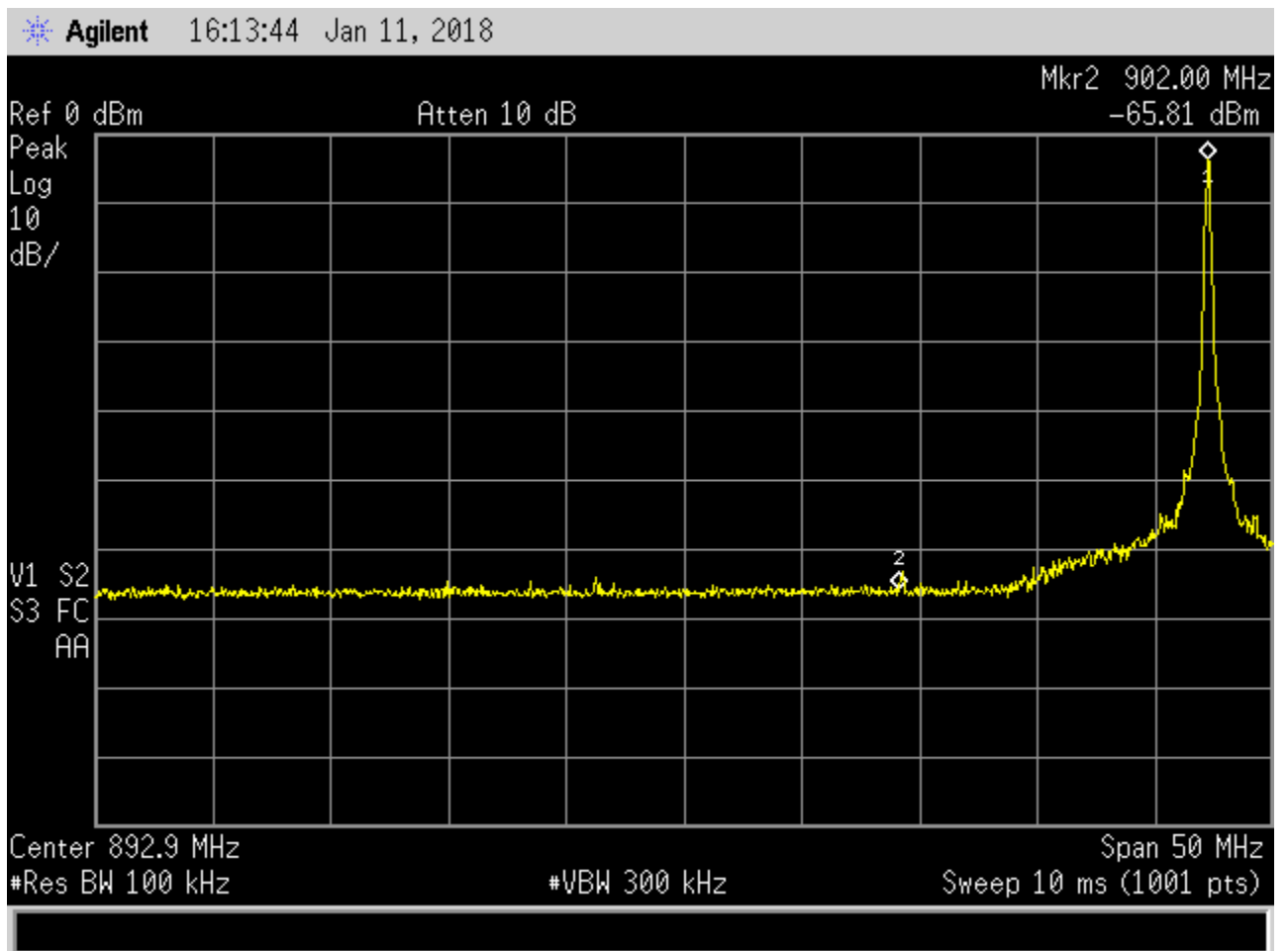
Frequency (MHz)	Meter (dBuV/m)	Antenna (dB)	Cable (dB)	Amp (dB)	Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Polarity
915.126	81.6	22.4	6.8	-21.3	89.5	94	-4.5	PK	V
915.127	83.8	22.4	6.8	-21.3	91.7	94	-2.3	PK	H

FCC 15.249(d), IC RSS-210 B.10(b) Band Edge Measurements
ANSI C63.10-2013, C63.4-2014

	5969 Robinson Ave. Riverside, CA 92503 (951)637-2630		Band Edge Measurements	
DNB Job Number:	88032A		Date:	01-11-2018
Customer:	Rain Bird Corporation			FCC 15.249(d) IC RSS-210 B.10(b)
Model Number:	WR2-RC, WR2-RFI, WR2-RFC	Specification:		
Description:	Control Interface			
High Band Edge		Single Channel 915MHz		



	5969 Robinson Ave. Riverside, CA 92503 (951)637-2630	Band Edge Measurements	
DNB Job Number:	88032A	Date:	01-11-2018
Customer:	Rain Bird Corporation		FCC 15.249(d) IC RSS-210 B.10(b)
Model Number:	WR2-RC, WR2-RFI, WR2-RFC	Specification:	
Description:	Control Interface		
Low Band Edge		Single Channel 915MHz	



FCC 2.1033 (b) (7) Equipment Photographs

To be filed as a separate attachment.

End of Report