TEST REPORT

Report Number: 3107498MIN-001S
Project Number: 3107498
December 8, 2006

Evaluation of the
ECR3500R30 Softener
FCC ID: OVA9451

to
FCC Part 2
FCC Part 15, Subpart C, Section 15.249

For
Ecowater Systems, Inc.

Test Performed by:	Test Authorized by:
Intertek	Ecowater Systems, Inc.
7250 Hudson Blvd. Suite 100	1890 Woodlane Drive
Oakdale, MN 55128	Woodbury, MN 55125

Prepared by: _____ Date: December 8, 2006
Uri Spector

Approved by: _____ Date: December 8, 2006
Norman Shpilsher

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7250 Hudson Boulevard, Suite 100, Oakdale, MN 51228
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CONTENTS

1.0 GENERAL DESCRIPTION

1.1 Related Submittals Grants

This is single application of the *ECR3500R350 Softener* for Certification under FCC Part 15, Subpart C. There are no other simultaneous applications.
The Receiver portion will be verified under Declaration of Conformity.

1.2 Product Description

The *ECR3500R30 Softener* is a RF receiver-transmitter operating at frequency range from 909.12MHz to 920.12MHz. The intended use of the *ECR3500R30 Softener* is to generate and transmit a RF signal upon receiving the RF signal from other source. The *ECR3500R30 Softener i*s powered at 120VAC/60Hz via Ktec power adapter, model: KA12A240044U.

Antenna Description:

Integral antenna on to the RF Board inside the unit

Sample Submitted: November 14, 2006
Test Work Started: November 14, 2006
Test Work Completed: December 8, 2006

1.3 Test Methodology

Emission measurements were performed according to the procedures in ANSI C63.4-2003. All field strength radiated emissions measurements were performed in the semi-anechoic chamber, and for each scan, the procedure for maximizing emissions in Appendices D and E were followed. All field strength radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The test site facility used to collect the radiated and conducted measurement data is located at 7250 Hudson Blvd., Suite 100, Oakdale, Minnesota. This test facility has been fully described in a report dated on December 2005 submitted to FCC. Please reference the site registration number: 90706, dated December 6, 2005.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

Conducted Emissions testing for *ECR3500R30* was performed on the 120VAC side for the worst-case emissions.

2.2 EUT Setup

For simplicity of testing, the transmitter was wired to transmit continuously for spurious emissions testing.

2.3 EUT Exercising Software

N/A

2.4 Special Accessories

There are no special accessories necessary for compliance of these products.

Cables

N/A

2.5 Equipment Modification

No modifications were installed during the testing.

2.6 Support Equipment List and Description

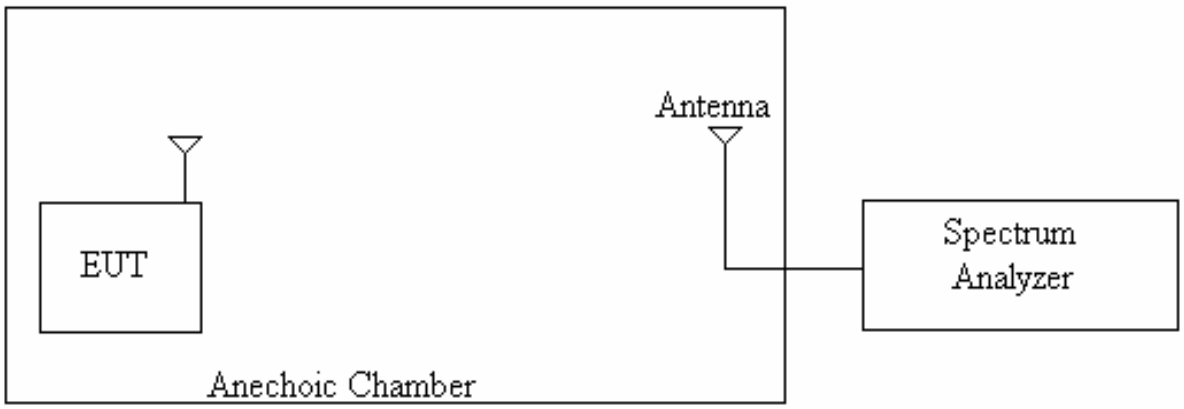
HP 6813B AC Power Source/Analyzer s/n: 3524A00552
Rohde & Schwarz SMT 03, Signal Generator, s/n DE12157 used to activate the Receiver for FCC 15.109 Radiated Emissions testing.

2.7 Test Configuration Block Diagrams

The EUT was setup as tabletop equipment.
The EUT was powered at 120VAC/60Hz.

Field Strength Measurements

For simplicity of testing, the Unit was set to transmit continuously for spurious emissions measurements.



3.0 TEST RESULTS

Data is included for the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs, data tables and graphical representations of the emissions are included.

The EUT is intended for operation under the requirements of Part 15 Subpart C. Specific test requirements include the following:

47 CFR 15.249(a)(b)	Field Strength of Fundamental
47 CFR 15.249(a)(b), 15.205	Field Strength of Harmonics
47 CFR 15.209	Out of Band Spurious Emissions Bandwidth of Emissions
47 CFR 15.207	Conducted Emissions
47 CFR 15.109	Unintentional Radiated Emissions

3.1 Field Strength of Fundamental and Harmonics Emissions, FCC 15.249(a)(b), 15.205

Field Strength of Fundamental and Harmonics Emissions measurements were made with Fundamental frequency at 909.12MHz, 913.12MHz and920.12MHz. The Harmonics emissions were tested up to 10th harmonic.

The Tables 3-1-1, 3-1-2 and 3-1-3 show the Field Strength of Fundamental Radiation.

Graphs 1, 2, 3 show the Field Strength of Harmonics Emissions. No emissions above 3rd harmonic were detected.
Note: Worst emission measured: 40.3 dbuV/m.

According to 15.31(e), for intentional radiators, measurements of the variation of the radiated signal level of the fundamental frequency, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. Measurements determined no change in variation of the radiated signal level of the fundamental frequency with the supply voltage varying between 85% and 115% of the nominal rated supply voltage. Therefore testing was performed at the nominal rated supply voltage.

Field Strength of Fundamental Ch: 1 **Date:** 11/17/2006

Company:	Ecowater
Model:	ECR3500R30
Test Engineer:	Uri Spector
Standard:	FCC Part 15.249
Test Site:	3 m Anechoic Chamber
Note:	Measurements were taking using a CISPR Quasi-Peak Detector with 100kHz Resolution Bandwidth Antenna Factors include Antenna Correction Factors and Cable Loss

Table # 3-1-1

Frequency	Antenna		Antenna Factor	QP Reading	Net at 3m.	Limit	Margin
MHz	Polarity	Hts(m)	dB(1/m)	dBµV	dBµV/m	dBµV/m	dB
909.03	V	161	25.1	67.1	92.2	94.0	-1.8
909.03	H	122	25.1	68.9	94.0	94.0	0.0

Field Strength of Fundamental Ch: 2 **Date:** 11/17/2006

Company: Ecowater
Model: ECR3500R30
Test Engineer: Uri Spector
Standard: FCC Part 15.249
Test Site: 3 m Anechoic Chamber
Note: Measurements were taking using a CISPR Quasi-Peak Detector
with 100kHz Resolution Bandwidth
Antenna Factors include Antenna Correction Factors and Cable Loss

Table # 3-1-2

Frequency	Antenna		Antenna Factor	QP Reading	Net at 3m.	Limit	Margin
MHz	Polarity	Hts(m)	dB(1/m)	dBµV	dBµV/m	dBµV/m	dB
913.03	V	115	25.1	66.7	91.8	94.0	-2.1
913.03	H	125	25.1	68.7	93.8	94.0	-0.1

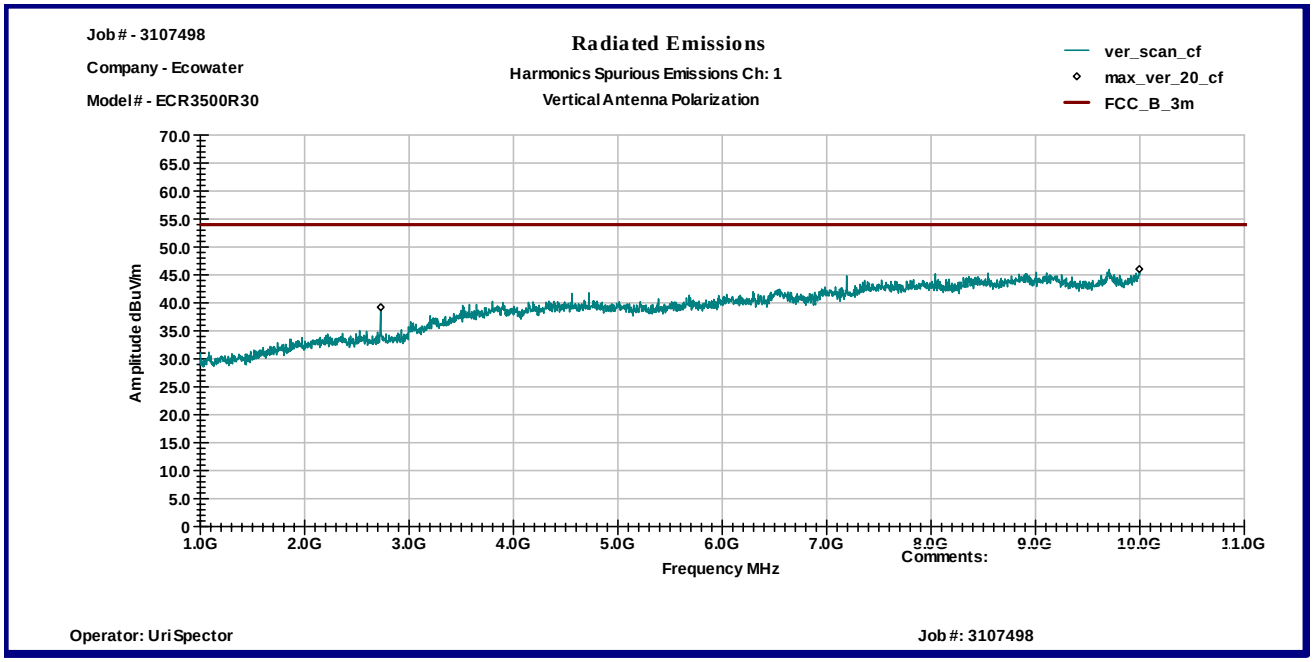
Field Strength of Fundamental Ch: 3 **Date:** 11/17/2006

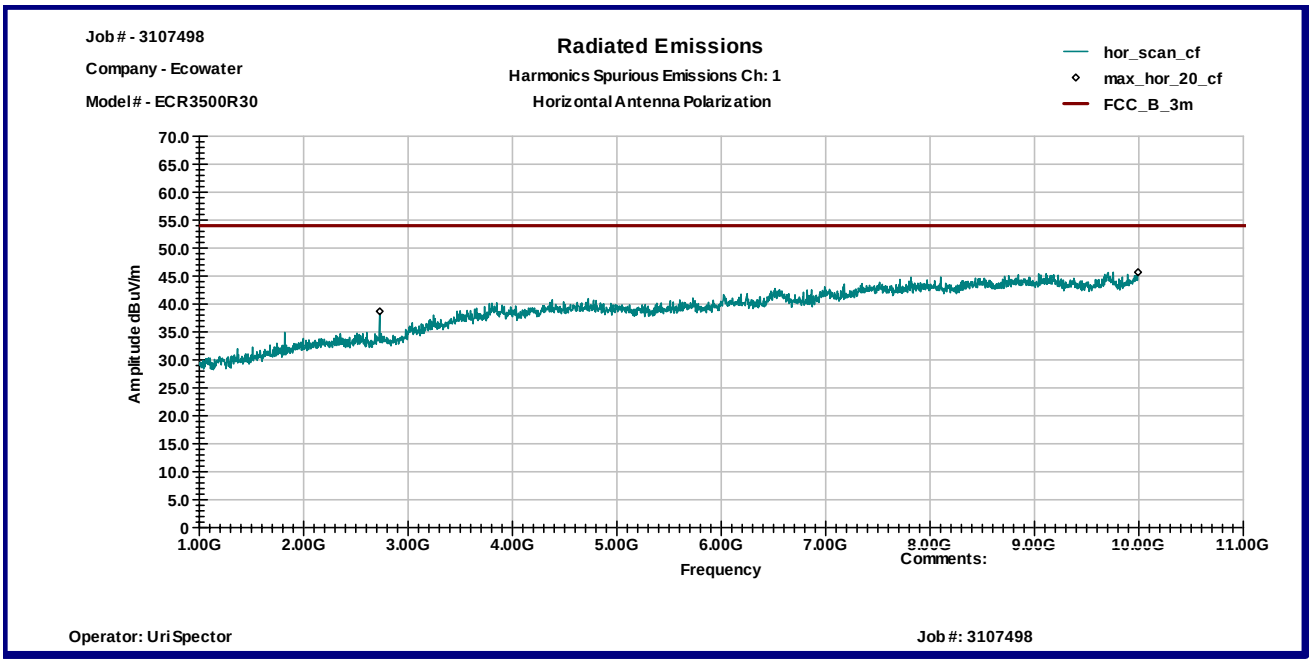
Company: Ecowater
Model: ECR3500R30
Test Engineer: Uri Spector
Standard: FCC Part 15.249
Test Site: 3 m Anechoic Chamber
Note: Measurements were taking using a CISPR Quai-Peak Detector
with 100kHz Resolution Bandwidth
Antenna Factors include Antenna Correction Factors and Cable Loss

Table # 3-1-3

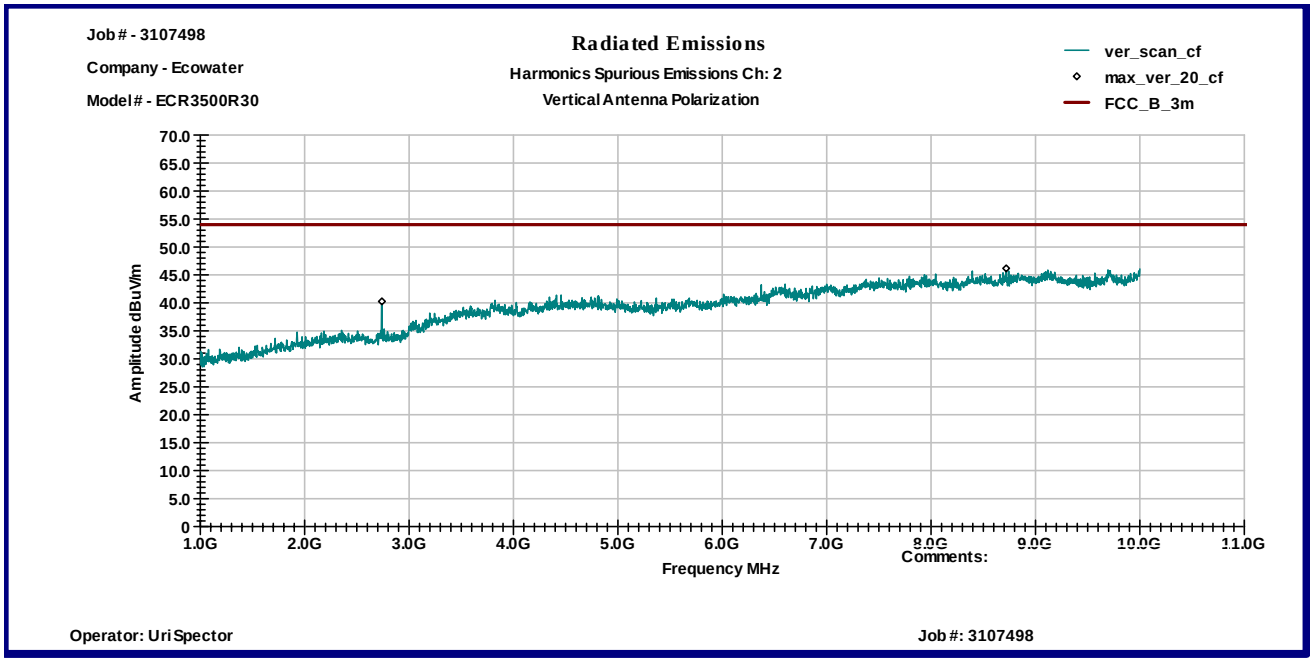
Frequency	Antenna		Antenna Factor	QP Reading	Net at 3m.	Limit	Margin
MHz	Polarity	Hts(m)	dB(1/m)	dBµV	dBµV/m	dBµV/m	dB
920.03	V	112	25.2	66.2	91.4	94.0	-2.6
920.03	H	125	25.2	67.8	93.0	94.0	-1.0

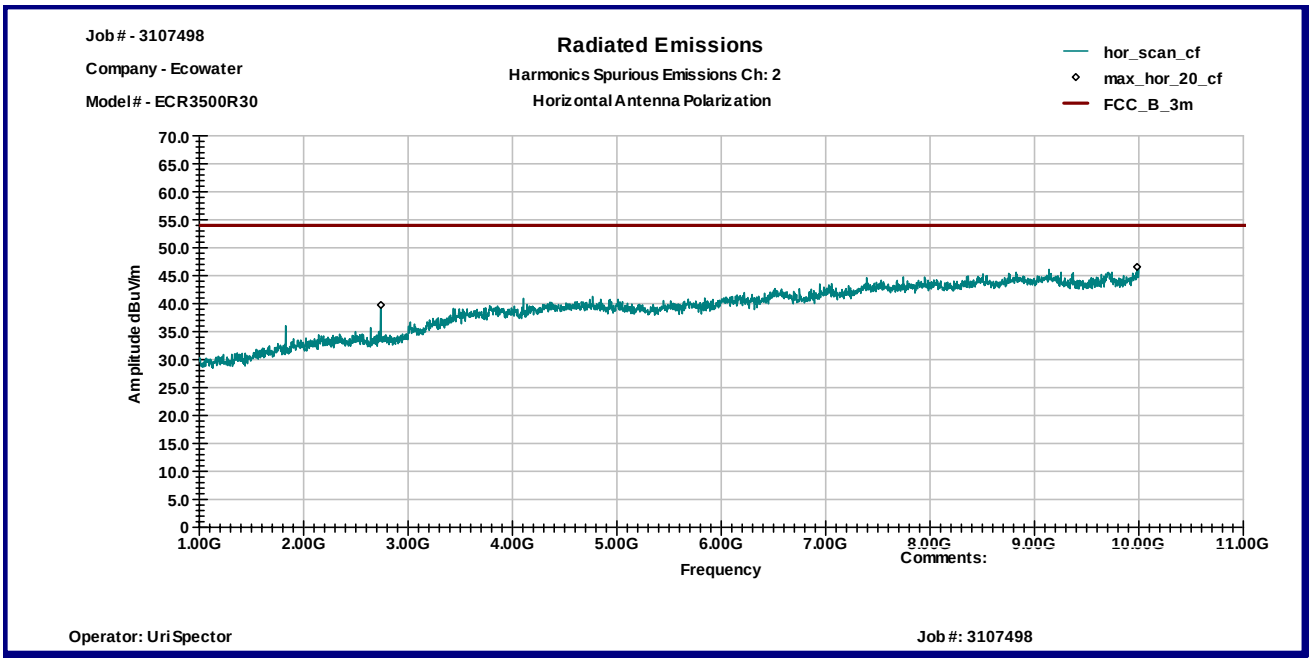
Graph 1


Job # - 3107498
Company - Ecowater
Model # - ECR3500R30
Radiated Emissions
Harmonics Spurious Emissions Ch: 1
Vertical Antenna Polarization
ver_scan_cf
max_ver_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.0G
2.0G
3.0G
4.0G
5.0G
6.0G
7.0G
8.0G
9.0G
10.0G
11.0G
Frequency MHz
Comments:
Operator: UriSpector
Job #: 3107498

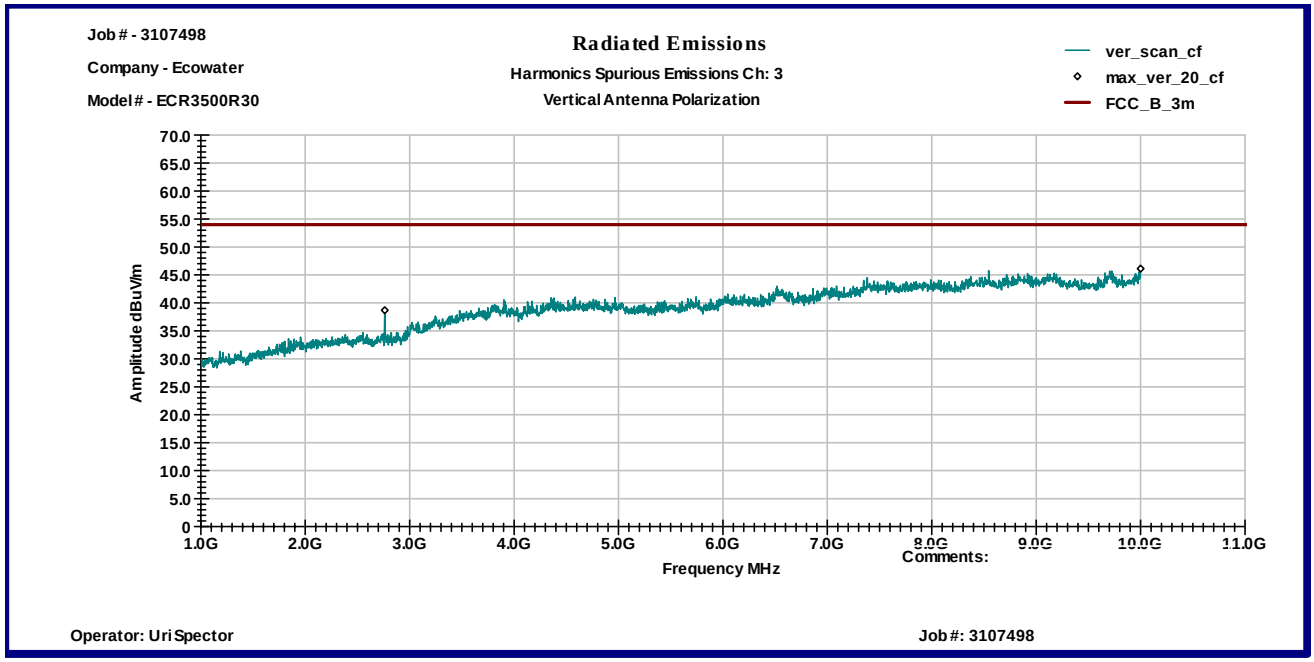

Job # - 3107498
Company - Ecowater
Model # - ECR3500R30
Radiated Emissions
Harmonics Spurious Emissions Ch: 1
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.00G
2.00G
3.00G
4.00G
5.00G
6.00G
7.00G
8.00G
9.00G
10.00G
11.00G
Frequency
Comments:
Operator: UriSpector
Job #: 3107498

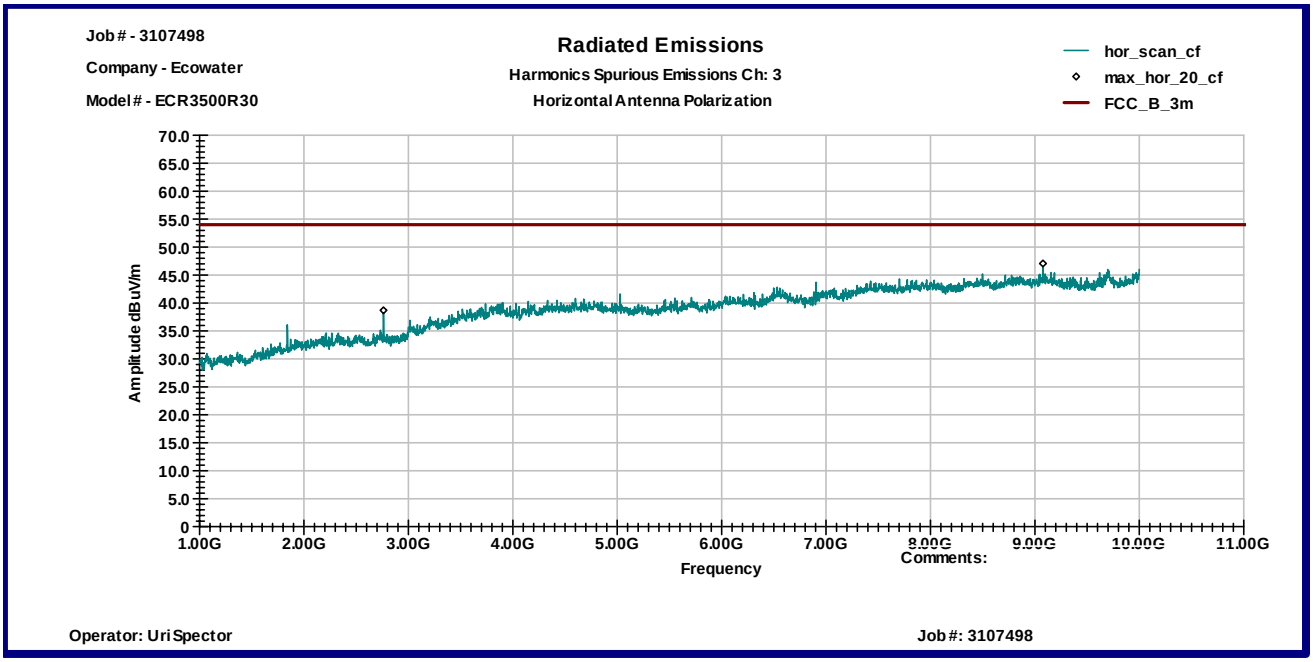
Graph 2


Job # - 3107498
Company - Ecowater
Model # - ECR3500R30
Radiated Emissions
Harmonics Spurious Emissions Ch: 2
Vertical Antenna Polarization
ver_scan_cf
max_ver_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.0G
2.0G
3.0G
4.0G
5.0G
6.0G
7.0G
8.0G
9.0G
10.0G
11.0G
Frequency MHz
Comments:
Operator: Uri Spector
Job #: 3107498


Job # - 3107498
Company - Ecowater
Model # - ECR3500R30
Radiated Emissions
Harmonics Spurious Emissions Ch: 2
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.00G
2.00G
3.00G
4.00G
5.00G
6.00G
7.00G
8.00G
9.00G
10.00G
11.00G
Frequency
Comments:
Operator: Uri Spector
Job #: 3107498

Graph 3


Job # - 3107498
Company - Ecowater
Model # - ECR3500R30
Radiated Emissions
Harmonics Spurious Emissions Ch: 3
Vertical Antenna Polarization
ver_scan_cf
max_ver_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.0G
2.0G
3.0G
4.0G
5.0G
6.0G
7.0G
8.0G
9.0G
10.0G
11.0G
Frequency MHz
Comments:
Operator: Uri Spector
Job #: 3107498


Job # - 3107498
Company - Ecowater
Model # - ECR3500R30
Radiated Emissions
Harmonics Spurious Emissions Ch: 3
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.00G
2.00G
3.00G
4.00G
5.00G
6.00G
7.00G
8.00G
9.00G
10.00G
11.00G
Frequency
Comments:
Operator: Uri Spector
Job #: 3107498

3.2 Out of Band Spurious Emissions, FCC 15.249(c), 15.209

Out-of-band measurements were made for frequencies:
- 902MHz
- 928MHz.

Output frequency of the EUT is 908.38MHz

The EUT complies with the Standard requirements Out of Band Spurious Emissions for Section 15.249(c). Table 3-2-1 shows the Out of Band Spurious Emissions.

Out of Band Spurious Emissions **Date:** **11/17/2006**

Company: Ecowater
Model: ECR3500R30
Test Engineer: Uri Spector
Standard: FCC Part 15.249(c),15.209
Test Site: 3m Anechoic Chamber, 3m measurement distance
Note: The table shows the worst case radiated emissions
All measurements were taken using a Quasi-peak detector

Table # 3-2-1

Frequency	Antenna			QP reading	Total QP	QP Limit	Margin	Comments
MHz	Polarity	Hts(cm)	Factor (dB1/m)	dBµV	dBµV/m	dBµV/m	dB	
902.00	V	119	25.0	17.6	42.6	46.0	-3.4	
902.00	H	114	25.0	20.7	45.7	46.0	-0.3	
928.00	V	100	25.3	13.9	39.2	46.0	-6.8	
928.00	H	112	25.3	15.7	41.0	46.0	-5.0	

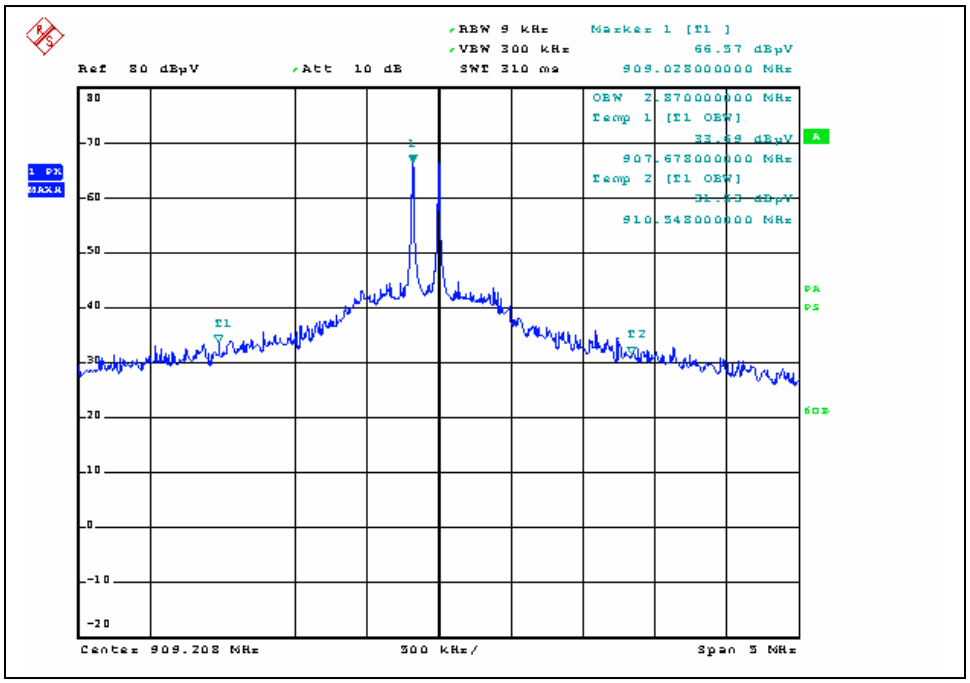
3.3 Bandwidth of Emissions

Bandwidth of Emissions measurements was made for frequency of 909.12MHz.

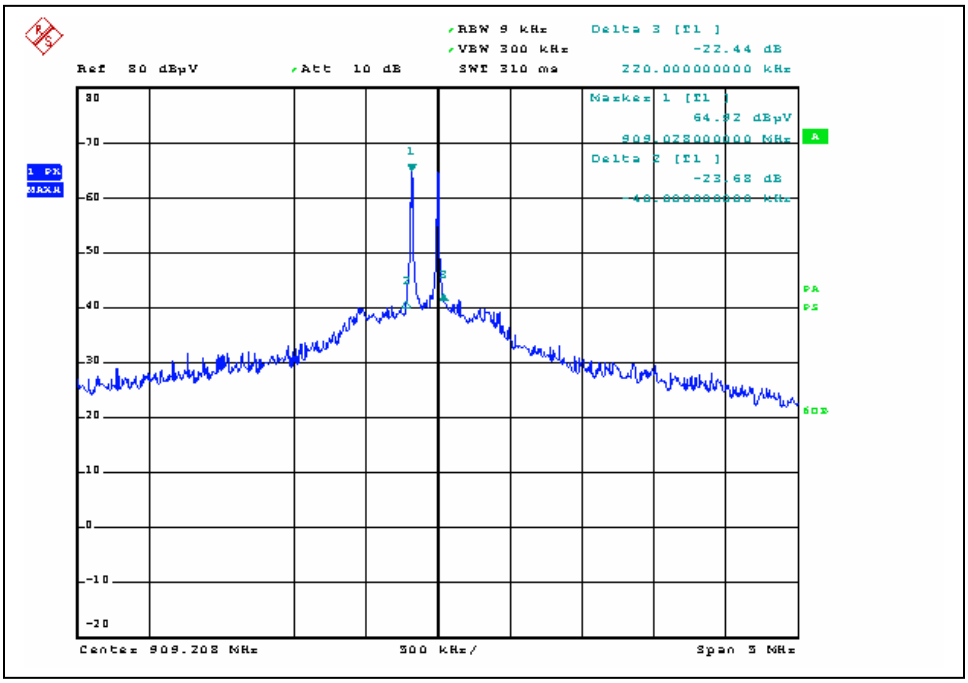
Bandwidth of Emissions for the EUT at level –20dB was measured at 220kHz.
Bandwidth of Emissions for the EUT at 99% power was measured at 2.87MHz.

The Graphs 3-3-1, 3-3-2 show the Bandwidth of Emissions.

Graph # 3-3-1



Graph # 3-3-2

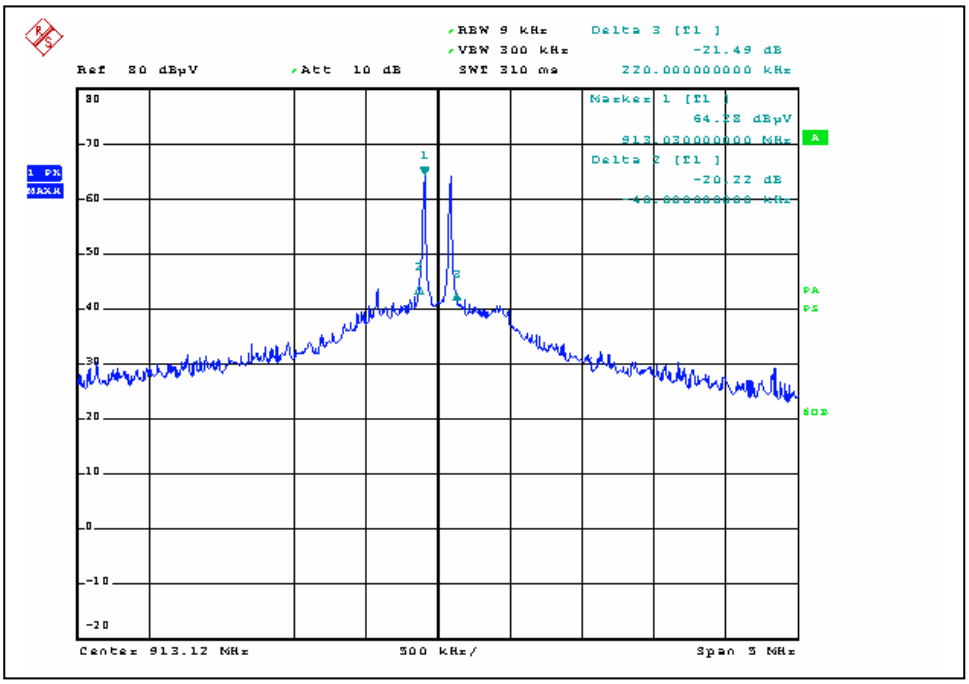

RBW 9 kHz
VBW 300 kHz
SWT 310 ms
Delta 3 [T1]
-22.44 dB
220.000000000 kHz
Ref 80 dBµV
Att 10 dB
Marker 1 [T1]
64.92 dBµV
909.028000000 MHz
Delta 2 [T1]
-23.68 dB
1 PK
MAXH
80
70
60
50
40
30
20
10
0
-10
-20
Center 909.208 MHz
300 kHz/
Span 3 MHz

Bandwidth of Emissions measurements was made for frequency of 913.12MHz.

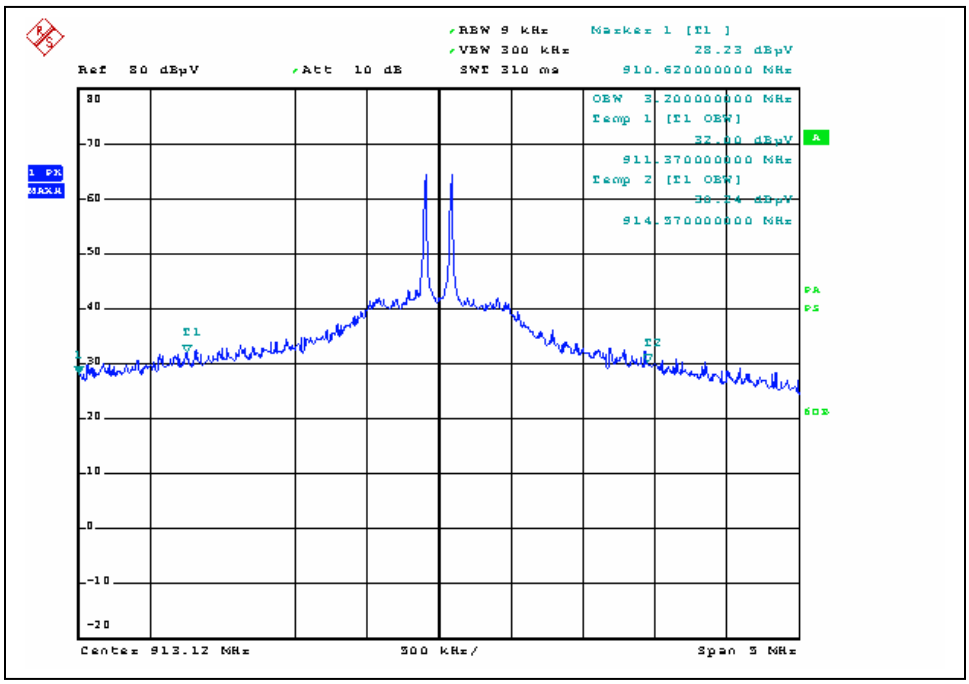
Bandwidth of Emissions for the EUT at level –20dB was measured at 220kHz.
Bandwidth of Emissions for the EUT at 99% power was measured at 3.2MHz.

The Graphs 3-3-3, 3-3-4 show the Bandwidth of Emissions.

Graph # 3-3-3



Graph # 3-3-4

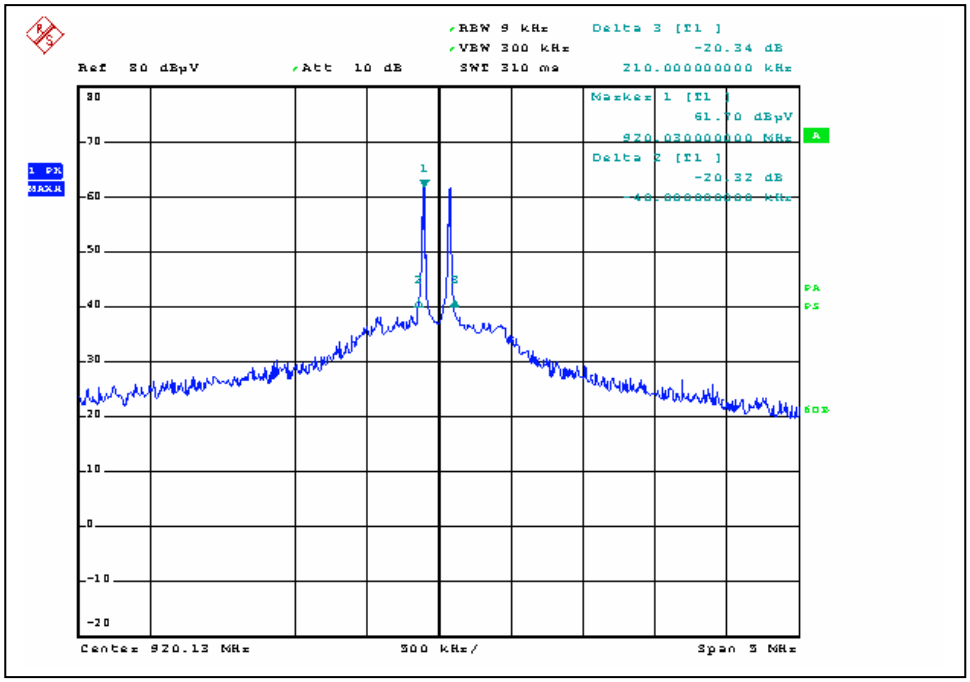

RBW 9 kHz
VBW 300 kHz
SWT 310 ms
Marker 1 [T1]
28.23 dBµV
910.6200000000 MHz
Ref 80 dBµV
Att 10 dB
OBW 3.200000000 MHz
Temp 1 [T1 OBW]
32.00 dBµV
911.3700000000 MHz
Temp 2 [T1 OBW]
914.3700000000 MHz
1 PK
MAXH
A
PA
PS
T1
T2
Center 913.12 MHz
300 kHz/
Span 3 MHz

Bandwidth of Emissions measurements was made for frequency of 920.12MHz.

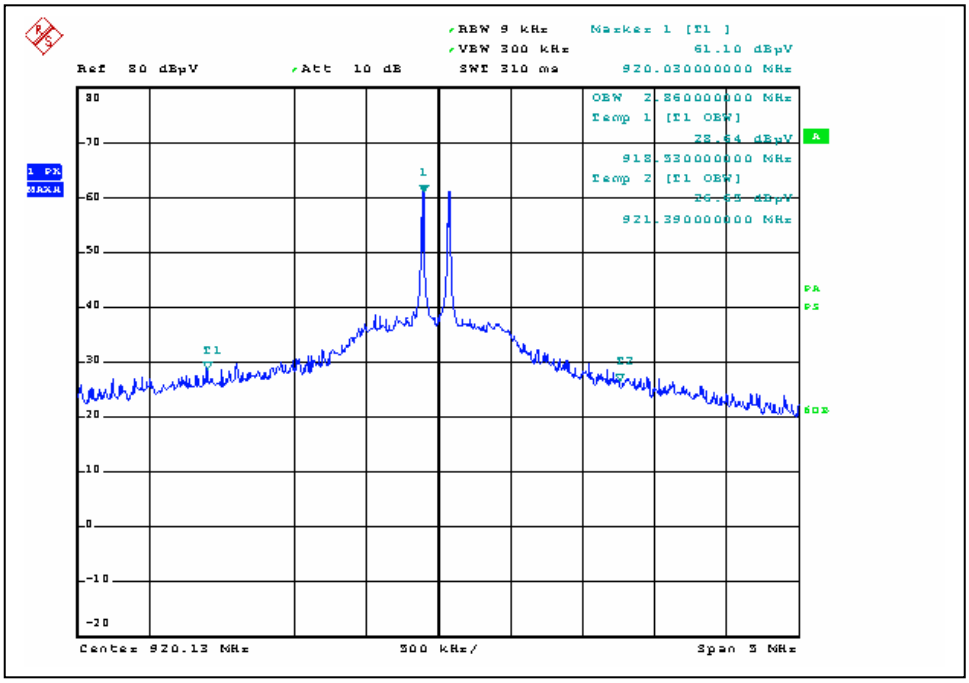
Bandwidth of Emissions for the EUT at level –20dB was measured at 210kHz
Bandwidth of Emissions for the EUT at 99% power was measured at 2.86MHz.

The Graphs 3-3-5, 3-3-6 show the Bandwidth of Emissions.

Graph # 3-3-5



Graph # 3-3-6


RBW 9 kHz
VBW 300 kHz
SWT 310 ms
Marker 1 [T1]
61.10 dBµV
920.030000000 MHz
Ref 80 dBµV
Att 10 dB
OBW 2.860000000 MHz
Temp 1 [T1 OBW]
28.64 dBµV
918.330000000 MHz
Temp 2 [T1 OBW]
26.65 dBµV
921.390000000 MHz
1 PK
MAXH
T1
T2
PA
PS
80
70
60
50
40
30
20
10
0
-10
-20
Center 920.13 MHz
300 kHz/
Span 3 MHz

3.4 Conducted Emissions, FCC 15.207

Conducted Emissions testing was performed in frequency range from 150kHz to 30MHz.

The Table 3-4-1 and Graph 3-4-1 show the Conducted Emissions.

TILE Instrument Control System EMI Measurement Software

Conducted Emissions From 150kHz to 30MHz **Date:** 11/17/2006

Company: Ecowater
Model: ECR3500R30
Test Engineer: Uri Spector
Standard: FCC Part 15.207
Note: The table shows the worst case conducted emissions
Measurements were taken using a Peak or CISPR Quasi-peak detector

Table # 3-4-1

Line 1

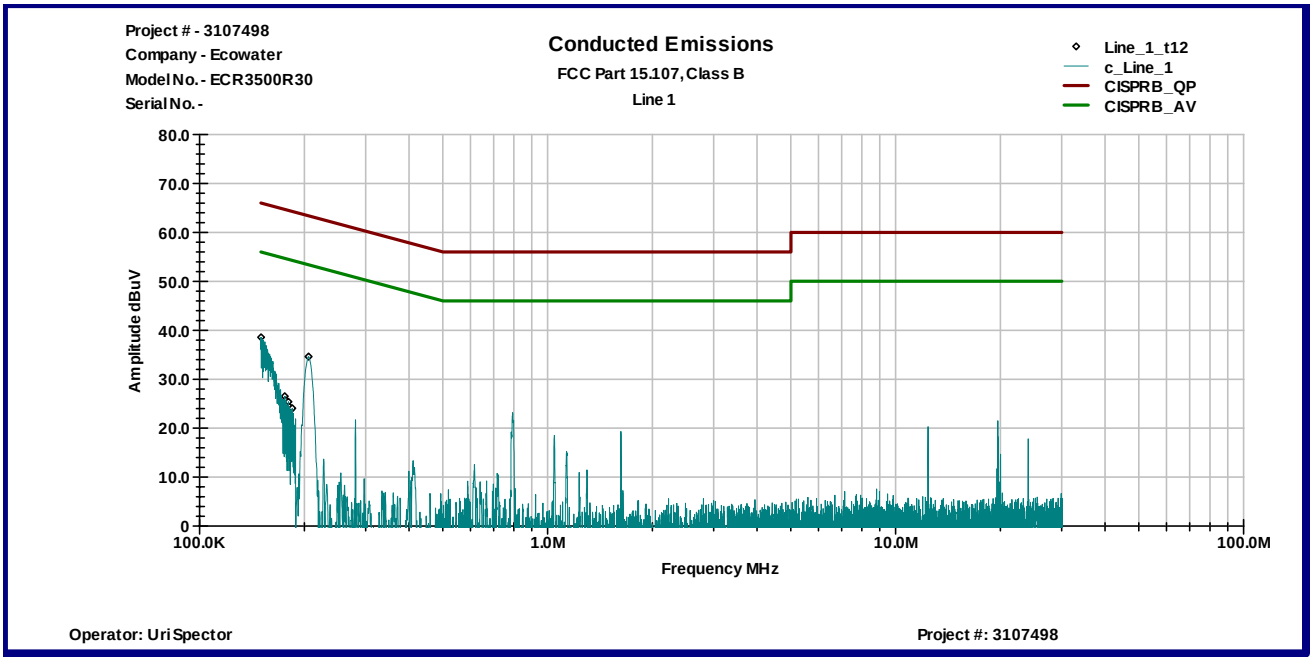
Frequency	Peak dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
150.16 KHz	38.6	66.0	56.0	-27.4	-17.4
174.16 KHz	25.8	64.8	54.8	-38.9	-28.9
175.71 KHz	26.5	64.7	54.7	-38.2	-28.2
177.03 KHz	25.7	64.6	54.6	-39.0	-29.0
177.58 KHz	24.7	64.6	54.6	-39.9	-29.9
178.2 KHz	23.8	64.6	54.6	-40.8	-30.8
178.9 KHz	24.7	64.5	54.5	-39.8	-29.8
179.91 KHz	25.4	64.5	54.5	-39.1	-29.1
181.23 KHz	24.3	64.4	54.4	-40.1	-30.1
182.94 KHz	23.8	64.4	54.4	-40.6	-30.6
184.49 KHz	24.1	64.3	54.3	-40.2	-30.2
205.66 KHz	34.6	63.4	53.4	-28.8	-18.8

Line 2

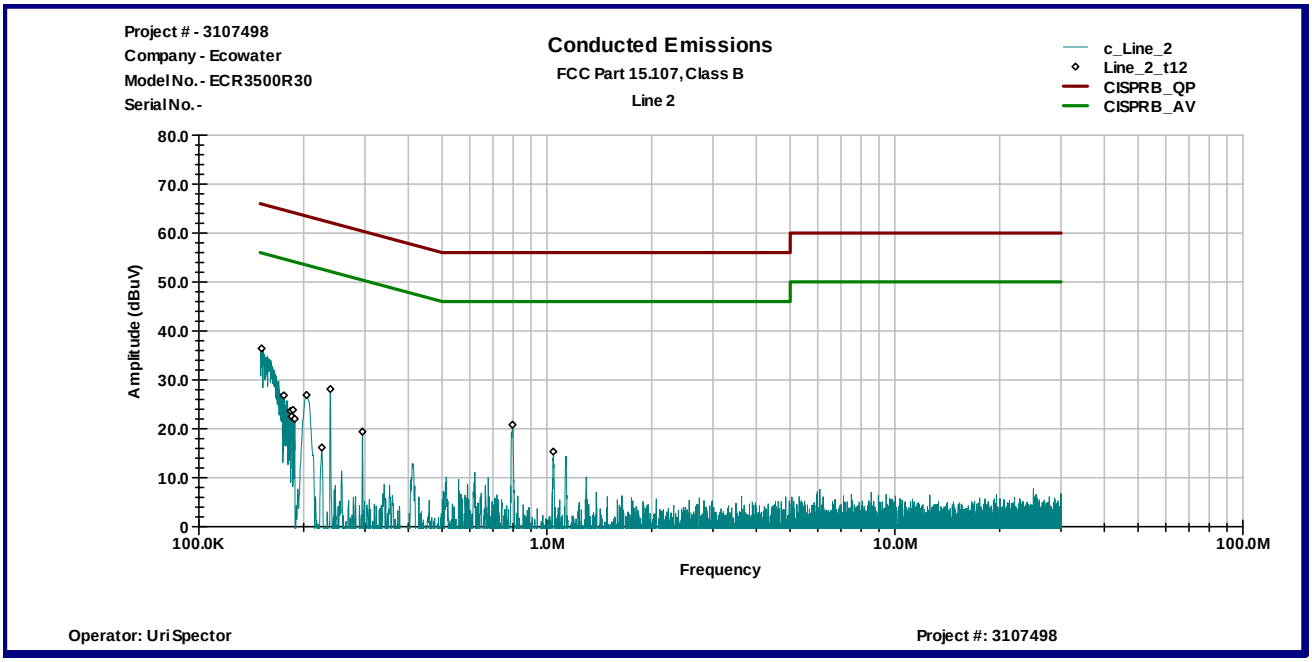
Frequency	Peak dBµV	QP Limit dBmV	AVG Limit dBmV	QP Margin dB	AVG Margin dB
151.4 KHz	36.4	65.9	55.9	-29.5	-19.5
175.48 KHz	26.8	64.7	54.7	-37.9	-27.9
183.48 KHz	23.7	64.3	54.3	-40.7	-30.7
184.8 KHz	22.5	64.3	54.3	-41.8	-31.8
186.43 KHz	23.9	64.2	54.2	-40.3	-30.3
188.53 KHz	22.0	64.1	54.1	-42.1	-32.1
203.9 KHz	26.9	63.5	53.5	-36.6	-26.6
225.51 KHz	16.2	62.6	52.6	-46.4	-36.4
238.6 KHz	28.1	62.1	52.1	-34.0	-24.0
295.1 KHz	19.4	60.4	50.4	-41.0	-31.0
796.16 KHz	20.8	56.0	46.0	-35.2	-25.2
1.0435 MHz	15.3	56.0	46.0	-40.7	-30.7

Graph # 3-4-1
Conducted Emissions

Line 1



Line 2

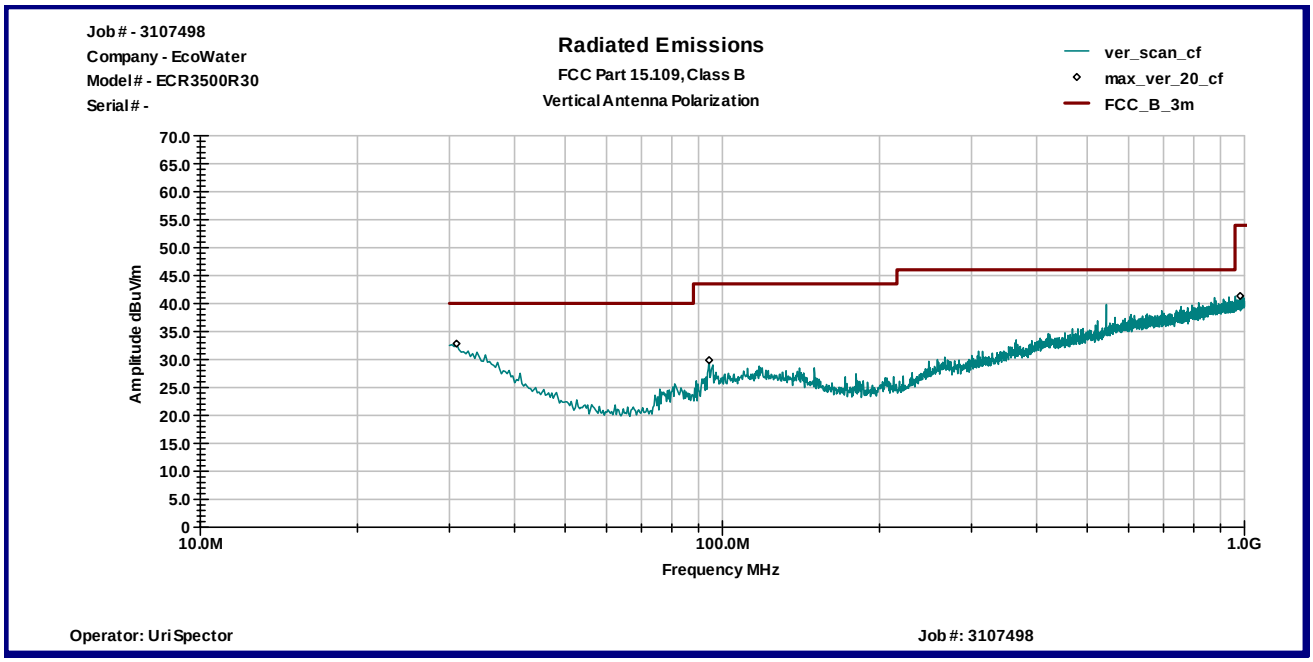


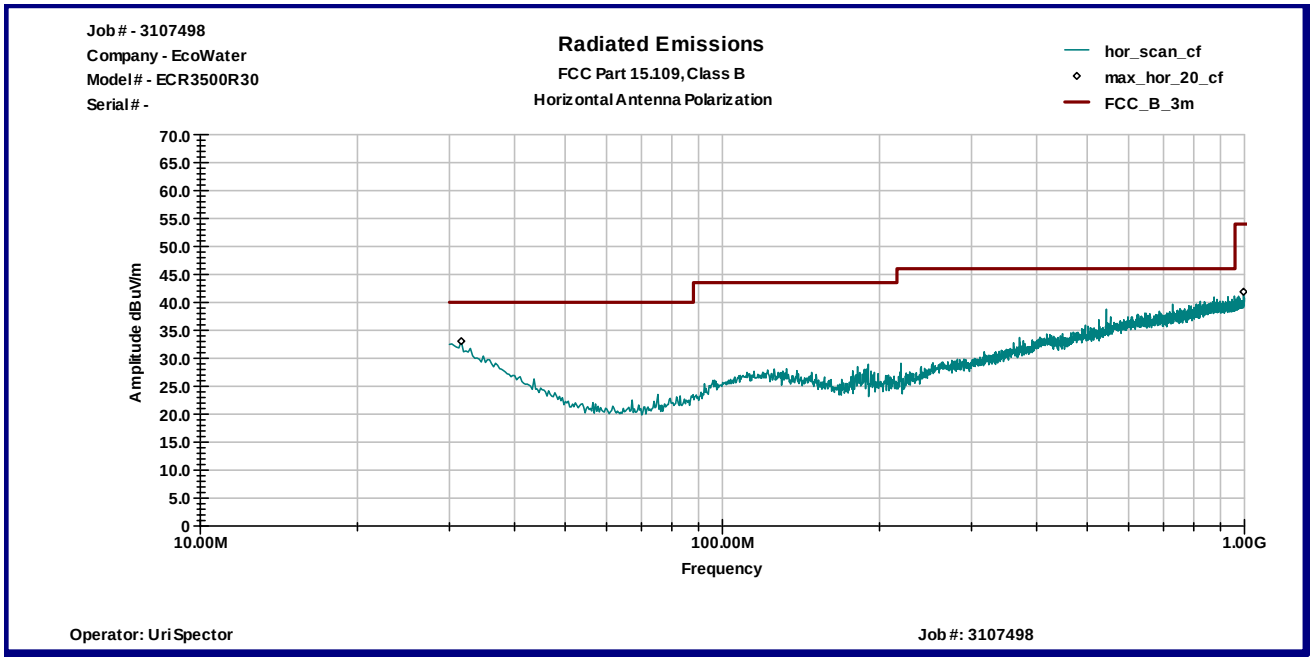
3.5 Radiated Emissions, FCC 15.109, Class B

The EUT was tested as a digital device according to FCC Part 15.109, Class B in frequency range from 30MHz to 5GHz. Radiated Emissions testing was performed in Anechoic Chamber with 3m-easurement distance. Signal generator was used in close proximity to activate the EUT in receiving mode.
The Signal Generator was tuned to 909.12MHz and its antenna was located in close proximity to the EUT. The transmitting frequency was excluded from the measurement.

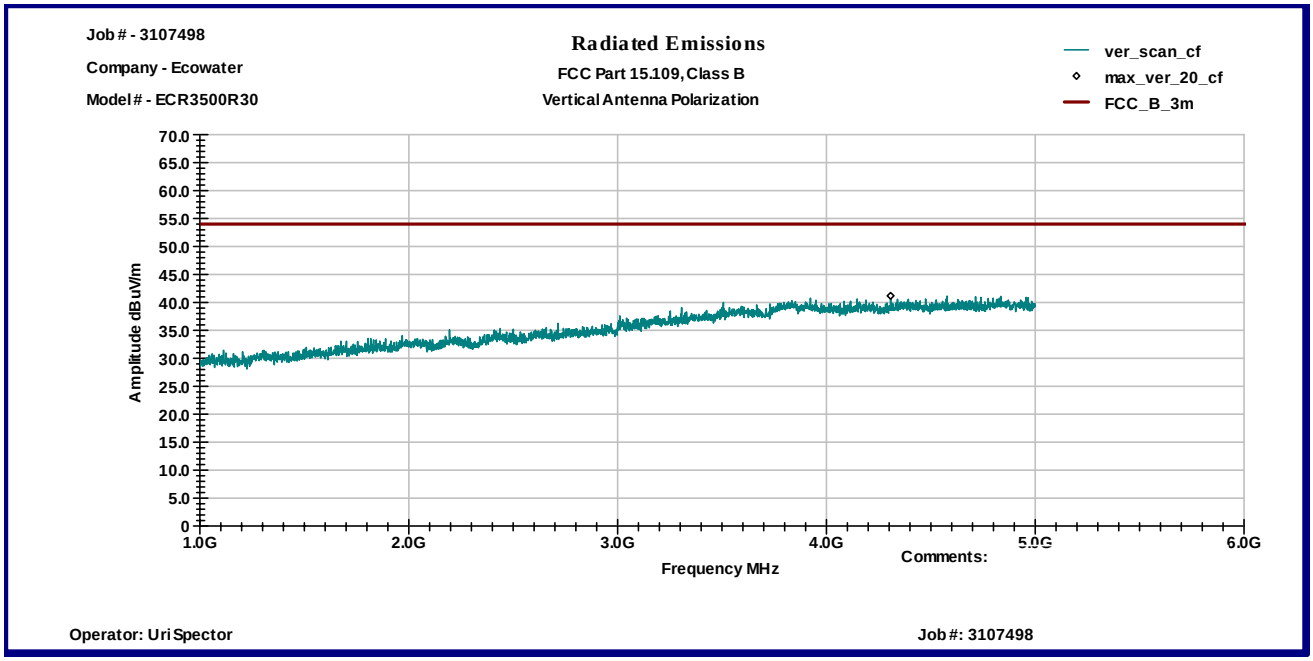
The Graphs 3-5-1 & 3-5-2 show the Radiated Emissions. No emissions were detected in the frequency range from 30MHz to 5GHz.

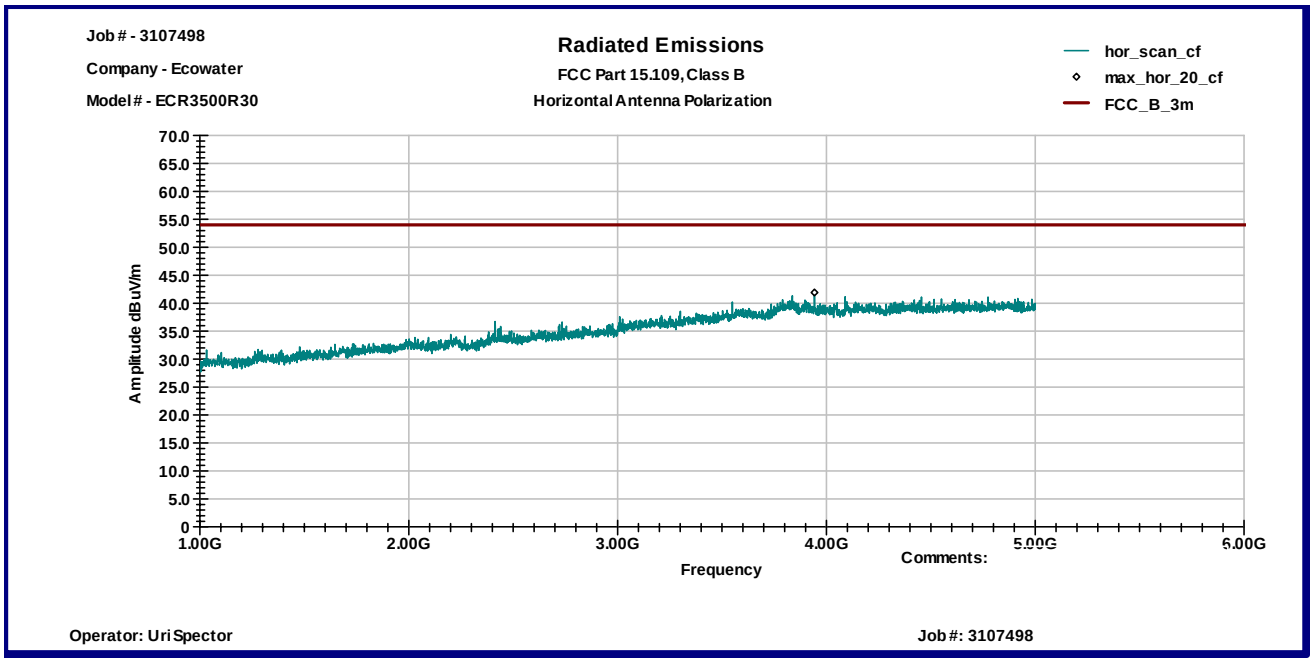
Graph 3-5-1




Job # - 3107498
Company - EcoWater
Model # - ECR3500R30
Serial # -
Radiated Emissions
FCC Part 15.109, Class B
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
10.00M
100.00M
1.00G
Frequency
Operator: Uri Spector
Job #: 3107498

Graph 3-5-2


Job # - 3107498
Company - Ecowater
Model # - ECR3500R30
Radiated Emissions
FCC Part 15.109, Class B
Vertical Antenna Polarization
ver_scan_cf
max_ver_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.0G
2.0G
3.0G
4.0G
5.0G
6.0G
Frequency MHz
Comments:
Operator: Uri Spector
Job #: 3107498


Job # - 3107498
Company - Ecowater
Model # - ECR3500R30
Radiated Emissions
FCC Part 15.109, Class B
Horizontal Antenna Polarization
hor_scan_cf
max_hor_20_cf
FCC_B_3m
Amplitude dBuV/m
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
1.00G
2.00G
3.00G
4.00G
5.00G
6.00G
Frequency
Comments:
Operator: Uri Spector
Job #: 3107498

3.6 Test Procedure

Field Strength Measurements

The EUT was placed on a non-conductive table 0.8m above the ground plane inside the Anechoic Chamber. The table was centered on a motorized turntable, which allows 360-degree rotation. The measurement antenna was positioned at 3m distance. The Bicono-Log antenna was used in frequency range from 30MHz to 1GHz, and the Horn antenna was used in frequency range above 1GHz. The radiated emissions were maximized by configuring the EUT through its placement in three orthogonal axes, by rotating the EUT, by changing antenna polarization, and by changing antenna height from 1 to 4m. Method of the direct Field Strength Calculation is shown in Section 3.6.

Conducted Emissions

For conducted emissions testing, the equipment is moved to an insulating platform over the ground plane, and the EUT is powered from a LISN. Both sides of the AC line are measured and the results are compared to the applicable limits. Measurements are taken using CISPR quasi-peak and average detectors when the peak readings approach or exceed the average limit. Only quasi-peak readings are taken when the emissions from the EUT meet the average limit as measured with the quasi-peak detector.

3.7 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.
The basic equation with a sample calculation is as follows:
FS = RA + AF + CF - AG

Where: FS = Field Strength in dB(µV/m)
RA = Receiver Amplitude in dB(µV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB(m^{-1})
AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(µV) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(µV/m).

RA = 48.1 dB(µV)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dB
FS = RA + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(µV/m)

In the tables the Cable correction factors are included to the Antenna Factors.

Tested by:

Uri Spector
EMC Project Engineer
Intertek ETL SEMKO

Signature

Date: December 8, 2006

4.0 TEST EQUIPMENT

Receivers/Spectrum Analyzers and Test Software

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
HP85462A Receiver RF Section	3325A00106	04/06	04/07	X
HP85460A RF Filter Section	3330A00109	04/06	04/07	X
Rohde & Schwarz FSP 40 Spectrum Analyzer	100024	07/06	07/07	X
Rohde & Schwarz ESCI Spectrum Analyzer	100358	04/06	04/07	X
TILE! Instrument Control System	ver. 3.4.k.15	N/A	N/A	X

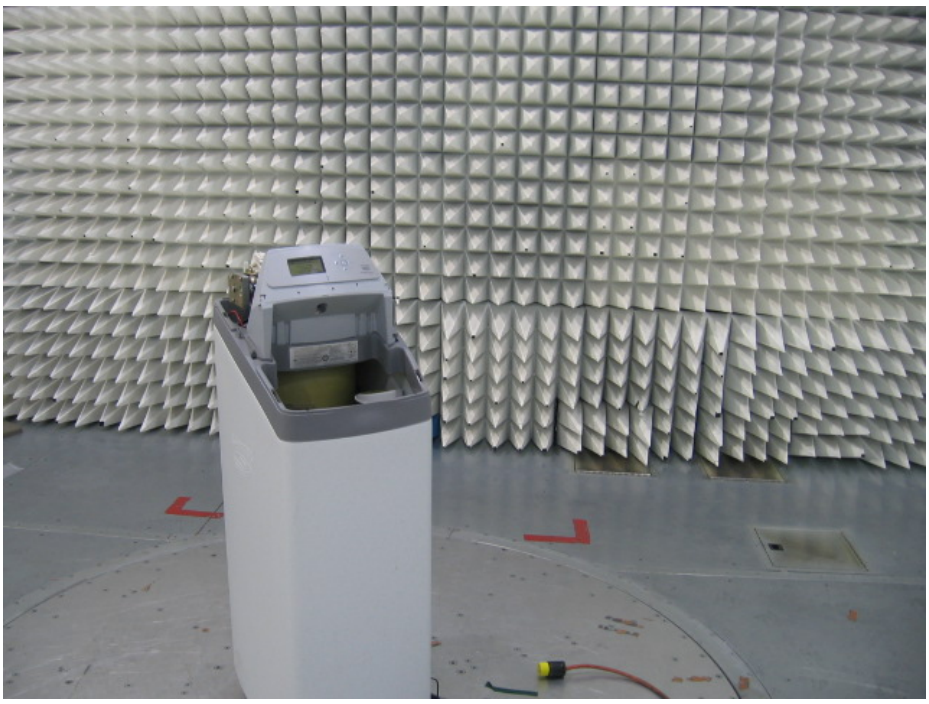
Antennas

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
Schaffner-Chase Bicono-Log Antenna	2468	01/06	01/07	X
EMCO Horn Antenna 3115	9507-4513	01/06	01/07	X

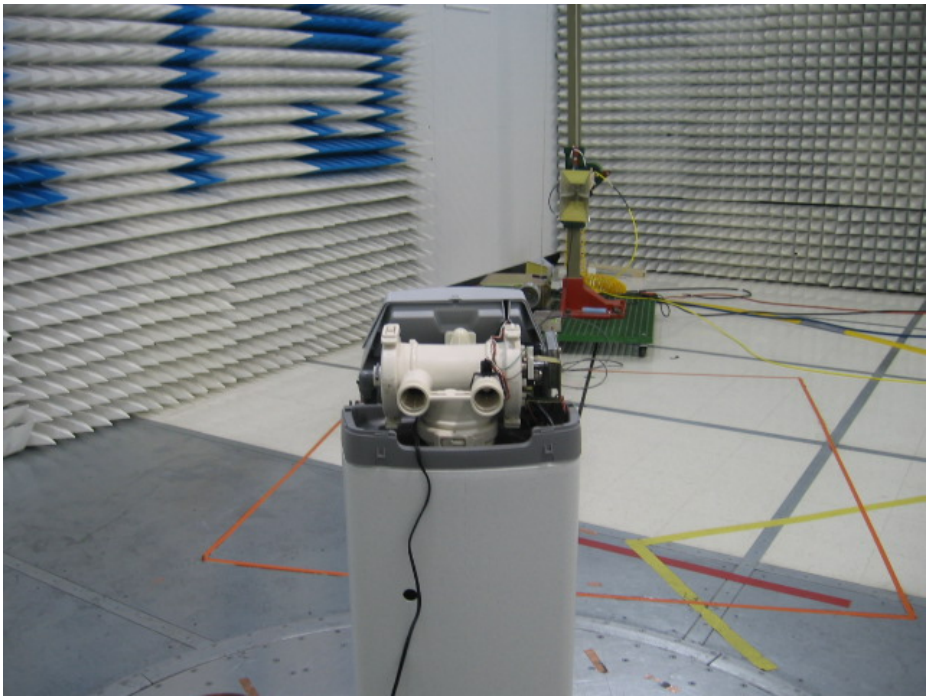
Artificial Mains Networks/Pre-Amplifiers/Filters

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
FCC LISN-2	316	05/06	05/07	X
MITEQ Pre-Amplifier AMF-5D-00501800-28-13P	1122951	02/06	02/07	X
Reactel 7HS-1G-S12 Filter	0223	01/06	01/07	X

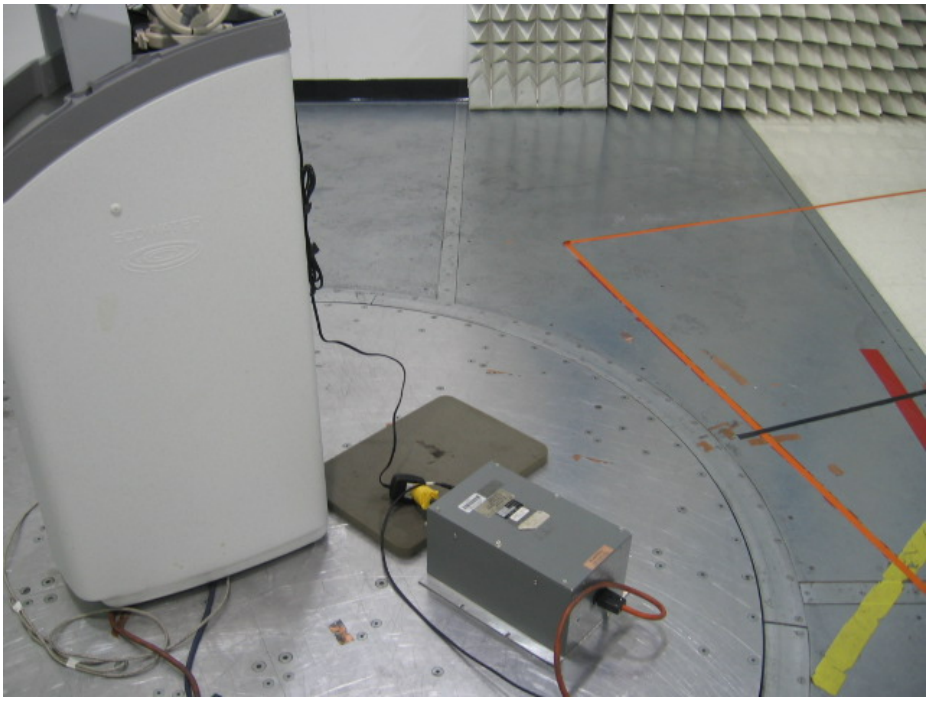
EXHIBIT 1
CONFIGURATION PHOTOS



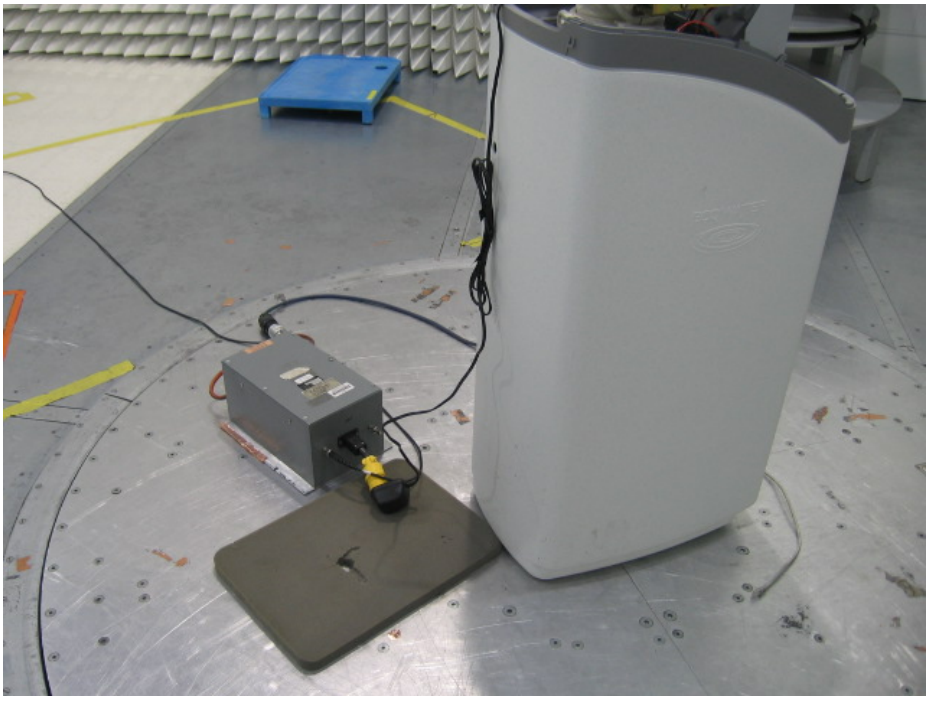
Radiated Emissions Test Configuration



Radiated Emissions Test Configuration



Line Conducted Emissions Test Configuration



Line Conducted Emissions Test Configuration