

Certification Test Report

FCC ID: 2AF28BR001

FCC Rule Part: 15.247

ACS Report Number: 15-0461.W04.1A

Applicant: Clorox Services Company
Model: 0B54

Test Begin Date: October 26, 2015
Test End Date: October 31, 2015

Report Issue Date: December 8, 2015



FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

Reviewed by:

A handwritten signature in black ink, appearing to read "Kirby Munroe", is written over a horizontal line.

Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This test report shall not be reproduced except in full. This report may be reproduced in part with prior written consent of ACS, Inc. The results contained in this report are representative of the sample(s) submitted for evaluation.

This report contains 13 pages

TABLE OF CONTENTS

1	GENERAL	3
1.1	PURPOSE.....	3
1.2	PRODUCT DESCRIPTION	3
1.3	TEST METHODOLOGY AND CONSIDERATIONS	3
2	TEST FACILITIES.....	4
2.1	LOCATION	4
2.2	LABORATORY ACCREDITATIONS/RECOGNITIONS/CERTIFICATIONS	4
2.3	RADIATED EMISSIONS TEST SITE DESCRIPTION	5
2.3.1	<i>Semi-Anechoic Chamber Test Site</i>	5
2.3.2	<i>Open Area Tests Site (OATS)</i>	6
2.4	CONDUCTED EMISSIONS TEST SITE DESCRIPTION	7
3	APPLICABLE STANDARD REFERENCES.....	7
4	LIST OF TEST EQUIPMENT	8
5	SUPPORT EQUIPMENT	9
6	EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM	9
7	SUMMARY OF TESTS.....	10
7.1	ANTENNA REQUIREMENT – FCC: SECTION 15.203	10
7.1.1	<i>Radiated Spurious Emissions - FCC 15.205, 15.209; IC RSS-247 5.5, RSS-Gen 8.9/8.10</i> ...	10
7.1.1.1	Measurement Procedure	10
7.1.1.2	Measurement Results	10
8	CONCLUSION.....	13

1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations for a class II permissive change.

The purpose of this permissive change is to add a ceramic chip antenna to the pre-approved module.

1.2 Product description

The 0B54 is an 802.11b/g/n capable transceiver.

Technical Information:

Mode of Operation: WLAN 802.11b/g/n
 Frequency Range: 2412MHz – 2462MHz
 Number of Channels: 11
 Channel Separation: 5 MHz
 Modulations: 802.11b: DSSS
 802.11g/n: OFDM
 Antenna Type/Gain: Ceramic Chip Antenna / 0.5dBi gain
 Input Power: 3Vdc

Applicant Information:

Clorox Services Company
 P.O. Box 493
 Pleasanton, CA 94566

EUT Serial Numbers: PCC3915-142

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

The purpose of this permissive change is to add a new antenna to a pre-approved module, therefore only radiated emissions were performed. All modes of operation, including all available data rates, were evaluated. The data presented in this report represents the worst case where applicable.

For radiated emissions, the EUT was evaluated in three orientations. The worst case orientation was X-orientation.

Table 1.3-1: 802.11b/g/n Radio Test Configuration

Mode of Operation	Frequency (MHz)	Channel	Test Software Power Setting	Data Rate (Setting)
802.11b	2412	1	17	5.5 MBPS
	2437	6	17	
	2462	11	17	
802.11g	2412	1	13	36 MBPS
	2437	6	13	
	2462	11	13	
802.11n 20 MHz	2412	1	12	MCS 0
	2437	6	12	
	2462	11	12	

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 511277

Industry Canada Lab Code: IC 4175A

VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 – 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 – 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

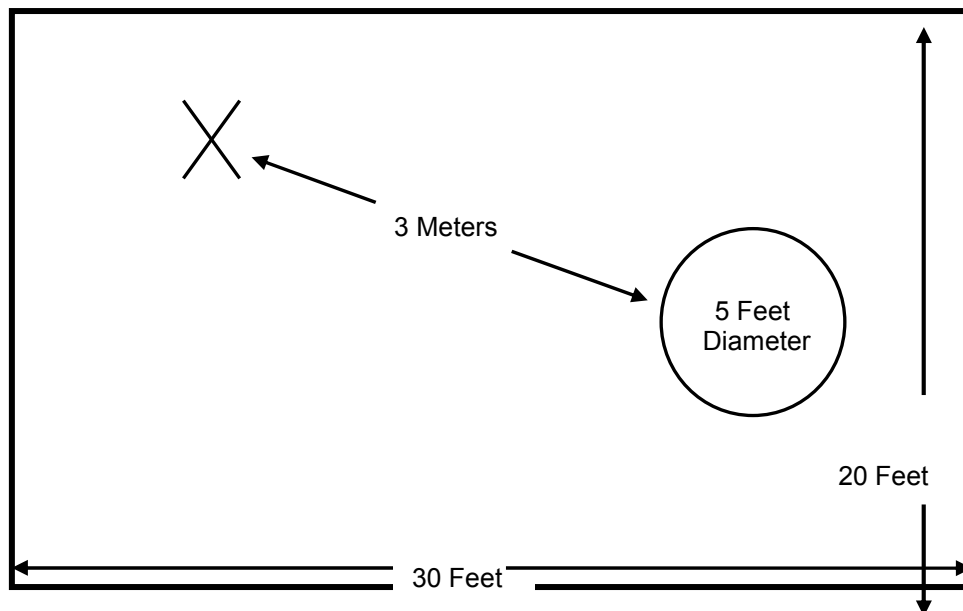


Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 – 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 – 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

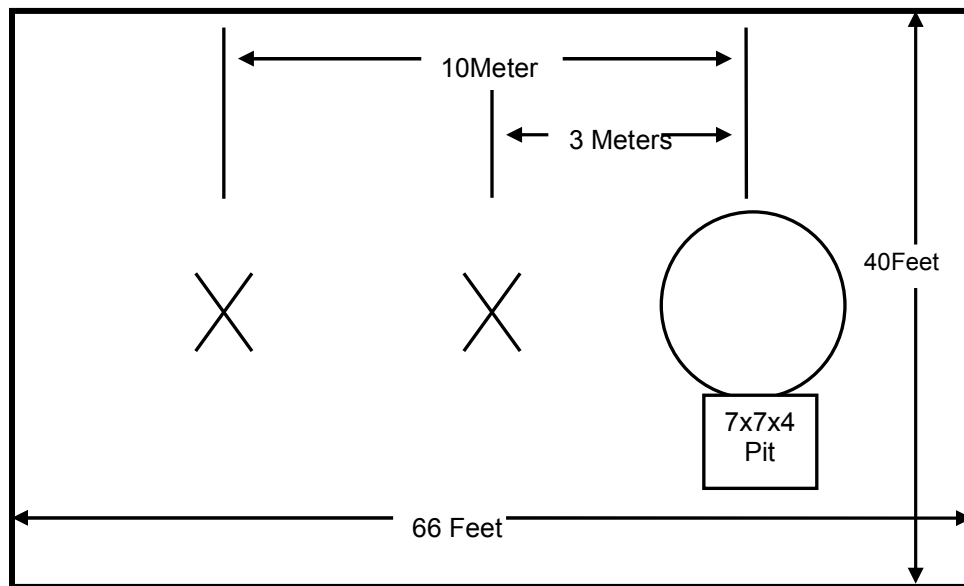


Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal ground reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 2.4-1:

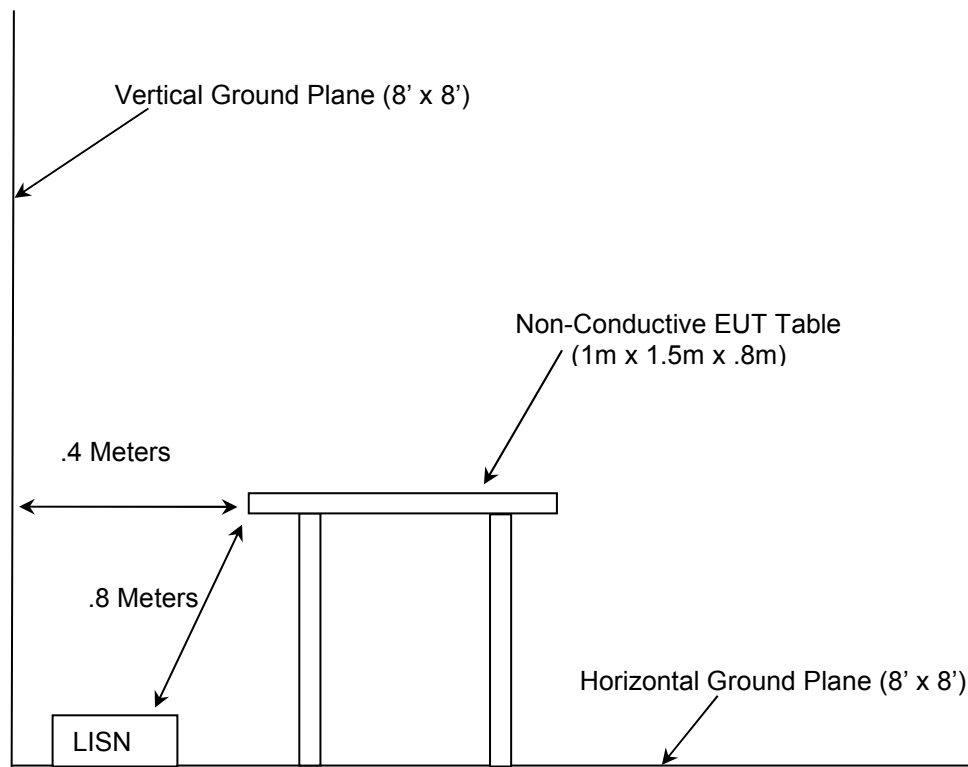


Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ❖ ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2015
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2015

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

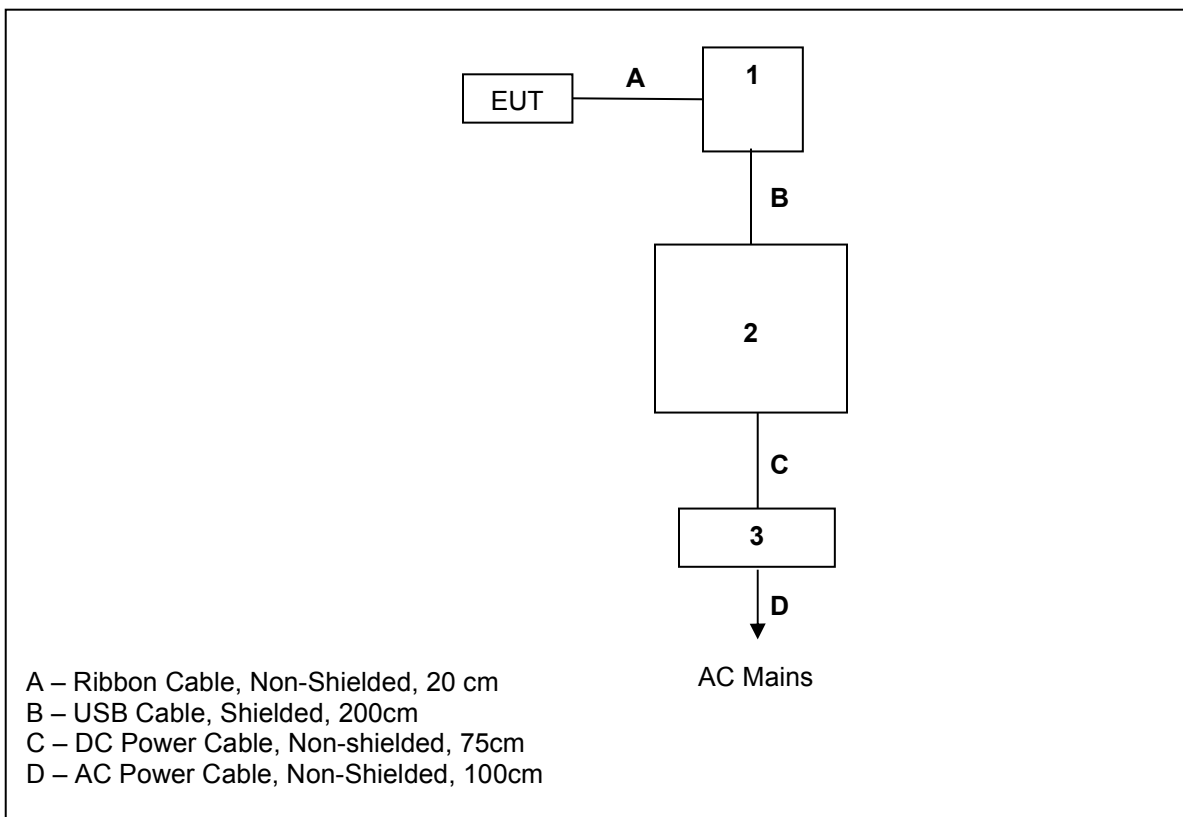
AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	7/14/2015	7/14/2016
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	7/14/2015	7/14/2016
30	Spectrum Technologies	DRH-0118	Antennas	970102	4/30/2015	4/30/2017
40	EMCO	3104	Antennas	3211	2/10/2015	2/10/2017
73	Agilent	8447D	Amplifiers	2727A05624	7/15/2015	7/15/2016
167	ACS	Chamber EMI Cable Set	Cable Set	167	10/20/2015	10/20/2016
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	3/3/2015	3/3/2016
432	Microwave Circuits	H3G020G4	Filters	264066	5/20/2015	5/20/2016
338	Hewlett Packard	8449B	Amplifiers	3008AD01111	8/21/2015	8/21/2017
412	Electro Metrics	LPA-25	Antennas	1241	7/24/2014	7/24/2016
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	11/5/2014	11/5/2015
616	Florida RF Cables	SMRE	Cables	N/A	9/3/2015	9/3/2016

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Evaluation Board	Flextronics	N/A	ACS #6
2	Laptop Computer	Dell	PP18L	CN-0KU184-12961-7A2-C488
3	Laptop Power Supply	Dell	PA-1900-02D	CN-09T215-71615-54P-271E

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

**Figure 6-1: Test Setup Block Diagram**

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The antenna is a non-detachable ceramic chip with 0.5dBi gain, therefore satisfying the requirements of 15.203.

7.1.1 Radiated Spurious Emissions - FCC 15.205, 15.209; IC RSS-247 5.5, RSS-Gen 8.9/8.10

7.1.1.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 25GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3MHz respectively.

The EUT was caused to generate a continuous modulated carrier on a single channel.

Each emission found to be in a restricted band was compared to the applicable radiated emission limits.

7.1.1.2 Measurement Results

Table 7.1.1.2-1: Radiated Spurious Emissions Tabulated Data – 802.11b

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2390	61.57	49.23	H	-5.49	56.08	43.74	74.0	54.0	17.9	10.3
2390	56.92	44.48	V	-5.49	51.43	38.99	74.0	54.0	22.6	15.0
Middle Channel										
7311	49.07	34.57	H	7.76	56.83	42.33	74.0	54.0	17.2	11.7
7311	48.21	34.37	V	7.76	55.97	42.13	74.0	54.0	18.0	11.9
High Channel										
2483.5	51.13	38.81	H	-5.04	46.09	33.77	74.0	54.0	27.9	20.2
2483.5	49.05	36.30	V	-5.04	44.01	31.26	74.0	54.0	30.0	22.7
2488.94	54.16	37.82	H	-5.01	49.15	32.81	74.0	54.0	24.9	21.2
7386	49.57	37.42	H	7.80	57.37	45.22	74.0	54.0	16.6	8.8
7386	44.85	33.46	V	7.80	52.65	41.26	74.0	54.0	21.3	12.7

Table 7.1.1.2-2: Radiated Spurious Emissions Tabulated Data – 802.11g

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2390	76.62	56.26	H	-5.49	71.13	50.77	74.0	54.0	2.9	3.2
2390	72.05	51.66	V	-5.49	66.56	46.17	74.0	54.0	7.4	7.8
Middle Channel										
7311	49.29	35.74	H	7.76	57.05	43.50	74.0	54.0	17.0	10.5
7311	46.04	38.13	V	7.76	53.80	45.89	74.0	54.0	20.2	8.1
High Channel										
2483.5	64.08	48.06	H	-5.04	59.04	43.02	74.0	54.0	15.0	11.0
2483.5	58.85	43.16	V	-5.04	53.81	38.12	74.0	54.0	20.2	15.9

Table 7.1.1.2-3: Radiated Spurious Emissions Tabulated Data – 802.11n

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2390	75.37	56.87	H	-5.49	69.88	51.38	74.0	54.0	4.1	2.6
2390	71.53	52.54	V	-5.49	66.04	47.05	74.0	54.0	8.0	7.0
Middle Channel										
7311	48.17	40.36	H	7.76	55.93	48.12	74.0	54.0	18.1	5.9
7311	45.70	33.71	V	7.76	53.46	41.47	74.0	54.0	20.5	12.5
High Channel										
2483.5	64.02	47.60	H	-5.04	58.98	42.56	74.0	54.0	15.0	11.4
2483.5	58.19	43.59	V	-5.04	53.15	38.55	74.0	54.0	20.8	15.4
7386	47.15	34.55	H	7.80	54.95	42.35	74.0	54.0	19.0	11.6

Sample Calculation:

$$R_C = R_U + CF_T$$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak

Corrected Level: $61.57 - 5.49 = 56.08\text{dBuV/m}$

Margin: $74\text{dBuV/m} - 56.08\text{dBuV/m} = 17.9\text{dB}$

Example Calculation: Average

Corrected Level: $49.23 - 5.49 - 0 = 43.74\text{dBuV}$

Margin: $54\text{dBuV} - 43.74\text{dBuV} = 10.26\text{dB}$

8 CONCLUSION

In the opinion of ACS, Inc. the 0B54, manufactured by Clorox Services Company meets the requirements of FCC Part 15 subpart C.

END REPORT