Excellence in Compliance Testing

Certification Test Report

FCC ID: Z9O-FAS1533
IC: 10060A-FAS1533

FCC Rule Part: 15.249
IC Radio Standards Specification: RSS-210

ACS Report Number: 13-2145.W06.1A

Manufacturer: UltraClenz, LLC
Model: FAS1533-00, FAS1533-01, FAS1533-02, and FAS1533-03

Test Begin Date: **November 4, 2013**
Test End Date: **January 8, 2014**

Report Issue Date: April 22, 2014

ACCREDITED TESTING

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ACLASS, ANSI, or any agency of the Federal Government.

Project Manager:

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Reviewed by:

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This report contains 14 pages

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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 and Industry Canada's Radio Standards Specification RSS-210.

1.2 Product description

Models FAS1533-00, FAS1533-01, FAS1533-02, and FAS1533-03 are soap/sanitizer beacons which include three transceivers operating at 125 kHz, 433 MHz and 2405 MHz. Each model variant is electrically identical and differs only by the cosmetic housing color and power cable length configuration. The FAS1533 series of models are part of a patient safeguard system insuring proper hygiene of healthcare workers. The device wakes-up a badge when the dispenser is activated, collects badge's ID via 2.4 GHz and transmits it to 433 MHz network.

Technical Details
Frequency of Operation: 2405 MHz
Number of Channels: 1
Modulation: GFSK
Data Rate: 2 Mbps
Antenna / Gain: Inverted-F PCB antenna / 6.3 dBi
Input Voltage: 3 VDC

Manufacturer Information:
UltraClenz, LLC
1201 Jupiter Park Drive
Jupiter, FL 33458

Test Sample Serial Number(s): 1336UB001

Test Sample Condition: Good

1.3 Test Methodology and Considerations

Models FAS1533-00, FAS1533-01, FAS1533-02, and FAS1533-03 are electrically identical and differ only by the cosmetic housing color and power cable length configuration. Model FAS1533-02 was evaluated for full compliance and deemed representative of all model variants. The unit was evaluated for radiated emissions for the 2.4 GHz radio . The unit was evaluated in the orientation of typical installation. The unit was continuously pulsing during the evaluation.

The 433 MHz and 2405 MHz radios can transmit simultaneously, per the customer's theory of operation. Therefore, the EUT was evaluated for inter-modulation products generated by the co-located 433 MHz and 2405 MHz radios continuously transmitting at the same time. All inter-modulation products were found to be compliant to the limits of FCC 15.209 and RSS-210.

The 125 kHz and 433 MHz transmitters are evaluated separately in their respective certification test reports. The unintentional emissions evaluation is documented separately in a verification test report.

2 TEST FACILITIES

2.1 Location

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

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 475089
Industry Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

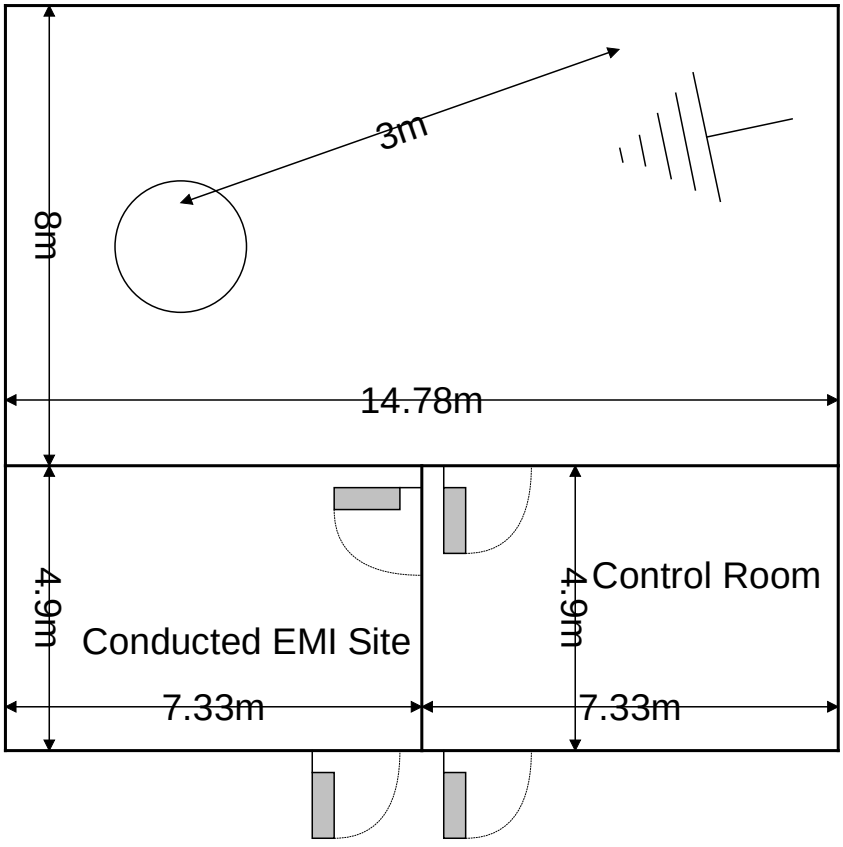


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

A diagram of the room is shown below in figure 2.3.2-1:

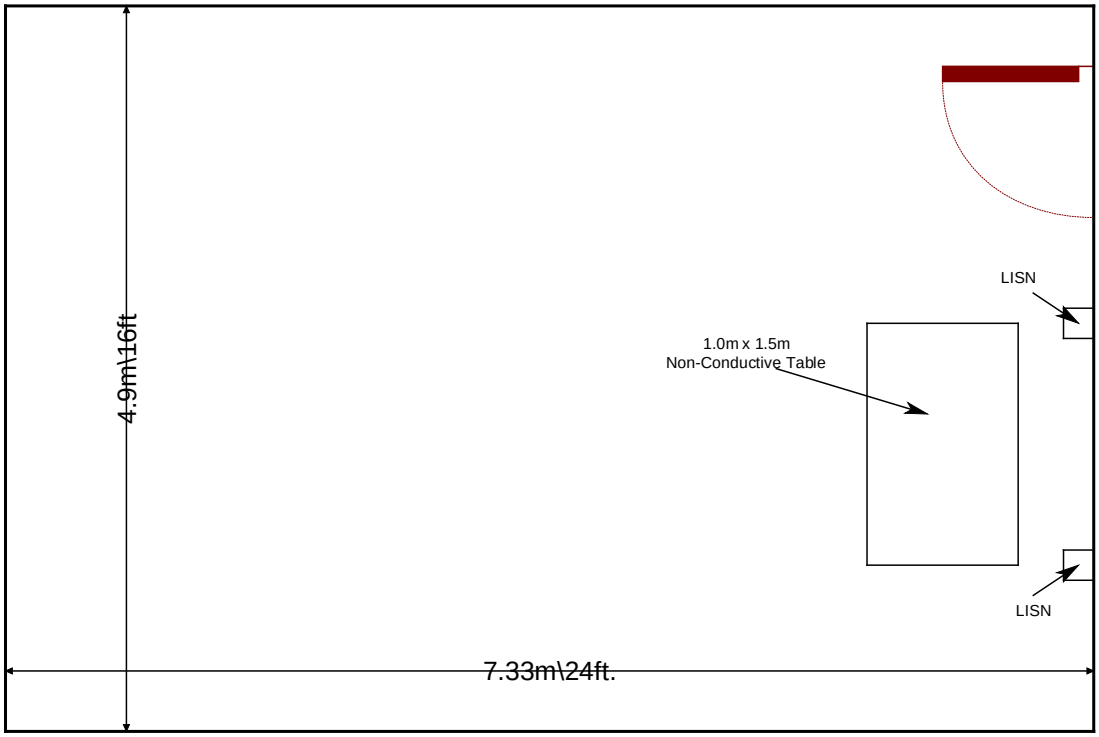


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2014
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2014
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8 December 2010.
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radio communication Equipment, Issue 3, December 2010.

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
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/8/2013	1/8/2015
524	Chase	CBL6111	Antennas	1138	1/7/2013	1/7/2015
2006	EMCO	3115	Antennas	2573	4/24/2013	4/24/2015
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2012	12/31/2013
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2013	12/31/2014
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/1/2013	1/1/2014
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	2/27/2014	2/27/2015
2044	QMI	N/A	Cables	2044	12/31/2012	12/31/2013
2044	QMI	N/A	Cables	2044	12/31/2013	12/31/2014
2076	Hewlett Packard	HP5061-5458	Cables	2076	12/29/2012	12/29/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	12/31/2013	12/31/2014
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/20/2012	12/20/2013
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/16/2013	12/16/2014
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
2070	Mini Circuits	VHF-8400+	Filter	2070	12/31/2012	12/31/2013
2070	Mini Circuits	VHF-8400+	Filter	2070	1/1/2014	1/1/2015
2072	Mini Circuits	VHF-3100+	Filter	30737	12/31/2012	12/31/2013
2072	Mini Circuits	VHF-3100+	Filter	30737	1/1/2014	1/1/2015
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/29/2012	12/29/2013
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/31/2013	12/31/2014

Notes:

- **NCR=No Calibration Required**
- **The asset information is provided to cover the entire test period.**
- **All the assets listed above were only used during the active period of the calibration cycles.**

5 SUPPORT EQUIPMENT

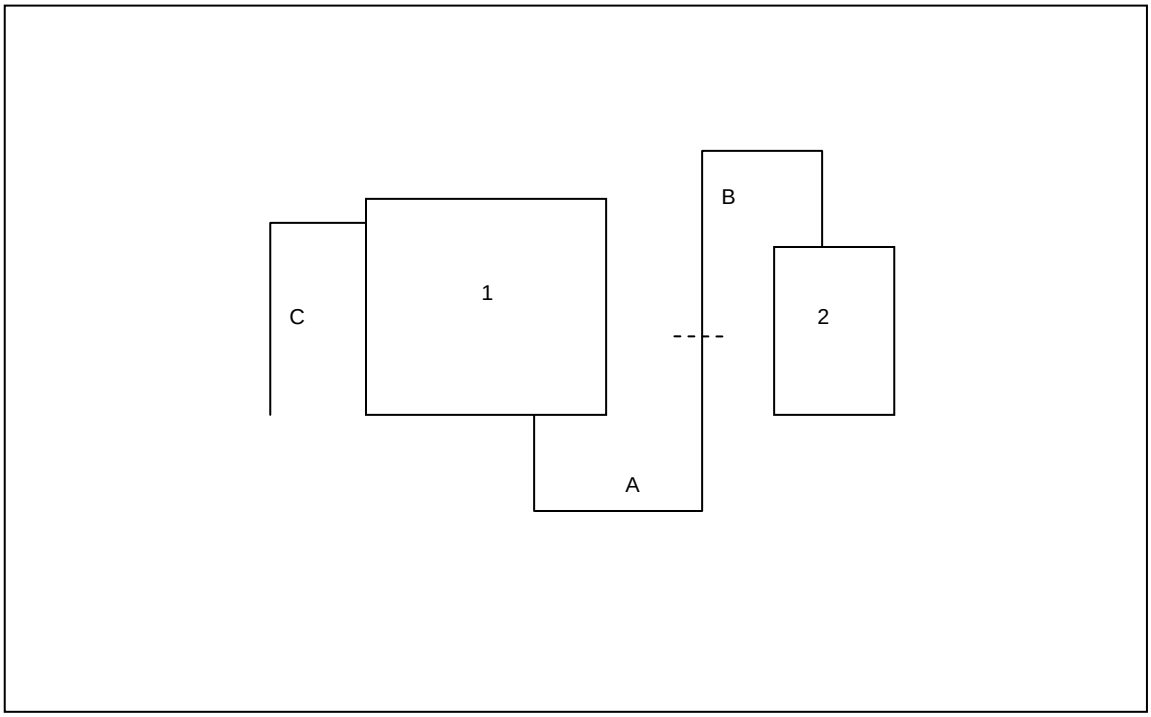
Table 5-1: EUT and Support Equipment Description

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	UltraClenz	FAS1533-00, FAS1533-01, FAS1533-02, and FAS1533-03	1336UB001
2	2 AA Battery Holder	N/A	N/A	N/A

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Power Cable	0.5 m	No	EUT to Battery Holder Cable
B	Power Cable	0.4 m	No	EUT Power Cable to Battery Holder Cable
C	Wire Antenna	0.16 m	No	None

6 EQUIPMENT UNDER 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 EUT uses an internal printed inverted-F antenna that is etched to the PCB. The antenna cannot be replaced without permanently damaging the device, hence meeting the requirements of FCC Section 15.203.

7.2 20dB / 99% Bandwidth: IC RSS-Gen 4.6.1

7.2.1 Measurement Procedure

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.

The spectrum analyzer span was set to 2 to 5 times the estimated 20 dB bandwidth of the signal. The RBW was to ≥ 1% to 5% of the estimated emission bandwidth. The trace was set to max hold using a peak detector and the reference level was set to the highest amplitude observed. The bandwidth was measured 20 dB down from the reference level using the delta function of the analyzer.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission, including the emissions skirts. The RBW was greater or equal to 1% of the span. The occupied 99% bandwidth was measured by using a delta marker at the lower and upper frequencies leading to 0.5% of the total power.

7.2.2 Measurement Results

Results are shown below in Table 7.2.2-1 and Figures 7.2.2-1 through 7.2.2-2

Table 7.2.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
2405	2616.0	2750.0

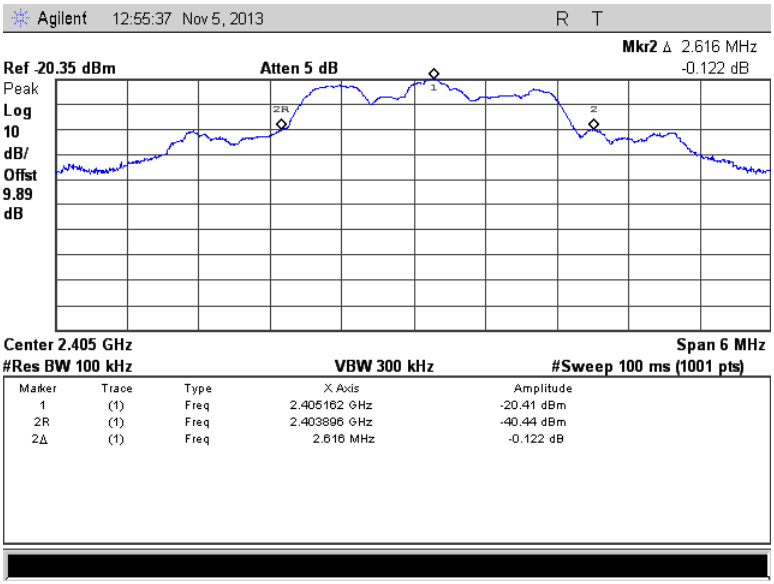


Figure 7.2.2-1: 20dB BW

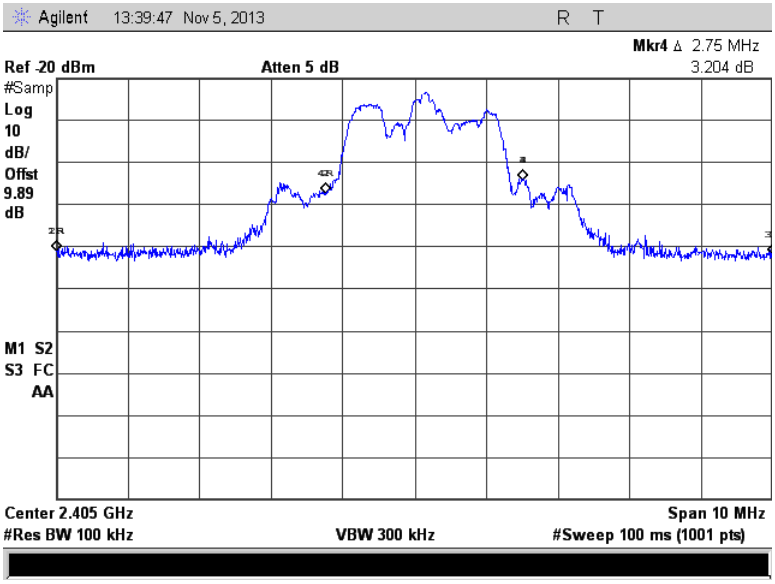


Figure 7.2.2-2: 99% OBW

7.3 Radiated Spurious Emissions - FCC Section 15.249 (a); IC: RSS-210 A2.9

7.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 26GHz, 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 made with RBW and VBW of 1 MHz and 3MHz respectively.

The unit was continuously pulsing. A Duty Cycle Correction of 0.72% corresponding to -42.85 dB was applied to the peak measurements for the average results. The justification of the duty cycle is provided in the customer's theory of operation document.

7.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 26GHz are reported in the Table 7.3.2-1 below.

Table 7.3.2-1: Radiated Spurious Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	avg	(H/V)	(dB)	pk	avg	pk	avg	pk	avg
Fundamental Frequency										
2405	100.80	100.80	H	-7.94	92.86	50.01	114	94	21.1	44.0
2405	87.85	87.85	V	-7.94	79.91	37.06	114	94	34.1	56.9
Spurious Emissions										
2390	68.94	68.94	H	-8.00	60.94	18.09	74	54	13.1	35.9
2390	61.32	61.32	V	-8.00	53.32	10.47	74	54	20.7	43.5
2400	63.44	63.44	H	-7.96	55.48	12.63	74	54	18.5	41.4
2400	59.36	59.36	V	-7.96	51.40	8.55	74	54	22.6	45.5
2420.37	69.78	69.78	H	-7.87	61.91	19.05	74	54	12.1	34.9
2420.37	61.28	61.28	V	-7.87	53.41	10.55	74	54	20.6	43.4
4810	50.25	50.25	H	-0.64	49.61	6.76	74	54	24.4	47.2
4810	51.18	51.18	V	-0.64	50.54	7.69	74	54	23.5	46.3

*** Notes:**

- **All emissions above 4810 MHz were attenuated below the permissible limits and the noise floor of the measurement equipment.**
- **The fundamental frequency was measured using a RBW of 3 MHz.**
- **A duty cycle correction factor corresponding to the logarithm of the max transmit time over a 100 ms period, equal to 20*log(0.72/100) = -42.85 dB was applied to the average measurements.**

7.3.3 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

Duty Cycle (DC) = 20*log(0.72/100) = -42.85 dB

Example Calculation: Peak
Corrected Level: 68.94 + (-8.0) = 60.94 dBµV/m
Margin: 74dBuV/m – 60.94 dBµV/m = 13.1 dB

Example Calculation: Average
Corrected Level: 68.94 + (-8.0) – 42.85= 18.09 dBµV/m
Margin: 54dBuV/m – 18.09 dBµV/m = 35.9 dB

8 CONCLUSION

In the opinion of ACS, Inc. the FAS1533-00, FAS1533-01, FAS1533-02, and FAS1533-03, manufactured by UltraClenz, LLC meet the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT