Excellence in Compliance Testing

Certification Test Report

FCC ID: Z9O-FAS1541
IC: 10060A-FAS1541

FCC Rule Part: 15.231
IC Radio Standards Specification: RSS-210

ACS Report Number: 15-2042.W06.2B

Manufacturer: UltraClenz, LLC
Model: FAS1541-00

Test Begin Date: **June 4, 2015**
Test End Date: **July 27, 2015**

Report Issue Date: August 27, 2015

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

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 ANAB, ANSI, or any agency of the Federal Government.

Reviewed by:

Thierry Jean-Charles
EMC Engineer
Advanced Compliance Solutions, Inc. .

This report contains 15 pages

TABLE OF CONTENTS

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

The model FAS1541-00 is a hospital bed beacon. It includes three transceivers operating at 125 kHz, 433 MHz and 2405 MHz, respectively. The Bed Beacon, along with its internal low frequency antenna, is mounted to a patient bed. Its function is to communicate with the Badge worn by the Healthcare Worker (HCW) when the HCW comes in close proximity with the patient bed (bed event), collect bed event data from that Badge and then transmit the collected data to a network where it will ultimately be sent to an offsite server for processing and archiving.

Technical Details
Frequency of Operation: 433.9 MHz
Number of Channels: 1
Modulation: FSK
Data Rate: 250 kbps
Antenna / Gain: 1/4 Wave Helical Antenna / 1.9 dBi
Input Voltage: 3 VDC (Size D battery)

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

Test Sample Serial Number(s): 1E000006

Test Sample Condition: Good

1.3 Test Methodology and Considerations

The FAS1541-00 is a battery operated device, with no provision for alternate power sources. The device is exempted from the power line conducted emissions requirements.

The FAS1541-00 was evaluated for radiated emissions for the 433 MHz radio in the orientation of typical installation.

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-Gen.

The 125 kHz and 2405 MHz transmitters are assessed 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 ANAB 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:

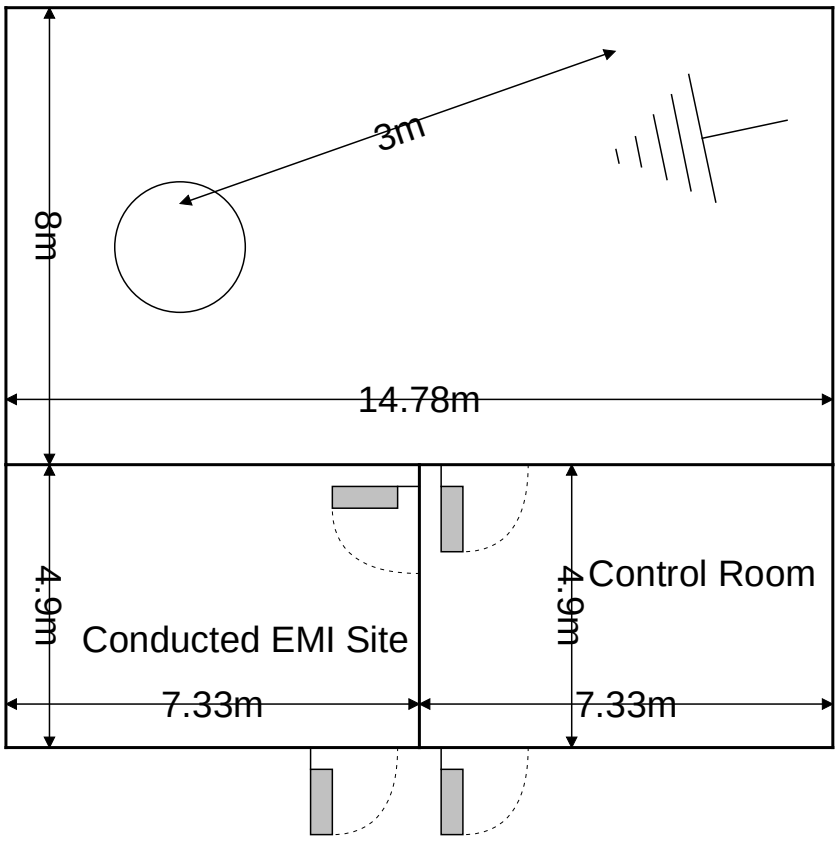


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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. Data is 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 evaluations requiring 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:

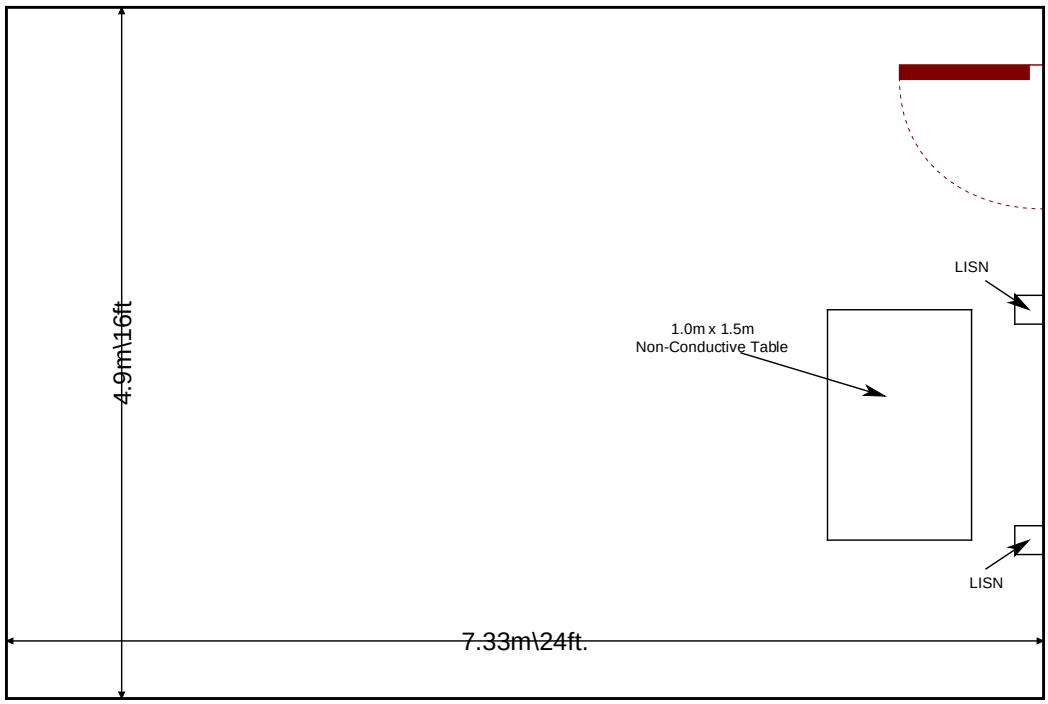


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2014: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 kHz to 40 GHz
- 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
- 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 for Compliance of Radio Apparatus, Issue 4, November 2014.

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	12/26/2014	12/26/2016
2002	EMCO	3108	Antennas	2147	11/22/2013	11/22/2015
2004	EMCO	3146	Antennas	1385	11/22/2013	11/22/2015
2006	EMCO	3115	Antennas	2573	4/14/2015	4/14/2017
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2014	12/31/2015
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	2/17/2015	2/17/2016
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/12/2014	12/12/2015
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
2073	Mini Circuits	NHP-800	Filter	10247	12/31/2014	12/31/2015
2094	Mini Circuits	SHP-1000+	Filter	R UU27401137	3/27/2015	3/27/2016
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/31/2014	12/31/2015

NCR=No Calibration Required

5 SUPPORT EQUIPMENT

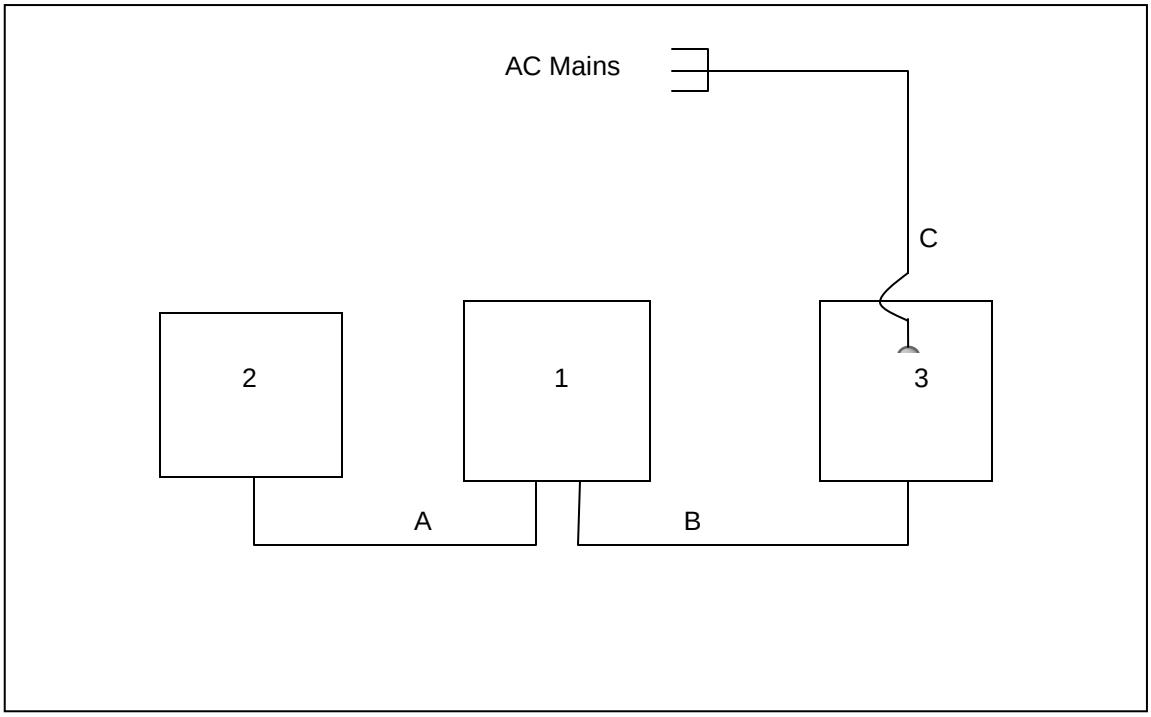
Table 5-1: Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	UltraClenz	FAS1541-00	1E000006
2	125 kHz Antenna	UltraClenz	FAS1540-01	1448-001A-001188
3	Power Sensor	UltraClenz	FAS1542-03	1448-001F

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	RJ11	1.23 m	No	EUT to Antenna
B	RJ11	1.82 m	No	EUT to Sensor
C	AC power Cord	1.5 m	No	Sensor to AC Mains

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 1.9 dBi 1/4 wave helical antenna soldered directly to the PCB. The antenna is not detachable thus meeting the requirements of 15.203.

7.2 20dB / 99% Bandwidth: FCC: Section 15.231 (c)(1) / IC RSS-210.A.1.1.3

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 RBW was to ≥ 1% to 5% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. The Delta function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

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:

Table 7.2.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
433.9	530	525

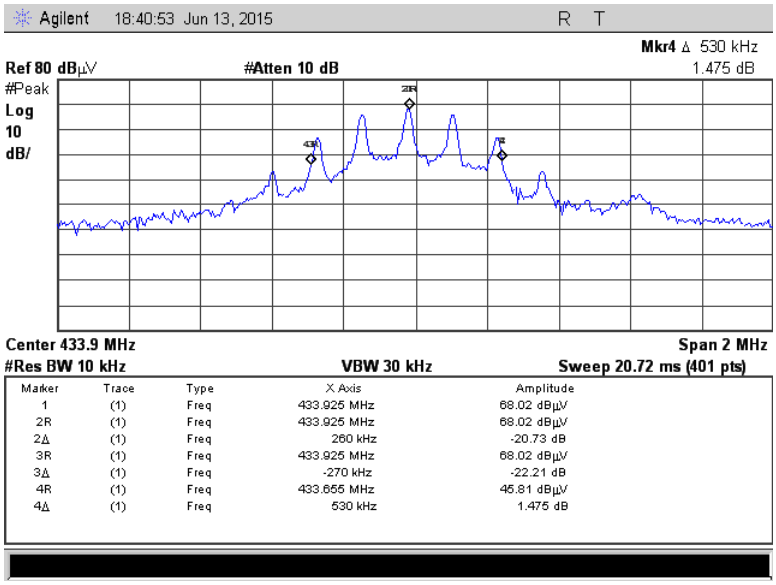


Figure 7.2.2-1: 20dB BW

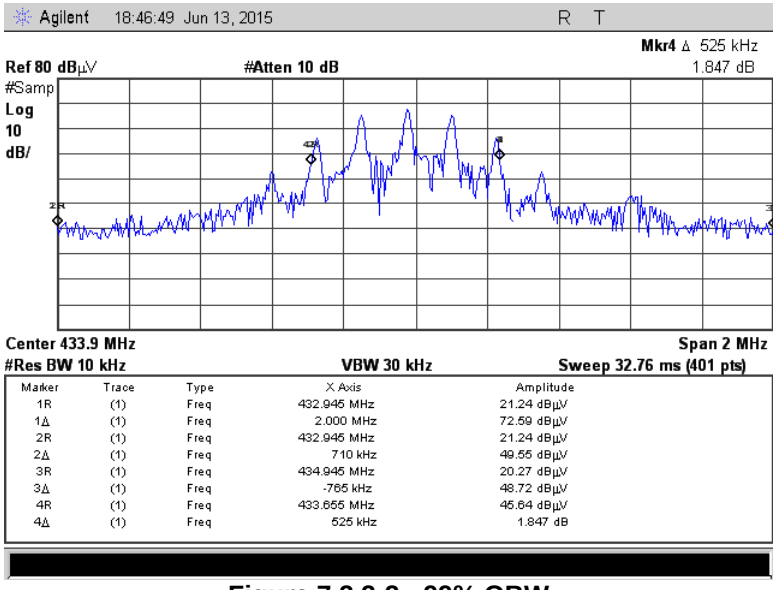


Figure 7.2.2-2: 99% OBW

7.3 Radiated Spurious Emissions – FCC: Section 15.231 (b)/ IC: RSS-210 A1.1.2

7.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 9 kHz to 4.5 GHz, 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 of 1 MH and VBW of 3 MHz and 30Hz, respectively.

A Duty Cycle Correction of 1.312% corresponding to -37.64 dB was applied to the peak measurements for the average results. The justification of the duty cycle is provided in the manufacturer's theory of operation document.

7.3.2 Measurement Results

Radiated spurious emissions found in the band of 9 kHz to 4.5 GHz are reported 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										
433.945	71.49	70.96	H	19.37	90.86	52.69	100.8	80.8	9.9	28.1
433.945	71.15	70.54	V	19.37	90.52	52.27	100.8	80.8	10.3	28.5
Spurious Emissions										
867.85	31.62	25.14	H	1.49	33.11	-11.02	80.8	60.8	47.7	71.8
867.85	30.32	20.90	V	1.49	31.81	-15.26	80.8	60.8	49.0	76.1
1301.775	59.64	55.60	H	-9.25	50.39	8.71	74.0	54.0	23.6	45.3
1301.775	59.35	55.33	V	-9.25	50.10	8.44	74.0	54.0	23.9	45.6
1735.7	56.85	51.03	H	-5.46	51.39	7.93	80.8	60.8	29.4	52.9
1735.7	55.46	49.31	V	-5.46	50.00	6.21	80.8	60.8	30.8	54.6
2169.625	64.81	60.78	H	-2.33	62.48	20.80	80.8	60.8	18.3	40.0
2169.625	68.66	65.07	V	-2.33	66.33	25.09	80.8	60.8	14.5	35.7
2603.55	49.35	36.98	H	0.12	49.47	-0.54	80.8	60.8	31.3	61.3
2603.55	48.80	35.72	V	0.12	48.92	-1.80	80.8	60.8	31.9	62.6
3037.475	50.10	40.04	H	2.87	52.97	5.27	80.8	60.8	27.8	55.5
3037.475	51.52	41.07	V	2.87	54.39	6.30	80.8	60.8	26.4	54.5
3471.4	46.38	32.55	H	4.81	51.19	-0.28	80.8	60.8	29.6	61.1
3471.4	45.91	32.54	V	4.81	50.72	-0.29	80.8	60.8	30.1	61.1
3905.325	46.80	34.75	H	7.29	54.09	4.40	74.0	54.0	19.9	49.6
3905.325	47.96	35.62	V	7.29	55.25	5.27	74.0	54.0	18.8	48.7
4339.25	44.38	31.02	H	8.98	53.36	2.36	74.0	54.0	20.6	51.6
4339.25	44.29	31.01	V	8.98	53.27	2.35	74.0	54.0	20.7	51.7

* Notes:

1. The fundamental level was measured using RBW = 1 MHz which is greater than the measured emission bandwidth.
2. A duty cycle correction factor corresponding to 20*log(1.312/100) was applied to the average measurements.
3. All emissions above 4339.25 MHz were attenuated below the permissible limits and the noise floor of the measurement equipment.

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 Correction Factor = 20 * log(1.312/100) = -37.64

Example Calculation: Peak
Corrected Level: 59.64 + (-9.25) = 50.39 dBµV/m
Margin: 74 dBµV/m – 50.39 dBµV/m = 23.6 dB

Example Calculation: Average
Corrected Level: 55.6 + (-9.25) – 37.64= 8.71 dBµV
Margin: 54 dBµV – 8.71 dBµV = 45.3 dB

7.4 Periodic Operation – FCC: CFR 47 15.231(a) / IC: RSS-210 A1.1.1

7.4.1 Test Methodology

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. A transmitter activated automatically shall cease transmission within 5 seconds after activation. The transmitter was activated automatically and was evaluated using a spectrum analyzer at zero span with a 5 second sweep time.

7.4.2 Test Results

The results are shown below.

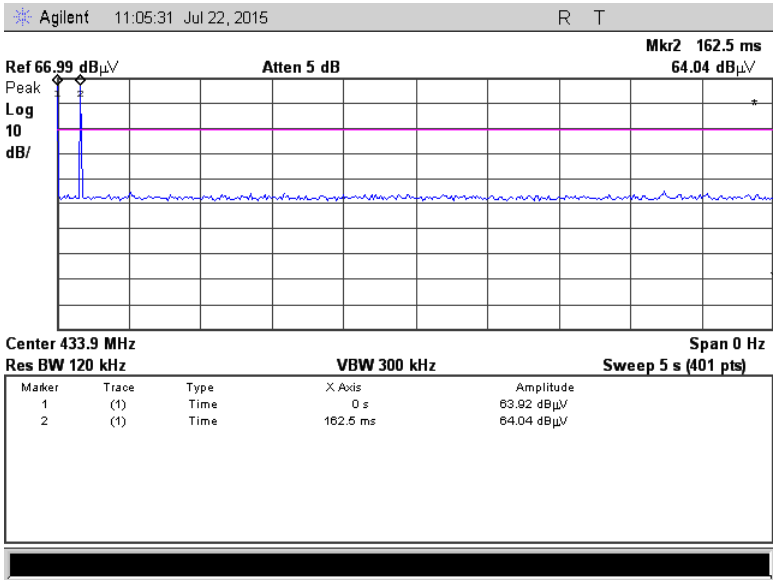


Figure 7.4.2-1: Periodic Operation

8 CONCLUSION

In the opinion of ACS, Inc. the FAS1541-00, manufactured by UltraClenz, LLC meet the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT