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Certification Test Report

**FCC ID: Z9O-FAS1521
IC: 10060A-FAS1521**

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

ACS Report Number: 14-2067.W06.1A

Manufacturer: UltraClenz, LLC
Model(s): FAS1521-01

Test Begin Date: **November 14, 2014**
Test End Date: **November 14, 2014**

Report Issue Date: December 23, 2014



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.

Reviewed by:

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

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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

The model FAS1521-01 PSS Door Monitor is designed to track healthcare worker hand hygiene compliance with respect to a specific hospital room, by recording whether or not a soap or sanitizer was used during patient room entries and exits.

Technical Details

Frequency of Operation: 433.9 MHz

Number of Channels: 1

Modulation: FSK

Data Rate: 250 kbps

Antenna / Gain: 1/4 Wave Monopole Antenna / -2.3 dBi

Input Voltage: 3 VDC (Size D battery)

Manufacturer Information:

UltraClenz, LLC

1201 Jupiter Park Drive

Jupiter, FL 33458

Test Sample Serial Number(s): 1301-001A-000024

Test Sample Condition: Good

1.3 Test Methodology and Considerations

The EUT was evaluated in the orientation of typical orientation for the adjustable sensor set to the right and to the left side of the equipment. The test report documents the configuration leading to the highest emissions. The unit was continually pulsing during the evaluation.

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 ACCLASS 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:

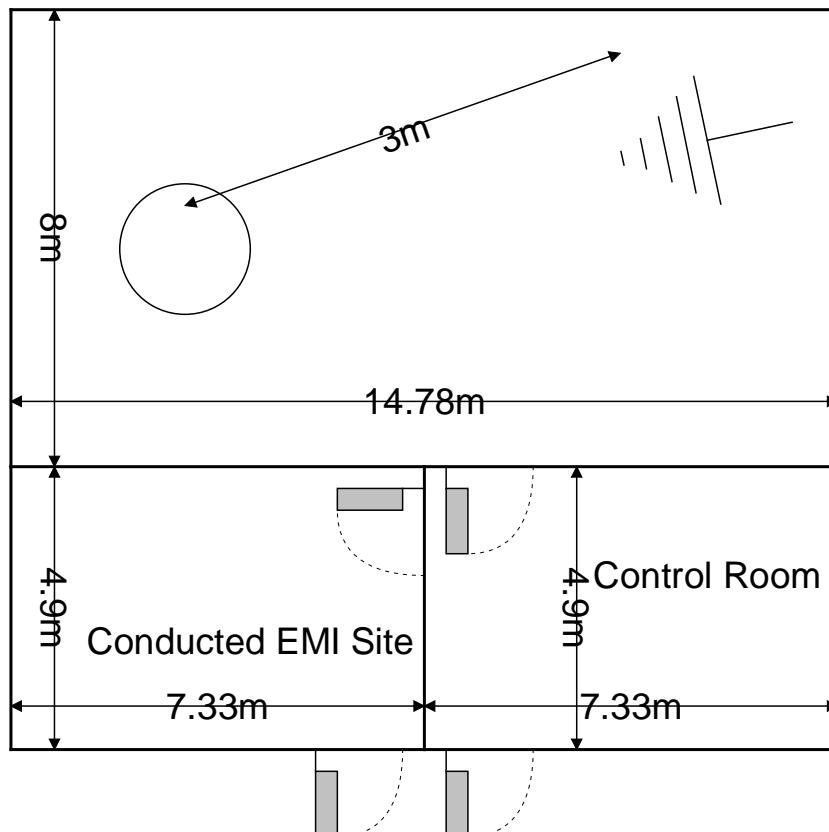


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are $7.3 \times 4.9 \times 3 \text{ m}^3$. As per ANSI C63.4 2009 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 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:

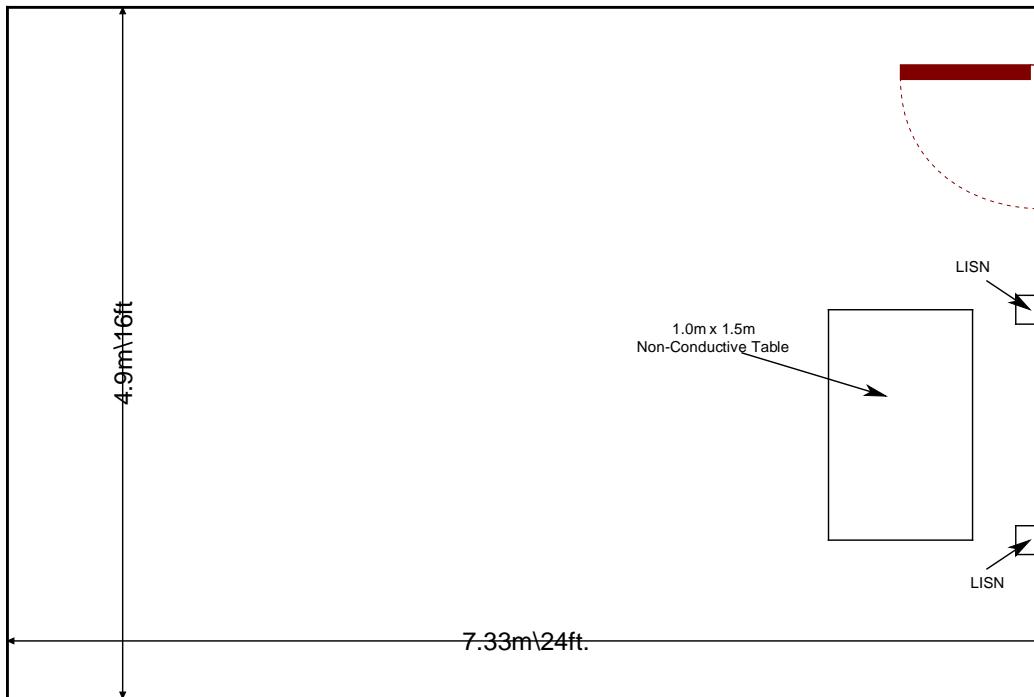


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ❖ ANSI C63.4-2009: 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 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 | 1/8/2013 | 1/8/2015 |
| 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 | 4/24/2013 | 4/24/2015 |
| 2011 | Hewlett-Packard | HP 8447D | Amplifiers | 2443A03952 | 12/31/2013 | 12/31/2014 |
| 2037 | ACS Boca | Chamber EMI Cable Set | Cable Set | 2037 | 2/27/2014 | 2/27/2015 |
| 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 |
| 283 | Rohde & Schwarz | FSP40 | Spectrum Analyzers | 1000033 | 9/18/2013 | 9/18/2015 |
| 2073 | Mini Circuits | NHP-800 | Filter | 10247 | 1/1/2014 | 1/1/2015 |
| 2094 | Mini Circuits | SHP-1000+ | Filter | R UU27401137 | 4/7/2014 | 4/7/2015 |
| 2086 | Merrimac | FAN-6-10K | Attenuators | 23148-83-1 | 12/31/2013 | 12/31/2014 |

NCR=No Calibration Required

5 SUPPORT EQUIPMENT

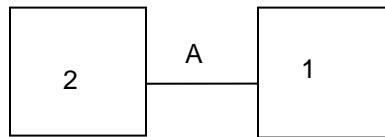
Table 5-1: Support Equipment

| Item # | Type Device | Manufacturer | Model/Part # | Serial # |
|--------|-------------------|-----------------|--------------|------------------|
| 1 | EUT | UltraClenz, LLC | FAS1521-01 | 1301-001A-000024 |
| 2 | Triggering Switch | UltraClenz, LLC | N/A | N/A |

Table 5-2: Cable Description

| Cable # | Cable Type | Length | Shield | Termination |
|---------|------------|--------|--------|---------------|
| A | Ribbon | 0.37 m | No | EUT to Switch |

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 -2.3 dBi 1/4 wave monopole antenna soldered to the PCB, 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 \geq 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 between 1% to 5% of the estimated bandwidth. 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] |
|--------------------|-------------------------|------------------------|
| 433.9 | 530.0 | 515.0 |

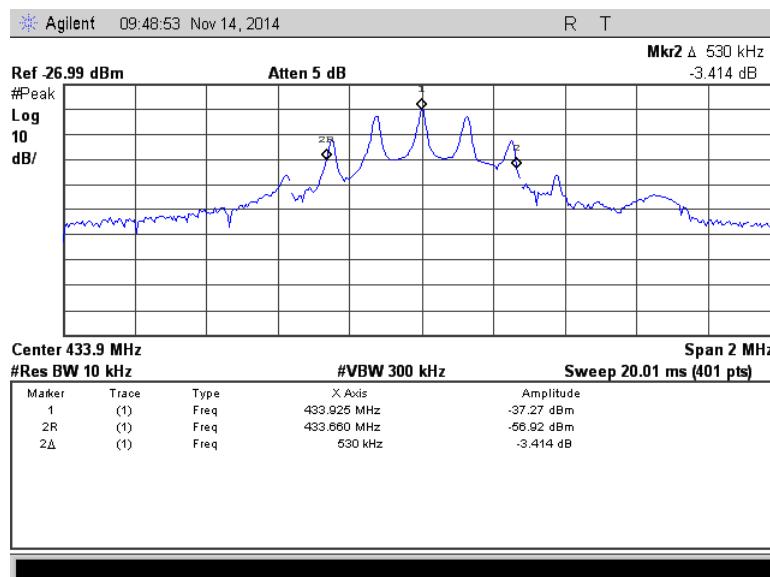


Figure 7.2.2-1: 20dB BW

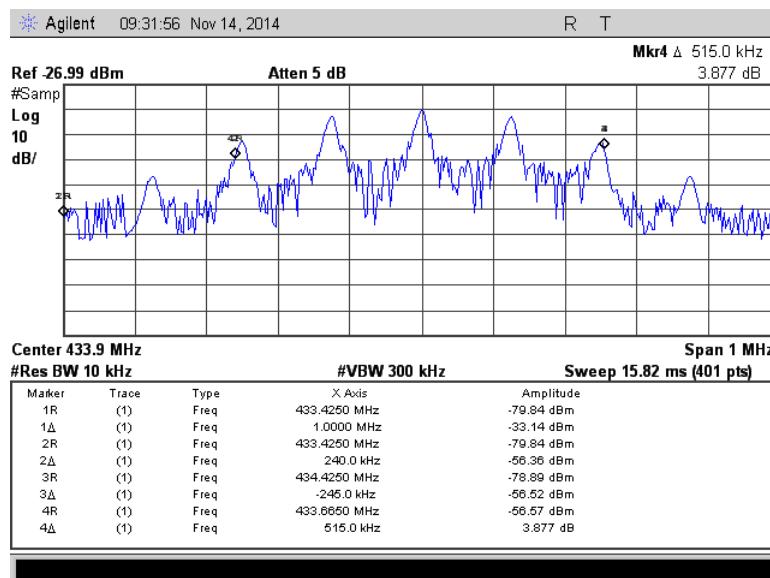


Figure 7.2.2-2: 99% OBW

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 30MHz to 4.5GHz, 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 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 customer's theory of operation document.

7.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 4.5GHz 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 (H/V) | Correction Factors (dB) | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|------------------------------|-----------------|--------|------------------------------|-------------------------------|-----------------------------|-------|-------------------|------|----------------|------|
| | pk | avg | | | pk | avg | pk | avg | pk | avg |
| Fundamental Frequency | | | | | | | | | | |
| 433.8 | 102.40 | 101.80 | H | -7.77 | 94.63 | 56.39 | 100.8 | 80.8 | 6.2 | 24.4 |
| 433.8 | 100.90 | 100.30 | V | -7.77 | 93.13 | 54.89 | 100.8 | 80.8 | 7.7 | 25.9 |
| Spurious Emissions | | | | | | | | | | |
| 410 | ----- | 46.51 | H | -9.01 | ----- | 37.50 | ----- | 46 | ----- | 8.5 |
| 410 | ----- | 42.47 | V | -9.01 | ----- | 33.46 | ----- | 46 | ----- | 12.5 |
| 867.6 | 36.50 | 32.62 | H | 1.53 | 38.03 | -3.49 | 80.8 | 60.8 | 42.8 | 64.3 |
| 867.6 | 39.71 | 36.84 | V | 1.53 | 41.24 | 0.73 | 80.8 | 60.8 | 39.6 | 60.1 |
| 1301.4 | 66.98 | 63.33 | H | -10.13 | 56.85 | 15.56 | 74 | 54 | 17.2 | 38.4 |
| 1301.4 | 64.19 | 60.28 | V | -10.13 | 54.06 | 12.51 | 74 | 54 | 19.9 | 41.5 |
| 1735.2 | 56.41 | 49.39 | H | -6.57 | 49.84 | 5.18 | 80.8 | 60.8 | 31.0 | 55.6 |
| 1735.2 | 54.11 | 46.31 | V | -6.57 | 47.54 | 2.10 | 80.8 | 60.8 | 33.3 | 58.7 |
| 2169 | 64.15 | 57.89 | H | -3.50 | 60.65 | 16.75 | 80.8 | 60.8 | 20.2 | 44.1 |
| 2169 | 60.59 | 54.22 | V | -3.50 | 57.09 | 13.08 | 80.8 | 60.8 | 23.7 | 47.7 |
| 2602.8 | 46.53 | 33.96 | H | -0.80 | 45.73 | -4.48 | 80.8 | 60.8 | 35.1 | 65.3 |
| 2602.8 | 45.45 | 33.15 | V | -0.80 | 44.65 | -5.29 | 80.8 | 60.8 | 36.2 | 66.1 |
| 3036.6 | 47.02 | 36.01 | H | 1.66 | 48.68 | 0.02 | 80.8 | 60.8 | 32.1 | 60.8 |
| 3036.6 | 48.37 | 36.06 | V | 1.66 | 50.03 | 0.07 | 80.8 | 60.8 | 30.8 | 60.7 |
| 3904.2 | 43.91 | 31.69 | H | 6.05 | 49.96 | 0.10 | 74 | 54 | 24.0 | 53.9 |
| 3904.2 | 42.66 | 30.28 | V | 6.05 | 48.71 | -1.31 | 74 | 54 | 25.3 | 55.3 |

* Note:

1. All emissions above 3905 MHz were attenuated below the permissible limits and the noise floor of the measurement equipment.
2. The fundamental level was measured using RBW = 1 MHz which is greater than the measured emission bandwidth.

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 |

Example Calculation: Peak

$$\text{Corrected Level: } 66.98 + (-10.13) = 56.85 \text{ dB}\mu\text{V/m}$$

$$\text{Margin: } 74 \text{ dB}\mu\text{V/m} - 56.85 \text{ dB}\mu\text{V/m} = 17.2 \text{ dB}$$

Example Calculation: Average

$$\text{Corrected Level: } 63.33 + (-10.13) - 37.64 = 15.56 \text{ dB}\mu\text{V}$$

$$\text{Margin: } 54 \text{ dB}\mu\text{V} - 15.56 \text{ dB}\mu\text{V} = 38.4 \text{ dB}$$

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.

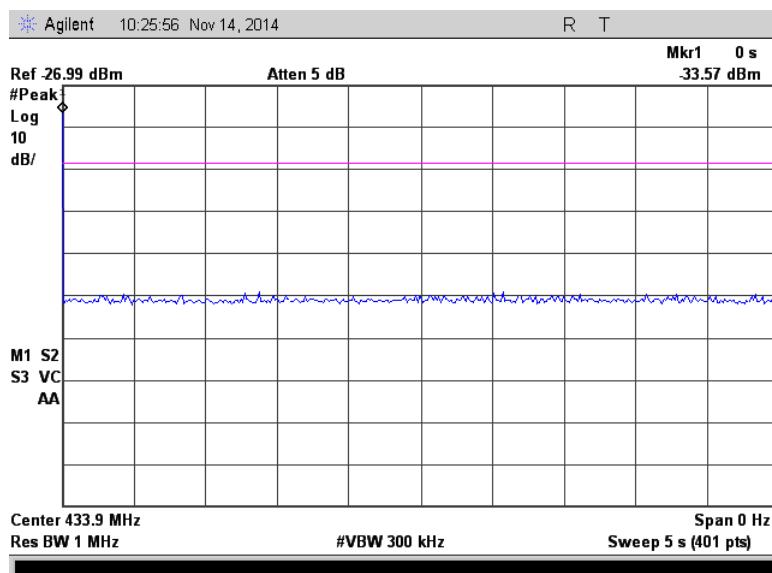


Figure 7.4.2-1: Periodic Operation

8 CONCLUSION

In the opinion of ACS, Inc. the FAS1521-01, manufactured by UltraClenz, LLC meet the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT