Excellence in Compliance Testing

Certification Test Report

FCC ID: Z9O-FAS1511
IC: 10060A-FAS1511

FCC Rule Part: 15.209
IC Radio Standards Specification: RSS-210

ACS Report Number: 11-2104.W06.3B

Manufacturer: UltraClenz, LLC
Model: FAS1511-02

Test Begin Date: **November 11, 2011**
Test End Date: **April 17, 2012**

Report Issue Date: September 4, 2012

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:

Kirby Munroe
Director, Wireless Certifications
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This report contains 17 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 FAS1511-02 is a hospital bed beacon. The unit includes three transceivers operating at 125 kHz, 433 MHz and 2405 MHz, respectively. The FAS1511-02 part of an UltraClenz's patient safeguard system insuring proper hygiene of healthcare workers when approaching patient's bed. The EUT wakes-up a badge within a close range, collects the badge's ID via 2.4GHz and transmits it to 433 MHz network.

Technical Details
Frequency of Operation: 125 kHz
Number of Channels: 1
Modulation: OOK
Data Rate: 2.4 kbps
Antenna: Coil (Loop) Antenna
Input Voltage: 3 VDC (battery)/ 9 VDC AC to DC Adapter.

Manufacturer Information:
UltraClenz, LLC
1440 W Indiantown Rd., Suite 350
Jupiter, FL 33435

Test Sample Serial Number(s): N/A

Test Sample Condition: Good

1.3 Test Methodology and Considerations

The unit was evaluated for radiated and power line conducted emissions for the 125 kHz transmitter. The 125 kHz radio does not transmit simultaneously with the 433 MHz and the 2405 MHz co-located radios, per the customer's theory of operation. Therefore, the 125 kHz radio was not evaluated for inter-modulation products with the co-located 433 MHz and 2405 MHz radios.

Preliminary evaluations were performed for the unit set in 2 orthogonal orientations corresponding to the positions of typical installation as well as for the unit powered through a fresh battery and through an AC to DC adapter. Preliminary evaluations were also peformed for different orientations of the loop antenna, simulating different inclinations of a hospital bed. The results are reported for the configuration leading to the highest emissions . The unit was continuously pulsing during the evaluation.

The 433 MHz and 2405 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 #: 587595
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:

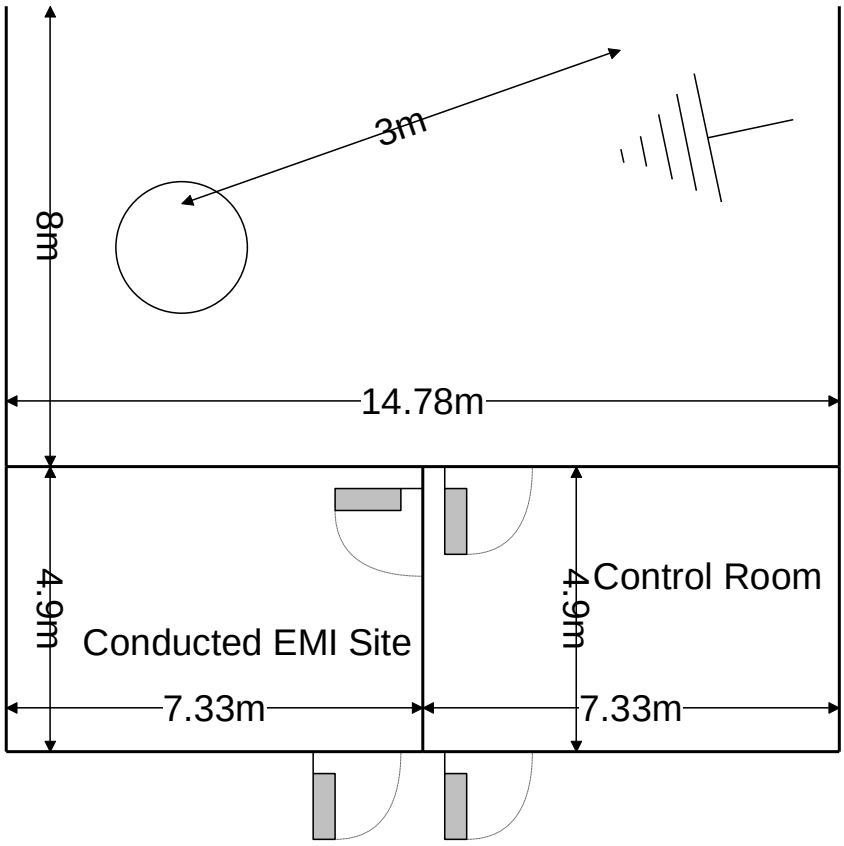


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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:

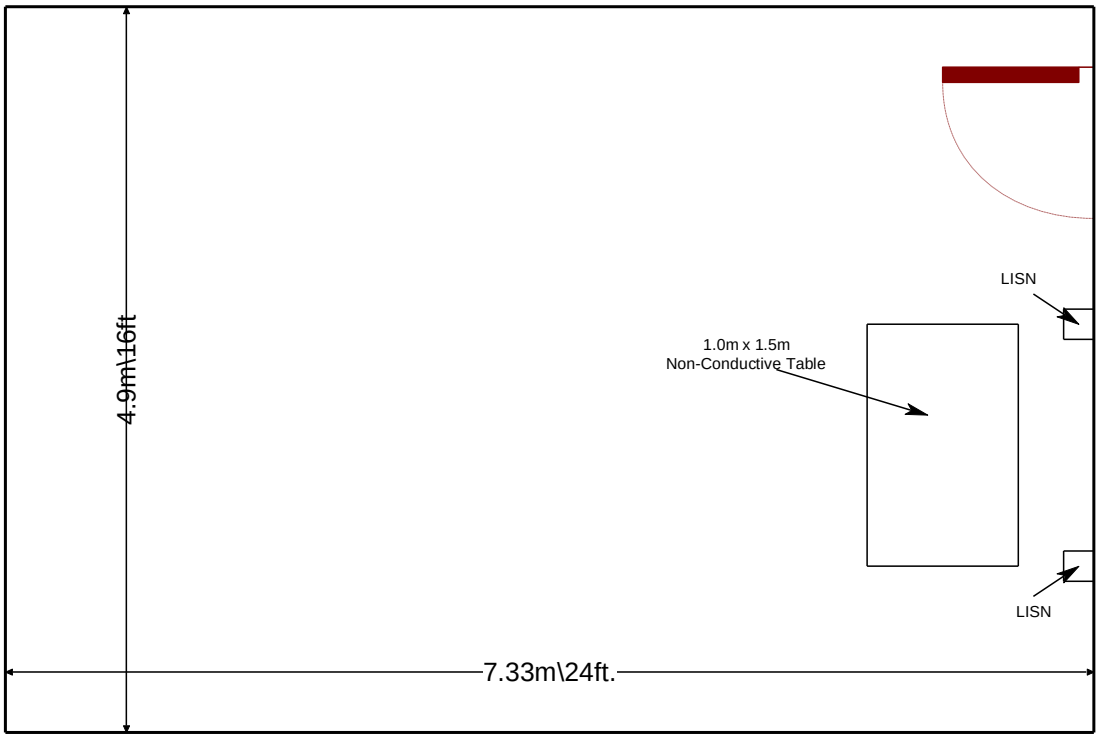


Figure 2.3.2-1: AC Mains Conducted EMI Site

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
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2011
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2011
- 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 Radiocommunication Equipment, Issue 3, Dec 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	1/5/2011	1/5/2013
524	Chase	CBL6111	Antennas	1138	1/7/2011	1/7/2013
78	EMCO	6502	Antennas	9104-2608	1/31/2011	1/31/2013
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	1/3/2011	1/3/2012
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	1/2/2012	1/2/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/7/2011	1/7/2012
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/2/2012	1/2/2013
2022	EMCO	LISN3825/2R	LISN	1095	8/19/2011	8/19/2013
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	1/6/2011	1/6/2012
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	1/2/2012	1/2/2013
2064	CIR Q-TEL	FHT/22-10K-13/50-3A/3A	Filter	9	1/15/2011	1/15/2012
2064	CIR Q-TEL	FHT/22-10K-13/50-3A/3A	Filter	9	12/30/2011	12/30/2012

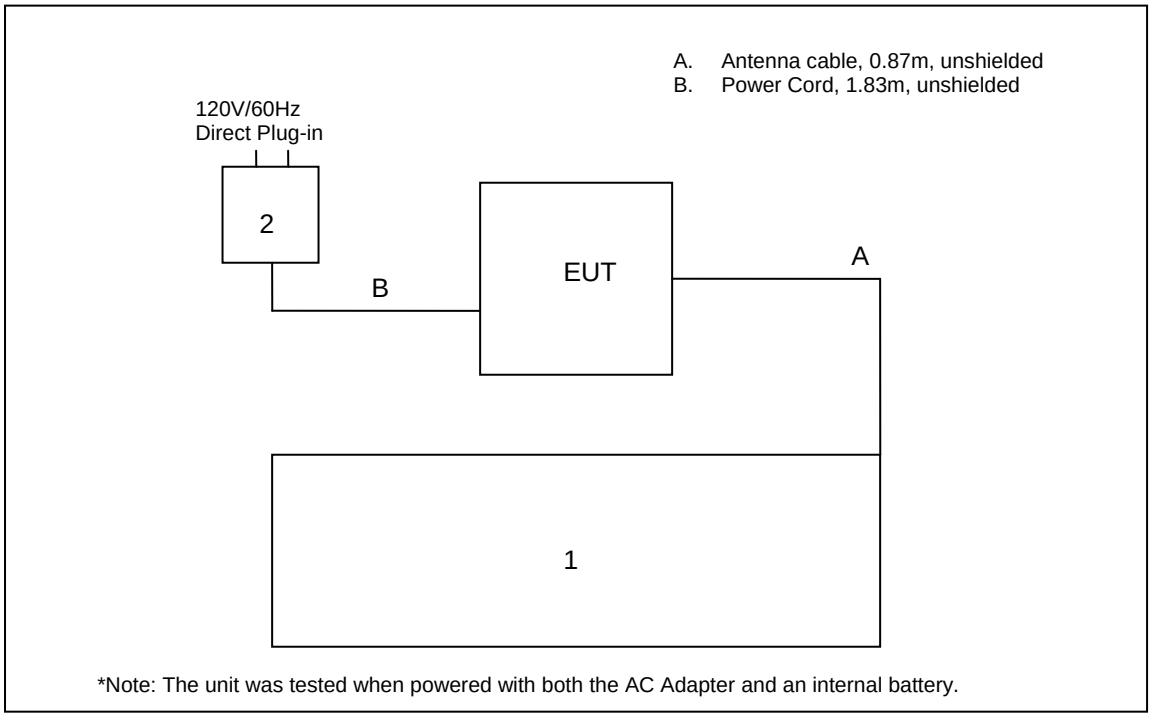
NCR=No Calibration Required

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Bed Mat/Loop Antenna	UltraClenz, LLC	N/A	N/A
2	9VDC AC Adapter	Xicon	109024	0624 NL

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



*Note: The unit was tested when powered with both the AC Adapter and an internal battery.

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 FAS1511-02 uses a coil antenna with a molex connector at the antenna port, thus meeting the requirements of 15.203.

7.2 20dB / 99% Bandwidth: FCC: Section 15.215 / 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 3 times the estimated bandwidth of the emission. The RBW was to ≥ 1% 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 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]
0.125	21.70	21.15

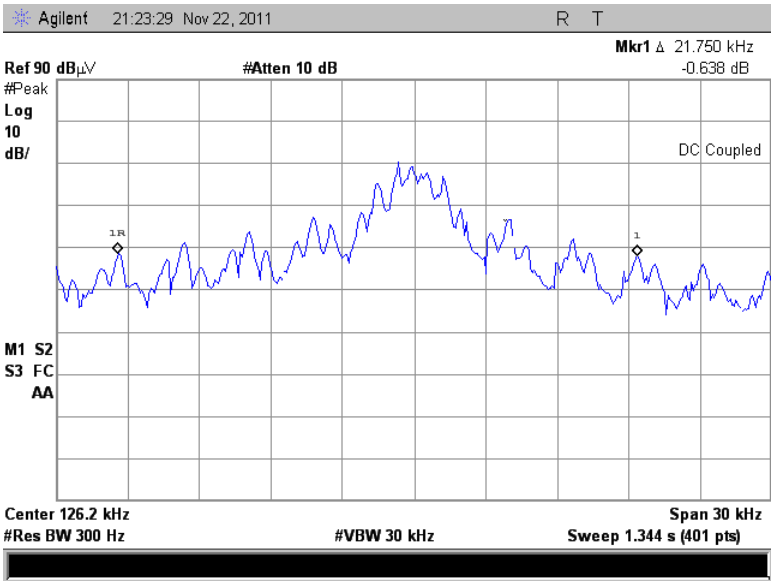


Figure 7.2.2-1: 20dB BW

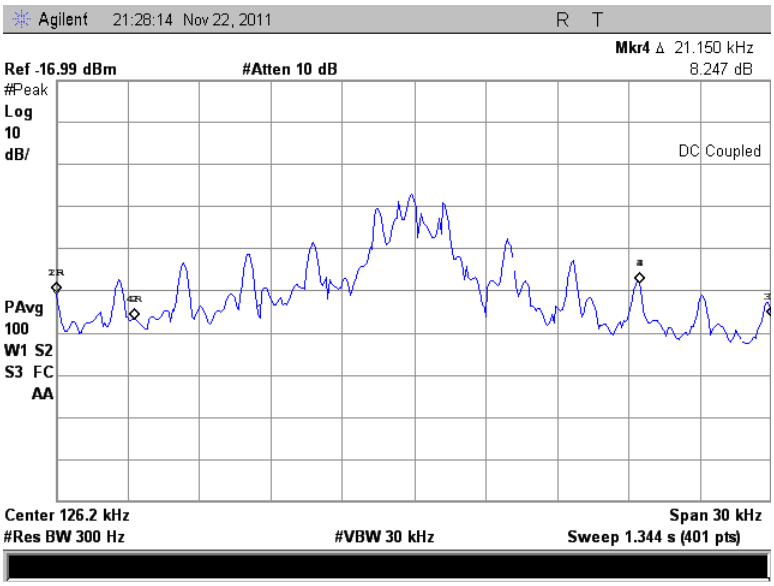


Figure 7.2.2-2: 99% OBW

7.3 Radiated Spurious Emissions – FCC: Section 15.209 / IC: RSS-210 2.5

7.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 100 kHz to 1GHz. Section 15.33(a)(4) specifies, if the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to frequency specified in 15.33(b)(1) for unintentional radiators. The upper frequency range for the digital device is 1000MHz which greater than the 10_{th} harmonic of the fundamental frequency. The upper frequency range measured was 1000MHz.

Measurements below 30MHz were performed in a semi-anechoic chamber with a 3 meter separation distance between the EUT and measurement antenna. The EUT was rotated 360 and the loop antenna rotated about the vertical axis to maximize each emission. The magnetic loop receiving antenna was positioned with its center 1 meter above the ground.

The spectrum analyzer's resolution and video bandwidths were set to 300 Hz and 1000 Hz respectively for frequencies below 150 kHz and 9 kHz and 30 kHz respectively for frequencies above 150 kHz and below 30 MHz. The fundamental levels were measured using a resolution bandwidth of 30 kHz which is greater than the measured emission bandwidth. For measurements in the frequency bands 9-90 kHz and 110-490 kHz, an average detector was used. When average measurements are specified, the peak emissions were also compared to a limit corresponding to 20 dB above the maximum permitted average limit according to Part 15.35. All other emissions were measured using a Quasi-peak detector. The final measurements were then corrected by antenna correction factors and cable loss for comparison to the limits.

Measurements above 30 MHz were performed in a semi-anechoic chamber with a 3 meter separation distance between the EUT and measurement antenna. 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 1000 MHz, quasi-peak measurements were made using a resolution bandwidth (RBW) of 120 kHz and a video bandwidth (VBW) of 300 kHz.

7.3.2 Distance Correction for Measurements Below 30 MHz – Part 15.31

Radiated measurements were performed at a distance closer than 300 meters and 30m as required, according to Part 15.209. Therefore a correction factor was applied to account for propagation loss at the specified distance. The propagation loss was determined by using the square of an inverse linear distance extrapolation factor (40dB/decade) according to 15.31. A sample calculation of the distance correction factor is shown below for limits expressed at a 300m measurement distance and a 30m measurement distance.

Distance correction factor (300m Specified Test Distance) = 40*Log (Test Distance/300)
= 40*Log (3/300)
= - 80 dB

Distance correction factor (30m Specified Test Distance) = 40*Log (Test Distance/30)
= 40*Log (3/30)
= - 40 dB

7.3.3 Measurement Results

Radiated spurious emissions found in the band of 100 kHz to 1GHz are reported in the Table 7.3.3-1 below.

Table 7.3.3-1: Radiated Spurious Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/avg	(H/V)	(dB)	pk	Qpk/avg	pk	Qpk/avg	pk	Qpk/avg
Fundamental Frequency										
0.125	86.54	79.64	V	10.53	97.07	90.17	125.7	105.7	28.63	15.53
Spurious Emissions										
0.25	52.78	41.13	V	10.49	63.27	51.62	119.6	99.6	56.3	48.0
0.375	55.44	43.46	V	10.42	65.86	53.88	116.1	96.1	50.2	42.2
0.625	46.53	43.18	V	10.59	---------	53.77	--------	71.7	---------	17.9
0.875	38.77	34.23	V	10.46	---------	44.69	--------	68.8	---------	24.1
Emissions Above 30 MHz										
31.4201	46.44	45.26	V	-8.71	---------	36.55	--------	40.0	---------	3.5
31.9169	33.65	31.26	H	-8.97	---------	22.29	--------	40.0	---------	17.7
66.4742	46.22	41.29	H	-20.62	---------	20.67	--------	40.0	---------	19.3
86.5471	49.21	42.62	H	-18.43	---------	24.20	--------	40.0	---------	15.8
88.7484	49.35	42.27	V	-18.28	---------	23.98	--------	43.5	---------	19.5
145.291	38.18	32.40	H	-14.69	---------	17.71	--------	43.5	---------	25.8
146.66	40.04	34.04	V	-14.83	---------	19.21	--------	43.5	---------	24.3
148.297	40.40	34.30	V	-14.99	---------	19.31	--------	43.5	---------	24.2
244.24	37.70	34.67	V	-13.67	---------	21.00	--------	46.0	---------	25.0
964.606	25.27	21.73	H	1.94	---------	23.68	--------	54.0	---------	30.3
999.9	26.25	22.02	V	2.41	---------	24.44	--------	54.0	---------	29.6

* Note: The fundamental emission was measured using a RBW of 30 kHz which is greater than the emission bandwidth.

7.3.4 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: 52.78 + 10.49 = 63.27dBµV/m
Margin: 119.6 dBµV/m – 63.27dBµV/m = 56.3dB

Example Calculation: Average
Corrected Level: 41.13 + 10.49 – 0= 51.62dBµV/m
Margin: 99.6 dBµV/m – 51.62dBµV/m = 48.0dB

7.4 Power Line Conducted Emissions – FCC: Section 15.207 / IC: RSS-Gen 7.2.4

7.4.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.4.2 Measurement Results

Results of the test corresponding to the EUT configuration leading to the worse case emissions are shown below in Table 7.4.2-1 and Figure 7.4.2-1 to Figure 7.4.2-2.

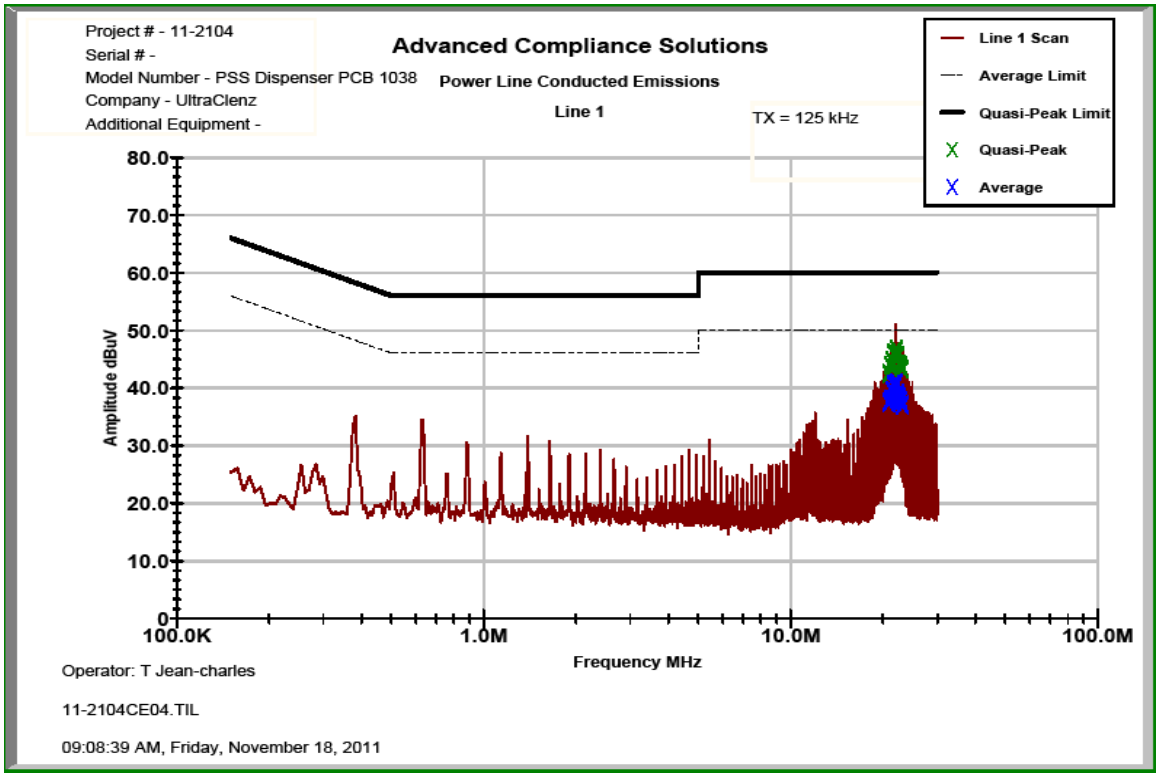


Figure 7.4.2-1: Conducted Emissions Results – Line 1

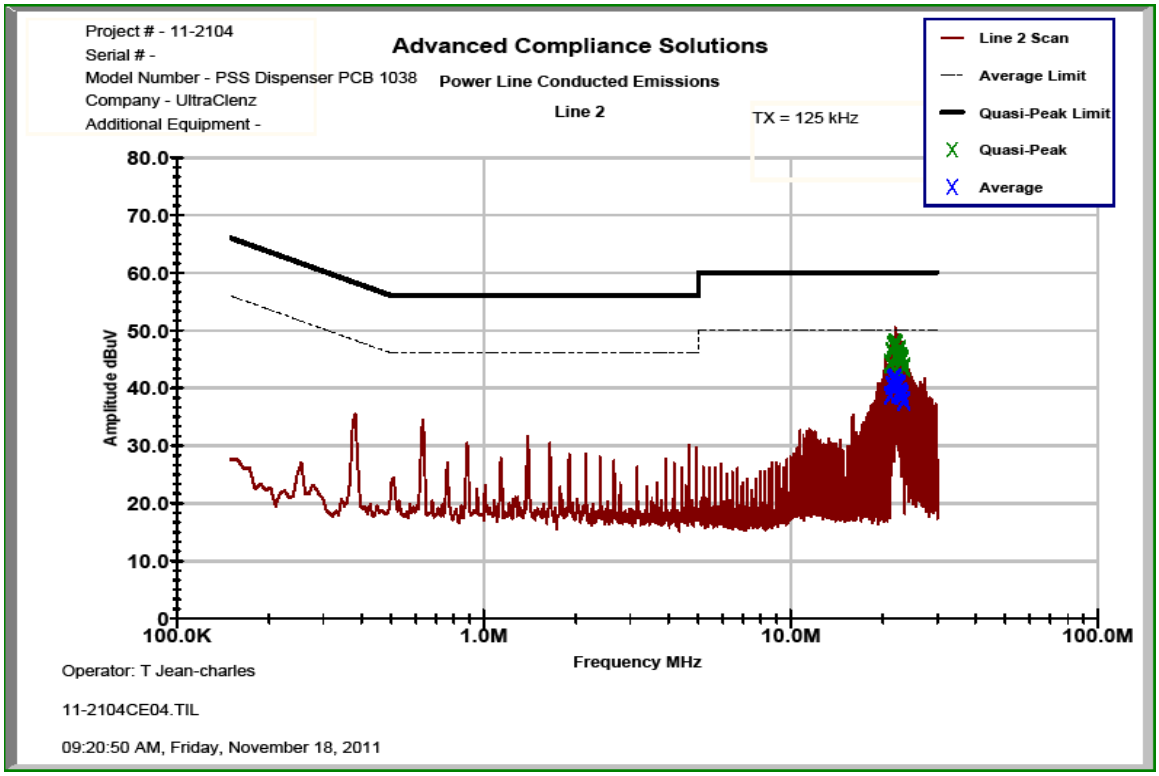


Figure 7.4.2-2: Conducted Emissions Results – Line 2

Table 7.4.2-1: Conducted EMI Results

☒ Line 1 ☒ Line 2 ☐ Line 3 ☐ Line 4
☐ To Ground ☒ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

Plot Number: 11-2104CE04
Power Supply Description: 9 VDC

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
Line 1									
20.829	39.637	34.614	2.72	42.36	37.33	60.00	50.00	17.6	12.7
21.0858	40.924	34.983	2.71	43.64	37.70	60.00	50.00	16.4	12.3
21.3373	41.634	36.537	2.72	44.35	39.25	60.00	50.00	15.7	10.7
21.5849	42.925	37.456	2.72	45.64	40.17	60.00	50.00	14.4	9.8
21.8356	42.704	37.127	2.72	45.42	39.85	60.00	50.00	14.6	10.2
22.0915	43.58	37.783	2.71	46.29	40.50	60.00	50.00	13.7	9.5
22.3466	42.432	35.949	2.72	45.15	38.66	60.00	50.00	14.9	11.3
22.5934	40.958	35.221	2.72	43.68	37.94	60.00	50.00	16.3	12.1
22.8521	40.596	34.634	2.72	43.32	37.35	60.00	50.00	16.7	12.6
23.1012	40.004	33.805	2.71	42.72	36.52	60.00	50.00	17.3	13.5
Line 2									
21.0879	41.186	35.593	2.80	43.98	38.39	60.00	50.00	16.0	11.6
21.336	43.146	37.36	2.80	45.95	40.16	60.00	50.00	14.1	9.8
21.5887	44.199	38.41	2.80	47.00	41.21	60.00	50.00	13.0	8.8
21.8425	44.624	38.568	2.81	47.43	41.38	60.00	50.00	12.6	8.6
22.0927	44.466	37.643	2.80	47.26	40.44	60.00	50.00	12.7	9.6
22.3528	42.548	35.823	2.80	45.35	38.62	60.00	50.00	14.7	11.4
22.6029	43.418	37.396	2.80	46.22	40.20	60.00	50.00	13.8	9.8
22.8559	42.204	36.075	2.81	45.01	38.88	60.00	50.00	15.0	11.1
23.1041	41.63	35.51	2.80	44.43	38.31	60.00	50.00	15.6	11.7
23.3601	40.3	34.425	2.80	43.10	37.23	60.00	50.00	16.9	12.8

8 CONCLUSION

In the opinion of ACS, Inc. the FAS1511-02, manufactured by UltraClenz, LLC meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT