Excellence in Compliance Testing

Certification Test Report

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

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

ACS Report Number: 11-2104.W06.1B

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.

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This report contains 16 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 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 433MHz 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
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 2.4 GHz radio. Preliminary evaluation 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 or through an AC to DC adapter. 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 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 #: 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:

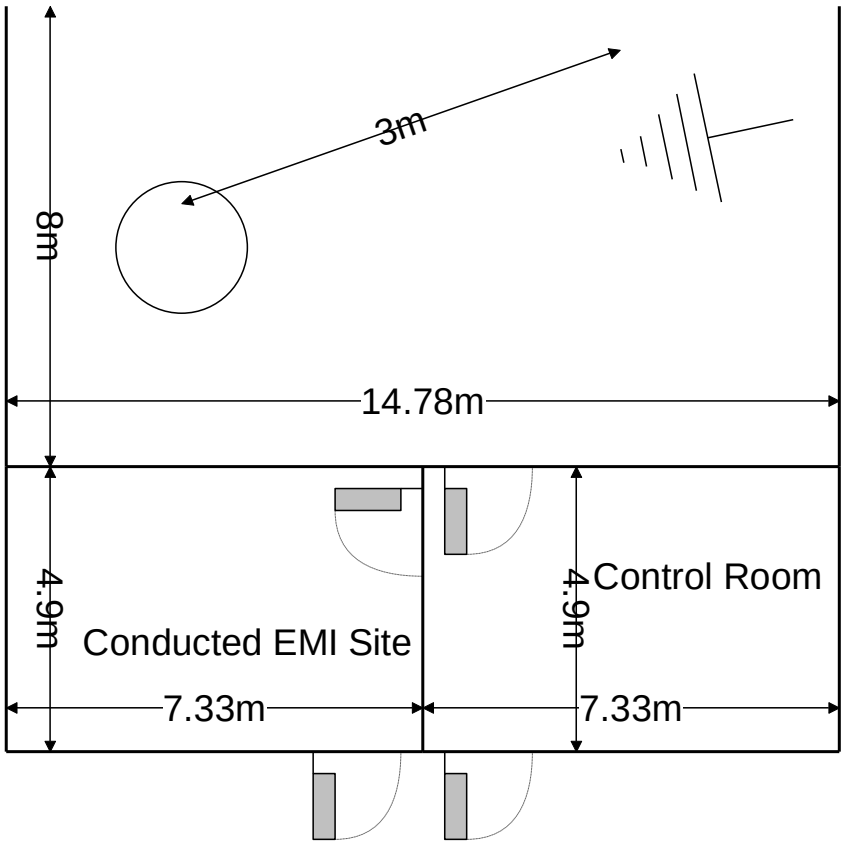


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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:

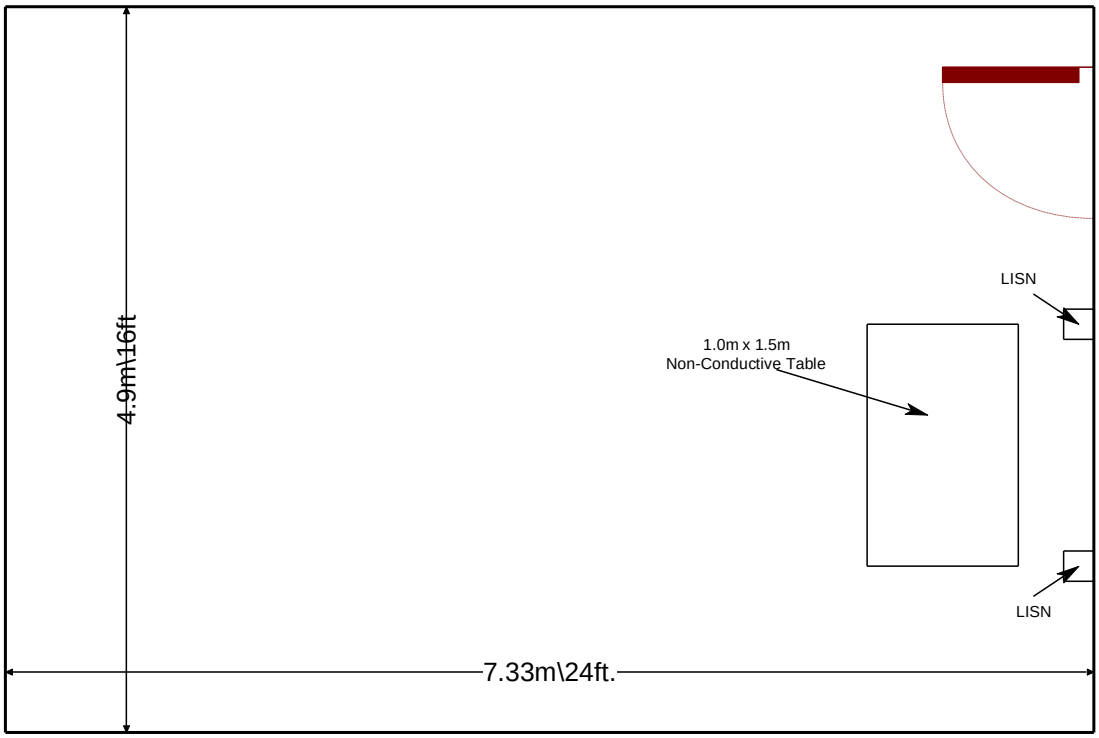


Figure 2.3.2-1: AC Mains Conducted EMI Site

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
2006	EMCO	3115	Antennas	2573	3/2/2011	3/2/2013
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
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
2044	QMI	N/A	Cables	2044	1/7/2011	1/7/2012
2044	QMI	N/A	Cables	2044	1/2/2012	1/2/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	2/2/2011	2/2/2012
2076	Hewlett Packard	HP5061-5458	Cables	2076	1/2/2012	1/2/2013
RE586	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00168	9/23/2011	9/23/2012
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

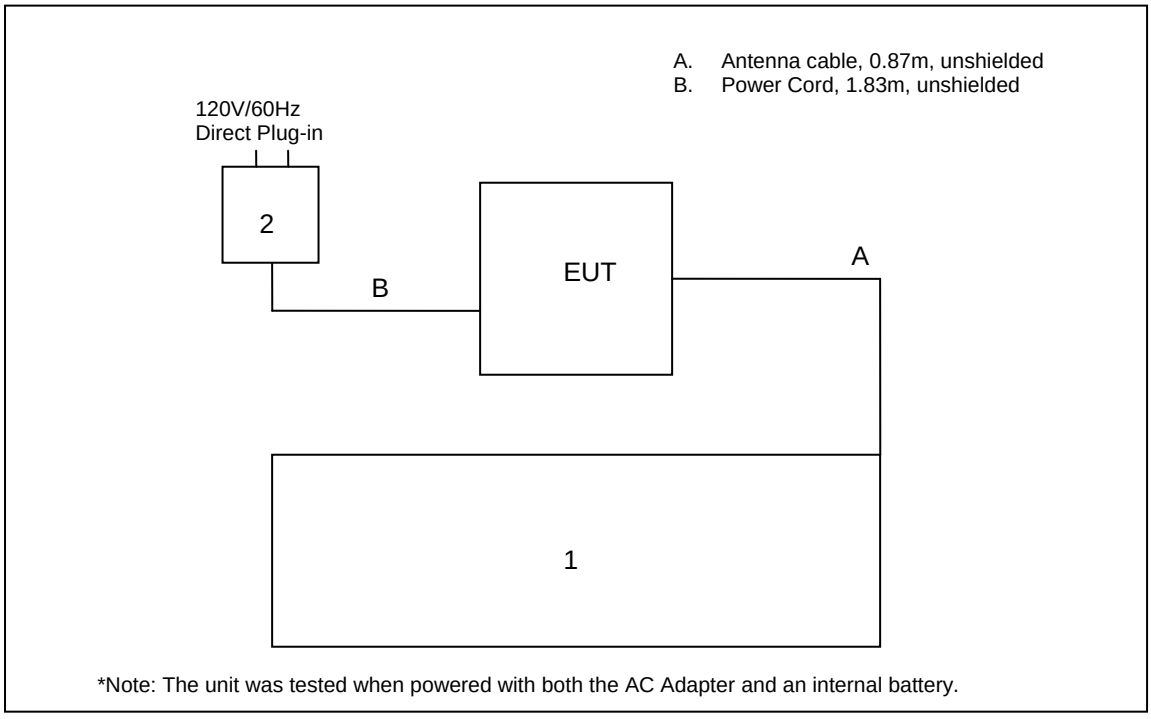
NCR=No Calibration Required

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 internal 6.3 dBi PCB inverted-F antenna, thus meeting the requirements of 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 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]
2405	2362.5	2400

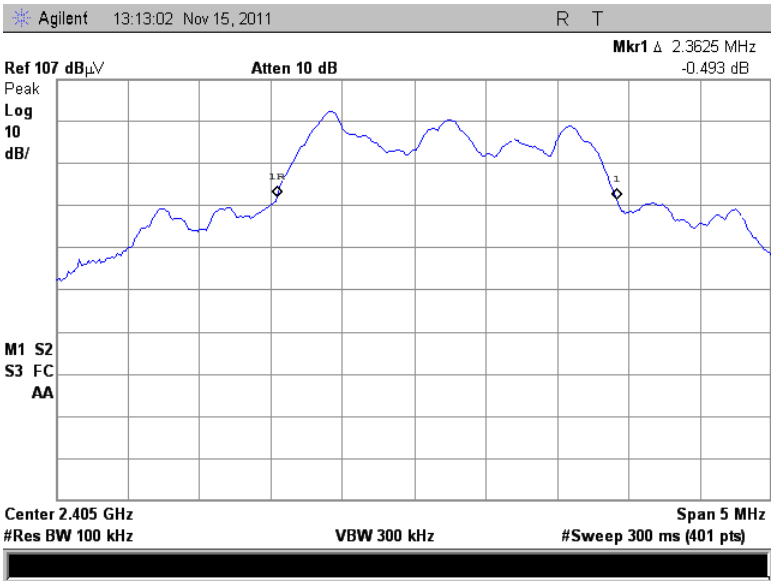


Figure 7.2.2-1: 20dB BW

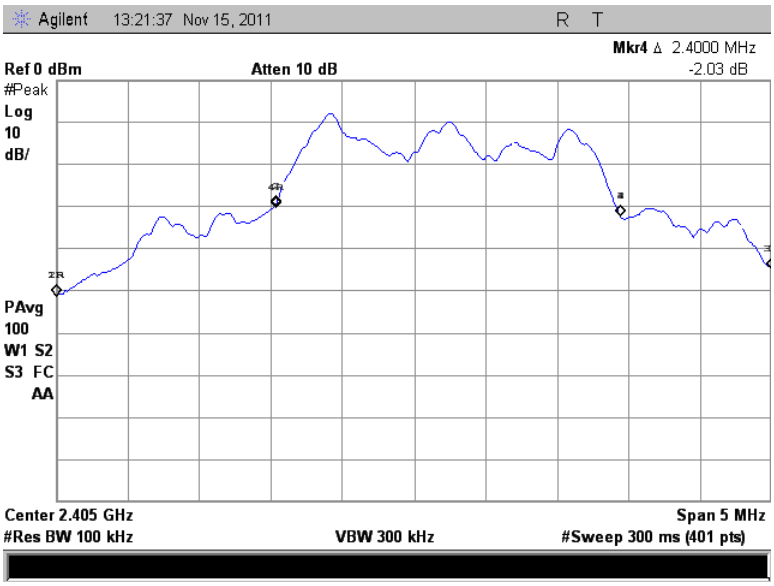


Figure 7.2.2-2: 99% OBW

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	95.82	95.82	H	-10.25	85.57	42.72	114	94	28.4	51.3
2405	100.10	100.10	V	-10.25	89.85	47.00	114	94	24.1	47
Spurious Emissions										
2388.4	64.00	64.00	H	-10.32	53.68	10.83	74	54	20.30	43.20
2388.5	67.52	67.52	V	-10.32	57.20	14.35	74	54	16.80	39.60
2390	64.55	64.55	H	-10.31	54.24	11.39	74	54	19.80	42.60
2390	68.50	68.50	V	-10.31	58.19	15.34	74	54	15.80	38.70
2400	59.52	59.52	H	-10.27	49.25	6.40	74	54	24.70	47.60
2400	63.33	63.33	V	-10.27	53.06	10.21	74	54	20.90	43.80
2420.4	68.87	68.87	V	-10.18	58.69	15.83	74	54	15.30	38.20
2420.5	64.95	64.95	H	-10.18	54.77	11.91	74	54	19.20	42.10
2422	63.49	63.49	H	-10.18	53.31	10.46	74	54	20.70	43.50
2422	67.04	67.04	V	-10.18	56.86	14.01	74	54	17.10	40.00
4810	48.12	48.12	H	-2.74	45.38	2.53	74	54	28.60	51.50

* 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.

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
Corrected Level: 48.12 + (-2.74) = 45.38dBµV/m
Margin: 74dBuV/m – 45.38dBµV/m = 28.6dB

Example Calculation: Average
Corrected Level: 48.12 + (-2.74) – 42.85= 2.53dBµV
Margin: 54dBuV – 2.53dBµV = 51.5dB

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.

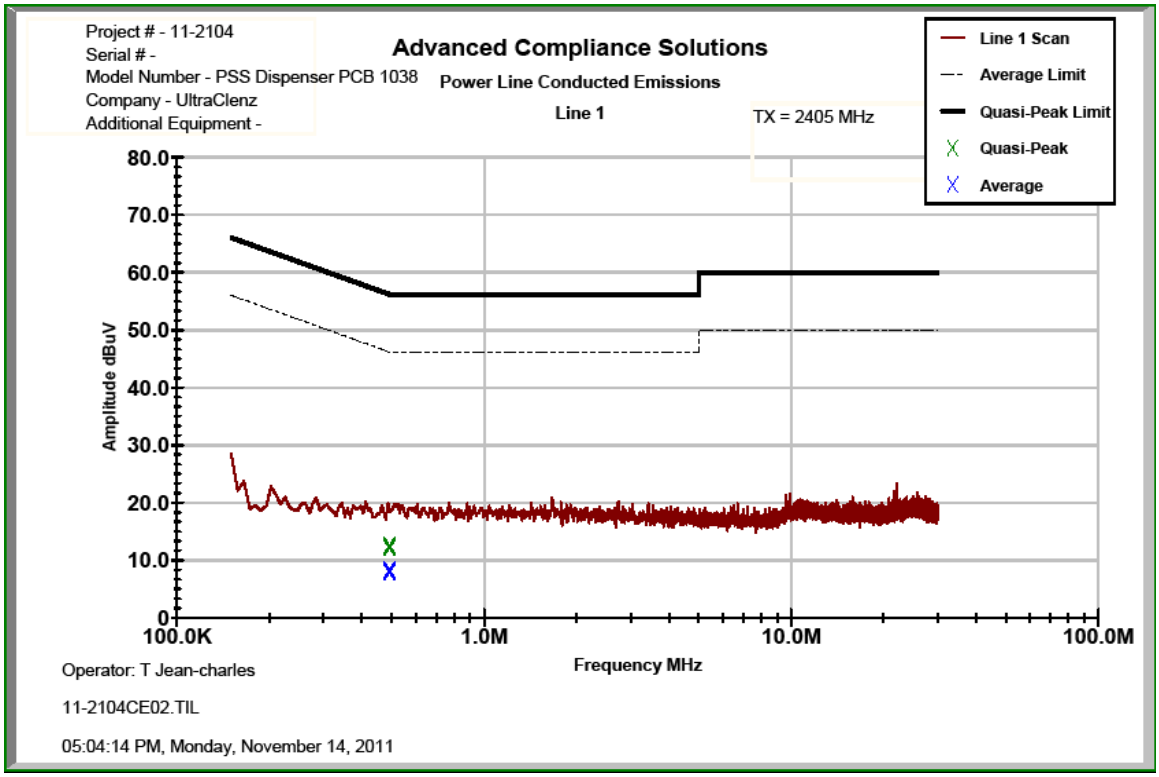


Figure 7.4.2-1: Conducted Emissions Results – Line 1

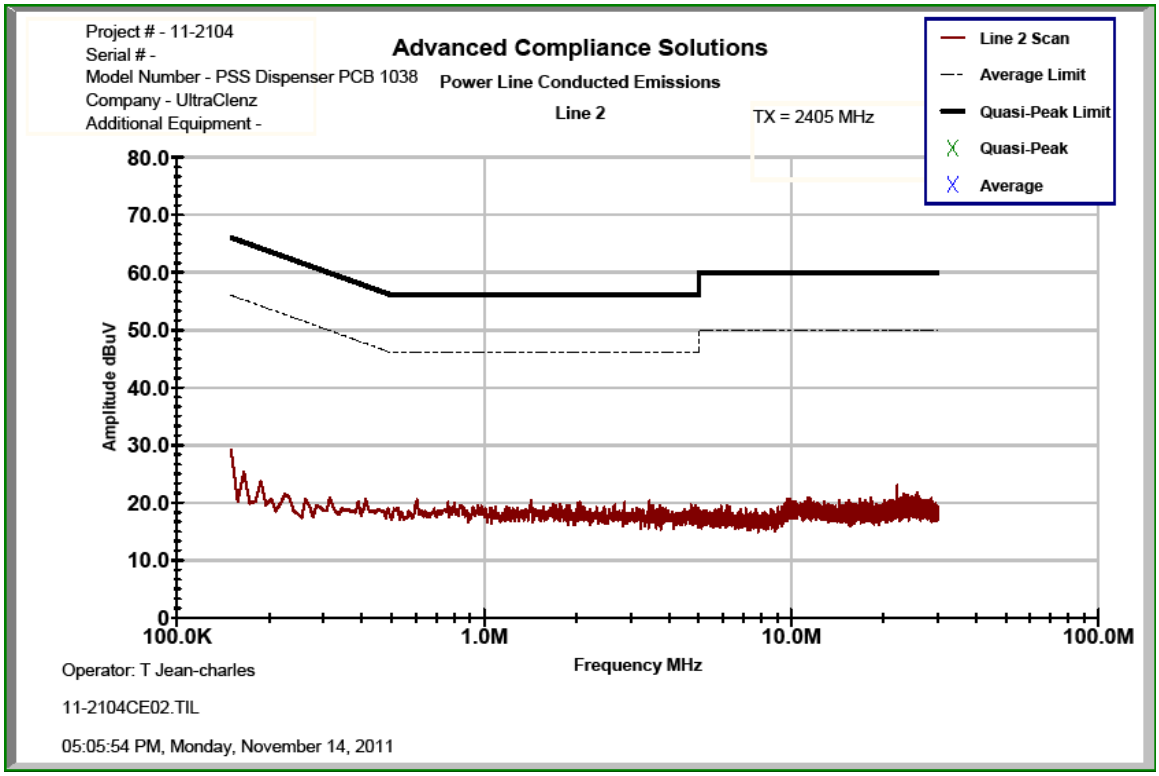


Figure 7.4.2-2: Conducted Emissions Results – Line 2

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: 11-2104CE02
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									
0.150005	20.713	11.075	2.27	22.99	13.35	66.00	56.00	43.0	42.7
0.49145	11.978	7.752	0.59	12.56	8.34	56.14	46.14	43.6	37.8
4.99845	9.705	5.595	0.59	10.29	6.18	56.00	46.00	45.7	39.8
5.00565	9.737	5.496	0.57	10.31	6.07	60.00	50.00	49.7	43.9
10.2619	7.533	3.362	2.85	10.38	6.21	60.00	50.00	49.6	43.8
22.2205	13.509	11.84	2.71	16.22	14.55	60.00	50.00	43.8	35.4
23.4047	7.11	3.147	2.72	9.83	5.86	60.00	50.00	50.2	44.1
Line 2									
0.150293	22.51	10.967	2.36	24.87	13.33	65.98	55.98	41.1	42.7
0.505299	12.088	7.922	0.59	12.68	8.51	55.91	45.91	43.2	37.4
4.99805	9.709	5.608	0.66	10.37	6.27	56.00	46.00	45.6	39.7
5.00725	9.807	5.55	0.67	10.47	6.22	60.00	50.00	49.5	43.8
22.2238	15.224	13.685	2.80	18.02	16.49	60.00	50.00	42.0	33.5

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