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Certification Test Report

FCC ID: R7PNG0R1S1
IC: 5294A-NG0R1S1

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Report Number: 12-0529.W04.1A

Manufacturer: Landis+Gyr Technology, Inc.
Model: Utilinet, Modular SCADA/DA

Test Begin Date: December 13, 2012
Test End Date: December 21, 2012

Report Issue Date: March 13, 2013

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

Reviewed by:
Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 18 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 Certification for a Class II Permissive Change.

The reason for this Class II Permissive Change is the addition of an inter-stage SAW filter for spurious emission reduction.

1.2 Product description

The UtiliNet SCADA Single Board Radio (UtiliNet SBR) is for use by OEM vendors wanting to incorporate the UtiliNet SBR capability within their SCADA/DA and metering products.

The UtiliNet SBR is a self-contained 100 mW Integrated WanGate Radio (IWR) which includes voltage regulation, micro-processor, radio transmitter and receiver.

Technical Details:

Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Data Rates Supported (kbps)
902.1 - 927.9	240	100	9.6

Modulation Format: FSK
Antenna Type / Gain: Whip / 5 dBi (MMG (Manufacturer's Marketing Group) P/N 16-1000-0
Operating Voltage: 5VDC
RF Connector: MCX

Manufacturer Information:
Landis+Gyr Technology, Inc.
30000 Mill Creek Ave., Suite 100
Alpharetta, GA 30022

EUT Serial Numbers: 91510DF9

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

The UtiliNet, Modular SCADA/DA was originally approved with two different board variations, one with a connector for an external antenna and the other with an integral PCB antenna. This permissive change is applicable to the variant with the external antenna connector only. The grantee has declared the internal antenna variant obsolete.

The EUT was tested in multiple orientations for radiated emissions and worst case data presented in this report where applicable.

Only characteristics potentially affected by the EUT modifications for this permissive change were reported. Characteristics not degraded or potentially affected by the change are not included in this report (e.g. number of hopping channels, channel separation, channel dwell time).

Software power setting during test: 80

2 TEST FACILITIES

2.1 Location

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

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 511277
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 – 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 – 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

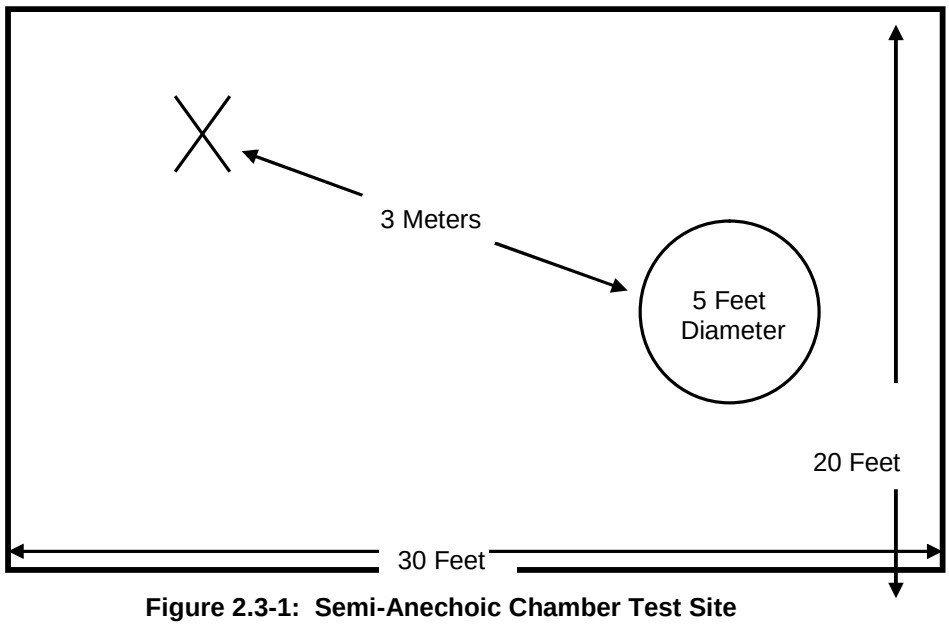

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 – 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 – 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

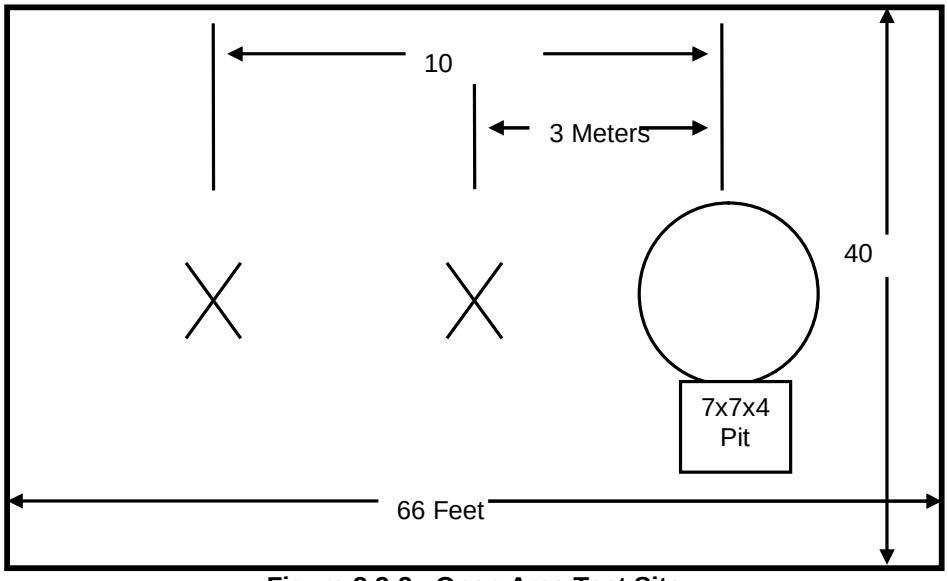

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal ground reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 2.4-1:

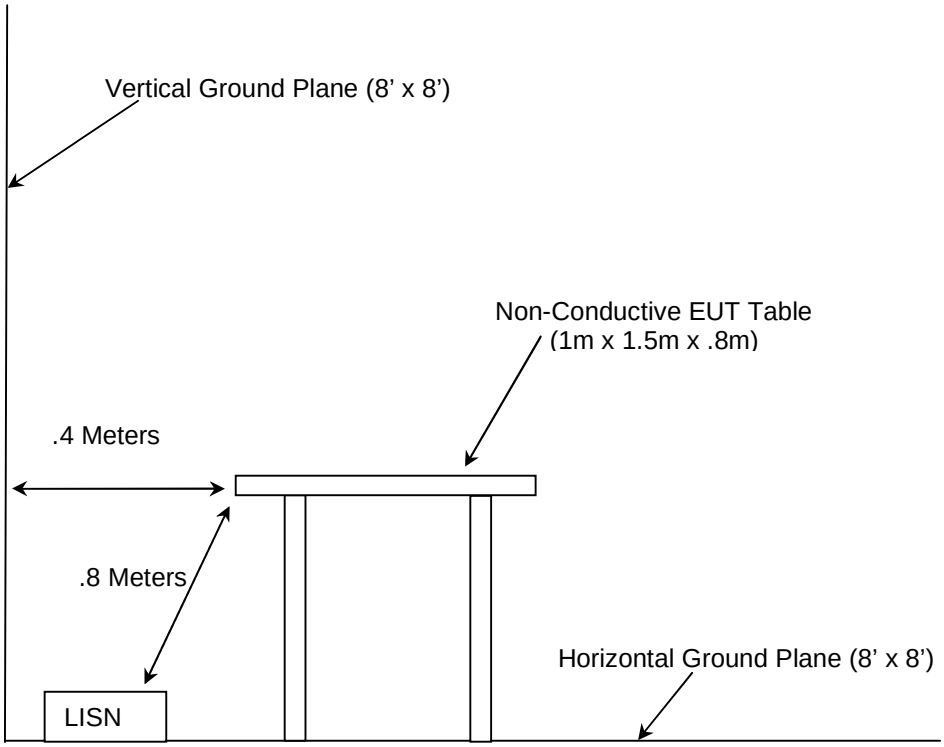

Figure 2.4-1: AC Mains Conducted EMI Site

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, 2012
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2012
- FCC Public Notice DA 00-705 – Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000
- 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, 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
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	8/2/2012	8/2/2014
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	8/2/2012	8/2/2014
30	Spectrum Technologies	DRH-0118	Antennas	970102	4/27/2011	4/27/2013
40	EMCO	3104	Antennas	3211	2/11/2011	2/11/2013
73	Agilent	8447D	Amplifiers	2727A05624	9/28/2012	9/28/2013
167	ACS	Chamber EMI Cable Set	Cable Set	167	12/21/2011	12/21/2012
167	ACS	Chamber EMI Cable Set	Cable Set	167	12/17/2012	12/17/2013
267	Agilent	N1911A	Meters	MY45100129	1/23/2012	1/23/2014
268	Agilent	N1921A	Sensors	MY45240184	1/17/2012	1/17/2014
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/1/2012	8/1/2013
291	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	None	11/20/2012	11/20/2013
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	4/2/2012	4/2/2013
337	Microwave Circuits	H1G513G1	Filters	282706	7/2/2012	7/2/2013
338	Hewlett Packard	8449B	Amplifiers	3008A01111	8/2/2012	8/2/2013
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	8/2/2012	8/2/2013
412	Electro Metrics	LPA-25	Antennas	1241	7/27/2012	7/27/2014
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	11/20/2012	11/20/2013

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	DC Bench Power Supply	Hewlett Packard	E3630A	KR64308603

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

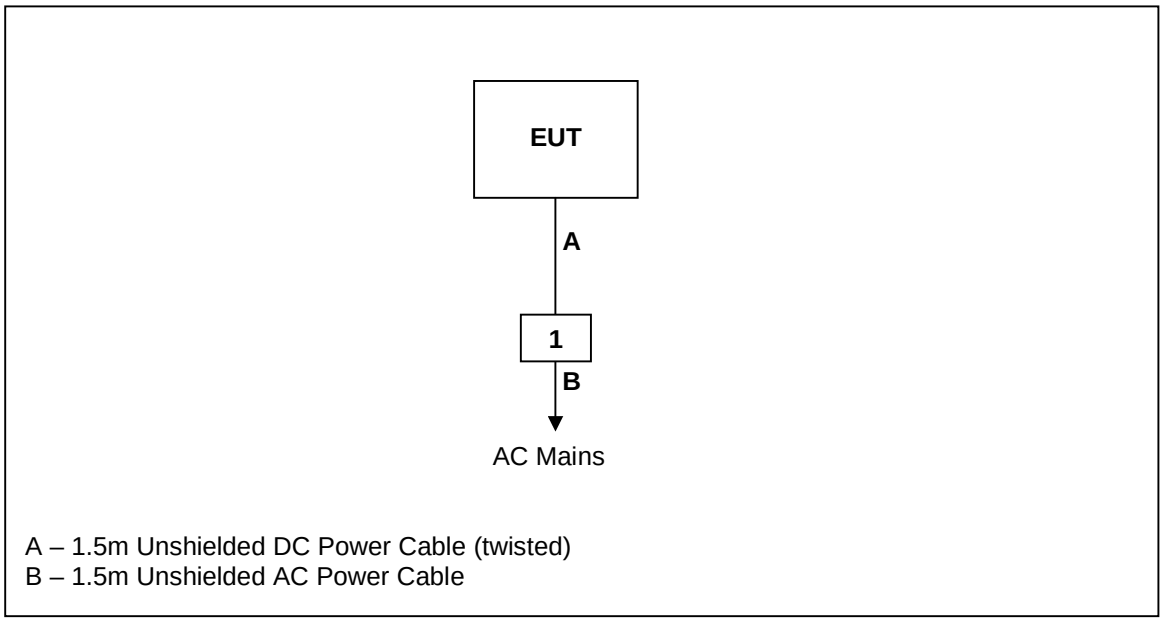

Figure 6-1: Test Setup Block Diagram

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 utilizes an on board MCX female coaxial RF connector, and therefore meets the requirements of Section 15.203.

7.2 Peak Output Power - FCC Section 15.247(b)(2) IC: RSS-210 A8.4(1)

7.2.1 Measurement Procedure (Conducted Method)

The RF output port of the EUT was directly connected to the input of a power meter. The device employs >50 channels therefore the power is limited to 1 Watt.

7.2.2 Measurement Results

Results are shown below in Table 7.2.2-1 below:

Table 7.2.2-1: RF Output Power

Frequency [MHz]	Level [dBm]
902.1	21.32
915.0	21.58
927.9	19.43

7.3 20dB / 99% Bandwidth - FCC: Section 15.247(a)(1)(i) IC: RSS-210 A8.1(c)

7.3.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The span of the spectrum analyzer display was set between two times and five times the occupied bandwidth (OBW) of the emission. The RBW of the spectrum analyzer was set to approximately 1 % to 5 % of the OBW. 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 and side bands. The RBW was to ~ 1% of the span. The trace was set to max hold with a sample detector. The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth.

7.3.2 Measurement Results

Results are shown below in Table 7.3.2-1 and Figures 7.3.2-1 through 7.3.2-6.

Table 7.3.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]
902.1	23.5	22.3
915.0	22.8	21.5
927.9	23.8	22.3

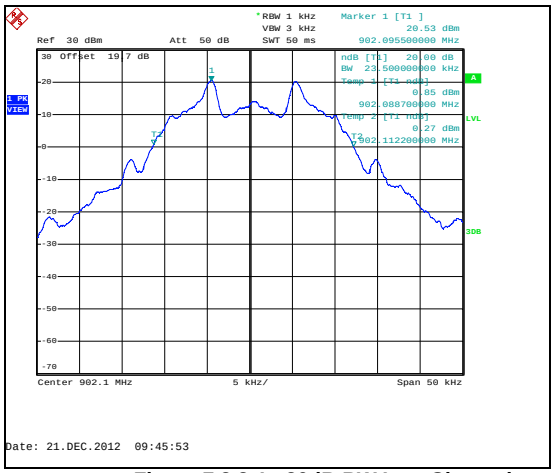

Figure 7.3.2-1: 20dB BW Low Channel

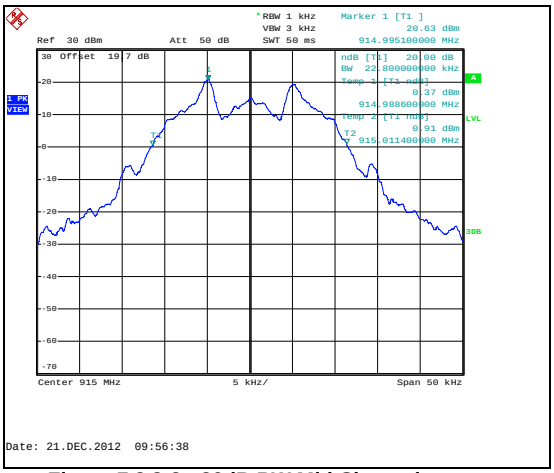

Figure 7.3.2-2: 20dB BW Mid Channel

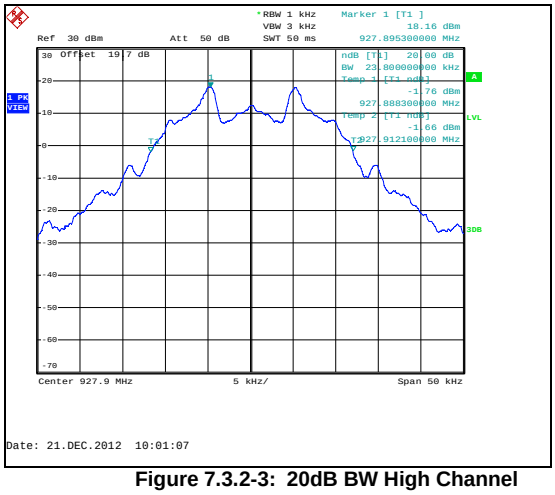

Figure 7.3.2-3: 20dB BW High Channel

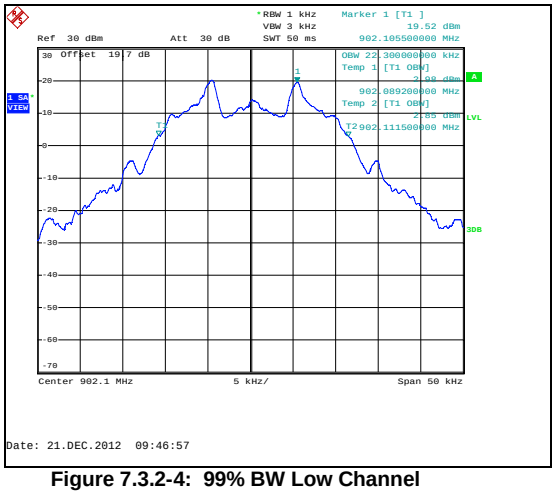

Figure 7.3.2-4: 99% BW Low Channel

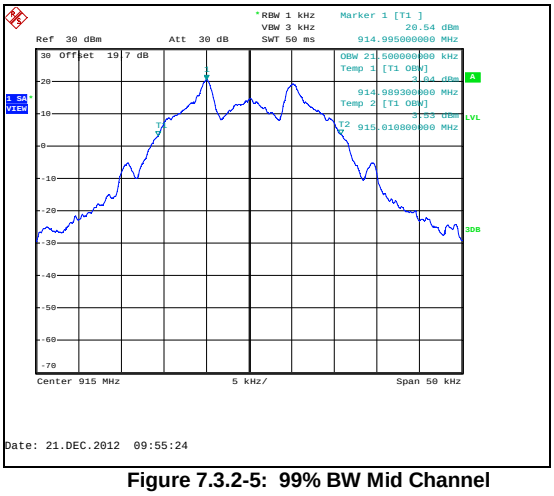

Figure 7.3.2-5: 99% BW Mid Channel

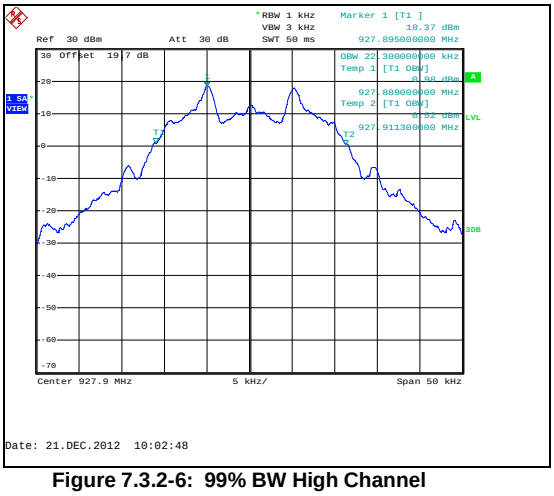

Figure 7.3.2-6: 99% BW High Channel

7.4 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC: RSS-210 A8.5

7.4.1 Band-Edge Compliance of RF Conducted Emissions

7.4.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement the spectrum analyzer's RBW was set to ≥ 1% of the span, and the VBW was set to >> RBW.

7.4.1.2 Measurement Results

Results are shown in the figures 7.4.1.2-1 to 7.4.1.2-4 below.

NON-HOPPING MODE:

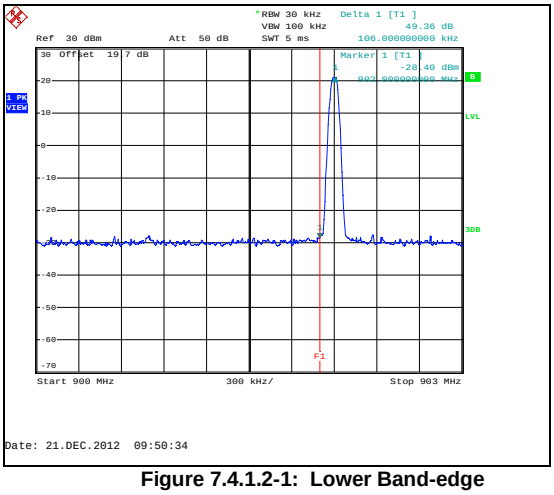

Figure 7.4.1.2-1: Lower Band-edge

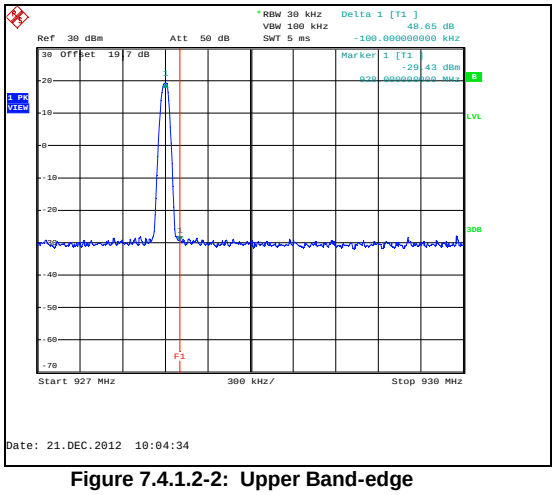

Figure 7.4.1.2-2: Upper Band-edge

HOPPING MODE:

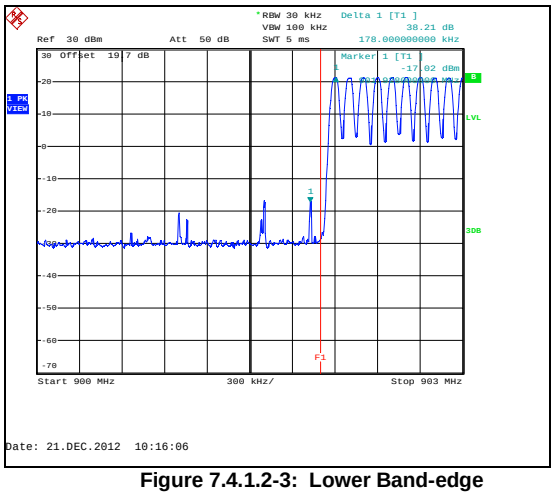

Figure 7.4.1.2-3: Lower Band-edge

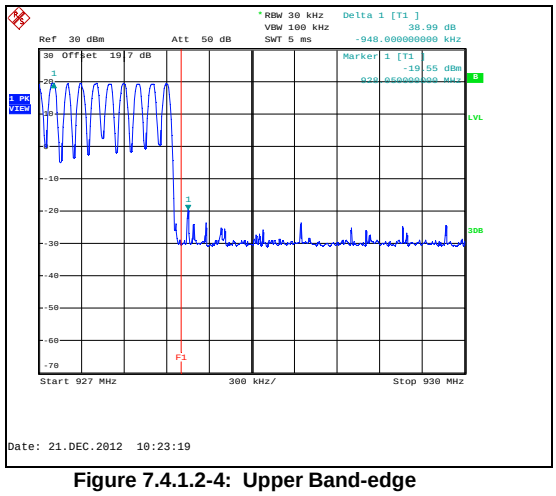

Figure 7.4.1.2-4: Upper Band-edge

7.4.2 RF Conducted Spurious Emissions

7.4.2.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 10GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100kHz. A peak detector function was used with the trace set to max hold.

7.4.2.2 Measurement Results

Results are shown below in Figures 7.4.2.2-1 to 7.4.2.2-6:

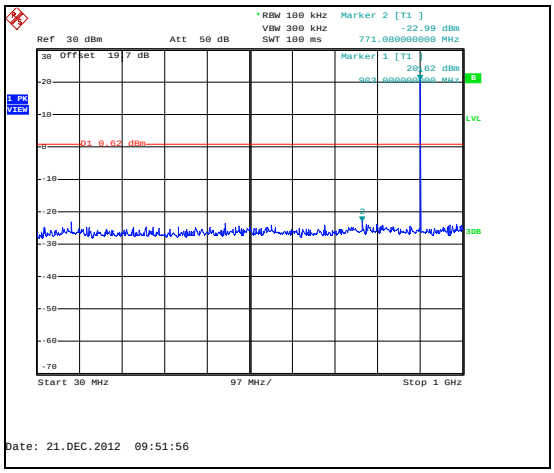

Figure 7.5.2.2-1: 30 MHz – 1 GHz – Low Channel

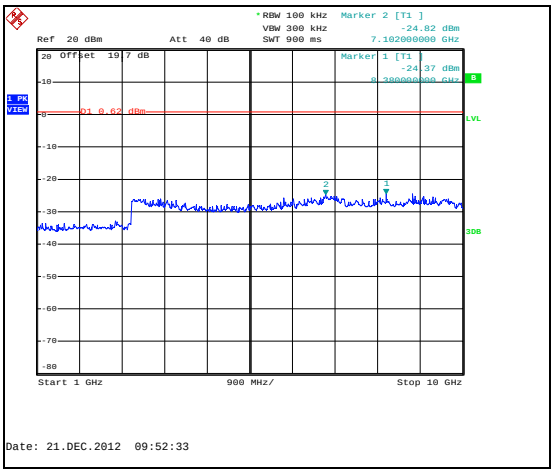

Figure 7.5.2.2-2: 1 GHz – 10 GHz – Low Channel

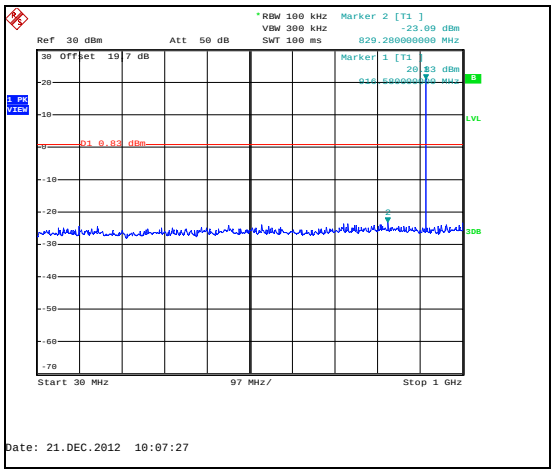

Figure 7.5.2.2-3: 30 MHz – 1 GHz –Mid Channel

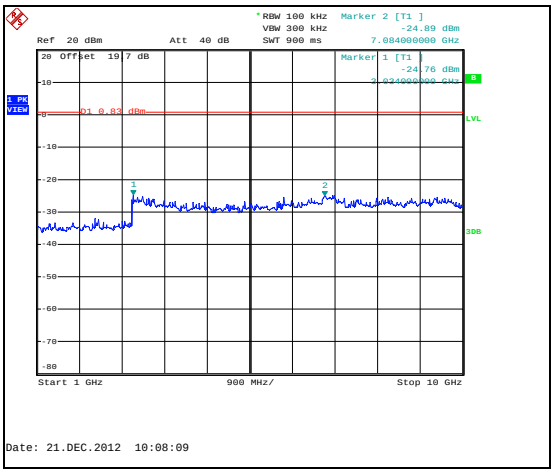

Figure 7.5.2.2-4: 1 GHz – 10 GHz – Mid Channel

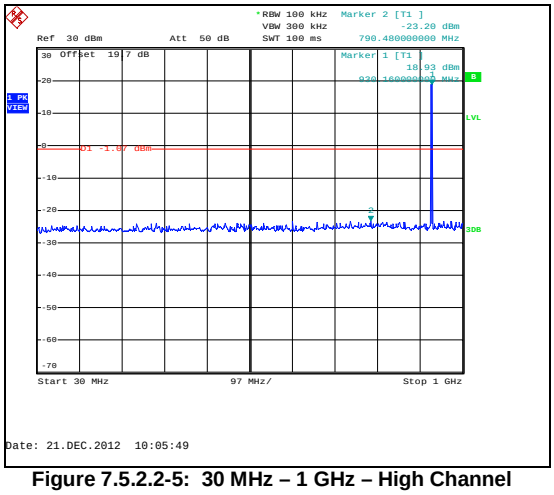

Figure 7.5.2.2-5: 30 MHz – 1 GHz – High Channel

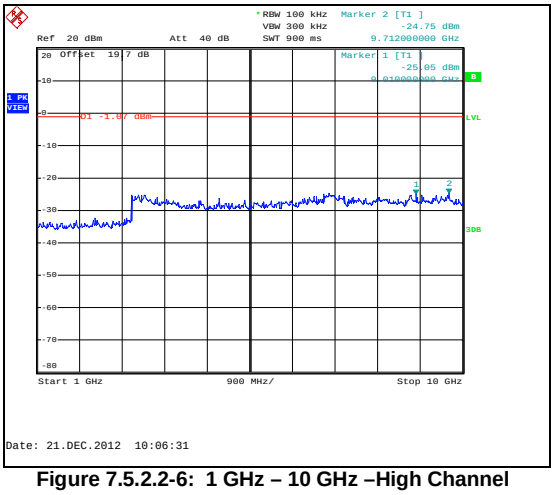

Figure 7.5.2.2-6: 1 GHz – 10 GHz –High Channel

7.4.3 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.6

7.4.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 10GHz, 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 were made with RBW and VBW of 1 MHz and 3MHz respectively.

The EUT was caused to generate a continuous modulated carrier on the hopping channel.

Each emission found to be in a restricted band was compared to the applicable radiated emission limits.

7.4.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in the Tables 7.4.3.2-1 to 7.4.3.2-3 below.

Table 7.4.3.2-1: Radiated Spurious Emissions Tabulated Data – X Position

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
Low Channel										
961	---------	39.56	H	1.49	---------	41.05	--------	54.0	---------	13.0
961	---------	45.39	V	1.49	---------	46.88	--------	54.0	---------	7.1
2706.3	48.21	40.52	H	-3.68	44.53	36.84	74.0	54.0	29.5	17.2
2706.3	48.51	40.06	V	-3.68	44.83	36.38	74.0	54.0	29.2	17.6
Middle Channel										
973.97	---------	38.88	H	1.56	---------	40.44	--------	54.0	---------	13.6
973.97	---------	42.28	V	1.56	---------	43.84	--------	54.0	---------	10.2
2745	47.07	37.04	V	-3.56	43.51	33.48	74.0	54.0	30.5	20.5
7320	47.19	40.01	H	7.74	54.93	47.75	74.0	54.0	19.1	6.3
7320	47.04	40.21	V	7.74	54.78	47.95	74.0	54.0	19.2	6.1
High Channel										
986.86	---------	35.96	H	1.87	---------	37.83	--------	54.0	---------	16.2
986.86	---------	41.29	V	1.87	---------	43.16	--------	54.0	---------	10.8
979.5	---------	32.96	H	1.78	---------	34.74	--------	54.0	---------	19.3
979.5	---------	39.38	V	1.78	---------	41.16	--------	54.0	---------	12.8

Table 7.4.3.2-2: Radiated Spurious Emissions Tabulated Data – Y Position

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
Low Channel										
961	---------	40.45	H	1.49	---------	41.94	--------	54.0	---------	12.1
961	---------	46.37	V	1.49	---------	47.86	--------	54.0	---------	6.1
2706.3	48.62	41.10	H	-3.68	44.94	37.42	74.0	54.0	29.1	16.6
2706.3	50.72	45.06	V	-3.68	47.04	41.38	74.0	54.0	27.0	12.6
3608.4	48.17	38.08	H	-0.49	47.68	37.59	74.0	54.0	26.3	16.4
Middle Channel										
973.96	---------	38.52	H	1.56	---------	40.08	--------	54.0	---------	13.9
973.96	---------	42.58	V	1.56	---------	44.14	--------	54.0	---------	9.9
2745	48.51	40.44	H	-3.56	44.95	36.88	74.0	54.0	29.0	17.1
2745	48.01	40.74	V	-3.56	44.45	37.18	74.0	54.0	29.5	16.8
3660	47.27	37.75	H	-0.25	47.02	37.50	74.0	54.0	27.0	16.5
7320	47.32	40.85	H	7.74	55.06	48.59	74.0	54.0	18.9	5.4
High Channel										
979.5	---------	33.24	H	1.78	---------	35.02	--------	54.0	---------	19.0
979.5	---------	38.45	V	1.78	---------	40.23	--------	54.0	---------	13.8
986.86	---------	35.02	H	1.87	---------	36.89	--------	54.0	---------	17.1
986.86	---------	41.39	V	1.87	---------	43.26	--------	54.0	---------	10.7

Table 7.4.3.2-3: Radiated Spurious Emissions Tabulated Data – Z Position

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
Low Channel										
961	---------	40.71	H	1.49	---------	42.20	--------	54.0	---------	11.8
961	---------	45.56	V	1.49	---------	47.05	--------	54.0	---------	7.0
2706.3	47.17	36.35	H	-3.68	43.49	32.67	74.0	54.0	30.5	21.3
2706.3	49.02	41.28	V	-3.68	45.34	37.60	74.0	54.0	28.7	16.4
Middle Channel										
973.96	---------	40.30	H	1.56	---------	41.86	--------	54.0	---------	12.1
973.96	---------	41.29	V	1.56	---------	42.85	--------	54.0	---------	11.2
2745	46.41	36.15	H	-3.56	42.85	32.59	74.0	54.0	31.1	21.4
2745	47.52	38.56	V	-3.56	43.96	35.00	74.0	54.0	30.0	19.0
7320	46.01	37.39	H	7.74	53.75	45.13	74.0	54.0	20.3	8.9
High Channel										
986.86	---------	35.50	H	1.87	---------	37.37	--------	54.0	---------	16.6
986.86	---------	41.52	V	1.87	---------	43.39	--------	54.0	---------	10.6
2783.7	49.06	41.84	V	-3.43	45.63	38.41	74.0	54.0	28.4	15.6

7.4.3.3 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: 48.21 - 3.68 = 44.53dBuV/m
Margin: 74dBuV/m – 44.53dBuV/m = 29.5dB

Example Calculation: Average

Corrected Level: 40.52 - 3.68 - 0 = 36.84dBuV
Margin: 54dBuV – 36.84dBuV = 17.2dB

8 CONCLUSION

In the opinion of ACS, Inc. Utilinet, Modular SCADA/DA, manufactured by Landis+Gyr Technology, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210 as applicable to this Class II Permissive Change.

END REPORT