Excellence in Compliance Testing

Certification Test Report

FCC ID: R7PEG1R1S2

FCC Rule Part: 15.247

ACS Report Number: 14-0226.W04.1B

Manufacturer: Landis+Gyr Technology, Inc.
Model: Gridstream Focus AX Integrated, High-Speed, External Antenna

Test Begin Date: June 5, 2014
Test End Date: June 26, 2014

Report Issue Date: June 27, 2014

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 13 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 for a class II permissive change.

The purpose of the class II permissive change is to include a new external antenna for the 900 MHz LAN radio.

1.2 Product description

Gridstream Focus AX Integrated, High-Speed, External Antenna meter is an Active Energy kWh/kW/TOU Meter with field-proven Digital Multiplication Measurement Technique to ensure a highly accurate load performance and dependability during the entire life of the product. It is an integrated solution with FOCUS AX advanced metering electronics the Gridstream RF communication electronics (900 MHz LAN radio) combined together on a single PCB. It also offers a Service Disconnect option and ZigBee connectivity for HAN applications.

Technical Details:

The Gridstream Focus AX Integrated, High-Speed, External Antenna 900 MHz radio provides 4 distinct modes of operation as outlined below.

Mode of Operation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Data Rates Supported (kbps)
(1) Wide Mode	902.3 - 927.8	86	300	9.6, 19.2, 38.4, 115.2
(2) Narrow Mode	904.0 - 927.9	240	100	9.6, 19.2, 38.4
(3) Full Narrow Mode	902.3 - 927.8	256	100	9.6, 19.2, 38.4
(4) SUN Mode	902.2 – 927.8	129	200	50.0

Modulation format: FSK
Antenna Type/Gain: PCB (Model No.: FXP14 GPS, Part No: FXP14.07.0100A); 1.5dBi
Operating Voltage: 240VAC

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

EUT Serial Numbers: 117 896 404

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

1.3 Test Methodology and Considerations

The Gridstream Focus AX Integrated, High-Speed, External Antenna contains both 900 MHz and 2.4GHz radios. The 900 MHz LAN radio and the 2.4 GHz Zigbee radio operate under CFR 47 Part 15.247 and IC RSS-210. This report addresses the 900 MHz LAN radio only.

The EUT was evaluated in an orientation representative of final installation.

Software DAC power setting during test: 163

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
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:

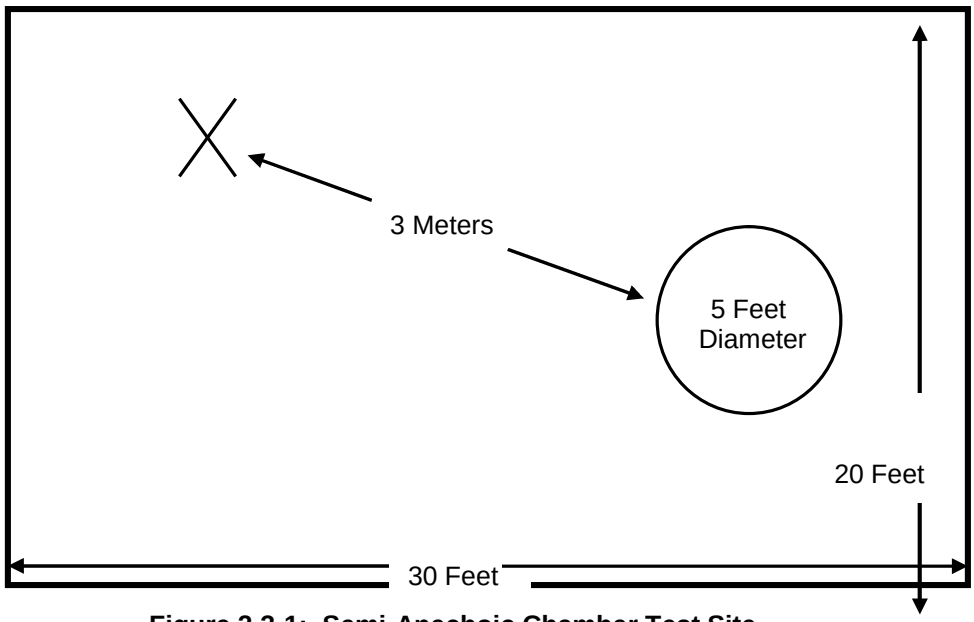

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

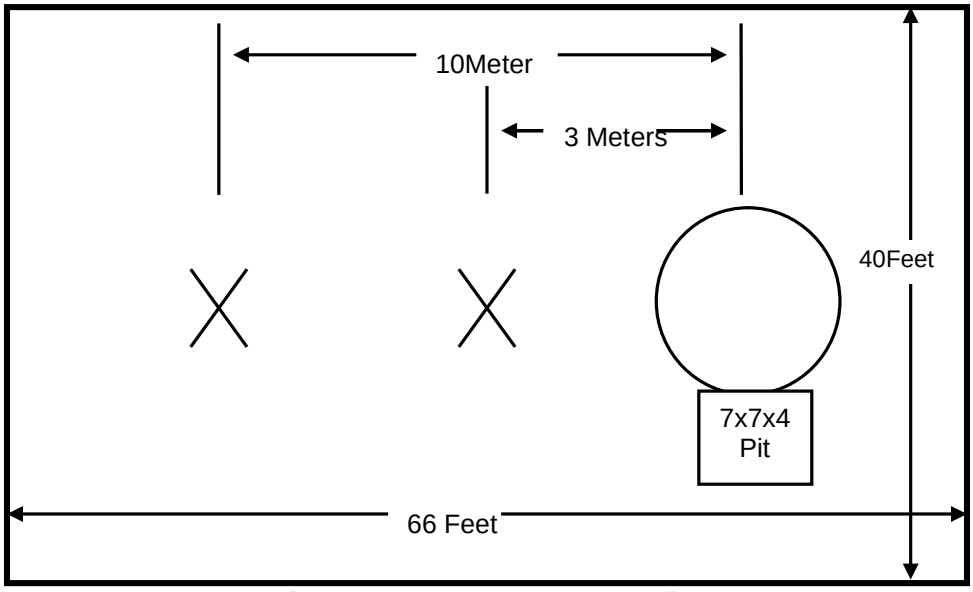

Figure 2.3-2: Open Area Test Site

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:

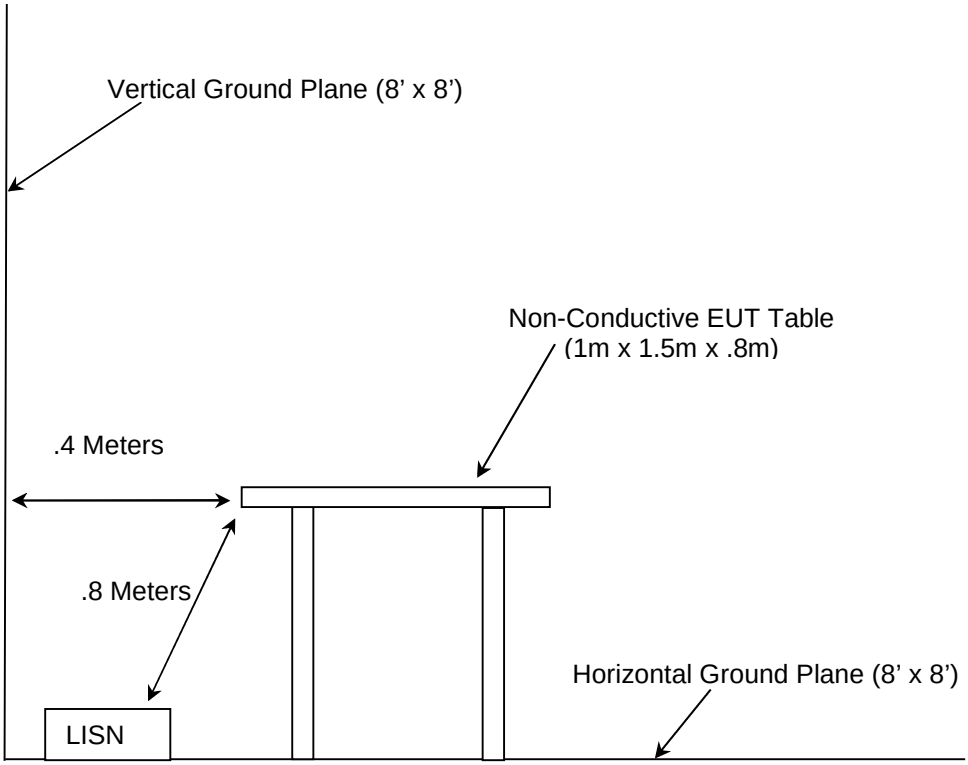

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2009: American National Standard for Methods of Measurement of Radio-Noise Emissions from low-voltage electrical and electronic equipment in the range of 9kHz to 40 GHz
- 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
- 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	4/23/2013	4/23/2015
40	EMCO	3104	Antennas	3211	2/14/2013	2/14/2015
73	Agilent	8447D	Amplifiers	2727A05624	7/16/2013	7/16/2014
153	EMCO	3825/2	LISN	9411-2268	7/31/2012	7/31/2014
167	ACS	Chamber EMI Cable Set	Cable Set	167	11/7/2013	11/7/2014
168	Hewlett Packard	11947A	Attenuators	44829	1/27/2014	1/27/2015
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	3/17/2014	3/17/2015
324	ACS	Belden	Cables	8214	6/4/2014	6/4/2015
331	Microwave Circuits	H1G513G1	Filters	31417	6/2/2014	6/2/2015
338	Hewlett Packard	8449B	Amplifiers	3008A01111	7/30/2013	7/30/2015
412	Electro Metrics	LPA-25	Antennas	1241	7/27/2012	7/27/2014
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	11/7/2013	11/7/2014
616	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	N/A	9/26/2013	9/26/2014
RE361	Agilent	AT/E7405A	Analyzers	MY42000089	5/30/2014	5/30/2016

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
The EUT was tested standalone with no support equipment utilized.				

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

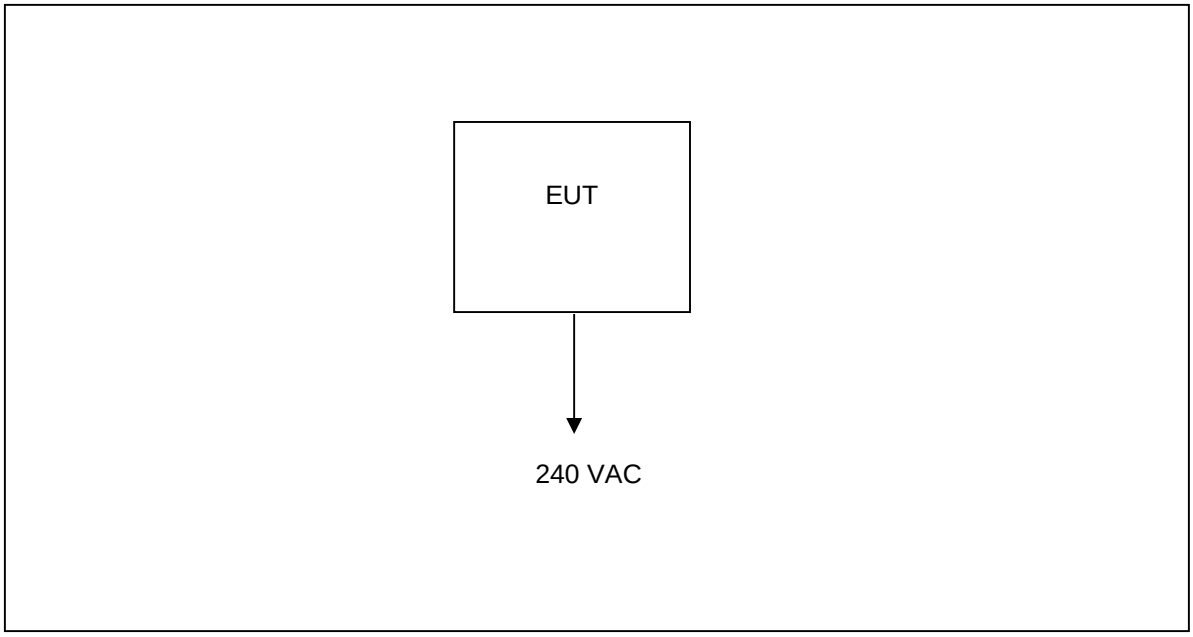

Figure 6-1: Test Setup Block Diagram

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 antenna is a PCB (Model No.: FXP14 GPS, Part No: FXP14.07.0100A) with 1.5dBi gain and a unique U.FL connector, thus meeting the requirements of Section 15.203.

7.2 Power Line Conducted Emissions – FCC 15.207, IC: RSS-Gen 7.2.4

7.2.1 Measurement Procedure

Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

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

7.2.2 Measurement Results

Results of the test are shown below in Tables 7.2.2-1 and 7.2.2-2.

Table 7.2.2-1: Conducted EMI Results – Line 1 – 240 VAC

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
29.99	38.44	25.69	11.22	49.66	36.91	60.00	50.00	10.3	13.1
29.911	37.12	27.07	11.22	48.34	38.29	60.00	50.00	11.7	11.7
28.5071	38.7	24.96	11.17	49.87	36.13	60.00	50.00	10.1	13.9
28.25	37.71	23.46	11.16	48.87	34.62	60.00	50.00	11.1	15.4
0.3	35.64	31.19	10.19	45.83	41.38	60.24	50.24	14.4	8.9
0.2078	39.98	36.87	10.21	50.19	47.08	63.29	53.29	13.1	6.2

Table 7.2.2-2: Conducted EMI Results – Line 2 – 240 VAC

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
2.471	39.7	26.68	10.20	49.90	36.88	56.00	46.00	6.1	9.1
2.435	43.1	31.84	10.20	53.30	42.04	56.00	46.00	2.7	4.0
2.29415	39	27	10.20	49.20	37.20	56.00	46.00	6.8	8.8
2.2099	38.43	26.94	10.20	48.63	37.14	56.00	46.00	7.4	8.9
2.107	37.99	25.85	10.20	48.19	36.05	56.00	46.00	7.8	10.0
1.359	38.64	27.93	10.19	48.83	38.12	56.00	46.00	7.2	7.9
0.5046	34.08	18.04	10.19	44.27	28.23	55.92	45.92	11.7	17.7

7.3 Radiated Spurious Emissions - FCC 15.205, 15.209; IC RSS-210 2.2, RSS-Gen 7.2.2

7.3.1 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.

Radiated spurious emissions were evaluated for all combinations of operating modes and data rates with worst case data provided. Worst case reported was 9.6kbps.

7.3.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 10GHz 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	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2706.9	49.23	42.22	H	-4.56	44.67	37.66	74.0	54.0	29.3	16.3
2706.9	50.01	43.08	V	-4.56	45.45	38.52	74.0	54.0	28.6	15.5
4511.5	47.87	37.93	H	0.74	48.61	38.67	74.0	54.0	25.4	15.3
4511.5	48.08	38.31	V	0.74	48.82	39.05	74.0	54.0	25.2	15.0
5413.8	45.75	36.02	H	3.53	49.28	39.55	74.0	54.0	24.7	14.4
966.28		26.86	V	1.47	---------	28.33	--------	54.0	---------	25.7
966.28		23.53	H	1.47	---------	25.00	--------	54.0	---------	29.0
1160	47.95	36.25	V	-12.43	35.52	23.82	74.0	54.0	38.5	30.2
9023	48.77	42.5	H	9.02	57.79	51.52	74.0	54.0	16.2	2.5
9023	46.56	37.37	H	9.02	55.58	46.39	74.0	54.0	18.4	7.6
9023	45.16	34.45	V	9.02	54.18	43.47	74.0	54.0	19.8	10.5
Middle Channel										
2745	47.63	39.25	H	-4.41	43.22	34.84	74.0	54.0	30.8	19.2
2745	49.84	42.98	V	-4.41	45.43	38.57	74.0	54.0	28.6	15.4
4575	47.04	37.09	H	0.87	47.91	37.96	74.0	54.0	26.1	16.0
4575	47.58	37.93	V	0.87	48.45	38.80	74.0	54.0	25.5	15.2
7320	44.97	34.45	H	7.81	52.78	42.26	74.0	54.0	21.2	11.7
9150	47.63	38.64	H	9.00	56.63	47.64	74.0	54.0	17.4	6.4
9150	47.91	39.17	V	9.00	56.91	48.17	74.0	54.0	17.1	5.8
High Channel										
2783.7	48.74	40.87	H	-4.25	44.49	36.62	74.0	54.0	29.5	17.4
2783.7	50.11	44.32	V	-4.25	45.86	40.07	74.0	54.0	28.1	13.9
4639.5	47.54	38.94	H	1.01	48.55	39.95	74.0	54.0	25.4	14.0
4639.5	47.91	39.25	V	1.01	48.92	40.26	74.0	54.0	25.1	13.7
7423.2	45.85	36.17	H	7.95	53.80	44.12	74.0	54.0	20.2	9.9
962.97		36.84	H	1.54	---------	38.38	--------	54.0	---------	15.6
962.98		40.98	V	1.54	---------	42.52	--------	54.0	---------	11.5
960		39.05	V	1.60	---------	40.65	--------	46.0	---------	5.4
960		32.14	V	1.60	---------	33.74	--------	46.0	---------	12.3

7.3.2.1 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: 49.23 - 4.56 = 44.67dBuV/m
Margin: 74dBuV/m – 44.67dBuV/m = 29.3dB

Example Calculation: Average

Corrected Level: 42.22 - 4.56 - 0 = 37.66dBuV
Margin: 54dBuV – 37.66dBuV = 16.3dB

8 CONCLUSION

In the opinion of ACS, Inc. the Gridstream Focus AX Integrated, High-Speed, External Antenna, manufactured by Landis+Gyr Technology, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT