Excellence in Compliance Testing

Certification Test Report

FCC ID: R7PFTAR2S1
IC: 5294A-FTAR1S1

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

ACS Report Number: 15-0159.W06.1A

Manufacturer: Landis+Gyr Technology, Inc.
Model: Communications Adapter

Test Begin Date: April 28, 2015
Test End Date: April 30, 2015

Report Issue Date: June 23, 2015

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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

This report contains 20 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.

1.2 Product description

The Communications Adapter module is a battery powered "bridge" between a PC based application and the 900MHz End Point Meter. The module contains a 900MHz two-way transceiver, a logarithmic detector for one-way Rx, Bluetooth transceiver, and a lithium ion battery. It is contained in a belt mounted, damage resistant plastic housing. The intent of the field tool is to be a close range device for trouble shooting Electric, Gas, and Water modules.

Technical Information:
The model Communications Adapter provides two distinct modes of operation; frequency hopping mode at high power, and single channel mode at low power. This report addresses the single channel mode as outlined below.

Mode of Operation	Frequency Range (MHz)	Number of Channels	Channel Separation (kHz)	Data Rates Supported (kbps)
1	902.3 - 927.5	64	400	50, 115.2, 150, 200

Modulation Format: FSK/GFSK
Antenna Type / Gain: Ceramic Chip Antenna / -1.0 dBi gain
Operating Voltage: 4.2VDC (Internal Battery) / 120VAC/60Hz (External Power Supply)

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

EUT Serial Numbers: 00000000 (Radiated), 40B90F10 (Conducted)

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

1.3 Test Methodology and Considerations

All modes of operation, including all available data rates, were evaluated. The data presented in this report represents the worst case where applicable.

For radiated emissions, three orientations of the EUT were evaluated to determine worst case. The worst case orientation was determined to be the Y orientation.

The EUT has provisions for battery charging using an external power supply. Radiated emissions were tested with the EUT standalone which is the typical use configuration. AC power line conducted emissions were evaluated with the external power supply connected and batteries charging.

Both the 900 MHz LAN radio and the Bluetooth radio can transmit simultaneously. Radiated inter-modulation products were evaluated with the 900 MHz LAN radio in DSS mode at a higher power level and found to be in compliance.

Software power setting during test (900 MHz Radio): 47
Software version number (900 MHz Radio): S5GS26-09.50.J10

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:

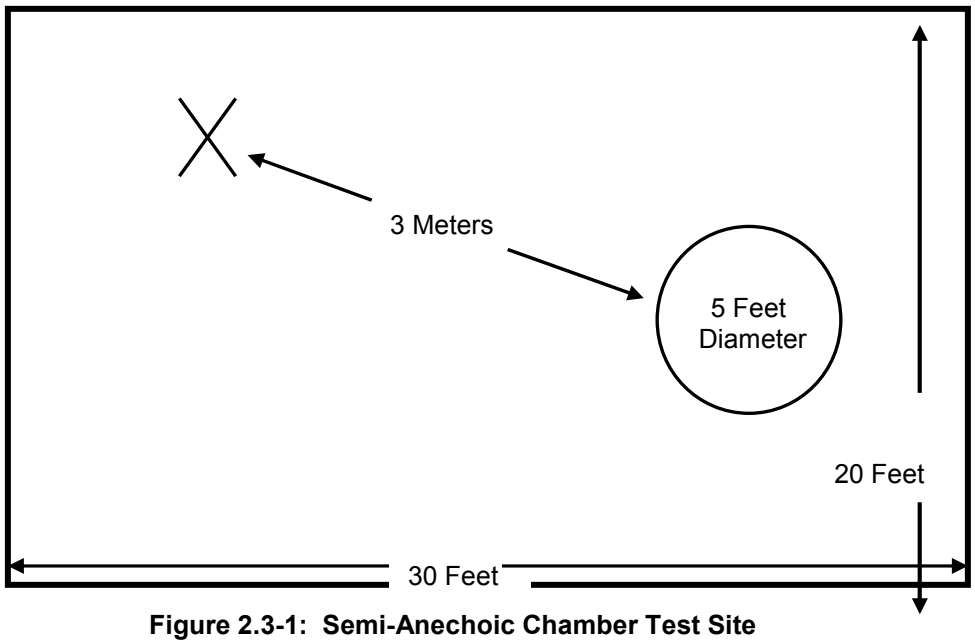

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

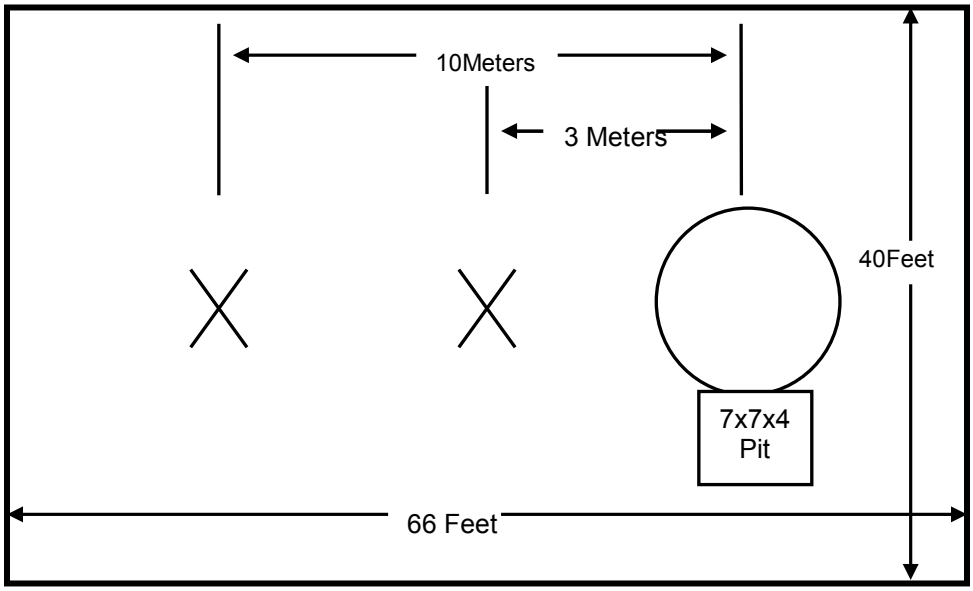

Figure 2.3-2: Open Area Test Site

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 4.1.3-1:

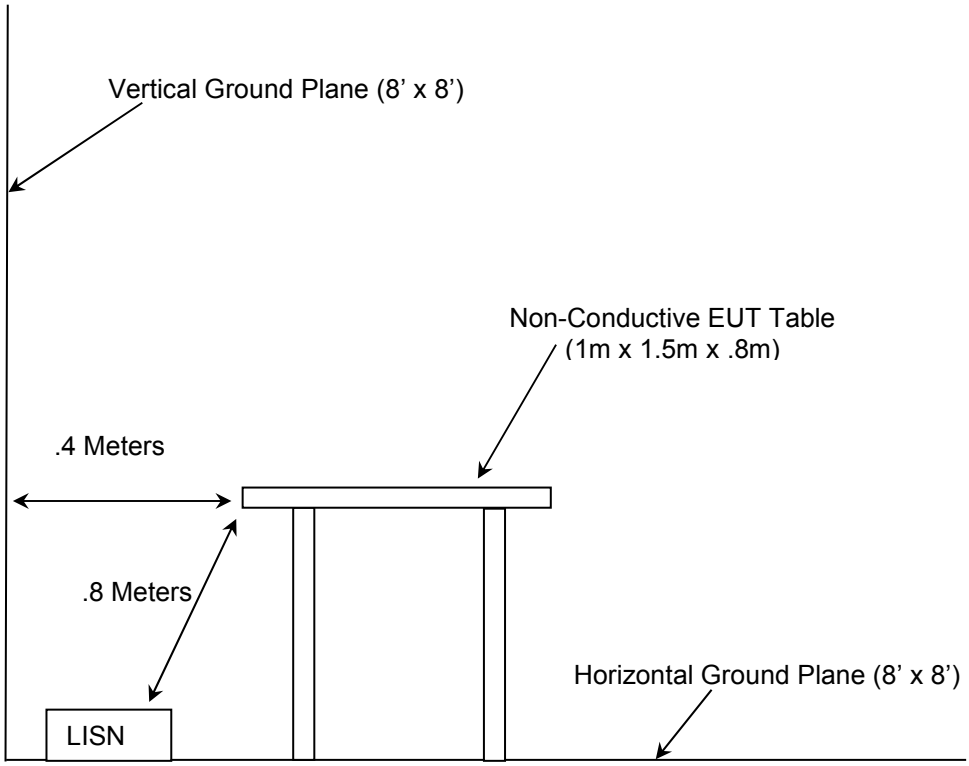

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices
- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices – Reference for Industry Canada only
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2015
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2015
- 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 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
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	7/11/2014	7/11/2015
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	7/11/2014	7/11/2015
40	EMCO	3104	Antennas	3211	2/10/2015	2/10/2017
73	Agilent	8447D	Amplifiers	2727A05624	7/15/2014	7/15/2015
167	ACS	Chamber EMI Cable Set	Cable Set	167	10/28/2014	10/28/2015
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	3/3/2015	3/3/2016
329	A.H.Systems	SAS-571	Antennas	721	7/15/2013	7/15/2015
331	Microwave Circuits	H1G513G1	Filters	31417	6/2/2014	6/2/2015
338	Hewlett Packard	8449B	Amplifiers	3008A01111	7/30/2013	7/30/2015
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	7/14/2014	7/14/2015
412	Electro Metrics	LPA-25	Antennas	1241	7/24/2014	7/24/2016
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	11/5/2014	11/5/2015
616	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	N/A	9/10/2014	9/10/2015
622	Rohde & Schwarz	FSV40	Analyzers	101338	7/12/2014	7/12/2015

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Wall Wart Power Supply	Landis + Gyr	69-1757	N/A

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

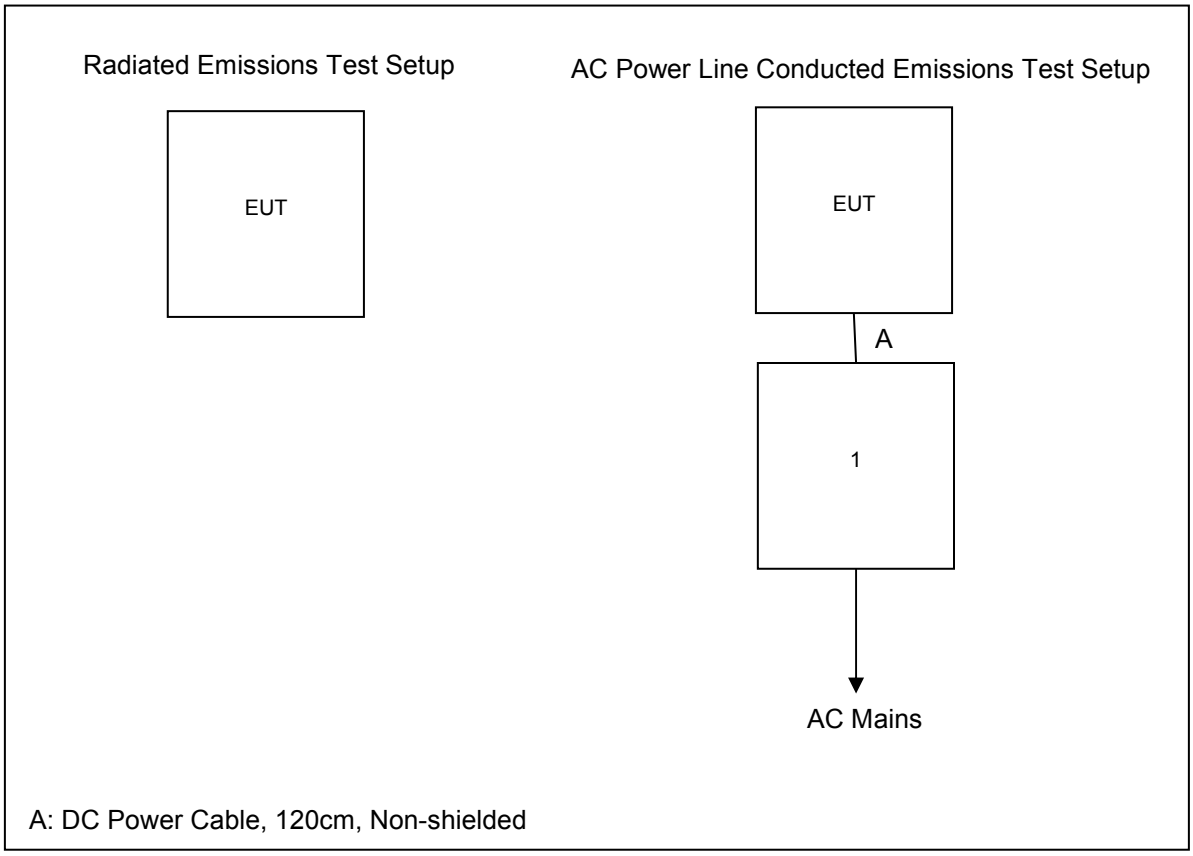

Figure 6-1: Test Setup Block Diagram

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 15.203

The integral antenna is a ceramic chip with -1.0dBi gain and cannot be removed without permanently damaging the device, therefore satisfying the requirements of Section 15.203.

7.2 Power Line Conducted Emissions – FCC 15.207; IC RSS-Gen 8.8

7.2.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. 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

Table 7.2.2-1: Conducted EMI Results – Line 1

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.920240	---	22.94	46.00	23.06	L1	10.3
0.920240	39.08	---	56.00	16.92	L1	10.3
1.215932	---	19.46	46.00	26.54	L1	10.3
1.215932	38.18	---	56.00	17.82	L1	10.3
2.707114	---	17.76	46.00	28.24	L1	10.4
2.707114	37.28	---	56.00	18.72	L1	10.4
2.925752	---	21.28	46.00	24.72	L1	10.4
2.925752	38.27	---	56.00	17.73	L1	10.4
3.089679	---	17.35	46.00	28.65	L1	10.4
3.089679	36.84	---	56.00	19.16	L1	10.4
3.746593	---	18.89	46.00	27.11	L1	10.4
3.746593	37.98	---	56.00	18.02	L1	10.4

Table 7.2.2-2: Conducted EMI Results – Line 2

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
1.327856	---	14.73	46.00	31.27	N	10.3
1.327856	35.40	---	56.00	20.60	N	10.3
1.355611	---	16.45	46.00	29.55	N	10.3
1.355611	35.61	---	56.00	20.39	N	10.3
1.698096	---	18.14	46.00	27.86	N	10.3
1.698096	35.73	---	56.00	20.27	N	10.3
1.758818	---	17.41	46.00	28.59	N	10.3
1.758818	36.55	---	56.00	19.45	N	10.3
2.774849	---	12.54	46.00	33.46	N	10.3
2.774849	30.26	---	56.00	25.74	N	10.3
2.965832	---	12.78	46.00	33.22	N	10.4
2.965832	33.62	---	56.00	22.38	N	10.4

7.3 20dB / 99% Bandwidth – FCC 15.215; IC RSS-Gen 6.6

7.3.1 Measurement Procedure

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 ndB down and delta function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

The occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% bandwidth. The span of the analyzer was set to capture all products of the modulation process, including the emission sidebands. The resolution bandwidth was set to 1% to 5% of the occupied bandwidth. The video bandwidth was set to 3 times the resolution bandwidth. A peak detector was used.

7.3.2 Measurement Results

Table 7.3.2-1: 20dB / 99% Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]	99% Bandwidth [kHz]	Data Rate (kbps)
902.3	93.52	88.42	50
902.3	234.57	205.13	115.2
902.3	182.86	156.88	150
902.3	243.35	210.07	200
915.0	93.39	88.11	50
915.0	234.99	204.91	115.2
915.0	179.96	157.01	150
915.0	243.17	209.91	200
927.5	96.66	88.26	50
927.5	234.75	204.83	115.2
927.5	180.13	157.08	150
927.5	242.49	209.93	200

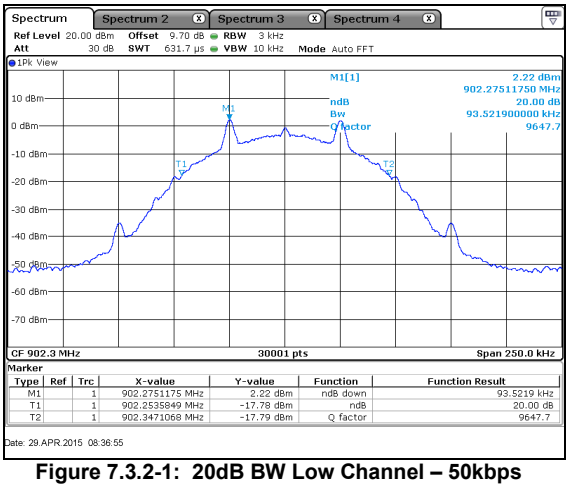

Figure 7.3.2-1: 20dB BW Low Channel – 50kbps

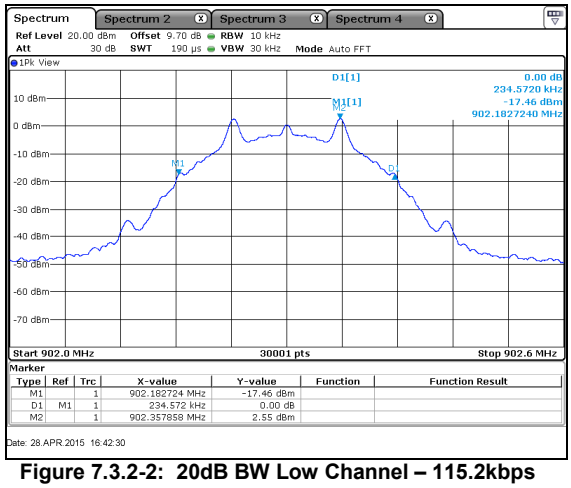

Figure 7.3.2-2: 20dB BW Low Channel – 115.2kbps

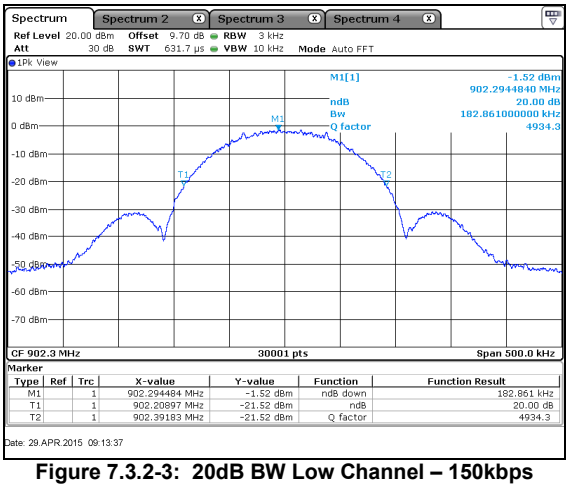

Figure 7.3.2-3: 20dB BW Low Channel – 150kbps

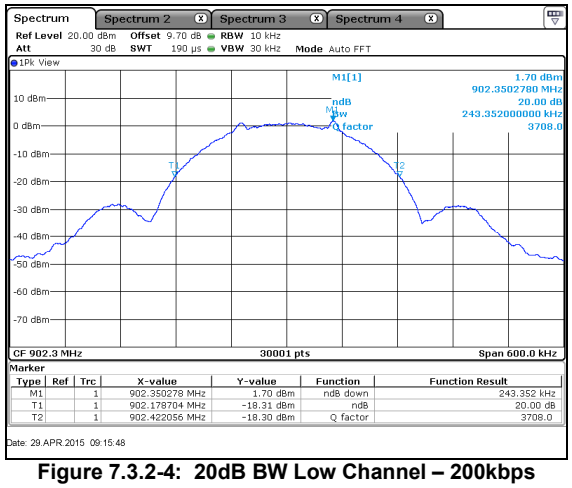

Figure 7.3.2-4: 20dB BW Low Channel – 200kbps

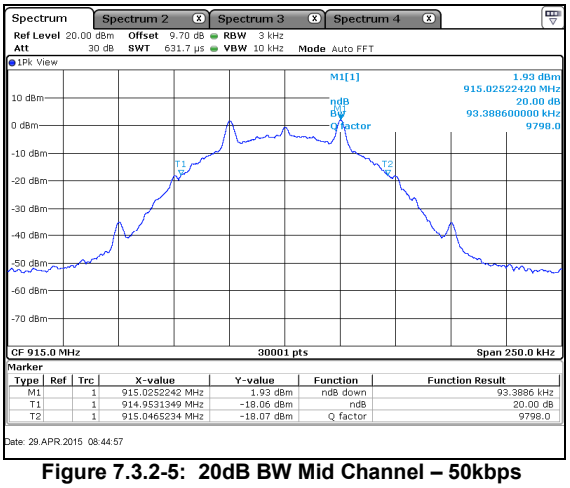

Figure 7.3.2-5: 20dB BW Mid Channel – 50kbps

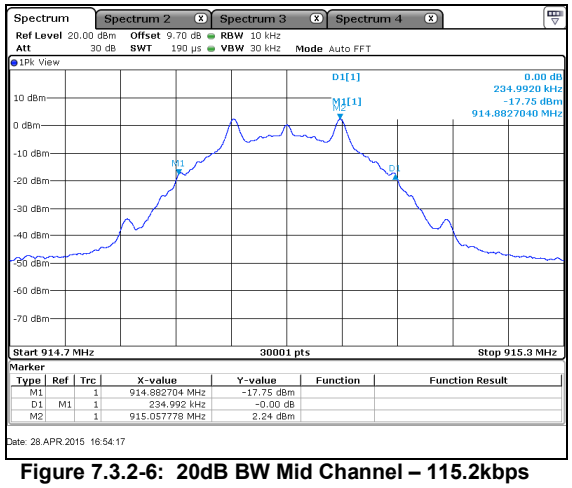

Figure 7.3.2-6: 20dB BW Mid Channel – 115.2kbps

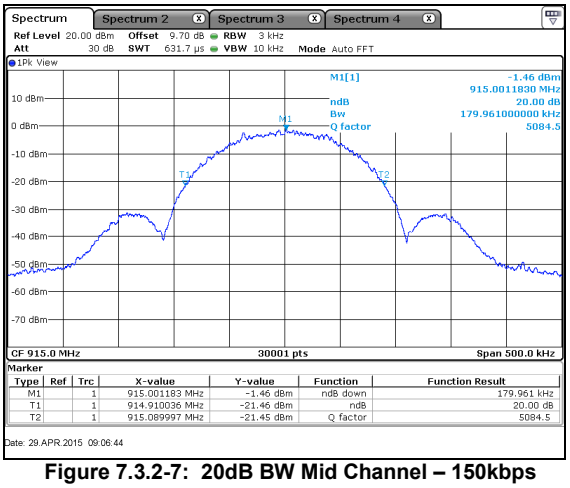

Figure 7.3.2-7: 20dB BW Mid Channel – 150kbps

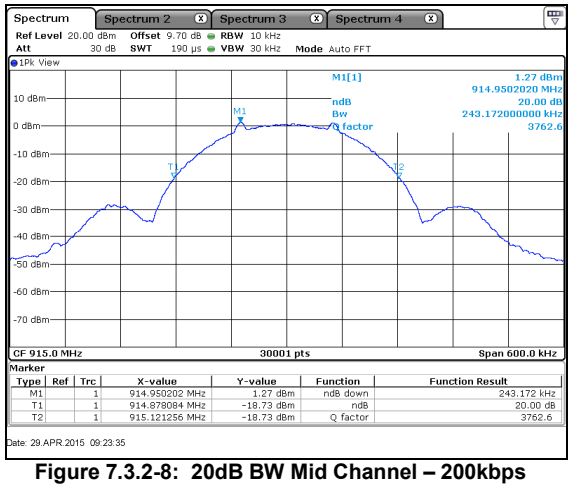

Figure 7.3.2-8: 20dB BW Mid Channel – 200kbps

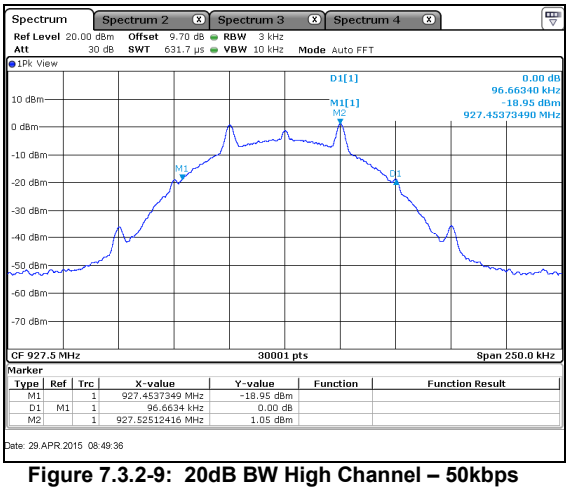

Figure 7.3.2-9: 20dB BW High Channel – 50kbps

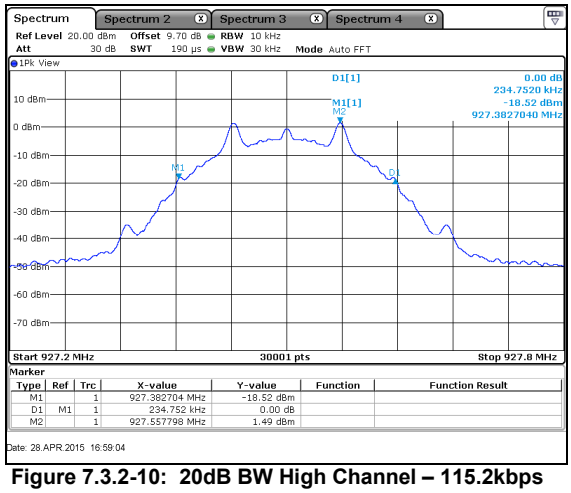

Figure 7.3.2-10: 20dB BW High Channel – 115.2kbps

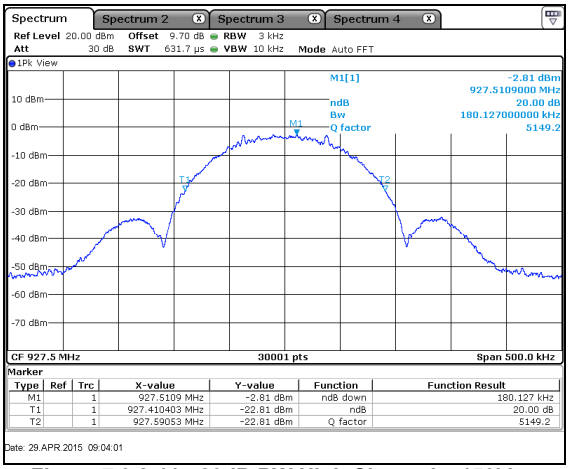

Figure 7.3.2-11: 20dB BW High Channel – 150kbps

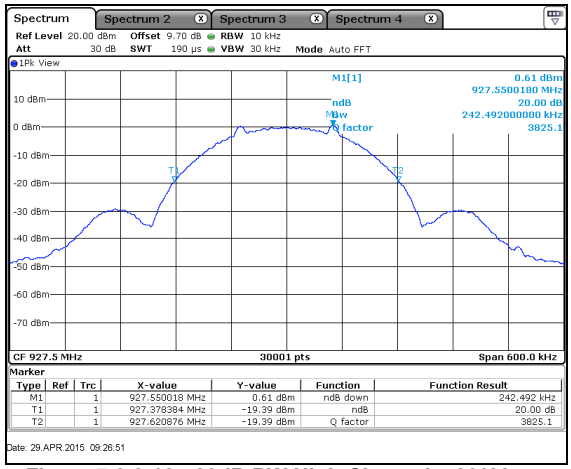

Figure 7.3.2-12: 20dB BW High Channel – 200kbps

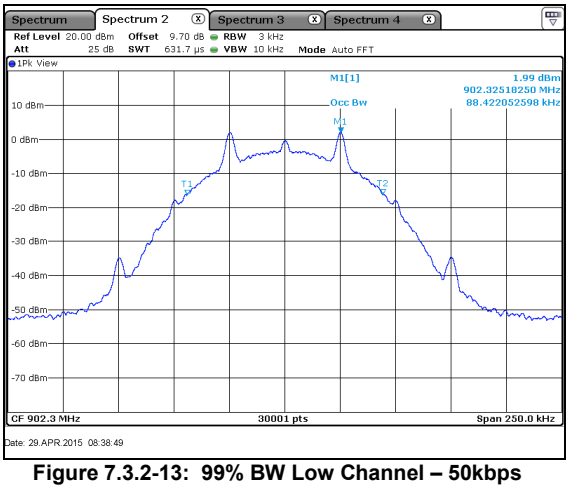

Figure 7.3.2-13: 99% BW Low Channel – 50kbps

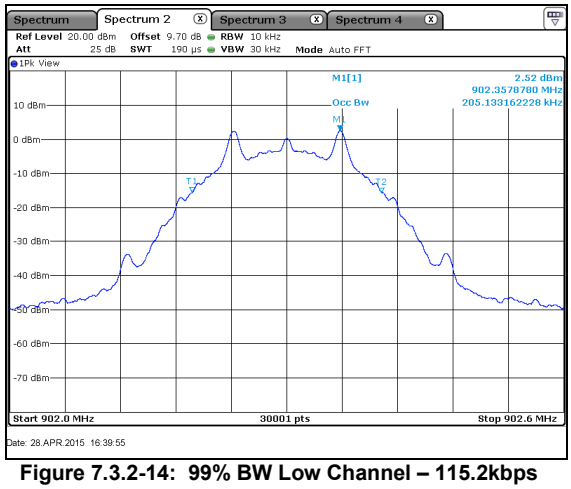

Figure 7.3.2-14: 99% BW Low Channel – 115.2kbps

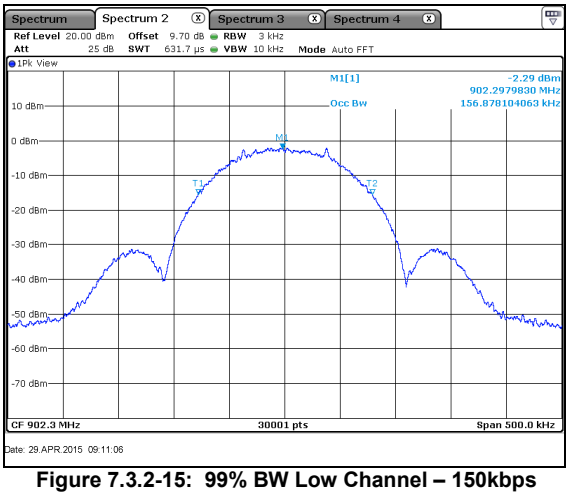

Figure 7.3.2-15: 99% BW Low Channel – 150kbps

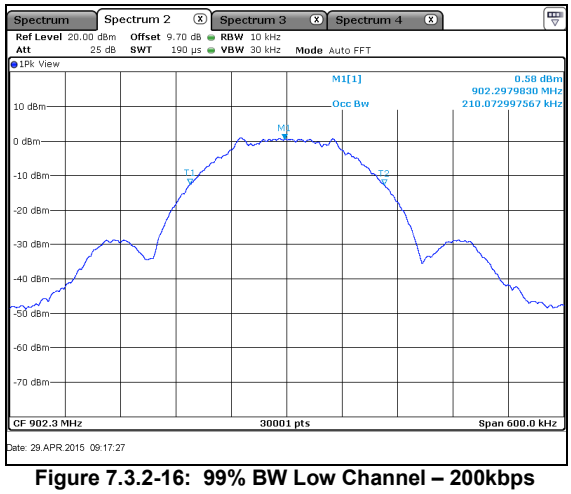

Figure 7.3.2-16: 99% BW Low Channel – 200kbps

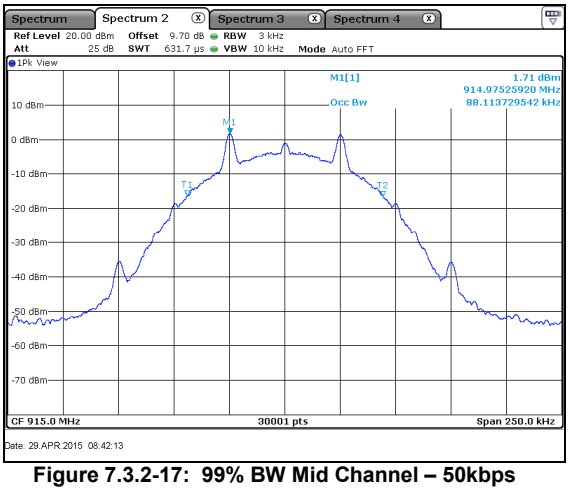

Figure 7.3.2-17: 99% BW Mid Channel – 50kbps

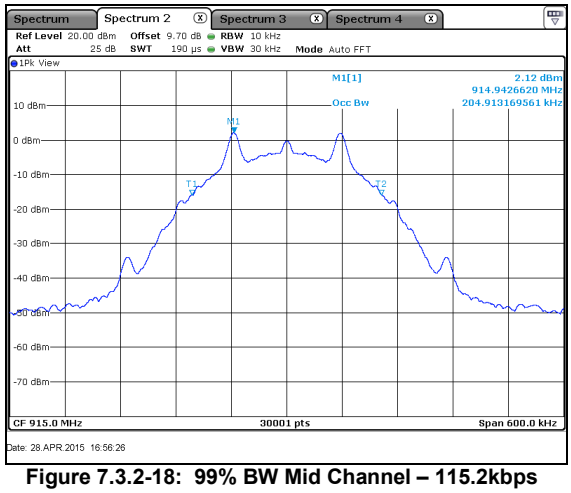

Figure 7.3.2-18: 99% BW Mid Channel – 115.2kbps

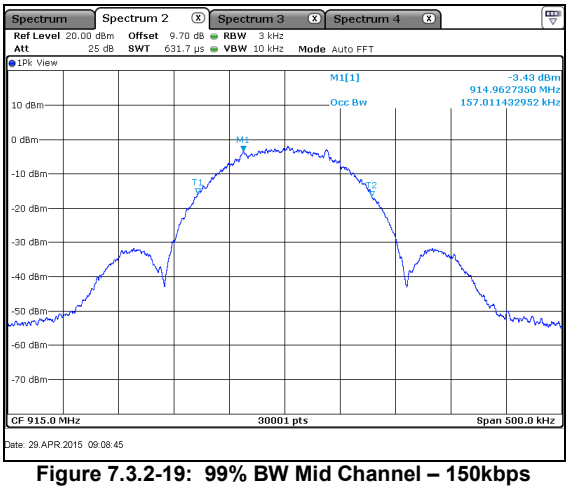

Figure 7.3.2-19: 99% BW Mid Channel – 150kbps

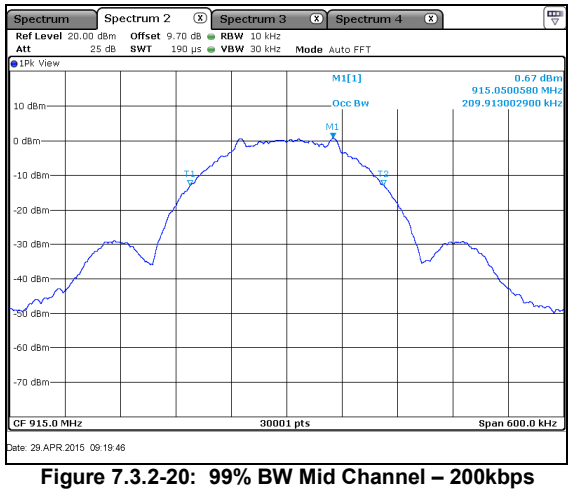

Figure 7.3.2-20: 99% BW Mid Channel – 200kbps

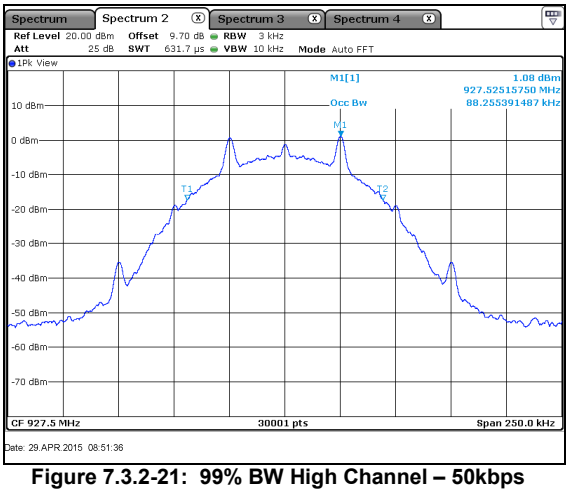

Figure 7.3.2-21: 99% BW High Channel – 50kbps

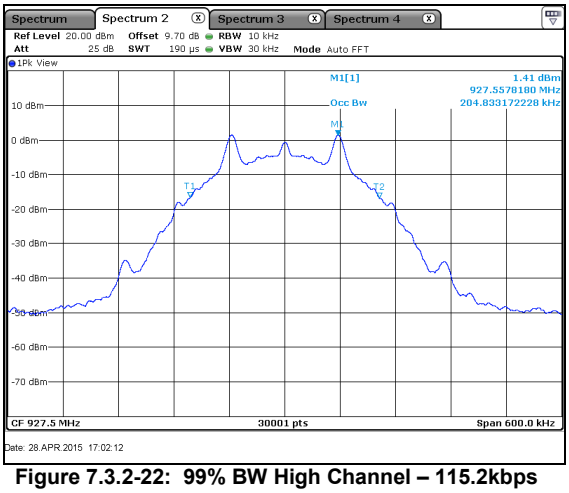

Figure 7.3.2-22: 99% BW High Channel – 115.2kbps

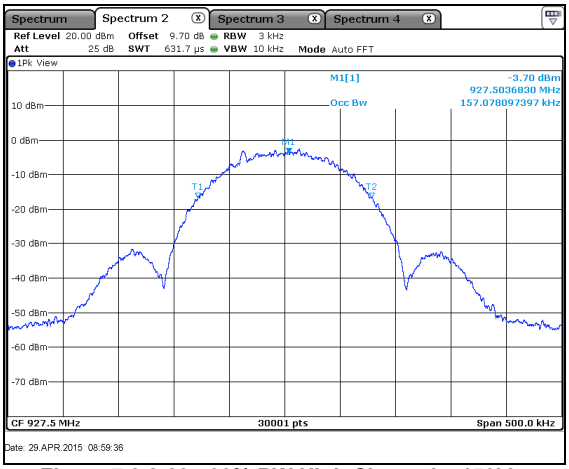

Figure 7.3.2-23: 99% BW High Channel – 150kbps

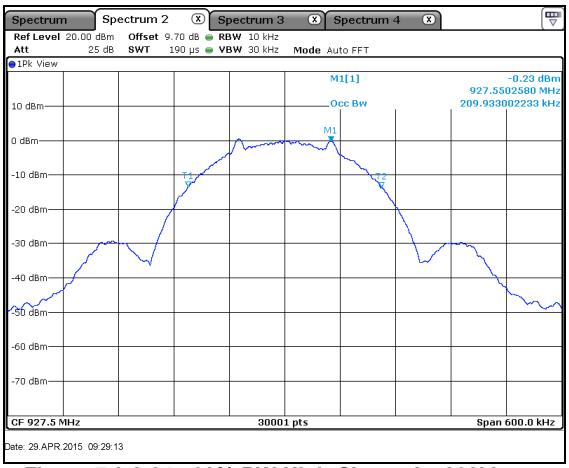

Figure 7.3.2-24: 99% BW High Channel – 200kbps

7.4 Fundamental Field Strength – FCC 15.249(a); IC RSS-210 A2.9(a)

7.4.1 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. Quasi-peak measurements were made with RBW and VBW of 120 kHz and 300 kHz respectively.

7.4.2 Measurement Results

Table 7.4.2-1: Fundamental Field Strength

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
902.3	71.60	71.29	H	0.31	---------	71.60	--------	94.0	--------	22.4
902.3	78.90	78.57	V	0.31	---------	78.88	--------	94.0	--------	15.1
915	73.38	73.10	H	1.10	---------	74.20	--------	94.0	--------	19.8
915	79.72	79.44	V	1.10	---------	80.54	--------	94.0	--------	13.4
927.5	73.60	73.27	H	1.13	---------	74.40	--------	94.0	--------	19.6
927.5	79.62	79.32	V	1.13	---------	80.45	--------	94.0	--------	13.5

7.5 Radiated Spurious Emissions – FCC 15.249(a)(d)(e); IC RSS-210 A2.9(a)(b)

7.5.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 10 GHz, > 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.

All out of band emissions were evaluated, including any emissions at or near the band-edge.

7.5.2 Measurement Results

Table 7.5.2-1: Radiated Spurious Emissions

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
902.3 MHz (Low Channel)										
902	---------	34.68	H	0.28	---------	34.96	--------	46.0	---------	11.0
902	---------	42.20	V	0.28	---------	42.48	--------	46.0	---------	3.5
1804.6	49.51	40.72	H	-8.81	40.70	31.91	74.0	54.0	33.3	22.1
914.8 MHz (Middle Channel)										
1830	50.31	43.02	H	-8.63	41.68	34.39	74	54	32.3	19.6
927.5 MHz (High Channel)										
928	---------	23.03	H	1.12	---------	24.15	--------	46.0	---------	21.9
928	---------	27.04	V	1.12	---------	28.16	--------	46.0	---------	17.8
1855	51.32	44.53	H	-8.45	42.87	36.08	74.0	54.0	31.1	17.9

7.5.3 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: Quasi-Peak

Corrected Level: 34.68 + 0.28 = 34.96dBuV

Margin: 46dBuV – 34.96dBuV = 11.0dB

8 CONCLUSION

In the opinion of ACS, Inc. the Communications Adapter, 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