

TEST REPORT

Report Number: 100414419MIN-003

Project Number: G100414419

Testing performed on the
Spectrum 2100 AWS Path 1/Path 2 Secondary Remote Access Unit
SPT-S1-2121-1MIMO
to
47 CFR, Part 27:2009, Enclosure Spurious Radiated Emissions

For
TE Connectivity / LGC Wireless

Test Performed by:
Intertek Testing Services NA, Inc.
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Oakdale, MN 55128 USA

Test Authorized by:
TE Connectivity / LGC Wireless
541 E Trimble Road
San Jose, CA 95131 USA

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Date: June 3, 2011

Reviewed by: Norman Shpilsher
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Date: June 3, 2011

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1.0 DESCRIPTION OF THE SAMPLE (EUT)

Model:	Spectrum 2100 AWS Path 1/Path 2 Secondary Remote Access Unit SPT-S1-2121-1MIMO
Type of EUT:	Distributed Antenna System / Repeater
Frequency Range:	2110-2155MHz
Company:	TE Connectivity / LGC Wireless
Customer:	Sue Cyr
Address:	541 E. Trimble Road San Jose, CA 95131 USA
Phone:	408-952-2445
Fax:	408-952-2645
e-mail:	sue.cyr@te.com
Test Standards:	<input type="checkbox"/> EN 55022:2006 +A1:2007, Class T <input type="checkbox"/> EN 55011:2007 +A2:2007, Group T , Class T <input checked="" type="checkbox"/> 47 CFR, Part 27:2009, Enclosure Spurious Radiated Emissions <input type="checkbox"/> 47 CFR, Part 15:2009, §15.109, Class A <input type="checkbox"/> ICES-003, Issue 4:2004 <input type="checkbox"/> EN 55014-1:2006 <input type="checkbox"/> EN 61326-1:2006 <input type="checkbox"/> Class T for Radiated and Conducted Emissions <input type="checkbox"/> Basic Immunity Test Requirements <input type="checkbox"/> Immunity Test Requirements for Industrial Locations <input type="checkbox"/> EN 60601-1-2:2001 +A1:2006 <input type="checkbox"/> EN 61000-6-3:2007 <input type="checkbox"/> EN 61000-6-4:2007 <input type="checkbox"/> EN 61000-3-2:2006 <input type="checkbox"/> EN 61000-3-3:1995 +A1:2001 +A2:2006 <input type="checkbox"/> EN 61000-6-1:2007 <input type="checkbox"/> EN 61000-6-2:2005 <input type="checkbox"/> EN 55024:1998 + A1:2001 + A2:2003
Date Sample Submitted:	June 1, 2011
Test Work Started:	June 1, 2011
Test Work Completed:	June 3, 2011
Test Sample Conditions:	<input type="checkbox"/> Damaged <input type="checkbox"/> Poor (Usable) <input checked="" type="checkbox"/> Good <input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production <input type="checkbox"/> Used

2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST STANDARD	TEST	RESULT
Part 27	Enclosure Spurious Radiated Emissions	Pass

2.1 Statement of the Measurement Uncertainty

Note: The measured result in this report is within the specification limits by more than the measurement uncertainty; the measured result indicates that the product tested complies with the specification limit.

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be: ± 4 dB at 10m and ± 5.4 dB at 3m

The expanded uncertainty ($k = 2$) for conducted emissions from 150 kHz to 30 MHz has been determined to be:
 ± 2.6 dB

3.0 EQUIPMENT UNDER TEST

3.1 Power Configuration

Rated voltage:	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/> 400VAC <input type="checkbox"/> VDC <input type="checkbox"/> Other:
Rated current:	Amp.
Rated frequency:	<input type="checkbox"/> 50Hz <input checked="" type="checkbox"/> 60Hz
Number of phases:	<input checked="" type="checkbox"/> 1 Phase <input type="checkbox"/> 3 Phases

3.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

- ☐ - Standby
- ☐ - Test program (H - Pattern)
- ☒ - Continuous Operation (see details below)
- ☐ - Specific test program
- ☐ -

Operating modes of the EUT:

No.	Description
1	Continuous amplifying at 2111MHz, 2132MHz, and 2154MHz

Cables:

No.	Type	Length	Designation	Note
1	Two RF coax cables	10m each	RF input and output RF cables	
2	3-wire, unshielded	1.8m	AC Power Input	

Support equipment/Services:

No.	Item	Description
1	Agilent 8648C	Signal Generator
2	Prism Host Unit p/n 1449226	Host Unit
3	IFEU p/n MR2216G7	54 V Power Supply
4	Prism DRU unit	DRU
5	Spectrum IFEU Unit	IFEU
6	Spectrum Main Ray	Remote Antenna

General notes: None

3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	<u>15-35 ° C</u>
Humidity:	<u>30-60 %</u>
Atmospheric pressure:	<u>86-106 kPa</u>

4.0 TEST CONDITIONS AND RESULTS

4.1 Enclosure Spurious Radiated Emissions

Description of the test location

Test location: ☐ OATS ☒ Anechoic Chamber

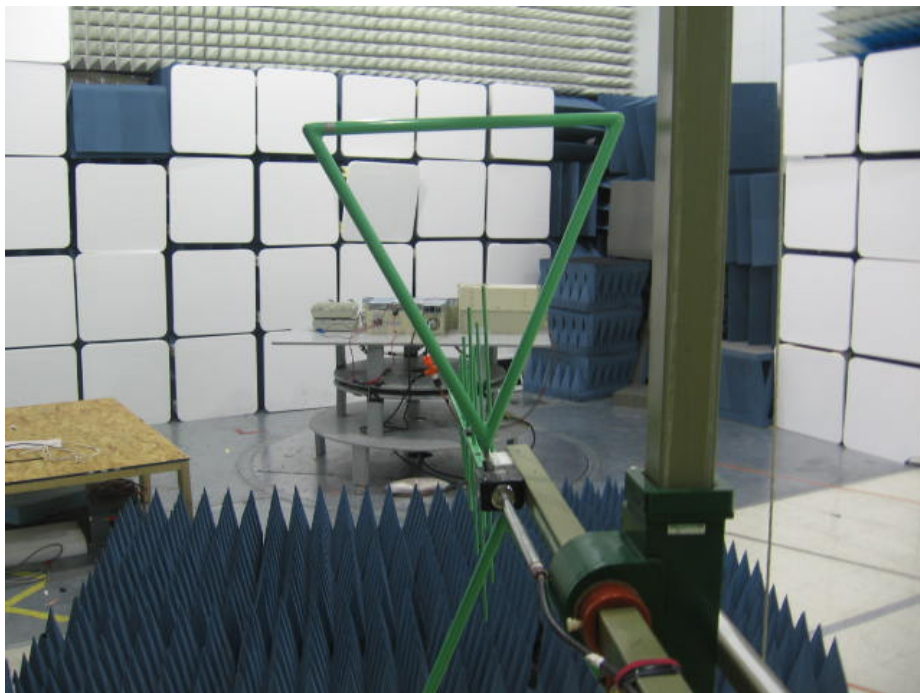
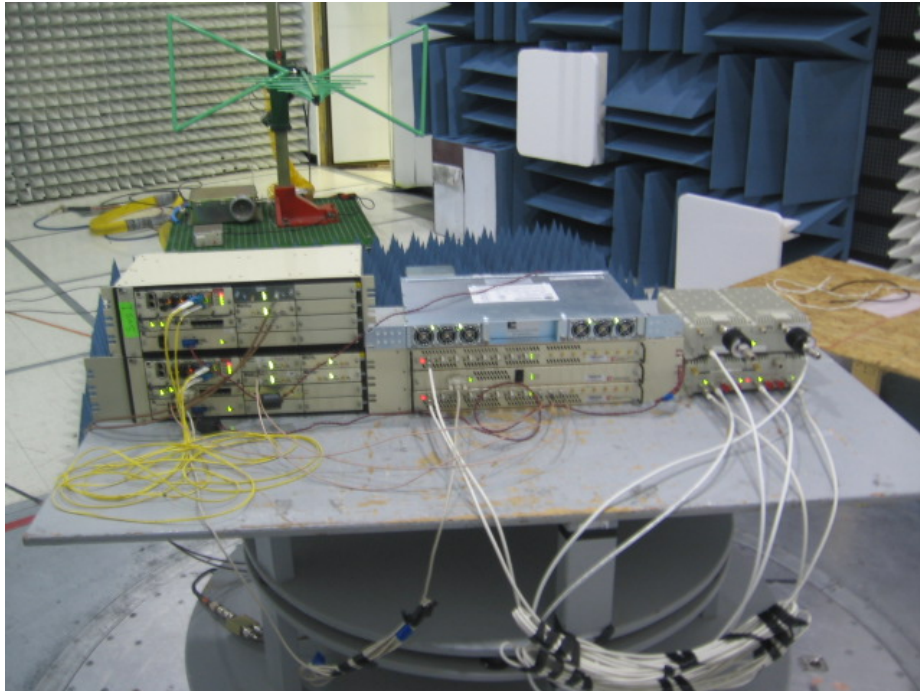
Test distance: ☐ 10 meters ☒ 3 meters

Test result: **Pass**

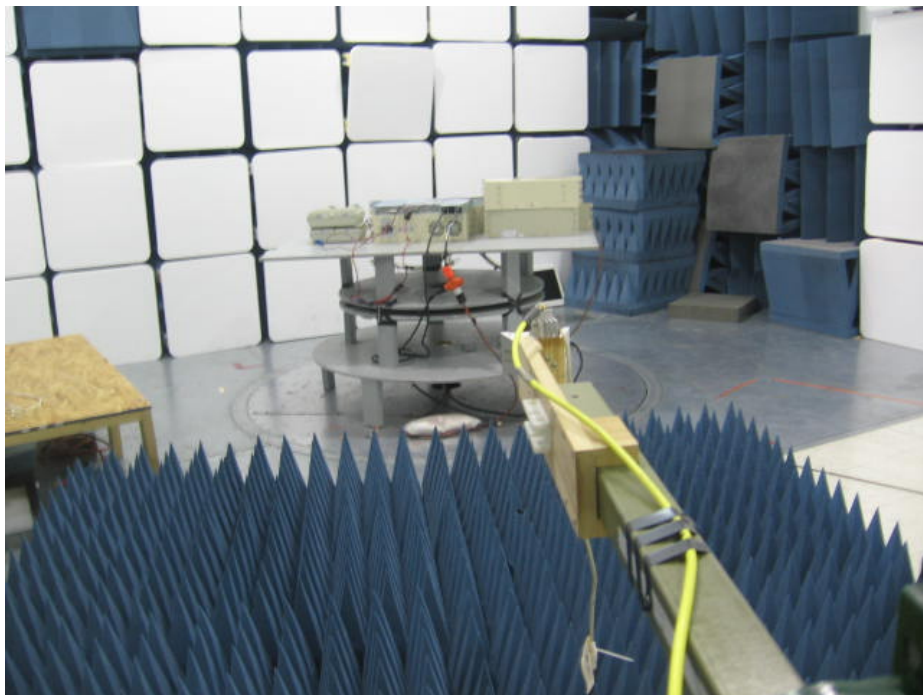
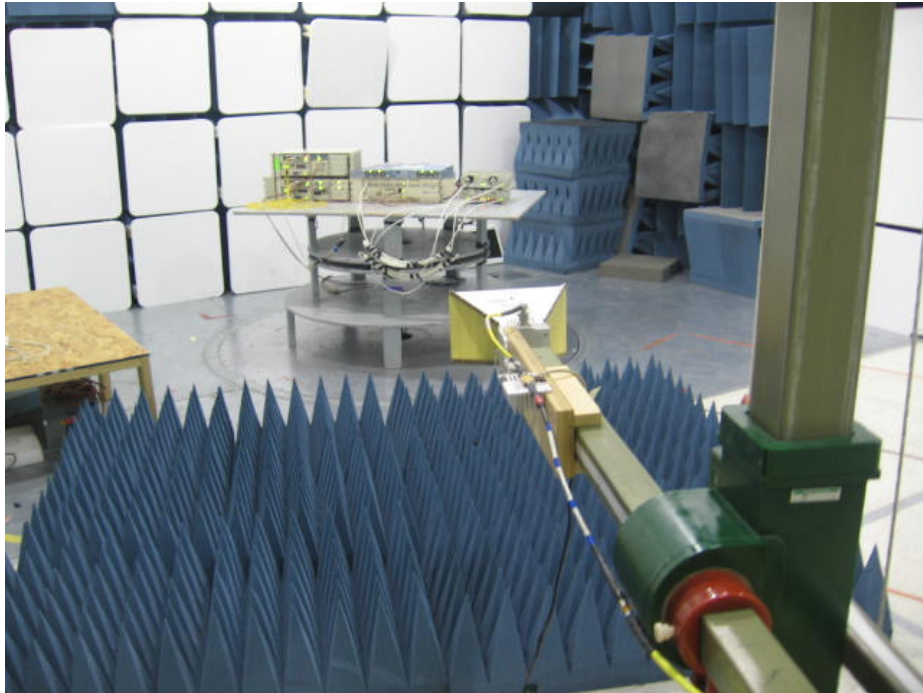
Frequency range: 30MHz-22GHz for 2110-2155MHz unit

Max. Emissions margin: 15.1 dB below the Reference Limits

- Notes:**
1. The Radiated Emissions testing was performed in the Anechoic chamber at 3m measurement distance (see Tables 1-2 and Graphs 1-18)
 2. The Spurious Radiated Power limits of -13dBm was correlated with field strength Reference Limit of 82.2dB μ V/m during field strength measurements at 3m measurement distance (see Tables 1-2).
 3. Emissions with margin less than 20dB below the reference limit were measured with substitution method (see Table 3)
 4. Emissions at operating frequencies were excluded from the tables
-



Test Setup Photos



Test Setup Photos

Date:	June 1, 2011	Result: Pass
Tested by:	Ivaylo Nadarliyski	
Standard:	FCC Part 27	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Channels 2110-2155MHz Frequency Range 30-1000MHz	

Table 1

Frequency	Ant. Polarity	Peak Reading dBμV	Ant.Factor dB1/m	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
Channel 2111MHz						
61.452 MHz	V	37.6	7.0	44.6	82.2	-37.6
361.76 MHz	V	33.6	18.0	51.6	82.2	-30.6
368.78 MHz	V	27.2	18.0	45.1	82.2	-37.1
448.45 MHz	V	45.8	19.6	65.4	82.2	-16.8
361.76 MHz	H	38.2	18.0	56.2	82.2	-26.0
368.78 MHz	H	30.4	18.0	48.3	82.2	-33.9
448.45 MHz	H	47.4	19.6	67.0	82.2	-15.2
921.63 MHz	H	21.5	25.6	47.0	82.2	-35.2
Channel 2132MHz						
61.229 MHz	V	37.9	7.0	44.9	82.2	-37.3
341.06 MHz	V	29.4	17.0	46.4	82.2	-35.8
368.78 MHz	V	27.7	18.0	45.7	82.2	-36.6
469.5 MHz	V	45.7	20.3	66.0	82.2	-16.2
341.06 MHz	H	38.7	17.0	55.7	82.2	-26.5
368.78 MHz	H	30.9	18.0	48.8	82.2	-33.4
469.5 MHz	H	46.3	20.3	66.6	82.2	-15.6
921.63 MHz	H	21.2	25.6	46.8	82.2	-35.5
Channel 2154MHz						
318.95 MHz	V	36.3	16.6	52.9	82.2	-29.3
368.78 MHz	V	27.9	18.0	45.9	82.2	-36.3
491.04 MHz	V	40.0	20.7	60.8	82.2	-21.5
921.63 MHz	V	19.3	25.6	44.8	82.2	-37.4
318.95 MHz	H	41.0	16.6	57.5	82.2	-24.7
368.78 MHz	H	30.6	18.0	48.5	82.2	-33.7
491.04 MHz	H	40.7	20.7	61.4	82.2	-20.8
921.63 MHz	H	21.7	25.6	47.2	82.2	-35.0

Date:	June 1-3, 2011	Result: Pass
Tested by:	Richard Blonigen & Ivaylo Nadarliyski	
Standard:	FCC Part 27	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Channels 2110-2155MHz Frequency Range 1-22GHz	

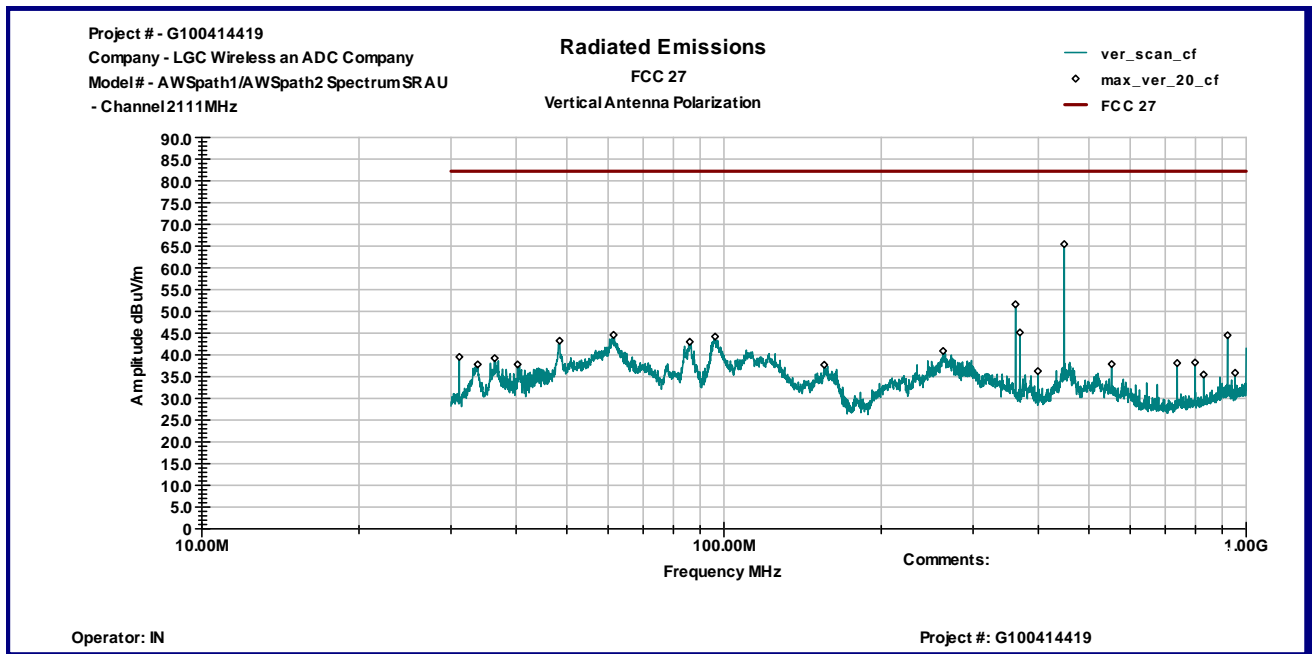
Table 2

Frequency MHz	Antenna Polarity	Peak Reading dBμV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBμV/m	Limit dBμV/m	Margin dB
Channel 2111MHz							
1.2482 GHz	V	66.3	27.2	38.9	54.6	82.2	-27.7
4.2232 GHz	V	54.0	37.4	37.0	54.4	82.2	-27.8
7.46 GHz	V	58.2	42.7	36.5	64.5	82.2	-17.7
7.9666 GHz	V	47.2	43.2	36.1	54.4	82.2	-27.9
1.2482 GHz	H	67.1	27.1	38.9	55.3	82.2	-26.9
4.2232 GHz	H	58.4	37.4	37.0	58.8	82.2	-23.4
7.46 GHz	H	57.6	42.8	36.5	63.9	82.2	-18.3
7.9666 GHz	H	49.2	43.2	36.1	56.3	82.2	-25.9
Channel 2132MHz							
4.264 GHz	V	57.1	37.5	37.0	57.5	82.2	-24.7
7.46 GHz	V	58.7	42.7	36.5	65.0	82.2	-17.3
7.9666 GHz	V	47.4	43.2	36.1	54.6	82.2	-27.6
17.993 GHz	V	40.9	53.5	33.9	60.5	82.2	-21.7
1.2482 GHz	H	65.9	27.1	38.9	54.1	82.2	-28.1
4.264 GHz	H	55.8	37.4	37.0	56.3	82.2	-25.9
7.46 GHz	H	60.5	42.8	36.5	66.8	82.2	-15.4
7.9666 GHz	H	49.0	43.2	36.1	56.1	82.2	-26.1
Channel 2154MHz							
1.2482 GHz	V	67.1	27.2	38.9	55.4	82.2	-26.8
7.46 GHz	V	57.8	42.7	36.5	64.1	82.2	-18.1
7.9666 GHz	V	47.3	43.2	36.1	54.4	82.2	-27.8
10.772 GHz	V	44.2	46.6	34.7	56.1	82.2	-26.1
1.2482 GHz	H	65.4	27.1	38.9	53.6	82.2	-28.6
7.46 GHz	H	60.8	42.8	36.5	67.1	82.2	-15.1
7.9666 GHz	H	49.2	43.2	36.1	56.3	82.2	-25.9
8.616 GHz	H	45.4	44.5	35.7	54.1	82.2	-28.1

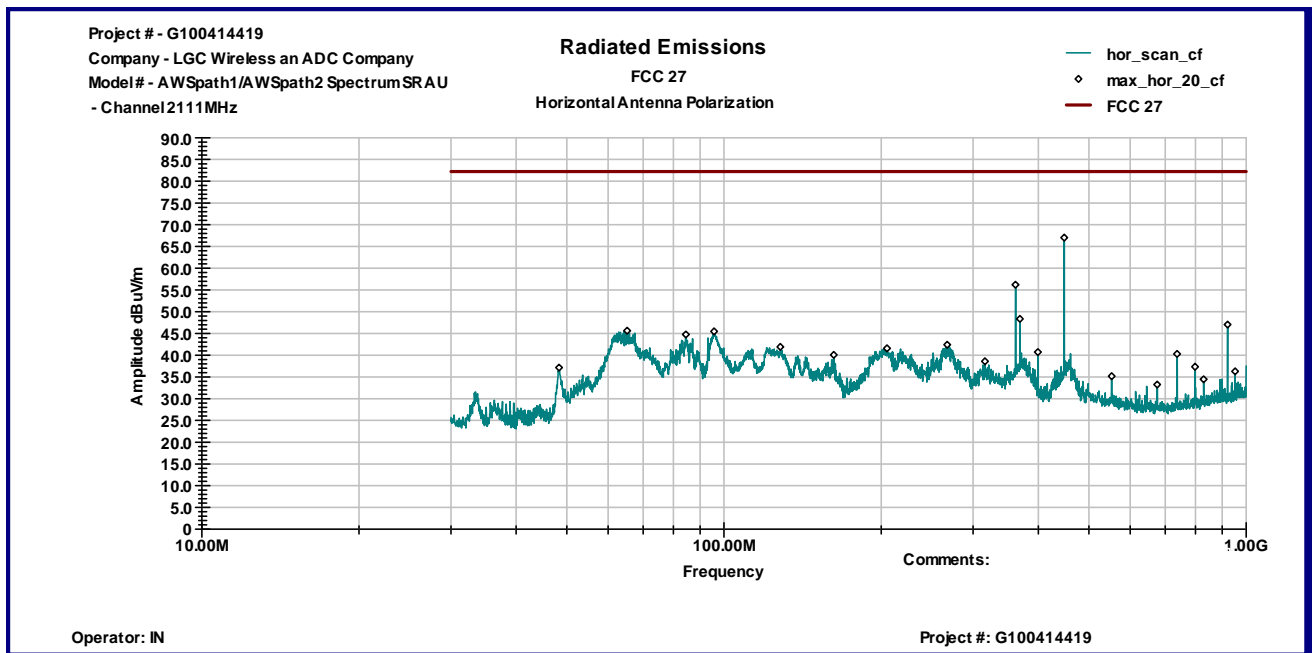
Date:	June 3, 2011	Result: Pass
Tested by:	Richard Blonigen	
Standard:	FCC Part 27	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Substitution Method Channels 2110-2155MHz Frequency Range 30MHz-22GHz	

Table 3

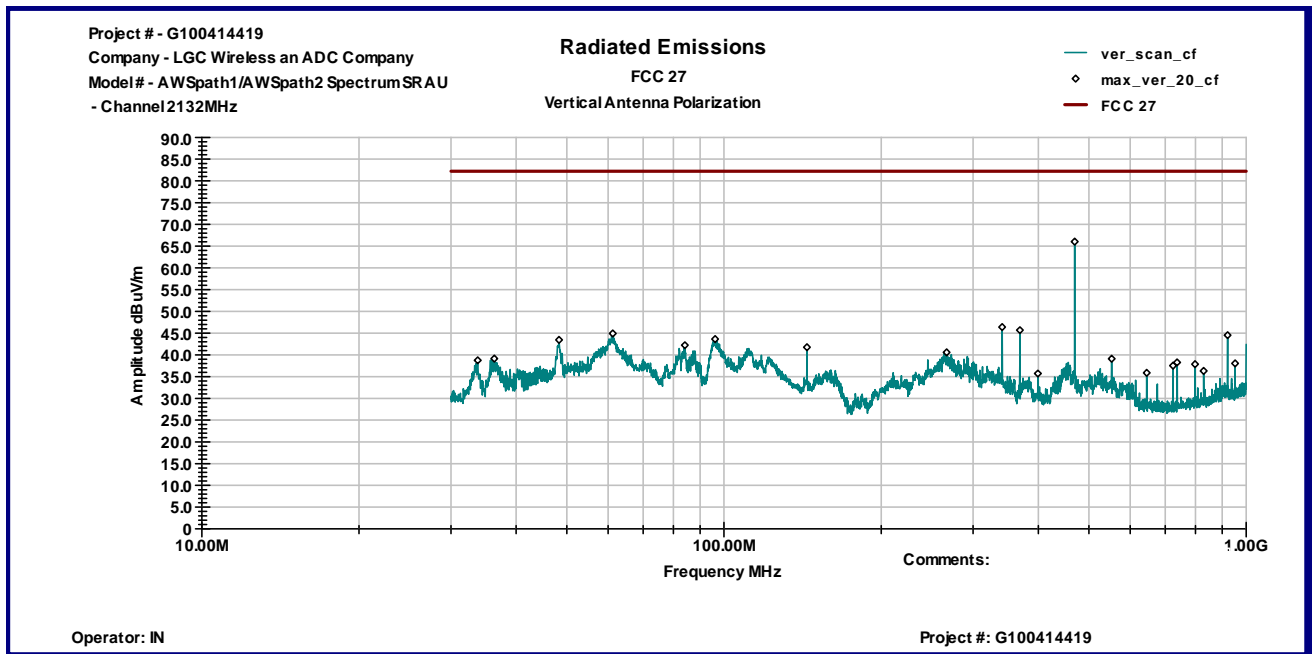
Frequency MHz	Antenna Polarity	Measured Emissions dBμV	Substitution Antenna Power dBm	Substitution Antenna Gain dBi	Cable Loss dB	Additional Loss/Gain dB	Emissions EIRP dBm	Limits dBm	Margin dB
Channel 2111MHz									
448.5	V	45.8	-31.0	0.0	0.5	0.0	-31.5	-13.0	-18.5
448.5	H	47.4	-29.9	0.0	0.5	0.0	-30.4	-13.0	-17.4
7460.00	V	58.2	-38.4	11.2	2.1	0.0	-29.3	-13.0	-16.3
7460.00	H	57.6	-38.7	11.2	2.1	0.0	-29.6	-13.0	-16.6
Channel 2132MHz									
469.5	V	45.7	-30.6	0.0	0.5	0.0	-31.1	-13.0	-18.1
469.5	H	46.3	-29.0	0.0	0.5	0.0	-29.5	-13.0	-16.5
7460.00	V	58.7	-37.6	11.2	2.1	0.0	-28.5	-13.0	-15.5
7460.00	H	60.5	-35.8	11.2	2.1	0.0	-26.7	-13.0	-13.7
Channel 2154MHz									
7460.00	V	57.8	-38.7	11.2	2.1	0.0	-29.6	-13.0	-16.6
7460.00	H	60.8	-35.5	11.2	2.1	0.0	-26.4	-13.0	-13.4



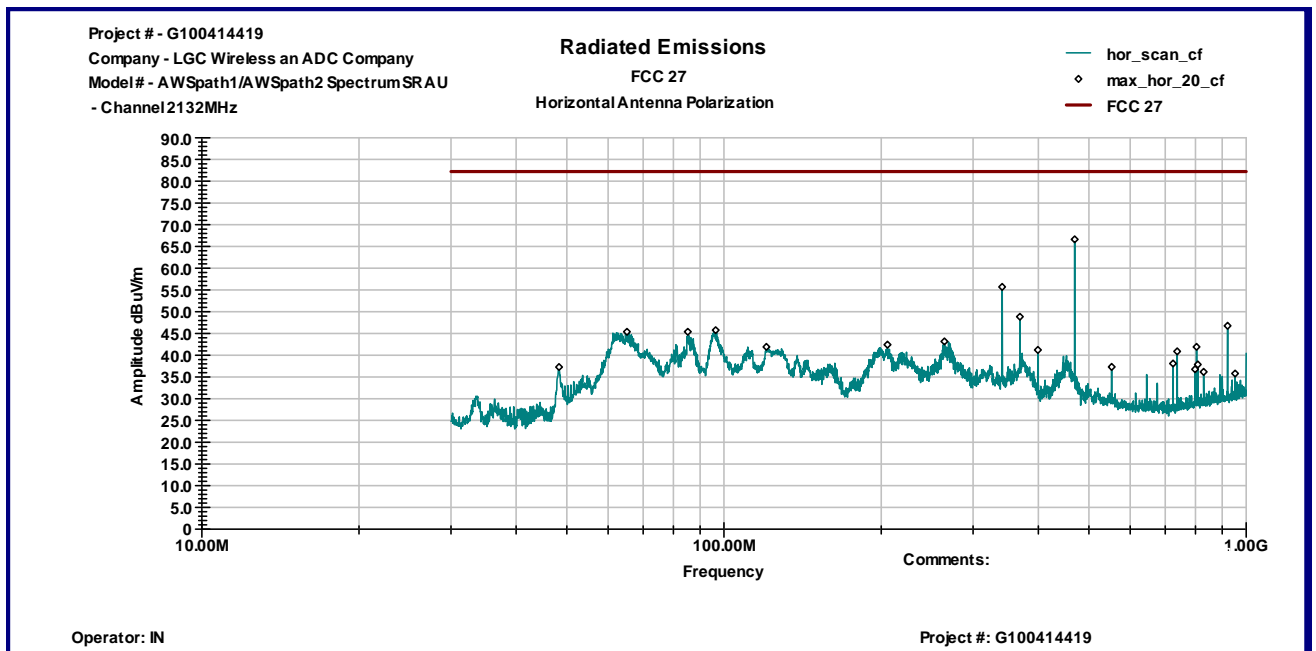
Graph 1



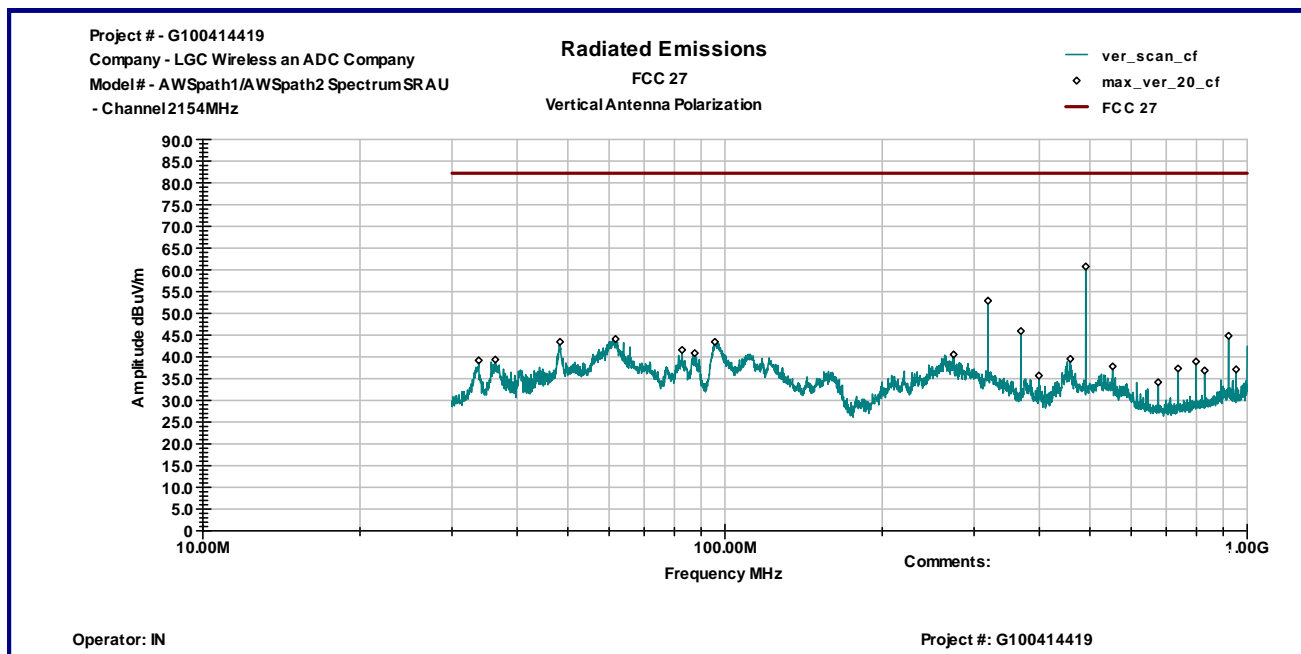
Graph 2



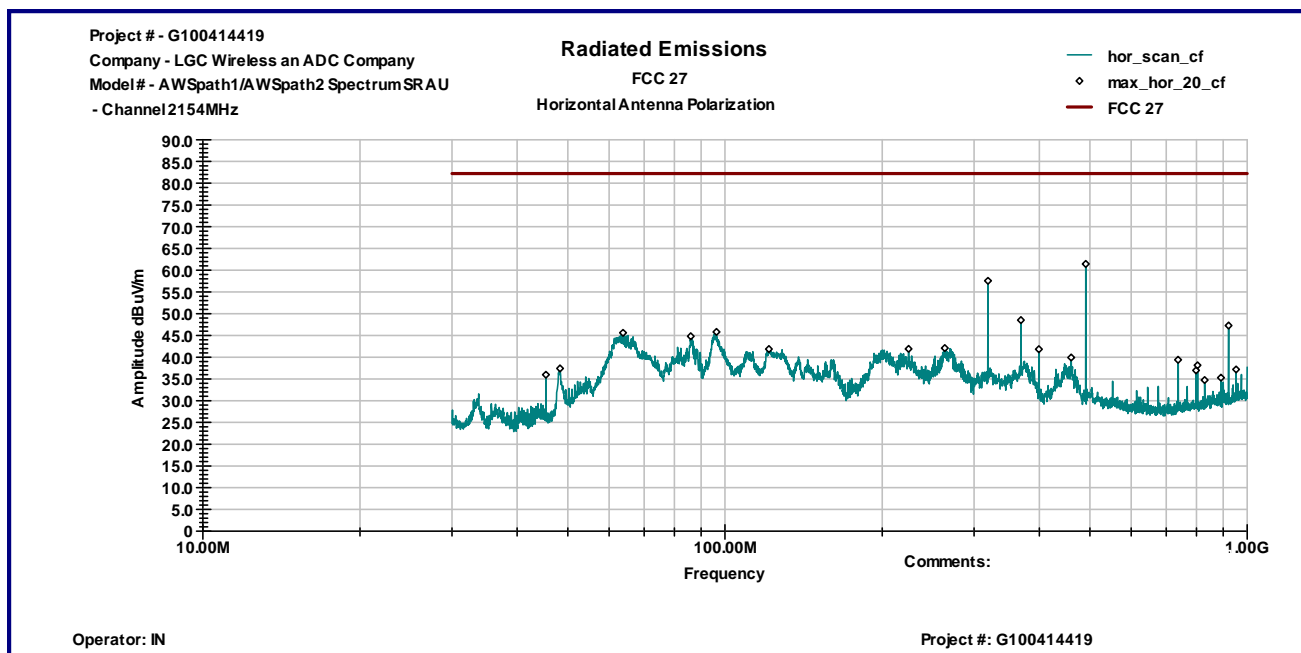
Graph 3



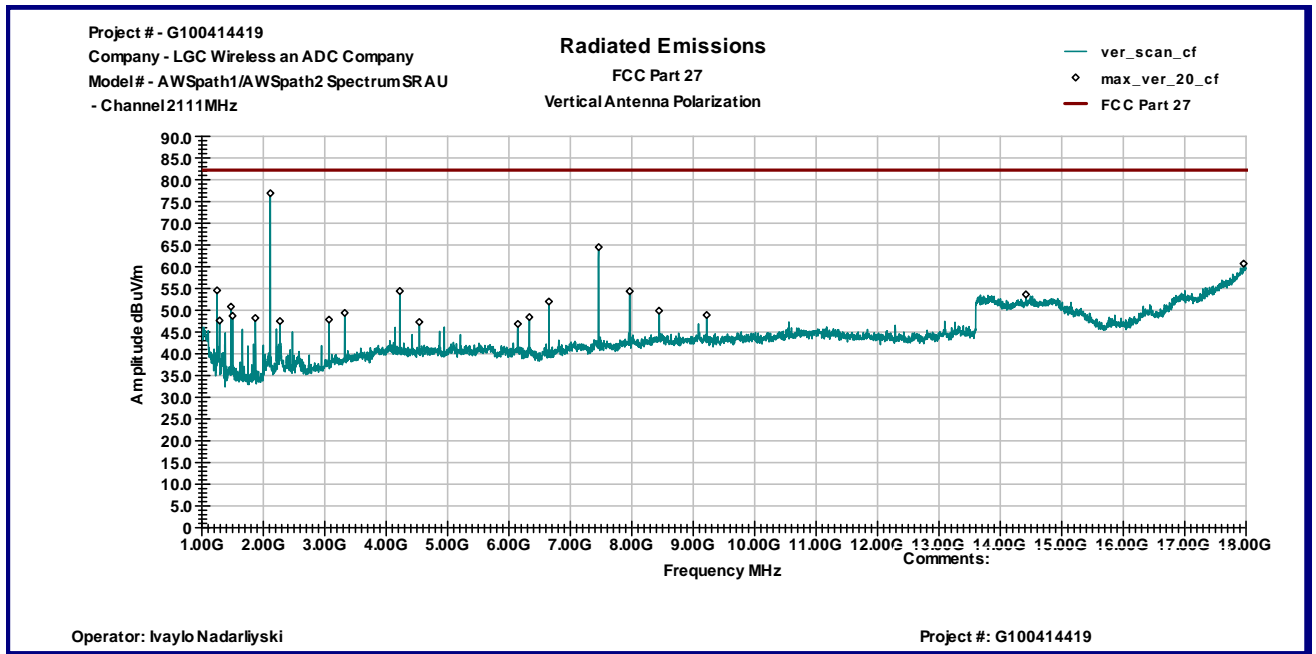
Graph 4



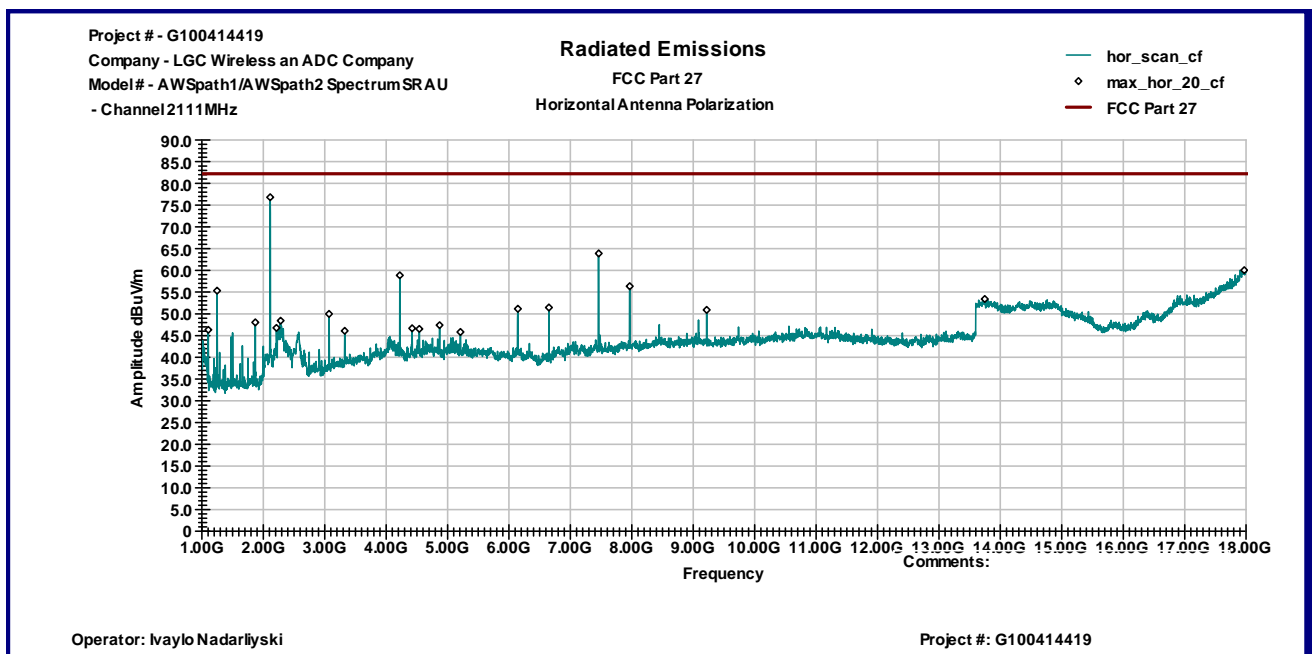
Graph 5



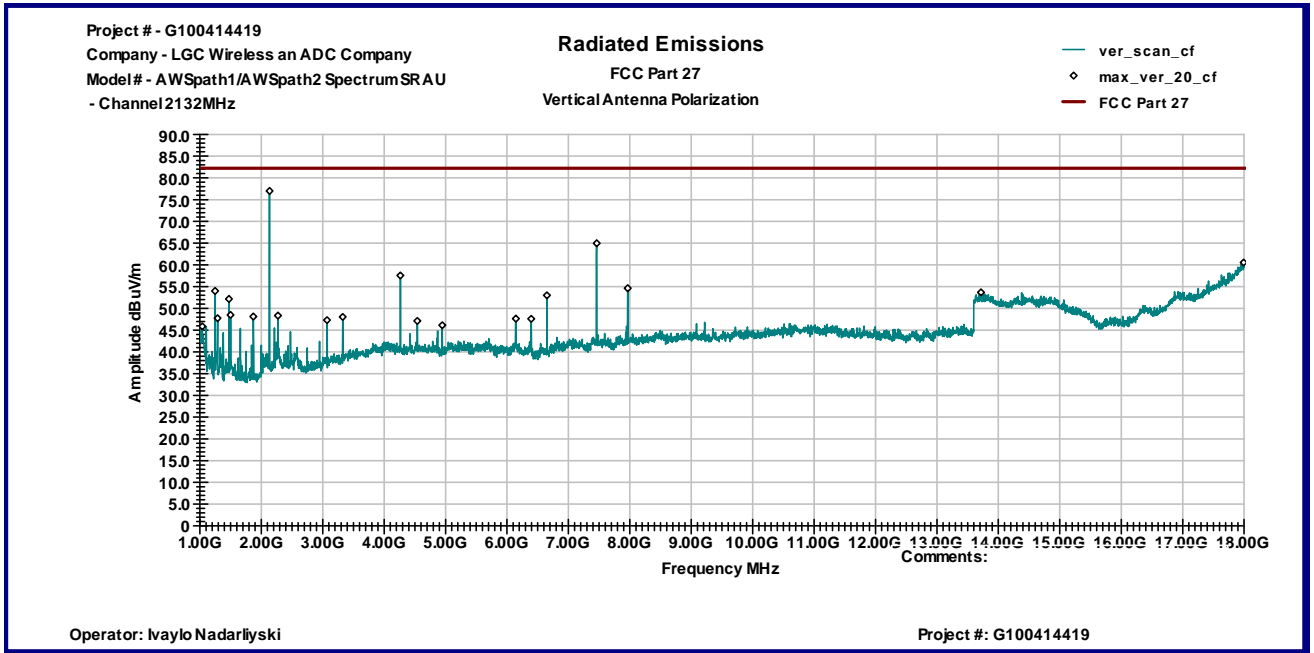
Graph 6



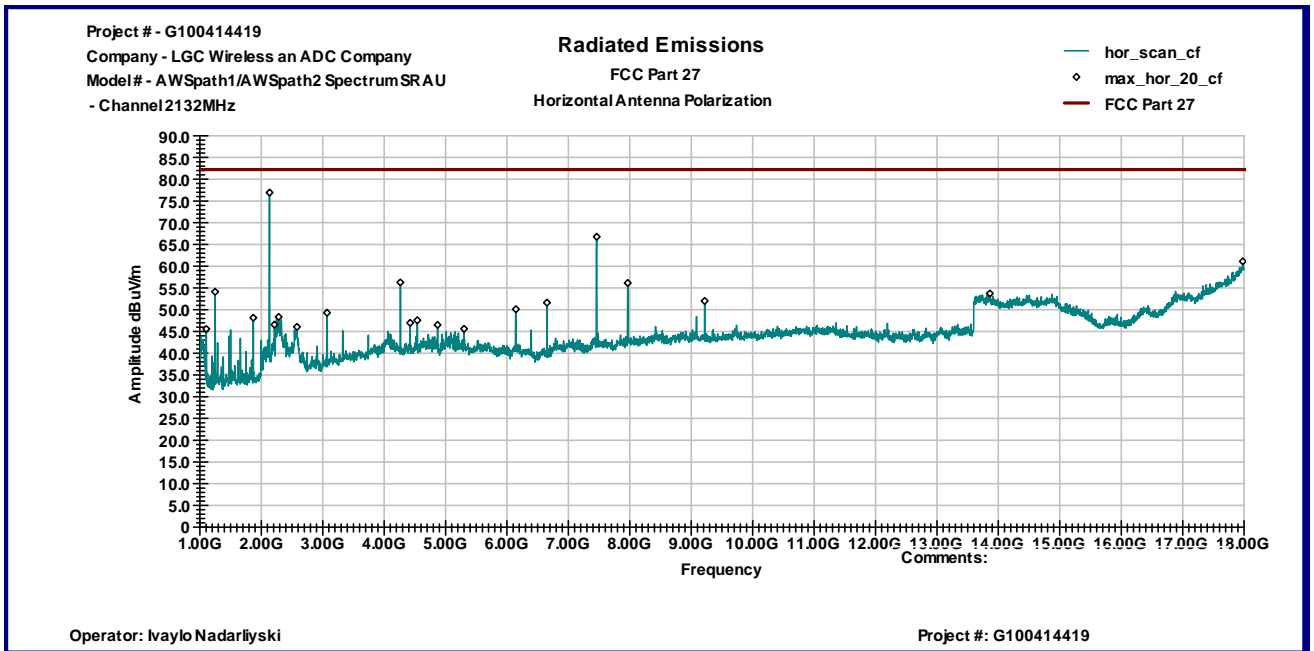
Graph 7



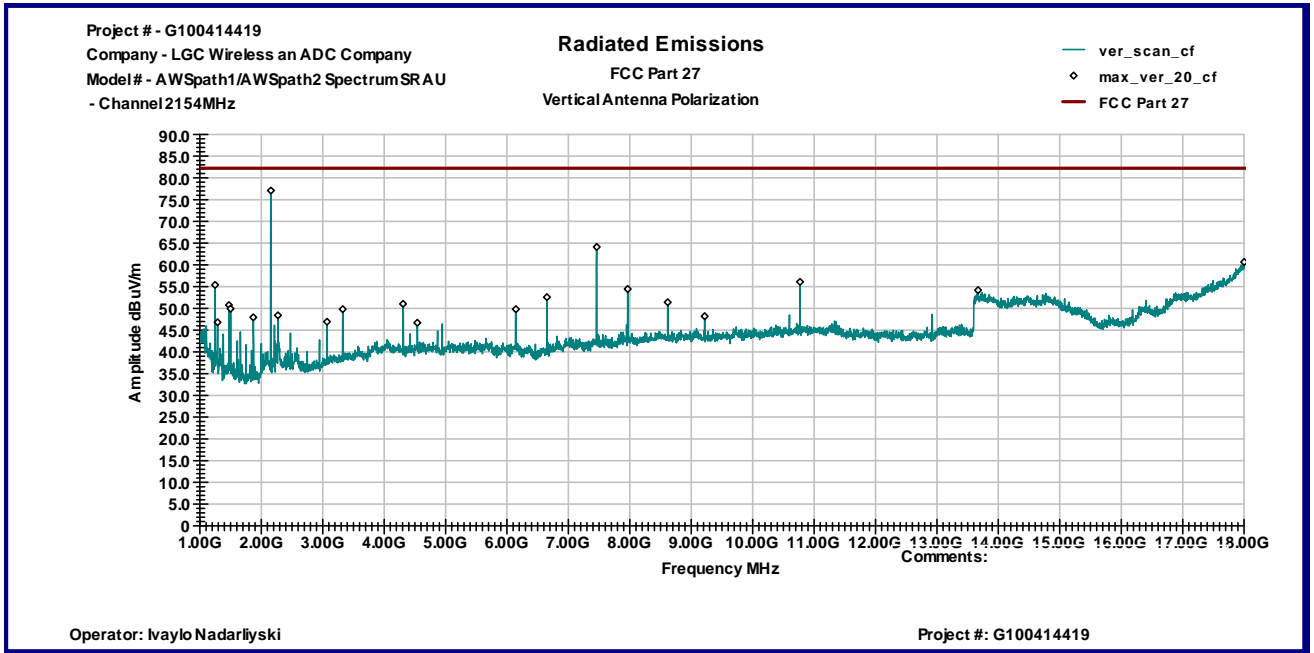
Graph 8



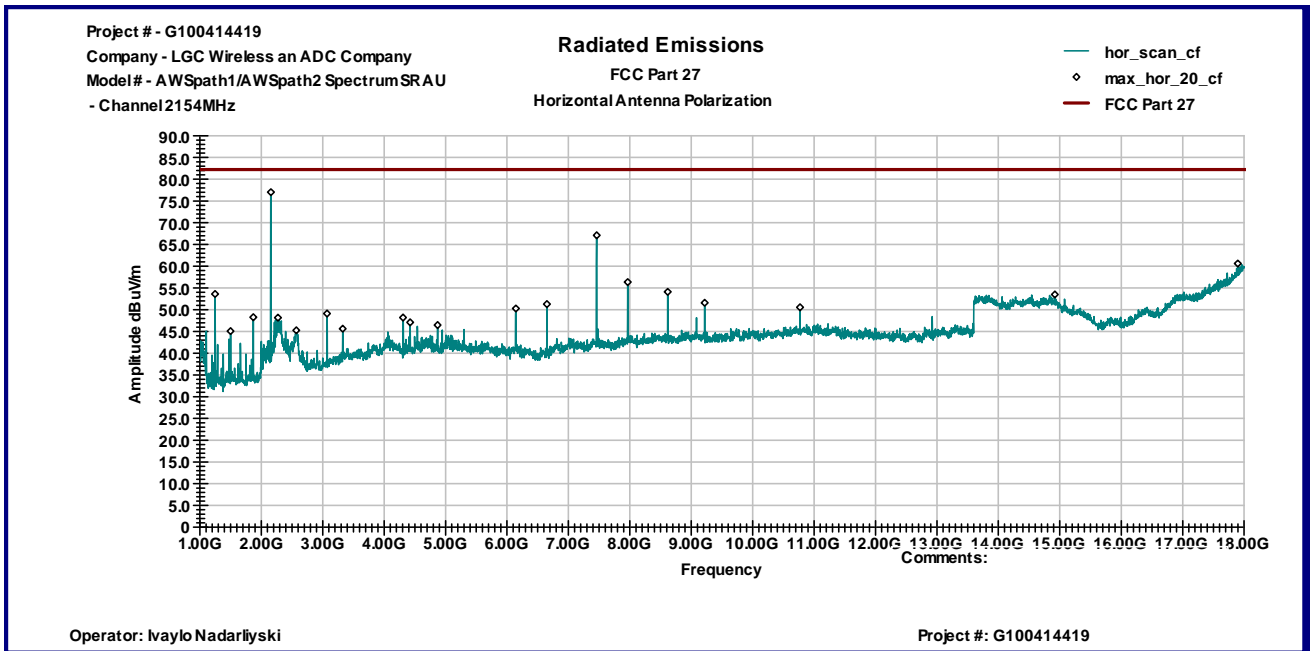
Graph 9



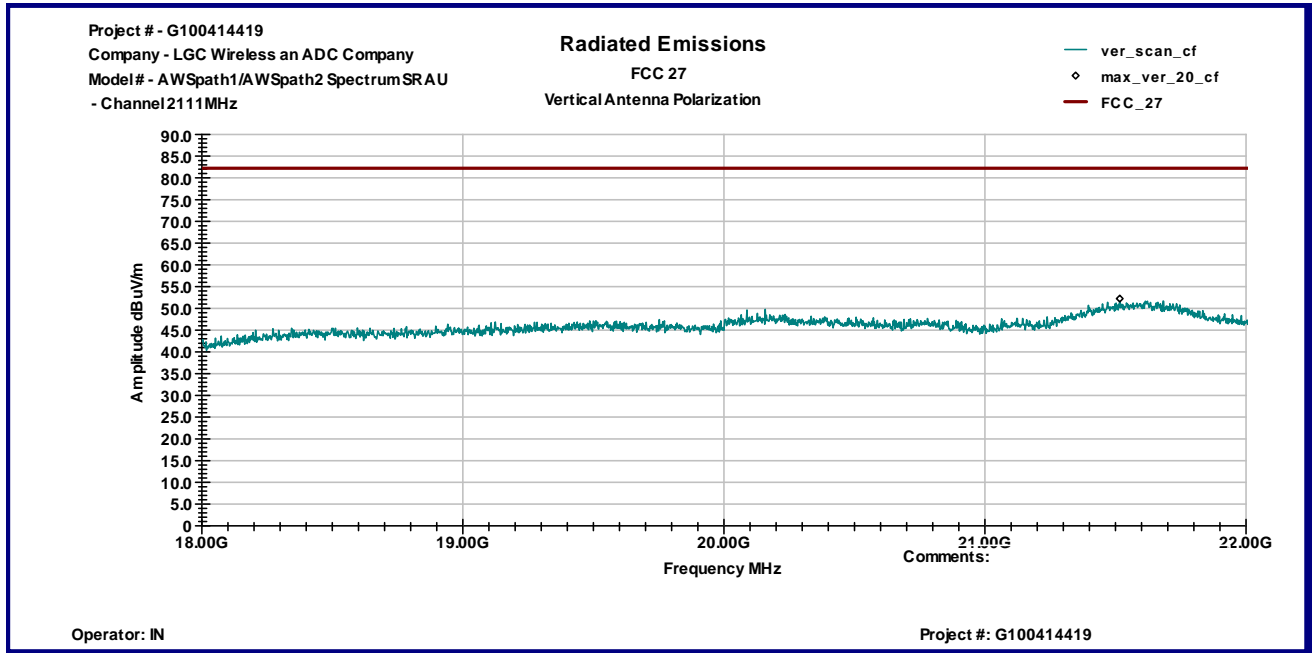
Graph 10



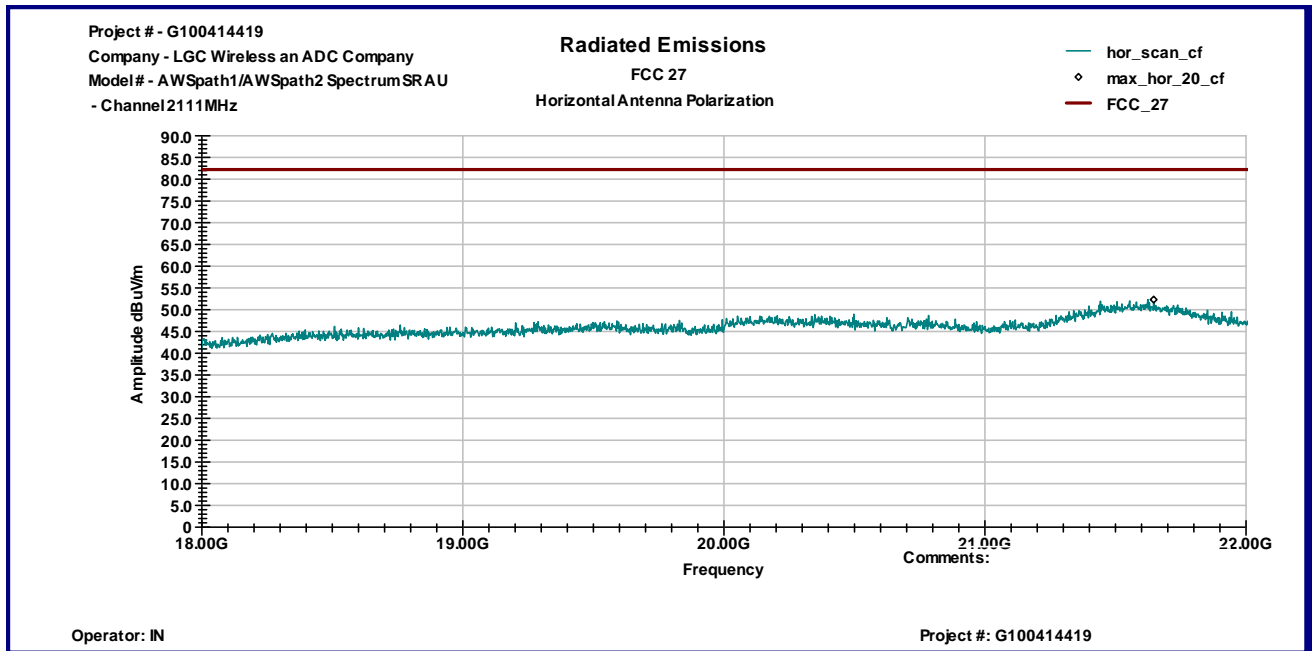
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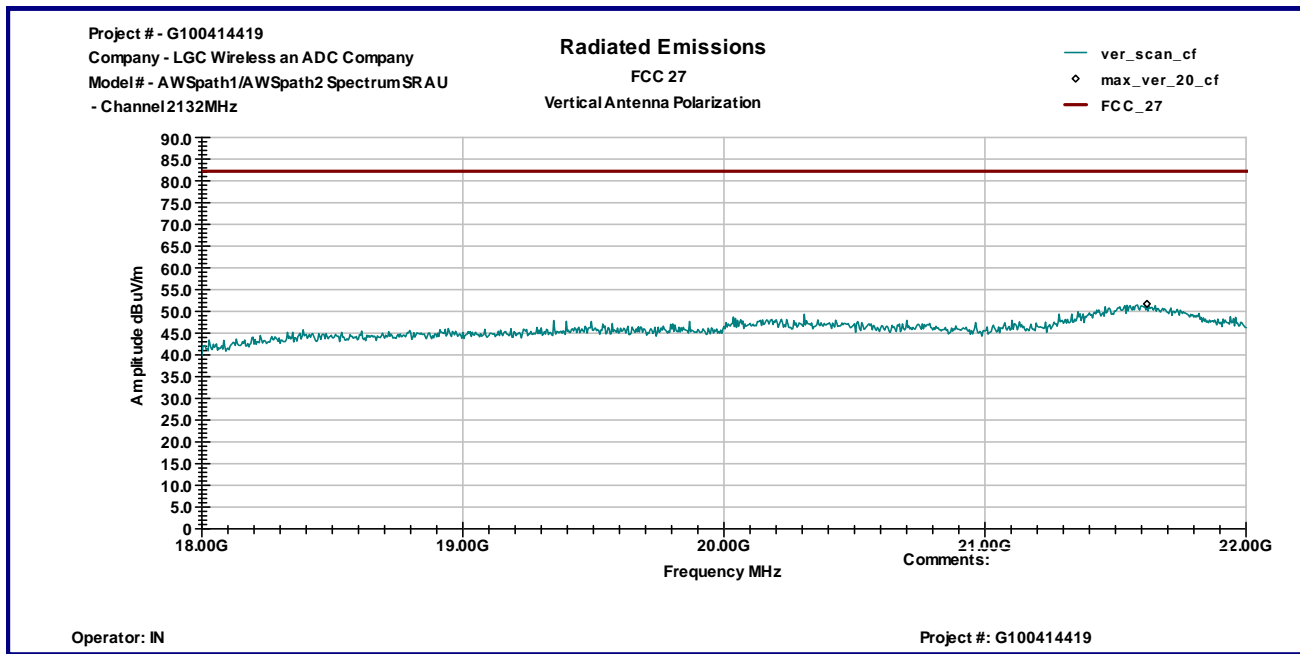
Graph 12



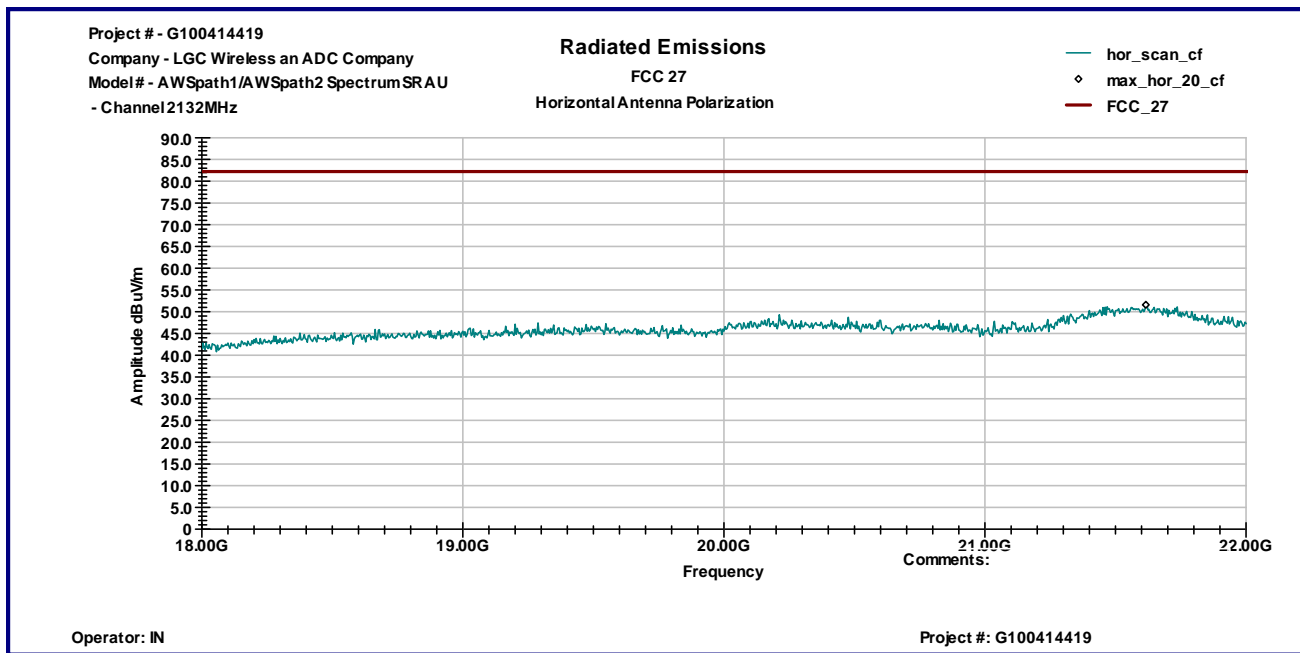
Graph 13



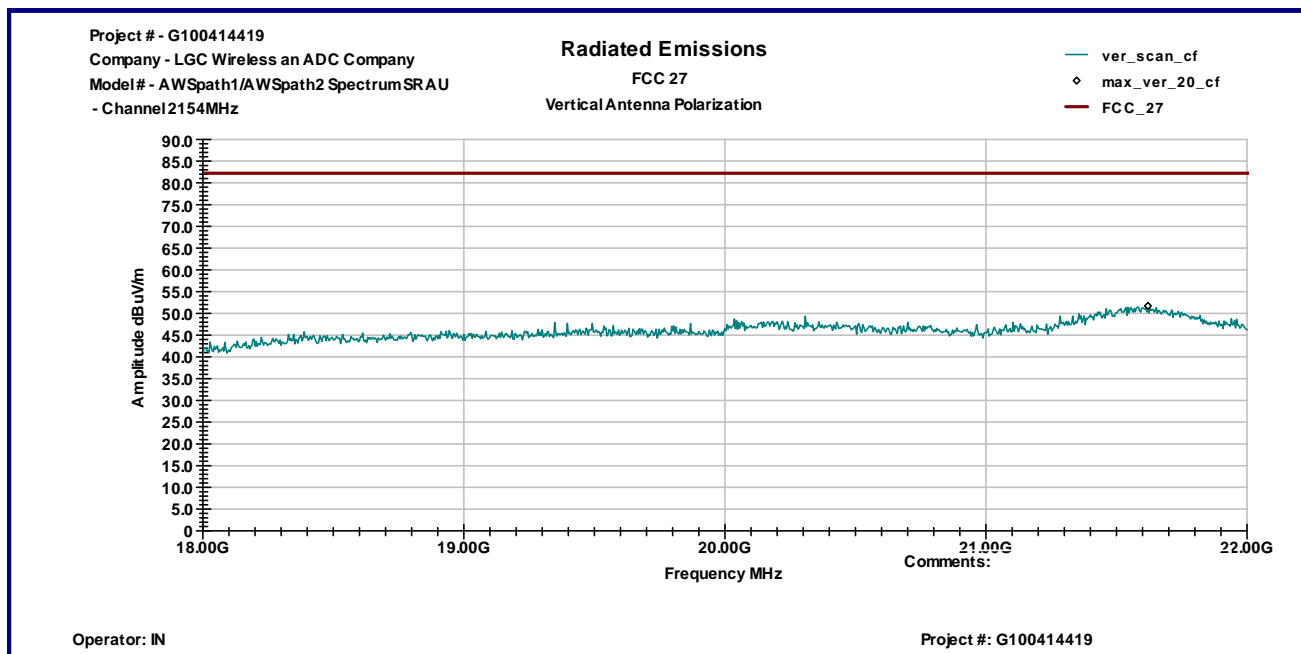
Graph 14



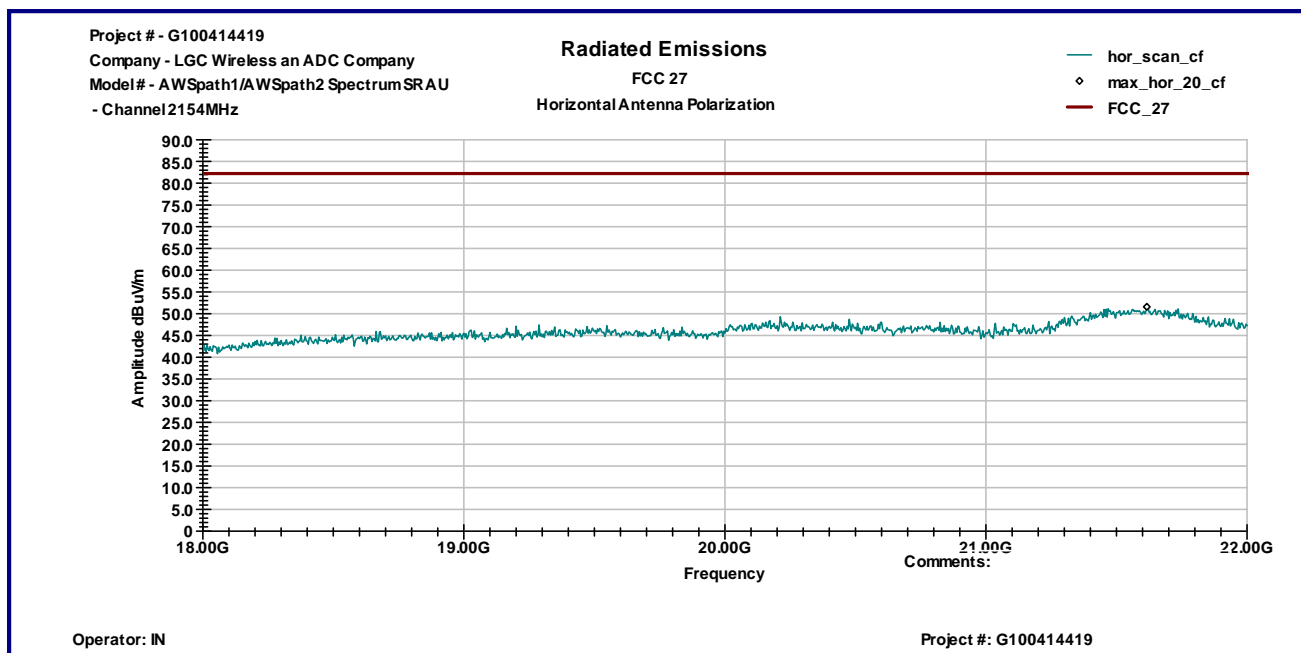
Graph 15



Graph 16



Graph 17



Graph 18

Date:	June 3, 2011	Result: Pass
Tested by:	Richard Blonigen	
Standard:	FCC Part 27	
Test Point:	Enclosure	
Operation mode:	See page 5	
Note:	Substitution Method Channels 2110-2155MHz Frequency Range 1-22GHz	

Table 2

Frequency MHz	Antenna Polarity	Measured Emissions dBμV	Substitution Antenna Power dBm	Substitution Antenna Gain dBi	Cable Loss dB	Additional Loss/Gain dB	Emissions EIRP dBm	Limits dBm	Margin dB
Channel 2111MHz									
448.5	V	45.8	-31.0	0.0	0.5	0.0	-31.5	-13.0	-18.5
448.5	H	47.4	-29.9	0.0	0.5	0.0	-30.4	-13.0	-17.4
7460.00	V	58.2	-38.4	11.2	2.1	0.0	-29.3	-13.0	-16.3
7460.00	H	57.6	-38.7	11.2	2.1	0.0	-29.6	-13.0	-16.6
Channel 2132MHz									
469.5	V	45.7	-30.6	0.0	0.5	0.0	-31.1	-13.0	-18.1
469.5	H	46.3	-29.0	0.0	0.5	0.0	-29.5	-13.0	-16.5
7460.00	V	58.7	-37.6	11.2	2.1	0.0	-28.5	-13.0	-15.5
7460.00	H	60.5	-35.8	11.2	2.1	0.0	-26.7	-13.0	-13.7
Channel 2154MHz									
7460.00	V	57.8	-38.7	11.2	2.1	0.0	-29.6	-13.0	-16.6
7460.00	H	60.8	-35.5	11.2	2.1	0.0	-26.4	-13.0	-13.4

5.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	12559	12/07/2011	<input checked="" type="checkbox"/>
Spectrum Analyzer	R & S	ESCI	100358	12909	07/12/2011	<input checked="" type="checkbox"/>
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	14459	10/18/2011	<input checked="" type="checkbox"/>
Horn Antenna	EMCO	3115	9507-4513	9936	04/29/2012	<input checked="" type="checkbox"/>
Horn Antenna	EMCO	3115	6579	15580	05/25/2012	<input checked="" type="checkbox"/>
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	10/06/2011	<input checked="" type="checkbox"/>
System	TILE! Instrument Control		Ver. 3.4.K.29	15259	VBU	<input checked="" type="checkbox"/>
Waveguide Horn Antenna	EMCO	3116	9904-2423	9705	10/04/2011	<input checked="" type="checkbox"/>
Pre-Amplifier	MITEQ	AMF-6F-16002600-25-10P	1222383	MIN-0065	10/06/2011	<input checked="" type="checkbox"/>