FCC PART 15 SUBPART C

EMI MEASUREMENT AND TEST REPORT

For

LG Electronics, Inc.

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Youngdungpo-Gu, Seoul, 150-096, Korea

FCC ID: BEJLW2100AP

July 16, 2002

This Report Concerns:	**Equipment Type:**
☒ Original Report	Wireless LAN

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Report No.: R0206171

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *LG Electronics, Inc.*'s product, model *LW2100AP* or the "EUT" as referred to in this report is a wireless LAN. The EUT measures approximately 5.75" L x 6.50" W x 1.75"H.

The EUT delivers the freedom to configure the network without wire and functions as an IEEE 802.3 Ethernet-based Residential Gateway. It provides 10/100 Dual Speed Ethernet port for a DSL Modem, Cable Modem, or other Broadband access device and one 10M Ethernet port for connection to a home or small office network.

The EUT provides the following features:

- 2 Ethernet ports
- DHCP server function for automatic TCP/IP address management
- NAT/PAT: Internet sharing allows users to access the internet simultaneously
- Web-based configuration & management: Embedded web browser eases network configuration and management, from anywhere in the world.
- Acts as a firewall: protects the computer from intruders
- LED indicators: power, WAN(Internet link), AIR1, LAN(Local link), AIR2
- Input power: 5Vdc/2.0A
- Operating environment: Temperature: 0°~50°, humidity: 0%~80%
- Shelf environment: temperature: -40°~70°, humidity: 0%~95%

The EUT utilized Best Technology Co., Ltd. AC/DC power adapter, M/N: BPA-072.

** The test data was only good for test sample. It may have deviation for other product samples.*

1.2 Objective

This type approval report is prepared on behalf of *LG Electronics, Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for peak output power, antenna requirement, 6 dB bandwidth, power density, 100 kHz bandwidth of band edges, RF exposure of emission, conducted and spurious radiated emission.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2000, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2000.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8564E	08303	12/6/02
HP	Spectrum Analyzer	8593B	2919A00242	12/20/02
HP	Amplifier	8349B	2644A02662	12/20/02
HP	Quasi-Peak Adapter	85650A	917059	12/6/02
HP	Amplifier	8447E	1937A01046	12/6/02
A.H. System	Horn Antenna	SAS0200/571	261	12/27/02
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/02
Com-Power	Biconical Antenna	AB-100	14012	11/2/02
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/02
Com-Power	LISN	LI-200	12208	12/20/02
Com-Power	LISN	LI-200	12005	12/20/02
BACL	Data Entry Software	DES1	0001	12/20/02
Rohde & Schwarz	Signal Generator	SMIQ03B	1125.5555.03	7/10/02
Rohde & Schwarz	I/Q Modulation Generator	AMIQ	1110.2003.02	8/10/02

*** Statement of Traceability: Bay Area Compliance Laboratory Corp.** certifies that all calibration has been performed using suitable standards traceable to the NATIONAL INSTITUTE of STANDARDS and TECHNOLOGY (NIST).

1.7 PC System Configuration List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
eMachine	PC System	Etower 266	QD388-100-27852	DOC
Tyan	Motherboard	V72	MA98125	DOC
Sony	Floppy Drive	N4847	JU-256A276P	DOC
Maxtor	Hard Disk	90845D4	A4153EBCC108	DOC
LG	CD-ROM	CR-8322B	11S36L8727ZJ17CM 302121	IU09TB060CR B
Fortron Source	Power Supply	FSP145-50NI	W17178420 (9843)	DOC
Digital	Ethernet Card	1695	42464	None

1.8 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
eMachine	PC System	Etower 266	QD388-100-27852	DOC
AGD	Monitor	GD-500X	5N0008541	None
Dell	KB	RT70D00	753622030114	E5XKBM104M10UC
Newmen	Mouse	MS-010	None	DOC
HP	Printer	2225C+	None	BS46XU2225C

1.9 External I/O Cable List and Details

Description	Length (M)	From	To
Shielded KB Cable	2.0	PS/2 KB Port/Host	KB
Shielded Mouse Cable	1.8	PS/2 Mouse Port/Host	Mouse
Shielded VGA Cable	1.8	VGA Port/Host	Monitor
Shielded Parallel Cable	1.5	Parallel Port/Host	Printer
Shielded RJ45 Cable	1.2	Ethernet Port/Host	EUT
Shielded RJ45 Cable	1.0	RJ45 Port/EUT	Terminated

2 - SYSTEM TEST CONFIGURATION AND REQUIREMENT

2.1 Description of Test Configuration

The EUT was configured for testing in a typical fashion (as normally used by a typical user).

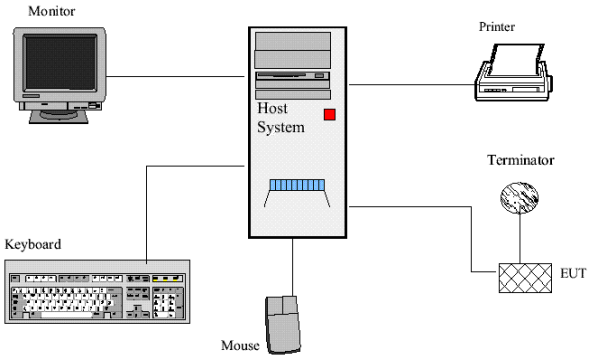
2.2 Block Diagram

Please refer to Exhibit D.

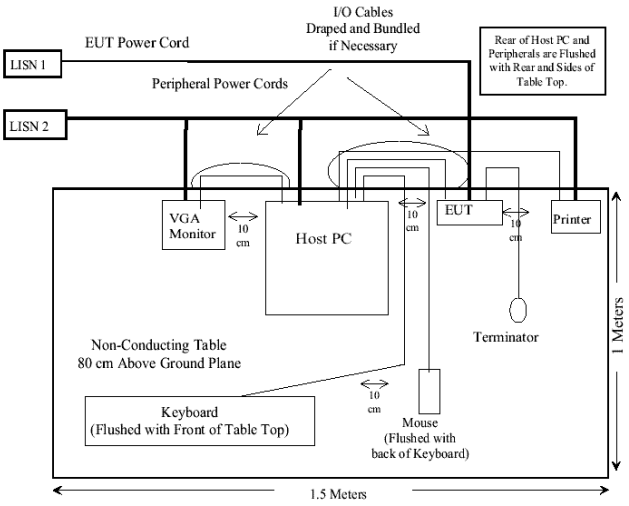
2.2 Equipment Modification

No modification(s) was made by BACL Corp. to ensure EUT comply with applicable limits and requirements.

2.3 Configuration of Test System



2.4 Test Setup Block Diagram



3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	STANDARD	MEASURED	REFERENCE
§15.247 (b) (2)	Output Power	≤ 100mW	50.70mW	Section 4
§15.247 (a) (2)	6 dB Bandwidth	≥ 500kHz	11.08MHz	Section 6
§ 15.205 §15.209 (a) §15.209 (f)	Restricted Bands, Radiated Emission, Spurious Emission	< 54dBuV	47.1dBuV	Section 5
§ 15.205 §15.209 (a) §15.209 (f)	Receiver Emission	< 46dBuV	40.7dBuV	Section 9
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edges	≥ 20dB	48.00dB	Section 7
§15.247 (d)	Peak Power Spectral Density	≤ 8dBm	4.33dBm	Section 8
§15.203	Antenna Requirement	Eternal Fixed	Available	Section 11
§ 2.1091	RF Safety Requirements	≤ 1mW/cm^2	0.016mW/cm^2	Section 12
§15.207 (a)	Conducted Emission	< 48dBuV	34.6dBuV	Section 10

4 - CONDUCTED OUTPUT POWER

4.1 Standard Applicable

For frequency hopping, according to §15.247(b) (2), the maximum peak output power of the transmitter shall not exceed 1 Watt.

4.2 Measurement Procedure

1. Place the EUT on the bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a power meter.

4.3 Measurement Result

Channel No.	Test Data (dBm)	Test Data (mW)	Limit	Test Result
Low	16.32	42.85	≤1W	Compliant
Middle	16.12	41.40	≤1W	Compliant
High	16.32	42.85	≤1W	Compliant

4.4 Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Due Date
Agilent	E4419B	GB40202891	4/8/03
Agilent	E4412A	US38486529	4/8/03

4.5 Test Results

Frequency	Output Power (dBm)	Output Power (mW)	Standard (mW)	Result
Low	16.05	40.27	≤ 100	Compliant
Middle	16.36	43.25	≤ 100	Compliant
High	17.05	50.70	≤ 100	Compliant

4.6 Plots for Effective Radiated Power Test Result

Please see the pictures hereinafter.

Agilent
E4419B
EPM Series Power Meter
16.05dBm

Agilent
E4419B
EPM Series Power Meter
16.36dBm

Agilent
E4419B
EPM Series Power Meter
17.05dBm

5 - SPURIOUS EMISSION

5.1 Standard Applicable

According to §15.209 (f) and §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation f a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit.

5.2 Measurement Procedure

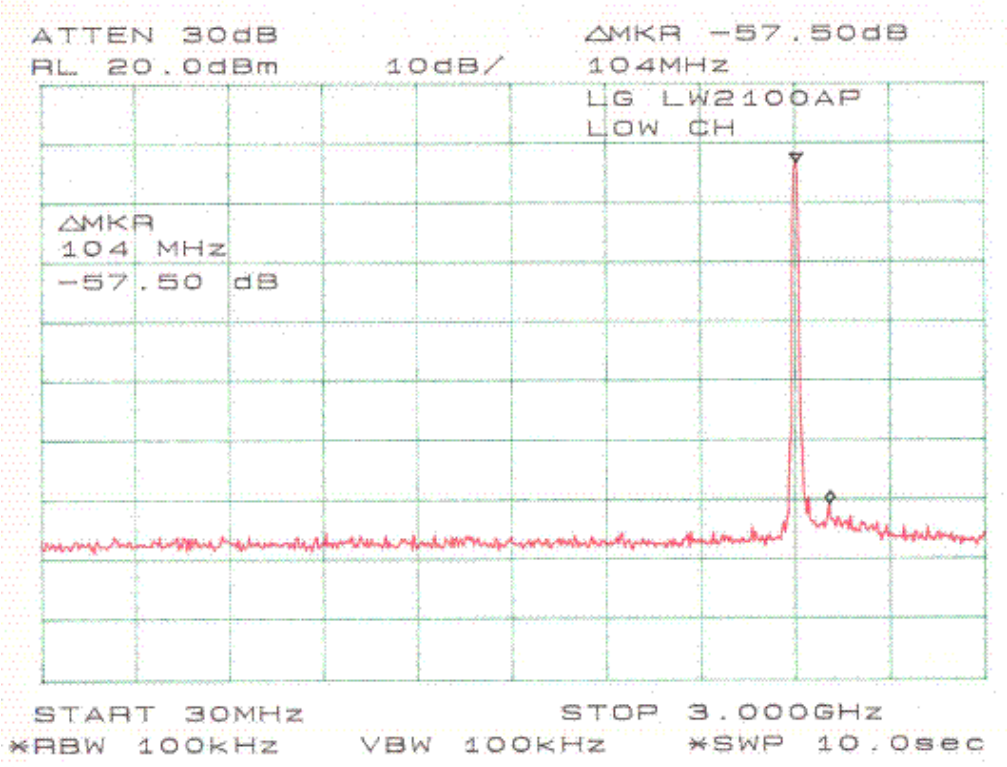
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

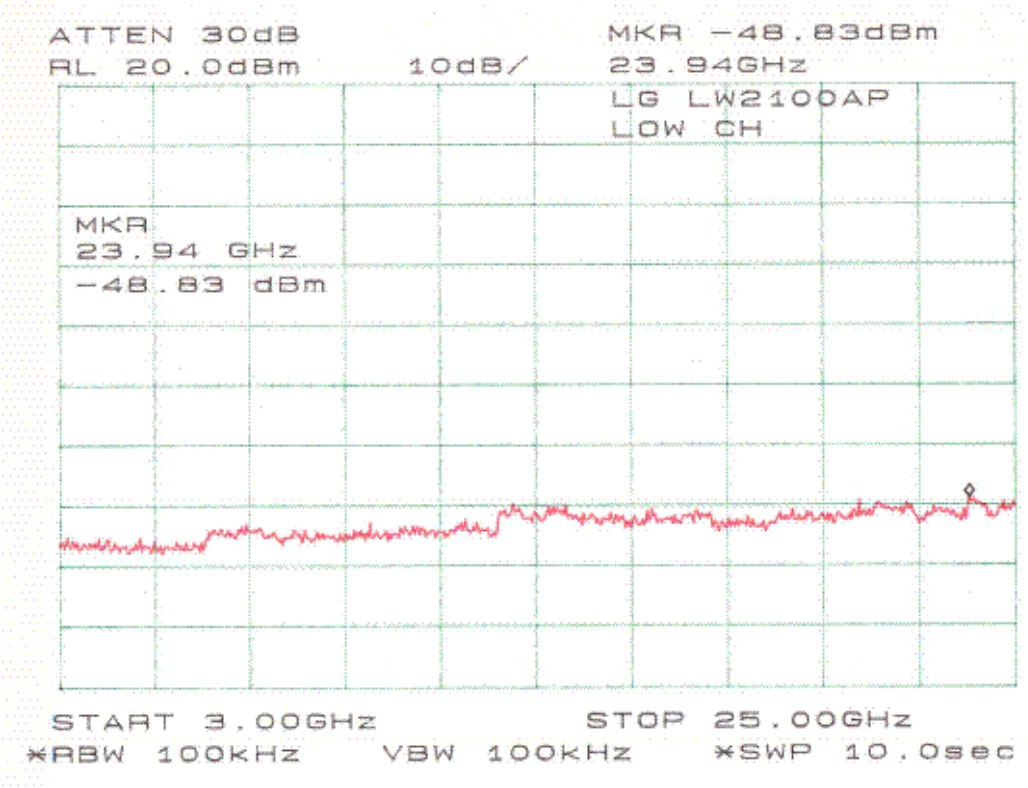
5.3 Measurement Data

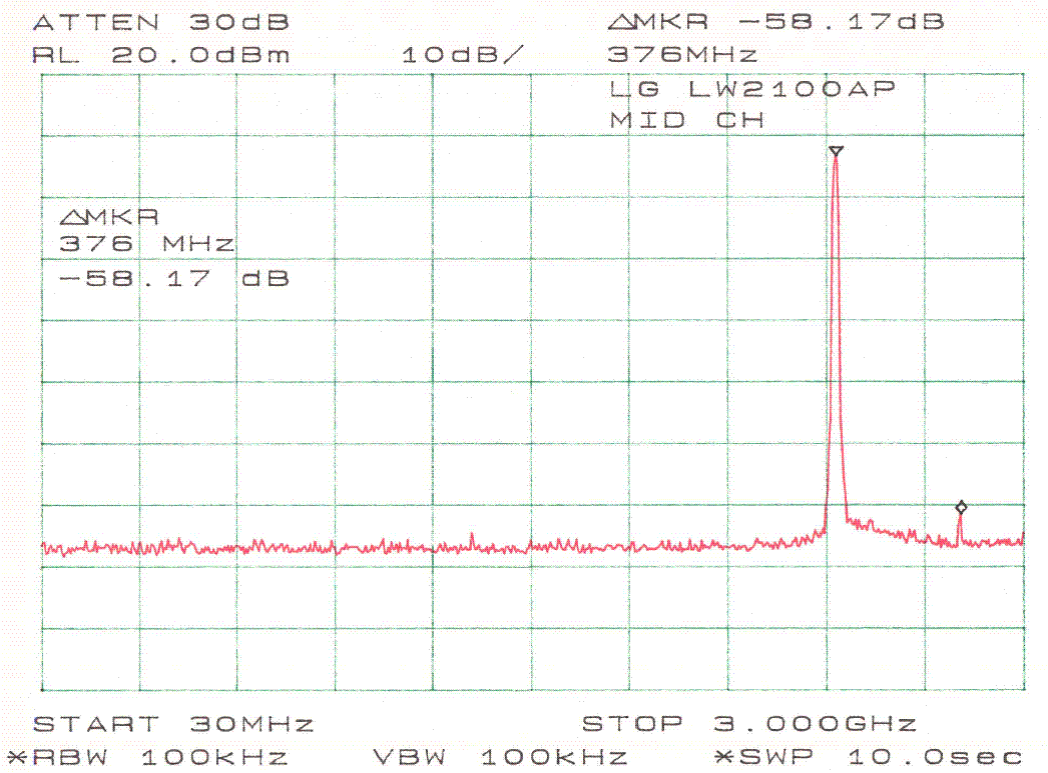
Please refer to the appending for more information.

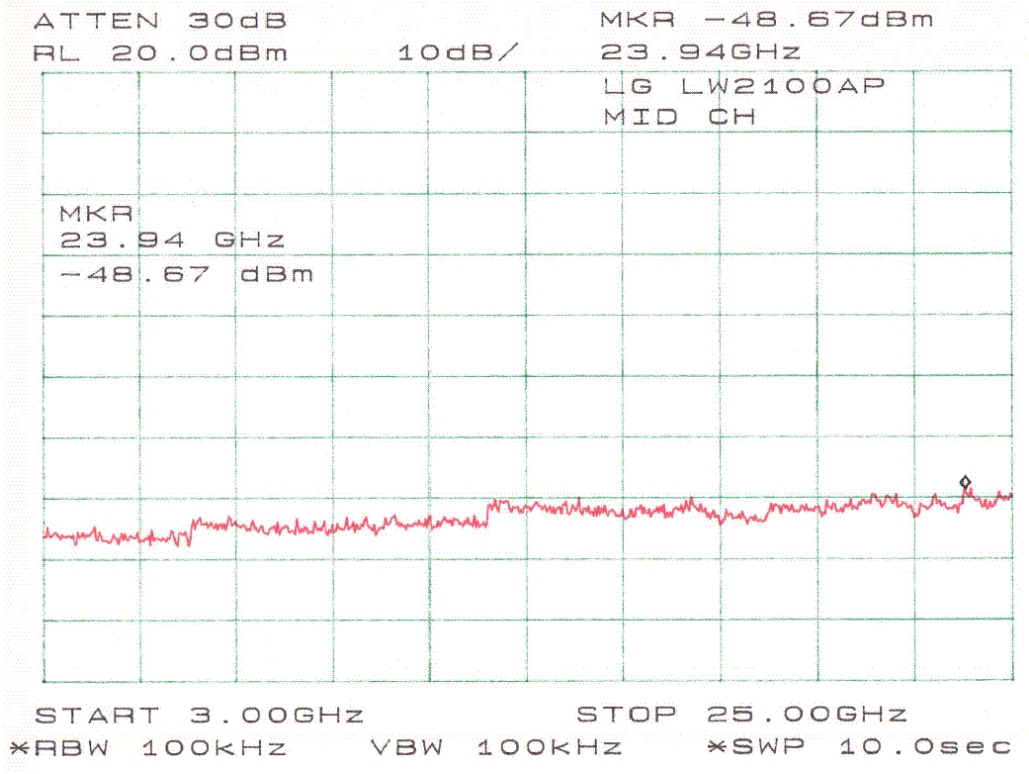
5.4 Test Result

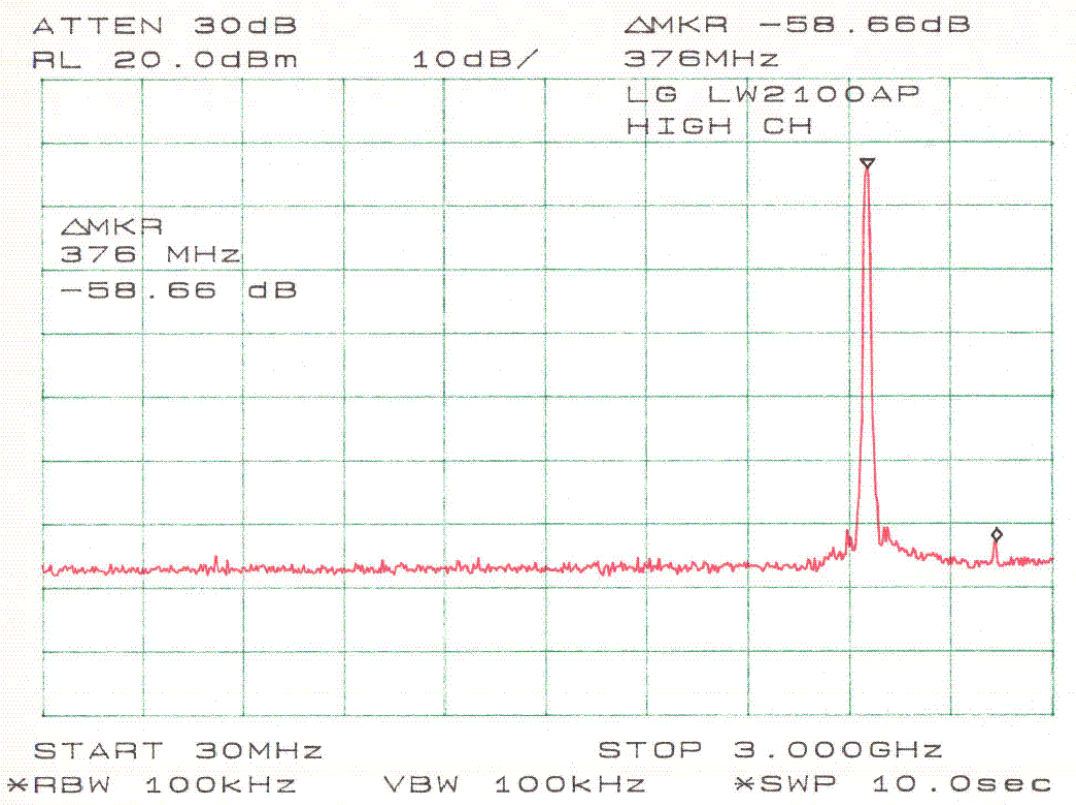
Please refer to the plots hereby.

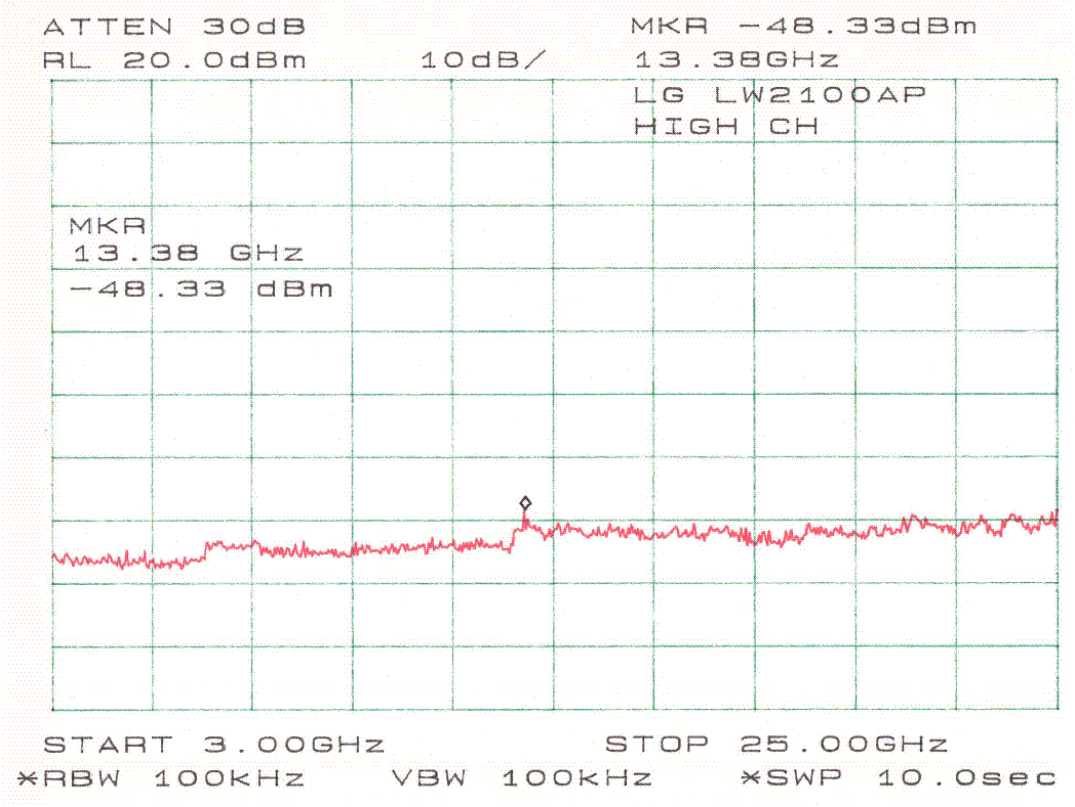

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -57.50dB
104MHz
LG LW2100AP
LOW CH
ΔMKR
104 MHz
-57.50 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -48.83dBm
23.94GHz
LG LW2100AP
LOW CH
MKR
23.94 GHz
-48.83 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -58.17dB
376MHz
LG LW2100AP
MID CH
ΔMKR
376 MHz
-58.17 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -48.67dBm
23.94GHz
LG LW2100AP
MID CH
MKR
23.94 GHz
-48.67 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -58.66dB
376MHz
LG LW2100AP
HIGH CH
ΔMKR
376 MHz
-58.66 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -48.33dBm
13.38GHz
LG LW2100AP
HIGH CH
MKR
13.38 GHz
-48.33 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

6 - 6 DB BANDWIDTH OF EMISSIONS

6.1 Standard Applicable

According to §15.247(a)(2), for direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

6.2 Measurement Procedure

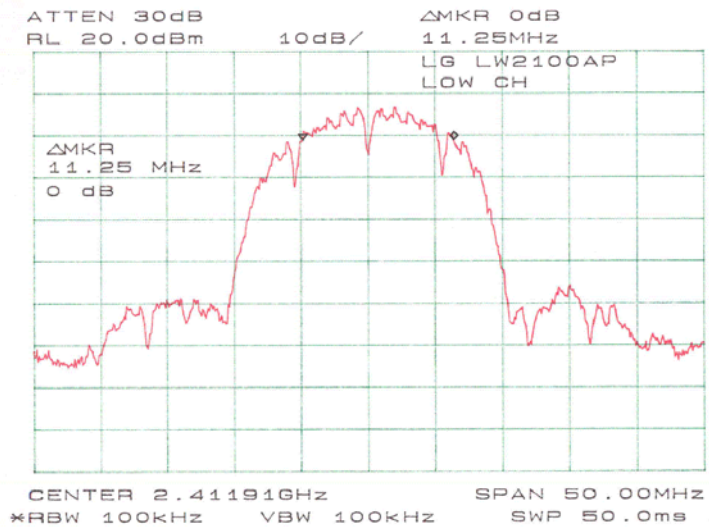
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

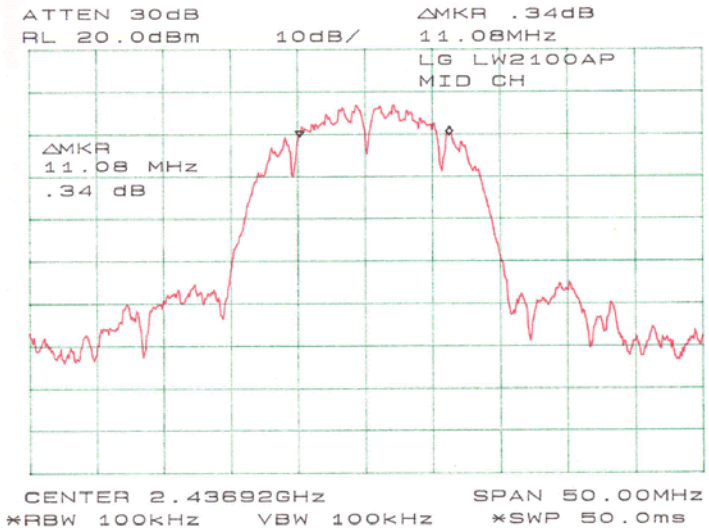
6.3 Measurement Data

Frequency	Measurement (MHz)	Standard (kHz)	Result
Low	11.25	≥ 500	Compliant
Middle	11.08	≥ 500	Compliant
High	11.17	≥ 500	Compliant

6.4 Plot of 6dB Bandwidth

Please refer to the hereinafter plots for more details.


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR 0dB
11.25MHz
LG LW2100AP
LOW CH
ΔMKR
11.25 MHz
0 dB
CENTER 2.41191GHz
SPAN 50.00MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR .34dB
11.08MHz
LG LW2100AP
MID CH
ΔMKR
11.08 MHz
.34 dB
CENTER 2.43692GHz
SPAN 50.00MHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.17dB
11.17MHz
LG LW2100AP
HIGH CH
ΔMKR
11.17 MHz
-.17 dB
CENTER 2.46199GHz
SPAN 50.00MHz
*RBW 100kHz
*VBW 100kHz
*SWP 50.0ms

7 - 100 KHZ BANDWIDTH OF BAND EDGES

7.1 Standard Applicable

According to §15.247(c), if *any* 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a), whichever results in the lesser attenuation.

7.2 Measurement Procedure

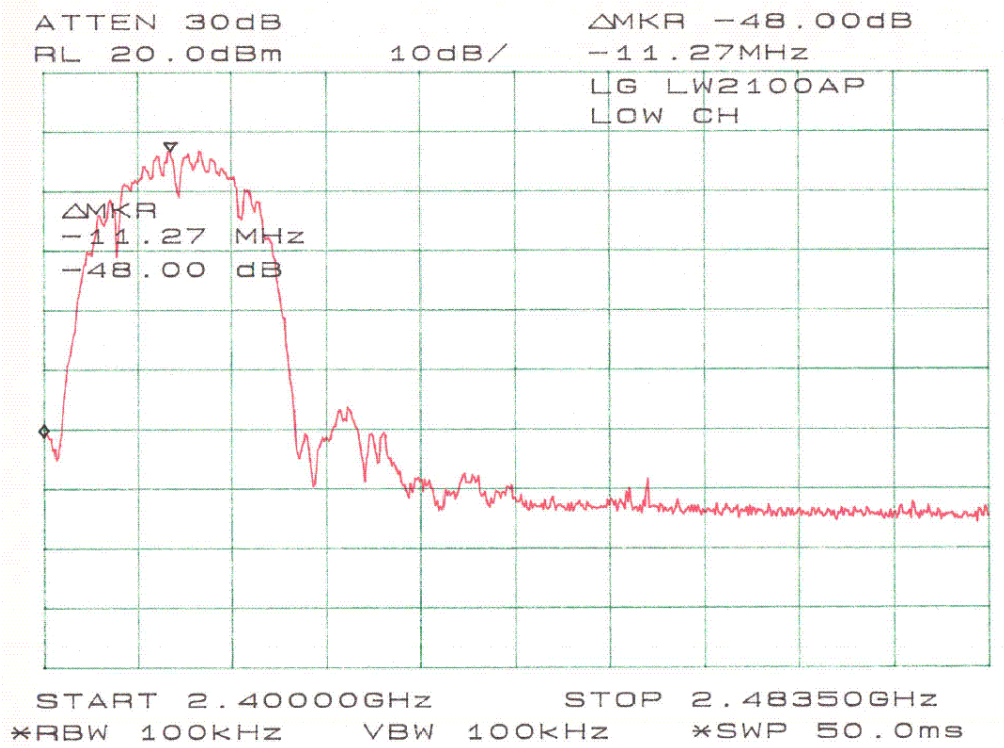
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

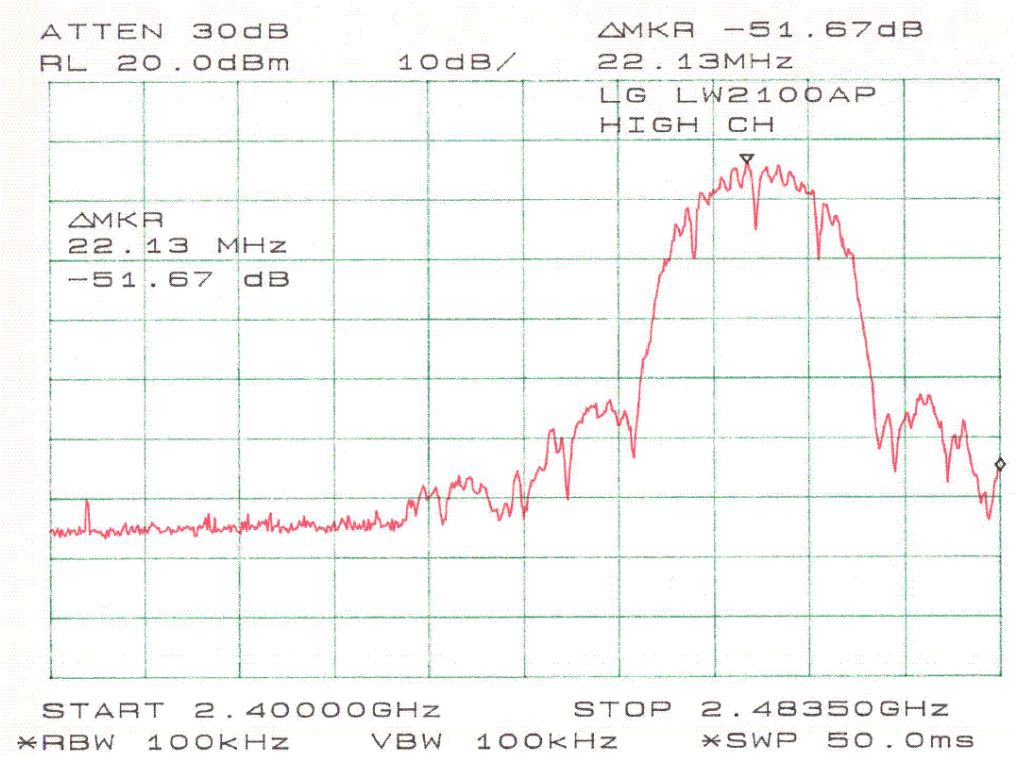
7.3 Test Results

Frequency	Measurement	Standard	Result
Low	48.00	≥ 20dB	Compliant
High	60.33	≥ 20dB	Compliant

7.4 Plots of 100kHz Bandwidth of Band Edge

Please refer to the hereinafter plots for more details.


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -48.00dB
-11.27MHz
LG LW2100AP
LOW CH
ΔMKR
-11.27 MHz
-48.00 dB
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -51.67dB
22.13MHz
LG LW2100AP
HIGH CH
ΔMKR
22.13 MHz
-51.67 dB
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms

8 - POWER DENSITY

8.1 Standard Applicable

According to §15.247 (d), for direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

8.2 Measurement Procedure

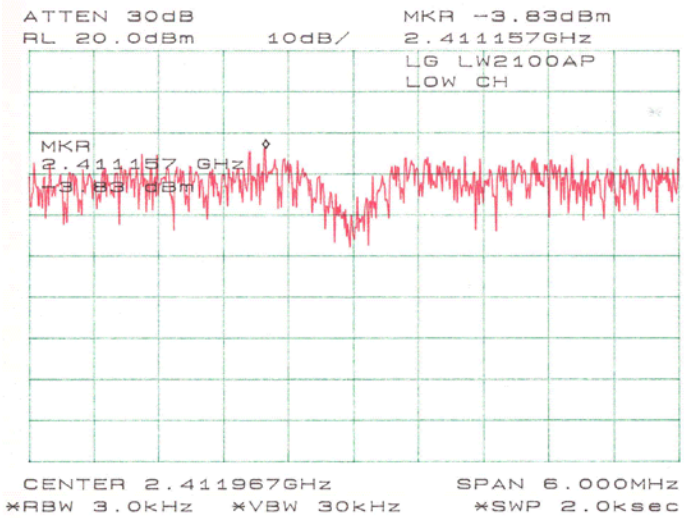
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Repeat above procedures until all frequencies measured were complete.

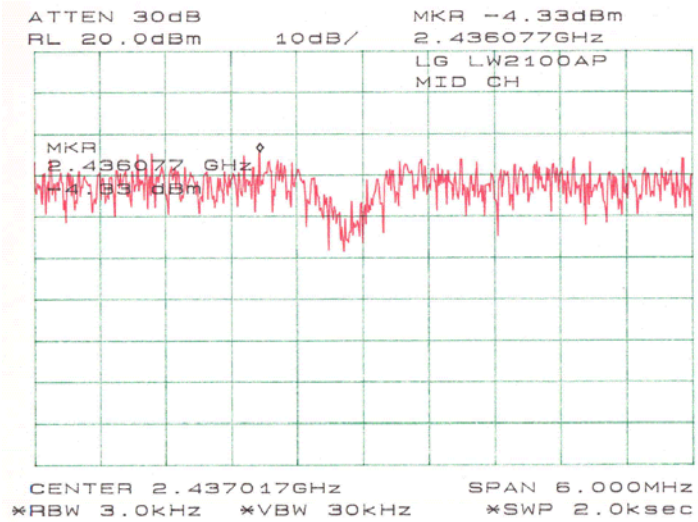
8.3 Test Results

Frequency	Measured (dBm)	Standard (dBm)	Result
Low	3.83	≤ 8	Compliant
Middle	4.33	≤ 8	Compliant
High	4.83	≤ 8	Compliant

8.4 Plots for Peak Power Density Test Result

Please see the plots hereinafter.


ATTEN 30dB
RL 20.0dBm 10dB/
MKR -3.83dBm
2.411157GHz
LG LW2100AP
LOW CH
MKR
2.411157 GHz
-3.83 dBm
CENTER 2.411967GHz
SPAN 6.000MHz
*RBW 3.0kHz *VBW 30kHz
*SWP 2.0ksec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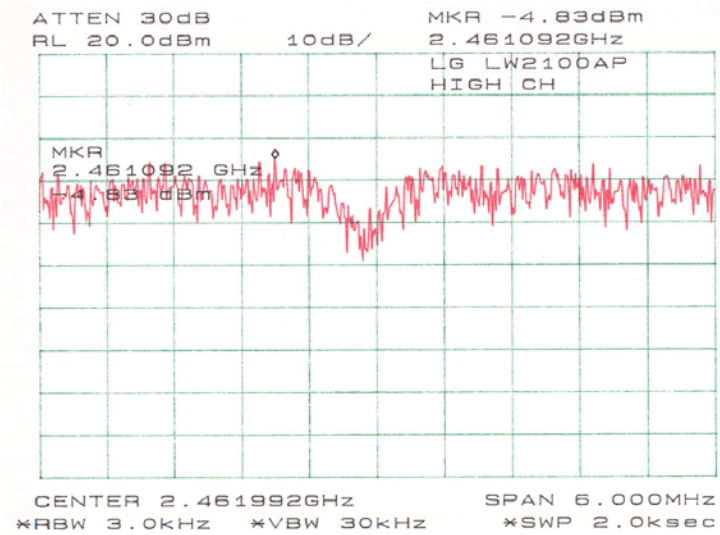
RL 20.0dBm 10dB/
MKR -4.33dBm
2.436077GHz
LG LW2100AP
MID CH
MKR
2.436077 GHz
-4.33 dBm
CENTER 2.437017GHz
SPAN 6.000MHz
*RBW 3.0kHz *VBW 30kHz
*SWP 2.0ksec


ATTEN 30dB
RL 20.0dBm 10dB/
MKR -4.83dBm
2.461092GHz
LG LW2100AP
HIGH CH
MKR
2.461092 GHz
-4.83 dBm
CENTER 2.461992GHz
SPAN 6.000MHz
*RBW 3.0kHz *VBW 30kHz
*SWP 2.0ksec

9 - RADIATED EMISSION

9.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ±4.0 dB.

9.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4-2000. The specification used was the FCC 15 Subpart C limits.

The EUT was placed on the center of the test table. The PC system was put at the back center edge of the test table with the monitor on one side and the printer on the other side. The rear of the EUT and support peripherals was flushed with the rear of the test table.

The keyboard was put directly in front of the monitor. The mouse was next to the keyboard and flushed with the rear of the keyboard.

The spacing between peripherals was 10cm.

External I/O were draped along the turntable and bundled if necessary.

The EUT utilized 120Vac/60Hz power source.

9.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 25GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency ..... 30 MHz
Stop Frequency 25GHz
Sweep Speed ..... Auto
IF Bandwidth ..... 1 MHz
Video Bandwidth ..... 1 MHz
Quasi-Peak Adapter Bandwidth..... 120 kHz
Quasi-Peak Adapter Mode..... Normal
Resolution Bandwidth..... 1MHz

9.4 Test Procedure

For the radiated emissions test, the EUT power cord was connected to the AC floor outlet since the power supply used in the EUT did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dBμV of specification limits), and are distinguished with a "**Qp**" in the data table.

9.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Subpart C. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Subpart C Limit

9.6 Summary of Test Results

According to the data in section 11.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207 and 15.247, and had the worst margin of:

Intentional Emission, 1000MHz to 25GHz, 3 meters

-6.9 (Avg.) dBμV at 7236.00 MHz in the Horizontal polarization, Low Channel

-10.2 (Avg.) dBμV at 7310.94.00 MHz in the Vertical polarization, Middle Channel

-11.3 (Avg.) dBμV at 4924.00 MHz in the Vertical polarization, High Channel

Unintentional Emission, 30 to 1000MHz, 3 meters

-5.3 dBμV at 480.05 MHz in the Horizontal polarization

9.7 Radiated Emission Test Data

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Mode
MHz	dBμV/m	Degree	Meter	H/V	dBμV/m	dBμV/m	dB	dBμV/m	dBμV/m	dB	
Low Channel											
7236.00	31.4	45	1.0	H	35.1	5.6	30.0	47.1	54	-6.9	AVG
7236.00	30.2	225	1.2	V	35.1	5.6	30.0	45.9	54	-8.1	AVG
4824.00	32.0	225	1.2	V	32.5	4.9	30.0	44.4	54	-9.6	AVG
4824.00	30.0	45	1.0	H	32.5	4.9	30.0	42.4	54	-11.6	AVG
Middle Channel											
7310.94	33.1	180	1.2	V	35.1	5.6	30.0	43.8	54	-10.2	AVG
4873.96	34.7	180	1.2	V	32.5	4.9	30.0	42.1	54	-11.9	AVG
7310.94	30.0	315	1.0	H	35.1	5.6	30.0	40.7	54	-13.3	AVG
4873.96	30.2	315	1.0	H	32.5	4.9	30.0	37.6	54	-16.4	AVG
High Channel											
4924.00	32.0	135	1.0	V	32.5	4.9	30.0	42.7	54	-11.3	AVG
4924.00	31.5	90	1.0	H	32.5	4.9	30.0	42.2	54	-11.8	AVG
7386.00	33.2	90	1.0	H	35.1	5.6	30.0	40.6	54	-13.4	AVG
7386.00	30.0	135	1.0	V	35.1	5.6	30.0	37.4	54	-16.6	AVG
Unintentional Emission											
480.05	45.2	225	1.8	H	16.4	7.3	28.2	40.7	46	-5.3	/
800.00	36.0	90	1.5	H	21.8	10.5	28.4	39.9	46	-6.1	/
900.00	32.4	180	1.2	H	22.3	11.2	27.6	38.3	46	-7.7	/
44.00	44.6	90	1.3	V	12.3	1.4	26.9	31.4	40	-8.6	/
750.01	35.2	90	1.8	H	20.4	9.6	28.6	36.6	46	-9.4	/
80.10	45.6	270	1.4	V	9.2	2.3	27.5	29.6	40	-10.4	/
50.00	43.7	90	1.0	V	10.2	1.7	27.3	28.3	40	-11.7	/
600	35.8	0	1.2	H	18.6	8.2	29.0	33.6	46	-12.4	/
527.99	36.3	180	1.5	H	16.6	7.5	28.7	31.7	46	-14.3	/
131.99	41.3	90	1.2	V	10.7	2.8	27.5	27.3	43.5	-16.2	/
307.99	38.3	315	1.0	H	13.5	5.3	27.3	29.8	46	-16.2	/
150.00	38.3	270	1.0	V	12.0	3.5	27.5	26.3	43.5	-17.2	/

10 - CONDUCTED EMISSIONS

10.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ±2.4 dB.

10.2 EUT Setup

The measurement was performed at the **O**pen **A**rea **T**est **S**ite, using the same setup per ANSI C63.4-2000 measurement procedure. The specification used was FCC Class B limits.

The EUT was placed on the center of the test table. The PC system was put at the back center edge of the test table with the monitor on one side and the printer on the other side. The rear of the EUT and support peripherals was flushed with the rear of the test table.

The keyboard was put directly in front of the monitor. The mouse was next to the keyboard and flushed with the rear of the keyboard.

The spacing between peripherals was 10cm.

External I/O were draped along the turntable and bundled if necessary.

The EUT utilized 120Vac/60Hz power source.

10.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conduction test:

Start Frequency..... 450 kHz
Stop Frequency..... 30 MHz
Sweep Speed..... Auto
IF Bandwidth..... 10 kHz
Video Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth ..... 9 kHz
Quasi-Peak Adapter Mode..... Normal

10.4 Test Procedure

During the conducted emission test, the power cord of the EUT was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dBμV of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

10.5 Summary of Test Results

According to the data in section 12.6, the EUT complied with the FCC Conducted margin for a Class B device and these test results is deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations, with the *worst* margin reading of:

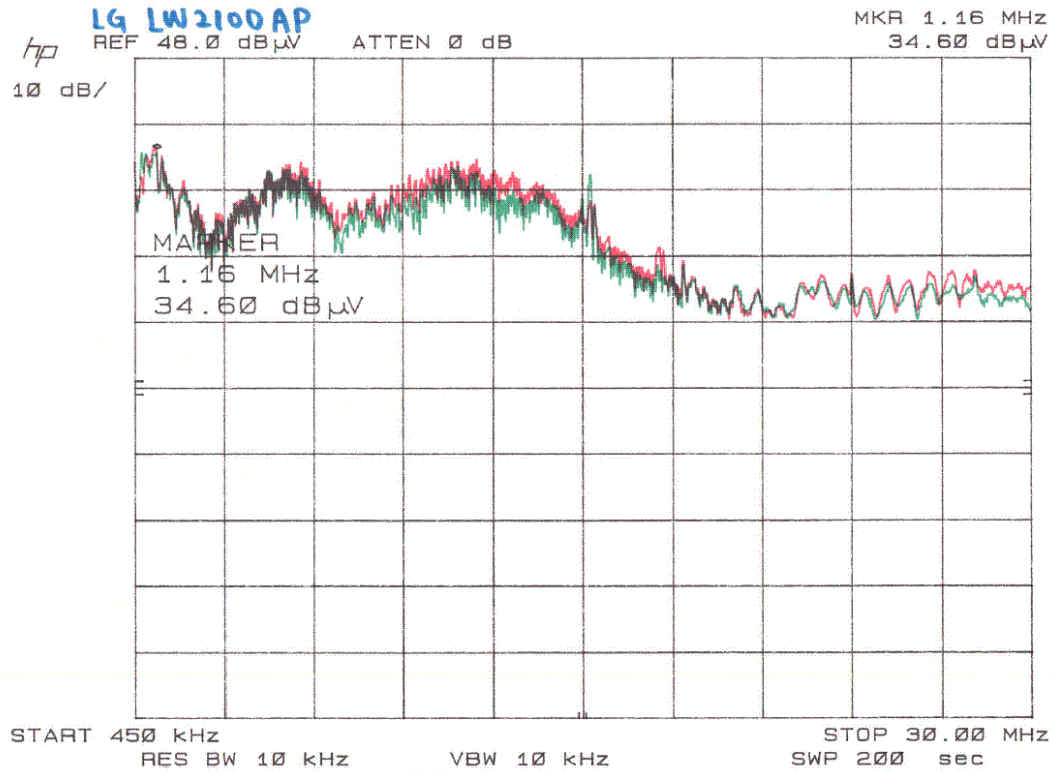
-13.4 dBμV at 1.16 MHz in the Line mode

10.6 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency MHz	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
1.16	34.6	QP	Line	48	-13.4
0.66	33.7	QP	Neutral	48	-14.3
11.74	32.6	QP	Line	48	-15.4
5.95	31.7	QP	Line	48	-16.3
11.15	31.6	QP	Neutral	48	-16.4
5.47	31.1	QP	Neutral	48	-16.9

10.7 Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented in the following page as reference.



11 - ANTENNA REQUIREMENT

11.1 Standard Applicable

For intentional device, according to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to § 15.247 (1), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

11.2 Antenna Connected Construction

The directional gain of antenna used for transmitting is 2 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

12 - RF SAFETY REQUIREMENTS TO 2.1091

According to §15.247(b)(4) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-15000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal: 17.05 (dBm)
Maximum peak output power at antenna input terminal: 50.70 (mW)
Antenna Gain (typical): 2 (dBi)
Maximum antenna gain: 1.58 (numeric)
Prediction distance: 20 (cm)
Predication frequency: 2400 (MHz)
MPE limit for uncontrolled exposure at prediction frequency: 1 (mW/cm^2)
Power density at predication frequency: 0.016 (mW/cm^2)
Maximum allowable antenna gain: 99.09 (numeric)
Maximum allowable antenna gain: 19.96 (dBi)

Test Result

The predicted power density level at 20 cm is $0.016 mW/cm^2$. This is below the uncontrolled exposure limit of $1 mW/cm^2$ at 2400 MHz.

This EUT is classed as mobile equipment.