PCTEST Engineering Laboratory, Inc.

6660-B Dobbin Road • Columbia, MD 21045 • U.S.A.
TEL (410) 290-6652 • FAX (410) 290-6654
http://www.pctestlab.com

CERTIFICATE OF COMPLIANCE
FCC Part 24 Class II Permissive Change

LG Information & Communications, Ltd.
LG Twin Towers, 20 Yoido-Dong
Youngdungpo-Gu, Seoul, 150-721 KOREA
Attn: Mr. Won-Chul Kim, General Manager
System Engineering Team

Dates of Tests: September 07-09, 1999
Test Report S/N: 24.990903515.FFM
Test Site: PCTEST Lab, Columbia MD U.S.A.

FCC ID	**FFMSTAREX-1900BTS**
APPLICANT	**LG Information & Communications, Ltd.**

Classification:	**Licensed Base Station for Part 24 (PCB)**
FCC Rule Part(s):	**§24(E), §2**
EUT Type:	**Base Station Transceiver Subsystem (CDMA)**
Trade Name/Model(s):	***LGIC STAREX-1900***
Frequency Range:	**Tx: 1951.25 – 1968.75 MHz**
	Rx: 1871.25 – 1888.75MHz
Max Output Power:	**20.0 Watts**
Orig. Frequency Blocks:	**Block C, Block F**
New Frequency Blocks:	**Block B, Block E**
Frequency Tolerance:	**0.000005% (0.05 ppm)**
Original Grant Date:	**March 13, 1998**
Class II Change(s):	**Added Frequency Blocks B & E with passive filter & Up-Down converter**

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947 with the following remarks (Note Codes):

** (BC) The output power is continuously variable from the value listed in this entry to 5%-10% of the value listed.*

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

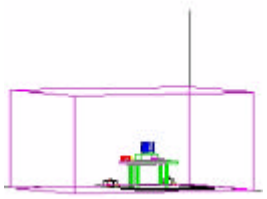
PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a)

Randy Ortanez
President & Chief Engineer

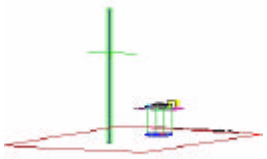
9 9 0 9 0 3 5 1 5 . F F M

NVLAP LAB CODE 100431-0

TABLE OF CONTENTS



MEASUREMENT REPORT



Scope – Product Evaluation and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

§2.1033 General Information

Applicant Name:	**LG Information & Communications, Ltd.**
Address:	**LG Twin Towers, 20 Yoido Dong Youngdungpo-Gu, Seoul, 150-721 KOREA**
Attention:	**Mr. Won-Chul Kim General Manager, System Engineering Team**

- FCC ID: **FFMSTAREX-1900BTS**
- Trade Name/Model(s): ***LGIC STAREX-1900***
- Quantity: Quantity production is planned
- Emission Designator: 1M25FXW
- Power Range: 0.00005 – 20.0 W
- Maximum Power Rating: 20.0 W (+43 dBm)
- FCC Classification: Licensed Base Station for Part 24 (PCB)
- Equipment (EUT) Type: Base Station Transceiver Subsystem
- Original Frequency Block(s): Block C, Block F
- New Frequency Block(s): Block B, Block E
- Channel(s): 425 - 775
- Modulation: CDMA
- FCC Rule Part(s): §24(E), §2
- Application Type: Class II Permissive Change
- Tx Frequency Range: 1951.25 – 1968.75 MHz
- Rx Frequency Range: 1871.25 – 1888.75 MHz
- Frequency Tolerance: ± 0.05 ppm
- Dates of Tests: September 07-09, 1999
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Original Grant Date(s): March 13, 1998
- **Class II Change(s):** **Added Frequency Blocks B & E with passive filter & Up-Down converter**

1.1 INTRODUCTION

These measurement tests were conducted at ***PCTEST Engineering Laboratory, Inc.*** facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.

PCTEST Lab is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. The Scope of PCTEST Accreditation are for Electromagnetic Compatibility and Telecommunications and FCC.

1.2 PCTEST Location

The map at right shows the location of the PCTEST Lab, its proximity to the FCC Lab, the Columbia vicinity area, the Baltimore-Washington International (BWI) airport, and the city of Baltimore, and the Washington, D.C. area. (see Figure1).

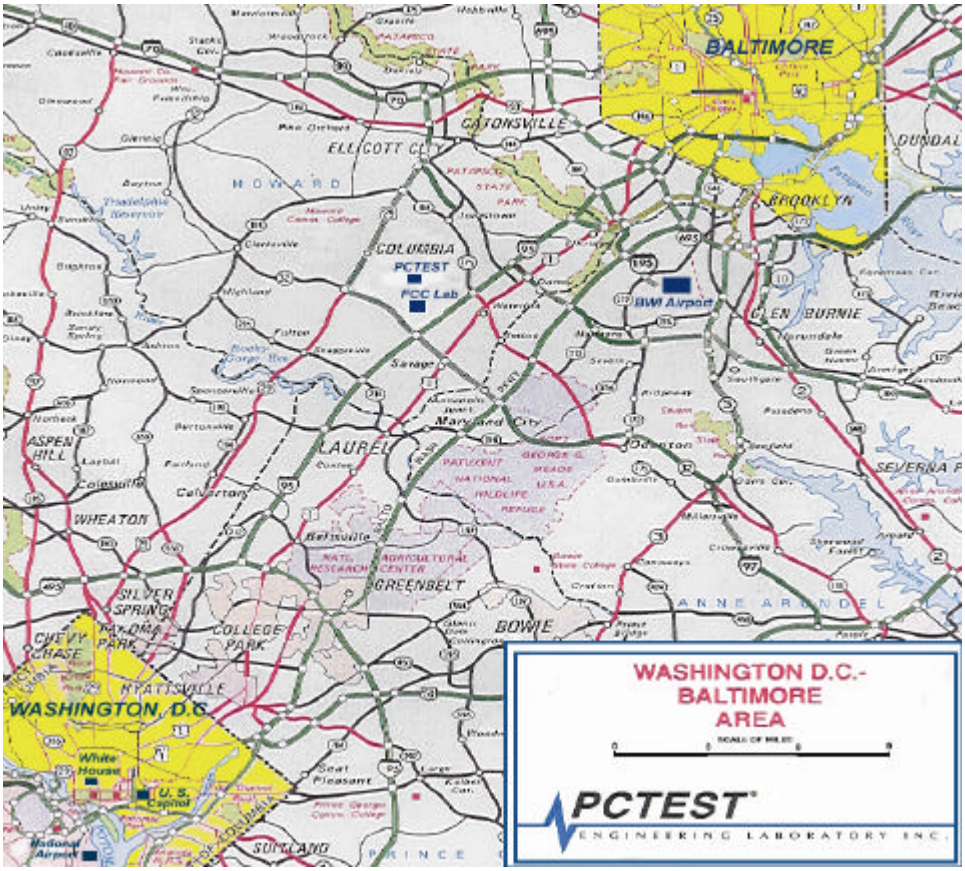


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

2.1 INSERTS PER §2.1033(d)

§2.1033(d) Function of Active Devices

The Function of active devices are shown in Attachment I.

§2.1033(d) Circuit Diagrams & Description (Confidential)

The circuit diagrams & description are shown in Attachment H.

§2.1033(d) Block Diagrams (Confidential)

The block diagrams are shown in Attachment G.

§2.1033(d) Description of Freq. Stabilization Circuit

The description of frequency stabilization circuit is shown in Attachment I.

§2.1033(d) Description for Suppression of Spurious Radiation, for Limiting Modulation, and Harmonic Suppresion Circuits

The description of suppression stabilization circuits are shown in Attachment I.

3.1 DESCRIPTION OF TESTS

3.2 §24.238 Occupied Bandwidth Emission Limits

(a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB.

(b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(c) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(d) The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

3.3 §2.1051 Spurious and Harmonic Emissions at Antenna Terminal

The level of the carrier and the various conducted spurious and harmonic frequencies are measured by means of a calibrated spectrum analyzer and microwave pre-amplifier. The spectrum is scanned from 10 MHz or the lowest frequency generated in the equipment up to 20 GHz. The transmitter is set to its maximum rated output power and modulated according to the manufacturer's supplied modulation characteristics.

BLOCK	Freq. Range (MHz) Receiver (Rx)	Freq. Range (MHz) Transmitter (Tx)
A	1850 - 1865	1930 - 1945
B	1870 - 1885	1950 - 1965
C	1895 - 1910	1975 - 1990
D	1865 - 1870	1945 - 1950
E	1885 - 1890	1965 - 1970
F	1890 - 1895	1970 - 1975

Table 1. Broadband PCS Service Frequency Blocks.

3.1 DESCRIPTION OF TESTS (CONTINUED)

3.4 §24.229 Frequencies

At the input terminals of the spectrum analyzer, an isolator (RF pad), and a high-pass filter are connected between the test transceiver (for conducted tests) or the receive antenna (for radiated tests), and the analyzer. The high-pass filter (signals below 2 GHz) is to limit the fundamental frequency from interfering with the measurement of low level spurious and harmonic emissions and to ensure that the preamplifier is not saturated.

3.5 §2.1053 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emissions above 1 GHz is measured at out 3-meter indoor site. The EUT is placed on the turntable connected to a dummy load in normal operation using the intended power source. A receiving antenna located 3 meters from the turntable receives any signal radiated from the transmitter and its operating accessories. The antenna is varied from 1 to 4 meters and the polarization is varied (horizontal and vertical) to determine the worst-case emission level. To obtain actual radiated signal strength, a signal generator is adjusted in output until a reading identical to that obtained with the actual transmitter is obtained at the receiver. Signal strength is read directly from the generator and recorded on the attached table.

3.6 §24.135 Frequency Stability/Temperature Variation

The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.0001 (±1 ppm) of the center frequency.

3.1 DESCRIPTION OF TESTS (Continued)

3.7 24.232(b) Conducted Output Power

The RF output power is measured via Gigatronic Power Meter and Sensor.

Supply Voltage: 220 VAC

Modulation: CDMA

Channel No.	Nominal FREQ (MHz)	Power Output (dBm)
425	1951.25	43.00
600	1960.00	43.00
775	1968.75	42.85

.

Test Data

Radiated Measurements

§ 2.1053 Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1951.25 MHz
CHANNEL: 425 (Low)
MEASURED OUTPUT POWER: 43.0 dBm = 20.00 W
MODULATION SIGNAL: CDMA (Internal)
DISTANCE: 3 meters
LIMIT: 43 + 10 log10 (W) = 56.01 dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	EIRP (dBm)	(dBc)
3902.50	-110.5	45.5	V	125.9	-53.23	96.2
5853.75	-125.0	50.3	V	41.2	-62.93	105.9
7805.00	-127.0	54.6	V	53.7	-60.63	103.6
9756.25	< -130					
11707.50	< -130					

NOTES:

1. The bandwidth is set per §24.238.
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is placed 3m. Away from the receiving antenna and the EIRP is calculated using the formula:
   EIRP (dBm) = 10Log10(((r(mV/m)/1 x 106)2/30.0/1x10-3
   EIRP (dBm) = 10Log10[(3 x FS/1 x 106)2 / (30.0) x 1000]
   EIRP (dBm) = [3 x FS)/1 x 106]2 / 30.0

Test Data

Radiated Measurements

§ 2.1053 Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY:	1960.00	MHz	
CHANNEL:	600 (Middle)		
MEASURED OUTPUT POWER:	43.0 dBm =	20.00	W
MODULATION SIGNAL:	CDMA (Internal)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	56.01	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	EIRP (dBm)	(dBc)
3920.00	-110.5	45.6	V	127.4	-53.13	96.1
5880.00	-125.0	50.4	V	41.7	-62.83	105.8
7840.00	-129.5	54.7	V	40.7	-63.03	106.0
9800.00	< -130					
11760.00	< -130					

NOTES:

1. The bandwidth is set per §24.238.
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is placed 3m. Away from the receiving antenna and the EIRP is calculated using the formula:
   EIRP (dBm) = 10Log10(((r(mV/m)/1 x 106)2/30.0/1x10-3
   EIRP (dBm) = 10Log10[(3 x FS/1 x 106)2 / (30.0) x 1000]
   EIRP (dBm) = [3 x FS)/1 x 106]2 / 30.0

Test Data

Radiated Measurements

§ 2.1053 Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY:	1968.75	MHz	
CHANNEL:	775 (High)		
MEASURED OUTPUT POWER:	43.0 dBm =	20.00	W
MODULATION SIGNAL:	CDMA (Internal)		
DISTANCE:	3	meters	
LIMIT:	43 + 10 log10 (W) =	56.01	dBc

FREQ. (MHz)	LEVEL (dBm)	AFCL (dB)	POL (H/V)	F/S (μV/m)	EIRP (dBm)	(dBc)
3937.50	-111.0	45.7	V	121.6	-53.53	96.5
5906.25	-125.0	50.4	V	41.7	-62.83	105.8
7875.00	-129.0	54.8	V	43.7	-62.43	105.4
9843.75	< -130					
11812.50	< -130					

NOTES:

1. The bandwidth is set per §24.238.
2. The spectrum was checked from 25 MHz up to the 10th harmonic.
3. All emissions not listed were found to be more than 20dB below the limit.
4. < -130dBm is below the floor of the spectrum analyzer.
5. The EUT is placed 3m. Away from the receiving antenna and the EIRP is calculated using the formula:
   EIRP (dBm) = 10Log10(((r(mV/m)/1 x 106)2/30.0/1x10-3
   EIRP (dBm) = 10Log10[(3 x FS/1 x 106)2 / (30.0) x 1000]
   EIRP (dBm) = [3 x FS)/1 x 106]2 / 30.0

Test Data

§ 24.135 FREQUENCY STABILITY

OPERATING FREQUENCY: 1,951,250,000 Hz

CHANNEL: 425

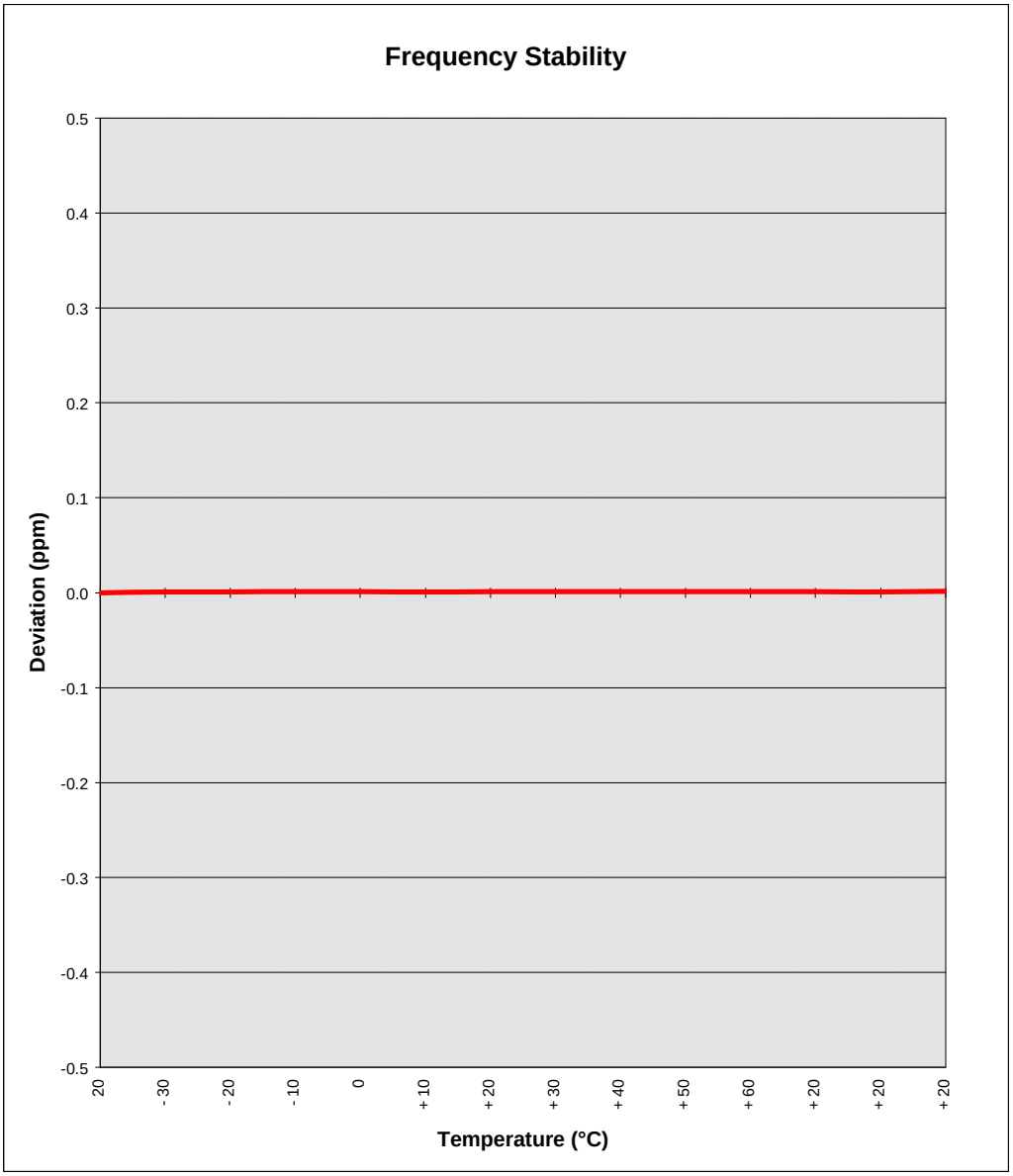
REFERENCE VOLTAGE: 220.0 VAC

DEVIATION LIMIT: 0.000005 % or 0.05 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (ºC)	FREQ. (Hz)	Deviation (%)
100 %	220.00	+ 20 (Ref)	1,951,250,000	0.00000000
100 %		- 30	1,951,249,998	0.00000008
100 %		- 20	1,951,249,998	0.00000008
100 %		- 10	1,951,249,998	0.00000010
100 %		0	1,951,249,998	0.00000010
100 %		+ 10	1,951,249,998	0.00000008
100 %		+ 20	1,951,249,998	0.00000010
101 %		+ 25	1,951,249,998	0.00000010
100 %		+ 30	1,951,249,998	0.00000010
100 %		+ 40	1,951,249,998	0.00000010
100 %		+ 50	1,951,249,997	0.00000013
100 %		+ 60	1,951,249,997	0.00000013
85 %	187.00	+ 20	1,951,249,998	0.00000010
115 %	253.00	+ 20	1,951,249,998	0.00000008
VOLT. ENDPOINT	170.00	+ 20	1,951,249,997	0.00000015

Test Data

§ 24.135 FREQUENCY STABILITY



5.1 PLOT(S) OF EMISSIONS

(SEE ATTACHMENT D)

6.1 TEST EQUIPMENT

6.2 Type	Model	Cal. Due Date	S/N
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	08/15/00	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	04/17/00	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	08/10/00	3144A02458
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/00	2232A19558
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/00	1851A09816
Signal Generator*	Rohde & Schwarz (0.1-1000MHz)	09/11/99	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	04/12/00	0792-03271
Ailtech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/00	0805-03334
Ailtech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/99	0608-03241
Quasi-Peak Adapter	HP 85650A	08/15/00	2043A00301
Ailtech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	03/11/00	0194-04082
CDMA Test Set	HP E6380A CDMA	06/04/00	US38030105
DC Power Supply	HP 60328	05/20/00	3415A-09817
RG58 Coax Test Cable	No. 167		n/a
Harmonic/Flicker Test System	HP 6841A (IEC 555-2/3)		3531A00115
Broadband Amplifier (2)	HP 8447D		1145A00470, 1937A03348
Broadband Amplifier	HP 8447F		2443A03784
Transient Limiter	HP 11947A (9kHz-200MHz)		2820A00300
Horn Antenna	EMCO Model 3115 (1-18GHz)		9704-5182
Horn Antenna	EMCO Model 3115 (1-18GHz)		9205-3874
Horn Antenna	EMCO Model 3116 (18-40GHz)		9203-2178
Biconical Antenna (4)	Eaton 94455/Eaton 94455-1/Singer 94455-1/Compliance Design 1295, 1332, 0355		
Log-Spiral Antenna (3)	Ailtech/Eaton 93490-1		0608, 1103, 1104
Roberts Dipoles	Compliance Design (1 set)		
Ailtech Dipoles	DM-105A (1 set)		33448-111
EMCO LISN	3816/2		1079
EMCO LISN	3816/2		1077
EMCO LISN	3725/2		2009
Microwave Preamplifier 40dB Gain	HP 83017A (0.5-26.5GHz)		3123A00181
Microwave Cables	MicroCoax (1.0-26.5GHz)		
Ailtech/Eaton Receiver	NM37/57A-SL		0792-03271
Spectrum Analyzer	HP 8594A		3051A00187
Spectrum Analyzer (2)	HP 8591A		3034A01395, 3108A02053
Modulation Analyzer	HP 8901A		2432A03467
NTSC Pattern Generator	Leader 408		0377433
Noise Figure Meter	HP 8970B		3106A02189
Noise Figure Meter	Ailtech 7510		TE31700
Noise Generator	Ailtech 7010		1473
Microwave Survey Meter	Holaday Model 1501 (2.450GHz)		80931
Digital Thermometer	Extech Instruments 421305		426966
Attenuator	HP 8495A (0-70dB) DC-4GHz		
Bi-Directional Coax Coupler	Narda 3020A (50-1000MHz)		
Shielded Screen Room	RF Lindgren Model 26-2/2-0		6710 (PCT270)
Shielded Semi-Anechoic Chamber	Ray Proof Model S81		R2437 (PCT278)
Enviromental Chamber	Associated Systems Model 1025 (Temperature/Humidity)		PCT285

* Calibration traceable to the National Institute of Standards and Technology (NIST).

7.1 SAMPLE CALCULATIONS

$$\text{Level } \mu\text{/Vm @ 3 meters} = \text{Log } 10^{-1} \frac{(\text{dBm} + 107 + \text{AFCL})}{20}$$

$$\text{Log } 10^{-1} \frac{(-14 + 107 + 31.7)}{20}$$

1717908.4 μ/Vm @ 3 meters

Sample Calculation (relative to a dipole)

EIRP (dBm) = $10 \text{ Log}_{10} (((r(\mu V/m)1x10^{6})^{2}/30.0/1x10^{-3})$

EIRP (dBm) = $10 \text{ Log}_{10}(((3(1717908.4)1x10^{6})^{2}/30.0/1x10^{-3})$

EIRP (dBm) = 29.46

8.1 RECOMMENDATION/CONCLUSION

The data collected shows that the **LG INFORMATION & COMMUNICATIONS, LTD. Base Station Transceiver Subsystem FCC ID: FFMSTAREX-1900BTS, with the Class II Permissive Change(s) described,** complies with all the requirements of Parts 2 and 24 of the FCC rules.