

# LG Electronics Inc.

## Quality & Reliability Center

36, Munlae-dong, 6-ga, Youngdungpo-gu, Seoul 150-096, Korea  
Tel: + 82 2 2630 3090~3, Fax: +82 2 2635 5543

### **CERTIFICATION OF COMPLIANCE**

#### **Class II Permissive Change**

**Date of Issue: January 20, 2004**

**Test Report No: 00431-4529-C4007**

|                            |                                            |
|----------------------------|--------------------------------------------|
| Applicant:                 | LG Electronics Inc.                        |
| Regulation:                | FCC Part 22 , Part2                        |
| Test procedure:            | ANSI C63.4-2001, TIA/EIA603                |
| Equipment Class:           | Intentional Radiators                      |
| EUT Type:                  | Single Band, Single Mode CDMA Mobile Phone |
| FCC ID:                    | BEJRD5130                                  |
| Class II Permissive Change | Added Hitachi antenna                      |
| <u>Trade Name(s):</u>      | <u>Model No.:</u>                          |
| <b>LG</b>                  | <b>LG-RD5130</b>                           |

This device has been verified to comply with the applicable requirements in the FCC Part 22 & Part2 and was tested in accordance with the measurement procedures specified in ANSI C63.4-2001, TIA/EIA 603.

I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



Kyeom-Soon Kim / General Manager  
Quality and Reliability Center  
LG Electronics Inc.

# REPORT FOR AN INTENTIONAL RADIATORS

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**U.S. Responsible Party:** LG Electronics USA Inc.  
**Address:** 6133 North River Road, Suite 1100 (Riverway Plaza)  
Rosemont, IL 60018, USA

**Contact Person:** P. H. Byun, General Manager  
**Telephone No.:** (847) 692-4630 EXT.329  
**Manufacturer:** LG Electronics Inc.  
**Address:** 459-9, Kasan-Dong, Kunchon-Gu, Seoul, 153-023, Korea  
**FCC ID No.:** BEJRD5130  
**EUT Class:** Intentional Radiators  
**EUT Type:** Single Band, Single Mode CDMA Mobile Phone  
**Trade Name:** LG  
**Model No.:** LG-RD5130  
**Rule Part:** FCC Part 22, Part2  
**Test Procedure:** ANSI C63.4-2001, TIA/EIA603  
**Date of Test:** January 5 ~ 19, 2004  
**Date of Receipt of EUT:** January 5, 2004  
**Date of Issue:** January 30, 2004  
**Test Report No.:** 00431-4529-C4007  
**Test Result:** **Positive**

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*Quality and Reliability Center reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production unit of this model are manufactured with identical electrical and mechanical components.*

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Tested by:



Reviewed by:



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Y. S. Lee / Senior Research Engineer  
Quality and Reliability Center  
LG Electronics Inc.

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J. C. Lee / Senior Research Engineer  
Quality and Reliability Center  
LG Electronics Inc.

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## **1. GENERAL INFORMATION**

### **1.1 Descriptions of equipment under test (EUT)**

- 1.1.1 Manufacturer: LG Electronics Inc.  
459-9, Kasan-Dong, Kunchon-Gu, Seoul, 153-023, Korea
- 1.1.2 EUT Type: Single Band, Single Mode CDMA Mobile Phone
- 1.1.3 Model No.: LG-RD5130
- 1.1.4 Serial No.: N/A
- 1.1.5 Trade Name: LG
- 1.1.6 FCC ID No.: BEJRD5130
- 1.1.7 System characteristic and descriptions
  - 1) Output power: 24.3dBm (ERP)
  - 2) Antenna type: Fixed Type (Chip-Type-Antenna-Module) 50 ohms
  - 3) Transmitting of frequency range: 824 ~ 849 MHz.

### **1.2 Regulations applied to EUT**

FCC Part 22 ; Part2

### **1.3 Measurement procedure**

ANSI C63.4-2001, TIA/EIA603

Both conducted and radiated testing were performed according to the procedures documented on chapter 13 of ANSI C63.4 and TIA/EIA603

### **1.4 Measurement place**

**LG Electronics Inc. Quality and Reliability Center**  
36, Munlae-dong, 6-ga, Youngdungpo-gu, Seoul 150-096, Korea

## **2. TEST SITE**

### **Anechoic chamber**

The test facilities used to perform radiated and conducted emissions tests are accredited by Nation Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200040-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

### **2.2 A shielded enclosure**

The measurement of conducted spurious emissions was made in a shielded enclosure providing sufficient shielding effectiveness.

### 3. CALIBRATIONS OF MEASURING INSTRUMENTS

All measurements were made with instruments calibrated according to the recommendation by manufacturer. Measurement of radiated emissions and conducted emissions were made with instruments conforming to American National Standards Institute, ANSI C63.4-2001. The calibration of measuring instrument, including any accessories that may affect test results, were performed according to the recommendation by manufacturer.

### 4. DESCRIPTION OF TEST CONDITION

#### 4.1 RF Power Output

- 1) On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- 2) The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the frequency of the transmitter.
- 3) The output of the test antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- 4) The transmitter shall be switched on, if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- 5) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- 6) The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- 7) The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- 8) The maximum signal level detected by the measuring receiver shall be noted.

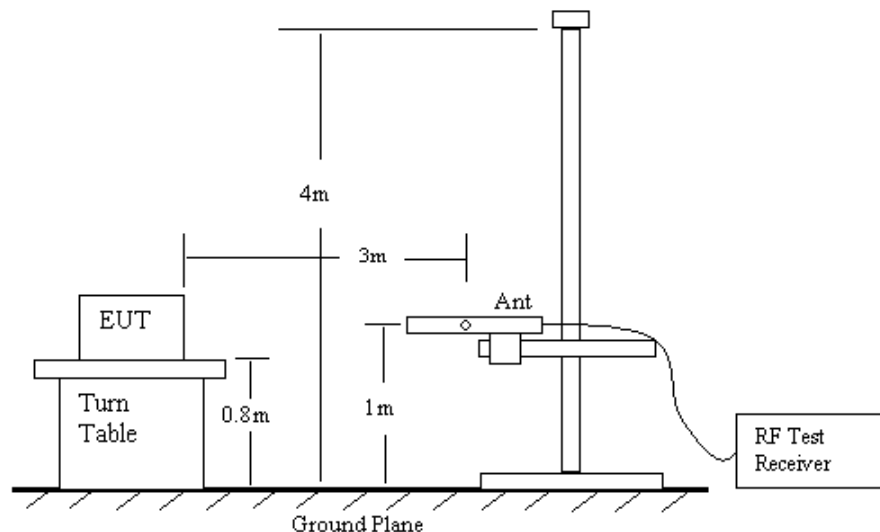


Figure1. Radiated Emission Measurement 30 to 1000 MHz

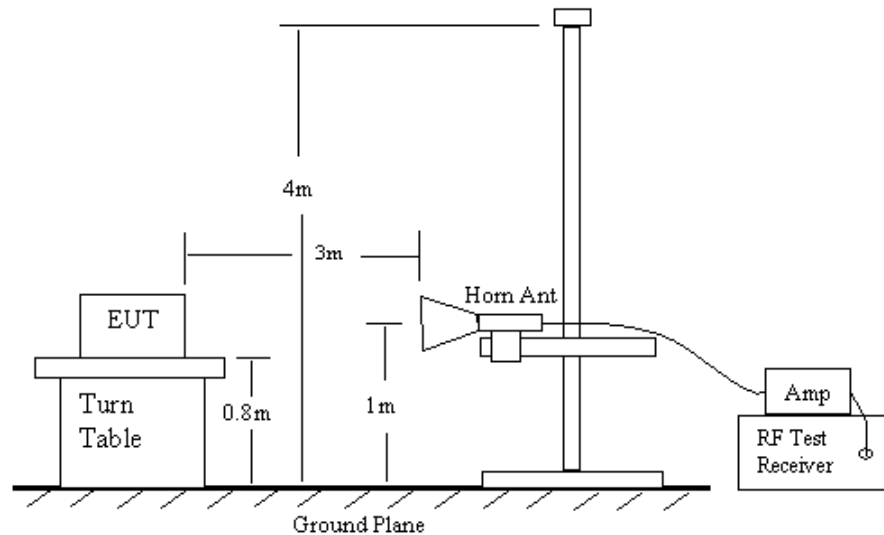


Figure2. Radiated Emission Above 1000 MHz

- 9) The transmitter shall be replaced by a tuned dipole (substitution antenna).
- 10) The substitution antenna shall be oriented for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- 11) The substitution antenna shall be connected to a calibrated signal generator.
- 12) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- 13) The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- 14) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
- 15) The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- 16) The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.
- 17) The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.

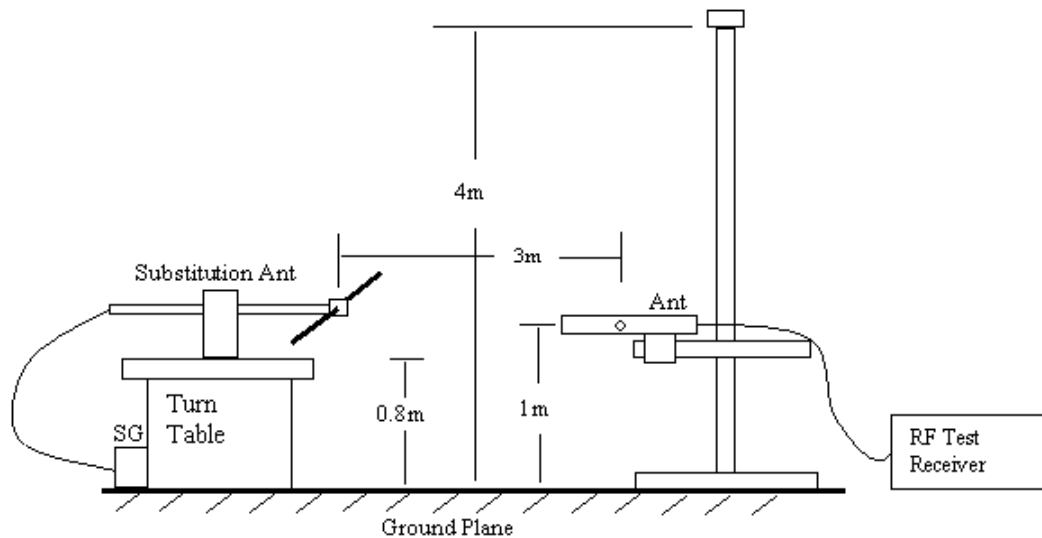


Figure3. Radiated Emission – Substitution Method

## 4.2 Modulation Characteristics

According to CFR 47 section 2.1047 (a), for Voice Modulated Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000 Hz shall be measured.

According to CFR 47 section 22.915: A unit that transmits emission type F3E must not exceed a peak frequency deviation of  $\pm 5$  kHz, and the audio frequency response shall not exceed 3.125 kHz.

According to CFR 47 section 22.915: Audio Frequency Low Pass Filter between the modulation limiter & the modulation stage of the transmitter. At any frequency ( $f$  in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least  $60 \log_{10}(f/3)$  dB greater than the attenuation at 1 kHz. Above 20 kHz, it must have an attenuation of at least 50 dB greater than the attenuation at 1 kHz.

### 4.2.1 Modulation Limit

- 1) Configure the EUT as shown below, adjust the audio input for 60% of rated system deviation at 1 kHz using this level as a reference (0 dB) and vary the input level from  $-20$  to  $+20$  dB. Record the frequency deviation obtained as a function of the input level.
- 2) Repeat step 1 with input frequency changing to 300, 1004 and 2500 Hz in sequence.

### 4.2.2. Audio Frequency Response

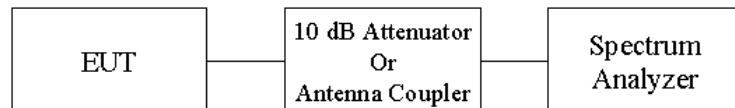
- 1) Configure the EUT as shown below.
- 2) Adjust the audio input for 20% of rated system deviation at 1 kHz using this level as a reference (0 dB).
- 3) Vary the audio frequency from 100 Hz to 10 kHz and record the frequency deviation.
- 4) Audio frequency response =  $20 \log_{10}(\text{Deviation of test frequency} / \text{Deviation of 1 kHz reference})$ .

#### 4.2.3 Audio Low Pass Filter Response

- 1) Configure The EUT as shown below.
- 2) Connect the audio frequency generator as close as possible the input of the post limiter low pass filter within the transmitter under test.
- 3) Connect the audio spectrum analyzer to the output of the post limiter low pass filter within the transmitter under test.
- 4) Apply 1000 Hz tone from the audio frequency generator and adjust the level per manufacturer's specifications.
- 5) Record the dB level of the 1000 Hz spectral line on the audio spectrum analyzer as  $LEV_{REF}$ .
- 6) Set the audio frequency generator to the desired test frequency between 3000 Hz and the upper low pass filter limit.
- 7) Record audio spectrum analyzer levels, at the frequency in step 6).
- 8) Record the dB level on the audio spectrum analyzer as  $LEV_{FREQ}$ .
- 9) Calculate the audio frequency response at the test frequency as:  
$$\text{Low pass filter response} = LEV_{FREQ} - LEV_{REF}$$
- 10) Repeat the 6) through 9) for all the desired test frequencies.

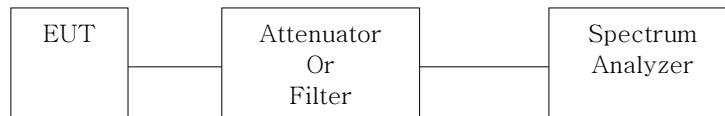
#### 4.3 Occupied Bandwidth

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% of the Emission bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

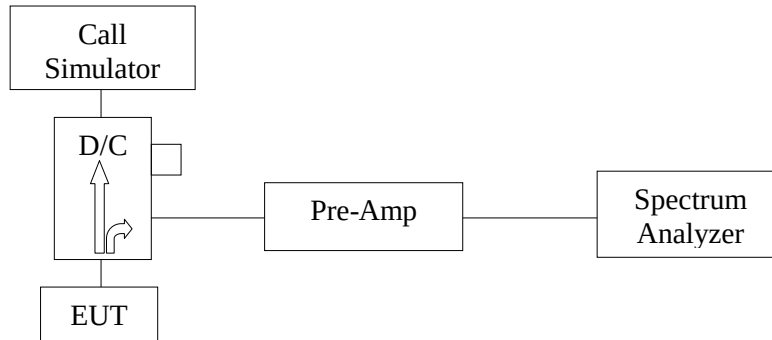


#### 4.4 Spurious Emission at Antenna Terminal

- 1) EUT's RF output connector (made solely for the purpose of the test) is connected to the spectrum analyzer, and set as close as possible to the bottom of the block edge and one set as close as possible to the top of the block edge. Set the RES BW to 1% of the emission bandwidth to show compliance with the  $-13\text{dBm}$  limit, in the 1 MHz bands immediately outside and adjacent to the top and bottom edges of the frequency block.
- 2) For the Out-of-Band measurements a 1 MHz RES BW was used to scan from 30 MHz to  $5 \times f_0$  of the fundamental carrier for all frequency block. A display line was placed at  $-13\text{dBm}$  to show compliance for spurious, and harmonics.



- 3) 22.917(f): Mobile emissions in base frequency range. The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitter operated must be attenuated to a level not to exceed  $-80\text{dBm}$  at the transmit antenna connector.



#### 4.5 Field Strength of Spurious Radiation

- 1) On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- 2) The test antenna shall be oriented initially for vertical polarization located 3 m from the EUT to correspond to the frequency of the transmitter.
- 3) The output of the test antenna shall be connected to the measuring receiver and either a peak or average detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- 4) The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- 5) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- 6) The transmitter shall then be rotated through  $360^\circ$  in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- 7) The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- 8) The maximum signal level detected by the measuring receiver shall be noted.

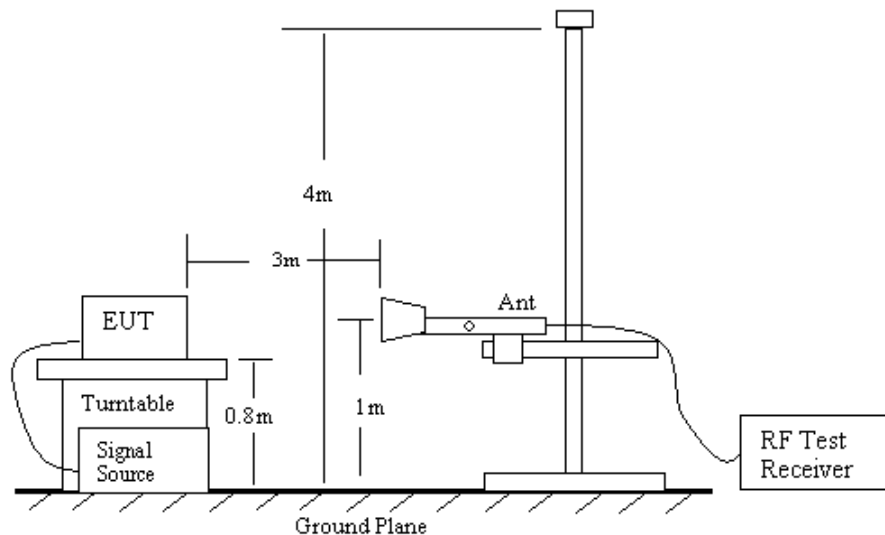


Figure4. Radiated Emission Measurement

- 9) The transmitter shall be replaced by a substitution antenna.
- 10) The substitution antenna shall be oriented for vertical polarization.
- 11) The substitution antenna shall be connected to a calibrated signal generator.
- 12) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- 13) The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

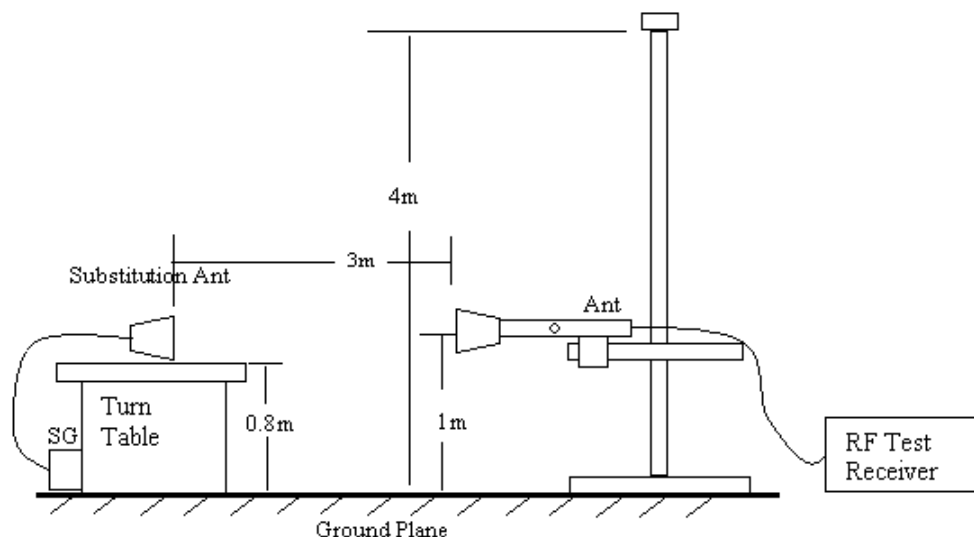


Figure5. Radiated Emission – Substitution Method set-up

- 14) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

- 15) The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- 16) The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.
- 17) The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.

## 4.6 Frequency Stability

### 4.6.1 Frequency stability versus environmental temperature

- 1) Setup the configuration per figure 6 for frequencies measurement inside the environmental chamber. Set the temperature of the chamber to 25°C. Set SA Resolution Bandwidth low enough to obtain the desired frequency resolution and measure the EUT 25°C operating frequency as reference frequency.
- 2) Turn EUT off and set Chamber temperature to -30°C.
- 3) Allow sufficient time (approximately 20 to 30 minus after chamber reach the assigned temperature) for EUT to stabilize. Turn on EUT and measure the EUT operating frequency. Turn off EUT after the measurement.
- 4) Repeat step 3 with a 10°C increased per stage until the highest temperature of +50°C reached, record all measured frequencies on each temperature step.

### 4.6.2 Frequency stability versus input voltage

- 1) Setup the configuration per figure 6 and set chamber temperature to 25°C. Use a variable power supply to power the EUT and set output voltage to EUT nominal input voltage. Set SA Resolution Bandwidth low enough to obtain the desired frequency resolution and measure the EUT 25°C operating frequency as reference frequency.
- 2) Slowly reduce the EUT input voltage to specified extreme voltage variation ( $\pm 15\%$ ) and record the maximum frequency change.

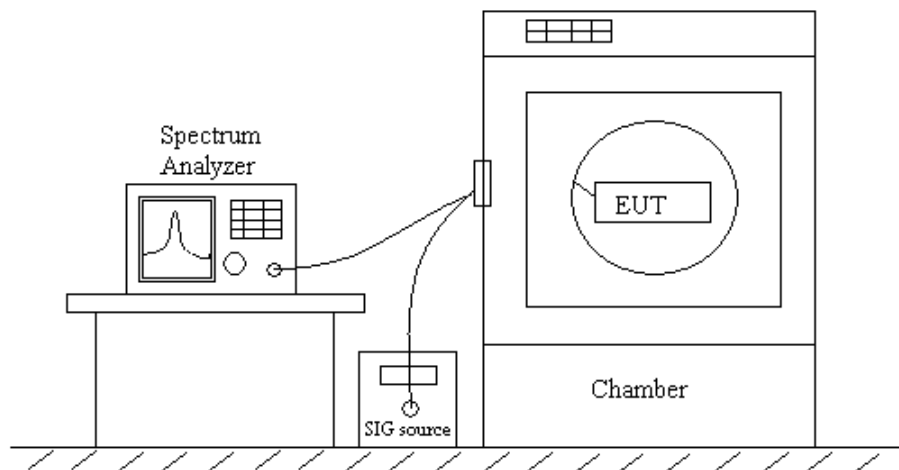


Figure6. Frequency Stability

## 5. TEST DATA

### 5.1. RF Power Output ( § 2.1046)

Product: Single Band, Single Mode CDMA Mobile Phone  
Model: LG-RD5130

Serial No.: N/A  
Test Date: January 12, 2004

CDMA Output Power (ERP)

| Freq.<br>(MHz)           | SG<br>Reading<br>(dBm) | Amp.<br>Gain(dB) | CL<br>(dB) | Pol.<br>(H/V) | Gain<br>(dBi) | Ant.<br>Impedance<br>Matching(dB) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|--------------------------|------------------------|------------------|------------|---------------|---------------|-----------------------------------|--------------|----------------|----------------|
| Low Channel(CH#: 1013)   |                        |                  |            |               |               |                                   |              |                |                |
| 824.70                   | -4.4                   | 40.0             | 2.4        | V             | -             | 10.0                              | <b>23.2</b>  | 38.5           | -15.3          |
| Middle Channel(CH#: 363) |                        |                  |            |               |               |                                   |              |                |                |
| 835.89                   | -5.1                   | 40.0             | 2.4        | V             | -             | 10.0                              | <b>22.5</b>  | 38.5           | -16.0          |
| High Channel(CH#: 777)   |                        |                  |            |               |               |                                   |              |                |                |
| 848.31                   | -3.3                   | 40.0             | 2.4        | V             | -             | 10.0                              | <b>24.3</b>  | 38.5           | -14.2          |

NOTES: RBW = VBW = 3 MHz

**Result: Positive**

## 5.2. Modulation Characteristics ( § 2.1047)

The EUT is single mode CDMA only.

**Result: Not Applicable**

## 5.3. Occupied Bandwidth / 26dB Emission Bandwidth( § 2.1049)

Product: Single Band, Single Mode CDMA Mobile Phone  
Model: LG-RD5130

Serial No.: N/A  
Test Date: January 9, 2004

| Channel | Frequency<br>(MHz) | Occupied BW<br>(MHz) | 26 dB Emission BW<br>(MHz) |
|---------|--------------------|----------------------|----------------------------|
| Low     | 824.70             | 1.275                | 1.480                      |
| Middle  | 835.89             | 1.272                | 1.455                      |
| High    | 848.17             | 1.282                | 1.445                      |

#### 5.4. Spurious Emission at Antenna Terminal ( § 2.1051)

Product: Single Band, Single Mode CDMA Mobile Phone  
Model: LG-RD5130

Serial No.: N/A  
Test Date: January 9, 2004

##### Band Edge

| Channel | Frequency (MHz) | SA Reading (dBm) | CL (dB) | Level (dBm)  | Limit (dBm) | Margin (dB) |
|---------|-----------------|------------------|---------|--------------|-------------|-------------|
| Low     | 824.00          | -15.3            | 0.5     | <b>-15.3</b> | -13.0       | -2.3        |
| High    | 849.00          | -13.6            | 0.5     | <b>-13.6</b> | -13.0       | -0.6        |

NOTES: RBW=14.8kHz(Low), 14.55kHz(High) (above 1% of 26 dB Emission Bandwidth)

##### Out-of-Band

| Channel | Frequency (GHz) | SA Reading (dBm) | CL (dB) | Level (dBm)  | Limit (dBm) | Margin (dB) |
|---------|-----------------|------------------|---------|--------------|-------------|-------------|
| Low     | 1.664           | -29.0            | 0.5     | <b>-29.0</b> | -13.0       | -16.0       |
| Middle  | 1.685           | -22.5            | 0.5     | <b>-22.5</b> | -13.0       | -9.5        |
| High    | 1.714           | -31.3            | 0.5     | <b>-31.3</b> | -13.0       | -18.3       |

NOTES: RBW = VBW = 1 MHz

##### CDMA Mobile Emission in Base Frequency Range

| Channel | Frequency (MHz) | SA Reading (dBm) | CL (dB) | Amp Gain(dB) | Level (dBm)   | Limit (dBm) | Margin (dB) |
|---------|-----------------|------------------|---------|--------------|---------------|-------------|-------------|
| Low     | 876.00          | -100.0           | 1.0     | 28.0         | <b>-100.0</b> | -80.0       | -20.0       |
| Middle  | 876.00          | -100.6           | 1.0     | 28.0         | <b>-100.6</b> | -80.0       | -20.6       |
| High    | 872.19          | -100.9           | 1.0     | 28.0         | <b>-100.9</b> | -80.0       | -20.9       |

NOTES: RBW = 100 kHz, VBW=300 kHz

**Result: Positive**

## 5.5. Field Strength of Spurious Radiation ( § 2.1053)

Product: Single Band, Single Mode CDMA Mobile Phone  
Model: LG-RD5130

Serial No.: N/A  
Test Date: January 16, 2004

| Frequency<br>(GHz)      | SG Reading<br>(dBm) | CL<br>(dB) | Pol.<br>(H/V) | Gain<br>(dBi) | Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|-------------------------|---------------------|------------|---------------|---------------|---------------|--------------|----------------|----------------|
| Low Channel(CH#:1013)   |                     |            |               |               |               |              |                |                |
| 1.649                   | -40.3               | 4.1        | V             | 8.1           | 6.0           | <b>-38.5</b> | -13.0          | -25.5          |
| 1.649                   | -48.1               | 4.1        | H             | 8.1           | 6.0           | <b>-46.3</b> | -13.0          | -33.3          |
| 2.474                   | -58.4               | 5.2        | V             | 9.4           | 7.3           | <b>-56.4</b> | -13.0          | -43.4          |
| 2.474                   | -56.8               | 5.2        | H             | 9.4           | 7.3           | <b>-54.8</b> | -13.0          | -41.8          |
| Middle Channel(CH#:363) |                     |            |               |               |               |              |                |                |
| 1.672                   | -44.8               | 4.2        | V             | 8.1           | 6.0           | <b>-43.1</b> | -13.0          | -30.1          |
| 1.672                   | -46.2               | 4.2        | H             | 8.1           | 6.0           | <b>-44.5</b> | -13.0          | -31.5          |
| 2.508                   | -54.7               | 5.3        | V             | 9.5           | 7.4           | <b>-52.7</b> | -13.0          | -39.7          |
| 2.508                   | -56.7               | 5.3        | H             | 9.5           | 7.4           | <b>-54.7</b> | -13.0          | -41.7          |
| High Channel(CH#:777)   |                     |            |               |               |               |              |                |                |
| 1.697                   | -39.9               | 4.2        | V             | 8.2           | 6.1           | <b>-38.1</b> | -13.0          | -25.1          |
| 1.697                   | -44.0               | 4.2        | H             | 8.2           | 6.1           | <b>-42.2</b> | -13.0          | -29.2          |
| 2.544                   | -51.1               | 5.3        | V             | 9.5           | 7.4           | <b>-49.1</b> | -13.0          | -36.1          |
| 2.544                   | -56.1               | 5.3        | H             | 9.5           | 7.4           | <b>-54.1</b> | -13.0          | -41.1          |

**Result: Positive**

## 5.6. Frequency Stability ( § 2.1055)

Product: Single Band, Single Mode CDMA Mobile Phone  
Model: LG-RD5130

Serial No.: N/A  
Test Date: January 19, 2004

| Reference Frequency: CDMA Middle Channel 835.890034 MHz @ 25°C<br>limit: to stay $\pm 2.5$ ppm = 2089.725 Hz |                                    |                                               |             |                             |
|--------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------|-------------|-----------------------------|
| Power Supply<br>(Vdc)                                                                                        | Environment<br>Temperature<br>(°C) | Frequency Deviation Measured with Time Elapse |             |                             |
|                                                                                                              |                                    | (MHz)                                         | Delta (ppm) | Limit (ppm)                 |
| 3.70                                                                                                         | 50                                 | 835.890042                                    | -0.01       | $\pm 2.5$                   |
| 3.70                                                                                                         | 40                                 | 835.890032                                    | 0.00        | $\pm 2.5$                   |
| 3.70                                                                                                         | 30                                 | 835.889973                                    | 0.07        | $\pm 2.5$                   |
| <b>3.70</b>                                                                                                  | <b>25</b>                          | <b>835.890034</b>                             | <b>0.00</b> | <b><math>\pm 2.5</math></b> |
| 3.70                                                                                                         | 20                                 | 835.889963                                    | 0.08        | $\pm 2.5$                   |
| 3.70                                                                                                         | 10                                 | 835.889965                                    | 0.08        | $\pm 2.5$                   |
| 3.70                                                                                                         | 0                                  | 835.890023                                    | 0.01        | $\pm 2.5$                   |
| 3.70                                                                                                         | -10                                | 835.889965                                    | 0.08        | $\pm 2.5$                   |
| 3.70                                                                                                         | -20                                | 835.889983                                    | 0.06        | $\pm 2.5$                   |
| 3.70                                                                                                         | -30                                | 835.889977                                    | 0.07        | $\pm 2.5$                   |
| 2.79 (End point)                                                                                             | 25                                 | 835.889944                                    | 0.11        | $\pm 2.5$                   |
| 3.15(-15%)                                                                                                   | 25                                 | 835.890030                                    | 0.00        | $\pm 2.5$                   |
| 4.25(+15%)                                                                                                   | 25                                 | 835.890036                                    | 0.00        | $\pm 2.5$                   |

## 6. LIST OF INSTRUMENTS USED

| Type                            | Maker    | Model                | Cal. Date  | Cal. Due Date |
|---------------------------------|----------|----------------------|------------|---------------|
| Test receiver                   | R&S      | ESI40                | 10-May-03  | 10-May-04     |
| Spectrum Analyzer               | HP       | 8593A                | 04-Apr.-03 | 04-Apr.-04    |
| Wireless Communication Test Set | Agilent  | E5515C               | 16-Mar.-03 | 16-Mar.-04    |
| Transmitter Tester              | Agilent  | E4406A               | 04-Apr.-03 | 04-Apr.-04    |
| Signal Generator                | R&S      | SMR40                | 25-Aug.-03 | 25-Aug.-04    |
| Tuned dipole Antenna            | S/B      | UHAP                 | 26-May-03  | 26-May-04     |
| Biconical Antenna               | S/B      | VHAP                 | 26-May-03  | 26-May-04     |
| Log-periodic Antenna            | S/B      | VHALP9107            | 26-May-03  | 26-May-04     |
| Tx Horn Antenna                 | EMCO     | 3115                 | 13-Oct.-03 | 13-Oct.-04    |
| Rx Horn Antenna                 | EMCO     | 3115                 | 13-Oct.-03 | 13-Oct.-04    |
| HFP                             | ANDECHS  | WHK1.2/15G           | 26-Oct.-03 | 26-Oct.-04    |
| HFP                             | ANDECHS  | WHK2.0/18G           | 26-Oct.-03 | 26-Oct.-04    |
| HFP                             | ANDECHS  | WHK2.8/18G           | 26-Oct.-03 | 26-Oct.-04    |
| Amplifier                       | MITQ     | AMF-4D-001180-24-10P | 21-Oct.-03 | 21-Oct.-04    |
| Amplifier                       | EIN      | 603L                 | 02-Jun.-03 | 02-Jun.-04    |
| DC Power Supply                 | Testlink | AK-1205D             | 14-Oct.-03 | 14-Oct.-04    |
| Temperature Chamber             | ESPEC    | SH-641               | 13-May-03  | 13-May-04     |
| Duplexer                        | Telwave  | 5188-25BK            | N/A        | N/A           |
| Step Attenuator                 | R&S      | DPSP                 | 22-Apr.-03 | 22-Apr.-04    |

R&S: Rohde & Schwarz  
Cal. Date: Calibration date

S/B: Schwarzbeck  
Cal Due Date: Next calibration due date