

**Test Report From:**

LGC Wireless  
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Test of:

LGCell, 1900 MHz Microcellular Distributed Antenna System v4.0

To Part 24, Subpart E and Part 2, Subpart J  
of the FCC Rules and Regulations

Test Report No:

FCC ID: NOO

**APPLICATION FOR CERTIFICATION**

## **CERTIFICATION OF ENGINEERING REPORT**

This report has been prepared by LGC Wireless to verify compliance of the device described below with the requirements of Part 24, Subpart E and Part 2, Subpart J of the FCC rules and Regulations. This report may be reproduced in full. Partial reproduction may only be made with the written consent of LGC Wireless. The results in this report apply only to the sample tested.

Applicant: LGC Wireless

Manufacturer: LGC Wireless

Model Number: LGCell DAS1900-4

FCC ID: NOO-DAS1900-4

On this 2nd day of December ,1999, I, individually, and for LGC Wireless Inc., certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

LGC Wireless

Reviewed by:

Paul Allan

Paul Allan

Director, Engineering Operations

Tested by:

John Stevenson

RF Hardware Test Engineer

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## **SECTION 1. – EQUIPMENT UNDER TEST (EUT)**

### **1.1 Introduction**

The following data is submitted for Certification of the LGCell, in accordance with Part 24, Subpart E and Part 2, Subpart J of FCC Rules and Regulations.

### **1.2 Description**

The LGCell PCS 1900 v4.0 system consists of a main hub, an expansion hub, and four remote antenna units. The product is specifically designed as an in-building distributed antenna system using dual mode fiber optic cable and CAT V UTP cable.

The frequency of operation is a specified 1.25 MHz channel in the CDMA PCS 1900 band channel, any TDMA 1900 band channel, or any GSM 1900 band channel as designated by the licensed local service provider.

The system operates with an expected 40 dB gain in either the Uplink or Downlink with a maximum power out of +10 dBm on the duplex port and 0 dBm gain on the simplex ports on the downlink and with a maximum power out of +10 dBm and 0 dBm on the Uplink. Typical maximum operating levels are expected to be less than 0 dBm.

The antenna units are powered by a DC voltage on one pair of the UTP from the expansion hub and ground is provided on another pair. The hubs are powered by 115 V AC.

The system is designed to work on A, B, D, E, or F Blocks per CFR 47 Part 24.229.

### **1.3 Information Required for Certification**

#### **§2.1033(a) Application for Certification**

A complete FCC Form 731 accompanies this application for certification.

#### **§2.1033(c) (1-3) Technical Report**

Applicant: LGC Wireless Inc.  
585 East Brokaw Rd.  
San Jose, Ca. 95112

FCC ID: NOO

Installation/Operating Instructions: Included as an electronic attachment as part of the electronically filed application package.

§2.1033(c) (4) Type or types of emission

Emission Designators:

GSM: GXW, NXW

CDMA: F9W, NXW

TDMA: F1D, F9W, DXW, 6XW, NXW

§2.1033(c) (5) Frequency Range

1850-1910 MHz and 1930-1990 MHz

§2.1033(c) (6) Power Levels

The maximum transmit power ratings are listed in the attached Instruction manual as part of this electronically filed application.

§2.1033(c) (7) Maximum Power Ratings

The maximum peak transmit power is +20 dBm (measured). Results are included as part of this electronically filed application package.

§2.1033(c) (8) DC Voltages and DC Currents

The only DC voltages and currents present are those powering the Remote antenna units. Those values are 12 V and approximately 600 mA.

§2.1033(c) (9) Tune up procedure over the power range

The tuning procedure for the system will be sent to the FCC as an attachment as part of the electronically filed application.

§2.1033(c) (10) Circuit Diagrams

Complete circuit diagrams are to be sent to the FCC as an attachment as part of the electronically filed application. The diagrams will cover the following:

Frequency stabilization (PLL and Pilot Tone)

Suppression of spurious radiation (Filtering)

Modulation limiting: Not Applicable

Power limiting (Uplink clamping circuits/ No Downlink power limiting)

§2.1033(c) (11) Photographs/Drawings of the label

The FCC label is placed on the EUT as shown in the label drawing in Appendix 4.

### §2.1033(c) (12) Equipment Photographs

Photographs of the equipment are shown in the accompanying EMC Technologies report.

### §2.1033(c) (13) Digital Modulation Techniques

GSM, CDMA, TDMA; The test results are included as part of this electronically filed package.

### §2.1033 (c) (14) Data Required

The data required by §2.1046-§2.1057, inclusive, was measured in accordance with the procedures set out in §2.1041 and is included as part of this electronically filed package.

### §2.1033 (c) (15, 16)

Not Applicable

## **SECTION 2 - MEASUREMENT REQUIREMENTS**

### **2.1 Introduction**

The following data is submitted for Certification of a Licensed PCS 1900Mhz system for LGC Wireless, in accordance with Part 24, Subpart E and Part 2, Subpart J of FCC Rules and Regulations. The measurement procedures were in accordance with the requirements of §2.1041.

### **2.2 Measurements Required**

#### §24.51(c) Equipment Authorization

Applicants for certification of transmitters that operate in these services must determine that the equipment complies with IEEE C95.1-1991 (ANSI/IEEE C95.1-1992), "IEEE Standards for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." SAR measurement methods are specified in IEEE C95.3-1991, "Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave."

Enclosed in Appendix 3 is a statement verifying compliance to this section.

#### §2.1046 RF Power Output - §24.232

##### §2.1046(a)

For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the

transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033(c) (8).

#### §24.232 Power and antenna height limits

Paragraphs a and b are not applicable. Output power is less than 100 mW. Data is included as part of this electronically filed package.

#### §2.1047 Modulation Characteristics

The LGCell uses pi/4 DQPSK modulation, therefore, this section does not apply. Enclosed with the measurement data is the measured standard frequency deviation from the LGCell with a modulated signal.

#### §2.1049 Occupied Bandwidth

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions:

(h) Transmitters employing digital modulation techniques – when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators, or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

All digital modulation techniques were tested to an occupied bandwidth at 99% power out. The data is included as part of this electronically filed package.

#### §2.1051 Spurious Emissions at Antenna Terminals - §24.238

#### **§2.1051**

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminal when properly loaded with a suitable artificial antenna.

All RF data is included as part of this electronically filed package.

#### **§24.238(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.

## Criteria

The reference level for spurious emissions at the antenna terminals was taken from the measured output power (P), therefore, the spurious must be attenuated at least  $43 + 10 \log (P)$ .

All emissions outside of the  $-26$  dB emissions bandwidth were at least 26 dB down from the carrier. Data for all of the digital modulation techniques is included as part of this electronically filed package.

### §2.1055 Frequency Stability - §24.235

#### **§2.1055**

- (a) The frequency stability was measured with variation of ambient temperature as follows:
- (1) From 0 deg. to +50deg centigrade.
  - (b) Frequency measurements were made at the extremes of the specified temperature range and at a single interval of 25 deg. centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. the short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.
  - (d) The frequency stability shall be measured with variation of primary supply voltage as follows:

#### **§24.235**

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

#### **§2.1057**

If the equipment operates below 10 GHz, the spectrum shall be investigated to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

The EUT was tested to the tenth harmonic of the fundamental frequency and the data is included as part of this electronically filed application package.



**SECTION 3 – MEASUREMENT DATA**

The LGCell operates in Blocks A through F from 1850 MHz to 1910 MHz, and 1930 MHz to 1990 MHz. Testing was performed with the LGCell tuned to B, D, and F Band frequencies.

- Data obtained was submitted as part of the electronically filed package and are entitled “B Band.pdf”, “D Band.pdf”, and “F Band.pdf”.
- Additional data for 2.1057 is entitled “Harmonics.pdf”.
- Spurious emissions data is included and entitled “Spurious Emissions Full Spectrum.pdf”.

**Appendix 1 – Test Equipment Used**

| <b>Mfr/Model No</b> | <b>Description</b>                      | <b>Serial Number</b> | <b>Cal Date</b> |
|---------------------|---|----------------------|-----------------|
| Anritsu/MS8606A     | Digital Mobile Radio Transmitter Tester | M06971               | 1/28/99         |
| HP/8593E            | Spectrum Analyzer                       | 3547U01188           | 4/27/99         |
| HP/8594E            | Spectrum Analyzer                       | 3801A05466           | 4/27/99         |
| HP/8594E            | Spectrum Analyzer                       | 3801A05532           | 5/6/99          |
| R&S/SMIQ 03         | Signal Generator                        | DE23533              | 6/30/99         |
| R&S/SMIQ 03         | Signal Generator                        | DE22093              | 10/22/97        |
| R&S/SMIQ 03         | Signal Generator                        | DE22422              | 1/21/98         |
|                     |   |                      |                 |
|                     |   |                      |                 |

The equipment listed above is calibrated every 12 months (except the signal generators which are calibrated on a 36 month interval) by an independent calibration laboratory .

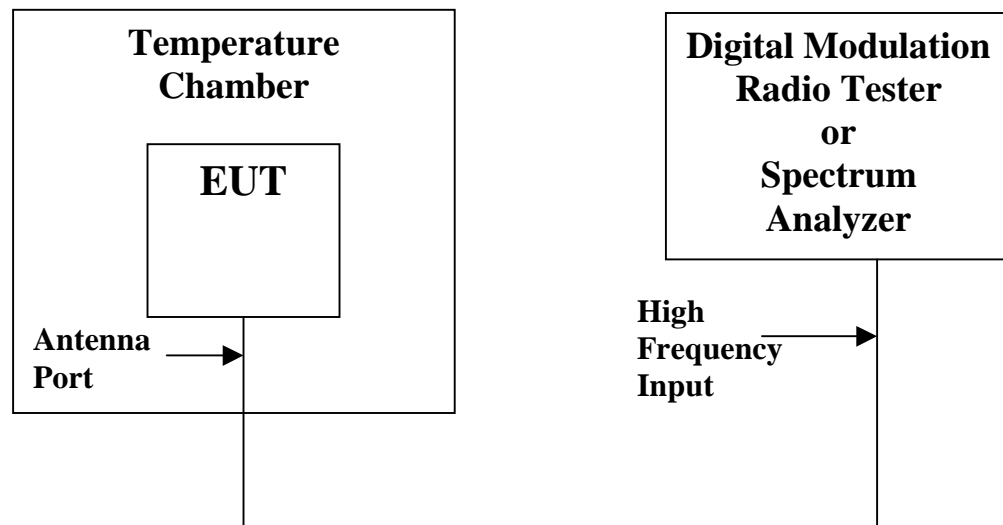
## Appendix 2 – Carrier Frequency Stability Test Procedure

### FCC Section 24.235 Carrier Frequency Stability

The EUT was placed inside of a temperature chamber and directly connected to the spectrum analyzer via the antenna output port as shown in the block diagram below. The computer was used to control the EUT to permit it to transmit on pre-determined channels. The carrier frequency stability was measured using the spectrum analyzer or the digital modulation radio tester.

The EUT was placed inside of the temperature chamber at 25 deg. C for one hour in order to stabilize the temperature of the chamber and the EUT. This measurement was recorded as a reference for the measurements at the other temperatures and the battery voltage extremes using the modulation domain analyzer.

The modulation domain analyzer's settings were set as follows:



## **Appendix 3 Compliance Statements**


### **Part 24**


Based on the results of our in-house testing and that of the contracted lab, EMC International Services, we believe our equipment is in compliance with the requirements of FCC CFR 47 Part 24 Subpart E.


### **SAR**


Based on the fact that our product is a low power device, is not a hand held device, and only on rare occasions be within 20 cm of an individual, we are in compliance with SAR requirements.

### Appendix 4 Labels

|   |  |
|---|--|
| <b>LGC Wireless Inc.</b><br>MPN: DAS19M-4-X<br>FCC ID: NOO-DAS19-4-X<br>Input 100-240@1.6A 50-60Hz<br>Made in USA |  |
| EPN: XXXXXX-X REV: XX   | SN: VXXXXXXXXX   |

|   |  |
|---|--|
| <b>LGC Wireless Inc.</b><br>MPN: DAS19E-4<br>FCC ID: NOO-DAS19-4-X<br>Input 100-240@1.6A 50-60Hz<br>Made in USA |  |
| EPN: XXXXXX-X REV: XX   | SN: VXXXXXXXXX   |

|  |  |
|--|--|
| <b>LGC Wireless Inc.</b><br>MPN: DAS19A-4GSM<br>FCC ID: NOO-DAS19-4-X<br>Input 100-240@1.6A 50-60Hz<br>Made in USA |  |
| EPN: XXXXXX-X REV: XX  | SN: VXXXXXXXXX   |

|   |  |
|---|--|
| <b>LGC Wireless Inc.</b><br>MPN: DAS19A-4<br>FCC ID: NOO-DAS19-4-X<br>Input 100-240@1.6A 50-60Hz<br>Made in USA |  |
| EPN: XXXXXX-X REV: XX   | SN: VXXXXXXXXX   |