

Lucent Technologies
Bell Labs Innovations



Subject: **Application for FCC Product Certification under FCC ID:
AS5ONEBTS-10, of the FLEXENT PCS CDMA Transceiver
System with Enhanced Digital Pre-Distortion (EDPD)**

Date: **February 27, 2006**

From: 67 Whippany Road
Whippany, NJ 07981

Rudolf J. Pillmeier
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E-Mail: rpillmeier@lucent.com

Mr. Sid Sanders, President
Timco Engineering, Inc.
849 N.W. State Road 45,
P. O. Box 370
Newberry, Florida 32669

Dear Mr. Sanders:

Subject: Application for Class II Permissive Change of FCC ID: AS5ONEBTS-10

Dear Examiner:

The Lucent Technologies' FLEXENT® Broadband PCS UMTS-CDMA Transceiver System (1900), subject of this request for a Class II Permissive Change, was previously authorized for UMTS operation, under **FCC ID: AS5ONEBTS-10**. The "Multi-Carrier CDMA Radio" (MCR1900), Model BNJ64, can be used either as a Multi-Carrier CDMA or Multi-Carrier UMTS transceiver. There are no physical, hardware or circuit changes to the transceiver. Lucent Technologies hereby requests that the CDMA emission designator **1M25F9W** be added to the **AS5ONEBTS-10** authorization. All required supporting exhibits, not previously submitted with the initial filing, are attached.

The **FLEXENT® PCS UMTS-CDMA EDPD Transceiver System with Enhanced Digital Pre-Distortion (EDPD)** configures a CDMA MCR1900 and P2PAM to allow for increased capacity. The Transceiver System includes many of the principle RF components which have been previously filed under various FCC ID's. These include the (1) Multi-Carrier Radio (MCR1900), Model BNJ64, authorized under FCC ID: AS5ONEBTS-09, (2) P2PAM power amplifier authorized under FCC ID: AS5ONEBTS-06, (3) New 60 MHz wide Dual Duplex (DDpx) low loss transmit filters covering the PCS Spectrum 1930-1990 MHz and (4) Rubidium and Crystal Reference Oscillator Module (OMR/OMC) 15 MHz. The EDPD system uses the present hardware in conjunction with an enhanced version of the UMTS system software used to monitor the output of the transmit amplifiers and feed it back to the MCR for processing and distortion cancellation. These components are considered as a system due to (1) the DDpx filters providing RF feedback to the transceiver in the form of Closed Loop Gain Control (CLGC) which provide constant power over temperature, and (2) Lucent's proprietary Enhanced Digital Pre Distortion (EDPD) technology which enables communication between the transceiver, power amplifier and the transmit filter to achieve this goal.

This Class II change applies the CDMA parameters to the UMTS system transceiver authorization, which used these same active components and was reviewed and authorized under FCC ID: AS5ONEBTS-10. The principal differences are the standard CDMA format, the 1M25F9W emissions designator, the output power of 20 watts per carrier for one through six carriers and the number of amplifiers required to support the transmit chain. The measurement exhibits attached to this application demonstrate full compliance with FCC Part 24 Subpart E – Broadband PCS following the procedural requirements specified in FCC Part 2 Subpart J – Equipment Authorization Procedures. The data, summarized below, is in the form presently used by the Commission's Radio Equipment List.

Manufacturer: Lucent Technologies Inc.
Equipment Identification: AS5ONEBTS-10
Rules Part Number: Part 24, Subpart E – Broadband PCS
Frequency Range: Transmit 1930–1990 MHz (All PCS Blocks)
Output Power: 0.010 to 20.0 Watts per CDMA carrier - 120 Watts Total
Frequency Tolerance: ± 0.05 ppm
Emission Designator: 1M25F9W

The EDPD feature was developed for the North America Region (NAR) deployment to increase overall system efficiency, capacity and transmitter power control. The transceiver can and will operate under the previous FCC ID's, albeit at lower power and efficiency, should the EDPD detect system malfunction. The conversion from EDPD to non-EDPD operation is by software control alone at the installation site. There are no physical, hardware or circuit changes to the MCR1900 Radio channel control circuit packs or frequency reference system.

EDPD functionality for the MCR-1900 transceiver was developed in accordance to the guidelines of 3GPP2.S0002-A, *Physical Layer Standard for cdma2000 Spread Spectrum Systems*, 3GPP2.C.S0024 - *cdma2000 High Rate Packet Data Air Interface Specification* and 3GPP2 TSG-C.S0032-1-*Recommended Minimum Performance Standards for CDMA2000 High Rate Packet Data Access Network*. These Standards contains the physical layer of the IMT-2000, CDMA Multi-Carrier Mode, IMT-2000 CDMA MC, for land mobile wireless systems based upon cellular principles. The Standards is a revision of the Telecommunications Industry Association Standard TIA/EIA/IS-2000.2, *Physical Layer Standard for cdma2000 Spread Spectrum Systems*. This Standards includes the capabilities of Telecommunications Industry Association Standard TIA/EIA-95-B and TIA/EIA/IS-856.

Attached are the FCC Form 731 (Application for Equipment Authorization – Radio Frequency Devices), the required measurement data and exhibits specific to this request for initial equipment authorization of the PCS CDMA EDPD Transceiver System. The technical or non-technical contact at Lucent Technologies will comply with any request for additional information should the need arise. The attached exhibits with the applicable FCC Rule section are assembled and presented in accordance with the *Table of Contents* attachment. Included is a formal letter requesting confidentiality for the following exhibits:

<u>Exhibit #</u>	<u>FCC Rule Section</u>	<u>Exhibit Title</u>
Exhibit 4	Section 2.1033(c) (8,9)	Active Circuit Devices Drive Levels, Tune-Up procedures
Exhibit 5	Section 2.1033(c) (10)	Complete Circuit Diagrams, Circuitry for Spurious Suppression
Exhibit 6	Section 2.1033(c) (12,3)	Installation and Operating Instructions

Should there be any questions or procedural issues please feel free to contact me by email and/or phone.

Sincerely,

Rudolf J. Pillmeier
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Att. Table of Contents for the FLEXENT® PCS CDMA EDPD Transceiver System Product Certification Report

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Cover Letter
Request for Confidentiality

<u>LU Exhibit #</u>	<u>FCC Rule Number</u>	<u>Description</u>
Exhibit 1	Section 2.1033(a)	FCC Form 731
Exhibit 2	Section 2.911 (d),(g),(e)	Qualifications and Certifications
Exhibit 3	Section 2.1033(c) (1,2,4,5,6,7,)	Manufacturers, FCC Identifier, Emissions Type, Frequency Range and RF Power Range, Maximum power
Exhibit 4	Section 2.1033(c) (8,9)	Active Circuit Devices Drive Levels, Tune-Up procedures (Confidential)
Exhibit 5	Section 2.1033(c) (10)	Complete Circuit Diagrams, Circuitry for Spurious Suppression (Confidential)
Exhibit 6	Section 2.1033(c) (12,3)	Installation and Operating Instructions (Confidential)
Exhibit 7	Section 2.1033(c) (10)	Circuitry for Determining Frequency
Exhibit 8	Section 2.1033(c) (11)	Identification Label Drawing and Location
Exhibit 9	Section 2.1033(c) (12)	Photographs of the Equipment
Exhibit 10	Section 2.1033(c) (13)	Description of Modulation System

Test Report Exhibits

<u>LU Exhibit #</u>	<u>FCC Rule Number</u>	<u>Description of Test Report Exhibits</u>
Exhibit 11	Section 2.1033(c) (14)	Listing of Required Measurements
Exhibit 12	Section 2.1046	Measurement of Radio Frequency Power Output
Exhibit 13	Section 2.1047	Measurement of Modulation Characteristics
Exhibit 14	Section 2.1049	Measurement of Occupied Bandwidth
Exhibit 15	Section 2.1051	Measurement of Spurious Emissions at Antenna
Exhibit 16	Section 2.1053	Field Strength of Spurious Radiation
Exhibit 17	Section 2.1055	Measurement of Frequency Stability

Exhibit 2 QUALIFICATIONS and CERTIFICATIONS

January 27, 2006

Section 2.911 (d) QUALIFICATION OF ENGINEERS

Section 2.911 (d) Technical test data shall be signed by the person who performed or supervised the tests. The person signing the test data shall attest to the accuracy of such data. The Commission may require such person to submit a statement showing that he is qualified to make or supervise the required measurements.

Walter Steven Majkowski is a Member of Technical Staff at Lucent Technologies Bell Laboratories. He holds a BSEE from New Jersey Institute of Technology and was trained in the FCC testing procedures. Mr. Majkowski is the Lead engineer for the filing of CDMA Wireless Base station products at Lucent Technologies. Mr. Majkowski is a NARTE certified EMC engineer, Certificate number EMC-001859-NE, and has at least twenty six years of EMC design and testing experience. Mr. Majkowski has previously filed over nineteen different wireless products.

Rudolf J. Pillmeier
Technical Manager
FCC/EMC Compliance Test Group
Whippany, NJ

Exhibit 2 *continued*

SECTION 2.911 (e)(g) CERTIFICATION OF TECHNICAL TEST DATA

Section 2.911(e) The signatures of the applicant and the person certifying the test data shall be made personally by those persons on the original application; copies of such documents may be conformed. Signatures and certifications need not be made under oath.

Section 2.911(g) Signed, as used in this section, means an original handwritten signature; however, the Office of Engineering and Technology may allow signature by any symbol executed or adopted by the applicant with the intent that such symbol be a signature, including symbols formed by computer-generated electronic impulses.

I hereby certify that the technical test data are the results of tests performed or supervised by me.

Walter Steven Majkowski NCE
Member Technical Staff
Whippany Compliance Laboratory

Exhibit 3 FCC REQUIRED INFORMATION

The following information is presented in the content and format requested by the FCC:

Section 2.1033 (c)(1):

The full name and mailing address of the manufacturer of the device and the applicant for certification.

Manufacturer: Lucent Technologies
6200 E Broad St
Columbus, OH 43213-1569 U S

Applicant: Lucent Technologies
Room: 4c402
600-700 Mountain Avenue.
Murray Hill, NJ 07974-0636
Sandra L. Janssen
Strategic Information Manager
Phone: 908-582-4959 Fax 908-582-3104
email: sjanssen@lucent.com

Lucent Technologies, Inc. will be the manufacturer of this product. The **AS5ONEBTS-10** will only be marketed under the Lucent Technologies Inc. trademark.

Section 2.1033(c)(2): FCC Identifier

AS5ONEBTS-10

Section 2.1033(c)(4): Type or types of emission:

4M1F9W
1M25F9W

The 4M1F9W emissions designator was previously authorized. The 1M25F9W emissions designator is the subject of this application

Section 2.1033(c)(5): Frequency range Transmit:

1930–1990 MHz

Section 2.1033(c)(6): Range of operating power values or specific operating power levels, and description of any means provided for variation of operating power.

Lucent Technologies' Broadband PCS UMTS-CDMA EDPD Transceiver System (1900), which is incorporated into the CDMA Flexent® OneBTS™ Modular Cell 4.0B wireless base station, is the subject of this Class II Change under the FCC ID: **AS5ONEBTS-10**. The CDMA1900 Transceiver System consists of the principle RF components: (1) Crystal Reference Oscillator Module (OMA) at 15 MHz, (2) UMTS-CDMA Multi-Carrier CDMA Radio (MCR1900), Model BNJ64, which was previously authorized by the Federal Communications Commission under FCC ID: **AS5ONEBTS-09**, (3) P2PAM power amplifier, and (4) 60 MHz bandwidth Dual Duplex (DDpx) transmit filter covering the PCS spectrum 1930-1990 MHz. These components are considered as a system due to the DDpx filters providing RF feedback to the transceiver in the form of Closed Loop Gain Control (CLGC) to provide constant power with over temperature and Lucent's proprietary Enhanced Digital Pre-Distortion (EDPD) technology which enables software to communicate between the transceiver, power amplifier and the transmit filter to achieve this goal.

This CDMA EDPD Transceiver System is designed to operate in Lucent Flexent™ OneBTS™ Broadband PCS UMTS/CDMA wireless base station. The MCR1900 can operate for both multi-carrier CDMA and UMTS technologies; the subject of this request for certification is operation in the Code Domain Multiple Access Telecommunications System (CDMA) for multiple 1.25 MHz emission bandwidth CDMA carriers (1M25F9W). The transceiver can be converted from CDMA to UMTS (or UMTS to CDMA) by software alone, which can be performed at the installation site. There are no physical, hardware or circuit changes to the transceiver. The subject of this application is CDMA.

EXHIBIT 3: FCC REQUIRED INFORMATION

Section 2.1033(c)(6): *continued* Range of operating power values or specific operating power levels, and description of any means provided for variation of operating power.

The maximum rated output power at the antenna terminal of 20 Watts (+43 dBm), 3-second average, per 1.25MHz emission bandwidth carrier. Power adjustment is software controlled, using a digital signal to set and adjust voltage variable attenuators in the MCR1900 transceiver. The range of attenuation control is 30 dB, with a resolution of 0.05 dB.

Section 2.1033(c)(7): Maximum power rating as defined in the applicable part (s) of the rules.

The Lucent Flexent™ OneBTS™ PCS UMTS-CDMA EDPD Transceiver System has a maximum rated CDMA output power at the antenna terminal of 20 Watts per carrier (+43 dBm), for one to six carriers. This 20 Watt/carrier (+43 dBm) output is per each 1.25 MHz emission bandwidth CDMA carrier. The total power at the antenna terminals is 120 Watts for the six CDMA carriers.

Section 2.1033 (c)(10): A description of all circuitry and devices for determining and stabilizing frequency.

The Lucent Flexent™ OneBTS™ PCS UMTS-CDMA EDPD Transceiver System, which utilizes a 1.25 MHz carrier emission bandwidth, is designed to operate in the Broadband PCS frequency spectrum. Frequency stability of the carrier frequency is achieved with an accuracy better than the rated ± 0.05 ppm by the 15 MHz reference frequency generated by a GPS locked stable Rubidium Oscillator Module (OMR) using proprietary phase locked loop (PLL) circuitry.

SECTION 2.1033(c) (6): Range of operating power values or specific operating power levels, and description of any means provided for variation of operating power.

Response: The **PCS UMTS-CDMA EDPD Transceiver, FCC ID: AS5ONEBTS-10** utilizes the P2PAM/ AS5ONEBTS-06 with additional information from that presented in the P2PAM/ AS5ONEBTS-06 filings. The P2PAM/ AS5ONEBTS-06 is a nominally rated 52 Watt/ 43 dB fixed gain linear amplifier. The output power that is delivered to the J4 antenna output connector of the cabinet in which the P2PAM's are mounted is reduced from this maximum value by filter insertion loss, RF transmission losses and margin for long term reliability. The FCC "Range of Power" delivered at the J4 antenna connection is 0.02 to 20 Watts per carrier (+2 /-4 dB). This power is under continuous software control.

When the P2PAM is configured within the **PCS UMTS-CDMA EDPD Transceiver, FCC ID: AS5ONEBTS-10** as a single CDMA Multi Carrier Amplifier, the maximum long term average rated power at the J4 antenna output connector remains 20 Watts +2 /-4 dB per carrier for one or two carriers. The total power at the antenna port for a single Multi Carrier Amplifier MCA configuration is 40 Watts +2 /-4 dB maximum.

When the P2PAM is configured within the **PCS UMTS-CDMA EDPD Transceiver, FCC ID: AS5ONEBTS-10** as a dual CDMA Multi Carrier Amplifier, the maximum long term average rated power at the J4 antenna output connector remains 20 Watts +2 /-4 dB per carrier for one or four carriers. The total power at the antenna port for a dual Multi Carrier Amplifier MCA configuration is 80 Watts +2 /-4 dB maximum.

When the P2PAM is configured within the **PCS UMTS-CDMA EDPD Transceiver, FCC ID: AS5ONEBTS-10** as a triple CDMA Multi Carrier Amplifier, the maximum long term average rated power at the J4 antenna output connector remains 20 Watts +2 /-4 dB per carrier for one or six carriers. The total power at the antenna port for a dual Multi Carrier Amplifier MCA configuration is 120 Watts +2 /-4 dB maximum.

SECTION 2.1033(c) (7): Maximum power rating as defined in the applicable part of the rules.

Response: The maximum average power output of the **PCS UMTS-CDMA EDPD Transceiver, FCC ID: AS5ONEBTS-10** at the J4 antenna output connector is 20.0 Watts per carrier for one to six carriers with 120 watts total +2 /-4 dB maximum for a six carrier Multi Carrier Amplifier configuration.

The use of post transmit filter combiners can allow multiple J4 outputs to share a given antenna connection.

Exhibit 7- Circuitry For Determining Frequency, Limiting Modulation and Power

SECTION 2.1033(c) (10)

A schematic diagram and a description of all circuitry and devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation, and for limiting power.

Section 2.1033 (c)(10) A description of all circuitry and devices for determining and stabilizing frequency.

Response: Lucent Technologies' **Flexent® PCS UMTS-CDMA EDPD Transceiver System**, which is incorporated into the **FLEXENT® OneBTS® PCS CDMA Modular Cell 4.0** wireless base station, is designed to operate in the Broadband PCS frequency band. Frequency stability of the carrier frequency is achieved with an accuracy better than the rated ± 0.05 ppm by the 15 MHz reference frequency generated by a highly stable Rubidium oscillator module (OMR) plus proprietary phase locked loop circuitry (PLL).

The frequency stabilization and accuracy of the **PCS UMTS-CDMA EDPD Transceivers** CDMA signal amplified by the **P2PAM** and measured at the **PCS Modular Cell 4.0** J4 connector is solely a function of the input signal from the **MCR-1900 (FCC ID: AS5ONEBTS-09)**. The Common Timing Unit (CTU) provides the time and frequency reference used by the **MCR-1900 (FCC ID: AS5ONEBTS-09)**. The CTU is a highly accurate time and frequency unit which relies upon a signal lock of GPS satellite signals to provide the primary discipline of system timing. In the event of loss of GPS lock the Rubidium Reference Oscillator (**OMU-RB**) or the Crystal Oscillator Module (**OMU-XO**) can provide up to eight hours of flywheel operation. The system provides for automatic timing synchronization upon reacquisition of GPS lock. The system is powered by an AC-DC power converter with battery backup to provide immunity to power fluctuations and failures. A complete description of the system is fully documented in the supplied manual, **Flexent® CDMA Modular Cell 4.0 Operations, Administration and Maintenance Release 25.0**. This manual has been requested for confidentiality.

Section 2.1033 (c)(10)

A description of all circuitry and devices for limiting modulation and power.

Response: The frequency determination, stabilization, modulation limiting and power control of the transmit signal is provided by the UMTS-CDMA Multi Carrier Radio (**MCR-1900**), Model BNJ64, which was previously authorized by the Federal Communications Commission under FCC ID: **AS5ONEBTS-09**, granted 22 February 2005 for all PCS Blocks. The **MCR-1900/ AS5ONEBTS-09** supplies the modulated signals to be amplified and all power control functions. The **PCS UMTS-CDMA EDPD Transceiver/ AS5ONEBTS-10** frequency conversion, stabilization and power control circuitry is fully described in the **MCR-1900/AS5ONEBTS-09** filing and in Exhibit 6 which details the basic frequency reference.

Exhibit 10**SECTION 2.1033(c) (13)**

For equipment employing digital modulation techniques, a detailed description of the modulation system to be use, including response characteristics of any filters provided, and a description of the modulating wavetrain, shall be submitted for the maximum rated conditions under which the equipment will be operated.

Response:

The Lucent UMTS Flexent™ OneBTS™ PCS UMTS-CDMA Multi-Carrier Radio (MCR1900), BNJ64, previously authorized under FCC ID: **AS5ONEBTS-09**, is a 15 MHz / 11 CDMA carrier emission bandwidth base station transceiver designed to operate in the Broadband PCS frequency band 1930-1990 MHz. The MCR1900 which generates the modulated signal is able to generate either 5 MHz carrier emission bandwidth UMTS (W-CDMA) signals or 1.25 MHz carrier emission bandwidth CDMA signals. This system and circuitry was fully described in the original filings for the MCR1900 authorized under FCC ID: **AS5ONEBTS-09** granted 22 February 2005 for all PCS Blocks and has not changed.

EDPD functionality for the MCR-1900 transceiver was developed in accordance to the guidelines of 3GPP2.S0002-A, *Physical Layer Standard for cdma2000 Spread Spectrum Systems*, 3GPP2.C.S0024 - *cdma2000 High Rate Packet Data Air Interface Specification* and 3GPP2 TSG-C.S0032-1-*Recommended Minimum Performance Standards for CDMA2000 High Rate Packet Data Access Network*. These Standards contains the physical layer of the IMT-2000, CDMA Multi-Carrier Mode, IMT-2000 CDMA MC, for land mobile wireless systems based upon cellular principles. The Standards is a revision of the Telecommunications Industry Association Standard TIA/EIA/IS-2000.2, *Physical Layer Standard for cdma2000 Spread Spectrum Systems*. This Standards includes the capabilities of Telecommunications Industry Association Standard TIA/EIA-95-B and TIA/EIA/IS-856.

The electrical design of the MCR-1900 is unchanged from the original filings.