

Nemko Test Report No.:

4L0356RUS1

Applicant:

Nokia Inc.
6000 Connection Drive
Irving, Texas 75039

Equipment Under Test:

UltraSite WCDMA Base Station Transceiver
Unit with FCC ID: L7KWTRC-01

In Accordance With:

FCC Part 24, Subpart E
Broadband PCS Base Station Transmitter

Tested By:

Nemko Dallas Inc.
802 N. Kealy
Lewisville, Texas 75057-3136



Authorized By:

Tom Tidwell, Frontline Manager

Date:

7/9/04

Total Number of Pages:

30

Table of Contents

Section 1. Summary of Test Results.....	3
Section 2. General Equipment Specification.....	5
Section 3. RF Power Output	7
Section 4. Occupied Bandwidth.....	9
Section 5. Spurious Emissions at Antenna Terminals	11
Section 6. Field Strength of Spurious	15
Section 7. Frequency Stability	18
Section 8. Test Equipment List	20
ANNEX A - TEST DETAILS	21
ANNEX B - TEST DIAGRAMS	27

Section 1. Summary of Test Results

Manufacturer: Nokia

Model No.: UltraSite WCDMA Base Transceiver Station Model Supreme Indoor

Serial No.: 3J041801083

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 24, Subpart E.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. NONE

Nemko Dallas Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Dallas Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report applies only to the items tested.

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	100W	Complies
Occupied Bandwidth	24.238	Unspecified	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	Complies
Frequency Stability	24.235	± 0.05 ppm	Complies

Measurement uncertainty is expressed to a confidence level of 95%.

Section 2. General Equipment Specification

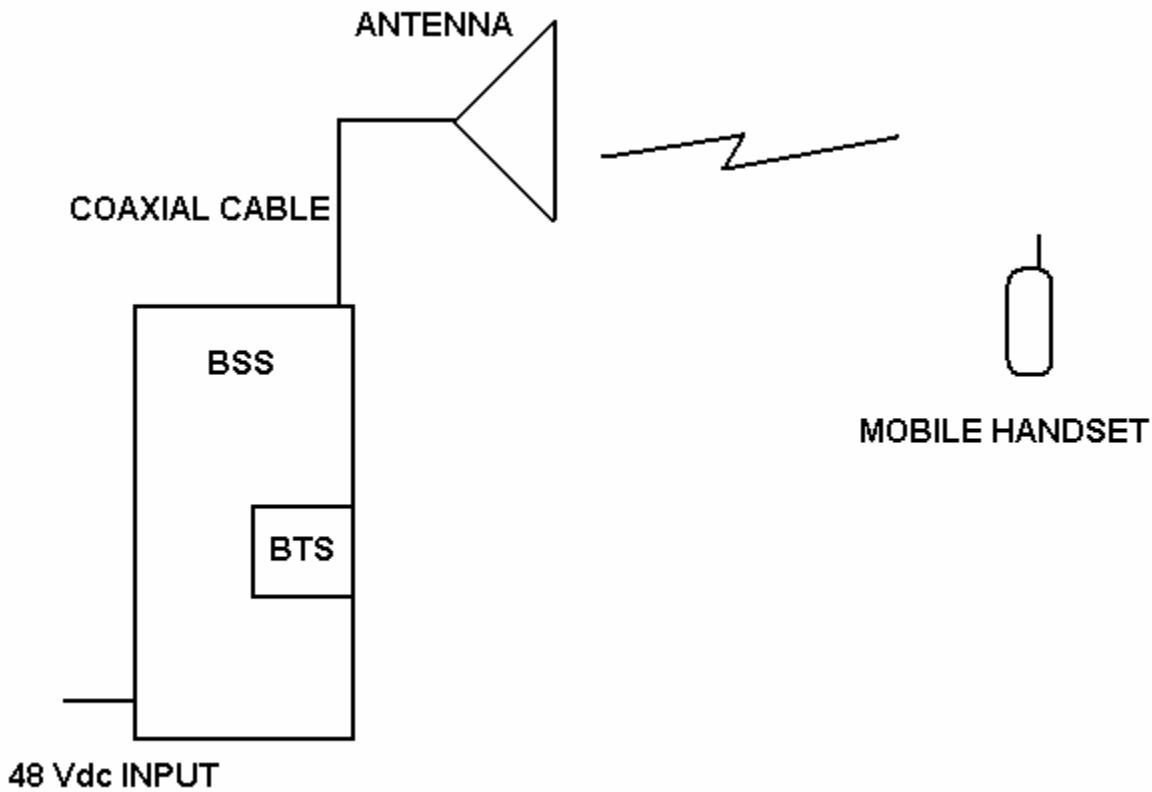
Supply Voltage Input:	48 Vdc		
Frequency Bands:	TX	<input checked="" type="checkbox"/> Block A : 1930 – 1945 MHz	<input checked="" type="checkbox"/> Block D : 1945 – 1950 MHz
		<input checked="" type="checkbox"/> Block B : 1950 – 1965 MHz	<input checked="" type="checkbox"/> Block E : 1965 – 1970 MHz
		<input checked="" type="checkbox"/> Block F : 1970 – 1975 MHz	<input checked="" type="checkbox"/> Block C : 1975 – 1990 MHz
Frequency Bands:	RX	<input type="checkbox"/> Block A : 1850 – 1865 MHz	<input type="checkbox"/> Block B : 1865 – 1870 MHz
		<input type="checkbox"/> Block C : 1870 – 1885 MHz	<input type="checkbox"/> Block D : 1885 – 1890 MHz
		<input type="checkbox"/> Block E : 1890 – 1895 MHz	<input type="checkbox"/> Block F : 1895 – 1910 MHz
Type of Modulation and Designator:	W-CDMA (4M23F9W) <input checked="" type="checkbox"/> GSM (200KG7W) <input type="checkbox"/> NADC (40K0DXW) <input type="checkbox"/>		
Maximum No. of Carriers:	1		
Output Impedance:	50 ohms		
RF Output:	Per channel: 416.9 mW		
Band Selection:	Software <input checked="" type="checkbox"/>	Duplexer <input type="checkbox"/>	Fullband <input type="checkbox"/>

System Description

The BTS performs the radio function of the Base Station System (BSS), and is connected to the Radio Network Controller (RNC) via the Abis interface, and to Mobile Stations (MS) via the Air interface (Antenna). The BSC is further connected to the Mobile Switching Center (MSC) and the Operation and Maintenance Center (OMC).

Setup for testing: The transmitter was set up according to 3GPP TS 25.141 Test Model 1 for all tests except frequency stability. 64 DPCCHs at 30 ksps (SF=128) distributed randomly across the code space, at random power levels and random timing offsets, were defined to simulate a realistic operating scenario which may have high PAR (Peak-to-Average Ratio). The transmitter was set up according to 3GPP TS 25.141 Test Model 4 for the frequency stability tests.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 6/28/2004

Test Results: Complies.

Measurement Data: Refer to attached plot

Modulation Type	Frequency (MHz)	Measured Output Power (dBm)	Measured Output Power (mW)
WCDMA	1960	26.2	416.9

Equipment Used: 1036-1064-1042

Measurement Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 55 %

Test Data – RF Power Output



Nemko Dallas, Inc.

Dallas Headquarters:
 802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667

Data Plot		RF POWER OUTPUT			
Page 1 of 1		Complete <input checked="" type="checkbox"/> X			
Job No.:	4L0356R	Date:	6/28/2003		
Specification:	PT24	Temperature(°C):	22		
Tested By:	David Light	Relative Humidity(%):	55		
E.U.T.:	W-CDMA TRANSMITTER				
Configuration:	TX FULL POWER CENTER CHANNEL				
Sample Number:	1				
Location:	Lab 1	RBW:	Refer to plots		
Detector Type:	Rms	VBW:	Refer to plots		
Measurement		Distance: NA m			
Test Equipment Used					
Antenna:	Directional Coupler:				
Pre-Amp:	Cable #1: #N/A				
Filter:	Cable #2:				
Receiver:	1036	Cable #3:			
Attenuator #1	1064	Cable #4:			
Attenuator #2:	Mixer:				
Additional equipment used:					
Measurement Uncertainty: +/-1.7 dB					
<p>Ref Lvl 20 dBm</p> <p>Marker 1 [T1] -10.69 dBm</p> <p>1.96000000 GHz</p> <p>RBW 50 kHz</p> <p>VBW 500 kHz</p> <p>SWT 2 s</p> <p>RF Att Unit</p> <p>20 dBm</p> <p>26.2 dB Offset</p> <p>1VIEW</p> <p>1RM</p> <p>CH PWR -18.75 dB</p> <p>REF PWR 26.20 dBm</p> <p>CH BW 4.09600000 MHz</p> <p>-10.69 dBm 1.96000000 GHz</p> <p>-10</p> <p>-20</p> <p>-30</p> <p>-40</p> <p>-50</p> <p>-60</p> <p>-70</p> <p>-80</p> <p>Center 1.96 GHz 819.2 kHz Span 8.192 MHz</p> <p>Date: 28.JUN.2004 13:23:01</p>					
<p>Notes:</p> <hr/> <hr/> <hr/>					

Nemko Dallas, Inc.
FCC ID: L7KWTRC-01
EQUIPMENT: Supreme Indoor

FCC PART 24, SUBPART E
BROADBAND PCS BASE STATION TRANSMITTER
Test Report No.: 4L0356RUS1

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 6/28/2004

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1064-1042

Measurement +/- 1.6 dB
Uncertainty:

Temperature: 22 °C

Relative Humidity: 55 %

Test Data – Occupied Bandwidth



Nemko Dallas, Inc.

Dallas Headquarters:
 802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667

Data Plot		Occupied Bandwidth			
Page 1 of 1				Complete _____	
Job No.:	4L0356R	Date:	6/28/2004	Preliminary:	_____
Specification:	PT24	Temperature(°C):	22		
Tested By:	David Light	Relative Humidity(%):	55		
E.U.T.:	W-CDMA TRANSMITTER				
Configuration:	TX FULL POWER IN BAND CENTER				
Sample Number:	1				
Location:	Lab 1	RBW:	Refer to plots		
Detector Type:	Peak	VBW:	Refer to plots	Measurement	
				Distance: NA m	
Test Equipment Used					
Antenna:	Directional Coupler:				
Pre-Amp:	Cable #1: #N/A				
Filter:	Cable #2: _____				
Receiver:	Cable #3: _____				
Attenuator #1	Cable #4: _____				
Attenuator #2:	Mixer: _____				
Additional equipment used: _____					
Measurement Uncertainty: +/-1.7 dB					
Date:	28.JUN.2004 13:15:05				
Notes:	20 dB Bandwidth				

Nemko Dallas, Inc.
FCC ID: L7KWTRC-01
EQUIPMENT: Supreme Indoor

FCC PART 24, SUBPART E
BROADBAND PCS BASE STATION TRANSMITTER
Test Report No.: 4L0356RUS1

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 6/28/2004

Test Results: Complies.

Test Data: Refer to attached plots

Equipment Used: 1036-1064-1042

Measurement +/- 1.6 dB
Uncertainty:

Temperature: 22 °C

Relative Humidity: 55 %

Test Data – Spurious Emissions



Nemko Dallas, Inc.

Dallas Headquarters:
 802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667

Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 3		Complete <input checked="" type="checkbox"/> X Preliminary: _____	
Job No.:	4L0356R	Date:	6/28/2004
Specification:	PT24	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%):	55
E.U.T.:	W-CDMA TRANSMITTER		
Configuration:	TX FULL POWER		
Sample Number:	1		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Rms	VBW:	Refer to plots
Measurement		Distance: NA m	
Test Equipment Used			
Antenna:	Directional Coupler:		
Pre-Amp:	Cable #1: #N/A		
Filter:	Cable #2: _____		
Receiver:	Cable #3: _____		
Attenuator #1	Cable #4: _____		
Attenuator #2:	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
Ref Lvl 1 20 dBm Marker 1 LTIJ -2.91 dBm 1.93250000 GHz RBW 50 kHz VBW 50 kHz SWT 8.5 ms RF Att Unit 20 dBm			
26.2 dB Offset LIMIT CHECK : PASSED [T1] -2.91 dBm 1.93250000 GHz			
1 MA			
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80			
Center 1.93 GHz 819.2 kHz Span 8.192 MHz			
Date: 28.JUN.2004 13:06:25			
Notes: LOWER BANDEDGE 1932.5 MHz Tx			

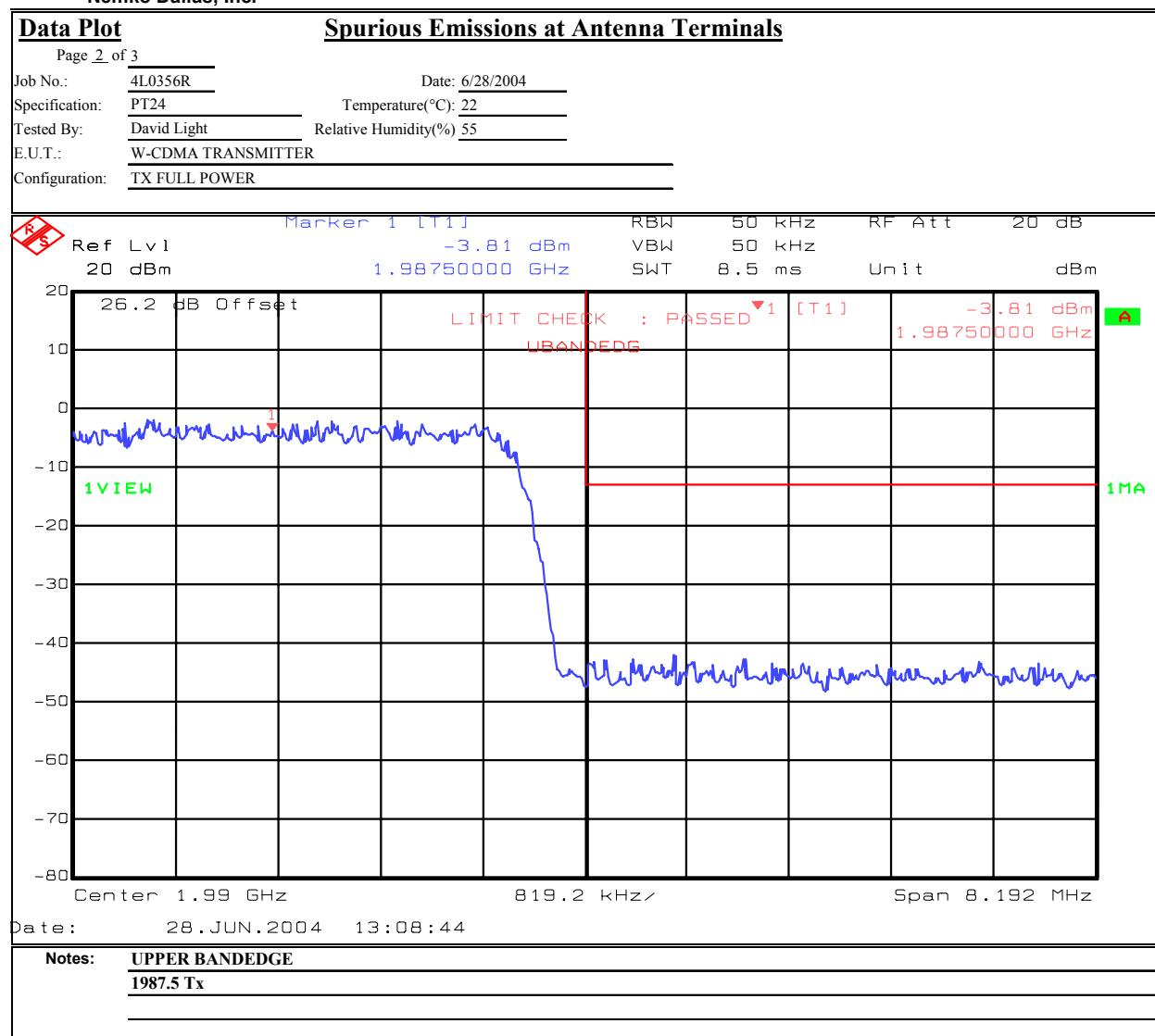
Test Data – Spurious Emissions



Nemko Dallas, Inc.

Dallas Headquarters:
 802 N. Kealy

Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667

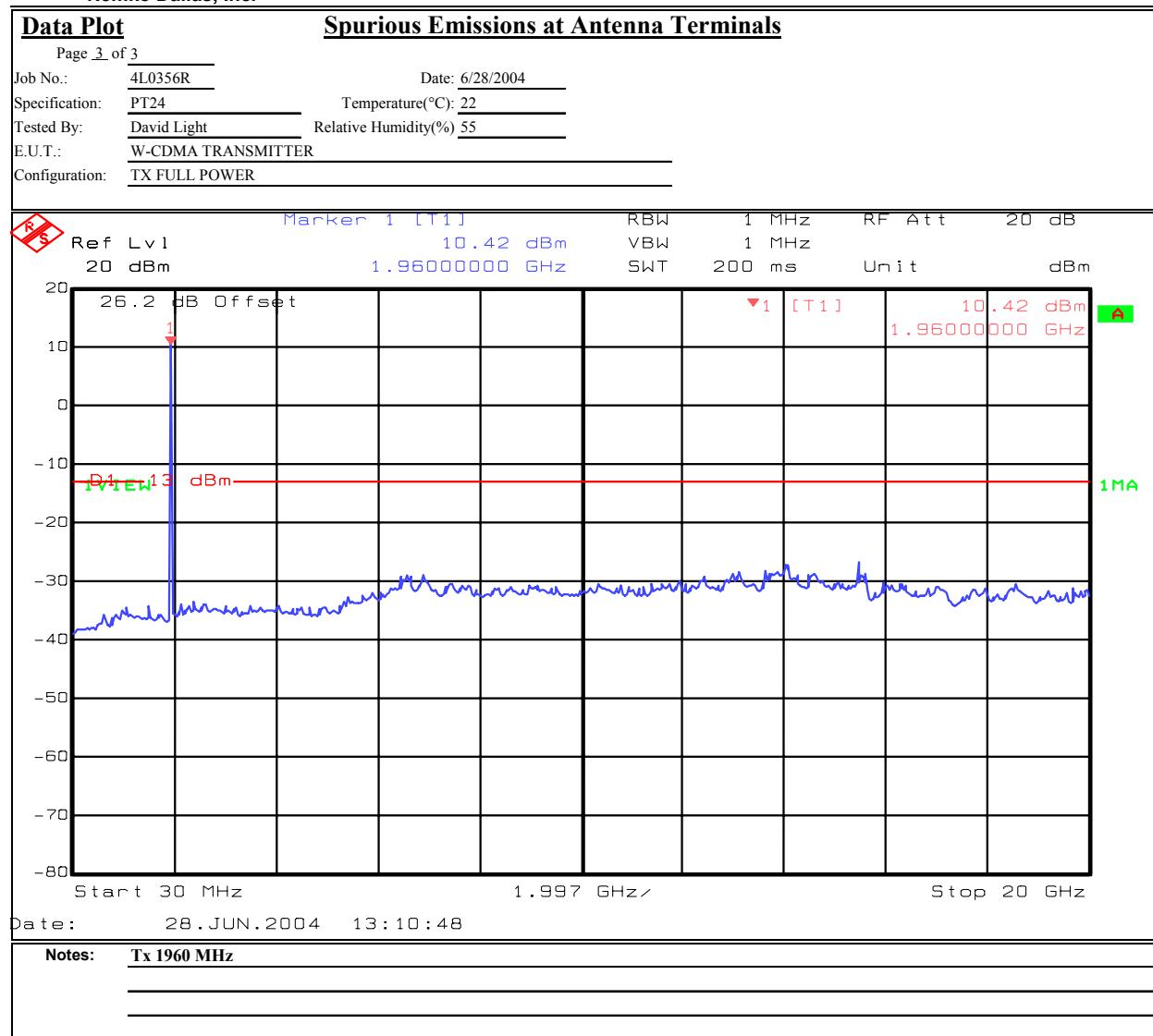


Test Data – Spurious Emissions



Nemko Dallas, Inc.

Dallas Headquarters:
 802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667



A detailed investigation of the spectrum was made. The plot provided is representative of the test results as no spurious emissions were detected.

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 6/30/04

Test Results: Complies.

Test Data: See attached table.

Equipment Used: 1016, 1033, 1067, 1464

Measurement +/- 1.6 dB
Uncertainty:

Temperature: 22 °C

Relative Humidity: 40 %

NOTE: For field strength of spurious emissions testing the transceiver was tested with rf power amplifier (FCC ID: E675JS0066) installed in the rf output path. The rf power amplifier was not used during any other FCC Part 24 tests presented in this report.

The spectrum was searched from 30 MHz to the 10th harmonic of the carrier.

Test Data - Radiated Emissions



Nemko Dallas, Inc.

Dallas Headquarters:
 802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667

EIRP Substitution Method										
Page <u>1</u> of 1		Date: 6/30/04		Complete <input checked="" type="checkbox"/> <input type="checkbox"/>						
Job No.:	4L0356	Specification:	PT24	Temperature(°C):	22	Preliminary				
Tested By:	David Light	Relative Humidity(%)	40							
E.U.T.:	WCDMA TRANSMITTER									
Configuration:	TX FULL POWER MID BAND									
Sample No.:	1		RBW:	1 MHz		Measurement				
Location:	AC 1		VBW:	1 MHz		Distance:	3 m			
Test Equipment Used										
Antenna:	1033		Directional Coupler:							
Pre-Amp:	1016		Cable #1:	1067						
Filter:			Cable #2:							
Receiver:	1464		Cable #3:							
Attenuator #1:			Cable #4:							
Attenuator #2:			Mixer:							
Additional equipment used:										
Measurement Uncertainty: +/-1.7 dB										
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)		EIRP (dBm)	EIRP (mW)	Polarity	Comments
5880	-61.8	39.7		31.9	10.4		-43.6	0.0000	V	
7840	-53.8	43.3		32.9	11.2		-32.2	0.0006	V	
5880	-57.0	40.5		31.9	10.4		-38.0	0.0002	H	
7840	-52.8	44.1		32.9	11.2		-30.4	0.0009	H	
Notes: Searched spectrum to the 10th harmonic of carrier										

Nemko Dallas, Inc.
FCC ID: L7KWTRC-01
EQUIPMENT: Supreme Indoor

FCC PART 24, SUBPART E
BROADBAND PCS BASE STATION TRANSMITTER
Test Report No.: 4L0356RUS1

Photographs of Test Setup



Nemko Dallas, Inc.
FCC ID: L7KWTRC-01
EQUIPMENT: Supreme Indoor

FCC PART 24, SUBPART E
BROADBAND PCS BASE STATION TRANSMITTER
Test Report No.: 4L0356RUS1

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: John Fish	DATE: 7/2/04

Test Results: Complies

Measurement Data: Standard Test Frequency: 1960 MHz
Standard Test Voltage: 48 Vdc

Test Data – Frequency Stability



Nemko Dallas, Inc.

Dallas Headquarters:
 802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667

Frequency Stability							
Page 1 of 1							
Job No.:	4L0356R	Date: 7/2/2004					
Specification:	CFR 47, Part 24						
Tested By:	John Fish						
E.U.T.:							
Configuration:	Ularosite WCDMA Base Station Transceiver Unit with FCC ID: L7KWTRC-01						
Serial Number:	3J041801083						
Test Equipment Used							
Antenna:		Directional Coupler: _____					
Pre-Amp:		Cable #1: _____					
Filter:		Cable #2: _____					
Receiver:		Test Analyzer: R&S FSIQ03					
Attenuator #1							
Attenuator #2:							
Measurement Uncertainty:	1x10 ⁻⁷ ppm	Standard Test Frequency 1960.000000 MHz					
Temp (°C)	Measured Frequency (MHz)	Rho	Test Voltage	Frequency Error (Hz)	Rated (+/-Hz)	Error (ppm)	Comment
20	1959.999986		48.0	-14.1	98	-0.007194	
20	1959.999982		55.2	-18.0	98	-0.009184	
20	1960.000017		40.8	17.3	98	0.008827	
50	1959.999988		48.0	-12.3	98	-0.006276	
40	1960.000012		48.0	12.4	98	0.006327	
30	1959.999989		48.0	-10.6	98	-0.005408	
10	1960.000010		48.0	10.4	98	0.005306	
0	1959.999982		48.0	-18.3	98	-0.009337	
-10	1959.999992		48.0	-7.9	98	-0.004031	
-20	1960.000009		48.0	8.5	98	0.004337	
-30	1959.999988		48.0	-11.9	98	-0.006071	
Notes:	Limit is the manufacturer's rated tolerance.						

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
1033	Horn antenna	EMCO 3115	8812-3035	09/22/03	09/22/05
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1042	CABLE, 4M	STORM PR90-010-144	N/A	09/02/03	09/01/04
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1067	Blue cable 4m	Storm PR90-010-144	0	07/29/03	07/28/04
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05
Cal Cert 2330/2003	Signal analyzer	Rohde & Schwarz FSIQ3	100044	02/10/04	02/10/05
1306 1311	Antenna biconical	ICC BCON 30300	212	09/09/03	09/08/04
1522 718	Cable Assy, LAB 5 - D OATS	KTL Site D OATS	N/A	03/11/04	03/11/05
1554	Amplifier, RF	RF Consultants LNA-25	0	02/04/04	02/03/05
1311	ANTENNA, LOG PERIODIC	EMCO 3146	1753	06/03/02	06/03/03
718	HP SPECTRUM ANALYZER	HEWLETT PACKARD 8591EM	3639A00980	02/11/04	02/10/05

Nemko Dallas, Inc.
FCC ID: L7KWTRC-01
EQUIPMENT: Supreme Indoor

FCC PART 24, SUBPART E
BROADBAND PCS BASE STATION TRANSMITTER
Test Report No.: 4L0356RUS1

ANNEX A - TEST DETAILS

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
--------------------------------------	--------------------------

Minimum Standard: Para. No.24.232. Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.

Method Of Measurement: CDMA Per ANSI/J-STD-014
TDMA Per ANSI/J-STD-010

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter or a spectrum analyzer.

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
---	--------------------------

Minimum Standard: Para. No. 24.238(b). 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.

Method Of Measurement:

The 26 dB occupied bandwidth of the carrier emission is measured using a spectrum analyzer with Resolution Bandwidth set to 1% of the necessary bandwidth of the transmitted carrier.

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.1051

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Method Of Measurement:

Spectrum analyzer settings:

RBW: 1 MHz

VBW: 1 MHz

Within 1 MHz of the upper and lower edges of the assigned band of operation the resolution bandwidth is lowered to 1 % of the 26 dB occupied bandwidth of the transmitted carrier.

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.1053
---	--------------------------

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Test Method: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to an isotropic. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic.

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
--	--------------------------

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method Of Measurement:

Frequency Stability With Voltage Variation

The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency error is measured. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

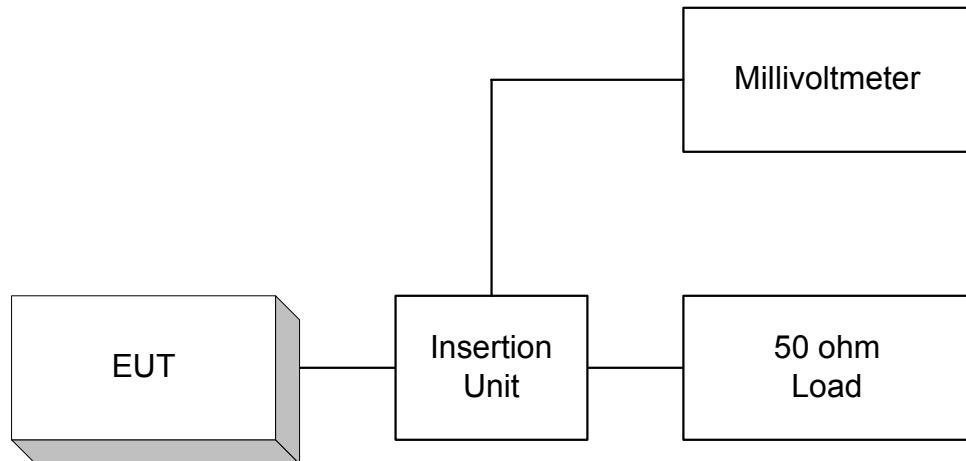
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency error is measured.

Nemko Dallas, Inc.
FCC ID: L7KWTRC-01
EQUIPMENT: Supreme Indoor

FCC PART 24, SUBPART E
BROADBAND PCS BASE STATION TRANSMITTER
Test Report No.: 4L0356RUS1

ANNEX B - TEST DIAGRAMS

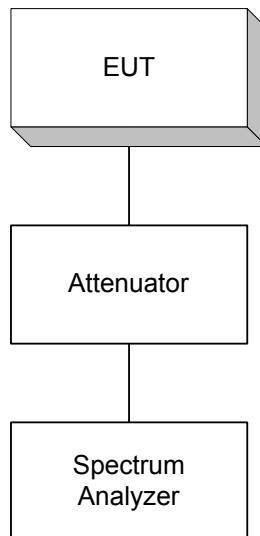
Para. No. 2.985 - R.F. Power Output



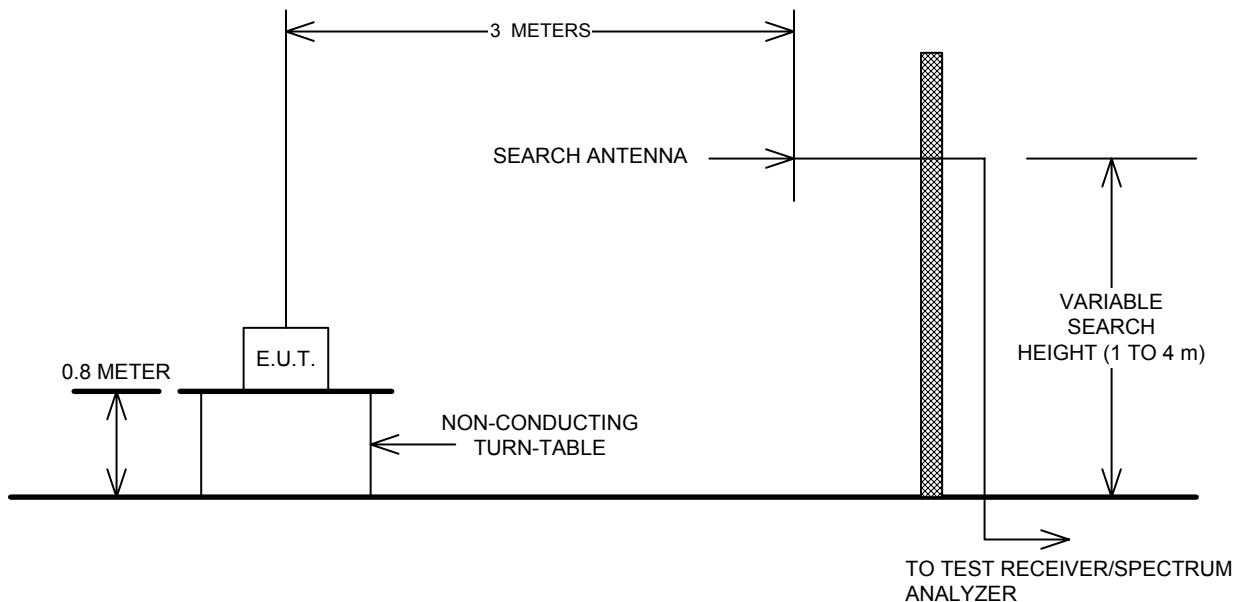
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

