

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

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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.

- | | | | |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission | <input checked="" type="checkbox"/> | Production Unit |
| <input type="checkbox"/> | Class II Permissive Change | <input type="checkbox"/> | 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

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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

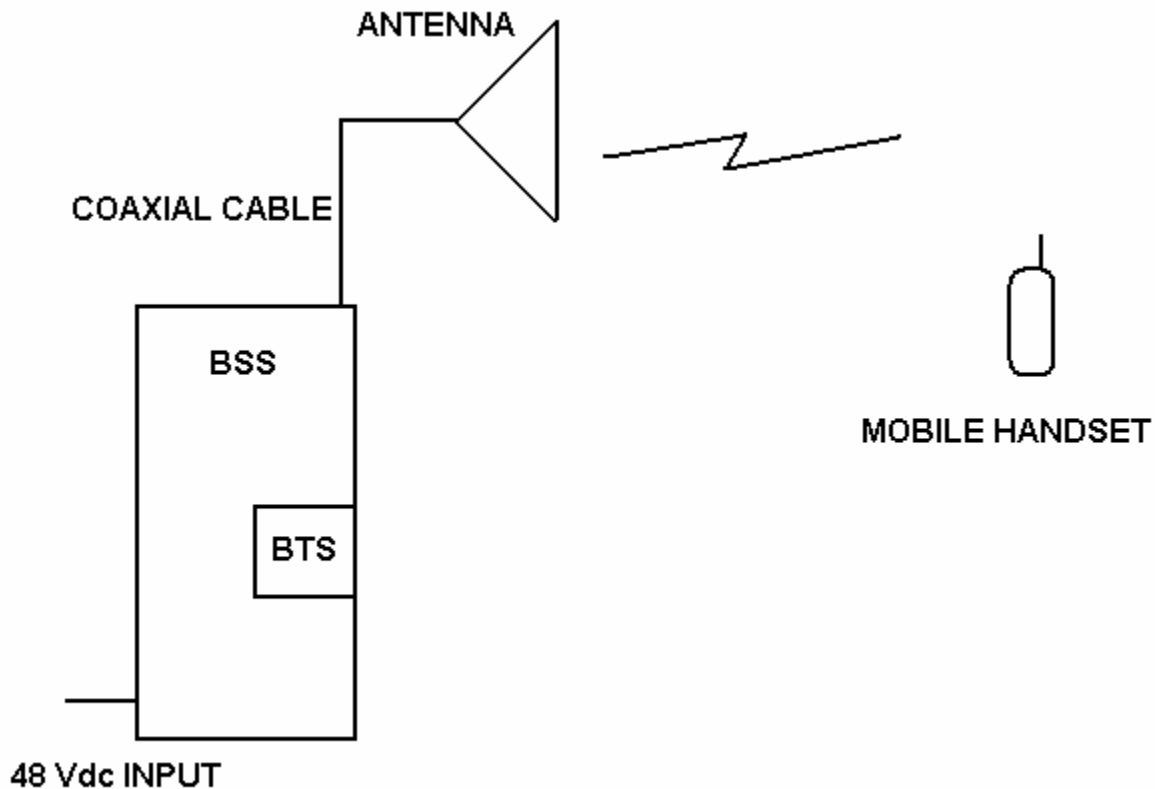
Supply Voltage Input:	48 Vdc		
Frequency Bands: TX	<input checked="" type="checkbox"/>	Block A :	1930 – 1945 MHz
	<input checked="" type="checkbox"/>	Block D :	1945 – 1950 MHz
	<input checked="" type="checkbox"/>	Block B :	1950 – 1965 MHz
	<input checked="" type="checkbox"/>	Block E :	1965 – 1970 MHz
	<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)	GSM (200KG7W)	NADC (40K0DXW)
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maximum No. of Carriers:	1		
Output Impedance:	50 ohms		
RF Output:	Per channel: 416.9 mW		
Band Selection:	Software	Duplexer	Fullband
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<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 DPCHs at 30 kbps (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 %

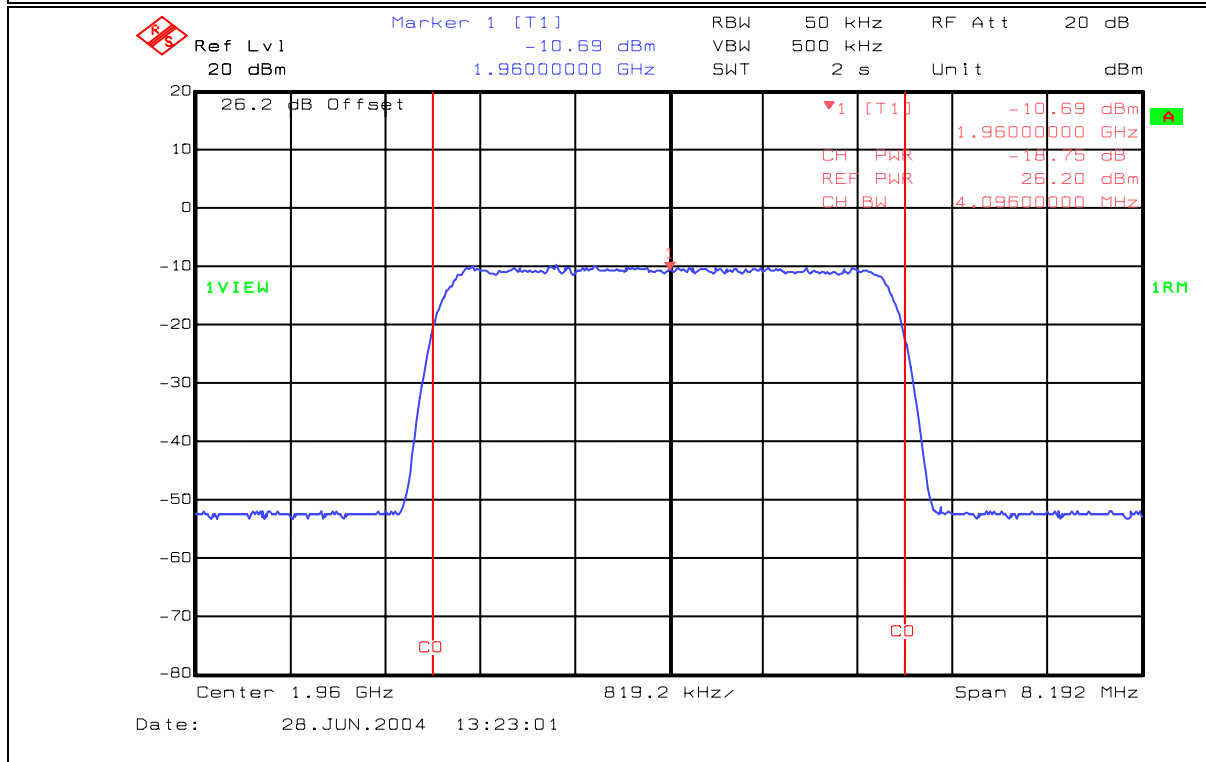
Test Data – RF Power Output



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Data Plot		RF POWER OUTPUT		Complete
Page 1 of 1				<u> X </u>
Job No.:	4L0356R	Date:	6/28/2003	Preliminary: <u> </u>
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	Measurement
Detector Type:	Rms	VBW:	Refer to plots	Distance: <u> NA </u> 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			



Notes:

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 Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 55 %

Test Data – Occupied Bandwidth



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Data Plot		Occupied Bandwidth		Complete _____															
Page 1 of 1				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 IN BAND CENTER																			
Sample Number: 1																			
Location: Lab 1	RBW: Refer to plots			Measurement															
Detector Type: Peak	VBW: Refer to plots			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																			
<table border="1"> <thead> <tr> <th>Ref</th> <th>Lvl</th> <th>RBW</th> <th>VBW</th> <th>SWT</th> <th>RF Att</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>dBm</td> <td>50 kHz</td> <td>50 kHz</td> <td>10 ms</td> <td>20 dB</td> <td>dBm</td> </tr> </tbody> </table>						Ref	Lvl	RBW	VBW	SWT	RF Att	Unit	20	dBm	50 kHz	50 kHz	10 ms	20 dB	dBm
Ref	Lvl	RBW	VBW	SWT	RF Att	Unit													
20	dBm	50 kHz	50 kHz	10 ms	20 dB	dBm													
Date: 28.JUN.2004 13:15:05																			
Notes: 20 dB Bandwidth																			

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
Uncertainty:** +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 55 %

Test Data – Spurious Emissions



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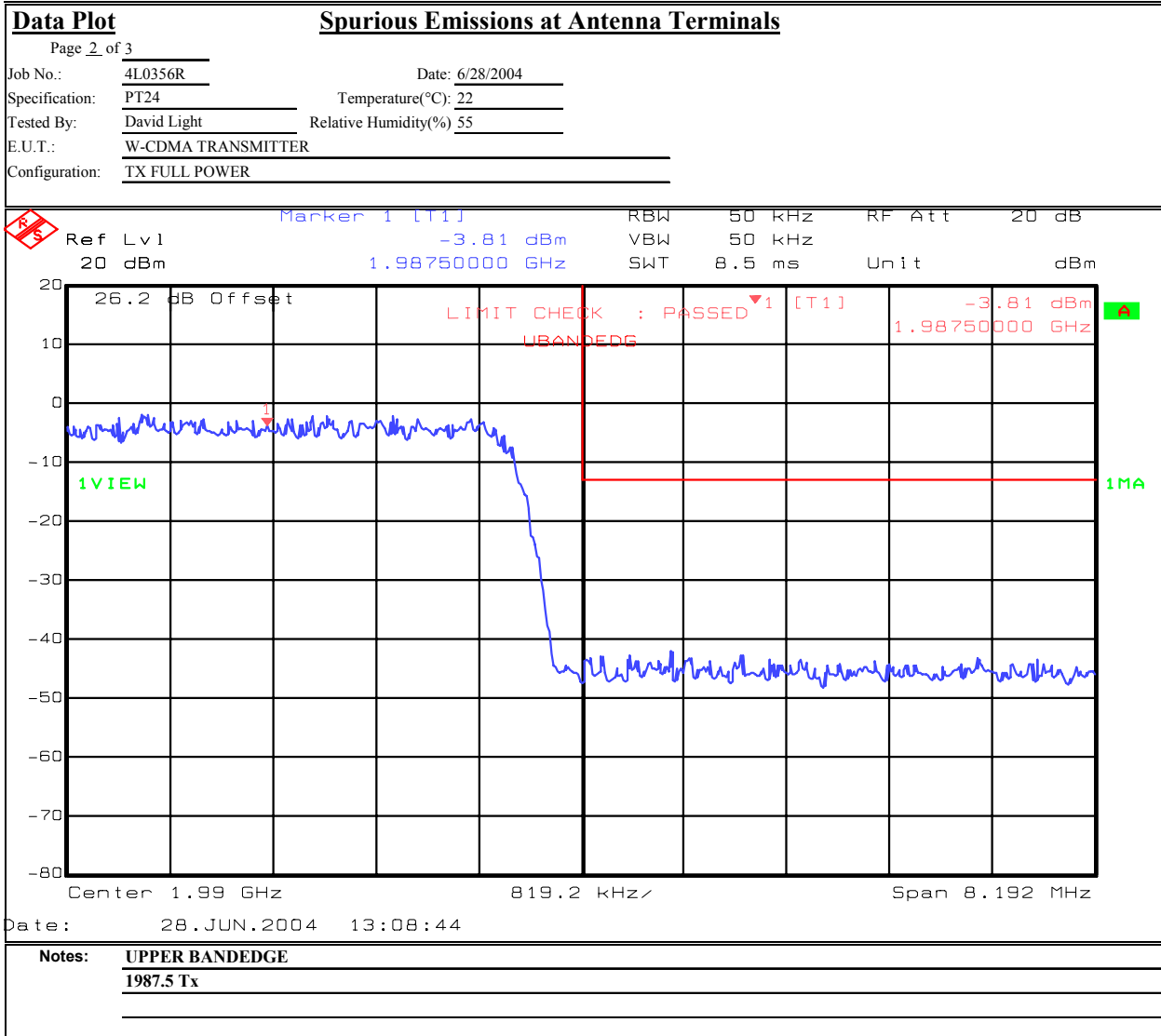
Data Plot		Spurious Emissions at Antenna Terminals	
Page <u>1</u> of <u>3</u>		Complete <u>X</u>	
Job No.: 4L0356R	Date: <u>6/28/2004</u>	Preliminary: _____	
Specification: PT24	Temperature(°C): <u>22</u>		
Tested By: <u>David Light</u>	Relative Humidity(%): <u>55</u>		
E.U.T.: <u>W-CDMA TRANSMITTER</u>			
Configuration: <u>TX FULL POWER</u>			
Sample Number: <u>1</u>			
Location: <u>Lab 1</u>	RBW: <u>Refer to plots</u>	Measurement	
Detector Type: <u>Rms</u>	VBW: <u>Refer to plots</u>	Distance: <u>NA</u> m	
Test Equipment Used			
Antenna: _____	Directional Coupler: _____		
Pre-Amp: _____	Cable #1: <u>#N/A</u>		
Filter: _____	Cable #2: _____		
Receiver: <u>1036</u>	Cable #3: _____		
Attenuator #1: <u>1064</u>	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: <u>+/-1.7 dB</u>			
Ref Lvl 20 dBm Marker 1 [T1] RBW 50 kHz RF Att 20 dB 20 dBm 1.93250000 GHz VBW 50 kHz Unit dBm 26.2 dB Offset -2.91 dBm 1.93250000 GHz -2.91 dBm LIMIT CHECK : PASSED [T1] 1MA			
Center 1.93 GHz 819.2 kHz/ Span 8.192 MHz			
Date: 28.JUN.2004 13:06:25			
Notes: <u>LOWER BANDEDGE</u> <u>1932.5 MHz Tx</u>			

Test Data – Spurious Emissions



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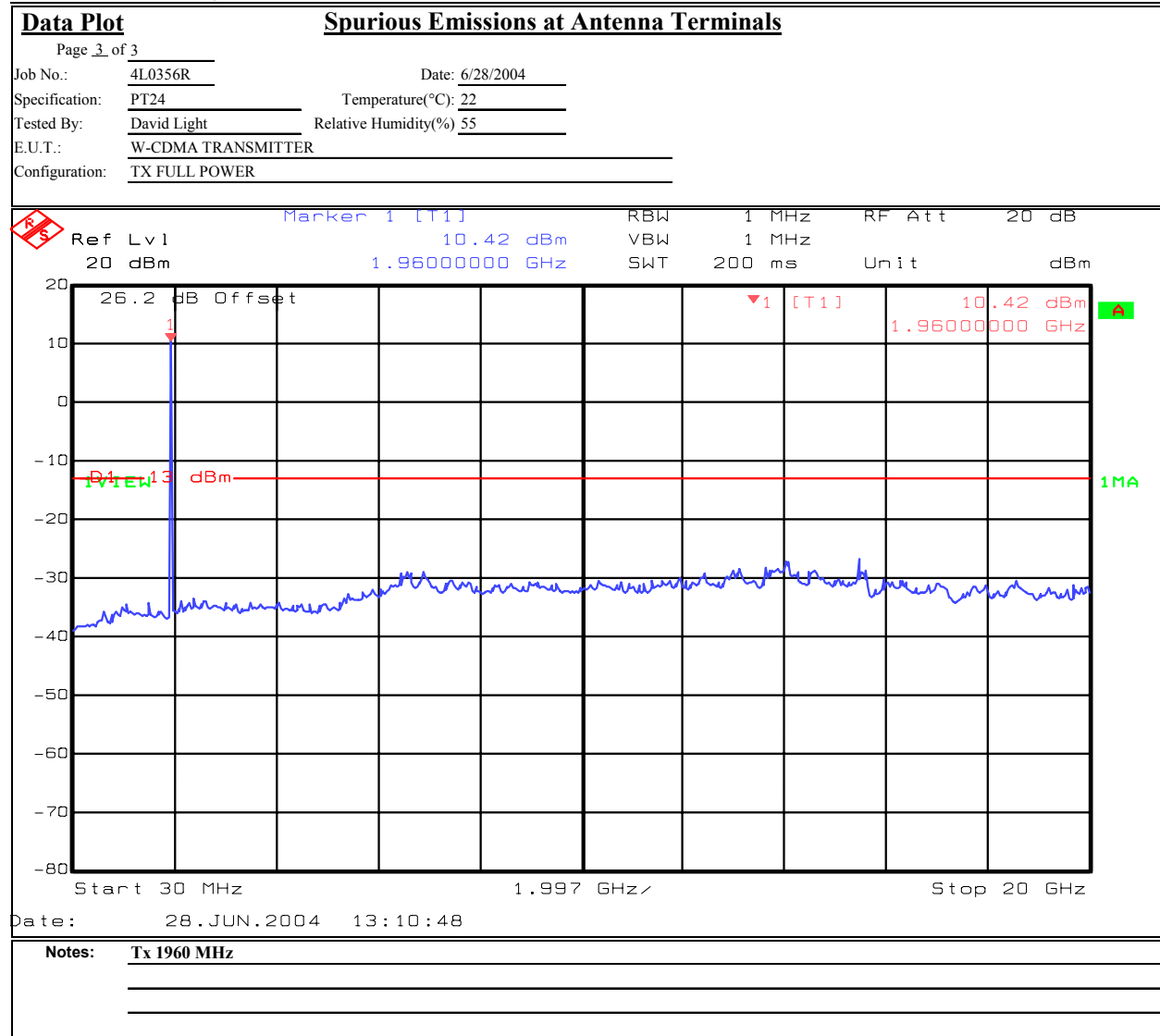
Test Data – Spurious Emissions



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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 Uncertainty: +/- 1.6 dB

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



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<u>EIRP Substitution Method</u>										
Page <u>1</u> of <u>1</u>								Complete <u> x </u>		
Job No.:	<u>4L0356</u>	Date:	<u>6/30/04</u>			Preliminary	<u> </u>			
Specification:	<u>PT24</u>	Temperature(°C):	<u>22</u>							
Tested By:	<u>David Light</u>	Relative Humidity(%)	<u>40</u>							
E.U.T.:	<u>WCDMA TRANSMITTER</u>									
Configuration:	<u>TX FULL POWER MID BAND</u>									
Sample No:	<u>1</u>									
Location:	<u>AC 1</u>	RBW:	<u>1 MHz</u>			Measurement				
Detector Type:	<u>Peak</u>	VBW:	<u>1 MHz</u>			Distance:	<u>3 m</u>			
Test Equipment Used										
Antenna:	<u>1033</u>	Directional Coupler:	<u> </u>							
Pre-Amp:	<u>1016</u>	Cable #1:	<u>1067</u>							
Filter:	<u> </u>	Cable #2:	<u> </u>							
Receiver:	<u>1464</u>	Cable #3:	<u> </u>							
Attenuator #1	<u> </u>	Cable #4:	<u> </u>							
Attenuator #2:	<u> </u>	Mixer:	<u> </u>							
Additional equipment used:	<u> </u>									
Measurement Uncertainty:	<u>+/-1.7 dB</u>									
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										

Photographs of Test Setup



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



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<u>Frequency Stability</u>	
Page <u>1</u> of <u>1</u>	Date: 7/2/2004
Job No.: 4L0356R	Specification: CFR 47, Part 24
Tested By: <u>John Fish</u>	E.U.T.: _____
Configuration: <u>Ultrasite WCDMA Base Station Transceiver Unit with FCC ID: L7KWTRC-01</u>	Serial Number: <u>3J041801083</u>
<u>Test Equipment Used</u>	
Antenna: _____	Directional Coupler: _____
Pre-Amp: _____	Cable #1: _____
Filter: _____	Cable #2: _____
Receiver: _____	Test Analyzer: <u>R&S FSIQ03</u>
Attenuator #1: _____	
Attenuator #2: _____	
Measurement Uncertainty: <u>1x10⁻⁷ ppm</u>	Standard Test Frequency <u>1960.000000</u> 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

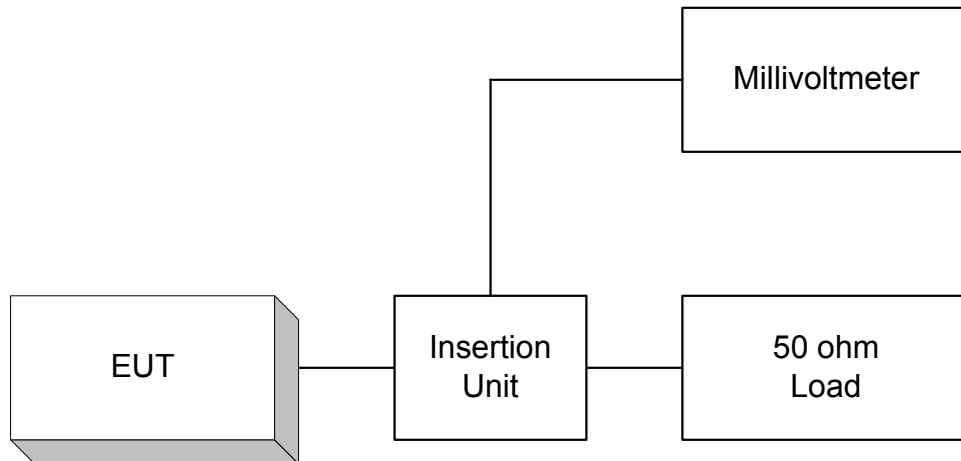
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency error is measure. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

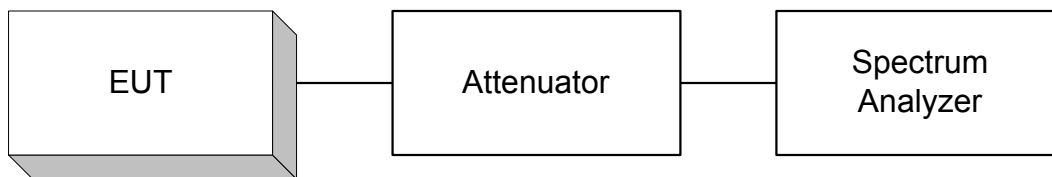
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency error is measured.

ANNEX B - TEST DIAGRAMS

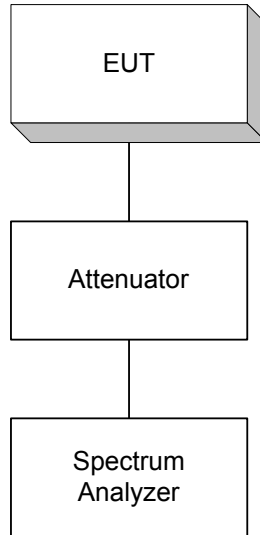
Para. No. 2.985 - R.F. Power Output



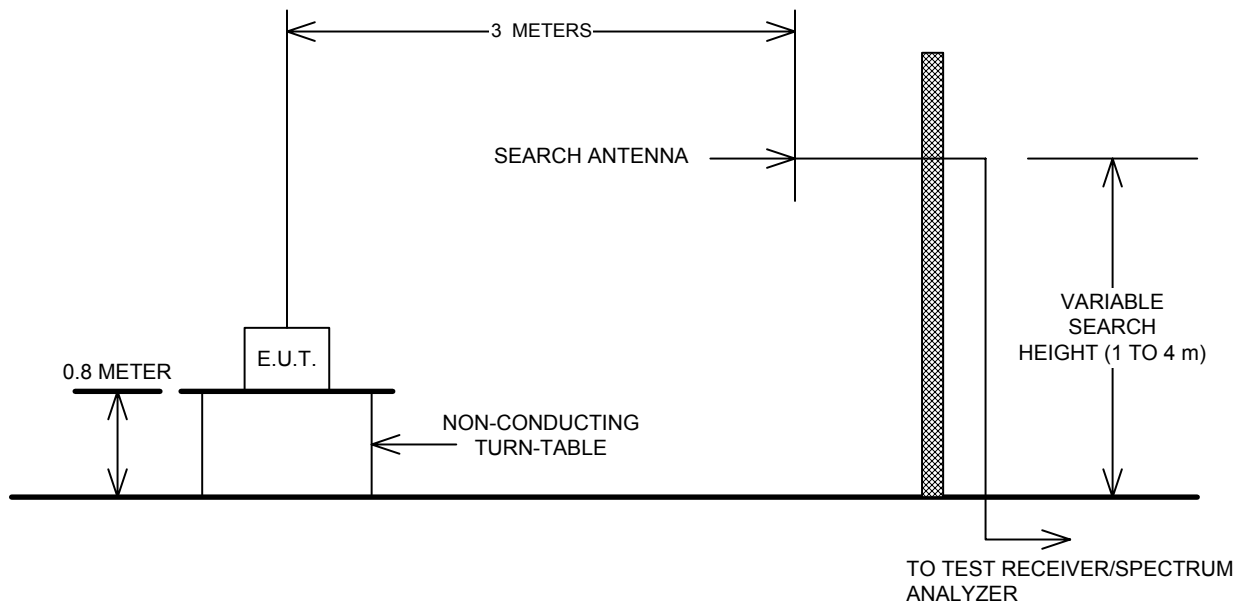
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

