

Nemko Test Report: 4L0194RUS4REV1

Applicant: Enfora, Inc.
661 E. 18th Street
Plano, TX 75074

**Equipment Under Test:
(E.U.T.)** GSM0110

In Accordance With: **FCC Part 24, Subpart E**
Broadband PCS Subscriber Station

Tested By: Nemko USA Inc.
802 N. Kealy
Lewisville, TX
75057-3136

Authorized By: 
Dustin Oaks, Engineer

Date: 4/08/2005

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EQUIPMENT: GSM0110

Section 1. Summary of Test Results

Manufacturer: Enfora, Inc.

Model No.: GSM0110

Serial No.: None

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
See " Summary of Test Data".

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This report applies only to the items tested.

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	24.232	Complies
Occupied Bandwidth (GSM)	24.238	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	*Complies
Field Strength of Spurious Emissions	24.238(a)	*Complies
Frequency Stability	24.235	Complies

Footnotes:

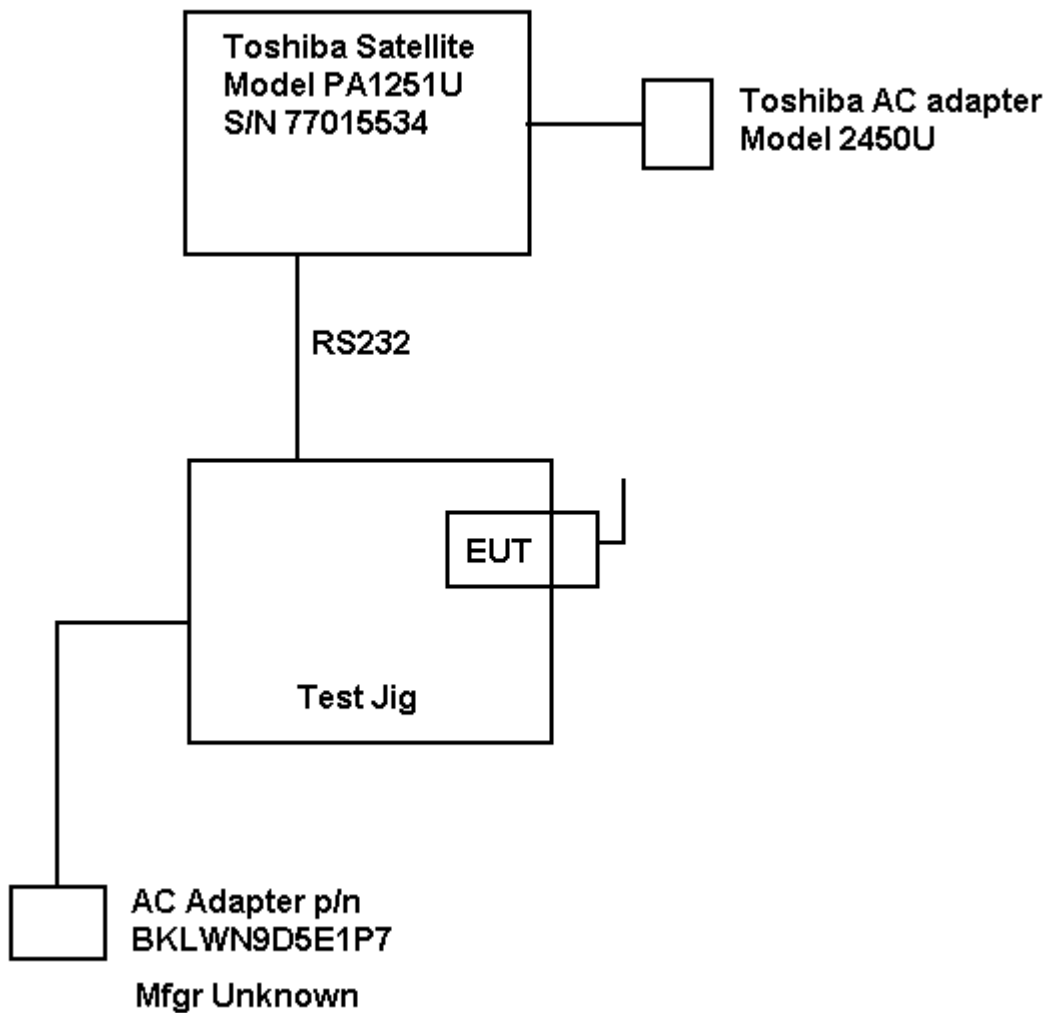
The conducted data presented in this test report was originally taken in April 2004. Radiated measurements were repeated as the only change was antenna redesign.

Section 2. General Equipment Specification

Supply Voltage Input:	3.6 Vdc
Frequency Bands:	☒ Block A: 1850 – 1865 MHz ☒ Block B: 1865 – 1870 MHz ☒ Block C: 1870 – 1885 MHz ☒ Block D: 1885 – 1890 MHz ☒ Block E: 1890 – 1895 MHz ☒ Block F: 1895 – 1910 MHz
Type of Modulation and Designator:	300KG7W
Necessary Bandwidth:	300 kHz
Output Impedance:	50 ohms
RF Output (Rated):	2 W (e.i.r.p.)

System Description

This device is a wireless PCMCIA GSM/GPRS wireless modem that operates in the PCS band and in the 800 MHz Cellular band.

System Diagram

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 3/11/05

Test Results: Complies.

Measurement Data:

Antenna Conducted:

Modulation Type	Power Level	Output Power (dBm)	Output Power (W)
GSM	PL0	28	0.63

Unit has no provisions for conducted measurements, values based on manufacturers settings. PL0 is the setting to produce the maximum output power.

Test Data – EIRP (Radiated)



Nemko Dallas, Inc.

Dallas Headquarters:

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

EIRP Substitution MethodPage 1 of 2

Job No.: 4L0194 Date: 3/11/05 Complete X
Preliminary _____
Specification: PT 24 Temperature(°C): 24
Tested By: David Light Relative Humidity(%) 35
E.U.T.: Orion
Configuration: Tx full power at 1880.2 MHz
Sample No: 1
Location: AC 3 RBW: 300 kHz Measurement
Detector Type: Peak VBW: 300 kHz Distance: 3 m

Test Equipment Used

Antenna: 1304 Directional Coupler: _____
Pre-Amp: 1016 Cable #1: 1484
Filter: 1482 Cable #2: 1485
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
1880.2	-11.7	31.0		0	9.4		28.7	741.3	V	
1880.2	-11.8	33.0		0	9.4		30.6	1148.2	H	
1909.8	-12.3	31.0		0	9.4		28.1	645.7	V	
1909.8	-13.0	33.0		0	9.4		29.4	871.0	H	
1880.2	-14.0	31.0		0	9.4		26.4	436.5	V	
1880.2	-11.0	33.0		0	9.4		31.4	1380.4	H	

Notes: _____

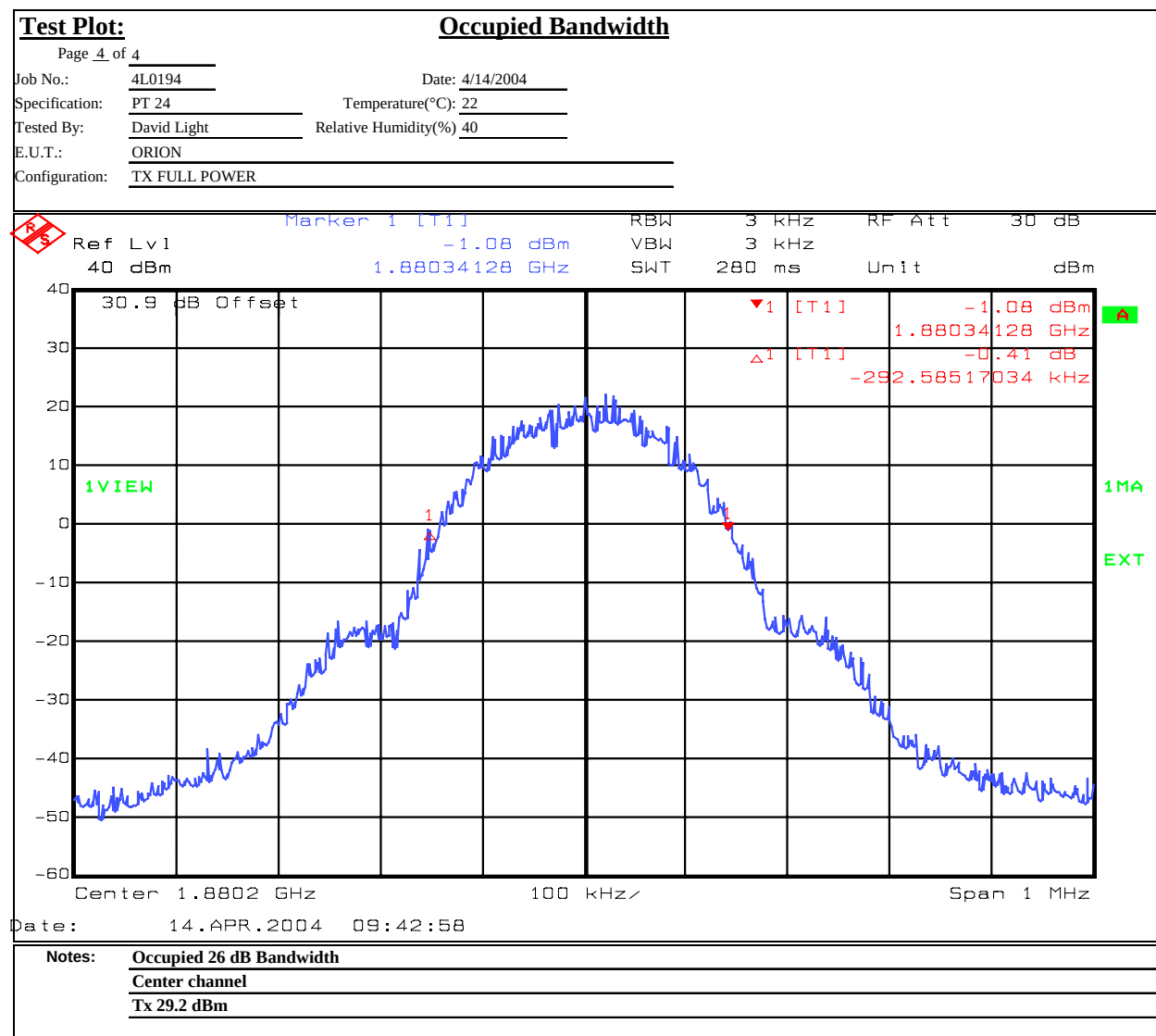
Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (GSM)

PARA. NO.: 2.1047

TESTED BY: David Light

DATE: 4/14/04

Test Results: Complies.**Test Data:** See attached plots.

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 4/14/04

Test Results: Complies.

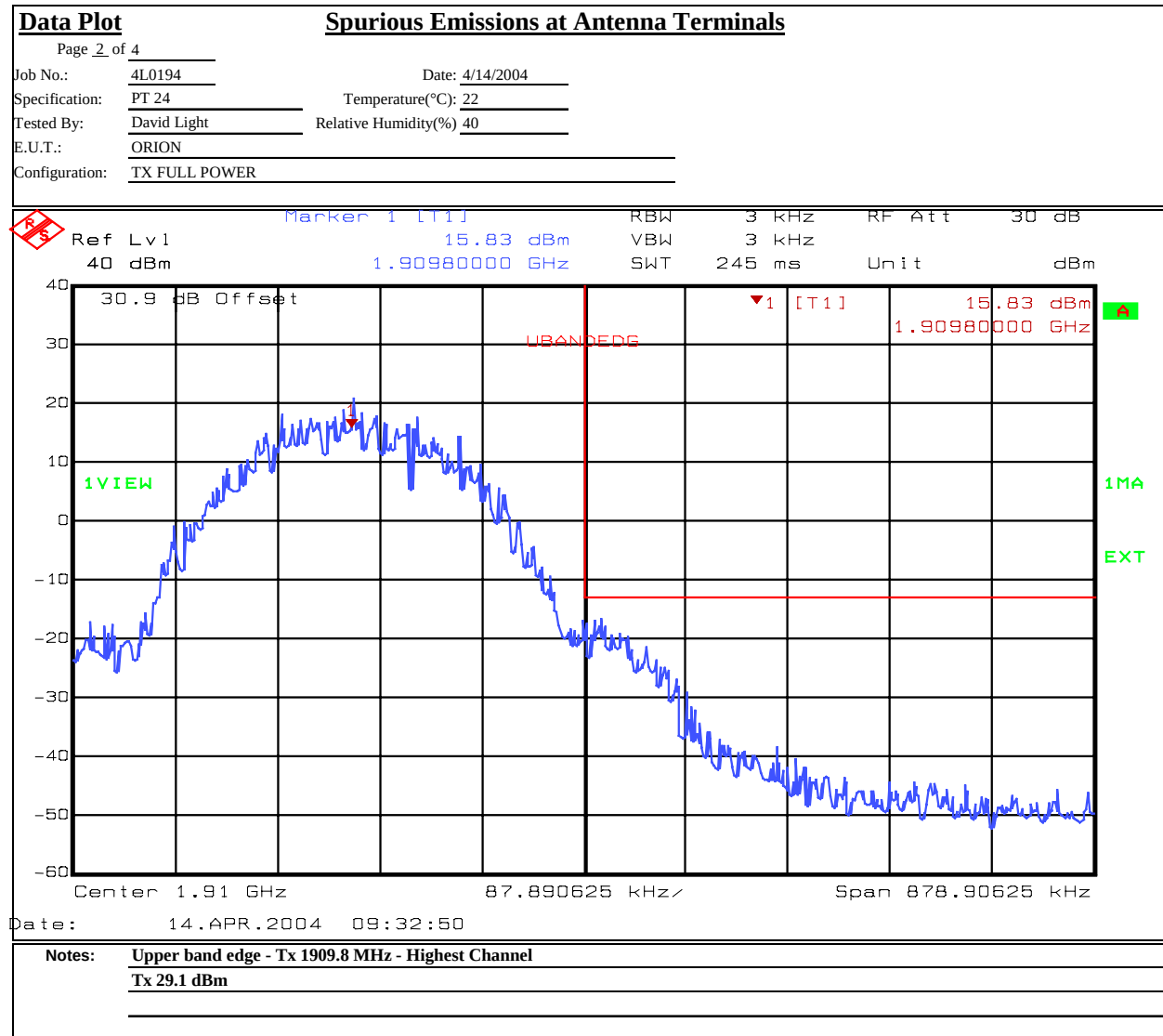
Test Data:

NAME OF TEST	WORST-CASE SPURIOUS LEVEL(dBm)
0 to 20 GHz Spurious	-23
Lower Band Edge	-18
Upper Band Edge	-18

Test Data – Spurious Emissions at Antenna Terminals

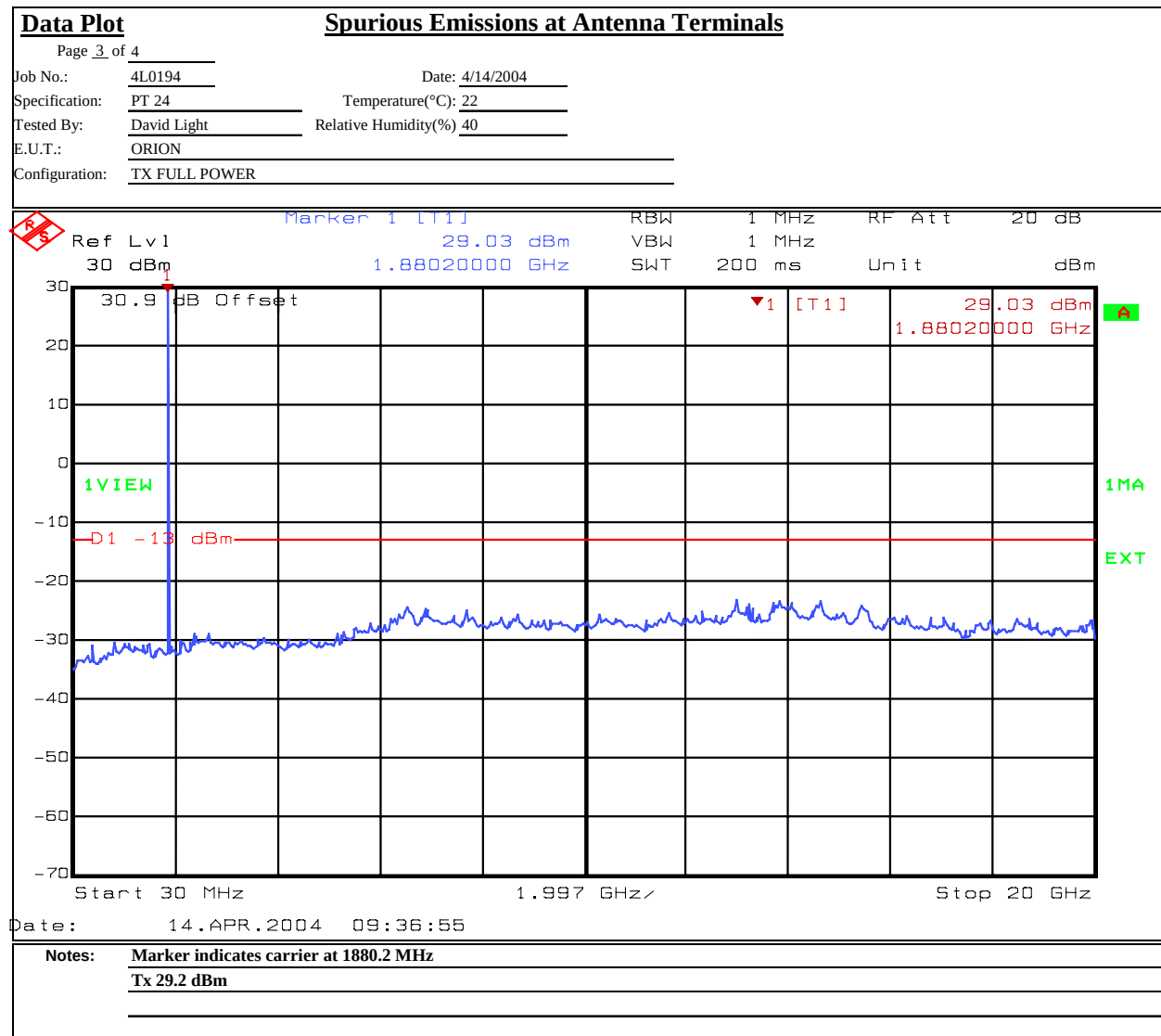
Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 4		Complete <u>X</u>	
Job No.: 4L0194	Date: 4/14/2004	Preliminary: _____	
Specification: PT 24	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
E.U.T.: ORION			
Configuration: TX FULL POWER			
Sample Number: 1			
Location: Lab 1	RBW: Refer to plots	Measurement	
Detector Type: Peak	VBW: Refer to plots	Distance: <u>NA</u> m	
Test Equipment Used			
Antenna: _____	Directional Coupler: _____		
Pre-Amp: _____	Cable #1: 1626		
Filter: _____	Cable #2: _____		
Receiver: 1036	Cable #3: _____		
Attenuator #1: 1467	Cable #4: _____		
Attenuator #2: 1478	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
Date: 14.APR.2004 09:29:46			
Notes: Lower band edge - Tx 1850.2 MHz - Lowest channel			
Tx at 28.9 dBm			

Test Data – Spurious Emissions at Antenna Terminals



EQUIPMENT: GSM0110

Test Data – Spurious Emissions at Antenna Terminals



Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 3/11/05

Test Results: Complies.

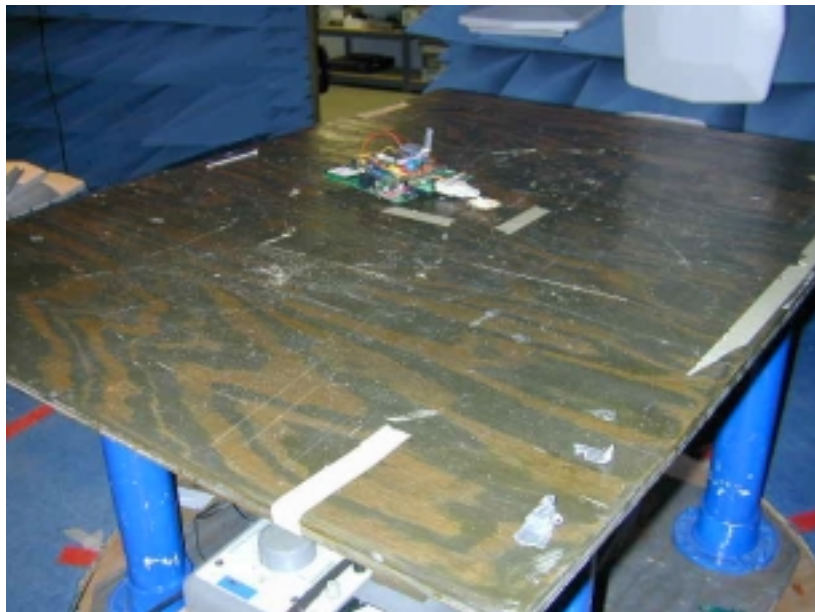
Test Data: See attached table.

Field Strength of Spurious Emissions

[illegible]

Notes: _____

Photographs of Test Setup



Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 24.235
TESTED BY: David Light	DATE: 4/15/04

Test Results: Complies.

Measurement Data: Standard Test Frequency: 1880.252740 MHz
 Standard Test Voltage: 3.6 Vdc

EQUIPMENT: GSM0110

Test Data – Frequency Stability

<u>Frequency Stability</u>							
Page <u>1</u> of <u>1</u>							
Job No.: 4L0194		Date: 4/15/2004					
Specification: PT 24		Temperature(°C): 22					
Tested By: David Light		Relative Humidity(%) 40					
E.U.T.: Orion							
Configuration: Tx at center band							
Sample Number: 1							
<u>Test Equipment Used</u>							
Antenna: #N/A		Directional Coupler:					
Pre-Amp: #N/A		Cable #1: 1626					
Filter: #N/A		Cable #2:					
Receiver: 1026							
Attenuator #1: 1478							
Attenuator #2: #N/A							
Measurement Uncertainty: 1×10^{-17} ppm							
Standard Test Frequency <u>1880.252740</u> MHz							
Temp (°C)	Measured Frequency (MHz)		Test Voltage	Frequency Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	1880.252740		3.6	0	4700.6	0.0	
20	1880.252700		3.06	-40	4700.6	0.0	
20	1880.252715		4.14	-25	4700.6	0.0	
50	1880.252090		3.6	-650	4700.6	-0.3	
40	1880.251250		3.6	-1490	4700.6	-0.8	
30	1880.252960		3.6	220	4700.6	0.1	
10	1880.248990		3.6	-3750	4700.6	-2.0	
0	1880.250300		3.6	-2440	4700.6	-1.3	
-10	1880.249873		3.6	-2867	4700.6	-1.5	
-20	1880.255500		3.6	2760	4700.6	1.5	
-30	1880.251746		3.6	-994	4700.6	-0.5	
Notes:							

Section 8. Test Equipment List

April 2004

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1467	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1478	20db Attenuator DC 18 Ghz	MCL Inc. BW-S20W6	NONE	CBU	N/A
1626	CABLE, 5 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/29/04	03/29/06
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/24/03	07/23/04
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/24/03	07/23/04
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	02/11/03	02/11/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	04/22/03	04/21/04
1026	FREQUENCY COUNTER	HEWLETT PACKARD 5350B	8232A01493	01/23/04	01/22/05

March 2005

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	08/26/04	08/26/05
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	08/02/04	08/02/05
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	11/12/04	11/12/05
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
791	PREAMP, 25dB	ICC LNA25	398	11/12/04	11/12/05
1983	CABLE	KTL Site A OATS	N/A	03/11/04	03/11/05
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	07/23/04	07/23/05
760	Antenna biconical	Electro Metrics MFC-25	477	06/22/04	06/22/05

ANNEX A - TEST METHODOLOGIES

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-008
TDMA Per ANSI/J-STD-010
PCS 1900 Per ANSI/J-STD-007

Detachable Antenna:

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

Integral Antenna:

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 a dipole. 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 a dipole.

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:CDMA Per ANSI/J-STD-008

Spectrum analyzer settings:

RBW: 30 kHz

VBW: $\geq$ RBW

Span: 5 MHz

Sweep: Auto

GSM Per ANSI/J-STD-007

RBW: 3 kHz

VBW: $\geq$ RBW

Span: 2 MHz

Sweep: Auto

NADC Per IS-136

RBW: 1 kHz

VBW: $\geq$ RBW

Span: 1 MHz

Sweep: Auto

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:

CDMA Per ANSI/J-STD-008

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 20 kHz (< 1MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM Per ANSI/J-STD-007

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: Disabled

NADC Per IS-136

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 1 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: Disabled

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

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

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: CDMA Per ANSI/J-STD-008
TDMA Per ANSI/J-STD-007
NADC Per IS-136

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 is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

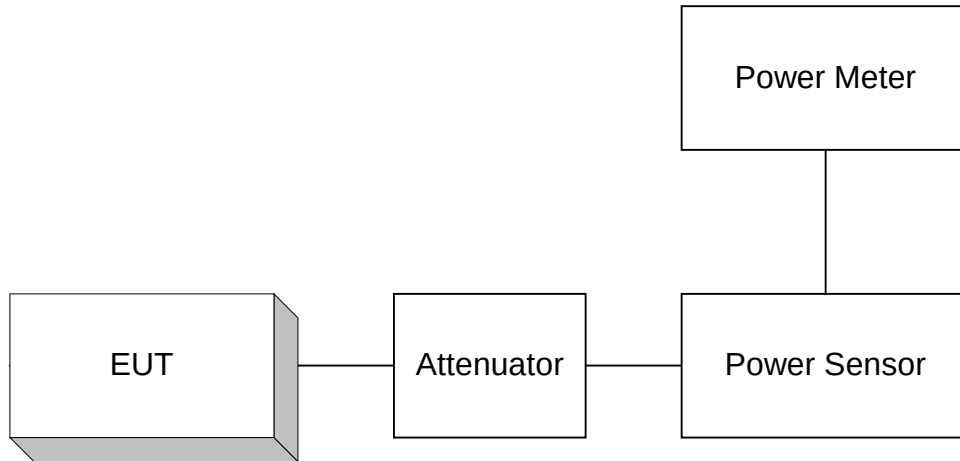
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

Digitally Modulated Signals

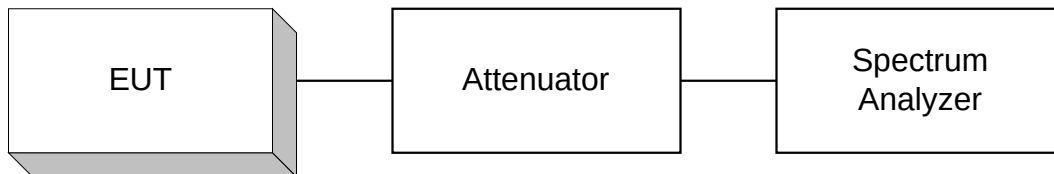
Equipment that produces a digitally modulated carrier is tested using a vector modulation analyzer. Frequency accuracy and rho are measured over the specified environmental extremes.

ANNEX B - TEST DIAGRAMS

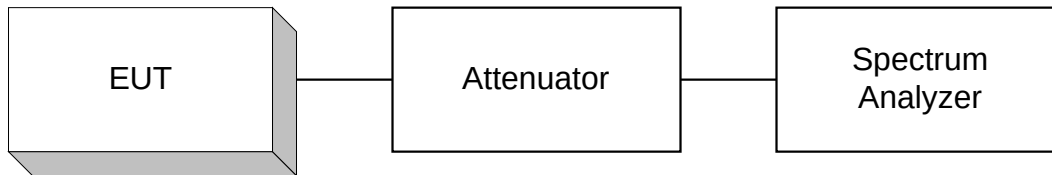
Para. No. 2.985 - R.F. Power Output



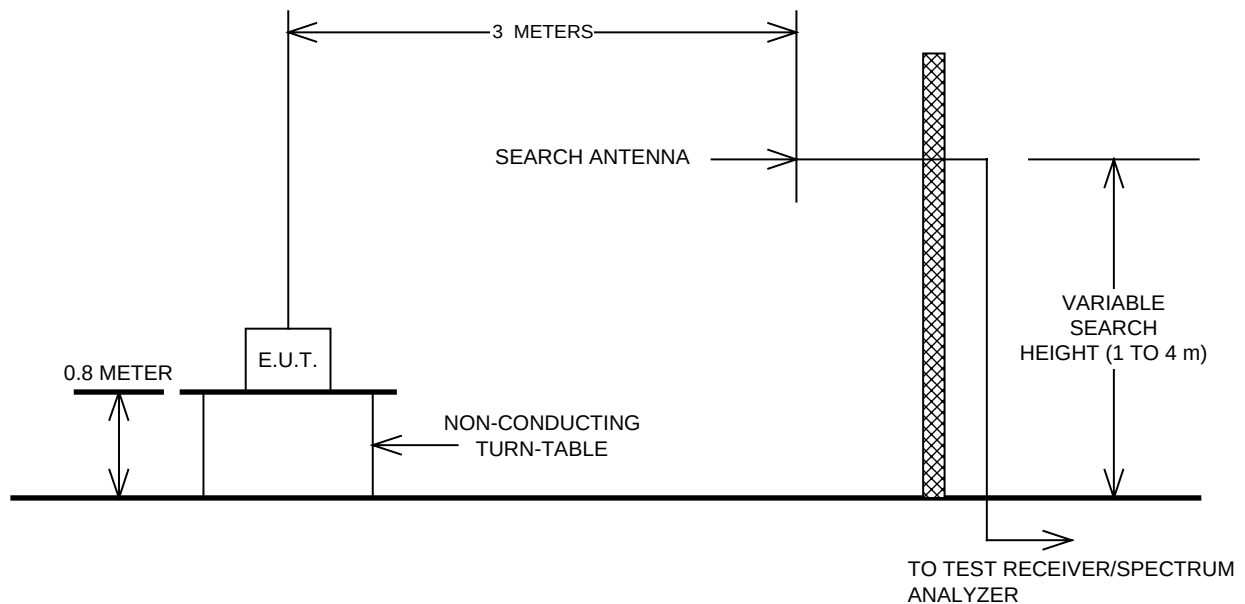
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

