

**Nemko Test Report:** 3L0024RUS2

**Applicant:** Nokia Mobile Phones, Inc.  
6021 Connection Drive  
Irving, Texas 75039

**Equipment Under Test:** Model 2260  
(E.U.T.)

**In Accordance With:** **FCC Parts 2 and 24**  
Broadband PCS Subscriber Station

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

**Authorized By:**



David Light, Lab Resource Manager

**Date:** 3/7/03

**Total Number of Pages:** 28

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EQUIPMENT: 2260

**Section 1. Summary of Test Results**

Manufacturer: Nokia

Model No.: Model 2260

Serial No.: ESN: 11007344015,  
ESN: 11007344017General: **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.

See "Summary of Test Data".

TESTED BY: Eldon BerryDATE: February 14, 2003

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This report applies only to the items tested.

EQUIPMENT: 2260

## Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	2W eirp	Complies
Occupied Bandwidth (TDMA)	24.238		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	Must remain in band	Complies

## Footnotes:

EQUIPMENT: 2260

**Section 2. General Equipment Specification**

<b>Supply Voltage Input:</b>	3.8 Vdc		
<b>Frequency Bands:</b>	1850.04 to 1909.92 MHz		
<b>Emission Designator:</b>	30K0DXW		
<b>Type of Modulation and Designator:</b>	<b>CDMA (G7W)</b> <input type="checkbox"/>	<b>GSM (GXW)</b> <input type="checkbox"/>	<b>NADC (DXW)</b> <input checked="" type="checkbox"/>
<b>Output Impedance:</b>	50 ohms		
<b>RF Output (Rated):</b>	0.832 W		

### **System Description**

This device is a wireless dual band/dual mode phone that operates in the cellular and PCS bands.

### **System Diagram**

Refer to separate EXHIBITS

EQUIPMENT: 2260

**Section 3. RF Power Output**

NAME OF TEST: RF Power Output

PARA. NO.: 24.232(b)

TESTED BY: Eldon Berry

DATE: 27 Jan 03

**Test Results:** Complies.**Measurement Data:****RF Power Output (Conducted)**

Job No.: 3L0024R Date: 3/6/03  
Specification: CFR 47, Part 2 Temperature(°C): 23  
Tested By: David Light ▼ Humidity(%) 32  
E.U.T.: 2260  
Configuration: \_\_\_\_\_  
Detector: Peak ▼

**Test Equipment Used:**

Power Meter: E4418B	Directional Coupler: 1055
Power Sensor: 8482H	Cable #1: 1629
Load: _____	Cable #2: _____
Spectrum Analyzer: 1036	Cable #3: _____
Attenuator #1: 1/16/04	Cable #4: _____
Attenuator #2: _____	Cable #5: _____
Attenuator #3: _____	Cable #6: _____
Attenuator #4: _____	

Measurement Uncertainty: +/- .7 dB

Frequency MHz	Channel	Modulation Type	Output Power (dBm)	Output Power (mW)
1850.04	2	PCS	25.96	394.46
1879.95	999	PCS	27.78	599.79
1909.92	1998	PCS	26.61	458.14

EQUIPMENT: 2260

**Test Data - EIRP**

<u><b>EIRP Substitution Method</b></u>										
Page <u>1</u> of <u>1</u>							Complete <u>X</u>			
Job No.: 3L0024R		Date: 24Jan03					Preliminary _____			
Specification:		Temperature(°C): <u>22</u>								
Tested By: Eldon Berry		Relative Humidity(%) <u>28</u>								
E.U.T.: RH-39 Model 2260										
Configuration:										
Sample No: S01										
Location: A-OATS		RBW: 100 kHz		Measurement						
Detector Type: Peak		VBW: 100 kHz		Distance: <u>3</u> m						
<u><b>Test Equipment Used</b></u>										
Antenna: 1304, 1404		Directional Coupler: _____								
Pre-Amp: _____		Cable #1: <u>1983</u>								
Filter: _____		Cable #2: _____								
Receiver: 1036		Cable #3: _____								
Attenuator #1: _____		Cable #4: _____								
Attenuator #2: _____		Mixer: _____								
Additional equipment used: 1304, 1053, 406, 1056										
Measurement Uncertainty: +/-3.6 dB										
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)	Substitution Input [dBm]	Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)		EIRP (dBm)	EIRP (mW)	Polarity	Comments
1850.04	-21.2	43.0	43.0	0	9.2		31.0	1244.5146	V	
1850.04	-25.5	42.6	42.6	0	9.2		26.3	421.6965	H	
1879.95	-22.9	43.9	43.9	0	9.2		30.2	1035.1422	V	
1879.95	-24.1	42.6	42.6	0	9.2		27.7	582.1032	H	
1909.92	-22.5	44.7	44.7	0	9.2		31.4	1364.5831	V	
1909.92	-25.1	42.4	42.4	0	9.2		26.5	441.5704	H	



EQUIPMENT: 2260

#### Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (TDMA)	PARA. NO.: 24.238
TESTED BY: Eldon Berry	DATE: 1/30/2003

**Test Results:** Complies.

**Test Data:** See attached plots.

EQUIPMENT: 2260

## Test Plot – Occupied Bandwidth

## Data Plot

Page 1 of

Job No.: 3L0024R

Specification:

Tested By: Eldon Berry

E.U.T.: 2260

Configuration: Antenna port

Sample Number: S01

Location: Lab 1

Detector Type: Peak

## Occupied Bandwidth

Date: 1/30/2003

Temperature(°C): 23

Relative Humidity(%): 32

Complete: X

Preliminary:

RBW: Refer to plots

VBW: Refer to plots

## Test Equipment Used

Antenna:

Pre-Amp:

Filter:

Receiver: 1036

Attenuator #1: 1477

Attenuator #2:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB

Directional Coupler: 1055

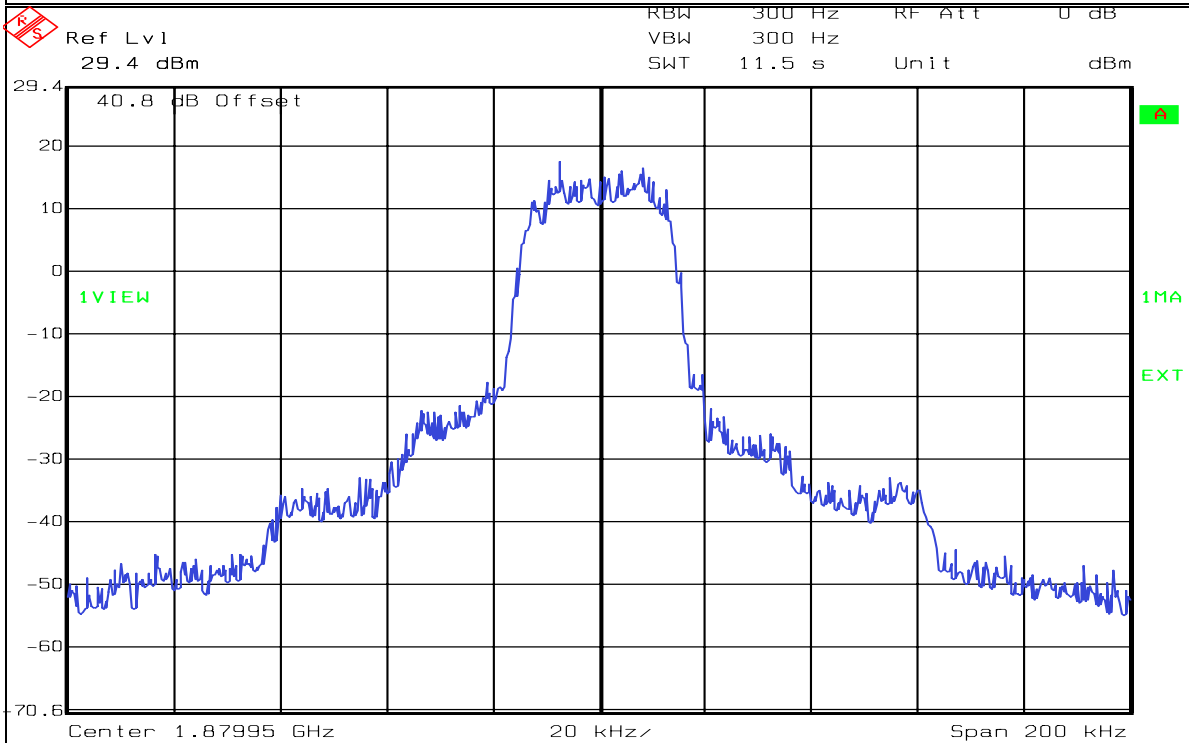
Cable #1:

Cable #2: 1629

Cable #3:

Cable #4:

Mixer:

Title: Horizontal  
Date: 30.JAN.2003 16:51:31

Notes: Channel 999 PCS TDMA

EQUIPMENT: 2260

**Section 5. Spurious Emissions at Antenna Terminals**

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 24.238
TESTED BY: Eldon Berry	DATE: 30Jan03

**Test Results:** Complies.**Test Data:**

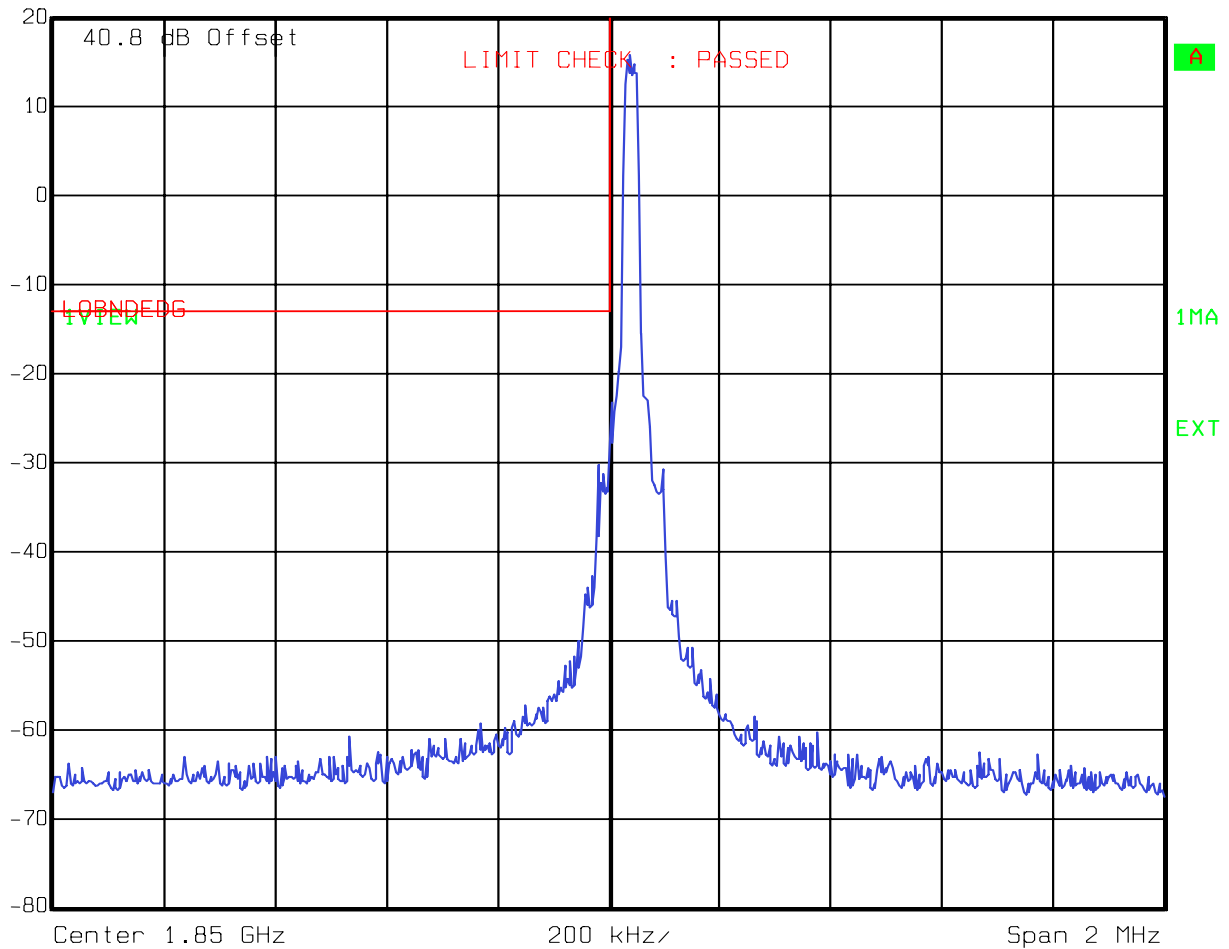
Frequency MHz	Channel	Modulation Type	Level (dBm)	FCC Limit (dBm)
3759.9	999	TDMA	-32.8	-13.0
5639.8	999	TDMA	-36.9	-13.0
7519.8	999	TDMA	-32.9	-13.0
93999.8	999	TDMA	-31.2	-13.0
11279.7	999	TDMA	-30.2	-13.0
13159.7	999	TDMA	-28.9	-13.0
15039.6	999	TDMA	-28.7	-13.0
16919.5	999	TDMA	-30.3	-13.0
18799.5	999	TDMA	-31.2	-13.0

NOTE: The spectrum analyzer RBW and VBW for emission measurements listed above is 1 MHz/1 MHz.

## Test Plots – Spurious Emissions at Antenna Terminals

Ref Lvl  
20 dBm

RBW	300 Hz	RF Att	10 dB
VBW	300 Hz	Mixer	-20 dBm
SWT	115 s	Unit	dBm

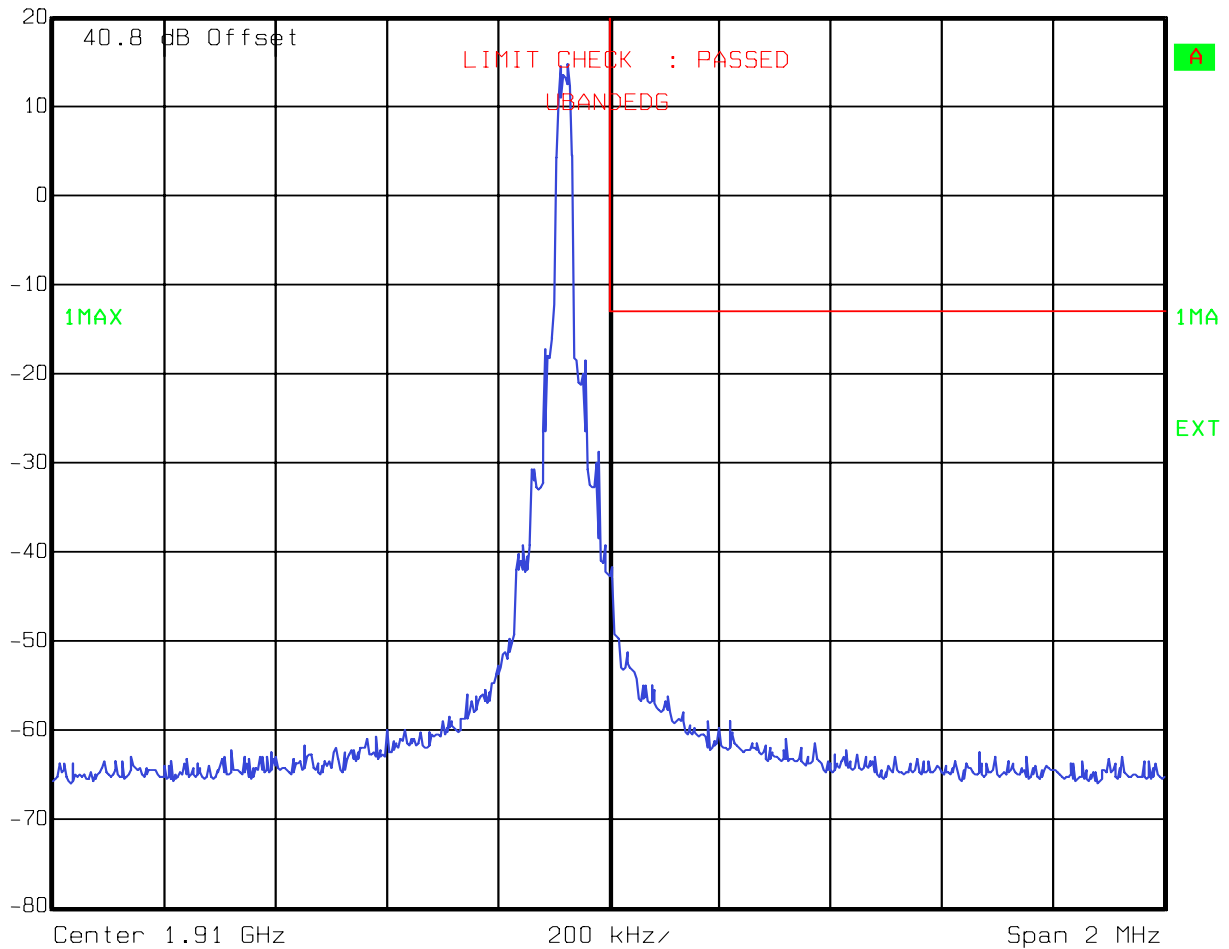


Title: Horizontal  
Date: 27.JAN.2003 14:40:26

## Test Plots – Spurious Emissions at Antenna Terminals

Ref Lvl  
20 dBm

RBW	300 Hz	RF Att	10 dB
VBW	300 Hz	Mixer	-20 dBm
SWT	115 s	Unit	dBm



Title: Horizontal  
Date: 27.JAN.2003 16:13:44

EQUIPMENT: 2260

## Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 24.238
TESTED BY: Eldon Berry	DATE:23Jan03

**Test Results:** Complies.

**Test Data:** See attached table.

### EIRP Substitution Method

Page 1 of 1

Job No.: 3LOO24

Date: 1/25/03

Complete X

Preliminary \_\_\_\_\_

Specification: CFR 47, Part 2.1053

Temperature(°C): 20

Tested By: Tom Tidwell

Relative Humidity(%) 21

E.U.T.:	Type: RH-39
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Model: 2260 Mexican build

Configuration:	PL 0, Chan. 999. Worst-case of three orthogonal axis.
----------------	---

Sample No:	2	ESN: 11007344017
------------	---	------------------

Location: AC 3

RBW: 1 MHz

## Measurement

Detector Type:	Peak
----------------	------

VBW: 1 MHz

Distance: 3 m

### Test Equipment Used

Antenna: 993

Directional Coupler: \_\_\_\_\_

Pre-Amp:	1016
----------	------

Cable #1:	1483
-----------	------

Filter:	1482
---------	------

Cable #2:	1484
-----------	------

Receiver: 1036

Cable #3:	1485
-----------	------

Attenuator #1	1466
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Cable #4:

Attenuator #2:

Mixer: \_\_\_\_\_

Additional equipment used:

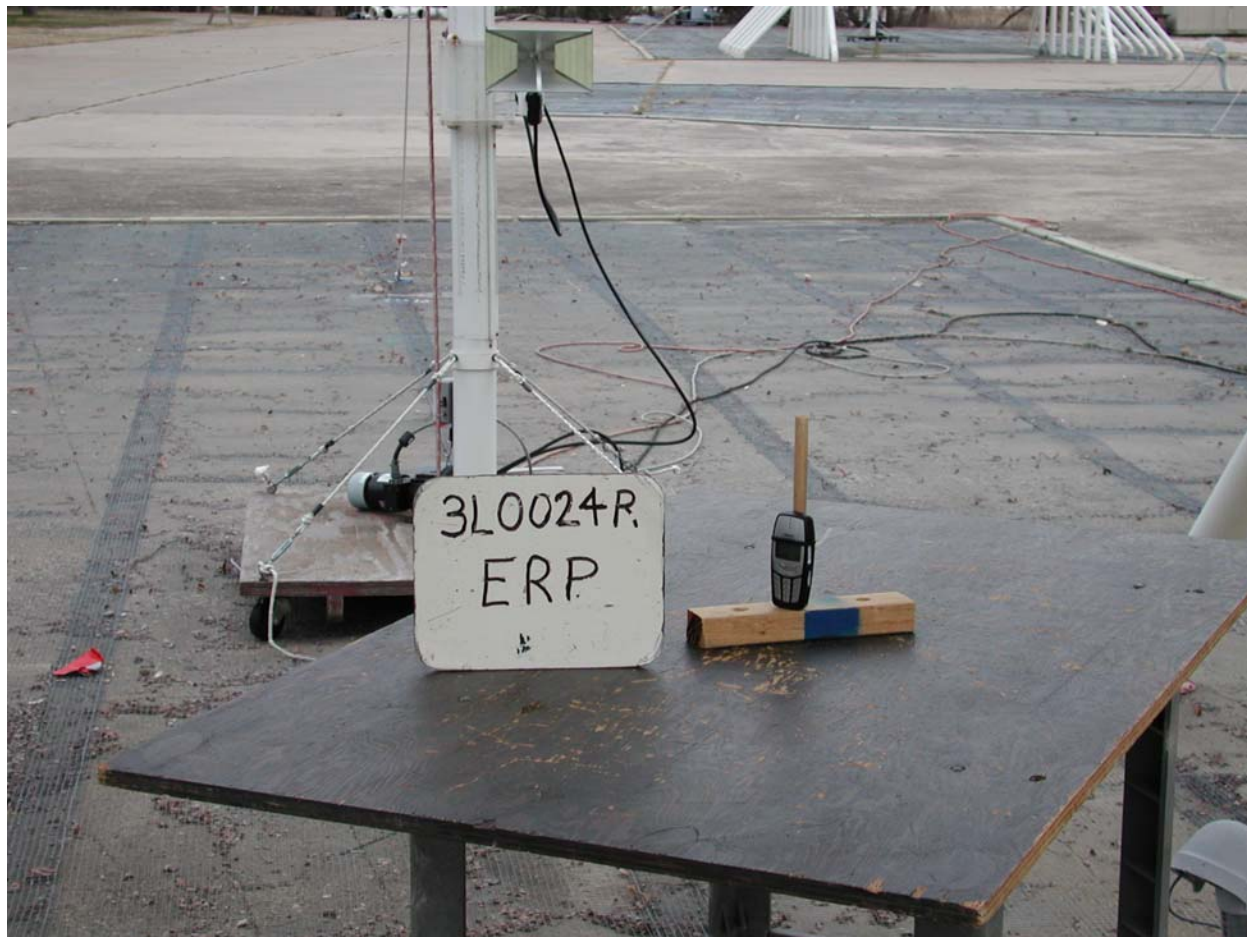
Measurement Uncertainty:	+/-3.6 dB
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[illegible]

**Notes:**

EQUIPMENT: 2260

### Photographs of Test Setup





EQUIPMENT: 2260

## Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 24.235
TESTED BY: Eldon Berry	DATE: 31Jan03

**Test Results:** Complies.

### Measurement Data:

Band of Operation PCS  
 Mode TDMA  
 Channel 999  
 Standard Test Frequency: 1879.95 MHz  
 Standard Test Voltage: 3.8 Vdc

Temperature	Voltage (Vdc)	Frequency (MHz)	Change (Hz)	Change (PPM)
50	3.8	1879.949974	-26	.013
40	3.8	1879.949989	-11	.005
30	3.8	1879.949991	-9	.004
20	3.8	1879.949990	-10	.005
10	3.8	1879.949988	-12	.006
0	3.8	1879.949986	-14	.007
-10	3.8	1879.949991	-9	.004
-20	3.8	1879.949991	-9	.004
-30	3.8	1879.949991	-9	.004
20	3.8	1879.949993	-7	.003
20	4.4	1879.949994	-6	.003
20	3.4*	1879.949988	-9	.004

\* Battery end point

EQUIPMENT: 2260

## Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
406	POWER METER	HP 436A	2512A22082	04/03/02	04/03/03
993	Horn antenna	A.H. Systems SAS-200/571	XXX	01/08/02	01/09/04
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	07/15/02	07/15/03
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
1053	SIGNAL GENERATOR	ROHDE & SCHWARZ SMIQ 03	DE22081	08/13/02	08/13/03
1055	DUAL DIRECTIONAL COUPLER	NARDA 3022	73393	Cal Not Req	N/A
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/31/03
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/31/03
1404	Dipole set	EMCO 3121C	9701-1256	06/10/02	06/10/03
1466	10 db Attenuator DC 8.0 Ghz	Midwest Microwave 292/10db	NONE	CBU	N/A
1477	20db Attenuator DC 18 Ghz	MCL Inc. BW-S20W5	NONE	CBU	N/A
1482	Band Pass Filter	K & L 11SH10-4000/T12000-0/0	2	CBU	N/A
1483	Cable 4m	Storm PR90-010-144	N/A	CBU	N/A
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/15/02	07/15/03
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/15/02	07/15/03
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1983	CABLE	KTL Site A OATS	N/A	08/05/02	08/05/03
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	01/10/02	01/10/03
	Cellular Test System	Wavetek 3600D	9228038	11/25/02	11/25/03
1054	DUAL DIRECTIONAL COUPLER	NARDA 3020A	34366	Cal Not Req	N/A
1058	DUAL DIRECTIONAL COUPLER	HEWLETT PACKARD 11692D	1212A03366	Cal Not Req	N/A

Power Meter E4418B, S/N. GB40206972, Cal. 9/19/02, Due 9/19/03

Power Sensor 8482H, S/N. 3318A05855, Cal. 12/19/02, Due 12/19/03

## ANNEX A - TEST METHODOLOGIES

EQUIPMENT: 2260

NAME OF TEST: RF Power Output

PARA. NO.: 2.1046

**Minimum Standard:** Para. No.24.232. Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

**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.

EQUIPMENT: 2260

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

EQUIPMENT: 2260

NAME OF TEST: Spurious Emission at Antenna  
Terminals

PARA. NO.: 2.1053

**Minimum Standard:**

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of 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 (< 1 MHz 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: 300 Hz (< 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.

EQUIPMENT: 2260

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.1053
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**Minimum Standard:** 24.238(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

**Calculation Of Field Strength Limit**

**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.

EQUIPMENT: 2260

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

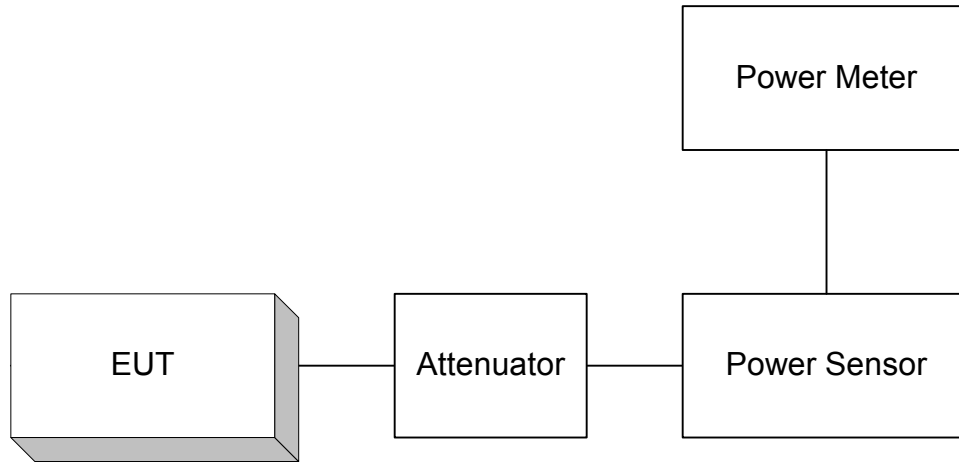
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.



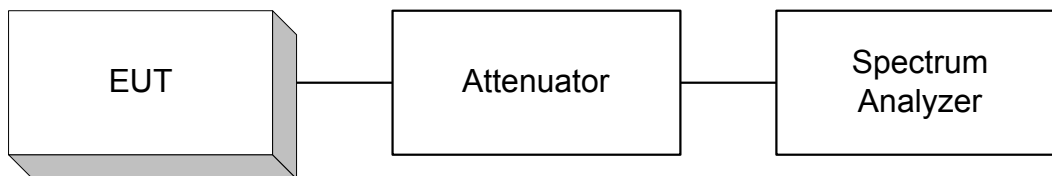
## ANNEX B - TEST DIAGRAMS

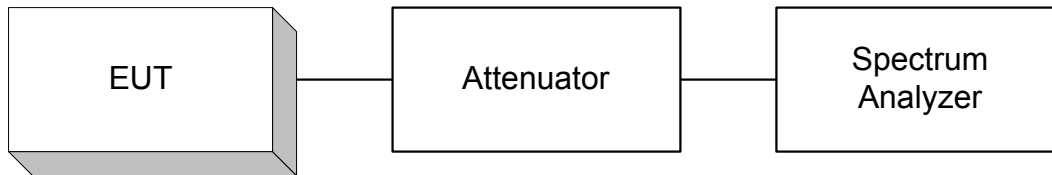
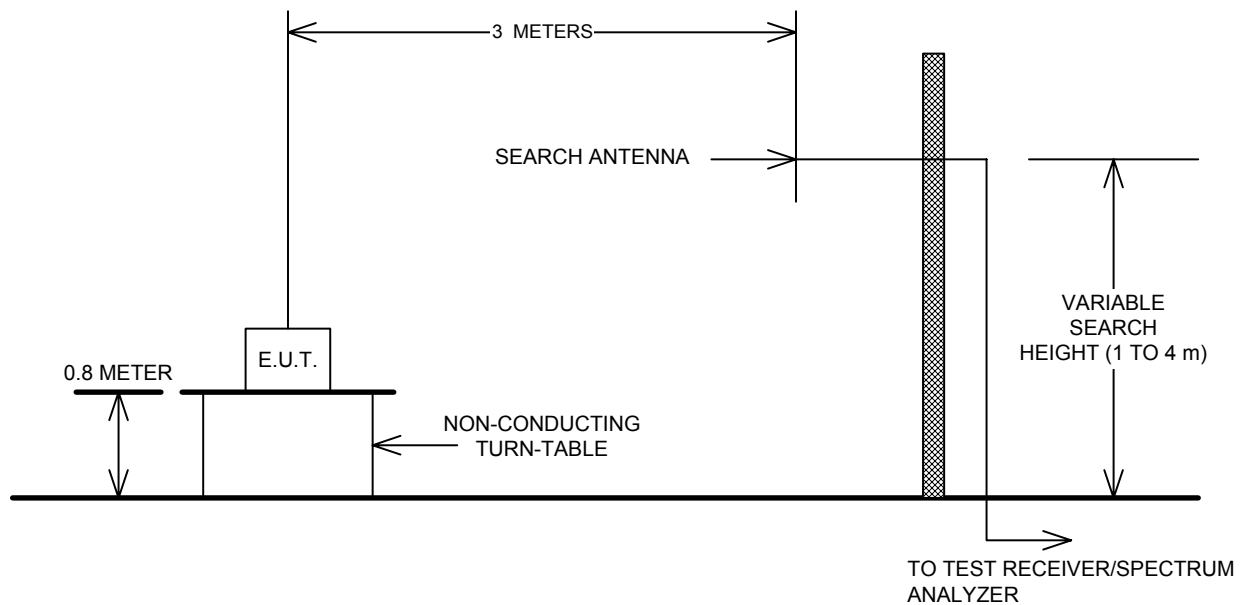
EQUIPMENT: 2260

Para. No. 2.1046 - R.F. Power Output



Para. No. 2.1049 - Occupied Bandwidth



**Para. No. 2.1053 Spurious Emissions at Antenna Terminals****Para. No. 2.1053- Field Strength of Spurious Radiation**

Para. No. 2.1055 - Frequency Stability

