

Nemko Test Report: 3L0024RUS1

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 22**
800 MHz Cellular Subscriber Units

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

Authorized By:



David Light, Lab Resource Manager

Date: 3/7/2003

Total Number of Pages: 29

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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 22, Subpart H.



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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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	2.1046	7W ERP	Complies
Occupied Bandwidth (Voice & SAT)	2.1049	Mask	Complies
Occupied Bandwidth (WB Data & SAT)	2.1049	Mask	Complies
Occupied Bandwidth (ST)	2.1049	Mask	Complies
Occupied Bandwidth (SAT)	2.1049	Mask	Complies
Occupied Bandwidth (SAT)	2.1049	Not Specified	Complies
Spurious Emissions at Antenna Terminals	2.1051	-13 dBm	Complies
Field Strength of Spurious Emissions	2.1053	82.3 dB μ V/m	Complies
Frequency Stability	2.1055	2.5 ppm	Complies

Footnotes:

Section 2. General Equipment Specification

Frequency Range, MHz:	824.04 to 848.97
Tunable Bands:	824.04 to 848.97 and 1850 to 1909.92 Not selectable by user
Necessary Bandwidth:	30 kHz
Type of Modulation and Designator:	40K0F1D, 40K0F8W, and 30K0DXW
Output Impedance:	50 ohms
RF Power Output (rated):	690.2 mW
Duty Cycle:	Continuous
Channel Spacing:	30 kHz
Operator Selection of Frequency:	Software Controlled
Power Output Adjustment Capability:	Software Controlled

Operational 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 (Conducted)

NAME OF TEST: RF Power Output	PARA. NO.: 22.913
TESTED BY: Eldon Berry	DATE: 27Jan03

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

Job No.: 3L0024R Date: 1/27/03
 Specification: CFR 47, Part 2 Temperature(°C): 23
 Tested By: Eldon Berry ▼ Humidity(%) 32
 E.U.T.: 2260
 Configuration: _____
 Detector: Peak ▼

Test Equipment Used:

Power Meter: E4418B Directional Coupler: 1054
 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: +/- 1.6 dB

Freque MH	Channe	Modulatio Typ	Output (dBm	Output Powe (mW
824.0	991	AMP	25.3	338.8
836.5	384	AMP	25.1	323.6
848.9	799	AMP	24.9	309
824.0	991	TDMA	27.2	434.6
836.5	384	TDMA	27.3	537.0
848.9	799	TDMA	27.3	537.0

ERP Substitution Method

Page 1 of 1		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>Test Equipment Used</u>		
Antenna: 1304, 1404	Directional Coupler: _____	
Pre-Amp: _____	Cable #1: 1983	
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		

[illegible]

Notes:

Section 4. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions At Antenna Terminals PARA. NO.: 2.1051

TESTED BY: Eldon Berry

DATE: 1/30/2003

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

Frequency MHz	Channel	Modulation Type	Level (dBm)	FCC Limit (dBm)
1673.0	384	AMPS	-41.6	-13.0
2509.6	384	AMPS	-46.2	-13.0
3346.1	384	AMPS	-49.1	-13.0
4182.6	384	AMPS	-53.6	-13.0
5019.1	384	AMPS	-54.2	-13.0
5855.6	384	AMPS	-51.4	-13.0
6692.2	384	AMPS	-50.7	-13.0
7528.7	384	AMPS	-50.5	-13.0
8365.2	384	AMPS	-50.4	-13.0
Frequency MHz	Channel	Modulation Type	Level (dBm)	FCC Limit (dBm)
1673.0	384	TDMA	-37.7	-13.0
2509.6	384	TDMA	-31.2	-13.0
3346.1	384	TDMA	-40.6	-13.0
4182.6	384	TDMA	-54.0	-13.0
5019.1	384	TDMA	-53.0	-13.0
5855.6	384	TDMA	-51.1	-13.0
6692.2	384	TDMA	-48.4	-13.0
7528.7	384	TDMA	-50.1	-13.0
8365.2	384	TDMA	-50.6	-13.0

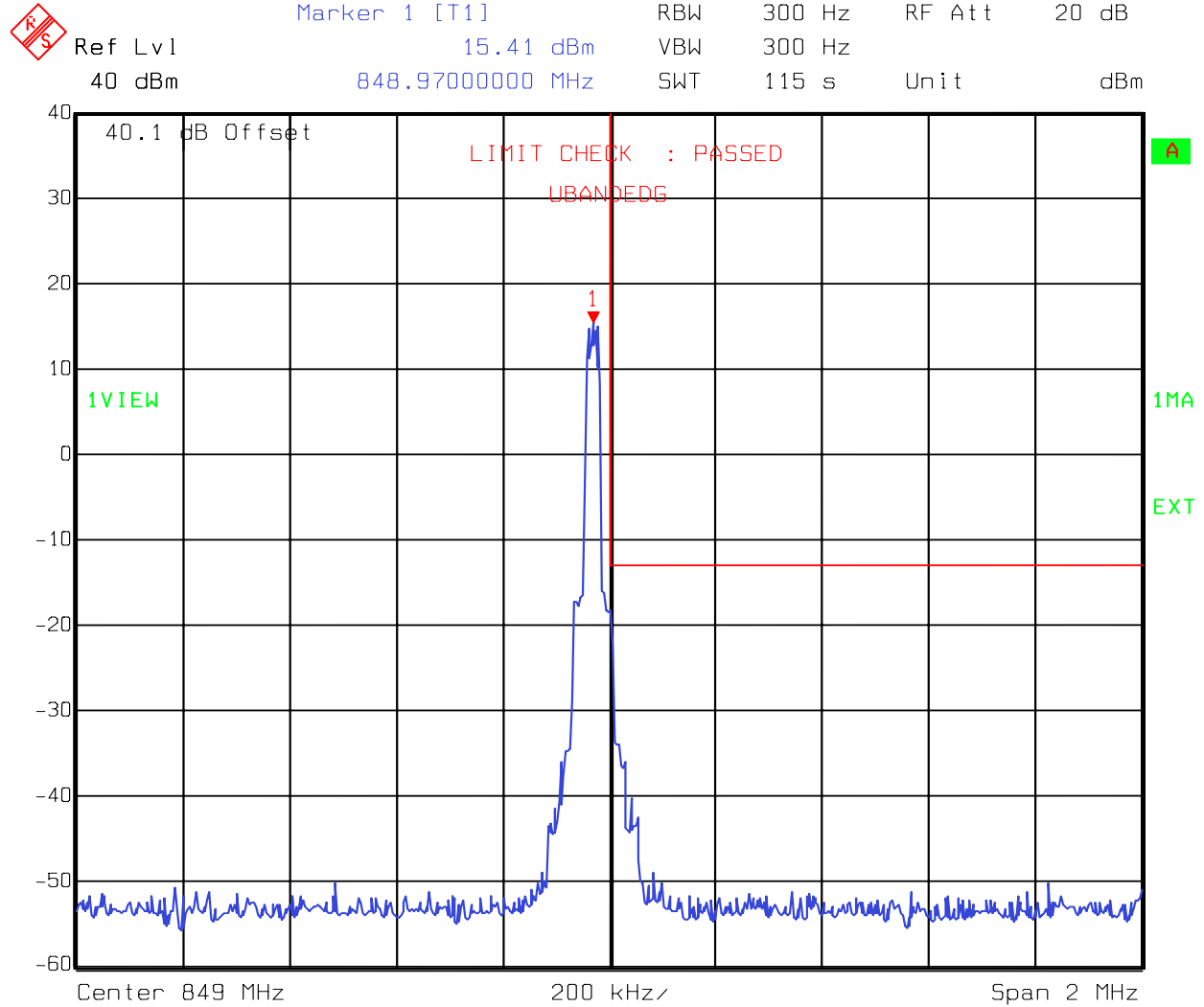
NOTE: The above data was measured using a 1 MHz RBW, 1 MHz VBW

Equipment Used: 1036-1629-1477-1054-1055-1056**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 20 °C**Relative Humidity** 22 %

EQUIPMENT: 2260

Test Plots – Spurious Emissions at Antenna Terminals

TDMA

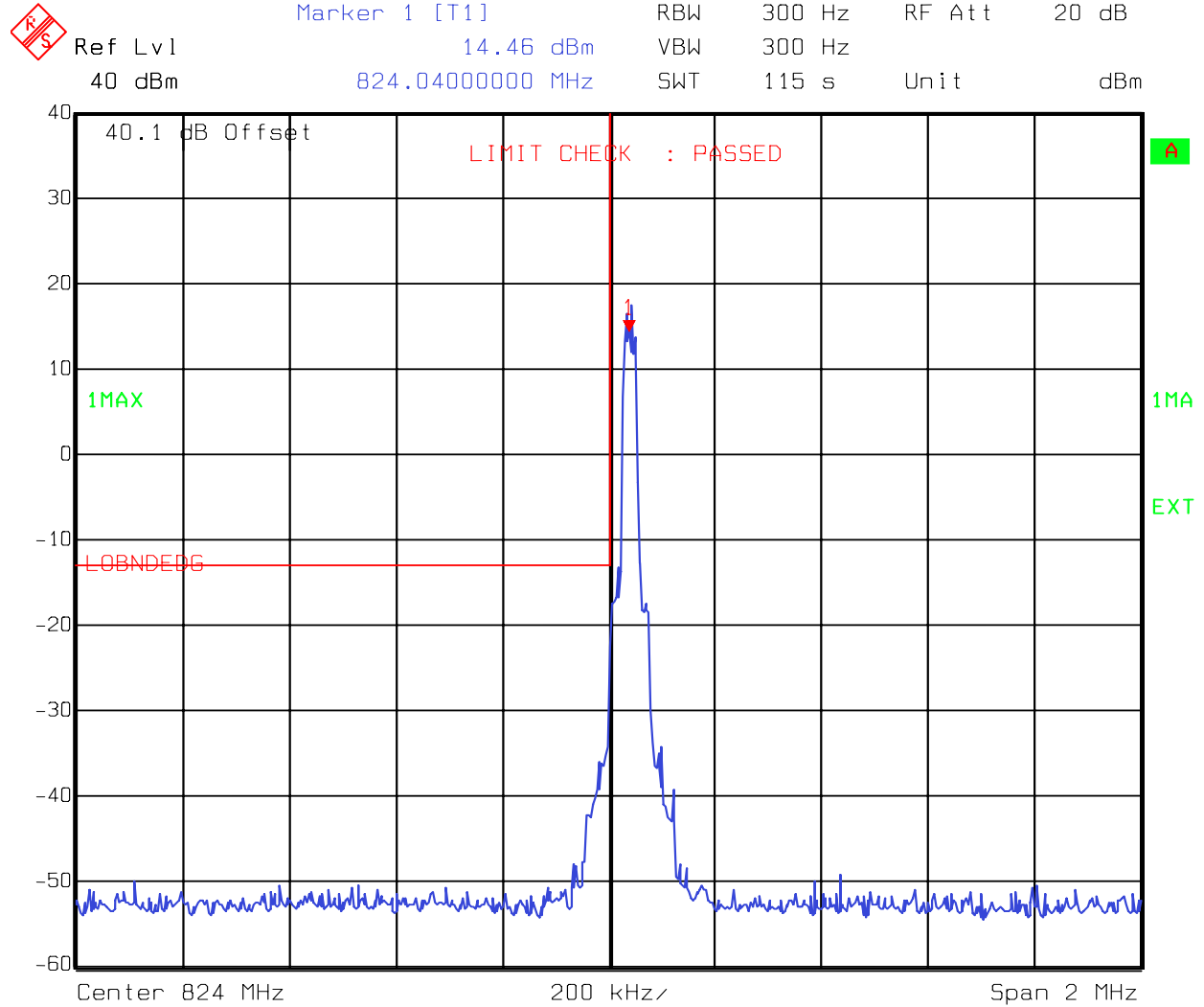


Title: Horizontal
Date: 27.JAN.2003 16:32:28

EQUIPMENT: 2260

Test Plots – Spurious Emissions at Antenna Terminals

TDMA



Title: Horizontal
Date: 27.JAN.2003 16:44:15

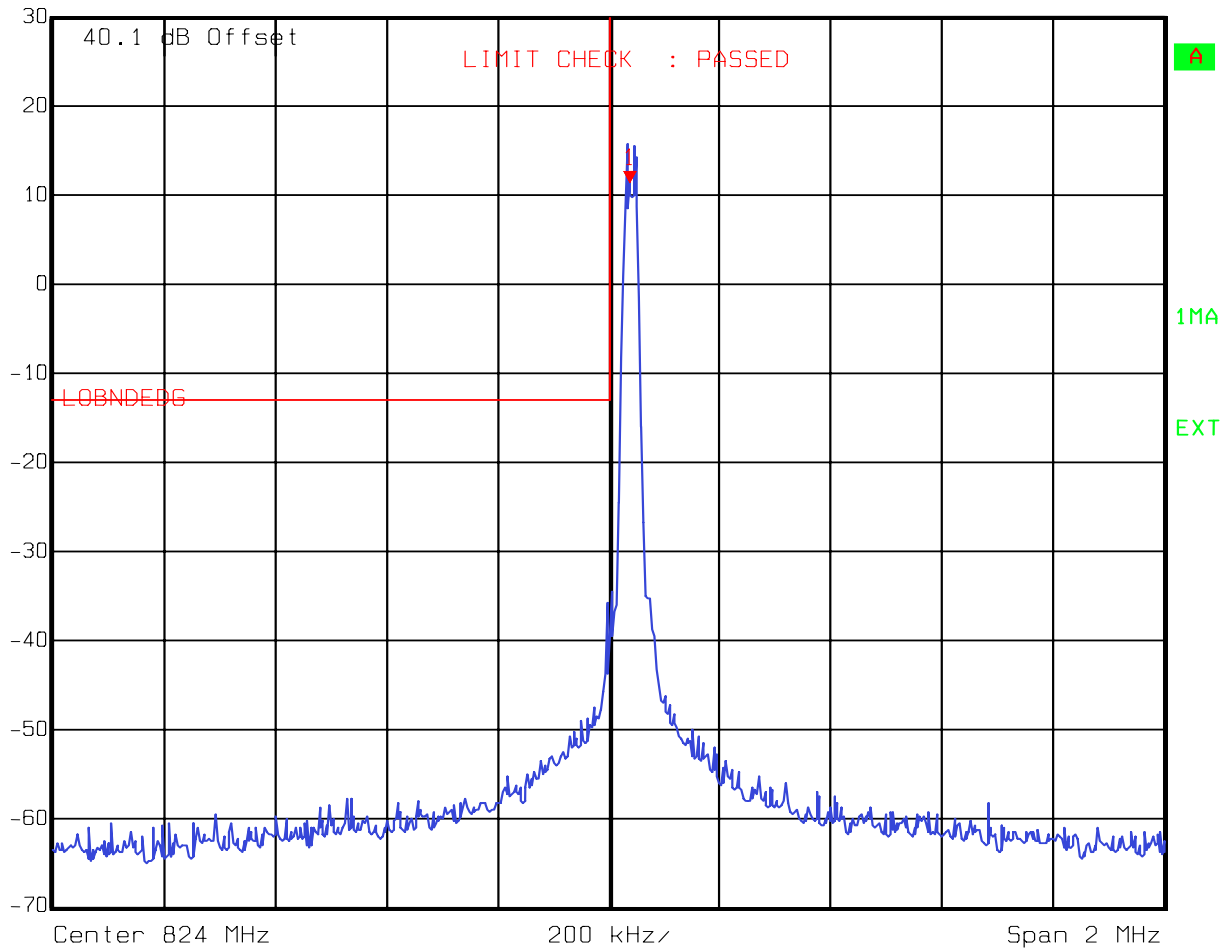
EQUIPMENT: 2260

Test Plots – Spurious Emissions at Antenna Terminals

AMPS



Ref Lvl 30 dBm
Marker 1 [T1] 11.45 dBm
824.0400000 MHz
RBW 300 Hz
VBW 300 Hz
SWT 115 s
RF Att 10 dB
Unit dBm



Title: Horizontal
Date: 28.JAN.2003 11:41:01

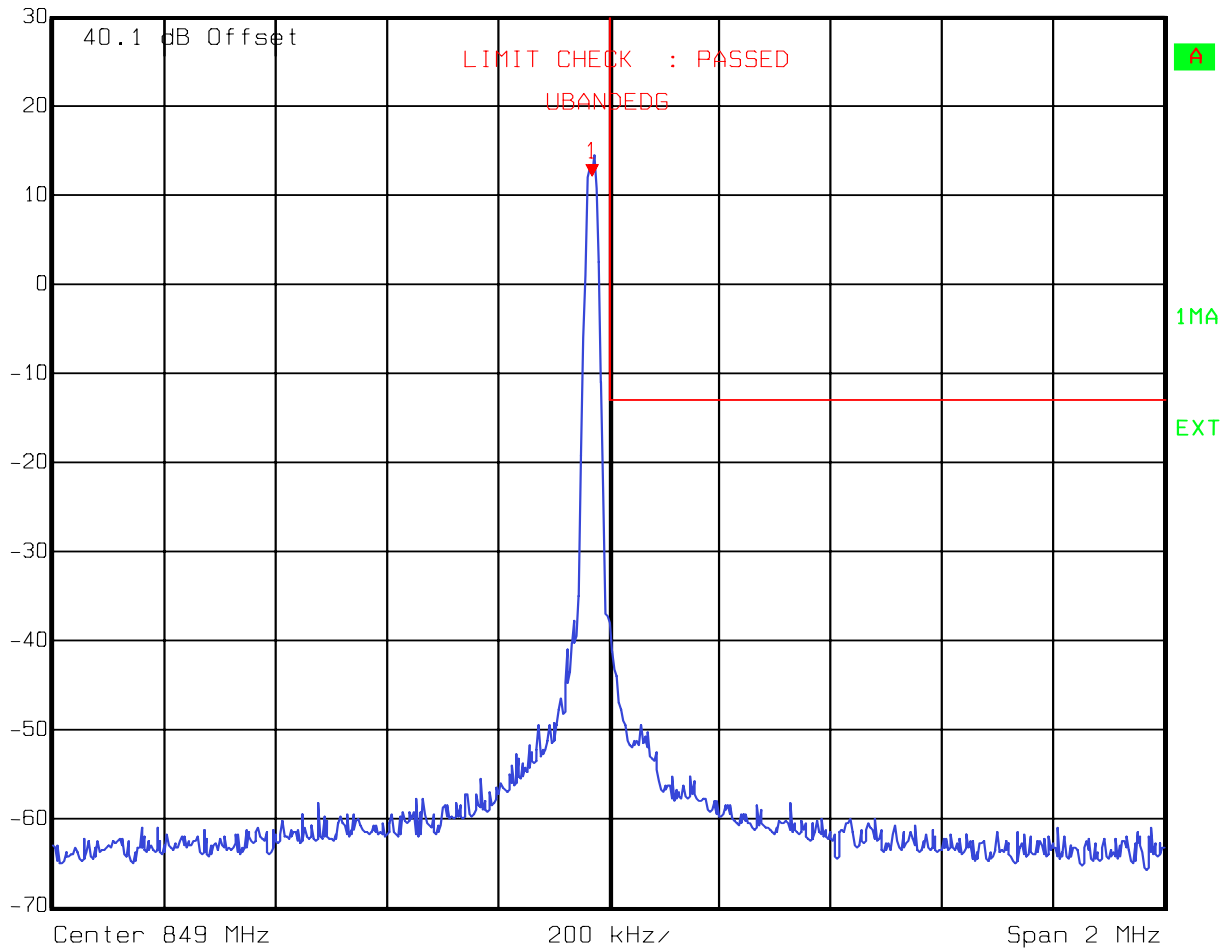
EQUIPMENT: 2260

Test Plots – Spurious Emissions at Antenna Terminals

AMPS



Marker 1 [T1] RBW 300 Hz RF Att 10 dB
Ref Lvl 12.01 dBm VBW 300 Hz
30 dBm 848.9700000 MHz SWT 115 s Unit dBm



Title: Horizontal
Date: 28.JAN.2003 12:15:55

Section 5. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: Eldon Berry	DATE: 1/23/2003

Test Results: Complies.

Measurement Data: See attached table.

EQUIPMENT: 2260

Test Data - Radiated Emissions



Nemko Dallas, Inc.

Dallas Headquarters:

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 Lewisville, TX 75057
 Tel: (972) 436-9600
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ERP Substitution Method

Page 1 of

Job No.: 3L0024R Date: 23Jan03 Complete X
 Preliminary

Specification: Part 22 Temperature(°C): 21
 Tested By: Eldon Berry Relative Humidity(%) 16
 E.U.T.: Model 2260
 Configuration: PCS
 Sample No: S01
 Location: AC 1 RBW: 100 kHz Measurement
 Detector Type: Peak VBW: 100 kHz Distance: 3 m

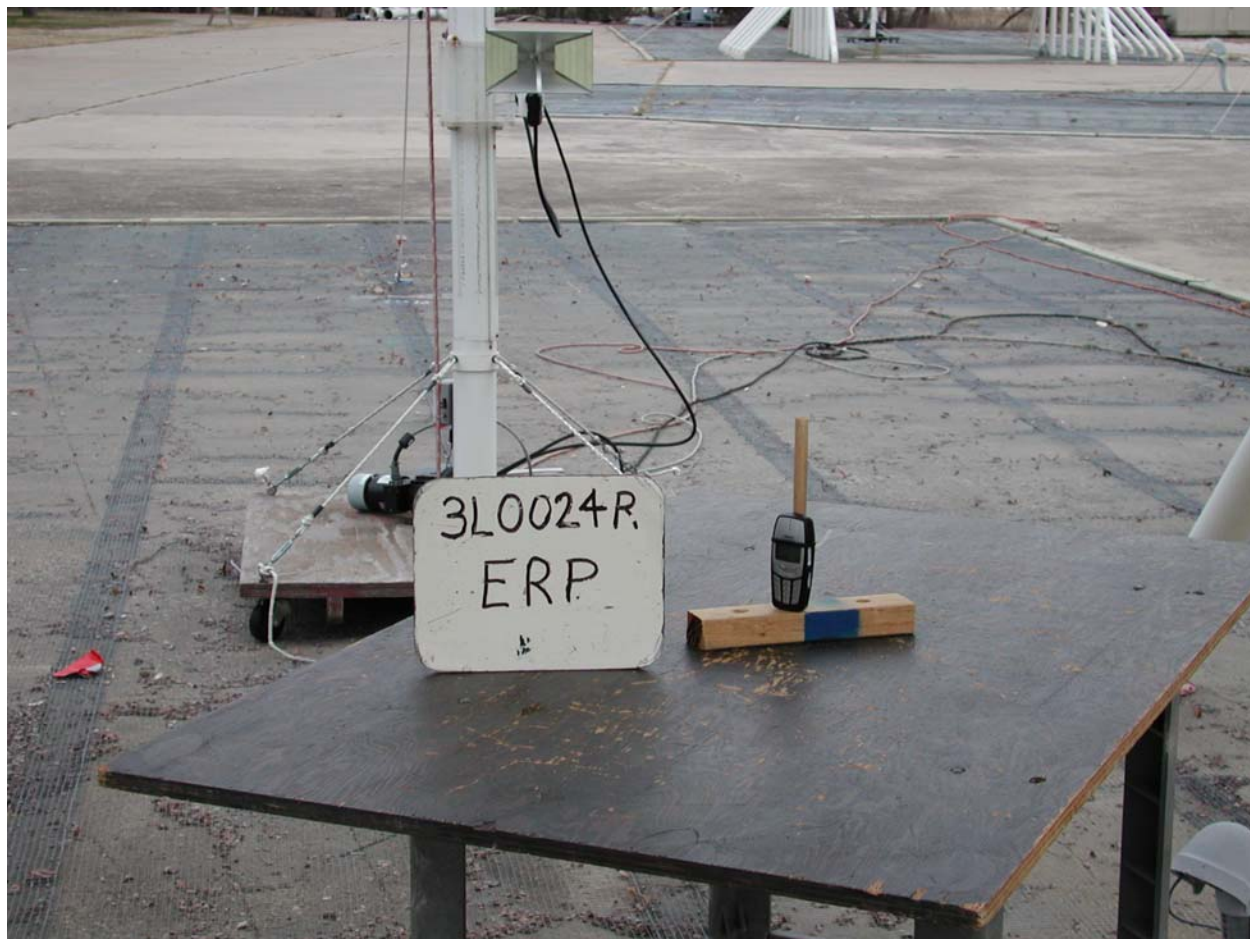
Test Equipment Used

Antenna: 1304 Directional Coupler:
 Pre-Amp: 1016 Cable #1: 1485
 Filter: Cable #2: 1484
 Receiver: 1036 Cable #3: 1046
 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 (dBd)		ERP (dBm)	ERP (mW)	Polarity	Comments
1673.04	-67.3	31.0		32.6	7.3		-61.7	0.0000	V	
2509.56	-47.8	35.5		33	8.0		-37.4	0.0002	V	
3346.08	-56.7	39.8		32.7	8.0		-41.6	0.0001	V	
4182.60	-68.0	45.3		33.2	8.2		-47.7	0.0000	V	
5019.12	-66.9	41.3		32.7	8.2		-50.1	0.0000	V	
5855.64	-69.8	39.8		31.8	9.3		-52.5	0.0000	V	
6692.16	-70.4	41.3		31.6	9.4		-51.3	0.0000	V	
7528.68	-72.7	41.8		32.5	9.2		-54.2	0.0000	V	
8365.20	-71.1	42.8		33.4	9.1		-52.6	0.0000	V	
1673.04	-72.8	33.0		32.6	7.3		-65.2	0.0000	H	
2509.56	-52.7	35.5		33	8.0		-42.3	0.0001	H	
3346.08	-49.5	36.3		32.7	8.0		-37.9	0.0002	H	
4182.60	-69.6	34.8		33.2	8.2		-59.8	0.0000	H	
5019.12	-69.5	38.3		32.7	8.2		-55.7	0.0000	H	
5855.64	-69.4	37.8		31.8	9.3		-54.1	0.0000	H	
6692.16	-73.8	39.2		31.6	9.4		-56.9	0.0000	H	
7528.68	-74.7	41.5		32.5	9.2		-56.6	0.0000	H	
8365.20	-73.7	42.5		33.4	9.1		-55.5	0.0000	H	

Notes: Searched spectrum to the 10th harmonic of carrier

Photographs of Test Setup



Section 6. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: Eldon Berry	DATE:

Test Results: Complies.

Measurement Data: See attached tables.

Equipment Used:

Measurement Uncertainty: ppm

Temperature: 22 °C

Relative Humidity: 30 %

EQUIPMENT: 2260

Test Data – Frequency Stability

Band of Operation Cellular
 Mode of Operation: AMPS
 Channel 384
 Standard Test Frequency: 836.52 MHz
 Standard Test Voltage: 3.8 Vdc

Temperature	Voltage (Vdc)	Frequency (MHz)	Change (Hz)	Change (ppm)
50	3.8	836.520267	276	0.329
40	3.8	836.520327	327	0.391
30	3.8	836.520340	340	0.406
20	3.8	836.520341	341	0.407
10	3.8	836.520344	344	0.411
0	3.8	836.520458	458	0.547
-10	3.8	836.520405	405	0.484
-20	3.8	836.520317	317	0.378
-30	3.8	836.520311	311	0.371
20	4.4	836.520334	334	0.399
20	3.4*	836.520334	334	0.399

Band of Operation Cellular
 Mode of Operation TDMA
 Channel 384
 Standard Test Frequency: 836.52 MHz
 Standard Test Voltage: 3.8 Vdc

Temperature	Voltage (Vdc)	Frequency (MHz)	Change (Hz)	Change (ppm)
50	3.8	836.520004	4	0.004
40	3.8	836.519995	-5	0.005
30	3.8	836.519994	-6	0.007
20	3.8	836.519994	-6	0.007
10	3.8	836.519993	-7	0.008
0	3.8	836.519994	-6	0.007
-10	3.8	836.519992	-8	0.009
-20	3.8	836.519993	-7	0.008
-30	3.8	836.519995	-5	0.005
-20	4.4	836.519992	-8	0.009
-30	3.4*	836.519993	-7	0.008

*Note – Unit cutoff point.

EQUIPMENT: 2260

Section 7. 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

Agilent power meter E4418B s/n GB40206972 Cal'd 9/19/02 Due 9/19/03

Agilent power sensor 8482H s/n 3318A05855 Cal'd 12/19/02 Due 12/19/03

ANNEX A - TEST DETAILS

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

Minimum Standard: Para. No. 22.913(a). The E.R.P. of mobile transmitter and auxiliary test transmitter must not exceed 7 watts.

EIA is 19B Para. No. 3.2.1.3. The transmitter shall be compiled of 8 distinct power levels.

The output power shown above shall be maintained within the range of +2 dB, -4 dB of nominal dBW value

PL	I	II	III
0	+6	+2	-2
1	+2	+2	-2
2	-2	-2	-2
3	-6	-6	-6
4	-10	-10	-10
5	-14	-14	-14
6	-18	-18	-18
7	-22	-22	-22

Method Of Measurement:Detachable Antenna:

The power at antenna terminals is measured using an in-line power meter.

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**

(i) **Minimum Standard:** No in-band emission requirements.

Para. No. 22.917(a). 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 on band edges (up to 1 MHz from band edge):

RBW: 1% of 26 dBc bandwidth

VBW: \geq RBW

Span: 2 MHz

Sweep: Auto

Spectrum Analyzer Settings out-of-band(> 1MHz from band edge):

RBW: 100 kHz or greater

VBW: \geq RBW

Sweep: Auto

Input Signal Characteristics (F3E/F3D):

AF1 frequency: 2.5 kHz

AF1 level: 16 dB above the level sufficient to produce ± 6 kHz deviation with a 1 kHz tone.

SAT: 6000 Hz SAT

SAT level: sufficient to produce ± 2 kHz deviation.

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

10 kbps WBD + DAT

ST

**NAME OF TEST: Spurious Emission at Antenna
Terminals****PARA. NO.: 2.1053**

Minimum Standard: Para. No. 22.917(a). 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:

RBW: 100 kHz or greater.

VBW: \geq RBW

Start Frequency: 0 MHz

Stop Frequency: 10 GHz

Sweep: Auto

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

Minimum Standard: Para. No. 22.917(a). 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.

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.

The spectrum is searched to 10 GHz.

NAME OF TEST: Frequency Stability**PARA. NO.: 2.1055****Minimum Standard:**
shall remainPara. No. 22.355. The transmitter carrier frequency
within the tolerances given in Table C-1.

Freq. Range (MHz)	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	2.5	2.5

Table C-1

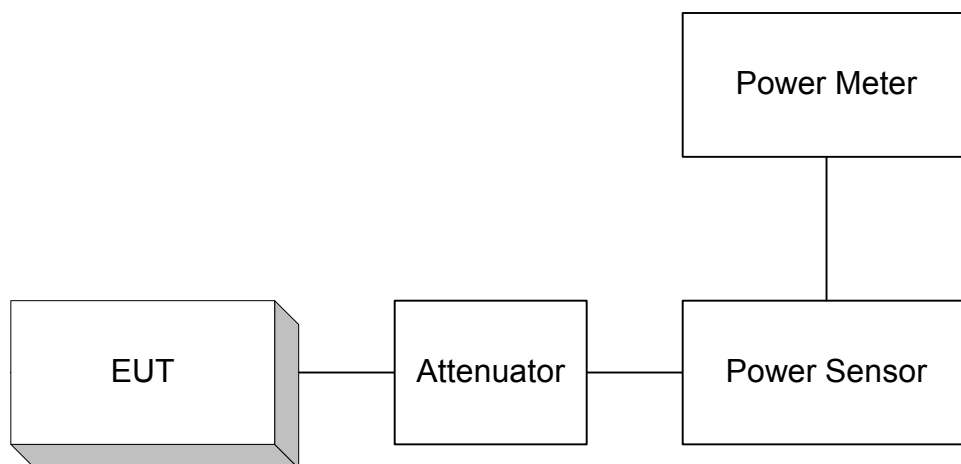
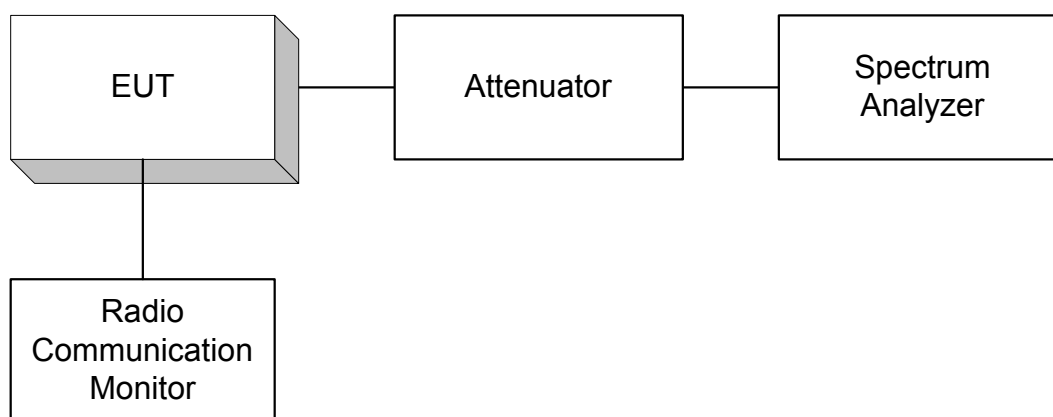
Method Of Measurement:Frequency Stability With Voltage Variation:

The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. 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.

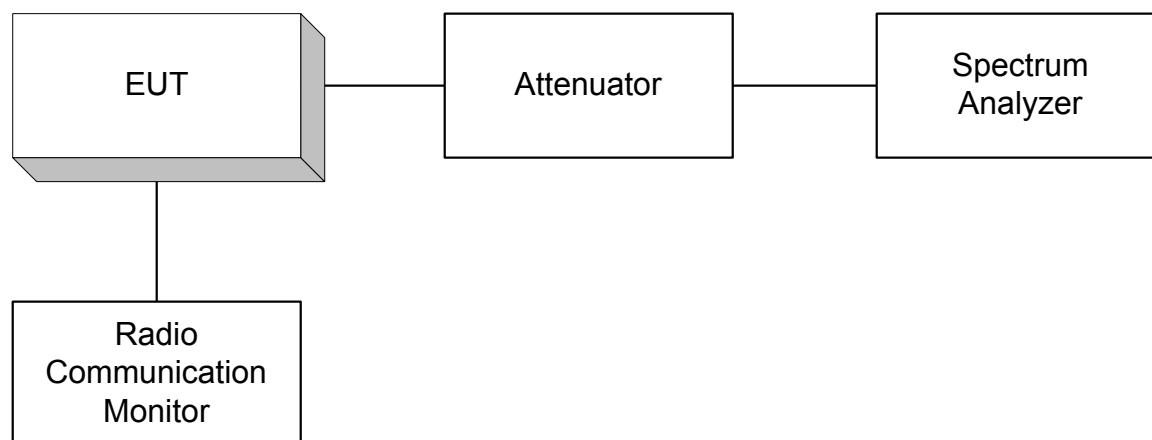
Frequency Stability With Temperature Variation:

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.

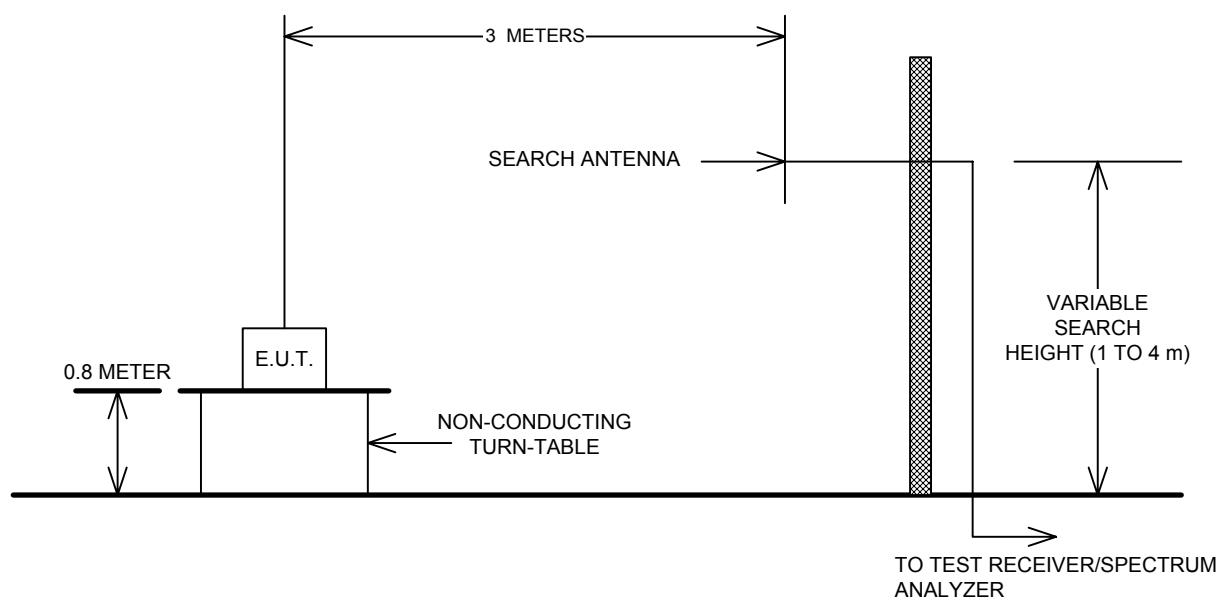
ANNEX B - TEST DIAGRAMS

Para. No. 2.1046 - R.F. Power Output**Para. No. 2.1049 - Occupied Bandwidth**

The Radio Communication Monitor is used only to provide modulation input for external modulation.

Para. No. 2.1053 Spurious Emissions at Antenna Terminals

The Radio Communication Monitor is used only to provide modulation input for external modulation.

Para. No. 2.1053 - Field Strength of Spurious Radiation

Para. No. 2.1055 - Frequency Stability

