

**Nemko Test Report:** 1L0456RUS1

**Applicant:** GTRAN Wireless

**Equipment Under Test:  
(E.U.T.)** GPC-2100 PCS Band modem

**FCC ID:** PL5GPC-2100

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

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

**Authorized By:**



Tom Tidwell, RF Group Manager

**Date:** 9/26/01

**Total Number of Pages:** 32

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*EQUIPMENT:* GPC-2100*FCC ID:* PL5GPC-2100

PROJECT NO.:

1L0456RUS1

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**Section 1. Summary of Test Results**

Manufacturer: GTRAN

Model No.: GPC-2100

Serial No.: S01

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.

See " Summary of Test Data".



**NVLAP LAB CODE: 100426-0**

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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 (CDMA)	24.238		Complies
Occupied Bandwidth (GSM)	24.238	N/A	N/A
Occupied Bandwidth (NADC)	24.238	N/A	N/A
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	$\pm 0.05$ ppm	Complies

**Footnotes:**

This device supports CDMA only.

*EQUIPMENT:* GPC-2100*FCC ID:* PL5GPC-2100

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**Section 2. General Equipment Specification****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

**CDMA  
(F9W)**

1M25F9W

**GSM  
(GXW)****NADC  
(DXW)****Output Impedance:**

50 ohms

**RF Output (Rated):**

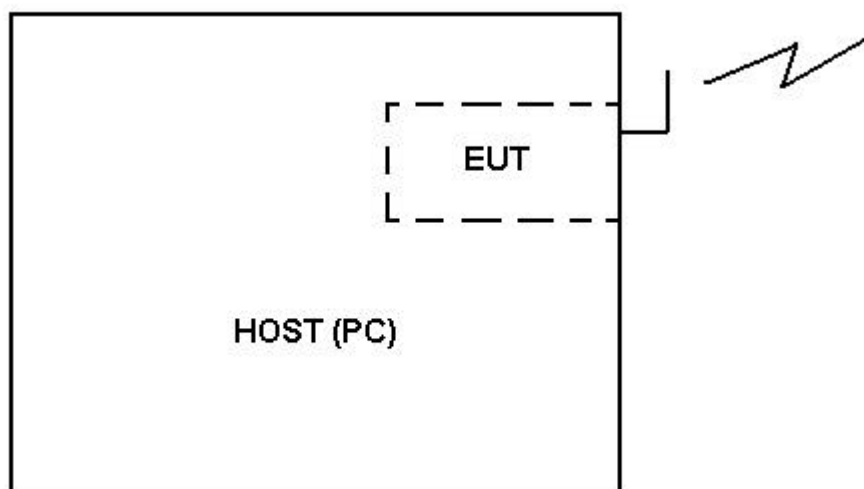
0..269 W

**System Description**

M/A-COM's MD59-0049 integrated downconverter combines a low noise amplifier, RF amplifier, mixer, IF amplifier, and LO buffer in a miniature 4 millimeter plastic MLF package that has an exposed backside for improved high frequency grounding.

M/A-COM designed the MD59-0049 for applications requiring high linearity wide dynamic range and low power consumption. By application of a suitable control voltage to pin 13, the linearity of the device can be controlled in real time to keep the current as low as possible.

M/A-COM fabricates the MD59-0049 using a 0.5 micron low noise E/D GaAs MESFET process. The process features full passivation for increased performance and reliability.

**System Diagram**

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FCC PART 24, SUBPART E

BROADBAND PCS SUBSCRIBER STATION

EQUIPMENT: GPC-2100

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### Section 3. RF Power Output

NAME OF TEST: RF Power Output

PARA. NO.: 2.1046

TESTED BY: David Light

DATE:8/30/2001

Test Results: Complies.

#### Measurement Data:

Modulation Type	Channel	Output Power (dBm)	Output Power (W)
CDMA	25	24.0	0.250
CDMA	600	24.1	0.257
CDMA	1175	24.3	0.269

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## **Section 4. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth (CDMA)	PARA. NO.: 2.1047
TESTED BY: David Light	DATE: 8/30/01

**Test Results:**

Complies.

**Test Data:**

See attached plots.

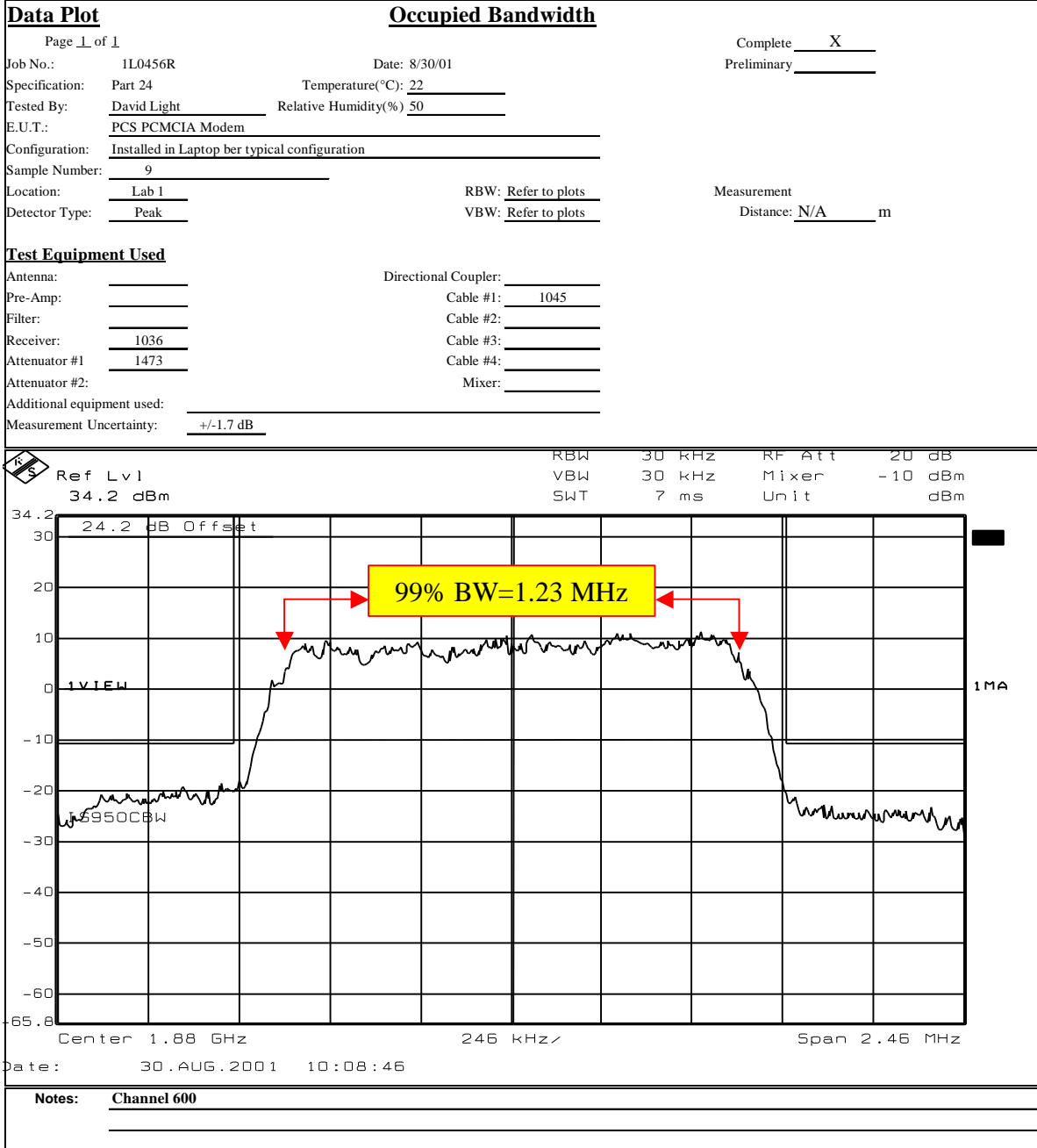




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NAME OF TEST: Occupied Bandwidth (GSM)

MARK NO.: 2.1049

TESTED BY:

DATE:

**Test Results:**

Complies.

**Test Data:**

See attached plots.

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NAME OF TEST: Occupied Bandwidth (NADC)

PARA. NO.: 2.1049

TESTED BY:

DATE:

**Test Results:**

Complies.

**Test Data:**

See attach 4-10-05

**Not Applicable**

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

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 8/30/01

**Test Results:**

Complies.

**Test Data:**

See attached plots

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EQUIPMENT: GPC-2100

FCC ID: PL5GPC-2100

PROJECT NO.:

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# Data Plot

## Spurious Emissions at Antenna Terminal

Page 1 of 2

Complete X

Job No.: 1L0456R

Date: 8/30/01

Preliminary           

Specification: Part 24

Temperature(°C): 22

Tested By: David Light

Relative Humidity(%) 50

E.U.T.: PCS PCMCIA Modem

Configuration: Installed in laptop per typical installation

Sample Number: 9

Location: Lab 1

RBW: Refer to plots

Measurement

Detector Type: Peak

VBW: Refer to plots

Distance: N/A m

### Test Equipment Used

Antenna:                     

Directional Coupler:                     

Pre-Amp:                     

Cable #1: 1045

Filter:                     

Cable #2:                     

Receiver: 1036

Cable #3:                     

Attenuator #1: 1473

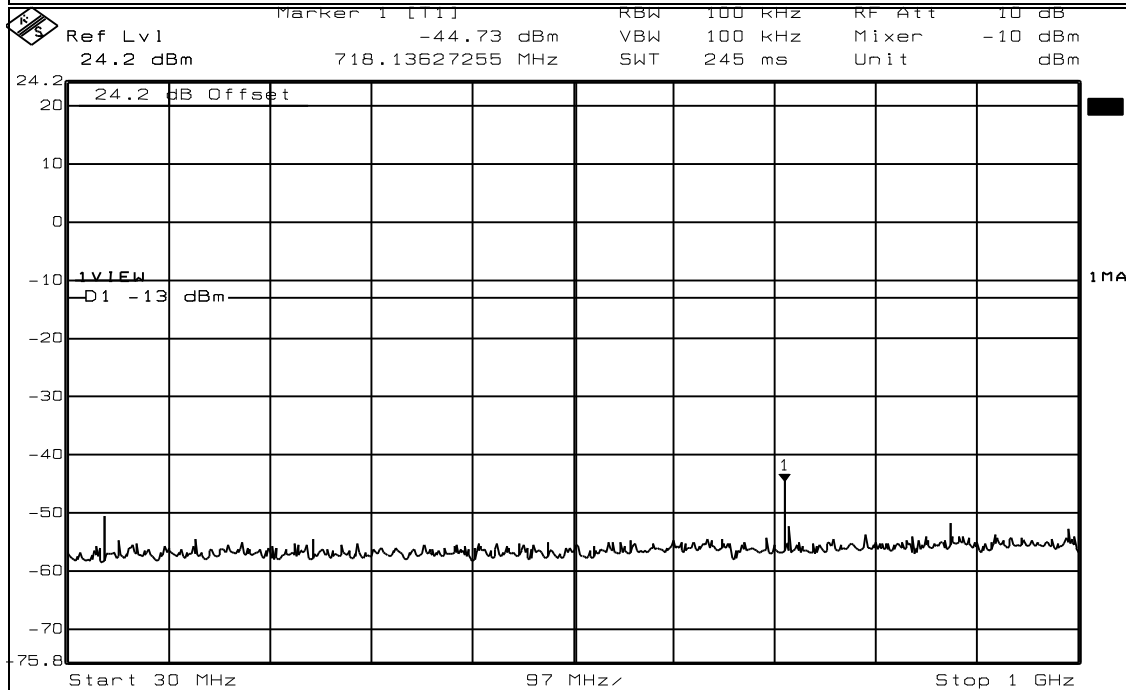
Cable #4:                     

Attenuator #2:                     

Mixer:                     

Additional equipment used:                     

Measurement Uncertainty: +/-1.7 dB



Date: 30.AUG.2001 10:13:58

Notes: Transmit full power at channel 600

EQUIPMENT: GPC-2100

FCC ID: PL5GPC-2100

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## Data Plot

Page 1 of 2

## Bandedges

Job No.: 1L0456R

Date: 8/30/01

Complete X

Preliminary \_\_\_\_\_

Specification: Part 24

Temperature(°C): 22

Tested By: David Light

Relative Humidity(%) 50

E.U.T.: PCS PCMCIA Modem

Configuration: Installed in laptop per typical configuration

Sample Number: 9

Location: Lab 1

RBW: Refer to plots

Measurement

Detector Type: Peak

VBW: Refer to plots

Distance: N/A m

## Test Equipment Used

Antenna: \_\_\_\_\_

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

Pre-Amp: \_\_\_\_\_

Cable #1: 1045

Filter: \_\_\_\_\_

Cable #2: \_\_\_\_\_

Receiver: 1036

Cable #3: \_\_\_\_\_

Attenuator #1: 1473

Cable #4: \_\_\_\_\_

Attenuator #2: \_\_\_\_\_

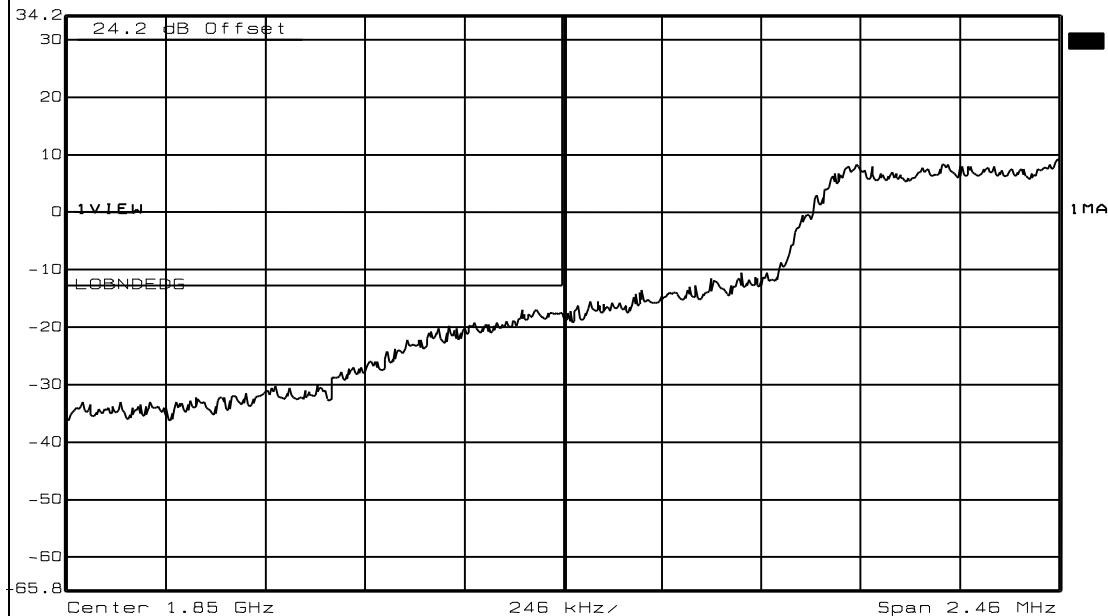
Mixer: \_\_\_\_\_

Additional equipment used: \_\_\_\_\_

Measurement Uncertainty: +/-1.7 dB

Ref Lvl  
34.2 dBm

RBW 30 kHz RF Att 20 dB  
VBW 30 kHz Mixer -10 dBm  
SWT 7 ms Unit dBm



Date: 30.AUG.2001 9:27:37

Notes: Lower bandedge  
Channel 25



## Dallas Headquarters:

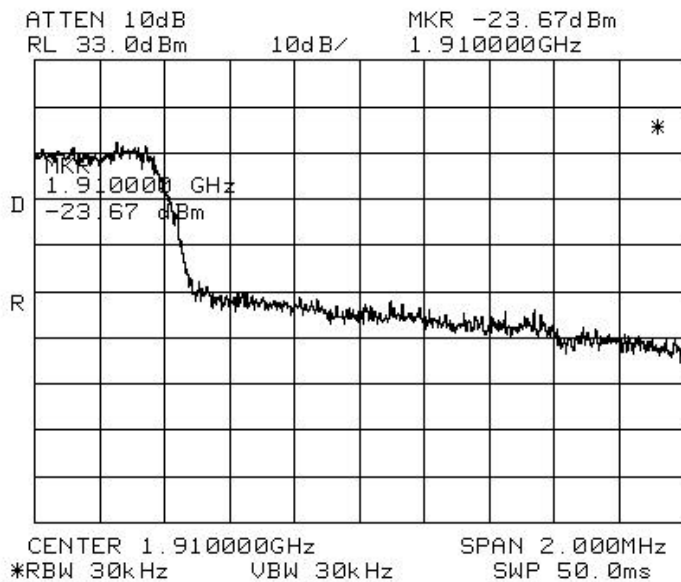
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**Data Plot Bandedges**

Page 2 of 2

Job No.: 1L0456R Date: 8/30/01  
Specification: Part 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS PCMCIA Modem  
Configuration: Installed in laptop per typical configuration



Notes: Upper bandedge  
Channel 1175



## Dallas Headquarters:

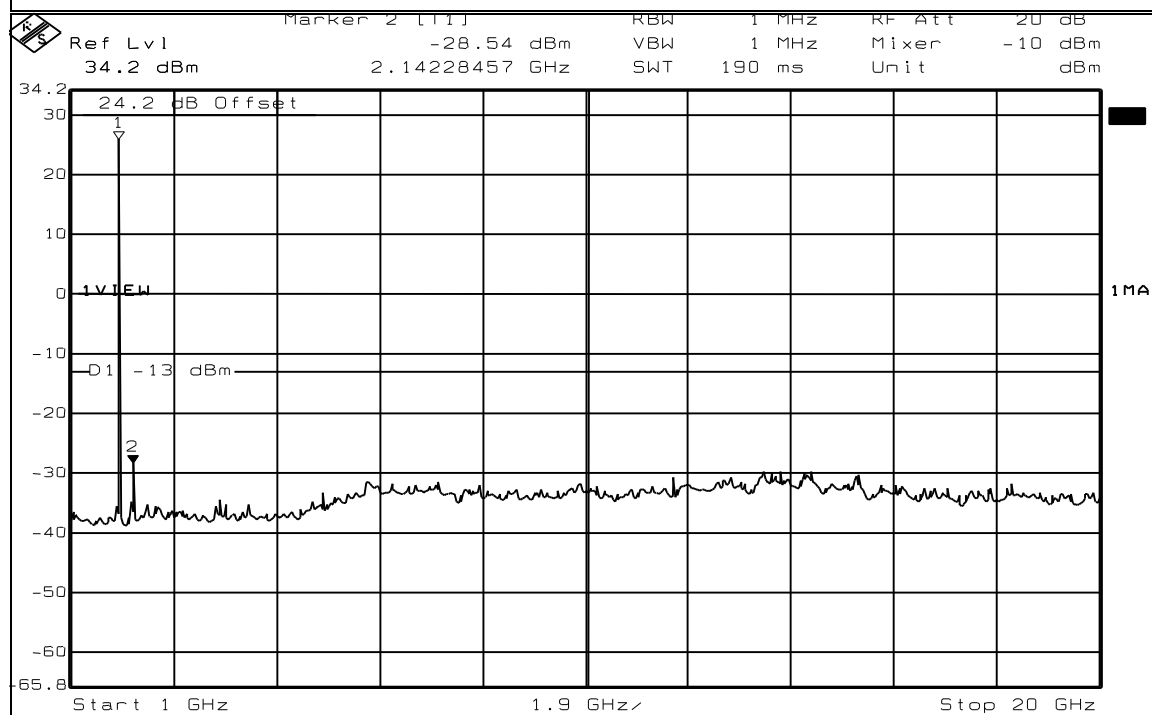
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**Data Plot Spurious Emissions at Antenna Terminal**

Page 2 of 2

Job No.: 1L0456R Date: 8/30/01  
Specification: Part 24 Temperature(°C): 22  
Tested By: David Light Relative Humidity(%) 50  
E.U.T.: PCS PCMCIA Modem  
Configuration: Installed in laptop per typical installation



Date: 30.AUG.2001 10:16:08

Notes: Transmit full power at channel 600  
Marker 1 indicates carrier  
Marker 2 indicates highest emission



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FCC PART 24, SUBPART E

BROADBAND PCS SUBSCRIBER STATION

*EQUIPMENT:* GPC-2100

*FCC ID:* PL5GPC-2100

PROJECT NO.:

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## **Section 6. Field Strength of Spurious**

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY:	DATE:

**Test Results:**

Complies.

**Test Data:**

See attached table.

EQUIPMENT: GPC-2100

FCC ID: PL5GPC-2100

PROJECT NO.:

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## Test Data - Radiated Emissions



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## Field Strength of Spurious Emissions

Page 1 of 1

Job No.: 1L0456 Date: 9/4/01 Complete X  
Preliminary \_\_\_\_\_

Specification: Temperature(°C): 22  
Tested By: Lance Walker Relative Humidity(%) 50

E.U.T.: WIRELESS MODEM

Configuration: TX AT CH 600

Sample No: S09

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: 1484  
Filter: 1481 Cable #2: 1485  
Receiver: 1464 Cable #3: 1043  
Attenuator #1: 1472 Cable #4: \_\_\_\_\_  
Attenuator #2: \_\_\_\_\_ Mixer: \_\_\_\_\_

Additional equipment used: \_\_\_\_\_

Measurement Uncertainty: +/-3.6 dB

Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)	Attn. (dB)	Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	Limit (dBm)	ERP (dBm)	ERP (mW)	Polarity	Comments
3760	-55.0	34.3	20	33.7	8.0	-13	-26.4	0.002307	H	Noise floor
5640	-56.0	36.0	20	33.5	9.1	-13	-24.4	0.003597	H	Noise floor
7520	-54.8	39.8	20	33	9.4	-13	-18.6	0.013868	H	Noise floor
9400	-54.8	41.4	20	35.7	10.1	-13	-19.1	0.012417	H	Noise floor
11280	-54.6	44.4	20	35.8	11.1	-13	-14.9	0.032211	H	Noise floor
13160	-62.1	47.5	20	34.5	11.2	-13	-18.0	0.015885	H	Noise floor
15040	-61.8	47.1	20	32.7	11.4	-13	-16.0	0.024889	H	Noise floor
16920	-61.1	46.1	20	32.7	13.0	-13	-14.6	0.034356	H	Noise floor
3760	-55.0	40.4	20	33.7	8.0	-13	-20.3	0.009290	V	Noise floor
5640	-56.0	38.5	20	33.5	9.1	-13	-21.9	0.006397	V	Noise floor
7520	-54.8	40.4	20	33	9.4	-13	-17.9	0.016069	V	Noise floor
9400	-54.8	39.3	20	35.7	10.1	-13	-21.2	0.007621	V	Noise floor
11280	-54.6	42.0	20	35.8	11.1	-13	-17.4	0.018365	V	Noise floor
13160	-62.1	44.8	20	34.5	11.2	-13	-20.6	0.008670	V	Noise floor
15040	-61.8	46.5	20	32.7	11.4	-13	-16.6	0.021777	V	Noise floor
16920	-61.1	44.3	20	32.7	13.0	-13	-36.5	0.000226	V	Noise floor
1880	-15.0	29.9	0	0	6.4		21.2	131.825674	V	Fundamental Reading
1880	-21.3	32.7	0	0	6.4		17.7	59.429216	H	Fundamental Reading

Notes:

## Photographs of Test Setup

### FRONT VIEW



### REAR VIEW



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FCC PART 24, SUBPART E

BROADBAND PCS SUBSCRIBER STATION

*EQUIPMENT:* GPC-2100

*FCC ID:* PL5GPC-2100

PROJECT NO.:

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## Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 24.235
TESTED BY: David Light	DATE:9/4/01

**Test Results:**

Complies.

**Measurement Data:**

Standard Test Frequency: 1880 MHz

Standard Test Voltage: 3.8 Vdc

## Test Data –Frequency Stability



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Fax: (972) 436-2667

## Frequency Stability

Client: GtranW.O.# 1L0456REUT: PCS PCMCIA modemS/N: S09Date: 9/4/01Tech: Walker

Test Equipment used:

Temperature	Voltage	Frequency Error (Hz)
20 °C	3.8 Vdc	1250
20 °C	4.4 Vdc	1230
20 °C	3.2 Vdc	1230
10 °C	3.8 Vdc	480
0 °C	3.8 Vdc	350
-10 °C	3.8 Vdc	20
-20 °C	3.8 Vdc	360
30 °C	3.8 Vdc	130
40 °C	3.8 Vdc	1570
50 °C	3.8 Vdc	1100
-30 °C	3.8 Vdc	Device ceased operation at -24°C
-24 °C	3.8 Vdc	342

Data taken 12/21-01

Data taken 12/21-01

## BROADBAND PCS SUBSCRIBER STATION

EQUIPMENT: GPC-2100

FCC ID: PL5GPC-2100

PROJECT NO.:

1L0456RUS1

## Section 8.

## Test Equipment List

ASSET	Description	Manufacturer Model Number	Serial Number	Cal. Date
925	Duel tracking DC power supply	Topward 6306D	0	01/00/00
1171	Frequency counter	Hewlett Packard 5340A	1724A04663	09/07/00
1043	Flexible cable 1m	Astrolab Inc. 32027-2-29094K-1M	0	01/29/01
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/01/01
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	06/01/01
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	09/17/01
1473	20db Attenuator DC 18 Ghz	Midwest Microwave 290-20db	NONE	CBU
1483	Cable 4m	Storm PR90-010-144	N/A	06/04/01
1481	Microwave Highpass Filter	K & L 3DH1-2000/T8000-0/0	4	Cal B4 Use
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU
993	Horn antenna	A.H. Systems SAS-200/571	XXX	07/16/99
283	ENVIROMENTAL CHAMBER	ENVIROTRONICS SH27	129010083	05/02/01

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FCC PART 24, SUBPART E

BROADBAND PCS SUBSCRIBER STATION

*EQUIPMENT:* GPC-2100

*FCC ID:* PL5GPC-2100

PROJECT NO.:

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## **ANNEX A - TEST METHODOLOGIES**

*EQUIPMENT:* GPC-2100*FCC ID:* PL5GPC-2100

PROJECT NO.:

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**NAME OF TEST: RF Power Output****PARA. NO.: 2.985**

**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:**

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation  $GP/4\pi R^2 = E^2/120\pi$  and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator



*EQUIPMENT:* GPC-2100*FCC ID:* PL5GPC-2100

PROJECT NO.: 1L0456RUS1

**NAME OF TEST: Occupied Bandwidth****PARA. NO.: 2.989**

**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:* GPC-2100*FCC ID:* PL5GPC-2100

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**NAME OF TEST: Spurious Emission at Antenna Terminals      PARA. NO.: 2.991**

**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 (&gt; 1 MHz from Band Edge)

RBW: 20 kHz (&lt; 1MHz from Band Edge)

VBW:  $\geq$  RBW

Sweep: Auto

Video Avg: 6 Sweeps

GSM Per ANSI/J-STD-007

RBW: 1 MHz (&gt; 1 MHz from Band Edge)

RBW: 3 kHz (&lt; 1 MHz from Band Edge)

VBW:  $\geq$  RBW

Sweep: Auto

Video Avg: Disabled

NADC Per IS-136

RBW: 1 MHz (&gt; 1 MHz from Band Edge)

RBW: 1 kHz (&lt; 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.

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FCC PART 24, SUBPART E

BROADBAND PCS SUBSCRIBER STATION

*EQUIPMENT:* GPC-2100

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PROJECT NO.:

1L0456RUS1

**NAME OF TEST: Field Strength of Spurious Radiation**

**PARA. NO.: 2.993**

**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.: 2.995**

**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.

**Nemko Dallas**

FCC PART 24, SUBPART E

BROADBAND PCS SUBSCRIBER STATION

*EQUIPMENT:* GPC-2100

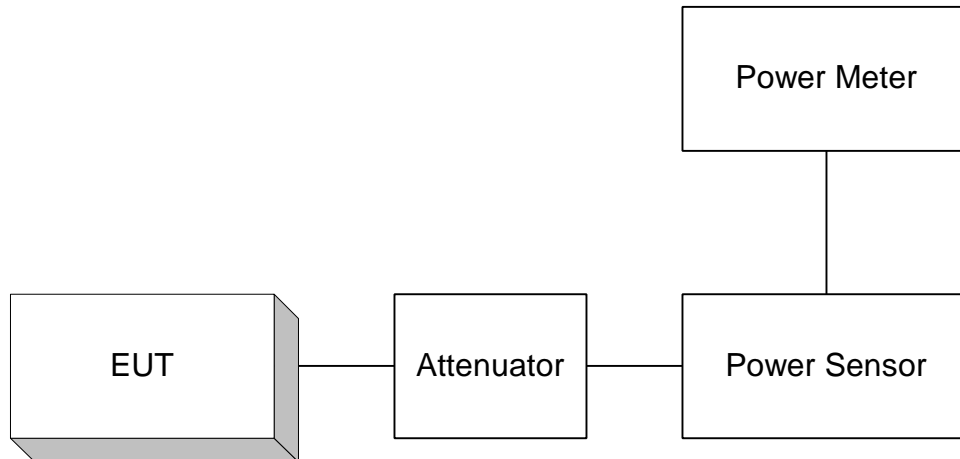
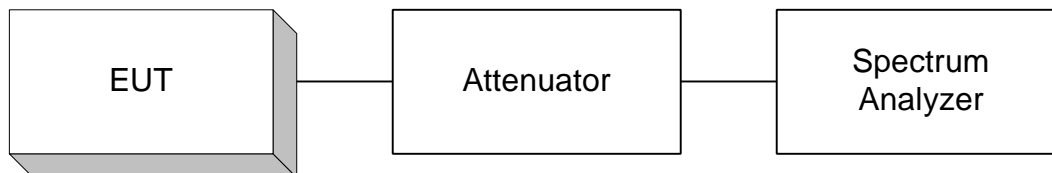
*FCC ID:* PL5GPC-2100

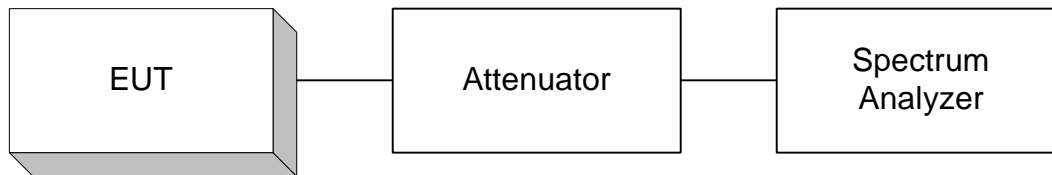
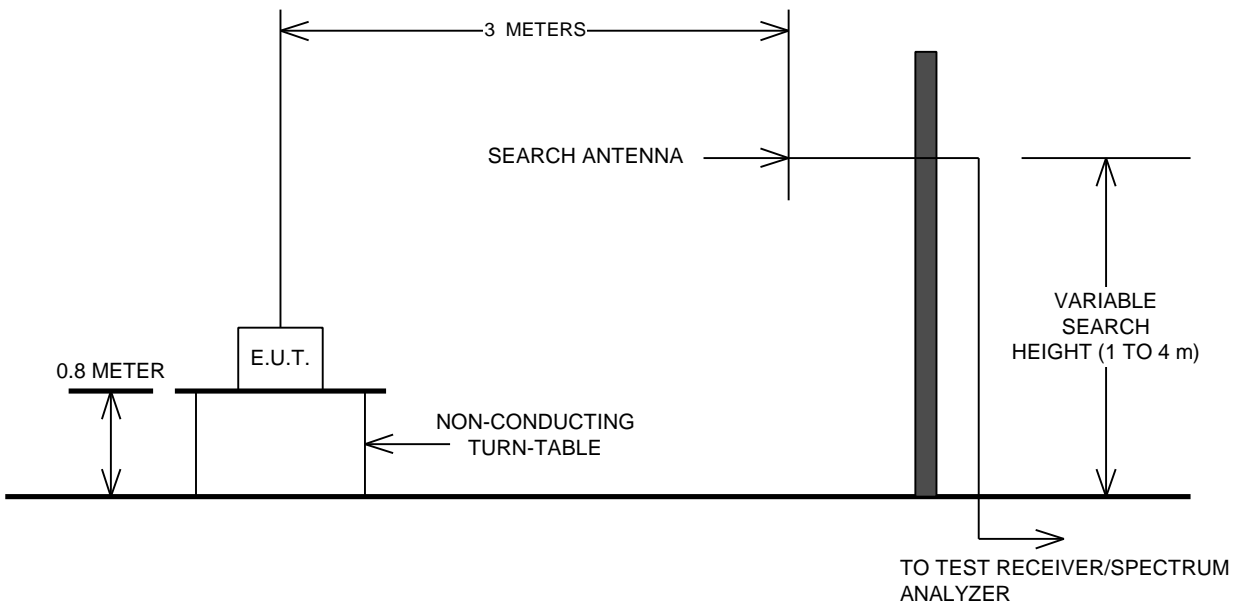
PROJECT NO.:

1L0456RUS1

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## **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**

