

Nemko Test Report: 1L0199RUS1

Applicant: GTRAN, Inc.
12071 Tejon St. Suite 450
Westminster, CO 80234

**Equipment Under Test:
(E.U.T.)** GPC-3000

FCC ID: PL5GCP-3000

In Accordance With: **FCC Part 22, Subpart H**
800 MHz Cellular Subscriber Units

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

Authorized By: 

Tom Tidwell, RF Group Manager

Date: 6/7/01

Total Number of Pages: 35

Table of Contents

Section 1. Summary of Test Results 3

Section 2. General Equipment Specification..... 5

Section 3. RF Power Output..... 7

Section 4. Occupied Bandwidth..... 8

Section 5. Spurious Emissions at Antenna Terminals 10

Section 7. Frequency Stability 19

Section 8. Test Equipment List..... 21

ANNEX A - TEST DETAILS 22

ANNEX B - TEST DIAGRAMS 32

Section 1. Summary of Test Results

Manufacturer: GTRAN, Inc.

Model No.: GPC-3000

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 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”.



NVLAP LAB CODE: 100426-0

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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	2.1046	7W ERP	< 7W ERP	Complies
Audio Frequency Response	2.1047	6dB/Octave	N/A	N/A
Audio Low Pass Filter Response	2.1047	Graph	N/A	N/A
Modulation Limiting	2.1047	Graph	N/A	N/A
Occupied Bandwidth (Voice & SAT)	2.1049	Mask	N/A	N/A
Occupies Bandwidth (WB Data & SAT)	2.1049	Mask	N/A	N/A
Occupied Bandwidth (ST)	2.1049	Mask	N/A	N/A
Occupied Bandwidth (SAT)	2.1049	Mask	N/A	N/A
Occupied Bandwidth (Digital)	2.1049	Not Specified	Plot	Complies
Spurious Emissions at Antenna Terminals	2.1051	-13 dBm	< -13 dBm	Complies
Field Strength of Spurious Emissions	2.1053	-13 dBm	< -13 dBm	Complies
Frequency Stability	2.1055	2.5 ppm	< 2.5 ppm	Complies

Footnotes: The device transmits CDMA signals only.

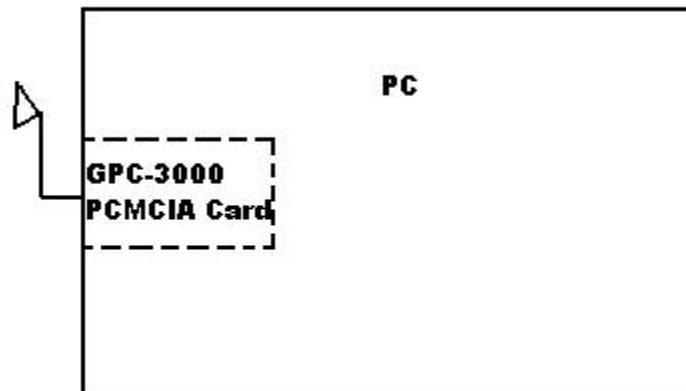
Section 2. General Equipment Specification

Frequency Range:	824.7-848.31 MHz
Necessary Bandwidth:	1.23 MHz
Type of Modulation and Designator:	1M25F9D
Output Impedance:	50 ohms
RF Power Output (rated):	355 mW (25.5 dBm)
Duty Cycle:	Continuous
Channel Spacing:	1.25 MHz
Operator Selection of Frequency:	Software Controlled
Power Output Adjustment Capability:	Software Controlled

Operational Description

GTRAN DotSurfer GPC-3000 PCMCIA Card is high-speed Wireless Modem.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 5/21/2001

Test Results: Complies.

Measurement Data:

Channel	Output Power (dBm)	Rated Power (dBm)
1013	25.5	25.5
384	25.5	25.5
777	25.5	25.5

Equipment Used: 1036-1469-1046

Measurement Uncertainty: 1.7 dB

Temperature: 22 °C

Relative Humidity: 50 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (Digital Modulation)	PARA. NO.: 2.1047
TESTED BY: David Light	DATE:5/22/2001

Test Results: Complies.

Measurement Data: See attached graph.

Equipment Used: 1036-1046-1469

Measurement Uncertainty: 1.7 dB
1 X 10⁻⁷ ppm

Temperature: 22 °C

Relative Humidity: 50 %

Test Data – Occupied Bandwidth – Digital Modulation



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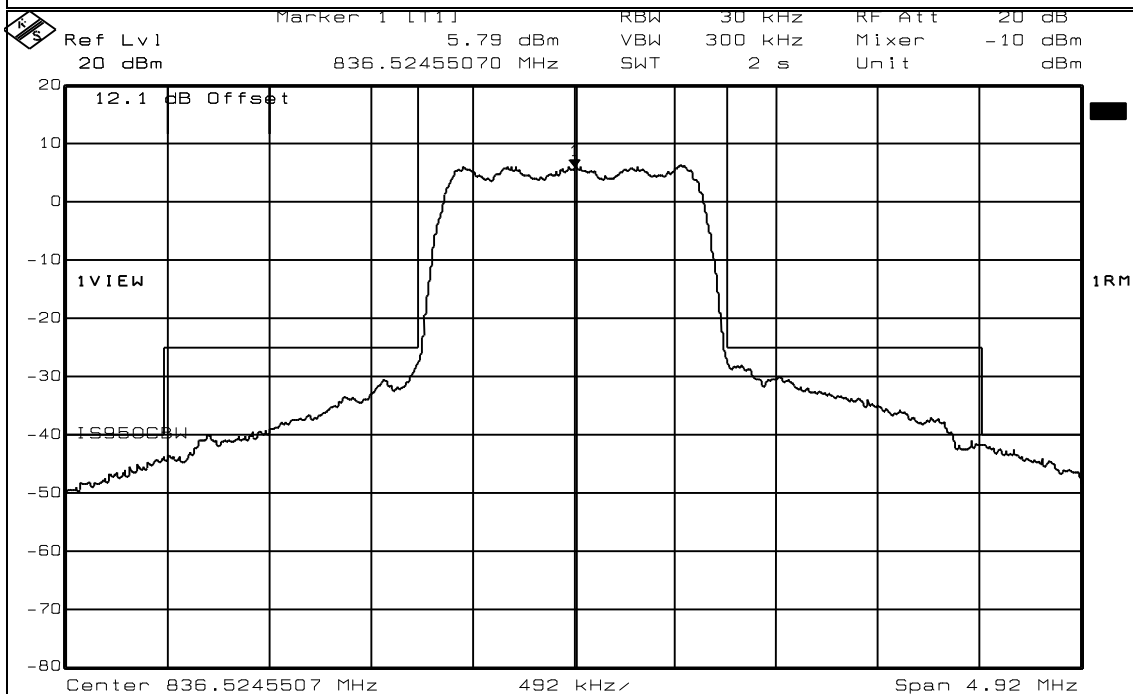
Data Plot

Page 1 of 1

Job No.: 1L0199R Date: 5/22/01 Complete X
Specification: IS-95 Temperature(°C): 22 Preliminary _____
Tested By: David Light Relative Humidity(%) 50
E.U.T.: GPC-3000
Configuration: TRANSMIT FULL POWER
Sample Number: S01
Location: Lab 2 RBW: 30 kHz
Detector Type: Rms VBW: 300 kHz Measurement Distance: N/A m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1046
Filter: _____ Cable #2: _____
Receiver: 1036 Cable #3: _____
Attenuator #1: 1469 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-3.6 dB



Date: 22.MAY.2001 13:17:12

Notes:

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions At Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE:5/21/2001

Test Results: Complies.

Measurement Data: See attached graph.

Equipment Used: 1036-1046-1469

Measurement Uncertainty: 1.7 dB
1 X 10⁻⁷ ppm

Temperature: 22 °C

Relative Humidity: 50 %

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FCC PART 22, SUBPART H
800 MHz CELLULAR SUBSCRIBER
UNITS

EQUIPMENT:GPC-3000

PROJECT NO.: 1L0199RUS1

Test Data – Spurious Emissions at Antenna Terminals



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Data Plot Bandedges

Page 1 of 2

Job No.: 1L0155R Date: 6/26/01
Specification: PART 22 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: GPC-3000 (DOT SURFER)
Configuration: TRANSMIT CDMA MID-BAND

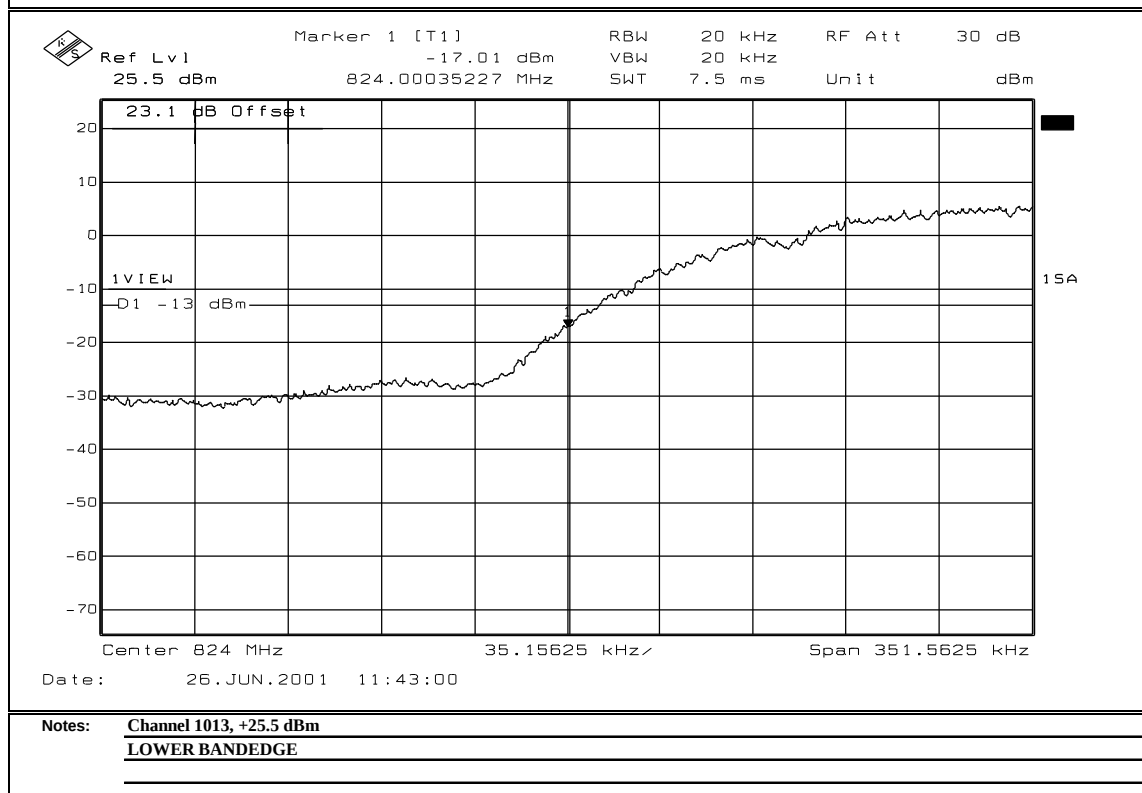
Complete X
Preliminary

Sample Number: S01
Location: Lab 1 RBW: Refer to plots
Detector Type: Peak VBW: Refer to plots

Measurement
Distance: N/A m

Test Equipment Used

Antenna: Directional Coupler:
Pre-Amp: Cable #1: 1046
Filter: Cable #2:
Receiver: 1036 Cable #3:
Attenuator #1: 1469 Cable #4:
Attenuator #2: Mixer:
Additional equipment used:
Measurement Uncertainty: +/-1.7 dB



Test Data – Spurious Emissions at Antenna Terminals



Dallas Headquarters:

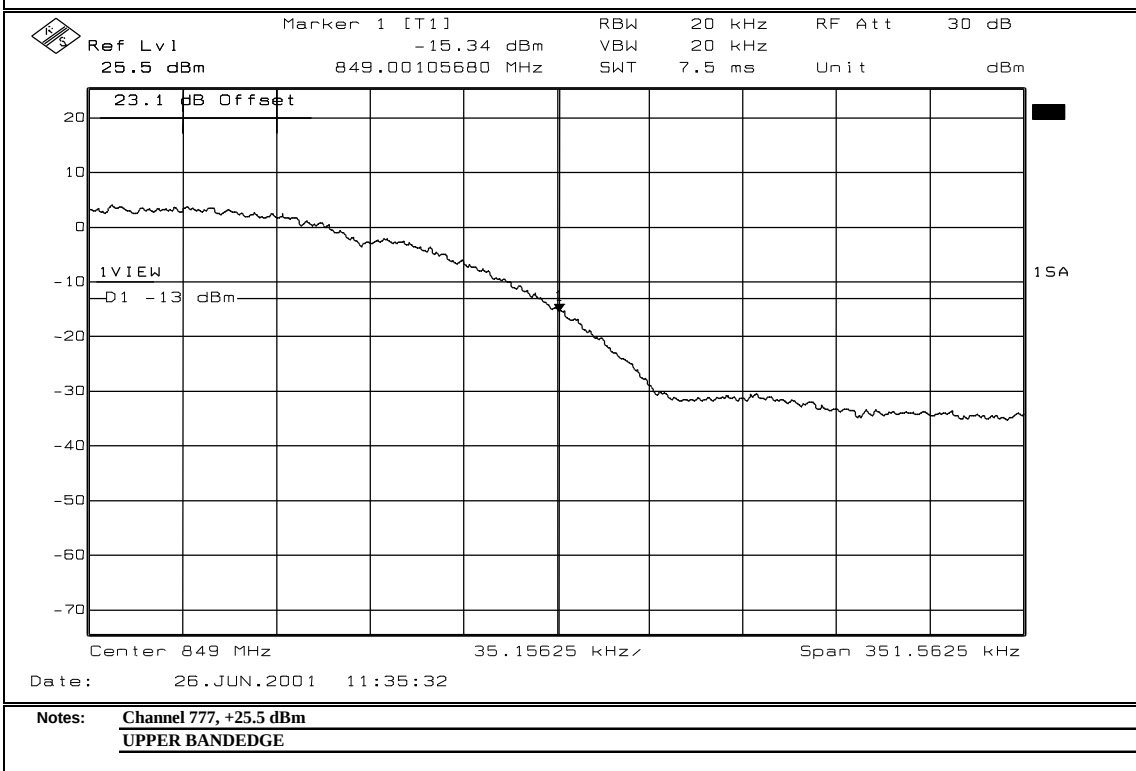
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Data Plot Bandedges

Page 2 of 2

Job No.: 1L0155R Date: 6/26/01
Specification: PART 22 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: GPC-3000 (DOT SURFER)
Configuration: TRANSMIT CDMA MID-BAND



Test Data – Spurious Emissions at Antenna Terminals



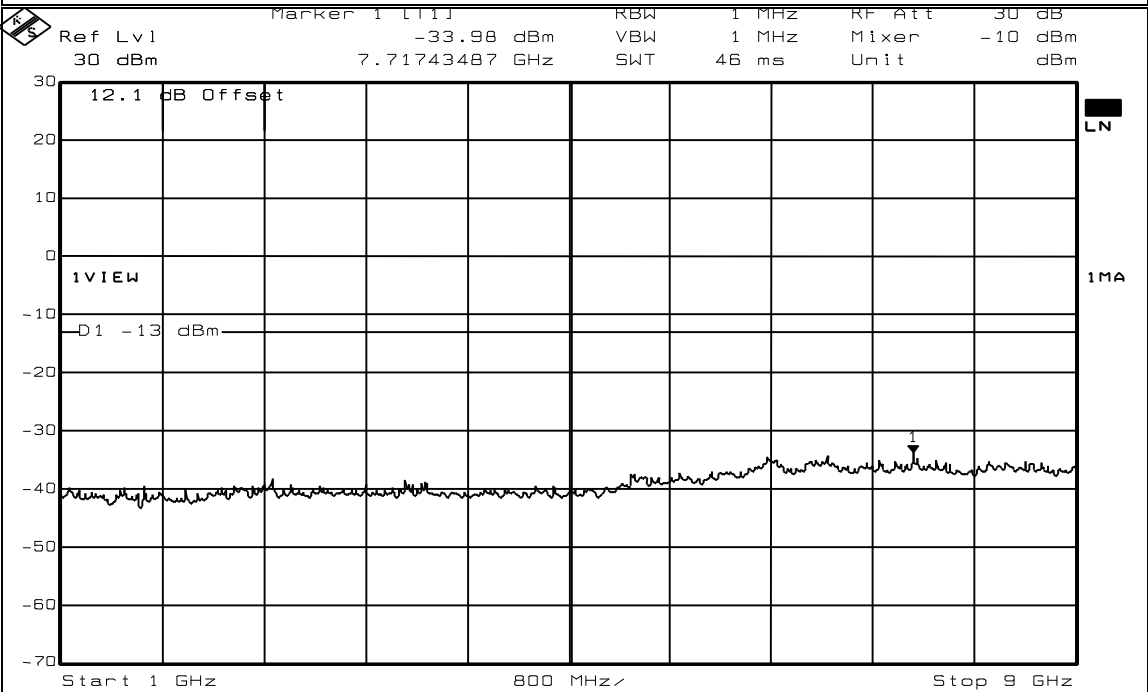
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Data Plot Antenna Port Spurious Emissions

Page 2 of 2

Job No.: 1L0155R Date: 5/21/01
Specification: PART 22 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: GPC-3000 (DOT SURFER)
Configuration: TRANSMIT CDMA MID-BAND



Date: 21.MAY.2001 12:15:22

Notes: TRANSMIT FULL POWER CDMA SIGNAL AT MID-BAND
MARKER INDICATES HIGHEST EMISSION (NOISE FLOOR)

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FCC PART 22, SUBPART H
800 MHz CELLULAR SUBSCRIBER
UNITS

EQUIPMENT:GPC-3000

PROJECT NO.: 1L0199RUS1

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: David Light	DATE:5/22/2001

Test Results: Complies.

Measurement Data: See attached table.

Equipment Used: 1036-1016-1481-1484-1485

Measurement Uncertainty: 1.7 dB

Temperature: 22 °C

Relative Humidity: 50 %

Test Data – Field Strength of Spurious Emissions



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Field Strength of Spurious Emissions										
Page <u>1</u> of <u>1</u>						Complete <u>X</u>				
Job No.:	1L0199R	Date: 5/22/01				Preliminary _____				
Specification:	Part 22	Temperature(°C): <u>22</u>								
Tested By:	David Light	Relative Humidity(%) <u>50</u>								
E.U.T.:	GPC-3000									
Configuration:	Transmit full power									
Sample No:	S01									
Location:	AC 3	RBW: 1 MHz				Measurement				
Detector Type:	Peak	VBW: 1 MHz				Distance: <u>3</u> m				
Test Equipment Used										
Antenna:		Directional Coupler:								
Pre-Amp:	1016	Cable #1:				1484				
Filter:	1481	Cable #2:				1485				
Receiver:	1036	Cable #3:								
Attenuator #1:		Cable #4:								
Attenuator #2:		Mixer:								
Additional equipment used: _____										
Measurement Uncertainty: <u>+/-3.6 dB</u>										
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	Limit (dBm)	ERP (dBm)	ERP (mW)	Polarity	Comments
1673	-69.2	29.9		0	6.4	-13	-33.0	0.000501	V	
2509	-52.0	35.6		33.3	8.0	-13	-41.8	0.000067	V	
3436	-62.8	37.1		33.6	8.1	-13	-51.2	0.000008	V	Noise floor
4183	-57.1	42.8		33.4	7.9	-13	-39.8	0.000105	V	
5019	-65.0	40.6		32.8	9.1	-13	-48.1	0.000015	V	Noise floor
5856	-65.0	38.5		32.5	9.1	-13	-49.9	0.000010	V	Noise floor
6692	-65.0	38.3		32.7	10.1	-13	-49.3	0.000012	V	Noise floor
7529	-66.0	40.4		33	9.4	-13	-49.1	0.000012	V	Noise floor
8365	-66.0	41.6		33.7	9.7	-13	-48.4	0.000015	V	Noise floor
1673	-64.3	32.7		0	6.4	-13	-25.3	0.002979	H	
2509	-57.6	34.6		33.3	8.0	-13	-48.3	0.000015	H	
3436	-62.8	35.8		33.6	8.1	-13	-52.5	0.000006	H	Noise floor
4183	-63.5	35.2		33.4	7.9	-13	-53.8	0.000004	H	Noise floor
5019	-65.0	36.3		32.8	9.1	-13	-52.5	0.000006	H	Noise floor
5856	-65.0	36.0		32.5	9.1	-13	-52.4	0.000006	H	Noise floor
6692	-65.0	37.8		32.7	10.1	-13	-49.7	0.000011	H	Noise floor
7529	-66.0	39.8		33	9.4	-13	-49.8	0.000011	H	Noise floor
8365	-66.0	42.2		33.7	9.7	-13	-47.8	0.000017	H	Noise floor
Notes: Scanned spectrum to the 10th harmonic of carrier frequency										

Photographs of Test Setup

FRONT VIEW



REAR VIEW



Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: David Light	DATE:5/21/2001

Test Results: Complies.

Measurement Data: See attached table.

Standard Test Frequency: 836.52 MHz
Standard Test Voltage: 115 VAC

Equipment Used: 1036-283-1042-1469

Measurement Uncertainty: 1×10^{-7} ppm

Temperature: 22 °C

Relative Humidity: 50 %

Test Data – Frequency Stability



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Frequency Stability

Client: G-TranW.O.# 1L0155REUT: GPC-3000 (Dot Surfer)S/N: NoneDate: 5/21/01Tech: Light

Test Equipment used: 1036-283-1469-1042

Temperature	Voltage	Frequency Error (Hz)	Rho
20 °C	115 VAC	-133	0.9918
20 °C	98 VAC	-237	0.9927
20 °C	132 VAC	-248	0.9926
10 °C	115 VAC	+775	0.9932
0 °C	115 VAC	+531	0.9931
-10 °C	115 VAC	+408	0.9926
-20 °C	115 VAC	+219	0.9907
-30 °C	115 VAC	-107	0.9926
30 °C	115 VAC	-498	0.9911
40 °C	115 VAC	-503	0.9917
50 °C	115 VAC	-453	0.9927
Note - Power to DUT is regulated by Laptop PC			
Maximum frequency deviation = +775 Hz / -503 Hz			

EQUIPMENT:GPC-3000

PROJECT NO.: 1L0199RUS1

Section 8. Test Equipment List

ASSET	Description	Manufacturer Model Number	Serial Number	Cal. Date	Cal. Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	06/14/99	06/14/01
1046	Flex cable 1m	Astrolab Inc. 32022-2-29094K-1M	N/A	01/29/01	01/29/02
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1016	AMPLIFIER	HEWLETT PACKARD 8449A	2749A00159	05/24/00	05/24/01
1481	Microwave Highpass Filter	K & L 3DH1-2000/T8000-0/0	4	Cal B4 Use	N/A
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	05/25/00	05/25/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	05/25/00	05/25/01
283	ENVIROMENTAL CHAMBER	ENVIROTRONICS SH27	129010083	05/02/01	05/02/02
1042	CABLE, 4M	STORM PR90-010-144	N/A	05/23/00	05/23/01

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FCC PART 22, SUBPART H
800 MHz CELLULAR SUBSCRIBER
UNITS

EQUIPMENT:GPC-3000

PROJECT NO.: 1L0199RUS1

ANNEX A - TEST DETAILS

NAME OF TEST: RF Power Output**PARA. NO.: 1.1046****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:

If the antenna is not detachable from the circuit then the Power Output is derived using 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: Audio Frequency Response	PARA. NO.: 2.1047
---	--------------------------

Minimum Standard:

Para. No. 15-19-B. From 300 to 3000 Hz the audio frequency response shall not vary more than +1 to -3 dB from a true 6dB octave pre-emphasis characteristic as referred to 1000 Hz level (with the exception of a permissible 6dB per octave roll-off from 2500 to 3000 Hz).

Method Of Measurement:

Operate the transmitter with the compressor disabled, and monitor the output with a frequency deviation meter or standard test receiver without standard 750-microsecond de-emphasis, with expander disabled, and without C-message weighted filter (see 6.6.2). Apply a sine wave audio input to the transmitter external audio input port, vary the modulating frequency from 300 to 3000 Hz and observe the input levels necessary to maintain a constant ± 2.9 kHz system deviation.

NAME OF TEST: Audio Low Pass Filter Response	PARA. NO.: 2.1047
---	--------------------------

Minimum Standard:

Para. No. 22.915 (d). For mobile stations, signals must be attenuated as a function of frequency as follows:

- i. In the frequency ranges 3.0 to 5.9 Hz and 6.1 to 15 kHz, 40 log (f/3) dB.
- ii. In the frequency range 5.9 to 6.1 kHz, 35 dB
- iii. In the frequency range above 15 kHz, 28 dB.

Method Of Measurement:

Adjust the audio input frequency to 1000 Hz and adjust the input level to 20 dB greater than that required to produce ± 8 kHz deviation. Note the output level on the frequency deviation meter or standard test receiver. Using the output level as reference (0dB), vary the modulating frequency from 3000 Hz to 30,000 Hz and observe the change in output while maintaining a constant audio input level.

NAME OF TEST: Modulation Limiting	PARA. NO.: 2.1047
--	--------------------------

Minimum Standard: Para. No. 22.915(b)

The levels of the modulating signals must be set to the values specified below and must be maintained within $\pm 10\%$ of these values.

Voice: ± 12 kHz

SAT: ± 2 kHz

Wideband Data: ± 8 kHz

ST: ± 8 kHz

Method Of Measurement:

Voice: A 1 kHz audio tone is injected at levels between -45 and +20 dBVrms. The peak deviation is noted. This is repeated with a 300 Hz tone and a 3 kHz tone.

SAT: A SAT tone is generated by the mobile station and the peak deviation is measured.

Wideband Data: Wideband data is generated by the mobile station and the peak deviation is measured.

ST: ST data is generated by the mobile station and the peak deviation is measured.

NAME OF TEST: Occupied Bandwidth (Voice & SAT)	PARA. NO.: 2.1049
---	--------------------------

Minimum Standard: 22.917(b) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

- (i) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz: at least 26 dB
- (ii) On any frequency removed from the carrier frequency by more than 45 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz
VBW: $\geq$ RBW
Span: 100 kHz
Sweep: Auto
Mask: CELLF3E

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.

NAME OF TEST: Occupied Bandwidth (WBD & SAT)	PARA. NO.: 2.1049
---	--------------------------

Minimum Standard: 22.917(d) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: $\geq$ RBW

Span: 200 kHz

Sweep: Auto

Mask: CELLF1D

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

10 kbps WBD + DAT

ST

EQUIPMENT:GPC-3000

PROJECT NO.: 1L0199RUS1

NAME OF TEST: Spurious Emission at Antenna Terminals	PARA. NO.: 2.1051
---	--------------------------

Minimum Standard:

Para. No. 22.917(b). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 30 kHz (AMPS). As required for digital modulations.

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(b). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

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. 22.355. The transmitter carrier frequency shall remain 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.

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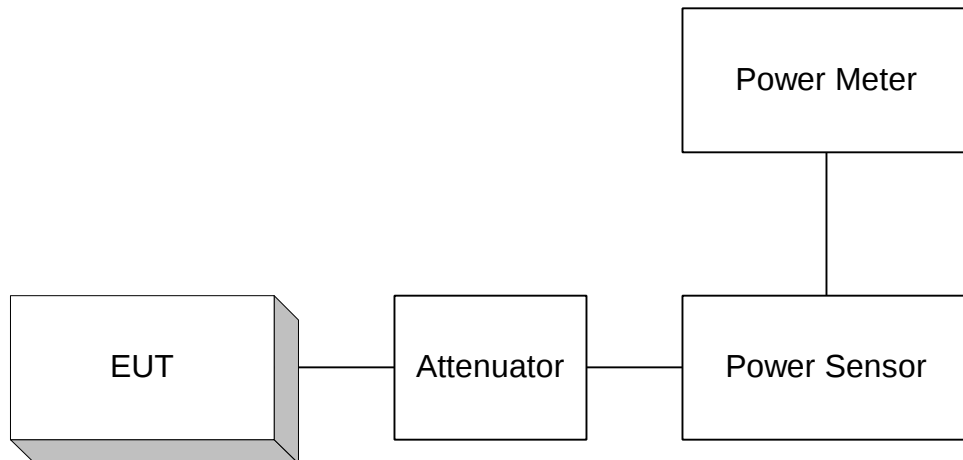
FCC PART 22, SUBPART H
800 MHz CELLULAR SUBSCRIBER
UNITS

EQUIPMENT:GPC-3000

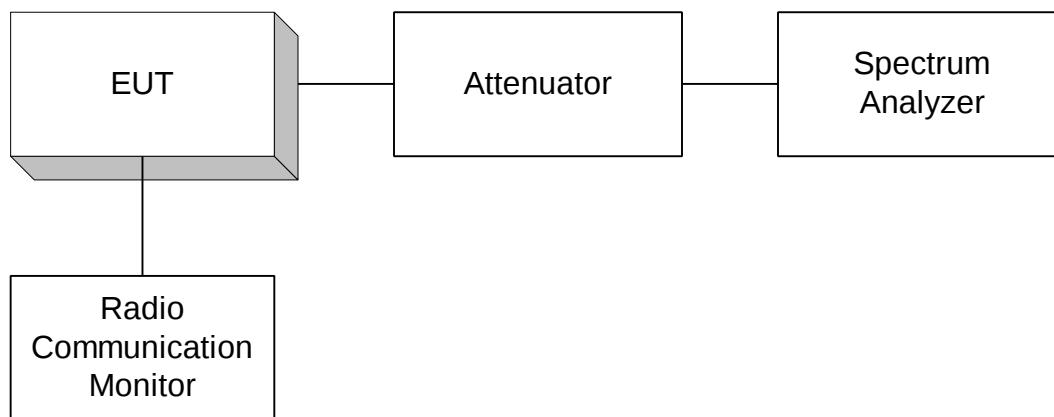
PROJECT NO.: 1L0199RUS1

ANNEX B - TEST DIAGRAMS

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

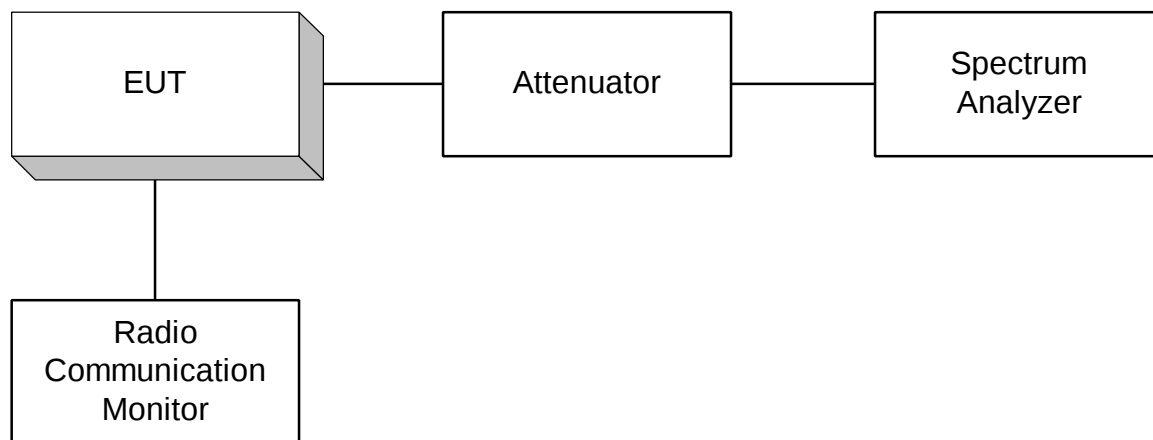


Para. No. 2.1049 - Occupied Bandwidth



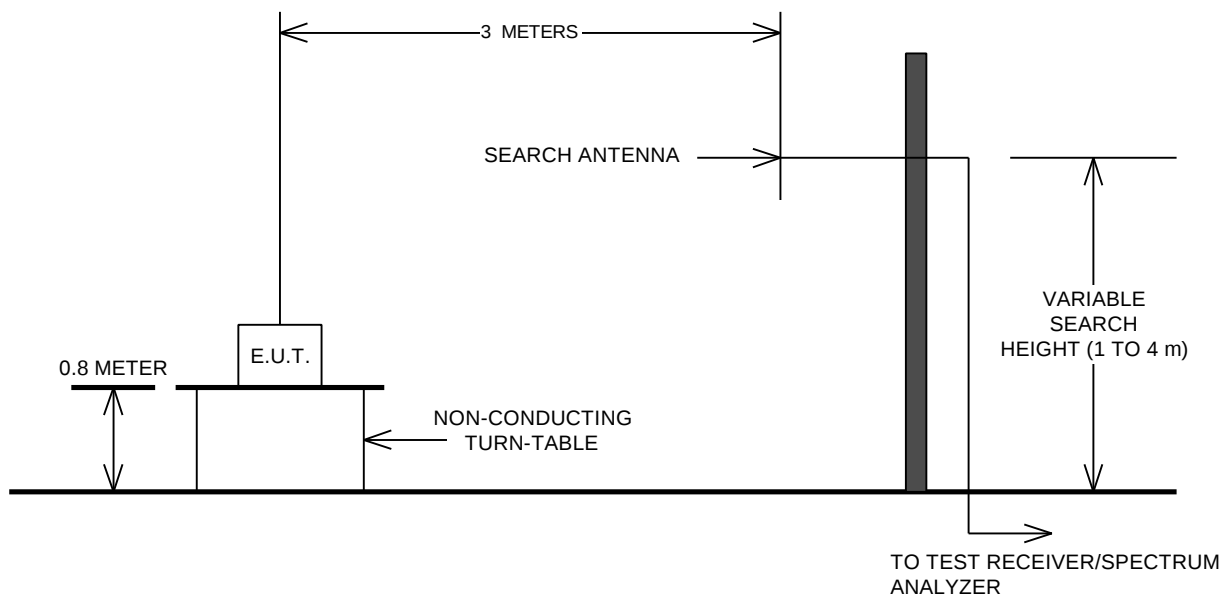
The Radio Communication Monitor is used only to provide modulation input for external modulation.

Para. No. 2.1051 Spurious Emissions at Antenna Terminals

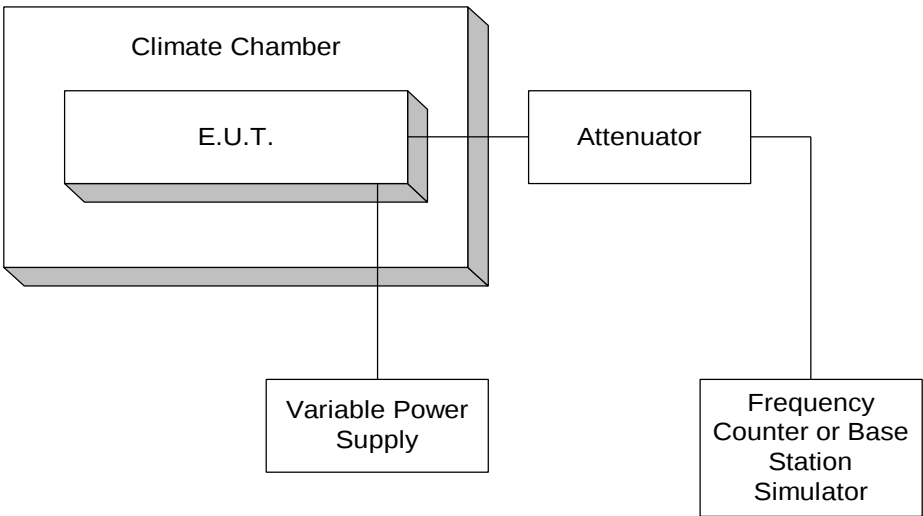


The Radio Communication Monitor is used only to provide modulation input for external modulation.

Para. No. 2.1053 - Field Strength of Spurious Radiation



Para. No. 2.1055 - Frequency Stability



Para. No. 2.1045 – Audio Frequency Response, Audio Low Pass Filter Response
And Modulation Limiting

