| | |
|---|---|
| **Nemko Test Report No.:** | **1L0270RUS1** |
| **Applicant:** | **GRAYSON WIRELESS**<br>140 Vista Center Drive<br>Forest, Virginia 24551 |
| **Equipment Under Test:** | **GWMT 1920** |
| **In Accordance With:** | **FCC Part 24, Subpart E**<br>Broadband PCS Base Station Transmitter |
| **Tested By:** | Nemko Dallas Inc.<br>802 N. Kealy<br>Lewisville, Texas 75057-3136 |
| **Authorized By:** |  <br>Tom Tidwell, RF Group Manager |
| **Date:** | 7/16/01 |
| **Total Number of Pages:** | 39 |

## Table of Contents

## Section 1. Summary of Test Results

Manufacturer: GRAYSON WIRELESS

Model No.: Model GWMT 1920

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.
See " Summary of Test Data".

**NVLAP LAB CODE: 100351-0**

## Summary Of Test Data

| NAME OF TEST | PARA. NO. | SPEC. | MEAS. | RESULT |
|---|---|---|---|---|
| RF Power Output | 24.232 | 100W | < 100W | Complies |
| Occupied Bandwidth (CDMA) | 24.238 | MASK | N/A | N/A |
| Occupied Bandwidth (GSM) | 24.238 | MASK | N/A | N/A |
| Occupied Bandwidth (NADC) | 24.238 | MASK | N/A | N/A |
| Occupied Bandwidth (CW) | 24.238 | Not Specified | Plot | Complies |
| Spurious Emissions at Antenna Terminals | 24.238(a) | -13 dBm | < -13 dBm | Complies |
| Field Strength of Spurious Emissions | 24.238(a) | -13 dBm E.I.R.P. | < -13 dBm | Complies |
| Frequency Stability | 24.235 | Must stay within frequency block | Stays within frequency block | Complies |

**Footnotes For N/A's:**

The device transmits CW carriers only.

**Measurement uncertainty is expressed to a confidence level of 95%.**

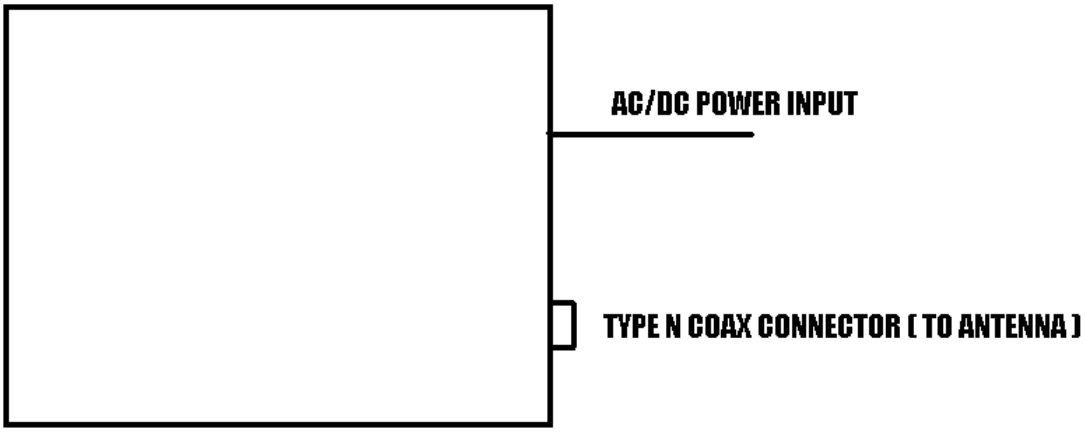
## Section 2. General Equipment Specification

| | | |
|---|---|---|
| **Supply Voltage Input:** | | 115 VAC |
| **Frequency Bands:** | **TX** | ☒ Block A : 1930 – 1945 MHz<br>☒ Block D : 1945 – 1950 MHz<br>☒ Block B : 1950 – 1965 MHz<br>☒ Block E : 1965 – 1970 MHz<br>☒ Block F : 1970 – 1975 MHz<br>☒ Block C : 1975 – 1990 MHz |
| **Frequency Bands:** | **RX** | ☒ Block A : 1850 – 1865 MHz<br>☒ Block B : 1865 – 1870 MHz<br>☒ Block C : 1870 – 1885 MHz<br>☒ Block D : 1885 – 1890 MHz<br>☒ Block E : 1890 – 1895 MHz<br>☒ Block F : 1895 – 1910 MHz |
| **Footnote** | | The transmitter operates in the entire band of 1850-1890 MHz. Manufacture prohibits operation in the unlicensed band of 1910-1930 MHz. |
| | | **CW (NON)** ☒ **CDMA (1M25G7W)** ☐ **GSM (200KGXW)** ☐ **NADC (40K0DXW)** ☐ |
| **Maximum No. of Carriers:** | | 1 |
| **Output Impedance:** | | 50 ohms |
| | | Per channel: 20 W<br>Total: 20 W |
| | | **Software** ☐ **Duplexer** ☐ **Fullband** ☒ |

## System Description

The GWMT 1920 is a self-contained CW transmitter operating in the PCS band.

## System Diagram



## Section 3. RF Power Output

| NAME OF TEST: RF Power Output | PARA. NO.: 2.1046 |
|---|---|
| TESTED BY: Chinda Poy | DATE: 6/21/01 |

**Test Results:** Complies.

**Measurement Data:**

| Frequency (MHz) | Supply Voltage | Output Power (dBm) | Rated Power (dBm) | Measured / Rated (dBm) |
|---|---|---|---|---|
| 1880 | 115 VAC (Nominal) | 42.7 | 43 | 0.99/1 |
| 1960 | 115 VAC (Nominal) | 42.9 | 43 | 0.99/1 |
| 1880 | 98 VAC | 42.7 | 43 | 0.99/1 |
| 1960 | 98VAC | 42.9 | 43 | 0.99/1 |
| 1880 | 132 VAC | 42.7 | 43 | 0.99/1 |
| 1960 | 132 VAC | 42.9 | 43 | 0.99/1 |
| 1880 | 13 VDC | 42.6 | 43 | 0.99/1 |
| 1960 | 13 VDC | 42.9 | 43 | 0.99/1 |
| 1880 | 11 VDC | Stopped Operation | 43 | N/A |
| 1960 | 11 VDC | Stopped Operation | 43 | N/A |
| 1880 | 15 VDC | 42.6 | 43 | 0.99/1 |
| 1960 | 15 VDC | 42.9 | 43 | 0.99/1 |

**Equipment Used:** 1604-1065-1046-1036

**Measurement Uncertainty:** +/- 1.7 dB

**Temperature:** 22 °C

**Relative Humidity:** 50 %

## Section 4. Occupied Bandwidth

| NAME OF TEST: Occupied Bandwidth (CDMA) | PARA. NO.: 2.1049 |
|---|---|
| TESTED BY: | DATE: |

Not Applicable

**Test Results:** Complies.

**Test Data:** See attached data.

**Equipment used:**

**Measurement Uncertainty:** +/- 1.6 dB

**Temperature:** °C

**Relative Humidity:** %

| NAME OF TEST: Occupied Bandwidth (GSM) | PARA. NO.: 2.1049 |
|---|---|
| TESTED BY: | DATE: |

**Test Results:** Complies.

**Test Data:** See attached plots

**Equipment Used:**

Not Applicable

**Measurement Uncertainty:** +/- 1.6 dB

**Temperature:** °C

**Relative Humidity:** %

| NAME OF TEST: Occupied Bandwidth (NADC) | PARA. NO.: 2.1049 |
|---|---|
| TESTED BY: | DATE: |

**Test Results:** Complies.

**Test Data:** See attached plots.

**Equipment used:**

Not Applicable

**Measurement Uncertainty:** +/- 1.6 dB

**Temperature:** °C

**Relative Humidity:** %

| NAME OF TEST: Occupied Bandwidth (CW) | PARA. NO.: 2.1049 |
|---|---|
| TESTED BY: Chinda Poy | DATE: 6/21/01 |

**Test Results:** Complies.

**Measurement Data:** See attached graph.

**Equipment Used:** 1483-1065-1064-1036

**Measurement Uncertainty:** +/- 1.7 dB

**Temperature:** 25 °C

**Relative Humidity:** 38 %

## Test Data – Occupied Bandwidth (CW)

**Data Plot** **OCCUPIED BANDWIDTH (CW)**

Page 1 of 2 — Complete X

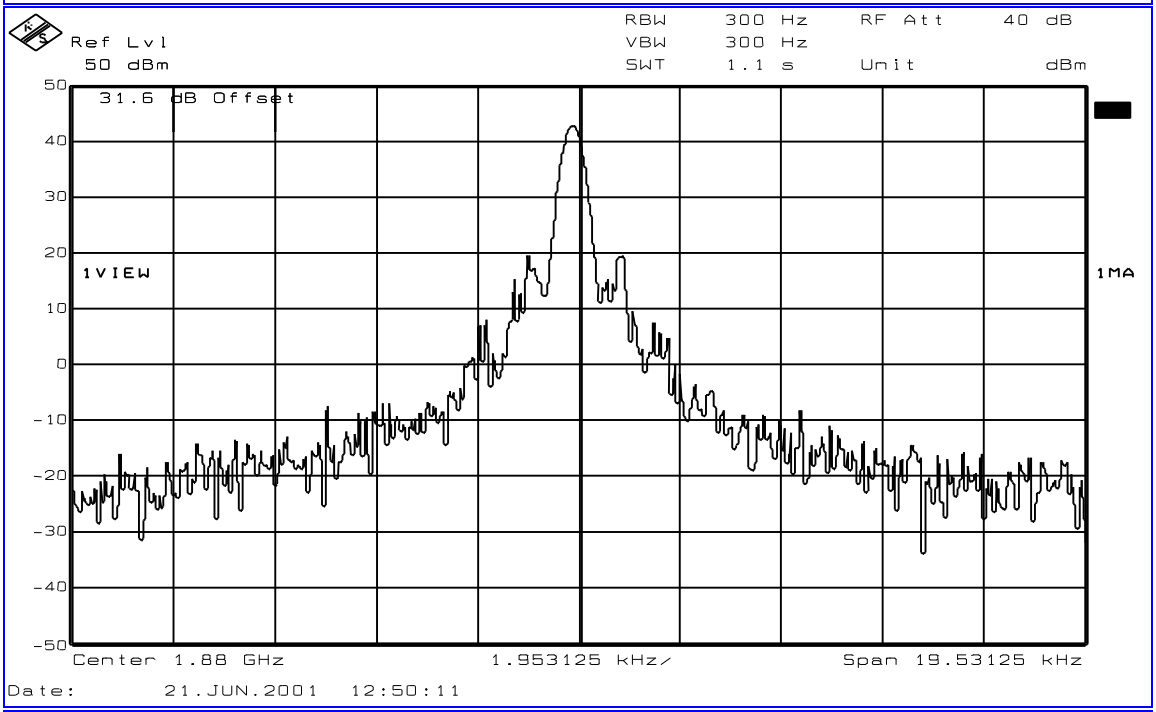
| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: 6/21/01 | Preliminary |
| Specification: | Part 24 | Temperature(°C): 25 | |
| Tested By: | Chinda Poy | Relative Humidity(%) 38 | |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |
| Sample Number: | | | |
| Location: | Lab 1 | RBW: Refer to plots | |
| Detector Type: | Peak | VBW: Refer to plots | |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1483 |
| Filter: | | Cable #2: | |
| Receiver: | 1036 | Cable #3: | |
| Attenuator #1 | 1065 | Cable #4: | |
| Attenuator #2: | 1064 | Mixer: | |

Additional equipment used:

Measurement Uncertainty: +/-3.6 dB



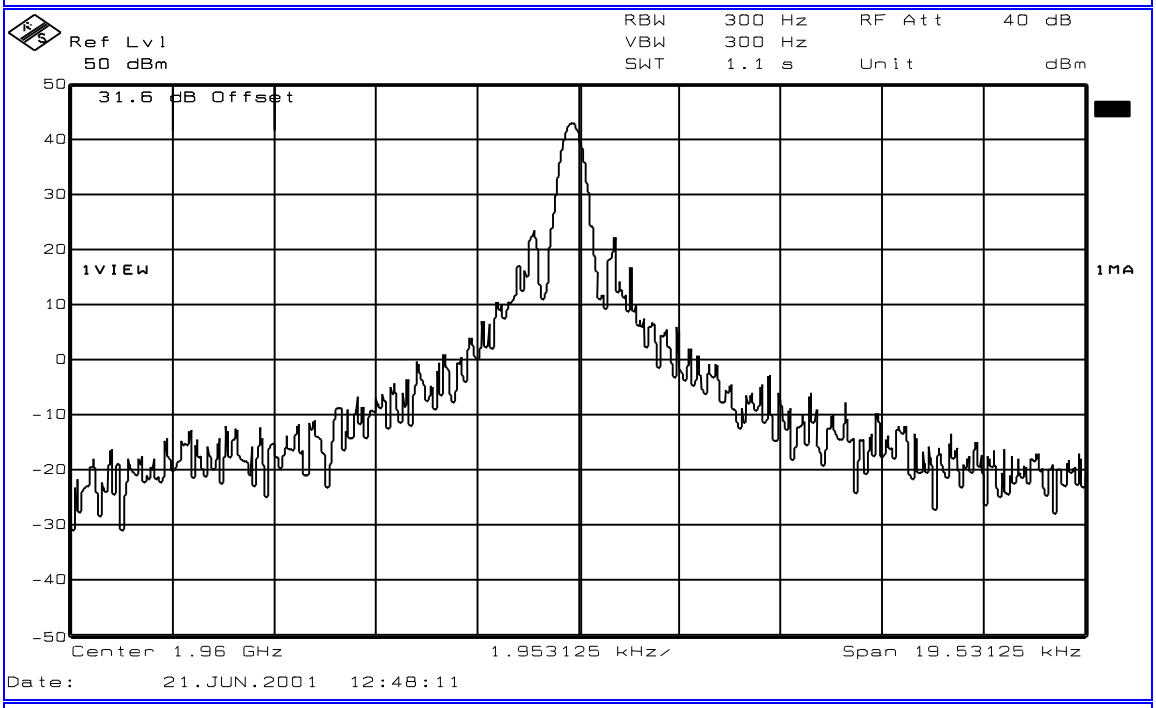

**Notes:** **UPLINK**

## Test Data – Occupied Bandwidth (CW)

**Data Plot OCCUPIED BANDWIDTH (CW)**

Page 2 of 2

| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: | 6/21/01 |
| Specification: | Part 24 | Temperature(°C): | 25 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 38 |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |




**Notes:** **DOWNLINK**

## Section 5. Spurious Emissions at Antenna Terminals

| | |
|---|---|
| NAME OF TEST: Spurious Emissions @ Antenna Terminals | PARA. NO.: 2.1051 |
| TESTED BY: Chinda Poy | DATE: 6/21/01 |

**Test Results:** Complies.

**Test Data:** Refer to plots

**Equipment Used:** 1036-1065-1064-1483

**Measurement Uncertainty:** +/- 1.6 dB

**Temperature:** 25 °C

**Relative Humidity:** 38 %

## Test Data – Spurious Emissions at Antenna Terminals

**Data Plot** **SPURIOUS EMISSIONS AT ANTENNA TERMINAL**

Page 1 of 4

Complete X
Preliminary

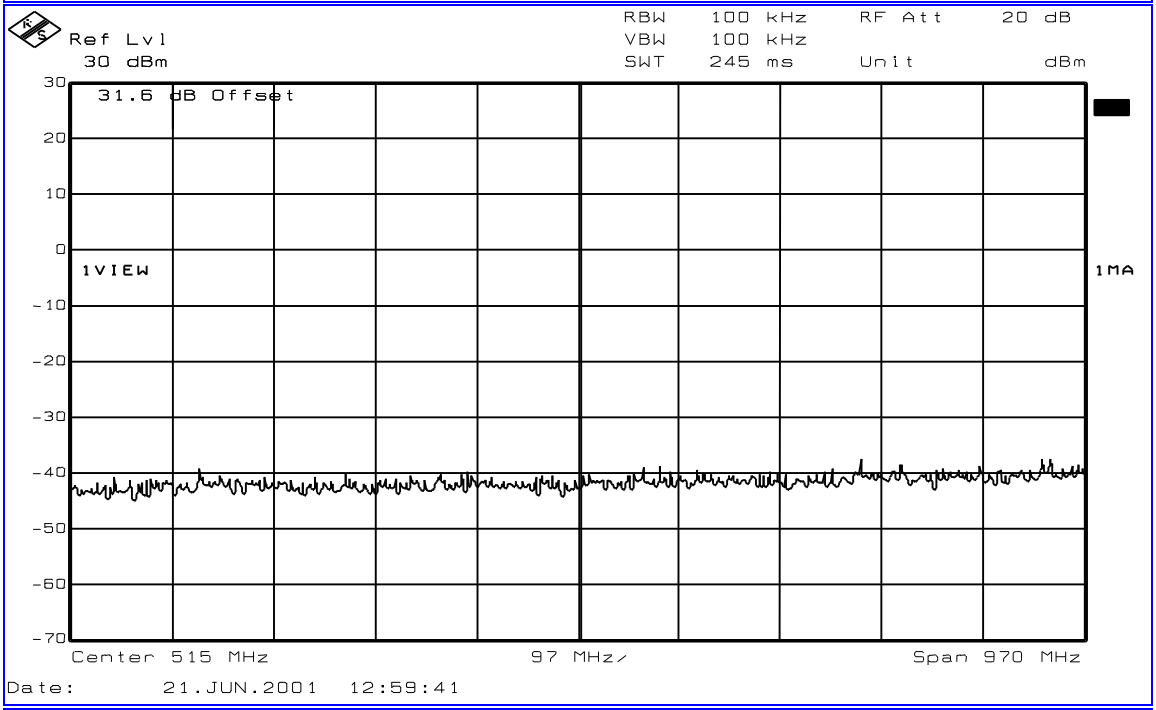
| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: 6/21/01 | |
| Specification: | Part 24 | Temperature(°C): 25 | |
| Tested By: | Chinda Poy | Relative Humidity(%) 38 | |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |
| Sample Number: | | | |
| Location: | Lab 1 | RBW: Refer to plots | |
| Detector Type: | Peak | VBW: Refer to plots | |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1483 |
| Filter: | | Cable #2: | |
| Receiver: | 1036 | Cable #3: | |
| Attenuator #1 | 1065 | Cable #4: | |
| Attenuator #2: | 1064 | Mixer: | |

Additional equipment used:

Measurement Uncertainty: +/-3.6 dB



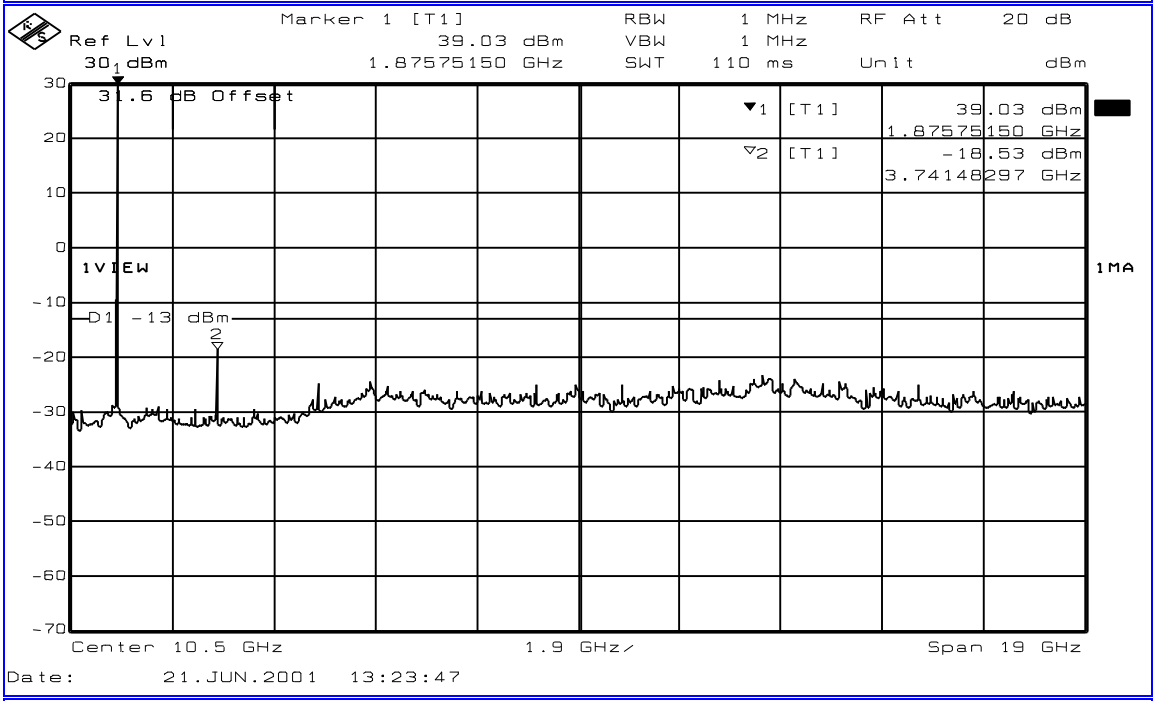

**Notes:** **UPLINK**
**No Emissions Indicated**

## Test Data – Spurious Emissions at Antenna Terminals

**Data Plot** **SPURIOUS EMISSIONS AT ANTENNA TERMINAL**

Page 2 of 4

| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: | 6/21/01 |
| Specification: | Part 24 | Temperature(°C): | 25 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 38 |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |



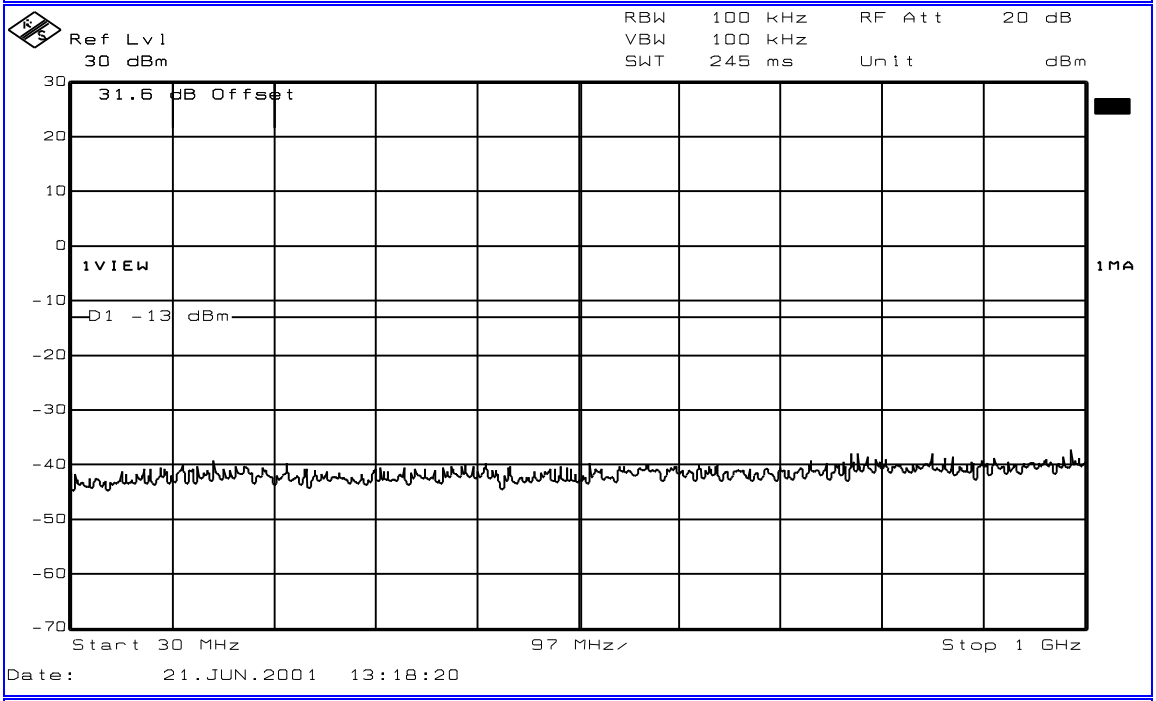

**Notes:**
**UPLINK**
**Marker 1 indicates carrier**
**Marker 2 indicates highest emission**

## Test Data – Spurious Emissions at Antenna Terminals

**Data Plot** **SPURIOUS EMISSIONS AT ANTENNA TERMINAL**

Page 3 of 4

| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: | 6/21/01 |
| Specification: | Part 24 | Temperature(°C): | 25 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 38 |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |



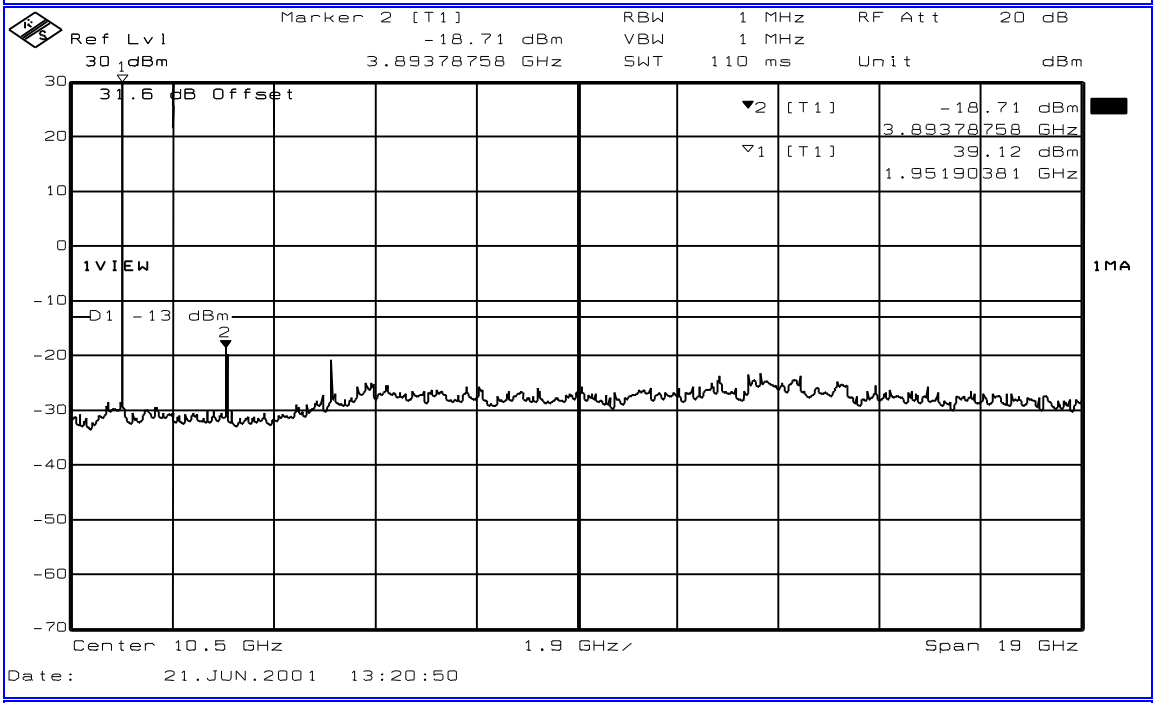

**Notes:** **DOWNLINK**
**No Emissions Indicated**

## Test Data – Spurious Emissions at Antenna Terminals

**Test Plot:** **SPURIOUS EMISSIONS AT ANTENNA TERMINAL**

Page 4 of 4

| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: | 6/21/01 |
| Specification: | Part 24 | Temperature(°C): | 25 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 38 |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |




**Notes:**
**DOWNLINK**
**Marker 1 indicates carrier**
**Marker 2 indicates highest emission**

## Test Data – Spurious Emissions at Antenna Terminals

**Data Plot BANDEDGE (CW)**

Page 1 of 4 — Complete X — Preliminary

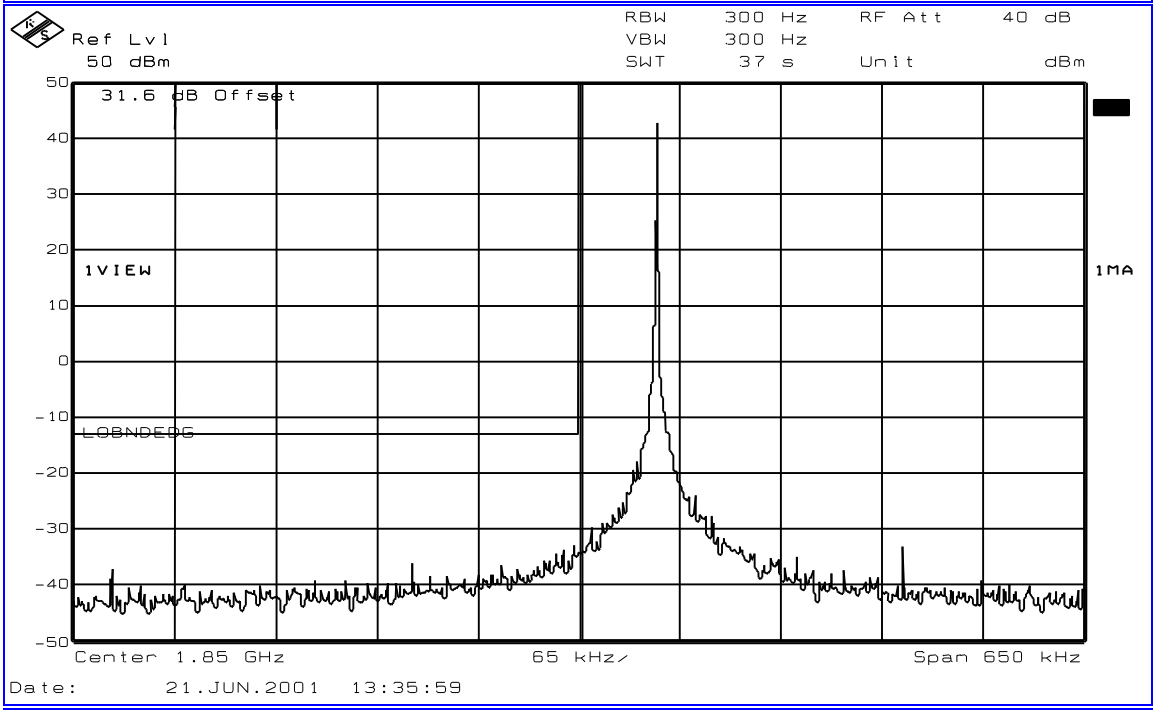
| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: 6/21/01 | |
| Specification: | Part 24 | Temperature(°C): 25 | |
| Tested By: | Chinda Poy | Relative Humidity(%) 38 | |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |
| Sample Number: | | | |
| Location: | Lab 1 | RBW: Refer to plots | |
| Detector Type: | Peak | VBW: Refer to plots | |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1483 |
| Filter: | | Cable #2: | |
| Receiver: | 1036 | Cable #3: | |
| Attenuator #1 | 1065 | Cable #4: | |
| Attenuator #2: | 1064 | Mixer: | |

Additional equipment used:

Measurement Uncertainty: +/-3.6 dB



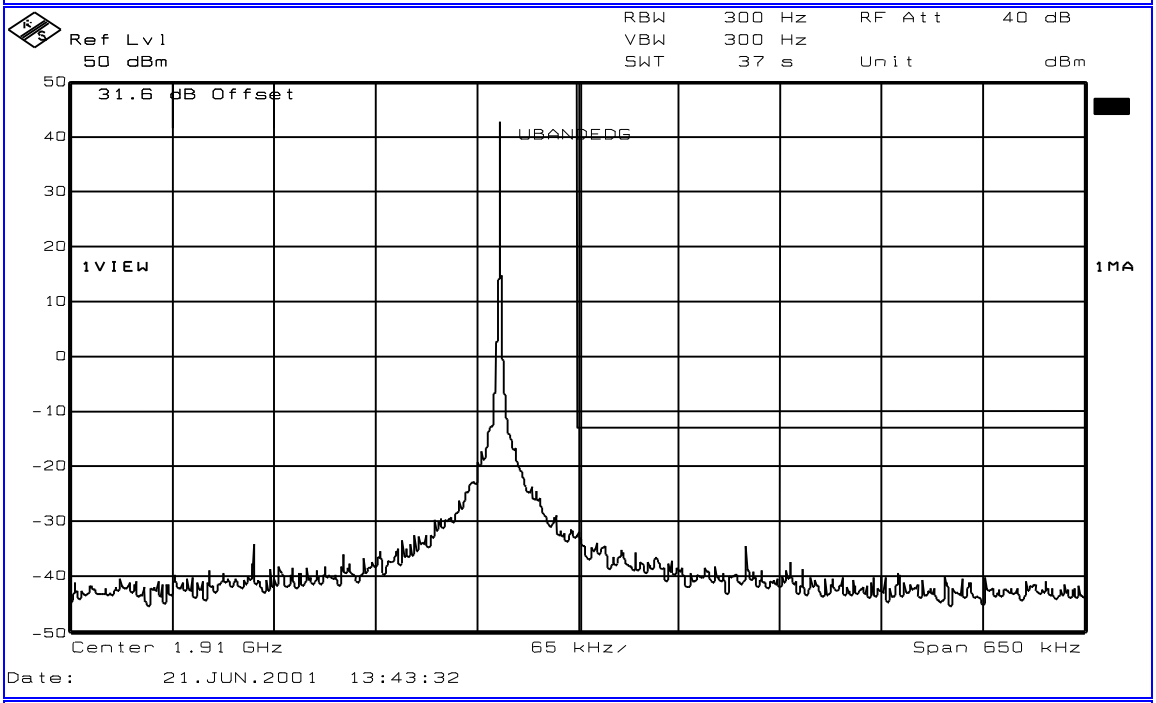

**Notes:** **UPLINK**
**Lower Bandege**
**Channel 1 (1850.05 MHz)**

## Test Data – Spurious Emissions at Antenna Terminals

**Data Plot BANDEDGE (CW)**

Page 2 of 4

| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: | 6/21/01 |
| Specification: | Part 24 | Temperature(°C): | 25 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 38 |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |



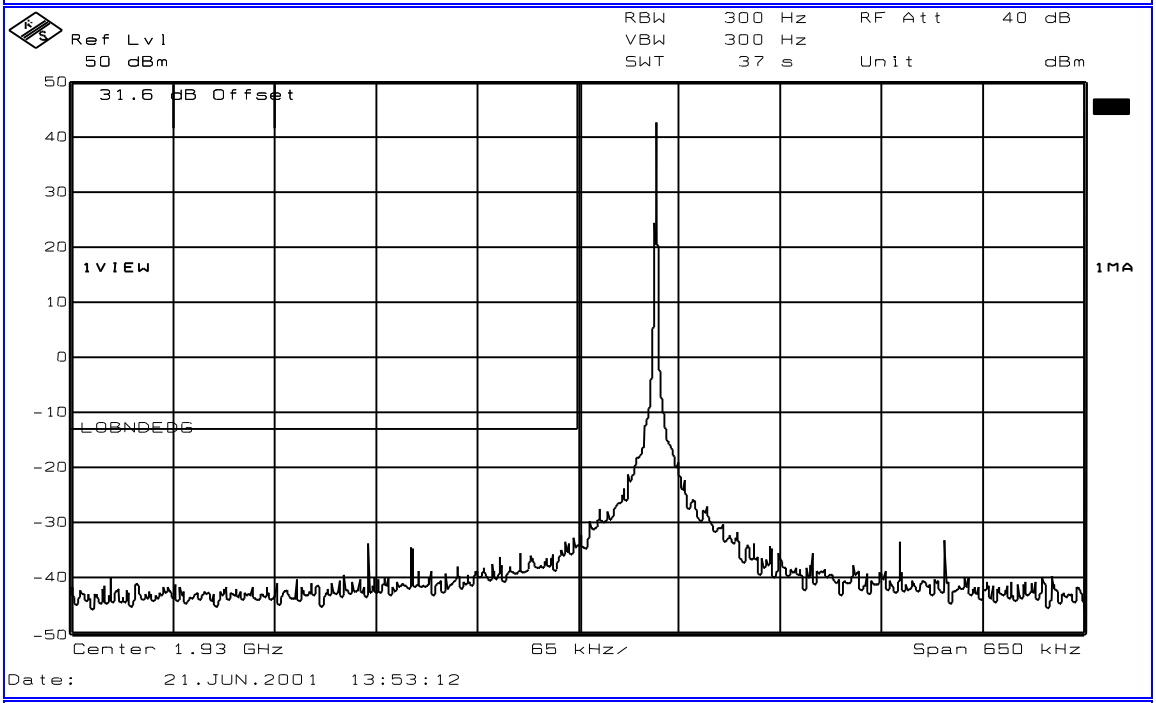

**Notes:**
**UPLINK**
**Upper Bandedge**
**Channel 1199 (1909.95 MHz)**

## Test Data – Spurious Emissions at Antenna Terminals

**Data Plot BANDEDGE (CW)**

Page 3 of 4

| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: | 6/21/01 |
| Specification: | Part 24 | Temperature(°C): | 25 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 38 |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |



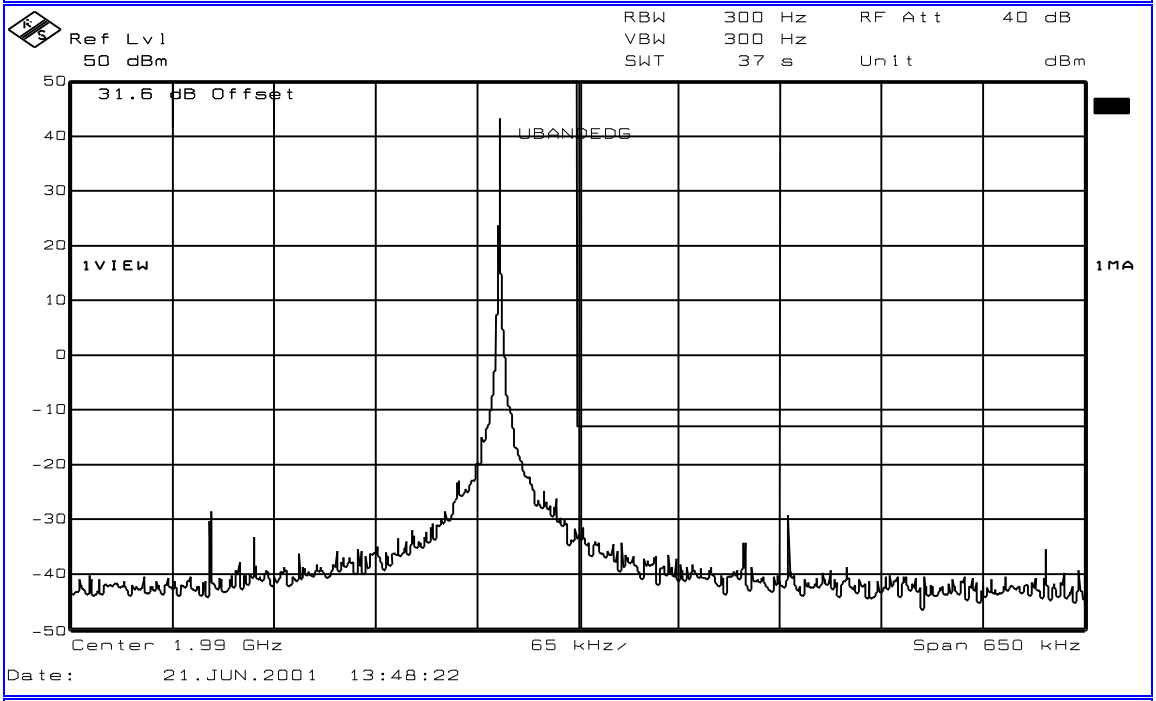

**Notes:** **DOWNLINK**
**Lower Bandedge**
**Channel 1 (1930.05 MHz)**

## Test Data – Spurious Emissions at Antenna Terminals

**Test Plot: BANDEDGE (CW)**

Page 4 of 4

| | | | |
|---|---|---|---|
| Job No.: | 1L0270R | Date: | 6/21/01 |
| Specification: | Part 24 | Temperature(°C): | 25 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 38 |
| E.U.T.: | GWMT 1920 | | |
| Configuration: | TX Full Power | | |




**Notes:** **DOWNLINK**
**Upper Bandedge**
**Channel 1199 (1989.95 MHz)**

Section 6. Field Strength of Spurious

| | |
|---|---|
| NAME OF TEST: Field Strength of Spurious Emissions | PARA. NO.: 2.1051 |
| TESTED BY: Chinda Poy | DATE: 6/21/01 |

**Test Results:** Complies.

**Test Data:** See attached table.

**Equipment Used:** 1464-1484-1485-1043-1016-993

**Measurement Uncertainty:** +/- 1.7 dB

**Temperature:** 25 °C

**Relative Humidity:** 38 %

## Test Data - Radiated Emissions

### Field Strength of Spurious Emissions

Page 1 of

Complete X
Preliminary

Job No.: 1L0270R
Specification: Part 24
Tested By: Chinda Poy
E.U.T.: GWMT 1920
Configuration: TX Full Power
Sample No:
Location: AC 3
Detector Type: Peak

Date: 6/21/01
Temperature(°C): 25
Relative Humidity(%) 38

RBW: 1 MHz
VBW: 1 MHz

Measurement Distance: 3 m

**Test Equipment Used**

Antenna: 993
Pre-Amp: 1016
Filter:
Receiver: 1464
Attenuator #1
Attenuator #2:
Additional equipment used:
Measurement Uncertainty: +/-3.6 dB

Directional Coupler:
Cable #1: 1484
Cable #2: 1485
Cable #3: 1043
Cable #4:
Mixer:

| Frequency (MHz) | Meter Reading (dBm) | Correction Factor (dB) | | Pre-Amp Gain (dB) | Substitution Antenna Gain (dBd) | | ERP (dBm) | ERP (mW) | Polarity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 3920 | -45.0 | 40.4 | | 33.3 | 8.0 | | -29.9 | 0.00 | V | |
| 5880 | -54.7 | 38.5 | | 33.3 | 9.1 | | -40.4 | 0.00 | V | |
| 7840 | -54.5 | 40.4 | | 33.3 | 9.4 | | -37.9 | 0.000161 | V | Noise Floor |
| 9800 | -54.2 | 40.4 | | 36 | 10.5 | | -39.2 | 0.000119 | V | Noise Floor |
| 11760 | -55.0 | -49.3 | | 35.5 | 11.0 | | -128.8 | 0.000000 | V | Noise Floor |
| 13720 | -53.3 | 47.6 | | 33.3 | 10.4 | | -28.6 | 0.001384 | V | Noise Floor |
| 15680 | -53.5 | 43.2 | | 33.2 | 13.6 | | -29.9 | 0.00 | V | Noise Floor |
| 17640 | -53.5 | 51.0 | | 33.5 | 8.7 | | -27.3 | 0.00 | V | Noise Floor |
| 19600 | -52.8 | 53.1 | | 32.2 | 6.4 | | -25.6 | 0.002767 | V | Noise Floor |
| | | | | | | | | | | |
| 3920 | -48.2 | 34.3 | | 33.3 | 8.0 | | -39.1 | 0.000122 | H | |
| 5880 | -56.0 | 36.0 | | 33.3 | 9.1 | | -44.2 | 0.000038 | H | Noise Floor |
| 7840 | -55.0 | 39.8 | | 33.3 | 9.4 | | -39.1 | 0.00 | H | Noise Floor |
| 9800 | -55.5 | 42.6 | | 36 | 10.5 | | -38.4 | 0.000145 | H | Noise Floor |
| 11760 | -54.2 | 46.0 | | 35.5 | 11.0 | | -32.7 | 0.000542 | H | Noise Floor |
| 13720 | -53.3 | 50.8 | | 33.3 | 10.4 | | -25.4 | 0.002917 | H | Noise Floor |
| 15680 | -53.2 | 44.0 | | 33.2 | 13.6 | | -28.8 | 0.001315 | H | Noise Floor |
| 17640 | -52.3 | 53.6 | | 33.5 | 8.7 | | -23.5 | 0.004467 | H | Noise Floor |
| 19600 | -52.5 | 54.6 | | 32.2 | 6.4 | | -23.7 | 0.004305 | H | Noise Floor |

**Notes:** **DOWNLINK SCANNED TO THE 10TH HARMONIC**

## Test Data - Radiated Emissions

Nemko Dallas, Inc.

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

### Field Strength of Spurious Emissions

Page 1 of 2 — Complete X — Preliminary

Job No.: 1L0270R — Date: 6/21/01
Specification: Part 24 — Temperature(°C): 25
Tested By: Chinda Poy — Relative Humidity(%) 38
E.U.T.: GWMT 1920
Configuration: TX Full Power
Sample No:

| Frequency (MHz) | Meter Reading (dBm) | Correction Factor (dB) | | Pre-Amp Gain (dB) | Substitution Antenna Gain (dBd) | | ERP (dBm) | ERP (mW) | Polarity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 3760 | -53.7 | 34.3 | | 33.3 | 8.0 | | -44.6 | 0.00 | H | |
| 5640 | -55.7 | 36.0 | | 33.3 | 9.1 | | -43.9 | 0.00 | H | Noise Floor |
| 75200 | -54.8 | 54.6 | | 33.3 | 6.4 | | -27.1 | 0.001968 | H | Noise Floor |
| 9400 | -55.2 | 41.4 | | 36 | 10.1 | | -39.7 | 0.000106 | H | Noise Floor |
| 11280 | -54.8 | 44.4 | | 35.5 | 11.1 | | -34.8 | 0.000330 | H | Noise Floor |
| 13160 | -54.2 | 47.5 | | 33.3 | 11.2 | | -28.9 | 0.001300 | H | Noise Floor |
| 15040 | -52.3 | 47.1 | | 33.2 | 11.4 | | -27.1 | 0.00 | H | Noise Floor |
| 16920 | -52.5 | 46.1 | | 33.5 | 13.0 | | -26.8 | 0.00 | H | Noise Floor |
| 18800 | -52.8 | 54.6 | | 32.2 | 6.4 | | -24.0 | 0.004018 | H | Noise Floor |
| | | | | | | | | | | |
| 3760 | -50.0 | 40.4 | | 33.3 | 8.0 | | -34.9 | 0.000322 | V | |
| 5640 | -56.2 | 38.5 | | 33.3 | 9.1 | | -41.9 | 0.000064 | V | Noise Floor |
| 75200 | -54.0 | 53.1 | | 33.3 | 6.4 | | -27.9 | 0.00 | V | Noise Floor |
| 9400 | -55.3 | 39.3 | | 36 | 10.1 | | -42.0 | 0.000063 | V | Noise Floor |
| 11280 | -55.5 | 42.0 | | 35.5 | 11.1 | | -38.0 | 0.000160 | V | Noise Floor |
| 13160 | -55.2 | 44.8 | | 33.3 | 11.2 | | -32.5 | 0.000564 | V | Noise Floor |
| 15040 | -53.7 | 46.5 | | 33.2 | 11.4 | | -29.0 | 0.001262 | V | Noise Floor |
| 16920 | -53.3 | 44.3 | | 33.5 | 13.0 | | -29.5 | 0.001127 | V | Noise Floor |
| 18800 | -53.2 | 53.1 | | 32.2 | 6.4 | | -25.9 | 0.002559 | V | Noise Floor |
| | | | | | | | | | | |
| | | | | | | | | | | |
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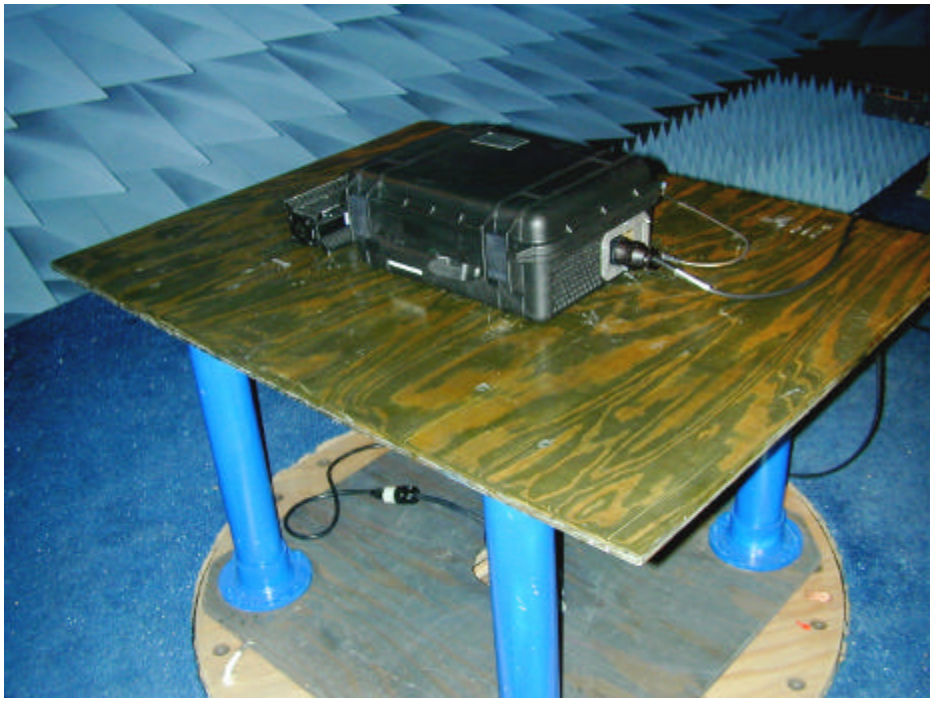
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

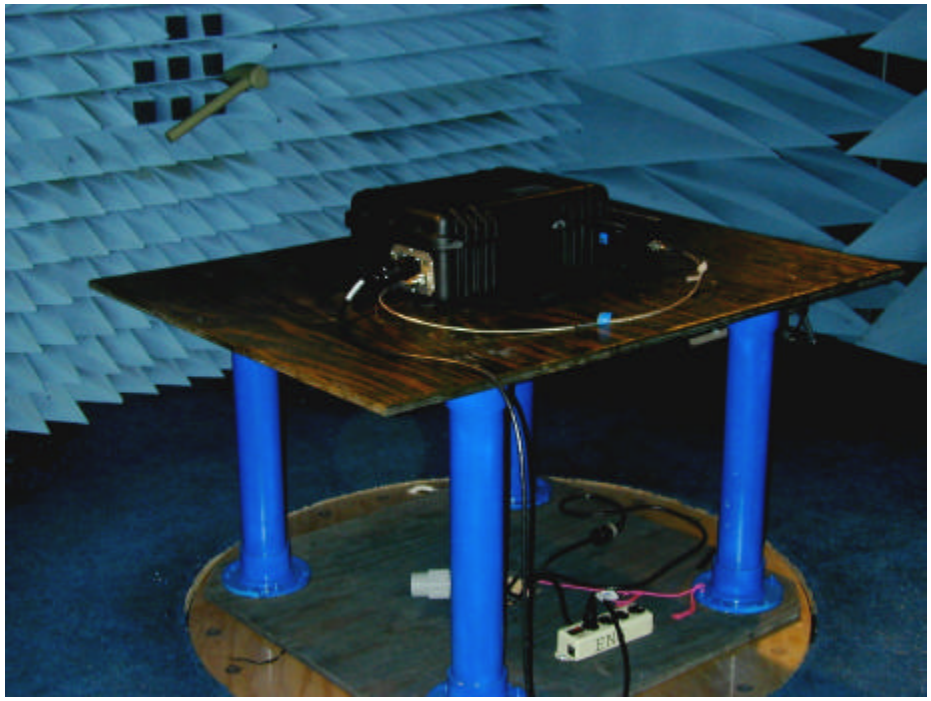
**Notes:** **UPLINK SCANNED TO THE 10TH HARMONIC**

## Photographs of Test Setup

FRONT VIEW



REAR VIEW



## Section 7. Frequency Stability

| | |
|---|---|
| NAME OF TEST: Frequency Stability | PARA. NO.: 2.1055 |
| TESTED BY: Chinda Poy | DATE: 6/22/01 |

**Test Results:** Complies

**Measurement Data:** Standard Test Frequency: ___1880___ MHz
Standard Test Voltage: ____115_____ Vac

## Test Data – Frequency Stability

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

### Frequency Stability

Client: Grayson Wireless W.O.# 1L0270R

EUT: Model GWMT 1920 S/N: None

Date: 6/22/01 Tech: C.POY

Test Equipment used:

| Temperature | Voltage | Frequency Error (Hz) |
|---|---|---|
| 20 °C | 115 VAC | -50 |
| 20 °C | 98 VAC | -50 |
| 20 °C | 132 VAC | -50 |
| 20 °C | 13 VDC | -50 |
| 20 °C | 11 VDC | Ceased operation |
| 20 °C | 15 VDC | -50 |
| | | |
| 10 °C | | -153 |
| 0 °C | | -315 |
| -10 °C | | -319 |
| -30 °C | | -404 |
| | | |
| 30 °C | | -720 |
| 40 °C | | -1201 |
| 50 °C | | -1618 |
| | | |

## 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 |
| 1464 | Spectrum analyzer | Hewlett Packard 8563E | 3551A04428 | 01/02/01 | 01/02/02 |
| 1064 | ATTENUATOR | NARDA 776B-20 | NONE | CBU | N/A |
| 1065 | ATTENUATOR | NARDA 776B-10 | NONE | CBU | N/A |
| 1604 | ATTENUATOR | NARDA 776B-20 | NONE | CBU | N/A |
| 1016 | Pre-Amp | HEWLETT PACKARD 8449A | 2749A00159 | 05/30/01 | 05/30/02 |
| 1483 | Cable 4m | Storm PR90-010-144 | N/A | 06/04/01 | 06/04/02 |
| 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 | 06/01/01 | 06/01/02 |
| 1043 | Flexable cable 1m | Astrolab Inc. 32027-2-29094K-1M | 0 | 01/29/01 | 01/29/02 |
| 993 | Horn antenna | A.H. Systems SAS-200/571 | XXX | 07/16/99 | 07/16/01 |
| | | | | | |

# ANNEX A - TEST DETAILS

| **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-014
TDMA Per ANSI/J-STD-010

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 f rom 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

| **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-014

Spectrum analyzer settings:
RBW: 30 kHz
VBW: ≥ RBW
Span: 5 MHz
Sweep: Auto

GSM Per ANSI/J-STD-010

RBW: 3 kHz
VBW: ≥ RBW
Span: 2 MHz
Sweep: Auto

NADC Per IS-136

RBW: 1 kHz
VBW: ≥ 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-014

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 30 kHz (< 1MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM Per ANSI/J-STD-010

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: ≥ 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: ≥ 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 up per and lower edges of the appropriate frequency block.

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

**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.

**Calculation Of Field Strength Limit**

An example of attenuation requirement of 43 + 10 Log P is equivalent to -13 dBm ($5 \times 10^{-5}$ Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$GP/4\pi R^2 = E^2/120\pi$

For emissions ≤ 1 GHz:

G = 1.64 (Dipole Gain)
P = $10^{-5}$ Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R}$$

$$\mathrm{E} = \frac{\sqrt{30 \times 1.64 \times 5 \times 10^{-5}}}{3} = 0.016533 \text{ V / m} = 84.4 \text{ dB}\mu\text{V / m}$$

For emissions > 1 GHz:

G = 1 (Isotropic Gain)
P = $1 \times 10^{-5}$ Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = 84.4 - 20Log\sqrt{1.64} = 82.3dB\mu V / m@3m$$

| **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-014
TDMA Per ANSI/J-STD-010
NADC Per IS-136

Frequency Stability With Voltage Variation

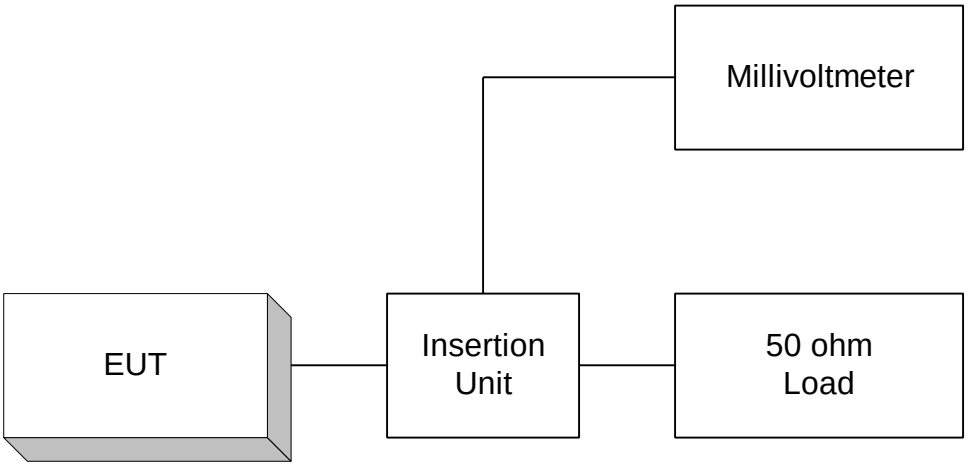
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

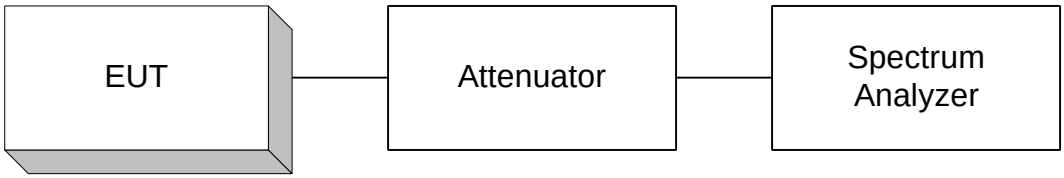
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

# ANNEX B - TEST DIAGRAMS

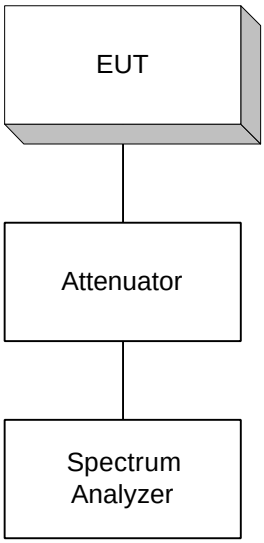
**Para. No. 2.985 - R.F. Power Output**



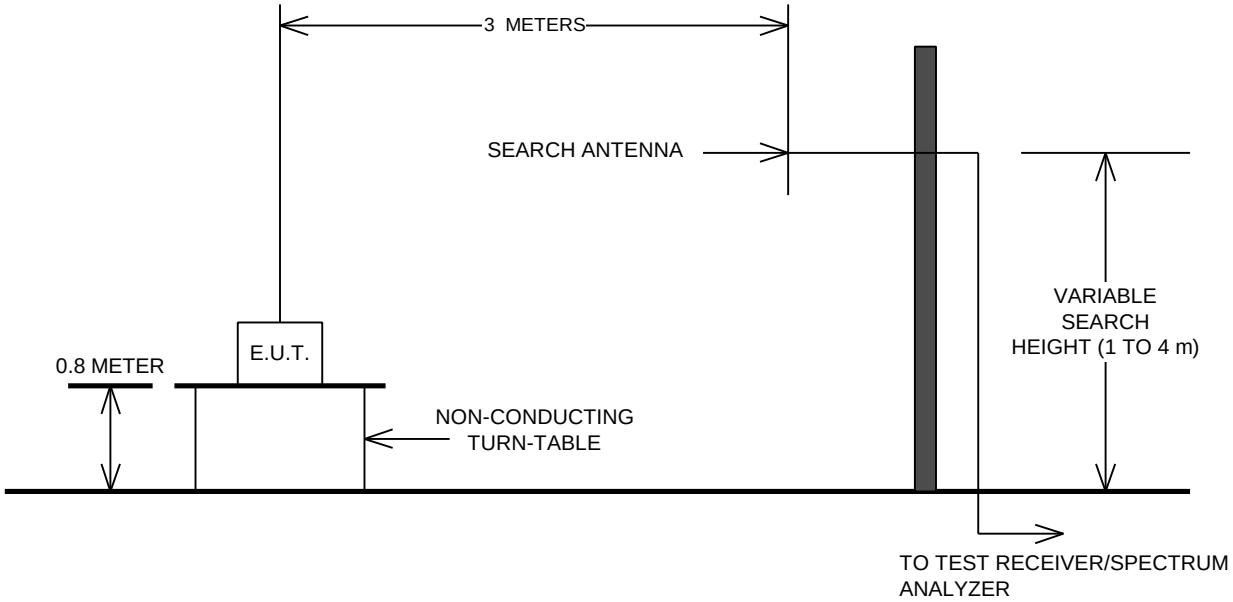

**Para. No. 2.989 - Occupied Bandwidth**



## Para. No. 2.991 Spurious Emissions at Antenna Terminals




## Para. No. 2.993 - Field Strength of Spurious Radiation



## Para. No. 2.995 - Frequency Stability