| | |
|---|---|
| **NEMKO Test Report No.:** | **1L0242RUS1** |
| **Applicant:** | **Communication Components Inc.**<br>299 Forest Ave.<br>Paramus, NJ 07652 |
| **Equipment Under Test:** | **CE-1819-100 CDMA Cell Extender** |
| **FCC ID:** | **NT3CE-1819** |
| **In Accordance With:** | **FCC Part 24, Subpart E**<br>Broadband PCS Repeaters |
| **Tested By:** | Nemko Dallas Inc.<br>802 N. Kealy<br>Lewisville, Texas 75057-3136 |
| **Authorized By:** |  <br>Tom Tidwell, RF Group Manager |
| **Date:** | 7/2/01 |
| **Total Number of Pages:** | 44 |

## Table of Contents

## Section 1. Summary of Test Results

Manufacturer: Communication Components

Model No.: CE-1819-100 CDMA Cell Extender

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: 100426-0**

## 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 | Input/Output | Plot | Complies |
| Occupied Bandwidth (GSM) | 24.238 | Input/Output | N/A | N/A |
| Occupied Bandwidth (NADC) | 24.238 | Input/Output | 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 | | N/A | N/A |

**Footnotes:**

(1) Modulation characteristics were not tested since the E.U.T. processes but does not produce a modulated waveform.

**Measurement uncertainty for each test configuration is expressed to 95% probability.**

## Section 2. General Equipment Specification

| | | |
|---|---|---|
| **Supply Voltage Input:** | | 115 VAC |
| **Frequency Bands:** | **Downlink:** | ☒ 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:** | **Uplink:** | ☒ 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 |
| **Type of Modulation and Designator:** | | **CDMA (G7W)** ☒ **GSM (GXW)** ☐ **NADC (DXW)** ☒ |
| **Output Impedance:** | | 50 ohms |
| **RF Output (Rated):** | **Uplink** | Per channel: N/A W<br>Total: N/A W |
| **RF Output (Rated):** | **Downlink** | CDMA / NADC<br>Per channel: 21.9 W / 2 W<br>Total: 43.7 W / 4 W |
| **Frequency Translation:** | | **F1-F1** ☒ **F1-F2** ☐ **N/A** ☐ |
| **Band Selection:** | | **Software** ☐ **Duplexer** ☒ **Fullband** ☐ |

**Description of Modifications For Class II Permissive Change**

**Not Applicable**

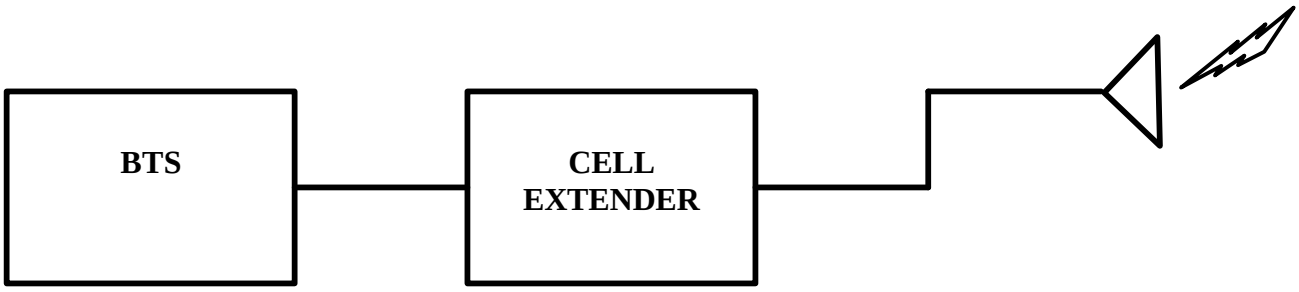
**Modifications Made During Testing**

# Not Applicable

## Description of Operation

Communication Components Inc., Cell Extender products are designed to extend the range and coverage area of CDMA / TDMA type base stations in PCS wireless communications.

## System Diagram



## Section 3. RF Power Output

| NAME OF TEST: RF Power Output | PARA. NO.: 2.1046 |
|---|---|
| TESTED BY: Chinda PoyTTidwell | DATE: 5/14/01 |

**Test Results:** Complies.

**Measurement Data:**

| | Modulation Type | Per Channel Output Power (dBm) | Composite Output Power (dBm) |
|---|---|---|---|
| Uplink | CDMA | N/A | N/A |
| Downlink | CDMA | 43.4 | 46.4 |
| Uplink | NADC | N/A | N/A |
| Downlink | NADC | 33.3 | 36.3 |

**Equipment Used:** 1464-1065-1064-1045

**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: Chinda PoyTTidwell | DATE: 5/14/01 |

**Test Results:** Complies.

**Test Data:** See attached plot(s).

**Equipment Used:** 1464-1065-1064-1045

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

**Temperature:** 22 °C

**Relative Humidity:** 50 %

## Test Data—Occupied Bandwidth—CDMA

**Data Plot** **Occupied Bandwidth CDMA**

Page 1 of 2

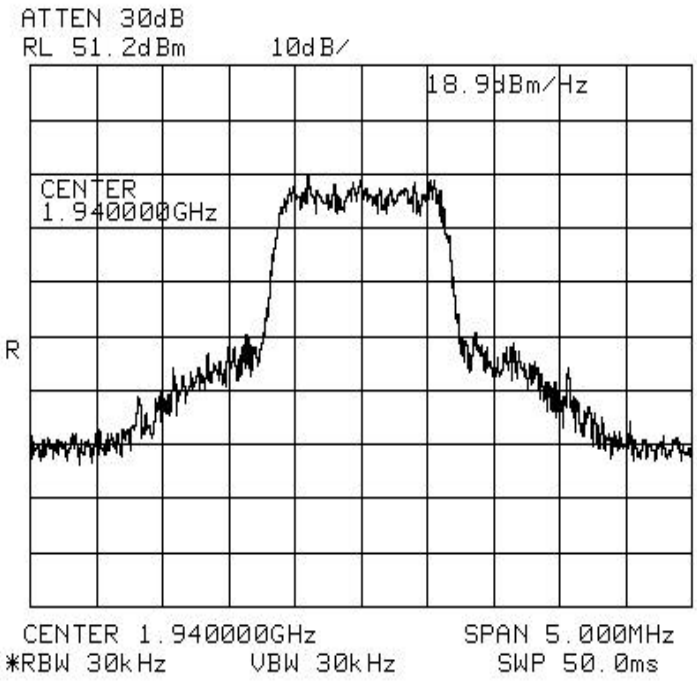
Complete X
Preliminary

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: 5/14/01 | |
| Specification: | Part 24 | Temperature(°C): 22 | |
| Tested By: | Chinda Poy | Relative Humidity(%) 50 | |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |
| Sample Number: | | | |
| Location: | Lab 2 | RBW: Refer to plots | |
| Detector Type: | Peak | VBW: Refer to plots | |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1045 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1604 | Cable #4: | |
| Attenuator #2: | 1065 | Mixer: | |

Additional equipment used:
Measurement Uncertainty: +/-3.6 dB



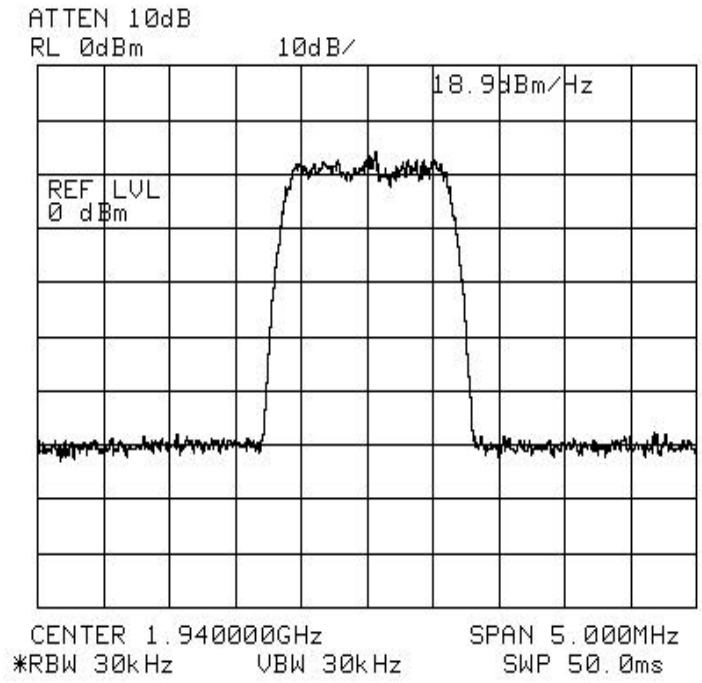

**Notes:** **OUTPUT SIGNAL CDMA ( A-BLOCK )**
**DOWNLINK**

## Test Data—Occupied Bandwidth—CDMA

**Data Plot** **Occupied Bandwidth CDMA**

Page 2 of 2

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: | 5/14/01 |
| Specification: | Part 24 | Temperature(°C): | 22 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 50 |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |




**Notes:** **INPUT SIGNAL CDMA ( A-BLOCK )**
**DOWNLINK**

## Test Data—Occupied Bandwidth—CDMA

**Data Plot** **Occupied Bandwidth CDMA**

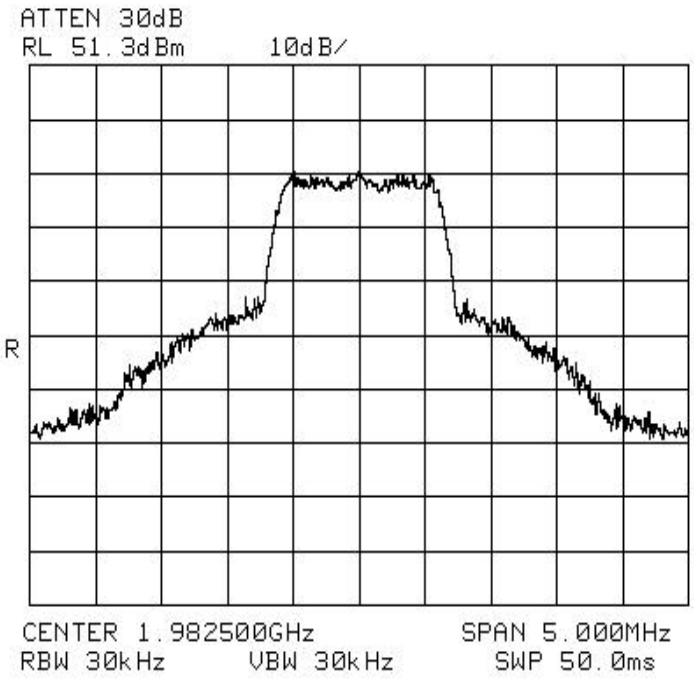
Page 1 of 2

Complete X
Preliminary

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: 5/21/01 | |
| Specification: | Part 24 | Temperature(°C): 22 | |
| Tested By: | Chinda Poy | Relative Humidity(%) 50 | |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |
| Sample Number: | | | |
| Location: | Lab 2 | RBW: Refer to plots | |
| Detector Type: | Peak | VBW: Refer to plots | |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1045 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1604 | Cable #4: | |
| Attenuator #2: | 1065 | Mixer: | |
| Additional equipment used: | | | |
| Measurement Uncertainty: | +/-3.6 dB | | |



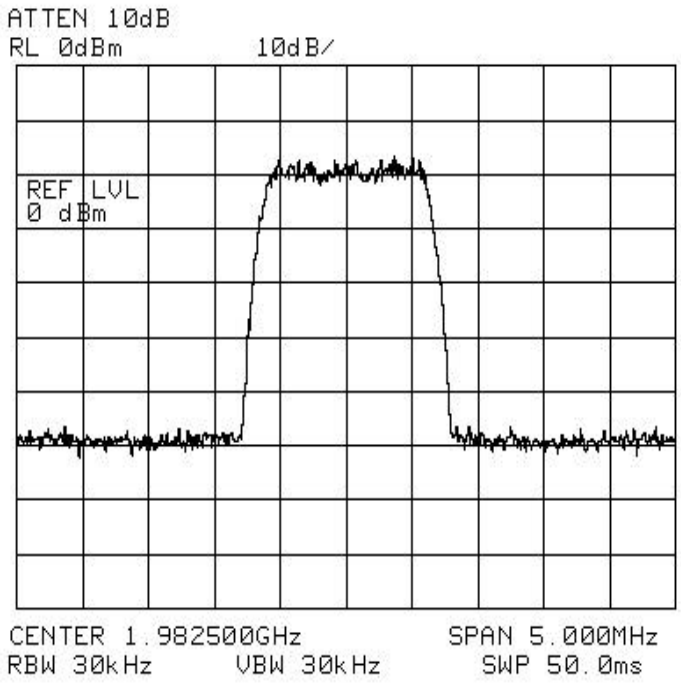

**Notes:** **OUTPUT SIGNAL CDMA ( C-BLOCK )**
**DOWNLINK**

## Test Data—Occupied Bandwidth—CDMA

**Data Plot** **Occupied Bandwidth CDMA**

Page 2 of 2

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: | 5/21/01 |
| Specification: | Part 24 | Temperature(°C): | 22 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 50 |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |




**Notes:** **INPUT SIGNAL CDMA ( C-BLOCK )**
**DOWNLINK**

| NAME OF TEST: Occupied Bandwidth (NADC) | PARA. NO.: 2.1049 |
|---|---|
| TESTED BY: Chinda PoyTTidwell | DATE: 5/14/01 |

**Test Results:** Complies.

**Test Data:** See attached plot(s).

**Equipment Used:** 1464-1064-1065-1045

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

**Temperature:** 22 °C

**Relative Humidity:** 50 %

## Test Data—Occupied Bandwidth—TDMA

**Data Plot** **Occupied Bandwidth TDMA**

Page 1 of 2

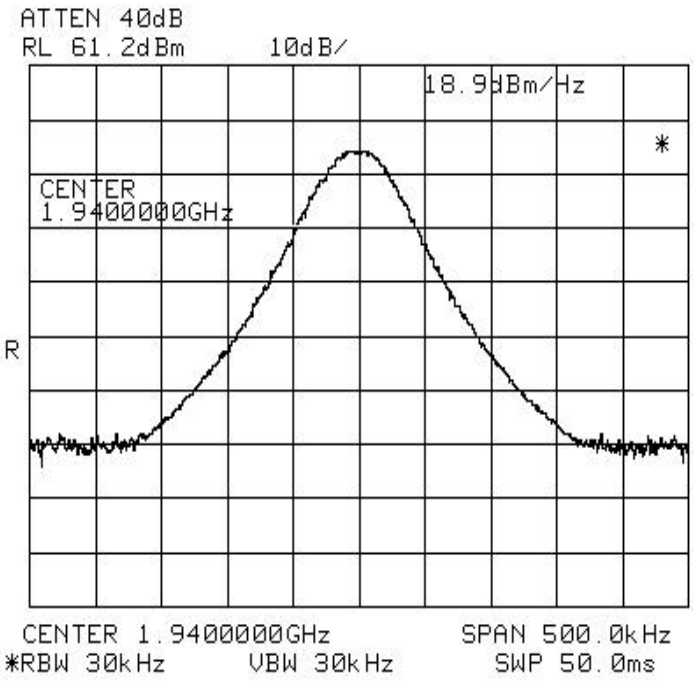
Complete X
Preliminary

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: 5/14/01 | |
| Specification: | Part 24 | Temperature(°C): 22 | |
| Tested By: | Chinda Poy | Relative Humidity(%) 50 | |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |
| Sample Number: | | | |
| Location: | Lab 2 | RBW: Refer to plots | |
| Detector Type: | Peak | VBW: Refer to plots | |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1045 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1064 | Cable #4: | |
| Attenuator #2: | 1065 | Mixer: | |

Additional equipment used:
Measurement Uncertainty: +/-3.6 dB



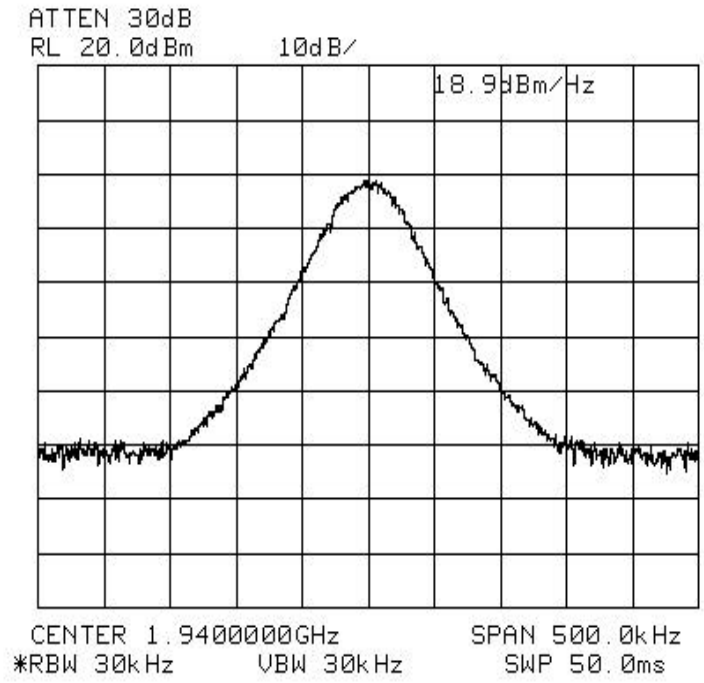

**Notes:** **OUTPUT SIGNAL TDMA ( A-BLOCK )**
**DOWNLINK**

## Test Data—Occupied Bandwidth—TDMA

**Data Plot** **Occupied Bandwidth TDMA**

Page 2 of 2

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: | 5/14/01 |
| Specification: | Part 24 | Temperature(°C): | 22 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 50 |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |




**Notes:** **INPUT SIGNAL TDMA ( A-BLOCK )**
**DOWNLINK**

## Test Data—Occupied Bandwidth—TDMA

**Data Plot** **Occupied Bandwidth TDMA**

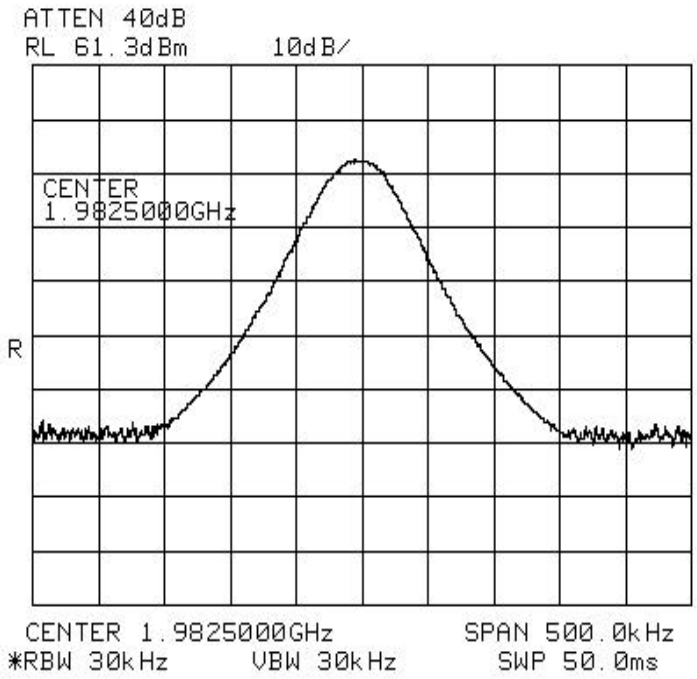
Page 1 of 2

Complete X
Preliminary

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: 5/21/01 | |
| Specification: | Part 24 | Temperature(°C): | 22 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 50 |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |
| Sample Number: | | | |
| Location: | Lab 2 | RBW: | Refer to plots |
| Detector Type: | Peak | VBW: | Refer to plots |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1045 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1064 | Cable #4: | |
| Attenuator #2: | 1065 | Mixer: | |
| Additional equipment used: | | | |
| Measurement Uncertainty: | +/-3.6 dB | | |



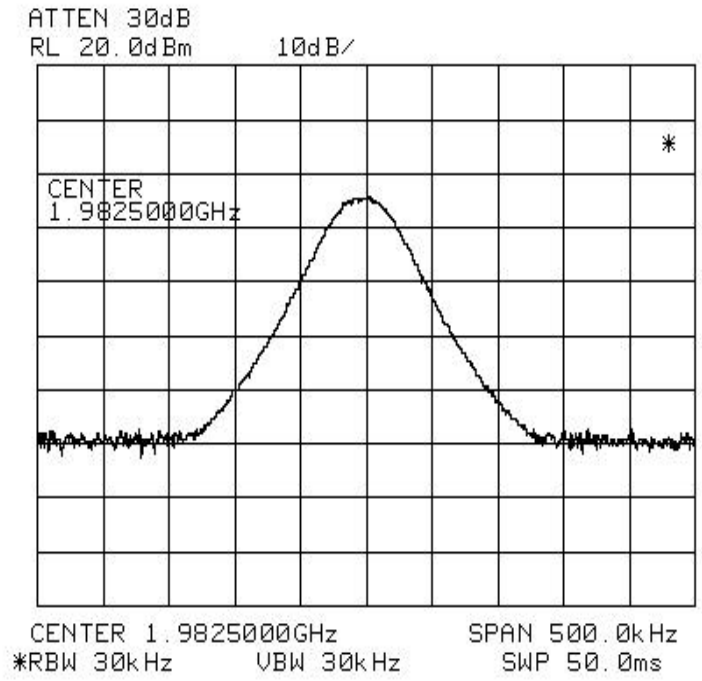

**Notes:** **OUTPUT SIGNAL TDMA ( C-BLOCK )**
**DOWNLINK**

## Test Data—Occupied Bandwidth—TDMA

**Data Plot** **Occupied Bandwidth TDMA**

Page 2 of 2

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: | 5/21/01 |
| Specification: | Part 24 | Temperature(°C): | 22 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 50 |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |




**Notes:** **INPUT SIGNAL TDMA ( C-BLOCK )**
**DOWNLINK**

## Section 5. Spurious Emissions at Antenna Terminals

| | |
|---|---|
| NAME OF TEST: Spurious Emissions @ Antenna Terminals | PARA. NO.: 2.1051 |
| TESTED BY: Chinda PoyTTidwell | DATE: 5/14/01 |

**Test Results:** Complies.

**Test Data:** See attached plot(s).

**Equipment Used:** 1464-1064-1065-1045

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

**Temperature:** 22 °C

**Relative Humidity:** 50 %

## Test Data --- Spurious Emissions at Antenna Terminals

**Data Plot** **SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

Page 1 of 2

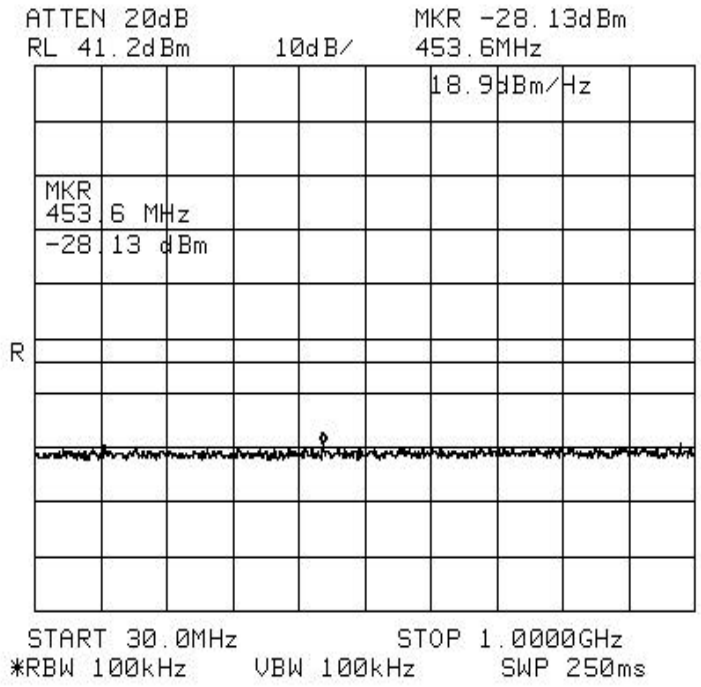
Complete X
Preliminary

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: 5/14/01 | |
| Specification: | Part 24 | Temperature(°C): 22 | |
| Tested By: | Chinda Poy | Relative Humidity(%) 50 | |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |
| Sample Number: | | | |
| Location: | Lab 2 | RBW: Refer to plots | |
| Detector Type: | Peak | VBW: Refer to plots | |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1045 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1064 | Cable #4: | |
| Attenuator #2: | 1065 | Mixer: | |

Additional equipment used:
Measurement Uncertainty: +/-3.6 dB



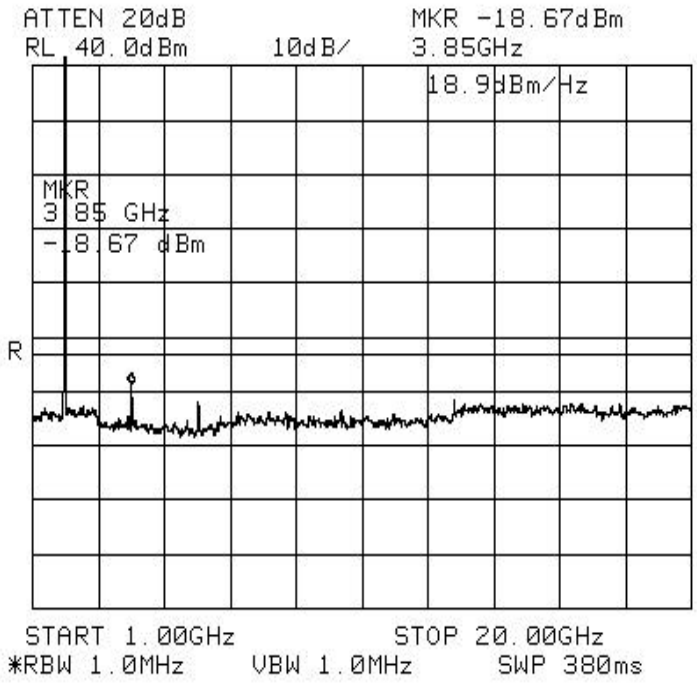

**Notes:** **30 MHz - 1 GHz**
**MARKER INDICATE HIGHEST NOISE FLOOR READING**

## Test Data --- Spurious Emissions at Antenna Terminals

**Data Plot** **SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

Page 2 of 2

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: | 5/14/01 |
| Specification: | Part 24 | Temperature(°C): | 22 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 50 |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |




**Notes:** **1 GHz - 20 GHz**
**MARKER INDICATES HIGHEST EMISSION**

## Test Data --- Spurious Emissions at Antenna Terminals

**Data Plot** **Intermodulation Characteristics CDMA**

Page 1 of 1 Complete X

Job No.: 1L0242R Date: 5/14/01 Preliminary

Specification: part 22 Temperature(°C): 22

Tested By: Chinda Poy Relative Humidity(%) 50

E.U.T.: Cell Extender

Configuration: Tx Full Power

Sample Number:

Location: Lab 2 RBW: Refer to plots

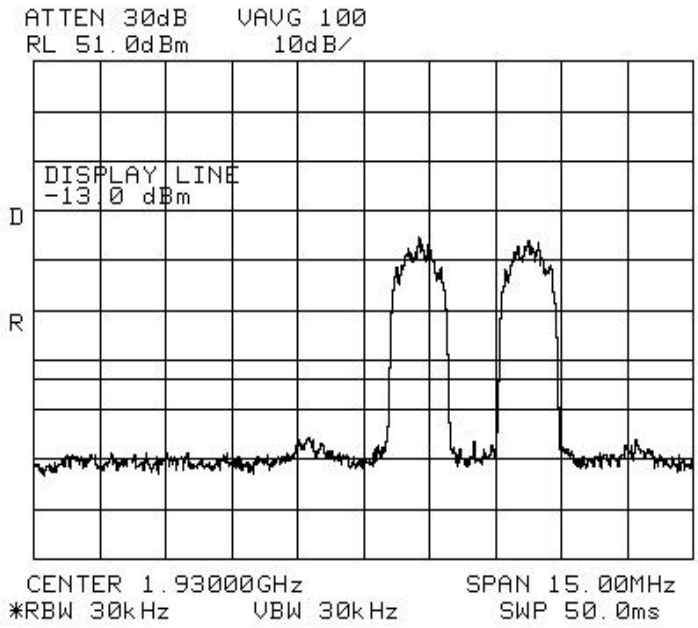
Detector Type: Peak VBW: Refer to plots

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1045 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1064 | Cable #4: | |
| Attenuator #2: | 1065 | Mixer: | |

Additional equipment used:

Measurement Uncertainty: +/-3.6 dB




**Notes:** **CDMA INTERMOD LOW BAND ( OUT OF BAND )**
**DOWNLINK ( A-BLOCK )**

## Test Data --- Spurious Emissions at Antenna Terminals

**Data Plot** **Intermodulation Characteristics CDMA**

Page 1 of 3 Complete X

Job No.: 1L0242R Date: 5/21/01 Preliminary

Specification: part 22 Temperature(°C): 22

Tested By: Chinda Poy Relative Humidity(%) 50

E.U.T.: Cell Extender

Configuration: Tx Full Power

Sample Number:

Location: Lab 2 RBW: Refer to plots

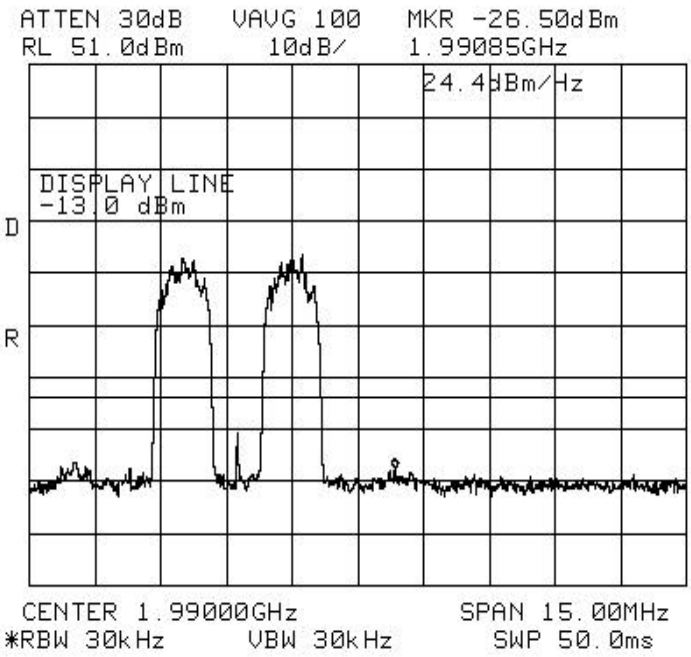
Detector Type: Peak VBW: Refer to plots

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1045 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1064 | Cable #4: | |
| Attenuator #2: | 1065 | Mixer: | |

Additional equipment used:

Measurement Uncertainty: +/-3.6 dB




**Notes:** **CDMA INTERMOD UPPER BAND ( OUT OF BAND )**
**DOWNLINK ( C-BLOCK )**

## Test Data --- Spurious Emissions at Antenna Terminals

**Data Plot CDMA BANDEDGE**

Page 1 of 1 Complete X

Job No.: 1L0242R Date: 5/10/01 Preliminary

Specification: part 22 Temperature(°C): 24

Tested By: Chinda Poy Relative Humidity(%) 41

E.U.T.: Cell Extender

Configuration: Tx Full Power

Sample Number:

Location: Lab 2 RBW: Refer to plots

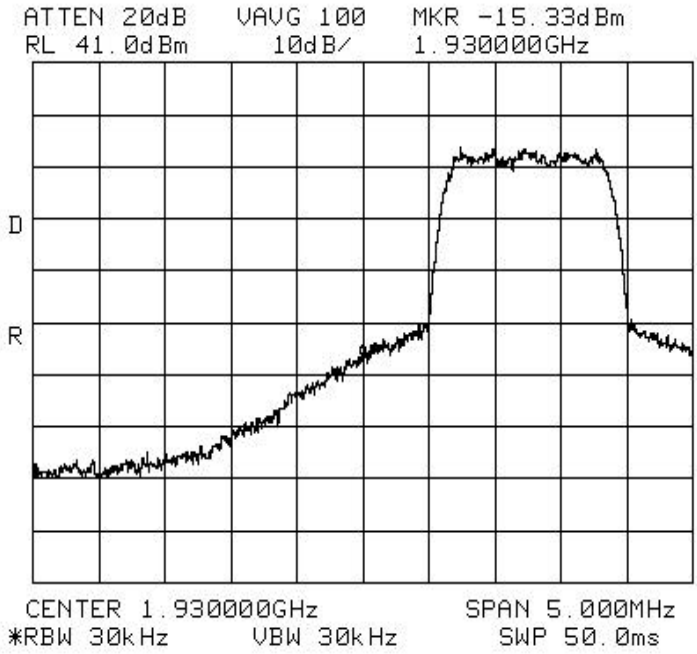
Detector Type: Peak VBW: Refer to plots

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1043 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1065 | Cable #4: | |
| Attenuator #2: | 1470 | Mixer: | |

Additional equipment used:

Measurement Uncertainty: +/-3.6 dB




**Notes:**
**CDMA LOWER BANDEDGE ( DOWNLINK )**
**LAST AVALABLE CHANNEL ( A-BLOCK )**
**CHANNEL 25 ( 1931.25MHz )**

## Test Data --- Spurious Emissions at Antenna Terminals

**Data Plot** **CDMA BANDEDGE**

Page 1 of 1 Complete X

Job No.: 1L0242R Date: 5/21/01 Preliminary

Specification: Part 24 Temperature(°C): 22

Tested By: Chinda Poy Relative Humidity(%) 50

E.U.T.: Cell Extender

Configuration: Tx Full Power

Sample Number:

Location: Lab 2 RBW: Refer to plots

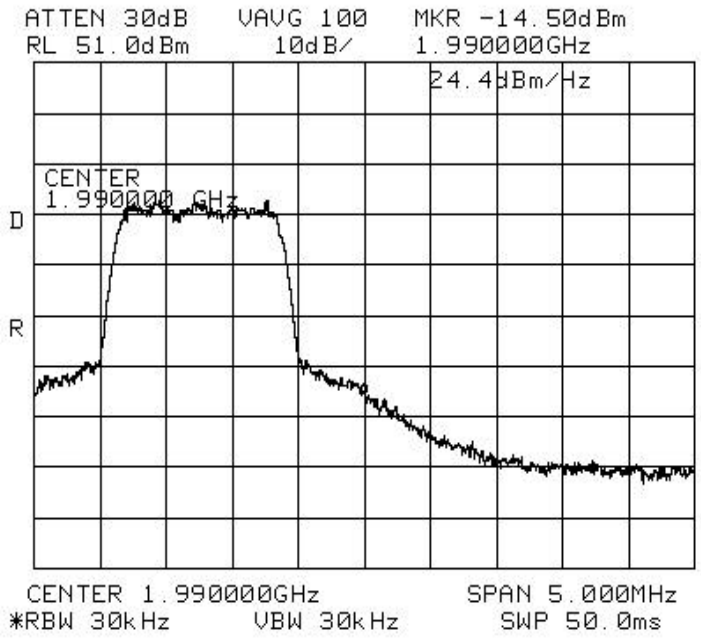
Detector Type: Peak VBW: Refer to plots

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1043 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1065 | Cable #4: | |
| Attenuator #2: | 1470 | Mixer: | |

Additional equipment used:

Measurement Uncertainty: +/-3.6 dB




**Notes:**
**CDMA UPPER BANDEDGE ( DOWNLINK )**
**LAST AVALABLE CHANNEL ( C-BLOCK )**
**CHANNEL 1175 ( 1988.75MHz )**

## Test Data --- Spurious Emissions at Antenna Terminals

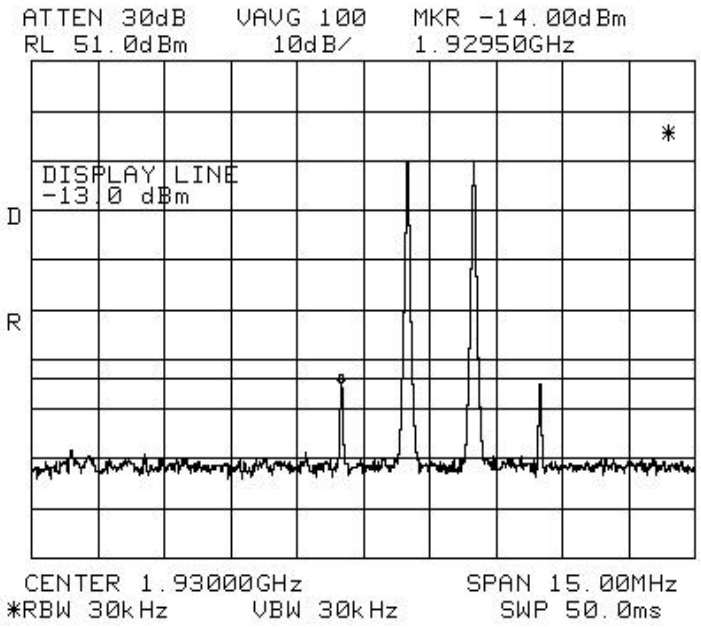
**Data Plot** **Intermodulation Characteristics TDMA**

Page 1 of 1 — Complete X — Preliminary

| | | | |
|---|---|---|---|
| Job No.: | 1L0242R | Date: 5/14/01 | |
| Specification: | Part 24 | Temperature(°C): | 22 |
| Tested By: | Chinda Poy | Relative Humidity(%) | 50 |
| E.U.T.: | Cell Extender | | |
| Configuration: | Tx Full Power | | |
| Sample Number: | | | |
| Location: | Lab 2 | RBW: | Refer to plots |
| Detector Type: | Peak | VBW: | Refer to plots |

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1045 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1064 | Cable #4: | |
| Attenuator #2: | 1065 | Mixer: | |
| Additional equipment used: | | | |
| Measurement Uncertainty: | +/-3.6 dB | | |




**Notes:** **TDMA INTERMOD LOWER BAND ( OUT OF BAND )**
**DOWNLINK ( A-BLOCK )**

## Test Data --- Spurious Emissions at Antenna Terminals

**Data Plot** **Intermodulation Characteristics TDMA**

Page 1 of 1 Complete X

Job No.: 1L0242R Date: 5/21/01 Preliminary

Specification: Part 24 Temperature(°C): 22

Tested By: Chinda Poy Relative Humidity(%) 50

E.U.T.: Cell Extender

Configuration: Tx Full Power

Sample Number:

Location: Lab 2 RBW: Refer to plots

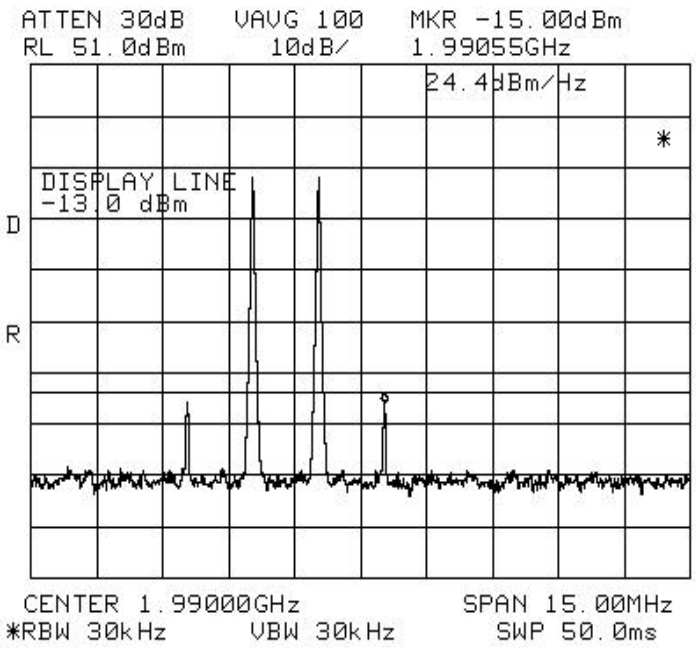
Detector Type: Peak VBW: Refer to plots

**Test Equipment Used**

| | | | |
|---|---|---|---|
| Antenna: | | Directional Coupler: | |
| Pre-Amp: | | Cable #1: | 1045 |
| Filter: | | Cable #2: | |
| Receiver: | 1464 | Cable #3: | |
| Attenuator #1 | 1064 | Cable #4: | |
| Attenuator #2: | 1065 | Mixer: | |

Additional equipment used:

Measurement Uncertainty: +/-3.6 dB




**Notes:** **TDMA INTERMOD UPPER BAND ( OUT OF BAND )**
**DOWNLINK ( C-BLOCK )**

## Section 6. Field Strength of Spurious

| | |
|---|---|
| NAME OF TEST: Field Strength of Spurious Emissions | PARA. NO.: 2.1051 |
| TESTED BY: Chinda PoyTTidwell | DATE: 5/21/01 |

**Test Results:** Complies.

**Test Data:** See attached table.

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

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

**Temperature:** 22 °C

**Relative Humidity:** 48 %

**Test Data - Radiated Emissions - Uplink**

# Not Applicable

## Test Data - Radiated Emissions - Downlink

### Field Strength of Spurious Emissions

Page 1 of 1 — Complete X — Preliminary

Job No.: 1L0242R — Date: 5/21/01
Specification: PART 24 — Temperature(°C): 22
Tested By: Chinda Poy — Relative Humidity(%): 48
E.U.T.: CELL EXTENDER
Configuration: TX FULL POWER
Sample No:
Location: AC 2 — RBW: 1 MHz — Measurement Distance: 3 m
Detector Type: Peak — VBW: 1 MHz

**Test Equipment Used**

Antenna: 993 — Directional Coupler:
Pre-Amp: 1016 — Cable #1: 1484
Filter: — Cable #2: 1485
Receiver: 1464 — Cable #3:
Attenuator #1 — Cable #4:
Attenuator #2: — Mixer:
Additional equipment used:
Measurement Uncertainty: +/-3.6 dB

| Frequency (MHz) | Meter Reading (dBm) | Correction Factor (dB) | | Pre-Amp Gain (dB) | Substitution Antenna Gain (dBd) | | ERP (dBm) | ERP (mW) | Polarity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 3880 | -35.8 | 40.4 | | 33.3 | 8.0 | | -20.7 | 0.01 | V | |
| 5820 | -42.0 | 38.5 | | 32.8 | 9.1 | | -27.2 | 0.00 | V | |
| 7760 | -35.3 | 40.4 | | 33 | 9.4 | | -18.4 | 0.014322 | V | |
| 9700 | -46.8 | 40.4 | | 36.1 | 10.5 | | -32.0 | 0.000637 | V | |
| 11640 | -48.0 | -49.3 | | 36.1 | 11.0 | | -122.4 | 0.000000 | V | |
| 13580 | -57.7 | 47.6 | | 34.2 | 10.4 | | -33.9 | 0.000411 | V | |
| 15520 | -60.8 | 43.2 | | 34.5 | 13.6 | | -38.5 | 0.00 | V | NOISE FLOOR |
| 17460 | -60.3 | 47.0 | | 34.7 | 11.7 | | -36.2 | 0.00 | V | NOISE FLOOR |
| 19400 | -61.2 | 53.1 | | 34.3 | 6.4 | | -36.1 | 0.000248 | V | NOISE FLOOR |
| | | | | | | | | | | |
| 3880 | -36.8 | 34.3 | | 33.3 | 8.0 | | -27.8 | 0.001671 | H | |
| 5820 | -37.3 | 36.0 | | 32.8 | 9.1 | | -25.0 | 0.003133 | H | |
| 7760 | -37.7 | 39.8 | | 33 | 9.4 | | -21.5 | 0.01 | H | |
| 9700 | -47.8 | 42.6 | | 36.1 | 10.5 | | -30.8 | 0.000836 | H | |
| 11640 | -47.5 | 46.0 | | 36.1 | 11.0 | | -26.6 | 0.002208 | H | |
| 13580 | -59.0 | 50.8 | | 34.2 | 10.4 | | -32.0 | 0.000638 | H | NOISE FLOOR |
| 15520 | -59.3 | 44.0 | | 34.5 | 13.6 | | -36.2 | 0.000239 | H | NOISE FLOOR |
| 17460 | -60.3 | 50.5 | | 34.7 | 11.7 | | -32.8 | 0.000528 | H | NOISE FLOOR |
| 19400 | -61.5 | 54.6 | | 34.3 | 6.4 | | -34.8 | 0.000334 | H | NOISE FLOOR |
| | | | | | | | | | | |
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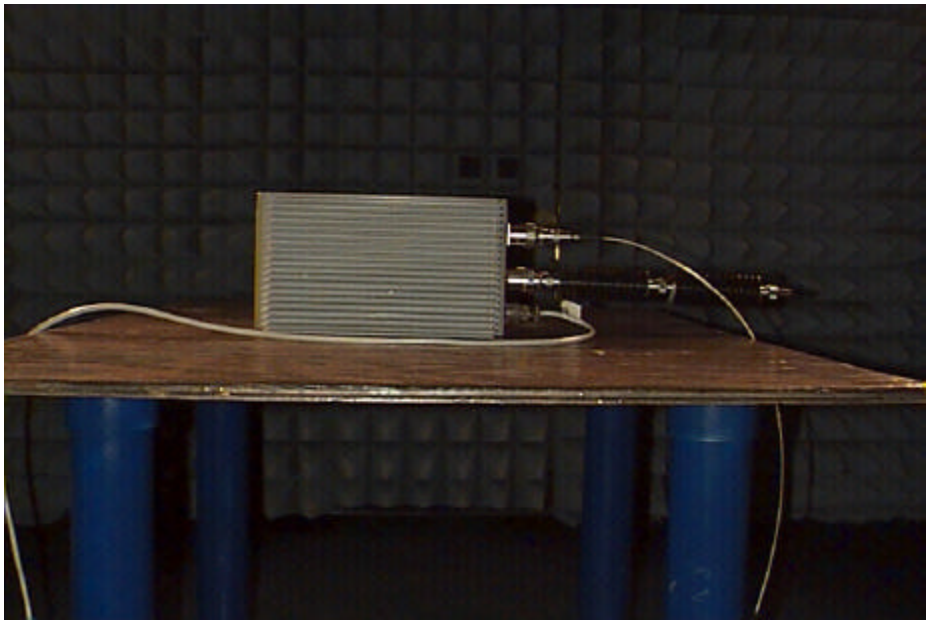
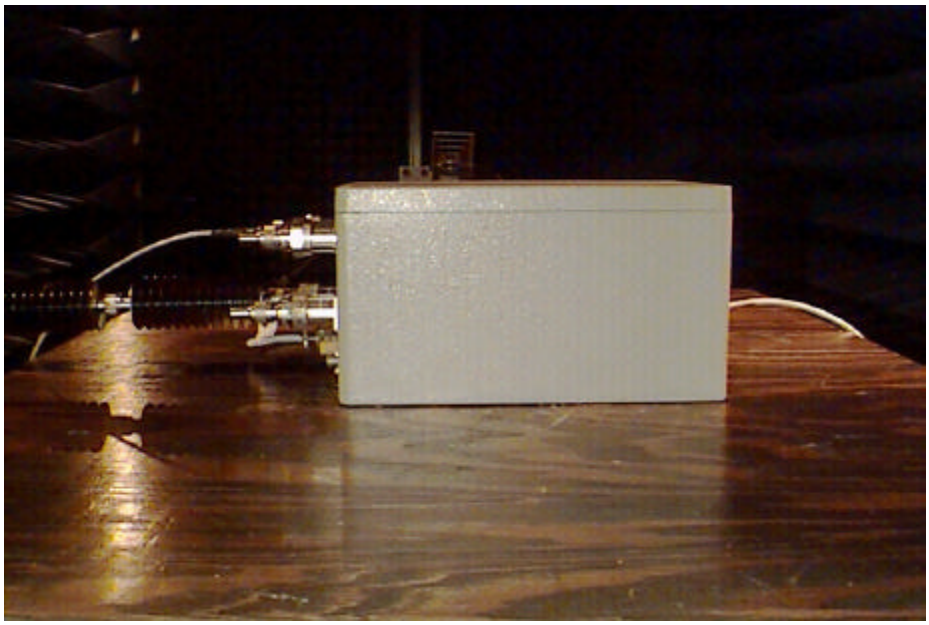
**Notes:** **Scanned to the 10th Harmonic**

## Photographs of Test Setup

FRONT VIEW



REAR VIEW



## Section 7. Frequency Stability

| | |
|---|---|
| NAME OF TEST: Frequency Stability | PARA. NO.: 2.1055 |
| TESTED BY: TTidwell | DATE: |

**Test Results:** Complies.

**Measurement Data:** See attached table.

Standard Test Frequency: MHz
Standard Test Voltage:



**Equipment Used:**

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

**Lab Temperature:** °C

**Relative Humidity:** %

## Section 8. Test Equipment List

| ASSET | Description | Manufacturer Model Number | Serial Number | Cal. Date | Cal. Due |
|---|---|---|---|---|---|
| 1464 | Spectrum analyzer | Hewlett Packard 8563E | 3551A04428 | 01/02/01 | 01/02/02 |
| 993 | Horn antenna | A.H. Systems SAS-200/571 | XXX | 07/16/99 | 07/16/01 |
| 1016 | AMPLIFIER | HEWLETT PACKARD 8449A | 2749A00159 | 05/24/00 | 05/24/01 |
| 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 |
| 1064 | ATTENUATOR | NARDA 776B-20 | NONE | CBU | N/A |
| 1065 | ATTENUATOR | NARDA 776B-10 | NONE | CBU | N/A |
| 1045 | CABLE 2m | Astrolab Inc. 32027-2-29094-72TC | N/A | 05/23/00 | 05/23/01 |
| | | | | | |
| | | | | | |

# 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:**

Detachable Antenna:
The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

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

| **NAME OF TEST: Occupied Bandwidth** | **PARA. NO.: 2.1047** |
|---|---|

**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

Spectrum analyzer settings:
RBW: 30 kHz
VBW: ≥ RBW
Span: 5 MHz
Sweep: Auto
Mask: Set markers to -26 dB from peak of CW.

GSM

RBW: 3 kHz
VBW: ≥ RBW
Span: 2 MHz
Sweep: Auto
Mask: Set markers to -26 dB from peak of CW.

NADC

RBW: 1 kHz
VBW: ≥ RBW
Span: 1 MHz
Sweep: Auto
Mask: Set markers to -26 dB from peak of CW.

**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

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

GSM

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: Disabled

NADC

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 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 upper 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)

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

| **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:**

Frequency Stability With Voltage Variation

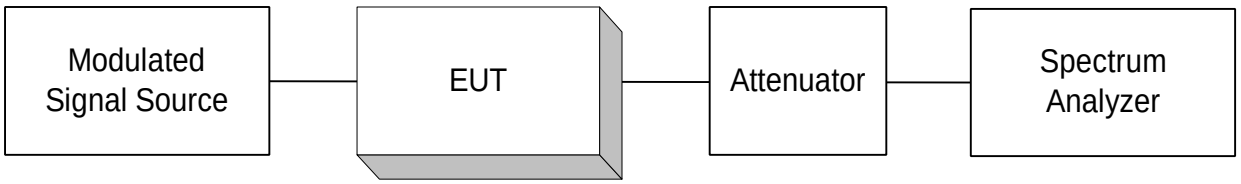
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the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

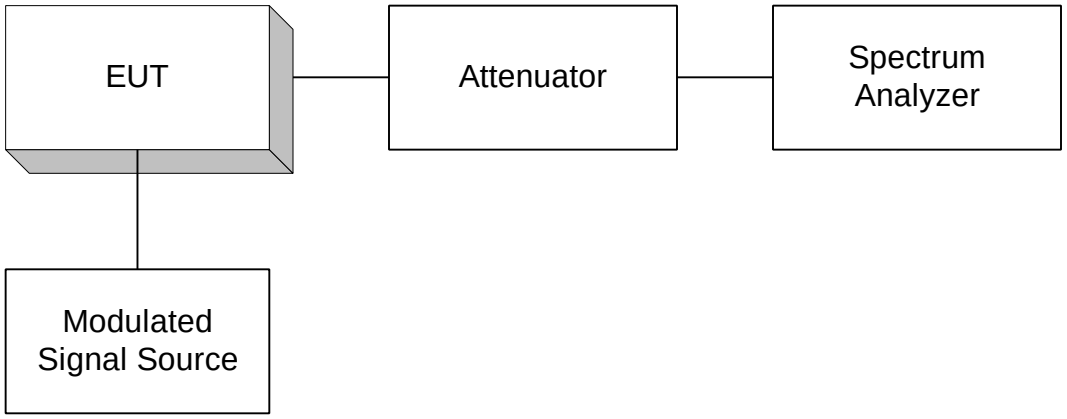
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

# ANNEX B - TEST DIAGRAMS

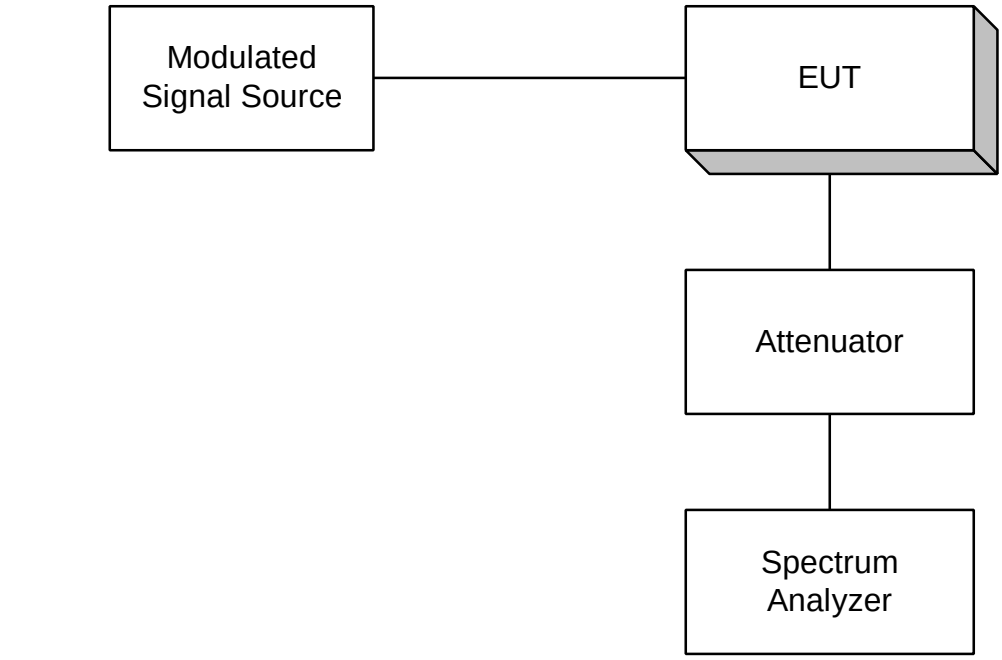
**Para. No. 2.985 - R.F. Power Output**

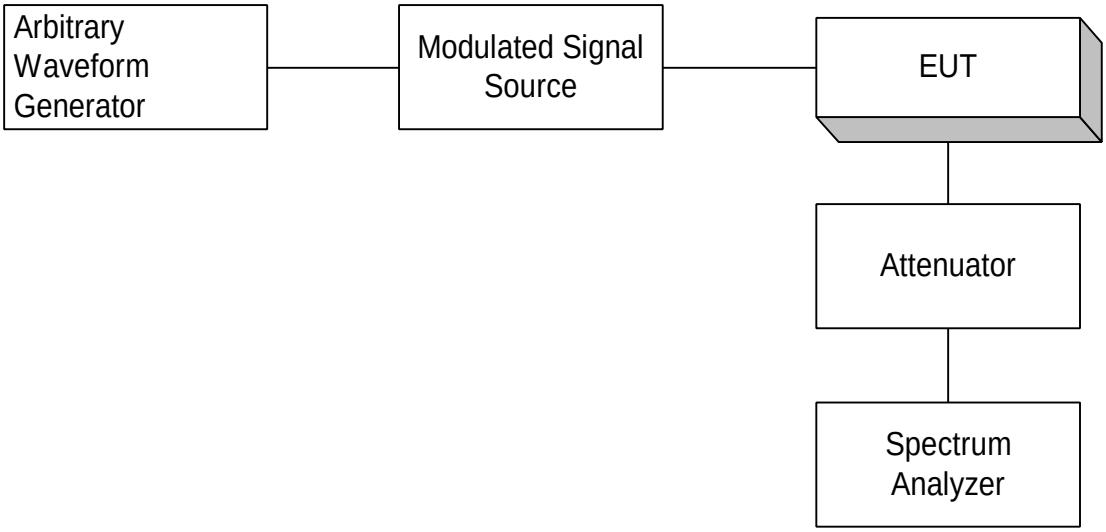



**Para. No. 2.989 - Occupied Bandwidth**

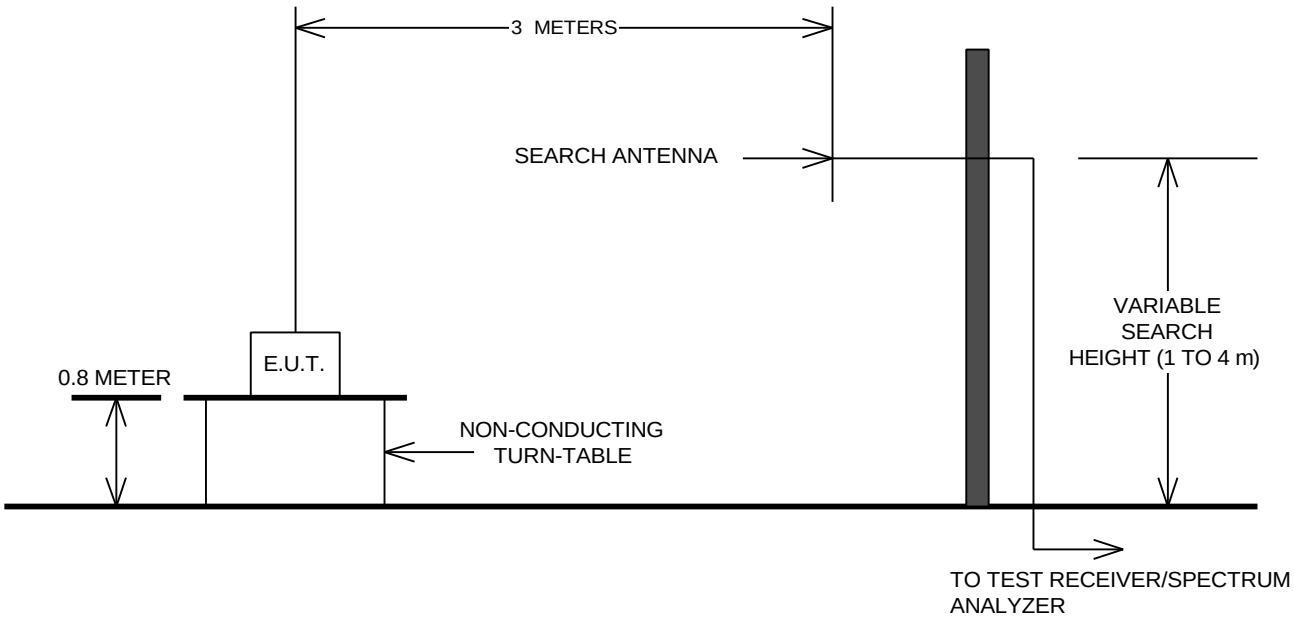


**Para. No. 2.991 Spurious Emissions at Antenna Terminals**



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




## Para. No. 2.995 - Frequency Stability